

ES BEAMTOOL 7

FAST, EASY, OPEN TECHNIQUE
DEVELOPMENT FOR NDT



USER'S MANUAL

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BeamTool 7 User Manual Edition 2015

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CHAPTER (1): WELCOME TO BEAMTOOL 7



The original BeamTool was created to provide a quick and easy way to do simple ray tracing by allowing the user to specify a piece with a weld and add wedge(s) and transducer(s) to display a beam path.

BeamTool is now in its seventh generation, and offers users many features:

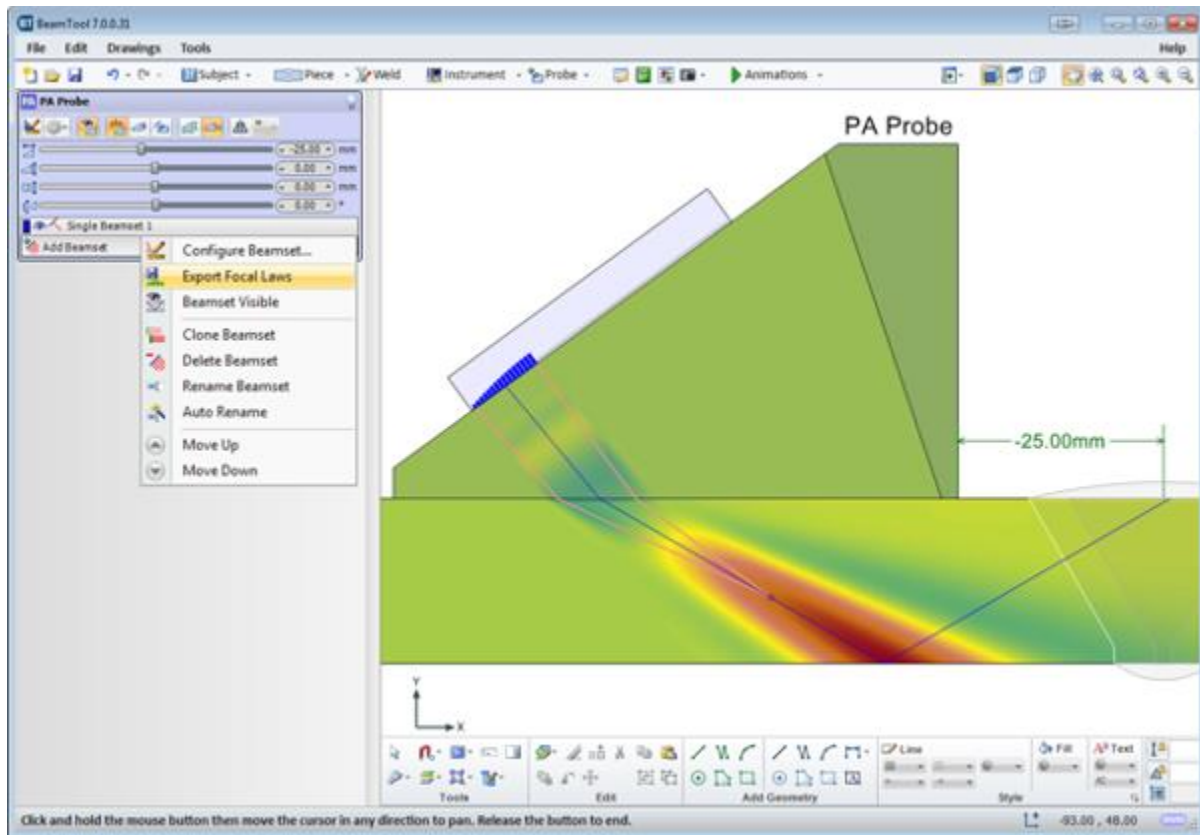
- CAD Layers: used to control a group of graphics. Layer visibility can be turned on or off. Control graphics by locking and unlocking layers so they are not accidentally modified.
- CAD Tools: interactive rotate and move tools, rotate geometries commands (90 and 180 degrees), new rotate geometry construction aid, remove duplicate geometries command.

- Piece and Annotative Geometries: circle geometry, rotatable rectangle geometry, rotatable bitmap geometry.
- Restructured CAD Toolbar: display settings and snap settings pop-ups, new add geometry popup.
- Contact and immersion support for conventional and phased array probes.
- TOFD probe elevation offsetting. This allows the use of a pair of TOFD probes on a piece with different thicknesses.
- ID/OD pinning for TOFD probes
- Improved near field calculations based on equations by Udo Schlengermann and KFactor Polynomials
- Material properties for polygons can now be configured via the geometry context menu.
- Beam refraction through geometries with dissimilar materials.
- Single beam beamset. This new beamset is useful when developing zonal techniques.
- Improved probe visualization: wedge damping visualization to phased array wedges, transducer orientation visualization on phased array, transducer visualization on top view, beamset element usage visualization on reports.
- Equipment management for instrument configuration and validation.
- **Calibration Block Designer** - Design custom calibration blocks and generate reports that include all aspects of a calibration block to support machining. Built to comply with ASME code stipulations using target measuring tools
- **Wedge Drawings** - new auto wedge drawing generation features makes it easy to automatically generate fully dimensioned wedge drawings with all of the important dimensions clearly labeled. Everything you need to have a custom wedge manufactured to properties entered into an instrument or application is presented in black and white.
- Backing Bar - a backing bar can now be added and configured in a plate piece configuration.
- Show Snell's Law - Displays a visualization of Snell's Law where the beam refracts into the piece. This option is available for **Single Beamsets**, **Reference Beamsets**, and UT Probe Configuration.
- Recents - As you use BeamTool, the software will remember which transducers, wedges and equipment you commonly use. The recently used probes and wedges will be available for quick access from a drop-down menu, without having to import from a file or our extensive catalog.
- Crop Mode - beams can now be cropped in distance and time as well as the traditional skips.
- Side Probe Bar - provides the full readout of the probe menu but is pinned to the left hand side of BeamTool.
- **Probe Identifier** - allows the user to quickly identify the configuration options for the selected probe in a multi-probe workspace.
- **Geometry Navigator** - allows you to visualize, highlight and select all of the geometries in a drawing.
- **Materials** - users can now define create a custom library of materials that they commonly use. Seamless integration makes it easy to implement any material you need.
- **Drawings** - a powerful set of tools that allow users to create and manage additional drawings within a single BeamTool workspace. Drawings can be used for wedge drawings, HighTemp Management, additional piece drawings or any other kind of drawing that helps support a technique.

- Info Tips - provides additional information in a flash. Just hover over the light bulb icon on a probe box and the Info Tips pops up with relevant information about the probe, its beams, transducer properties, etc. This information would normally be available in a BeamTool report, but now you can get a live update to aid in your technique design.
- **Application Tips** - mini lessons designed to help you get the most out of BeamTool. Application Tips can be displayed automatically when BeamTool starts and are available anytime from the Help menu.
- Geometry Alignment - aligns objects horizontally or vertically relative to each other. Objects are positioned relative to the first object selected.
- **Full Matrix Capture Beamset** - a specific data-acquisition processing using ultrasonic phased-array probes. For an array of N elements, each element is successively used as a transmitter, while all other elements are used to receive.
- Zoom Selected - zooms to fit the selected geometry.
- Trim Tool - the new interactive trim tool allows users to easily trim intersecting lines to precise lengths.
- Improved InspectionBank Integration

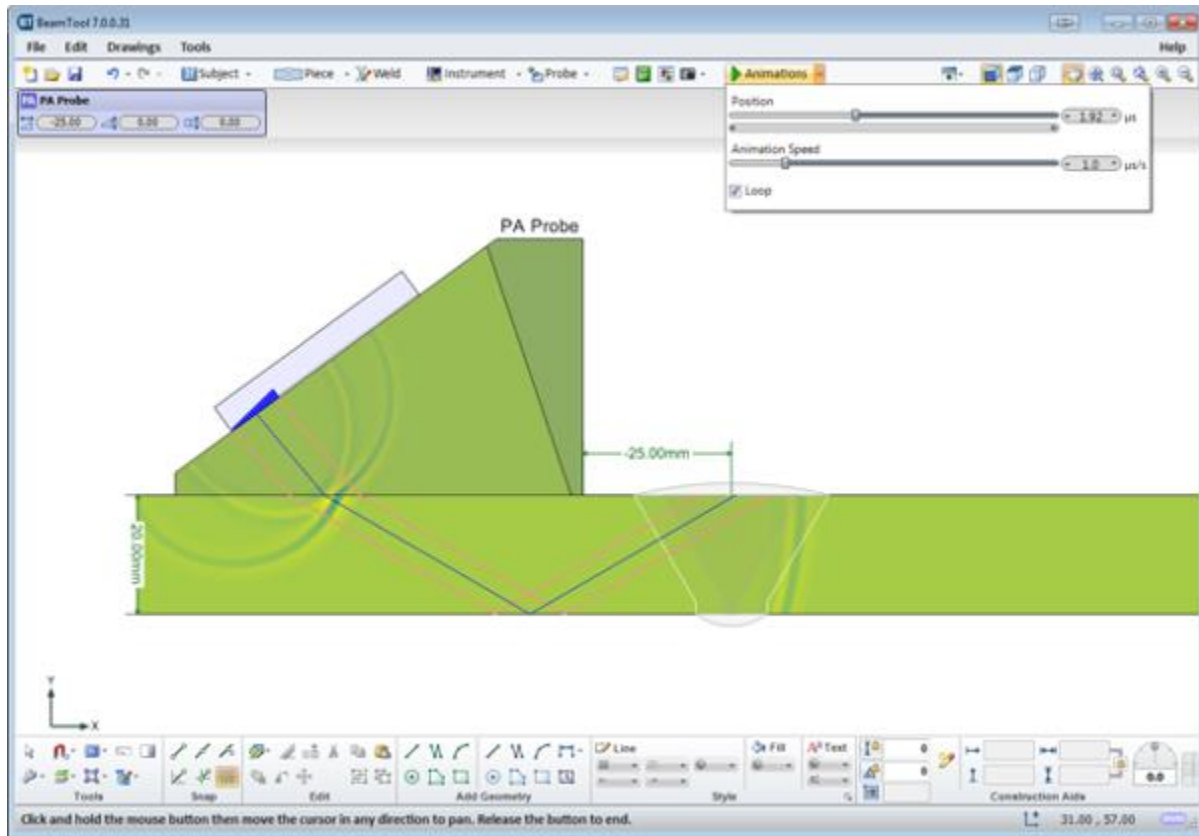
CHAPTER (2): NEW IN BEAMTOOL 7

[Export Focal Laws](#) (Focal Law Calculator) - Exports a law file based on your beamset configuration. Law files can be imported into an instrument by technicians to greatly decrease setup time.

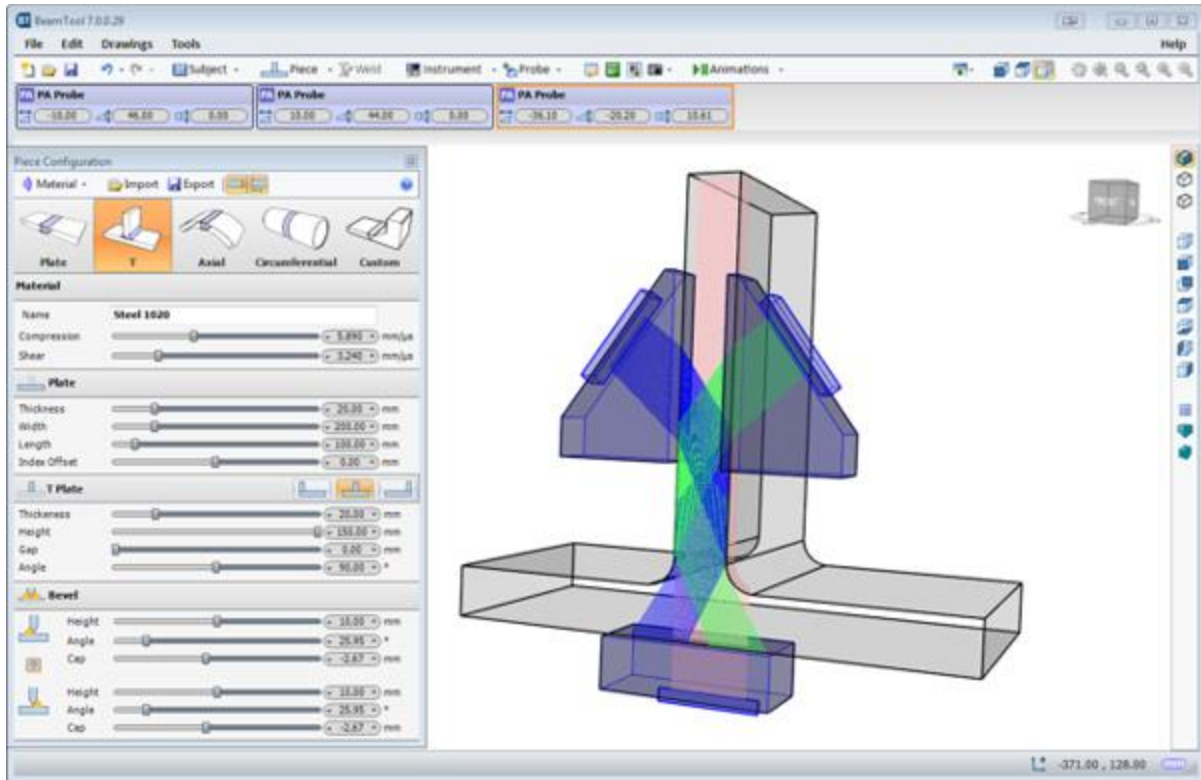


[Simulation Module](#) (A-scan & Sound Field Animation) - The A-Scan Add-on Module has been revamped in BeamTool 7. The module has been renamed to Simulation Add-on Module and now also includes the Sound Field Animation features. [Sound Field Animation](#) shows how elements firing in a phased array probe constructively form a wave front and how that wave front propagates into the piece.

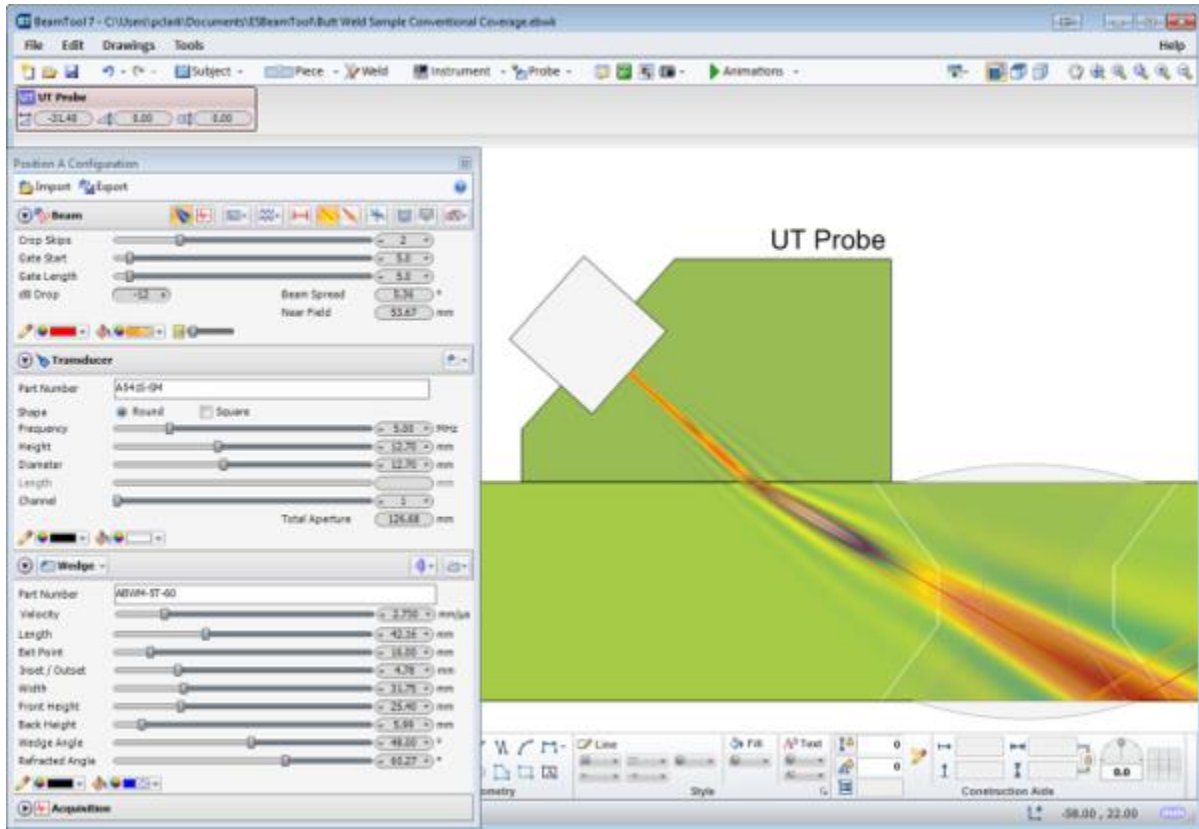
Correct Focal Laws for High Temp



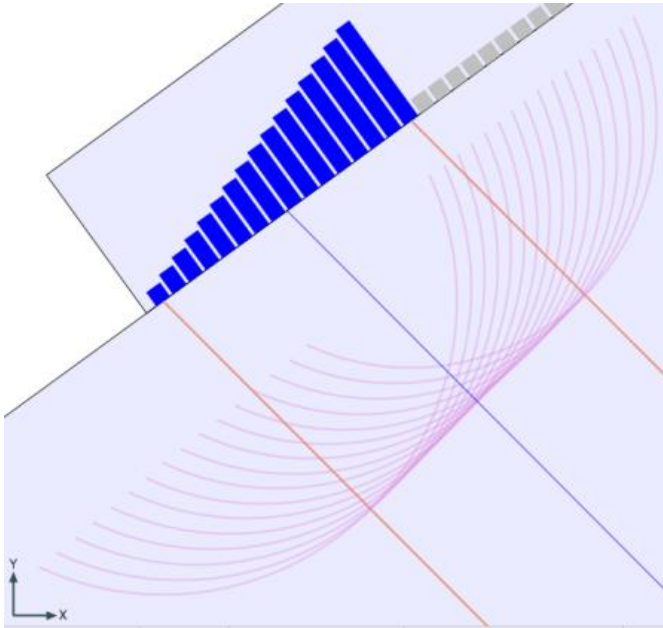
[T Piece Configuration](#) - improved and simplified way to configure L and T shape welded components from easy to configurable menu.



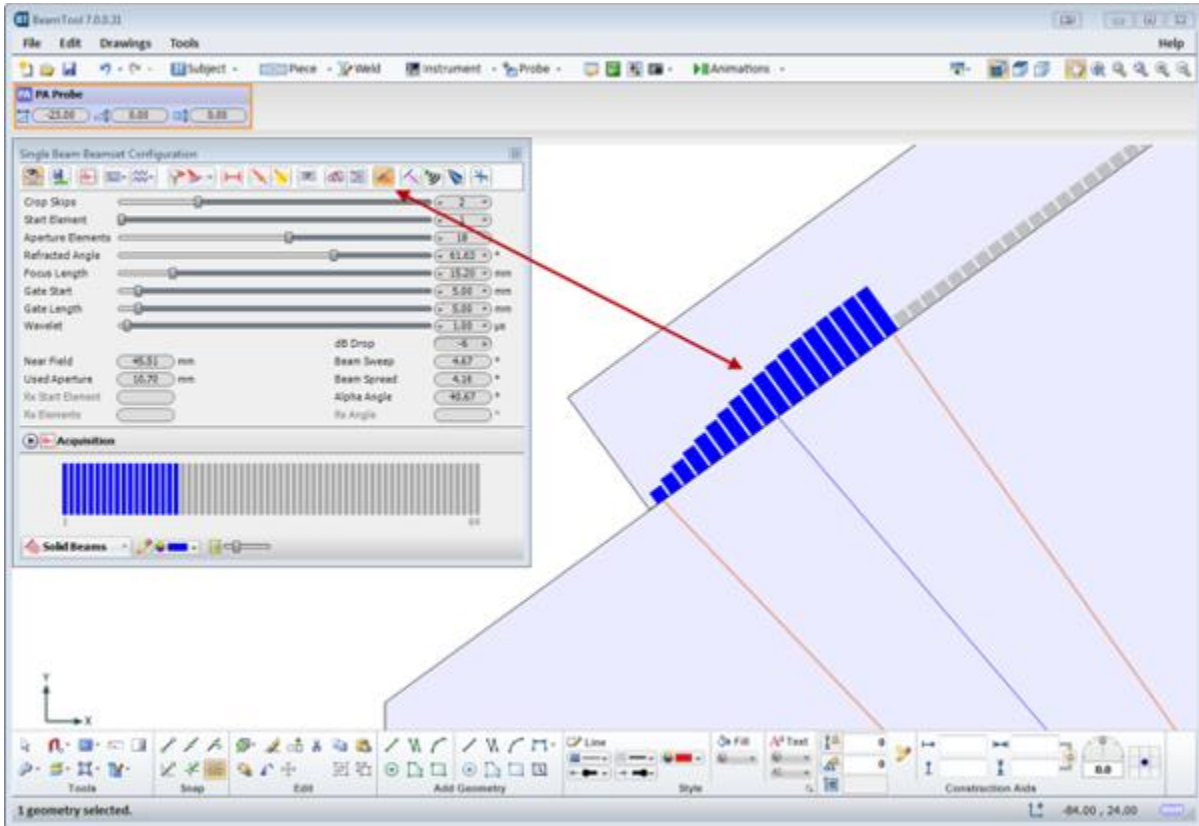
[Sound Pressure Visualization](#) - a powerful educational tool for rendering sound pressure at any point in the field represented by a geometric or bitmap wavefront. Using real field physics the wavefront can be focused, and even steered, by adding a time delay to change the refracted angle. This option is available for Single Beam Beamsets and Conventional UT Probes.



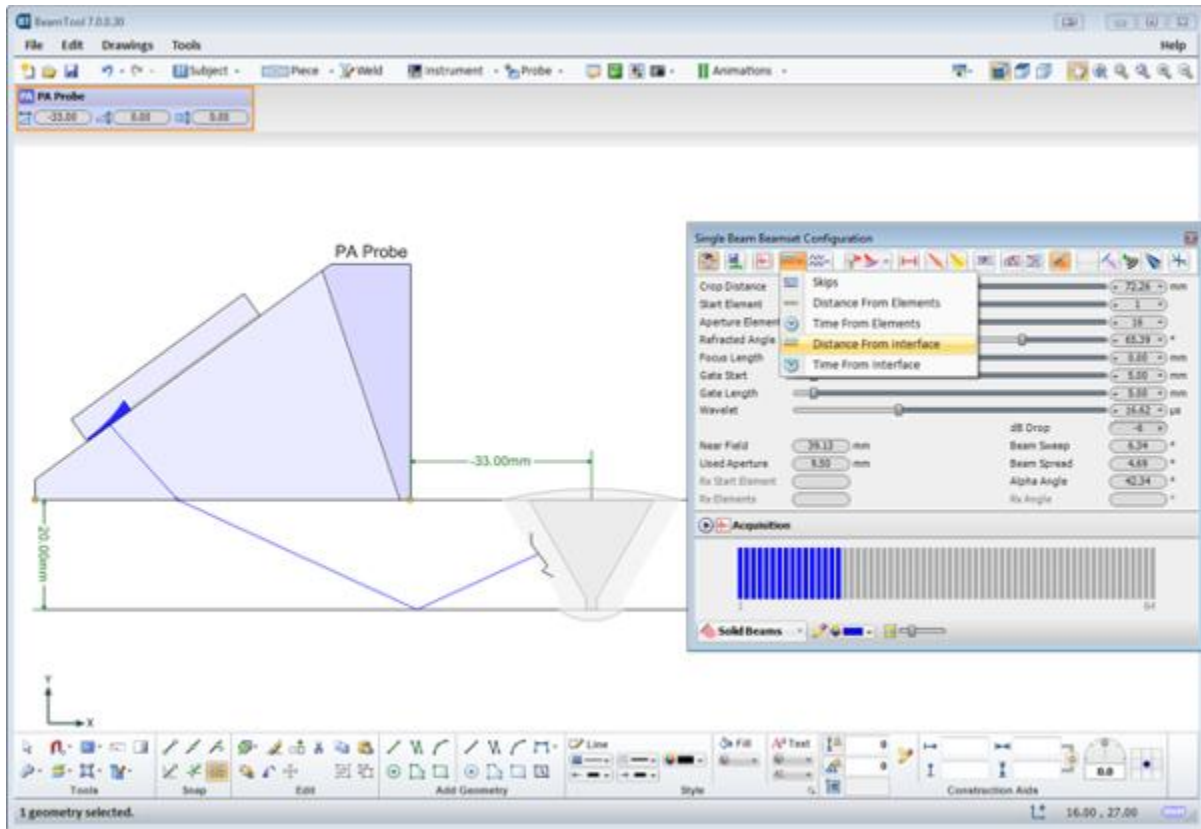
[Wavelet Visualization](#) - displays the wavelets for each individual element at a selected time in microseconds (Single Beamset only).



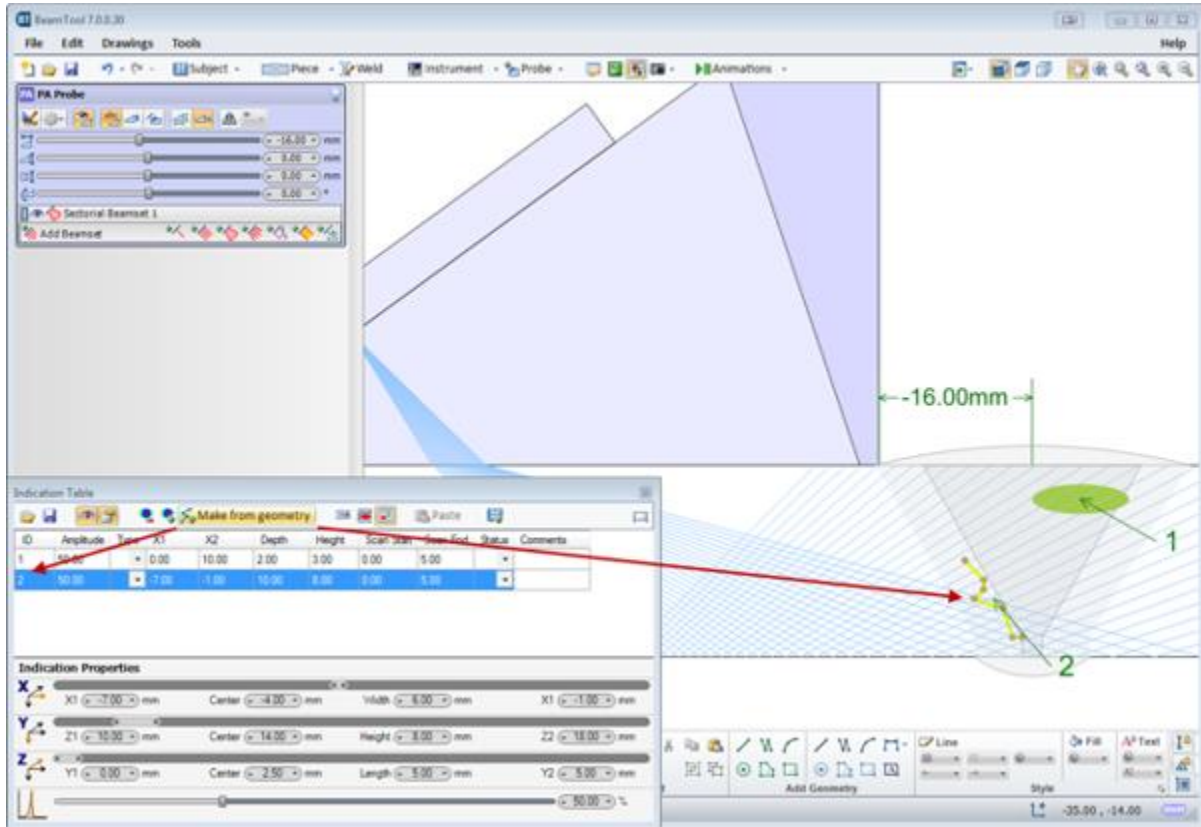
[Focal Delay Visualization](#) - the Show Elements option for Single Beamsets will now live reflect the focal delays as beam parameters are modified.



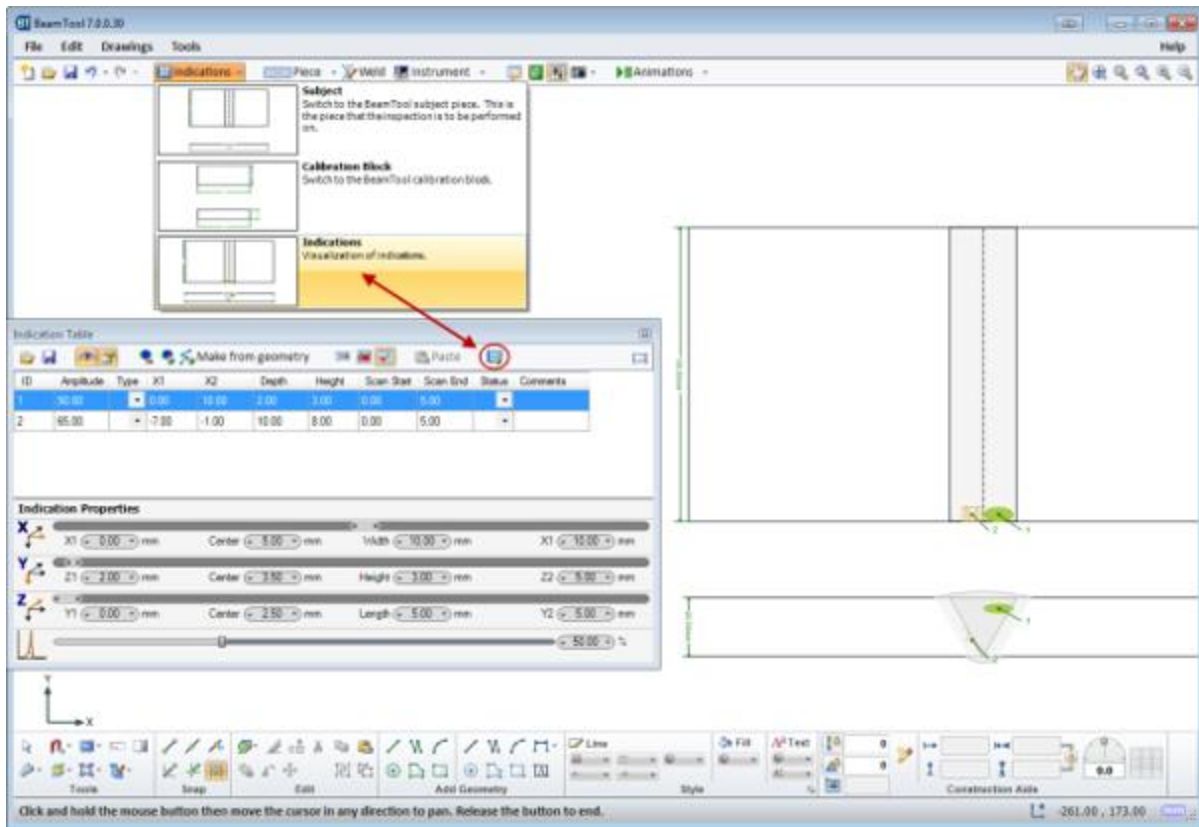
[Additional Crop Modes](#) - users now have the option to crop beams at Distance from Interface and Time from Interface.



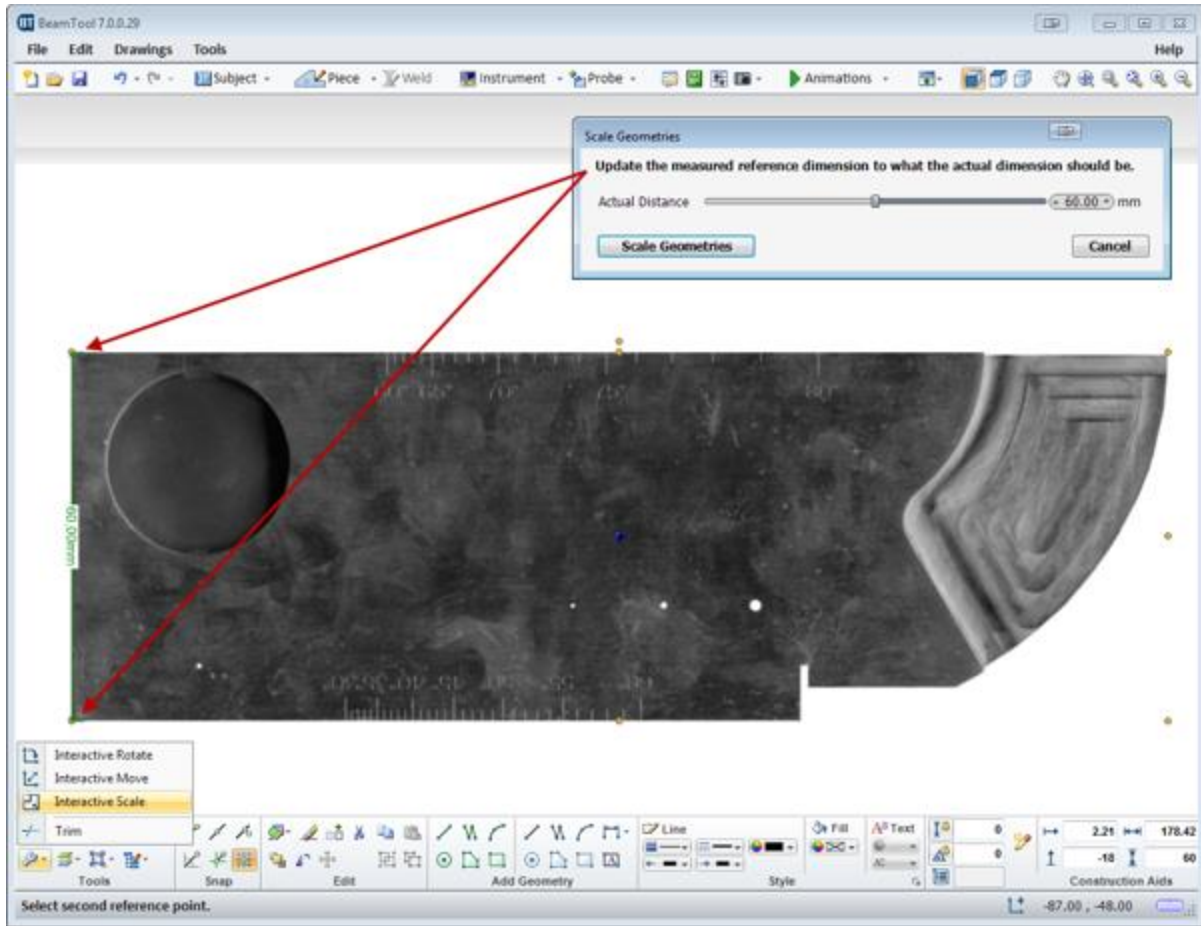
[Make Indication from Geometry](#) - indications can now be added to the indication table from selected geometries in the workspace.



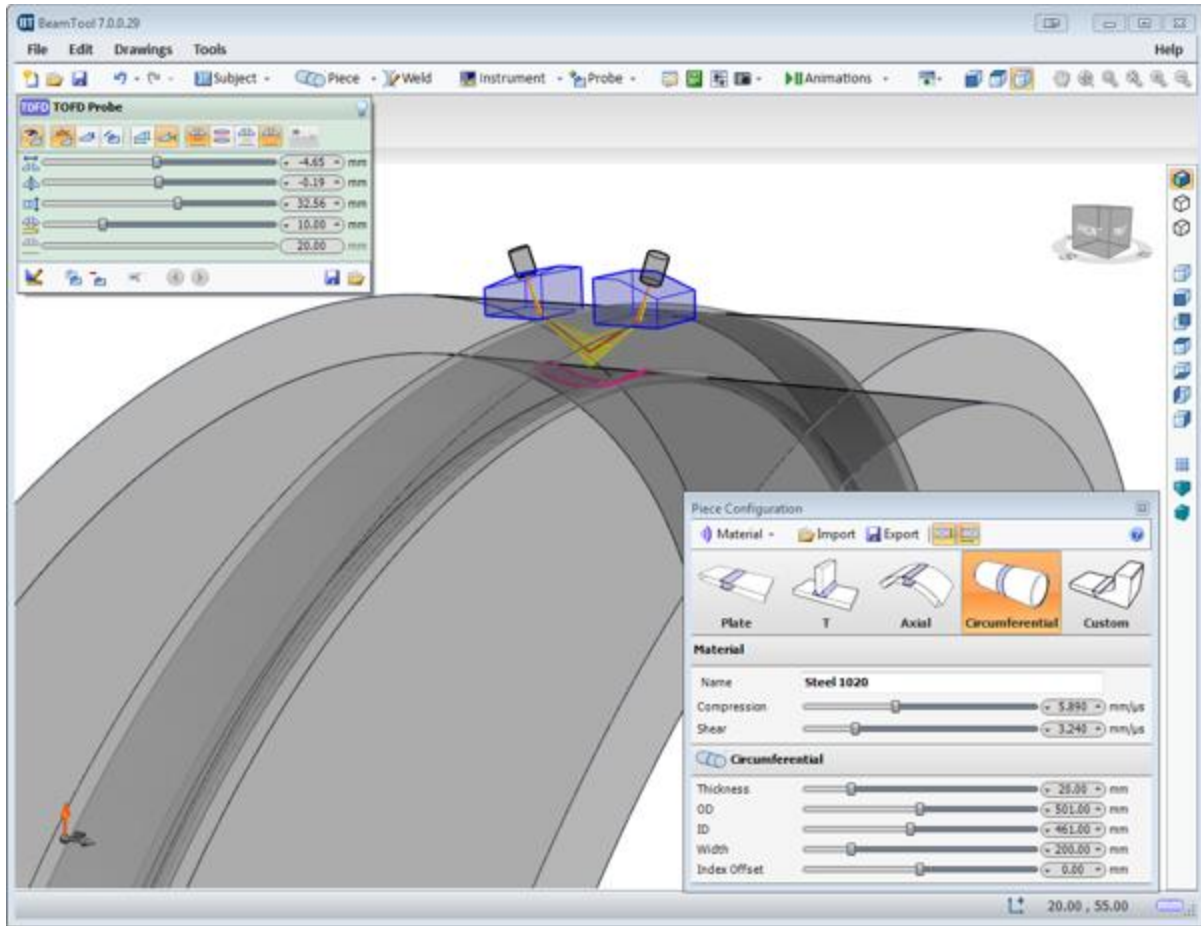
[Add Drawing Set for Indications](#) - Indication drawing sets can now be added to the workspace.



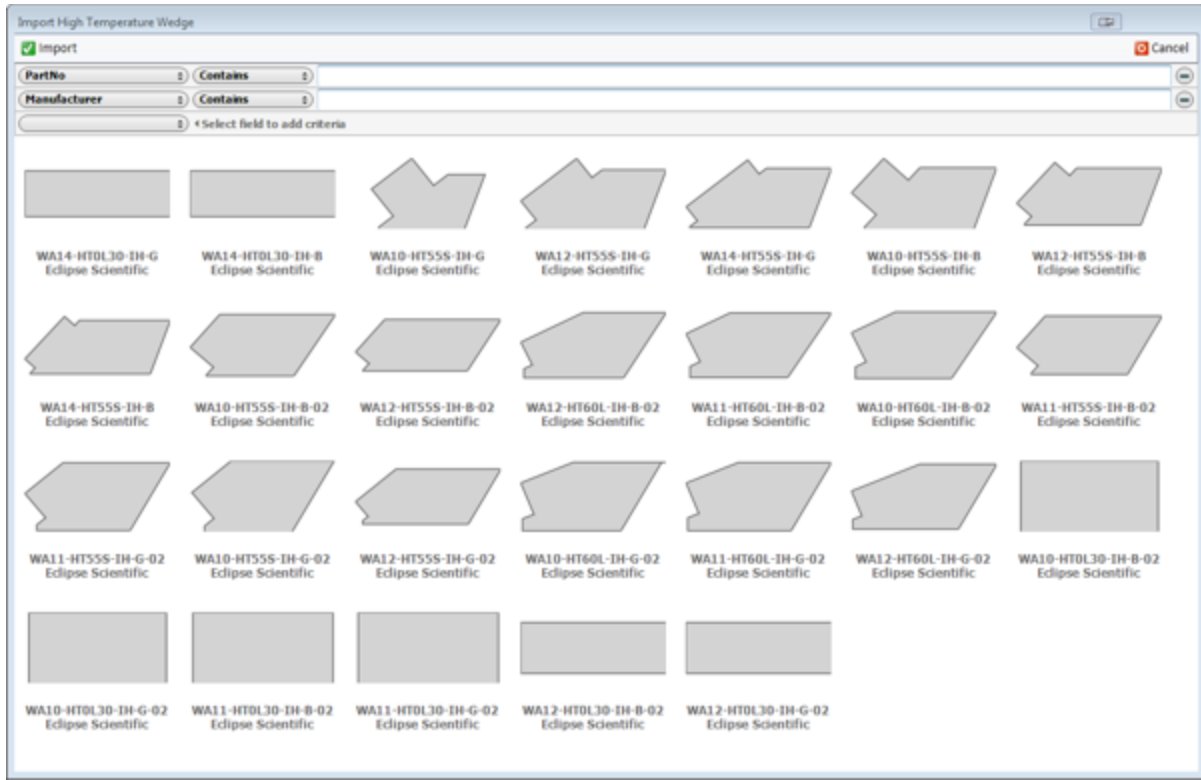
[Interactive Scale](#) - allows users to easily scale images and geometries to precise measurements.



[3D Rendering of Circumferential Piece](#) - circumferential pieces are now properly represented in 3D View.



[New Wedges in HighTemp Catalog](#) - the High Temp catalog has been populated with several new Eclipse Scientific High Temp probes.
















CHAPTER (3): GETTING STARTED

BeamTool gives the user the ability to quickly define typical inspection parameters to rapidly and clearly present technique development. Its intuitive user interface allows a user to be productive immediately after installation without spending a lot of time learning how to use it.

Hovering the mouse over a button or menu option will pop up a "Super Tooltip". Super Tooltips provide readily available explanations for all buttons and visual picklists allow for a preview before the command is executed.

3.1 CREATING A TYPICAL TECHNIQUE

Creating a typical technique can be quickly and easily achieved:

1. Start with the default Simple Plate or select an ID/OD Piece or use  [Piece Geometries](#) to define your own.
2. Configure your  [Piece and Weld](#) (using a  [Plate](#),  [T](#),  [Axial](#),  [Circumferential](#) or  [Custom Piece](#)).
3.  [Add](#) and  [Configure](#) Probes.
4.  [Add](#) and  [Configure](#) Beams.
5. Add  [Geometries](#).
6. Create  [Reports](#).

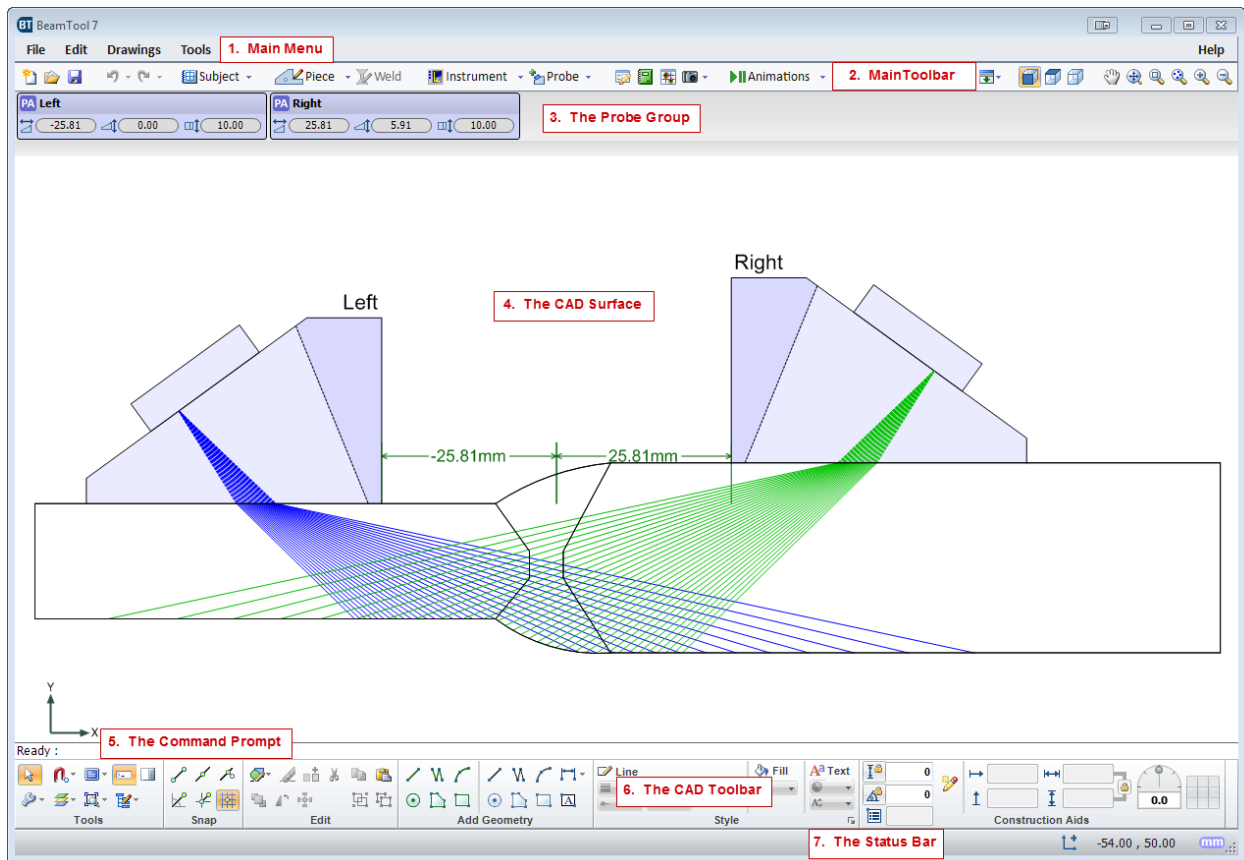
In addition, [custom reports](#) can be created and graphics can be easily [exported](#) to other applications.

CHAPTER (4): MENUS, TOOLBARS & LAYOUT

4.1.1 MENUS, TOOLBARS & LAYOUT

The BeamTool layout is divided into seven major sections:

1. [The Main Menu](#) - Access to workspace management and other tools
2. [The Main Toolbar](#) - Quick and easy access to workspace management and other tools
3. [The Probe Groups](#) - Access to Probe configuration
4. [The CAD Surface](#) - Visualization and manipulation of piece, probes, and geometries
5. [The Command Prompt](#) - The Command Prompt is a precision drawing tool used to quickly draw and edit geometries with specific dimensions
6. [The CAD Toolbar](#) - Access to CAD configuration and manipulation tools
7. The Status Bar - Provides status updates on CAD tool usage, surface navigation, workspace management, etc.



4.2 MAIN MENU

BeamTool's **Main Menu** provides access to workspace management and other various tools. The three sub-menus accessible from the main menu are:

- [File](#) - Access to workspace and document management options and tools
- [Edit](#) - Access to various editing tools.
- [Drawings](#) - Access to tools for creating and managing drawing sets.
- [Tools](#) - Access to various information and operational tools. The BeamTool [Options](#) dialog is also accessed from the Tools menu.
- [Help](#) - Access to documentation and BeamTool product options.

4.2.1 FILE MENU

There are a number of options located under the File menu.

New Workspace

Creates a new workspace displaying default values for piece and probe.

Open Workspace

Allows the user to open a previously saved workspace. A workspace preview pane is available in the Open Workspace window providing a thumbnail view of the workspace currently selected.

Recent Files

Displays a list of the most recently opened workspaces. A workspace can be opened by selecting from this list.

Save Workspace

Allows the user to save the current workspace. If the workspace has not been previously saved the Save Workspace dialog will appear allowing the user to specify the workspace filename. If the workspace has been previously saved the workspace will be re-saved (overwrite) to the existing workspace filename.

Save Workspace As

Allows the user to save the current workspace. Displays the Save Workspace dialog every time, allowing the user to specify a new workspace filename or overwrite the existing workspace filename.

Page Setup

Allows the user to setup the page properties when printing a workspace.

Print

Allows the user to print the available drawing sets in the workspace. See [Print Drawings](#) for more information.

Import

Allows the user to import graphics from an external file. Click [here](#) for help on using Import.

Export

Allows the user to export the graphics displayed in the drawing. Click [here](#) for help on using Export.

 **Report**

Allows the user to create reports from the data specified. Click [here](#) for help on using the Report option.

 **Document Info**





Can be used to store notes related to a workspace. This information can also be added to report templates.

 **Exit**

Exits BeamTool.

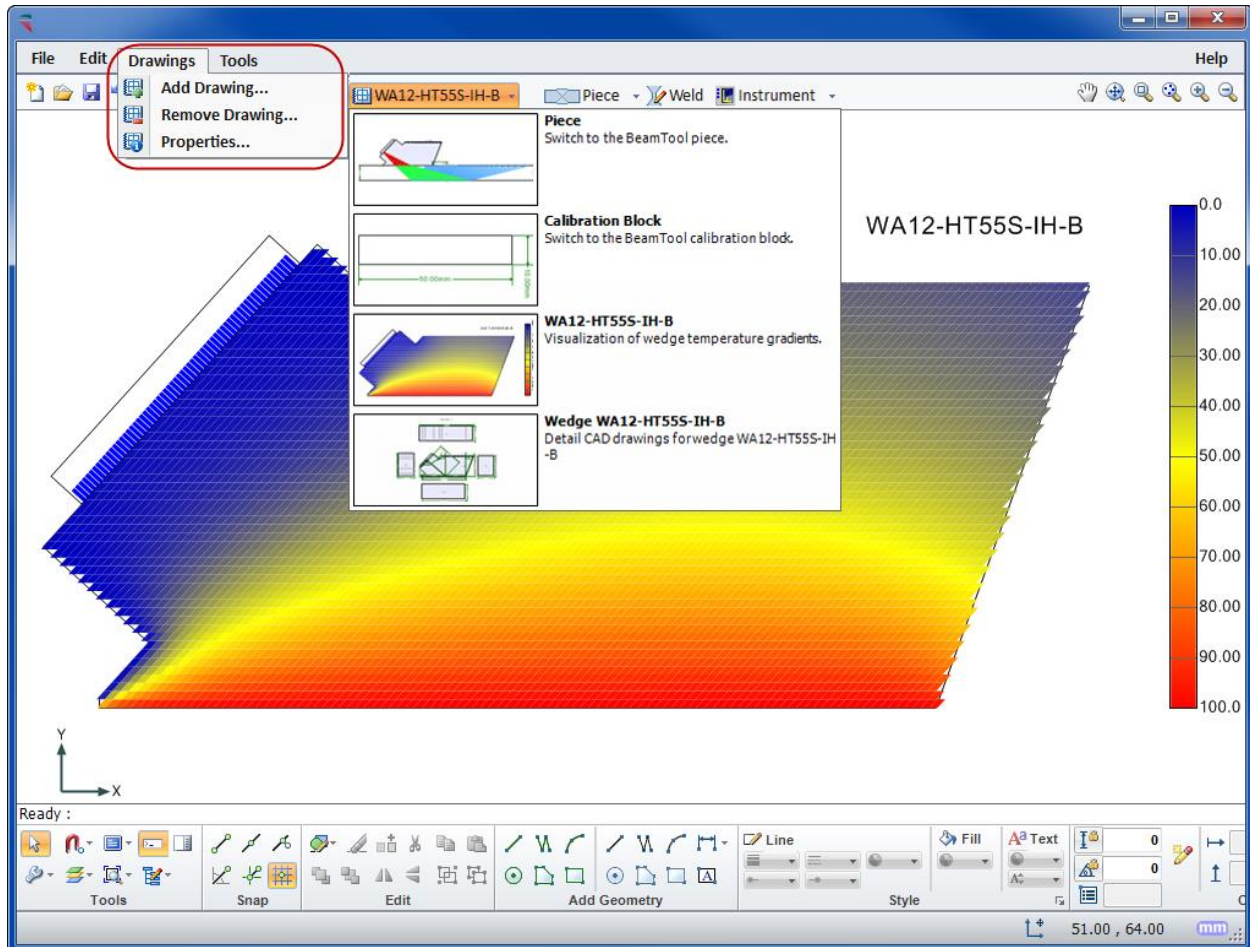
4.2.2 EDIT MENU

There are a number of options located under the Edit menu.


 Undo	Erases the last modification done to the workspace.
 Redo	Brings back the last removed modification to the workspace.
 Snapshot Image	Copies an image of the workspace to the clipboard.
 Snapshot Metafile	Copies a metafile of the workspace to the clipboard.


4.2.3 DRAWINGS


Drawings is a powerful set of tools that allow users to create and manage additional drawings within a single BeamTool workspace. Drawings can be used for calibration blocks, wedges, HighTemp management, indications, additional piece drawings or any other kind of custom drawing that helps support a technique. You can quickly print all of the drawing sets or customize the print job to specific drawings and specific views (see [Printing](#) for more information).




4.2.3.1 DRAWING MENU OPTIONS

 **Add Drawing** - Opens the Drawing Properties dialog box where you can name and describe the drawing you want to add. After the drawing properties have been defined, the CAD Surface area will change from the "Subject" drawing to a blank CAD Surface where you can create the new drawing. The new drawing will be available from the Active Drawing drop-down menu found on the [Main Toolbar](#).

 **Remove Drawing** - Removes the active drawing from the CAD surface and the Subject/Drawing/CalBlock drop-down menu found on the [Main Toolbar](#).

 **Properties** - Opens the Drawing Properties dialog box the name and description of the drawing are defined.

4.2.3.2 *ADD DRAWINGSET LOCATIONS*

BeamTool has the ability to automatically generate drawing sets for specific items. The  Add Drawingset button can found in the Phased Array Probe Configuration dialog box (in the Wedge options drop-down menu) , the HighTemp Wedge dialog box, the CalBlock Designer dialog box, the ZonalCalBlock Designer dialog box, and the Indication Table dialog box.

4.2.4 TOOLS MENU

These are the tools that can be found under the Tools menu.

Geometry Inspector

The [Geometry Inspector](#) allows advanced users to manipulate Piece and Annotation geometries at a lower level than that of the CAD Tools.

Command Prompt

The [Command Prompt](#) is a precision drawing tool used to quickly draw and edit geometries with specific dimensions.

Convert Simple Piece to Custom

Converts the Simple Piece plate into individual custom geometries allowing you to manipulate the piece geometries.

NOTE - When using this tool proceed with caution. Please remember that any existing geometries and annotations that have been added to the workspace will be erased.

Delete Duplicate Geometries

Scans the geometries that have been added to the workspace and removes any extras that have the exact same attributes.

Construct Top View

This tool analyzes the side view of a custom piece and automatically draws a top view.

Simplify Poly-Geometry

This tool analyzes the poly-geometries in a workspace and eliminates redundant poly-geometries to reduce file size.

Add-on Manager

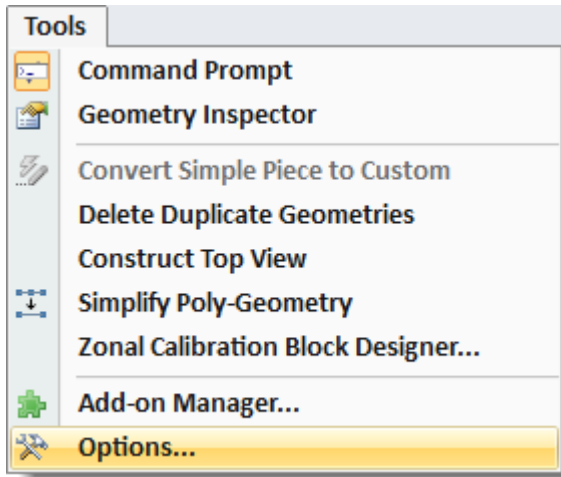
Allows the user to view and activate available [Add-on Modules](#).

Options

Allows the user to specify options. Click [here](#) for help on specifying Options.

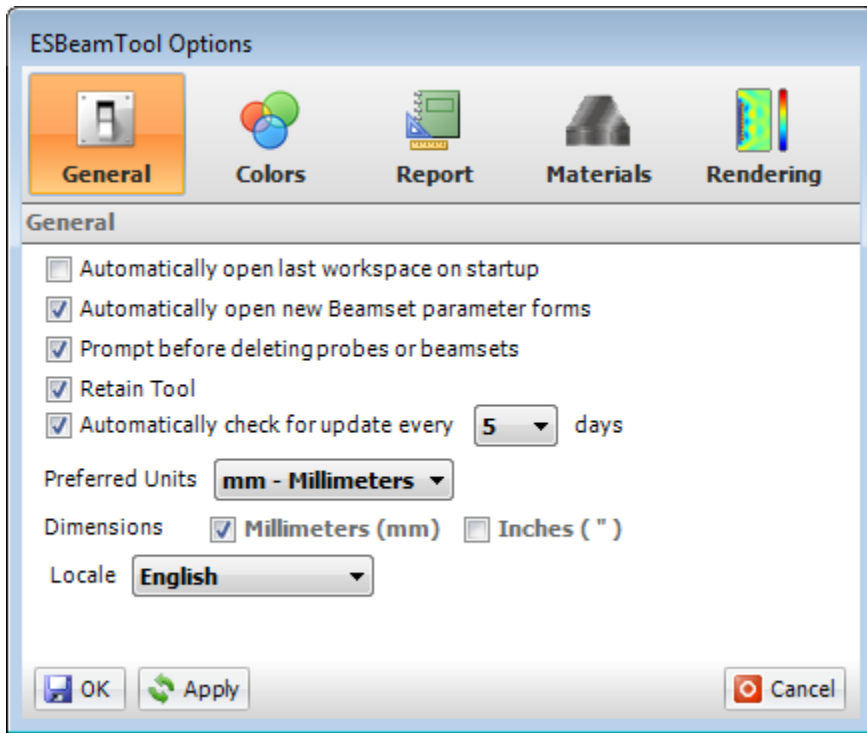
4.2.4.1 OPTIONS

There are a number of options available to customize the way BeamTool presents data.



4.2.4.1.1 GENERAL TAB OPTIONS

Below are options that can be accessed by selecting Tools → Options → General.



Automatically open last workspace on startup	If checked, displays the last saved workspace when BeamTool is invoked.
Automatically open new Beamset parameter forms	If checked, the Beam Configuration dialog is automatically displayed when a beamset is added. If not checked, the user must select the Beam Configuration button that appears when a beamset is added.

Prompt before deleting probes or beamsets	If checked, a prompt is displayed when the Delete Probe or Delete Beamset button is selected confirming the deletion request. If not checked, a prompt is not displayed and the probe or beamset is deleted without confirmation.
Retain Tool	If checked, a tool stays running after it has completed. If unchecked, the active tool switches back to the arrow tool after completion.
Automatically check for update every # days	If checked, an automatic update is performed every number of specified days. If not checked, an automatic update is not performed.
Preferred Units	Indicates the units of measurement to be used.
Dimensions-Millimeters/Inches	Specify the unit(s) to be displayed for all dimension measurements. This does not affect the unit(s) of measurement displayed in configuration dialogs.
Locale	Indicates the language in which BeamTool will be displayed. Specifying a new locale requires a restart of the system. Please refer to XMLocalize for more information regarding language options.

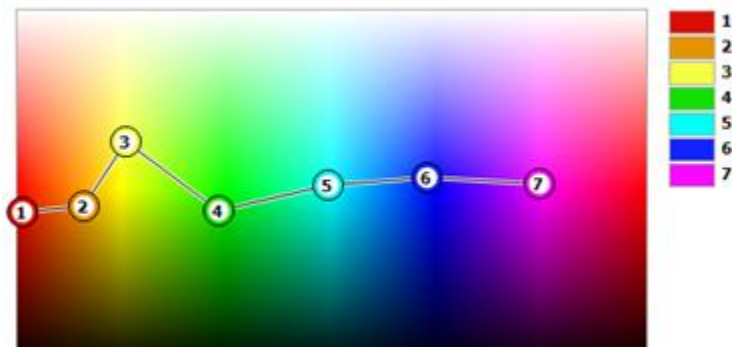
4.2.4.1.2 COLORS TAB OPTIONS

Below are options that can be accessed by selecting Tools → Options → Colors.

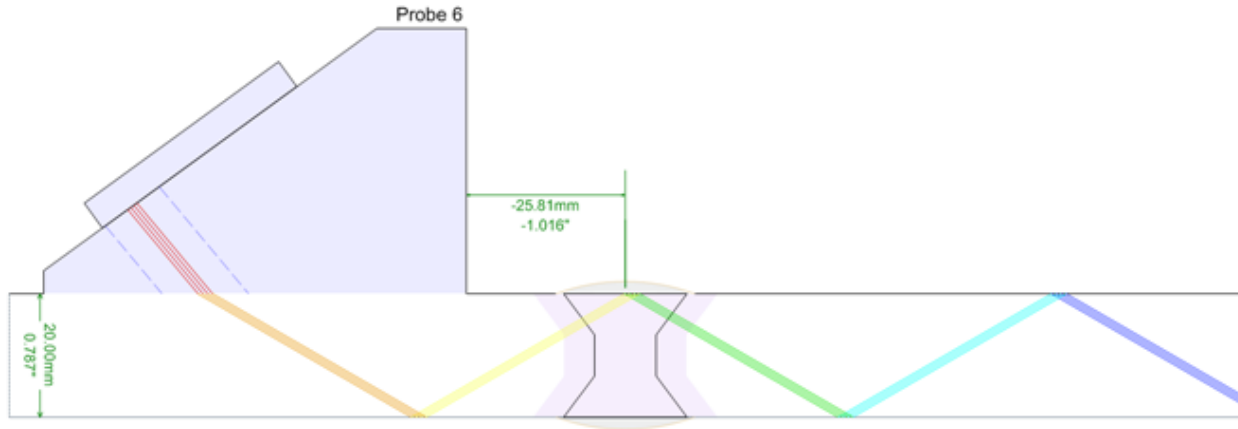
Dimensions - Text Color	Specify the color to display dimension labels.
Dimensions - Line Color	Specify the color to display dimension lines.
Labels - Text Color	Specify the color to display all other labels.
Beam Spread - Fill Color	Specify the color of the beam spread beams.
Near Field - Fill Color	Specify the color of the near field indicators.
Focal Point - Fill Color	Specify the color of the focal point indicators.
Gates - Fill Color	Specify the color of the gate indicator.
TOFD Resolution	Specify the color of the TOFD resolution indicator lines.

4.2.4.1.3 BEAM SKIP COLORING

Beam Skip Coloring is used to easily identify the colors to be used for each 1/2 beam skip displayed for Phased Array beamsets. Color markers can be dragged and dropped at any location on the color palette. Additional color markers can be added by double clicking on the color palette and markers can be removed by selecting Delete on the keyboard.

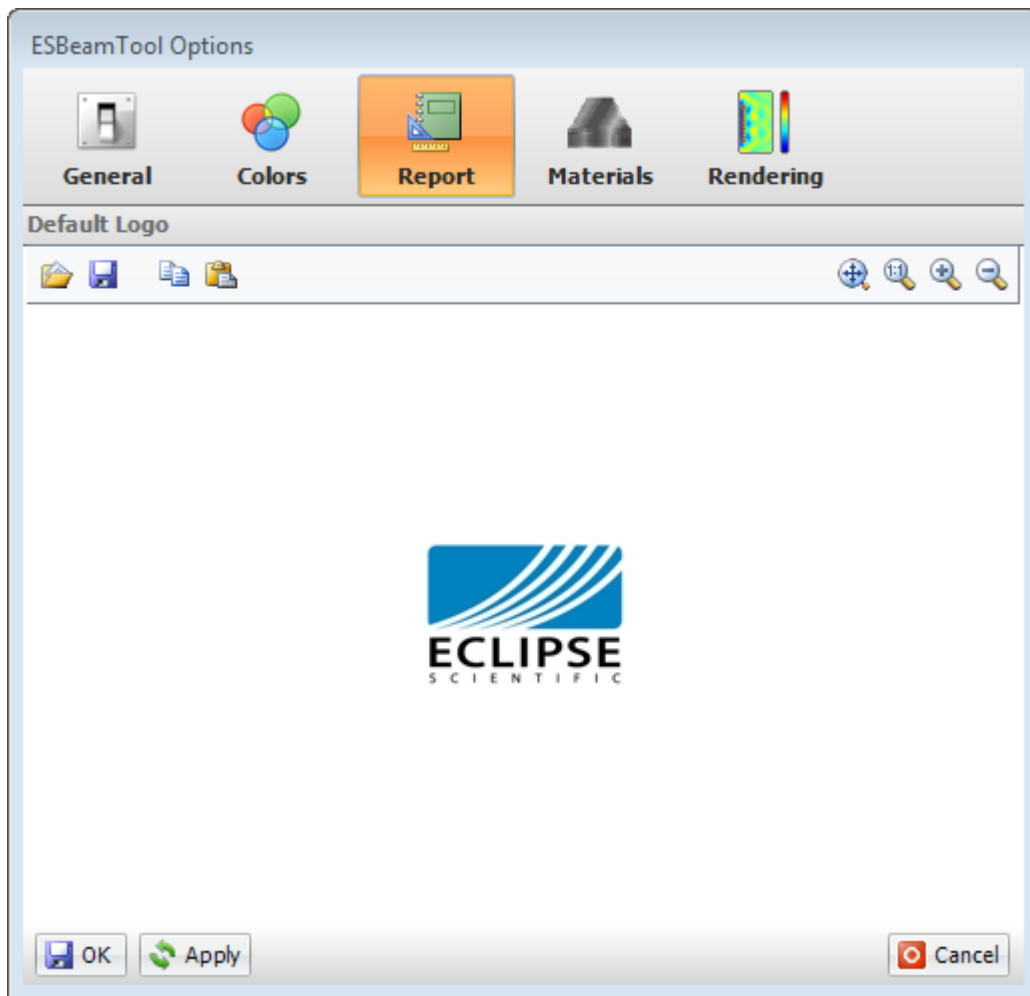


When configuring Phased Array beamsets Color List can be selected from the Beam Type picklist and the colors specified for Beam Skip Coloring are applied to the beam. If the number of 1/2 beam skips displayed exceeds the number of colors specified for the Beam Skip Coloring the color order is repeated.



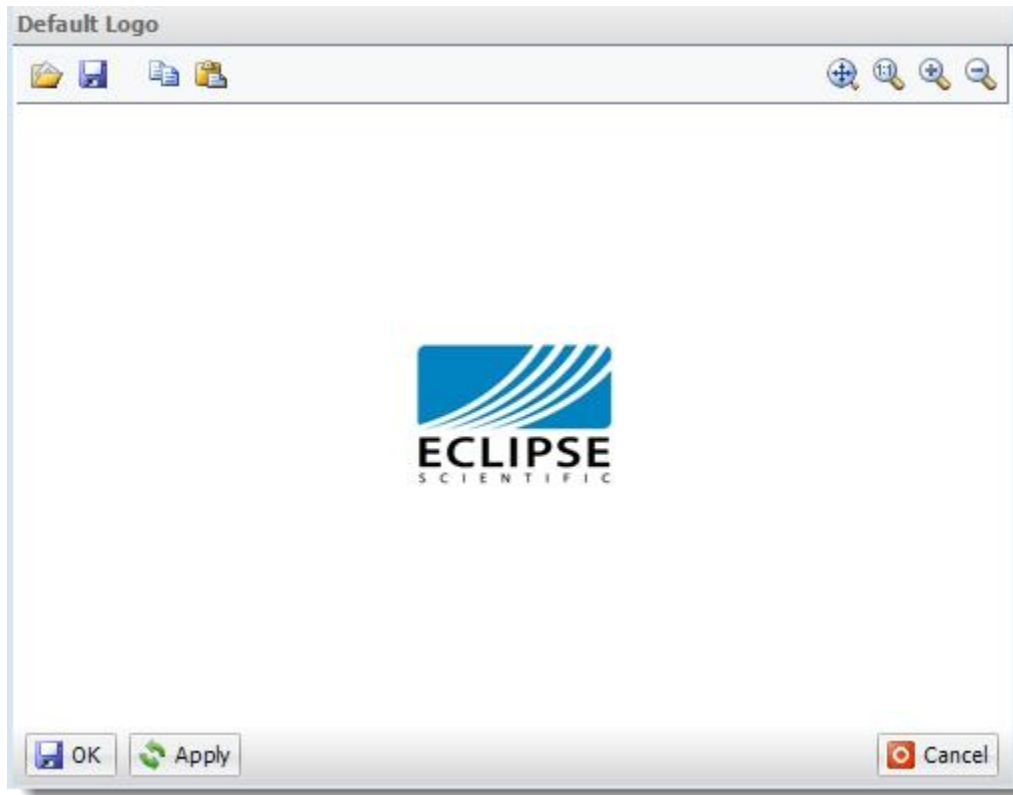
4.2.4.1.4 REPORT TAB OPTIONS

Below are options that can be accessed by selecting Tools → Options → Report.



4.2.4.1.5 DEFAULT LOGO

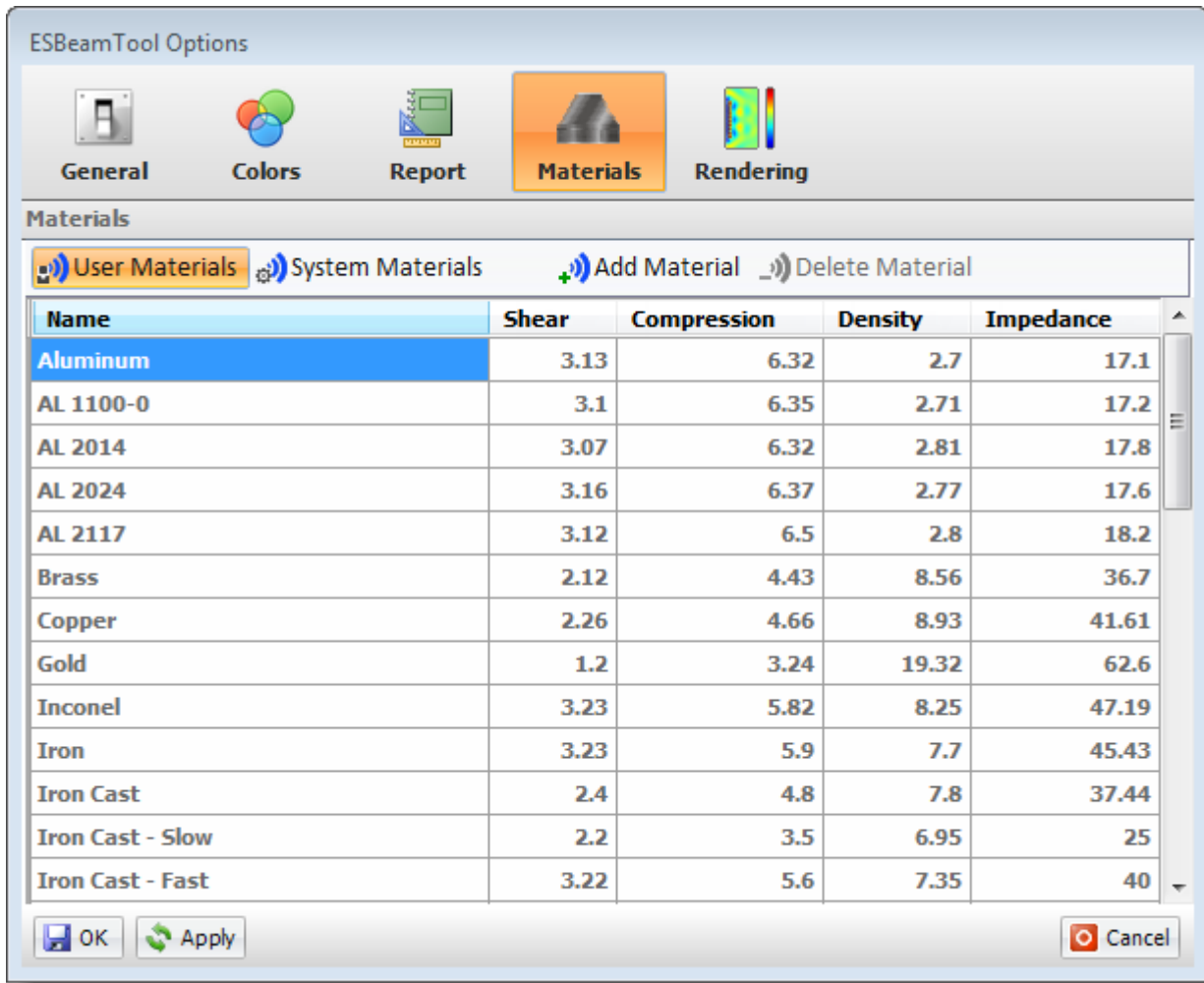
For use in [Reports](#) and the [Report Template Editor](#), a **Default Logo** can be loaded into the Options. The logo will always default to the Eclipse Scientific logo.



4.2.4.1.6 MATERIALS TAB OPTIONS

BeamTool has a huge catalog of materials to choose from, allowing users to define material parameters on the fly. Starting in BeamTool 6, users can create a custom library of materials that they commonly use. Seamless integration makes it easy to implement any material you need.

Below are options that can be accessed by selecting Tools → Options → Materials.

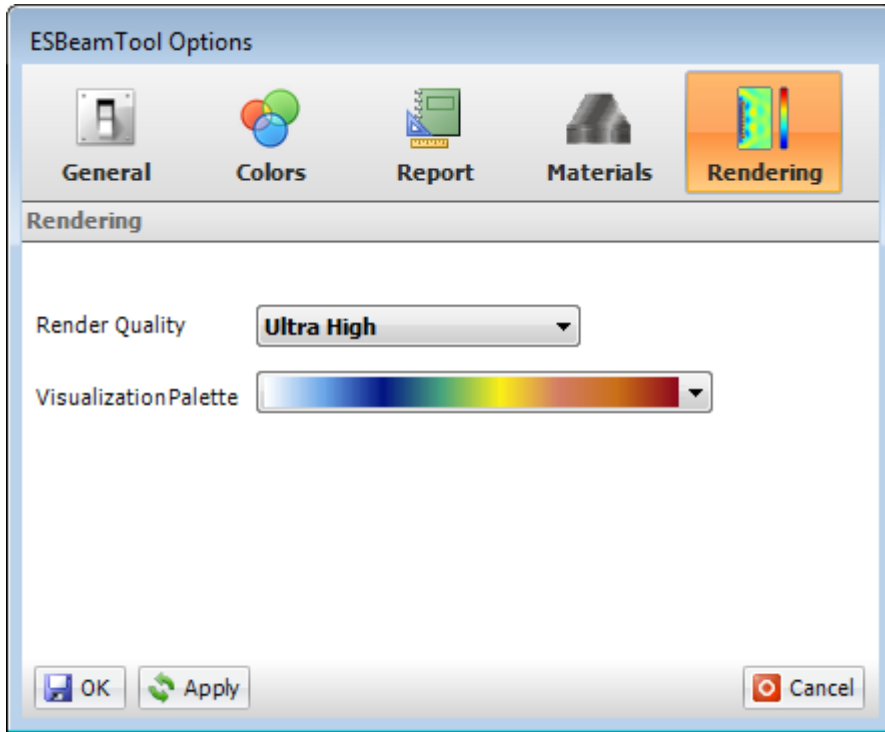


Materials Tab Toolbar Options

User Materials	Displays the list of Materials added by the user.
System Materials	Displays the list of Materials that are standard with BeamTool.
Add Material	Adds a new material to the User Materials list.
Delete Material	Removes the selected material from the User Materials list.

4.2.4.2 RENDERING TAB OPTIONS

Below are options that can be accessed by selecting Tools → Options → Rendering.



Render Quality	Allows the user to select the render quality. Render quality defines the number of pixels to be used in the render process. A higher quality setting here, will result in a longer render process for the Sound Field Animation.
Visualization Palette	Select different palettes to be used for rendering.

4.2.5 HELP MENU

There are a number of options located under the Help menu.

Contents

Displays the BeamTool Help file.

Application Tips

Application Tips are mini lessons that are designed to help you get the most out of BeamTool. Clicking on Application Tips from the Help Menu will open the Application Tips dialog box. You can cycle through the available Application Tips, and toggle on and off the option to show Application Tips when you start BeamTool.

Check For Update

Checks for updates available for BeamTool.

Support

Opens our website to the BeamTool Support page. Inquiries are sent to Eclipse Scientific's dedicated BeamTool support team who will provide prompt assistance.

Deactivate License

An BeamTool license can be activated on one machine only. If you would like to move your license to another machine you can select **Deactivate License** to release the license from the current machine to allow for activation on another. When you deactivate the license it will disable BeamTool on the current machine. This option is not available for the HardLock version.

Localization

Displays the [XMLocalize](#) editor which can be used to correct translation inaccuracies. Modifications to this file can be submitted to the BeamTool support team for inclusion in a future release of BeamTool. Click [here](#) for more information.

Admin

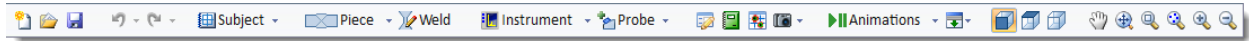
The Admin drop-down menu allows you to set the default size of screen shots.

About

Displays information about BeamTool.

4.3 MAIN TOOLBAR

The **Main Toolbar** provides quick and easy access to some common workspace management tools, various information tools and dialogs, and CAD Surface tools.



New Workspace

Creates a new workspace displaying default values for piece and probe.

Open Workspace

Opens a previously saved workspace.

Save Workspace

Saves the current workspace. If the workspace has not been previously saved the Save Workspace dialog will appear allowing the user to specify the workspace filename. If the workspace has been previously saved the workspace will be overwritten.

Undo

Reverts the workspace to its state before the most recent editing action was performed. Also provides a list of all the most recent editing actions performed, allowing the ability to revert the workspace back a number of editing steps.

Redo

Reverts the workspace to its state before the most recent undo was performed. Also provides a list of all the most recent undos performed, allowing the ability to revert the workspace forward a number of editing steps.

Active Drawing

This drop down menu allows you to quickly change your workspace from Subject Piece to Calibration Block to Wedge Drawings to Custom Drawings.

Piece Geometry/Piece Configuration

The drop down menu is used to select the general [Piece Geometry](#) from Plate, Axial, Circumferential and Custom types. After the piece geometry is selected from the drop down menu, clicking on the Piece graphic displays the [Piece Configuration](#) dialog which can be used to specify the data values for the piece.

Weld Configuration

Displays the Weld Configuration dialog which can be used to specify the data values for the weld.

Instrument Info

[Instrument Info](#) is a database of additional fields that can be manually populated by the user or imported from a catalog and included on reports.

Add Probe

Pops up a drop-down list of available Probe types. Allows probes to be [added](#) to the workspace.

Document Info

[Document Info](#) is a database of additional fields that can be populated by the user and included on reports.

Report

Generate [Reports](#) documenting the technique scan plan or complete technique document. Use [Instrument Info](#) and [Document Info](#) to populate additional technique properties.

Indication Table

Displays the [Indication Table](#) dialog used to manage indications.

Copy to Clipboard

Copies the contents of the workspace to the clipboard making it available for use in another application such as Microsoft Word or PowerPoint. By default, clicking the button will copy a bitmap image of the visible CAD surface to the clipboard. Using the button's drop-down, both bitmap image and metafile images are available. Metafile images can be used in applications like AutoCAD, Corel, etc.

Animations

Opens up a drop down menu where the Position, Speed and Loop options can be modified for an animation. See [Sound Field Animation](#) for more information.

Compact Probe Bar / **Full Probe Bar** / **Side Probe Bar**

Toggles between Compact Probe Bar (provides a minimal readout and a popover edit panel), Full Probe Bar (provides the full readout of the probe menu) and Side Probe Bar (provides the full readout of the probe menu but is pinned to the left hand side of BeamTool).

Display Side View

Displays the drawing as a side view.

Display Top View

Displays the drawing as a top view.

Display 3D View

Displays the drawing as a [3D View](#).

Pan Drawing

Puts the cursor in panning mode allowing the user to pan around the drawing. You can also pan by holding down the scroll wheel and dragging and dropping using the mouse.

Zoom Fit

Fits and centers the drawing in the current displayable drawing area (workspace). (Ctrl+F)

Zoom Window

Specify an area in the drawing to be zoomed into by holding down the left mouse button and dragging the mouse to select the area.

Zoom Selection

Zooms to fit the selected geometry.

Zoom In

Zooms into the drawing. The user can also scroll up using their mouse wheel to zoom in. (Page Up)

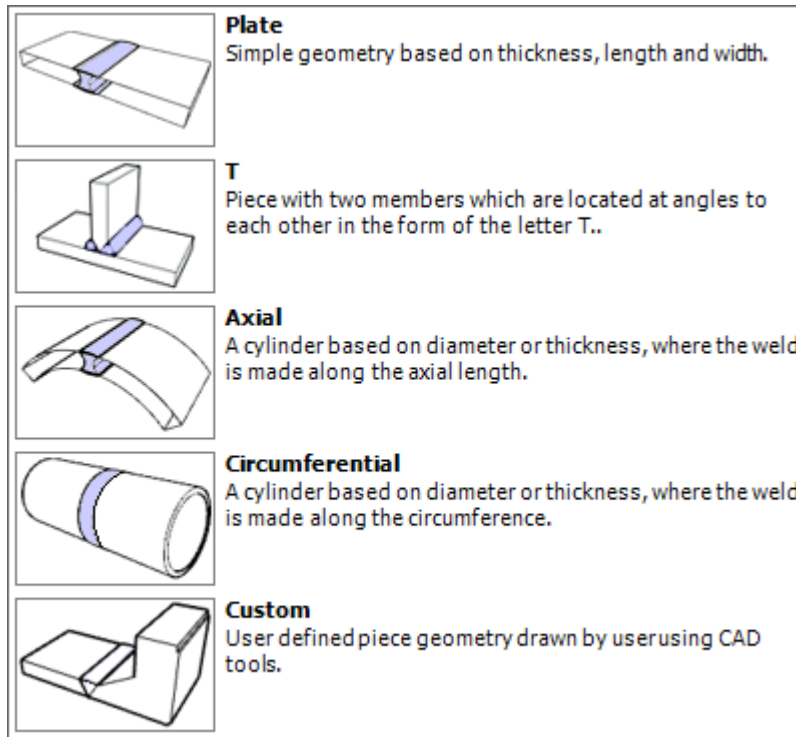
Zoom Out

Zooms out of the drawing. The user can also scroll down using their mouse wheel to zoom out. (Page Down)

CHAPTER (5): PIECE

Piece Geometry

By default, a simple [Plate](#) piece with a simple weld is displayed in the drawing pane. Alternatively an [T](#), [Axial](#), [Circumferential](#) or [Custom](#) piece can be selected using the Piece Geometry drop-down menu located on the [Main Toolbar](#).



When T is selected the default Plate piece graphics are removed and replaced with T piece graphics.

When Axial is selected the default Plate piece graphics are removed and replaced with Axial piece graphics.

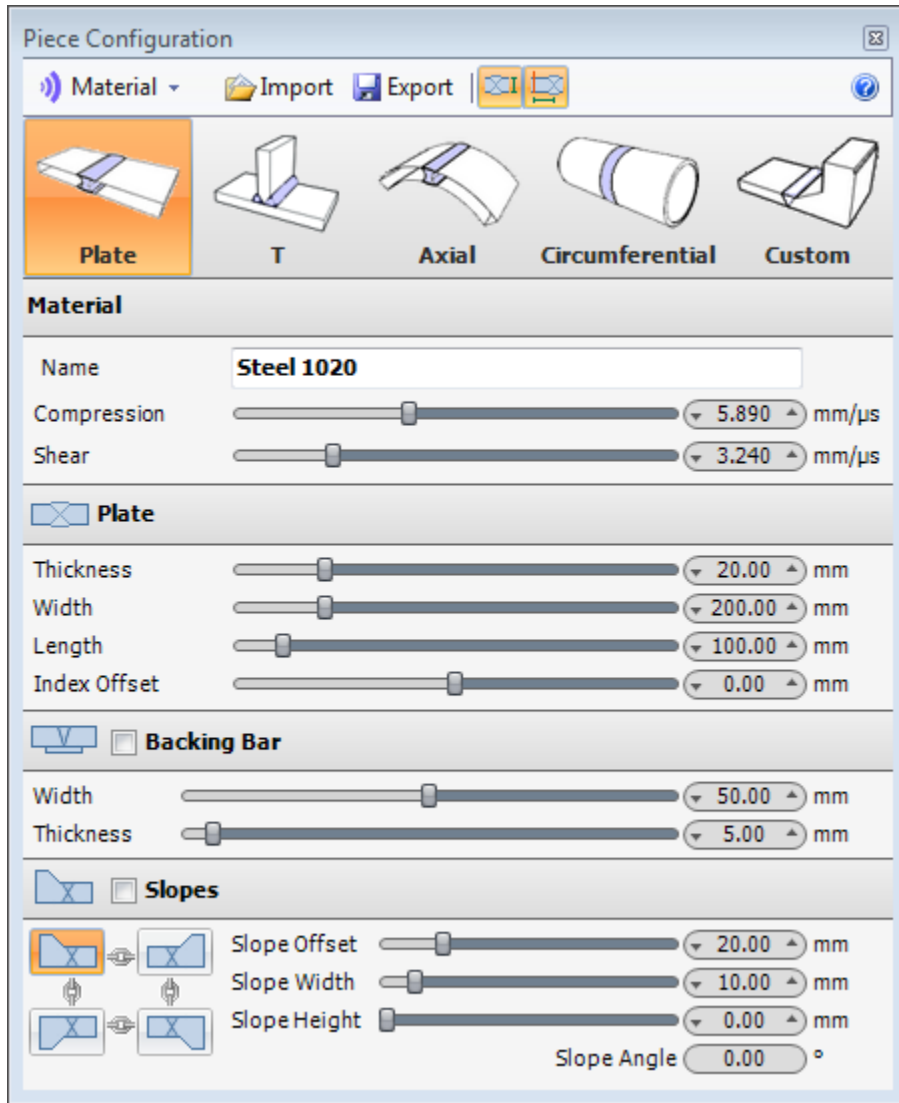
When Circumferential is selected the default Plate piece graphics are removed and replaced with Circumferential piece graphics.

If Custom is selected the default Plate piece graphics are removed. Also, the Weld Configuration and Display option buttons are disabled, as custom pieces do not have a weld, or allow for automated dimensioning.

All piece types can be customized using the [Piece Configuration](#) and  [Weld Configuration](#) dialogs. Both of these menus are found on the [Main Toolbar](#).

5.1 PLATE PIECE CONFIGURATION

A Plate piece and weld can be configured by pressing the **Piece Configuration** button located on the [Main Toolbar](#). This will display the Piece Configuration dialog, which can be used to specify the data values to be used to generate the piece geometry.



5.1.1 PIECE CONFIGURATION

Below are the values that can be set for a piece and weld. To specify a value you can a) move the slider right or left, b) click the right or left value spinner or c) click on the value displayed in the value spinner and type a value. The preview and drawing panes will update on the fly as the values are modified.

Select a Material Velocity

The Piece Velocity can be set by selecting a material from the Material picklist:

1. Press the **Material** button located on the Piece Configuration dialog. A list of available materials will be displayed.
2. Select a material from the list. The Material Velocity values will be set with the assigned material velocities.

Open an Existing Piece and Weld Configuration

Once the Piece Configuration dialog has been displayed, existing piece and weld configurations (*.ebp) can be opened:

1. Press the **Open** button and navigate to the BeamTool directory (default location) containing the configuration file (*.ebp) to be opened.
2. Select the file and press **Open**. The configuration data will now be displayed in the dialog and the drawing pane will update to display the selected piece and weld.

Save a Piece and Weld Configuration

Once a piece and weld configuration is complete it can be saved (*.ebp):

1. Press the **Save** button and navigate to the BeamTool directory (default location).
2. Enter a name for the file in the *File name* field and press **Save**.

Display Piece Dimensions

Displays the thickness of the piece on the drawing.

Display Piece Index Offset Dimension

Displays the distance of the offset point (if set using Piece Configuration will display as vertical gold bar) from the center point of the weld on the drawing.




Plate

Thickness	The thickness of the piece of material containing the weld.
Width	The width of the piece of material containing the weld.
Length	The length of the piece of material containing the weld.
Index Offset	Offset location on the piece to be used instead of center of weld.

Backing Bar

Thickness	The thickness of the backing bar.
Width	The width of the backing bar.

 **Slopes**

 Slope Offset	Specifies the distance from the weld center line where the slope starts.
 Slope Width	Specifies the width of the slope along the piece surface.
 Slope Height	Specifies the height or elevation of the slope past the piece surface.

NOTE: Use the  Link Horizontal and  Link Vertical buttons to mirror adjustments made to slopes.

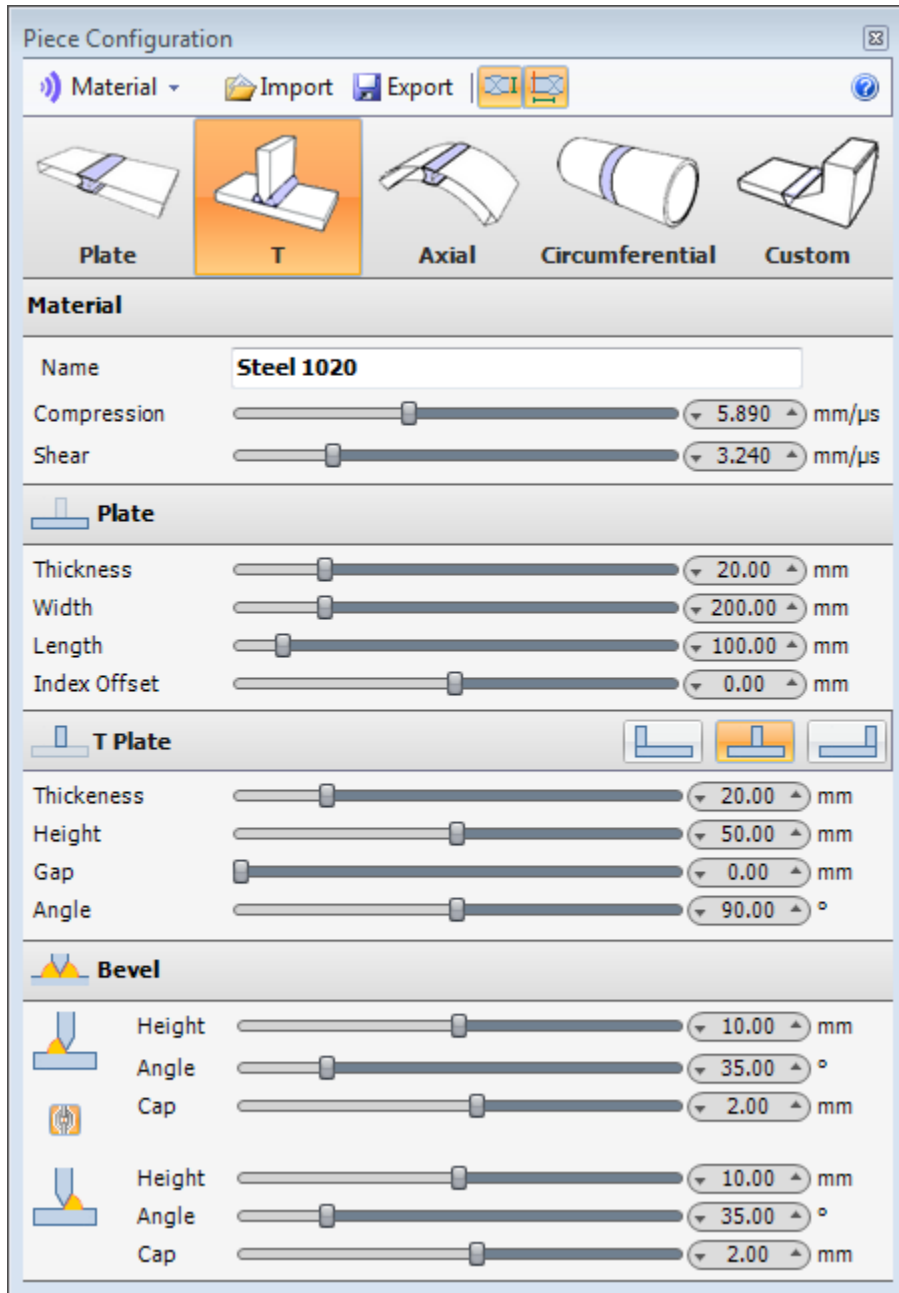
Material

Compression	Same plane directional velocity of the piece.
Shear	Right angle directional velocity of the piece.

5.2

5.3 T PIECE CONFIGURATION

A T piece and weld can be configured by pressing the **T Piece Configuration** button located on the [Main Toolbar](#). This will display the T Piece Configuration dialog, which can be used to specify the data values to be used to generate the T piece geometry.



5.3.1 T PIECE CONFIGURATION

Below are the values that can be set for a T piece and weld. To specify a value you can a) move the slider right or left, b) click the right or left value spinner or c) click on the value displayed in the value spinner and type a value. The preview and drawing panes will update on the fly as the values are modified.

Select a Material Velocity

The Piece Velocity can be set by selecting a material from the Material picklist:

1. Press the **Material** button located on the Piece Configuration dialog. A list of available materials will be displayed.
2. Select a material from the list. The Material Velocity values will be set with the assigned material velocities.

Open an Existing Piece and Weld Configuration

Once the T Piece Configuration dialog has been displayed, existing piece and weld configurations (*.ebp) can be opened:

1. Press the **Open** button and navigate to the BeamTool directory (default location) containing the configuration file (*.ebp) to be opened.
2. Select the file and press **Open**. The configuration data will now be displayed in the dialog and the drawing pane will update to display the selected piece and weld.

Save a Piece and Weld Configuration

Once a piece and weld configuration is complete it can be saved (*.ebp):

1. Press the **Save** button and navigate to the BeamTool directory (default location).
2. Enter a name for the file in the *File name* field and press **Save**.

Display Piece Dimensions

Displays the thickness of the piece on the drawing.

Display Piece Index Offset Dimension

Displays the distance of the offset point (if set using Piece Configuration will display as vertical gold bar) from the center point of the weld on the drawing.

Material

Name	The common name for the material (Example, Steel 1020)
Compression	Same plane directional velocity of the piece.
Shear	Right angle directional velocity of the piece.

Plate


Thickness	The thickness of the piece of material containing the weld.
Width	The width of the piece of material containing the weld.
Length	The length of the piece of material containing the weld.
Index Offset	Offset location on the piece to be used instead of center of weld.

 T Plate (
 /
 /
)

Thickness	The thickness of the piece of material containing the weld.
Height	The height of the piece of material containing the weld.
Gap	The distance between the bottom of the vertical piece and top of the horizontal piece.
Angle	The angle at which the vertical piece is welded to the horizontal piece.

 Bevel

Height	The height of the bevel of the vertical piece.
Angle	The angle of the bevel of the vertical piece.
Cap	The cap offset.

NOTE: Use the  Link Bevel button to mirror adjustments made to bevels.

5.4 AXIAL PIECE CONFIGURATION

An Axial piece and weld can be configured by pressing the **Piece Configuration** button located on the Piece group. This will display the Piece Configuration dialog which can be used to specify the data values to be used.

5.4.1 PIECE CONFIGURATION

Below are the values that can be set for an Axial geometry piece and weld. To specify a value you can a) move the slider right or left, b) click the right or left value spinner or c) click on the value displayed in the value spinner and type a value. The preview and drawing panes will update on the fly as the values are modified.

Material

Compression	Same plane directional velocity of the piece.
Shear	Right angle directional velocity of the piece.

Axial

Thickness	The thickness of the piece of material.
OD	The diameter measurement taken from the outside edge of the piece.
ID	The diameter measurement taken from the inside of the piece.
Sweep	The curve of the diameter in degrees.
Length	The length of the piece of material.
Index Offset	The offset point from the center point of the weld on the drawing.

5.4.2 OTHER TOOLS AVAILABLE

In addition to the options available above the following tools are available during piece and weld configuration:

Open an Existing Piece and Weld Configuration

Once the Piece Configuration dialog has been displayed, existing piece and weld configurations (*.ebp) can be opened:

1. Press the **Open** button and navigate to the BeamTool directory (default location) containing the configuration file (*.ebp) to be opened.
2. Select the file and press **Open**. The configuration data will now be displayed in the dialog and the drawing pane will update to display the selected piece and weld.

Save a Piece and Weld Configuration

Once a piece and weld configuration is complete it can be saved (*.ebp):

1. Press the **Save** button and navigate to the BeamTool directory (default location).
2. Enter a name for the file in the *File name* field and press **Save**.

Select a Material Velocity

The Piece Velocity can be set by selecting a material from the Material picklist:

1. Press the **Material** button located on the Piece Configuration dialog. A list of available materials will be displayed.
2. Select a material from the list. The Material Velocity values will be set with the assigned material velocities.

Display Piece Dimensions

Displays the thickness of the piece on the drawing.

Display Piece Index Offset Dimension

Displays the distance of the offset point (if set using Piece Configuration will display as vertical gold bar) from the center point of the weld on the drawing.

5.5 CIRCUMFERENTIAL PIECE CONFIGURATION

A Circumferential piece and weld can be configured by pressing the **Piece Configuration** button located on the Piece group. This will display the Piece Configuration dialog which can be used to specify the data values to be used.

5.5.1 PIECE CONFIGURATION

Below are the values that can be set for a Circumferential geometry piece and weld. To specify a value you can a) move the slider right or left, b) click the right or left value spinner or c) click on the value displayed in the value spinner and type a value. The preview and drawing panes will update on the fly as the values are modified.

Material

Compression	Same plane directional velocity of the piece.
Shear	Right angle directional velocity of the piece.

Axial

Thickness	The thickness of the piece of material.
OD	The diameter measurement taken from the outside edge of the piece.
ID	The diameter measurement taken from the inside of the piece.
Width	The width of the piece of material containing the weld.
Index Offset	The offset point from the center point of the weld on the drawing.

5.5.2 OTHER TOOLS AVAILABLE

In addition to the options available above the following tools are available during piece and weld configuration:

Open an Existing Piece and Weld Configuration

Once the Piece Configuration dialog has been displayed, existing piece and weld configurations (*.ebp) can be opened:

1. Press the **Open** button and navigate to the BeamTool directory (default location) containing the configuration file (*.ebp) to be opened.
2. Select the file and press **Open**. The configuration data will now be displayed in the dialog and the drawing pane will update to display the selected piece and weld.

Save a Piece and Weld Configuration

Once a piece and weld configuration is complete it can be saved (*.ebp):

1. Press the **Save** button and navigate to the BeamTool directory (default location).
2. Enter a name for the file in the *File name* field and press **Save**.

Select a Material Velocity

The Piece Velocity can be set by selecting a material from the Material picklist:

1. Press the **Material** button located on the Piece Configuration dialog. A list of available materials will be displayed.
2. Select a material from the list. The Material Velocity values will be set with the assigned material velocities.

