

# T/HIS 22.1

# T/HIS 22.1 – Contents

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    - LS-DYNA to ISO-MME Improvements
    - Automotive Assessments Improvements
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    - VTC Quality Criteria Workflows
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  - Initial Window Placement
- Flexible Automation and Integration
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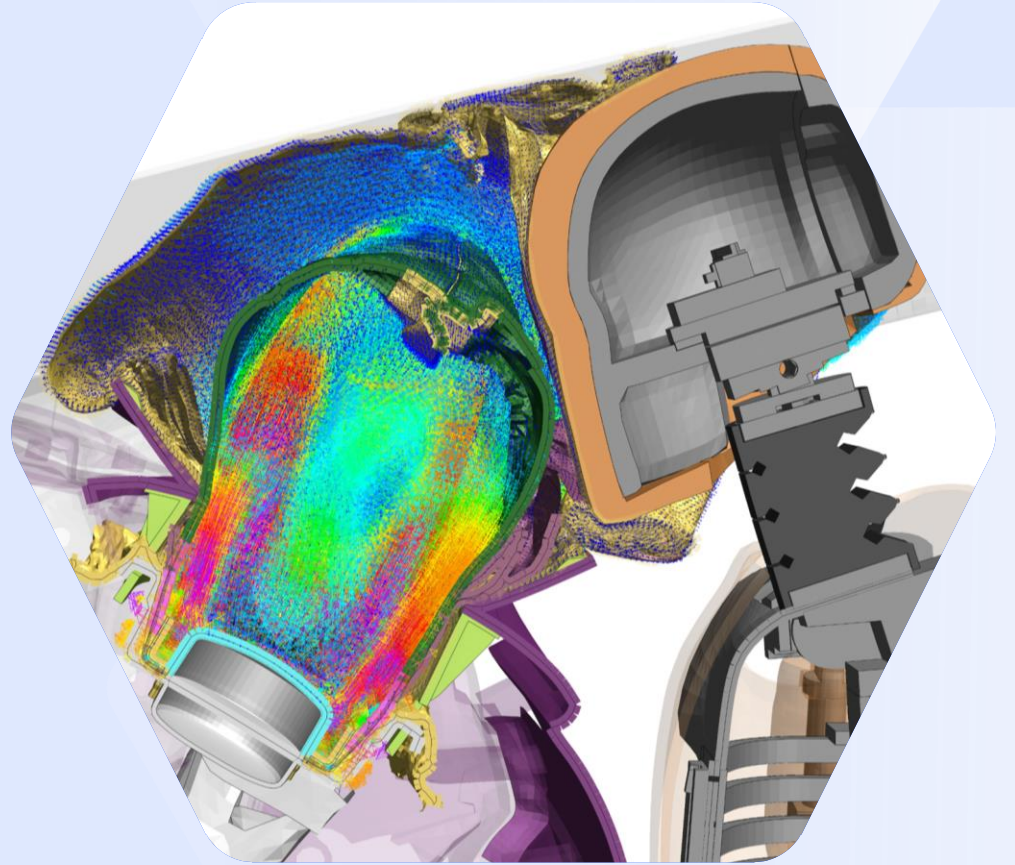
# Complete Ansys LS-DYNA Support

# Airbags



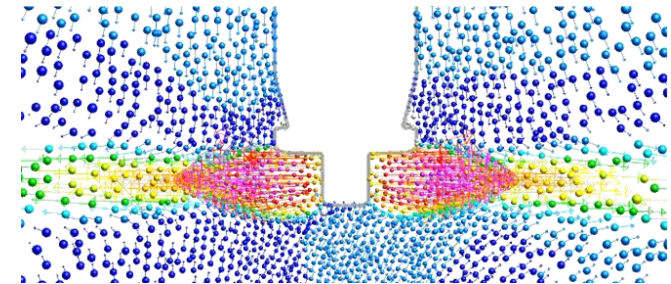
# Support for \*AIRBAG\_CPG

A New Airbag Gas Solver



# Support for Continuum-based Particle Gas (CPG)

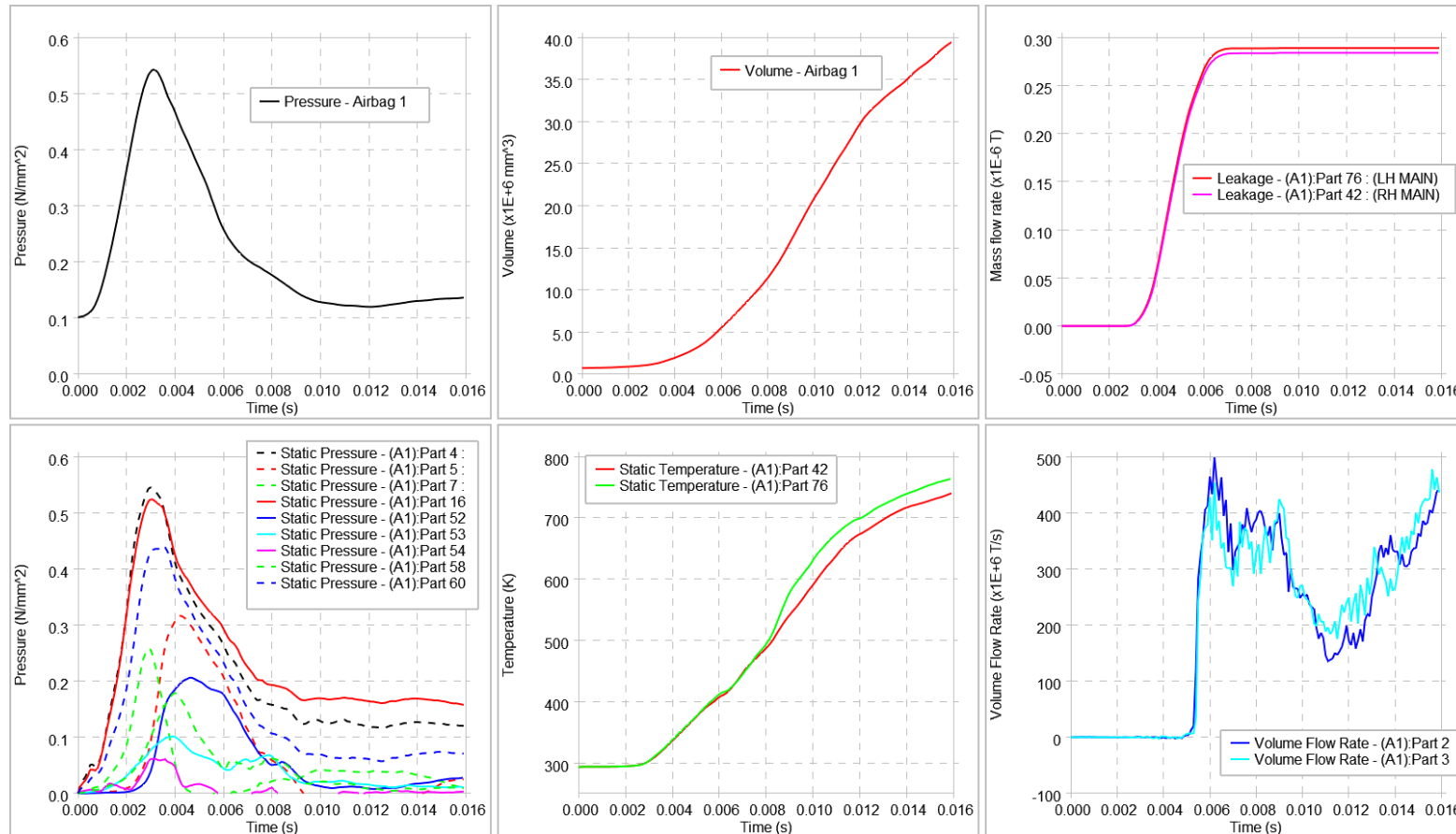
- CPG is a new continuum-based particle approach for airbag simulations, available from Ansys LS-DYNA 2025R1 (R16).
- As a fully functional fluid solver, CPG is more effective at simulating gas flow than the corpuscular particle method (CPM), and more capable at internal fluid-structure interaction than ALE.
- Key features:
  - Compressible Navier-Stokes solver coupled with an ideal gas equation of state.
  - Meshless by design, based on a generalized finite-difference scheme.
  - Particle cloud fills airbag volume, gas passes from particle to particle (Eulerian approach).
  - Particles added or removed only when necessary.
  - Excellent accuracy, robustness & scalability to hundreds of cores.
- Designed for airbag simulation, validated by airbag CAE engineers:
  - Simple \*AIRBAG\_CPG keyword format that copies other \*AIRBAG\_ types. Same input data for inflators, fabric, etc.
  - First release supports internal structures, simple venting, fabric porosity, multiple gases/orifices/inflators, moving environment, local particle refinement, and more.
  - Inviscid with free-slip boundary by default, although viscosity and wall friction available.
- CPG is destined to take airbag simulation to the next level required for virtual testing, however accurate input data and well folded models are also vital to achieve useful results.



# Support for CPG Results in T/HIS

We work closely with Ansys to ensure that the Oasys LS-DYNA Environment is the leading choice for CPG workflows

- T/HIS 22.0 supports all R16 CPG data in the binout file:

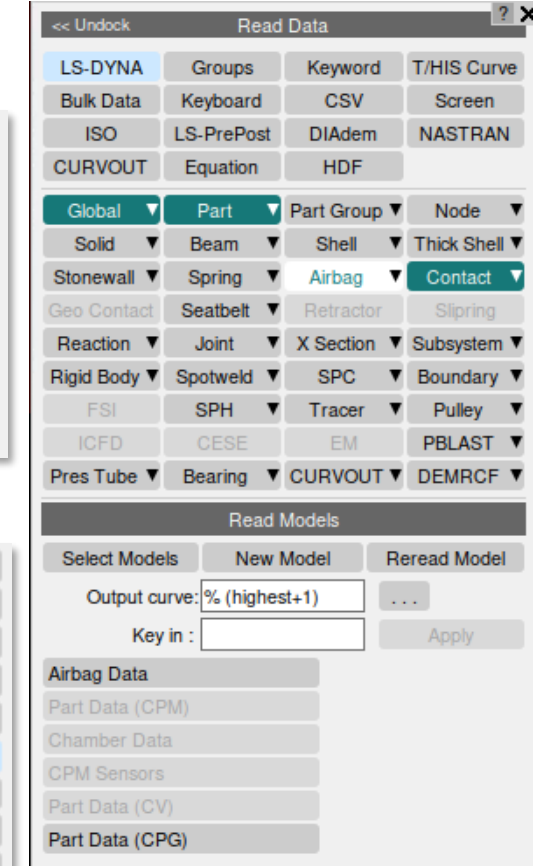


## Per airbag

PR - Pressure
VO - Volume
IE - Internal energy
IN - Mass flow rate in
OU - Mass flow rate out
MIN - Mass in
MOU - Mass out
TM - Total mass

## Per part

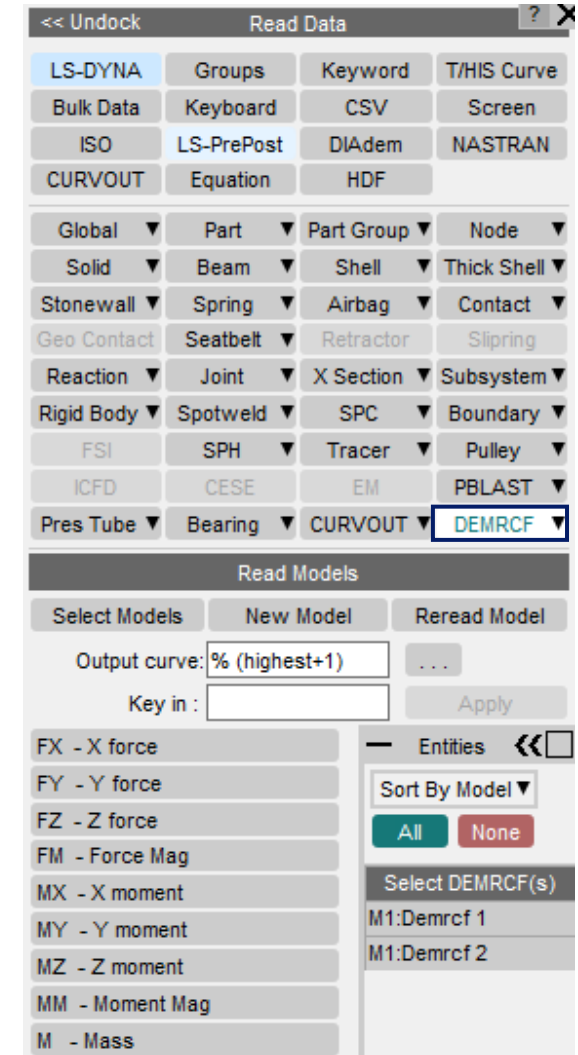
AR - Area
FX - X Force
FY - Y Force
FZ - Z Force
LK - Leakage
SPR - Static Pressure
TPR - Total Pressure
STE - Static Temperature
TTE - Total Temperature
VFR - Volume Flow Rate



DEMRCF

# DEMRCF

- A new ASCII output file *demrcf* has been introduced. This output reports the non-tied coupling between discrete element spheres (DES) and surfaces that are part of either shell parts or solid parts.
- The demrcf output file allows the plotting of contact forces, moments, and the corresponding mass from the contact surface to the DES element, provided this data is available.
- To output relevant data:
  - Define the necessary contacts using the \*DEFINE\_DE\_TO\_SURFACE\_COUPLING keyword in PRIMER.
  - The output frequency of the coupling forces within the DEM interface force file is controlled by the \*DATABASE\_BINARY\_DEMFOR keyword.
  - To record this information in the *demrcf* output file, enable the RCFORC field within the DATABASE → (ASCII)\_OPTION menu.





ICVOUT

# ICVOUT

- A new ASCII output file *icvout* (incompressible control volume) is now supported by T/HIS. The icvout output file allows the plotting of pressure, volume, flow rate and area of control volumes, provided the data is available.
- BINOUT file containing icvout data can now be read into T/HIS and plotted for its components.
- Volume and Pressure are output as ICV (Incompressible Control Volume) components of the control volumes.
- Flow rate and Area are output as ICVI (Incompressible Control Volume Interaction) components of the control volumes.
- To output relevant data:
  - Define the control volumes using \*DEFINE\_CONTROL\_VOLUME in PRIMER, that output the pressure and volume components.
  - The flow area between the interacting control volumes is defined using \*DEFINE\_CONTROL\_VOLUME\_FLOW\_AREA.
  - The interaction between the interacting control volumes is defined using \*DEFINE\_CONTROL\_VOLUME\_INTERACTION.

Read Data

LS-DYNA Groups Keyword T/HIS Curve

Bulk Data Keyboard CSV Screen

ISO LS-PrePost DIAdem NASTRAN

CURVOUT Equation HDF

Global Part Part Group Node

Solid Beam Shell Thick Shell

Stonewall Spring Airbag Contact

Geo Contact Seatbelt Retractor Slipping

Reaction Joint X Section Subsystem

Rigid Body Spotweld SPC Boundary

FSI SPH Tracer Pulley

ICFD CESE EM PBLAST

Pres Tube Bearing CURVOUT DEMRCF

Read Models

Select Models New Model Reread Model

Output curve: % (highest+1)

Key in :

Apply

Node Data

Point Data

Thermal Data

Drag Data

ICVOUT ICV

ICVOUT ICVI

<.. Go Back

PR - Pressure

VO - Volume

Sort By Model

All None

Select ICFD ICV(s)

M1:ICV 1

M1:ICV 2

<.. Go Back

AR - Area

FR - Flow Rate

Sort By Model

All None

Select ICFD ICVI(s)

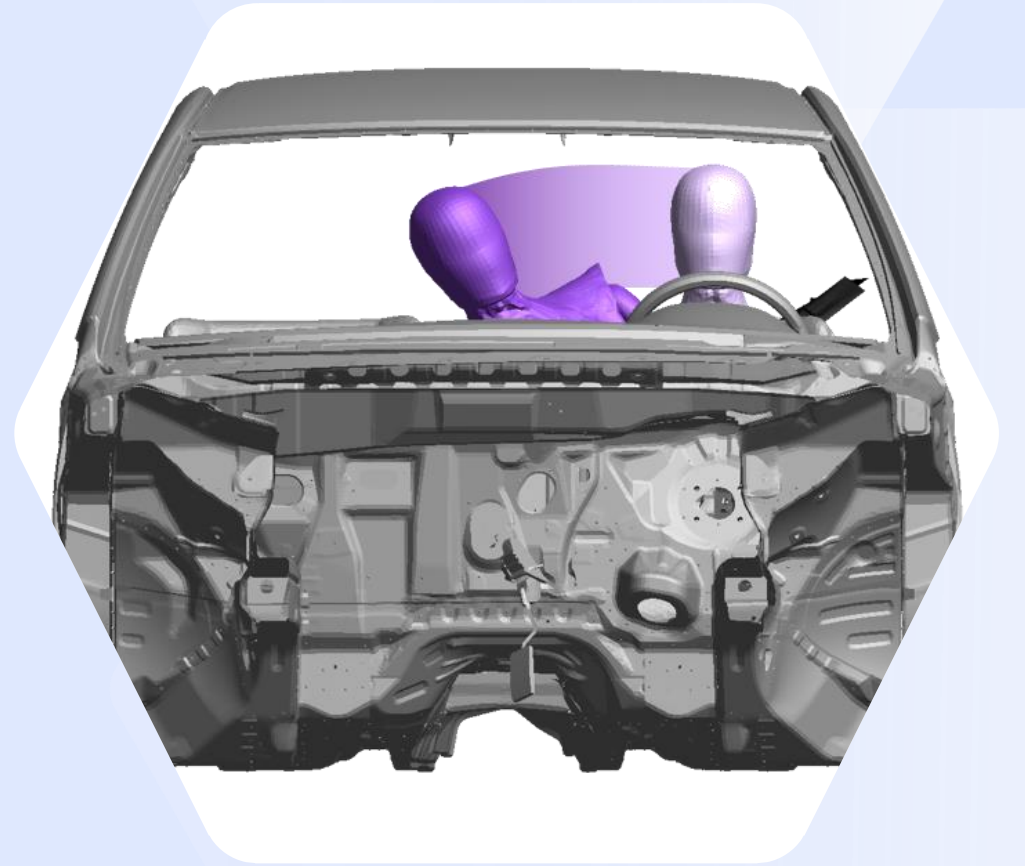
M1:ICVI 10

# Efficient End-to-End Workflows

## Virtual Testing

- [C-NCAP Management Regulation](#)
- [Euro NCAP 2026 Protocols](#)
- [Working with Test Data](#)
- [LS-DYNA to ISO-MME Improvements](#)
- [Automotive Assessments Improvements](#)
- [SimVT](#)
- [VTC Quality Criteria Workflows](#)
- [VTC Videos Workflows](#)

# C-NCAP Management Regulation



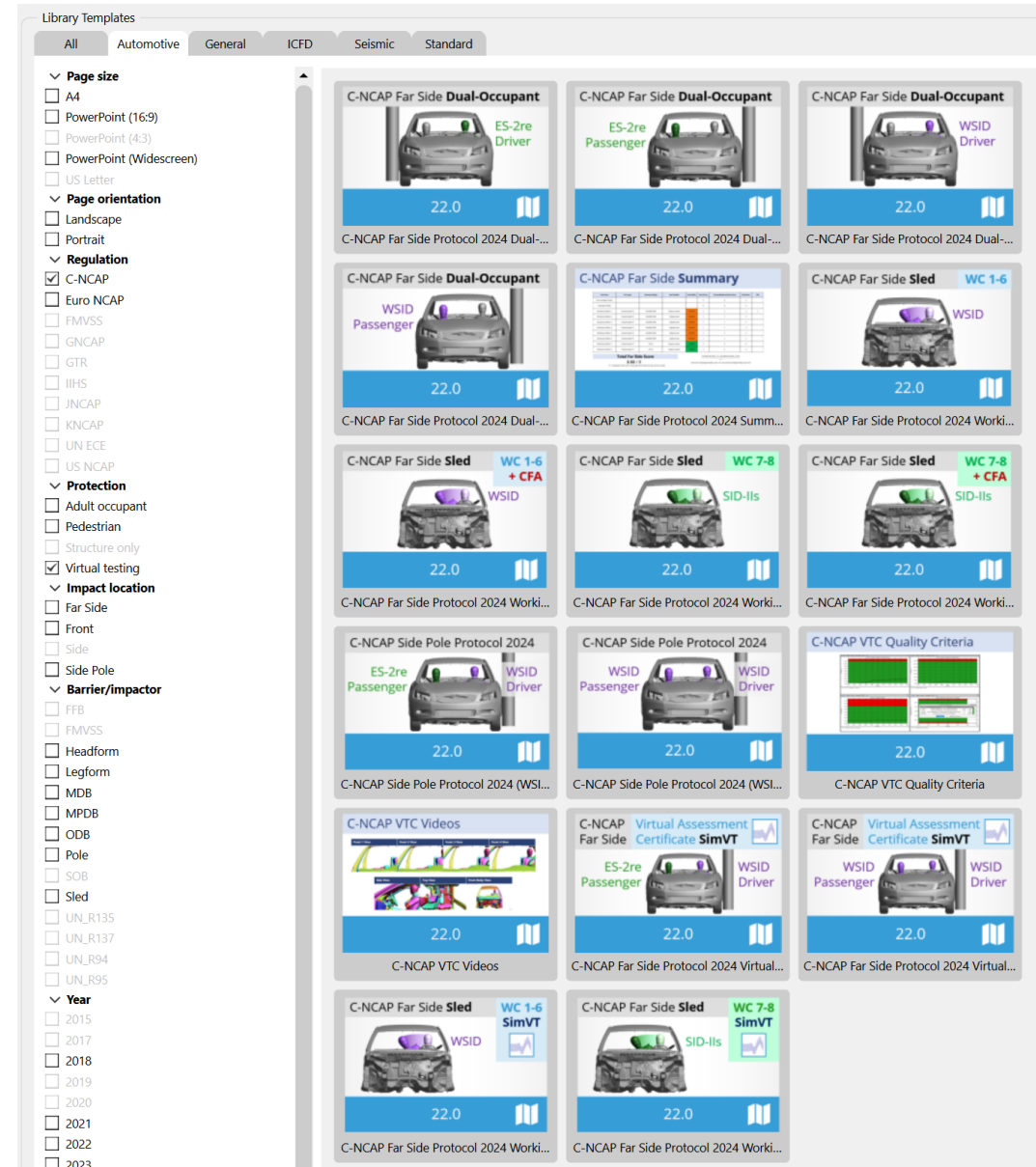


# C-NCAP Management Regulation (2024 Edition)

Since Oasys 21.1, there has been support for the various requirements of the C-NCAP Far Side Occupant Protection Protocol, including:

- For each of the eight Working Conditions:
  - Occupant injury assessment
  - ISO Correlation Fitting indices
  - Correction Factor A
- Dual-Occupant Penalty calculation
- ISO correlation fitting indices for the Virtual Assessment Certificate (prerequisite for the symmetry of far side occupant protection airbags)
- Overall score calculation

[Read the documentation to learn more](#)

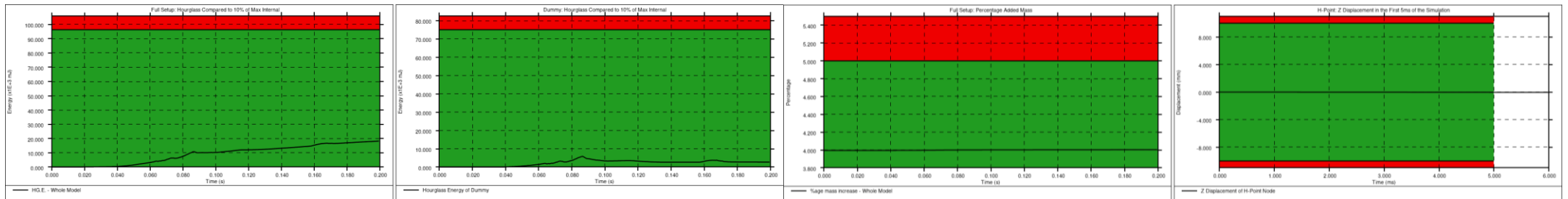


# C-NCAP VTC Quality Criteria

- The C-NCAP VTC Quality Criteria Workflow tool follows the same principals as the Euro NCAP version but assesses the quality criteria specified in section H.1.1(f) of the C-NCAP Far Side Simulation & Assessment Protocol.
- The tool can be automated using the REPORTER template provided.

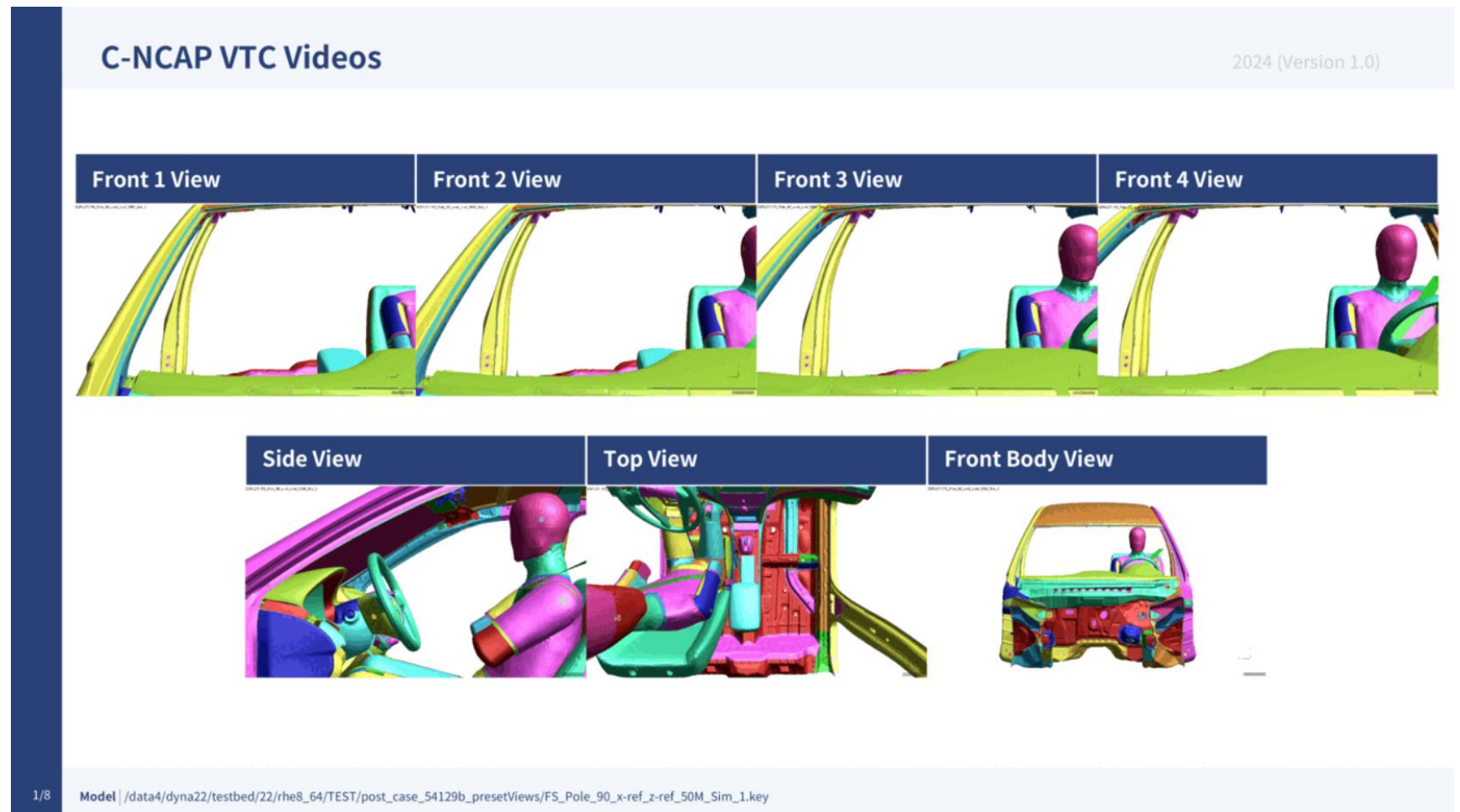
C-NCAP VTC Quality Criteria				
Component	Test Description	Limit	Result	
Full Setup	Maximum Hourglass Energy < 10% of Maximum Internal Energy	96312	18243	✓
Dummy	Maximum Hourglass Energy < 10% of Maximum Internal Energy	75128	5834.5	✓
Full Setup	Maximum Added Mass (%) < Total Model Mass at the Beginning of the Simulation	5	4.0043	✓
H-Point Node	Z Displacement (mm) in the First 5ms of the Simulation	10	0.00085449	✓

Write Results      Model Units: U2 (mm, t, s)



# C-NCAP VTC Videos

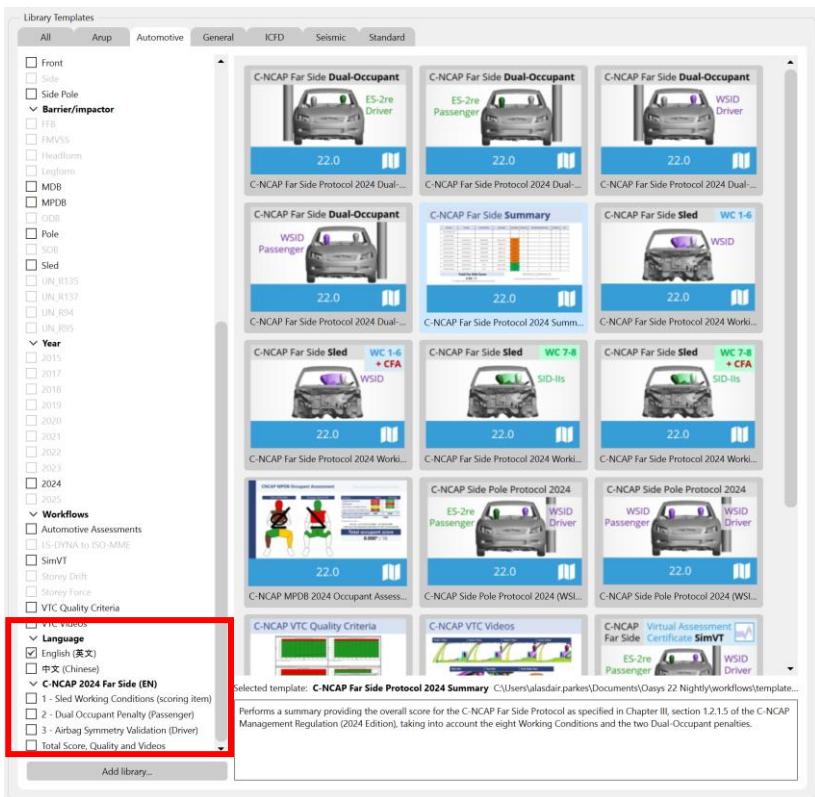
- The **C-NCAP VTC Videos** Workflow tool follows the same principles as the Euro NCAP version but helps you calculate the views and export the videos specified in section H.2.8 of the C-NCAP Far Side Occupant Protection Protocol (2024 Edition).
- Use the standard Workflow method in **PRIMER** and **D3PLOT** or the whole process can be automated using the **REPORTER** template provided.



