

# arivis InViewR

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Basics user guide

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## Preface

Arivis InViewR is a fully immersive, interactive image exploration tool. It is designed to give users the ability to render and explore any three-dimensional stack of images in a virtual reality (VR) environment with full depth perception without the need for extensive pre-processing of data.

With arivis ImageCore at its heart, it is built for speed and interactivity no matter the size of the raw data. This means that image stacks must first be imported into arivis SIS files for visualisation if they are not already. This simple drag and drop process does not usually require a lot of configuration as the software can directly import most common microscopy file formats. For more information on imports, please refer to help files or our training videos.

Arivis InViewR uses a direct volumetric rendering system requiring little by way of pre-processing of the data. There is no need to create isosurfaces or any additional volume objects, as long as the volume information is stored in a Z stack of 2D images. Images from some acquisition devices may need to be processed into such stacks prior to the import in the software (e.g. X-Ray microtomography). However, some adjustment of intensity and opacity settings will be required for best results.

Arivis InViewR uses a combination of tools from third party providers to provide the VR experience. The arivis InViewR workstation is typically delivered pre-configured so that minimal further configuration is required, but some set up may be necessary to adapt to your installed environment (e.g. Guardian system).

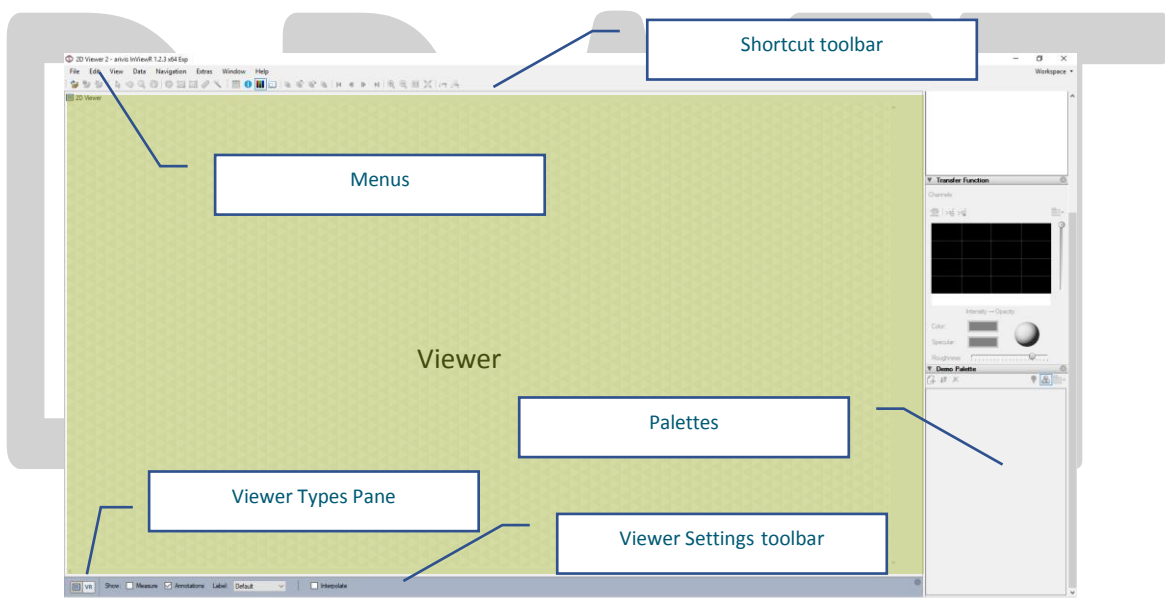
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## Desktop Interface

The arivis InViewR interface is split between the desktop interface and the VR environment, with some element available in only one or the other, and some elements available in both. As the desktop environment is necessary for several types of interactions (e.g. creating movies or high resolution snapshot images), it is important to be familiar with it.

As with most Microsoft Windows desktop packages the main interface is built from multiple discreet elements. The main elements of the InViewR desktop interface are:

- The **menu bar**
- The **Shortcut toolbar**, which is mode sensitive and gives access to commonly accessed tools and functions
- The **Palettes**, where users can control various aspects of the software (e.g. render settings, opacity curves, geometries)
- **Viewer** where images are displayed. Note that when in the VR environment the volume render is also displayed in the desktop viewer



Some palettes open automatically, but other must be manually turned on or off. Right-click in the Palette space to show the Palettes menu. Already opened palettes have icons highlighted in blue. Click on any palette in the menu to toggle its visibility.

At the bottom left of the viewer is the Viewer Types pane which allows the user to switch between the 2D view and VR environment.

## Importing images

To open or open images into arivis InViewR, drag and drop the file(s) you wish to import into an opened viewer. If the file is already in the SIS format, it will open straight away. If the file is not in the SIS format but is of a fully supported type (LIF, CZI, ND2, OIF...), the import will require that you select a name and save location for the new SIS file that will be created.

If the image data is held in multiple files or the metadata type is not fully supported you'll also need to choose an import scenario.

When the file is finished imported you can adjust it as required by adjusting colours and levels and switch to the VR viewer to navigate through your data in 3D.

## Adjusting colour and display range

Images imported into InViewR will automatically be adjusted for the brightest and darkest pixel intensities in the stack. Use the colour bar sliders on the right of the viewer to make further adjustments of black/white levels. Right-click on the colour bar to change the look-up table.

Further adjustments of to the transparency of pixels (opacity) will be required for optimal visualisation in VR. Please check the section on adjusting the opacity curve below.

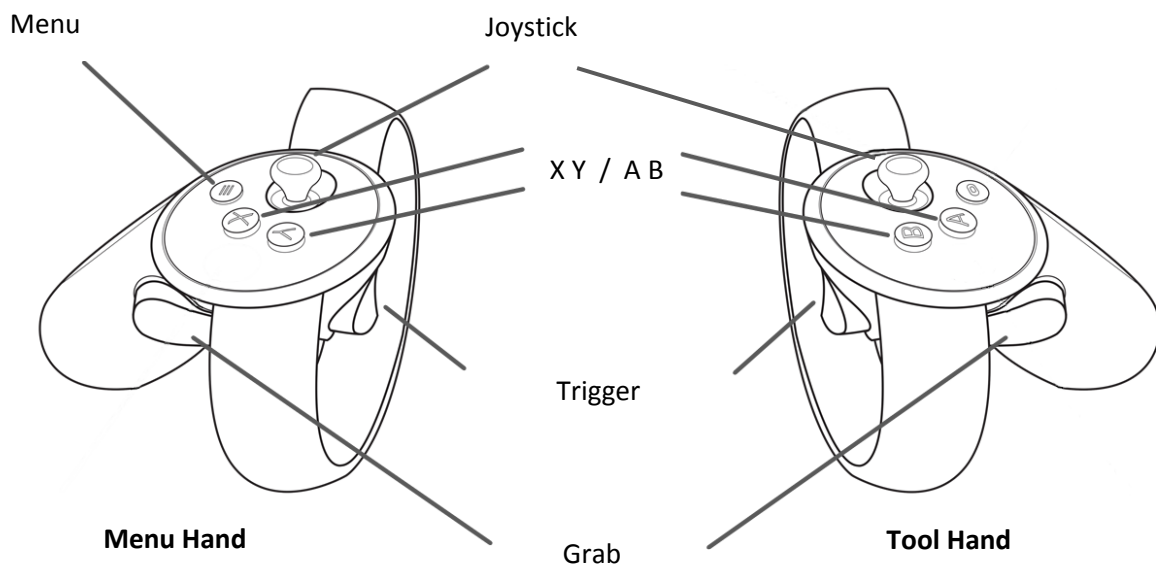
## Basic navigation

In the 2D view, use the Navigator palette to select the Scope, Frame or Plane to display.

Use the Viewer Types pane at the bottom left of the workspace to switch between the 2D and 3D view. Arivis InViewR can be configured to use either Oculus Touch controllers or Leap Motion device for navigation and interaction in VR depending on availability from the Settings Palette.

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## Oculus Touch Controller



Beside of their positional information for 3D navigation, the controller offers also buttons and joysticks as input controls.

The **Menu** button always opens the **main menu** where users can access and adjust various information and settings related to the visualisation, tools (like measuring, clipping and counting), data (like channels, surfaces and points of interest), and opacity curves .

The **Menu hand Joystick** gives quick access to the various **modes**.

The **X** button is mode sensitive and can reset the view or remove picked objects, like measurement points or markers.

The **Y** button opens the **tool menu** relevant to the current mode.

The **A** button is mode sensitive and performs different functions depending on context (add POI/measure).

The **B** button shows the **Help** screen relevant to the current mode.

The **Grab** buttons can always be used to **move**, **rotate** and **scale** the volume.

