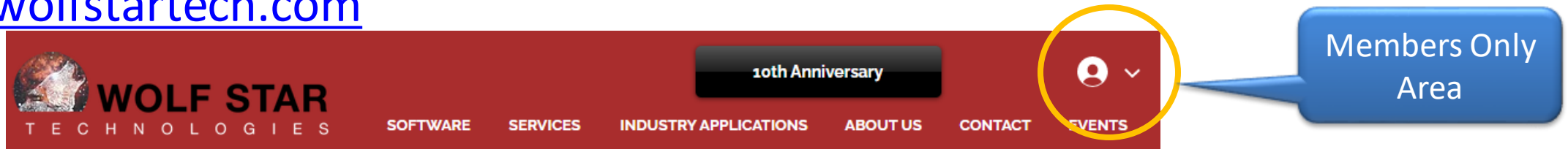
WOLF STAR
TECHNOLOGIES

True-Load Enhancements
2020-12-01

Tim Hunter

Enhancements Overview

- Major Release – Re-Introduction of True-LDE!!!
  - License offered free to all users until 2020-06-01
  - Give it a try and Enjoy!
- 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.
- 34 Enhancements, 4 Bug Fixes

Overview – Major Enhancements

- True-LDE – Linear Dynamic Events
- New icons for True-QSE, Pre-Test, Post-Test, True-LDE
- Fiber Optic Strain Gauge cabling
- Import GOIs added to standard gauge import
- Import of Gauge / GOI names supported
- Export of Gauge number / Gauge Name to GaugeLines CSV file
- More math added to TFU Manager

Enhancements - Overview

Bug Fixes

Details

True-LDE

Details

Update / Install

True-Load Icons

Major Features

Fiber Optic Cabling

Write Gauge Lines

Import Gauge Line Improvements

Solver Specific

Ansys WorkBench Updates

Abaqus Plug-in Updates

Utilitarian Improvements

TFU Mgr GUI Update

Cross Plots – Available in tfuTools

Save Animation

On Screen Ruler

Measure Utils

Add Load Checks

Group Sorting

Key Plane

PSD to Time

Bulk Import TFU files

TFU Mathematics

Safety Save

Bug Fixes

Bugs

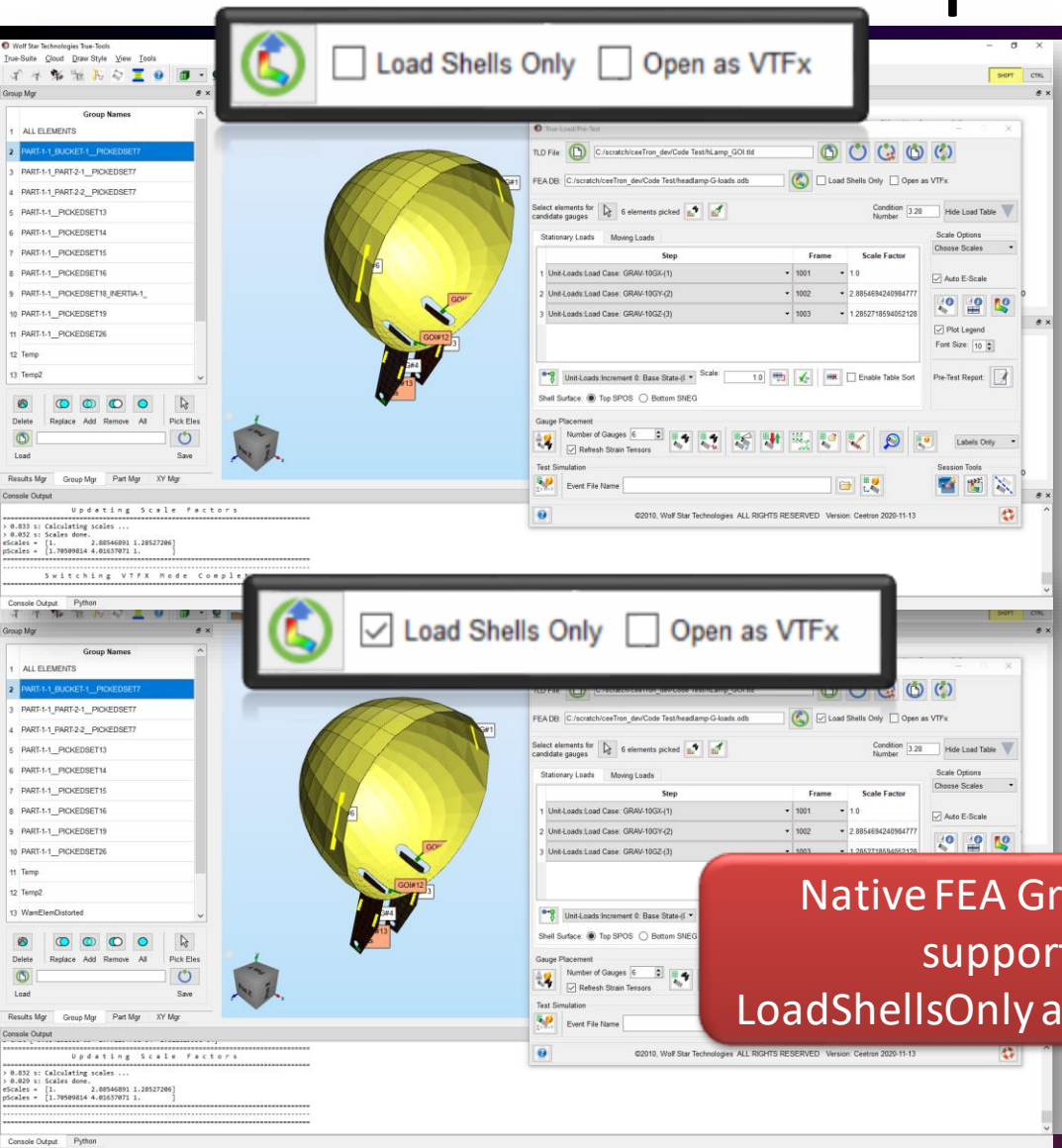
Release Level	Module	Type	Description
12/1/2020	POST	Bug	ShellsOnly Flag not written to QSE file in Post
12/1/2020	POST	Bug	Two SimMes files (one with spaces / one without) are being written -- we only want one (with spaces)
12/1/2020	PRE	Bug	Lots of GUI issues in GOI form … we need to clean up.
12/1/2020	PRE	Bug	When loading Open as VTFx, native FEA groups are not loaded properly
12/1/2020	QSE	Bug	Save as FFT does not update the event table.
12/1/2020	QSE	Bug	When loading Open as VTFx, native FEA groups are not loaded properly

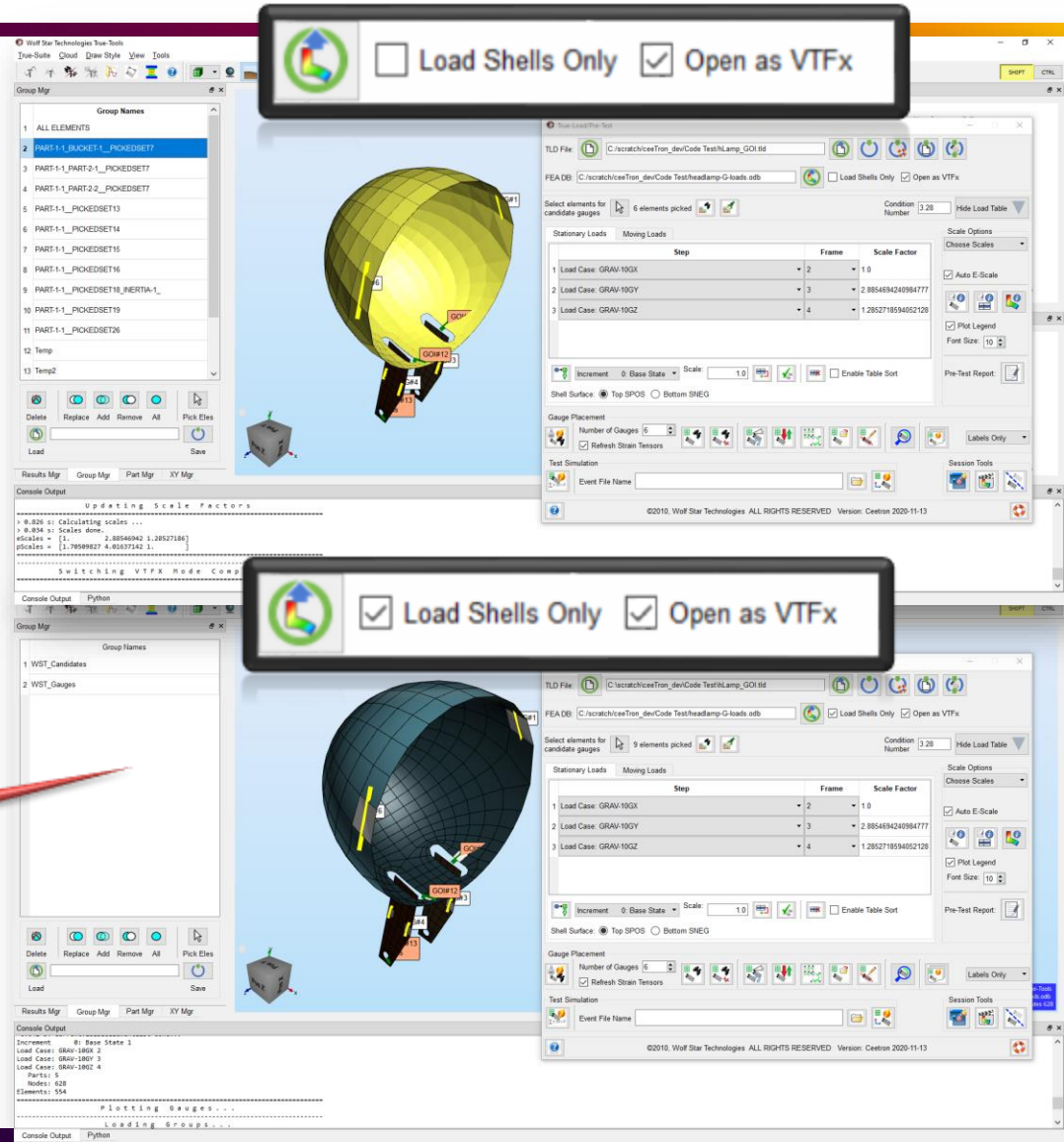
All of these issues are fixed (except where noted). These are fairly self-explanatory

These two issues are the same issue. Details on the next slide.

This issue is being worked on by Ceetron. Fix is expected in Q1 2021.

Groups issue with LoadShellsOnly and OpenAsVTFx



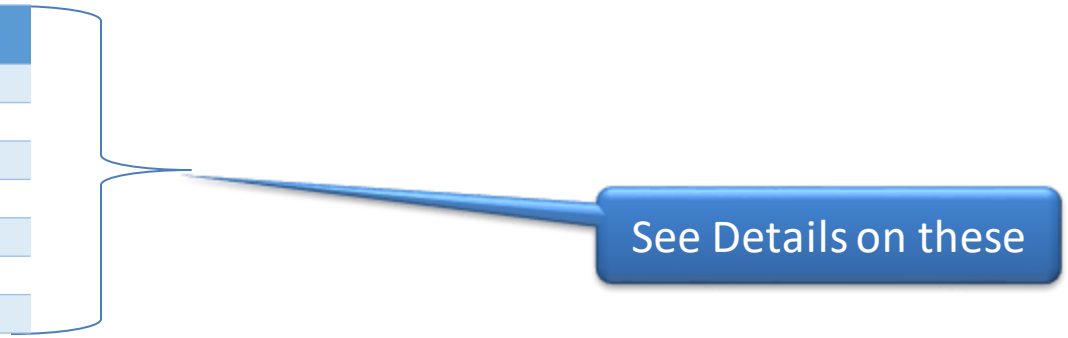


Native FEA Groups are not supported for LoadShellsOnly and OpenAsVTFx

Enhancements - Overview

Enhancements – True-Load Environment

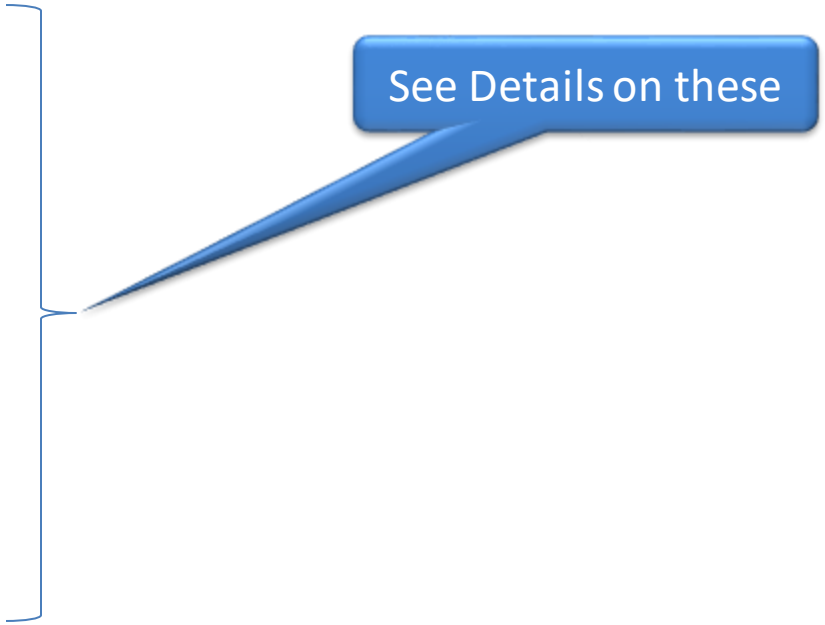
Release Level	Module	Type	Description
12/1/2020	ALL	Enhancement	Add MP4 file output to Results Manager
12/1/2020	ALL	Enhancement	Fix ruler to be intuitive when spun
12/1/2020	ALL	Enhancement	Sort groups in Group Manager
12/1/2020	ALL	Enhancement	Add to plane picker: Key In
12/1/2020	ALL	Enhancement	Add 3 Pt Arc to Measure Utils
12/1/2020	ALL	Enhancement	Add MidPt to Measure Utils
12/1/2020	ALL	Enhancement	Add Coordinates of Pt to Measure Utils



Release Level	Module	Type	Description
12/1/2020	DIM	Enhancement	Remove last floppy from T-L!
12/1/2020	DIM	Enhancement	Move safety save btn to standard location

Enhancements – TFU Mgr

Release Level	Module	Type	Description
12/1/2020	TFU	Enhancement	Make Cross Plot a tfuTools function
12/1/2020	TFU	Enhancement	Fix filter to make data Real before processing (numpy.real() or y.real())
12/1/2020	TFU	Enhancement	Add sqrt, sqr, sqrt(sumSqr)
12/1/2020	TFU	Enhancement	Add PSD to Time to tfuTools
12/1/2020	TFU	Enhancement	Add PSD to Time function to GUI
12/1/2020	TFU	Enhancement	Bulk import TFU files
12/1/2020	TFU	Enhancement	After CSV (and other import) print "xxxx.csv imported"
12/1/2020	TFU	Enhancement	Add AVG Functions to GUI
12/1/2020	TFU	Enhancement	Add function to create 1/y
12/1/2020	TFU	Enhancement	UNV Read - fix issue with trailing zeroes
12/1/2020	TFU	Enhancement	UNV Read - Allow for even and uneven spaced data



Enhancements - Pre

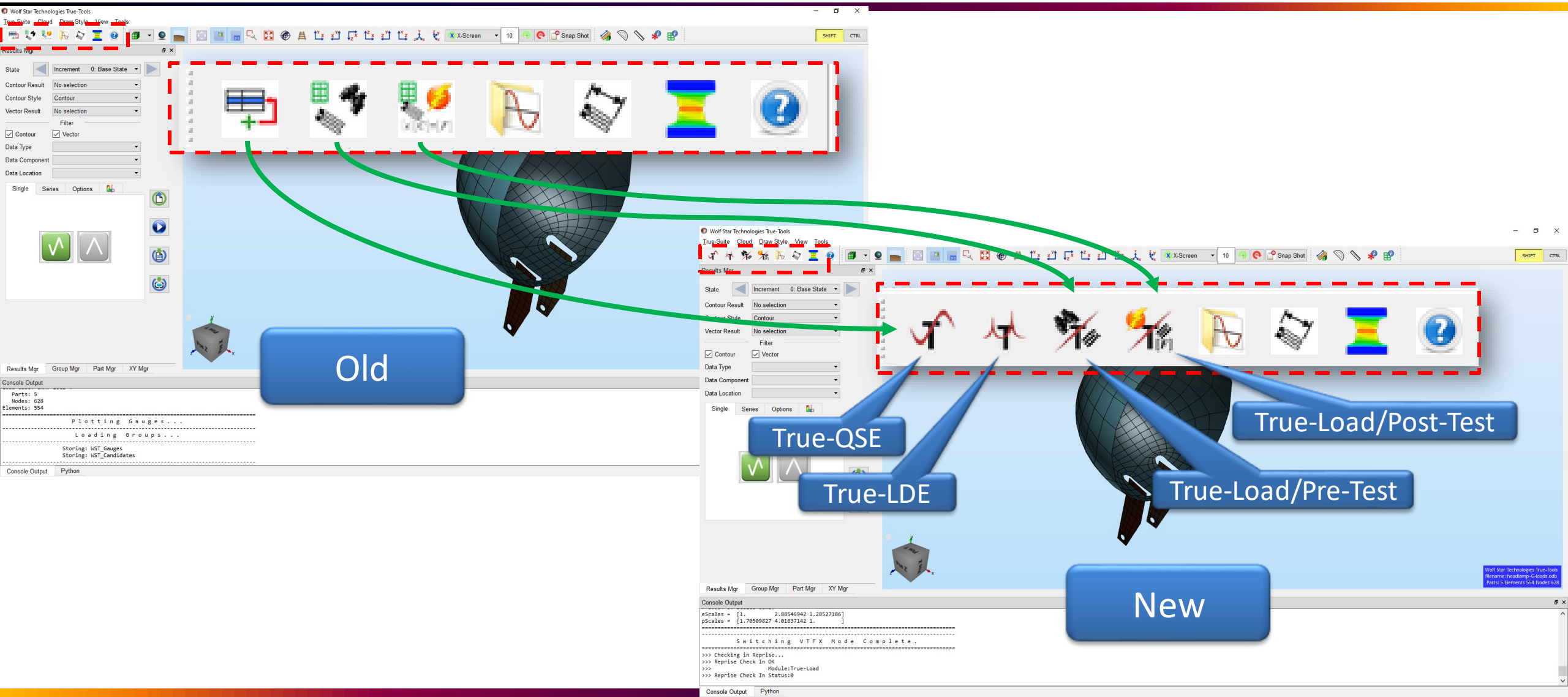
Release Level	Module	Type	Description
12/1/2020	PRE	Enhancement	"Add More Gauges" displays gauges in all details ... need to obey GUI setting
12/1/2020	PRE	Enhancement	Update eMat should make gauges valid
12/1/2020	PRE	Enhancement	When importing gauges from TLD add option (CheckBox) for importing GOIs
12/1/2020	PRE	Enhancement	When importing gauges / GOIs, import the names too
12/1/2020	PRE	Enhancement	Add Row to table check to see if load is already there
12/1/2020	PRE	Enhancement	Add all steps to table checks to see if loads are already in table.
12/1/2020	PRE	Enhancement	When deleting loads, activate the save button
12/1/2020	PRE	Enhancement	Add Fiber-Optic B-spline Utility

Enhancements - QSE

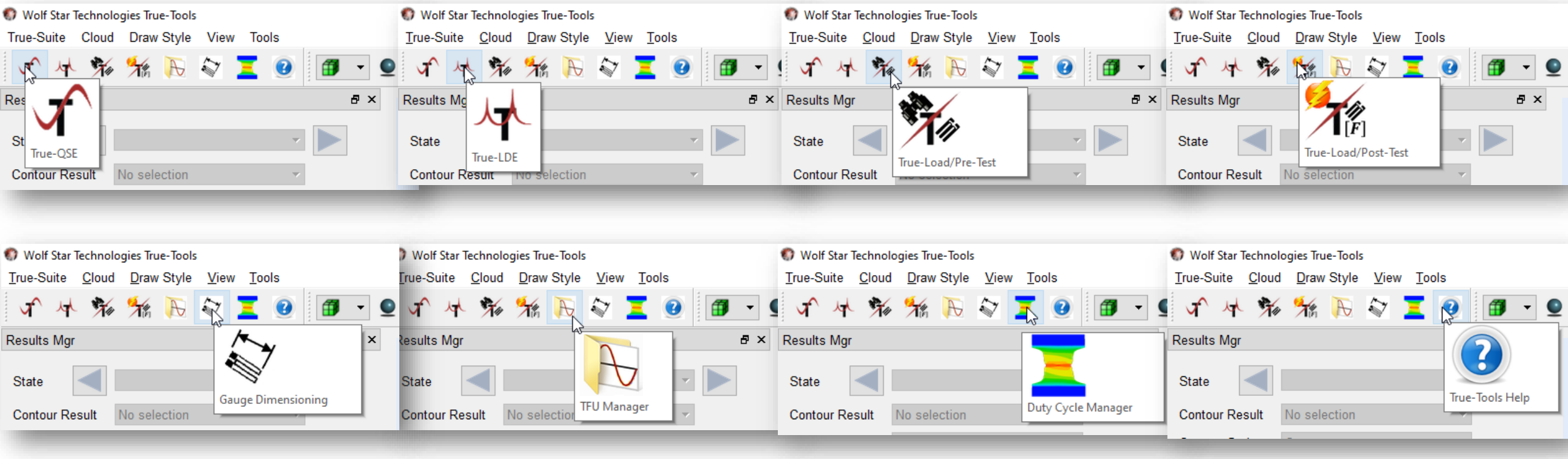
Release Level	Module	Type	Description
12/1/2020	QSE	Enhancement	Fix imaginary number issue when saving functions (Reaction Forces) in Nodal and Elemental Functions
12/1/2020	QSE	Enhancement	Fix element selection issues on multiple GOI runs
12/1/2020	QSE	Enhancement	Move safety save btn to standard location

