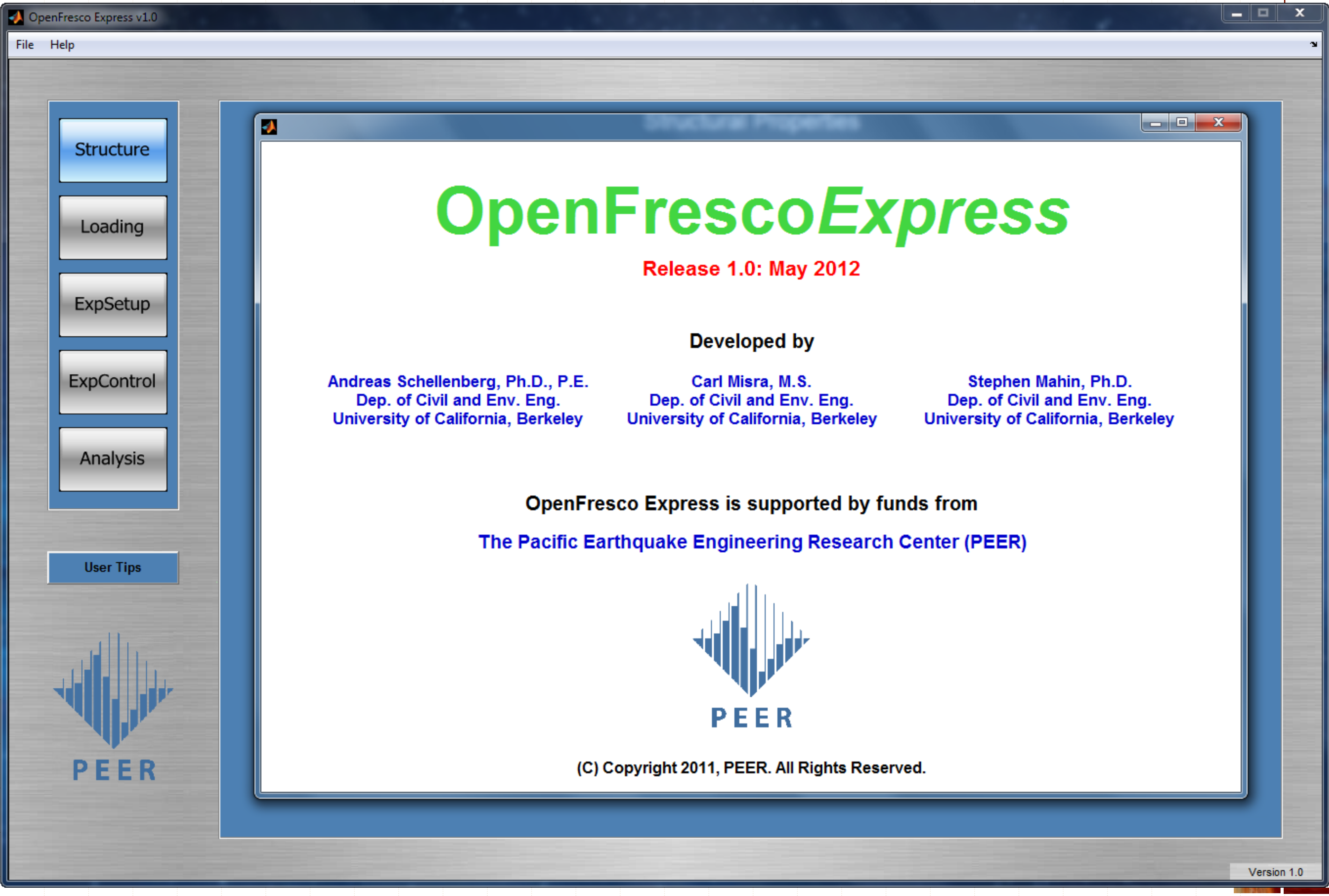
OpenFresco*Express*

Andreas Schellenberg
Carl Misra
Stephen Mahin

The Pacific Earthquake Engineering Research Center (PEER)

OpenFresco*Express* Overview

- Graphical user interface that is designed to simplify the running of hybrid simulations
- Guides the user through a step-by-step process to define the key parameters in a hybrid simulation
- Plots test data and error monitors in real time for checking the validity of results
- Allows the user to perform ground motion or free vibration tests


OpenFresco Express v1.0
File
Help
Structure
Loading
ExpSetup
ExpControl
Analysis
User Tips
PEER
Version 1.0

OpenFresco*Express*

Release 1.0: May 2012

Developed by

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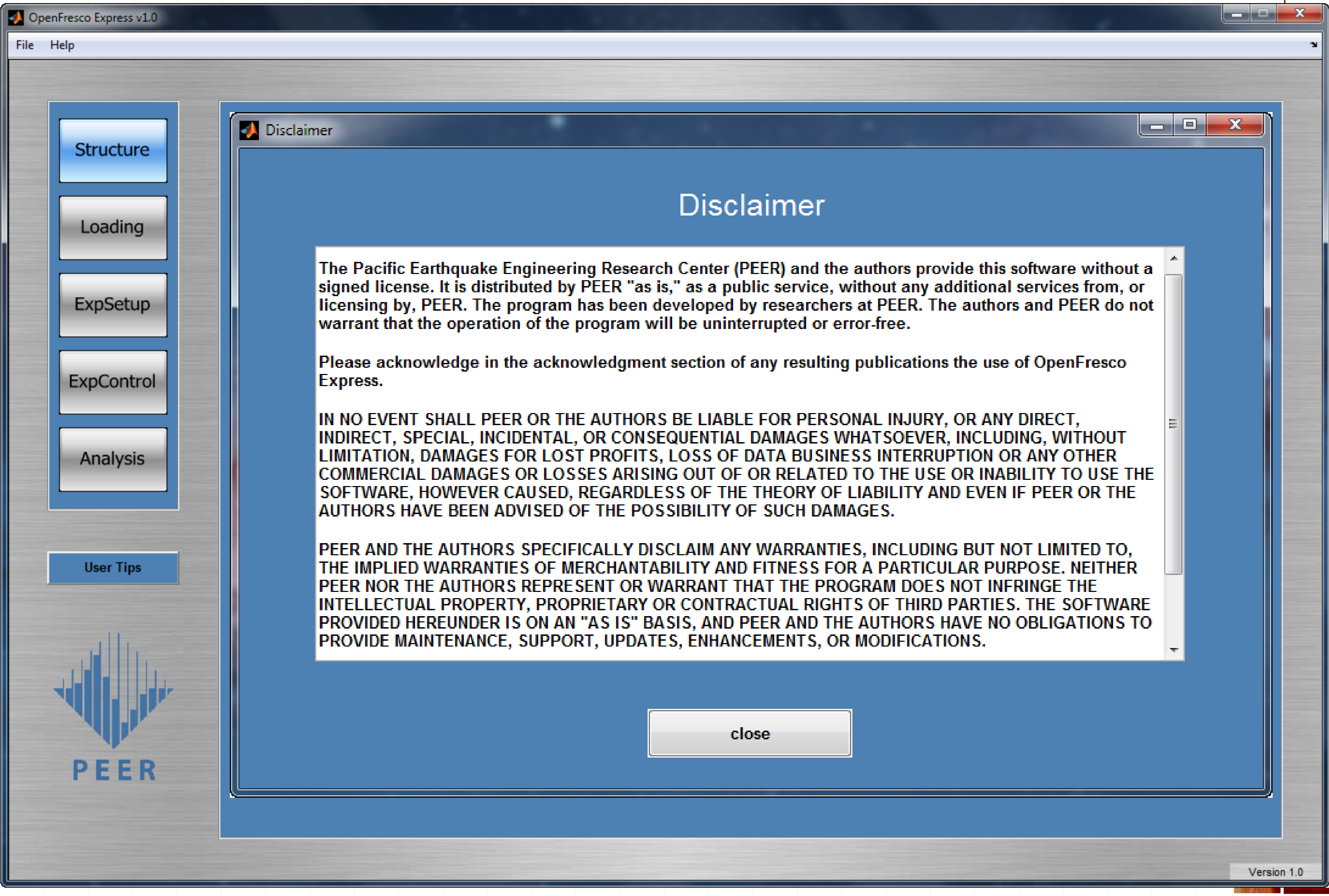

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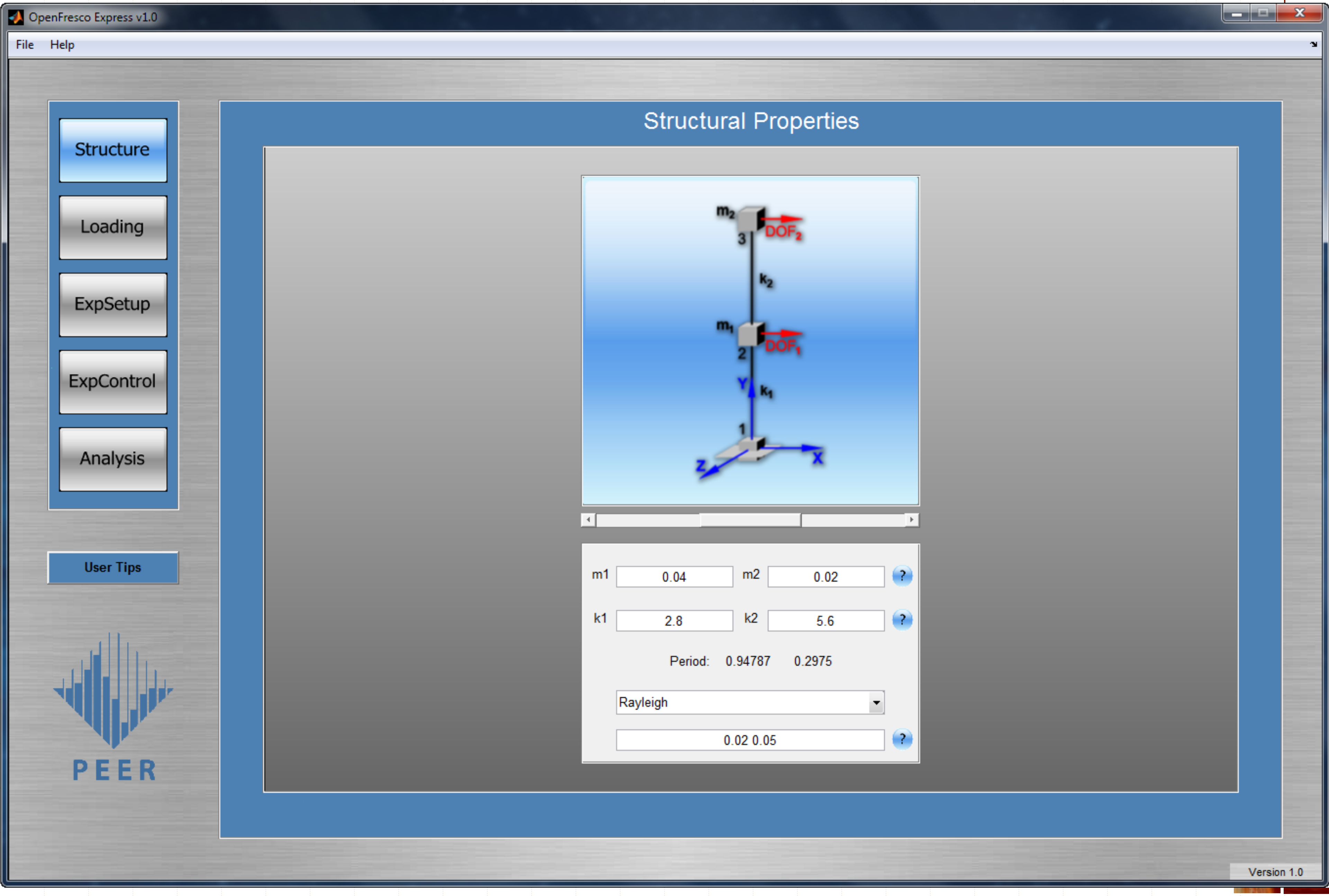
OpenFresco Express v1.0
File
Help
Structure
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PEER
Structural Properties
m2
DOF2
3
k2
m1
DOF1
2
Y
k1
1
Z
X
Version 1.0

