

Altair Safety Report Manager 2022.3

Side Impact Modules

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When contacting Altair support, specify the product and version number you are using along with a detailed description of the problem. It is beneficial for the support engineer to know what type of workstation, operating system, RAM, and graphics board you have, so include that in your communication.

Location	Telephone	E-mail
Australia	+61 3 9866 5557	anzsupport@altair.com
Brazil	+55 113 884 0414	br_support@altair.com
Canada	+1 416 447 6463	support@altairengineering.ca
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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 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.

	🖁 Altair Safety	Report Manager								\times
~	Impact Type: Regulation:	Front v FMVSS 208 v		Main Overlay 1 Overlay 2 Overlay	3 Overlay 4	Dyna	♥ ○ Test Data	HDF 💌	6	© 🔶
1	Protocol: Units:	Full Frontal		Title:	main_iter_	-7				Input Check
2	# of Overlay:	0		Previous session file:						1
		Config same as Main		Analysis results directory:	F p					Search
3	# of Processes:	14 *		Config excel file:	Þ					🕞 Save As
		More options		Tracking system nodes (N1, N2, N3):		¥	*	 Apply to Modules 		
	Select Module		Overlay	< Animation >						
	🗹 🎡 Anima	ation	false ^							
	🗆 🍥 Batte	ry Section Force	true							
	🗆 🍥 Collis	ion Detection	false	Tracking System			$\overline{7}$			
	🗆 🍥 Dash	Intrusion Contour Plot	false				_			
	AR10.	Intrusion Cross Section	true	N1			Node I			
	🗆 🍥 Defor	med Shape	false	N2			Node I			
~		acement Plot	false							
4	-4El-	Aperture Deformation	true	N3			Node I4			
\sim	101	gy Distribution	true							
	-10-	e Mount Failure	false	Title			View	+		
	- Mile.	oded View	false							
	ATA.	Tank Interaction	false	- Con	nponents I			• ×		
		Tank Zone X Assessment	true							
	-6-	Tank Zone Y Assessment	true							
	🗆 🎡 Load		true							
	🗌 🍥 Осси	pant	true 🗸							
	1 of 28 selected									
(5)	Report output diree	ctory:							۶	😁 Now
\sim										

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. Based on this selection the modules list (section #4) gets updated.

Impact Type:	Front	*
Regulation:	FMVSS 208	*
Protocol:	Full Frontal	*
Units:	mm/ms/kg	*

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.

# of Overlay:	(2)	*		Main	Overlay 1	Overlay 2	Overlay 3	Overlay 4	
	Sar	n <mark>e as main</mark>	-	Title:					

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.

# of Processes:	14	¥
	More 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, data type & 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.

Main Overlay 1 Overlay 2 Overlay	3 Overlay 4
	O CAE Data Dyna ✓ ○ Test Data HDF ✓
Title:	
Previous session file:	
Analysis results directory:	
Config excel file:	
Tracking system nodes (N1, N2, N3):	 Apply to Modules

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.

Run Module	Overlay	Configuration			
Animation	false	2			
Dash Intrusion Contour Plot	false	Tracking_System			
Dash Intrusion Cross Section	true	N1		v Node	14
Deformed Shape	false			- Nouc	1.0
Energy Distribution	true	N2	8000000	* Node	14
Engine Mount Failure	false	N3	15838433	✓ Node	14
Exploded View	false	110	13535133	Node	1.14
Load Path	true	Body Side Type	Components		
🔲 🍥 Occupant	true	Body Side Assembly/Components	150364 150365	v Components	14
Pedal Column Motion	true	DASH Assembly			-
Run Statistics	false	Туре	Assemblies		
		Assembly/Comp Name/ID		 Components 	14
Structural Assessment	false				
1 of 21 selected					- 1

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.



arch here				
Name	Size	Date modified	Туре	
iii testT01	253198 KB	27/01/23 03:42 PM	File	
				selected 1
E Data> Radioss> Solver Inpu arch here	t File:			
	t File: Size	Date modified	Туре	
arch here	Size	Date modified 27/01/23 03:37 PM		
arch here Name	Size 1216449		RAD File	

Change curve attributes & publish session

This section is mainly used for the overlay scenario.

The change curve attributes option is 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.

🗹 m1_hg	Isolate Only	Show	Hide Show All	
m2_hg	Layer Color		Layer Line Thickness	~
	Symbol Color		Symbol Size	
	Symbol	On	Off	
	Notes Font	А		
	Notes Position		*	
	Legend	On	© Off	
	Legend Font	A		
	BarGraph Categor	ry Font A	BarGraph Gap	

After changing the curve & note related attributes using the overlay setting dialog, user can click on Publish session icon <a> 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.

Tracking System	
N1	15849041 V Node 14
N2	15839164 V Node 14
N3	15838433 V Node 14
Title	View 🕂
7 Y Assemblies H	Top 👻 🗙
9 Y Components 14	Iso 👻 🗙

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

Occupant >							
Driver Passenger							
Dummy Model 50th	* Du	mmy Version config	* Res	et			
i-¿Driver Restraint Type		w					
Driver ID							
Driver Injury Criteria	Subcase	Datatype	Request	Component	Filter		
HEAD_ACC_X	nodout		-				
HEAD_ACC_Y	ebstat ebstat_cpm deforc	1	H3-50TH_DU	MY-1_HEAD_ACCELEROM MY-1_HEAD_ACCELEROM MY-1_HEAD_ACCELEROM	ETER_Y 2000002		
HEAD_ACC_Z	disbout			MY-1_CHEST_ACCELERON			
HEAD_ACC_RES	elout gistet	1	H3-50TH_DUR	MY-1_CHEST_ACCELERON	ETER_Z 2000006		
NECK_UPPER_MOMENT_Y		• [MY-1_PELVIS_ACCELERION MY-1_PELVIS_ACCELERION			
NECK_UPPER_FORCE_X	sodout	× .	1	Y	1	Y	
NECK_UPPER_FORCE_Z		+ (}•[)+ [*	w.	
CHEST_DEFLECTION		× [}• [)+ [+	w	
CHEST_ACC_X		× [}•[)+ [)+[w	
CHEST_ACC_Y		÷ [)+()+[w	
CHEST_ACC_Z		4	4	H.	-	*	

Modules

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

- Animation
- Barrier Face Overlap
- Battery Section Force
- Collision Detection
- Deformed Shape
- Displacement Plot
- Door Aperture Deformation
- Energy Distribution
- Exploded View
- Fuel Tank Interaction
- Fuel Tank Zone X Assessment
- Fuel Tank Zone Y Assessment
- Load Path
- Occupant
- Plastic Strain
- Run Statistics
- Structural Intrusions
- User Defined Outputs
- Vehicle Yaw Pitch Roll
- Velocity Separation
- Weld Failure

Animation

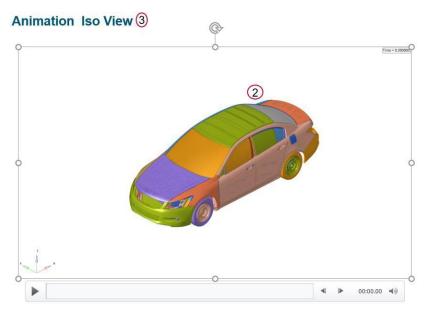
Animation module lets you create gif animations of the selected parts (or assemblies) in the user selected standard views.

Run Module	Overlay	Configuration	
Animation	false		
E Dash Intrusion Contour Plot	false		
Dash Intrusion Cross Section	n true	Taulin Data	
Deformed Shape	false	Tracking System	
Energy Distribution	true	N1 158	349041 Y Node 14
🗐 🍥 Engine Mount Failure	false	N2 158	339164 V Node 14
Exploded View	false		339164 V Node 14 (1)
🗐 🍘 Load Path	true	N3 158	338433 - Node 14
🗐 🍥 Occupant	true		
Pedal Column Motion	true	Title	View
E 🖗 Run Statistics	false	7 V Assemblies (3 Top * ×
E Structural Assessment	false	9 V Assemblies 14	lso 🔸 🗙
📰 🍥 Structural Vehicle Kinematic	s false		
E 🎒 Structure Plastic Strain	false		
1 of 20 selected		<	1
Output directory: C/temp/s/IIHS_front/iihs_fro	ont_test		e 😁

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:



Barrier Face Overlap

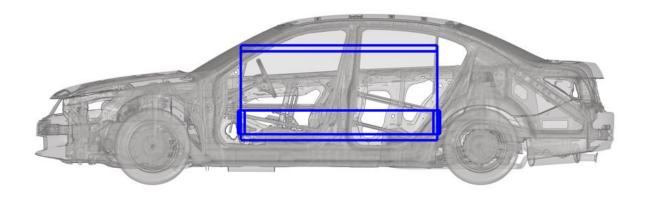
Barrier Face module lets you create an image of the MDB Barrier Face, and the vehicle as shown below. This will help visualize how the barrier is positioned relative to the vehicle parts such as upper body & occupants so that any deviation or offset can be easily found out.