True-Load Icons

True-Load Application Icons have changed

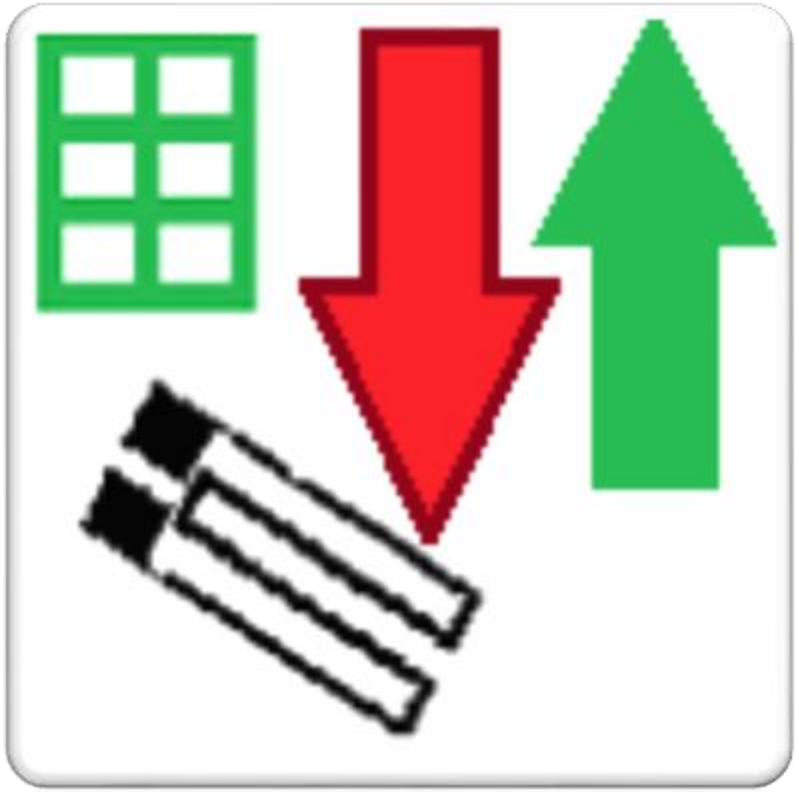


New Tool Tips with Large Icons

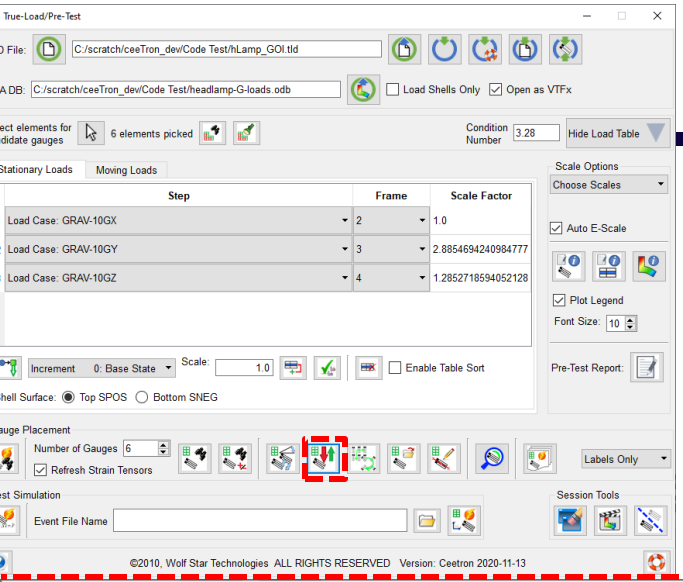


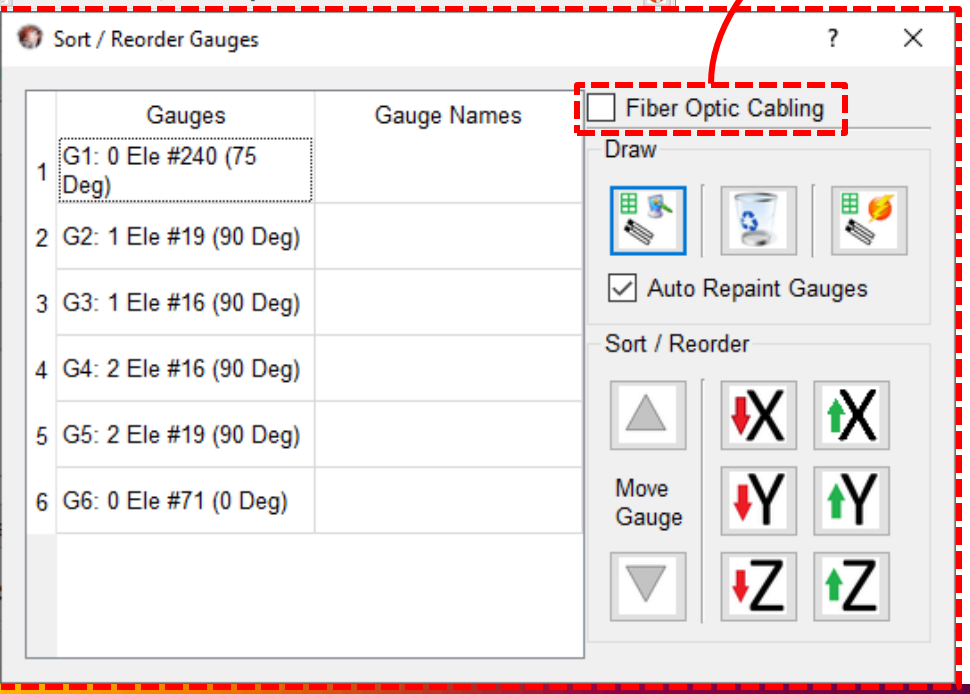
When hovering over the True-Load Application Icons, a large Icon shows in the Tool Tip text.

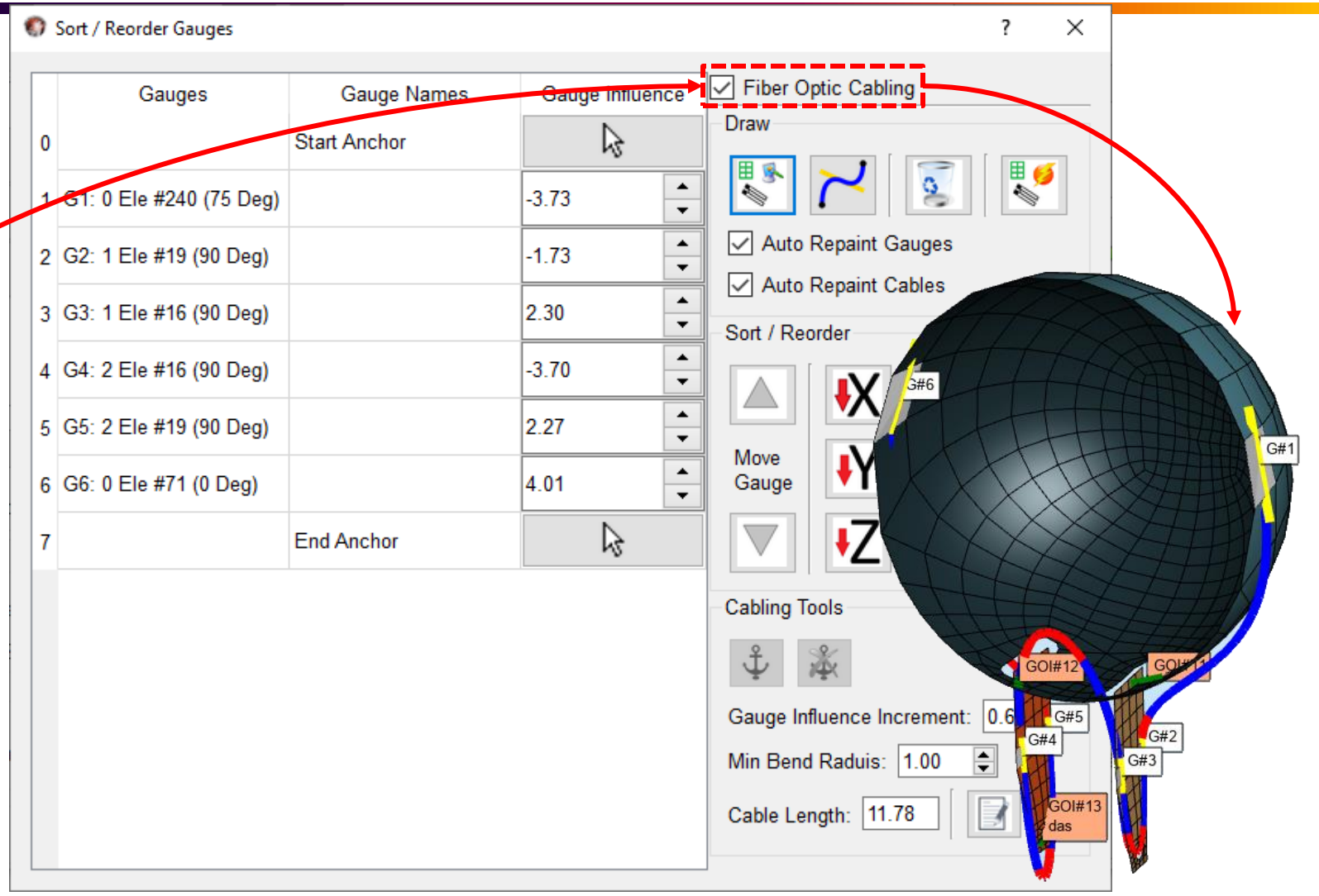
Fiber Optic Cabling



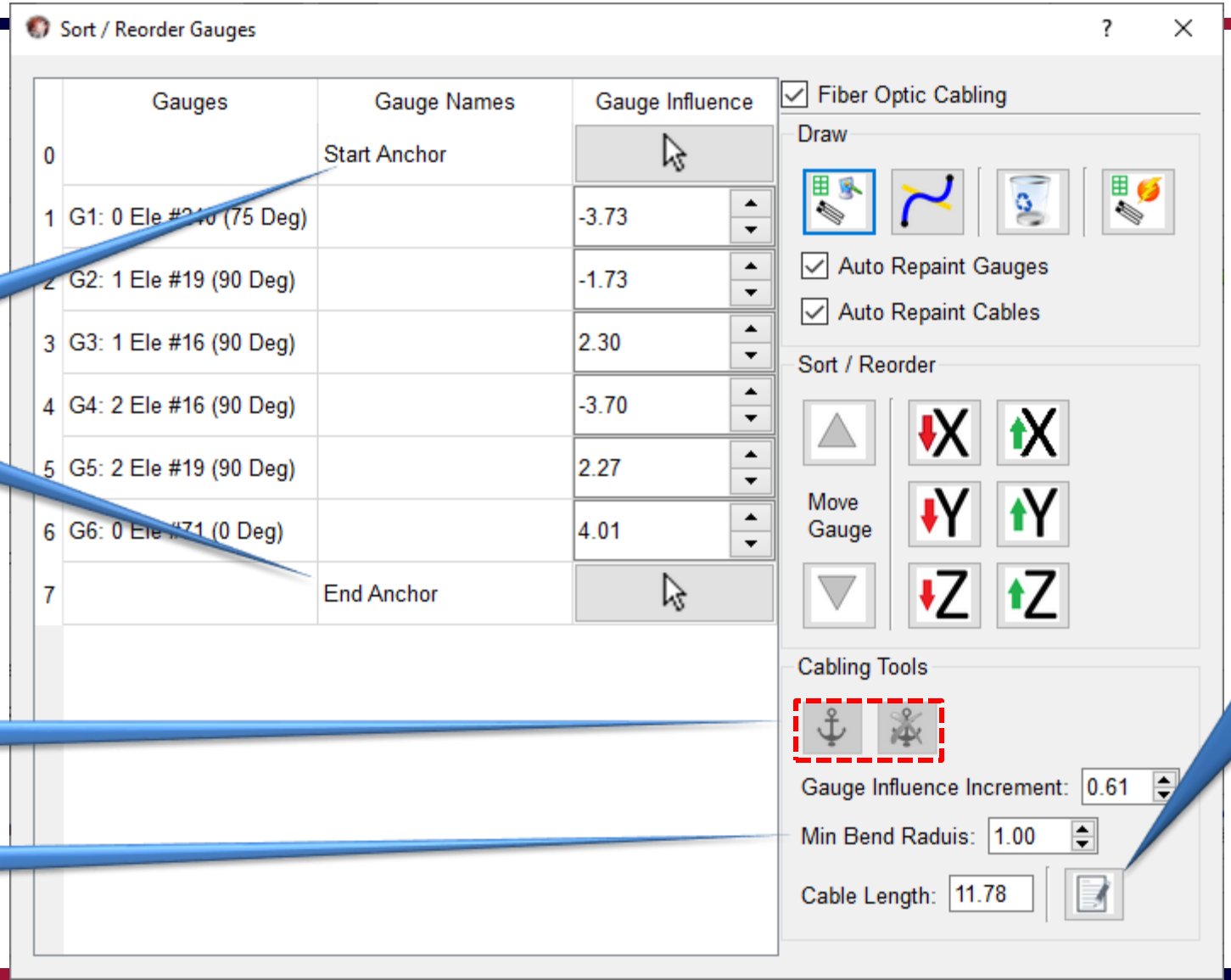
Fiber Optic Cabling







Fiber Optic Cabling



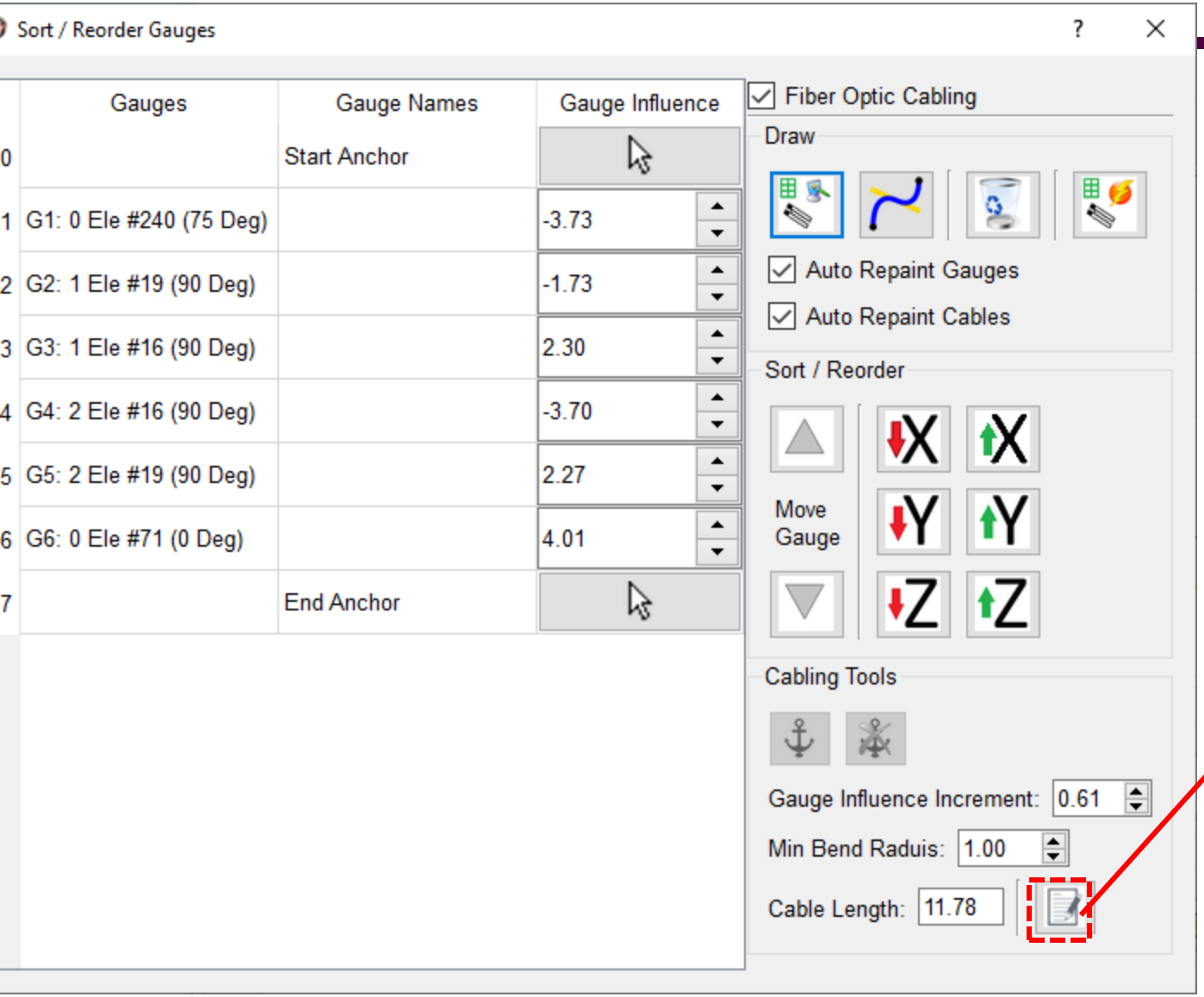
Start / End Anchors

Add / Delete Intermediate Anchors

Specify Minimum Bend Radius

Fiber Optic Cable Specification Report (Next Slide)

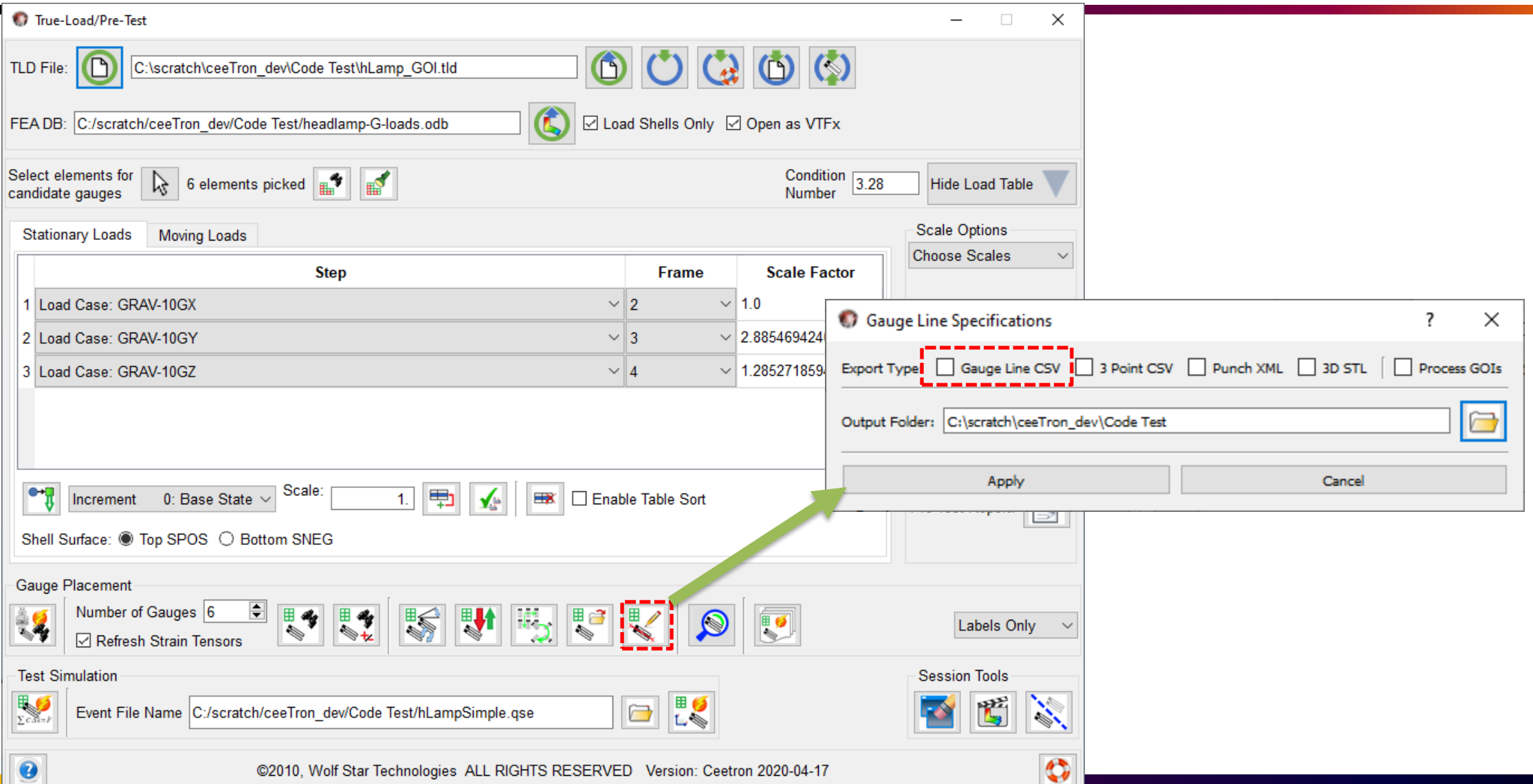
Fiber Optic Cabling



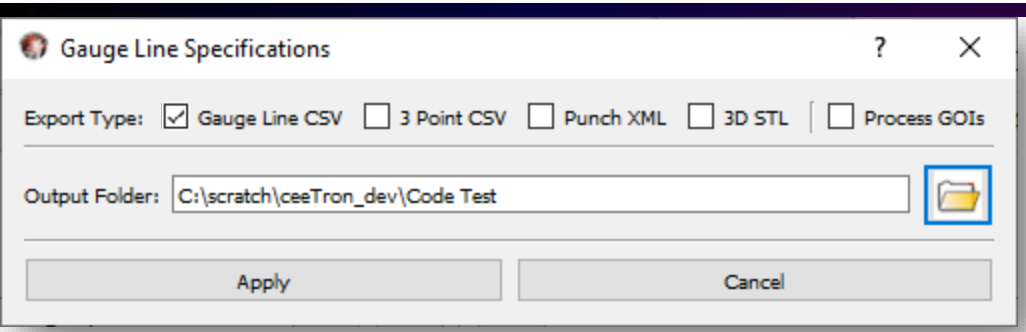
True-Load Fiber Optic Cabling Report			
Date Generated:	11/18/2020 10:25		
Total Cable Length:	11.78		
Linear Position	Number	Name	Details
0.0000	G1		Part 0 Ele #240 (75 Deg)
2.9857	G2		Part 1 Ele #19 (90 Deg)
4.4537	G3		Part 1 Ele #16 (90 Deg)
6.7917	G4		Part 2 Ele #16 (90 Deg)
8.9785	G5		Part 2 Ele #19 (90 Deg)
11.7838	G6		Part 0 Ele #71 (0 Deg)