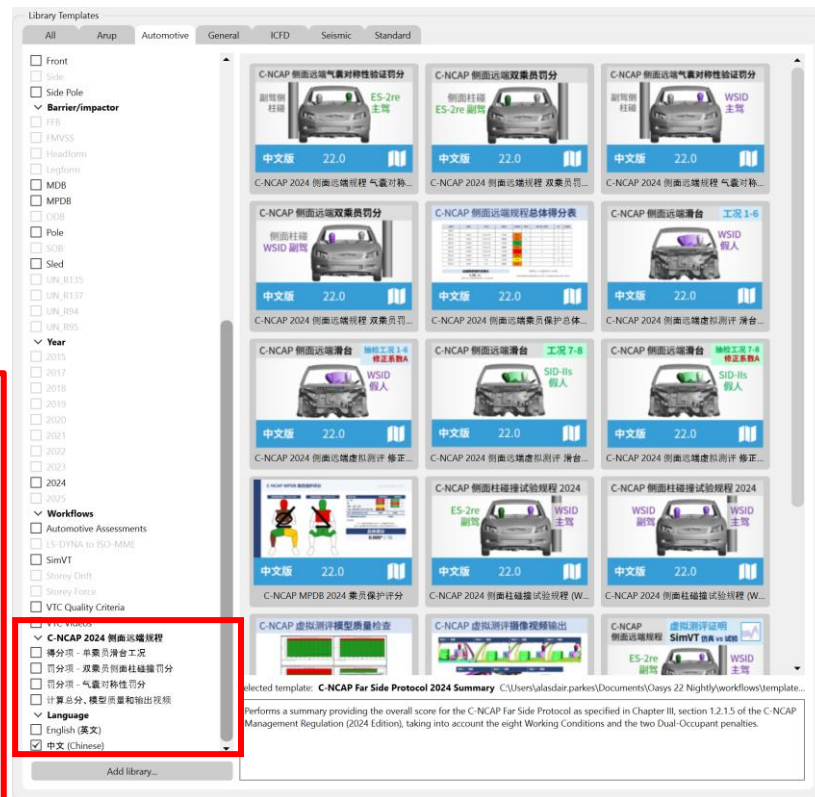
# Chinese Language Reports

# 中文版报告模板

- You now have access to all the C-NCAP REPORTER templates in both English and Chinese, for ease of communication with your teams, partners, suppliers, and C-NCAP.
- 所有 C-NCAP REPORTER 模板都同时提供英文和中文版供您使用，方便您与团队、合作伙伴、供应商，和 C-NCAP 沟通。



- ✓ **C-NCAP 2024 侧面远端规程**
- ☐ 得分项 - 单乘员滑台工况
- ☐ 罚分项 - 双乘员侧面柱碰撞 罚分
- ☐ 罚分项 - 气囊对称性罚分
- ☐ 计算总分、模型质量和输出视频
- ✓ **Language**
- ☒ English (英文)
- ☒ 中文 (Chinese)
- ✓ **C-NCAP 2024 Far Side (EN)**
- ☐ 1 - Sled Working Conditions (scoring item)
- ☐ 2 - Dual Occupant Penalty (Passenger)
- ☐ 3 - Airbag Symmetry Validation (Driver)
- ☐ Total Score, Quality and Videos



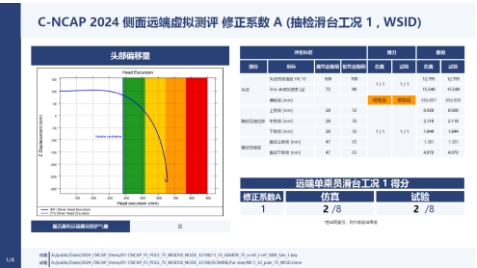
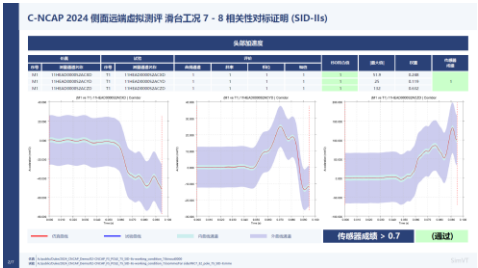
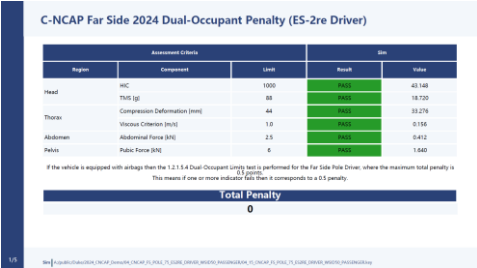
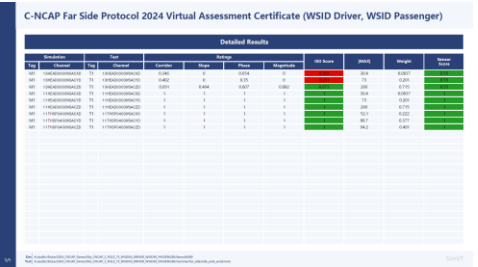
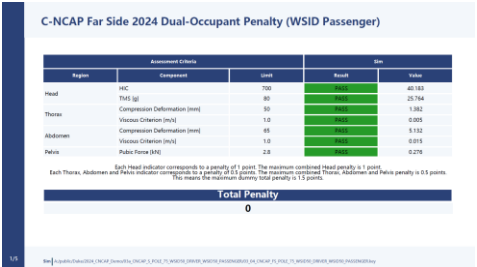
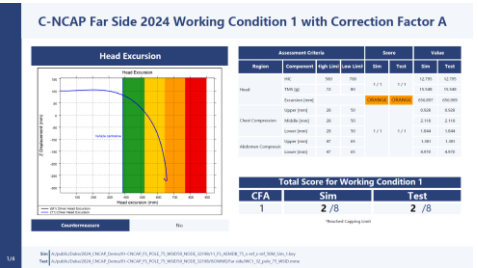
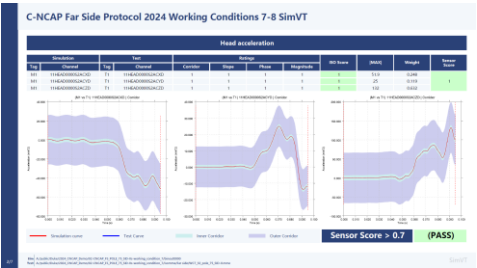


# Chinese Language Reports

- Example reports generated by C-NCAP REPORTER templates, in English (left) and Chinese (right):

# 中文版报告模板

- 下方展示了由 C-NCAP REPORTER 模板自动生成的英文版（左侧）和中文版（右侧）报告示例。

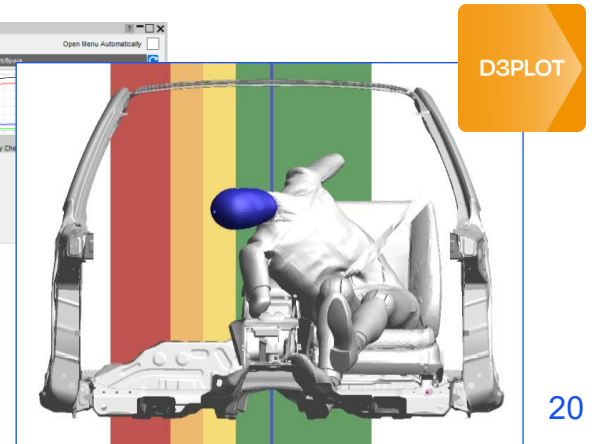
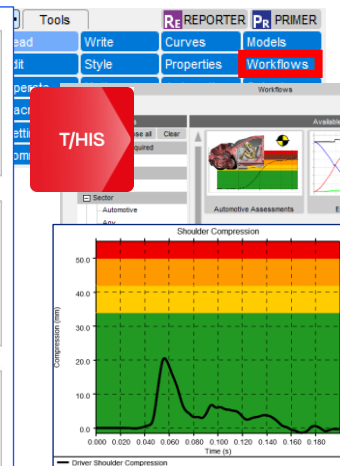
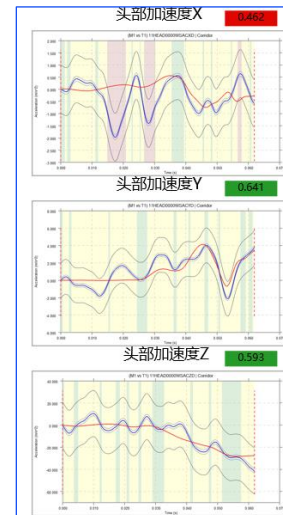
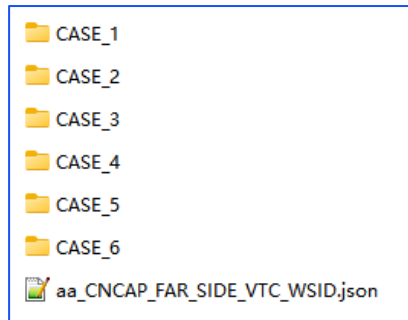
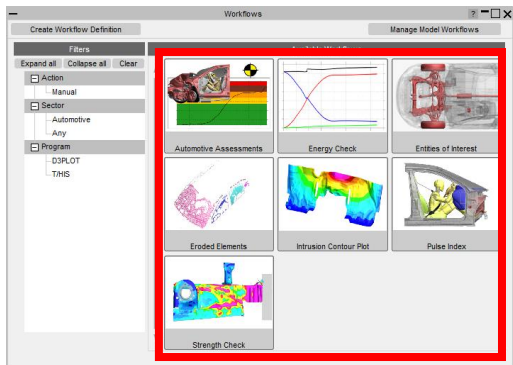
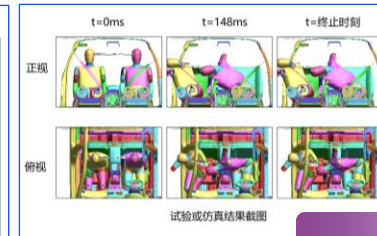
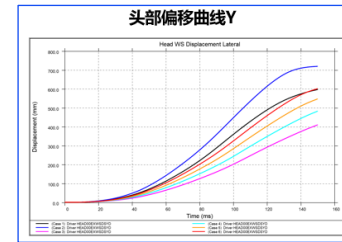
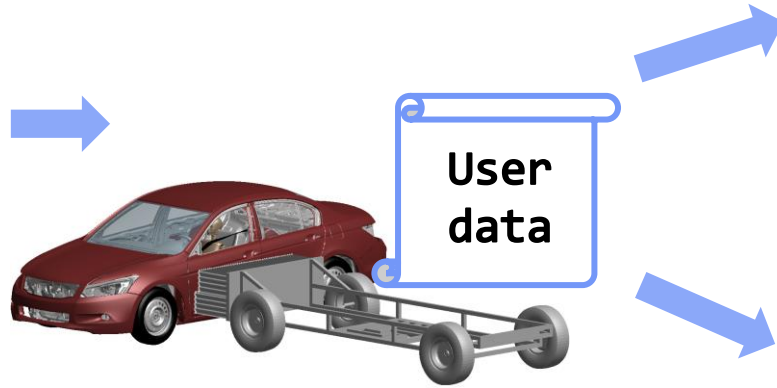
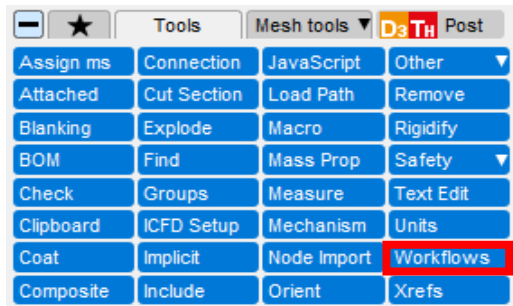




# C-NCAP Far Side 2024 Official Format Template (inc. O2O)

- The C-NCAP Far Side 2024 protocol (including Occupant to Occupant Assessment) can now be produced in the official format template as requested by C-NCAP. Set up your models in PRIMER, tag with user data using Workflows, and run the REPORTER Templates. Alternatively, outputs can be viewed interactively in D3PLOT and T/HIS. Full instructions in Chinese can be found in our documentation under Workflows.

序号	工况	假人	座椅位置	头部偏移量	头部得分	胸部得分	合计
工况1*	32柱碰*75°	WS50	设计位置	黄色区	4	4	8
工况2	32柱碰*75°	WS50	座椅位置: 最高	橙色区	3	3	6
工况3	32柱碰*90°	WS50	设计位置	绿色区	4	4	8
工况4*	32柱碰*90°	WS50	座椅位置: 最高	绿色区	4	4	8
工况5	32柱碰*60°	WS50	设计位置	黄色区	4	4	8
工况6*	32柱碰*60°	WS50	座椅位置: 最高	黄色区	4	4	8
工况7	32柱碰*75°	sid2s	设计位置	橙色区	3	3	6
工况8*	32柱碰*75°	sid2s	最高	橙色区	3	3	6
合计总分							58,000
换算分(占乘员保护)							7,250



- Below shows a preview of the automatically generated contents for C-NCAP 2024 Far Side VTC report.



# C-NCAP Far Side 2024 Official Format Template (inc. O2O)

- Below shows a preview of the automatically generated contents for C-NCAP 2024 O2O report.

REPORTER

### Far side气囊保护效果一致性证明报告

【左侧柱碰，WSID + ES2RE】

提交日期

X年X月X日

提交单位

XXX

提交人

XXX

提交人联系方式

XXXXXXXXXX

左侧柱碰模型质量检查

左侧柱碰模型质量检查

左侧柱碰模型质量检查

左侧柱碰模型质量检查

左侧柱碰模型质量检查

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左侧柱碰模型质量检查

左侧柱碰模型质量检查

### 右侧柱碰 (WSID+WSID)

r=0ms

r=148ms

r=终止时刻

正面

侧面

试验成功的结果截图

试验成功的结果截图

试验成功的结果截图

试验成功的结果截图

试验成功的结果截图

试验成功的结果截图

试验成功的结果截图

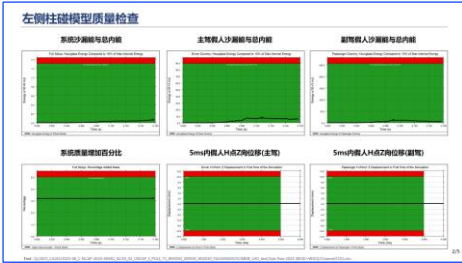
试验成功的结果截图

试验成功的结果截图

试验成功的结果截图

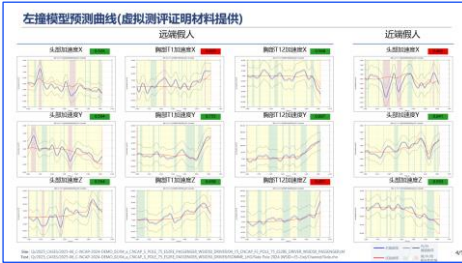
试验成功的结果截图

试验成功的结果截图



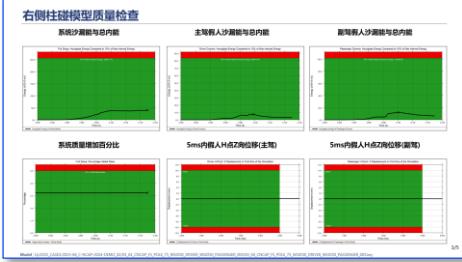
左侧柱碰模型质量检查

项目	判定标准	数值	限值	结果
假人模型	最大尺寸偏差小于10mm	60000	1.0E+06	通过
主驾假人	最大尺寸偏差小于10mm	7402.3	89141	通过
副驾假人	最大尺寸偏差小于10mm	11512	2.25E+05	通过
假人模型	最大尺寸偏差(%)	3.1923	5	通过
主驾H点位移	在碰撞后假人H点位移(主驾)	0.035889	±10	通过
副驾H点位移	在碰撞后假人H点位移(副驾)	0.035889	±10	通过



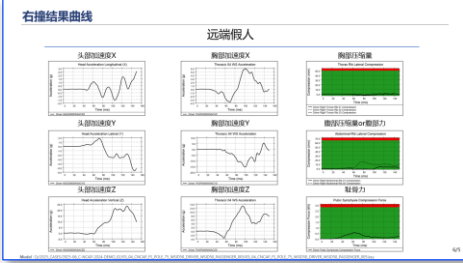
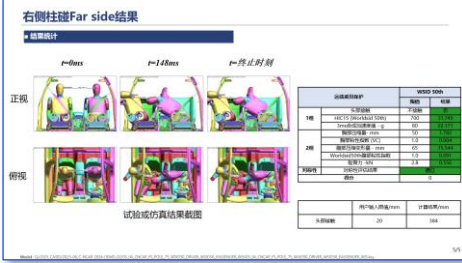
左撞模型预测曲线(虚拟测评证明材料提供)

项目	判定标准	数值	限值	结果
假人模型	最大尺寸偏差小于10mm	60000	1.0E+06	通过
主驾假人	最大尺寸偏差小于10mm	7402.3	89141	通过
副驾假人	最大尺寸偏差小于10mm	11512	2.25E+05	通过
假人模型	最大尺寸偏差(%)	3.1923	5	通过
主驾H点位移	在碰撞后假人H点位移(主驾)	0.035889	±10	通过
副驾H点位移	在碰撞后假人H点位移(副驾)	0.035889	±10	通过



右侧柱碰模型质量检查

项目	判定标准	数值	限值	结果
假人模型	最大尺寸偏差小于10mm	60000	1.0E+06	通过
主驾假人	最大尺寸偏差小于10mm	7402.2	89141	通过
副驾假人	最大尺寸偏差小于10mm	11512	2.25E+05	通过
假人模型	最大尺寸偏差(%)	3.1923	5	通过
主驾H点位移	在碰撞后假人H点位移(主驾)	0.035889	±10	通过
副驾H点位移	在碰撞后假人H点位移(副驾)	0.035889	±10	通过





# C-NCAP Front AEB OOP 2024 Official Format Template

- The C-NCAP Front AEB OOP 2024 protocol can now be produced in the official format template as requested by C-NCAP. Set up your models in PRIMER, tag with user data using Workflows, and run the REPORTER Templates. Alternatively, outputs can be viewed interactively in D3PLOT and T/HIS. Full instructions in Chinese can be found in our documentation under Workflows.

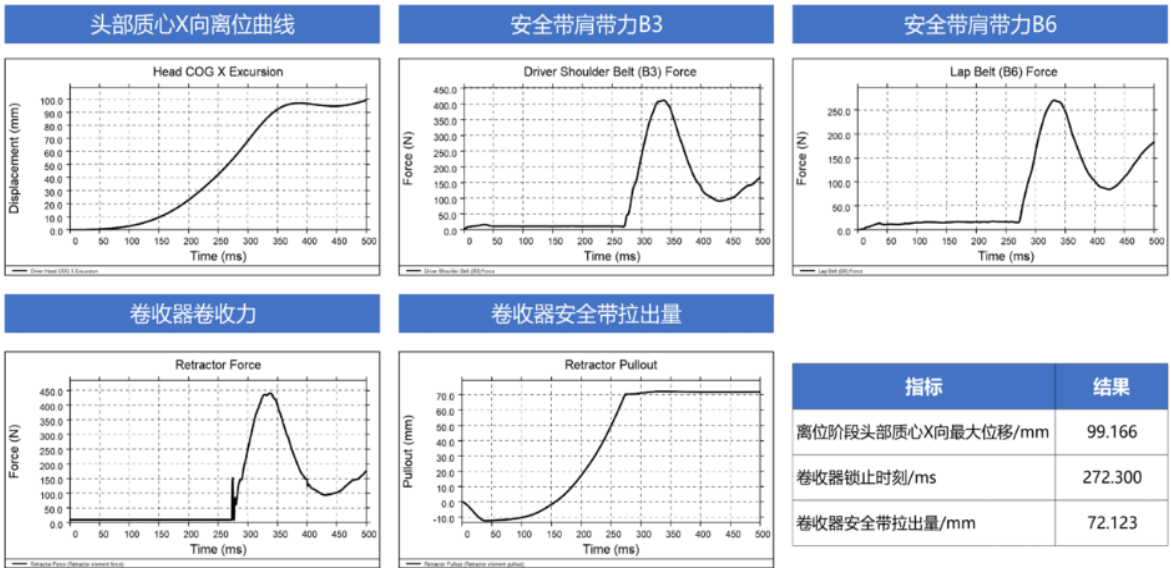
工况OOP+MPDB预测伤害明细

■ 工况OOP+MPDB预测结果统计

	测量部位	测量参数	滤波频率等级CFC	伤害指标计算	OOP+MPDB
驾驶员 THOR 50th 男性假人	头部	加速度Ax、Ay、Az	1000	HIC15合成加速度	27.410
				3ms 合成加速度值(g)	20.801
				脑损伤DAMAGE	0.169
	颈部	力Fx	1000	剪切力 Fx (kN)	1.696
		力Fz		张力 Fz (kN)	0.810
		力矩My	600	伸张弯矩 My (Nm)	-6.259
	胸部	胸部压缩量	180	左上肋骨位移量(mm)	23.387
				左下肋骨位移量(mm)	10.346
				右上肋骨位移量(mm)	33.836
				右下肋骨位移量(mm)	20.621
	腹部	腹部压缩量	180	左侧腹部压缩量(mm)	28.829
				右侧腹部压缩量(mm)	31.657

工况OOP+MPDB乘员伤害结果预测曲线

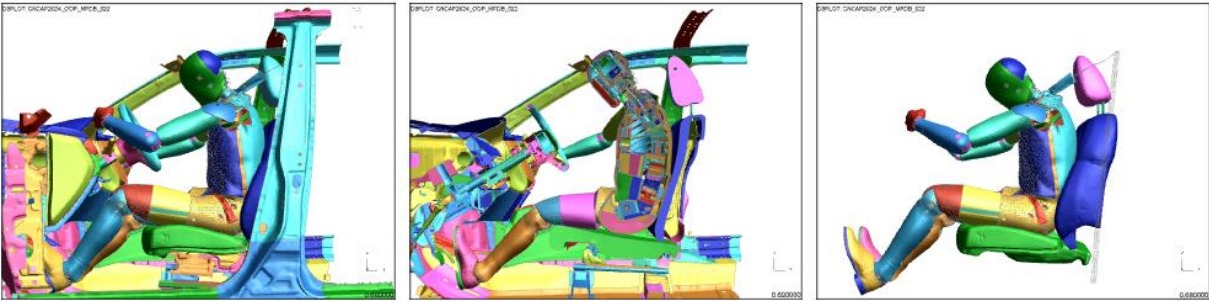
■ 制动阶段离位预测结果 (0~500ms)



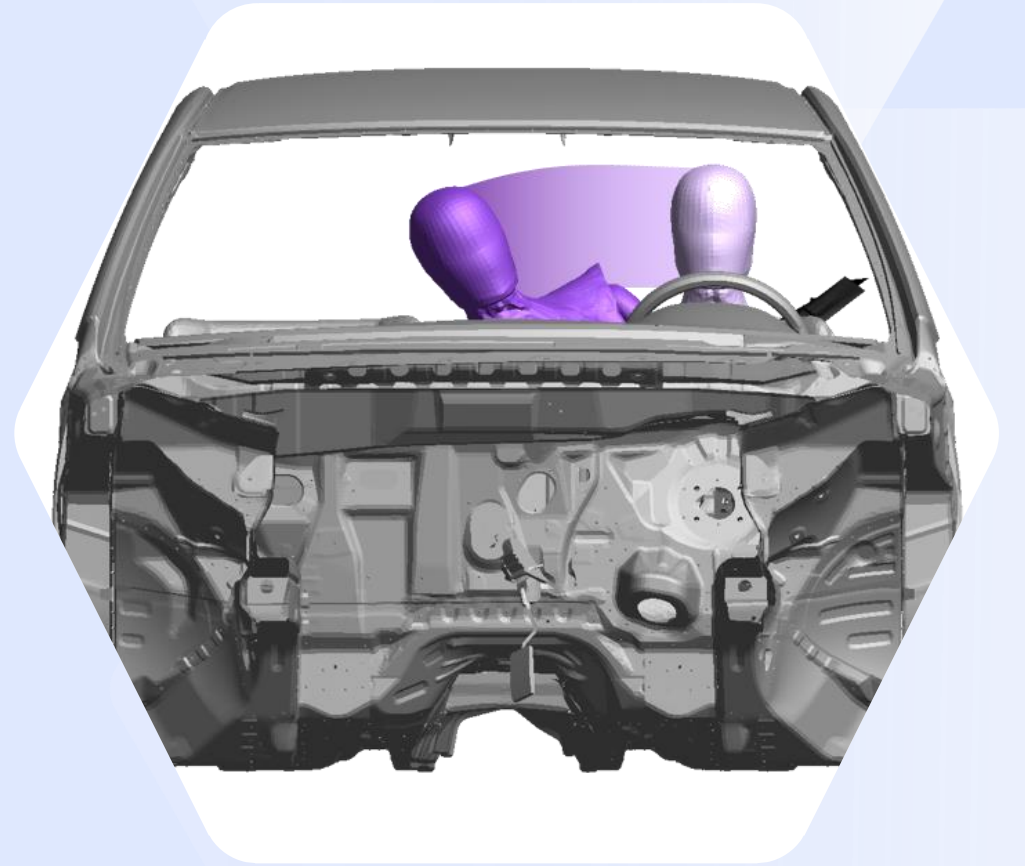
全局

过H点XZ剖视

只有假人、座椅、  
安全带、气囊的动画



# Euro NCAP 2026 Protocols

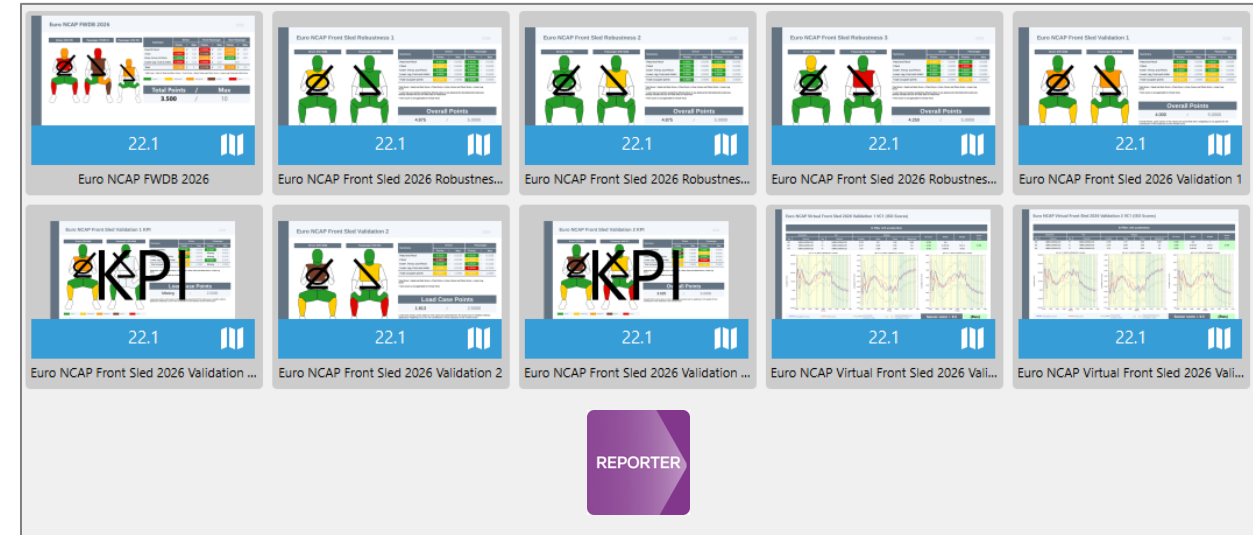




# Euro NCAP Virtual Frontal Impact – Overview

In Oasys 22.1, support has been added for the 2026 Virtual Frontal Impact Protocol. This new protocol supports the following Crash Tests:

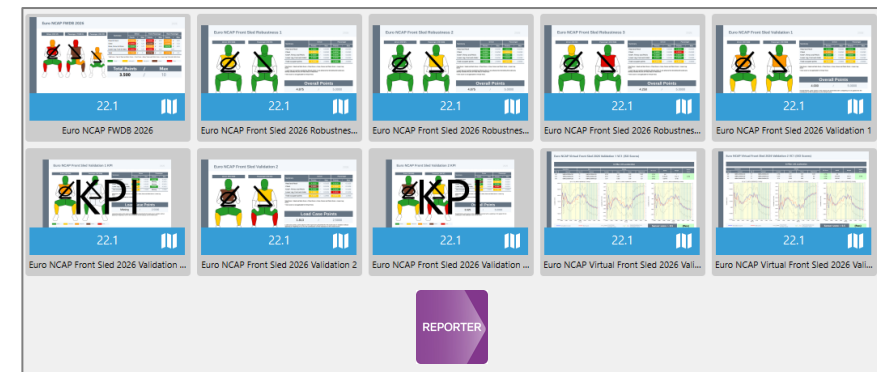
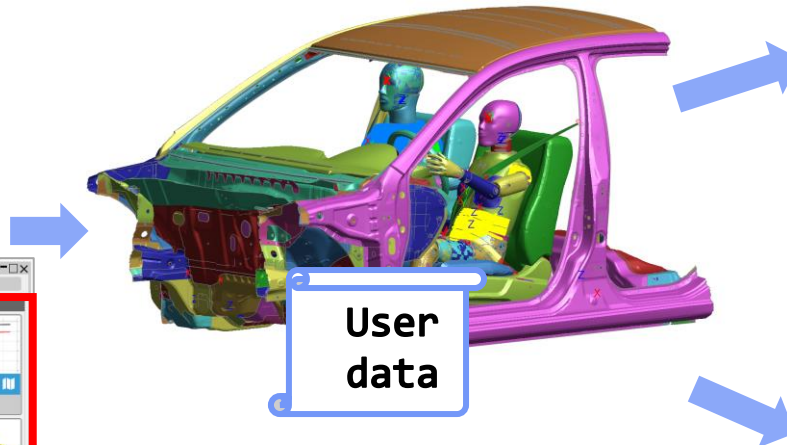
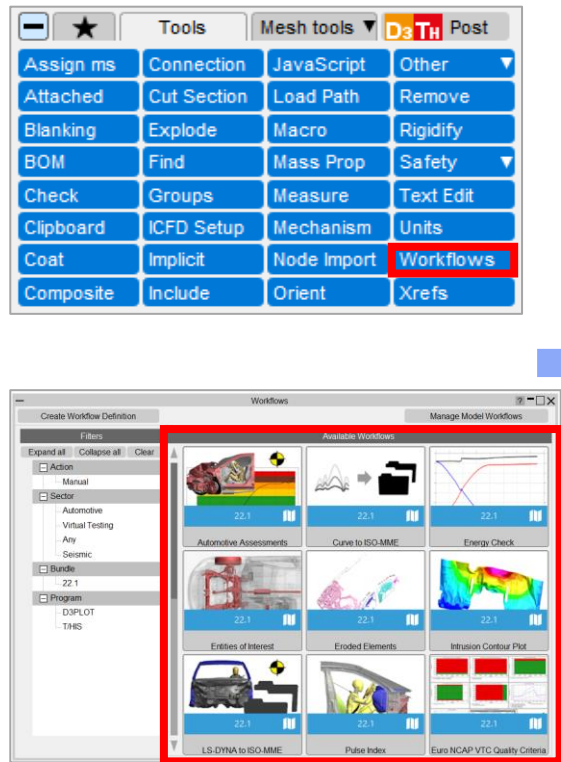
- Front Sled
  - Robustness 1
  - Robustness 2
  - Robustness 3
  - Validation 1
  - Validation 1 KPI
  - Validation 2
  - Validation 2 KPI
- Full Width Deformable Barrier (FWDB)
- All templates provide summary tables, graphs of injury criteria and calculate scores in compliance with Euro NCAP.