Run Module		Overlay	< Barrier Face Overlap >
de Carrier 😳 🗹	Face Overlap	false ^	<u>×</u>
🗆 🍥 Battery	Section Force	true	
🗆 🍥 Collisio	n Detection	true	
Deform	ed Shape	false	Vehicle Comp Selection Vehicle Components I Components
🗆 🍥 Door Ap	erture Deformation	true	Barrier Cladding Comp Selection Components H Components
🗆 🍥 Energy	Distribution	true	
Explode	d View	false	
🗆 🎯 Fuel Ta	nk Interaction	false	
🗆 🎯 Fuel Ta	nk Zone X Assessment	true	
🗆 🎯 Fuel Ta	nk Zone Y Assessment	true	
C 💮 Key180		true	
1 of 20 selected			

Inputs:

- 1) Vehicle component selection. This includes all the vehicle parts such as upper body, occupants, door beams etc. They are displayed in grey, transparent color.
- 2) Barrier cladding components selection. This includes the front cladding parts on the barrier. A component set is created for the selected cladding parts & displayed as shown in the image.

Output report:



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.

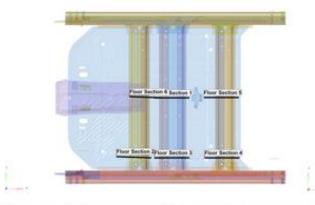
- 1) Images consisting of floor and the battery parts along with cross section members
- 2) A summary table showing the cross-member forces for all the user defined battery & floor sections
- 3) A summary table showing the battery intrusion measurements at various user selected locations
- Images of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

Run Module	Overlay < Battery Section Force > 1
Battery Section Force	
Collision Detection	Battery, Floor Sections Battery Intrusions
Deformed Shape	false Forces Filter
Door Aperture Deformation	true
Energy Distribution	Front Floor Components I C (3)
Exploded View	
Generation	false Battery Components I C 4
101	Vehicle to Impactor Contact
Fuel Tank Volume Change	Ŭ
Fuel Tank Zone X Assessment	true
Fuel Tank Zone Y Assessment	true Battery Sections Pioor Sections
Plastic Strain	false 6 Battery Section 1 Floor Section 1
1 of 20 selected	
1 0120 selected	
	Overlav <battery force="" section=""></battery>
Run Module Battery Section Force	
Collision Detection	true Battery, Floor Sections Battery Intrusions 8
Geformed Shape	false Filter (9)
Door Aperture Deformation	
Energy Distribution	true Intrusions PointA PointB Dir
Exploded View	false
Geographic Fuel Tank Interaction	false
🗆 🍥 Fuel Tank Volume Change	true Intrusion Loc 2 v Node H N v Node H N X v X
Fuel Tank Zone X Assessment	true
George V Assessment	true
Plastic Strain	false
1 of 20 selected	folen V v
	He Ho

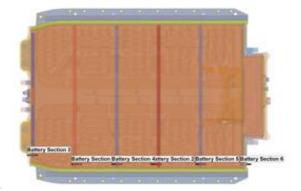
Inputs:

- 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)

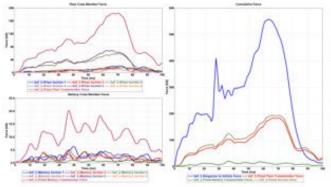
Output report:

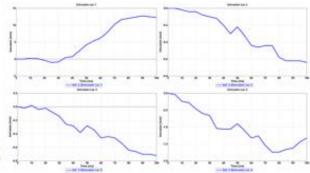


Battery Cross Member	Force	Floor Cross Member Force				
Title	Force (kN)	Title	Force [kN			
Battery Section 1	6.37	Floor Section 1	20.89			
Battery Section 2	4.44	Floor Section 2	16.18			
Battery Section 3	1.07	Floor Section 3	15.36			
Battery Section 4	5.30	Floor Section 4	58.88			
Battery Section 5	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

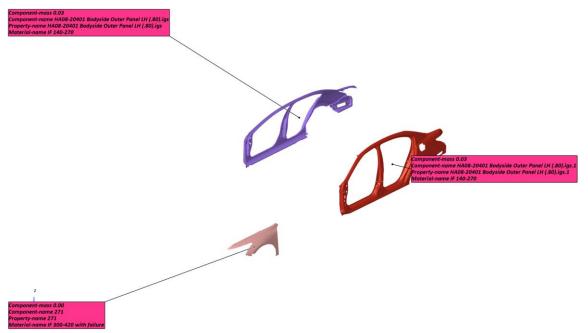
BOM module is an advanced exploded view module. It has the capability to include data name attributes as annotations in the report. Users can pick from several data names (around 100) related to components, property, and material entity attributes. The selected BOM info can be easily attached as annotations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

	Datanames		
\bigcirc	IZZcog	0	
(2)	lines	(3)	
\smile		U	
	moduleid		
			4
•			-
Label			
Component-mass			
	Label	2	2 IZZcog lines lumpedmass mass material materialid moduleid Label

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.

Run Module	Overlay	< Collision Det	tection >						
Animation	false ^	State	Last		าก				
Battery Section Force	true								
Collision Detection	true								
Geformed Shape	false	Title	Group A		Туре	Group B		Туре	+
Ooor Aperture Deformation	true	pair 1	535242 535016 535017 +	Components 1	Component	535024 535026 535027	- Components	Components	
Energy Distribution	true						components 11		4
Exploded View	false	pair 2	500031 535023 535038 👻	Components	Components	535037	* Components	Components	×
Geographic Fuel Tank Interaction	false	pair 3	500002 500029 500034 ~	Components 1	Components	500020 500604	~ Components	Components	×
🗆 🍥 Fuel Tank Volume Change	true	pano	000002.000000	components			Componenta 11	Components	
Fuel Tank Zone X Assessment	true	pair 4	545003 545005 545001 +	Components	Components	426000 426001	~ Components	Components	×
Fuel Tank Zone Y Assessment	true								
Plastic Strain	false								
Rear Barrier Face Overlap	false								
Rear Bumper Plastic Strain	false								
🗆 🍥 Rear Rail Crush	false								
Run Statistics	false								
Spare Tire Bolt Force	true								
User Defined Output	true 🗸								
2 of 20 selected	日日								

Inputs:

- 5) Select the time step state at which the collision detection is performed
- 6) 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:

pair 2





Y X

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)

un Module	Overlay	Configuration					
Animation	false	^					
E 🎯 Dash Intrusion Contour Plot	false						
E 🎯 Dash Intrusion Cross Section	true	Tradical Castor					
Deformed Shape	false	Tracking System	-				
Energy Distribution	true	N1	1528	7725 - Node	14		
Engine Mount Failure	false	N2	2108	8810 - Node	1		
Exploded View	false			in the second se			
📄 🍥 Load Path	true	N3	2108	9957 - Node	14		
🖻 🍥 Occupant	true						
E 🎯 Pedal Column Motion	true	Title 2		3	Туре	View	4 😱
				1.5/	1900	1011	
		party out of the second s				1	The second second
Run Statistics	false	Deform_1	9 24 25 56 57	- Assemblies	Assemblies	ISO	* ×
Run Statistics	false	Deform_1	9 24 25 56 57	- Assemblies		1	* ×
Constant Statistics Structural Assessment	false false	party out of the second s		- Assemblies	Assemblies		* x * x
		Deform_1		- Assemblies	Assemblies		* ×
Structural Assessment	false	Deform_1 Deform_2	24 25 56	Assemblies Assemblies	Assemblies		* x * x
Structural Assessment Structural Vehicle Kinematics	false false	Deform_1 Deform_2	24 25 56	Assemblies Assemblies	Assemblies		* x * x
Structural Assessment Structural Vehicle Kinematics Structural Vehicle Kinematics Structure Plastic Strain	false false false	Deform_1 Deform_2	24 25 56	Assemblies Assemblies	Assemblies		* x * x
Structural Assessment Structural Vehicle Kinematics Structural Vehicle Strain User Defined Output	false false false true	Deform_1 Deform_2	24 25 56	Assemblies Assemblies	Assemblies		* x * x