Write Gauge Lines

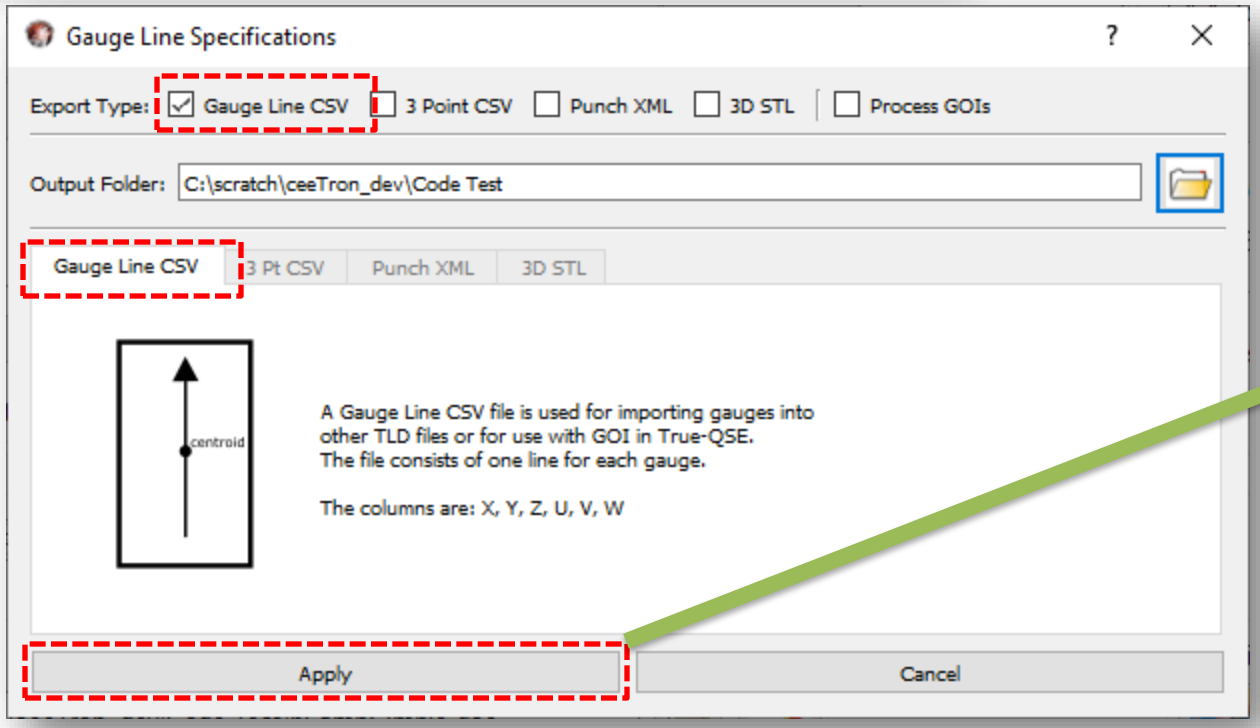
Write Gauge Lines GUI - Improvements



GaugeLines.csv

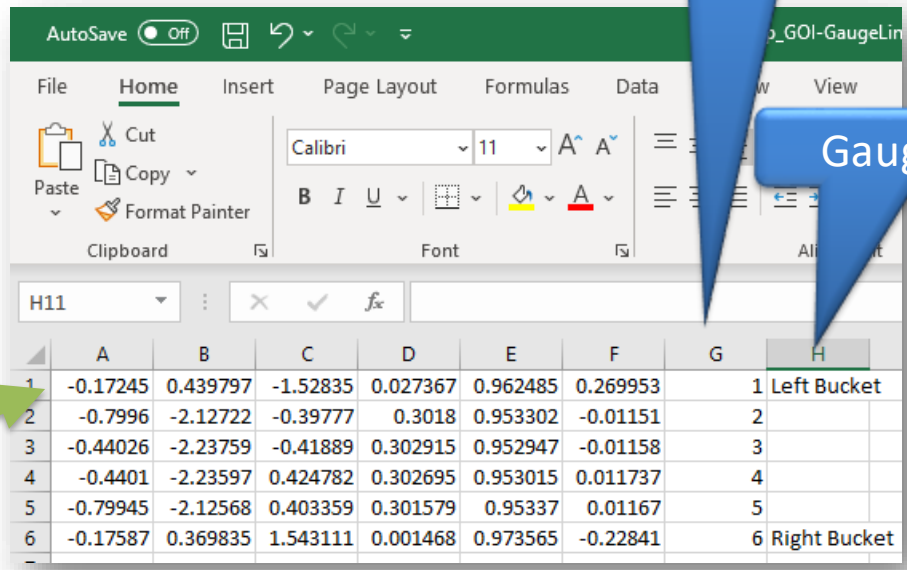


Creates GaugeLines.csv file used for importing and for GOI in True-QSE



Gauge Number

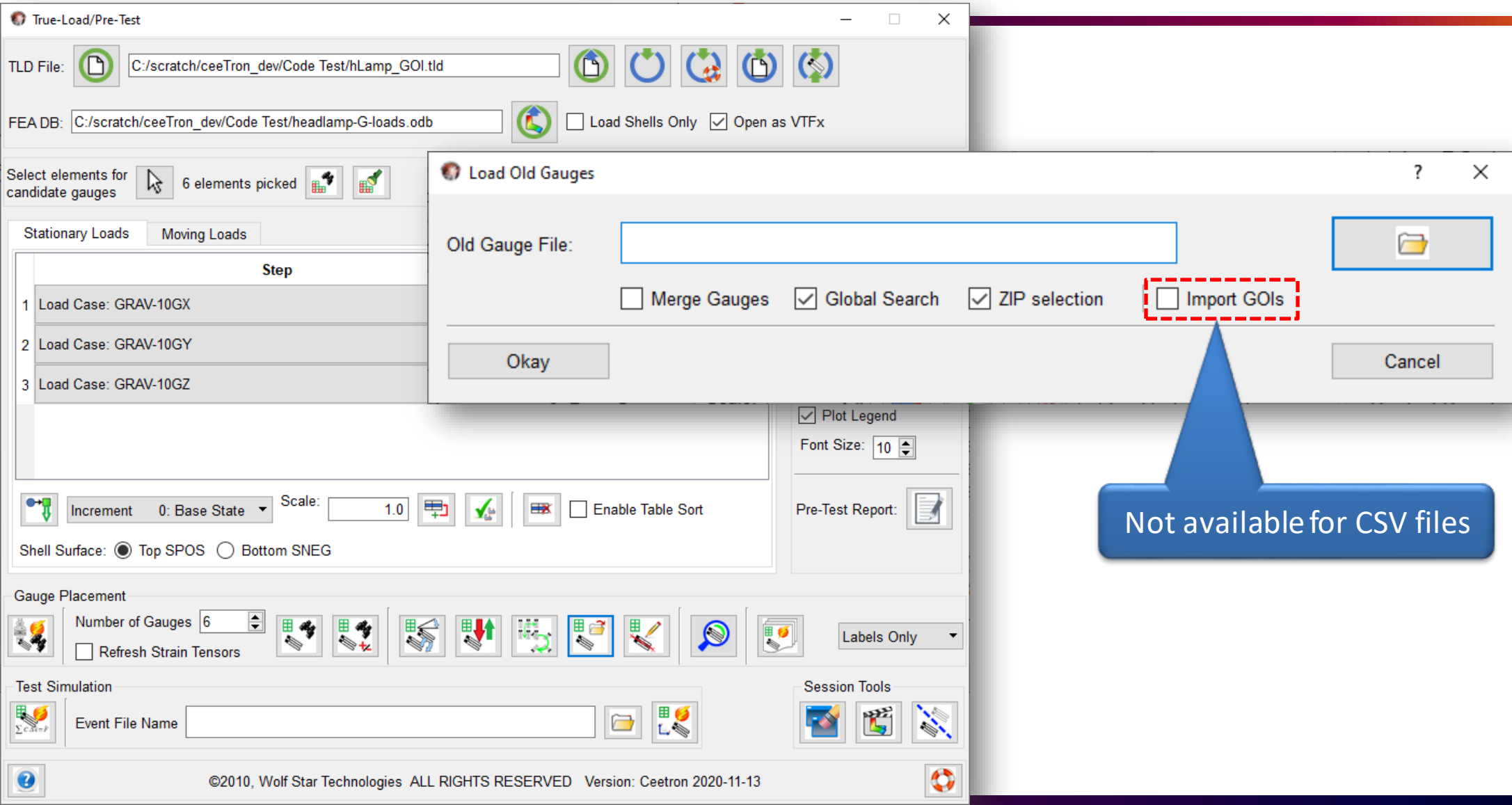
Gauge Name



	A	B	C	D	E	F	G	H
1	-0.17245	0.439797	-1.52835	0.027367	0.962485	0.269953	1	Left Bucket
2	-0.7996	-2.12722	-0.39777	0.3018	0.953302	-0.01151	2	
3	-0.44026	-2.23759	-0.41889	0.302915	0.952947	-0.01158	3	
4	-0.4401	-2.23597	0.424782	0.302695	0.953015	0.011737	4	
5	-0.79945	-2.12568	0.403359	0.301579	0.95337	0.01167	5	
6	-0.17587	0.369835	1.543111	0.001468	0.973565	-0.22841	6	Right Bucket

Import Gauge Line Improvements

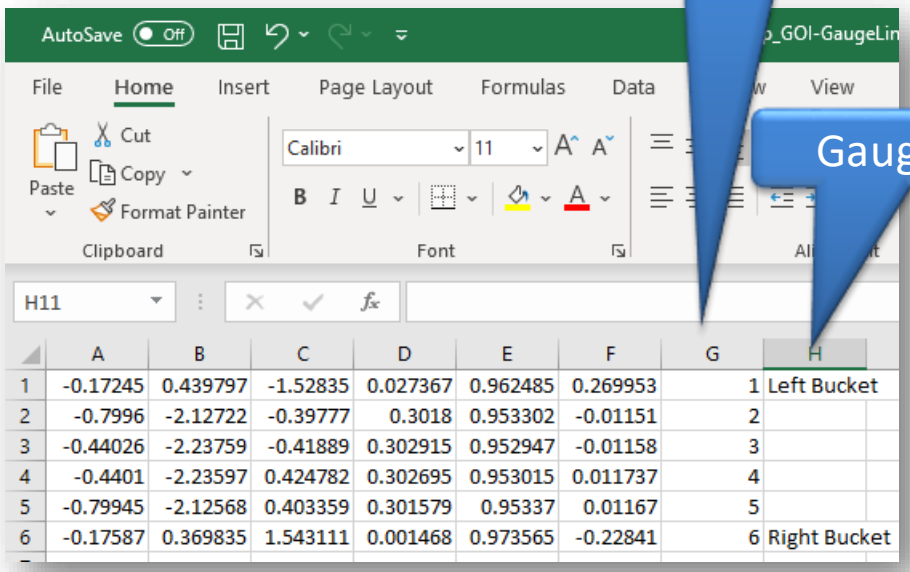
GOIs may be imported from TLD files



Import Gauges supports Gauge Names too

Gauge Number

Gauge Name



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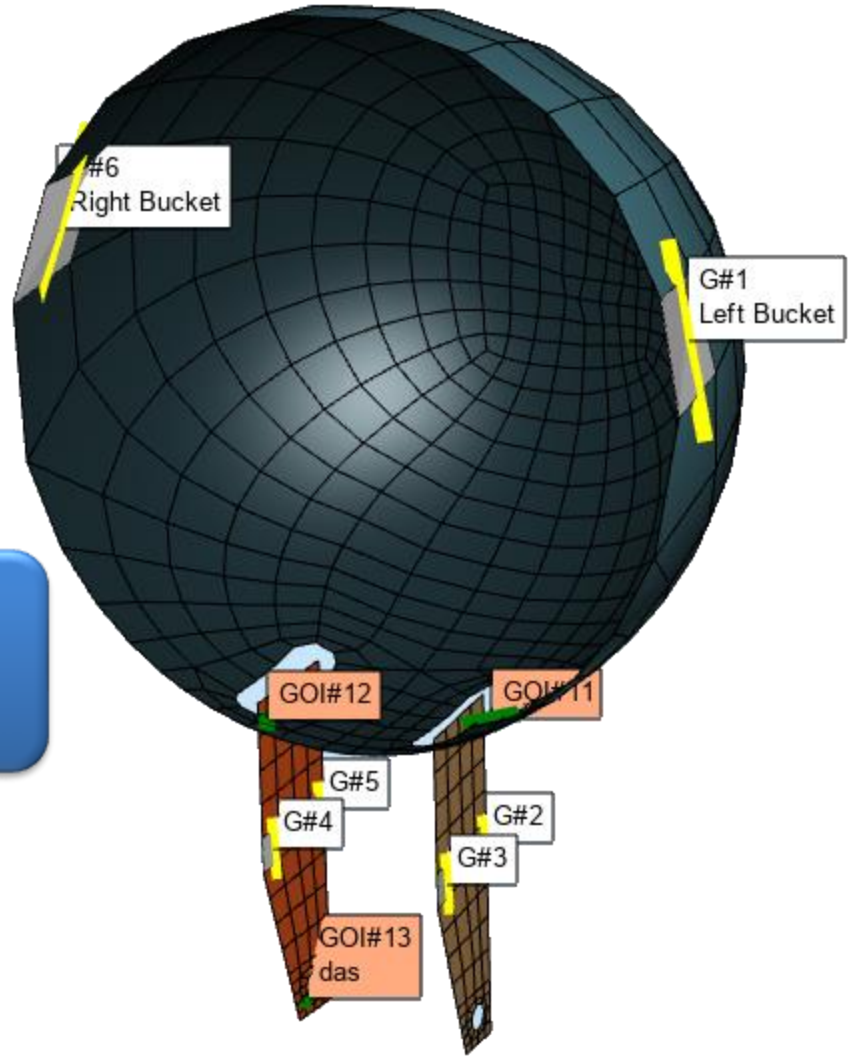
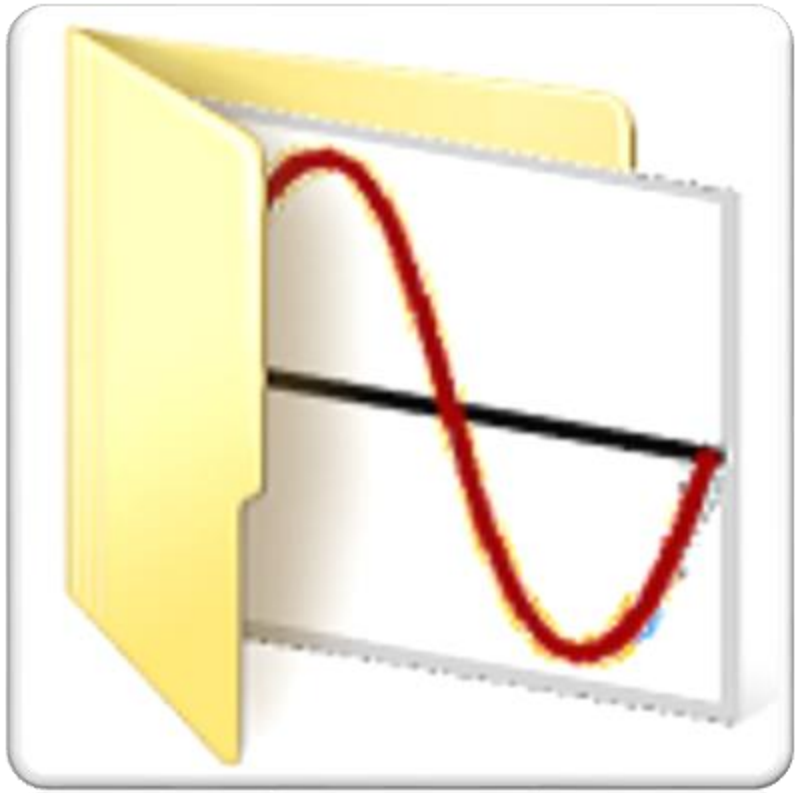
6	-0.17587	0.369835	1.543111	0.001468	0.973565	-0.22841	6	Right Bucket

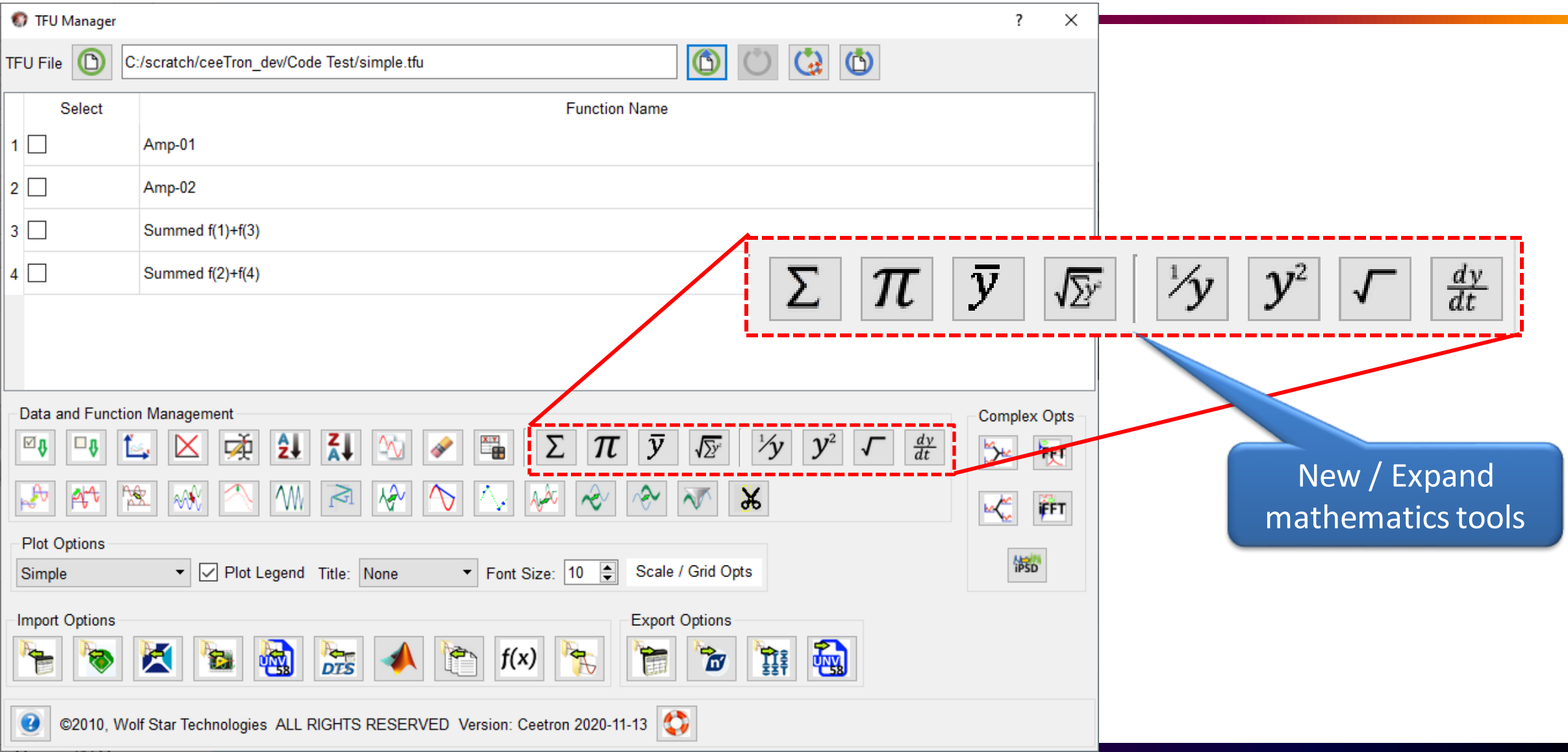
Names in CSV and TLD file are supported



TFU Mathematics



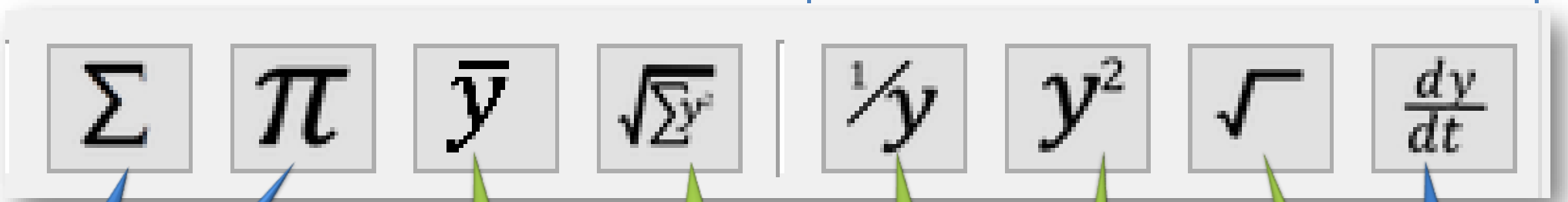
TFU Mathematics



TFU Math Tools

One Function Generated

One Function Generated for each functon selected



Sum

Multiply

Average

Root Sum Square (RSS)

