

True-Load Enhancements

2023-03-31



Tim Hunter

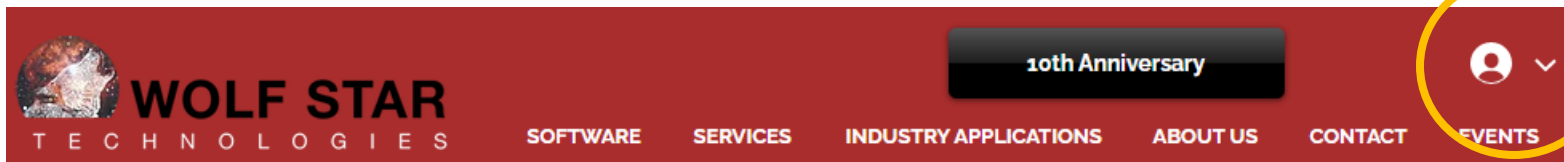


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Enhancements Overview

- Great updates in this release!!!
- Most of the enhancements discussed in this document are updates in performance and usability
- Some new features have been added.
- 51 Enhancements, 5 Bug Fixes



Members Only
Area





Overview – Major Enhancements

- Great new capability! TFU – Weibull Analysis
- Pre-Test picking allow for switching between shells and vtfx
- GOI / Test Data Compare –Stats show in multiple GOI Report
- Ability to save user views
- Find gauges at a distance – User request!!!
- Pick to Hide / Show Parts
- New Curve smoothing capabilities



Enhancements - Overview



Bug Fixes



Details



WOLF STAR

True-Load Enhancements
2023-03-31



Tim Hunter





Details

Major Features

Pre-Test Picking



Save Views



Find Gauges at Distance



Solver Specific

Nastran ODS

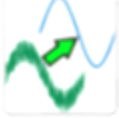


Utilitarian Improvements

Weibull



Curve Smoothing



dy/dt Refinements

$$\frac{dy}{dt}$$

Change Working Directory



Save GIF



LAC Matrix



Simulate Strains



Post-Test Batch



Post-Test Contact Control



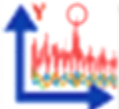
Post-Test Report



ODS Field Results UI



Max Load Plot



GOI Test Data Compare Stats



FEA DB Relative Path



Show / Hide Parts



Bug Fixes





Bugs

Module	Type	Description
ALL	Bug	fix info element picking
ALL	Bug	fix element/node display on menu change in pick by label tool bar
POST	Bug	Error when Generate HTML is unchecked
PRE	Bug	Merge gauge import not working
QSE	Bug	Enable buttons after new DB loaded

If an FEA DB was not found, then when the FEA DB was loaded, the results query buttons were greyed out. This is fixed now.



Enhancements - Overview





Enhancements – True-Load Environment

Module	Type	Description
ALL	Enhancement	WST CAE2VTFX (ceetron CAE2VTFX will be retired)
ALL	Enhancement	Enable user stored views
ALL	Enhancement	Part Mgr: Pick to Hide / Show prints out part name
ALL	Enhancement	Add save to GIF in saving animations
ALL	Enhancement	Force cursor in output console to end
ALL	Enhancement	add memory clean to plotting
ALL	Enhancement	make histogram bins top-inclusive
ALL	Enhancement	improve memory management (in varCopy())
ALL	Enhancement	add copy/move scratch files option to change working directory

Highlighted Records Documented on Details page





Enhancements – TFU Mgr

Module	Type	Description
TFU	Enhancement	Make anfnorRainflow a C++ DLL - for speed improvement
TFU	Enhancement	Use numpy.histo2d() for histogramming 2d data
TFU	Enhancement	Add Ytol / change verbiage on Dy/Dt GUI
TFU	Enhancement	Add Ytol / change verbiage on Smooth Curve
TFU	Enhancement	Add Ytol / change verbiage on Dy/Dt GUI
TFU	Enhancement	Add Ytol / change verbiage on Smooth Curve
TFU	Enhancement	Add Wiebull Analysis to TFU Mgr
TFU	Enhancement	TFU Tracking - Clear Buttons and Behavior
TFU	Enhancement	Allow bulk stats to work with functions of different length
TFU	Enhancement	On dy/dt allow for 1st order (linear) approx functions
TFU	Enhancement	Bulk Stats PNG to be stored in subfolder
TFU	Enhancement	store Bulk Stats CSVs in subfolder
TFU	Enhancement	obey plot legend selection in Bulk Stats plots
TFU	Enhancement	Basename on Plot for Bulk Stats
TFU	Enhancement	TFU Manager Print suppression for speed increase

Highlighted Records Documented on Details page

Major new capability –
Weibull Analysis capability





Enhancements - Pre

Highlighted Records Documented on Details page

Module	Type	Description
PRE	Enhancement	Add minimum distance between gauges to search algorithm - Jan 2023 Release - John Deere request
PRE	Enhancement	Checkbox / Store FEA DB w/ relative path
PRE	Enhancement	When switching between Load Shells Only, VTFX and native preserve element selection.
Pre	Enhancement	3D Bar chart for Load Sensitivity to Strain (LAC Matrix)
PRE	Enhancement	Add LAC Matrix to Pre-Test Report
Pre	Enhancement	Sim Strains on FEA DB use closest ele -- mesh does not have to match.
PRE	Enhancement	Update WST_Candidates after Depopulate Gauges
PRE	Enhancement	Disable Generate Moving Loads Button if the Moving Loads Table is empty





Enhancements - Post

Highlighted Records Documented on Details page

Module	Type	Description
Post	Enhancement	Add generation of allCrossPlots to end of Post-Test Batch (Added TODO in Library -- After Release)
POST	Enhancement	Do not remove spaces (' ') from file names
POST	Enhancement	Enable Hybrid Loads, Contact control for Batch Mode --> Need to redo Post-Test batch to be macro based... too many special cases
Post	Enhancement	Add LAC Matrix to Post-Test Report
POST	Enhancement	Duplicate Hyperlink buttons in report
Post	Enhancement	Save Contact Control setting to external file (allow reloading -- like gauge mapping)
Post	Enhancement	Make DAT files only available for Batch Mode





Enhancements - QSE

Module	Type	Description
QSE	Enhancement	Checkbox / Store FEA DB w/ relative path
QSE	Enhancement	Add stats to GOI Test Compare
QSE	Enhancement	Add ODS generator for Op2 files
QSE	Enhancement	In ODS Form, make sure LineEdits are set to EditingFinished
QSE	Enhancement	In ODS Export, make sure result ODS is INCLUSIVE of Start and Stop time
QSE	Enhancement	In ODS Export have a check box to show markers on plot. The default should be unchecked.
QSE	Enhancement	No markers on Plot All - ODS Export
QSE	Enhancement	Obey QSE plot legend check box
QSE	Enhancement	Speed up QSE zoom box draw (use existing y max and min)
QSE	Enhancement	QSE Print suppression for speed increase
QSE	Enhancement	Max load Plot like ODS plot
QSE	Enhancement	add event info button; event info no longer printed during event generation

Highlighted Records Documented on Details page



Install Auto File Open and Icons





Install Auto File Open and Icons

WinZip Self-Extractor

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by Wolf Star Technologies, LLC

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is strictly prohibited under US Copyright protection

OK

1

WinZip Self-Extractor - True-Load_Installer_2022-08-29.exe

You may need to edit
- <install_dir>/config.py

Setup

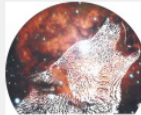
Cancel

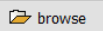
C:\WINDOWS\system32\cmd.exe

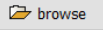
C:\Users\TIMHUN~1\AppData\Local\Temp\WZSE0...

Wolf Star Technologies
True-Tools Installer
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Wolf Star Technologies Installer

 **WOLF STAR**
T E C H N O L O G I E S

Destination Directory: C:\TrueLoadApp 

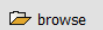
Python 3.6 | Anaconda 4.3.1 (64-bit) Directory: D:\Anaconda3 

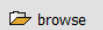
Default FEA: *.odb 

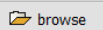
☐ Open as VTFx

☐ Install Abaqus CAE Plugin

☐ Download Ansys WorkBench Plugin

Shortcut Location (e.g. Desktop): C:\Users\TimHunter\OneDrive - Wolf Star Technologies\Desktop 

Default work dir (for shortcut): C:/scratch 

Licensing Path -- Optional
(e.g. port@host; <path to LIC file>): 5053@WST11 

Install

Cancel

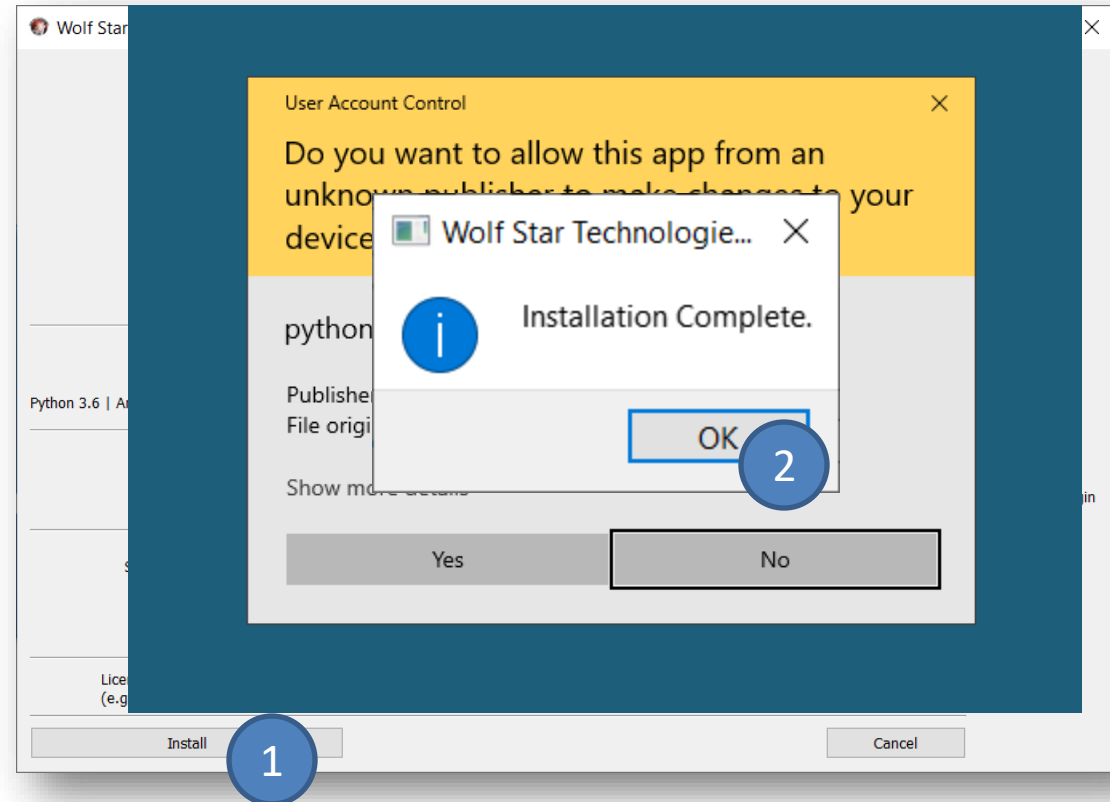
Options to install 3rd Party
Plugins during True-Load install.

These can be installed later
through the Tools Menu.





Install Auto File Open and Icons



Clicking **Yes** with Admin privileges installs file icons and file open methods.

Clicking **No**, or not having Admin privileges completes the install just without file icons and open methods.



Install Auto File Open and Icons

File Icons



*.LDE → True-LDE



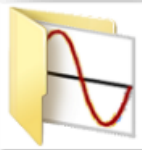
*.QSE → True-QSE



*.TLD → True-Load



*.T3D → ODS (from True-QSE)



*.TFU → TFU File



*.VTFx → VTFx File

Double Clicking Opens
TrueLoadApp and loads file

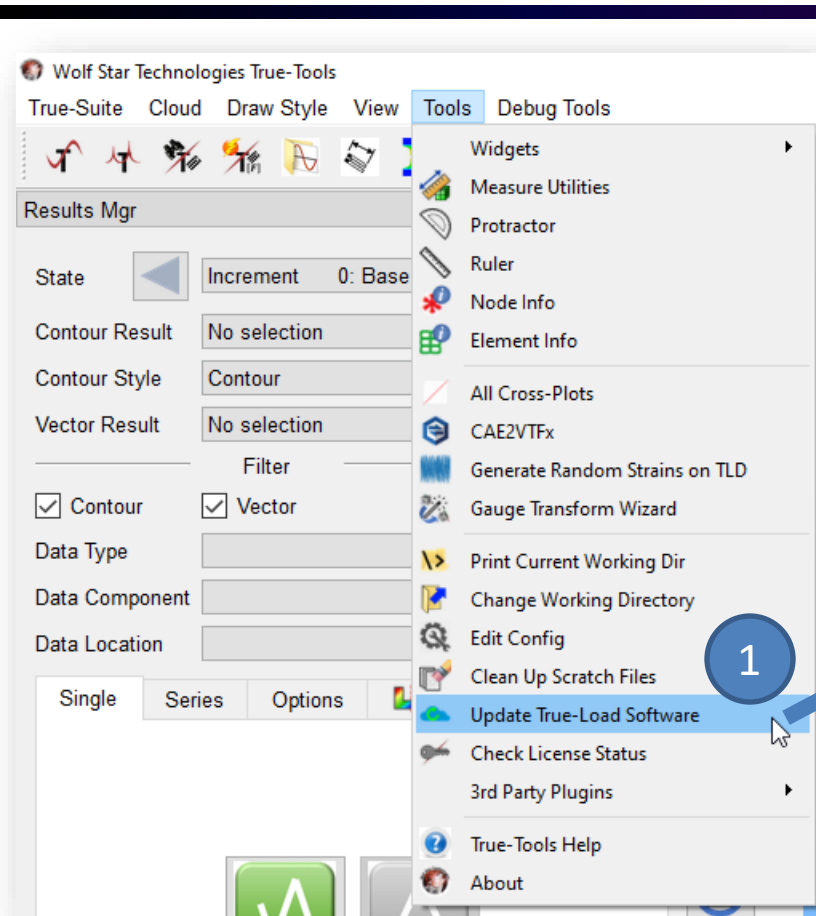
Double Clicking Opens
VTFxViewer and loads file

Secure Software Download





Secure Software Download



Connections to FTP servers is through SFTP and should be able to be accessed through secure firewalls.

If you still cannot download the software, please contact us to provide direct downloads for you.



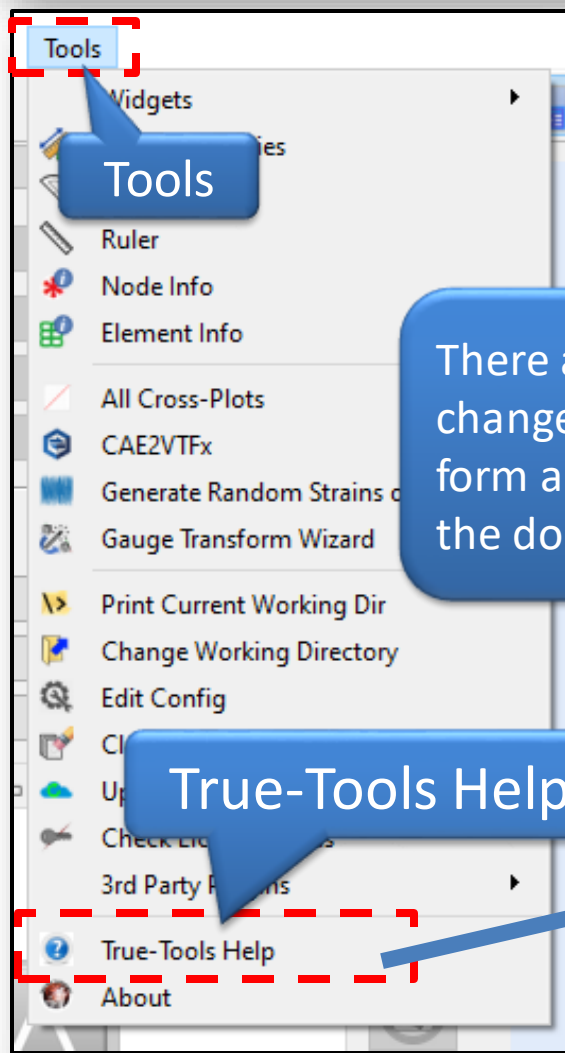
Help



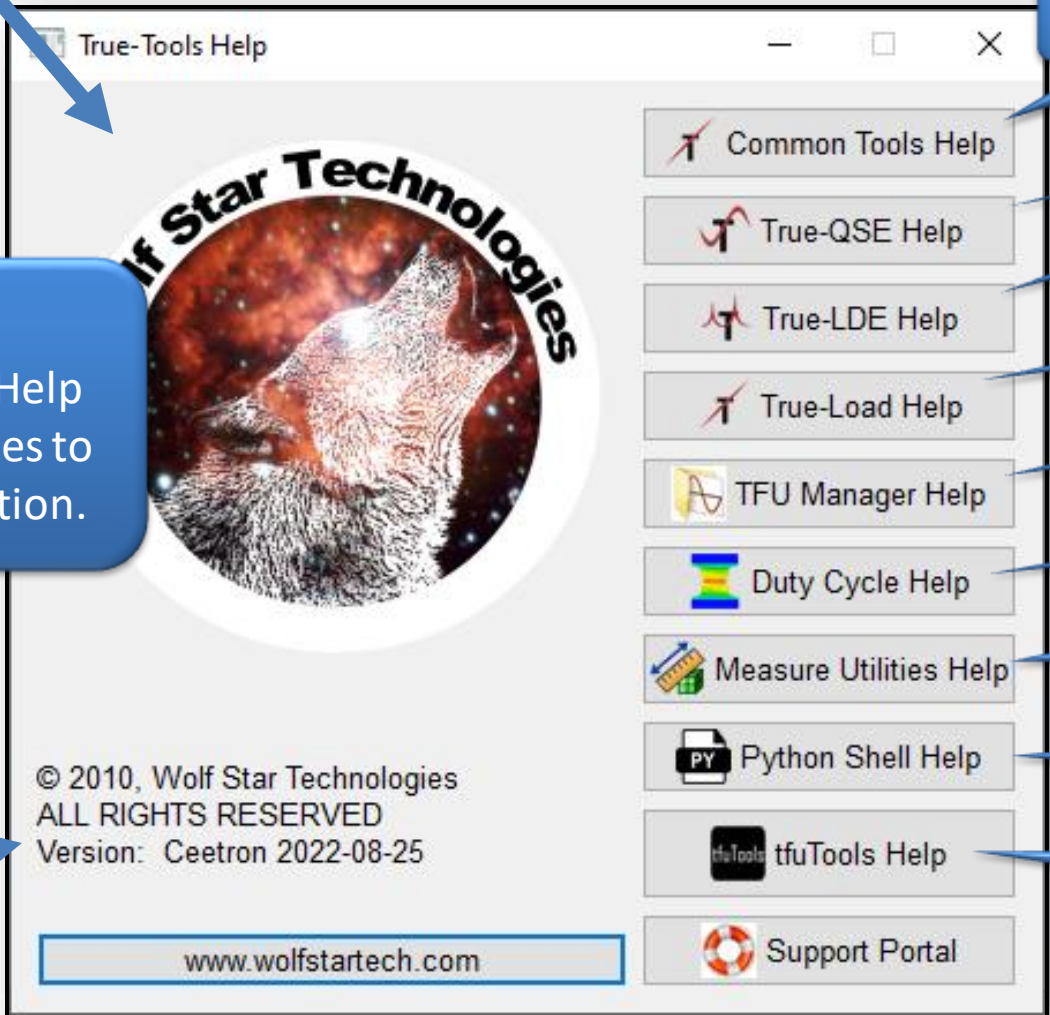


True-Tools Help

Help



There are some changes to the Help form and updates to the documentation.



Common Tools

True-QSE

True-LDE

True-Load

TFU Manager

Duty Cycle

Measure Utilities

Python Shell

tfuTools

True-Tools Help



Save GIF





Save Animation as GIF

Results Mgr

State

Contour Result

Contour Style

Vector Result

☒ Contour ☒ Vector

Data Type: Displacement

Data Component

Data Location

Single Series Options

1 30 41

Tracking TFU

Results Mgr Group Mgr Part Mgr XY Mgr

Save As

This PC > Windows (C:) > scratch > ceeTron_dev > Code Test

Search Code Test

New folder

Name	Type	Size	Tags
ANI TEST	File folder		
annieTestGaug...	File folder		
annieTestGaugName...	File folder		
ansysHlamp-ansysHla...	File folder		
ansysHlamp-ansysHla...	File folder		
Big TLD	File folder		
GIF Test	File folder		
headlampLoadsRS...	File folder		
headlampLoadsRS...	File folder		

File name: hlampExample

Save as type: MP4 Files (*.mp4) AVI Files (*.avi) MP4 Files (*.mp4) **GIF Files (*.gif)**

1 **2** **3**

Play Animation

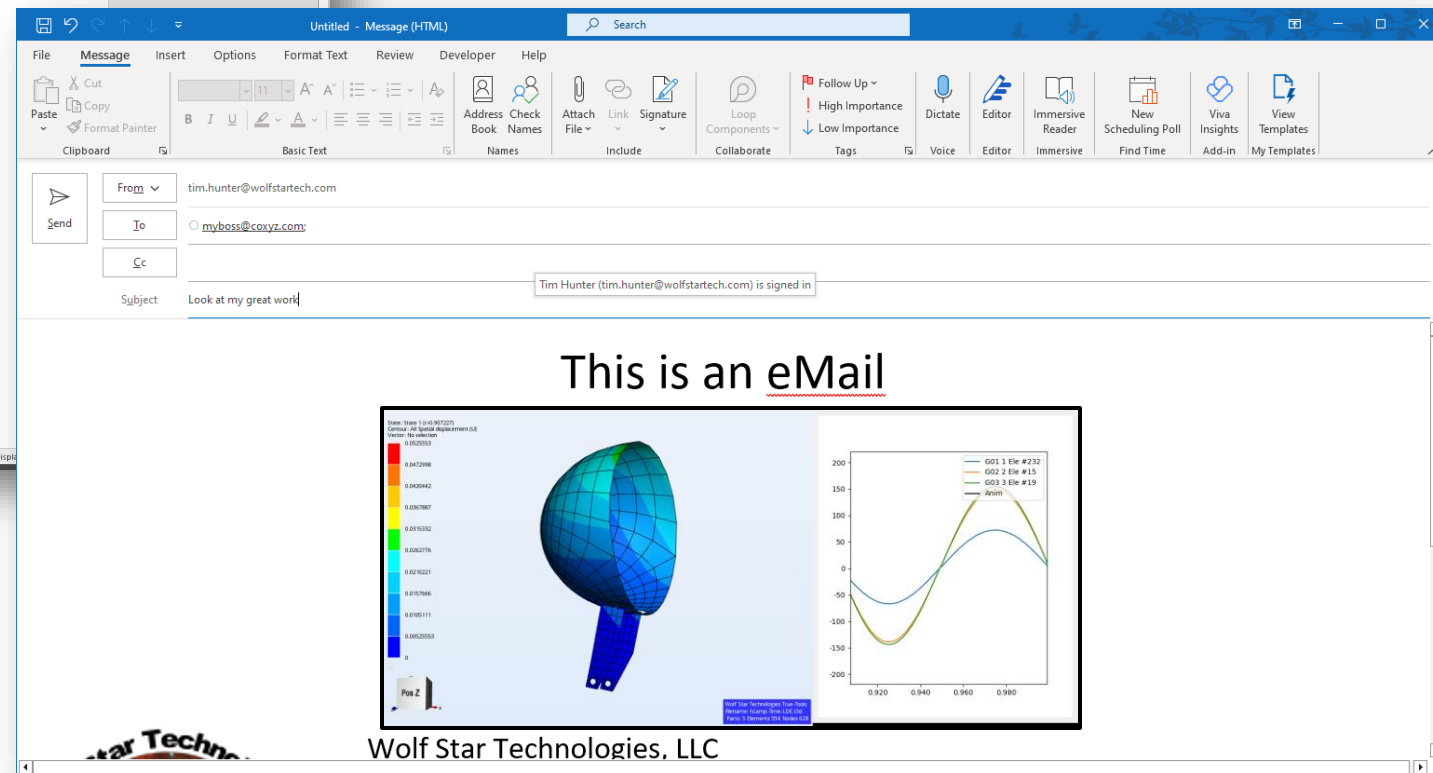
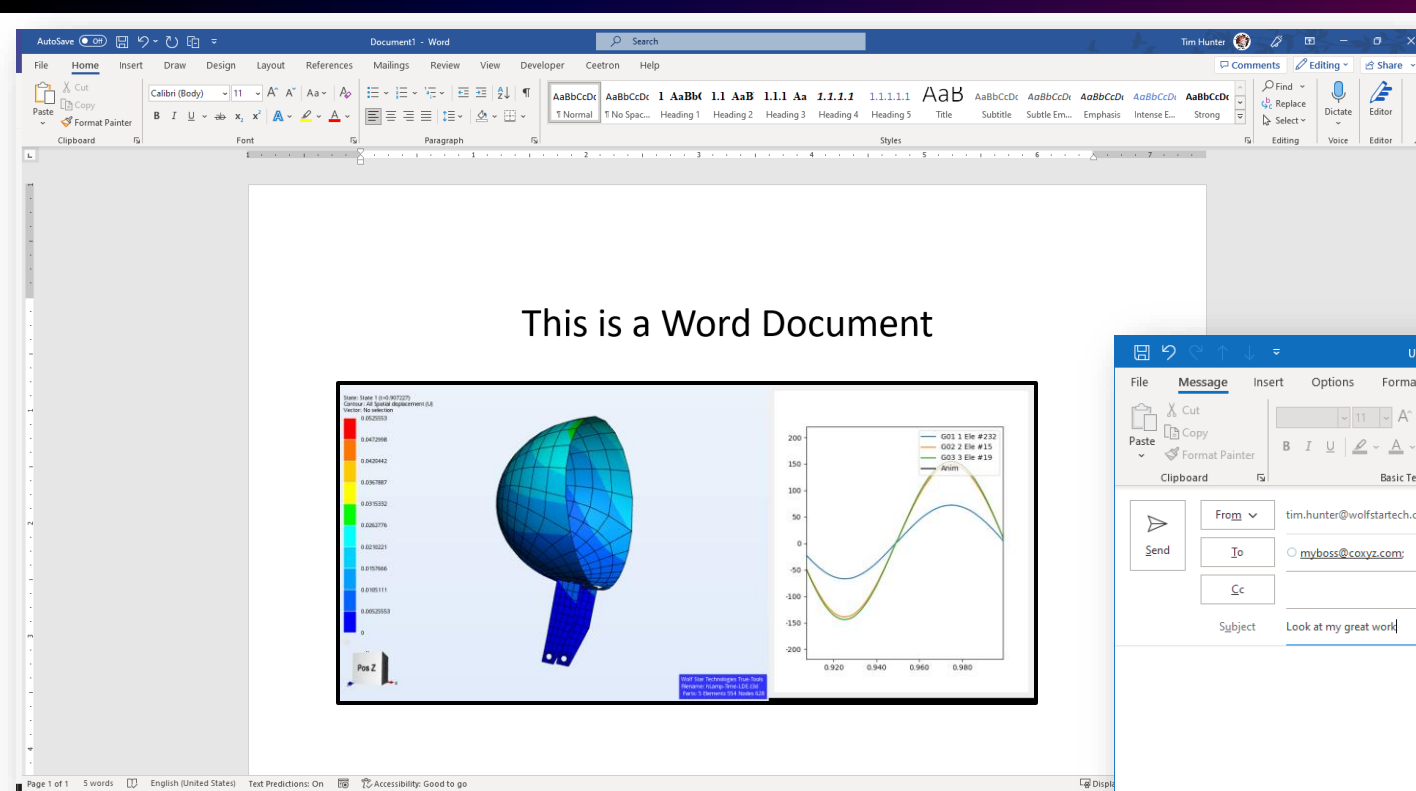
Save Animation

GIF option

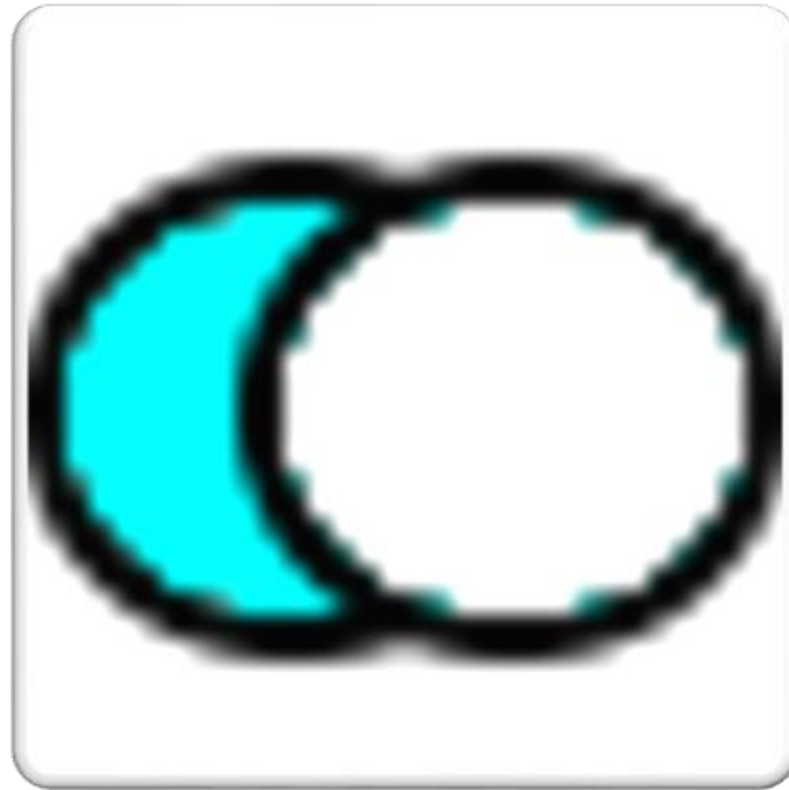
Also works with Function Tracking



GIFs animate in Word Docs and eMails!