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

2 Deformed Shape – Deform_1_TOP



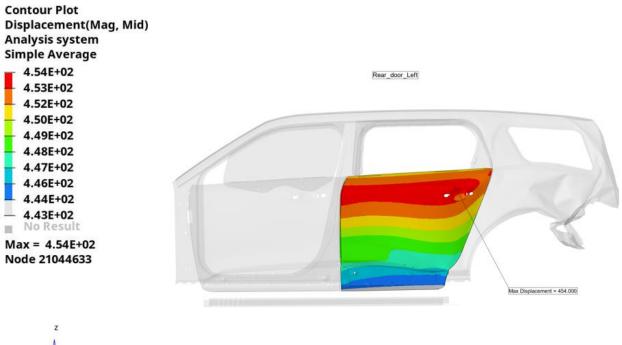
Displacement Plot

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

Run Module	Overlay	< Clisplacement Plot>
Animation	false	
Given Section Force	true	Title (1) Components (2) MaxValue Adjacent Comps/Assy View (5)
Collision Detection	true	
Deformed Shape	false	Rear_door 12501 v Components 14 450 12510 12502 12505 v Components 14 Left v X
Displacement Plot	false	
Coor Aperture Deformation	true	
Genergy Distribution	true	
Exploded View	false	
George Fuel Tank Interaction	false	
Fuel Tank Zone X Assessment	true	
Fuel Tank Zone Y Assessment	true	
🗆 🍈 Load Path	true	
Operation Plastic Strain	false	
Given Statistics	false	
User Defined Output	true	
Vehicle Yaw Pitch Roll	true	
Wold Failura	faleo Y	×
1 of 17 selected		

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



4

X

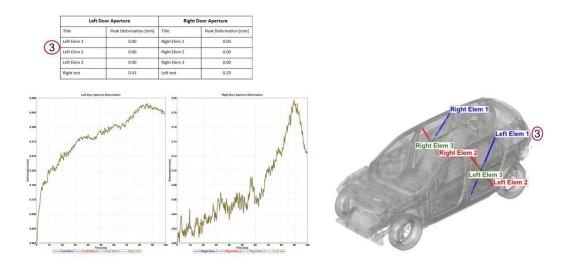
Door Aperture Deformation

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

(11) 1919	odule	Overlay	< Door Aperture Deformation >						
	Animation	false							
	Deformed Shape	false	CFC 180						
	Door Aperture Deformation	true	CFC 180	- Filter					
0	Energy Distribution	true							
	Exploded View	false	✓ Compo	nents H Components (of Impactor				
	Fuel Tank Zone X Assessment	false			9				
E 4	Fuel Tank Zone Y Assessment	false							
	Plastic Strain	false	Door Elems	Subcase	Ү Туре	Y Request	Y Component	4	
	Rear Barrier Face Overlap	false	Left Elem 1		*	*	*	*	
	Rear Bumper Plastic Strain	false							3
	Rear Rail Crush	false	Right Elem 1		*	*	Y	* ×	<u> </u>
■ 6	Run Statistics	false							
	User Defined Output	true							
0	Velocity Separation	true							

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



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.

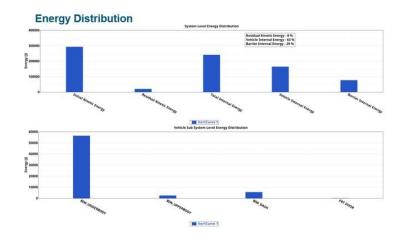
For the barrier, energy plots are created for Initial kinetic energy, residual kinetic energy, total internal energy, vehicle internal energy and barrier internal energy.

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

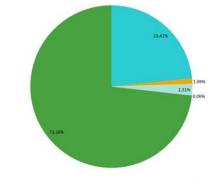
un Module	Overlay	Configuration				
Animation	false	^				
Dash Intrusion Contour Plot	false					
Dash Intrusion Cross Section	true		L			
E Offermed Shape	false	Barrier	ODB	V Components	A (1)	
Energy Distribution	true					
Engine Mount Failure	false	Subsystem Energy	Title		Туре	4
Exploded View	false		1.			
E 💮 Load Path	true	BW_UNDERBODY	8	✓ Components H	Components	× (3)
Cccupant	true	BIW_UPPERBODY	9	Y Assemblies	Assemblies	×
Pedal Column Motion	true					
		BIW_DASH	7	✓ Assemblies	Assemblies	×
Run Statistics	false	FRT DOOR	24	Y Assemblies	Assemblies	×
Structural Assessment	false					
Structural Vehicle Kinematics	false					
Structure Plastic Strain	false					
🗏 🍥 User Defined Output	true					
Vehicle Kinematics Vertical	true					
Vehicle Kinematics XY Disp	true					
of 20 selected	faleo	× .				

Inputs:

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



Energy Distribution Pie Chart



BIW_UNDERBODY BIW_UPPERBODY BIW_DASH FRT DOOR OTHERS

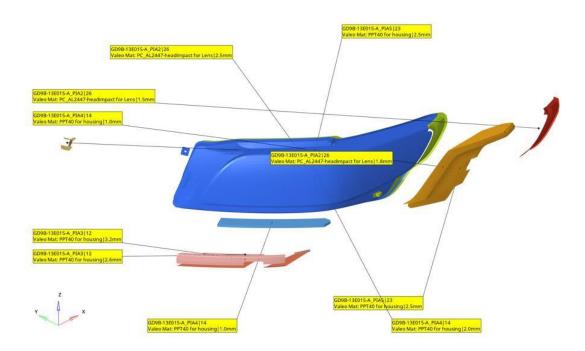
Exploded View

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.

Run Module	Overlay	Confi	iguration							
C Animation	false	^								
Dash Intrusion Contour Plot	false	TH	1					-		
Dash Intrusion Cross Section	true	Title	3					Туре	4	
Deformed Shape	false	(1)	DASHCOWL	9	*	Assemblies	14	Assemblies	×	2
Energy Distribution	true		UNDERBODY	56		Assemblies		Assemblies	×	
Engine Mount Failure	false		ONDERBODI	50		Assemblies	14	Assemblies	^	
Exploded View	false	ſ	UPPERBODY	57	~	Assemblies	11	Assemblies	×	
🔳 🍈 Load Path	true									
Cccupant	true									

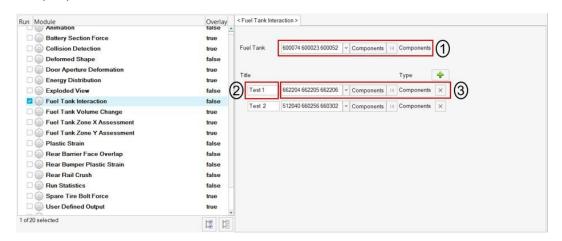
Inputs:

- 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.

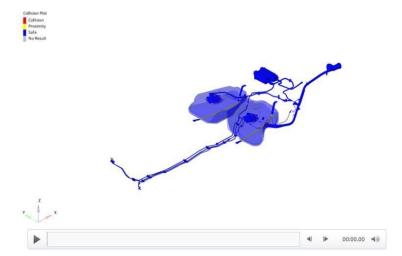


Inputs:

- 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:





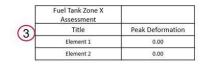
Fuel Tank Zone X Assessment

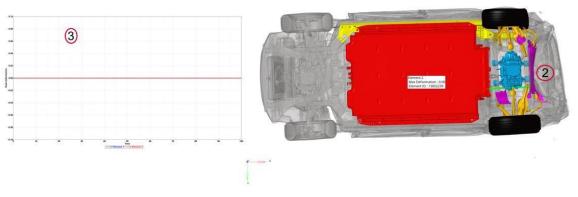
This module is used to evaluate the deformation of fuel tank zone spring elements. It computes the deformation between fuel tank zone cross members along X direction by measuring the spring element deformations.

