

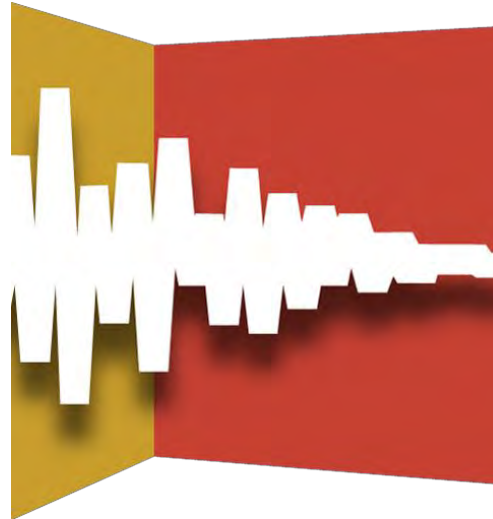


Welcome!

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User Defined Transient



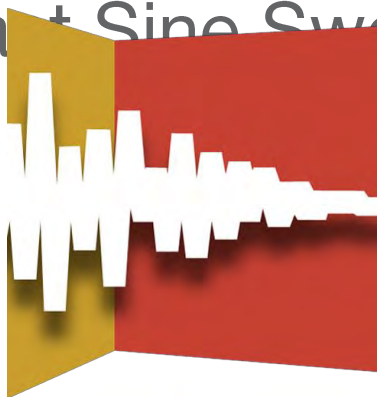
November 2018
Jade Vande Kamp
Training & Education Manager

Innovation
Do the Right Thing
Collaboration
Capable & Competent
Strong & Driven Work Ethic
Accountable & Responsible



User Defined Applications and Use Cases

- Earthquake/Seismic
- Transient Waveform Replication
- Short Duration Waveform Replication
- Arbitrary Periodic Waveform Creation
- Synthetic Pulse Generation
- Chirp – Fast Sine Sweep
- Modal Pulse Generation (closed loop)



- User Defined Pulse
- Sine Beat
- Cosine Beat
- Damped Sine Wave
- Damped Sine Wave with Damping Ratio
- Teardrop Sine Wave
- Multiple Sine Beat
- Multiple Sine Beat with Pause
- Linear Chirp
- Exponential Chirp
- Linear Triangle
- Exponential Triangle
- Sine Wave
- Triangle Wave
- Square Wave
- Burst Random
- Enveloped Burst Random
- Random Beat

- Seismic/Earthquake/Modal/Arbitrary Periodic Waveforms
 - IEEE-344 specifies multiple types of fragility and resonance tests
 - Sine Beat
 - Consists of a ramped sinusoid at a specified frequency and amplitude
 - At Least 5 Beats
 - Sufficient pause between beats to allow product to reach resting position
 - GOAL: Produce a defined TRS acceleration and observe the response of product
 - Decaying Sine Waves (Damped Sine Wave with Damping Ratio)
 - Similar goals as Sine Beat
 - Similar to a sine sweep, able to sweep much faster
 - Controlled Iteratively, like a shock pulse
 - Decay/Damped by a specified amount (0.5% - 10%)
 - GOAL: Observe amplification/magnification of input signal by product

Sine Beat with Pause

- Waveform Parameters (Create Tab)

