D3PLOT 10.1

Basic Functions

Oasys D3PLOT

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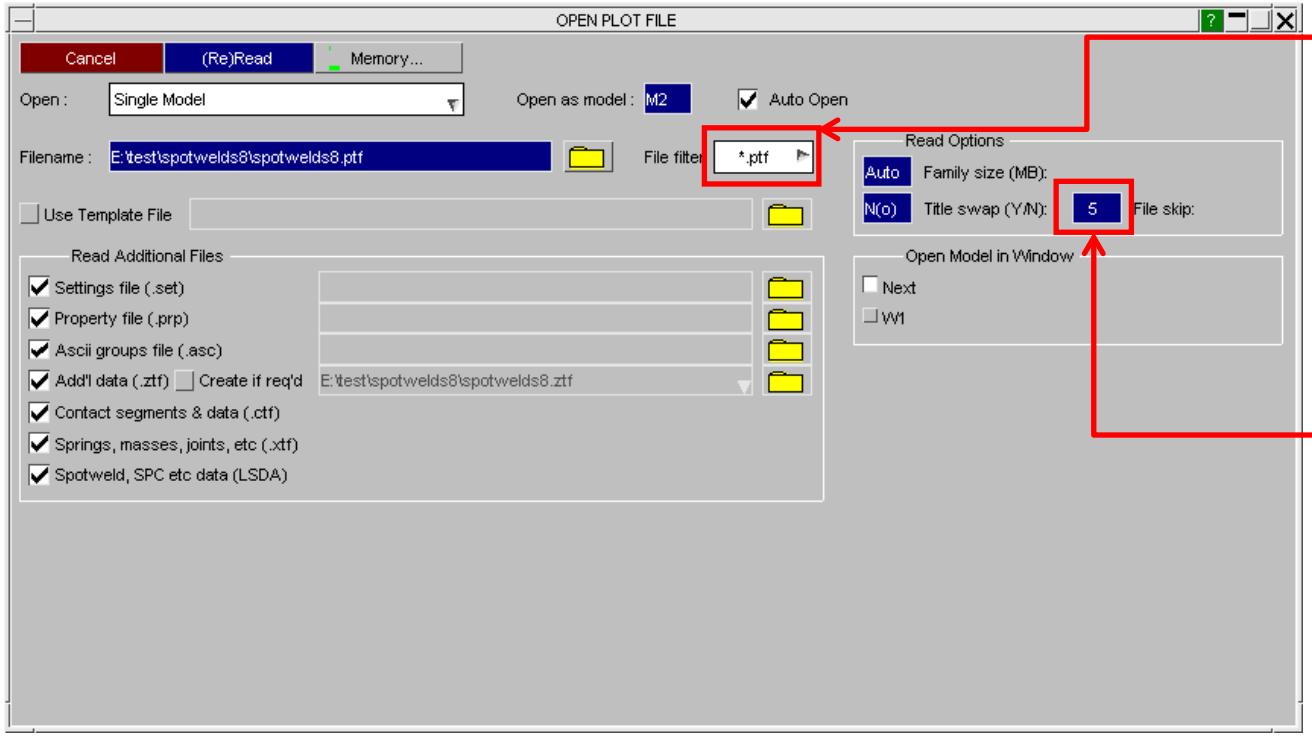
Opening Models

- The default “Open Model” menu allows a single model to be selected by either typing in a filename or browsing for a file.
- Multiple models can also be opened – see advanced section.



For LSTC filenames (d3plot etc), use the File filter to select d3*.

If there are large gaps in the file family, (e.g. d3plot, d3plot01, d3plot02, d3plot15), increase “File Skip”

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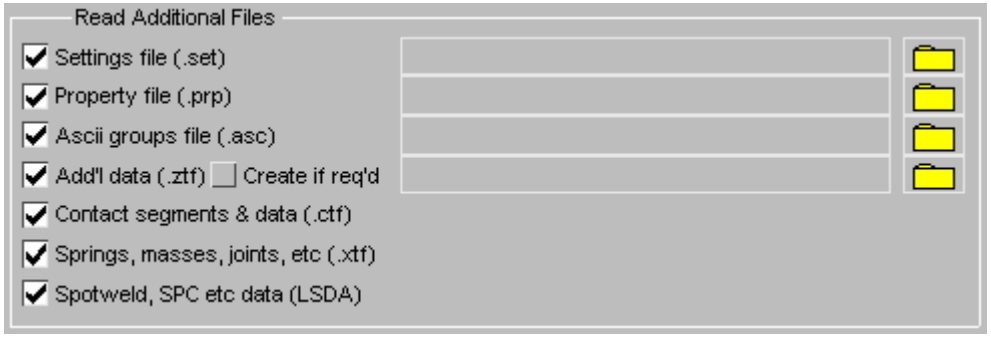
Opening Models

- In addition to reading the PTF/d3plot file, a number of additional files can also be selected:



Settings File	Contains D3PLOT program settings for each model / window
Properties File	Contains model data; colours, blanking, transparency etc
Ascii groups	Group information
Add'l data (.ztf)	Contains additional data used by D3PLOT to plot items not in the PTF/d3plot file (created by PRIMER).
Contact data (.ctf)	Contains information on contact surface location and forces
Spring / mass (.xtf)	Contains information on springs, lumped masses, joints
Spotweld, SPC (LSDA)	Contains data for spotwelds, SPCs, seatbelts, X-sections.

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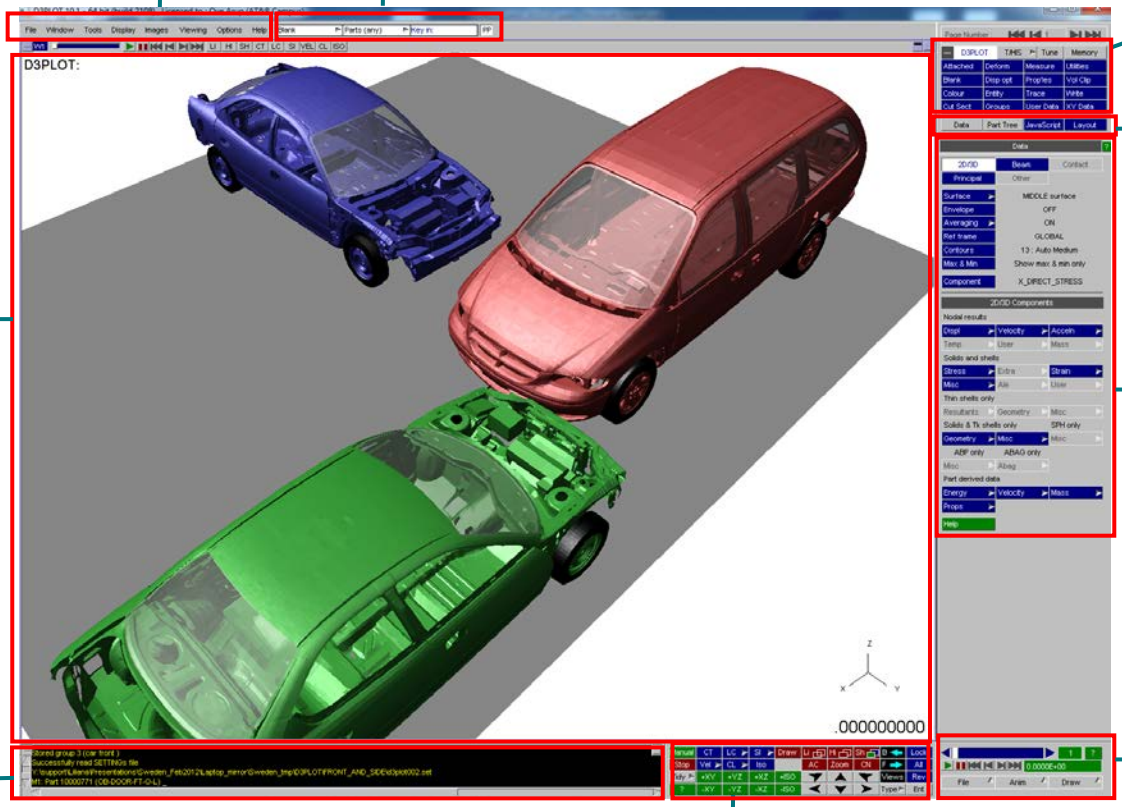
User Interface – D3PLOT 10.1

Top menus

Allows access to basic options, keywords and tools, in a drop-down menu format.

Quick-Pick Control

Controls the mouse action when applied within the graphics area.



Tools

Provides access to D3PLOT specific functions.

Menu tabs

These control which option is displayed in the current menu panel. Model and Part Tree will always be available in addition to selected options.

Graphics Area

Area within which graphics are drawn.

Current menu panel

"Current Menu Panel" Displays the menu for the option currently selected by the menu tabs.

Dialogue & List area

Area for command-line input and output, also acts a listing area for messages.

Animation Controls

Controls states and what is displayed during animation

Viewing & Drawing Commands

Provides all aspects of view control: direction, perspective, scale, etc. Contains the drawing commands and their settings.

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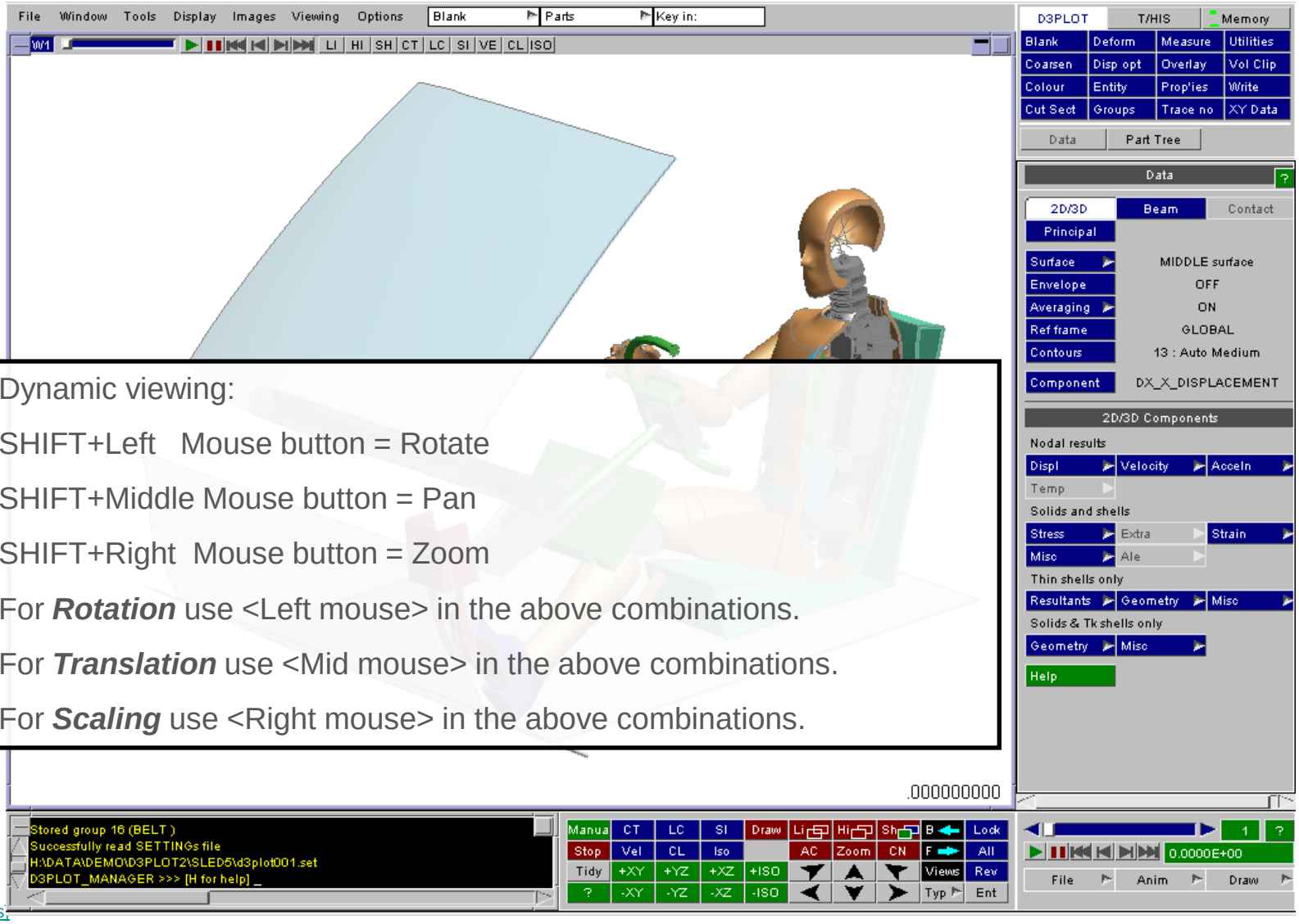
User interface – Dynamic viewing



Dynamic viewing:

SHIFT+Left Mouse button = Rotate

SHIFT+Middle Mouse button = Pan

SHIFT+Right Mouse button = Zoom

For ***Rotation*** use <Left mouse> in the above combinations.

For ***Translation*** use <Mid mouse> in the above combinations.

For ***Scaling*** use <Right mouse> in the above combinations.

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Plotting modes – LI, HI and SH

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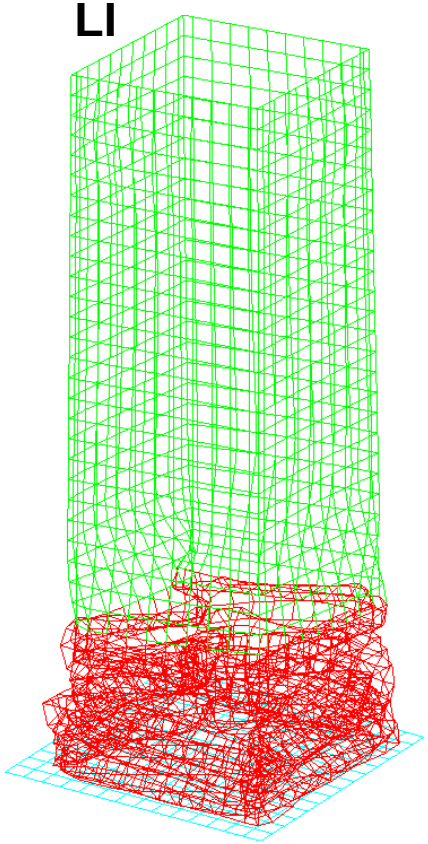
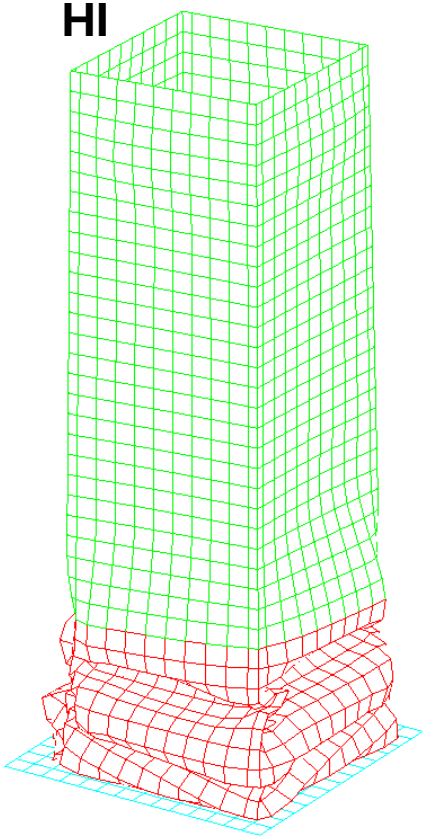
LI

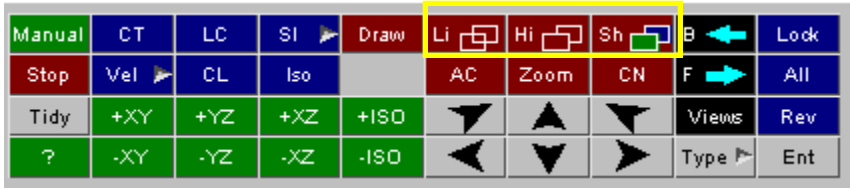


HI



SH

Note: In combination with SH, also use shortcut key ‘y’ to show mesh.



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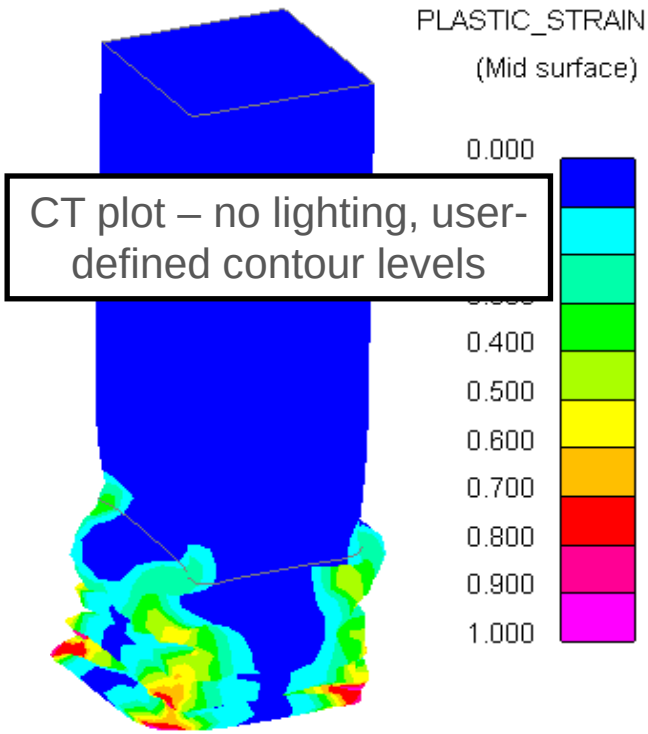
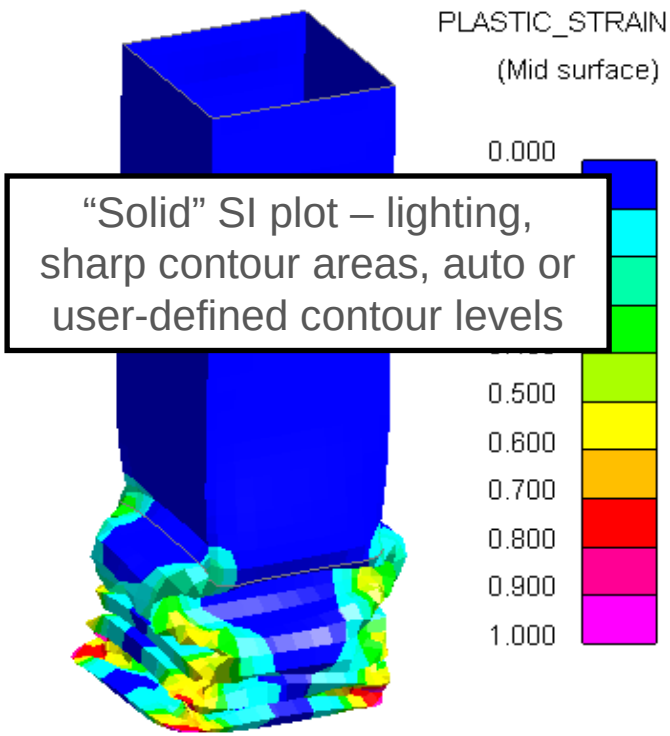
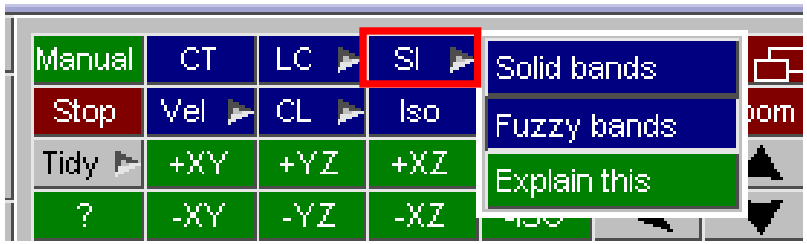
Plotting modes – CT and SI



CT plot – no lighting, user-defined contour levels



"Solid" SI plot – lighting, sharp contour areas, auto or user-defined contour levels



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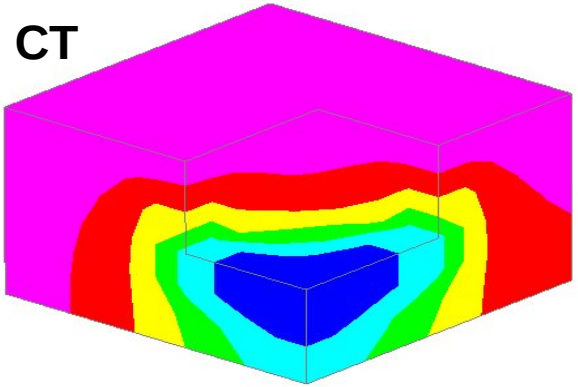
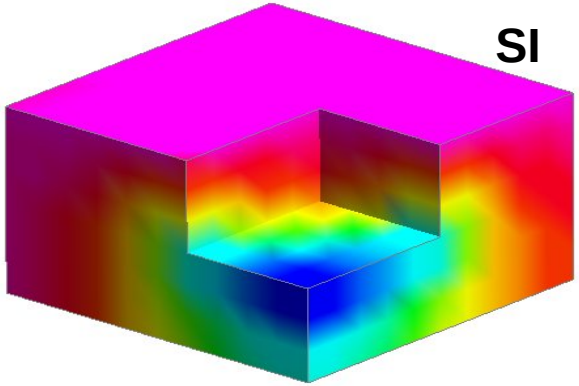
Plotting modes – Contour Plots

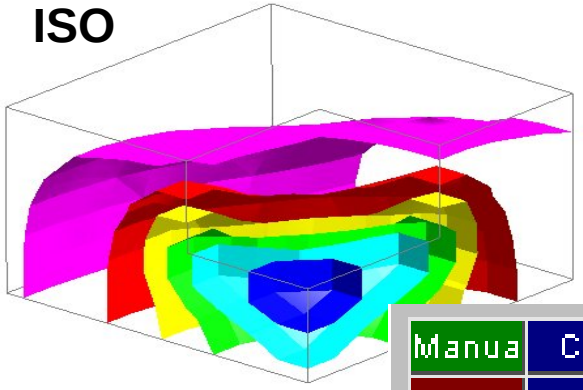
CT



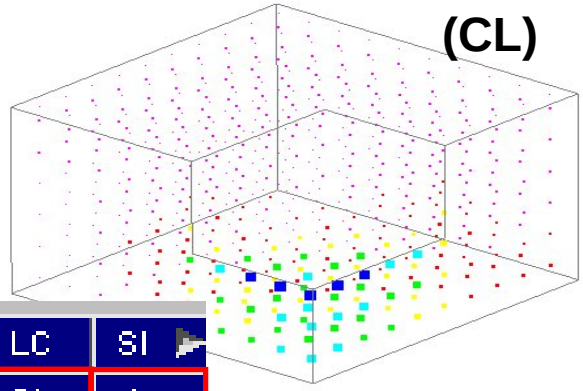
SI



ISO



Node Cloud (CL)



ISO surfaces and Node Cloud (CL) allow better display of results inside blocks of solid elements

ISO – shows surfaces of constant data value, within a solid element mesh

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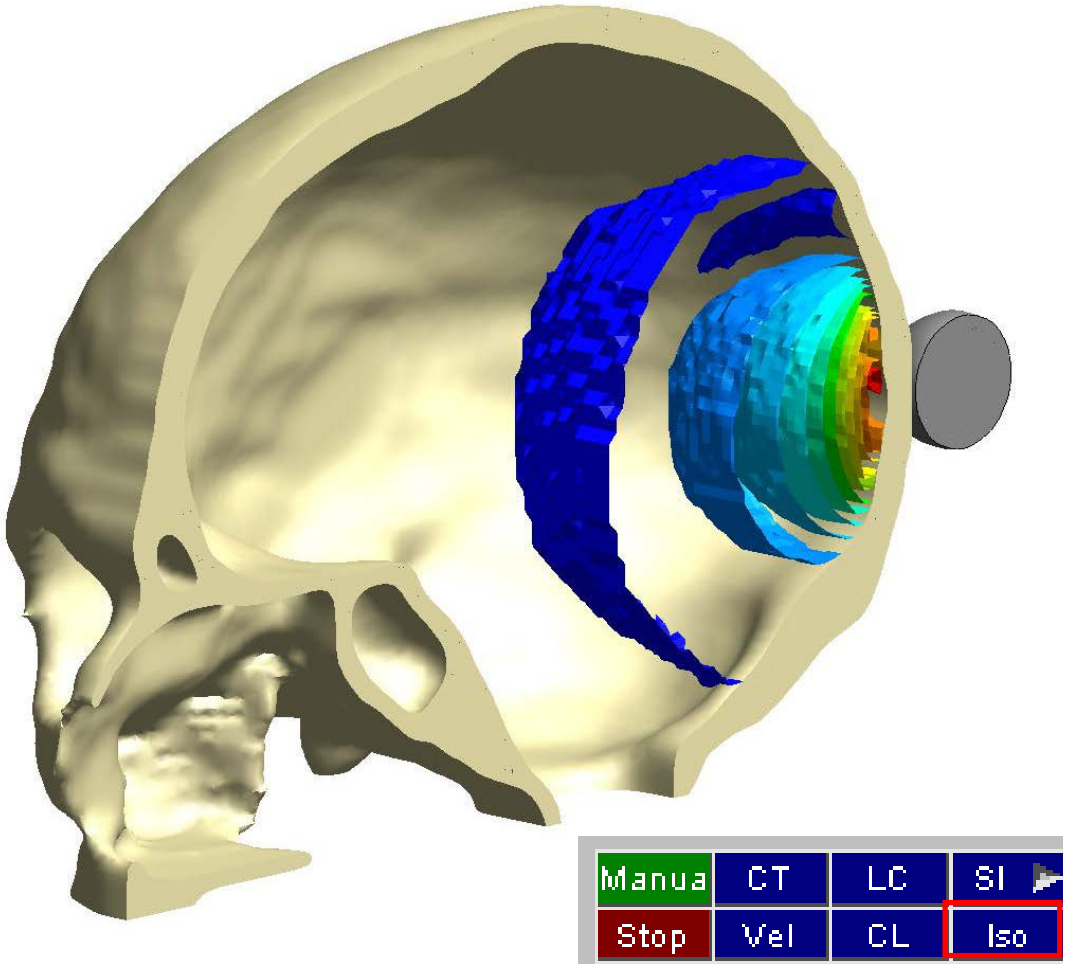
Plotting modes - ISO

ISO plot is especially useful for fluid/structure models. In this example the display mode of the skull is set to SHADED, while the ISO surfaces are displayed for the fluid mesh that fills and surrounds the skull.



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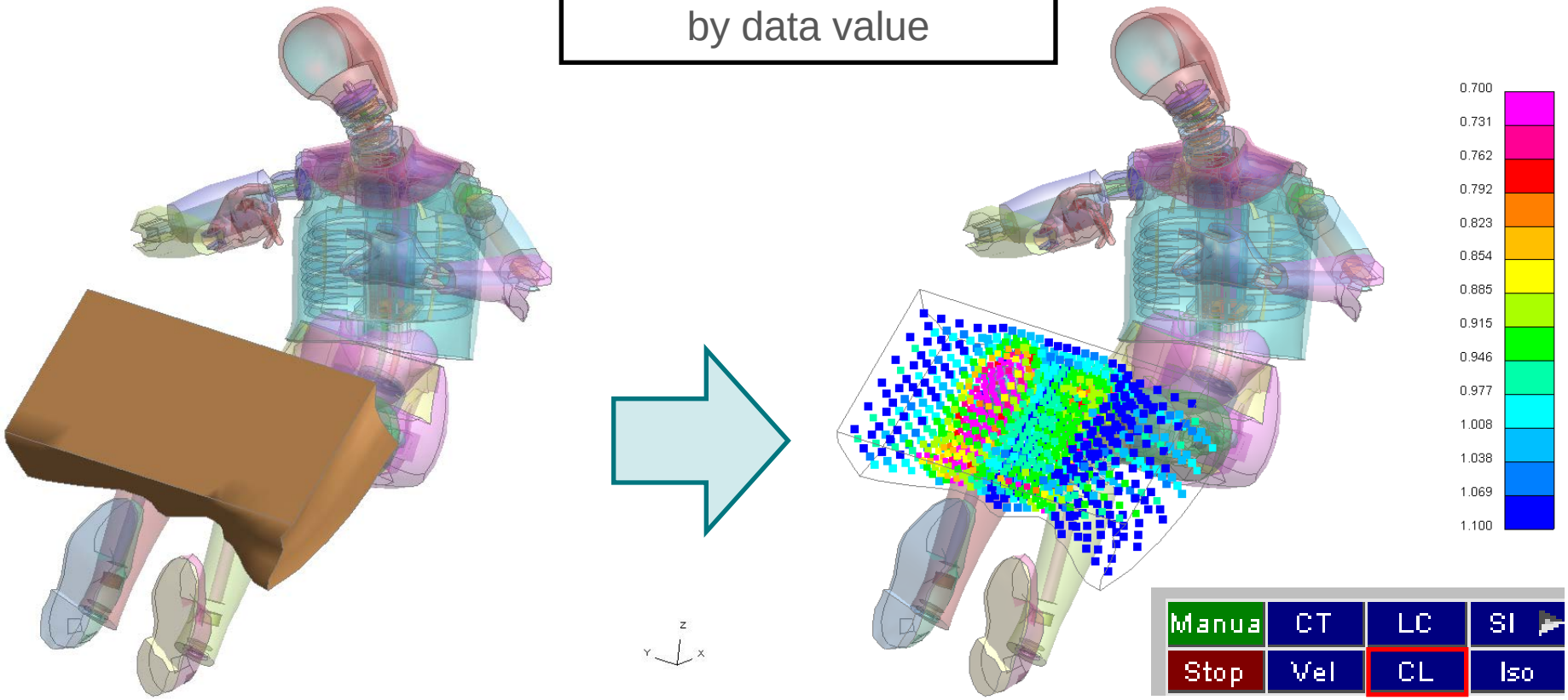
Plotting modes – Cloud Plot (CL)

CL- Cloud plot – shows a dot at the centre of each solid element, coloured by data value



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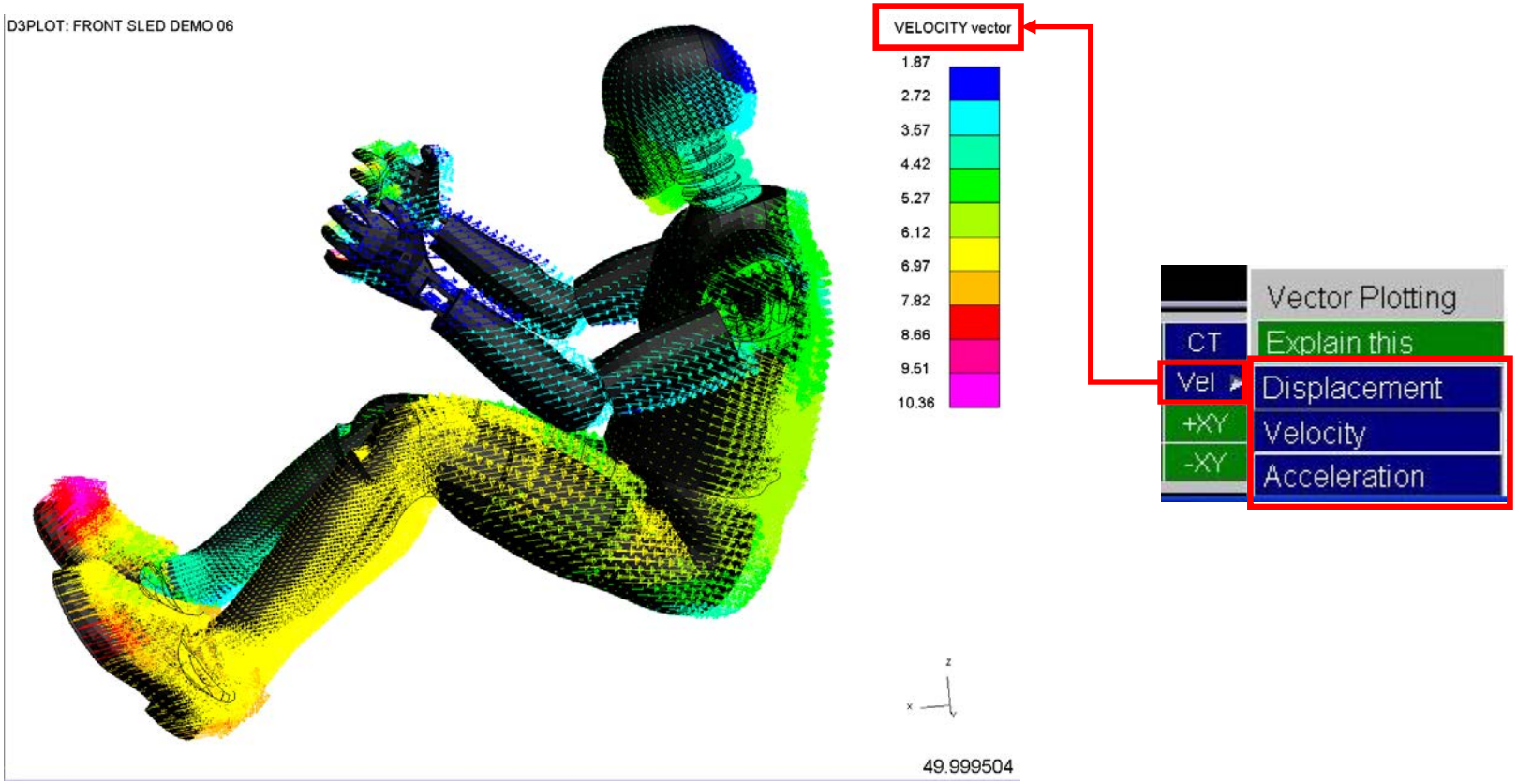
Plotting modes – Vector

- Velocity/Vector plot offers a choice of displacement, velocity or acceleration arrow-plots.



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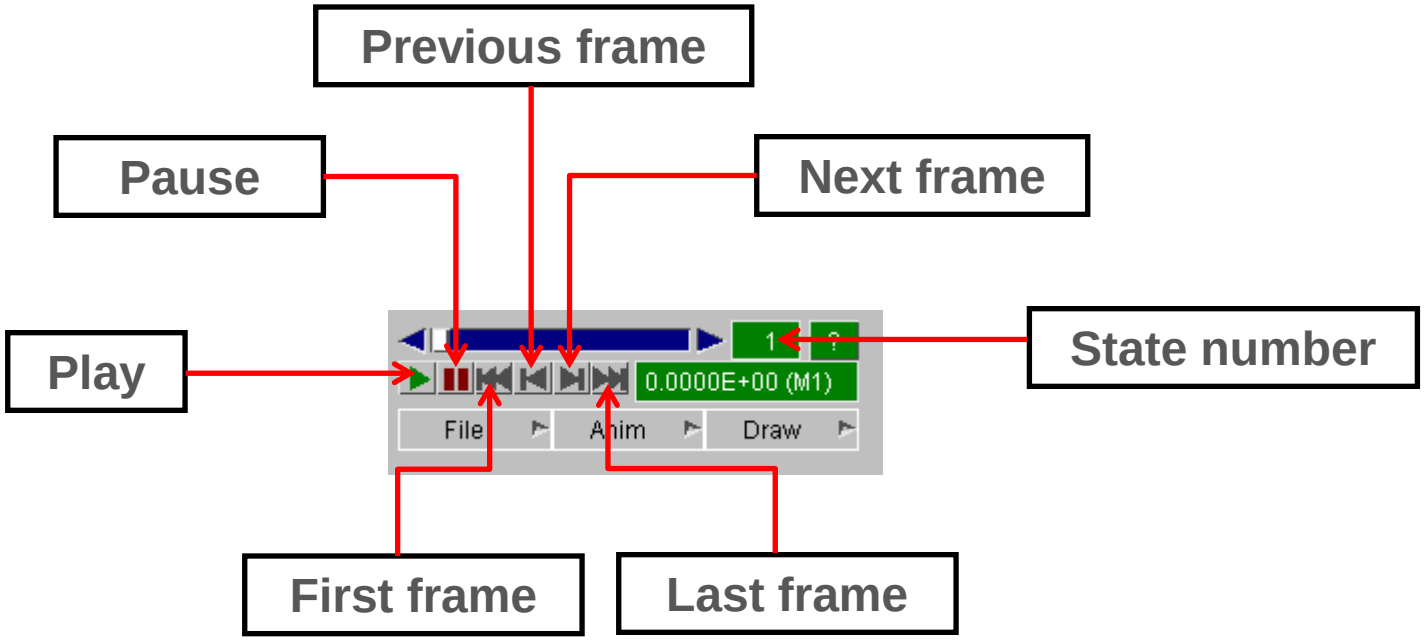
Animating

- All windows can be animated using the controls in the bottom right corner:



… or animations can be controlled for individual windows using the controls in each window:

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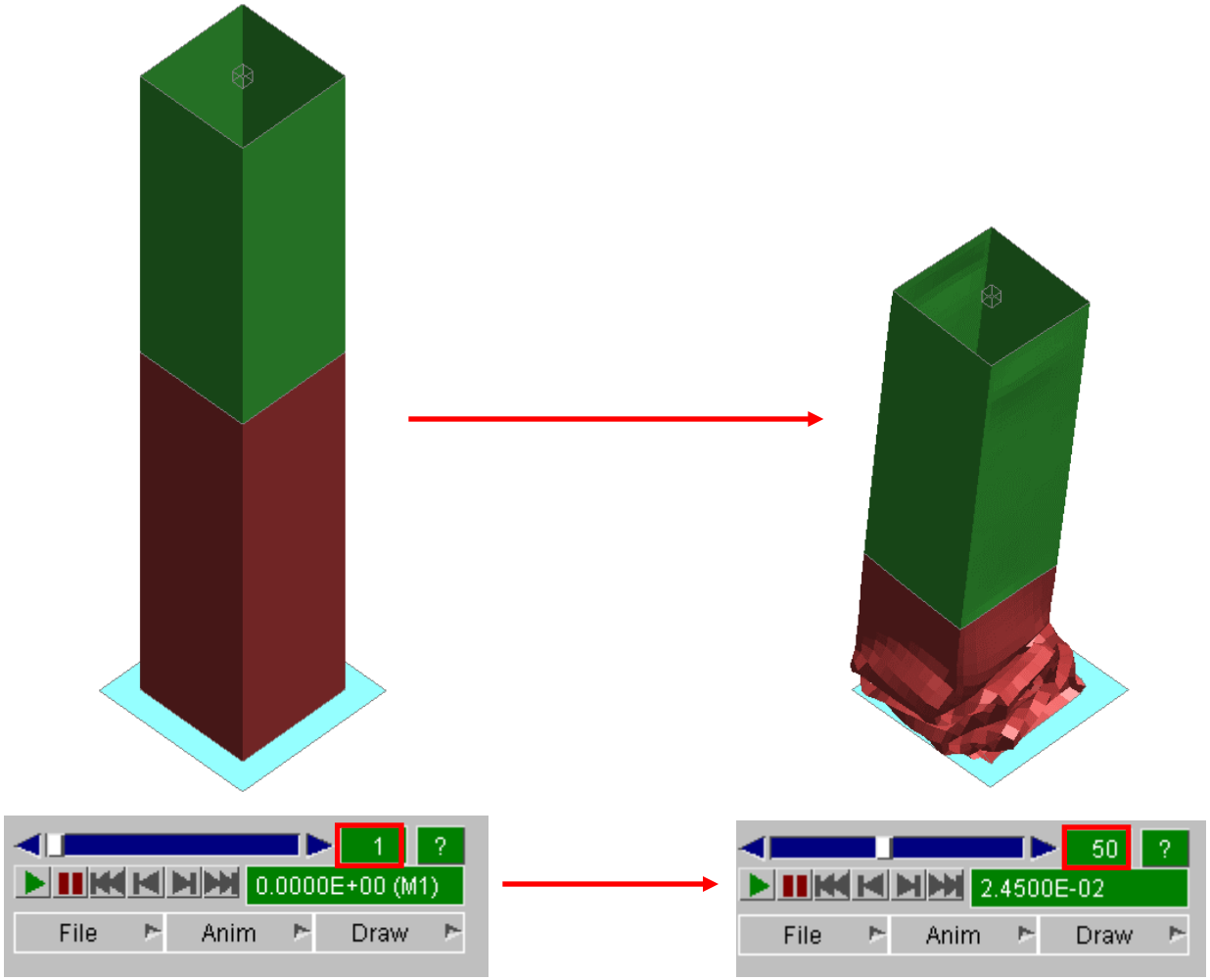
Animating

- Plot state numbers can be entered to skip to a certain state:



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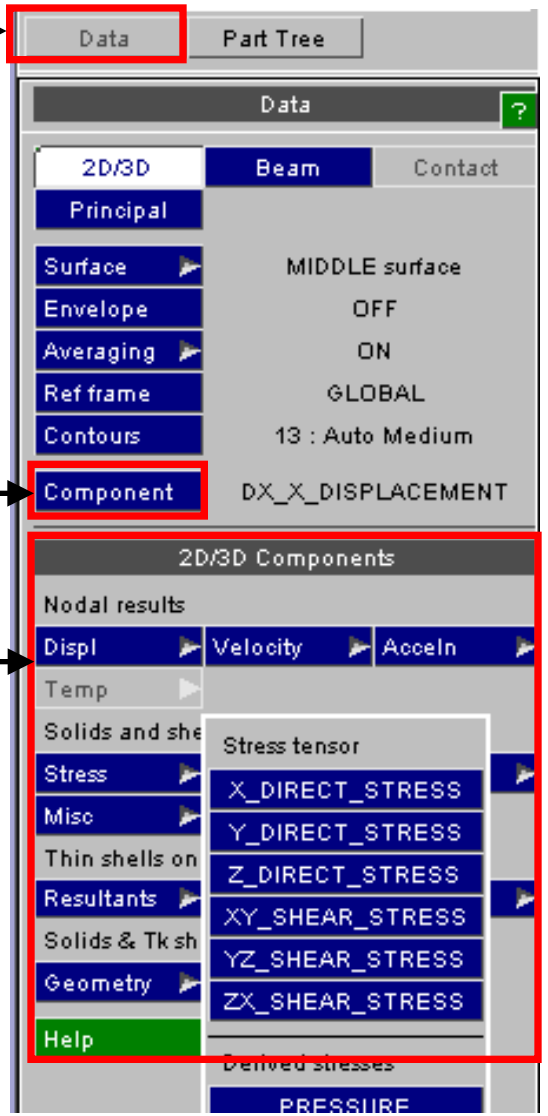
The DATA menu for contouring

- The DATA menu controls the contents of result plots: which data component is contoured, contour levels, etc.
- Press CT or SI (or shortcut F) to create a contour/fringe plot

Bring the DATA menu to the front

The Component button invokes this menu, allowing the data component to be selected from drop-down menus



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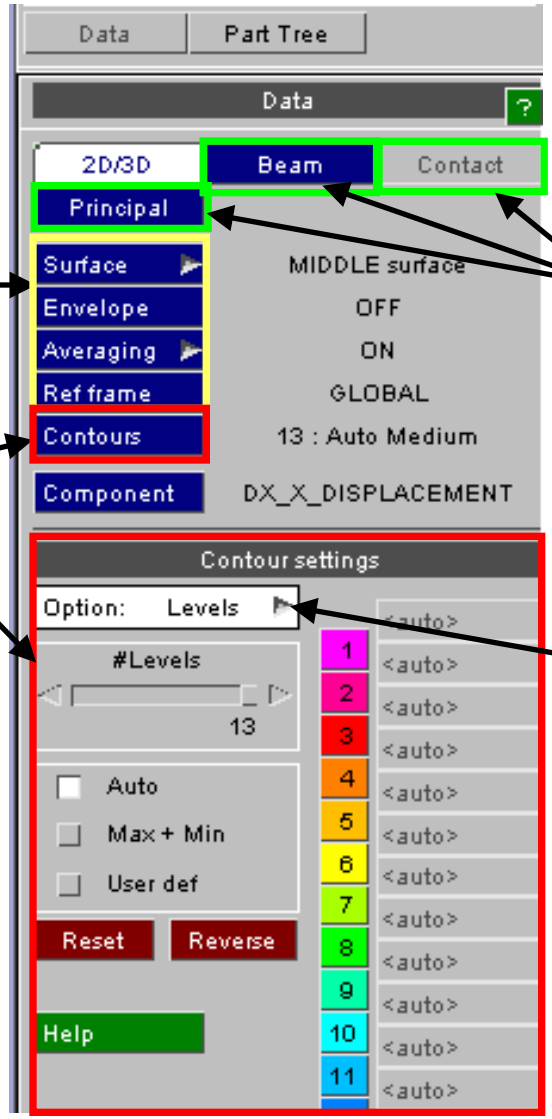
The DATA menu for contouring

Other controls – averaging switches, shell surface selection, etc

Contour level control



Controls for other types of plotting – beam plots (bending moment diagrams etc); principal stress vector plots; contact pressure plots

Other options under here include Limiting Values, to display only entities whose data value is within a given range

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The DATA menu for contouring

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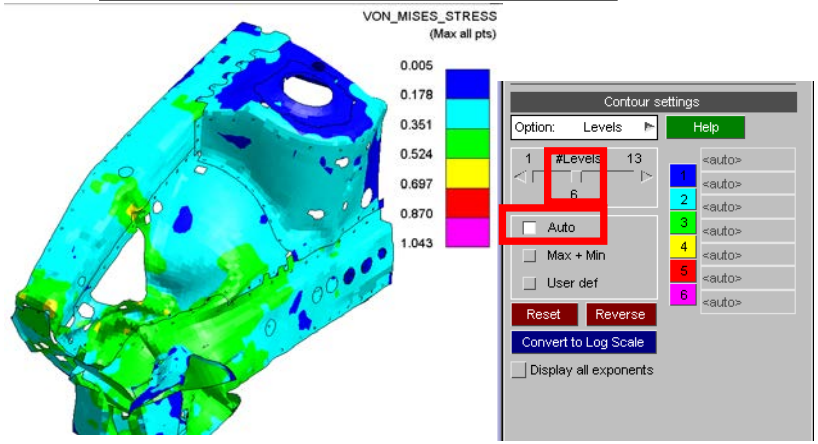
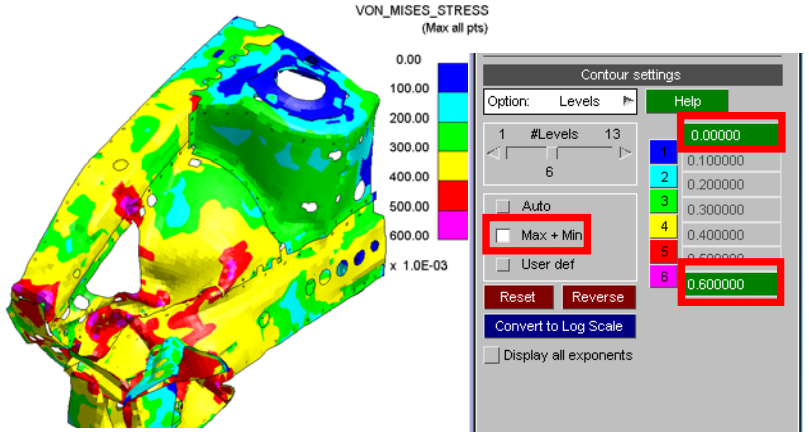
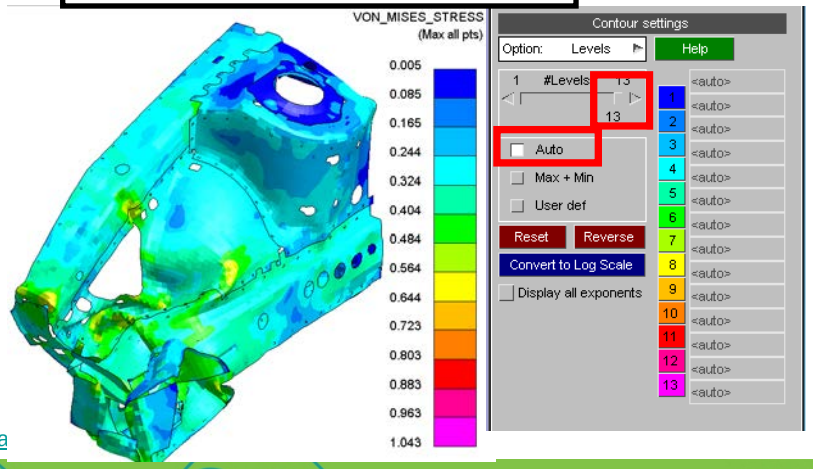
Control settings: Auto option – 6 levels



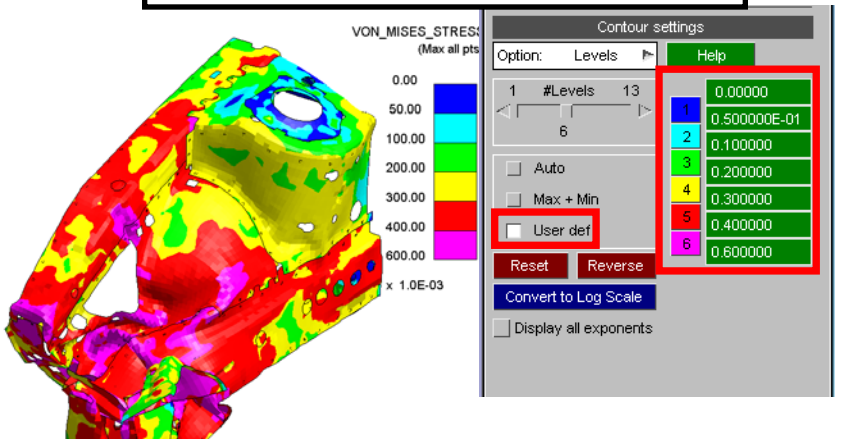
Control settings: Max + Min – enter the max and min values



Control settings: Auto option – 13 levels



Control settings: User def – enter all the levels manually



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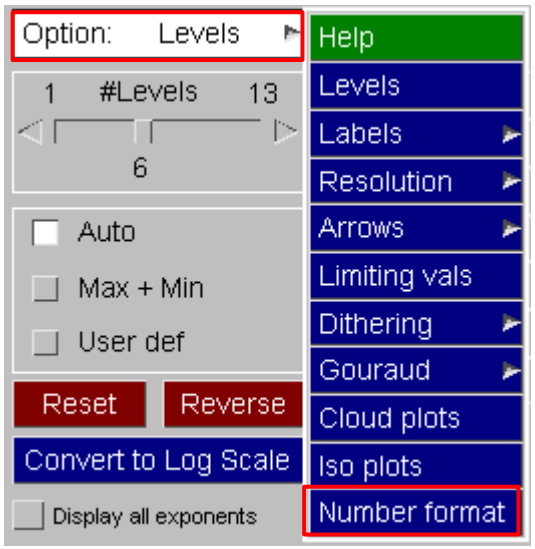
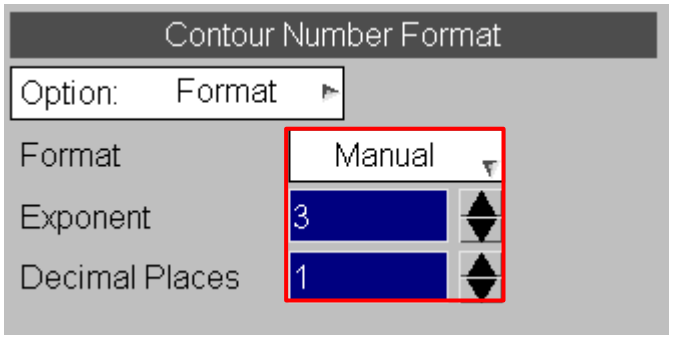
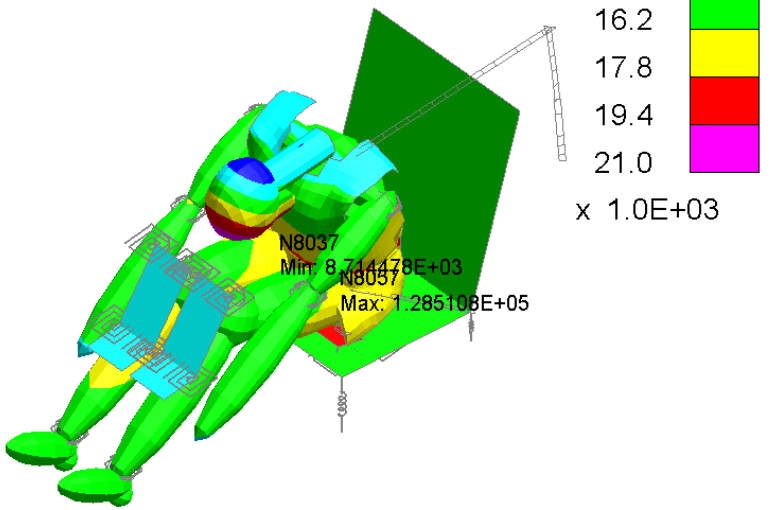
Contour Bar Number Format

- By default D3Plot will try to work out a sensible number format to display the contour bar numbers. However, the number format can be controlled manually.







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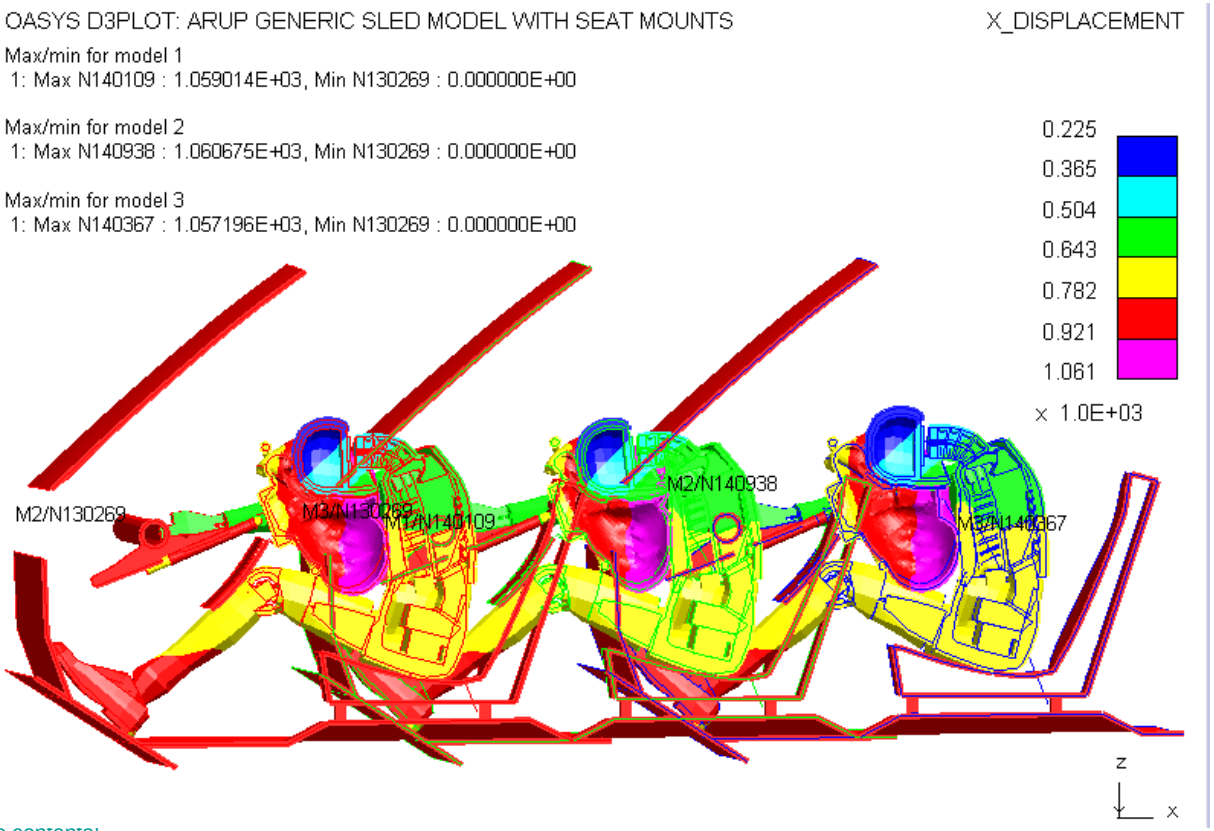
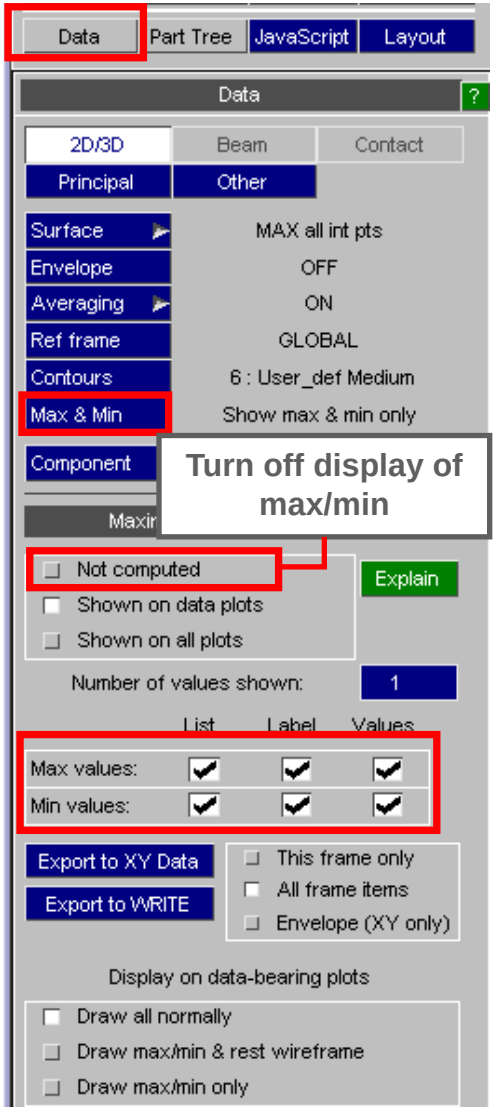
Max and min on plots

- Nodes or elements have the maximum and minimum values annotated on plots – this can be controlled or turned off.





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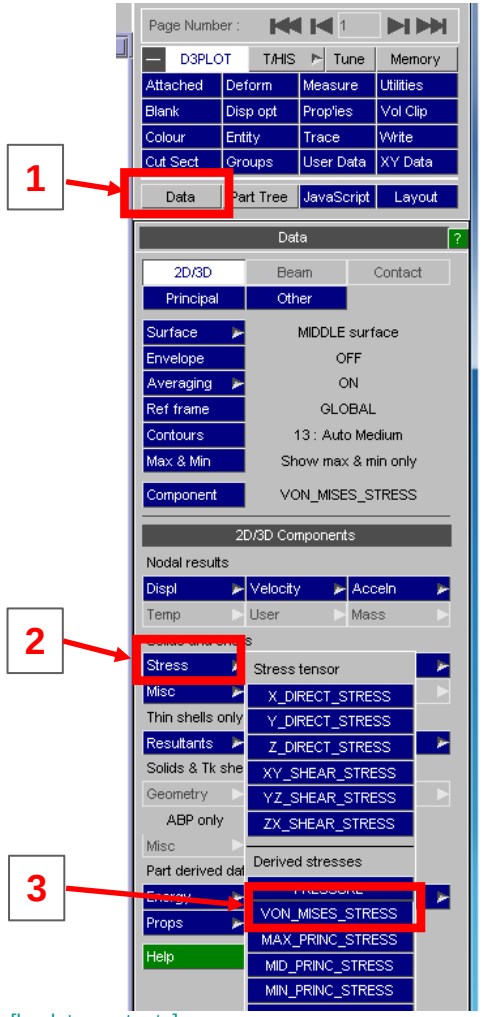
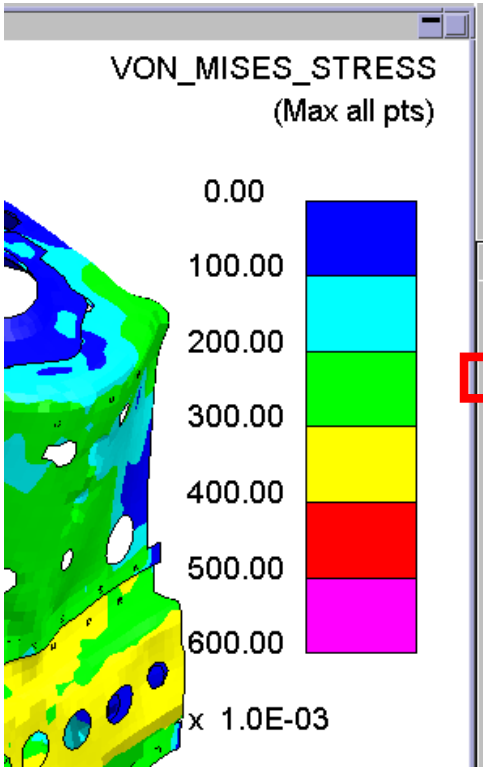
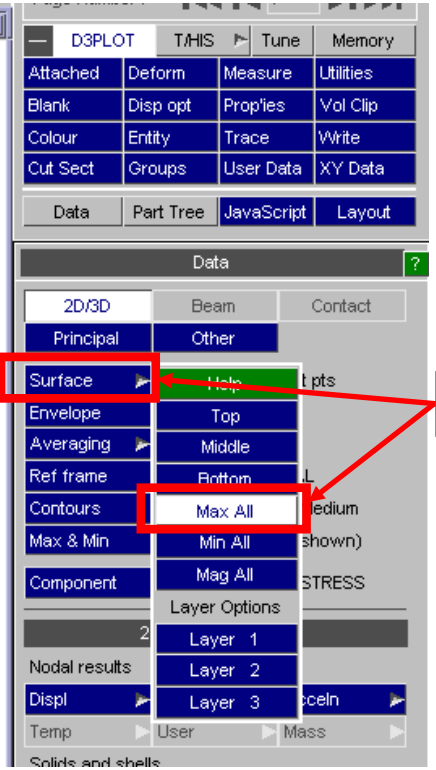
Data Components – 2D/3D

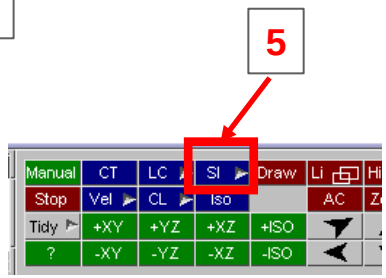
- **Shells** - example of plotting von Mises stress, steps 1-5:



By default the results for the Middle integration point of a shell is shown; however, this can be changed, based on what was made available via MAXINT in *DATABASE_EXTENT_BINARY – for example “Layer 1”,Layer 2”,…, for each integration point, or “Max all” value can be read.







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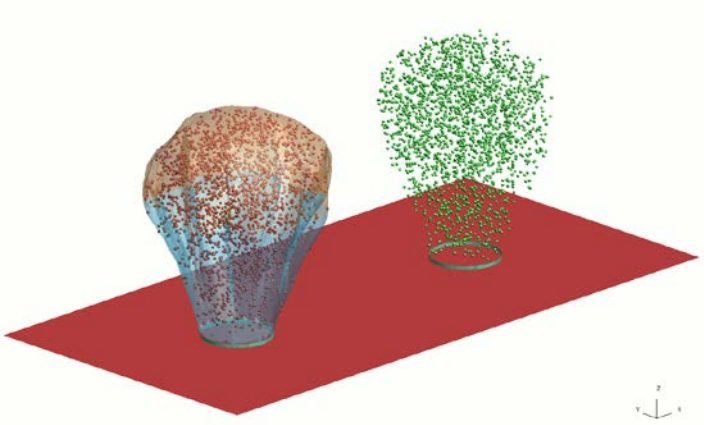
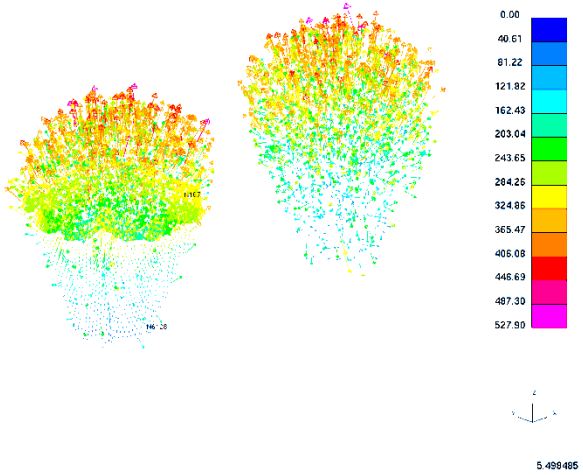
Data Components – 2D/3D

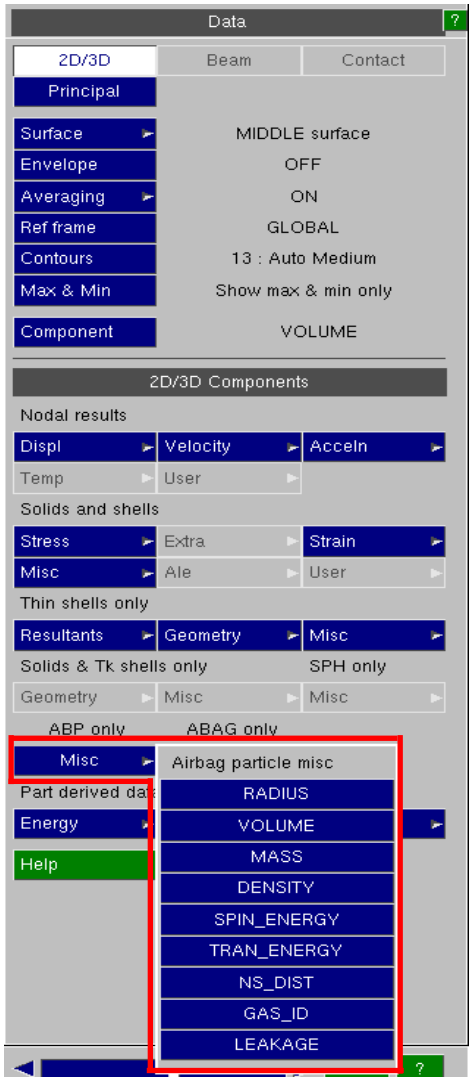
Oasys D3PLOT

Airbag Particles

- Airbag Particle data from PTF / d3plot files is fully supported
- Airbag Particles can be included in vector plots
- Special data components just for Airbag Particles are available in normal contouring modes







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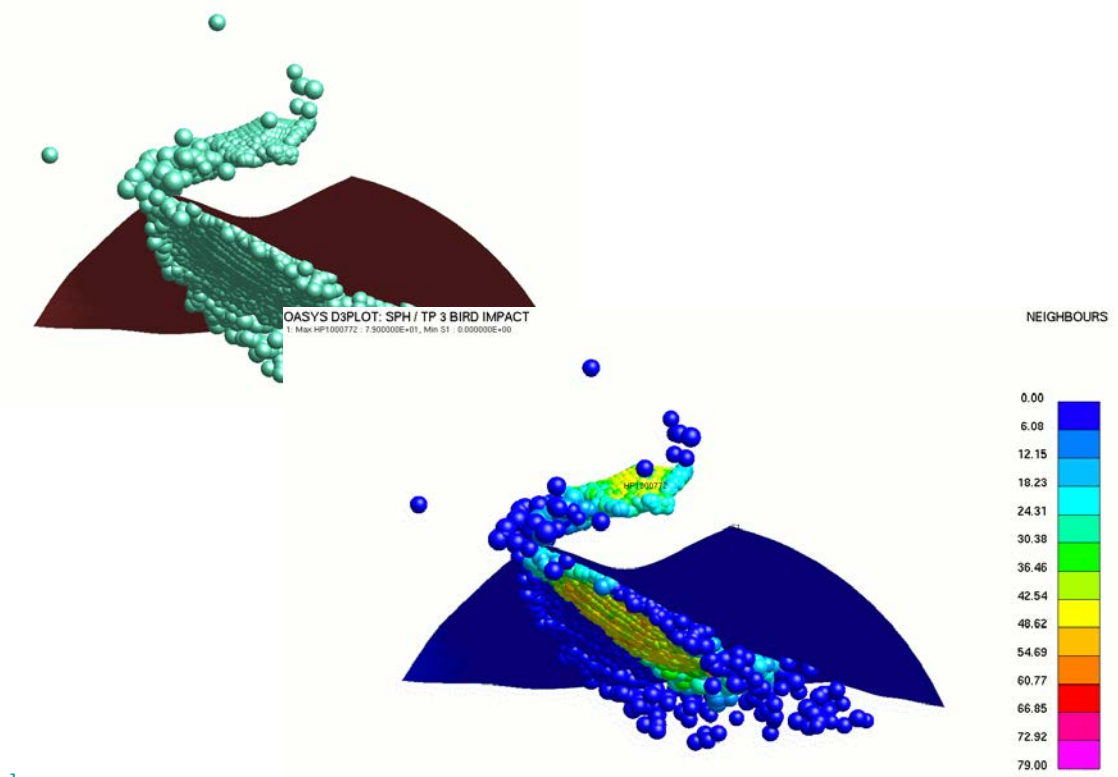
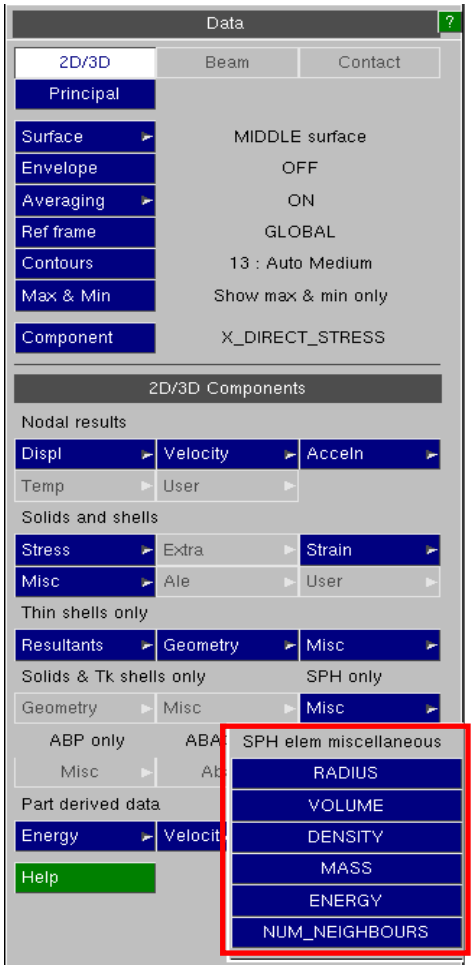
Data Components – 2D/3D

Oasys D3PLOT

SPH Elements

- SPH Elements are fully supported
- SPH data components may be plotted, written and graphed as XY data





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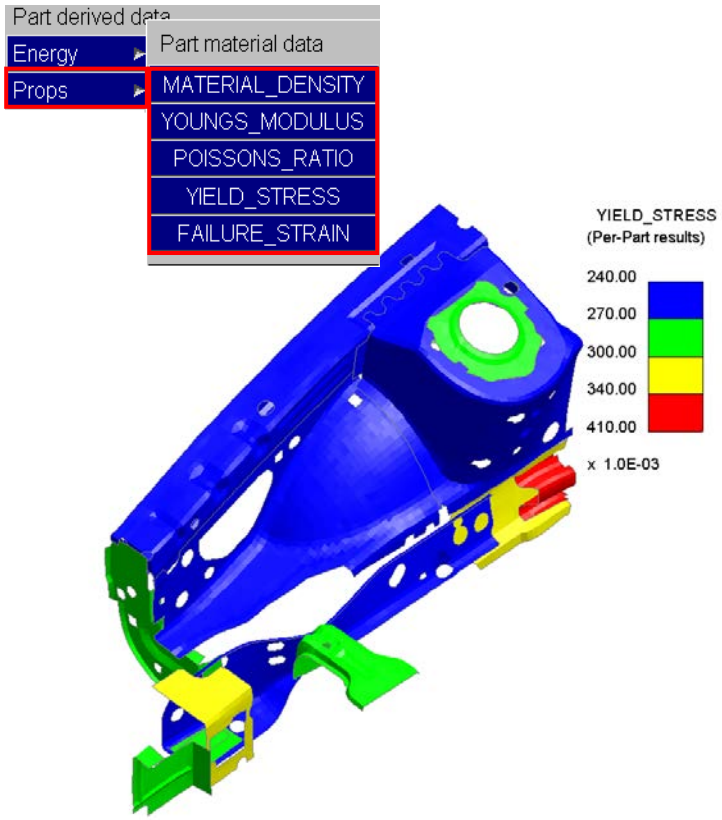
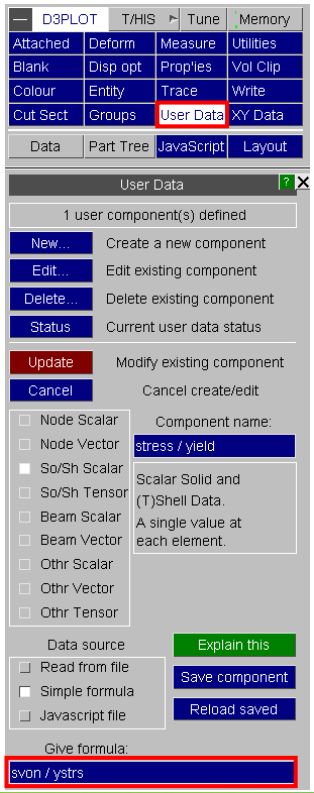
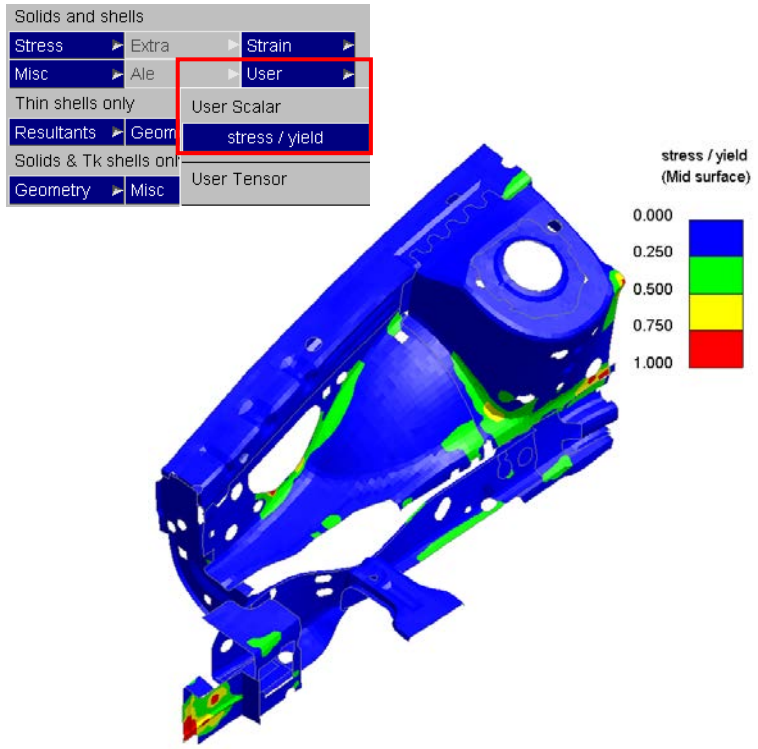
Data Components – 2D/3D

- Material properties of parts can be contour plotted, used in user-defined components and written out from the WRITE menu.
- These come from the ZTF file created by Primer.

An example of its use could be to create a user defined component to plot stress / yield:







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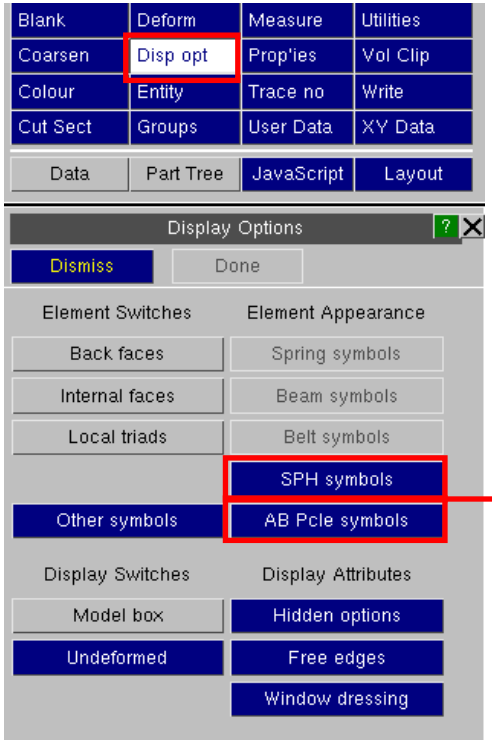
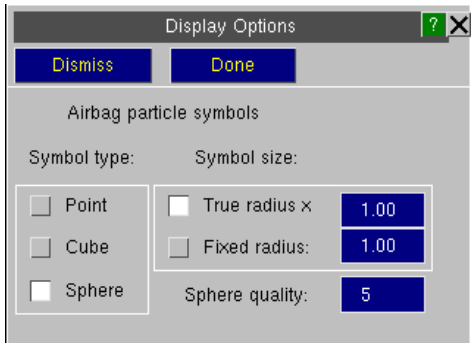
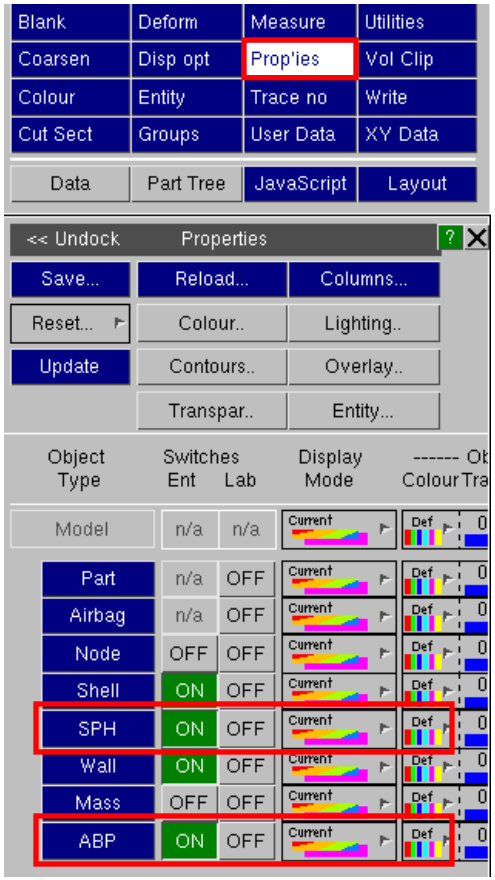
Airbag Particles / SPH Elements

- The symbol type and size of Airbag Particles and SPH Elements can be controlled in Display options





- The visual properties can be altered in the same way as other elements



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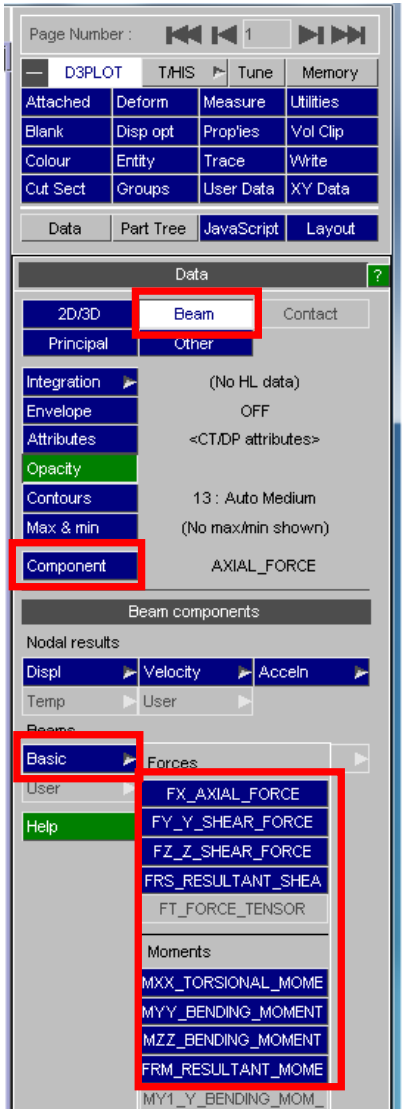
Data Components – Beam

Plotting Beams

- Beam elements cannot be contoured in the same way as 2D and 3D elements, since they have no visual area on which to plot results. Therefore the special "Beam" plotting data display mode must be used to visualise results from beams.
- All beam types have the BASIC set of data components: 3 forces + 3 moments.
- Belytschko-Schwer beams using a resultant plastic formulation will have "extra" PLASTIC components.
- Hughes-Liu (integrated) beams can optionally write "extra“ STRESS (and strain) values at integration points.
- D3PLOT supports both basic and "extra" data components for all these beam types.



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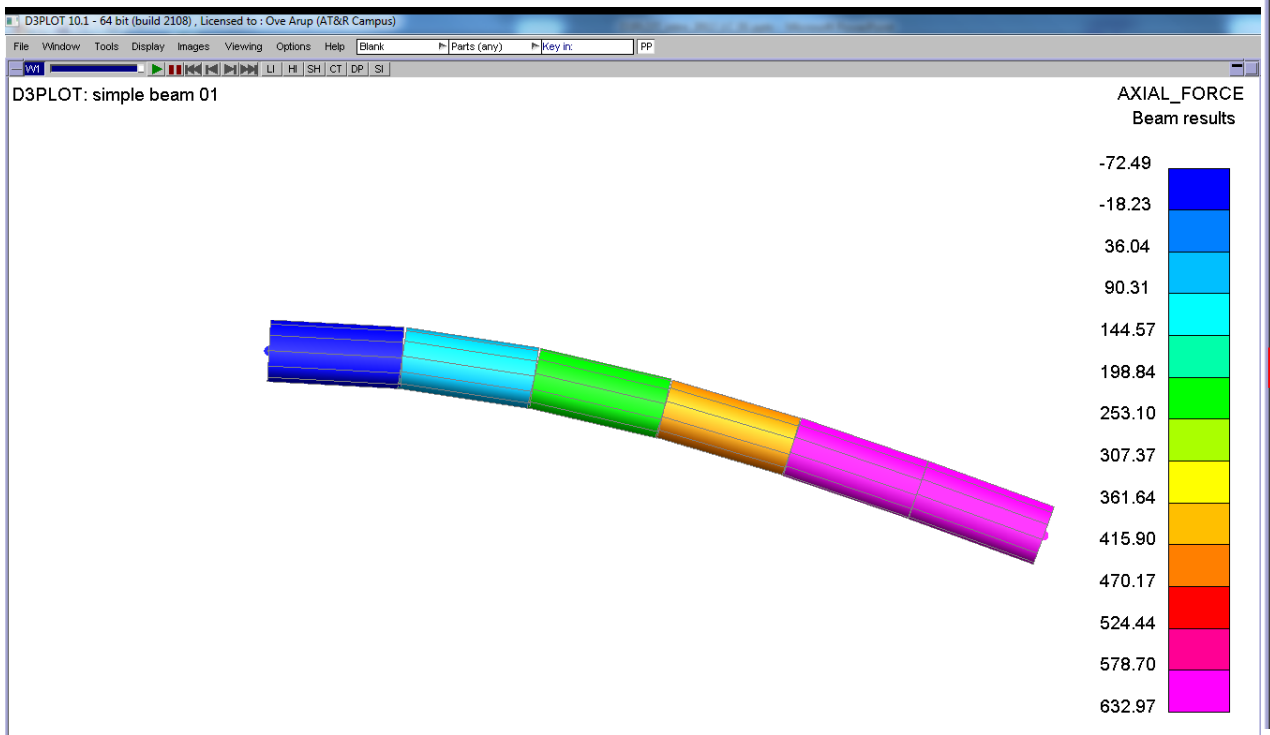
Data Components – Beam

Plotting Beams

- D3PLOT can plot the actual beam thickness, if a .ZTF file is output from PRIMER and available in the run folder; the thickness can be changed from “Attributes”. If no .ZTF file has been read, a square section of the "Thickness" given below will be used.