Display Piece Dimensions

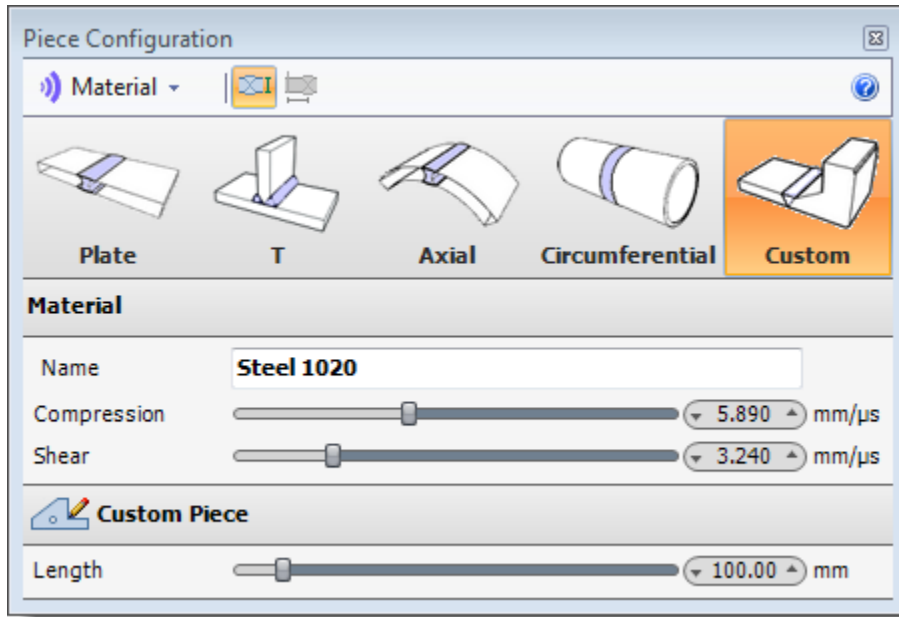
Displays the thickness of the piece on the drawing.

Display Piece Index Offset Dimension

Displays the distance of the offset point (if set using Piece Configuration will display as vertical gold bar) from the center point of the weld on the drawing.

5.6 CUSTOM PIECE CONFIGURATION

A Custom piece can be configured by pressing the **Piece Configuration** button located on the [Main Toolbar](#). This will display the Piece Configuration dialog which can be used to specify the data values to be used.



5.6.1 PIECE CONFIGURATION

Below are the values that can be set for a custom piece. To specify a value you can a) move the slider right or left, b) click the right or left value spinner or c) click on the value displayed in the value spinner and type a value.

Select a Material

The Piece Velocity can be set by selecting a material from the Material picklist:

1. Press the **Material** button located on the Piece Configuration dialog. A list of available materials will be displayed.
2. Select a material from the list. The Material Velocity values will be set with the assigned material velocities.

Display Piece Dimensions

Displays the thickness of the piece on the drawing.

Display Piece Index Offset Dimension

Displays the distance of the offset point (if set using Piece Configuration will display as vertical gold bar) from the center point of the weld on the drawing.

Material Velocity

Compression	Same plane directional velocity of the piece.
Shear	Right angle directional velocity of the piece.

 **Custom Piece**

Length	The length of the piece of material.
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CHAPTER (6): WELD CONFIGURATION

Weld Configuration

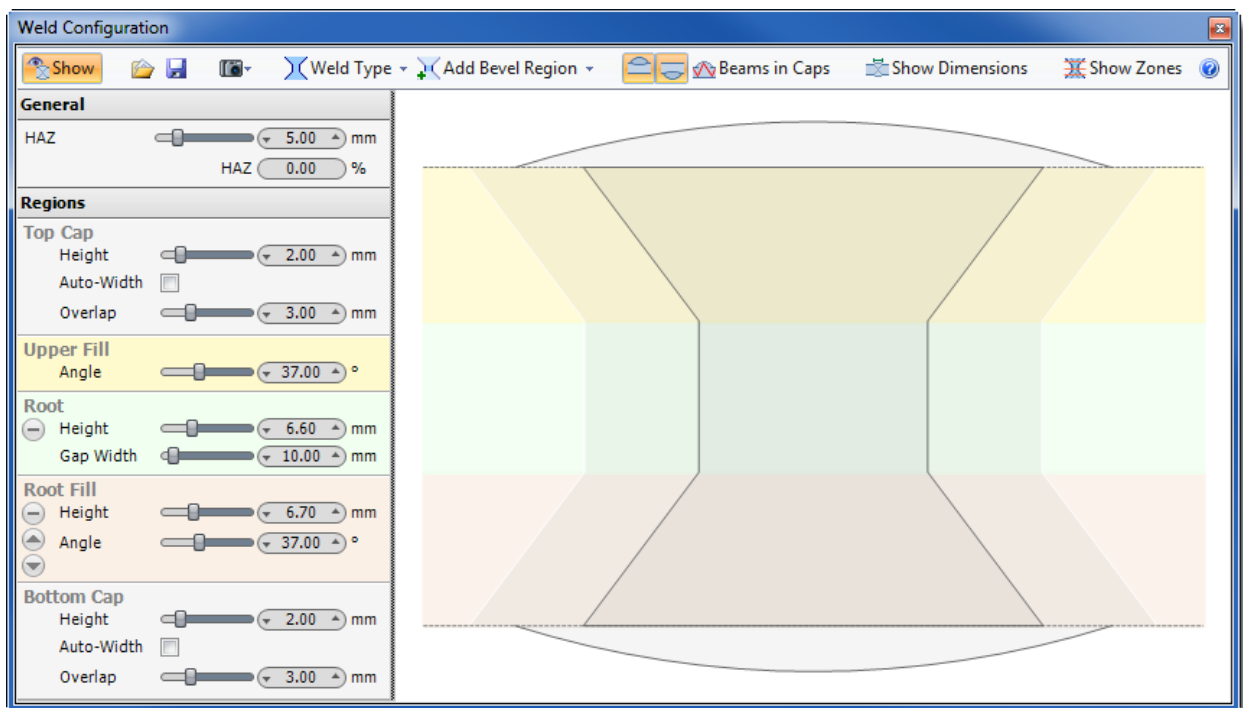
The weld can be configured by pressing the  **Weld Configuration** button located on the [Main Toolbar](#). This will display the Weld Configuration dialog which can be used to specify the parameters and geometries of the weld bevel. The Weld Configuration dialog is also used to configure weld Zones.

*Please note that portions of the Weld Configuration dialog are limited to users of the **BeamTool ZONAL** Add-On.

The intent of the Weld Configuration dialog is to provide the ability to define a weld bevel by defining the specific [Regions](#) within the bevel. The regions are predefined from categories: Fills, Hot Pass, Roots, etc. Once a bevel is defined, its regions can be divided into [Zones](#)* that can be used in conjunction with a [Zonal Beamset](#)* and **Beam Solver**.

Opening the Advanced Weld Editor provides access to

- Pre-defined weld bevels
- Bevel region gallery
- Bevel region configuration
- Zone generation*



To modify the bevel configuration, pre-defined weld bevels can be selected from the **Weld Type** drop-down, specific bevel regions can be added to the weld via the **Add Bevel Region** drop-down, and regions can be configured via the **Regions** panel.

6.1.1 WELD CONFIGURATION TOOLBAR

In addition to the attribution available above the following tools are available using the Weld Configuration dialog:



Toggles on and off the display of the weld in the drawing.

Open an Existing Piece and Weld Configuration

Once the Weld Configuration dialog has been displayed, existing piece and weld configurations (*.ebp) can be opened:

1. Press the **Open** button and navigate to the BeamTool directory (default location) containing the configuration file (*.ebp) to be opened.
2. Select the file and press **Open**. The configuration data will now be displayed in the dialog and the preview and drawing panes will update to display the selected piece and weld.

Save a Piece and Weld Configuration

Once a Piece and Weld Configuration is complete it can be saved (*.ebp):

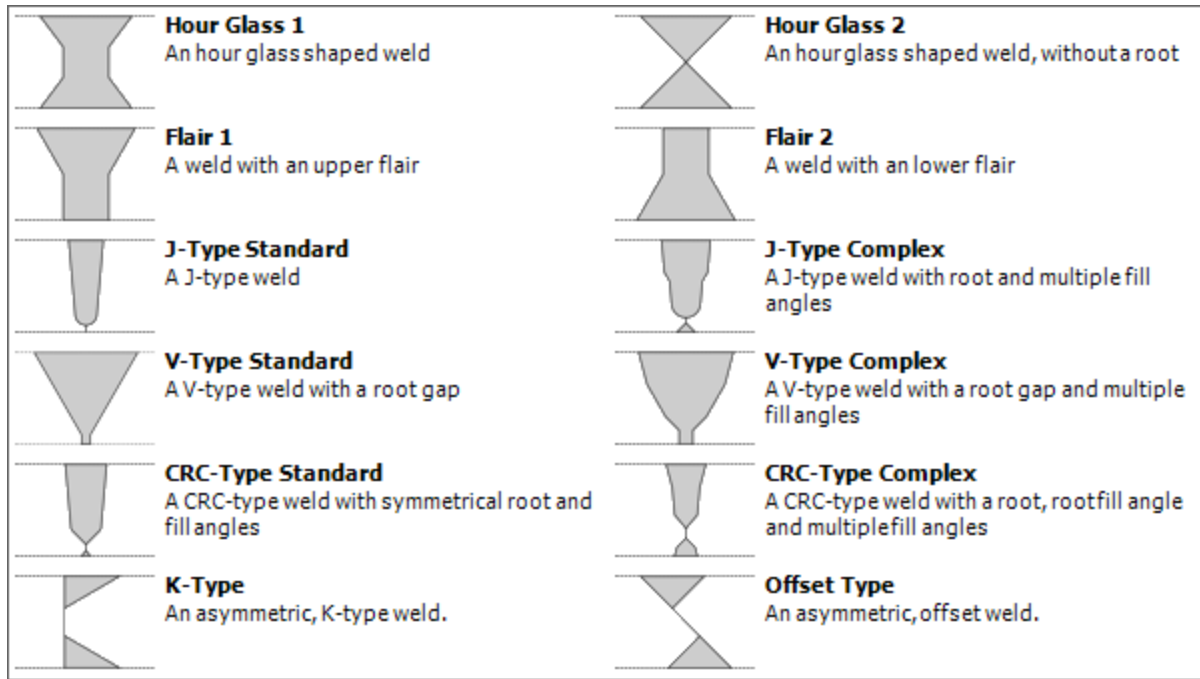
1. Press the **Save** button and navigate to the BeamTool directory (default location).
2. Enter a name for the file in the *File name* field and press **Save**.

Snapshot

Copy image, metafile or detail layers to the Windows Clipboard.

Weld Type

The Weld Type drop-down button provides access to pre-defined weld types:



These pre-defined weld types have been constructed with regions that have been customized to particular real-world weld bevel types. Once a pre-defined weld has been selected, its regions are displayed in the Regions Panel.

Add Bevel Region

Click on the Add Bevel Region icon for a drop-down list of bevel regions. A Weld must be constructed from one or more [Regions](#). Regions define the shape, size, and structure of the weld bevel. More on [Weld Regions](#) here.

If a pre-defined weld does not conform exactly to the needed specifications, one can be modified as necessary. Additional regions can be added, or regions not required can be removed. Regions can be re-ordered (vertically). And individual region parameters can be modified to suit. More on [Weld Region editing here](#).

Top Cap

When selected, the graphics for the Top Cap are displayed in both the preview and drawing.

Bottom Cap

When selected, the graphics for the Bottom Cap are displayed in both the preview and drawing.

Project Beams into Caps

When selected, beams present in the workspace will be projected into the weld caps instead of being reflected at the piece boundary.

 **Display Weld Dimensions**

When selected the weld dimensions are displayed in the drawing.

 **Show Zones***

If using the **BeamTool ZONAL Add-On**, the **Show Zones** button provides access to the [Zones](#) generation panel. Zones can be used in conjunction with a [Zonal Beamset](#)*. More on [Zones](#) here.


6.1.1.1 GENERAL PARAMETERS

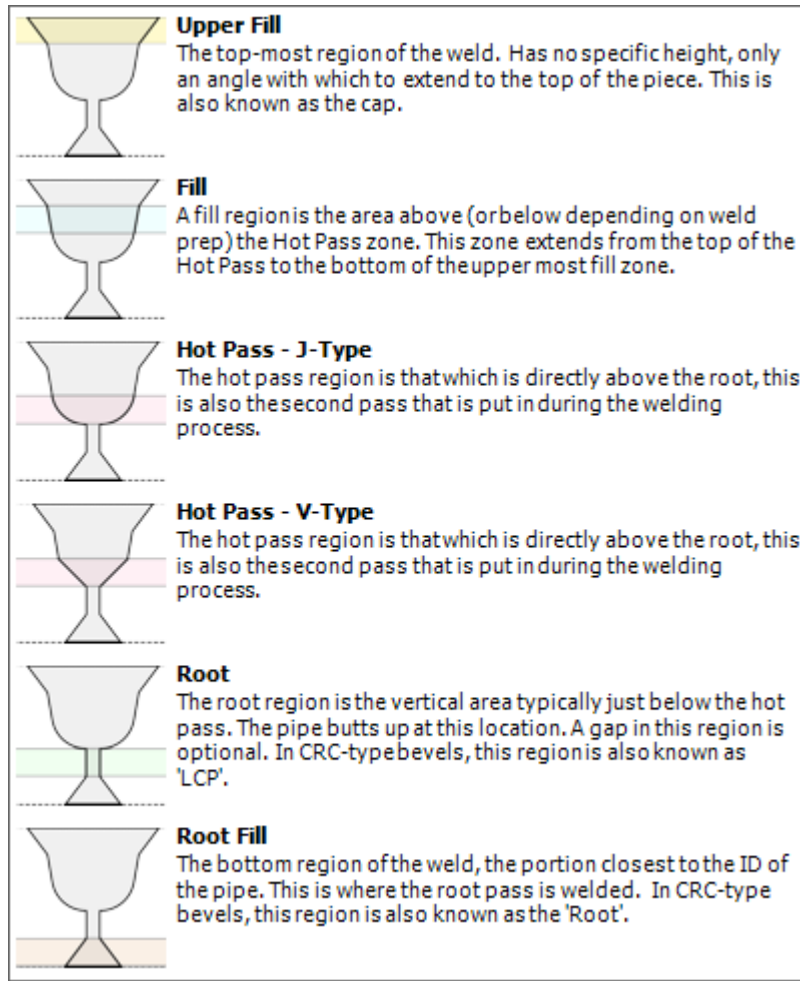
Below are the values that can be set for a piece and weld. To specify a value you can a) move the slider right or left, b) click the right or left value spinner or c) click on the value displayed in the value spinner and type a value. The preview and drawing panes will update on the fly as the values are modified.

HAZ	The Heat Affected Zone. The portion of the base metal whose structure or properties have been changed by the heat of welding or cutting.
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6.2 WELD REGIONS

Weld Regions are the building blocks of a weld bevel. From the [Weld Configuration](#) dialog, Weld Regions can be added, edited, and modified to create a weld bevel to suit (most) real-world situations.

Once a pre-defined Weld Type has been selected (or simply starting with the default weld type), the  **Add Bevel Region** drop-down button can be used to add new (or replace existing) regions:

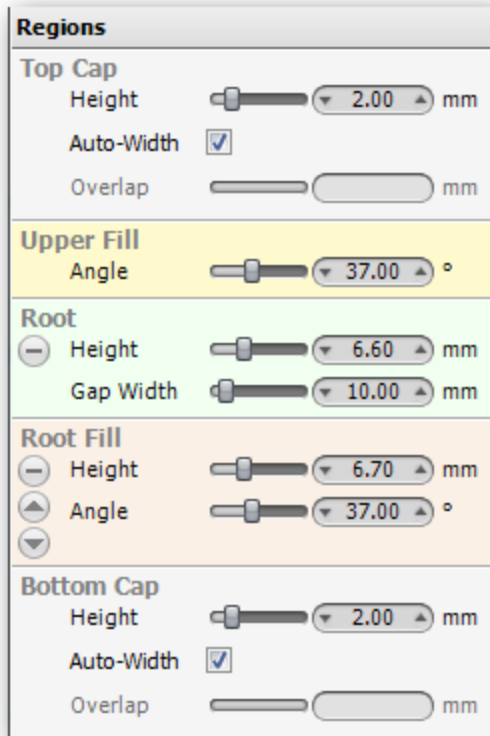


Weld regions can be used together in almost any combination, but the following points should be considered when constructing a custom weld bevel from individual regions:

- A weld bevel must always have a single Upper Fill region
- A weld bevel can only have a single Hot Pass and a single Root region
- A weld bevel can have multiple Fill and/or Root Fill regions
- Region types always appear in the same vertical position within the weld bevel

- The Upper Fill region is always at the top of the bevel
- The Fill regions are always below the Upper Fill region and above the Hot Pass, Root, and Root Fill regions (if they exist in the weld)
- The Hot Pass region is always below the Upper Fill and Fill regions and always above the Root region and Root Fill regions (if they exist in the weld)
- The Root region is always below the Upper Fill and Fill and Hot Pass regions and always above the Root Fill regions (if they exist in the weld)
- Root Fill regions are always at the bottom of the bevel

Once a region is added to the weld, it appears (with the rest of the weld's regions) in the Regions panel:



6.2.1 REGION EDITING

The Regions panel is used to modify the order and existence of regions within the weld, as well as to modify the specific attributes of each region.

The utility buttons on the left side of each region section can be used to:

- ⊖ **Delete** - Remove the selected region from the weld
- ⬆ **Move Up** - Reorder the selected region above the previous region OF THE SAME TYPE
- ⬇ **Move Down** - Reorder the selected region below the next region OF THE SAME TYPE

6.2.2 REGION ATTRIBUTES

The attributes of each region can then be customized to any particular need. The available attributes depend on the particular region.

Top Cap - The region above the Upper Fill. The height can be adjusted with or without the option to Auto-Width based on height. If the Auto-Width is de-selected, the overlap can be adjusted separate from the height.

Upper Fill – The top-most region of the weld. Has no specific height, only an angle with which to extend to the top of the piece. This region is mandatory when defining a bevel.

- Angle

Fill – The region above the hot pass containing 1 or more sets of angle & height

- Angle(s)
- Height(s)

Hot Pass – A variable region that can be J-type (radius) or V-type (angle). J-type is specified by a radius and an optional height configuration – ‘Auto-Height’ or ‘Manual’. Automatic height calculates to the point where the fill region’s angle makes a tangent on the radius. J-type also allows an optional “**Landing**” width. V-type allows a simple angle and height.

J-Type

- Radius
- Height
 - Auto - Determines the appropriate height so that the face of the above fill region will intersect a the radius at an exact tangent
 - OR
 - Manual
- Landing width - The horizontal width before the radius begins its sweep

V-Type

- Angle
- Height

Root – A vertical region directly below the hot pass. Can have an optional gap width.

- Height
- Gap width - The distance between the left and right faces of the weld bevel

Root Fill – The region below the hot pass containing 1 or more sets of angle & height


- Angle(s)
- Height(s)

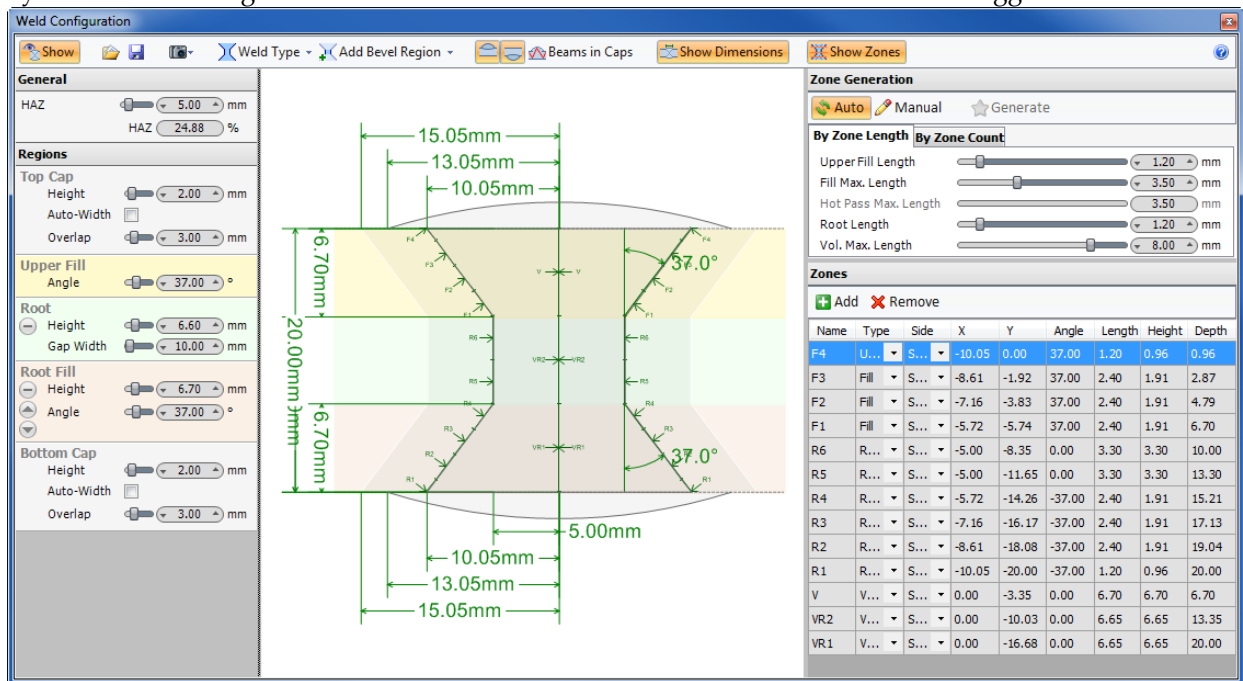
Bottom Cap - The region below the Root Fill. The height can be adjusted with or without the option to Auto-Width based on height. If the Auto-Width is de-selected, the overlap can be adjusted separate from the height.

6.3 WELD ZONES

Weld Zones are used in conjunction with a [Zonal Beamset](#) to provide targeted steering of individual beams into individual locations along the face of a weld bevel.

NOTE: Weld Zones are only available to users of the **BeamTool Zonal Add-On**.

As a weld bevel is being defined in the [Weld Configuration](#) dialog, the Weld Zone panel(s) can be displayed by clicking the  **Show Zones** toggle button:



The screenshot shows the Weld Configuration dialog box with the Show Zones option activated. The dialog is divided into several panels:

- General:** HAZ (5.00 mm), HAZ (24.88 %).
- Regions:** Top Cap (Height: 2.00 mm, Auto-Width, Overlap: 3.00 mm), Upper Fill (Angle: 37.00 °), Root (Height: 6.60 mm, Gap Width: 10.00 mm), Root Fill (Height: 6.70 mm, Angle: 37.00 °), Bottom Cap (Height: 2.00 mm, Auto-Width, Overlap: 3.00 mm).
- Zone Generation:** Auto (selected), Manual, Generate. Sliders for Upper Fill Length (1.20 mm), Fill Max. Length (3.50 mm), Hot Pass Max. Length (3.50 mm), Root Length (1.20 mm), Vol. Max. Length (8.00 mm).
- Zones:** Add, Remove. Table with columns: Name, Type, Side, X, Y, Angle, Length, Height, Depth.

The preview shows a weld bevel with dimensions and zone annotations. The zones are defined by their Name, Type, Side, X, Y, Angle, Length, Height, and Depth. The zones are:

Name	Type	Side	X	Y	Angle	Length	Height	Depth
F4	U...	S...	-10.05	0.00	37.00	1.20	0.96	0.96
F3	Fill	S...	-8.61	-1.92	37.00	2.40	1.91	2.87
F2	Fill	S...	-7.16	-3.83	37.00	2.40	1.91	4.79
F1	Fill	S...	-5.72	-5.74	37.00	2.40	1.91	6.70
R6	R...	S...	-5.00	-8.35	0.00	3.30	3.30	10.00
R5	R...	S...	-5.00	-11.65	0.00	3.30	3.30	13.30
R4	R...	S...	-5.72	-14.26	-37.00	2.40	1.91	15.21
R3	R...	S...	-7.16	-16.17	-37.00	2.40	1.91	17.13
R2	R...	S...	-8.61	-18.08	-37.00	2.40	1.91	19.04
R1	R...	S...	-10.05	-20.00	-37.00	1.20	0.96	20.00
V	V...	S...	0.00	-3.35	0.00	6.70	6.70	6.70
VR2	V...	S...	0.00	-10.03	0.00	6.65	6.65	13.35
VR1	V...	S...	0.00	-16.68	0.00	6.65	6.65	20.00

Once the Show Zones option has been activated, the Zone Generation and Zones panels are displayed, and zone annotations are added to the preview and drawing surfaces.

6.3.1 ZONE GENERATION PANEL TOOLBAR

Auto

When in Auto Zone Generation mode, the zones table is automatically regenerated from the defined weld regions and zone generation input parameters whenever the regions or parameters are modified. In this mode, zones are always kept in sync with their defining inputs.

Modifications to generated zones in the zones table are not permitted, as any updates would be lost during the next automatic regeneration. The exception to this is any manual zones that have been added to the zones table through the Add Manual Zone dialog.

Manual

When in Manual Zone Generation mode, the zones table is not regenerated when modifications are made to weld regions or zone generation input parameters. Instead, the zones table can be manually regenerated by using the Generate button.

Generated zones can be modified through the zones table, because regeneration will not occur automatically and will not overwrite any edits.

Generate

Will trigger zone table regeneration when in Manual mode, using current weld regions and zone generation input parameter values. Any zones that were previously generated by an auto or manual regeneration will be replaced. Any manually added zones will remain.

6.3.2 ZONE GENERATION PANEL TABS

The Zone Generation Panel has two tabs for configuring zones.

6.3.2.1 BY ZONE LENGTH TAB PARAMETERS

Upper Fill Length – The maximum length of the uppermost zone, generated from the upper fill region

Fill Max. Length – The maximum length of zones generated from root, root fill, v-type hot pass, fill, and upper fill regions

Hot Pass Max. Length – The maximum length of zones generated from v-type hot pass regions

Root Length – The maximum length of the root zone, generated from the bottommost root region

Vol. Max. Length – The maximum length of a volumetric zone. Volumetric zones are targeted along the center of the vertical axis of the weld.

Upper Fill Overlap – Allows the fill zones in the upper fill region to ignore the length of upper fill zone. The upper fill zone is still generated, but will be overlapped by a fill zone.

Root Overlap – Allows the fill zones in the bottommost root region to ignore the length of root zone. The root zone is still generated, but will be overlapped by a fill zone.

6.3.2.2 BY ZONE COUNT TAB PARAMETERS

Cap Zone Depth - The vertical depth from top of the piece to the bottom of the cap zone.

Num. Fill Zones - The number of equally sized zones between the bottom to the cap zone, and the top of the hot pass zone including the hot pass overlap value.

Hot Pass Overlap - The distance into the hot pass zone to where the bottom of the first fill zone is positioned.

Hot Pass Angle - Only used in bevels with j-type hot pass regions. The angle of the hot pass zone face. Also determines the zone target position by where along the radius a tangent equals the zone face angle.

Root Zone Depth - The vertical depth from bottom of the piece to the top of the root zone.

Num. Vol. Zones - The number of equally sized zones between the defined top and bottom vol. zone depths.

Top Vol. Depth - The vertical depth from the top of the piece to the top of the upper-most volumetric zone.

Bottom Vol. Depth - The vertical depth from the bottom of the piece to the bottom of the bottom-most volumetric zone.

A zone is essentially a line that has a position, length and orientation. This gives a zone a starting and ending point, and an angle. Zones also have a specific **Target** that is its main focus point. Typically the zone's target is directly in the middle of its length. The zone angle and target play an important role when using the [Zonal Beamset](#) Zonal Solver.

Two types of zones are created:

Fusion - zones that follow the fusion face of the weld bevel

Volumetric - zones that follow the vertical center of the weld bevel

Zones are generated (from the bottom of the weld bevel up) using the following steps:

1. Determine the root zone (R1), using the **Root Max.** parameter.
 - R1 is always located in the bottom-most root region.
2. Divide the remainder of the bottom-most root region into zones (R2 – Rx) of equal size, using the **Fill Max.** parameter.
 - if the **UF Overlap** option is activated, the entire bottom-most root region is divided, resulting in overlapping zones in the root
3. Divide any existing root regions into zones (Rx – Ry) of equal size, using the **Fill Max.** parameter.
4. Determine the hot pass zone(s). V-Type hot pass regions are divided into zones (HP1 – HPx) or equal size, using the **HP Max.** parameter.
 - J-Type hot pass regions are not divided and will only ever generate a single zone (HP).
5. Divide any existing fill regions into zones (F1 – Fx) of equal size, using the **Fill Max.** parameter.
6. Determine the upper fill zone (Fx), using the **UF Max.** parameter.
 - the upper fill zone is always located in the upper fill region.
 - if the **UF Overlap** option is activated, the entire top-most root region is divided, resulting in overlapping zones in the upper fill
7. Divide the remainder of the upper fill region into zones (Fx – Fy) of equal size, using the **Fill Max.** parameter.
8. Divide the area below the bottom of the hot pass region into volumetric root zones (VR1 – VRx) or equal size, using the **Volumetric Max.** parameter.
9. Divide the area above the bottom of the hot pass region into volumetric root zones (V1 – Vx) or equal size, using the **Volumetric Max.** parameter.

NOTE:

- It is important to note that the zones are generated with their length in mind, unlike regions which are defined by their height. The length of a zone will always be greater or equal to its height.
- Adjacent regions with equal fill angles are treated as a single region, and are divided into equal zones spanning the joined regions
- Zone names are not indexed (IE. R1, R2, etc.) if a zone prefix is only used once. For example, if there is only a single Hot Pass zone, it will be named "HP", not "HP1".

Zones By Count Algorithm

Zones are generated using the following steps:

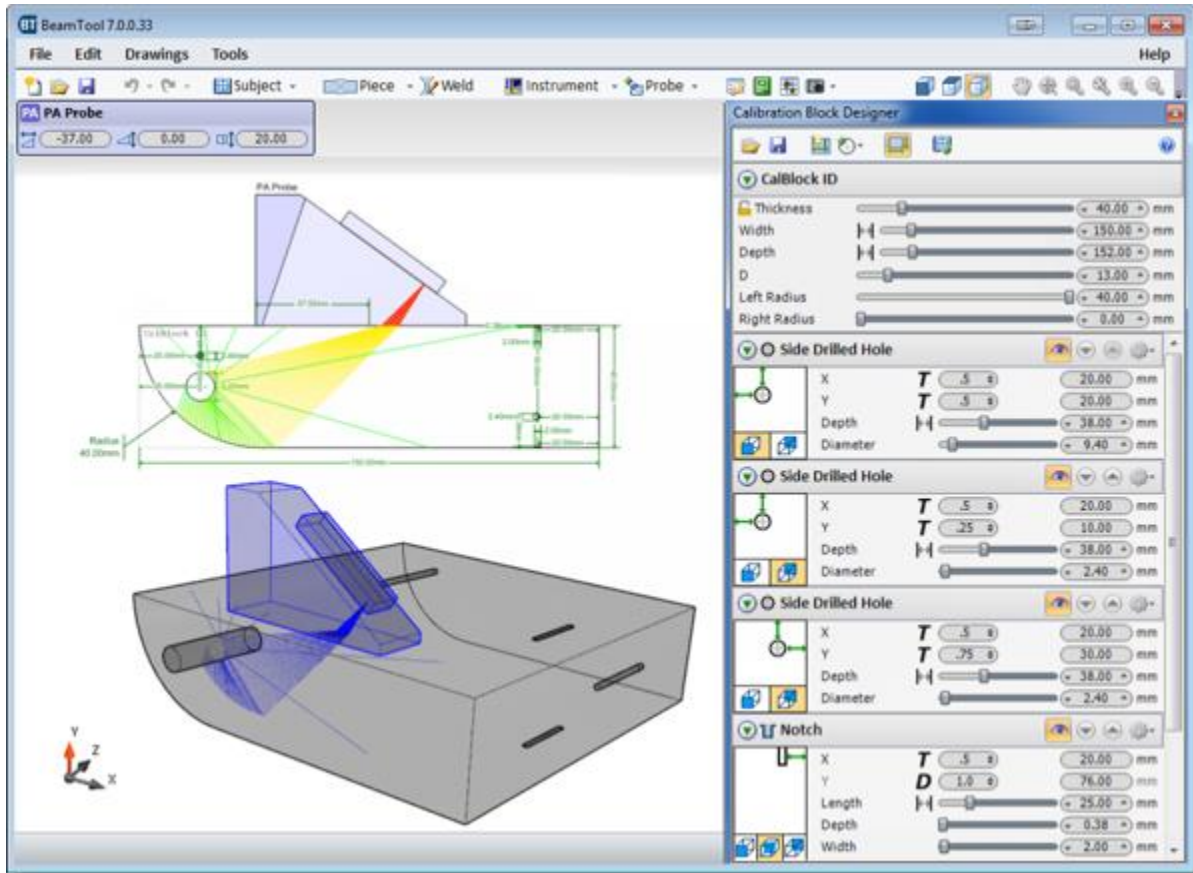
1. Determine the root zone (R), using the Root Zone Depth parameter
 - R is always located in the bottom-most root region.
2. Determine the cap zone (C), using the Zap Zone Depth parameter
 - C is always located in the upper fill region
3. Determine the hot pass zone (HP)
 - a) if using a v-type hot pass region, HP is the entire region face
 - b) if using a j-type hot pass region, HP is constructed using the Hot Pass Angle parameter. The zone target will be positioned along the region face where the tangent angle is equal to the defined angle parameter value. The zone length will be the height of the HP region
4. Determine the fill zones (F1 – Fx)
 - First determine the bottom point of the fill area by applying the Hot Pass Overlap parameter value as a negative offset from the top of the hot pass zone.
 - Using the determined bottom point of the fill and the top point of the fill area as the bottom of the C zone, divide the remaining bevel face into a total of Num. Fill Zones zones of equal length.
5. Determine the volumetric zone (V1 – Vx)
 - Using the Top Vol. Depth and Bottom Vol. Depth parameter values as positions on the center of the bevel, divide the distance between into a total of Num.Vol. Zones zones of equal length.

NOTE:

Weld bevels that include additional fill angles or root fills cannot be used with the Zones By Count zone generation method.

CHAPTER (7): CALIBRATION BLOCK

Easily generate an ASME compliant calibration block with the click of a button. Targets are added based on your piece thickness, while meeting the requirements of ASME Section 5, article 4, Figure 434.2.1. You can also design custom calibration blocks and generate reports that include all aspects of a calibration block to support machining. This allows the technician to spend more time on developing a technique.



7.1 CALIBRATION BLOCK DESIGNER TOOLBAR AND OPTIONS



Import

Import a previously saved CalBlock file. CalBlock files are saved with a *.btcb file extension.

Export

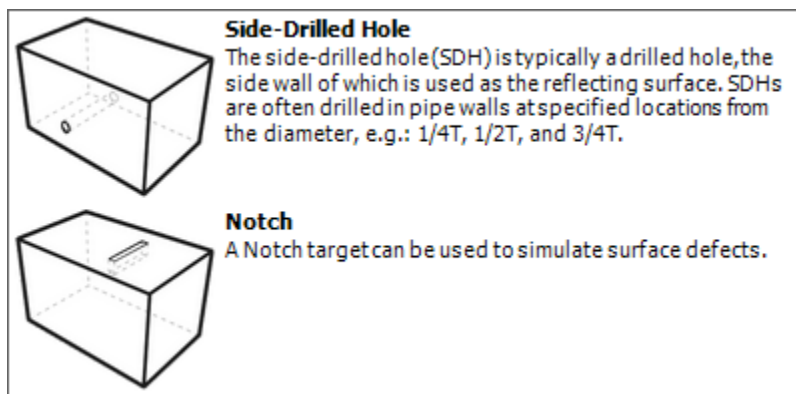
Export your CalBlock to file in order to use it again. CalBlock files are saved with a *.btcb file extension.

Auto Cal Block

Automatically creates an ASME compliant CalBlock based on the thickness of the subject. Once created, the CalBlock can be modified to meet specific requirements.

Add Target

Provides a drop-down menu of available targets to add to the calibration block. Available targets are Side-Drilled Hole and Notch. As targets are added their configuration panels will appear below the CalBlock parameters.



View Dimensions

Toggles on and off the view of the target dimensions in the workspace.

View Dimension Factors


When distances are based on a factor of T or D, display the factor on the dimension as an annotation.

Add Drawing Set

Brings up the Drawing Properties dialog box where you can name and describe a drawing you want to add. After the drawing properties have been defined, the selected drawing will be available from the Active Drawing drop-down menu found on the [Main Toolbar](#). See [Drawings](#) for more information on working with Drawings.

Dimension Options

Throughout the Calibration Block Designer dimensions can be set using one of three dimension options:

	Absolute Distance
T	Factor of Thickness
D	Factor of D

Choose the factoring applied by using the drop down menus:

¼	.25
½	.5
¾	.75
=	1
2x	2
3x	3
4x	4
5x	5



Absolute Distance - exact measurement from reference to position.

Factor of Thickness - measurement based on a factor of the thickness.

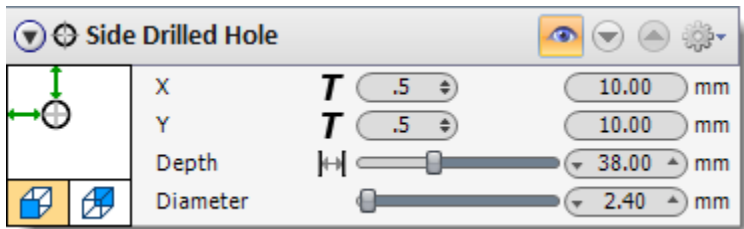
Factor of D - measurement based on a factor of D (minimum distance set by user). The value of D defaults to the ASME standard of 1/2" (13mm).

CalBlock Parameters

A serial number or identification number can be added to the drawing. Double-click on the "CalBlock" text to enter a custom value.

Thickness	Adjusts the overall thickness of the calibration block on the Y axis. The Thickness is Locked  to the thickness of the subject. Click the Lock icon to Unlock  and adjust to any thickness.
Width	Adjusts the overall width of the calibration block on the X axis.
Depth	Adjusts the overall depth of the calibration block on the Z axis.
D	Adjusts the minimal distance value. This value defaults to the ASME standard of 1/2" (13mm).
Left Radius	Adds a radius to the bottom left hand corner of the CalBlock.
Right Radius	Adds a radius to the bottom right hand corner of the CalBlock.

SDH Target Panel Options



 **Collapse Panel**

Collapses and expands the SDH Panel.

 **Target Visibility**

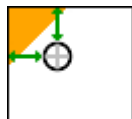
Toggles the visibility of the SDH target in the drawing.

 **Change Order**

Controls the order of the Target Panels in the Calibration Block Designer window.

 **Options Drop-Down**

Provides options for  Deleting,  Cloning and  Renaming the SDH target.



SDH Target Corner Anchor

Selects the corner anchor point for the SDH Target. Options include, Top Left, Top Right, Bottom Left and Bottom Right.



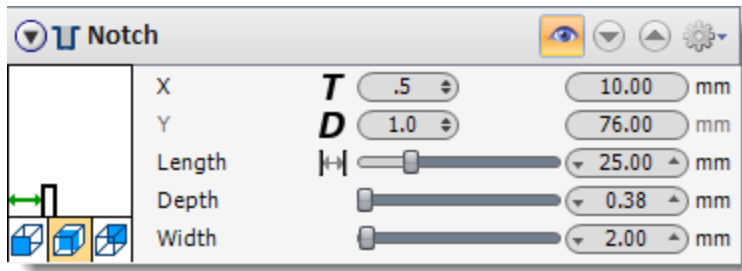
SDH Target Face Anchor

Selects the face anchor point for the SDH Target. Options include, Front and Back.

Side Drilled Hole Parameters

X	Defines the position of the SDH target of the X axis.
Y	Defines the position of the SDH target of the Y axis.
Depth	Defines the position for the depth of the SDH target.
Diameter	Defines the position for the diameter of the SDH target.

Notch Target Panel Options



Collapse Panel

Collapses and expands the Notch Panel.

Target Visibility

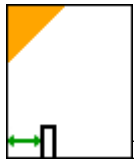
Toggles the visibility of the Notch target in the drawing.

Change Order

Controls the order of the Target Panels in the Calibration Block Designer window.

Options Drop-Down

Provides options for  Deleting,  Cloning and  Renaming the Notch target.



Notch Target Corner Anchor

Selects the corner anchor point for the Notch Target. Options include, Top Left, Top Right, Bottom Left and Bottom Right.



Notch Target Face Anchor

Selects the face anchor point for the Notch Target. Options include, Front, Centered and Back.

Notch Parameters

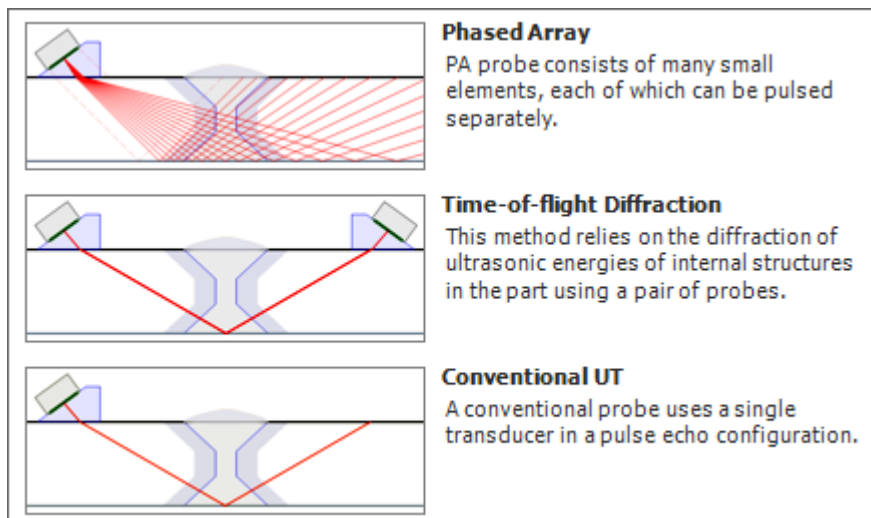
X	Defines the measurement for the location of the notch target of the X axis.
Y	Defines the measurement for the location of the notch target of the Y axis.
Length	Defines the measurement for the length of the notch target.
Depth	Defines the measurement for the depth of the notch target.
Width	Defines the measurement for the width of the notch target.

CHAPTER (8): PROBES

Probes

A probe is made up of a transducer and an optional wedge. A probe can be added to a workspace by using the [Add a Probe](#) menu option. Once added, a probe can be customized using the corresponding [Probe group](#). The Probe group provides access to the [Probe Configuration](#) which is used to specify the data values to be used for both the transducer and wedge. The Probe group also provides the ability to control what information is displayed on the drawing.

BeamTool supports the placement of Phased Array, Time Of Flight Diffraction and Conventional UT probes.




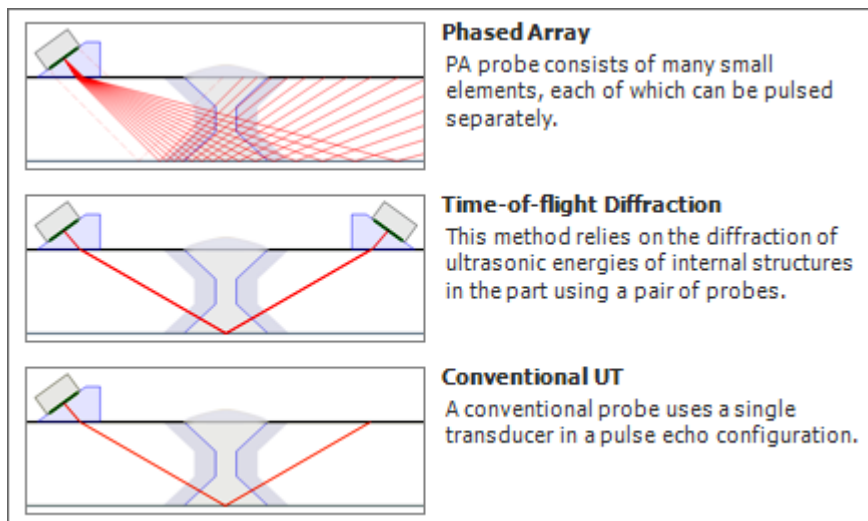
8.1 ADDING PROBES

A probe is made up of a transducer and an optional wedge. BeamTool supports the placement of Phased Array, Time of Flight Diffraction and Conventional UT probes.

Add a Probe



Multiple probes can be displayed in a workspace. By default, when BeamTool is opened there are no probes displayed on the drawing. To add a probe:

1. Press the  **Add Probe** button located on the main toolbar.
2. From the picklist select the type of probe to be placed:



A Probe group is added to the main toolbar and the new probe is displayed in the drawing.

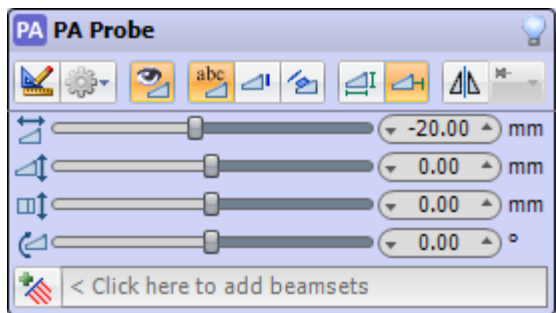
3. Press the button again to add another probe.

Once placed, probes can be configured by pressing the  [Probe Configuration](#) button available on the Probe group. Beamsets can also be added for Phased Array probes by pressing the  [Add Beamset](#) button on the Probe group. Beams for Time of Flight Diffraction and Conventional UT probes are automatically generated during probe placement.

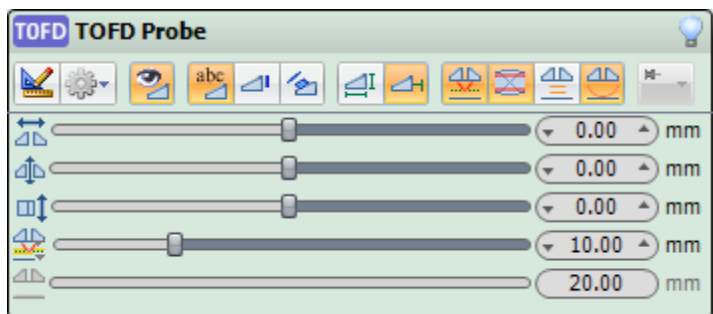
8.2 PROBE GROUPS

Each probe added to the workspace will have a corresponding probe menu added to the toolbar. You can change the view of the probe menu between Compact Probe Bar (provides a minimal readout and a popover edit panel) and Full Probe Bar (provides the full readout of the Probe menu) by clicking on the corresponding icons found on the [Main Toolbar](#). [Phased Array](#), [TOFD](#) and [Conventional UT](#) probe groups are colored uniquely and have differing options.

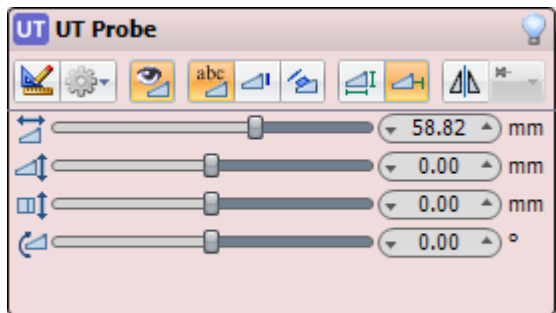
Phased Array:



TOFD:



Conventional UT:



8.2.1 PROBE CONFIGURATION

The transducer and wedge attributes of a probe can be modified via [Probe Configuration](#) button.

8.2.2 PROBE TOOLS

Each Probe Group has a Probe Tools drop-down menu that provides various actions that can be performed on a probe:

Clone a Probe

A probe can be created based on attribution specified for an existing probe. To clone an existing probe to create a new one:

1. Press the **Probe Tools** button located on the Probe group for the appropriate probe
2. Press the **Clone Probe** button. A new probe will be added using the identical attributes as the cloned probe.

Delete a Probe

Probes that have been added to the workspace using the **Add Probe** button can be removed. To remove a probe:

1. Press the **Probe Tools** button located on the Probe group for the appropriate probe
2. Press the **Delete Probe** button. The Probe group and corresponding graphics in the drawing are removed.

Rename a Probe

By default, probes are given a name that is used to distinguish it on the main toolbar and on the workspace and in reports via a label. This default name can be changed by double-clicking the probe name display on the top of the probe group (press "Enter" to save changes) or via the **Probe Tools** button:

1. Press the **Probe Tools** button located on the Probe group for the appropriate probe
2. Press the **Rename** button. The Probe group and corresponding graphics in the drawing are removed.

Re-Order Left

When multiple probes exist in the workspace, you can use this tool to re-order the active Probe Group menu one position to the left.

Re-Order Right

When multiple probes exist in the workspace, you can use this tool to re-order the active Probe Group menu one position to the right.

Import an Existing Probe

A probe added to the workspace can be configured manually through the various configuration options, or can be imported from an existing probe configuration (*.btps):

1. Press the **Probe Tools** button located on the Probe group for the appropriate probe
2. Press the **Import...** button and navigate to the BeamTool directory (default location) containing the configuration file (*.btps) to be opened.
3. Select the file and press **Open**. The configuration data will now be displayed in the dialog and the preview and drawing panes will update to display the selected wedge and transducer.

Export or Save a Probe Configuration


Once a Probe Configuration is complete it can be saved as a PA probe configuration (*.btps) or TOFD/Conventional probe set configuration (includes beam):

1. Press the **Probe Tools** button located on the Probe group for the appropriate probe
2. Press the **Export...** button and navigate to the BeamTool directory (default location).
3. Enter a name for the file in the File name field and press **Save**.

Additional Options

Additional probe group options are described in [Probe Options](#)

8.4 PROBE CONFIGURATION

A probe can be configured by pressing the  **Probe Configuration** button located on the Probe group.

Select a probe type below to see a detailed description of the available attributes that can be set for that type of probe.*

***NOTE: The refracted angle may vary slightly from the manufacturer's specified angle as the Piece velocity specified in BeamTool may be different than the velocity used by the manufacturer. Please adjust the Piece velocity or the Probe refracted angle as necessary.**

[Phased Array Probe Configuration](#)

[Time-of-Flight Diffraction Probe Configuration](#)

[Conventional UT Probe Configuration](#)

8.4.1 OTHER TOOLS AVAILABLE

In addition to the options available above, the following buttons are available during Probe configuration:

Expand Menu

All items in the corresponding menu are displayed.

Collapse Menu

Hides menu items in the corresponding menu.

Open an Existing Probe

Once the Probe Configuration dialog has been displayed, existing probe configurations (*.ebwt) can be opened:

1. Press the **Open Probe** button and navigate to the BeamTool directory (default location) containing the configuration file (*.ebwt) to be opened.
2. Select the file and press **Open**. The configuration data will now be displayed in the dialog and the preview and drawing panes will update to display the selected wedge and transducer.

Save a Probe Configuration

Once a Probe Configuration is complete it can be saved as a PA probe configuration (*.ebwt) or TOFD/Conventional probe set configuration (includes beam):

1. Press the **Save Probe** button and navigate to the BeamTool directory (default location).
2. Enter a name for the file in the File name field and press **Save**.

Add Drawing Set

Brings up the Drawing Properties dialog box where you can name and describe a drawing you want to add. After the drawing properties have been defined, the selected drawing will be available from the Active Drawing drop-down menu found on the [Main Toolbar](#). See [Drawings](#) for more information on working with Drawings.

Transducer Options

The options below are available by selecting from the Transducer picklist:

Import a Previously Saved Transducer

Previously saved transducer configurations (*.ebt) can be opened:

1. Press the **Open Transducer** button and navigate to the BeamTool directory (default location) containing the configuration file (*.ebt) to be imported.
2. Select the file and press **Open**. The configuration data will now be displayed in the dialog and the preview and drawing panes will update to display the selected transducer.

Save a Transducer

Once a transducer configuration is complete it can be saved (*.ebt):

1. Press the **Save Transducer** button and navigate to the BeamTool directory (default location).
2. Enter a name for the file in the File name field and press **Save**.

Import a Transducer from Catalog

Transducer data can be imported into BeamTool from an available catalog. To import from catalog:

1. Press the **Import from catalog** button to display a list of available transducer configurations.
2. Select the transducer record to be used and press **Import**. The transducer data is now displayed in the Probe Configuration dialog.

8.4.1.1 WEDGE OPTIONS

The options below are available by selecting from the Wedge picklist:

Import a Previously Saved Wedge

Previously saved wedge configurations (*.ebw) can be imported:

1. Press the **Open Wedge** button and navigate to the BeamTool directory (default location) containing the configuration file (*.ebw) to be opened.
2. Select the file and press **Open**. The configuration data will now be displayed in the dialog and the preview and drawing panes will update to display the selected wedge.

Save a Wedge

Once a wedge configuration is complete it can be saved (*.ebw):

1. Press the **Save Wedge** button and navigate to the BeamTool directory (default location).
2. Enter a name for the file in the File name field and press **Save**.

Import a Wedge from Catalog

Wedge data can be imported into BeamTool from an available catalog. To import from catalog:

1. Press the **Import from Catalog** button to display a list of available wedge configurations.
2. Select the wedge record to be used and press **Import**. The wedge data is now displayed in the Probe Configuration dialog.

Select a Wedge Material

The Wedge Velocity can be set by selecting a material from the Velocity picklist:

1. Press the **Material** button located on the Probe Configuration dialog. A list of available materials will be displayed.
2. Select a material from the list. The Velocity value will be set with the assigned material (compression) velocity.
3. The Material picklist can also be displayed by right clicking on the *Velocity* field.

High Temperature

When the High Temperature add-on is activated, this button can be used to import a High Temp Wedge from catalog, or visualize HighTemp for the selected wedge. To import:

1. Press the **Import High Temp Wedge** button to display a list of available HighTemp wedge configurations.
2. Select the HighTemp wedge record to be used and press **Import**. The wedge data is now displayed in the Probe Configuration dialog.

Color Properties



The line and fill colors of transducers, wedges and beams can be adjusted with the color properties tool.

8.4.2 PHASED ARRAY PROBE CONFIGURATION

General probe configuration options are described in [Probe Configuration](#). Options specific to phased array probes are described below. To specify a value you can **a)** move the slider right or left, **b)** click the right or left value spinner or **c)** click on the value displayed in the value spinner and type a value. The drawing pane will update on the fly as the values are modified.

8.4.2.1 TRANSDUCER OPTIONS

Normal Mount

The transducer is mounted onto the wedge so that the FIRST element is at the point described by the wedge's **Xt** and **Z** parameters.

Reversed Mount

The transducer is mounted onto the wedge so that the LAST element is at the point described by the wedge's **Xt** and **Z** parameters.

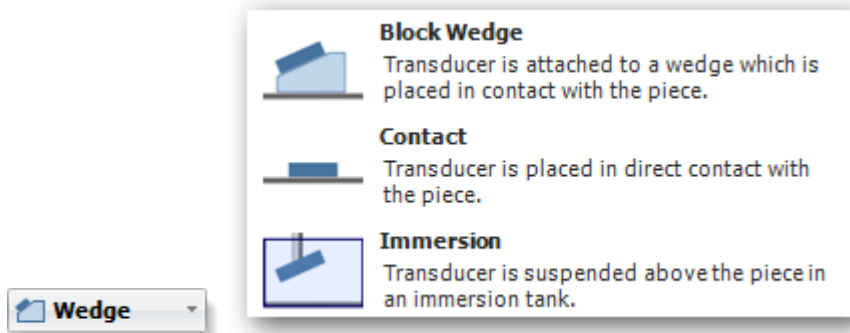
Parameters

Part Number	The part number of the transducer (entered by user or populated from import)
Frequency	The number of complete cycles per unit of time.
Total Elements	The total number of elements on the transducer that are available to convert the electrical energy into acoustical energy.
Element Pitch	The distance between the centers of two adjacent elements.
Element Width	The width of a single piezocomposite element.
Passive Width	The length of a single piezocomposite element.
Start Channel	The channel on the PA instrument that the transducer is connected to.
Element Gap	The gap between adjacent elements.
Total Aperture	The Total Elements multiplied by the Element Pitch. (read only)

8.4.2.2 WEDGE OPTIONS

Wedge Mode

The probe's wedge mode can be modified by clicking the **Wedge Mode** button. This will pop-up a drop-down list with **Block Wedge**, **Contact**, and **Immersion** options. Selecting the block wedge mode will display the full list of the following parameters. Selecting contact or immersion modes will hide all the wedge parameters aside from **Velocity**. When using contact or immersion modes, the velocity value is applied to the couplant or immersion medium.



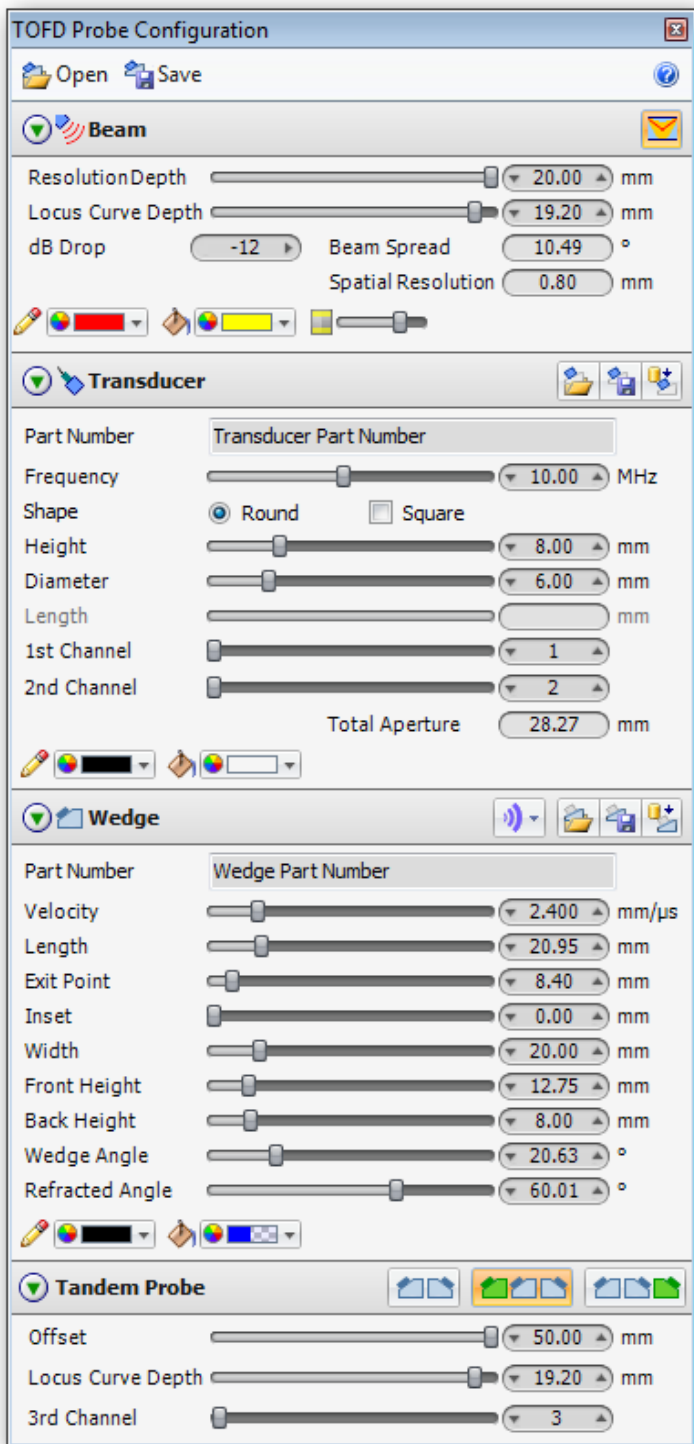
Changing the wedge mode will remove the wedge display from the drawing pane and will automatically set a new default value for the probe's elevation offset.

Parameters

Part Number	The part number of the wedge (entered by user or populated from import).
Velocity	The material (compression) velocity of the wedge, couplant or immersion medium. Right click on the field to select a velocity for a specified material. Velocity value can also be set by selecting from the Material picklist.
X	The length of the wedge in contact with the piece between the start location of the transducer and the front face.
Xt	The length of the wedge in contact with the piece between the back face of the wedge and start location of the transducer.
Z	The height of the first transducer element from the piece.
Height	The height of the wedge.
Width	The width of the wedge. (Changes visible in Top View)
Angle	The angle of the wedge on which the transducer sits.
Inset / Outset	This is the distance the transducer is recessed into the wedge or out from the wedge. Positive values are into the wedge and negative values are out from the wedge. This is sometimes referred to as the Pocket Depth.
Outset Buffer	The space between the outset on the wedge and the edges.
Front Slope	The angle of the slope at the front of the wedge
Damping Depth	The distance the damping groove extends into the wedge from the wedge face. The damping groove runs parallel to a line extending from the bottom of the wedge face to the top of the wedge slope.
Radius	
Wedge Length	The total length of the wedge in contact with the piece. (read only)

8.4.3 TIME-OF-FLIGHT DIFFRACTION PROBE CONFIGURATION

General probe configuration options are described in [Probe Configuration](#). Options specific to TOFD probes are described below. To specify a value you can **a)** move the slider right or left, **b)** click the right or left value spinner or **c)** click on the value displayed in the value spinner and type a value. The drawing pane will update on the fly as the values are modified.



8.4.3.1  BEAM OPTIONS Display Beam Coverage

Displays the estimated coverage area based on beam spread and refraction.

Parameters

Resolution Depth	The precision in which you can size the depth of a flaw.
Locus Curve Depth	The precision in which you can define the depth of the Locus Curve. Locus curves indicate the maximum detection range of a TOFD configuration. They can be used to identify whether additional techniques are required to cover areas beyond range. With a standard TOFD configuration, an indication may be detected somewhere between the two probes within the locus curve. However, the actual location of the indication might not be directly between the two probes symmetrically. A third probe (tandem probe) can be added to remove the ambiguity. The location of the indication can be more accurately determined by the intersection of the two locus curves.
Spatial Resolution	The distinguishing distance between two flaws.
dB Drop	Specifies the amplitude drop method to be used.
Beam Spread	The increase in beam diameter with distance from the aperture from which the beam emerges.
Near Field	A section of the radiated beam that is within a (small) number of wavelengths of the beam source.

8.4.3.2  TRANSDUCER OPTIONS

Parameters

Part Number	The part number of the transducer (entered by user or populated from import).
Frequency	The number of complete cycles per unit of time.
Shape	Toggle on Round or Square to specify the shape of the transducer.
Height	The height of the transducer.
Diameter	The diameter of the transducer. (Round transducers only)
Width	The width of the transducer. (Square transducers only)
Length	The length of the transducer. (Square transducers only)
Channel	The channel on the PA instrument that the first transducer is connected to.
2nd Channel	The channel on the PA instrument that the second transducer is connected to.
Total Aperture	Usually a single element. (read only)

8.4.3.3  WEDGE OPTIONS




Parameters

Part Number	The part number of the wedge (entered by user or populated from import).
Velocity	The material velocity of the wedge. Right click on the field to select a velocity for a specified material.
Length	The total length of the wedge in contact with the piece.
Exit Point	The distance between the front face of the wedge and the point at which the beam exits the wedge.
Inset	The depth of the inset into the wedge in which the transducer sits.
Width	The width of the wedge. (Changes visible in Top View)
Front Height	The height of the front face of the wedge.
Back Height	The height of the back face of the wedge.
Wedge Angle	The angle of the wedge on which the transducer sits.
Refracted Angle	The angle of the beam through the wedge based on the velocity.

8.4.3.4 TANDEM PROBE OPTIONS

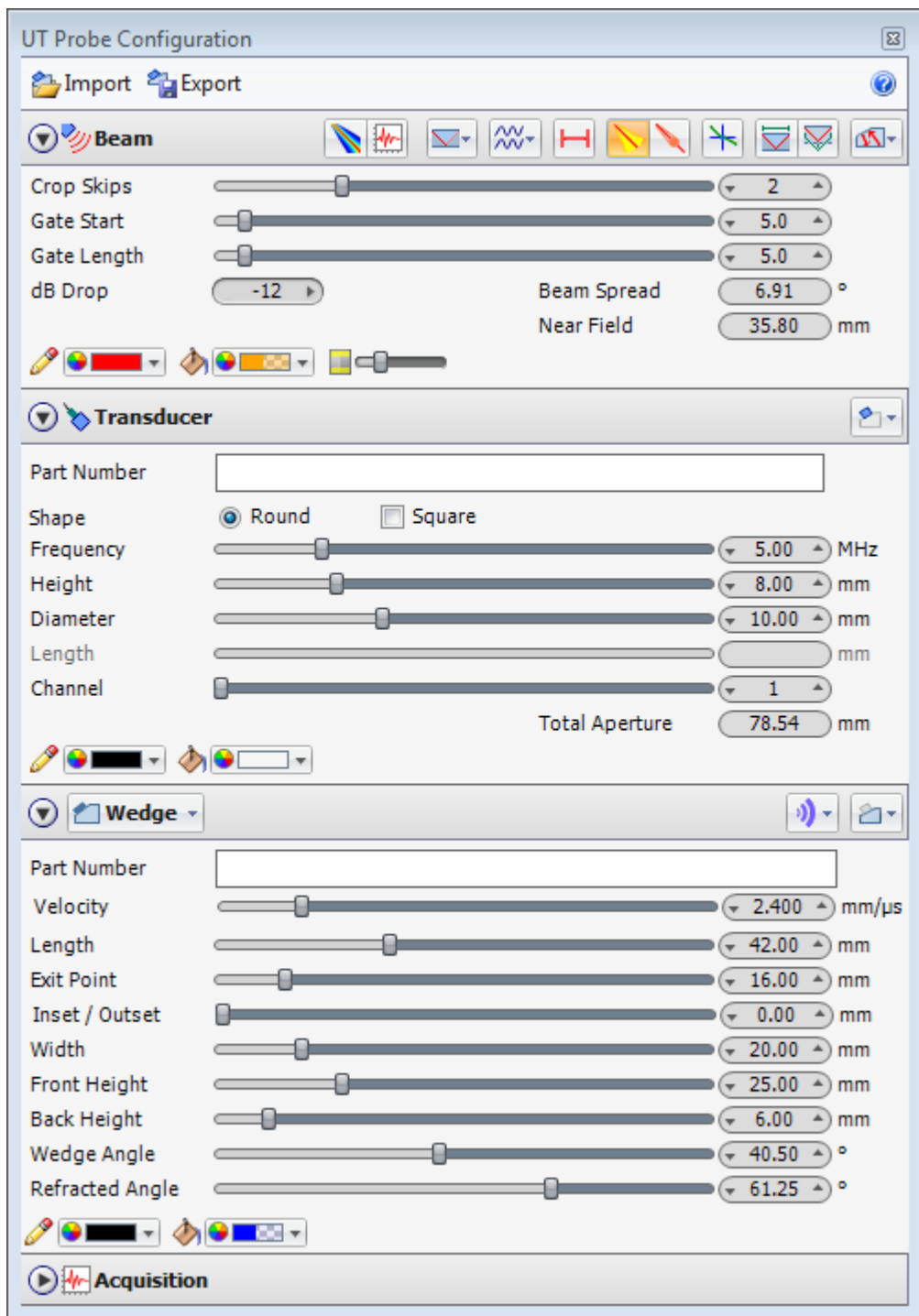
TOFD probes can be configured in Tandem mode, where a third probe is configured to work in conjunction with the existing left or right probe.

Parameters

 Tandem None	Removes any tandem probes from the piece.
 Tandem Left	Places a tandem probe on the left hand side of the piece.
 Tandem Right	Places a tandem probe on the right hand side of the piece.

8.4.4 CONVENTIONAL UT PROBE CONFIGURATION

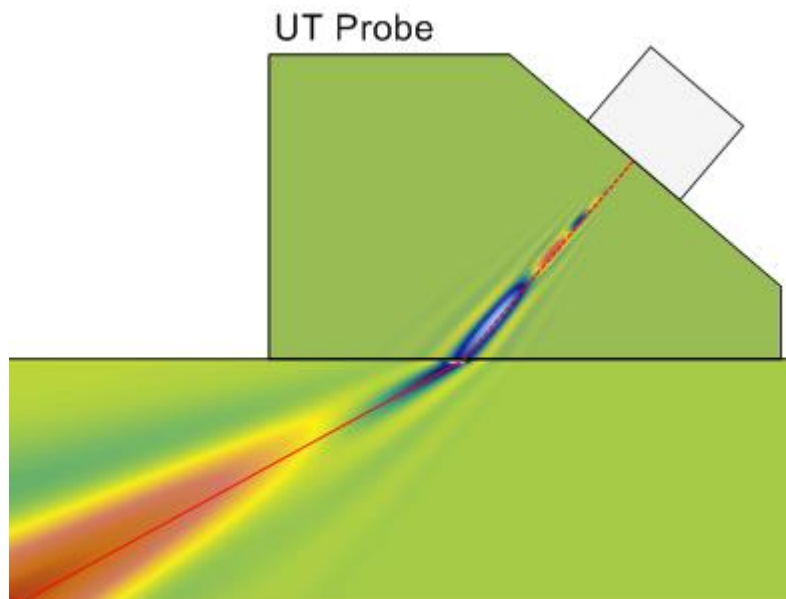
General probe configuration options are described in [Probe Configuration](#). Options specific to conventional UT probes are described below. To specify a value you can **a)** move the slider right or left, **b)** click the right or left value spinner or **c)** click on the value displayed in the value spinner and type a value. The drawing pane will update on the fly as the values are modified.



8.4.4.1 BEAM OPTIONS

Sound Pressure

Visually renders sound pressure at any point in the field represented by a geometric or bitmap wavefront. Using real field physics the wavefront can be focused, and even steered, by adding a time delay to change the refracted angle.



Display A-Scan

Displays an A-Scan visualization for the probe. Additional detail on configuring A-Scans can be found [here](#).

Crop Mode

Identify any type point on a beam path based on  Distance from Elements,  Time from Elements,  Distance from Interface,  Time from Interface or  Skips.

- Distance from Elements: Beams are cropped at a specific distance from the elements along the beam path.
- Time from Elements: Beams are cropped at a specific time from the elements along the beam path based on the velocity of the materials.
- Distance from Interface: Beams are cropped at a specific distance from where the beam enters the piece.
- Time from Interface: Beams are cropped at a specific time from where the beam enters the piece.
- Skips: Beams are cropped by setting the number of skips (reflections).

 **Use Piece Shear Velocity**

Selects the Shear velocity of the piece to be used when calculating the beam path through the piece.

 **Use Piece Compression Velocity**

Selects the Compression velocity of the piece to be used when calculating the beam path through the piece.

 **Display Beam Spread**

Displays how the beam spreads out as it propagates through the material.

 **Show Snell's Law**

Displays a visualization of Snell's Law where the beam refracts into the piece.

 **Display Beam Near Field**

Displays the area in the sound beam immediately in front of the transducer and is calculated using the frequency and cross-sectional area of the transducer surface.

 **Display Surface Distance Dimension**

Displays the distance along the entry surface between the initial entry point into the specimen and its reflected exit point.

 **Display V Path Distance Dimension**

Displays the total distance the beam travels through the specimen from the initial entry point to the exit point.

 **Display Pitch Catch**

Displays the path a reflected beam would take back into a wedge and the elements that could best be used to receive this signal.

Parameters

Gate Start	The distance from the exit point on the bottom of the wedge to the start point of the gate.
Gate Length	The length of the gate segment.
dB Drop	Specifies the amplitude drop method to be used.

Beam Spread	The increase in beam diameter with distance from the aperture from which the beam emerges.
Near Field	A section of the radiated beam that is within a (small) number of wavelengths of the beam source.

8.4.4.2 TRANSDUCER OPTIONS

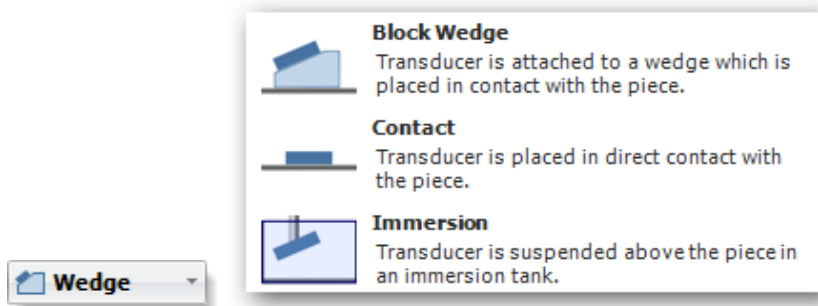
Parameters

Part Number	The part number of the transducer (entered by user or populated from import)
Frequency	The number of waves that pass a given point in a specified unit of time.
Shape	Toggle on Round or Square to specify the shape of the transducer.
Height	The height of the transducer.
Diameter	The diameter of the transducer. (Round transducers only)
Width	The width of the transducer. (Square transducers only)
Length	The length of the transducer. (Square transducers only)
Channel	The channel on the PA instrument that the transducer is connected to.
Total Aperture	Usually a single element. (read only)

8.4.4.3 WEDGE OPTIONS

Wedge Mode

The probe's wedge mode can be modified by clicking the **Wedge Mode** button. This will pop-up a drop-down list with **Block Wedge**, **Contact**, and **Immersion** options. Selecting the block wedge mode will display the full list of the following parameters. Selecting contact or immersion modes will hide all the wedge parameters aside from **Velocity**. When using contact or immersion modes, the velocity value is applied to the couplant or immersion medium.



Changing the wedge mode will remove the wedge display from the drawing pane and will automatically set a new default value for the probe's elevation offset.

Parameters

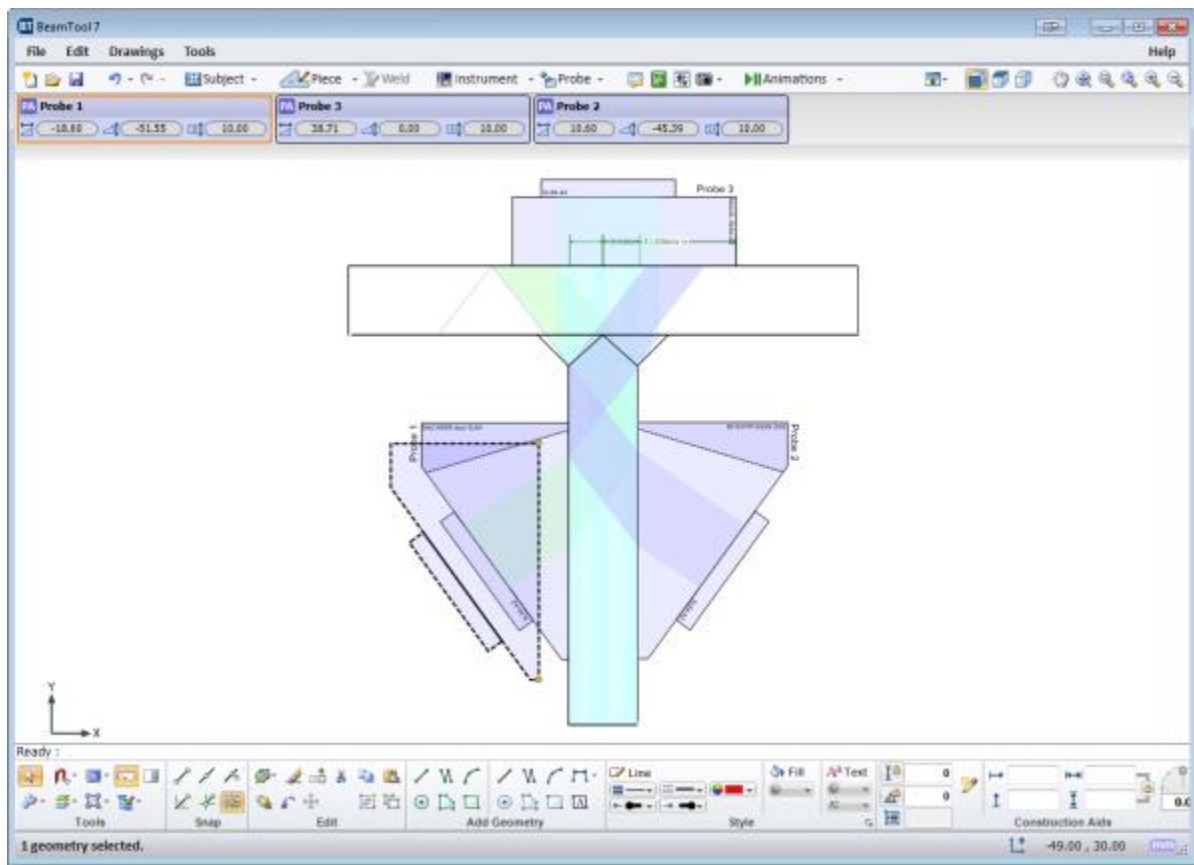
Part Number	The part number of the wedge (entered by user or populated from import).
Velocity	The material velocity of the wedge. Right click on the field to select a velocity for a specified material.
Length	The total length of the wedge in contact with the piece.
Exit Point	The distance between the front face of the wedge and the point at which the beam exits the wedge.
Inset	The depth of the inset into the wedge in which the transducer sits.
Width	The width of the wedge. (Changes visible in Top View)
Front Height	The height of the front face of the wedge.
Back Height	The height of the back face of the wedge.
Wedge Angle	The angle of the wedge on which the transducer sits.
Refracted Angle	The angle of the beam through the wedge based on the velocity.

Acquisition

The Acquisition parameters are not directly utilized in BeamTool rendering, but can in downstream applications through export or import. Eclipse's TrueView girth weld scanning system, for example.

8.5 PROBE POSITIONING

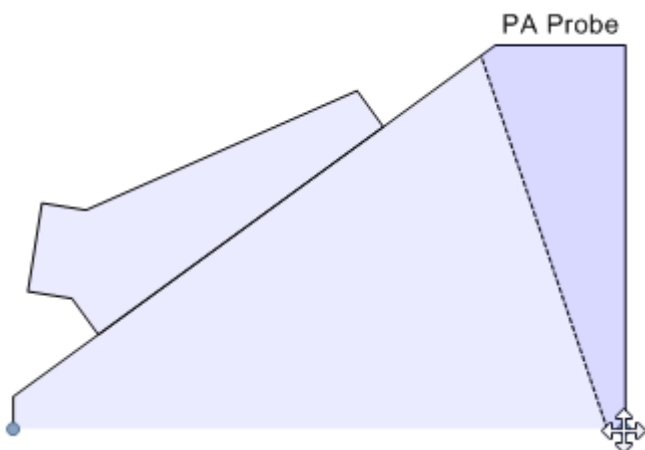
Probes can be positioned interactively through the workspace surface.



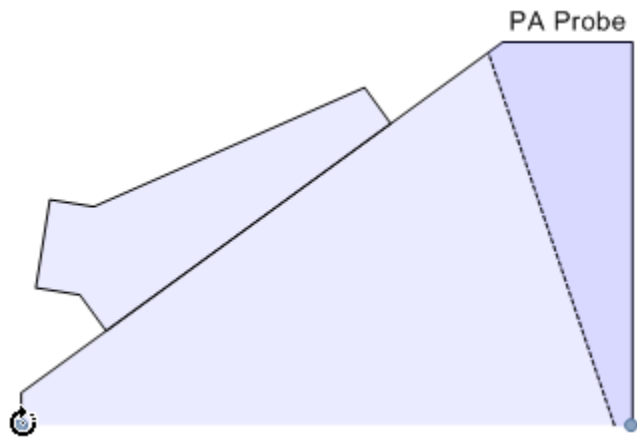
Click and hold to drag and drop Phased Array and Conventional probes to place them anywhere on your workspace.

Handles are provided for positioning and rotating probes on both side and top views.

The handle on the front of the probe is used for positioning.



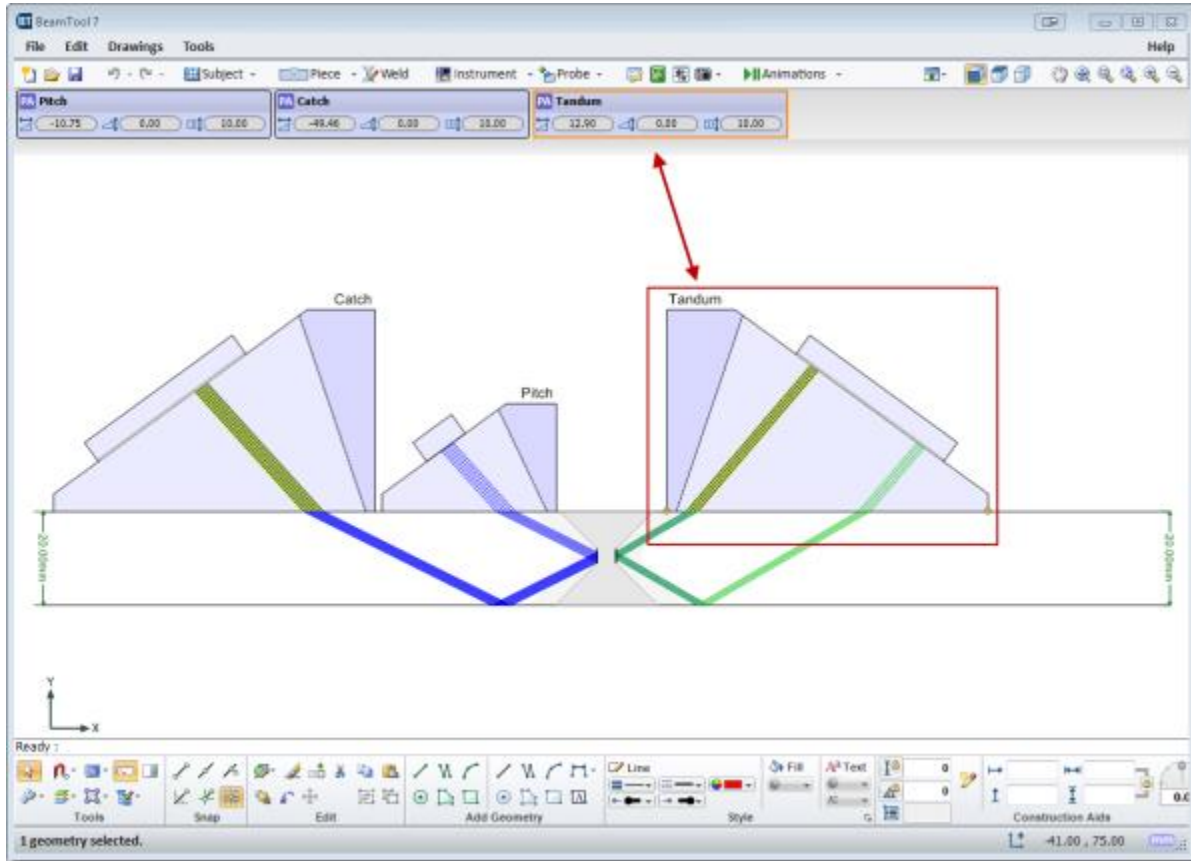
The Handle on the back of the probe is used for rotating



Snapping and Construction Aids can also be used to help accurately position your probes.

8.6 PROBE IDENTIFIER










When a probe is selected in the workspace, BeamTool will automatically highlight the probes corresponding configuration box. This allows the user to quickly identify the configuration options for the selected probe in a multi-probe workspace. Multiple probe selection is also supported.









8.7 PROBE OPTIONS



In addition to configuring some simple probe attributes, the Probe Group also provides the ability to do the following:

8.7.1 ALL PROBE GROUPS



 Probe Configuration	Displays the Probe Configuration dialog which can be used to specify detailed probe attributes.
 Probe Tools	Provides access to the Clone, Delete, Rename, Import and Export probe commands.
 Clone Probe	Creates a probe based on attribution set for existing probe.
 Delete Probe	Removes the probe. The Probe group and corresponding graphics in the drawing are removed.
 Rename Probe	When selected, the Probe name is editable.
 Re-Order Left	When multiple probes exist in the workspace, you can use this tool to re-order the active Probe Group menu one position to the left.
 Re-Order Right	When multiple probes exist in the workspace, you can use this tool to re-order the active Probe Group menu one position to the right.
 Import Probe	When selected, imports the beam configurations for a previously saved probe set (*.ebps).
 Export Probe	When selected, exports the probe set (*.ebps).



 Display Probe	When selected, displays the probe and associated graphics (labels and beams) on the drawing.
 Display Probe Name	When selected, displays the name of the probe on the drawing.
 Display Wedge Part Number	When selected, displays the wedge part number on the drawing.
 Display Transducer Part Number	When selected, displays the transducer part number on the drawing.
 Display Wedge Dimensions	When selected, displays the X, Xt, Z and Height values for the wedge on the drawing.
 Display Wedge Position Dimension	When selected, displays the distance of the wedge from the centre point on the weld on the drawing.

8.7.2 PHASED ARRAY GROUP ONLY






 Flip Probe	Flips the probe horizontally.
 Pin	Controls how the probe is pinned to an ID/OD piece (available on ID/OD pieces only).





 Add Beamset	Adds a Beamset to a Phased Array probe.
--	---

 Probe Position (Side View - Horizontal)	Adjusts the probe distance from the center of the weld.
 Probe Position (Side View - Vertical)	Adjusts the probe distance from the top face of the piece


 Probe Position (Top View)	Adjusts the probe position along the width of the top face of the piece (available in Top View only).
 Rotate Probe	Rotates the Probe +/- 90 degrees





8.7.3 TOFD GROUP ONLY

 Display Crossover Dimensions	When selected, displays the percentage and distance into the piece that the transmitter beam travels to the point it meets the receiver beam.
 Display Dead Zones	When selected, displays the near surface discontinuity areas for the top and bottom walls of the piece.
 Spatial Resolution	When selected, displays the height of the smallest resolvable flaw at a given depth.
 Display Locus Curve	When selected, displays a locus curve indicating the maximum detection range of the TOFD configuration.
 Pin	Controls how the probe is pinned to an ID/OD piece (available on ID/OD pieces only).

 Index Offset	The distance the probes are offset horizontally. This is based on the horizontal center of the beam crossover.
 Elevation Offset	The distance probe A and probe B are vertically offset from one another. Positive numbers elevate probe B and negative numbers offset probe A.
 Probe Position (Top View)	Adjusts the probe position along the width of the top face of the piece (available in Top View only).
 Crossover Depth	This is the depth within the piece that the beam crossover should occur.

8.7.4 CONVENTIONAL UT GROUP ONLY

 Flip Probe	Flips the probe horizontally.
 Pin	Controls how the probe is pinned to an ID/OD piece (available on ID/OD pieces only).

 Probe Position (Side View - Horizontal)	Adjusts the probe distance from the center of the weld.
 Probe Position (Side View - Vertical)	Adjusts the probe distance from the top face of the piece.
 Probe Position (Top View)	Adjusts the probe position along the width of the top face of the piece (available in Top View only).
 Rotate Probe	Rotates the Probe +/- 90 degrees.

8.7.5 OTHER TOOLS AVAILABLE

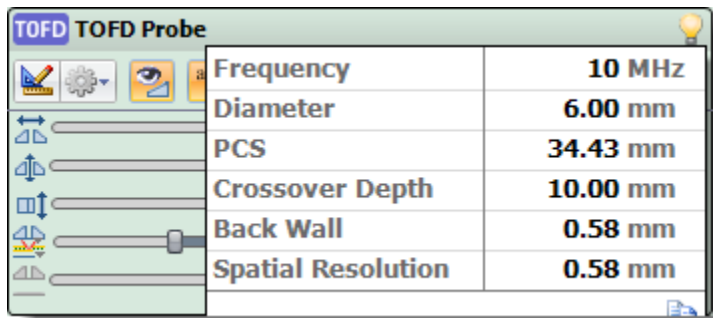
In addition to the buttons available above the following information is available using the Piece group.

Recents

As you use BeamTool, the software will remember which transducers, wedges and equipment you commonly use. The recently used probes and wedges will be available for quick access from a drop-down menu, without having to import from a file or our extensive catalog.

💡 Probe Info Tips

Probe Info can be selected to display a quick summary of the key Probe values specified.



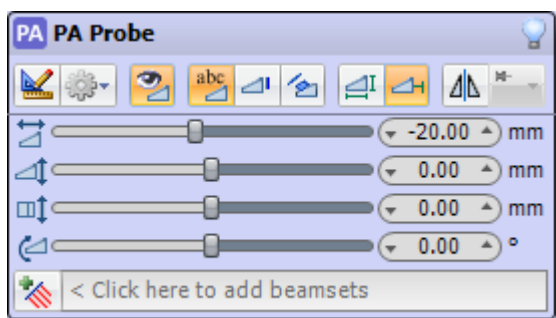
The screenshot shows a software window titled "TOFD TOFD Probe" with a lightbulb icon in the top right corner. The window contains a table of probe parameters and a vertical toolbar on the left with icons for various settings.

Frequency	10 MHz
Diameter	6.00 mm
PCS	34.43 mm
Crossover Depth	10.00 mm
Back Wall	0.58 mm
Spatial Resolution	0.58 mm

CHAPTER (9): PHASED ARRAY

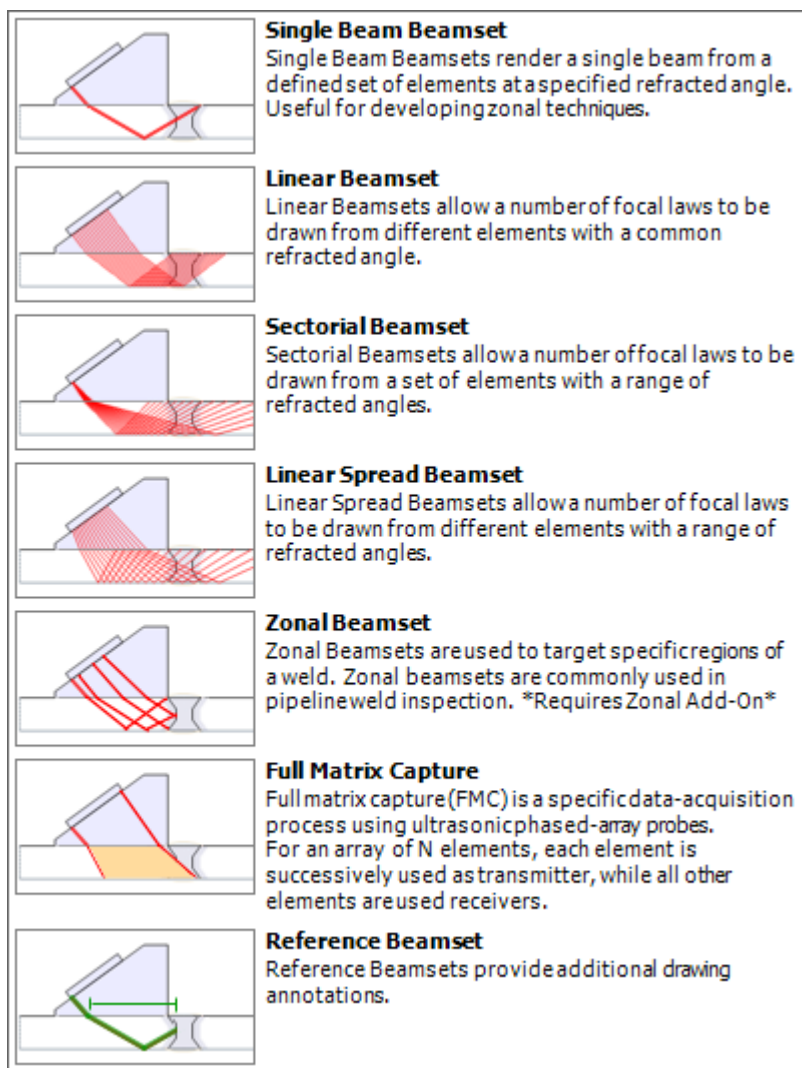
Phased Array testing is a specialized type of ultrasonic testing that uses sophisticated multi-element array transducers and powerful software to steer high frequency sound beams through the test piece and map returning echoes, producing detailed images of internal structures similar to medical ultrasound images. It is used for inspection of critical structural metals, pipeline welds, aerospace components and similar applications where the additional information supplied by phased array inspection is valuable.


The phased array probe is comprised of many small ultrasonic elements each of which can be pulsed individually. By varying the timing, for instance by pulsing the elements one by one in sequence along a row, a pattern of interference is set up that results in a beam at a set angle. In other words, the beam can be steered electronically. The beam is swept like a search light through the piece being examined and the data from multiple beams are put together to make a visual image showing a slice through the piece.



9.1 PHASED ARRAY BEAMSETS

Phased Array probes support seven types of beamsets:



Beamsets can be [added](#) to a phased array probe by clicking the  **Add Beamset**, or one of the seven beamset icons on the appropriate probe group.

 [Single Beam Beamset](#)

 [Linear Beamset](#)

 [Sectorial Beamset](#)

 [Linear Spread Beamset](#)

 [Zonal Beamset](#)

 [Full Matrix Capture Beamset](#)

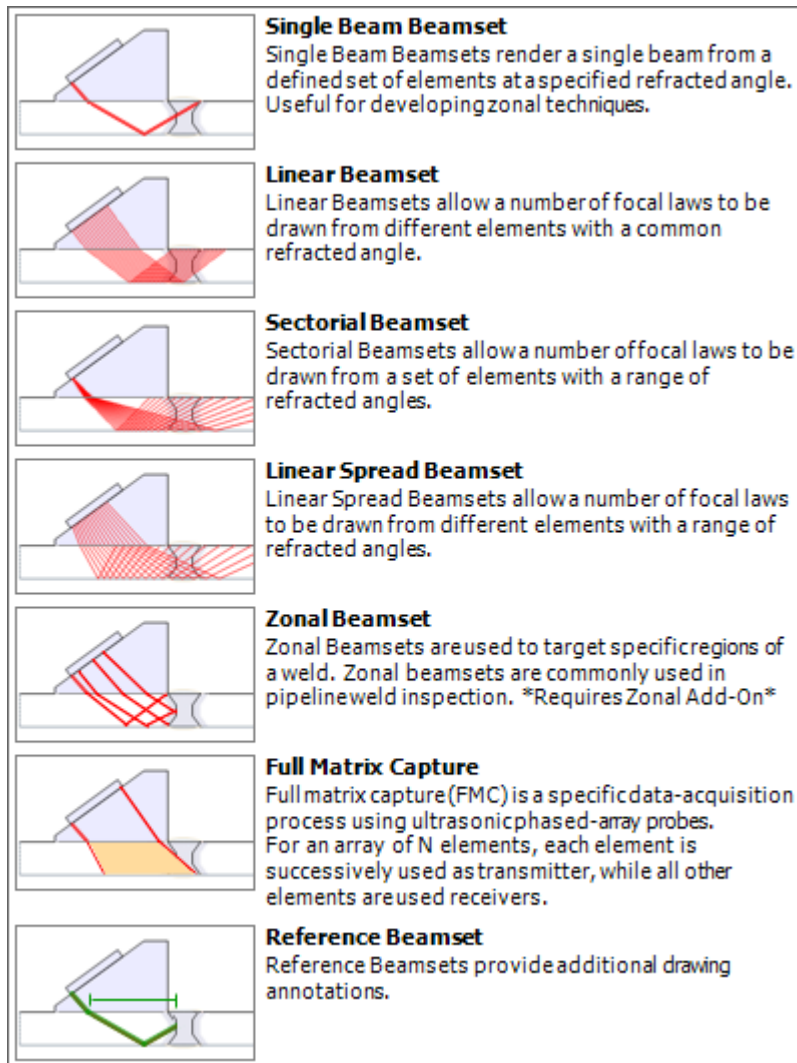
 [Reference Beamset](#)

More than one beamset can be added to a single PA probe.

Once added, a beamset can be modified and [configured](#) by clicking on the **Beamset Tab** that gets added to the Probe group


9.1.1 ADDING PA BEAMSETS

Phased Array probes support six types of beamsets:






Add a Beamset

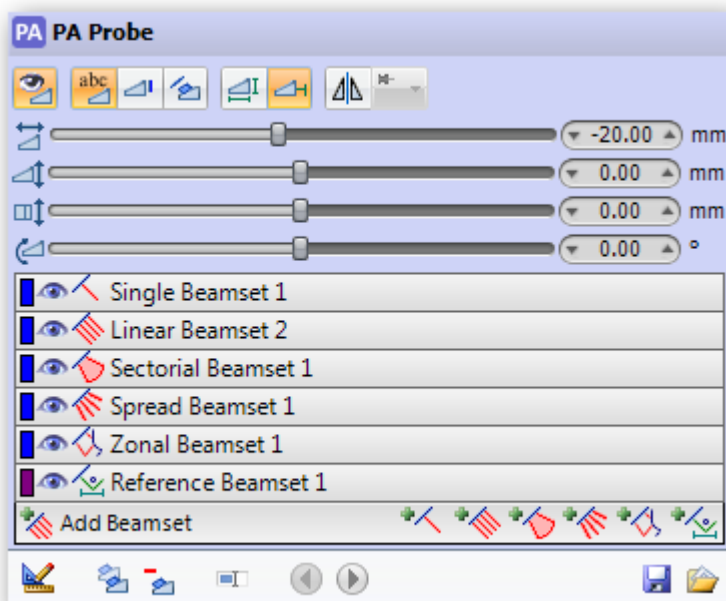
A Phased Array probe can display one or more beamsets. There are two methods to add a beamset to a probe:

1. Press the  Add Beamset button located on the Probe group for the selected probe. A drop down list containing the available beamsets is displayed. Select the appropriate beamset from the list. The beamset is displayed on the drawing for the selected probe. A Single Beam, Linear, Sectorial, Linear Spread, Zonal, Full Matrix Capture or Reference Beamset tab is added to the Probe group.
2. You can also add a beamset by clicking on one of the seven corresponding icons found on the Probe Group.

[Single Beam Beamset](#)

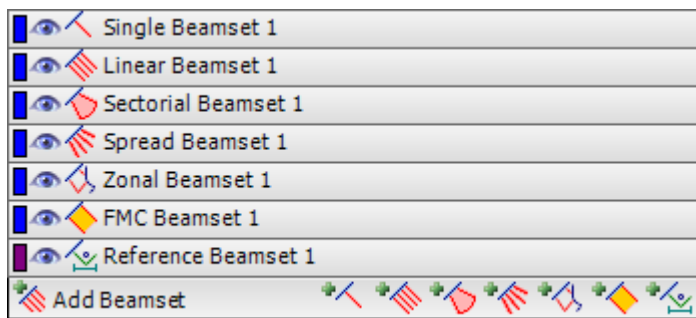
-  [Linear Beamset](#)
-  [Sectorial Beamset](#)
-  [Linear Spread Beamset](#)
-  [Zonal Beamset](#)
-  [Full Matrix Capture Beamset](#)
-  [Reference Beamset](#)

A [Beamset Tab](#) will be added to the probe group (above the  Add Beamset icon) for each beamset added to the probe.



A beamset can be [configured](#) on the beamset tab menu, or by clicking the beamset tab.

9.1.2 PHASED ARRAY BEAMSET TABS

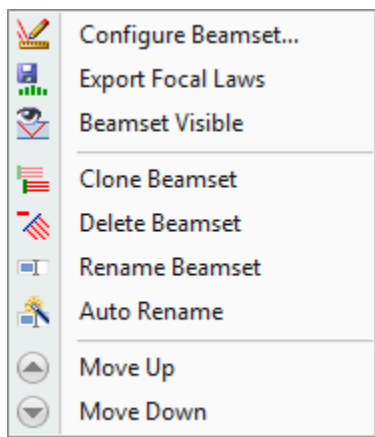


A beamset tab is added to the probe group (above the Add Beamset button) for each beamset added to the probe. The beamset tab displays the following information/options:

- Color bar indicating the current beamset line color
- Type of beamset (single beam, linear, sectorial, linear spread, zonal or reference)
- Beamset visibility (on or off)
- Up and down arrows for re-ordering beamsets when multiple beamsets are present
- The ability to delete the beamset

Configure Beamset

A beamset tab is also a button that can be used to access additional beamset functions. Double-clicking the beamset tab will open the [Beamset Configuration](#). Right-clicking on the beamset tab pops up a drop-down list with the following options.



Configure Beamset

The specific parameters of the beamset can be set through the **Configure Beamset** button. A description of the available beamset parameters can be found in [Beamset Configuration](#).

Export Focal Laws

Exports a law file based on your beamset configuration. Law files can be imported into an instrument by technicians to greatly decrease setup time.

Beamset Visibility

To avoid workspace clutter the visibility of beamset graphics in the drawing can be turned on or off. By default, beamset graphics are displayed. To turn the visibility off:

1. Select **Beamset Visible** from the menu. The beamset graphics are removed from the drawing but the beamset button remains available on the probe toolgroup. The **Beamset** button on the probe toolgroup no longer displays the Visibility (closed eye) indicator.
2. Select **Beamset Visible** again to display the graphics in the drawing. The **Beamset** button on the probe toolgroup displays the Visibility (eye) indicator.