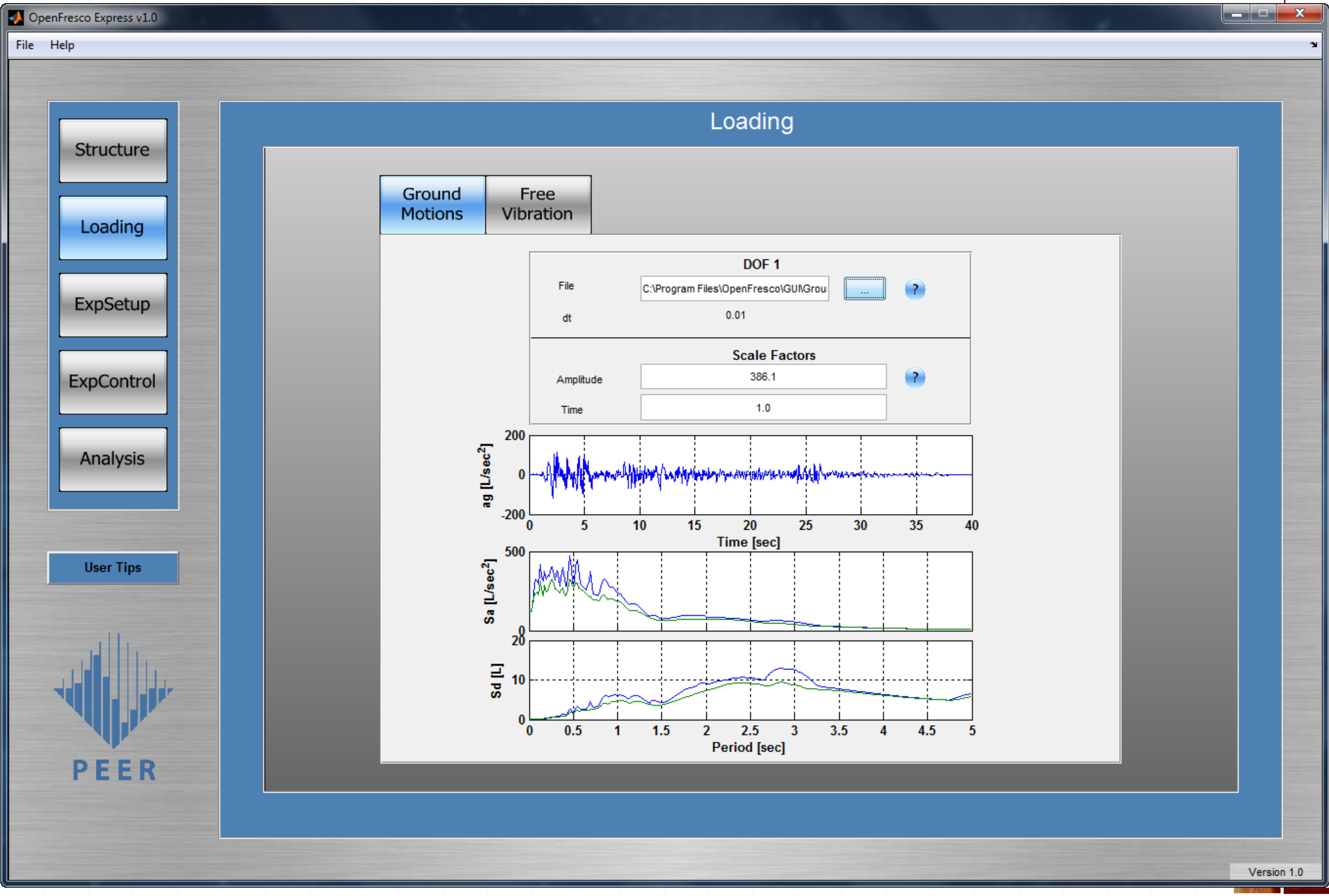
m1 0.04 m2 0.02

k1 2.8 k2 5.6

Period: 0.94787 0.2975

Rayleigh

0.02 0.05


OpenFresco Express v1.0
File
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PEER
Loading
Ground Motions
Free Vibration
ag [L/sec²]
200
0
-200
0
5
10
15
20
25
30
35
40
Time [sec]
Sa [L/sec²]
500
0
Sd [L]
20
10
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Period [sec]
Version 1.0

DOF 1

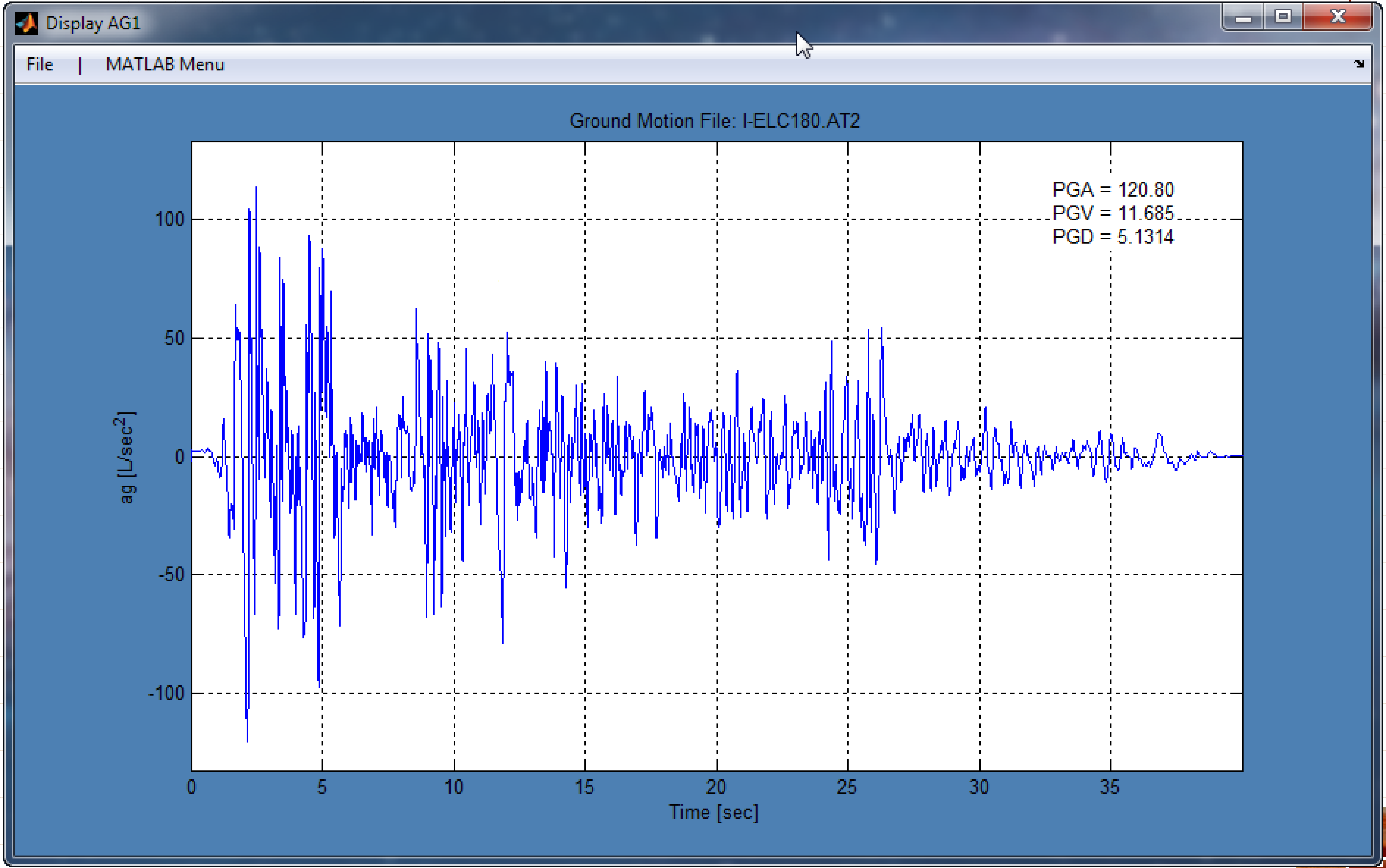
File: C:\Program Files\OpenFresco\GUI\Grou