Run Module	Overlay	< Fuel Tank Zone X Assessment >				
📰 🍥 Animation	false					1
E 🌍 Deformed Shape	false	Filter	1			
E Oor Aperture Deformation	true	riter				
Energy Distribution	true					
Exploded View	false	Impactor Compor	ents 14 Components			
🔽 🥘 Fuel Tank Zone X Assessment	false					
📰 🍥 Fuel Tank Zone Y Assessment	false	Wheel Compor	ents 14 Components			
E 💮 Plastic Strain	false	Fuel Tank Compor	ents 14 Components			
E 🎯 Rear Barrier Face Overlap	false					
🗐 🍈 Rear Bumper Plastic Strain	false	Rear Rail Compor	ents 11 Components (2))		
E 🍘 Rear Rail Crush	false	Chassis Compor				
E G Run Statistics	false					
E 🎒 User Defined Output	true	Exhaust Compor	ents II Components			
Content Separation	true	Motor Compor	ents 14 Components			
		Title Subcase	Туре	Request	Component	•
1 of 14 selected		Element 1		•	v	- × 3

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





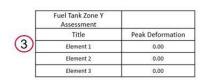
Fuel Tank Zone Y Assessment

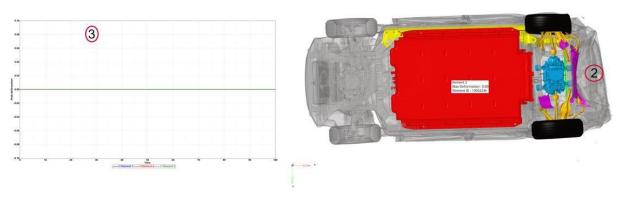
This module is used to evaluate the deformation of fuel tank zone spring elements. It computes the deformation between fuel tank zone cross members along Y direction by measuring the spring element deformations.

Run Module	Overlay	< Fuel Tank Zone Y Assessment >					
E 🍥 Animation	false						1
Deformed Shape	false	Filter					
Door Aperture Deformation	true	riter		1			
Energy Distribution	true						
Exploded View	false	Impactor	Components	Components			
E 🏐 Fuel Tank Zone X Assessment	false		1-	7.			
Fuel Tank Zone Y Assessment	false	Wheel	Components	Components			
Plastic Strain	false	Fuel Tank	Components 1	Components			
🗐 🎡 Rear Barrier Face Overlap	false		1 1	-	0		
Rear Bumper Plastic Strain	false	RearRail	Components 1	Components	(2)		
🗐 🍥 Rear Rail Crush	false	Chassis	Components	Components	-		
Run Statistics	false						
User Defined Output	true	Exhaust	Components	Components			
Velocity Separation	true	Motor	Components	Components			
		Title Subcase		Туре	Request	Component	+
1 of 14 selected		Element 1	5		× [•	· × 3

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





Load Path

The Load Path module lets you create following report summary.

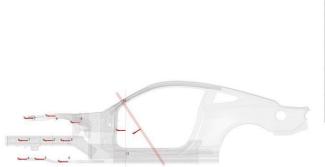
1) It creates an image of the vehicle and identifies the location of each cross section that is defined by the user in the config file

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

Module	false	Configuration									
Dash Intrusion Contour Plot	false		Common State								
Dash Intrusion Cross Section	true	Filter	1000	. *							
Deformed Shape	false	Title	Position 1		Position 2		Position 3	Position 4	Position 5	Position 6	
Energy Distribution	true		Front		Mid		Rear				+ (2 * × (3
🖺 🍥 Engine Mount Failure	false	Rail LHS	100010	L.	100016	1.	100018	1.1	1.1		
Exploded View	false	Hairths	100010		100016		100010		J* [* ^ (c
2 💿 Load Path	true	Rail RHS	100011	~	100017	*	100019	~	*	*	* ×
🛙 🎯 Occupant	true	Subframe LHS	500017		500011	1.	500003		Ju (6	
Pedal Column Motion	true	Subirame LHS	500017		500011		500003		r L		* ×
		Subframe RHS	500018	÷	500012	~	500004	¥ [*	¥	* ×
🖞 🍥 Run Statistics	false	Shotgun LHS	100042		100044	~	240004	 • [-		* ×
🛙 🍥 Structural Assessment	false	Shotgun RHS	100043		100045	*	240008			- I	~ ×
🛯 🍥 Structural Vehicle Kinematics	false		1								
Structure Plastic Strain	false	Rocker RHS	100038	Y		*		~	*		* ×
🛯 🍚 User Defined Output	true	A-Pillar LHS	240001	~		*		*	*		* ×
Vehicle Kinematics Vertical	true	4 P.H. P. IN	240002								
🛛 🍚 Vehicle Kinematics XY Disp	true	A-Pillar RHS	240002	۲		*		×	×	× .	* ×
Wheel Kinematics	false	Driveshaft LHS	555000	¥		¥	555001	*	~	v [~ ×
		Rocker LHS	100026	v		v)• [•]• [~ ×
		Rocker RHS	100038	÷		v		v		.	* ×

Cross Section Locations

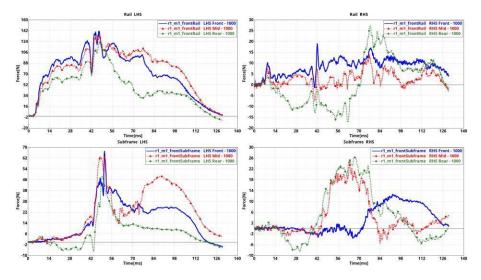


1	Rail Front
2	Rail Mid
3	Rail Rear
4	Subframe Front
5	Subframe Mid
6	Subframe Rear
7	Shotgun Front
8	Shotgun Mid
9	Shotgun Rear
10	A-Pillar Front
11	Rocker Front

Load	Path	Summa	ary
------	------	-------	-----

#	Title	Peak Load [LHS] (KN)	Area(mm2)	lx (mm4)	ly (mm4)	J (mm4)	Sx (mm3)	Sy (mm3)	Peak Load [RHS] (KN)	Area (mm2)	lx (mm4)	ly (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	16516 8.37	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
з	Rail Rear	125.37	39.52	124027.32	71430.19	-43017.08	880.11	776.17	27.44	39.52	18420 6.11	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	3589.0 2	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	4033.1 0	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	3589.0 1	8405.06	0.00	214.27	280.17
7	Shotgun Front	23.95	64.34	74444.15	272987.83	-22519.68	699.06	1554.8 5	4.45	64.34	59385. 91	278937.03	-34549.85	699.07	1554.8 5
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	4893.4 0	2722.5 6	35.47	136.25	21570 98.05	1226453.29	-446369.53	3312.09	4441.0 9
10	Rocker Front	115.19	120.65	8934548.12	336710.24	-176468.24	12426. 70	3454.3 4	17.31	120.65	97954 51.07	904324.39	999808.24	12426.70	3454.3 4

Cross Section Force Plot



Occupant

Occupant module allows users to create occupant safety report for various regulations and crash modes. It generates following summary report based on user selected info.

- 1) Occupant summary table
- 2) Bar graphs comparing the Driver/Passenger results against the regulation criteria
- 3) Occupant performance plots

ASRM has the capability to generate occupant report for the following side impact regulation and crash modes. For each regulation, the corresponding dummy types & versions supported is also listed in the below table.