Additionally, the visibility of the beamset can be specified using the **Toggle Beamset Visibility** button located on the Beamset Configuration dialog.

Clone Beamset

Beamsets that have been added to the workspace using the **Add Beamset** button can be cloned, creating a beamset with duplicate attribution. To clone a beamset:

1. In the probe toolgroup click on the beamset to be cloned and select **Clone Beamset** from the menu. A new beamset toolgroup and corresponding graphics are added to the Probe toolgroup.

Delete Beamset

Beamsets that have been added to the workspace using the **Add Beamset** button can be removed. To remove a beamset:

1. In the probe toolgroup click on the beamset to be removed and select **Delete Beamset** from the menu. The beamset toolgroup and corresponding graphics in the drawing are removed.

Rename Beamset

Beamsets that have been added to the workspace using the **Add Beamset** button can be renamed from the system generated name. To rename a beamset:

1. In the probe toolgroup right click on the beamset to be renamed and select **Rename** from the menu. Type the new name and select press Enter on the keyboard.

Auto Rename

Generates a static beamset name based on angles and wave type of the selected beamset.


Re-Order Up

When multiple beamsets exist, you can use this tool to re-order the selected beamset tab one position up.

Re-Order Down

When multiple beamsets exist, you can use this tool to re-order the selected beamset tab one position down.

9.1.3 CONFIGURATION OF PHASED ARRAY (PA) BEAMSETS

Once a beamset has been [added](#) to a Phased Array probe it can be configured by double-clicking on the Beamset tab added to the Probe group or by selecting  **Configure Beamset** from the right-click [Beamset Tab](#) menu. This will display the Beam Configuration dialog which can be used to specify the data values to be used.

Some configuration options and parameters are available to all types of beamsets, but other options and parameters are only available to certain beamset types.

9.1.3.1 COMMON BEAMSET OPTIONS

Below are the options that can be set for most Phased Array beamsets.

Toggle Beamset Visibility

To avoid workspace clutter the visibility of beamset graphics in the drawing can be turned on or off. By default, beamset graphics are displayed. Deselect the Toggle Beamset Visibility button to hide the beamset graphics.

Export Focal Laws

Exports a law file based on your beamset configuration. Law files can be imported into an instrument by technicians to greatly decrease setup time.

Crop Mode

Identify any type point on a beam path based on  Distance from Elements,  Time from Elements,  Distance from Interface,  Time from Interface or  Skips.

- Distance from Elements: Beams are cropped at a specific distance from the elements along the beam path.
- Time from Elements: Beams are cropped at a specific time from the elements along the beam path based on the velocity of the materials.
- Distance from Interface: Beams are cropped at a specific distance from where the beam enters the piece.
- Time from Interface: Beams are cropped at a specific time from where the beam enters the piece.
- Skips: Beams are cropped by setting the number of skips (reflections).

Use Piece Shear Velocity

Selects the Shear velocity of the piece to be used when calculating the beam path through the piece.

Use Piece Compression Velocity

Selects the Compression velocity of the piece to be used when calculating the beam path through the piece.

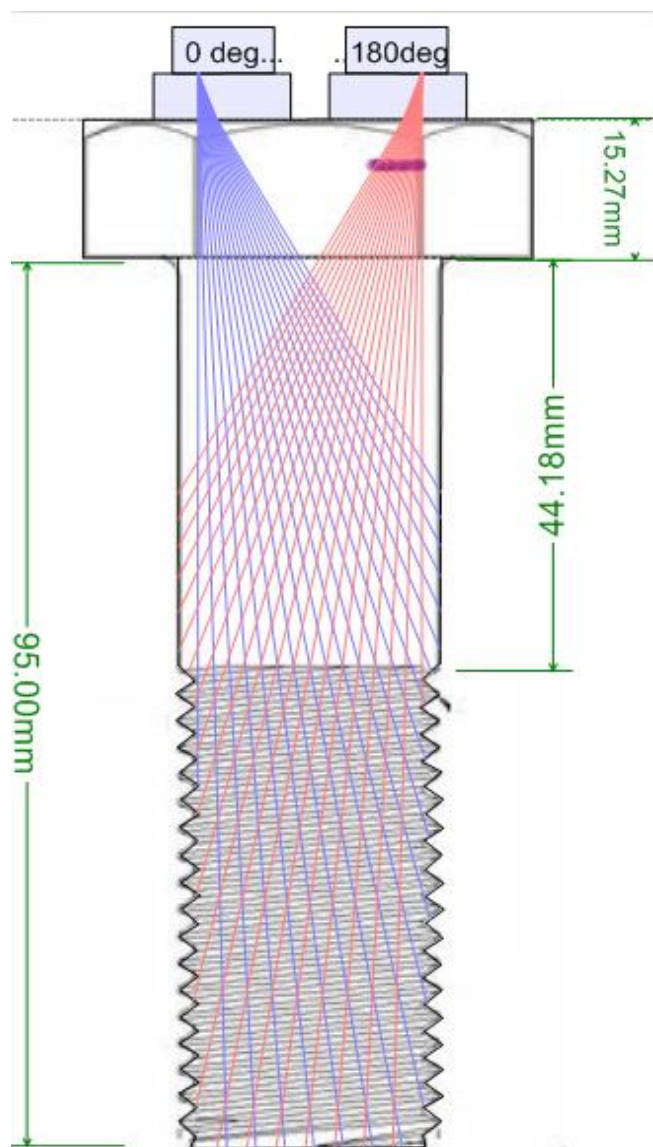
Display Beam Focus


Defines the point at which a sound beam converges to minimum diameter and maximum sound pressure and beyond which the beam diverges.

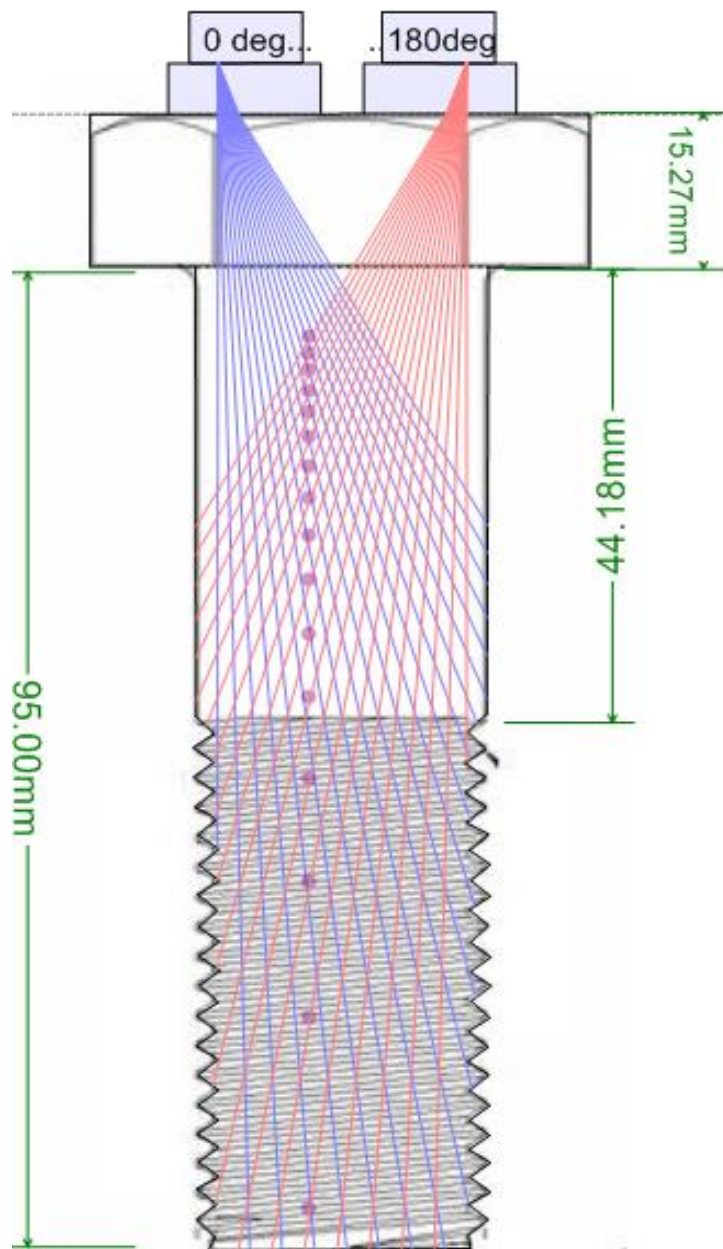
A Focus Type can be specified and used to display the beam's focus into the piece.


1. Select the Focus Type button. A list of Focus Types are displayed.
2. Select the appropriate Focus Type:

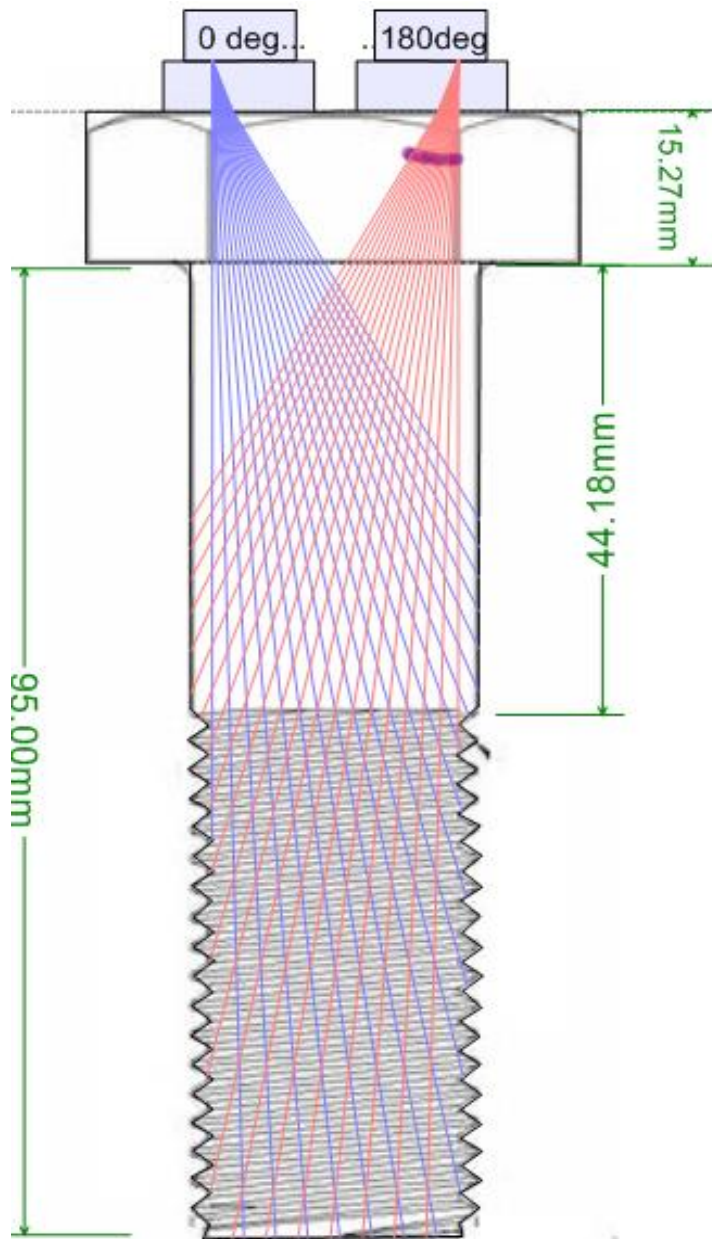
  True Depth - True depth is the specified distance into the piece parallel to the bottom of the wedge.




 Projection - Projection is the specified distance in the piece parallel to the front of the wedge.



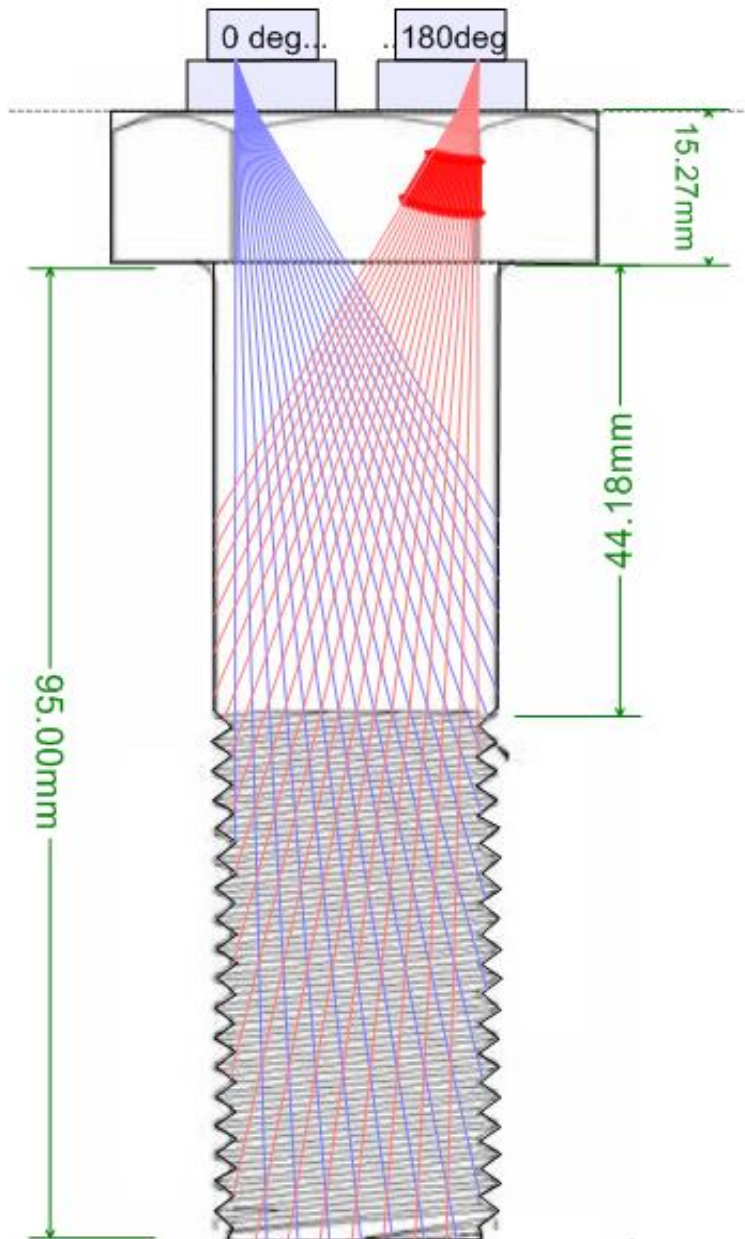
 Half Path - Half Path is the distance along each beam from the point where the beam enters the piece.



 None - Do not perform focusing.

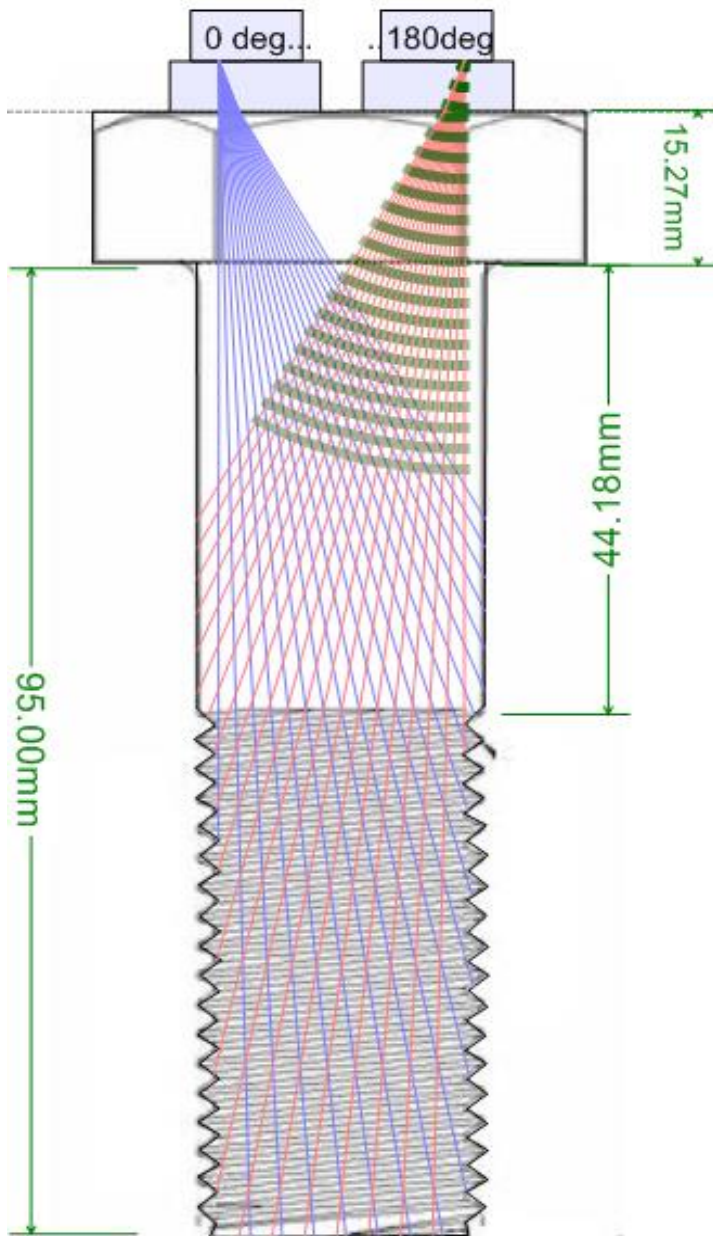
Display Gate

The Gate describes an electronic means to monitor a specific segment of distance.



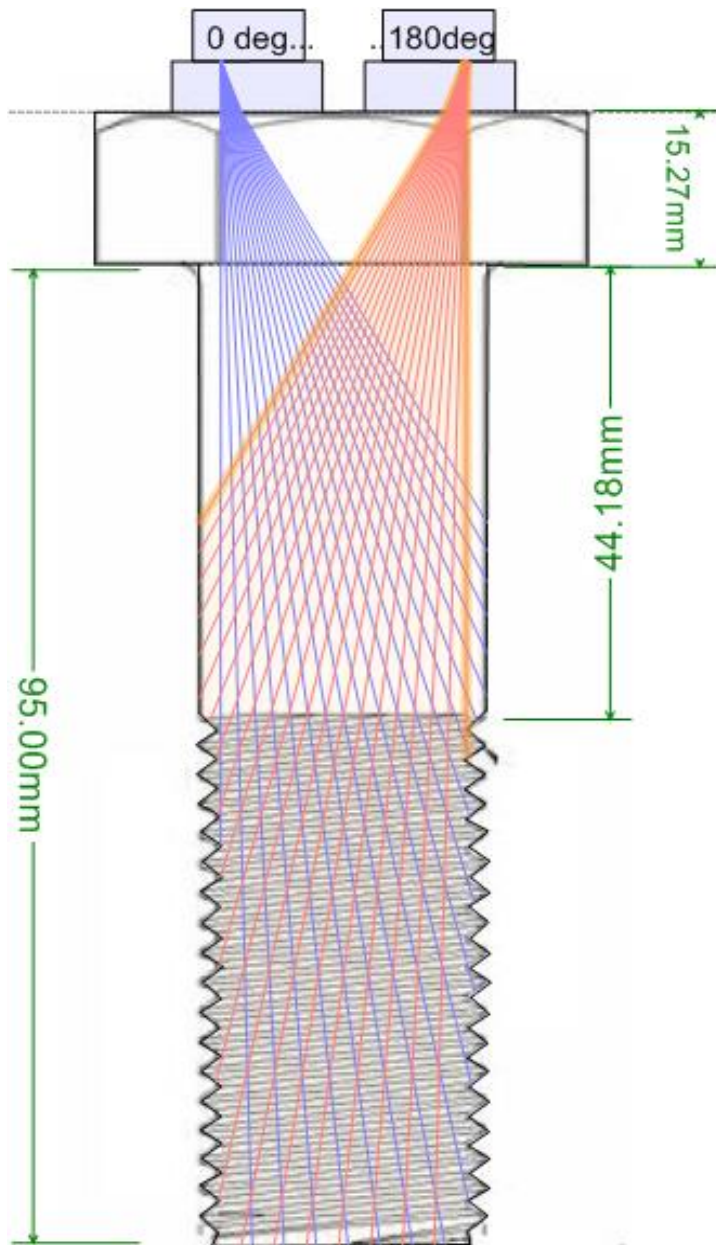
Display Beam Near Field

Displays the area in the sound beam immediately in front of the transducer and is calculated using the frequency and cross-sectional area of the transducer surface.



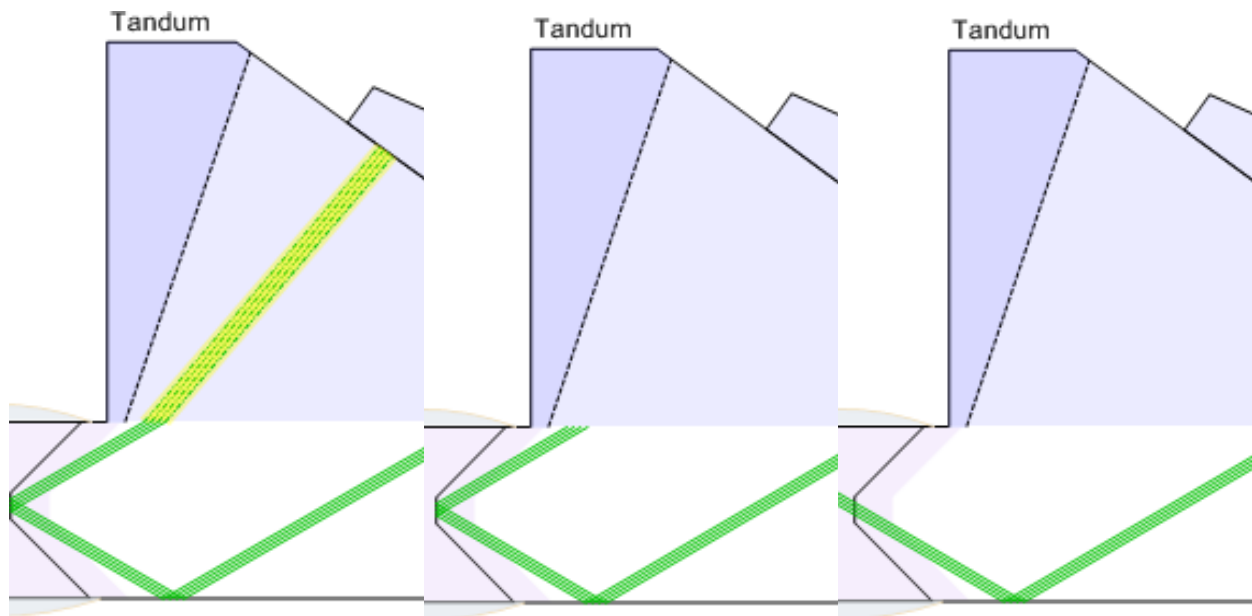
Display Beam Spread

Displays how the beam spreads out as it propagates through the material.



 **Display Pitch Catch**

Displays the path a reflected beam would take back into a wedge and the elements that could best be used to receive this signal.



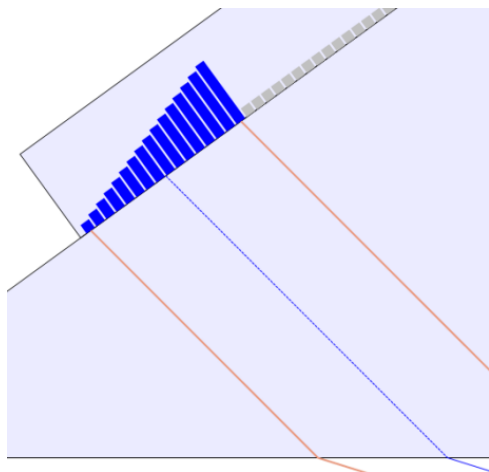
-  Display Pitch Catch turned on and  Display Pitch Catch Turned off
-  Reflect Off Weld turned on  Reflect Off Weld turned off

 **Reflect Off Weld**

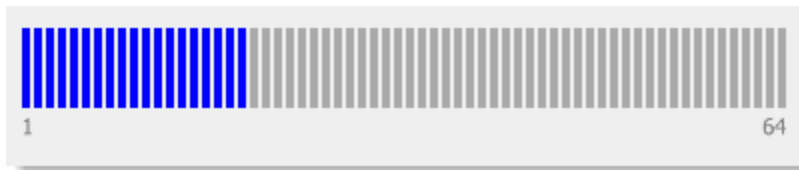
Beams will reflect off the weld instead of passing through.

 **Show Elements**

Displays the elements and element usage information on the transducer. [Single Beam Beamsets](#) will live reflect the focal delays as beam parameters are modified.

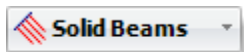


Element Utilization



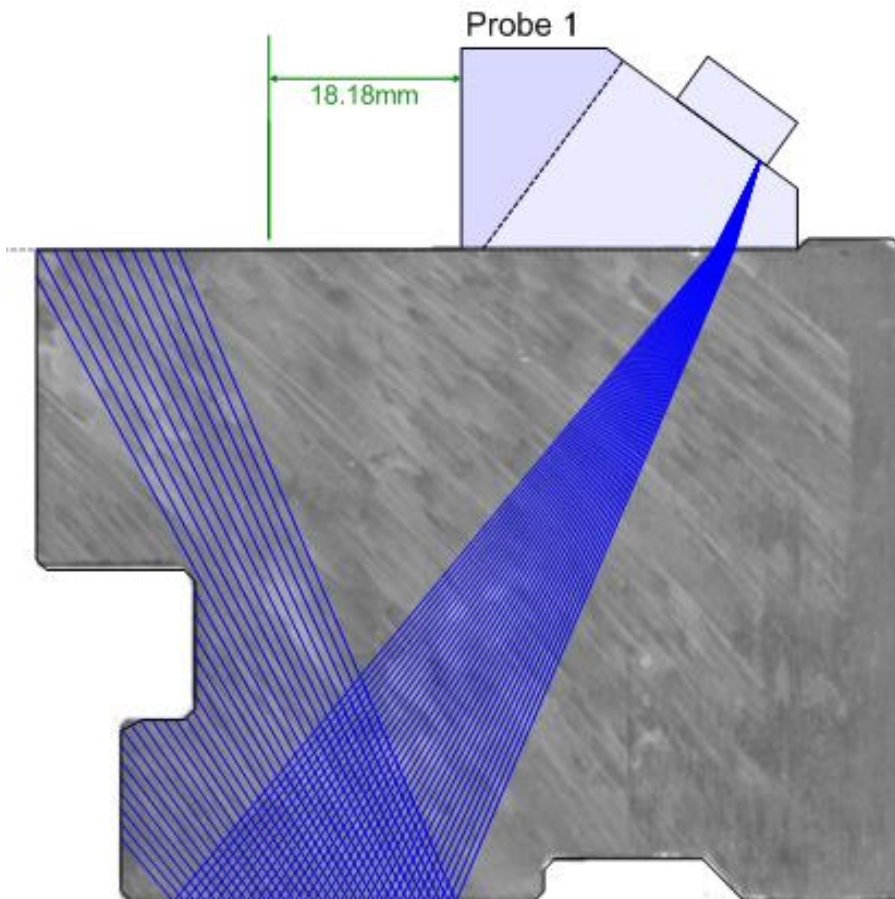
The Beamset Configuration dialog summarizes the element usage by displaying graphically the number of elements available for the selected transducer and the usage based on the aperture settings specified.

Beam Type

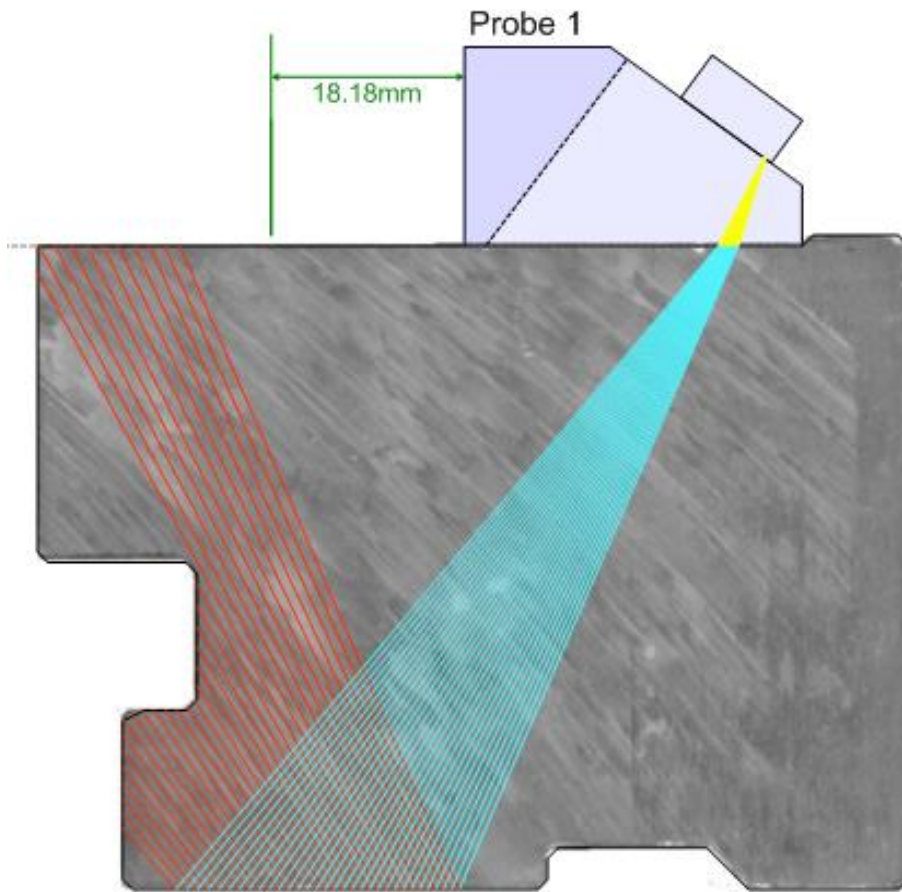


A pick-list of available beam types:

- **Solid Beams** - displays all of the beams in the same color.



- **Color List** - displays each beam skip in the color defined in File → Options.



Line Color

Color(s) to be used to display the beams for both the preview and drawing panes.



Beam Buffer Visibility

Visibility of the beam buffer lines that indicate the bounds of the elemental area(s).

Parameters

To specify a value you can **a)** move the slider right or left, **b)** click the right or left value spinner or **c)** click on the value displayed in the value spinner and type a value. The preview and drawing panes will update on the fly as the values are modified.

Start Element	The number of the first element in the aperture.
Focus Length	The distance from the bottom of the wedge to the focus point. Calculated based on Display Beam Focus selected (see Other Tools Available below).
Gate Start	The distance from the exit point on the bottom of the wedge to the start point of the gate.
Gate Length	The length of the gate segment.

In addition to the tools and parameters described above, specific beamsets have their own unique tools and parameters. Click on the links below for more details.

 [Single Beam Beamset](#)

 [Linear Beamset](#)

 [Sectorial Beamset](#)

 [Linear Spread Beamset](#)

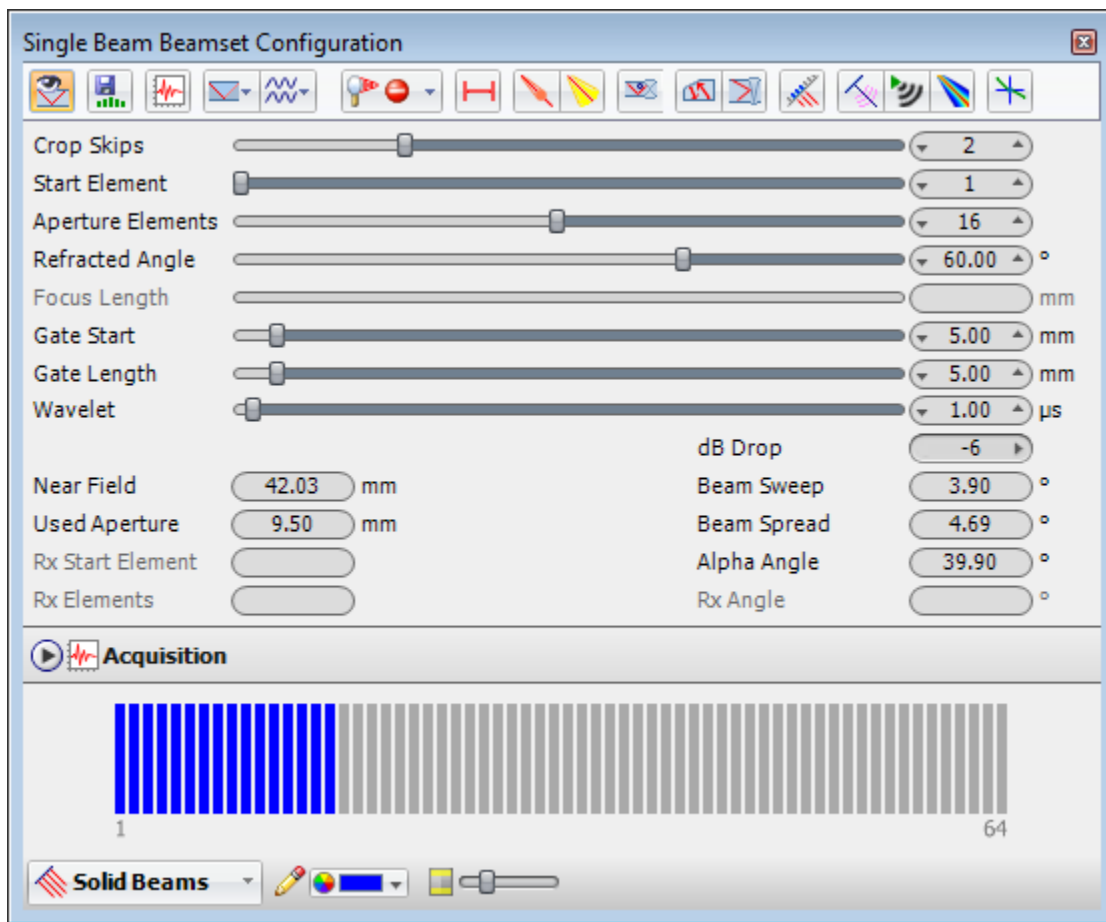
 [Zonal Beamset](#)

 [Full Matrix Capture Beamset](#)

 [Reference Beamset](#)

9.1.3.2 SINGLE BEAM BEAMSET

Single Beam Beamsets render a single beam from a defined set of elements at a specified refracted angle. Useful for developing zonal techniques.



9.1.3.2.1 SINGLE BEAM BEAMSET CONFIGURATION OPTIONS

Toggle Beamset Visibility

To avoid workspace clutter the visibility of beamset graphics in the drawing can be turned on or off. By default, beamset graphics are displayed. Deselect the Toggle Beamset Visibility button to hide the beamset graphics.



Export Focal Laws

Exports a law file based on your beamset configuration. Law files can be imported into an instrument by technicians to greatly decrease setup time.

Display A-Scan

Displays an A-Scan visualization for the beamset. Additional detail on configuring A-Scans can be found [here](#).

Crop Mode

Identify any type point on a beam path based on  Distance from Elements,  Time from Elements,  Distance from Interface,  Time from Interface or  Skips.

- Distance from Elements: Beams are cropped at a specific distance from the elements along the beam path.
- Time from Elements: Beams are cropped at a specific time from the elements along the beam path based on the velocity of the materials.
- Distance from Interface: Beams are cropped at a specific distance from where the beam enters the piece.
- Time from Interface: Beams are cropped at a specific time from where the beam enters the piece.
- Skips: Beams are cropped by setting the number of skips (reflections).

Use Piece Shear Velocity

Selects the Shear velocity of the piece to be used when calculating the beam path through the piece.

Use Piece Compression Velocity


Selects the Compression velocity of the piece to be used when calculating the beam path through the piece.

Display Beam Focus


Defines the point at which a sound beam converges to minimum diameter and maximum sound pressure and beyond which the beam diverges.


A Focus Type can be specified and used to display the beam's focus into the piece.

1. Select the Focus Type button. A list of Focus Types are displayed.
2. Select the appropriate Focus Type:

 True Depth - True depth is the specified distance into the piece parallel to the bottom of the wedge.


 Projection - Projection is the specified distance in the piece parallel to the front of the wedge.

 Half Path - Half Path is the distance along each beam from the point where the beam enters the piece.

 None - Do not perform focusing.

 **Display Gate**

The Gate describes an electronic means to monitor a specific segment of distance.

 **Display Beam Near Field**

Displays the area in the sound beam immediately in front of the transducer and is calculated using the frequency and cross-sectional area of the transducer surface.

 **Display Beam Spread**

Displays how the beam spreads out as it propagates through the material.

 **Display Beam Angle**


Displays the angle of the beam relative to the weld angle.

 **Display Pitch Catch**

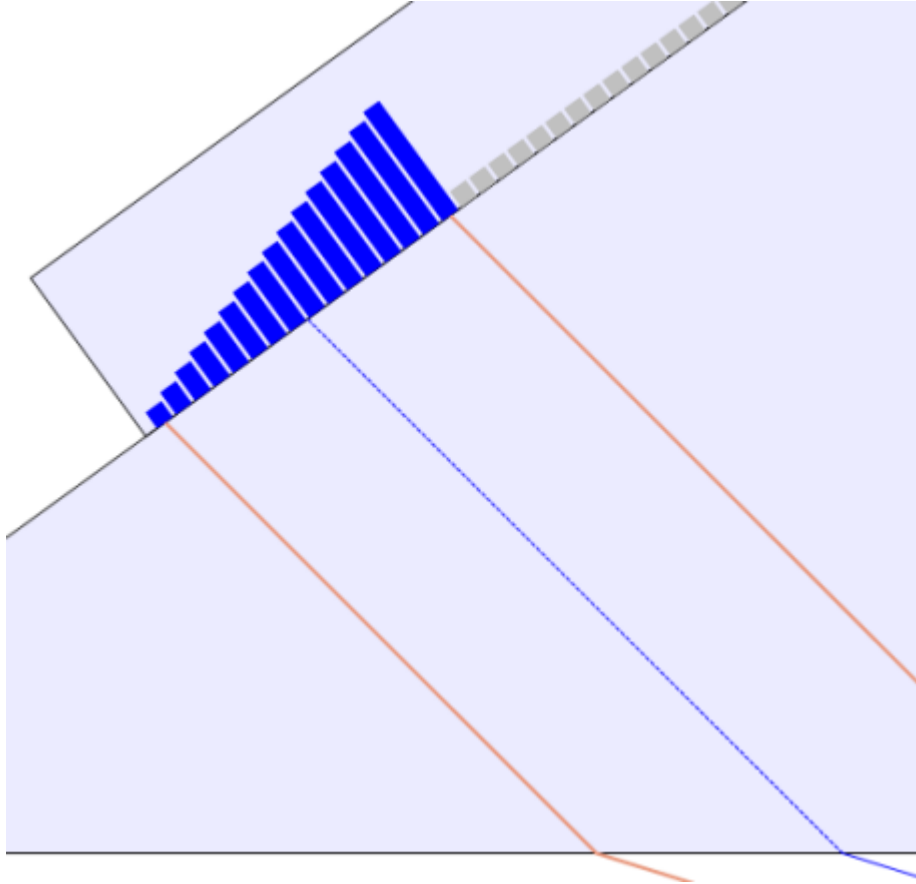
Displays the path a reflected beam would take back into a wedge and the elements that could best be used to receive this signal.

 **Reflect Off Weld**

Beams will reflect off the weld instead of passing through.

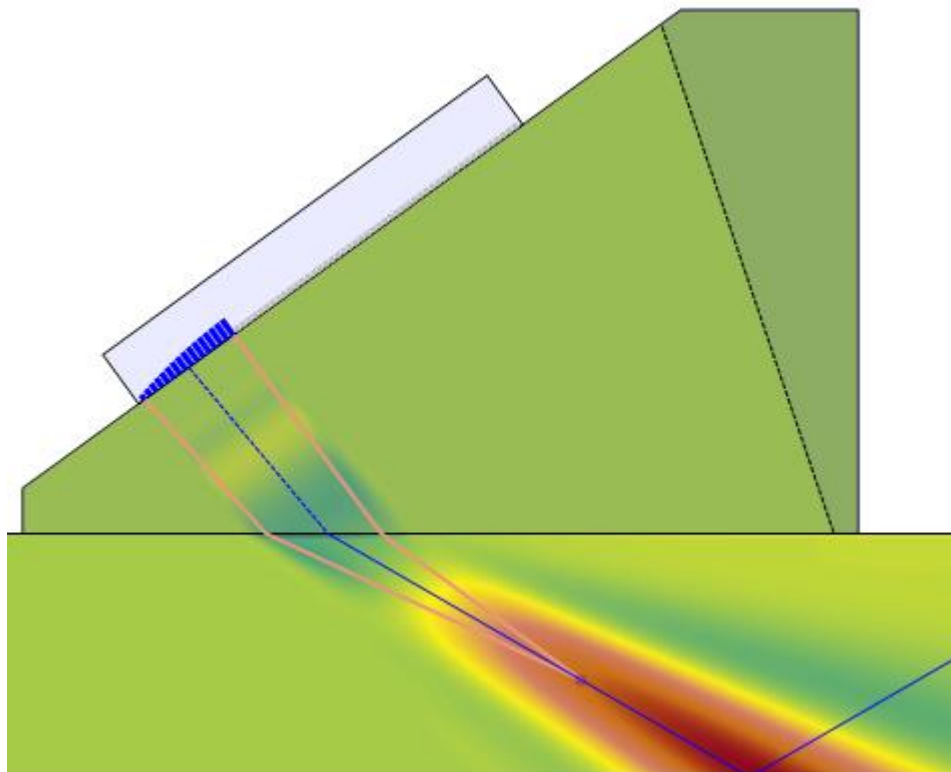
 **Show Elements**

Displays the elements and element usage information on the transducer. Turn on Show Elements for Single Beam Beamsets to visualize the focal delays as beam parameters are modified.



 **Show Sound Pressure**

Visually renders sound pressure at any point in the field represented by a geometric or bitmap wavefront. Using real field physics the wavefront can be focused, and even steered, by adding a time delay to change the refracted angle. A powerful educational tool for rendering sound pressure at any point in the field represented by a geometric or bitmap wavefront. The sound pressure visualization does not reflect off the back wall, and will not interact with indications or other geometries.



 **Show Snell's Law**

Displays a visualization of Snell's Law where the beam refracts into the piece.

Parameters

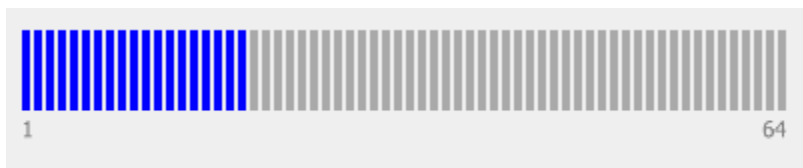
Start Element	The number of the first element in the aperture.
Aperture Elements	The number of contiguous elements in the aperture.
Refracted Angle	The angle of the beam within the piece or part.
Focus Length	The distance from the bottom of the wedge to the focus point. Calculated based on Display Beam Focus selected.

Gate Start	The distance from the exit point on the bottom of the wedge to the start point of the gate.
Gate Length	The length of the gate segment.
Wavelet	Specifies the time in micros seconds where the wavelets are visualized.
dB Drop	Specifies the amplitude drop method to be used.
Near Field	The estimated distance in front of the transducer in which the beam exhibits a change in wave front . (read only)
Used Aperture	The Elements Used multiplied by the Element Pitch. (read only)
Beam Sweep	The difference between the exit point of the first beam to the last beam. (read only)
Beam Spread	The divergence of the sound beam as it travels through the piece. (read only)
Alpha Angle	The incident angle of the beam within the wedge. (read only)
Rx Start Element	The first element in a group of elements assigned to receive in pitch catch configuration. This is automatically configured based on the parameters of the transmitting beam.
Rx Elements	The number of elements configured to receive in a pitch catch configuration.
Rx Angle	The maximum angle at which a beam can be received.

Acquisition

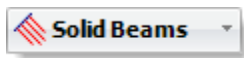
The Acquisition parameters are not directly utilized in BeamTool rendering, but can in downstream applications through export or import. Eclipse's TrueView girth weld scanning system, for example.

Element Utilization



The Beamset Configuration dialog summarizes the element usage by displaying graphically the number of elements available for the selected transducer and the usage based on the aperture settings specified.

Beam Type



A pick-list of available beam types:

- **Solid Beams** - displays all of the beams in the same color.
- **Color List** - displays each beam skip in the color defined in File → Options.

Line Color



Color(s) to be used to display the beams for both the preview and drawing panes.

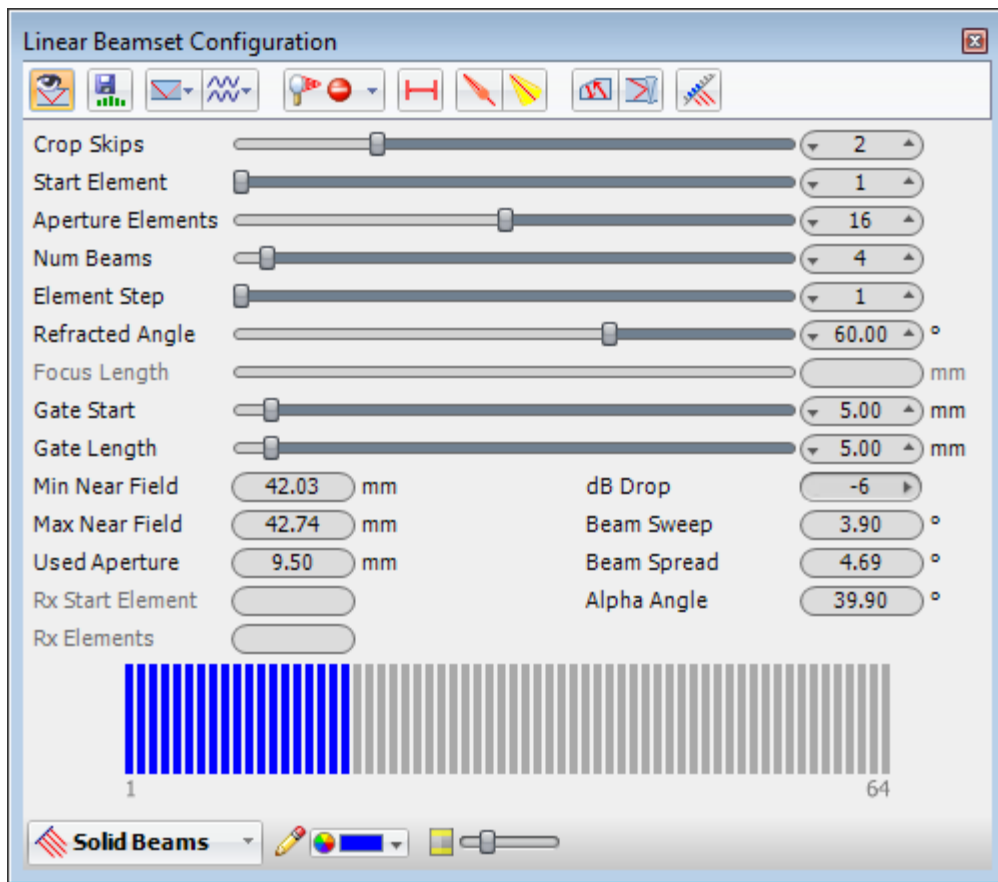
Beam Buffer Visibility



Visibility of the beam buffer lines that indicate the bounds of the elemental area(s).

9.1.3.3 LINEAR BEAMSET

Linear Beamsets allow a number of focal laws to be drawn from different elements with a common refracted angle.



9.1.3.3.1 LINEAR BEAMSET CONFIGURATION OPTIONS

Toggle Beamset Visibility

To avoid workspace clutter the visibility of beamset graphics in the drawing can be turned on or off. By default, beamset graphics are displayed. Deselect the Toggle Beamset Visibility button to hide the beamset graphics.

Export Focal Law

Exports a law file based on your beamset configuration. Law files can be imported into an instrument by technicians to greatly decrease setup time.

Use Piece Shear Velocity

Selects the Shear velocity of the piece to be used when calculating the beam path through the piece.

Use Piece Compression Velocity

Selects the Compression velocity of the piece to be used when calculating the beam path through the piece.

Crop Mode

Identify any type point on a beam path based on  Distance from Elements,  Time from Elements,  Distance from Interface,  Time from Interface or  Skips.



- Distance from Elements: Beams are cropped at a specific distance from the elements along the beam path.
- Time from Elements: Beams are cropped at a specific time from the elements along the beam path based on the velocity of the materials.
- Distance from Interface: Beams are cropped at a specific distance from where the beam enters the piece.
- Time from Interface: Beams are cropped at a specific time from where the beam enters the piece.
- Skips: Beams are cropped by setting the number of skips (reflections).

Display Beam Focus



Defines the point at which a sound beam converges to minimum diameter and maximum sound pressure and beyond which the beam diverges.



A Focus Type can be specified and used to display the beam's focus into the piece.

1. Select the Focus Type button. A list of Focus Types are displayed.
2. Select the appropriate Focus Type:

  True Depth - True depth is the specified distance into the piece parallel to the bottom of the wedge.

  Projection - Projection is the specified distance in the piece parallel to the front of the wedge.

  Half Path - Half Path is the distance along each beam from the point where the beam enters the piece.

  None - Do not perform focusing.

Display Gate

The Gate describes an electronic means to monitor a specific segment of distance.

Display Beam Near Field

Displays the area in the sound beam immediately in front of the transducer and is calculated using the frequency and cross-sectional area of the transducer surface.

Display Beam Spread

Displays how the beam spreads out as it propagates through the material.

Display Pitch Catch

Displays the path a reflected beam would take back into a wedge and the elements that could best be used to receive this signal.

Reflect Off Weld

Beams will reflect off the weld instead of passing through.

Show Elements

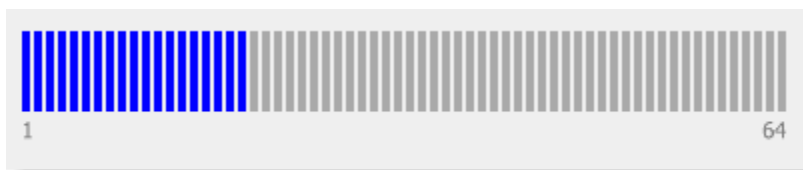
Displays the elements and element usage information on the transducer.

Parameters

Start Element	The number of the first element in the aperture.
Aperture Elements	The number of contiguous elements in the aperture.
Num Beams	The number of beams used.
Element Step	The number of offset elements for each beam being fired.
Refracted Angle	The angle of the beam within the piece or part.
Focus Length	The distance from the bottom of the wedge to the focus point. Calculated based on Display Beam Focus selected.
Gate Start	The distance from the exit point on the bottom of the wedge to the start point of the gate.
Gate Length	The length of the gate segment.
dB Drop	Specifies the amplitude drop method to be used.
Min Field Near	The estimated minimum distance in front of the transducer in which the beam exhibits a change in wave front . (read only)

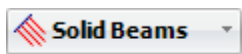
Max Field	Near	The estimated maximum distance in front of the transducer in which the beam exhibits a change in wave front. (read only)
Used Aperture		The Elements Used multiplied by the Element Pitch. (read only)
Beam Sweep		The difference between the exit point of the first beam to the last beam. (read only)
Beam Spread		The divergence of the sound beam as it travels through the piece. (read only)
Alpha Angle		The incident angle of the beam within the wedge. (read only)
Rx Element	Start	The first element in a group of elements assigned to receive in pitch catch configuration. This is automatically configured based on the parameters of the transmitting beam.
Rx Elements		The number of elements configured to receive in a pitch catch configuration.

Element Utilization



The Beamset Configuration dialog summarizes the element usage by displaying graphically the number of elements available for the selected transducer and the usage based on the aperture settings specified.

Beam Type



A pick-list of available beam types:

- **Solid Beams** - displays all of the beams in the same color.
- **Color List** - displays each beam skip in the color defined in File → Options.

Line Color



Color(s) to be used to display the beams for both the preview and drawing panes.

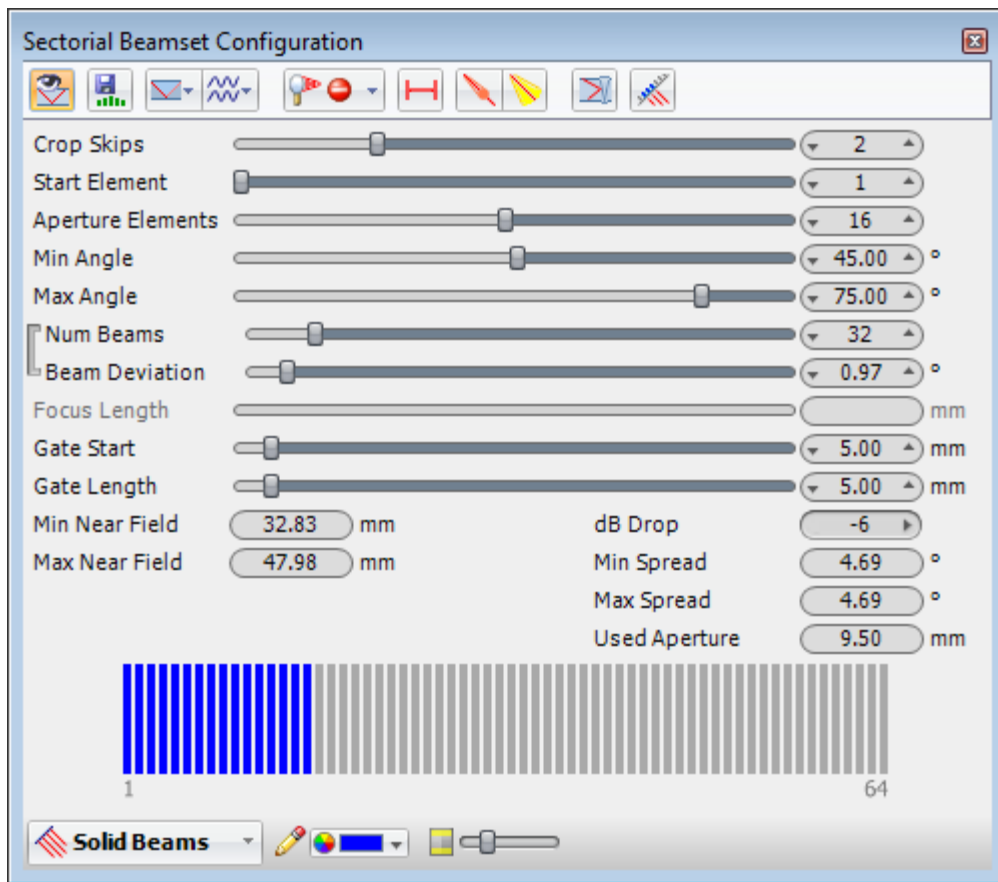
Beam Buffer Visibility



Visibility of the beam buffer lines that indicate the bounds of the elemental area(s).

9.1.3.4 SECTORIAL BEAMSET

Sectorial Beamsets allow a number of focal laws to be drawn from different elements with a range of refracted angles.



9.1.3.4.1 SECTORIAL BEAMSET CONFIGURATION OPTIONS

Toggle Beamset Visibility

To avoid workspace clutter the visibility of beamset graphics in the drawing can be turned on or off. By default, beamset graphics are displayed. Deselect the Toggle Beamset Visibility button to hide the beamset graphics.

Export Focal Law

Exports a law file based on your beamset configuration. Law files can be imported into an instrument by technicians to greatly decrease setup time.

Display A-Scan

Displays an A-Scan visualization for the beamset. Additional detail on configuring A-Scans can be found [here](#).


Use Piece Shear Velocity

Selects the Shear velocity of the piece to be used when calculating the beam path through the piece.

Use Piece Compression Velocity

Selects the Compression velocity of the piece to be used when calculating the beam path through the piece.

Crop Mode

Identify any type point on a beam path based on  Distance from Elements,  Time from Elements,  Distance from Interface,  Time from Interface or  Skips.



- Distance from Elements: Beams are cropped at a specific distance from the elements along the beam path.
- Time from Elements: Beams are cropped at a specific time from the elements along the beam path based on the velocity of the materials.
- Distance from Interface: Beams are cropped at a specific distance from where the beam enters the piece.
- Time from Interface: Beams are cropped at a specific time from where the beam enters the piece.
- Skips: Beams are cropped by setting the number of skips (reflections).

Display Beam Focus



Defines the point at which a sound beam converges to minimum diameter and maximum sound pressure and beyond which the beam diverges.



A Focus Type can be specified and used to display the beam's focus into the piece.

1. Select the Focus Type button. A list of Focus Types are displayed.
2. Select the appropriate Focus Type:

  True Depth - True depth is the specified distance into the piece parallel to the bottom of the wedge.

  Projection - Projection is the specified distance in the piece parallel to the front of the wedge.

  Half Path - Half Path is the distance along each beam from the point where the beam enters the piece.

  None - Do not perform focusing.

 **Display Gate**

The Gate describes an electronic means to monitor a specific segment of distance.

 **Display Beam Near Field**

Displays the area in the sound beam immediately in front of the transducer and is calculated using the frequency and cross-sectional area of the transducer surface.

 **Display Beam Spread**

Displays how the beam spreads out as it propagates through the material.

 **Reflect Off Weld**

Beams will reflect off the weld instead of passing through.

 **Show Elements**

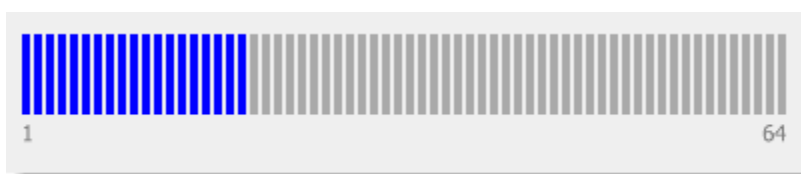
Displays the elements and element usage information on the transducer.

Parameters

Start Element	The number of the first element in the aperture.
Aperture Elements	The number of contiguous elements in the aperture.
Min Angle	The refracted angle of the first beam.
Max Angle	The refracted angle of the last beam.
Num Beams	The number of beams used.
Beam Deviation	The angle between beam steps. (read only)
Focus Length	The distance from the bottom of the wedge to the focus point. Calculated based on Display Beam Focus selected.
Gate Start	The distance from the exit point on the bottom of the wedge to the start point of the gate.
Gate Length	The length of the gate segment.
dB Drop	Specifies the amplitude drop method to be used.

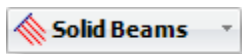
Min Near Field	The estimated minimum distance in front of the transducer in which the beam exhibits a change in wave front . (read only)
Max Near Field	The estimated maximum distance in front of the transducer in which the beam exhibits a change in wave front. (read only)
Min Spread	The estimated minimum beam spread. (read only)
Max Spread	The estimated maximum beam spread. (read only)
Used Aperture	The Elements Used multiplied by the Element Pitch. (read only)

Element Utilization



The Beamset Configuration dialog summarizes the element usage by displaying graphically the number of elements available for the selected transducer and the usage based on the aperture settings specified.

Beam Type



A pick-list of available beam types:

- **Solid Beams** - displays all of the beams in the same color.
- **Color List** - displays each beam skip in the color defined in File → Options.

Line Color



Color(s) to be used to display the beams for both the preview and drawing panes.

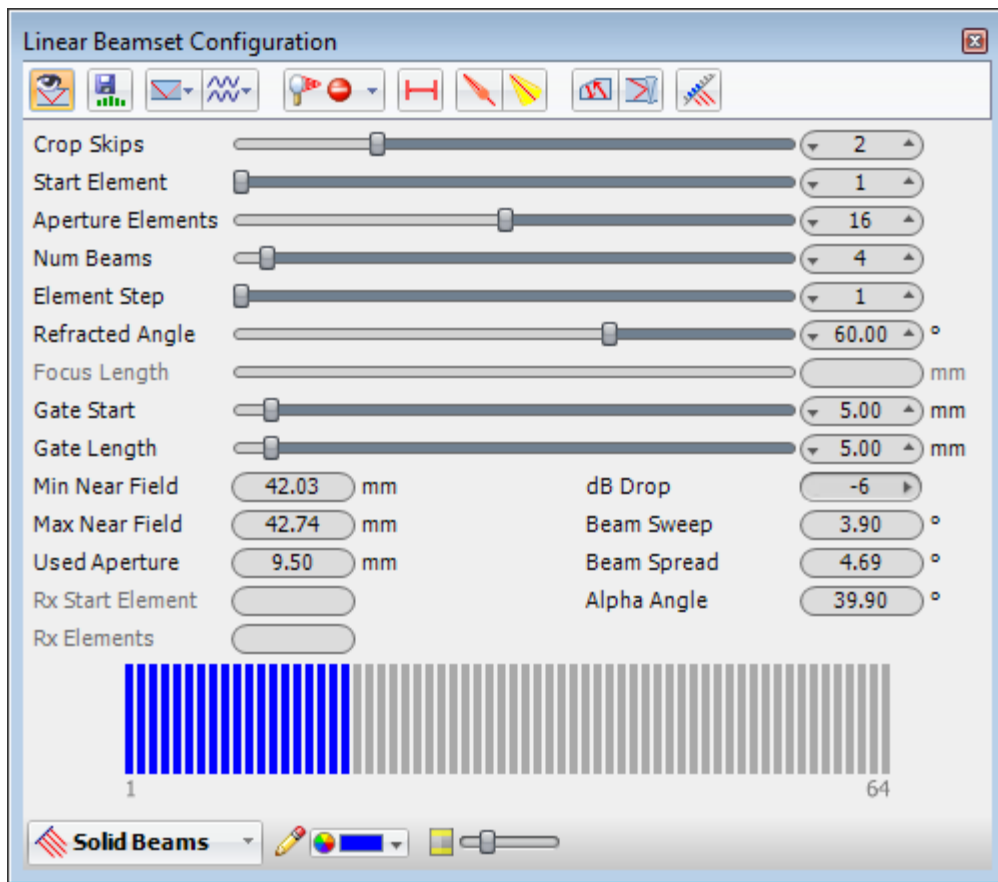
Beam Buffer Visibility



Visibility of the beam buffer lines that indicate the bounds of the elemental area(s).

9.1.3.5 LINEAR SPREAD BEAMSET

Linear Spread Beamsets allow a number of focal laws to be drawn from different elements with a range of refracted angles.



9.1.3.5.1 LINEAR SPREAD BEAMSET CONFIGURATION OPTIONS

Toggle Beamset Visibility

To avoid workspace clutter the visibility of beamset graphics in the drawing can be turned on or off. By default, beamset graphics are displayed. Deselect the Toggle Beamset Visibility button to hide the beamset graphics.

Export Focal Law

Exports a law file based on your beamset configuration. Law files can be imported into an instrument by technicians to greatly decrease setup time.


Use Piece Shear Velocity

Selects the Shear velocity of the piece to be used when calculating the beam path through the piece.

Use Piece Compression Velocity

Selects the Compression velocity of the piece to be used when calculating the beam path through the piece.

Crop Mode

Identify any type point on a beam path based on  Distance from Elements,  Time from Elements,  Distance from Interface,  Time from Interface or  Skips.



- Distance from Elements: Beams are cropped at a specific distance from the elements along the beam path.
- Time from Elements: Beams are cropped at a specific time from the elements along the beam path based on the velocity of the materials.
- Distance from Interface: Beams are cropped at a specific distance from where the beam enters the piece.
- Time from Interface: Beams are cropped at a specific time from where the beam enters the piece.
- Skips: Beams are cropped by setting the number of skips (reflections).

Display Beam Focus



Defines the point at which a sound beam converges to minimum diameter and maximum sound pressure and beyond which the beam diverges.



A Focus Type can be specified and used to display the beam's focus into the piece.

1. Select the Focus Type button. A list of Focus Types are displayed.
2. Select the appropriate Focus Type:

  True Depth - True depth is the specified distance into the piece parallel to the bottom of the wedge.


  Projection - Projection is the specified distance in the piece parallel to the front of the wedge.

  Half Path - Half Path is the distance along each beam from the point where the beam enters the piece.

  None - Do not perform focusing.

Display Gate

The Gate describes an electronic means to monitor a specific segment of distance.

 **Display Beam Near Field**

Displays the area in the sound beam immediately in front of the transducer and is calculated using the frequency and cross-sectional area of the transducer surface.

 **Display Beam Spread**

Displays how the beam spreads out as it propagates through the material.

 **Reflect Off Weld**

Beams will reflect off the weld instead of passing through.

 **Show Elements**

Displays the elements and element usage information on the transducer.

Parameters

Start Element	The number of the first element in the aperture.
Aperture Elements	The number of contiguous elements in the aperture.
Num Beams	The number of beams used.
Element Step	The number of offset elements for each beam being fired.
Min Angle	The minimum beam angle.
Max Angle	The maximum beam angle.
Focus Length	The distance from the bottom of the wedge to the focus point. Calculated based on Display Beam Focus selected.
Gate Start	The distance from the exit point on the bottom of the wedge to the start point of the gate.
Gate Length	The length of the gate segment.
Min Near Field	The estimated minimum distance in front of the transducer in which the beam exhibits a change in wave front . (read only)
Max Near Field	The estimated maximum distance in front of the transducer in which the beam exhibits a change in wave front. (read only)
Beam Deviation	The angle between beam steps. (read only)

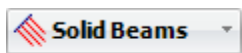
dB Drop	Specifies the amplitude drop method to be used.
Min Spread	The estimated minimum beam spread. (read only)
Max Spread	The estimated maximum beam spread. (read only)
Used Aperture	The Elements Used multiplied by the Element Pitch. (read only)

Element Utilization



The Beamset Configuration dialog summarizes the element usage by displaying graphically the number of elements available for the selected transducer and the usage based on the aperture settings specified.

Beam Type



A pick-list of available beam types:

- **Solid Beams** - displays all of the beams in the same color.
- **Color List** - displays each beam skip in the color defined in File → Options.

Line Color



Color(s) to be used to display the beams for both the preview and drawing panes.

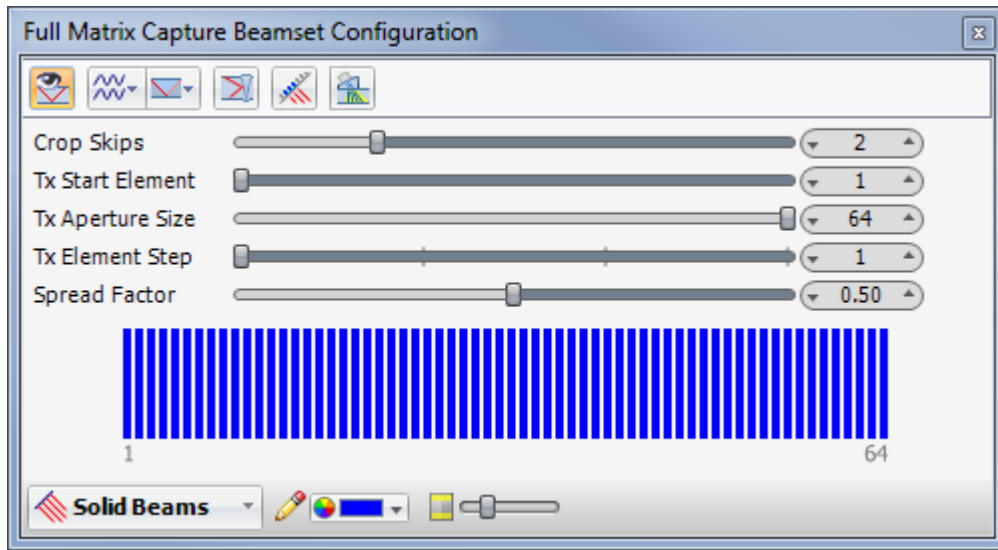
Beam Buffer Visibility



Visibility of the beam buffer lines that indicate the bounds of the elemental area(s).

9.1.3.6 FULL MATRIX CAPTURE BEAMSET

Full Matrix Capture (FMC) is a specific data-acquisition process using ultrasonic phased-array probes. For an array of N elements, each element is successively used as a transmitter, while all other elements are used to receive.



9.1.3.6.1 FULL MATRIX CAPTURE BEAMSET CONFIGURATION OPTIONS

Toggle Beamset Visibility

To avoid workspace clutter the visibility of beamset graphics in the drawing can be turned on or off. By default, beamset graphics are displayed. Deselect the Toggle Beamset Visibility button to hide the beamset graphics.

Use Piece Shear Velocity

Selects the Shear velocity of the piece to be used when calculating the beam path through the piece.

Use Piece Compression Velocity

Selects the Compression velocity of the piece to be used when calculating the beam path through the piece.

Crop Mode

Identify any type point on a beam path based on  Distance from Elements,  Time from Elements,  Distance from Interface,  Time from Interface or  Skips.

- Distance from Elements: Beams are cropped at a specific distance from the elements along the beam path.

- Time from Elements: Beams are cropped at a specific time from the elements along the beam path based on the velocity of the materials.
- Distance from Interface: Beams are cropped at a specific distance from where the beam enters the piece.
- Time from Interface: Beams are cropped at a specific time from where the beam enters the piece.
- Skips: Beams are cropped by setting the number of skips (reflections).

 **Reflect Off Weld**

Beams will reflect off the weld instead of passing through.

 **Show Elements**

Displays the elements and element usage information on the transducer.

 **Show Center Beams**

Toggles the display of the reference beams that describes the center of the spread for each element.

Parameters

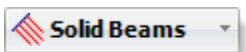
Tx Start Element	The number of the first element in the aperture.
Tx Aperture Size	The number of contiguous elements in the aperture.
Tx Element Step	The number of offset elements for each beam being fired.
Spread Factor	A value that is applied to, and controls, the beam spread angle.

Element Utilization



The Beamset Configuration dialog summarizes the element usage by displaying graphically the number of elements available for the selected transducer and the usage based on the aperture settings specified.

Beam Type



A pick-list of available beam types:

- **Solid Beams** - displays all of the beams in the same color.
- **Color List** - displays each beam skip in the color defined in File → Options.

Line Color



Color(s) to be used to display the beams for both the preview and drawing panes.

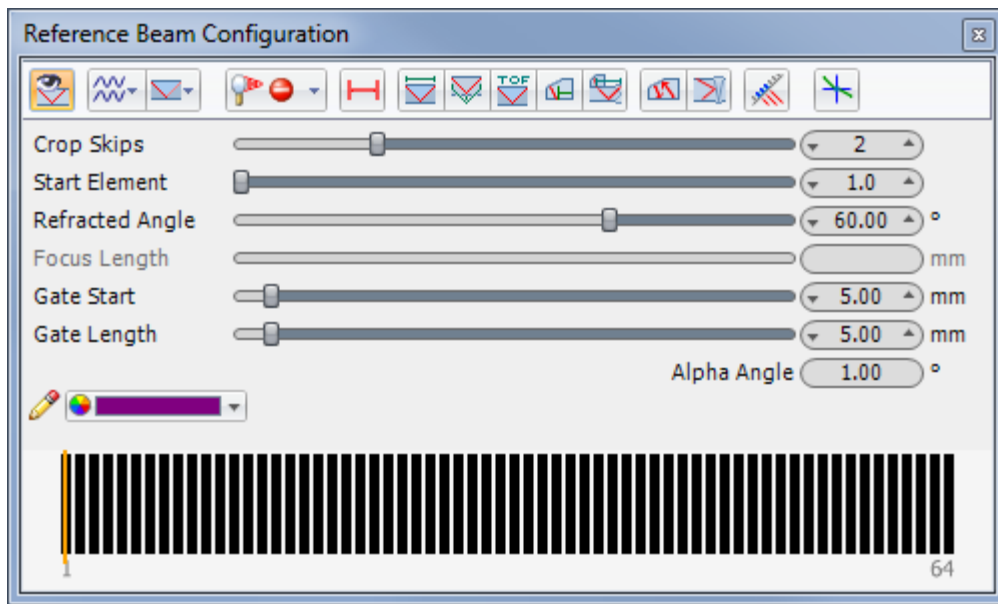
Beam Buffer Visibility



Visibility of the beam buffer lines that indicate the bounds of the elemental area(s).

9.1.3.7 REFERENCE BEAMSET

Reference Beamsets provide additional drawing annotations.



9.1.3.7.1 REFERENCE BEAMSET CONFIGURATION OPTIONS

Toggle Beamset Visibility

To avoid workspace clutter the visibility of beamset graphics in the drawing can be turned on or off. By default, beamset graphics are displayed. Deselect the Toggle Beamset Visibility button to hide the beamset graphics.






Use Piece Shear Velocity

Selects the Shear velocity of the piece to be used when calculating the beam path through the piece.

Use Piece Compression Velocity

Selects the Compression velocity of the piece to be used when calculating the beam path through the piece.

Crop Mode

Identify any type point on a beam path based on  Distance from Elements,  Time from Elements,  Distance from Interface,  Time from Interface or  Skips.

- Distance from Elements: Beams are cropped at a specific distance from the elements along the beam path.


- Time from Elements: Beams are cropped at a specific time from the elements along the beam path based on the velocity of the materials.
- Distance from Interface: Beams are cropped at a specific distance from where the beam enters the piece.
- Time from Interface: Beams are cropped at a specific time from where the beam enters the piece.
- Skips: Beams are cropped by setting the number of skips (reflections).

Display Beam Focus


Defines the point at which a sound beam converges to minimum diameter and maximum sound pressure and beyond which the beam diverges.


A Focus Type can be specified and used to display the beam's focus into the piece.

1. Select the Focus Type button. A list of Focus Types are displayed.
2. Select the appropriate Focus Type:

 True Depth - True depth is the specified distance into the piece parallel to the bottom of the wedge.

 Projection - Projection is the specified distance in the piece parallel to the front of the wedge.

 Half Path - Half Path is the distance along each beam from the point where the beam enters the piece.

 None - Do not perform focusing.

Display Gate

The Gate describes an electronic means to monitor a specific segment of distance.

Display Surface Distance Dimension

Displays the distance between the initial entry point of the first element and the exit point out of the piece from the refracted angle.

Display V Path Distance Dimension


Displays the total distance the beam travels through the piece from the initial entry point of the first element to the exit point out of the piece from the refracted angle.

Display Time of Flight

Displays the time of flight for each segment in the reference beam.

 **Display Beam Exit to Front Face**

Displays the distance from the front of the wedge to where the beam exits the wedge.

 **Display Beam Exit to Weld**

Displays the distance from the point where the beam exits the wedge to the center of the weld.

 **Display Pitch Catch**

Displays the path a reflected beam would take back into a wedge and the elements that could best be used to receive this signal.

 **Reflect Off Weld**

Beams will reflect off the weld instead of passing through.

 **Show Elements**

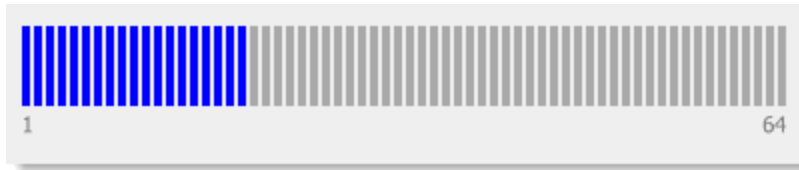
Displays the elements and element usage information on the transducer.

 **Show Snell's Law**

Displays a visualization of Snell's Law where the beam refracts into the piece.

Parameters

Start Element	The number of the first element in the aperture.
Refracted Angle	The angle of the beam within the piece or part.
Focus Length	The distance from the bottom of the wedge to the focus point. Calculated based on Display Beam Focus selected (see Other Tools Available below).
Gate Start	The distance from the exit point on the bottom of the wedge to the start point of the gate.
Gate Length	The length of the gate segment.
Alpha Angle	The incident angle of the beam within the wedge. (read only)
Line Color	Color to be used to display the beam for both the preview and drawing panes.

Element Utilization

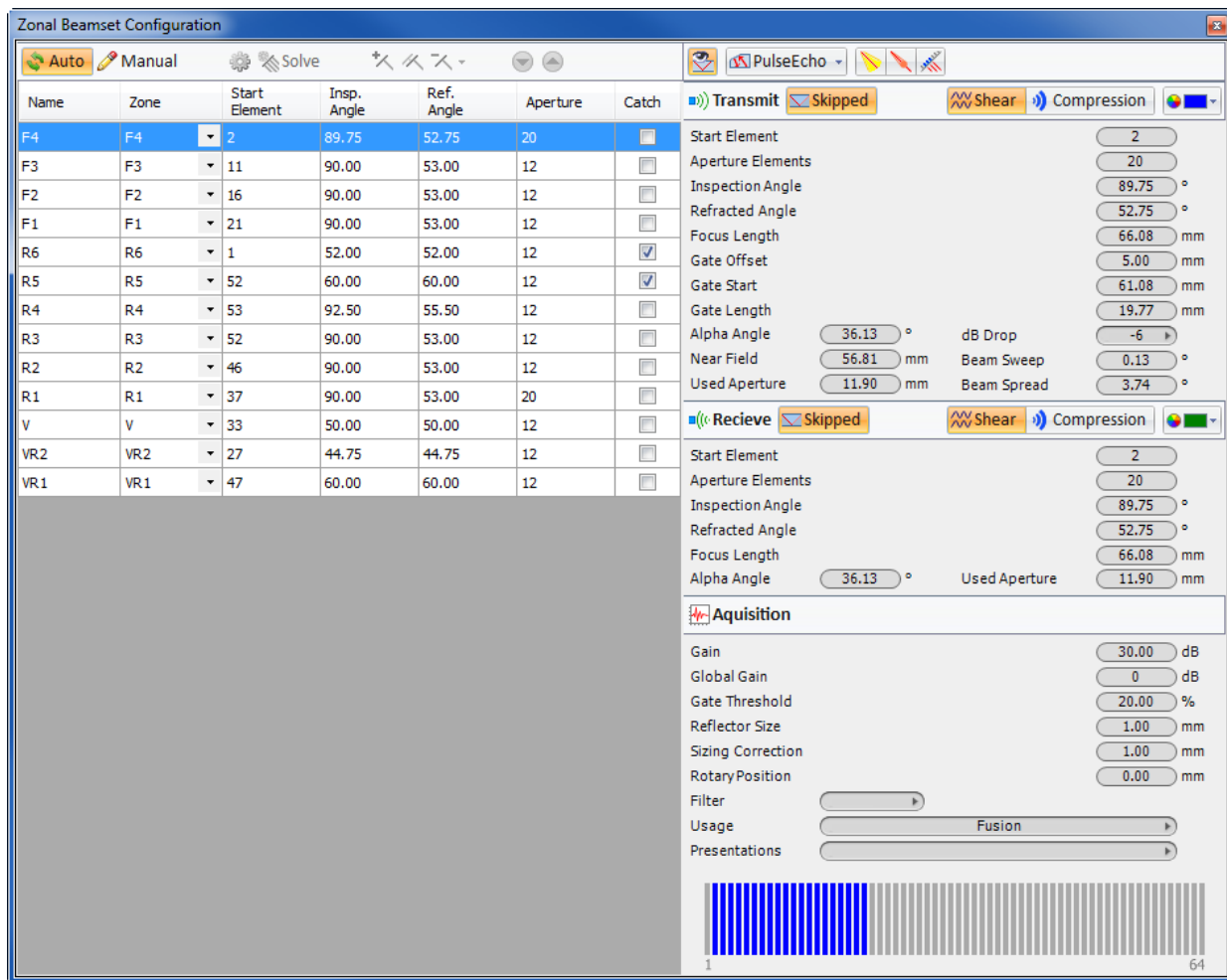
The Beamset Configuration dialog summarizes the element usage by displaying graphically the number of elements available for the selected transducer and the usage based on the aperture settings specified.

9.1.4 ZONAL BEAMSET

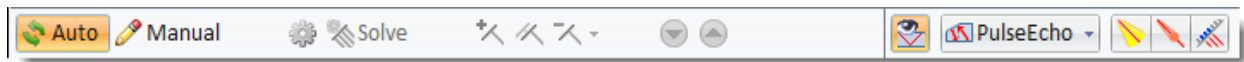
A Zonal Beamset is used in conjunction with [Weld Zones](#) to provide targeted steering of individual beams into specific locations along the face of a weld bevel.

NOTE: Zonal Beamset and Weld Zones are only available to users of the **BeamTool Zonal Add-On**.

A Zonal Beamset is a collection of Targeted Beamset beams, that are configured and manipulated through a list. Beams can be added and removed from the list, either manually or through the automated Beam Solver. Once added to a phased array probe, a zonal beamset can be configured using the following dialog, and related tools:




9.1.4.1 ZONAL BEAMSET CONFIGURATION TOOLBAR


 **Auto**

When in Auto Solving mode, the zonal beams are automatically regenerated whenever the zones, probe or solver options are modified. In this mode, beams are always kept in sync with their defining inputs. Modifications to generated beams are not permitted, as any updates would be lost during the next automatic solving.

 **Manual**

When in Manual Solving mode, the beams are not regenerated when modifications are made to zones, probe or solver options. Instead, the beams can be manually regenerated by using the Solve button. Generated beams can be modified through the beam parameters, because solving will not occur automatically and will not overwrite any edits.

 **Zonal Solver Options**

Opens the [Zonal Solver Options](#) dialog. Click [here](#) for more information.

 **Solve**

Automatically adds and configures beams for each zone in the weld bevel.

 **Add**

Adds a single beam. The new beam will not be targeted at a zone. Default parameters are used for the new beam.

 **Clone**

Copies the selected beam.

 **Delete/Delete All**

Delete removes the selected beam and Delete All removes all of the beams from the list.

 **Move Down**

Moves the selected beamset down one row, in the beamset list.

 **Move Up**

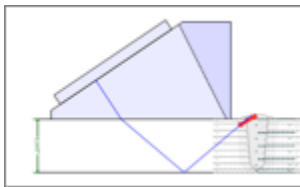
Moves the selected beamset up one row, in the beamset list.

Toggle Beamset Visibility

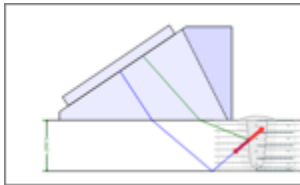
To avoid workspace clutter the visibility of beamset graphics in the drawing can be turned on or off. By default, beamset graphics are displayed. Deselect the Toggle Beamset Visibility button to hide the beamset graphics.

Pitch Catch Drop Down

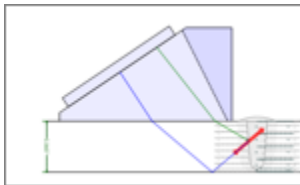
PulseEcho - Transmit and receive on the same elements



Pitch-CatchManual - Transmit and receive using different elements and manually steer the transmit and receive beams from the target to the probe.



PitchCatchAuto - Transmit and receive using different elements and automatically steer the transmit beams from the target to the probe, with the receive beam automatically determined based on the reflection off of the weld bevel.



Display Beam Spread

Displays how the beam spreads out as it propagates through the material.

Display Beam Near Field

Displays the area in the sound beam immediately in front of the transducer and is calculated using the frequency and cross-sectional area of the transducer surface.

Show Elements

Displays the elements and element usage information on the transducer.

Skipped

Defines whether the beam should be skipped off of the back-wall or projected directly from the probe to the target.

Use Piece Shear Velocity

Selects the Shear velocity of the piece to be used when calculating the beam path through the piece.

Use Piece Compression Velocity

Selects the Compression velocity of the piece to be used when calculating the beam path through the piece.

Line Color



Color(s) to be used to display the beams for both the preview and drawing panes.

Beam Parameters

After a beam is added to the list, it appears in the summary table on the left of the dialog. The table summarizes the pertinent details that make one zonal beam differ from another. When a beam is selected from the tab its full details will be displayed in the panel on the right of the dialog and its parameters can then be modified as necessary (when in manual mode). The Beam Parameters is split into three sections.

1. Transmit
2. Receive
3. Acquisition

Transmit Parameters

Start Element	The number of the first element in the aperture.
Aperture Elements	The number of contiguous elements in the aperture.
Inspection Angle	The angle at which the beam intersects the zone face
Refracted Angle	The angle of the beam within the piece or part.
Focus Length	The distance from the bottom of the wedge to the focus point. Calculated based on Display Beam Focus selected.
Gate Offset	The distance from the target to the start of the gate.

Gate Start	The distance from the exit point on the bottom of the wedge to the start point of the gate.
Gate Length	The length of the gate segment.
dB Drop	Specifies the amplitude drop method to be used.
Near Field	The estimated distance in front of the transducer in which the beam exhibits a change in wave front. (read only)
Used Aperture	The Elements Used multiplied by the Element Pitch. (read only)
Beam Sweep	The difference between the exit points of the first beam to the last beam. (read only)
Beam Spread	The divergence of the sound beam as it travels through the piece. (read only)
Alpha Angle	The incident angle of the beam within the wedge. (read only)

Receive Parameters

Start Element	The first element in a group of elements assigned to receive in pitch catch configuration. This is automatically configured based on the parameters of the transmitting beam.
Aperture Elements	The number of elements configured to receive in a pitch catch configuration.
Inspection Angle	The angle at which the beam intersects the zone face.
Refracted Angle	The angle of the beam within the piece or part.
Focus Length	The distance from the bottom of the wedge to the focus point. Calculated based on Display Beam Focus selected.
Alpha Angle	The incident angle of the beam within the wedge. (read only)
Used Aperture	The Elements Used multiplied by the Element Pitch. (read only)

Acquisition


The Acquisition parameters are not directly utilized in BeamTool rendering, but can in downstream applications through export or import. Eclipse's TrueView girth weld scanning system, for example.

Element Utilization



The Beamset Configuration dialog summarizes the element usage by displaying graphically the number of elements available for the selected transducer and the usage based on the aperture settings specified.

Beam Solver

Using the  **Solve** function, beams are automatically added to the beamset list via the powerful **Beam Solver** algorithm. The beams added by the solver will be targeted to the zones that were configured in the [Weld Configuration](#) dialog. Each zone/region type defined during weld configuration is treated slightly differently by the solver. The technique used to target each zone has been implemented to maximize signal strength.

Using the General parameters and Instructions defined in the **Zonal Solver Options** dialog, the solver will create a beam targeted to the relevant zone.

Zone Solving

To solve for any given zone, BeamTool attempts to create an optimal beam using the **Instructions** that correspond to that zone type and angle. Using the instruction's optimal inspection angle (and aperture, path, etc.), a beam is projected out from the zone target. If the beam intersects the probe's transducer, an appropriate beam path from probe to the zone should be possible. If a path to the transducer cannot be found, the inspection angle is adjusted by Angle Increment and tested again. The solver will increment and oscillate to either side of the optimal angle until a path can be found. If the Min Angle or Max Angle is reached, then number of Skips is increased and the process is repeated.

If no combination of angles and skips can be found, a 'broken' beam at the optimal angle is added to the beams list.

Because the solver starts with the optimal angle and skips then moves onto less and less optimal paths, as soon as it finds the first successful path it can stop, knowing it's found its most optimal one.

When a path has been found from the target to the transducer, the solver builds an element aperture using the determined refracted angle, and adds a beam to the beams list.

Gates

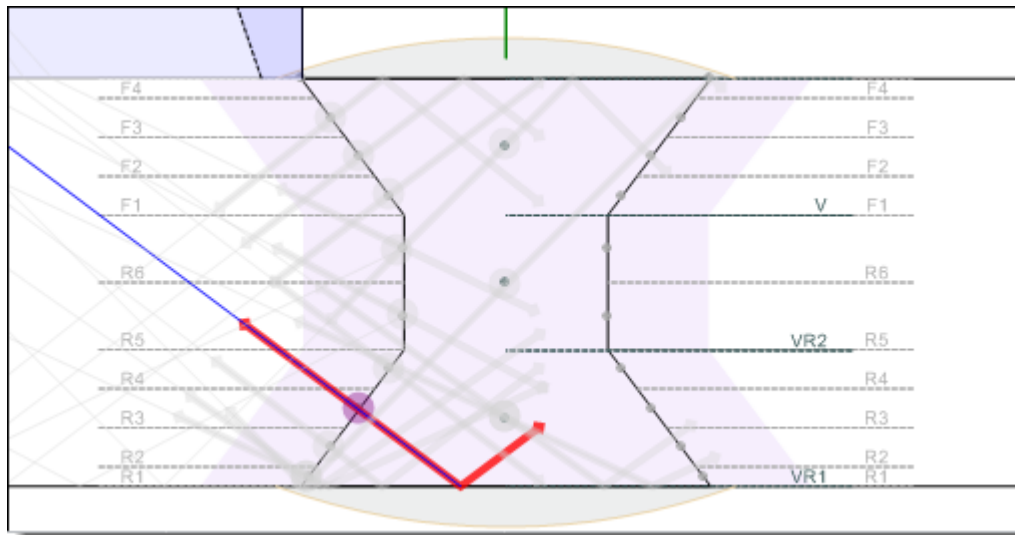
Gates are automatically applied to the solved beams. Fusion zones and Volumetric zones are treated differently, but both use a new option that allows **Gating Pass-Through**. Normally, gate visualization directly follows along the beam path, but Gating Pass-Through allows the gate visualization to pass through the weld (or other reflective geometry) even though the beam may be reflecting.

Focusing

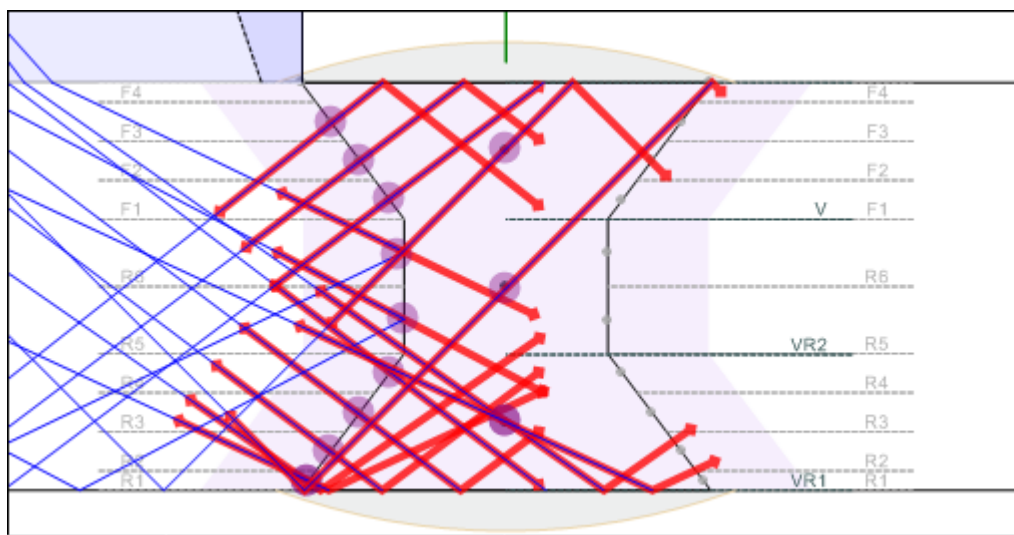
Focusing is automatically applied to the solved beams. “Half-path” focusing is applied directly on top of the zone target in all cases.

Display

When configuring a zonal beamset (with the zonal beamset configuration dialog open), the individual beams are rendered to the main CAD surface with beam “ghosting”. This visualization helps reduce screen noise by ghosting/disabling/graying-out all beams but the currently selected one.



When the configuration dialog is closed, ghosting is disabled and all beams are rendered normally.



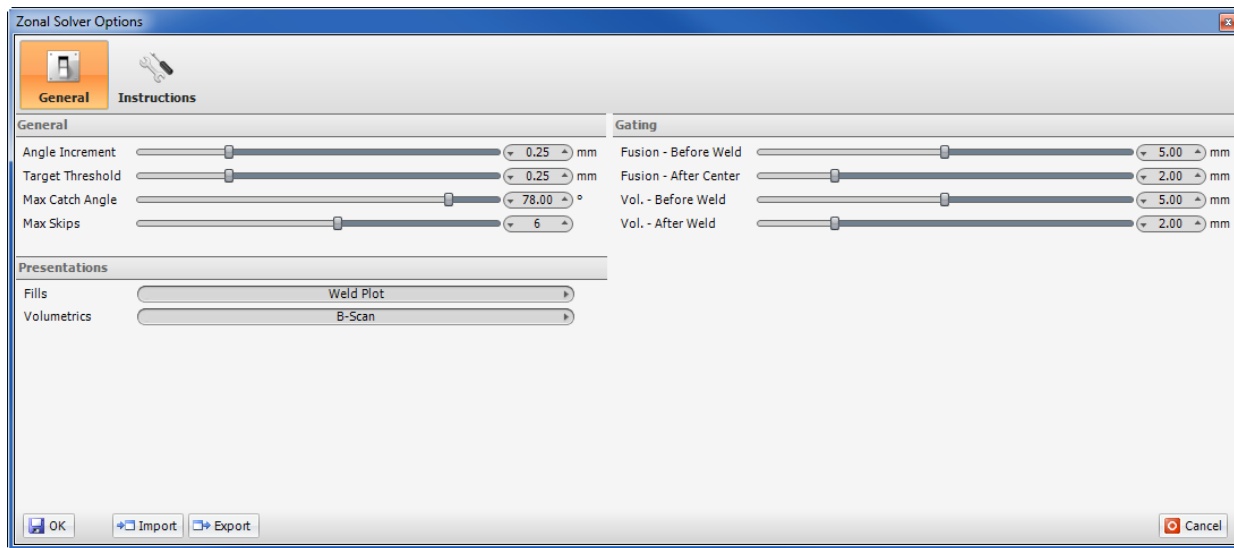
9.1.4.2 ZONAL SOLVER OPTIONS

The Solver Options configure how the solver behaves and defines how each combination of zone type and angle should be solved. If a zone matches multiple instructions, the solver will generate multiple beams. When the solver matches a zone to an instruction, it uses that instructions parameters and the general parameters to create a beam that should maximize signal strength.

Zonal Solver Options General Tab

The Zonal Solver Options General Tab is split into three main sections.

1. General
2. Gating
3. Presentations



General Parameters

Angle Increment	The resolution of the angle adjustments solver. A lower value will provide a more accurate solution but will increase the solver run-time.
Target Threshold	The maximum distance a candidate beam's intersection point can be from the zone target to consider the beam an acceptable solution. A lower value will improve accuracy but may prevent the solver from finding solutions for some zones.
Max Skips	The maximum number of skips that the solver will attempt to use.

Gating Parameters

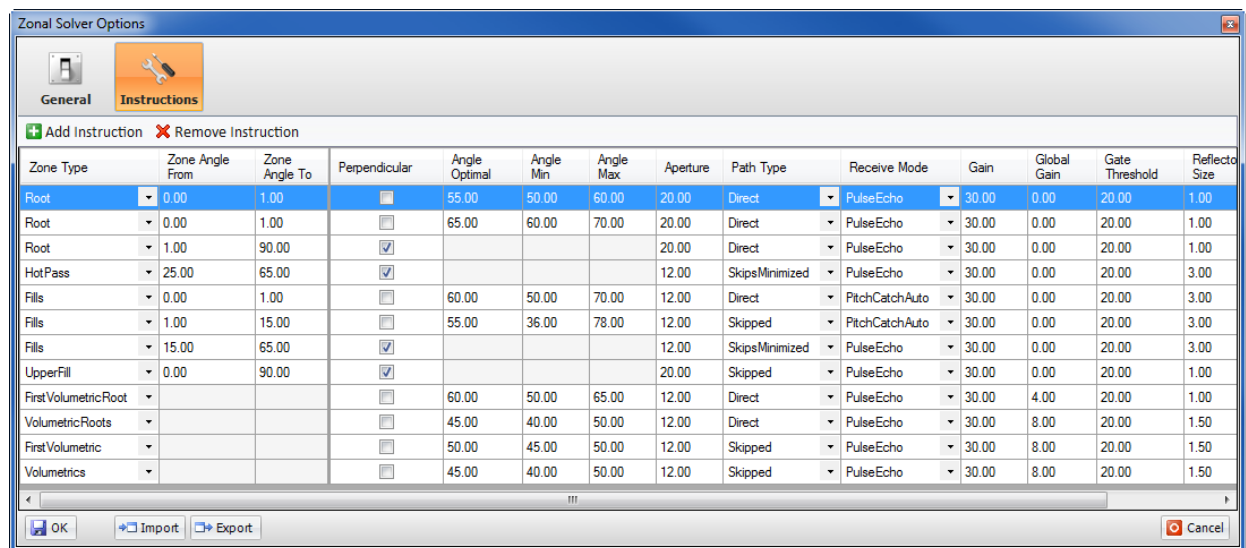
Fusion Before Weld	The length of the gate to be applied to fusion zone beams before the weld bevel fusion face.
Fusion After Weld	The length of the gate to be applied to fusion zone beams after the center of the weld bevel.
Vol. - Before Weld	The length of the gate to be applied to volumetric zone beams before the weld fusion face.
Vol. - After Weld	The length of the gate to be applied to volumetric zone beams after the back of the weld fusion face.

Presentations Parameters

The Presentations section allows you to select different types of Fills and Volumetrics. Options include Weld Plot, B-Scan, Coupling and TOFD.

Fills	The default Presentations value to use for Fill zones
Volumetrics	The default Presentations value to use for Volumetrics zones

Zonal Solver Options Instructions Tab



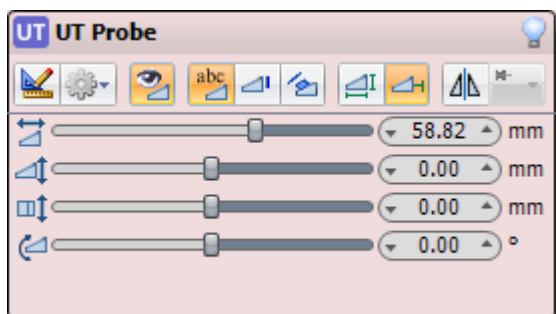
Instructions

Zone Type	The type of zone to attempt match
Zone Angle From	The low angle range to attempt to match
Zone Angle To	The high angle range to attempt to match
Perpendicular	Toggles perpendicular or inspection angle-specific solving
Angle Optimal	If not perpendicular, the optimal inspection angle
Angle Min	If not perpendicular, the minimum inspection angle
Angle Max	If not perpendicular, the maximum inspection angle
Aperture	The element aperture to use
Path Type	Direct – inspect target in OD to ID direction. I.e. 1, 3, 5 ... skips Skipped – inspect the target from ID to ID. I.e. 2, 4, 6 ... skips Skips Minimized – inspect with the fewest skips possible
Receive Mode	How the receive path should be determined (modes described elsewhere)

Gain, Global Gain, Gate Threshold, Reflector Sizing Correction	Default values for the Acquisition parameters used in downstream (export/import) applications
---	---

CHAPTER (10): CONVENTIONAL UT

In ultrasonic testing, a transducer connected to a diagnostic machine is passed over the piece being inspected. In reflection mode the transducer sends pulsed waves through a couplant on the surface of the object and receives the sound reflected back to the device. Reflected ultrasound comes from an interface such as the back wall of the piece or from a defect. In attenuation mode a transmitter sends ultrasound through one surface and a separate receiver detects the amount that has reached it on another surface after traveling through the piece. Defects or other conditions in the space between the transmitter and receiver reduce the amount of sound transmitted thus indicating their presence.

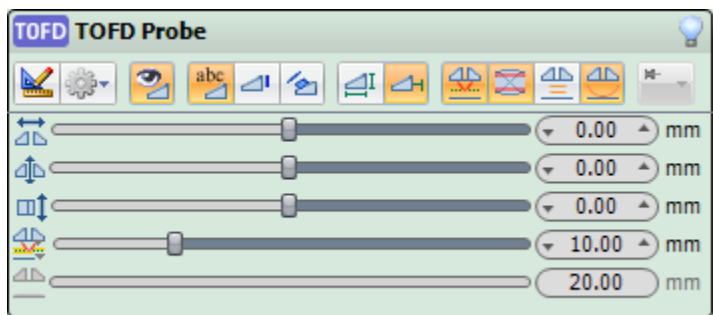


CHAPTER (11): TIME-OF-FLIGHT DIFFRACTION (TOFD)

Time-of-Flight Diffraction method of ultrasonic inspection is a very sensitive and accurate method for nondestructive testing of welds for defects. The use of TOFD enables weld discontinuities to be sized more accurately.