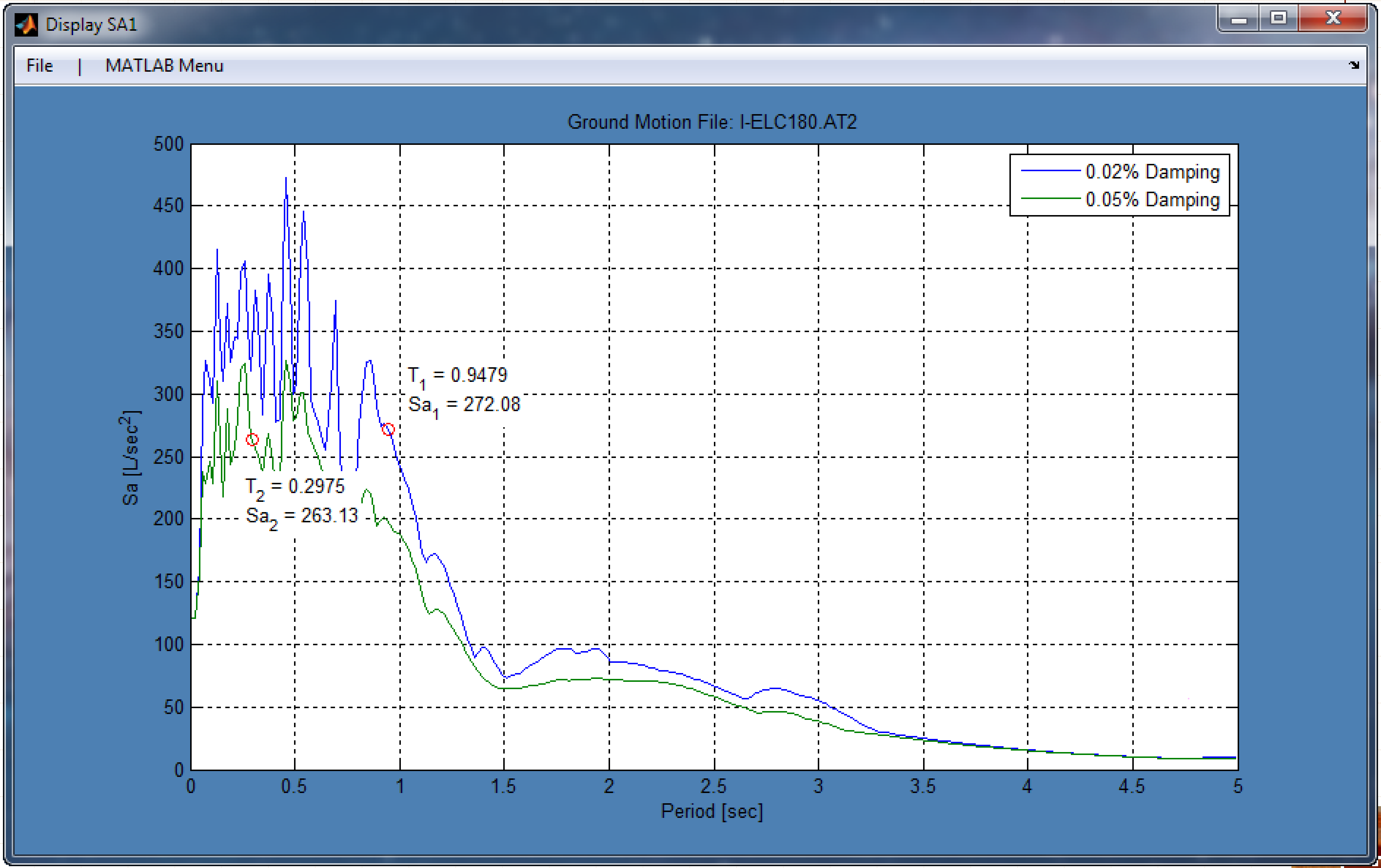
dt: 0.01

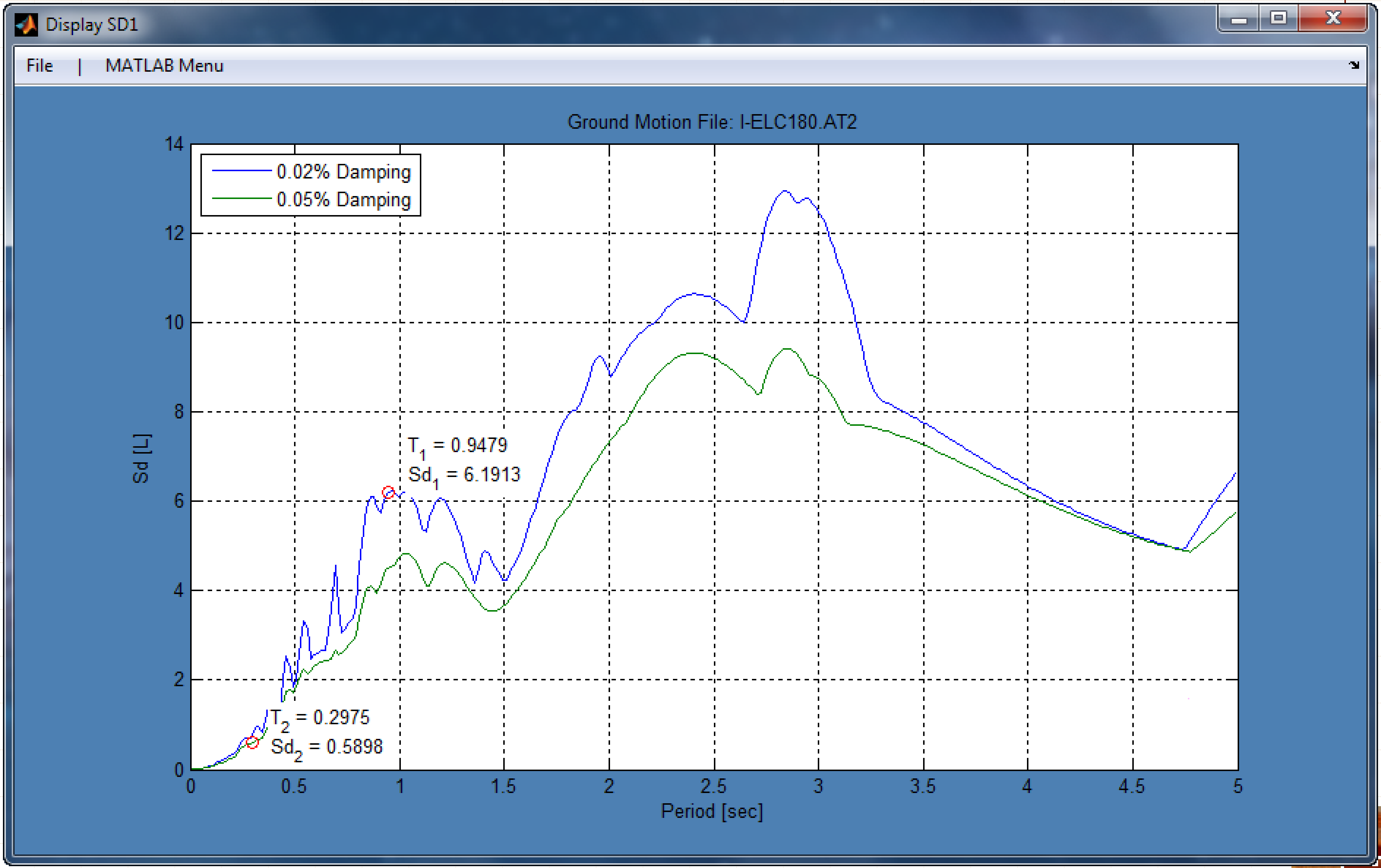
Scale Factors

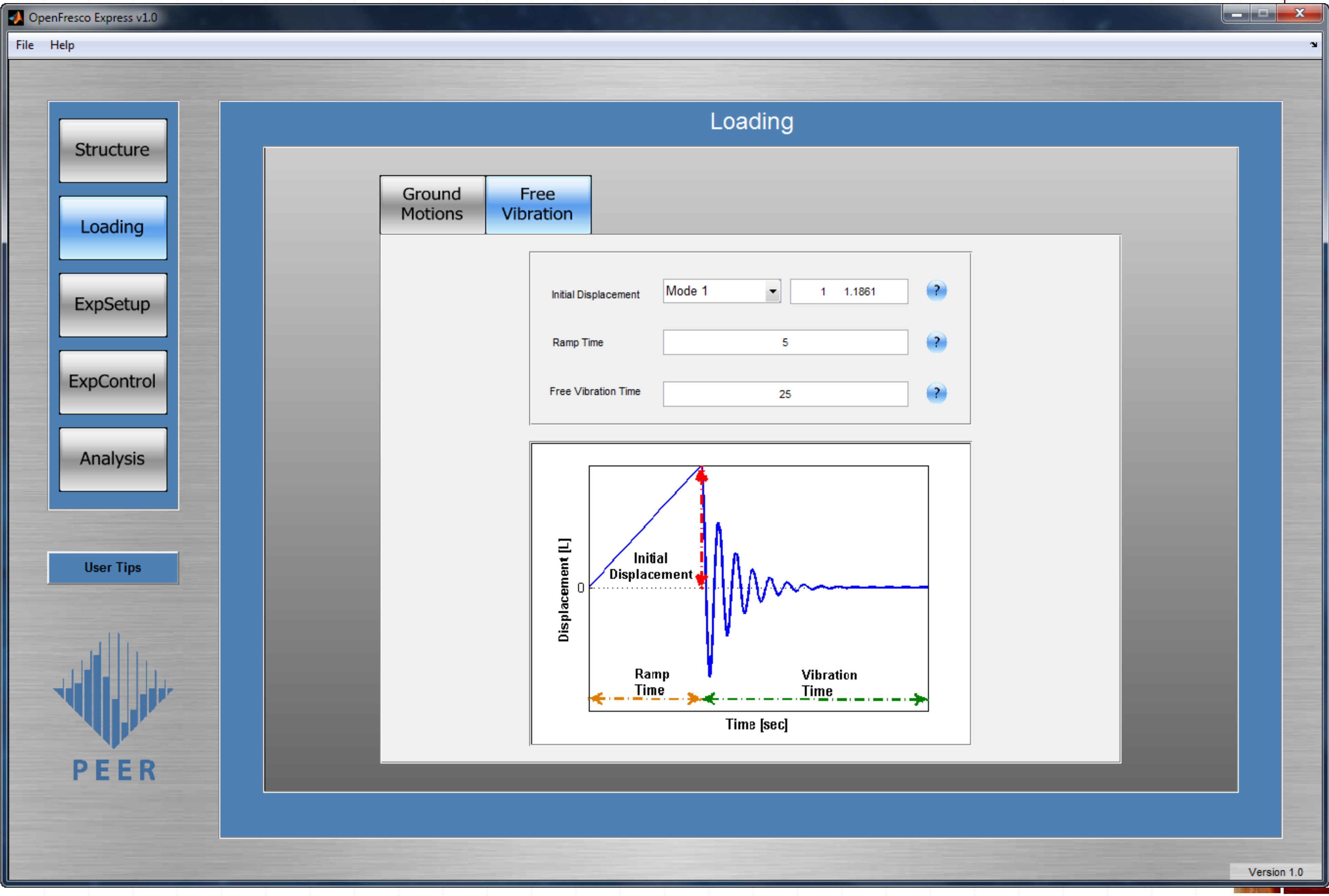
Amplitude: 386.1

Time: 1.0


Display AG1
File | MATLAB Menu
Ground Motion File: I-ELC180.AT2
PGA = 120.80
PGV = 11.685
PGD = 5.1314
100
50
0
-50
-100
ag [L/sec^2]
0
5
10
15
20
25
30
35
Time [sec]


Display SA1
File | MATLAB Menu
Ground Motion File: I-ELC180.AT2
0.02% Damping
0.05% Damping
T1 = 0.9479
Sa1 = 272.08
T2 = 0.2975
Sa2 = 263.13
Sa [L/sec2]
Period [sec]
0
50
100
150
200
250
300
350
400
450
500
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5


Display SD1
File | MATLAB Menu
Ground Motion File: I-ELC180.AT2
0.02% Damping
0.05% Damping
$T_1 = 0.9479$
$Sd_1 = 6.1913$
$T_2 = 0.2975$
$Sd_2 = 0.5898$
Sd [L]
0
2
4
6
8
10
12
14
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Period [sec]