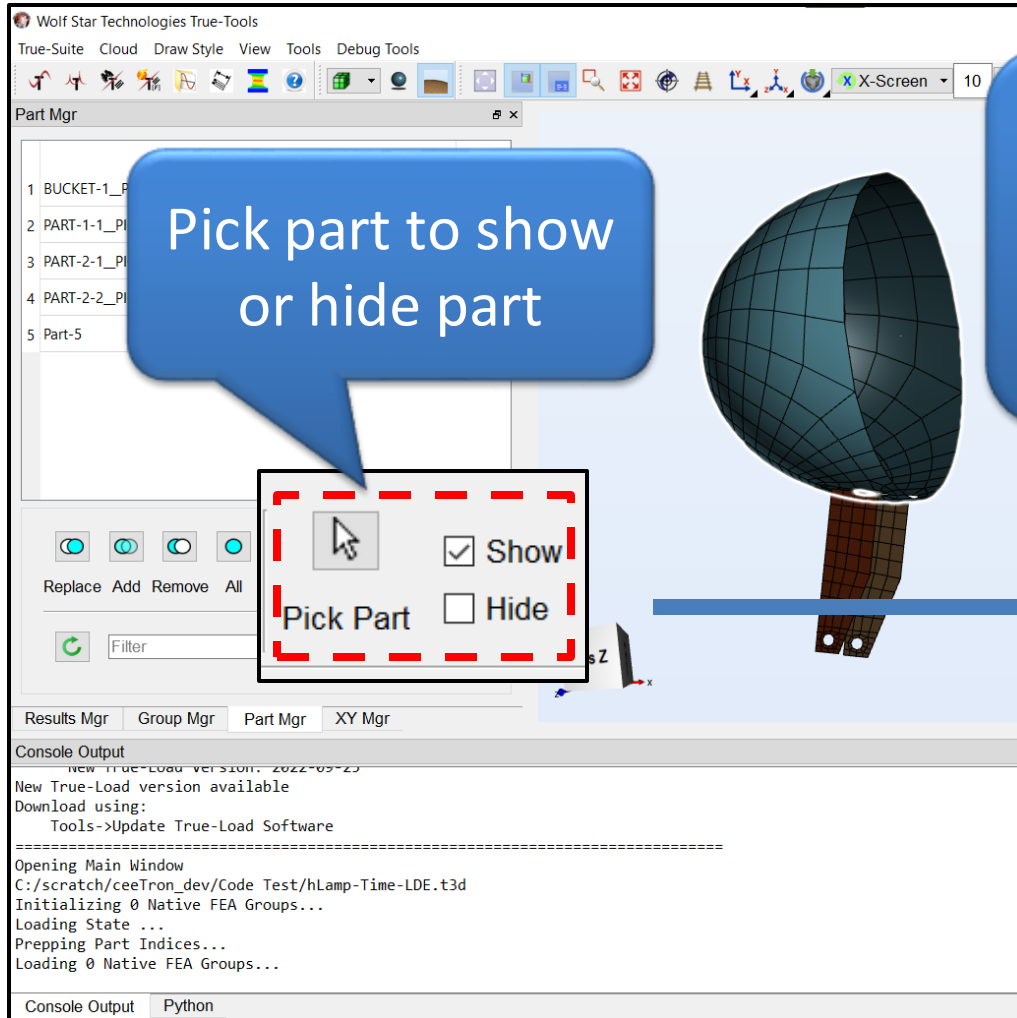


Show / Hide Parts

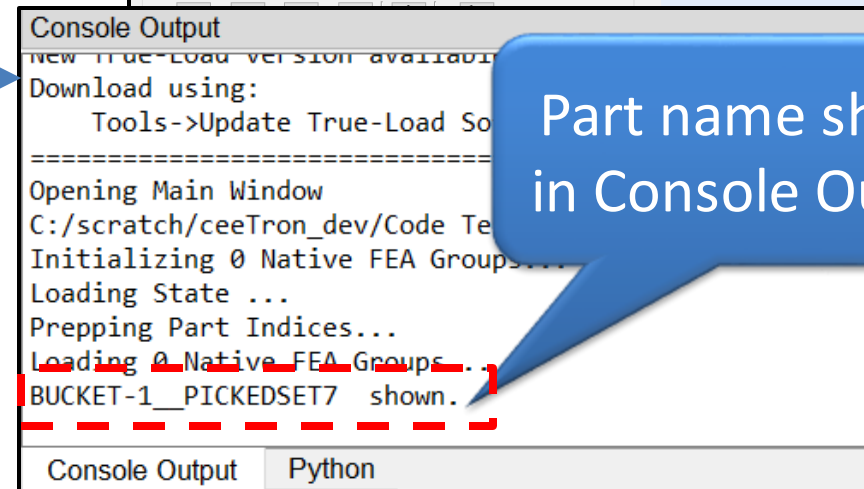




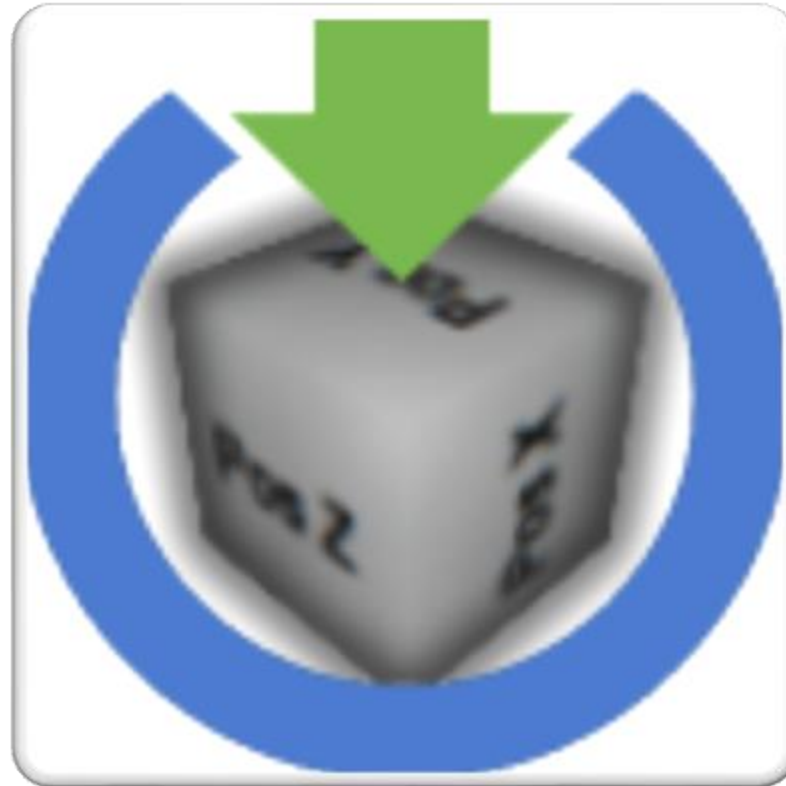
Pick Part Visibility



Showing part name increases transparency when changing part visibility with model picks.



Save Views





Save User Views

The screenshot shows the software interface with a menu bar (True-Suite, Cloud, Draw Style, View, Tools, Debug Tools) and a toolbar. A blue callout box labeled "Add View" points to a button in the toolbar. Another blue callout box labeled "View Name" points to the "View Name" text field in the "Add User View Form" dialog box. A third blue callout box labeled "Zoom Type" points to the "Current Zoom" radio button in the same dialog box. A fourth blue callout box explains that "Current Zoom" and "Auto Fit" options control the zoom level of the saved view. A fifth blue callout box states that model rotation and zoom can be saved across True-Load sessions, making navigation easier. The background shows a 3D model of a sphere with a grid and a rainbow color gradient.

Wolf Star Technologies True-Tools

True-Suite Cloud Draw Style View Tools Debug Tools

Add View

View Name

Zoom Type

Current Zoom Auto Fit

Okay Cancel

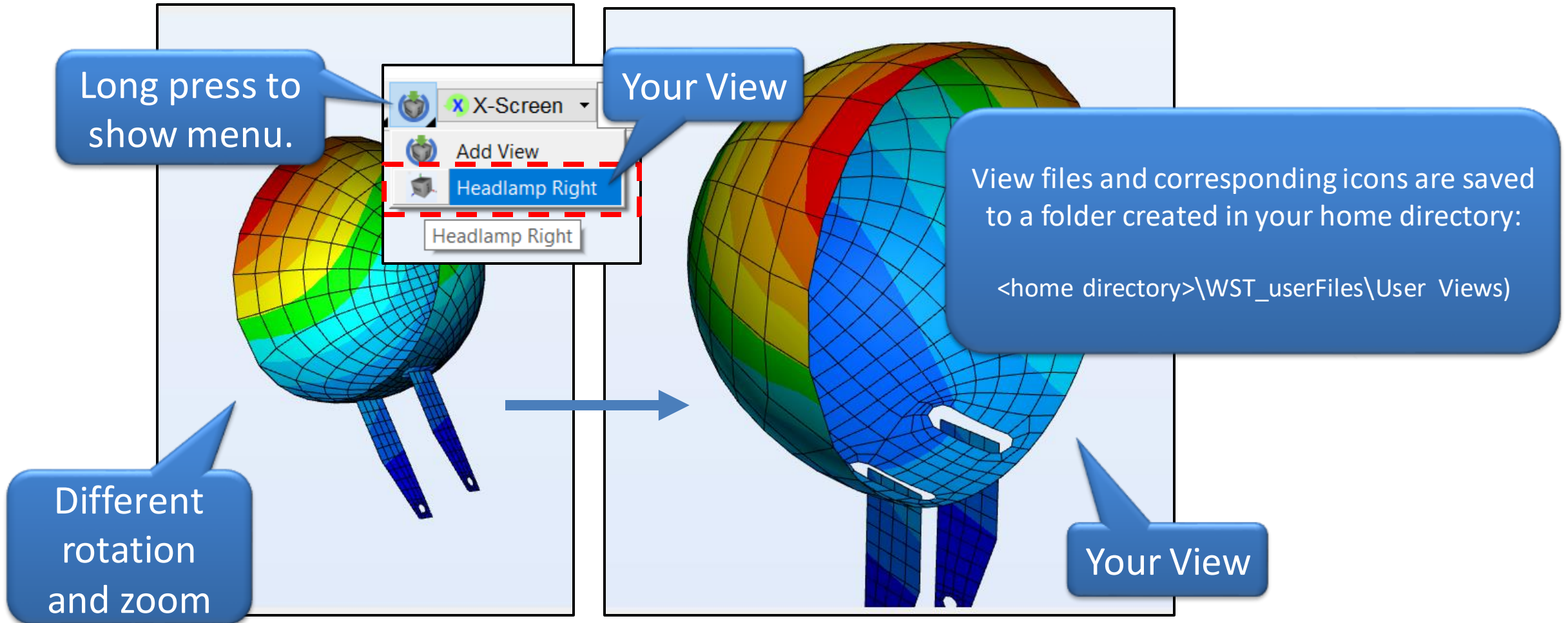
"Current Zoom" and "Auto Fit" options control the zoom level of the saved view.

Model rotation and zoom can be saved across True-Load sessions. Saving views makes navigating a model easier.

X-Screen



Save User Views



Change Working Directory





Change Working Directory Scratch File Management

Tools Menu

Change Working Directory

Scratch File Options

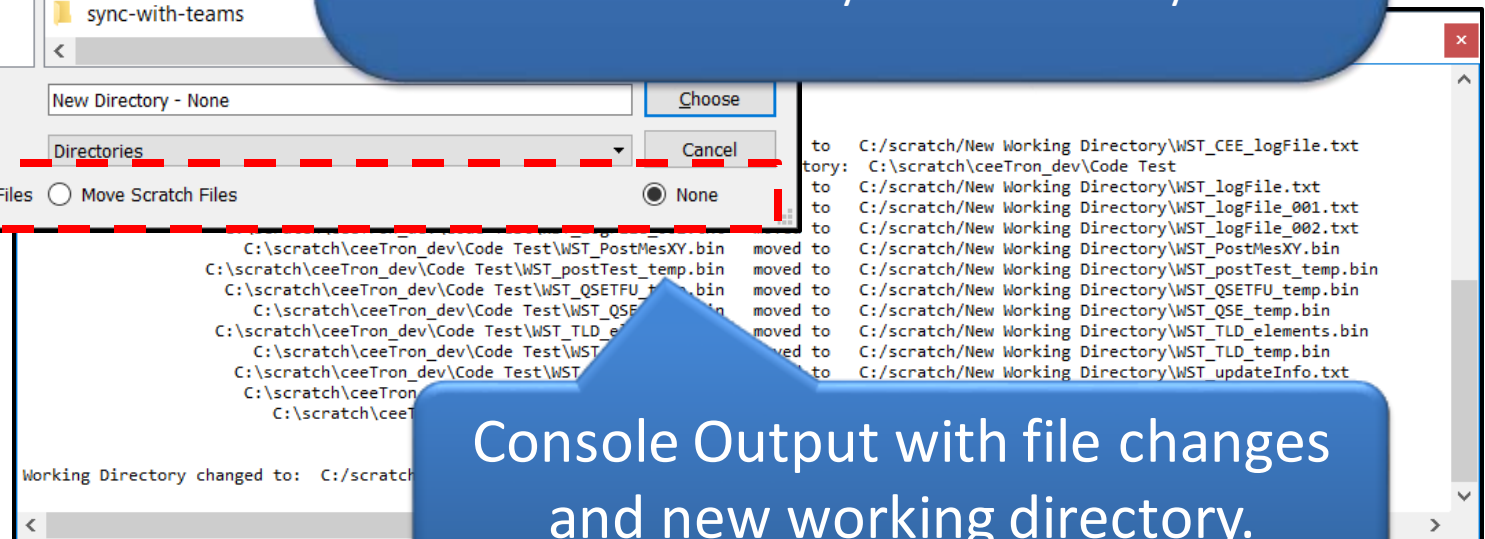
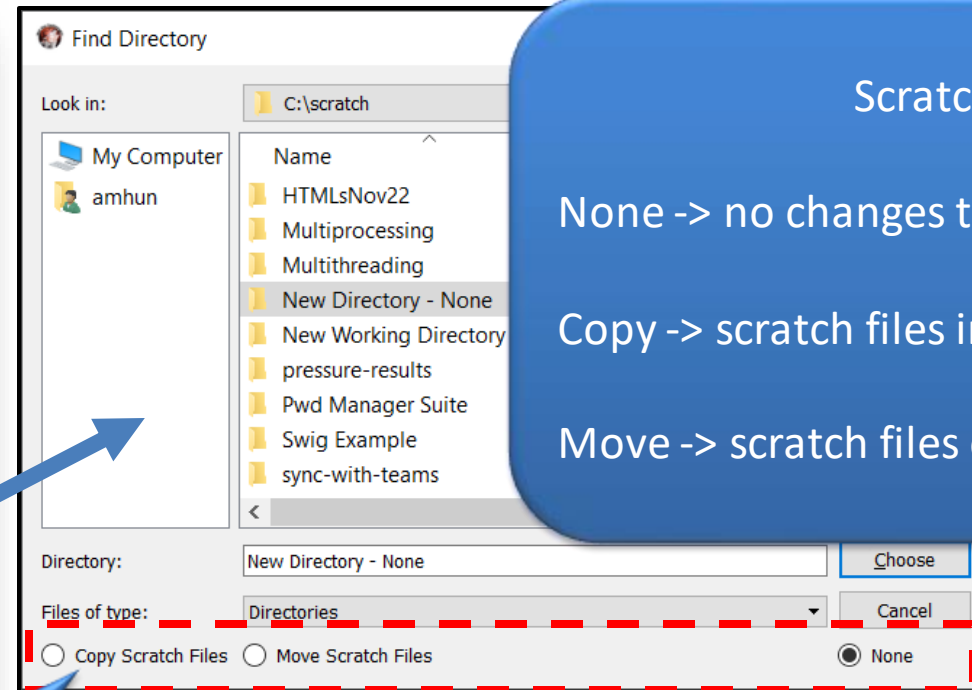
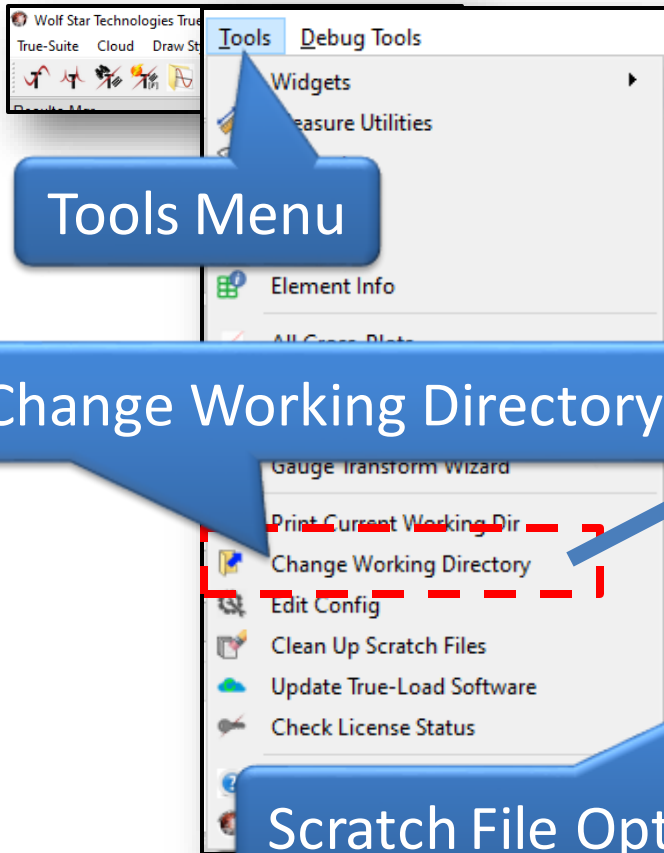
Scratch file options:

None -> no changes to scratch file locations

Copy -> scratch files in original and new directory

Move -> scratch files only in new directory

Console Output with file changes
and new working directory.



Post-Test Contact Control





Contact Control Settings Saved

New Load
Table button

True-Load/Post-Test

TLD File:

Output Management

Destination directory for output: ☐ Absolute Path (./../Razor Scooter/Razor Scooter/Test Data/2022-09-19)

File Name Prefix: Suffix:

☒ Auto Prefix: ☒ Auto Suffix:

Test Data Management Hybrid Load Management Moving Load Management **Contact Control**

Contact Control File:

Step	Frame	Operator	Value	Description
2	Unit-Loads:Load Case: FOOT-100N-FY-(2)	1002	None	0.0
3	Unit-Loads:Load Case: FOOT-100N-FZ-(3)	1003	None	0.0
4	Unit-Loads:Load Case: REARAXLE-100N-FX-(4)	1004	None	0.0
5	Unit-Loads:Load Case: REARTIRE-100N-FY-(5)	1005	None	0.0
6	Unit-Loads:Load Case: REARTIRE-100N-FZ-(6)	1006	None	0.0
7	Unit-Loads:Load Case: REARTIRE-100NM-MY-(7)	1007	None	0.0

Event Generation

☐ Batch Mode ☒ Generate HTML

Cross Plot Options

Cross Plot Color:

☒ Cross Plot Axes ☐ Cross Plot Error Axes

10 % Error Bounds

Session Tools

☐ Plot Legend Font Size:

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Contact control file
management

Saved automatically
when Loads are
calculated





Contact Control Settings Saved

True-Load/Post-Test

TLD File:

Output Management

Destination directory for output: ☐ Absolute Path (./../Razor Scooter/Razor Scooter/Test Data/2022-09-19)

File Name Prefix: Suffix:

☒ Auto Prefix: ☒ Auto Suffix:

Test Data Management Hybrid Load Management Moving Load Management **Contact Control**

Refresh Load Table Contact Control File:

Step	Frame	Operator	Value	Description
1 Unit-Loads:Load Case: FOOT-100N-FX-(1)	1001	None	0.0	
2 Unit-Loads:Load Case: FOOT-100N-FY-(2)	1002	>	0.0	Values > 0.0, will be 0.0
3 Unit-Loads:Load Case: FOOT-100N-FZ-(3)	1003	None	0.0	
4 Unit-Loads:Load Case: REARAXLE-100N-FX-(4)	1004	None	0.0	
5 Unit-Loads:Load Case: REARTIRE-100N-FY-(5)	1005	<	0.0	Values < 0.0, will be 0.0
6 Unit-Loads:Load Case: REARTIRE-100N-FZ-(6)	1006	None	0.0	

Event Generation ☐ Batch Mode ☒ Generate HTML

Cross Plot Options Cross Plot Color: ☒ Cross Plot Axes ☐ Cross Plot Error Axes 10 % Error Bounds

Session Tools Labels Only ☐ Plot Legend Font Size: 10

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Re-load settings

Settings saved automatically to CTC file.

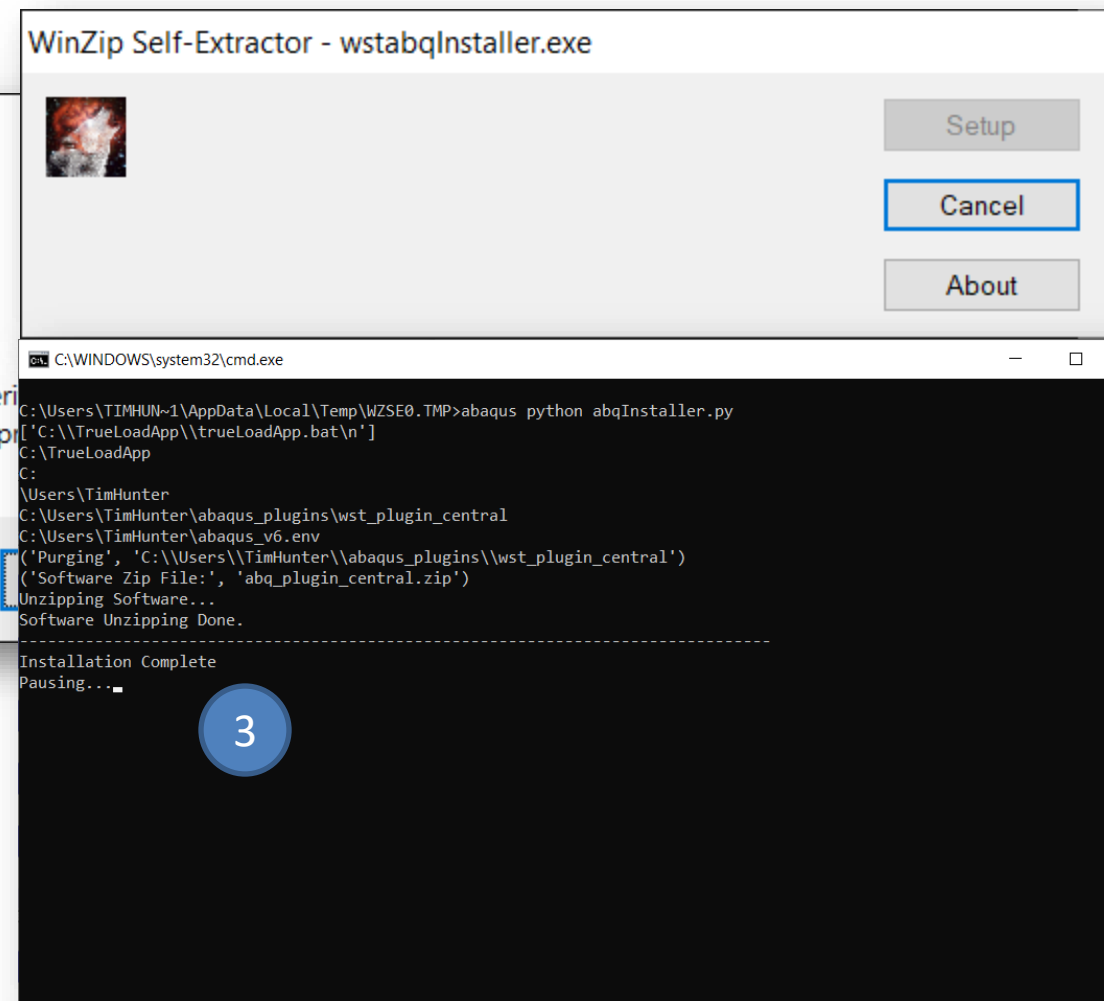
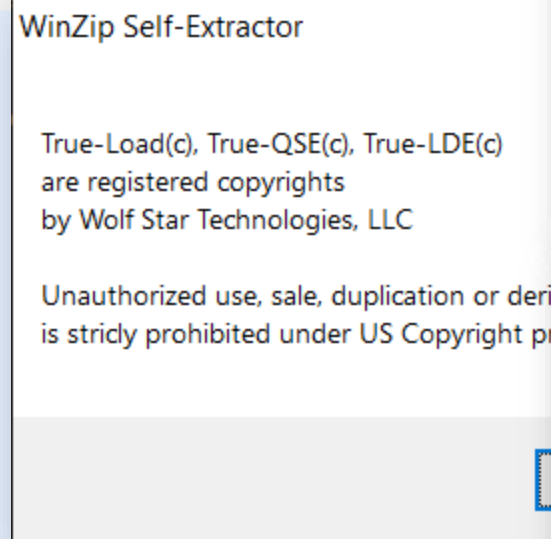
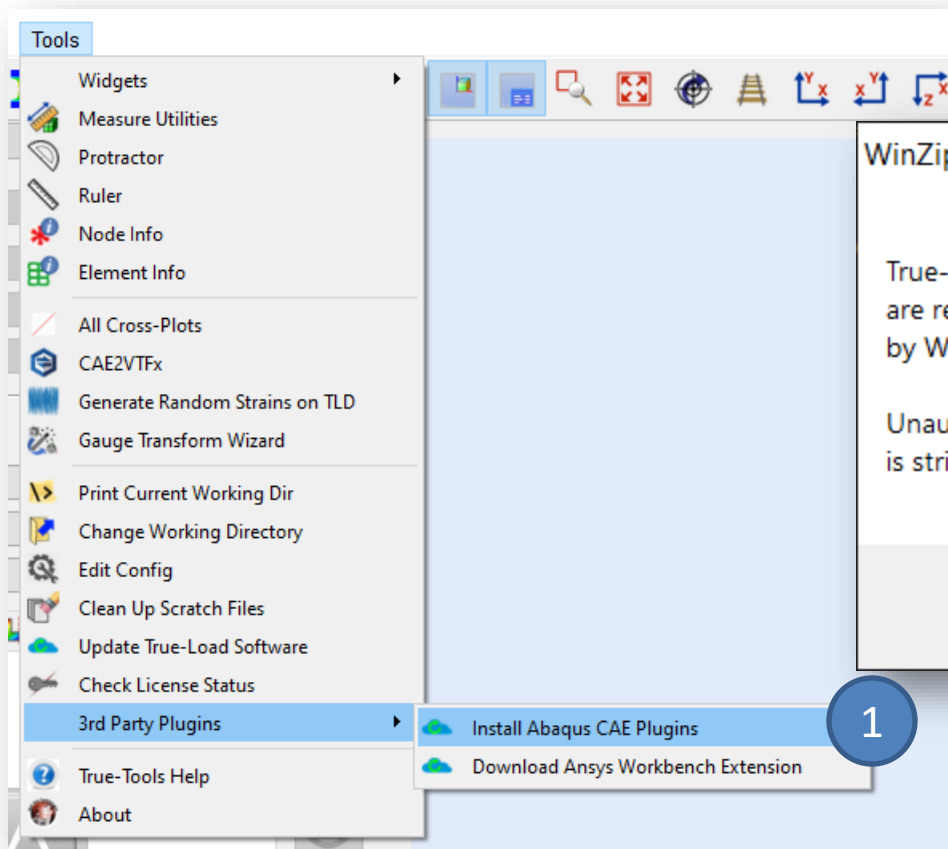


