Altair Safety Report Manager

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Altair Safety Report Manager

The Altair Safety Report Manager (aka ASRM) is a fully customizable automatic report generation utility for crash & safety regulations. It allows users to create a First Sight Report PPT for the selected impact type & regulation. The PPT report which consists of plots & animations that are generated based on various inputs entered by the user.

A standard report is delivered for each mode with the following info and contents.

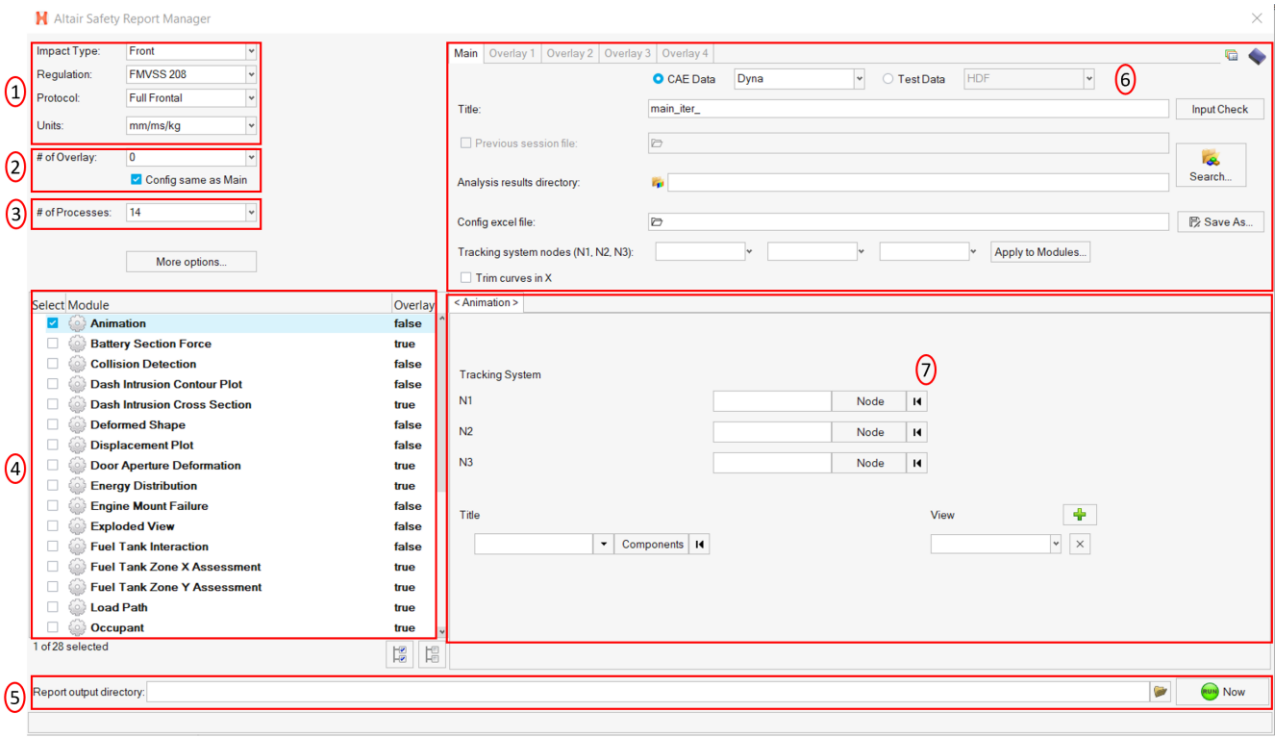
- Model information
- Run quality statistics
- Occupant requirements
- Structure overview
- User defined plots

In addition, HyperView template & session files are created at the end of report generation which contains all plots/animations for closer analysis. It has the capability to overlay plots from different iterations. It is also possible to overlay plots with test data in HyperView.

The ASRM utility can also be run on HPC after job completion.

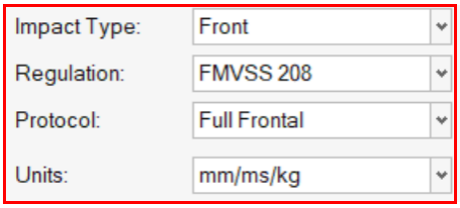
ASRM GUI Overview

Below is a snapshot of the ASRM GUI. To understand the ASRM workflow better, the GUI is divided into various sections as highlighted & numbered in the below picture. The main functionality of all the sections is briefly described below.



Impact Type & Units selection Section

In this section, user will be able to select the Impact Type, Regulation, and the Protocol for which he / she wants to generate the PPT report along with the source units used for running the simulation. Based on this selection the modules list (section #4) gets updated.



Overlay selection section

In this section user will be able to select the overlay option. Following scenarios are supported.

- When you want to generate report for a single run then you would set overlay option to 0. Therefore, overlay tabs (in section #6) is disabled.

- When you want to run in overlay mode, then you must pick appropriate number of overlay runs. The overlay tabs get enabled based on the number selected. User can select up to 4 iterations for overlay.

Please note that only those modules which run in HyperGraph (that create curves / graphs) are supported for overlay mode. There is a specific overlay status column next to modules list that indicates the overlay support for each module.

No. of Processes selection & save session file section

This section allows user to enter the no. of processes to be used when executing the utility. ASRM has the capability to run the report generation in parallel based on the no. of processes selected.

It also saves TPL files and session files at the end of the report generation. Users can also choose to export curves (curves created from the respective plotting modules) into **Excel** format. Click on the **More options…** button to select these options.

Modules list

This section allows users to select the modules to be run for report generation. User must make sure to select the module that he / she wants to include in the report generation.

Output directory selection

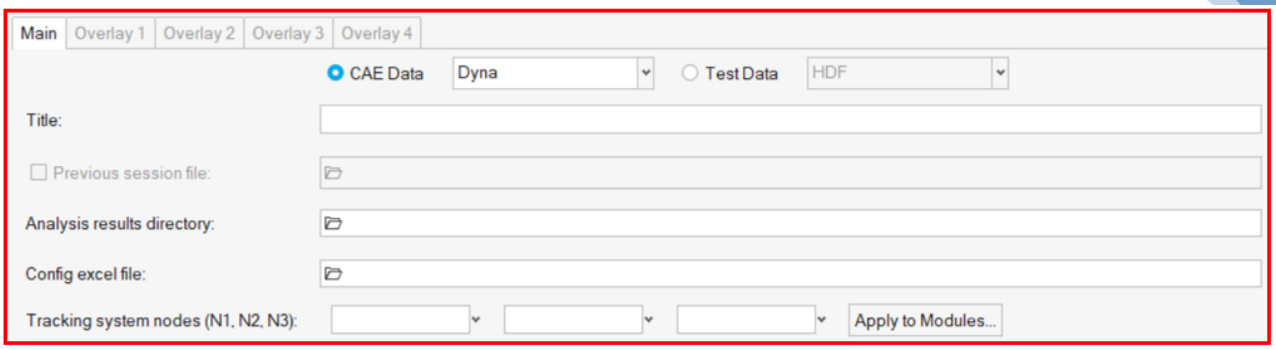
In this section user will select the output directory path. This is where all the output files such as the session files, images, animations, PPT & log files from the ASRM run will be created.

Main section

Input directory & configuration section

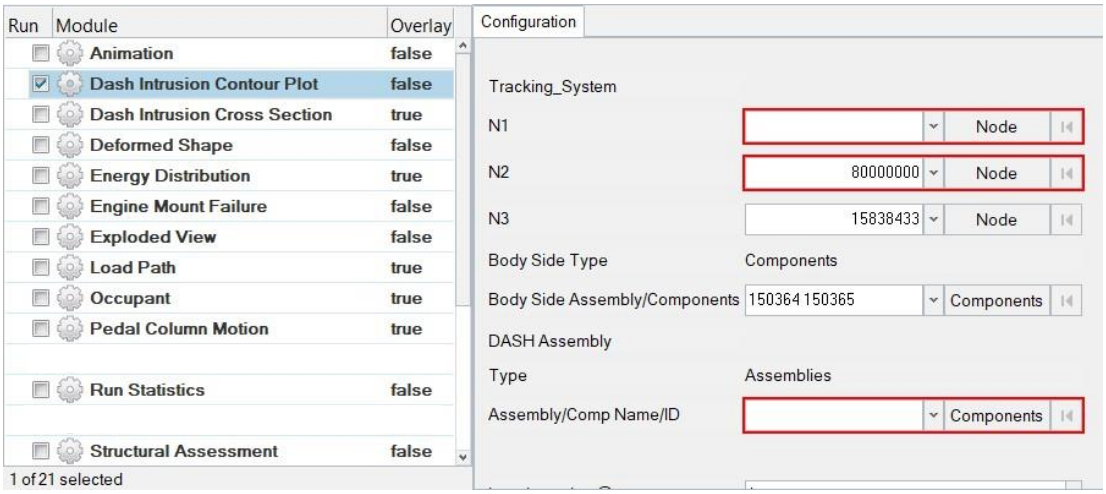
In this section, user will be able to select the following.

- Type of data being used for generating the report. It could be CAE simulation data or physical test data.
- Title for the report which will be used for creating results directory as well as prefix for curve names & summary tables
- Results directory path where the solver input file, results files such as animation & time history files or test data are located.
- Config file path (if it exists already)
- Define global tracking system using 3 nodes (requests from Time history file). This is an optional input. Once the global tracking system is defined, it can be easily applied to other modules where tracking system is an input. Click on **Apply to Modules…** button, a selection dialog pops up, select the modules to apply the 3 nodes, and click **Apply&Close** button.



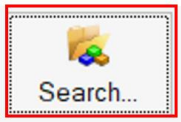
Input Validation check

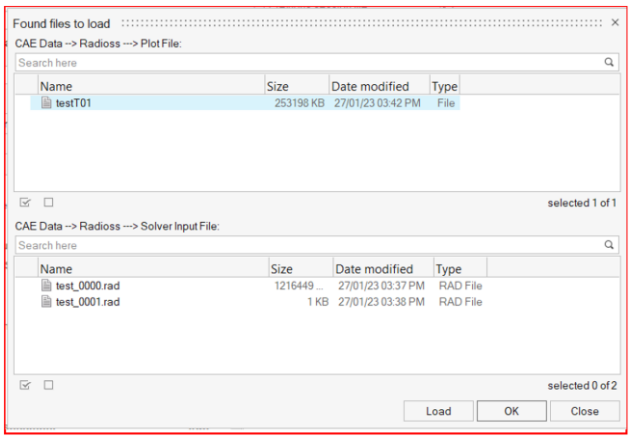
Input Check button would run a quick validation check to verify if the inputs defined for various modules selected is valid. The verification is done on the results files available in the input directory specified. Any invalid inputs and missing input found from validation check will be highlighted in RED in the ASRM GUI as shown below.



Search function

Search button will let users to select and import the 2D time history file (CAE (T01 / binout) or physical test data (HDF / ISO MME)) as well as main solver input file into the current session. This is required for defining the inputs for all the modules. An additional dialog called **files to load** will be displayed to select the files as shown below.

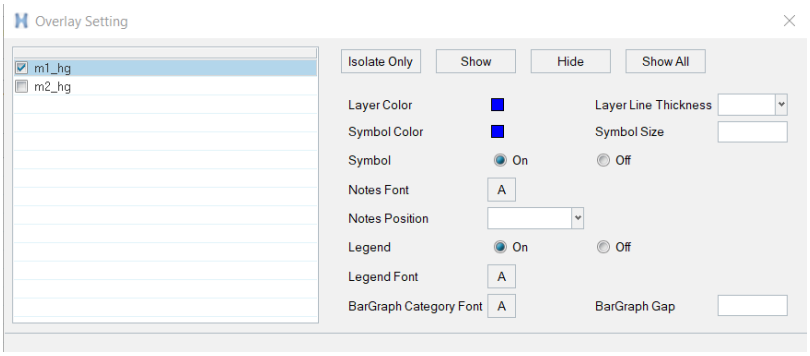




Change curve attributes & publish session

This section is mainly used for the overlay scenario.

The change curve attributes option  brings up an overlay setting dialog as shown below. This will allow to change various curve & note related attributes for the overlay session per layer basis.

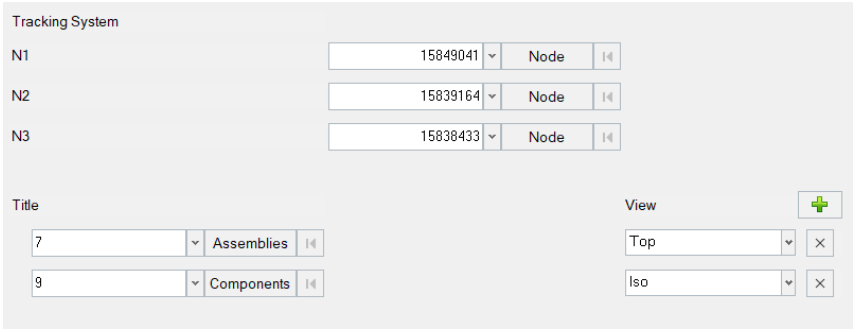


After changing the curve & note related attributes using the overlay setting dialog, user can click on Publish session icon  which would publish a report for the overlay session.

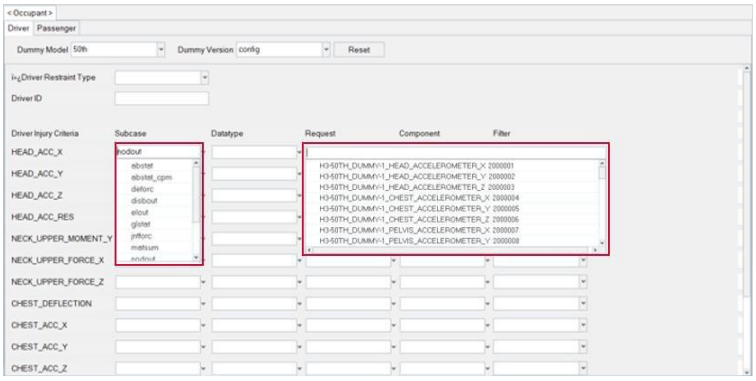
Configuration section

This is the section wherein the inputs required for all the modules will be entered & displayed. For defining the inputs, firstly make sure to load both the 3D (solver input file) file as well as Time History file using the Load button. Then start defining the inputs for the modules.

FE entities such as nodes, components or assemblies can be selected from graphics screen from the loaded solver input file.



Inputs from the Time History files (subcases, requests & components) can be selected from the drop-down context dialog as shown below.



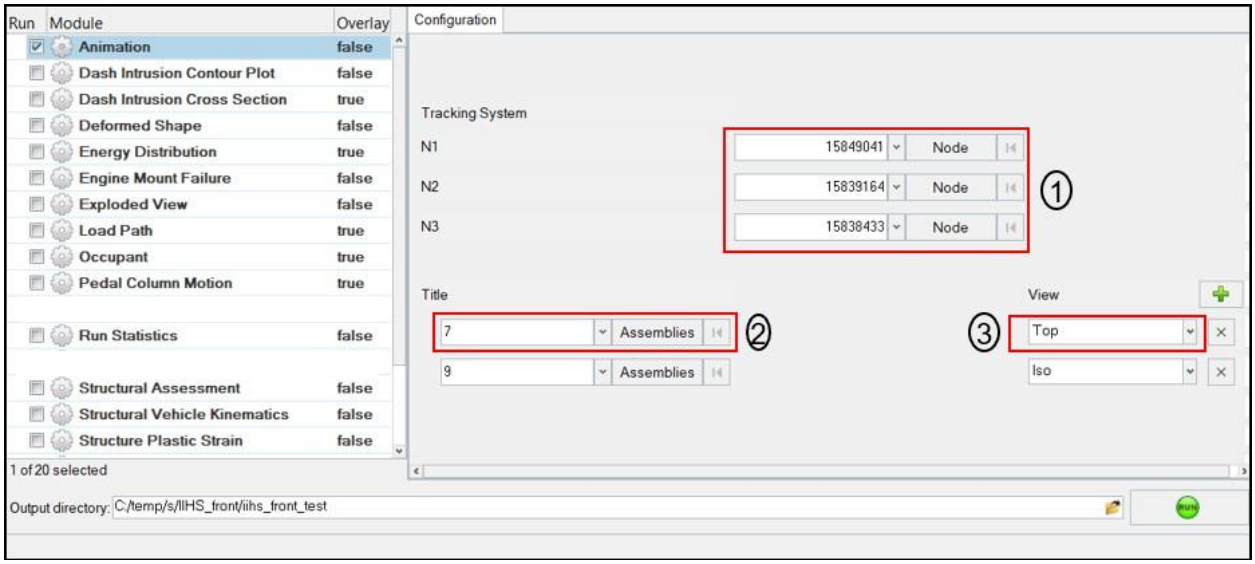
Modules

Following is the list of modules supported by ASRM utility for rear impact type.