Measuring the amplitude of reflected signal is a relatively unreliable method of sizing defects because the amplitude strongly depends on the orientation of the discontinuity. Instead of amplitude, TOFD uses the time of flight of the diffracted ultrasonic signals from the top and bottom of the discontinuity to determine the position of a reflector.

In a TOFD system, a pair of probes sits on opposite sides of a weld. One of the probes emits an ultrasonic pulse that is picked up by the probe on the other side. In undamaged material, the signals picked up by the receiver probe are from two waves: one that travels along the surface and one that reflects off the backwall. When a crack is present, there is a diffraction of the ultrasonic wave from the tips of the discontinuity. Using the measured time of flight of the pulse, the depth of a discontinuity can be calculated automatically by simple trigonometry. This method is even more reliable than radiographic testing of a weld.



CHAPTER (12): CAD SURFACE

The CAD Surface is a blank canvas for adding a [Piece](#), [Probes](#), and [Geometries](#).

To assist in the adding, editing and positioning of [Probes](#), and [Geometries](#), the CAD surface has a number of options and tools available. Through the CAD Toolbar [Tools](#) group, options like **Rulers**, **Grids**, **Crosshair**, **Snapping**, and **Layers** can be turned on or off and configured. Through the [Main Toolbar](#), tools like **Zooming** and **Positioning** are available.

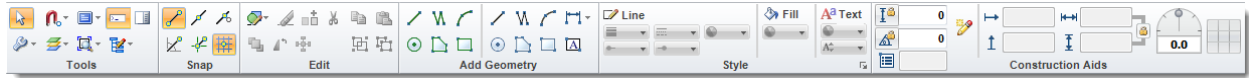
Through the [Main Toolbar](#), the CAD Surface can also be configured to display a **Top View**, **Side View**, or **3D View** of the workspace.

- **Left clicking** on the CAD Surface will start the **geometry selection** mode.
- **Right clicking** on the CAD Surface will display a context menu. If the right click is on top of a geometry selection, the context menu will display geometry tools and options. If the right click is not on top of a geometry selection, the context menu will display CAD surface tools and options.
- **Middle clicking** on the CAD Surface will temporarily activate the **Pan** tool. Click and hold the middle mouse button, then drag the mouse around to pan the CAD Surface around the workspace.
- **Scrolling** on the CAD Surface will zoom the display in and out.



CHAPTER (13): CAD TOOLBAR

CAD Tools for creating and manipulating custom geometries are available through the CAD Toolbar:



Through this toolbar [Geometries](#) can be **Added** to the workspace, [Edited](#), [Styled](#) and [Adjusted](#). Other [Tools](#) are also available to improve the efficiency and ease of drawing.

The CAD Toolbar is divided into the following groups:






- [Tools](#) - CAD Surface configuration, access to interactive tools, and [Layers](#)
- [Snap](#) - Quick access to the Snap settings contained in the [Tools](#) pop-up
- [Edit](#) - Access to geometry manipulation tools
- [Add Geometry](#) - Quick access to adding [Piece](#) and [Annotative](#) geometries
- [Style](#) - Access to geometry styling tools
- [Construction Aids](#) - Access to geometry positioning and sizing tools

13.1 CAD TOOLS


13.1.1 TOOLS GROUP





The CAD Tools group provides access to various drawing and CAD Surface tools. Grouped into four pop-up menus, the CAD tools are:




-  **Arrow Tool** The Arrow Tool allows you to select and manipulate graphics. Once selected, a graphic can be moved by dragging or resized using the available handles.
-  **Geometry Inspector** Displays the [Geometry Inspector](#) to the right of the CAD Surface.
-  **Command Prompt** Displays the [Command Prompt](#) above the CAD Toolbar.
-  **Viewport Manager** Opens the [Viewport Manager](#) dialog box.
-  **Geometry Navigator** Opens the [Geometry Navigator](#) dialog box.

13.1.1.1 INTERACTIVE TOOLS




The  **Interactive Tools** pop-up provides access to the following tools:


-  **Interactive Rotate** Activates the Interactive Rotate Tool, which provides a means of defining the center of the rotation point and the angle at which to rotate selected geometries.
-  **Interactive Move** Activates the Interactive Move Tool, which provides a means of defining the direction and distance at which to move selected geometries.
-  **Interactive Trim** Activates the Interactive Trim Tool, which allows users to easily trim intersecting lines to precise lengths.
-  **Interactive Scale** Activates the Interactive Scale Tool, which allows users to easily scale images and geometries to precise measurements. When activated, the user is prompted to select two points of the image or geometry to scale. The user then defines the actual measurement and clicks on the Scale Geometry button.

13.1.1.2 DISPLAY SETTINGS


The  **Display Settings** pop-up provides access to the following groups of tools:


Workspace Objects

-  **Show Images** When selected, displays images in the drawing.
-  **Lock Images** Locks any image graphics so they cannot be moved or selected when editing other graphics.
-  **Show Annotations** When Show Annotations is selected Annotation redlines are displayed in the drawing. When not selected, Annotation redlines are not displayed. Show Annotations does not affect the visibility of Piece geometries.

 **Show Dynamic Dimensions** When Show Dynamic Dimensions is selected supported Dynamic Dimensions are displayed in the drawing. When not selected, supported Dynamic Dimensions are not displayed


Display Settings

 **Show Rulers** Displays a horizontal and vertical ruler around the drawing area.

 **Show Ruler** Displays markers on the ruler relative to where the cursor is on the CAD Surface.

Markers

 **Show Crosshairs** Displays horizontal and vertical crosshairs on the cursor.



 **Show Small** Displays a small horizontal and vertical crosshairs on the cursor.

Crosshairs

 **Show Alignment Marker** Displays an alignment marker on the handle of the selected geometry. The marker corresponds to the Construction Aids Placement Grid selection.







 **Command Prompt** Displays the [Command Prompt](#) above the CAD Toolbar.

Grid Settings


 Show Grid	Toggles the visibility of the grid on and off.
 Show Grid Axis	If checked, the X and Y axis are highlighted in blue.
X, Y	Specify the numerical spacing units for X and Y axis.

13.1.1.3 SNAP SETTINGS

The  **Snap Settings** pop-up provides access to the following tools:

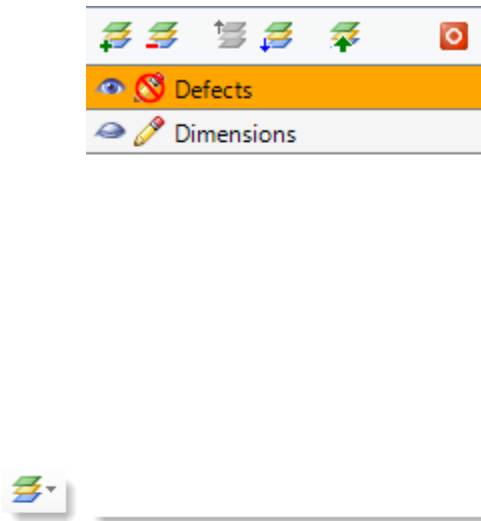
 Snap to Points	If checked, points within an annotation will snap to the nearest end point of an annotation, within a set tolerance.
 Snap to Mid Point	If checked, points within an annotation will snap to the nearest mid point of an annotation, within a set tolerance.
 Snap Nearest	If checked, points within an annotation will snap to the nearest point on an annotation within a set tolerance.
 Snap Alignment	If checked, points within an annotation will dynamically snap to existing geometry features, within a set tolerance.
Geometric Tolerance Snap	The tolerance distance to be used when snapping to an existing geometry.
 Snap to Grid	If checked, points within an annotation will snap to the nearest grid intersection when drawn, moved or resized.
 Orthographic Snap	If checked, points within an annotation are restricted to the X or Y axis relative to the selected start point.
Orthographic Tolerance Snap	The tolerance distance to be used when snapping to the X or Y axis.

13.1.1.4 LAYERS







The  **Layers** pop-up menu provides the ability to [define and manipulate CAD Layers](#). Geometries (both reflective and annotative) can be added to and moved between CAD Layers. Individual Layers can be added or removed, reordered, hidden, and locked.

13.1.2 CAD LAYERS



The CAD Layers pop-up provides the ability to define multiple CAD Layers. Geometries (both reflective and annotative) can be added to and moved between CAD Layers. Individual Layers can be added or removed, reordered, hidden/displayed, and set as uneditable/editable.



The row of buttons on the top of the Layers pop-up provides access to the following functions:

 Add Layer	Creates a new layer.
 Delete Layer	Deletes the selected layer. All geometries on this layer will also be deleted.
 Move Layer Up	Moves the selected layer's paint order up in front of other layers.
 Move Layer Down	Moves the selected layer's paint order down behind other layers.
 Move Geometries	Moves the selected geometries into the selected layer.
 Close Layers Pop-up	Closes the Layers pop-up.

Each layer is represented as a row in the pop-up window. A layer can be **renamed** by double-clicking on the layer row. Each layer row also provides the following functions:

 Visibility	Toggles the visibility of the layer on the CAD surface.
 Locking	Toggles the locking of the layer. When locked, a layer cannot be edited.

The [Geometry Inspector](#) can be used to change the view of [legends](#) created in different layers. The example below has two legends that were created in separate layers.

The legend on the right is selected and the Geometry Inspector field called "CalloutLayers" is set to "Current". This means that only geometries in the currently selected layer are shown in the legend.








The legend in the middle has the "CalloutLayers" field set to "All" and is displaying all dimensions from all layers.

13.2 VIEWPORTS

A viewport is a region of the screen used to display a different view of the total image to be shown. As you work you can split the drawing area into one or more adjacent rectangular views. Viewports are useful for large and detailed drawings, and can be selected for printing and display in reporting.

The Viewport Manager can be by clicking on the  icon found in the [Tools](#) section of the [CAD Toolbar](#).

13.2.1 VIEWPORT MANAGER OPTIONS

 Add Viewport	Adds a new viewport to the workspace.
 Rename Viewport	Renames the selected viewport.
 Show Viewport	Changes the workspace view to the selected viewport.
 /  Visibility	Toggles available layer views on and off in the workspace for the default viewport, and toggles available layer views on and off in the report for all other viewports.
 /  Show Report In	Determines if the viewport is included in the Print Drawings dialog box and in the Reports or not.

Click [here](#) for more information on working with viewports.




13.2.2 WORKING WITH VIEWPORTS

A viewport provides the ability to define rectangular subset areas of the top and side views. These can be used to [print detailed areas of interest](#), in reports and for quick navigation to areas.

13.2.2.1 ADDING AND DELETING VIEWPORTS



There is a viewport automatically created in the Viewport Manager called "**Default**". This is the view of the entire workspace.

Other Viewports can be added in one of three ways:


1. Click on the Viewport icon  found in the pop-up menu in the Add Geometry section of the [CAD Toolbar](#).
2. Click on the Viewport icon  found in the pop-up menu in the Edit section of the [CAD Toolbar](#).
3. Click on the Add Viewport icon  found in the [Viewport Manger](#).

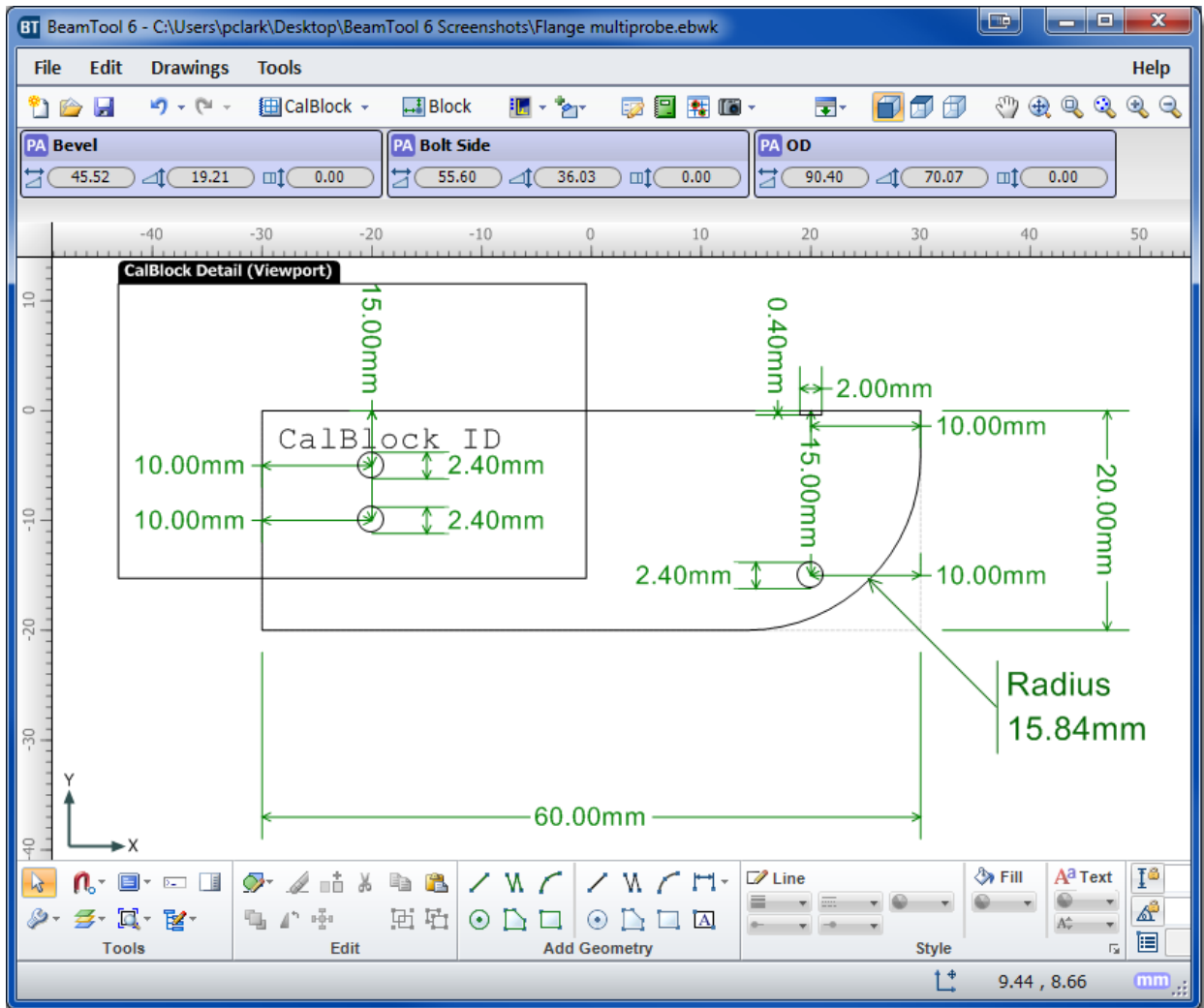
Viewports can be deleted by selecting the viewport in the workspace and pressing the "**Delete**" key on your keyboard.

13.2.2.2 LAYERS IN VIEWPORTS

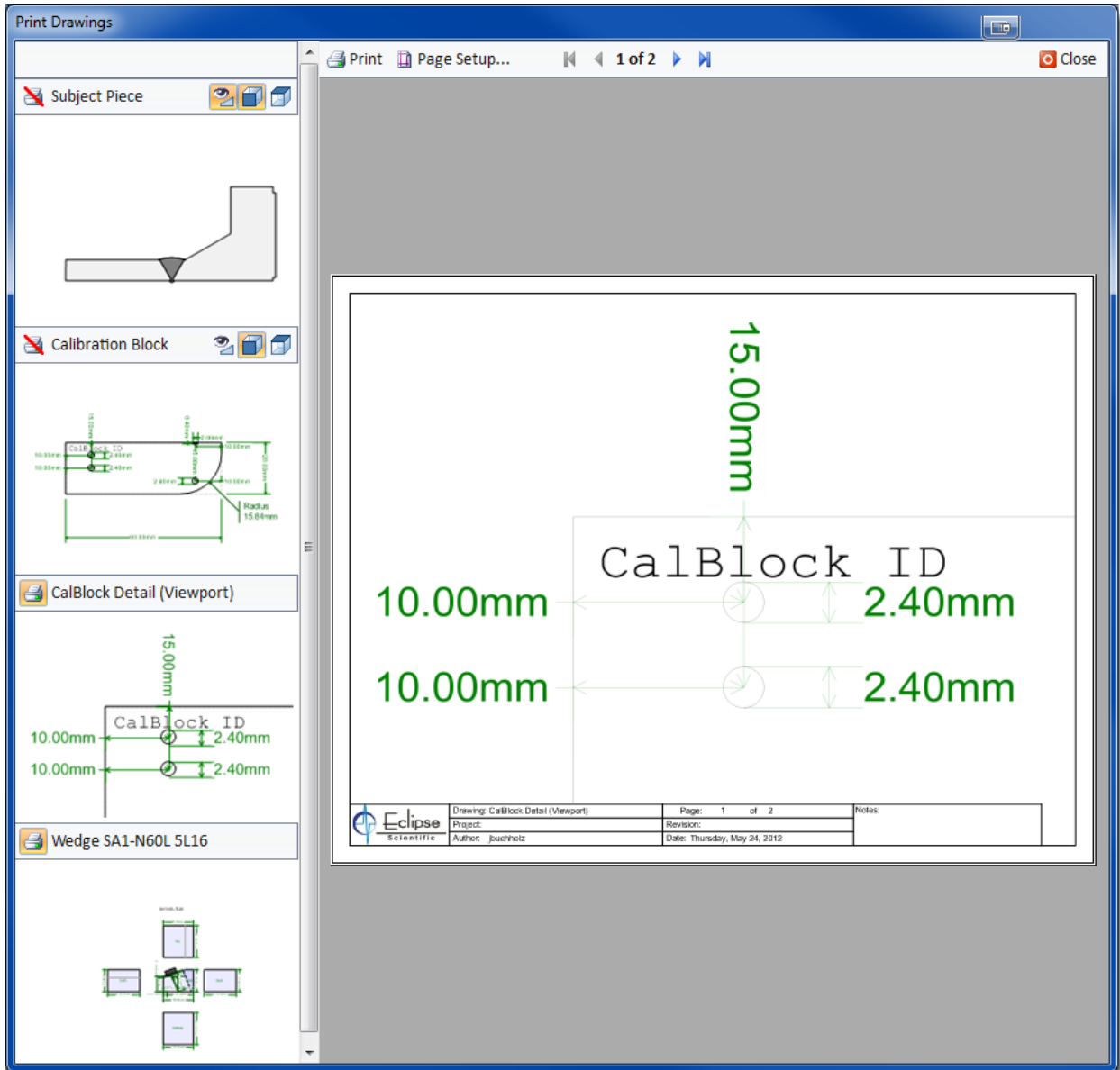
All layers created in the workspace will automatically be added to the [Viewport Manager](#). Viewports can be configured with independent layer visibility from the main workspace surface. The Visibility icons  /  found in the [Viewport Manager](#), toggles available layer views on and off in the workspace for the **Default viewport only**, and toggles available layer views on and off in the report for all other viewports. This makes it possible to add additional context to report images that may not be necessary on the main workspace view.

13.2.2.3 VIEWPORTS IN PRINTING


All viewports will show in the [Print Drawings](#) dialog box as long as the Print icon  is turned on for each viewport in the [Viewport Manager](#). In the example below we have created one viewport called CalBlock Detail.

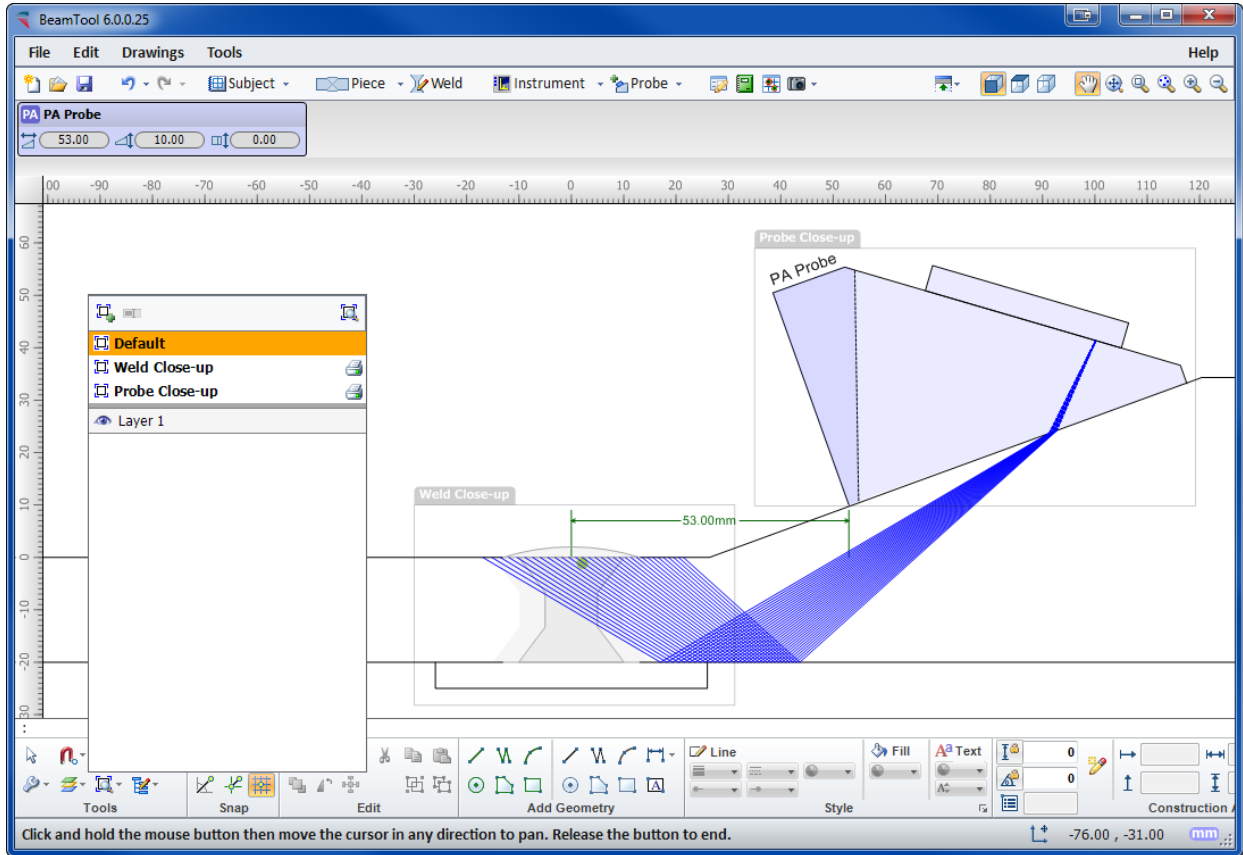


Click on Print from the [File Menu](#) to bring up the Print Drawings dialog box. You will see all of your active viewports available to print.

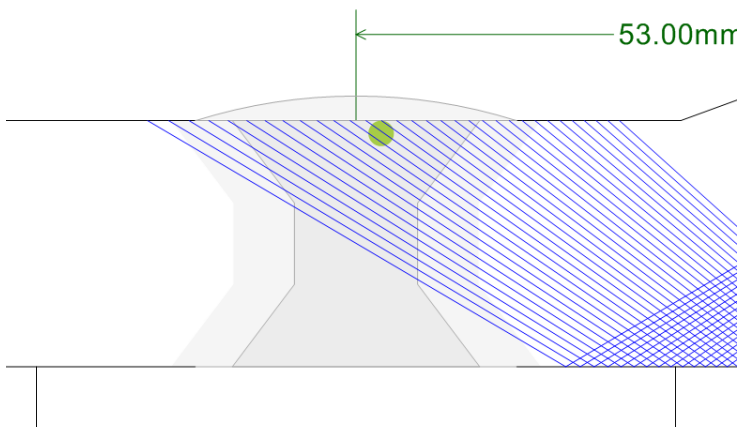


13.2.2.3.1.1 VIEWPORTS IN REPORTS

All viewports will show in a report as long as the Print icon  is turned on for each viewport in the [Viewport Manager](#). In the example below we have created two viewports but only Viewport #1 is selected to show in the report.



Below is the Viewport labeled "Weld Close-up" shown in the report.




Weld Close-up



















13.3 EDIT






The **Edit** group on the CAD toolbar provides access to a number of geometry editing functions.



Geometries can be added to the CAD surface from the Edit group via the  **Add Geometry** pop-up. The various types of geometries that can be added are described in the [Geometries](#) section.

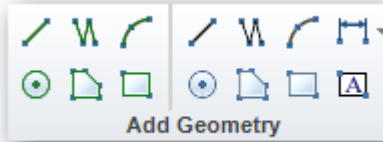
Once geometries have been added to the CAD surface, they can be edited via the various editing tools available in the Edit group. [Selecting one or more geometries](#) will enable the following tools in the Edit group:

 Delete Selected	Deletes the selected graphic(s)
 Duplicate Selected	Duplicates the selected graphic(s)
 Cut	Deletes the current selection and places it on the clipboard.
 Copy	Places the current selection on the clipboard.
 Paste	Copies the current contents of the clipboard onto the workspace.
 Ordering Pop-Up - changes the stacking order of objects on a layer	
 Bring to Front	Brings the selection to the front of all other graphics, so that no part is hidden by other graphics.
 Send to Back	Sends the selection behind all other graphics.
 Transform Pop-Up - transform objects by rotation or flipping.	
 Flip Vertical	Flips the selection along its vertical axis.
 Flip Horizontal	Flips the selection along its horizontal axis.
 Rotate Clockwise	Rotates the selection 90 degrees in a clockwise direction.
 Rotate Counter-Clockwise	Rotates the selection 90 degrees in a counter-clockwise direction.
 Rotate 180	Rotates the selection 180 degrees.
 Alignment Pop-Up - aligns objects horizontally or vertically relative to each other. Objects are positioned relative to the first object selected.	
 Left	Aligns the selected geometries to the left of the first selected object.
 Center	Aligns the selected geometries to the center of the first selected object.
 Right	Aligns the selected geometries to the right of the first selected object.

 Top	Aligns the selected geometries to the top of the first selected object.
 Middle	Aligns the selected geometries to the middle of the first selected object.
 Bottom	Aligns the selected geometries to the bottom of the first selected object.
 Group	Groups the selected graphics so that they can be treated like a single graphic.
 Un-Group	Breaks a group of graphics back into individual graphics.

13.4 ADD GEOMETRY

The **Add Geometry** group provides quick access to a subset of the geometry tools available through the **Add Geometry pop-up** accessible in the [Edit](#) group.



The following [Piece](#) and [Annotative](#) geometries can be added from the **Add Geometry** group. Other [Geometries](#) must be added through the **Add Geometry pop-up** accessible in the [Edit](#) group.

Piece Geometries:

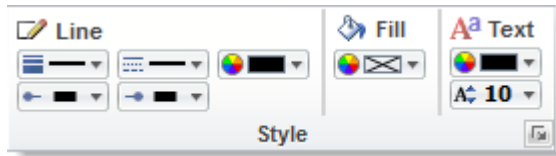
Line	Places a user defined line that will reflect beams projected from a probe
Arc	Places a user defined arc that will reflect beams projected from a probe.
Circle	Places a user defined circle that will reflect beams projected from a probe.
Polygon	Places a user defined polygon that will reflect beams projected from a probe.
Rectangle	Places a user defined rectangle that will reflect beams projected from a probe.
Polyline	Places a user defined polyline that will reflect beams projected from a probe.

Annotative Geometries:

Line	Places a user defined line that will not reflect beams projected from a probe
Arc	Places a user defined arc that will not reflect beams projected from a probe.
Dimensions	Places user defined dimensions that will not reflect beams projected from a probe.
Circle	Places a user defined circle that will not reflect beams projected from a probe.
Polygon	Places a user defined polygon that will not reflect beams projected from a probe.
Text Box	Places a user defined text box that will not reflect beams projected from a probe.
Polyline	Places a user defined polyline that will not reflect beams projected from a probe.
Rectangle	Places a user defined rectangle that will not reflect beams projected from a probe.

13.5 STYLE

Style tools can be accessed by selecting the appropriate tool button on the CAD toolbar Style group. Style tools can also be accessed by selecting **Properties** from the right click menu. These tools are only available when a [Piece](#) or [Annotative](#) geometry is selected.



Below are the editing tools available:

Line

Line Weight	Specifies the thickness of the line.
Line Style	Specifies the style (solid, dash, dotted) of the line.
Line Color	Specifies the color of the line.
Start Cap	Specifies the cap style placed at the beginning of the line.
End Cap	Specifies the cap style placed at the end of the line.

Fill

Fill Color	Specifies the color and level of transparency used to fill contained geometries such as rectangles, ellipses and polygons.
-------------------	--

Text












Text Color	Specifies the color of the selected text.
Text Scale	Specifies the size of the selected text graphics.

13.6 CONSTRUCTION AIDS

Construction Aids can be accessed through the CAD toolbar Construction Aids group. These tools are only available when a [Piece](#) or [Annotative](#) geometry is selected.



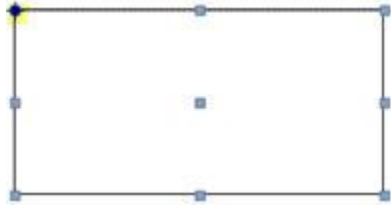
Below are the editing tools available:

 Lock Distance	When selected the Lock Distance restrains the line segment being drawn to the distance specified.
 Lock Angle	When selected the Lock Angle restrains the line segment being drawn to the angle specified.
 Draw Relative	When selected places the next point of the geometry being drawn at a point relative to the last point drawn using the distance and angle specified.
 Legend ID	Replaces the numerical value of the selected dimension geometry and replaces it with a user defined variable that will be displayed along with the numerical value in the Legend .
 Horizontal	Displays the calculated distance of the specified start point (see Measurement Start Point) from 0,0 along the Y axis.
 Vertical	Displays the calculated distance of the specified start point (see Measurement Start Point) from 0,0 along the X axis.
 Length	Displays the calculated length of the selection.
 Height	Displays the calculated height of the selection.
 Lock Aspect Ratio	Ensures that adjustments to Length and Width are made relative to each other, so that geometries maintain Length to Width ratio
 Rotate	Rotates the selection to the specified angle.
 Placement Grid	Specifies the geometry handle to calculate measurements from. An alignment marker can be displayed by selecting Show Alignment Marker in the Display Settings pop-up on CAD toolbar Tools group.

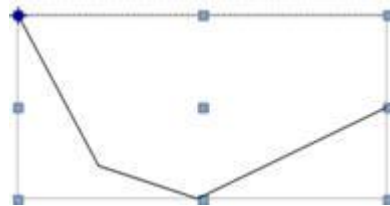
13.6.1

13.6.2 USING CONSTRUCTION AIDS

The Construction Aids can be used to quickly and precisely place Piece and Annotation geometries. When one or more geometries are selected, an invisible alignment rectangle is placed around the graphic(s). This rectangle consists of nine geometry handles that can be used during graphic alignment.



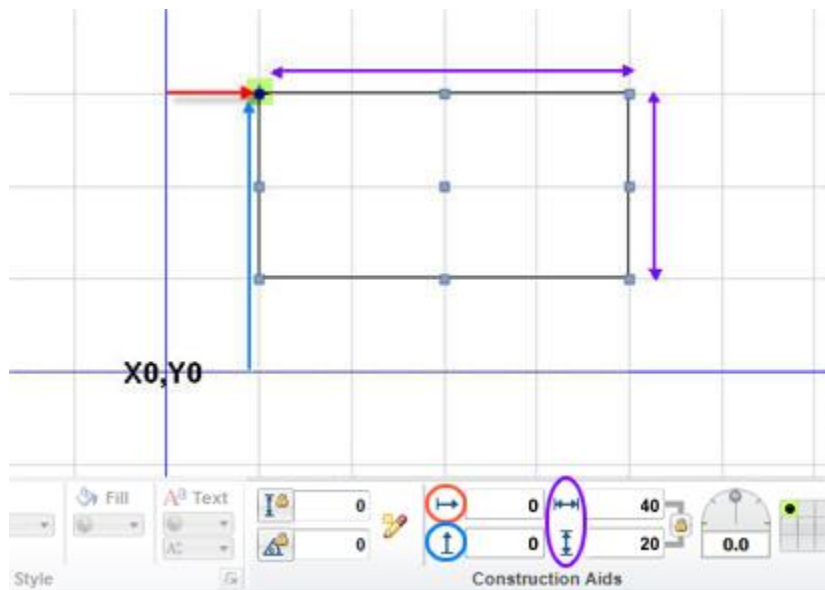
Rectangle



Polyline

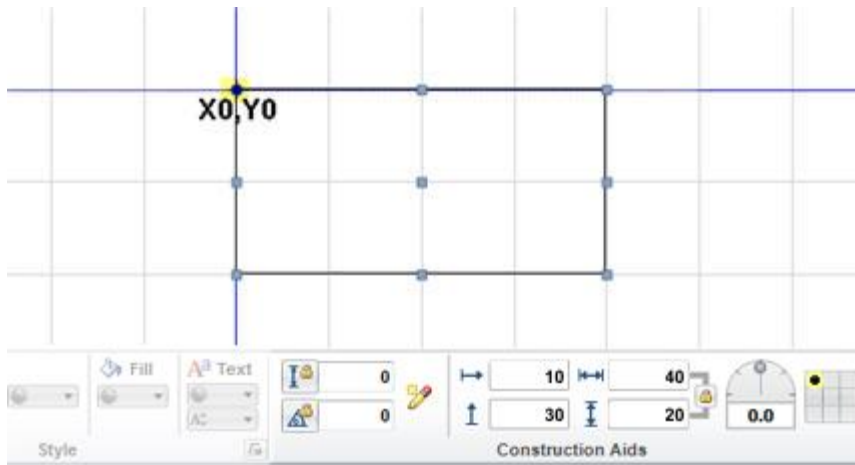
When **Show Annotation Marker** is selected in the [Display Settings](#) pop-up on CAD toolbar Tools group, the geometry handle that is specified for use in the Construction Aids is identified with an alignment marker. To change the geometry marker select one of nine geometry handles on the **Placement Grid**.

The Construction Aids fields display measurements for From Y (red), From X (blue) as well as Horizontal and Vertical start to end lengths for the selected graphic.



Values for From Y, From X and Horizontal and Vertical start to end lengths can be specified in the fields. When Enter is selected the graphic is positioned using these values.

In the example below the rectangle that was drawn at X30,Y10 has been modified to be placed at X0,Y0 using the Construction Aids.

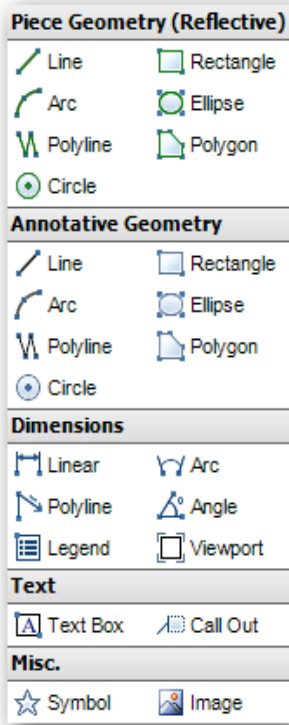


Construction Aids can also be used to specify a specific length (Lock Distance) and/or angle (Lock Angle) when placing graphics. Select the type of graphic that you would like to place and enter the length and/or angle and select Enter.

CHAPTER (14): GEOMETRIES

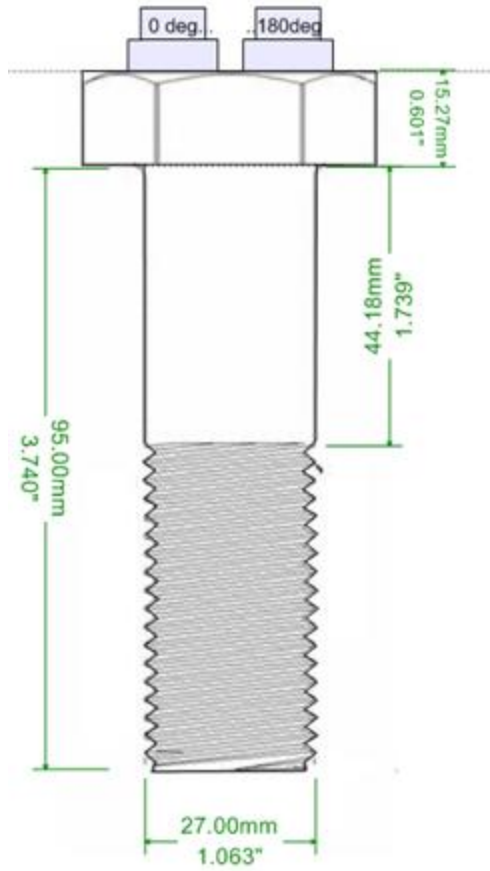
Geometries are used to provide additional information to a drawing. There are two types of geometries in BeamTool: [Annotative Geometries](#) which do not interact with projected beams and [Piece Geometries](#) which possess reflective and refractive properties and reflect beams projected from a probe

For more information select the appropriate type below:



- [Piece Geometries](#)
- [Annotative Geometries](#)

The following screenshot demonstrates how geometries can be used to construct detailed workspaces:










Piece Geometries are used to create the reflective outline of the bolt.

Annotative Geometries are used to display a bitmap image of the bolt and to display dimensions.

14.1 PIECE GEOMETRIES

Custom Piece Geometries allow the user to draw complex piece and weld configurations. Types of annotation include lines, arcs, polylines, rectangles and polygons. Custom Piece Geometries possess reflective properties and will reflect beams projected from the probe. The reflective and refractive properties can be disabled, and at this point the geometry is considered to be an [Annotative Geometry](#).

Piece Geometries include:

 Line	Places a user defined line that will reflect beams projected from a probe
 Arc	Places a user defined arc that will reflect beams projected from a probe.
 Polyline	Places a user defined polyline that will reflect beams projected from a probe.
 Circle	Places a user defined circle that will reflect beams projected from a probe.
 Rectangle	Places a user defined rectangle that will reflect beams projected from a probe.
 Ellipse	Places a user defined ellipse that will reflect beams projected from a probe.
 Polygon	Places a user defined polygon that will reflect beams projected from a probe.

14.1.1 ADDING PIECE GEOMETRIES

Piece Geometries can be added to a workspace from the CAD Toolbar [Edit](#) group, or through the CAD Toolbar **Add Geometry** group:

1. Select the appropriate geometry tool from the toolbar.
2. Place the geometry on the drawing following the placement prompts displayed in the status bar.








Tools available in the CAD toolbar [Tools](#) group can be used to assist in the accurate placement of geometries: grids, snaps, locks, layers, etc.

Once added to a workspace, geometries can be [selected](#) and then manipulated with [Edit Tools](#), [Style Tools](#) and [Construction Aids](#).







14.2 ANNOTATIVE GEOMETRIES

Annotative Geometries allow annotation to be added to the drawing to indicate additional information not automatically displayed by BeamTool. Types of annotation include lines, polygons, text boxes, symbols and dimensions. Image annotations can be added as a backdrop. Unlike Piece Geometries, Annotative Geometries do not possess reflective properties. For some Annotative Geometries, reflective and refractive properties can be selected, and at this point the geometry is considered to be a [Piece Geometry](#).



Annotative Geometries include:

 Line	Places a user defined line that will not reflect beams projected from a probe
 Arc	Places a user defined arc that will not reflect beams projected from a probe.
 Polyline	Places a user defined polyline that will not reflect beams projected from a probe.
 Circle	Places a user defined circle that will not reflect beams projected from a probe.
 Rectangle	Places a user defined rectangle that will not reflect beams projected from a probe.
 Ellipse	Places a user defined ellipse that will not reflect beams projected from a probe.
 Polygon	Places a user defined polygon that will not reflect beams projected from a probe.



Dimensions:

 Linear	Linear dimensions allow you to annotate distances on the drawing.
 Polydim	Polydim dimensions allow you to annotate multi-segment distances on the drawing.
 Arc	Arc dimensions allow you to annotate an arc distance on the drawing.
 Angle	Angle dimensions allow you to annotate angles on the drawing.
 Legend	The Legend is a whitespace management tool that displays a list of the specified dimensions annotated in the workspace.
 Viewport	A viewport is a region of the screen used to display a different view of the total image to be shown.

Text:

 Text Box	Places a user defined text box that will not reflect beams projected from a probe.
 Call Out	Places a user defined call out that will not reflect beams projected from a probe. Call Outs contain a text box and an associated directional line.

Misc:

 Symbol	Places a user defined symbol that will not reflect beams projected from a probe.
 Images	Allows the placement of an image on the drawing. Beams projected from a probe will not be reflected.

14.2.1 ADDING ANNOTATIVE GEOMETRIES

Annotative Geometries can be added to a workspace from the CAD Toolbar [Edit](#) group, or through the CAD Toolbar **Add Geometry** group:

1. Select the appropriate geometry tool from the toolbar.
2. Place the geometry on the drawing following the placement prompts displayed in the status bar.

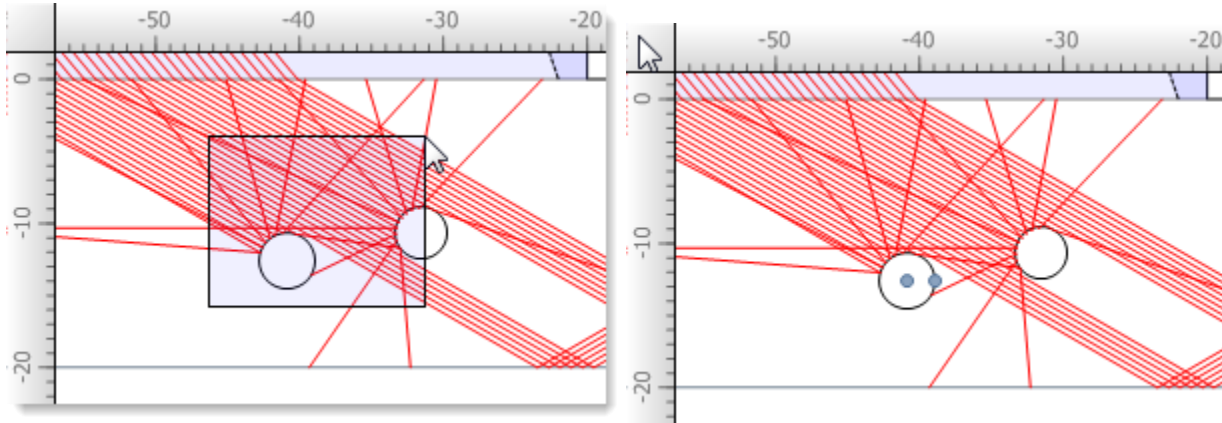
Tools available in the CAD toolbar [Tools](#) group can be used to assist in the accurate placement of geometries: grids, snaps, locks, layers, etc.

Once added to a workspace, geometries can be [selected](#) and then manipulated with [Edit Tools](#), [Style Tools](#) and [Construction Aids](#).

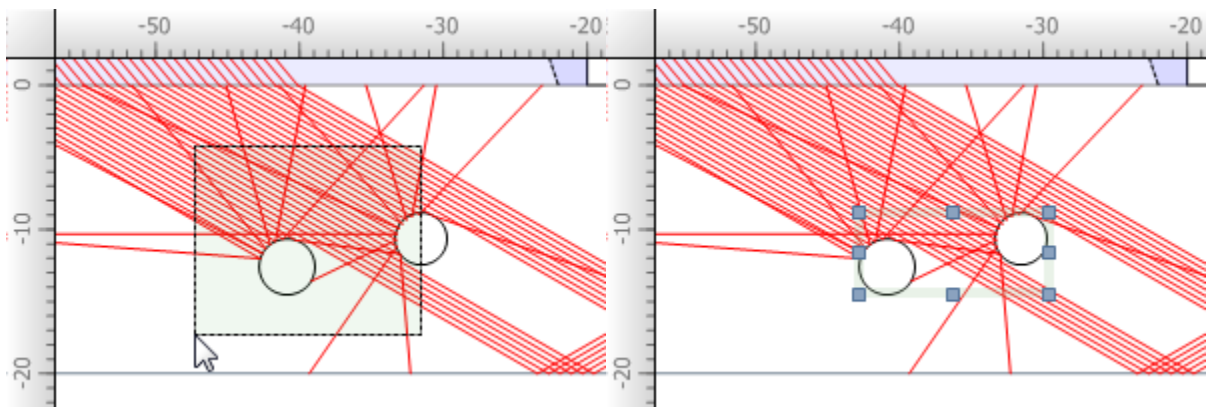
14.3 SELECTING GEOMETRIES

With the Arrow Tool active, specify the object(s) to be edited by clicking and dragging the mouse cursor over the CAD surface. A selection rectangle (blue) drawn left to right will select all features totally encompassed by the rectangle. A selection rectangle (green) drawn right to left will select all features touching the rectangle.

Left to Right selection:



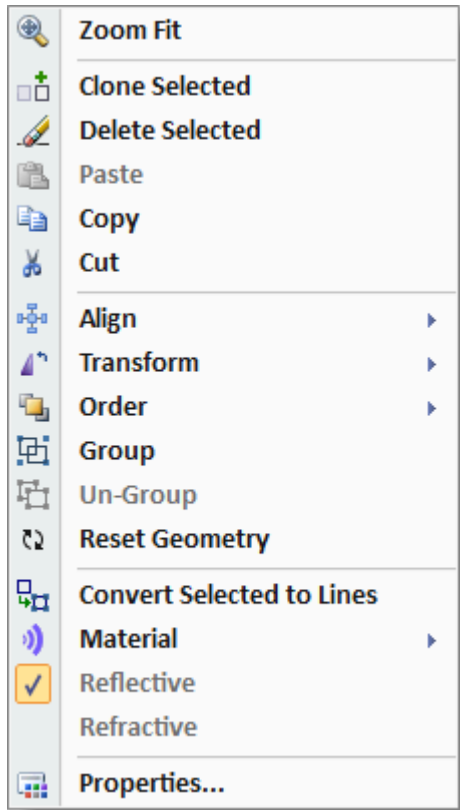
Right to Left selection:



Holding the CTRL key while selecting geometries on the CAD surface will combine the new selections with any current selections. Using this method of selection allows for the selection of a very specific subset of geometries.

Once selected, geometries can be:

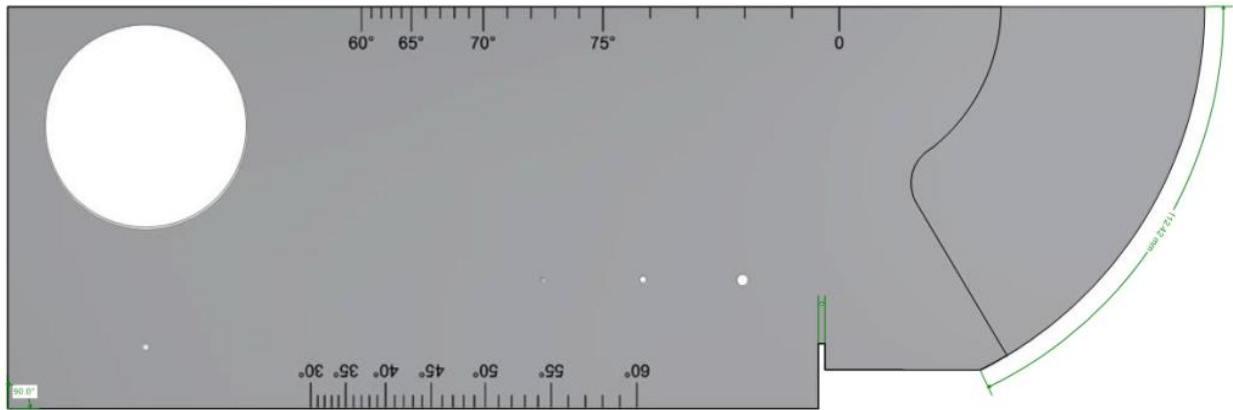
- repositioned, resized and rotated by adjusting the location of the visible handles
- manipulated with [Edit Tools](#), [Style Tools](#) and [Construction Aids](#) from the CAD toolbar
- **right-clicked** to access the context menu, providing many editing tools and access to the geometry **Properties** screen (only available from the right click context menu):




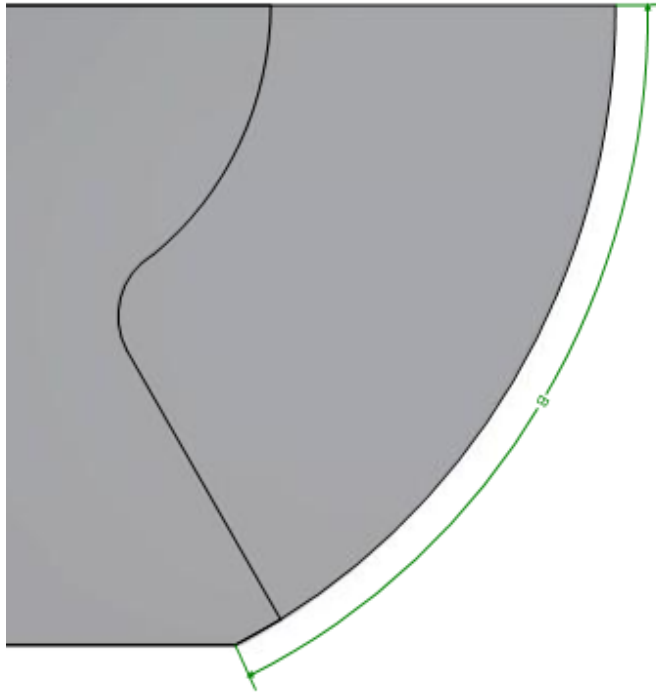
14.4 LEGEND

The Legend is a whitespace management tool that displays a list of the specified dimensions annotated in the workspace.

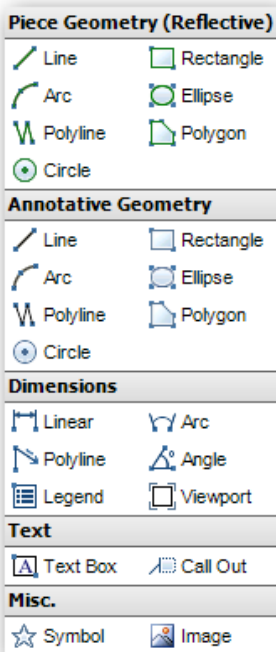
When a dimension geometry is added to a workspace the numerical value for that dimension is displayed by default. If a dimensions being displayed are small, or closely grouped together it is difficult to read.



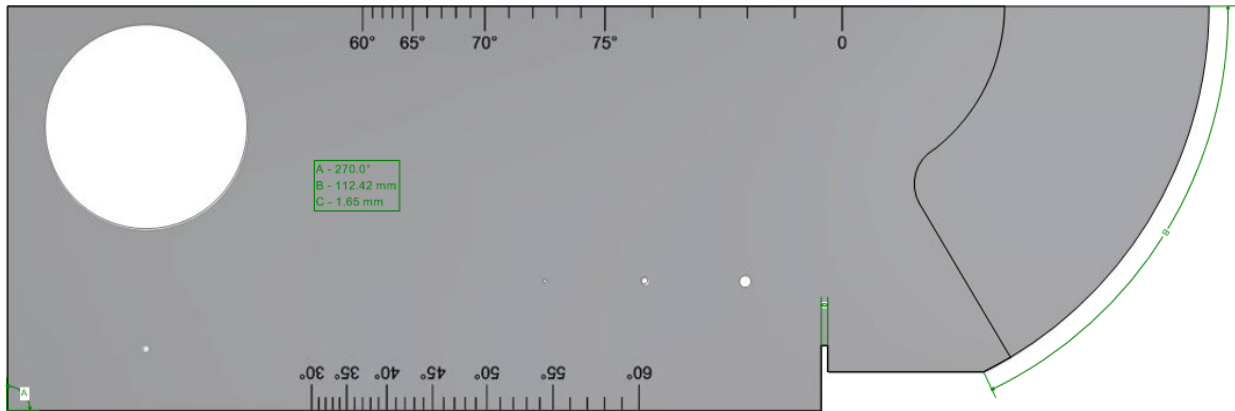
Start by assigning an ID to each dimension that will be identified in the Legend. To assign an ID, select the dimension, type an ID in the  Legend ID field and press enter. The numerical value will be replaced with the ID given.



Once all of the dimension have been assigned Legend IDs, select the Legend tool from the [Add Geometry Group](#), or type *legend* at the [Command Prompt](#).



With all Legend IDs assigned and the Legend tool turned on, the Legend will be displayed in the workspace.




The [Geometry Inspector](#) can be used to change the view of legends created in different layers. The example below has two legends that were created in separate layers.



The legend on the right is selected and the Geometry Inspector field called "LegendLayers" is set to "Current". This means that only geometries in the currently selected layer are shown in the legend.

The legend in the middle has the "LegendLayers" field set to "All" and is displaying all dimensions from all layers.

14.5 GEOMETRY INSPECTOR

Allows advanced users to manipulate Piece and Annotation geometries at a lower level than that of the CAD Tools.

The **Geometry Inspector** can be toggled on and off by clicking on the  **Geometry Inspector** icon from the [CAD Tools](#) group, or by selecting from the [Tools Menu](#). The **Geometry Inspector** is displayed to the right of the CAD Surface.

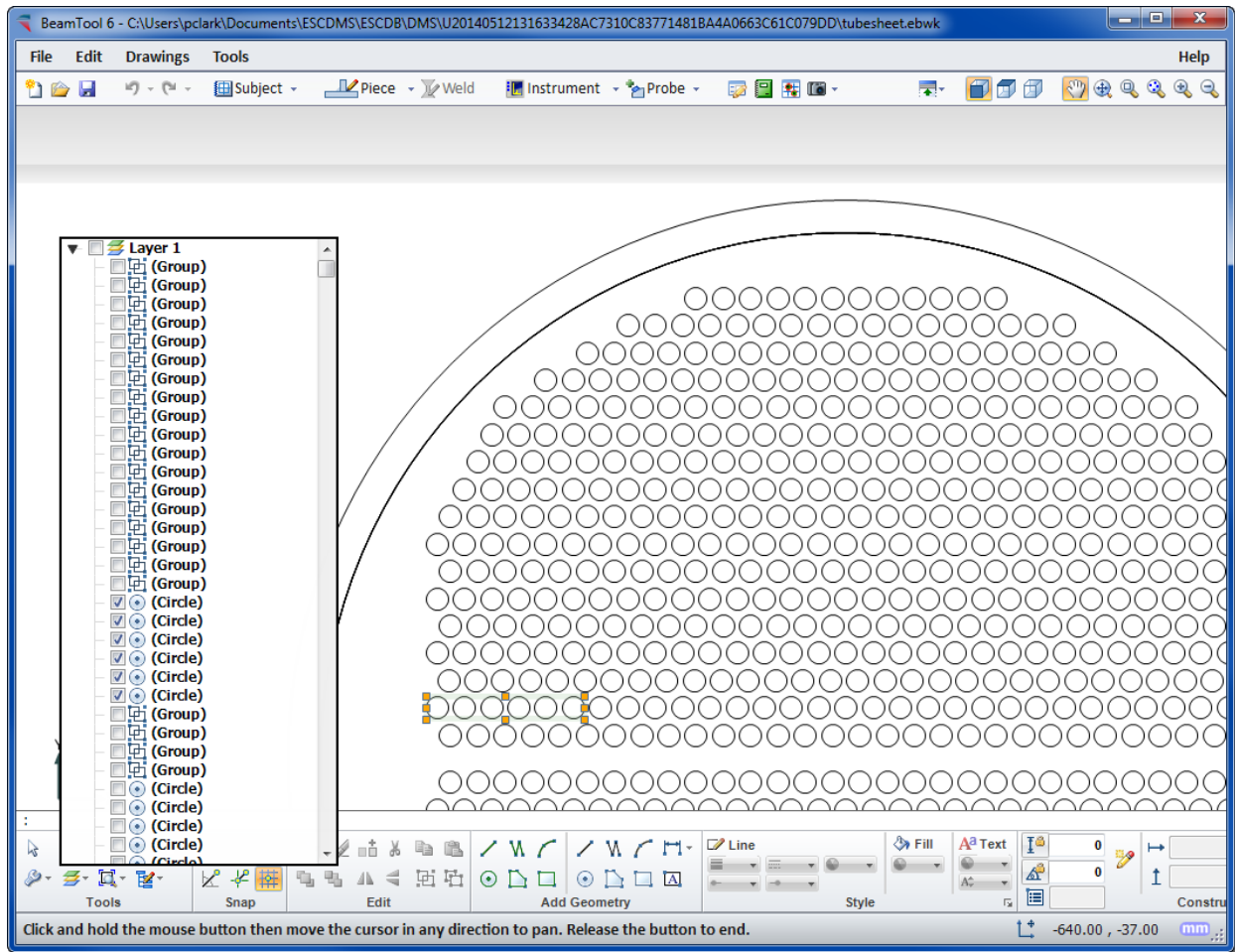
Misc	
Angle	347.32727855789778
Bottom	52.095349191062681
BottomLeft	(67.65,52.10)
BottomRight	(87.19,52.10)
CalloutLayers	Current
Center	(77.42,54.29)
EndPoint	87.1931444467982,52.095
ExtrudeDepth	0
ExtrudeZ	NaN
FillStyle	
GeometryTypeName	Legend
HandleCount	1
Height	4.3945307214329858
Hide3D	False
Left	67.649693539660177
Length	20.031434637123045
LineColor	 Green
LineDashStyle	Solid
LineEndCap	Flat
LineStartCap	Flat
LineWidth	1
MaterialName	
Reflective	False
Refractive	False
Right	87.193144446798215
StartPoint	67.6496935396602,56.489
Tag	
Text	
TextColor	 Green
TextScale	1
Top	56.489879912495667
TopLeft	(67.65,56.49)
TopRight	(87.19,56.49)
Velocity	0
VelocityLong	0
VelocityShear	0
Width	19.543450907138038
XMLString	67.6496935396602,56.489

Fields that have light text are read outs. Fields that are read outs cannot be edited. Click on a bold field to enter a new value or select from available drop-down menus and dialog boxes.

When multiple geometries are selected, the Geometry Inspector will change to show the common attributes of the selected geometries.

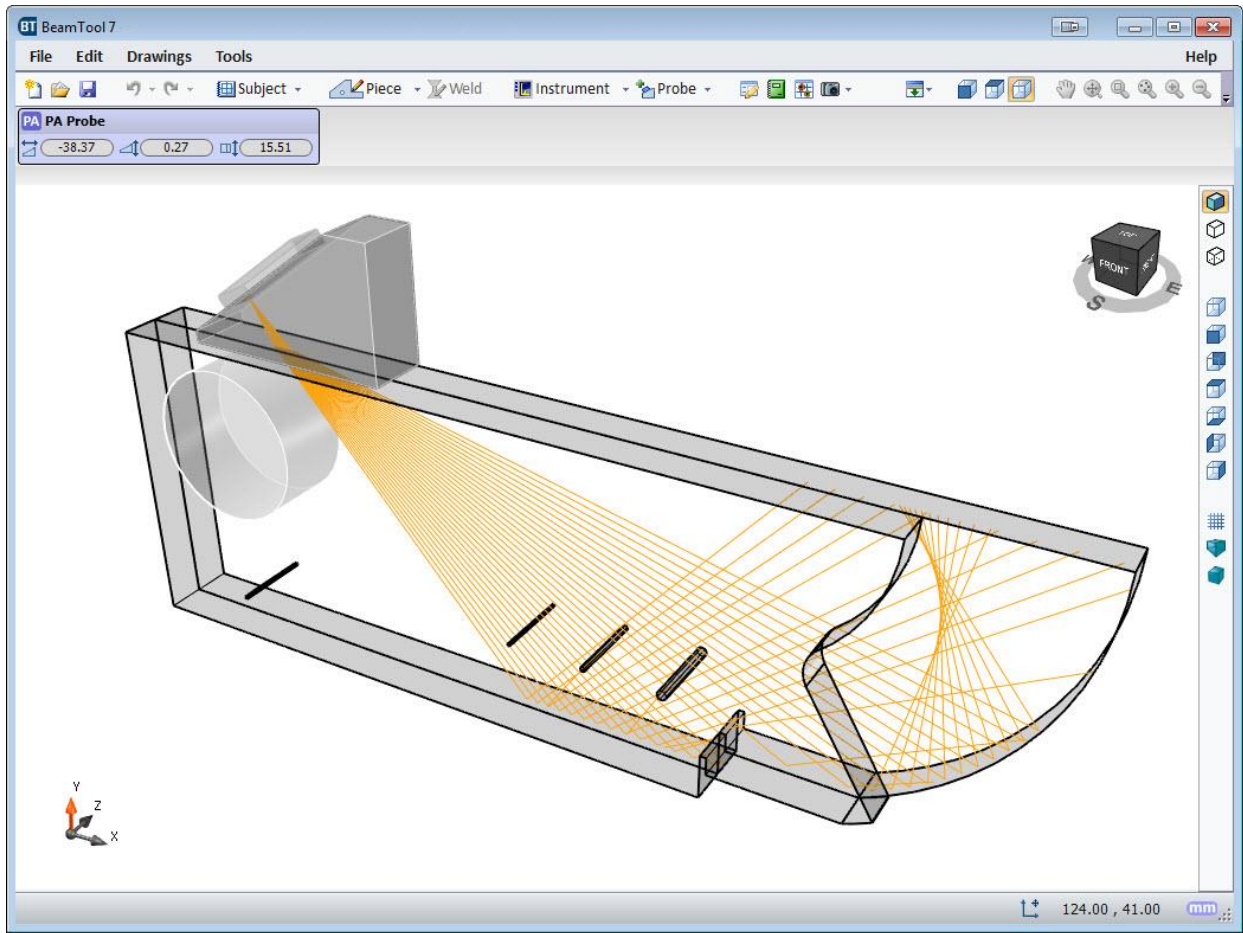
14.6 GEOMETRY NAVIGATOR

The Geometry Navigator allows you to visualize, highlight and select all of the geometries in a drawing. Geometries in the workspace are highlighted in yellow as the cursor is placed over the corresponding geometry in the Geometry Navigator window. Geometries are selected in the workspace when a check mark is placed next to them in the Geometry Navigator. This makes grouping, un-grouping and navigation easier than ever.



CHAPTER (15): 3D VIEW

The 3D view will display your piece, probes and beams in an interactive viewing environment. [Rotation](#), [Panning and Zooming](#) tools; [Mesh, Solid and Surface modeling modes](#); and [Perspective and Orthographic](#) projection modes all provide a powerful, intuitive, highly interactive modeling tool for visualizing your techniques.

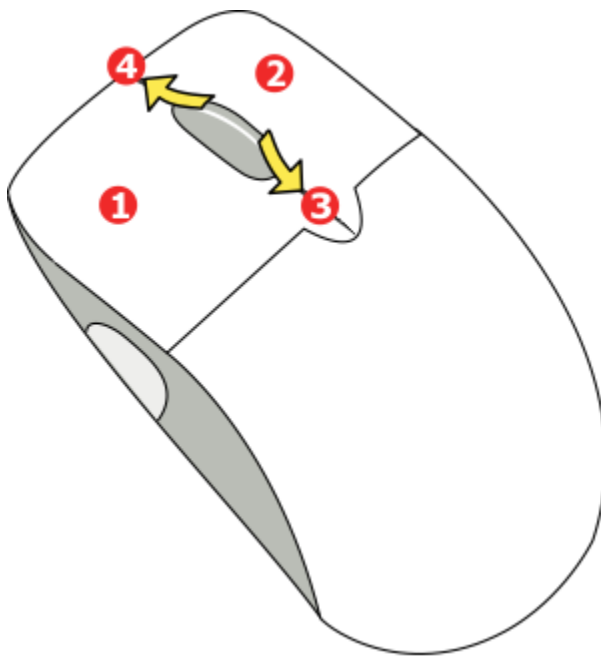


15.1 3D VIEW NAVIGATION

There are different 3D views available by clicking on the quick view icons in the [3D View Toolbar](#).

There are four navigation methods available in 3D View.

1. Hold down the left mouse button and drag to move.
2. Hold down the right mouse button and drag to rotate (vertical and horizontal rotation).
3. Use the scroll wheel on the mouse to zoom out from cursor.
4. Use the scroll wheel on the mouse to zoom in to cursor.



1 Move

2 Rotate

3 Zoom out from cursor

4 Zoom in to cursor

15.2 3D VIEW TOOLBAR

The 3D View Toolbar provides quick and easy access to the different views available in 3D View.

Display Shaded

Displays the drawing with different shades at each surface.

Display Hidden

Displays the drawing with hidden lines. Hidden lines represent edges and outlines that are invisible features of a drawing in a particular view.

Display Dashed Line

Displays the hidden lines of a drawing as dashed lines.

Display 3D View

Displays the drawing as a 3 dimensional view.

Display Front View

Displays the drawing as a front view.

Display Back View

Displays the drawing as a back view.

Display Top View

Displays the drawing as a top view.

Display Bottom View

Displays the drawing as a bottom view.

Display Left View

Displays the drawing as a left view.

Display Right View

Displays the drawing as a right view.

Display Grid

Toggles the visibility of the grid on and off.

Perspective View


Displays the drawing as an approximate representation, on a flat surface (such as paper), of an image as it is seen by the eye.

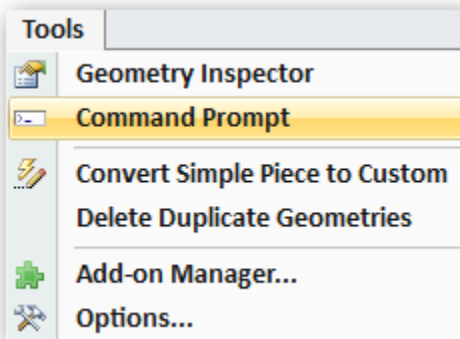
Isometric View

Displays the drawing in a way that the angles between the projection of the x, y, and z axes are all the same.

CHAPTER (16): COMMAND PROMPT

The Command Prompt is a precision drawing tool used to quickly draw and edit geometries with specific dimensions.

The Command Prompt can be toggled on and off by selecting  Command Prompt in the [Tools Menu](#) or in the [Display Settings](#) pop-up menu..



When the Command Prompt is turned on, it will appear above the [CAD Toolbar](#).



16.1 EXECUTE COMMANDS

To enter a command by using the keyboard, type the full command name on the Command Prompt and press Enter. The instructions in Help assume this step and do not specifically instruct you to press Enter after each entry. You can specify coordinates either by entering X,Y coordinate values or by using the pointing device to click a point on the screen.

The space in a command function is used to separate parameters. For example the command below will draw a line from #0,0 to 10,0.

Ready: *line #0,0 10,0*

The "<" symbol and the "@" symbol in a command function represents "at an angle of". For example, the commands below will clone the selected object at a distance of 10 and at an angle of 45 degrees.

Ready: *clone 10<45*

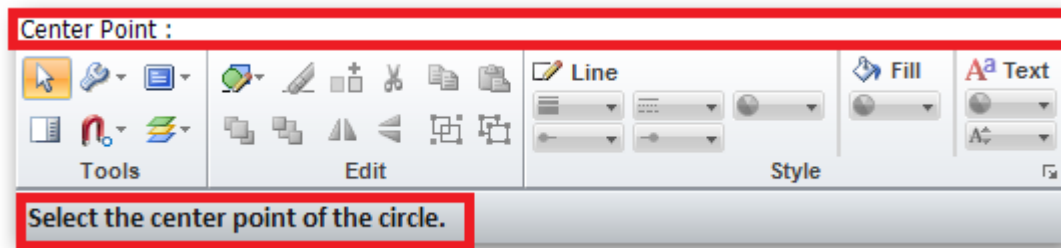
Ready: *clone 10@45*

The "#" symbol in a command function represents an absolute position.

Pressing the "Esc" key on the keyboard will cancel any Command Prompt functions and return the Command Prompt to a "Ready" status.

16.2 SPECIFY COMMAND OPTIONS

When you enter a command, the Command Prompt will change from "Ready" and prompt you for the next entry related to the command. The Status Bar will also display instructions for the next step in the command. For example, when you enter circle at the Command Prompt, the following prompt and status is displayed:



16.2.1 RELATIVE & ABSOLUTE

There are three options available when entering coordinates at the prompt. You can either enter your coordinates for an absolute position (example; #X,Y), coordinates relative to the current position (example: X,Y) and coordinates relative to the current position (example; distance<angle). Some commands such as Move are based on distance as opposed to position. Commands based on distance can be based on either absolute or relative.

16.2.2 PIECE GEOMETRIES & ANNOTATIVE GEOMETRIES

The command prompt creates [piece geometries](#) by default. In order to create [annotative geometries](#) you need to affix the letter "A" to the beginning of a geometry command. For example, to create an annotative line at the command prompt you would type "ALINE".

16.2.3 COMMAND PROMPT HELP

Typing *help* or *?* at the command prompt will open the help contents to the list of available commands.

16.3 COMMANDS

Below is a list of available commands that can be used at the BeamTool Command Prompt to construct and modify geometries.

16.3.1 CONSTRUCT COMMANDS

ARC

Creates a user defined arc.

Command entry: arc

To create an arc, specify a start point, end point, and middle point.

Ready: *arc*

Starting Point: *0,0*

End Point: *0,50*

Radius: *10*

CALLOUT

Places a user defined call out that will not reflect beams projected from a probe. Call Outs contain a text box and an associated directional line.

Command entry: callout

To create a callout, specify the start point and end point.

Ready: *callout*

Starting Point: *0,0*

Distance: *0,50* or *-50@45*

CIRCLE

Places a user defined circle.

Command entry: circle

To create a circle, specify a center point and radius.

Ready: *circle*

Center Point: *0,0*

Radius: *65*

DIM

Linear dimensions allow you to annotate distances on the drawing.

Command entry: dim

To create a linear dimension, specify the start point and end point.

Ready: *dim*

Starting Point: *0,0*

End Point: *10,0*

or

Ready: *dim 0,0 10,0*

or

Ready: *dim 0,0 10@45*

ELL

Places a user defined ellipse.

Command entry: ell

Ready: *ell*

Starting Point: *0,0*

End Point: *10,50*

or

Ready: *0,0 10,50*

or

Ready: *0,0 10@50*

IMAGE

Opens the Select Image window to browse for an image to place in the workspace.

Command entry: image

Ready: *image*

LEGEND

Displays a legend that shows a list of the specified dimensions that are annotated in the workspace.

Command entry: legend

To create a legend you must specify the starting point with your cursor.

Ready: *legend*

LINE

Creates a user defined line.

Command entry: line

To create a line, specify the start point and end point.

Ready: *line*

Starting Point: *0,0*

End Point: *10,0*

or

Ready: *line 0,0@10,0*

or

Ready: *line 0,0 10@45*

POLYLINE (PL)

Places a user defined polyline.

Command entry: polyline or pl

To create a polyline, specify a start point and all remaining points. Press "Enter" when polyline is drawn to exit the PL command function, or double click if you are selecting the points with your cursor.

Ready: *pl*

Starting Point: *0,0*

Next Point: *10,0*

Next Point: *10,40*

Next Point: *62,40*

Next Point: *Press "Enter" when finished to exit.*

POLYGON (PG)

Creates a user defined polygon.

Command entry: polygon or pg

To create a polygon, specify a start point and all remaining points. Press "Enter" when polygon is drawn to exit the PG command function, or double click if you are selecting the points with your cursor.

Ready: *pg*

Starting Point: *0,0*

Next Point: *10,0*

Next Point: *10,40*

Next Point: *62,40*

Next Point: *Press "Enter" when finished to exit.*

RECT

Creates a user defined rectangle.

Command entry: rect

To create a rectangle, specify a starting point and an end point.

Ready: *rect*

Starting Point: *0,0*

End Point: *25,0 or 45@30*

SYMBOL

Place a symbol on the workspace.

Command entry: symbol

Ready: *symbol*

Starting Point: *0,0*

Ending Point: *10,0*

VIEWPORT

Creates a user defined viewport.

Command entry: viewport

Ready: *viewport*

Starting Point: *0,10*

End Point: *40,-30*

or

Ready: *viewport 0,10 40,-30*

or

Ready: *line 0,10 40@-30*

16.3.2 MODIFY COMMANDS

CLONE

Creates a clone of the selected geometries.

Command entry: clone

Ready: *clone 0,20*

or

Ready: *clone 20@45*

COPY

Creates a copy of the selected geometries.

Command entry: copy

Ready: *copy 0,20*

or

Ready: *copy 20@45*

CUT

Removes the selected geometries from the workspace.

Command entry: cut

Ready: *cut*

DELETE

Deletes the selected geometries.

Command entry: delete

Ready: *delete*

EXTRUDE

Changes the extrude depth on the selected geometries.

Command entry: extrude

Ready: *extrude*

MOVE

Provides a means of defining the absolute position at which to move selected geometries.

Command entry: move

Ready: *move #0,0*

NUDGE

Nudges the selected geometries.

Command entry: nudge

Ready: *nudge 0,20*

or

Ready: *nudge 20@45*

PASTE

Pastes the content previously Cut or Copied.

Command entry: paste

Ready: *paste*

REDO

Reverses the undo command or advances the buffer to a more current state.

Command entry: redo

Ready: *redo*

ROTATE

Rotates the selected geometries at the specified angle.

Command entry: rotate

Ready: *rotate 10*

SCALE (SC)

Increase or decreases the size of the selected geometries.

Command entry: scale or sc

Ready: *sc 2 (scales the selected geometry to twice its original size)*

SELECTALL

Selects all of the geometries in the workspace.

Command entry: selectall

UNDO

Erases the last change done to the workspace.

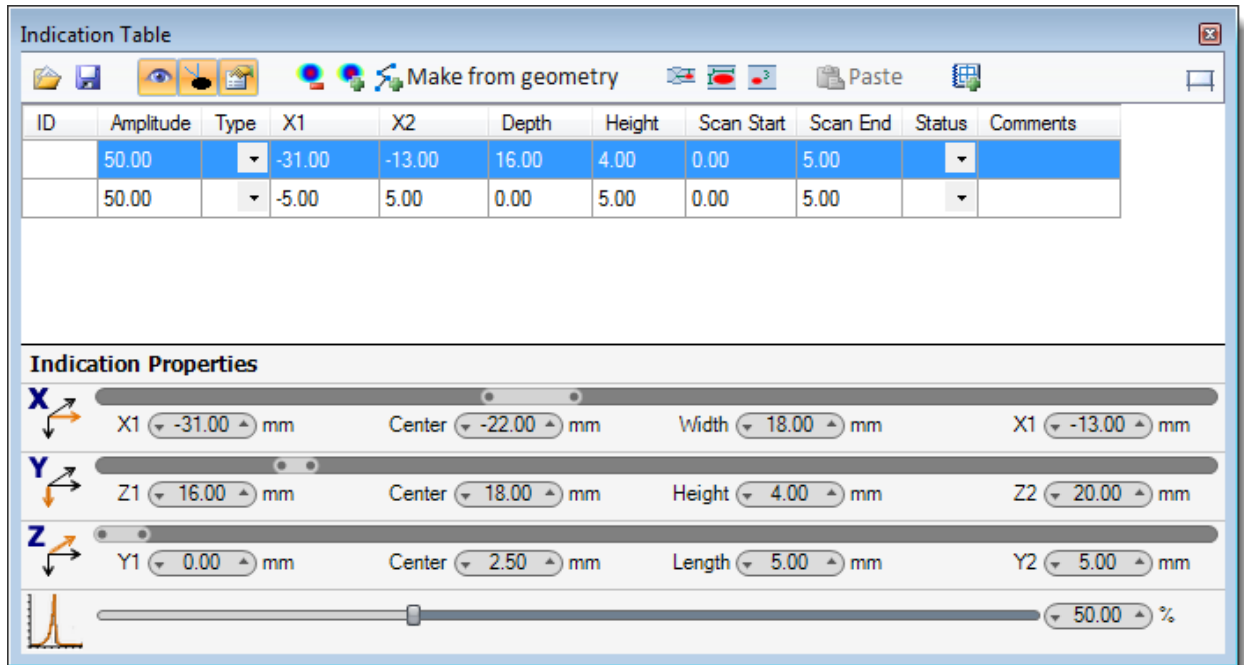
Command entry: undo

Ready: *undo*

Ready: *selectall*










CHAPTER (17): INDICATION TABLE






The Indication Table is used to manage indications that are visualized on the workspace. The amplitude of defects is visualized through a colored palettizer.



It can be opened by clicking on the  Indication Table icon found on the [Main Toolbar](#).

17.1 INDICATION TABLE OPTIONS

 Open	Opens a previously saved Eclipse Beam Indication file (*.ebi).
 Save	Saves the currently selected indication to a Eclipse Beam Indication file (*.ebi)
 Display Indications	Toggles the visibility of the indications in the workspace.
 Reflect	Determines whether or not the selected indication will reflect beams projected from a probe.
 Show Indication Properties	Toggles the Indication Properties controls menu at the bottom of the indications table.
 Remove Indication	Removes an indication from the Indication Table and removes it from the workspace. Click here for more information on working with indications.
 Add Indication	Adds a new indication to the Indication Table and displays it on the workspace. Click here for more information on working with indications.
 Make from Geometry	Allows the user to create and edit an indication from a selected geometry in the workspace.
 Display Position Dimensions	Toggles the position dimensioning from the weld center line and the top of the piece.


 Display Dimensions	Size	Toggles the size dimensions (X,Y) for the indications.
 Display Annotations	ID	Toggles the ID Annotation to identify the indications in the workspace.
 Paste		Allows users to copy indications directly from InspectionBank to the Indication Table for BeamTool.
 Add Drawing Set		Brings up the Drawing Properties dialog box where you can name and describe a drawing you want to add. After the drawing properties have been defined, the selected drawing will be available from the Active Drawing drop-down menu found on the Main Toolbar . See Drawings for more information on working with Drawings.
 Columns		Opens the Indication Columns picker used to select the indication attributes available for edit.

17.2 INDICATION PROPERTIES


When an indication is selected in the table, the controls at the bottom of window can be used to manipulate the X, Y,Z and amplitude values for the selected indication. Changes made to the indication here will replicate to the indication shown in the workspace.


To change the orientation of the indication for X,Y, or Z, simply grab and move the slider control.





The handles on the ends of the control  can be dragged back and forth to change the X,Y,Z size of the indication.

Indication Properties


X  X1 mm Center mm Width mm X2 mm

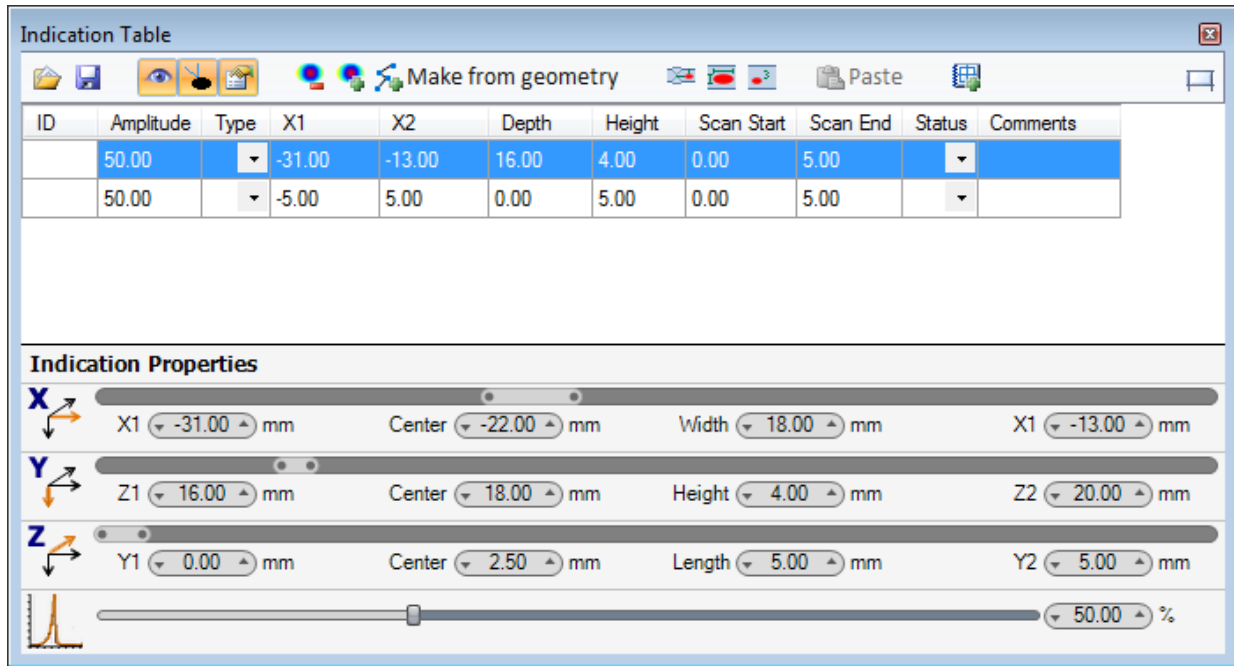
Y  Z1 mm Center mm Height mm Z2 mm



Z  Y1 mm Center mm Length mm Y2 mm

 %

17.3 HOW TO ADD & REMOVE INDICATIONS

To add an indication to your workspace you must first open the Indication Table by clicking on the  Indication Table icon found on the [Main Toolbar](#).

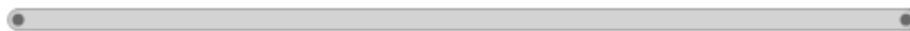



Click on the  Add Indication icon or select a geometry in the workspace and click on the  Make from geometry icon to display a new set of fields in the table.

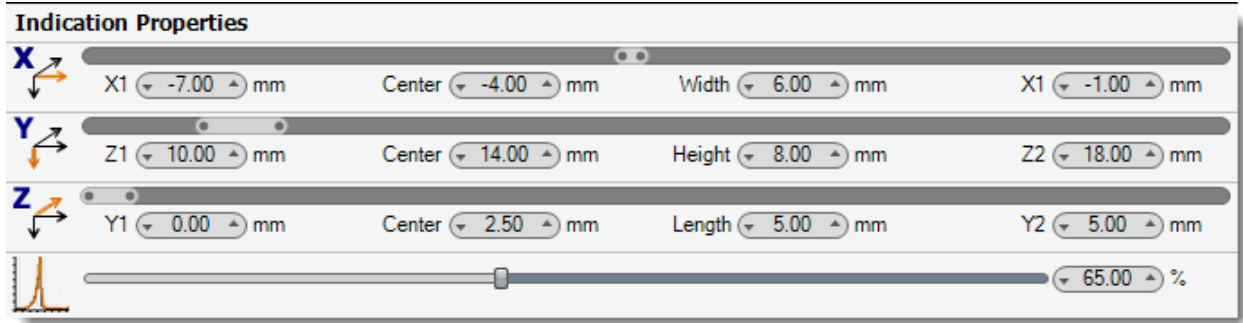
17.3.1 INDICATION PROPERTIES


When an indication is selected in the table, the controls at the bottom of window can be used to manipulate the X, Y,Z and amplitude values for the selected indication. Changes made to the indication here will replicate to the indications shown in the workspace.

To change the orientation of the indication for X,Y, or Z, simply grab and move the slider control.



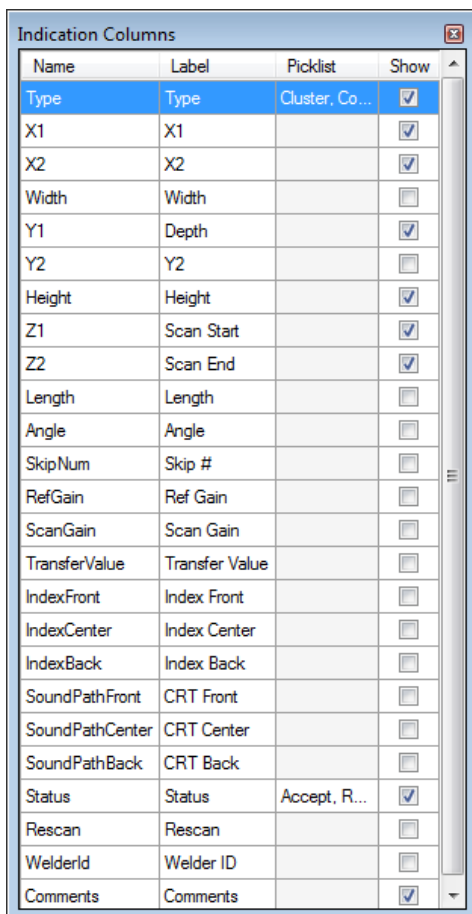
The handles on the ends of the control  can be dragged back and forth to change the X,Y,Z size of the indication.



To remove an indication from your workspace you must first open the Indication Table by clicking on the  Indication Table icon found on the [Main Toolbar](#).

Highlight any field of the indication you wish to remove and click on the  Remove Indication icon. The indication will no longer be visualized in the workspace.

Click on the Columns icon to open the Indication Columns dialog box. The Indications Column dialog box is used to select the Indication attributes made available to edit in the Indication Table.



Place a check mark in the "Show" section for the Indication attribute to show up in the Indication Table.

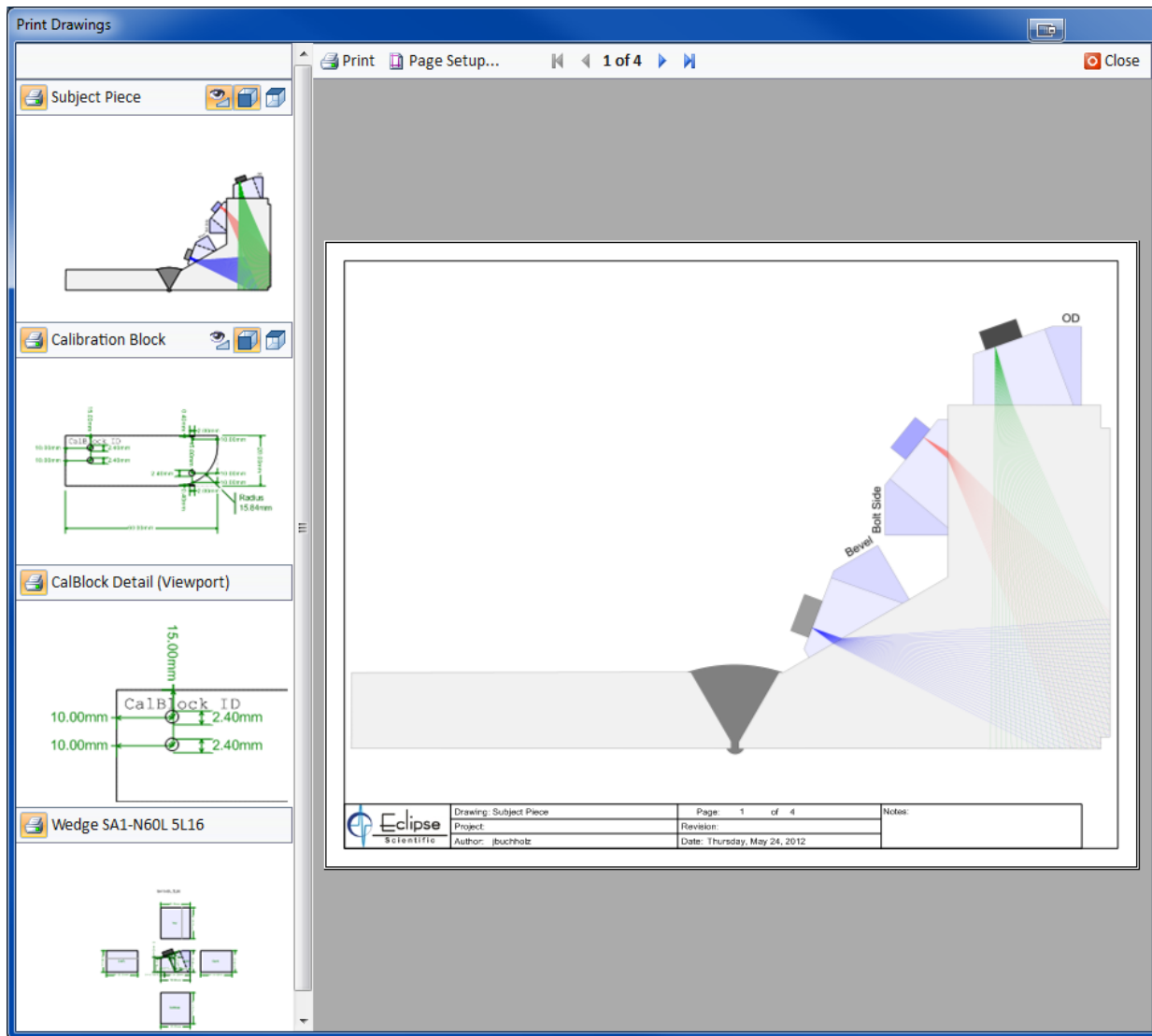
CHAPTER (18): REFERENCE

18.1 REFERENCE

With BeamTool's intuitive user interface it's easy to be productive immediately after installation without spending a lot of time learning how to use it. Super Tooltips ensure that an explanation of each tool's function is readily available without having to consult the online help. Visual picklists provide you with a preview of what a command does before it is executed.

18.2 PRINT DRAWINGS

The Print Drawings dialog box allows the user to control the print output based on the available drawingsets, and [viewports](#) in their workspace. Click on Print from the [File Menu](#) to bring up the Print Drawings dialog box.



18.2.1 PRINT DRAWINGS MAIN TOOLBAR

The Print Drawing main toolbar allows you to navigate through the available drawings/viewports and setup your page and printer options.



Print


Opens the print dialog box where you can select your available printer and execute the print job.

 **Page Setup**

Allows the user to setup the page properties when printing a workspace.

 **First Page**

Moves to the first drawing.

 **Previous Page**

Moves to the previous drawing.

 **Next Page**

Moves to the next drawing.

 **Last Page**

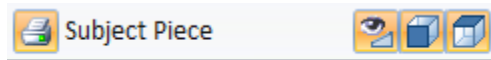
Moves to the last drawing.

 **Close**


Closes the Print Drawings dialog box.

18.2.2 PRINT DRAWINGS PANEL TOOLBAR

The Print Drawing panel toolbar allows you to select the drawings/viewports, and drawing views you want to print.

 **Print Drawing**

Toggles on and off the selection of the drawing to be sent to the printer.

 **Visualize Probe**

Toggles on and off the view of the Probe in the drawing to be printed.

 **Print Side View**


Toggles on and off the side view for the drawing to be printed.

 **Print Top View**

Toggles on and off the side view for the drawing to be printed.

18.2.3 PRINT DRAWINGS FOOTER

The print drawings footer included on each print drawing page. This information and logo is populated based on the values entered by the user in [Document Info](#).

	Drawing: High Temperature	Page: 1 of 4	Disclaimer: This drawing is not controlled when printed or viewed in a non-native format.
	Project: PAUT Inspection	Revision:	
	Author: Tom Montana	Date: Thursday, October 16, 2014	

18.3 MANAGING WORKSPACES

Below are the tools used to manage a workspace. They can be found under the File menu as well as on the main toolbar.

Create a New Workspace

To create a new workspace:

1. Press the **Save Workspace** button to save the currently displayed workspace.
2. Press the **New Workspace** button located on the main toolbar. A new workspace is created with default settings.

Open an Existing Workspace

To open an existing workspace:

1. Press the **Open Workspace** button located on the main toolbar and navigate to the BeamTool directory (default location) containing the workspace file (*.ebwk) to be opened.
2. Select the file and press **Open**. The workspace data will now be displayed in the Piece and Probe(s) configurations and the drawing pane will update to display the graphics.

Save a Workspace

Once a workspace configuration is complete it can be saved (*.ebwk):

1. Press the **Save Workspace** button and navigate to the BeamTool directory (default location).
2. Enter a name for the file in the *File name* field and press **Save**. If the workspace has been previously saved it will be automatically resaved using the path and filename specified during the initial save.

18.4 IMPORTING DRAWINGS

DWG, DXF and KXL files created in AutoCAD as well as Probe configurations and custom geometries previously created in BeamTool can be imported.

Import AutoDesk (DWG & DXF) Files

To import a DWG or DXF file:

1. Select Custom from the Piece type picklist.
2. Select **Import** → **Autodesk** from the File menu and navigate to the location of your file. Select **Open**.
3. Select millimeters (mm) or inches (in) for the DXF Base Units. Select **Import**. The DWG or DXF graphics are displayed in the workspace.

Note: Graphics are imported as a group. The Un-group command on the Edit toolbar can be used to ungroup the graphics allowing them to be manipulated individually.

Import KXL Files

To import a KXL file:

1. Select Custom from the Piece type picklist.
2. Select **Import** → **KXL** from the File menu and navigate to the location of your file. Select **Open**.
3. If solid lines are to be reflective check *Make solid style lines reflective*. Select **Import**. The KXL graphics are displayed in the workspace.

Import Probe Files

To import a Probe file:

1. Select **Import** → **Probe** from the File menu and navigate to the location of your file. Select **Open**.

Import Geometry Files

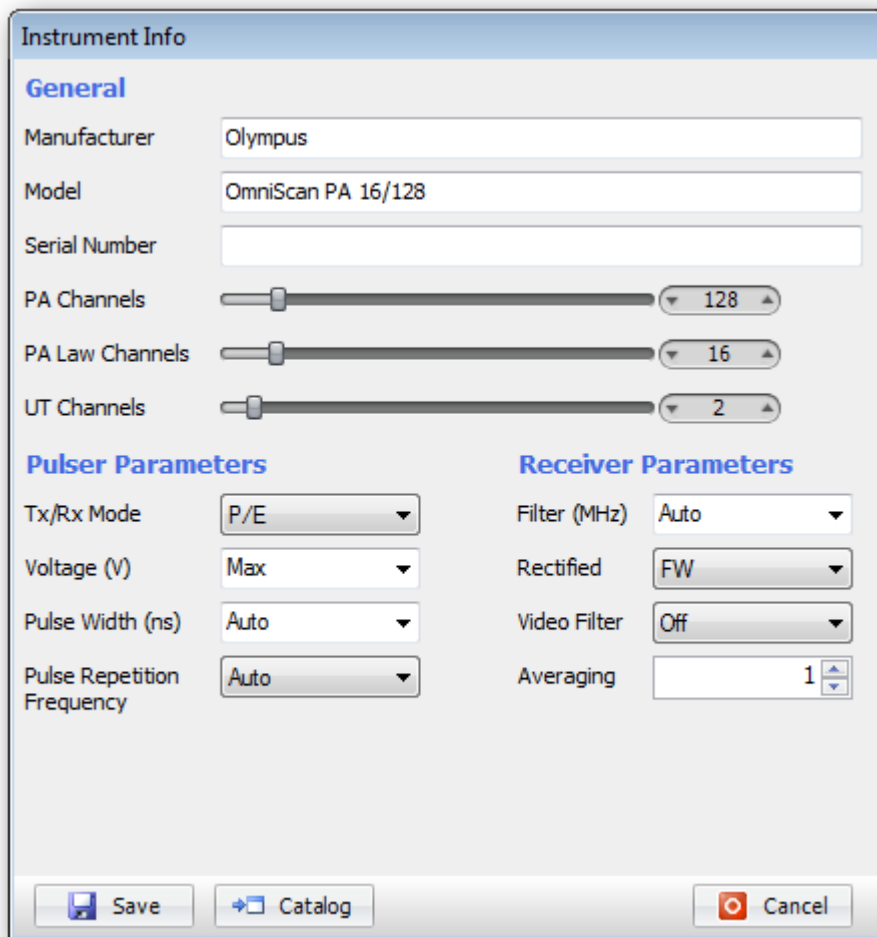
To import a Geometry file:

1. Select **Import** → **Geometry** from the File menu and navigate to the location of your file. Select **Open**.

18.5 INSTRUMENT INFO

The **Instrument Info** dialog is accessible by the  **Instrument Info** button on the [Main Toolbar](#).

Through this dialog, information about the acquisition Instrument can be entered. Various fields can be populated by hand, or can be loaded from a pre-populated catalog of instruments. Once populated, the Instrument Info field values will be displayed on various [Reports](#). Additional Instrument Info field values can be used by the [Report Template Editor](#) to include this information on a custom report.



Instrument Info

General

Manufacturer: Olympus

Model: OmniScan PA 16/128

Serial Number:

PA Channels: 128

PA Law Channels: 16

UT Channels: 2

Pulser Parameters

Tx/Rx Mode: P/E

Voltage (V): Max

Pulse Width (ns): Auto

Pulse Repetition Frequency: Auto

Receiver Parameters


Filter (MHz): Auto

Rectified: FW

Video Filter: Off

Averaging: 1

Save Catalog Cancel

Use the  **Catalog** button to open the **Import Instrument** dialog. Through this dialog, pre-populated instruments can be filtered, sorted, and selected for use. Values imported from the catalog can be overwritten in the Instrument Info dialog if necessary.

Import Instrument

Import

Manufacturer

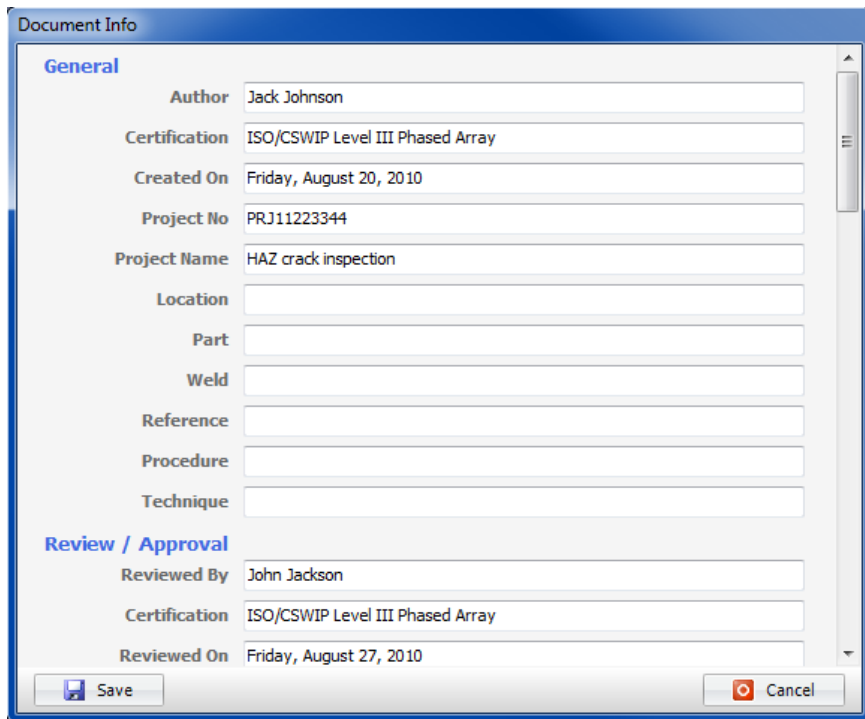
Model

Manufacturer	Model	PAChannels	LawChannels	UTChannels
PeakNDT	MicroPulse LT 2	0	0	2
PeakNDT	MicroPulse LT 4	0	0	4
PeakNDT	MicroPulse LT 8	0	0	8
PeakNDT	MicroPulse5 16	0	0	16
PeakNDT	MicroPulse5 32	0	0	32
PeakNDT	MicroPulse5 48	0	0	48
PeakNDT	MicroPulse5 64	0	0	64
PeakNDT	MicroPulsePA 128-16	128	128	16
PeakNDT	MicroPulsePA 256-16	256	256	16
PeakNDT	MicroPulsePA 512-16	512	512	16
PeakNDT	MicroPulsePA 64-16	64	64	16
PeakNDT	ScanMate 2	0	0	2
PeakNDT	ScanMate 4	0	0	4
Olympus	Focus LT 16/128	128	16	4
Olympus	Focus LT 32/128	128	32	4

18.6 DOCUMENT INFO

The **Document Info** dialog is accessible by the  **Document Info** button on the [Main Toolbar](#).