Crash Regulation	Crash Mode	Structure	Occupant
CNCAP	MDB	Yes	1st Row Left – WSID 5.0, 6.0, 7.0 2nd Row Left – SBLD 4.0.2, 4.3.1
ECE R95	MDB	Yes	1st Row Left – ES2Re 6.0, 7.0, 8.0.2
EURONCAP	MDB	Yes	1st Row Left – WSID 5.0, 6.0, 7.0 2nd Row Left – Q10; 2nd Row Right – Q6
EURONCAP	Pole	Yes	1st Row Left (left impact) - WSID 5.0, 6.0, 7.0 1st Row Right (right impact) – WSID 5.0, 6.0, 7.0
FMVSS 214	MDB	Yes	1st Row Left - ES2RE (v6.0, 7.0, 8.0.2) 2nd Row Left - SID IIs (SBLD v4.0.2, v4.3.1)
FMVSS 214	Pole	Yes	1st Row Left – ES2RE (v6.0, 7.0, 8.0.2) / SID IIs (SBLD v4.0.2, v4.3.1)
IIHS	MDB	Yes	1st Row Left - SID IIs (SBLD 4.0.2, 4.3.1) 2nd Row Left – SID IIs (SBLD 4.0.2, 4.3.1)
LATIN NCAP	Pole	Yes	1st Row Left – ES2Re 6.0, 7.0, 8.0.2
LINCAP	MDB	Yes	1st Row Left – ES2RE (v6.0, 7.0, 8.0.2) 2nd Row Left – SID IIs (SBLD 4.0.2, 4.3.1)
USNCAP	MDB	Yes	1st Row Left - ES2RE (v6.0, 7.0, 8.0.2) 2nd Row Left - SID IIs (SBLD v4.0.2, v4.3.1)
USNCAP	Pole	Yes	1st Row Left – ES2Re (6.0, 7.0, 8.0.2) / SID IIs (SBLD 4.0.2, 4.3.1)

Following is the list of default units used in occupant module for various quantities.

- Acceleration g
- Force kN
- Moment N*m
- Velocity m/s
- Length mm

Select Module	Overlay	< Occupant>						
Barrier Face Overlap	false 🔶	1st Rw Lft 2nd Rw Lft (1)	6					
Battery Section Force	false		- 2 Jummy Version	6.0				
🗆 🍥 ВОМ	false	Dummy Model HUM_ES-2re	 Bummy Version 	5.U	3)			
Collision Detection	false				Ū			^
Deformed Shape	false	1st Bw Ltt ID						
Displacement Plot	false	Tarriw Crib		(4)				
Door Aperture Deformation	true							
Energy Distribution	true	1st Rw Lft Injury Criteria	Subcase	Datatype	Request	Component	Filter	\sim
Fuel Tank Interaction	false	HEAD_ACC_X	nodout	nodout	acceleration head	x_acceleration	1000	·(5)
George Fuel Tank Zone X Assessment George Tank Zone Y Assessment	true	HEAD_ACC_Y	nodout	nodout	acceleration head	y_acceleration	1000	
Generation of the second	true							
Coupant	true	HEAD_ACC_Z	nodout	nodout	acceleration head	z_acceleration	1000	v
Plastic Strain	false	HEAD_ACC_RES	nodout	nodout	acceleration head	resultant_acceleration	1000	v
Run Statistics	false	SHOULDER_FORCE_FY	elout	beam	clavicle load cell	shear_s	600	v
Structural Intrusions	true	THORAX_UPPER_RIB	deforc	Force	upper rib deflection	change in length		v
User Defined Output	true	THORAX_MIDDLE_RIB	deforc	Force	middle rib deflection	change in length		*
Vehicle Yaw Pitch Roll	true	THORAX_MIDDLE_RIB		Force	middle no deflection	change in length		
Velocity Separation	true	THORAX_LOWER_RIB	deforc	Force	lower rib deflection	change in length		*
Weld Failure	false v	ABDOMINAL_FRONT_LOAD_FY	elout	beam	abdomen load cell front	shear_s	600	v
1 of 21 selected		_ABDOMINAL_MIDDLE_LOAD_FY	elout	beam	abdomen load cell mid	shear_s	600	v

Inputs:

1) Tabs allowing users to define occupant (driver & passenger) info independently

2) **Dummy model** selection option. Currently following dummy types are supported.

For the Side impact type, IIHS regulation & MDB protocol, we support SID-IIs dummy types.

For the Side impact type, LINCAP regulation, the tool supports ES2re dummy type for Drivers and SID-IIs dummy type for passengers.

3) **Dummy version** selection. Users can either select a particular version number from the drop down or set it to config option. When selecting a version number, all the subcase, datatype, request & component types along with filters are predefined for the user based on defaults config file. When user selects the config option then it is user's responsibility to define all the inputs. This is especially needed when using a newer dummy version.

4) **Driver ID / Passenger ID**. This option is enabled or used only when the dummy version is set to anything other than config. This is needed by the tool so it can differentiate between driver & passenger request IDs when plotting the occupant injury curves.

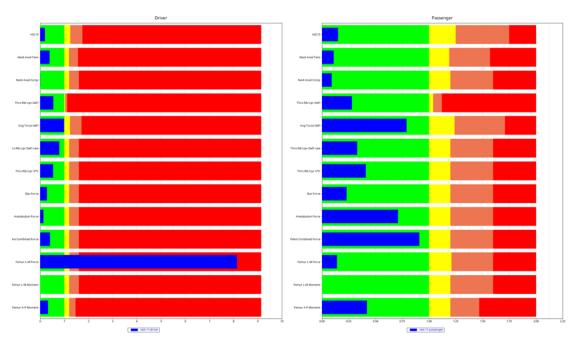
5) **Driver / Passenger Injury Criteria selection**. This option is enabled only when the dummy version is set to config. User should first make sure to load the Time History file (binout) by clicking the Load button. After loading the file, user can start defining the appropriate subcase, datatype, request & component types for each of the injury criteria.

Occupant >						
1st Rw Lft 2nd Rw Lft						
Dummy Model HUM_ES-2re	 Dummy Version 	config	✓ Reset			
1st Rw Lft Injury Criteria	Subcase	Datatype	Request Cor	mponent	Filter	1
HEAD_ACC_X			×		*	*
HEAD_ACC_Y	disbout elout	<u>^</u>	acceleration upper spine 60000 • acceleration lower spine 60000	02	*	*
HEAD_ACC_Z	eloutdet glstat		 acceleration lower rib 6000003 acceleration middle rib 600000 acceleration upper rib 6000005 	4	*	*
HEAD_ACC_RES	jntforc		acceleration pelvis 6000006		*	*
SHOULDER_FORCE_FY	nodout		acceleration head 6000007 acceleration clavicle 6000008	~	*	¥
THORAX_UPPER_RIB	rbdout	*	* *		*	*