OpenFresco Express v1.0
File
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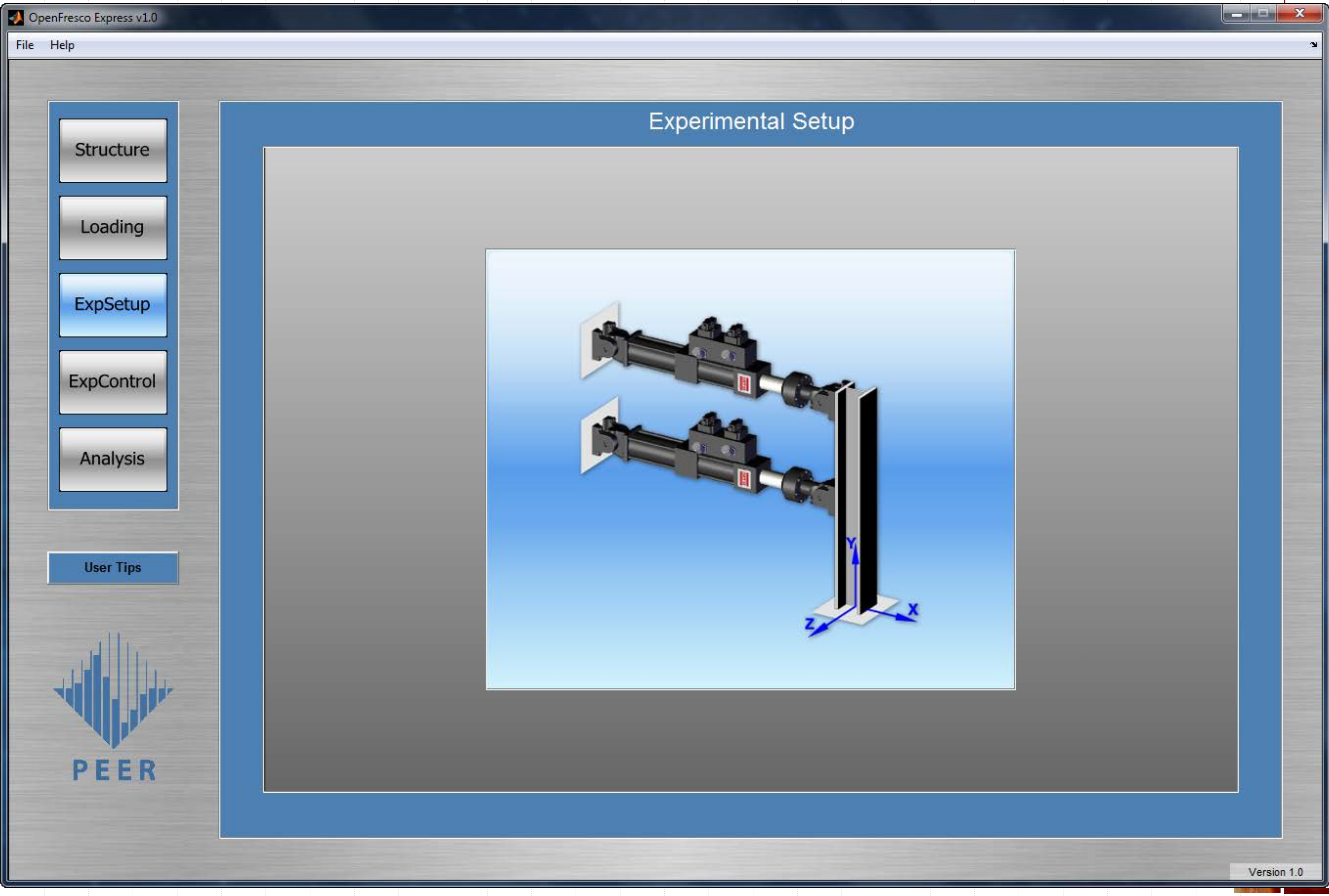
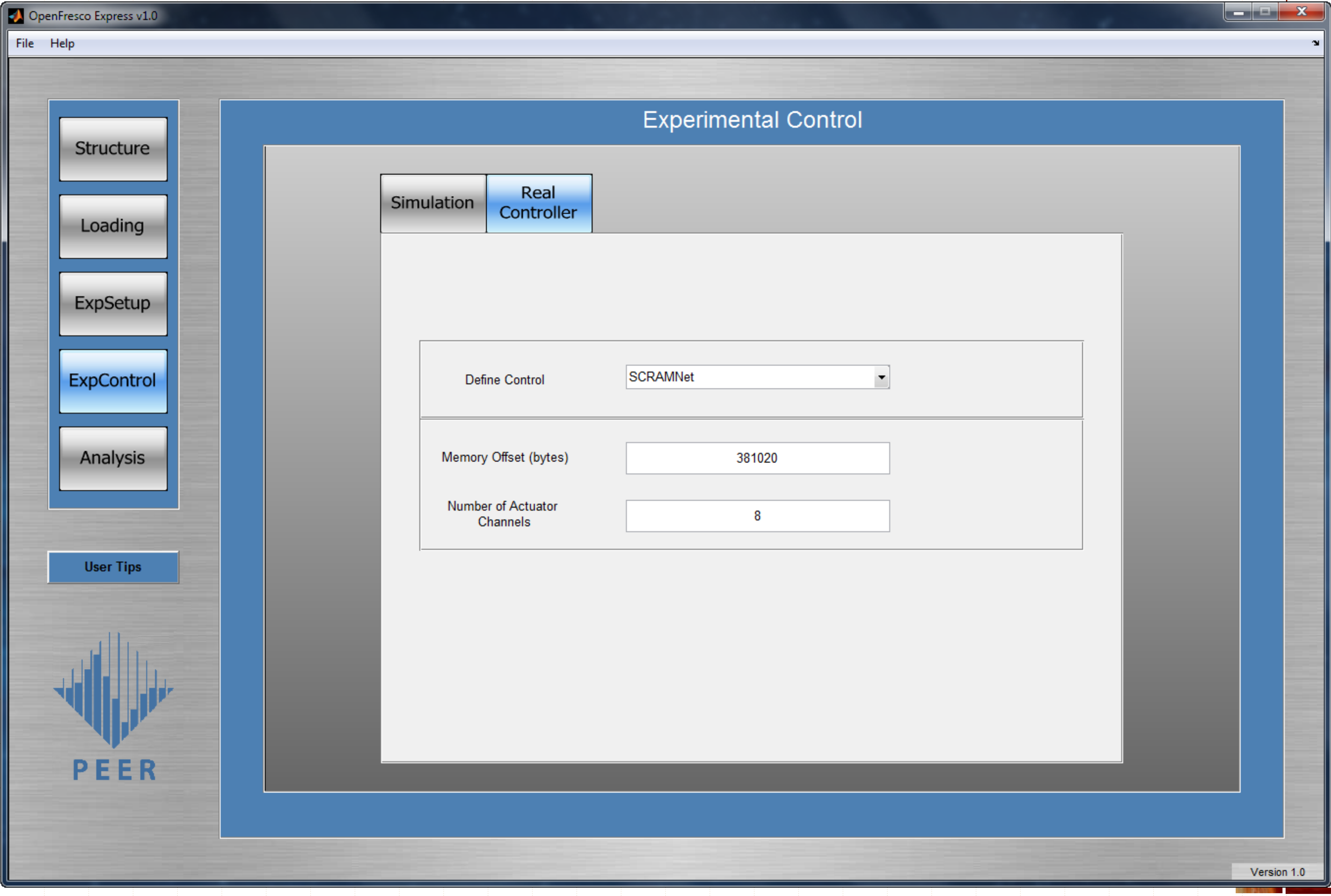
User Tips
PEER
Loading
Ground Motions
Free Vibration
?
Displacement [L]
0
Initial Displacement
Ramp Time
Vibration Time
Time [sec]
Version 1.0

Initial Displacement: Mode 1 — 1 1.1861

Ramp Time: 5

Free Vibration Time: 25


OpenFresco Express v1.0
File
Help
Structure
Loading
ExpSetup
ExpControl
Analysis
User Tips
PEER
Experimental Setup
Y
X
Z
Version 1.0


OpenFresco Express v1.0
File
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ExpControl
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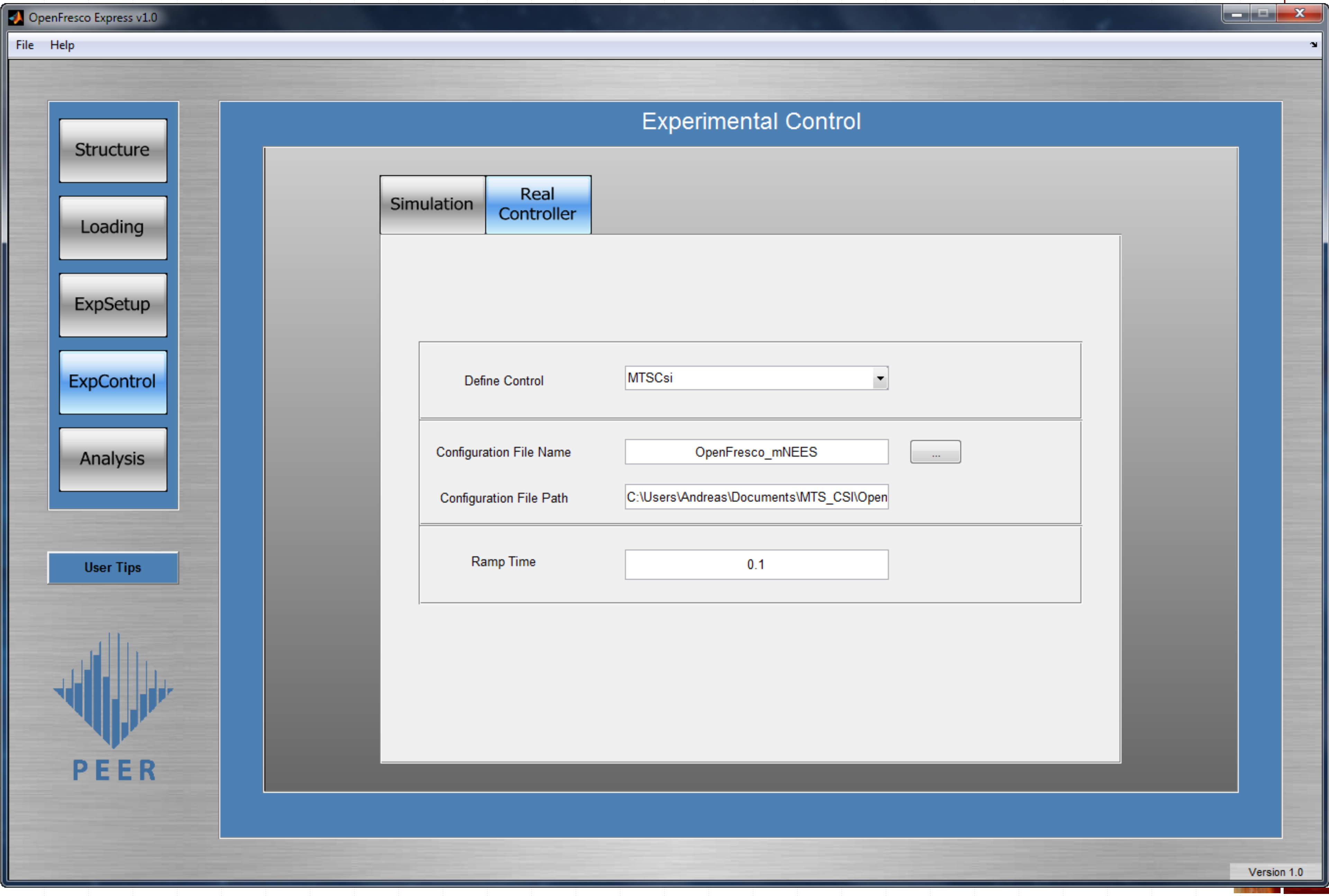
User Tips
PEER
Experimental Control
Simulation
Real Controller
Version 1.0

Define Control: SCRAMNet

Memory Offset (bytes): 381020

Number of Actuator Channels: 8


OpenFresco Express v1.0
File
Help
Structure
Loading
ExpSetup
ExpControl
Analysis
User Tips
PEER
Simulation
Real Controller
...
Version 1.0