Abaqus Plugins





Abaqus Plugins



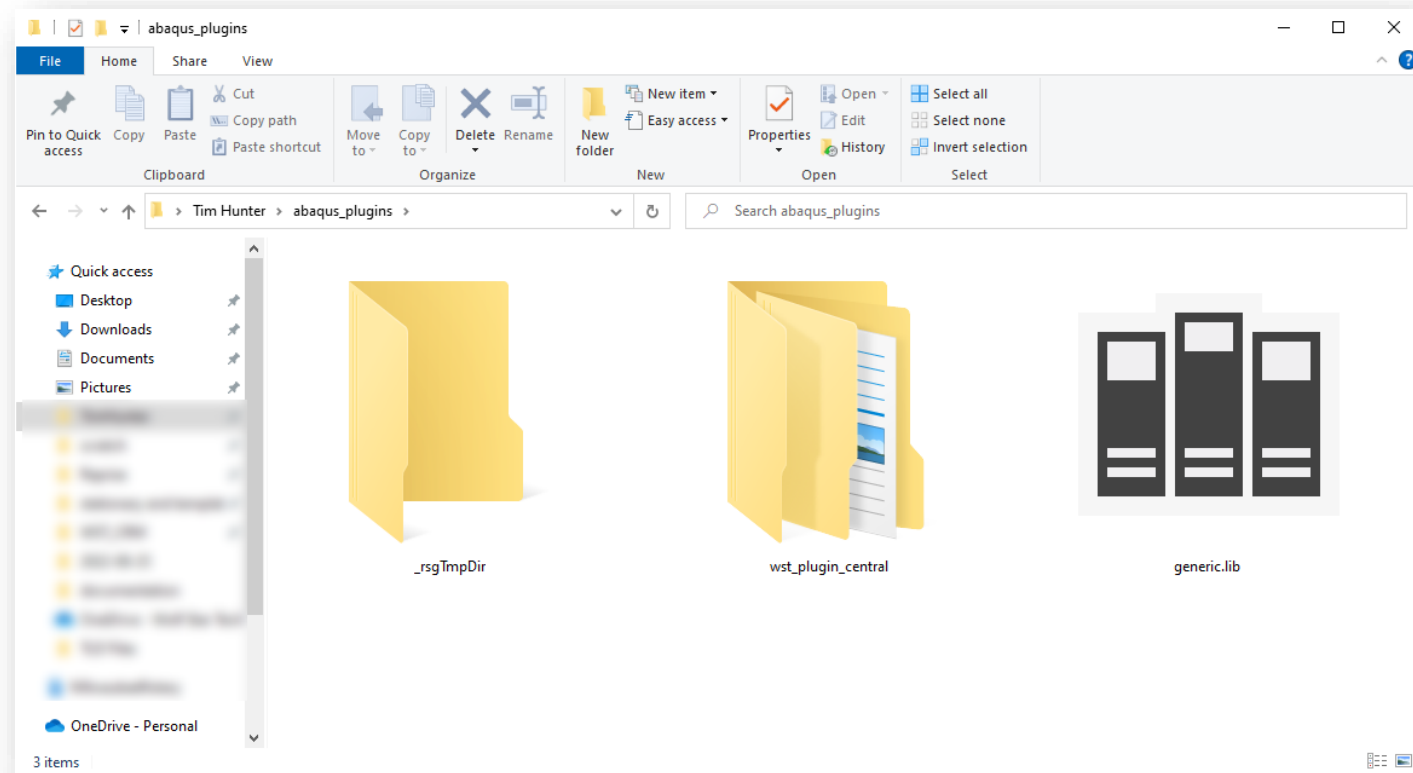


Abaqus Plugins

Plugin installer creates
<HomeDir>/abacus_plugins.

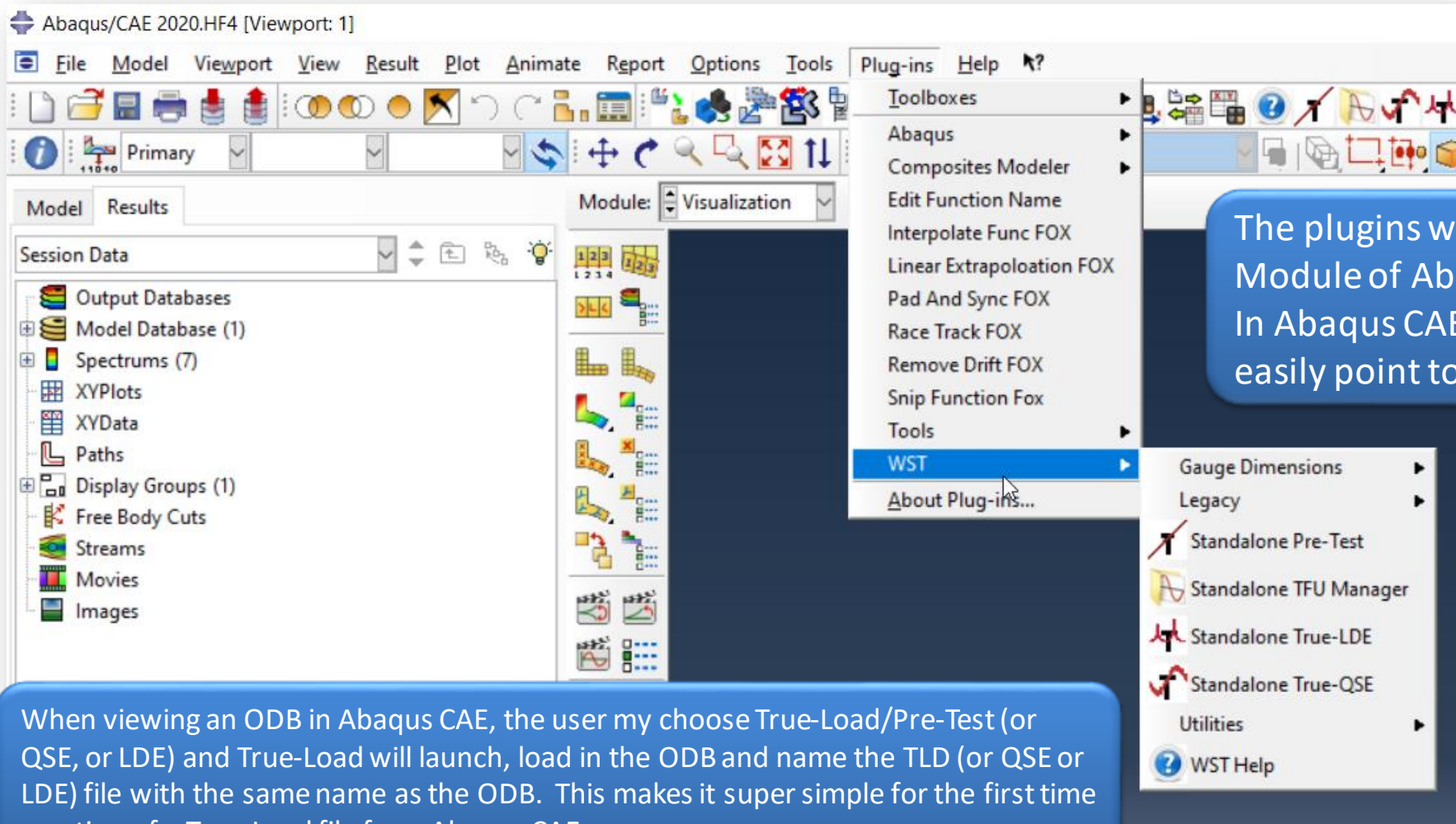
This is a standard folder that
Abaqus/CAE looks in for plugins.

The WST plugins are in a subfolder
called wst_plugin_central.





Abaqus Plugins



The plugins will appear in the Visualization Module of Abaqus CAE in the plugins menu. In Abaqus CAE the user may create toolbars to easily point to the plugins.



When viewing an ODB in Abaqus CAE, the user may choose True-Load/Pre-Test (or QSE, or LDE) and True-Load will launch, load in the ODB and name the TLD (or QSE or LDE) file with the same name as the ODB. This makes it super simple for the first time creation of a True-Load file from Abaqus CAE.

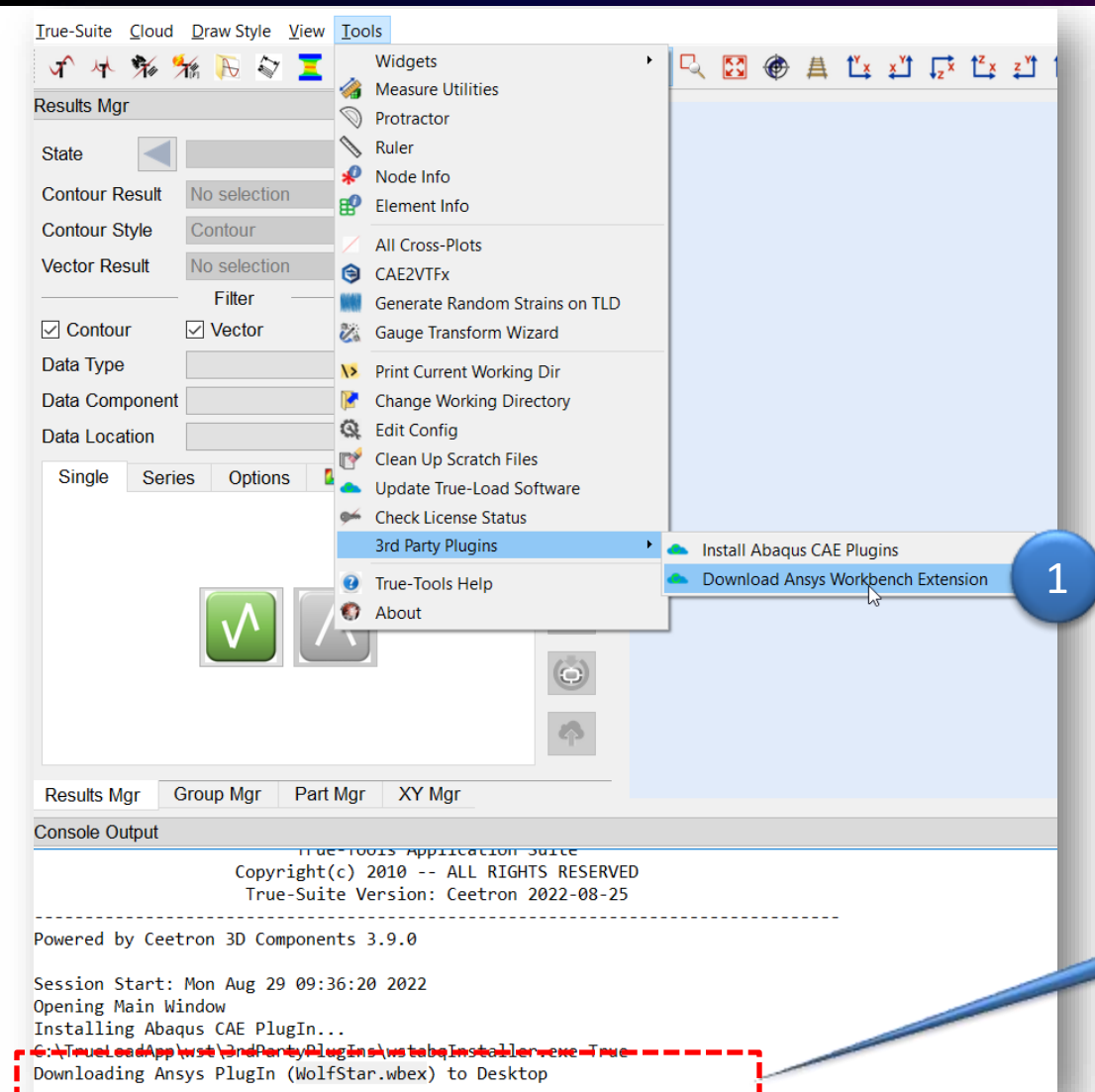


Anslys Plugin

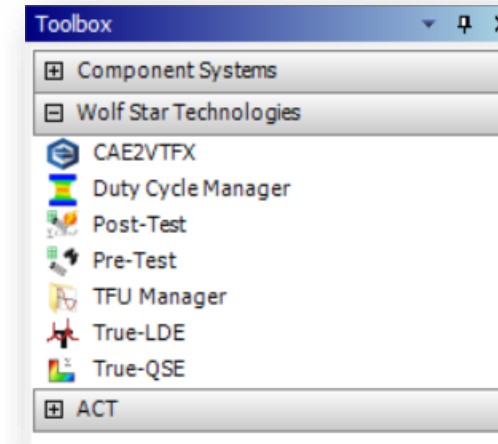




Ansys Plugin



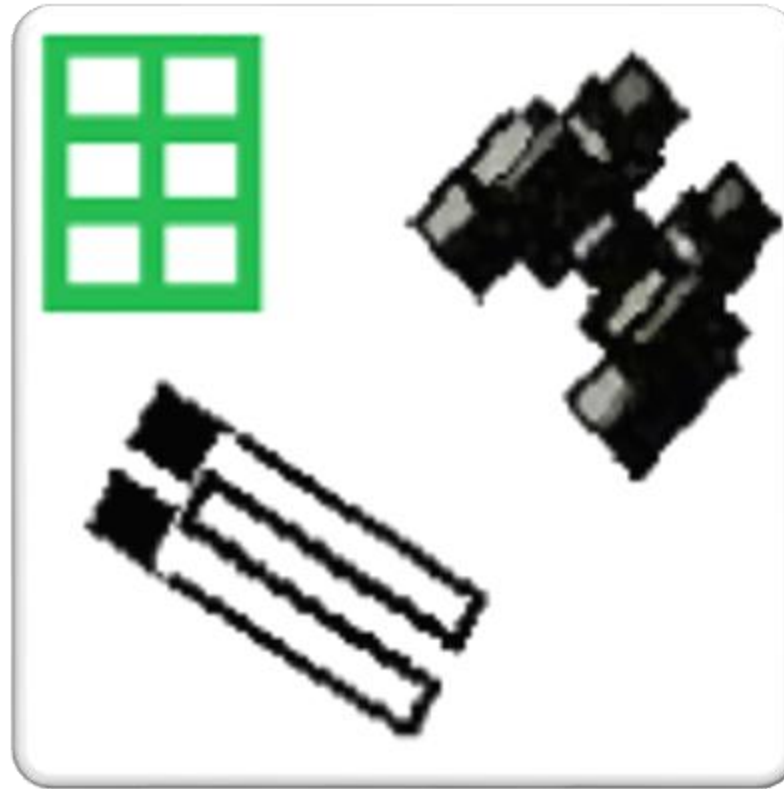
WBEX file installed in Ansys Workbench



WBEX extension downloaded to Desktop



Find Gauges at Distance





Pre-Test Form

True-Load/Pre-Test

TLD File:

FEA DB:

☒ Load Shells Only ☒ Open as VTFx ☒ Store FEA DB Relative Path

Select elements for candidate gauges: 6 elements picked

Session Tools:

Condition Number:

Stationary Loads | Moving Loads

Step	Frame	Scale Factor
1 Unit-Loads:Load Case: GRAV-10GX-(1)	1001	1.0
2 Unit-Loads:Load Case: GRAV-10GY-(2)	1002	2.835124239552774
3 Unit-Loads:Load Case: GRAV-10GZ-(3)	1003	1.2216377895843669

Unit-Loads:Increment 0: Base State-(0) Scale: ☐ Enable Table Sort

Shell Surface: ☒ Top SPOS ☐ Bottom SNEG

Min Distance between Gauges:

Gauge Placement:

Number of Gauges: ☒ Refresh Strain Tensors

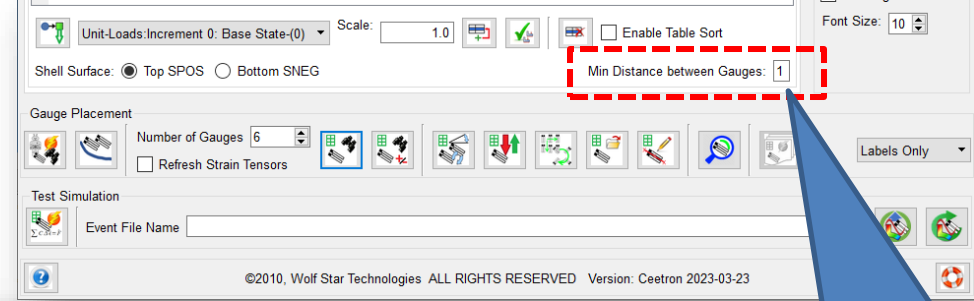
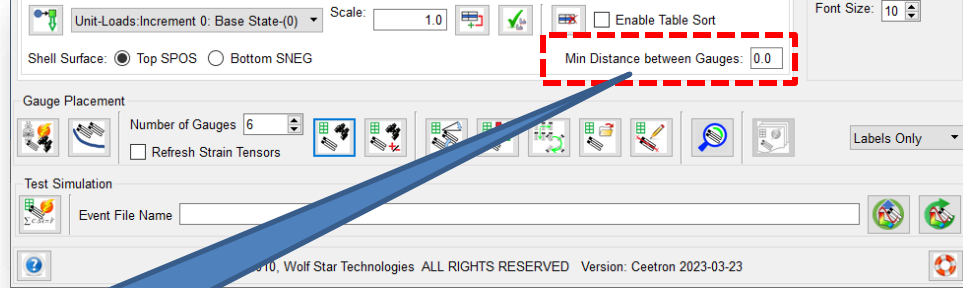
Test Simulation:

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New feature: Enter minimum distances between gauges found.

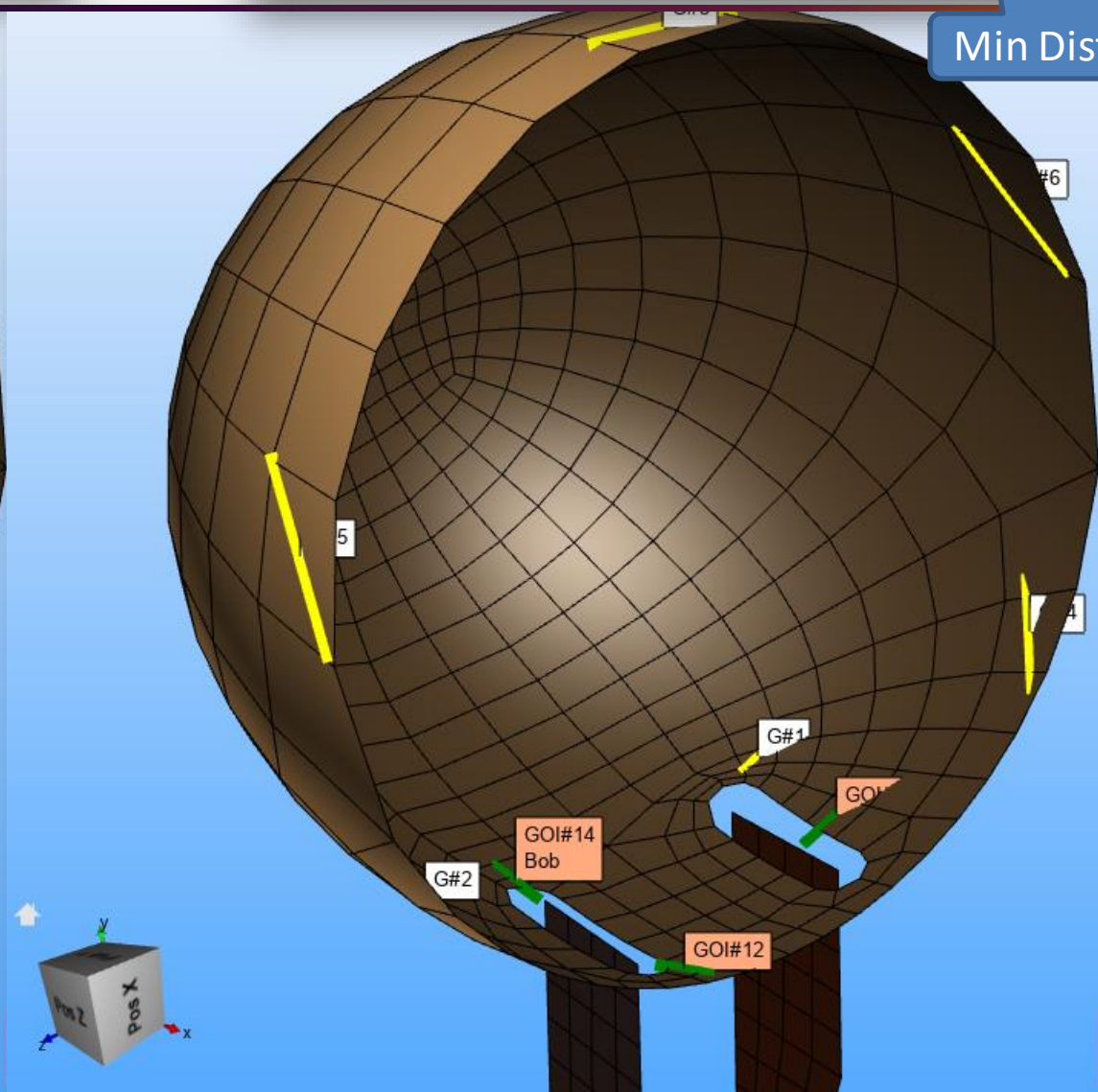
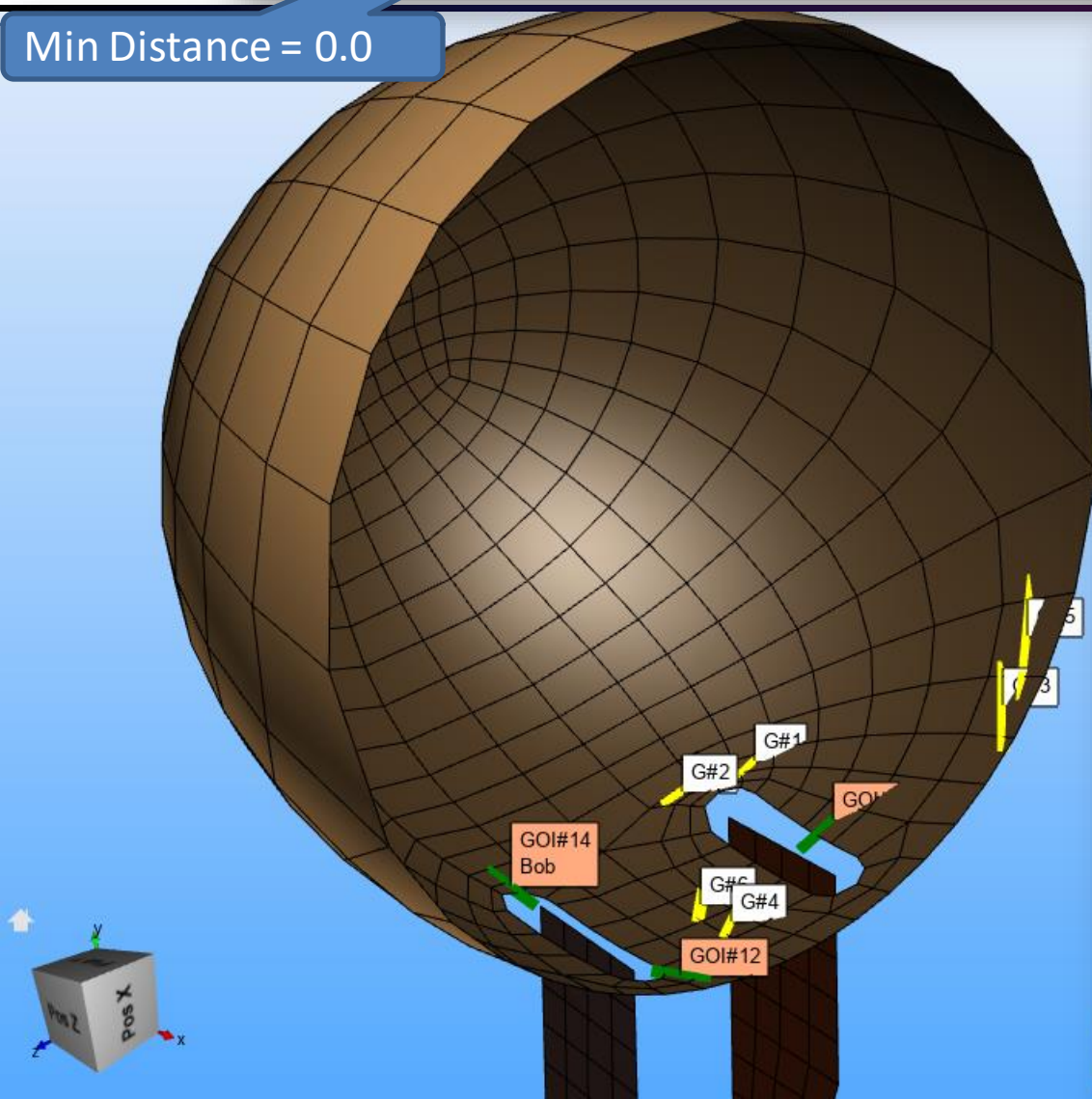
If value is zero (default) minimum distance is ignored.