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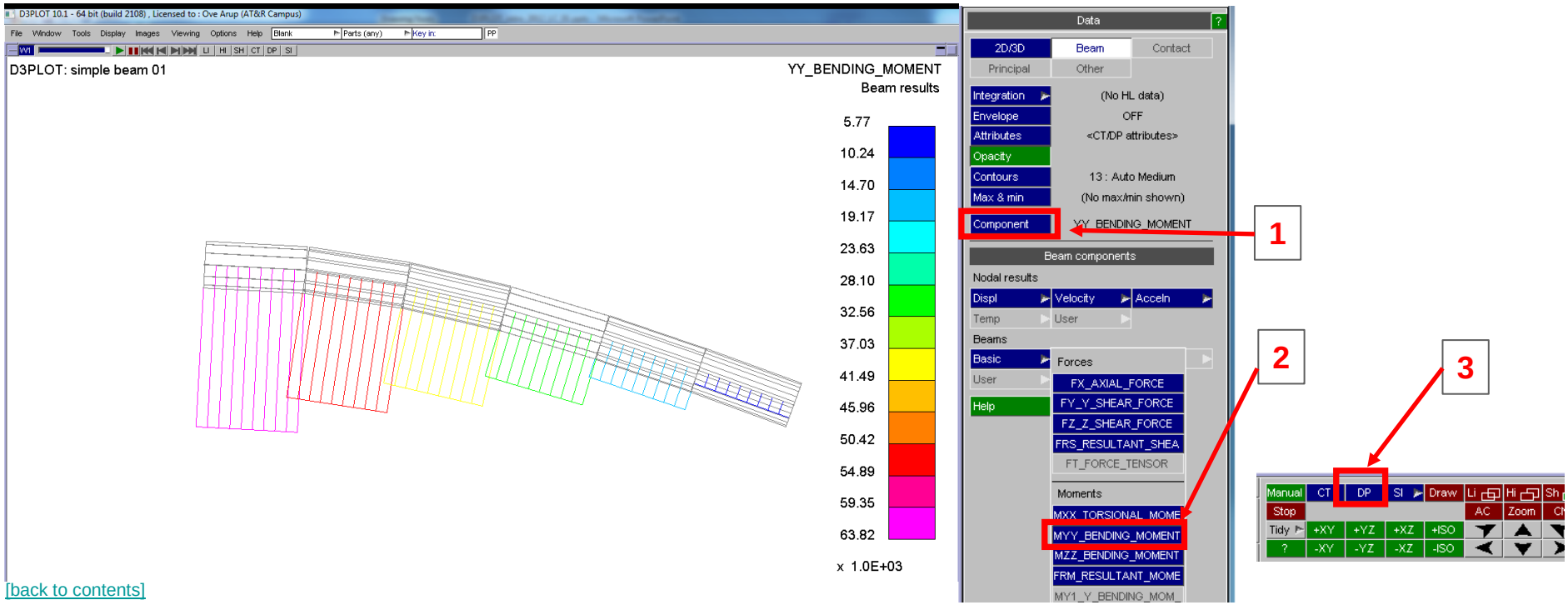
Data Components – Beam

Plotting Beams

- There are two data plotting modes for the display of beam results:
  - **DP** (DIAGRAM_PLOT) This produces a "diagram" plot showing results hatched on the beam. Hatching size is proportional to data magnitude, and colour also follows the normal contour band limits. Directional data is displayed by default on the relevant local beam axis. Any data component can be displayed this way, not just bending moments.



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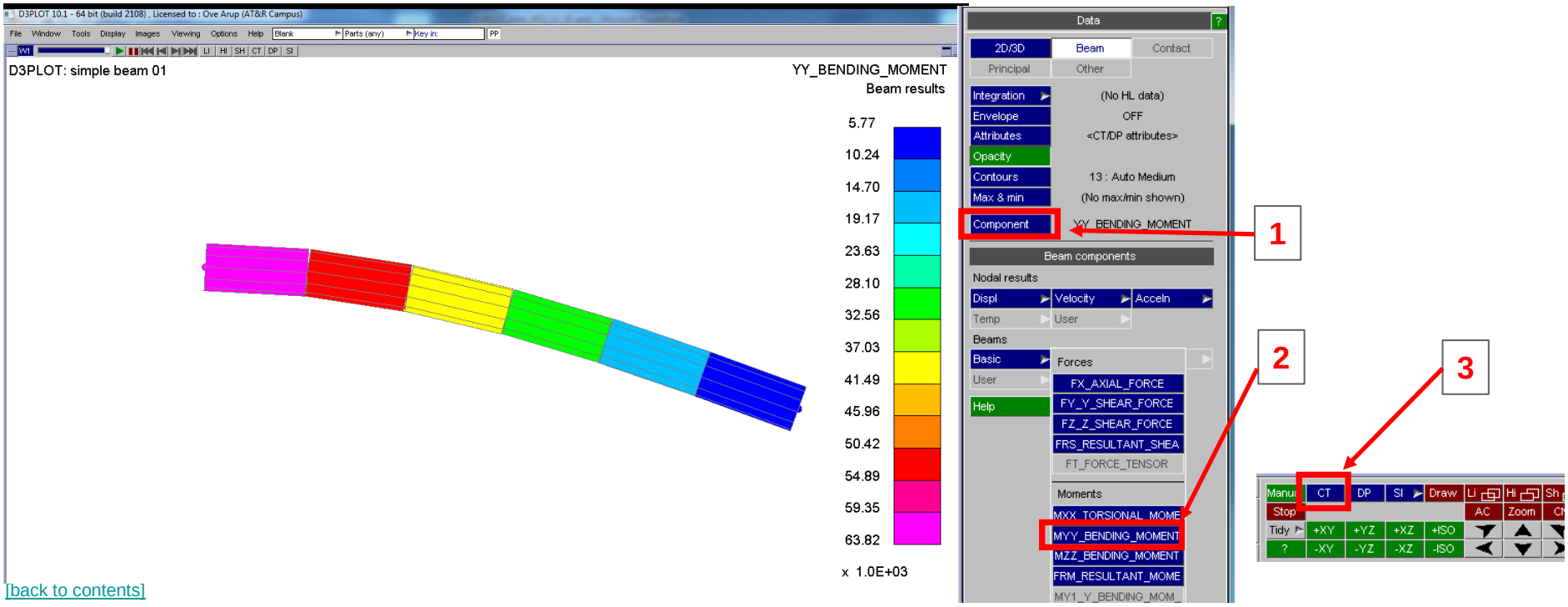
Data Components – Beam

Plotting Beams

- **CT** (CONTINUOUS_TONE) The continuous-tone plot shows exactly the same results as in the diagram plot, but the results are drawn as thick blocks of colour on the beam centreline. This can give less cluttered plots, but no visual indication of the data or beam orientation is possible.



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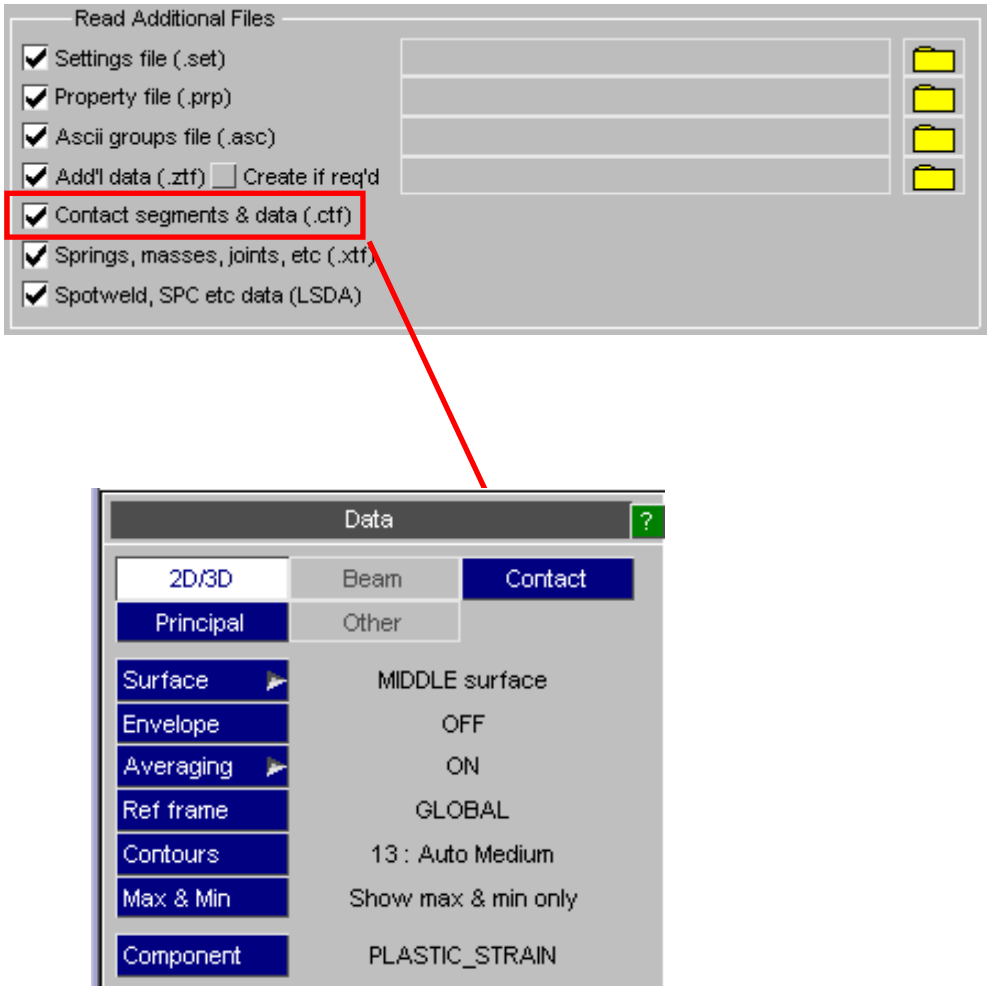
Data Components – Contact

- In order to be able to plot the contact area, a .CTF file needs to be requested when the analysis is submitted, please see the LS-DYNA manual for details.
- If a CTF is found and read when the model is loaded in D3PLOT, then the Contact plotting menu will become active.



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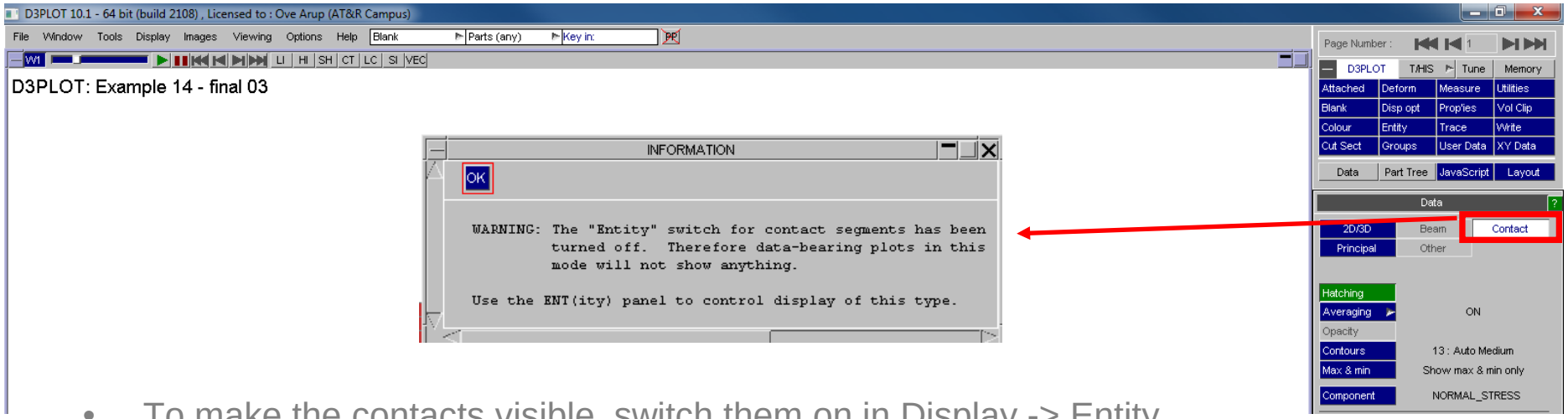
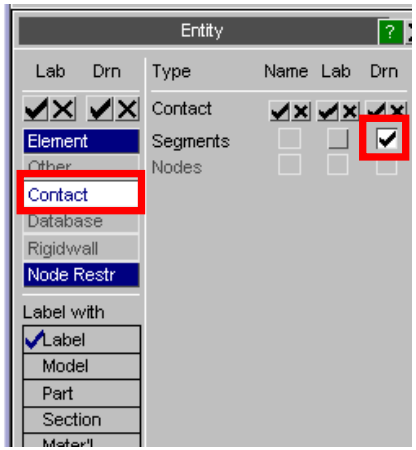
Data Components – Contact

- Visualizing contact area in D3PLOT: Data -> Contact -> A warning will appear as the contacts are not visible by default:



- To make the contacts visible, switch them on in Display -> Entity (shortcut ‘e’) -> Contact



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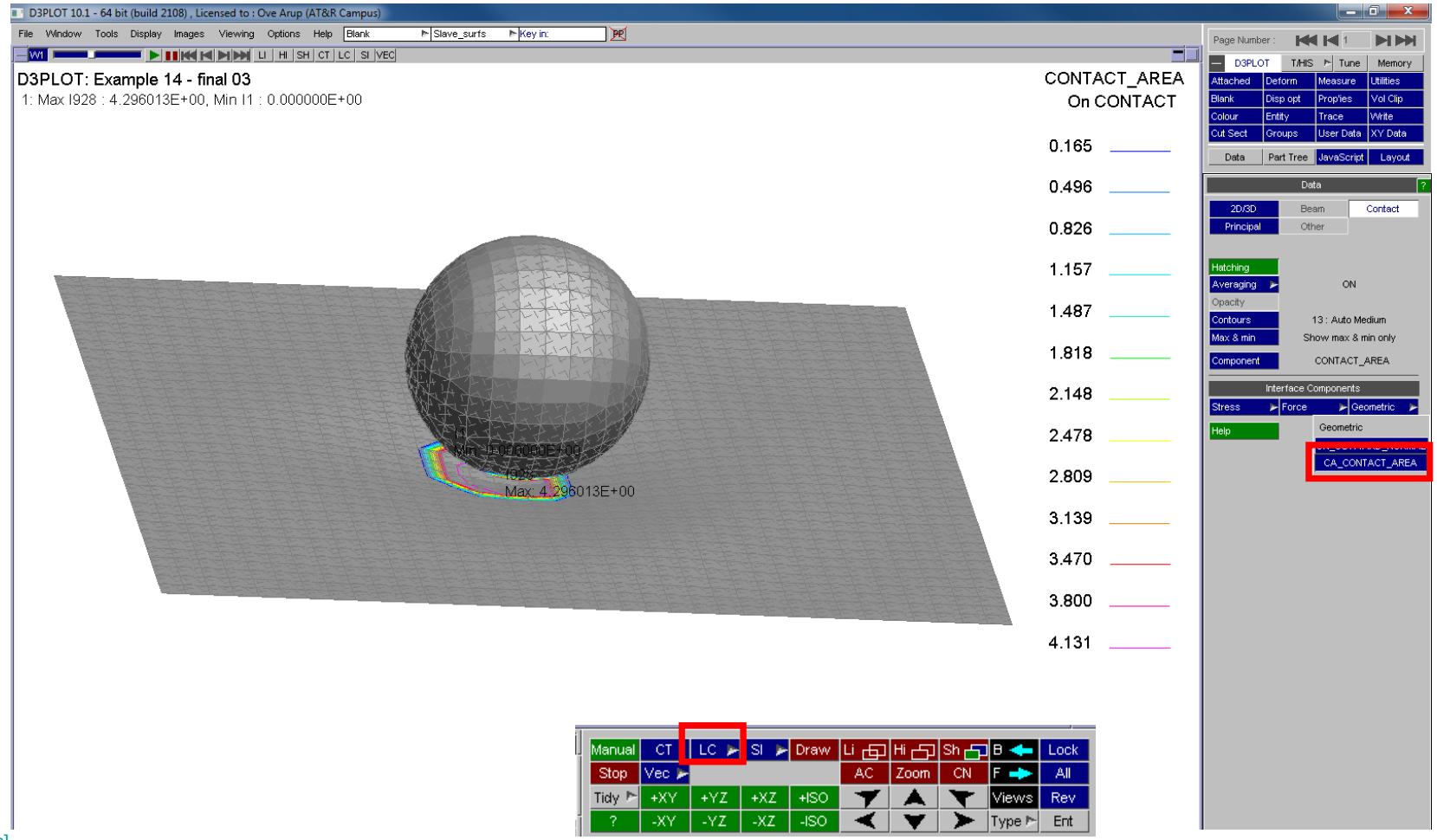
Data Components – Contact

- Visualizing contact area in D3PLOT: Data -> Contact -> Geometric: CA_CONTACT_AREA



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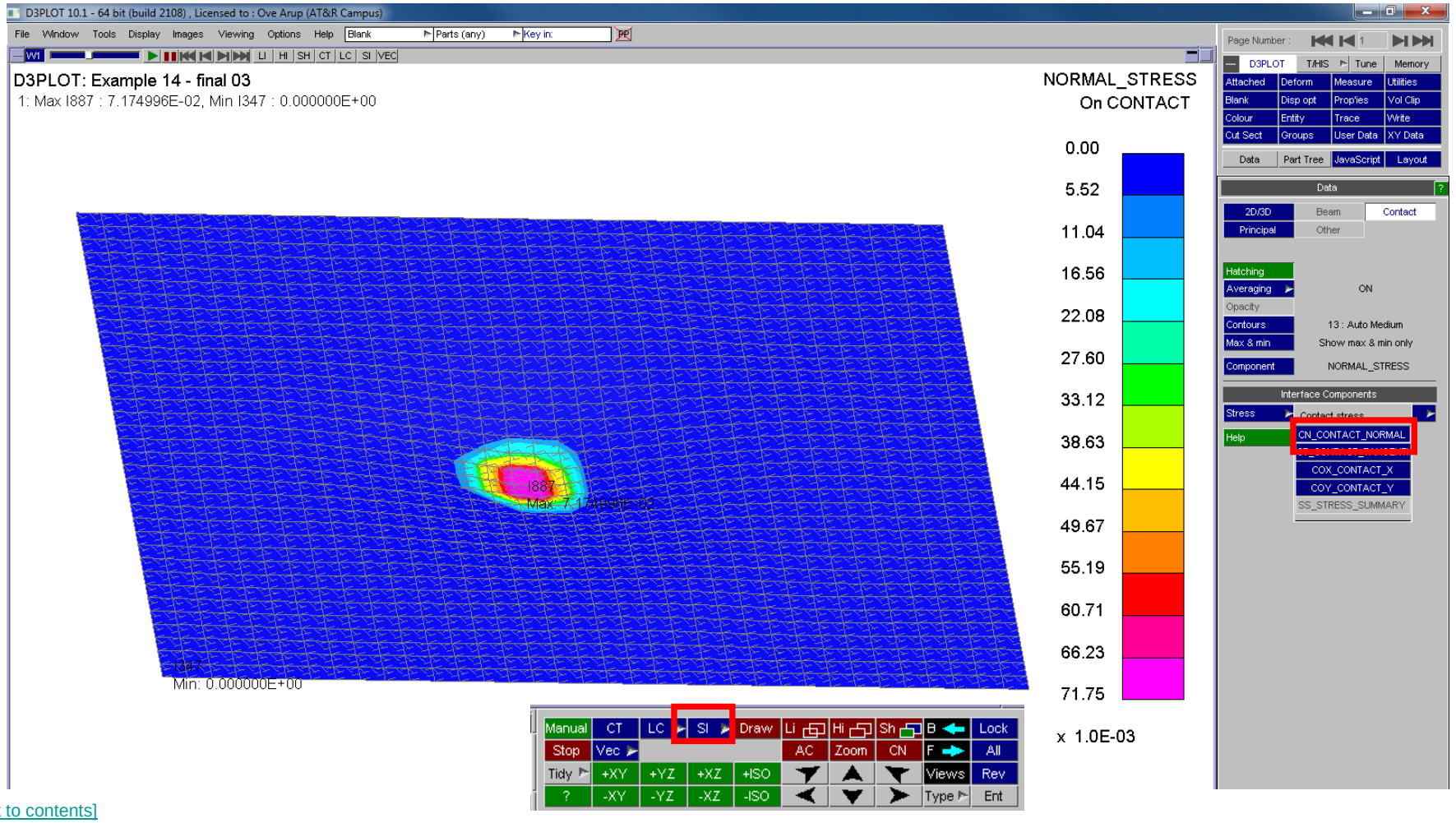
Data Components – Contact

- Visualizing contact stress in D3PLOT: Data -> Contact -> : CN_CONTACT_NORMAL



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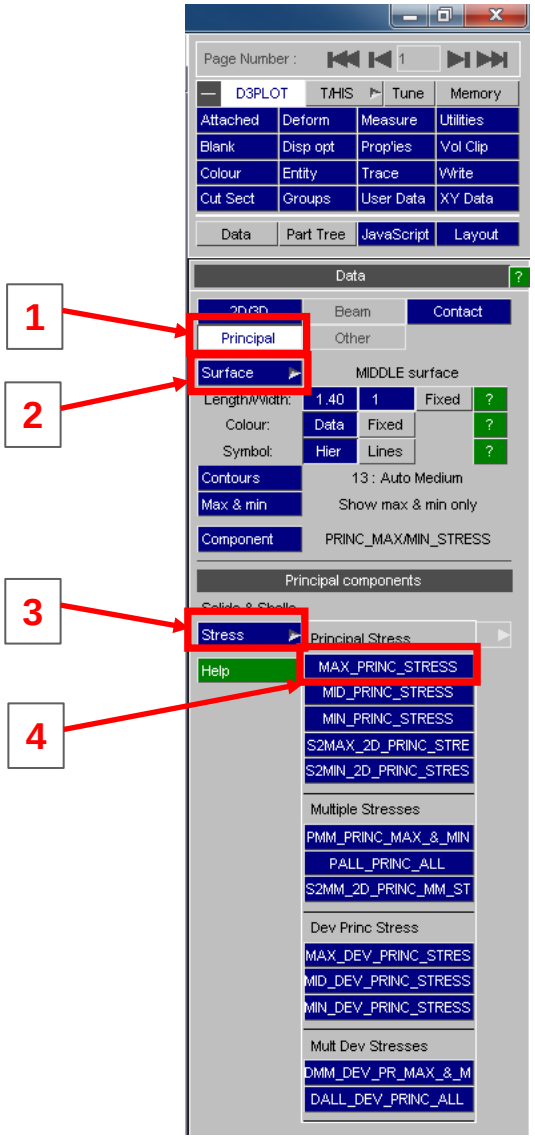
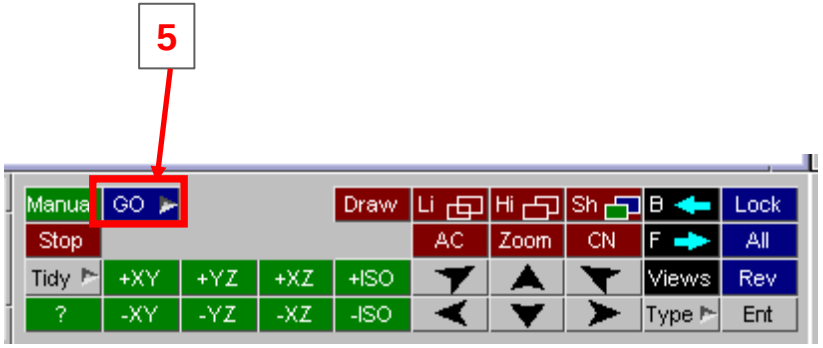
Data Components – Principal stress/strain

- The panel “Principal” controls the plotting of Principal stress and strain vector plots.
- These vectors can only be displayed on 2D and 3D elements (solids and shells), so if you have none of these in your model, it will be unavailable.
- STRESS and STRAIN categories are only made available if their respective tensors are present in the database file.





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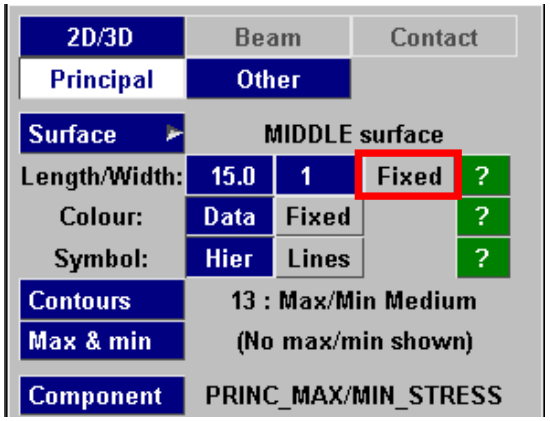
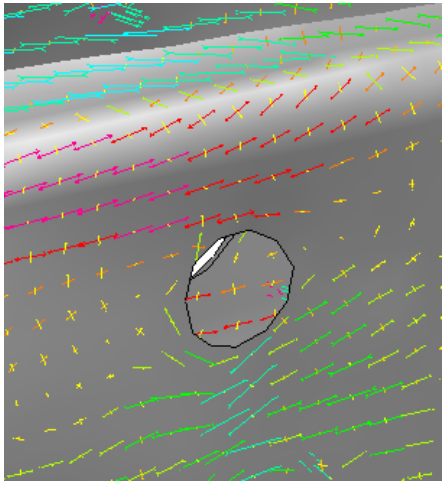
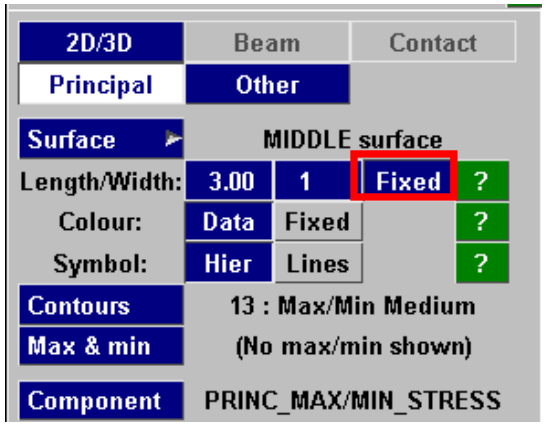
Data Components – Principal stress/strain

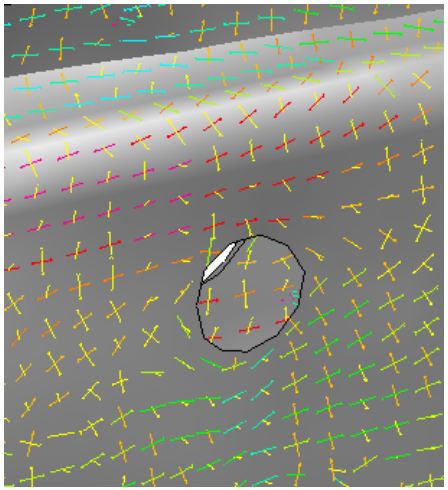
- By default the arrow length is proportional to stress.





- Alternatively the arrow length can be fixed.





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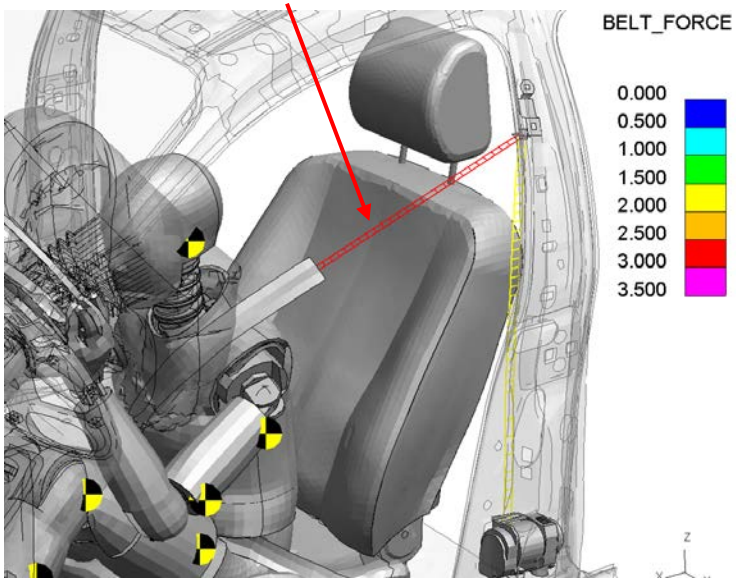
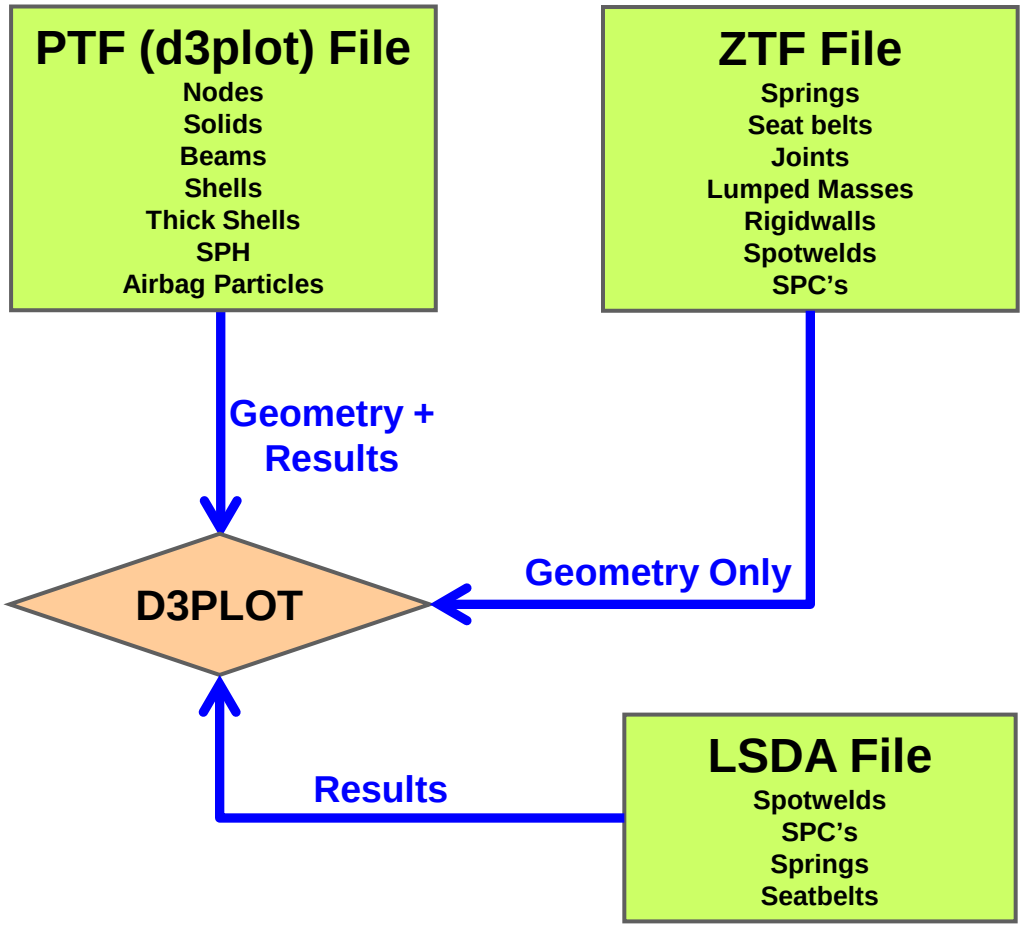
Data Components – Other (LSDA)

The ZTF file created by PRIMER includes data for SPC's, spotwelds, *DATABASE_CROSS_SECTIONS.

Results for spotwelds, SPC's, springs and 1D seatbelt elements can be read from the LSDA (binout) file and displayed.

1D seatbelt element forces





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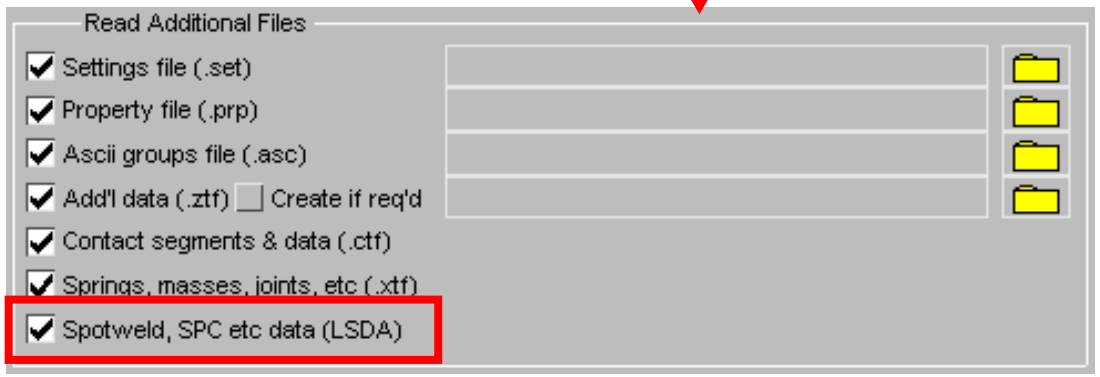
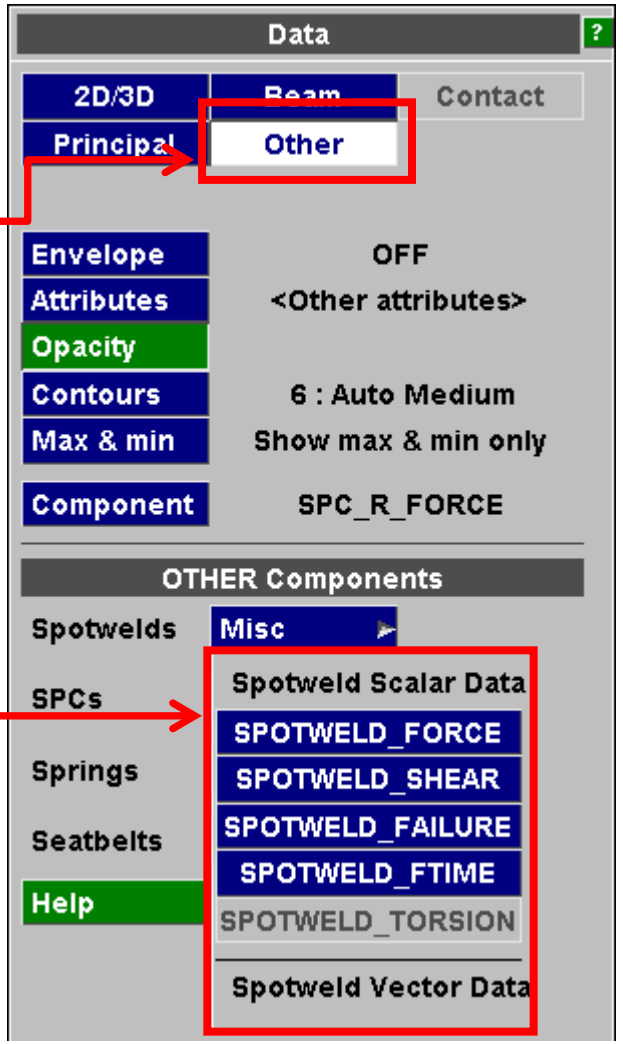
Data Components – Other (LSDA)

- LSDA (binout) data components are available under the ‘OTHER’ button in the ‘DATA’ menu.
  - Because the LSDA file can be large, it is read in a separate thread when the model is opened. The ‘OTHER’ button will be greyed out until this has been read. All other operations in D3Plot will still be available.
- Each type of data has its own sub-menu, listing the available data components.
- When reading a model, the user can choose to read the binout file or not.





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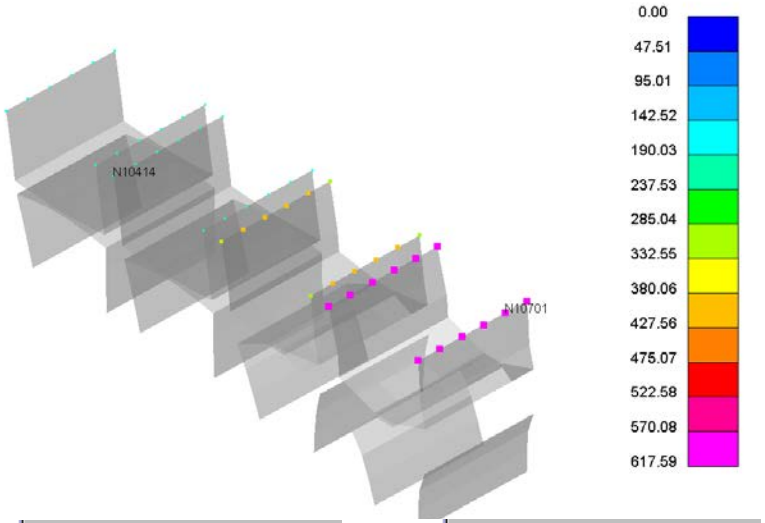
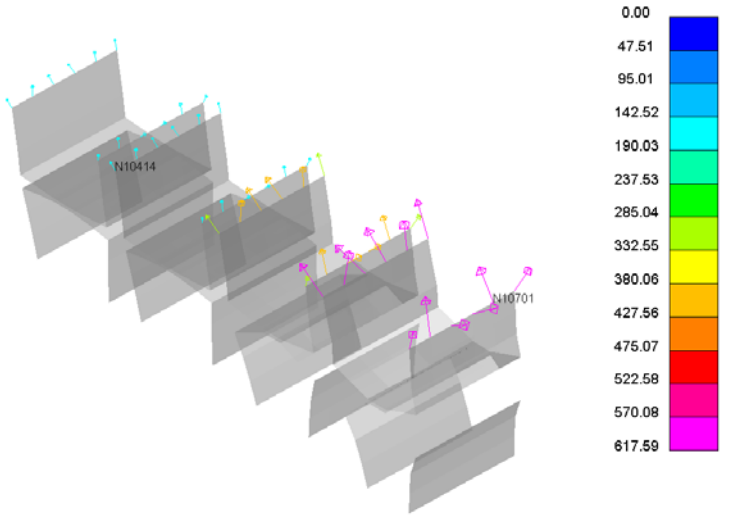
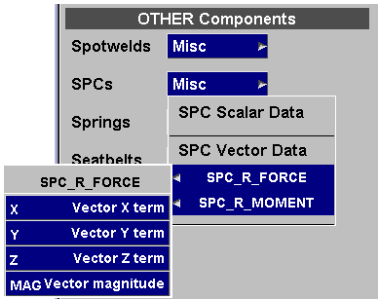
Data Components – Other (LSDA)

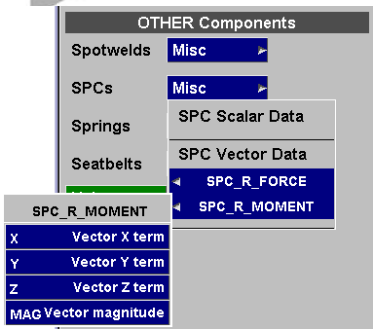
SPC Forces

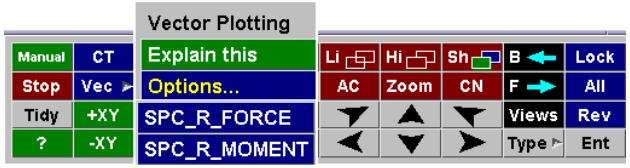
- Force and moment reactions on restraints (SPC forces) can be plotted (requires *DATABASE_SPCFORC in the keyword file)
- All the force and moment components can be plotted as coloured squares
- The “magnitude” components can also be plotted as vectors











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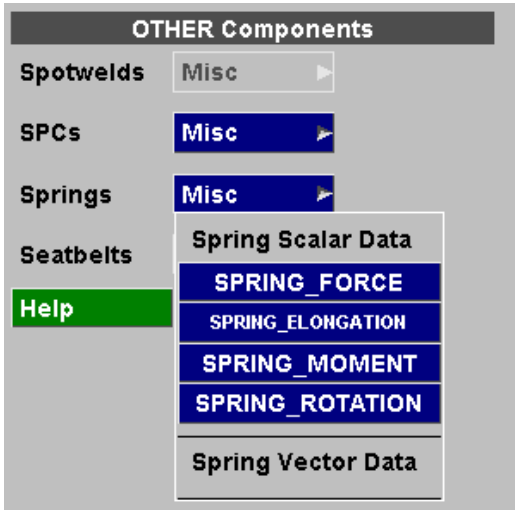
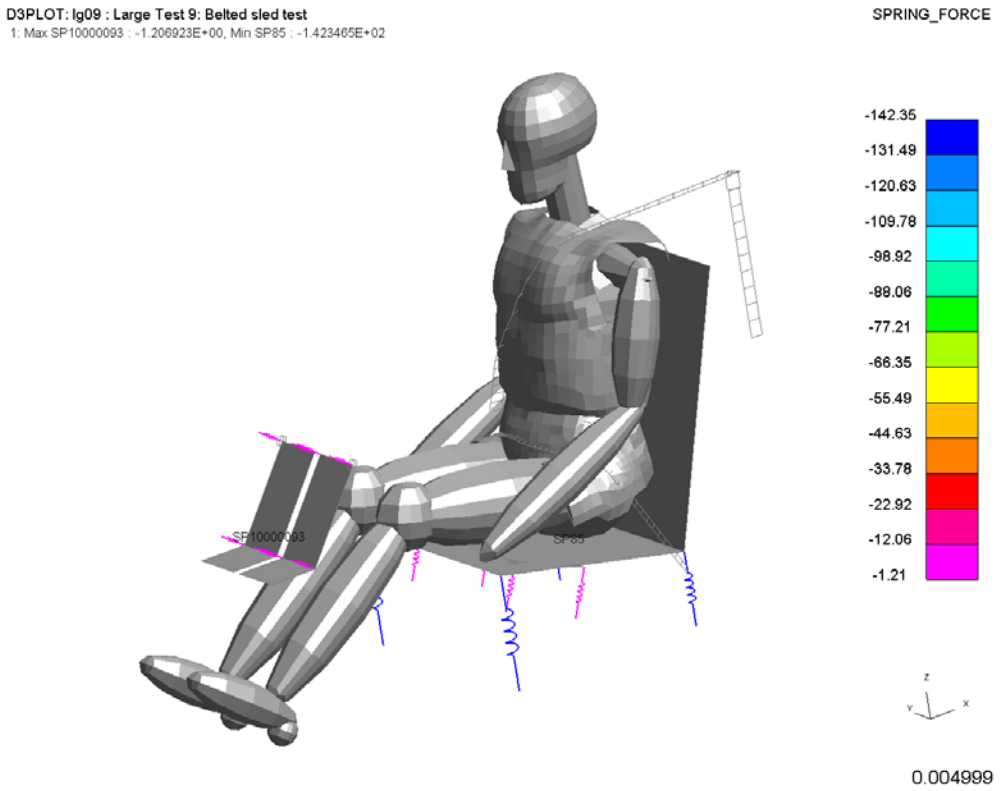
Data Components – Other (LSDA)

Spring Data

- The following Spring data components are available (requires *DATABASE_DEFORC in the keyword file):
  - Spring Force
  - Spring Elongation
  - Spring Moment
  - Spring Rotation





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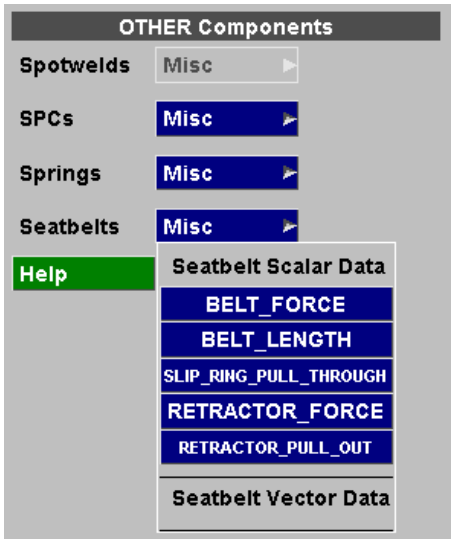
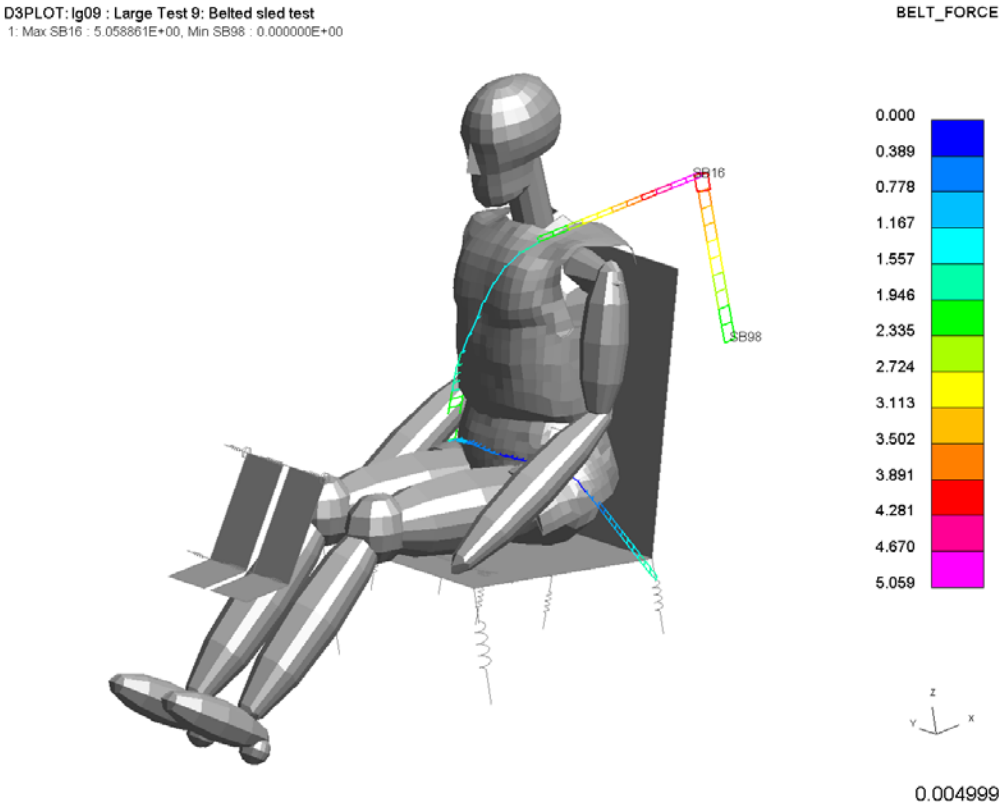
Data Components – Other (LSDA)

Seatbelt Data

- The following Seatbelt data components are available (requires *DATABASE_SBTOUT In the keyword file):
  - Seatbelt Force
  - Seatbelt Length
  - Slip Ring Pull Through
  - Retractor Force
  - Retractor Pull Out





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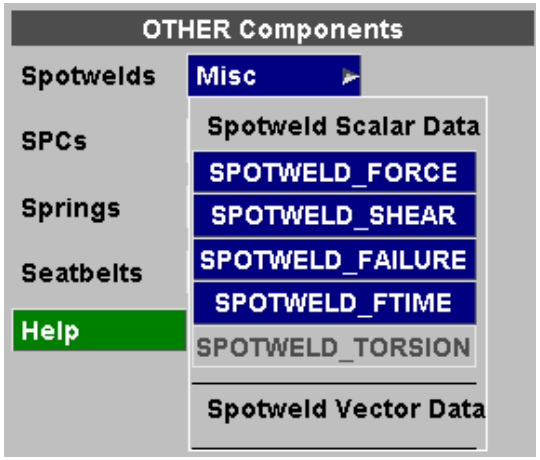
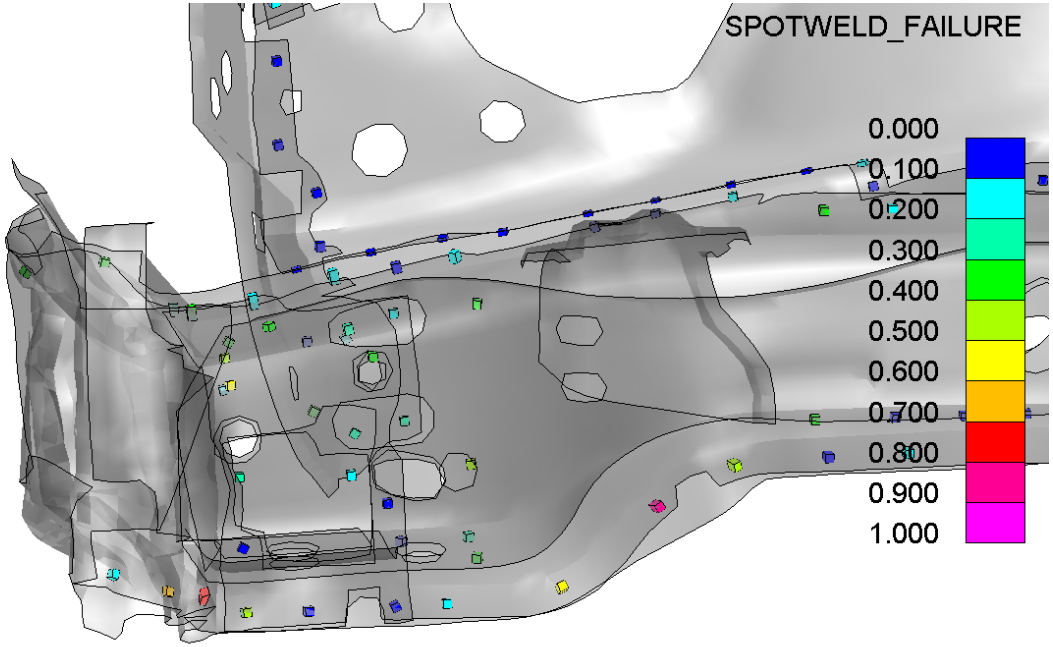
Data Components – Other (LSDA)

Spotweld Data

- The following spotweld data components are available (requires *DATABASE_SWFORC in the keyword file):
  - Spotweld Force (axial)
  - Spotweld Shear (resultant shear)
  - Spotweld Failure (force state relative to failure surface, =1.0 at failure)
  - Spotweld Failure Time (time at which failure occurred)
  - Spotweld Torsion





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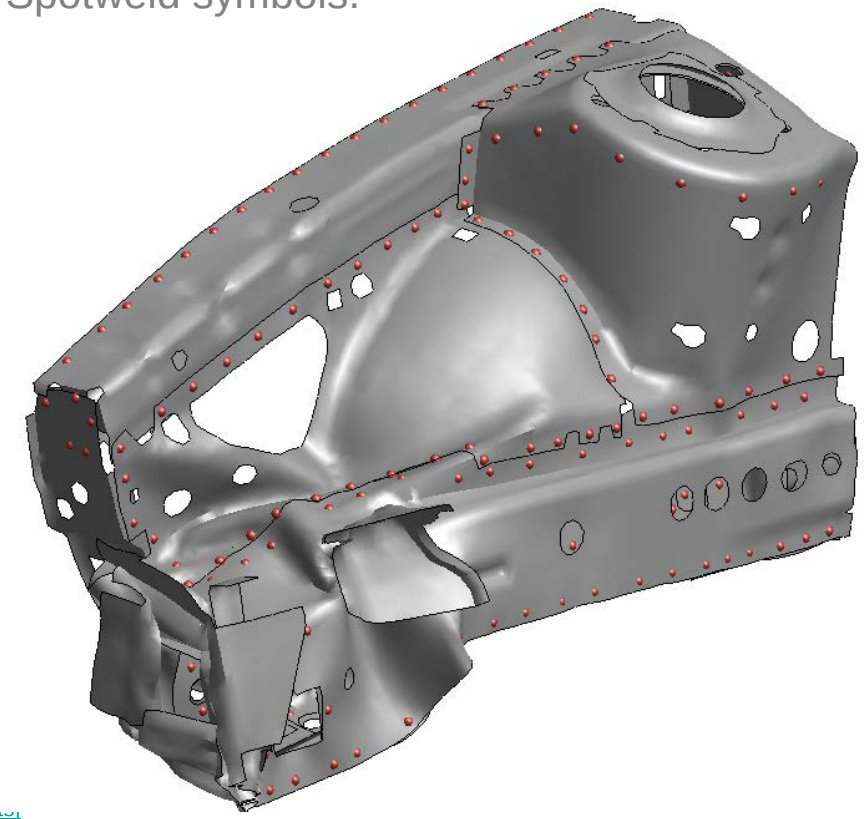
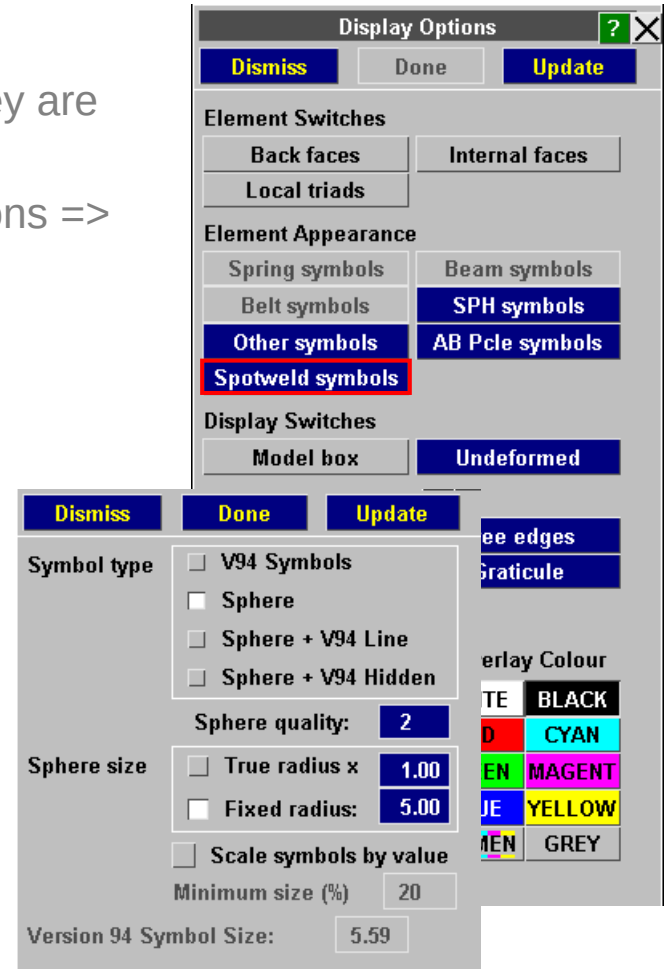
Data Components – Other (LSDA)

Oasys D3PLOT

Spotweld Drawing Style

- Spotweld elements can be drawn as spheres, so that they are not obscured by the panels.
- Options for setting the size and style are in Display Options => Spotweld symbols.





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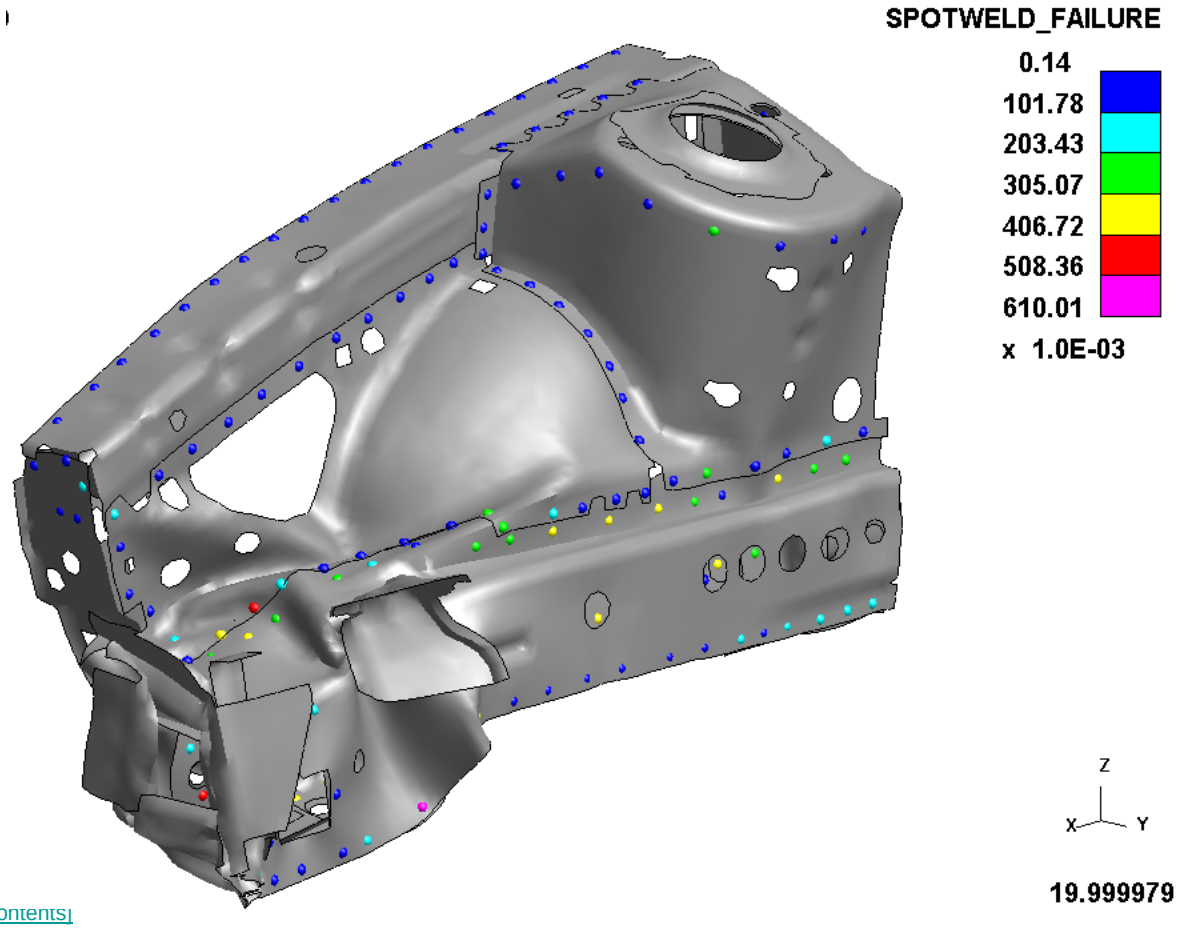
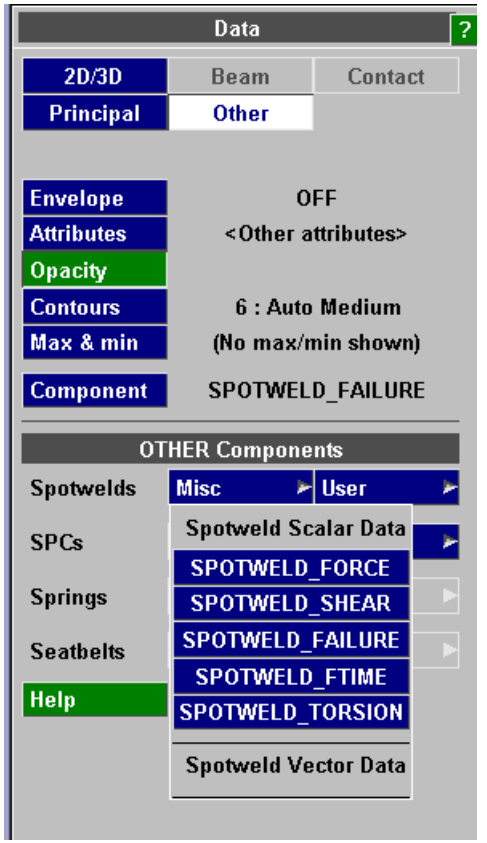
Data Components – Other (LSDA)

Spotweld Drawing Style

- The drawing style also applies to data plots.





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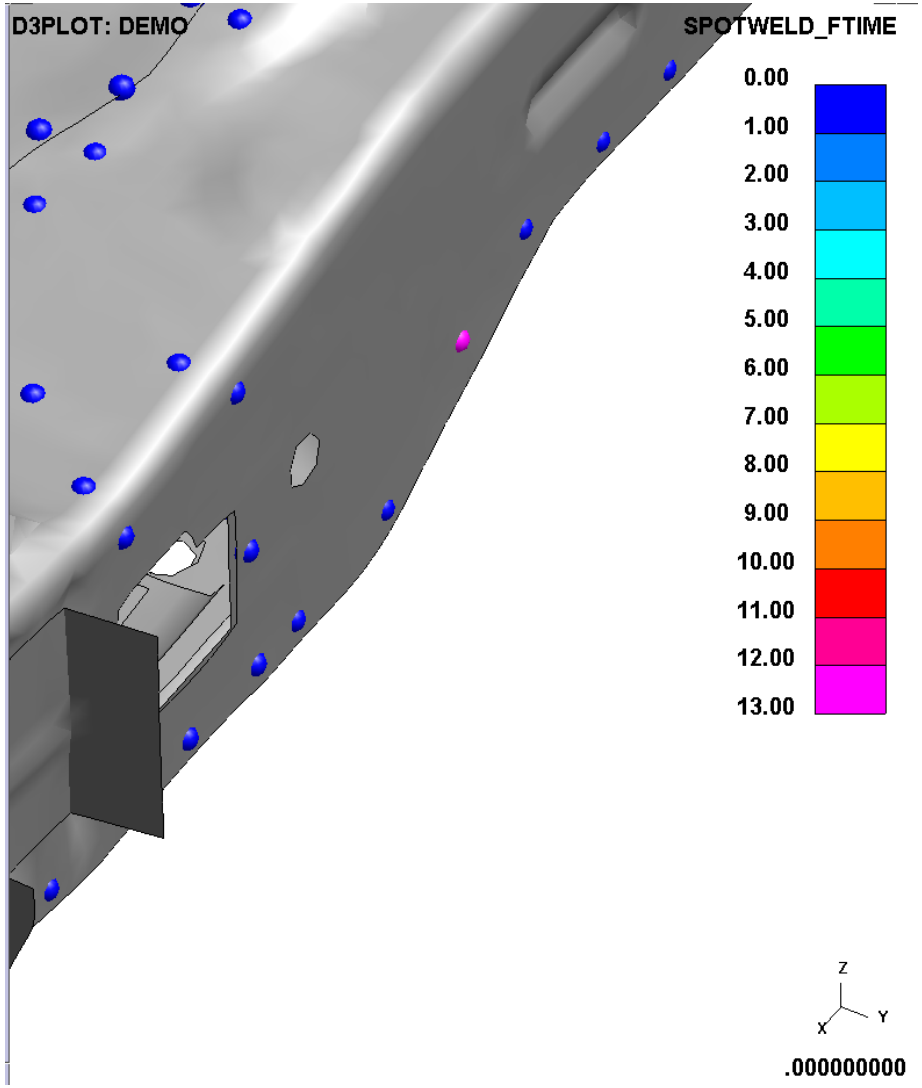
Data Components – Other (LSDA)

Spotweld Failure Time

- When spotweld failure time is present in the binout file, D3PLOT scans through all the time-states in the binout file to find the failure time of each spotweld. These failure times will still be contoured even if D3PLOT is set to a time-state before the failure occurred.
- In the image opposite, D3PLOT is displaying time=zero and showing a spotweld that failed at 13ms.



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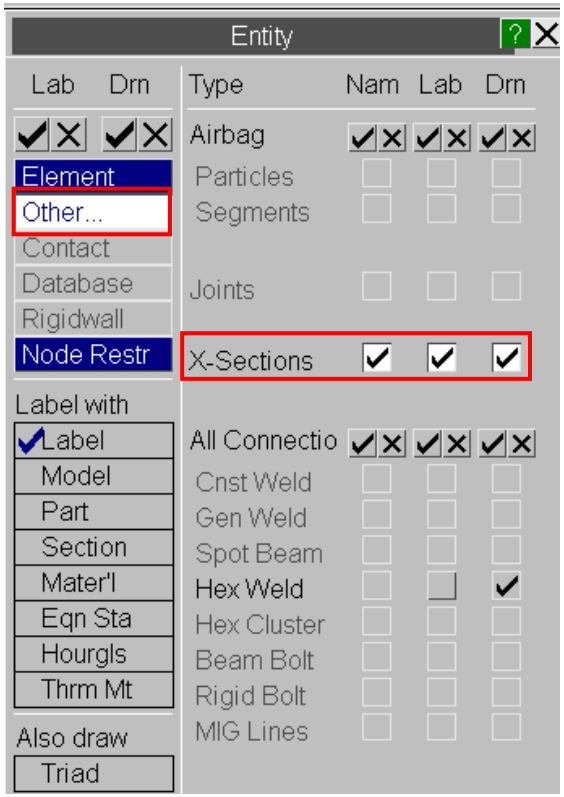
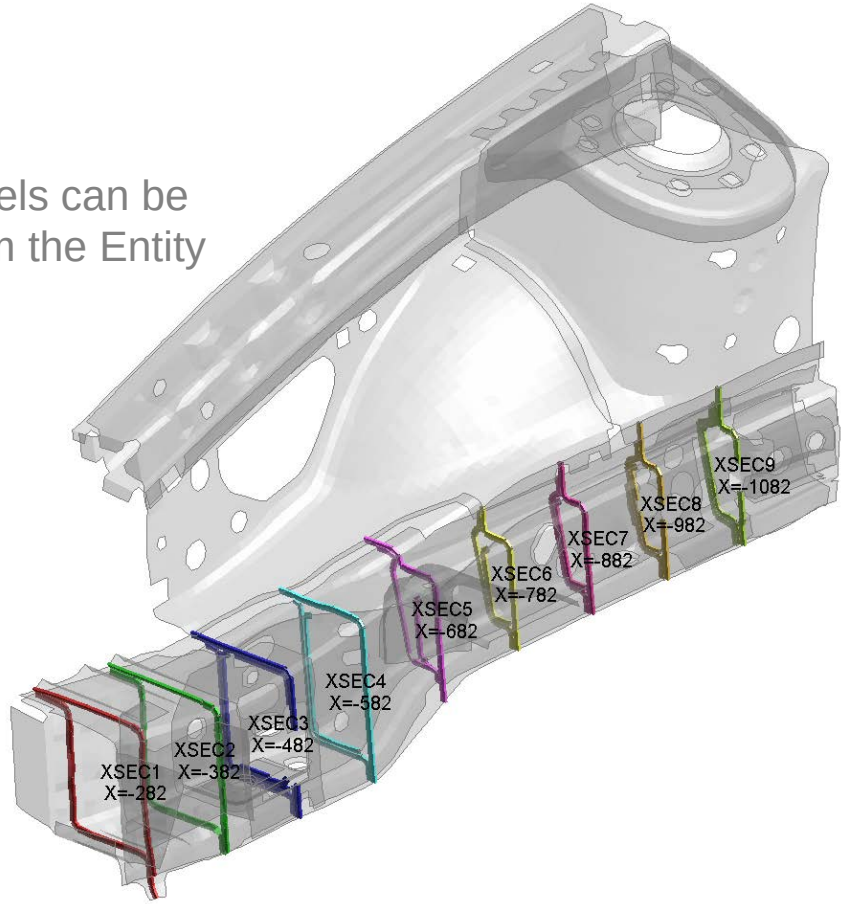
Data Components – Other (LSDA)

***DATABASE_CROSS_SECTION data**

- *DATABASE_CROSS_SECTION definitions can be displayed in D3PLOT (requires a ZTF file generated by Primer).



Names and Labels can be switched on from the Entity panel



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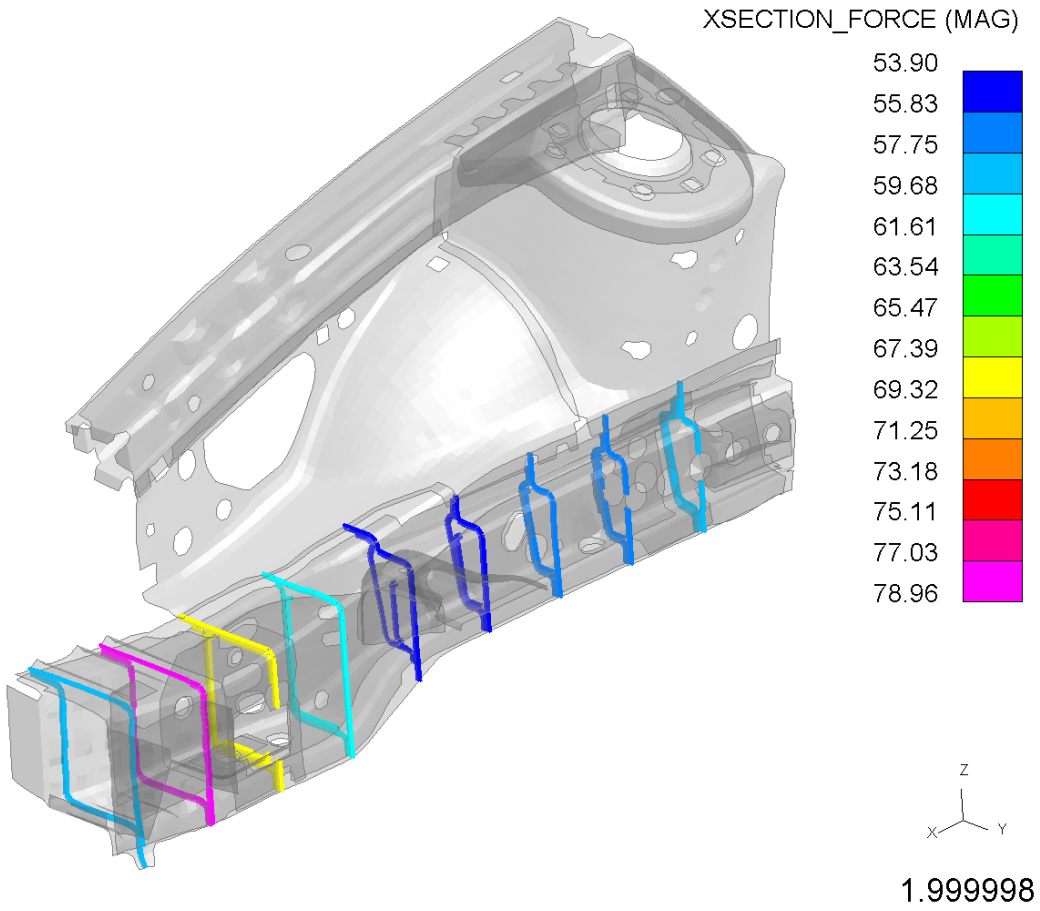
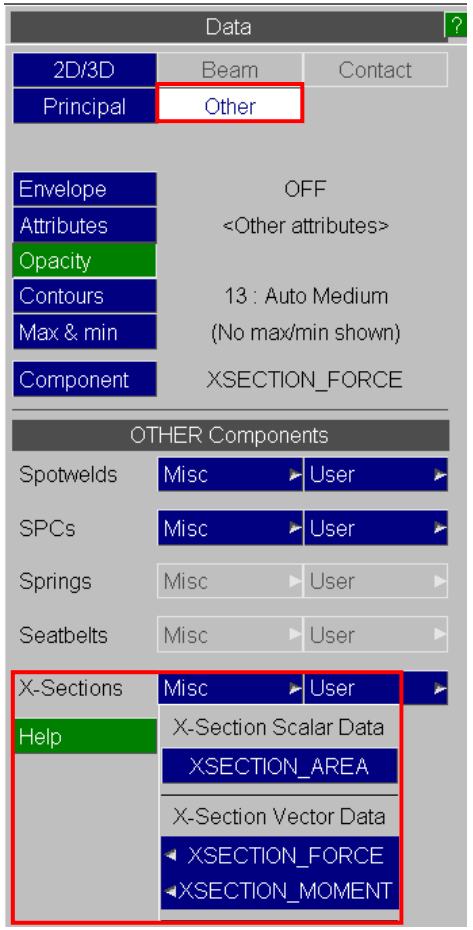
Data Components – Other (LSDA)

DATABASE_CROSS_SECTION data

- Cross Section Area, Force and Moments can be contoured.





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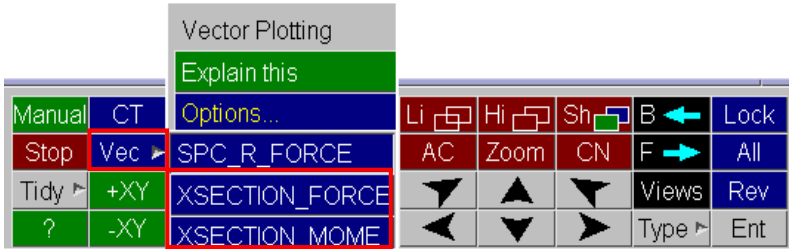
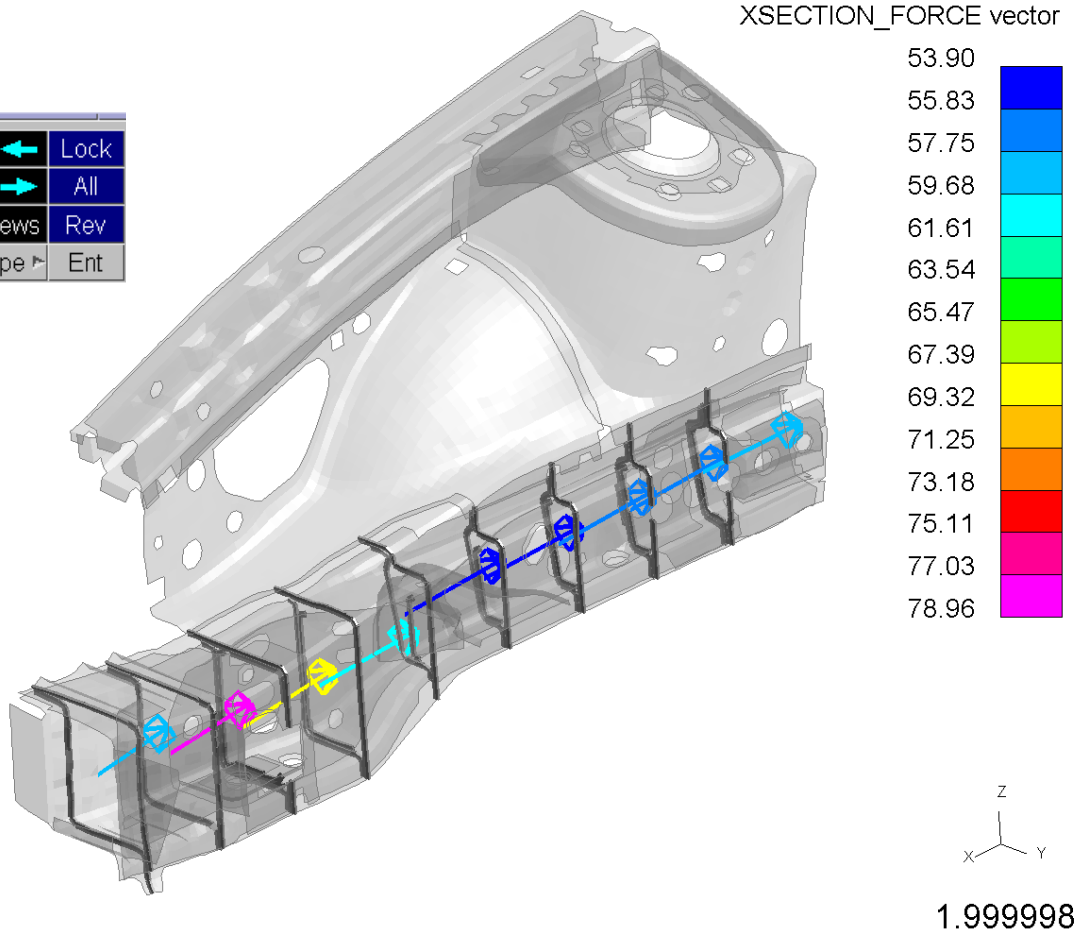
Data Components – Other (LSDA)

DATABASE_CROSS_SECTION data

- Vector plots of Forces and Moments can also be generated.