Reciprocal

Square

Square Root

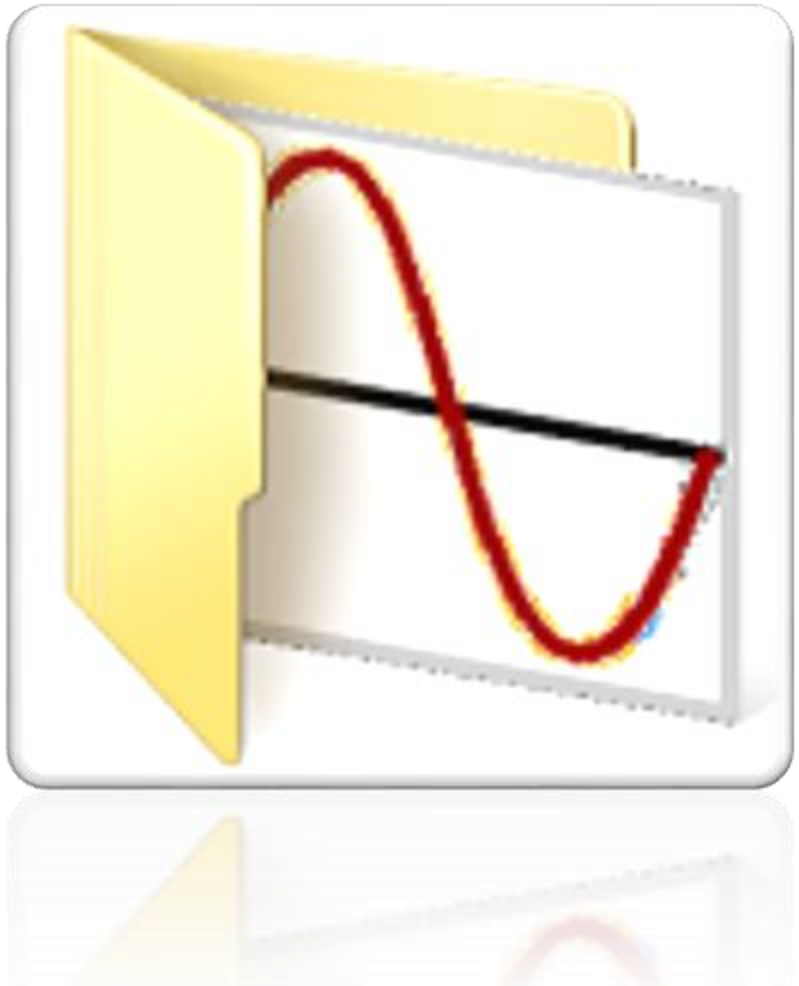
Derivative

Existing

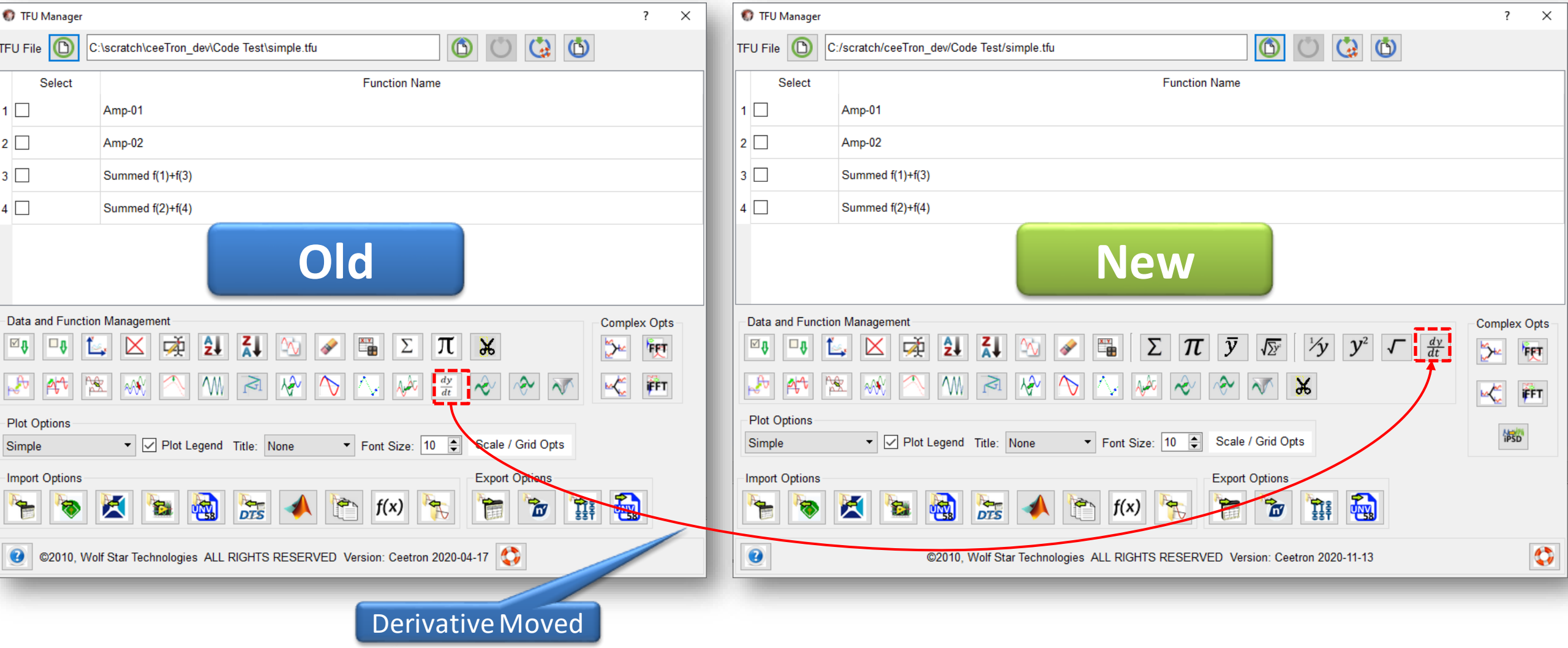
New

All math functionality is available through Python tfuTools

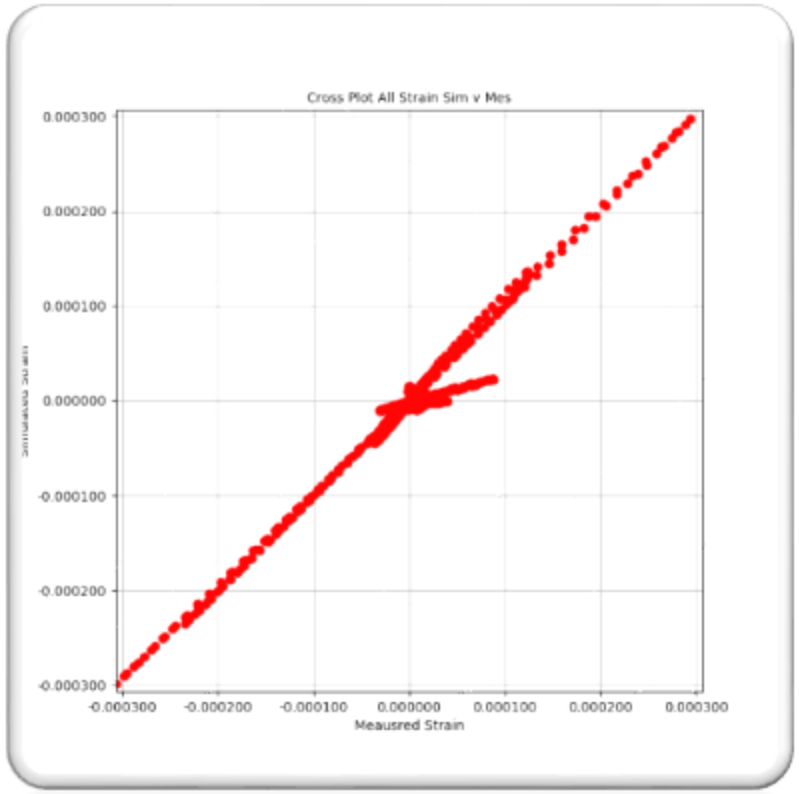
TFU Mgr GUI Update



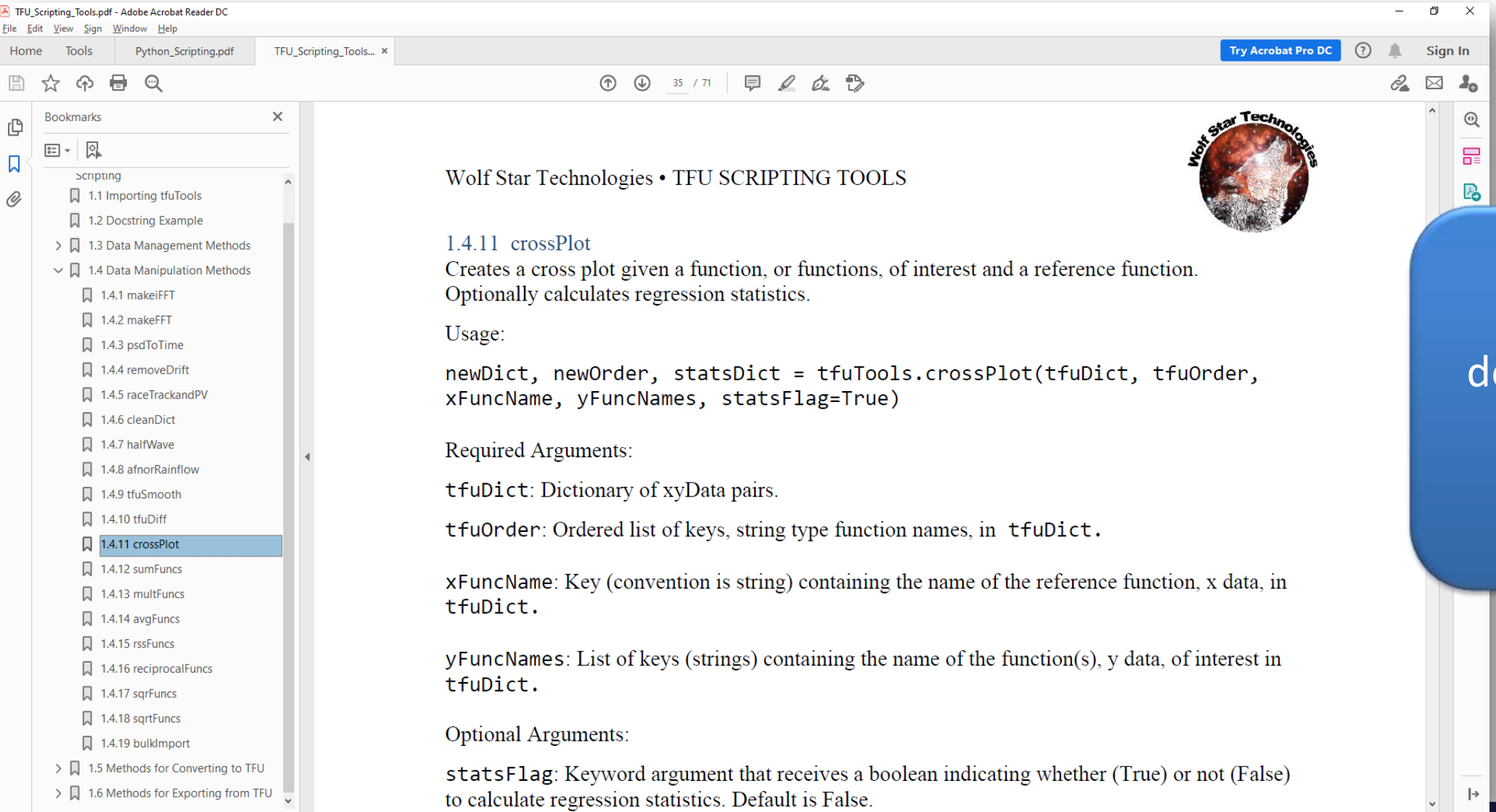
TFU Mgr GUI Update



Cross Plots – Available in tfuTools



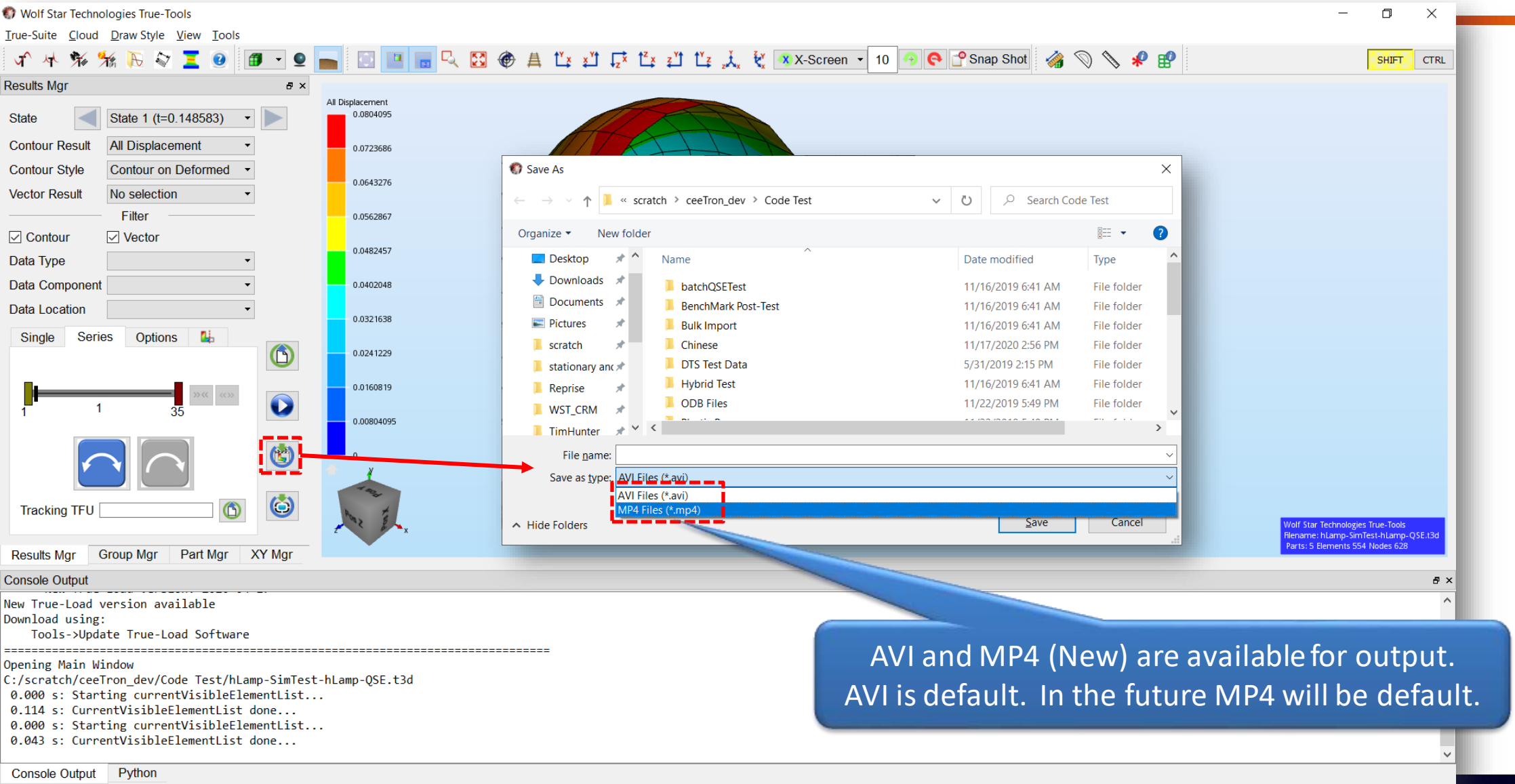
CrossPlots in tfuTools



tfuTools documentation of crossPlot functionality

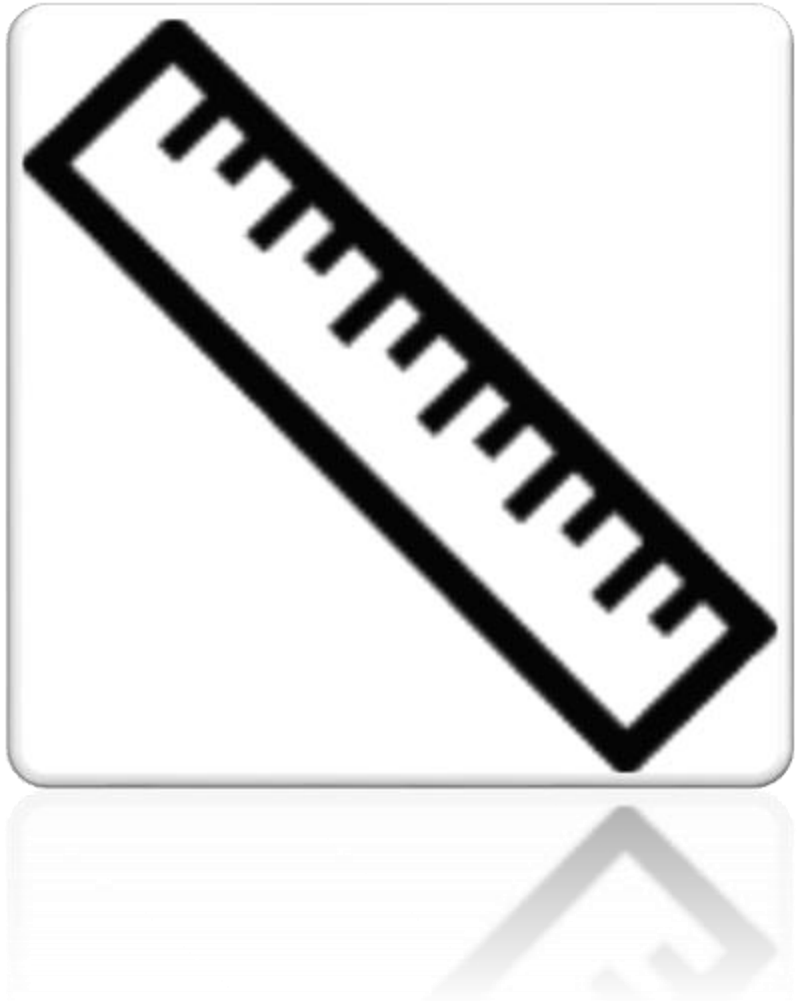
Save Animation

Save animation to MP4

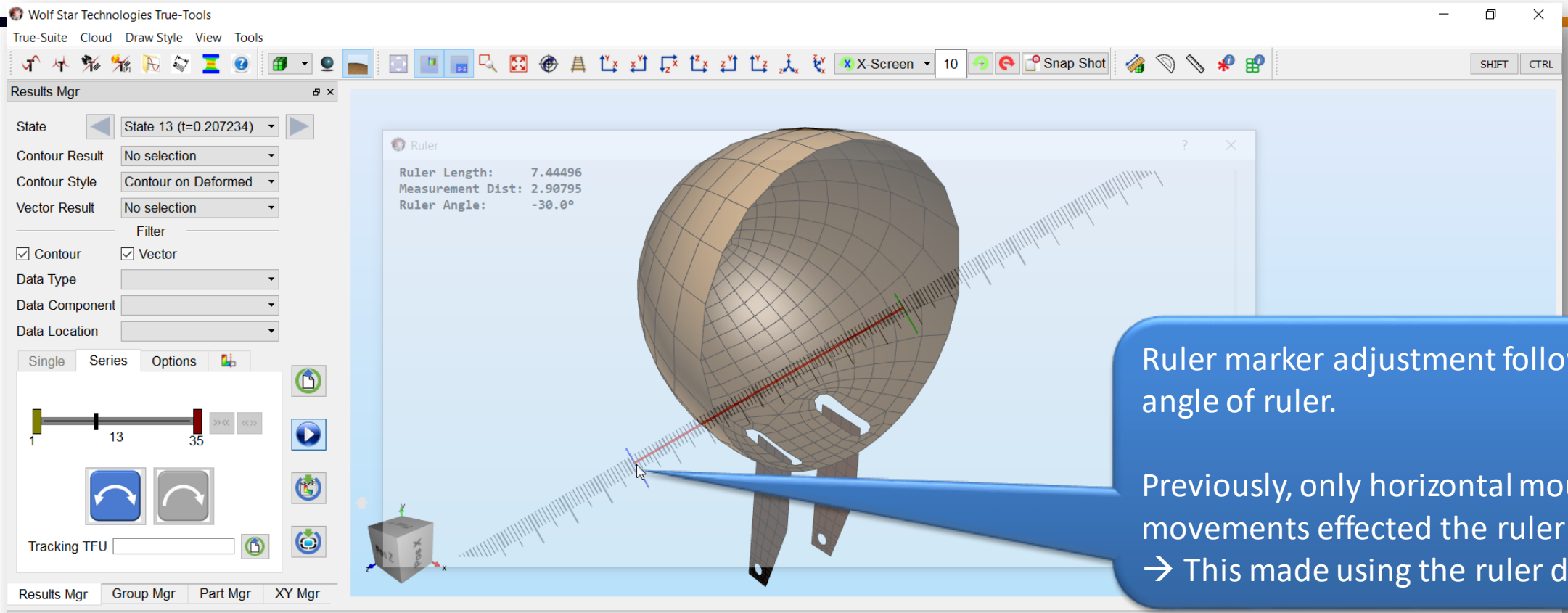


AVI and MP4 (New) are available for output.
AVI is default. In the future MP4 will be default.