The right **Trigger** button is mode sensitive and will effect different actions based on context (peek, add measurement points, adjust clipping plane, add counting markers).

Both **Trigger** buttons can be used to navigate the menus.

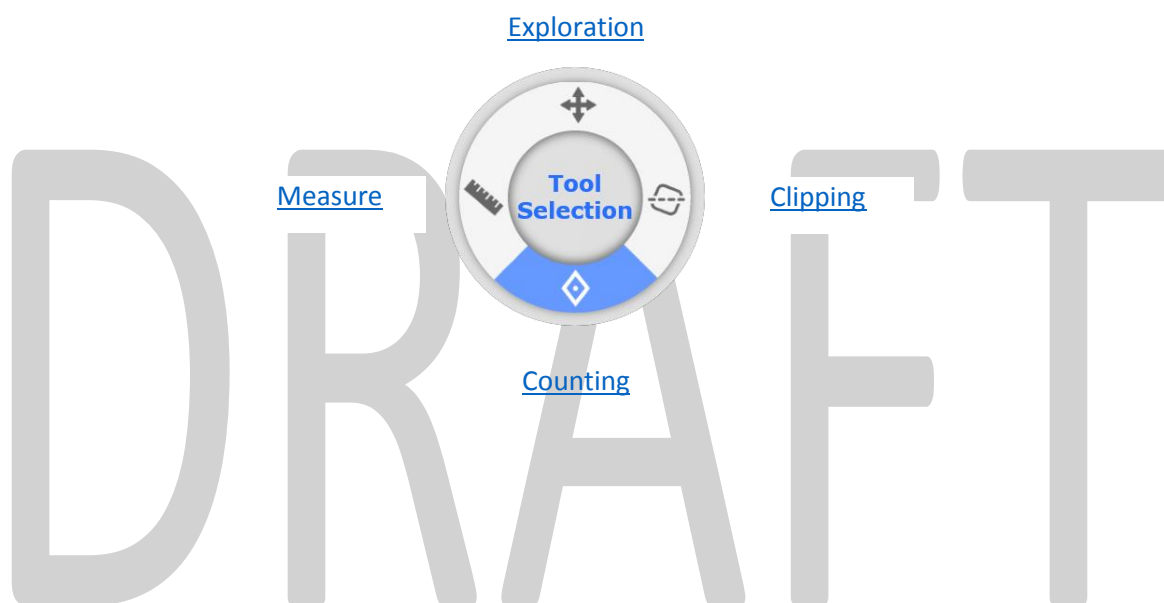
## Mode switching

In the VR environment, there are currently four modes of interacting with the data:

- **Explore**
- **Measure**
- **Clip**
- **Counting**

These modes mainly affect the behaviour of various buttons, enabling a Peek in **Exploration** mode, adding or modifying measurements in the **Measure** mode, adjusting the position of the clipping plane in **Clip** mode for example, and adding marker annotations in **Counting** mode.

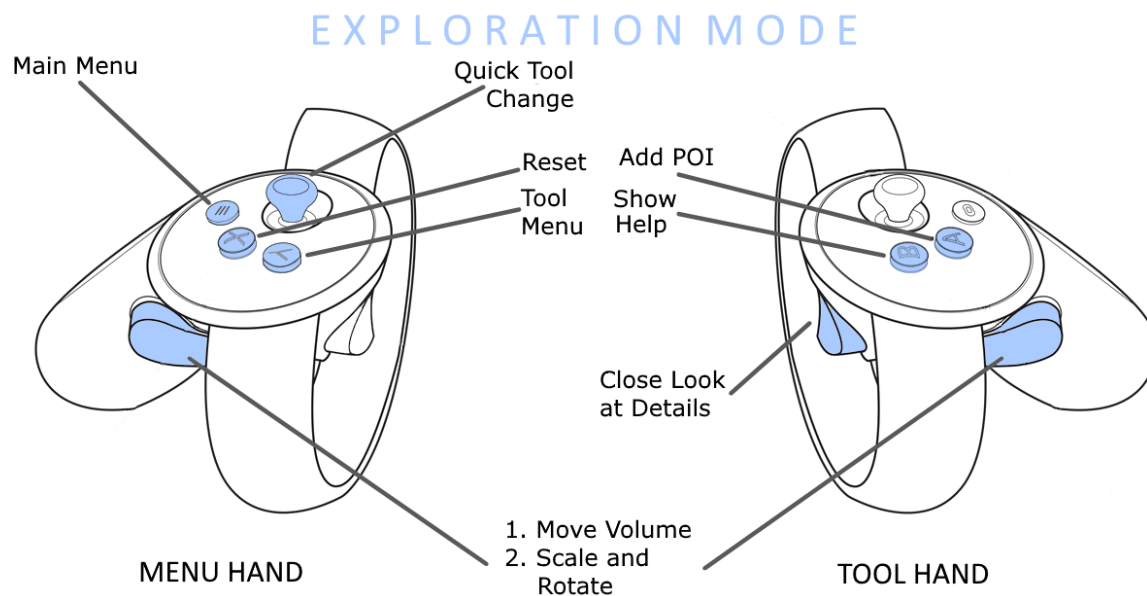
In any mode, use the [Menu hand Joystick](#) to select from the various modes:





## Exploration Mode

The **Exploration** mode is the general means of interacting with a volume in the VR, though most of the navigation tools are also available in the other modes as well.



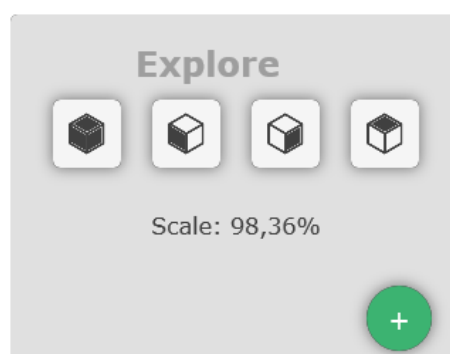
Use the **grab** button with one hand to **move** the volume.

Use the **grab** buttons with both hands to **scale** and **rotate** the volume.

In the **Exploration** mode, point at a point in the volume and hold the tool hand **trigger** button to quickly take a close up **peek** at a selected position. Release the **trigger** to return to the previous position. (This option can be turned on and off from the Home menu)

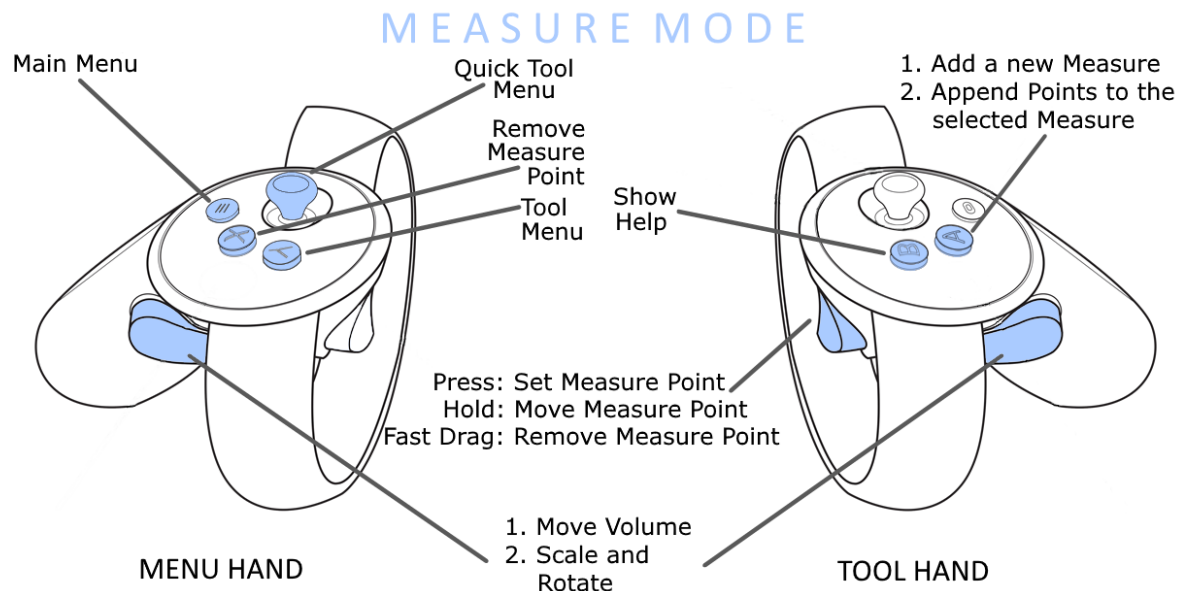
Use the **A** button to add points of interest (POIs). See the [points of interest section](#) below for more information about.

Use the **Y** button to **access the tool menu** and quickly switch between various pre-set volume positions.