Waveform: Multiple Sine Beat with Pause

Amplitude: 1G

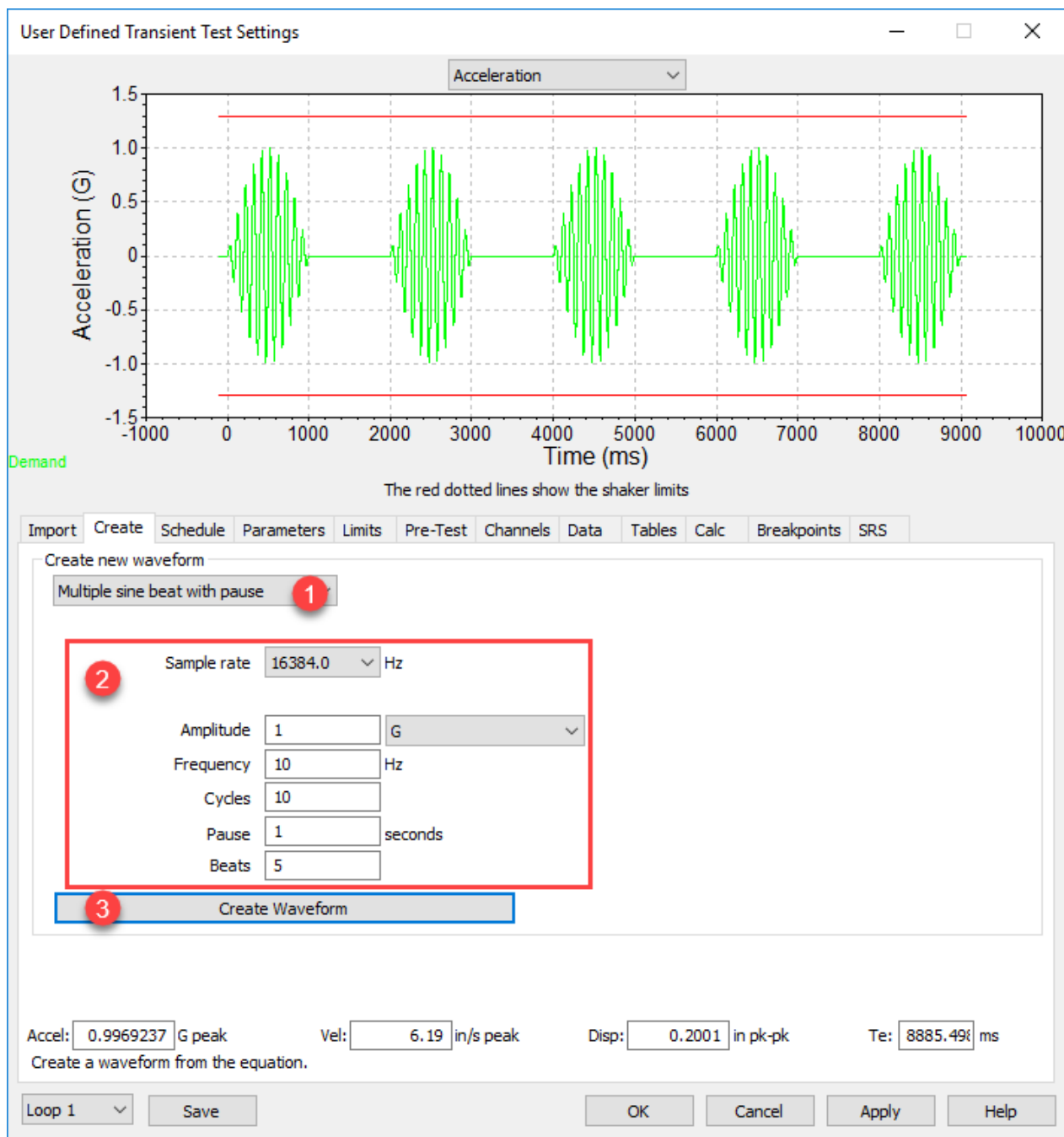
Frequency: 10Hz

Cycles: 10

Pause: 1 Second

Beats: 5

- Click Create Waveform



Sine Beat with Pause

- Waveform Parameters (Create Tab)