On Screen Ruler



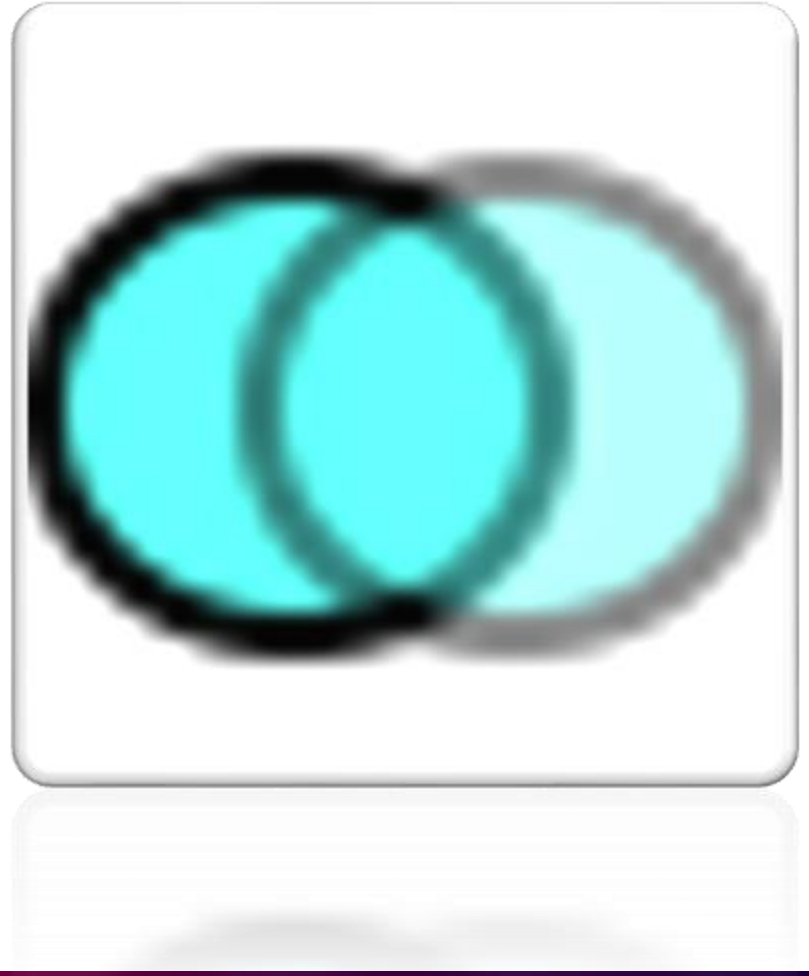
Ruler Marker Adjustment



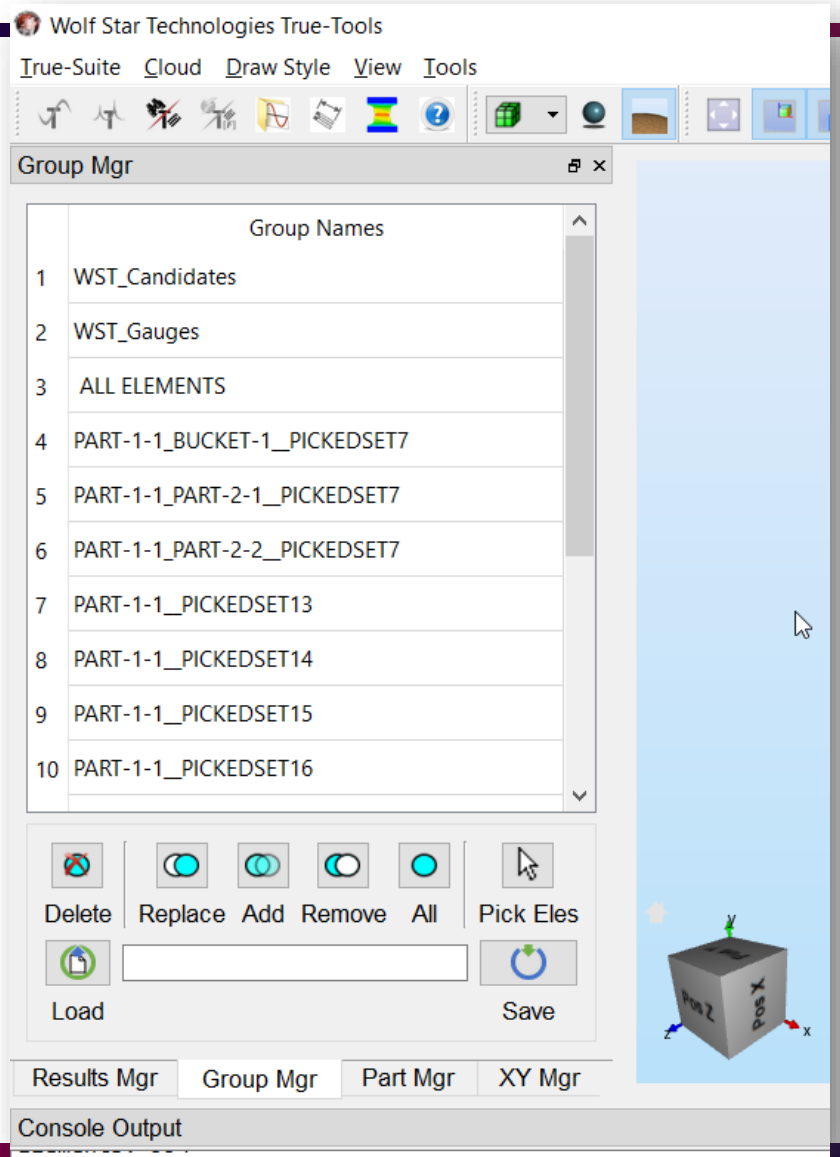
Ruler marker adjustment follows angle of ruler.

Previously, only horizontal mouse movements effected the ruler marker.
→ This made using the ruler difficult.

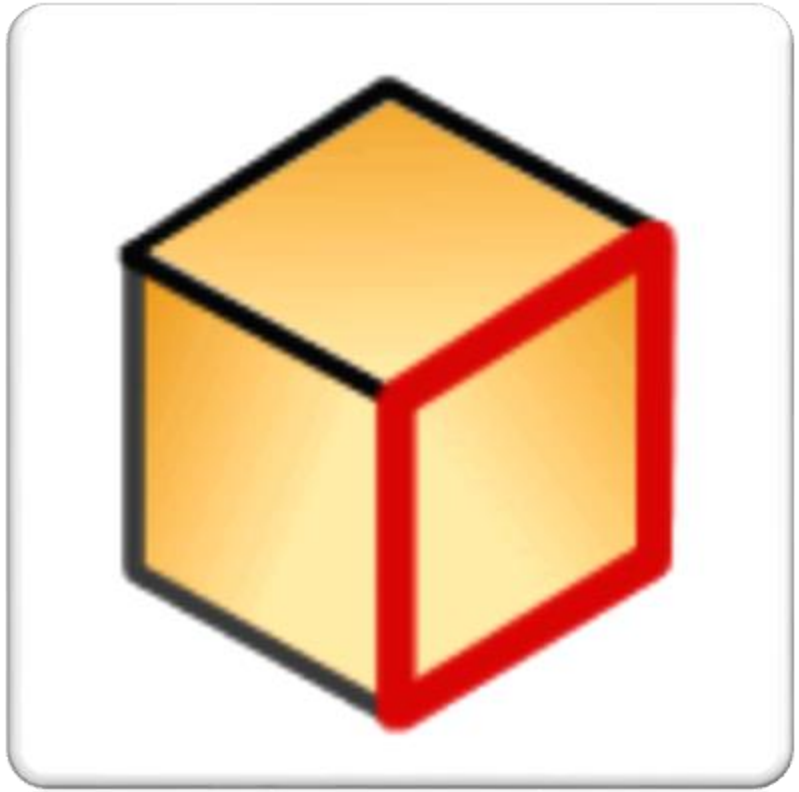
Group Sorting



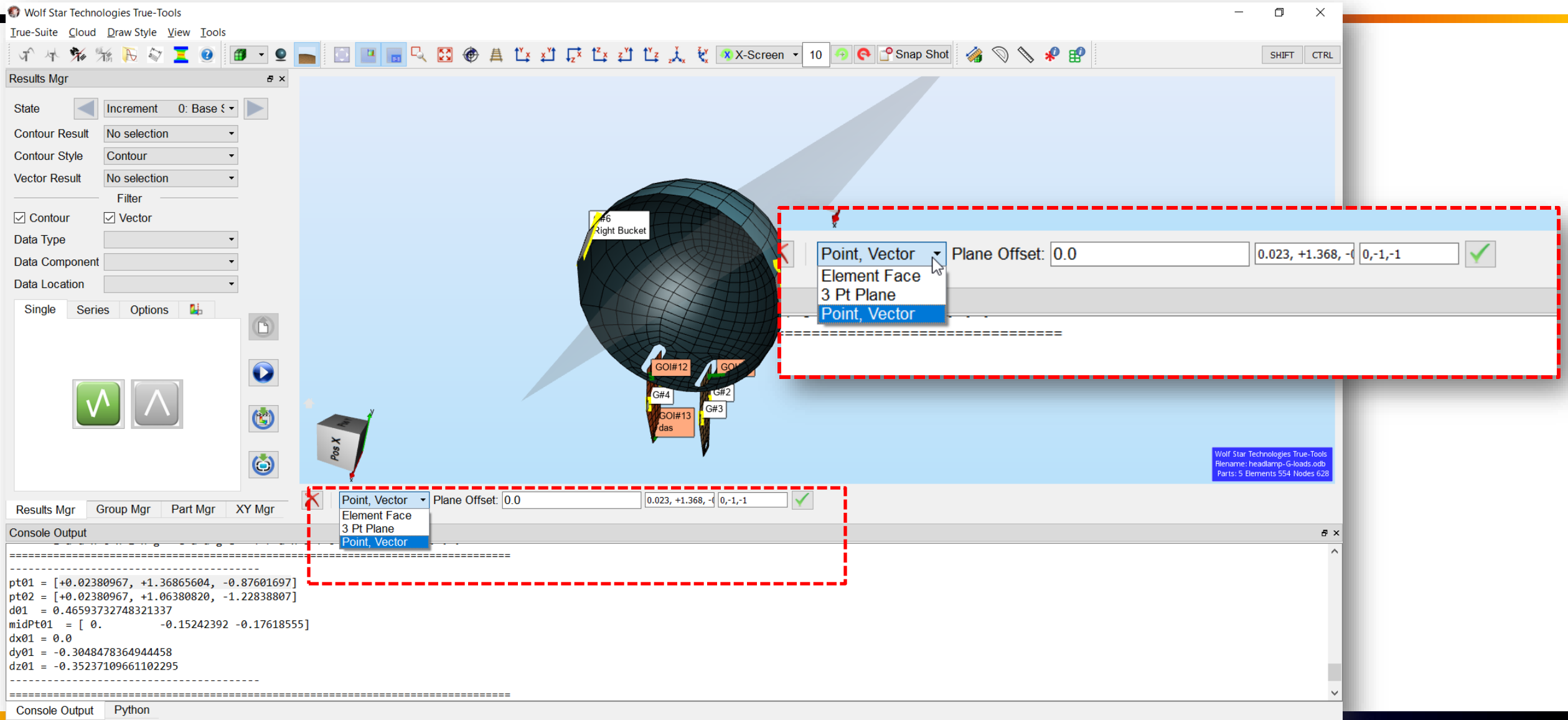
FEA Groups are now sorted alphabetically



Key Plane

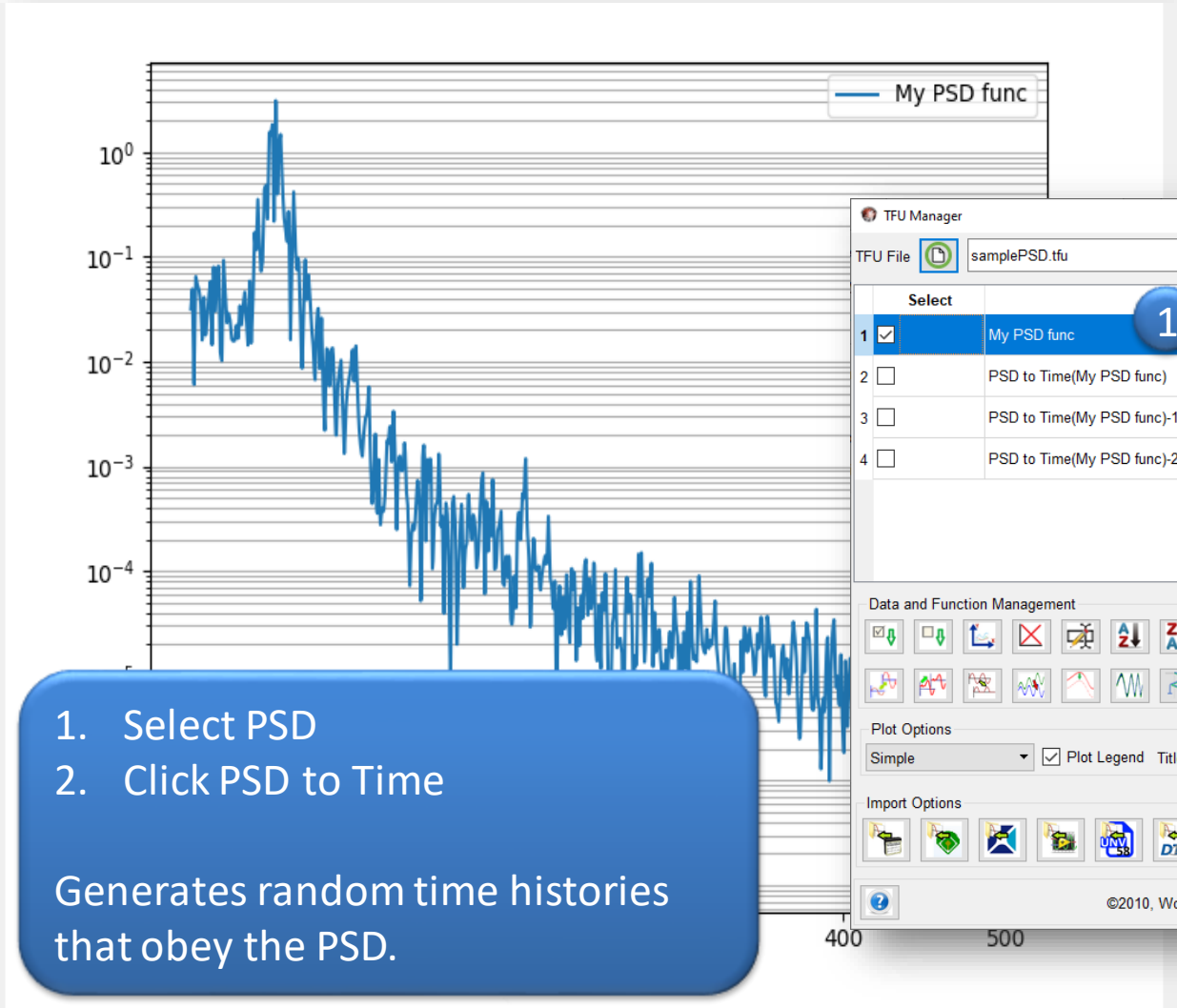


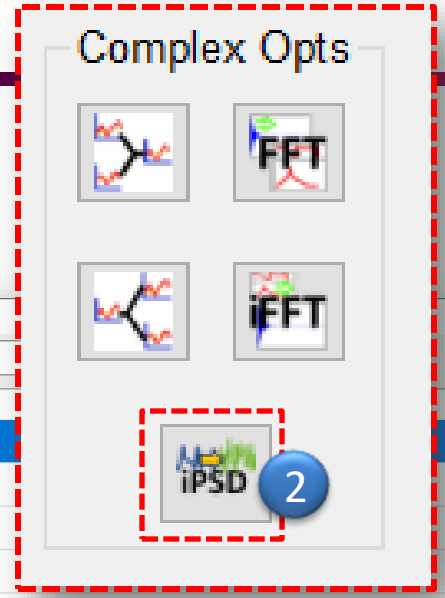
Key In Plane: Point, Normal



PSD to Time

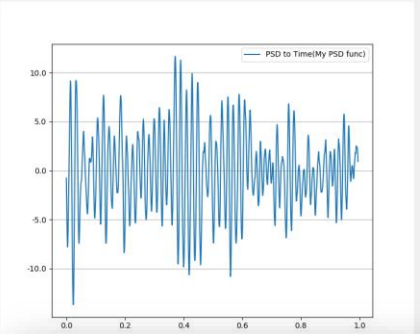
PSD to Time

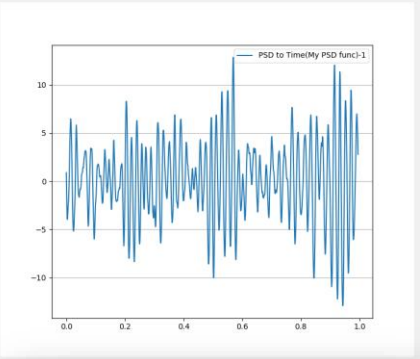


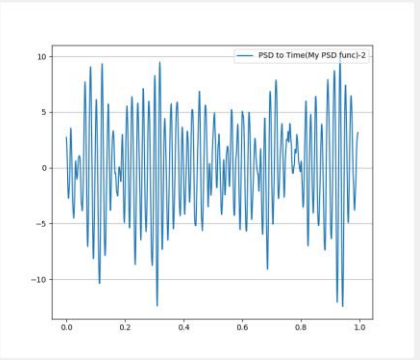


1. Select PSD
2. Click PSD to Time

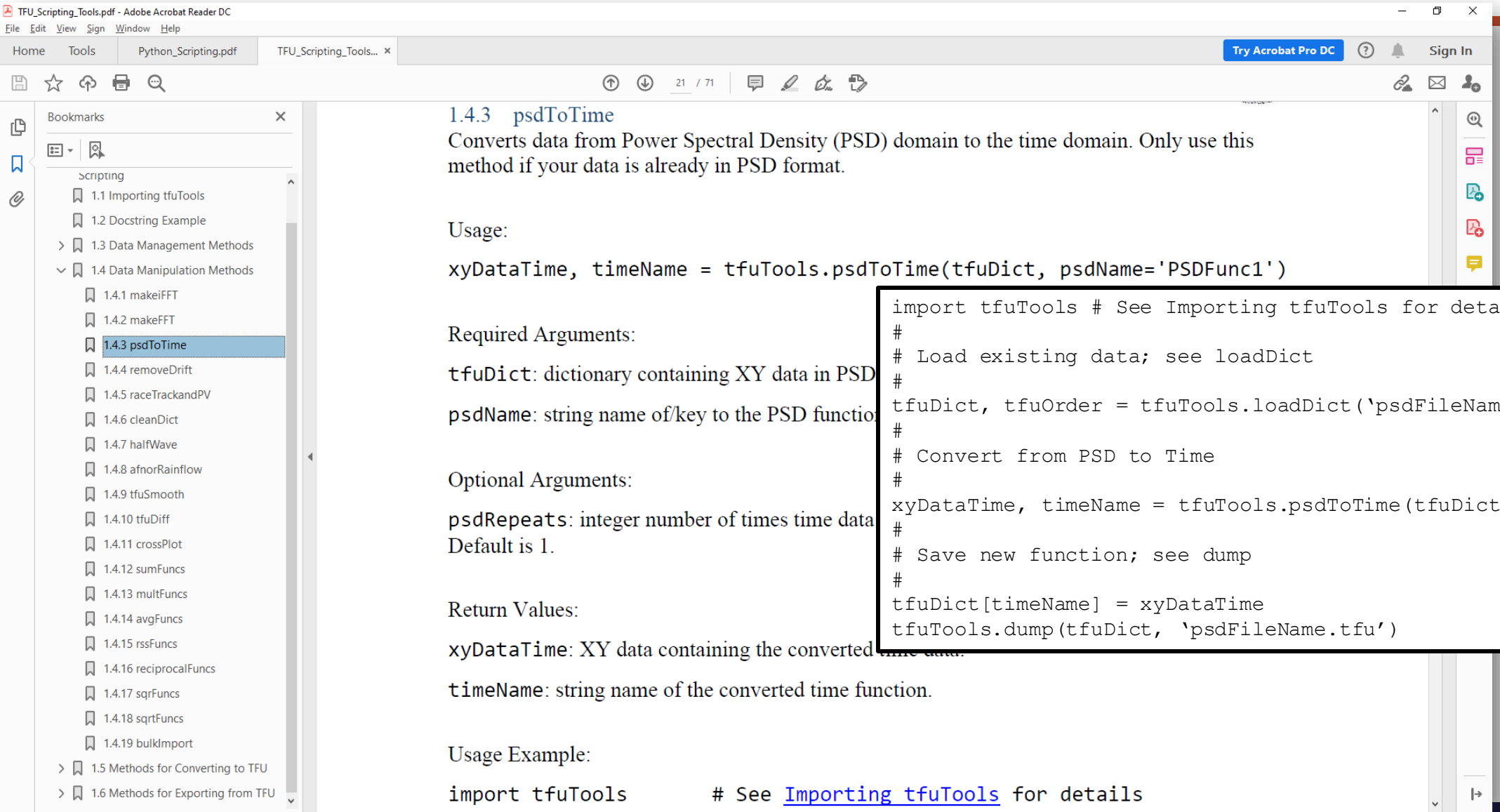
Generates random time histories that obey the PSD.





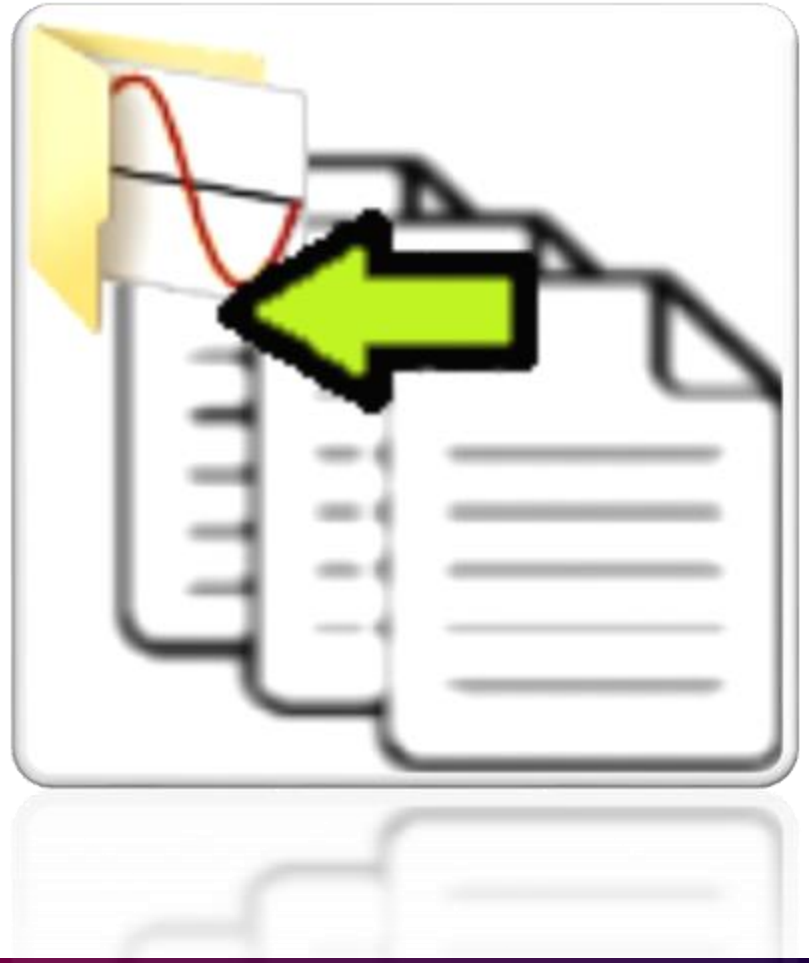


PSD to Time in tfuTools

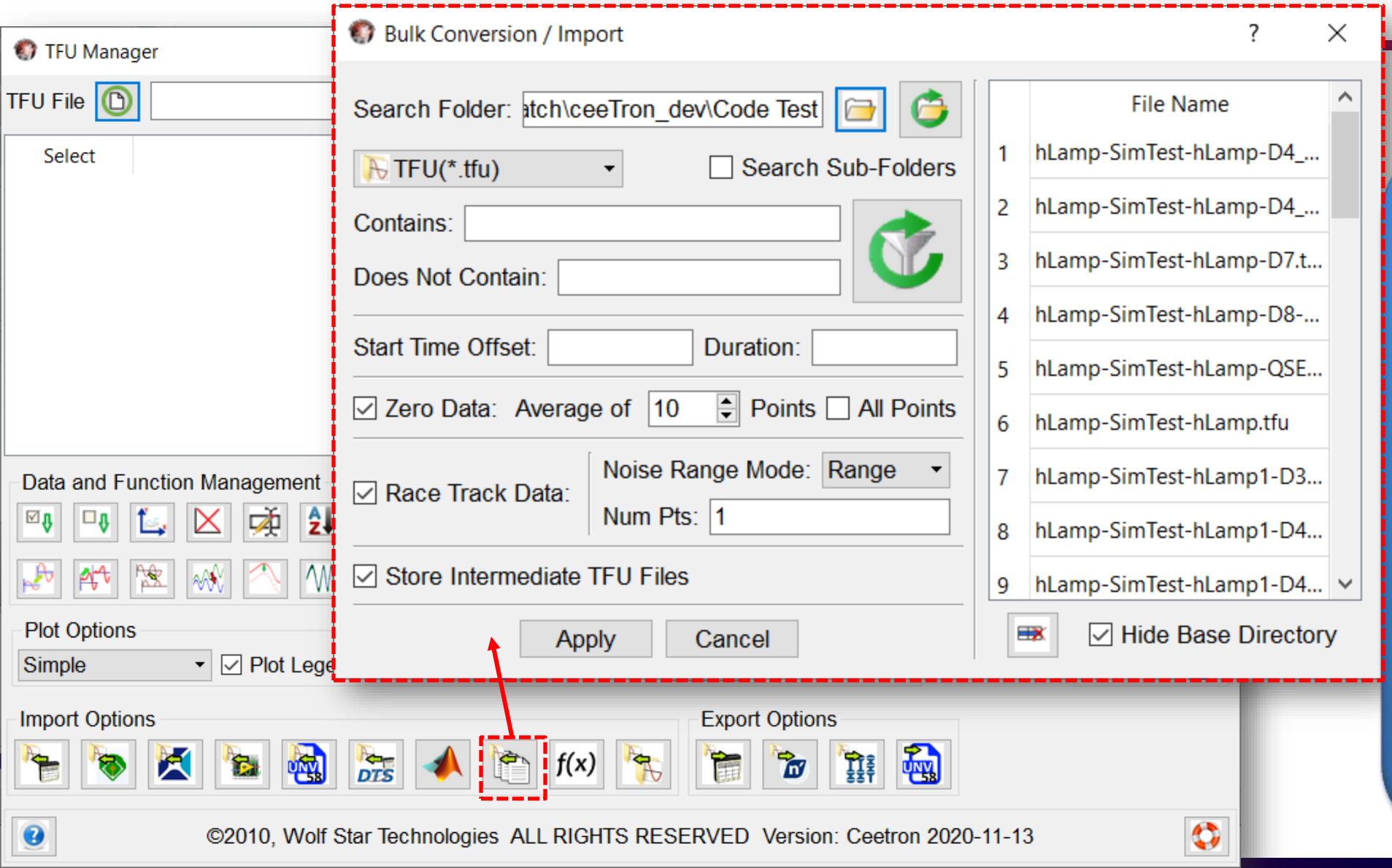



```
import tfuTools # See Importing tfuTools for details
#
# Load existing data; see loadDict
#
tfuDict, tfuOrder = tfuTools.loadDict('psdFileName.tfu')
#
# Convert from PSD to Time
#
xyDataTime, timeName = tfuTools.psdToTime(tfuDict,psdName='myPSDFunc')
#
# Save new function; see dump
#
tfuDict[timeName] = xyDataTime
tfuTools.dump(tfuDict, 'psdFileName.tfu')
```