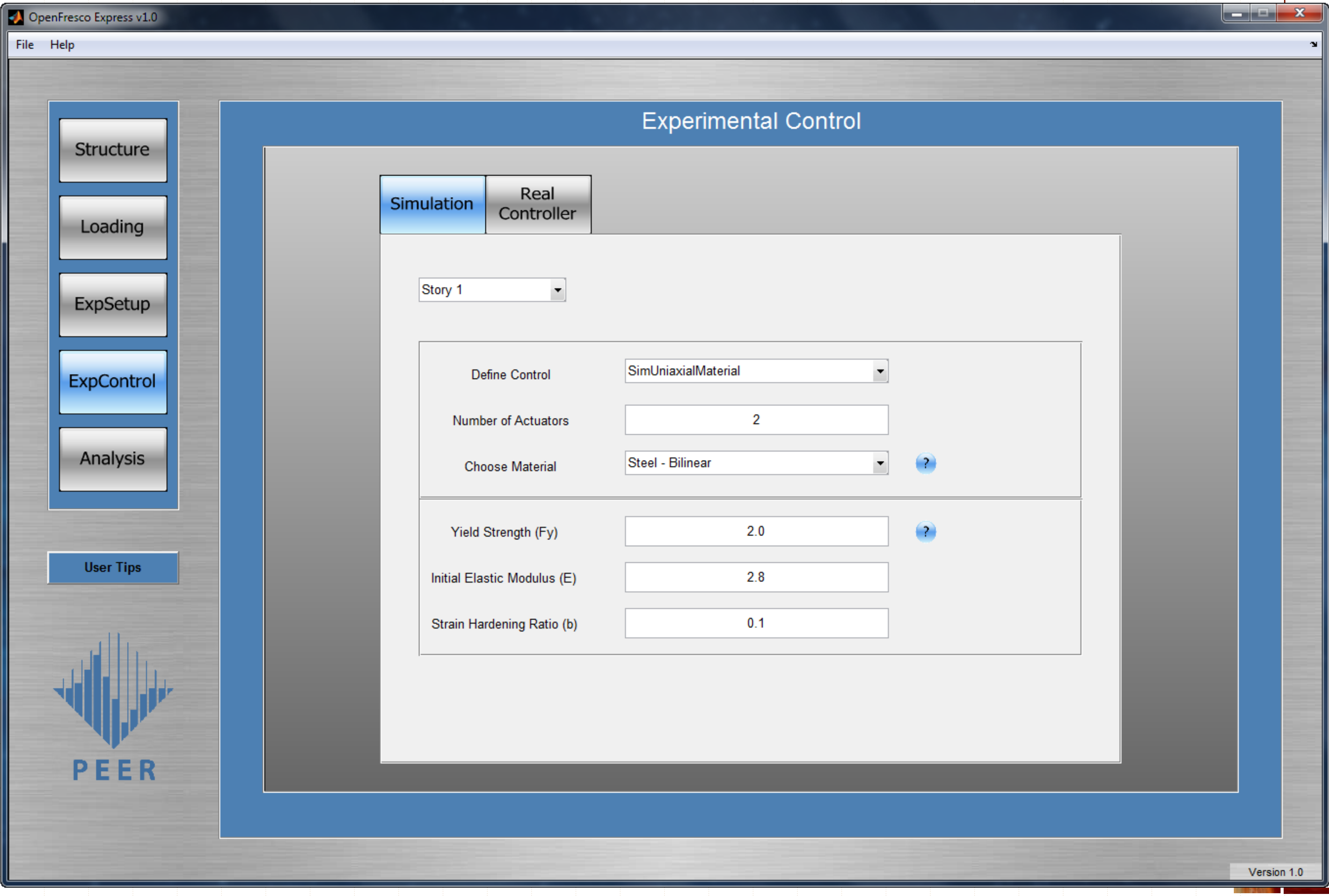
Experimental Control

Define Control: MTSCsi

Configuration File Name: OpenFresco_mNEES

Configuration File Path: C:\Users\Andreas\Documents\MTS_CSI\Open

Ramp Time: 0.1


OpenFresco Express v1.0
File
Help
Structure
Loading
ExpSetup
ExpControl
Analysis
User Tips
PEER
Simulation
Real Controller
Version 1.0

Experimental Control

Story 1

Define Control: SimUniaxialMaterial

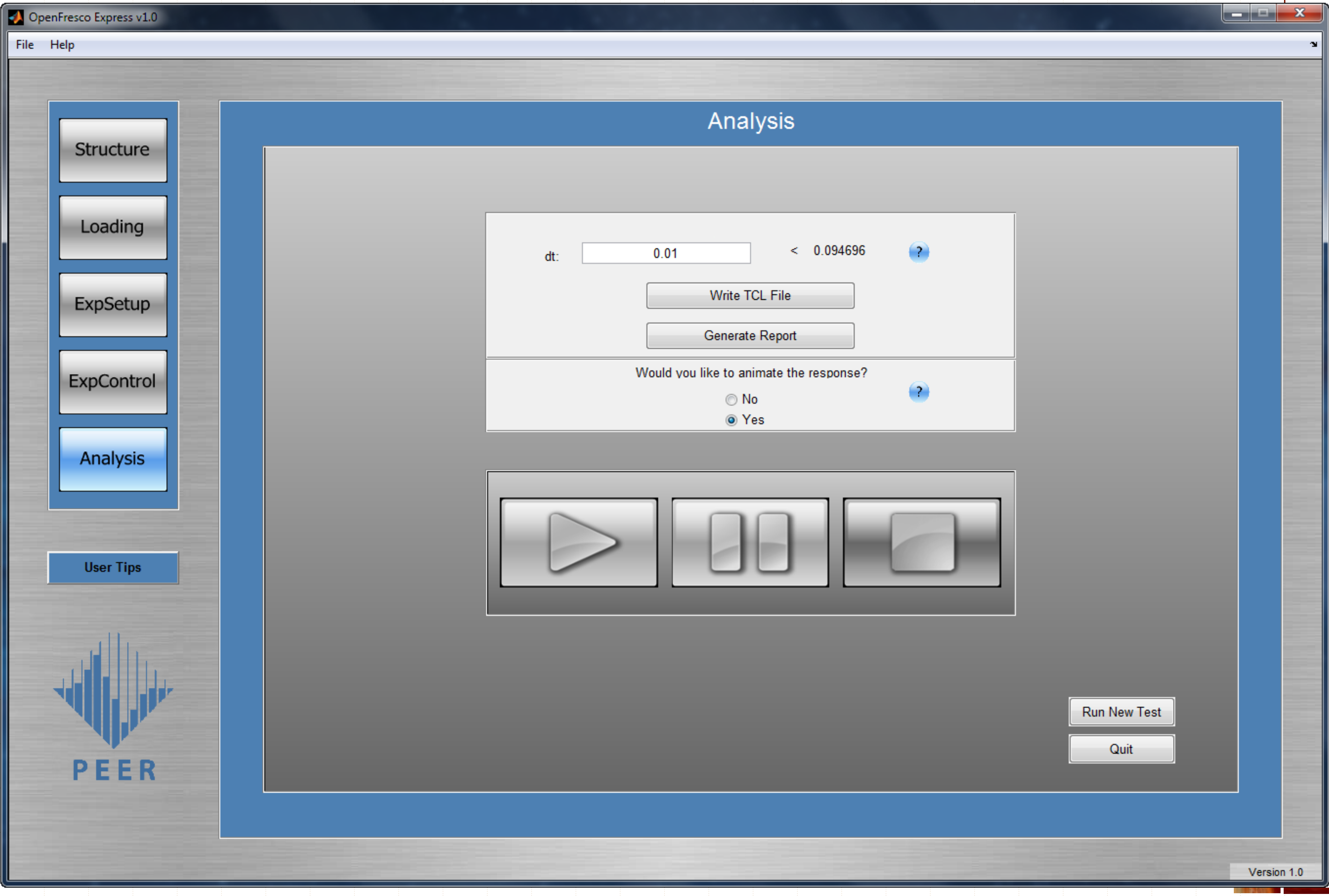
Number of Actuators: 2

Choose Material: Steel - Bilinear

Yield Strength (Fy): 2.0

Initial Elastic Modulus (E): 2.8

Strain Hardening Ratio (b): 0.1


OpenFresco Express v1.0
File
Help
Structure
Loading
ExpSetup
ExpControl
Analysis
User Tips
PEER
Analysis

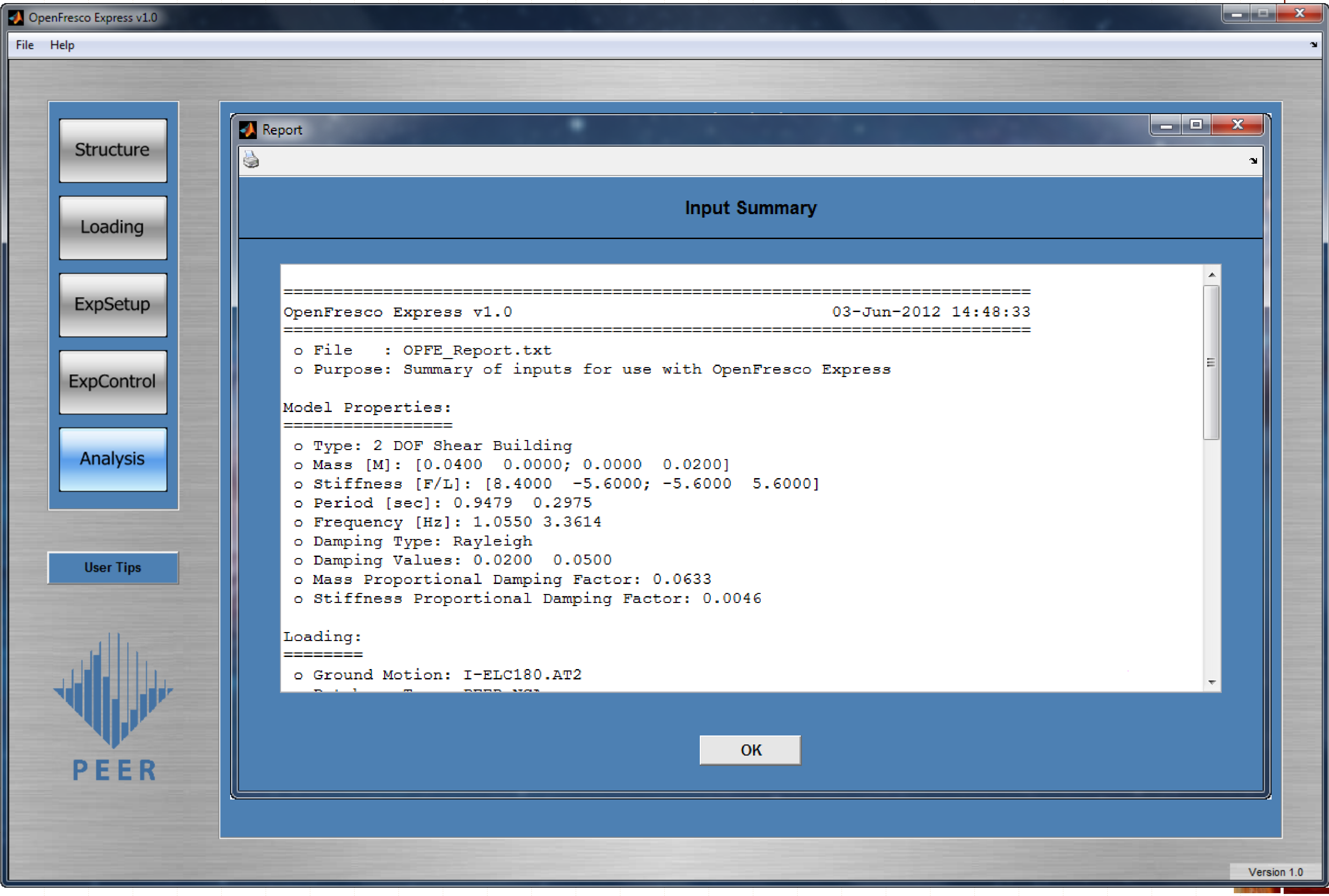
dt: 0.01 < 0.094696

Write TCL File
Generate Report

Would you like to animate the response?