- Please see related documentation:
  - [Euro NCAP FWDB](#)
  - [Euro NCAP Validation](#)
  - [Euro NCAP Validation KPI](#)
  - [Euro NCAP Robustness](#)
  - [Euro NCAP Scoring & Colour Bands](#)
  - [Euro NCAP Points](#)

# Euro NCAP Virtual Frontal Impact – Workflow

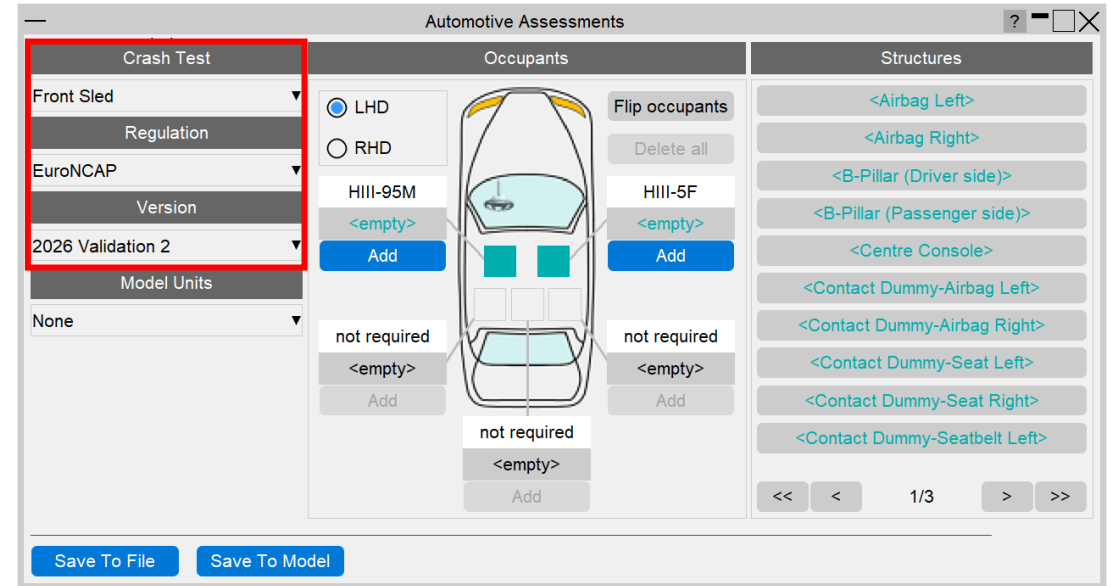
- The Euro NCAP Full Frontal protocol (including Occupant to Occupant Assessment) can now be produced in the official format template as requested by Euro NCAP. Set up your models in PRIMER, tag with user data using Workflows, and run the REPORTER Templates. Alternatively, outputs can be viewed interactively in T/HIS.



# Automotive Assessments in PRIMER

- In Automotive Assessments in PRIMER, select **Regulation** → **Euro NCAP**
- Then, to configure the various new Euro NCAP Virtual Front Protocol load cases, select:

- **Crash Test** → **FWDB Full Vehicle**
  - **Version** → **2026**
- **Crash Test** → **Front Sled**
  - **Version** → **2026 Robustness 1**
  - **Version** → **2026 Robustness 2**
  - **Version** → **2026 Robustness 3**
  - **Version** → **2026 Validation 1**
  - **Version** → **2026 Validation 2**



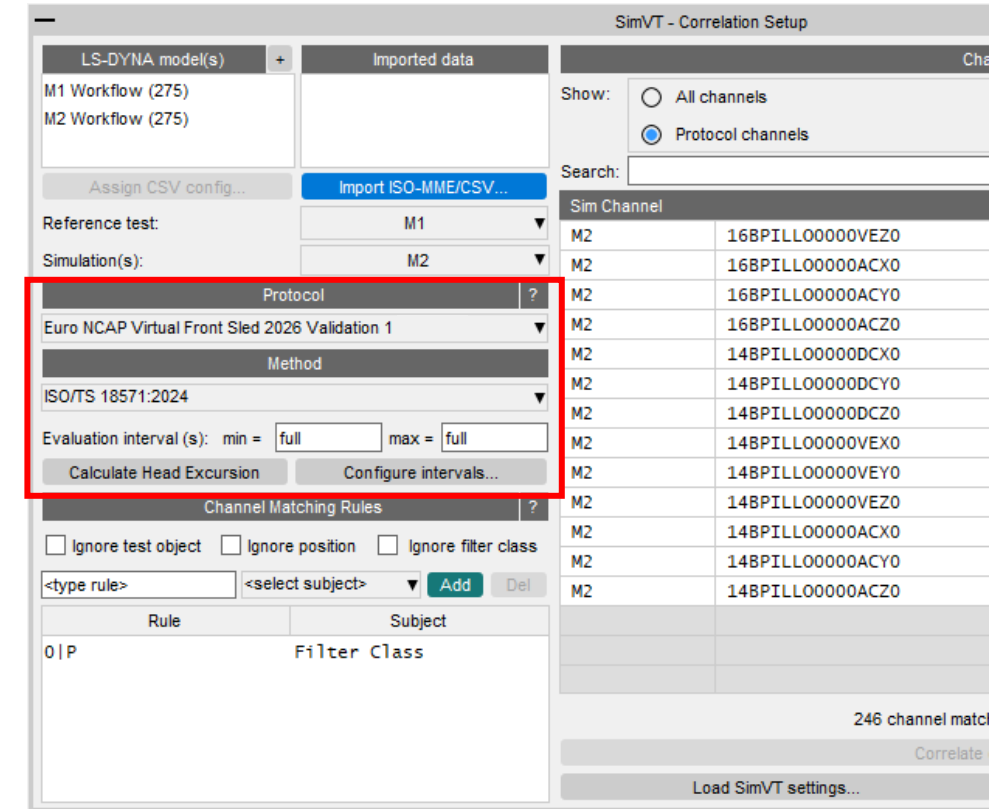
- Thereafter, proceed with setup as you would normally for Automotive Assessments ([see Automotive Assessments PRIMER documentation for details](#))

# Automotive Assessments in PRIMER

The easiest way to use SimVT is to [save Automotive Assessments user data for your LS-DYNA models first](#).

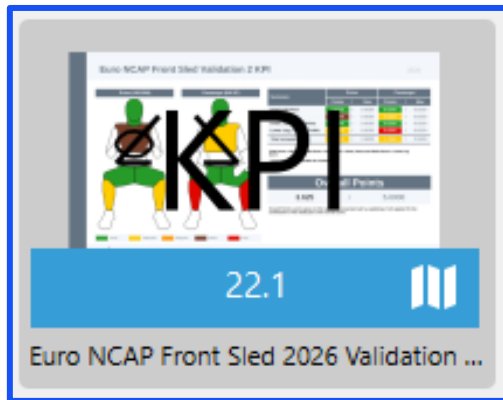
Then:

1. In T/HIS, read the model results
2. Select **Tools** → **Workflows** → **SimVT**
3. Import ISO-MME/CSV data for your test/reference
4. Select one of the Euro NCAP Virtual Front protocols:
  - Euro NCAP Virtual Front Sled 2026 Validation 1
  - Euro NCAP Virtual Front Sled 2026 Validation 2
5. Proceed as normal for SimVT ([see SimVT documentation for details](#))



# Euro NCAP Virtual Frontal Impact

## Preview of Validation 1 KPI Template



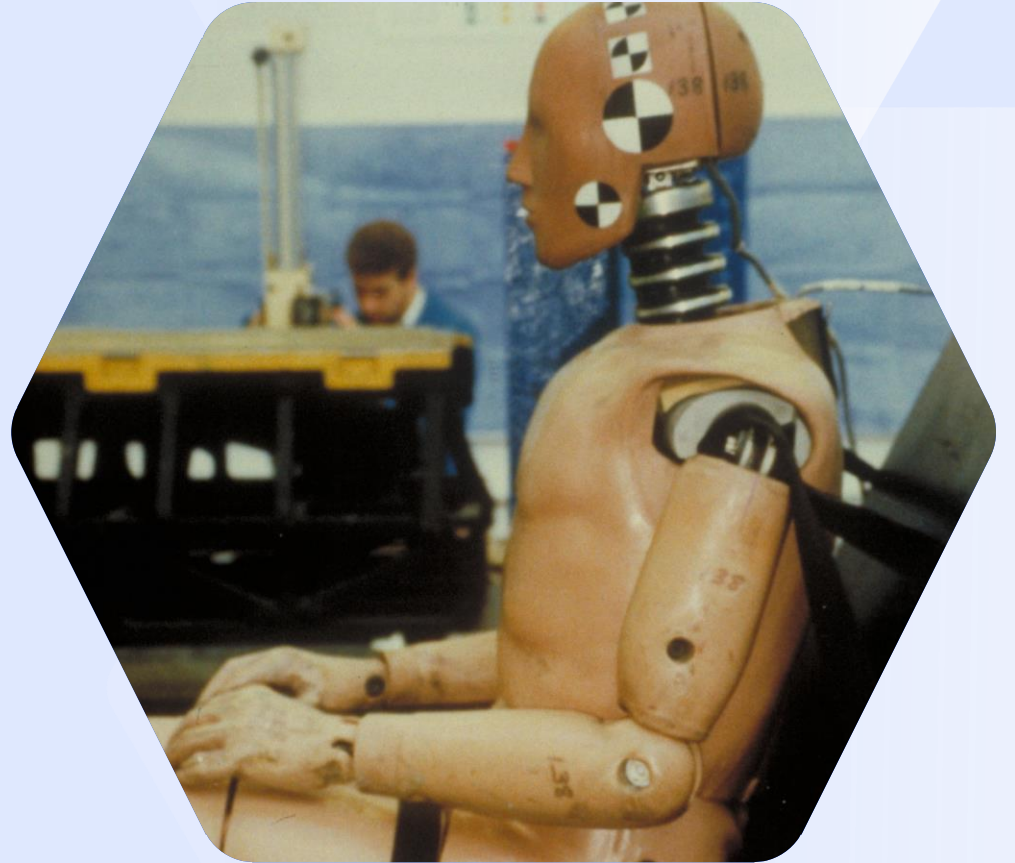


# Euro NCAP Virtual Frontal Impact

## Preview of FWDB Template



## Working with Test Data



# Improved unit handling and configuration for imported data

- Previously, imported ISO-MME data was assumed to be in SI units. This assumption was not always valid and data with non-standard units (e.g. accelerations in 'g' or rotations in 'degrees') needed to be manually scaled.
- Additionally, the vehicle drive side was inferred from the position code of the first occupant channel, which was assumed to be the driver.
- Now, when importing ISO-MME channel data, T/HIS attempts to automatically determine the units from the unit header in each channel file and the drive side from the "Driver position object 1" header in the MME file. However, it is not always possible to correctly infer this information.
- The new Import Configuration window (and Import Config. file) gives you the option to correct any issues with the channel units, polarity, scale and naming before importing ISO-MME or CSV data.

A	B	C	D
1 #DATA_SOURCE	/path/to/iso.mme		
2			
3 #DRIVE_SIDE	LHD		
4			
5 #PROTOCOL	None		
6			
7 #UNITS			
8 TIME	ms		
9 ACCELERATION	g		
10 FORCE	kN		
11 LENGTH	mm		
12 MOMENT	kN*m		
13 ROTATIONAL_VELOCITY	deg/s		
14 VELOCITY	ft/s		
15			
16 #CHANNEL_DATA			
17 Channel	New Name	Y Scale	Unit Type
18 11HEAD0000WSDCX0	<optional>	1	LENGTH
19 11HEAD0000WSDCY0	<optional>	1	LENGTH
20 11HEAD0000WSDCZ0	<optional>	1	LENGTH
21 11HEAD0000WSAVX0	<optional>	1	ROTATIONAL_VELOCITY
22 11HEAD0000WSAVY0	<optional>	1	ROTATIONAL_VELOCITY
23 11HEAD0000WSAVZ0	<optional>	1	ROTATIONAL_VELOCITY
24 11HEAD0000WSACX0	<optional>	1	ACCELERATION

Import  
Config.  
File

Import ISO-MME/CSV ...

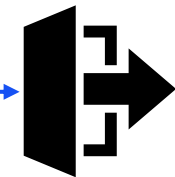
Import ISO-MME or CSV data in  
Automotive Assessments  
and SimVT

Configure import

Apply

Configuration file: Load Save Import additional channels from CSV...

Protocol	: CNCAP Far Side Sled 2024 (WSID)	Channel	New Name	Y Scale	Unit Type
Drive side	: LHD	HEAD_EXCURSION_X	<optional>	1	DISPLACEMENT
Units	: TIME	HEAD_EXCURSION_Y	<optional>	1	DISPLACEMENT
	ACCELERATION	HEAD_EXCURSION_Z	<optional>	1	DISPLACEMENT
	DISPLACEMENT	11HEAD0000WSACX0	<optional>	1	ACCELERATION
	ENERGY	11HEAD0000WSACY0	<optional>	1	ACCELERATION
	FORCE	11HEAD0000WSACZ0	<optional>	1	ACCELERATION
	MASS	11HEAD0000WSAVX0	<optional>	1	ROTATIONAL_VELOCITY
	MOMENT	11HEAD0000WSAVY0	<optional>	1	ROTATIONAL_VELOCITY
	ROTATION	11HEAD0000WSAVZ0	<optional>	1	ROTATIONAL_VELOCITY
	ROTATIONAL_VELOCITY	11NECKL000WSFOY0	<optional>	1	FORCE
		11NECKL000WSFOZ0	<optional>	1	FORCE
		11NECKL000WSMOX0	<optional>	1	MOMENT
		11SHLDRI00WSFOX0	<optional>	1	FORCE
		11SHLDRI00WSFOY0	<optional>	1	FORCE
		11SHLDRI00WSFOZ0	<optional>	1	FORCE
		11THSP0400WSACX0	<optional>	1	ACCELERATION
		11THSP0400WSACY0	<optional>	1	ACCELERATION
		11THSP0400WSACZ0	<optional>	1	ACCELERATION
		11PELV0000WSACX0	<optional>	1	ACCELERATION
		11PELV0000WSACY0	<optional>	1	ACCELERATION



Data Imported

# Import C-NCAP head excursion channel data from CSV file

- When importing ISO-MME or CSV test data, you can now import additional channels from a CSV file to associate them with the test data.
- The most common use case for this is to import a CSV with head excursion channel data that has been extracted from the physical test video footage using tracking software (e.g. as part of the C-NCAP Far Side 2024 protocols).

The screenshot displays two windows from the Oasys LS-DYNA software. The 'Import Configuration' window on the left shows a configuration for 'CNCAP Far Side Sled 2024 (WSID)' with various units and a list of channels. The 'Import Data from Additional Channels' window on the right shows the 'Import' button and a table of imported data.

**Import Configuration**

Configuration file: Load Save Import additional channels from CSV...

Protocol: CNCAP Far Side Sled 2024 (WSID)

Drive side: LHD

Units: TIME s

ACCELERATION m/(s\*s)

DISPLACEMENT m

ENERGY J

FORCE N

MASS kg

MOMENT Nm

ROTATION rad

ROTATIONAL\_VELOCITY rad/s

Channel New Name

Channel	New Name
HEAD_EXCURSION_X	<optional>
HEAD_EXCURSION_Y	<optional>
HEAD_EXCURSION_Z	<optional>
11HEAD0000WSACX0	<optional>
11HEAD0000WSACY0	<optional>
11HEAD0000WSACZ0	<optional>
11HEAD0000WSAVX0	<optional>
11HEAD0000WSAVY0	<optional>
11HEAD0000WSAVZ0	<optional>
11NECKL000WSFOY0	<optional>
11NECKL000WSFOZ0	<optional>
11NECKL000WSMOX0	<optional>
11SHLDRI00WSFOX0	<optional>
11SHLDRI00WSFOY0	<optional>
11SHLDRI00WSFOZ0	<optional>
11THSP0400WSACX0	<optional>
11THSP0400WSACY0	<optional>
11THSP0400WSACZ0	<optional>
11PELV0000WSACX0	<optional>
11PELV0000WSACY0	<optional>

**Import Data from Additional Channels**

Import

Source: [Text Box]

Channel name row number: 1 Is imported data head excursion? ☒

Units row number: 2 Show all rows ☒

Start reading data from row number: 3

Name: Import? HEAD\_EXCURSION\_X HEAD\_EXCURSION\_Y HEAD\_EXCURSION\_Z

New name: Time HEAD\_EXCURSION\_X HEAD\_EXCURSION\_Y HEAD\_EXCURSION\_Z

Units: TIME mm mm mm

Zero data? ☒ ☒ ☒ ☒

Row #	A	B	C	D
1	CHANNELS	HEAD_EXCURSION_X	HEAD_EXCURSION_Y	HEAD_EXCURSION_Z
2	TIME	mm	mm	mm
3	0.00000	0.00000	0.00000	0.00000
4	9.99810e-4	2.44141e-4	-1.83105e-4	7.07775e-17
5	1.99962e-3	9.76563e-4	-1.22070e-3	1.22070e-4
6	2.99943e-3	1.46484e-3	-2.19727e-3	7.32422e-4
7	3.99987e-3	-4.88281e-4	-5.49316e-4	2.28882e-3
8	4.99968e-3	-8.30078e-3	9.03320e-3	4.85229e-3
9	5.99949e-3	-2.70996e-2	3.38135e-2	8.85010e-3
10	6.99993e-3	-6.07910e-2	8.02002e-2	1.39771e-2
11	7.99974e-3	-1.13770e-1	0.153809	1.99280e-2
12	8.99955e-3	-1.91895e-1	0.264893	2.67029e-2
13	9.99999e-3	-3.06641e-1	0.429504	3.39355e-2
14	1.09998e-2	-4.69482e-1	0.665710	4.17175e-2
15	1.19996e-2	-6.88477e-1	0.985352	5.01099e-2
16	1.29994e-2	-9.62646e-1	1.38715	5.93872e-2
17	1.39999e-2	-1.28223	1.85797	6.93054e-2
18	1.49997e-2	-1.63599	2.38013	7.95288e-2
19	1.59995e-2	-2.01611	2.94177	8.96606e-2
20	1.69999e-2	-2.42090	3.54181	9.96704e-2



# Time of first sample

To accommodate the pre-crash (settling) phase in a simulation, a new “Time of first sample” input has been added to the Automotive Assessments workflow set-up in PRIMER.

## Automotive Assessments and SimVT

- In accordance with ISO-MME convention a **negative** time value is used to shift the start time of the output curves when post-processing using the Automotive Assessments or SimVT workflows in T/HIS.
- For example, if your analysis begins with 200 milliseconds of set-up (e.g. seat squash etc.) before the crash test load case commences then you would enter -0.2 in the “Time of first sample” input to shift the curves so that the crash test will effectively start at  $t=0$ .
- Any data before  $t=0$  is automatically discarded.

## LSDYNA to ISO-MME

- The “Time of first sample” value is also used by the LS-DYNA to ISO-MME workflow.
- If it is defined, then the “Time of first sample” header value will automatically be set in the channel files.
- Note that in this instance the samples which are shifted to time  $< 0$  will not be discarded as this only happens when the ISO-MME data is processed.

The screenshot shows the 'Automotive Assessments' window with three tabs: 'Occupants', 'Structures', and 'Options'. The 'Options' tab is active. In the 'Options' section, the 'Time of first sample' field is highlighted with a red box and contains the value '-0.2 s'. Below it, the 'Accelerations from dv/dt' checkbox is checked. The 'Structures' tab shows a list of components including '<Airbag>', 'B-Pillar (non-struck side)', 'Centre Console', '<Contact Dummy-Airbag>', 'Contact Dummy-Centre Console', 'Contact Dummy-Seat', 'Contact Dummy-Seatbelt', 'Driver Seat', 'Driver Shoulder Belt (B3)', and 'Dummy'. The 'Occupants' tab shows a car diagram with a checkmark in the driver's seat area.

```
Test object number      :1
Name of the channel     :Accel x - Node 10001 : ( HEAD0000WSAC) (Reg 0.100E-03)
Laboratory channel code :NOVALUE
Customer channel code   :NOVALUE
Channel code            :11HEAD0000WSACX0
Unit                    :m/(s*s)
Reference system        :NOVALUE
Pre-filter type         :NOVALUE
Cut off frequency       :NOVALUE
Channel amplitude class :NOVALUE
Sampling interval       :0.0001
Bit resolution          :NOVALUE
Time of first sample    :-0.02
Number of samples       :2000
0
-2.86178e-08
-5.19904e-09
```

# LS-DYNA to ISO-MME Improvements

LS-DYNA to ISO-MME	
<b>Assessments User Data</b>	
Front Sled	
EuroNCAP	
2026 Robustness 1	
<b>User Data</b>	
Front Sled 2026 Robustness 1	
Oasys Ltd	
Euro NCAP	
001	
1234	
Other - fill in textbox below dropdown	
Virtual-Mid	
<input checked="" type="radio"/> Today	
<input type="radio"/>	
1.6	
Euro NCAP 2026	
N/A	
Simulation	
Hill v1.7 (Humanetics)	
NA_TECHNICAL_REPORT_USER_MANUAL.pdf	
Hill v2.0 (Humanetics)	
NA_TECHNICAL_REPORT_USER_MANUAL.pdf	
G and green line (in metres):	N/A
and yellow line (in metres):	N/A
d orange line (in metres):	N/A
ed line (in metres):	N/A
is/EuroNCAP_FRONT_SLED_R1_LHD.csv	
NCAP_Front_Sled_R1/dyna_to_iso.mme	
<b>Solver Information</b>	
Solver Name:	L
Solver Version:	ls-4
Solver Precision:	SP
Platform Name:	RHE8
<b>Simulation Information</b>	
Number of CPUs:	32
Time step setting:	7.2e-7
Contact type between dummy and seat:	SURFACE SOF
Contact type between dummy and seatbelt:	SURFACE SOFT=
Contact type between dummy and airbag:	SURFACE SOFT=1
Number of contacts used in the overall simulation setup:	54
Number of elements:	2202649
Mass of total setup in kg:	410.73
Mass of driver dummy in kg:	79.09
Mass of passenger dummy in kg:	49.53
Mass of seat in kg:	28.32
Mass of sled in kg:	N/A
Mass of centre console in kg:	N/A
<b>Vehicle data</b>	
Name:	TUG
Reference number:	1234
Longitudinal velocity:	N/A
Lateral velocity:	N/A
Velocity:	35
Mass:	1000
<b>Impactor data</b>	
Name:	-
Velocity:	-

Textbox fields with this colour are required for suc  
Note that all fields are required to conform to the

# Support for Euro NCAP 2026

- Added new inputs according to Euro NCAP 2026 protocol
- We have also disabled the inputs which are not applicable according to version (e.g. 2024 or 2026)
- Added support for frontal VTC protocol channels export

LS-DYNA to ISO-MME

Automotive Assessments User Data	
Automotive Assessments Crash Test:	Front Sled
Automotive Assessments Regulation:	EuroNCAP
Automotive Assessments Version:	2026 Robustness 1

User Data	
Test name:	Front Sled 2026 Robustness 1
Laboratory name:	Oasys Ltd
Customer name:	Euro NCAP
Customer test ref number:	001
Customer project ref number:	1234
Virtual testing ref ID:	Other - fill in textbox below dropdown
Subtype of test:	Virtual-Mid
Test date:	<input checked="" type="radio"/> Today <input type="radio"/>
ISO-MME format:	1.6
Title:	Euro NCAP 2026
Regulation:	N/A
Type of data source:	Simulation
Dummy Simulation Model Driver:	Hill v1.7 (Humanetics)
Dummy Qualification Ref Driver:	NA_TECHNICAL_REPORT_USER_MANUAL.pdf
Dummy Simulation Model Passenger:	Hill v2.0 (Humanetics)
Dummy Qualification Ref Passenger:	NA_TECHNICAL_REPORT_USER_MANUAL.pdf
Distance between head CoG and green line (in metres):	N/A
Distance between head CoG and yellow line (in metres):	N/A
Distance between head CoG and orange line (in metres):	N/A
Distance between head CoG and red line (in metres):	N/A
Required output channels CSV:	Is/EuroNCAP_FRONT_SLED_R1_LHD.csv
Output directory:	NCAP_Front_Sled_R1\lsdyna_to_isomme

Export

Solver Information	
Solver Name:	LS-Dyna
Solver Version:	ls-dyna_mpp_s_R11_2_2
Solver Precision:	SP
Platform Name:	RHE8

Simulation Information	
Number of CPUs:	32
Time step setting:	7.2e-7
Contact type between dummy and seat:	SURFACE SOFT=1 FS=0.2
Contact type between dummy and seatbelt:	SURFACE SOFT=1 FS=0.2
Contact type between dummy and airbag:	SURFACE SOFT=1 FS=0.2
Number of contacts used in the overall simulation setup:	54
Number of elements:	2202649
Mass of total setup in kg:	410.73
Mass of driver dummy in kg:	79.09
Mass of passenger dummy in kg:	49.53
Mass of seat in kg:	28.32
Mass of sled in kg:	N/A
Mass of centre console in kg:	N/A

Calculate

Vehicle data	
Name:	TUG
Reference number:	1234
Longitudinal velocity:	N/A
Lateral velocity:	N/A
Velocity:	35
Mass:	1000

Impactor data	
Name:	-
Velocity:	-

Textbox fields with this colour are required for successful LS-DYNA to ISO-MME conversion.  
Note that all fields are required to conform to the Euro NCAP VTC protocol.