- Animation
- Animation New
- Battery Section Force
- Collision Detection
- Contour Plot
- Deformed Shape
- Displacement Plot
- Door Aperture Deformation
- Energy Distribution
- Exploded View
- Fuel Tank Interaction
- Fuel Tank Volume Change
- Fuel Tank Zone X Assessment
- Fuel Tank Zone Y Assessment
- Load Path
- Measure Plot
- Plastic Strain
- Rear Barrier Face Overlap
- Rear Bumper Plastic Strain
- Rear Rail Crush
- Run Statistics
- Spare Tire Bolt Force
- User Defined Outputs
- Vehicle Yaw Pitch Roll
- Velocity Separation
- Weld Failure

Animation

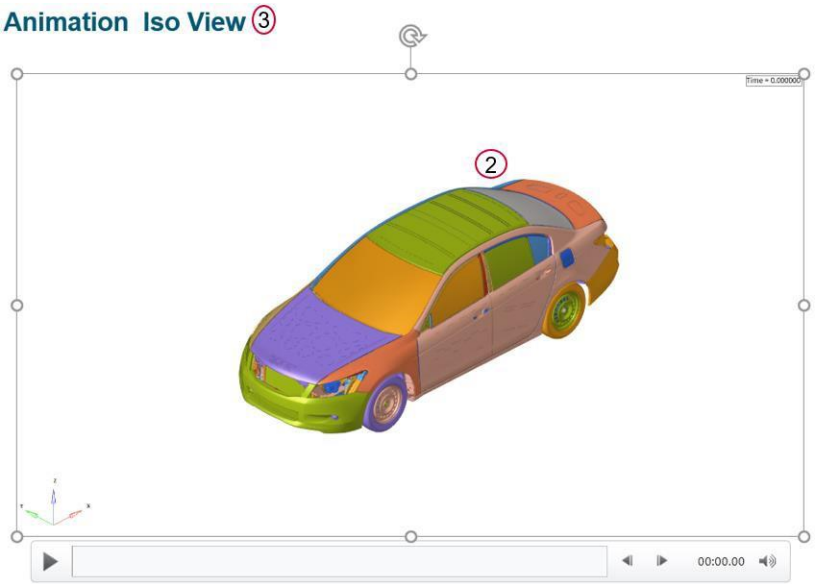
Animation module lets you create gif animations of the selected parts (or assemblies) in the user selected standard views.



Inputs:

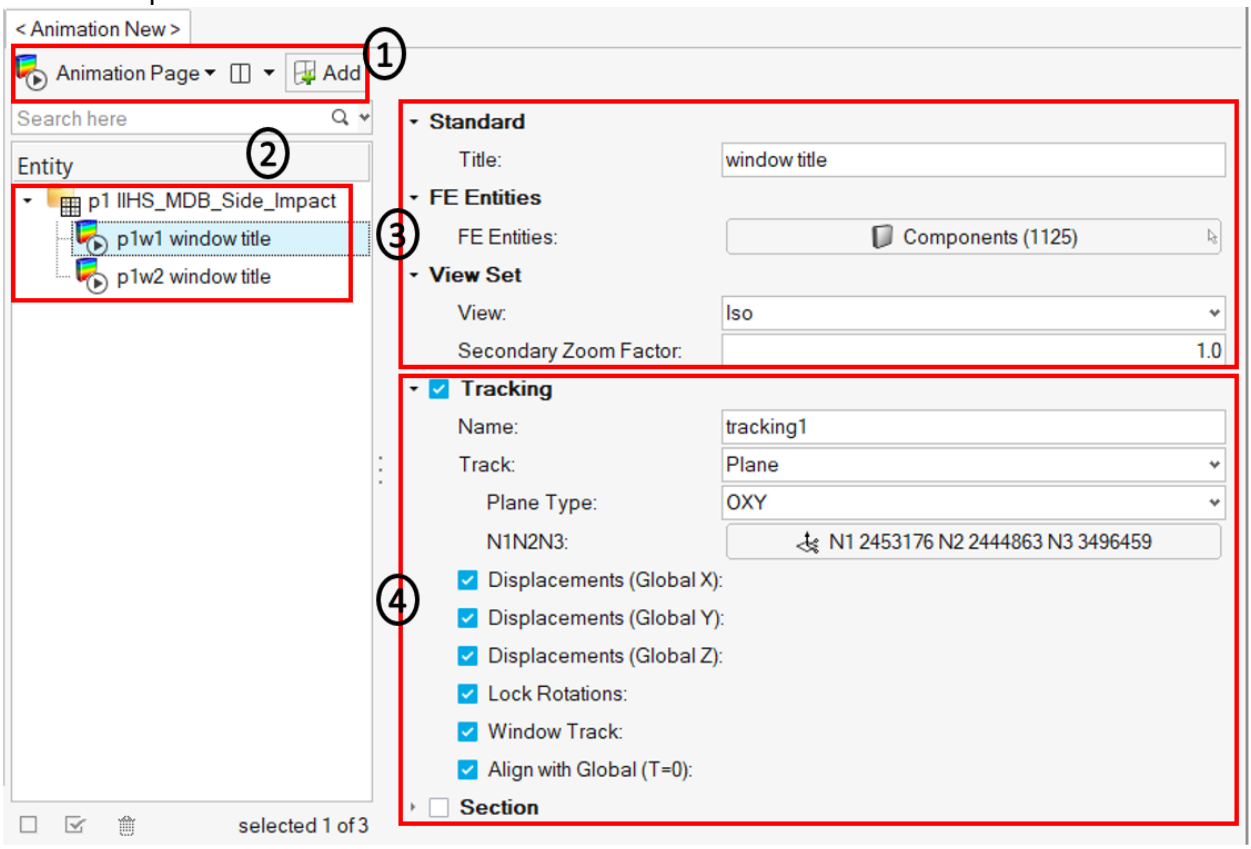
1) Node ID 1, 2 & 3 for defining tracking system
2) Part ID or Assembly ID to be used when capturing gif animations
3) One of the standard views to be used when capturing the gif animations for the part or assy ID selected in step #2

Output report:



Animation New

This module lets you capture animation of the selected parts (or assemblies) and offers flexibility in terms of page layout, view orientation, tracking and section cut. The GUI and the various inputs that are required to be defined are mentioned below.

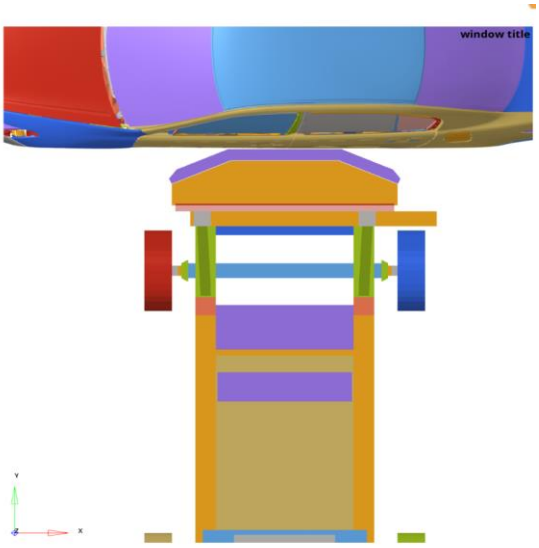


Inputs:

1) Use this input to select the page & window layout that will be captured and included in the report. 2 layouts are supported i.e. 1 x 1 and 1 x 2. Select the layout and click on **Add** button to add the page layout into the entity list browser.
2) The **Entity** list browser is used to list and manage the pages included by the user and their respective layouts.
3) Enter the **Title** used for the slide title in the report, select the **Components** to be used for the current page and the **View Set** to be used to orient the components.
4) Define **Tracking system** & **Section cut** details along with its attributes to be applied while generating the report.

ALTAIR

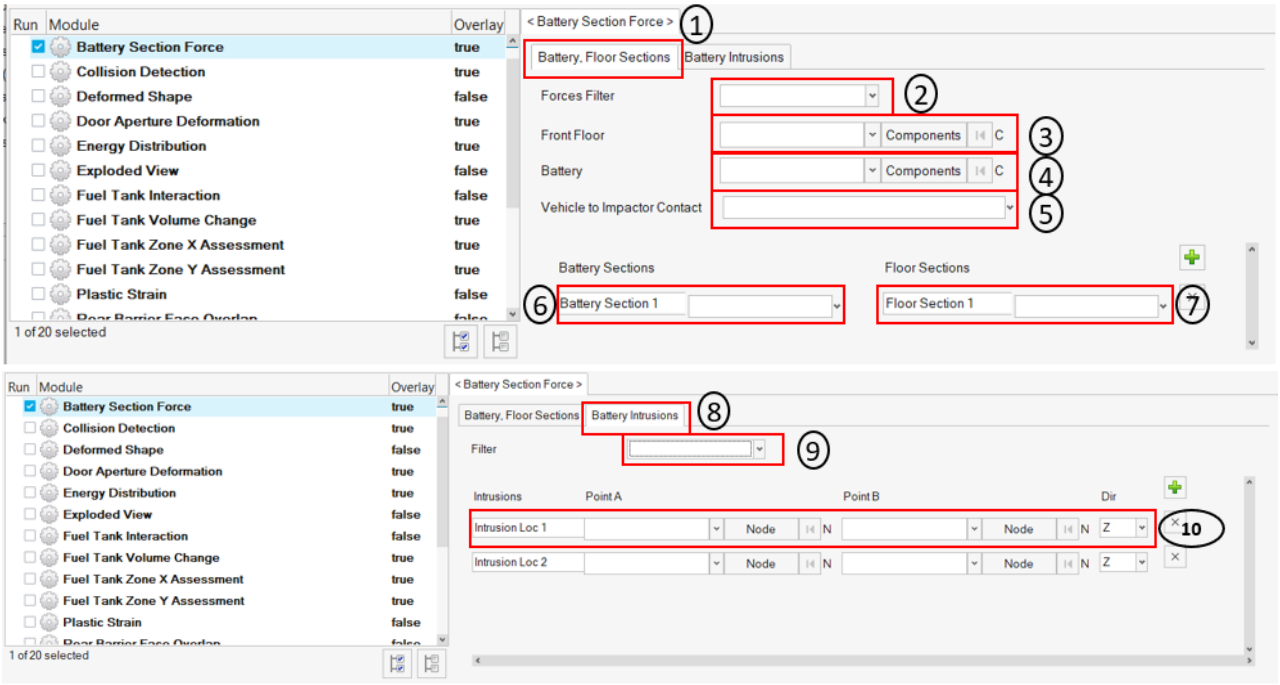
IIHS_MDB_Side_Impact



Battery Section Force

Battery Section Force module lets you create a summary report of battery and floor cross member section forces and battery intrusion measurements. The report consists of following.

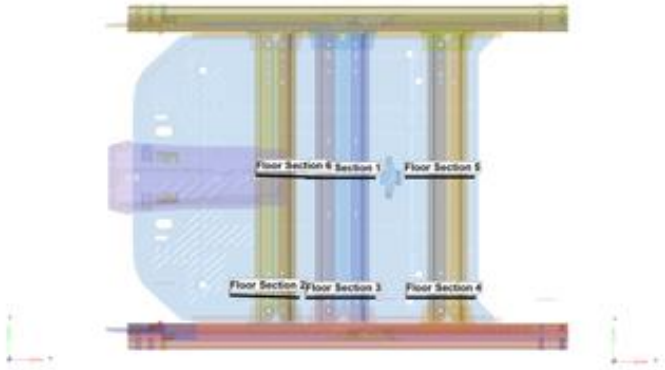
1) Images consisting of floor and the battery parts along with cross section members
2) A summary table showing the cross-member forces for all the user defined battery & floor sections
3) A summary table showing the battery intrusion measurements at various user selected locations
4) Images of the plots showing the battery & floor section forces along with the total floor & battery crossmember forces. Battery intrusion plots are also created at all the user selected locations.

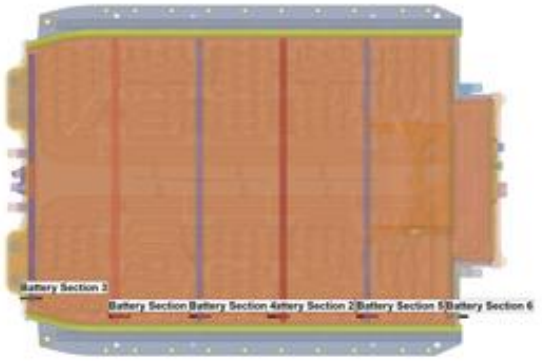


Inputs:

1) For battery & floor sections, following inputs are required.
    a. Filter class to be used for applying the filter to battery & floor cross member section forces plots
    b. Front floor & battery components or assemblies
    c. Vehicle to Impactor contact request
    d. User defined battery & floor sections
2) For battery intrusion measurements, following inputs are required.
    a. The source & target intrusion measurement locations. It could be either Node, Element or Component.
    b. The measurement direction (X/Y/Z)

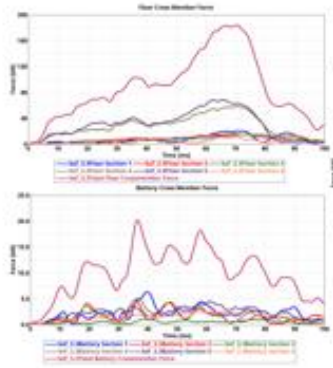
Output report:

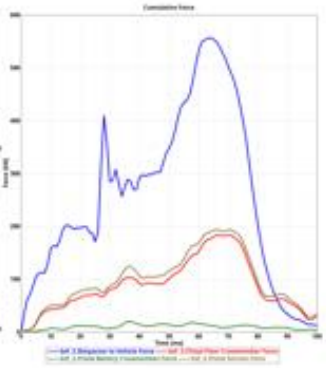


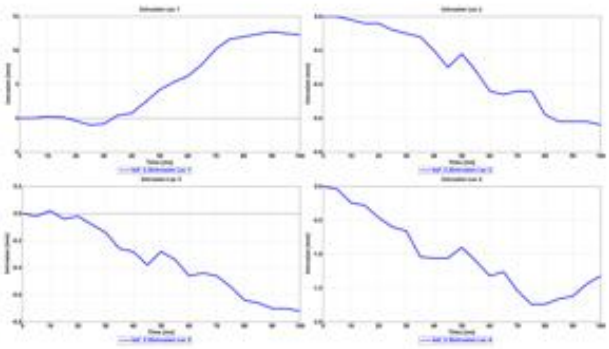


Battery Cross Member Force		Floor Cross Member Force	
Title	Force [kN]	Title	Force [kN]
Battery Section 1	6.37	Floor Section 1	20.89
Battery Section 2	4.44	Floor Section 2	16.18
Battery Section 3	1.07	Floor Section 3	15.36
Battery Section 4	5.10	Floor Section 4	58.88
Battery Section 5	4.56	Floor Section 5	68.69
Battery Section 6	2.56	Floor Section 6	14.13

Battery Intrusion	
Title	Intrusion [mm]
Intrusion Loc 1	12.78
Intrusion Loc 2	0.64
Intrusion Loc 3	0.72
Intrusion Loc 4	1.74

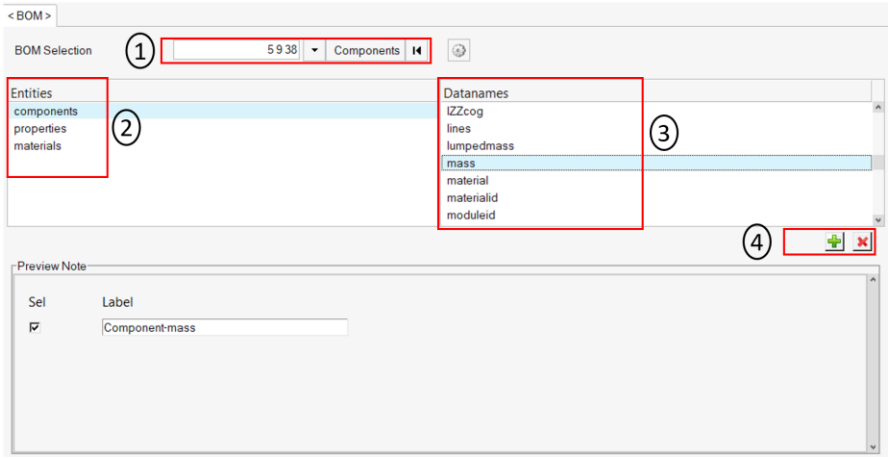






BOM

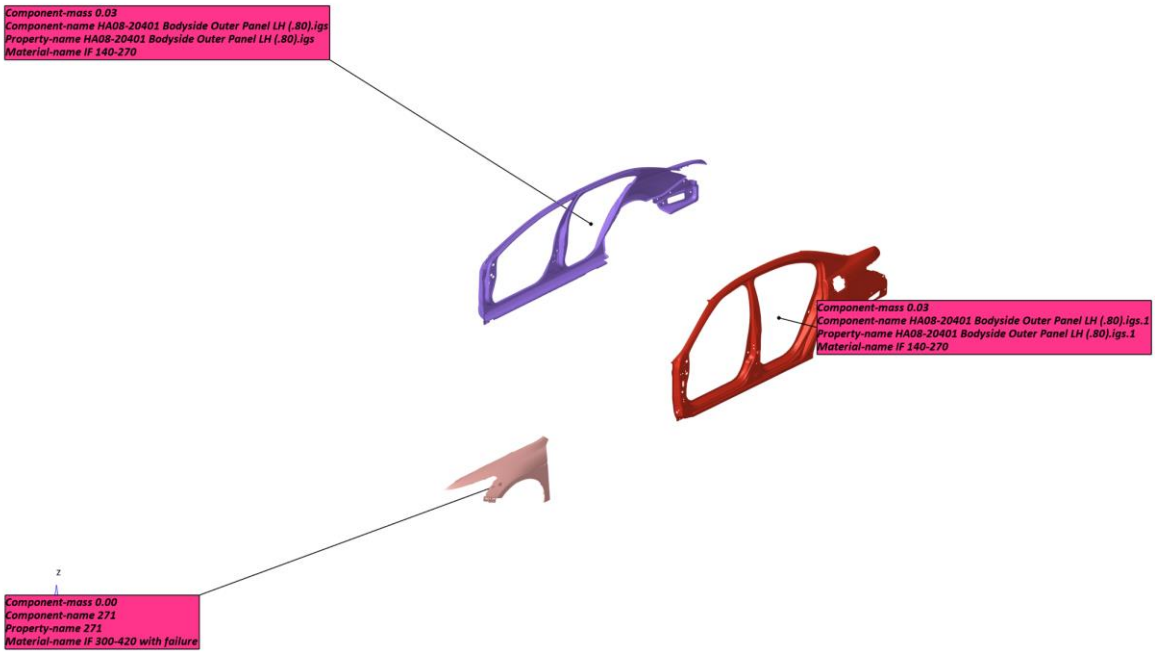
BOM module is an advanced exploded view module. It has the capability to include data name attributes as annotations in the report. Users can pick from several data names (around 100) related to components, property, and material entity attributes. The selected BOM info can be easily attached as annotations to the components in the exploded view.