Min Distance = 0.0

Min Distance = 1.0



Post-Test Batch





Batch Mode Solution Modes

True-Load/Post-Test

TLD File: C:/scratch/ceeTron_dev/Code Test/hLamp_GOI.tld

Output Management

Destination directory for output: Test Data Dir ☐ Absolute Path (.)< -- Current Directory

File Name Prefix: Suffix:

☒ Auto Prefix: hLamp_GOI ☒ Auto Suffix:

☒ Test Data Management ☒ Hybrid Load Management ☐ Moving Load Management ☒ Contact Control

Strain Data File: C:/scratch/ceeTron_dev/Code Test/batchun.dat

☒ micro Strain Max Sampling Rate: 0 Plastic Strain Value: 0

Event Generation

☒ Batch Mode ☒ Generate HTML

Cross Plot Options

Cross Plot Color: Red

☒ Cross Plot Axes ☐ Cross Plot Error Axes

10 % Error Bounds

Session Tools

☒ Plot Legend Font Size: 10

Labels Only

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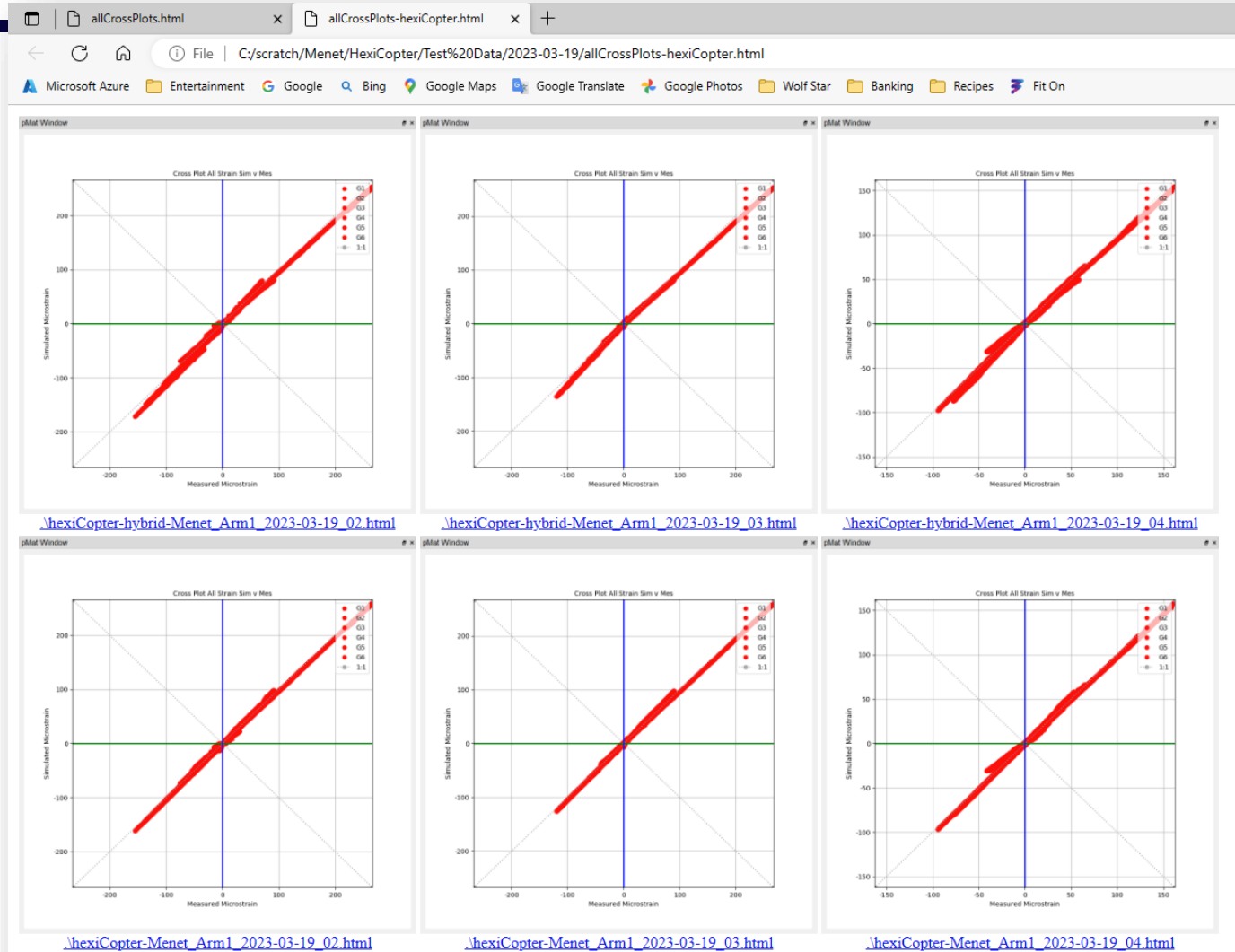
Batch Mode

Normal, Hybrid Loading and Contact Control are now supported in Batch Mode





Batch mode automatically creates All Cross Plots of Batch Mode Run



Post-Test Report





Report Hyperlinks

True-Load HTML file from Post-Test
Report Written: Thu Mar 23 16:40:41 2023

Navigation: [Unit Load Table](#) [Gauge Table](#) [True-Load Desktop](#) [Load Plots](#) [Overall Strain Correlation](#) [Strain Correlation Quality Table](#) [Gauges of Interest](#)

Required Input Files
True-Load File: hybrid-hexiCopter.tld
Software Version: Cestron 2023-03-23

Strain Data File: hybrid-Menet_Arm1_2023-03-19_02.tfu
FEA DB File (for reference): _FEA_Menet_Arm1_2023-03-19_02.ep2
Hybrid Loading QSE file: _Ctrl-hexiCopter_Menet_Arm1_2023-03-19_02.qse
Shells Only: True

Output Files
Quasi-Static Event (QSE) File: _hexiCopter-hybrid-Menet_Arm1_2023-03-19_02.qse
True Function File (TFU) File: _hexiCopter-hybrid-Menet_Arm1_2023-03-19_02.tfu
HTML Report File: _hexiCopter-hybrid-Menet_Arm1_2023-03-19_02.html
Simulated / Measured Strain File: _hexiCopter-hybrid-Menet_Arm1_2023-03-19_02-SimMes.tfu

Number of Gauges: 6
Condition Number of eMat: 1.154399564561163

Report Information [Unit Load Table](#) [Gauge Table](#) [True-Load Desktop](#) [Load Plots](#) [Overall Strain Correlation](#) [Strain Correlation Quality Table](#) [Gauges of Interest](#)

Load Table:

Step	Frame	Frame Description	Scale Factor
FX 1KN-SUBCASE 1-(1)	1000	FX 1KN-SUBCASE 1-(1) Frame = 1000	1.1378572864180225
FY 1KN-SUBCASE 2-(1)	1001	FY 1KN-SUBCASE 2-(1) Frame = 1001	1.0

Report Information [Unit Load Table](#) [Gauge Table](#) [True-Load Desktop](#) [Load Plots](#) [Overall Strain Correlation](#) [Strain Correlation Quality Table](#) [Gauges of Interest](#)

Gauge Table:

Chosen Gauges				eMat Strains			
Gauge Number	Gauge Name	Instance	Element Label	Strain Channel	Step: FX 1KN-SUBCASE 1-(1) Frame: 1000	Step: FY 1KN-SUBCASE 2-(1) Frame: 1001	Scale Factor
1		0	71	90.0	Chan#01 Uniaxial Gauge	-6.623201149633592911	-0.005574442
2		0	512	90.0	Chan#02 Uniaxial Gauge	0.00557442779429107	0.002789633
3		0	626	90.0	Chan#03 Uniaxial Gauge	-0.00557442911893129	0.002789633
4		0	430	90.0	Chan#04 Uniaxial Gauge	5.40238697595953e-20	-0.001788761

Report Information [Unit Load Table](#) [Gauge Table](#) [True-Load Desktop](#) [Load Plots](#) [Overall Strain Correlation](#) [Strain Correlation Quality Table](#) [Gauges of Interest](#)

eMat Window

All Strains Simulated and Measured

Microstrain

Time

Sim Str Mes Str

FX 1KN-SUBCASE 1-(1) Frame = 1000

Function plots

FX 1KN-SUBCASE 1-(1) Frame: 1000

hybrid-Menet_Arm1_2023-03-19_02_tfu==>FX 1KN-SUBCASE 1-(1) Frame: 1000

Load Scale Factor

Time

FY 1KN-SUBCASE 2-(1) Frame = 1001

Function plots

FY 1KN-SUBCASE 2-(1) Frame: 1001

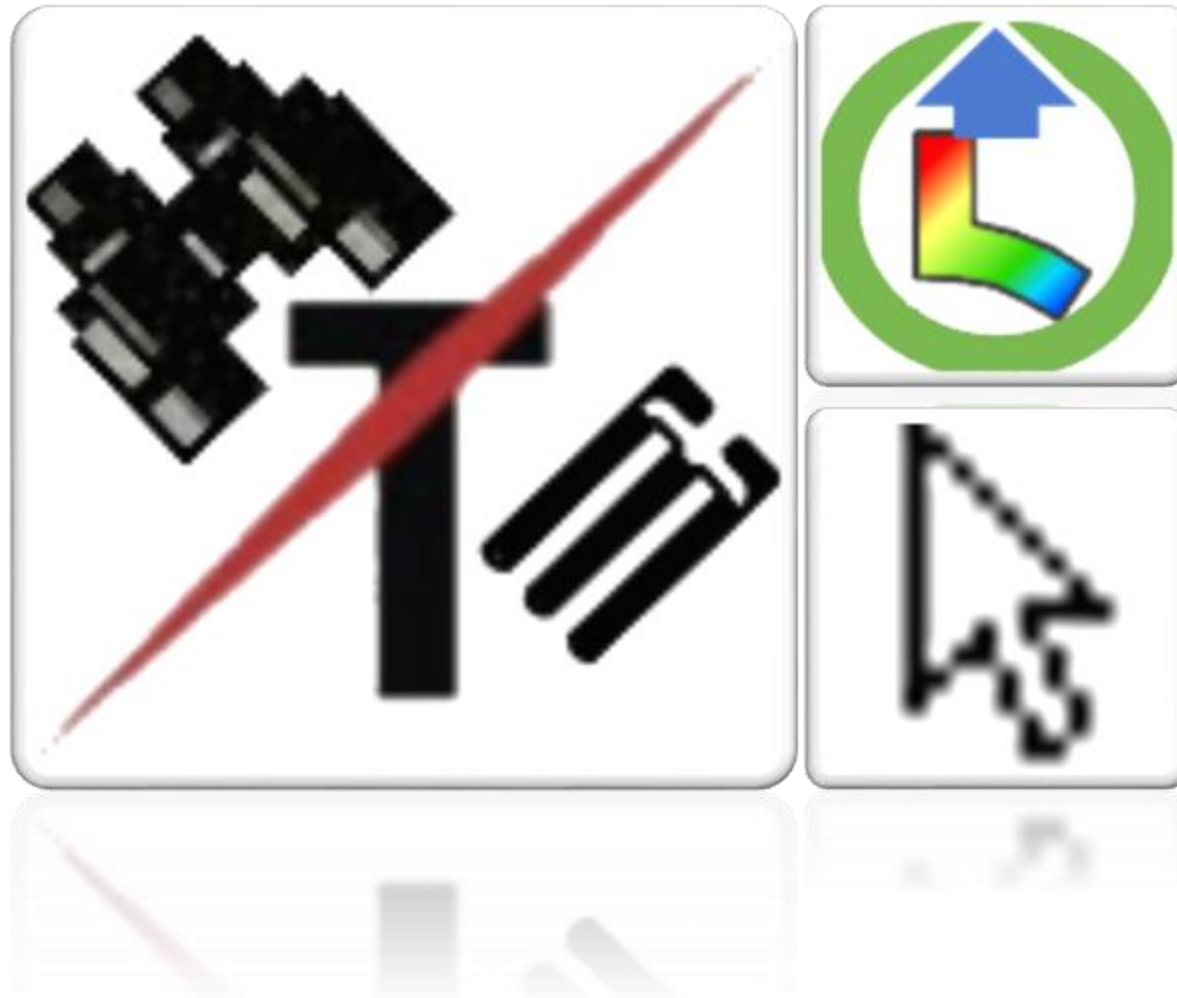
hybrid-Menet_Arm1_2023-03-19_02_tfu==>FY 1KN-SUBCASE 2-(1) Frame: 1001

Load Scale Factor

Time

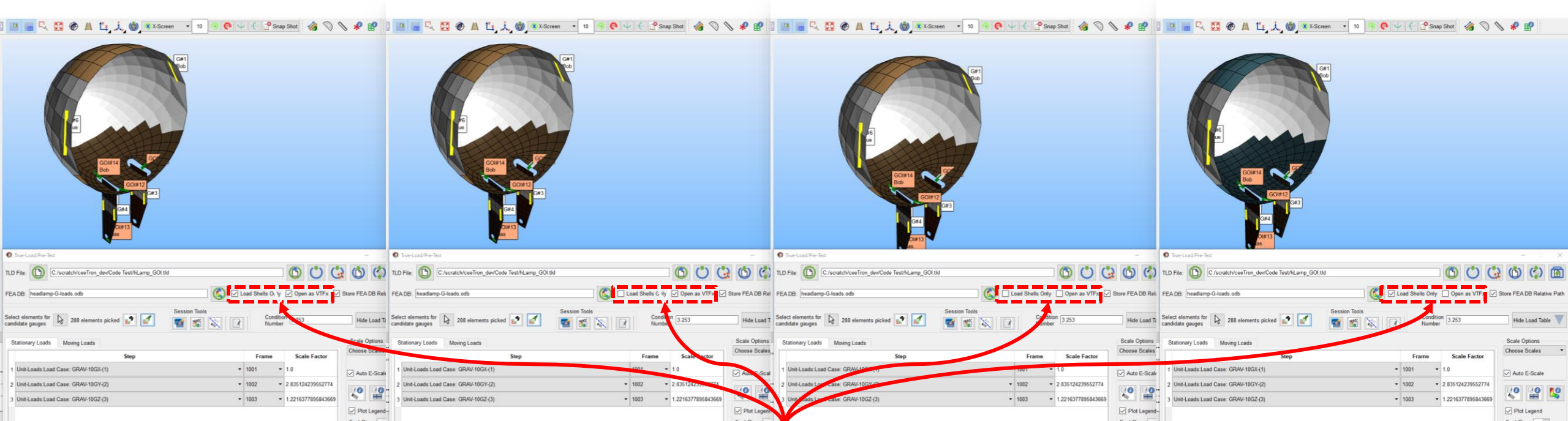
Hyperlinks in major section

Pre-Test Picking





Element Selection Preserved

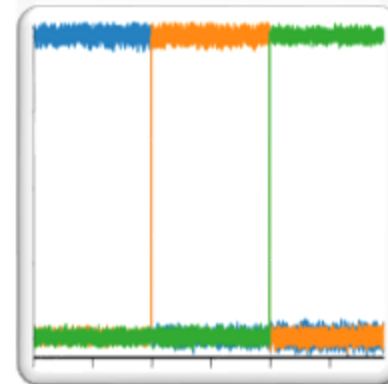
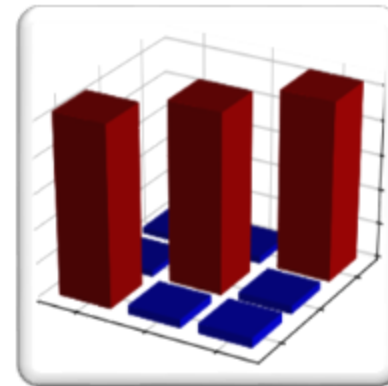
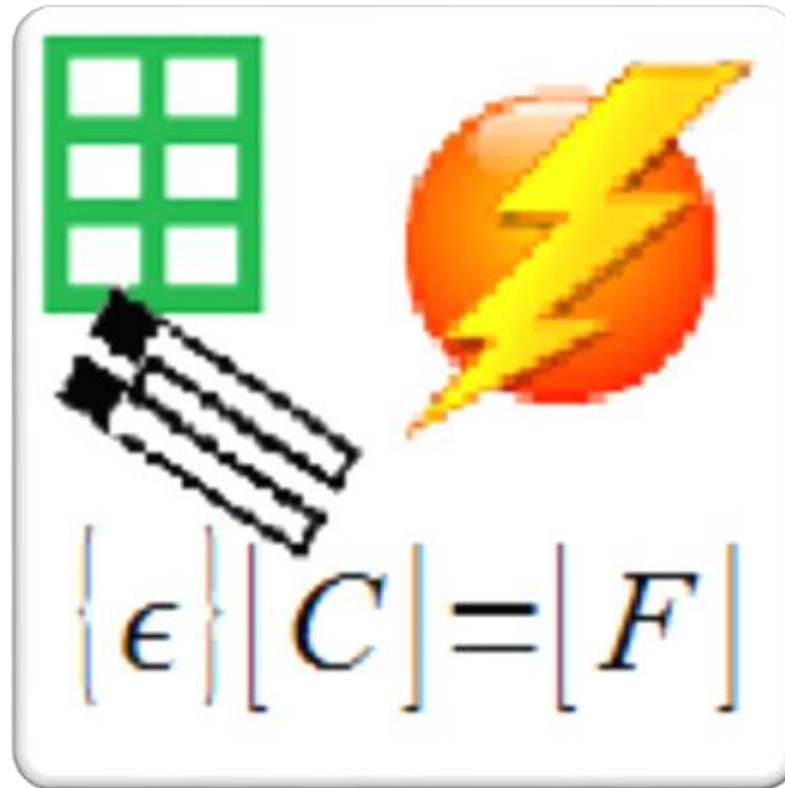


Element selection is preserved when switching between “Load Shells Only” and “Open as VTFX”

Previously, you would have to re-select elements for candidate gauges.

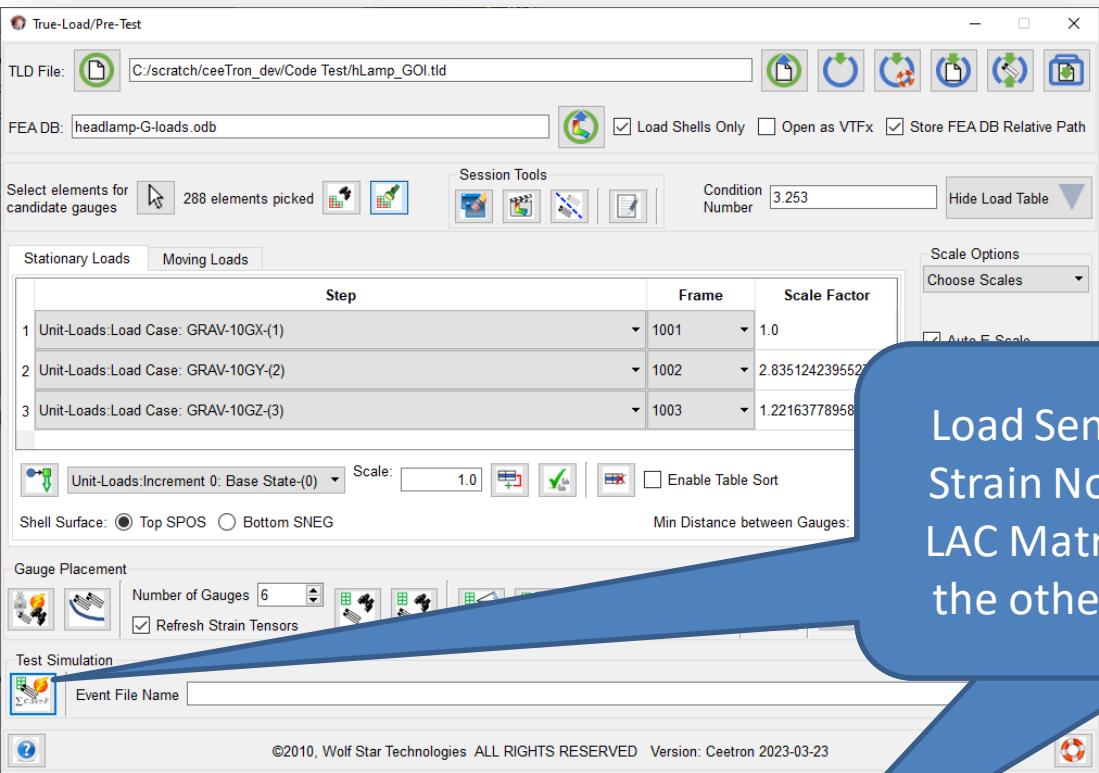


LAC Matrix

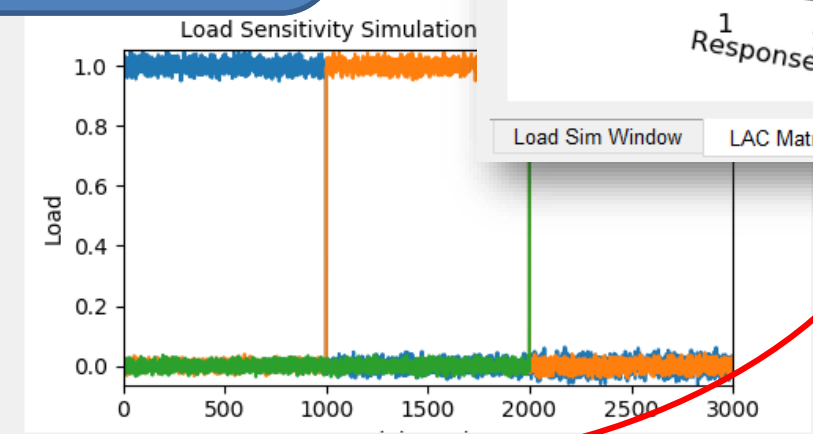
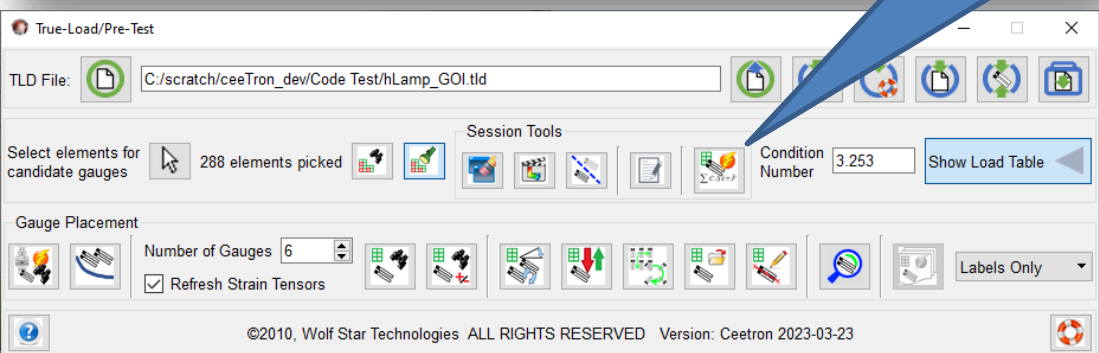
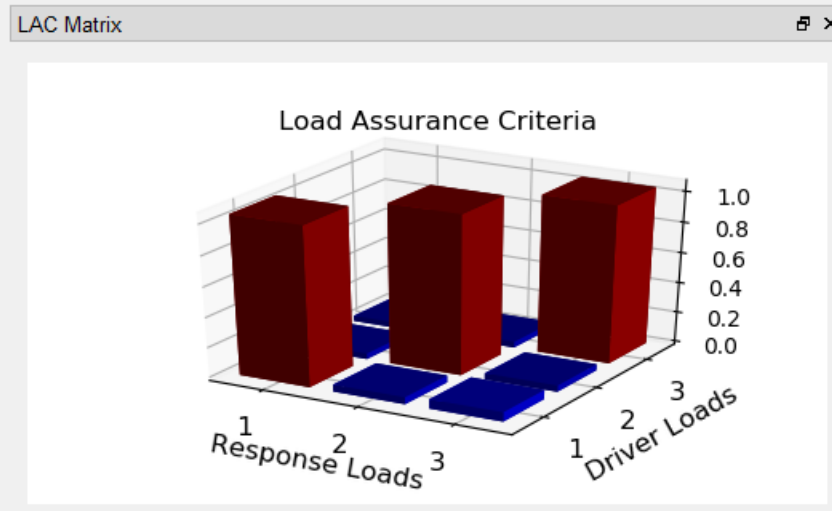
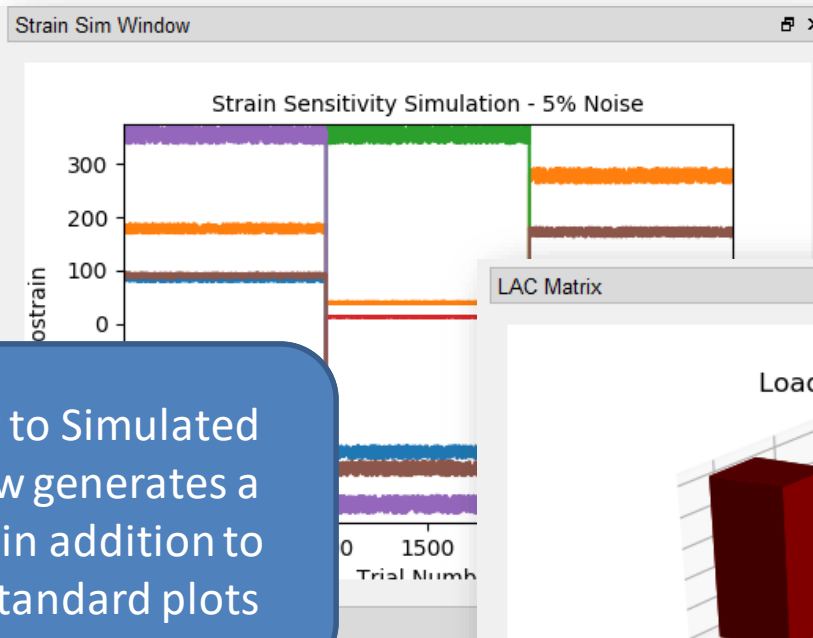




New Load Assurance Criteria (LAC) Matrix



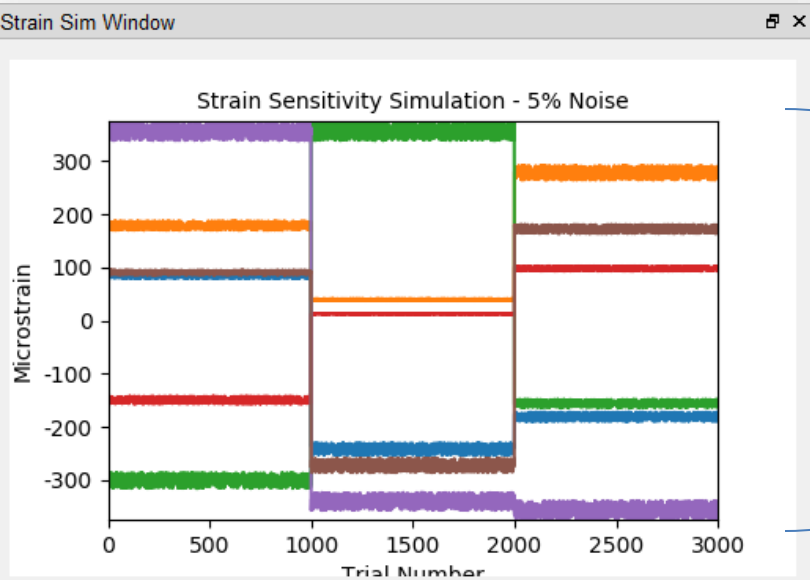
Load Sensivity to Simulated Strain Noise now generates a LAC Matrix plot in addition to the other two standard plots



Load Sim Window LAC Matrix

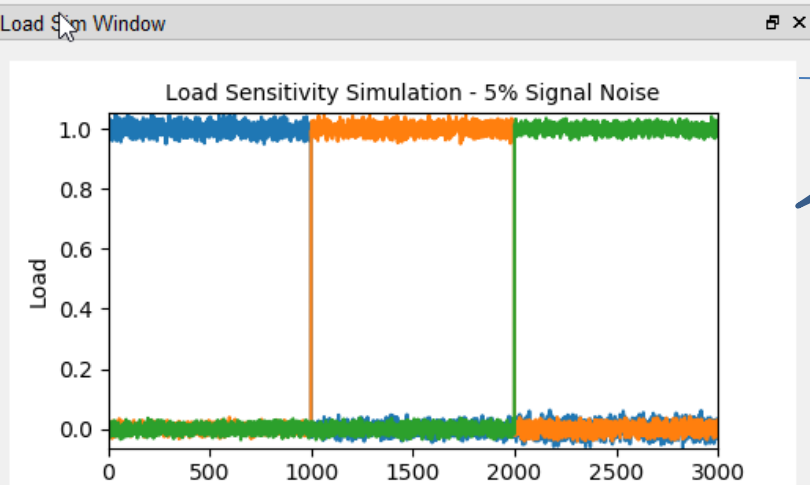


Load Sensitivity to Simulated Strain Noise

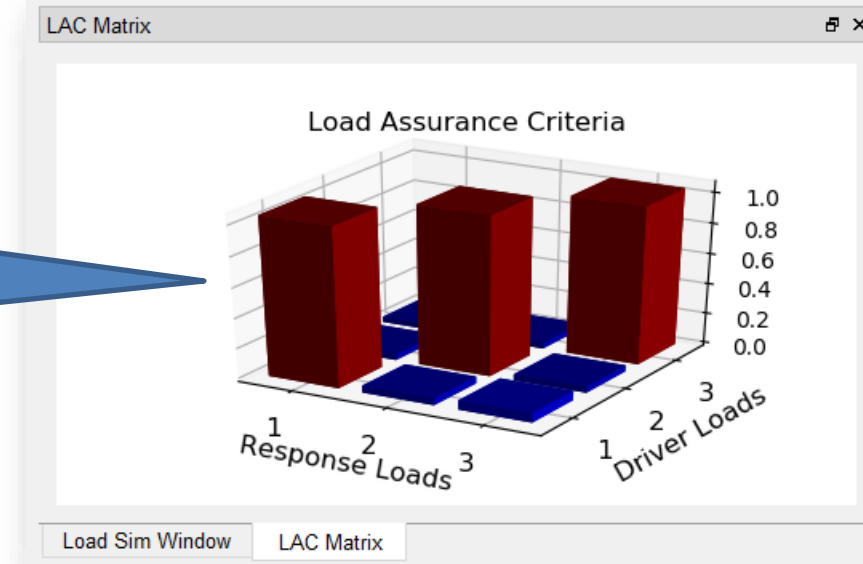


Idealized strain for each load being turned on with 5% random noise superimposed

LAC Matrix is a summary view of the Load Sim Window



Calculated loads from above strains showing each load being turned on and the other loads being turned off