## Measure Mode

The **Measure** mode is designed to give users a simple way to quickly define measurements of lengths and angles in the VR environment. The controls being spatially sensitive, this tool does not require the definition of iso-surfaces or segmented objects, simply point and click in the VR space to add points.



As with the **Exploration** mode, use the **grab** buttons to **move, scale** and **rotate** the volume.

Use the **tool hand trigger** to **add points**.

Point at existing measurement points with the tool hand then drag them while holding down the **trigger** to **adjust** their position.

Point at existing measurement points with the menu hand and use the **X** button to **remove** them.

Use the **Y** button to **access the tool menu** and select the type of measurements to perform and get information about the current active:



The Line Measurement defines a straight line between two points. Use the tool hand **trigger** to add points. Each pair of points defines a single straight line.

The Angle measurement defines an angle between two lines. Use the tool hand [trigger](#) to add points. Each triplet define two lines and the planar angle between them.

The Multi-point line defines a continuous line with multiple inflection points for measuring curved objects. Use the tool hand [trigger](#) button to add points in a line. Use the [A](#) button to end the current measurement and add a new one.

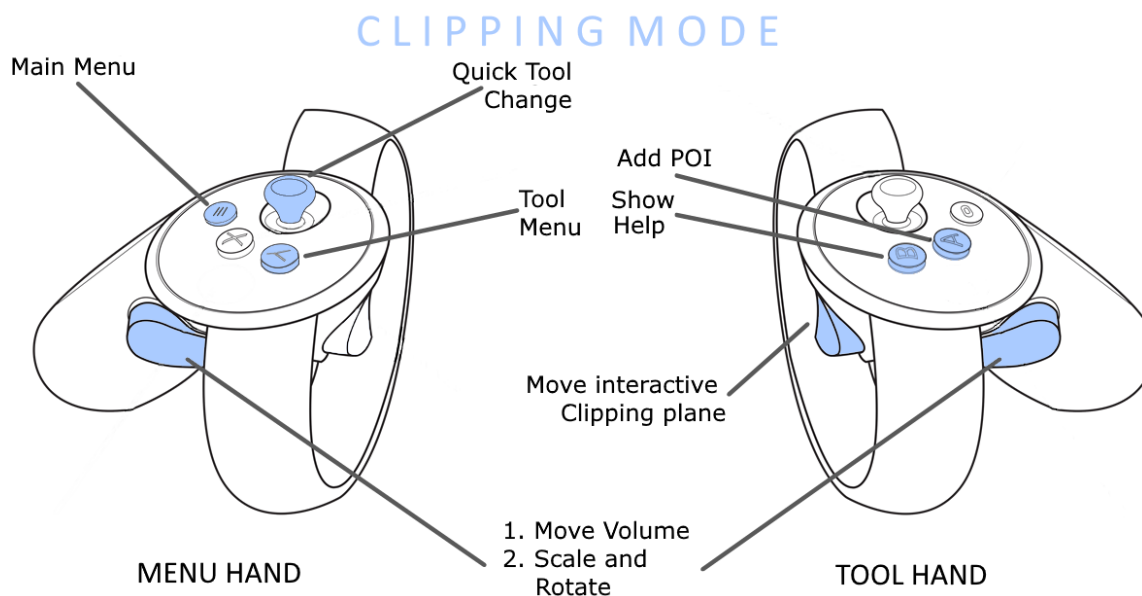
If you want to insert inflection points into an existing measurement, or want to continue one, select one of the existing points of the respective measurement and press the [A](#) button. Now, new points will be added after this point. To do that, use the [trigger](#) button as described before.

Active measurements will show in red, others will be displayed in yellow.

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## Clipping mode

The **Clipping** mode enables easy positioning of clipping planes to allow users to look inside volumes and better understand the structure of objects as well as their shapes and positions.

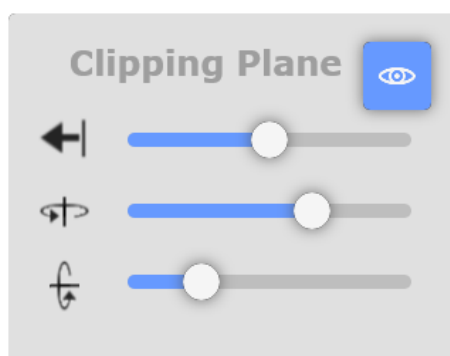


As with the Explore mode, use the **grab** buttons to **move**, **scale** and **rotate** the volume.

Hold the **tool hand trigger** to lock the clipping plane to the controller adjust its position. Release the trigger to lock the clipping plane in position relative to the volume.

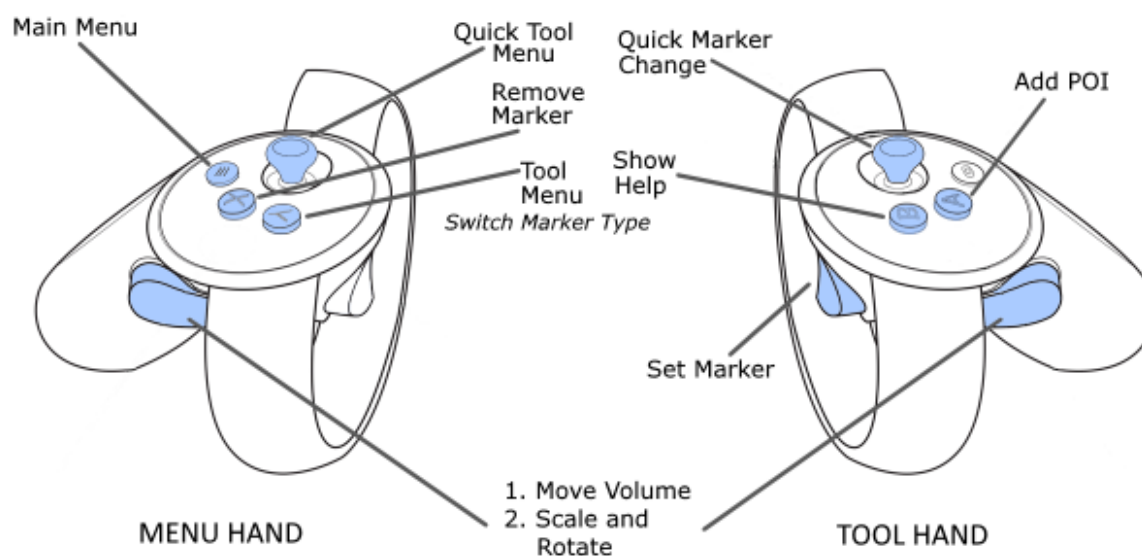
As with the Explore mode, use the **A** button to add points of interest.

Use the **Y** button to open the **tool menu** where you can enable or disable the clipping plane altogether or refine its position and angle with the offered sliders.



## Counting mode

The Counting mode is used to add markers in an image. Markers can be used to highlight a specific voxel which can be used to highlight specific features of the volume or count objects of various types. The marker annotations are visible both in the VR and 2D view and can be saved with the SIS file so they can be seen in other compatible software.



As with the Explore mode, use the **grab** buttons to **move**, **scale** and **rotate** the volume.

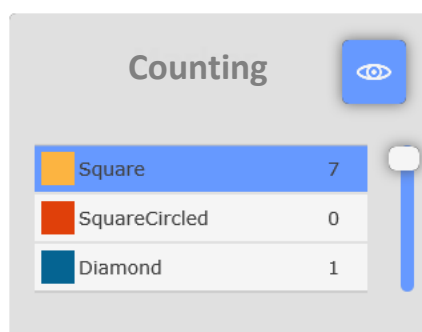
Use the **tool hand trigger** to **add marker points**.

Use the **tool hand joystick** to select from the various **marker types** as defined in the annotation count palette. As long as you use the joystick, a small display appears above the controller, showing the current active marker type and the number of marker instances. Press the joystick up or down to switch between the marker types, move it to the left to switch off the visibility of the current active marker type, or to the right to make them visible again.

Use the **X** button while pointing at an existing marker with the tool hand to **remove** the selected point.

As with the Explore mode, use the **A** button to add points of interest.

Use the **Y** button to open the **tool menu** where you can select from the available marker types, review total counts each marker type or delete them, and turn on or off the general marker visibility.



## Menu access and functions

In any mode, the **menu** button gives access to the main menu. From the main menu, users can:

- adjust various aspects of the workspace,
- adjust, store and reload opacity curve settings,
- manage additional image elements such as surfaces, channels and points of interest,
- manage measurements, clipping planes and markers,
- adjust render settings.

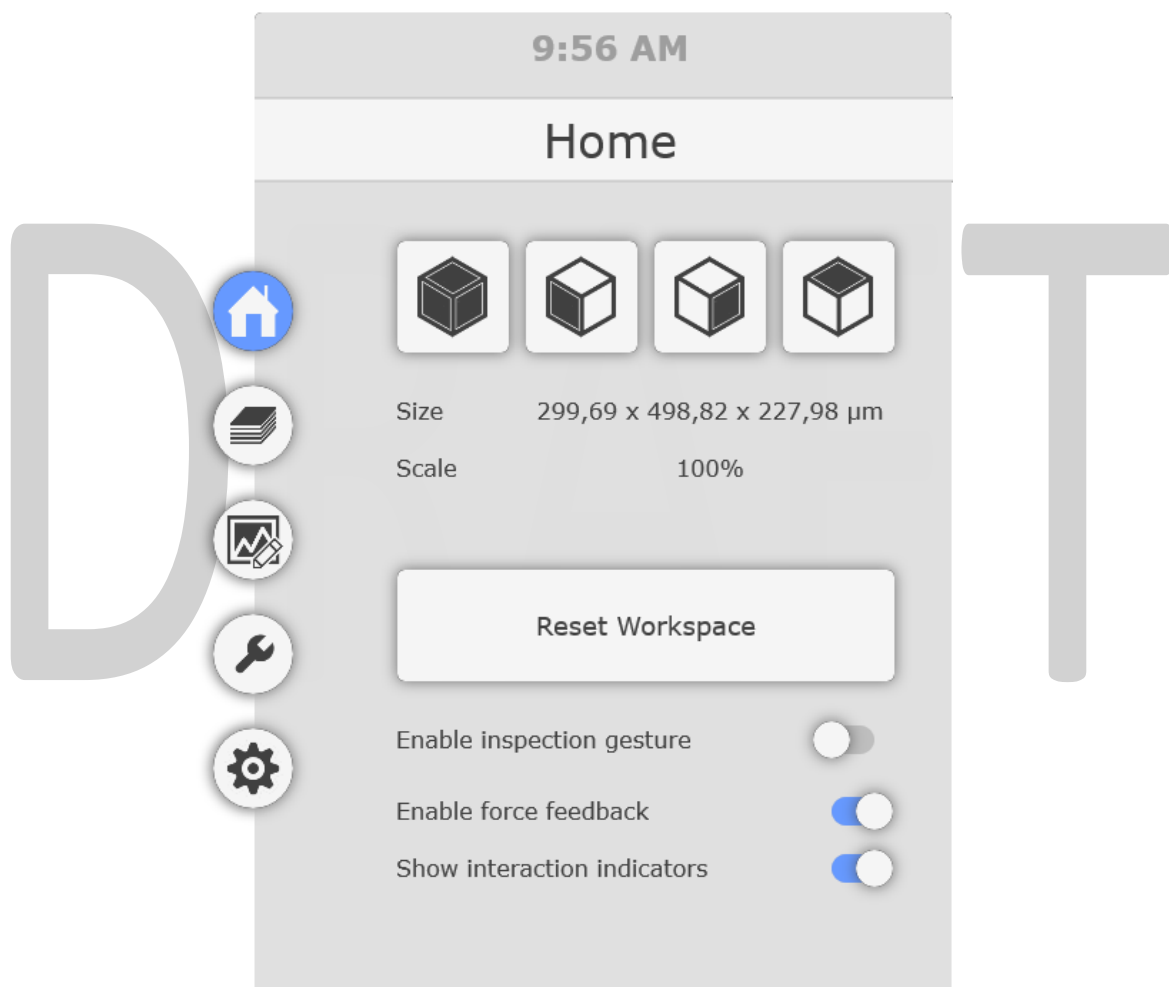
Within the menu, **point to select** any icons, buttons and sliders and use the **trigger** to **interact** with them.



## Home menu

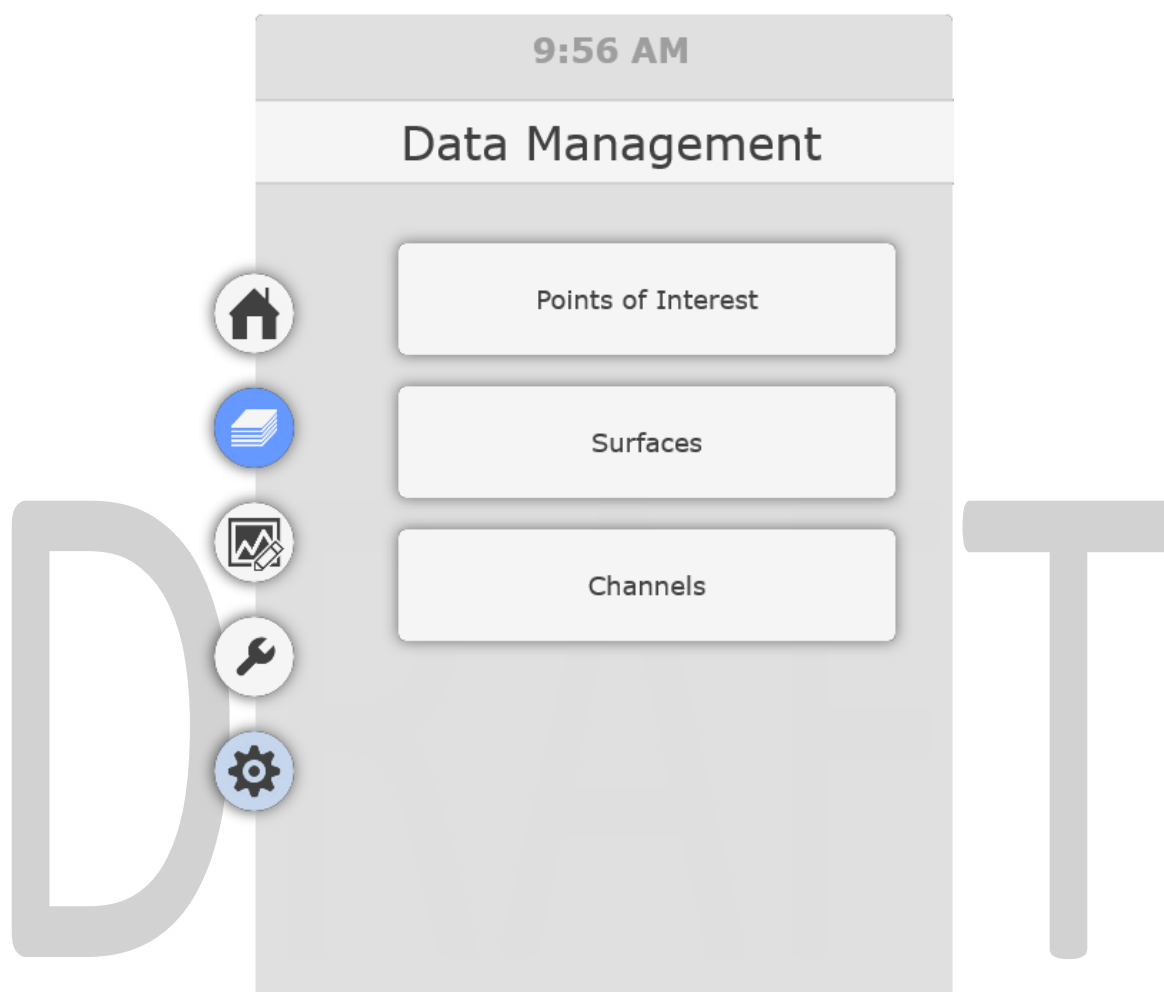
The Home menu is the first shown menu page when users activate the menu button. From the Home menu page users can:

- Use the icons at the top to reset the view to default volume orientations,
- Use the **Reset Workspace** button to restore the volume to the home orientation and remove all measurements and clipping planes,
- Enable/disable basic user interface settings.



## Data management menu

The Data Management menu page gives access to controls of the points of interest (POIs), surface objects and channel control.

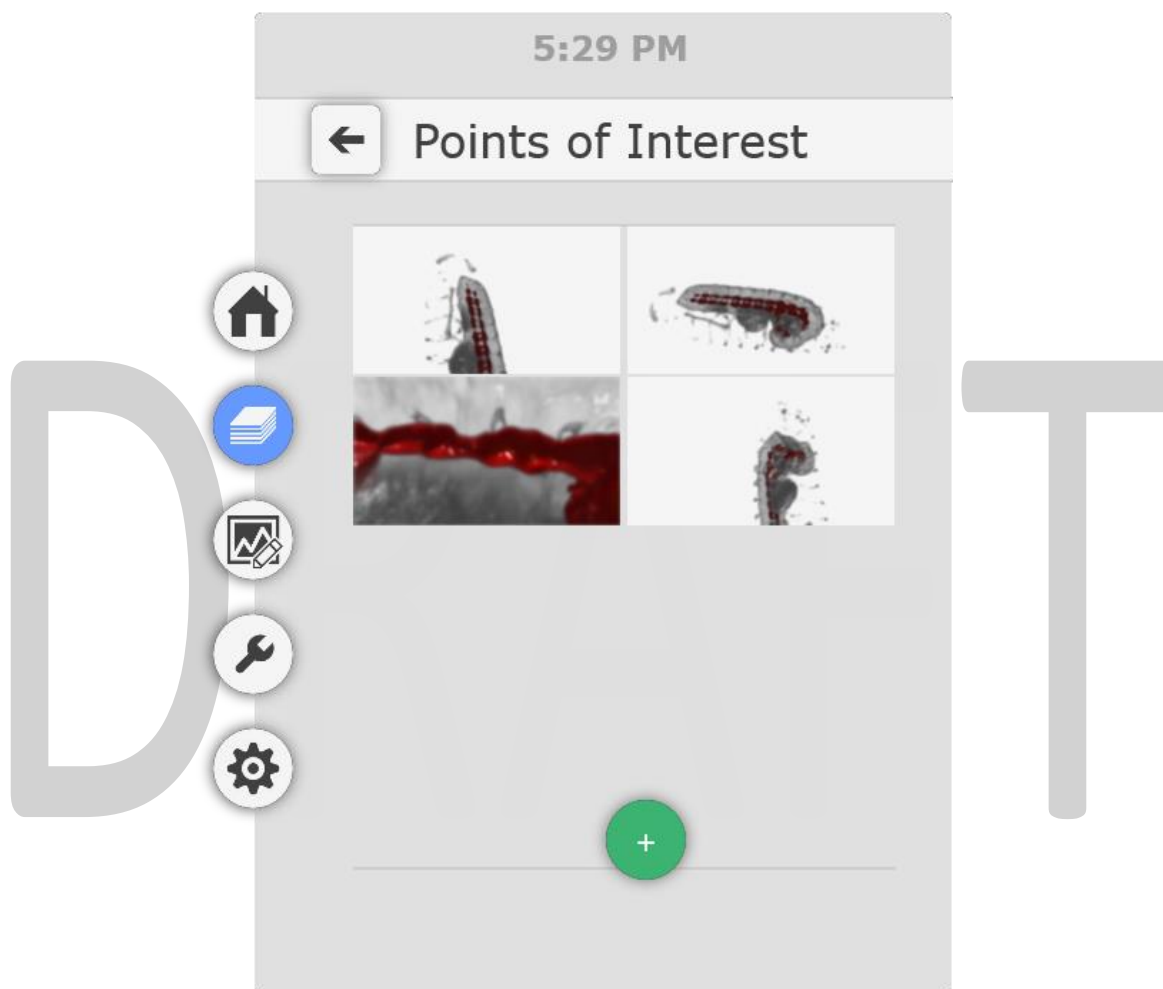




## Points of Interest menu


Points of interest can be used to record and restore the specific orientation and scaling of the image volume. POIs can be added and removed both within the VR environment and from the Demo Palette.

The most common way to add POIs is to use the **A** button in any of the Exploration, Clipping or Marker modes.



**Point to select** a POI and use the **trigger** to **activate** it.


Point to select the *trashcan* icon to the right of the POI image and use the **trigger** to **remove** it.


Point at the  at the bottom to **add** the current view and use the **trigger** to the POI list.


## Surfaces menu

Surfaces are 3D objects rendered from geometric information that can be added to a volume render to highlight specific shapes or features. These can be generated through image segmentation or from external packages (e.g. CAD software). Arivis InViewR supports OBJ files for import as surfaces.



Point to the  icon to the left of a surface name and use the [trigger](#) to turn on or off the visibility of the selected surface.

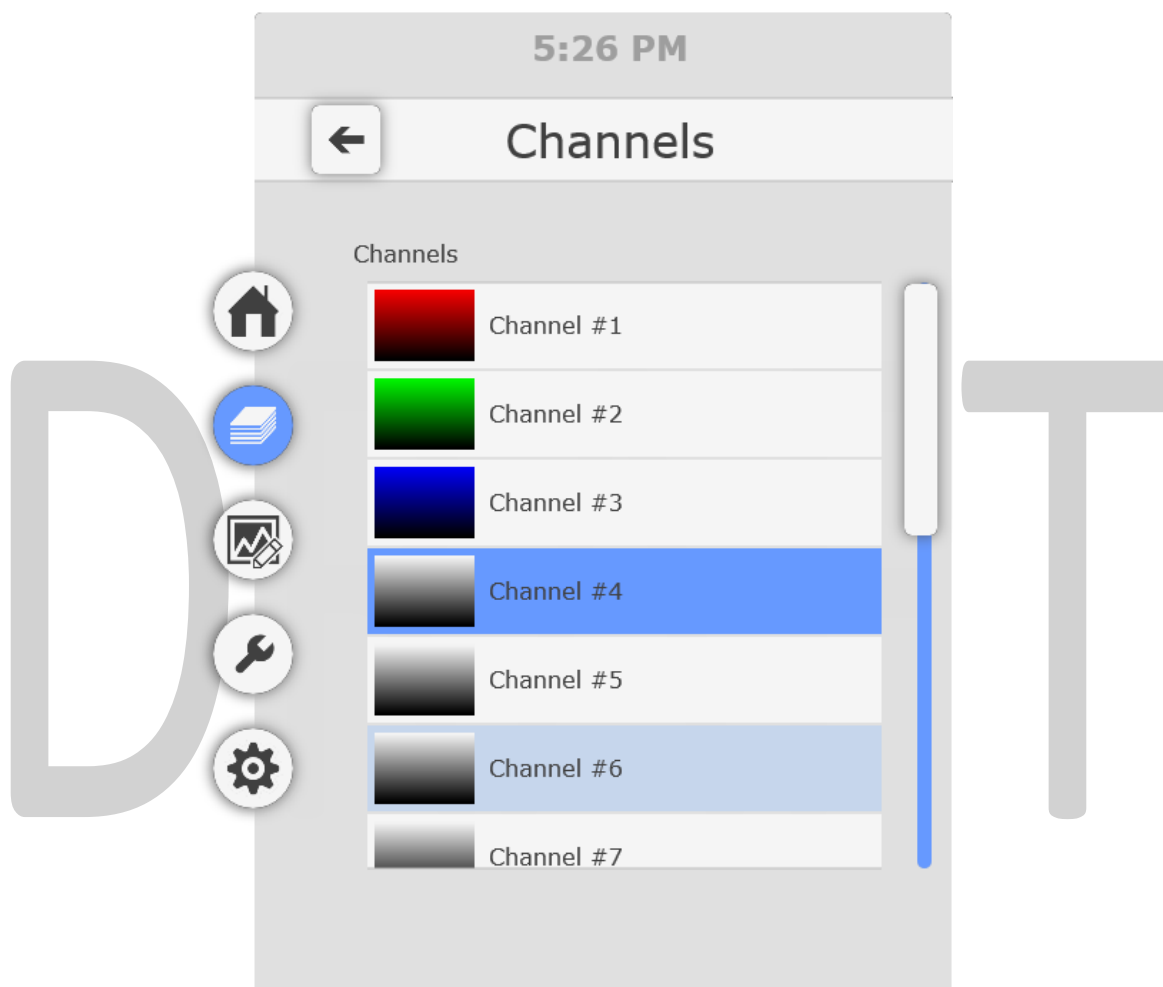
Point to the  icon to the left of a surface name and use the [trigger](#) to enable or disable clipping of the selected surface with the volume.

Point to the  icon to the right of a surface name and use the [trigger](#) to remove it. Note that you will need to reload the OBJ file if you wish to see the surface again.

## Channels menu

For speed and efficiency, arivis InViewR only renders single channel monochrome images. The channel displayed can be tinted or a colour gradient can be applied if required, but for multiple channel image users must select one of the available channels to view as and when needed. When activated, this page will show you the current displayed channel highlighted in blue.

Point to select any of the channels and use the [trigger](#) button to display the selected channel.