Inputs:

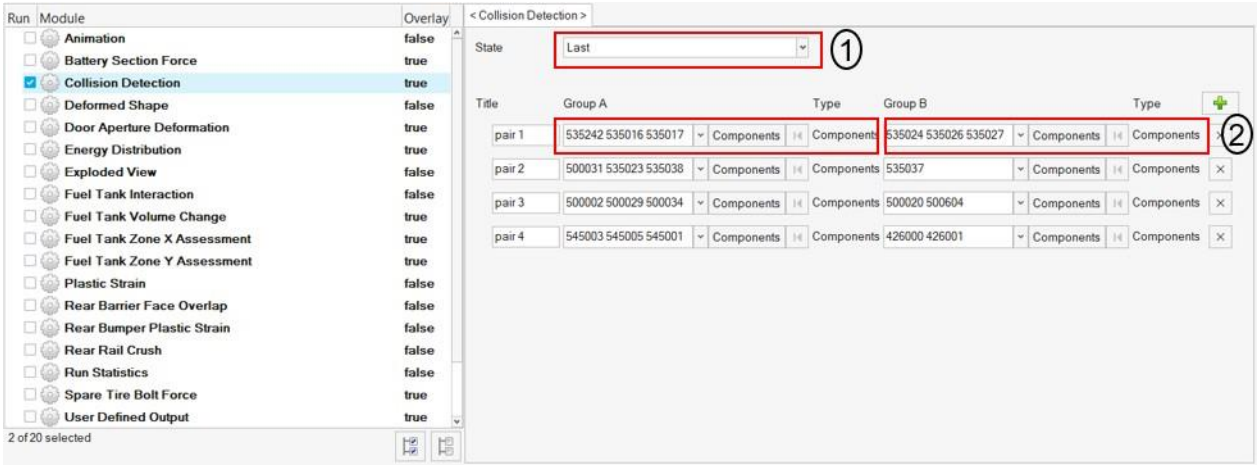
1) Select the assembly IDs or components IDs that should be included in the BOM report
2) Select the entity type for which the data name attribute should be searched
3) Select the appropriate data names from the list
4) Click on + icon to add the selected attribute

Output report:



Collision Detection

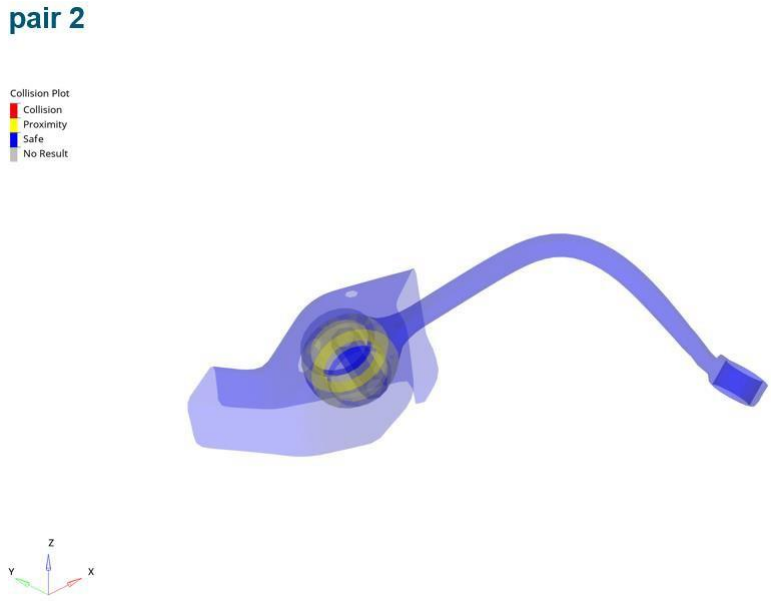
Collision detection module is used to perform collision interference checking. This module lets users to define a collision set by selecting a pair or groups of components (parts) and then detect penetration between the two pairs. Users can define multiple collision sets. This capability allows users to quickly perform design reviews.



Inputs:

1) Select the time step state at which the collision detection is performed
2) Select the components (parts) for each of the two Groups A & B. This forms one collision set. Likewise, users can define multiple collision sets

Output report:

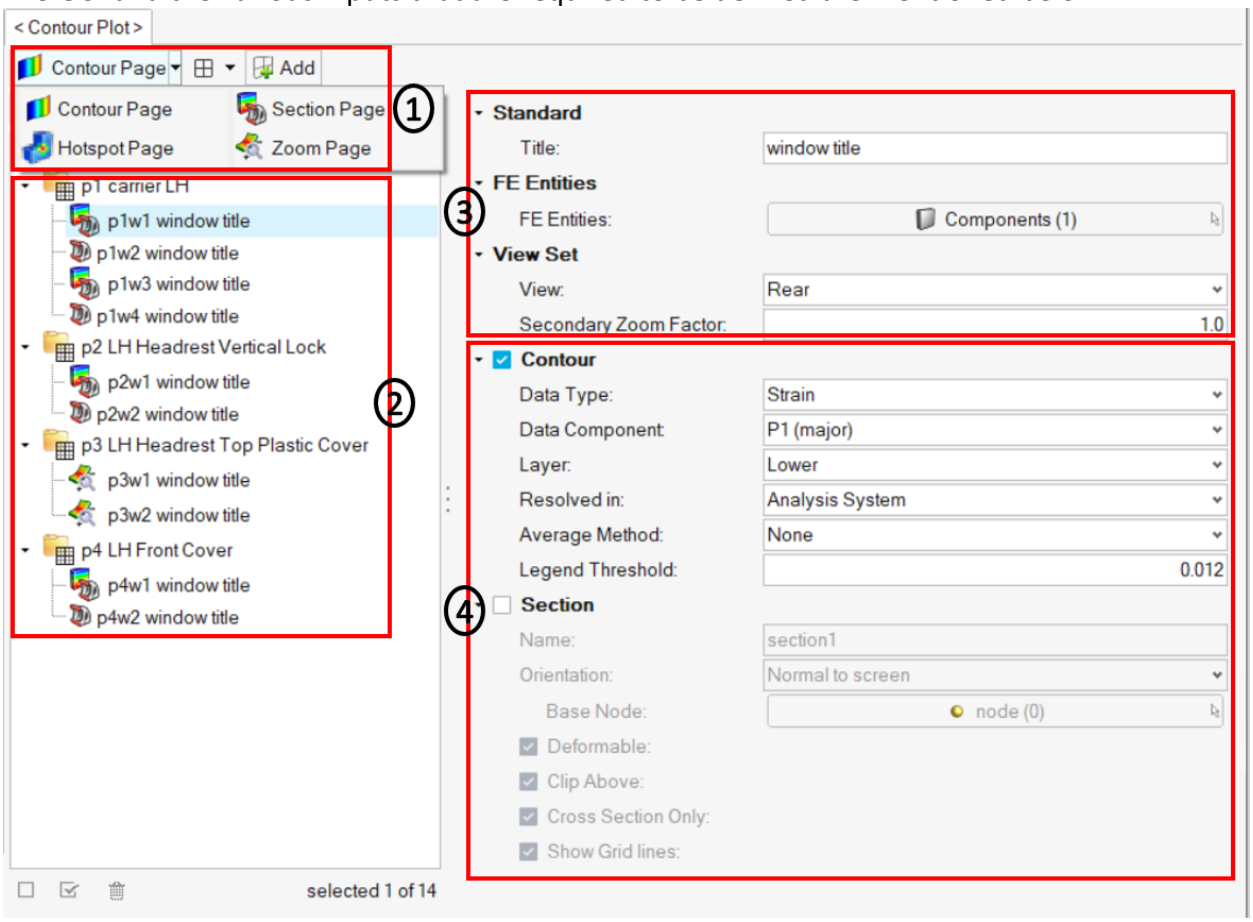


Contour Plot

This is a generic module that allows users to define 4 different types of pages and layouts (namely **Contour** page, **Section** page, **Hotspot** Page & **Zoom** page) and include them in the report. It has the following capability.

- Ability to generate reports with any scalar result datatype contour.
- Ability to find Hotspots & report them.
- Ability to draw section cuts.
- Ability to capture images with user specified zoom factor.

The GUI and the various inputs that are required to be defined are mentioned below.



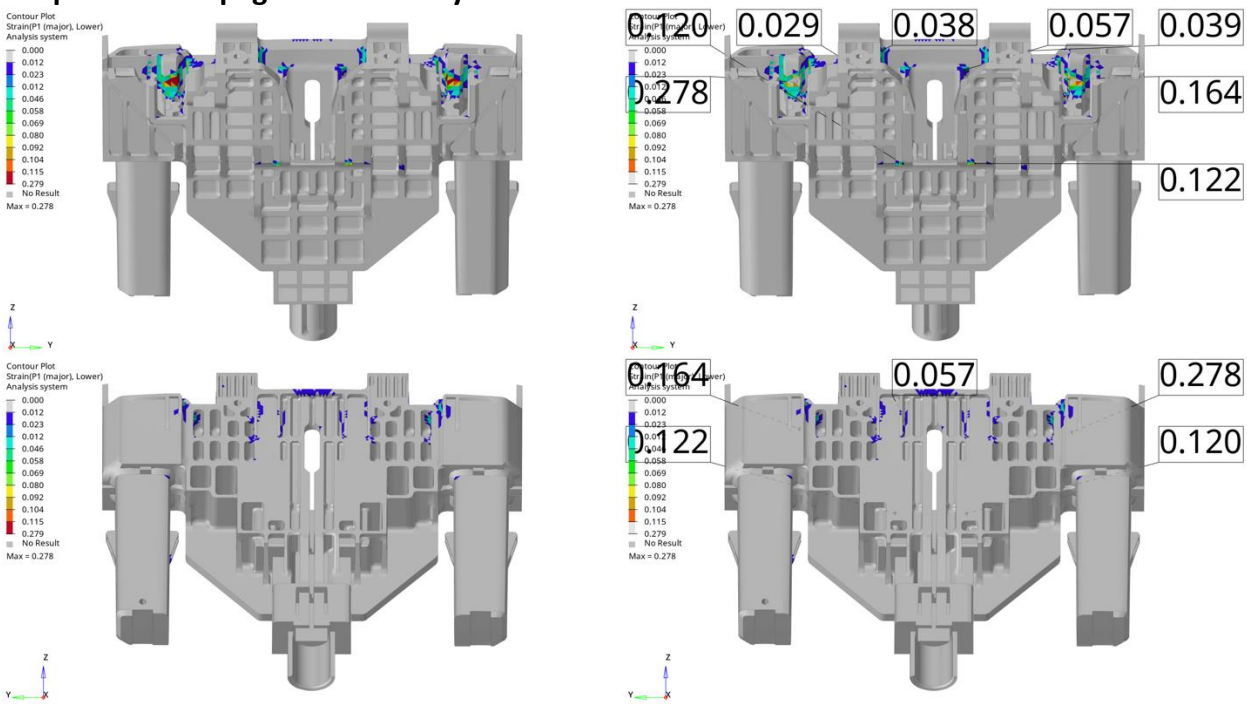
Inputs:

1) Use this input to select the page & window layout that will be captured and included in the report. The layouts supported are different for different page types as mentioned below.
    a. Contour page – 1 x 1, 1 x 2 & 2 x 2
    b. Section page – 1 x 2 & 2 x 2
    c. Hotspot page – 1 x 1
    d. Zoom page - 1 x 2 & 2 x 2.

    Select the required layout and click on **Add** button to add the page layout into the entity list browser.

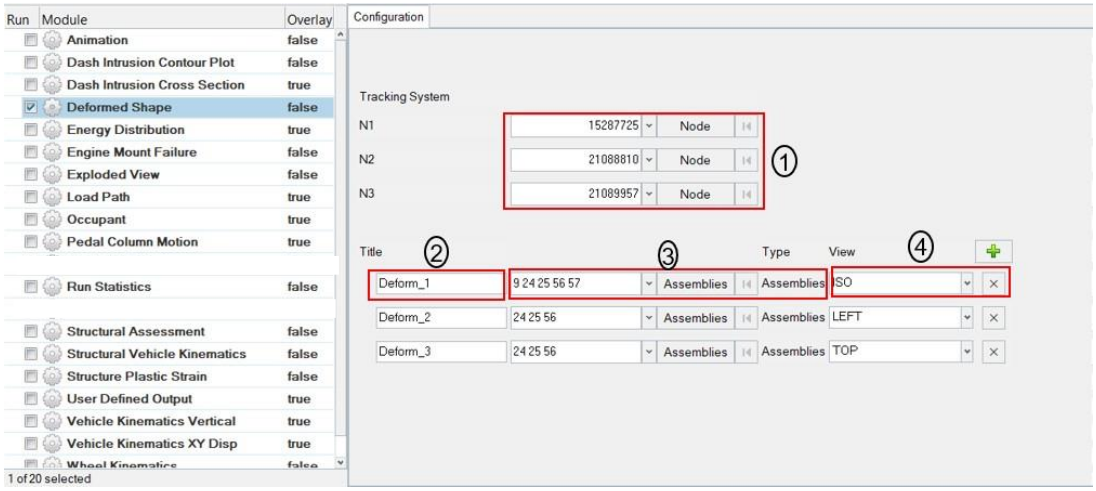
2) The **Entity** list browser is used to list and manage the pages included by the user and their respective layouts.
3) Enter the **Title** used for the slide title in the report, select the **Components** to be used for the current page type selected and the **View Set** to be used to orient the components.
4) Define the **Contour** & **Section** details (& all its attributes) to be applied while generating the report for the Contour module.

Output: Section page with 2 x 2 layout



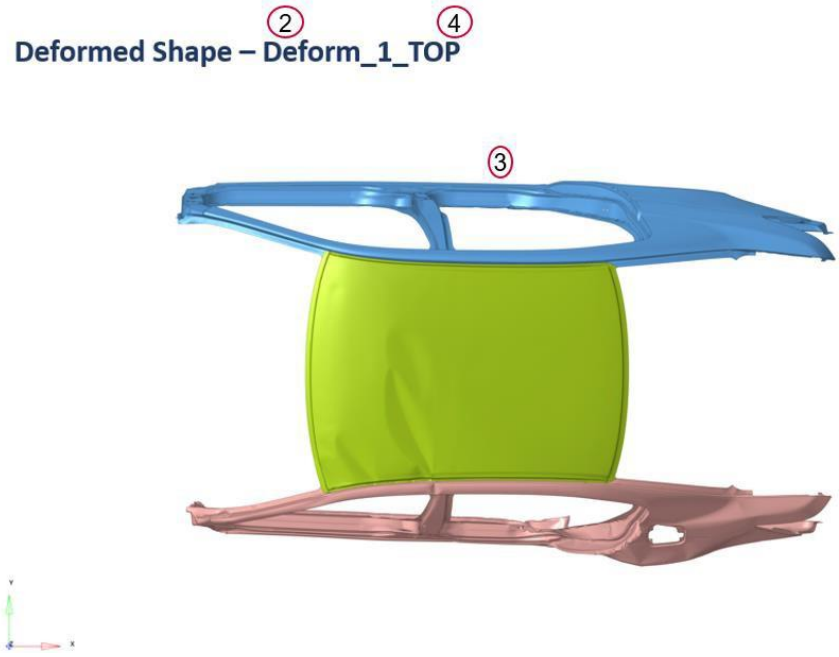
Deformed Shape

This module is used to create deformed shape of the user selected part sets (components or assemblies) in standard views (Left, Right, Top, Bottom, Front, Rear & Isometric views)



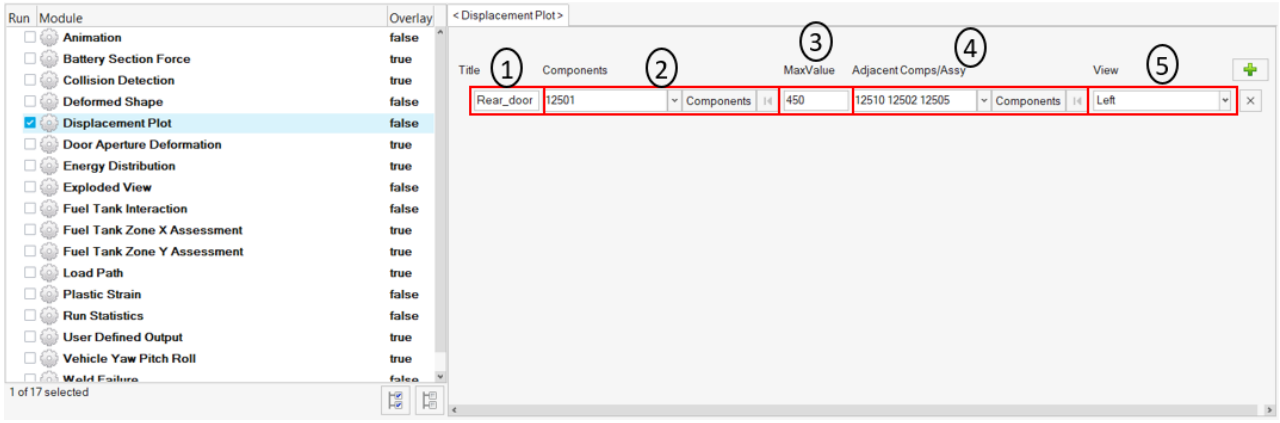
Inputs:

1) Node ID 1, 2 & 3 for defining tracking system
2) Label to be used for the slide title
3) Assembly IDs that will be considered for deformed shape
4) The view to be used for deformed shape image capture