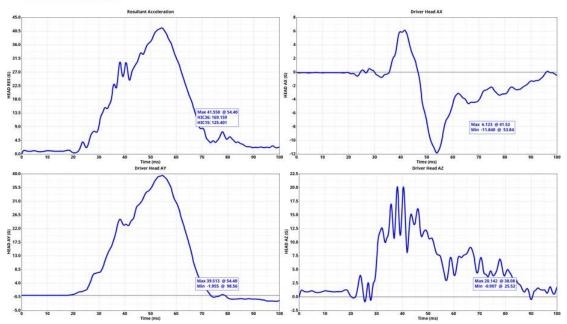
Occupant Summary

Occupant Results	Front - SID-IIs	Rear - SID-IIs	GOOD	ACCEPTABLE	MARGINAL	POOR	Internal
HIC(15ms)	22.59	121.61	623	779	935	935	610
Upr Neck Tension (kN)	0.78	1.19	2.1	2.5	2.9	2.9	2
Upr Neck Comp (kN)	0.08	0.20	2.5	3	3.5	3.5	2.4
Upr Neck Bending MX (N-m)	10.88	23.32	-	-	-	-	67
Head Kinematics	NA	NA	See Table	See Table	See Table	See Table	-
Shoulder Defl (mm)	5.43	16.42	-	-	-	60	-
Shoulder Force Fy (kN)	0.36	1.03	-	-	-	-	2.5
Shoulder Disp spike in Load?	NA	NA	-	-	-	Yes	-
Thorax Rib Upr Defl (mm)	23.16	21.66	51	53	55	55	-
Thorax Rib Mid Defl (mm)	25.40	28.86	51	53	55	55	-
Thorax Rib Lwr Defl (mm)	24.39	33.84	51	53	55	55	-
Abdmn Rib Upr Defl (mm)	19.39	30.07	51	53	55	55	-
Abdmn Rib Lwr Defl (mm)	21.66	26.99	51	53	55	55	-
Avg Rib Defl	22.80	28.28	34	42	50	50	-
Thrx Rib Upr Defl Rate (m/s)	3.50	2.86	8.2	9.84	11.48	11.48	-
Thrx Rib Mid Defl Rate (m/s)	2.92	2.01	8.2	9.84	11.48	11.48	-
Thrx Rib Lwr Defl Rate (m/s)	2.73	2.86	8.2	9.84	11.48	11.48	-
Abdmn Rib Upr Defl Rate (m/s)	3.44	2.49	8.2	9.84	11.48	11.48	-
Abdmn Rib Lwr Defl Rate (m/s)	3.50	2.09	8.2	9.84	11.48	11.48	-
Thorax Rib Upr V*C (mm)	0.00	0.00	1	1.2	1.4	1.4	-
Thorax Rib Mid V*C (mm)	0.00	0.00	1	1.2	1.4	1.4	-
Thorax Rib Lwr V*C (mm)	0.00	0.00	1	1.2	1.4	1.4	-
Abdmn Rib Upr V*C (m/s)	0.00	0.00	1	1.2	1.4	1.4	-
Abdmn Rib Lwr V*C (m/s)	0.00	0.00	1	1.2	1.4	1.4	-
Lumbar Spine Fy (kN)	0.33	0.94	-	-	-	-	2
Lumbar Spine Mx (N-m)	62.80	92.03	-	-	-	-	114
Pelvis Iliac Force Fy (kN)	0.71	1.59	4	4.8	5.6	5.6	-
Pelvis Acetabulum Force Fy (kN)	0.76	1.51	4	4.8	5.6	5.6	-
Pelvis Combined Force Fy (kN)	1.46	3.04	4	4.8	5.6	5.6	-
Upr Femur Fy (3msec-kN)	1.22	2.62	-	-	-	-	3.9
Lwr Femur Fx (3msec-kN)	0.10	0.16	2.8	3.4	3.9	3.9	-
Lwr Femur Fy (3msec-kN)	0.20	0.12	2.8	3.4	3.9	3.9	-
Lwr Femur Mx (3msec-Nm)	139.47	164.37	254	305	356	356	-
Lwr Femur My (3msec-Nm)	26.41	24.50	254	305	322	356	-









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.

Overlay	< Plastic Strain >				~						
false		-			(3)		\circ			~	
false	Title	Components (2	2)			Adjacent Comps/Assy	(4)		View	(5)	4
false C		a second s			-	1	~	-			_
true (1	B Pillar Inne	140060 140059 140133	~ Components	14	5	140417	 Components 	14	Left		* ×
true	B Pillar Out	140417	× Componente	14	4	140417	× Componente		fet	14	* ×
false	or mar out		- Componenta	1.6			- Components	12	con		
false	Rocker Out	125178 125175	~ Components	H	5		~ Components	\mathbb{H}_{1}^{1}	lso		* X
false	Packoring	105178 105160		Lu I	2		Companyate	14	leo		
true	Rocker IIII	125170 125100	Components	14	4		Components	14	150		* ×
true	RoofInner	190027 190119 190161	~ Components	16	3	140417 160059	~ Components	14	lso		××
true	Dest0 to	100000 100000				140417 100050			100		
false	Roof Outer	190023 190022	Components	14	5	140417 160059	 Components 	14	ISO		* ×
false	A Pillar Inne	140047 274123	~ Components	14	6	69	- Assemblies	14			* ×
true			1.1.		-		1.1				
true	A Pillar Out	140044	Components	14	/		 Components 	14			* ×
true	Front Door	200028 200024 200031	~ Components	14	8	140028 210041	~ Components	H	Left		×
true	Deser	210046 210042 210044			0	200023			1 - 0		
	RearDoor	210046 210043 210044	Components	14	9	200021	 Components 	14	Leit		×
比 比别											
	false false false false false false false false false false false false false false false false	false false true false false false false false false false false false false false false false false false false true true false forture false forture false forture false forture false forture false forture false forture false forture false forture false forture false forture	false false false Title Components false false Title Components false Pillar Inne 140060 140059 140133 B Pillar Inne 140040 140059 140133 B Pillar Inne 1400417 false Rocker Inn 125178 125175 false Roof Inner 190027 190119 190161 true Roof Inner 190023 190022 false A Pillar Inne 140047 274123 true Krue Front Door 200028 200024 200031 true Rear Door 210046 210043 210044	False Title Components 2 false Title Components 2 false B Pillar Inne 140060 140059 140133 Components false B Pillar Inne 140407 Components false B Pillar Out 140417 Components Be Recker Out 125178 125175 Components Rocker Out 125178 125160 Components Rocker Inn 125178 125160 Components Roof Outer 190023 190022 Components Roof Outer 190023 190022 Components A Pillar Inne 140047 274123 Components A Pillar Out 140044 Components Prior Door 200028 200024 200031 Components Rear Door 210046 210043 210044 Components Rear Door 210046 210043 210044 Components Rear Door 210046 210043 210044 Components Rear Door State	False Title Components 2 false Title Components 2 false B Pillar Inne 140060 140059 140133 Components 14 false B Pillar Out 140417 Components 14 false B Pillar Out 14017 Components 14 false Rocker Out 125178 125175 Components 14 Rocker Inn 125173 125160 Components 14 Roof Inner 190027 190119 190161 Components 14 Roof Outer 190023 190022 Components 14 A Pillar Inne 140047 274123 Components 14 A Pillar Out 140047 274123 Components 14 A Pillar Out 140044 Components 14 A Pillar Out 140044 Components 14 Rear Door 210046 210043 210044 Components 14	Title Components 3 false Title Components 0 false Title Components 0 false B Pillar Inne 140060 140059 140133 Components 6 false B Pillar Inne 140060 140059 140133 Components 6 false B Pillar Out 140417 Components 6 4 false Rocker Out 125178 125175 Components 6 3 3 true Roof Inner 190027 190119 190161 Components 6 3 3 true Roof Outer 190023 190022 Components 6 6 A Pillar Inne 140047 274123 Components 6 7 true true Pillar Out 140044 Components 7 7 true true Pillar Out 140044 Components 6 7 true true Rear Door 210046 210043 210044 Co	Title Components 3 Adjacent Comps/Assy false 1 B Pillar Inne 140050 140059 140133 Components 5 140417 fue B Pillar Inne 140050 140059 140133 Components 6 140417 false B Pillar Inne 140417 Components 6 140417 false B Pillar Inne 140417 Components 6 140417 false Rocker Inn 125178 125175 Components 6 140417 false Rocker Inn 125178 125160 Components 6 3 140417 false Roof Inner 190027 190119 190161 Components 6 69 140417 160059 fue Roof Outer 190023 190022 Components 6 69 69 fue Rue A Pillar Inne 140047 274123 Components 6 69 140425 fue Front Door 200024 200031 Components 6 69 140028 210041 Rear Door 210046	Title Components 3 Adjacent Comps/Assy 4 false Title Components 14 140417 Components 5 140417 Components false B Pillar Inne 140060 140059 140133 Components 14 140417 Components false B Pillar Out 140417 Components 14 140417 Components false B Pillar Out 140417 Components 14 140417 Components false B Pillar Out 125178 125175 Components 14 2 Components false Rocker Inn 125178 125160 Components 14 2 Components fue Itrue Isoof Outer 190027 190119 190161 Components 14 3 140417 160059 Components false fue A Pillar Inne 140047 274123 Components 6 69 Assemblies rue true Front Door 200028 200024 200031 Components 8 140028 210041	Bitse Tale Components Adjacent Comps/Assy false false 1 B Pillar Inne 140060 140059 140133 Components 5 140417 Components 140417 false B Pillar Inne 140050 140059 140133 Components 6 140417 Components 140417 false B Pillar Out 140417 Components 6 140417 Components 6 false Rocker Inn 125178 125175 Components 6 2 Components 6 false Rocker Inn 125178 125160 Components 6 3 140417 160059 Components 6 fue Roof Inner 190027 190119 190161 Components 6 5 140417 160059 Components 6 false false Nave Nave 140047 224123 Components 6 69 A sasemblies 6 fue Front Door 200024 200031 Components 6 6 6 9 200021 <	Bitse Title Components Adjacent Comps/Assy View false false <td>Bitse Tille Components Adjacent Comps/Assy View So false false</td>	Bitse Tille Components Adjacent Comps/Assy View So false false

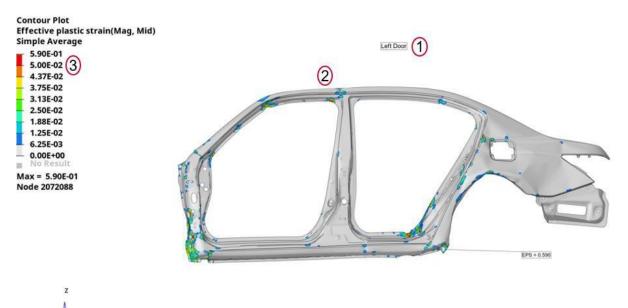
Inputs:

1) The component label

Δ

X

- 2) The plastic strain component IDs to be plotted
- 3) The plastic strain limit that is set when applying the contour (Enter the percent value)
- 4) The adjacent (or neighboring) components to be included in the image (transparent mode)
- 5) The standard view that should be used when capturing the image



Run Statistics

This module creates following summary info based on the inputs entered.