Nastran ODS





QSE create Nastran ODS

Wolf Star Technologies True-Tools

True-Suite Cloud Draw Style View Tools

Results Mgr

State LF-SHOCK-FX.SUBCASE 1-(1)

True-QSE

Event (QSE) File: h:\Vehicle Loading\Test Data\2022-12-13\harbingerLeafSpringFX-mod-Lap1_Run2-decim-D21-D64-D78.qse

FEA DB: ger/2022-Proj-001 Vehicle Loading/FEA/unit-loads-leafspring-004.op2

Event Definition

FEA: Step	FEA: Frame	Scale Factor	Model	Amplitude
1				
2				
3				
4				
5				

Generate Field Results

Event Name ...X-mod-Lap1_Run2-decim-D21-D64-D78.qse

T3D output File: -12-13\harbingerLeafSpringFX-mod-Lap1_Run2-decim-D21-D64-D78-QSE.t3d

Decimation Order 10

Start Index: 70974 End Index: 71193 Number of Frames: 22

Start Time: 354.87 End Time: 355.965 Time Span: 1.10000000000000227

Scratch file folder: C:\Users\Tim\AppData\Local\Temp

Pre-Load State: LF-SHOCK-FX.SUBCASE 1-(1)

Simple X Lin X Log

Help Options

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Results Mgr Group Mgr Part Mgr XY Mgr

Console Output

Picked Curve: LR-LEAFSPRING-FX:SUBCASE 33-(1), Frame #1032 :<TFU File> ->Lap1_Run2-decim_tfu=>LR-LEAFSPRING-FX:SUBCASE 33-(1) Frame: 1032 Value = (354.875 , 0.06336388249112638) , Sequence ID: 70975

Picked Curve: LR-LEAFSPRING-FY:SUBCASE 34-(1), Frame #1033 :<TFU File> ->Lap1_Run2-decim_tfu=>LR-LEAFSPRING-FY:SUBCASE 34-(1) Frame: 1033 Value = (354.875 , -0.054230513958234396) , Sequence ID: 70975

Picked Curve: LR-LEAFSPRING-FZ:SUBCASE 35-(1), Frame #1034 :<TFU File> ->Lap1_Run2-decim_tfu=>LR-LEAFSPRING-FZ:SUBCASE 35-(1) Frame: 1034 Value = (354.875 , 0.06799775119993921) , Sequence ID: 70975

Picked Curve: RR-LEAFSPRING-FX:SUBCASE 36-(1), Frame #1035 :<TFU File> ->Lap1_Run2-decim_tfu=>RR-LEAFSPRING-FX:SUBCASE 36-(1) Frame: 1035 Value = (354.88 , -0.15233091434706703) , Sequence ID: 70976

Picked Curve: RR-LEAFSPRING-FY:SUBCASE 37-(1), Frame #1036 :<TFU File> ->Lap1_Run2-decim_tfu=>RR-LEAFSPRING-FY:SUBCASE 37-(1) Frame: 1036 Value = (354.88 , 0.4327283610755947) , Sequence ID: 70974

Picked Curve: RR-LEAFSPRING-FZ:SUBCASE 38-(1), Frame #1037 :<TFU File> ->Lap1_Run2-decim_tfu=>RR-LEAFSPRING-FZ:SUBCASE 38-(1) Frame: 1037 Value = (354.87 , 0.39727631738326435) , Sequence ID: 70974

Picked Curve: LR-JOINCE-FZ:SUBCASE 45-(1), Frame #1041 :<TFU File> ->Lap1_Run2-decim_tfu=>LR-JOINCE-FZ:SUBCASE 45-(1) Frame: 1041 Value = (354.87 , 0.39727631738326435) , Sequence ID: 70974

Picked Curve: RR-JOINCE-FZ:SUBCASE 46-(1), Frame #1042 :<TFU File> ->Lap1_Run2-decim_tfu=>RR-JOINCE-FZ:SUBCASE 46-(1) Frame: 1042 Value = (354.92 , -0.40946475140963334) , Sequence ID: 70984

Picked Curve: LBOTH-UPRCA-FX:SUBCASE 39-(1), Frame #1038 :<TFU File> ->Lap1_Run2-decim_tfu=>LBOTH-UPRCA-FX:SUBCASE 39-(1) Frame: 1038 Value = (354.925 , -0.3998827872536398) , Sequence ID: 70985

Picked Curve: RBOTH-UPRCA-FX:SUBCASE 40-(1), Frame #1039 :<TFU File> ->Lap1_Run2-decim_tfu=>RBOTH-UPRCA-FX:SUBCASE 40-(1) Frame: 1039 Value = (354.87 , 0.30468416766275724) , Sequence ID: 70974

Picked Curve: LF-LWRCA-FY:SUBCASE 8-(1), Frame #1007 :<TFU File> ->Lap1_Run2-decim_tfu=>LF-LWRCA-FY:SUBCASE 8-(1) Frame: 1007 Value = (355.945 , 0.5257113357242127) , Sequence ID: 71189

Event plots

Format Curves Probe Zoom Out Quick Format

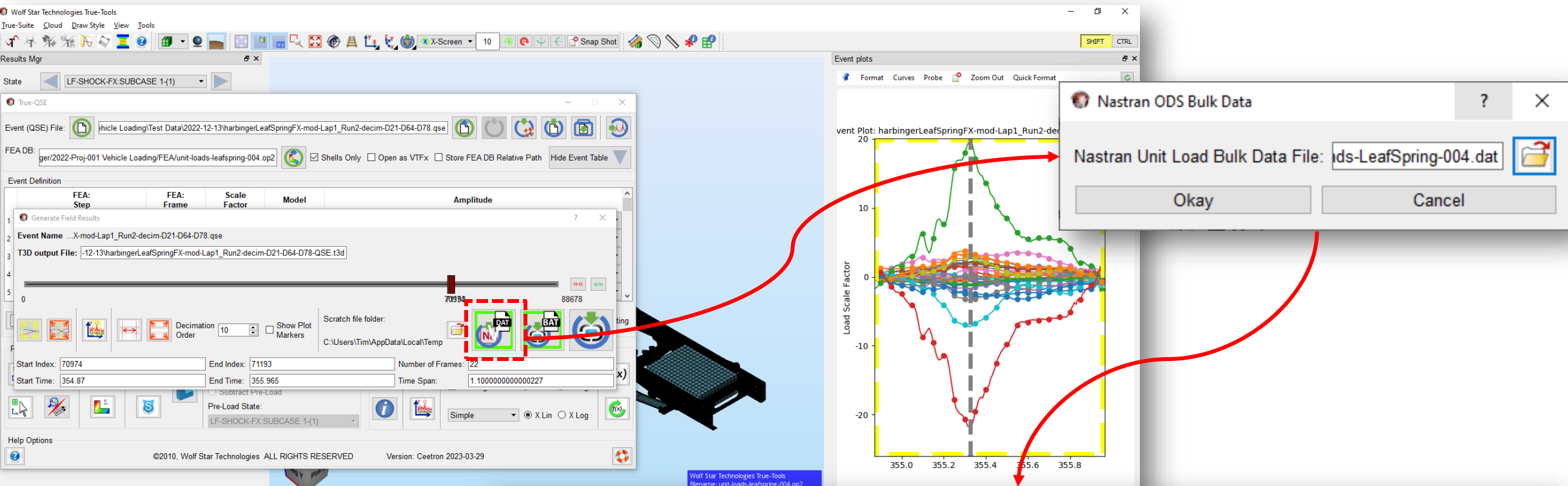
Event Plot: harbingerLeafSpringFX-mod-Lap1_Run2-decim-D21-D64-D78.

Load Scale Factor

355.0 355.2 355.4 355.6 355.8

Wolf Star Technologies True-Tools
Filename: unit-loads-leafspring-004.op2
Parts: 31 Elements 1153684 Nodes 1914197

QSE create Nastran ODS



Nastran ODS Deck

```

Start Time: 354.870000
End Time: 355.965000
Start Index: 70974
End Index: 71193
Decimation Order: 10
-----
('SubCase Bulk Data File: C:\\scratch\\...\\LeafSpringFX-mod-...-D21-D64-D78-subCase.dat')
(' Force Bulk Data File: C:\\scratch\\...\\LeafSpringFX-mod-...-D21-D64-D78-forceBulk.dat')
(' ODS Bulk Data File: C:\\scratch\\...\\ods\\LeafSpringFX-mod-...-D21-D64-D78.dat')
-----

```



Nastran ODS Deck

LeafSpringFX-mod- -D21-D64-D78-forceBulk.dat
LeafSpringFX-mod- -D21-D64-D78-subCase.dat
ods LeafSpringFX-mod- -decim-D21-D64-D78.dat

Nastran Deck for ODS Solve

C:\scratch\Harbinger\2022-Proj-001 Vehicle Loading\Test Data\2022-12-13\odsharbingerLeafSpringFX-mod-Lap1_Run2-decim-D21-D64-D78.dat - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

mergeVTFx.py harbingerTools.py odc LeafSpringFX-mod- -D21-D64-D78.dat

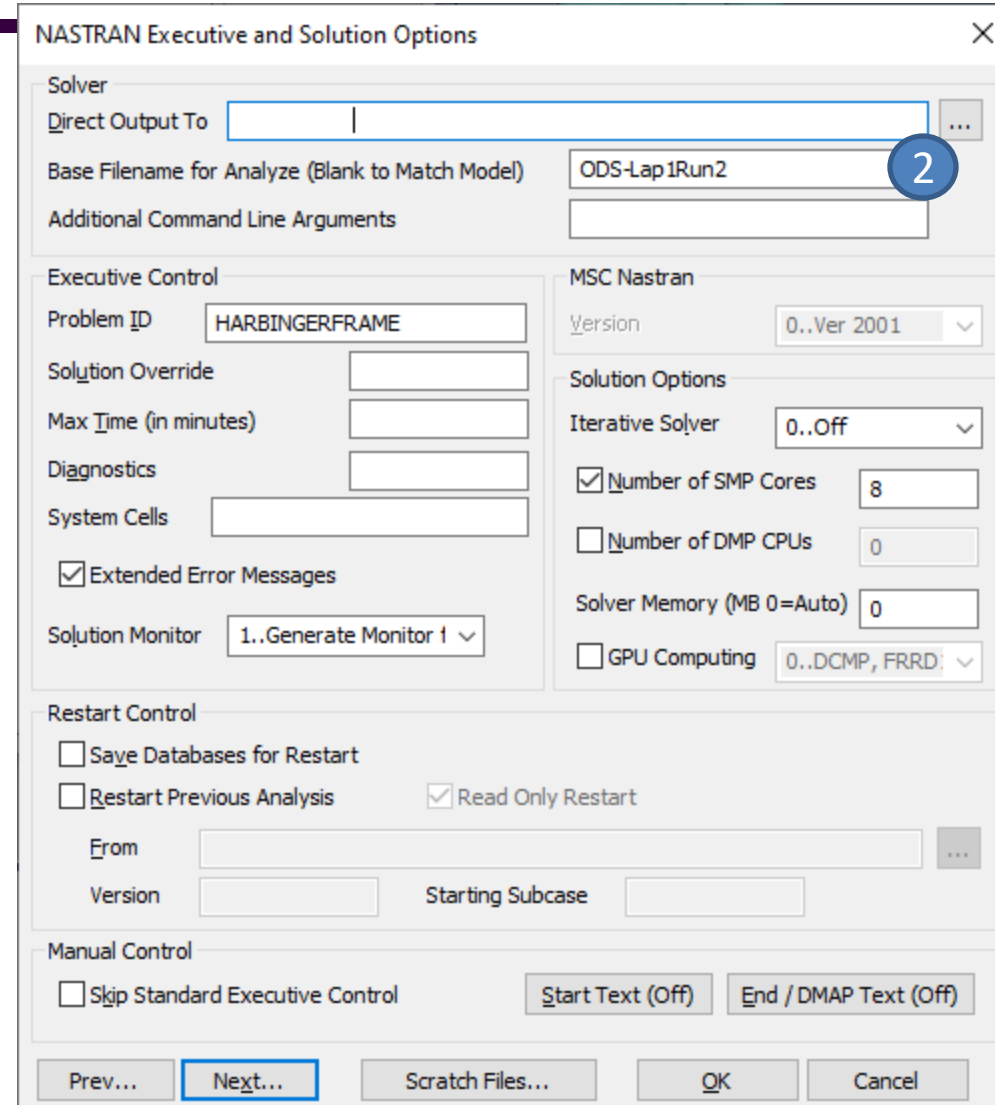
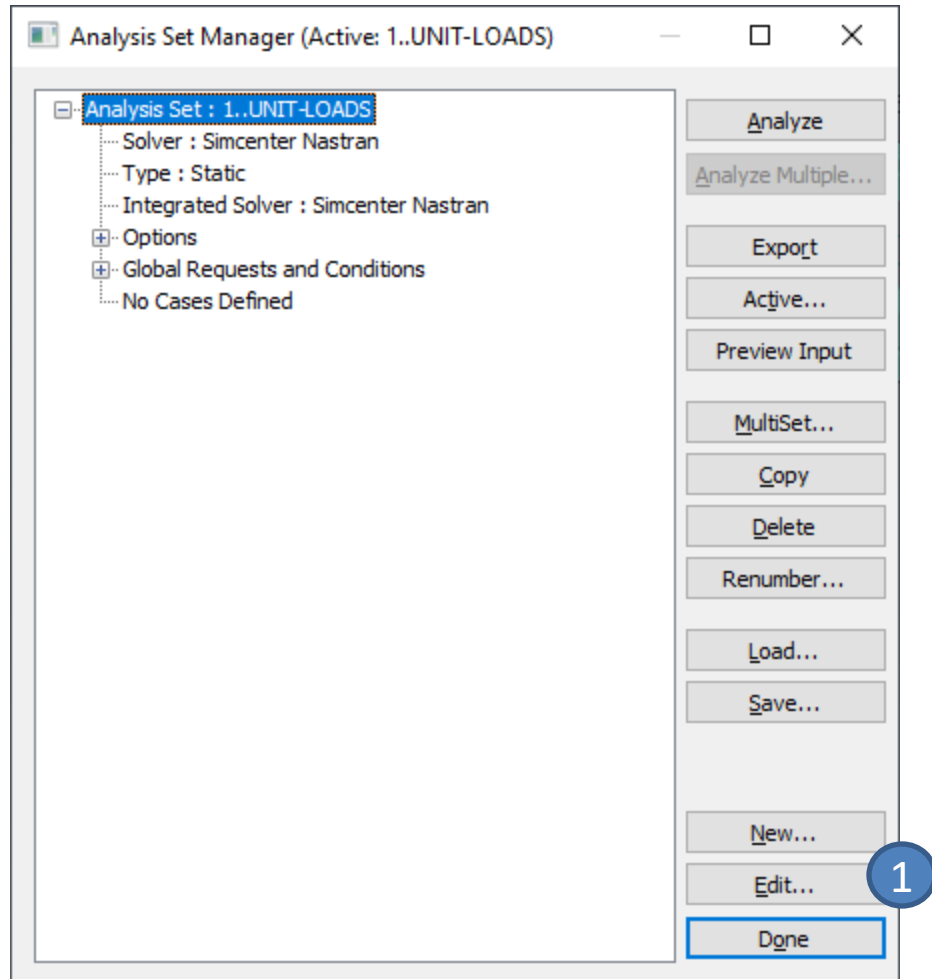
```
1 INIT MASTER(S)
2 NASTRAN SYSTEM(442)=-1, PARALLEL=8, SYSTEM(319)=1
3 ID HARBINGERFRAME, FEMAP
4 SOL SESTATIC
5 GEOMCHECK, NONE
6 CEND
7 ..TITLE=. UNIT-LOADS
8 ..ECHO=. NONE
9 ..DISPLACEMENT (PLOT) .= ALL
10 ..SPCFORCE (PLOT) .= ALL
11 ..SET .1.= 1005 THRU 1008,1011 THRU 1014,
12 ....2005 THRU 2006,50232,1395184 THRU 1395186,
13 ....1395215,1395270
14 ..OLOAD (PLOT) .= 1
15 ..FORCE (PLOT,CORNER) .= ALL
16 ..STRESS (PLOT,CORNER) .= ALL
17 ..STRAIN (PLOT,FIBER,CORNER) .= ALL
18 SUBCASE 1
19 INCLUDE 'C:\scratch\Harbinger\2022-Proj-001 Vehicle Loading\Test Data\2022-12-13\odsharbingerLeafSpringFX-mod-Lap1_Run2-decim-D21-D64-D78-subCase.dat'
20 BEGIN BULK
21 INCLUDE 'C:\scratch\Harbinger\2022-Proj-001 Vehicle Loading\Test Data\2022-12-13\odsharbingerLeafSpringFX-mod-Lap1_Run2-decim-D21-D64-D78-forceBulk.dat'
22 $ Femap Property 6 : Leaf Spring
23 PSHELL .....615240000 .....25.415240000 .....15240000 .....0.
24 $ Femap Property 3000000 : pt_bush.1
25 PBUSH .....3000000 .....K .....500 .....150 .....500 .....150000 .....75000 .....150000 .....
26 $ Femap Property 4000000
```

Include statements for FORCE and SUBCASE cards





Usage in FEMAP





Usage in FEMAP

NASTRAN Bulk Data Options

Portion of Model to Write: 0..Entire Model

PARAM

- ☒ AUTOSPC: 0..Eigenvalue
- ☒ GRDPNT: 0
- ☐ WTMAS: 1.
- ☒ K6ROT: 100.
- ☐ MAXRATIO: 10000000.
- ☐ NDAMP: 0.01
- ☒ INREL: -2..Automatic(Static)
- ☐ BOLTFACT: 10000000.
- ☐ ENFMOTN: 0..Constraint Mode
- ☐ SWPANGLE: 0.
- ☐ MGRID: 0
- MDOF: 1
- ☐ MATNL:
- ☐ TENSOQD: -1..Invoke conversion
- ☐ LANGLE: ☒ AUTOMPC
- ☐ LGDISP: ☐ DDRMM off
- ☐ LGSTRN: ☐ MODACC
- ☐ PRGPST: ☐ RESVEC
- ☒ OGEOM: ☐ On ☐ Off
- ☐ SRCOMPS: ☐ RESVINER
- ☐ NOFISR: ☐ CNTASET
- ☒ BAILOUT: ☐ SECOMB

Format

- ☐ ALPHA1
- ☐ ALPHA2
- ☒ Small Field
- ☐ Large Field
- ☐ Large Field
- ☐ Large Field

Translator Options

- ☐ All Plates as
- ☐ Skip Beam/B
- ☐ Gaps as Cor
- ☐ Dynamic Lo
- ☐ Write All Sta
- ☐ Rigid Elem. M

Manual Control

- ☐ Skip Standar
- ☐ End Text of File Outside Bulk

Start Text (On) End Text (Off)

Prev... Next... OK Cancel

Analysis Text

```
FORCE 70977 1011 11 1 0 -0.0
FORCE 70977 1012 12 1 0 -0.0
FORCE 70977 1005 0 1 0 -174.
FORCE 70977 1005 0 1 0 0.0
FORCE 70977 1005 0 1 0 -0.0
FORCE 70977 1006 0 1 0 -550.
FORCE 70977 1006 0 1 0 -0.0
FORCE 70977 1006 0 1 0 -0.0
FORCE 70977 1007 0 1 0 0.0
FORCE 70977 1007 0 1 0 -0.0
FORCE 70977 1008 0 1 0 -0.0
FORCE 70977 1008 0 1 0 0.0
FORCE 70977 1395184 0 1 0 0.0
FORCE 70977 1395184 0 1 0 -
FORCE 70977 50232 0 1 0 155
FORCE 70977 50232 0 1 0 -0.0
FORCE 70977 1395186 0 1 0 0.0
FORCE 70977 1395186 0 1 0 0.0
FORCE 70977 1395185 0 1 0 0.0
FORCE 70977 1395185 0 1 0 -
FORCE 70977 1013 0 1 0 0.0
FORCE 70977 1014 0 1 0 -0.0
```

Read Text From NASTRAN

File name: harbinger_LeafSpringFX-mod-lap1_run2-decim-D21-D64-D78-forceBulk.dat

ASTRAN (*.nas;*.dat;*.nid;*.d;*)

Open Cancel

Text From File

☒ As Text ☐ As INCLUDE Statement

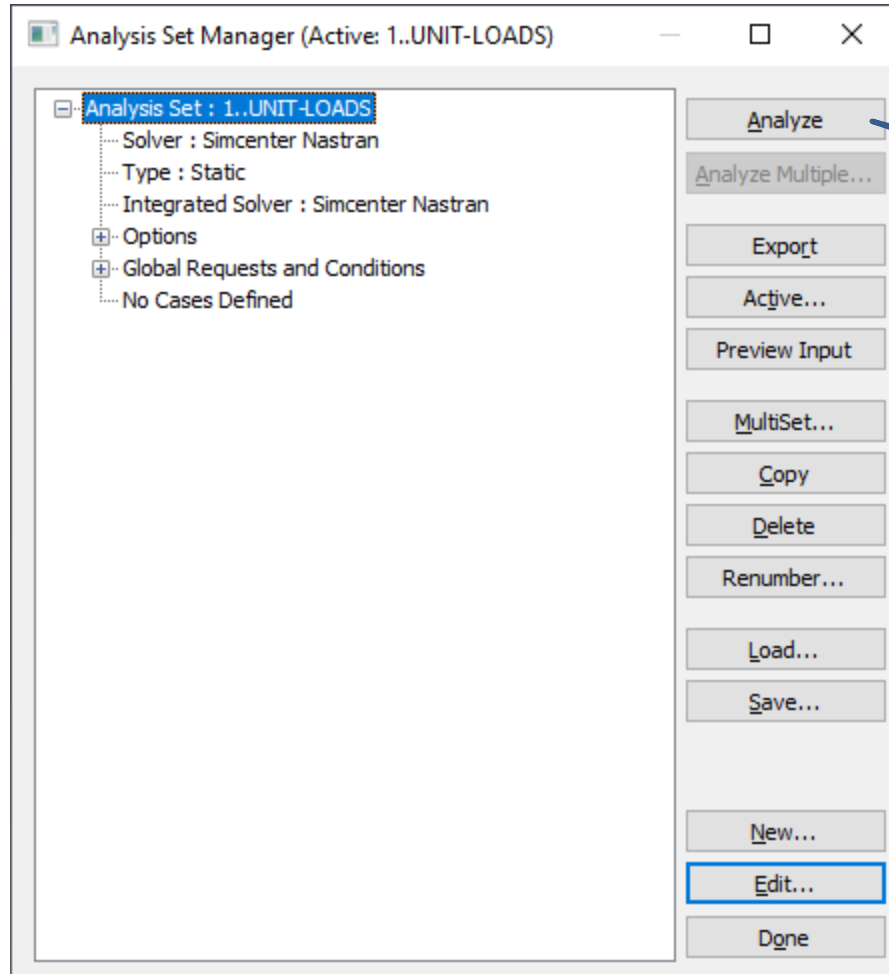
Select File... Delete All OK Cancel

7

9

10

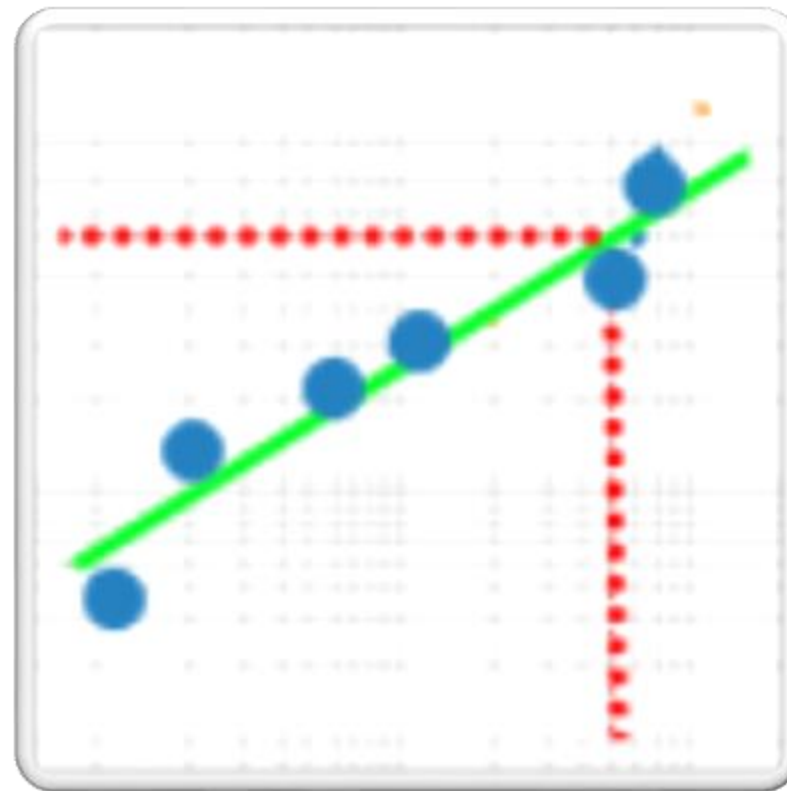
FEMAP



Then just Analyze

This will create an OP2 with results at every time step.

Weibull

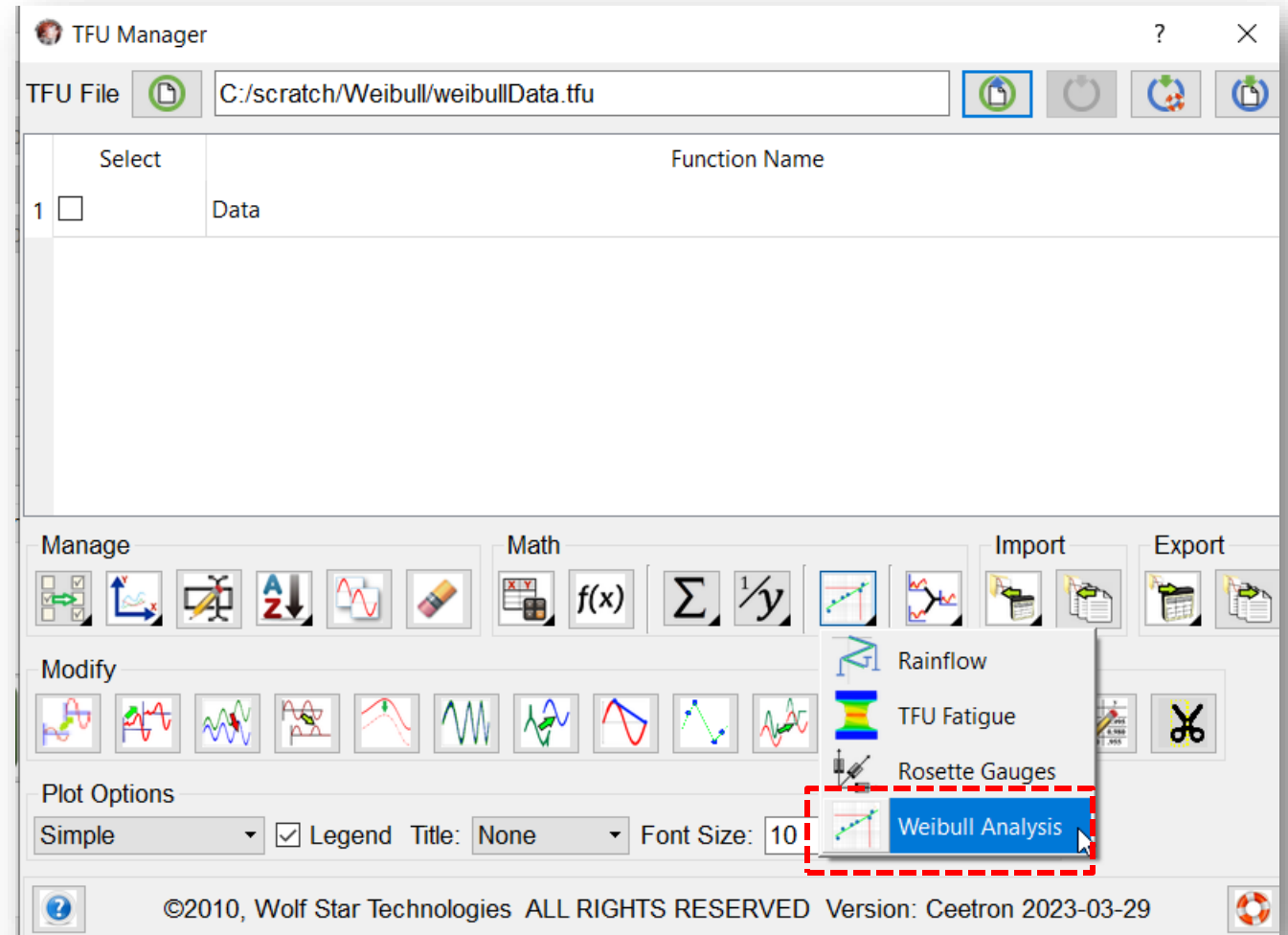




Weibull Analysis in TFU Mgr

Weibull Analysis is a methodology used for performing life data analysis. Life data is the result of measurements of a product's life. Weibull Analysis is an effective method of determining reliability characteristics and trends of a population using a relatively small sample size of field or laboratory test data.