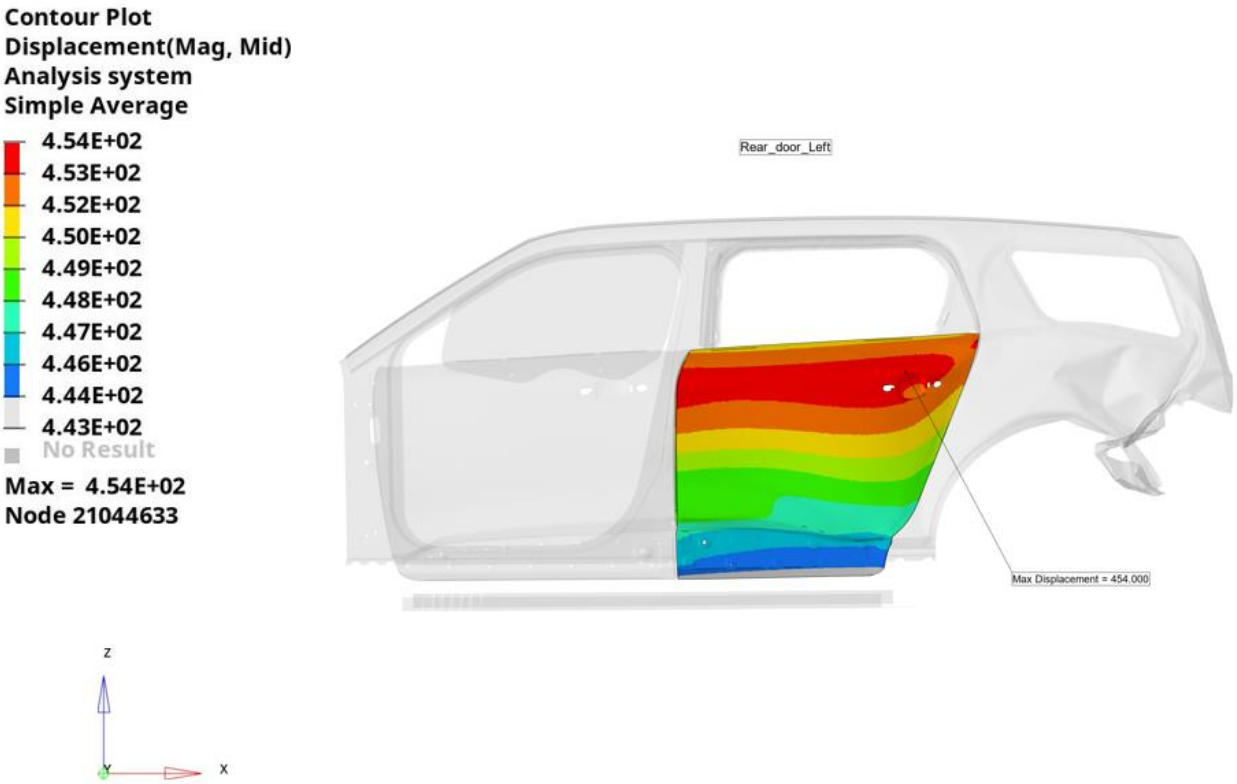
Displacement Plot

This module is used to generate a summary report of displacement contour for the user selected components.



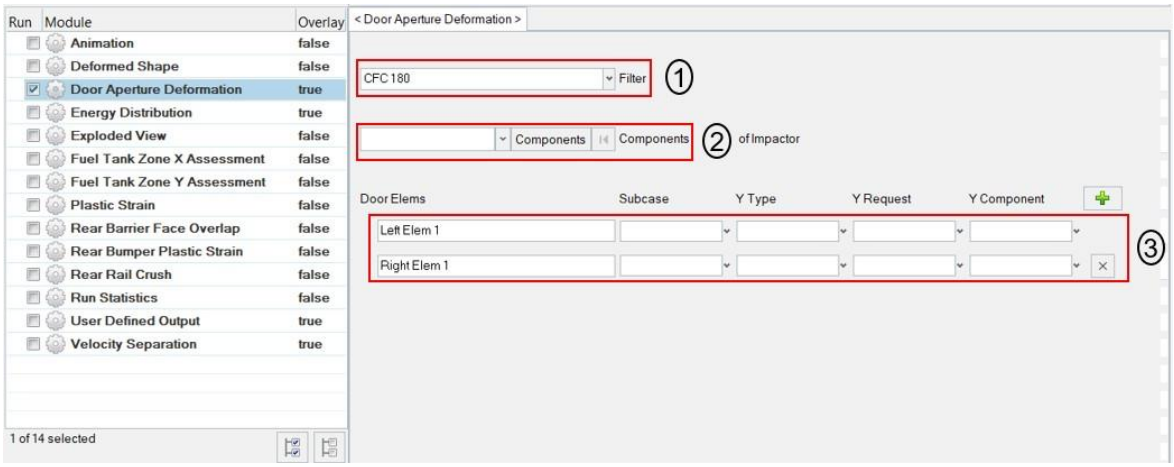
Inputs:

1) The component label
2) The component IDs used for creating displacement contour plots
3) The displacement upper limit that is set when applying the contour
4) The adjacent (or neighboring) components to be included in the image (transparent mode)
5) The standard view that should be set when capturing the image



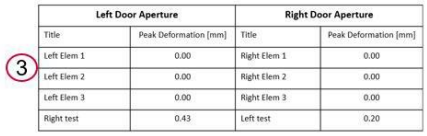
Door Aperture Deformation

This module is used to record the maximum door deformation using spring elements.



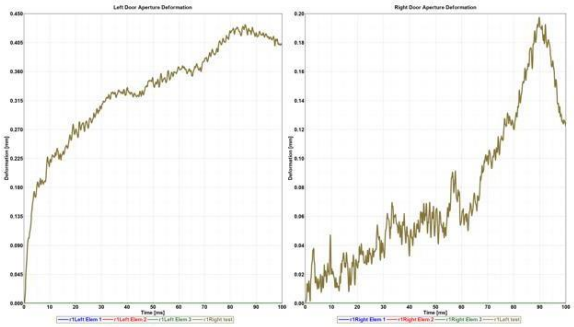
Inputs:

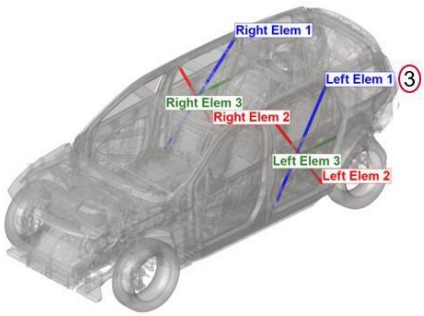
1) Filter class if required to filter the deformation curve
2) Impactor assembly or component ID which will be hidden from the image
3) The left & right door spring element request info (from time history file) for plotting the deformation curves



Left Door Aperture		Right Door Aperture	
Title	Peak Deformation [mm]	Title	Peak Deformation [mm]
Left Elem 1	0.00	Right Elem 1	0.00
Left Elem 2	0.00	Right Elem 2	0.00
Left Elem 3	0.00	Right Elem 3	0.00
Right test	0.43	Left test	0.20

3



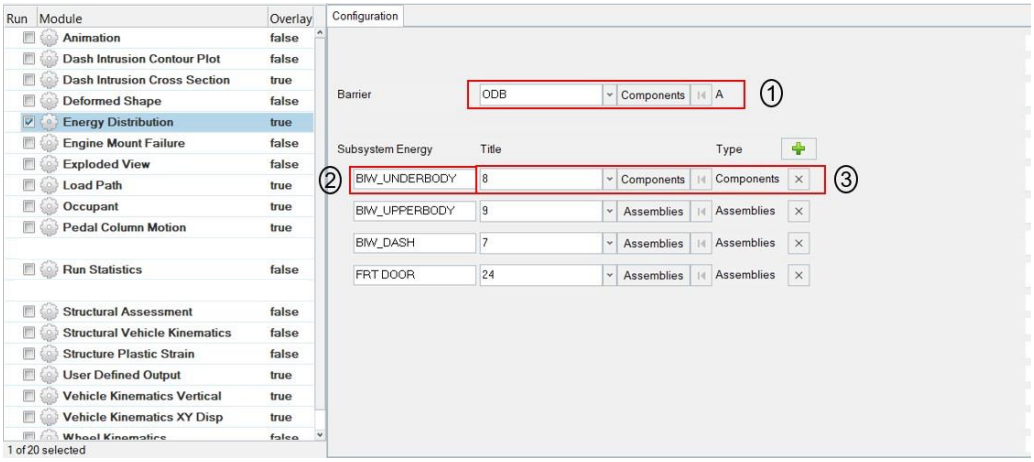


Energy Distribution

The Energy Distribution module is used to create energy distribution plots (bar graphs) for the barrier (system level) as well as for user selected sub systems such as BIW-upperbody, BIW-underbody etc.

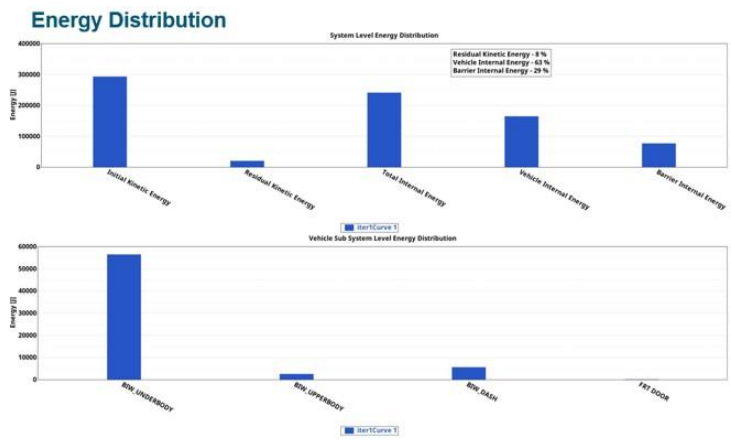
For the barrier, energy plots are created for Initial kinetic energy, residual kinetic energy, total internal energy, vehicle internal energy and barrier internal energy.

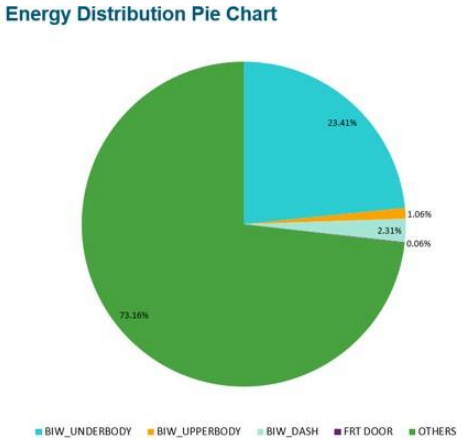
A pie chart is also created showing energy distribution for residual kinetic energy along with vehicle & barrier internal energy.



Inputs:

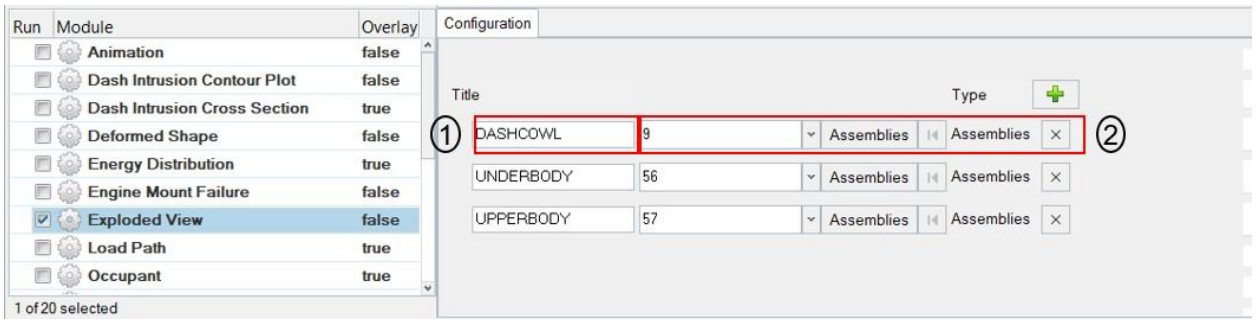
1) Barrier assembly or component ID
2) Subsystem name
3) Subsystem assembly or component ID





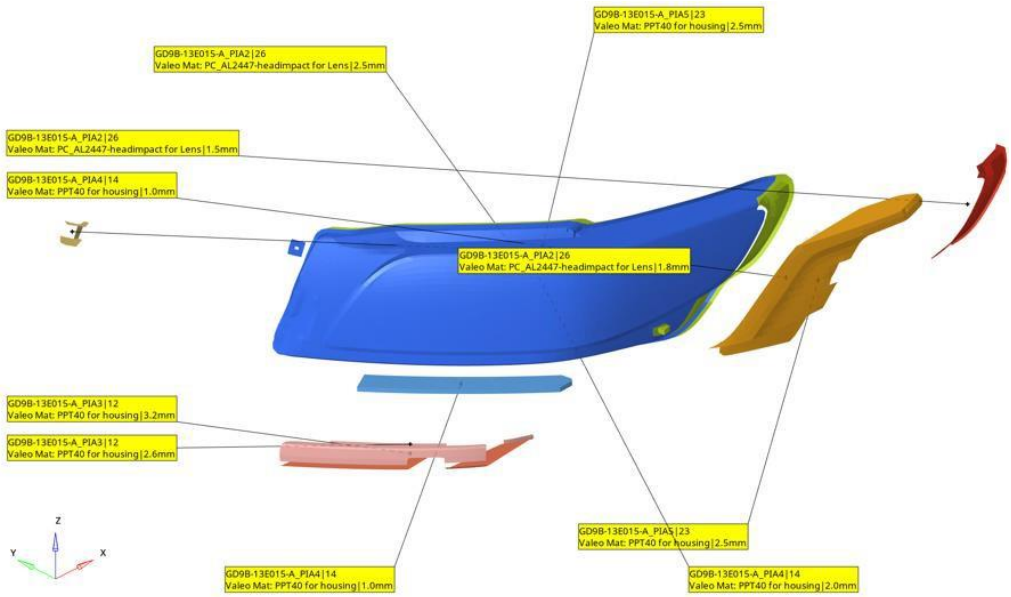
Exploded View

Exploded view lets you create images of parts in exploded view. For each user selected assembly, the parts are isolated (10 parts per slide) and exploded view is drawn and image is captured. Each part in exploded view is tagged with an annotation. It contains the part name, the material name and the assigned thickness.



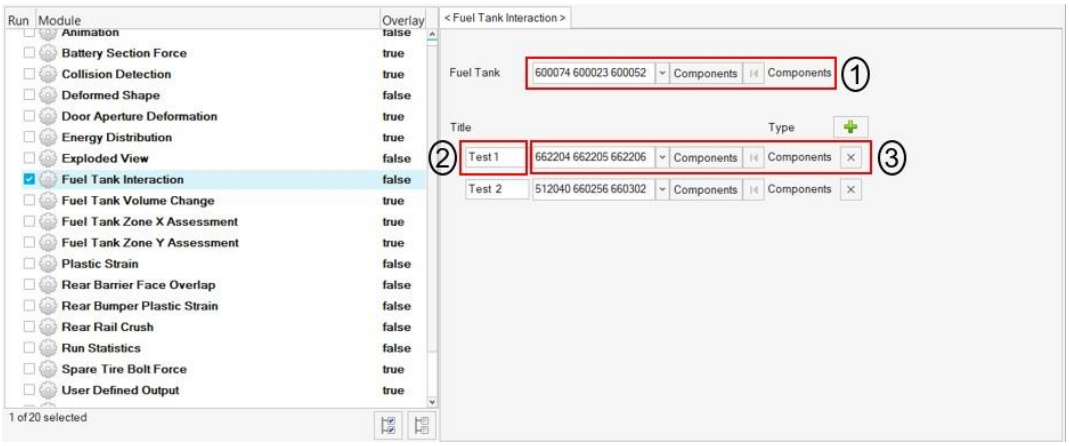
Inputs:

1) Title for the assembly that is considered for exploded view
2) Assembly or Component ID used for exploded view



Fuel Tank Interaction

This module is used to perform collision interference checking between the fuel tank assembly and the parts around it. The inputs are fuel tank assembly and the surrounding parts which might collide or meet with the fuel tank assembly during the simulation. The module will check and find out if penetration exists between the two groups. Accordingly, the components are colored, and an animation file (avi) is captured and embedded into the PPT. Users can define multiple parts.