# Mass calculation and Platform name update

- PRIMER workflow:
  - Replaced “Calculate Mass” with **“Check mass”** (the previous calculation could omit mass that was part of an encrypted keyword file).
  - Removed functionality which obtained the platform name from d3hsp/otf as it was reporting platform on which LS-DYNA was built on rather than where analysis was run. **Platform name** is now a manual input in the PRIMER workflow.
- T/HIS workflow:
  - Mass calculation for mass of different parts now works using the d3hsp/otf file rather than relying on the d3thdt/thf file.

The screenshot displays the LS-DYNA to ISO-MME interface, which is divided into several sections for data entry:

- Automotive Assessments User data:** Includes fields for Crash Test (Front Sled), Regulation (EuroNCAP), and Version (2026 Robustness 1).
- User data:** Includes fields for Test name (Front Sled 2026 Robustness 1), Laboratory name (Oasys Ltd), Customer name (Euro NCAP), Customer test ref number (001), Customer project ref number (1234), Virtual testing ref ID (Other - fill in textbox below dropdown), Subtype of test (Virtual-Mid), Test date (Today), ISO-MME format (1.6), Title (Euro NCAP 2026), Regulation (N/A), Type of data source (Simulation), Dummy Simulation Model Driver (Hill v1.7 (Humanetics)), Dummy Qualification Ref Driver (NA\_TECHNICAL\_REPORT\_USER\_MANUAL.pdf), Dummy Simulation Model Passenger (Hill v2.0 (Humanetics)), Dummy Qualification Ref Passenger (NA\_TECHNICAL\_REPORT\_USER\_MANUAL.pdf), and Required output channels CSV (hannels/EuroNCAP\_FRONT\_SLED\_R1\_LHD.csv). There are buttons for "Save to file" and "Save to model".
- Contact data:** Includes fields for Contact Type between dummy and seat, Contact Type between dummy and seatbelt, and Contact Type between dummy and airbag, all set to FACE\_TO\_SURFACE SOFT=1 FS=0.2. There is a "Get contact information" button.
- Vehicle data:** Includes fields for Name (TUG), Reference number (1234), Longitudinal velocity (N/A), Lateral velocity (N/A), Velocity (35), and Mass (1000).
- Impactor data:** Includes fields for Name and Velocity, both set to "-".
- Distance between head CoG and excursion lines:** Includes fields for Distance between head CoG and green line (in metres), Distance between head CoG and yellow line (in metres), Distance between head CoG and orange line (in metres), and Distance between head CoG and red line (in metres), all set to N/A. There is a "Calculate distance" button.
- Mass of parts:** Includes a "Check mass" button.
- Simulation Information:** Includes a field for Platform Name (RHE8).

At the bottom, there is a note: "Textbox fields with this colour are required for successful LS-DYNA to ISO-MME conversion. Note that all fields are required to conform to the Euro NCAP VTC protocol."



# REPORTER Template update

- The MME header table in the report is now updated dynamically depending on the header contents.

LS-DYNA to ISO-MME

EuroNCAP Front Sled 2026 Robustness 1

MME Headers	
Description	Value
Data format edition number	1.6
Laboratory name	Oasys Ltd
Customer name	Euro NCAP
Customer test ref. number	001
Customer project ref. number	1234
Title	Euro NCAP 2026
Timestamp	3/11/2025, 3:39:42 pm
Type of the test	Frontal Impact
Subtype of the test	Virtual-Mid
Date of the test	3/11/2025
Name of test object 1	TUG
Ref. number of test object 1	1234
Velocity test object 1	35
Mass test object 1	1000
Driver position object 1	1
Impact side test object 1	FR
Name of test object 2	-
Velocity test object 2	-
Type of data source	Simulation

Model	C:\Cases\Case_52799\post\1-his\EuroNCAP_FRONT\FRONT_SLED_R1\post_light_52799_EuroNCAP_Front_Sled_R1\05_Virtual-Sled-Robustness1-35kmph_002.key
Required output channel CSV	C:\SOURCE22\workflow_wizard_trunk_for_checking_post534\workflow_definitions\scripts\ldyna_to_issomme\EuroNCAP_VTC_Channels\EuroNCAP_FRONT_SLED_R1_LHD.csv
Output directory	C:\Cases\Case_52799\post\1-his\EuroNCAP_FRONT\FRONT_SLED_R1\post_light_52799_EuroNCAP_Front_Sled_R1\ldyna_to_issomme

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LS-DYNA to ISO-MME

EuroNCAP Front Sled 2026 Robustness 1

MME Headers	
Description	Value
.Dummy Simulation Model Driver	HIII v1.7 (Humanetics)
.Dummy Qualification Ref Driver	HUMANETICS_HIII_50M_V1.7_HARMONIZED_LS_DYNA_TECHNICAL_REPORT_USER_MANUAL.pdf
.Dummy Simulation Model Passenger	HIII v2.0 (Humanetics)
.Dummy Qualification Ref Passenger	HUMANETICS_HIII_SF_V2.0_HARMONIZED_LS_DYNA_TECHNICAL_REPORT_USER_MANUAL.pdf
.Solver Name	LS-Dyna
.Solver Version	ls-dyna_mpp_s_R11_2_2
.Solver Precision	SP
.Platform Name	RHEB
.Number of CPUs	32
.Time step setting	NOVALUE
.Contact Type dummy -seat	AUTOMATIC_SURFACE_TO_SURFACE SOFT=1 FS=0.2
.Contact Type dummy -belt	AUTOMATIC_SURFACE_TO_SURFACE SOFT=1 FS=0.2
.Contact Type dummy -airbag	AUTOMATIC_SURFACE_TO_SURFACE SOFT=1 FS=0.2
.Number of contacts	54
.Number of elements	2202649
.Mass of total setup in kg	410.73
.Mass of dummy 1 in kg	79.09
.Mass of dummy 2 in kg	49.53
.Mass of seat in kg	28.32

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Model

C:\Cases\Case\_52799\post\1-his\EuroNCAP\_FRONT\FRONT\_SLED\_R1\post\_light\_52799\_EuroNCAP\_Front\_Sled\_R1\05\_Virtual-Sled-Robustness1-35kmph\_002.key

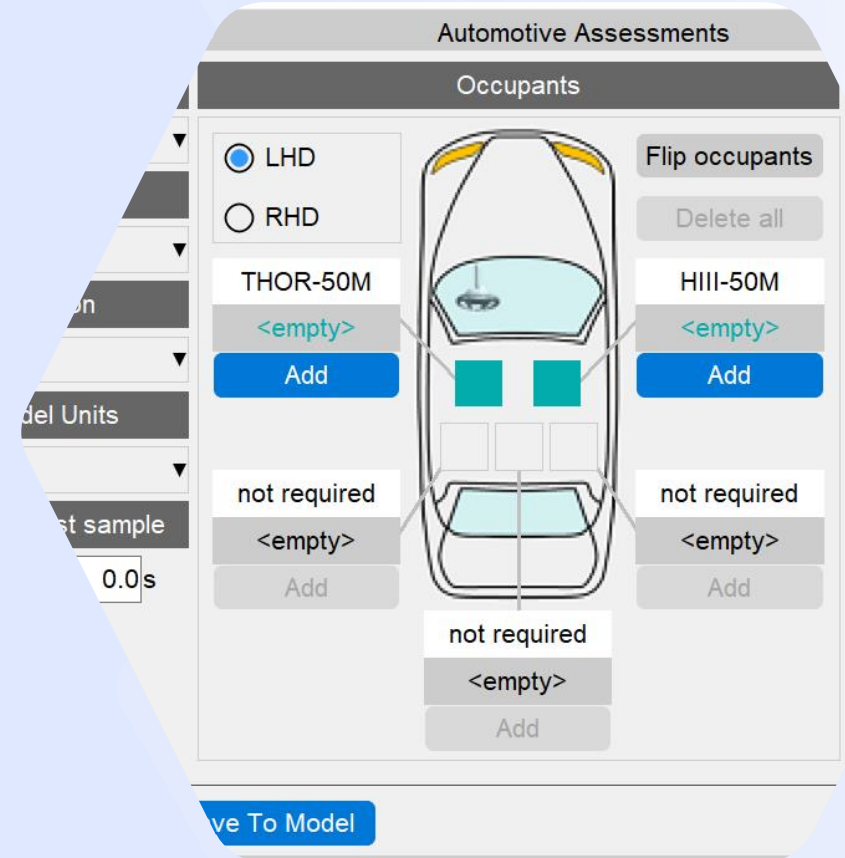
Required output channel CSV

C:\SOURCE22\workflow\_wizard\_trunk\_for\_checking\_post534\workflow\_definitions\scripts\ldyna\_to\_issomme\EuroNCAP\_VTC\_Channels\EuroNCAP\_FRONT\_SLED\_R1\_LHD.csv

Output directory

C:\Cases\Case\_52799\post\1-his\EuroNCAP\_FRONT\FRONT\_SLED\_R1\post\_light\_52799\_EuroNCAP\_Front\_Sled\_R1\ldyna\_to\_issomme

# Automotive Assessments Improvements



# Automotive Assessments Improvements

- Entity IDs that are defined but don't have corresponding \*DATABASE\_HISTORY\_XXXX keyword defined are now shown with a latent cyan-coloured textbox background:

HEAD		
Head: Global Coordinates (X,Y,Z)	node	10123
Head: Acceleration, Velocity (X,Y,Z)	node	10001
Head: Angular Accel. Angular Velocity. Angle (X,Y,Z)	node	10006
Head Offset (for C-NCAP calculation)	node	32198

- A window is now mapped when such entity IDs are selected or typed into the text box, giving you the option to create the corresponding \*DATABASE\_HISTORY\_XXXX keyword for them. It also provides an option to select the include file to which the keyword will be added. **Note:** you have to save the include and re(run) the analysis to obtain results for the corresponding entity.

Create \*DATABASE\_HISTORY\_NODE?

\*DATABASE\_HISTORY\_NODE not present for 32198. Do you wish to create it?

Create in Include: 08\_FS\_AEMDB\_75\_x-ref\_z-ref\_50M\_Sim\_1.key

☒ Update Current Layer Include

☐ Title:

Create Cancel

Dropdown to select the include file

If ticked, then the current layer include will be updated to the one selected in the dropdown above

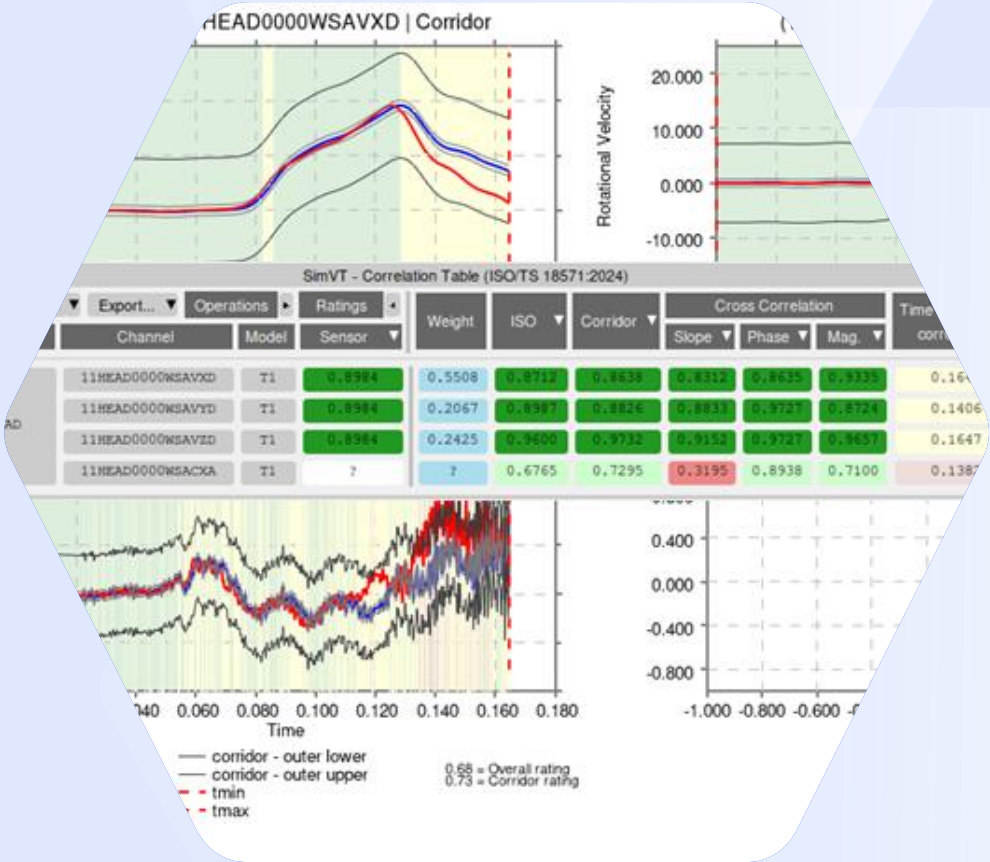
Option to provide optional Title

# Automotive Assessments Improvements

- The ISO channel codes have been updated for several channels in the Far Side VTC v1.1 draft protocol. The necessary changes have been incorporated in Automotive Assessments workflows tool, and backward compatibility support has been added for the older ISO codes. The channels whose ISO codes have changed are:
  - LAP Belt (SEBE000**3**B6FO00 to SEBE000**0**B6FO00)
  - Shoulder Belt (SEBE000**3**B3FO00 to SEBE000**0**B3FO00)
  - Contact Dummy-Airbag (**ARB**G0000WSFOX/Y/Z to **AIRB**0000WSFOX/Y/Z)
  - Thoracic Spine 04 and 12 Displacements (THSP04/1200**00**DCX/Y/Z0 to THSP04/1200**WS**DCX/Y/Z0).
- The 'Far Side + VTC' and 'Far Side' crash tests have been renamed to 'Far Side Sled' for consistency across the tools. The version for the former 'Far Side + VTC' is now 2024, while the version for the former 'Far Side' crash test is 2022. Support for backward compatibility has also been added.
- The term 'Physiology' has been renamed to 'Anthropometry' and support for backward compatibility has also been added.
- Users can now select multiple contacts for contact structures (Contact Dummy – Airbag, Contact Dummy – Centre Console, Contact Dummy –Seat and Contact Dummy - Seatbelt) via SELECT option.
- The WSID 50M dummy supplier has been renamed from “PDB” to "DYNAmore-PDB" to make it clearer that the dummy is from DYNAmore and co-developed with the PDB consortium.
- Acceleration curves from LS-DYNA results can now be derived by differentiating velocity curves (instead of raw acceleration output) by ticking the “Use dv/dt” option in PRIMER Automotive Assessments before saving user data. This option is honoured by SimVT and LS-DYNA to ISO-MME workflows which utilise Automotive Assessments user data.
- Added support to locate and load FEMZIP files in REPORTER templates when original d3plot results files have been deleted.

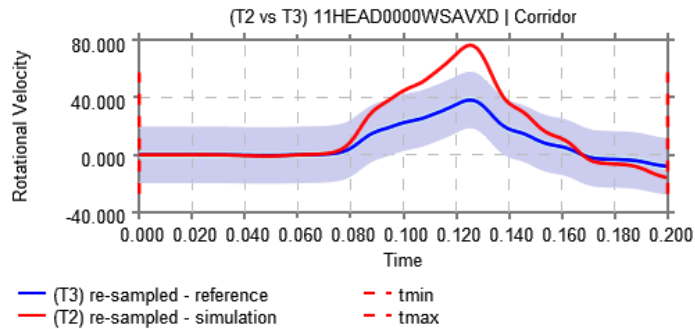


SimVT

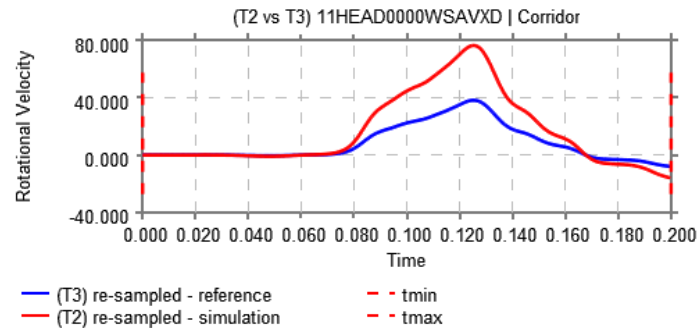


# SimVT: Graph Options – Show Corridors

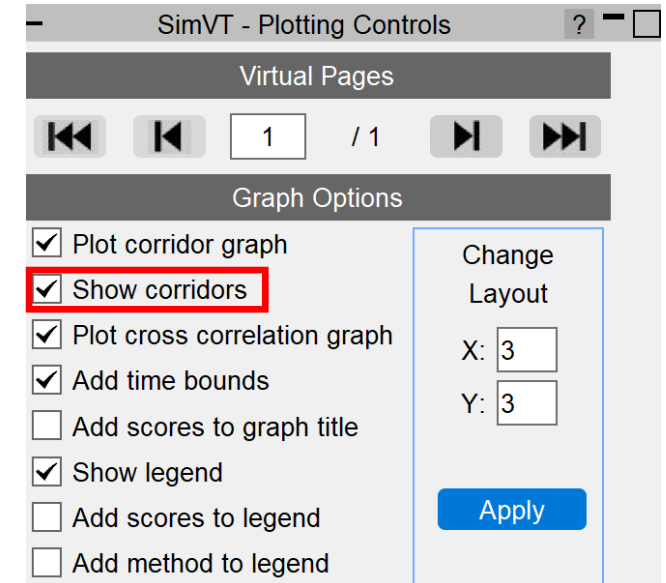
- A new graph option “Show corridors” has been added to SimVT plotting controls. This determines whether the inner and outer corridors are plotted along with the reference and simulation curves.
- Deselecting show corridors can help reduce clutter on the graphs.



Corridors turned on

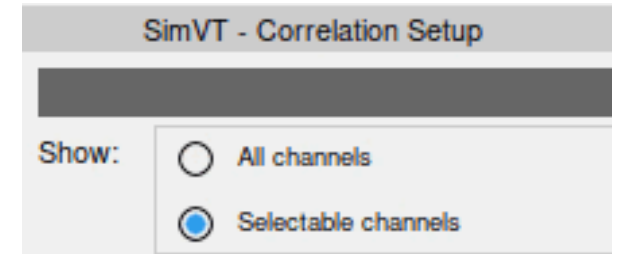


Corridors turned off



# SimVT: Improvements

- The performance of SimVT has improved when loading a large number of channels and when switching the channel table to show “All Channels”.

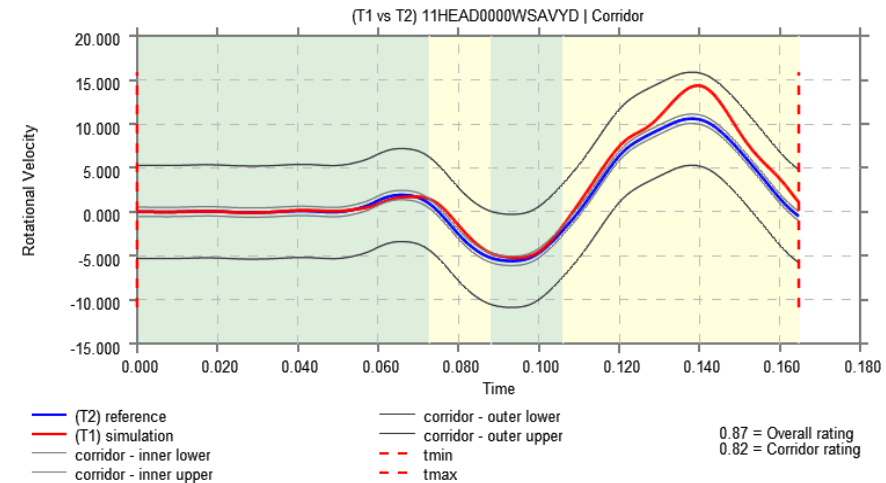
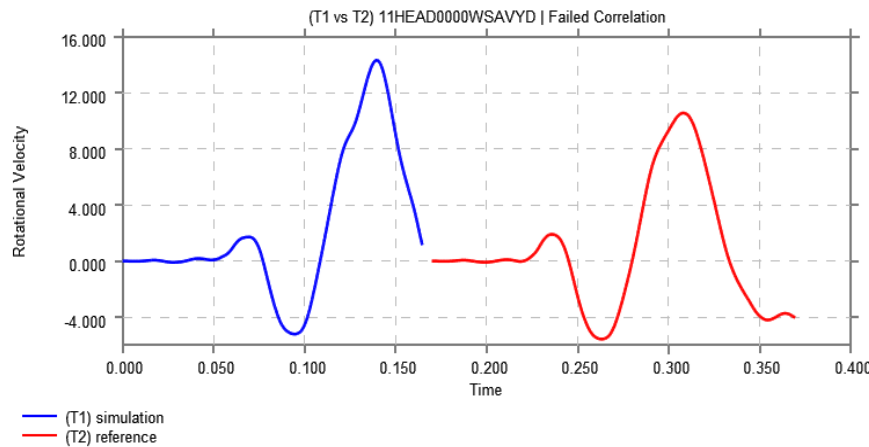


# SimVT: Diagnostic Tools

- In Virtual Testing, once the problem of data submission is overcome, the real challenge begins: **how to achieve an excellent safety rating?**
- **Achieving good correlation between simulation and test is crucial** – without good correlation in the validation loadcases, the virtual loadcases count for nothing and the overall score is low.
- SimVT now contains a set of **diagnostic tools** to help you **rapidly pinpoint problem areas** in your simulations and identify the **sources of poor correlation** – enabling you to **correct models, improve the robustness of designs, and maximise your safety rating.**

# SimVT: Error Graphs when results cannot be correlated

- If a correlation fails, error graphs will be shown. A common example of when a correlation might fail is when the simulation and reference curves are not aligned in time. This helps you identify any issues with the input data, and with this insight, you can correct any issues.
- An example is shown below with simulation and reference curves before correction (left), and after correction with correlation applied (right).



- The curves can be made to overlap using the operations panel available in the Correlation Table (e.g. by using ADDX, etc to meaningfully shift the simulation curve in time to overlap).



# SimVT: Correlation Table Filtering

- To help you navigate and analyse results more efficiently, SimVT now includes filtering controls in column headers.
- When filters are applied, rows that do not meet the selected criteria are hidden from view.
- These controls allow you to filter by various rating thresholds (e.g., pass/fail, with min/max values, etc).
- This feature improves usability, especially when working with large datasets, and ensures that you can quickly identify areas of interest or concern.

Drop down boxes for the score filters

SimVT - Correlation Table (ISO/TS 18571:2024)

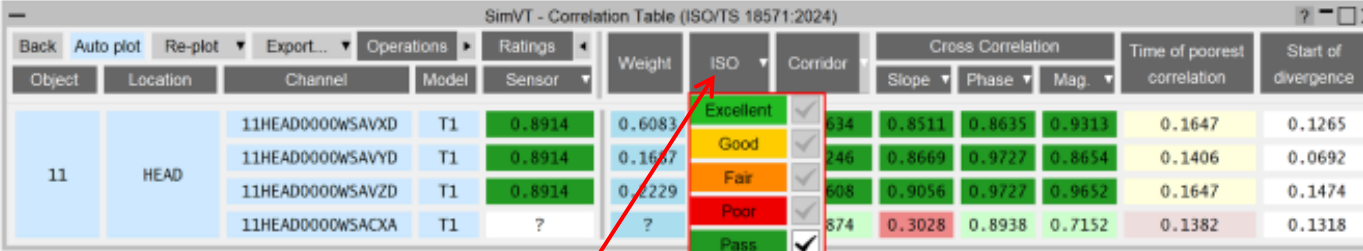
BackAuto plotRe-plotExport...OperationsRatings

ObjectLocationChannelModelSensorWeightISOCorridorCross CorrelationSlopePhaseMag.Time of poorest correlationStart of divergence

11	HEAD	11HEAD0000WSAVXD	T1	0.8914	0.6083	0.8745	0.8634	0.8511	0.8635	0.9313	0.1647	0.1265
		11HEAD0000WSAVYD	T1	0.8914	0.1687	0.8708	0.8246	0.8669	0.9727	0.8654	0.1406	0.0692
		11HEAD0000WSAVZD	T1	0.8914	0.2229	0.9530	0.9608	0.9056	0.9727	0.9652	0.1647	0.1474
		11HEAD0000WSACXA	T1	?	?	0.6973	0.7874	0.3028	0.8938	0.7152	0.1382	0.1318

# SimVT: Correlation Table Filtering

- The rating categories available include Excellent, Good, Fair, and Poor, and Pass and Fail (available when the protocol is set).
- The optional Pass and optional Fail filter checkboxes are displayed with brackets around them.
- There is also an Invalid checkbox which can be used to filter out any rows with any scores that had issues in obtaining the result.
- For ease of use, only the relevant checkboxes are active (ungreyed) when the popup appears.
- Additionally, you can set the Min and Max values to limit values between a certain threshold.
- You can use the Clear Filters button to remove all applied filters and restore the full dataset. Directly beneath this, a Close button allows users to exit the filter popup.

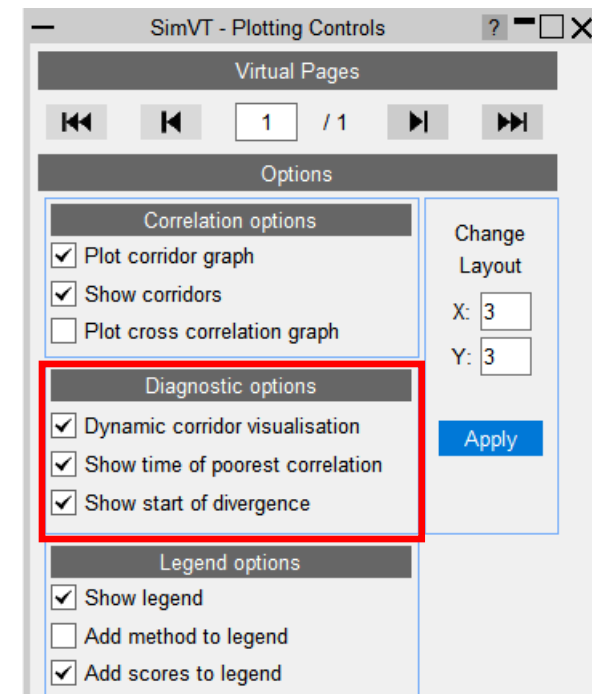
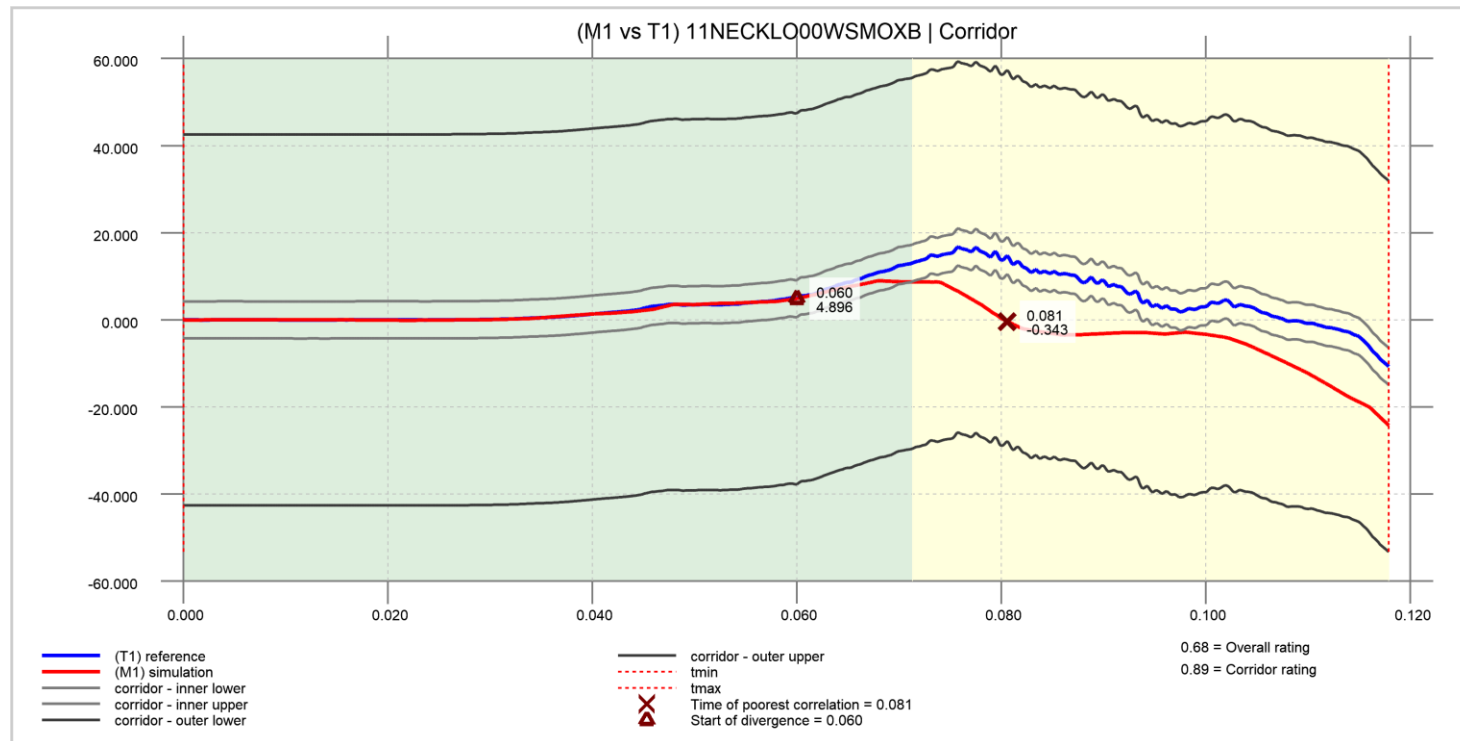


The screenshot shows the SimVT - Correlation Table (ISO/TS 18571:2024) interface. The main table displays data for Object 11, Location HEAD, with four channels (11HEAD0000WSAVXD, 11HEAD0000WSAVYD, 11HEAD0000WSAVZD, 11HEAD0000WSACXA) and their corresponding Model (T1), Sensor, Weight, and ISO rating. The ISO rating column is highlighted with a red arrow pointing to a dropdown menu. The dropdown menu lists the following options: Excellent, Good, Fair, Poor, Pass, Fail, (Pass), (Fail), Invalid, Min (0.0000), Max (1.0000), Clear Filters, and Close.