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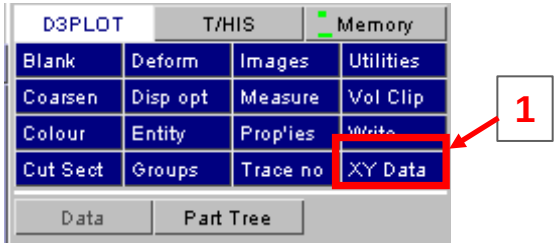
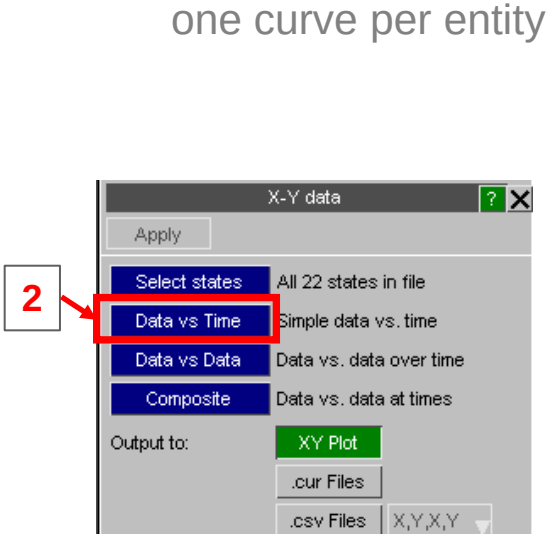
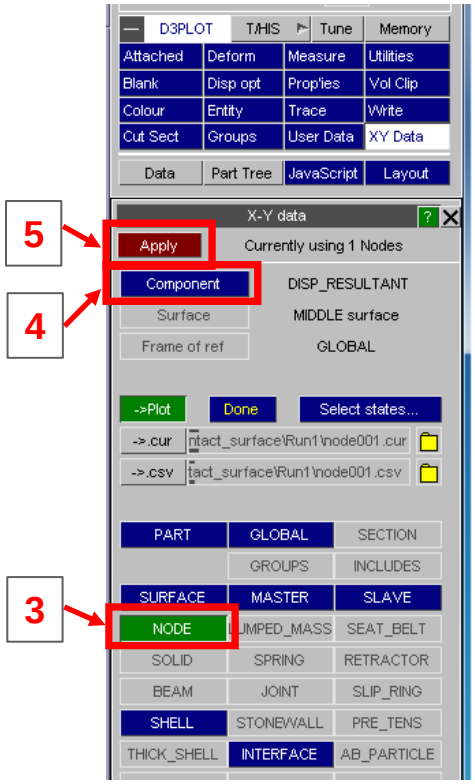
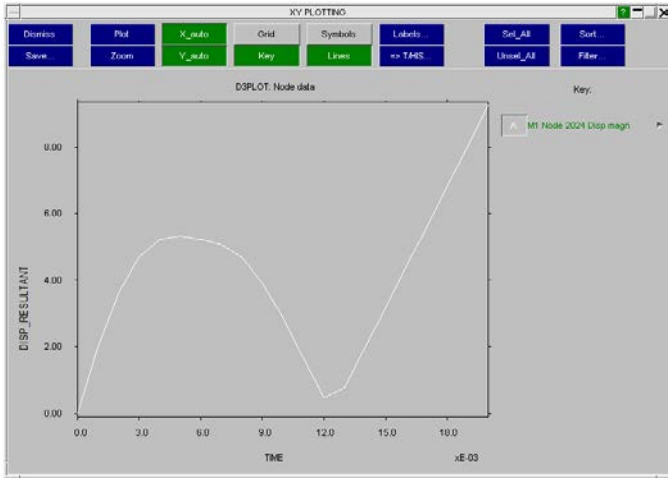
Other methods of extracting data

- Data listing (screen or text file) from “Write” menu
- “XY Data” turns information from the d3plot file into curves that can be displayed in D3PLOT and exported to T/HIS.
  - **Data-vs-time** – select the entities and data component; one curve per entity









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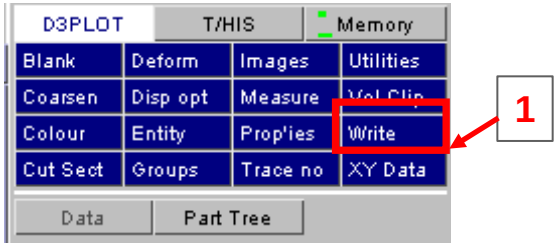
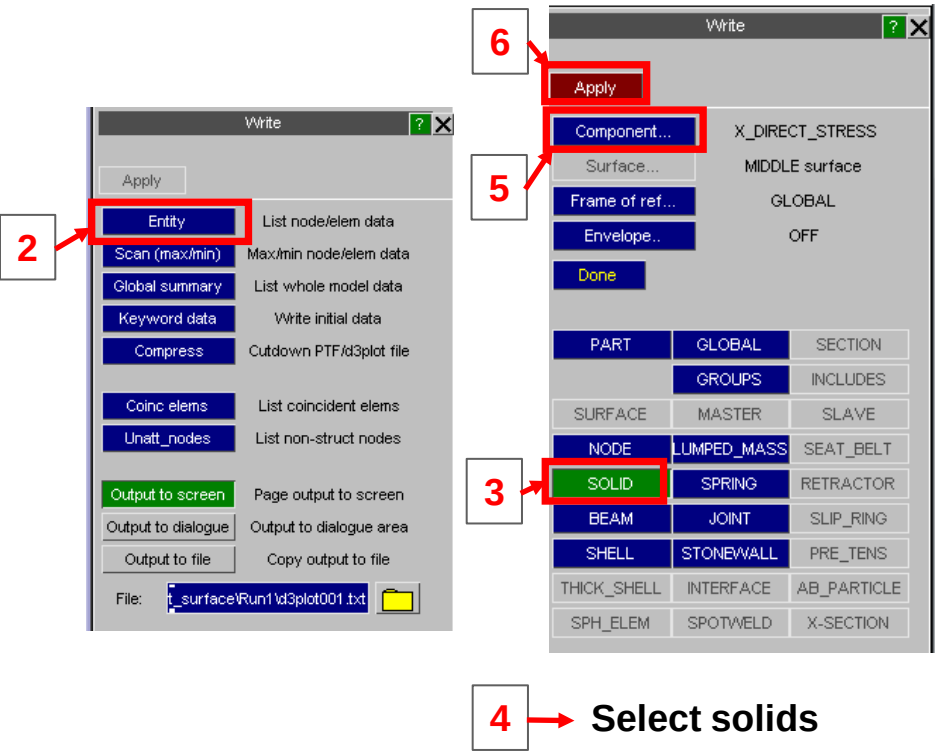
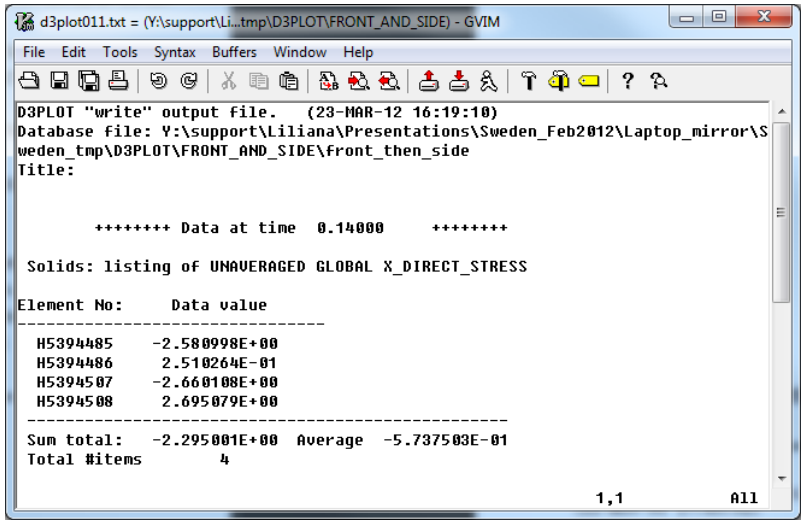
Other methods of extracting data

- Data listing (to screen or text file) from “Write” menu.
- The Entity option allows output of standard element and nodal data, eg. element stress, nodal acceleration, etc. The example below outputs x-stress for solids:







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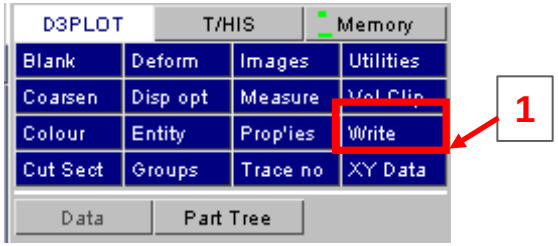
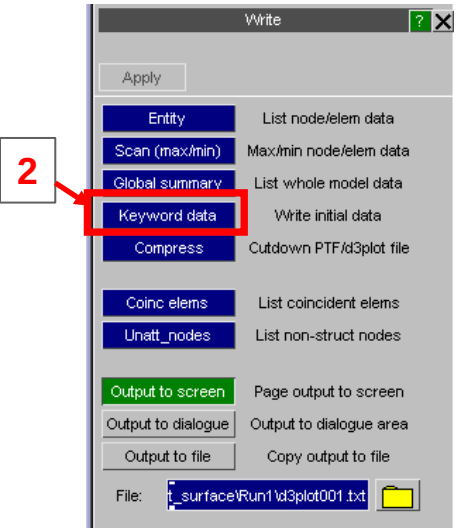
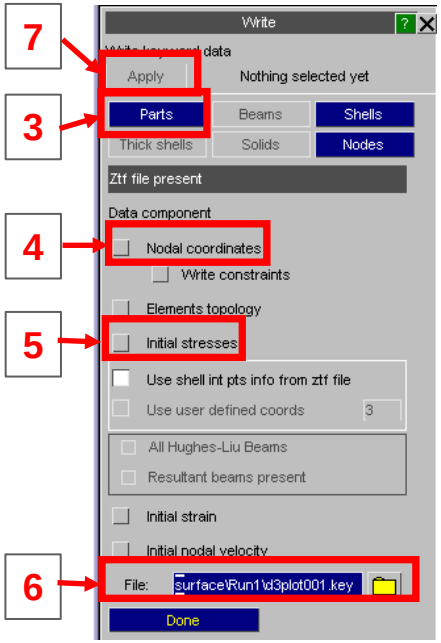
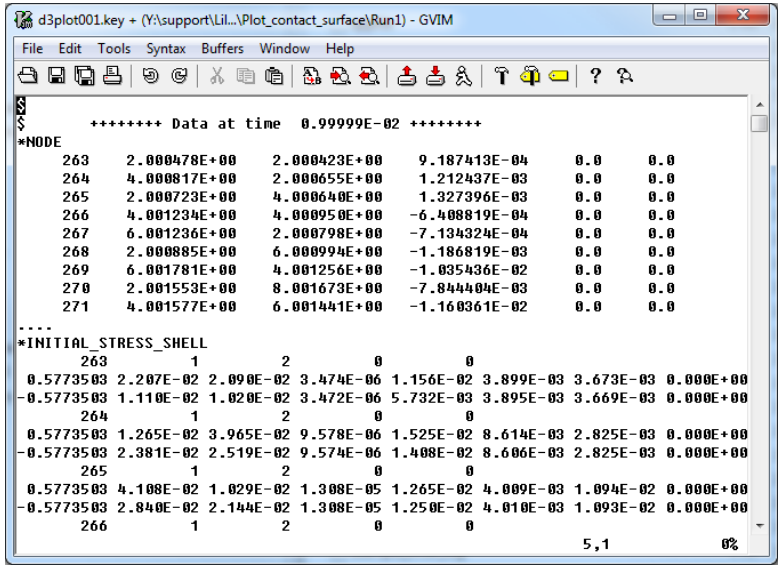
Other methods of extracting data

- Data listing (screen or text file) from “Write” menu.
- With this option, the coordinates of nodes at a particular plot state can be output to a .key file, together with initial stress, as an example.
- Can also output data values, for example X-displ for nodes.









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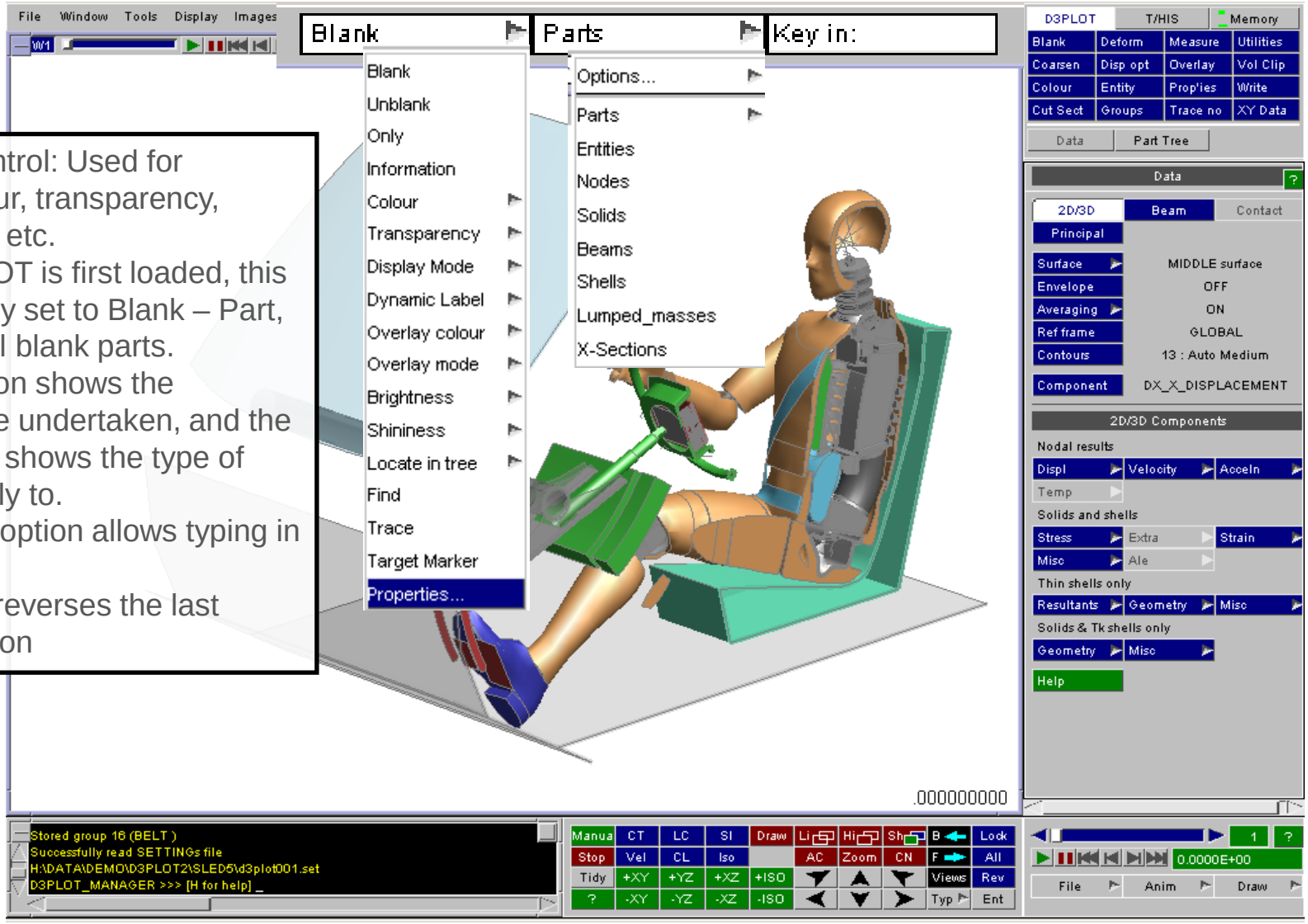
Quick pick

Quick-pick control: Used for blanking, colour, transparency, plotting mode, etc.

- When D3PLOT is first loaded, this is automatically set to Blank – Part, so left click will blank parts.
- The first option shows the operation to be undertaken, and the second option shows the type of item it will apply to.
- The “Key in” option allows typing in entities ID’s.
- Middle-click reverses the last quick-pick action



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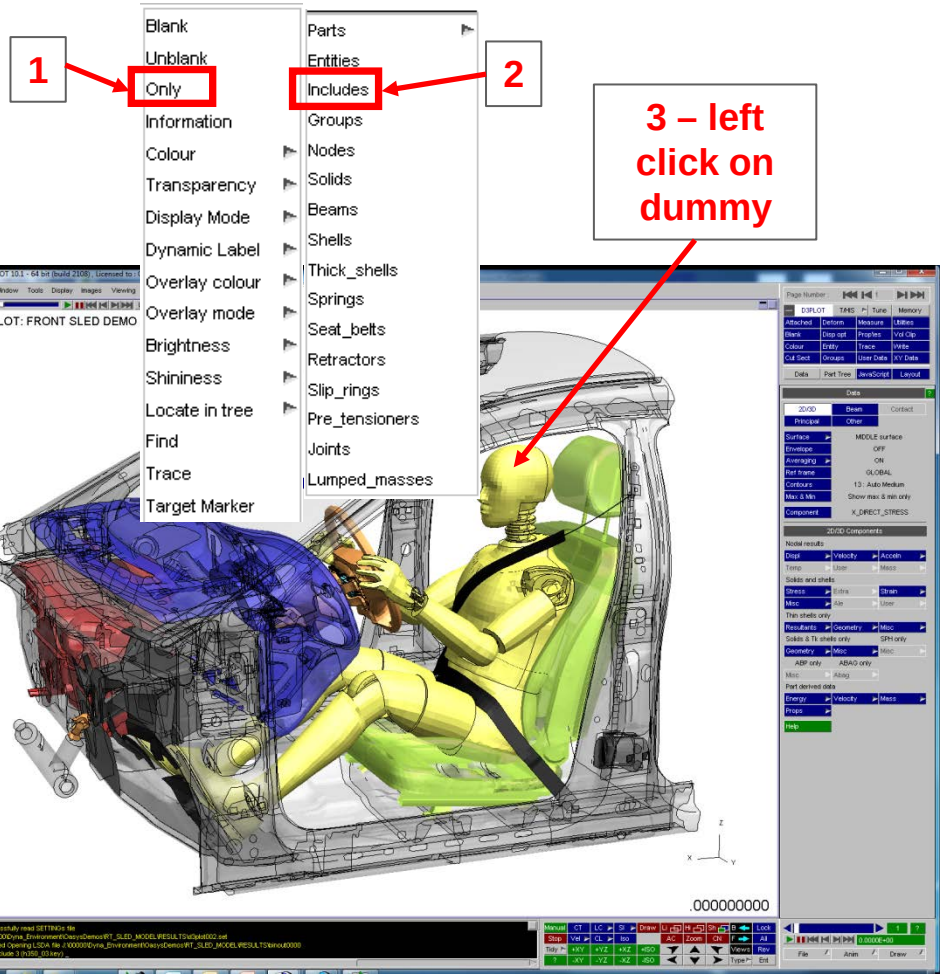
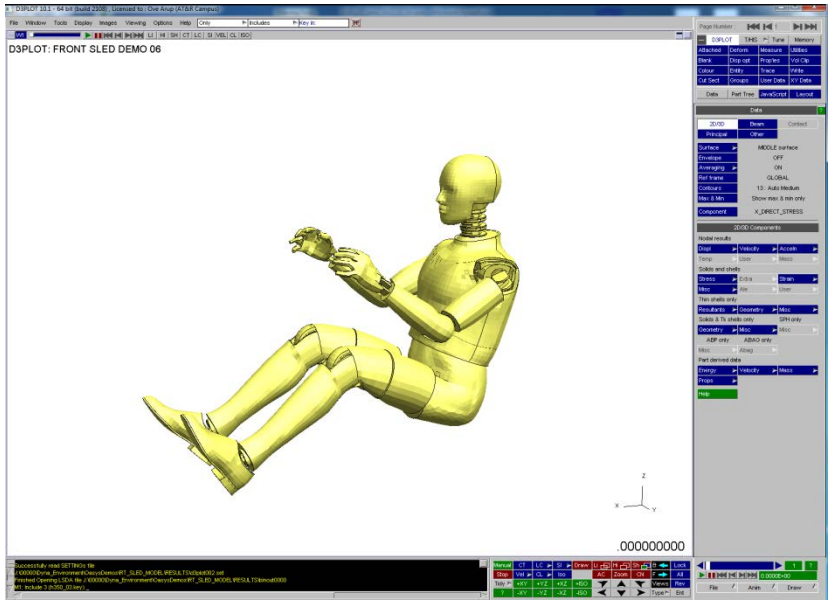
Quick-pick

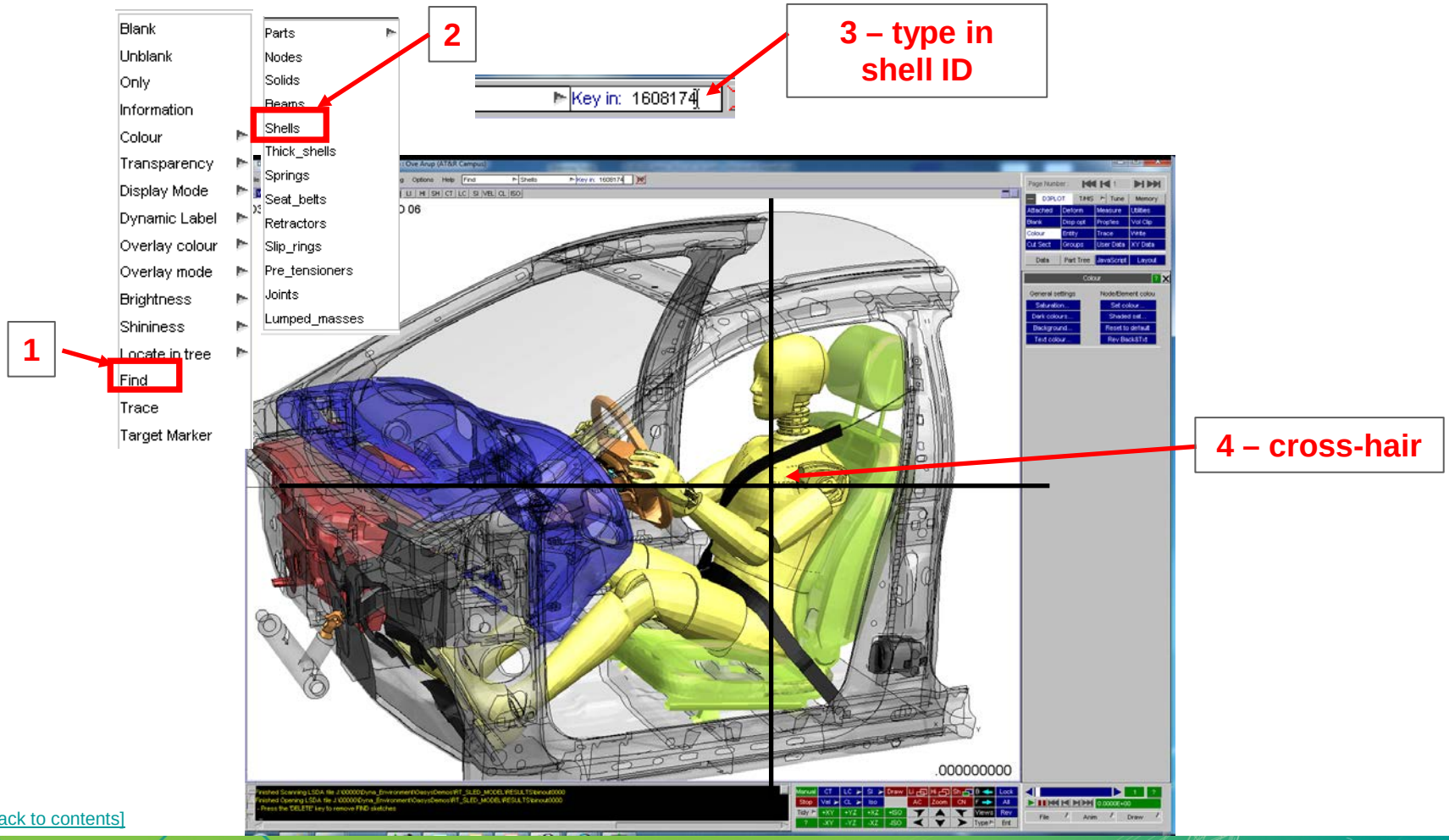
- For example, select Only, Include and click on the dummy in this example will only show the dummy include.





Quick-pick

- For example, select Find, Shells and type in a shell ID that you want to locate – D3PLOT will display a cross-hair at that location.



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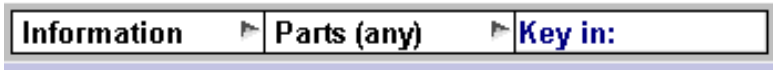
Quick-pick: Information

- Quick-Pick option Information gives details about Parts or other entities: Part ID, Part title, thickness, material type, density, Young's Modulus, etc.
- Material data and material type are not included in LS-DYNA's output files, but are passed to D3PLOT by the ztf file that can be written by Primer.



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Quick-pick: Predictive Picking

- D3Plot highlights and labels the entity that will be selected if the user clicks the mouse. This is called “predictive picking”.
- Predictive picking may be toggled on/off using the ‘P’ button, or using new keyboard shortcut P.

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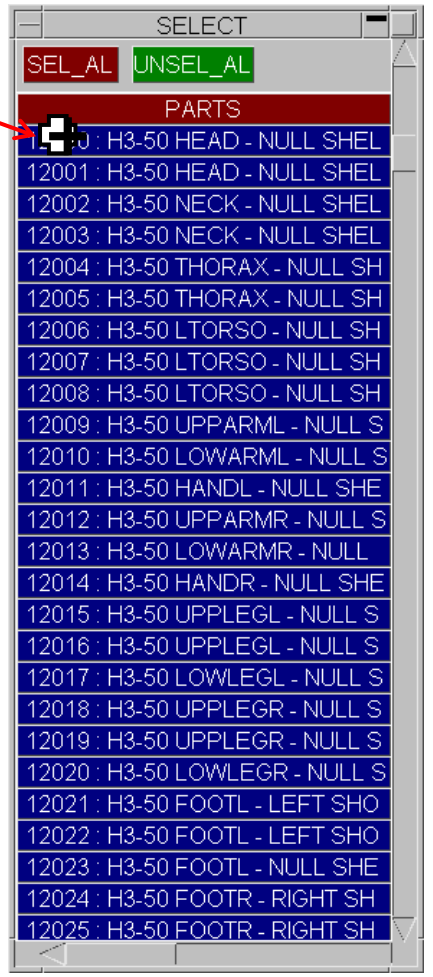
Quick-pick: Predictive Picking

- The same Predictive Picking sketch/label occurs when the user hovers over an entity in an Selection Menu

mouse



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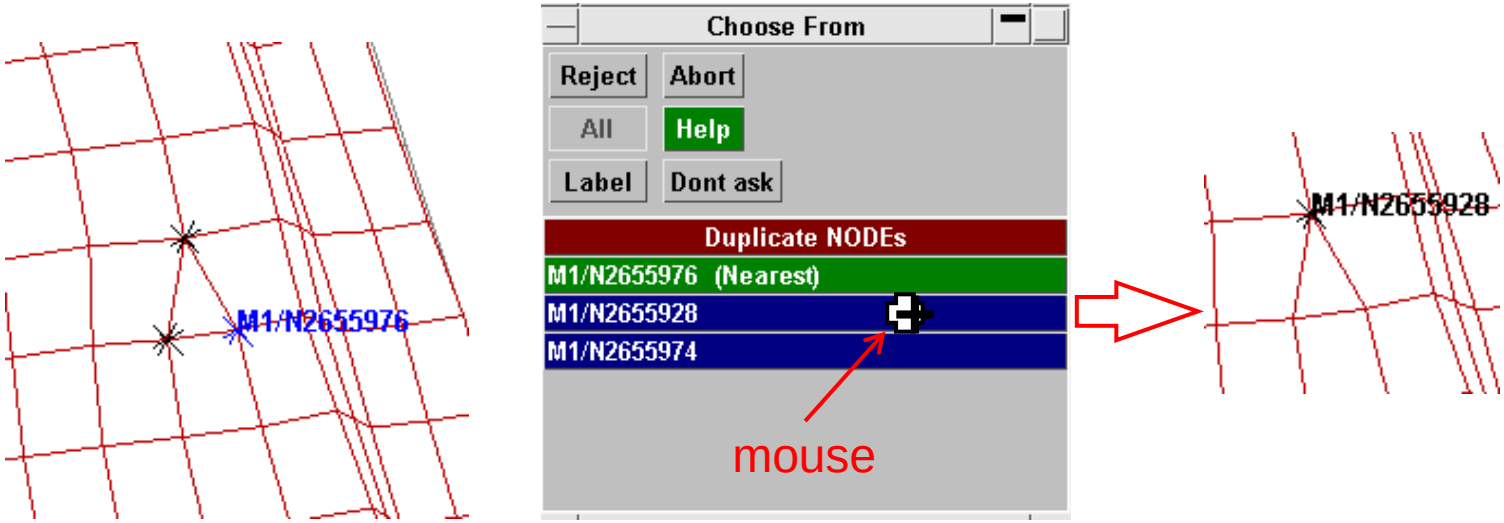
Quick-pick: Predictive Picking

- When a screen-pick is ambiguous, D3Plot highlights the closest entity (default selection) in blue. Hovering over an entity in the ambiguous menu causes that entity to be sketched.



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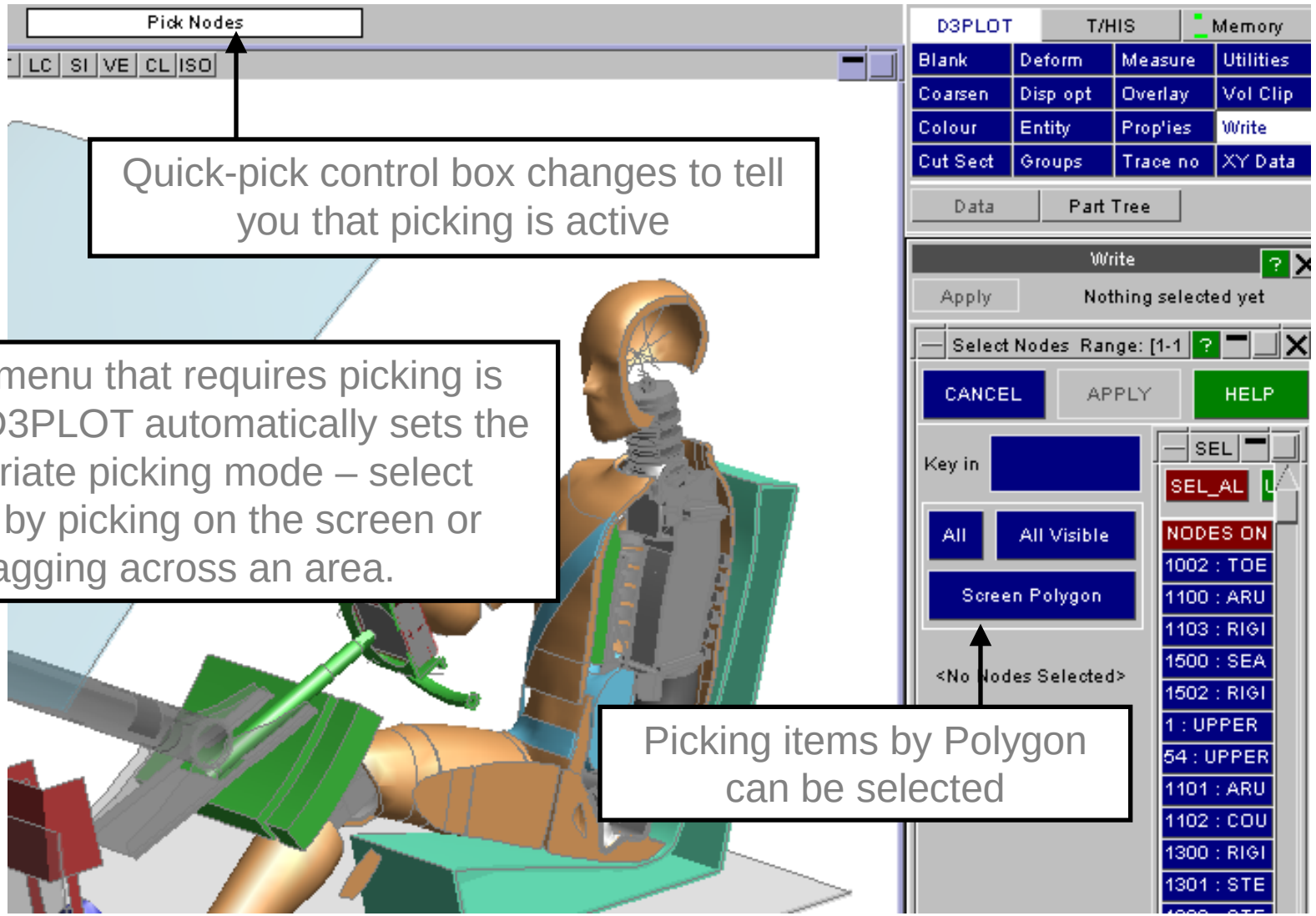
Picking Items



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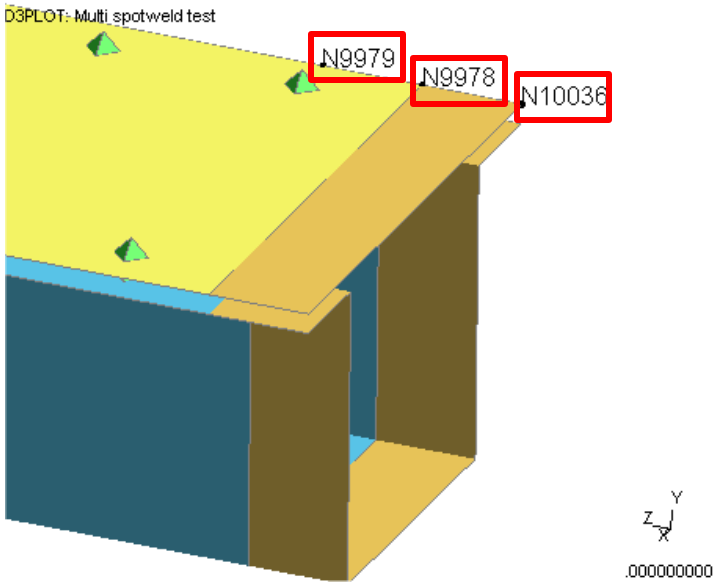
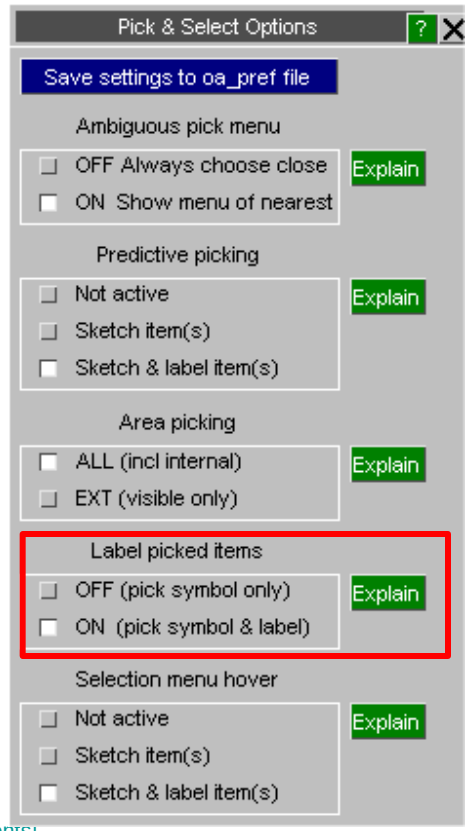
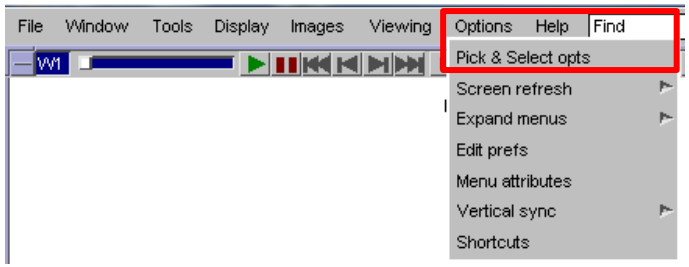
Annotation of Picked Entities

- In menus where items are picked interactively the entities are automatically labelled as they are picked.





- This behaviour can be turned off in the new Pick & Select Options menu and set via a preference option.



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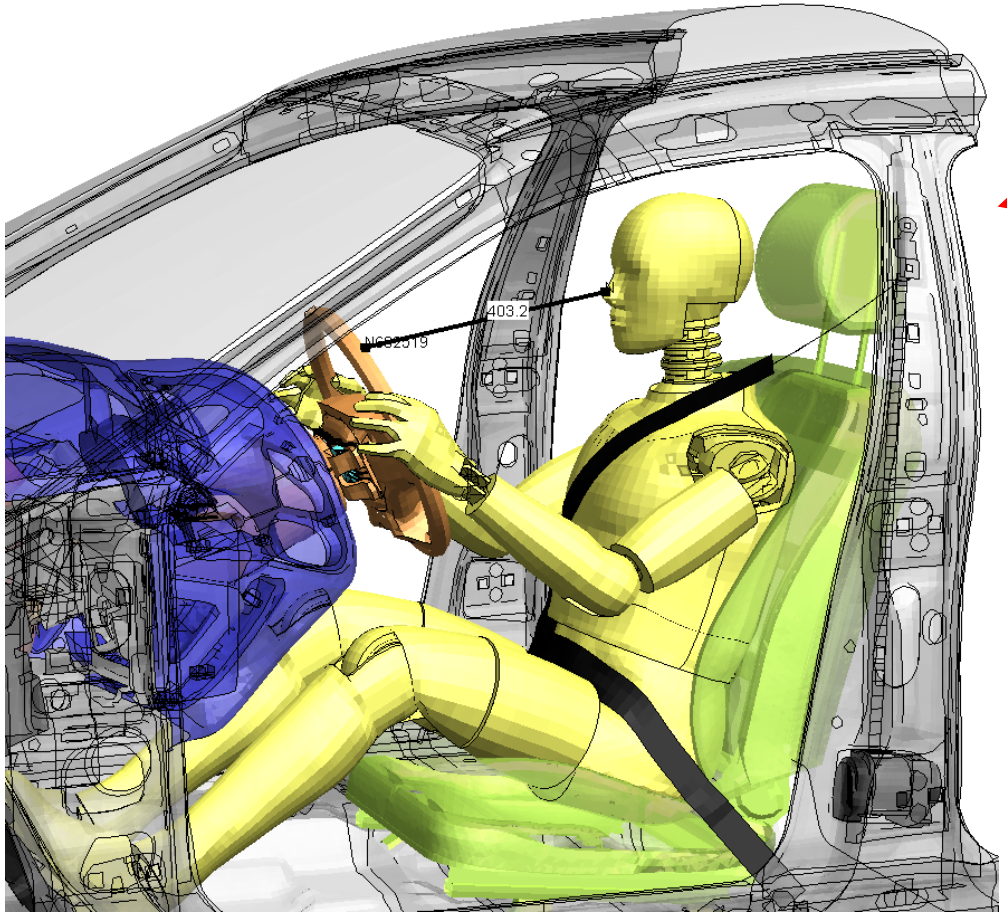
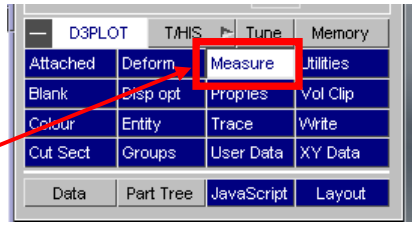
Measure

- The distance between nodes can be done using the measure panel (shortcut ‘m’):

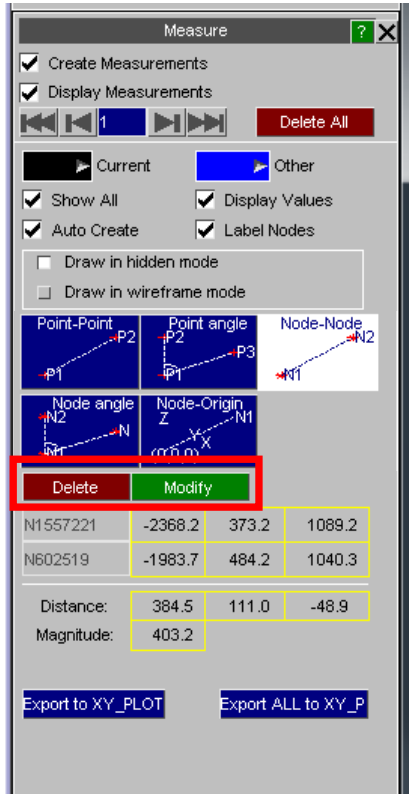




1

2

Pick 2 nodes



3

Delete or Modify the current Measure

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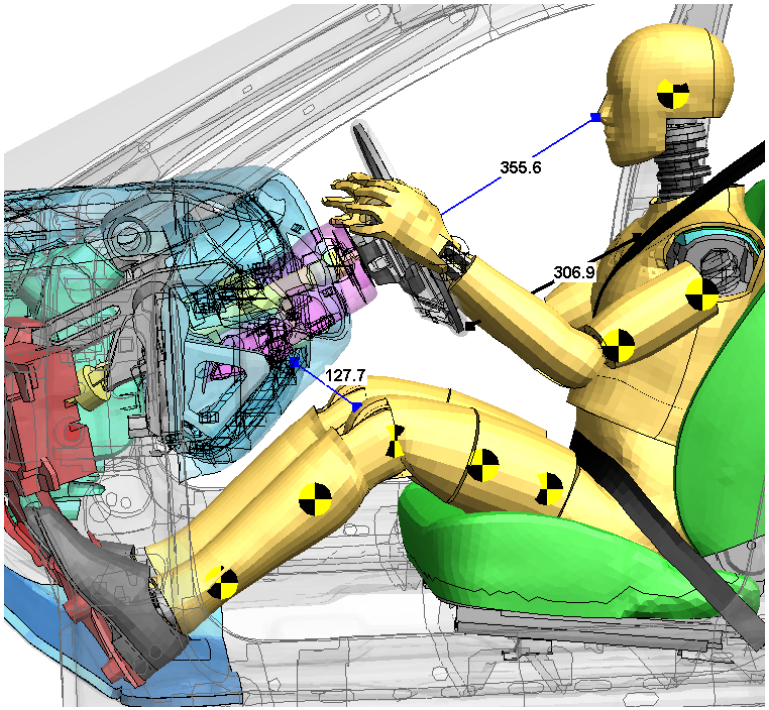
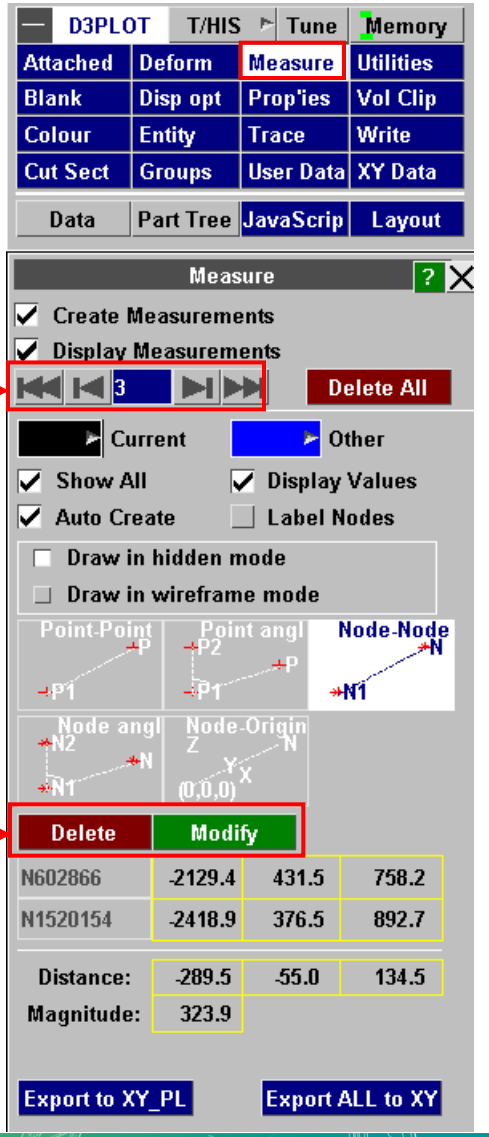
Measure

- Up to 100 “measures” may be defined. Each time the user clicks on another pair of nodes, a new “measure” is created.
- The panel shows the status of the “current” measure, which is drawn in a thick black line.



Controls which Measure is “current”

Delete or Modify the current Measure



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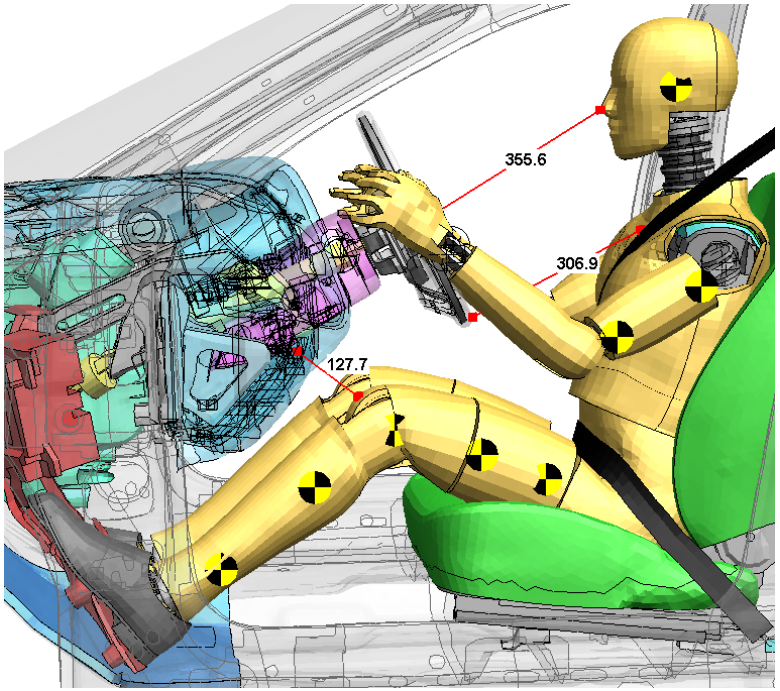
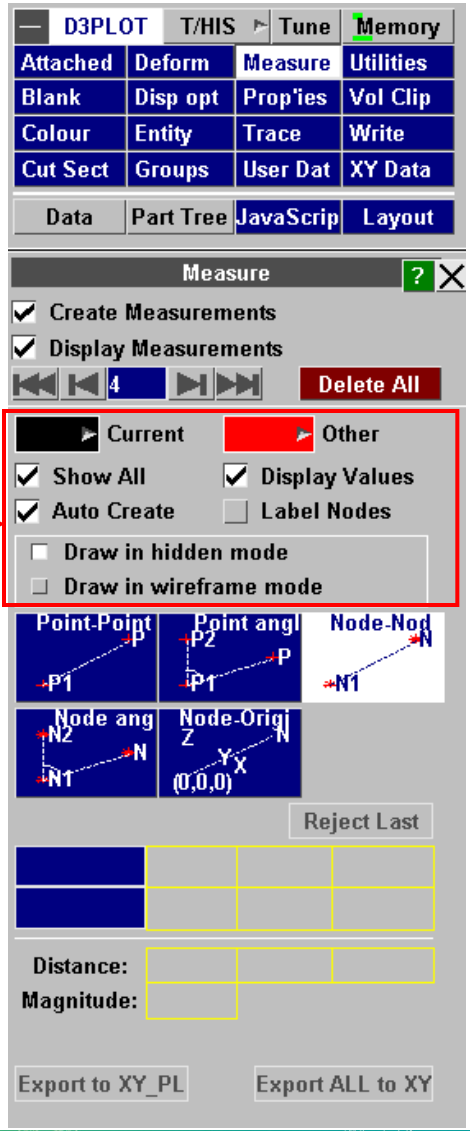
Measure

- Various formatting options are available, e.g. line colour, and whether or not to add node labels.



Formatting options



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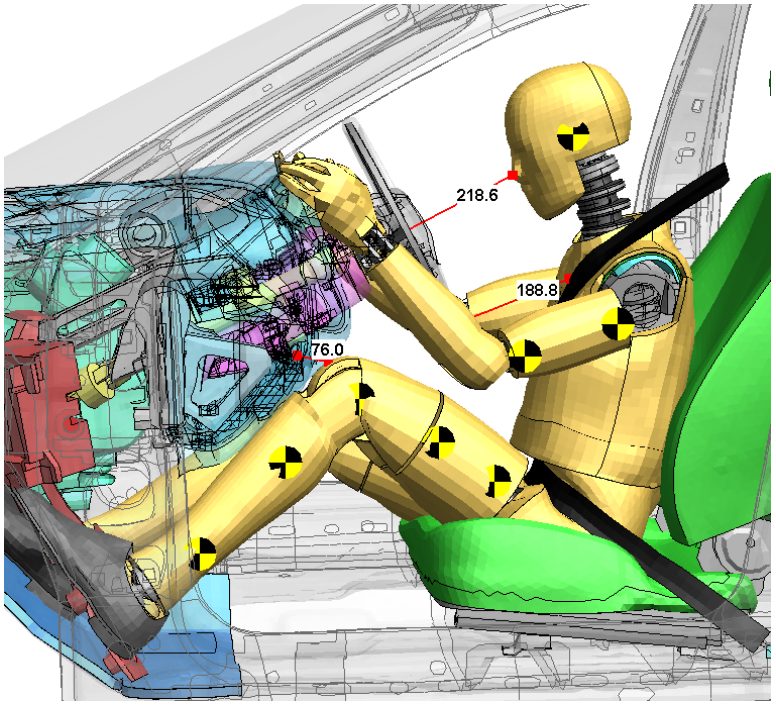
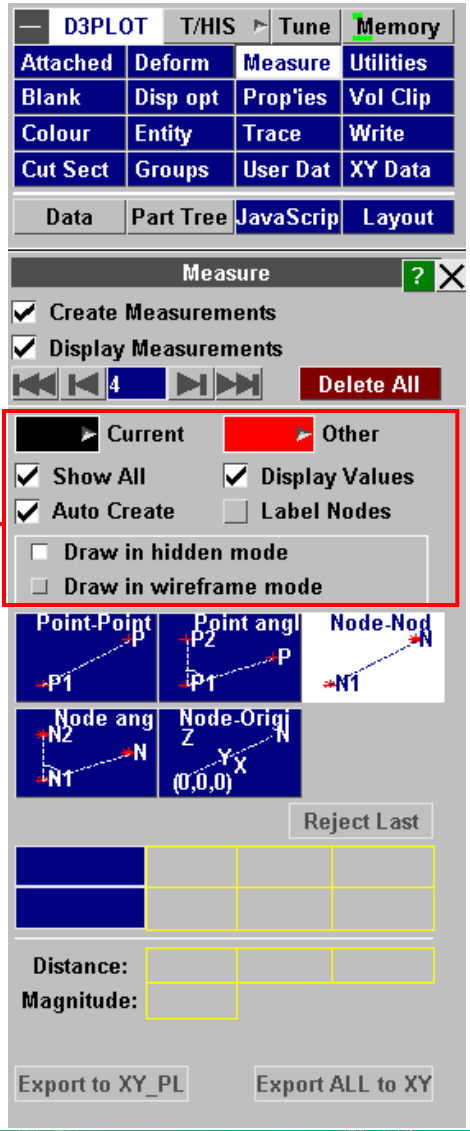
Measure

- The “measure”s remain visible until deleted.
- The measurement data (distance) is updated automatically when a different time-state is loaded.
- To remove all the “measure”s from the screen, press Delete All in the Measure menu, or press the Delete key on the keyboard.



Formatting options



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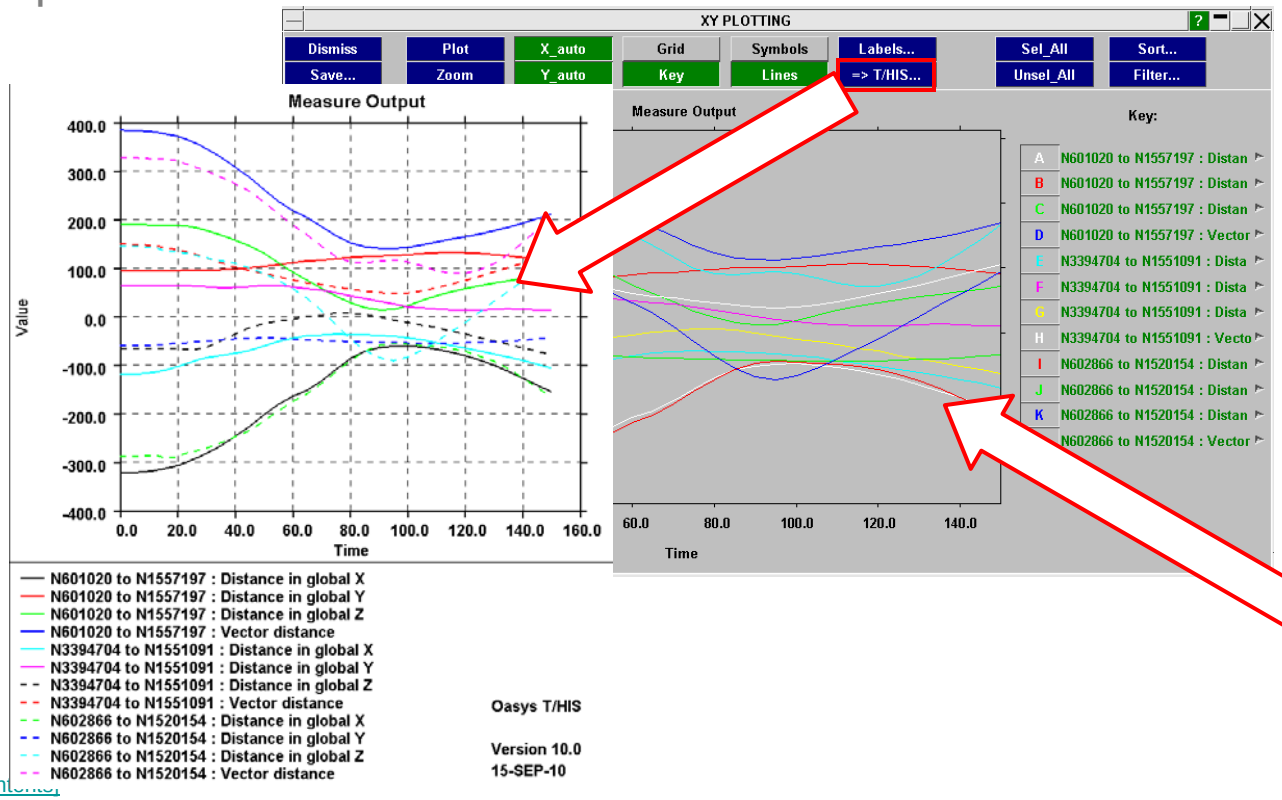
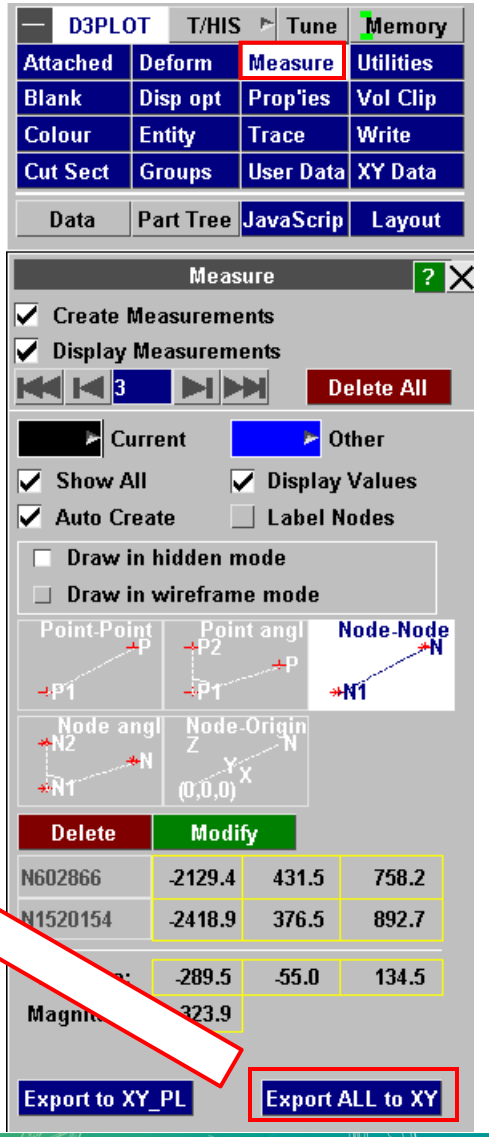
Measure

- The measurements can be exported as time-histories to T/HIS via XY_DATA.
- Separate curves are written for difference in X, Y, and Z-coordinates, and distance magnitude: 4 curves for each pair of nodes.





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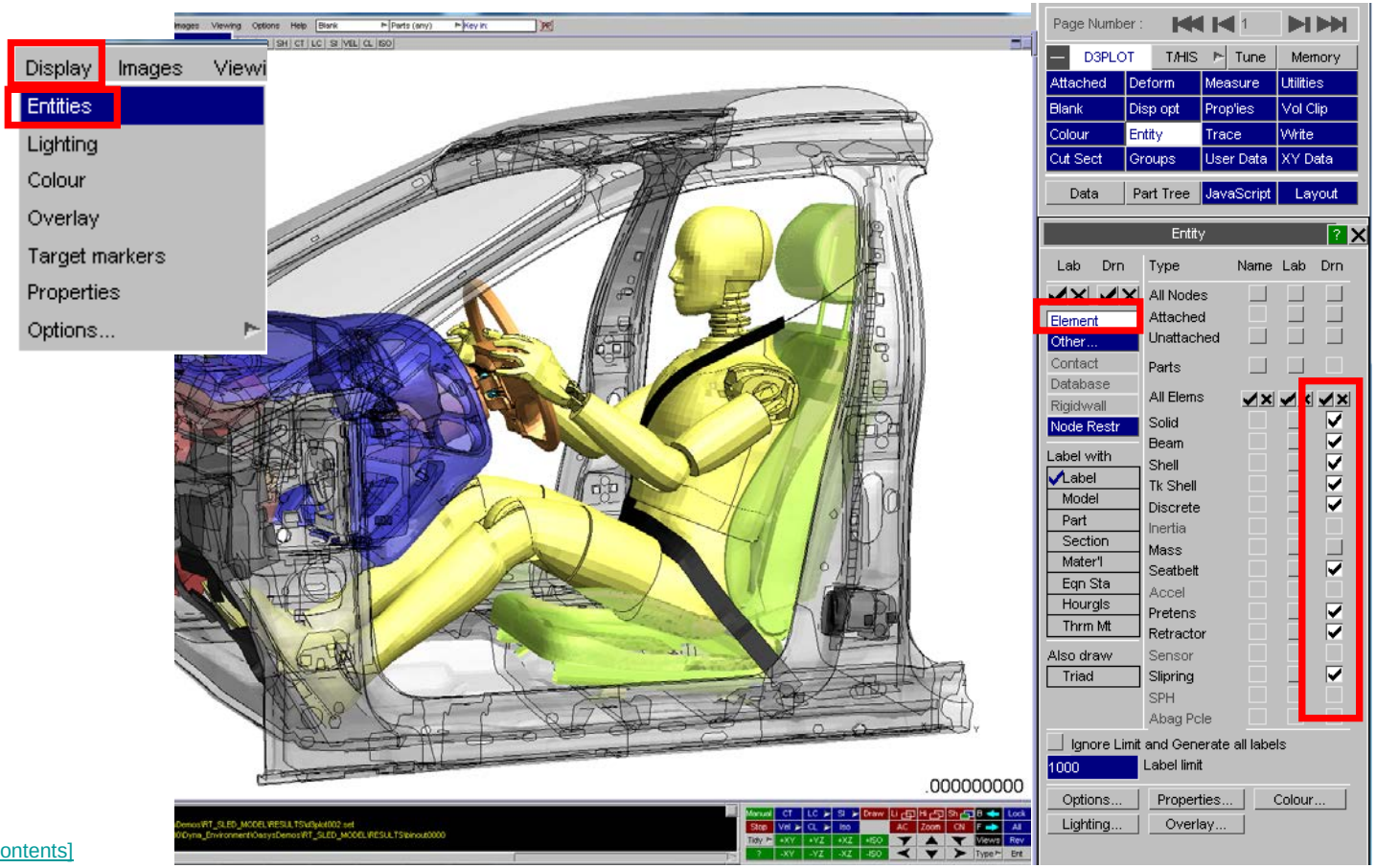
Displaying entities

- To control what entities are displayed, select “Display”->”Entities” and in the panel that opens tick on/off entities – by default all elements are displayed (except mass elements):



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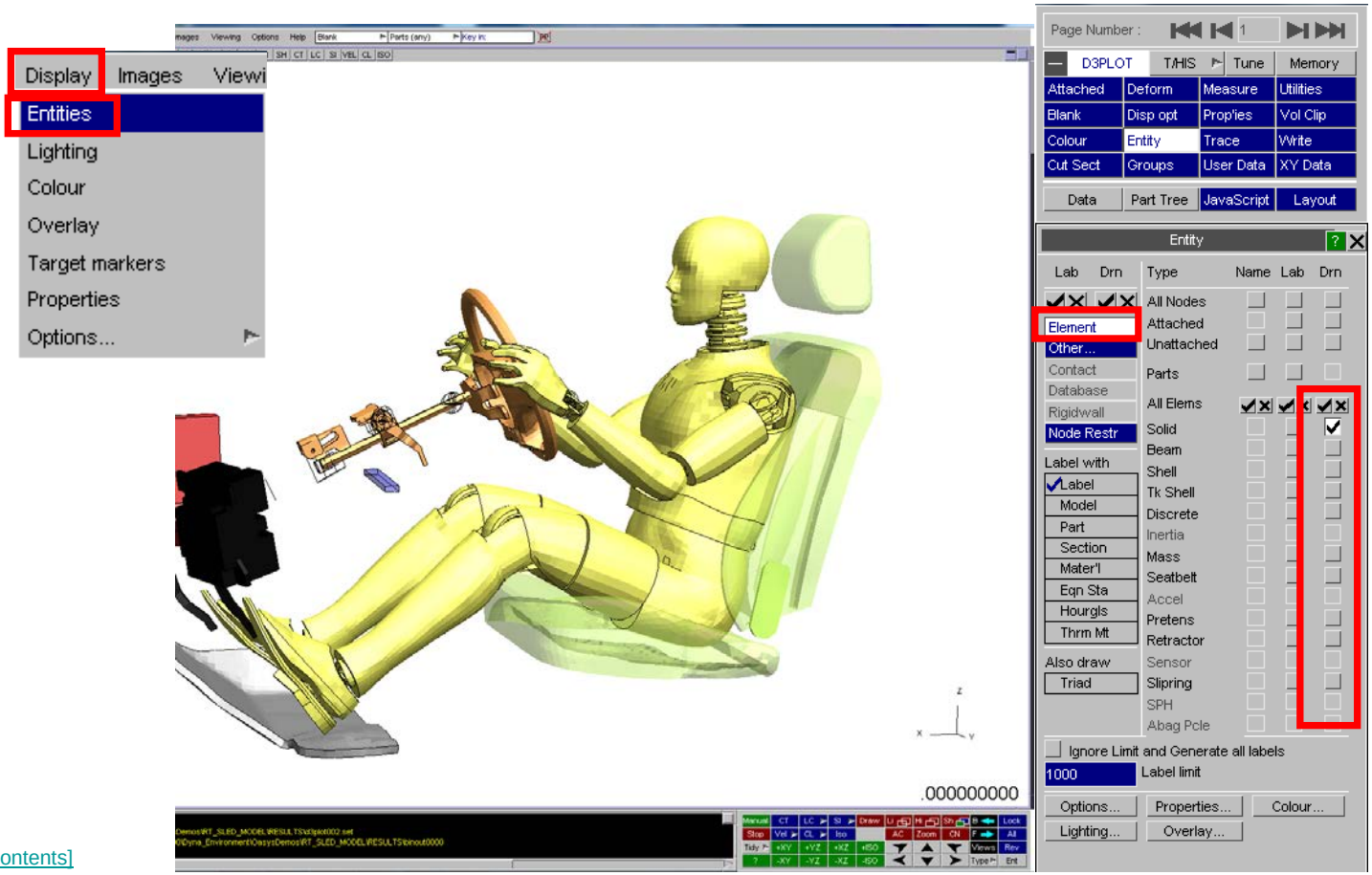
Displaying entities

- For example, here only the solid elements are displayed:



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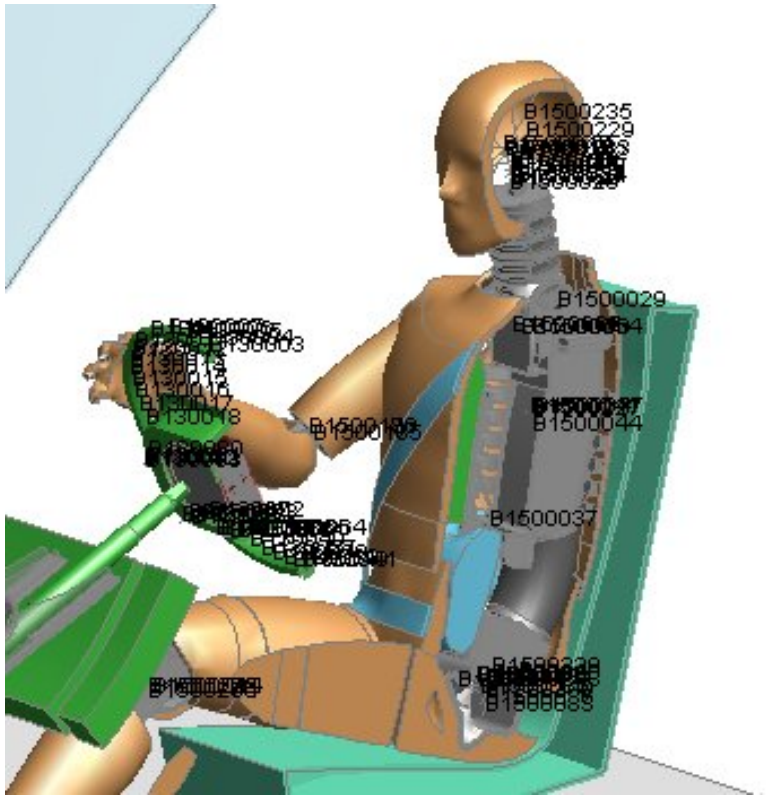
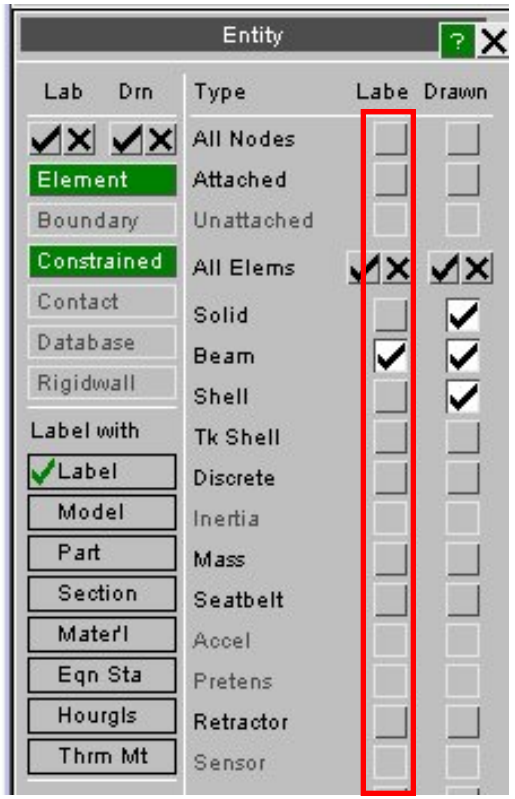
Labelling

- STATIC labels (labels drawn on all visible entities of the selected type) are now switched on/off in the ENTITY panel (shortcut E)





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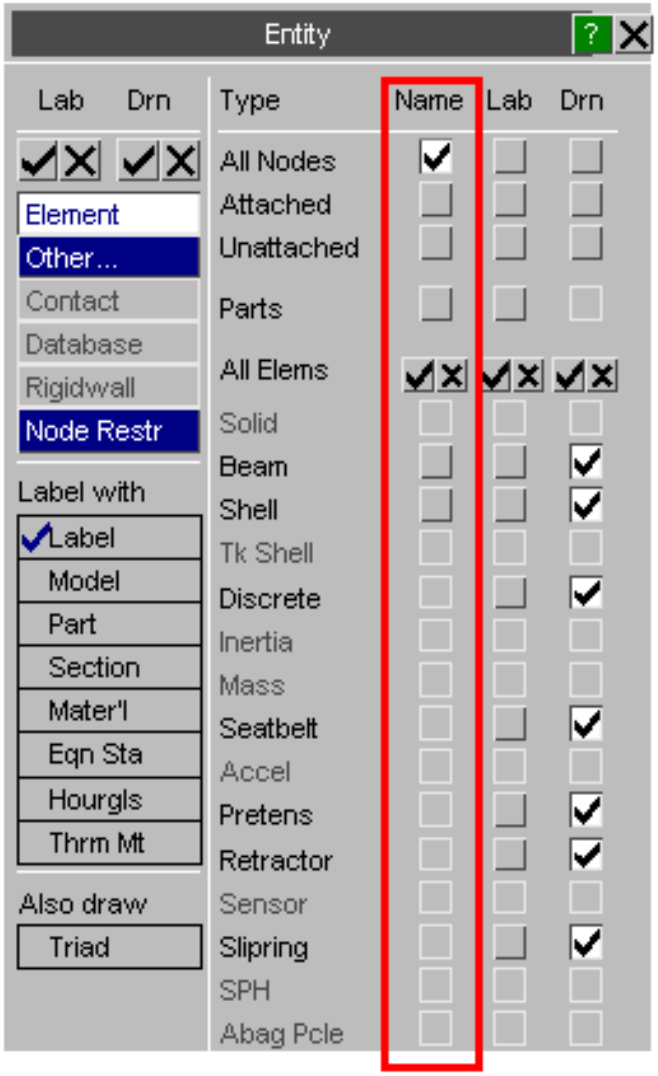
Labelling

- In addition to displaying entity labels, any names defined in the keyword file for the following can also be displayed using information in the ZTF file created by PRIMER.
  - Parts
  - Nodes(*DATABASE_HISTORY_NODE_ID)
  - Elements (*DATABASE_HISTORY…_ID)
  - Joints (*CONSTRAINED_JOINT_ID)
  - RigidWalls (*RIGIDWALL_..._ID)



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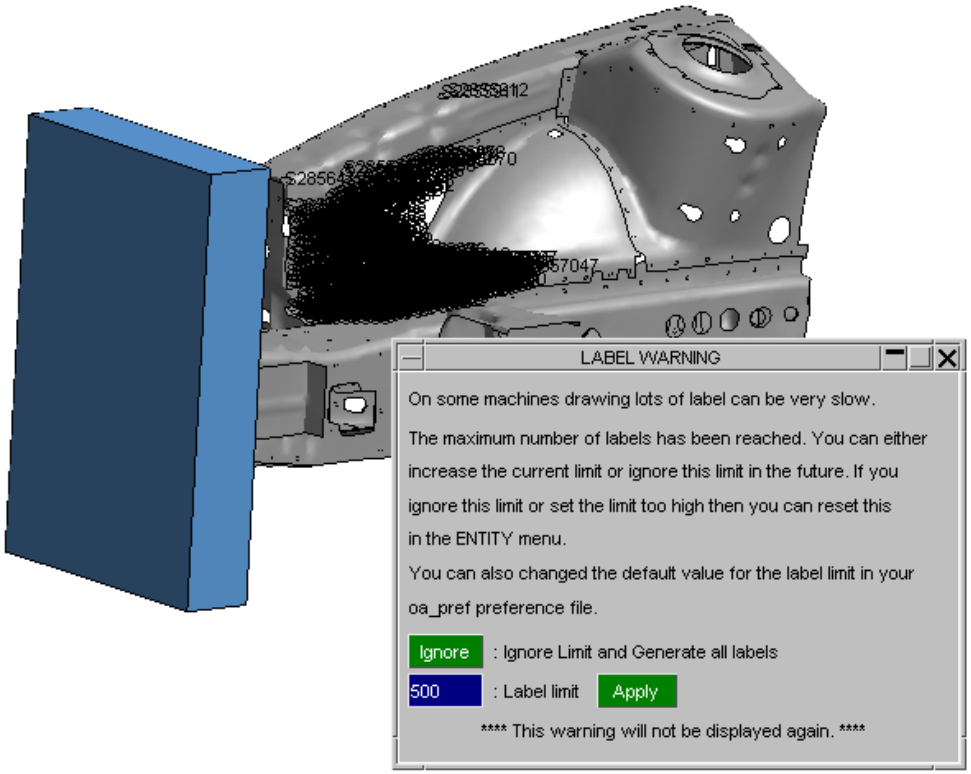
Labelling

- If node or element labels are switched on, drawing the whole model becomes very slow and the labels obscure the model.

- The maximum number of labels drawn can be controlled. A limiting number can be set either interactively or via a preference.



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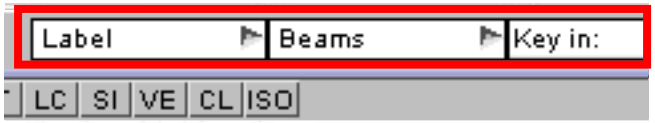
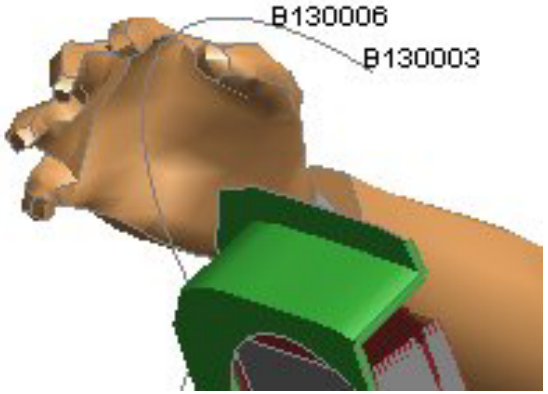
Labelling

- DYNAMIC labels (labels drawn on screen-picked items) are activated via Quick-Pick
- Use key-in box in Quick-pick control to identify an entity by label in the graphics window



- Use key-in box in Quick-pick control to identify an entity by label in the graphics window



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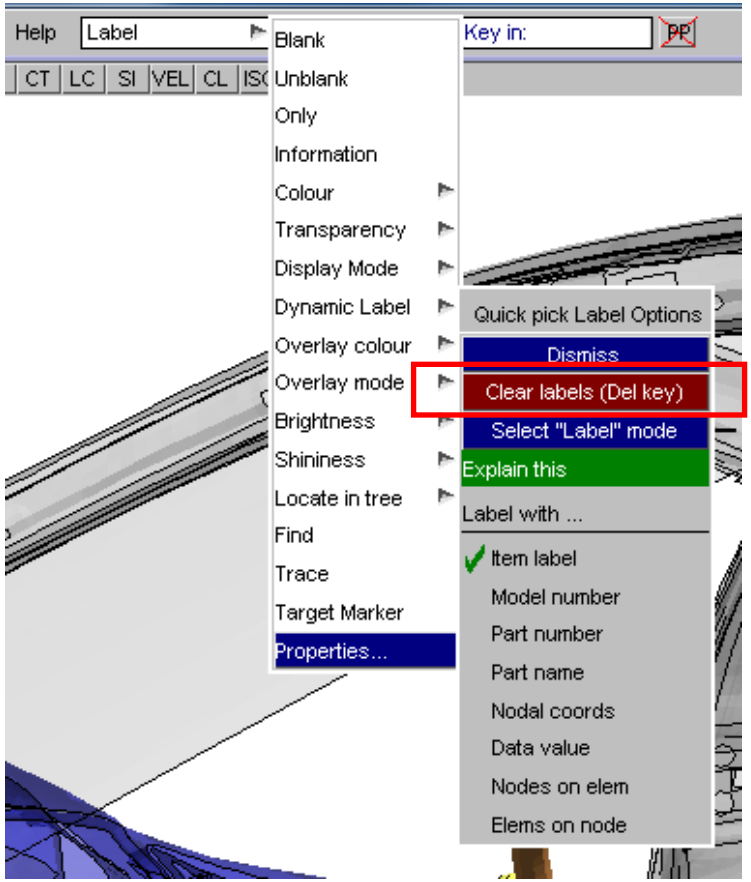
Labelling

- Use drop-down to control what information is written when labelling
- Labels now stay drawn during animation and re-drawing, until the Clear Labels button is clicked (or the Del key is pressed).



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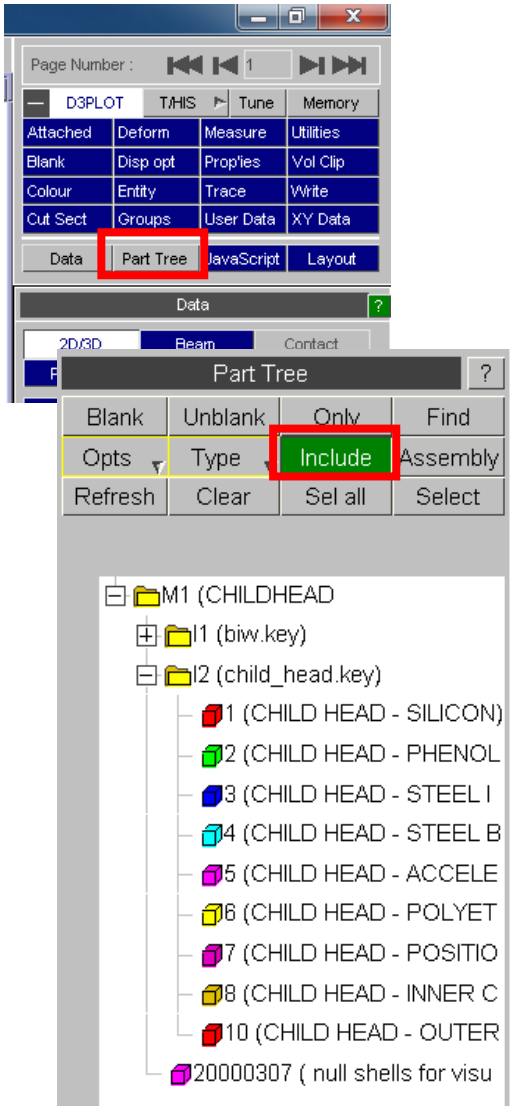
Part Tree

- Part Tree is available as in Primer – used for blanking and modifying properties of parts.
- INCLUDE file and/or Assembly structure is not in LS-DYNA's output files, but can be made available to D3PLOT using the ztf file written by Primer. This happens automatically in batch mode when submitting LS-DYNA through the Oasys shell. If submitting LS-DYNA by another means, you can create a ztf file
  - Either run Primer, Model=>Utilities=>Write ZTF
  - Or modify your LS-DYNA submission script to include ZTF file generation automatically – Oasys or your local Oasys distributor can advise.



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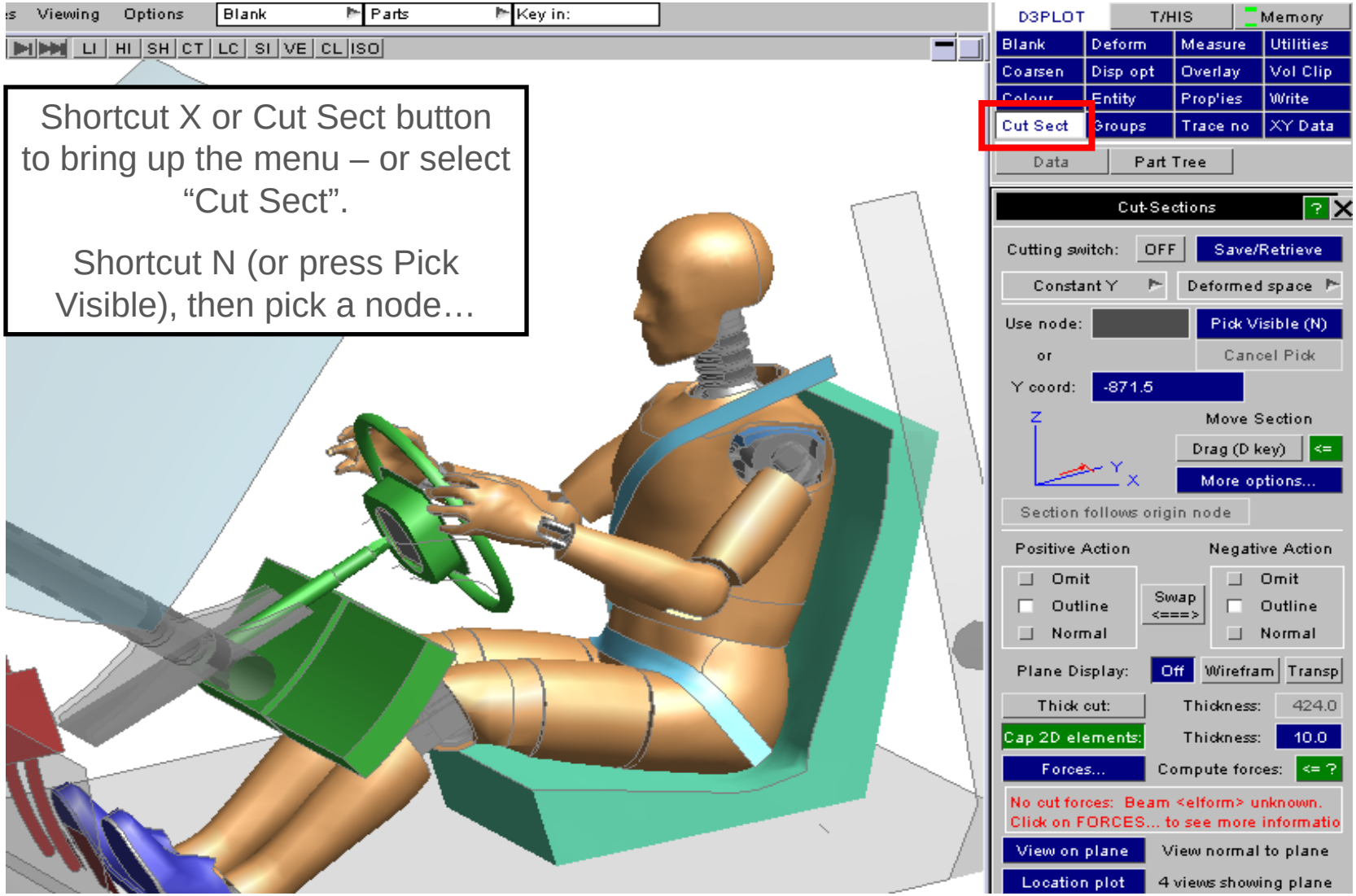
Cut Sections

Oasys D3PLOT

Shortcut X or Cut Sect button to bring up the menu – or select "Cut Sect".

Shortcut N (or press Pick Visible), then pick a node…



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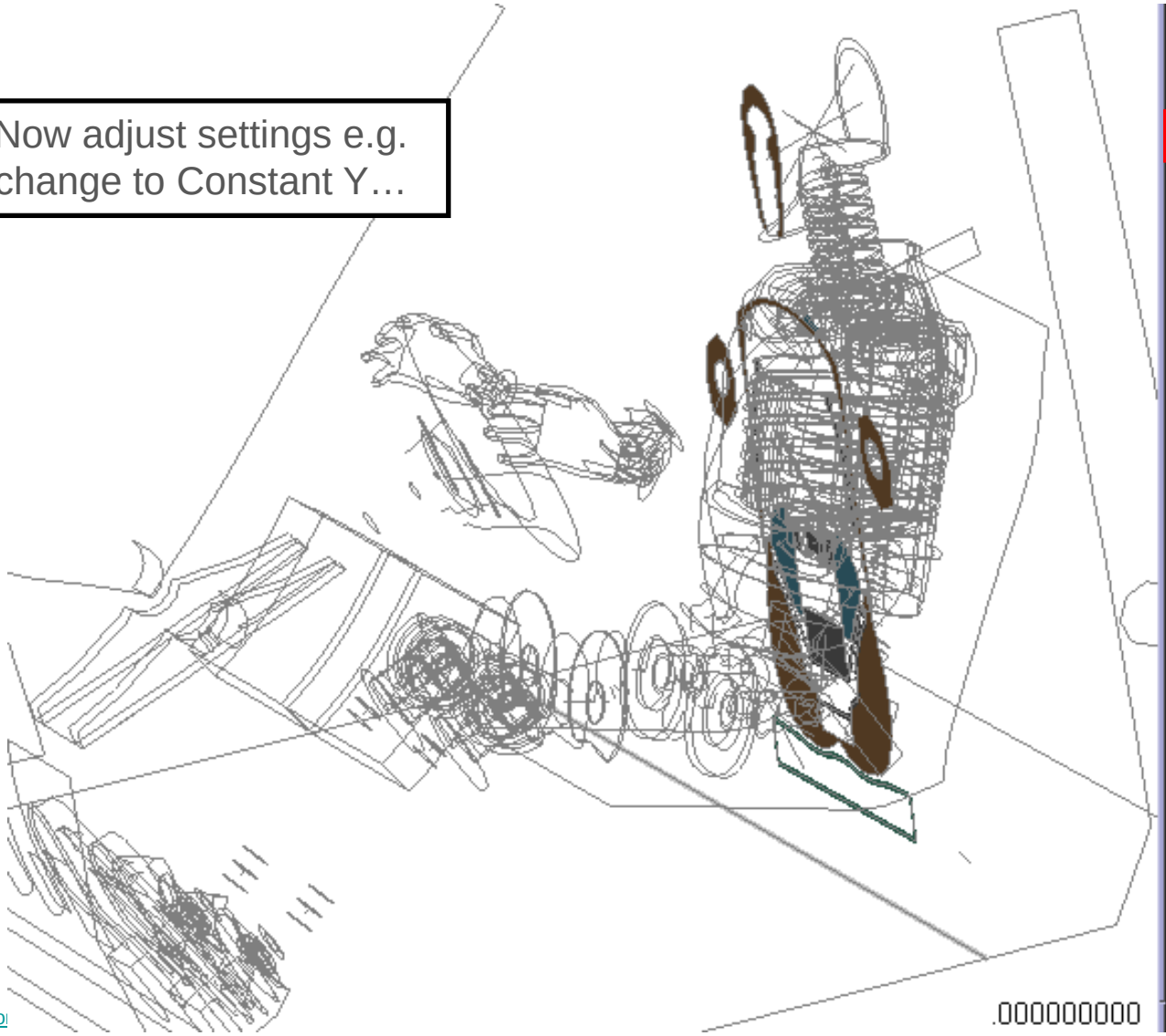
Cut Sections

Oasys D3PLOT

Now adjust settings e.g. change to Constant Y…



Cut-Sections

Cutting switch: ON | Save/Retrieve

Constant X | Deformed space

Use node: | Pick Visible (N)

or | Cancel Pick

X coord: 2383.1

Move Section

Drag (D key) | <=

More options...

Section follows origin node

Positive Action		Negative Action
Omit	Swap <===>	Omit
Outline		Outline
Normal		Normal

Plane Display: Off | Wirefram | Transp

Thick cut: | Thickness: 424.0

Cap 2D elements: | Thickness: 10.0

Forces... | Compute forces: <= ?