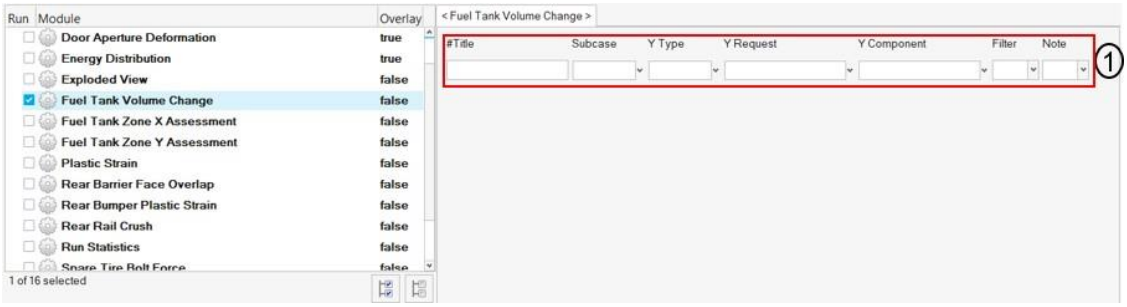
Inputs:

1) Select the fuel tank assembly (components or assembly)
2) Enter a title that is used as slide title in the PPT report
3) Select the components (assemblies) that might come in contact with the fuel tank assembly

Output report:

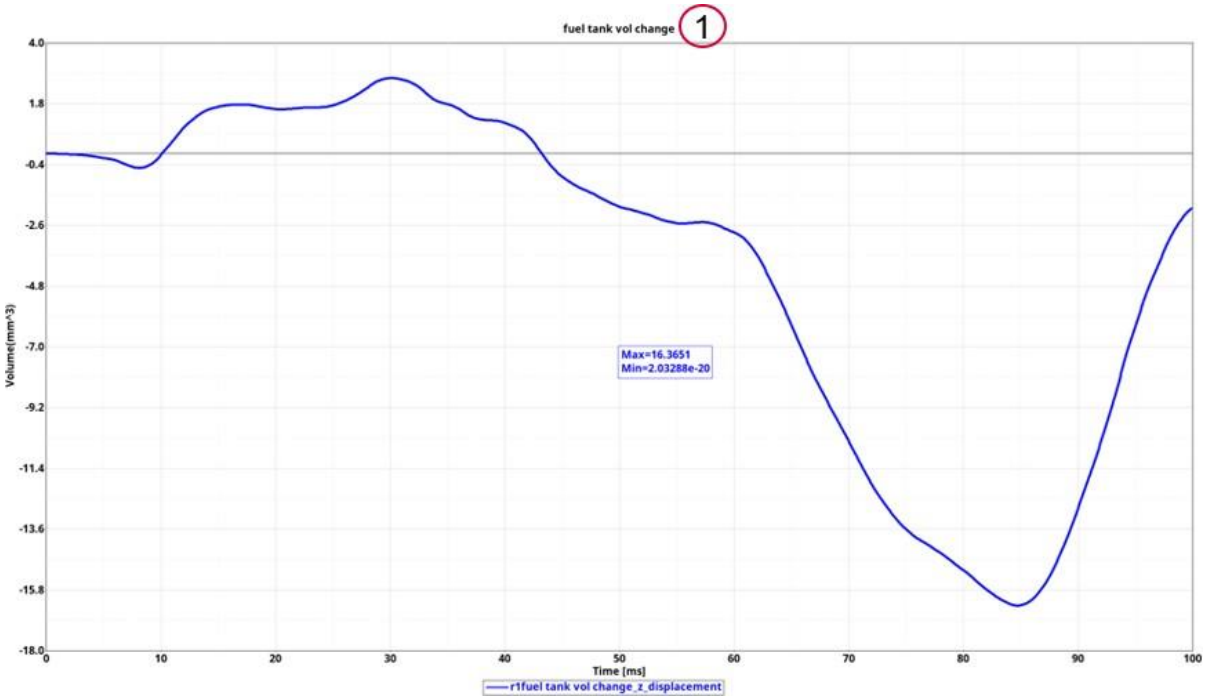
Fuel Tank Volume Change

This module is used to calculate the maximum percentage volume change for fuel tank across the simulation time steps. A graph of fuel tank volume over time will be plotted.



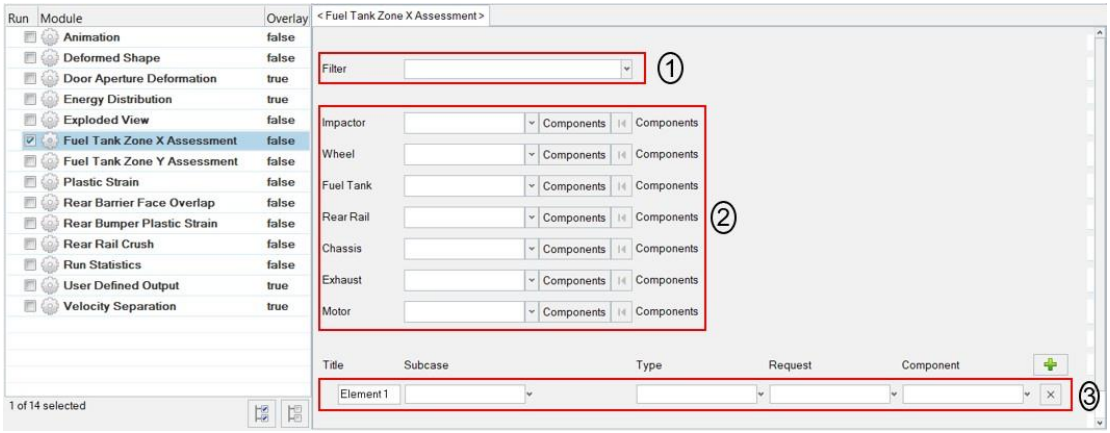
Inputs:

1) Enter the title for the plot
2) Select the subcase, Y type, Y request & Y component of fuel tank node ID from time history file
3) Select filter & note options if required



Fuel Tank Zone X Assessment

This module is used to evaluate the deformation of fuel tank zone spring elements. It computes the deformation between fuel tank zone cross members along X direction by measuring the spring element deformations.

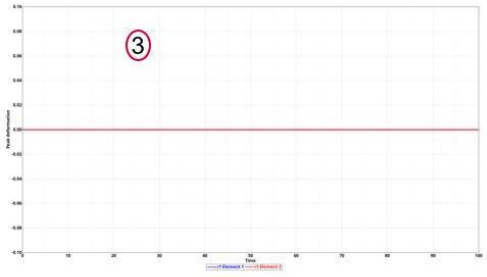


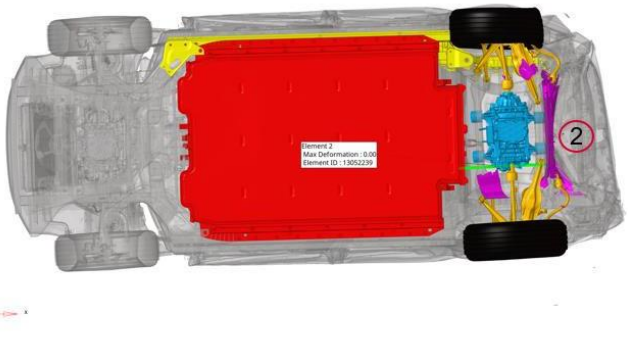
Inputs:

1) Filter class to be used if required to filter the deformation curve
2) Fuel tank zone cross members comp ID / Assy ID
3) The spring element request info (from time history file) for plotting the deformation curves

3

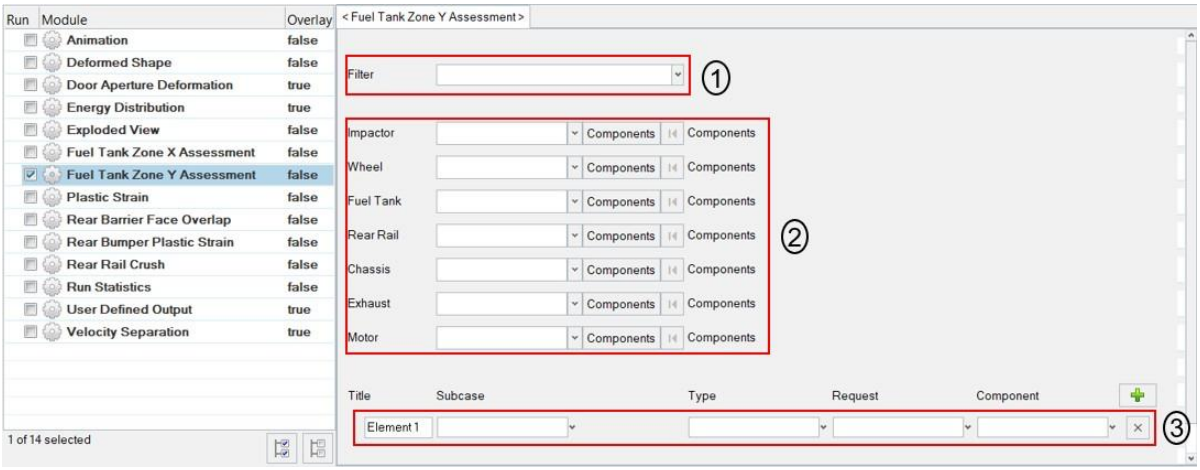
Fuel Tank Zone X Assessment	
Title	Peak Deformation
Element 1	0.00
Element 2	0.00





Fuel Tank Zone Y Assessment

This module is used to evaluate the deformation of fuel tank zone spring elements. It computes the deformation between fuel tank zone cross members along Y direction by measuring the spring element deformations.

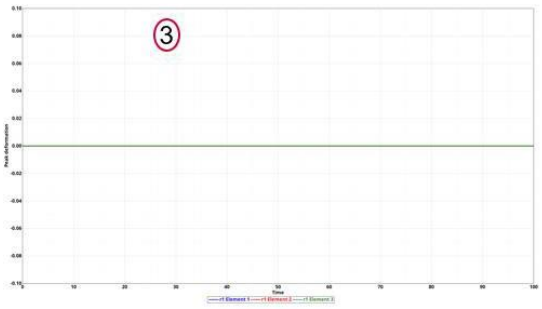


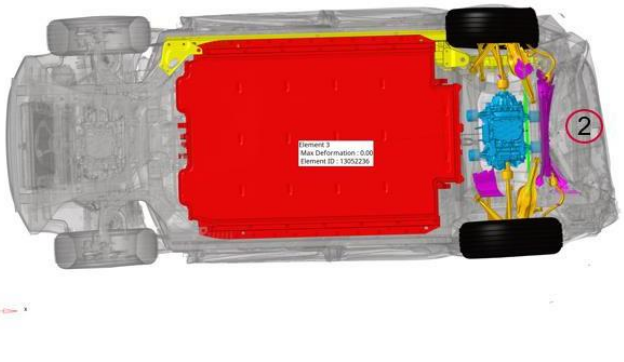
Inputs:

1) Filter class to be used if required to filter the deformation curve
2) Fuel tank zone cross members comp ID / Assy ID
3) The spring element request info (from time history file) for plotting the deformation curves

3

Fuel Tank Zone Y Assessment	
Title	Peak Deformation
Element 1	0.00
Element 2	0.00
Element 3	0.00





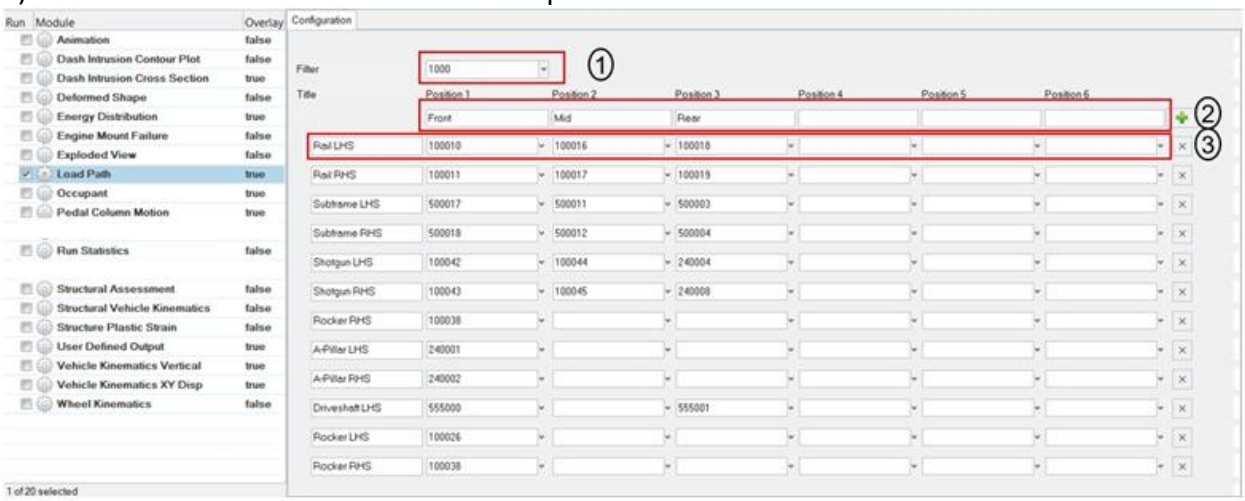
Load Path

The Load Path module lets you create following report summary.

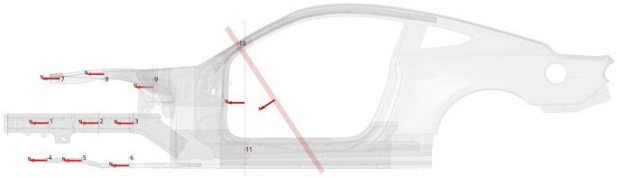
1) It creates an image of the vehicle and identifies the location of each cross section that is defined by the user in the config file

2) It creates a Load Path Section Forces and Properties summary table

3) It also creates Load Path section forces plots for all the cross sections



Cross Section Locations

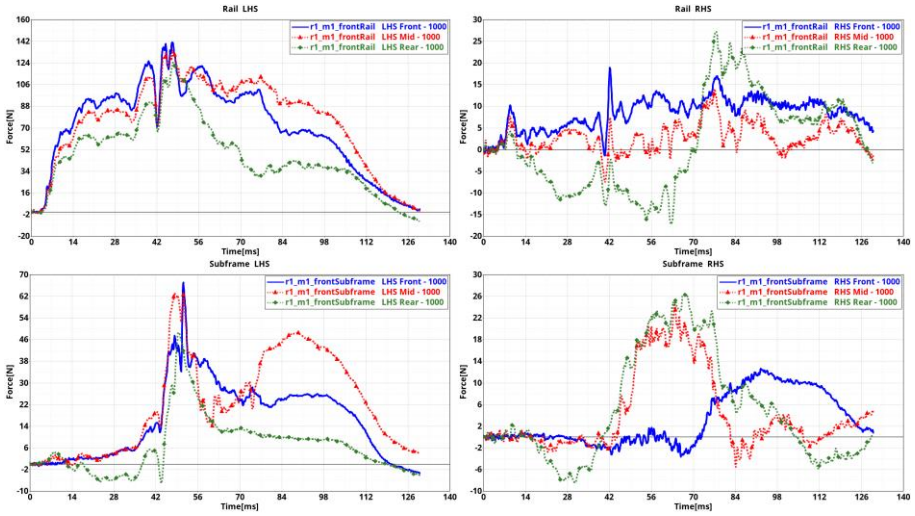


1	Rail Front
2	Rail Mid
3	Rail Rear
4	Subframe Front
5	Subframe Mid
6	Subframe Rear
7	Shotgun Front
8	Shotgun Mid
9	Shotgun Rear
10	A-Pillar Front
11	Rocker Front

Load Path Summary

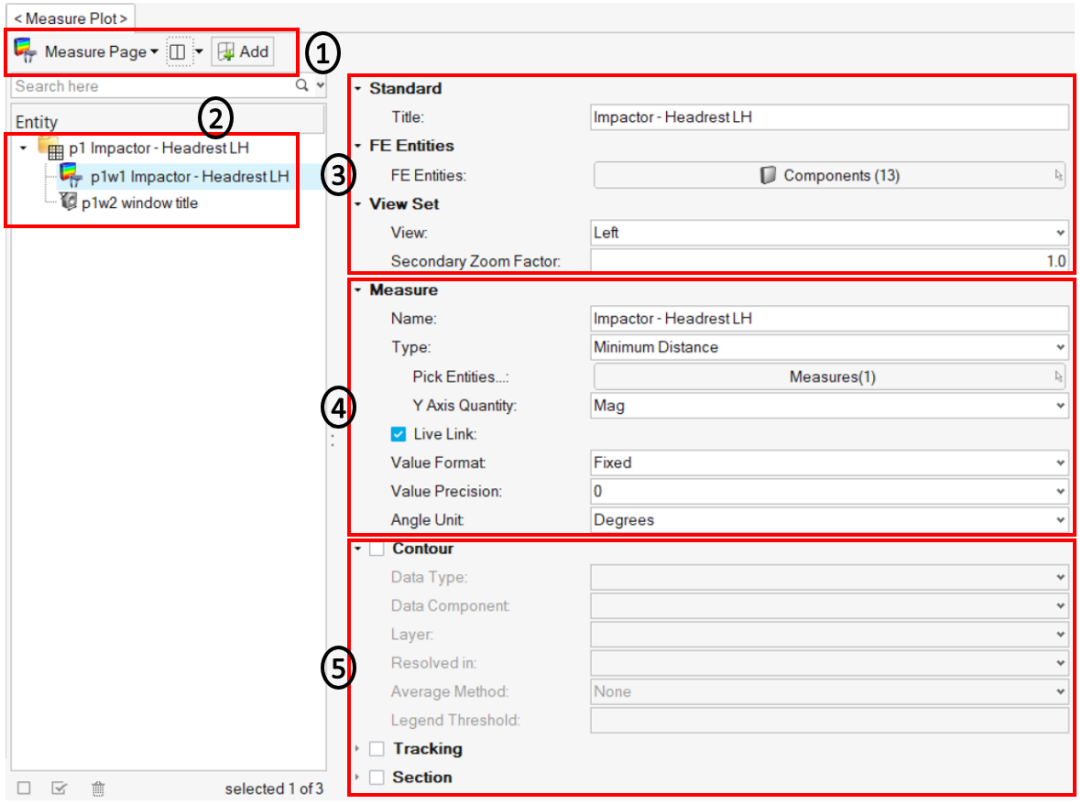
#	Title	Peak Load [LHS] (KN)	Area(mm2)	Ix (mm4)	Iy (mm4)	J (mm4)	Sx (mm3)	Sy (mm3)	Peak Load [RHS] (KN)	Area (mm2)	Ix (mm4)	Iy (mm4)	J (mm4)	Sx (mm3)	Sy (mm3)
		r1_m1_front													
1	Rail Front	141.00	38.37	178846.17	51224.93	-43216.83	847.13	693.77	18.93	38.37	165168.37	51224.92	-45234.58	847.13	693.77
2	Rail Mid	135.32	36.67	104454.26	65096.91	40738.48	792.97	679.60	14.11	36.63	63340.71	79026.63	17641.33	791.38	681.85
3	Rail Rear	125.37	39.52	124027.32	71430.19	-43017.08	880.11	776.17	27.44	39.52	184206.11	55540.15	-48580.74	880.11	776.17
4	Subframe Front	67.17	17.45	3589.02	8405.00	0.00	214.27	280.17	12.62	17.45	3589.02	8405.00	0.00	214.27	280.17
5	Subframe Mid	63.52	17.81	4033.52	8729.89	-0.58	228.13	290.98	24.74	17.81	4033.10	8729.89	0.54	228.20	290.98
6	Subframe Rear	49.07	17.45	3589.01	8405.06	0.00	214.27	280.17	26.45	17.45	3589.01	8405.06	0.00	214.27	280.17
7	Shotgun Front	23.95	64.34	74444.15	272987.83	-22519.68	699.06	1554.85	4.45	64.34	59385.91	278937.03	-34549.85	699.07	1554.85
8	Shotgun Mid	21.84	38.94	34520.59	143438.48	7054.20	791.54	961.01	20.31	38.94	47275.78	121756.20	39462.78	791.55	961.32
9	Shotgun Rear	31.99	131.04	2977343.36	4236128.96	3173750.07	4893.40	2722.56	35.47	136.25	2157098.05	1226453.29	-446369.53	3312.09	4441.09
10	Rocker Front	115.19	120.65	8934548.12	336710.24	-176468.24	12426.70	3454.34	17.31	120.65	9795451.07	904324.39	999808.24	12426.70	3454.34