○ No
● Yes

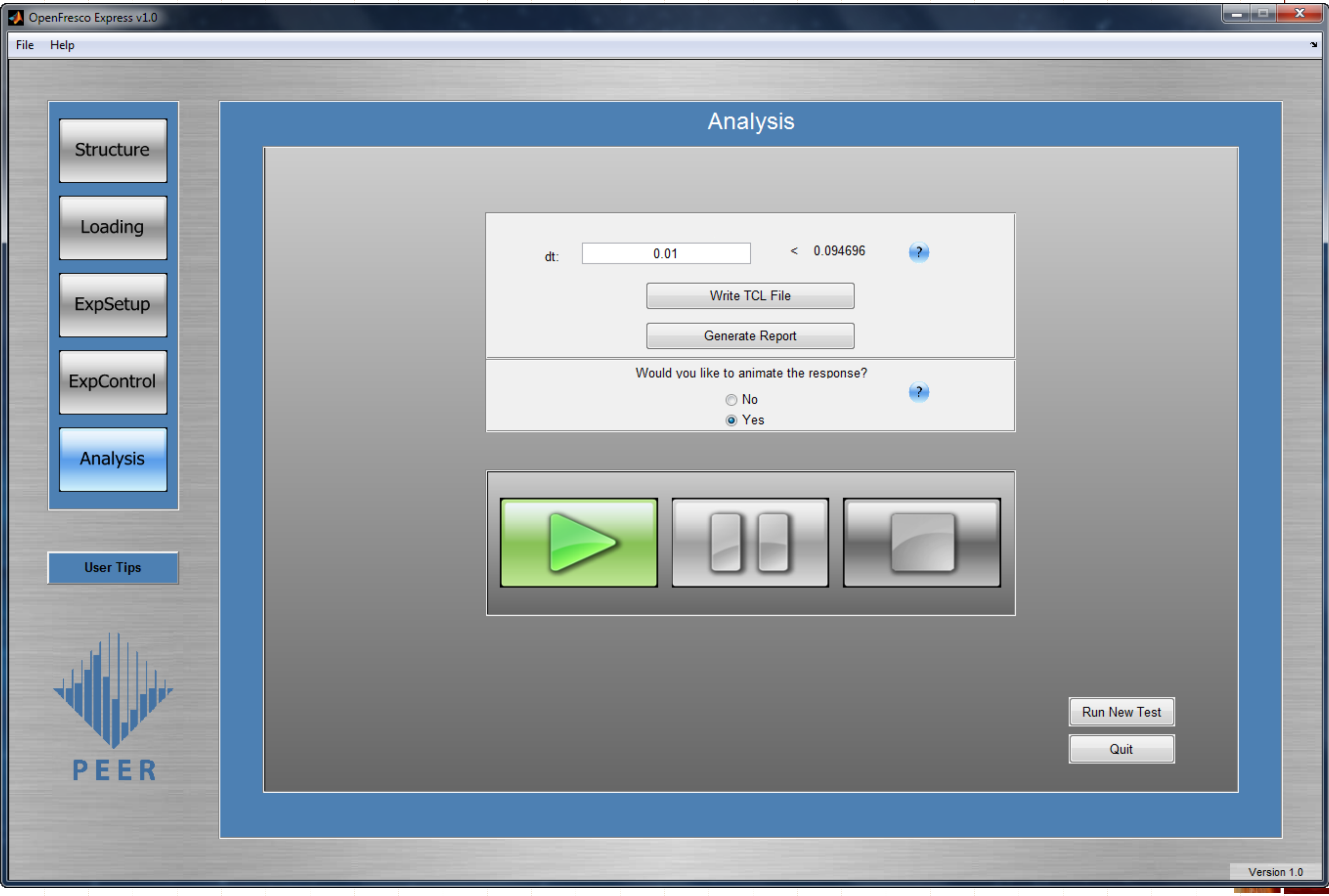
Run New Test
Quit
Version 1.0


OpenFresco Express v1.0
File
Help
Structure
Loading
ExpSetup
ExpControl
Analysis
User Tips
PEER
Report
Input Summary
OK
Version 1.0

```
==========================================================================
OpenFresco Express v1.0                                03-Jun-2012 14:48:33
==========================================================================
 o File    : OPFE_Report.txt
 o Purpose: Summary of inputs for use with OpenFresco Express

Model Properties:
=================
 o Type: 2 DOF Shear Building
 o Mass [M]: [0.0400  0.0000; 0.0000  0.0200]
 o Stiffness [F/L]: [8.4000  -5.6000; -5.6000  5.6000]
 o Period [sec]: 0.9479  0.2975
 o Frequency [Hz]: 1.0550 3.3614
 o Damping Type: Rayleigh
 o Damping Values: 0.0200  0.0500
 o Mass Proportional Damping Factor: 0.0633
 o Stiffness Proportional Damping Factor: 0.0046

Loading:
========
 o Ground Motion: I-ELC180.AT2
```


OpenFresco Express v1.0
File
Help
Structure
Loading
ExpSetup
ExpControl
Analysis
User Tips
PEER
Write TCL File
Generate Report
?
Run New Test
Quit

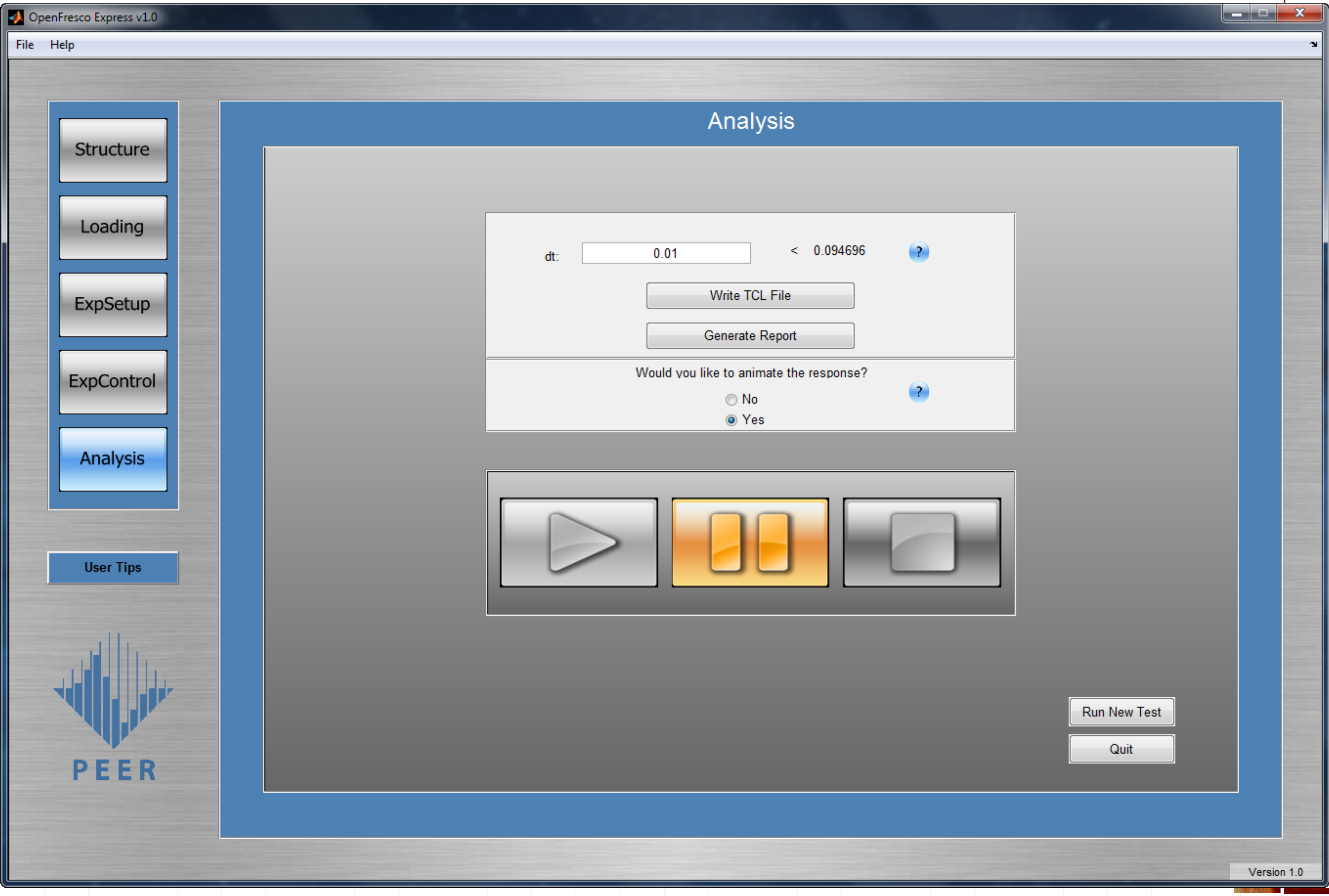
Analysis

dt: 0.01 < 0.094696

Would you like to animate the response?

○ No
● Yes

Version 1.0


OpenFresco Express v1.0
File
Help
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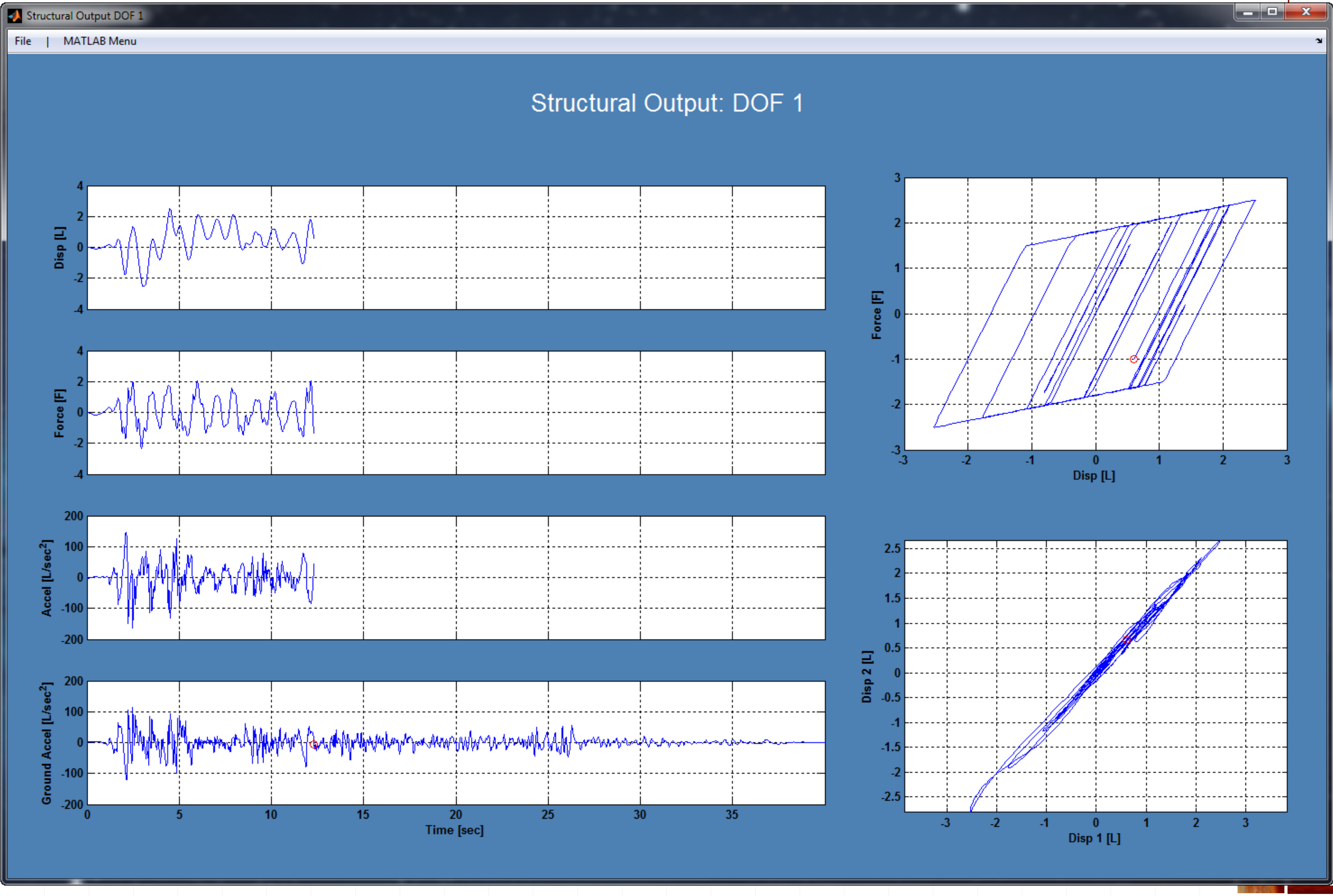
ExpSetup
ExpControl
Analysis
User Tips
PEER
Analysis
?
Write TCL File
Generate Report
?
Run New Test
Quit
Version 1.0