Bulk Import TFU files



Bulk Import TFU Files



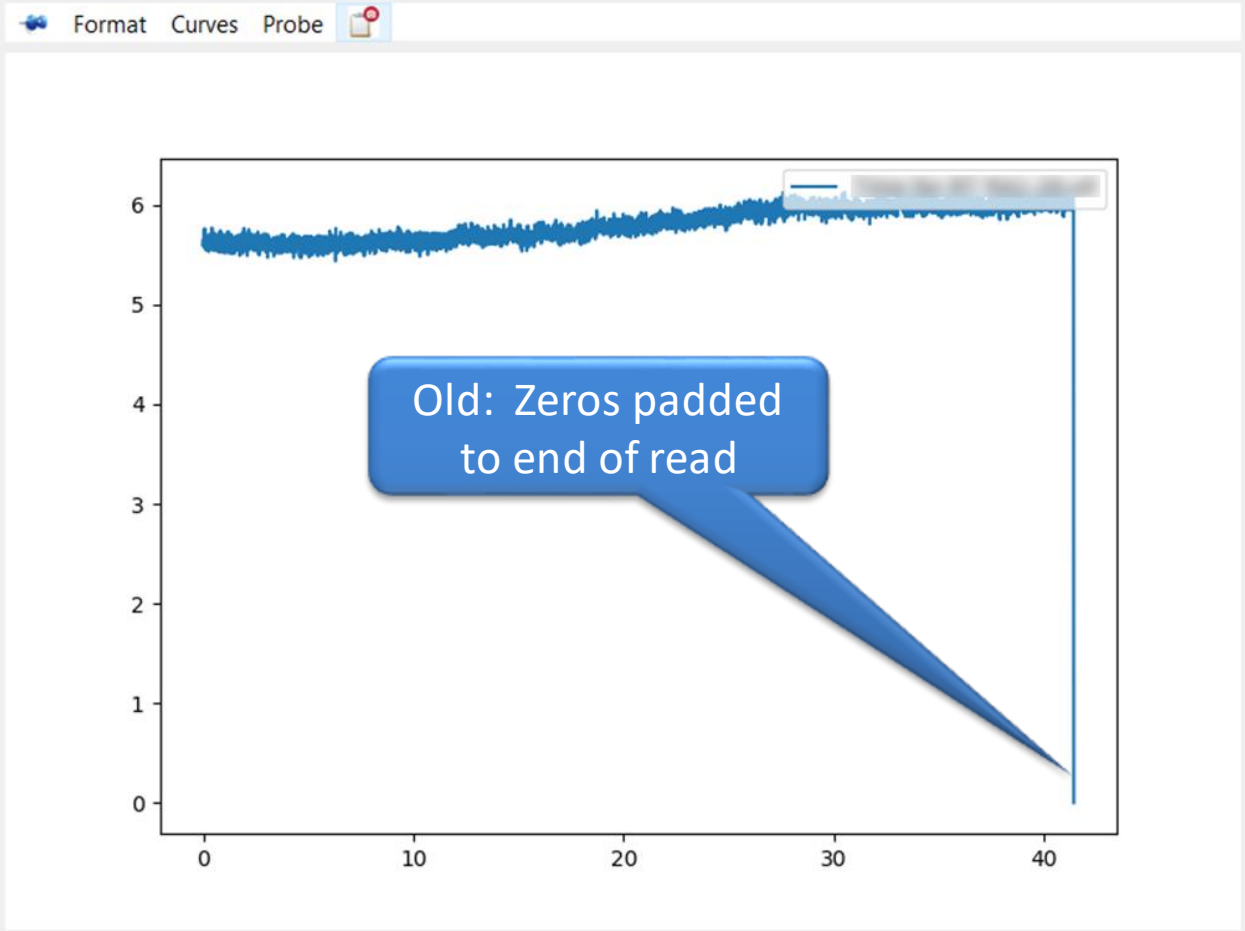
Seems counter-intuitive at first to "Bulk Import" TFU files.

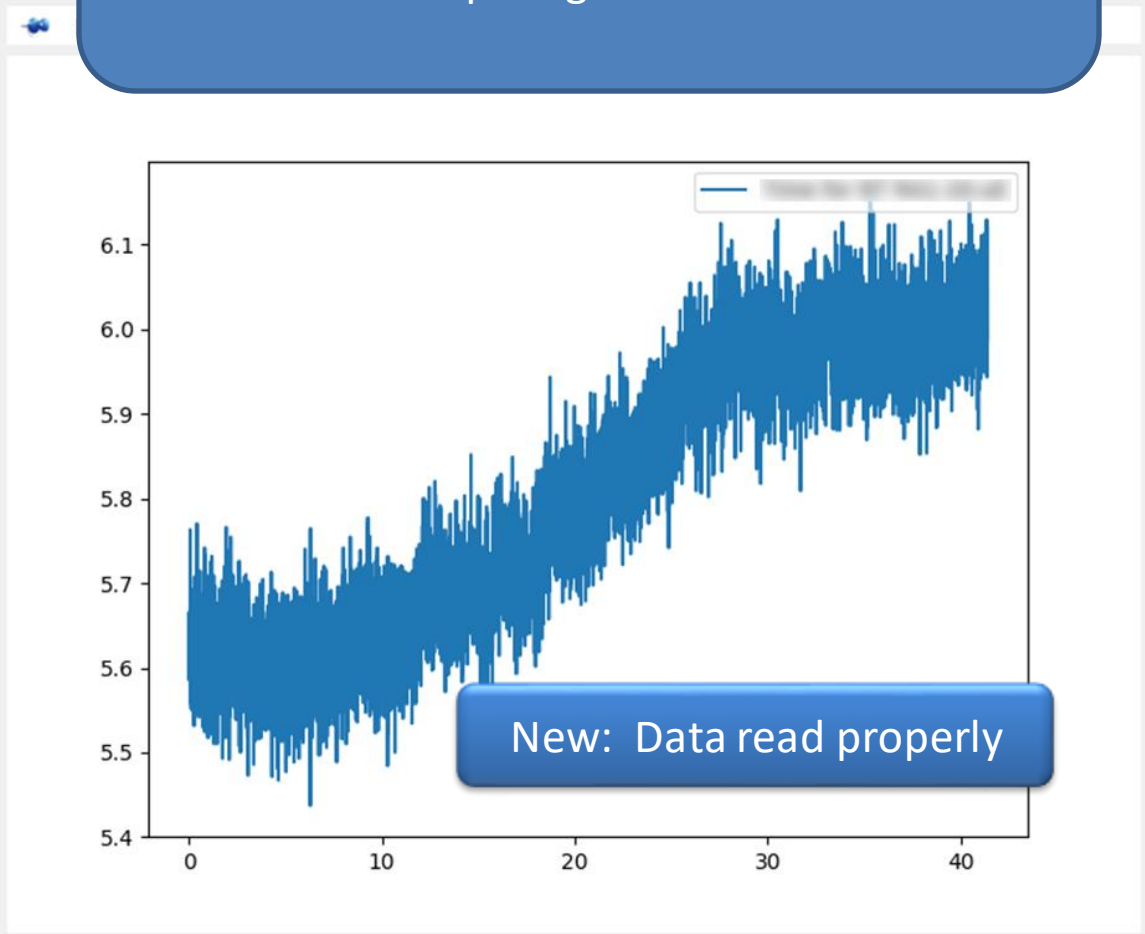
However, this is a clever usage of Bulk Import to allow you to Zero and Race Track existing TFU files quickly.

UNV 58 Reader

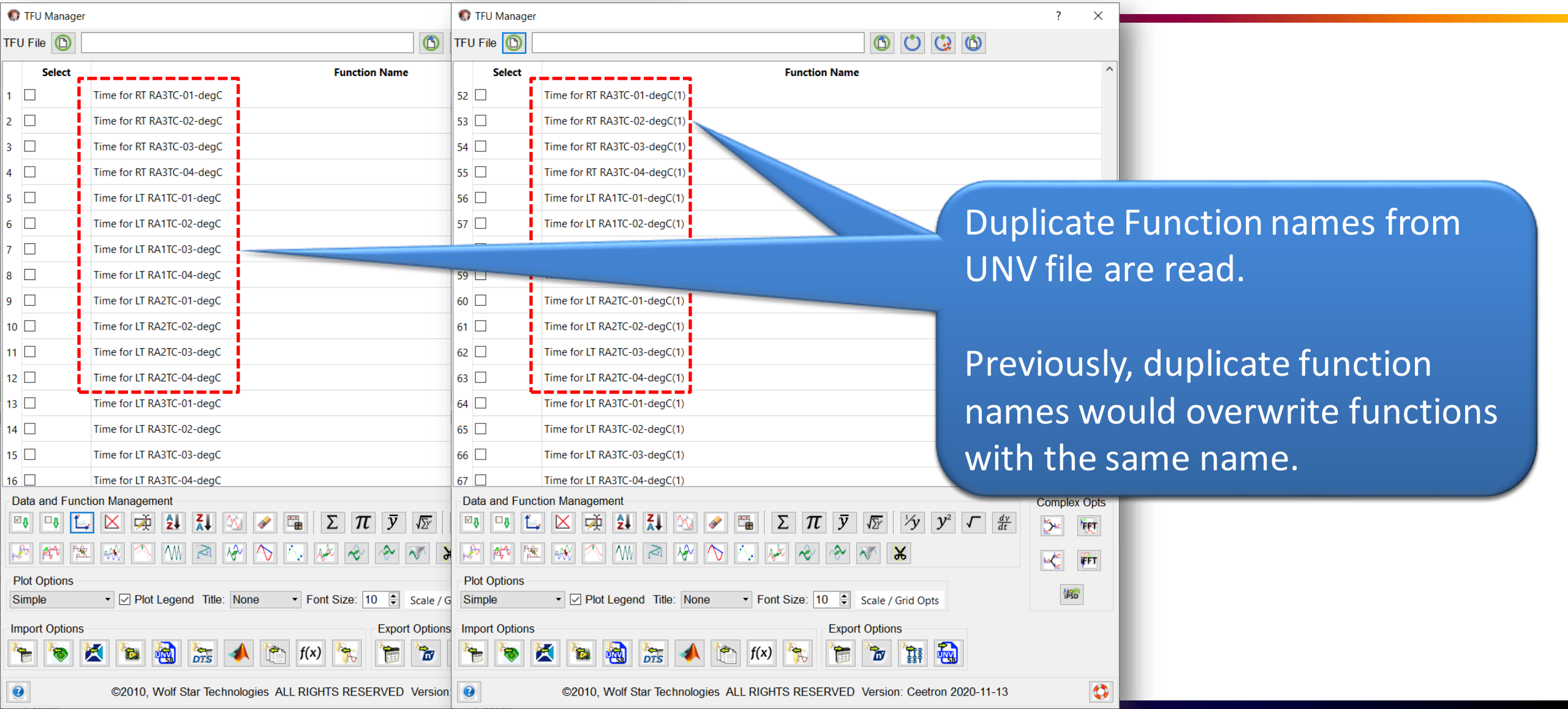
UNV Reader Improvements

Improvements:
- Eliminate trailing zeros in read
- Allow for even / uneven data spacing
- Allow for multiple signals with same name.





UNV Reader Improvements

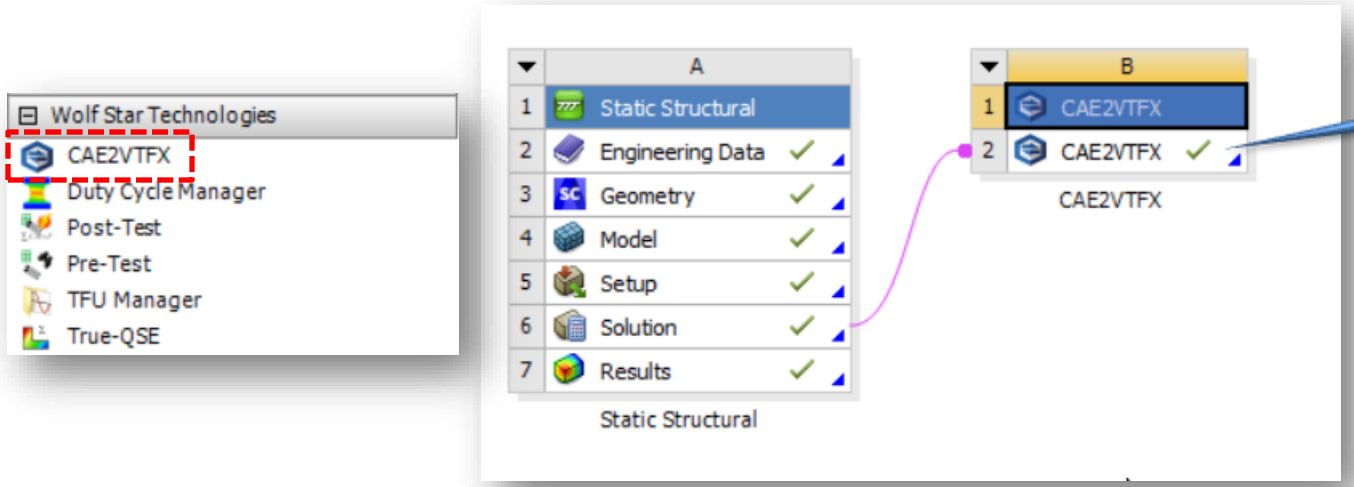


Duplicate Function names from UNV file are read.

Previously, duplicate function names would overwrite functions with the same name.

Ansys WorkBench Updates

Ansys WorkBench Updates

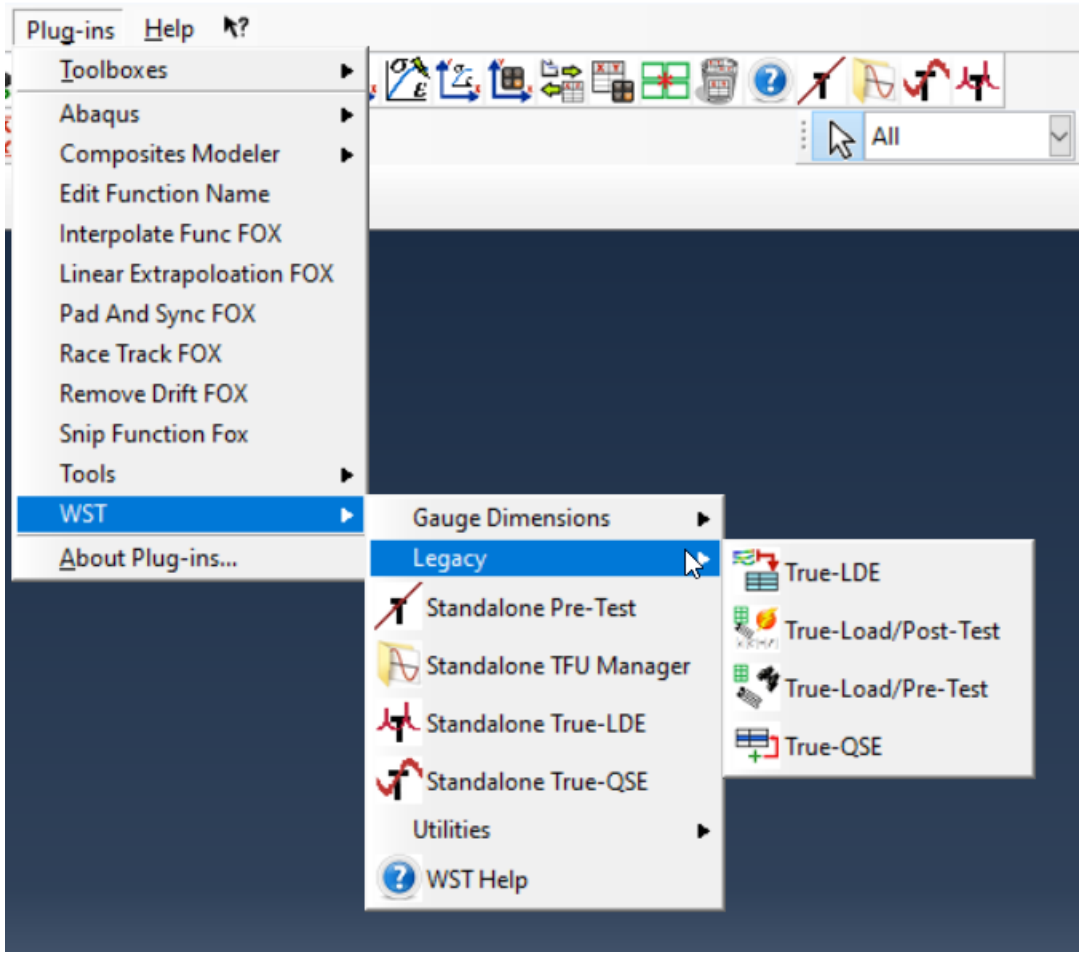


Generates VTFx file

Workbench plugins have been updated to eliminate issues with 2020 R2 environment variables

Abaqus Plug-in Updates

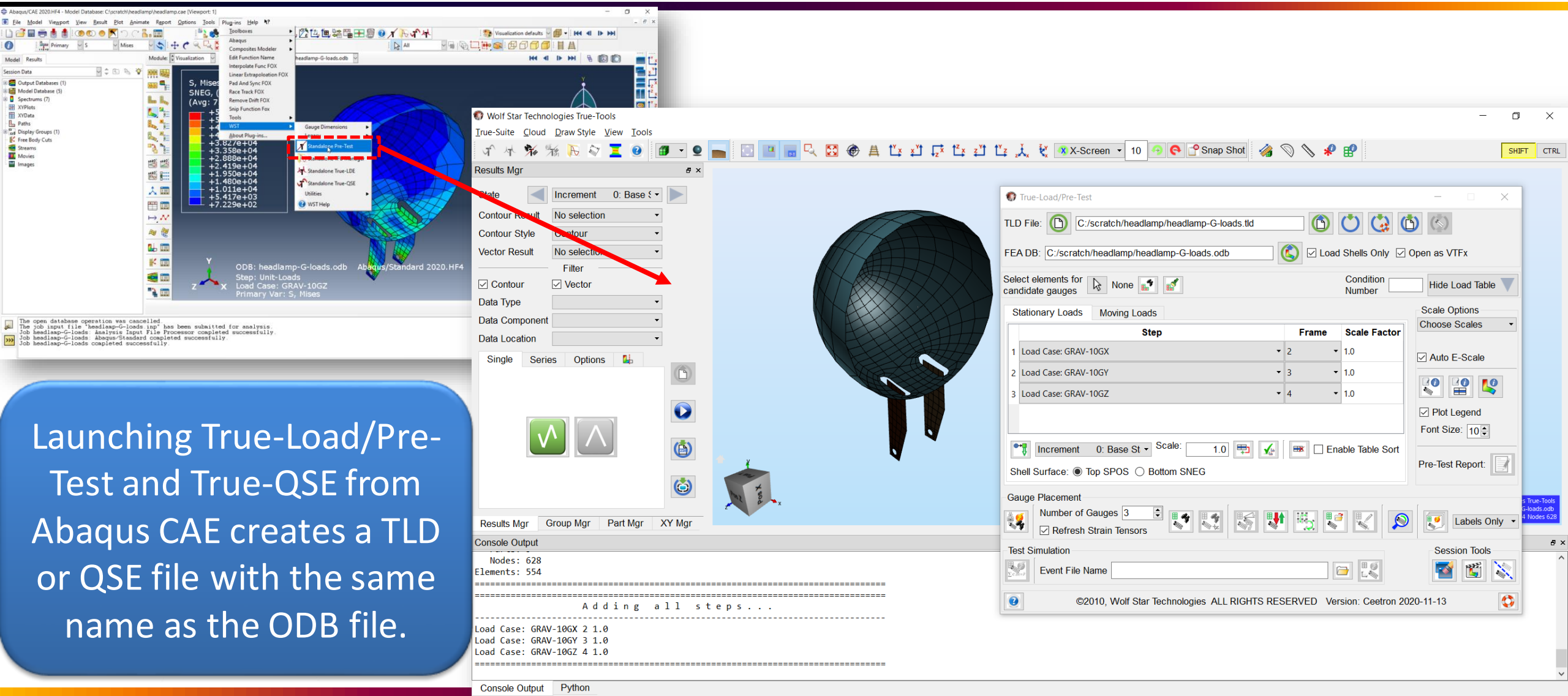
Abaqus Plug-in Updates



The Abaqus Plug-ins menu has been updated with the Standalone True-Load tools on top.