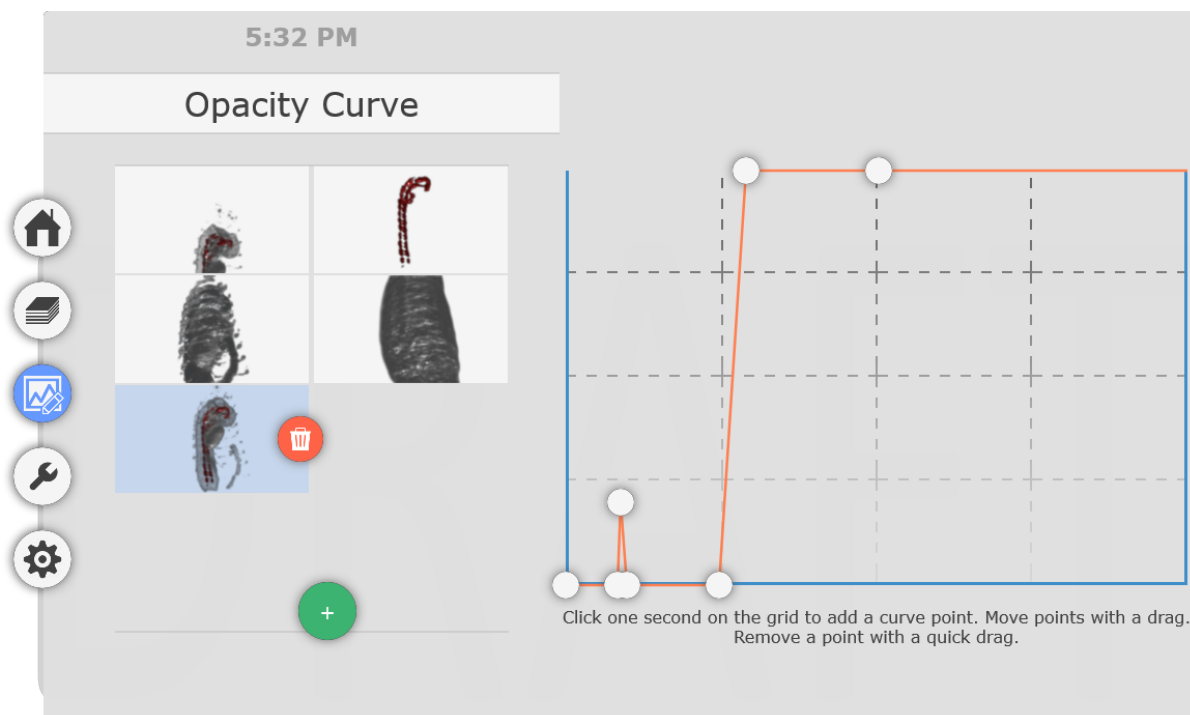


Note that depending on the size of the volume the loading of the selected channel may take some time.

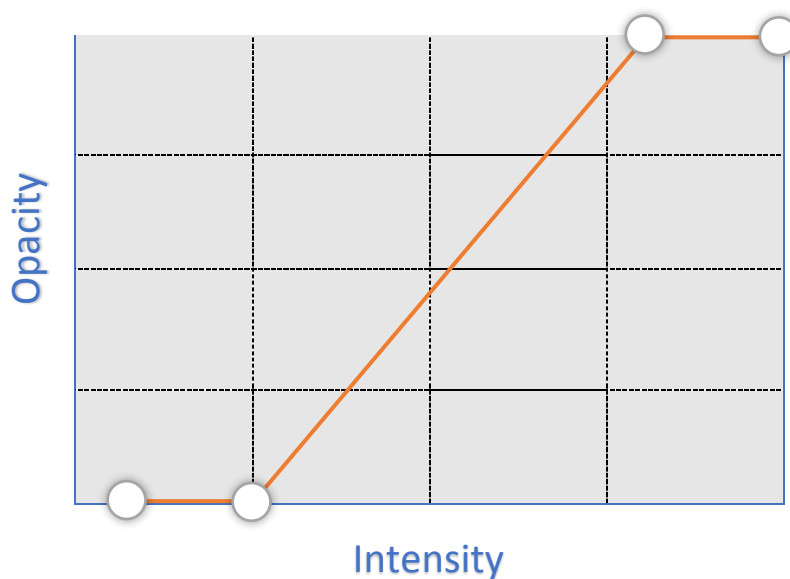
## Adjusting the opacity curve

Great visualisation of volume data may require some adjustments to the opacity curve. The opacity curve is a powerful and flexible tool that can be used to set various degrees of opacity for voxels in the volume based on their intensity. By default the opacity curve is set to a straight line between the darkest most transparent voxels, to the brightest most opaque voxel intensities. However, the opacity curve can be adjusted to an almost infinite degree of flexibility to enhance or hide specific voxel groups based on their intensities.

Use the [Menu](#) button to open the **main menu**, then point to the **Curve** icon to access the opacity curve settings.



The opacity curve graph has two axes:



The **opacity** scale is a percentage range that goes from 0 at the bottom which is completely transparent (invisible), to 100 at the top which is completely opaque.

The **Intensity** range matches the (selected) colour scale of the image and shows the lowest intensity (dark) value on the left and the highest intensity (bright) value on the right.

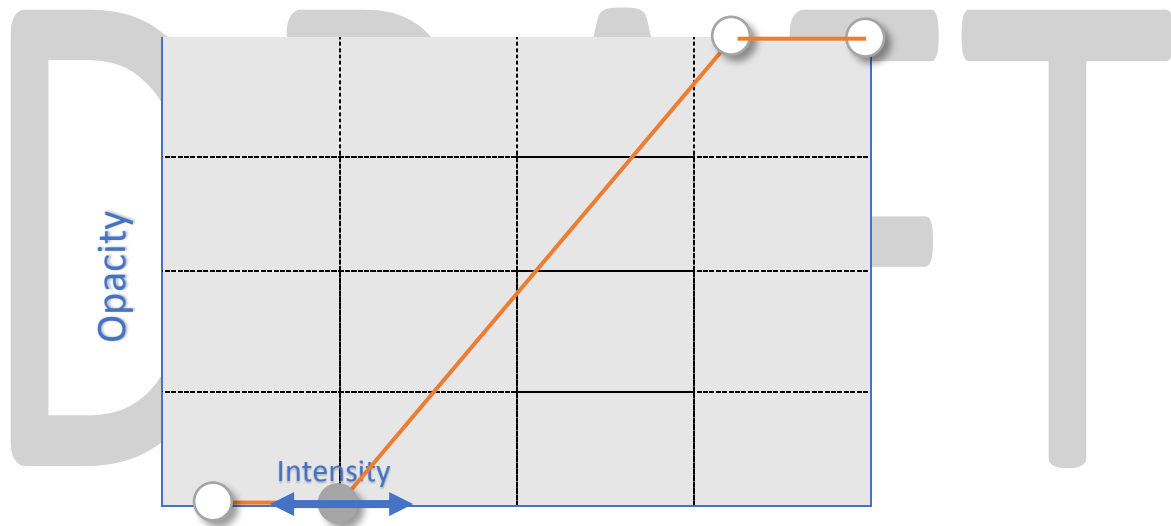
To adjust the position of the complete curve, point away from any point within the opacity curve graph with the controller cursor and drag it left or right to adjust its position.

To adjust the position of a curve point, point at it with the controller cursor and drag it to adjust its position.

To add a curve point, point at an empty spot on the graph for one second, then drag it to the desired position.

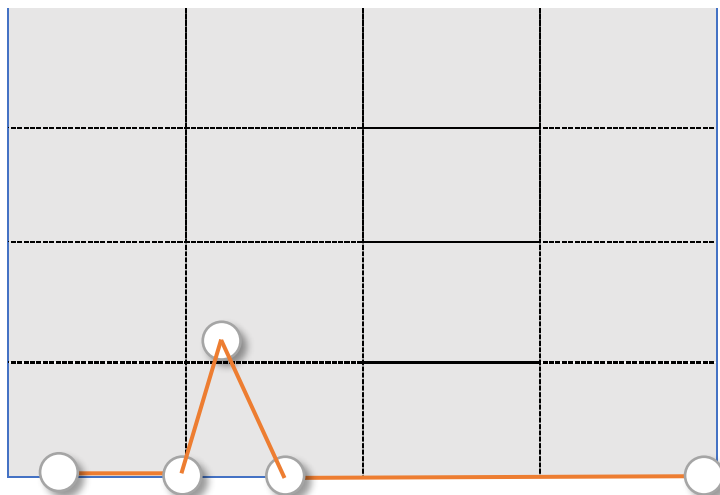
Point at an existing curve point and drag it outside of the graph area to remove it.

The most common type of opacity curve adjustment is simply adjusting the position of the transparent/black level to set the background transparency level.



Additionally, adjusting the steepness of the curve by moving the top opacity point will affect the apparent “hardness” of the surface, with a vertical curve appearing like an iso-surface.

In volumes with multiple discrete intensity ranges it can be useful to highlight very specific intensity ranges by using a “peak” curve.