To access them, right click on the header above a rating column (e.g. ISO).

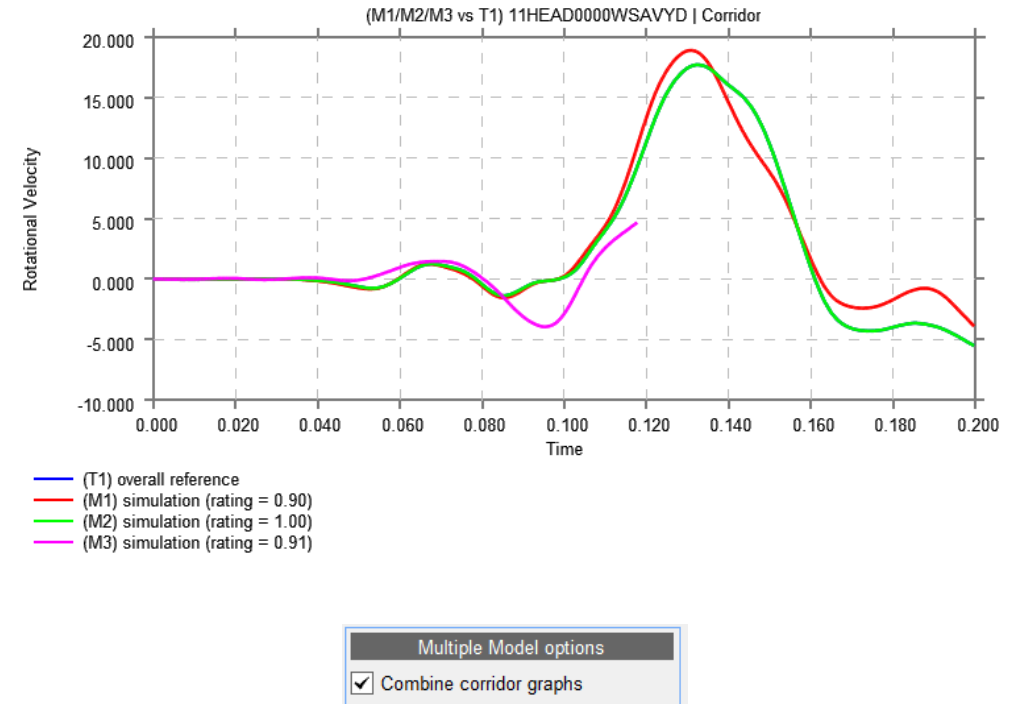
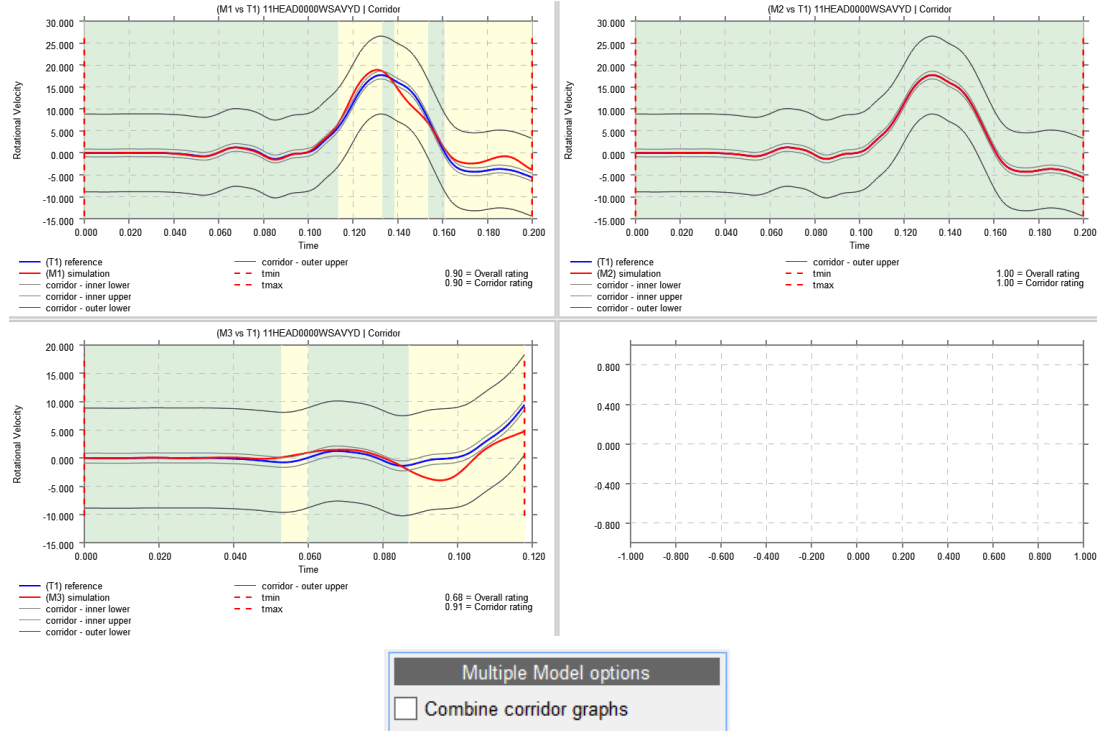
# SimVT: Dynamic Corridor Visualisation and Event Identification

- A new option “**Dynamic corridor visualisation**” has been added to help you visualise corridor performance over time and pinpoint problem areas quickly. When activated, it highlights **High correlation zone**, **Moderate correlation zone** and **Low correlation zone** over time.
- New options “**Show time of poorest correlation**” and “**Show start of divergence**” help you rapidly identify key time events in your analysis that could be causing poor correlation.

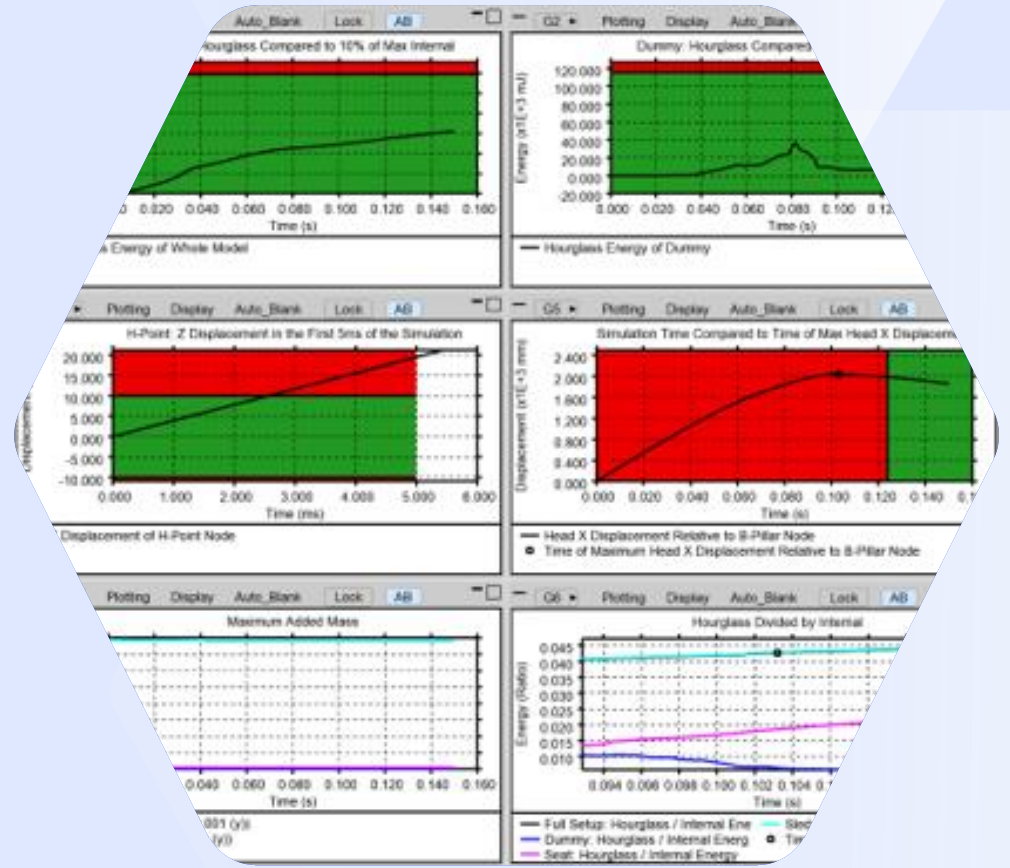


# SimVT: Overlaying multiple model results

- A new option **Combine corridor graphs** has been added, which controls if corridor graphs that share the same channel are combined in a single graph.
- Below is an example of a combination of plots with **Combine corridor graphs** unticked (left) and ticked (right).



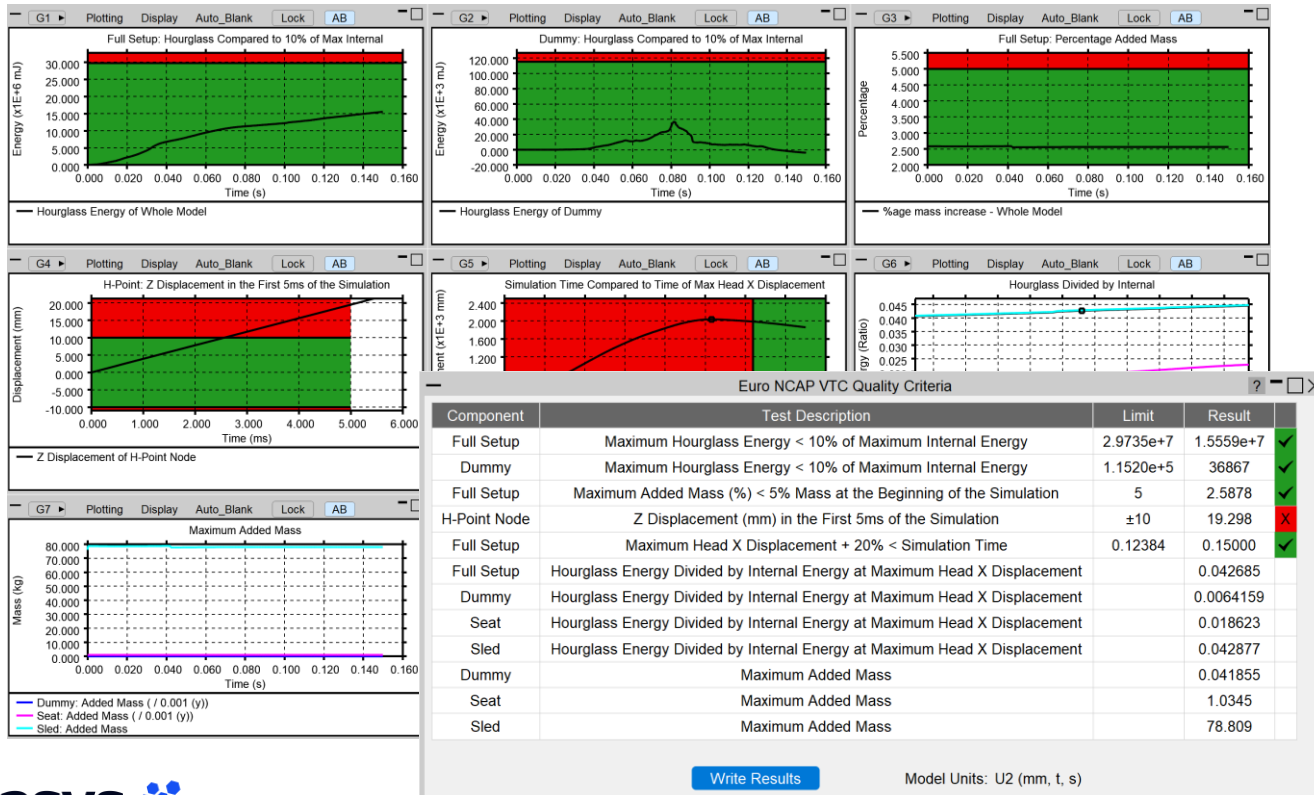
# VTC Quality Criteria Workflows





# Quality Criteria – Euro NCAP Frontal

- The Euro NCAP VTC Quality Criteria Workflows tool and associated REPORTER Template are now capable of assessing the Euro NCAP Virtual Frontal Simulation & Assessment Protocol (draft) as well as the existing Far Side protocol.



Euro NCAP VTC Quality Criteria

Test Type: Frontal (Draft)

Model Unit System: U2 (mm, t, s)

Display Time Unit: Seconds [s]

Display Energy Unit: Millijoules [mJ]

Display Displacement Unit: Millimetres [mm]

Display Mass Unit: Kilograms [kg]

Dummy Parts: 1030 PARTs selected

Head History Node (Global): 01HEAD0000T3ACX

H-point History Node: 01PELV0000T3ACZ

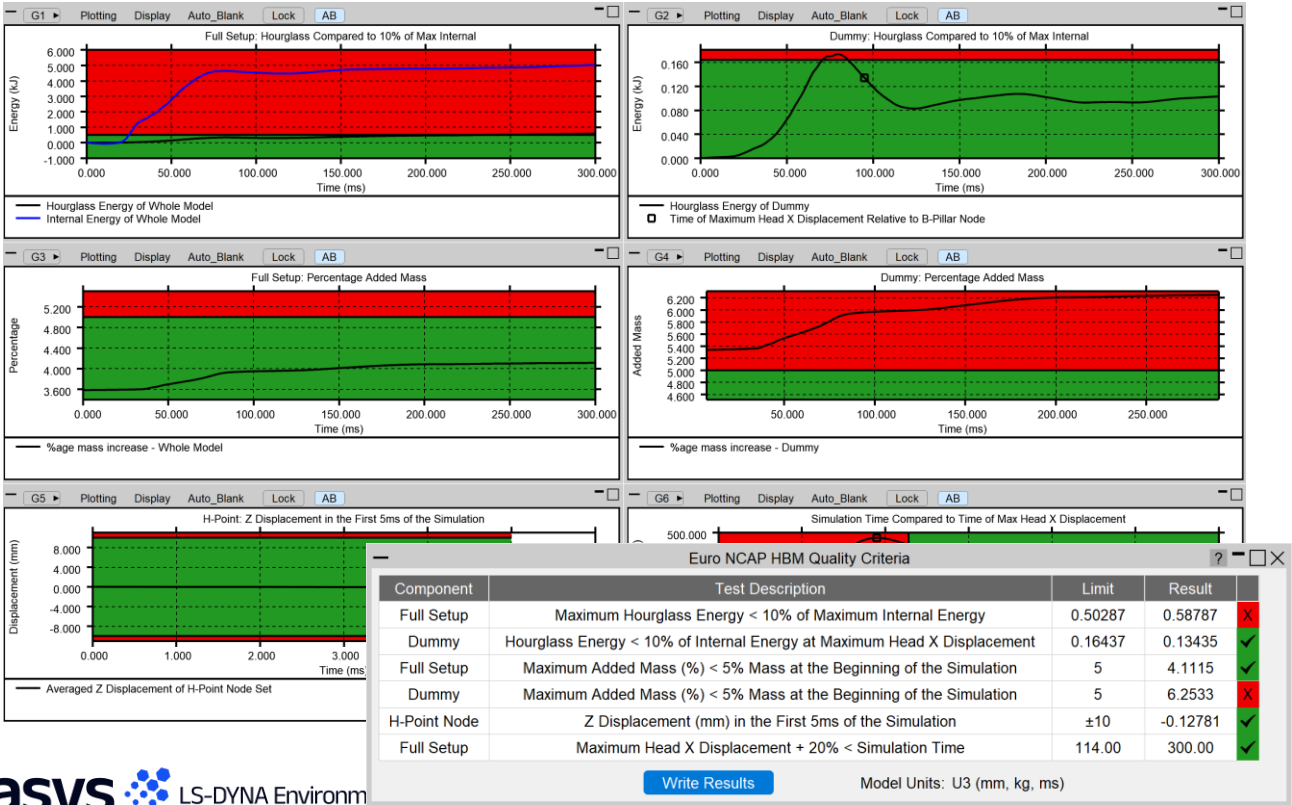
B-pillar History Node: 45011535

Seat Parts: 109 PARTs selected

Save To File Save To Model

# Quality Criteria – Euro NCAP HBM

- The Euro NCAP HBM Quality Criteria Workflows tool and associated REPORTER Template allow you to perform the quality checks outlined in Section 7.1 of the Euro NCAP VTC HBM Frontal Protocol (draft) relating to energy, added mass and displacements.



Euro NCAP HBM Quality Criteria

Model Unit System

U3 (mm, kg, ms)

Display Time Unit

Milliseconds [ms]

Display Energy Unit

Kilojoules [kJ]

Display Displacement Unit

Millimetres [mm]

Dummy Parts

1423 PARTs selected

Head History Node (Global)

ted-Kinematics\_Node\_Global

H-point History Node

e-History-Node\_Node\_Global

B-pillar History Node

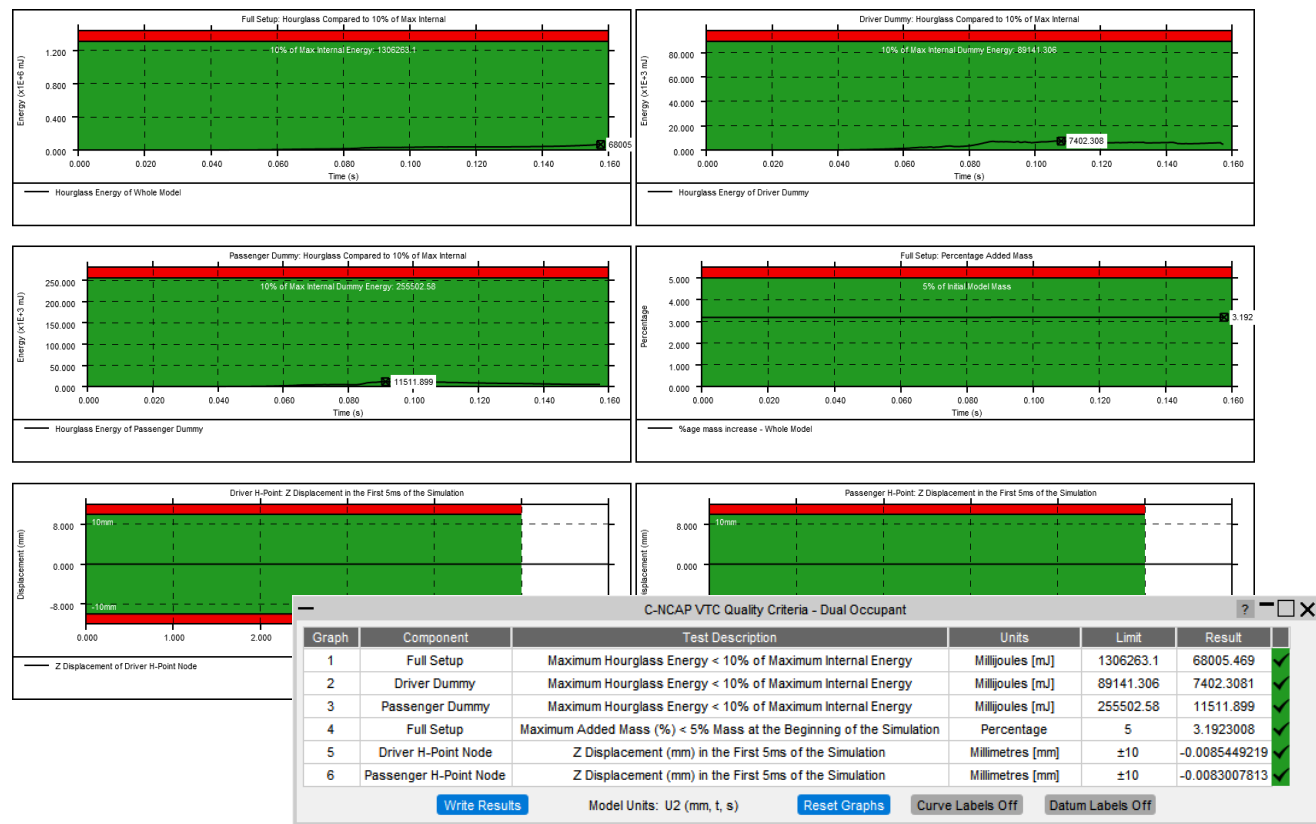
B-Pillar-accelerometer: 1

Save To File

Save To Model

# Quality Criteria: C-NCAP Occupant to Occupant (Dual Occupant)

- The C-NCAP Occupant to Occupant tool and associated REPORTER Template allow you to perform the quality checks required by the C-NCAP Far Side Occupant to Occupant Official Template, outlined in appendix H1.1.(f) of the C-NCAP 2024 Management Regulation relating to energy, added mass and displacements.



C-NCAP VTC Quality Criteria

Load Case

O2O (dual occupant)

Model Unit System

U2 (mm, t, s)

Display Time Unit

Seconds [s]

Display Energy Unit

Millijoules [mJ]

Driver Dummy Parts

918 PARTs selected

Driver H-pt History Node

10056

Passenger Dummy Parts

918 PARTs selected

Passenger H-pt History Node

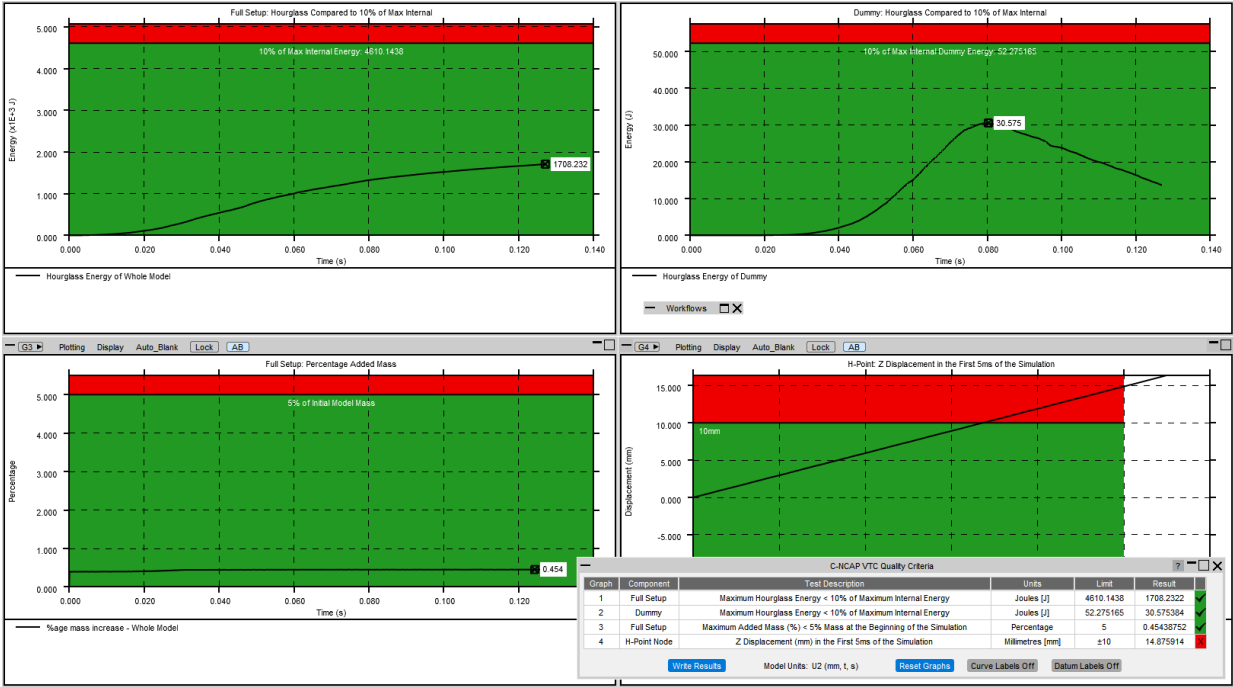
92010056

Save To File

Save To Model

# Quality Criteria: C-NCAP Front AEB OOP 2024

- A new load case “Front AEB OOP” is added to the C-NCAP VTC Quality Criteria tool. Fill in and save user data, then output the report in REPORTER, or view results interactively in T/HIS.



C-NCAP VTC Quality Criteria

Load Case

Front AEB OOP

Model Unit System

U2 (mm, t, s)

Display Time Unit

Seconds [s]

Display Energy Unit

Millijoules [mJ]

Dummy Parts

687 PARTs selected

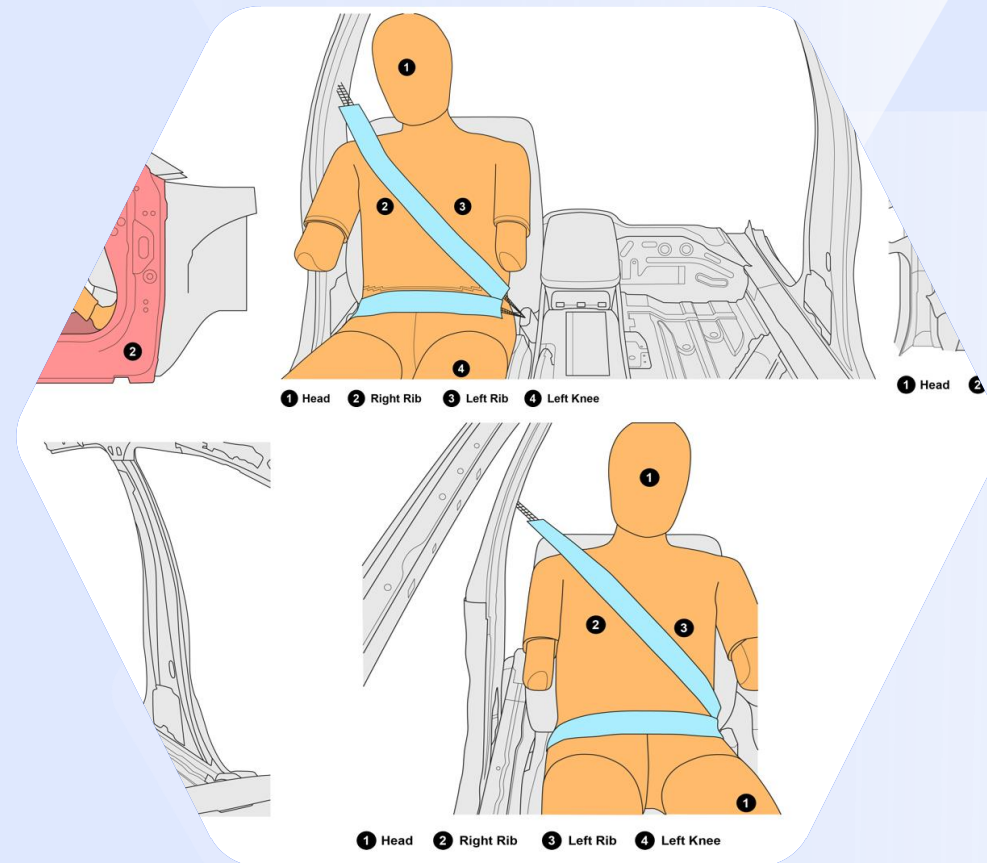
H-point History Node

01PELV0000H3AC0

Save To File

Save To Model

# VTC Videos Workflows





# VTC Videos Updates in PRIMER

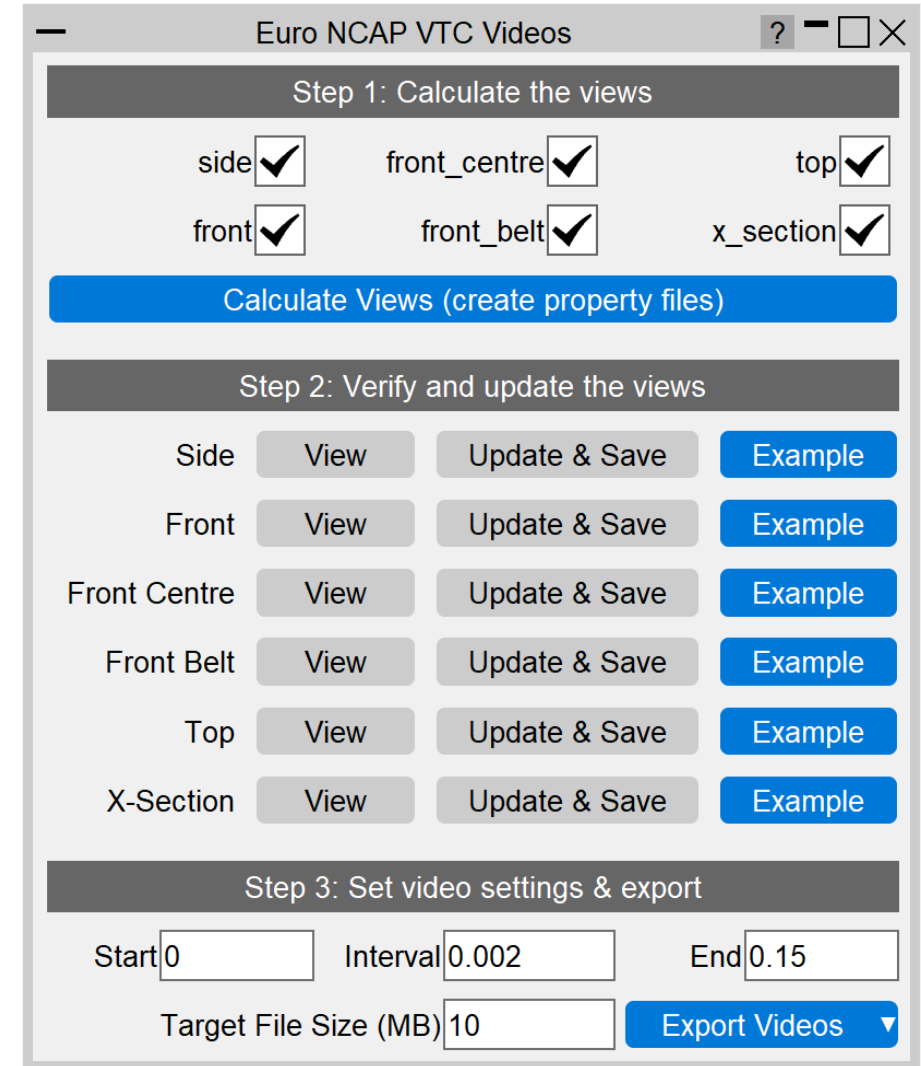
- VTC Videos are now combined into one Workflow, rather than having separate Workflows for each protocol.
- Inputs required for Euro NCAP Far Side have been significantly reduced
- Three shift deform nodes have been re-introduced as an option alongside using 1 shift deform node

The screenshot shows the 'Euro NCAP Far Side' configuration window. It contains the following fields and controls:

- Protocol:** A dropdown menu set to 'Euro NCAP Far Side'.
- Reference ID:** A dropdown menu set to 'FS\_Pole\_75\_x-ref\_z-ref\_50M\_Sim\_1' and an empty text input field below it.
- Unit System:** A dropdown menu set to 'None'.
- \*DATABASE\_BINARY\_D3PLOT DT:** A text input field followed by a blue 'Save DT' button.
- Head Node:** A text input field with a right-pointing arrow.
- Dummy Parts:** A text input field with a right-pointing arrow.
- Fixed Reference Node 1 (required):** A text input field followed by a 'Select...' button.
- Fixed Reference Node 2 (optional):** A text input field followed by a 'Select...' button.
- Fixed Reference Node 3 (optional):** A text input field followed by a 'Select...' button.
- Parts to Blank:** A text input field with a right-pointing arrow.
- Property Files Directory:** A text input field followed by a folder icon button.
- Side Selection:** Two radio buttons labeled 'LHD' and 'RHD'.
- Buttons:** A grey button with a question mark '?' and two buttons at the bottom: 'Save To File' and 'Save To Model'.