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
- 6) Penetration & intersections info for the model if the flag is set to Yes

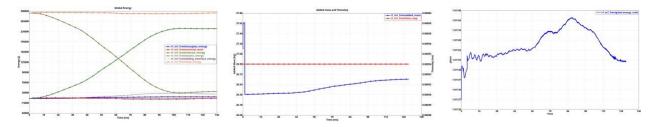
Run Module	Overlay	< Run Statistics >							
Animation	false			_					~
Gerrier Face Overlap	false	Program Name	2022_abcd	1					
Battery Section Force	true	Gateway	Test						
Collision Detection	true	Galeway	Test						
Deformed Shape	false	Run Discription	Test123						
Door Aperture Deformation	true	Restraint Status	Unbelted	\bigcirc					
Energy Distribution	true			(1)					
Exploded View	false	Body Style	Sedan	\sim					
Generation	false	Engine/Transmission	V6						
Fuel Tank Zone X Assessment	true	Test Speed	35 Kph						
Fuel Tank Zone Y Assessment	true	rescopeed							
🗆 🧼 Load Path	true	Driveline	FWD	_					
Cccupant Occupant	true	Impactor Assembly/Component	6 Y Assemblies 14	(2)					
Plastic Strain	false	, , , , , , , , , , , , , , , , , , , ,	×	\sim	_				
Run Statistics	false		X	ſ	Z				
Structural Intrusions	true	Front Wheel Coordinates	1432	850	510	*	Node	н	
User Defined Output	true	Rear Wheel Coordinates	4132	860	512	*	Node	T H	3
Velocity Separation	true						11000		
🗆 🎡 Weld Failure	false								
		Maximum N Curves	10	(4)					
1 of 19 selected		Penetration and Intersection	YES *	Ś					~

Model Info Summary & Run Quality Report

Program Name	Test	
Gateway	abcd	
Run Discription	Side Impact test run	1
Restraint Status	Belted	
Body Style	Sedan	
Engine/Transmission	V4	
Test Speed	35 Kph	1
Driveline	AWD	12 12
Run Name	Main.k	
Engineer	tejasr	
Model Run Date	09/18/2021	the th
Test Mode	Side IIHS MDB	1
Gross Vehicle Weight	3.13 kg	1
Impactor Weight	0.00 kg	1
Total Weight	3.13 kg	
Vehicle Front Axle Weight	1.59 kgs	1
Vehicle Rear Axle Weight	1.51 kgs	
Solver Version	mpp s R7.1.2	1 🦯
Number of CPU	8 CPU	1 1
Run Time	21 hr 41 min 54 sec	35K

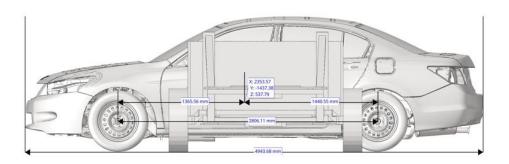


Global Energy, Added Mass, Time Step & Energy Ratio Plots



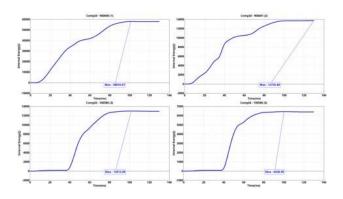
Vehicle Mass & Geometric Measurements

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



Material Internal Energy Summary

Material Internal Energy - Exploded View (Top 10)



Structural Intrusions

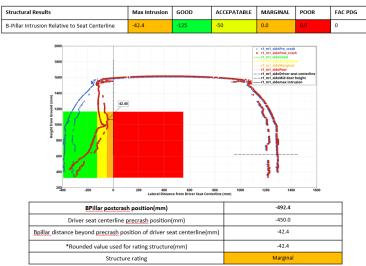
This module primarily computes structural intrusion as per IIHS regulation.

Configuration		
Pre_crash_components	160059 140053 180237 V Components H	1
Components_for_intrusion_calculation	140060 140059 140133 V Components H	2
Components_for_Bodyside_intrusion_calculation	140028 200021 210041 v Components H	3
Section_Cut		
N1	800122 v Node 14	
N2	800246 ¥ Node 14	(4)
Intrusion_Plot_Option	Max 👻	5
Time_Step_Range		
T_start	18	6
T_end	49	Ŭ
Tracking_System		
N1	20082769 ¥ Node 14	
N2	20082726 × Node 14	7
N3	20082806 v Node 14	
Driver_Seat_And_Mid_Door_Coordinate_Inputs		
Hpoint_X	3324.55	
Seat_centerline_Y	-450	
Hpoint_Z	625	
mid_door_z	625	
Apillar_Position_X	2250	8
Bpillar_Position_X	3000	
Rear_dummyH_point_X	3600	
Thorax_Upper	800	
Thorax_Lower	650	

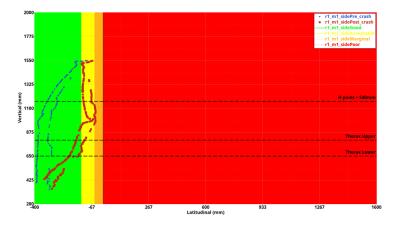
Inputs:

- 1) The component IDs representing pre-crash components
- 2) The component IDs required for intrusion calculations (Bpillar Inner & Outer parts)
- 3) The component IDs for plotting body side intrusions (Front & rear Fender, Front & rear door parts)
- 4) The 2 IDs required for Bpillar section cut
- 5) The intrusion plotting option (Max step or Last step)
- 6) Time step start & end range for plotting (or tracing) the Bpillar section cut profile
- 7) The 3 node IDs required for defining tracking system
- 8) Various driver seat and mid door coordinate inputs required for creating structural intrusions, Bpillar Inner & body side intrusion plots

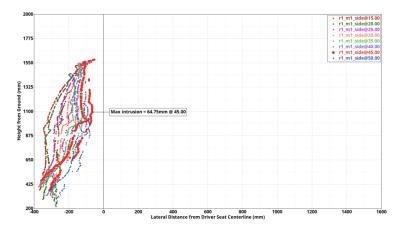
IIHS Side MDB Intrusion Plot



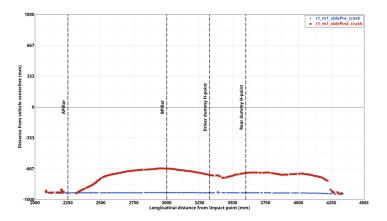
BPillar Inner



User Defined Intrusion



IIHS Bodyside MDB Intrusion Plot



User Defined Output

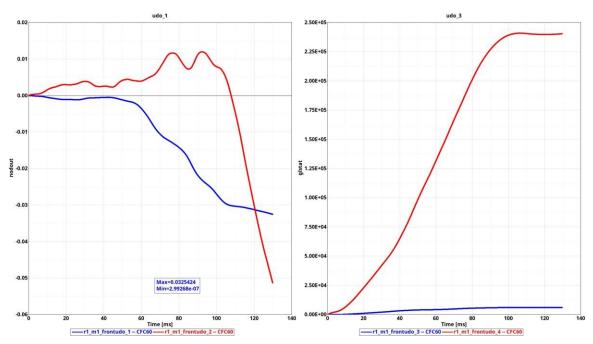
As the name suggests this module allows users to plot program specific Time History data. The plots are created based on user defined list of inputs as shown in the UI below.