No cut forces: Beam <elform> unknown.
Click on FORCES... to see more informatio

View on plane | View normal to plane

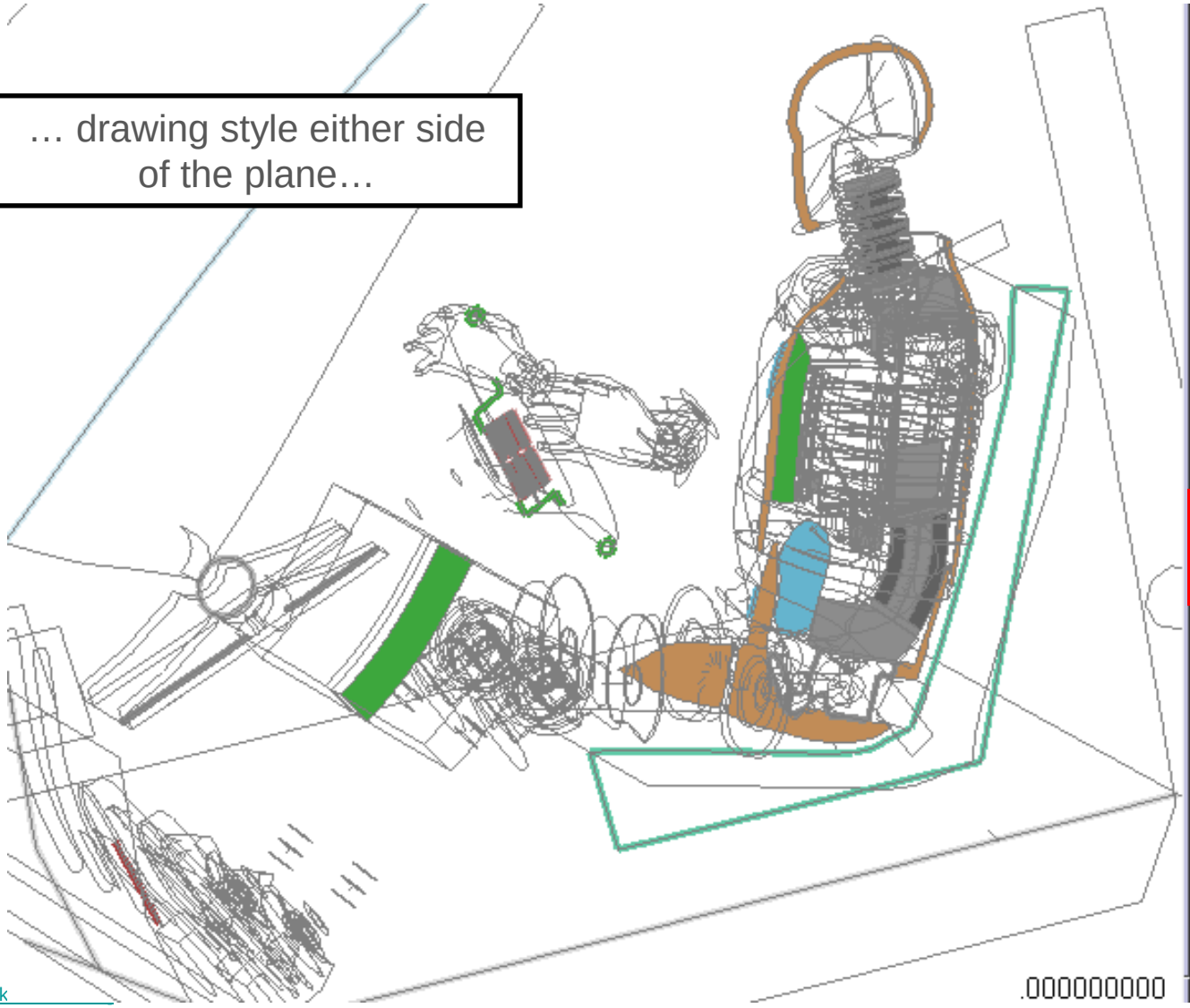
Location plot | 4 views showing plane

[back to co

Cut Sections

Oasys D3PLOT

… drawing style either side of the plane…



Cut-Sections

Cutting switch: ON | Save/Retrieve

Constant Y | Deformed space

Use node: | Pick Visible (N)

or | Cancel Pick

Y coord: -871.5

Move Section

Drag (D key) | <=

More options...

Section follows origin node

Positive Action		Negative Action
Omit	Swap <===>	Omit
Outline		Outline
Normal		Normal

Plane Display: Off | Wirefram | Transp

Thick cut: | Thickness: 424.0

Cap 2D elements: | Thickness: 10.0

Forces... | Compute forces: <= ?

No cut forces: Beam <elform> unknown.
Click on FORCES... to see more informatio

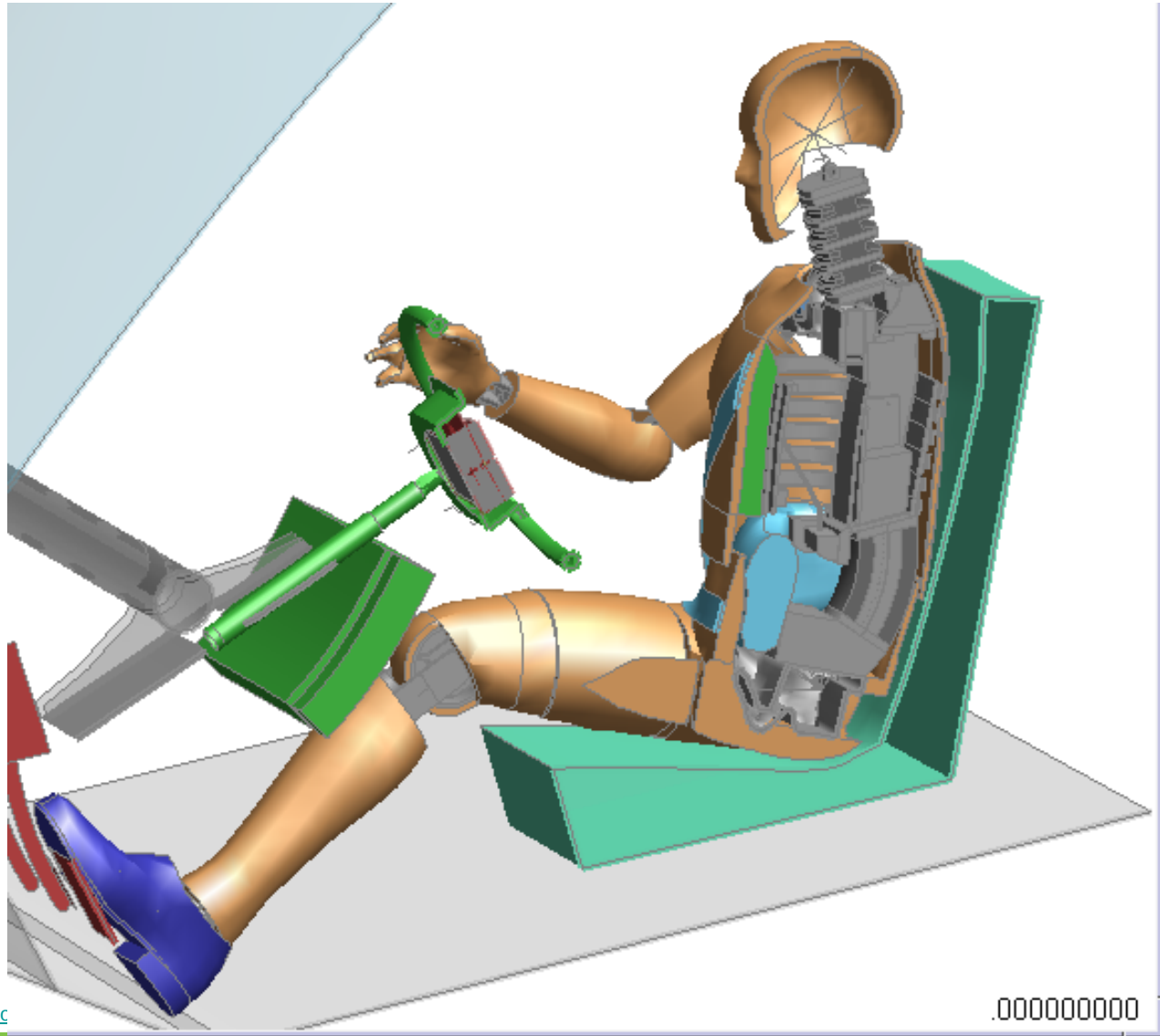
View on plane | View normal to plane

Location plot | 4 views showing plane

[back

Cut Sections

Oasys D3PLOT



Cut-Sections

Cutting switch: ON | Save/Retrieve

Constant Y | Deformed space

Use node: | Pick Visible (N)

or | Cancel Pick

Y coord: -871.5

Move Section

Drag (D key) | <=

More options...

Section follows origin node

Positive Action		Negative Action
Omit	Swap <====>	Omit
Outline		Outline
Normal		Normal

Plane Display: Off | Wirefram | Transp

Thick cut: | Thickness: 424.0

Cap 2D elements: | Thickness: 10.0

Forces... | Compute forces: <= ?

No cut forces: Beam <elform> unknown.
Click on FORCES... to see more informatio

View on plane | View normal to plane

Location plot | 4 views showing plane

[back to cc

Cut Sections

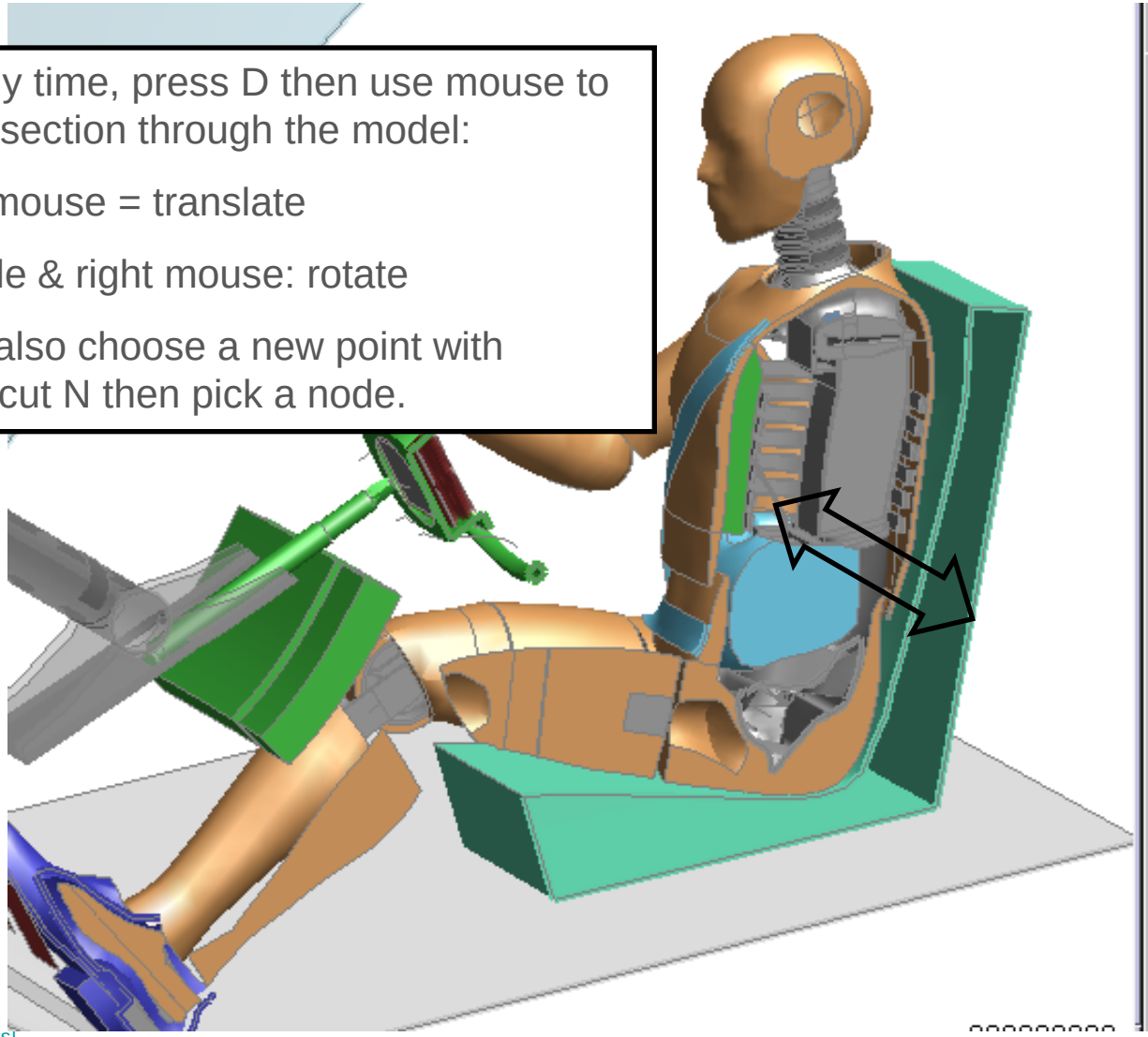
Oasys D3PLOT

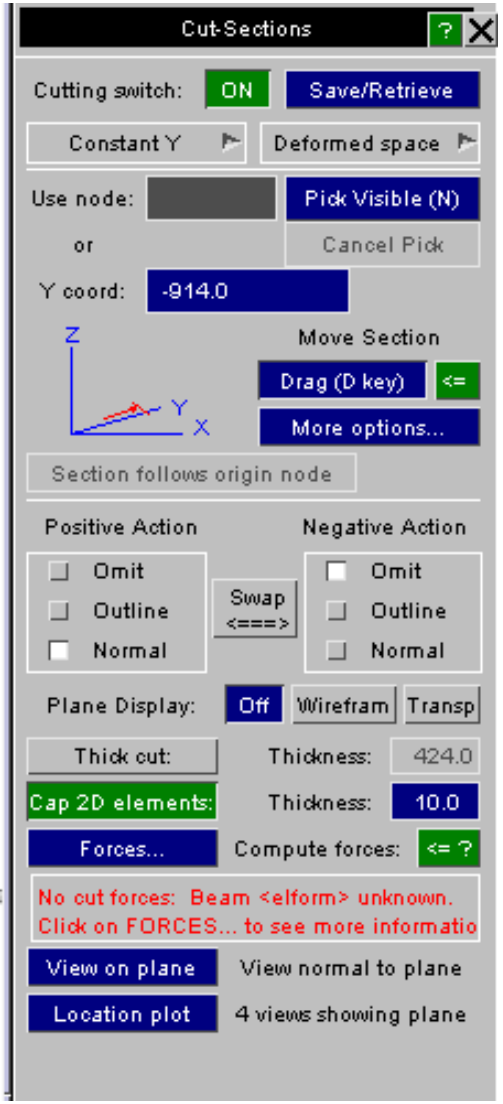
At any time, press D then use mouse to drag section through the model:

Left mouse = translate

Middle & right mouse: rotate

Can also choose a new point with shortcut N then pick a node.





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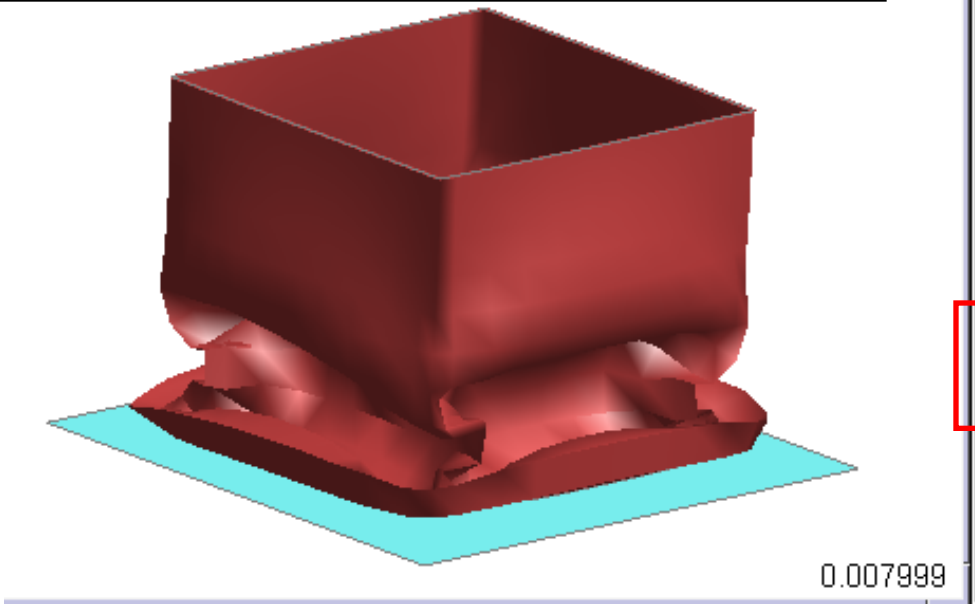
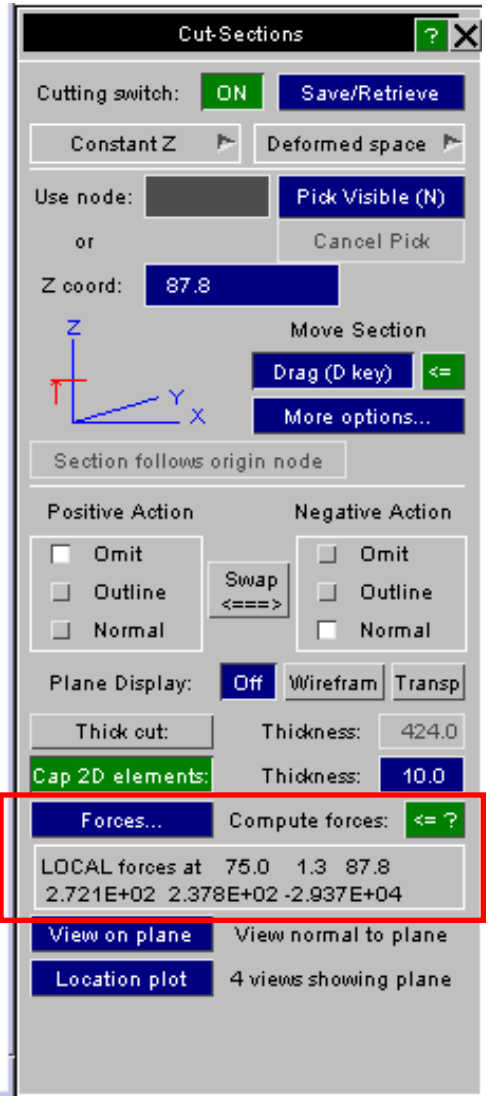
Cut Sections

Instant output of section forces. The forces change as you drag the section through the model.

If the model contains beam elements, this feature is unavailable until you first press Forces and tell D3PLOT what type of beams are present – the beam forces will contribute to the section force, and different types of beam use different sign conventions for shear force in the output files.





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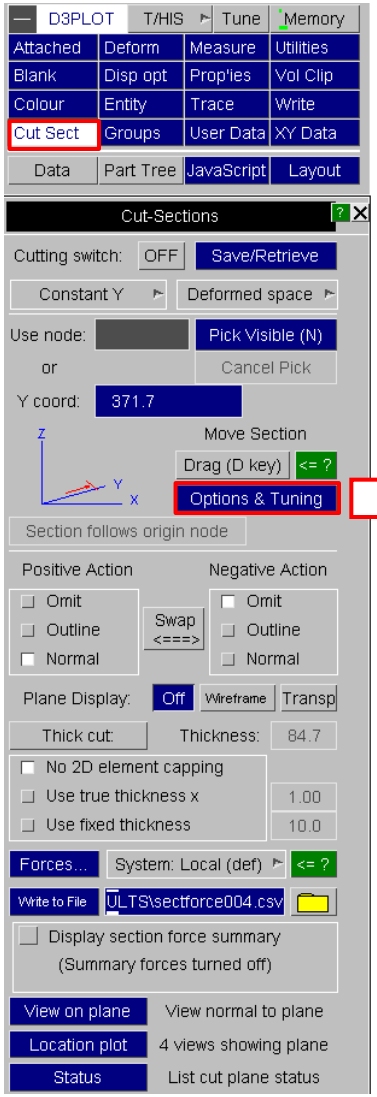
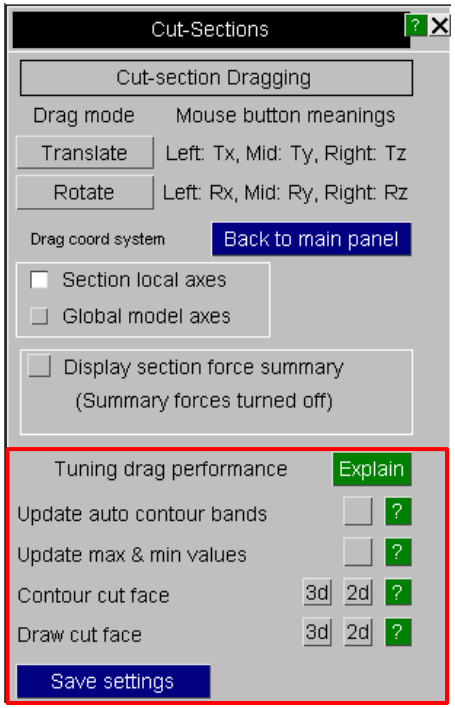
Cut Sections





- The dragging of cut sections through big models while displaying contours can be speeded up using the “Options & Tuning” panel.

Available options include :

- Update auto contour bands
- Update max and min values
- Draw the contours on the cut face
- Draw the cut face

- The settings can be saved as preferences in the oa_pref file.

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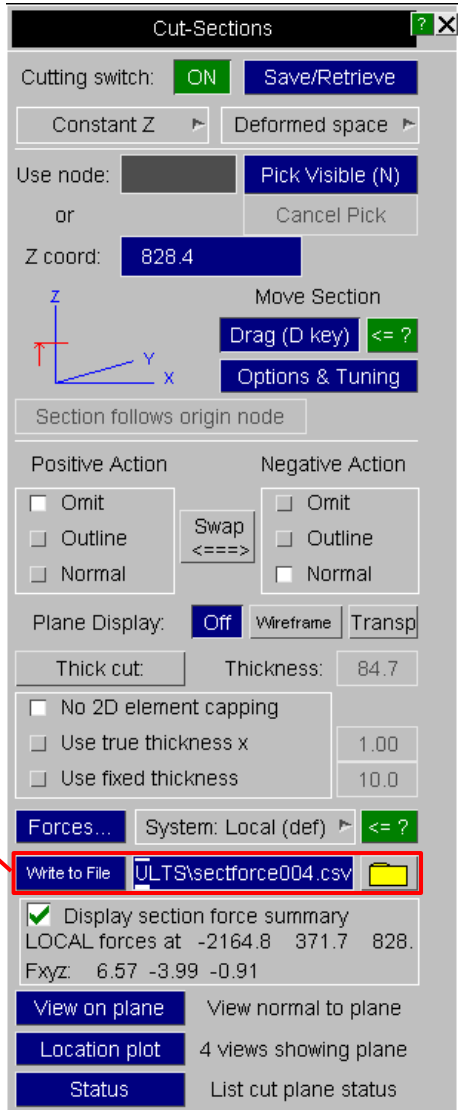
Cut Sections

- Cut section forces and moments can be written to a csv file:

M1/W1: Cut-plane force and moment output at time, 4.99950E+00

PART,	Fx,	Fy,	Fz,	Mxx,	Myy,	Mzz
800,	-7.9010E-03,	3.1136E-02,	1.7722E-01,	1.2989E+02,	-1.8429E-01,	4.1719E+00,
801,	-5.3758E-03,	2.7748E-03,	3.2521E-02,	1.7323E+01,	6.3289E+00,	3.9410E+00,
802,	3.5208E-02,	1.6776E-02,	-2.7701E-02,	-4.2919E+00,	-1.0906E+01,	-8.0308E+00,
804,	-1.7741E-04,	3.1860E-05,	-9.0481E-05,	1.1861E-03,	-3.1389E-02,	-2.5036E-02,
810,	1.0578E-02,	-3.9736E-04,	-7.6691E-02,	-5.7626E+01,	1.5117E+01,	-8.0408E+00,
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
2000242,	-1.3652E-03,	-4.4917E-03,	-2.3154E-03,	-3.0806E-01,	1.6120E-02,	-1.7210E+00,
2000246,	1.2085E-02,	6.4670E-03,	2.2472E-02,	1.1535E+01,	-1.6359E+01,	-1.5320E+00,
2000252,	9.4278E-03,	3.5153E-04,	3.5429E-03,	7.1106E-01,	-3.5469E+00,	-1.6143E+00,
2000265,	8.7467E-04,	-9.9446E-04,	2.0211E-03,	6.4750E-01,	-1.3898E+00,	-8.4476E-01,
2000266,	-2.9885E-03,	-4.8606E-04,	3.7147E-03,	4.9111E-01,	-3.1330E+00,	-6.8825E-02,
Total,	-8.0324E-01,	1.0326E-01,	-7.9019E-01,	-2.3442E+02,	5.9231E+02,	3.1704E+02,



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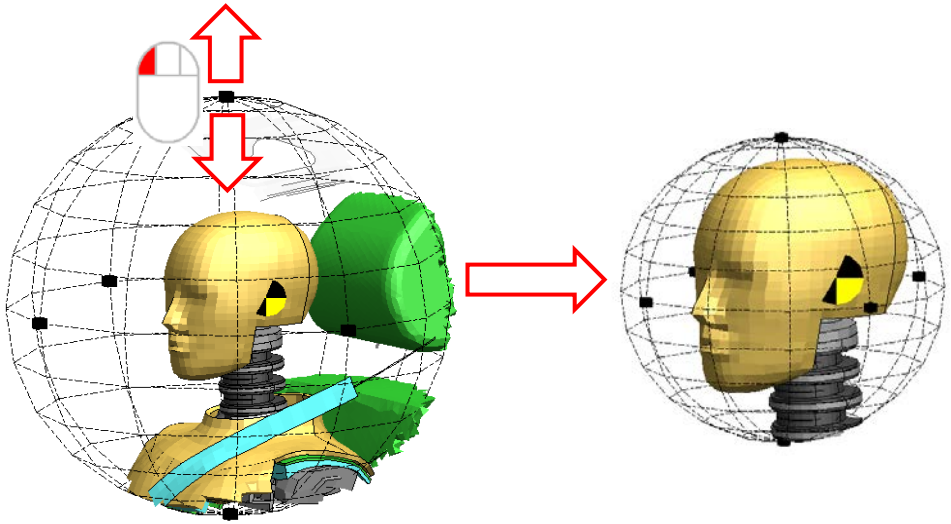
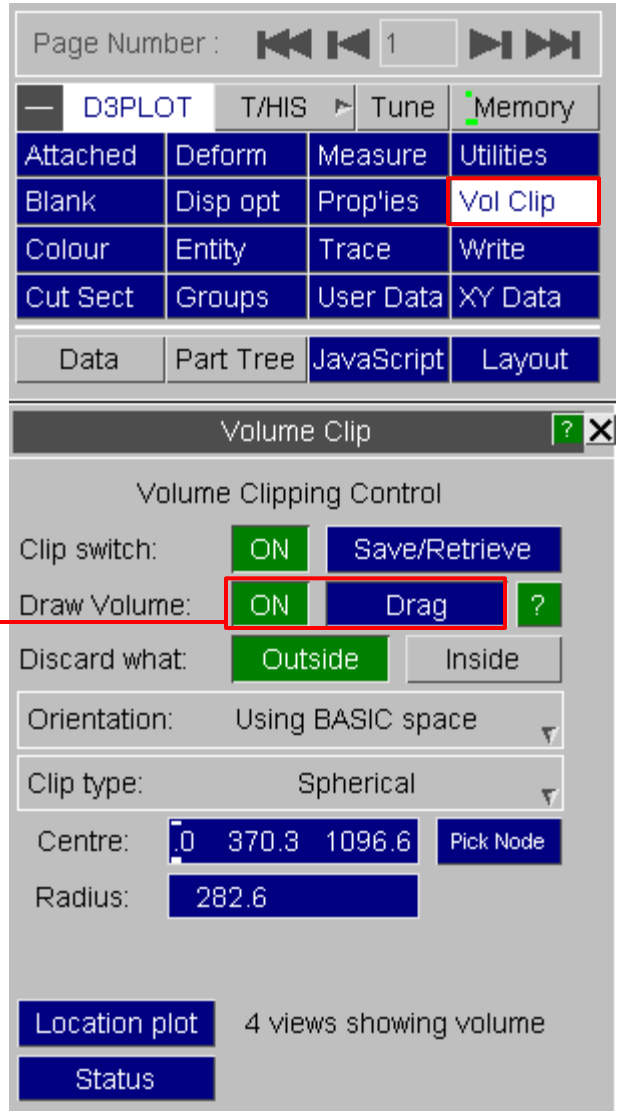
Volume Clipping

- The Volume Clipping displays just the entities within the specified volume.
- Volumes can be resized by clicking on handles and dragging



- They can be repositioned by clicking in the graphics screen:
  - Translate in the X direction – left button
  - Translate in the Y direction – middle button
  - Translate in the Z direction – right button



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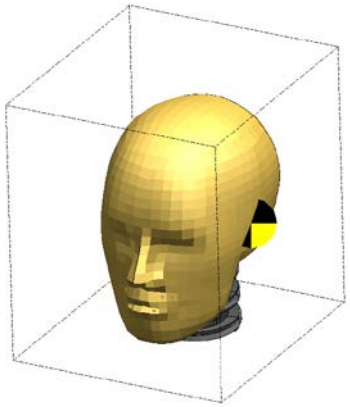
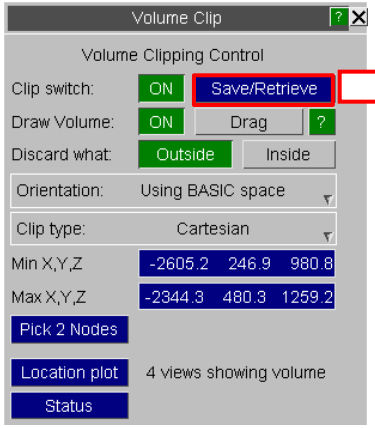
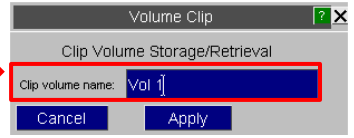
Volume Clipping

- Volumes can be saved and retrieved in a <volume.clip> file containing the type of volume, orientation and dimensions

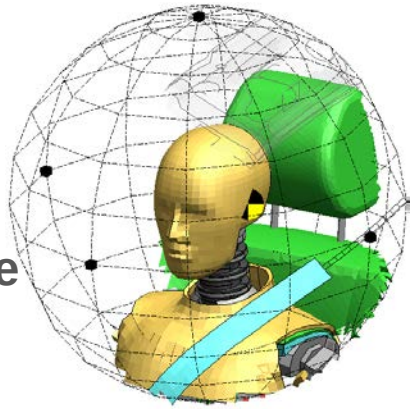
Store current volume

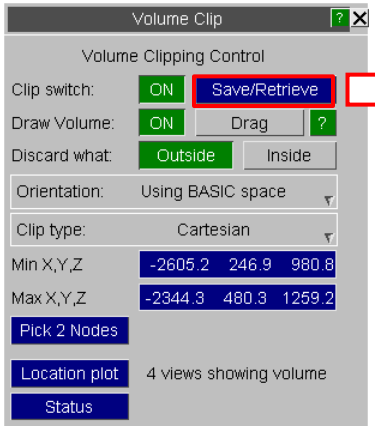


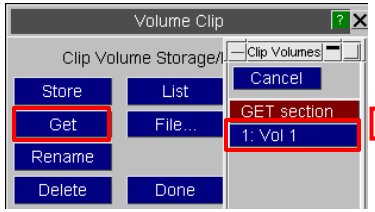


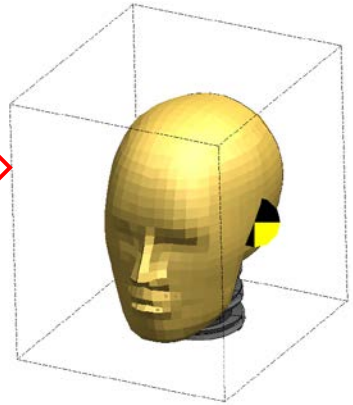


Get saved volume









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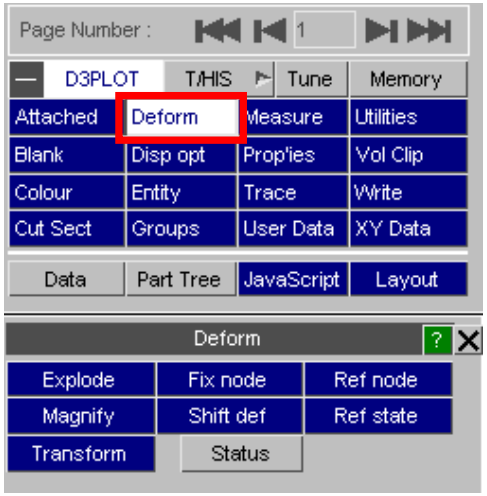
Deform functions

- The Deform menu has the following functions:
  - **Explode** - Artificially separates parts by applying "explosion" vectors to them.
  - **Magnify** - Allows scales other than 1.0 to be applied to graphical displacements.
  - **Fix node** - Subtracts the displacement at a node from that at all others, effectively "fixing“ it in model space.
  - **Shift def** - Fixes three nodes, forming a local coordinate system, against which all displacements are drawn (see next slides for details).
  - **Ref node** - Makes results relative to those at one or three nodes (see next slides for details).
  - **Ref state** - Makes results relative to a "reference" state in this or another model.
  - **Transform** - Apply translation, reflection, rotation and scale to a model as it is read in.



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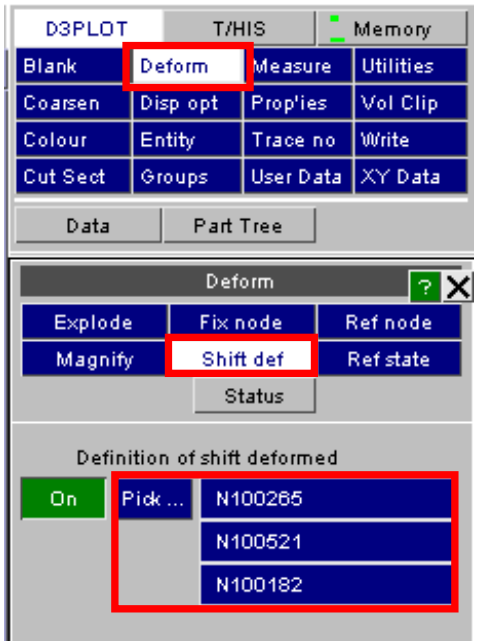
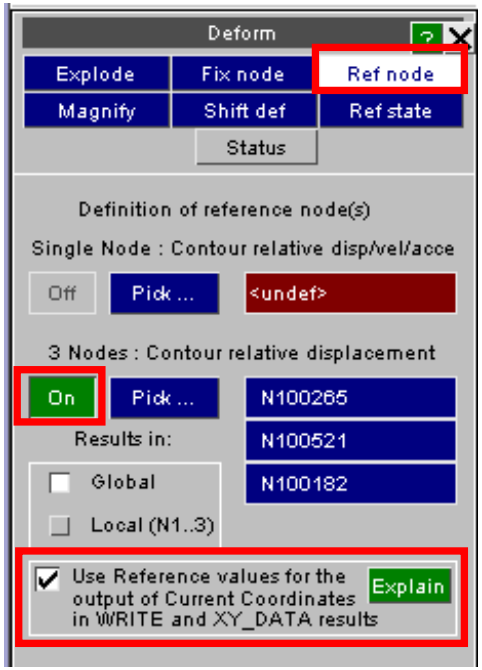
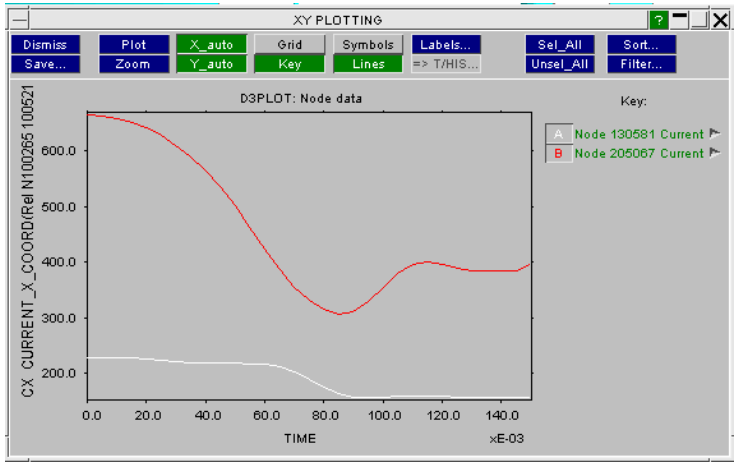
Deform – Shift Def & Ref node

- When using Shift-Deformed reference system, D3PLOT can contour and output displacements relative to the local coordinate system (using Deform=>Ref node).
- D3PLOT can also output current coordinates (using WRITE, XY_DATA) in the local coordinate system. This option is switched on in the Deform=>Ref node menu.







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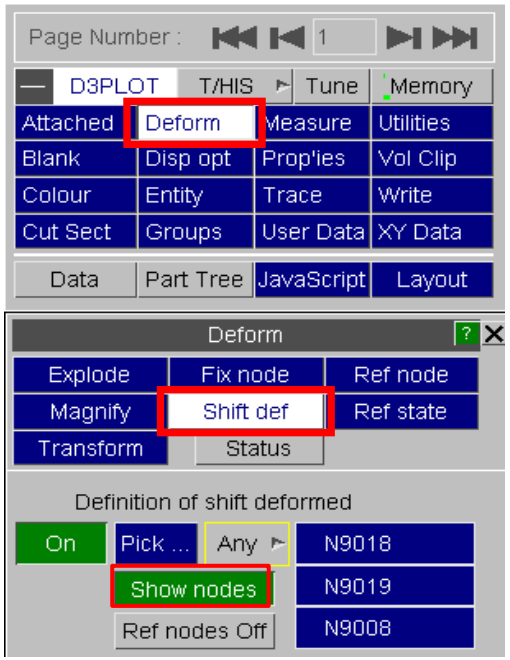
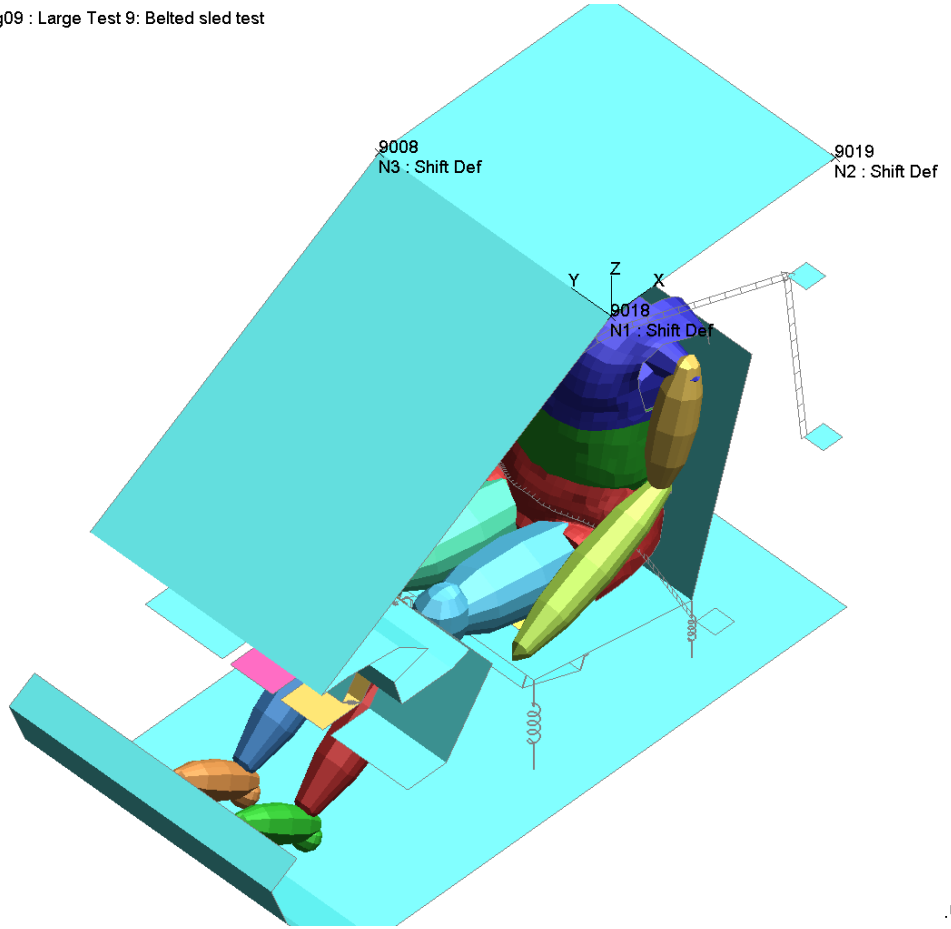
Deform – Shift Def Coordinate System

- The three nodes selected for Shift Deformed, and the local coordinate system, may now be displayed.





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Display options

- Display Options controls the appearance of each plot and many of the items drawn on each plot.

Element Switches

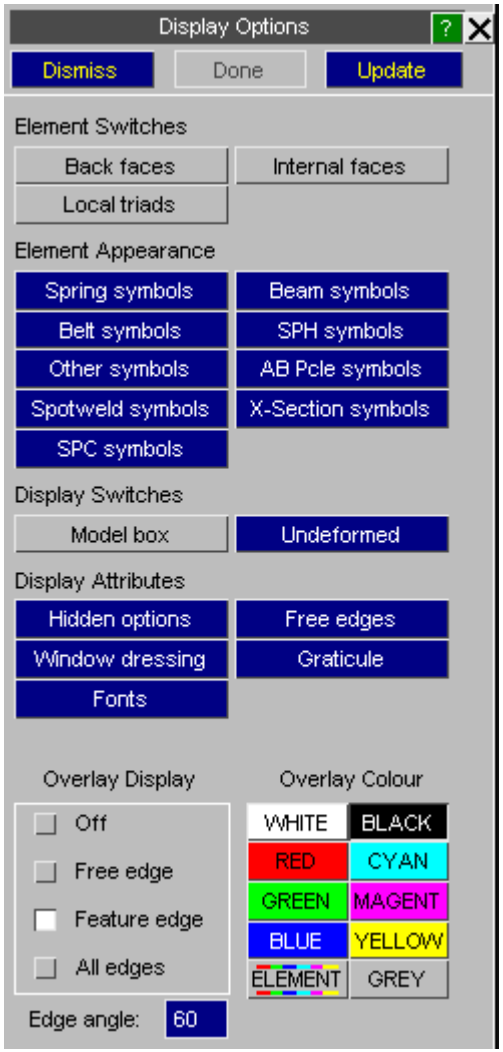
- These options control the display of back and internal faces of 3D elements and the display of element triads showing the local element axes.

Element Appearance

- These options control how a number of different element types are drawn. Some types have alternate symbols while others have options to control their sizes.

Display Switches

- These options can be used to display a box around the model and to display a models undeformed geometry.



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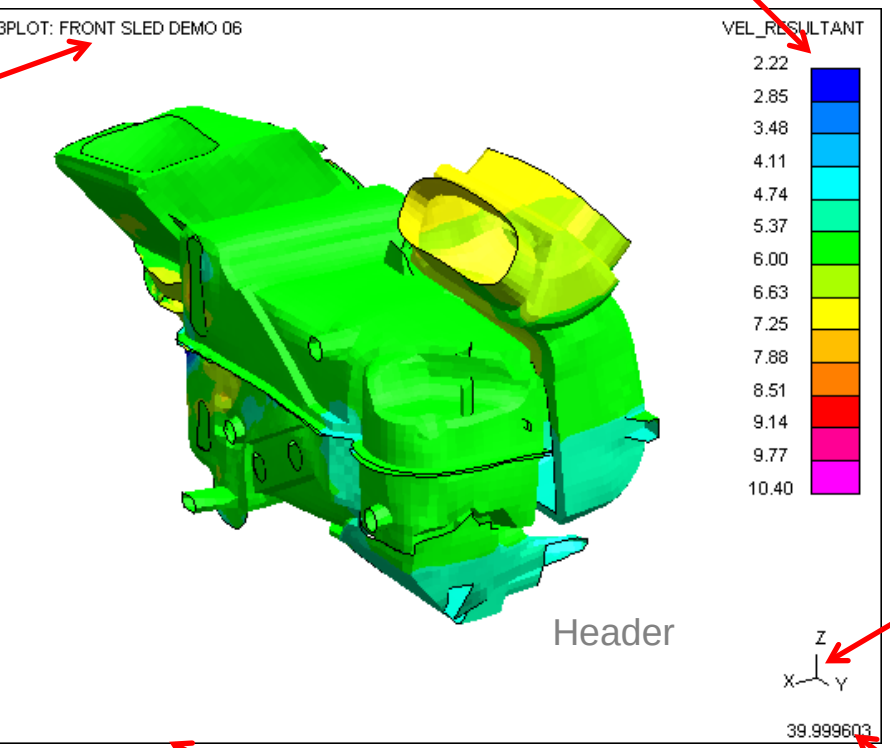
Display options : Window Dressing

- Window Dressing controls which additional items are added to plots.



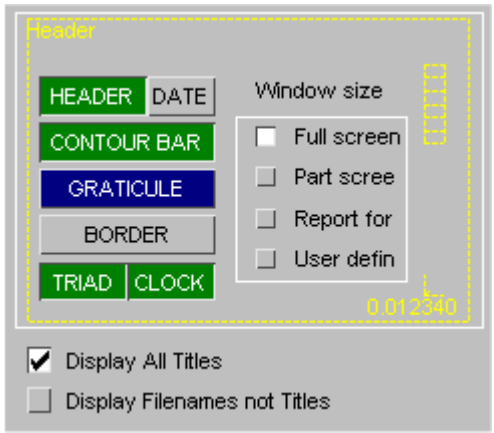
Contour Bar

Header

Triad

Border

Clock



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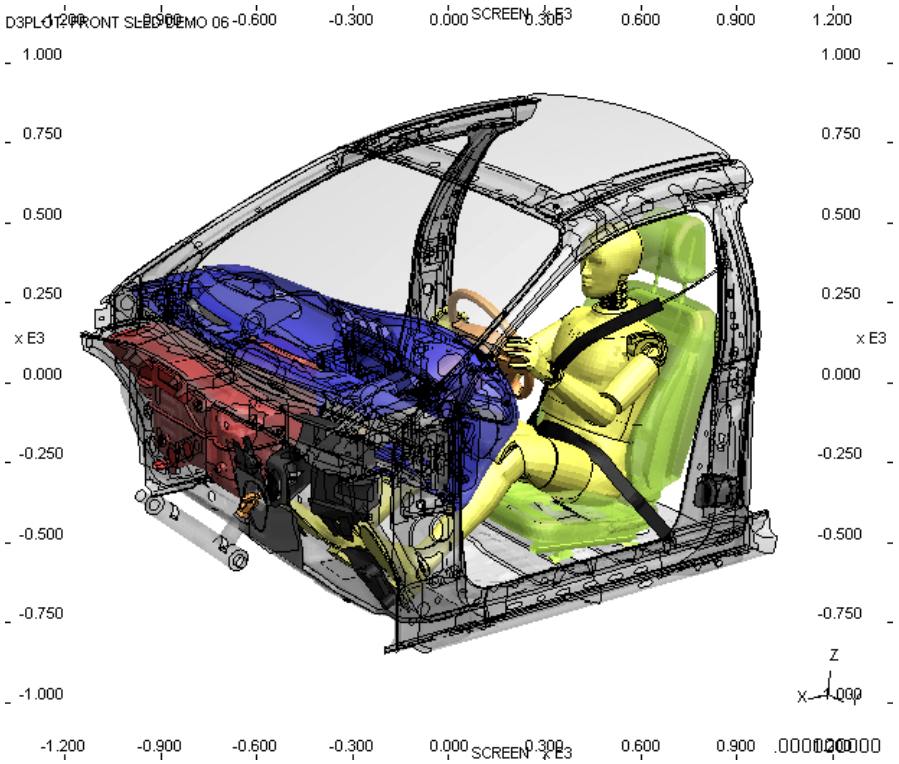
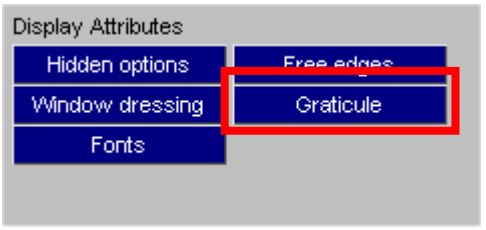
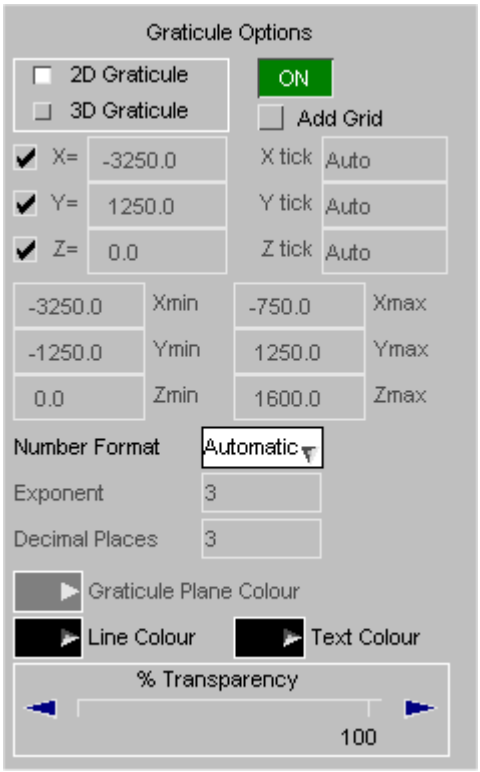
Display Options : Graticule

- The Graticule Option can be used to display the current model dimensions.
- In 2D mode the graticule shows either model space or screen space depending on the view







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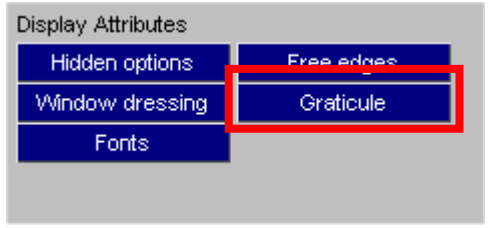
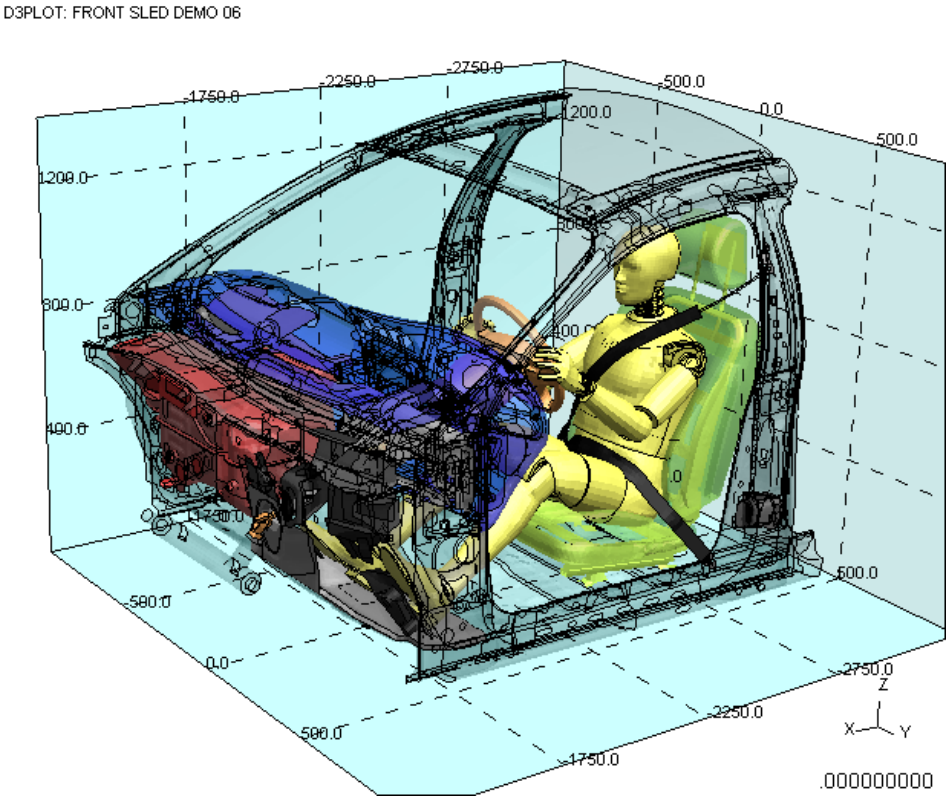
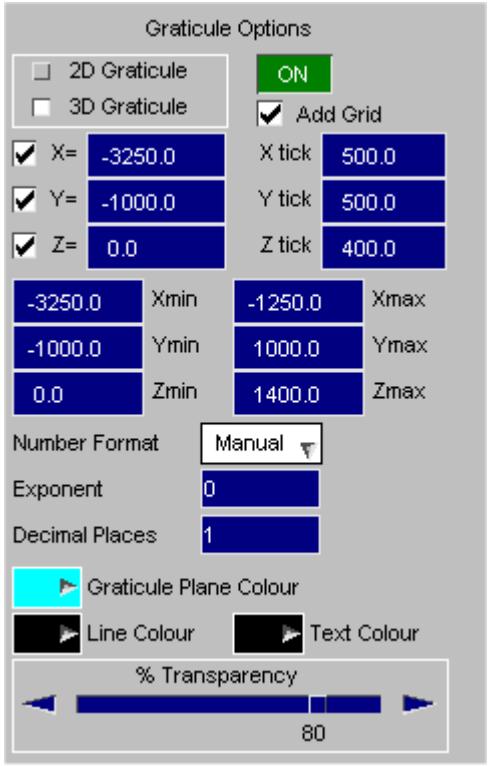
Display Options : Graticule

- In 3D mode the size and location of each plane can be set along with the grid spacing along each axis.







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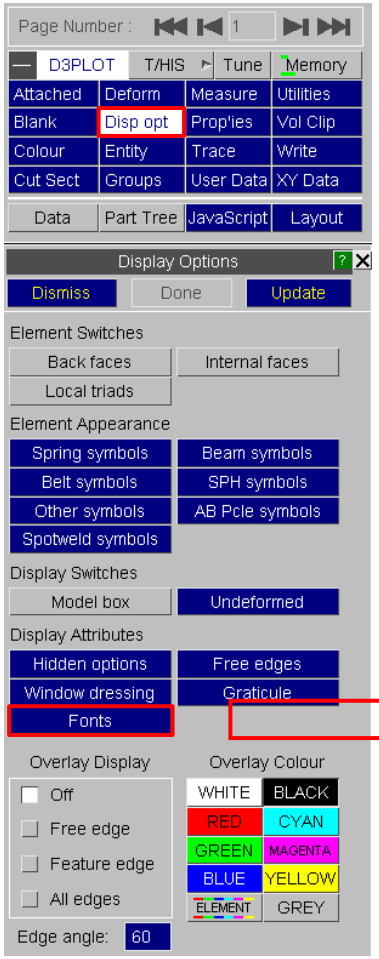
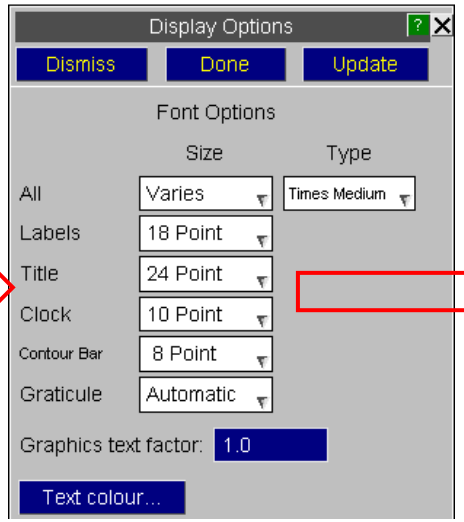
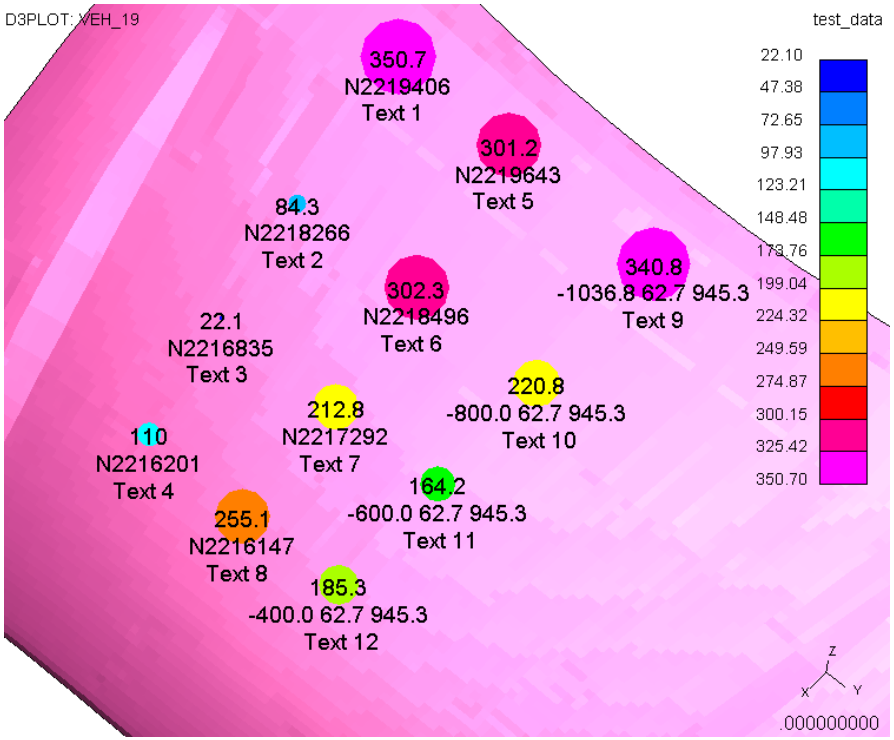
Display Options : Fonts



- Set text font size for
  - Labels
  - Title
  - Clock
  - Contour Bar
  - Graticule





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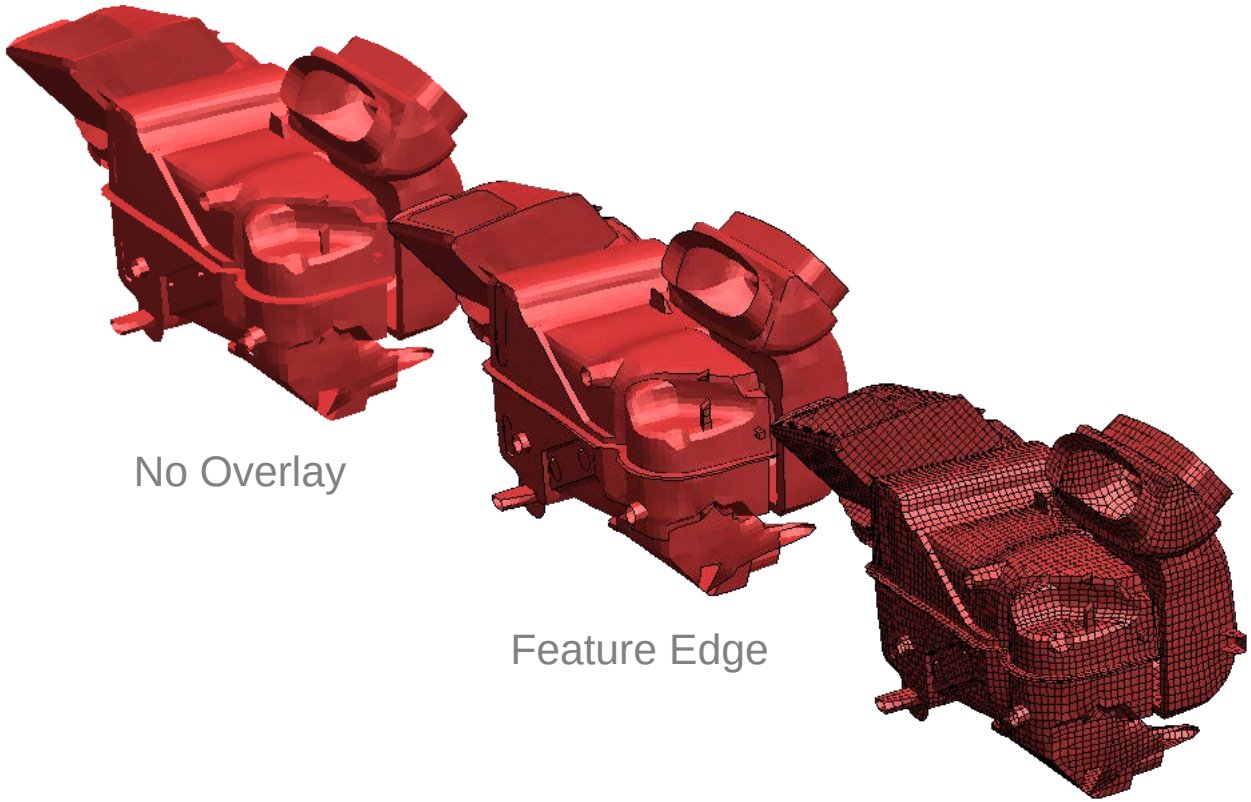
Display options: Element overlay

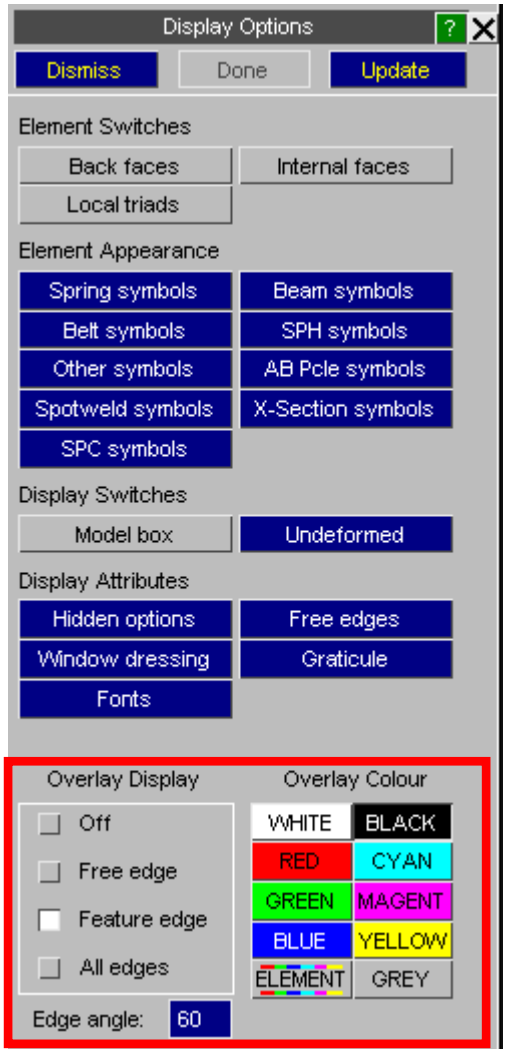
- The Overlay Options control how the hidden line overlay is drawn along with the colour used for the overlay (shortcut ‘Y’ cycles no/free/all overlay)



No Overlay

Feature Edge

All edges



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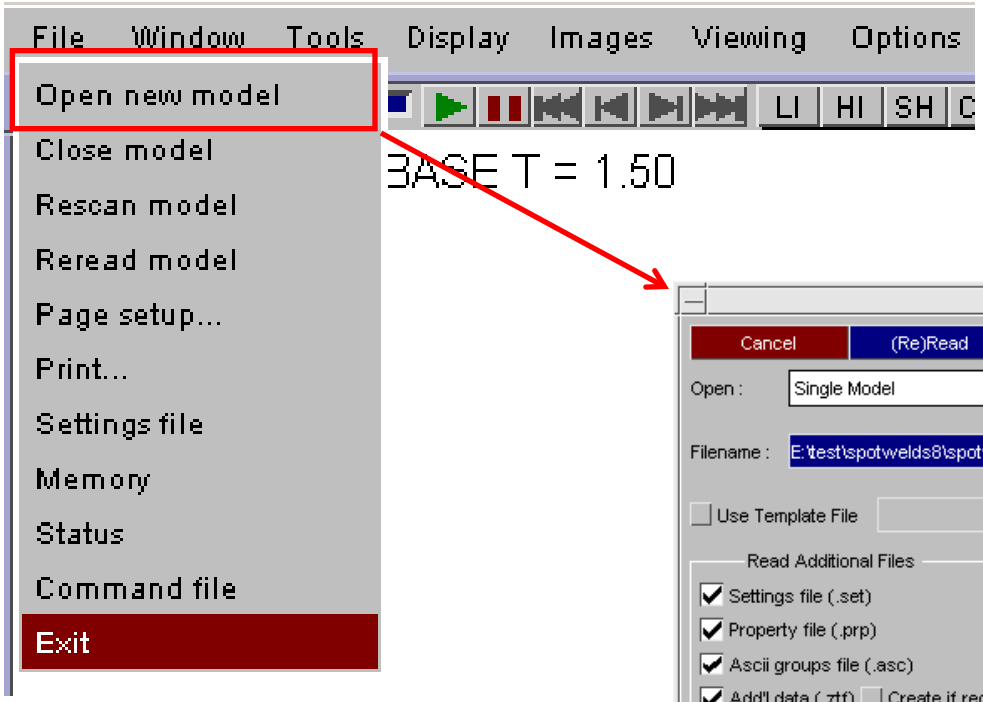
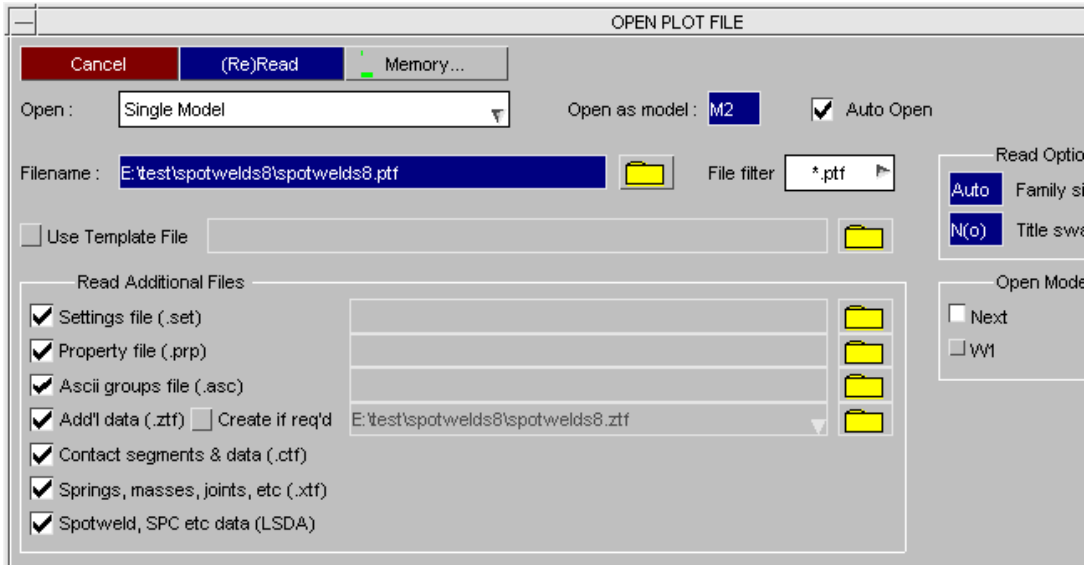
Multiple Models / Windows

- D3PLOT can accept up to 32 models simultaneously, subject to memory limit on your computer.
- To open a new model use the “File” menu.





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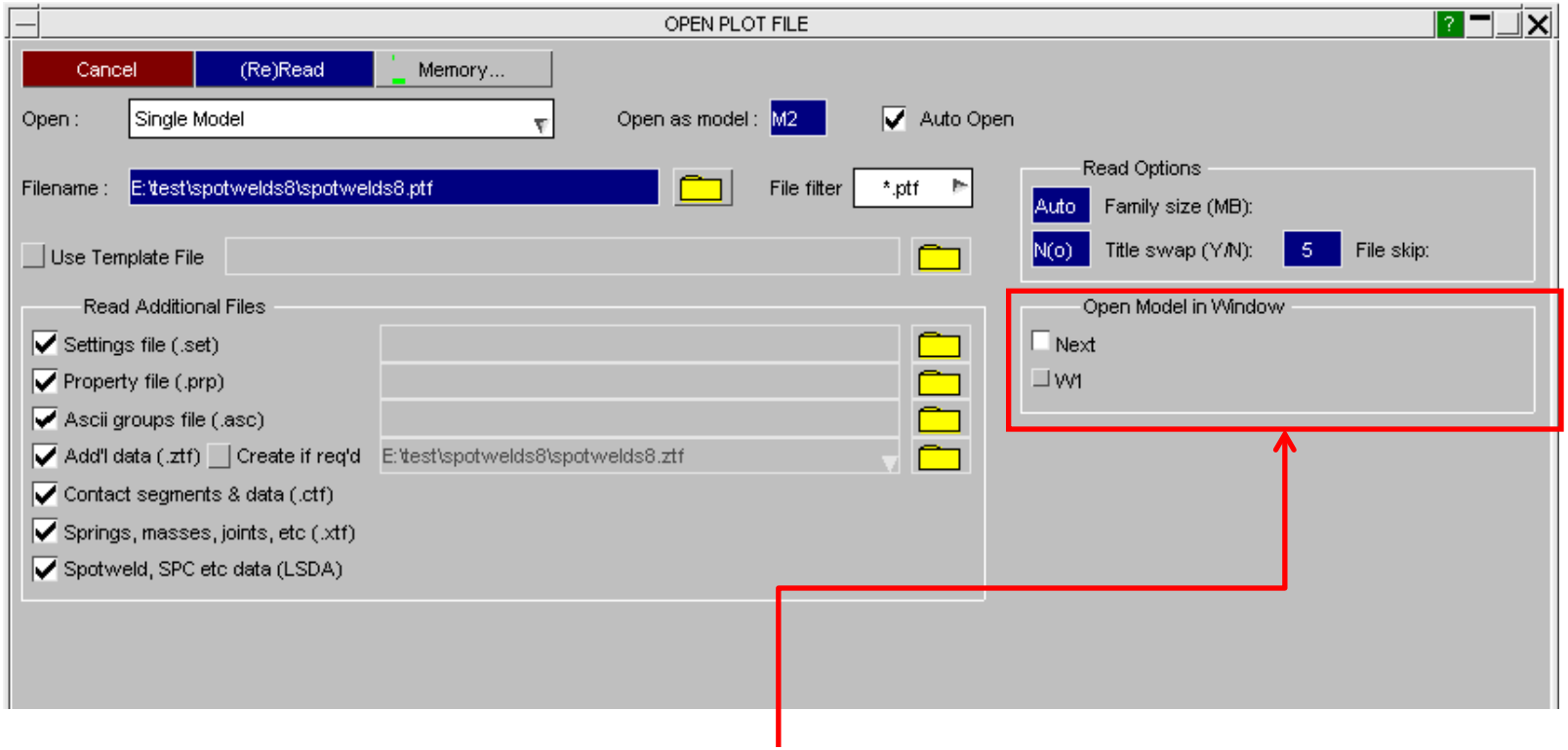
Multiple Models / Windows



- By default, D3PLOT opens a new window for each new model. This can be changed here when opening each model

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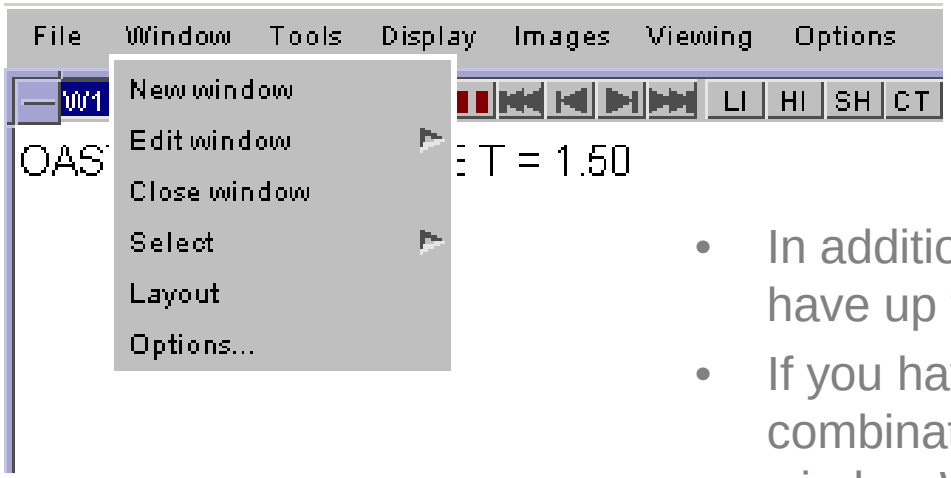
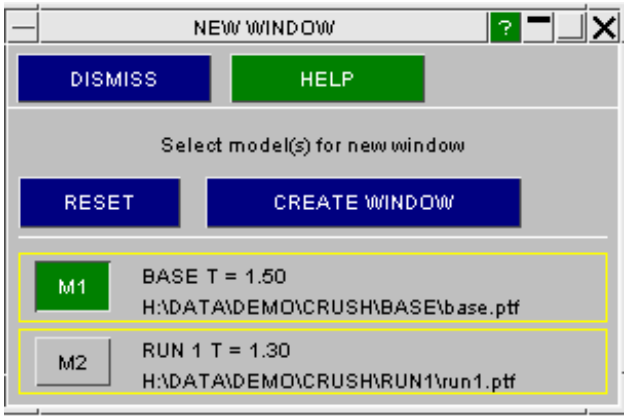
Multiple Models / Windows



- In addition to multiple models D3PLOT can have up to 32 windows simultaneously.
- If you have loaded multiple models, any combination of Models M1, M2… in each window W1, W2, etc is permitted.



- If you have multiple models then when you open a new window, D3PLOT asks which models should be put into it.

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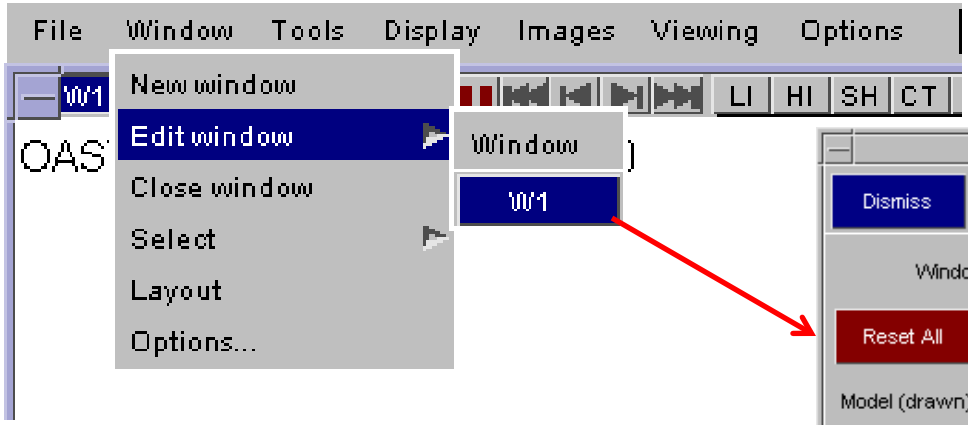
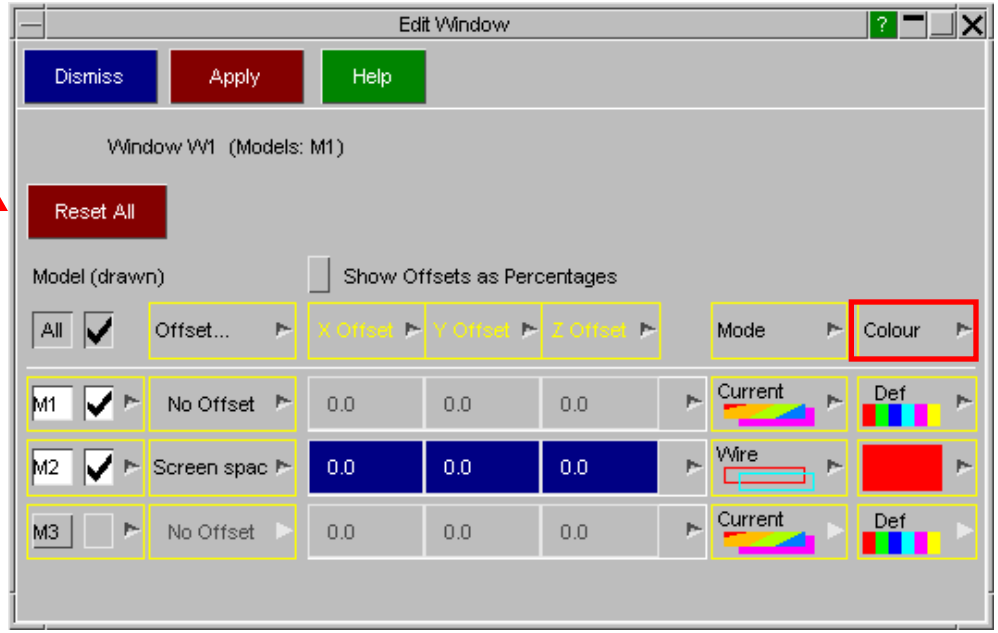
Multiple Models / Windows





- The Edit Window menu allows the Model/Window combination to be changed
- This menu offers colour by model to help identify models when overlaid

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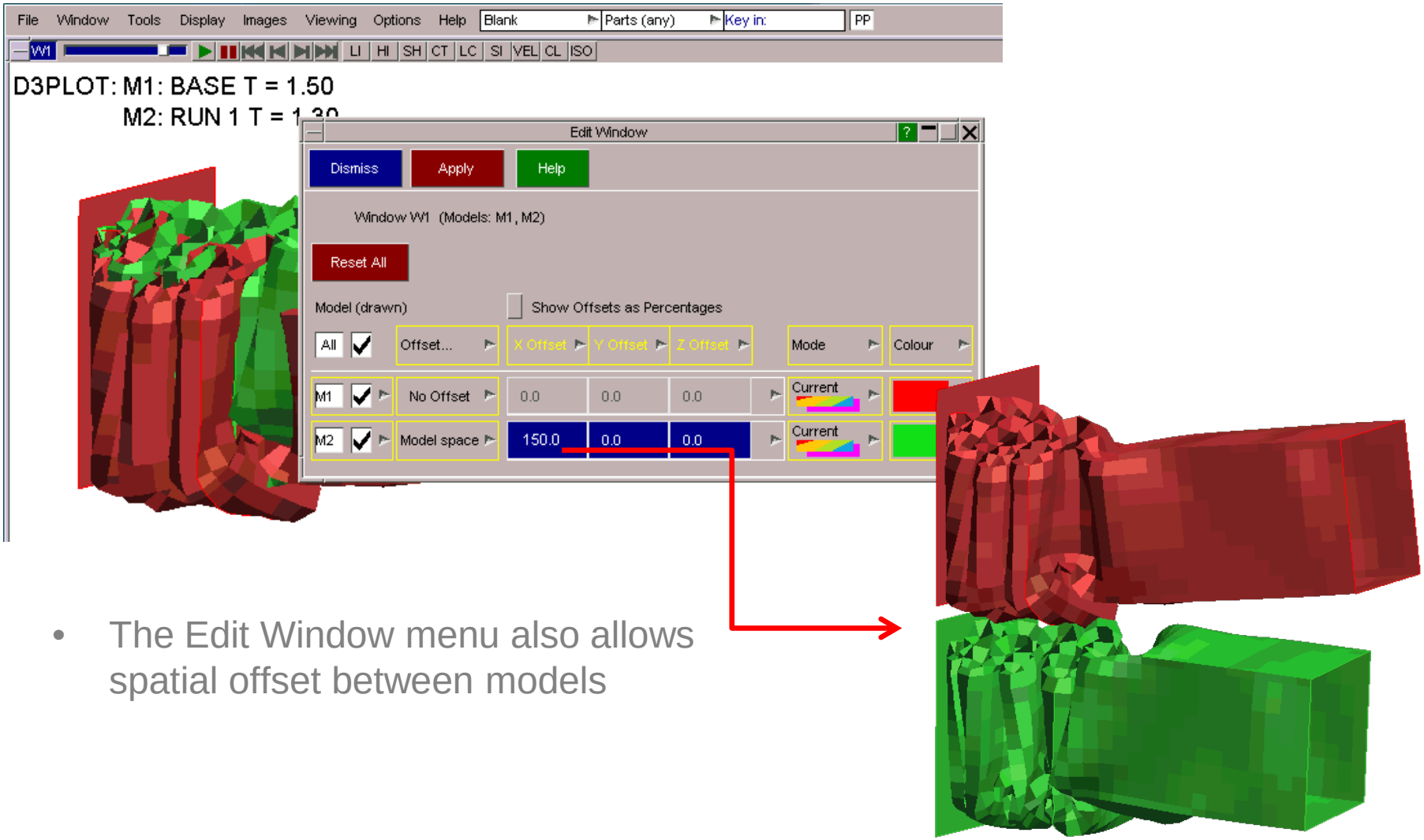
Multiple Models / Windows



- The Edit Window menu also allows spatial offset between models

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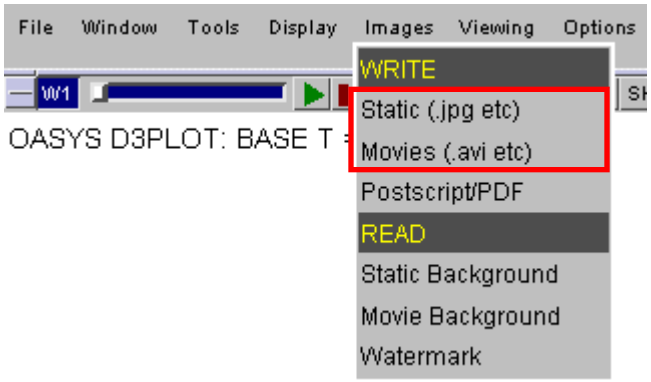
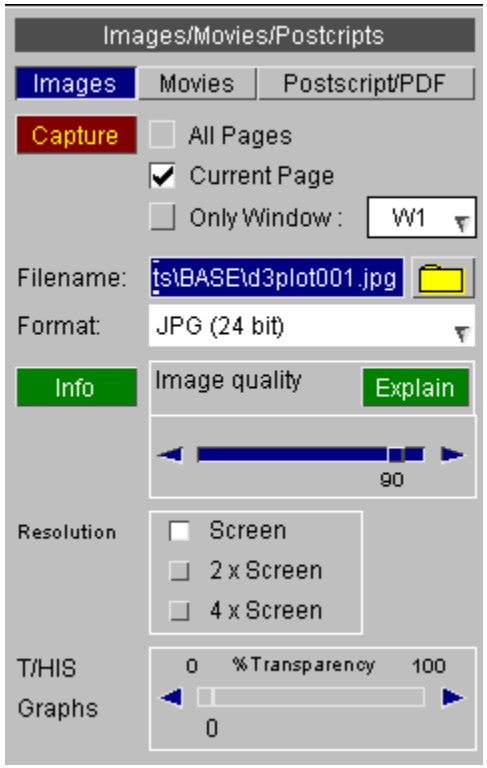
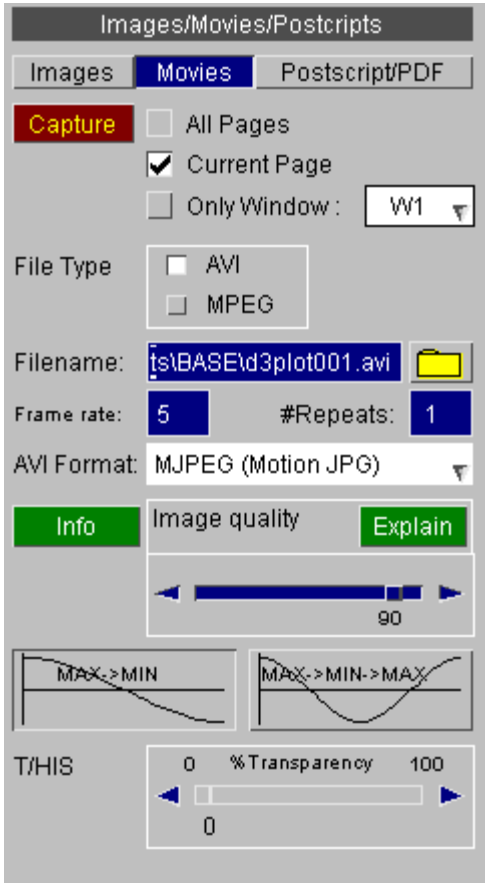
Image and movie output







Images and movies can include any or all of the windows, including the T/HIS window if active.