# VTC Videos Updates in POST

- The 'Step 2' section of the GUI has been redesigned for simplification adding an example button for each view.
- In 'Step 3', the displayed End time is now determined by model simulation end time rounded down to three decimal places rather than model simulation end time minus 1 interval step (which had caused issues with video capture previously).
- In 'Step 3', For the Euro NCAP versions, the Video Quality slider has been replaced with a target file size option to allow users to satisfy the 1-10 MB video requirement.
- REPORTER will now use the specified property files save directory from the Workflow data, rather than the REPORTER Template output directory.



The screenshot displays the 'Euro NCAP VTC Videos' application window, which is organized into three sequential steps:

- Step 1: Calculate the views**
  - Views to calculate are selected via checkboxes: side, front, front\_centre, front\_belt, top, and x\_section. All are currently checked.
  - A blue button labeled 'Calculate Views (create property files)' is located below the checkboxes.
- Step 2: Verify and update the views**
  - This section contains a table of view controls:

View	View	Update & Save	Example
Side	<input type="button" value="View"/>	<input type="button" value="Update &amp; Save"/>	<input type="button" value="Example"/>
Front	<input type="button" value="View"/>	<input type="button" value="Update &amp; Save"/>	<input type="button" value="Example"/>
Front Centre	<input type="button" value="View"/>	<input type="button" value="Update &amp; Save"/>	<input type="button" value="Example"/>
Front Belt	<input type="button" value="View"/>	<input type="button" value="Update &amp; Save"/>	<input type="button" value="Example"/>
Top	<input type="button" value="View"/>	<input type="button" value="Update &amp; Save"/>	<input type="button" value="Example"/>
X-Section	<input type="button" value="View"/>	<input type="button" value="Update &amp; Save"/>	<input type="button" value="Example"/>
- Step 3: Set video settings & export**
  - Input fields for 'Start' (0), 'Interval' (0.002), and 'End' (0.15) are provided.
  - A 'Target File Size (MB)' field is set to 10.
  - A blue button labeled 'Export Videos' with a dropdown arrow is at the bottom right.

# VTC Videos new protocol: C-NCAP Occupant to Occupant

- The C-NCAP Occupant to Occupant tool and associated REPORTER Template allow you to create the images required by the C-NCAP Far Side Occupant to Occupant Official Template to show the minimum distance between the far side head and the near side head.

Step 1: Calculate the views

Front ☒ Top ☒

Calculate Views (create property files)

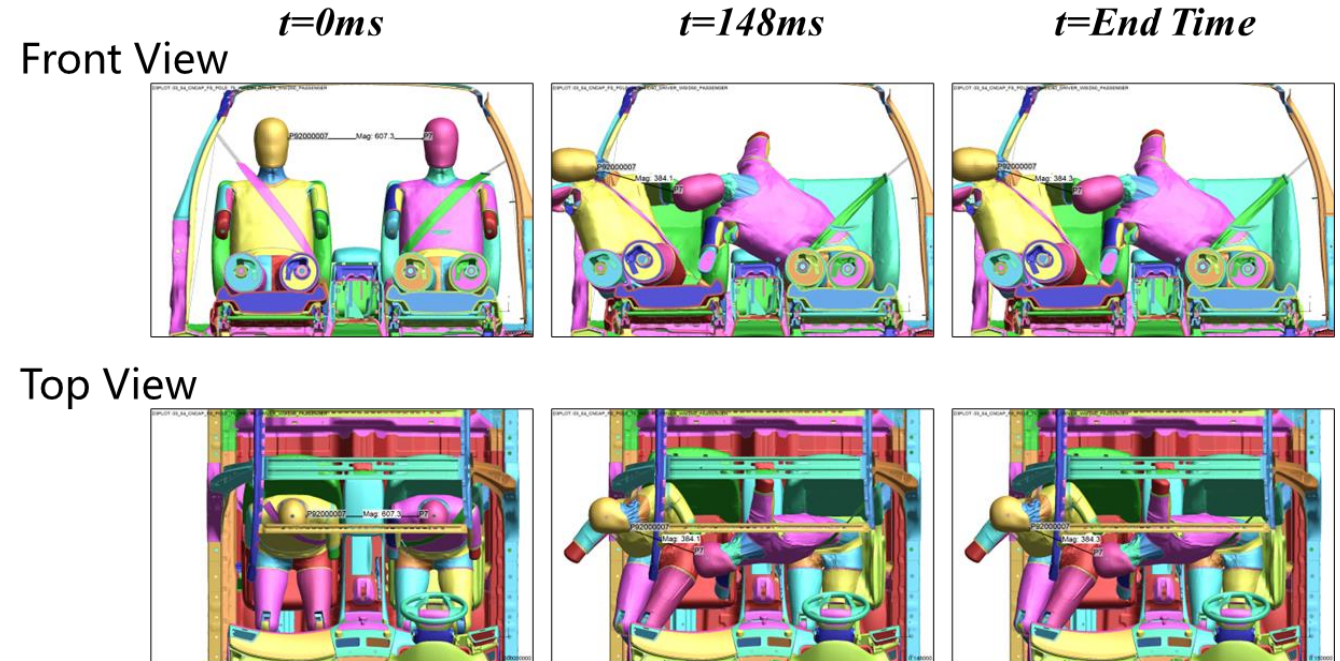
Step 2: View, Verify and update the views (Hover for help)

View Front Update & Save front view and Cut section

View Top Only update & save top view property

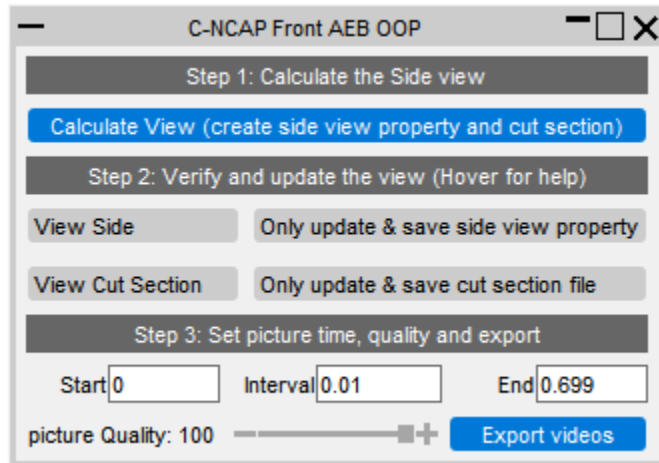
Step 3: Export the Picture

Export pictures



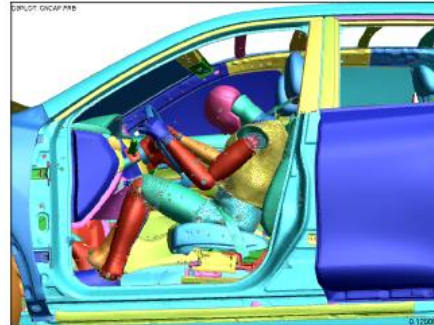
# VTC Videos new protocol: C-NCAP Front AEB OOP

- The C-NCAP Front AEB OOP tool and associated REPORTER Template allow you to create the images required by the C-NCAP 2024 Frontal VTC Official Template to show the required 3 views for all models used for this protocol.

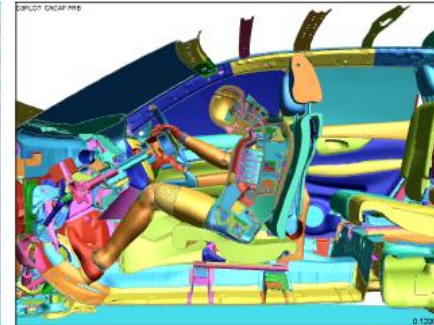


Videos for  
FRB / MPDB

Side View



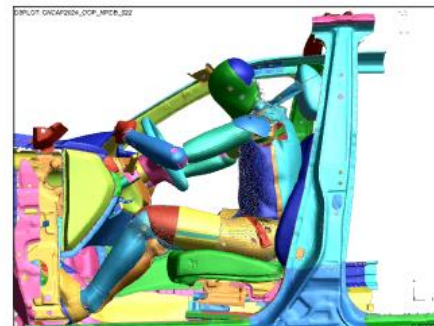
H-point Cut Section View



Dummy, Seatbelt and  
Seat only



Side View



H-point Cut Section View



Dummy, Seatbelt and  
Seat only



Videos for  
OOP + FRB /  
OOP + MPDB

# Pulse Index



# Pulse Index (PI)

- The Pulse Index Workflow allows you to estimate the acceleration that would be experienced by a vehicle occupant in a crash test scenario.
- Pulse Index has been updated following user feedback. The occupant mass input has been removed with stiffness now being taken per unit mass. Based on the stiffness input, the time period of the system is now displayed to serve as a sense check. The acceleration curve filter can now be chosen from three options: C60, C180, and C600. A differentiated velocity curve can now be used in place of the acceleration curve.

The screenshot shows the Pulse Index Workflow interface with the following sections and controls:

- Model**: Units: U1 (m, kg, s)
- Parameters**:
  - Initial velocity (m/s): 15.6
  - Restraint stiffness (per unit mass): (N/m/kg)
    - ☒ Constant: 2000
    - ☐ Variable: Select curve
  - Slack (m): 0
  - Measurement node: X-Axis
  - T: 0.1405 s
- Display Units**:
  - Time Units: Seconds [s]
  - Displacement Units: Metres [m]
  - Acceleration Units: ☒ g, ☐ Display Units
  - Acceleration Filter: C60
  - Read Velocity: ☐
  - Buttons: Save to file, Save to model

Red arrows point from the following text labels to the interface:

- Stiffness now per unit mass (points to the Restraint stiffness Constant value)
- Time period relating to current stiffness (points to the T: 0.1405 s value)
- Take acceleration as a differentiated velocity curve (points to the Read Velocity checkbox)
- Select filter applied to the acceleration curve (points to the Acceleration Filter dropdown)

Stiffness now  
per unit mass

Time period  
relating to  
current stiffness

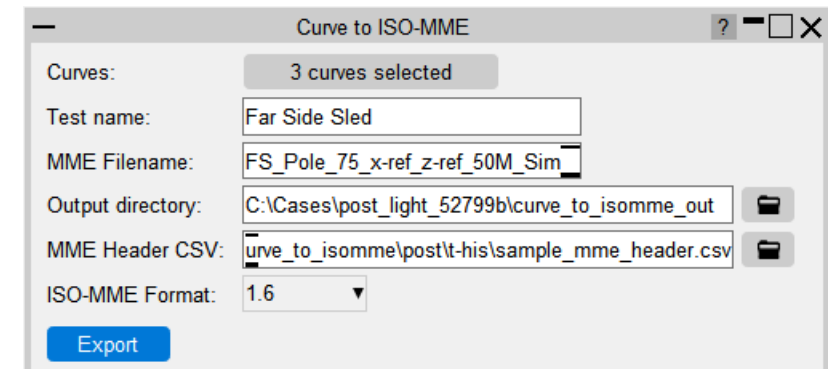
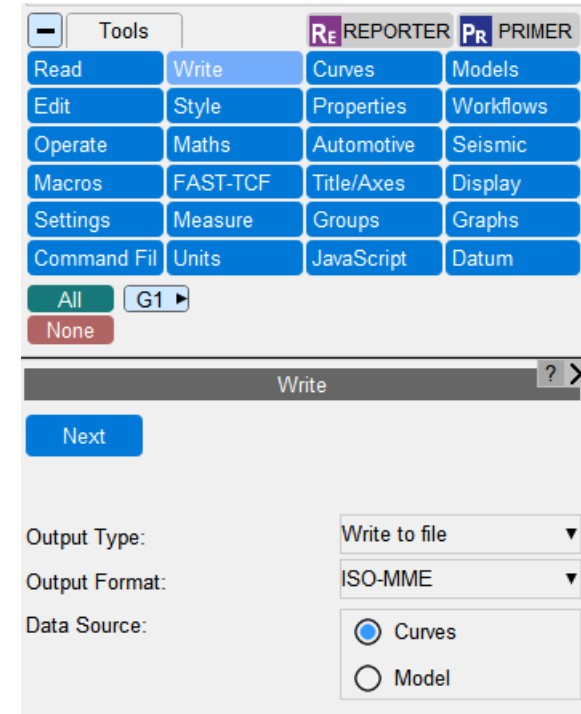
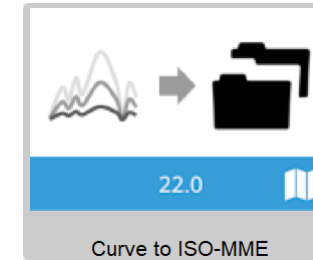
Take  
acceleration as  
a differentiated  
velocity curve

Select filter  
applied to the  
acceleration  
curve

# Curve to ISO-MME

# Curve to ISO-MME

- A new Workflows tool “Curve to ISO-MME” allows you to write any curves from your T/HIS session directly to ISO-MME format without the need of a configuration file.
- You can access the tool from either the **Tools** → **Workflows** menu or from:
  1. Select **Tools** → **Write**
  2. Select output format as ISO-MME
  3. Select Data source **Curves**
  4. Click **Next**



# Human-Safe Design

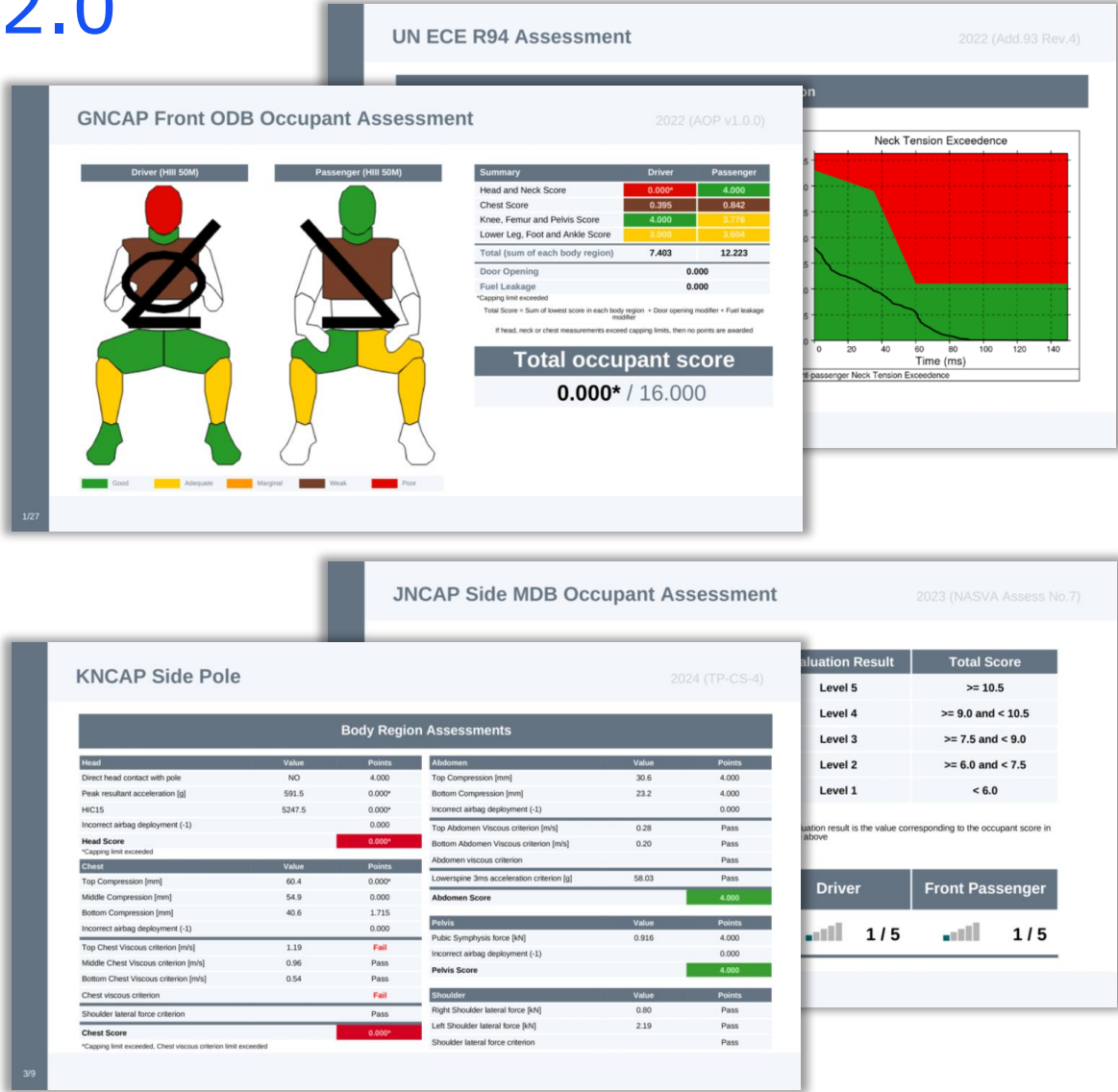
# Automotive Protocols



# New Protocols and Regulations V22.0

- Automotive Assessments and REPORTER now support the following new protocols and regulations:

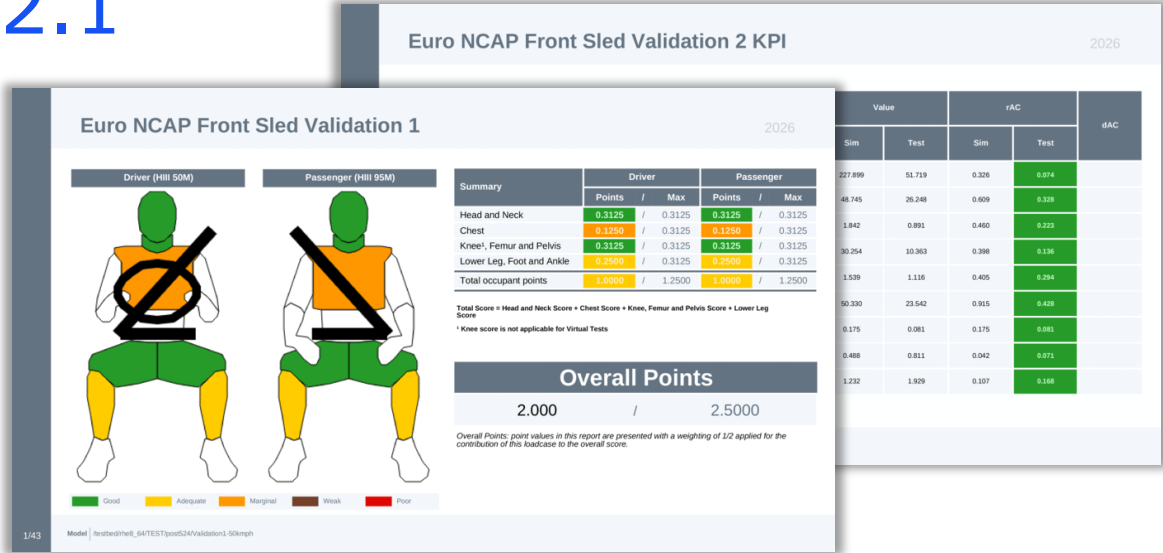
Regulation	Loadcase
Global NCAP	MDB, ODB, Side Pole
JNCAP	FFB, MDB, ODB
KNCAP	FFB, MDB, Side Pole
UN ECE	R94, R95, R135, R137



# New Protocols and Regulations V22.1

- Automotive Assessments and REPORTER now support the following new protocols and regulations:

Regulation	Loadcase
C-NCAP	Far Side (inc O2O & Official Format Versions), Front AEB OOP (Official Format), Side MDB, FRB
FMVSS	208 Front FFB
Euro NCAP	FWDB 2026, Front Sled 2026 (Validation 1 + (KPI), Validation 2 + (KPI), Robustness 1, Robustness 2, Robustness 3)



# Upgraded Protocols

- The following protocols have been updated:

Regulation	Loadcase	Update
C-NCAP	MPDB Occupant Assessment	<ul style="list-style-type: none"><li>• Rear Occupants Added</li></ul>
Euro NCAP	MPDB Occupant Assessment	<ul style="list-style-type: none"><li>• 2024 (Follows Adult Occupant Protocol v9.3)</li><li>• Includes DAMAGE assessment</li></ul>
IIHS	Front SOB	<ul style="list-style-type: none"><li>• 2024 (Version VII)</li><li>• New fuel modifier</li></ul>
IIHS	Side MDB	<ul style="list-style-type: none"><li>• 2024 (Version IV)</li><li>• New fuel modifier and updated head protection rating system</li></ul>

# Latest Protocol Support

Automotive Assessments Workflow

- Available for some time
- New in version 22.1
- New in version 22.0

Regulation	Year	Loadcase/Workflow	PRIMER	T/HIS	D3PLOT	REPORTER (migrated to workflows)	REPORTER (standard template)
C-NCAP	2018	ODB	●	●			●
	2021	Head Impact					●
		Leg Impact					●
	2023	MPDB Compatibility					●
	2024	MPDB Occupant	●	●		●	
		Side Pole	●	●		●	
		Far Side Pole	●	●		●	
		Far Side Sled	●	●		●	
		VTC Quality Criteria	●	●		●	
		VTC Videos	●		●	●	
		LS-DYNA to ISO-MME	●	●		●	
		SimVT		●		●	
		FRB	●	●		●	
		Side MDB	●	●		●	
		Far Side CNCAP Official Format	●	●	●	●	
		O2O CNCAP Official Format	●	●	●	●	
		O2O VTC Quality Criteria	●		●	●	
		O2O VTC Videos	●	●		●	
		Front AEB OOP Official Format	●	●	●	●	
		Front AEB OOP Quality Criteria	●	●		Part of Official Format	
		Front AEB OOP VTC Videos	●		●	Part of Official Format	

# Latest Protocol Support

Automotive Assessments Workflow

- Available for some time
- New in version 22.1
- New in version 22.0

Regulation	Year	Loadcase/Workflow	PRIMER	T/HIS	D3PLOT	REPORTER (migrated to workflows)	REPORTER (standard template)
Euro NCAP	2017	FFB	●	●		●	
		ODB	●	●		●	
	2020	MPDB Occupant	●	●		●	
		Side Pole	●	●			
		MDB	●	●	●		
	2022	Far Side	●	●	●		
		MDB	●	●	●	●	
		Side Pole	●	●		●	
	2023	MPDB Compatibility					●
		Head Impact					●
		Leg Impact					●
	Continued...						



# Latest Protocol Support

Automotive Assessments Workflow

- Available for some time
- New in version 22.1
- New in version 22.0

Regulation	Year	Loadcase/Workflow	PRIMER	T/HIS	D3PLOT	REPORTER (migrated to workflows)	REPORTER (standard template)
Euro NCAP	2024	Far Side Sled	●	●		●	
		MPDB Occupant	●	●		●	
		VTC Quality Criteria	●	●		●	
		VTC Videos	●		●	●	
		LS-DYNA to ISO-MME	●	●		●	
		SimVT		●		●	
	2026	Front Sled	●	●		●	
		FWDB Full Vehicle	●	●		●	
		VTC Quality Criteria	●	●		●	
		VTC HBM Quality Criteria	●	●		●	
		SimVT		●		●	

# Latest Protocol Support

Automotive Assessments Workflow

- Available for some time
- New in version 22.1
- New in version 22.0

Regulation	Year	Loadcase/Workflow	PRIMER	T/HIS	D3PLOT	REPORTER (migrated to workflows)	REPORTER (standard template)
FMVSS	2024	208 Front FFB	●	●		●	
Global NCAP	2022	MDB	●	●		●	
	2023	ODB	●	●		●	
	2024	Side Pole	●	●		●	
GTR	2019	Leg Impact					●
	2020	Head Impact					●
IIHS	2017	MDB	●	●	●		
		ODB	●	●			
		SOB	●	●			
	Continued...						

# Latest Protocol Support

Automotive Assessments Workflow

- Available for some time
- New in version 21.1
- New in version 22.0

Regulation	Year	Loadcase/Workflow	PRIMER	T/HIS	D3PLOT	REPORTER (migrated to workflows)	REPORTER (standard template)
IIHS	2021	MDB	●	●	●	●	
		MDB Structure Only				●	
		ODB	●	●		●	
		ODB Structure Only				●	
		SOB	●	●		●	
		SOB Structure Only				●	
	2024	MDB	●	●		●	
		MDB Structure Only				●	
		SOB	●	●		●	
		SOB Structure Only				●	

# Latest Protocol Support

Automotive Assessments Workflow

- Available for some time
- New in version 22.1
- New in version 22.0

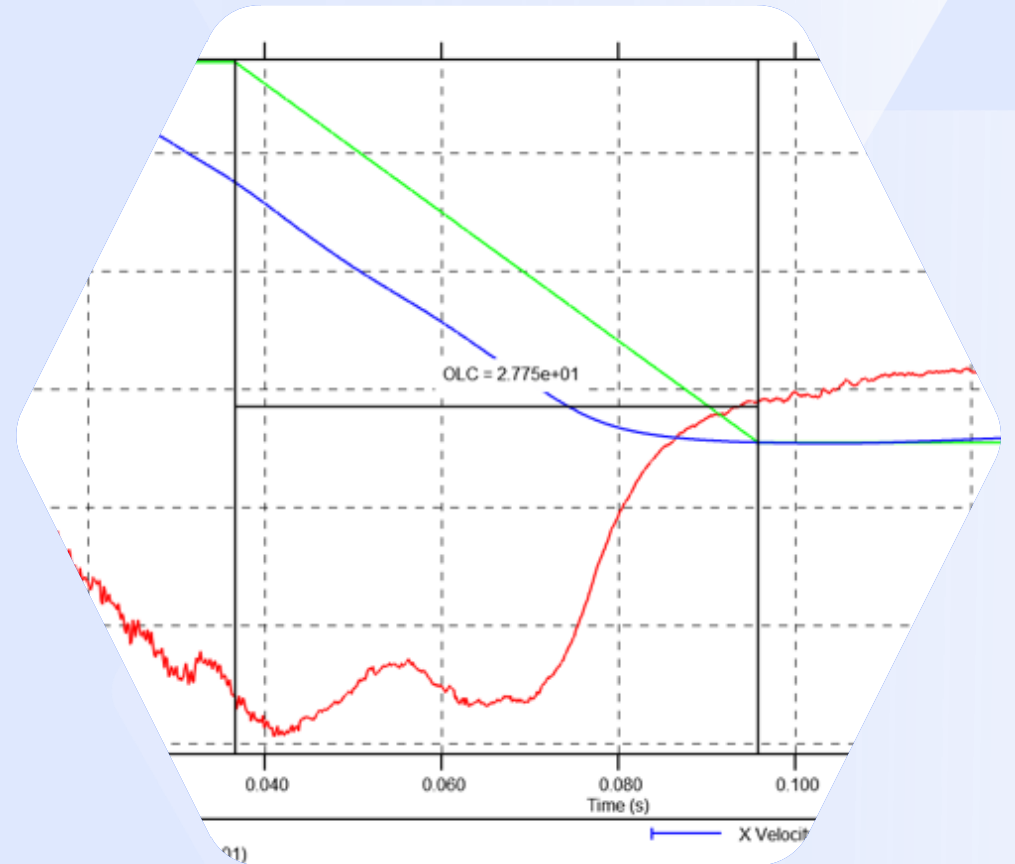
Regulation	Year	Loadcase/Workflow	PRIMER	T/HIS	D3PLOT	REPORTER (migrated to workflows)	REPORTER (standard template)
JNCAP	2018	Leg Impact					●
	2023	FFB	●	●		●	
		MDB	●	●		●	
		ODB	●	●		●	
KNCAP	2019	Leg Impact					●
	2024	FFB	●	●		●	
		MDB	●	●		●	
		Side Pole	●	●		●	
UN ECE	2015	R135 (Side Pole)	●	●		●	
	2022	R94 (ODB)	●	●		●	
	2023	R95 (Side MDB)	●	●		●	
		R137 (FFB)	●	●		●	

# New Automotive Operations

- Occupant Load Criterion (OLC)
- Tibia Index (TI)
- DAMAGE (DMG)



# Occupant Load Criterion (OLC)



# Occupant Load Criterion (OLC)

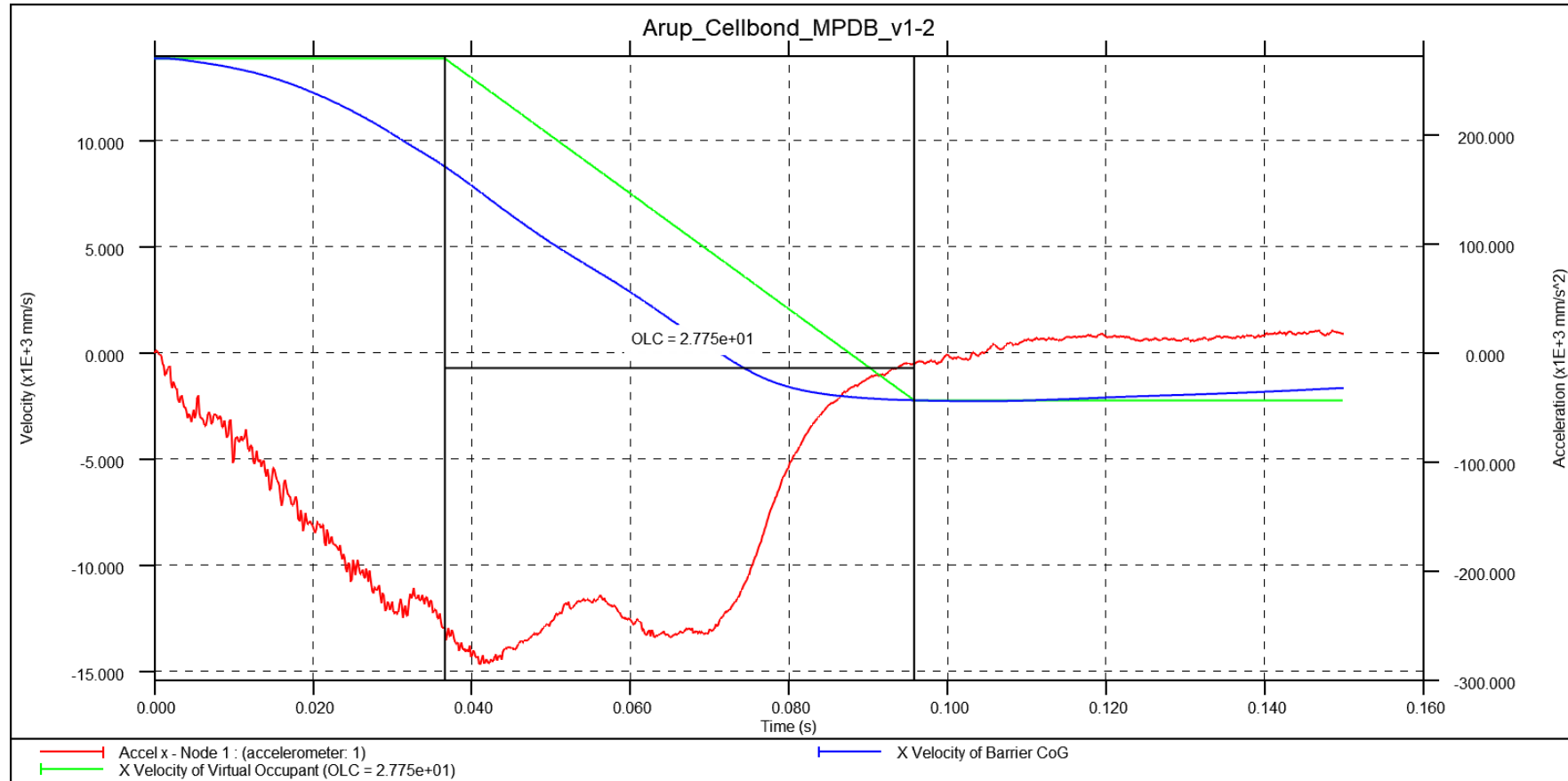
- T/HIS can now calculate OLC and generate velocity and displacement curves for MPDB Compatibility Assessment. The calculation follows the method specified in [Euro NCAP Technical Bulletin \(TB 027\) v1.1.1](#), which is intended to be used with [Adult Occupant Protection Assessment Protocol v9.1.1](#).
- The OLC Operation requires an X Acceleration Curve of the Barrier CoG as its first input and requires the Initial Velocity of the Barrier CoG either as a Velocity Curve or as a Numerical Value.

The screenshot shows a configuration window for the Occupant Load Criterion (OLC) operation. It includes an 'Apply' button at the top left. Below it are two checked options: 'Filter Curves using' (set to 'C180') and 'Always regularise curves'. A text field for 'New X axis interval (dt)' contains '0.10000E-03'. The 'Unit System' is set to 'mm, t, s'. There are three rows of input fields: 'X Accel Curve' (set to '#2'), 'X Velocity Input' (set to '#1'), and 'Output Curve' (set to '% (highest+1)'). Each input field has a dropdown arrow to its right. Red arrows point from the 'Filter Curves using' dropdown to the text 'Filter the Acceleration curve if required', and from the 'Always regularise curves' checkbox to 'Regularise the Acceleration curve if required'. A blue arrow points from the 'Output Curve' dropdown to the text 'Specify the curve id of the first output curve'. Another blue arrow points from the 'X Velocity Input' dropdown to the text 'Input the Velocity curve of the Barrier Model or type in the initial velocity as a numerical constant'. A red arrow points from the 'X Accel Curve' dropdown to the text 'Input the X Acceleration curve of the Barrier Model CoG'. The text 'Display the unit system of input curves' is also present but has no corresponding arrow.

Option	Value	Description
Filter Curves using	C180	Filter the Acceleration curve if required
Always regularise curves	Checked	Regularise the Acceleration curve if required
New X axis interval (dt)	0.10000E-03	
Unit System	mm, t, s	Display the unit system of input curves
X Accel Curve	#2	Input the X Acceleration curve of the Barrier Model CoG
X Velocity Input	#1	Input the Velocity curve of the Barrier Model or type in the initial velocity as a numerical constant
Output Curve	% (highest+1)	Specify the curve id of the first output curve

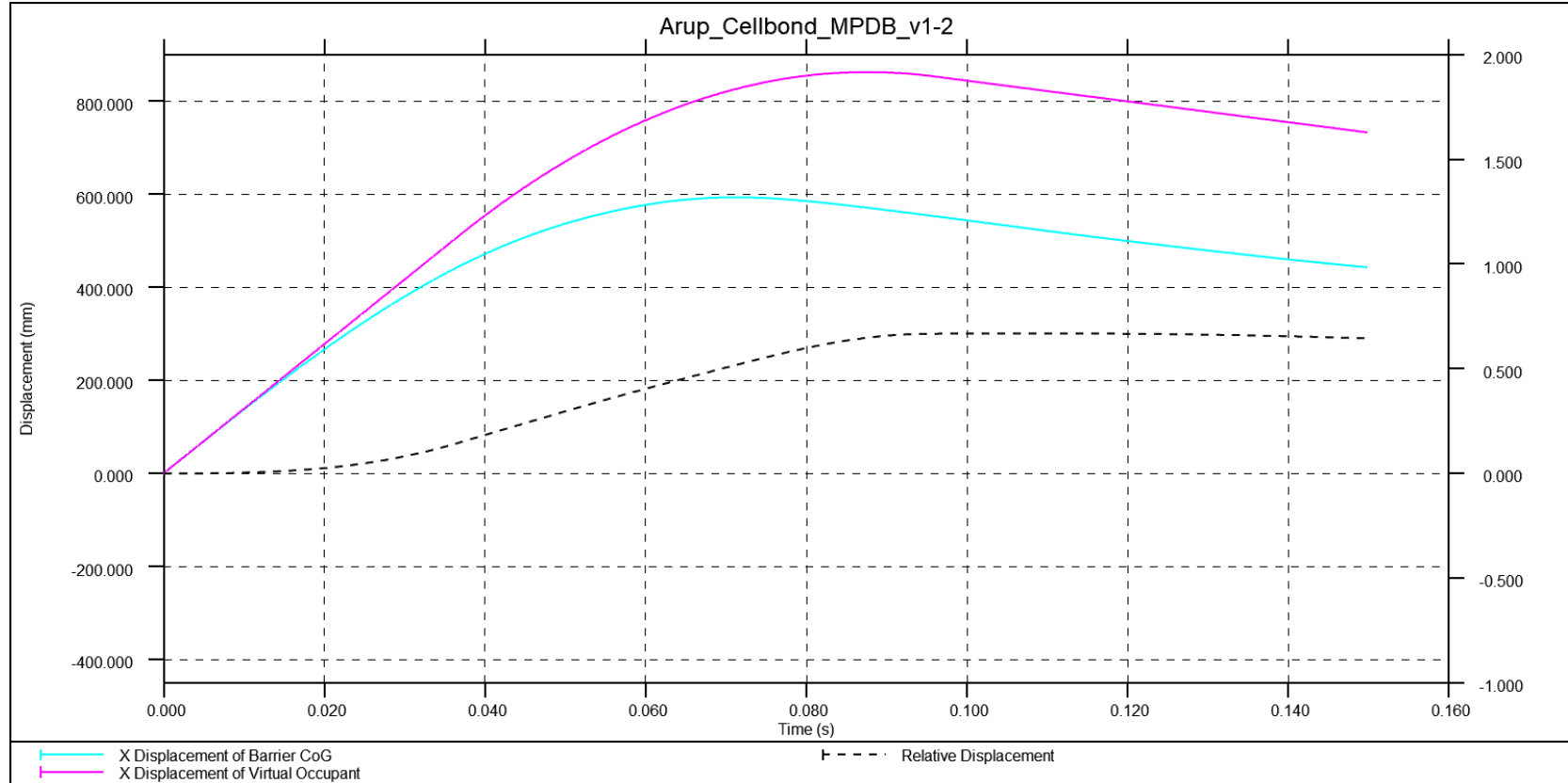
# Occupant Load Criterion (OLC)

- The OLC operation generates two velocity curves:

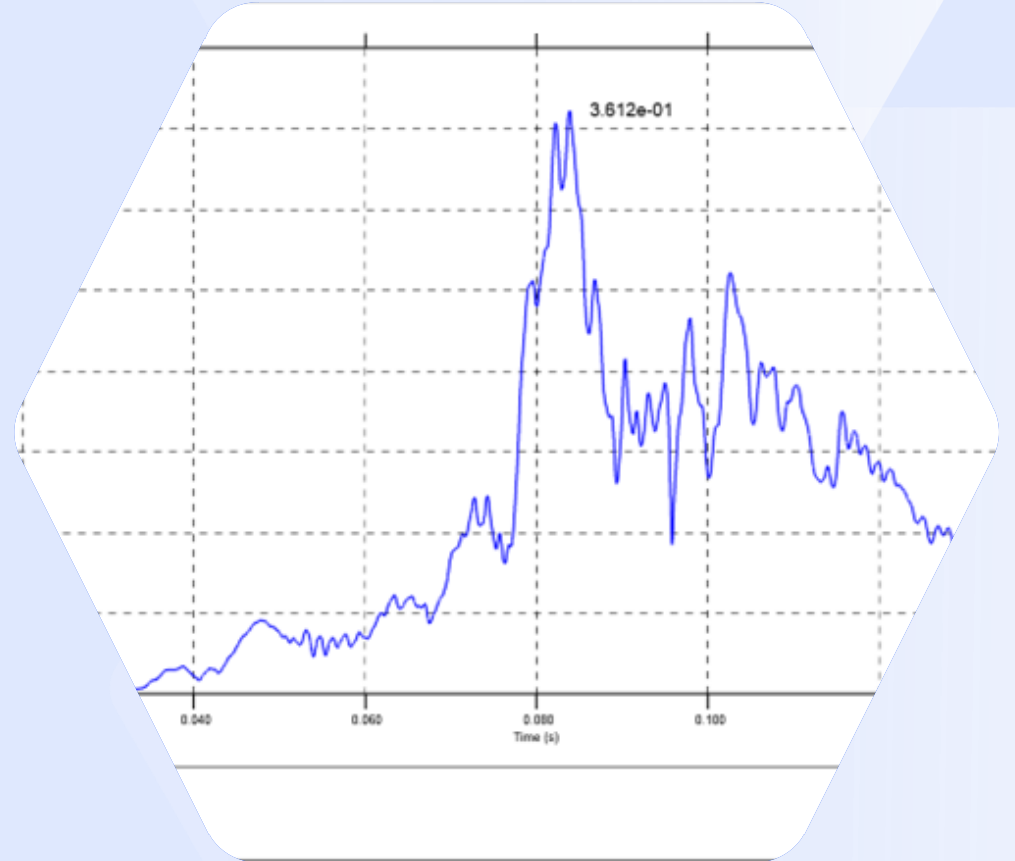


# Occupant Load Criterion (OLC)

- It also generates three displacement curves:



## Tibia Index (TI)





# Tibia Index (TI)

- T/HIS can now calculate the Tibia Index (TI) injury criterion and generate the Tibia Index curve, based on the following interaction formula specified in [Euro NCAP Technical Bulletin \(TB 021\) v4.1](#):

$$TI(t) = \left| \frac{M_R(t)}{(M_R)_c} \right| + \left| \frac{F_Z(t)}{(F_Z)_c} \right|$$

Where,  $M_R(t) = \sqrt{M_x(t)^2 + M_y(t)^2}$

- The TI operation requires three input curves  $F_Z(t)$ ,  $M_x(t)$  and  $M_y(t)$  and two critical constant input values  $(M_R)_c$  and  $(F_Z)_c$ .

# Tibia Index (TI)

Apply

☒ Filter Curves using C600

☒ Always regularise curves

0.10000E-04 New X axis interval (dt)

Unit System mm, t, s

Axial Curve #1

X Moment Curve #2

Y Moment Curve #3

Occupant type HIII-50M

Fzc (Critical Force) 0.3590E+05

Mrc (Critical Bending Moment) 0.2250E+06

Output Curve % (highest+1)

Select to filter the input curves before calculating TI, and select the filter class

C60

C180

C600

C1000

Select to regularise the input curves using the new X axis interval

Displays the unit system of the input curves

Input the Axial Curve ID

Input the X Moment Curve ID

Input the Y Moment Curve ID

Select the Occupant type

HIII-95M

HIII-50M

HIII-05F

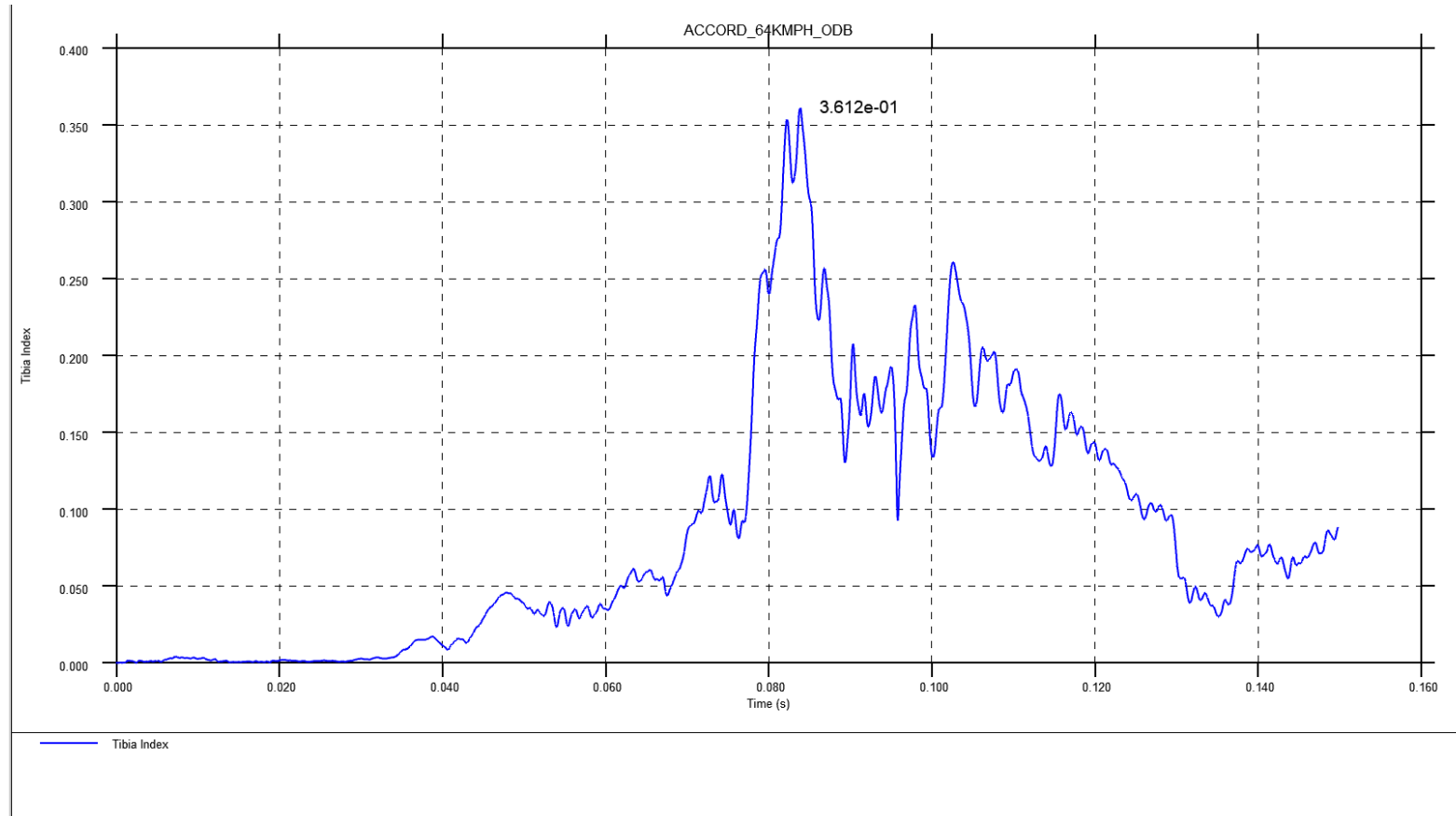
THOR

Other

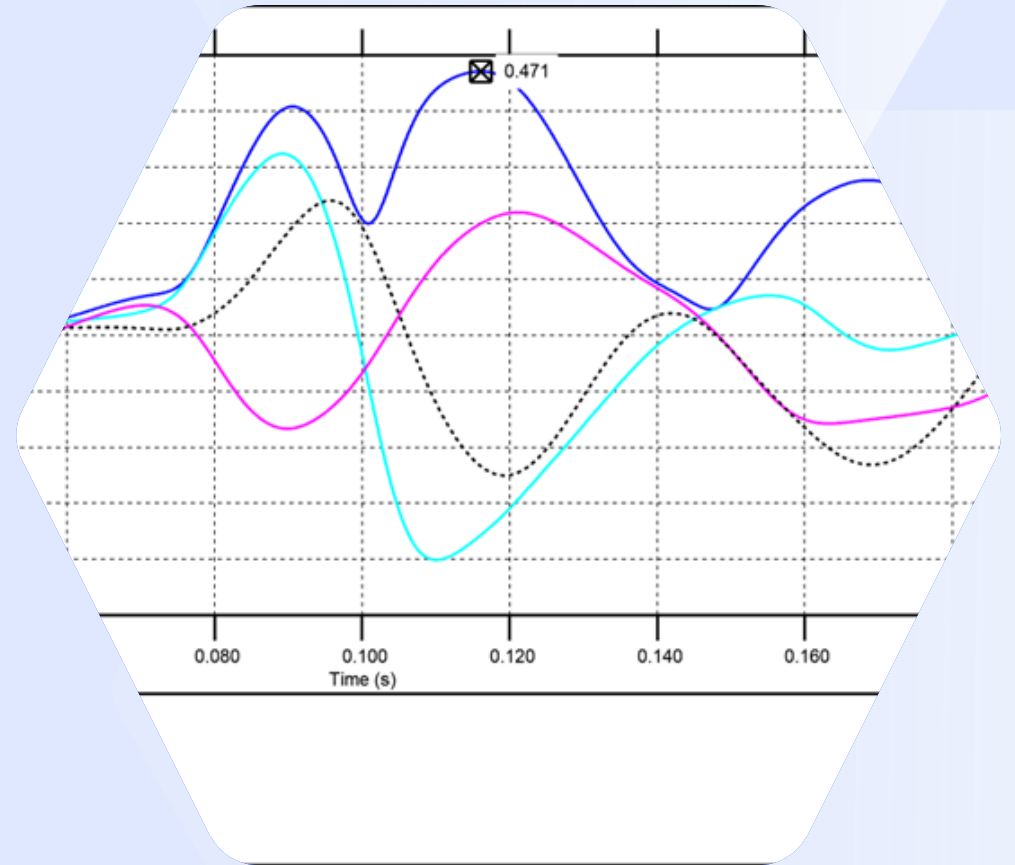
For the standard occupant types,  $(F_z)_c$  and  $(M_R)_c$  values are updated automatically. Otherwise, input suitable Critical force and Critical Bending Moment values.

# Tibia Index (TI)

- The TI operation generates a Tibia Index output curve.
- The Tibia Index value can be displayed on the graph by turning on the “Show Max Value” property of the Tibia Index curve.



## DAMAGE Criterion (DMG)



# Damage Criterion (DMG)

- The DAMAGE Criterion is a brain injury metric which is based on deformation output from a second-order system of equations.
- T/HIS can now calculate Damage Criterion (DMG) and generate the Damage curve, based on the interaction formula specified in the [Euro NCAP Technical Bulletin \(TB 035\) v1.0](#) (right).
- DMG requires three input curves: Head Rotation Velocity X, Head Rotation Velocity Y, Head Rotation Velocity Z.
- You can also select the calculation method used to perform the Damage operation. The available methods are:
  - RK4: Runge Kutta 4
  - RKF45: Runge Kutta 45
  - NBM: Newmark Beta method

$$\begin{bmatrix} m_x & 0 & 0 \\ 0 & m_y & 0 \\ 0 & 0 & m_z \end{bmatrix} \begin{Bmatrix} \ddot{\delta}_x \\ \ddot{\delta}_y \\ \ddot{\delta}_z \end{Bmatrix} + \begin{bmatrix} c_{xx} + c_{xy} + c_{xz} & -c_{xy} & -c_{xz} \\ -c_{xy} & c_{xy} + c_{yy} + c_{yz} & -c_{yz} \\ -c_{xz} & -c_{yz} & c_{xz} + c_{yz} + c_{zz} \end{bmatrix} \begin{Bmatrix} \dot{\delta}_x \\ \dot{\delta}_y \\ \dot{\delta}_z \end{Bmatrix} + \begin{bmatrix} k_{xx} + k_{xy} + k_{xz} & -k_{xy} & -k_{xz} \\ -k_{xy} & k_{xy} + k_{yy} + k_{yz} & -k_{yz} \\ -k_{xz} & -k_{yz} & k_{xz} + k_{yz} + k_{zz} \end{bmatrix} \begin{Bmatrix} \delta_x \\ \delta_y \\ \delta_z \end{Bmatrix} = \begin{bmatrix} m_x & 0 & 0 \\ 0 & m_y & 0 \\ 0 & 0 & m_z \end{bmatrix} \begin{Bmatrix} \ddot{u}_x \\ \ddot{u}_y \\ \ddot{u}_z \end{Bmatrix}$$

$$DAMAGE = \beta \max_t \{|\delta^{\rightarrow}(t)|\}$$

$$\delta^{\rightarrow}(t) = [\delta x(t) \ \delta y(t) \ \delta z(t)]^T$$

$\beta$  = scale factor,  $m$  = mass,  $c_{ij}$  = damping,  $k_{ij}$  = stiffness

$\delta''$ ,  $\delta'$ ,  $\delta$  = acceleration, velocity, displacement

$\ddot{u}$  = applied angular acceleration

$m_x = 1 \text{ kg}$ ,  $m_y = 1 \text{ kg}$ ,  $m_z = 1 \text{ kg}$

$k_{xx} = 32142 \text{ N/m}$ ,  $k_{yy} = 23493 \text{ N/m}$ ,  $k_{zz} = 16935 \text{ N/m}$ ,

$k_{xy} = 0 \text{ N/m}$ ,  $k_{yz} = 0 \text{ N/m}$ ,  $k_{xz} = 1636.3 \text{ N/m}$ ,

$a_1 = 5.9148 \text{ ms}$ ,

$\beta = 2.9903 \text{ 1/m}$

$[c] = a_1 \times [k]$

# Damage Criterion (DMG)

Apply

☒ Filter Curves using 

C60

☒ Always regularise curves

0.10000E-03

 New X axis interval (dt)

Unit System 

mm, t, s

X Rot. Velocity

#1

...

Y Rot. Velocity

#2

...

Z Rot. Velocity

#3

...

Calculation method 

☒ Runge Kutta 4

☐ Runge Kutta Fehlberg 45

☐ Newmark beta method

Output Curve 

% (highest+1)

...

Select to filter the input curves before calculating DMG, and select the filter class

Select to regularise the input curves using the new X axis interval

Displays the unit system of the input curves

Input the Head Rotational Velocity X

Input the Head Rotational Velocity Y

Input the Head Rotational Velocity Z

Select the Calculation method

C60

C180

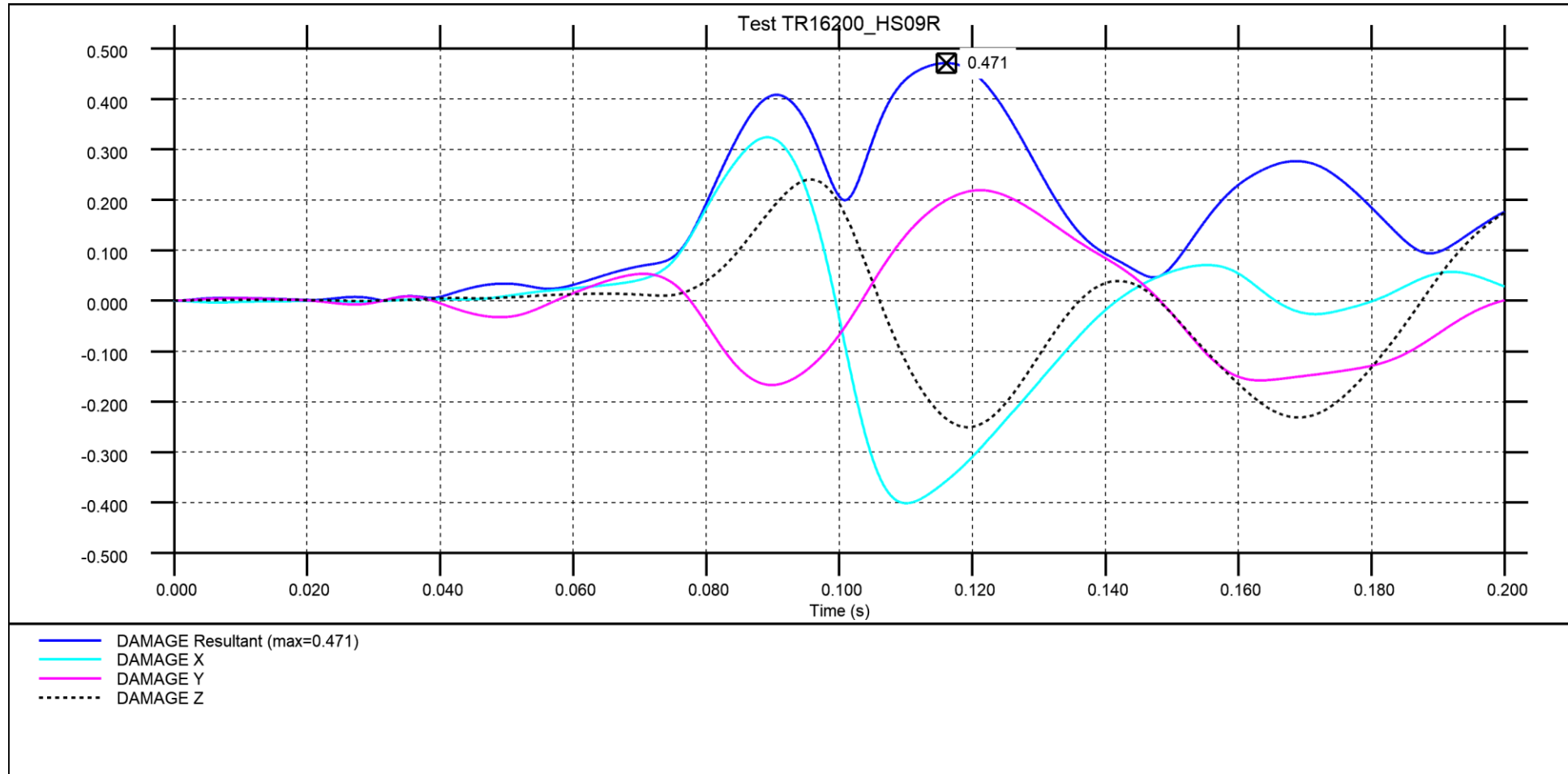
C600

C1000



# Damage Criterion (DMG)

- The DMG operation generates four DAMAGE curves:



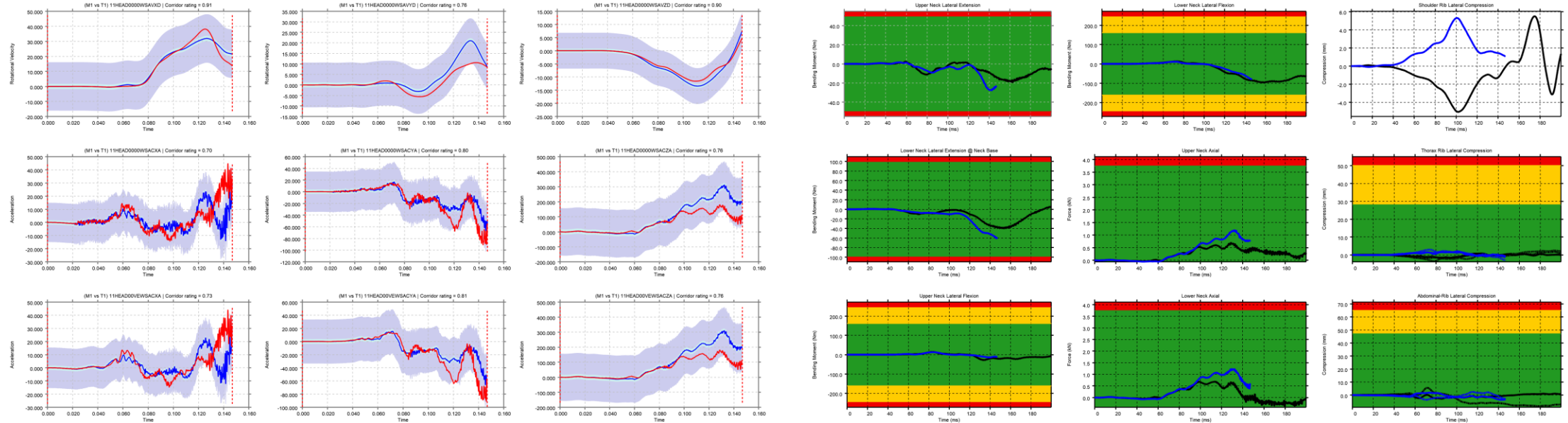
# Speed and Performance

# Datums

# Datums

- The previous hard-wired limit of 256 for datums has now been removed from T/HIS. Any number of datums can now be created with machine specifications being the limiting factor.