un Module	Overlay	Configuration									
E 🌍 Dash Intrusion Contour Plot	false ^	#Title	Subcase	Y Type	Y Request	Y Component	Filter	Note	X Axis Scale	Y Axis Scale	Window
E 🚱 Dash Intrusion Cross Section	true /	2	101070233	1000		and the second second	and an entry of the	1.12	100		1011
E 💮 Deformed Shape	false	udo_1	nodout	v nobon v	Local_r_rkr_in_bpir 100	 ry_displacement 	+ CFC 60	- Yes	*	1	1
Energy Distribution	true	udo_2	hodout	≁ nodout	Localr_rkr_in_bplr 100	v ix displacement	+ CFC 60	+ No	*	1	1
🛅 🍥 Engine Mount Failure	false										
Exploded View	false	udo_3	gistat	~ gistat	✓ gistot	 hourglass_energy 	+ CFC 60	- No	÷	1	1
🗐 🌍 Load Path	true	udo_4	gistet	~ gistat	v gistet	· internal_energy	+ CFC 60	v No	*	1	1
🖱 🍚 Occupant	true		1 gross		(grow	-noningConordly					
🗐 🍥 Pedal Column Motion	true	udo_5	matsum	~ matsum	 BR-Stopper_2mm 290 	 x_momentum 	+ CFC 60	v Yes		1	1
		udo_6	motsum	- matsum	 JR3T-15K873-Al2[BRK 	- z_momentum	+ CFC 60	+ Yes		1	1
🖗 Run Statistics false	Jacob Participant										
		udo_7	tuobdh	v ibdout	< 1005_1	 dircos_22 	✓ CFC 60	- Yes	*	1	1
E 🍥 Structural Assessment	false	udo_8	rcforc	+ refore	+ Vehicle20D8_IIHS0#s	w w force	+ CFC 68	- Yes	+	1	1
C G Structural Vehicle Kinematics	false					Januar					
E 💮 Structure Plastic Strain	false	udo_9	rcforc	✓ rcforc	 SteeringColumn2Surro 	 x_moment 	 CFC 60 	 Yes 		1	1
User Defined Output	true	udo_10	sectorc	+ sectorc	v Tunnel 1 100050	+ y_centroid	- CFC 60	- Yes		1	1
Vehicle Kinematics Vertical	true	000_10	secore	* secore	- Franker Toooso	- y_centroid	if lore to	11 100			- M.
Vehicle Kinematics XY Disp	true										
E 💮 Wheel Kinematics	false										

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)

Select Script module	Overlay	< Vehicle Yaw Pitch Roll >
Fuel Tank Zone Y Assessment	true	A
Load Path	true	
Occupant	true	LHS Coordinate Frame
Pedal Column Motion	true	
Plastic Strain	false	LHS Base Node 21093646 V Node III
Gamma Run Statistics	false	LHS X-axis Node 21091007 ~ Node 14
-		LHS XY-plane Node 21021810 - Node 16
Structural Assessment	false	
Structural Vehicle Kinematics	false	RHS Coordinate Frame
Structure Plastic Strain	false	RHS Base Node 21029001 v Node 14
User Defined Output	true	NODE 11
Vehicle Kinematics Vertical	true	RHS X-axis Node 21025712 v Node 16
Vehicle Kinematics XY Disp	true	
Vehicle Yaw Pitch Roll	true	RHS XY-plane Node 21093472 V Node II
Weld Failure	false	(4)
Wheel Kinematics	false	Rotation Sequence ZYX 3 Plot Quantities Yaw-Pitch-Roll v
1 of 26 selected		

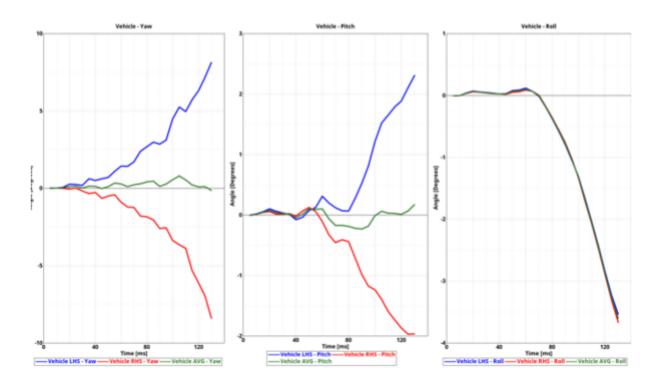
Inputs:

- 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



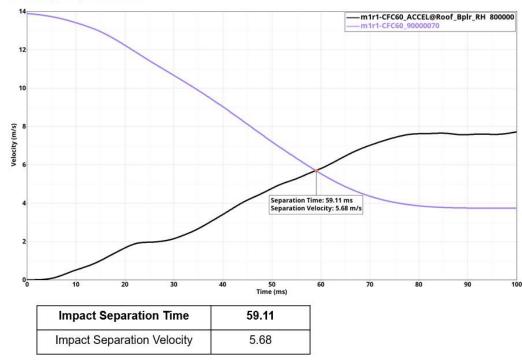
Velocity Separation

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

Run M	Nodule	Overlay	Configuration
	Barrier Face Overlap	false	
	Deformed Shape	false	
	Exploded View	false	Vehicle_node
			Barrier_node 90000070 v (2)
	Load Path	true	
	Occupant Side	true	
	Plastic Strain	false	
	Run Statistics	false	
•	Structural Intrusions	true	
	User Defined Output	true	
	Velocity Separation	true	

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

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.

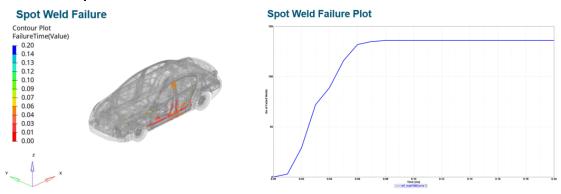
- First two slides give you the global viewpoint. It contains the complete view of the vehicle with all the ruptured welds color coded as per the failure time contour & another slide showing the cumulative graph of the ruptured welds across the simulation time steps.
- The subsequent slides capture the 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.

Run Module	Overlay	< Weld Failure >			
Animation Seformed Shape Ocor Aperture Deformation Energy Distribution	false false true true	1D Weld	Subcase Ytype	Ycomp	_
Exploded View	false	Axial	elout v beam	✓ axial	*
🗌 🍈 Fuel Tank Volume Change	false	Shear	elout v beam	v shear_s	- 1
Generation State Accession Fuel Tank Zone X Assessment Generation State Accession Fuel Tank Zone Y Assessment	false false	Resultant	elout v beam	✓ shear_t	
🗆 🍈 Plastic Strain	false	Solid Weld			
Rear Barrier Face Overlap Gear Bumper Plastic Strain	false false	Axial	swforc + swforc	✓ axial	~
Rear Rail Crush	false	Shear	swforc v swforc	v shear	- 2
Run Statistics Spare Tire Bolt Force	false	Resultant	swforc v swforc	 resultant_moment 	~
George Control Co	true				
Velocity Separation	true	Impactor			
🗹 🎡 Weld Failure	true		emblies II (3)		
		Assembly to consider 9 ~ Ass	emblies 14 (4)		
		L			
		Weld Material Card Selection	+		
of 17 selected	12 13	MATL196	× (5)		

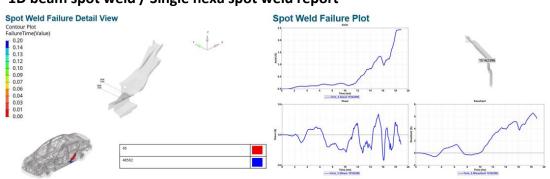
Inputs:

- 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:

Hexa Adhesive Failure Detail View

ailureTime(Value) 100.00 95.00		" To "
- 85.00		
- 75.00		
65.00		
55.00		
45.00		
35.00		
- 25.00		
15.00		
5.00		
0.00		
	Provide Automatica	



1)R2FB-S29299-A|13|BRKT QTR PNL TO WHL/HS|0.65mm 2)FNA7537534|1|XXXX-X279A33-A (SUPT BDY SD PNL TO WHL/HS LH)|0.95mm