Bitmap, jpeg images

Press Capture to record.

Movie files. Press Capture to record.

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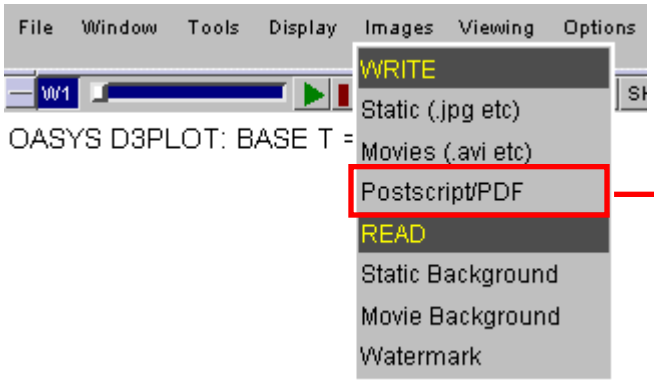
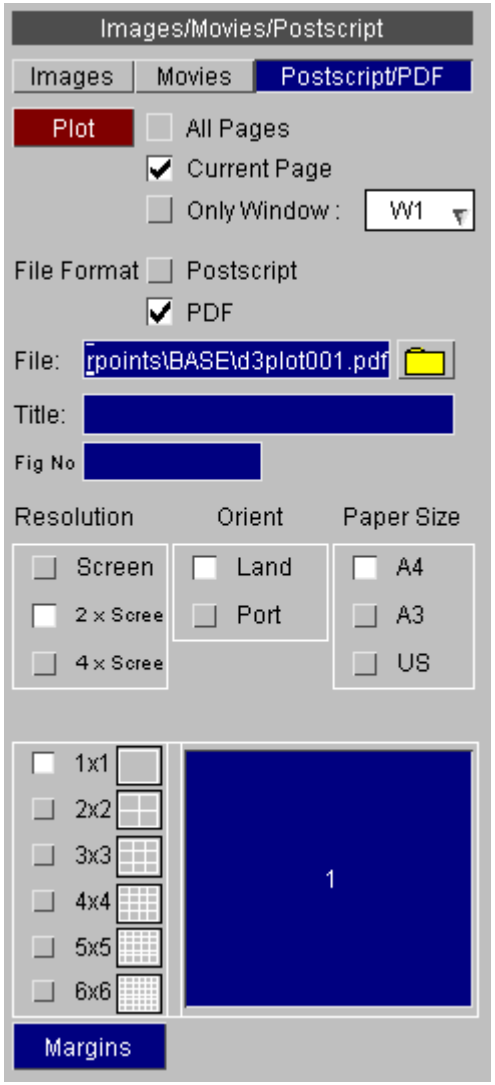
Image and movie output





Postscript – includes multiple images on one page

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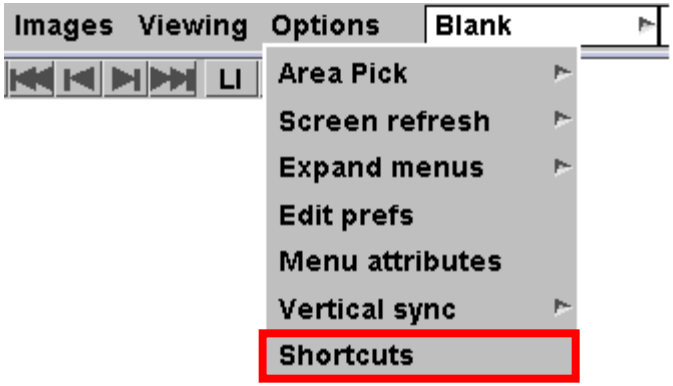
Shortcuts - customising

- Shortcuts are customisable and can be saved to different keys.

- Set the keys in the shortcuts menu accessed through Options (see menu on next slide).



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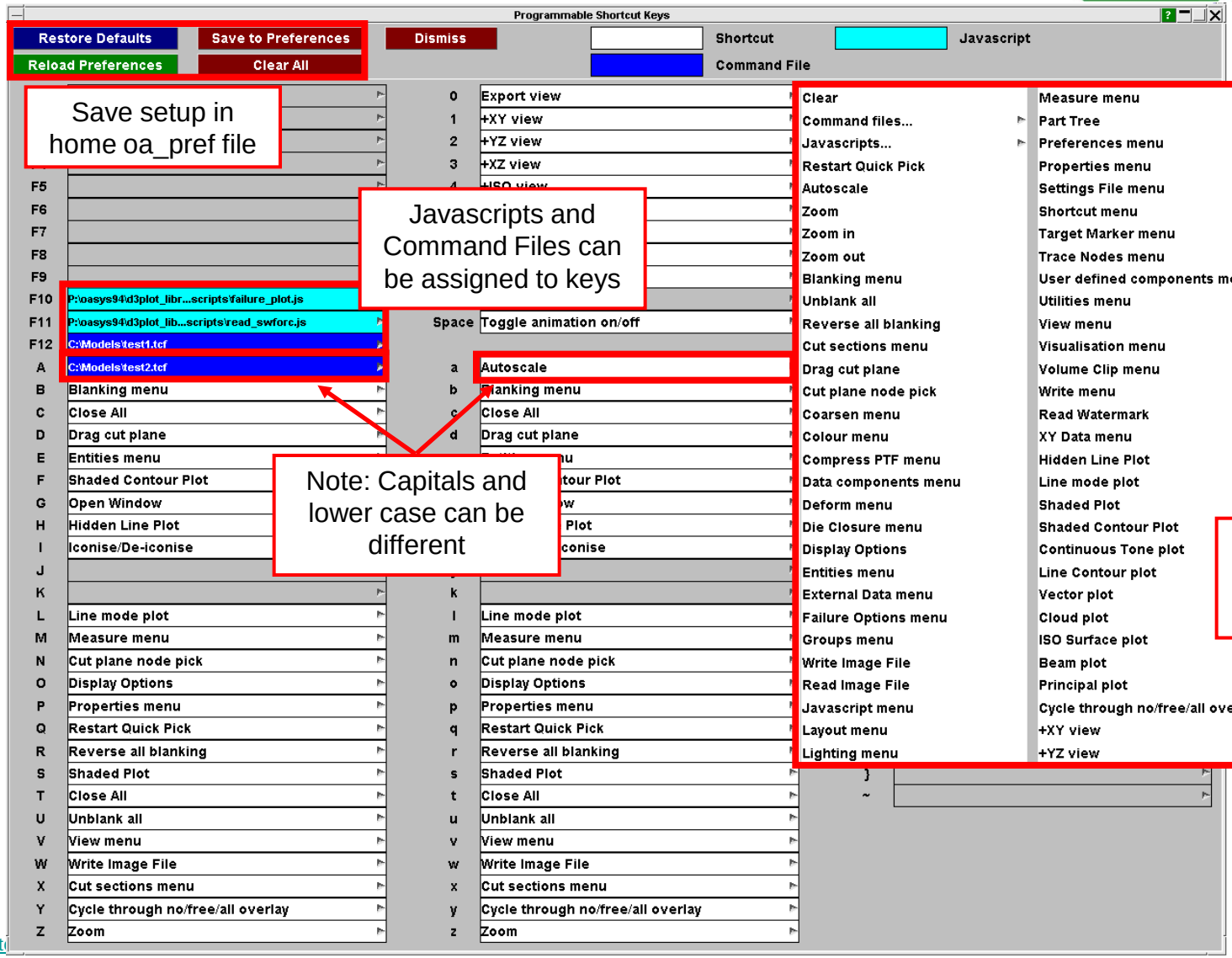
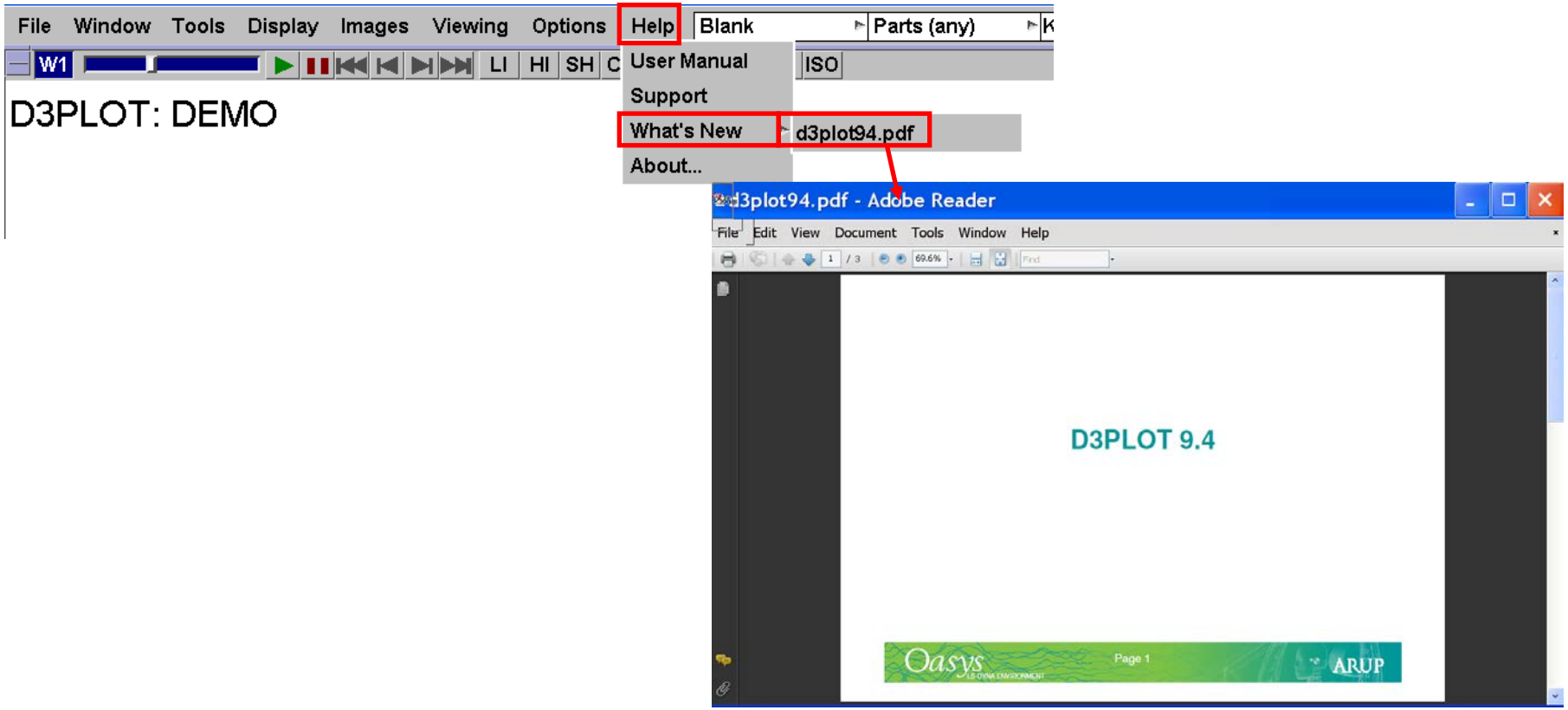
Shortcuts - customising



[back t

Documentation - What's new?

- A PDF document describing the latest features can be accessed from within D3PLOT at any time:



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Advanced Options

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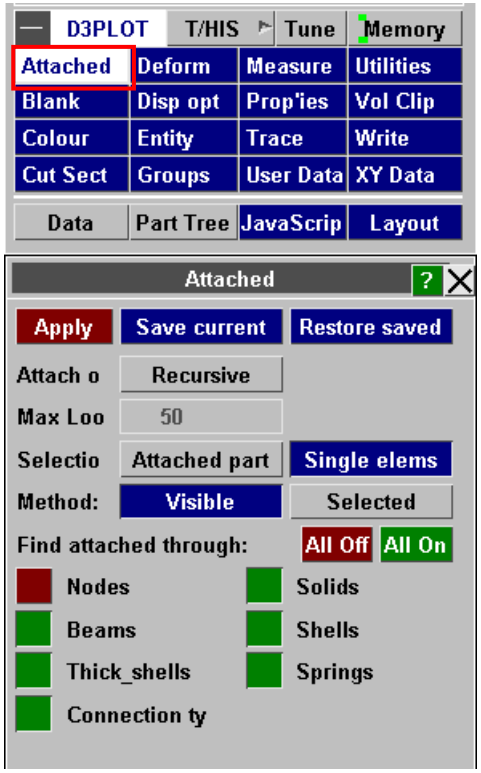
Find Attached

- The Attached menu can be used to find entities that are physically attached together. Each time you press Attached, D3PLOT does the following:
  - Looks at what you want to find attached (beams, shells etc.),
  - Find what is immediately "attached to" what is currently visible,
  - Unblanks these newly found items
  - Redraws the image.

- The result is progressively more and more of the model being drawn until nothing attached to what is currently visible (which is not necessarily the whole model) remains to be unblanked and drawn.



NOTE: This is slightly simpler than the Attached function in Primer as it only finds items attached at nodes.

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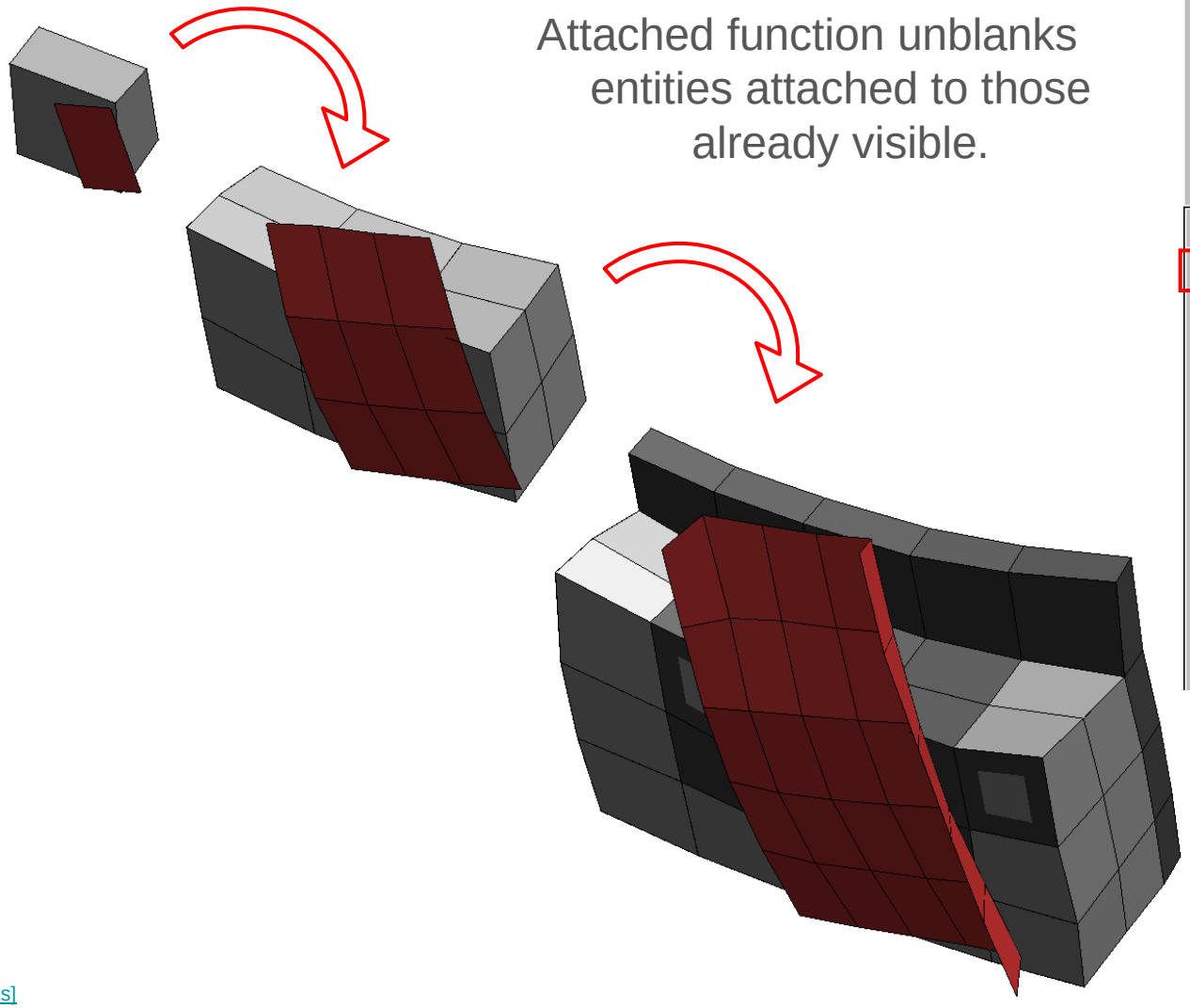
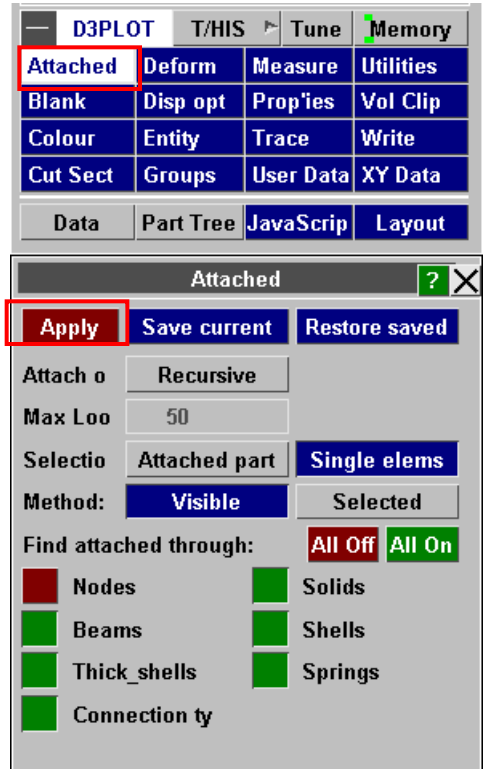
Find Attached



Attached function unblanks entities attached to those already visible.



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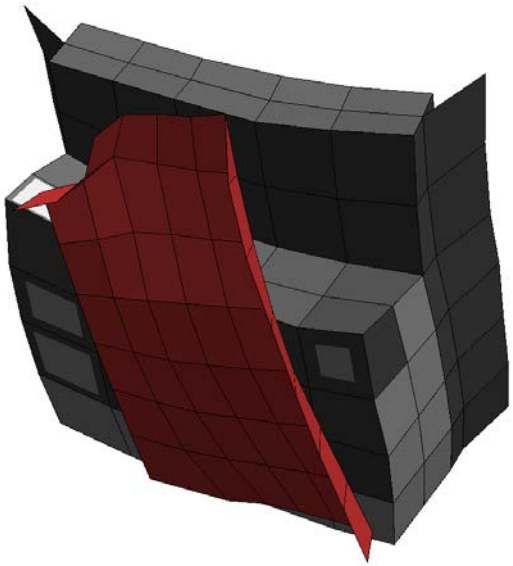
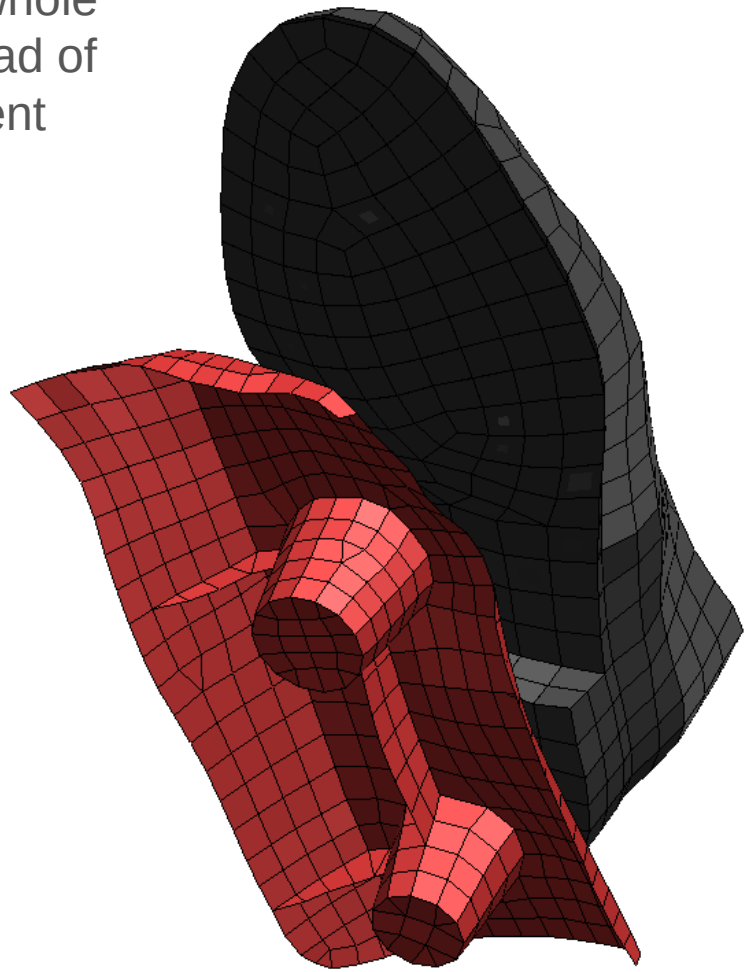
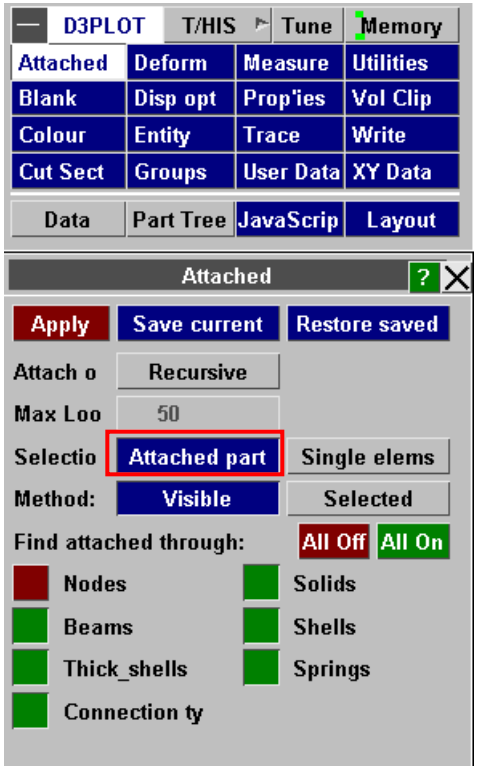
Find Attached

Attached can unblank whole attached parts instead of element-by-element







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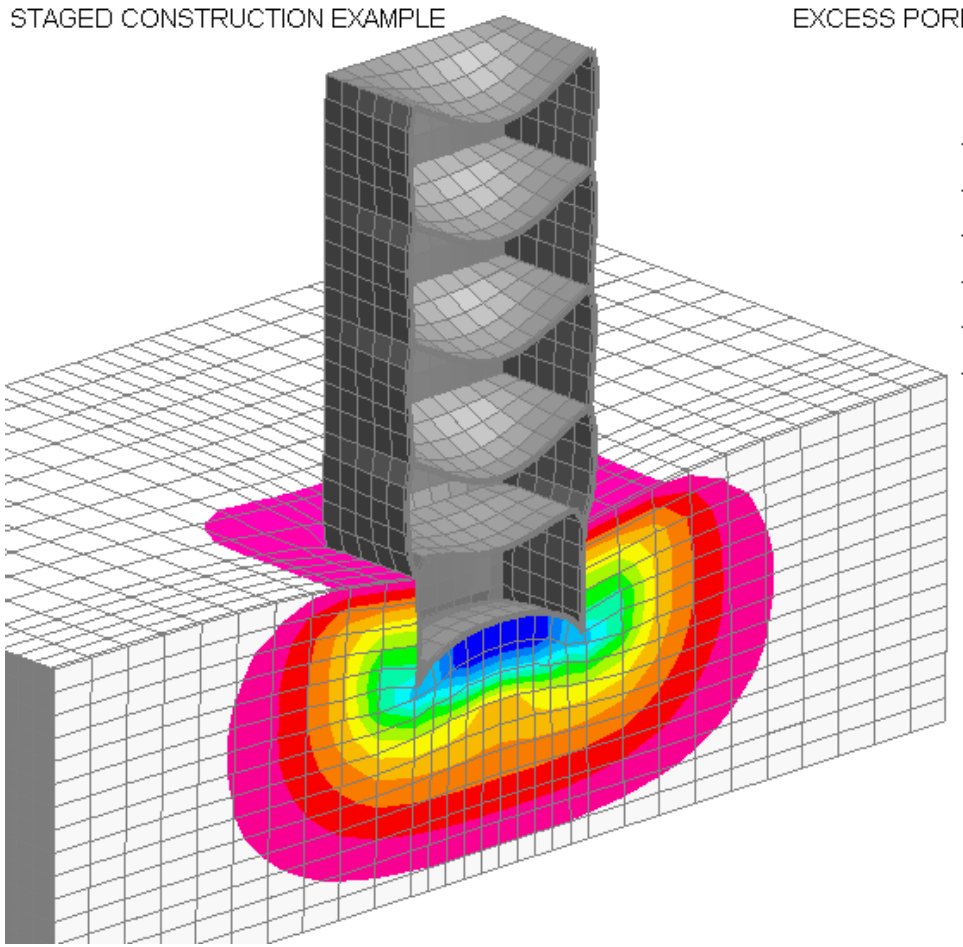
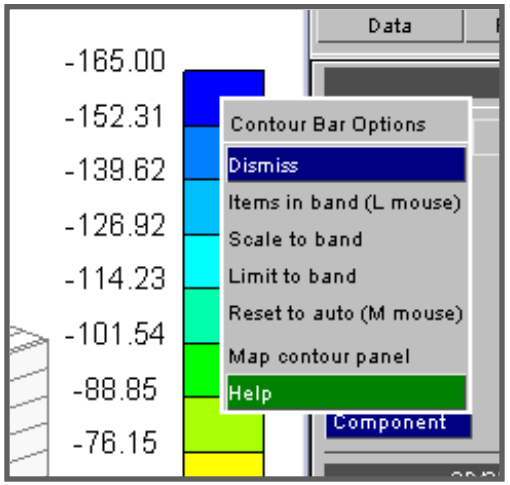
Contour options

- Finding which elements have a particular contour level:



Hover over a contour colour. The mouse symbol changes to CONT OPTS. Left-click to display only those elements which have that contour level, or right-click to see more options:



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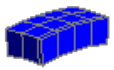
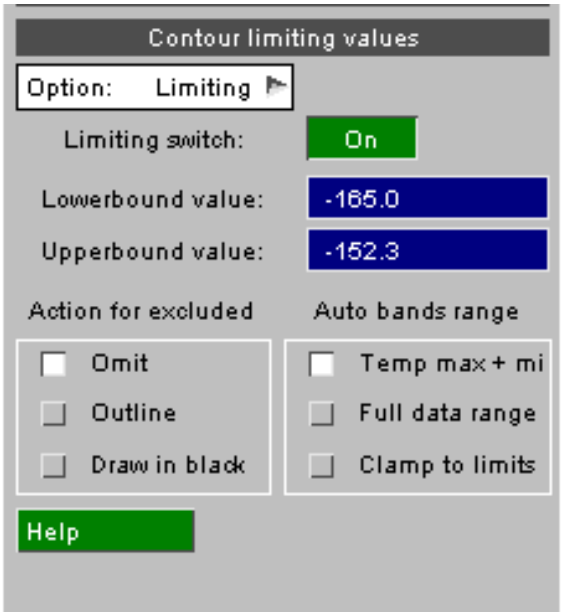
Contour options

- Finding which elements have a particular contour level:

Result of left-click on contour bar: only the elements with that contour level are displayed.



These options use the existing “Limiting Values” capability; this menu appears automatically when you click on a contour bar.



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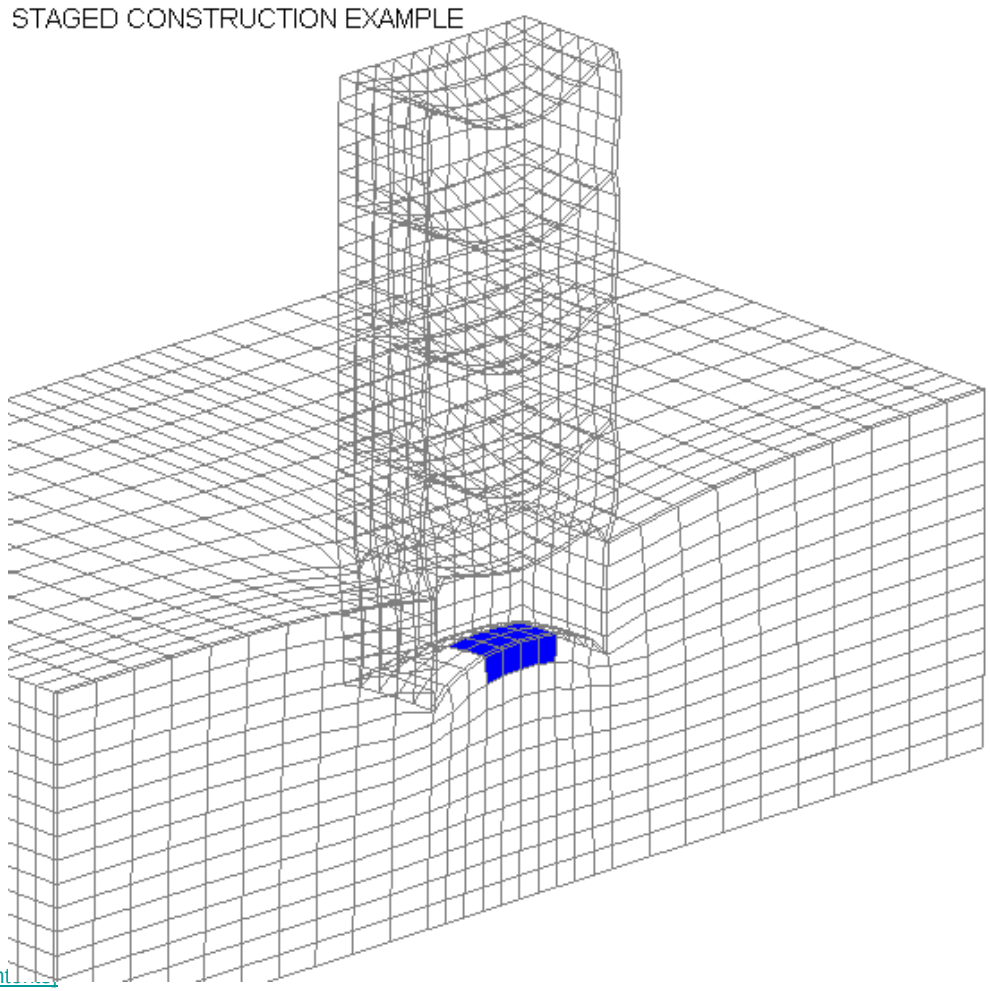
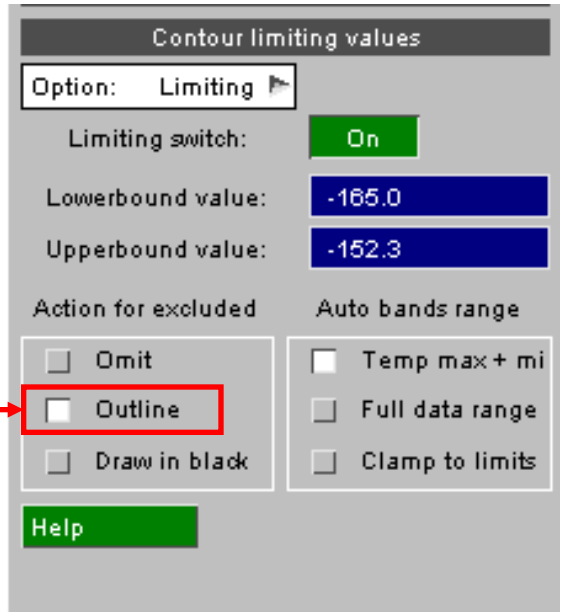
Contour options



To see these elements in context, draw the other elements in Outline



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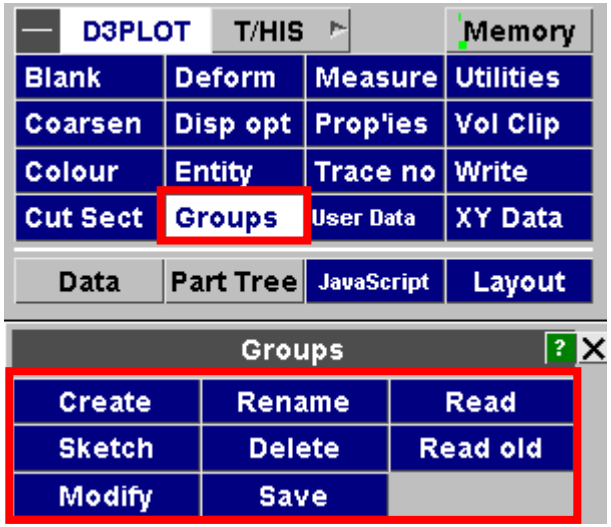
Groups

- D3PLOT allows the creation of groups, which then can be used in a number of menus, including:
  - Quick-pick
  - Blanking
  - Write
  - XY-Data
  - Part tree



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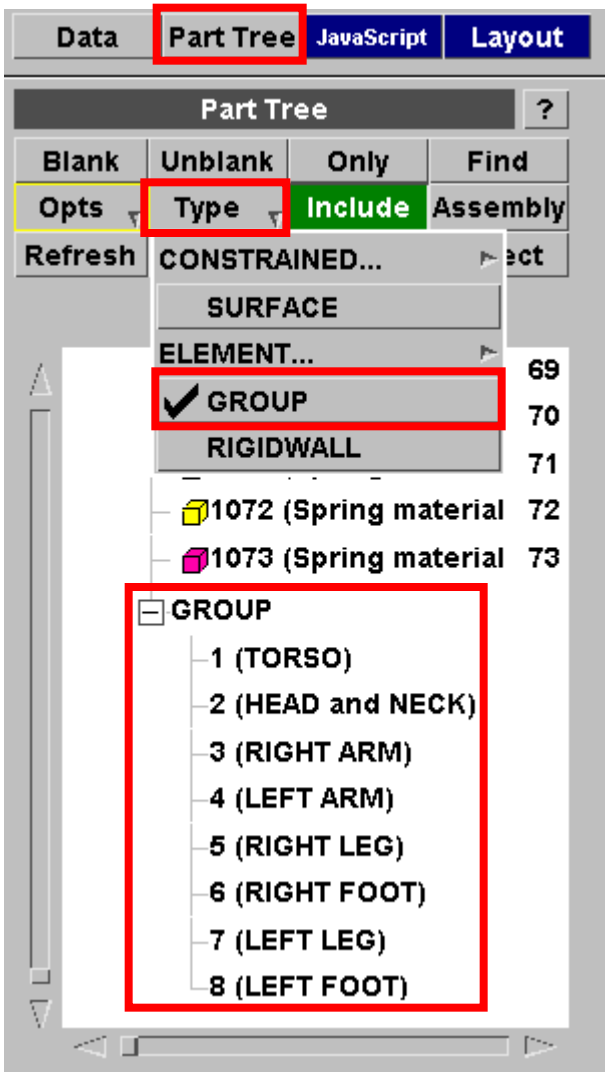
Groups

- Groups can be added to the Part Tree
  - Blanking and visual attributes can be set from here by right-clicking on the group



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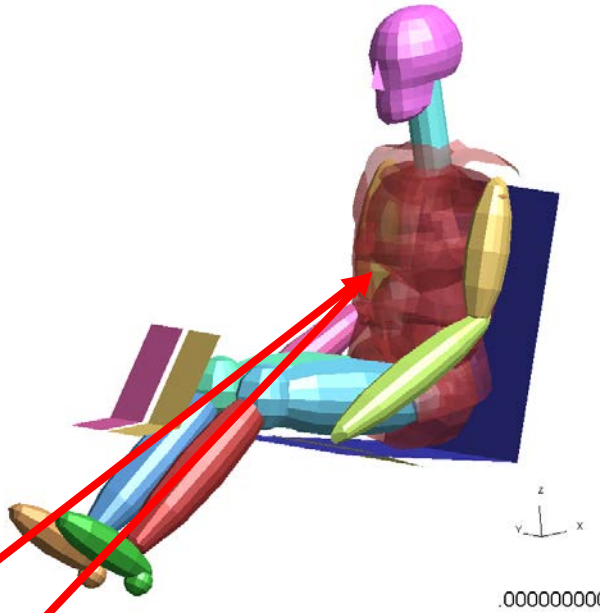
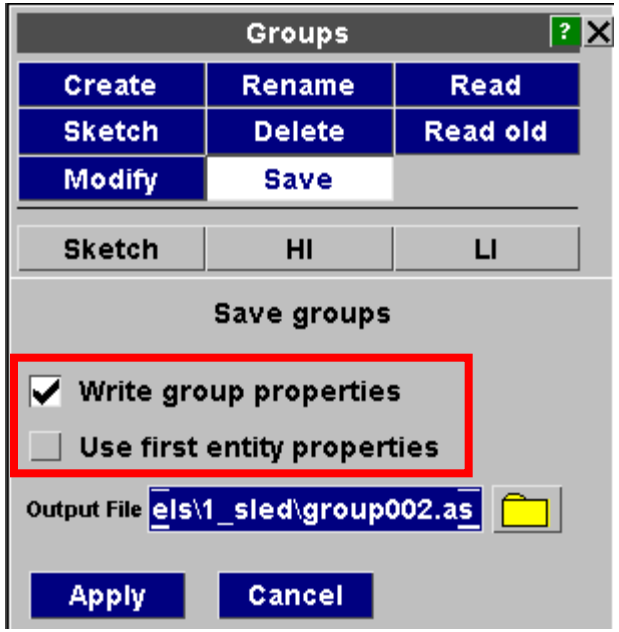
Groups

- The visual properties of groups can be written to and read from the groups ascii file, e.g.





TORSO

$ Label	Colour	Transparency	Display Mode	Overlay Mode	Status	Overlay Colour	Brightness	Shininess	Blanking
1	RED	50	CURRENT	CURRENT	*		90	70	UNBLANKED

$
PART 1 : 3
$

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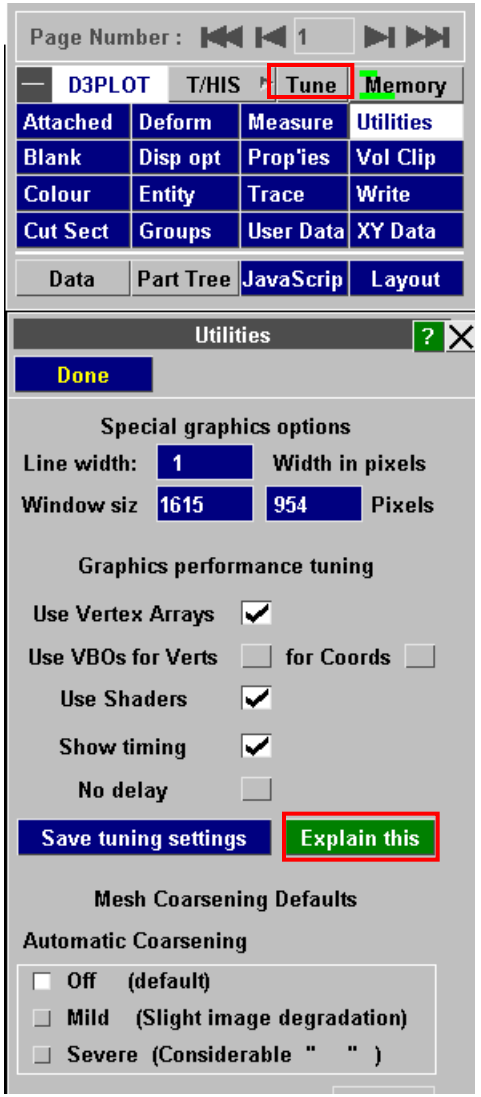
Tuning Graphics Performance

- D3PLOT can be tuned to take advantage of the capabilities of new graphics cards – typically for hardware manufactured from about 2007 onwards.
- Speed of animation of large models can be increased up to 5x or more on some graphics cards
- Instructions for doing this are given in the “Explain this” button.
- After tuning the performance, the settings can be saved to the preference file.



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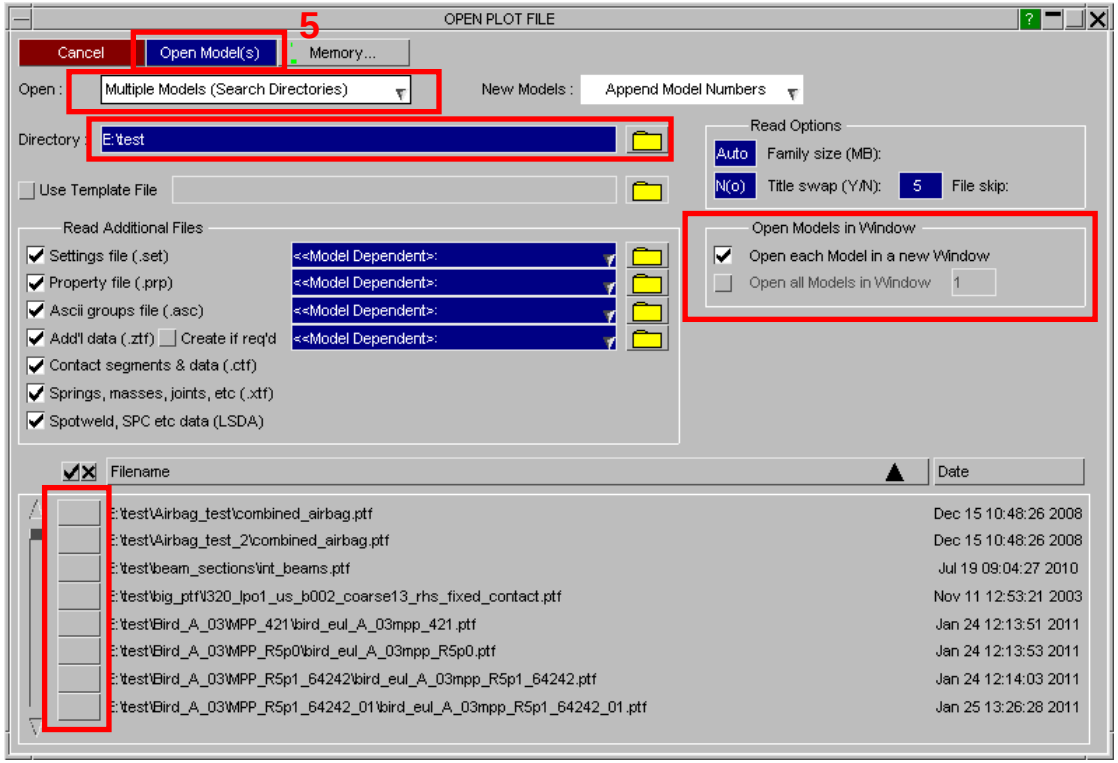
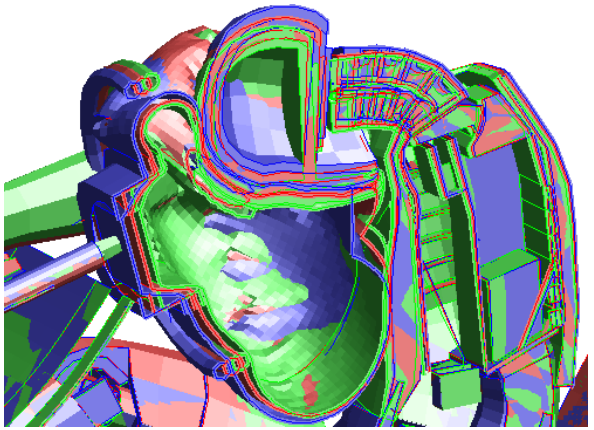
Open models from directory

- Open multiple models simultaneously, by browsing for a directory. Any LS-DYNA plot files in that directory or in subdirectories will be found and displayed.



1. Select the directory option
2. Browse for directory
3. Select models
4. Decide whether each model should have a separate window
5. Press “Open Models”



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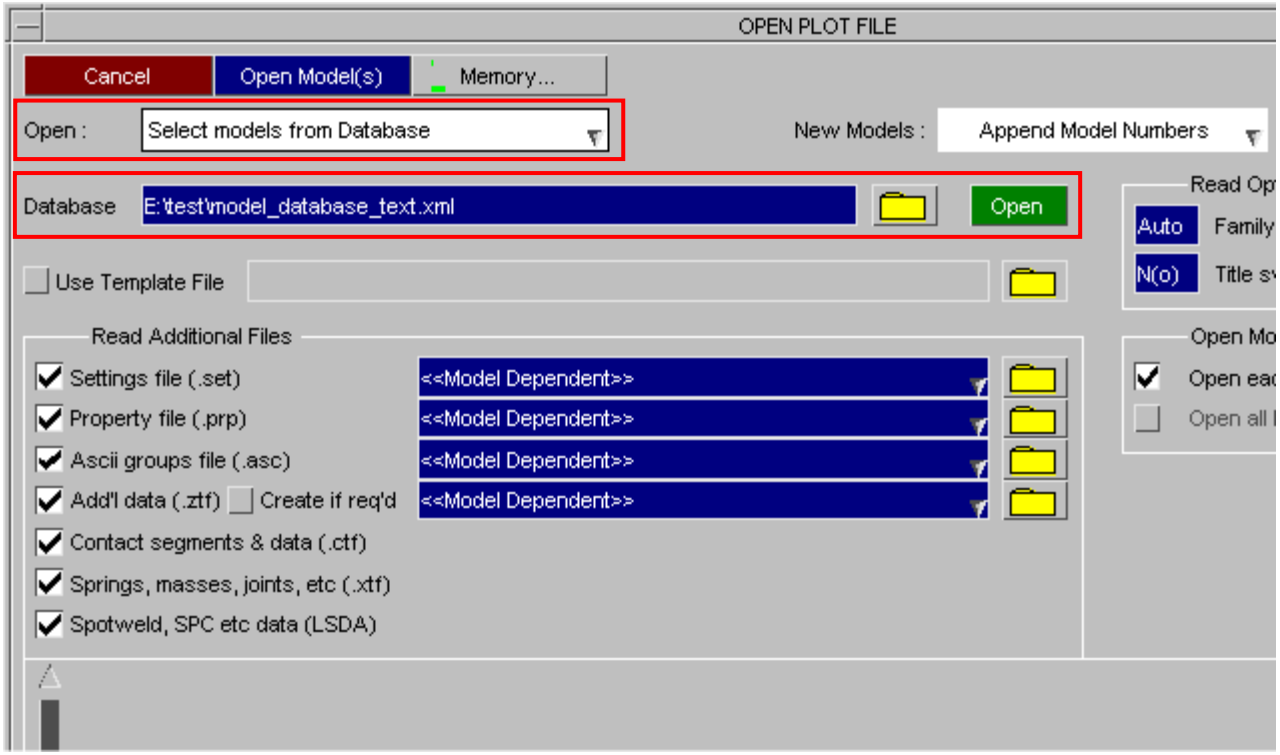
Opening Models – Model Database

- Multiple models can be selected from a model database.



1. Select the database option
2. Browse for the database file

- The same database of models is used for D3PLOT and T/HIS.

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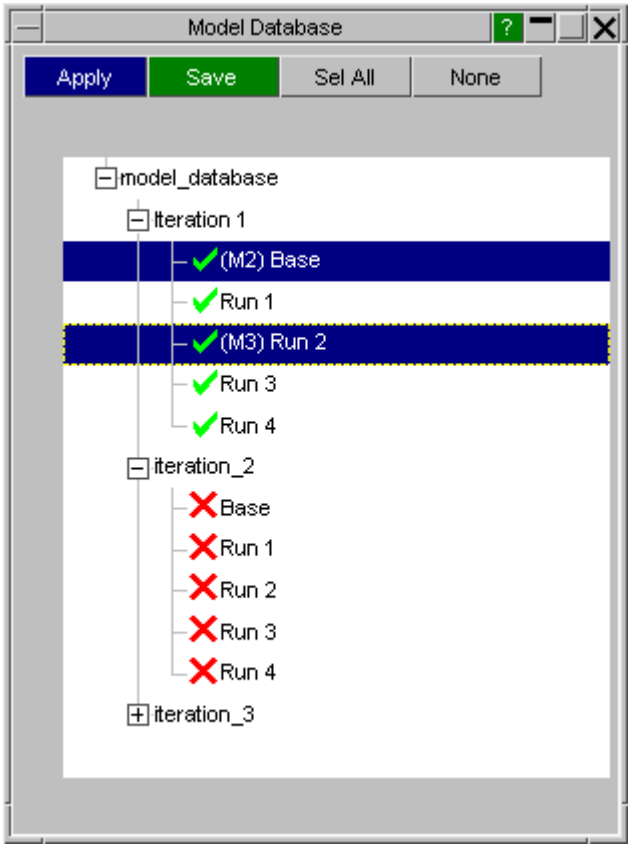
Opening Models – Model Database

- After selecting the database a new window will be displayed showing the contents of the database.
- As models are selected they are highlighted. M1, M2, etc indicates the D3PLOT model number after reading in.
- Models that cannot be found are marked with a red cross.
- Entries can be modified and deleted by right-clicking on them.
- New models can be added to the database interactively and the database saved for future use.
- The database file is XML based and can easily be edited by hand.



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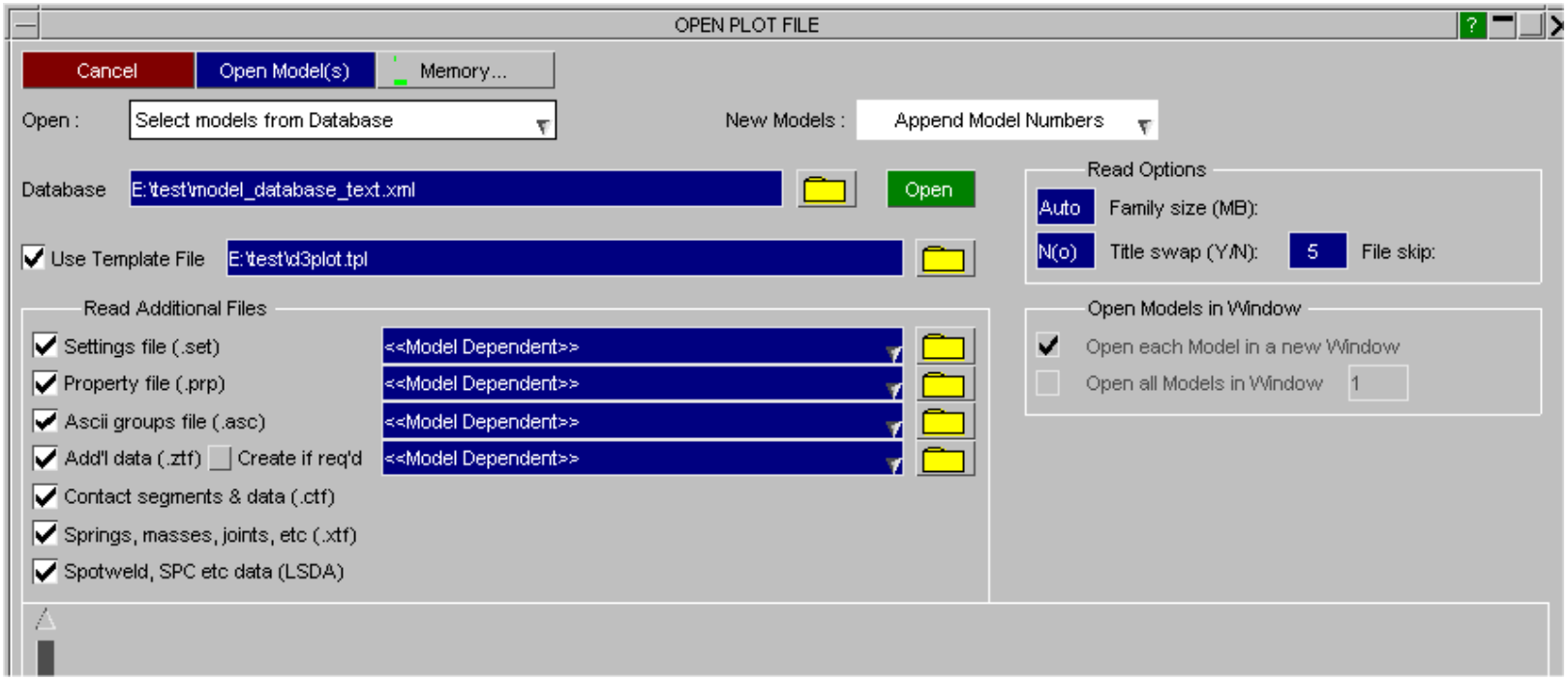
Opening Models – Template File

- An optional “Template” file can be specified when opening models:



- The “Template” file controls which window each model is loaded into.

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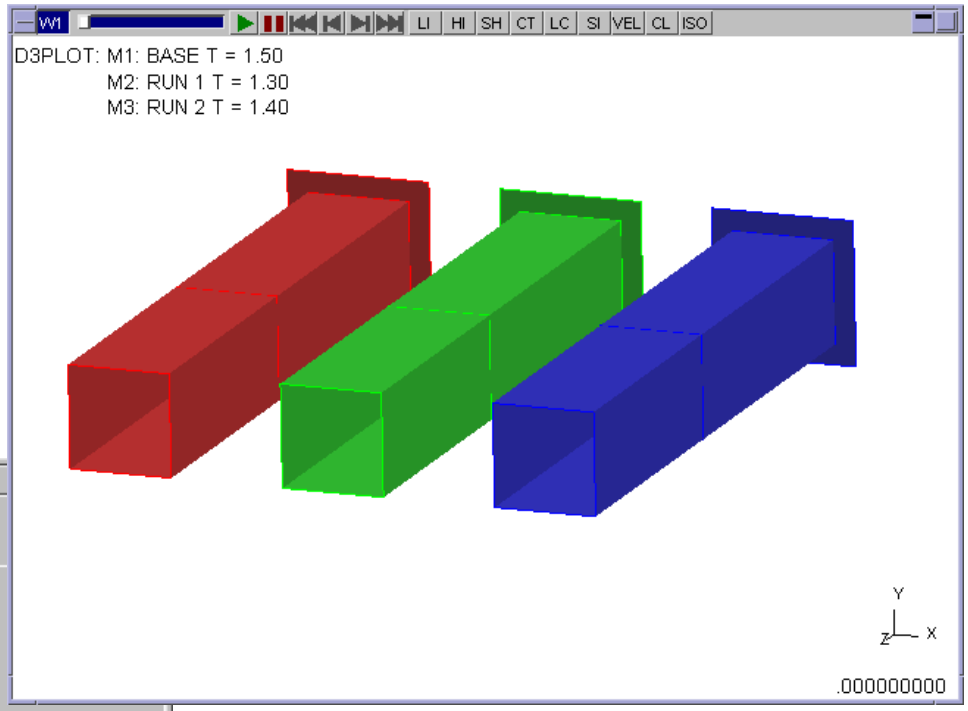
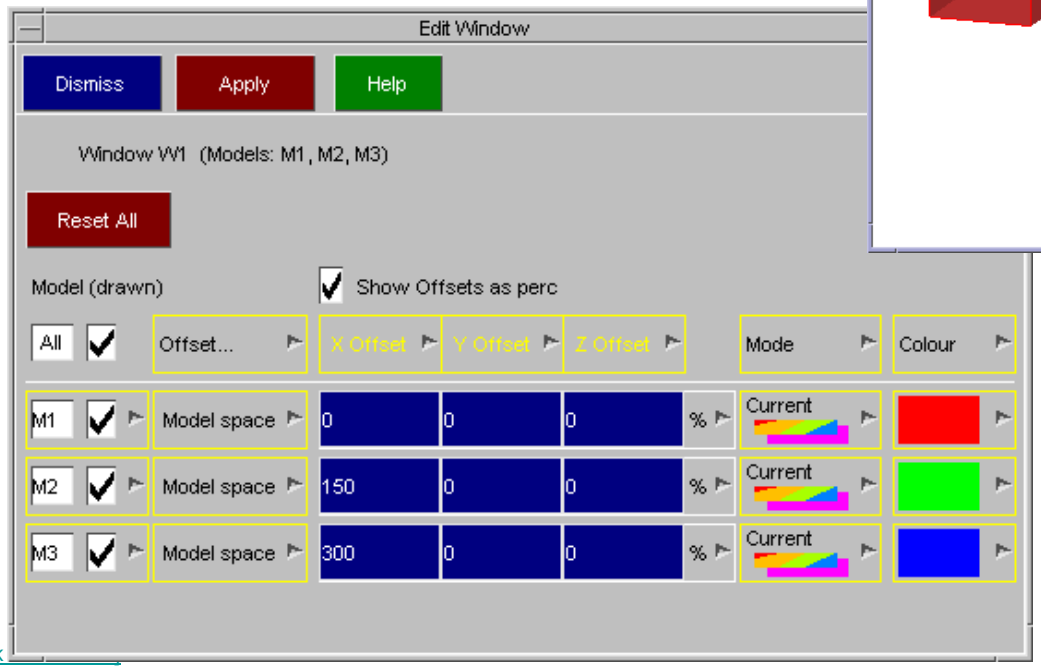
Opening Models – Template File

- All of the options available in the “EDIT Window” menu can be defined in the template file.
- The template file can contain settings for undefined models that are automatically applied after a model is opened.





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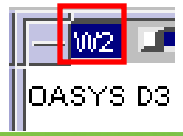
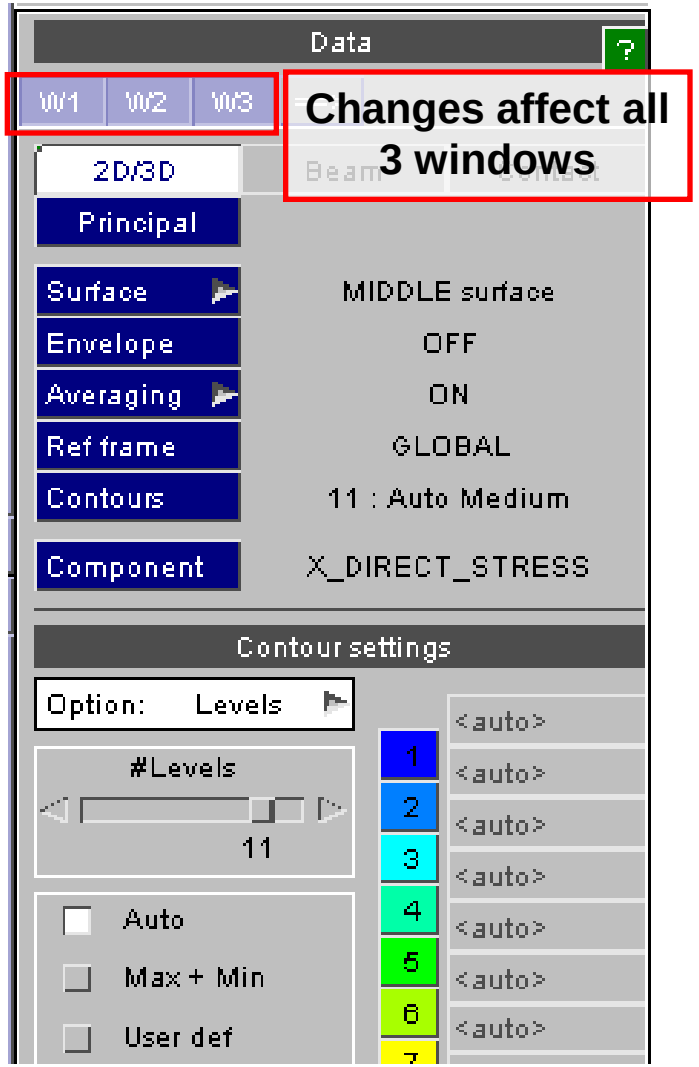
Control of settings and properties

- Some functions operate on a per-window basis. For example, cut sections may be applied to one or more or all windows; similarly for contour components, contour levels, etc.
- These menus have Window Tabs to show which windows should be affected when you work in that menu. Click the tabs to activate/deactivate.

- Can also deactivate a window by clicking here:





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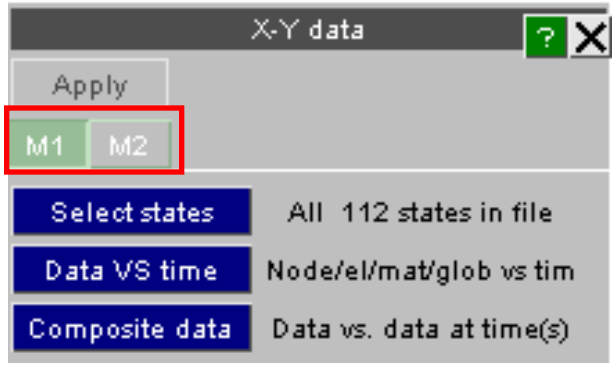
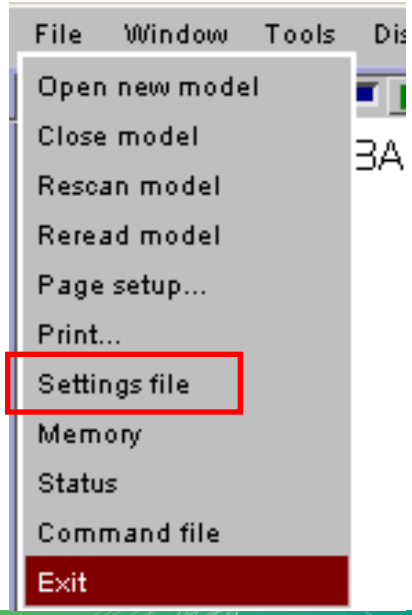
Control of settings and properties

- Colour, transparency and blanking are stored per Model, not per Window. Similarly, output from WRITE and XY_DATA is for a specific model. In these menus the tabs show M1, M2 etc instead of W1, W2. These control which model is being worked on.
- The Settings (non-model-specific, such as window layout, background colour, view, etc) may be saved to a settings file (e.g. d3plot001.set). The model-specific properties (blanking etc) may be saved to a Properties file (modelname001.prp). Both these files may be written or read back in from the File menu.
- Settings/properties files are automatically read in if the same model is read into another session of D3PLOT





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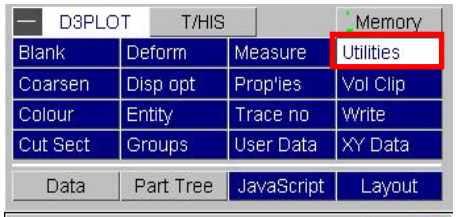
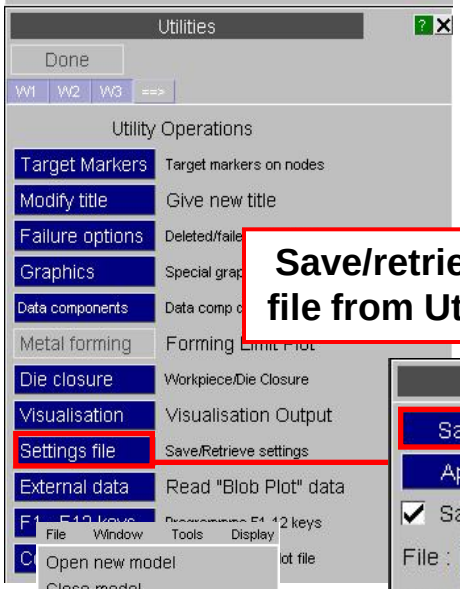
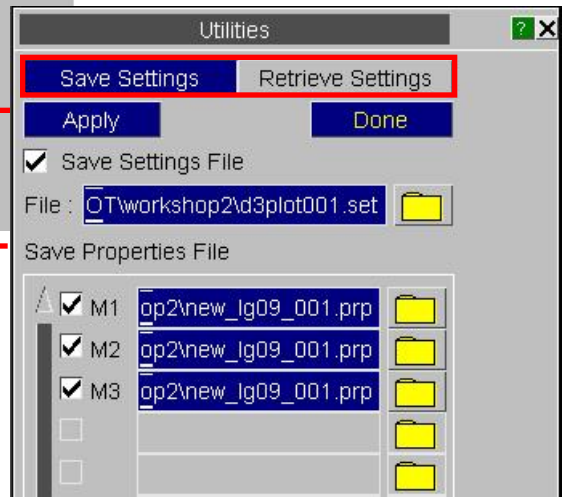
Settings files

- A “Settings” file can be saved containing all the model-independent parameters of all the windows in a D3PLOT session.
- The settings file also includes layout and contents of any graph windows. FAST-TCF scripts are included in the settings file so that the same curves may be re-created using different model data.
- It can be used to restore all your settings, views and graphs in a future D3PLOT session.

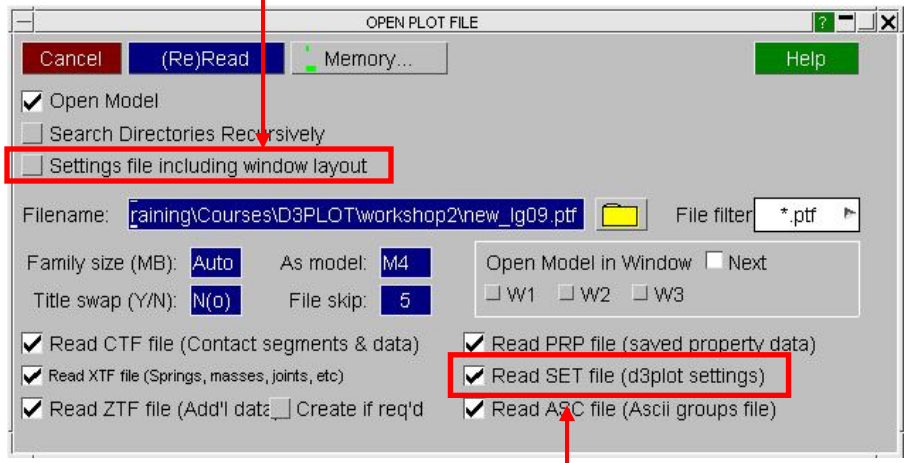




Save/retrieve settings file from Utilities menu



This option is useful when the settings file references multiple models – the user can browse separately for Model 1, Model 2, etc.



Option to read settings file when opening a model

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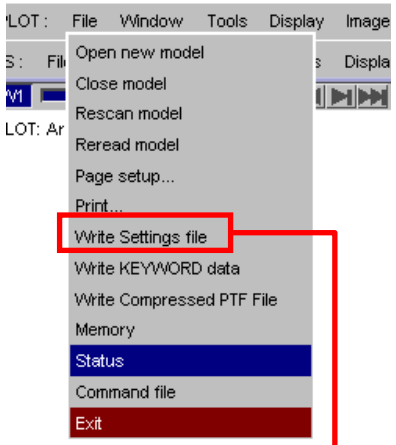
Settings files



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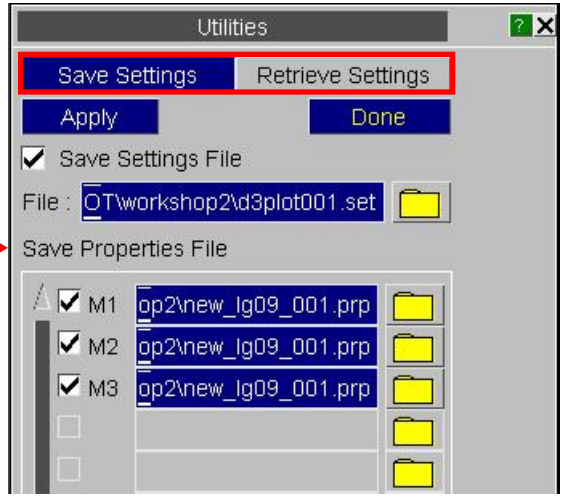
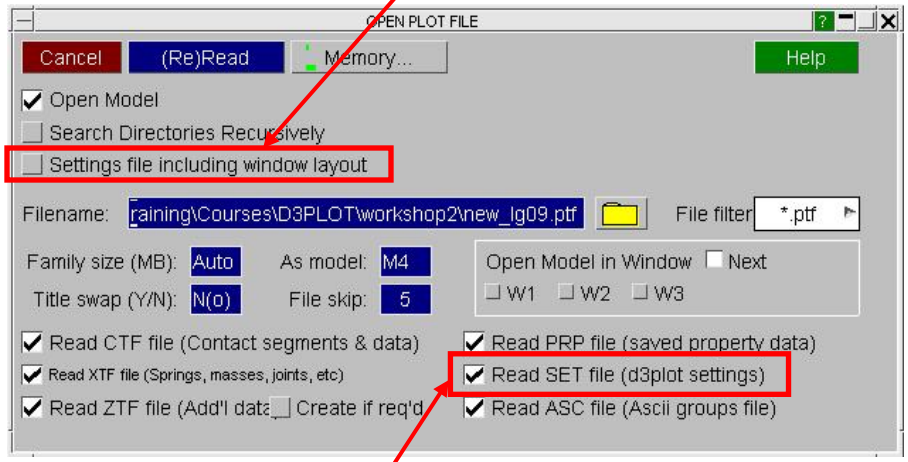
Save/retrieve settings file from Utilities menu



This option is useful when the settings file references multiple models – the user can browse separately for Model 1, Model 2, etc.



Option to read settings file when opening a model

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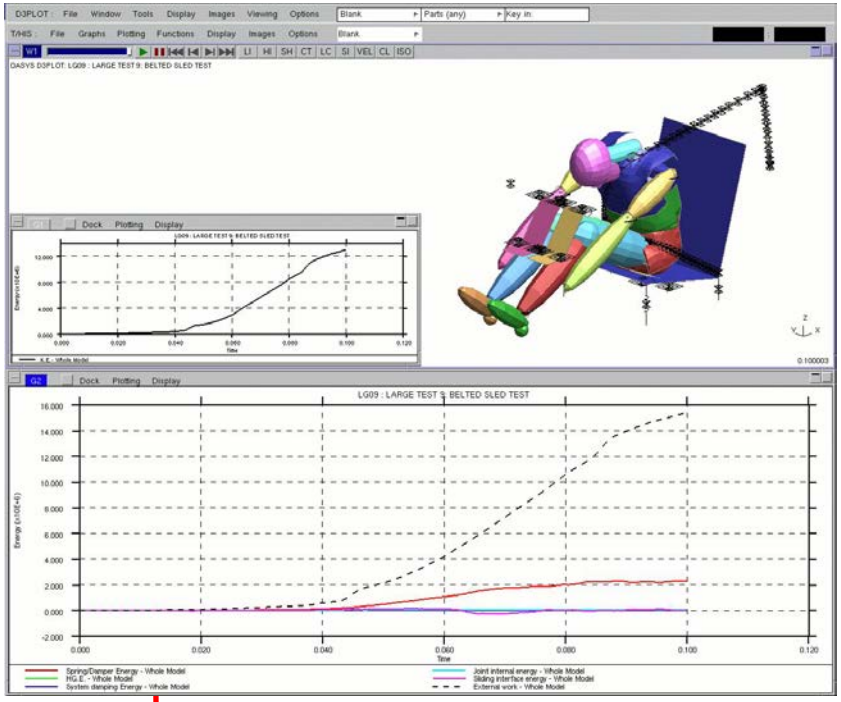
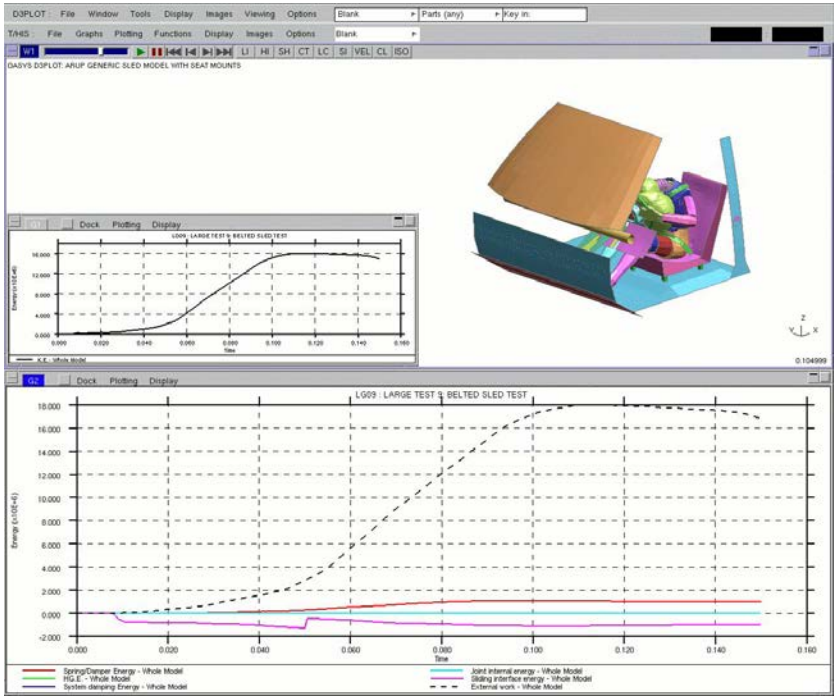
Settings files





Save a settings file

Open a different model in a new session of D3PLOT

Read in the settings file

The windows will have the same settings and layout; equivalent curves will be created automatically

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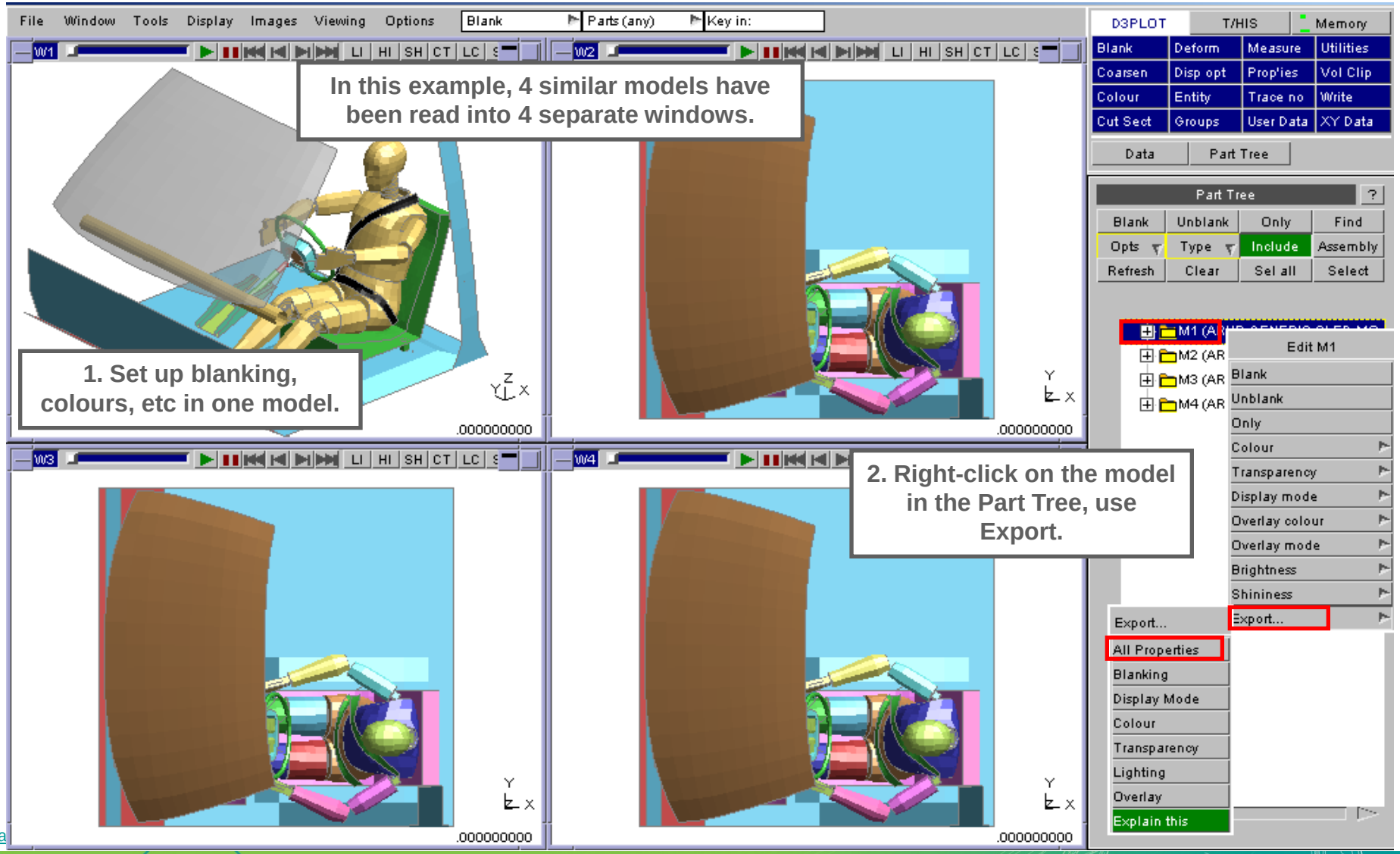
Exporting properties between models



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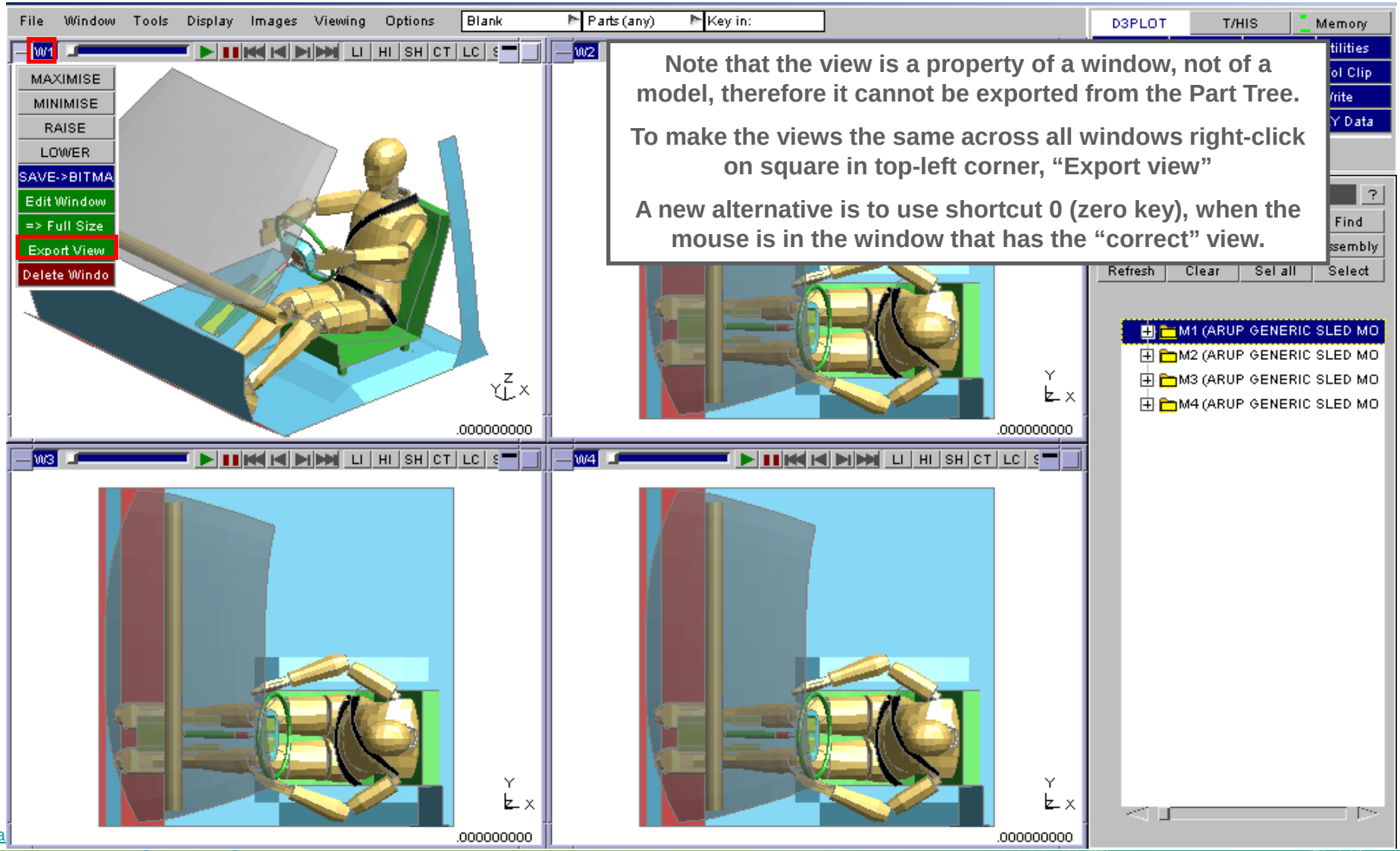
Exporting properties between models

Oasys D3PLOT



Note that the view is a property of a window, not of a model, therefore it cannot be exported from the Part Tree.

To make the views the same across all windows right-click on square in top-left corner, “Export view”

A new alternative is to use shortcut 0 (zero key), when the mouse is in the window that has the “correct” view.