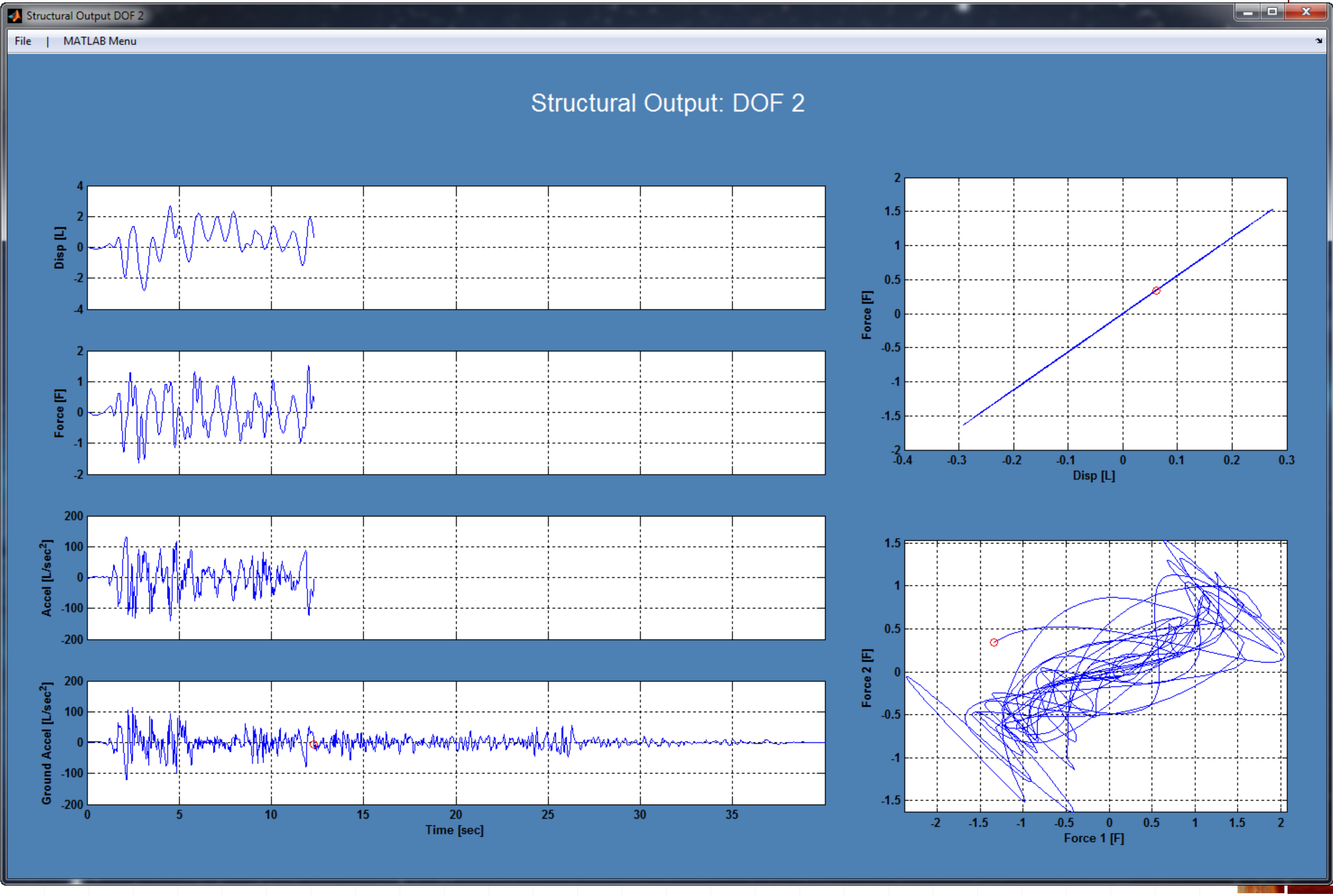
dt: 0.01 < 0.094696

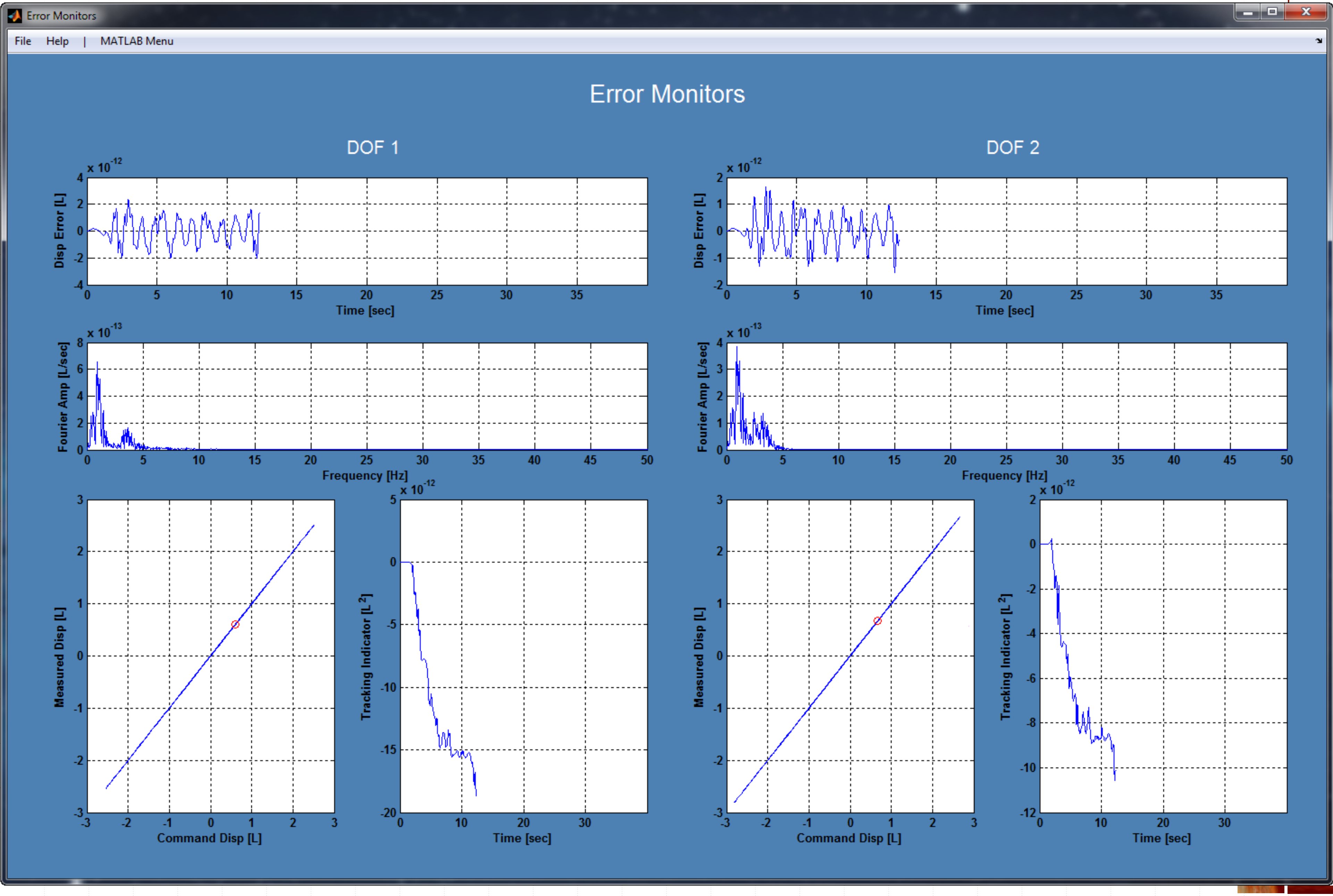
Would you like to animate the response?