Cross Section Force Plot



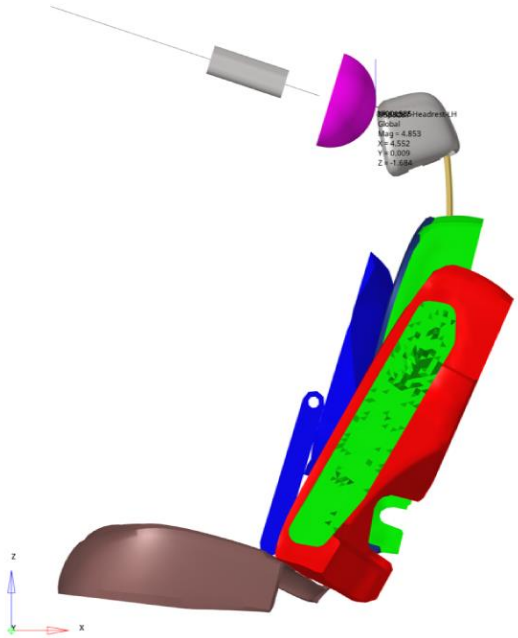
Measure Plot

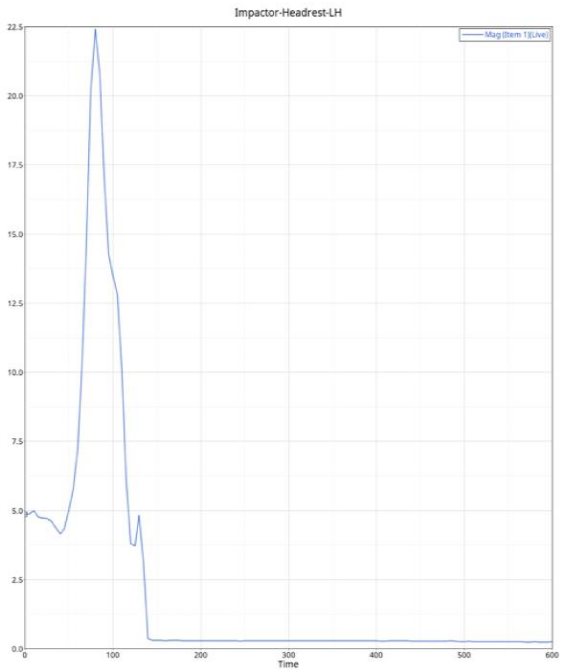
This is a generic module that allows users to apply various types of measures on the 3D animation results data, generate animations and measure plots and include them in the report. The GUI and the various inputs that are required to be defined are mentioned below.



Inputs:

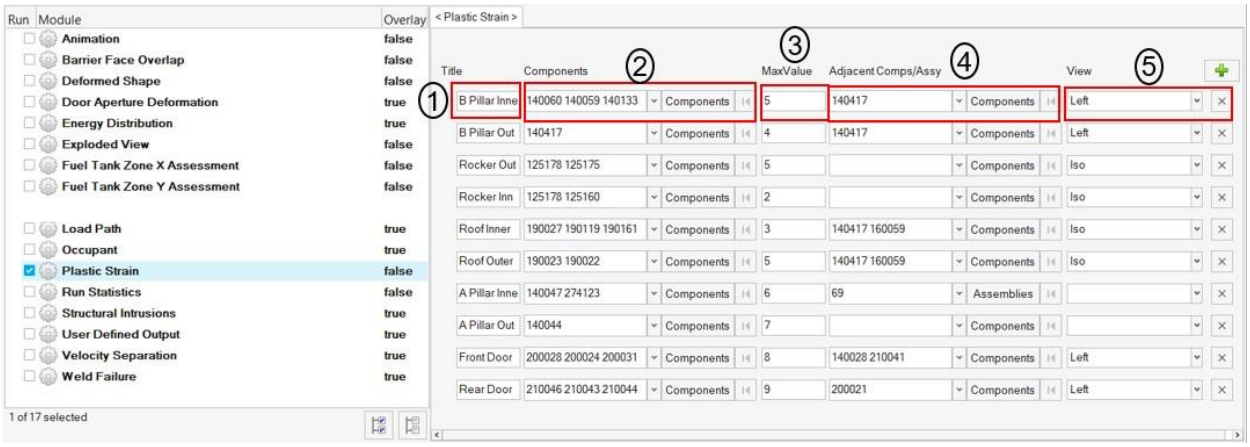
1) Use this input to select the page & window layout that will be captured and included in the report. 2 layouts are supported i.e. 1 x 2 and 2 x 2. Select the layout and click on **Add** button to add the page layout into the entity list browser.
2) The **Entity** list browser is used to list and manage the pages included by the user and their respective layouts.
3) Enter the **Title** used for the slide title in the report, select the **Components** to be used for the current measure and the **View Set** to be used to orient the components.
4) Define the **Measure** and all of its attributes to be applied such as measure type, measure entities, format & precision for the measure etc.
5) Optionally user can also enter the **Contour**, **Tracking** & **Section** details to be applied while generating the report for the Measure module.




Impactor-Headrest-LH
Mag (Item 1)(Live)
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
0
100
200
300
400
500
600
Time

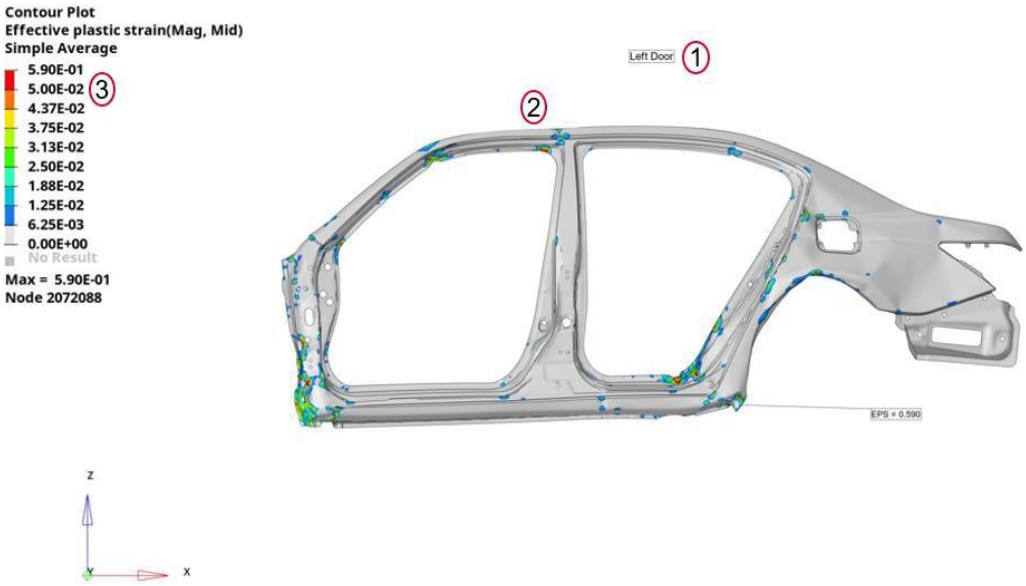
Plastic Strain

This module is used to generate a summary report of plastic strain for the components on the outer side of the vehicle structure.



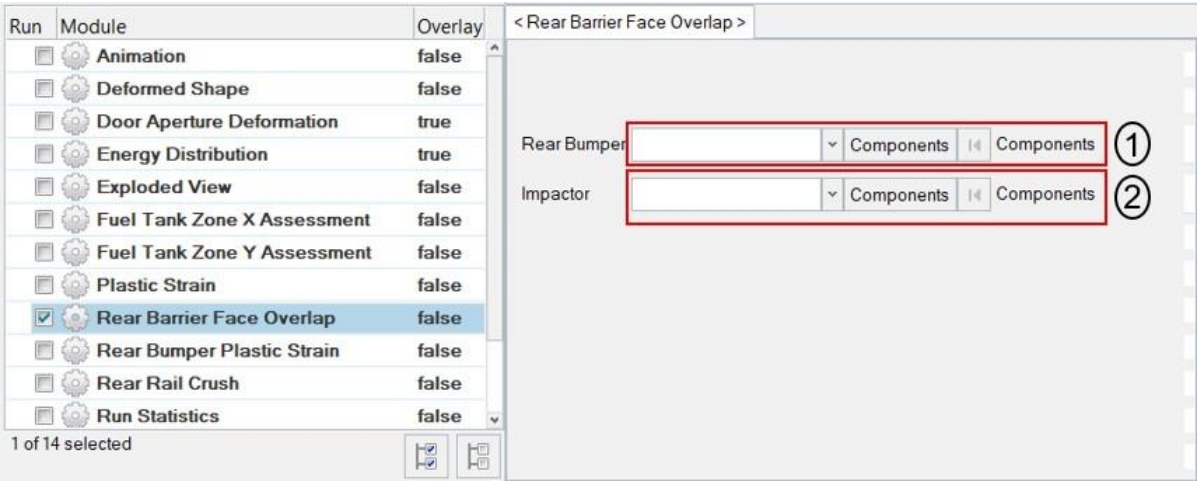
Inputs:

6) The component label
7) The plastic strain component IDs to be plotted
8) The plastic strain limit that is set when applying the contour
9) The adjacent (or neighboring) components to be included in the image (transparent mode)
10) The standard view that should be used when capturing the image



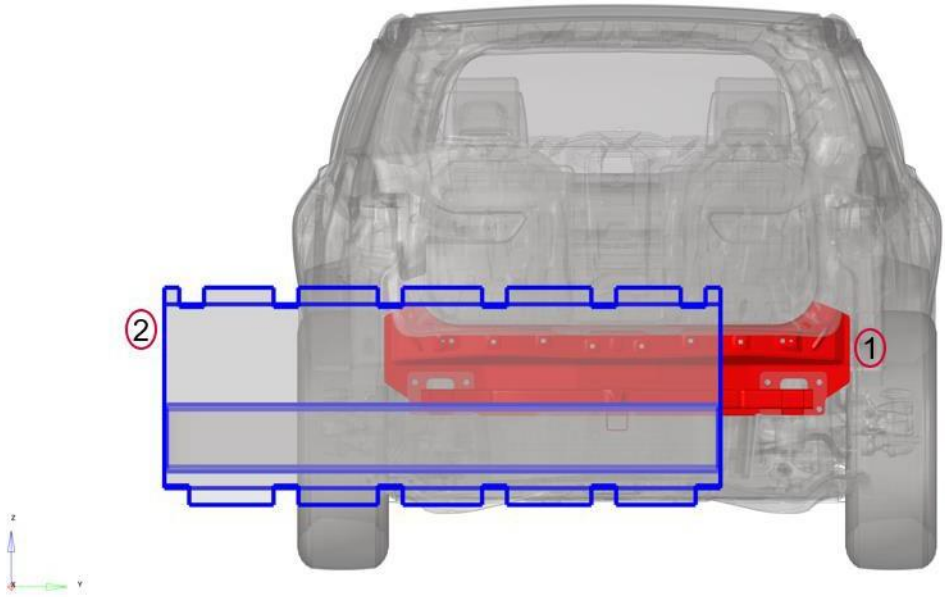
Rear Barrier Face Overlap

Rear barrier face module lets you create an image wherein the impactor front or barrier face is positioned relative to rear bumper.



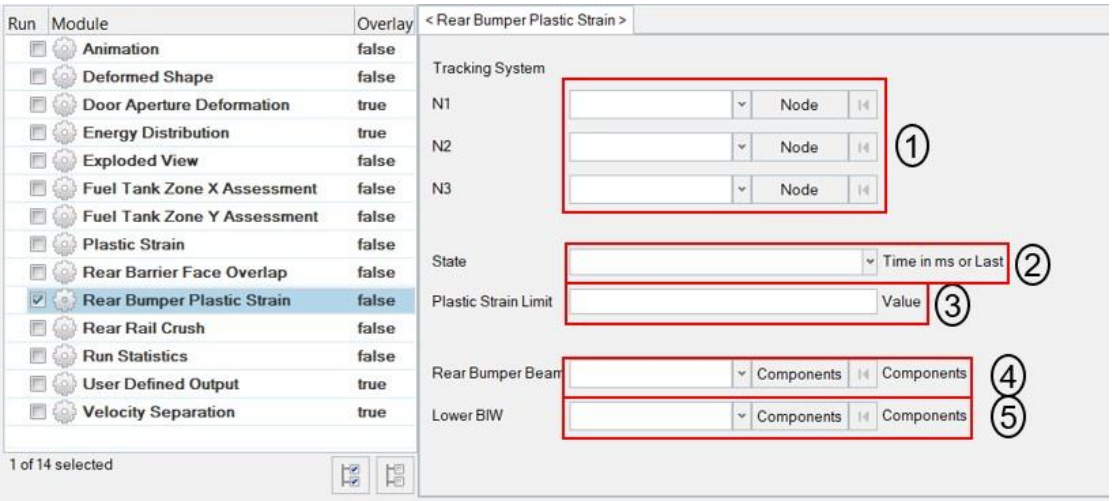
Inputs:

1) Rear bumper Component IDs / Assembly IDs
2) Impactor Component IDs / Assembly IDs



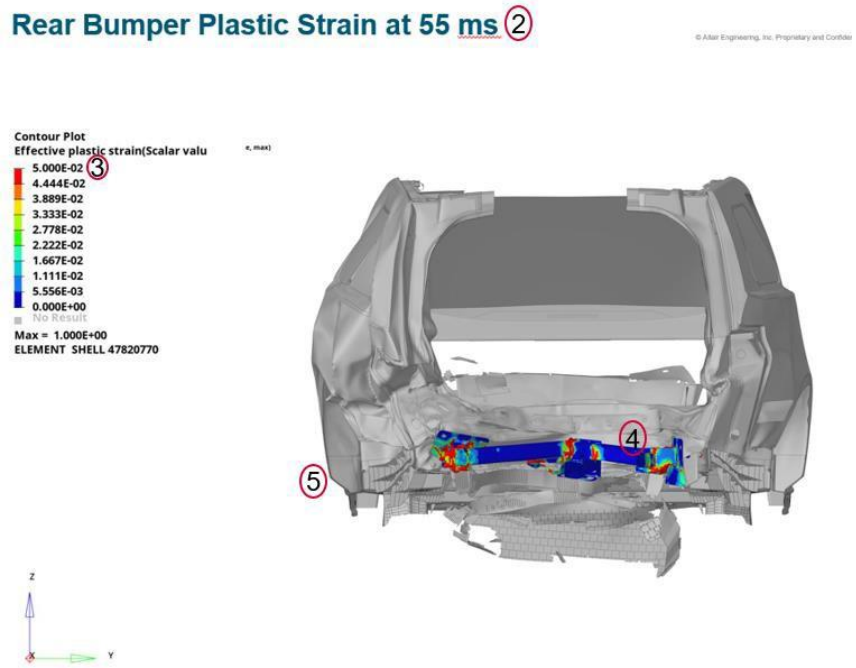
Rear Bumper Plastic Strain

This module is used to generate a summary report of rear bumper plastic strain contour at the user selected simulation step.