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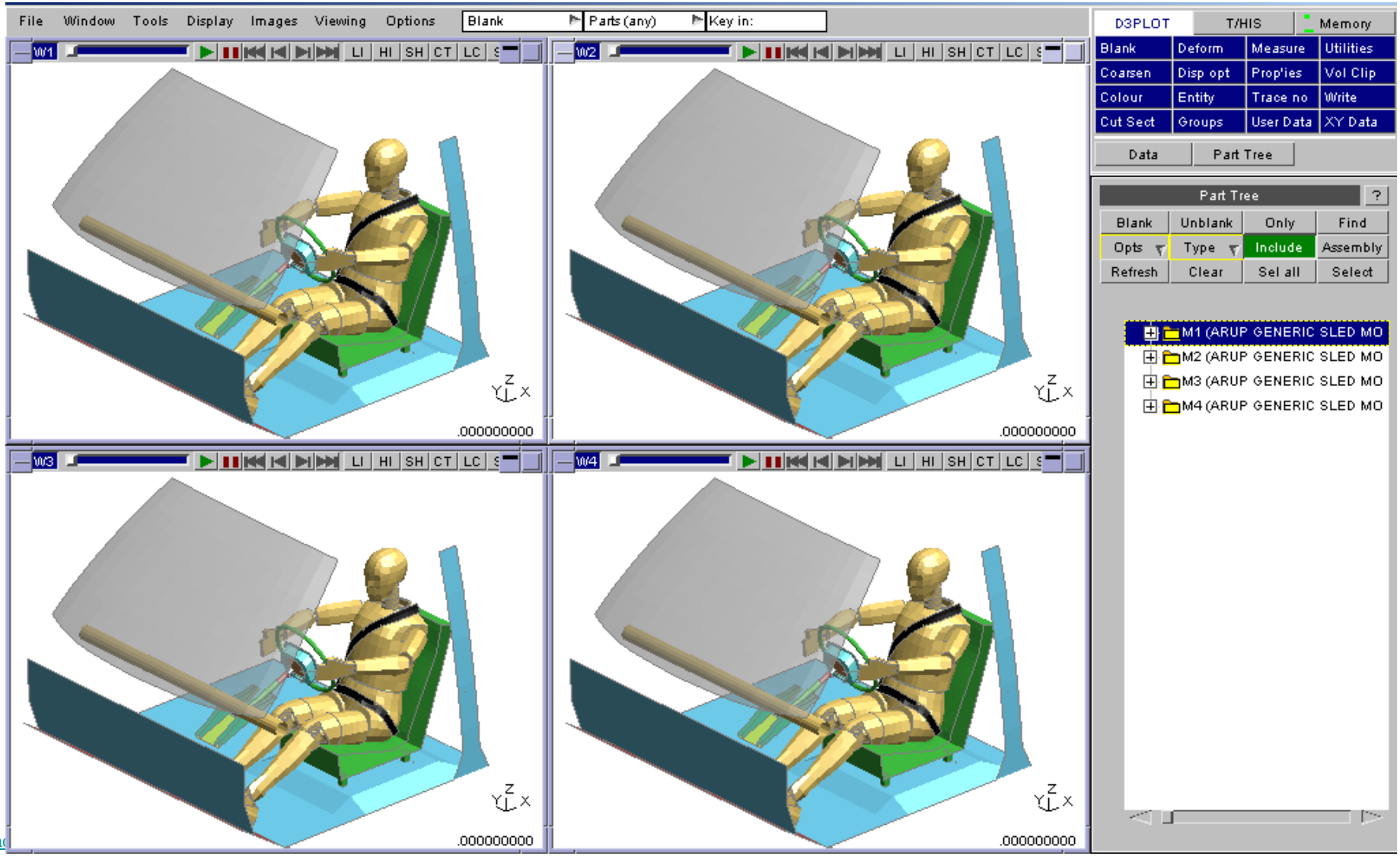
Exporting properties between models

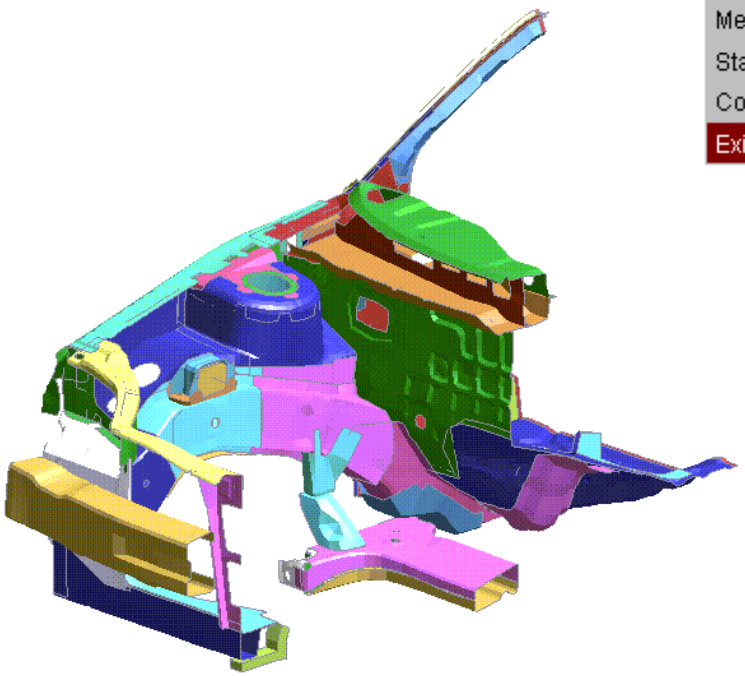
Oasys D3PLOT

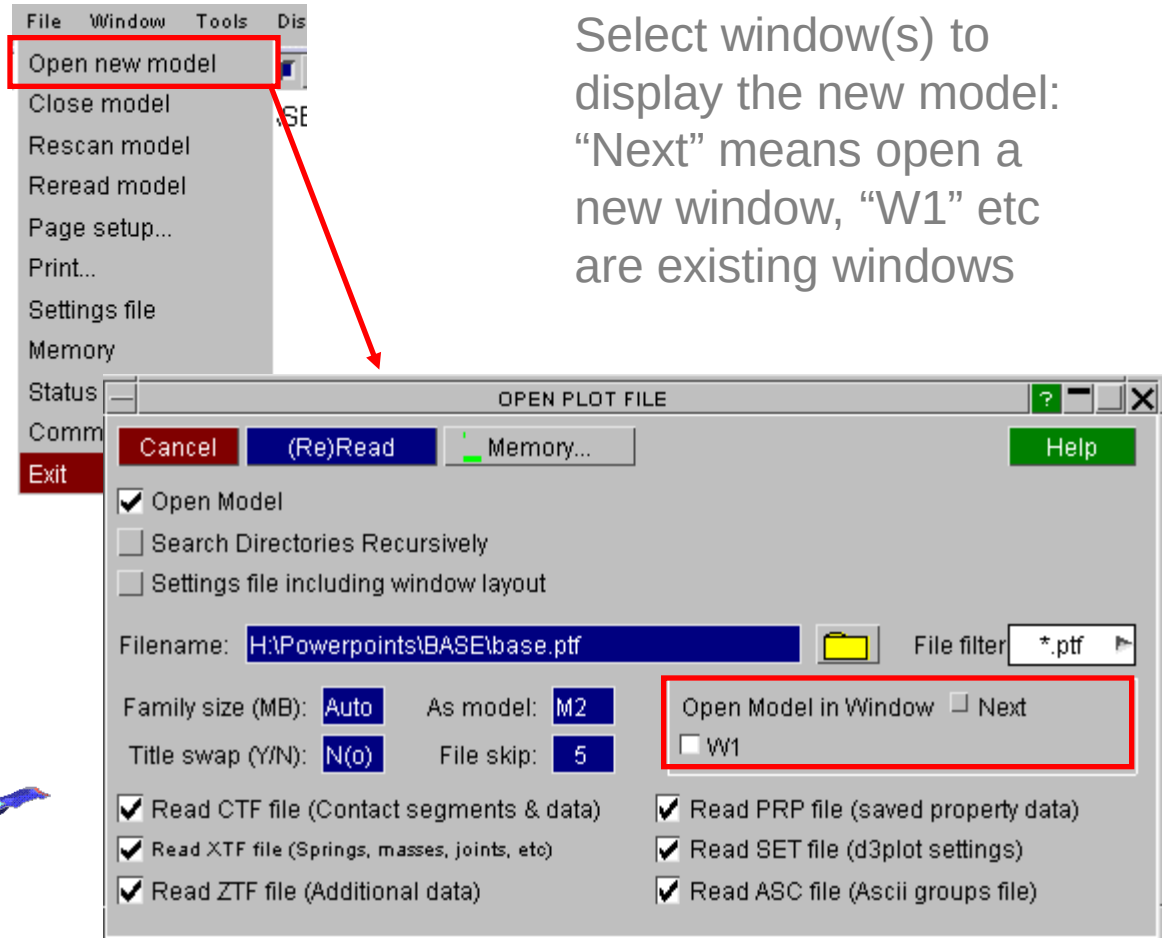


Overlay & comparison of models

Oasys D3PLOT

Now we wish to compare a similar model in the same window.





Select window(s) to display the new model: “Next” means open a new window, “W1” etc are existing windows

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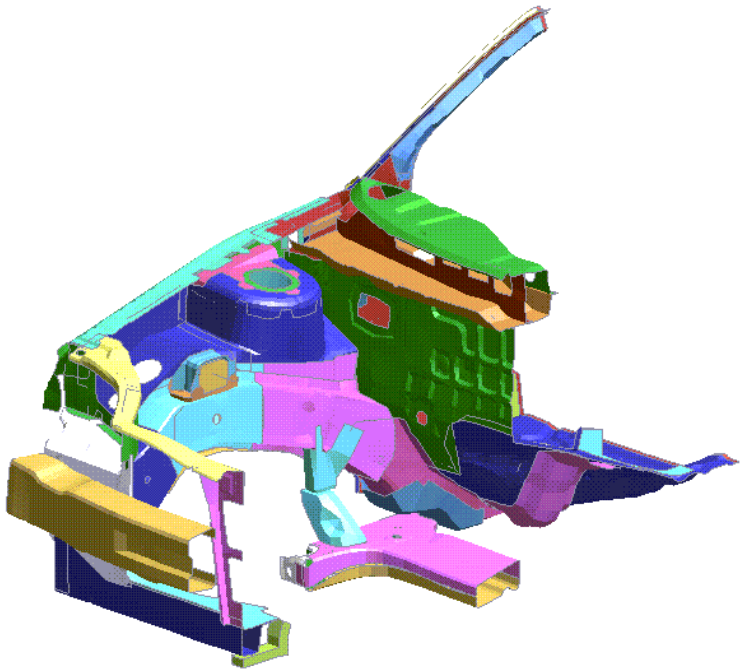
Overlay & comparison of models

Oasys D3PLOT

If two or more models are superimposed on one another, it is difficult to differentiate and compare.



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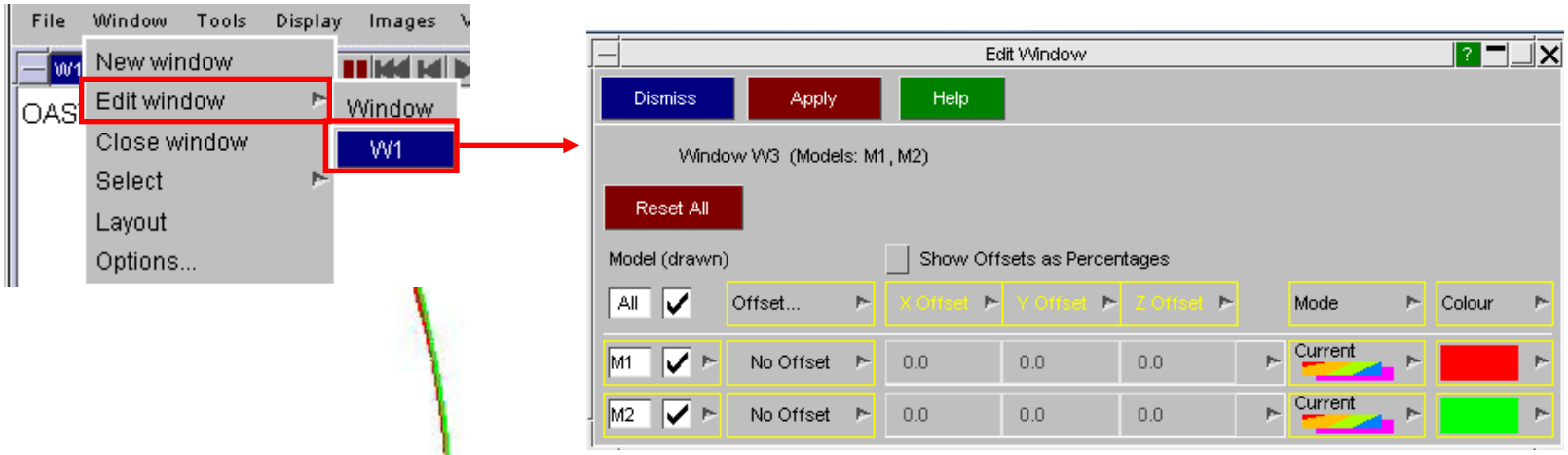
Overlay & comparison of models



The models can be distinguished by colour-coding each model and the differences can be viewed, e.g. in a cut section plot.

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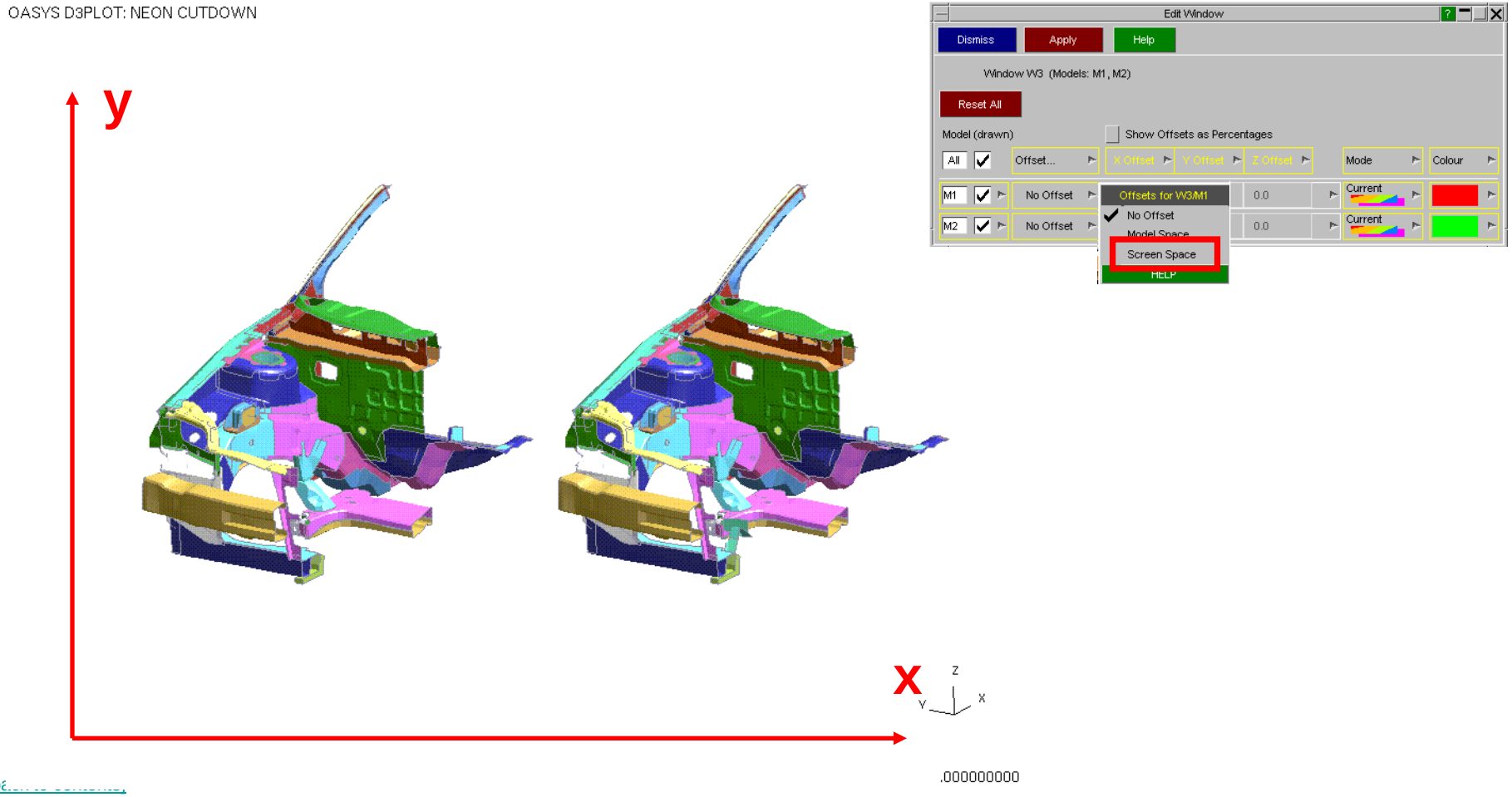
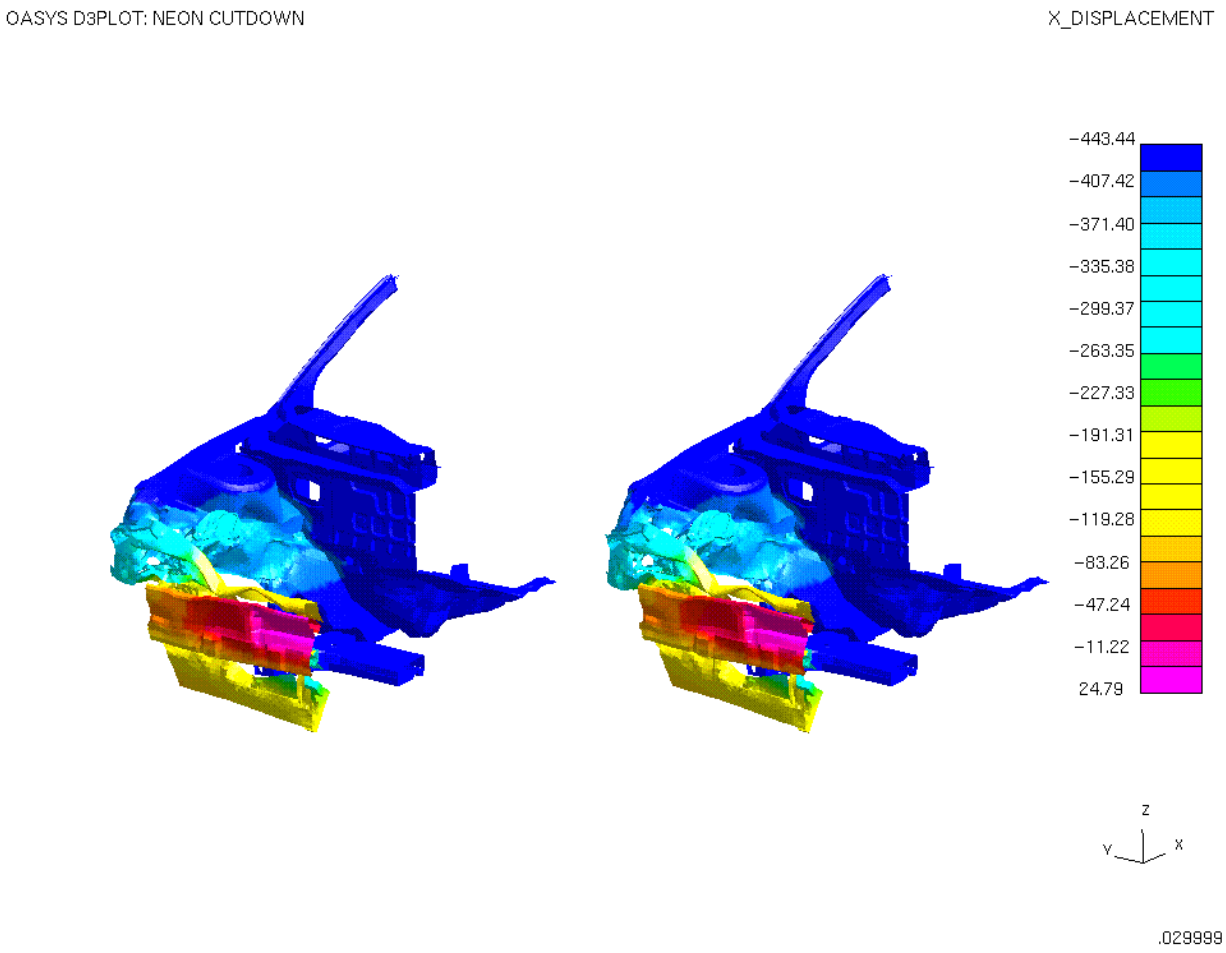
Overlay & comparison of models

"Screen space" will offset the models in the coordinate system shown in red



Overlay & comparison of models

Differences in results between similar models can be hard to see…



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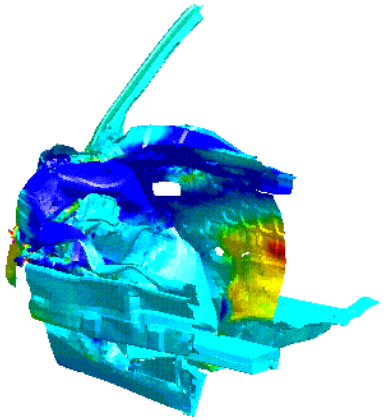
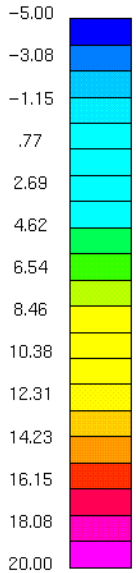
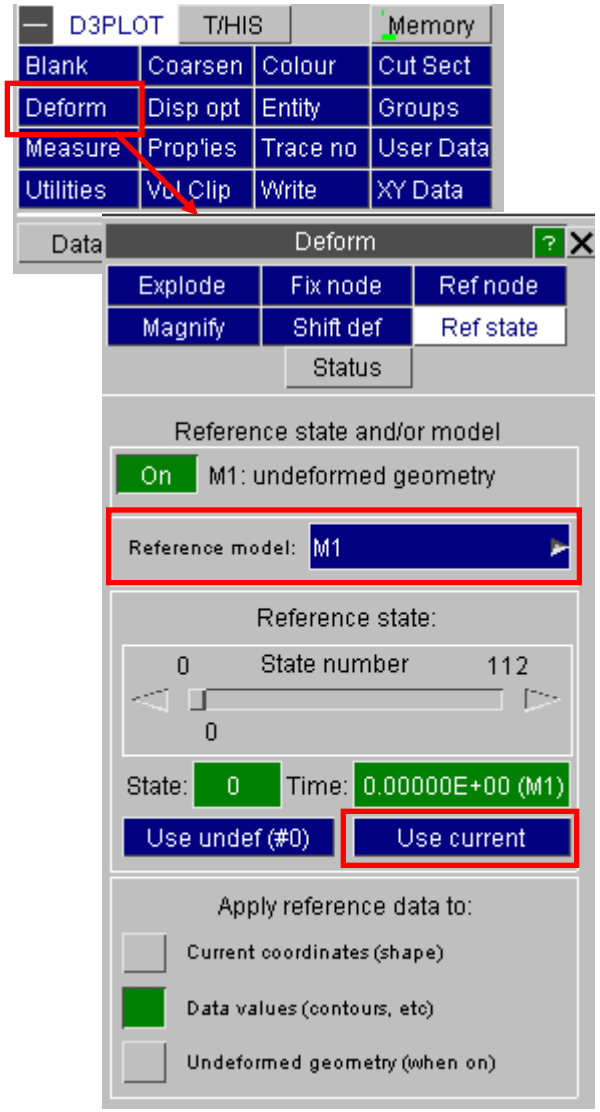
Overlay & comparison of models

"Use Current" means: plot the difference in the output variable relative to the current time state of the reference model (shown on the left). In other words, the reference state is the one shown in the picture, and will be updated during animation. As seen the reference model results relative to itself is zero.







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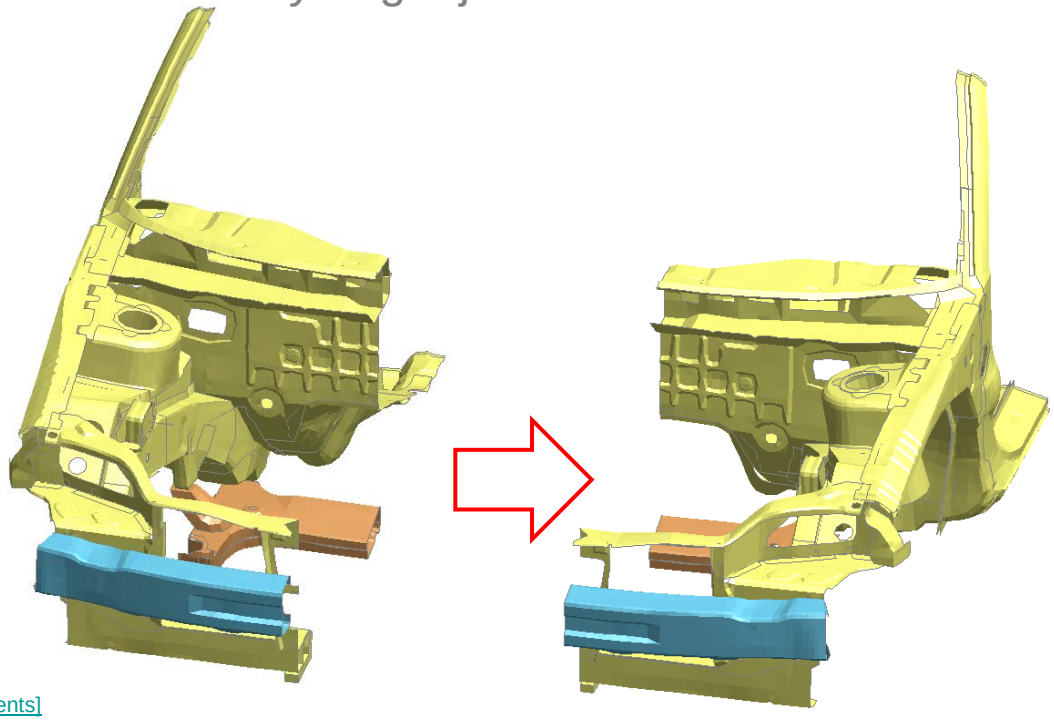
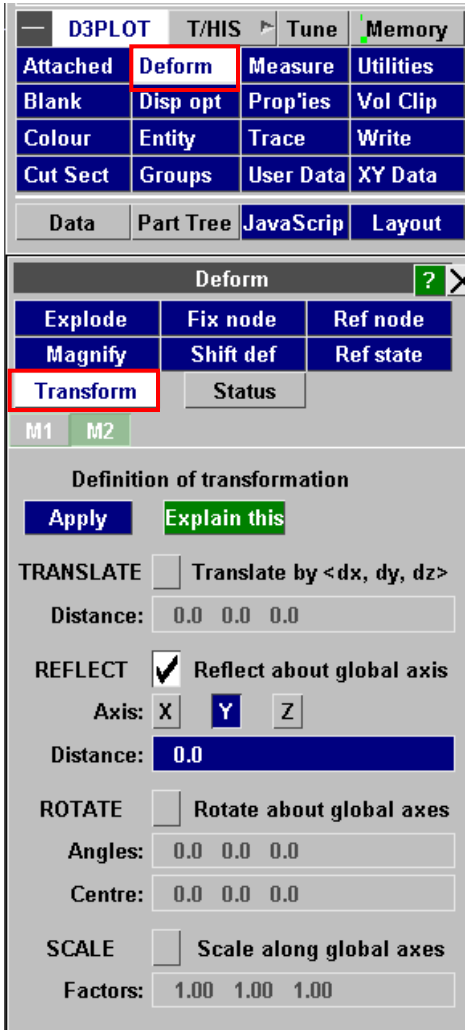
Reflecting Models and Results

- Deform=>Transform applies a geometrical transformation to the model geometry and results.
- A typical application would be to change a right-half model into a left-half model.
- The transformation does not change a half-model into a full model – you get just the reflected half.





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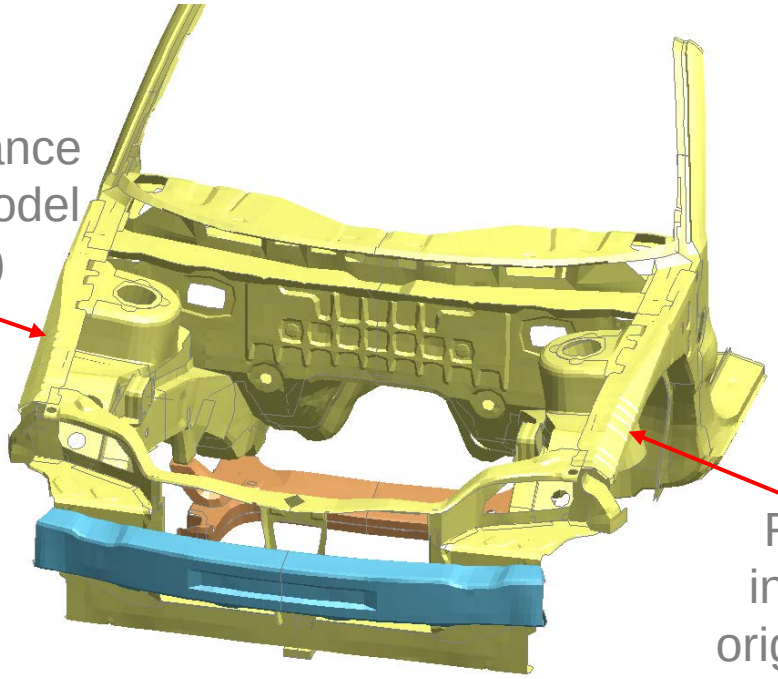
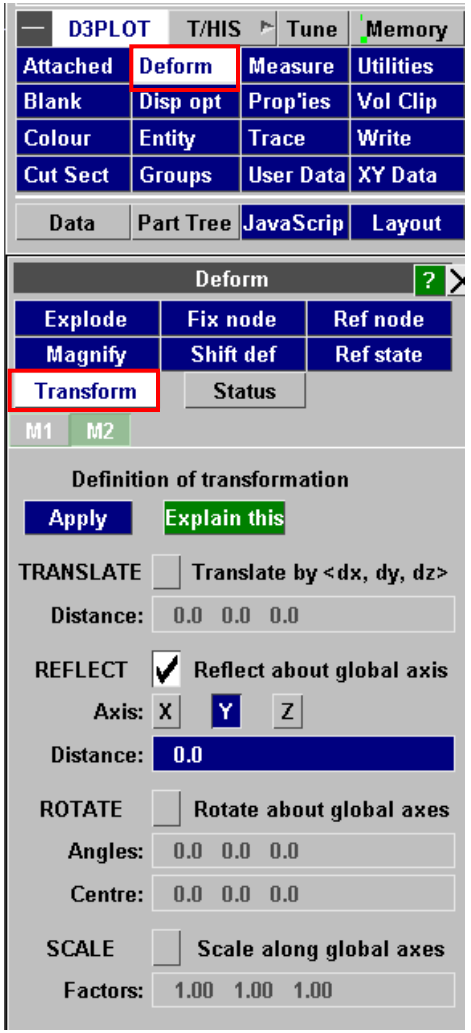
Reflecting Models and Results

- To see both halves together, read the original model again into the same window (this will become Model 2).





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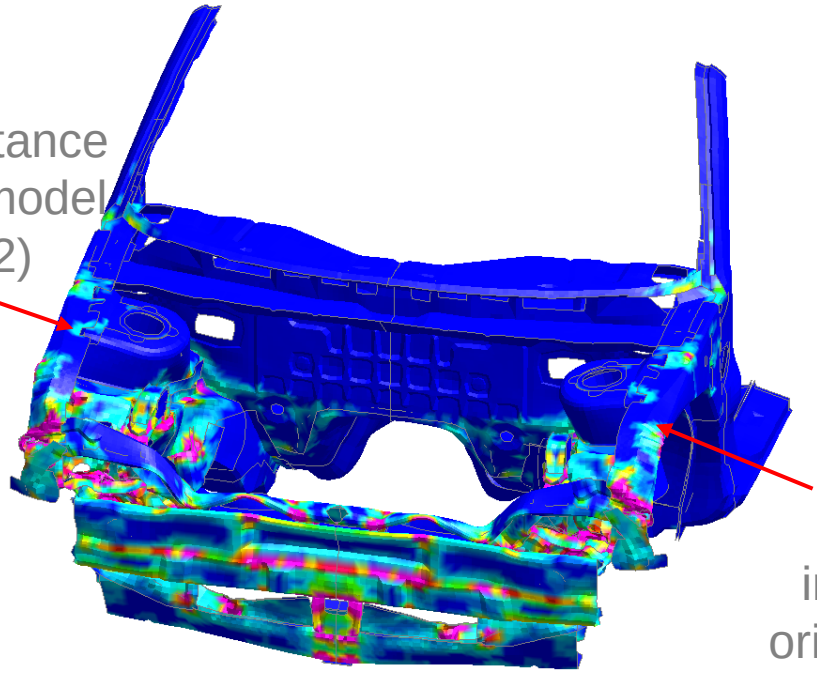
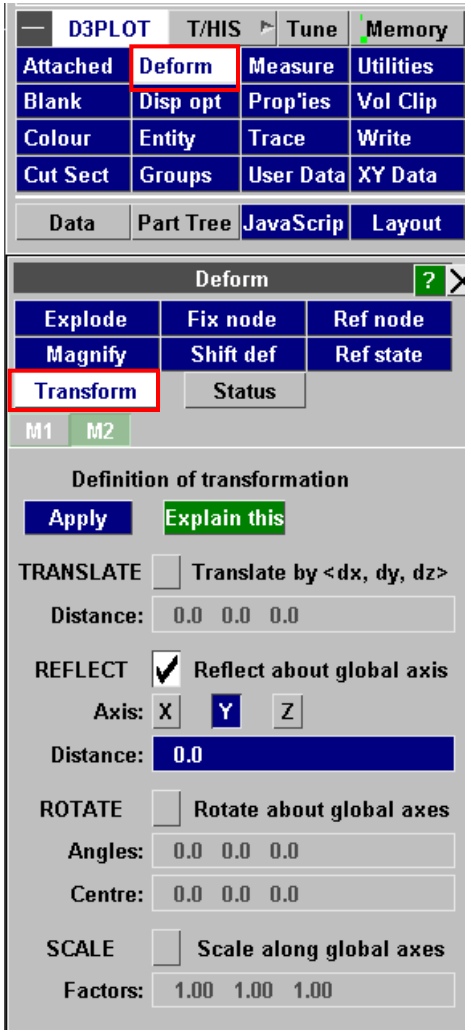
Reflecting Models and Results

- Results are also transformed, so the pair of models can be animated and results plotted as if it were a single full model.



Second instance of original model (Model 2)

Reflected instance of original model (Model 1)



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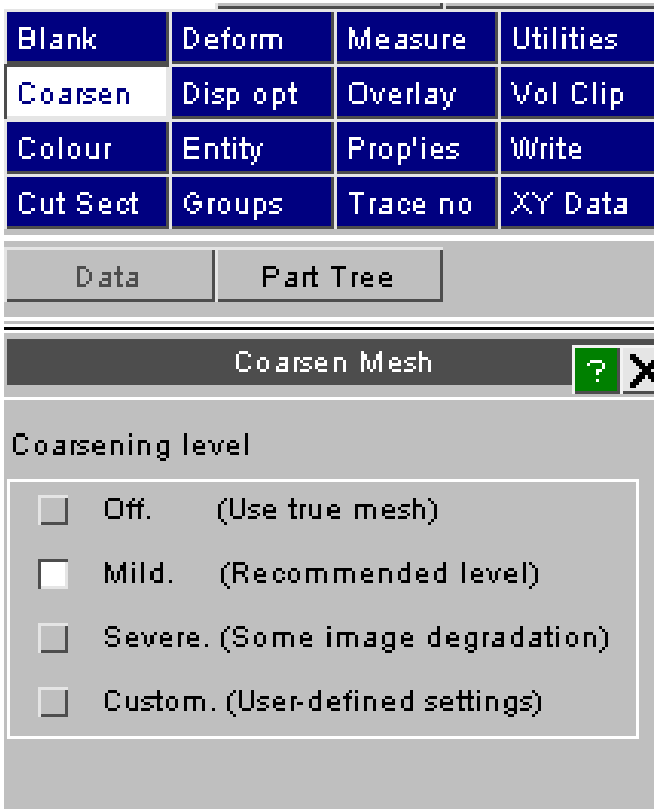
Faster animation

- The COARSEN feature can be used to speed up the animation. This works on models containing large numbers of quadrilateral shell elements by reducing mesh resolution in areas where the mesh is relatively flat.



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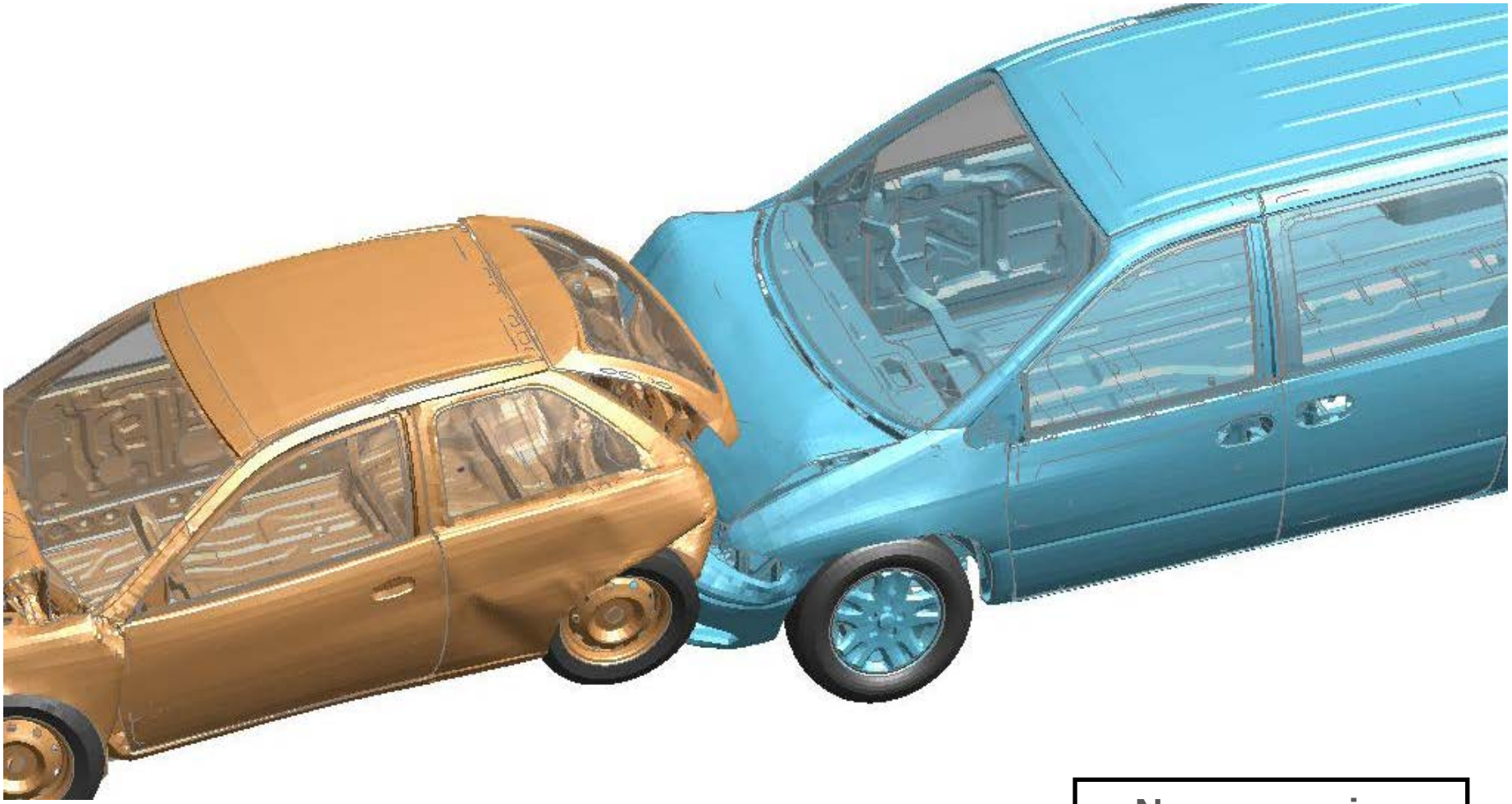
Faster animation - Coarsen

Oasys D3PLOT



No coarsening

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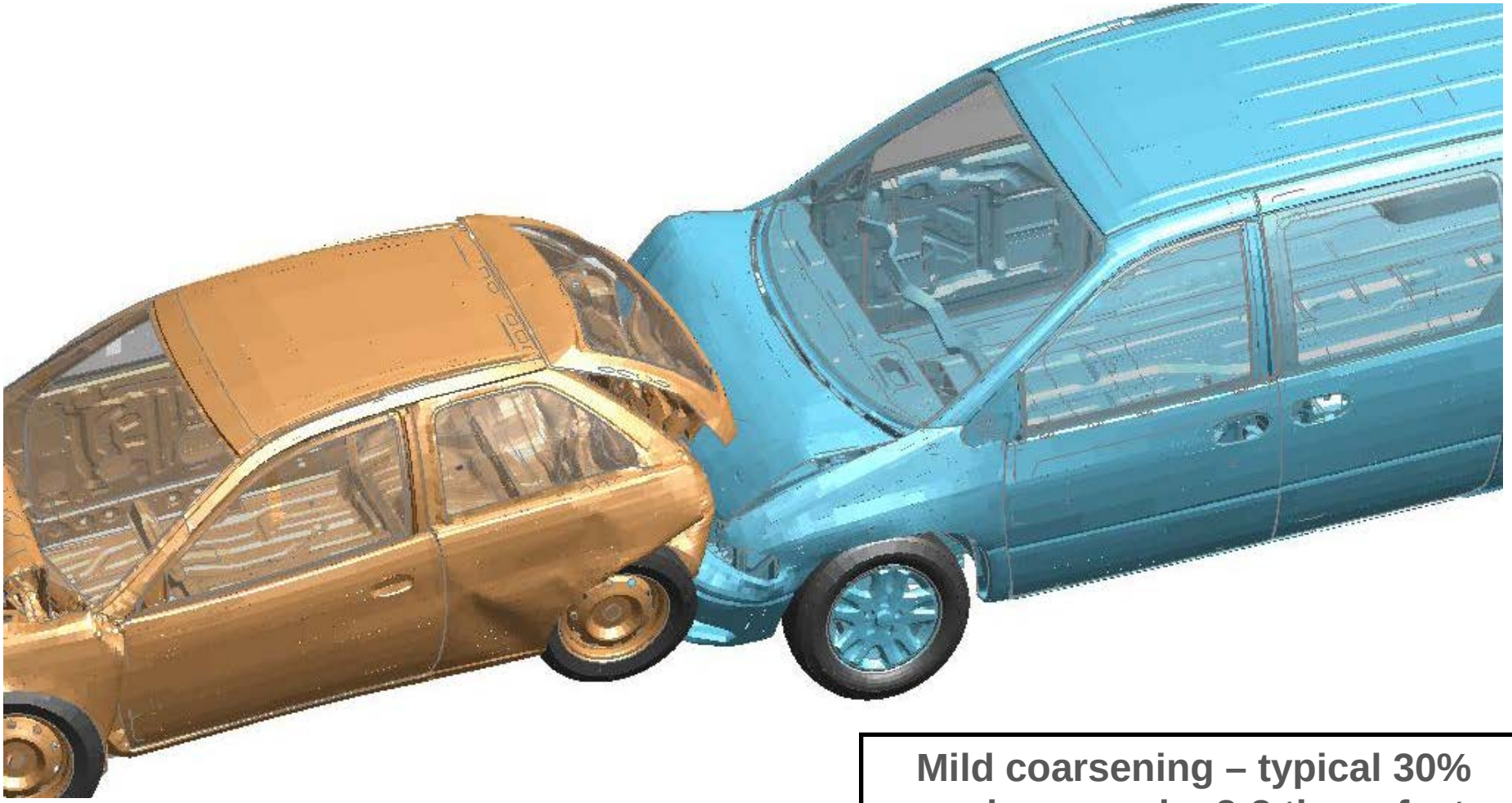
Faster animation - Coarsen

Oasys D3PLOT



Mild coarsening – typical 30% speed-up, can be 2-3 times faster for multi-million element models.

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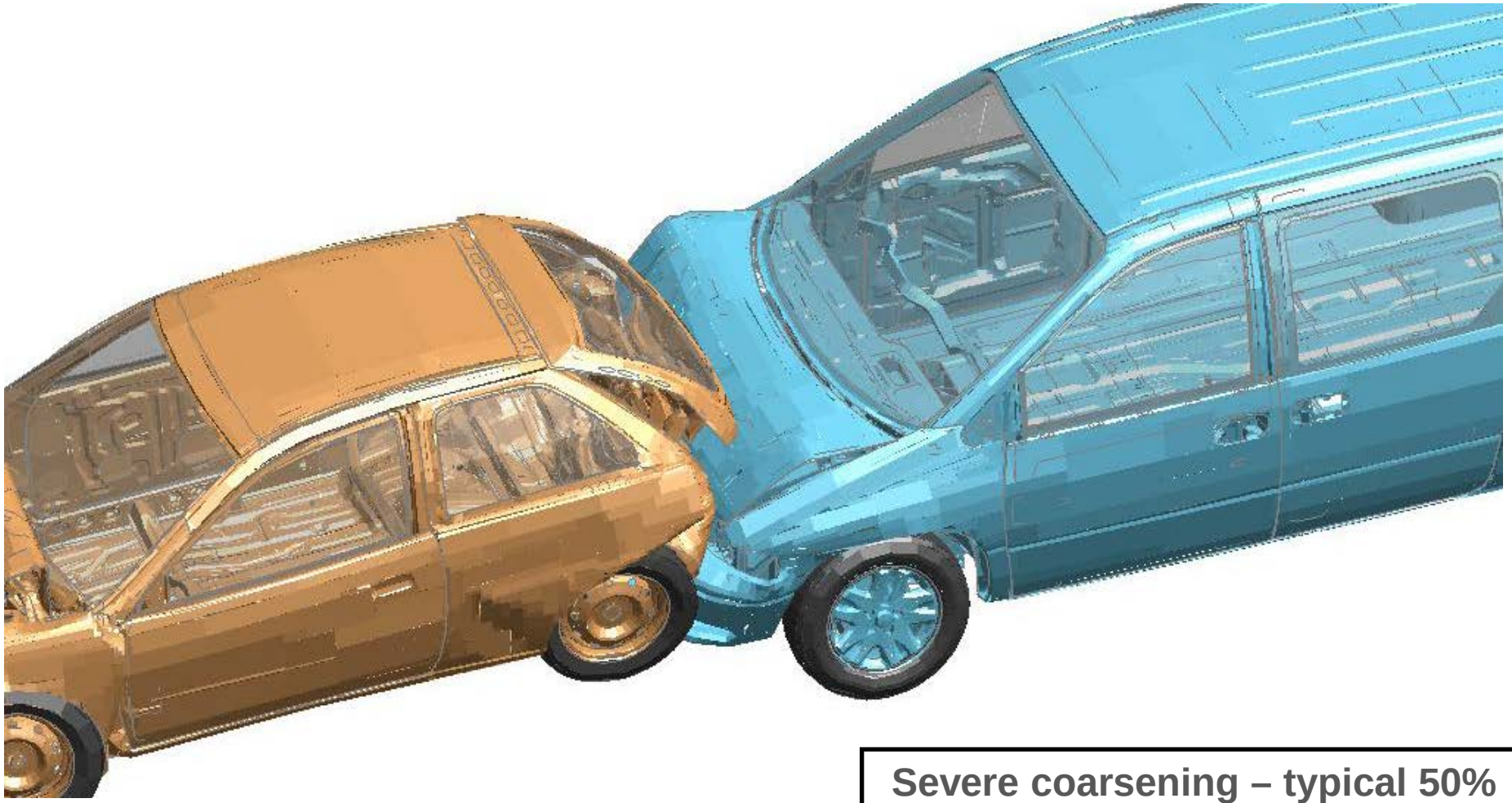
Faster animation - Coarsen

Oasys D3PLOT



Severe coarsening – typical 50% speed-up, can be 4-5 times faster for multi-million element models.

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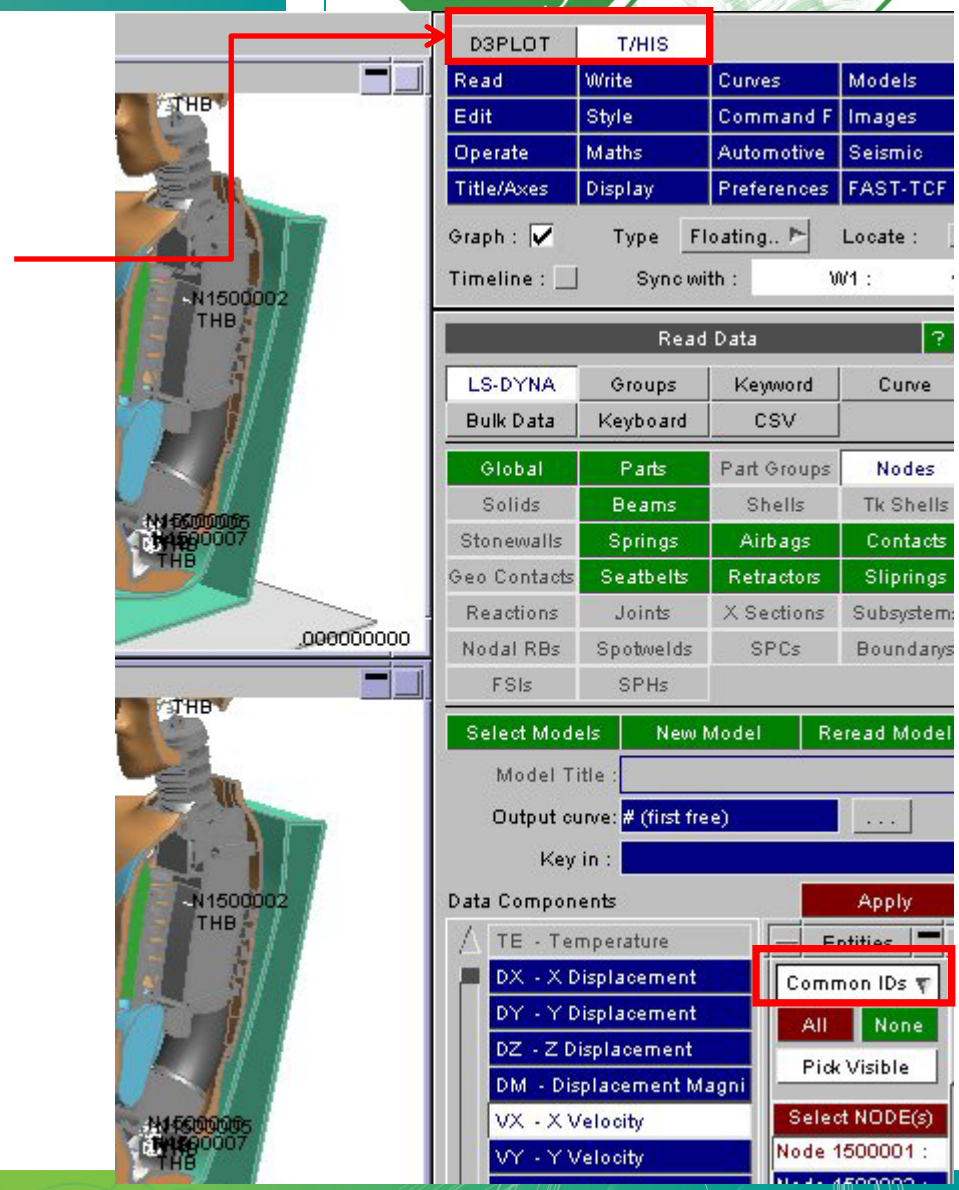
D3PLOT-T/HIS link

- Click on the T/HIS tab to start T/HIS inside D3PLOT
- Full T/HIS menu system available – switch between D3PLOT and T/HIS menus using the tabs
- Supports multiple models, T/HIS automatically opens all models; results from either or both models are continuously available. Here, the entity display type is set to “Common Ids”, allowing comparison of results for the same node across the two models.



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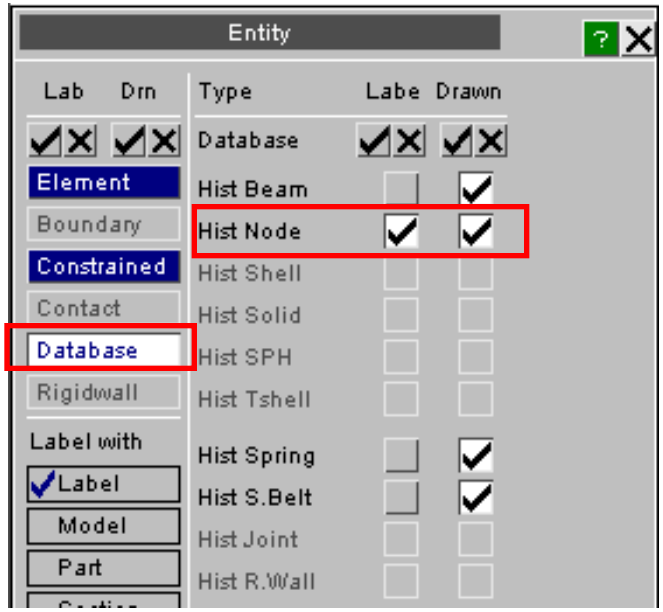
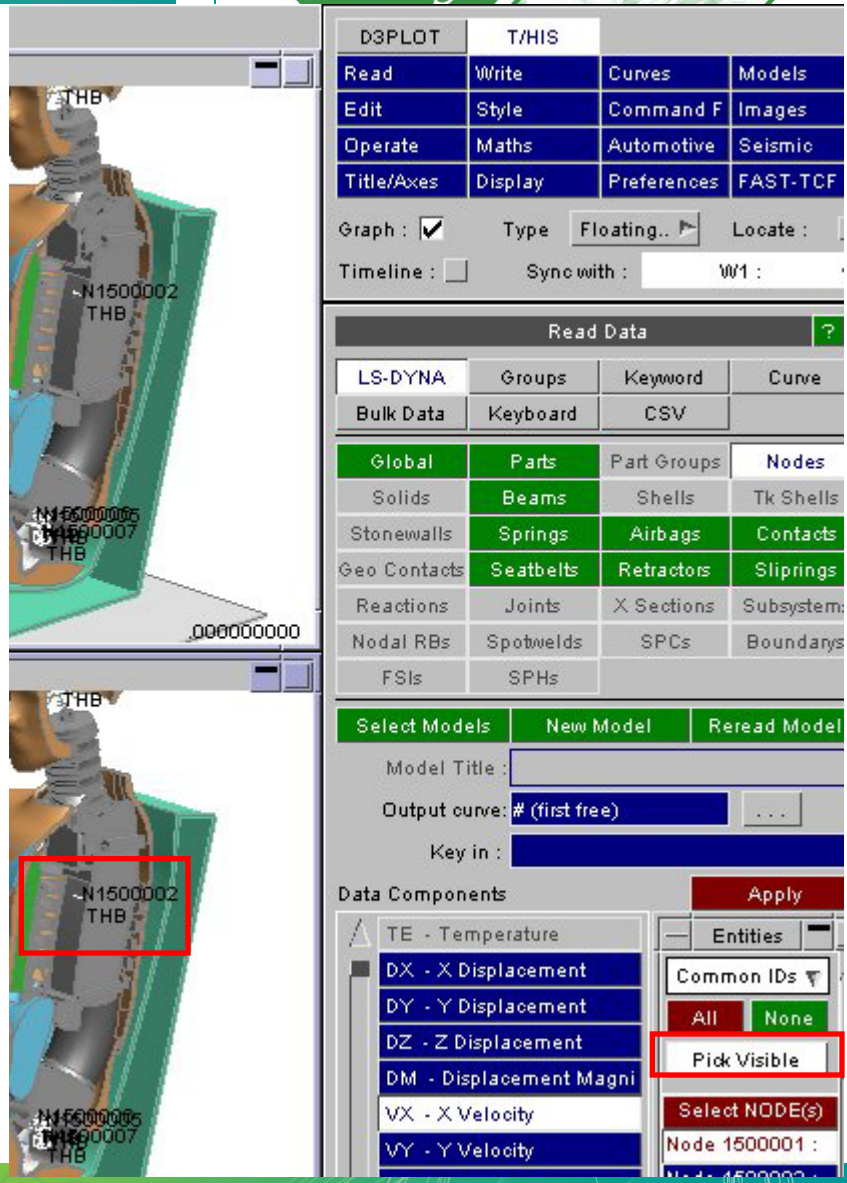
D3PLOT-T/HIS link

- When picking entities in T/HIS, a Pick Visible option is available, allowing entities to be picked from the D3PLOT windows
- Visibility of time-history data entities, and labels of these, are turned on/off in D3PLOT's Entity menu





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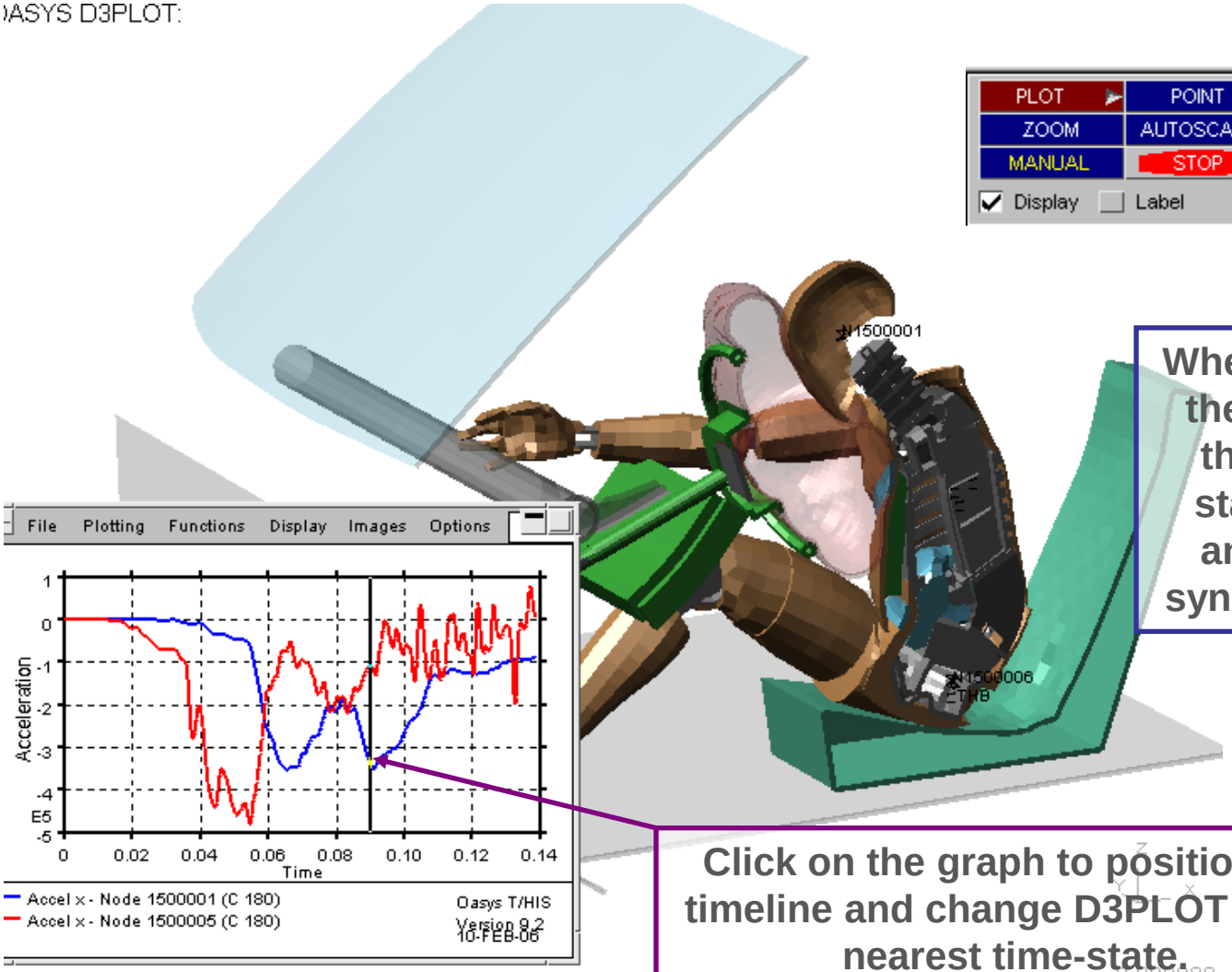
D3PLOT-T/HIS link

)ASYS D3PLOT:



When this box is checked, the Timeline is drawn at the time of the current state in D3PLOT. When animating, it moves to synchronise with D3PLOT

Click on the graph to position the timeline and change D3PLOT to the nearest time-state.

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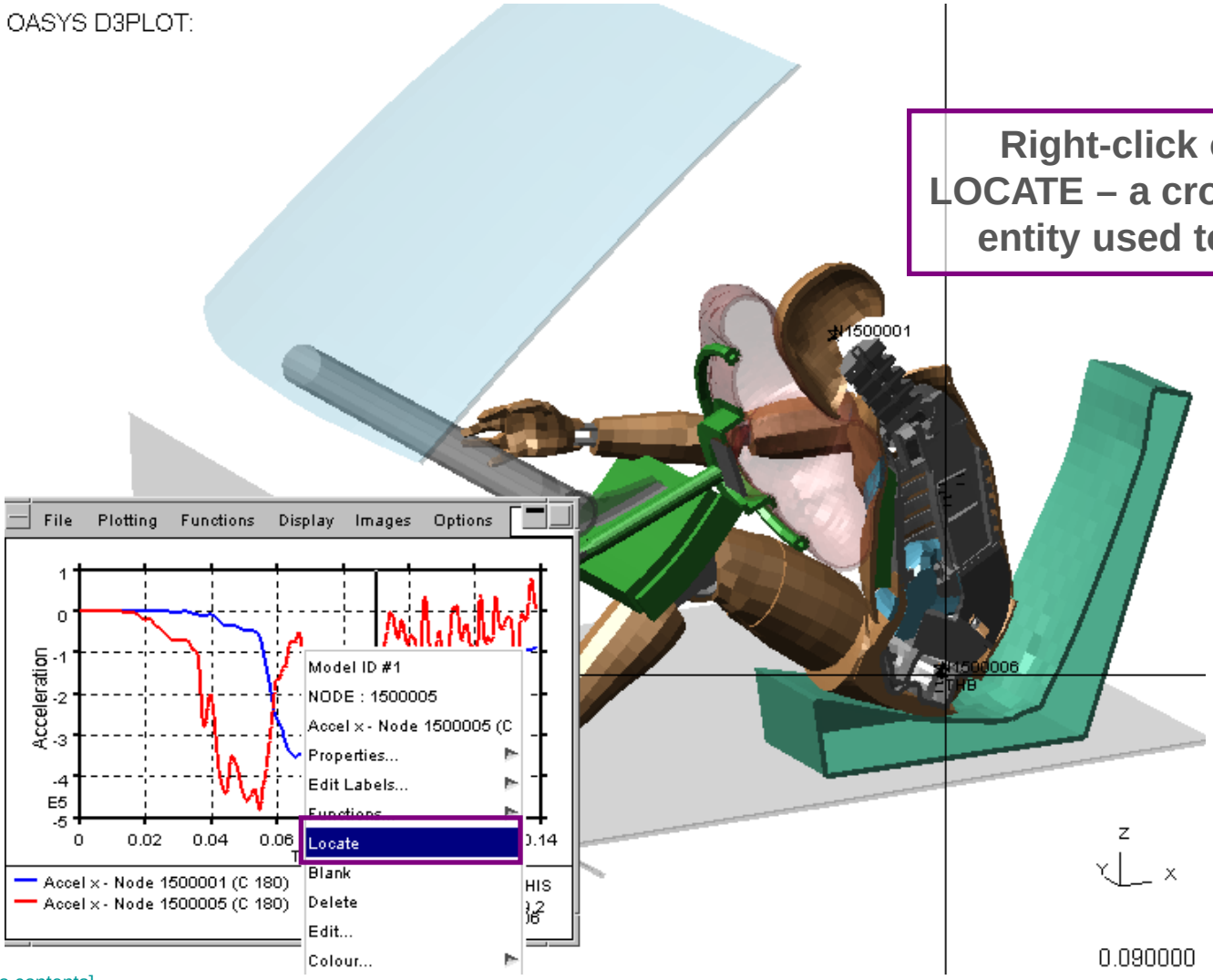
D3PLOT-T/HIS link



Right-click on a curve, press LOCATE – a cross-hair identifies the entity used to create that curve

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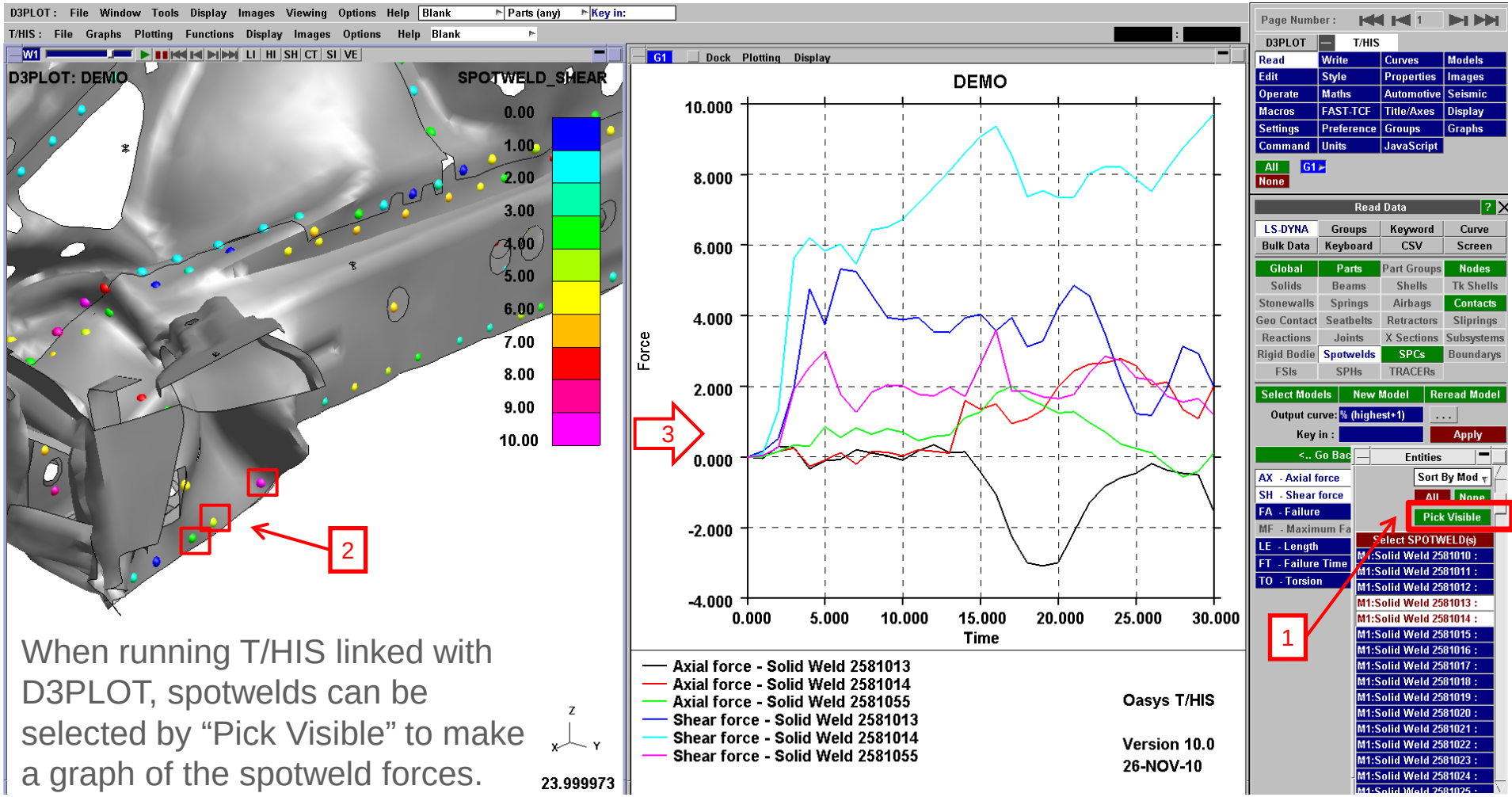
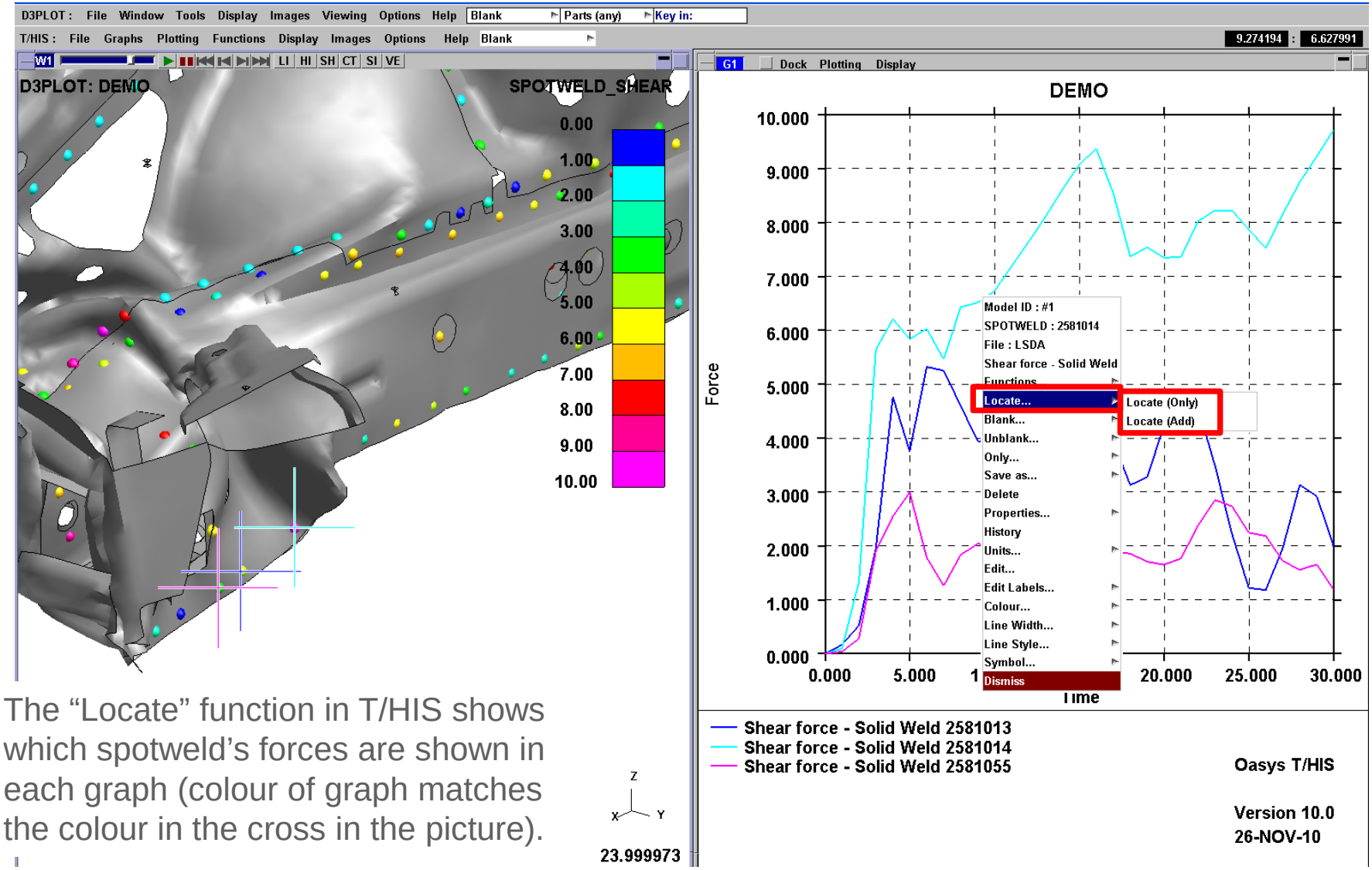
D3PLOT-T/HIS link



When running T/HIS linked with D3PLOT, spotwelds can be selected by “Pick Visible” to make a graph of the spotweld forces.

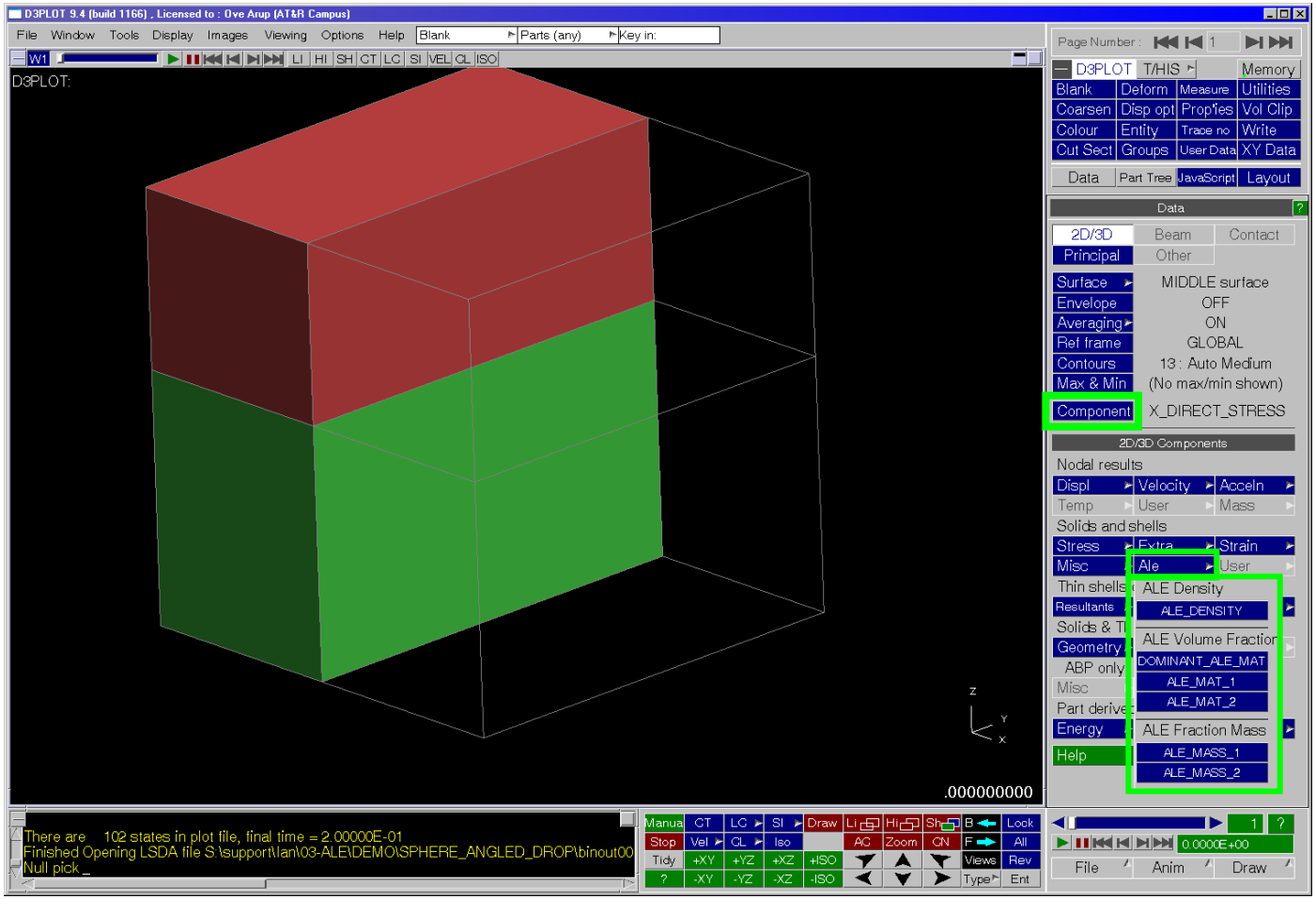
D3PLOT-T/HIS link



The “Locate” function in T/HIS shows which spotweld’s forces are shown in each graph (colour of graph matches the colour in the cross in the picture).

ALE data components

LS-DYNA outputs a number of specific ALE data components that can be plotted in D3PLOT



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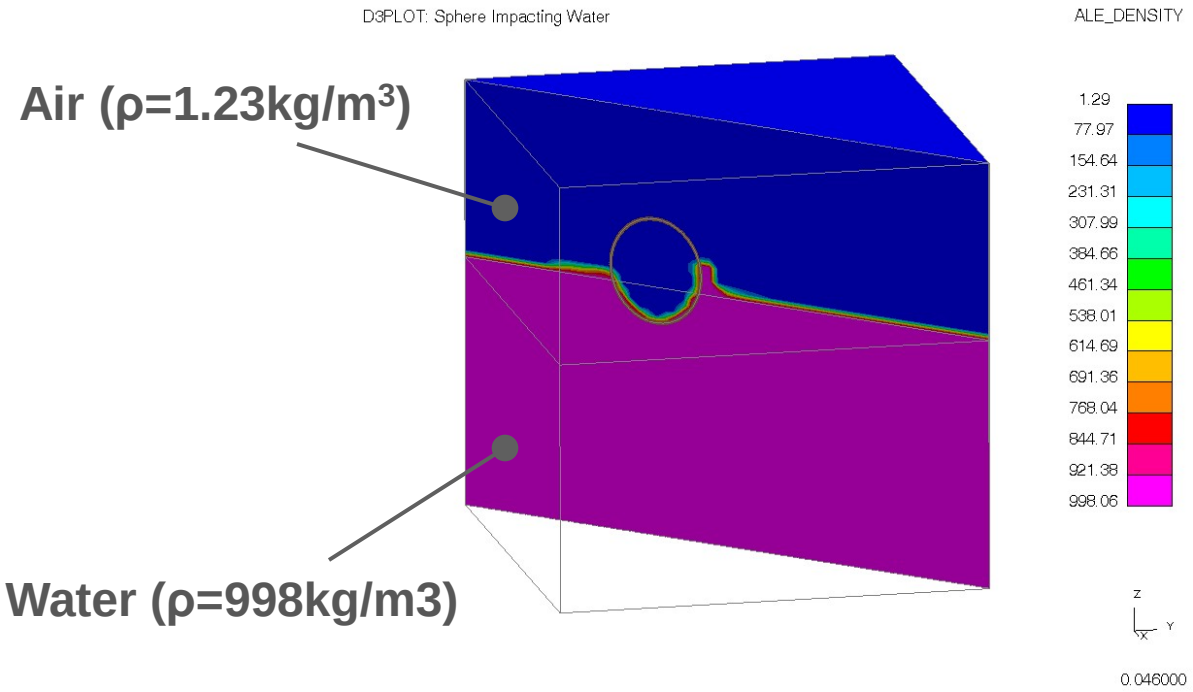
ALE data components

Fluid Density

This show the density of the fluid in each element which can vary during an analysis



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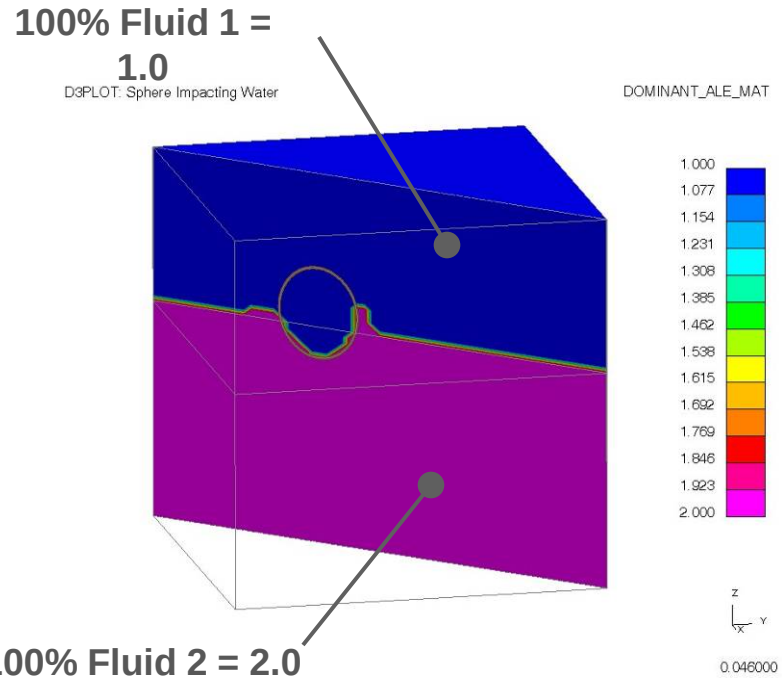
ALE data components

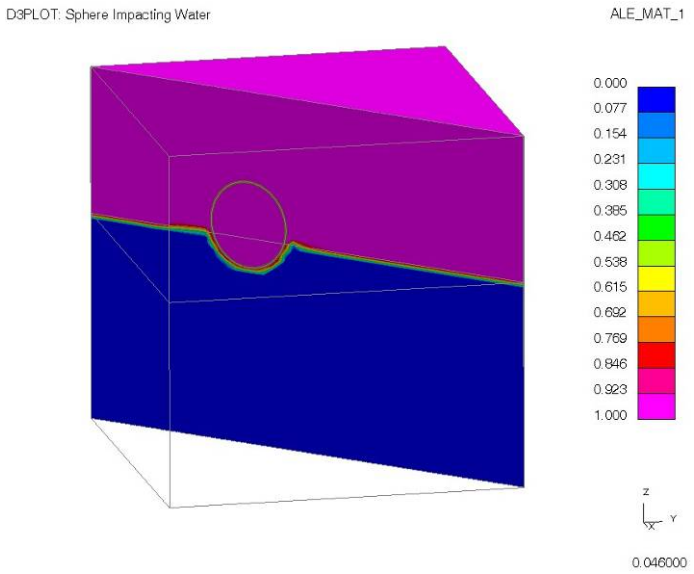
ALE Volume Fraction:

One option allows you to show all the fluids (1 = Fluid 1, 2 = Fluid 2 etc) or you can show the volume fraction for each fluid in your model.