Many constant and points datums in a single session:



# Write ISO-MME Files



# Write ISO-MME Files

New variables have been added to ISO-MME configuration files:

- **mandatoryHeaders:** Controls the inclusion of mandatory headers in MME files. When set to true, all mandatory headers are automatically included. When set to false, mandatory headers are omitted, allowing headers to be rearranged using the descriptor functionality. The default value for this variable is true.
- **testObjectHeaderNumber:** Specifies the test object header number required in MMD files. By default, this value corresponds to the first letter of the curve ISO code. This variable is used when a different test object number is required instead of the default behaviour.

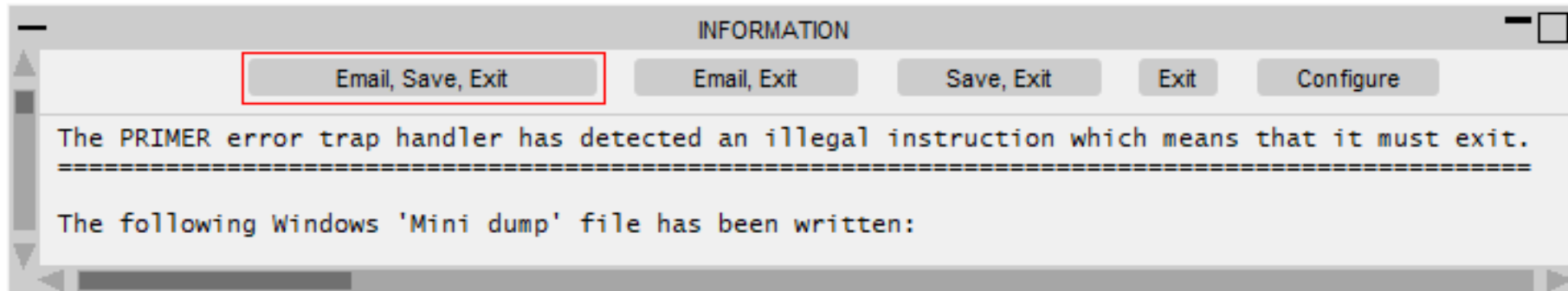
It is also now possible to write ISO-MME files directly from curves, without configuration, using the new [Curve to ISO-MME](#) Workflow.



# Email Minidump Files

# Windows Minidump files can now be emailed

- Following a crash on Windows a “minidump” file is created which, if sent, can sometimes enable us to diagnose the cause of the crash, suggest workarounds and fix the bug. Historically this file has been written to an obscure temporary directory making it laborious to extract and send it.
- T/HIS can now:
  - Compose an email automatically, attaching the minidump file.
  - Include further information about the crash (stack trace) in that email.
  - Launch the default email handler on the system so that you can add further information if you wish.
- This email is ***not*** sent automatically, you can choose to send it or not.
- Composition of these emails is optional; they can be turned off.

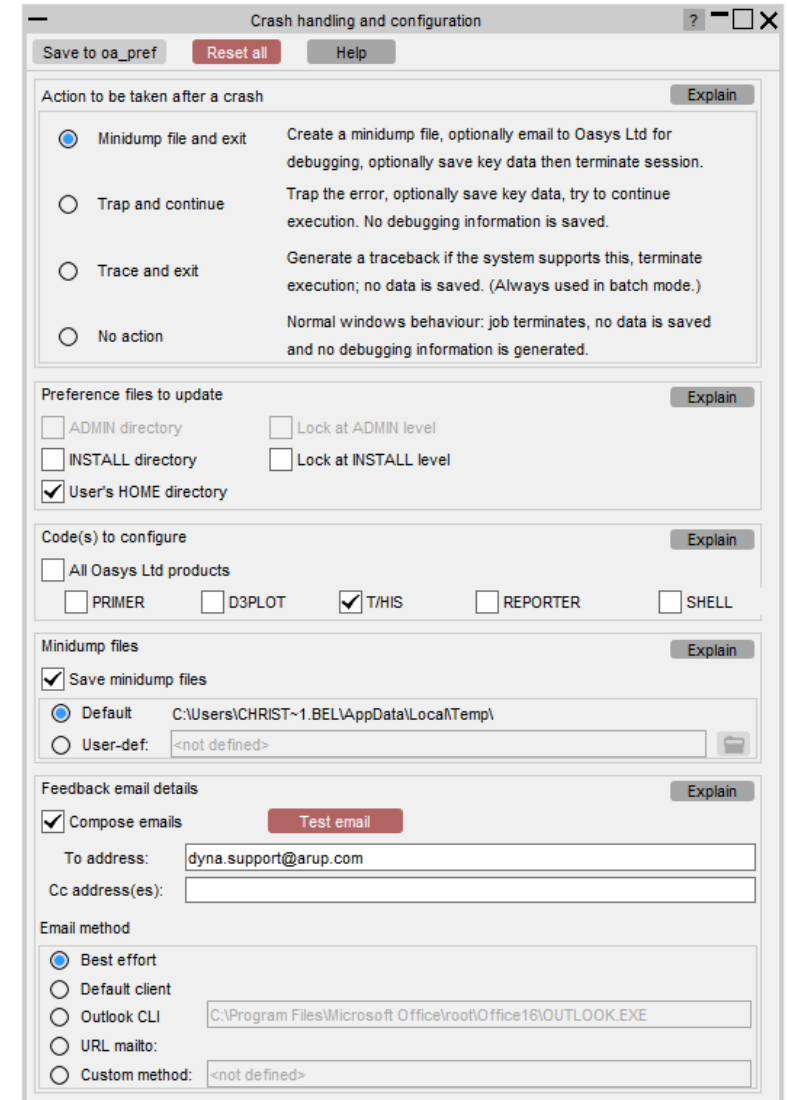


# Windows Minidump files can now be emailed (continued)

- Minidump files and crash handling generally can be configured by preferences, but to make this easier there is now an interactive GUI which can be used to control this behaviour:



- Crash dump behaviour can also be configured at the “admin” or “installation” levels during software installation, configuring it for all users.



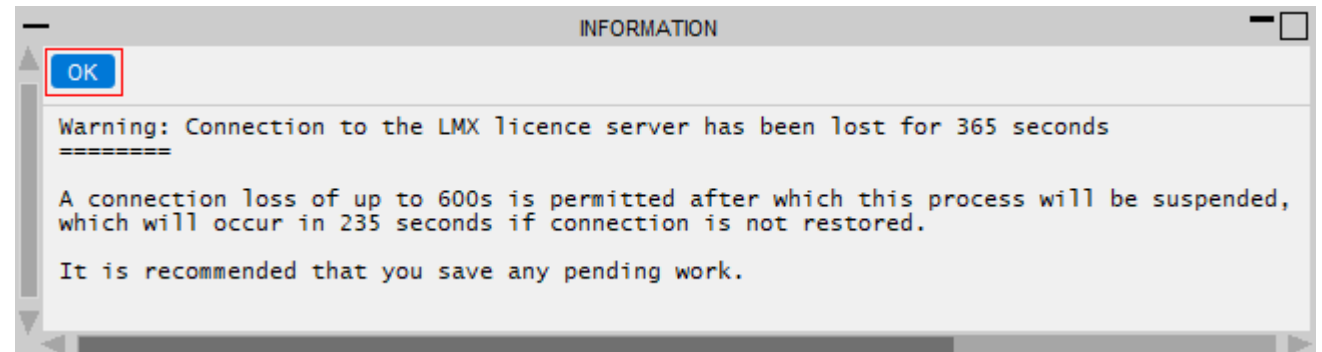
# Improved LMX server connection loss behaviour (V22.1 onwards)

# Improved LMX server connection loss behaviour (V22.1)

Oasys Ltd software uses the LMX licensing system which requires connection to a licence server when the software first starts. It also maintains regular contact with that server during the session to enable the server to keep track of usage. If contact with the server is lost for more than approximately 10 minutes the behaviour in versions before V22.1 was to terminate the session.

This has been changed from V22.1 onwards so that the session is suspended rather than terminated. When connection with the licence server is regained it will continue as before, or alternatively the user can choose to terminate it. The process now works as follows:

After approximately 6 minutes of server connection loss a warning message will appear:



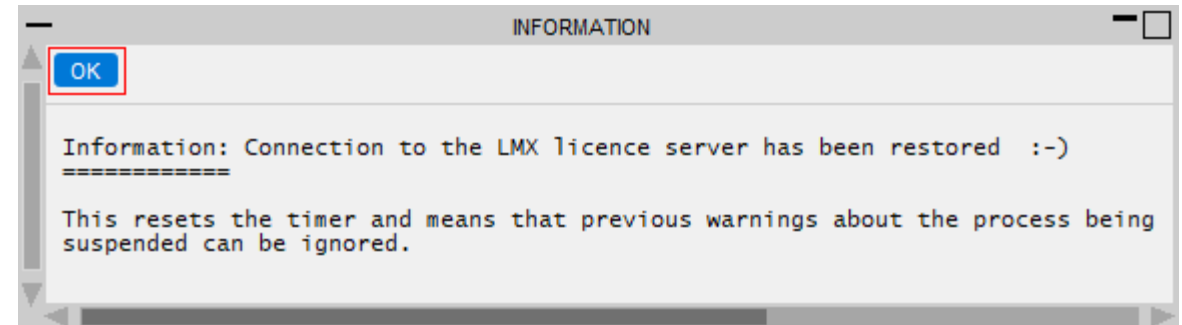
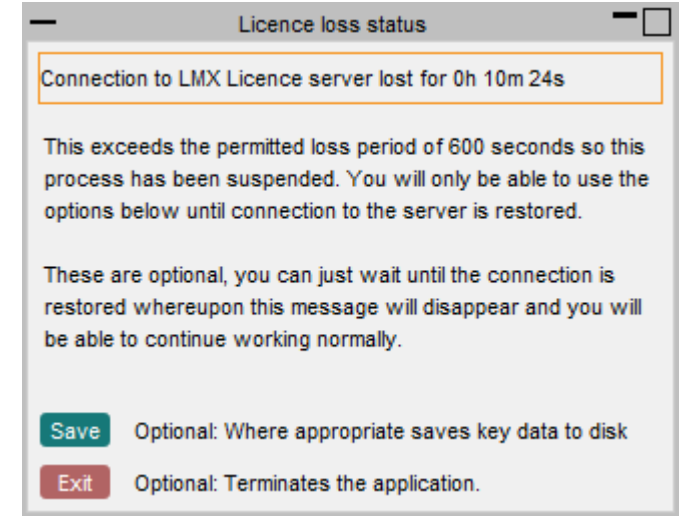
# Improved LMX server connection loss behaviour (V22.1)

This message will be updated at approximately one minute intervals, giving the time remaining, until the limit of ten minutes is reached. During this period T/HIS will operate normally.

When ten minutes of licence loss have elapsed it will be replaced with this dialogue. The T/HIS session will remain live but “frozen” so that no further work can be done. No data will be lost.

The user can just wait and do nothing, or **Save** all models to disk and continue to wait for the licence connection to be restored, or **Exit** normally.

If the licence server connection is restored this panel will disappear, this confirmation message will be shown and T/HIS will resume working normally.

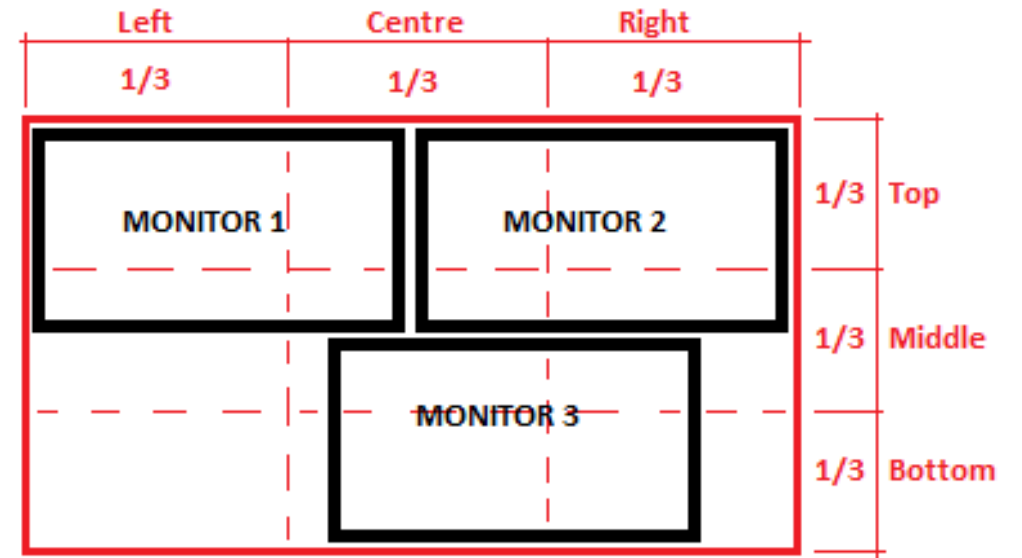
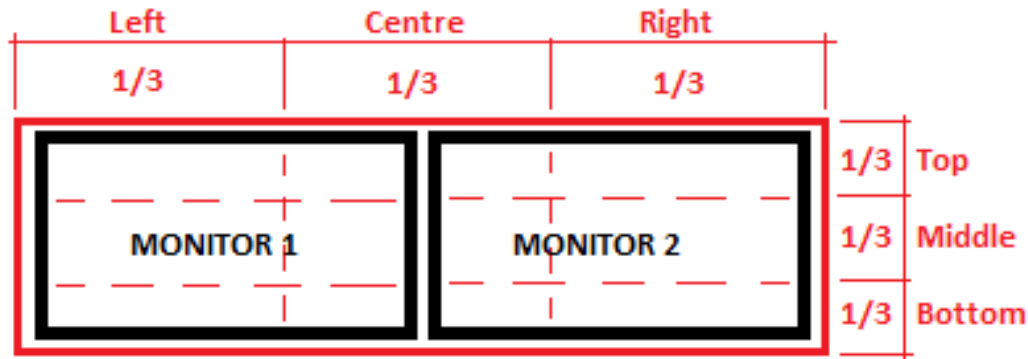




# Initial Window Placement

# Master T/HIS window can start on a selected monitor.

- On a multi-monitor desktop the “placement” preference can be used to select which of multiple monitors on a desktop the master T/HIS window starts in. Previously this was always the main display window. The bounding box (red) around the monitors (black) that make up the desktop in pixel space which is divided into 1/3rds. For example:



The preference value may be a combination of  
**LEFT | CENTRE | RIGHT**  
and / or

**TOP | MIDDLE | BOTTOM**

The monitor nearest to the centre of that 1/3<sup>rd</sup> sub-area is used.

# Flexible Automation and Integration

# JavaScript API

# JavaScript API

- It is no longer necessary to specify the memory required when running a script. The memory is now automatically increased as required.
- The function assigned to the Window onClose event can now return false to prevent the window closing if required.

# JavaScript API

- Functionalities to set and query the Model and Display Units have been added.
- The GetModelUnits and SetModelUnits methods can be accessed from the Model Class, using the model instance.
- The GetDisplayUnits and SetDisplayUnits methods can be accessed from the Units Class.



# JavaScript API

- New Automotive operations added to the Operate Class:

Class function	Required Inputs	Optional Inputs	Output	Example
<b>Operate.Olc()</b>	<ul style="list-style-type: none"><li>• Acceleration Curve</li><li>• Velocity Curve or Initial Velocity as a constant</li></ul>	<ul style="list-style-type: none"><li>• X axis Interval for regularization</li><li>• Filter type as a string</li></ul>	Returns an array of 5 curves	<pre>Operate.Olc(curve1, curve2, 0.001, 'C180'); or Operate.Olc(curve1, 13888, 0.001, 'C180');</pre>
<b>Operate.Ti()</b>	<ul style="list-style-type: none"><li>• Axial Curve</li><li>• X Moment Curve</li><li>• Y Moment Curve</li><li>• Critical Force value</li><li>• Critical Bending Moment value</li></ul>	<ul style="list-style-type: none"><li>• X axis Interval for regularization</li><li>• Filter type as a string</li></ul>	Returns a curve object	<pre>Operate.Ti(curve1, curve2, curve3, 35.9, 225, 0.0001, 'C600');</pre>
<b>Operate.Dmg()</b>	<ul style="list-style-type: none"><li>• X Rot. Velocity Curve</li><li>• Y Rot. Velocity Curve</li><li>• Z Rot. Velocity Curve</li><li>• Calculation method string: 'rk4', 'rkf45', 'nbm'</li></ul>	<ul style="list-style-type: none"><li>• X axis Interval for regularization</li><li>• Filter type as a string</li></ul>	Returns an array of 5 curves	<pre>Operate.Dmg(curve1, curve2, curve3, 'rk4', 0.001, 'C60');</pre>

# JavaScript API

- New methods added to the Model Class:

Member function	Required Inputs	Output	Example
<b>model.GetModelUnits()</b>	No Input	Returns Model Unit System	<pre>let model = Model.GetFromID(1); model.GetModelUnits();</pre>
<b>model.SetModelUnits()</b>	Model Unit System	True if Model units are set, else False	<pre>let model = Model.GetFromID(1); model.SetModelUnits("U2");</pre>

# JavaScript API

- New methods added to the Units Class:

Class function	Required Inputs	Output	Example
<b>Units.GetDisplayUnits()</b>	No Input	Returns Display Unit System	<code>Units.GetDisplayUnits();</code>
<b>Units.SetDisplayUnits()</b>	Display Unit System	True if Display units are set, else False	<code>Units.SetDisplayUnits("U2");</code>

# JavaScript API

- New property added to the Graph Class:

Member property	Output	Example
<code>graph.show_y2axis</code>	Gets / sets the display of the Y2 axis	<pre>let graph = Graph.GetFromID(1); graph.show_y2axis = Graph.ON;</pre>

# JavaScript API

- New property added to the Curve Class:

Member property	Output	Example
<code>curve.y_axis</code>	Gets / sets the Y axis the curve is plotted on	<pre>let curve = Curve.GetFromID(1); curve.y_axis = Curve.Y2_AXIS;</pre>

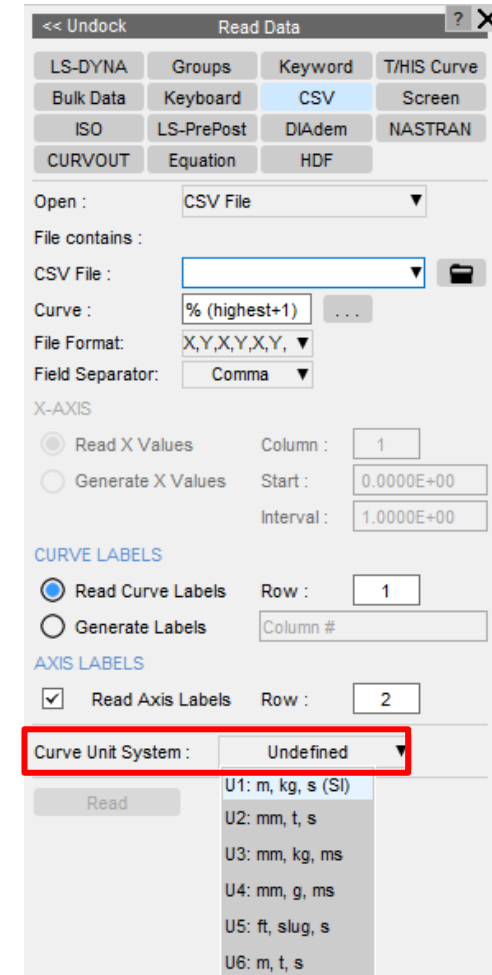
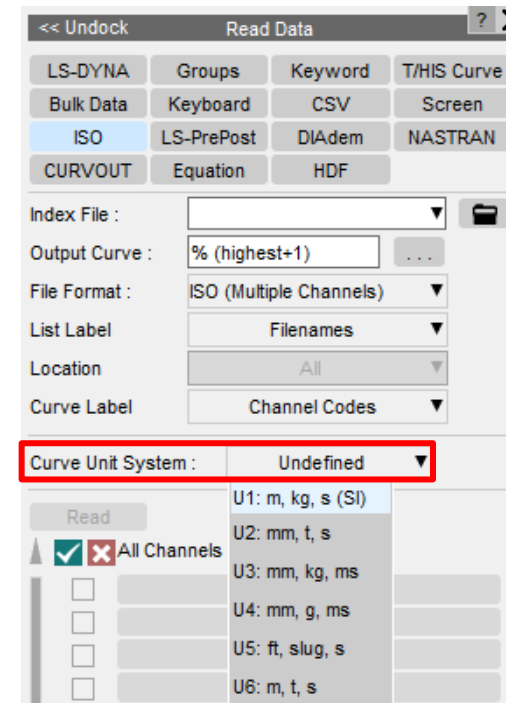
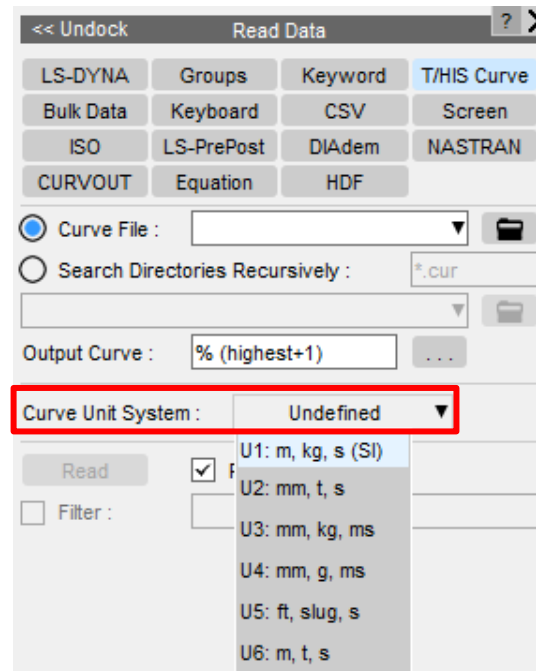
# Other Developments and Preferences



# Units

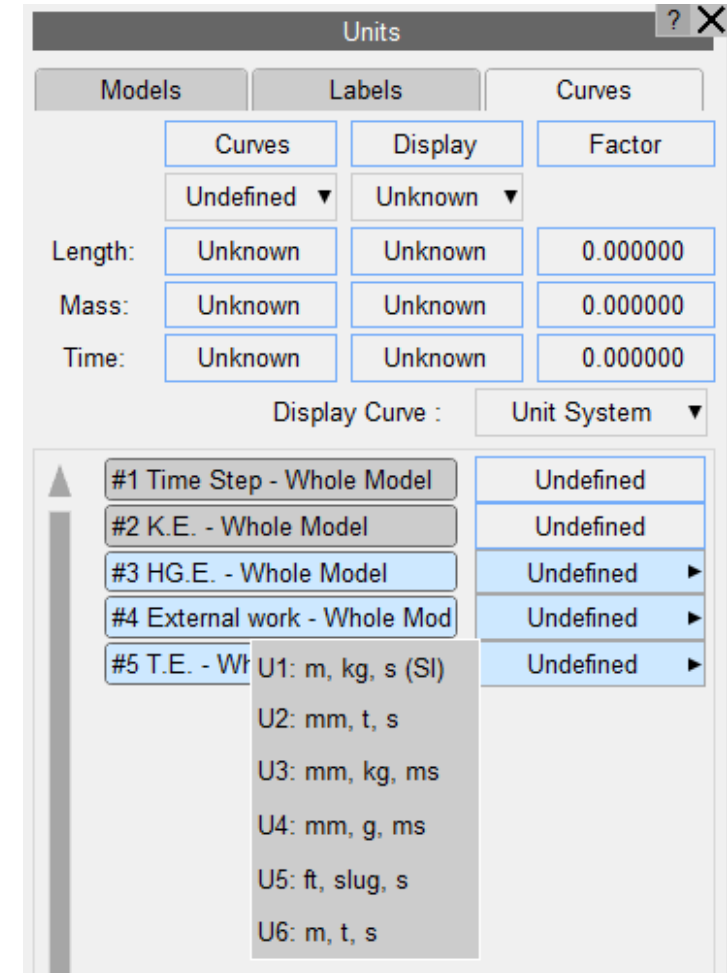
# Curve Unit System

- The **Curve Unit System** dropdown has been introduced in the Read Data panels of **T/HIS Curve**, **CSV** and **ISO**.
- If a unit system is not defined for the curves in the input file, then the unit system selected from this dropdown is applied to the curves read in from the input file.
- Once units are defined for input curves, T/HIS automatically displays units on graphs (even after subsequent curve operations) and knows what scale factor to apply to any constants in Automotive functions (such as [OLC](#) and [Tibia Index](#)).



# Curve Unit System

- Multi-selection of curves is now possible using the curves toggle button, allowing the Unit System or X-Y Units to be modified for multiple curves simultaneously.
- Display Units can also be viewed and adjusted directly from the curves panel.



# New Preferences

# New preferences

Preference	Description
<code>oasys*javascript_maximum_memory_size</code>	Maximum memory allocated for garbage collection (MB)
<code>oasys*cd_compose_email</code> <code>this*cd_compose_email</code>	Whether or not to offer to compose an email for sending minidump files.
<code>oasys*cd_email_address</code> <code>this*cd_email_address</code>	Email address in To: field of crash dump emails.
<code>oasys*cd_cc_addresses</code> <code>this*cd_cc_addresses</code>	Email address(es) in Cc: field of crash dump emails.
<code>oasys*cd_custom_email</code> <code>this*cd_custom_email</code>	Custom method of sending emails.
<code>oasys*cd_dump_directory</code> <code>this*cd_dump_directory</code>	Directory in which to save crash dump files
<code>oasys*cd_email_method</code> <code>this*cd_email_method</code>	Method used to create crash dump emails.
<code>oasys*cd_minidump_file</code> <code>this*cd_minidump_file</code>	Whether or not to create minidump files, and what to do with them.

# New preferences

Preference	Description
<code>this*ctable_show_olc</code>	Display OLC value
<code>this*s_to_ms_conversion_time</code>	Time threshold for seconds to milliseconds conversion
<code>this*show_olc_value</code>	Display OLC value
<code>this*damage_method</code>	Calculation method for calculating Damage injury metric
<code>this*automotive_constant_unit_system</code>	Unit system of the constants in DMG, OLC and TI Operation
<code>this*auto_filter</code>	Automatically filter curves
<code>this*auto_filter_class</code>	Filter class for automatic filtering of curves



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