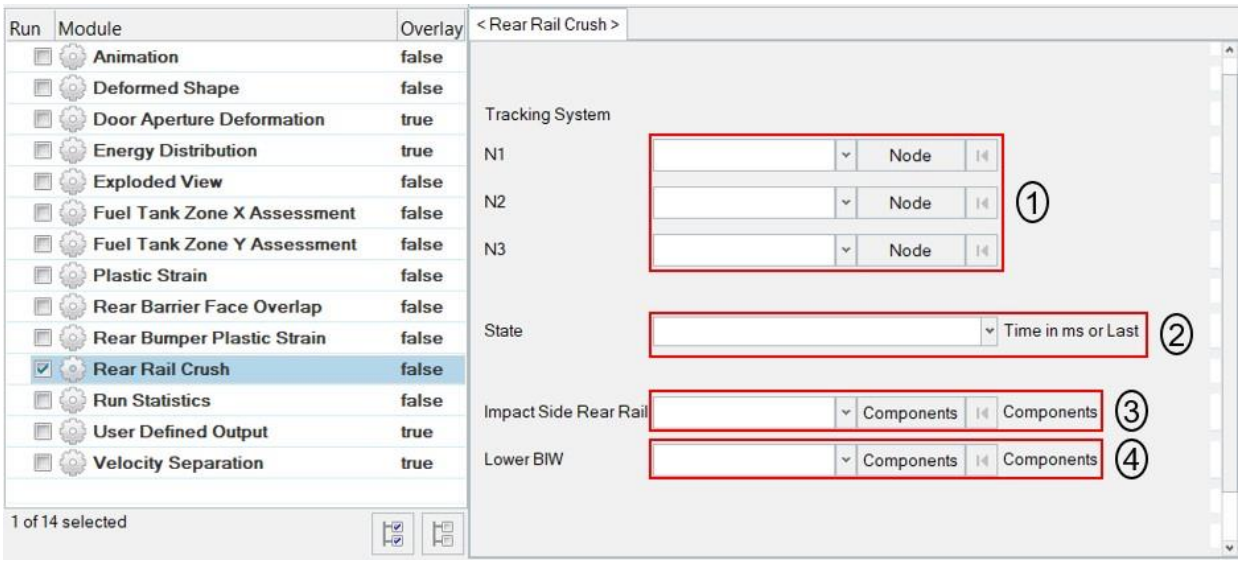
Inputs:

1) 3 nodes defining the tracking system
2) User selected simulation step (time in ms or Last)
3) Plastic strain limit
4) Rear bumper beam Component IDs / Assembly IDs
5) Lower BIW Component IDs / Assembly IDs



Rear Rail Crush

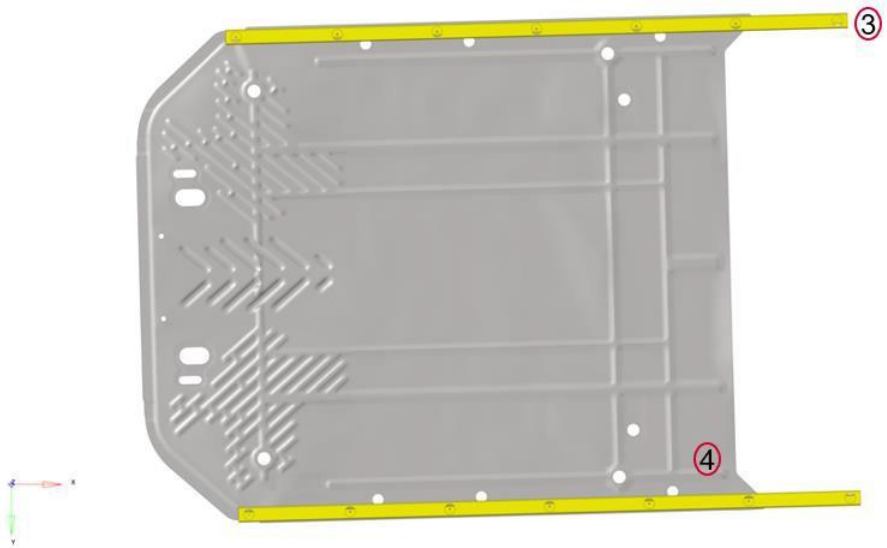
This module lets users to create a summary report of rear rail crush mode.



Inputs:

1) 3 nodes defining the tracking system
2) User selected simulation step (time in ms or Last)
3) Impact side rear rail Component IDs / Assembly IDs
4) Lower BIW Component IDs / Assembly IDs

r1 Rear Rail Crush at 100 ms ②



Run Statistics

This module creates following summary info.

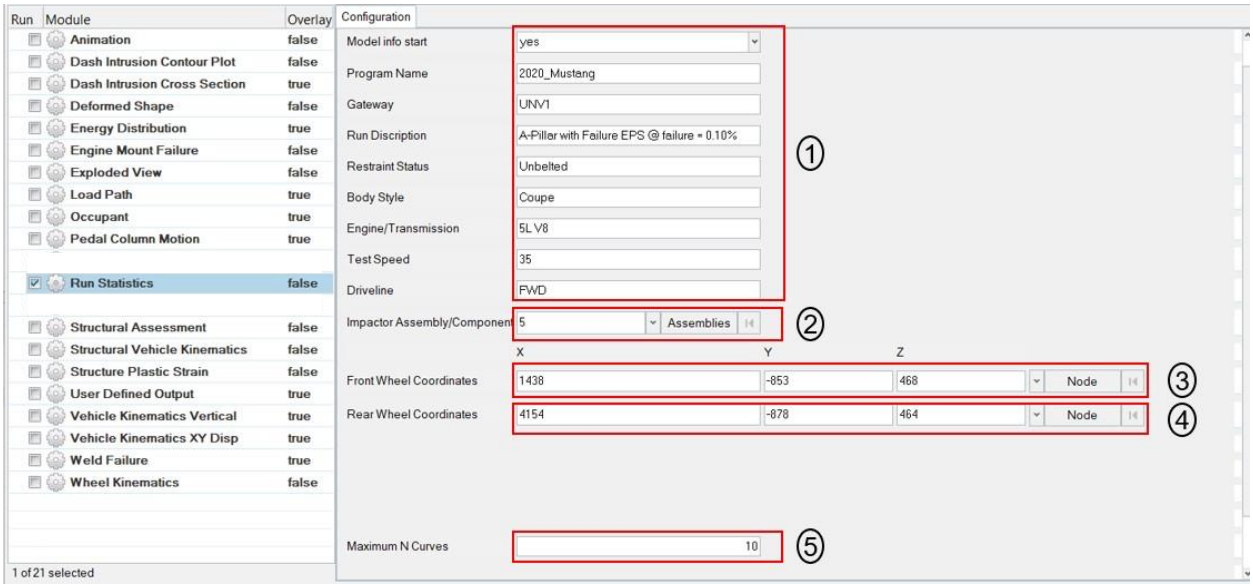
1) Model Information summary containing Program Name, Gateway, Run description, vehicle weight, solver version, run time etc.

2) Run Quality report which consists of termination time, termination type, mass added, energy ratio etc.

3) Plots consisting of global energy plots, added mass & time step plots and energy ratio plots

4) An image containing vehicle mass & geometric measurements

5) Material Internal Energy plots for the user defined Top N parts

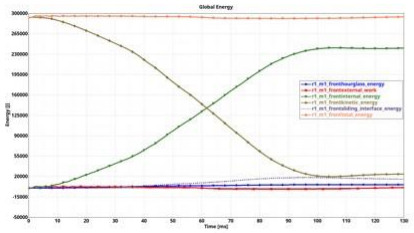
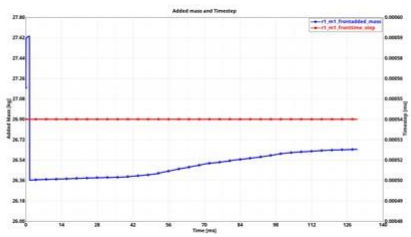
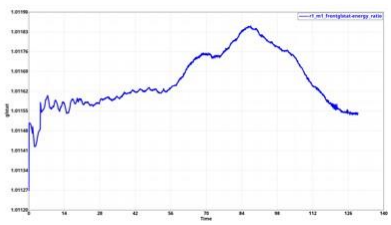


Model Info Summary & Run Quality Report

Program Name	2021_test_vehicle
Gateway	abcd
Run Discription	A-Pillar with Failure EPS @ failure = 0.10%
Restraint Status	Unbelted
Body Style	Sedan
Engine/Transmission	4L V6
Test Speed	35 Kph
Driveline	FWD
Run Name	Main.k
Engineer	tejasr
Model Run Date	0 9 / 1 8 / 2 0 2 1
Test Mode	Front IIHS ODB
Gross Vehicle Weight	1.65 kg
Impactor Weight	-0.00 kg
Total Weight	1.65 kg
Vehicle Front Axle Weight	0.96 kgs
Vehicle Rear Axle Weight	0.64 kgs
Solver Version	mpp s R7.1.2
Number of CPU	8 CPU
Run Time	14 hr 32 min 57 sec

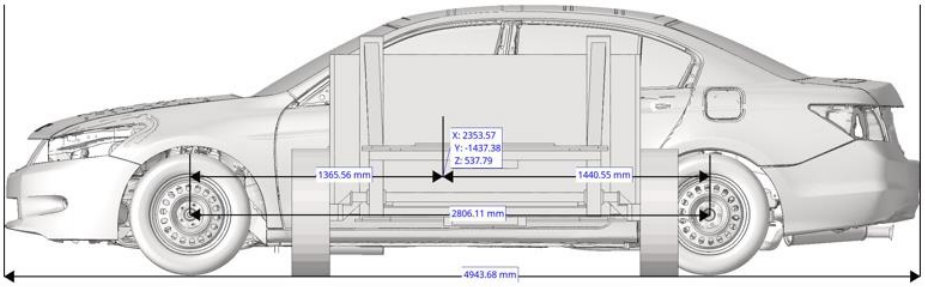
Run Quality	Result	Target
Termination Time	130.0 ms	130.0 ms
Termination Type	Normal Termination	
Mass Added @ T=0 [%]	1.49 %	< 1 %
Total Mass Added [%]	1.51 %	< 3 %
Total Mass Added [kg]	27.636 kg	
Energy -> Hourglass [%]	2.525 %	< 10 %
Energy -> Ratio [%]	1.0119 %	1 >= Energy Ratio < 1.01

Global Energy, Added Mass, Time Step & Energy Ratio Plots

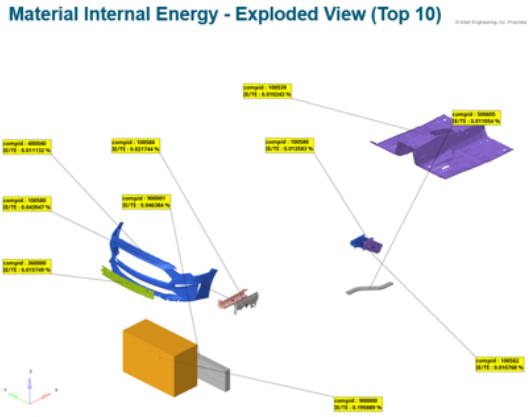




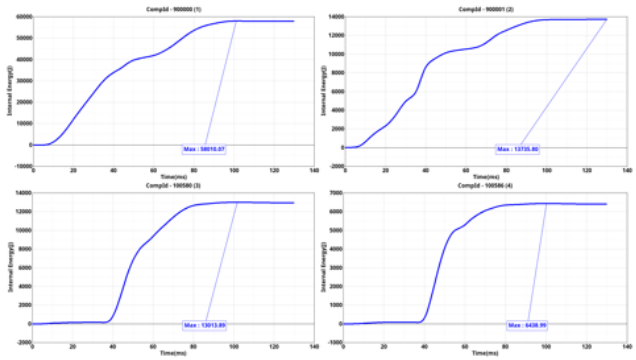
Vehicle Mass & Geometric Measurements

Vehicle Mass (kg)	1826.09 kg
Front Axle weight %	55.67%
Rear Axle weight %	44.33%



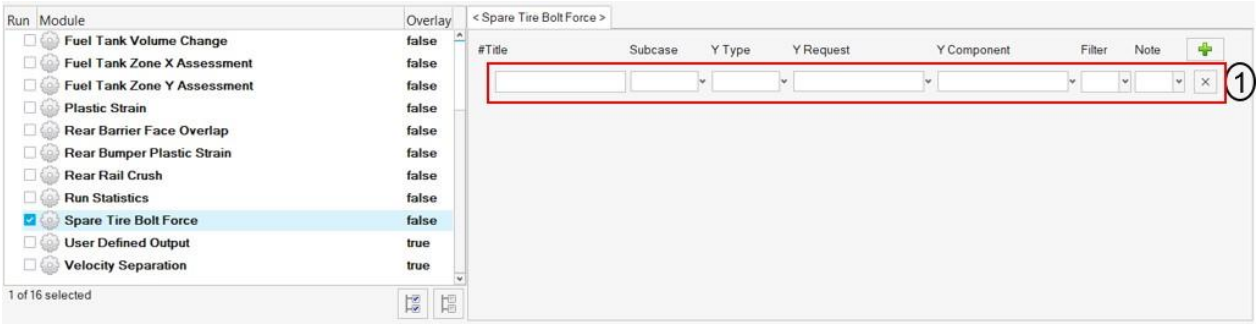
Material Internal Energy Summary





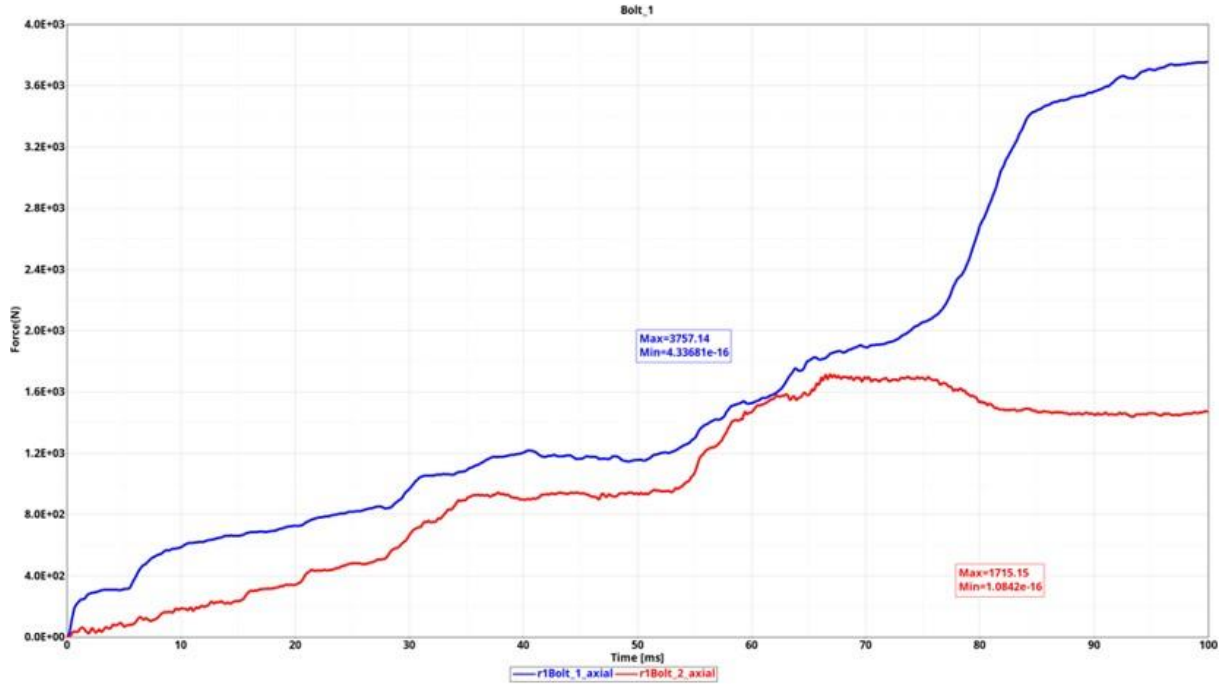
Spare Tire Bolt Force

This module is used to plot the spare tire bolt force (axial) across the simulation time steps.



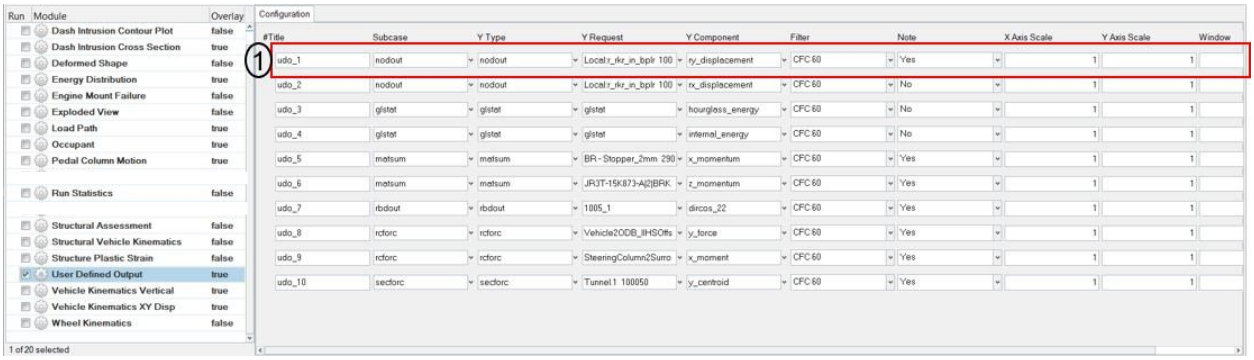
Inputs:

1) Enter the title for the plot
2) Select the subcase, Y type, Y request & Y component of bolt (beam element ID) from time history file
3) Select filter & note options as appropriate



User Defined Output

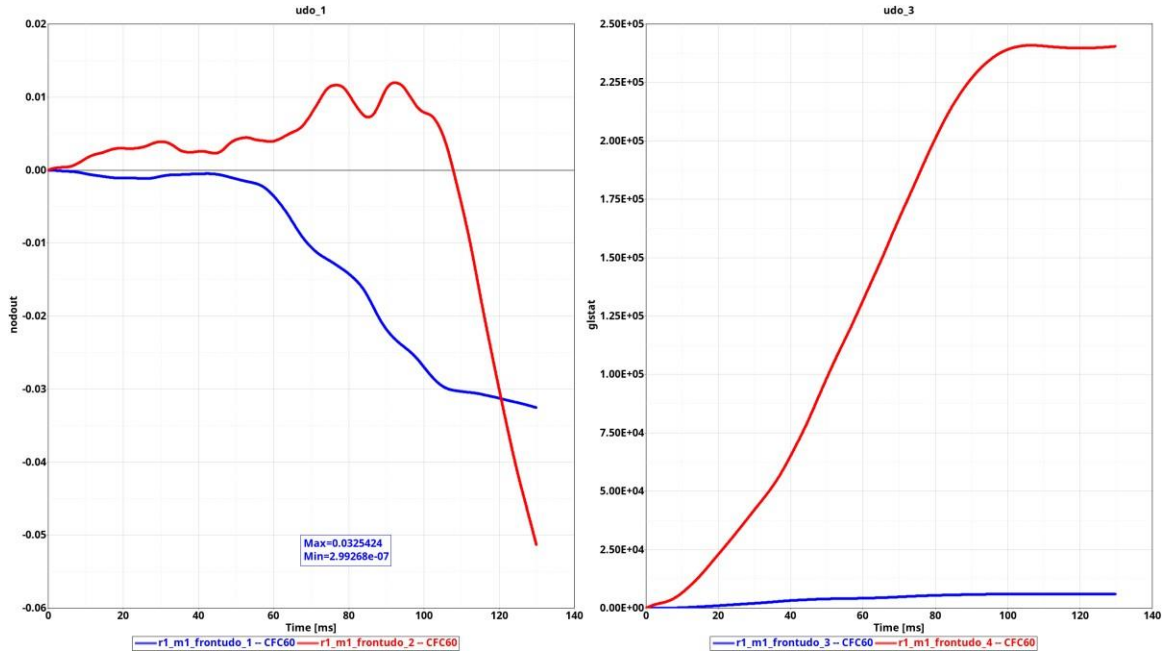
As the name suggests this module allows users to plot program specific Time History data. The plots are created based on user defined list of inputs as shown in the UI below.