Dominant ALE Fraction



ALE Fluid 1



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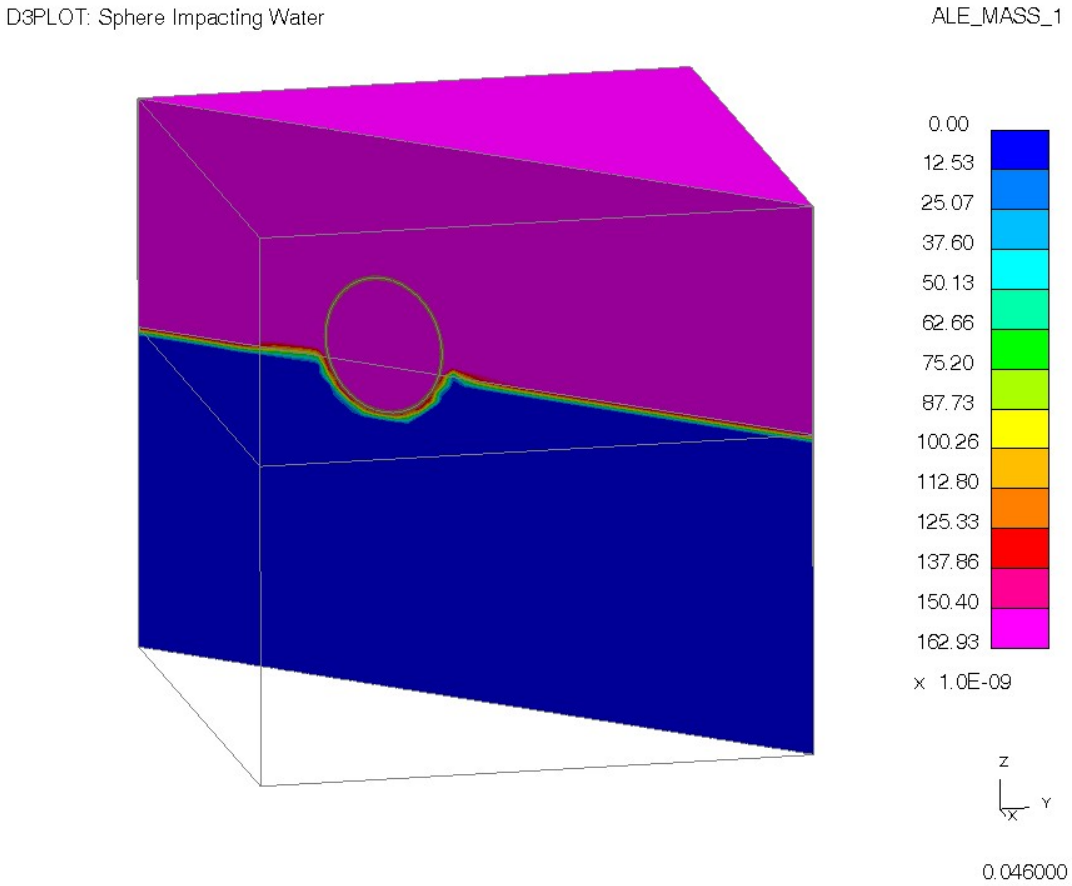
ALE data components

ALE Mass Fraction:

This allows you to show mass fraction for each fluid in your model.



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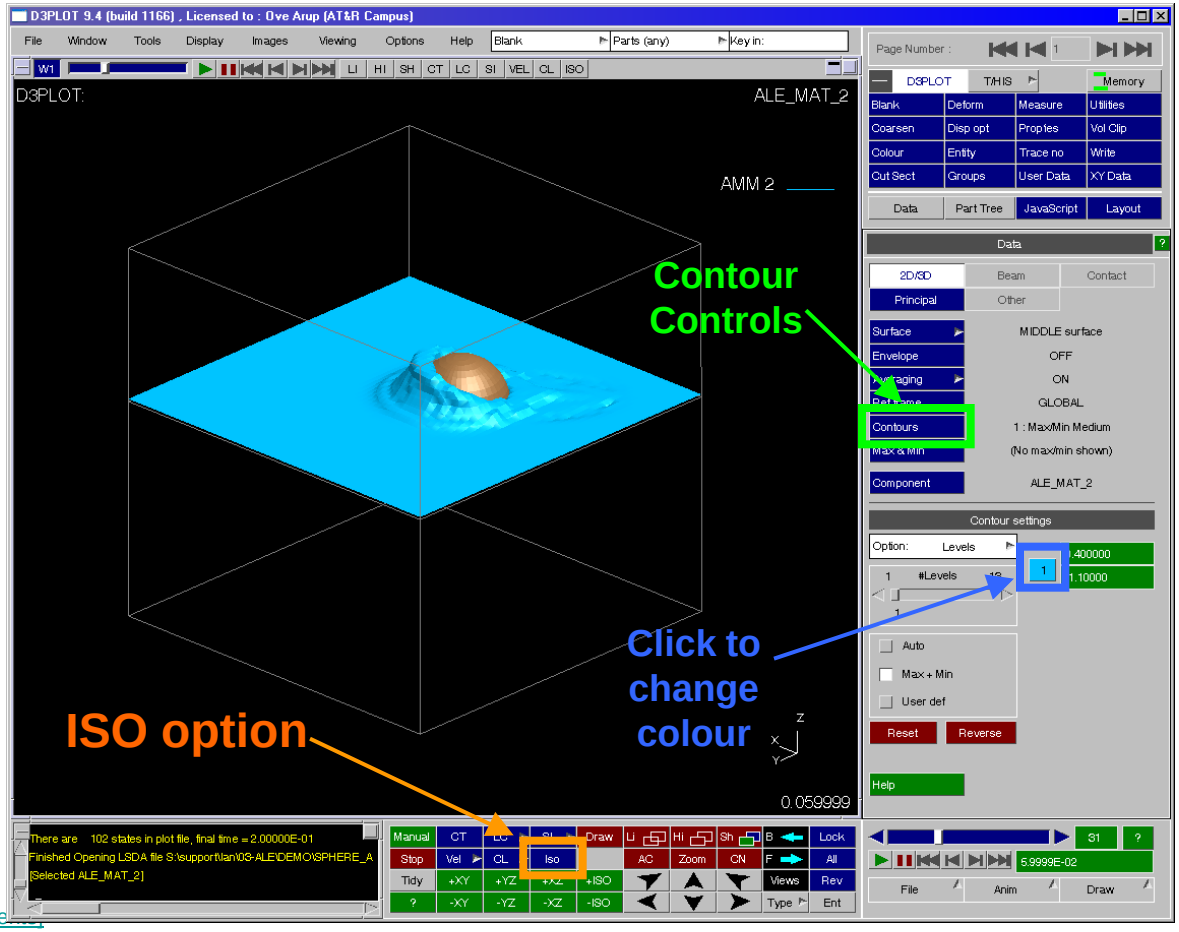
Visualizing ALE results

The ISO contour plot method in D3PLOT can be used with the volume fraction data component to visualize the interface between two fluids.



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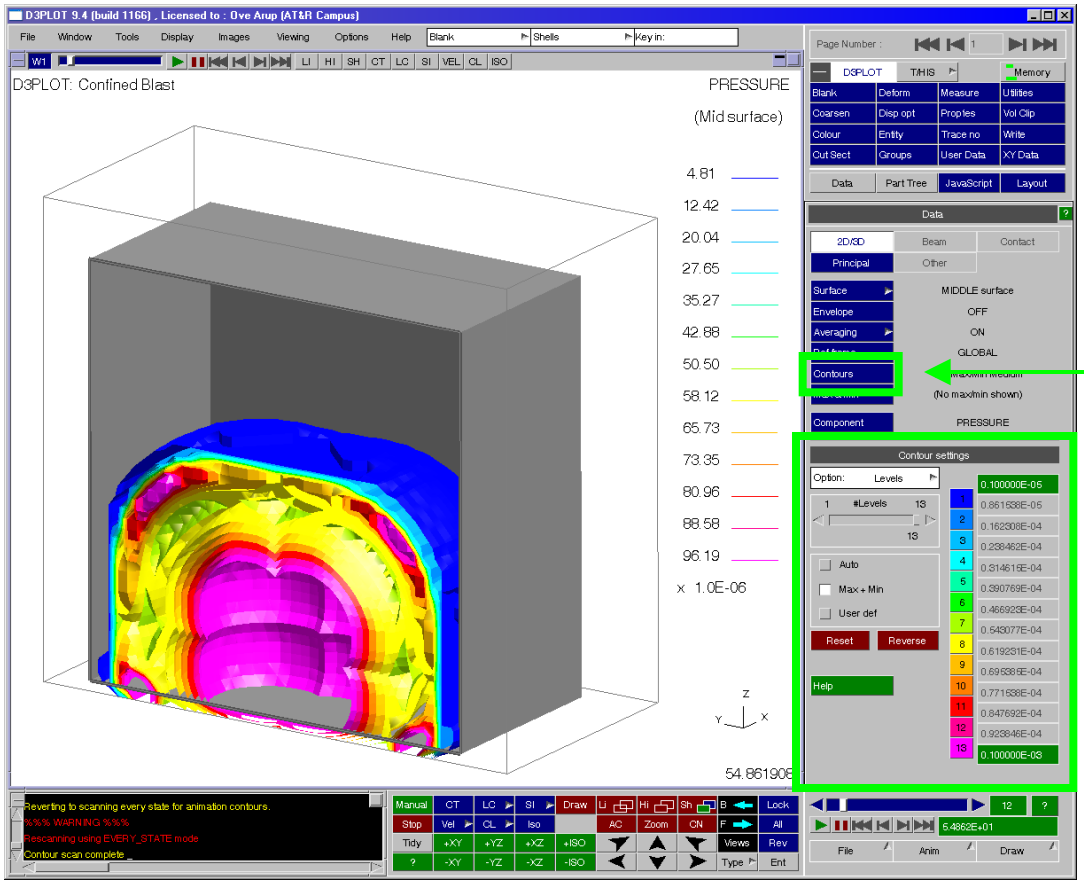
Visualizing ALE results

An ISO plot is also useful for visualizing the pressure wave in a blast analysis.



The max/min contour levels may need to be set manually to achieve a good image.

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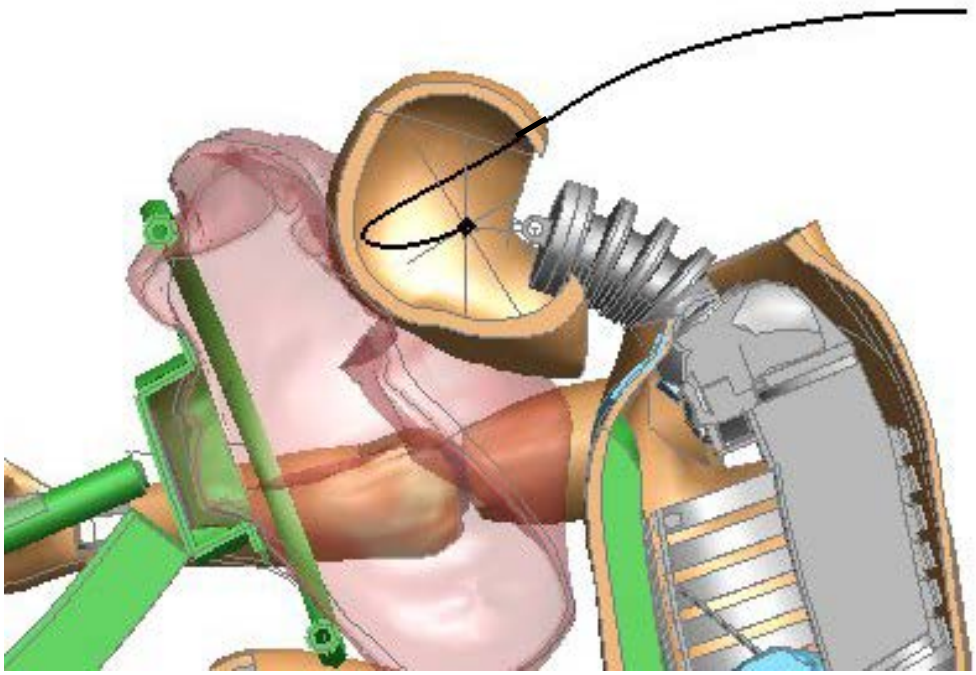
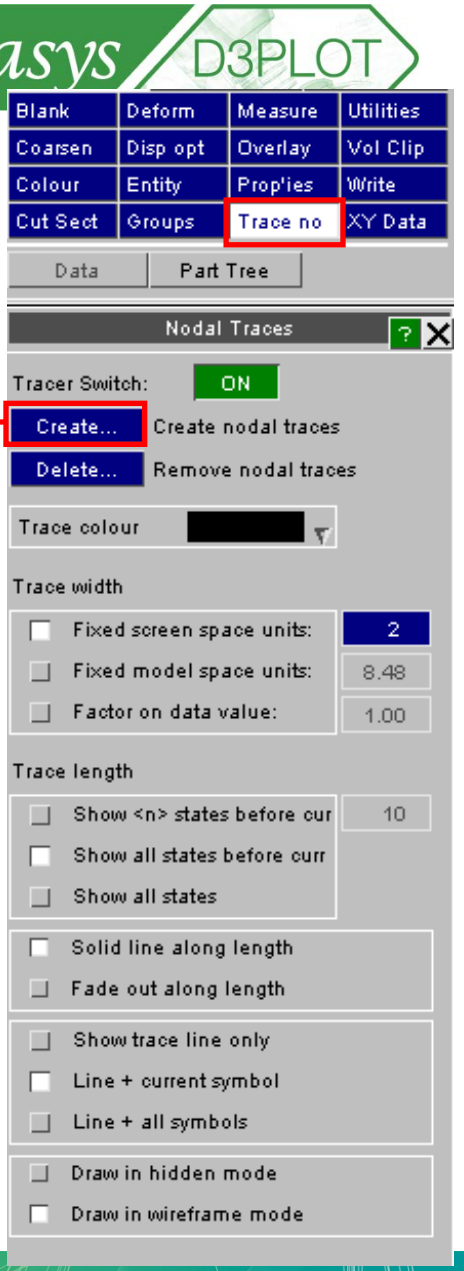
Trace Node

- The trajectory of selected nodes can be drawn



Select nodes



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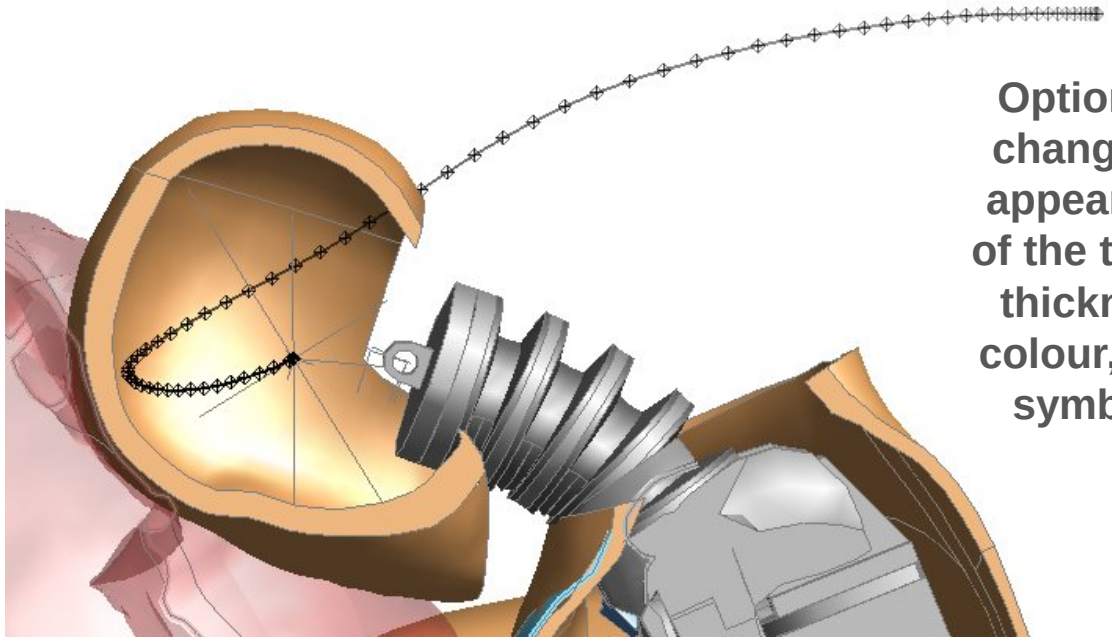
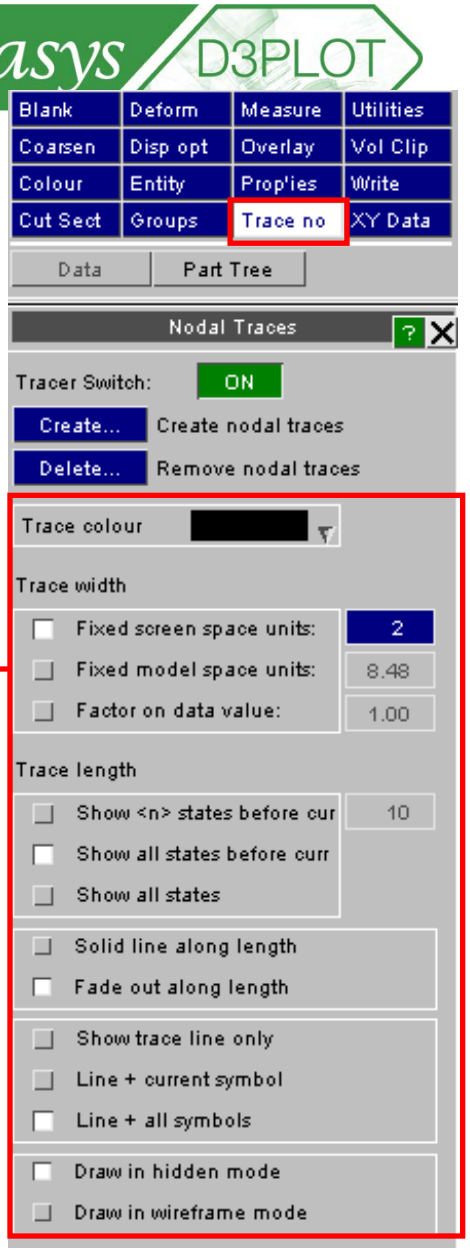
Trace Node

- The trajectory of selected nodes can be drawn



Options to change the appearance of the trace – thickness, colour, fade, symbols.



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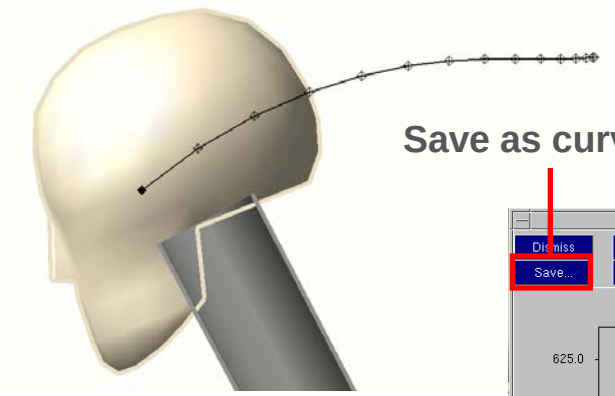
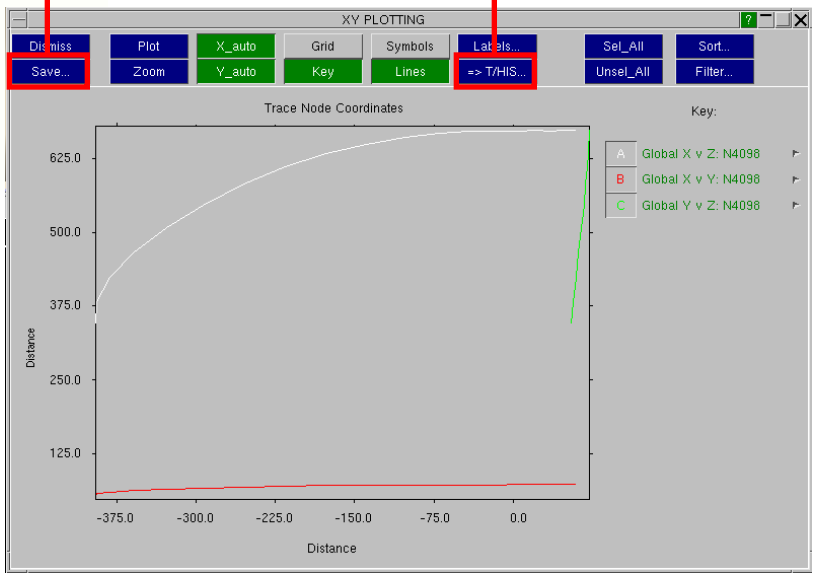
Trace Node – save to curve file

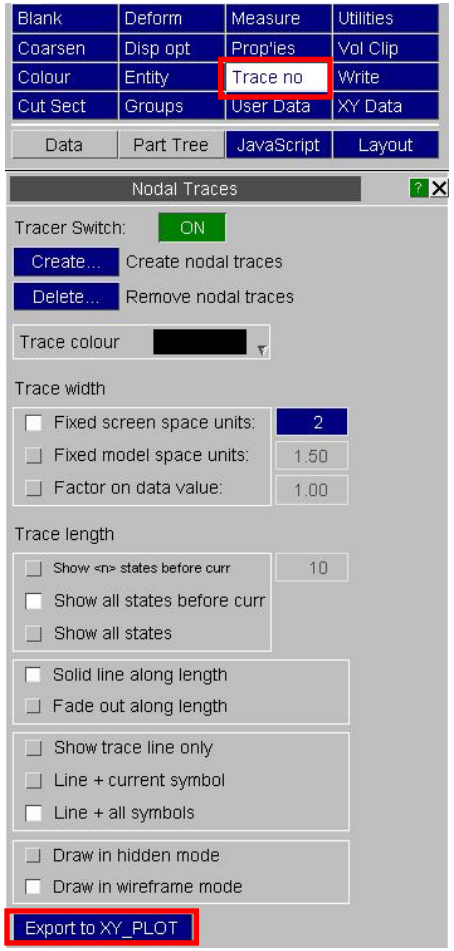
- The trajectories of selected nodes can be XY plotted and transferred to T/HIS



Save as curve files

Transfer to T/HIS link





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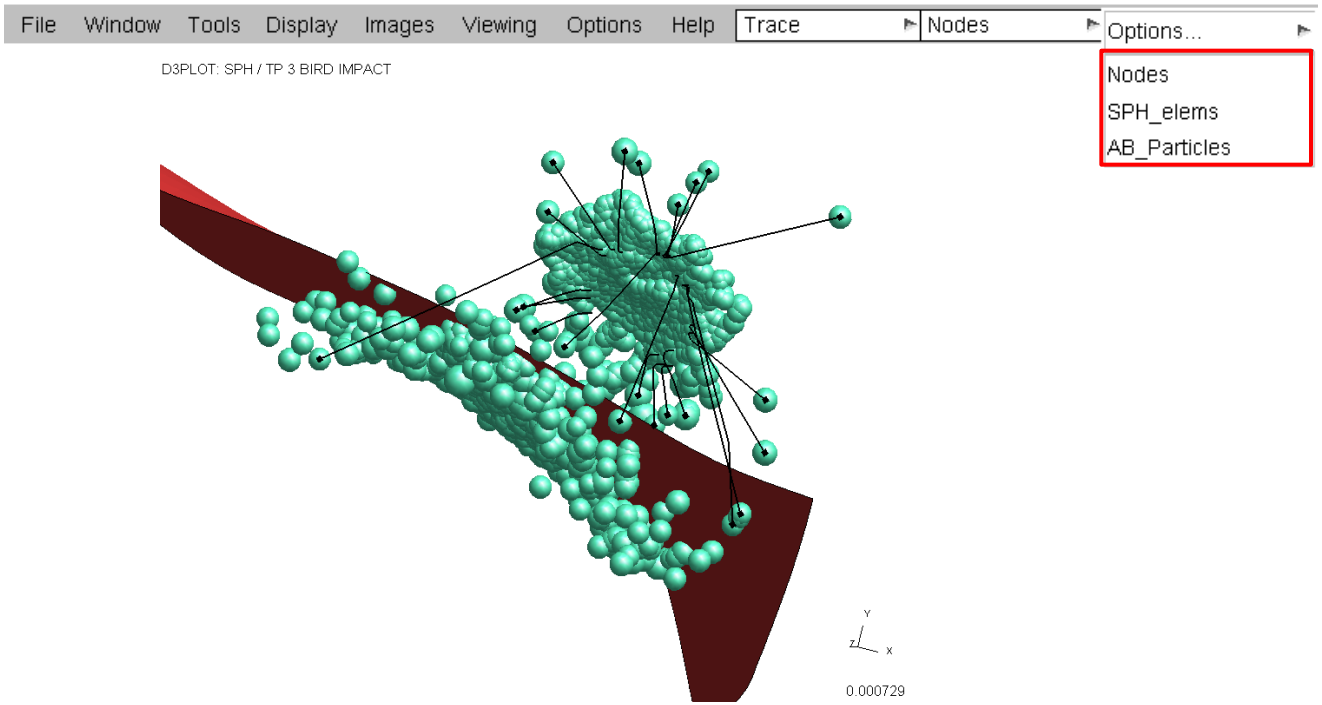
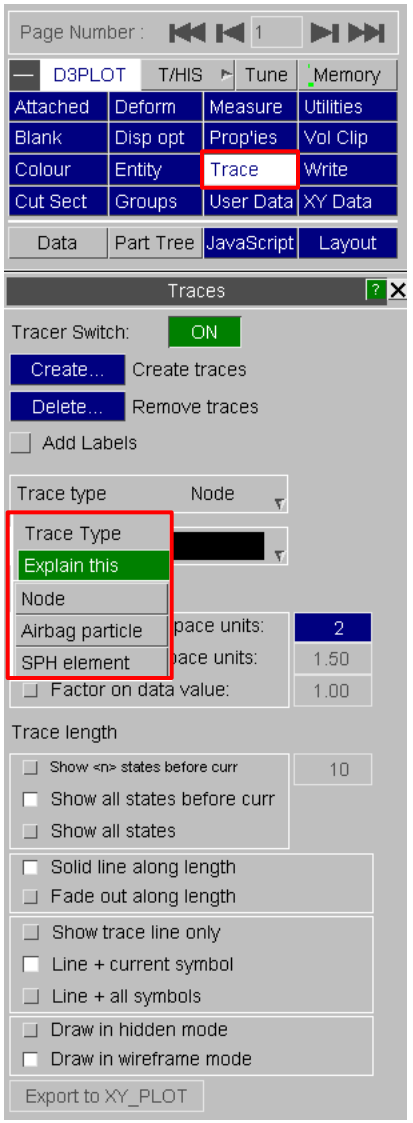
Trace Node

- Trace Node can also be applied to airbag particles or to SPH elements.
- Multiple items can be selected in one operation.
- Traces can also be selected through the Quick Pick menu





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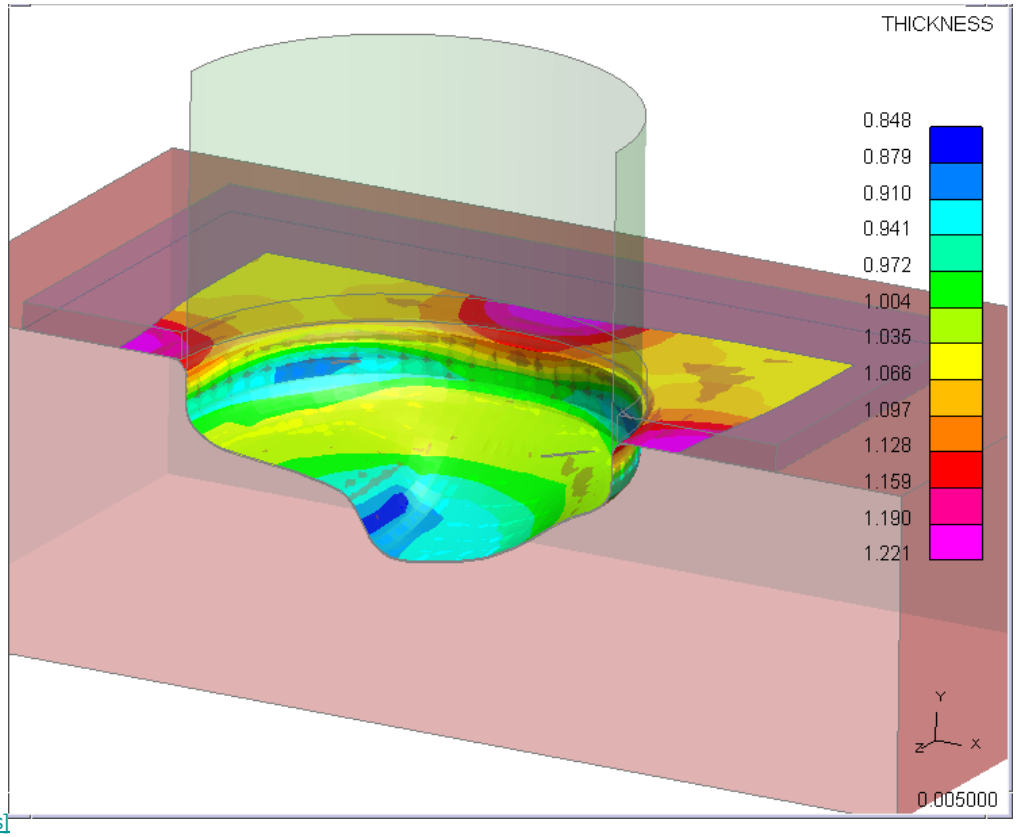
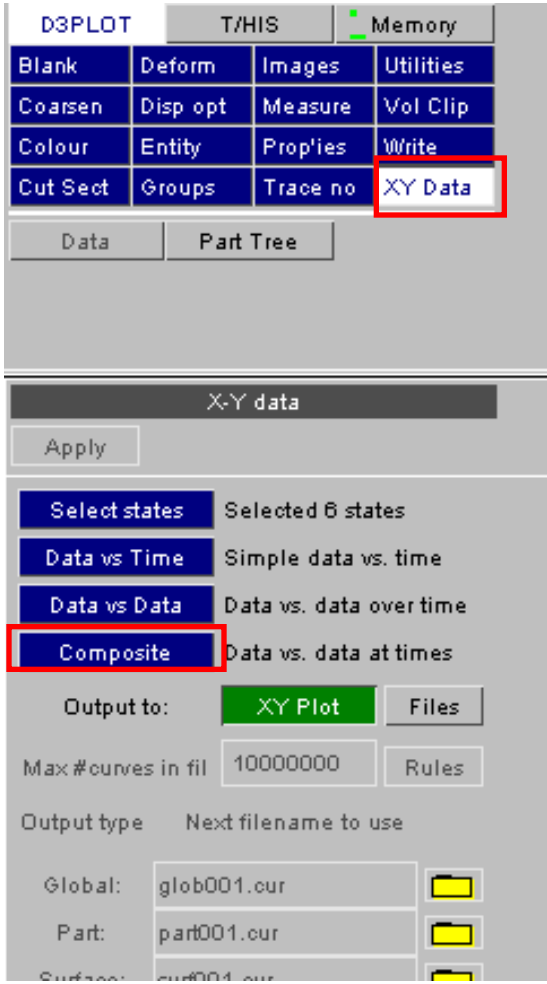
XY_DATA

- Using the XY_Data Composite option, certain combination of data can be extracted, for example, shell thickness versus x-coordinate on the symmetry-plane at a number of time-states.





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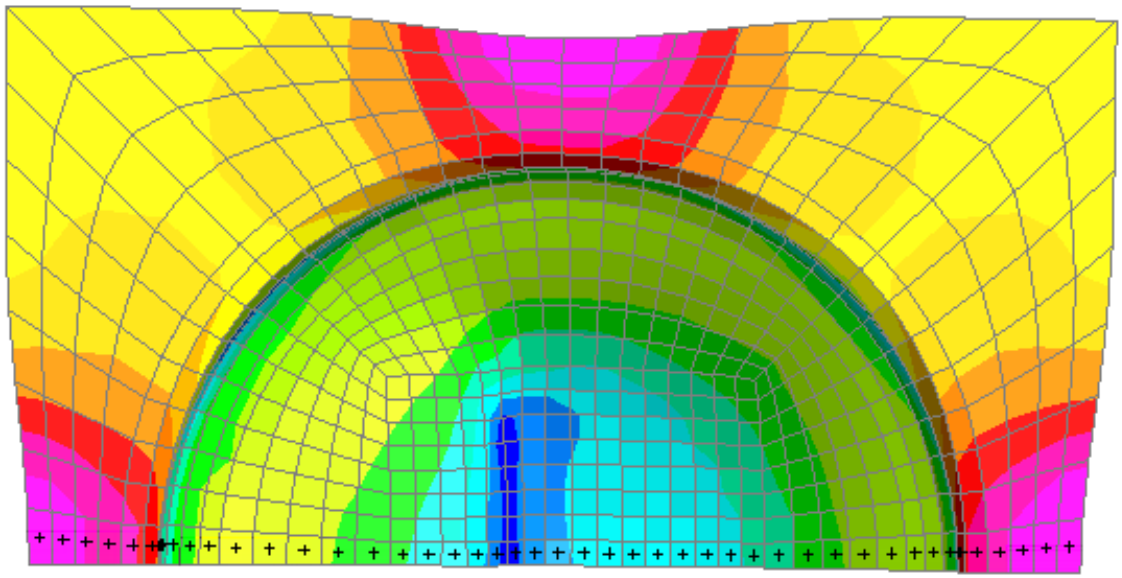
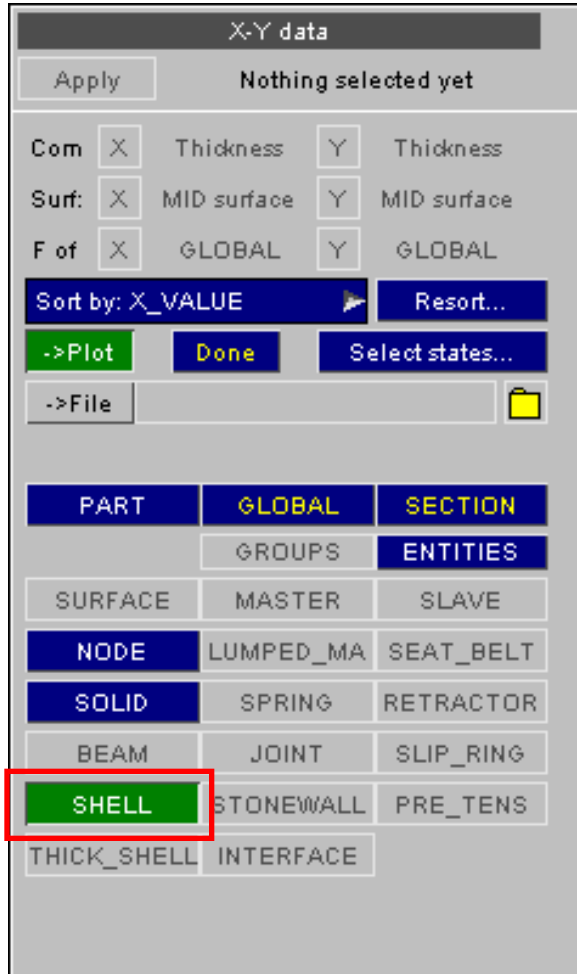
XY_DATA

- Screen-pick a line of elements (or nodes), e.g. by dragging out an area:





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XY_DATA

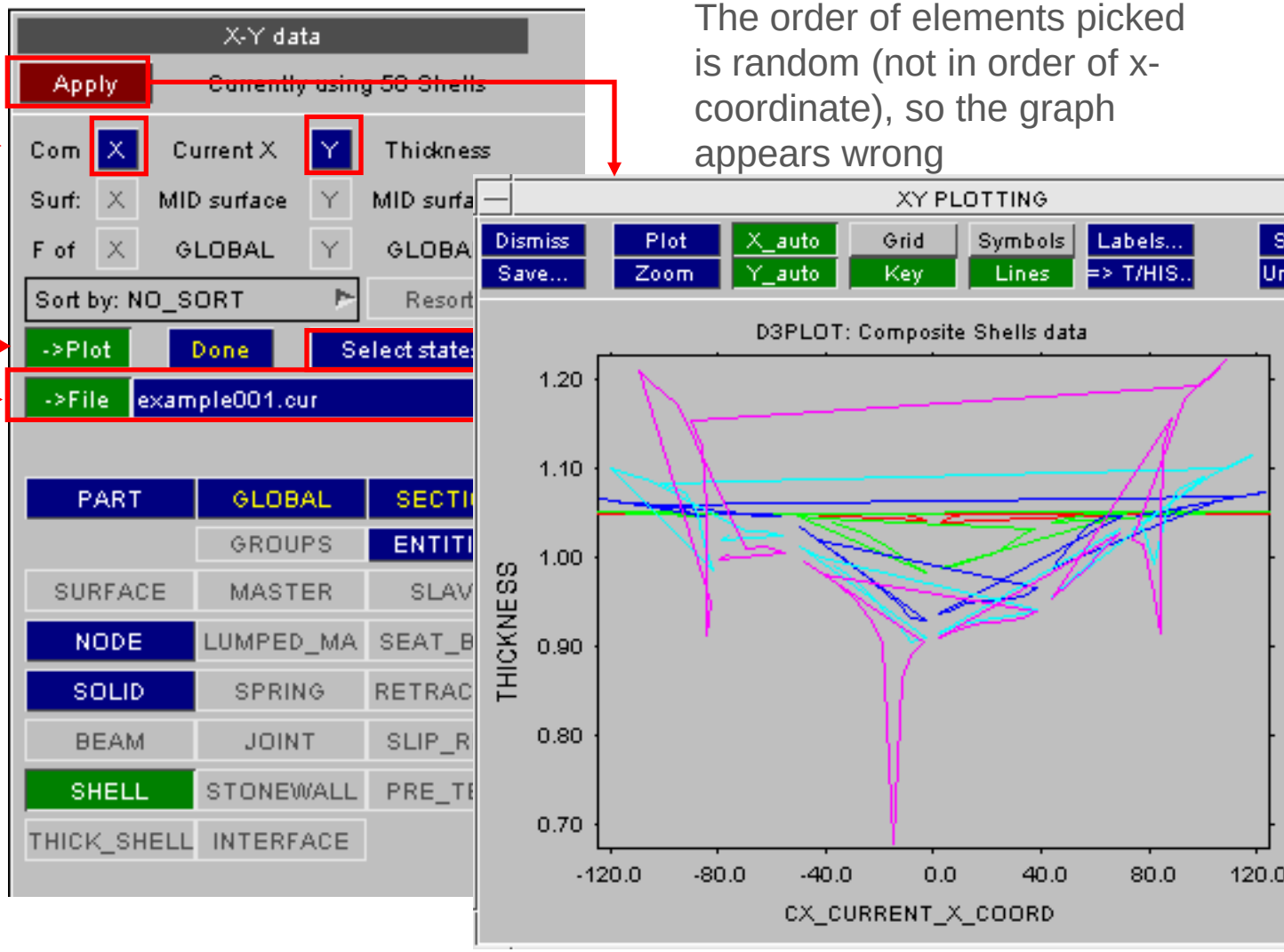
Select data component for X and Y-axes

Select time states (*)

Curve file name (*)

(*) - in previous versions of D3PLOT, this could be done only from the main XY_DATA menu

The order of elements picked is random (not in order of x-coordinate), so the graph appears wrong



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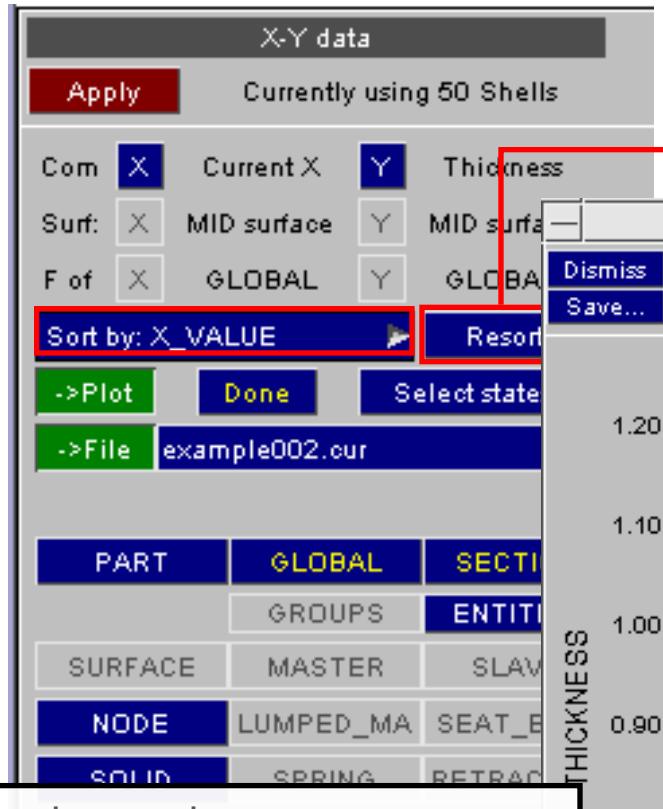
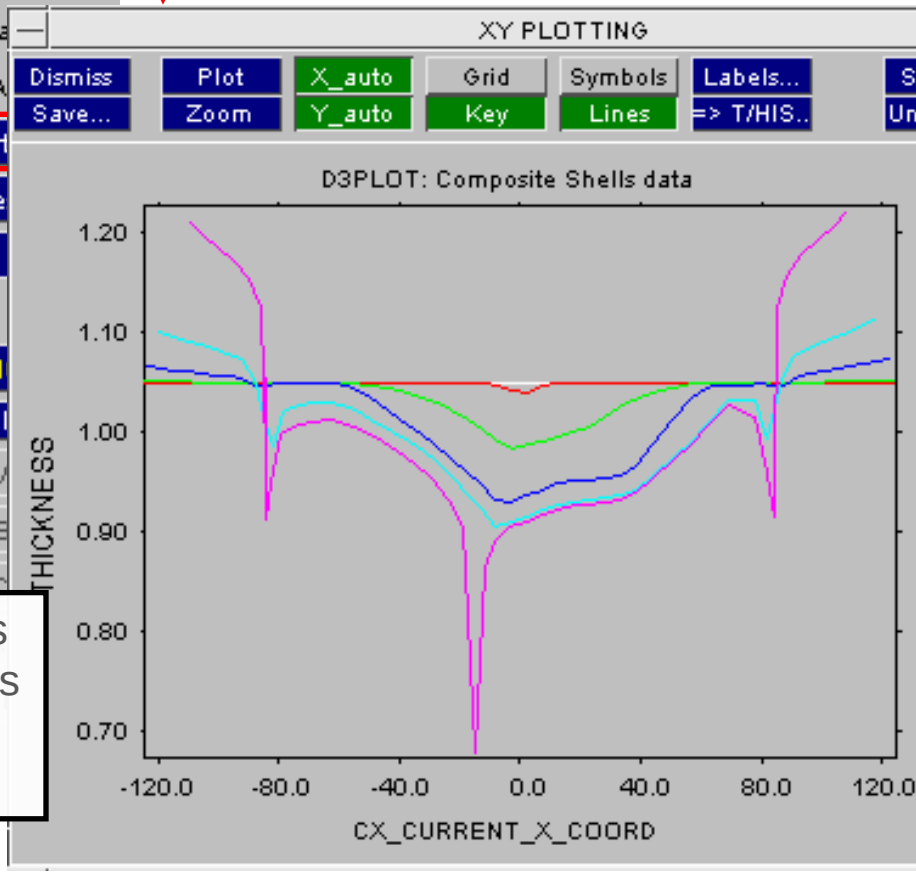
XY_DATA

Function to sort points, e.g. by x-value (so the points appear left-to-right on the graph). Press Resort.



After re-sorting, the graph is correct



XY_DATA Composite plot: each curve represents one time-state; each point on the curve represents one entity (node, element, etc); the user selects the data component for both X and Y-axes.

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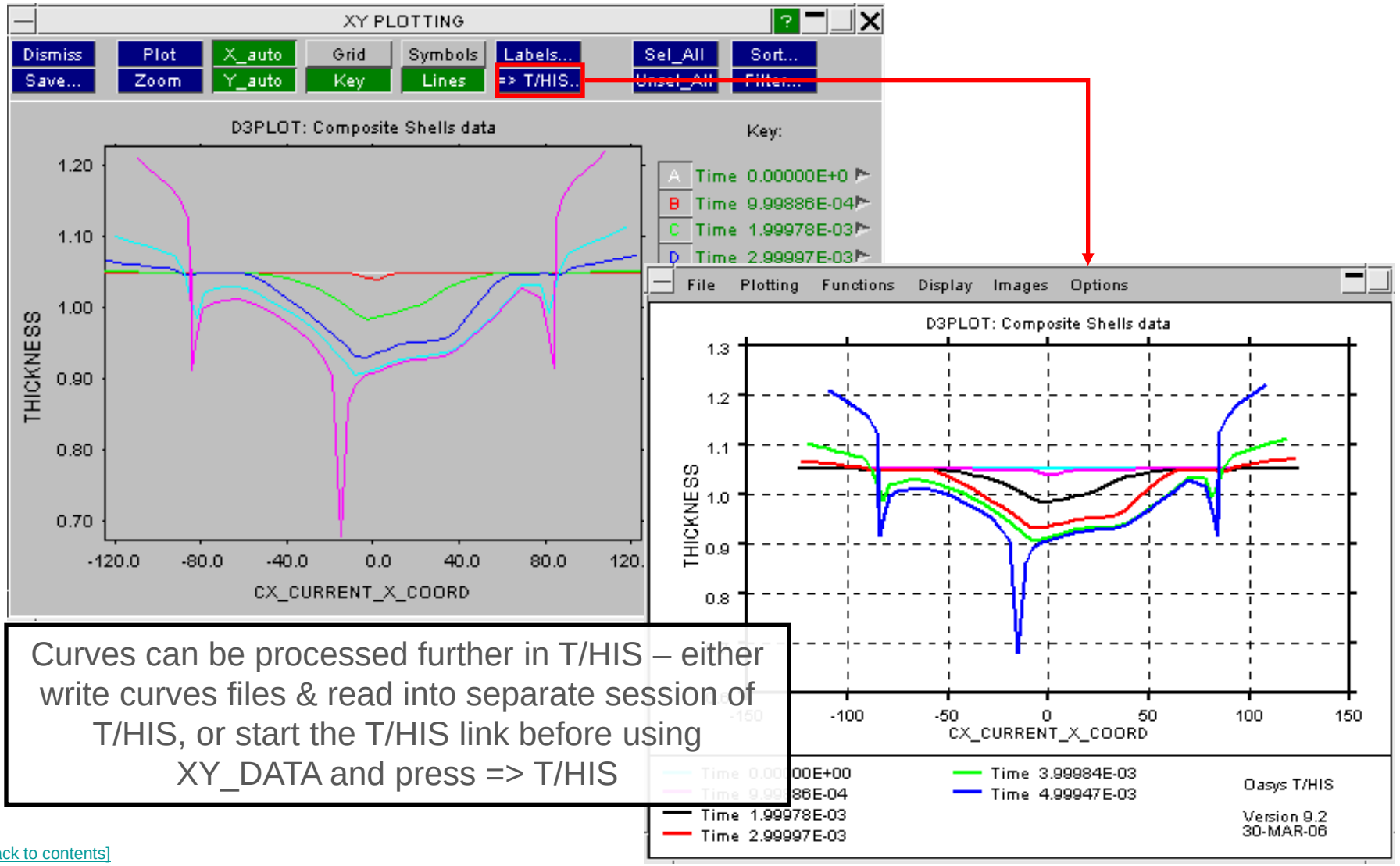
XY_DATA



Curves can be processed further in T/HIS – either write curves files & read into separate session of T/HIS, or start the T/HIS link before using XY_DATA and press => T/HIS

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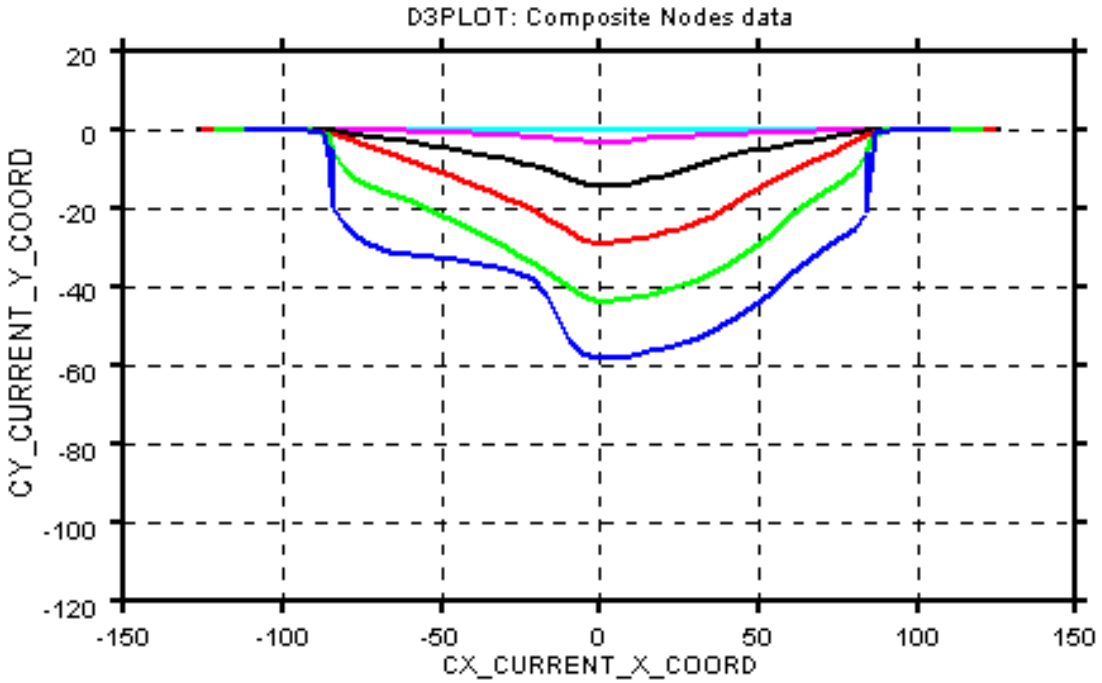
XY_DATA



Another example of Composite data – X-coord vs Y-coord shows how the shape evolves with time

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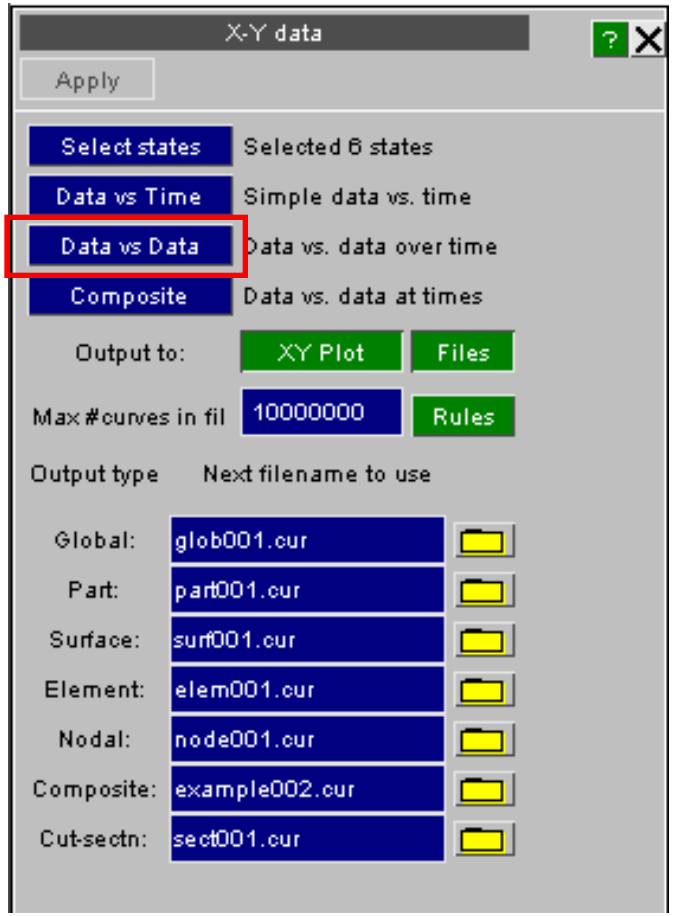
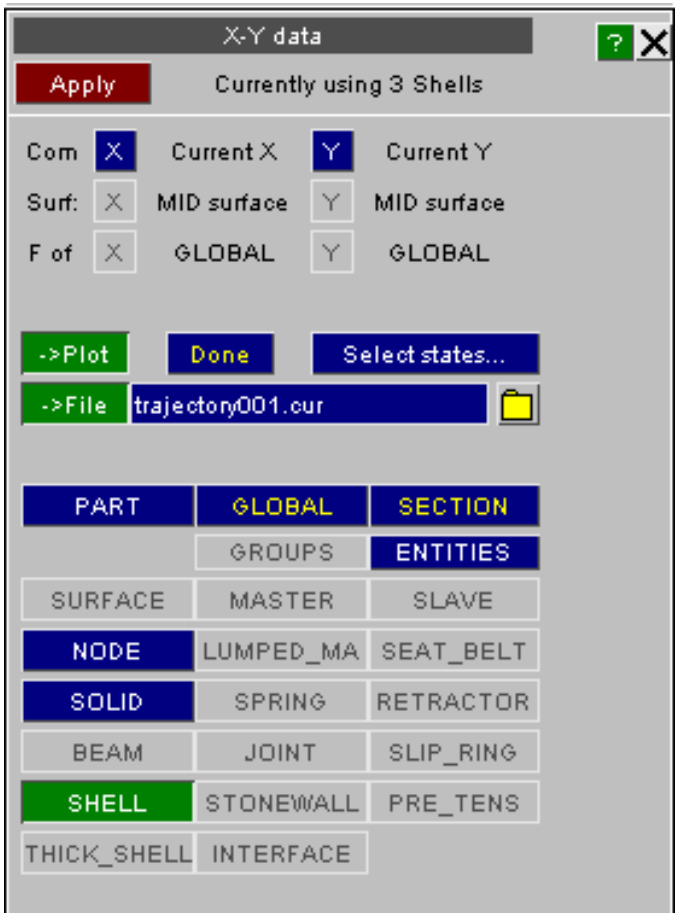
XY_DATA





Data-vs-Data is almost identical to Composite, except that a new curve is written for each selected Entity (node, element, etc), with each point on a curve representing one time state.

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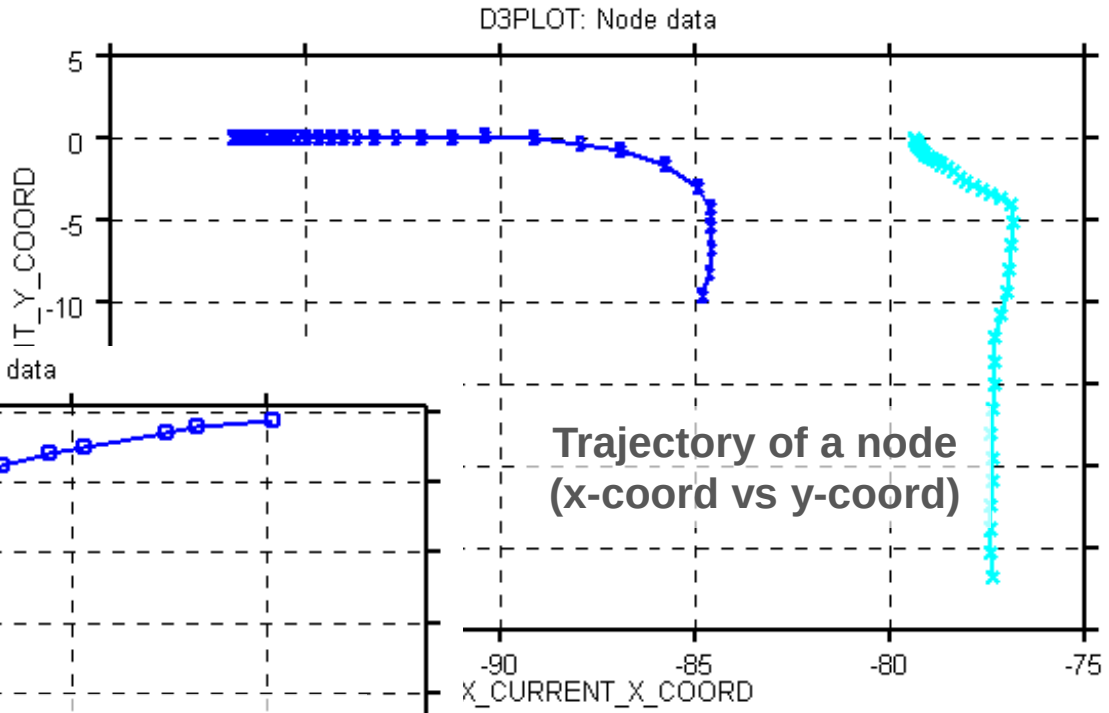
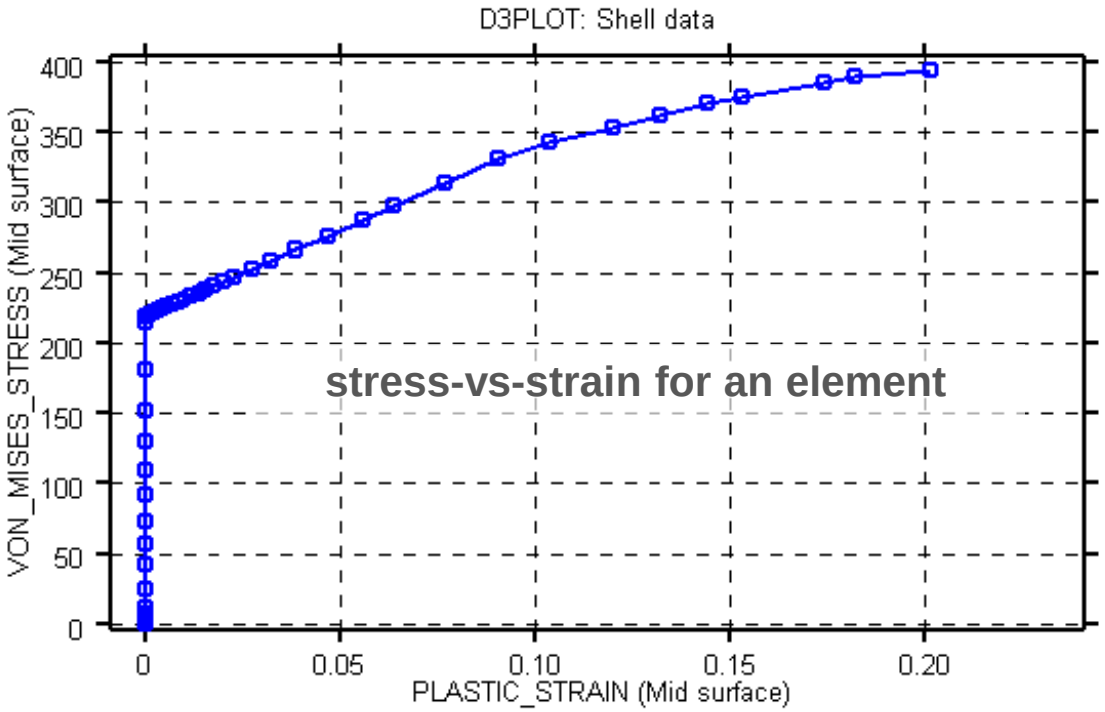
XY_DATA

Examples of Data-vs-data



Trajectory of a node (x-coord vs y-coord)

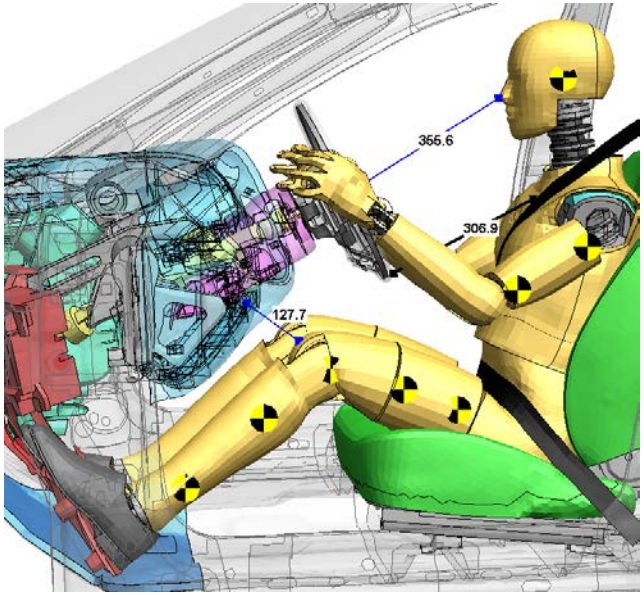


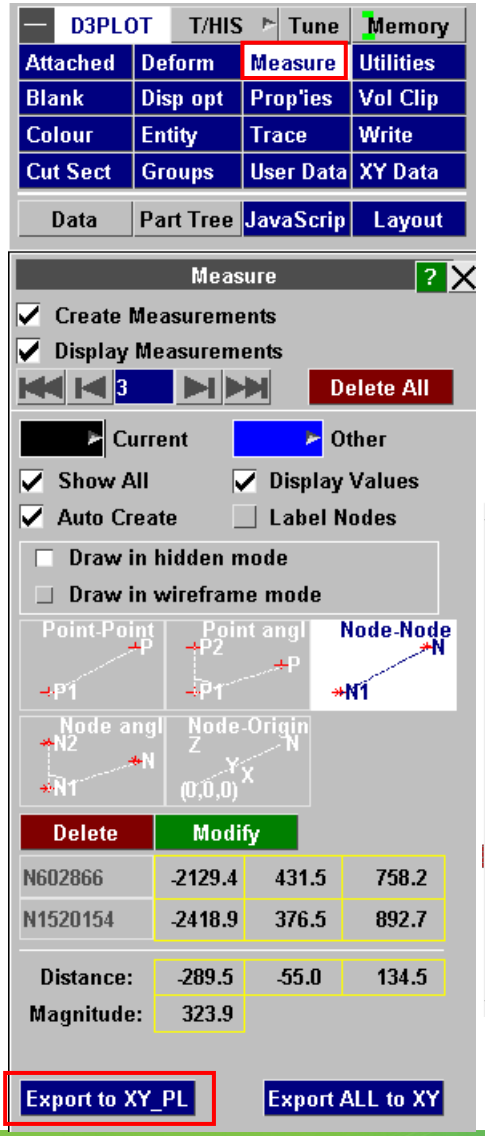
stress-vs-strain for an element

[bacl

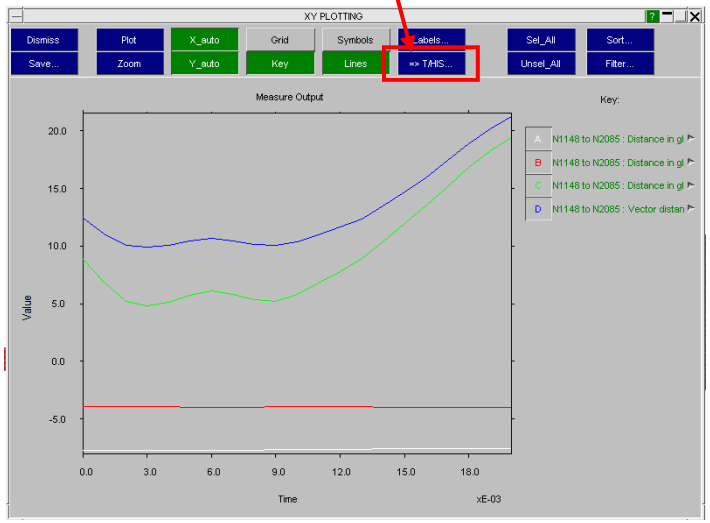
XY_DATA - Output of Measure

The measurements created by "Measure" can be output to T/HIS:





The XY_DATA graph menu can start a linked T/HIS session: the "=> T/HIS" button is always live.



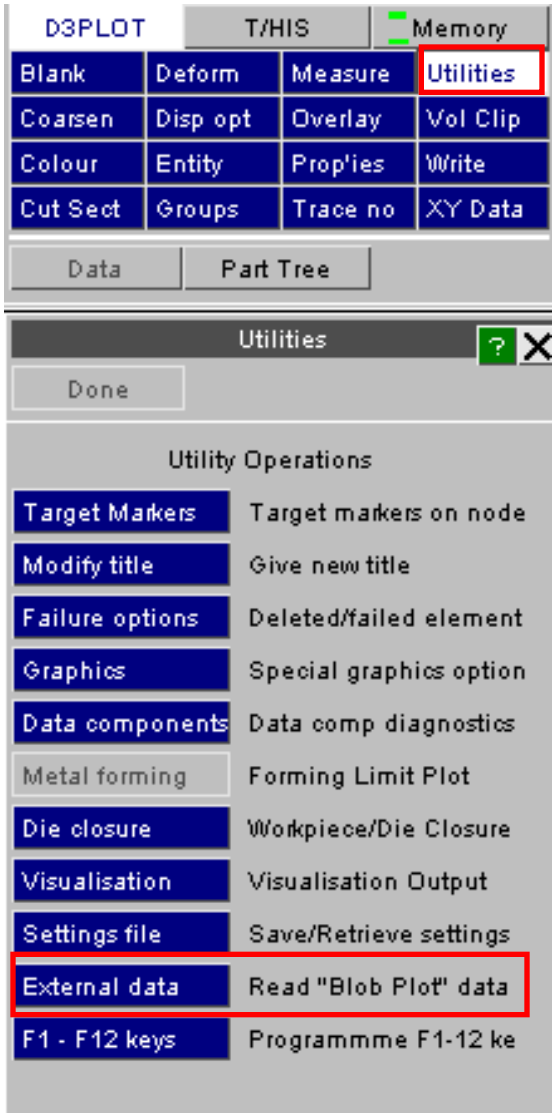
External Data – “Blob plots”

- A list of points, each with XYZ coordinates and a data value, can be read from an external file

Contents of typical file:

“data” X Y Z value

```
data 899.984 1393.17 895.182 4682.63
data 841.037 1276.24 896.854 1055.947
data 694.404 1399.28 851.726 343.4052
data 703.138 1308.79 861.869 627.7126
data 804.945 1171.9  898.937 476.1642
data 788.008 1057.62 903.647 467.8154
...(etc)...
```



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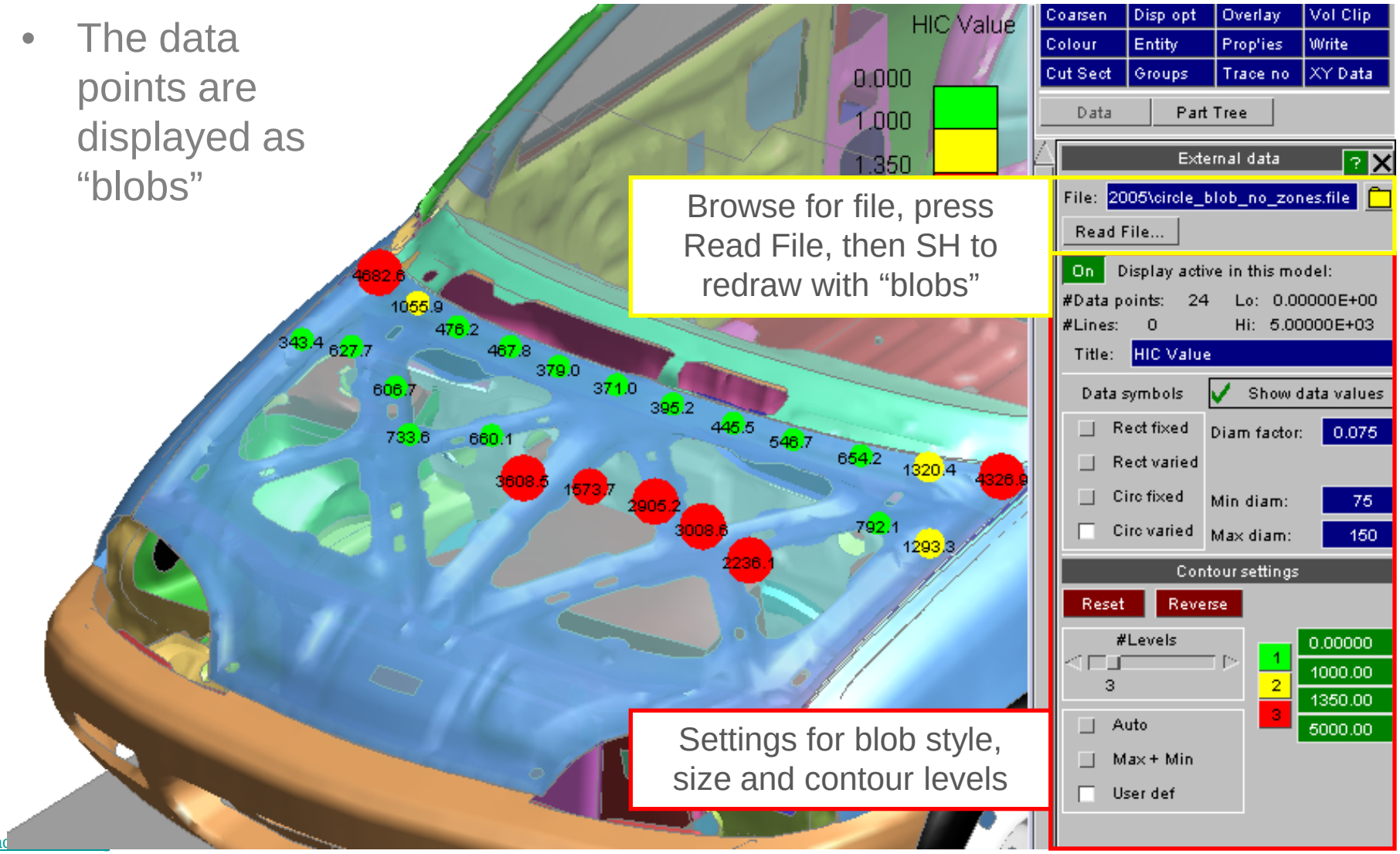
External Data – “Blob plots”

- The data points are displayed as “blobs”



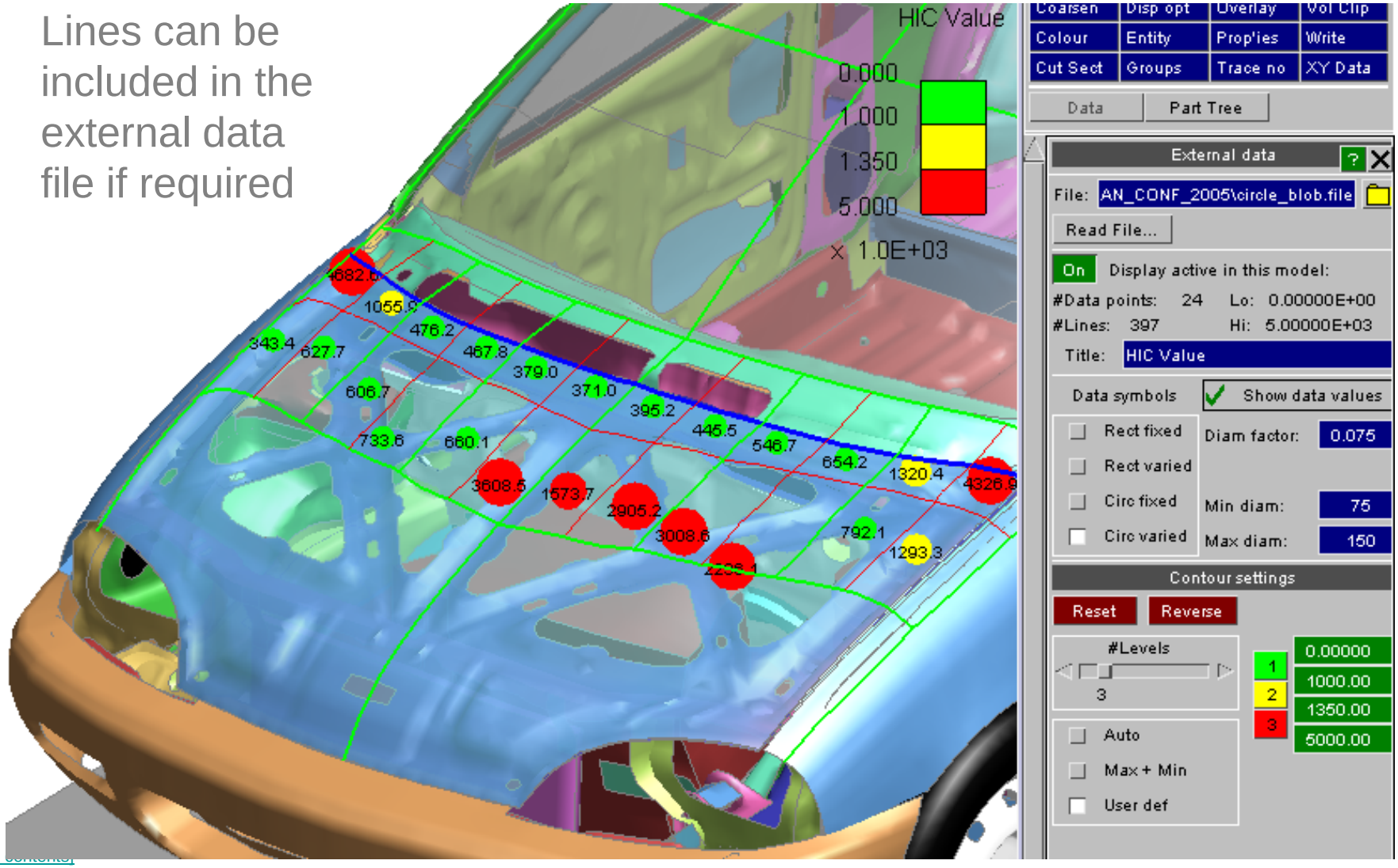
Browse for file, press Read File, then SH to redraw with “blobs”

Settings for blob style, size and contour levels

[bac

External Data – “Blob plots”

- Lines can be included in the external data file if required



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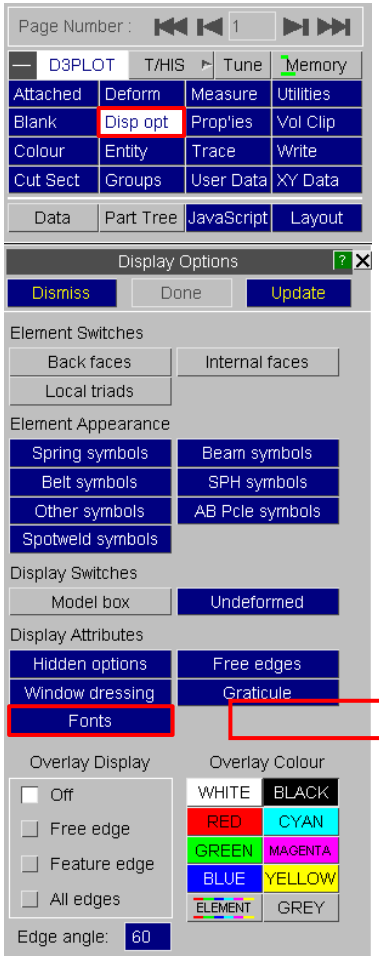
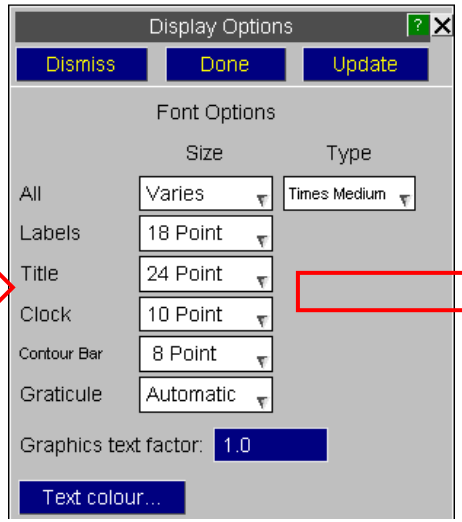
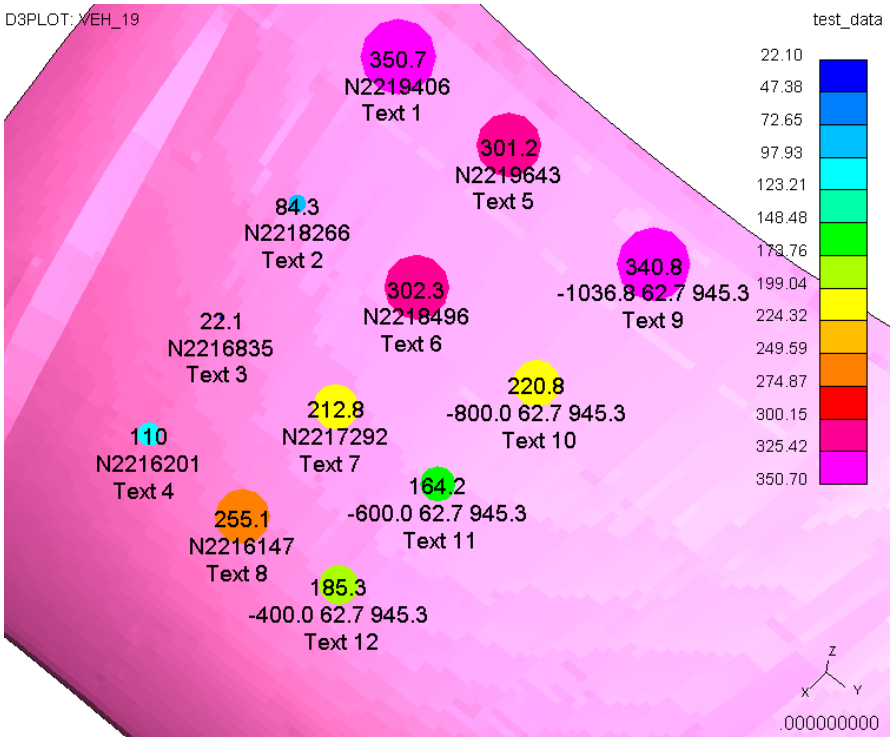
Text font size and type

- Set text font size for
  - Labels
  - Title
  - Clock
  - Contour Bar
  - Graticule







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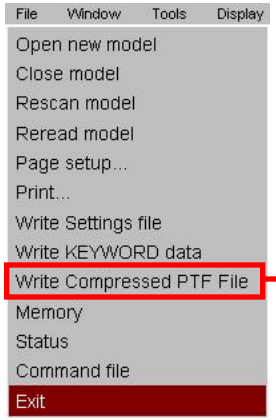
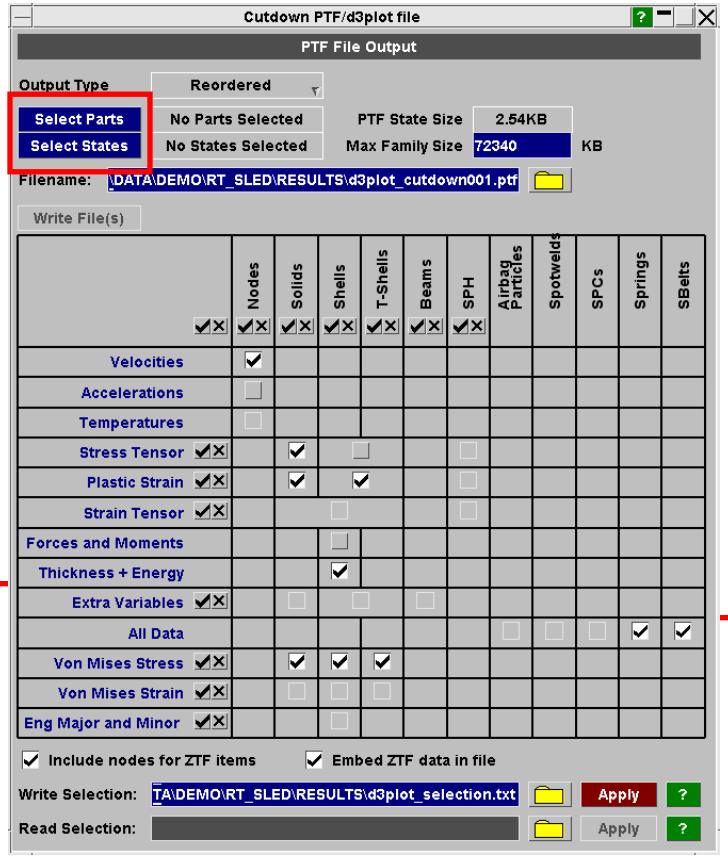
Compressed (cut-down) PTF File

- Cut-down PTF / d3plot files can be generated containing a subset of the data in the original files
- Reduction in the size of files is possible by:
  - Reducing the number of PARTS
  - Reducing the number of STATES
  - Removing data components





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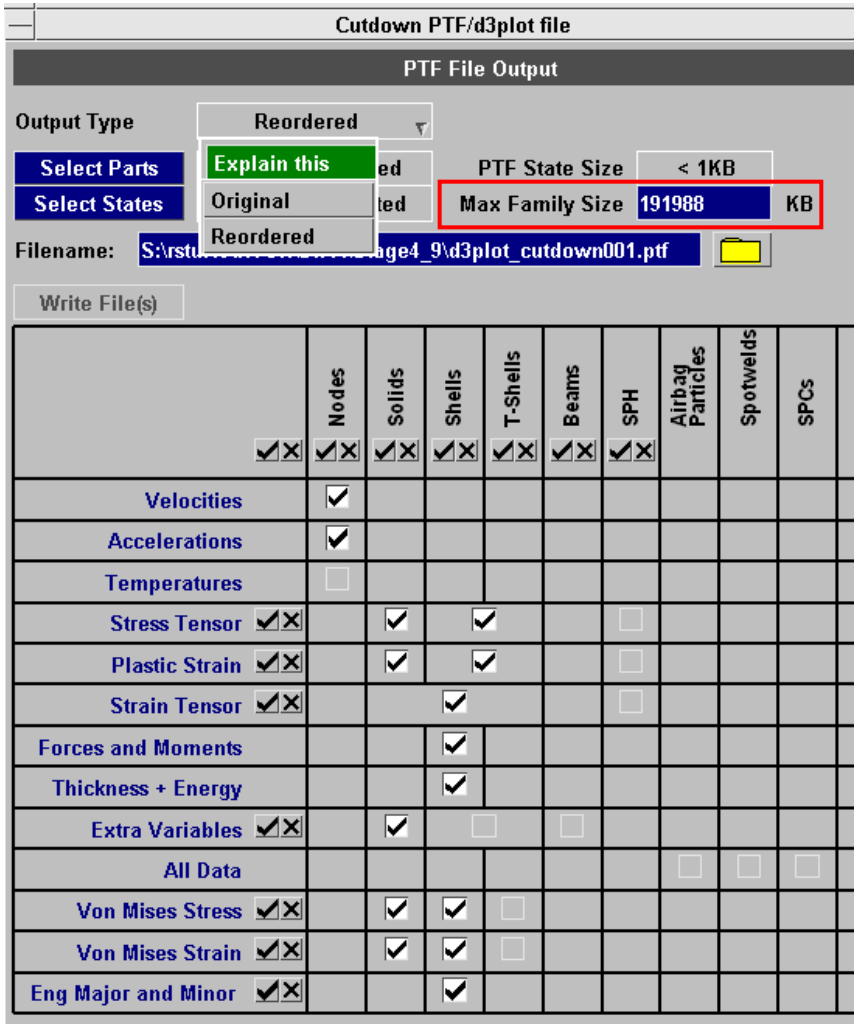
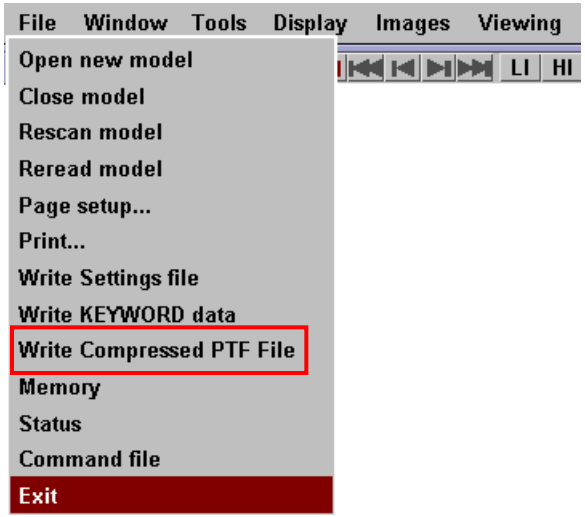
Compressed (cut-down) PTF File