Through this dialog, various details about the **Document**, **Workspace**, **Approval** process, **Instrument**, **Calibration**, **Scanner** and **Technique Details** can be entered. Once populated, the Document Info field values will be displayed on various [Reports](#) and [Print Drawings](#). Additional Document Info field values can be used by the [Report Template Editor](#) to include this information on a custom report.



Document Info

General

Author: Jack Johnson

Certification: ISO/CSWIP Level III Phased Array

Created On: Friday, August 20, 2010

Project No: PRJ11223344

Project Name: HAZ crack inspection

Location:

Part:

Weld:

Reference:

Procedure:

Technique:

Review / Approval

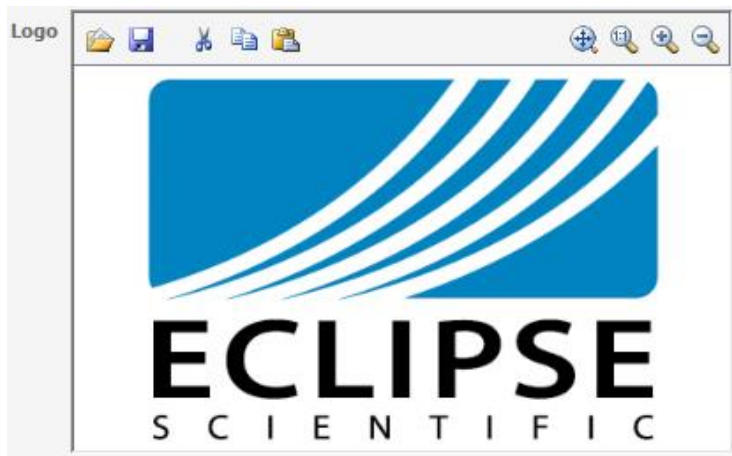
Reviewed By: John Jackson

Certification: ISO/CSWIP Level III Phased Array

Reviewed On: Friday, August 27, 2010

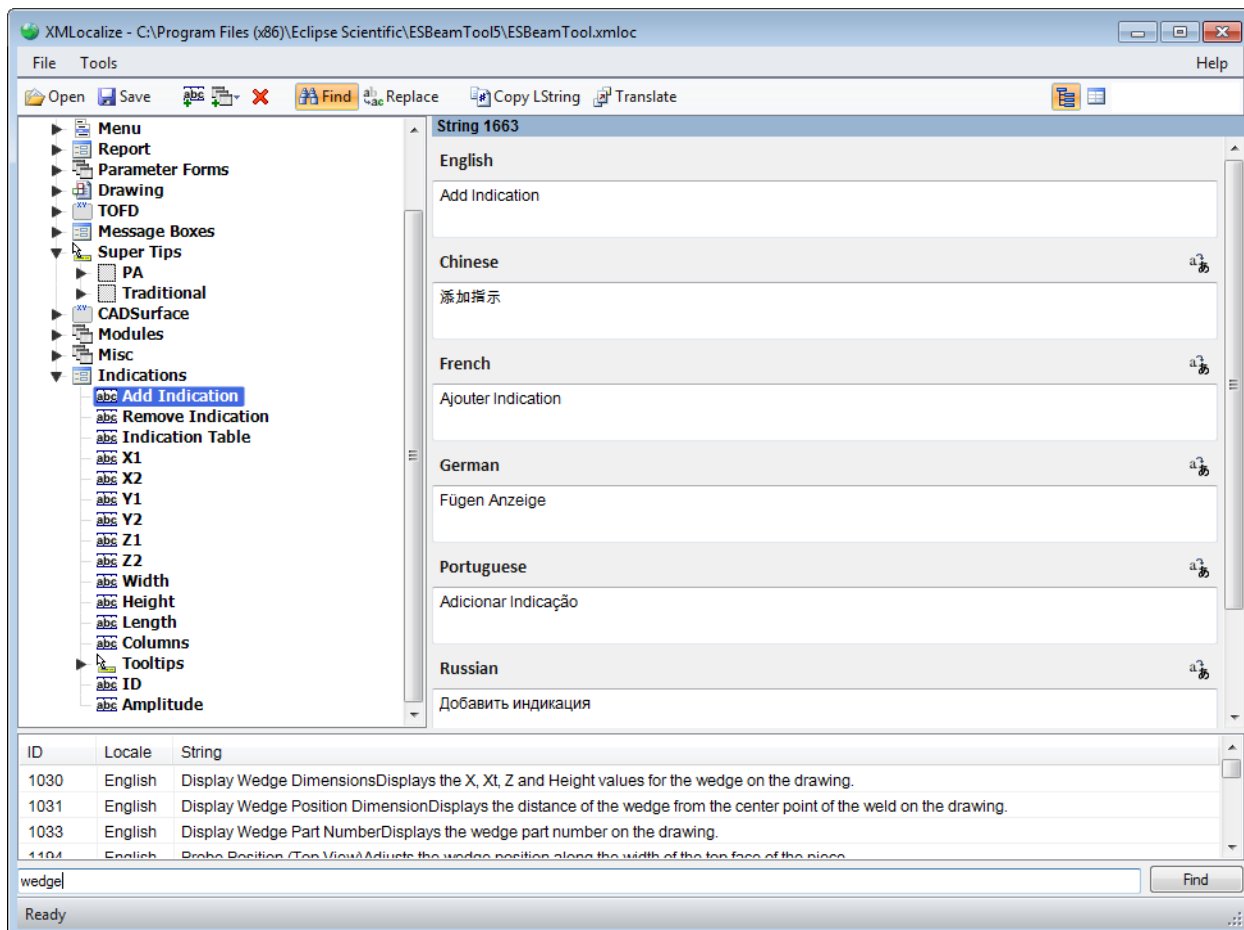
Save Cancel

The **Default Logo** specified in the [Options](#) dialog can be overridden here in the Document Info.



CHAPTER (19): XMLOCALIZE

The XMLocalize editor is used to add missing translation and or correct translation inaccuracies in BeamTool. Modifications to this file can be submitted to the BeamTool support team for inclusion in a future release of BeamTool.



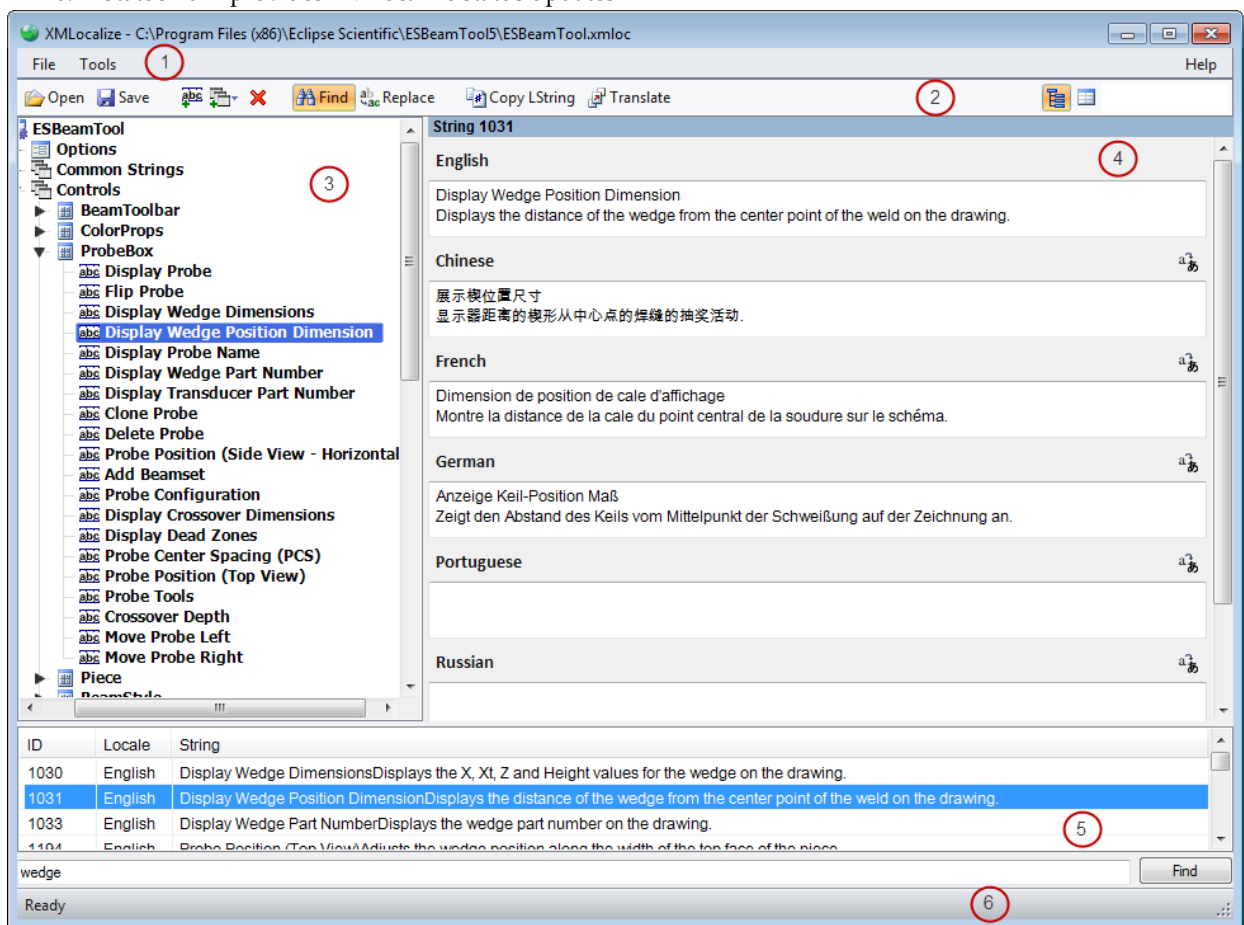
19.1 XMLocalize VIEWS, LAYOUT, MENUS & TOOLBAR

The XMLocalize has two different views. You can toggle between Tree View and Table View by clicking on their respective icons in the [XMLocalize Toolbar](#).

19.1.1 TREE VIEW

The XMLocalize Tree View layout is divided into six major sections.

1. XMLocalize Main Menu - access to XMLocalize [File Menu](#) and [Tools Menu](#)
2. [XMLocalize Tree View Tool Bar](#) - a toolbar use for localization management
3. Tree View - tree view of current strings available for modification
4. String Fields - displays the current translations of available languages for the selected string
5. Find View - used to search for strings based on text entered
6. Status Bar - provides XMLocalize status updates

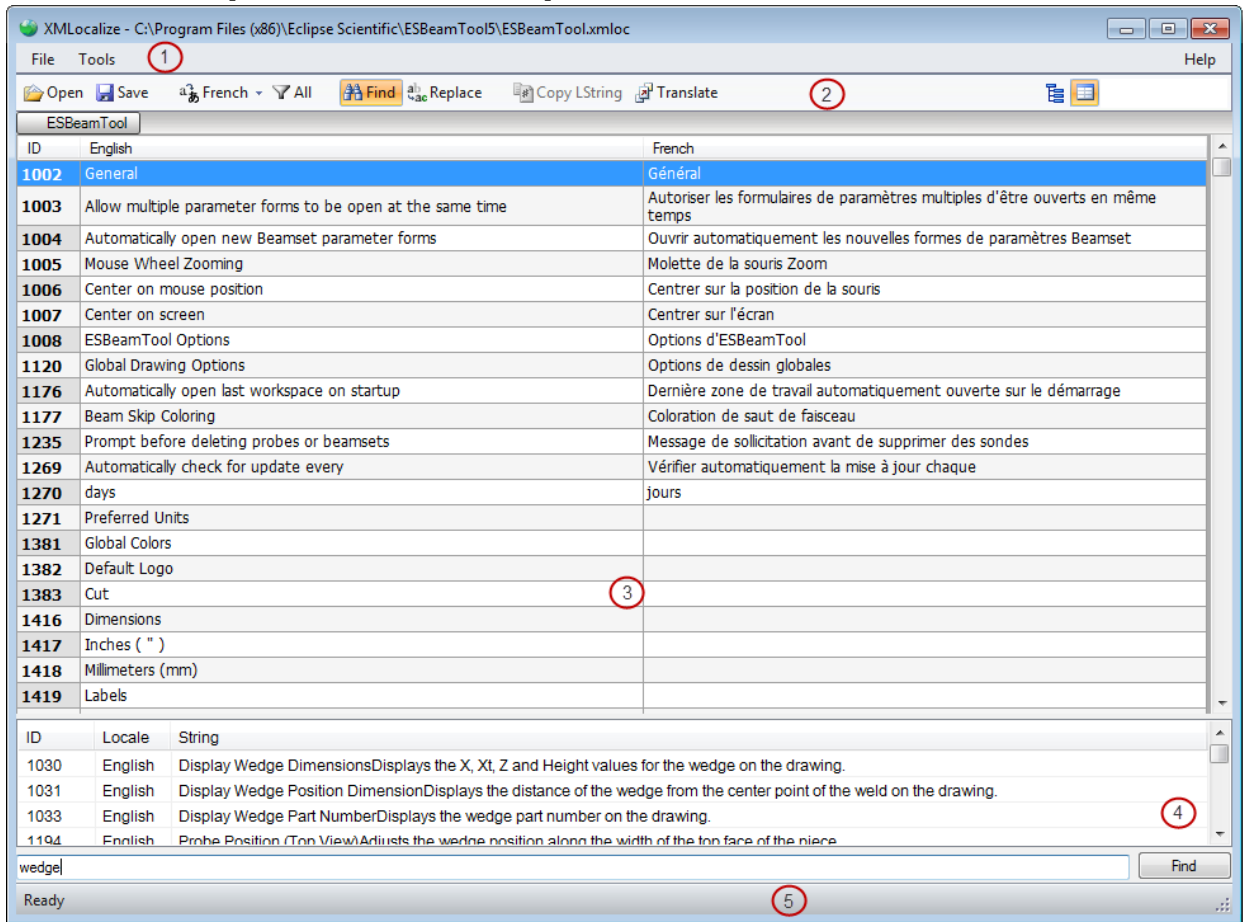


19.1.2 TABLE VIEW

The XMLocalize Table View layout is divided into six major sections.

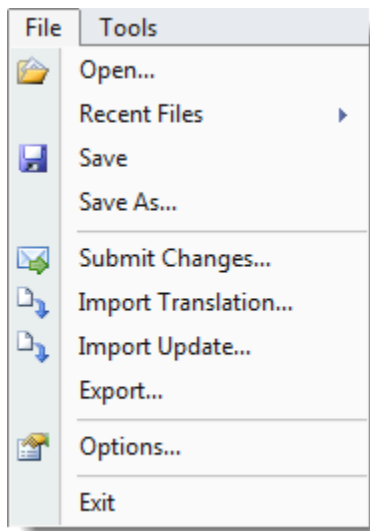
1. XMLocalize Main Menu - access to XMLocalize [File Menu](#) and [Tools Menu](#)
2. [XMLocalize Table View Tool Bar](#) - a toolbar use for localization management
3. TableView - table view of all strings available, the default language for the string, and string value for the selected language
4. Find View - used to search for strings based on text entered

5. Status Bar - provides XMLocalize status updates



19.2 XMLOCALIZE FILE MENU

There are a number of options located under the XMLocalize File menu .



Open

Allows the user to open a previously saved *.xmloc file in Windows Explorer

Recent

Displays a list of recent *.xmloc files used in XMLocalize

Save

Allows the user to save the current *.xmloc file

Save as

Allows the user to save the current *.xmloc file. Displays the Save *.xmloc file dialog every time, allowing the user to specify a new filename or overwrite the existing filename

Submit Changes

Automatically generates an Email with the *.xmloc file attached. The Email can be sent to BeamTool@eclipsescientific.com to be included in a future release of BeamTool

Import Translation

?

 **Import Update**

?

 **Options**

Opens the XMLocalize Options dialog box

Exit

Exits the XMLocalize editor

19.3 XMLOCALIZE TOOL MENU

These are the tools that can be found under the Tools menu.

Batch Translate Locale

Translates all strings for the selected language using Google Translate

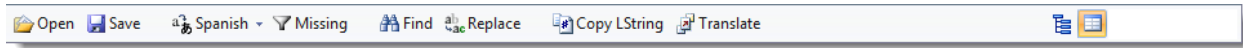
Translate Missing Strings

Translate all missing strings for the selected language using Google Translate

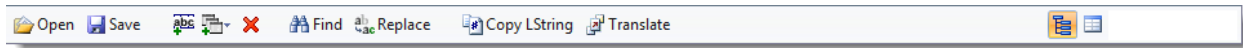
19.4 XMLLOCALIZE TOOLBAR

The toolbar provides quick and easy access to some common localization management tools.

Table View Toolbar



Tree View Toolbar



19.4.1.1 TOOLBAR OPTIONS

Open

Opens a previously saved localization file

Save

Allows the user to save the current *.xmloc file

Change Language

Change the language

Filter Missing/All

Changes the Table View to show all strings available for the selected language or just the missing strings for the selected language

Add String

Adds a new string to the selected node in the XMLocalize Tree View

Add Group

Adds a new group used to logically store multiple strings

Delete

Deletes the selected string, and or group of strings

 **Find**

Toggles on and off the Find View. The Find View is used to search for strings that contain text entered by the user

 **Replace**


Opens the Replace dialog box, used to find and replace text

 **Copy LString**

Used by developers to copy new strings created with XMLocalize into code

 **Translate**

Uses Google Translate to populate empty fields for all languages (Tree View), or selected language (Table View) of the selected string. This will not overwrite an existing entry for a language.

 **Table View**

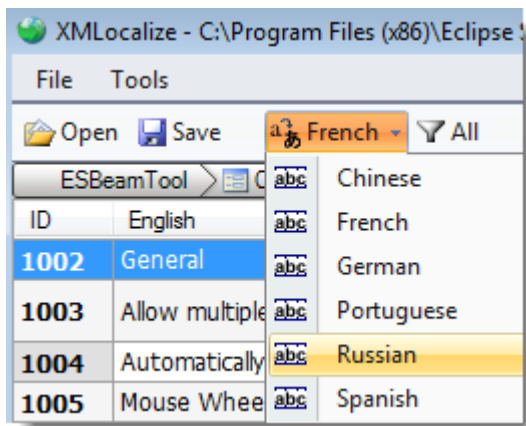
Toggles on and off the XMLocalize Table View


 **Tree View**


Toggles on and off the XMLocalize Tree View

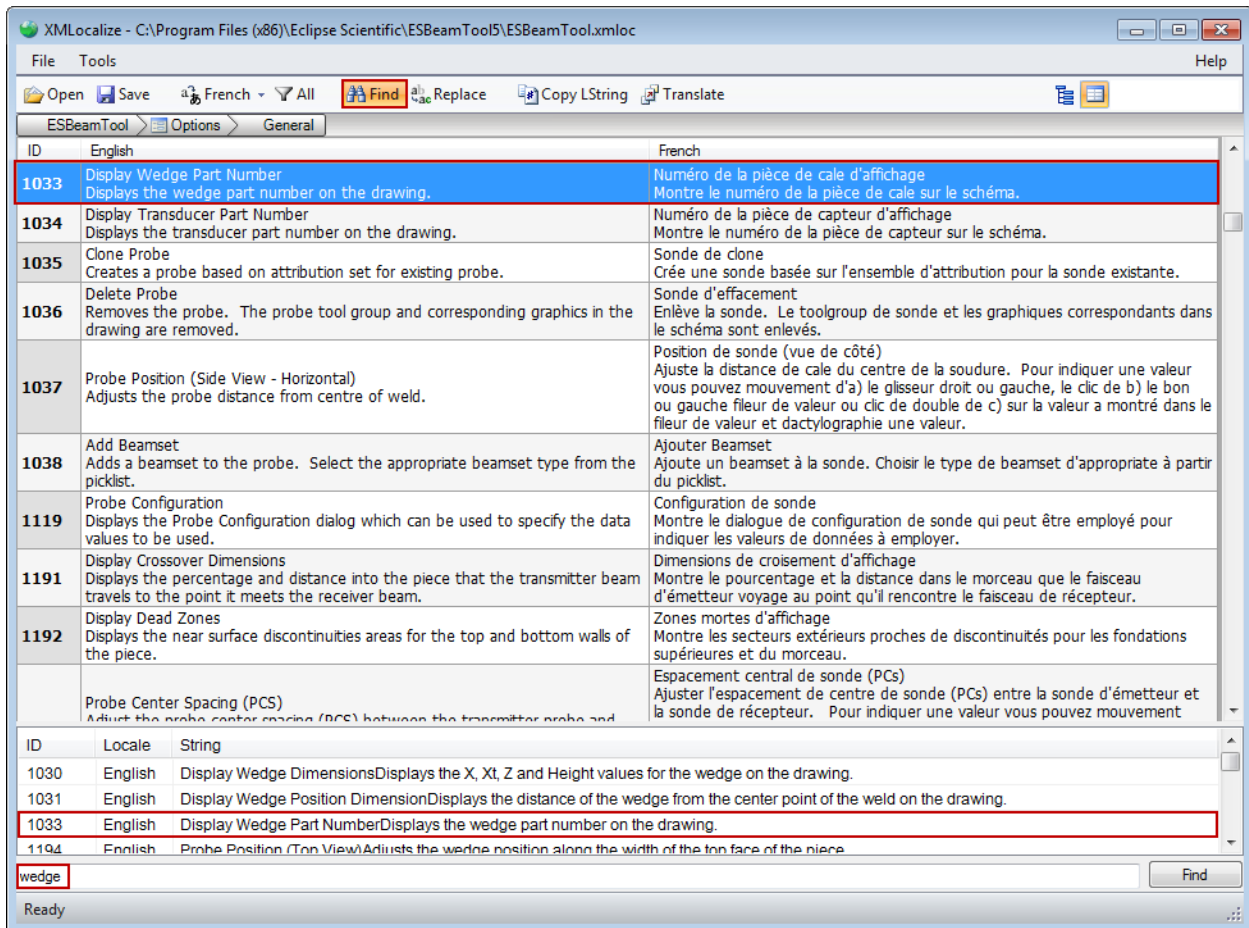
19.5 HOW TO TRANSLATE IN TABLE VIEW

To translate in Table View, you must first select the language you want to translate to. Click on the Language Picker icon to select your language of choice.

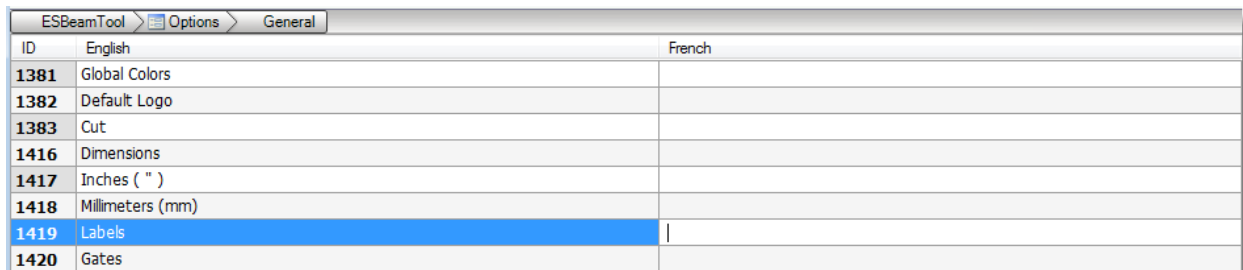



Use the Filter icon  to show All strings available for your selected language, or just the Missing strings.

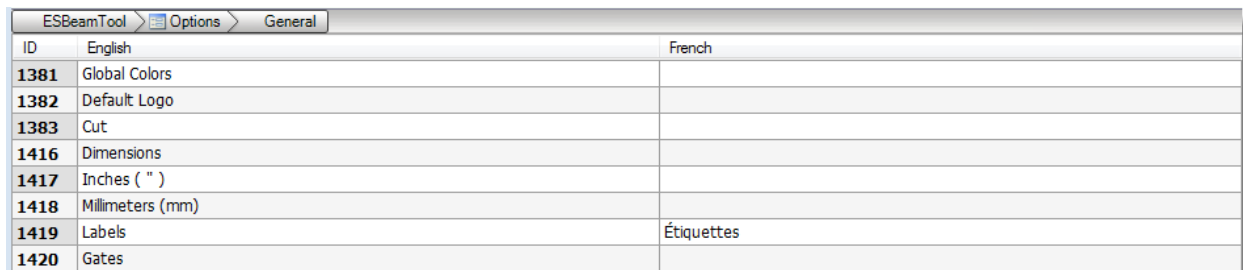
You can use the  Find icon to search for specific text in a string. In the example below we have performed a Find function for all strings that contain the word "wedge". By selecting string 1033 from the Find results at the bottom, the Table View automatically navigates to the selected string for editing.




To Translate a single string value, simply click on the empty language field next to the string.




Type in your text and press <Enter>. Click on the Save icon  to finish.

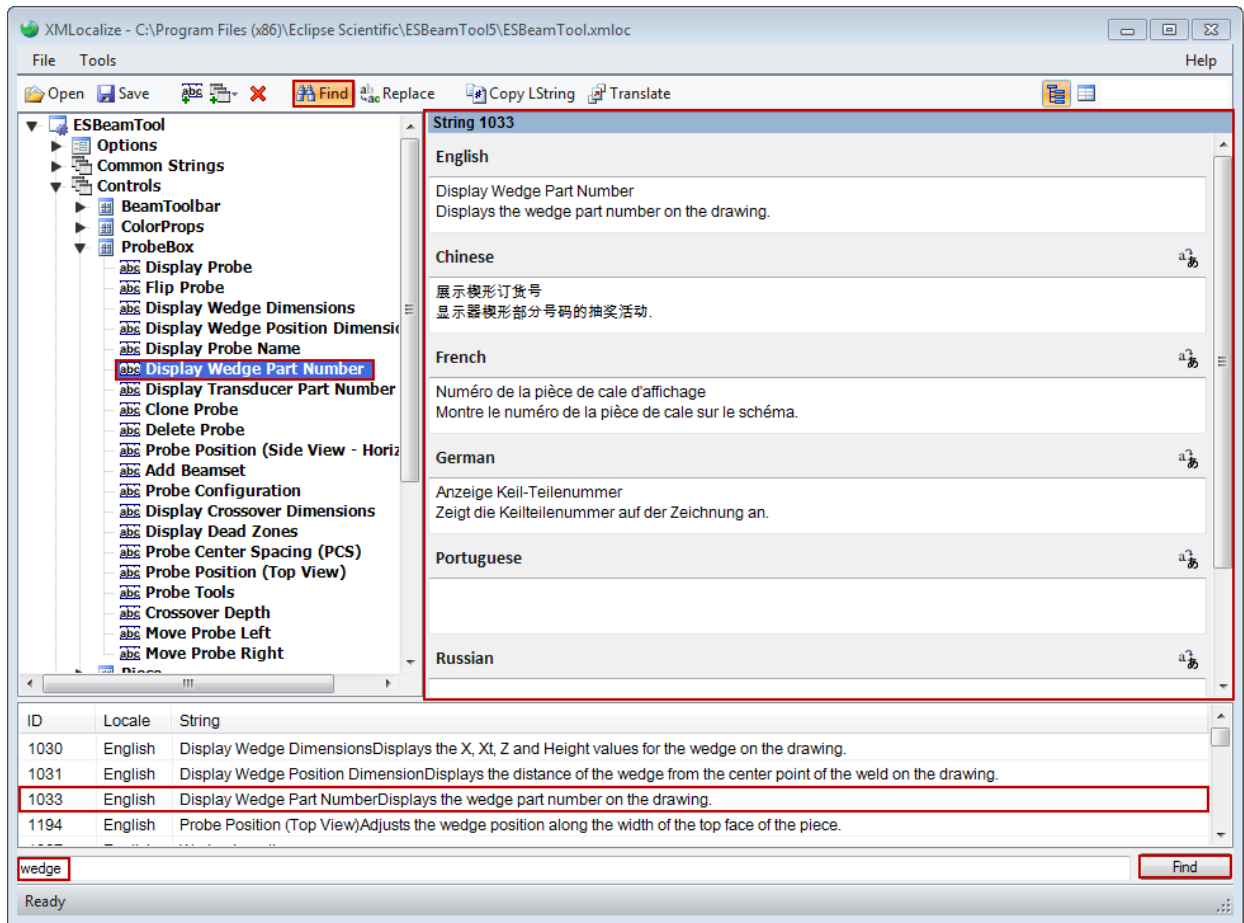


Click on the Translate icon  to automatically translate the selected string using Google Translate. This can be useful when translating strings with large amounts of text.

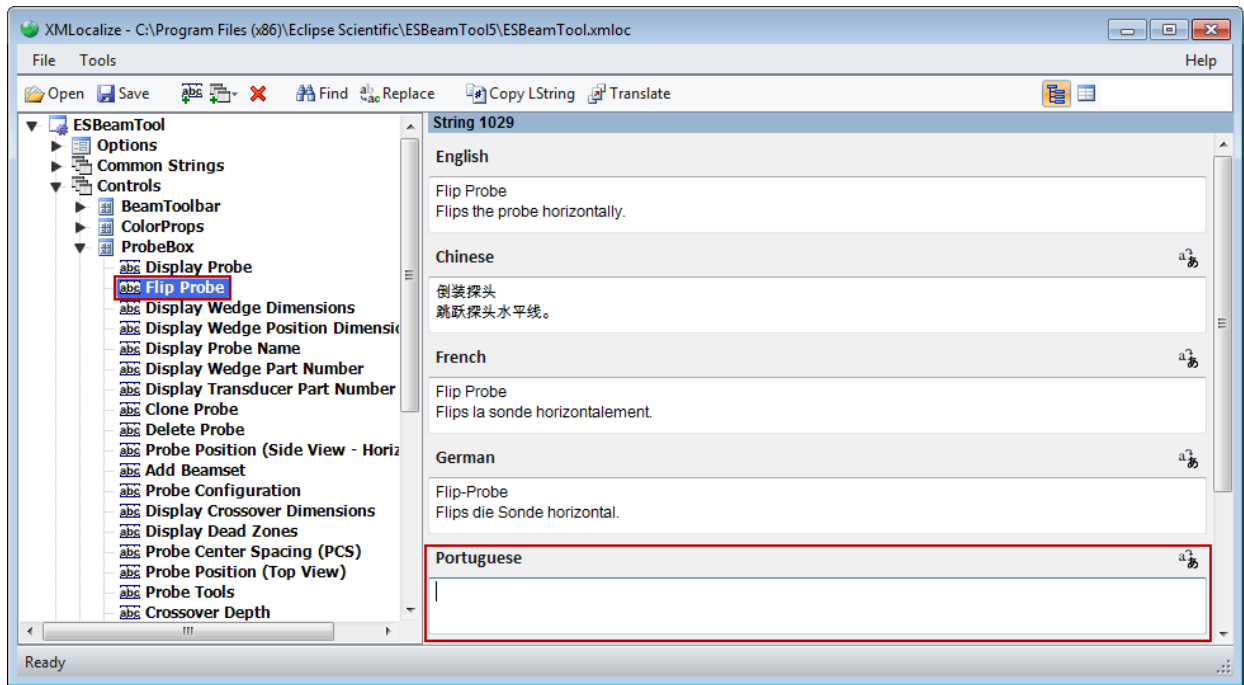
19.6 HOW TO TRANSLATE IN TREE VIEW


To translate in Tree View you can navigate the Tree View to expand and collapse groups of strings.

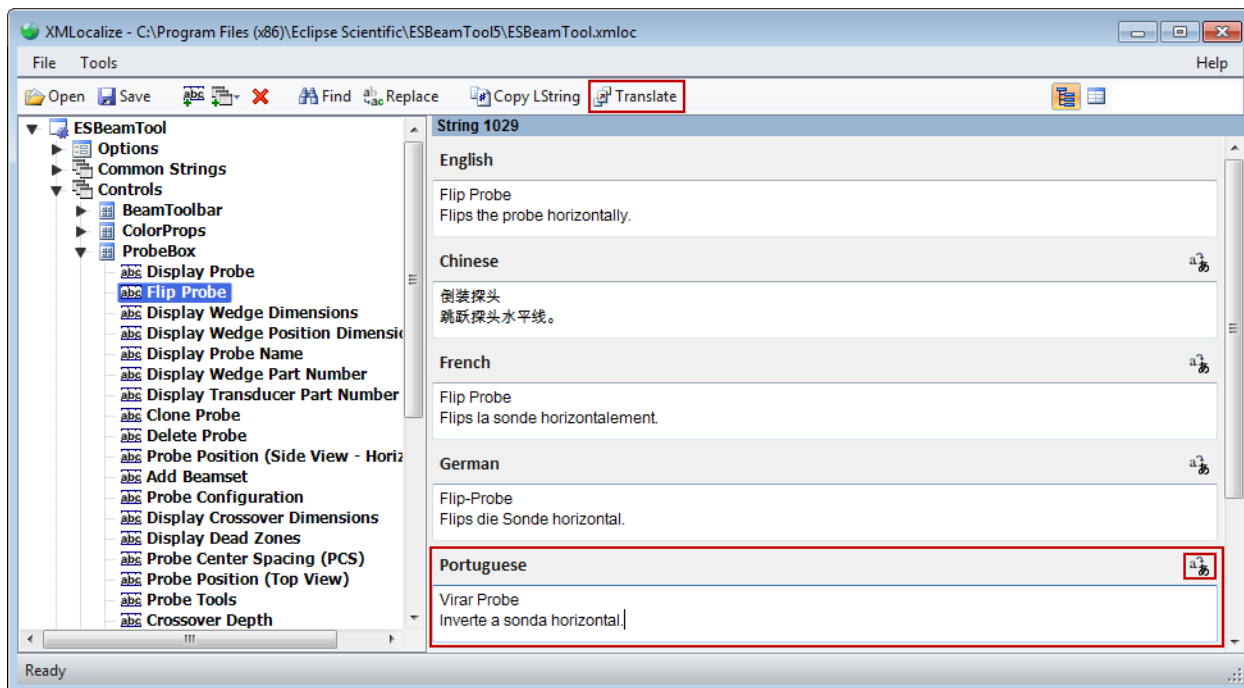
You can use the  Find icon to search for specific text in a string. In the example below we have performed a Find function for all strings that contain the word "wedge". By selecting string 1033 from the Find results at the bottom, the Table View automatically navigates to the selected string for editing.




To Translate a single string, navigate to the string in the Tree View, and click in the empty field below your language of choice.




Type in your text and press <Enter>. Click on the Save icon  to finish.



Clicking on either of the Translate icons  (highlighted above) when your cursor is in an empty language field will automatically translate the selected string using Google Translate. This can be useful when translating strings with large amounts of text.

CHAPTER (20): EXTRACTING DATA

There are a number of ways to extract the data from BeamTool to be used in other applications. The  **Copy to Clipboard** button copies the drawing to the clipboard in either bitmap or metafile format. Drawings can also be [exported](#) as either BMPs, JPEGs, PNGs or GIFs. The [reporting](#) option in BeamTool allows the user to create comprehensive reports that are easily incorporated into a document.

20.1 EXPORTING DRAWINGS

Drawings created in BeamTool can be exported to a number of file formats.

Export Image

Once a workspace configuration is complete it can be exported to one of the following formats: *.bmp, *.jpg, *.png, *.gif, *.wmf, *.emf, *.tdsx, *.icex, *.dwg or *.dxf.

1. Select **Export** → **Image** from the File menu and navigate to the location to store your file.
2. Enter a name for the file in the *File name* field.
3. Select the appropriate file format from the *Save as type* list and press **Save**.
4. Select a size for the exported drawing and press **Export**.

20.1.1.1 EXPORT DRAWING OPTIONS - BMP, JPG, PNG, GIF, WMF OR EMF

When exporting a drawing to any of the supported formats (excluding DXF) the size of the drawing can be specified using the Export Drawing window.

1. Select the appropriate size of the exported drawing using the picklist and press Export.

20.1.1.2 EXPORTING DRAWING OPTIONS - DWG

When exporting a DWG drawing the user is presented with a number of options.

20.1.1.3 ITEMS TO EXPORT

Piece Geometry	Exports the graphics associated to the piece and weld.
Annotations	Exports the graphics associated to the redline annotations.
Probes	Exports the graphics associated to the probe including wedge, transducer and beams.

Please note that the export DXF does not support the export of text, dimensions, bitmaps and symbols.

20.2 REPORTING

BeamTool provides HTML standards based reporting which allows reports to be generated and shared across the web or email. Report contents can be copied into other applications and edited for final presentation. Advanced users can create and save custom report templates using standard HTML editors.

Creating a Report

Reports can be instantly generated using the default templates included with BeamTool.

1. Follow the steps for Creating a Typical Technique.
2. Select the **Report** button from the main toolbar or from the **File** menu.
3. Select a default template from the list. A summary report is automatically generated including drawings and attribution.
4. Report can be saved to file or sent to a printer.

20.3 REPORT TEMPLATE EDITOR

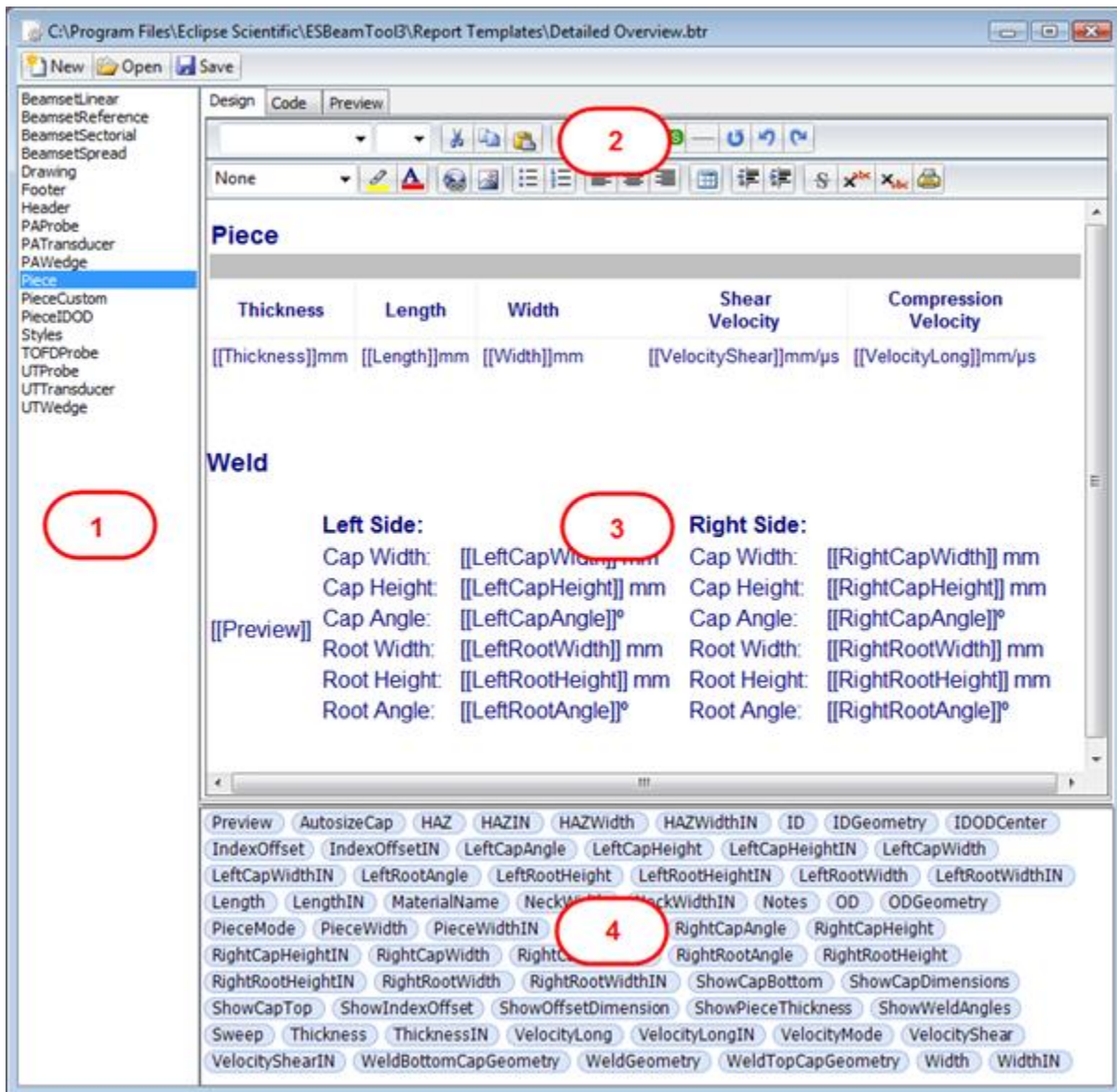
BeamTool provides HTML standards based reporting which allows reports to be generated and shared across the web or email. Report templates can be edited using the built in Report Template Editor.

20.3.1 EDITING A REPORT TEMPLATE

To edit a report template:

1. Press the Report button on the main toolbar or select from the **File** menu.
2. Once a report has been displayed select the report template to be modified from the template list.
3. Press the **Edit Template** button to display the Report Template Editor.

20.3.1.1 GETTING STARTED WITH THE REPORT TEMPLATE EDITOR



- 1 Report Sections Pane
- 2 Editor Toolbar (available in Design mode only)

3 Report Work Area (available in Design and Code modes only) and Preview

4 Available Fields Pane

20.3.1.2 EXAMPLE OF EDITING A REPORT TEMPLATE

Once the Report Template Editor is displayed you can customize an existing report template by doing the following:

1. In **Design Mode**, select a section from the Report Section pane. Report Sections include Header, Piece, Probe, Beam and Footer sections. The predefined section is displayed in the Report Work Area.
2. Modify the existing report fieldname captions or type new ones in the Report Work Area.
3. Select the appropriate field(s) from the Available Fields pane and drag and drop beside the fieldname captions.
4. Use the Editor Toolbar to specify font, size, color, etc.
5. Select the Preview tab to display the report with the additions and modifications made plus the existing workspace values.
6. Press the **Save** button to overwrite the existing report template or save as a new template file.

20.3.1.3 CREATING A NEW REPORT TEMPLATE

A new report template can be created without using an existing preformatted report template. To create a new report template:

1. Display the Report Template Editor and press the **New** button.
2. Select a section from the Report Section pane.
3. All of the Available Fields are listed (with fieldname captions) in the Report Work Area.
4. Edit and Save the new report template using the steps available in the above Example.

20.3.1.4 USING CODE MODE

Users familiar with HTML code can select the Code tab to display and modify the report template in HTML format.

CHAPTER (21): THIRD PARTY INTEGRATION

Eclipse has partnered with other companies in the NDT industry to allow for easy integration of BeamTool workspaces into other acquisition and analysis software systems.

21.1 TD FOCUS-SCAN & TD HANDY-SCAN

As of January 2010 all TD Focus-Scan and TD Handy-Scan systems are shipped with BeamTool pre-installed and older systems may be upgraded by TD to include this functionality. The integration brings together two of the most powerful and widely known computerized ultrasonic applications. It provides a comprehensive planning and data acquisition capability in a convenient package.

21.2 ZETEC ULTRAVISION

The BeamTool install includes a custom [UltraVision library](#) that can be used to integrate with Zetec UltraVision. With this library installed and configured, the UltraVision file menu is extended with the option to "Import BeamTool Workspace". This will automatically configure UltraVision with the probes, wedges, and beam sets you've configured in your BeamTool workspace.

21.3 ULTRAVISION LIBRARY

The BeamTool install includes a custom UltraVision library that can be used to integrate with Zetec UltraVision.

With this library installed and configured, the UltraVision file menu is extended with the option to "Import BeamTool Workspace". This feature will automatically configure UltraVision with the probes, wedges, and beam sets you've configured in your BeamTool workspace.

21.3.1 INSTALLATION

The BeamTool installer will automatically install and configure the UltraVision library as long as UltraVision is already installed on the computer. If installing UltraVision AFTER installing BeamTool, you will need to reinstall BeamTool to ensure the UltraVision library is configured properly

21.3.2 IMPORT BEAMTOOL WORKSPACE INTO ULTRAVISION

The Import BeamTool Workspace component for Zetec UltraVision allows you to quickly and easily set up a configuration in UltraVision based on an BeamTool configuration. Saved BeamTool workspaces can be imported into UltraVision saving time and reducing potential errors that might occur reconfiguring the setup in UltraVision. Pieces, wedges, transducers, and beamsets are all imported. Parameters for the UltraVision setup can be tweaked or you can transition directly to acquiring data.

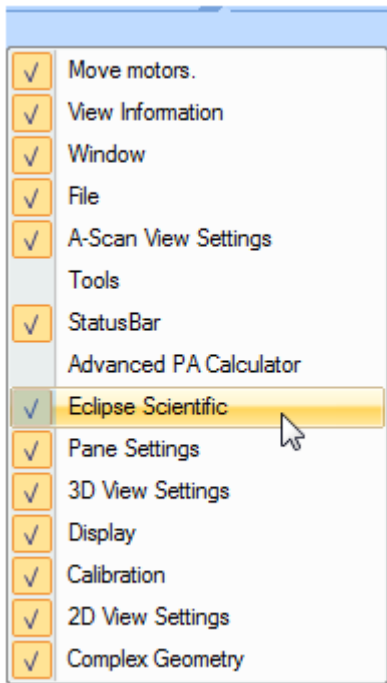
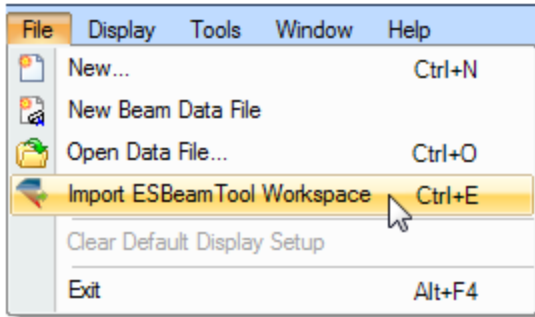
21.3.2.1 TERMINOLOGY

BeamTool and UltraVision use similar terminology but there are a few important differences. The following terms map directly:

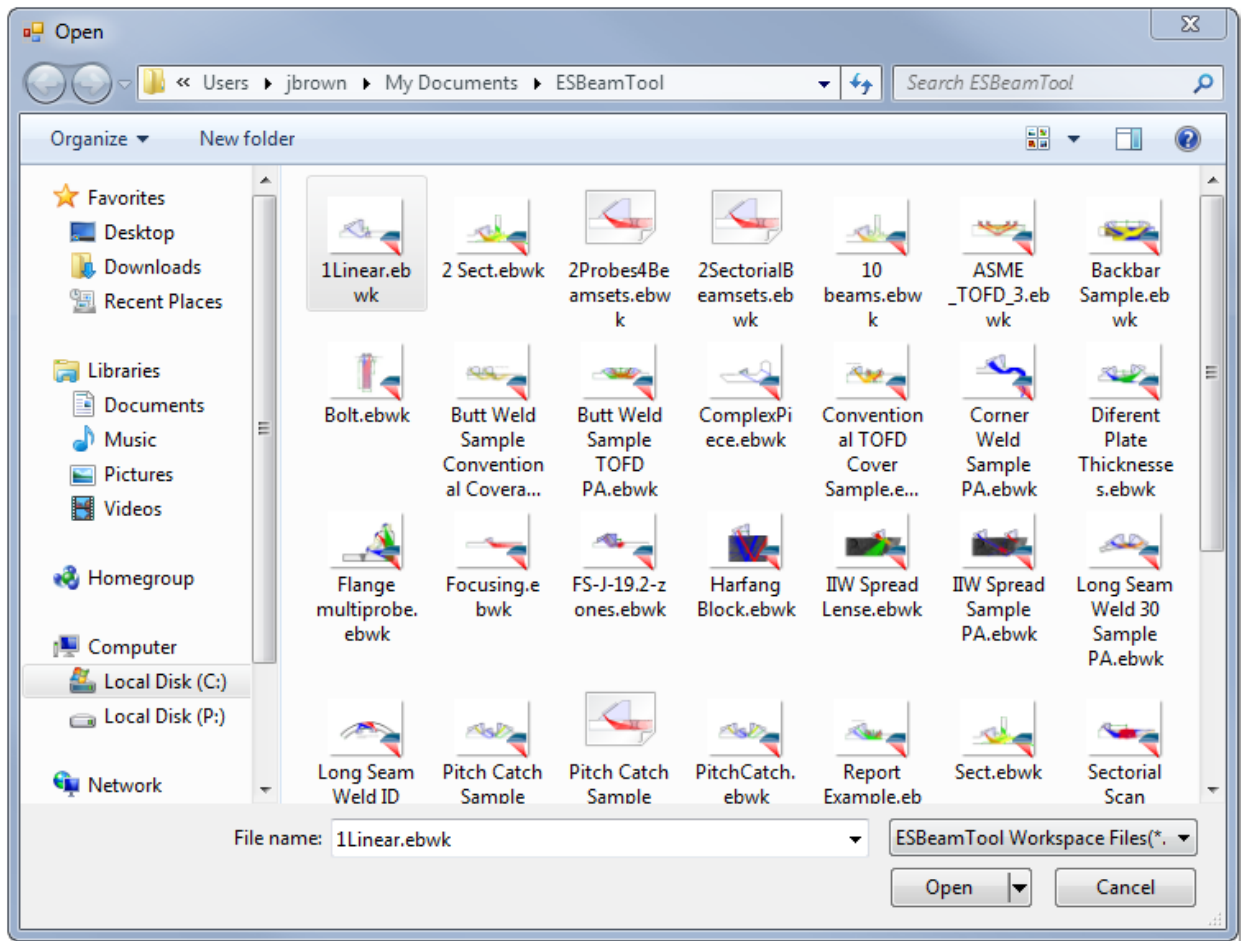
BeamTool	UltraVision
Piece	Specimen
Beamset	Channel
Beam	Focal Law

21.3.2.2 WORKFLOW

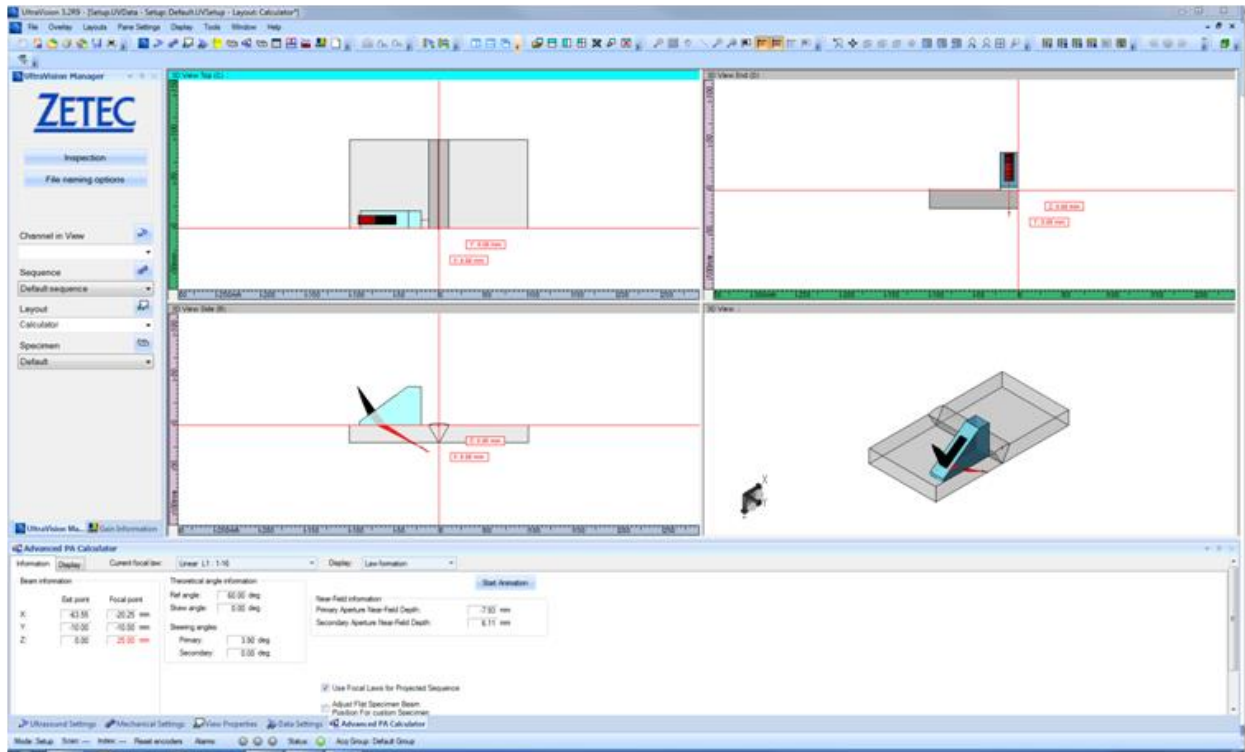
Importing a workspace involves only selecting the Import BeamTool Workspace "command" and then selecting a workspace file. The Import BeamTool Workspace component will be available from the UltraVision File menu and the Eclipse Scientific toolbar:



When the Import BeamTool Workspace command is initiated, the following dialog is presented:



This Open File dialog allows you to select an BeamTool workspace for import. The folder is defaulted to the BeamTool workspaces folder. The default view presents the workspace files as thumbnails to make locating a file easier. After a workspace file is selected and the Open button is pressed, there is no further user interaction required. It will take a few moments to process the workspace file and calculate the focal laws.



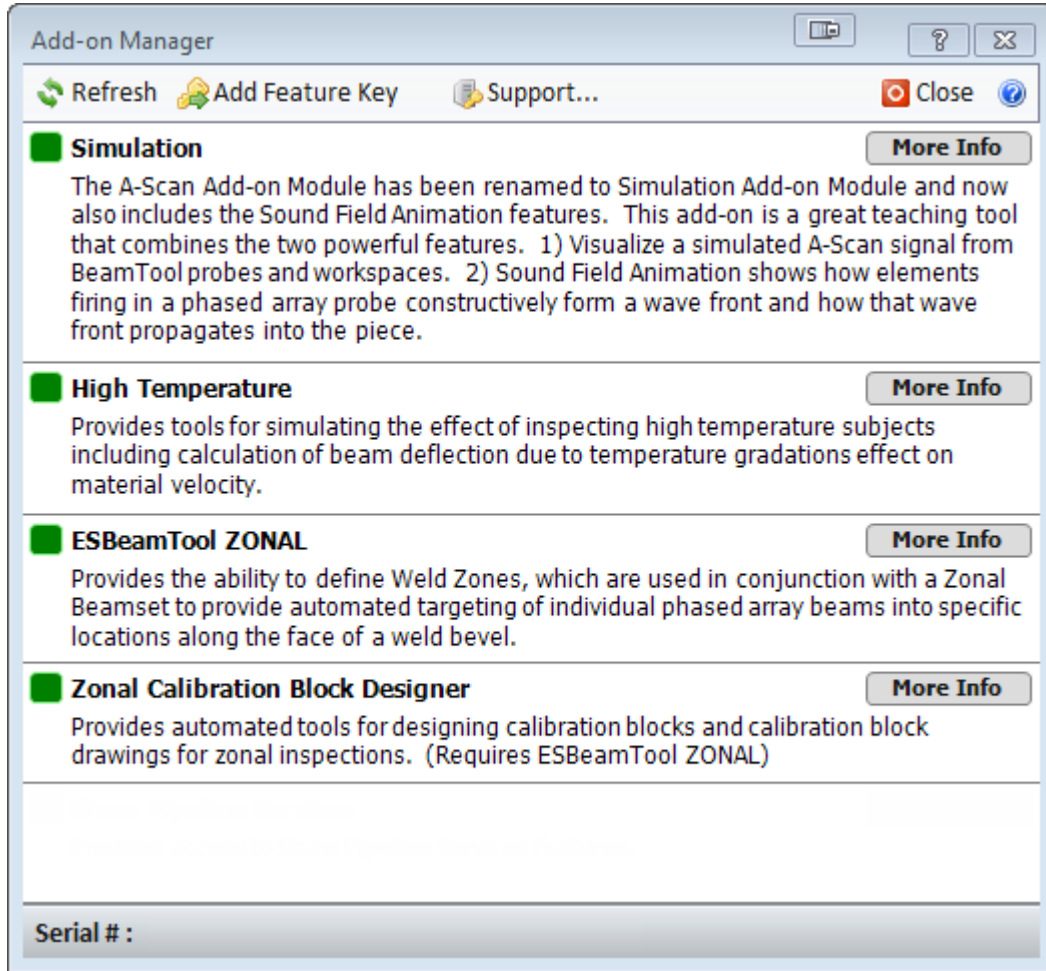
21.3.2.3 CURRENT LIMITATIONS:

The following areas of functionality are not yet supported with the current version.

- Pitch-catch configurations
- TOFD configurations
- Conventional UT configurations
- Custom pieces cannot be imported. An attempt is made to import the basic dimensions of the piece.
- Only very simple weld profiles are supported. The basic size and shape of the weld can be imported but UltraVision does not support the complex weld profiles used by BeamTool.

CHAPTER (22): ADD-ON MODULES

BeamTool supports the ability to license and activate separate add-on modules that provide additional functionality that goes beyond typical technique development. Add-on modules are viewed through the **Add-on Manager**, accessible through the [Tools Menu](#).



22.1 ADD-ON MANAGER OPTIONS

Refresh	Refreshes the Add-on Manager dialog box and activates any recently activated modules
Add Feature Key	Opens the Add Feature Key dialog box (Used to activate modules for SoftLock users without an active Internet connection)
Support	Opens the Support dialog box with contact information for purchasing add-on modules.
Close	Exits the Add-on Manager
Help	Opens the relevant Help content for the Add-on Manager

* The HASP# (HardLock) or SERIAL# (SoftLock) displayed at the bottom of the Add-on Manager is the number tied to your copy of BeamTool. Click on the number to copy it to the clipboard.

22.2 CURRENT MODULES

The BeamTool Add-on module catalog currently consists of:

Simulation

The [A-Scan](#) Add-on Module has been renamed to [Simulation](#) Add-on and now also includes the [Sound Field Animation](#) features. This add-on is a great teaching tool that combines the two powerful features. 1) Visualize a simulated A-Scan signal from BeamTool probes and workspaces. 2) Sound Field Animation shows how elements firing in a phased array probe constructively form a wave front and how that wave front propagates into the piece.

BeamTool High Temperature

The HighTemp Add-on provides tools for simulation of inspecting high temperature subjects, including calculation of beam deflection due to temperature gradations effect on material velocity within the wedge.

BeamTool ZONAL

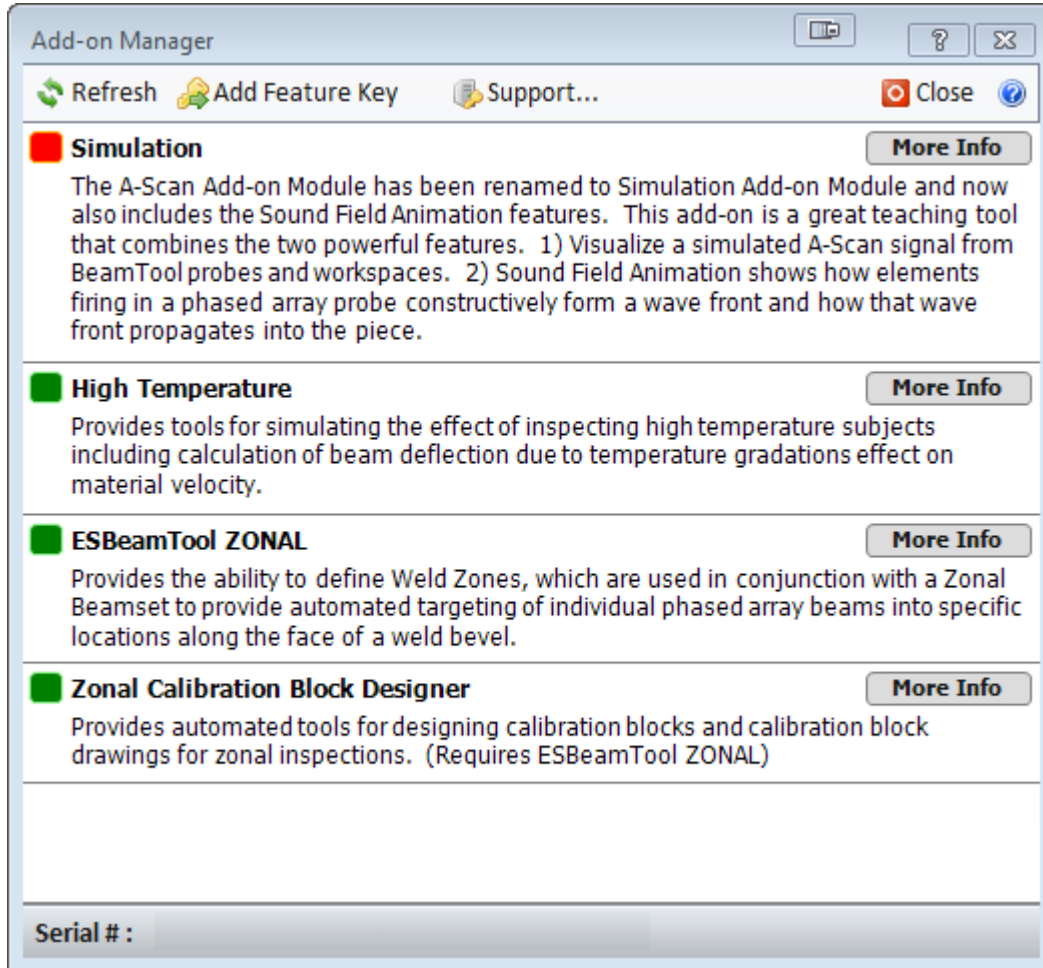
The BeamTool ZONAL Add-on is a zonal discrimination package that provides the ability to define weld bevel [Zones](#), which are used in conjunction with a [Zonal Beamset](#) and the Beam Solver to provide targeted steering of individual beams into individual locations along the face of a weld bevel.


Zonal Calibration Block Designer

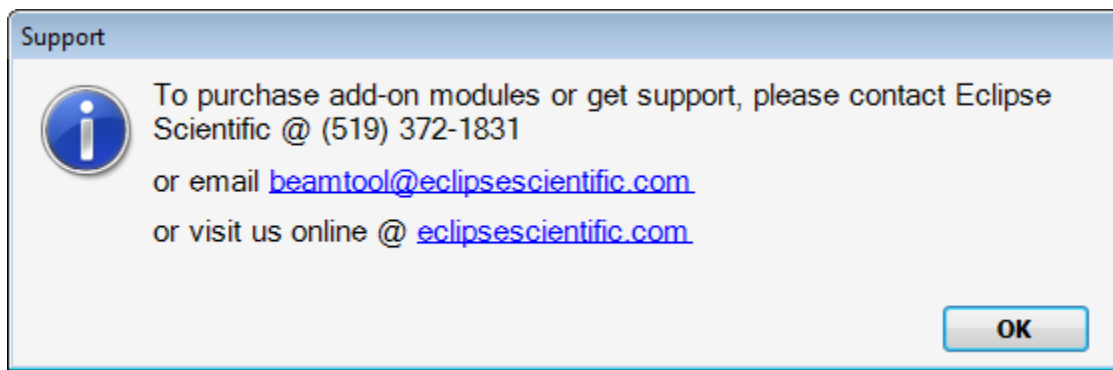
The [Zonal Calibration Block Designer](#) Add-on will provide the users with an expanded toolset for generating calibration block and wedge design drawings and documents.

22.3 HOW TO ACTIVATE AN ADD-ON MODULE

Add-on modules activated on your copy of BeamTool can be viewed through the **Add-on Manager**, accessible through the [Tools Menu](#). The color red next to a module indicates that you are not licensed for the module. The color green next to a module indicates you are licensed for the module.





To activate a module you are not currently licensed for, click on the  Support icon to display the Support dialog box.





The Support dialog box contains two links:

1. The email link will generate a new email (addressed to beamtool@eclipsescientific.com) using your default email client. Copy and paste your HASP# (HardLock) or SERIAL# (SoftLock) from the bottom of the Add-on Manger into the body of the email, and indicate which feature you would like to activate. BeamTool support will provide you with a quote. Once payment has been confirmed you will receive an email with a HASP Upgrade file (HardLock users only) or a Feature Key (SoftLock users only).
2. The website link will take you to the software tab of Eclipse Scientific's website. Click on the "Purchase" button to be taken to a secure site where you can purchase specific modules via Pay Pal. Once payment has been confirmed you will receive an email with a HASP Upgrade file (HardLock users only) or a Feature Key (SoftLock users only).

HardLock users activate a new module by plugging in their HASP Dongle (USB Key) and executing the upgrade file sent from BeamTool support. If the upgrade is successful a green icon will show next to the newly activated icon. Click on  Refresh if the icon is still red after applying the upgrade.

SoftLock users that have an active internet connection are automatically activated once they receive the new Feature Key email from BeamTool support. Click on the  Refresh if the icon is still red after receiving the new Feature Key email.

SoftLock users that do not have an active Internet connection, or are blocked by a firewall can click on the  Add Feature key and enter the Feature Key provided by BeamTool Support to activate a module. Click on  Refresh if the icon is still red after adding the Feature Key.

22.4 BEAMTOOL ZONAL

BeamTool ZONAL is an [Add-on module](#) that extends the capabilities of the already powerful BeamTool ray tracing and technique simulation application.

The BeamTool ZONAL Add-on provides the ability to define [Weld Zones](#), which are used in conjunction with a [Zonal Beamset](#) to provide automated targeting of individual phased array beams into specific locations along the face of a weld bevel.

With the ZONAL add-on activated, the [Weld Configuration](#) dialog allows access to the [Weld Zones](#) functionality:

The screenshot shows the 'Weld Configuration' dialog box. The central part displays a 3D model of a weld bevel with various dimensions and labels. The dimensions include 15.05mm, 13.05mm, 10.05mm, 6.70mm, 20.00mm, 5.00mm, and 37.0°. The zones are labeled F4, F3, F2, F1, R6, R5, R4, R3, R2, R1, V, VR2, and VR1.

The 'Zones' table on the right lists the following data:

Name	Type	Side	X	Y	Angle	Length	Height	Depth
F4	U...	S...	-10.05	0.00	37.00	1.20	0.96	0.96
F3	Fill	S...	-8.61	-1.92	37.00	2.40	1.91	2.87
F2	Fill	S...	-7.16	-3.83	37.00	2.40	1.91	4.79
F1	Fill	S...	-5.72	-5.74	37.00	2.40	1.91	6.70
R6	R...	S...	-5.00	-8.35	0.00	3.30	3.30	10.00
R5	R...	S...	-5.00	-11.65	0.00	3.30	3.30	13.30
R4	R...	S...	-5.72	-14.26	-37.00	2.40	1.91	15.21
R3	R...	S...	-7.16	-16.17	-37.00	2.40	1.91	17.13
R2	R...	S...	-8.61	-18.08	-37.00	2.40	1.91	19.04
R1	R...	S...	-10.05	-20.00	-37.00	1.20	0.96	20.00
V	V...	S...	0.00	-3.35	0.00	6.70	6.70	6.70
VR2	V...	S...	0.00	-10.03	0.00	6.65	6.65	13.35
VR1	V...	S...	0.00	-16.68	0.00	6.65	6.65	20.00

Weld Zones are constructed from the [Weld Regions](#) defined during the weld configuration. As a weld bevel is configured, [Weld Regions](#) are automatically divided into Weld Zones using the related zone configuration parameters.

The BeamTool ZONAL Add-on also provides access to the new [Zonal Beamset](#). With Weld Zones configured, a Phased Array Zonal Beamset can use the powerful new **Beam Solver** to automatically create individual beams that specifically target each zone. The **Beam Solver** will determine the appropriate beam parameters (refracted angle, gating, focusing, etc.) to maximize signal response for each zone, all with the click of single button.

Zonal Beamset Configuration

Name	Zone	Start Element	Insp. Angle	Ref. Angle	Aperture	Catch
F4	F4	2	89.75	52.75	20	<input type="checkbox"/>
F3	F3	11	90.00	53.00	12	<input type="checkbox"/>
F2	F2	16	90.00	53.00	12	<input type="checkbox"/>
F1	F1	21	90.00	53.00	12	<input type="checkbox"/>
R6	R6	1	52.00	52.00	12	<input checked="" type="checkbox"/>
R5	R5	52	60.00	60.00	12	<input checked="" type="checkbox"/>
R4	R4	53	92.50	55.50	12	<input type="checkbox"/>
R3	R3	52	90.00	53.00	12	<input type="checkbox"/>
R2	R2	46	90.00	53.00	12	<input type="checkbox"/>
R1	R1	37	90.00	53.00	20	<input type="checkbox"/>
V	V	33	50.00	50.00	12	<input type="checkbox"/>
VR2	VR2	27	44.75	44.75	12	<input type="checkbox"/>
VR1	VR1	47	60.00	60.00	12	<input type="checkbox"/>

Transmit (Skipped) [Shear] [Compression]

Start Element: 2
 Aperture Elements: 20
 Inspection Angle: 89.75 °
 Refracted Angle: 52.75 °
 Focus Length: 66.08 mm
 Gate Offset: 5.00 mm
 Gate Start: 61.08 mm
 Gate Length: 19.77 mm
 Alpha Angle: 36.13 ° dB Drop: -6
 Near Field: 56.81 mm Beam Sweep: 0.13 °
 Used Aperture: 11.90 mm Beam Spread: 3.74 °

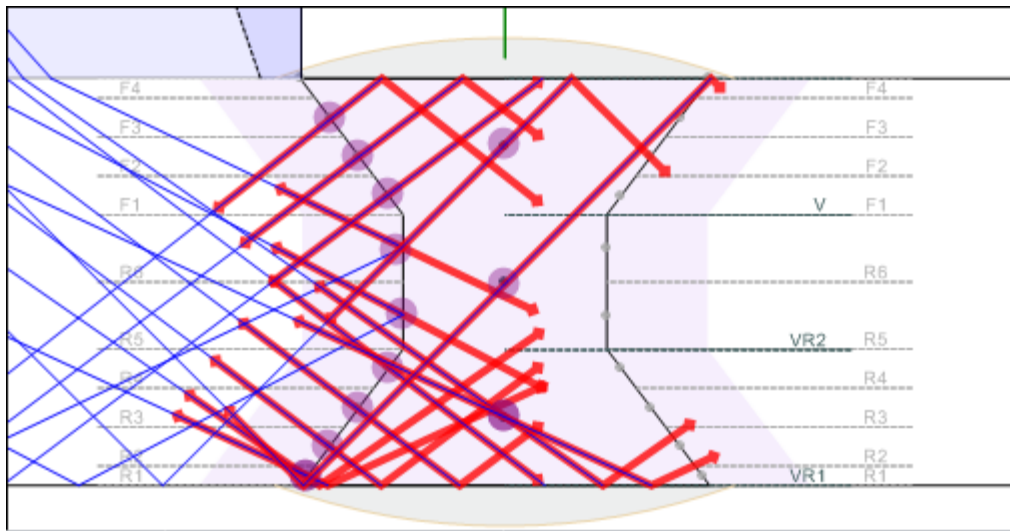
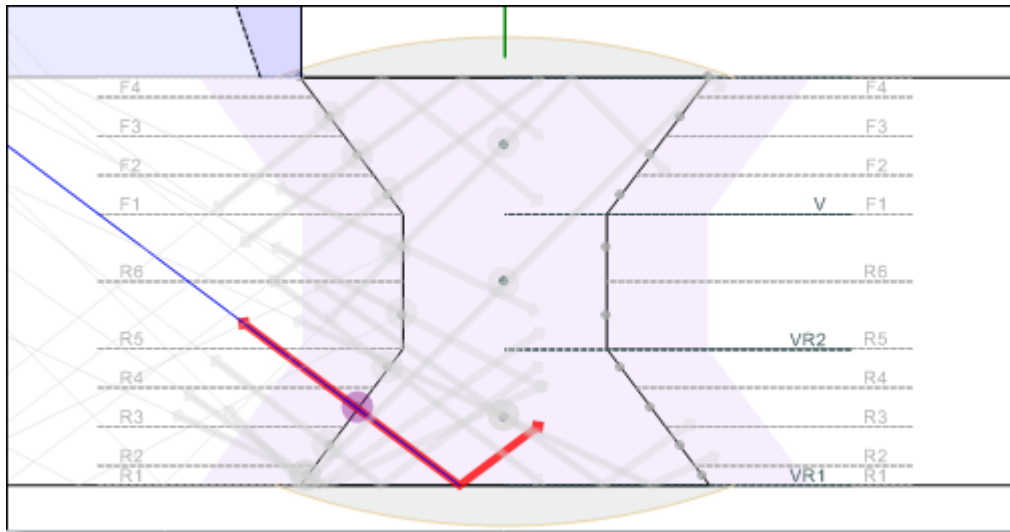
Receive (Skipped) [Shear] [Compression]

Start Element: 2
 Aperture Elements: 20
 Inspection Angle: 89.75 °
 Refracted Angle: 52.75 °
 Focus Length: 66.08 mm
 Alpha Angle: 36.13 ° Used Aperture: 11.90 mm

Aquisition

Gain: 30.00 dB
 Global Gain: 0 dB
 Gate Threshold: 20.00 %
 Reflector Size: 1.00 mm
 Sizing Correction: 1.00 mm
 Rotary Position: 0.00 mm
 Filter: []
 Usage: Fusion
 Presentations: []

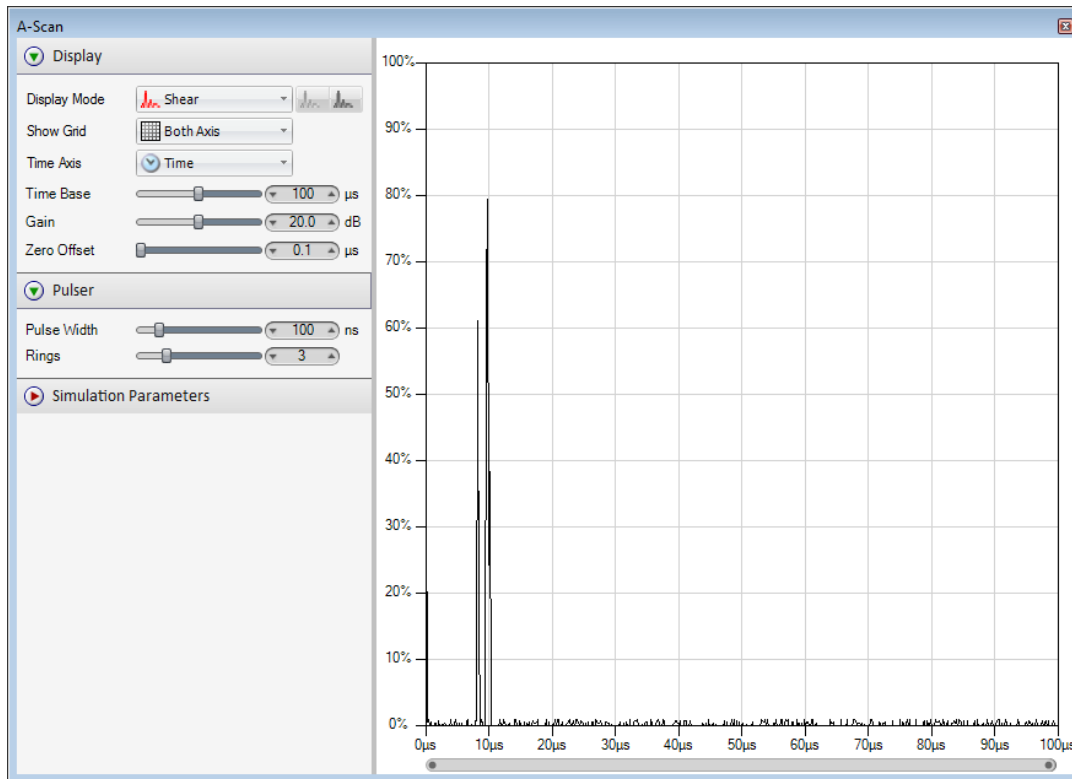
1 64



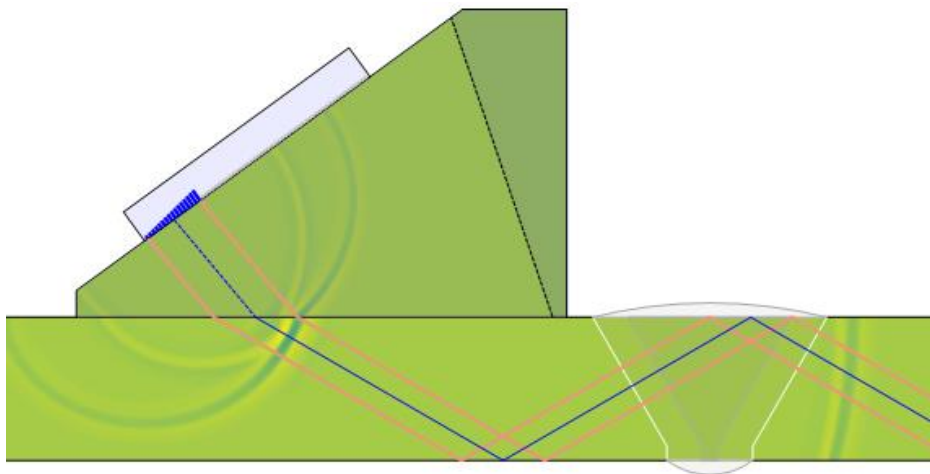
22.6 SIMULATION ADD-ON

The A-Scan Add-on Module has been renamed to Simulation Add-on Module and now also includes the Sound Field Animation features. This add-on is a great teaching tool that combines the two powerful features.

1) Visualize a simulated A-Scan signal from BeamTool probes and workspaces.



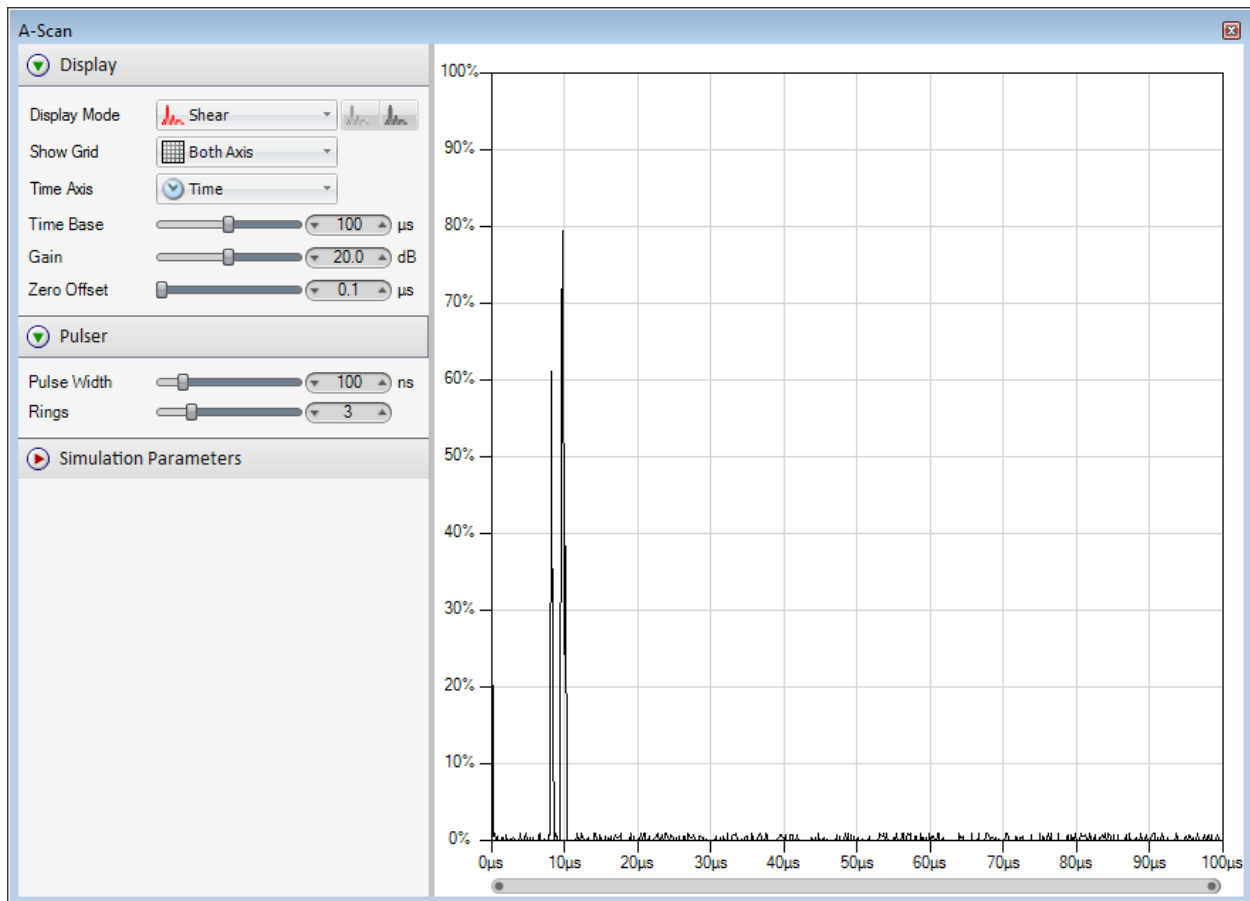
2) Sound Field Animation shows how elements firing in a phased array probe constructively form a wave front and how that wave front propagates into the piece.




22.7 BEAMTOOL A-SCAN

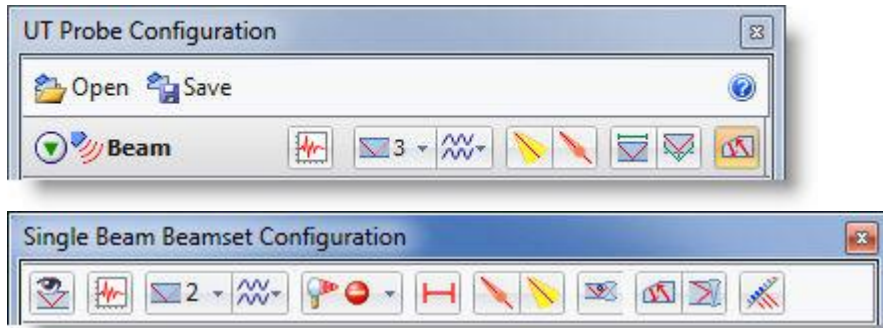
The A-Scan Display allows you to view a simulated A-scan representation of a phased-array single beamset or traditional UT probe configuration. The data is refreshed live as changes are made to the workspace and probe configuration. This functionality is ideal for learning and teaching. It does not have the accuracy that intense sound field processing would provide but it is far more performant and allows visualization of a live A-Scan while moving the probes on the piece geometry.


The display is meant to look as it would on a generic instrument and controls are provided that allow the configuration of common A-scan parameters. It makes a great instructional tool because it can also be controlled in ways that cannot be done on an instrument.




Reflections are detected using an array of normally invisible beams. The beams are parallel when first entering the piece then reflect/refract normally. This parallel 'spread' still simulates a wave front or beam spread to cover a wider area than a single line. Any beams returning to the transducer are processed as reflections. Reflection/transmission coefficients are calculated based on angle of reflection/refraction, material densities, material velocities, and wave mode. A simple but configurable material attenuation is also applied to the reflections by default.

The A-Scan dialog box can be accessed by clicking on the A-Scan icon  in the [UT Probe Configuration](#) and the [Phased Array Single Beam Beamset Configuration](#) menu only.



Note: Detecting reflections requires that the [probe](#) or [beamset](#) is configured with enough beam skips  to allow the beams to return to the transducer.

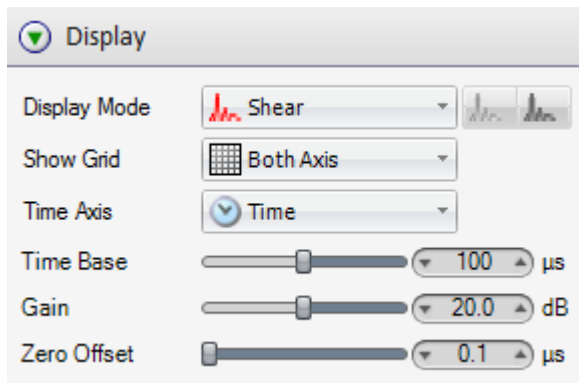
Note: In order to make sure a signal is coming back to the probe it is possible to use the Pitch/Catch  option for the [probe](#) or [beamset](#) that will display in yellow any signal coming back into the wedge.

22.7.1 A-SCAN OPTIONS

Options specific to A-Scan are described below. To specify a value you can **a)** move the slider right or left, **b)** click the right or left value spinner or **c)** click on the value displayed in the value spinner and type a value. The chart will update on the fly as the values are modified.

22.7.1.1 DISPLAY OPTIONS

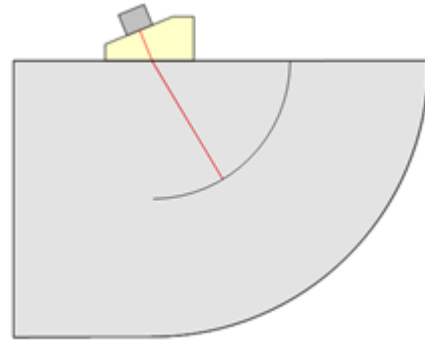
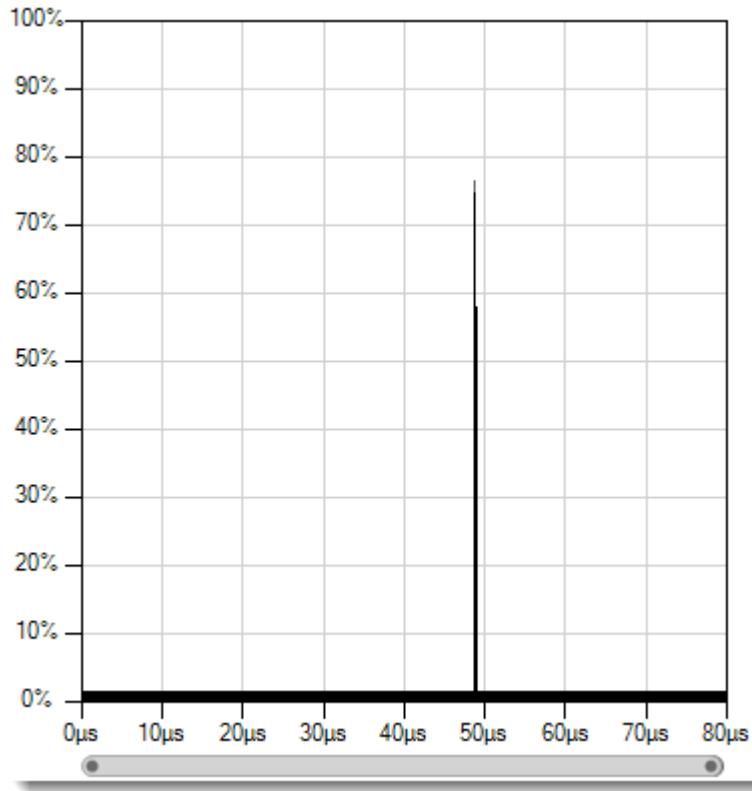
Controls the data that is displayed in the chart.



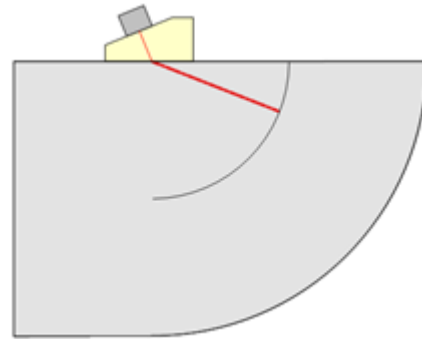
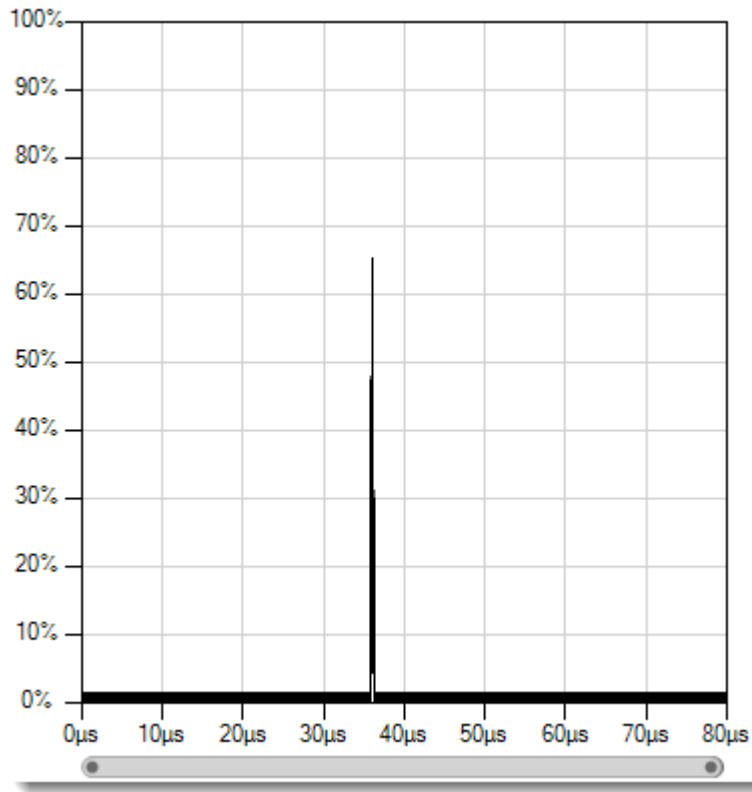
22.7.1.1.1 DISPLAY MODE

Changing the Display mode will automatically update the chart and the beamset.

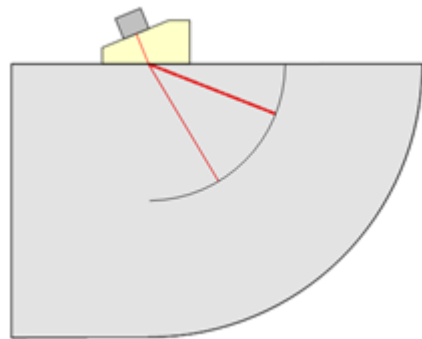
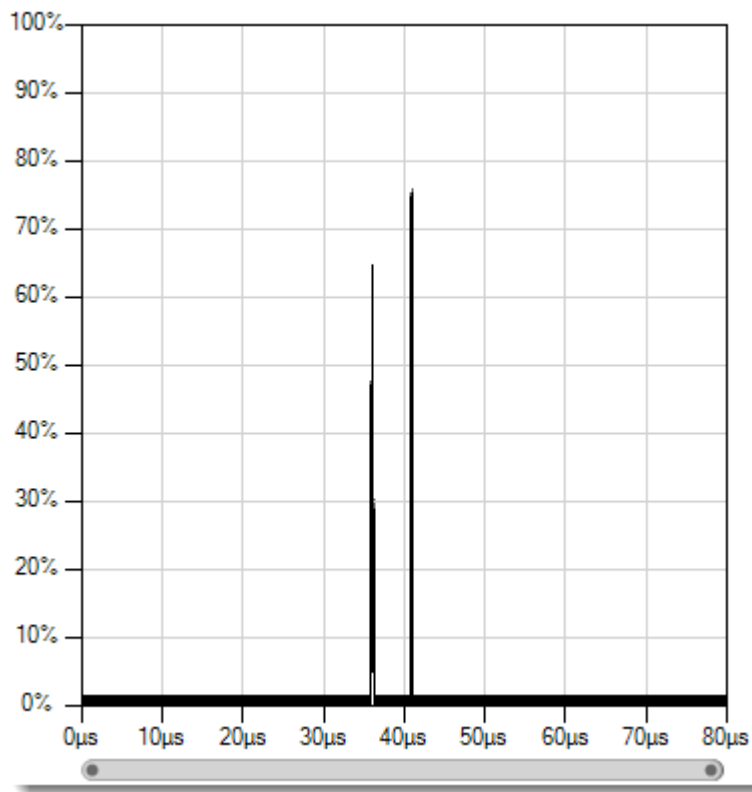
 Shear Wave




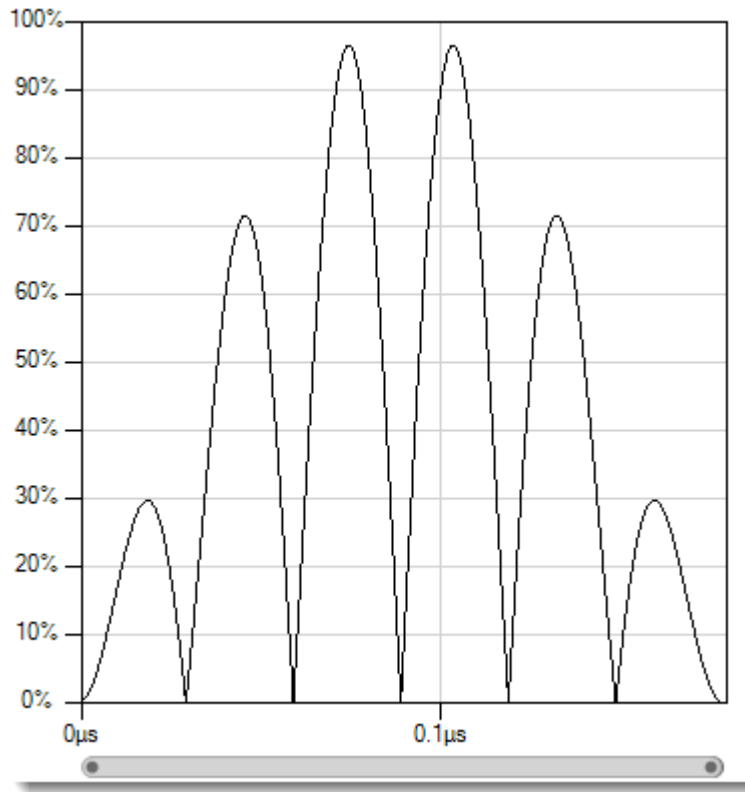
Compression Wave




Combined

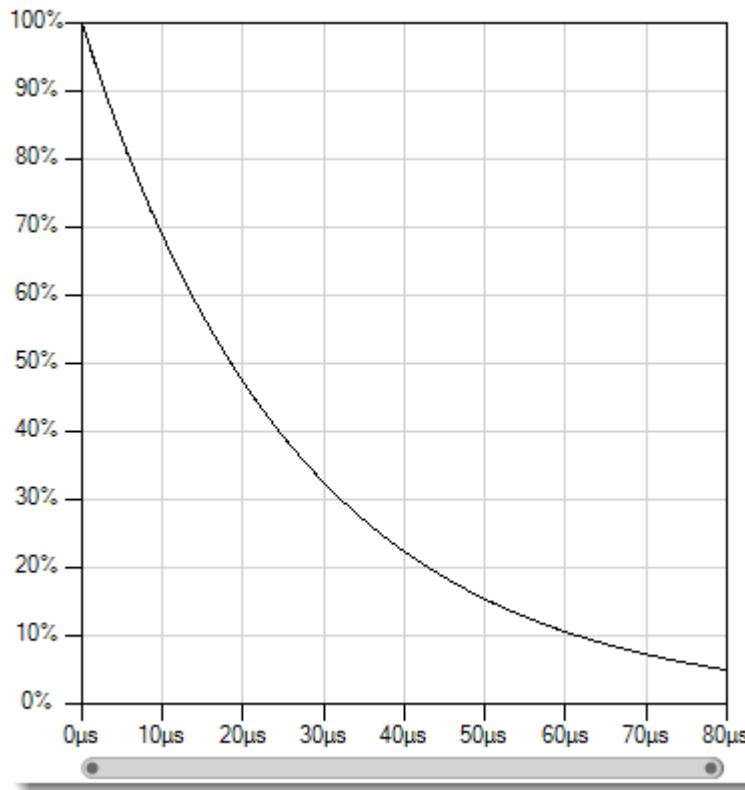


 Initial Pulse



This option displays the initial pulse (main bang). Parameters to modify the initial pulse shape are described under Pulser Options below.

 Attenuation Curve



This option displays the attenuation through distance in the material curve.

22.7.1.1.2 WAVE MODE VELOCITIES

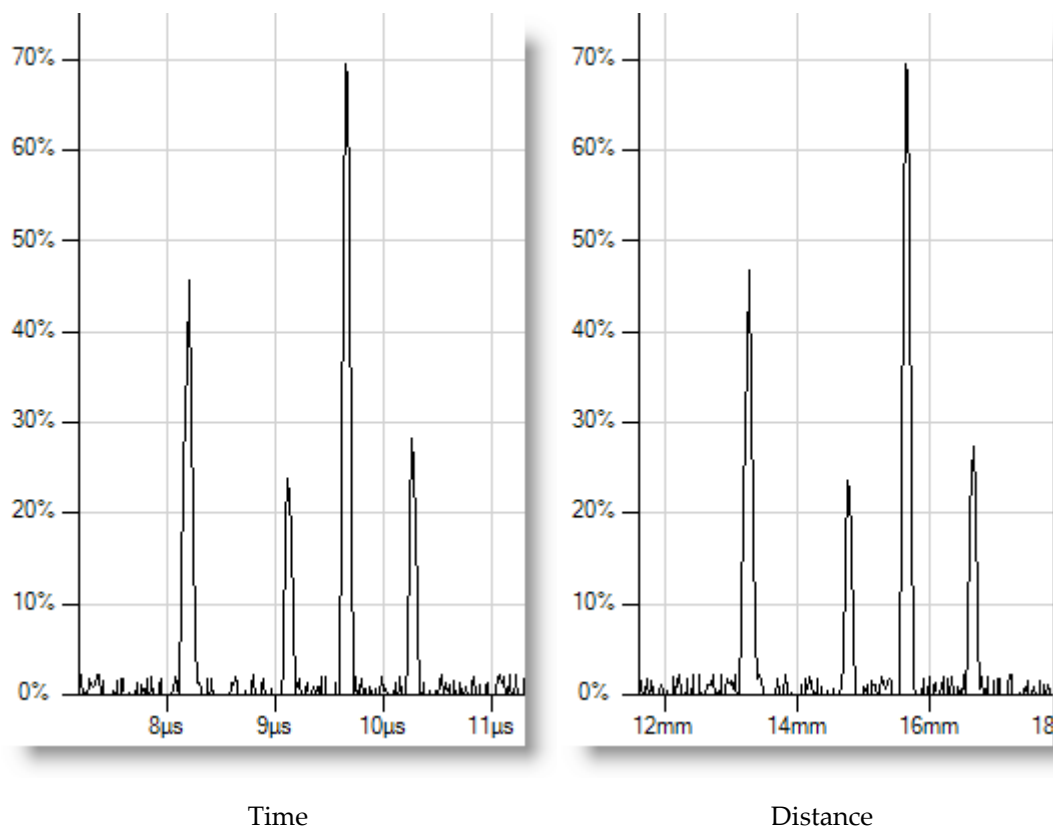
These buttons control the velocity that is used to calculate distances. They are only required when the X (time) axis is displayed in distance units and also when both shear and compression reflections are displayed (Combined mode). They are only enabled in that case. As with any instrument, if the shear velocity is selected then any compression reflections will be inaccurate and vice versa.

Show Grid

Options to show the horizontal line and labels, vertical lines and labels or both.

Time Axis

The units that are displayed on the X axis. Either time (in microseconds) or distance (in millimeters) can be displayed.



Gain

dB gain for the signal. Increasing or decreasing this value modifies the amplitude of the entire signal.

Zero Offset

The time interval, in microseconds, that is subtracted from the start of the A-Scan. This value can be increased to remove the initial wave or time representing path through a wedge.

22.7.1.1.3 PULSER OPTIONS

Pulse Width

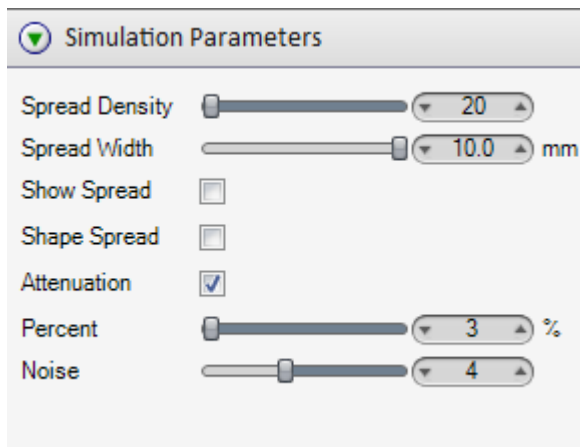
The width of the initial pulse in nanoseconds. The pulse width value is set to a default value based on the frequency of the probe.

Rings

The number of rings in the initial pulse

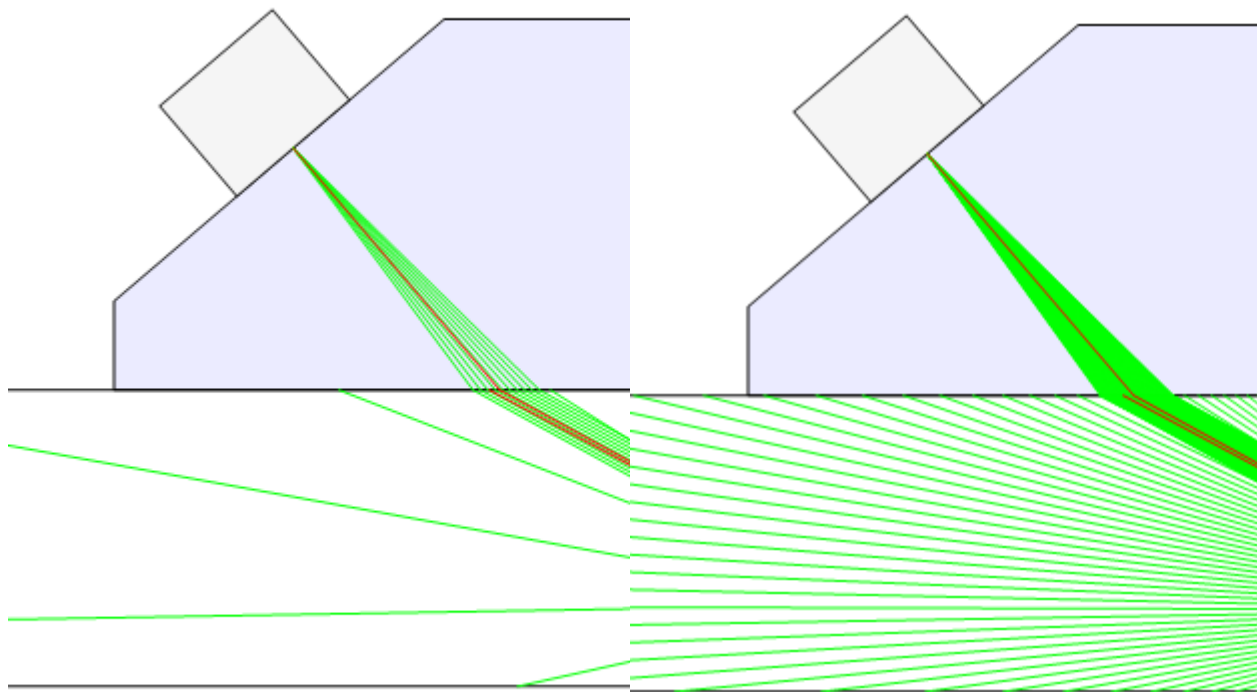
22.7.1.1.4 SIMULATION PARAMETERS

The Simulation Parameters menu is hidden by default but can be expanded by clicking on the group button on the panel title bar.



Spread Density

The number of beams that are used to simulate a wave and detect reflections. A larger value will usually be more accurate but will be less performant.

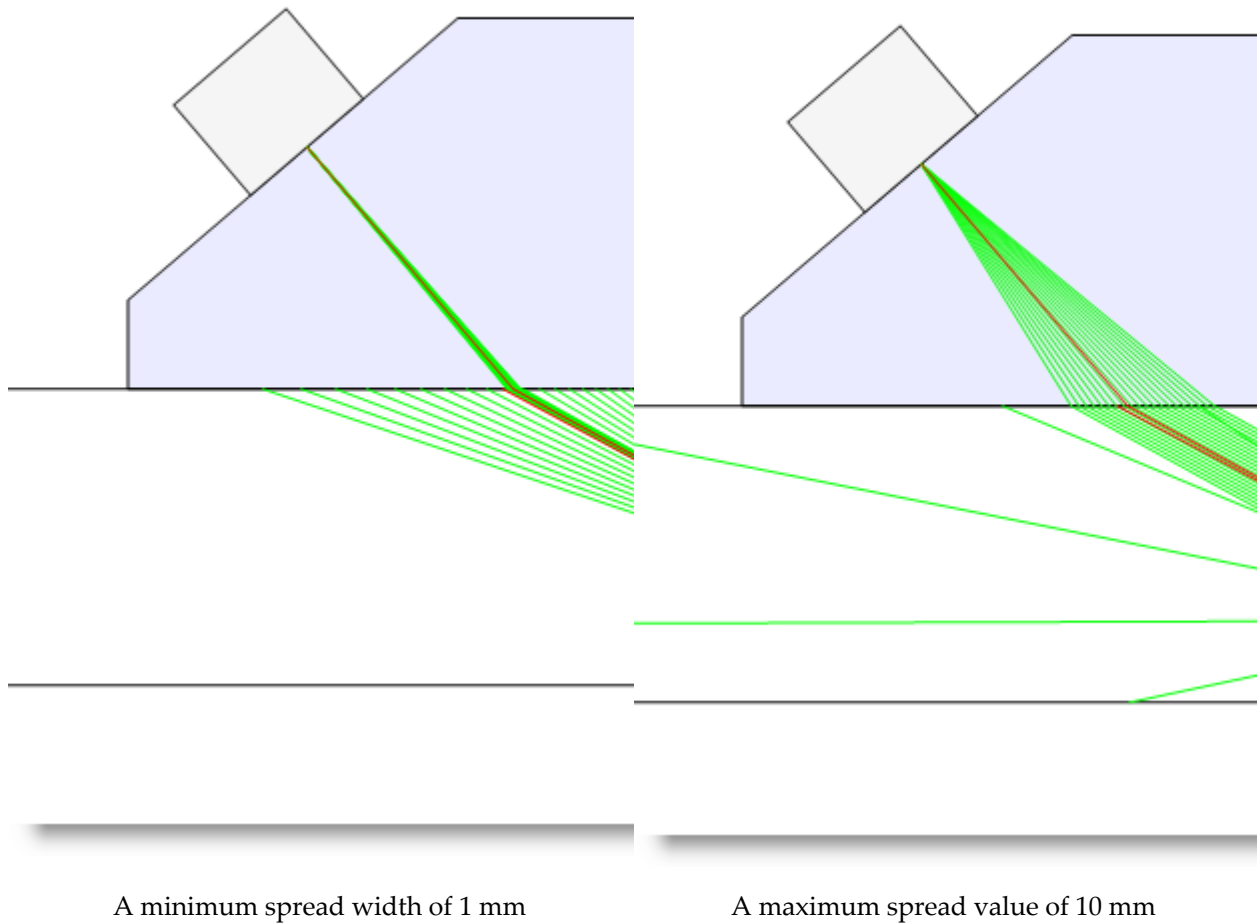


A spread density of 10

A spread density of 100

Spread Width

The width of the spread of beams. A smaller value will produce a narrow, dense array of beams. A larger value will produce a wider, sparse array of beams. Using a wider beam will cover a larger area but will potentially involve more scatter.

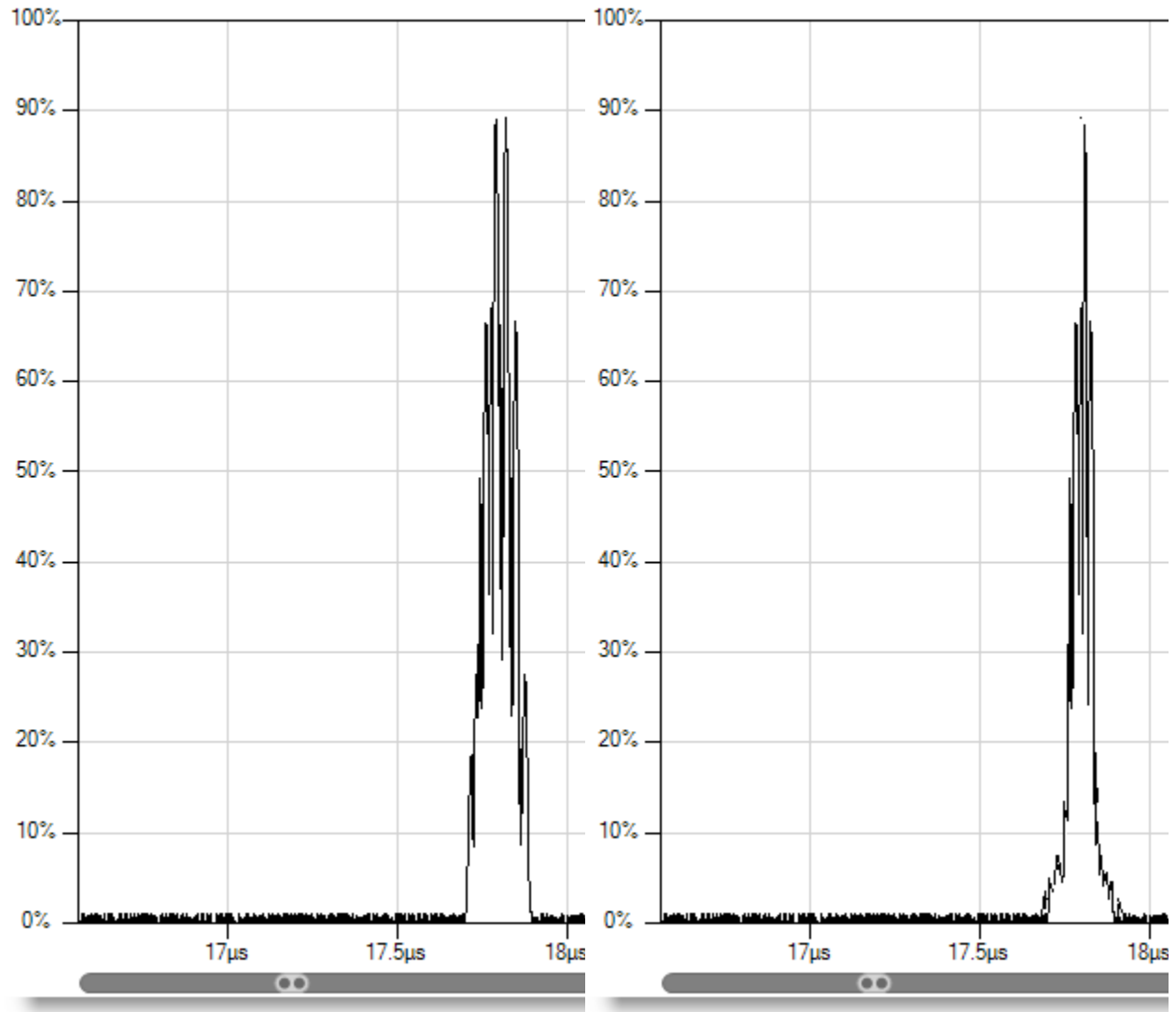


Show Spread

The visibility of the beams used for the A-Scan. This will toggle the visibility of the beams that are used to produce the A-scan. The beams are displayed in fuchsia to distinguish them from the actual beam and beam-spread beams.

Shape Spread

Shaping of the reflections by adjusting the amplitudes across the spread using a logarithmic curve. This can produce a more natural-looking reflection but can potentially produce unexpected results in cases of multiple reflections. It can also produce strange results depending on which part of the spread detected the reflection.



A default, unshaped reflection

A shaped reflection

Attenuation

Applies a material attenuation factor to reflections. The amplitude is adjusted based on the attenuation curve visible from the 'Attenuation Curve' display mode. A logarithmic curve is used to calculate the factor.

Percent

The material attenuation factor at the time line maximum. This is the percent of maximum amplitude at the time line maximum. A larger value decreases the material attenuation applied to reflections.

Noise

The level of noise in the signal. This can be reduced to 0 to provide a clearer signal or can be increased to provide a more realistic-looking signal. The noise is affected by gain.

22.7.1.2 CHART OPTIONS



22.7.1.2.1.1 NAVIGATING THE A-SCAN CHART

The slider control at the bottom of the A-scan chart allows panning and zooming through the X (time) axis. This provides an easy way to find and view any area of the time line.



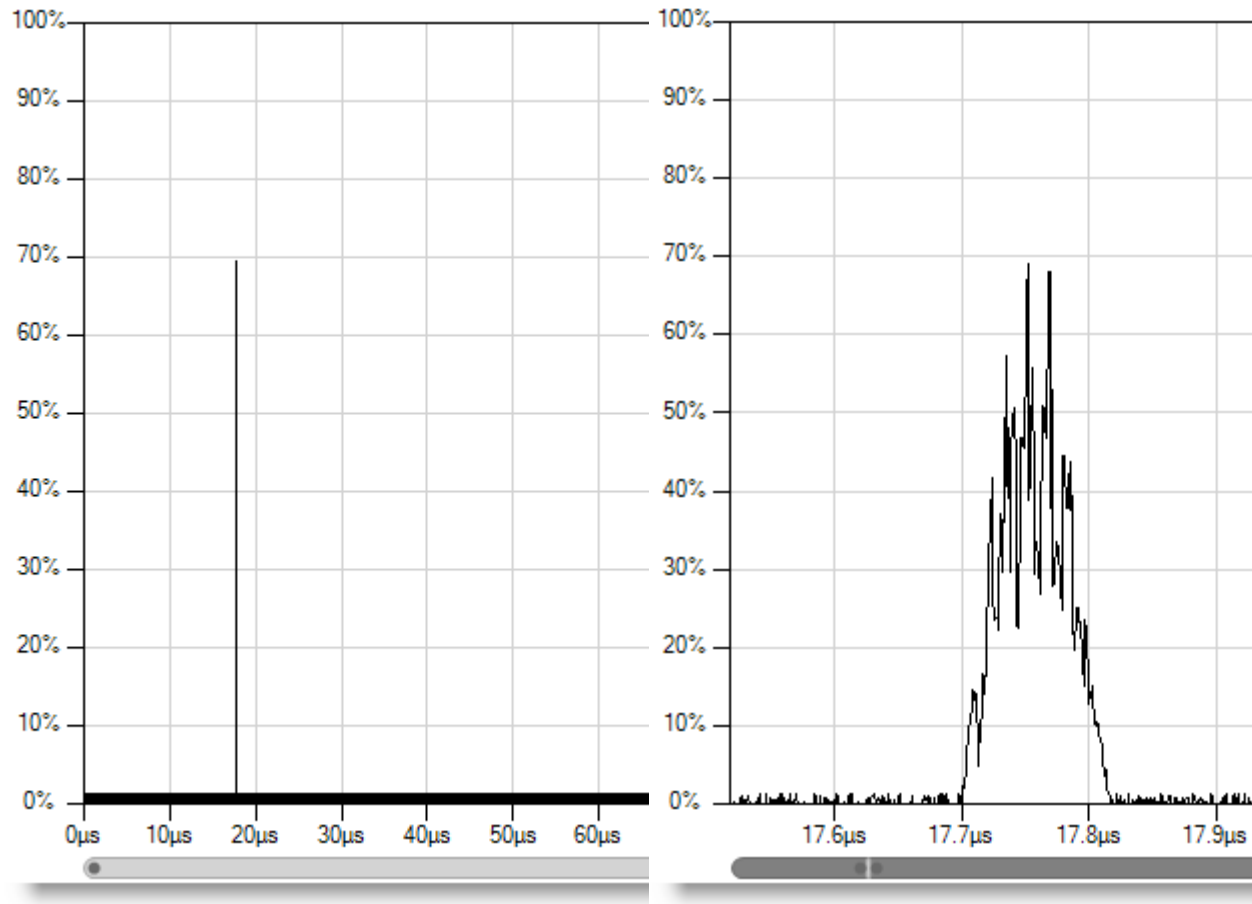
Right click on the slider control to and select Fit Signal to automatically fit the chart to the signal.



The handles on the ends of the control  can be dragged back and forth to zoom in and out. The bar itself can be dragged back and forth  to scroll through the time line.

Double-clicking the bar will zoom out to max.

The chart X-axis (time) automatically adjusts intervals to maintain an even grid.



Zoomed out to maximum time line (80 μ s)

With 10 μ s intervals

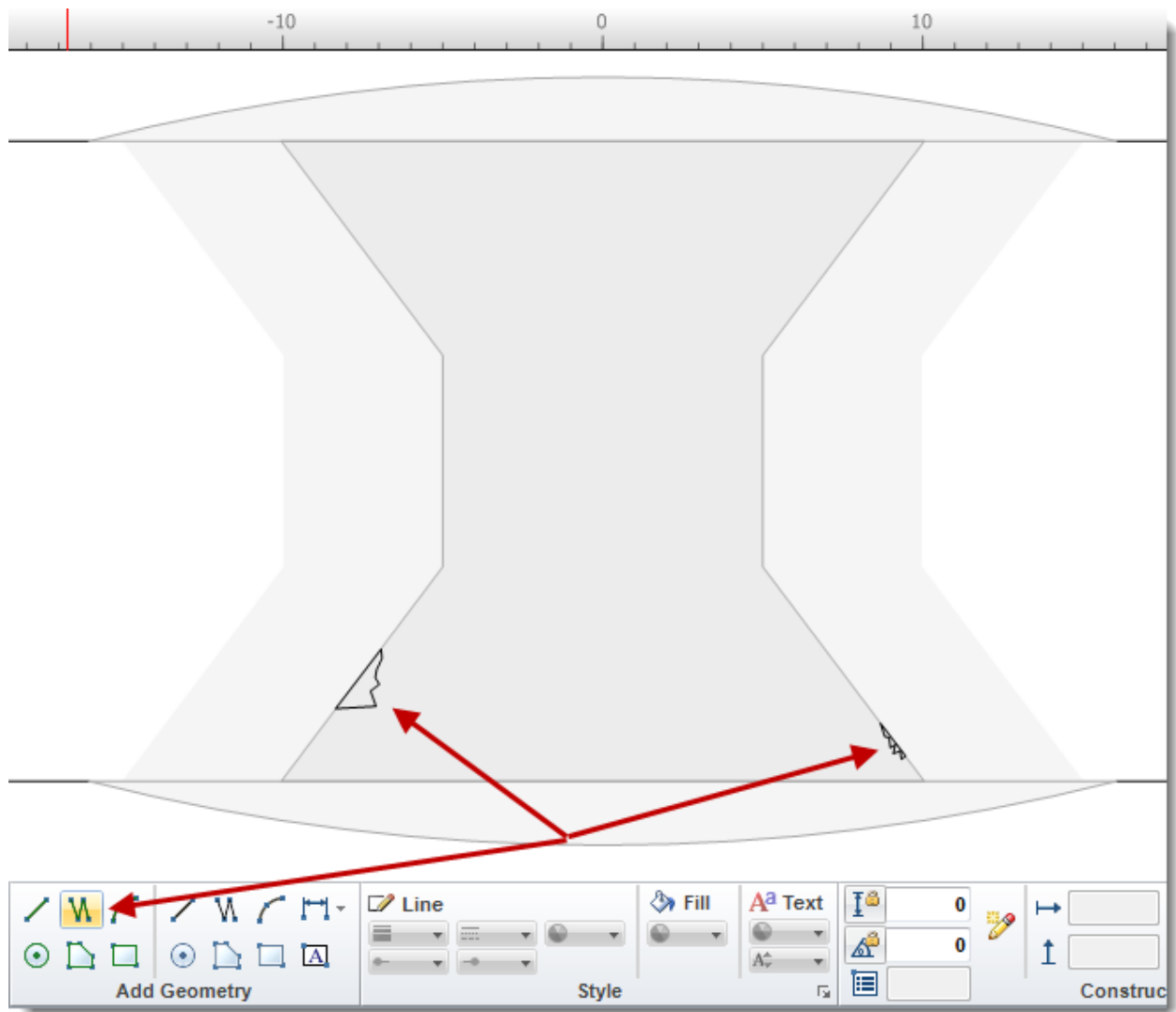
Zoomed in to the reflection (0.5 μ s range) with 0.1 μ s intervals

22.7.2 A-SCAN LESSON

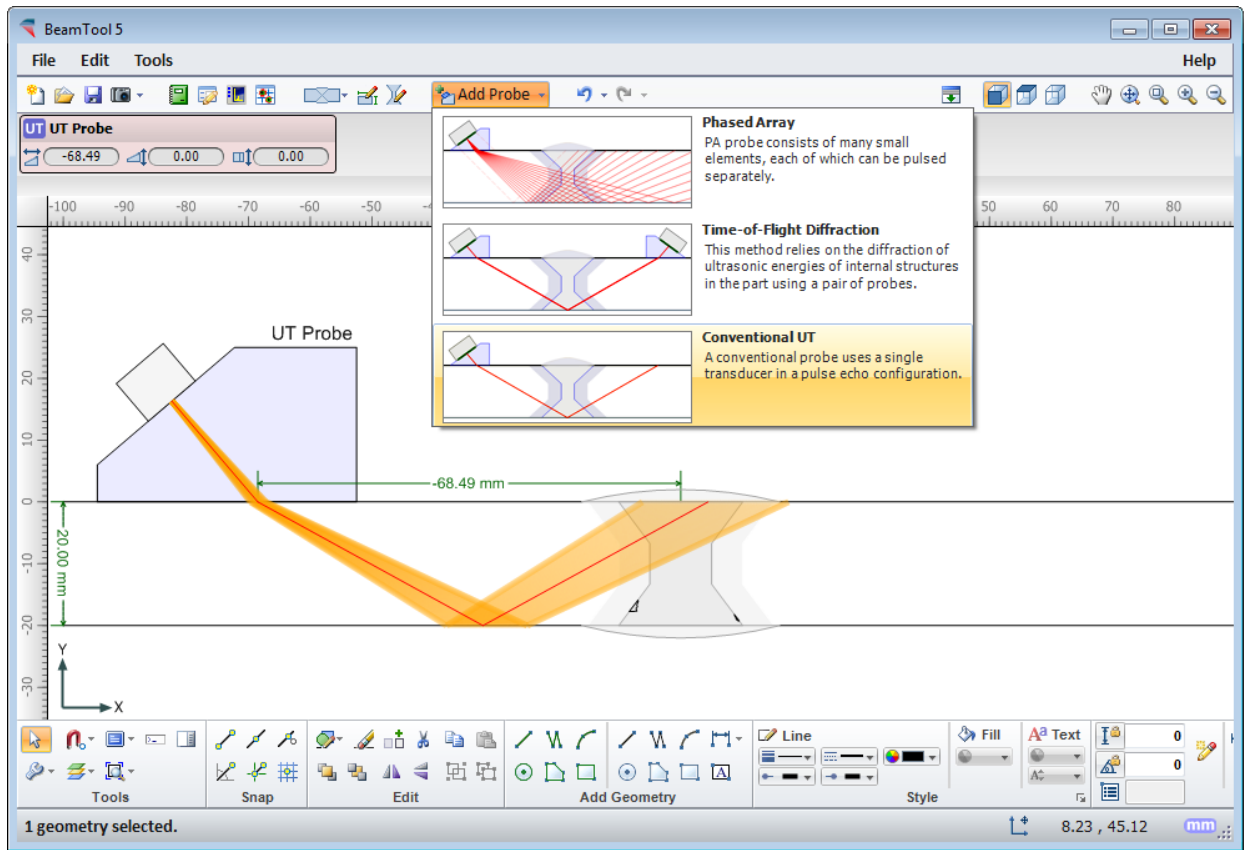
In this lesson we will demonstrate the A-Scan Add-on functionality in BeamTool. In order to proceed with this lesson you must have purchased the [Simulation Add-on Module](#). Please refer to the [Add-Ons](#) section to learn how to purchase the Simulation Add-on.




Now that you have your Simulation Add-on license activated, let's put it to work.

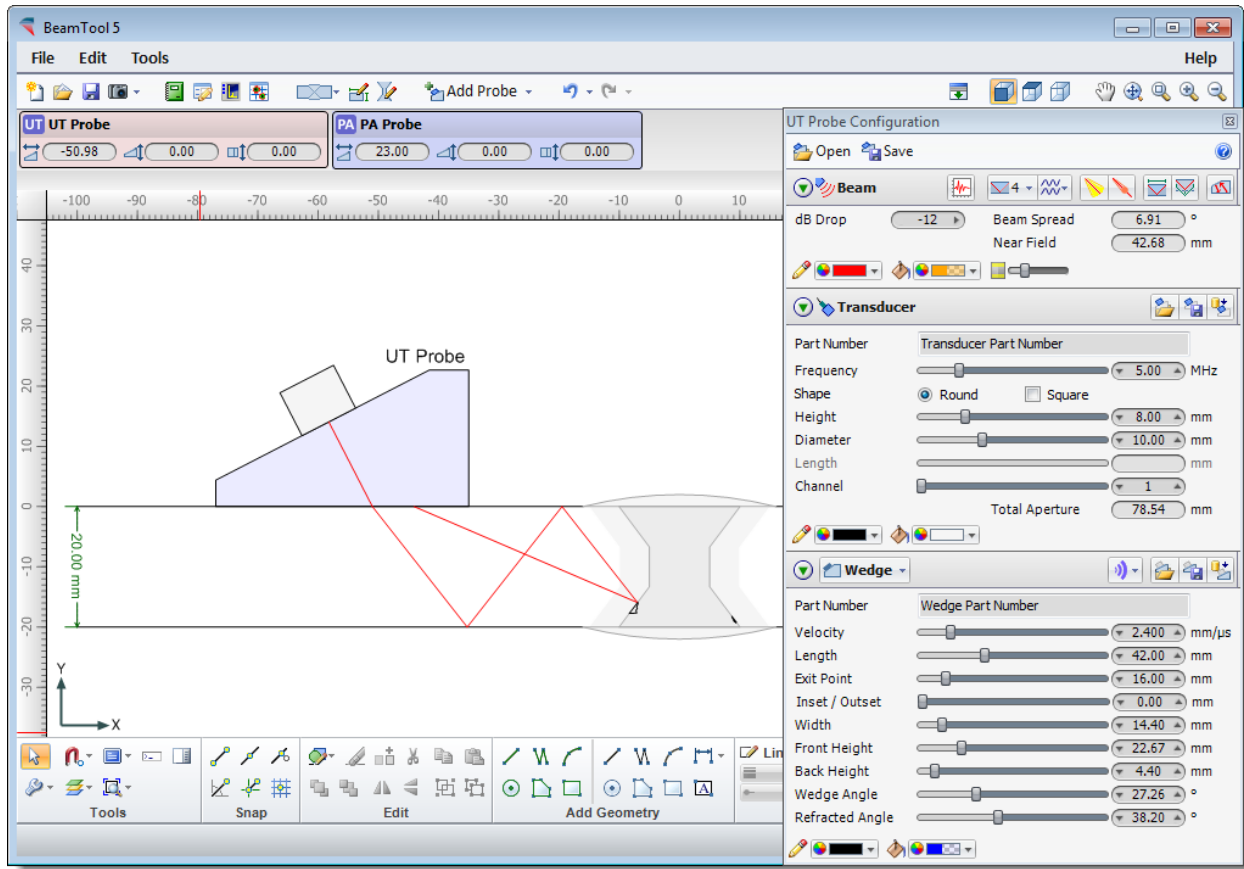
For this lesson we will start out with the default Plate Piece geometry. Use the [V Piece Polyline](#) drawing tool to add some defects in the weld.




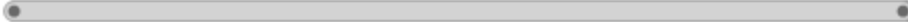


Add a [Conventional UT Probe](#) to the workspace.

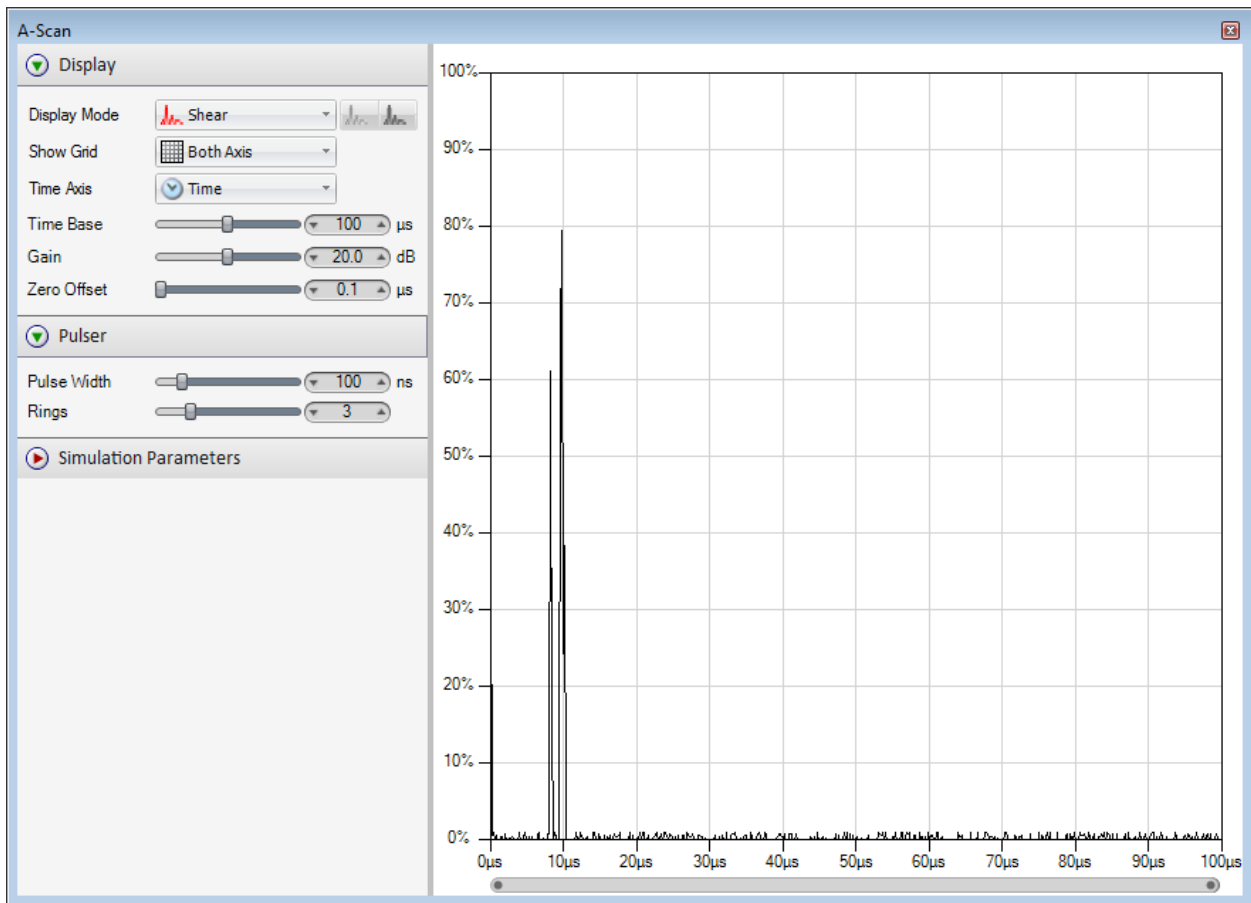


Open the UT Probe Configuration menu by clicking on the  Probe Config icon found in the UT Probe menu. Turn off the Show Beam Spread by clicking on the  Show Beam Spread icon. Detecting reflections requires that the probe/beamset is configured with enough beam skips to allow the beams to return to the transducer. Change the number of beam skips to 4 by clicking on the  Beam Skips icon.



Click on the  A-Scan icon to open the A-Scan dialog box.

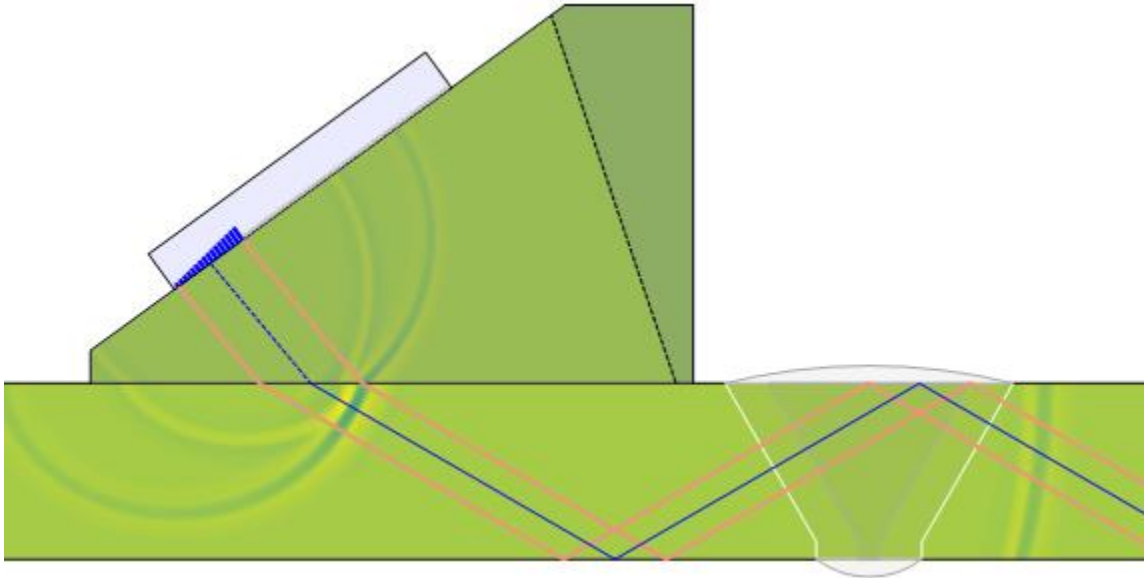
Use the slider control  at the bottom of the A-Scan chart to find and view the area of the time line where the signal occurs. The handles on the ends of the control  can be dragged back and forth to zoom in and out. The bar itself can be dragged back and forth  to scroll through the time line.



Use the display mode to visualize different scan data that is displayed in the chart. Changing the Display mode will automatically update the A-scan view and the Beamset.

22.7.3 SOUND FIELD ANIMATION

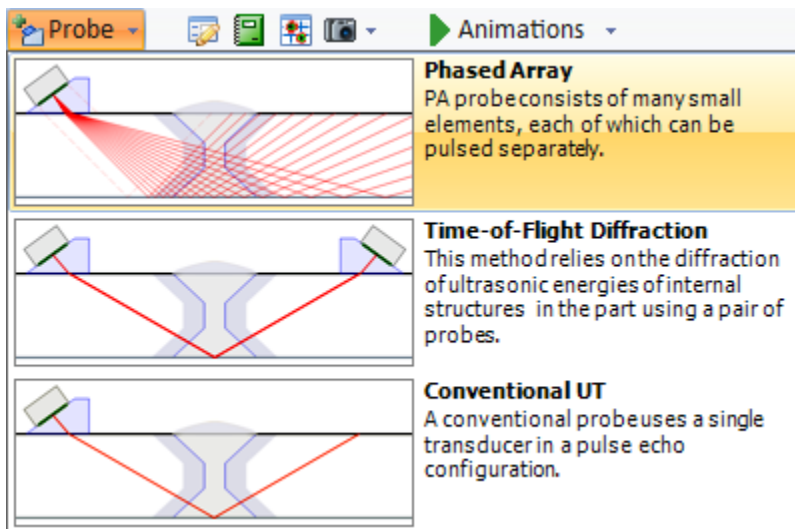
Sound Field Animation is part of the Simulation Add-on for BeamTool. This feature shows how elements firing in a phased array probe constructively form a wave front and how that wave front propagates into the piece.



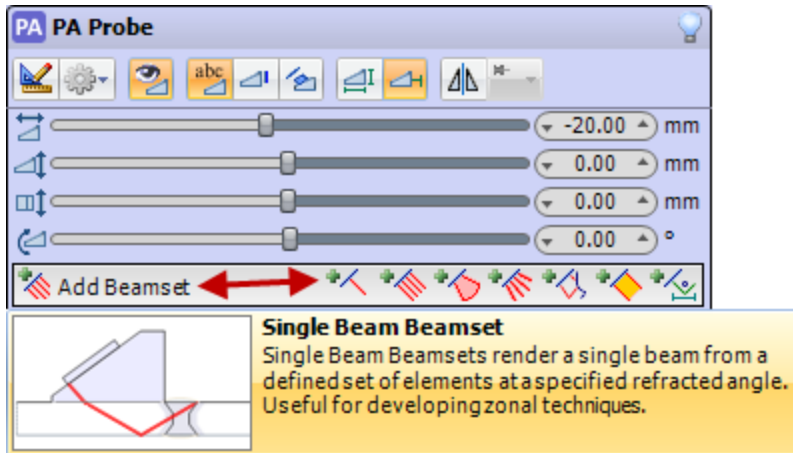
The Sound Field Animation is available for Phased Array Probes using a [Single Beam Beamset](#).

22.7.3.1 TURN ON SOUND FIELD ANIMATION

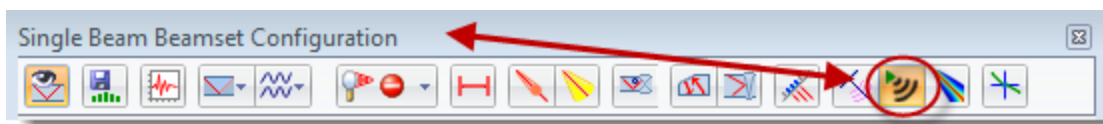
To turn on Sound Field Animation, you must first add a [Phased Array Probe](#) to your workspace from the [main toolbar](#).



Add a [Single Beam Beamset](#) to the PA probe.



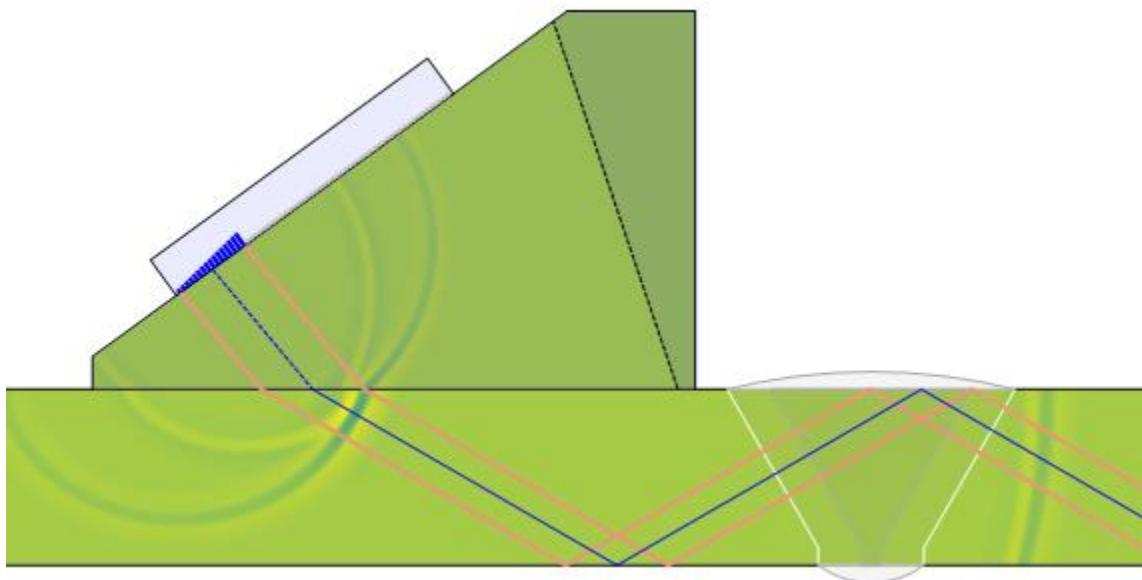
Open the Single Beam Beamset Configuration window and click on the Sound Field Animation Button.



When the Sound Field button is clicked, a progress bar will appear in the bottom left hand corner of BeamTool. This progress bar shows the status of the Sound Field processing.



When the progress bar is completed the Sound Field Animation will be shown in the workspace.

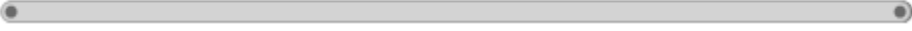



22.7.3.2 SOUND FIELD ANIMATION OPTIONS

The animation of the Sound Field can be configured using the Animations button found on the main toolbar.

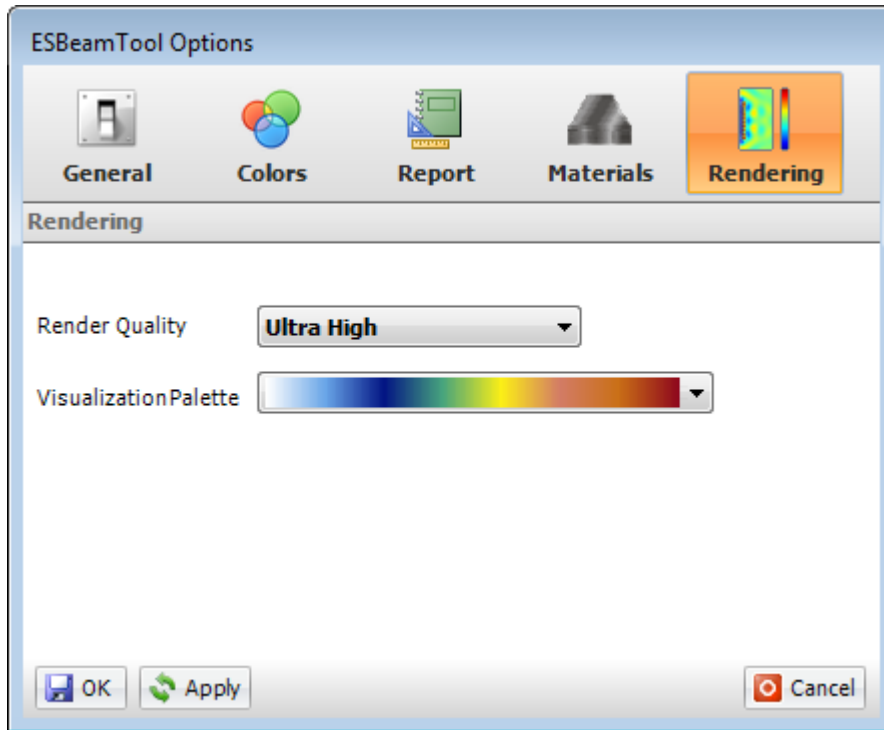
Clicking on the Animations button  will open up the drop down menu.



Position	<p>The current position of the animation in micro seconds. To change the range (start, stop) of the animation playback , simply grab and move the slider control.</p>  <p>The handles on the ends of the control  can be dragged back and forth to change the size of the range.</p>
Speed	Adjust the speed of the animation in micro seconds.
Loop	Allows the user to choose whether or not the animation will repeat when it reaches the end.

22.7.3.3 SOUND FIELD RENDERING OPTIONS

Below are options that can be accessed by selecting Tools → Options → Rendering.

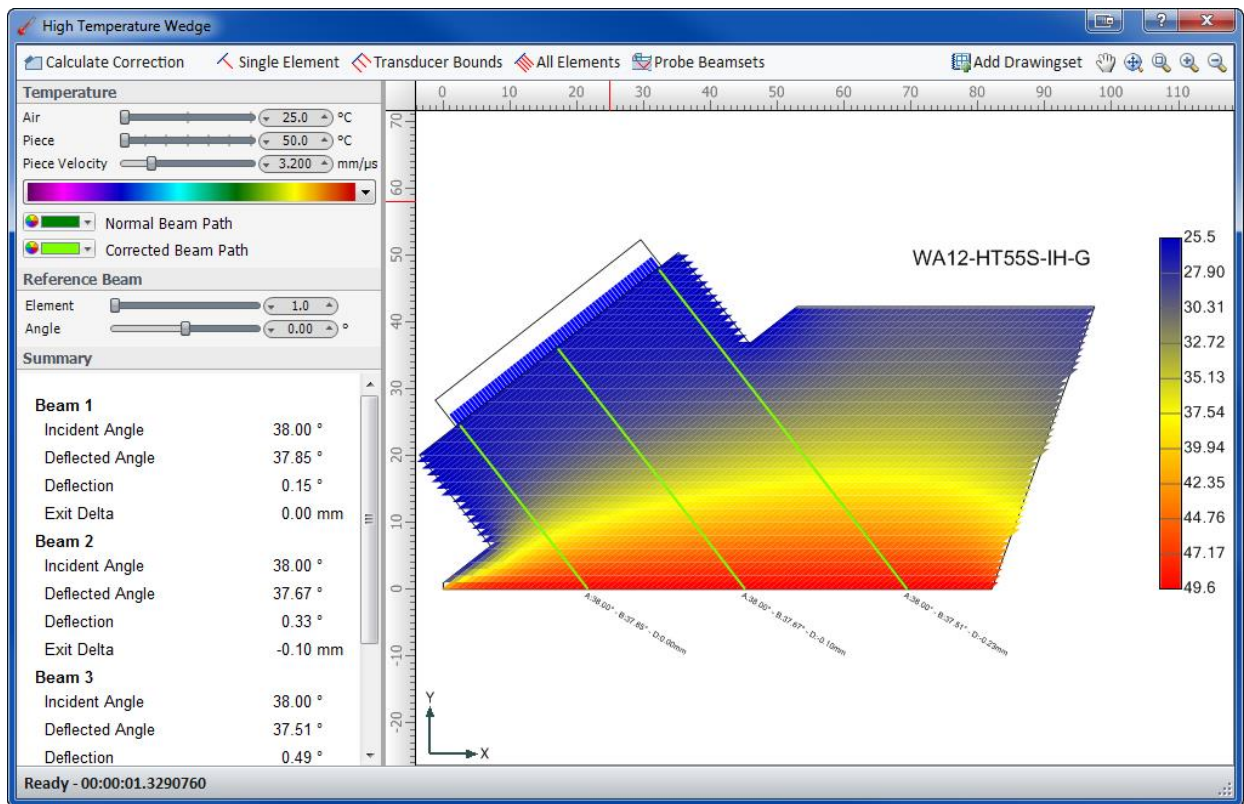



Render Quality	Allows the user to select the render quality. Render quality defines the number of pixels to be used in the render process. A higher quality setting here, will result in a longer render process for the Sound Field Animation.
Visualization Palette	Select different palettes to be used for rendering.

22.8 BEAMTOOL HIGHTEMP

The HighTemp module provides tools for simulation of inspecting high temperature subjects, including calculation of beam deflection due to temperature gradations effect on material velocity within the wedge.

These changes can be applied in BeamTool and new refracted angles and ray paths can be shown to the user as the actual ray path and refracted angles which will result as the effect of temperature gradient.



The High Temperature Wedge dialog box can be accessed by clicking on the arrow beside the High Temp icon  in the Wedge section of the [Phased Array Probe Configuration](#) menu only.



HighTemp Beam Path

Toggles on and off the view for the corrected HighTemp beam path in the workspace. When turned on, the original beam path is greyed out and the Corrected HighTemp beam path is bolded.



Import HighTemp Wedge

Wedge data can be imported into BeamTool from an available catalog. To import:

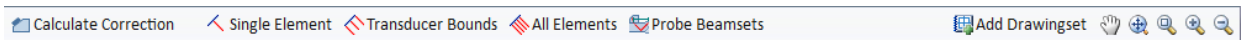
1. Press the **Import Wedge** button to display a list of available wedge configurations.
2. Select the wedge record to be used and press **Import**. The wedge data is now displayed in the Probe Configuration dialog.

Visualize HighTemp

Used to open the High Temperature Wedge dialog box after a HighTemp Wedge has been imported.

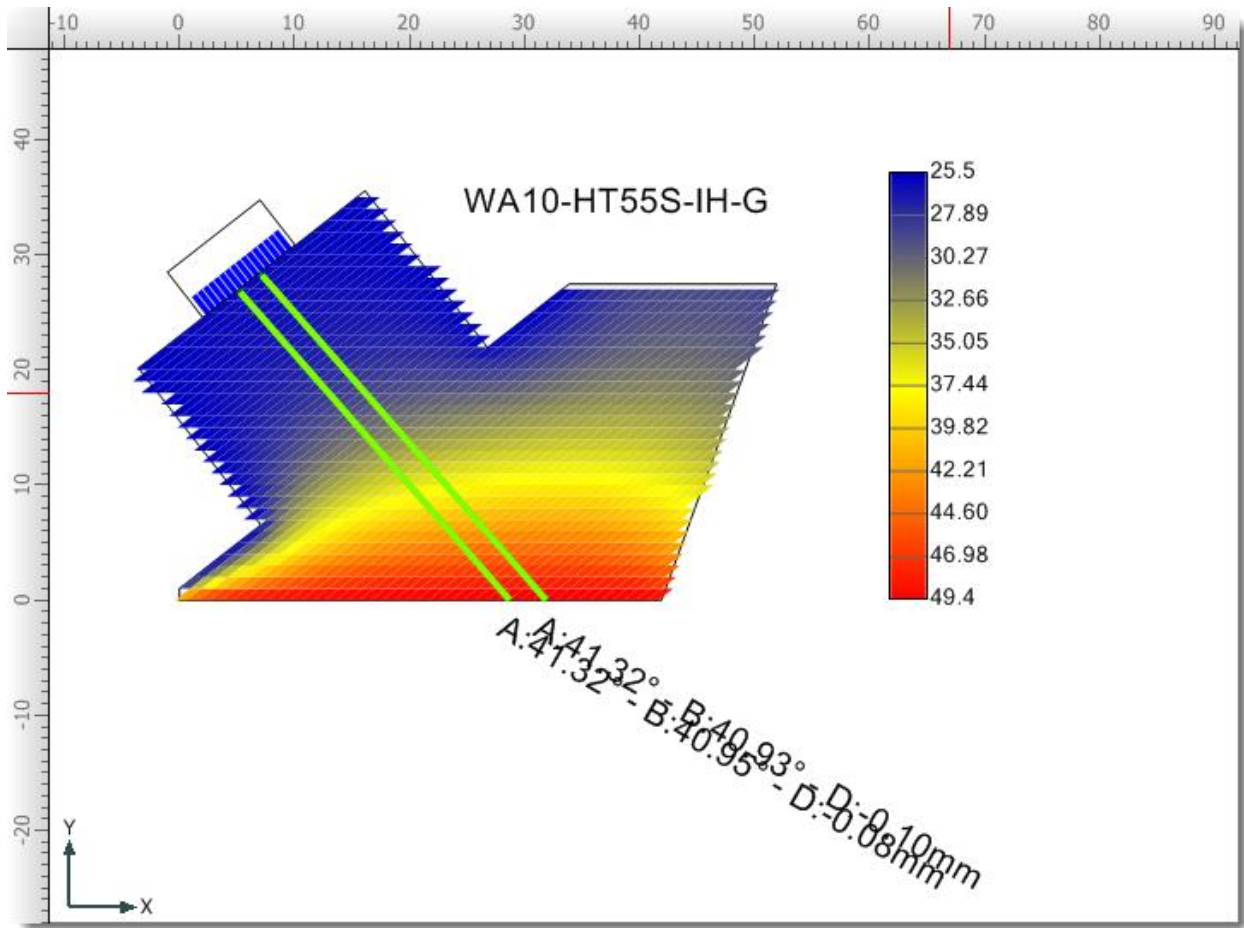
22.8.1 HIGH TEMPERATURE WEDGE TOOLBAR

The HighTemp Wedge Toolbar provides quick and easy access to some common HighTemp management tools



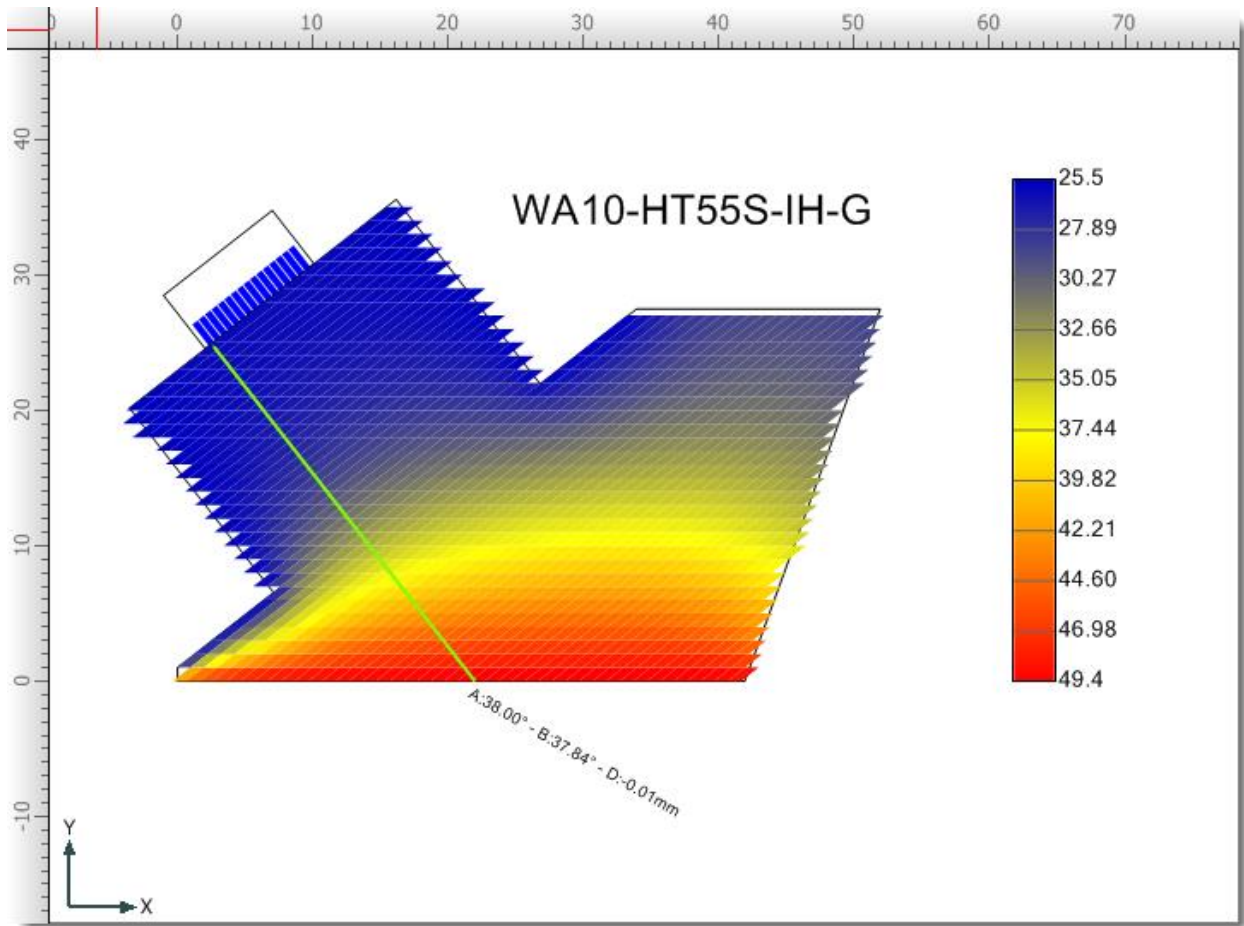
Calculate Correction

Calculates the beam path correction factors for all of the probes beamsets.



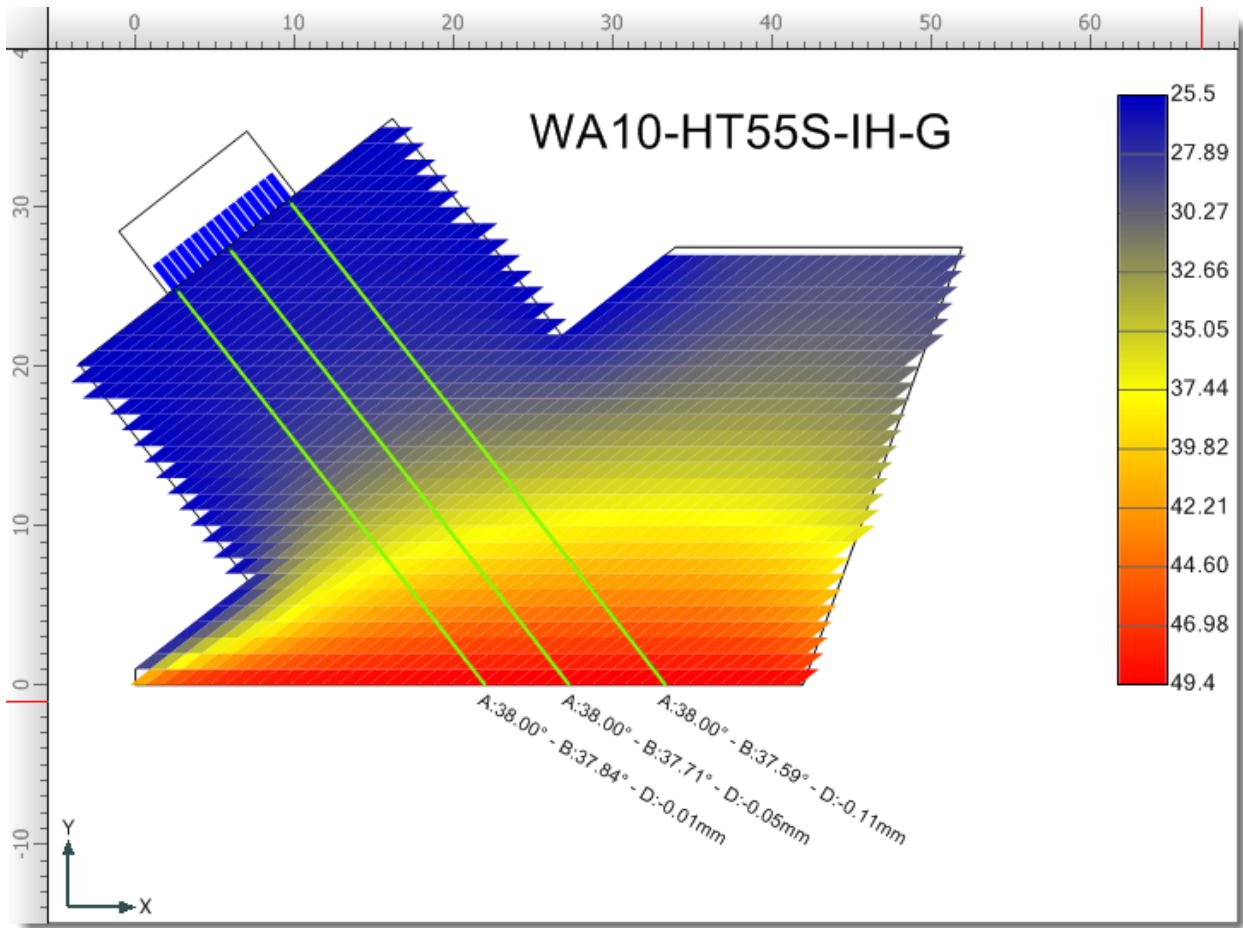
 **Single Element**

Render a single element at the angle specified.



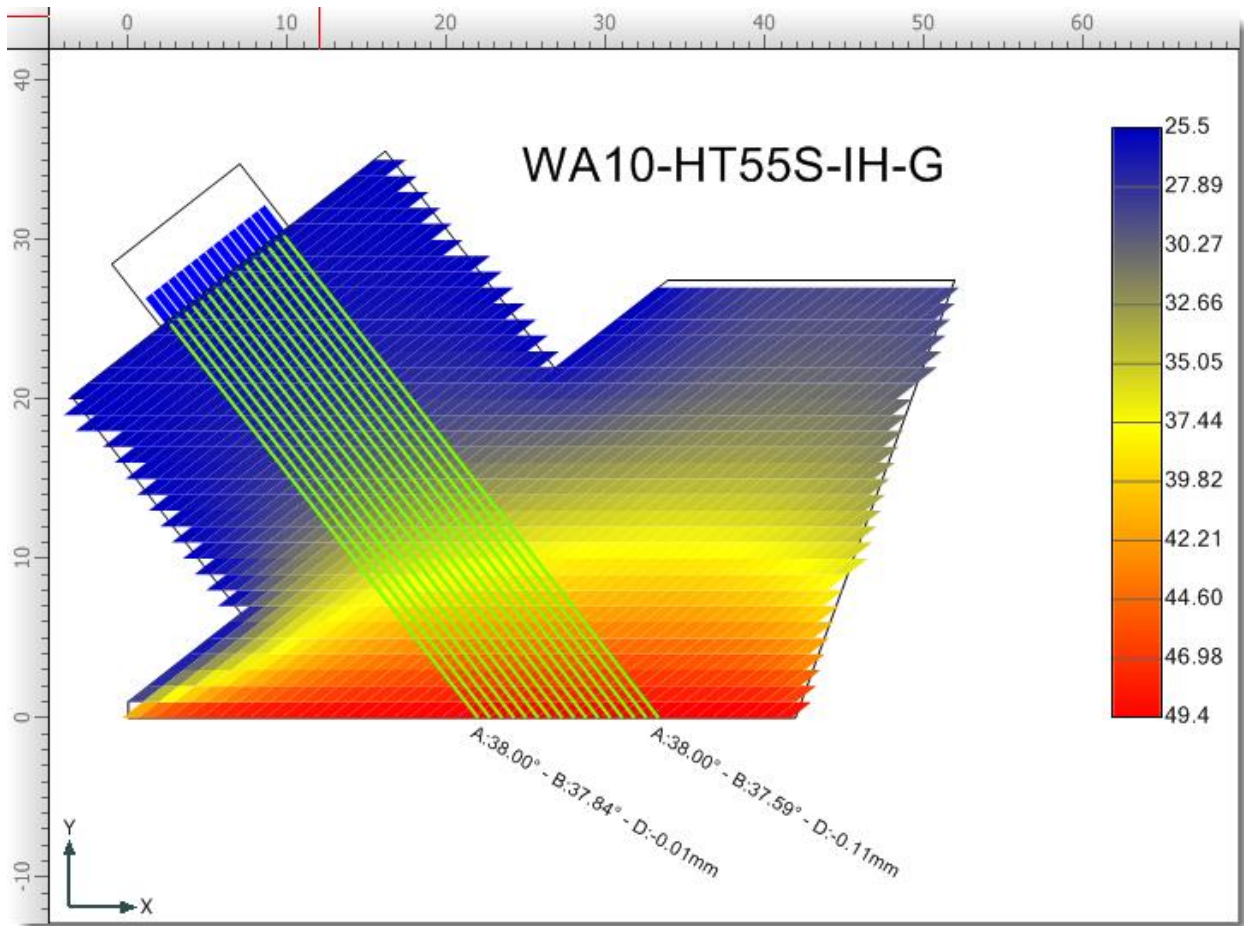
Transducer Bonds

Render beams at the first and last element and from the center of the array at the angle specified.



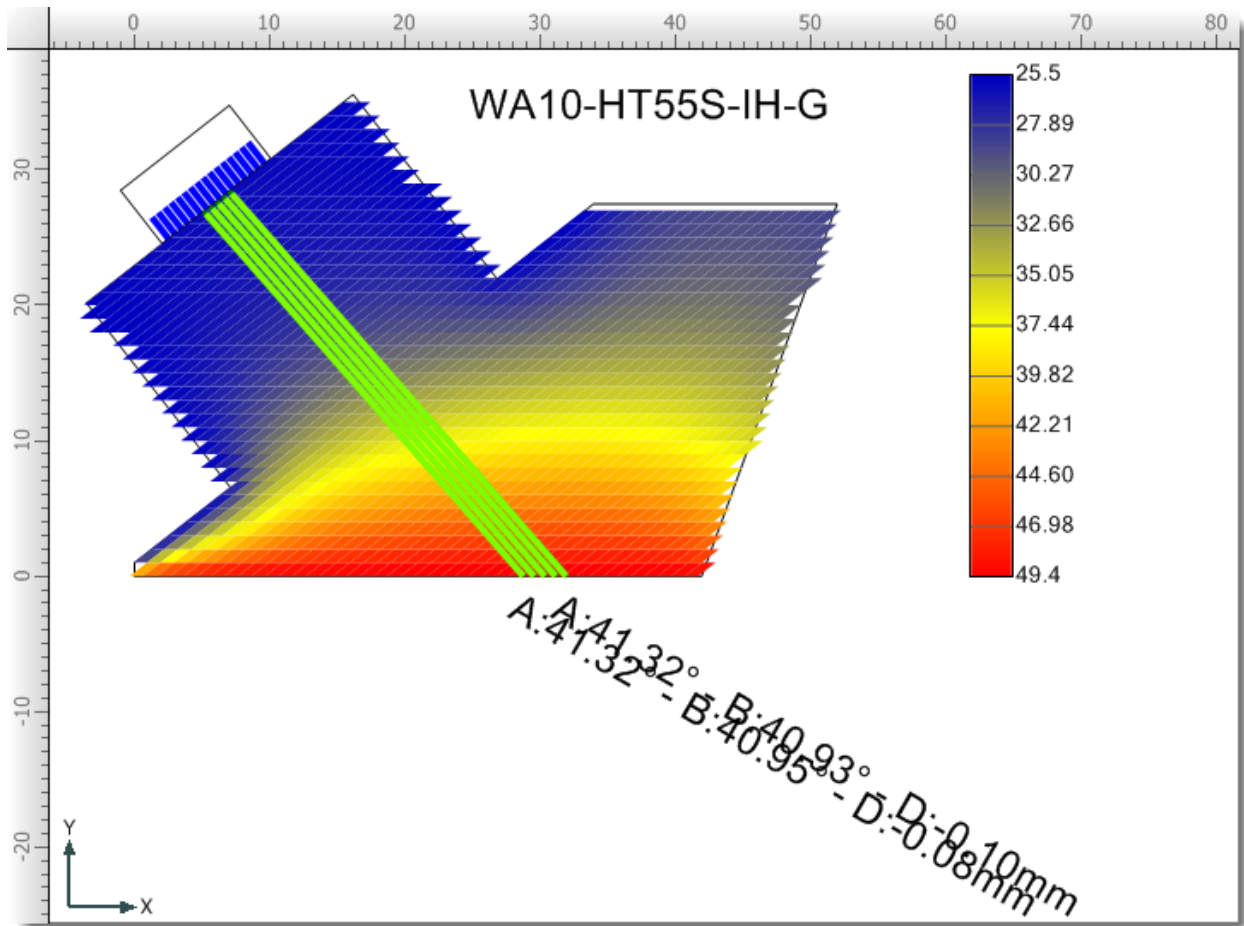
 All Elements

Render a beam for each element in the array at the angle specified.



Probe Beamsets

Render a beam path for each of the probes beamsets.



Add Drawingset

Brings up the Drawing Properties dialog box where you can name and describe a drawing you want to add. After the drawing properties have been defined, the selected drawing will be available from the Active Drawing drop-down menu found on the [Main Toolbar](#). See [Drawings](#) for more information on working with Drawings.

Pan Drawing

Puts the cursor in panning mode allowing the user to pan around the drawing. You can also pan by holding down the scroll wheel and dragging and dropping using the mouse

Zoom Fit


Fits and centers the drawing in the current displayable drawing area (workspace). (Ctrl+F)

Zoom Window

Specify an area in the drawing to be zoomed into by holding down the left mouse button and dragging the mouse to select the area.

Zoom In

Zooms into the drawing. The user can also scroll up using their mouse wheel to zoom in. (Page Up)

 **Zoom Out**

Zooms out of the drawing. The user can also scroll down using their mouse wheel to zoom out. (Page Down)

22.8.2 HIGH TEMPERATURE WEDGE OPTIONS

Options specific to the High Temperature Wedge dialog box are described below. The HighTemp wedge display will update on the fly as the values are modified.

Temperature Options

Air - temperature control for the air surrounding the wedge

Piece - temperature control for the piece

Pallet Picker - provides a list of predefined pallets for visualizing temperature in the HighTemp Wedge display

Normal Beam Path - selects the color used to display the Normal Beam Path in the HighTemp Wedge display

Corrected Beam Path - selects the color used to display the Corrected Beam Path in the HighTemp Wedge display

Reference Beam Options

Element - specifies the number of the element used when rendering a single element at the angle specified.

Angle - specifies the angle at which the beams are projected from the elements.

Summary Section

The summary section will displays relevant High Temperature calculations, based on the rendering selection from the toolbar. This information includes the Incident Angle, Deflected Angle, Deflection, Exit Delta, Average Deflection and Average Exit Delta.

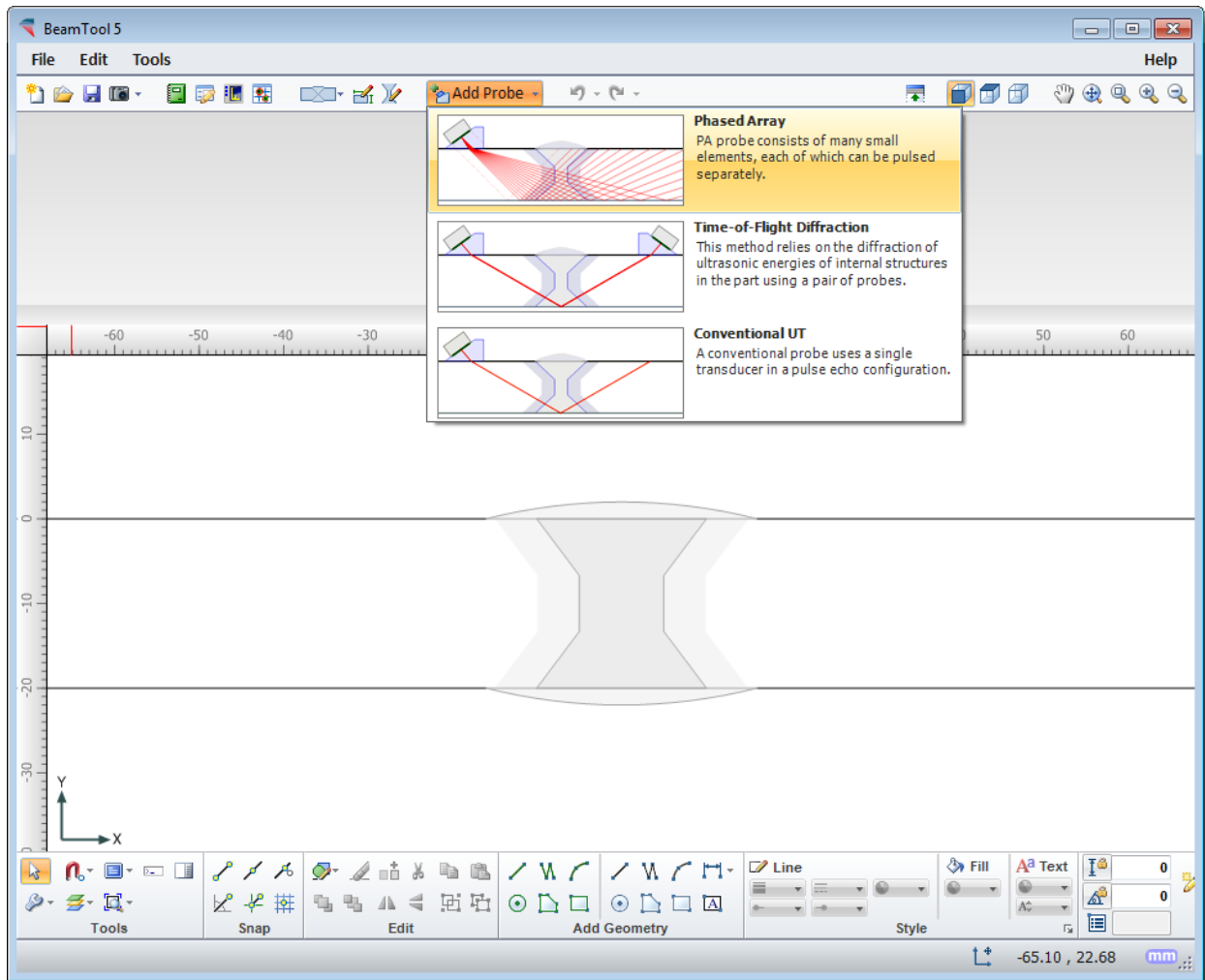
Summary	
Beam 3	
Incident Angle	41.32 °
Deflected Angle	41.16 °
Deflection	0.15 °
Exit Delta	-0.07 mm
Beam 4	
Incident Angle	41.32 °
Deflected Angle	41.15 °
Deflection	0.16 °
Exit Delta	-0.07 mm
Summary	
Average Deflection	0.15 °
Average Exit Delta	-0.06 mm




22.8.3 HIGH TEMPERATURE LESSON

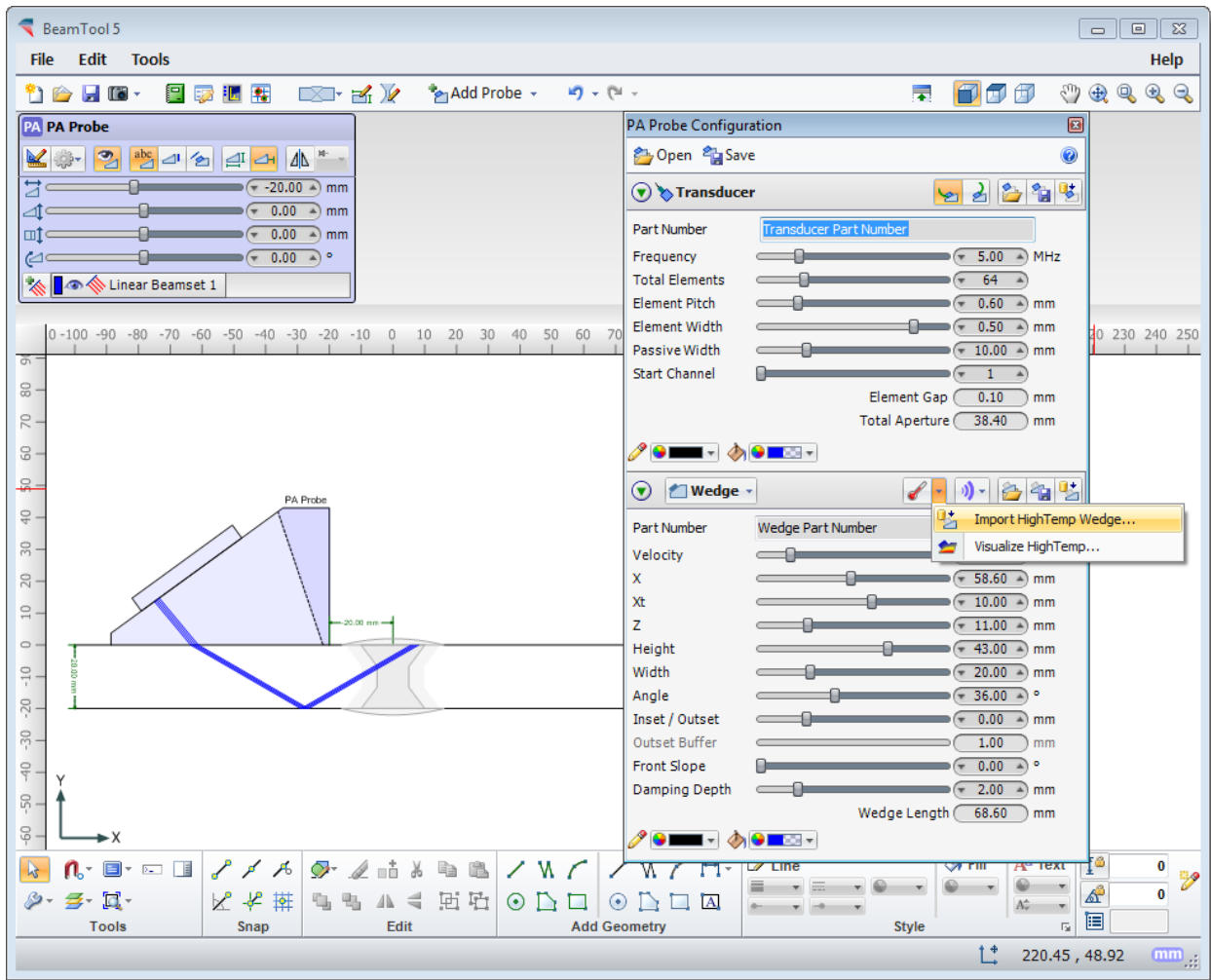
In this lesson we will demonstrate the High Temperature Add-on functionality in BeamTool. In order to proceed with this lesson you must have purchased the HighTemp Add-on module. Please refer to the [Add-Ons](#) section to learn how to purchase High Temp.

Now that you have your HighTemp license activated let's put it to work.

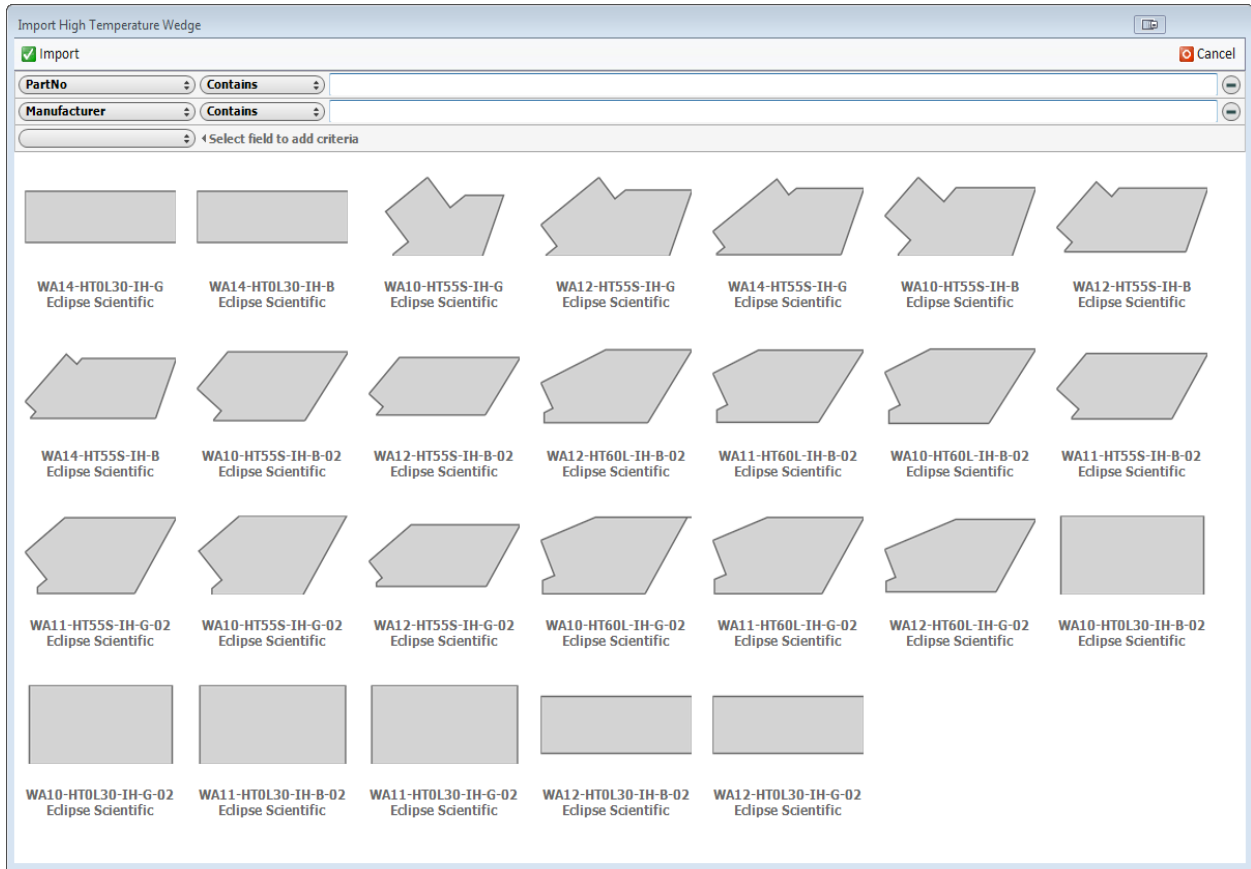
For this lesson we will start out with the default Plate Piece geometry and add a Phased Array Probe with a Linear Beamset (Using 12 Aperture Elements and 5 Beams).



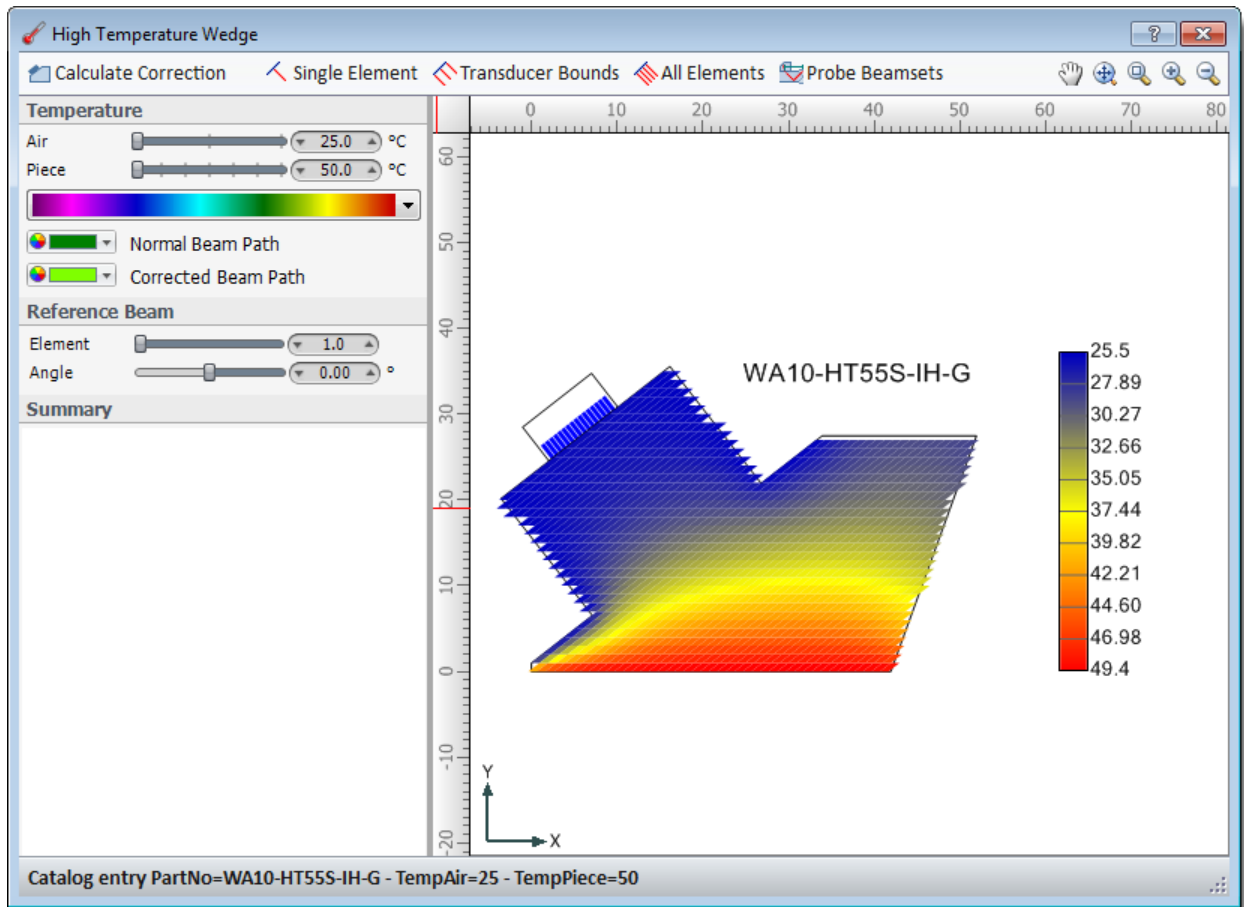
Click on the  Probe Configuration icon in the PA Probe Group to launch the PA Probe Configuration dialog. In the Wedge section of the PA Probe Configuration dialog, click on the arrow next to the  High Temp icon. Select  Import HighTemp Wedge from the drop down menu.



Select one of the High Temperature Wedges from the catalog and click on the Import button.



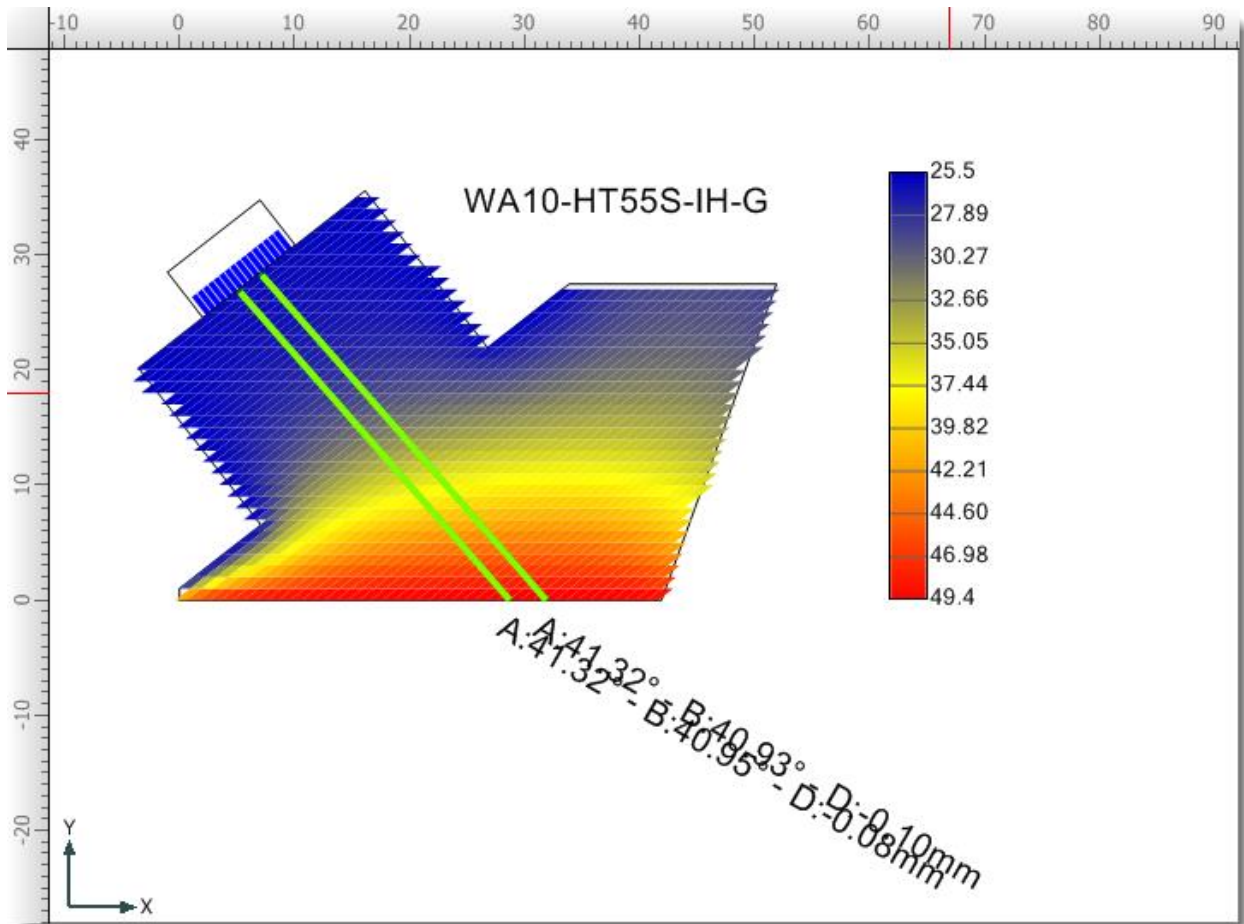
For this lesson we have selected the WA10-HT55S-IH-G, and we are using a Transducer with 16 total elements. Once you have selected the HighTemp Wedge to be imported, the High Temperature Wedge dialog box will open.



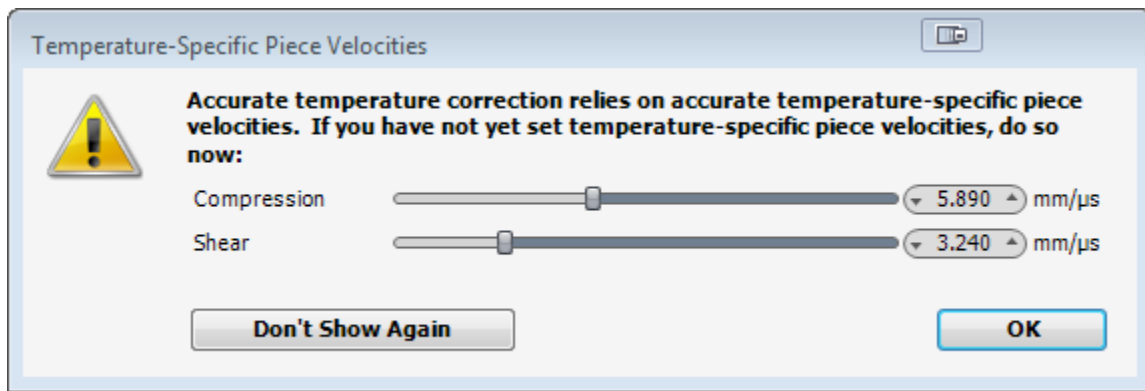
Use the HighTemp Wedge Toolbar to render various beam paths.

Calculate Correction

Calculates the beam path correction factors for all of the probes beamsets.

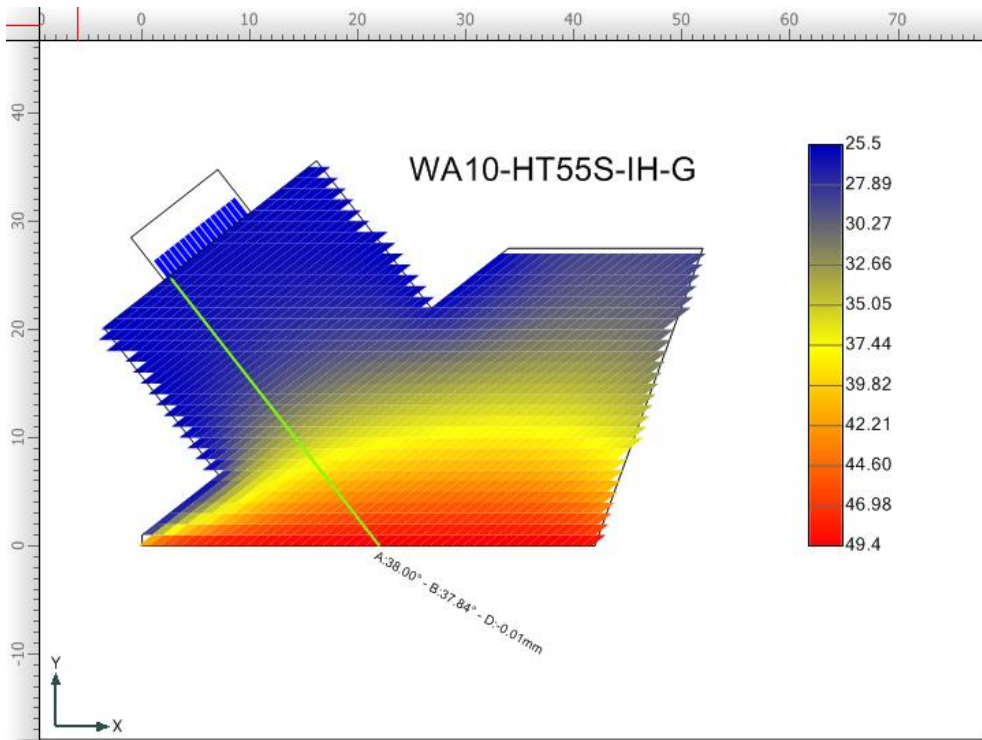



When this button is first clicked a pop-up window will come up to remind the user to set accurate temperature-specific piece velocities.



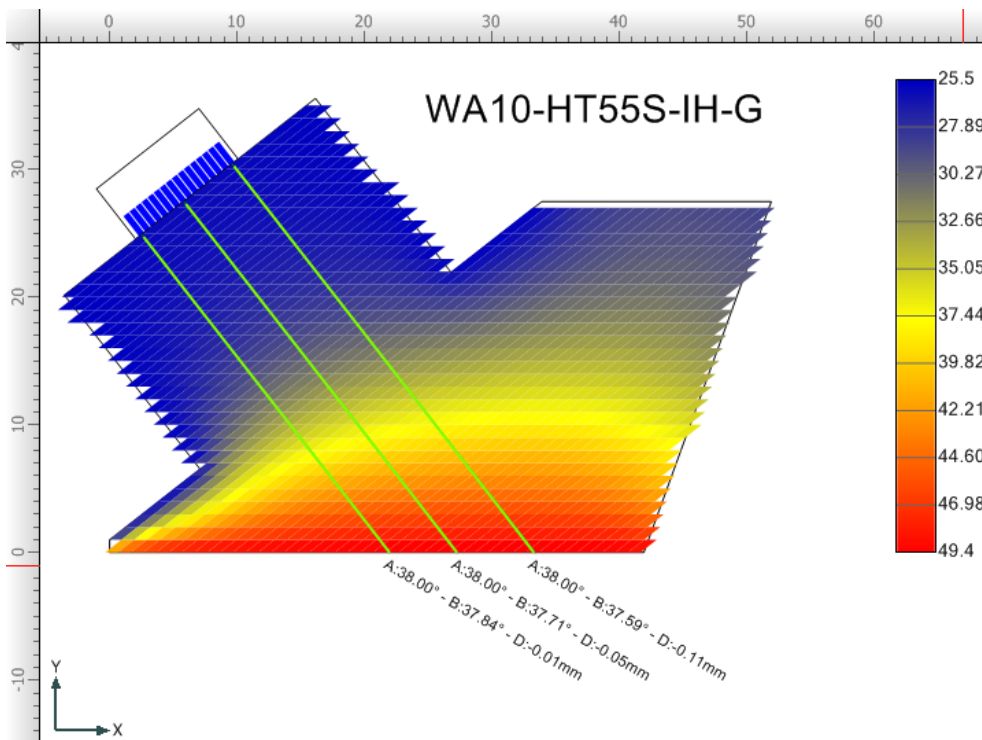
 **Single Element**


Render a single element at the angle specified.



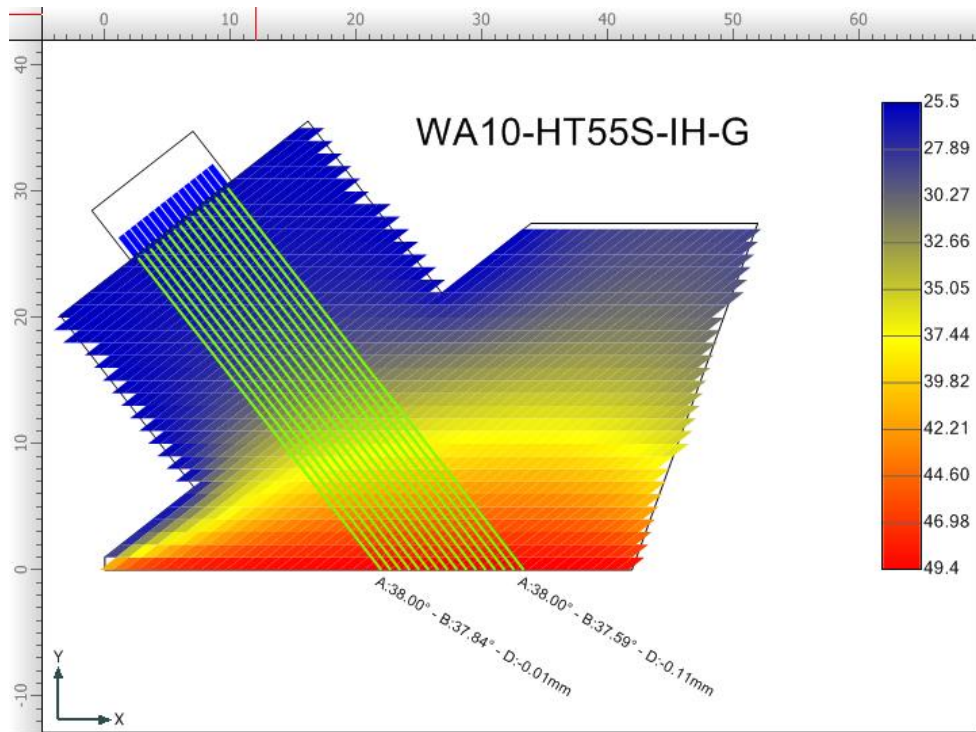
 **Transducer Bonds**

Render beams at the first and last element and from the center of the array at the angle specified.



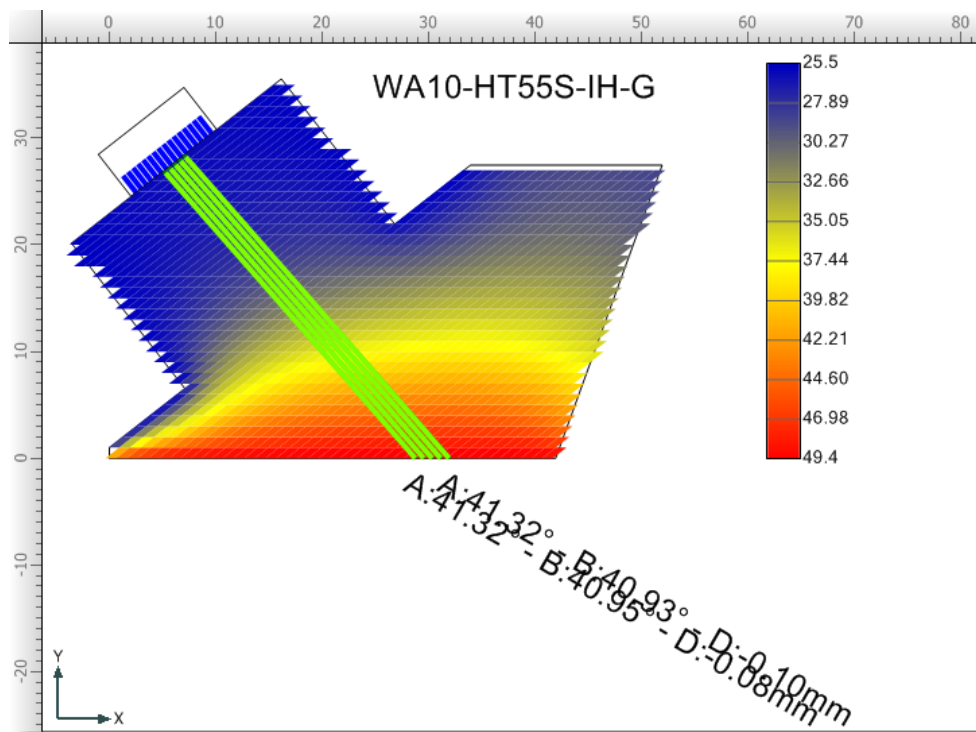
 **All Elements**


Render a beam for each element in the array at the angle specified.

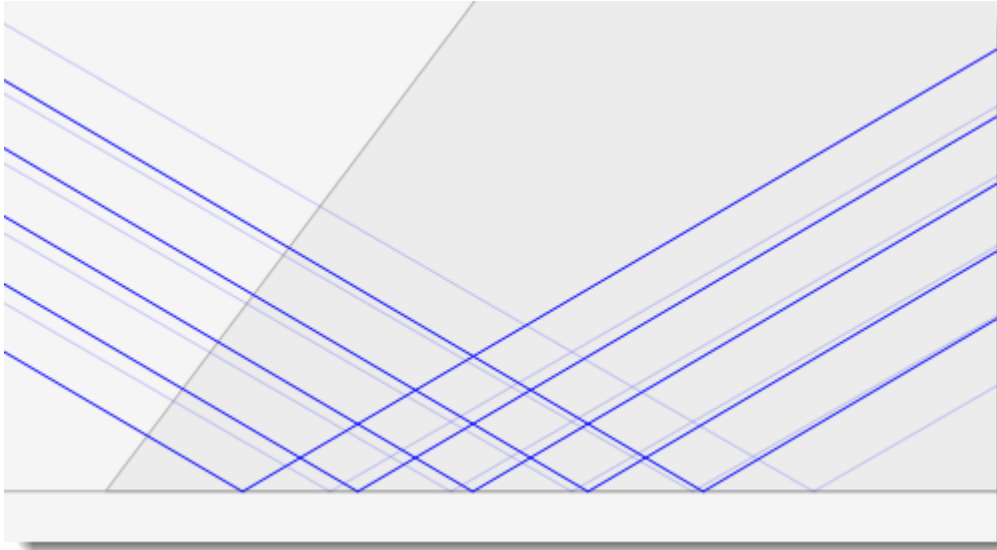


 **Probe Beamsets**

Render a beam path for each of the probes beamsets.