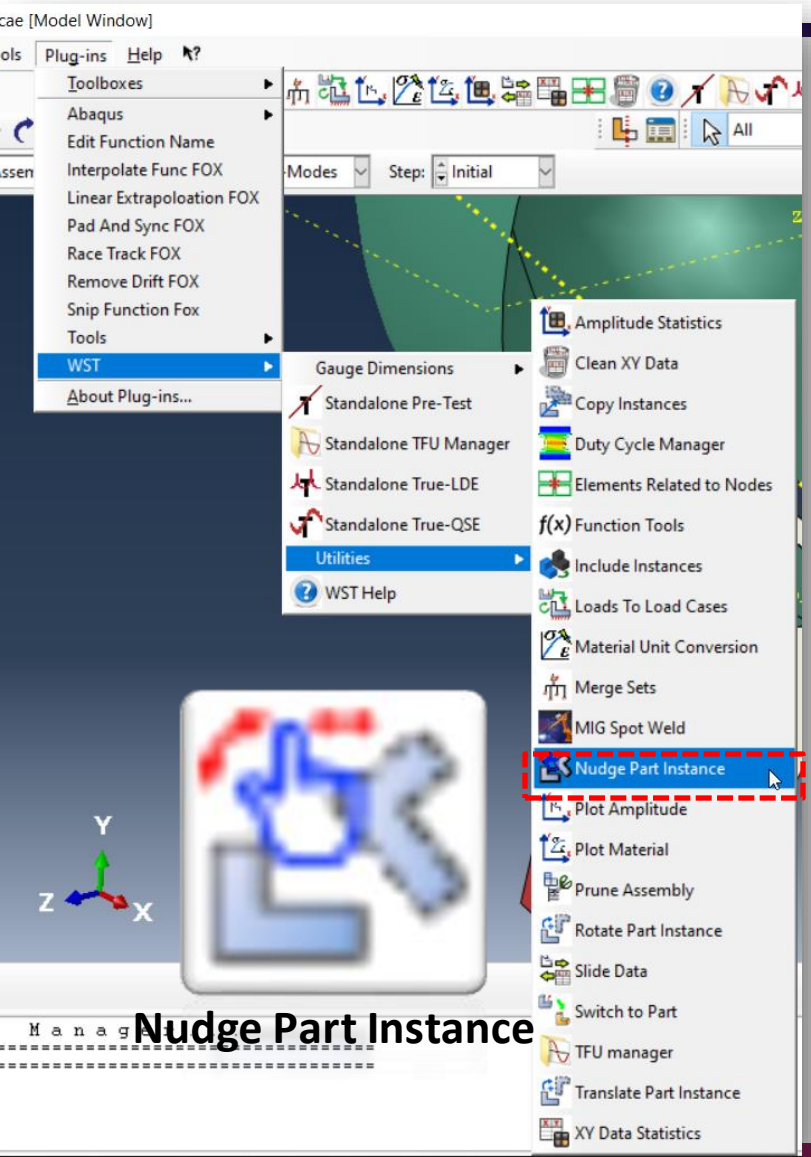
The Legacy True-Load tools are still available, but they are no longer supported.

Launching Standalone from Abaqus/CAE

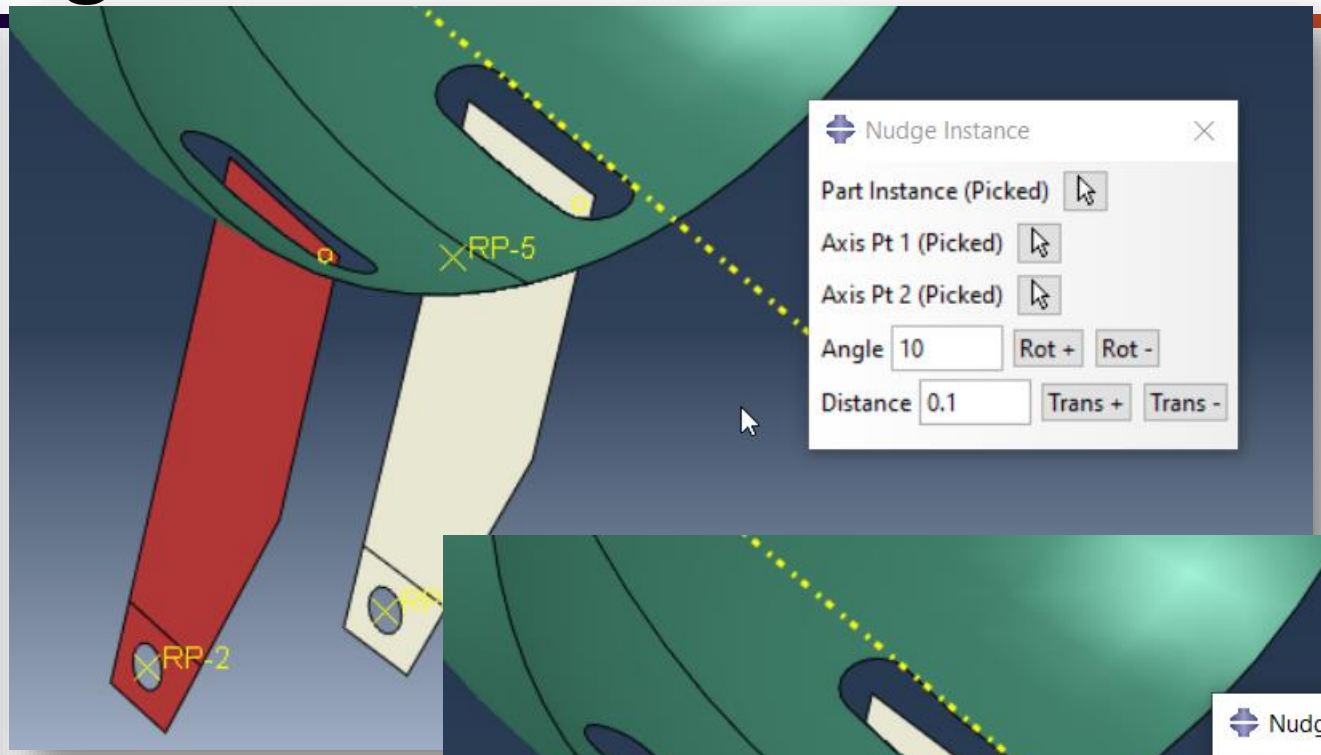


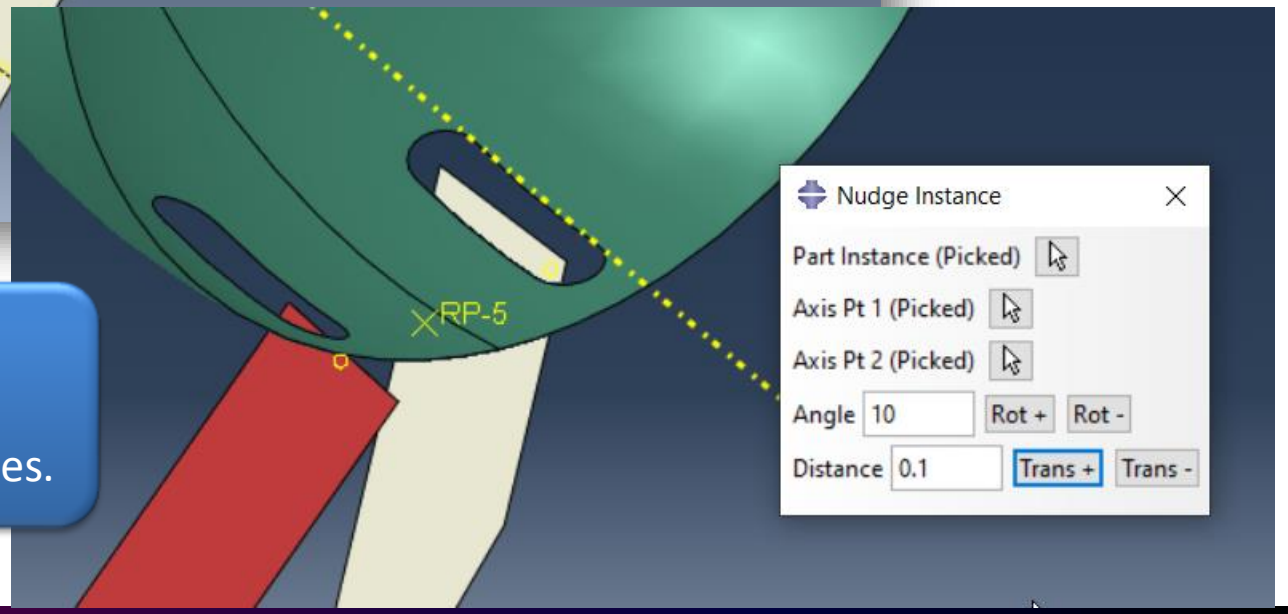
Launching True-Load/Pre-Test and True-QSE from Abaqus CAE creates a TLD or QSE file with the same name as the ODB file.

New Abaqus Utility Plug-in
Nudge Part Instance



Nudge Part Instance

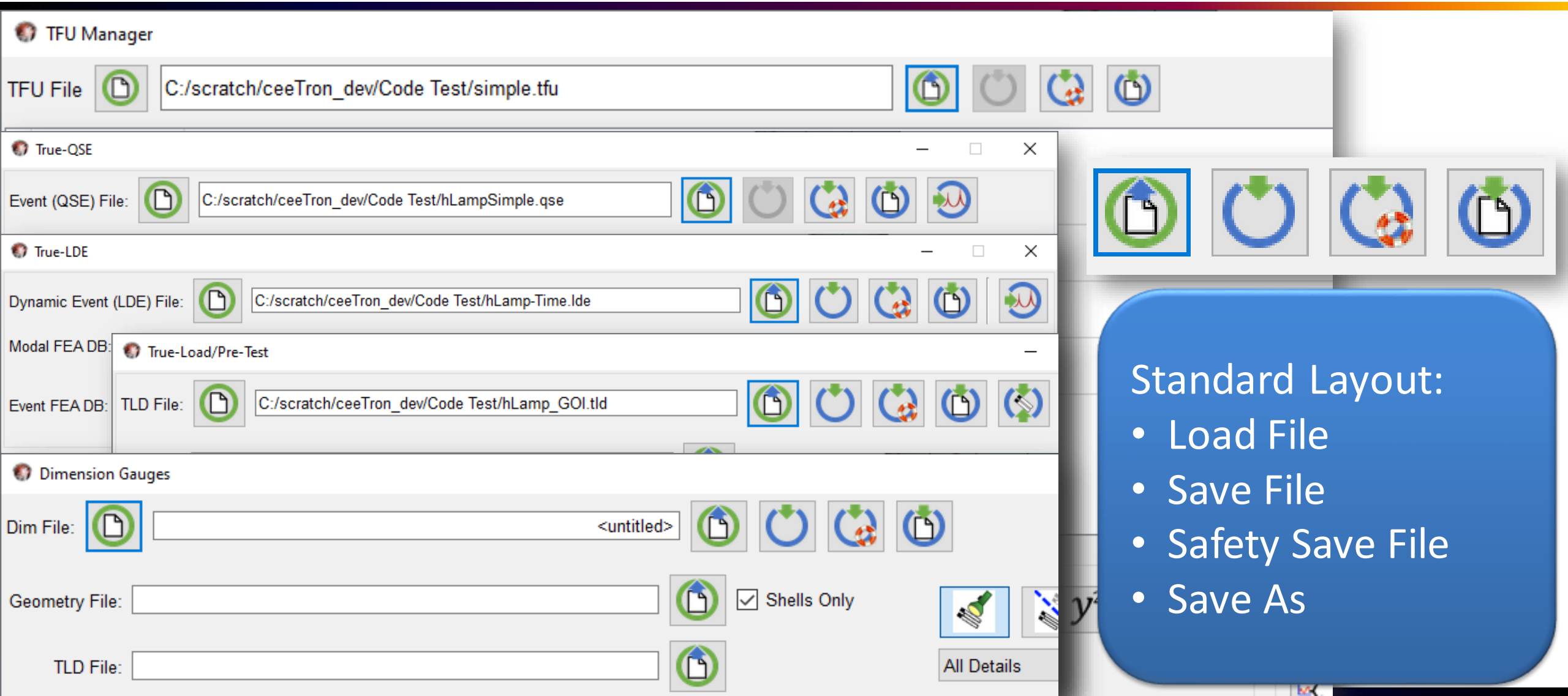




Useful for fine adjustment of position of instances.

Safety Save

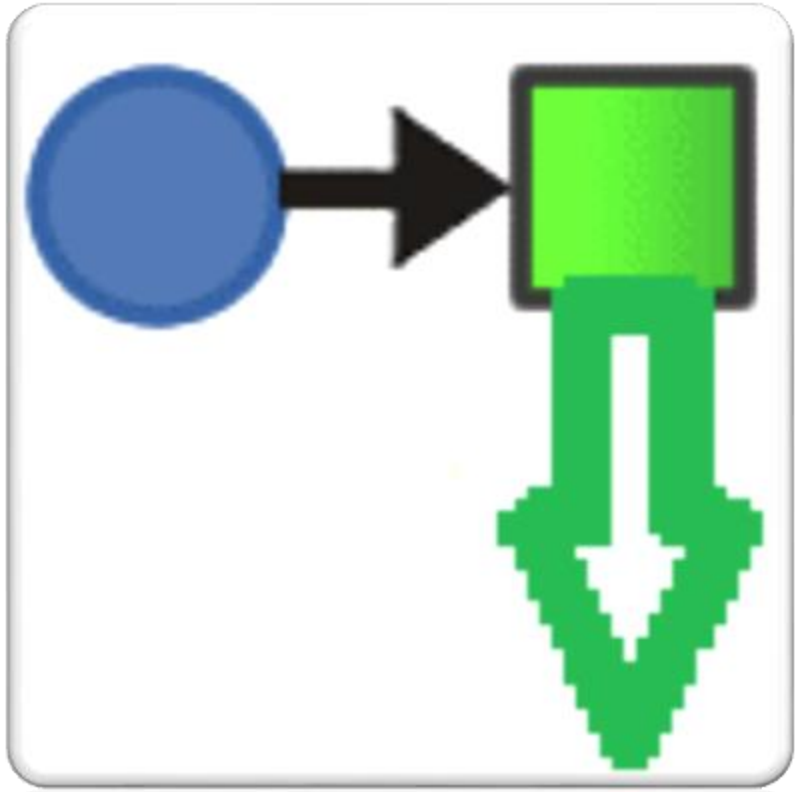
Standardize Safety Save Layout

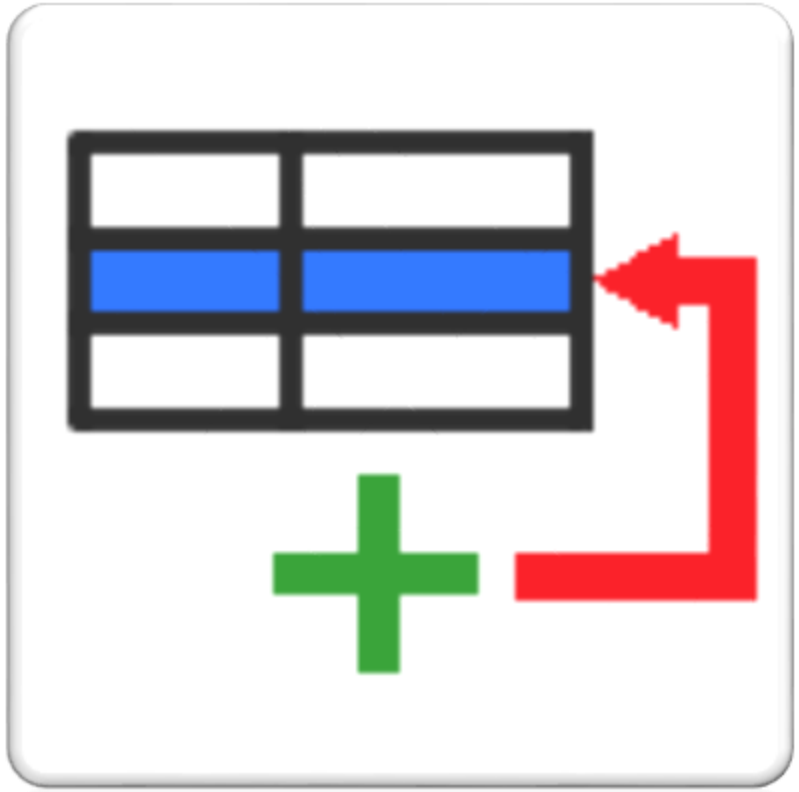


Standard Layout:

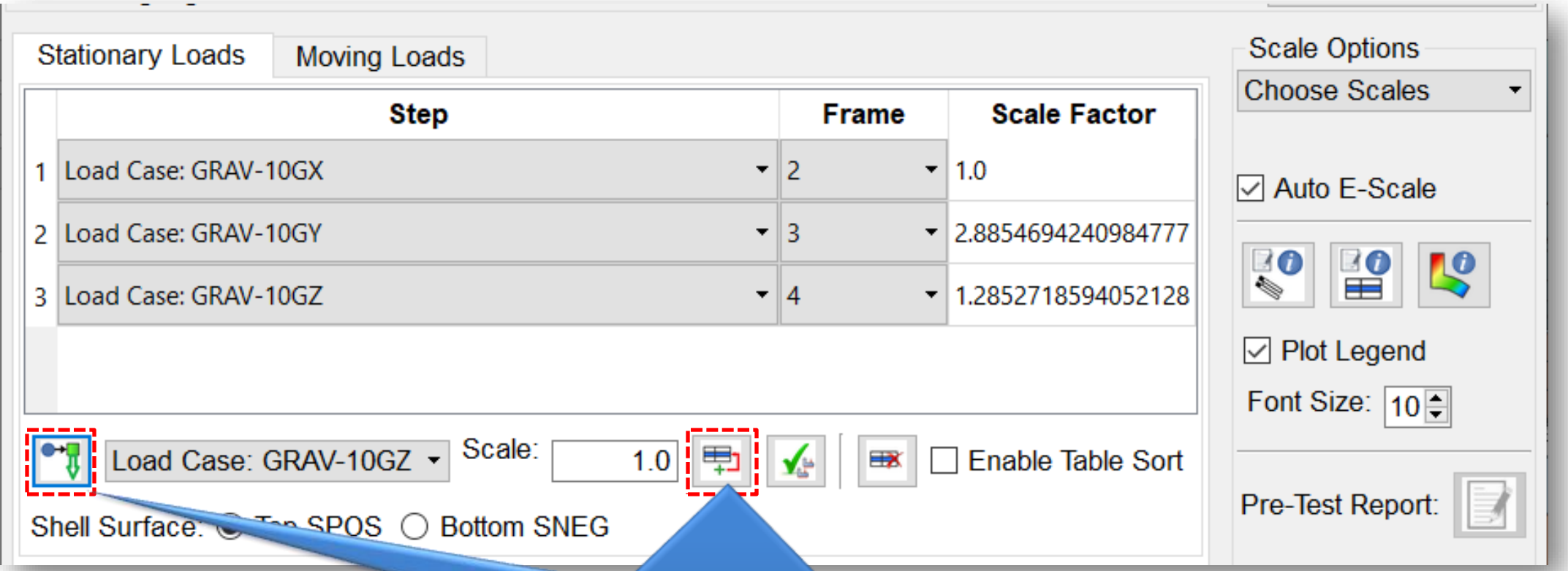
- Load File
- Save File
- Safety Save File
- Save As

Add Load Checks



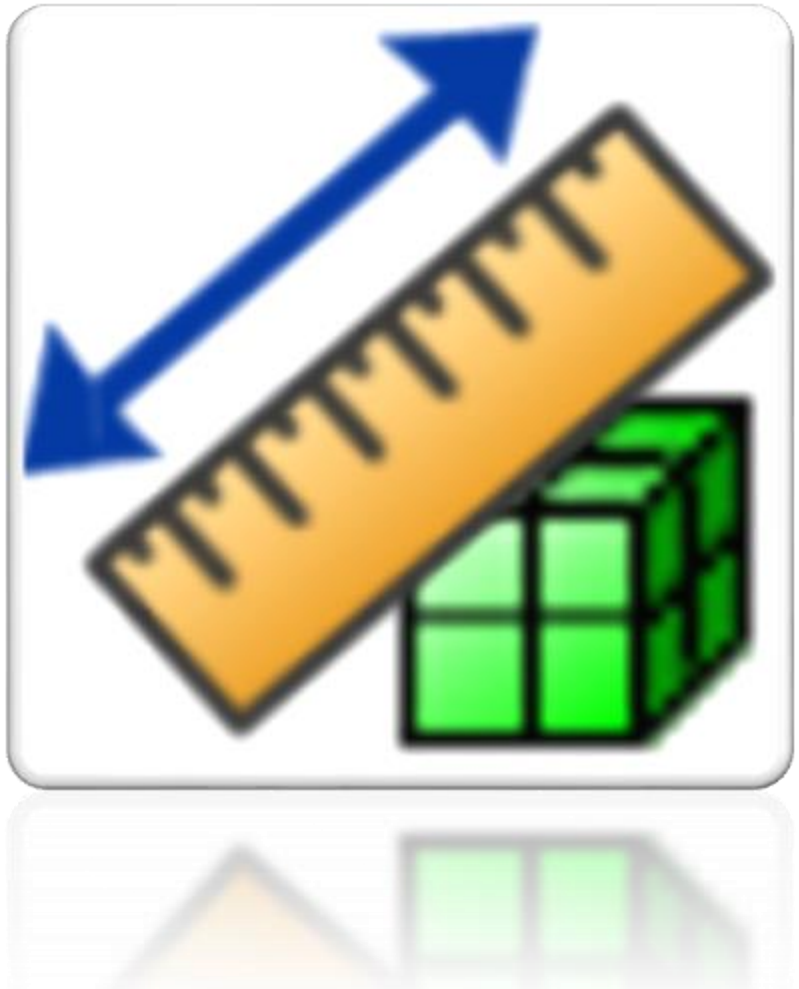


Add Load Checks



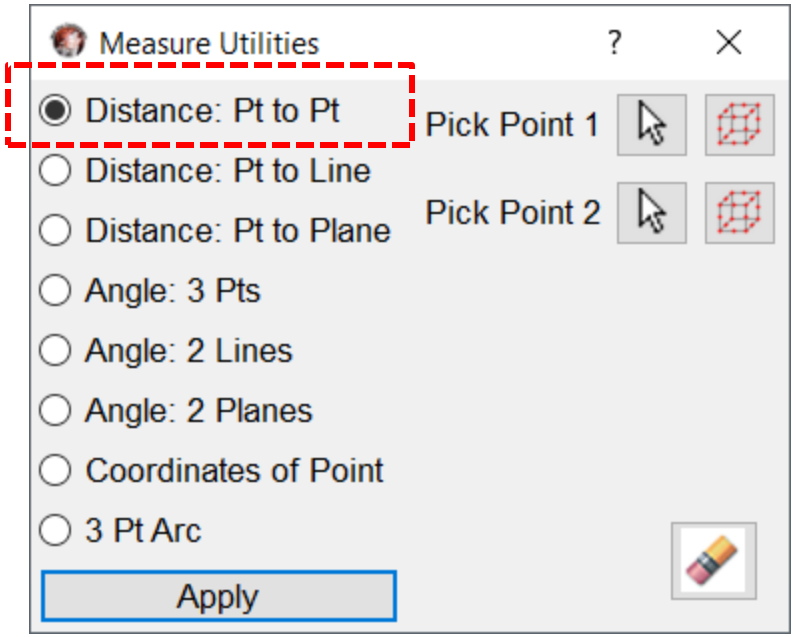
Loading States to the load table checks to make sure the State is not already in the load table.