Inputs:

For each user defined plot, following set of inputs are required.

- Label to be used as plot header
- Subcase name, Y Type, Y Request & Y Component from the Time History file
- Filter class to be used
- Note with Min & Max value is required to be created
- X & Y axes scale factors if required to be used
- Window number to be used when plotting the curves
- Y axis unit to be used for plotting the Y vector

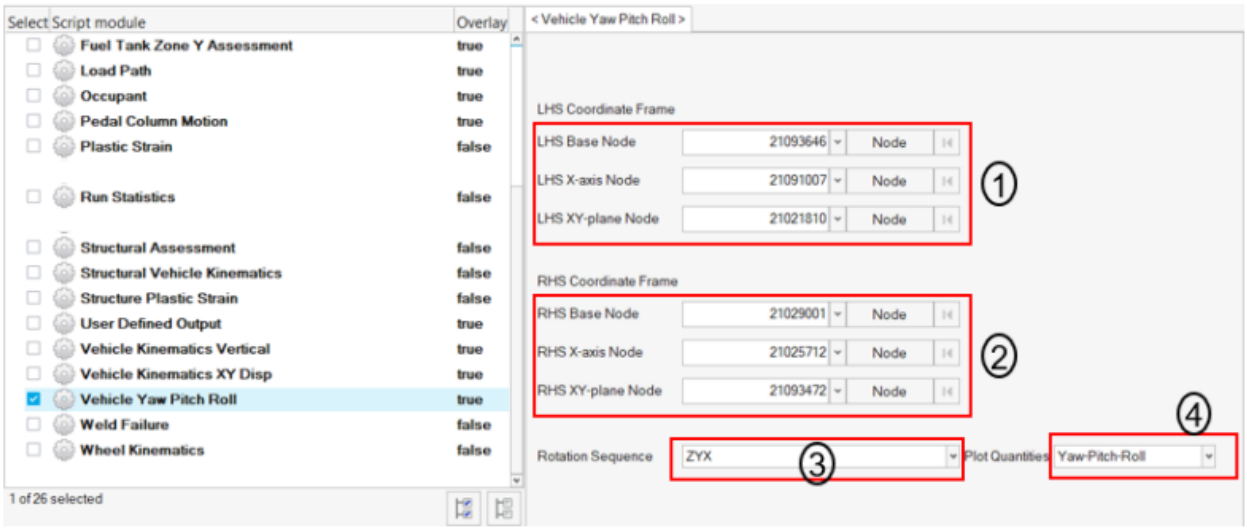


Vehicle Yaw Pitch Roll

This module generates the summary report capturing the vehicle rotations (yaw, pitch & roll) for the user selected coordinate frames. The module requires input selection of 2 nodes to define just the X-axis definition, or 3 nodes to define the X-axis and the XY-plane.

The Yaw, Pitch and Roll angles are calculated using Euler angles with the definition at Time=0.0 taken as the starting orientation. The default for the rotation sequence is "ZYX" and the user has the option to change to any of 5 other pre-defined sequences. User can also select between plotting 2 of the 3 angles or all 3 angles. If input is defined for the Left-Hand Side and Right-Hand Side coordinate systems, the average of the two is also plotted.

1) It plots LHS, RHS & Average yaw, pitch & roll plots based on the inputs defined
2) It also creates a summary table with the yaw, pitch & roll values (in degrees)



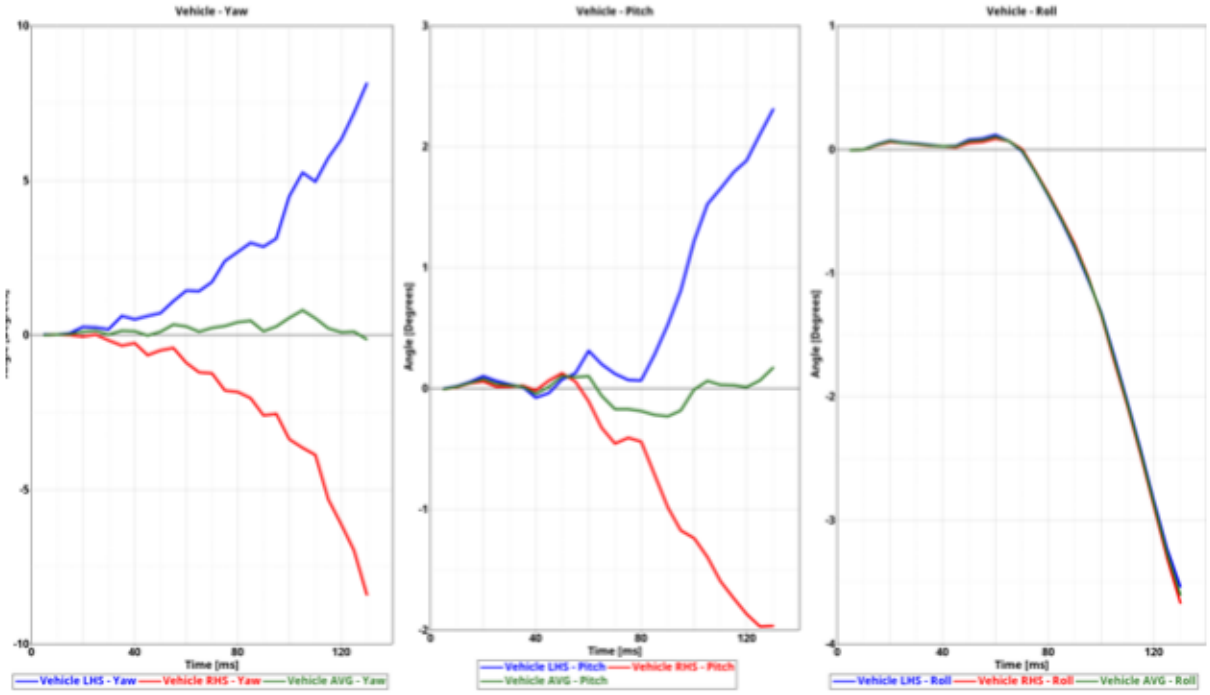
Inputs:

1) 3 nodes defining LHS coordinate frame (3D model)
2) 3 nodes defining RHS coordinate frame (3D model)
3) Rotation sequence (ZYX, ZXY, XYZ, XZY, YZX & YXZ)
4) Quantity to be plotted

Outputs:

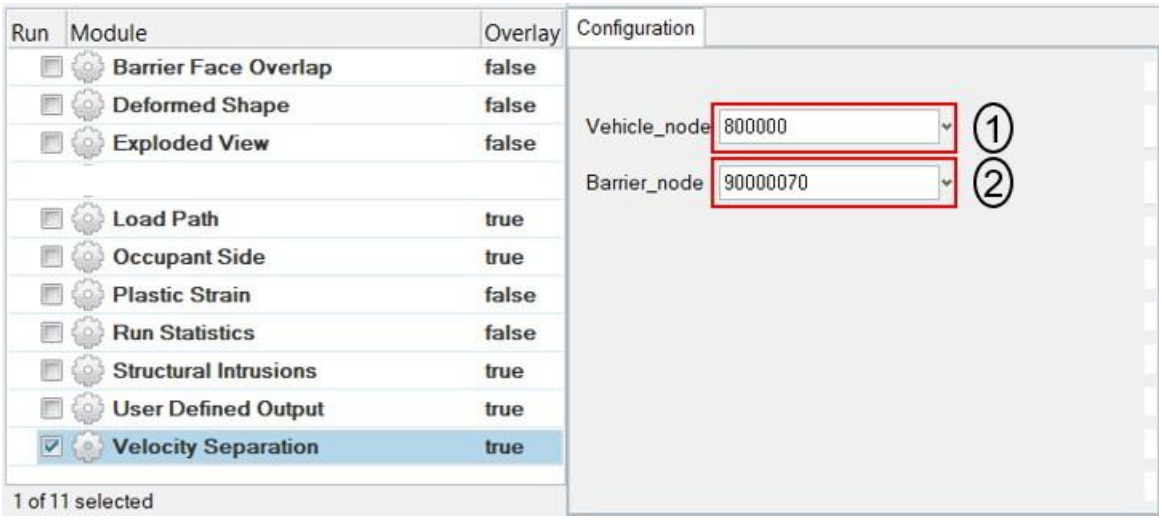
Vehicle Yaw / Pitch / Roll			
Side	Yaw [degrees]	Pitch [degrees]	Roll [degrees]
LHS	8.138	2.313	3.538
RHS	8.402	1.967	3.669
AVG	0.804	0.228	3.603

Vehicle YawPitchRoll Plot



Velocity Separation

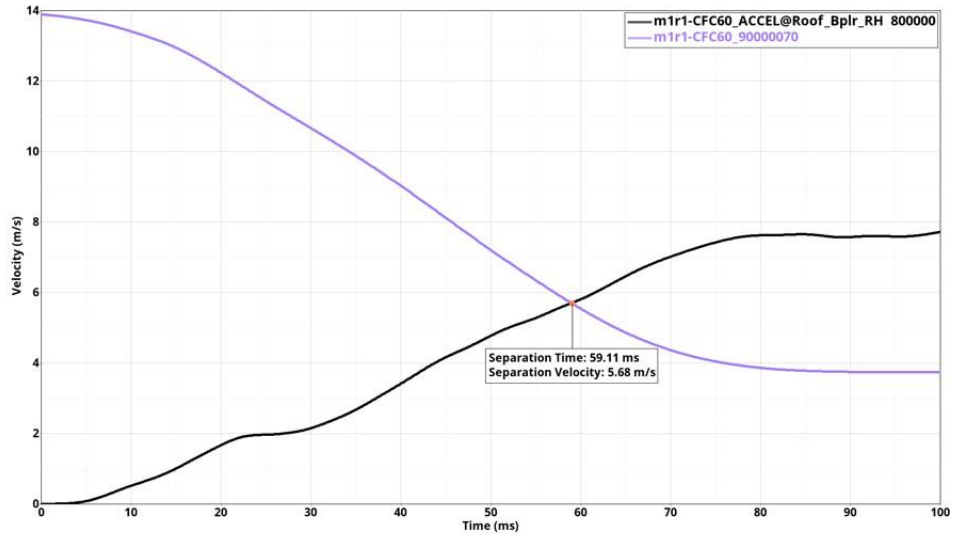
This module generates velocity plots for the selected vehicle and the barrier nodes during impact. Then finds out the time & velocity at which separation happens.



Inputs:

1) Vehicle node (request ID) ID from Time History file (binout)
2) Barrier node (request ID) ID from Time History file (binout)

Velocity Separation



Impact Separation Time	59.11
Impact Separation Velocity	5.68

Weld Failure

This module generates a detailed report of all the welds ruptured based on the user selected weld material. Following weld types are supported.

a. 1D beam spot welds

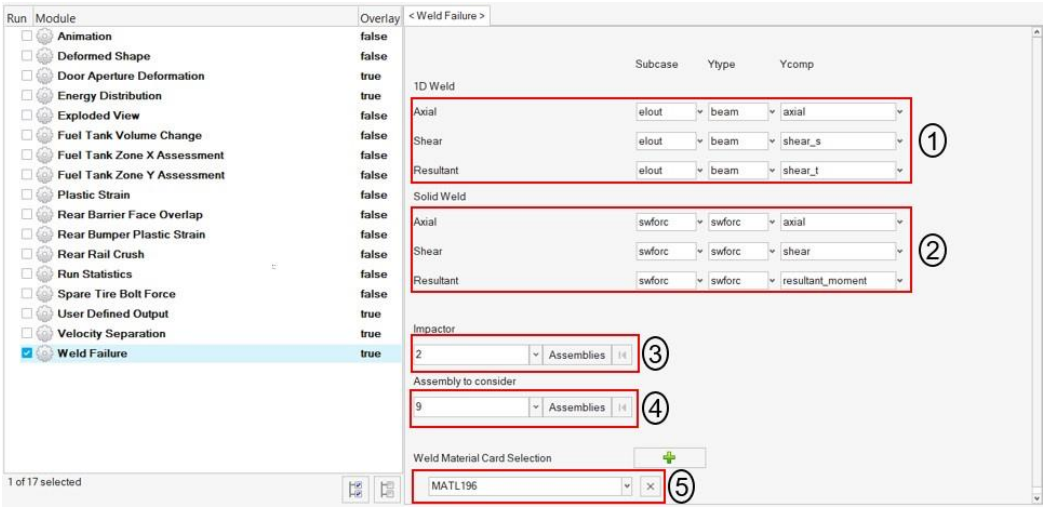
b. Single hexa spot welds

c. Hexa nuggets (cluster of hexa elements)

d. Hexa adhesives

The detailed PPT report generated can be categorized into following different sections.

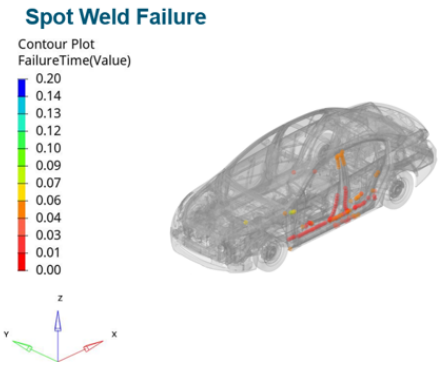
- First two slides give you the global viewpoint. It contains the complete view of the vehicle with all the ruptured welds color coded as per the failure time contour & another slide showing the cumulative graph of the ruptured welds across the simulation time steps.
- The subsequent slides capture the detailed report for each of the ruptured weld for each of the weld type found in the model.
- For 1D beam spot weld & single hexa spot weld types, the report contains an isolated view of the weld & its linked components & a graphs showing the axial, shear & resultant plots across the time steps.
- For hexa nuggets & hexa adhesive weld types, the report contains detailed view of the weld containing the linked components.

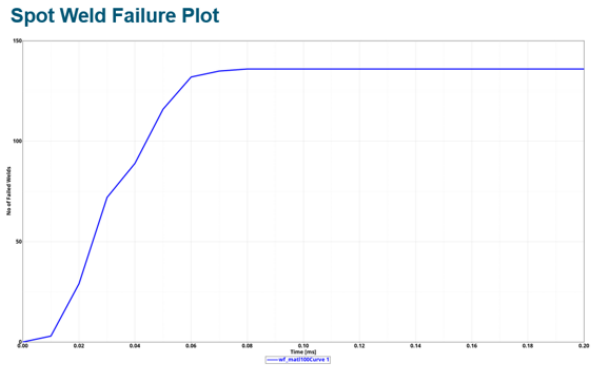


Inputs:

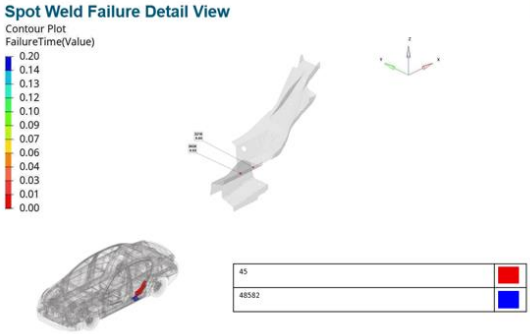
1) The time History info (binout) to be used for 1D beam spot welds axial, shear & resultant graphs
2) The time History info (binout) to be used for single hexa spot welds axial, shear & resultant graphs
3) Impactor assembly / component ID
4) Assembly ID / Component ID list (optional) to be used to find ruptured welds for report generation
5) Weld material ID used to find the ruptured welds

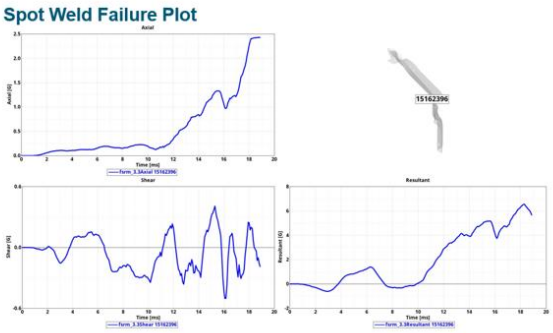
Global viewpoint:



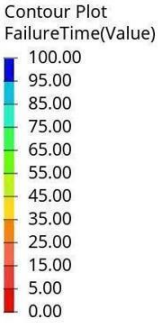


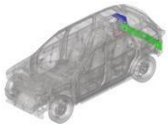
1D beam spot weld / Single hexa spot weld report





Hexa nuggets report:





R2FB_S11146_A|EXT|FLR|PAN|SD|RR|0.8mm	
R2HB-S27944-A|10|REINF RR LP OPG LWR|0.8mm	
R2HB-S40492-A|22|PNL LWR BK I|S|0.7mm	

Hexa adhesives report: