

True-Load Enhancements

2022-02-07



Tim Hunter

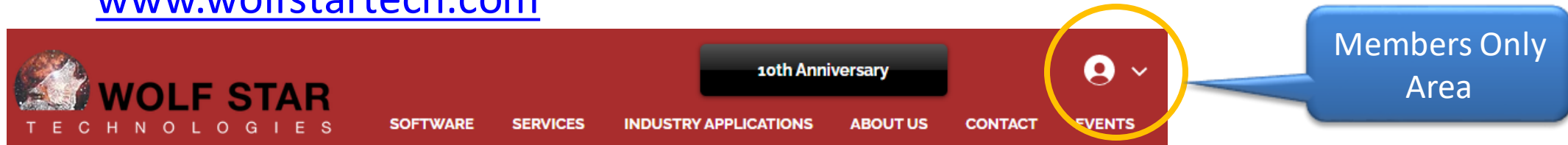


www.wolfstartech.com



Enhancements Overview

- Great updates in this release!!!
- Remember to try True-LDE – LDE to be included with license renewals on a free Promotional basis.
 - Video demonstrations of True-LDE in the Members Only area on www.wolfstartech.com

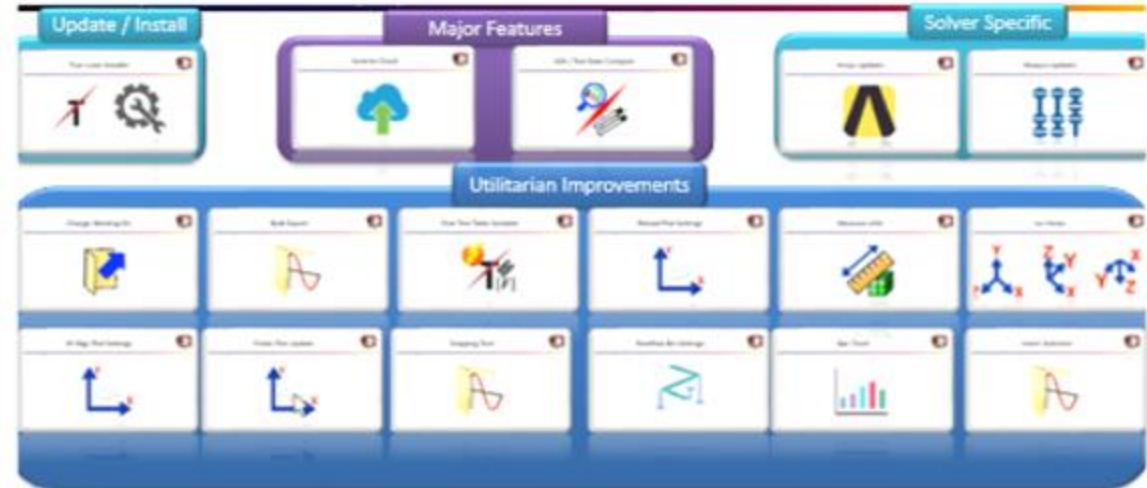


- Most of the enhancements discussed in this document are updates in performance and usability
- Some new features have been added.
- 48 Enhancements, 4 Bug Fixes



Overview – Major Enhancements

- Send to Cloud → One click upload to Ceetron Cloud
- GOI / Test Data compare – Interactive tool for comparing GOIs to test data
- Rainflow counting – user defined bins
- Bulk Export of TFU files
- Change Working directory
- Choice of ISO Views
- Measure Centroid of Element
- Lots of plotting improvements





Details

Update / Install

True-Load Installer



Major Features

Send to Cloud



GOI / Test Data Compare



Solver Specific

Ansys Updates



Abaqus Updates



Utilitarian Improvements

Change Working Dir



Bulk Export



Post-Test Table Sortable



Reload Plot Settings



Measure Utils



Iso Views



XY Mgr Plot Settings



Probe Plot Update



Snipping Tool



Rainflow Bin Settings



Bar Chart



Invert Selection



Bug Fixes





Bugs

Release Level	Module	Type	Description
2/7/2022	POST	Bug	Fix typo -- "Corollary"
2/7/2022	Post	Bug	GOIs fail when using mapped channels
2/7/2022	POST	Bug	Wrong vector used for GOI Strain calculations
2/7/2022	TFU	Bug	2nd Derivative disabled for Linear Approximation

Typo – this has been there since day 1.

This bug was caught by a user.

Enhancements - Overview





Enhancements – True-Load Environment

Release Level	Module	Type	Description
2/7/2022	ALL	Enhancement	Change working dir handling throughout code
2/7/2022	ALL	Enhancement	Enable Send to Cloud
2/7/2022	ALL	Enhancement	Save / Reload Plot Widget settings
2/7/2022	ALL	Enhancement	2D Bar Charts for Plot Widget
2/7/2022	ALL	Enhancement	Plot Probe to update Curve Combo
2/7/2022	ALL	Enhancement	Add to Measure Utils, Measure Centroid of Element
2/7/2022	ALL	Enhancement	Gauge Xform Wizard
2/7/2022	ALL	Enhancement	Add "ffmpeg.exe -vcodec h264" to output for MP4 creation -- fixes codecs for displaying in Web Pages.
2/7/2022	ALL	Enhancement	Add Army Iso view (Z down)
2/7/2022	ALL	Enhancement	Make Iso views stackable icons
2/7/2022	ALL	Enhancement	Axis digits on plots
2/7/2022	ALL	Enhancement	Set initial spin center to centroid of model when FEA DB is opened.
2/7/2022	ALL	Enhancement	Modify Ceetron readers to get tensor data from element centroids if element nodal data is not present
2/7/2022	ALL	Enhancement	Add Plot Options to XY Manager

Great new features

Release Level	Module	Type	Description
2/7/2022	DOC	Enhancement	Arrange tfuTools DOC to look like TFU Manager GUI
2/7/2022	DOC	Enhancement	Add tfuTools DOC to Help Widget

Release Level	Module	Type	Description
2/7/2022	DTY	Enhancement	Make sure DTY is named and saved before proceeding



Enhancements – TFU Mgr

Release Level	Module	Type	Description
2/7/2022	TFU	Enhancement	2D Bar Charts for TFU Manager
2/7/2022	TFU	Enhancement	2D Bar Chart - Multiple Data sets
2/7/2022	TFU	Enhancement	RainFlow -- User Specifed bins, plot sorted range pairs
2/7/2022	TFU	Enhancement	Update Rainflow GUI to spec bins
2/7/2022	TFU	Enhancement	On the snipping tool have option to keep or cut clip -- need to have option to compress time
2/7/2022	TFU	Enhancement	Invert Selection
2/7/2022	TFU	Enhancement	Bulk Import print text based progress ...
2/7/2022	TFU	Enhancement	Bulk Export Utility ...

See Details on these



Enhancements - Pre

Release Level	Module	Type	Description
2/7/2022	PRE	Enhancement	Add user defined STL Export
2/7/2022	PRE	Enhancement	When switching to VTFx update moving load table
2/7/2022	PRE	Enhancement	Add delete gauge capability to Sort / Reorder Cabling
2/7/2022	PRE	Enhancement	Populate Sort / Reorder gauges w/ gauge names
2/7/2022	PRE	Enhancement	Fiber Cabling -- continuous gauge placement - get gauge ordering correct and deal with no anchors
2/7/2022	PRE	Enhancement	Make QlineEdits wider in Tweak and Swap
2/7/2022	PRE	Enhancement	For ODB files make populate all steps skip "Base State" steps
2/7/2022	PRE	Enhancement	After Import gauges enable Load Sensitivity to strain variation button

See Details on these



Enhancements - Post

Release Level	Module	Type	Description
2/7/2022	POST	Enhancement	Make Post-Test Plots in MicroStrain
2/7/2022	POST	Enhancement	Post-Test plot labels are clipped
2/7/2022	POST	Enhancement	Put GOI strains in SimMes files
2/7/2022	POST	Enhancement	Sortable tables in Post-Test Report http://www.bu.edu/tech/services/cccs/websites/www.wordpress/how-to/sortable-searchable-tables/
2/7/2022	POST	Enhancement	GOI Strain plots in microStrain not Strain
2/7/2022	POST	Enhancement	Plot GOIs in microStrain -- not strain
2/7/2022	POST	Enhancement	Strain data preview plot needs to appear on T-L Monitor and not Primary Monitor

See Details on these



Enhancements - QSE

See Details on these

Release Level	Module	Type	Description
2/7/2022	QSE	Enhancement	GOI / Test Data Comparison GUI
2/7/2022	QSE	Enhancement	Fix stretchiness of QSE File LE



Enhancements - LDE

See Details on these

Release Level	Module	Type	Description
2/7/2022	LDE	Enhancement	Fix output prompt Safe Design Export
2/7/2022	LDE	Enhancement	Include Pre-Load in FE-Safe out
2/7/2022	LDE	Enhancement	Include Pre-Load in ODS

True-Load Installer





Placeholder for future updates

Results Manager



Ansys Updates





Ansys 2022

Ansys 2022 will be released in March / April build.

Ceetron is working on updates.

Abaqus Updates



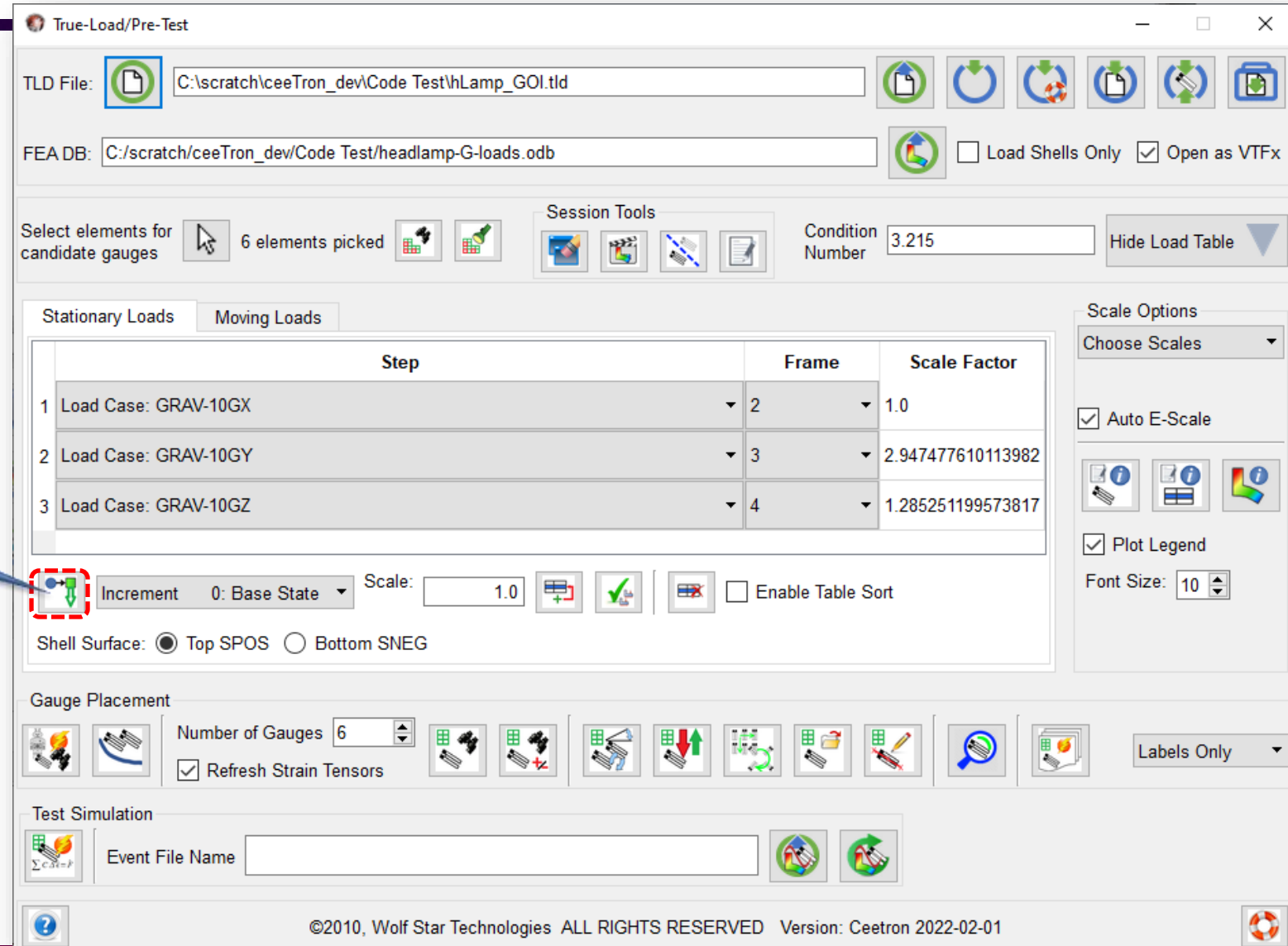


Load All Steps

For ODB files

Load All steps will skip any Base States. If you have a multi-step run, only frames that are not Base States will be loaded.

Previously, this only skipped the first Base State



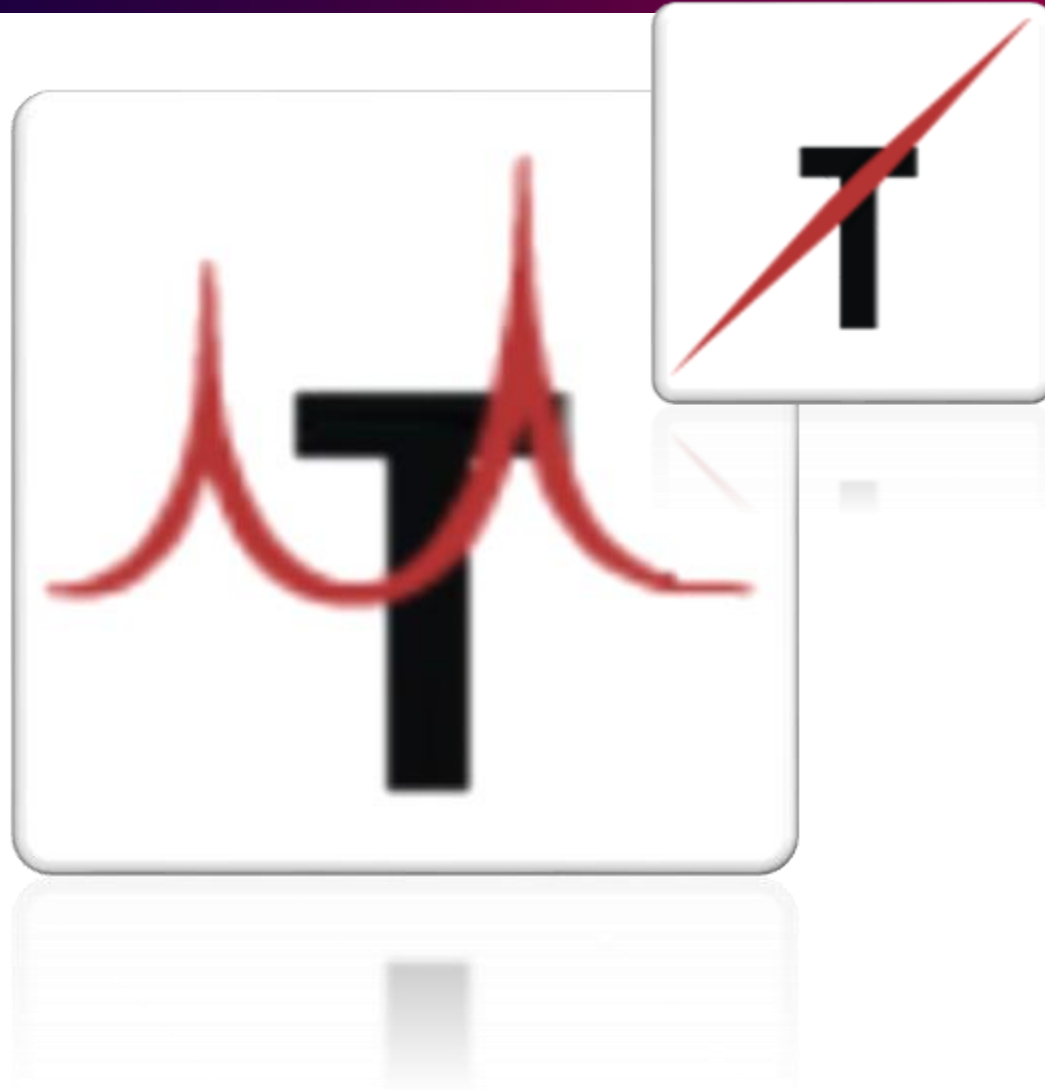


Abaqus 2022

Abaqus 2022 will be released in March / April build.

Ceetron is working on updates.

True-LDE





True-QSE support for True-LDE

- This request came from a user:
 - They use modally based True-Load solutions
 - They want to use their True-Load results in True-LDE
 - To fully understand the modal mass implications, etc.
 - They would like to use the True-QSE file and the corresponding loading functions (e.g. MPFs) in True-LDE
 - See next slide.



True-QSE support for True-LDE

Modal Mass Info automatically populated into the Mode Table

True-LDE

Dynamic Event (LDE) File: tim.lde

Modal FEA DB: C:/scratch/ceeTron_dev/Code Test/headlamp-Modes.odb

Event FEA DB: C:/scratch/ceeTron_dev/Code Test/hLampModal-SimTest-hLampModal.qse

☐ Shells Only ☒ Open as VTFx

Hide Table

Event Definition

Active	Freq (hz)	%X Mass	%Y Mass	%Z Mass	%RX Mass	%RY Mass	%RZ Mass	MPF Range	MPF Name
1 <input checked="" type="checkbox"/>	59.563	96.78%	82.73%	98.32%	0.61%	96.33%	1.33%	0.0046	T-L_MPF 01
2 <input checked="" type="checkbox"/>	257.415	76.45%	17.29%	0.01%	0.00%	0.00%	1.33%	0.00122	T-L_MPF 02
3 <input checked="" type="checkbox"/>	265.897	0.38%	1.24%	2.64%	0.01%	94.34%	0.00%	2.04e-05	T-L_MPF 03
4 <input checked="" type="checkbox"/>	511.273	19.94%	64.20%	0.03%	0.02%	1.78%	0.00%	8.51e-12	T-L_MPF 04

Number of Active Modes: 4

Filter Modes:

Results Generation

☒ Include Pre-Load

Pre-Load State: Increment

Plot Options

Font Size: 10

☒ Plot Legend

Simple

☒ Y Lin ☐ Y Log

☒ X Lin ☐ X Log

Help Options

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True-LDE

Dynamic Event (LDE) File:

Modal FEA DB: ☐ Shells Only ☒ Open as VTFx

Hide Table

Event Definition

1

Select a model file

Organize New folder

File name: hLampModal-SimTest-hLampModal.qse

QSE Files (*.qse)

Open Cancel

2

3

Modal based True-QSE file generated by True-Load/Post-Test

Post-Test Table Sortable





Post-Test Table Sortable

Click headers to sort ascending / descending

Gauge	Measured Strain Range MicroStrain	%RMS Error	Slope (m)	Intercept (b) MicroStrain	Corollary (r^2)
G1: 0 Ele #49917	813.691	2.494%	0.997	-21.719	0.9999
G2: 0 Ele #48116	820.706	6.658%	0.955	28.950	0.9999
G3: 0 Ele #54003	747.123	4.663%	1.025	-22.812	0.9999
G4: 0 Ele #46268	344.241	8.460%	1.091	-10.371	0.9978
G5: 0 Ele #44535	658.784	19.410%	0.928	-122.466	0.9579
G6: 0 Ele #44242	617.352	5.520%	1.019	35.399	0.9966
G7: 0 Ele #55007	677.889	5.130%	0.929	-31.609	0.9956
G8: 0 Ele #50041	267.714	12.892%	1.052	-30.660	0.9966
G9: 0 Ele #64941	578.871	12.035%	0.950	-62.749	0.9884
G10: 0 Ele #63374	498.666	14.386%	0.910	-52.046	0.9794
G11: 0 Ele #44349	383.602	5.116%	0.982	-17.170	0.9976
G12: 0 Ele #61869	937.911	1.764%	1.027	-0.315	0.9999
G13: 0 Ele #63350	666.281	1.655%	0.998	-10.142	0.9998
G14: 0 Ele #47084	536.703	4.009%	0.969	-10.420	1.0000
G15: 0 Ele #22320	36.027	80.998%	-0.626	14.313	-0.7964
G16: 0 Ele #23320	12.480	24.409%	1.073	-2.869	0.9033
G17: 0 Ele #37845	415.389	19.319%	0.803	29.619	0.9971
G18: 0 Ele #38210	150.403	38.154%	0.721	45.182	0.6960
G19: 0 Ele #8622	347.453	16.918%	1.160	-32.324	0.9985
G20: 0 Ele #11413	170.772	10.307%	0.896	-13.700	0.9830
Average:	10.494%	0.967	-16.631	0.9769	

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Pre-Test GUI Changes

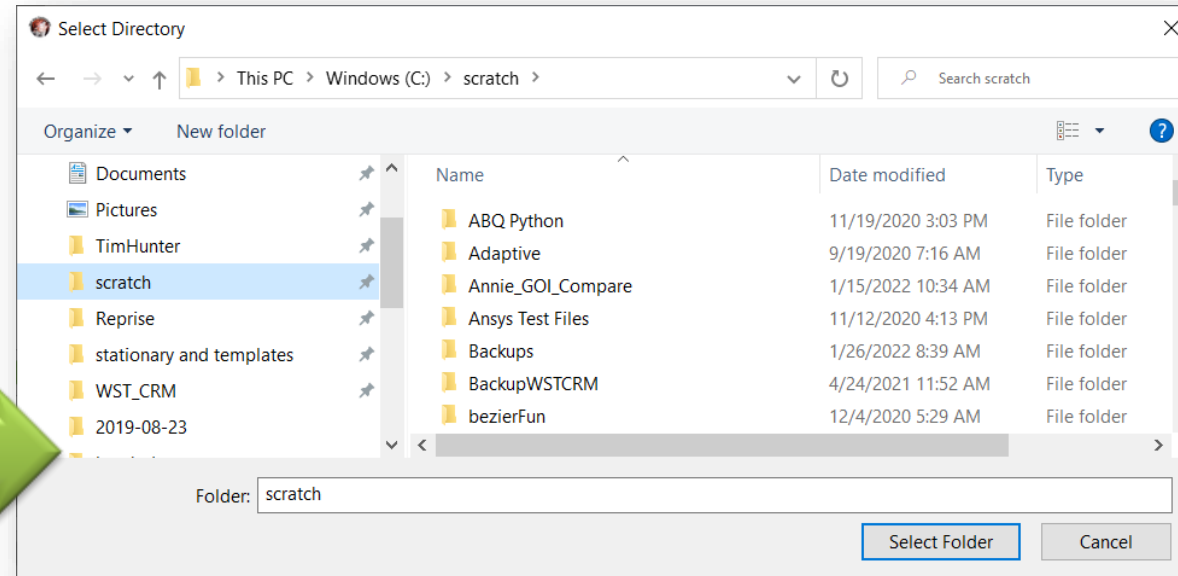
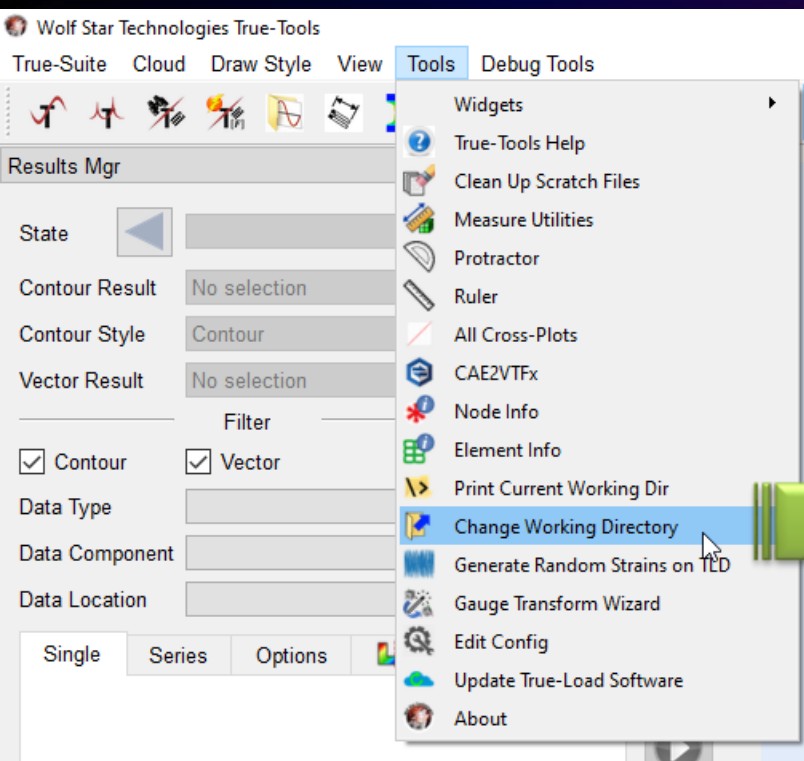


Change Working Dir





It just works



Note – File Open / Save dialog boxes will remember last directory accessed. This does not override the working directory.

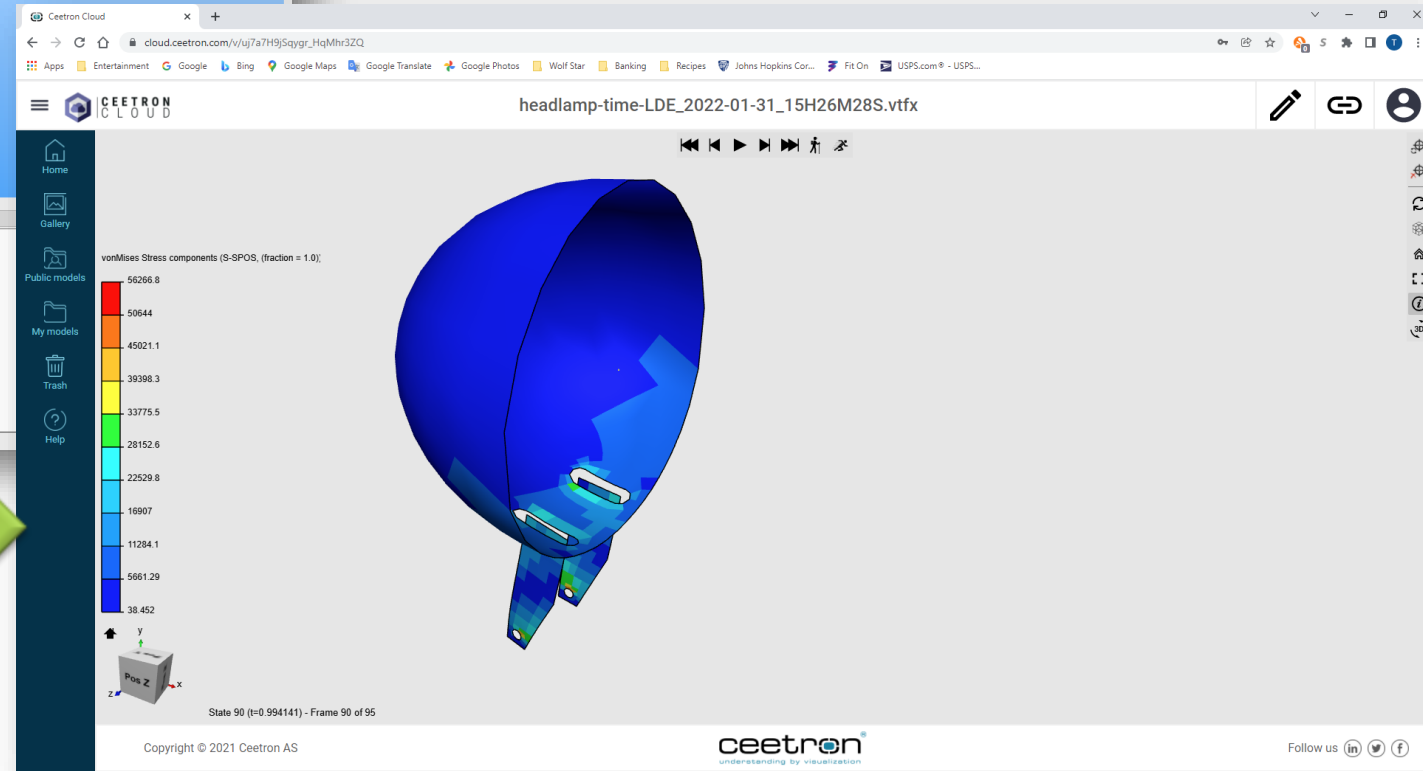
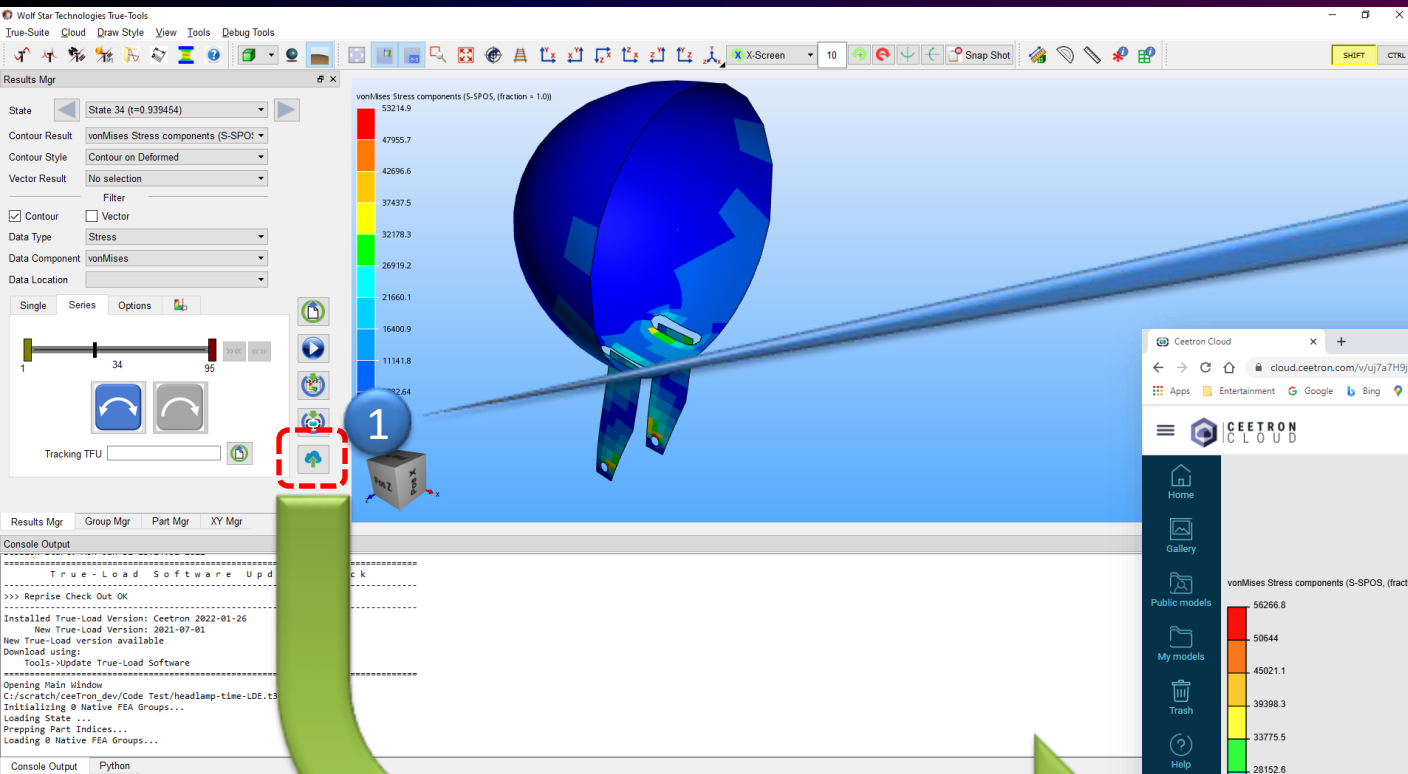
Send to Cloud





Send to Cloud

One click writes the VTFx file and uploads it to the Ceetron Cloud

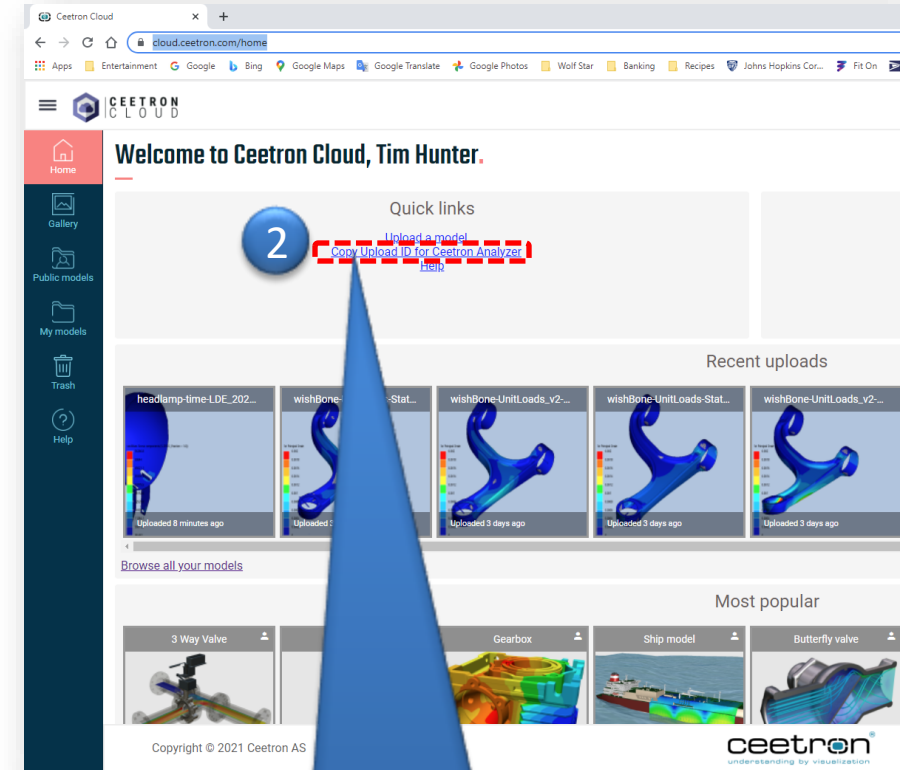




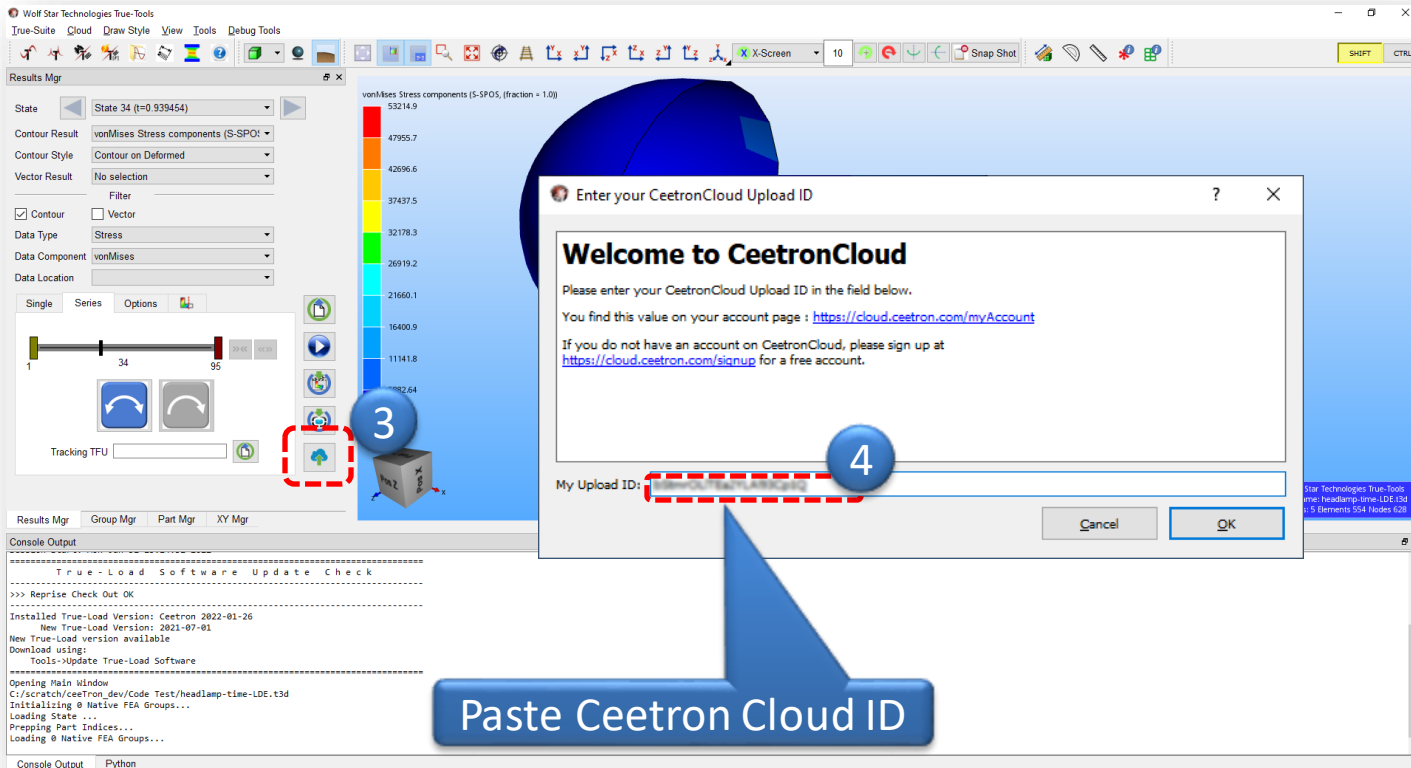
1. Need to have Ceetron Cloud account (free)
2. Need to get the Ceetron Cloud ID

First time issues

1 <https://cloud.ceetron.com/home>

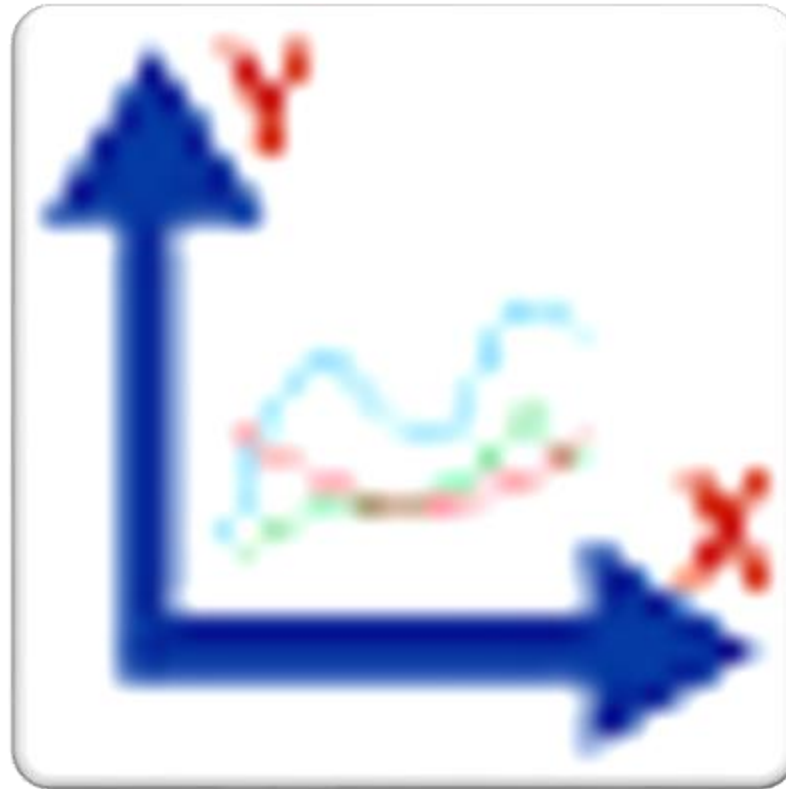


Copy Ceetron Cloud ID to Clipboard



Paste Ceetron Cloud ID

Reload Plot Settings

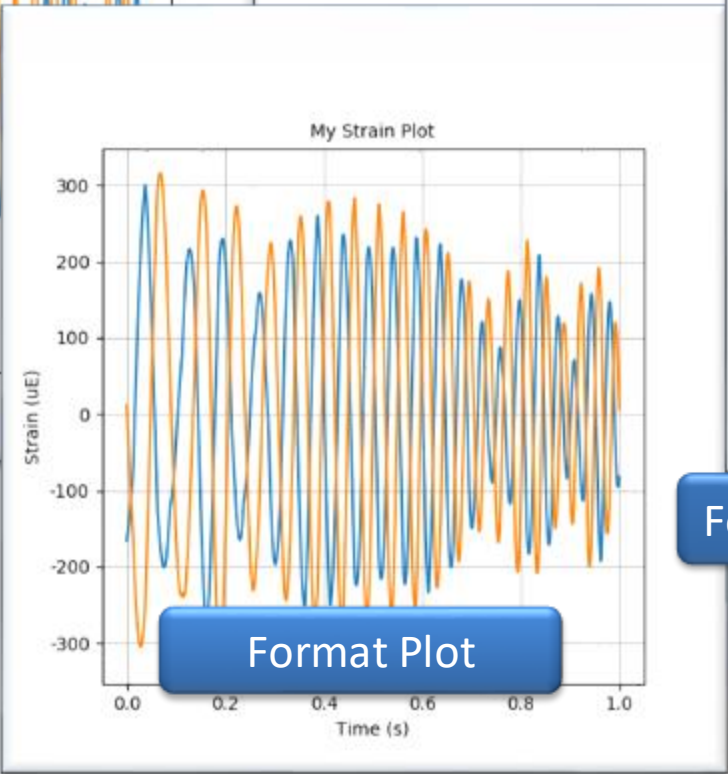




Reload Plot Settings

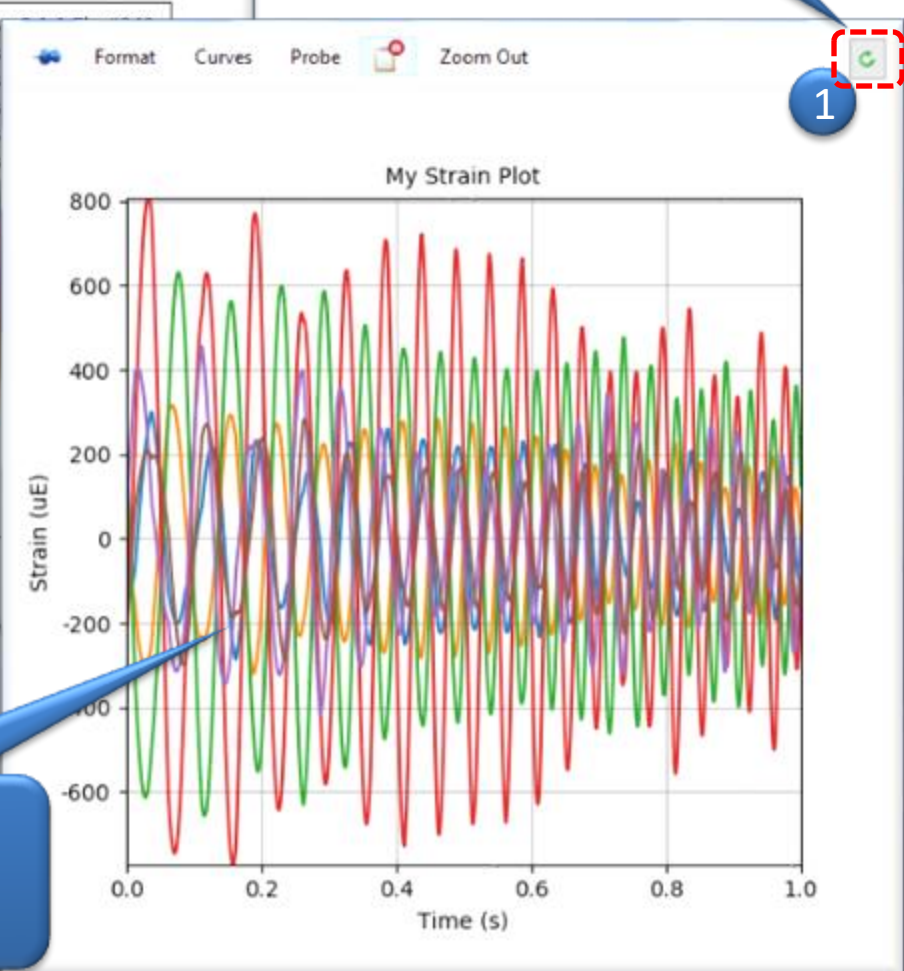
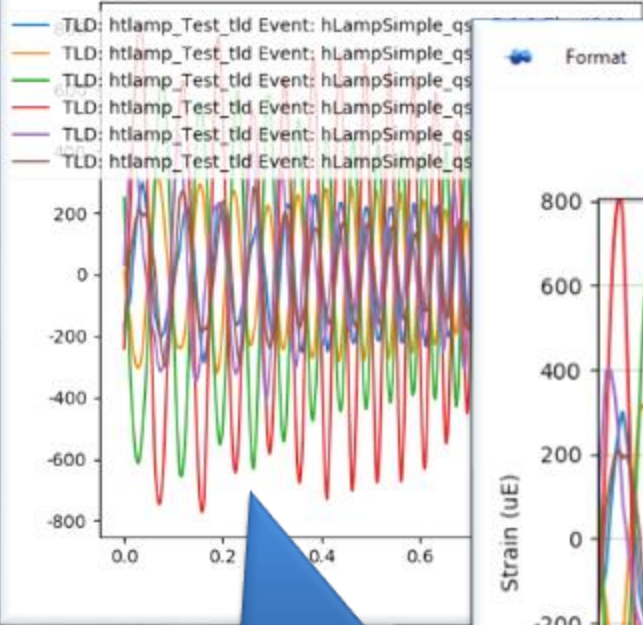
Click reload plot settings

Plot more / different data



Formatting is reset

Format restored.
Note: Need to turn off legend still

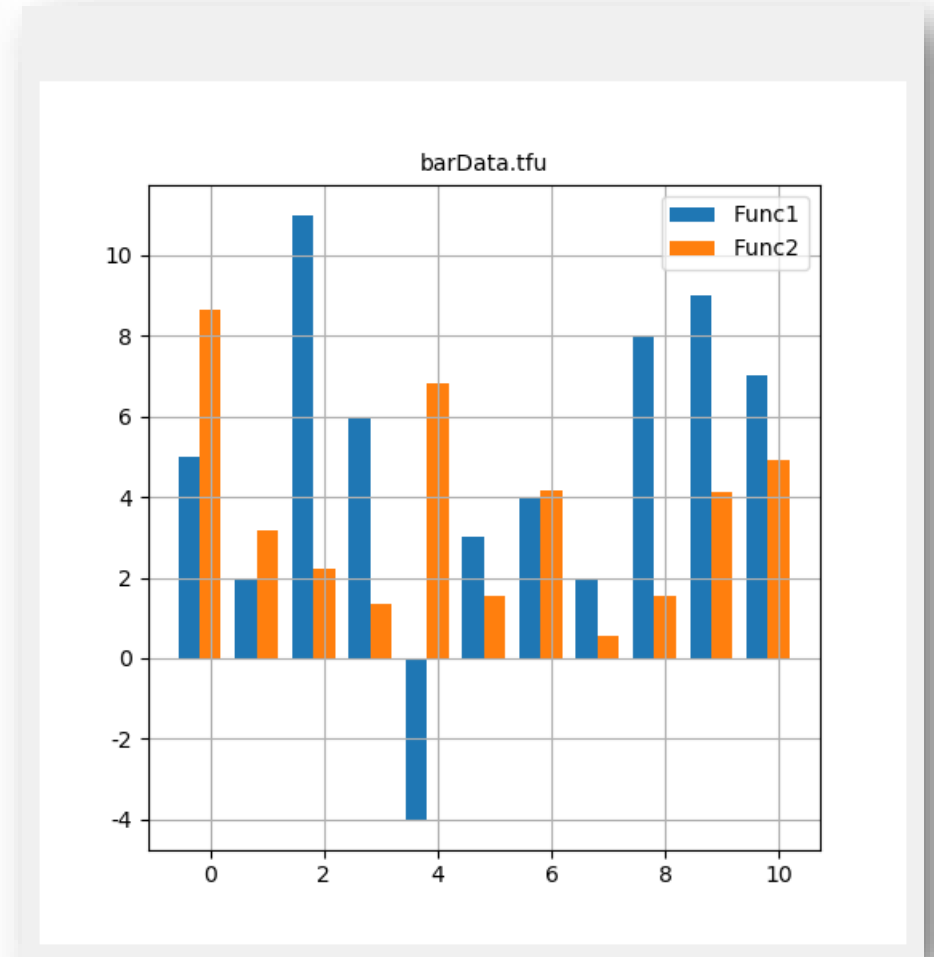
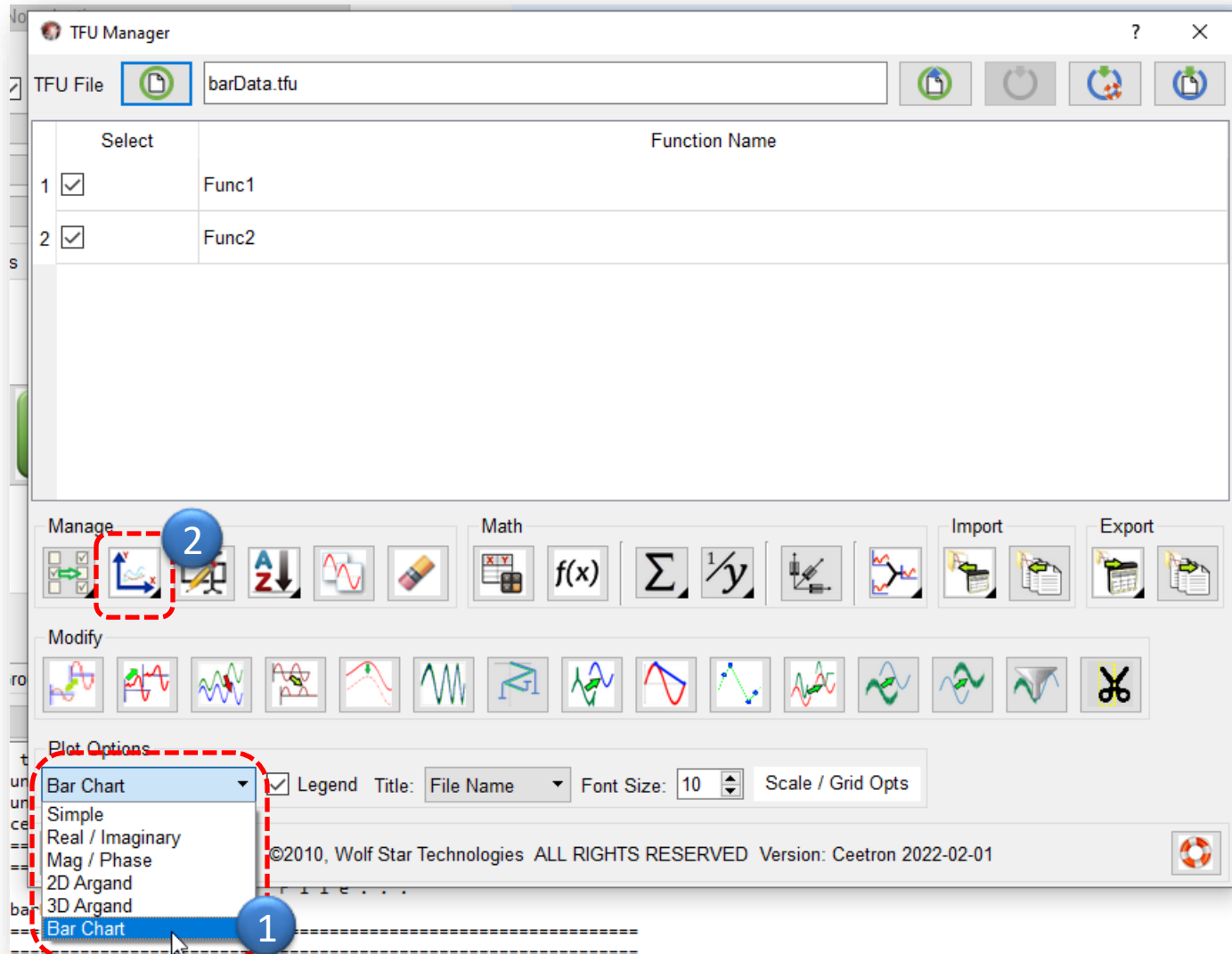


Bar Chart

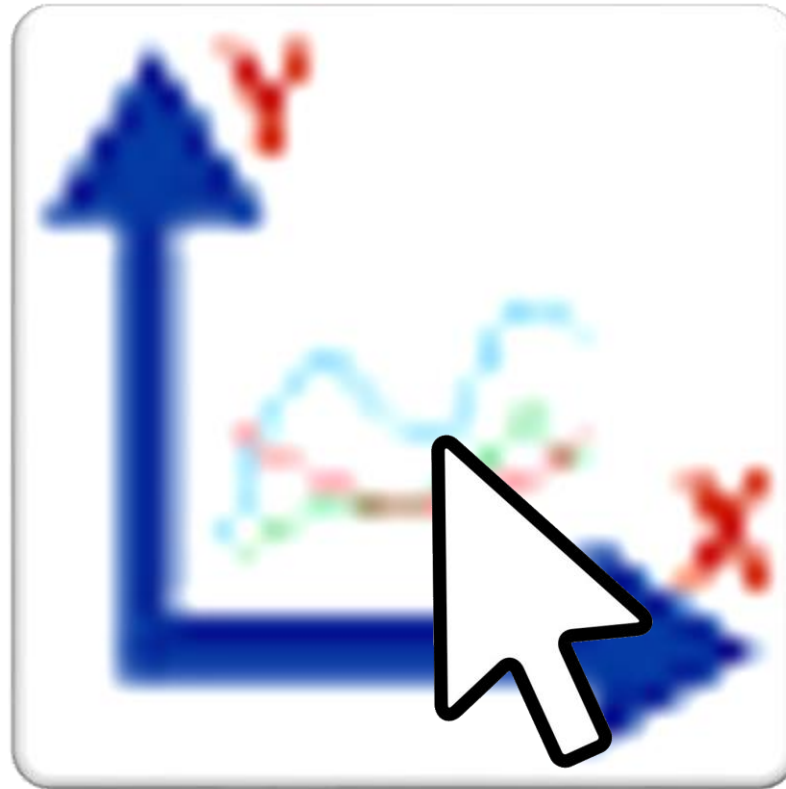




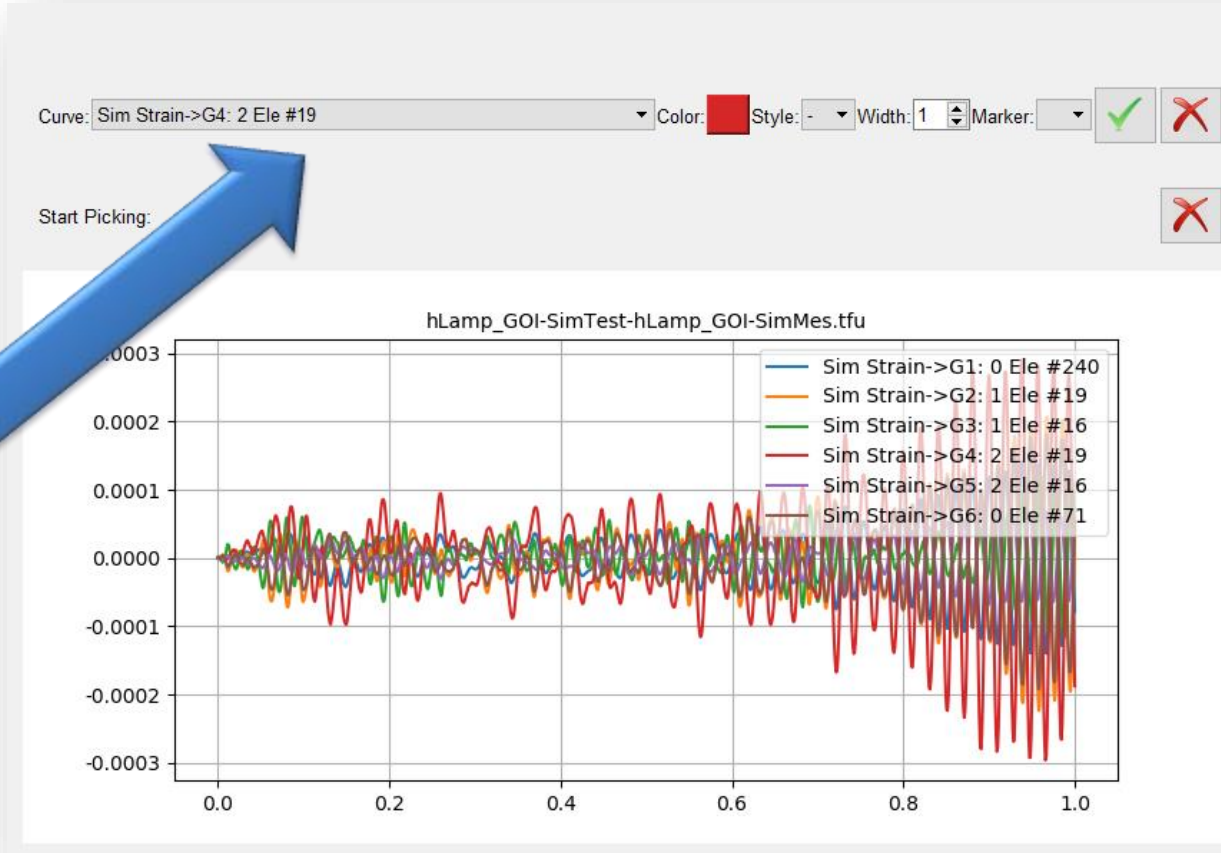
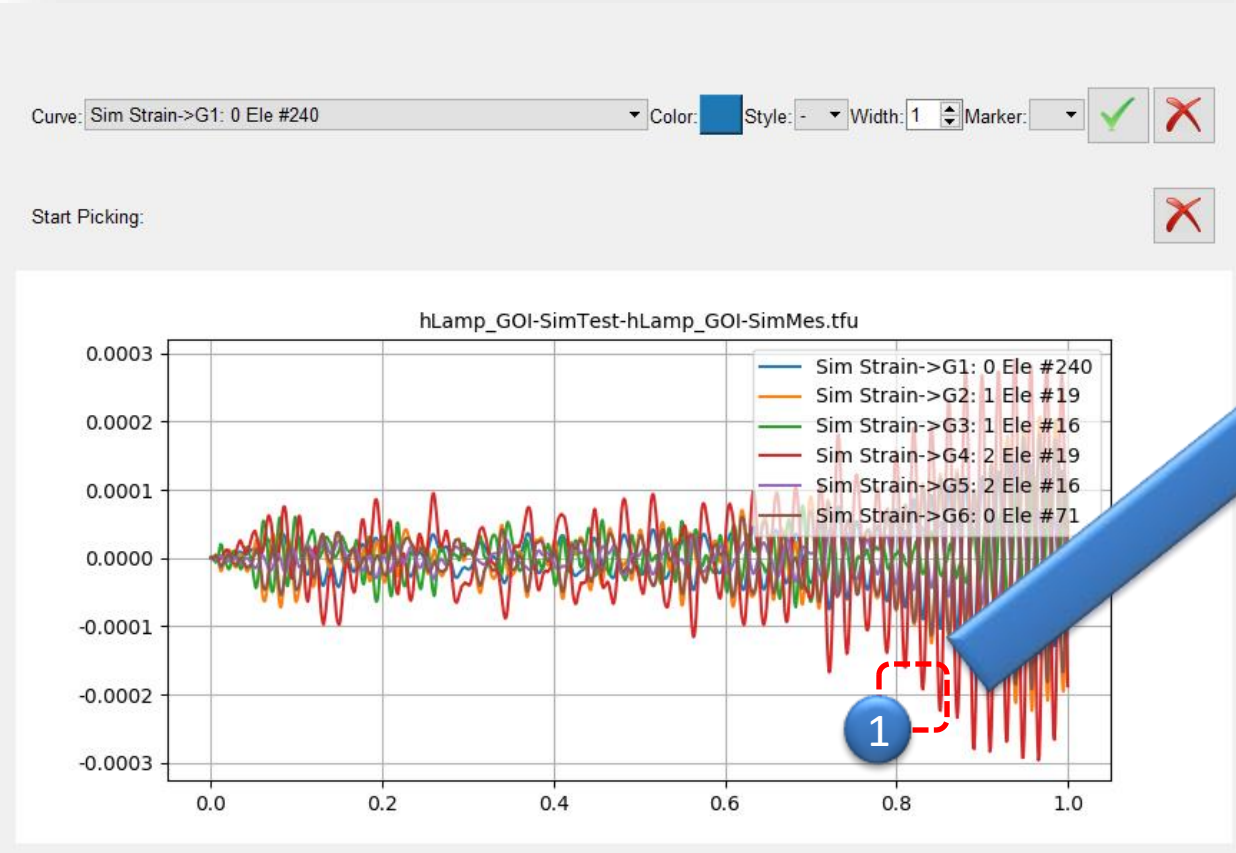
Bar Charts - Simple



Probe Plot Update

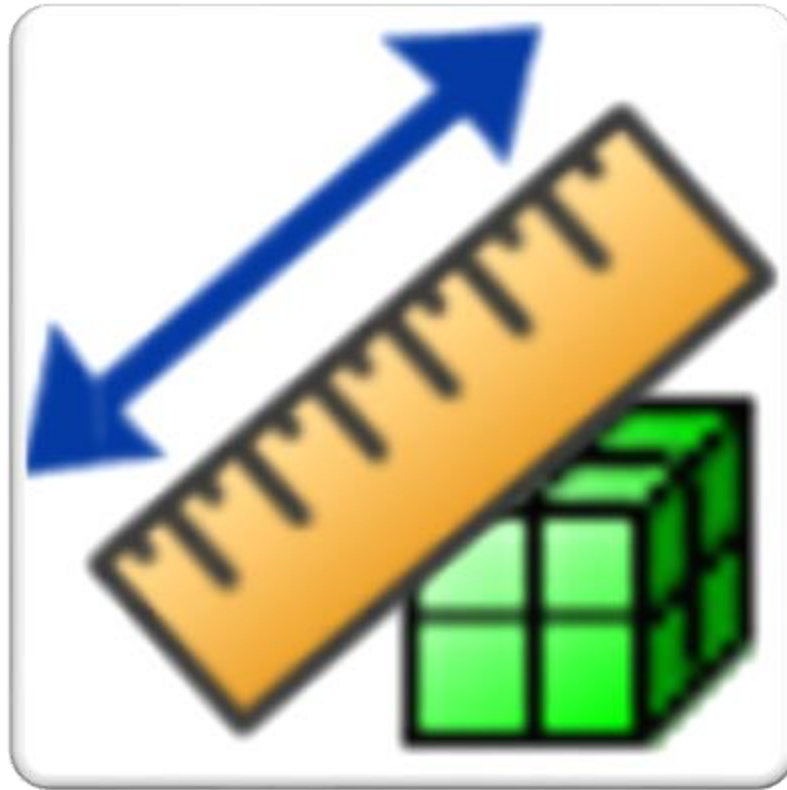


Probing a curve makes it the current curve for formatting



This makes updating curve plot characteristics easier.

Measure Utils





Centroid of Element

Wolf Star Technologies True-Tools

True-Suite Cloud Draw Style View Tools

Results Mgr

State State 1 (t=0.989247)

Contour Result No selection

Contour Style Contour

Vector Result No selection

Filter

Contour Vector

Data Type

Data Component

Data Location

Single Series Options

Measure Utilities

- ☐ Distance: Pt to Pt
- ☐ Distance: Pt to Line
- ☐ Distance: Pt to Plane
- ☐ Angle: 3 Pts
- ☐ Angle: 2 Lines
- ☐ Angle: 2 Planes
- ☐ Coordinates of Point
- ☐ 3 Pt Arc
- ☒ Centroid of Element

Pick Element 1

Apply

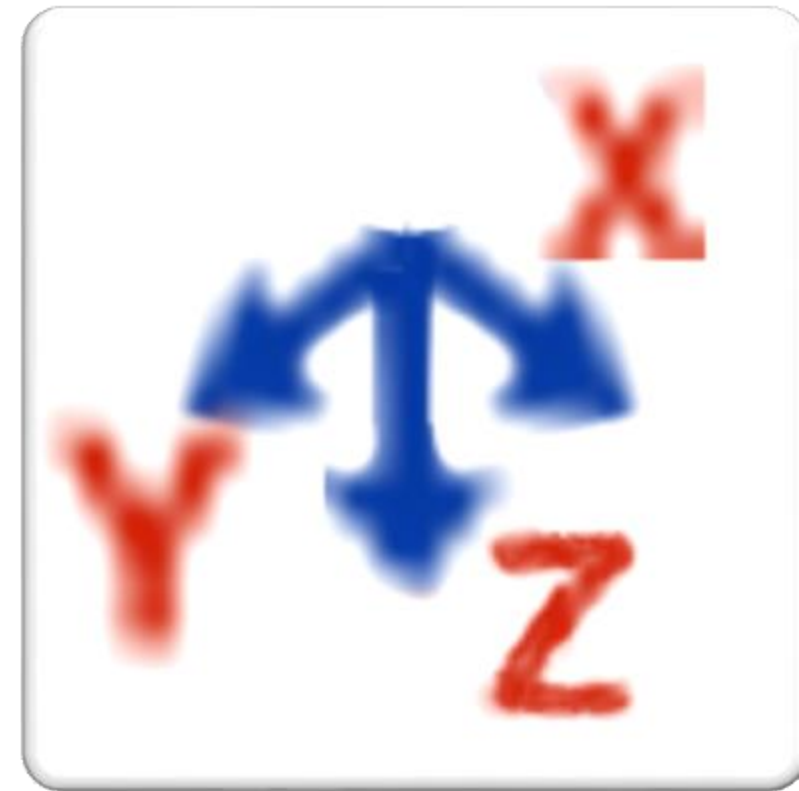
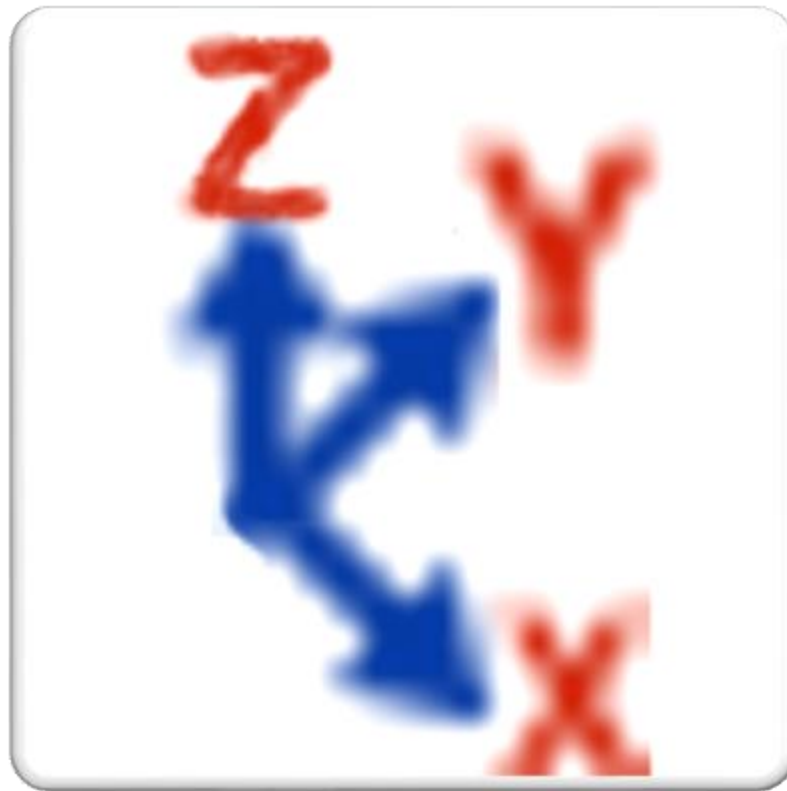
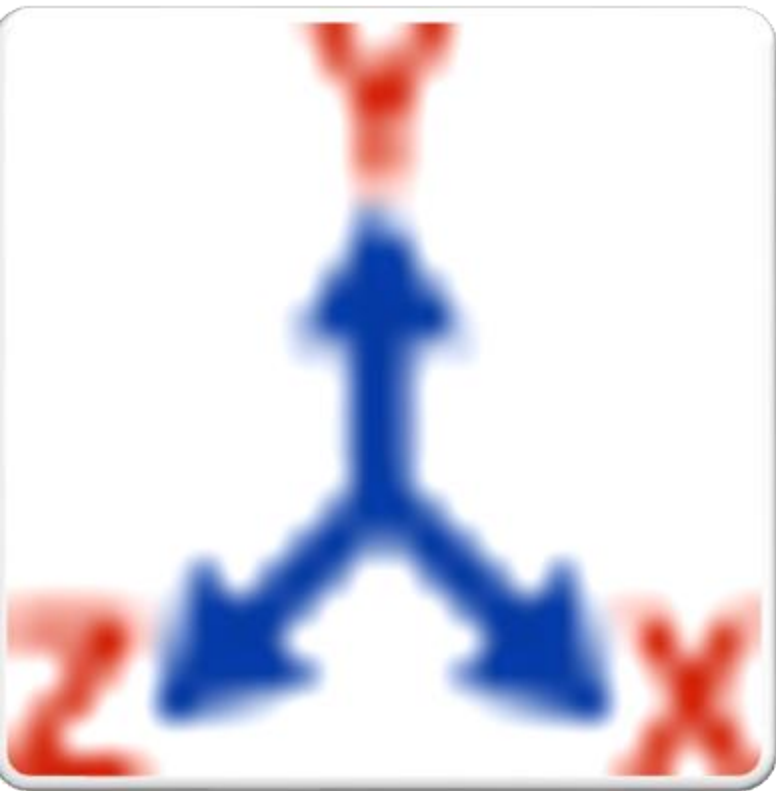
Python formatted listing

This is very useful for making manual GaugeLines.csv files

Console Output

```
Saving to clipboard...
Image copied to clipboard
C:/scratch/ceeTron_dev/Code Test/hLampSimple-QSE.t3d
Initializing 0 Native FEA Groups...
Loading State ...
Prepping Part Indices...
Loading 0 Native FEA Groups...
pt01 = [-0.15315524, +1.19834372, +1.05302842]
```

Iso Views





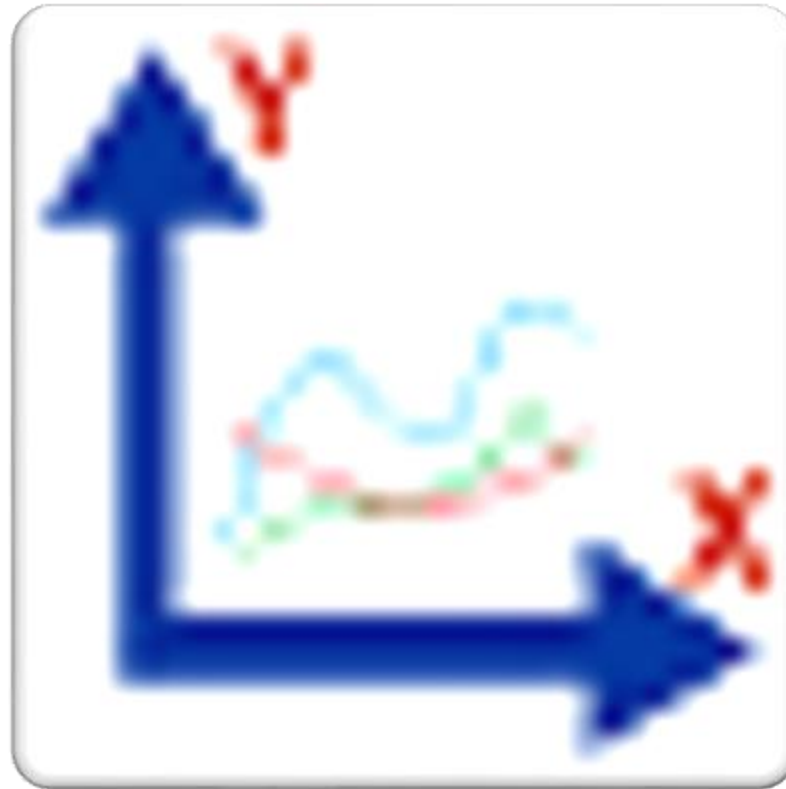
Iso Views in Icon Stack

The screenshot displays the Wolf Star Technologies True-Tools software interface. The main window shows a 3D model of a headlamp. A red dashed box highlights the 'X-Screen' icon stack in the top toolbar. A blue callout box points to the 'Iso Z Up' option in the stack, which is highlighted in blue. The 'Results Mgr' panel on the left shows various settings for the current view. The 'Console Output' panel at the bottom displays the following text:

```
Parts: 6
Nodes: 630
Elements: 556
=====
Plotting Gauges...
Loading Groups...
Storing: WST_Gauges
Storing: WST_Candidates
=====
```

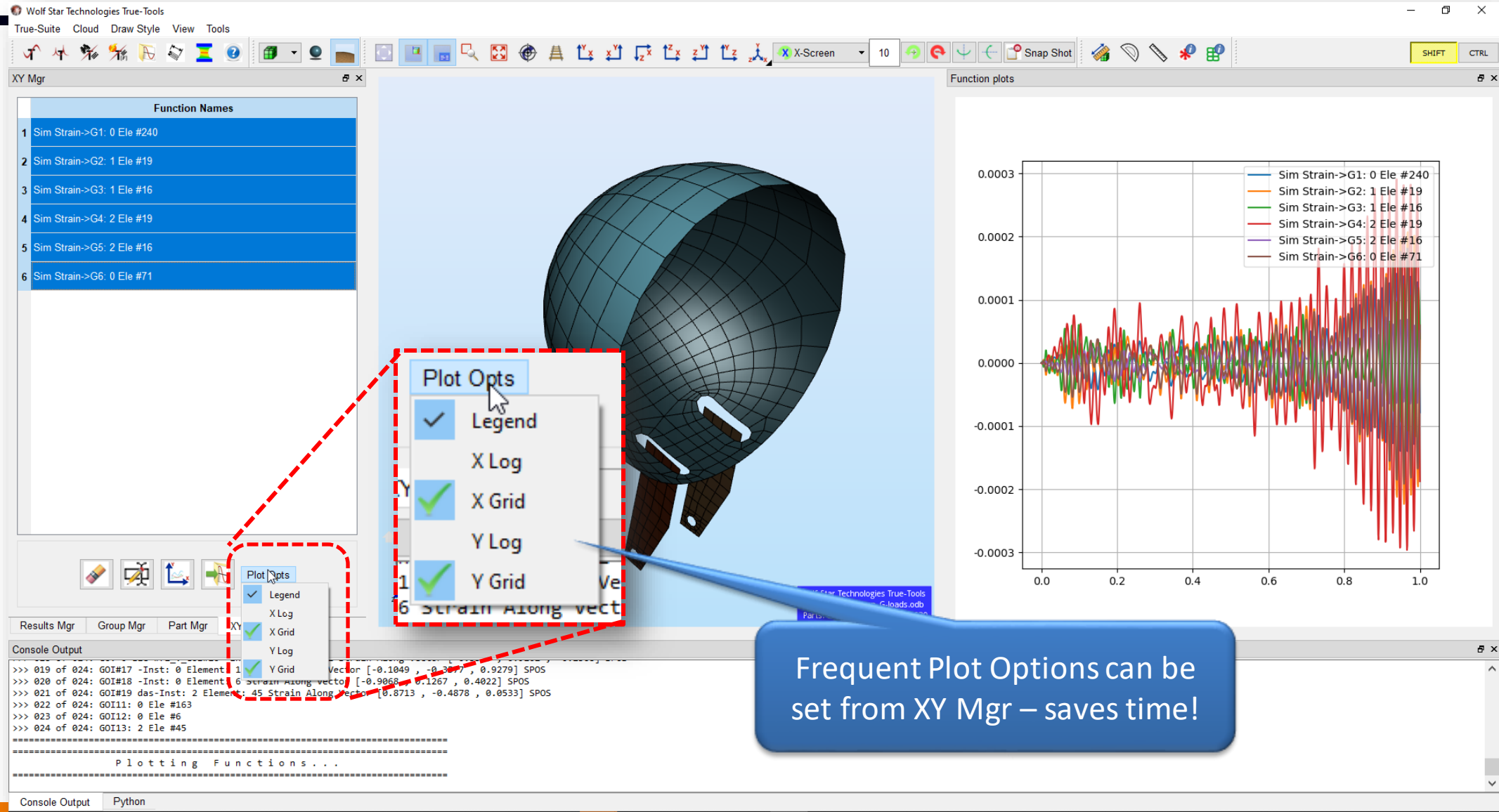
A blue callout box contains the text: "The Iso view chosen moves to top of stack and becomes default".

XY Mgr Plot Settings

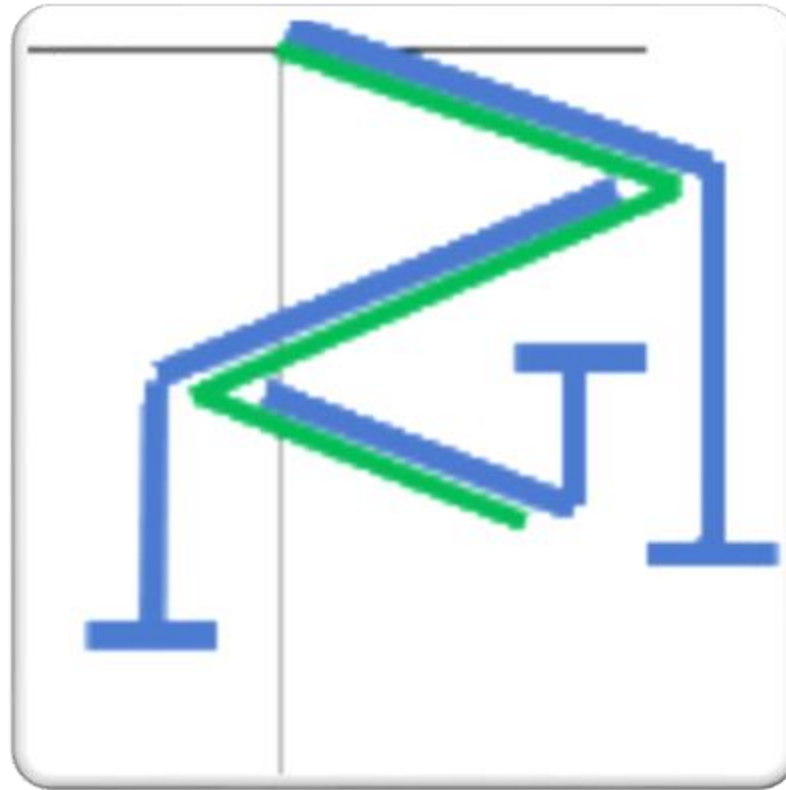




XY Mgr Plot Settings




Rainflow Bin Settings





Rainflow Bin Sizing

TFU Manager

TFU File  C:/scratch/ceeTron_dev/Code Test/SimTest-htlam

Select	
1 <input type="checkbox"/>	TLD: htlamp_Test_tld Event: hLampSimple_qse G
2 <input checked="" type="checkbox"/>	TLD: htlamp_Test_tld Event: hLampSimple_qse G
3 <input type="checkbox"/>	TLD: htlamp_Test_tld Event: hLampSimple_qse G
4 <input type="checkbox"/>	TLD: htlamp_Test_tld Event: hLampSimple_qse G
5 <input type="checkbox"/>	TLD: htlamp_Test_tld Event: hLampSimple_qse G
6 <input type="checkbox"/>	TLD: htlamp_Test_tld Event: hLampSimple_qse G

Rainflow Counting

Function: TLD: htlamp_Test_tld Event: hLampSimple_qse G:1 1 Ele #240

Race Track Range Mode: Percent % of Range 1 Number of Bins (mean, range) 11 ☐ Auto from Data

Data Range: 587 Mean Bin Size: 50 Range Bin Size: 50

Mean Bins: [-250, -200, -150, -100, -50, 0, 50, 100, 150, 200, 250]

Range Bins: [50, 100, 150, 200, 250, 300, 350, 400, 450, 500, 550]

Apply Cancel

Manage Math Import Export

Modify

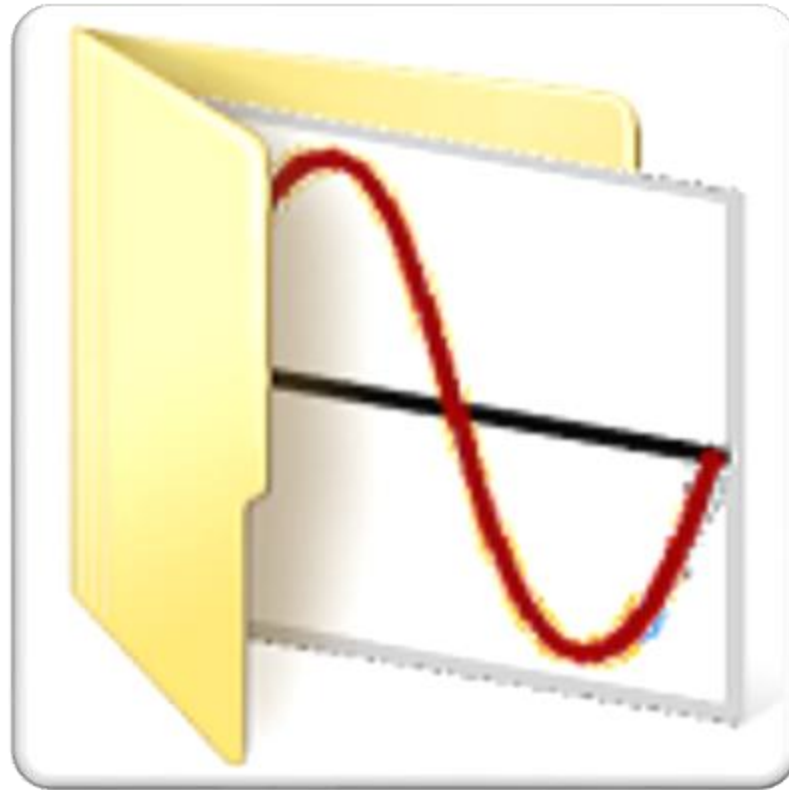
Plot Options: Simple ☒ Legend Title: None Font Size: 10 Scale / Grid Opts

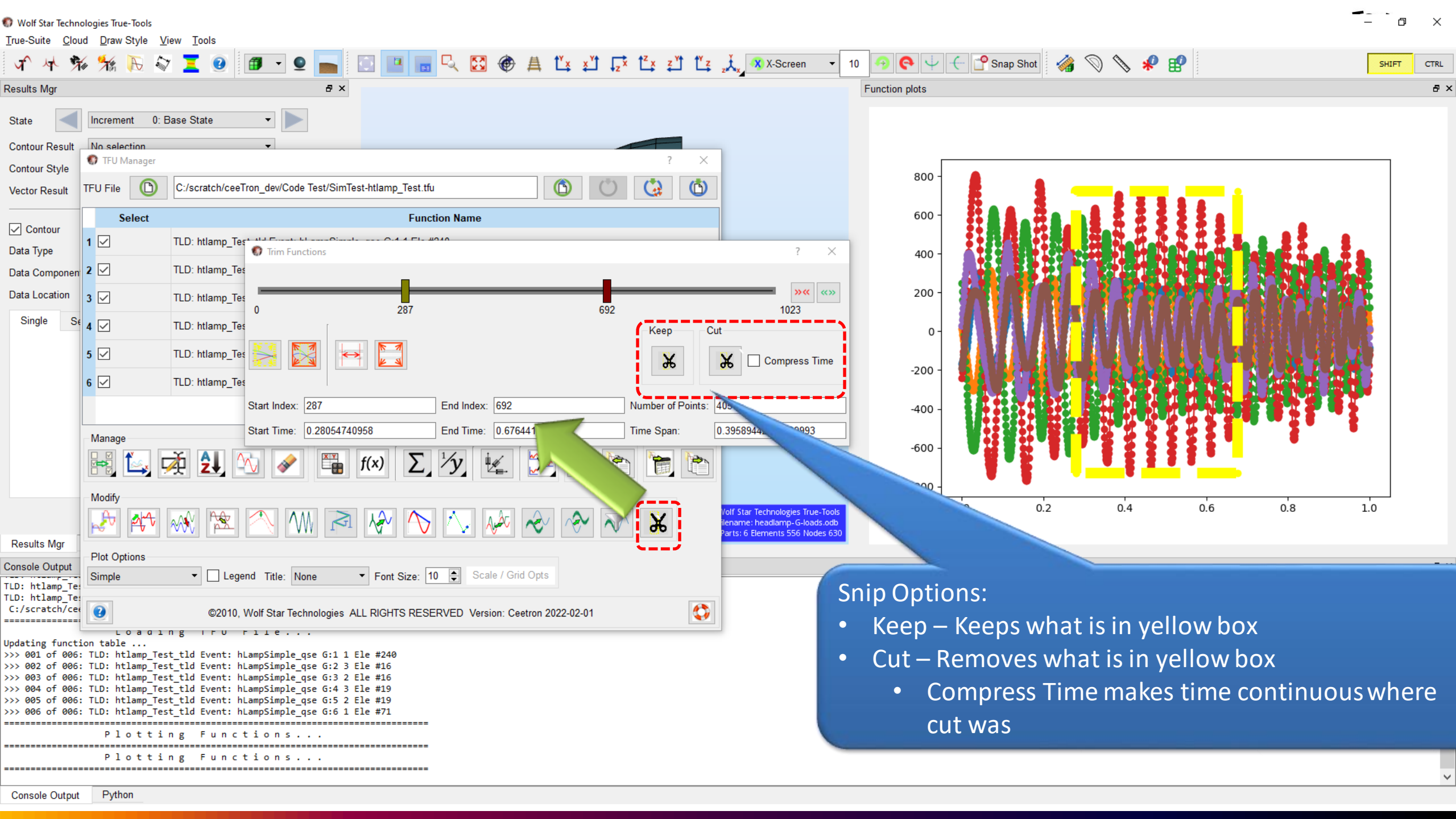
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Optional user specified Bin Sizes

Enable Manual Bin Sizing

Snipping Tool







Keep

Trim Functions

0 300 700 1023

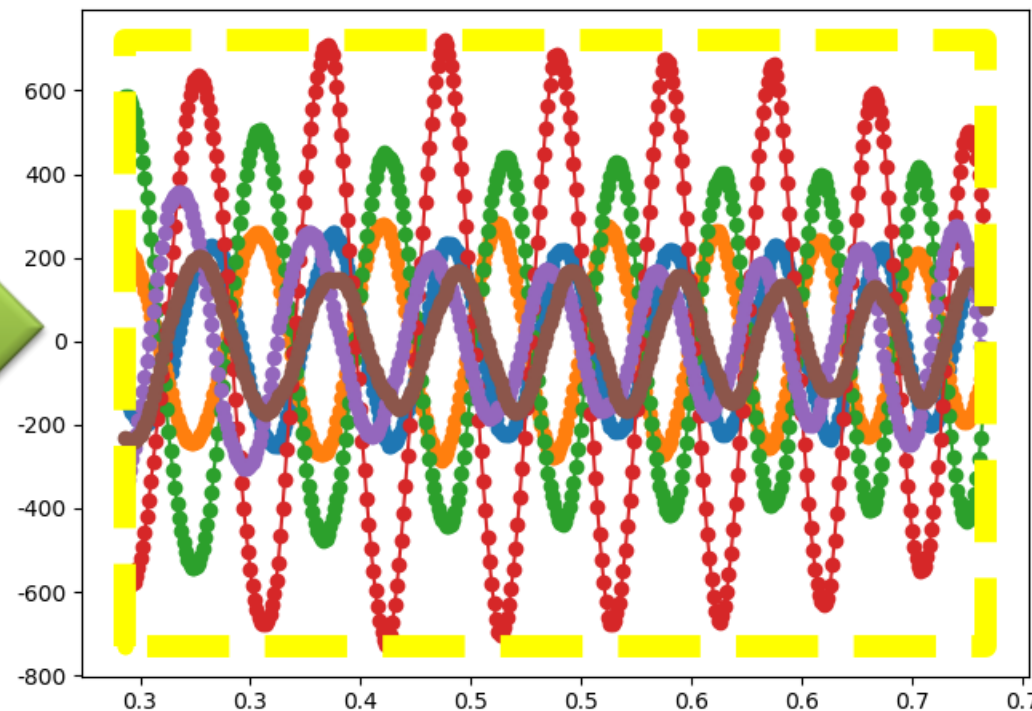
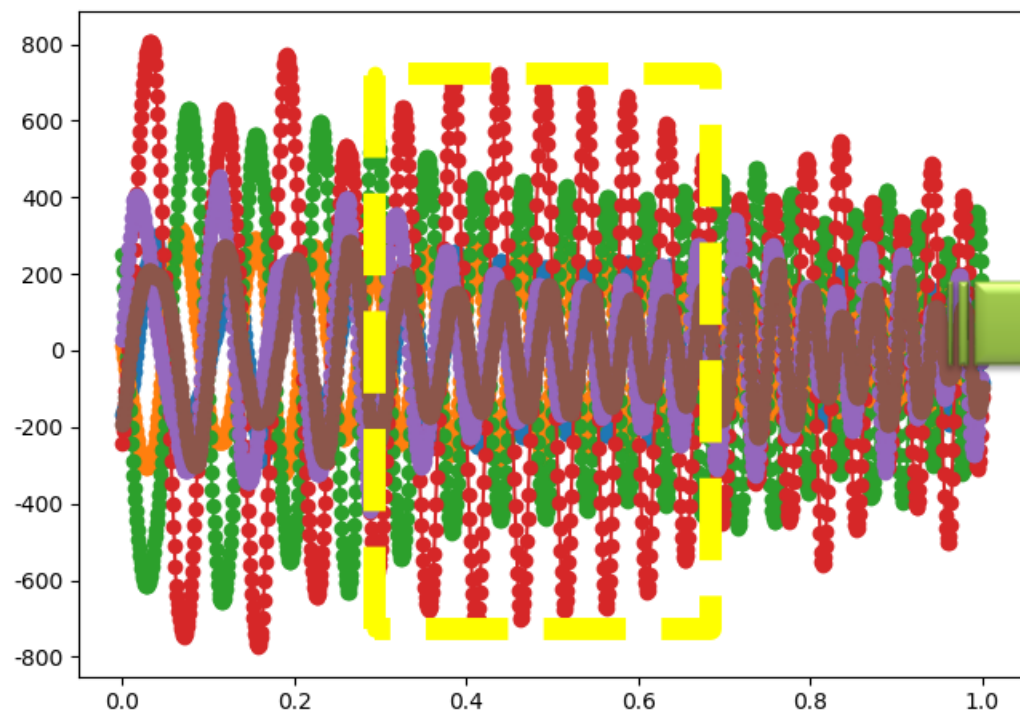
Start Index: 300 End Index: 700 Number of Points: 400

Start Time: 0.293255131965 End Time: 0.684261974585 Time Span: 0.39100684262

Keep Cut

1

Compress Time





Cut

Trim Functions

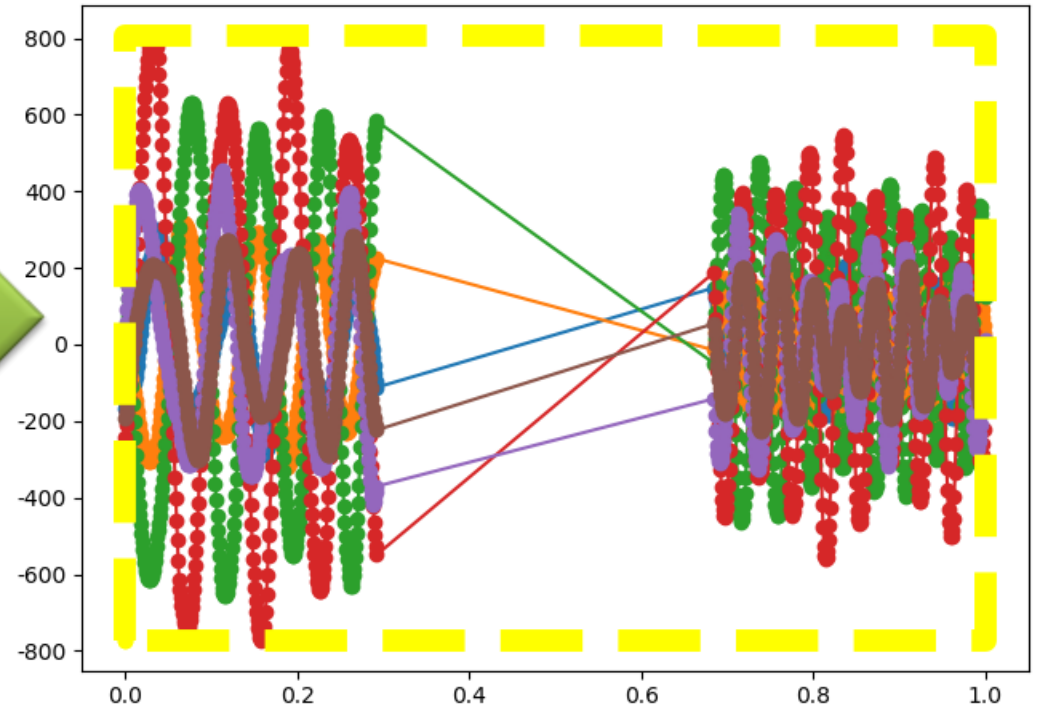
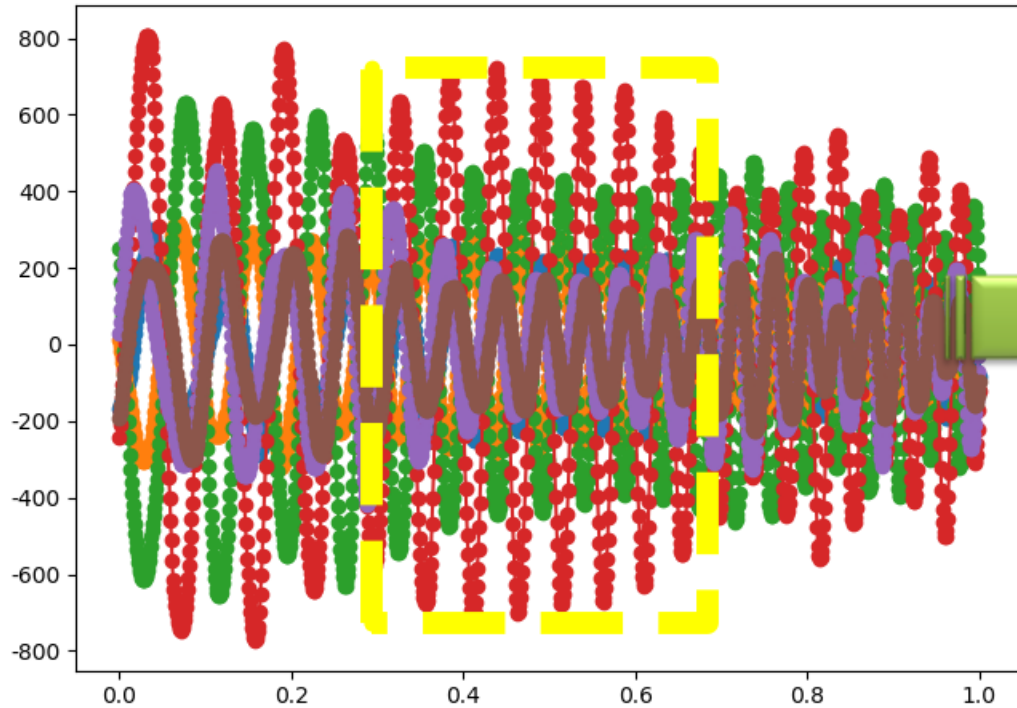
0 300 700 1023

Keep Cut 1

Compress Time

Start Index: 300 End Index: 700 Number of Points: 400

Start Time: 0.293255131965 End Time: 0.684261974585 Time Span: 0.39100684262





Cut
Compress Time

Trim Functions

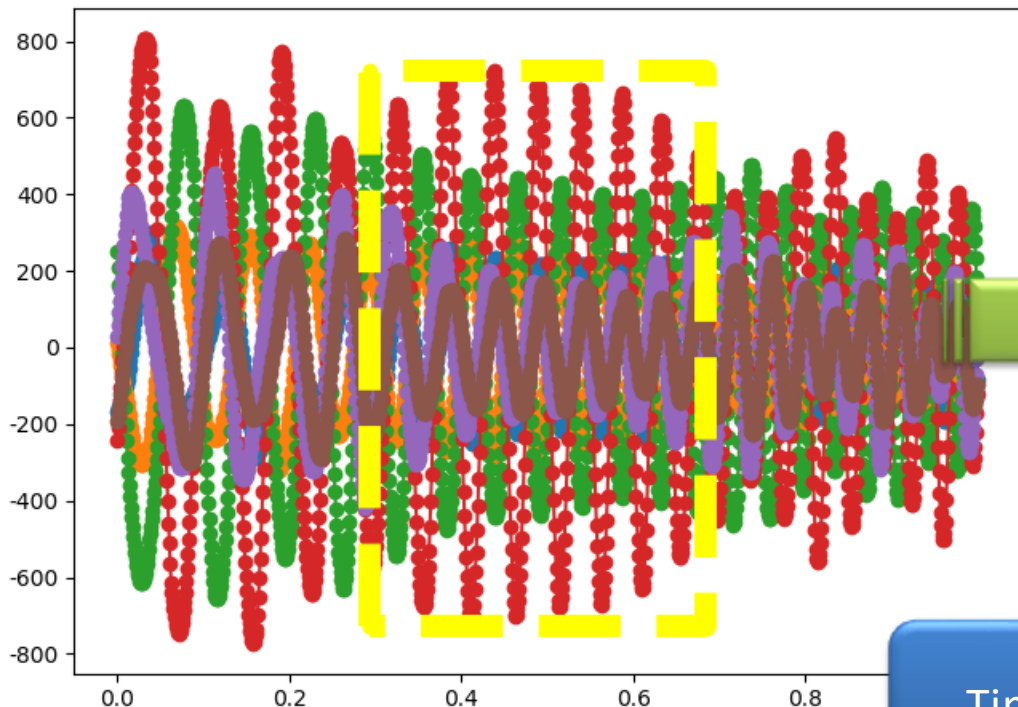
0 623

Keep Cut

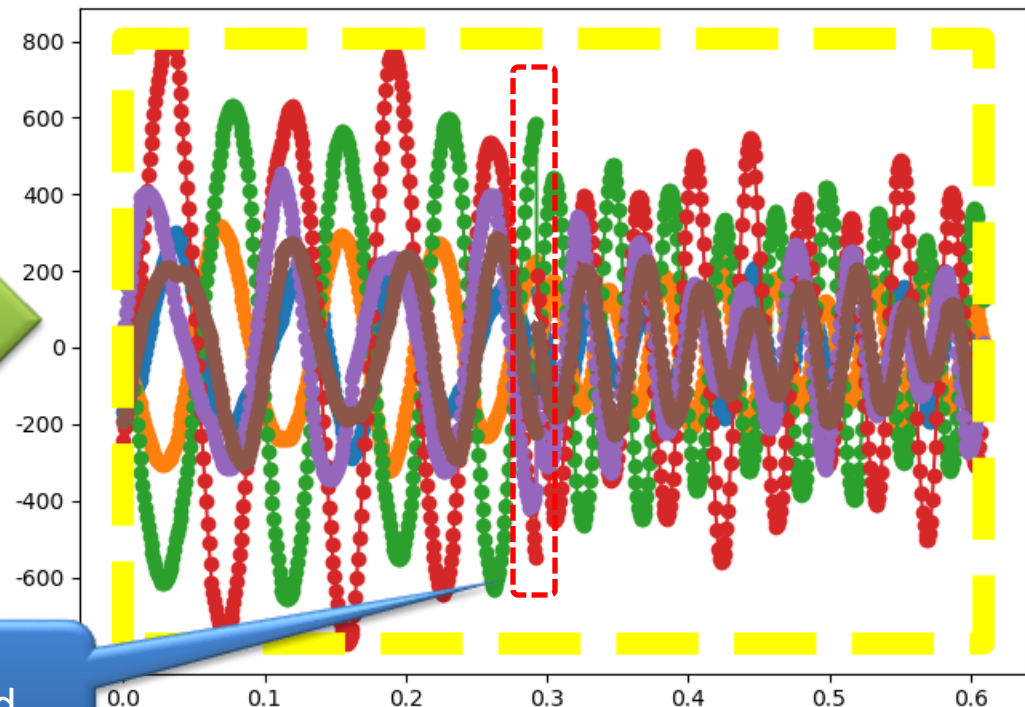
Compress Time

Start Index: 0 End Index: 623 Number of Points: 623

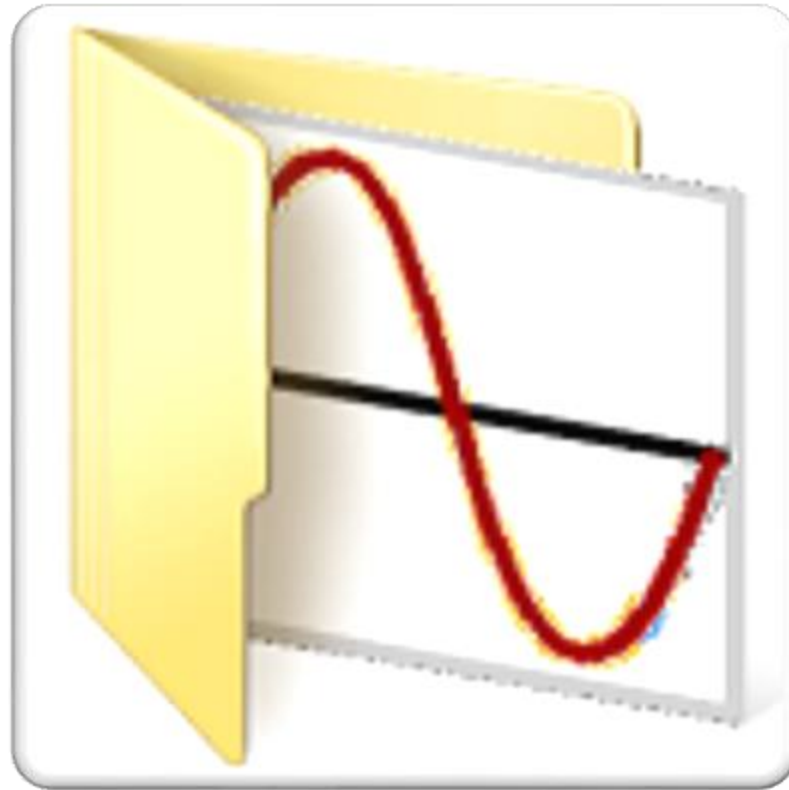
Start Time: 0.0 End Time: 1.0 Time Span: 1.0



Time Compressed








Invert Selection
















Default Auto Select is Invert Selection



TFU Manager



TFU File  C:/scratch/ceeTron_dev/Code Test/SimTest-htlamp_Test.tfu    

















	Select	Function Name
1	<input type="checkbox"/>	TLD: htlamp_Test_tld Event: hLampSimple_qse G:1 1 Ele #240
2	<input type="checkbox"/>	TLD: htlamp_Test_tld Event: hLampSimple_qse G:2 3 Ele #16
3	<input type="checkbox"/>	TLD: htlamp_Test_tld Event: hLampSimple_qse G:3 2 Ele #16
4	<input type="checkbox"/>	TLD: htlamp_Test_tld Event: hLampSimple_qse G:4 3 Ele #19
5	<input type="checkbox"/>	TLD: htlamp_Test_tld Event: hLampSimple_qse G:5 2 Ele #19
6	<input type="checkbox"/>	TLD: htlamp_Test_tld Event: hLampSimple_qse G:6 1 Ele #71




Manage       



Math  $f(x)$ Σ $1/y$   

Import  

Export  

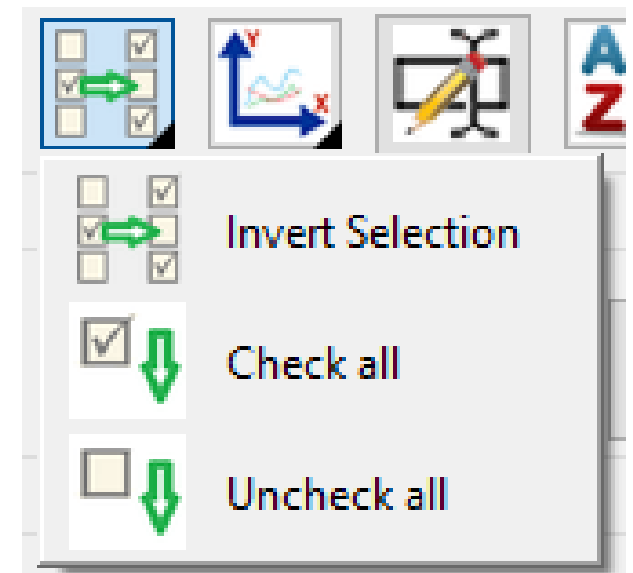
Modify                

Plot Options
Simple  ☐ Legend Title: None  Font Size: 10  Scale / Grid Opts

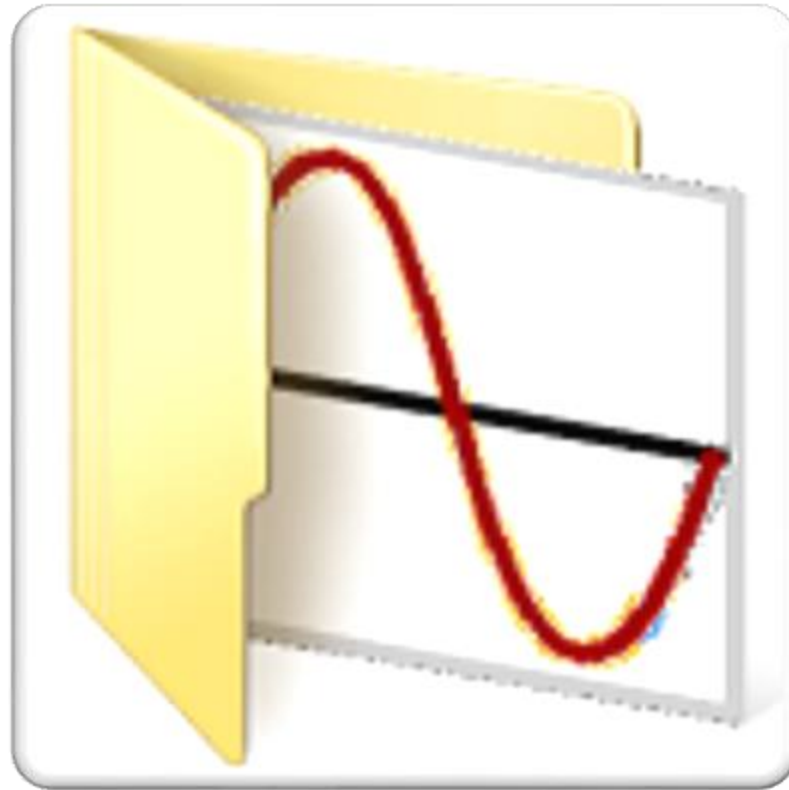
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The Default selection mode is Invert Selection.

- Invert Selection, inverts the checked boxes for the functions.
- If none are selected, invert will select all.
- If all are selected, invert will select none.
- Previous selection modes are still available




Bulk Export





Bulk Export

TFU Manager



TFU File 


Select

Exports selected TFU files to the chosen file format.

Like Bulk Import in reverse.


Bulk Export

Search Folder:  

TFU =>  CSV ☐ Search Sub-Folders








Contains:




Does Not Contain:







	File Name
1	wishBone-UnitLoads-Statisch_LC_Illb_3.tfu
2	wishBone-UnitLoads-Statisch_LC_Illb_4.tfu
3	wishBone-UnitLoads-Statisch_LC_Illb_7.tfu
4	wishBone-UnitLoads-Statisch_LC_Illb_8.tfu



















☐ Hide Base Directory

Manage       

Math  $f(x)$ Σ $1/y$  


Import  


Export  


Modify                  


Plot Options
Simple ☐ Legend Title: None Font


Available Export types

TFU =>  CSV

Contains  CSV

Does Not  nCode ASCII

 INP

 UNV

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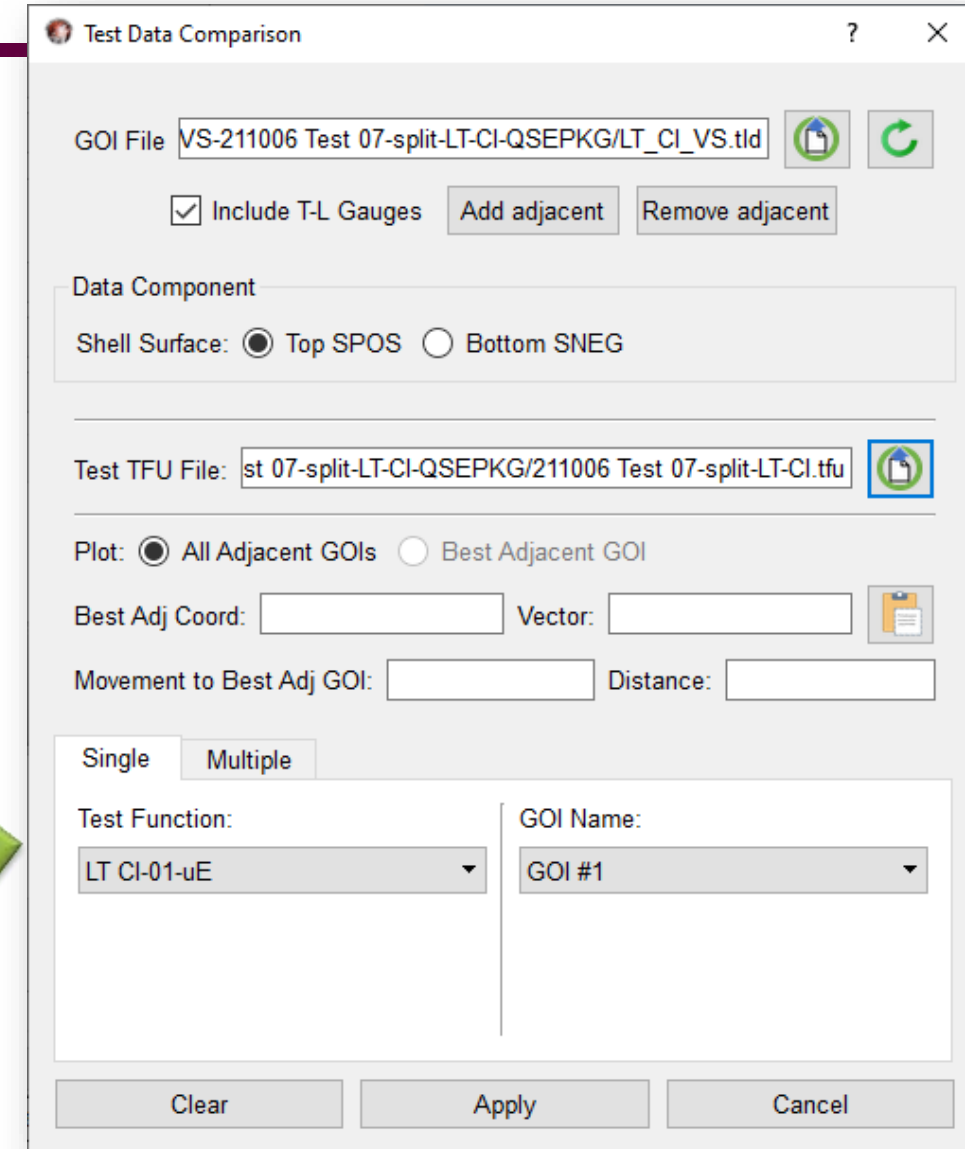
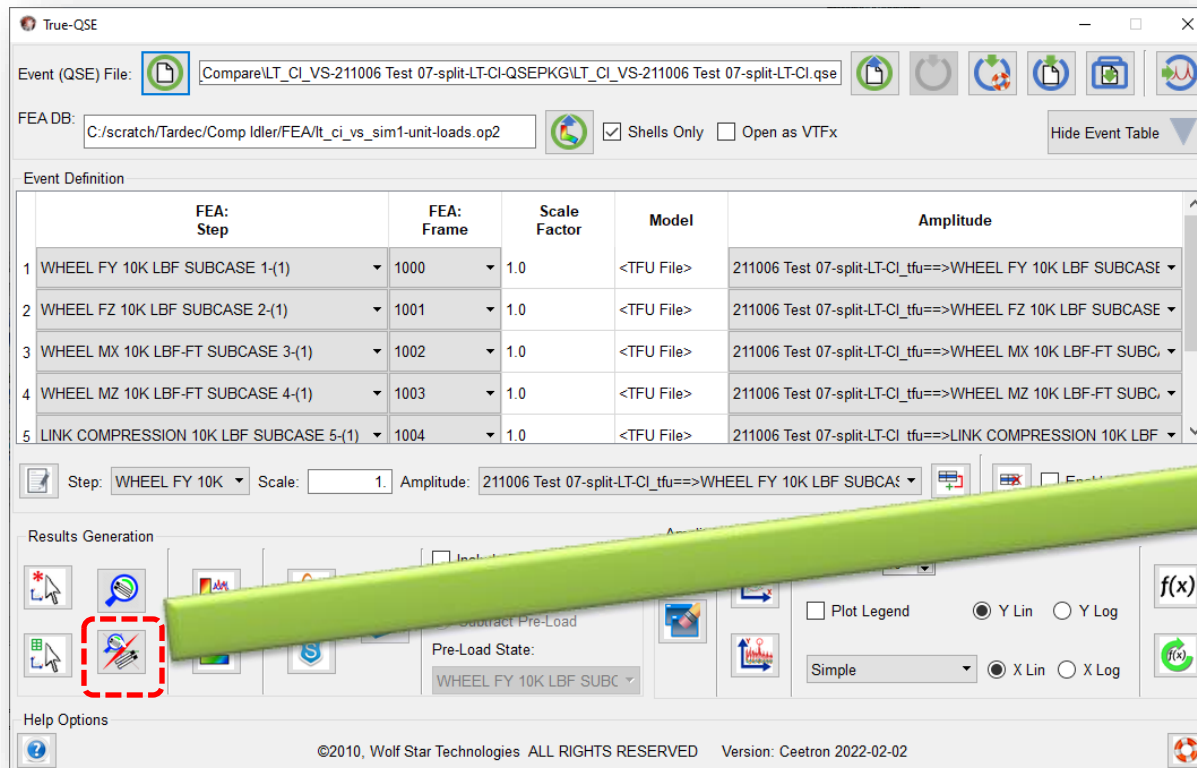
GOI / Test Data Compare





GOI / Test Data Compare



GOI / Test Data Compare is a fantastic new utility for comparing GOI strain response to measured test data. The next few slides will give an overview of the features





GOI / Test Data Compare


Test Data Comparison

GOI File: VS-211006 Test 07-split-LT-CI-QSEPKG/LT_CI_VS.tld  


☒ Include T-L Gauges

Data Component

Shell Surface: ☒ Top SPOS ☐ Bottom SNEG

Test TFU File: st 07-split-LT-CI-QSEPKG/211006 Test 07-split-LT-CI.tfu 

Plot: ☒ All Adjacent GOIs ☐ Best Adjacent GOI

Best Adj Coord: Vector: 

Movement to Best Adj GOI: Distance:

Test Function: LT CI-01-uE

GOI Name: GOI #1

Load in GOIs the using normal files (TLDs, CSVs). If you are using a TLD you can optionally use the T-L Gauges.

Load test data in using a TFU file.

Options / Output data

- If using Adjacent GOIs, you can plot just the best GOI.
- The best GOI coordinates and vector are stored as well as the movement from the original GOI and distance

Capability to process on multiple GOIs and multiple test channels. More on this later



Test data for Compare

GOI to Compare



GOI / Test Data Compare


Test Data Comparison

GOI File:  


☒ Include T-L Gauges

Data Component

Shell Surface: ☒ Top SPOS ☐ Bottom SNEG

Test TFU File: 

Plot: ☒ All Adjacent GOIs ☐ Best Adjacent GOI

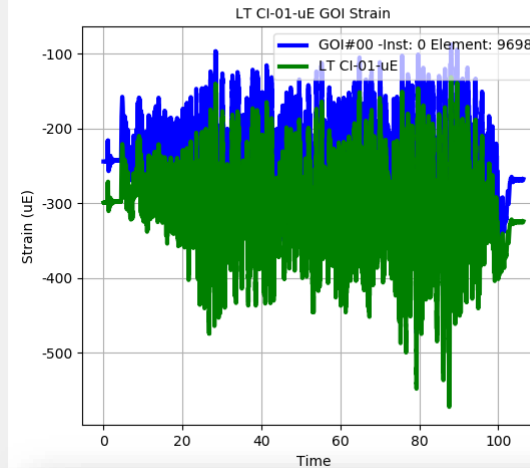
Best Adj Coord: Vector: 

Movement to Best Adj GOI: Distance:

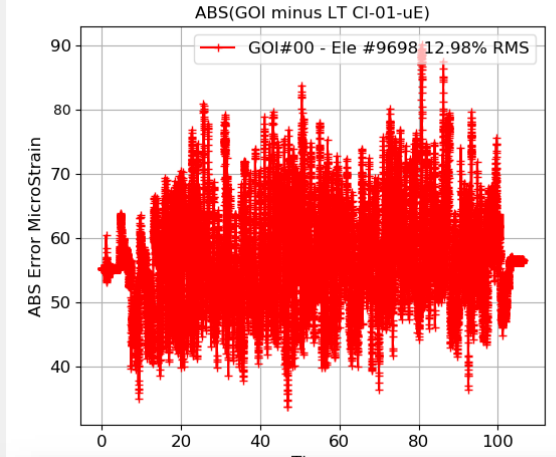
Test Function:

GOI Name:

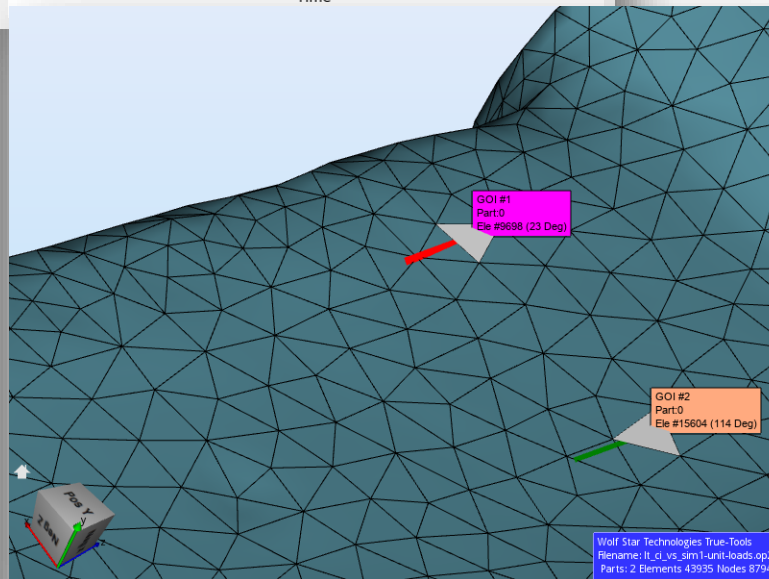
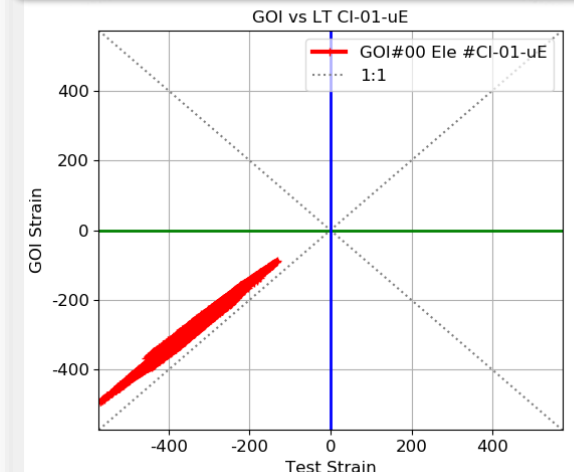
Time History: GOI , Test Strain



Abs(error): GOI - Test Strain



Cross Plot





Wolf Star Technologies True-Tools
Rename: lt_ci_vs_sln1-unit-loads.op2
Parts: 2 Elements 43935 Nodes 87944



GOI / Test Data Compare


Test Data Comparison

GOI File:  


☒ Include T-L Gauges Add adjacent Remove adjacent

Data Component

Shell Surface: ☒ Top SPOS ☐ Bottom SNEG

Test TFU File: 

Plot: ☒ All Adjacent GOIs ☐ Best Adjacent GOI

Best Adj Coord: Vector: 

Movement to Best Adj GOI: Distance:

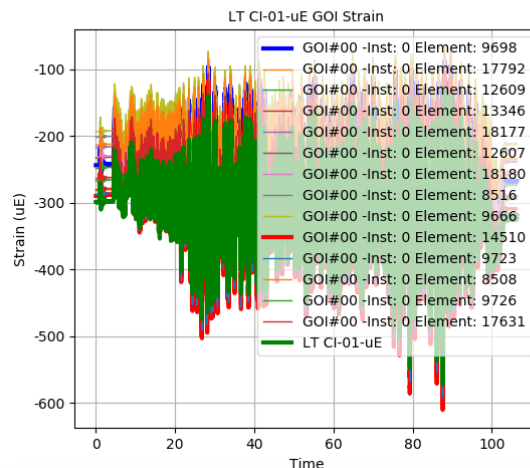
Single ☒ Multiple ☐

Test Function:

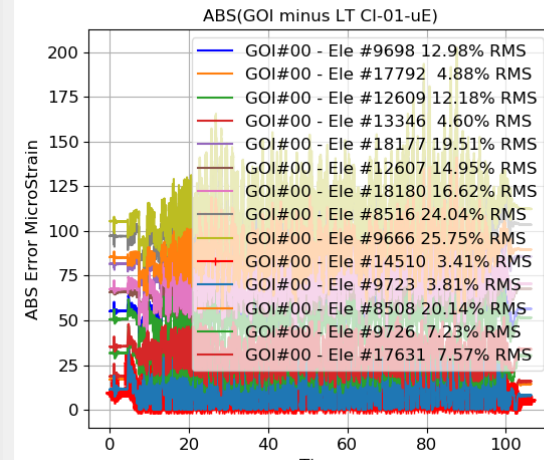
GOI Name:

Apply

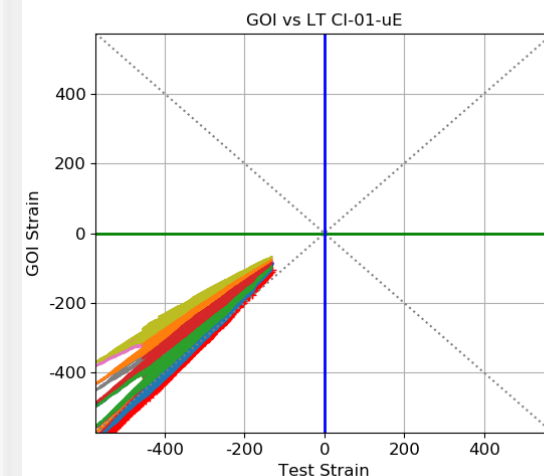
Time History: GOI , Test Strain



Abs(error): GOI - Test Strain

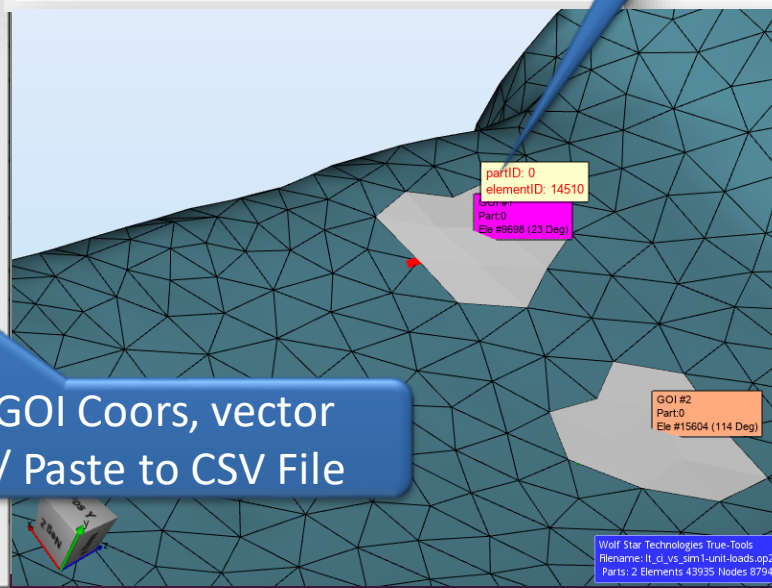


Cross Plot



Best GOI



Best GOI Coors, vector
Copy / Paste to CSV File





GOI / Test Data Compare


Test Data Comparison

GOI File:  


☒ Include T-L Gauges Add adjacent Remove adjacent

Data Component

Shell Surface: ☒ Top SPOS ☐ Bottom SNEG

Test TFU File: 

Plot: ☐ All Adjacent GOIs ☒ Best Adjacent GOI

Best Adj Coord: Vector: 

Movement to Best Adj GOI: Distance:

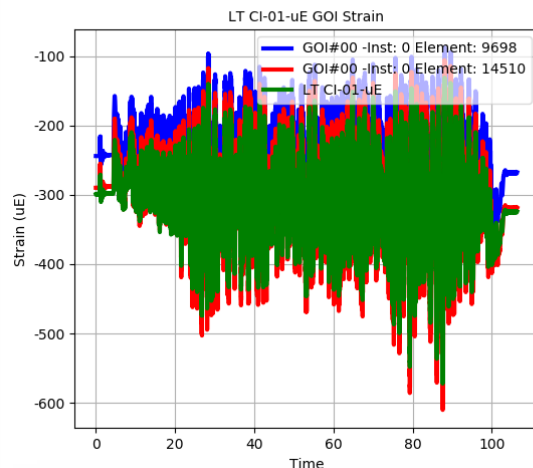
Single Multiple

Test Function:

GOI Name:

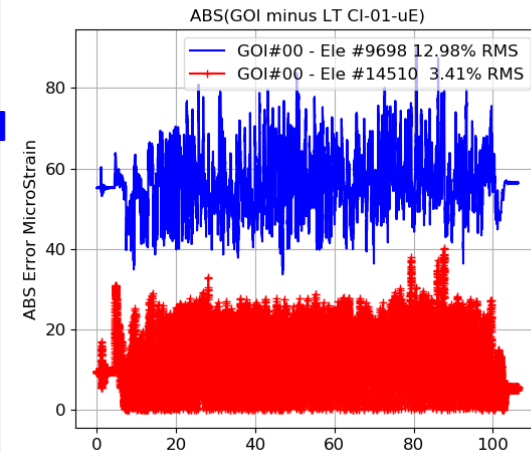
Apply

Time History: GOI , Test Strain



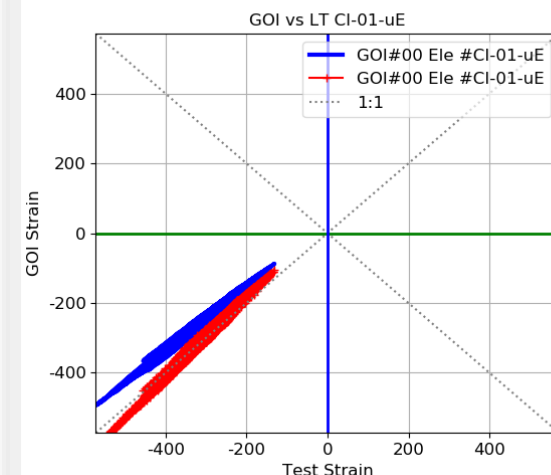
-- Blue Original GOI
-- Red Best GOI
-- Green Test Data

Abs(error): GOI - Test Strain

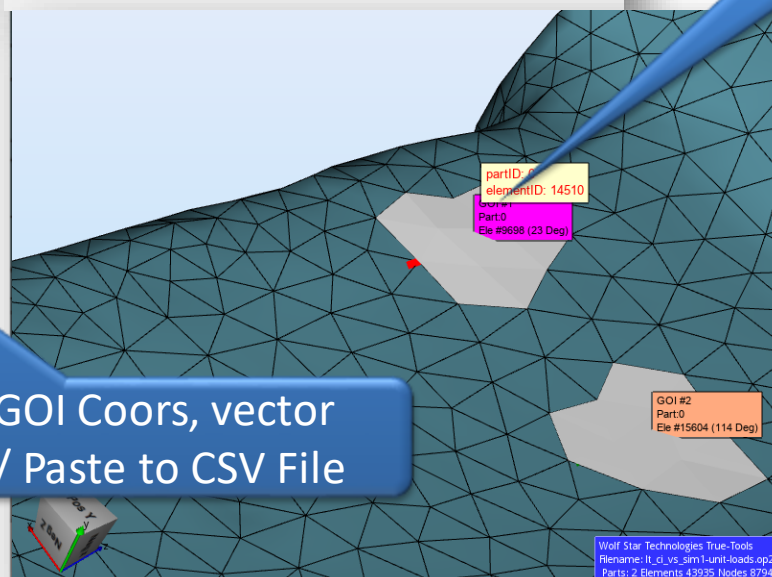


Best GOI

Cross Plot



Best GOI Coors, vector
Copy / Paste to CSV File



Wolf Star Technologies True-Tools
Filename: LT_CI_VS_sim1-unit-loads.op2
Parts: 2 Elements 43935 Nodes 67944



The screenshot displays two applications side-by-side. The top application is Microsoft Excel, showing a spreadsheet with data columns A through I. A blue text box is overlaid on the spreadsheet, containing the text "Generates Best GOI GaugeLines CSV". The bottom application is a web browser displaying a comparison of movement vectors and distances for three different models. The browser window shows a URL bar with "LT_CI_VS-211006 Test 07-split-47" and a search bar with "LT_CI_GOICompare.html". The browser content shows three rows of data, each with a movement vector and a movement distance. The first row shows a movement vector of (0.166, 0.014, 0.096) and a movement distance of 192. The second row shows a movement vector of (-0.070, 0.007, 0.123) and a movement distance of 141. The third row shows a movement vector of (0.036, -0.190, 0.042) and a movement distance of 198. Each row includes a plot of the movement vector and a plot of the movement distance.

	A	B	C	D	E	F	G	H	I
1	2.078	3.414	11.555	-0.001	-0.025	1			
2	1.085	3.504	11.325	-0.003	-0.027	1			
3	1.976	-1.479	11.374	-0.003	0.039	0.999			
4	0.921	-1.613	11.414	-0.004	0.022	1			
5	2.358	3.443	4.556	-0.086	0.014	0.996			
6	-2.808	3.42	4.88	0.087	0.004	0.996			

Generates Best GOI GaugeLines CSV

LT_CI_VS-211006 Test 07-split-47

Ready Display Settings 100%

LT_CI_VS-211006 Test 07-split-47

Wolfram | Banking | Recipes | Johns Hopkins Univ. | Fit On | USPS.com® - USPS...

Reading list

Movement vector: (0.166, 0.014, 0.096) Movement distance: 192

Movement vector: (-0.070, 0.007, 0.123) Movement distance: 141

Movement vector: (0.036, -0.190, 0.042) Movement distance: 198