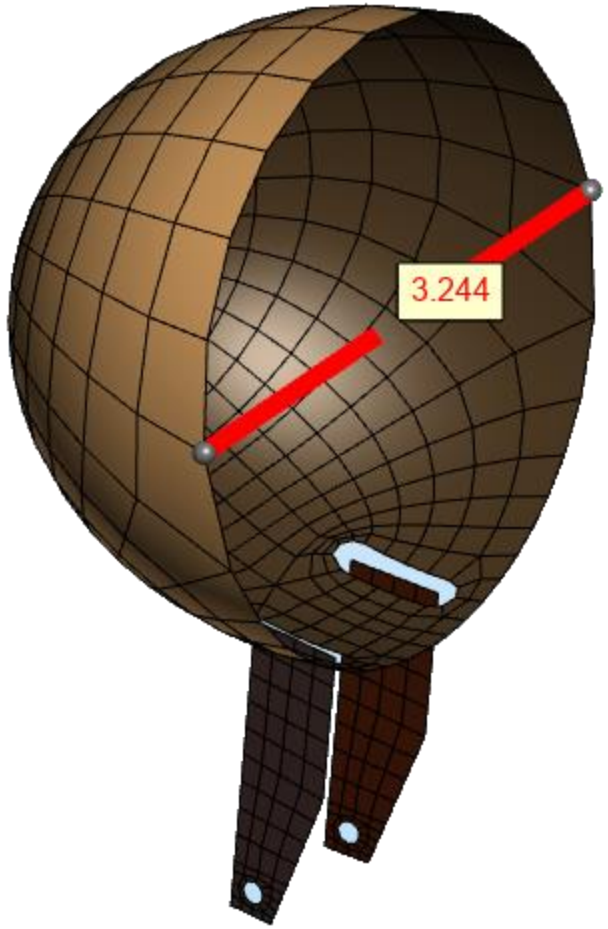
Measure Utils



Measure Utils

New Features:
- Mid Pt
- Coordinates of Point
- 3 Pt Arc

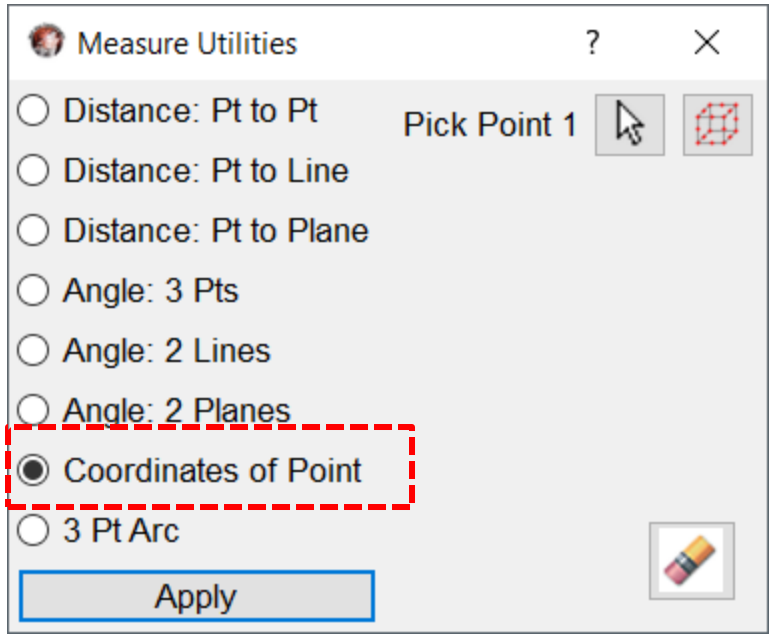


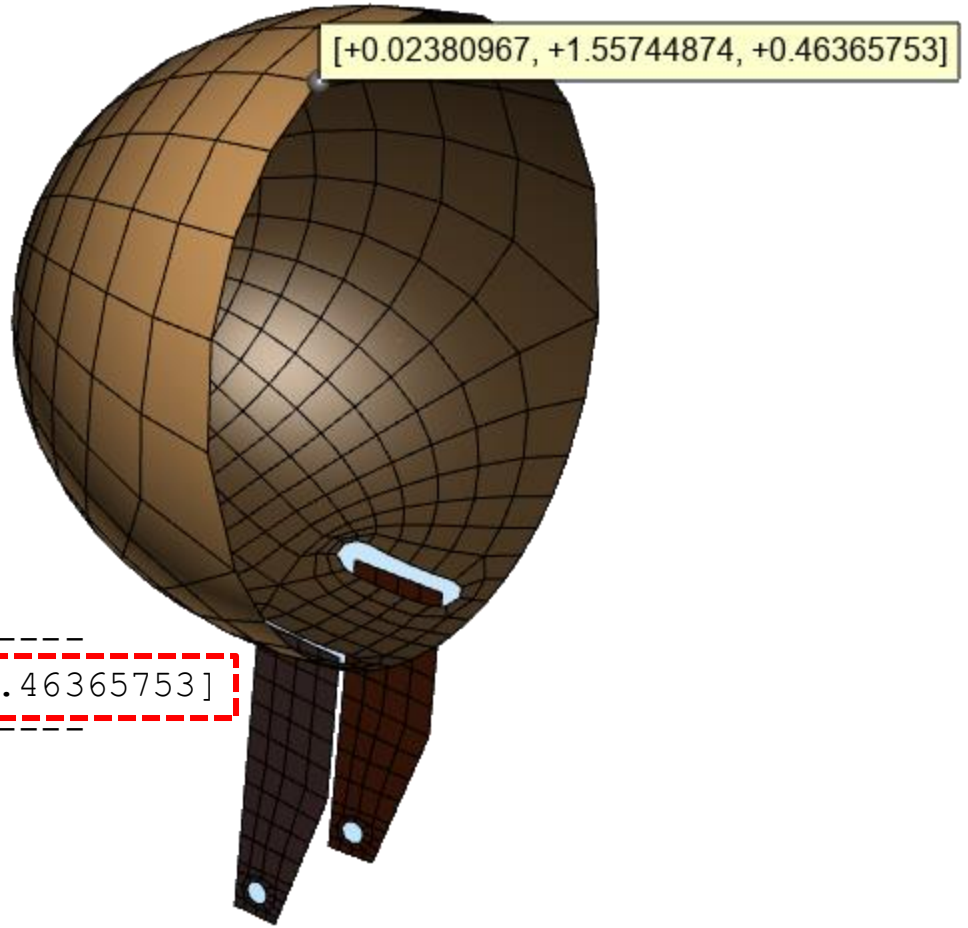



```
----------------------------------------
pt01 = [+0.02380967, +0.05605028, +1.62403309]
pt02 = [+0.02380967, +0.14896713, -1.61815751]
d01 = 3.24352176254778
midPt01 = [0.02380967 0.10250871 0.00293779]
dx01 = 0.0
dy01 = 0.09291685000061989
dz01 = -3.2421905994415283
----------------------------------------
```

Measure Utils

New Features:
- Mid Pt
- Coordinates of Point
- 3 Pt Arc

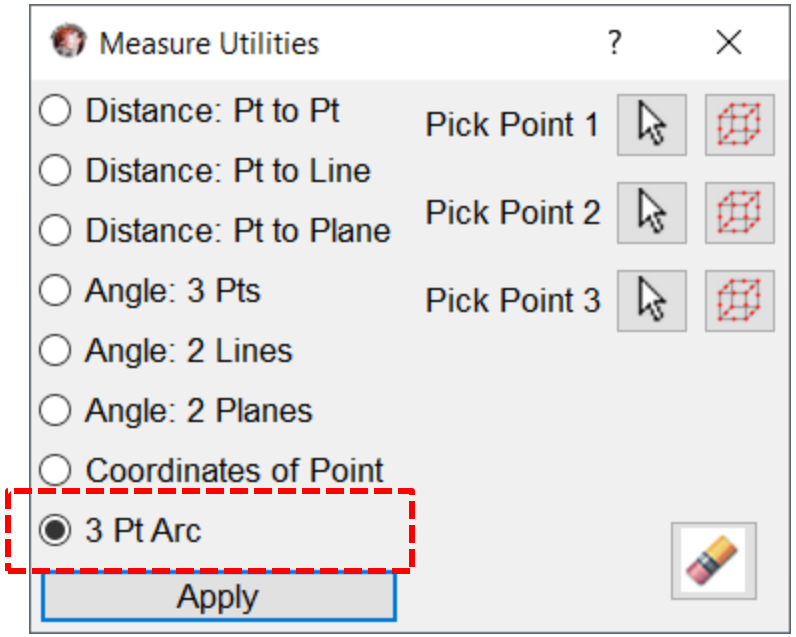


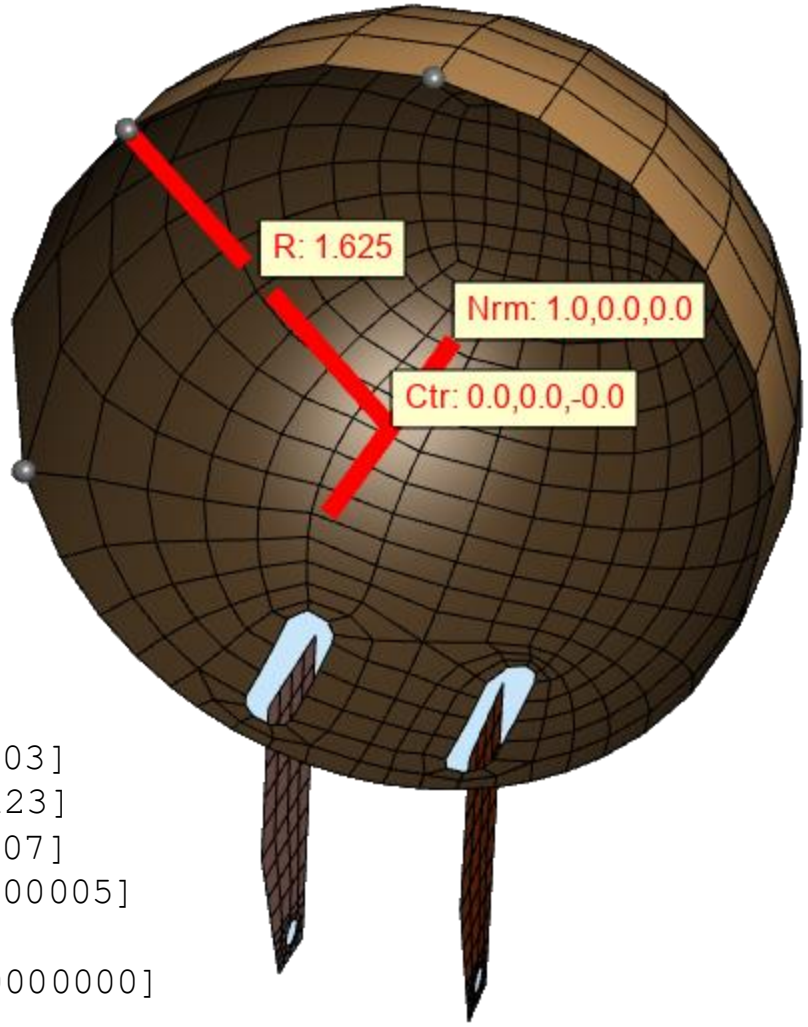



```
----------------------------------------
pt03 = [+0.02380967, +1.55744874, +0.46365753]
----------------------------------------
```

Measure Utils

New Features:
- Mid Pt
- Coordinates of Point
- 3 Pt Arc






```
----------------------------------------
pt04 = [+0.02380967, +1.62499952, -0.00130503]
pt05 = [+0.02380967, +1.04113710, +1.24766123]
pt06 = [+0.02380967, -0.61970305, +1.50219607]
ctrPt03 = [+0.02380967, +0.00000002, -0.00000005]
rad03 = 1.6250000264754414
nrmVec03 = [+1.00000000, +0.00000000, +0.00000000]
----------------------------------------
```

True-LDE

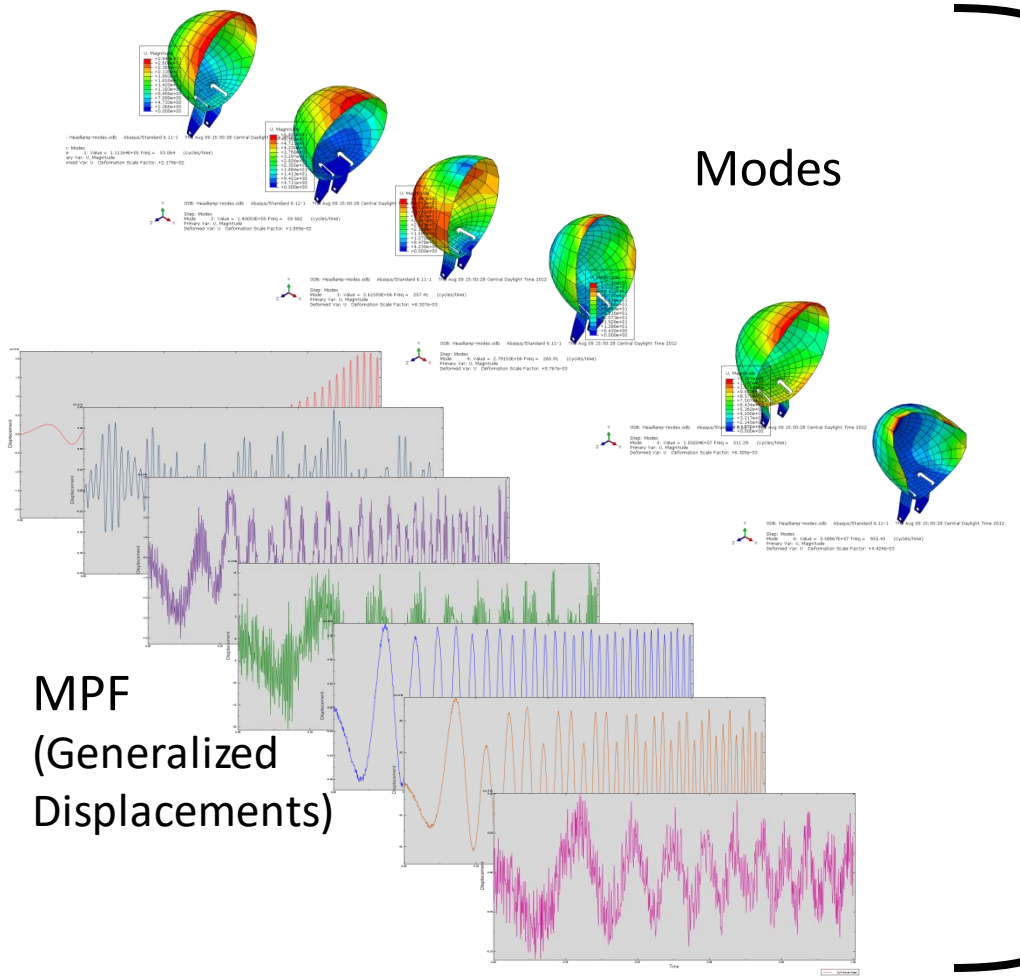
True-LDE Motivation

Traditional FEA

- ✘ Large storage requirements for field data
- ✘ Some FEA need to know nodes & elements for generating xyData output requests apriori
- ✘ Solution times can be slow (due to storage)
- ✘ New XY plots require resubmitting the deck
- ✘ Modal mass participation not obvious
- ✘ Pre-Load not considered in results transient results

- ✘ Not intuitive
- ✘ Batch mode oriented

True-LDE – Basic Concept



$\sum \Rightarrow$

- Nodal Functions
- Elemental Functions
- Operating Deflection Shapes
- FEA Based Fatigue

True-LDE – Important Features

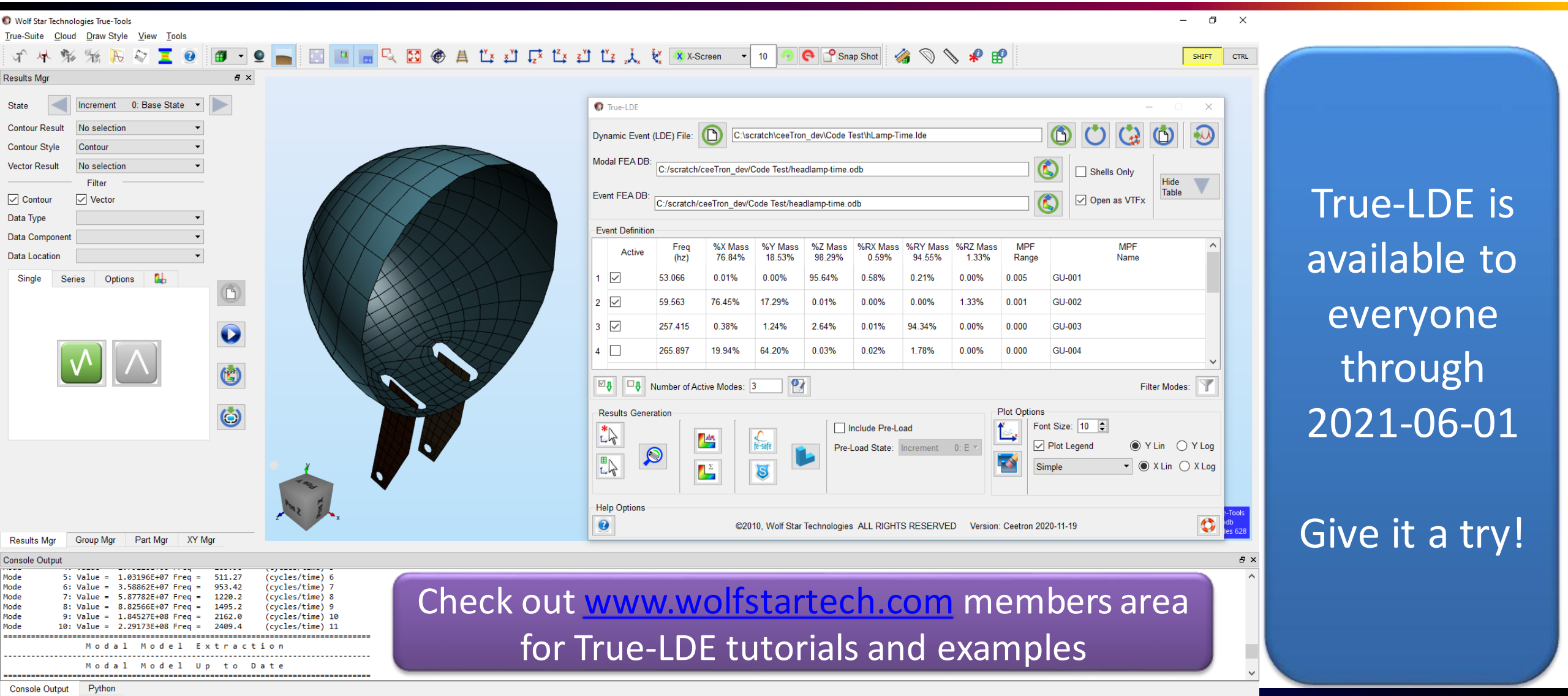
- Include Pre-Load
- No field results stored in the event step
  - Only MPFs
- Supports
  - Time Domain
  - Frequency Domain (deterministic)
  - PSD Domain (random)
- Interface to durability software
  - All in time domain
  - Ready-to-run
- Convert between Time, Frequency and PSD domains
- Familiar behavior – Results generation similar to True-QSE

A Recent Benchmark

	Original File		Prep for True-LDE™		
	freq_time_orig.inp		**freq_time_LDE.inp**		
Start Time	11:18:19 AM		12:05:35 PM		
End Time	11:32:26 AM		12:06:12 PM		
Elapsed Time	14.12	min	0.62	min	**95.63% Faster**
ODB Size	13,010,626,864	bytes	35,081,624	bytes	**99.73% Smaller**

When solving a linear dynamic response for use with True-LDE, FEA solution time is significantly faster because of the greatly reduced output in the response solution.

The True-LDE Interface



Check out www.wolfstartech.com members area for True-LDE tutorials and examples

True-LDE is available to everyone through 2021-06-01

Give it a try!