To visualize the corrected HighTemp Beam Path in your workspace, click on the  HighTemp icon in the PA Probe Configuration dialog box. When turned on, the original beam path is greyed out, and the HighTemp beam path is shown in bold.



22.10 ZONAL CALBLOCK DESIGNER

ZONAL CalBlock is an Add-on module that extends the capabilities of the already powerful BeamTool ray tracing and technique simulation application.

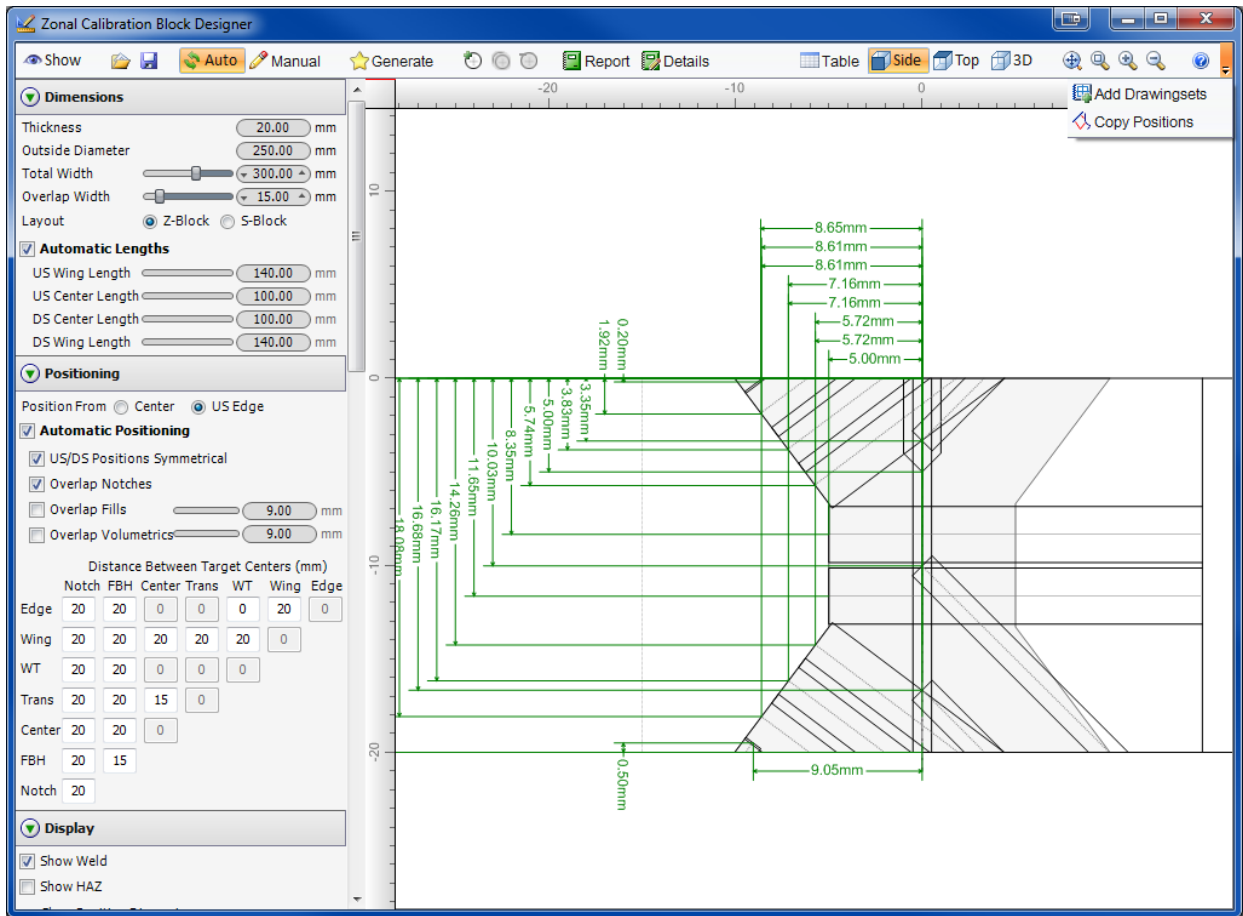
The ZONAL CalBlock module will provide the users with an expanded toolset for generating calibration block and wedge design drawings and documents.

If the user also owns the Zonal module, they will have the ability to produce a set of drawings automatically from their zonal configuration. The BeamTool Calibration Block Designer is a tool that is intended to automatically generate precise calibration block drawings. The generated drawings can be delivered to a machine shop for production.

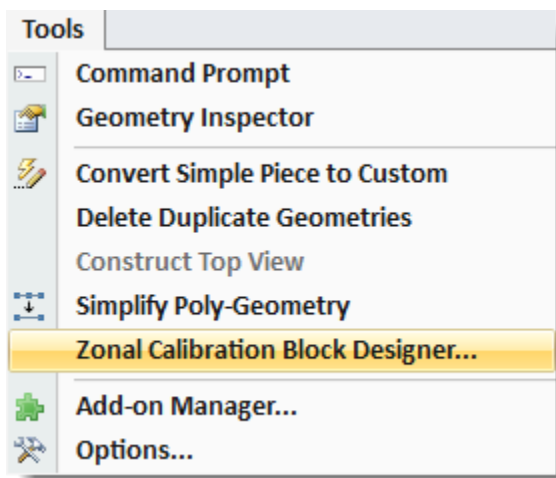
The ZONAL Calibration Block Designer utilizes the [Advanced Weld Editor](#), which provides the ability for users to define “regions” and “zones” within a weld bevel.

Weld regions and zones are constructed via customized algorithms, and are designed to provide optimized “full coverage” of a weld bevels’ fusion face and volume. The Advanced Weld Editor is a powerful tool which is discussed and documented elsewhere.

Taking advantage of optimized weld bevel zones, the Calibration Block Designer provides the ability for users to customize a calibration block that will include the necessary targets and notches to validate scanning procedures and techniques.

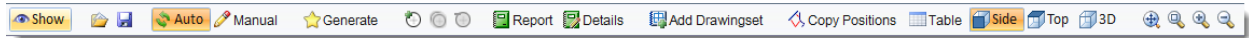


The ZONAL CalBlock Designer can be accessed by clicking on the Tools Menu and selecting Zonal Calibration Block Designer from the drop down menu.



22.10.1 ZONAL CALBLOCK DESIGNER TOOLBAR

The ZONAL CalBlock Designer toolbar provides quick and easy access to some common management tools, various information tools and dialogs.



Show

This will toggle the display of the Zonal CalBlock targets on the CAD workspace.

Import

Loads a Cal Block Designer export file, and overwrites the current configuration.

Export

Loads a Cal Block Designer export file, and overwrites the current configuration.

Auto

When in Auto Generation mode, the targets are automatically regenerated whenever the piece, zones or cal block options are modified. In this mode, targets are always kept in sync with their defining inputs. Modifications to generated targets (through the target Table) are not permitted, as any updates would be lost during the next automatic generation.

Manual

When in Manual Generation mode, the targets are not regenerated when modifications are made to piece, zones or cal block options. Instead, the targets can be manually regenerated by using the Generate button. Generated targets can be modified through Table mode, because regeneration will not occur automatically and will not overwrite any edits.

Generate


Manually generates the CalBlock targets from the Auto target options.

Add Manual

Opens the Add Manual Target dialog for adding custom targets.

Clone Manual

Clones the selected manual target.

 **Remove Manual**

Removes the selected manual target.

 **Report**

Generate CalBlock Reports documenting the weld regions and targets. Use the Calibration Info to populate additional properties.

 **Report Details**


Zonal Calibration Block Report Details dialog opens a database of additional fields that can be populated by the user and included on reports.

 **Add Drawingset**

Brings up the Drawing Properties dialog box where you can name and describe a drawing you want to add. After the drawing properties have been defined, the selected drawing will be available from the Active Drawing drop-down menu found on the [Main Toolbar](#). See [Drawings](#) for more information on working with Drawings.


 **Copy Positions**

Copies the currently configured top positions to the selected Zonal Beamsets, setting the appropriate Rotary Positions

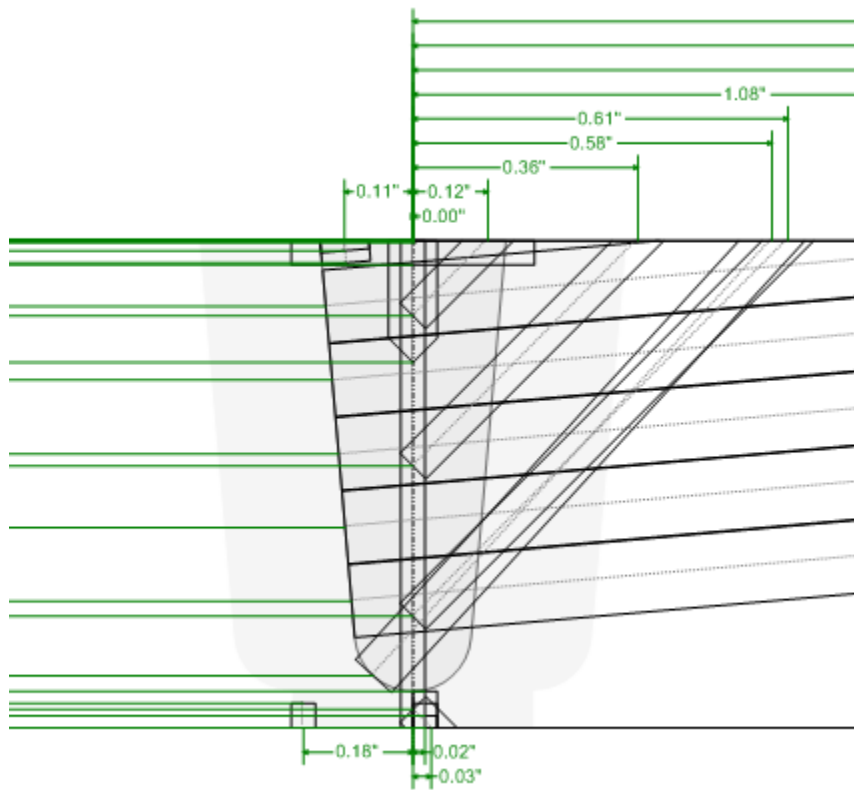
 **Table View**

Displays the targets in a Table View and activates the options for adding and deleting manual targets.

Name	Type	Stream	Position	X	Y	Width	Length	Depth	Angle	Notch Angle	Radiused
F5	Fill	Upstream	40.00	-3.58	-2.71	3.00	3.00	18.65	85.00	0.00	<input type="checkbox"/>
F4	Fill	Upstream	55.00	-3.32	-5.73	3.00	3.00	18.39	85.00	0.00	<input type="checkbox"/>
F3	Fill	Upstream	70.00	-3.05	-8.75	3.00	3.00	18.12	85.00	0.00	<input type="checkbox"/>
F2	Fill	Upstream	85.00	-2.79	-11.78	3.00	3.00	17.86	85.00	0.00	<input type="checkbox"/>
F1	Fill	Upstream	100.00	-2.52	-14.80	3.00	3.00	17.59	85.00	0.00	<input type="checkbox"/>
HP	HotPass	Upstream	115.00	-1.62	-17.87	2.00	2.00	24.24	42.50	0.00	<input type="checkbox"/>
New Hot Pass	HotPass	Upstream	130.00	0.00	-0.10	0.10	0.10	0.10	0.00	0.00	<input type="checkbox"/>
V3	Volumetric	Upstream	160.00	0.00	-3.08	1.50	1.50	4.36	45.00	0.00	<input type="checkbox"/>
V2	Volumetric	Upstream	175.00	0.00	-9.25	1.50	1.50	13.08	45.00	0.00	<input type="checkbox"/>
V1	Volumetric	Upstream	190.00	0.00	-15.42	1.50	1.50	21.80	45.00	0.00	<input type="checkbox"/>
VR	VolumetricRoot	Upstream	205.00	0.00	-19.25	1.50	1.50	1.06	45.00	0.00	<input type="checkbox"/>
TOFD OD	TOFD	Upstream	220.00	0.00	-5.00	2.00	10.00	5.00	0.00	44.50	<input type="checkbox"/>
Trans OD	Transverse	Upstream	235.00	0.00	-1.00	10.00	2.00	1.00	0.00	0.00	<input checked="" type="checkbox"/>
CN 1.0	CapNotch	Upstream	250.00	-3.82	0.00	2.00	10.00	1.00	5.00	0.00	<input checked="" type="checkbox"/>
RN 1.0	RootNotch	Upstream	250.00	0.00	-20.00	1.00	10.00	1.00	0.00	0.00	<input checked="" type="checkbox"/>
CN 0.5	CapNotch	Upstream	265.00	-3.82	0.00	2.00	10.00	0.50	5.00	0.00	<input checked="" type="checkbox"/>
RN 0.5	RootNotch	Upstream	265.00	0.00	-20.00	1.00	10.00	0.50	0.00	0.00	<input checked="" type="checkbox"/>
Center	Center	Center	280.00	0.00	0.00	1.00	5.00	20.00	0.00	0.00	<input type="checkbox"/>
CN 0.5	CapNotch	Downstream	295.00	3.82	0.00	2.00	10.00	0.50	5.00	0.00	<input checked="" type="checkbox"/>
RN 0.5	RootNotch	Downstream	295.00	0.00	-20.00	1.00	10.00	0.50	0.00	0.00	<input checked="" type="checkbox"/>
CN 1.0	CapNotch	Downstream	310.00	3.82	0.00	2.00	10.00	1.00	5.00	0.00	<input checked="" type="checkbox"/>
RN 1.0	RootNotch	Downstream	310.00	0.00	-20.00	1.00	10.00	1.00	0.00	0.00	<input checked="" type="checkbox"/>
VR	VolumetricRoot	Downstream	325.00	0.00	-19.25	1.50	1.50	1.06	45.00	0.00	<input type="checkbox"/>
V1	Volumetric	Downstream	340.00	0.00	-15.42	1.50	1.50	21.80	45.00	0.00	<input type="checkbox"/>
V2	Volumetric	Downstream	355.00	0.00	-9.25	1.50	1.50	13.08	45.00	0.00	<input type="checkbox"/>
V3	Volumetric	Downstream	370.00	0.00	-3.08	1.50	1.50	4.36	45.00	0.00	<input type="checkbox"/>
HP	HotPass	Downstream	400.00	1.62	-17.87	2.00	2.00	24.24	42.50	0.00	<input type="checkbox"/>
F1	Fill	Downstream	415.00	2.52	-14.80	3.00	3.00	17.59	85.00	0.00	<input type="checkbox"/>
F2	Fill	Downstream	430.00	2.79	-11.78	3.00	3.00	17.86	85.00	0.00	<input type="checkbox"/>
F3	Fill	Downstream	445.00	3.05	-8.75	3.00	3.00	18.12	85.00	0.00	<input type="checkbox"/>
F4	Fill	Downstream	460.00	3.32	-5.73	3.00	3.00	18.39	85.00	0.00	<input type="checkbox"/>
F5	Fill	Downstream	475.00	3.58	-2.71	3.00	3.00	18.65	85.00	0.00	<input checked="" type="checkbox"/>

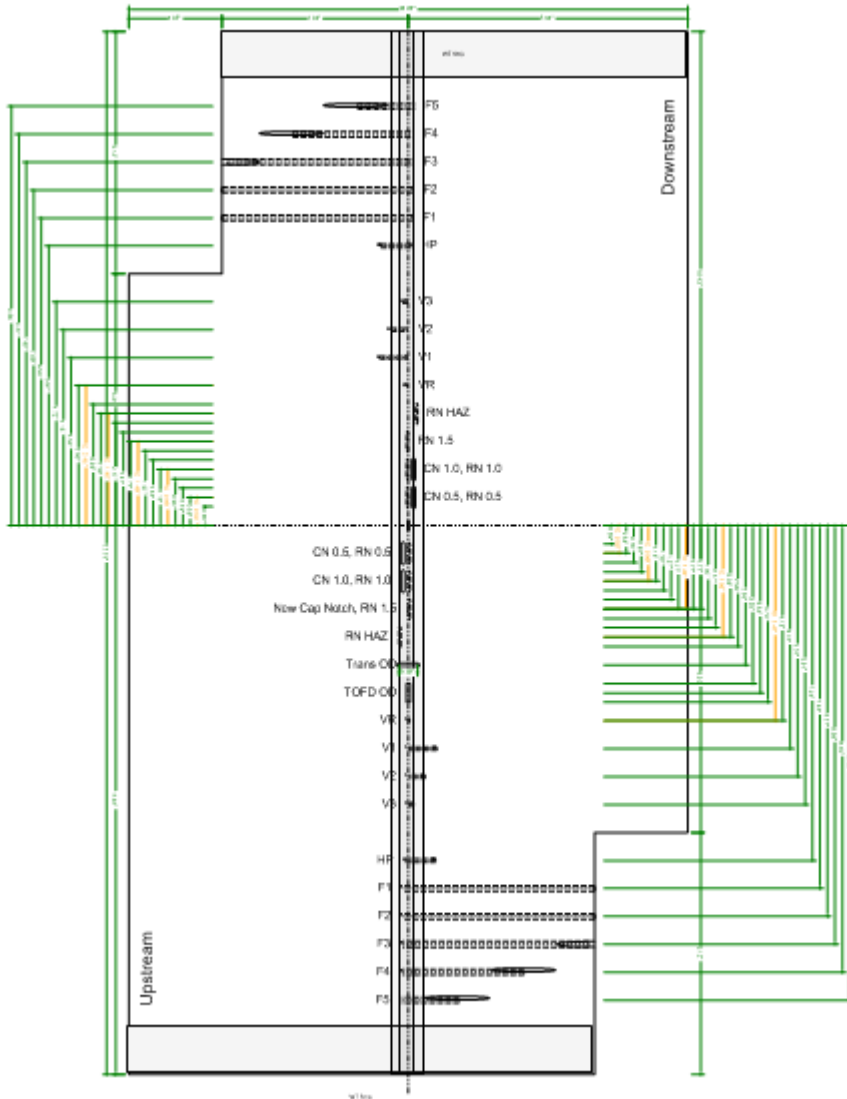
 **Display Side View**

Displays the drawing as a side view.



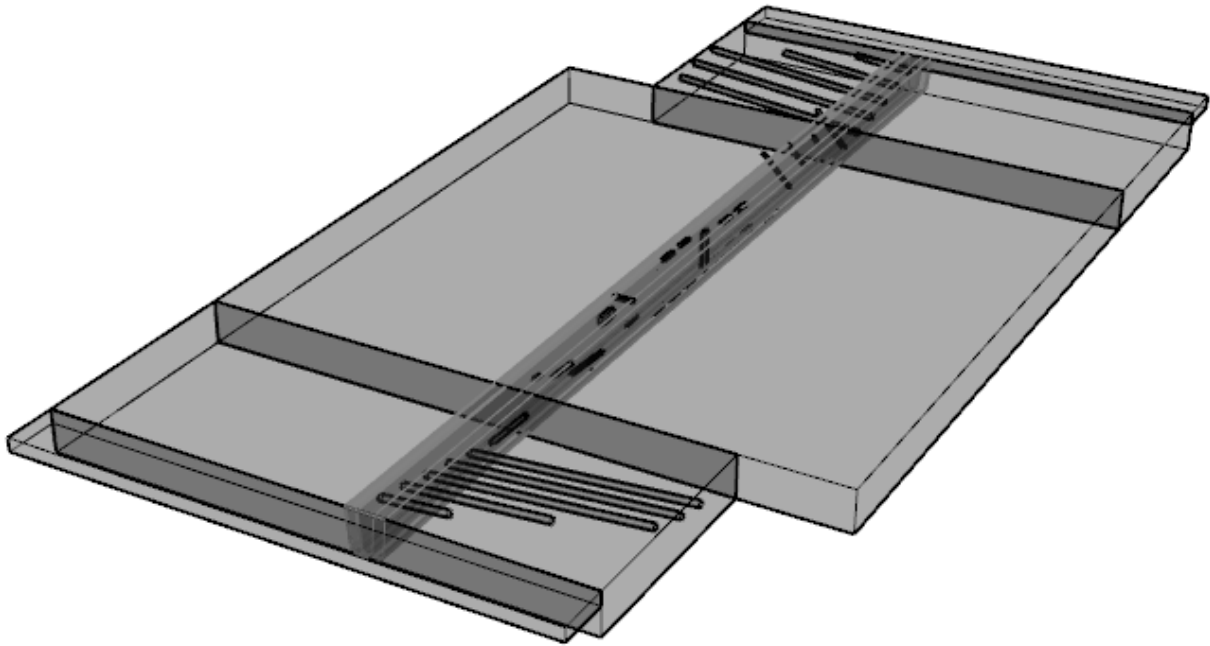
 **Display Top View**

Displays the drawing as a top view.




 **Display 3D View**

Displays the drawing as a [3D View](#).

 **Zoom Fit**

Fits and centers the drawing in the current displayable drawing area (workspace). (Ctrl+F)

 **Zoom Window**

Specify an area in the drawing to be zoomed into by holding down the left mouse button and dragging the mouse to select the area.

 **Zoom In**

Zooms into the drawing. The user can also scroll up using their mouse wheel to zoom in. (Page Up)

 **Zoom Out**

Zooms out of the drawing. The user can also scroll down using their mouse wheel to zoom out. (Page Down)

22.10.2 ZONAL CALBLOCK SIDEBAR MENU

The Zonal CalBlock Sidebar Menu how the automatic targets are generated and various options for modifying these targets and other parameters related to the calibration block. The menu is divided into nine sections.

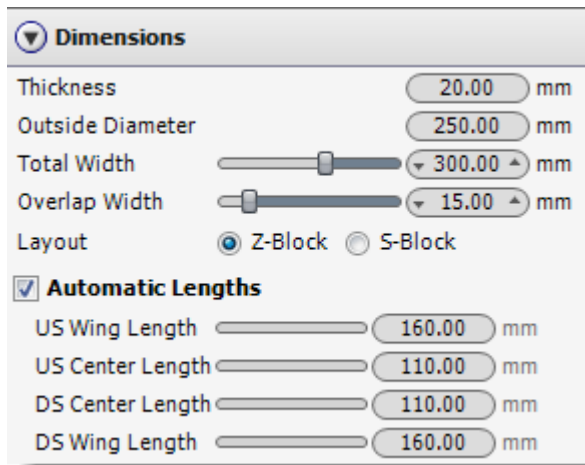
1. Dimensions
2. Positioning
3. Display
4. Notches
5. Fills
6. Volumetrics
7. TOFD
8. Transverse
9. Miscellaneous

Below are the values that can be set within the ZONAL CalBlock Sidebar Menu. To specify a value you can a) move the slider right or left, b) click the right or left value spinner or c) click on the value displayed in the value spinner and type a value. The active view will update on the fly as the values are modified.

 Toggles the view of the targets in Side View and Top View.

 Toggles the view of targets dimensions in Side View and Top View.

Dimensions



Dimensions

Thickness mm

Outside Diameter mm

Total Width mm

Overlap Width mm

Layout Z-Block S-Block

Automatic Lengths

US Wing Length mm

US Center Length mm

DS Center Length mm

DS Wing Length mm

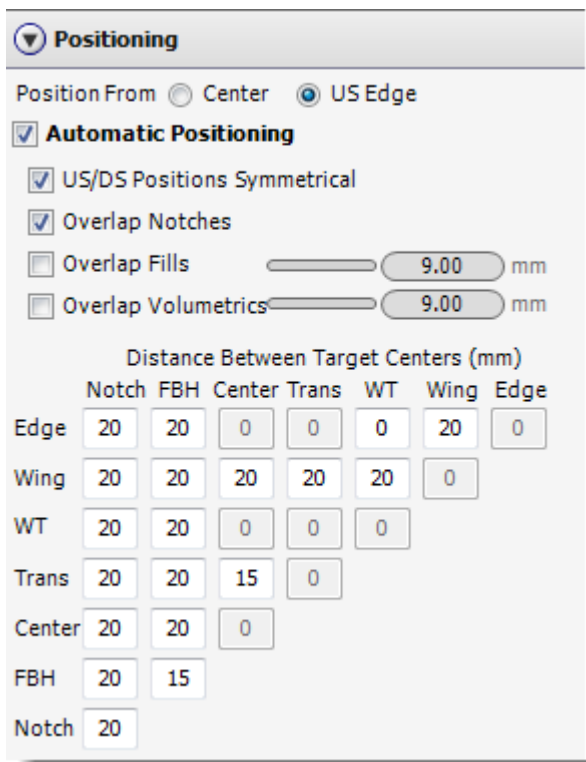
Dimensions Parameters

Thickness	The piece thickness.
Outside Diameter	The piece outside diameter
Total Width	Adjusts the overall width of the calibration block.
Overlap Width	Adjusts the overlap width of the calibration block.
Layout	Defines how the block wings should be oriented.

Automatic Lengths	Toggles the automatic length option, which determines block length based on min/max rotary positions.
US Wing Length	If Auto Length displays US wing length, otherwise allows adjustments.
US Center Length	If Auto Length displays US center section length, otherwise allows adjustments.
DS Center Length	If Auto Length displays DS center section length, otherwise allows adjustments.
DS Wing Length	If Auto Length displays DS wing length, otherwise allows adjustments.

Positioning

Options to help define circumferential position of targets.

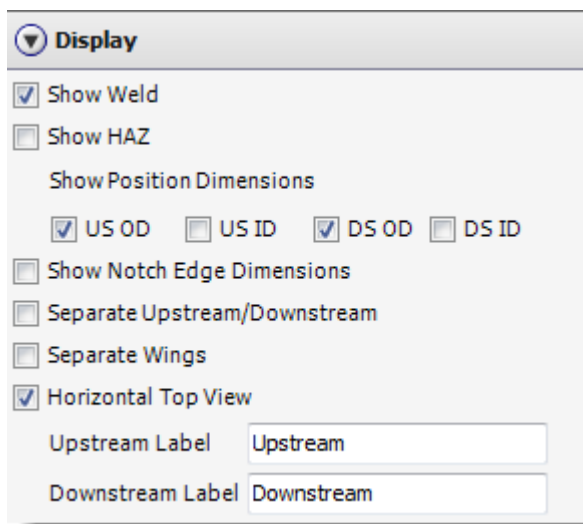


Positioning Parameters

Position From	Defines the reference point when rotary/top positions are added.
Automatic Positioning	Toggles on and off the Automatic Positioning option.
US/DS Positions Symmetrical	When positioning targets circumferentially this option will force symmetrical targets (i.e. V1 Up and V1 Down) to be the same distance from the center notch.
Overlap Notches	When positioning targets circumferentially this option will cause similar cap and root notches (i.e. CN 1.0 and RN 1.0) to be stacked vertically.
Overlap Fills	When positioning targets circumferentially this option will cause overlap fill targets that are no closer together than the specified threshold to be stacked vertically.

Overlap Volumetrics	When positioning targets circumferentially this option will cause volumetric targets that are no closer together than the specified threshold to be stacked vertically.
Edge	Represents the front and the back of the block
Wing	Represents the dividing line between the wings and center section
WT	Represents the wall thickness strip targets
Trans	Represents the transverse targets
Center	Represents the center notch target
FBH	Represents the flat bottom hole targets
Notch	Represents the notch type targets

Display



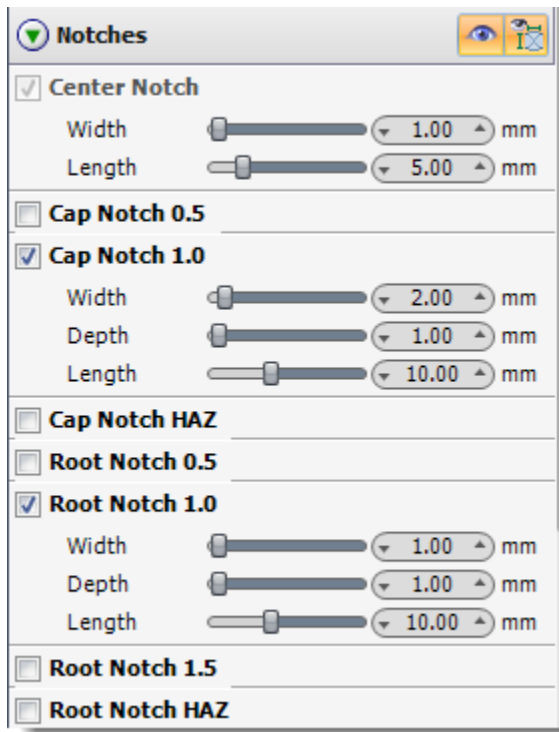
Display Parameters

Show Weld	Toggles the display of the weld in Side View, Top View and 3D View within Zonal CalBlock Designer.
Show HAZ	Toggles the display of the HAZ in Side View, Top View and 3D View within Zonal CalBlock Designer.
US OD	Toggles the display of upstream position dimensions on the outside diameter.
US ID	Toggles the display of upstream position dimensions on the inside diameter.
DS OD	Toggles the display of downstream position dimensions on the outside diameter.
DS ID	Toggles the display of downstream position dimensions on the inside diameter.
Show Notch Edge Dimensions	Adds additional dimensions for positioning points to the front and back edges of all notch targets
Separate Upstream/Downstream	Renders the US and DS center sections as separate components.
Separate Wings	Renders the wings of the block as separate components.
Horizontal Top View	Rotates the top view to be displayed with the weld centerline horizontally.
Upstream Label	Adds custom label to upstream section in Side View

Downstream Label	Adds custom label to downstream section in Side View
------------------	--

Notches

A notch is a machined reference target used for calibration or performance demonstration. Notch targets are defined by width, length and depth.

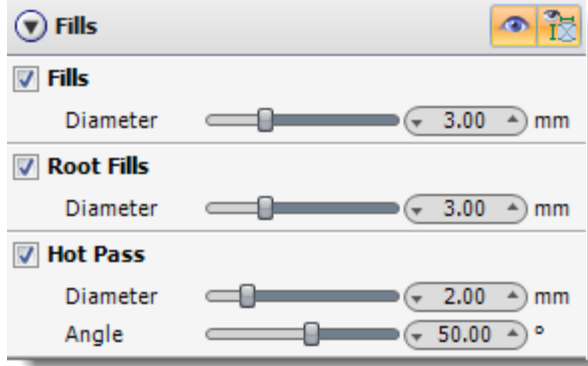


Notch Parameters

Notch Width	The dimension along the x axis of the target.
Notch Length	The dimension along the z axis of the target.
Notch Depth	The dimension from the ID or OD to the deepest point of the target.

Fills

A fill is a machined flat-bottom hole reference target that is positioned along the fusion face at a perpendicular angle. Fill targets are defined by width and angle.

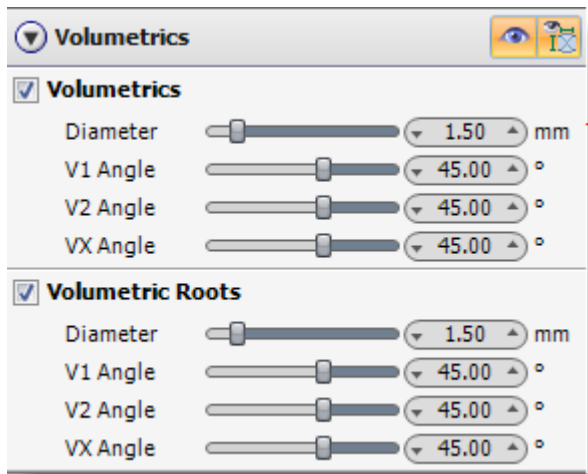


Fill Parameters

Fill Diameter	The diameter of the target.
Fill Angle	The angle as measured from the center line.

Volumetrics

A flat bottom hole that is positioned along the weld center line. Volumetric targets are defined by width, V1 Angle, V2 Angle and VX Angle.

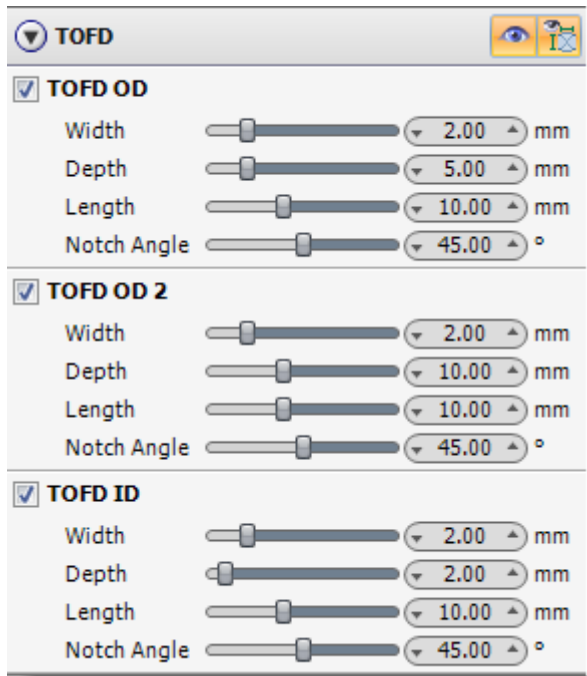


Volumetric Parameters

Volumetric Diameter	The diameter of the target.
V1 Angle	The angle from the center line for the first volumetric target.
V2 Angle	The angle from the center line for the second volumetric target.
VX Angle	The angle from the center line for any additional volumetric targets.

TOFD

A notch target centered along the weld center line. TOFD targets are defined by width, depth, length and V Angle.

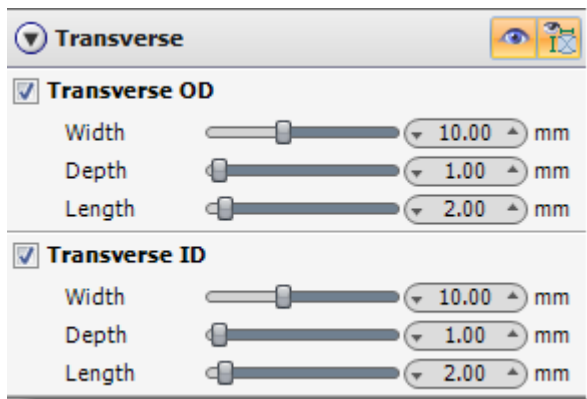


TOFD Parameters

Width	The dimension of the target on the x axis.
Depth	The dimension from the ID or OD to the deepest point of the target.
Length	The dimension of the target on the y axis.
Notch Angle	The angle of the apex at the bottom of the target.

Transverse

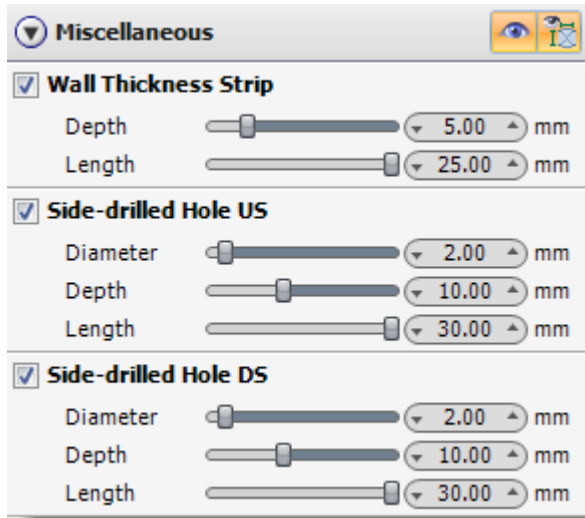
A notch target positioned perpendicular to the center line of the weld. Transverse targets are defined by width, depth and length.



Transverse Parameters

Transverse Width	The dimension along the x axis of the target.
Transverse Depth	The distance from the ID or OD to the deepest point of the target.
Transverse Length	The dimension along the z axis of the target.





Miscellaneous

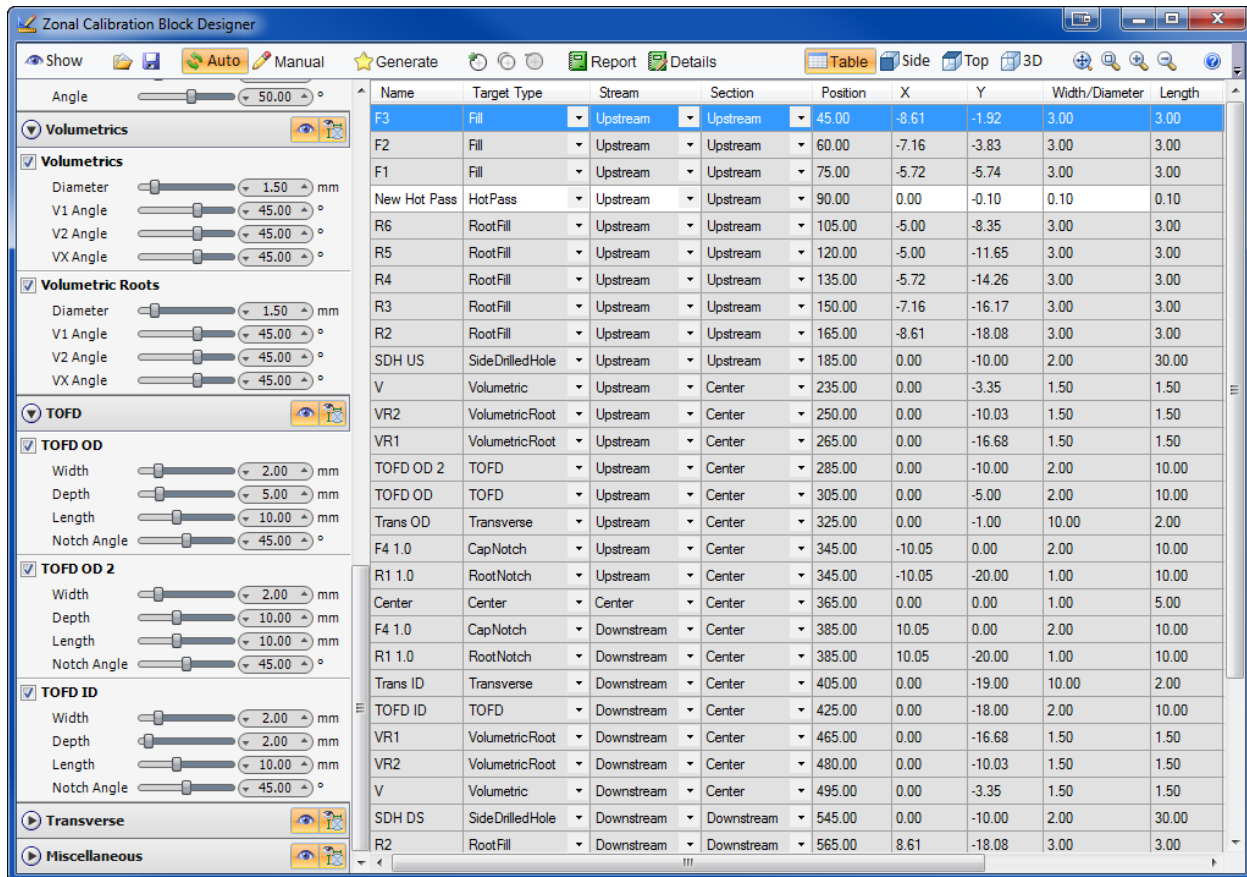


Miscellaneous Parameters

Wall Thickness Strip	Section attached to the end of each wing on the block. The wall thickness strip is defined by depth and length.
Wall Thickness Strip Depth	The dimension from the OD to the bottom of the strip as measured from the center of the length.
Wall Thickness Strip Length	The distance along the z axis
Side Drilled Holes	A hole that is drilled into the center section of the block, between the center section and a wing section. Side drilled holes are defined by diameter, depth and length.
Side Drilled Hole Diameter	Diameter of the side drilled hole.
Side Drilled Hole Depth	The distance from the OD to the center of the hole opening
Side Drilled Hole Length	The distance along the z axis from the edge of the center section to the bottom of the hole.



22.10.3 ADD VIEW & EDIT MANUAL TARGETS IN TABLE VIEW

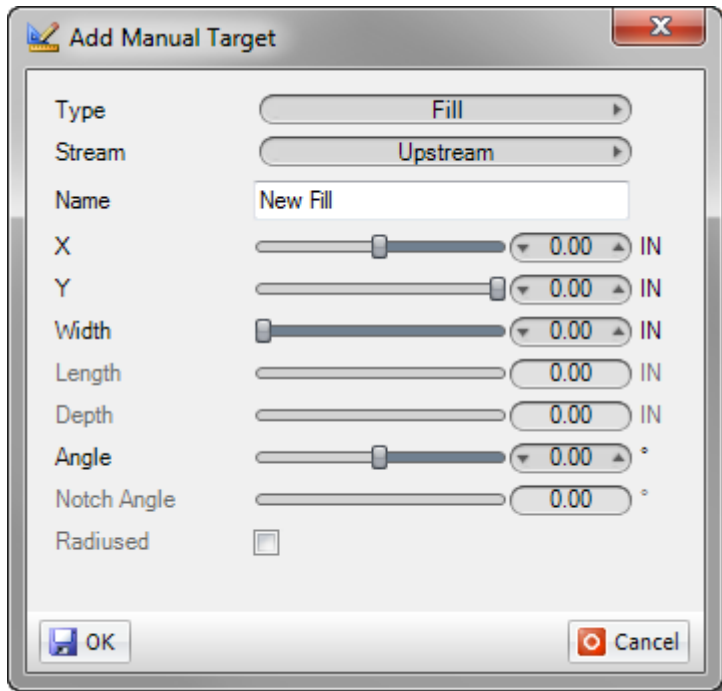
Clicking on the  Table button from the ZONAL CalBlock Designer toolbar will display all of the default targets in a table view and allow the user to ,  Clone and  Remove manual targets.



Name	Target Type	Stream	Section	Position	X	Y	Width/Diameter	Length
F3	Fill	Upstream	Upstream	45.00	-8.61	-1.92	3.00	3.00
F2	Fill	Upstream	Upstream	60.00	-7.16	-3.83	3.00	3.00
F1	Fill	Upstream	Upstream	75.00	-5.72	-5.74	3.00	3.00
New Hot Pass	HotPass	Upstream	Upstream	90.00	0.00	-0.10	0.10	0.10
R6	RootFill	Upstream	Upstream	105.00	-5.00	-8.35	3.00	3.00
R5	RootFill	Upstream	Upstream	120.00	-5.00	-11.65	3.00	3.00
R4	RootFill	Upstream	Upstream	135.00	-5.72	-14.26	3.00	3.00
R3	RootFill	Upstream	Upstream	150.00	-7.16	-16.17	3.00	3.00
R2	RootFill	Upstream	Upstream	165.00	-8.61	-18.08	3.00	3.00
SDH US	SideDrilledHole	Upstream	Upstream	185.00	0.00	-10.00	2.00	30.00
V	Volumetric	Upstream	Center	235.00	0.00	-3.35	1.50	1.50
VR2	VolumetricRoot	Upstream	Center	250.00	0.00	-10.03	1.50	1.50
VR1	VolumetricRoot	Upstream	Center	265.00	0.00	-16.68	1.50	1.50
TOFD OD 2	TOFD	Upstream	Center	285.00	0.00	-10.00	2.00	10.00
TOFD OD	TOFD	Upstream	Center	305.00	0.00	-5.00	2.00	10.00
Trans OD	Transverse	Upstream	Center	325.00	0.00	-1.00	10.00	2.00
F4 1.0	CapNotch	Upstream	Center	345.00	-10.05	0.00	2.00	10.00
R1 1.0	RootNotch	Upstream	Center	345.00	-10.05	-20.00	1.00	10.00
Center	Center	Center	Center	365.00	0.00	0.00	1.00	5.00
F4 1.0	CapNotch	Downstream	Center	385.00	10.05	0.00	2.00	10.00
R1 1.0	RootNotch	Downstream	Center	385.00	10.05	-20.00	1.00	10.00
Trans ID	Transverse	Downstream	Center	405.00	0.00	-19.00	10.00	2.00
TOFD ID	TOFD	Downstream	Center	425.00	0.00	-18.00	2.00	10.00
VR1	VolumetricRoot	Downstream	Center	465.00	0.00	-16.68	1.50	1.50
VR2	VolumetricRoot	Downstream	Center	480.00	0.00	-10.03	1.50	1.50
V	Volumetric	Downstream	Center	495.00	0.00	-3.35	1.50	1.50
SDH DS	SideDrilledHole	Downstream	Downstream	545.00	0.00	-10.00	2.00	30.00
R2	RootFill	Downstream	Downstream	565.00	8.61	-18.08	3.00	3.00

22.10.3.1 ADDING A MANUAL TARGET

To add a manual target you must be in Table View. Click on the  Table button from the ZONAL CalBlock Designer toolbar to switch to Table View. Once in Table View, click on the  Add Manual Target button from the ZONAL CalBlock Designer toolbar to open the Add Manual Target dialog box.



Enter the details for your manual target and click  OK to save your target to the Table View.

22.10.3.2 VIEWING MANUAL TARGETS

Manually entered targets and their configurable attributes will show up with a white background in the Table View.

F1	Fill	Upstream	100.00	-2.52	-14.80	3.00	3.00	17.59	85.00	0.00
Manual Target 1	Fill	Upstream	115.00	0.00	-0.10	0.10	0.10	0.10	0.00	0.00
HP	HotPass	Upstream	130.00	-1.62	-17.87	2.00	2.00	24.24	42.50	0.00
Manual Target 2	HotPass	Upstream	145.00	0.00	-0.10	0.10	0.10	0.10	0.00	0.00
V3	Center TOFD	Upstream	175.00	0.00	-3.08	1.50	1.50	4.36	45.00	0.00
V2	RootNotch CapNotch	Upstream	190.00	0.00	-9.25	1.50	1.50	13.08	45.00	0.00
V1	Transverse	Upstream	205.00	0.00	-15.42	1.50	1.50	21.80	45.00	0.00
VR	Volumetric VolumetricRoot	Upstream	220.00	0.00	-19.25	1.50	1.50	1.06	45.00	0.00
TOFD OD	HotPass	Upstream	235.00	0.00	-5.00	2.00	10.00	5.00	0.00	44.50
Trans OD	Fill RootFill	Upstream	250.00	0.00	-1.00	10.00	2.00	1.00	0.00	0.00
CN 1.0	RootHAZ CapHAZ	Upstream	265.00	-3.82	0.00	2.00	10.00	1.00	5.00	0.00
RN 1.0	WTStrip	Upstream	265.00	0.00	-20.00	1.00	10.00	1.00	0.00	0.00


The default targets show up with a grey background and their attributes are not configurable from the Table View. Default targets can be edited from the Zonal CalBlock Options Sidebar, and will update on the fly in the Table View.

22.10.3.3 EDITING MANUAL TARGETS

A manual target can be edited once it has been added to the Table View. A manual targets configurable attributes will display with a white background. Simply click in the field of the attribute you want to edit and make your changes. Press <Enter> when you are finished making your edits.

22.11


22.11.1.1 DELETING MANUAL TARGETS

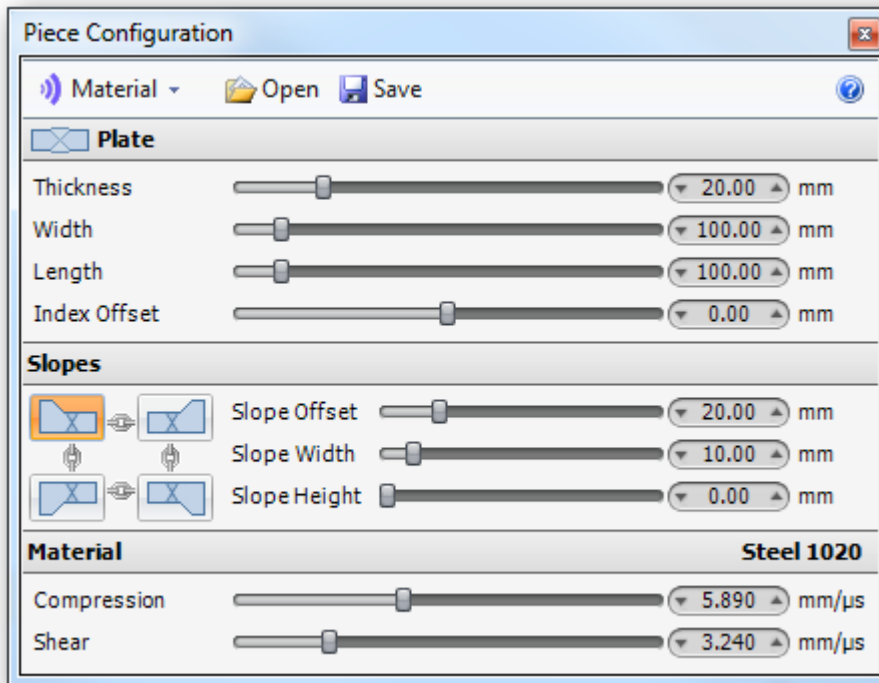
To delete a manual target from the Table View, select the target in the Table View by clicking on it and click on the  Remove Manual button from the ZONAL CalBlock Designer Toolbar.


CHAPTER (23): LESSONS

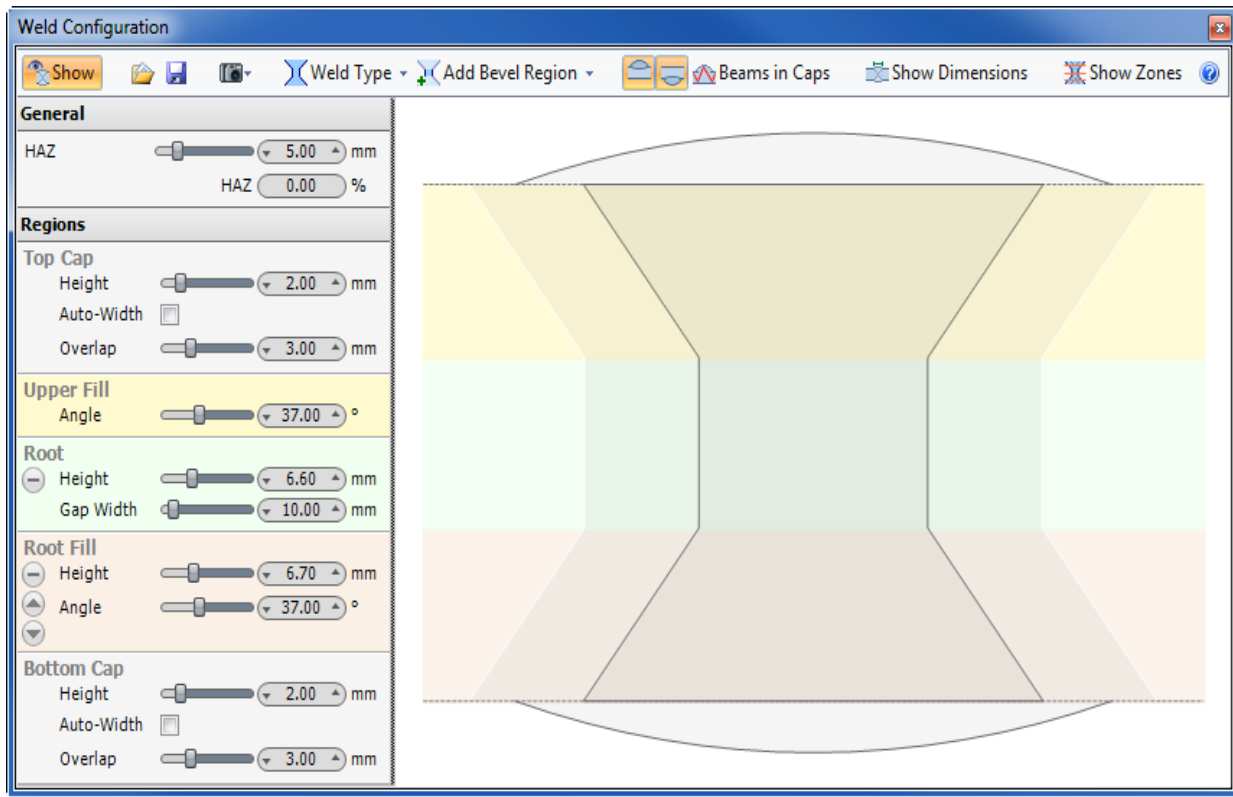
23.1 LESSON 1 GETTING STARTED


In this demonstration we are going to be working with a Simple Plate. When you select a new workspace this is the default setting.

Open the [Piece Configuration](#)  to choose your material and the measurements of your plate.



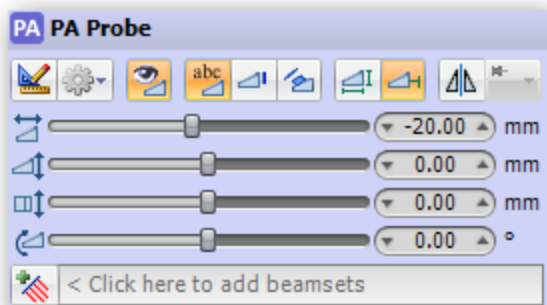
Open the [Weld Configuration](#)  to specify the data values to be used to generate the weld geometry.




Open the  Add Probe drop down menu to add a Phased Array Probe to the workspace.

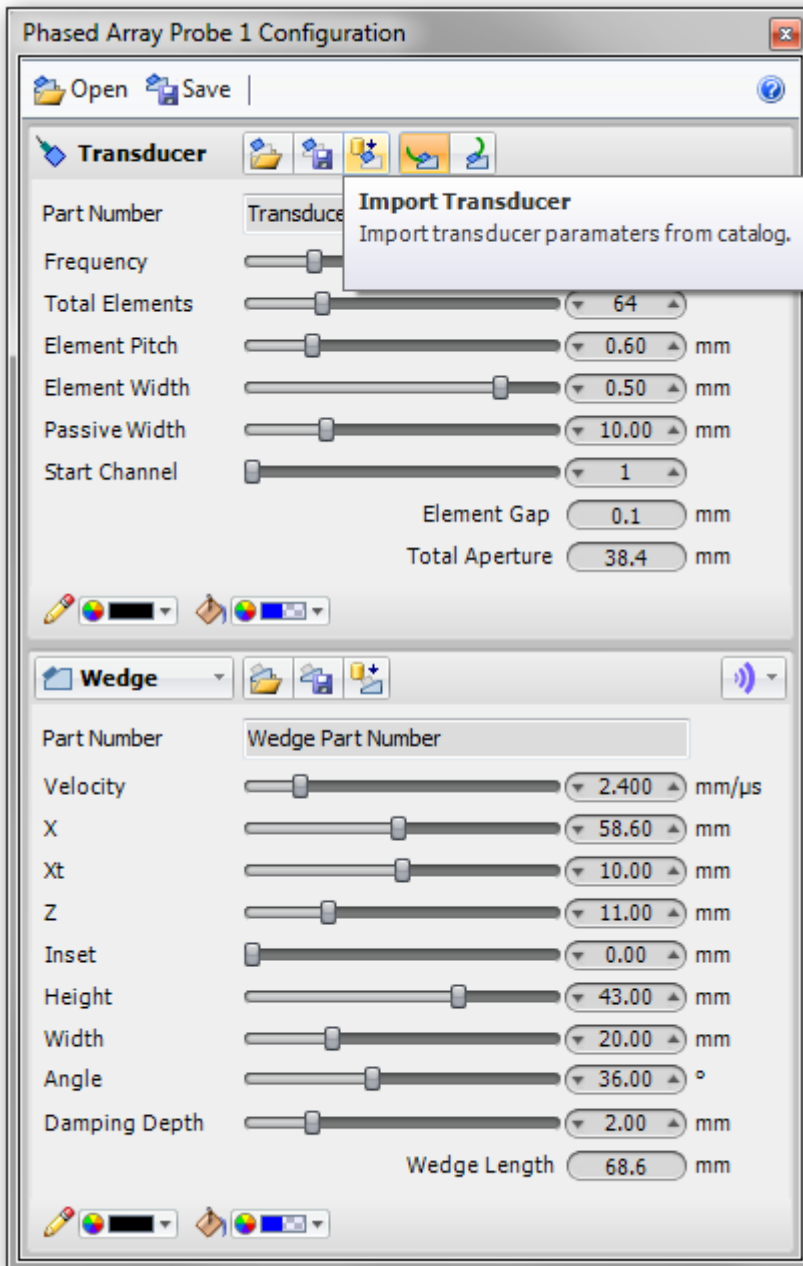
	<p>Phased Array PA probe consists of many small elements, each of which can be pulsed separately.</p>
	<p>Time-of-flight Diffraction This method relies on the diffraction of ultrasonic energies of internal structures in the part using a pair of probes.</p>
	<p>Conventional UT A conventional probe uses a single transducer in a pulse echo configuration.</p>

To change the default probe settings click on the  [Probe Configuration](#) icon from the [Probe Group](#).

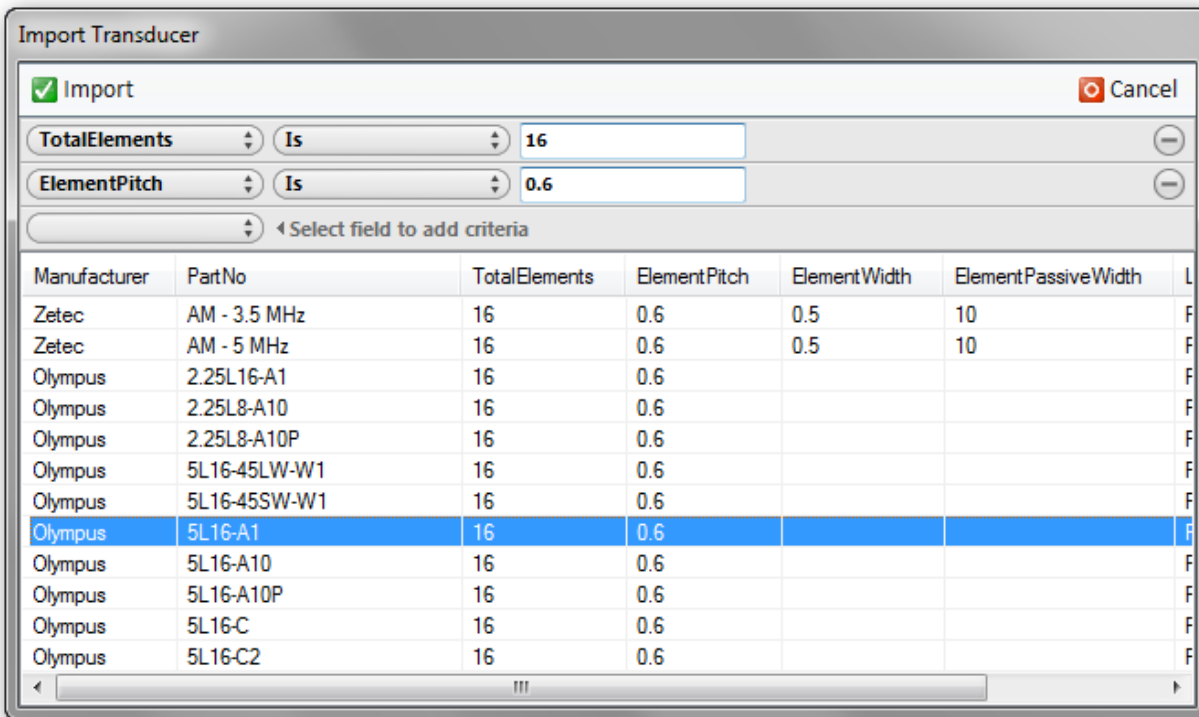



The [Probe Configuration](#) dialog box has many attributes that can be set for that type of probe. To specify a value you can a) move the slider right or left, b) click the right or left value spinner or c) click on the value displayed in the value spinner and type a value. The preview and drawing panes will update on the fly as the values are modified.


We will change the default transducer by clicking on the  Import Transducer icon from the [Probe Configuration](#) dialog box.

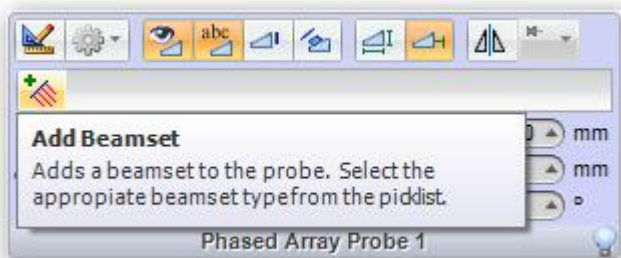


Limit the list of available transducers in the catalog by selecting criteria on the left, and a limiting factor on the right in the Import Transducer dialog box.



You can also change the default wedge by clicking on the  Import Wedge icon from the [Probe Configuration](#) dialog box.

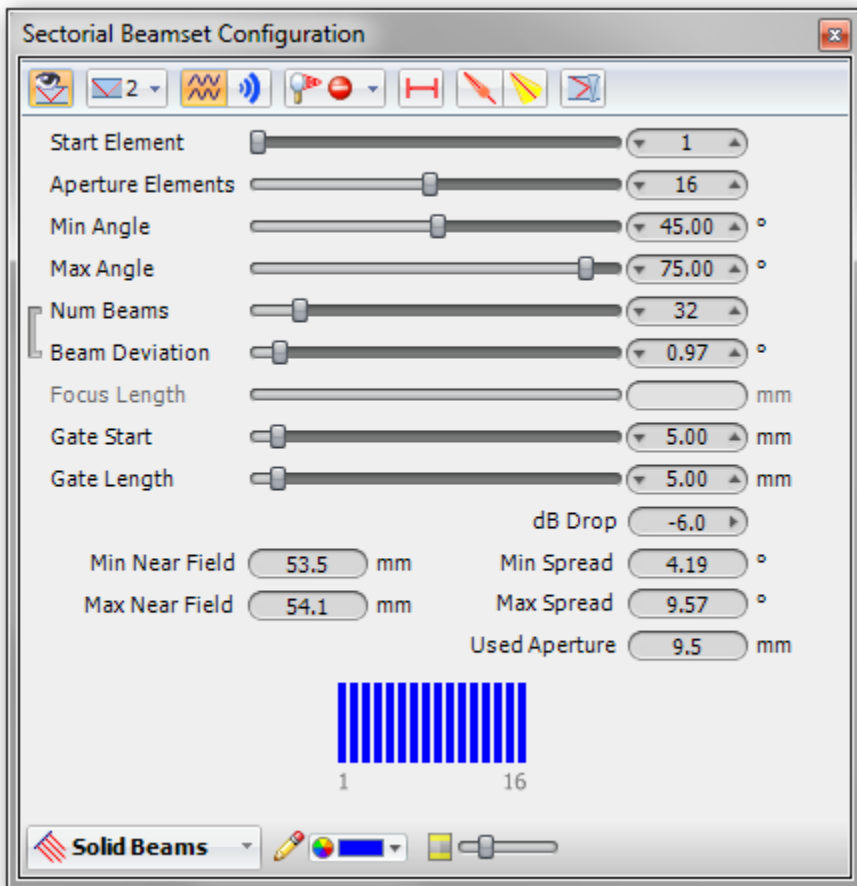
Now that we have our probe configured, we will add a beamset by clicking on the  Add Beamset icon from the [Probe Group](#).




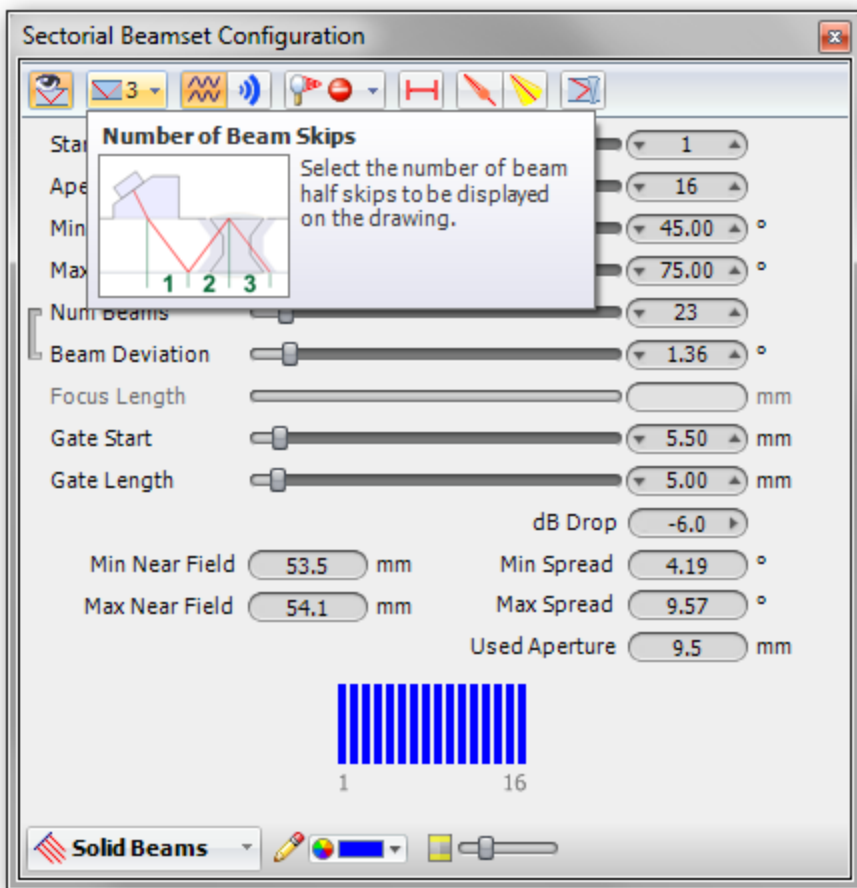
For this demonstration we will select a Sectorial Beamset.

	<p>Single Beam Beamset Single Beam Beamsets render a single beam from a defined set of elements at a specified refracted angle. Useful for developing zonal techniques.</p>
	<p>Linear Beamset Linear Beamsets allow a number of focal laws to be drawn from different elements with a common refracted angle.</p>
	<p>Sectorial Beamset Sectorial Beamsets allow a number of focal laws to be drawn from a set of elements with a range of refracted angles.</p>
	<p>Linear Spread Beamset Linear Spread Beamsets allow a number of focal laws to be drawn from different elements with a range of refracted angles.</p>
	<p>Zonal Beamset Zonal Beamsets are used to target specific regions of a weld. Zonal beamsets are commonly used in pipeline weld inspection. *Requires Zonal Add-On*</p>
	<p>Reference Beamset Reference Beamsets provide additional drawing annotations.</p>

The [Beamset Configuration](#) dialog box will open when a Beamset is selected. It can be used to specify the data values to be used. To specify a value you can a) move the slider right or left, b) click the right or left value spinner or c) click on the value displayed in the value spinner and type a value. The preview and drawing panes will update on the fly as the values are modified.

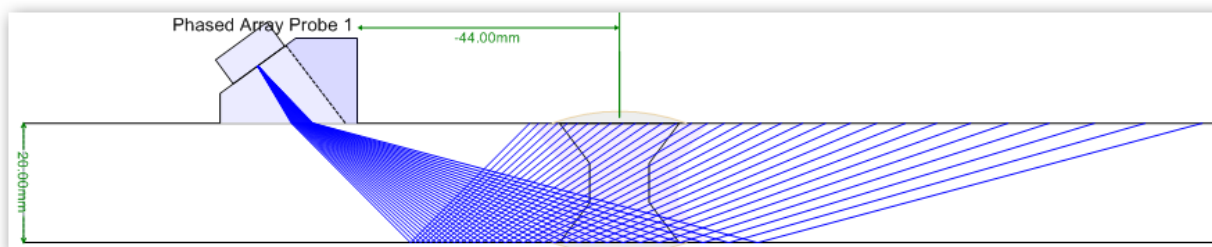


For this demonstration we are going to change the number of skips to from 1 to 2, by clicking on the  Number of Beam Skips icon and selecting 3 from the pick list.

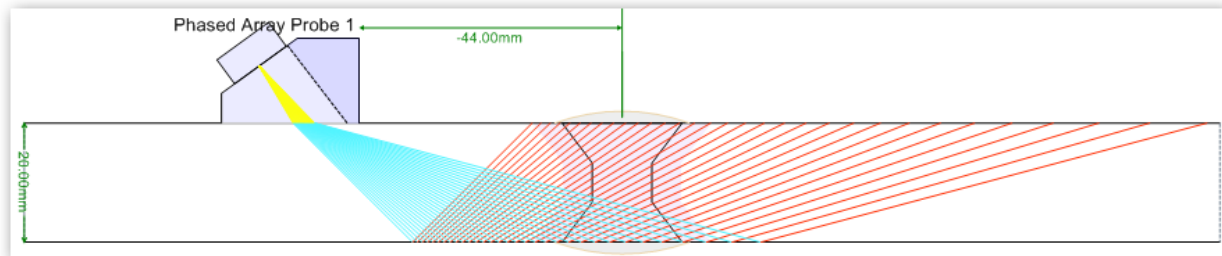




For this demonstration we will change the display of our beamset from Solid Beams to Color List. This will represent each skip as a different colour. The color palette can be customized in the [BeamTool Options](#).

Solid Beams

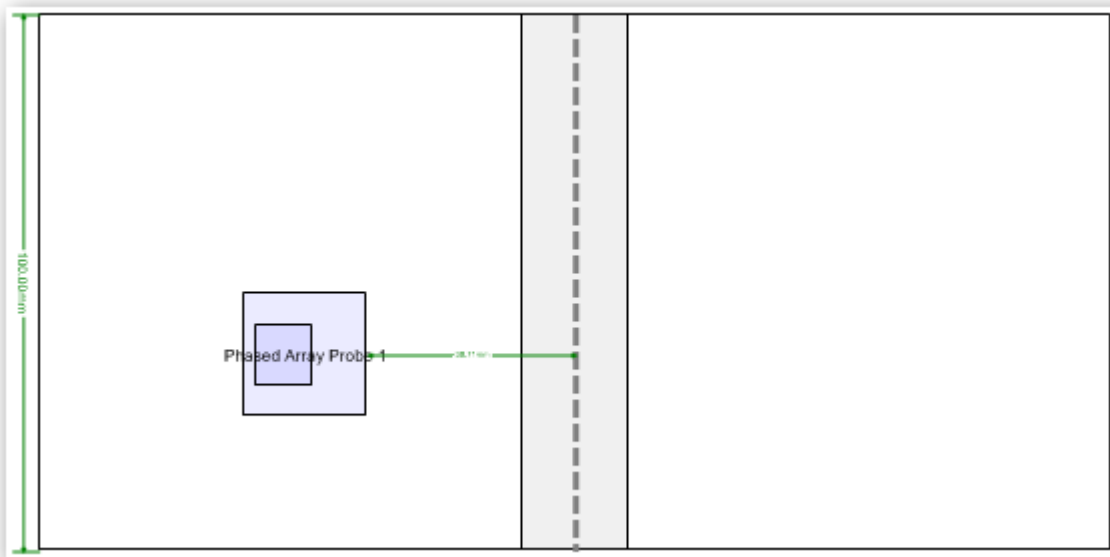



Color List



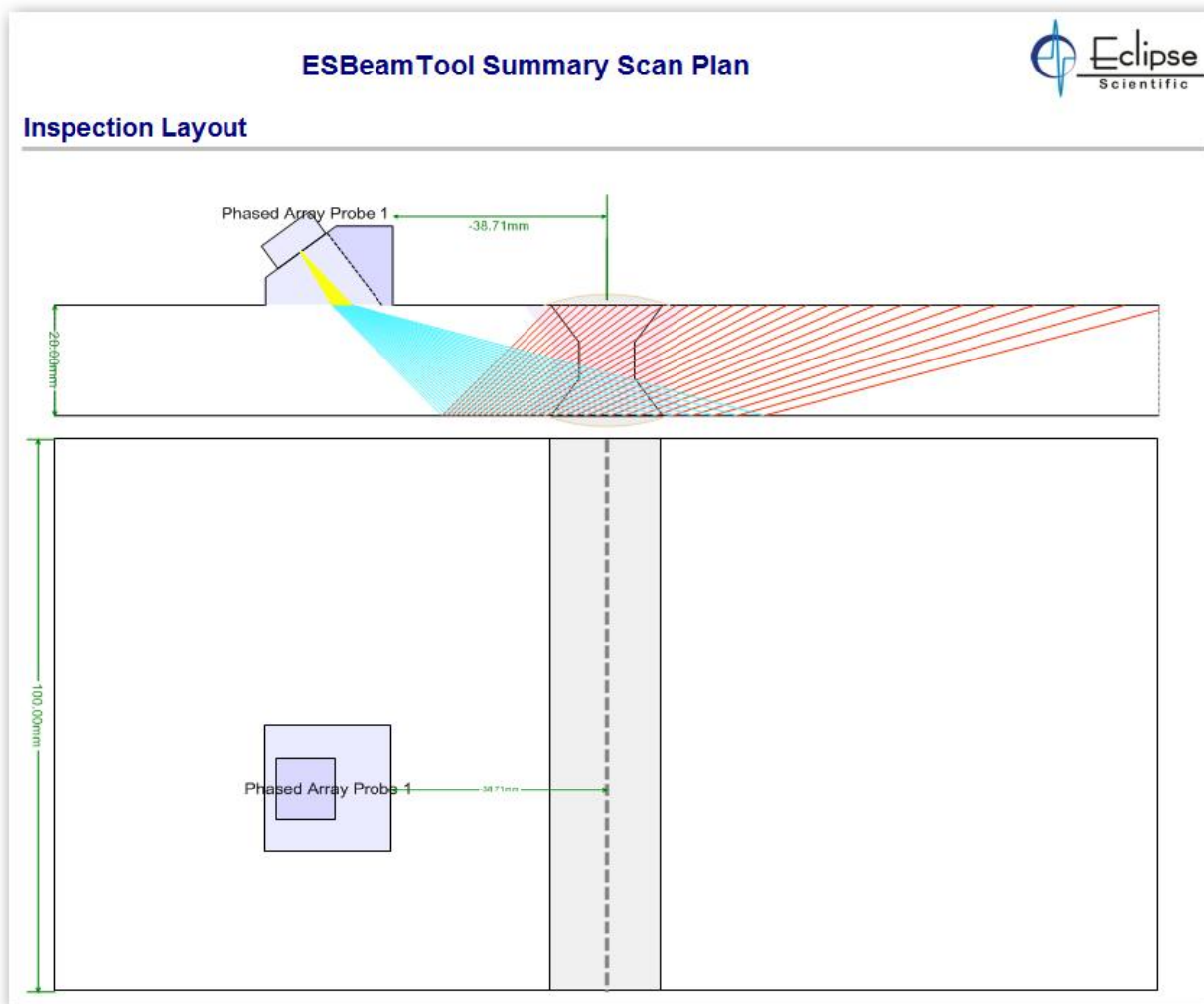
We can change the default side view to top view by clicking on the  Display Top View icon found in the [Main Toolbar](#). Change back to side view by clicking on the  Display Side View icon.

Top View



We can produce a report based on our current workspace by clicking on the  Report icon in the [Main Toolbar](#).

Sample Report



Piece

Material	Thickness	Length	Shear Velocity	Compression Velocity
Steel 1020	20mm	100mm	3.24mm/μs	5.89mm/μs

HAZ: 24.88% HAZ Width: 5mm

Weld

Region	Angle	Height	Gap	Radius	Landing
Upper Fill	37°				
Root		6.6mm	10mm		
Root Fill	37°	6.7mm			

Phased Array Probe: Phased Array Probe 1

Index Offset: -38.71mm Scan Offset: 36.56mm Mirrored: False

Wedge: SA10-N55S 5L16-A10

Velocity	Primary Offset	Height 1 st Element	Length	Width	Angle
2.33mm/μs	20.35mm	6.94mm	23.02mm	23mm	36.1°

Transducer: 5L16-A1
 Total Aperture: 9.6mm Number of Elements: 16 Element Pitch: 0.6mm

Sectorial Beamset

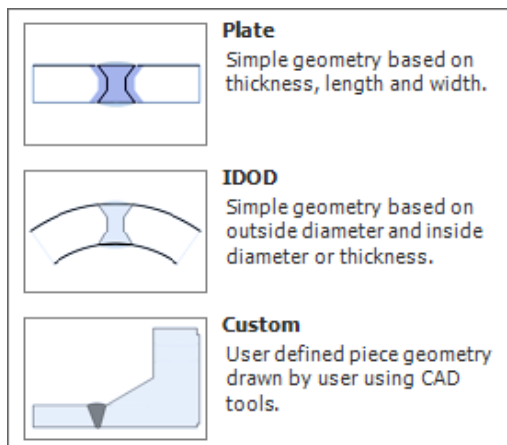
Law Config.: Sectorial Wave Type: Shear


Element Qty	First Element	Min Angle	Max Angle	Angle Steps	Focus
16	1	45°	75°	0.97°	None

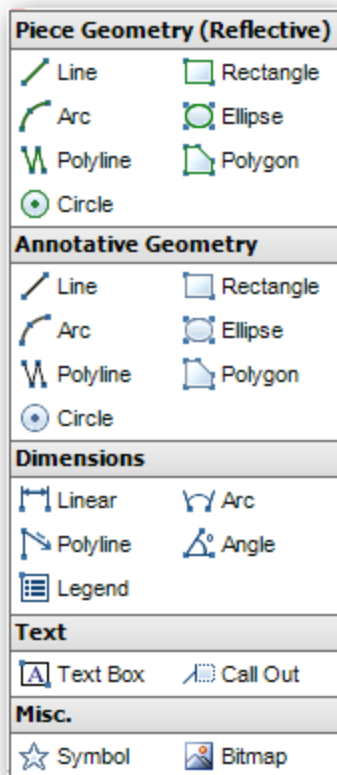
23.2 LESSON 2 IMAGES

In this demonstration we will import and scale a bitmap, and show how to work with layers.

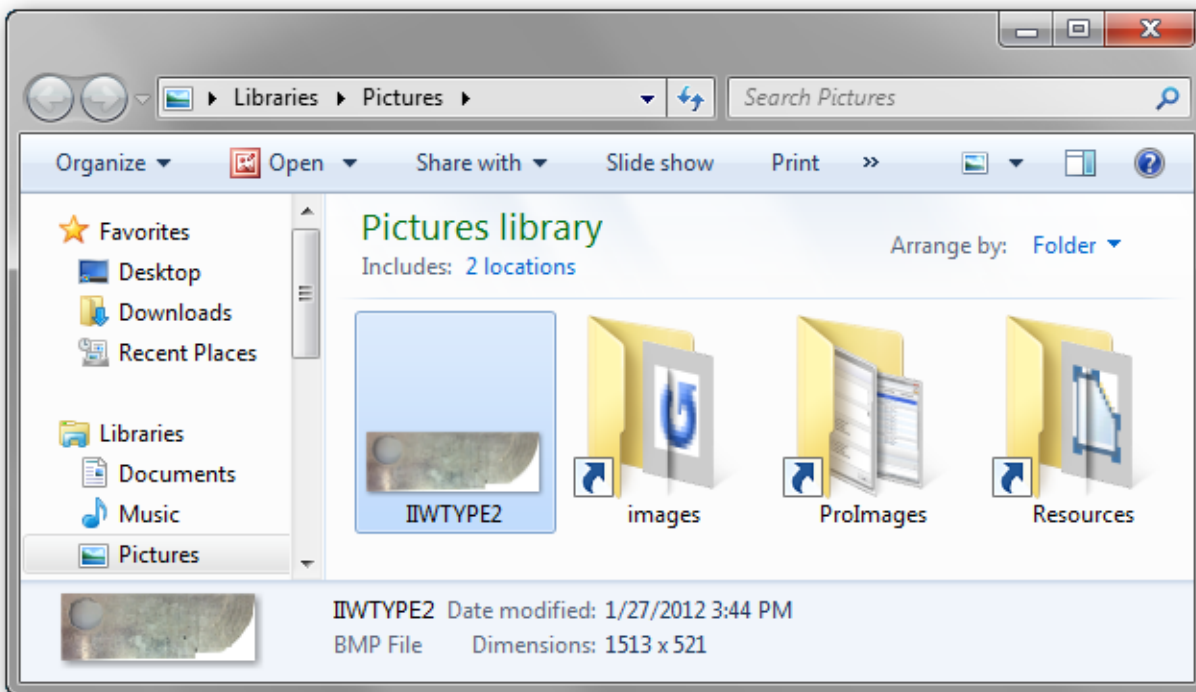
We will start with a new workspace. Change the default  Plate workspace to  Custom by clicking on the Piece Geometry pick list found in the [Piece Group](#).



With our workspace changed to custom its time to import the bitmap. Click on the  [Add Geometry](#) icon found in the [Edit Tools](#) section of the [CAD Toolbar](#) Select Image from the [Add Geometry Group](#) dialog box.

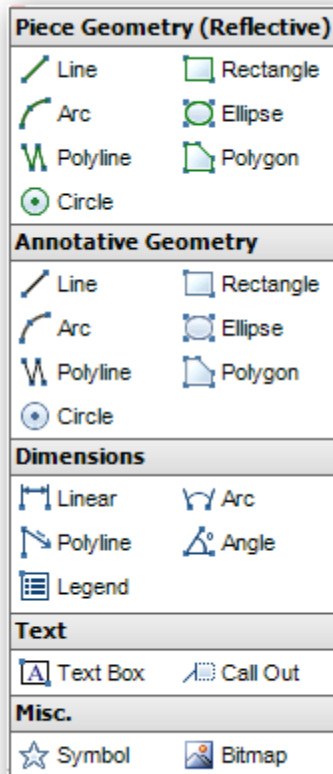


The Select Image browser will open and allow you to select the image that you would like to import. Highlight the image and click on Open.

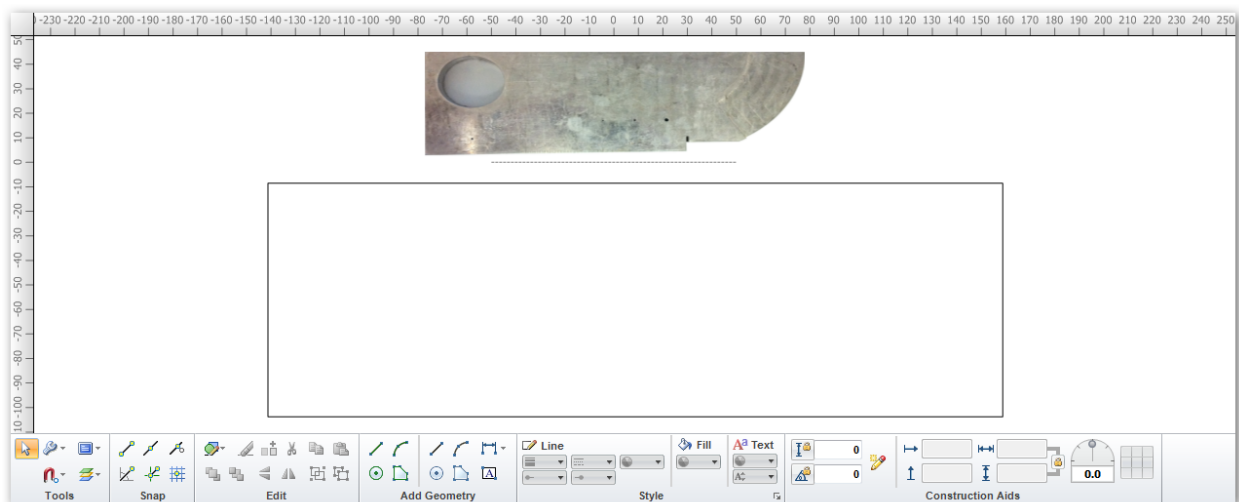


Click and drag your cursor over the workspace to place the image. The aspect ratio of the image is not maintained. To scale the image to its proper dimensions, we will use a rectangle for reference.

Click on the  [Add Geometry](#) icon found in the [Edit Tools](#) section of the [CAD Toolbar](#). Select Rectangle from the [Add Geometry Group](#) dialog box.






Click and drag your cursor over the workspace to draw the rectangle. With the rectangle selected we will use the [Construction Aids](#) found in the [CAD Toolbar](#) to enter the exact dimensions of Cal Block that we are working with.

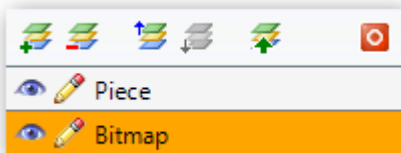






Before we overlay the bitmap onto the part we will separate them into different layers to help organize the workspace.



With the rectangle selected we will click on the  [Layers](#) icon found in the [Tools](#) section of the [CAD Toolbar](#).



From the Layers dialog box we will select  Move Geometries to add the selected rectangle to Layer 1. Double click on Layer 1 to give it a meaningful name and press enter.

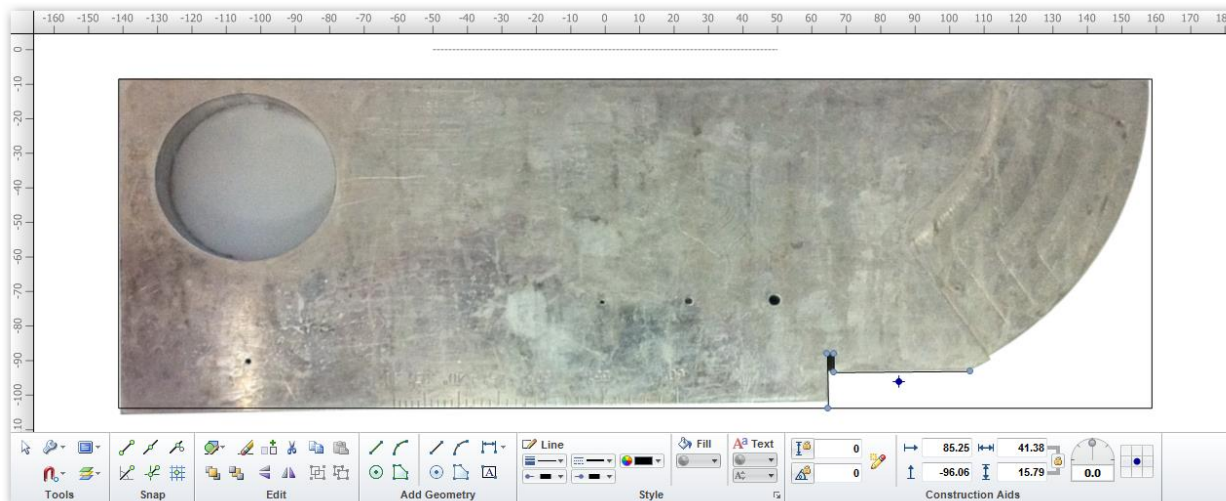
We will add a second layer by clicking on the  Add Layer icon in the Layers dialog box. Name the layer accordingly. Go back to the workspace and select your bitmap. Return to the [Layers](#) dialog box and highlight the second layer you created. Select the  Move Geometries icon to assign the bitmap to the second layer.






With our layers in place we can now toggle the view of the bitmap and piece by clicking on the  /  Visibility icons, and lock each layer from editing by clicking on the  /  Locking icons.

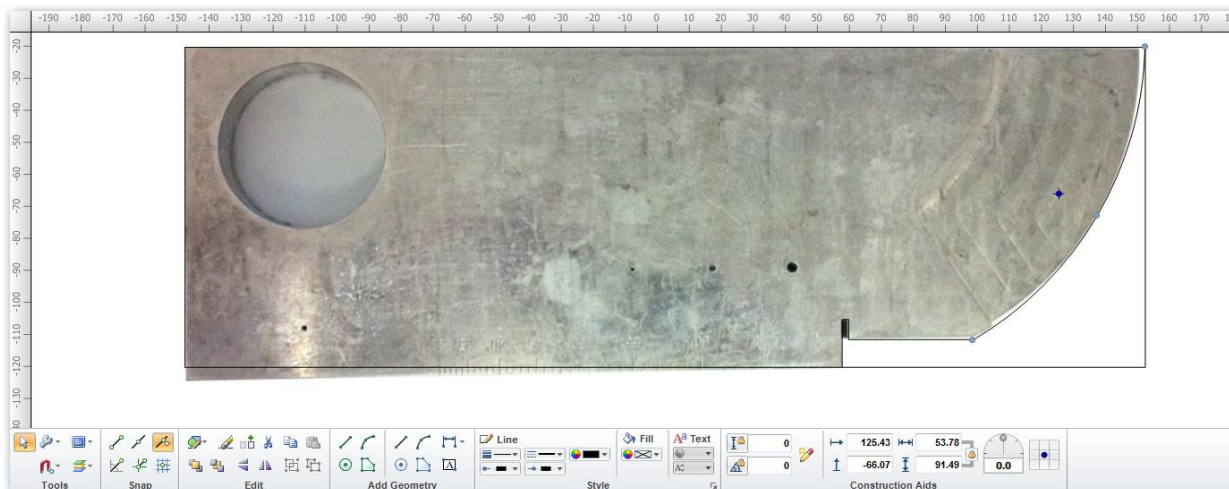
Now we will drag the bitmap over the piece and stretch it to scale. Once we have the bitmap where we want it, we will lock it in place to keep it from accidentally being moved. Click on the  Display Settings icon found in the [Tools](#) section of the [CAD Toolbar](#). Select the  Lock Images icon from the Display Settings dialog box.

We are ready to trace the outline of the calibration block. To do this we will open the  [Add Geometry](#) and select  Polyline from the Piece Geometry section. When we reach the area where the bitmap curves we will press ESC to stop the Polyline.

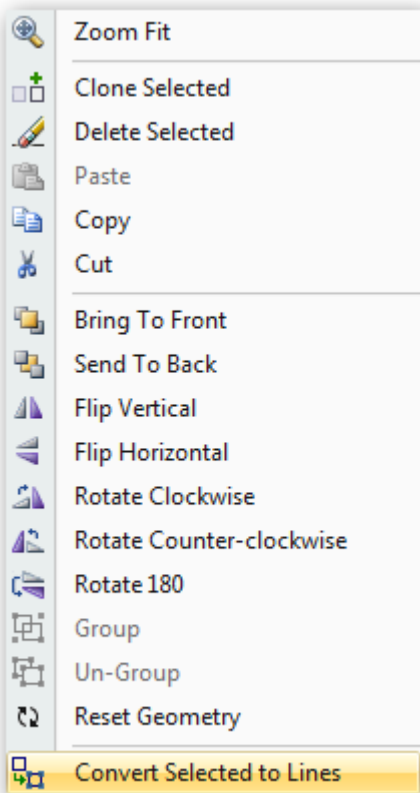


Click on the  Snap Settings icon found in the Tools section of the CAD Toolbar. Click on the  Snap to Nearest icon to avoid gaps while tracing.

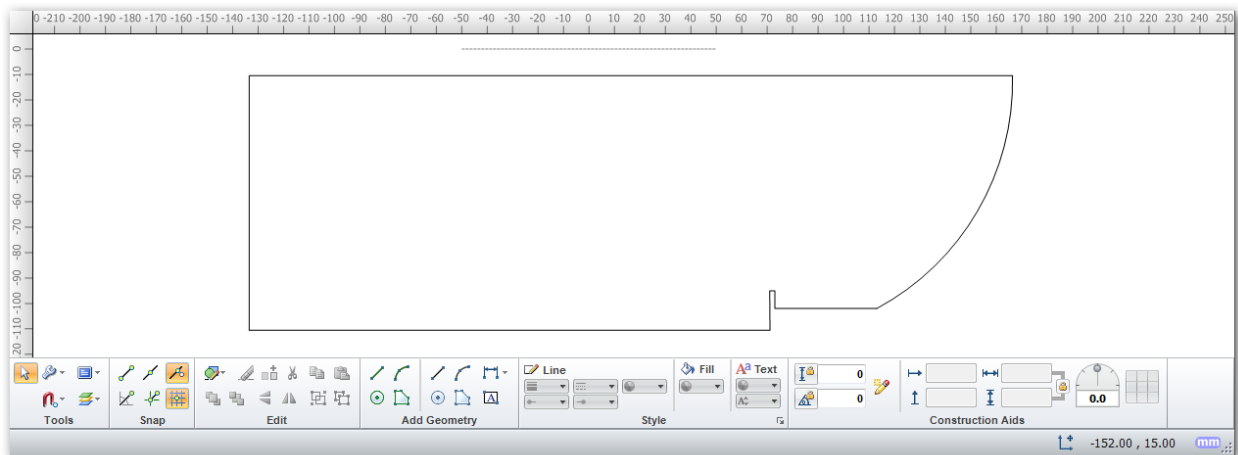
Click on the  Draw Piece Arc icon to trace the arc. This is found in the Add Geometry section of the CAD Toolbar.




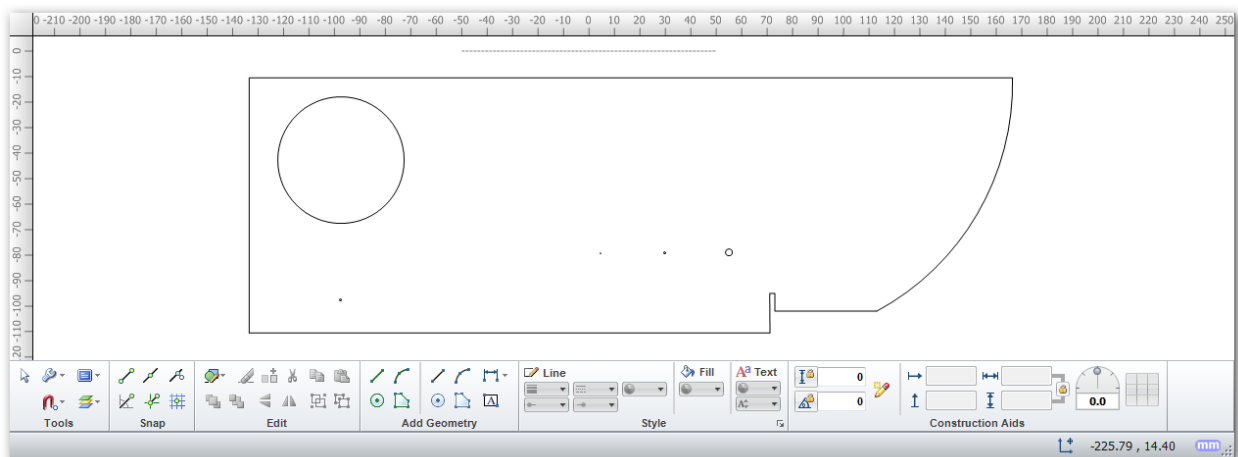
With all the outside edges of the bitmap in place we will select the rectangle and right click on it. Select Convert Selected to Lines from the dialog box. This will allow us to manipulate each line of the rectangle.



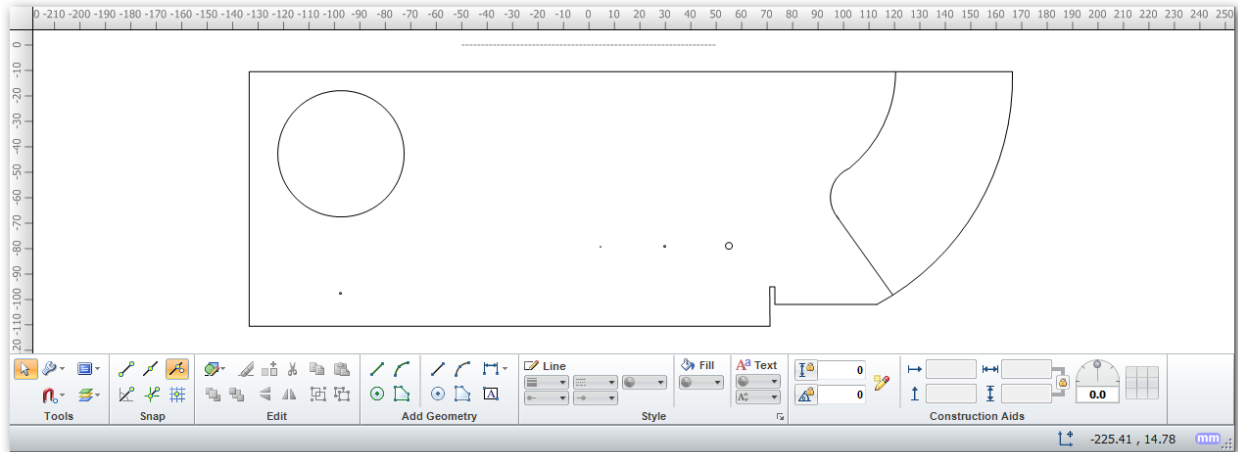
We will delete the right hand side of the rectangle and drag the bottom line to match the outline of our bitmap. If we turn off the view of the bitmap layer we now have the outline of our piece.



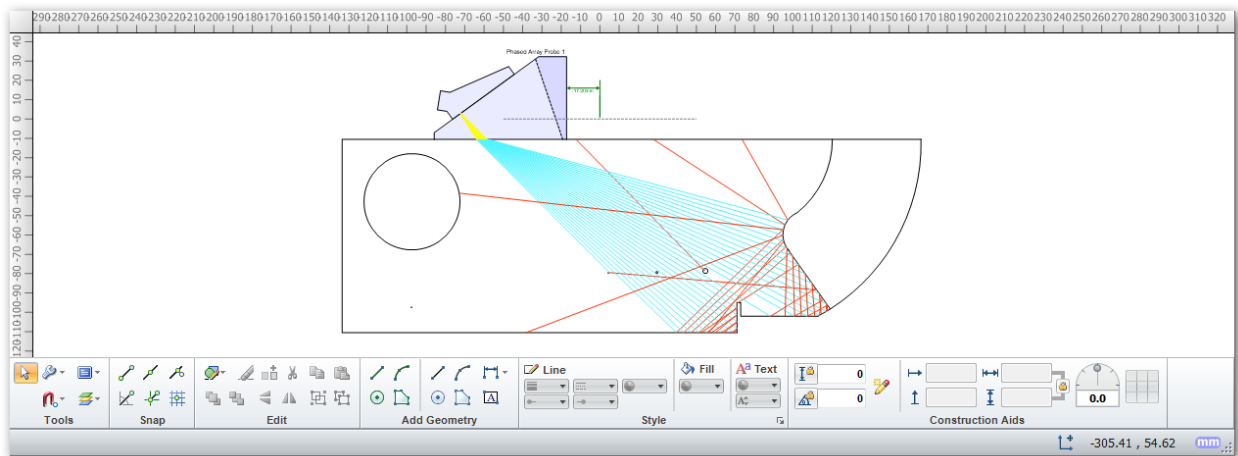
Now we will trace in the internal targets from the bitmap onto our piece. We will use the  Draw Piece Circle tool found in the Add Geometry section of the CAD Toolbar to trace our targets.



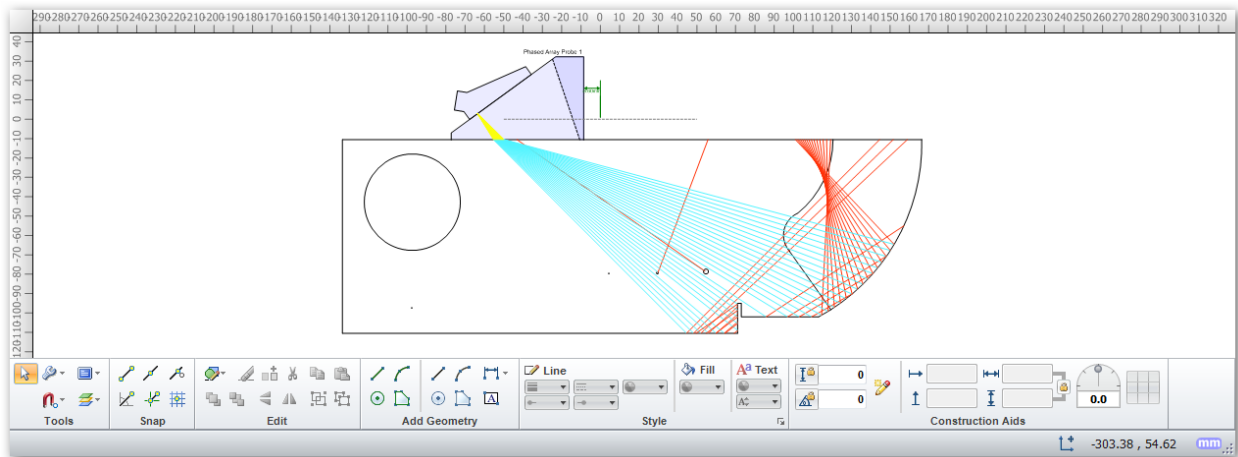
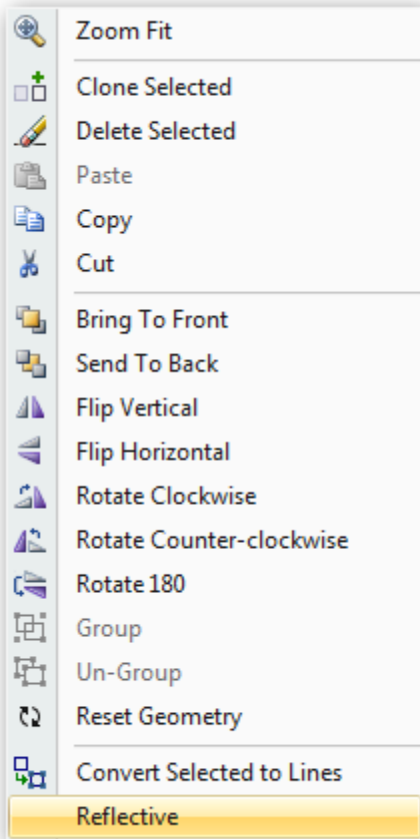
Now we will trace the 50mm radius using the  Draw Piece Arc and the  Draw Piece Line. These can be found in the Add Geometry section of the CAD Toolbar.