- File family member file size can be set





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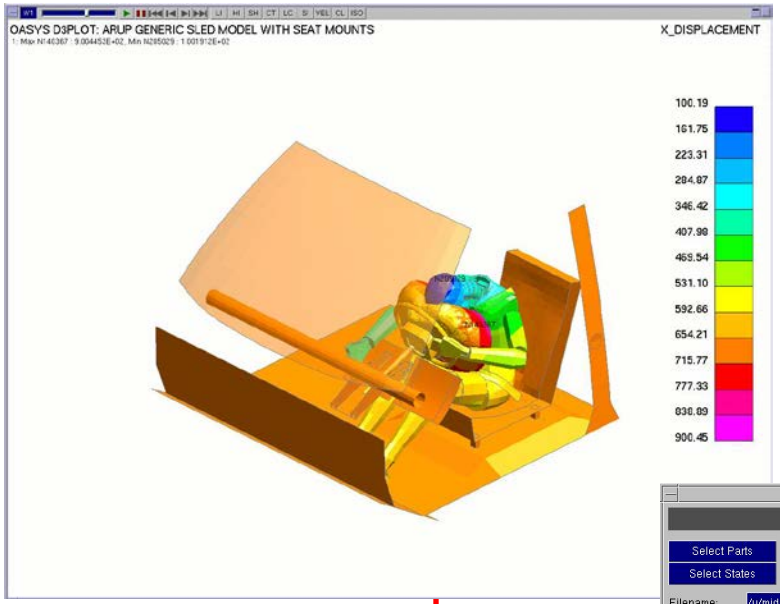
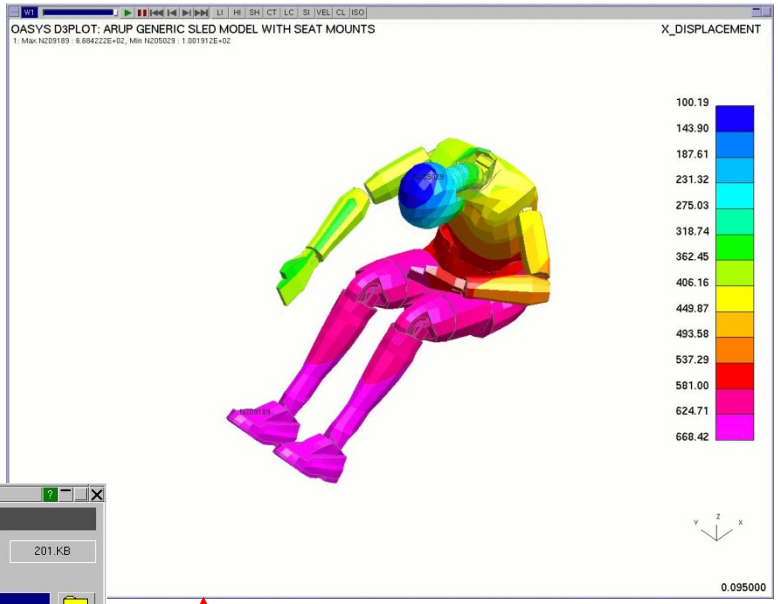
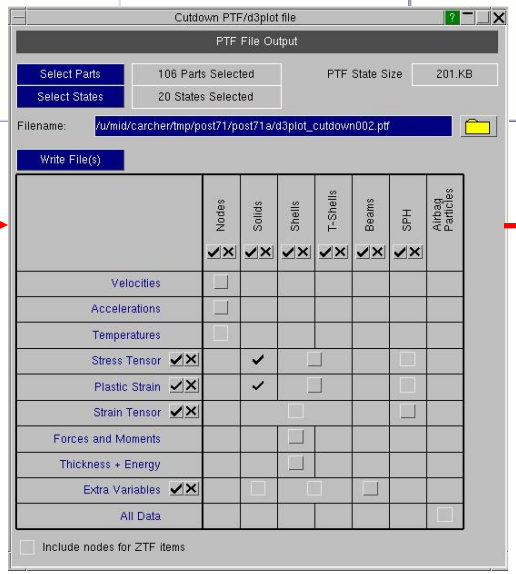
Compressed (cut-down) PTF File

Oasys D3PLOT







Original model

4 PTF Files, 93 MB
158 parts
32 time-states
Displacements, velocities, Accelerations, stresses, shell resultants

Cut-down model

1 PTF File, 5 MB
98 parts (dummy only)
20 time-states
Displacements only

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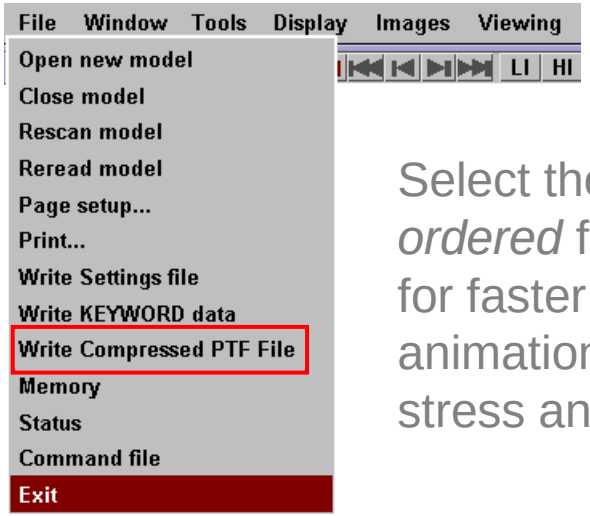
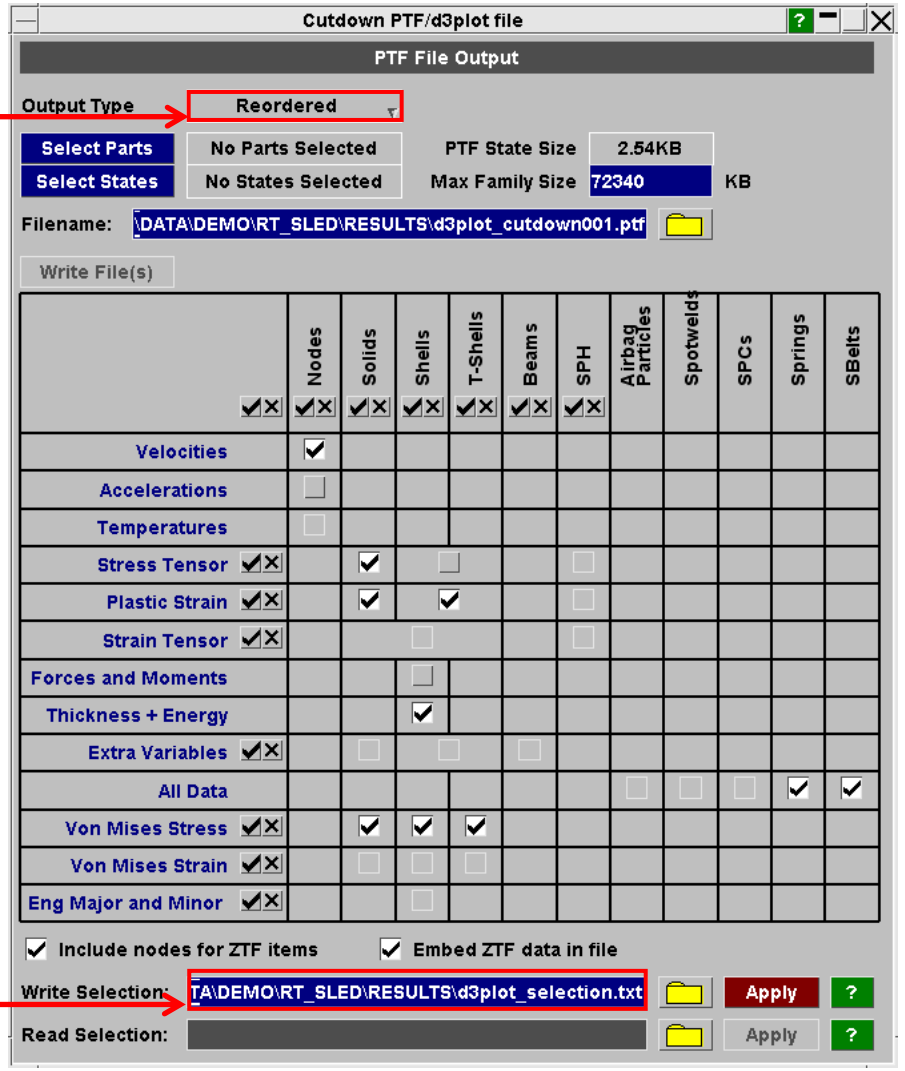
New File Format for Quicker Response



Select the new *re-ordered* file format for faster animation of stress and strain



Batch mode operation:

- First time – select the data interactively, record this file
- Next time – run D3PLOT in batch with *–ptfcut=filename.txt*

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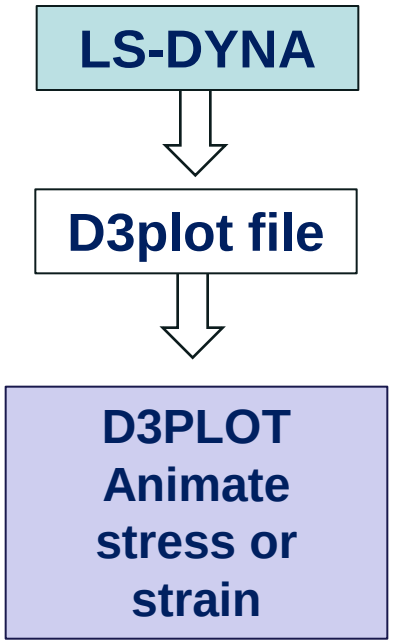
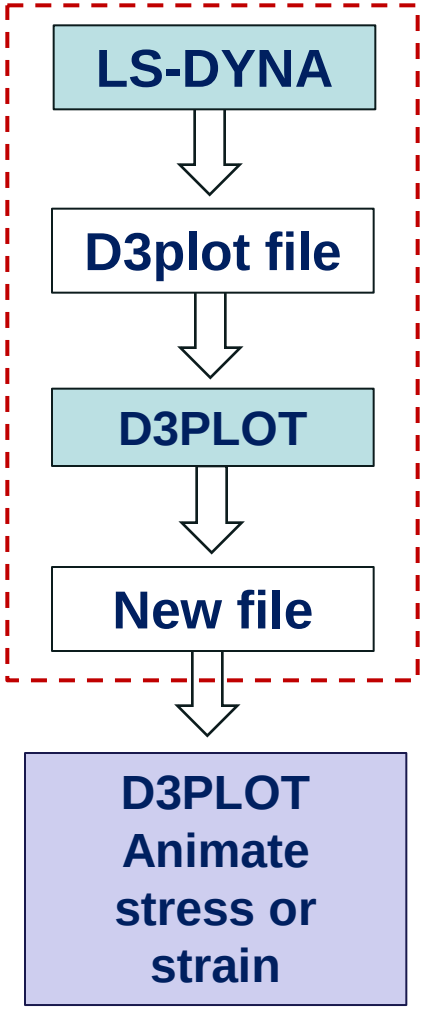
New File Format for Quicker Response



Slow
Reading stress or strain data is slow because of the structure of LS-DYNA's d3plot file



Reading data is 4-8x faster

This process can be done interactively or in batch.
LS-DYNA submission function could be modified to do this automatically when LS-DYNA terminates
The new file format is called "reordered"

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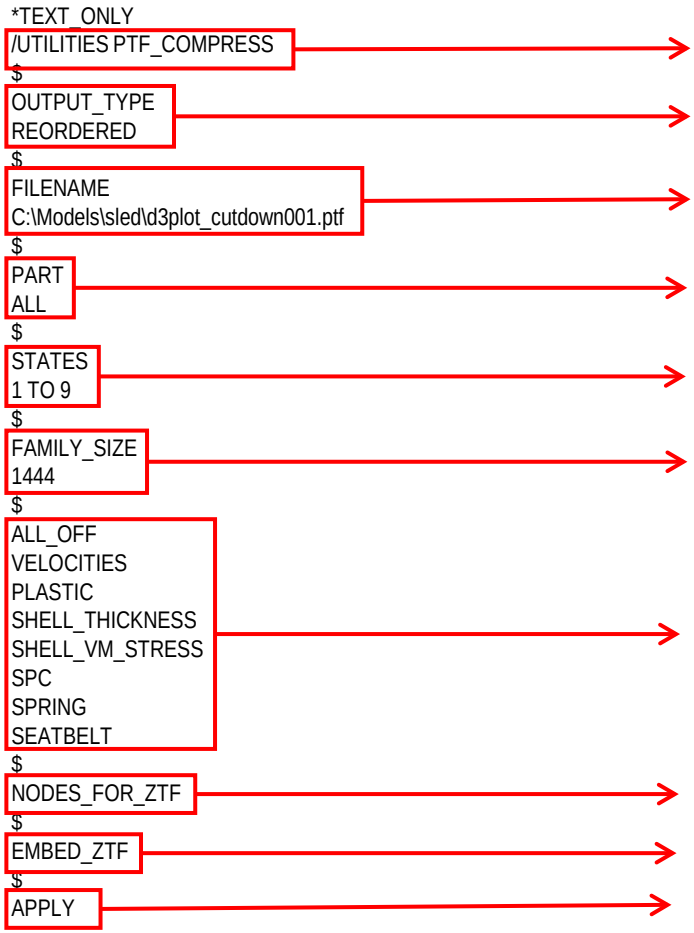
File Format for Batch Mode

The file that can be used to create a reordered database in batch mode is a command file with the following format. It can be created manually, or recorded from the "Compressed PTF" menu .



Select the PTF_COMPRESS menu

Set the output type to 'REORDERED'

Specify the output filename

Select the parts to output

Select the states to output

Set the family size in KB

Select the data components to output

Include nodes for ZTF items

Embed the ZTF file in the file

Write the Reordered database

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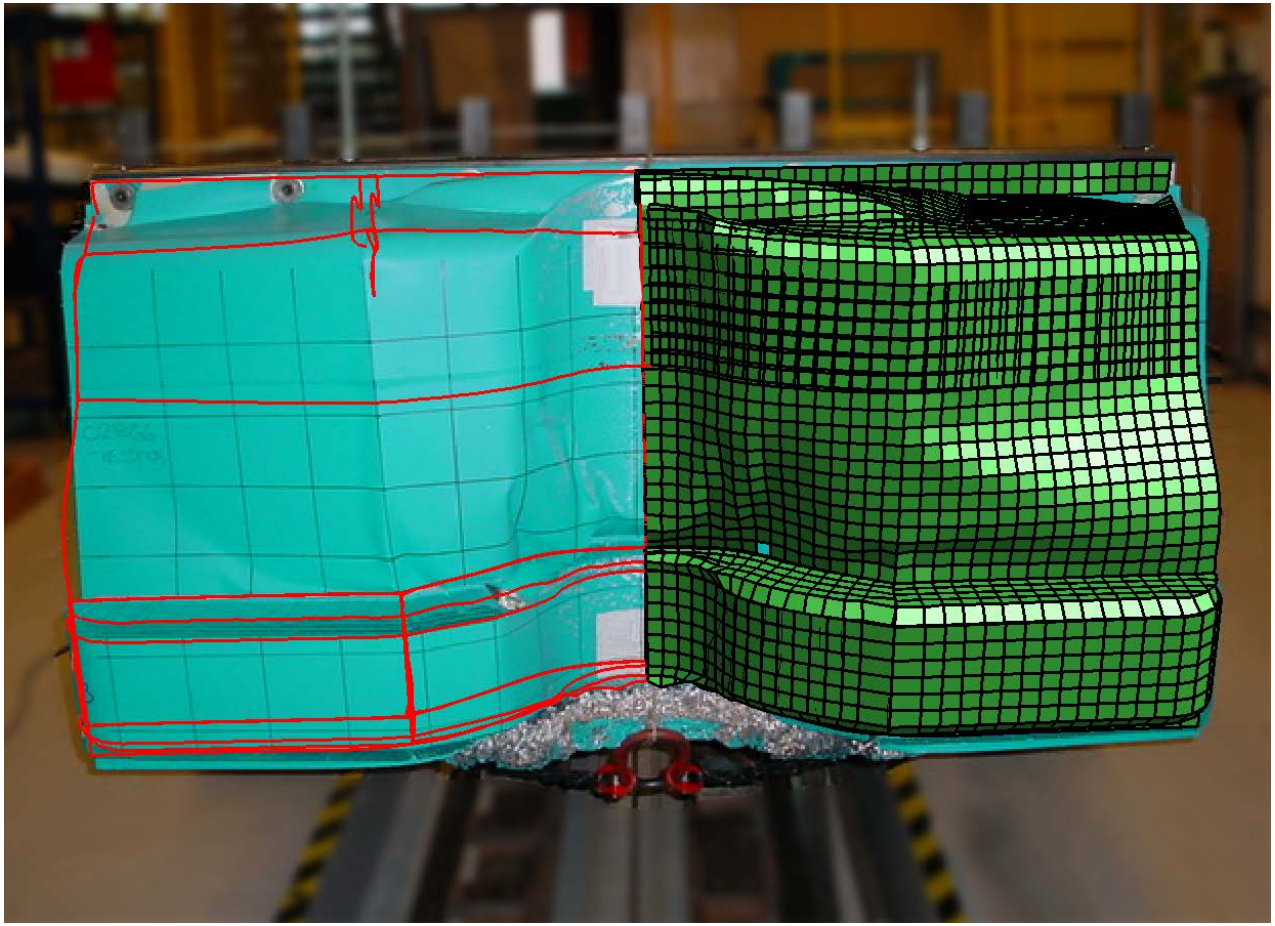
Background Image

Oasys D3PLOT

- All Oasys programs can read an image file, for use as background



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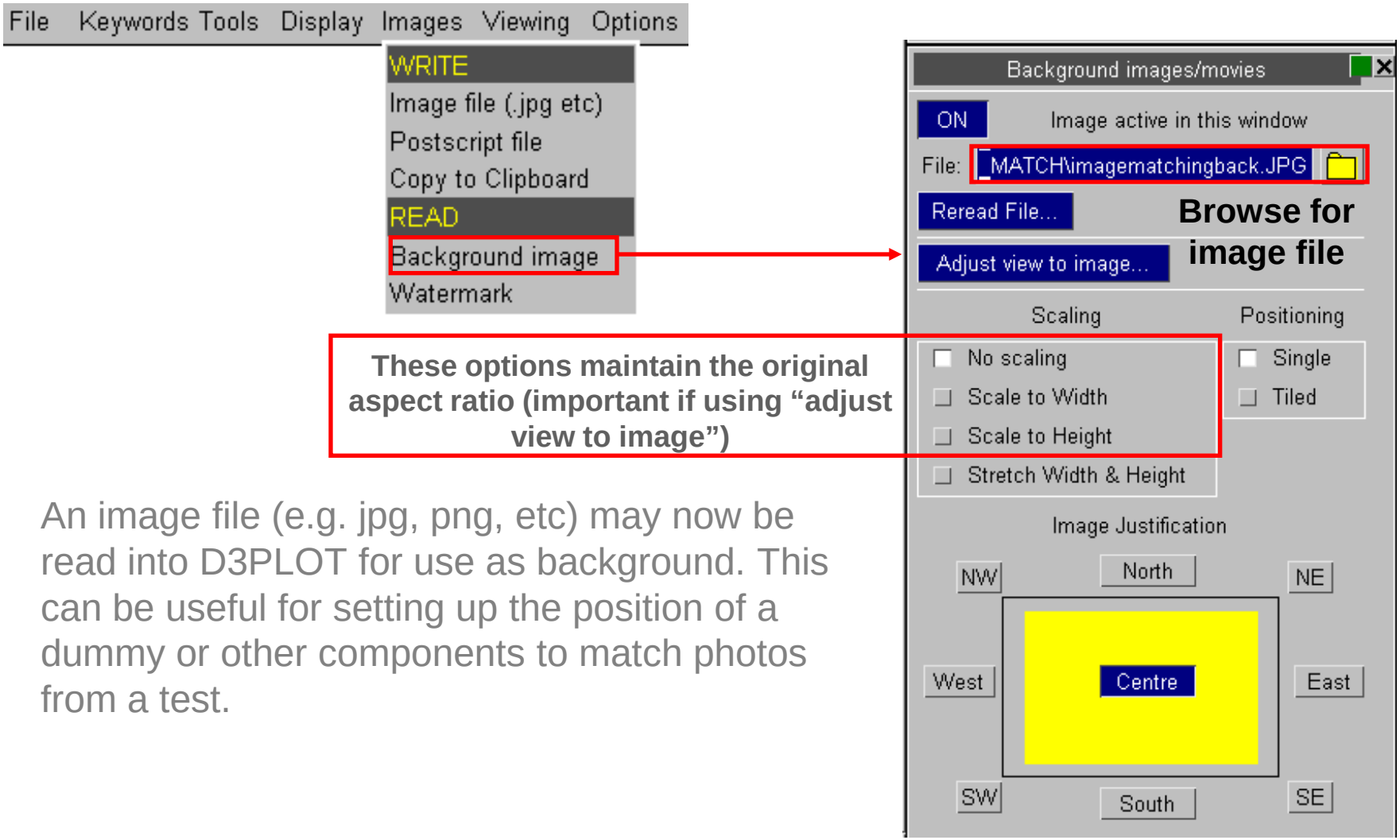
Background Image



- An image file (e.g. jpg, png, etc) may now be read into D3PLOT for use as background. This can be useful for setting up the position of a dummy or other components to match photos from a test.

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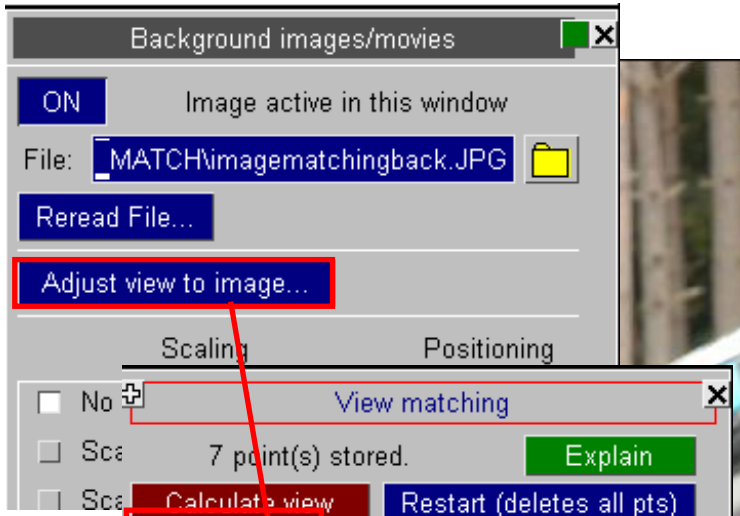
Background Image : view matching



Pick a node in the model, then click on the equivalent point in the background image. Repeat to create several node-point pairs – we recommend at least 5 pairs. Choose some pairs close to the camera, and others further away, to capture the depth of the image.

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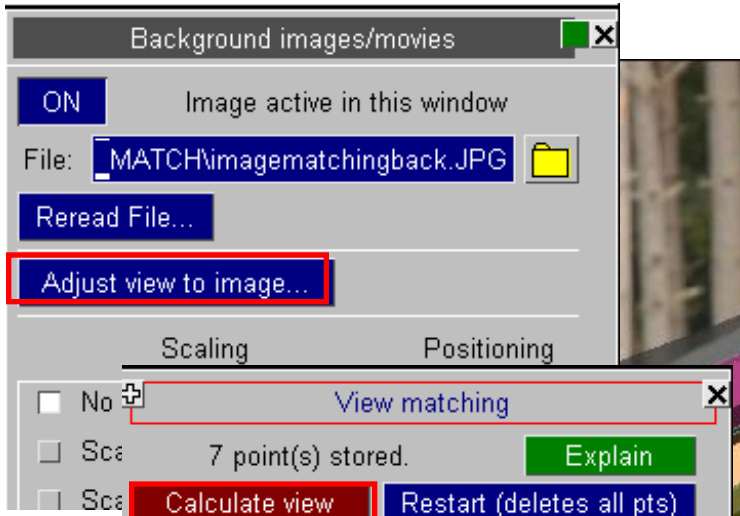
Background Image : view matching



Press “calculate view” – model viewing angle and perspective changes to minimise screen distance between picked nodes and their equivalent points in the image.

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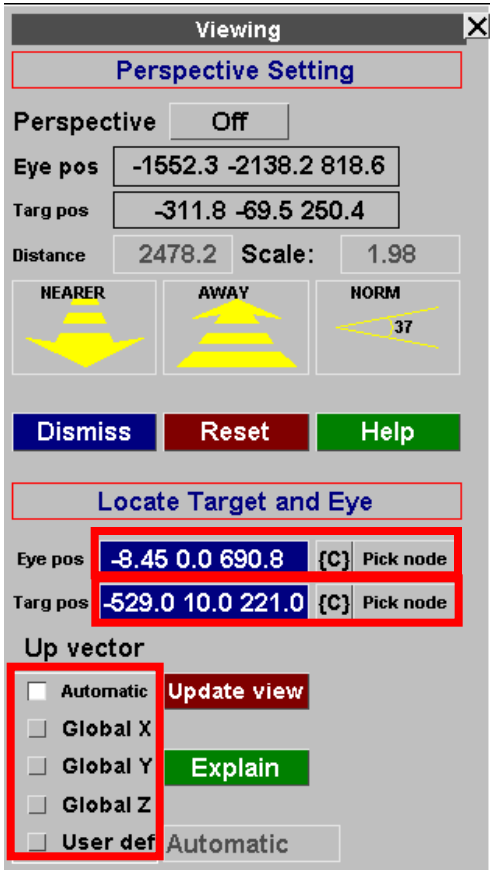
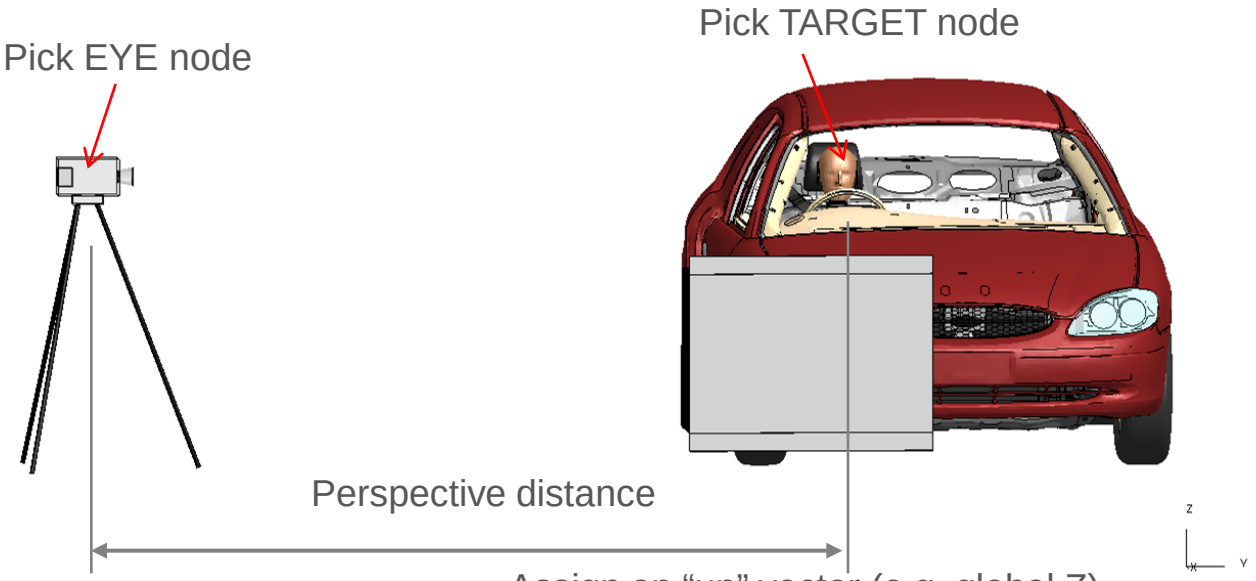
Background Image : Target and Eye

- Define camera (“eye”) and target locations
- D3PLOT calculates view angle and perspective automatically
- Saves time when comparing to test photos





Locations can be input as:
1. x,y,z coordinates
2. Current view “{C}”
3. Pick node

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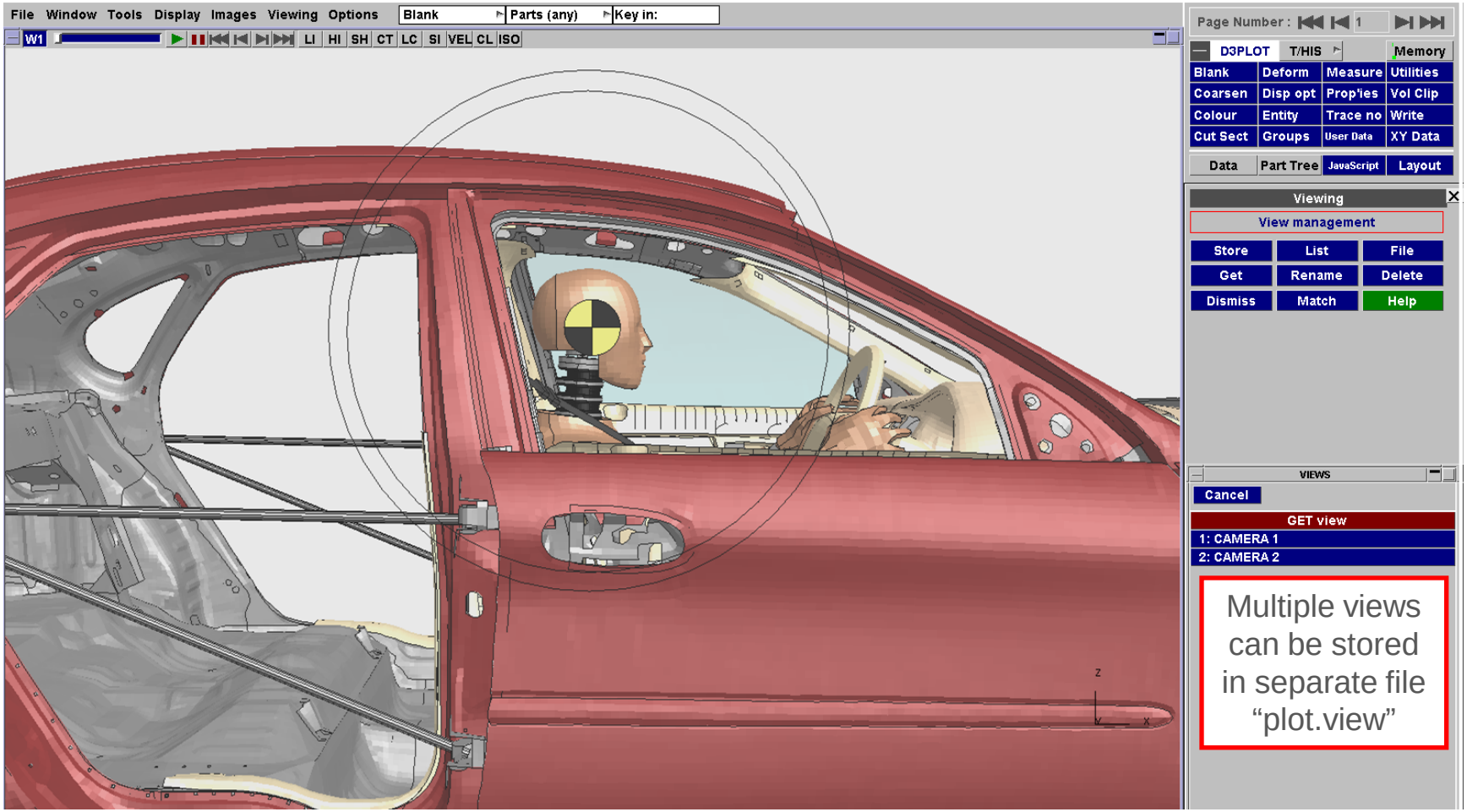
Background Image : Target and Eye



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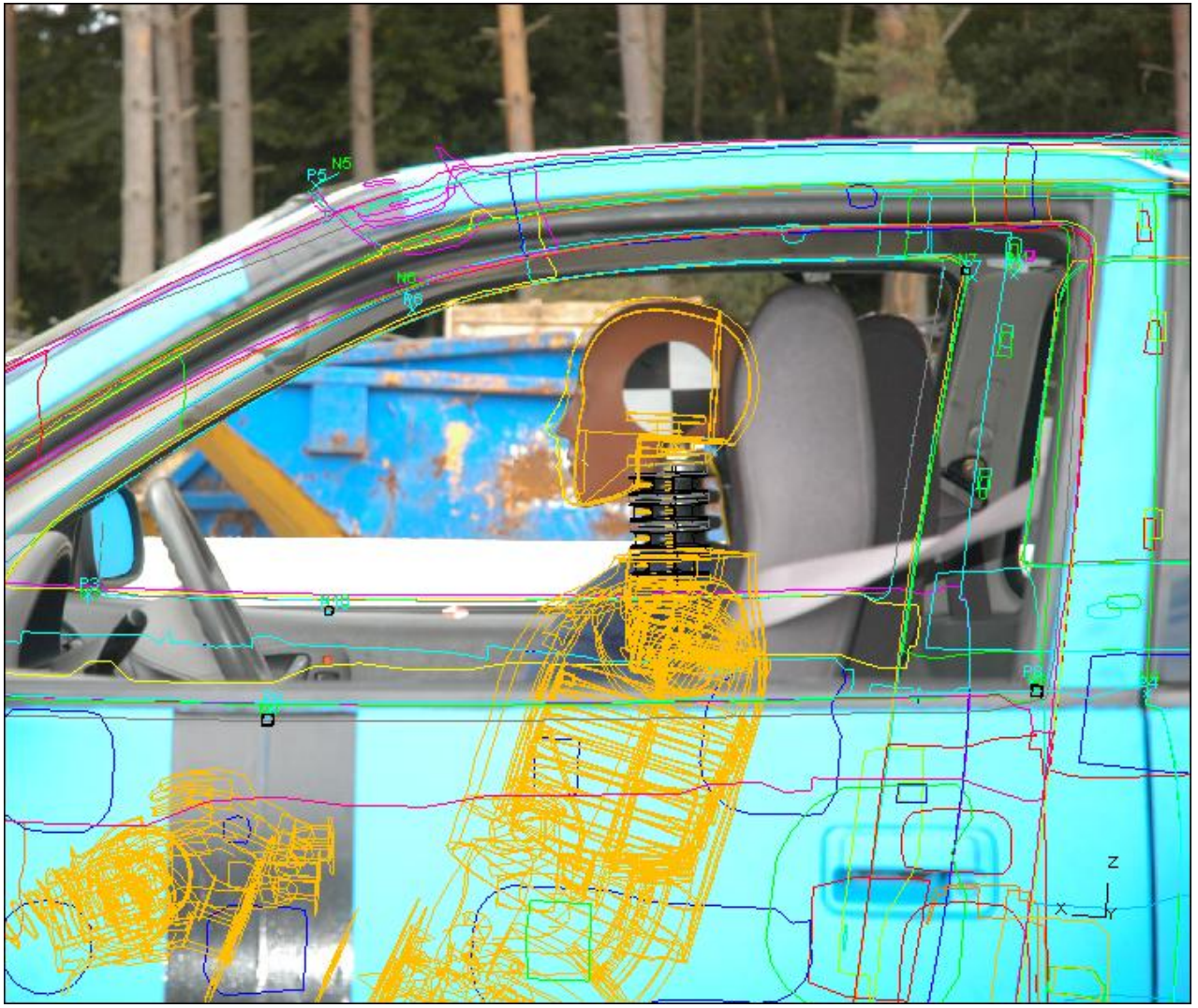
Background Image : Target and Eye

Oasys D3PLOT

- Can be used to help line up the model with a background image or movie



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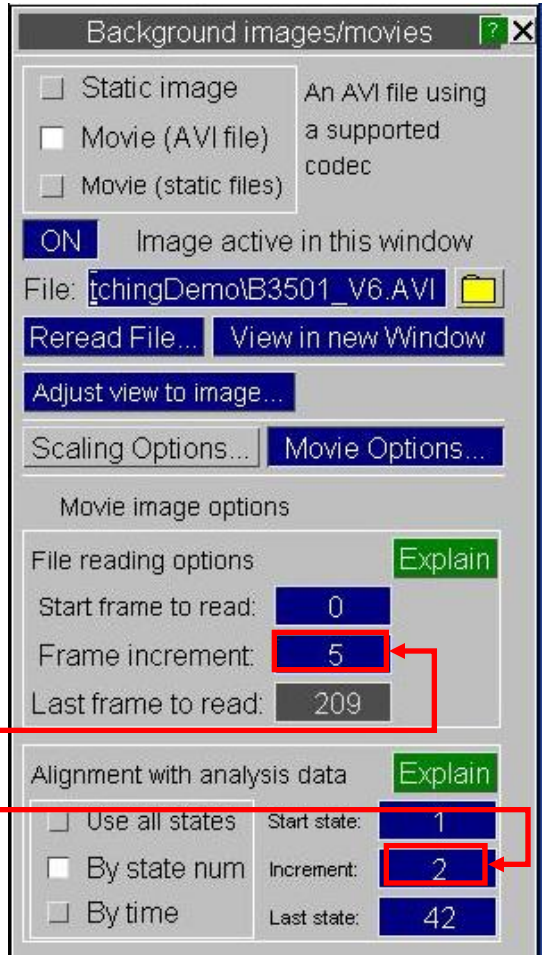
Background Animation

- Animation files may be read into a D3PLOT window (same window as model, or different window).
- Align model view to movie in the same way as image
- Use Movie Options to synchronise view and timing with model



e.g. Movie at 0.002s per frame vs. Simulation at 0.005s per frame.

To match, we need every 5 frames of the movie and every 2 frames of the simulation.

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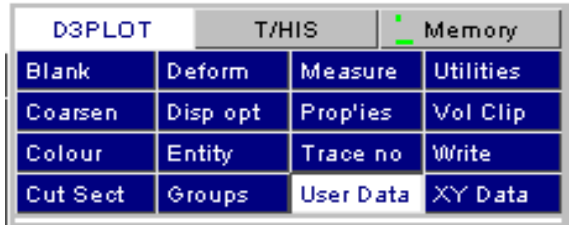
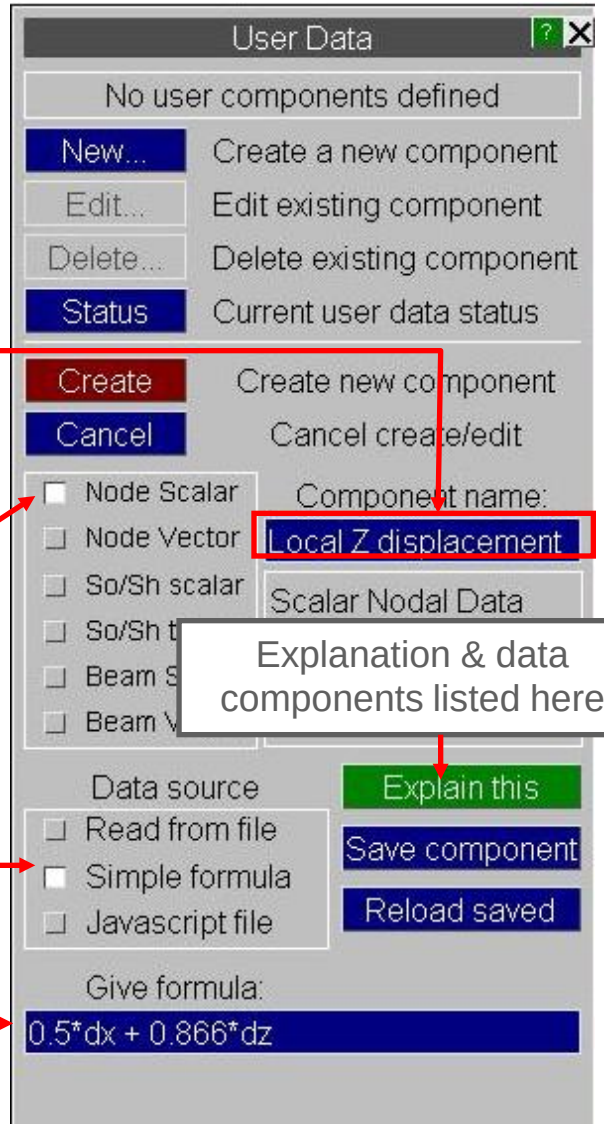
User-defined data

- User-defined data components for contour plots
- Example – displacement in a local axis system
- The local Z displacement will be calculated by a formula from the global X and Z displacements.





Name of component

In this example, we calculate a single value for each node

Explanation & data components listed here

The method used is a simple formula, using maths operations, numbers and existing data components. Here, DX means x-displacement, DZ means z-displacement

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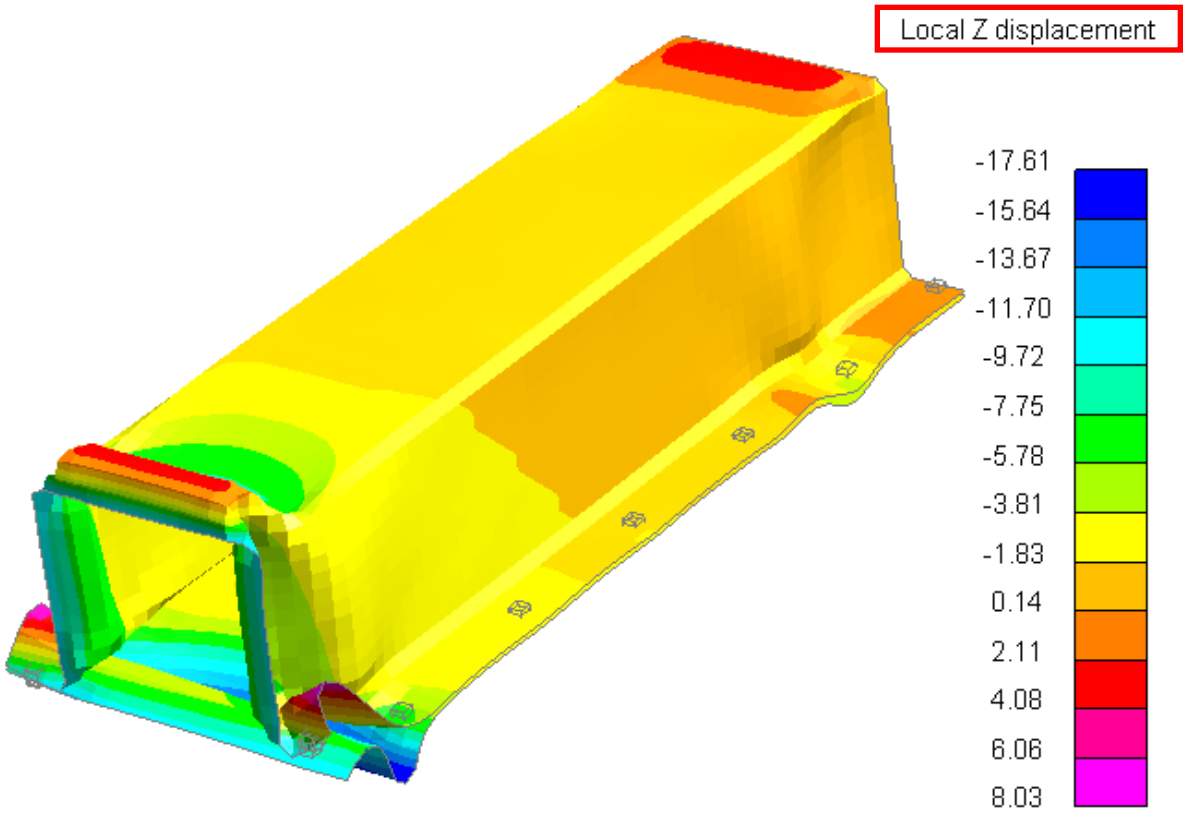
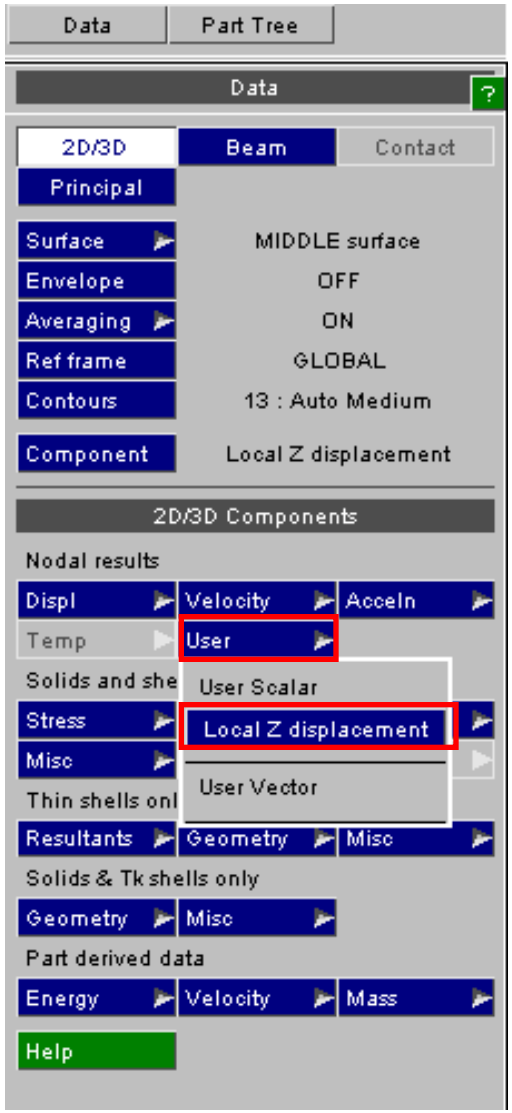
User-defined data

- Having defined the data component, we can now select it in the Data menu.





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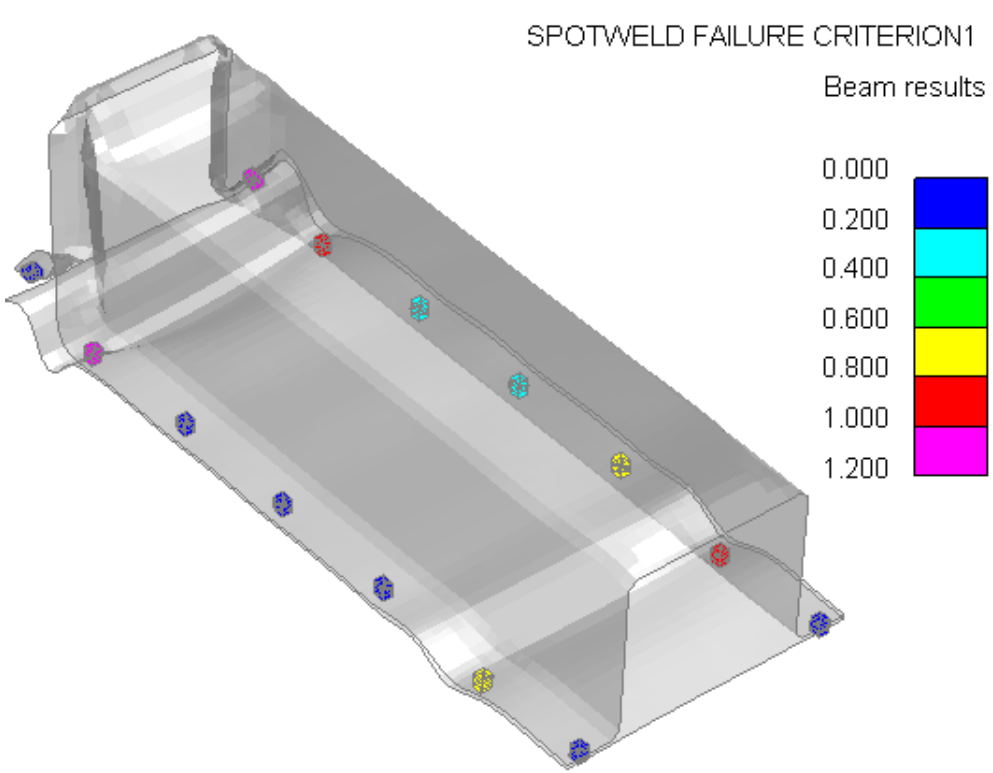
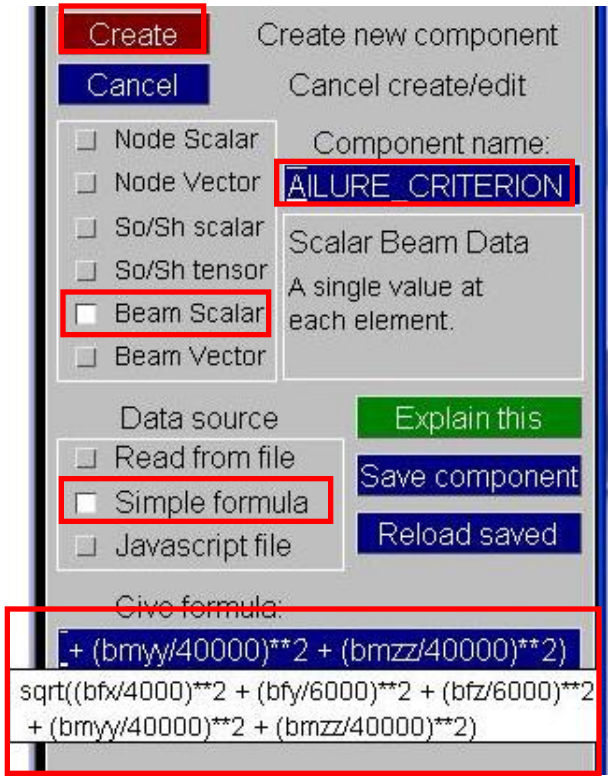
User-defined data

- Another example – failure criteria, in this case for beam-element spotwelds. We have calculated a failure criterion using a formula based on the beam force resultants.
- The formula can include mathematical operations such as SQRT or **





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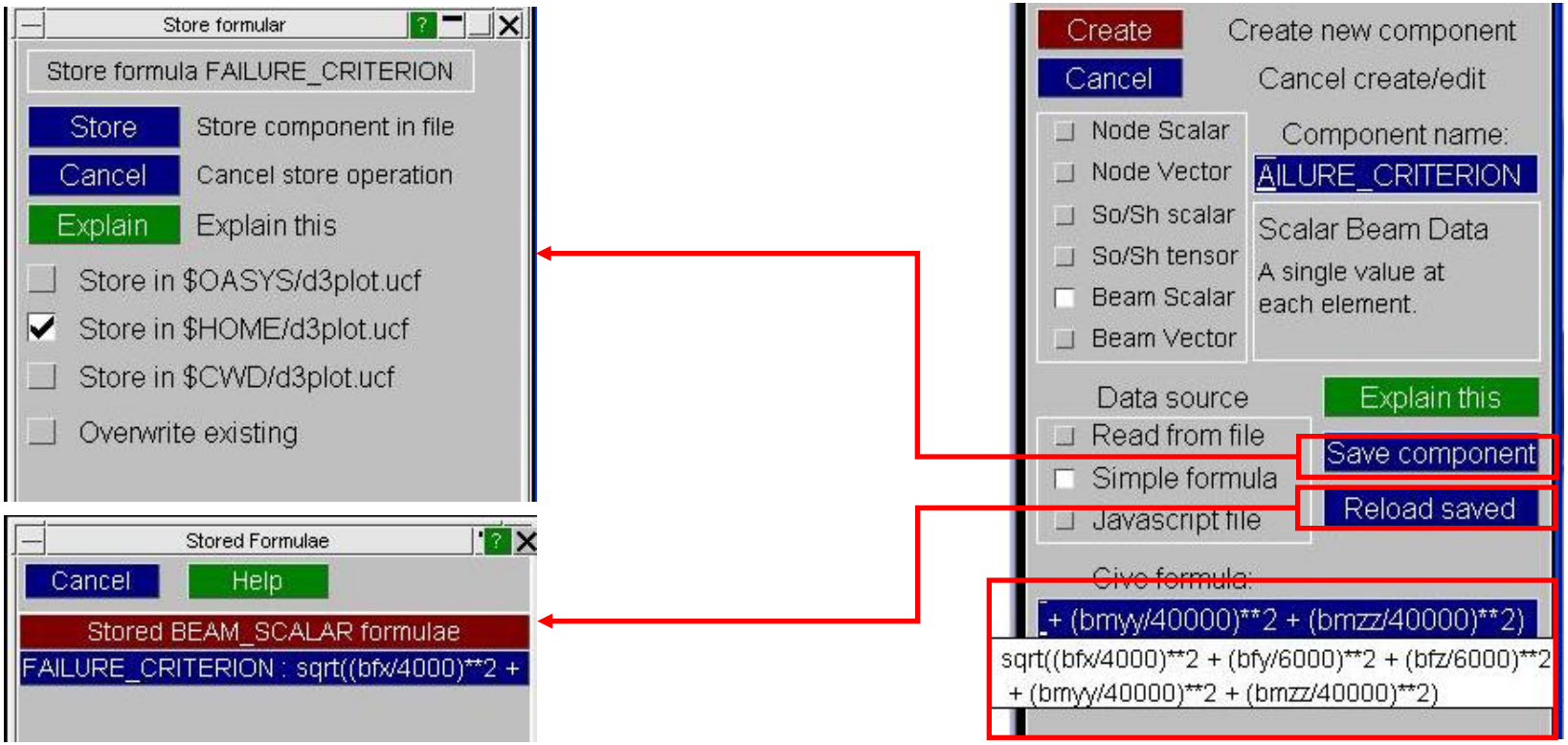
User-defined data

- Components that were simple formulae or read from file can be saved as .ucf files.
- The user-defined data components will then be available automatically in subsequent sessions of D3PLOT.



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D3PLOT JavaScript

- JavaScript is a fully-featured programming language, widely used for web programming, and similar to C++, C, Perl, etc.
- Allows users to program their own functions for D3PLOT, by writing a script (program) that the JavaScript interpreter understands.
- JavaScript Interpreter has been embedded in Oasys PRIMER, D3PLOT, T/HIS and Reporter. No special software or system setup is required.
- JavaScript has “Core” (standard) capabilities described in textbooks, e.g.
  - variables, arrays, strings, objects, functions, regular expressions.
  - Statements if, do, for, while, switch etc.
  - Operators + - / * ++ -- && || etc (like C and Perl)
- The Oasys software development team have extended JavaScript by adding new functions to access D3PLOT’s data and store new results ready for plotting. Users’ scripts can include both Core functions and Oasys extensions.
- The compilation step is done inside the interpreter – the script is source code and works on any computer platform.

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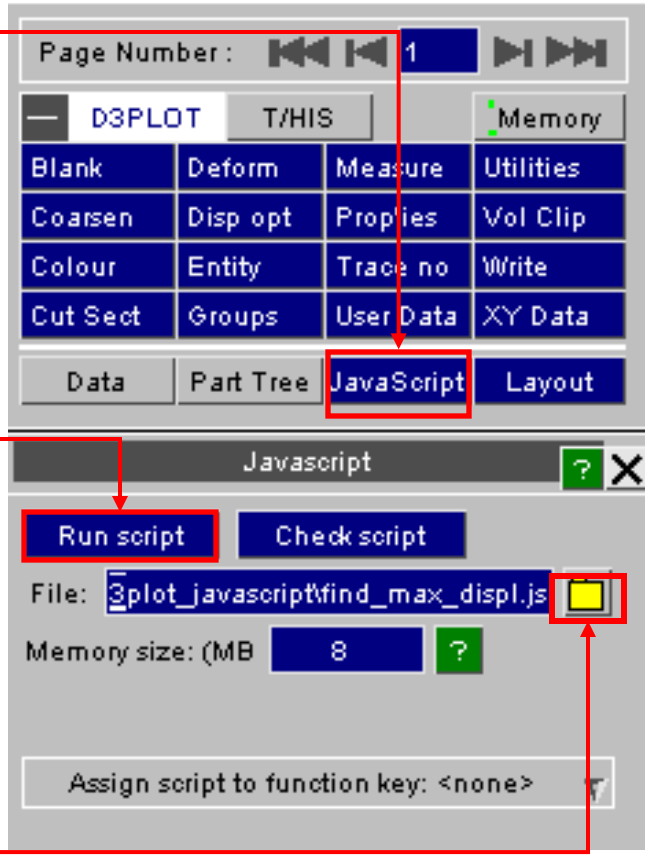
How to run an existing JavaScript

1. Tools=>JavaScript

- Each script is a separate text file. Scripts can be in any directory.



3. Run

2. Browse for the script

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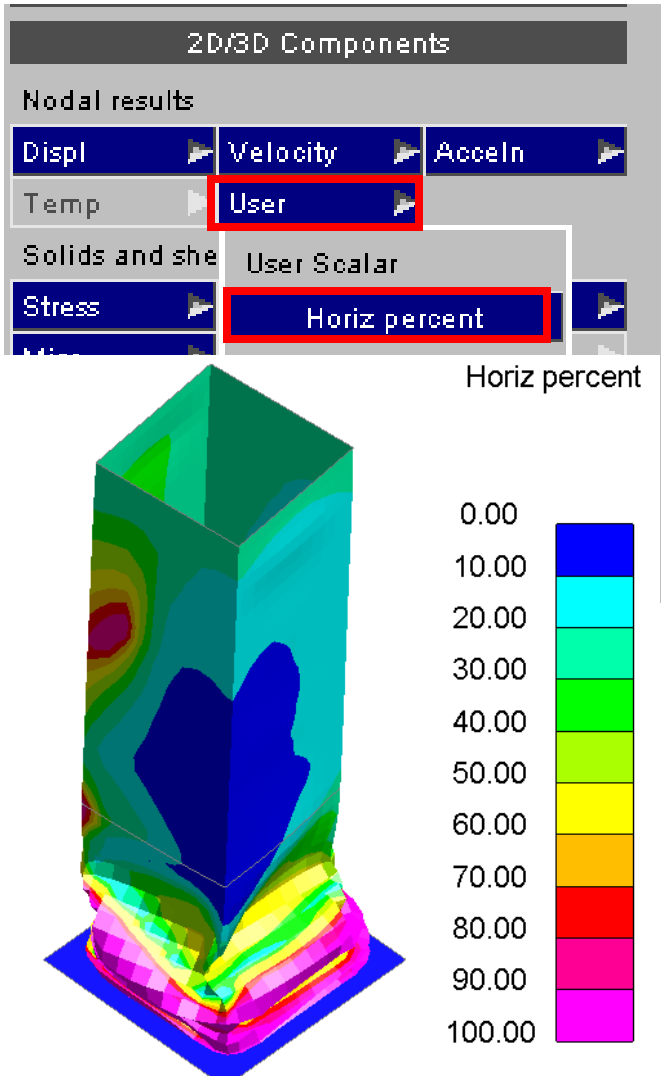
Plotting data created by a JavaScript

- If a JavaScript has been programmed to create results data for plotting, these will be stored as User-defined Binary (UBIN) Data Components
- The new data components will appear under *User* in the Data Component menu.
- Nodal data components will be under *Nodal Results=>User*, Solid or shell data will be under *Solids and shells=>User*, etc
- The data is also stored automatically on disk in files named *jobname_1.ubd*, *jobname_2.ubd*, etc. Next time the model is read into D3PLOT, the same data components will be present because D3PLOT will read them from the **.ubd* files.



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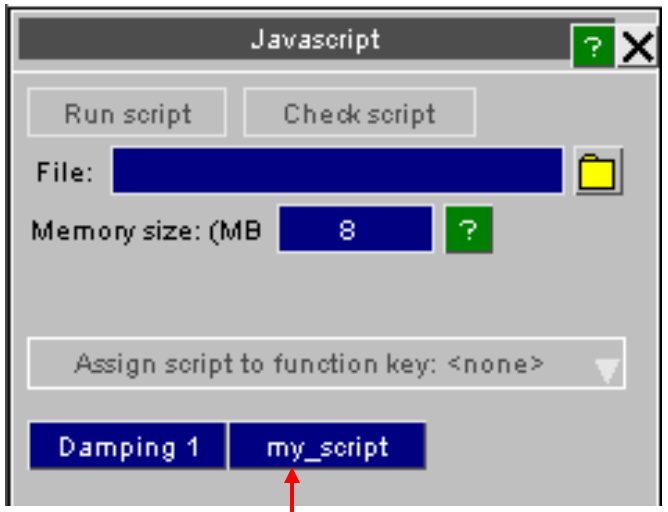
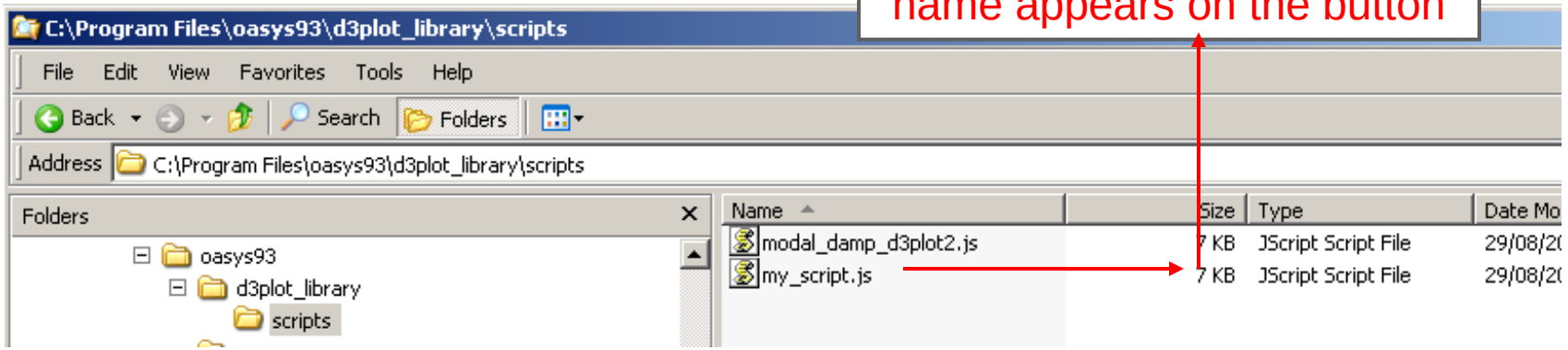
Making your scripts available to others

- Any script can be run by browsing for the script file.
- To make a script available more easily, copy it into the directory $OASYS\d3plot_library\scripts. For each script in this directory, a button appears in the script menu. Pressing the button runs the script.
- The same system applies in PRIMER



By default, the script file name appears on the button



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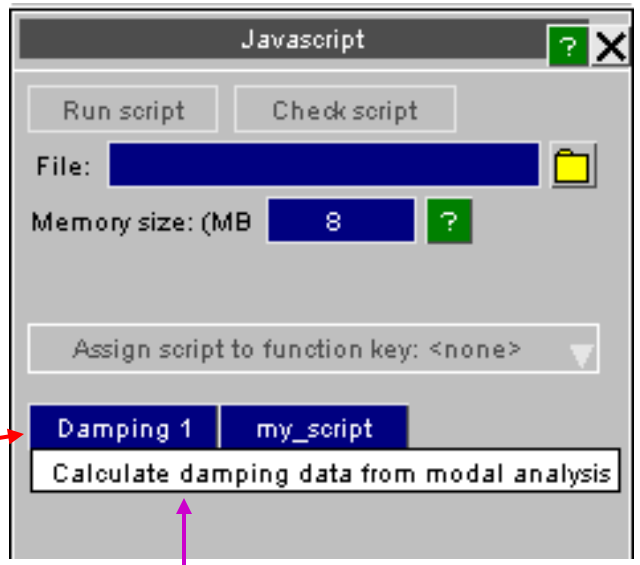
Making your scripts available to others

To change the name of the button (and optionally
to add hover text for the button) add a special comment at the top of the file containing text:

name:<name for button>
description:<hover text to display>




```
// name: Damping 1
// description: Calculate damping data from modal analysis
// It is assumed that Model 1 is the d3eigv file
// The script writes out damping data per mode
```

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D3PLOT Scripting

- **Advantages of writing a JavaScript to create a new capability:**
  - Quick turnaround – don't have to wait for new version of D3PLOT
  - Can keep your application confidential
  - Under your control – can do it yourself if you wish.
- **Possible applications**
  - Read data from an external file and plot it, e.g. spotweld forces from the swforc file
  - Calculate and plot failure-related data, e.g. stress/yield stress
  - Complex calculations involving comparisons of results across time-states
- **Resources for programmers**
  - Training material is available to download at http://www.oasys-software.com/dyna/en/training/tutorials.shtml .
  - Core JavaScript functions are described in textbooks, e.g. "JavaScript – The Definitive Guide" (5th edition) by David Flanagan, published by O'Reilly. ISBN 0-596-10199-6
  - Also try Web search for "core JavaScript reference"
  - D3PLOT's JavaScript extension functions are described in Appendix VI of the D3plot manual
  - Example scripts are provided in the *$OASYS/d3plot_library/examples* and *$OASYS/d3plot_library/scripts* directories

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JavaScript v User-defined data?

- User-defined data components can be defined directly in D3PLOT, e.g. using “simple formula” method. This is easier than writing a JavaScript to calculate results. When is a JavaScript needed?
  - “Simple formula” can be applied when the user-defined result for node n at time t depends only on data that exists in the ptf/d3plot file (e.g. displacements, velocities) for node n at time t. Similarly for elements – if the user-defined data at time t depends only on existing data for that element at time t.
  - If the user-defined data requires knowledge of results across multiple nodes/elements, or across multiple time-states, then “simple formula” cannot be used and a JavaScript is needed.
  - If the user-defined data is calculated using branching logic (i.e. is not a one-line mathematical formula), a JavaScript is needed.
  - If the user-defined data is calculated using data from an external file, in combination with the data in the results file, a JavaScript is needed.

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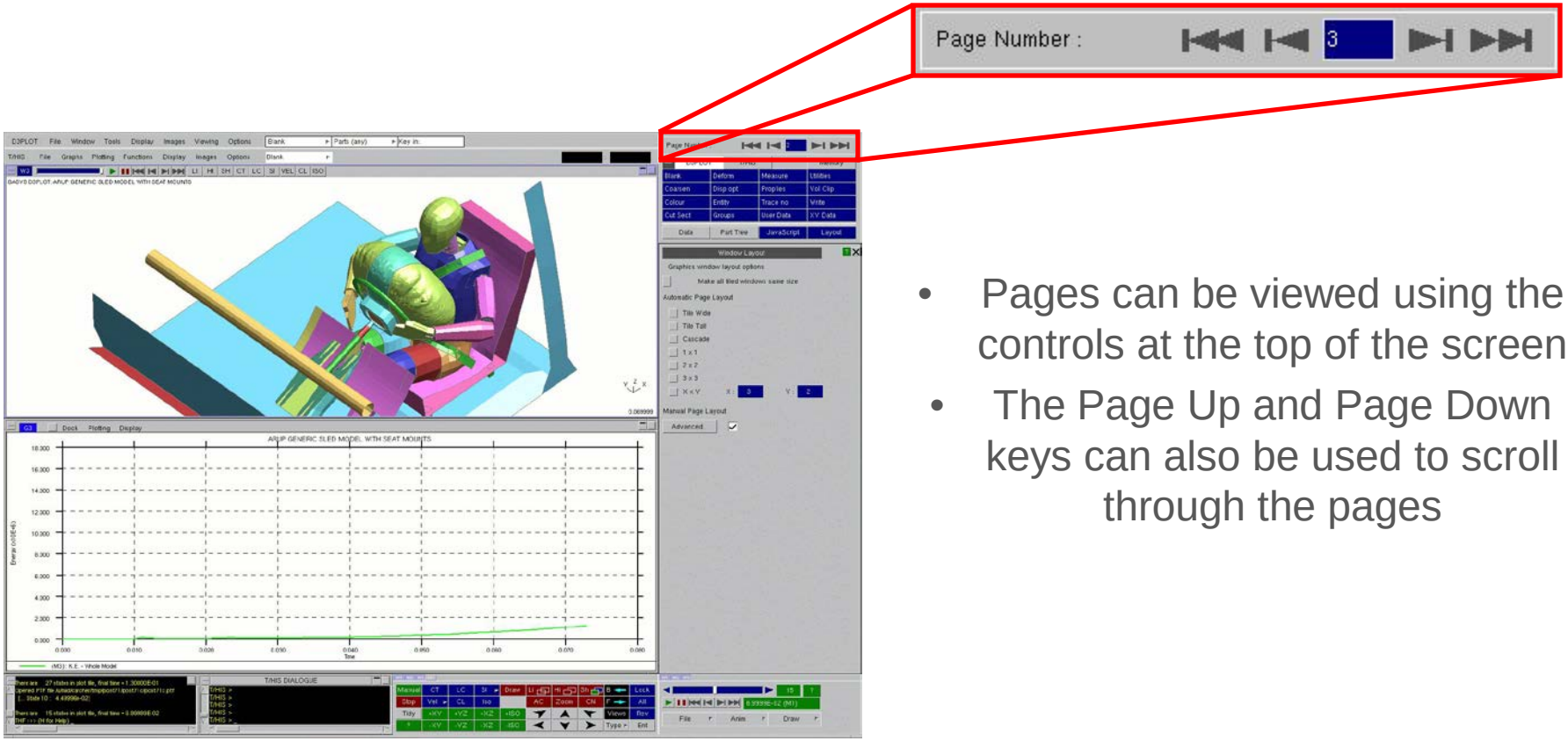
Page Control

- D3PLOT allows windows to be arranged on multiple pages. One page is visible at any time.



- Pages can be viewed using the controls at the top of the screen
- The Page Up and Page Down keys can also be used to scroll through the pages

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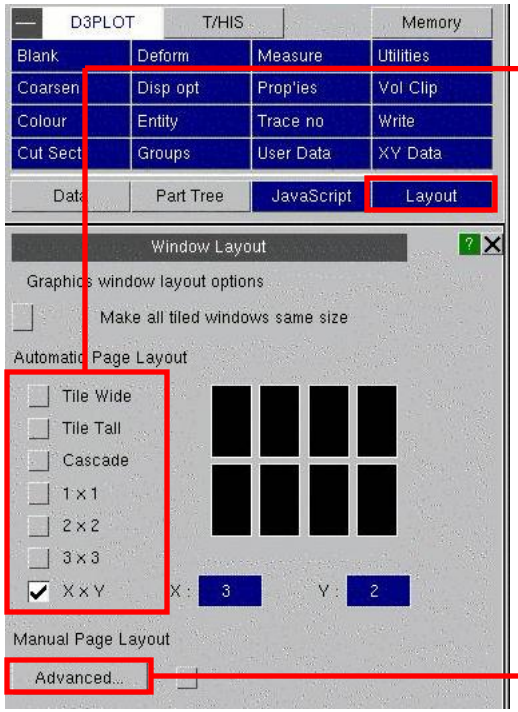
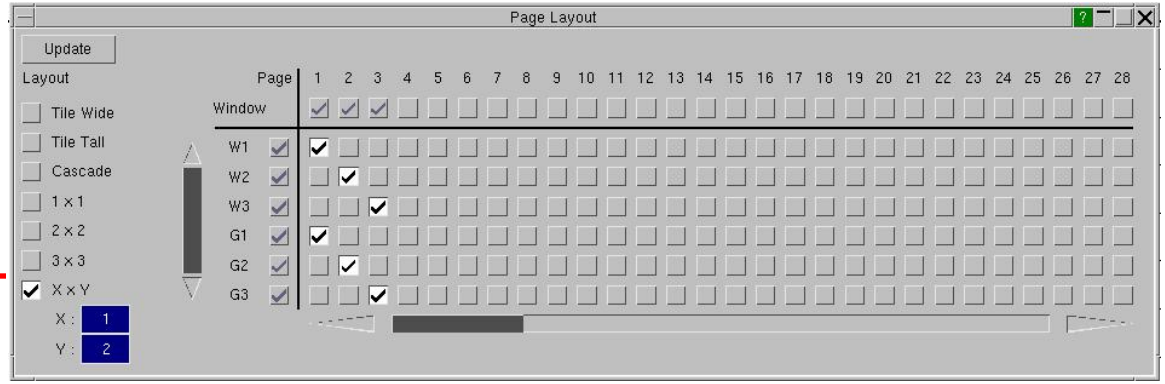
Page Layouts

- Windows are displayed on ‘pages’
- The layout and number of windows per page is controlled in the layout panel



- Defined layouts can be selected to automatically set the page layout



- Manual page layouts can be defined using the ‘Advanced…’ button
- Windows can be placed on different pages

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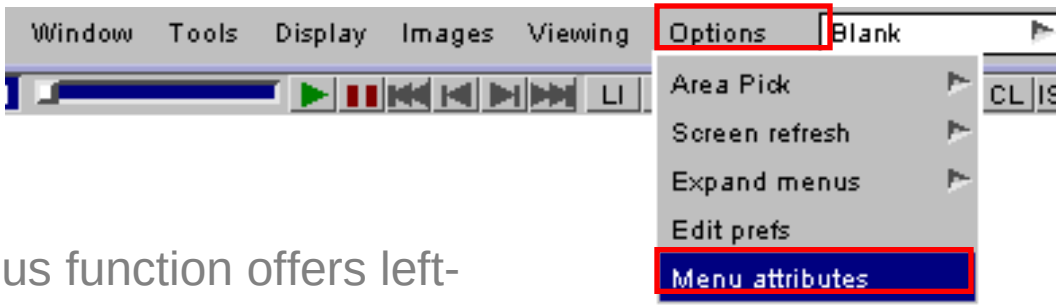
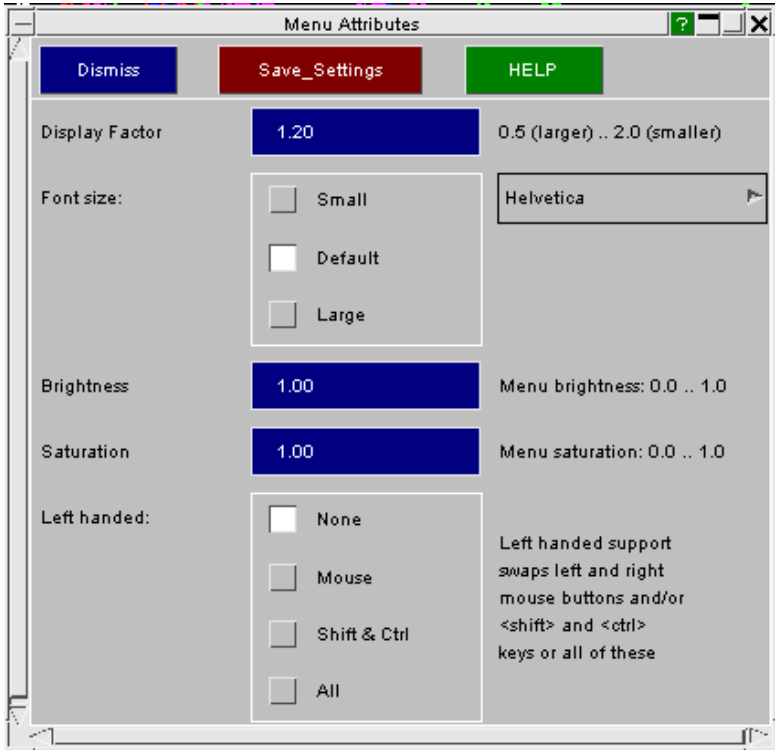
Menu Attributes



- New Menus function offers left-handed settings, font size and display factor
- These are also available as preferences, under “menu_attributes”.
- Interactive setting of display factor helps with wide screens, when the same preference may not suit all users.



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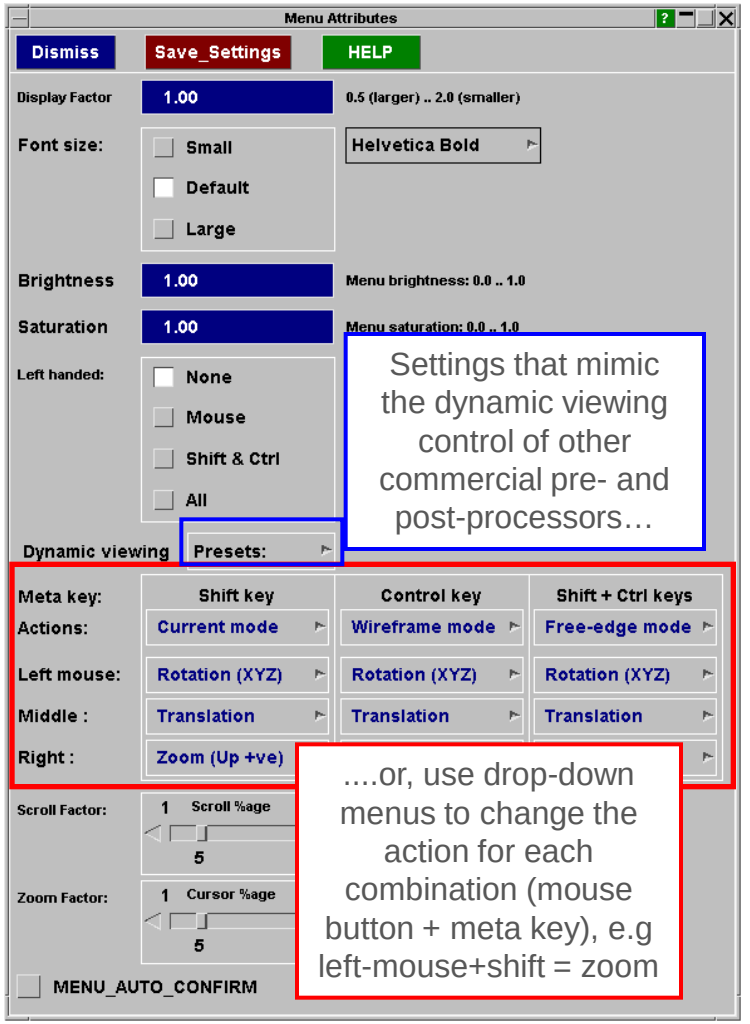
Menu Attributes - Dynamic Viewing

- Customisable dynamic viewing (i.e. control over which mouse buttons and keyboard keys are used to rotate, zoom and pan) can help users who are familiar with the dynamic viewing controls of other pre- and post-processors.
- Dynamic viewing behaviour may be set using the Options=>Menu Attributes menu.
- The settings may then be saved to the Preference file for use in future D3PLOT sessions.



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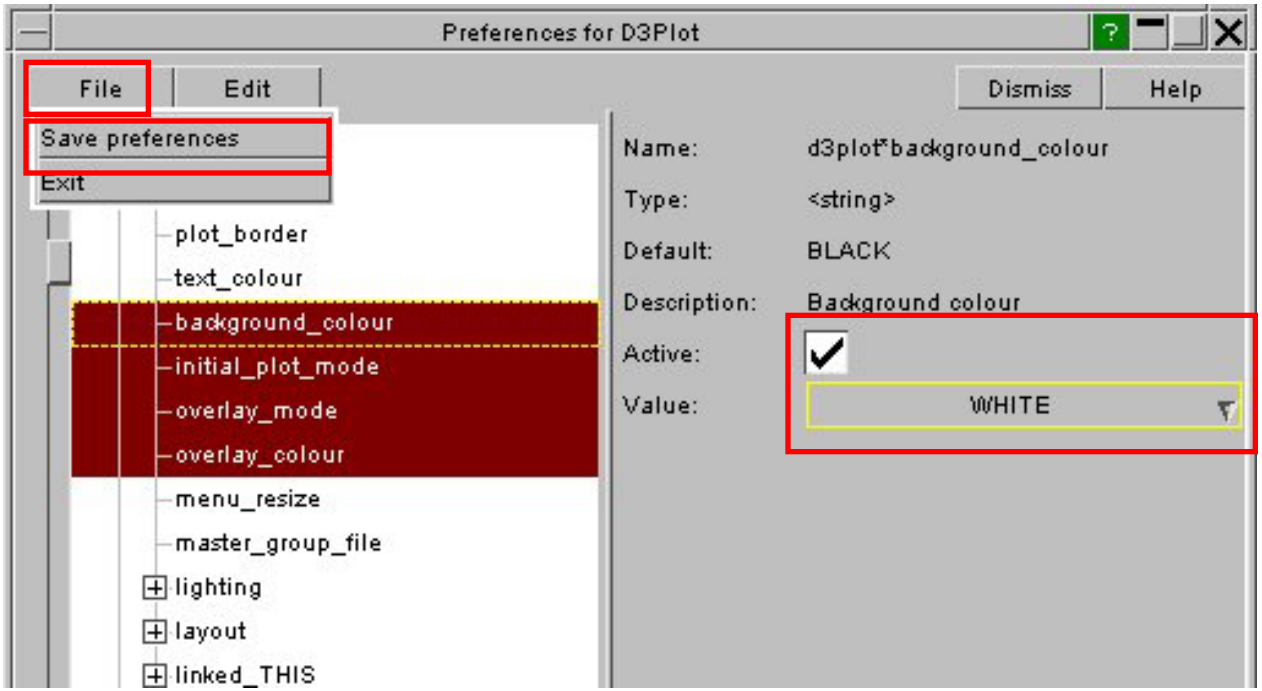
Edit Preferences

- Users can change their preferences (customisable settings) from within D3PLOT.

- Remember to Save Preferences before dismissing the menu.



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Shortcuts

- **Shortcut keys: buttons on keyboard that access commonly used functions. Not case sensitive.**
  - **?** = list of available shortcut keys
  - **ESC** = dismiss the menu that the mouse is over
  - **1,2,3,4,5,6,7,8** = XY, XZ, etc standard views; **V** = **V**iew menu
  - **A** = **A**utoscale
  - **B** = **b**lanking menu; **R** = **r**everse all blanking; **U** = **u**nblank all
  - **E** = **e**ntity visibility menu
  - **H**, **L, S** and **F** = perform **H**idden line, **L**ine, **S**haded and **F**ringe (SI) plots
  - **M** = **m**easure node-to-node
  - **O** = Display **O**ptions panel; **P** = **P**roperties panel
  - **Q** = Return to **Q**uick-pick mode
  - **X** = Cut Sections menu; **D** = Drag cut section; **N** = pick node on cut section
  - **Z** = **z**oom (drag across rectangular area)
  - **+** and **–** = zoom in and out
  - **I = I**conise all menus**; T** = **t**idy all menus; **C** = **c**lose all menus
  - Arrow keys ← , → : back/forward one state; **Home** = first state; **End** = last state
  - Space Bar – start/stop animating

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