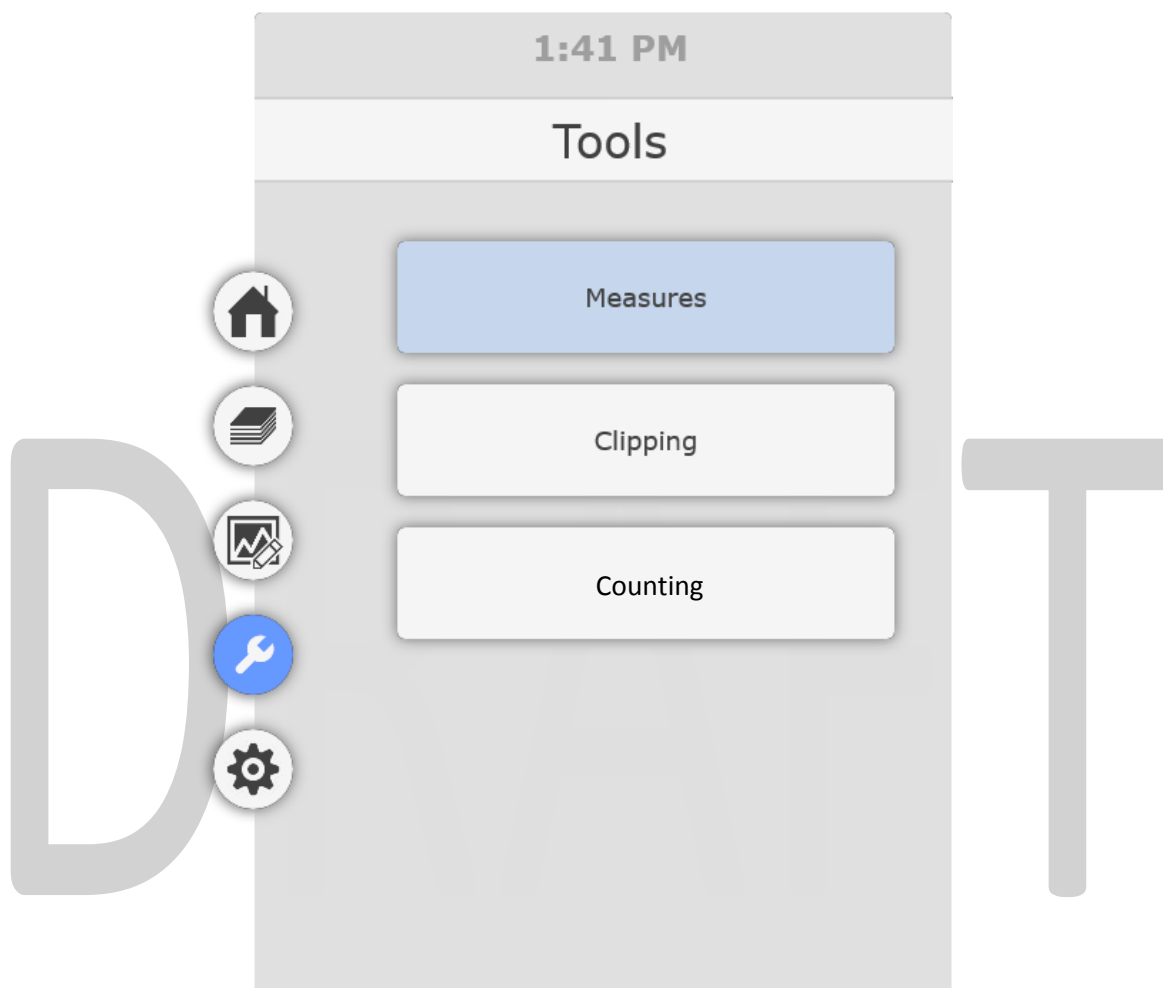


By setting the opacity for only a narrow range of intensities it is possible to highlight only the edges of objects making the body transparent, or highlight objects of specific densities. A narrow peak will be more specific to a narrow range of values. Adjusting the position of the peak left or right can reveal different structure or objects of different densities.

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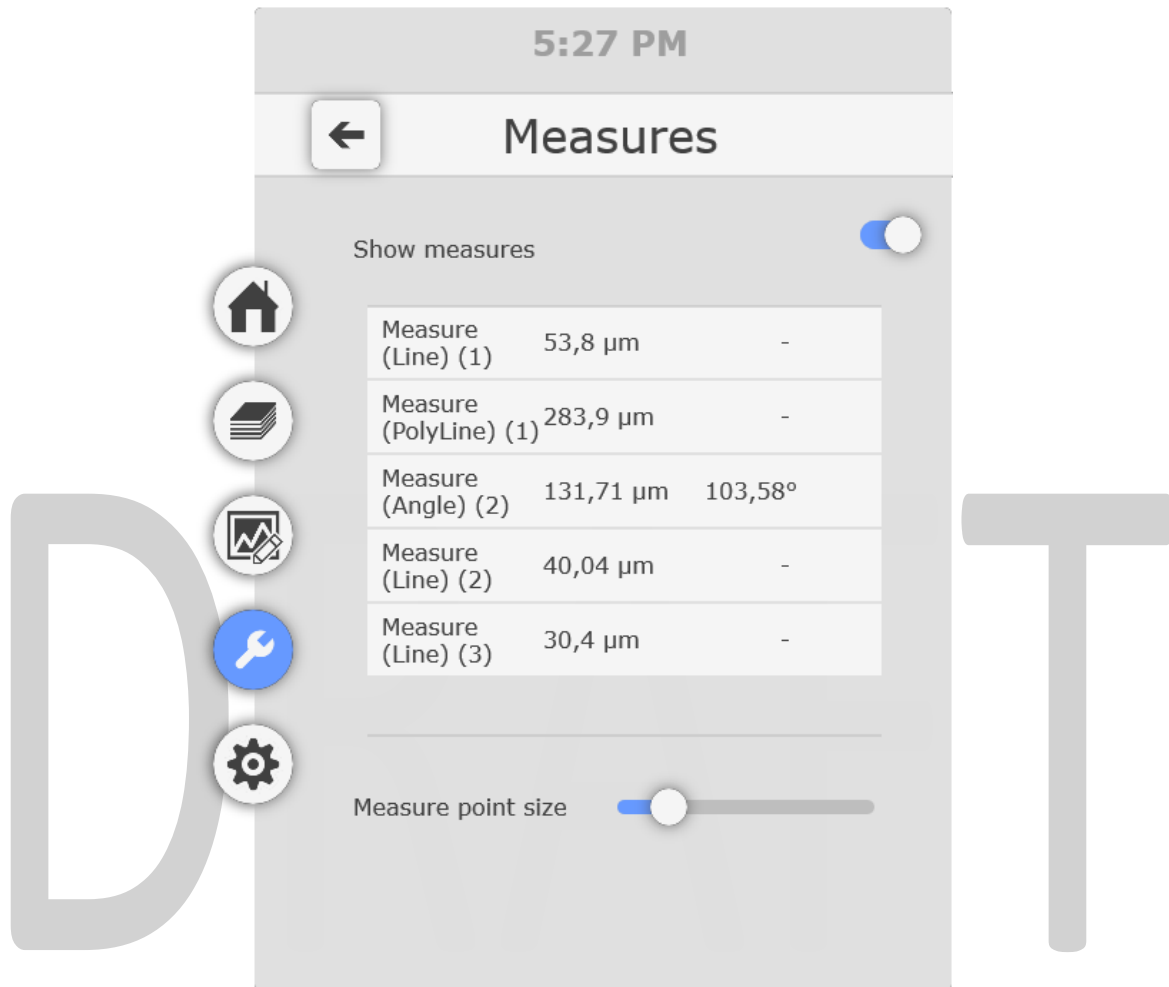
## Tools menu

The tools menu gives users access to options and results relating to the Measure, Clipping and Counting modes, including additional options that are not available from the contextual tool menu.



## Measures menu

The Measures menu allows the user to view existing measurement values, delete existing measurements and adjust measurement display parameters.



Measurements defined using the [measure tool](#) will appear in this list.

Point and [trigger](#) the [trashcan](#) icon to remove a measurement.

Use the *Show measures toggle* to show or hide all measurements from the image.

Use the *Measure point size* slider to adjust the size of the points and lines as displayed in the VR environment.



## Clipping menu

The Clipping menu allows the user to adjust the visibility and position/angle of the clipping plane, as well as loading pre-set absolute orientations.



Use the **Show clipping plane** toggle to turn on or off the clipping plane visibility.