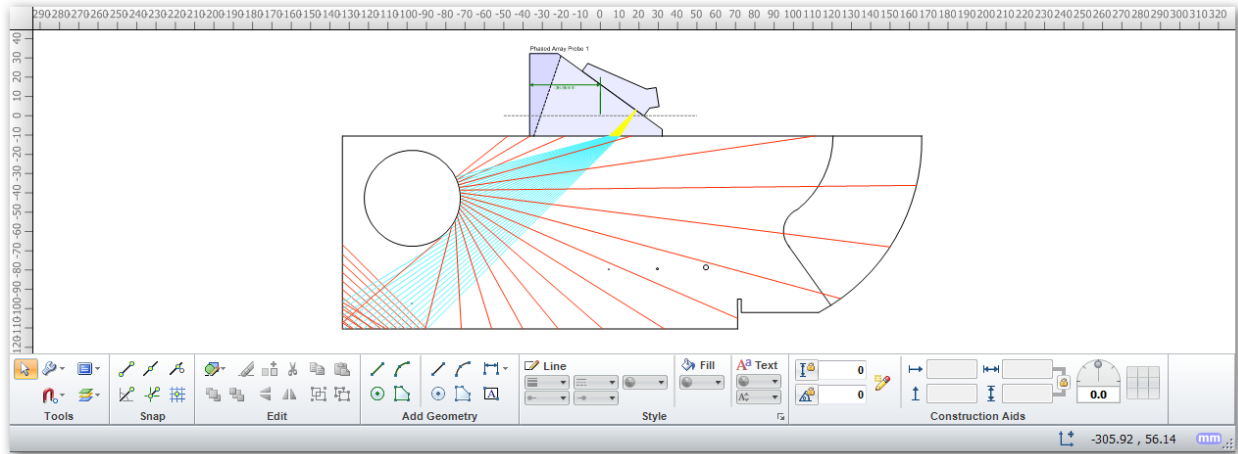
With our bitmap fully traced we will add a probe and beamset to see how it looks. (See [Lesson 1 Getting Started](#))



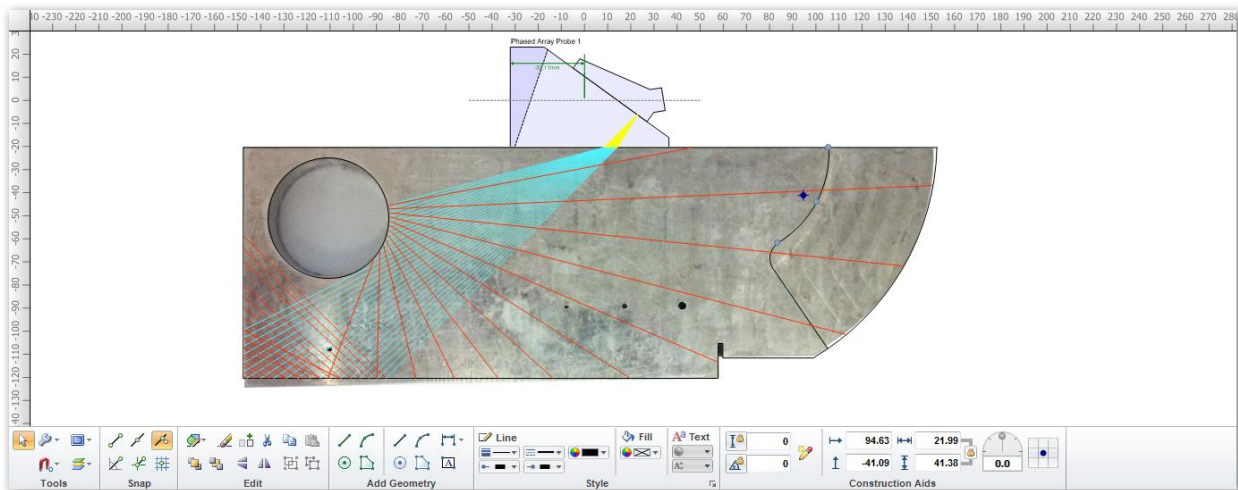
If we don't want the beamset to interact with the 50mm radius we can right click on each of the lines we used to create it and turn Reflective off by removing the check mark.



You can flip the probe horizontally on the piece by clicking on the  Flip Probe icon from the Probe Group.



Turn the bitmap layer back on to see how the probe and beamset interact.

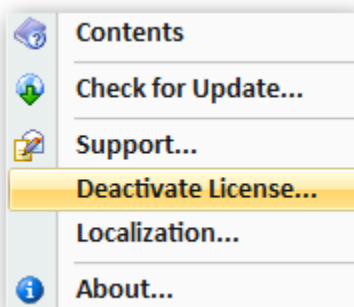


23.3 LESSON 3 DEACTIVATE AND TRANSFER LICENSE

In this lesson, we will go through the steps involved to deactivate and transfer a license. BeamTool makes it very easy to transfer your SoftLock license from one computer to another.

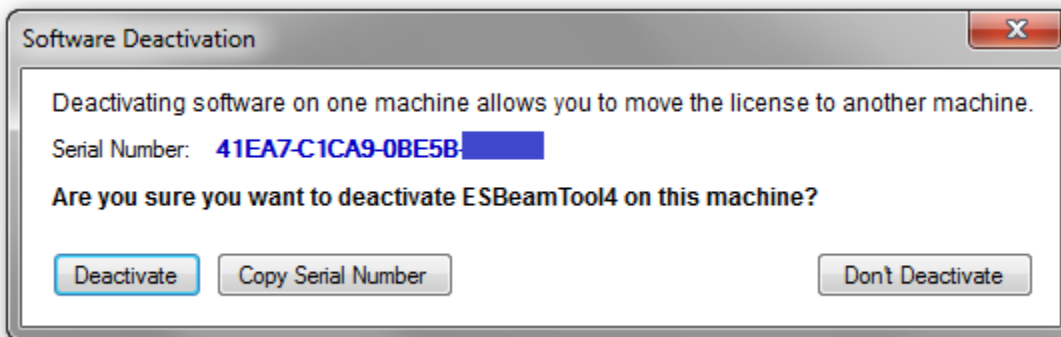
The first step is to deactivate the license on the computer you no longer want to use with BeamTool.

Click on the [Help Menu](#) and select Deactivate License... from the drop down menu.

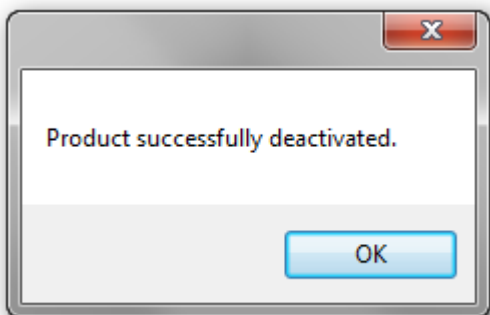


The Software Deactivation dialog box will bring up your serial number for BeamTool. If you do not have this number in your records, you have the option to Copy Serial Number to clipboard for future reference.

Click on Deactivate to finish the process.



You should get the dialog box below upon successful deactivation.





You are now ready to install your licensed version of BeamTool on another computer.

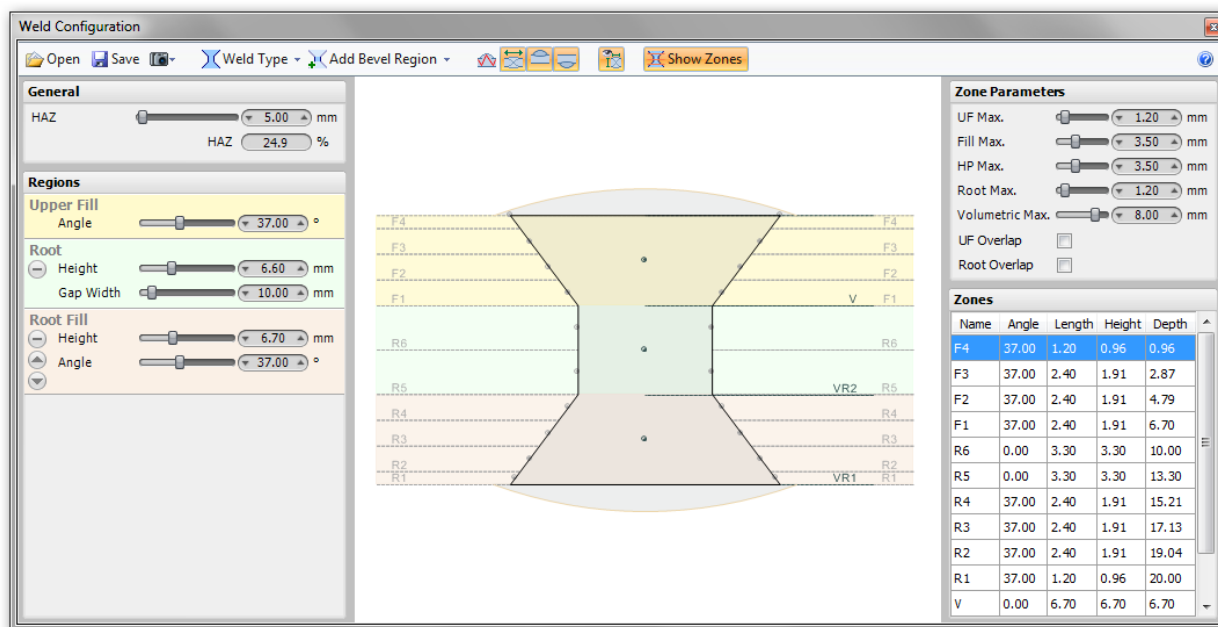
23.4 LESSON 4 ZONAL ADD-ON

In this lesson we will demonstrate the ZONAL functionality in BeamTool. In order to proceed with this lesson you must have purchased the ZONAL Add-on module. Please refer to the [Add-Ons](#) section to learn how to purchase ZONAL.

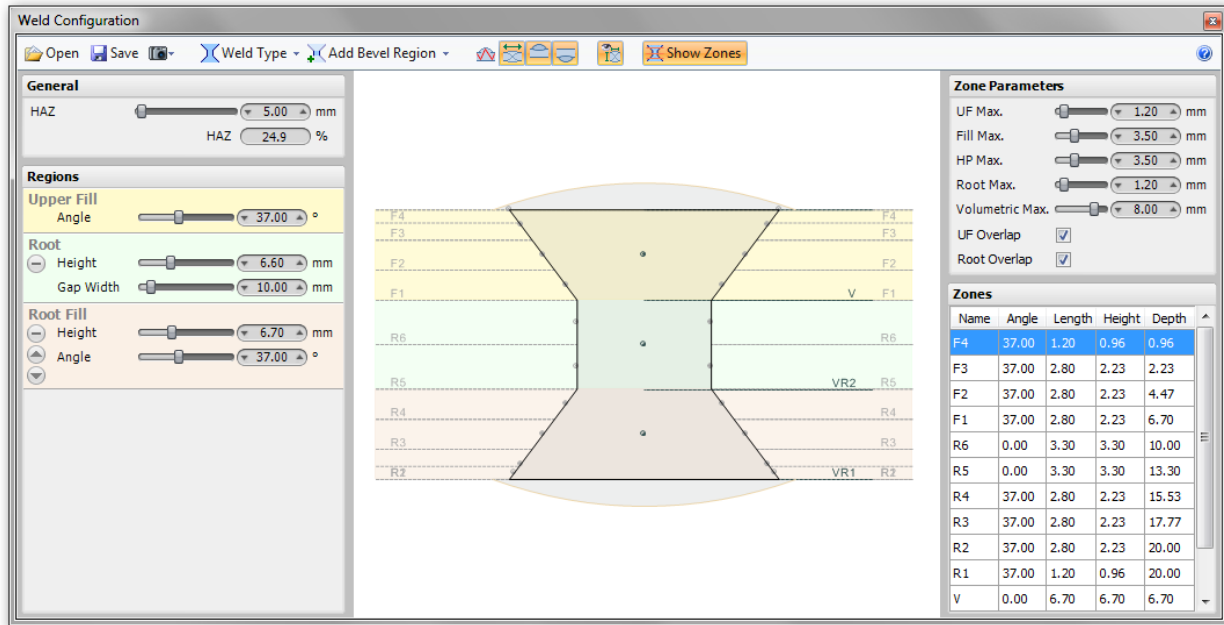
Now that you have your ZONAL license activated let's put it to work.

Configure your piece to match your requirements (see Lesson 1).

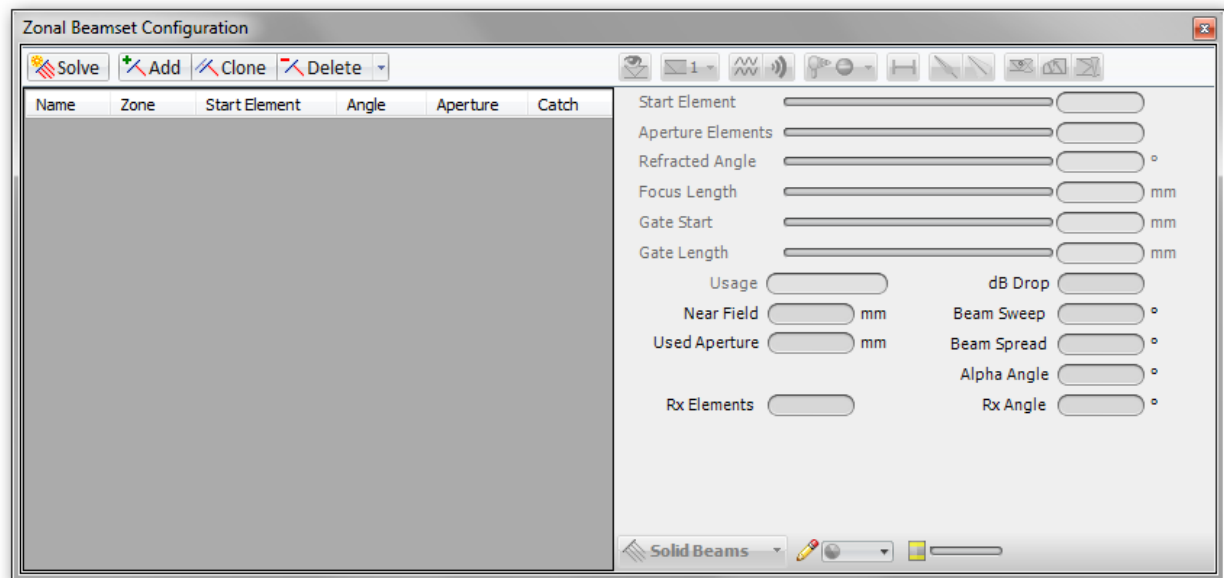
Click on the  [Weld Configuration](#) icon from the [Piece Group](#). Once your weld is configured click on the  [Show Zones](#) icon. These [Weld Zones](#) are created following the zone parameters and are based on the defined maximum length of the zone base along the fusion line. By default zones are created at the top of the upper fill and at the bottom of the root. The rest of these regions are divided into zones based on the parameters entered for your weld.



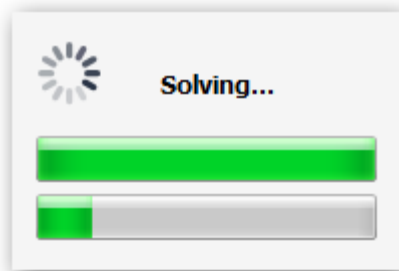
There is an option to overlap the default zones. They will still remain but they will not be considered when dividing the regions into zones as per the defined parameters of your weld.



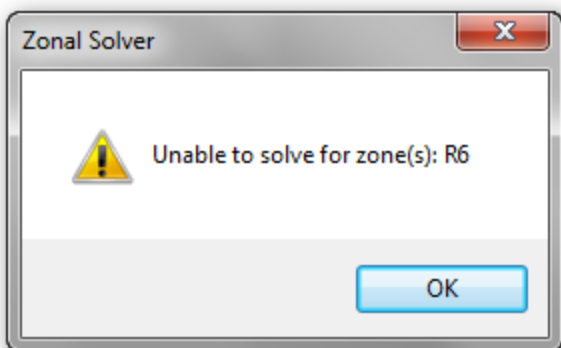
With your piece and weld configured add a [Phased Array Probe](#) and select [Zonal Beamset Configuration](#) from the [Add a Beamset](#) drop down menu. The [Zonal Beamset Configuration](#) dialog box will open.



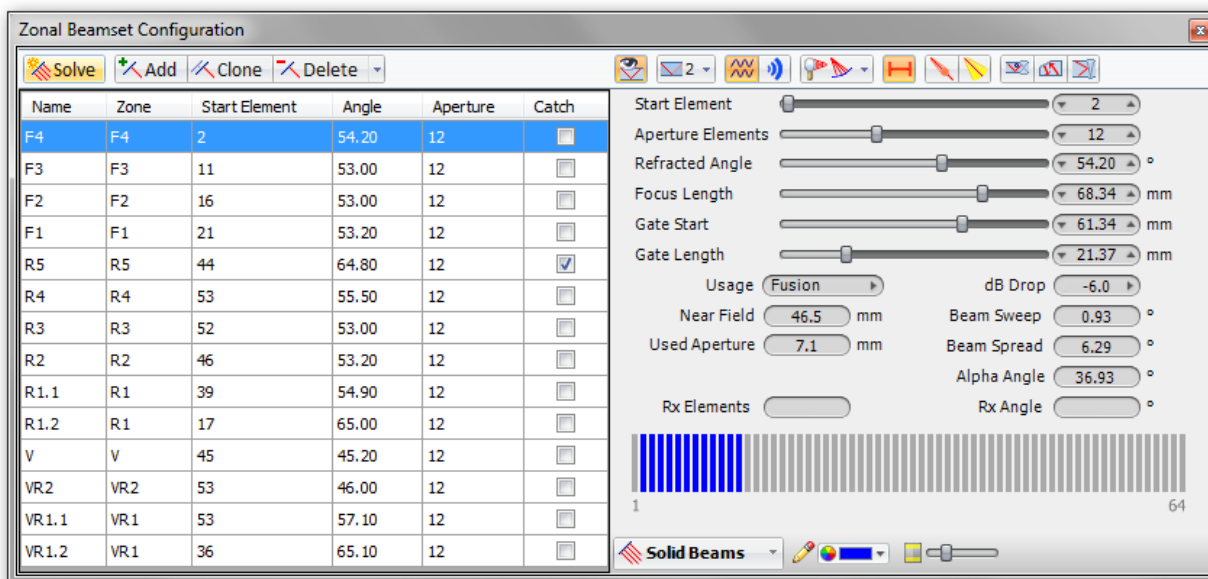
Click on the Solve icon to automatically add and configure beams for each zone in the weld bevel.



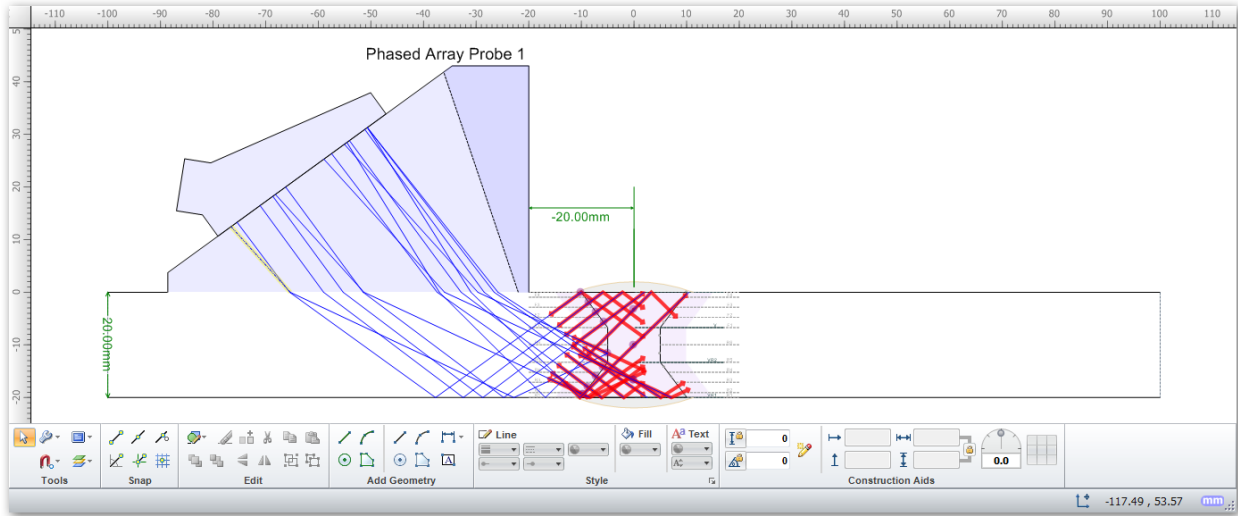
If you receive the message below, the Zonal Solver could not solve according to the rules for that zone. The beams may have to be manually added or modified.



After the Zonal Solver is finished you will have a list of beams displayed in the [Zonal Beamset Configuration](#) dialog box. With the Zonal Beamset Configuration dialog box open, each beam in the workspace is grayed out except for the one highlighted in the Zonal Beamset Configuration dialog box.



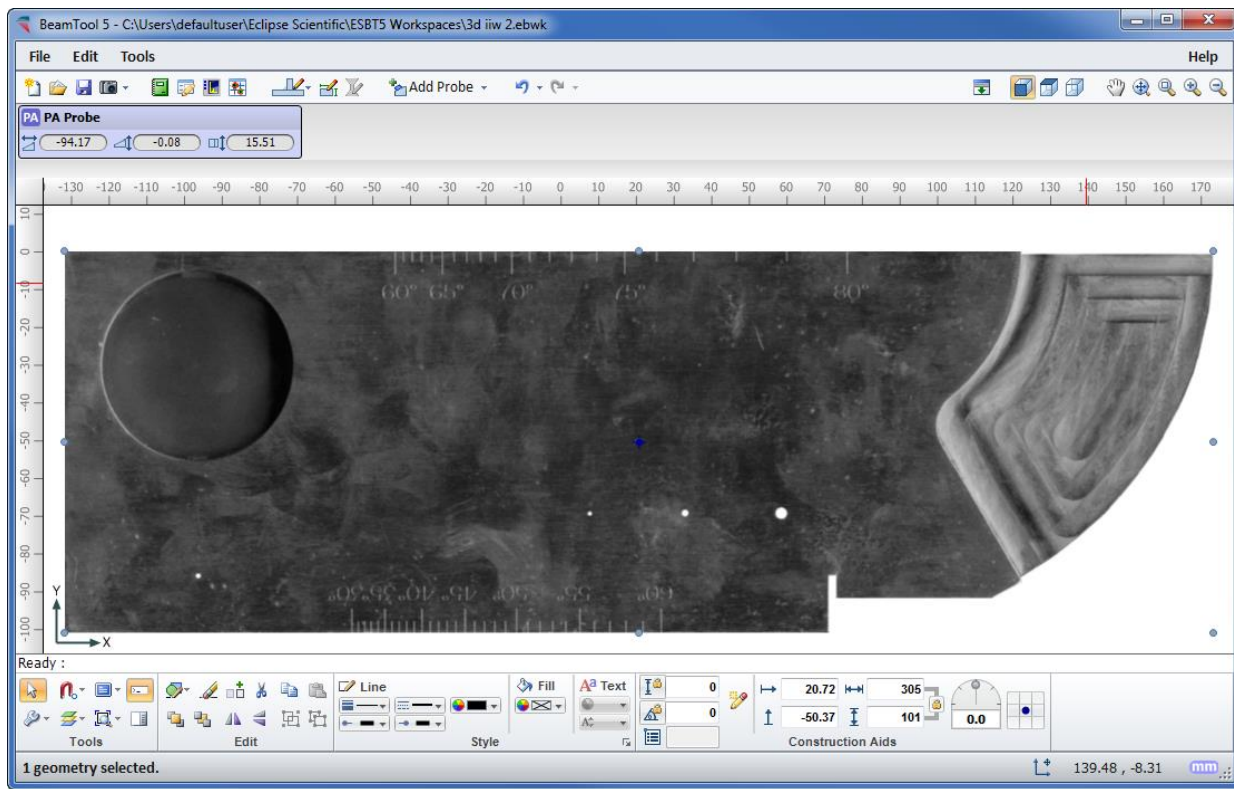
When the Zonal Beamset Configuration dialog box is closed, all of the beams become visible in the workspace.



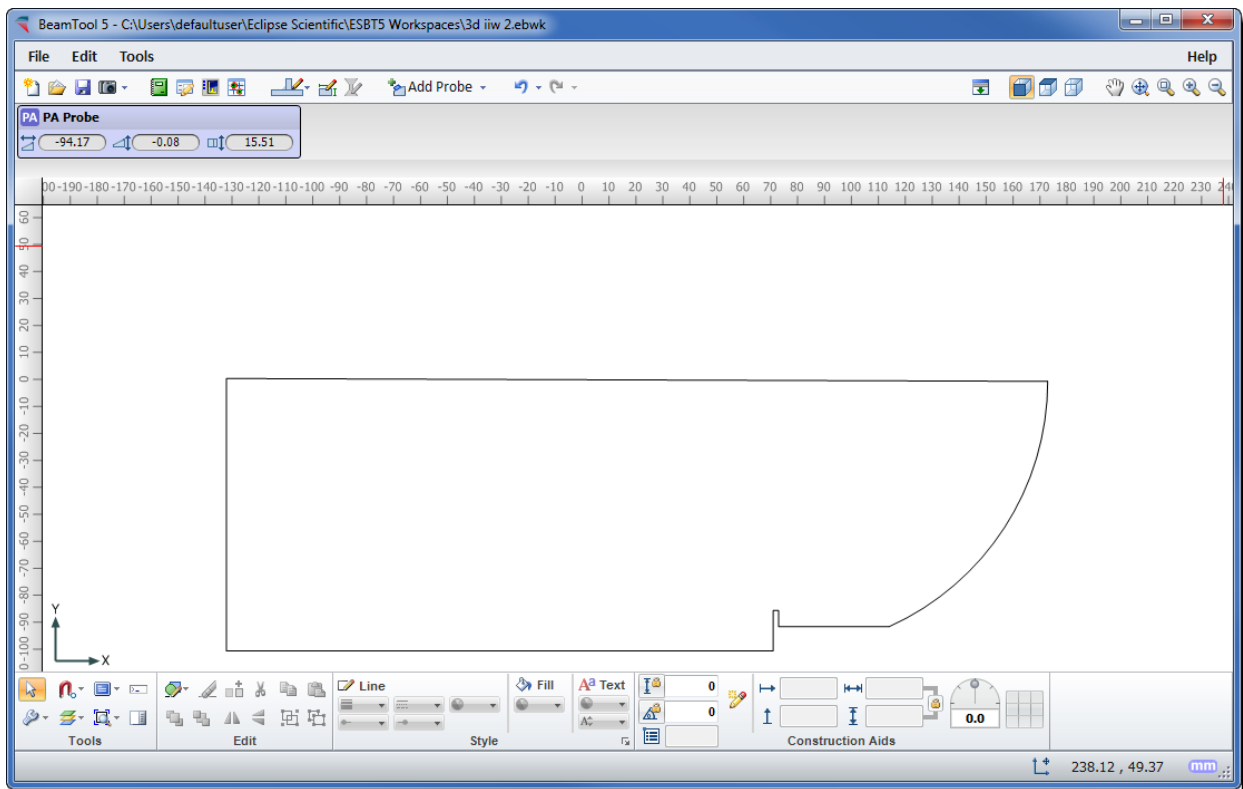
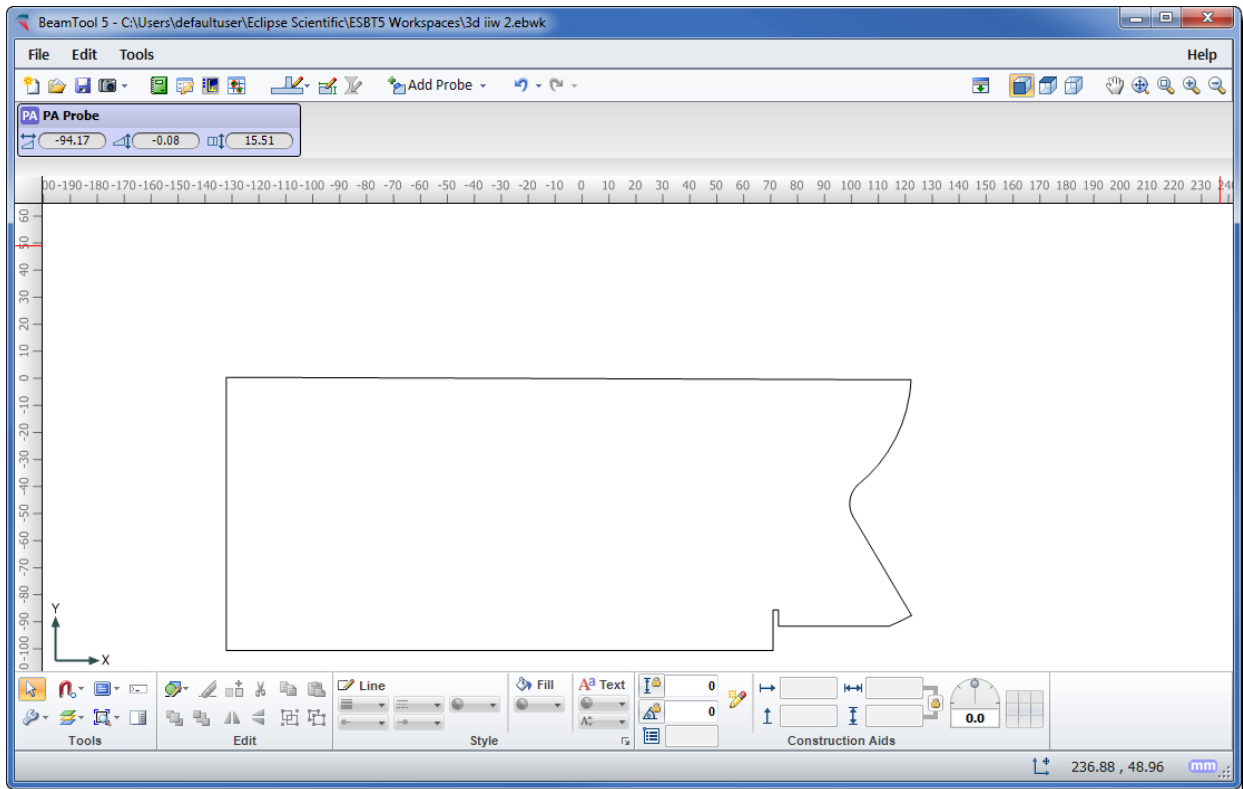
23.5 LESSON 5 ADVANCED 3D WORKSPACES

In this demonstration an IIW Type 2 Block will be used to see how workspaces can be created for [3D View](#).

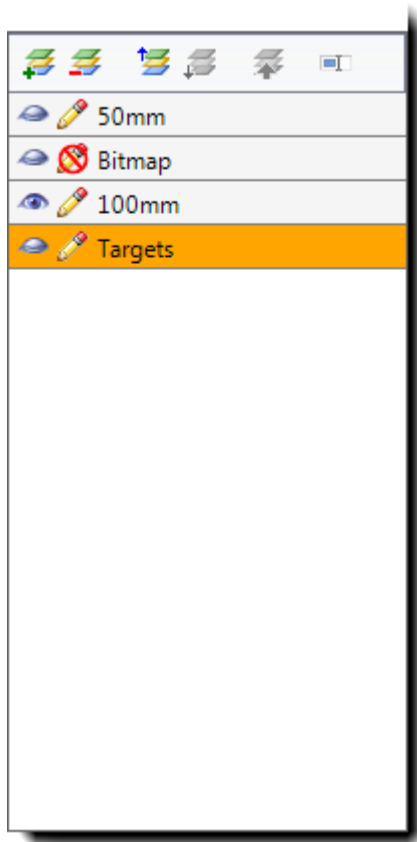
Import an image that can be traced (See [Lesson 2](#) or watch the [Bitmap Tracing](#) video on the web)



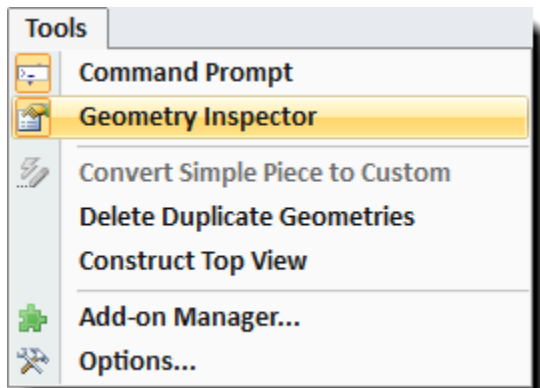
For this example, the block will be traced twice, once for the first 0-12.7mm that includes the 50mm radius, and again for 12.7mm-25.4 including the 100mm radius



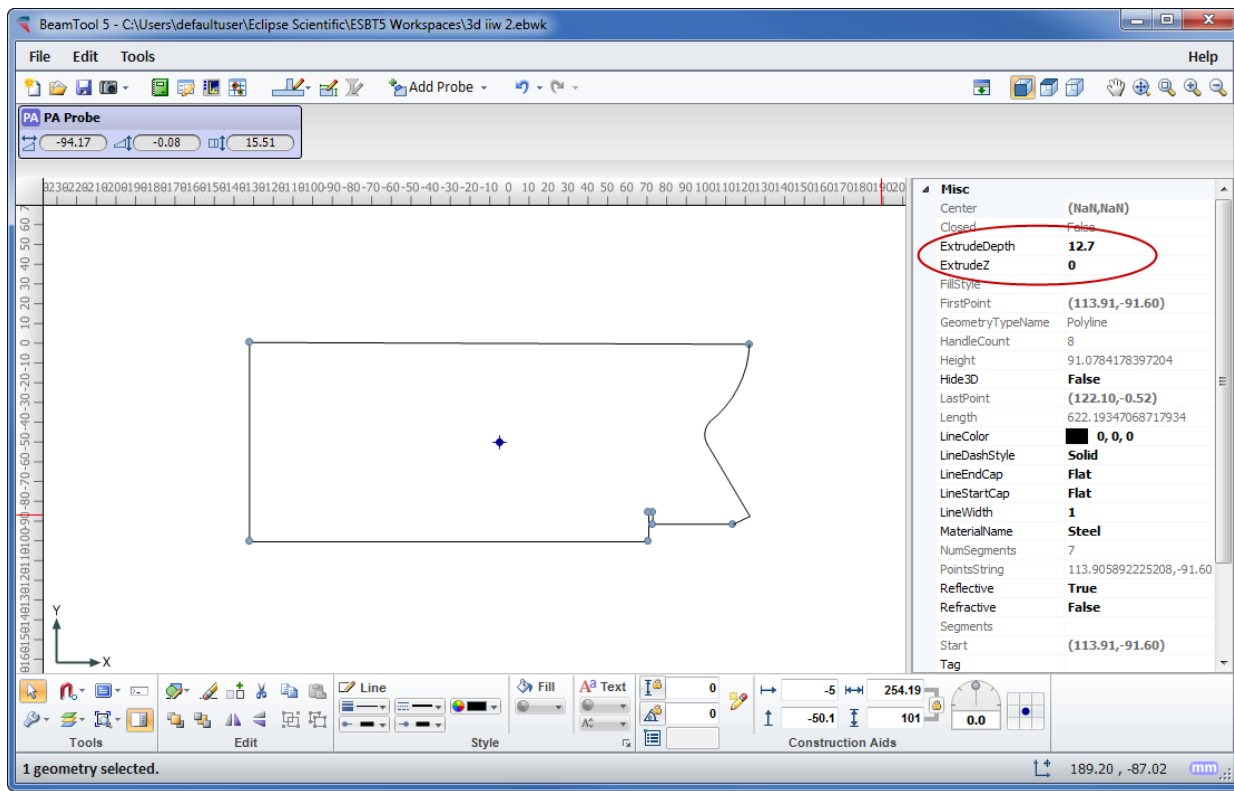
Use the [Layers](#) feature to separate the different components of the drawing



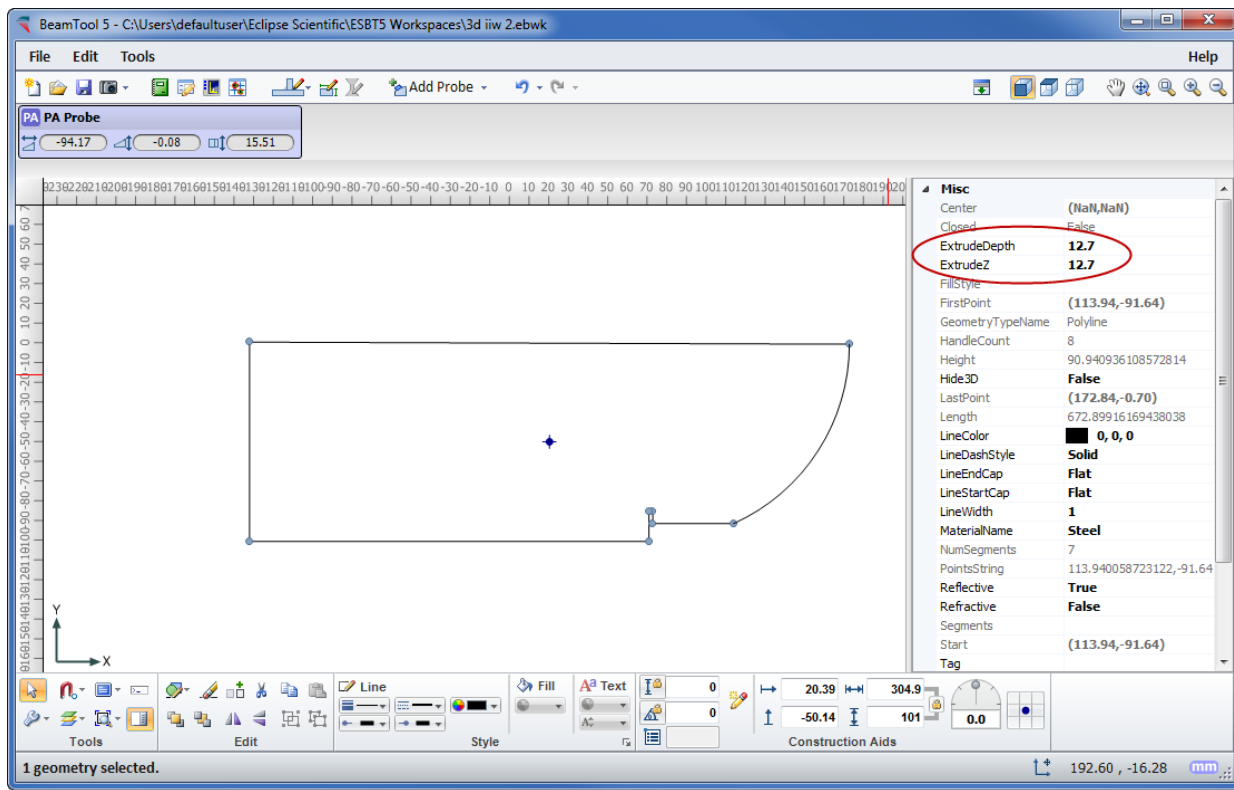
Click on the [Tools](#) menu, open the [Geometry Inspector](#)



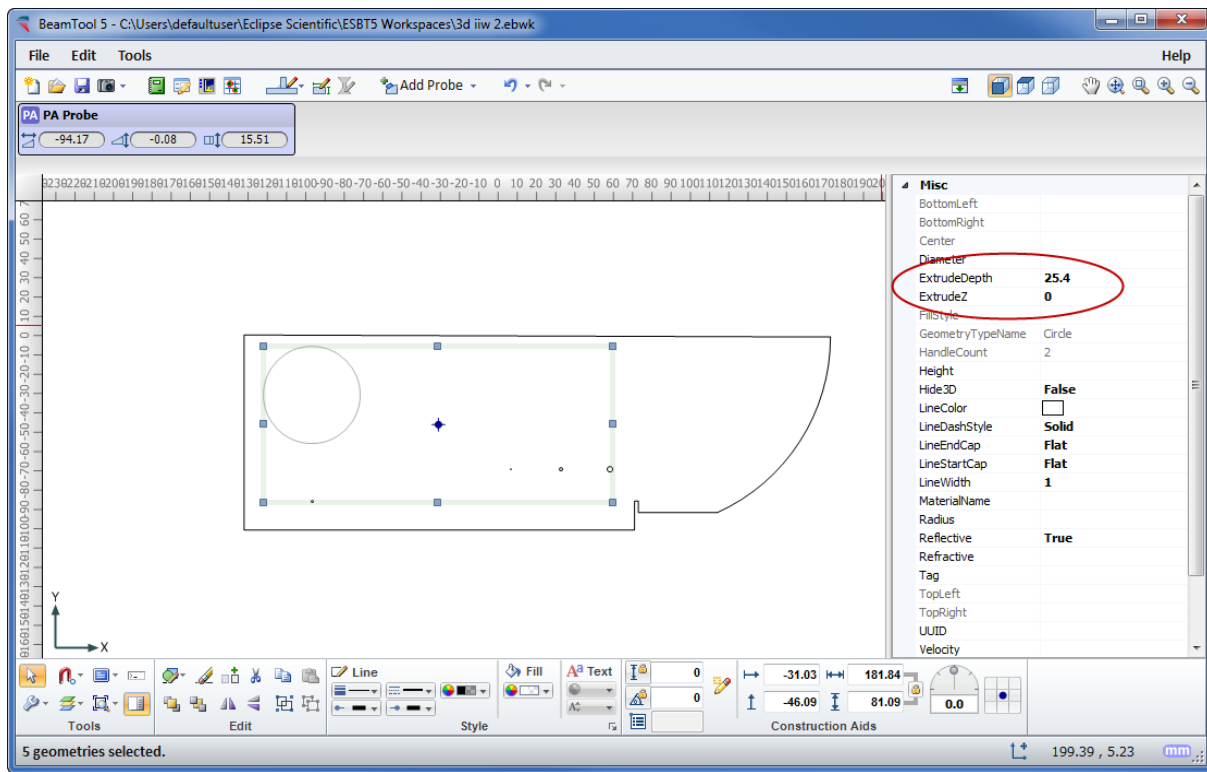
Select the 50mm radius outline, and in the Geometry Inspector set ExtrudeZ to 0 (this is the starting point of the geometry in the Z axis) , and ExtrudeDepth to 12.7 (This is the depth the Geometry is Extruded)



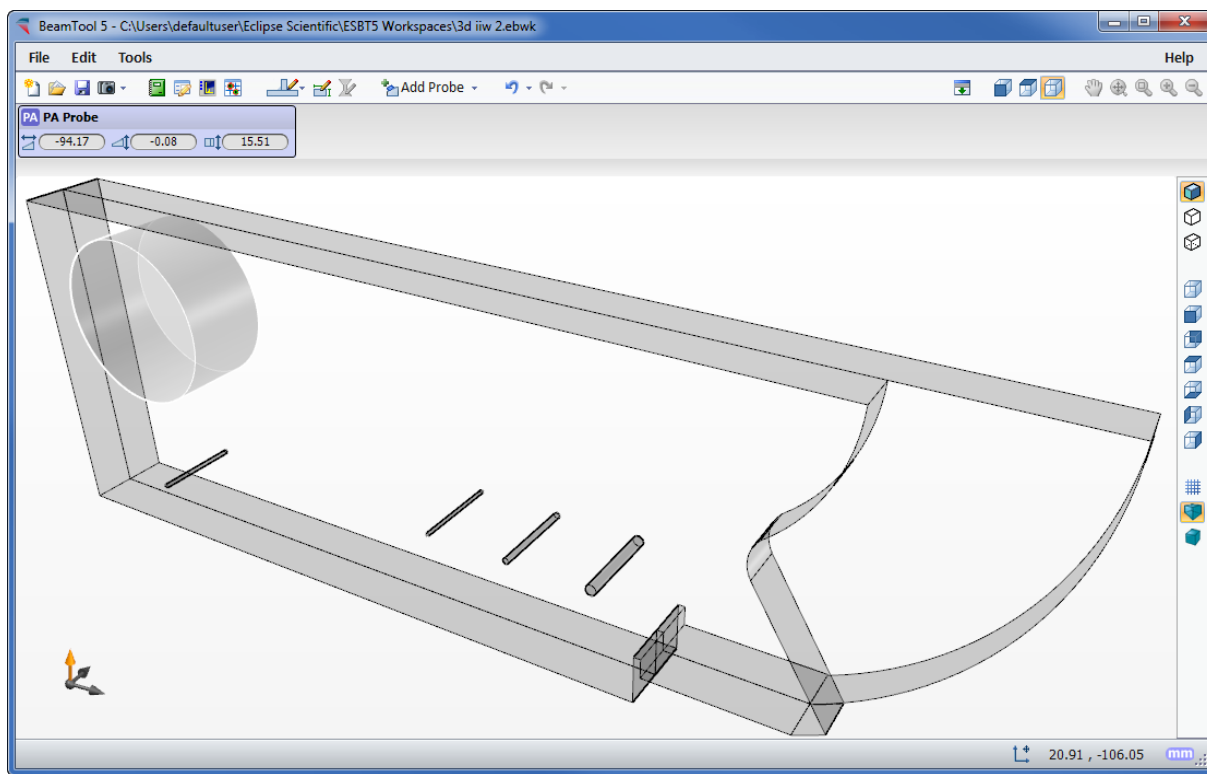
Select the outline with the 100mm radius, and In the Geometry Inspector Set ExtrudeZ to 12.7 and ExtrudeDepth to 12.7



Add the Side Drilled Holes and Lucite Insert into the drawing. Set their ExtrudeZ to 0 and the ExtrudeDepth to 25.4



When we change to [3D View](#), the different Z starting points and extrusion depths can be seen.

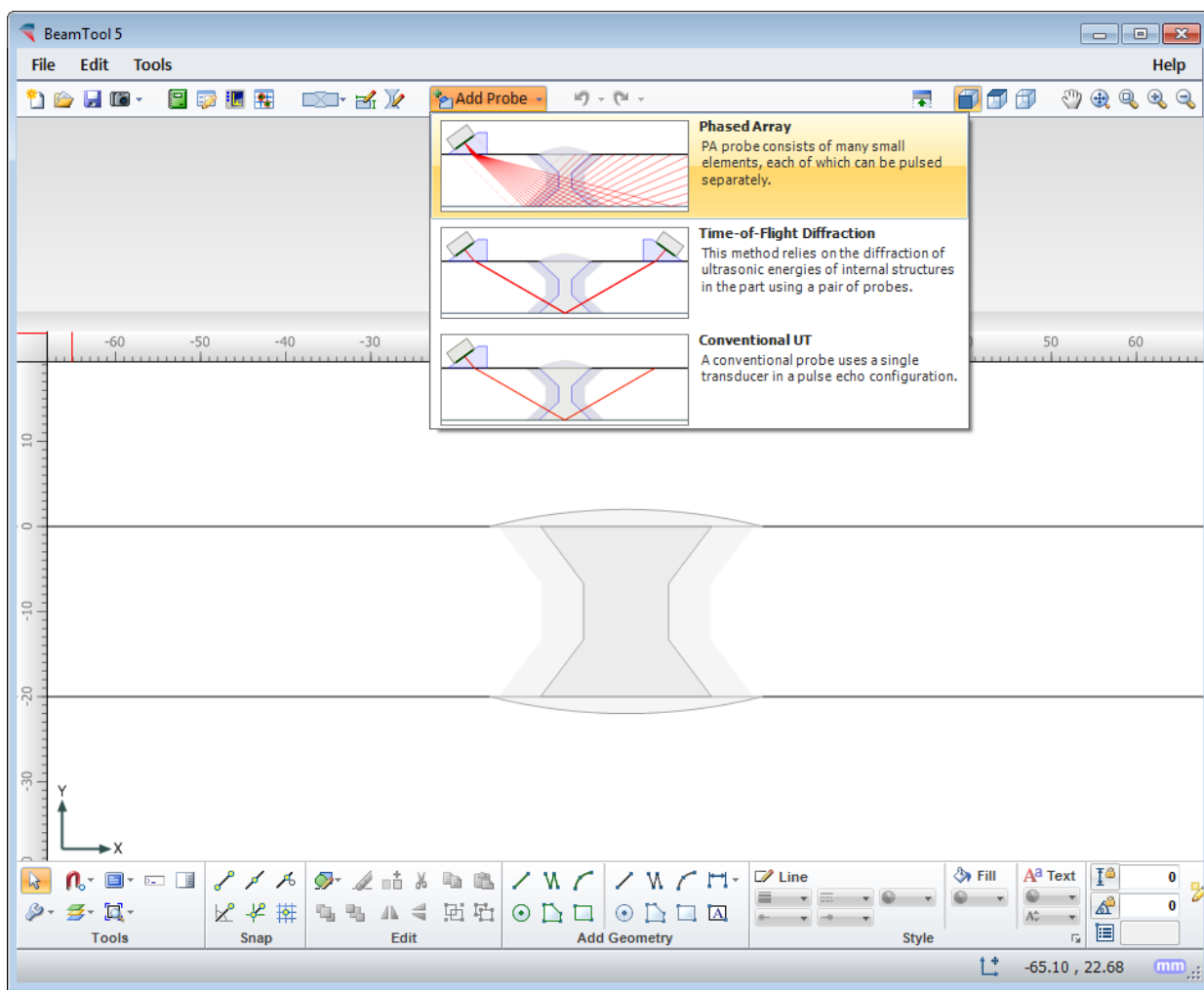





23.6 LESSON 6 HIGH TEMP ADD-ON

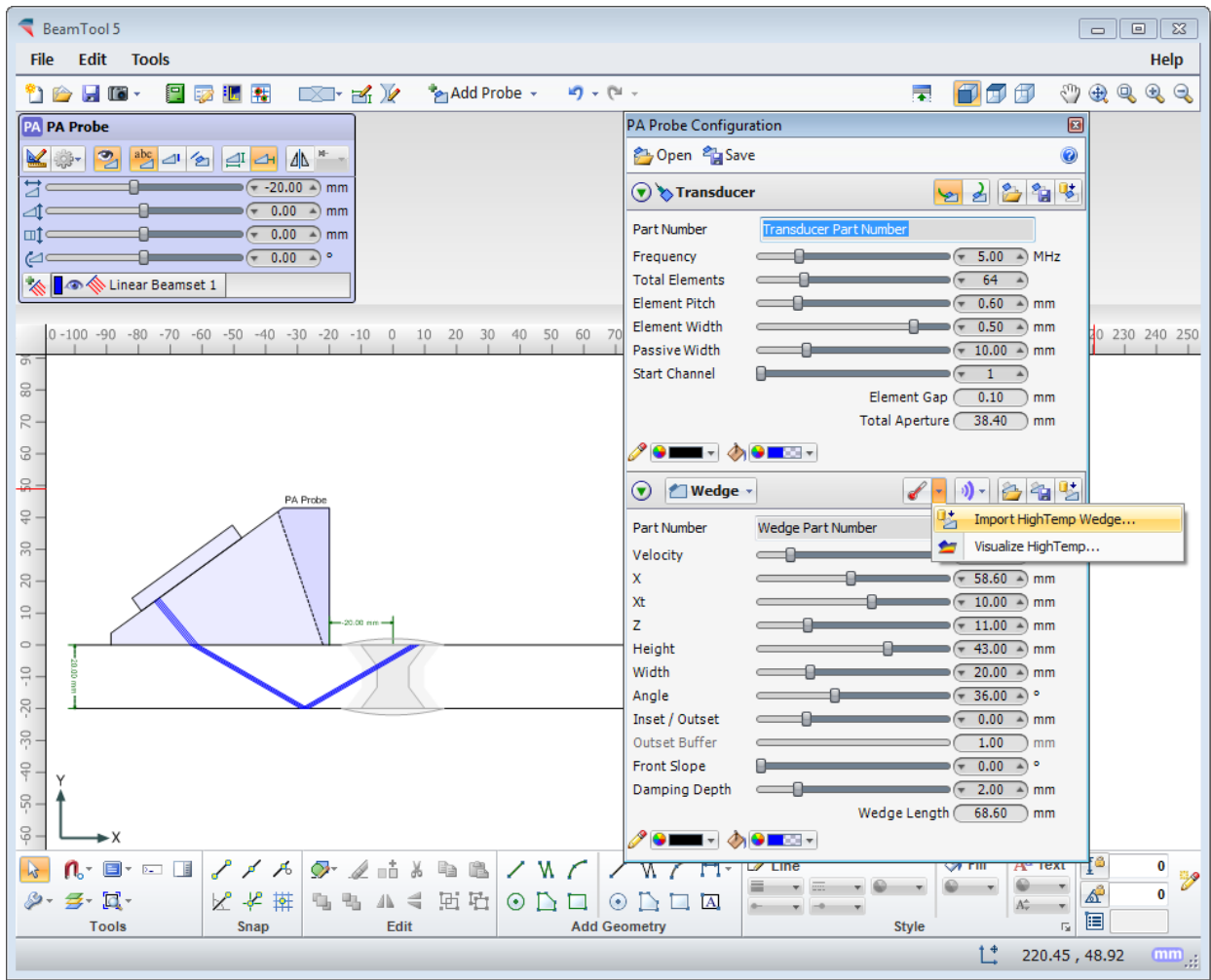
In this lesson we will demonstrate the High Temperature Add-on functionality in BeamTool. In order to proceed with this lesson you must have purchased the HighTemp Add-on module. Please refer to the [Add-Ons](#) section to learn how to purchase High Temp.


Now that you have your HighTemp license activated let's put it to work.

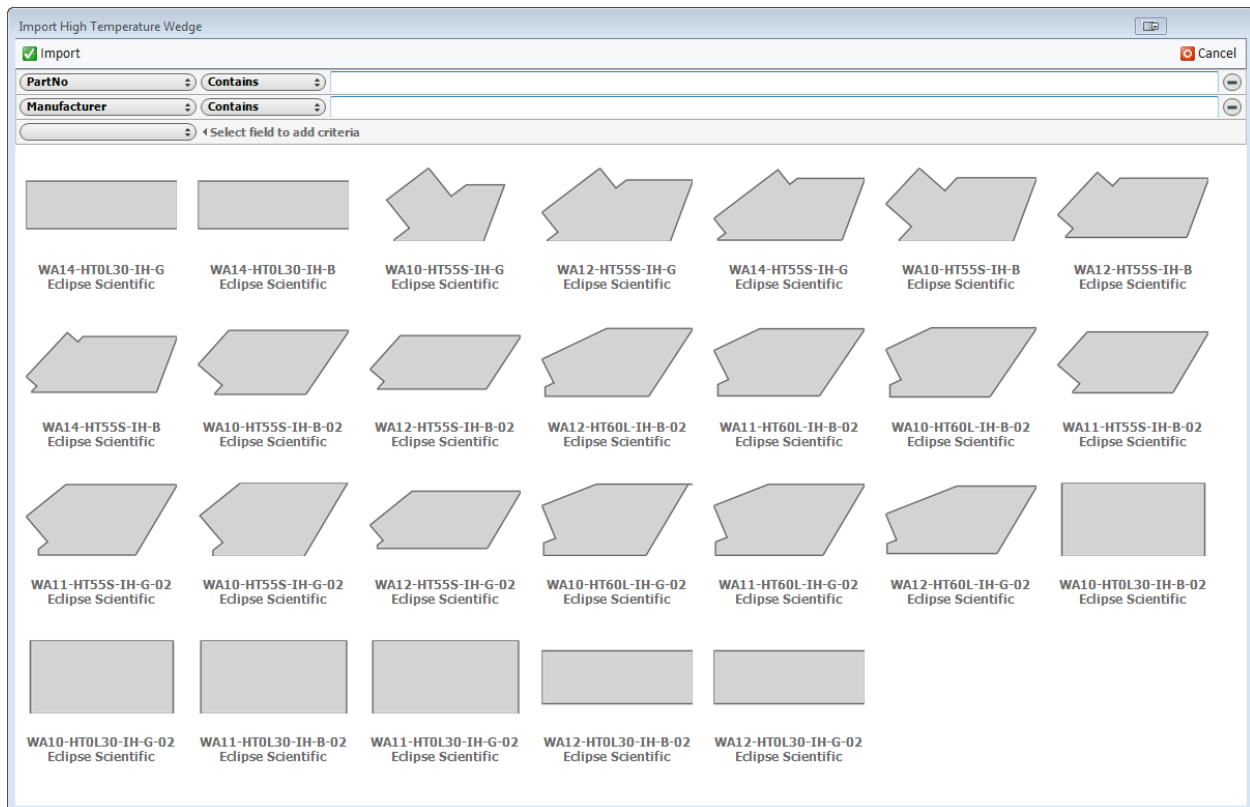
For this lesson we will start out with the default Plate Piece geometry and add a Phased Array Probe with a Linear Beamset (Using 12 Aperture Elements and 5 Beams).



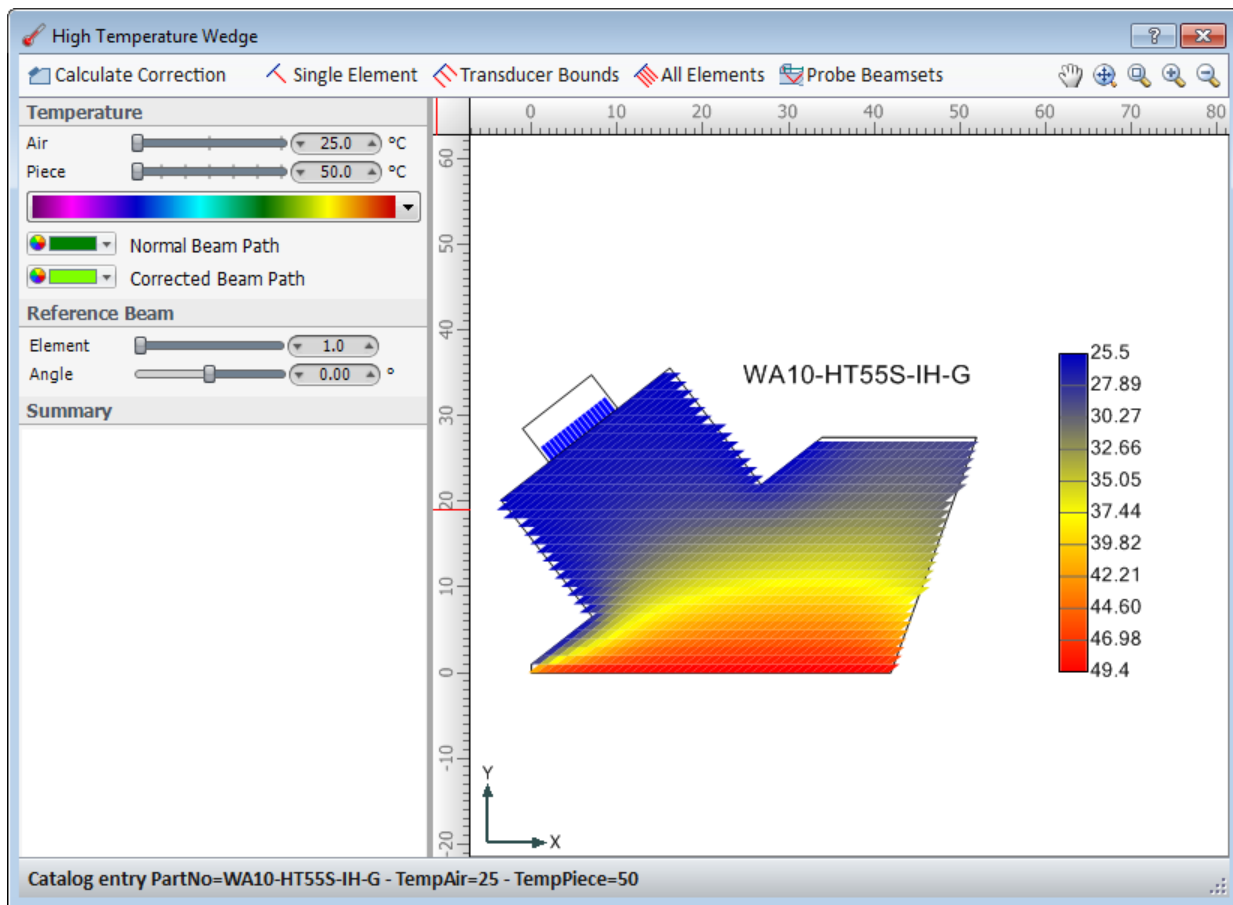
Click on the  Probe Configuration icon in the PA Probe Group to launch the PA Probe Configuration dialog. In the Wedge section of the PA Probe Configuration dialog, click on the arrow next to the  High Temp icon. Select  Import HighTemp Wedge from the drop down menu.



Select one of the High Temperature Wedges from the catalog and click on the  Import button.



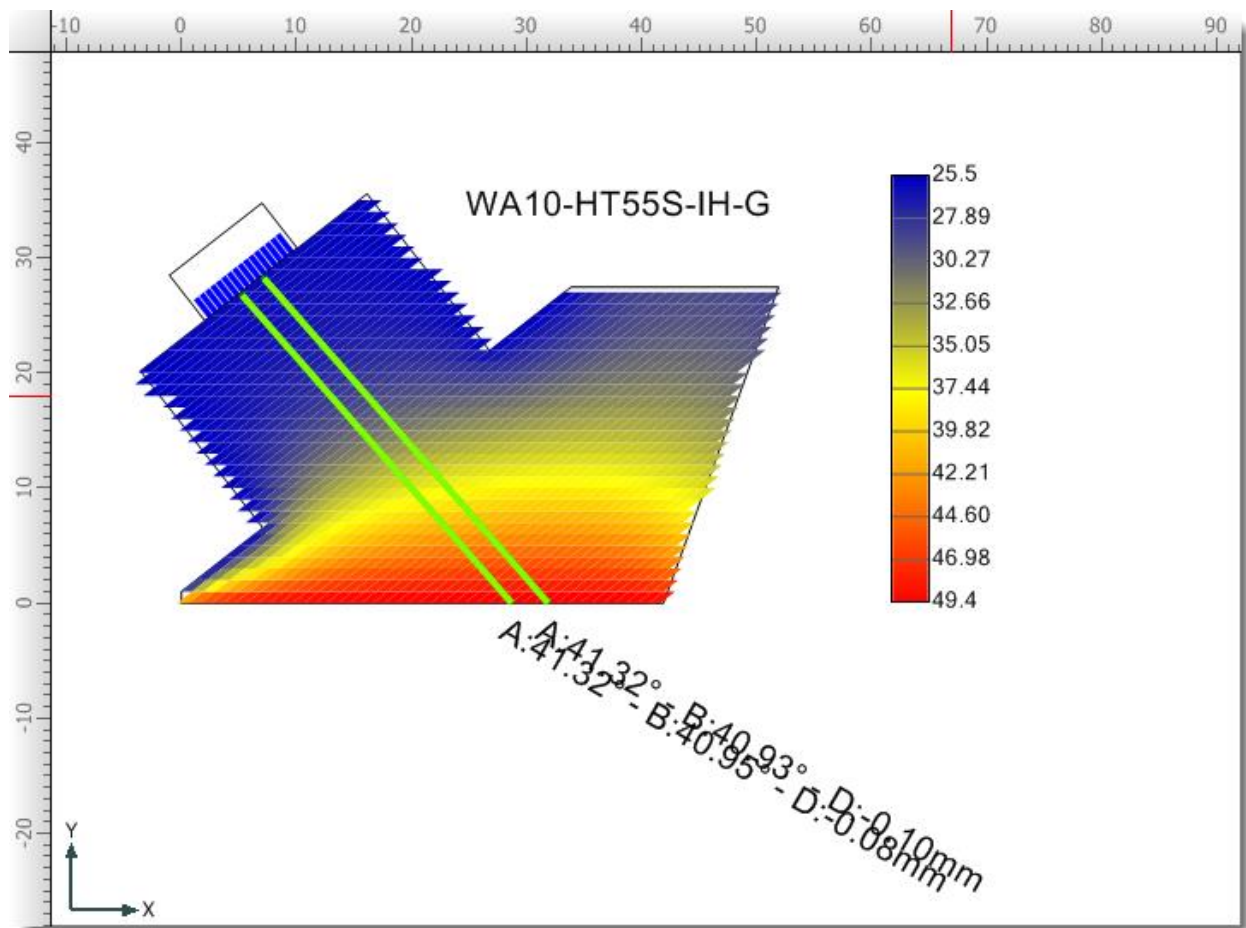
For this lesson we have selected the WA10-HT55S-IH-G, and we are using a Transducer with 16 total elements. Once you have selected the HighTemp Wedge to be imported, the High Temperature Wedge dialog box will open.




Use the HighTemp Wedge Toolbar and options to render various beam paths.


 Calculate Correction

Calculates the beam path correction factors for all of the probes beamsets.



When this button is first clicked a pop-up window will come up to remind the user to set accurate temperature-specific piece velocities.

Temperature-Specific Piece Velocities 

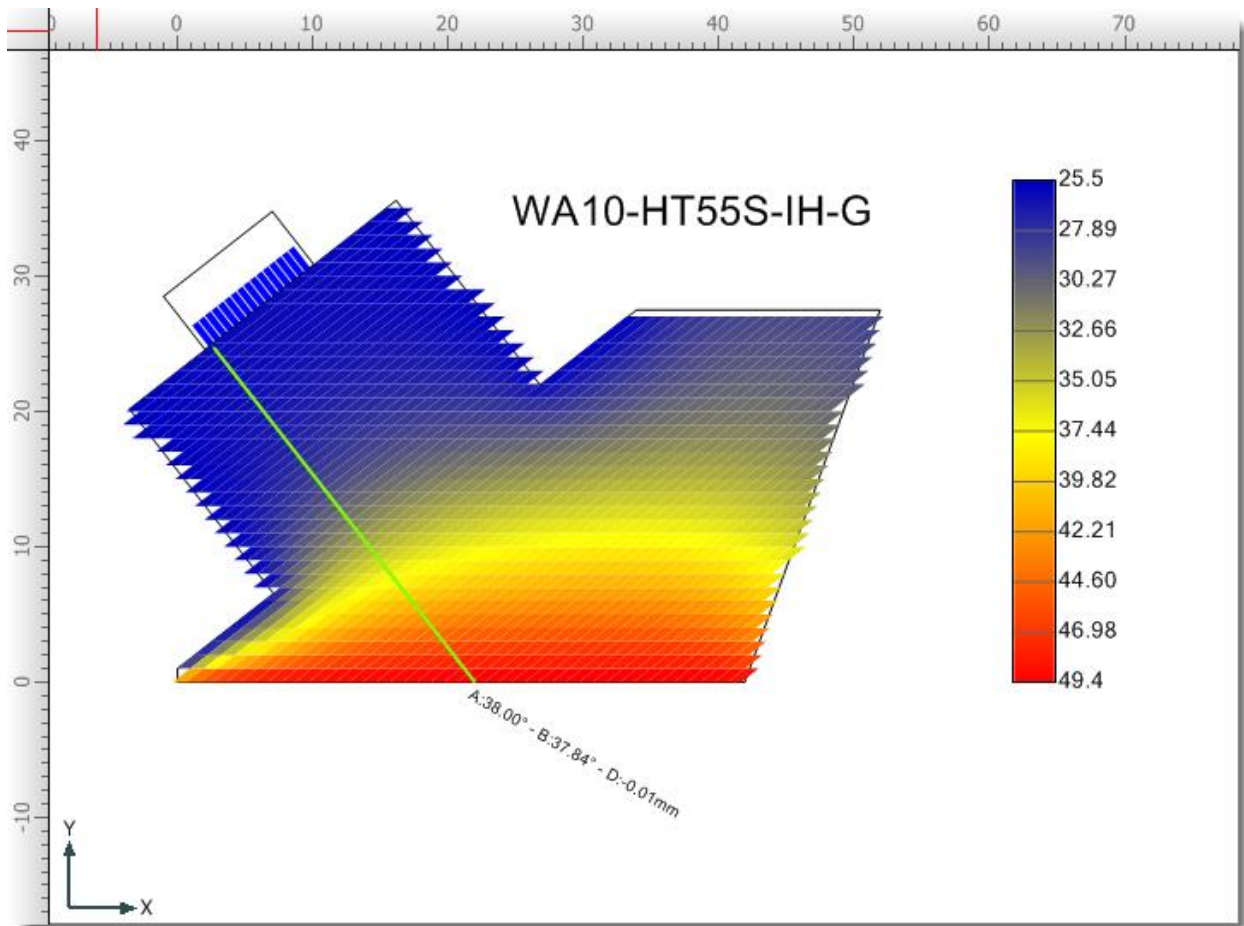
 **Accurate temperature correction relies on accurate temperature-specific piece velocities. If you have not yet set temperature-specific piece velocities, do so now:**


Compression mm/μs

Shear mm/μs

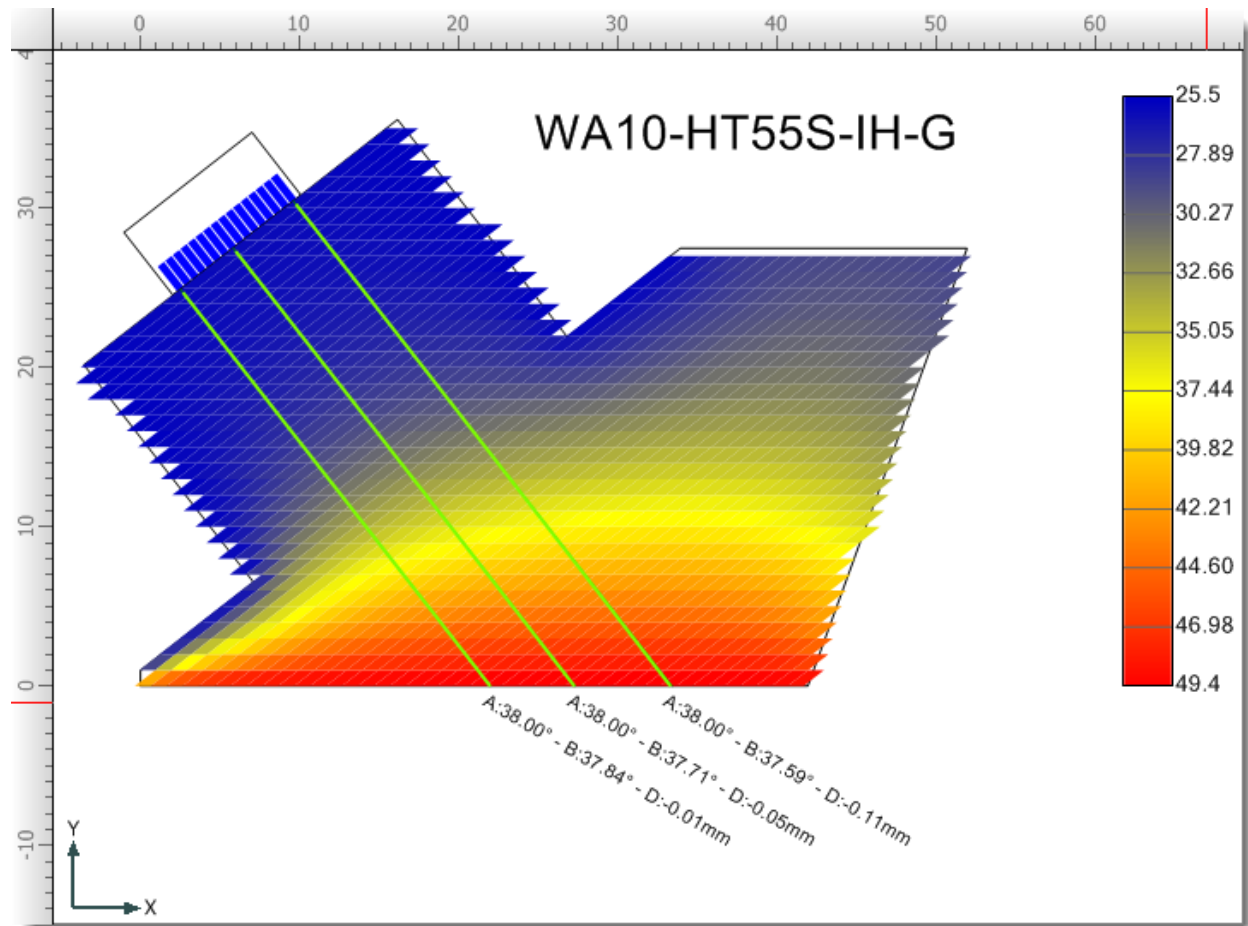
 **Single Element**

Render a single element at the angle specified.



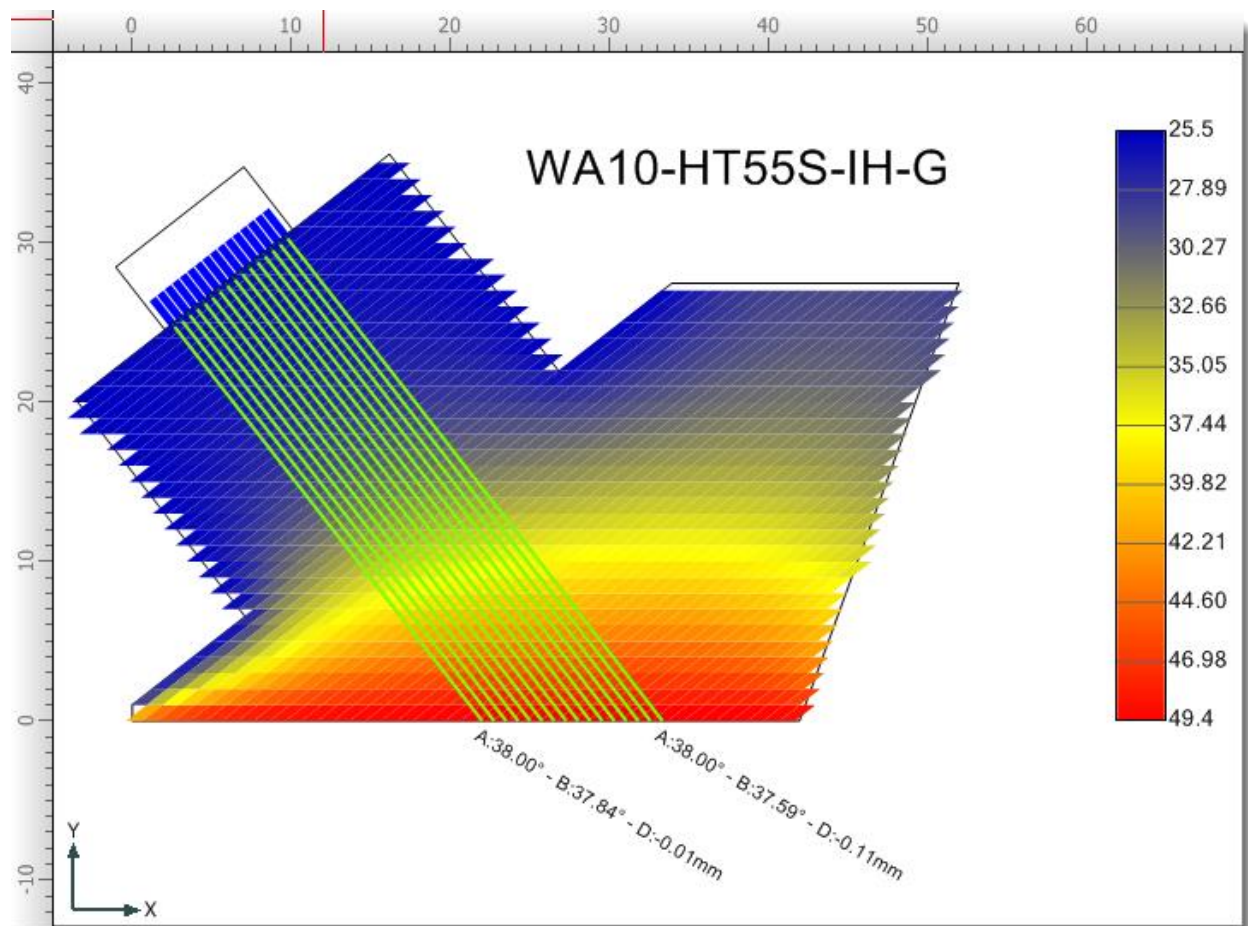
 **Transducer Bonds**

Render beams at the first and last element and from the center of the array at the angle specified.



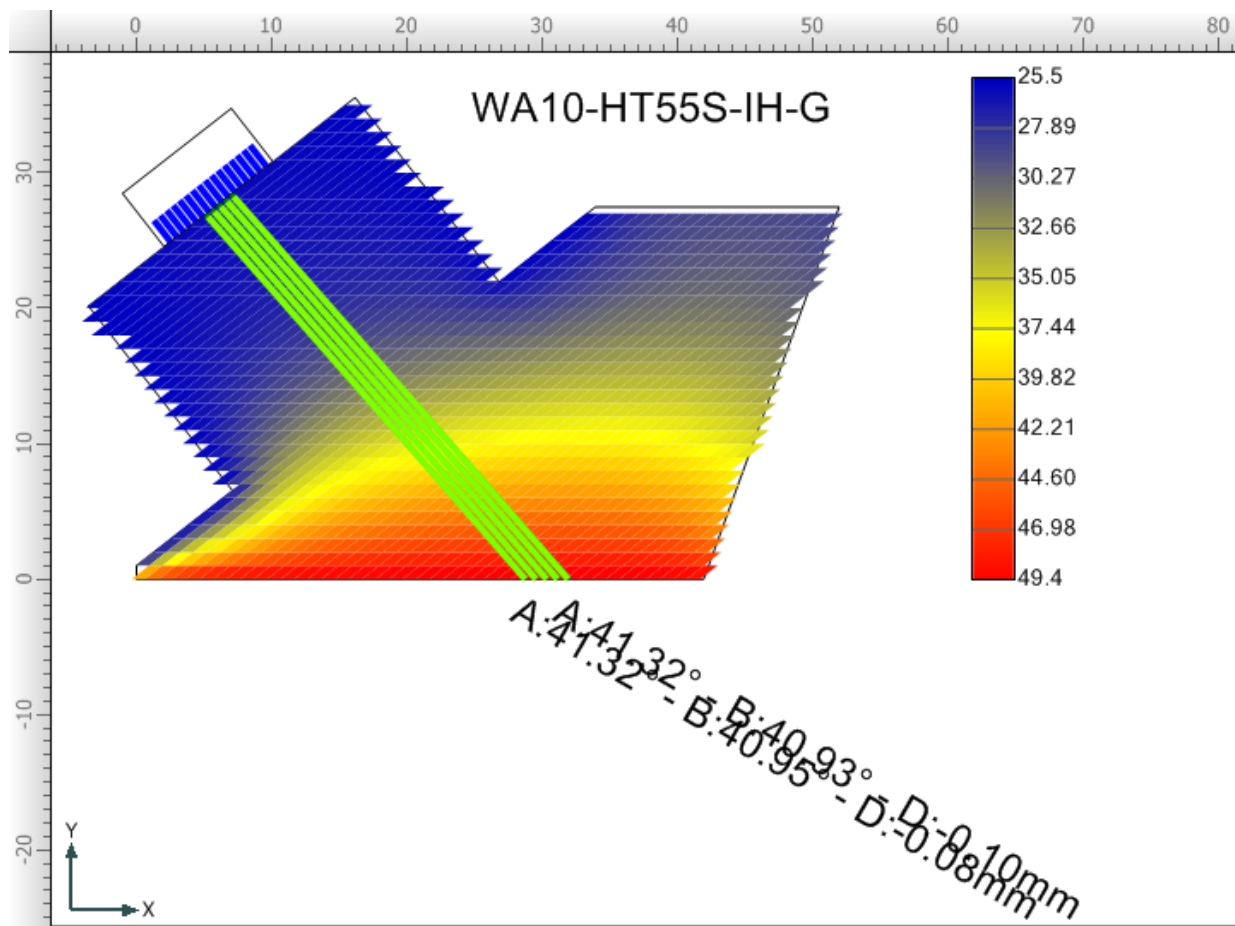
 All Elements


Render a beam for each element in the array at the angle specified.

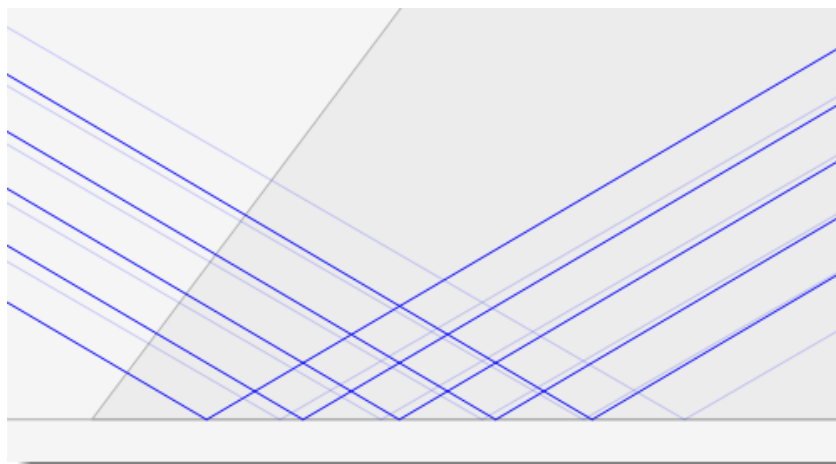


 **Probe Beamsets**

Render a beam path for each of the probes beamsets.



To visualize the corrected HighTemp Beam Path in your workspace, click on the  HighTemp icon in the [PA Probe Configuration](#) dialog box. When turned on, the original beam path is greyed out, and the HighTemp beam path is shown in bold.

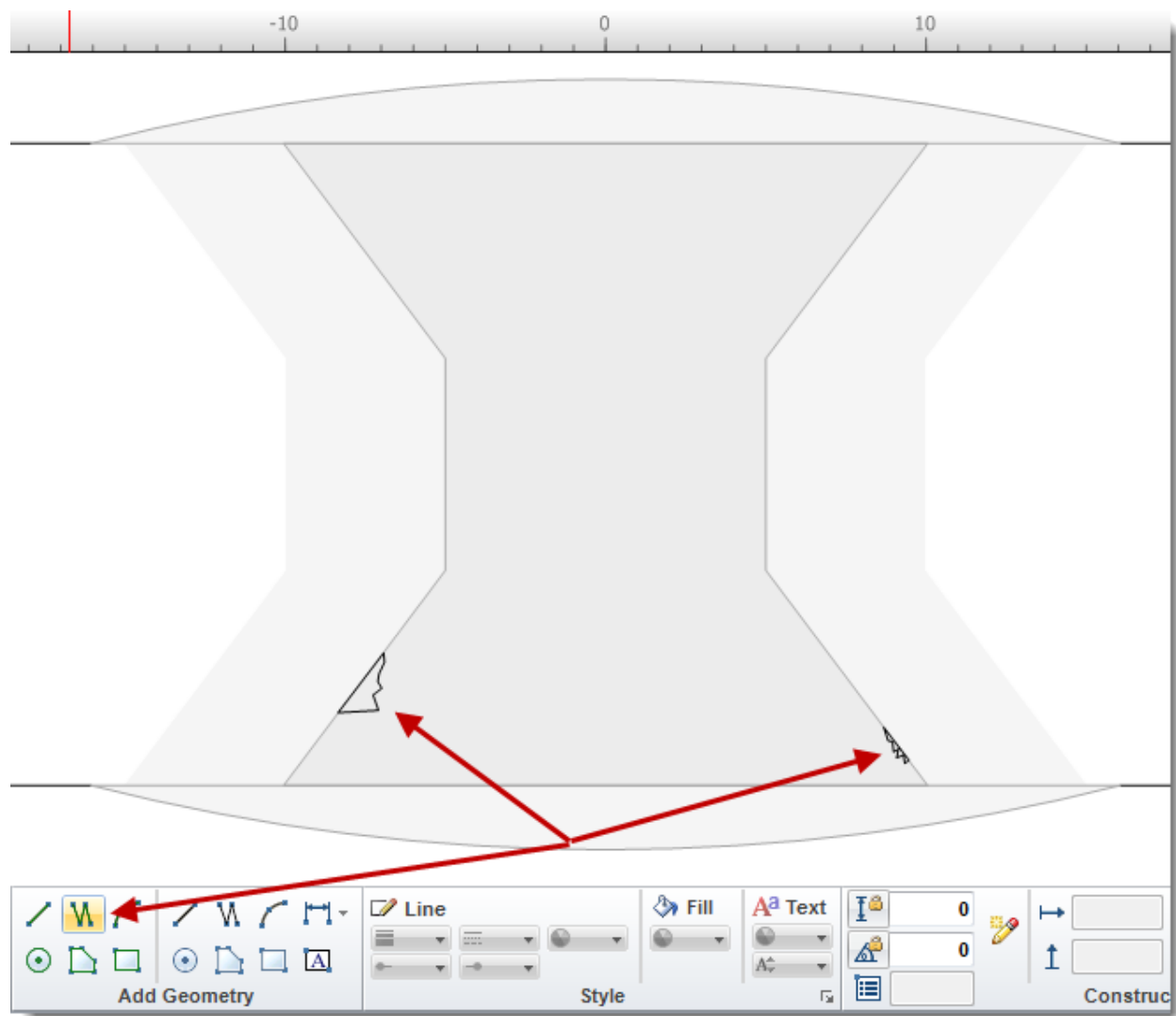


23.7 LESSON 7 A-SCAN

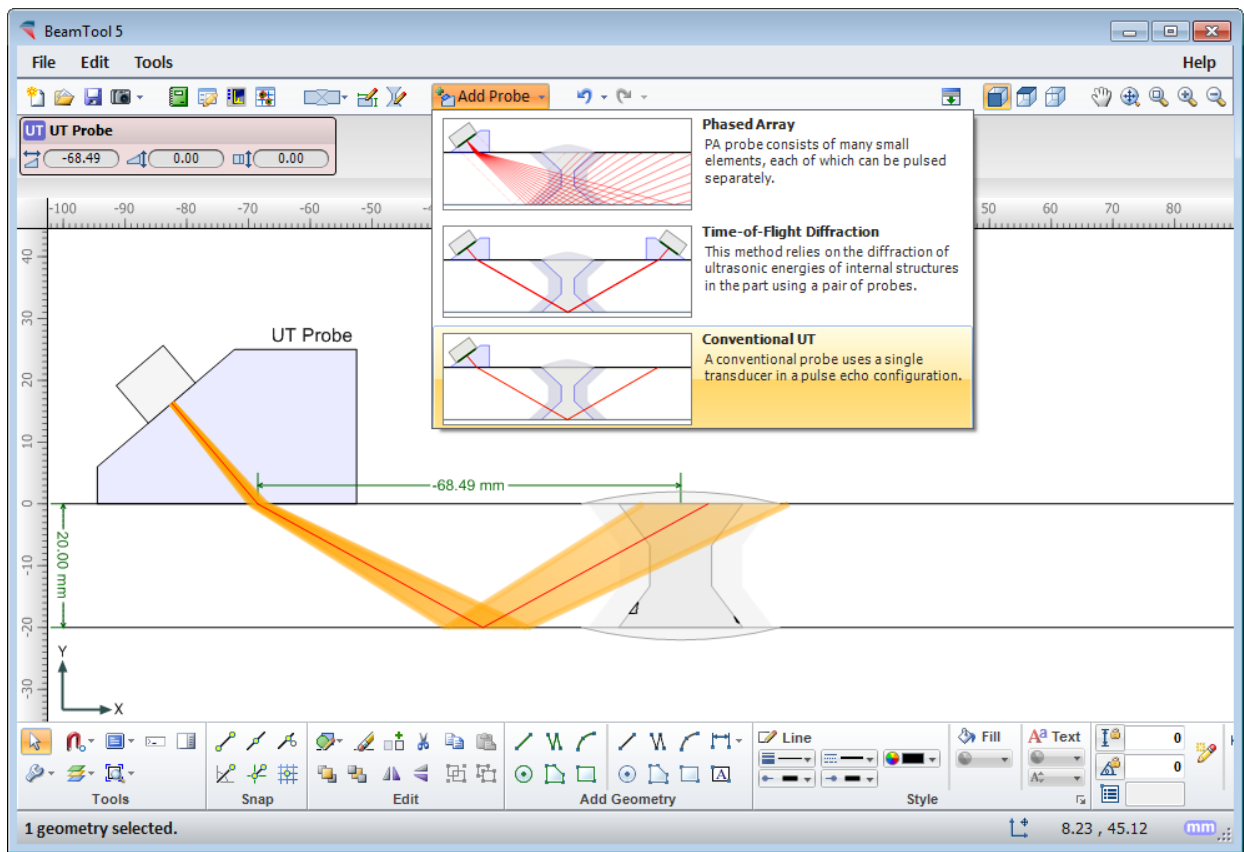
In this lesson we will demonstrate the A-Scan functionality in BeamTool. In order to proceed with this lesson you must have purchased the A-Scan Add-on module. Please refer to the [Add-Ons](#) section to learn how to purchase A-Scan.




Now that you have your A-Scan license activated let's put it to work.

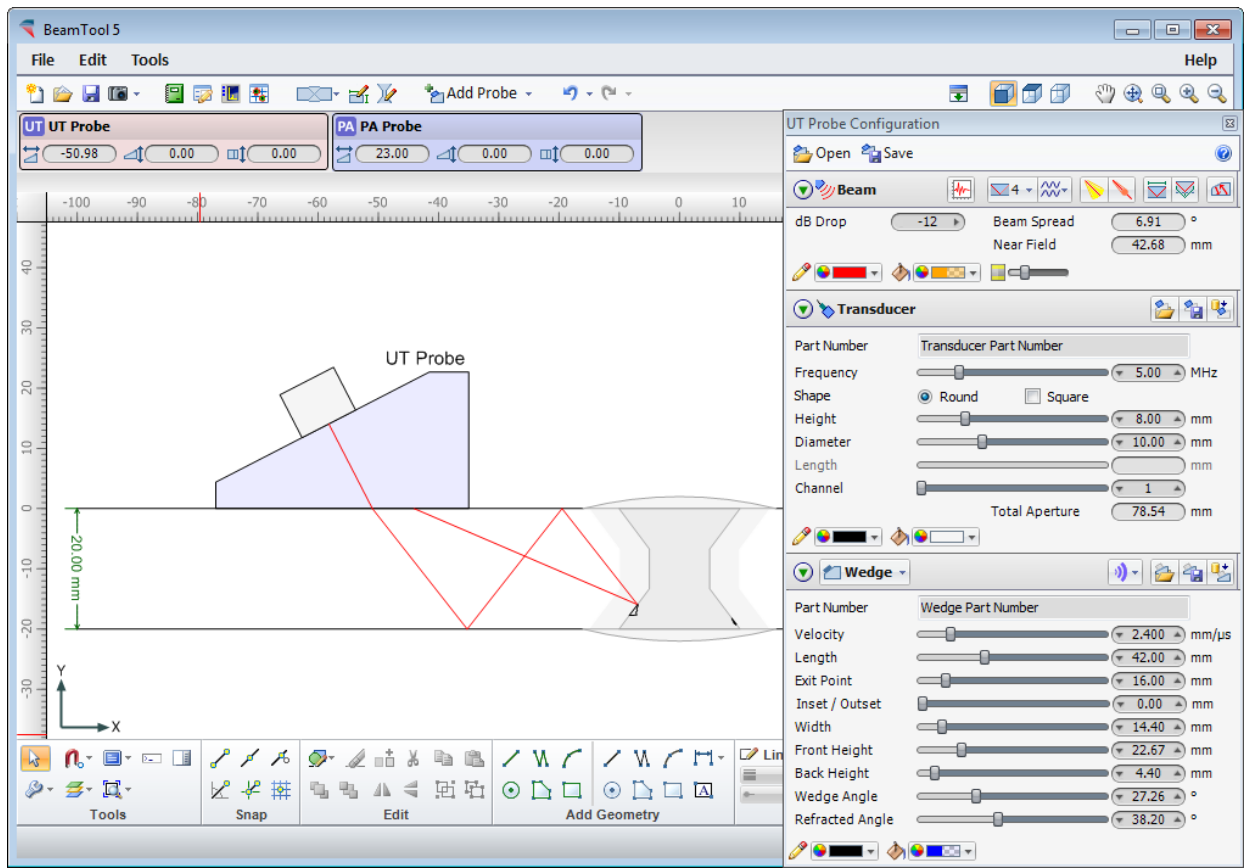
For this lesson we will start out with the default Plate Piece geometry. Use the [V Piece Polyline](#) drawing tool to add some defects in the weld.




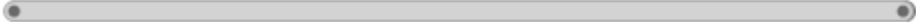


Add a [Conventional UT Probe](#) to the workspace.

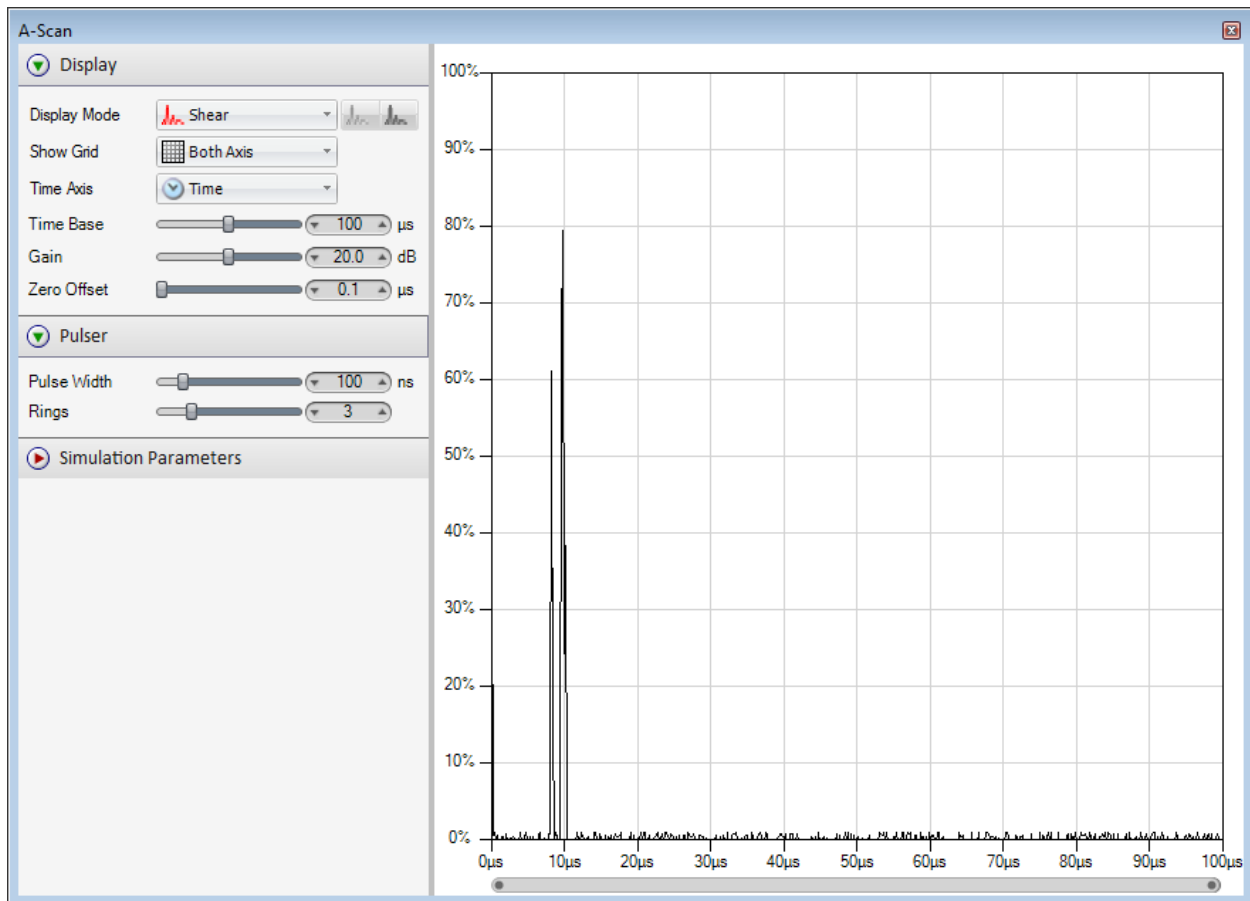


Open the UT Probe Configuration menu by clicking on the  Probe Config icon found in the UT Probe menu. Turn off the Show Beam Spread by clicking on the  Show Beam Spread icon. Detecting reflections requires that the probe/beamset is configured with enough beam skips to allow the beams to return to the transducer. Change the number of beam skips to 4 by clicking on the  Beam Skips icon.



Click on the  A-Scan icon to open the A-Scan dialog box.

Use the slider control  at the bottom of the A-Scan chart to find and view the area of the timeline where the signal occurs. The handles on the ends of the control  can be dragged back and forth to zoom in and out. The bar itself can be dragged back and forth  to scroll through the time line.



Use the display mode to visualize different scan data that is displayed in the chart. Changing the Display mode will automatically update the A-scan view and the Beamset.

23.8 TRAINING VIDEOS

Please follow the links below for BeamTool training videos.

[Getting Started Video](#) This video illustrates the creation of a very simple phased array technique. The technique ensures complete coverage of the weld by using two phased array sectorial beamsets to inspect the top and bottom of the weld.

[Bitmap Tracing](#) This video shows how to import a bitmap image and use it to trace a complex piece geometry.

[ZONAL Add-on](#) This video demonstrates how to use the BeamTool ZONAL Add-on. The BeamTool ZONAL Add-on provides the ability to define weld zones, which are used in conjunction with a Zonal Beamset to provide automated targeting of individual phased array beams into specific locations along the face of a weld bevel.

[**Editing Report Templates**](#) This video demonstrates how to edit report templates in BeamTool.

[Calibration Block Designer](#) Easily generate an ASME compliant calibration block with the click of a button. Targets are added based on your piece thickness, while meeting the requirements of ASME Section 5, article 4, Figure 434.2.1. You can also design custom calibration blocks and generate reports that include all aspects of a calibration block to support machining. This allows the technician to spend more time on developing a technique.

CHAPTER (24): SUPPORT

Eclipse Scientific values your business and your feedback is very important to us. If you are experiencing problems please use the **Check For Update** option under the Help menu to ensure you have the most recent version of the software.

If you are still experiencing problems we can be reached:

On the Web

Select Support from the Help menu in BeamTool to submit an inquiry directly from our [website](#).

Email

Email us at support@eclipsescientific.com and provide us with the following information:

- Full Name
- Company
- Serial Number or HardLock ID (displayed in About screen)
- Version of BeamTool
- Description of Problem or Question

Phone

Contact Eclipse Scientific BeamTool Support directly: Phone (519) 372-1831 or Fax (519) 372-2039