Ref: [Quality One: Weibull Analysis](#).





Weibull Analysis in TFU Mgr

TFU Manager

TFU File C:/scratch/Weibull/weibullData.tfu

Select Function Name

1 ☒ Data

Edit Functions

Data

Save as: Data ☒ Overwrite ☐ Edited Date

Number of Points: 12

	x	y
1	0.0	1000.0
2	1.0	100.0
3	2.0	5000.0
4	3.0	6000.0
5	4.0	-2000.0
6	5.0	200.0
7	6.0	-6500.0
8	7.0	7000.0
9	8.0	7000.0
10	9.0	600.0
11	10.0	5000.0
12	11.0	-10000.0

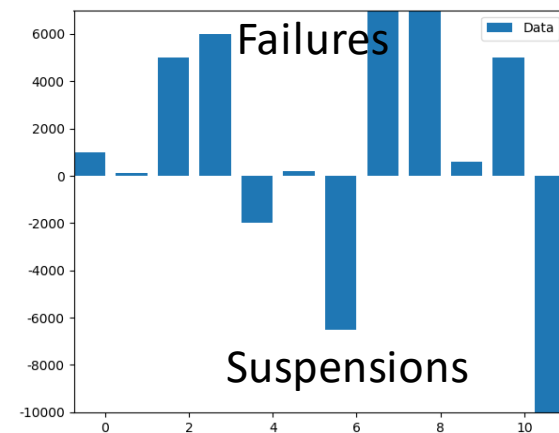
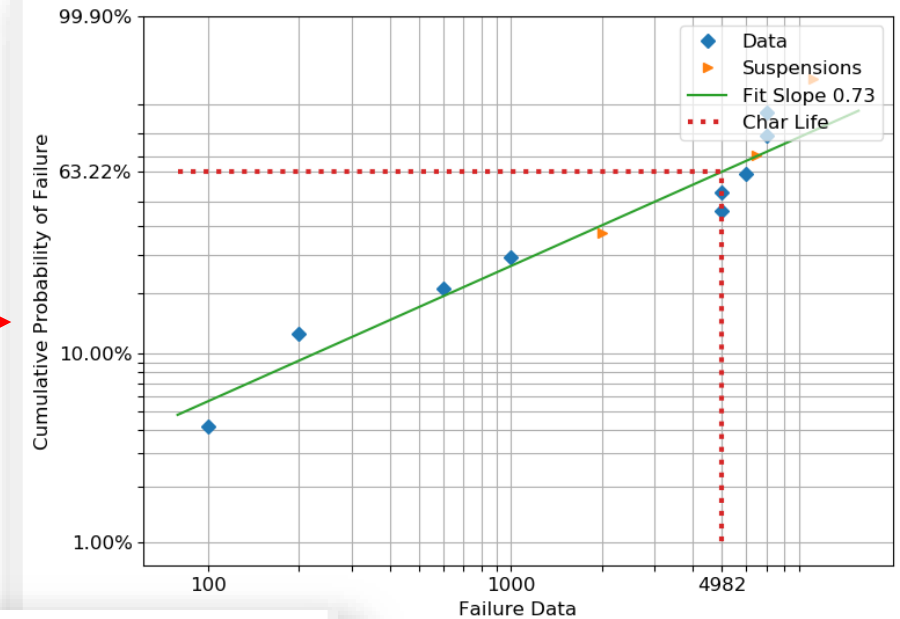
Import Export

Size: 10 Scale / Grid Opts

SERVED Version: Ceetron 2023-03-29

Save Cancel

Data to be analyzed: Positive values indicate failures; Negative values indicate suspensions (unfailed)





Weibull Analysis in TFU Mgr

- Current implementation:
 - Two Parameter Weibull
 - This means that the Weibull slope will intersect zero probably at zero failure data.
 - This may not be representative of your data (e.g. things like batteries have zero probability of failure at some finite life.)
- In Future Release:
 - Three Parameter Weibull
 - This will handle data with zero probability at non-zero life.

Simulate Strains



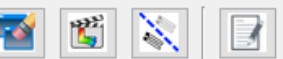
Simulate Strains on Gauges

True-Load/Pre-Test

TLD File:  C:/scratch/ceeTron_dev/Code Test/hLamp_GOI.tld

FEA DB:  ☒ Load Shell

Select elements for candidate gauges  6 elements picked  

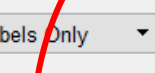
Session Tools 

Stationary Loads Moving Loads

Step	Fr
1 Unit-Loads:Load Case: GRAV-10GX-(1)	1001
2 Unit-Loads:Load Case: GRAV-10GY-(2)	1002
3 Unit-Loads:Load Case: GRAV-10GZ-(3)	1003

Unit-Loads:Increment 0: Base State-(0) Scale:    ☐ Enable Table Sort

Shell Surface: ☒ Top SPOS ☐ Bottom SNEG Min Distance between Gauges:

Gauge Placement  Number of Gauges ☒ Refresh Strain Tensors 

Test Simulation  Event File Name

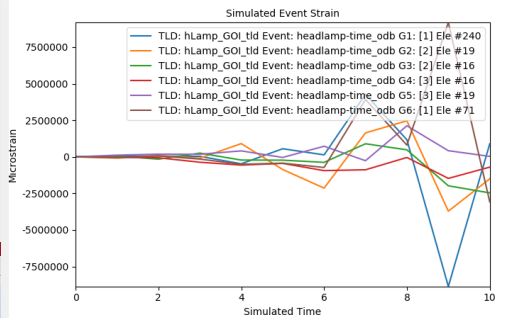
File name: headlamp-time.odb

Plot Legend Font Size:

Labels Only 

When using FEA DB for simulate strains, the FEA format and / or the FEA mesh does not have to match the TLD FEA DB

Simulated Event Strain



ANSYS Binary Result File(*.rst *.rth *.rfl)
ANSYS CDB File(*.cdb)
CGNS File(*.cgns)
Cgeo File(*.cgeo)
Ensignt CASE File(*.case)
FLUENT Mesh File(*.cas *.dat)
Femap File(*.neu)
Hyperworks H3D File(*.h3d)
IDEAS Universal File(*.unv *.univ)
LS-DYNA Keyword File(*.k *.key)
LS-DYNA state database (d3plot*.d3plot*.p)
MSC/Marc Post File(*.t16 *.t19)
NASTRAN Bulk Data File(*.dat *.bdf)
NASTRAN OUTPUT2(*.op2 *.bin)
OpenFoam Case File(*.foam)
PTC Analysis(*.neu)
PVTU File(*.pvtu)
QSE Files (*.qse)
STL File(*.stl *.sla)
Tecplot File(*.plt)
Transvalor File(*.fg3 *.fg2 *.fr3 *.may *.in3 *.t)
VTM/PVD File(*.vtm *.pvd)
VTU/PVD File(*.vtu *.pvd)
All files (*.*)
ABAQUS ODB File(*.odb)
Open Cancel

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GOI Test Data Compare Stats





GOI Test Data Compare Stats

True-QSE

Event (QSE) File:

FEA DB: ☒ Shells Only ☐ Open as VTFx ☒ Store FEA DB Relative Path

Event Definition

FEA: Step	FEA: Frame
FX 1KN.SUBCASE 1(1)	1000
FY 1KN.SUBCASE 2(1)	1001
FZ 1KN.SUBCASE 3(1)	1002

Step: FX 1KN.SUBCASE 1(1)

Results Generation

Help Options

1

Test Data Comparison

GOI File: ☒ Include T-L Gauges

Data Component

Shell Surface: ☒ Top SPOS ☐ Bottom SNEG

Map File:

Test TFD File:

Plot: ☐ All Adjacent GOIs ☒ Best Adjacent GOI

Best Adj Coord: Vector:

Movement to Best Adj: Distance:

Single ☒ Multiple

Test Function	GOI Name
1 Chan#01 Uniaxial	TLG #1
2 Chan#02 Uniaxial	TLG #2
3 Chan#03 Uniaxial	TLG #3
4 Chan#04 Uniaxial	TLG #4
5 Chan#05 Uniaxial	TLG #5
6 Chan#06 Uniaxial	TLG #6

Clear Cancel

2

3

hexiCopter-Menet_Arm2_2023-0

File | C:/scratch/Menet/HexiCopter/Test%20Data/2023-03-25/hexiCopter-Menet_Ar...

True-Load QSE GOI Test Data Compare Report
Report Written: Thu Mar 30 07:28:17 2023

GOI File: C:/scratch/Menet/HexiCopter/TLD Files/hexiCopter.tld
Test Data File C:/scratch/Menet/HexiCopter/Test Data/2023-03-25/Menet_Arm2_2023-03-25_05.tfu
QSE File: C:/scratch/Menet/HexiCopter/Test Data/2023-03-25/hexiCopter-hybrid-Menet_Arm2_2023-03-25_05.qse
Best GOI Lines CSV File: hexiCopter-Menet_Arm2_2023-03-25_05_BestGOI Lines.csv
HTML Report File: hexiCopter-Menet_Arm2_2023-03-25_05_GOICompare.html

Gauge VS Func	Measured Strain Maximum	Measured Strain Minimum	Measured Strain Range	Measured Strain RMS	Maximum Error	Minimum Error	Average Error	RMS Error	% RMS Error	Slope (m)	Intercept (b)	Corollary (r^2)
TLG #1 VS Chan#01 Uniaxial Gauge	125.21	-58.56	183.77	83.91	2.99	0.00	1.13	1.29	0.70	1.03	-0.19	1.00
TLG #2 VS Chan#02 Uniaxial Gauge	52.04	-83.77	135.80	55.23	4.04	0.00	1.72	2.10	1.54	0.94	-0.15	1.00
TLG #3 VS Chan#03 Uniaxial Gauge	37.09	-59.40	96.49	38.23	4.22	0.00	1.88	2.29	2.37	0.93	0.07	1.00
TLG #4 VS Chan#04 Uniaxial Gauge	42.82	-23.15	65.97	28.05	3.52	0.00	0.48	0.66	1.00	0.99	0.06	1.00
TLG #5 VS Chan#05 Uniaxial Gauge	19.12	-25.09	44.21	15.88	4.13	0.00	0.53	0.75	1.69	1.05	-0.17	1.00
TLG #6 VS Chan#06 Uniaxial Gauge	11.91	-17.50	29.41	10.85	4.29	0.00	0.55	0.73	2.50	1.03	-0.22	0.99
Average:					3.691		1.304	1.584	1.405%	0.974	-0.052	0.999

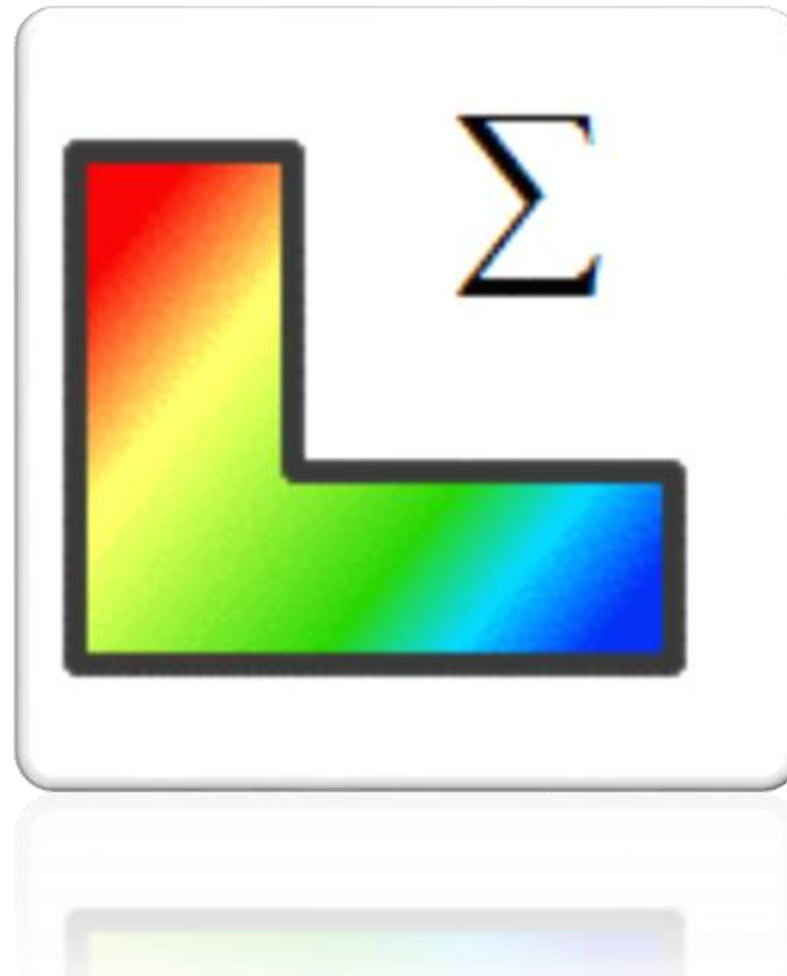
TLG #1 VS Chan#01 Uniaxial Gauge Best GOI Movement vector: (0.0

TLG #2 VS Chan#02 Uniaxial Gauge Best GOI Movement vector: (0.0

Stats on "Best" GOIs

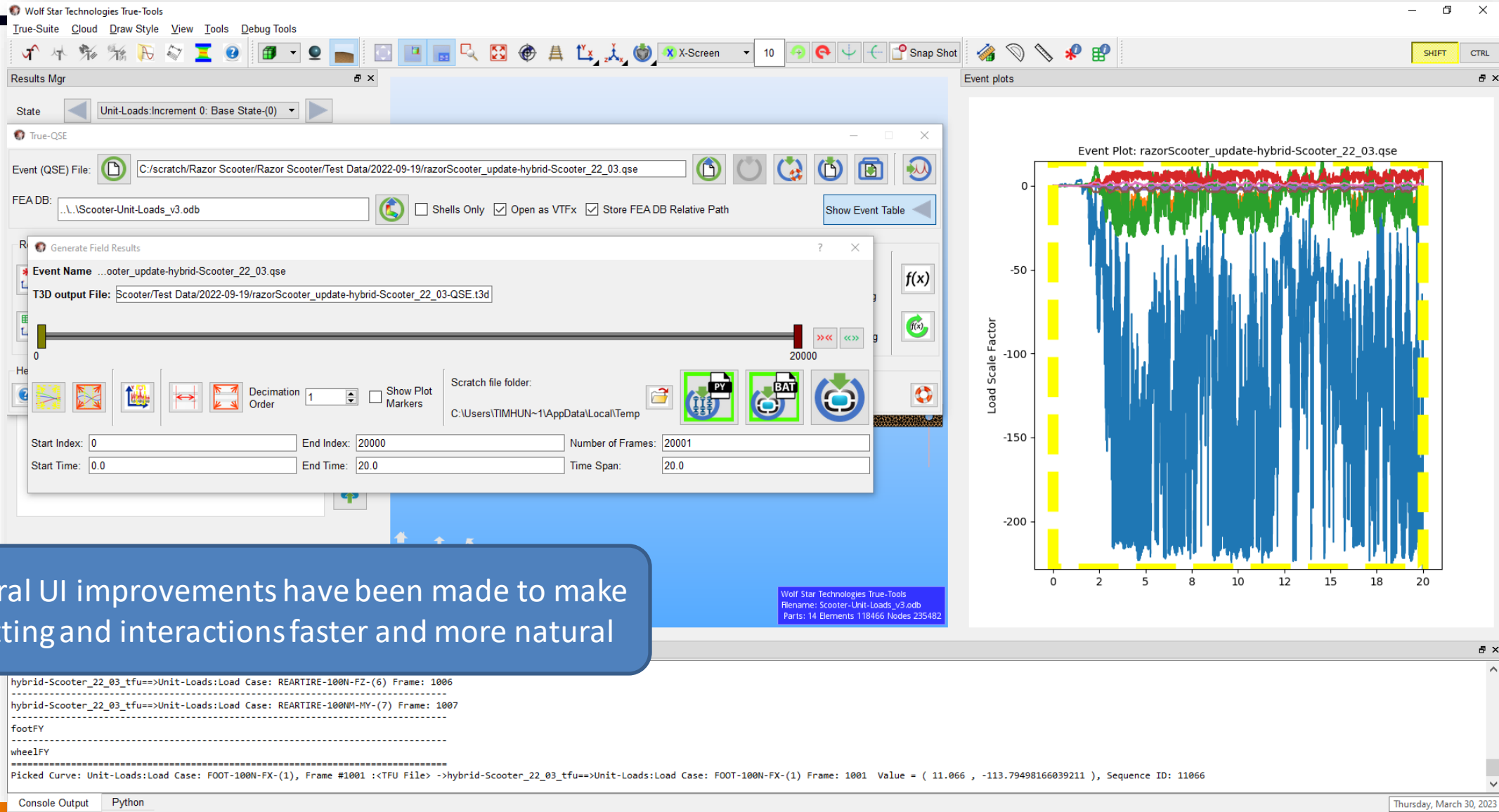


ODS Field Results UI





ODS Field Results UI

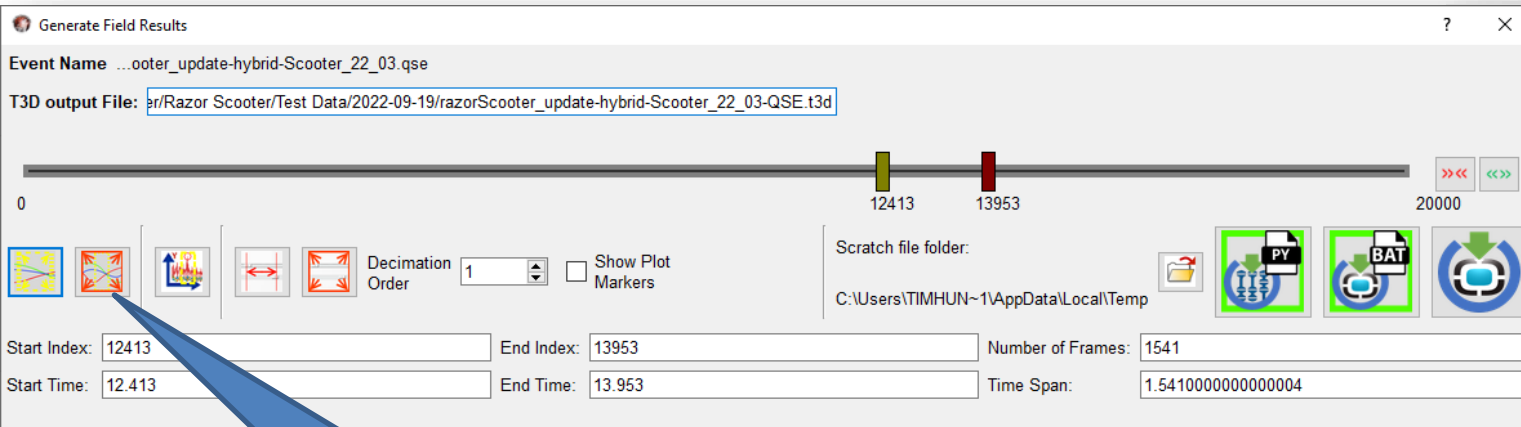


Several UI improvements have been made to make plotting and interactions faster and more natural

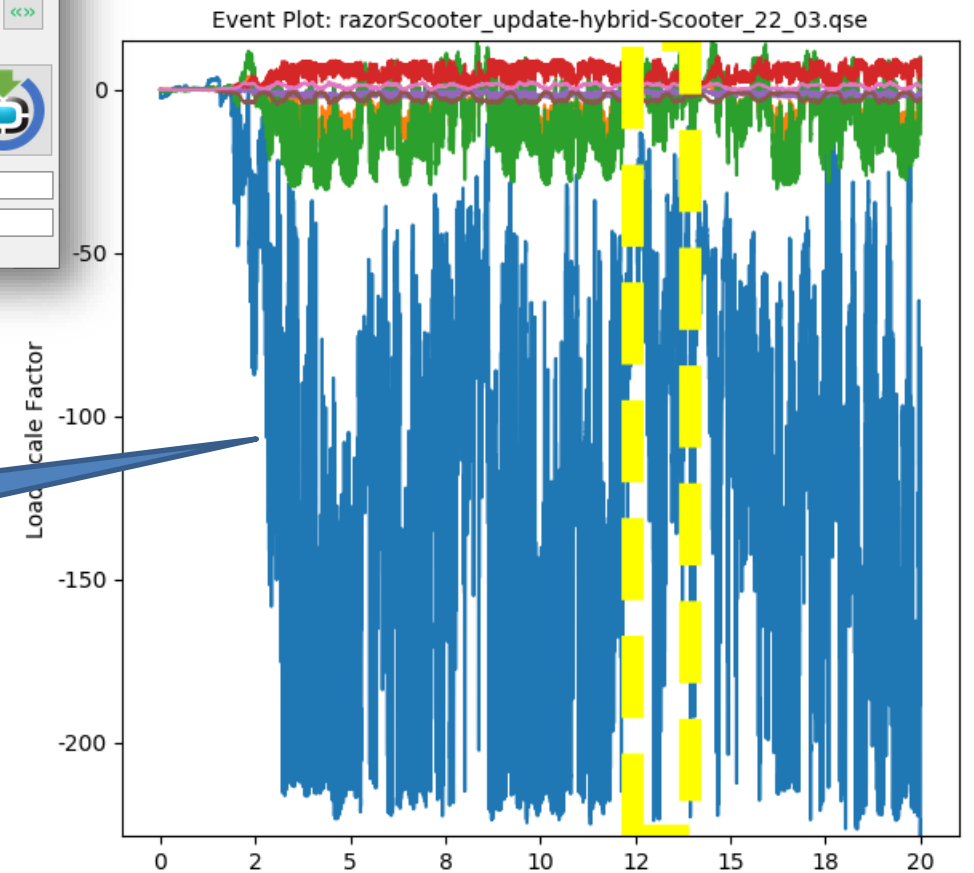




ODS Field Results UI

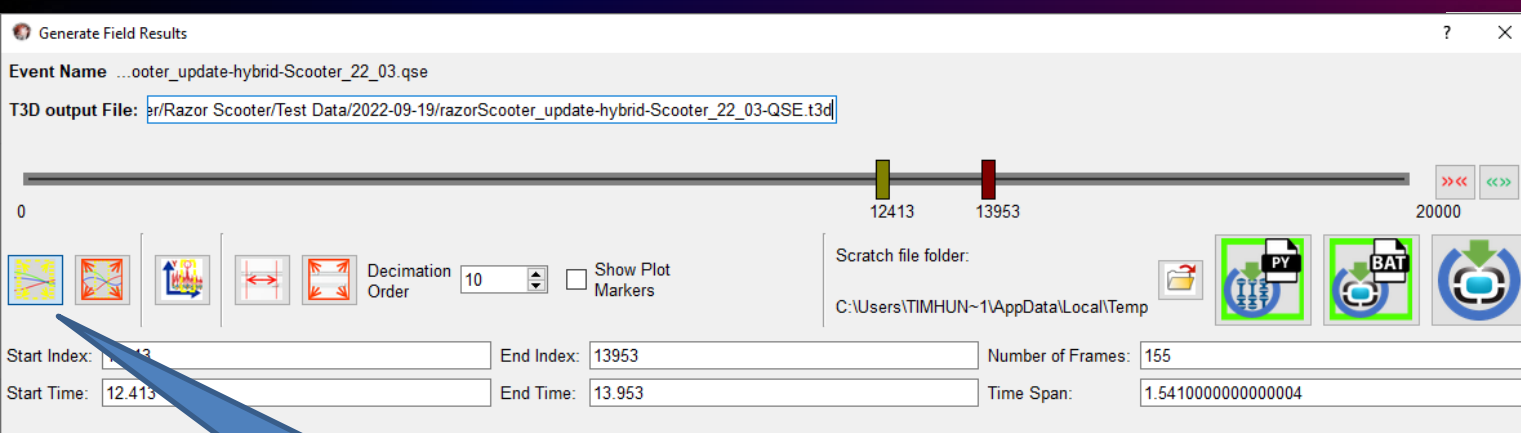


Plot All turns makers off on the plot.
This makes plotting faster

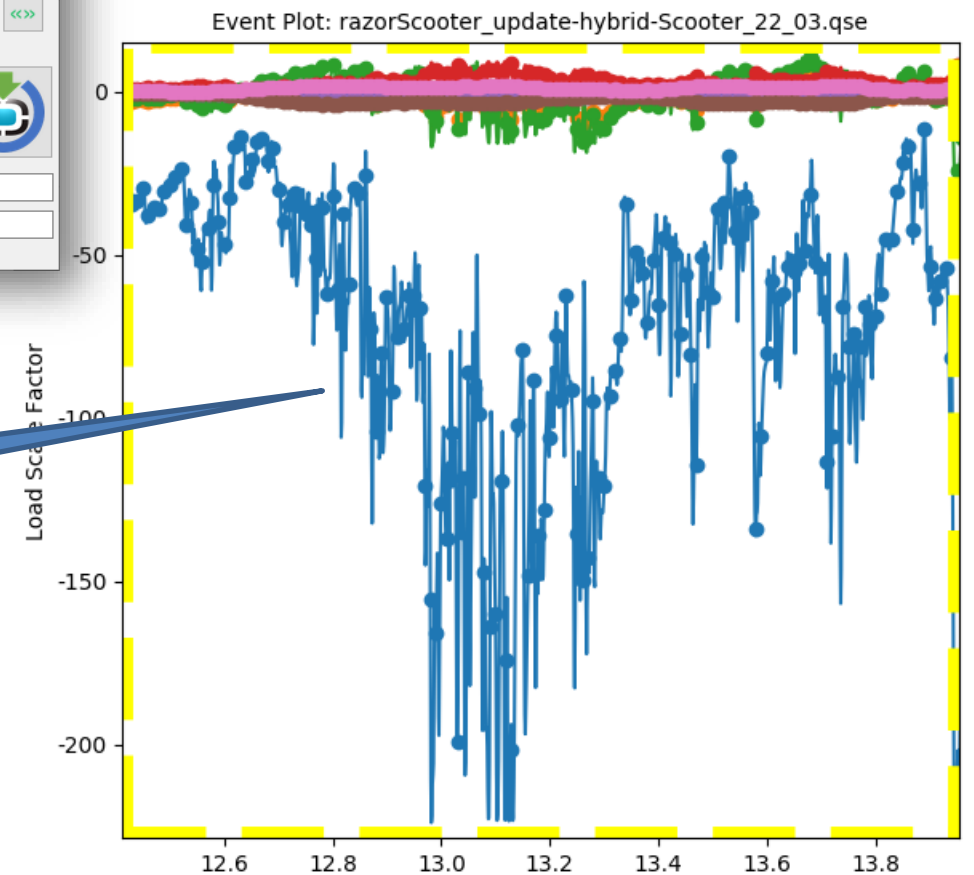




ODS Field Results UI



Plot Clip turns makers on to show detail





ODS Field Results UI

Generate Field Results

Event Name: razorScooter_update-hybrid-Scooter_22_03.qse

T3D output File: C:\Razor Scooter\Test Data\2022-09-19\razorScooter_update-hybrid-Scooter_22_03-QSE.t3d

0 12413 13953 20000

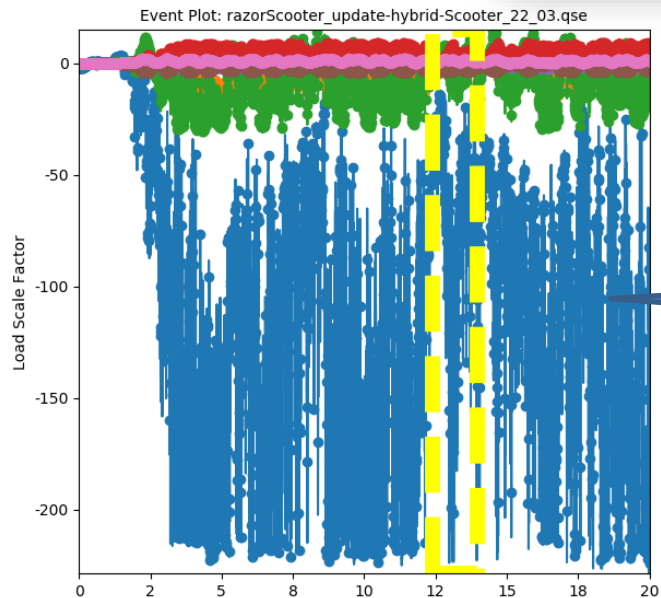
Decimation Order: 10

☒ Show Plot Markers

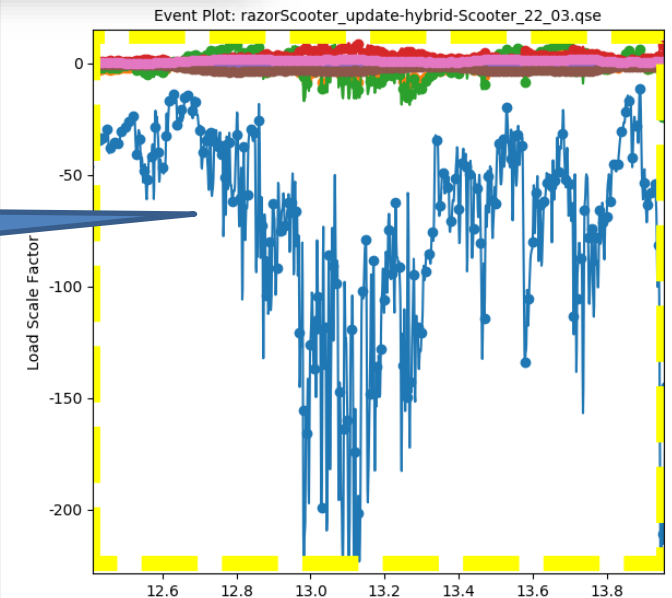
Scratch file folder: C:\Users\TIMHUN~1\AppData\Local\Temp

Start Index: 12413 End Index: 13953 Number of Frames: 155

Start Time: 12.413 End Time: 13.953 Time Span: 1.5410000000000004



Plot Marker checkbox to always plot markers (off by default)





ODS Field Results UI

Generate Field Results

Event Name: ...ooter_update-hybrid-Scooter_22_03.qse

T3D output File: ...er/Razor Scooter/Test Data/2022-09-19/razorScooter_update-hybrid-Scooter_22_03-QSE.t3d

0 12413 13953 20000

Plots obey settings on main QSE form

Decimation Order: 10 ☒ Show Plot Markers

Scratch file folder: C:\Users\TIMHUN~1\AppData\Local\Temp

Start Index: 12413 End Index: 13953 Number of Frames: 155

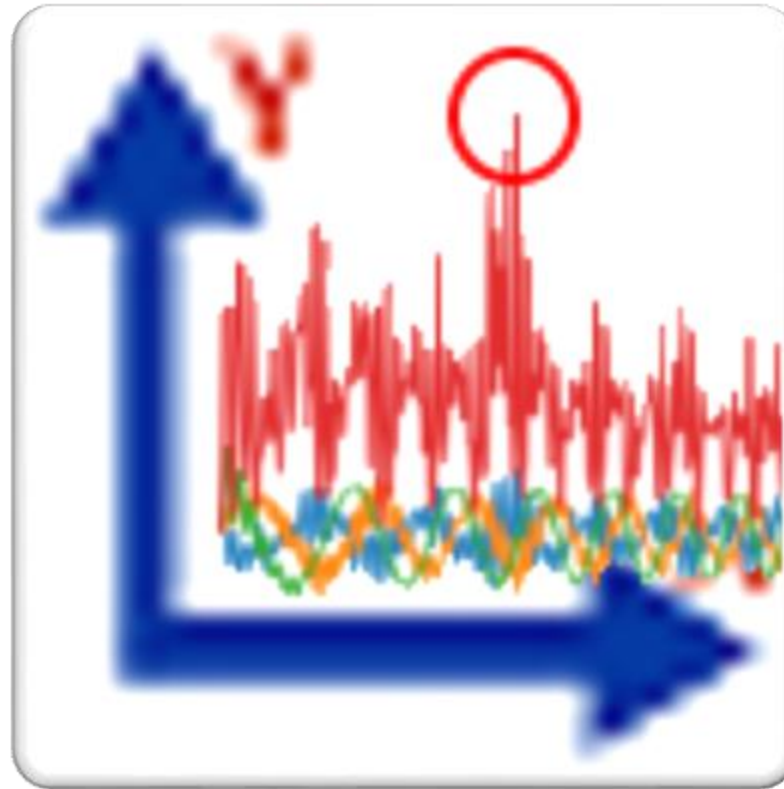
Start Time: 12.413 End Time: 13.953 Time Span: 1.5410000000000004

End time is inclusive now. Previously, the animation included up to the time (one index less than final time)

End time is INCLUSIVE!!!

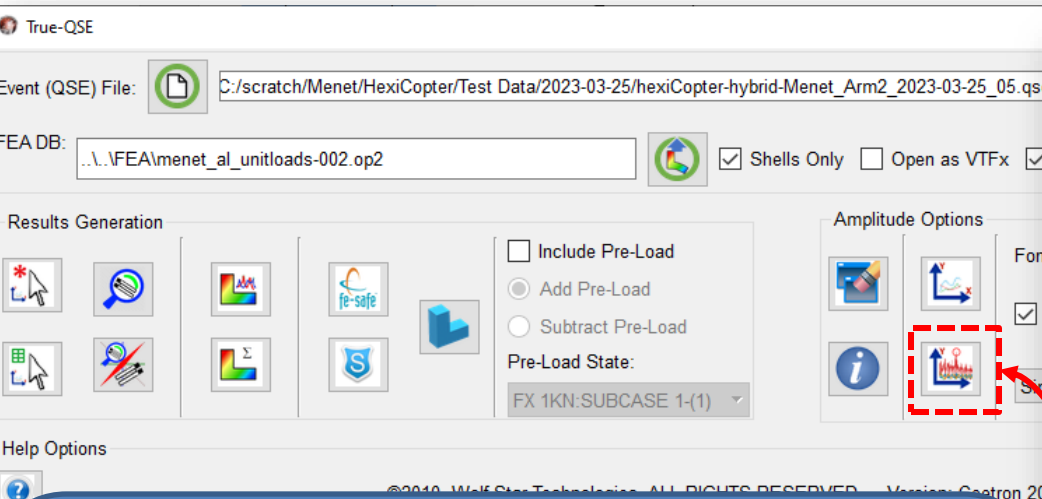


Max Load Plot





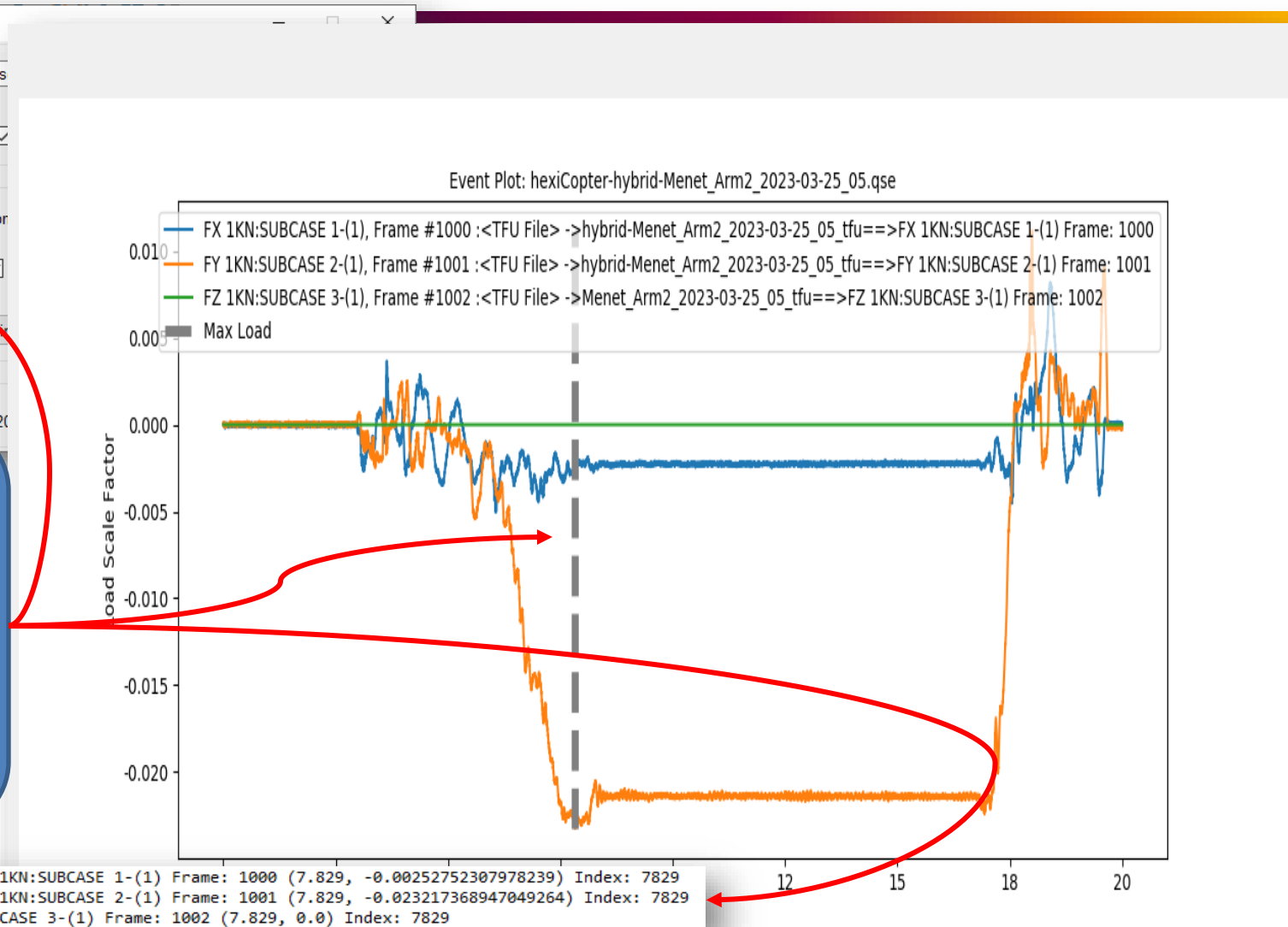
Max Load Plot



Max Load button shows location of max load and prints values.

Previous version did this, but plotted an extra RMS curve on plot which was confusing.

This is more understandable

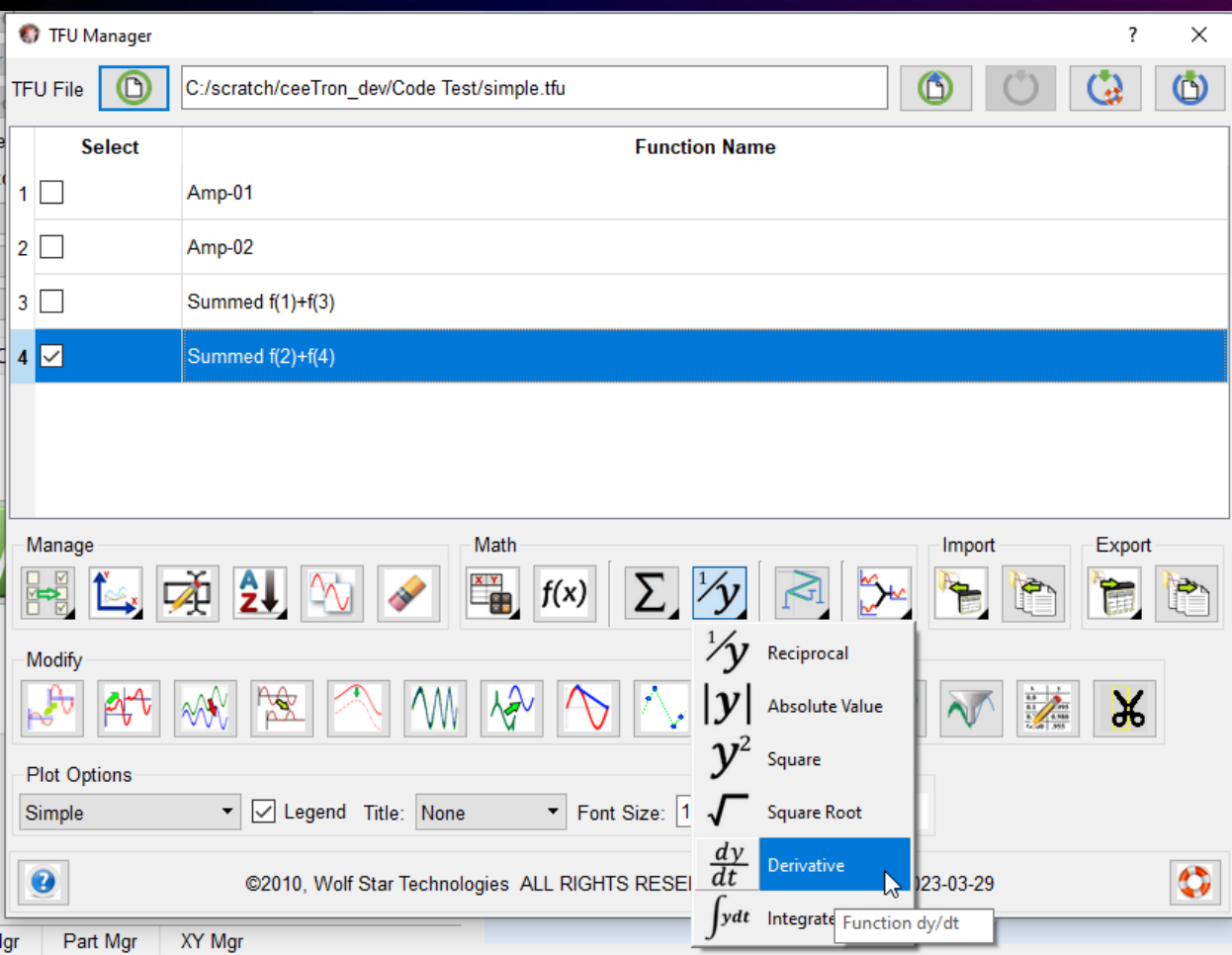


dy/dt Refinements

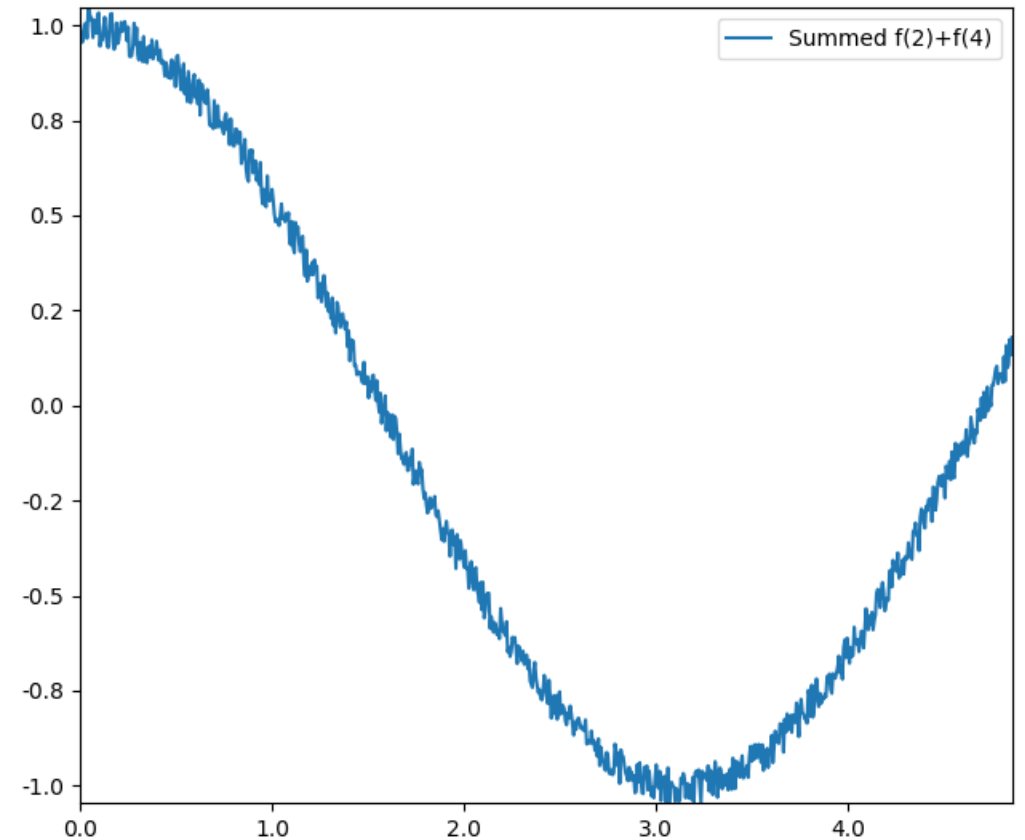
$$\frac{dy}{dt}$$



dy/dt Refinements



Numerical derivatives of noisy data





dy/dt Refinements

Calculate Derivative

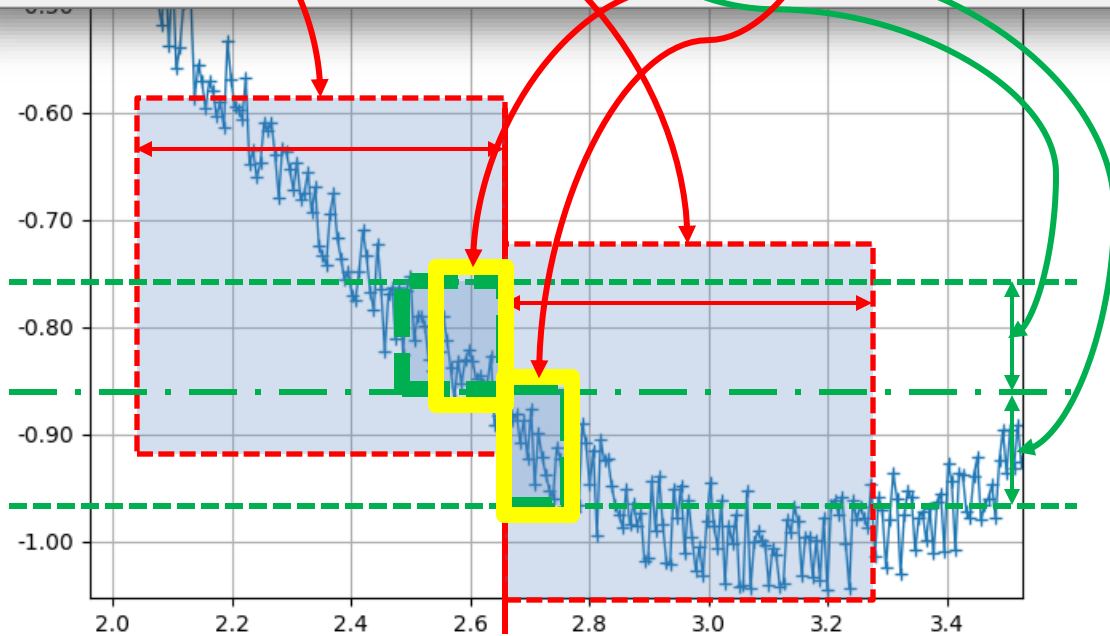
Segment Size: 200 points Y Tolerance: 0.1 ☒ Symmetric Segment Min Pts: 1

Approximating Polynomial Order: 2

Approximating Polynomial: $y = C0x^0 + C1x^1 + C2x^2$

Derivative: ☒ 1 ☐ 2

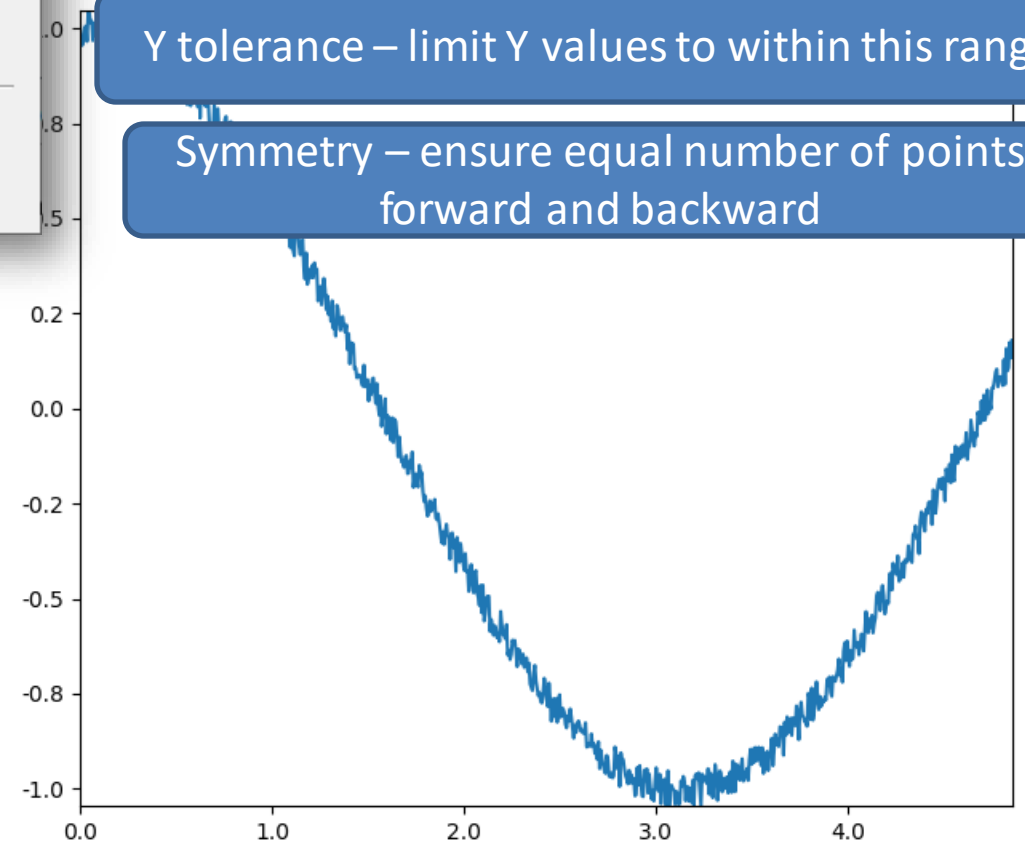
Okay Apply Cancel



Number of points per segment to fit polynomial through (old stuff)

Y tolerance – limit Y values to within this range

Symmetry – ensure equal number of points forward and backward





dy/dt Refinements

Calculate Derivative

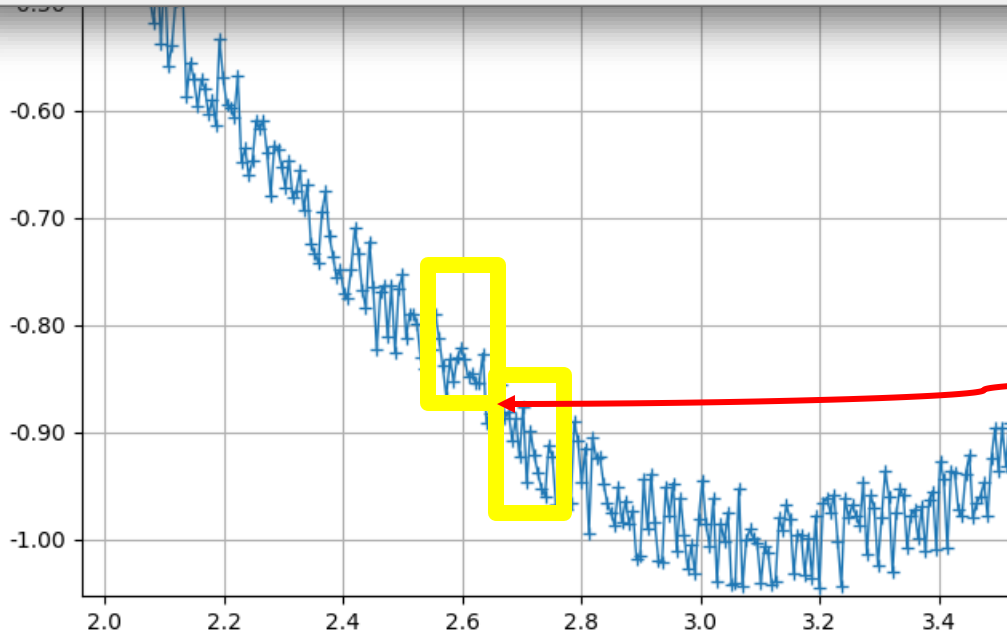
Segment Size: 200 points | Y Tolerance: 0.1 | ☒ Symmetric Segment | Min Pts: 1

Approximating Polynomial Order: 2

Approximating Polynomial: $y = C0x^0 + C1x^1 + C2x^2$

Derivative: ☒ 1 ☐ 2

Okay Apply Cancel



Approximating curve is fit through selected points

Closed form derivative is created from the polynomial function

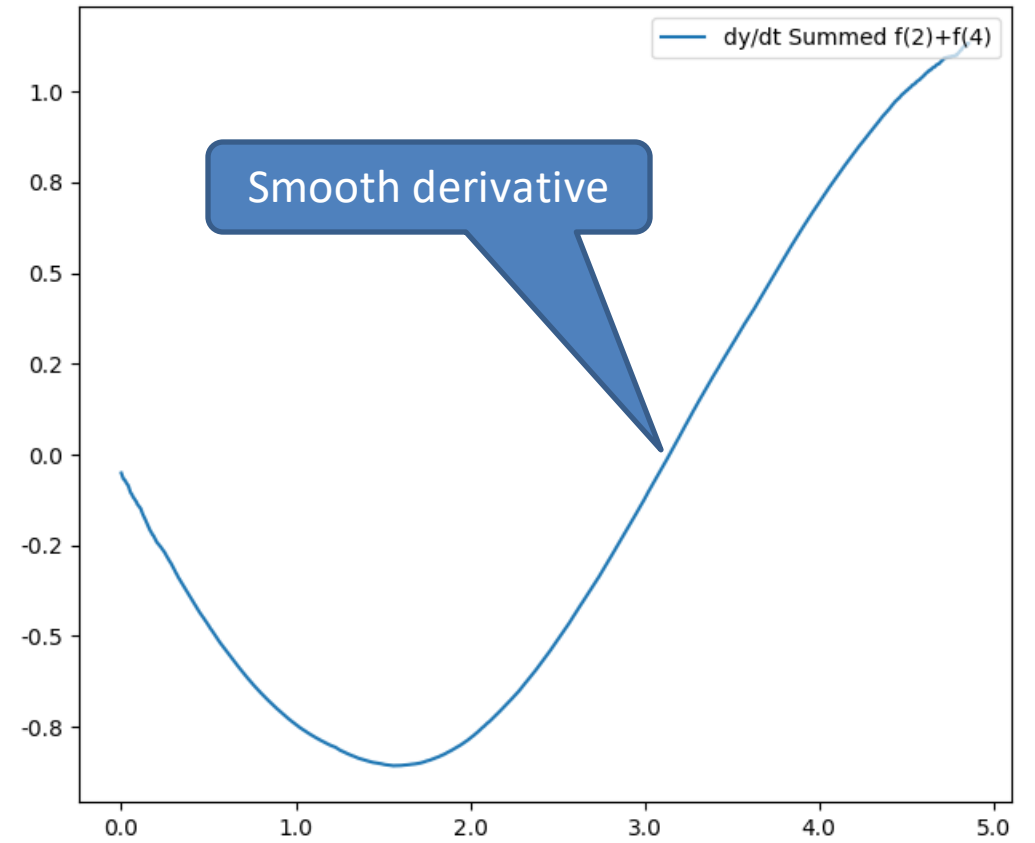
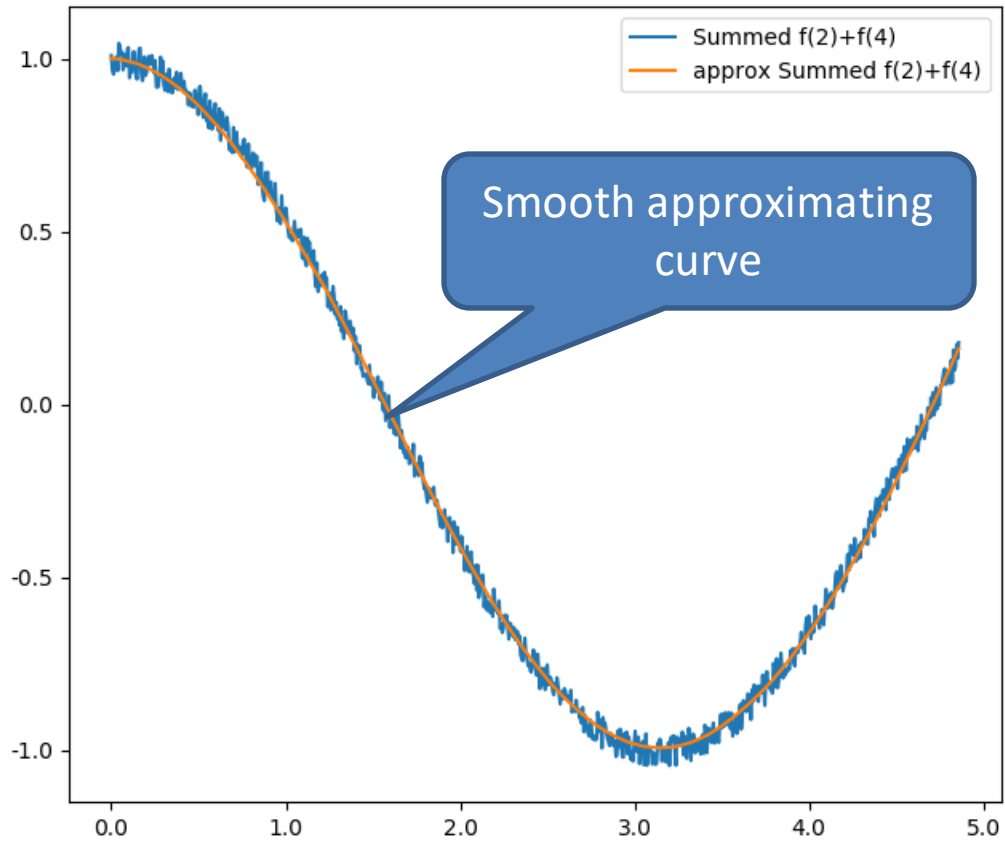
The closed form derivative is evaluated at the point

The process is repeated for every point in the function

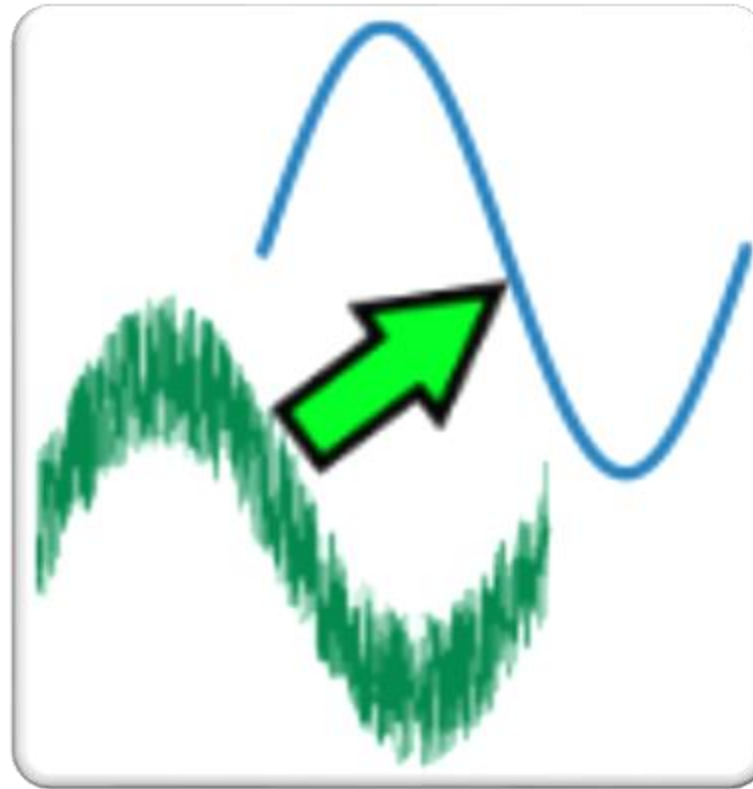




dy/dt Refinements



Curve Smoothing





Curve Smoothing

TFU Manager

TFU File  C:/scratch/ceeTron_dev/Code Test/simple.tfu    

Select	Function Name
1 ☐	Amp-01
2 ☐	Amp-02
3 ☐	Summed f(1)+f(3)
4 ☐	Summed f(2)+f(4)

Manage      

Math  $f(x)$ Σ $\frac{dy}{dt}$  

Import   

Export  

Modify                 

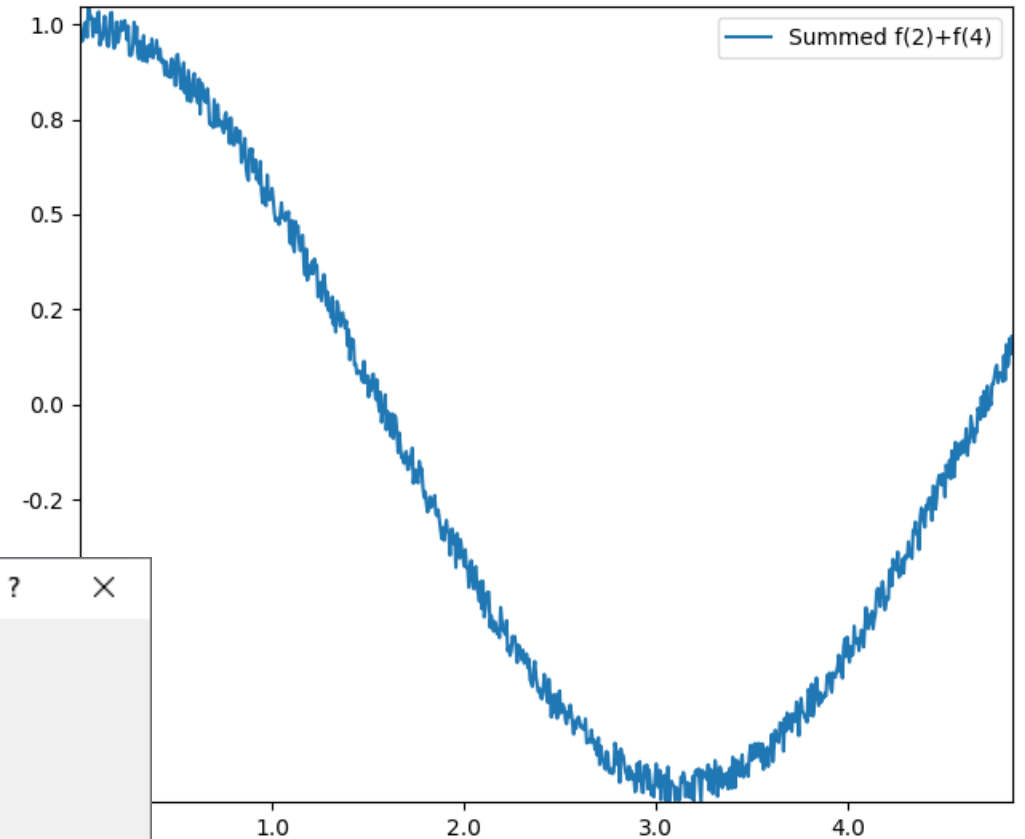
Plot Options: Simple 

Polynomial Smoothing

Segment Size: points | Y Tolerance: ☒ Symmetric Segment | Min Pts:

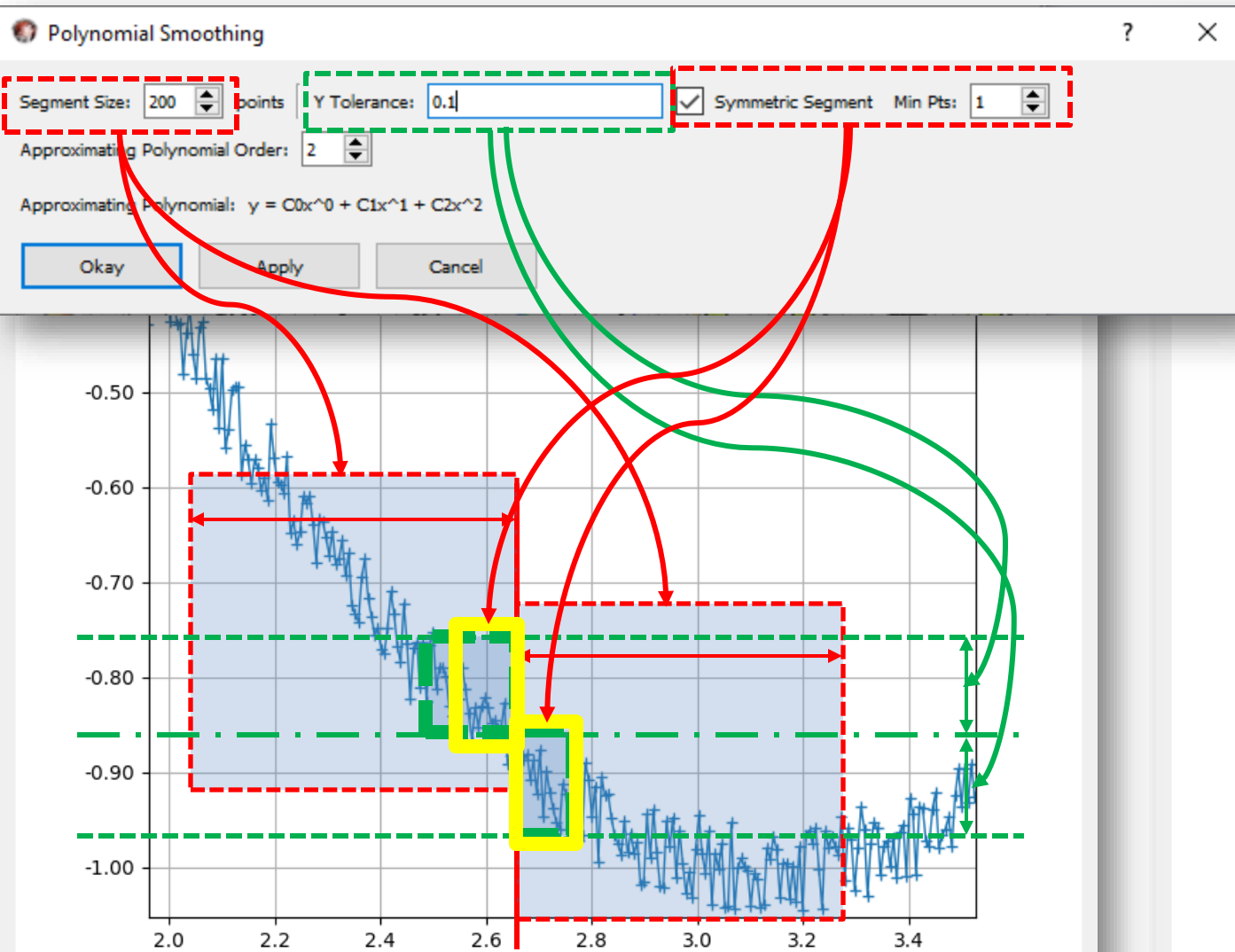
Approximating Polynomial Order:

Approximating Polynomial: $y = C0x^0 + C1x^1 + C2x^2$





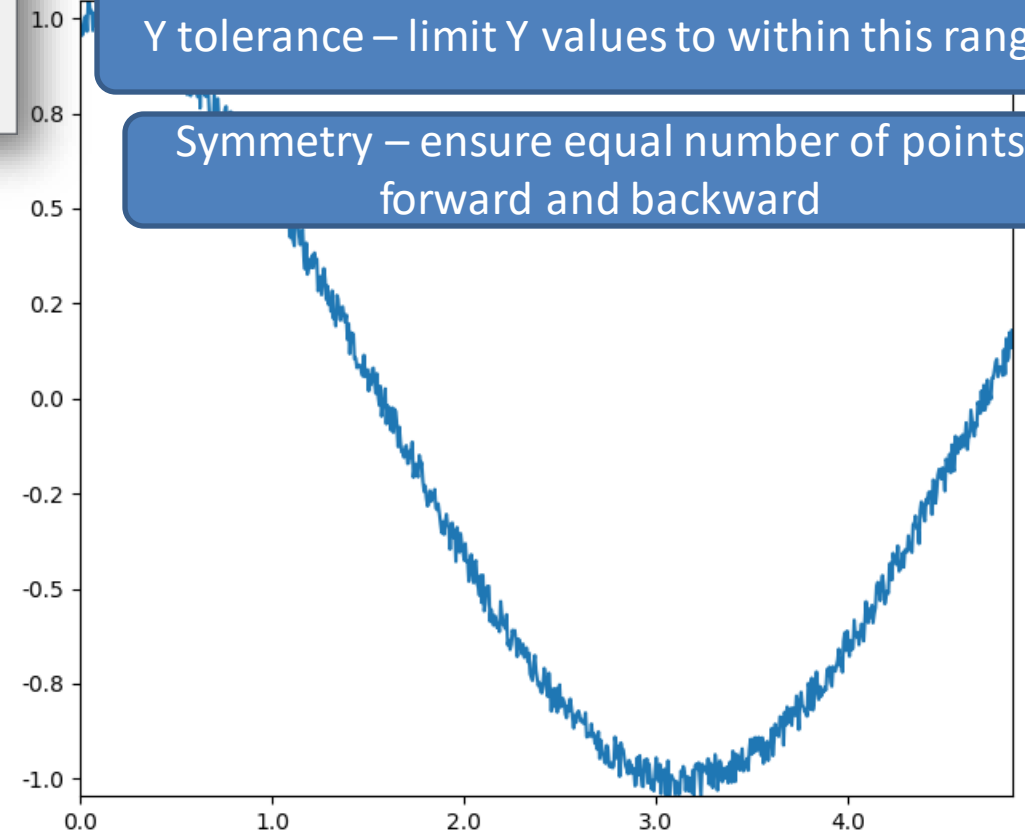
Curve Smoothing



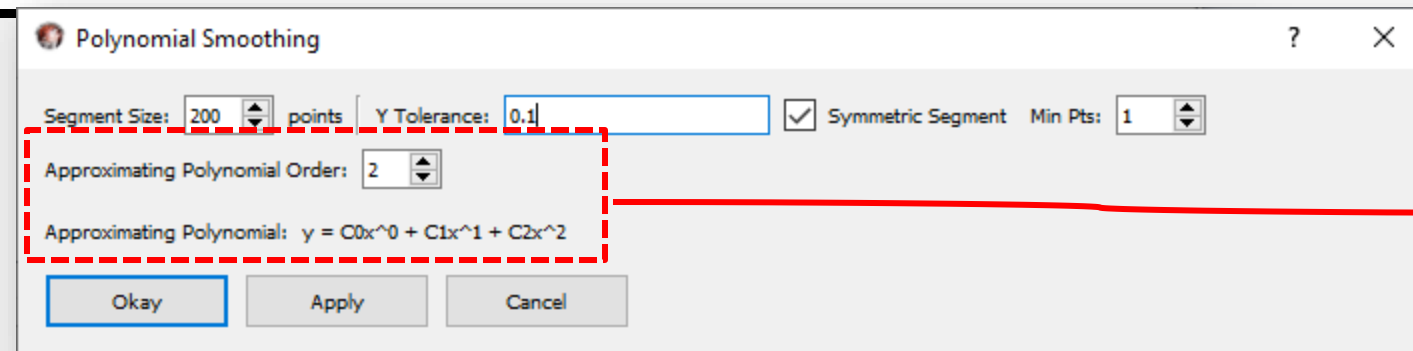
Number of points per segment to fit polynomial through (old stuff)

Y tolerance – limit Y values to within this range

Symmetry – ensure equal number of points forward and backward



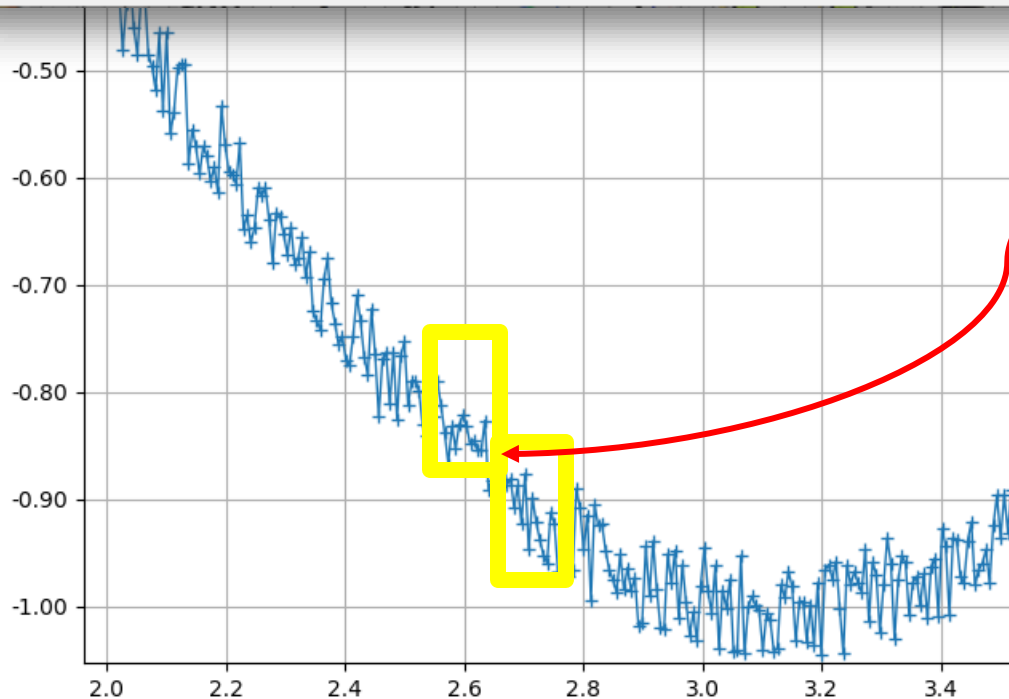
Curve Smoothing



Approximating curve is fit through selected points

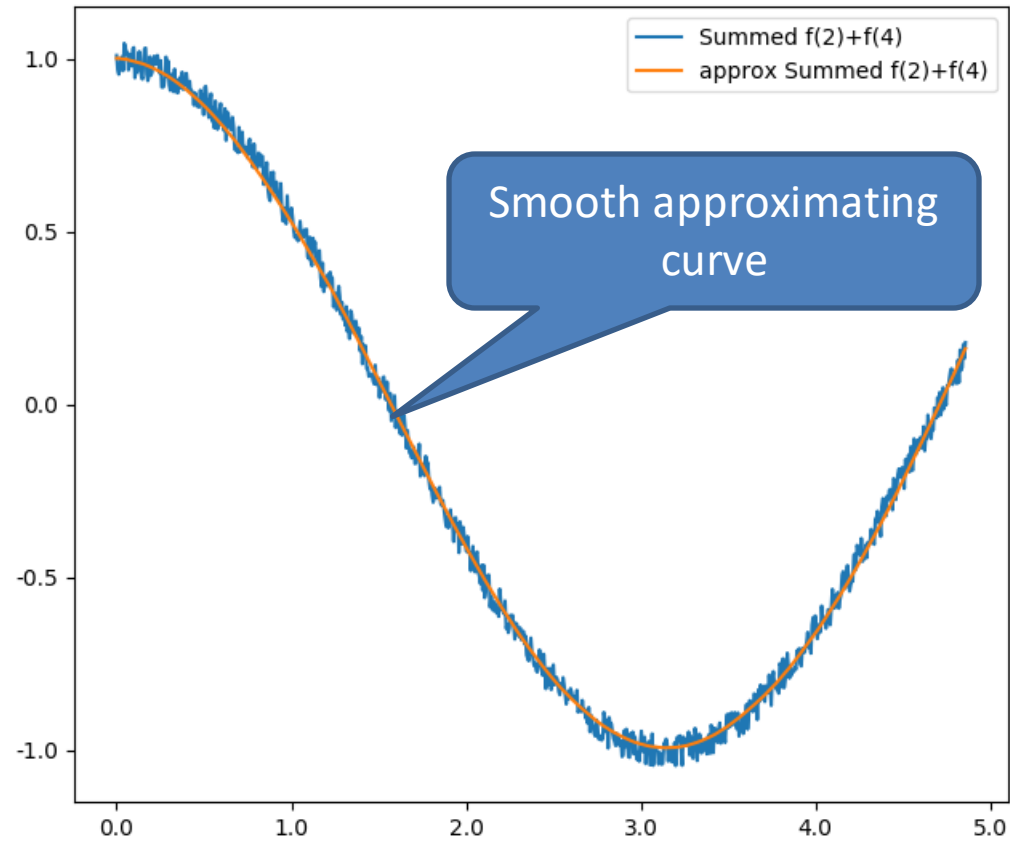
Polynomial is evaluated at point

The process is repeated for every point in the function





Curve Smoothing



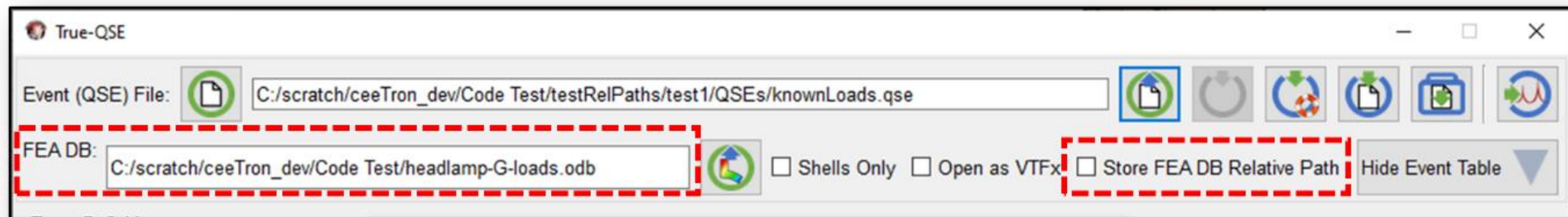
FEA DB Relative Path



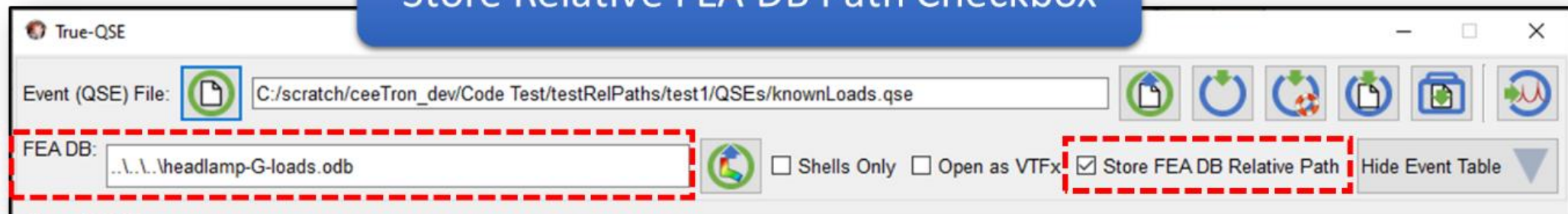


QSE – FEA DB Relative Path

The FEA database associated with the QSE file can be saved as a relative or absolute path. Saving the database as a relative path is useful if groups of files are moved (i.e. to another computer or drive).



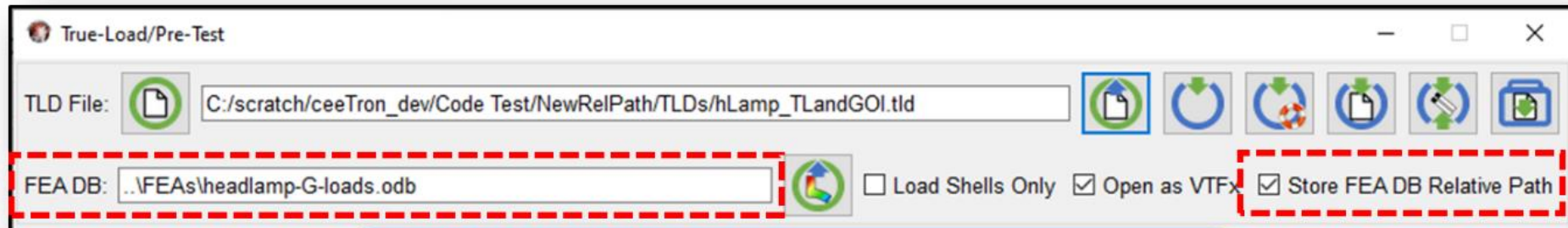
Store Relative FEA DB Path Checkbox



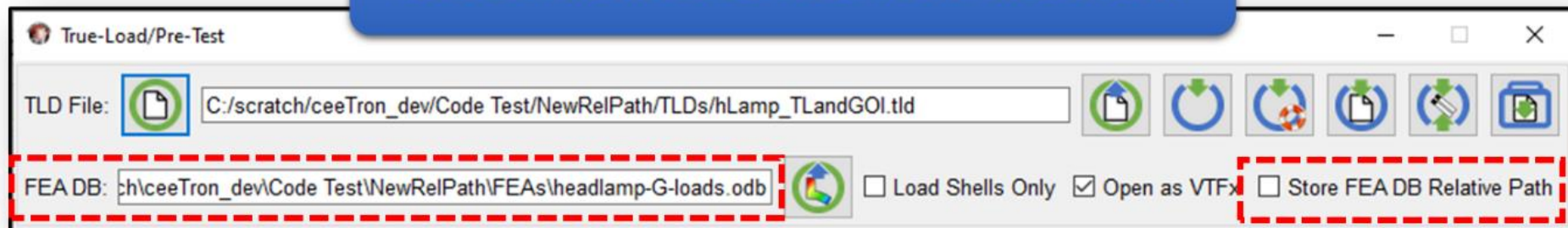


Pre-Test – FEA DB Relative Path

The FEA database associated with the TLD file can be saved as a relative or absolute path. Saving the database as a relative path is useful if groups of files are moved (i.e. to another computer or drive).



Store Relative FEA DB Path Checkbox





Relative Path Notes

- Relative path is turned on by default for new files (TLD / QSE)
- Existing TLD / QSE files will keep relative path turned off (unless changed by user)
- When Opening a QSE or TLD
 - The path to the TLD or QSE is found
 - The relative path is added to the path of the QSE or TLD
 - The FEA DB is attempted to be opened
 - If it is not found, the working directory is searched for the FEA DB
 - If the FEA DB still is not found a user dialog is opened asking the user to locate the FEA DB.