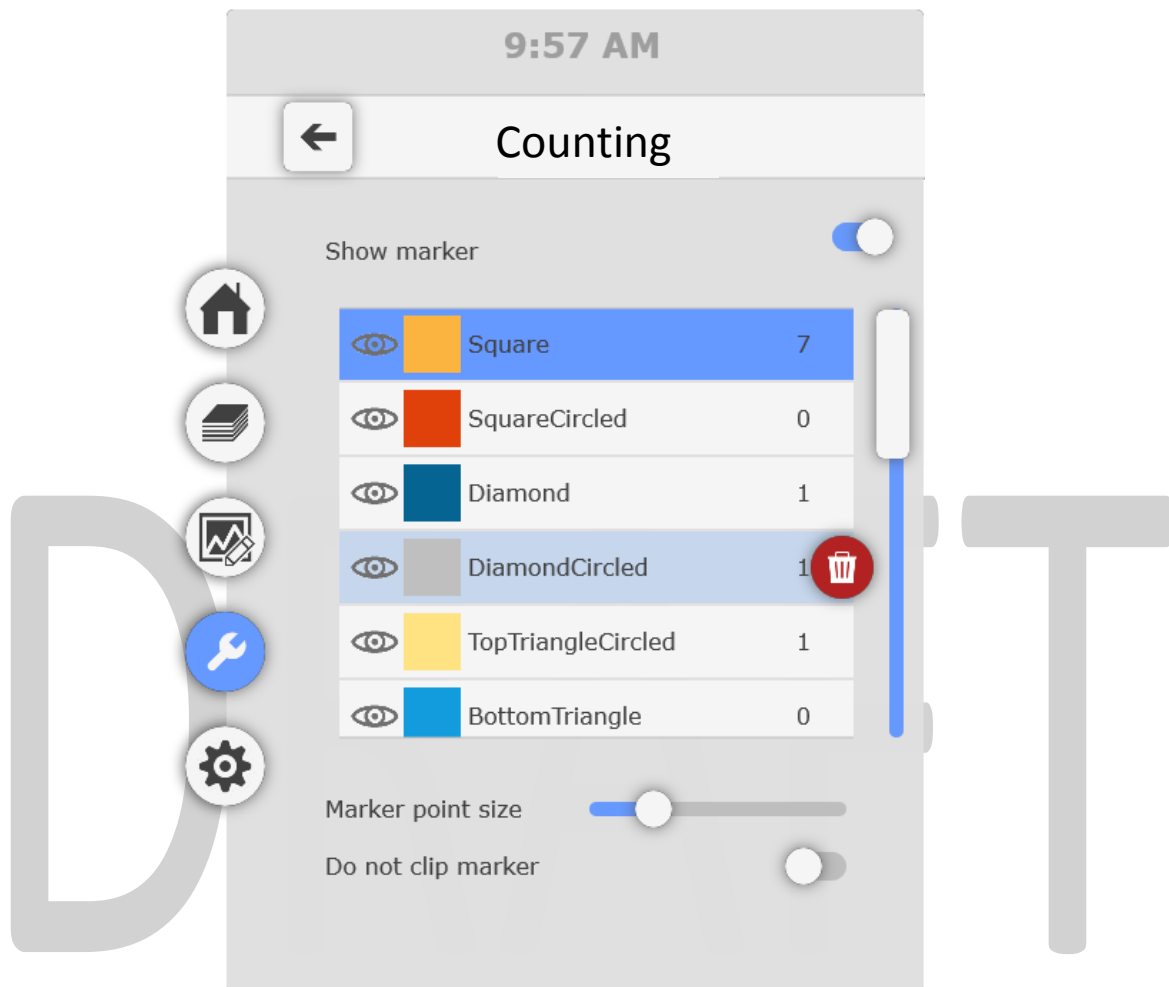
Use the **Distance**, **Tilt** and **Rotation** sliders to adjust the position and orientation of the clipping plane.

Use the buttons at the bottom to select from the following predefined orientations:

- X axis
- Z axis
- Y axis


## Counting menu

The Counting menu allows the user to toggle the visibility of markers, select, review and delete markers of each type, and adjust display parameters.



Use the **Show Marker** toggle to turn on or off the marker visibility.

Scroll down the list to review marker counts for each type, use the **trigger** to **select** a marker type.

Point to the  icon to the left of a selected marker type and use the **trigger** to **toggle visibility** for all markers of that type only.

Point to select the **trashcan** icon to the right of the marker type image and use the **trigger** to **remove** all markers of that type.

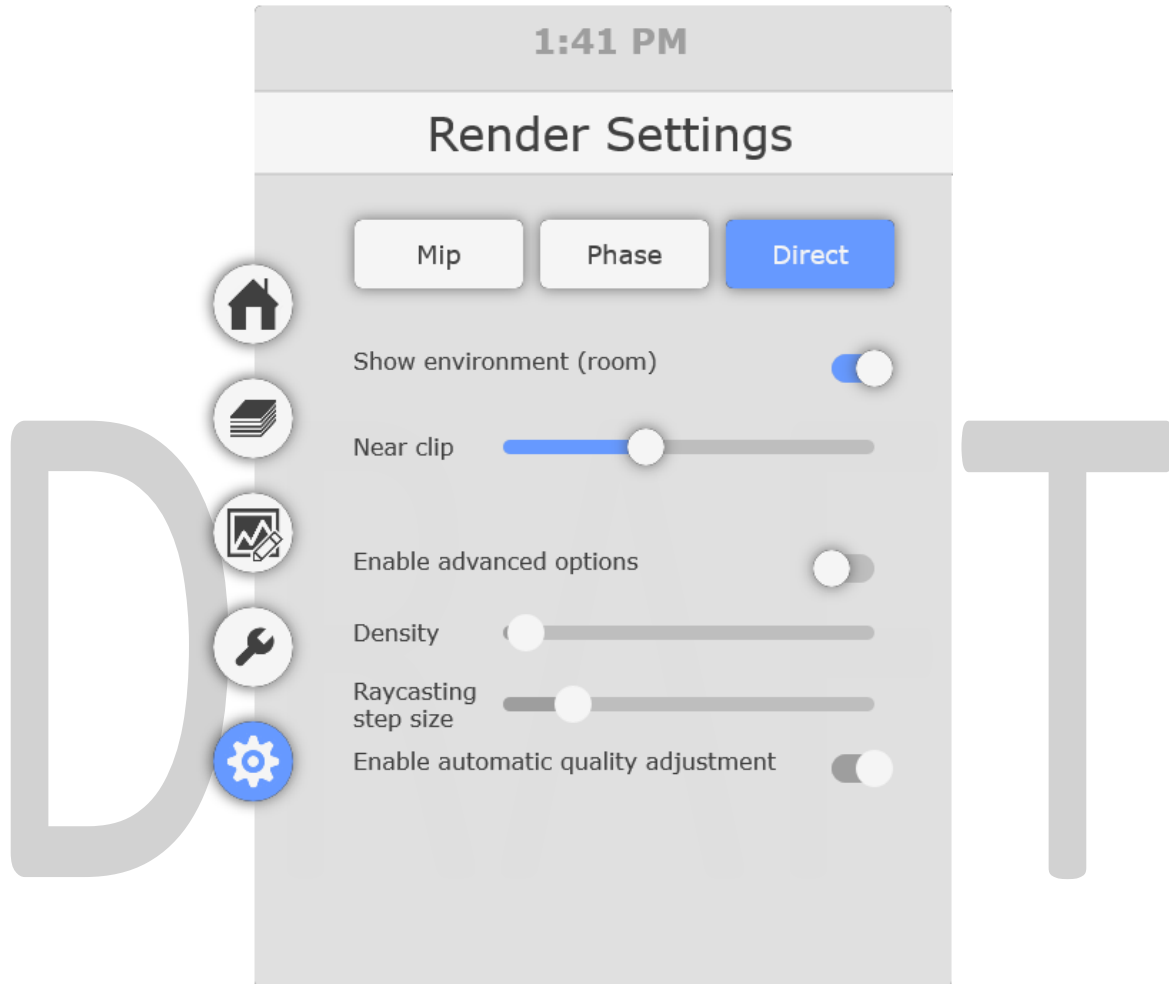
Use the Marker point size slider to **adjust the size** of the markers as displayed in the VR environment.

Use the Do no clip marker toggle to **enable or disable clipping** of the markers with the volume.

Marker types can be added or removed from the **Annotation Count** palette in the desktop environment. From the **Annotation Count** palette users can also add, remove or edit marker types as well as exporting results.

## Render Settings menu

The Render Setting menu allows the user to change various parameters that relate to the rendering of the volume.



Use the buttons at the top to select from one of the 3 rendering modes:

- **Mip** (maximum intensity projection) displays the brightest pixel in the axis of view
- **Phase** volume rendering includes an opacity setting but does not include lighting and shading
- **Direct** volume rendering includes opacity, lighting and shading

Use the **Show environment (room)** toggle to enable or disable the visibility of the virtual office, which can help with spatial awareness.

Use the **Near clip** slider to adjust the size of the clipping sphere that surrounds the viewer. This can be used to ensure better visibility of objects in crowded image volumes.

Advanced options should be adjusted with caution as they can have a significant impact on the speed and quality of the rendering.