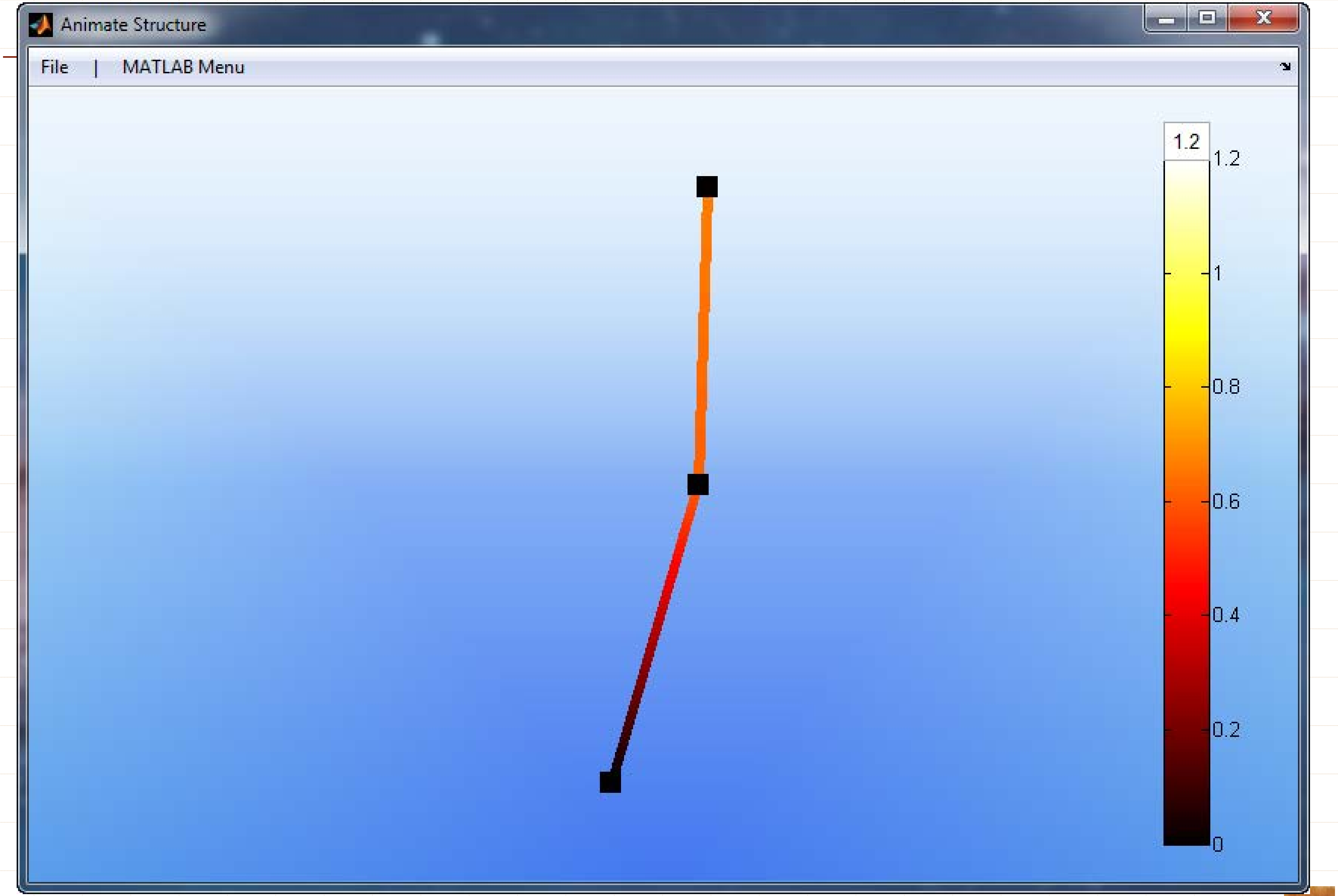
○ No

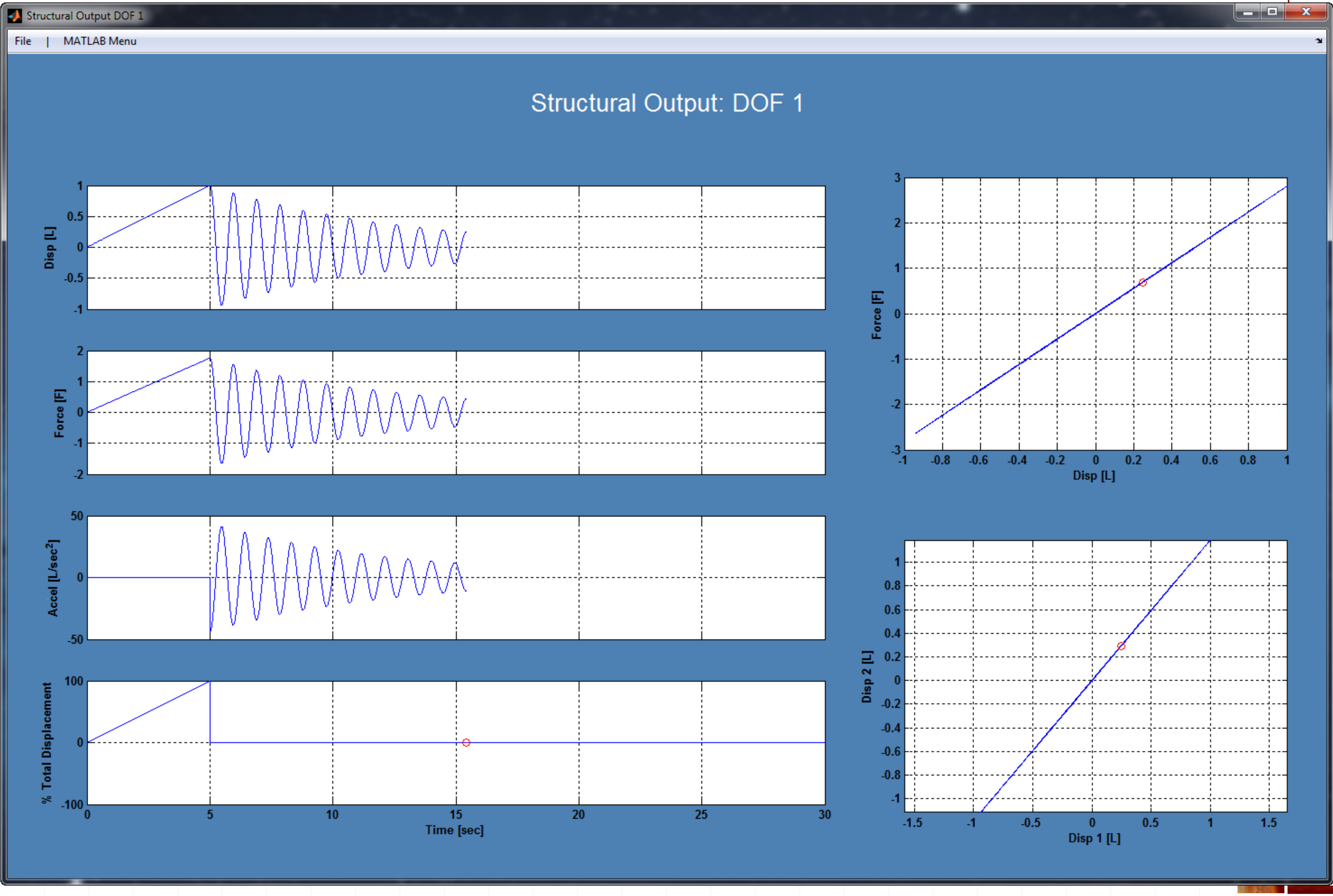
● Yes


Structural Output DOF 1
File | MATLAB Menu
Structural Output: DOF 1
Disp [L]
Force [F]
Accel [L/sec^2]
Ground Accel [L/sec^2]
Time [sec]
0
5
10
15
20
25
30
35
4
2
0
-2
-4
200
100
0
-100
-200
Force [F]
Disp [L]
3
2
1
0
-1
-2
-3
Disp 2 [L]
Disp 1 [L]
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5

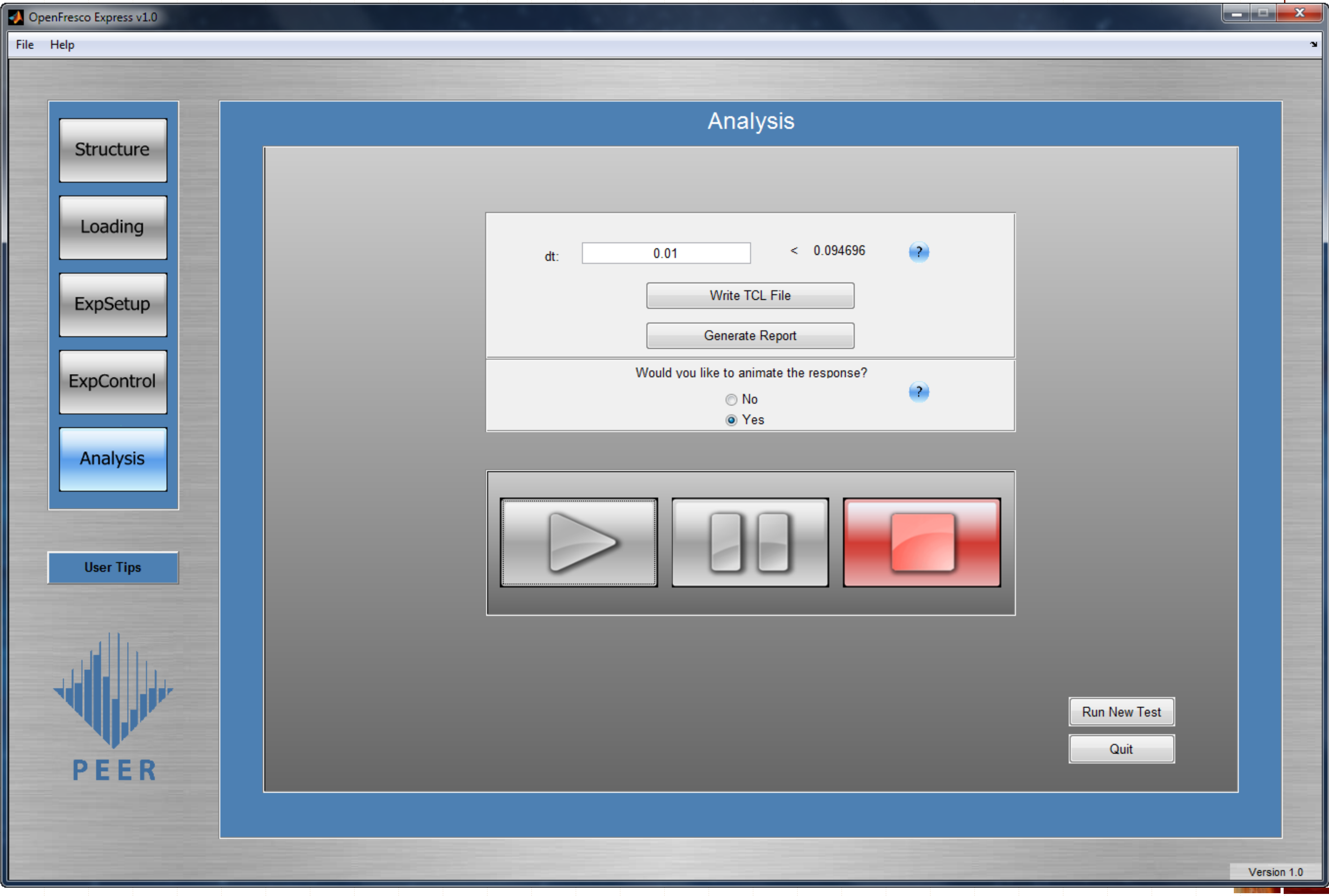

Structural Output DOF 2
File | MATLAB Menu
Structural Output: DOF 2
Disp [L]
Force [F]
Accel [L/sec^2]
Ground Accel [L/sec^2]
Time [sec]
0
5
10
15
20
25
30
35
4
2
0
-2
-4
2
1
0
-1
-2
200
100
0
-100
-200
Force [F]
Disp [L]
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-0.4
-0.3
-0.2
-0.1
0
0.1
0.2
0.3
Force 2 [F]
Force 1 [F]
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2


Error Monitors
File
Help
MATLAB Menu
Error Monitors
DOF 1
DOF 2
x 10^-12
Disp Error [L]
Time [sec]
x 10^-13
Fourier Amp [L/sec]
Frequency [Hz]
Measured Disp [L]
Command Disp [L]
Tracking Indicator [L^2]
x 10^-12
Time [sec]


Animate Structure
File
MATLAB Menu
1.2
1.2
1
0.8
0.6
0.4
0.2
0


Structural Output DOF 1
File | MATLAB Menu
Structural Output: DOF 1
Disp [L]
Force [F]
Accel [L/sec^2]
% Total Displacement
Time [sec]
0
5
10
15
20
25
30
1
0.5
0
-0.5
-1
2
1
0
-1
-2
50
0
-50
100
0
-100
Force [F]
Disp [L]
3
2
1
0
-1
-2
-3
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1
Disp 2 [L]
Disp 1 [L]
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1.5
-1
-0.5
0
0.5
1
1.5

OpenFresco



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Analysis

dt: 0.01 < 0.094696

Would you like to animate the response?

○ No

● Yes