Waveform: Damped Sine w/ Damping Ratio

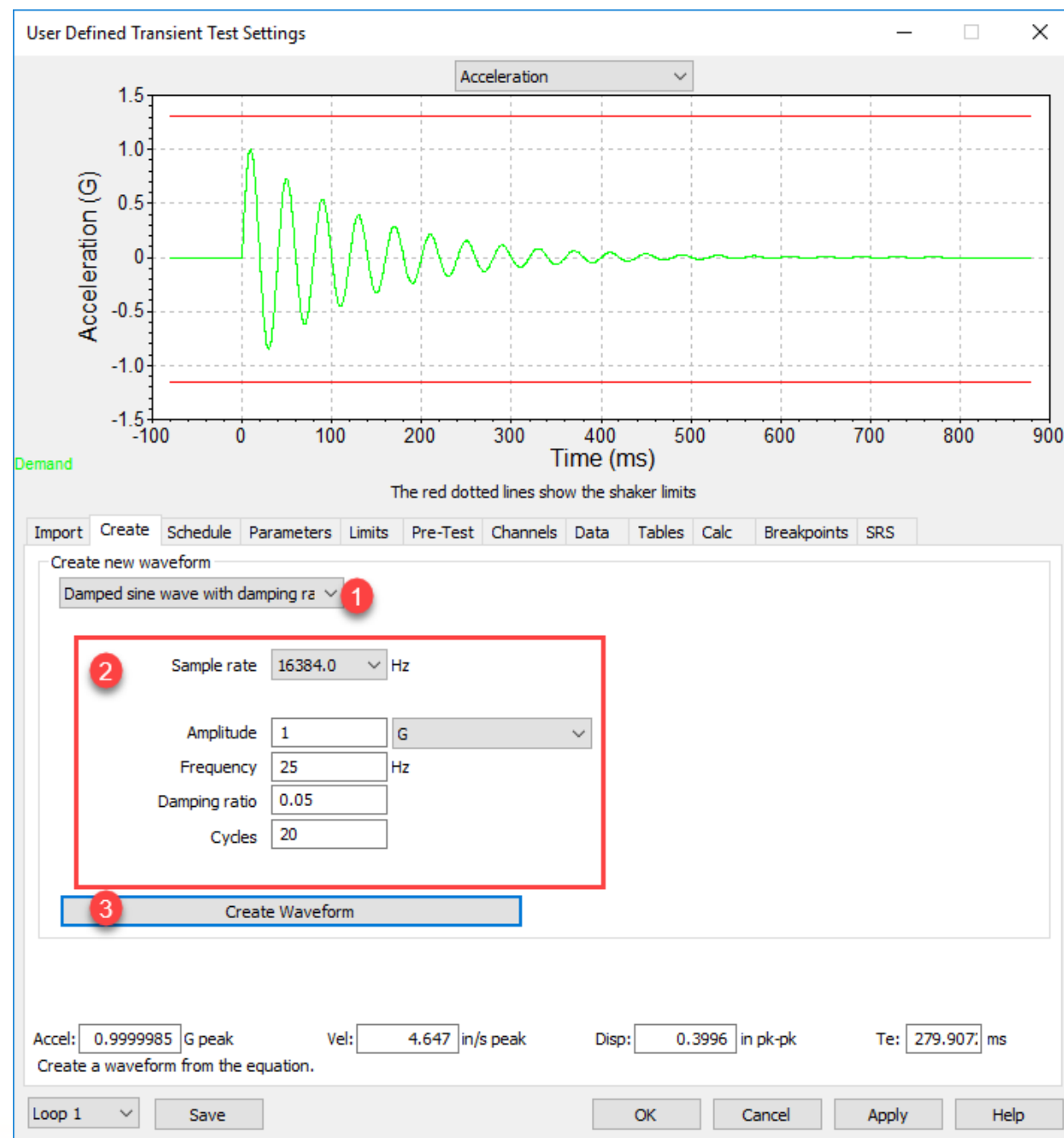
Amplitude: 1G

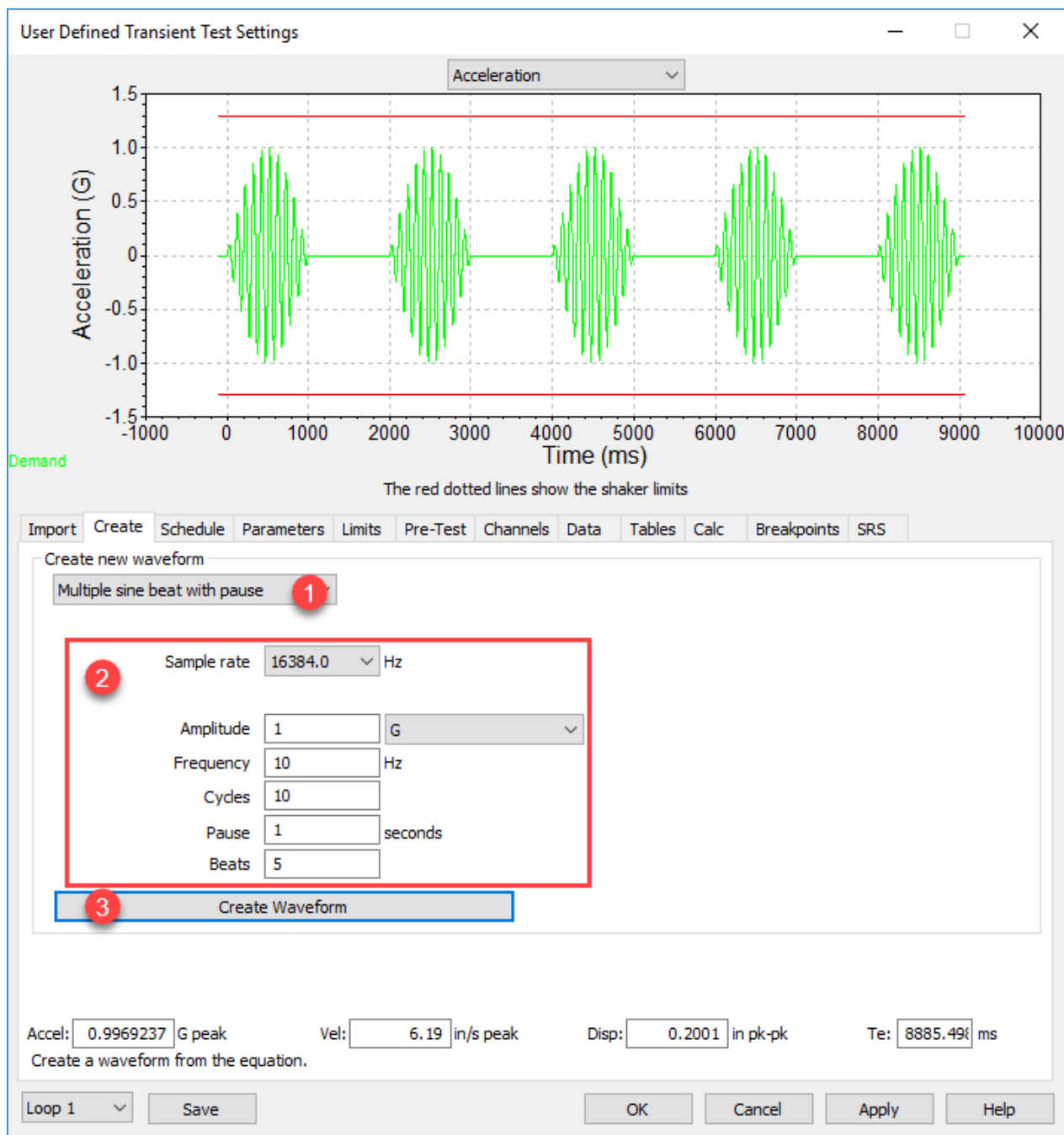
Frequency: 25Hz

Damping Ratio: 0.05 (5%)

Cycles: 20

- Click Create Waveform





Sine Beat with Pause

- Waveform Parameters (Create Tab)

Waveform: Exponential Chirp

Amplitude: 1G

Duration: 10 Seconds

Start Frequency: 2Hz

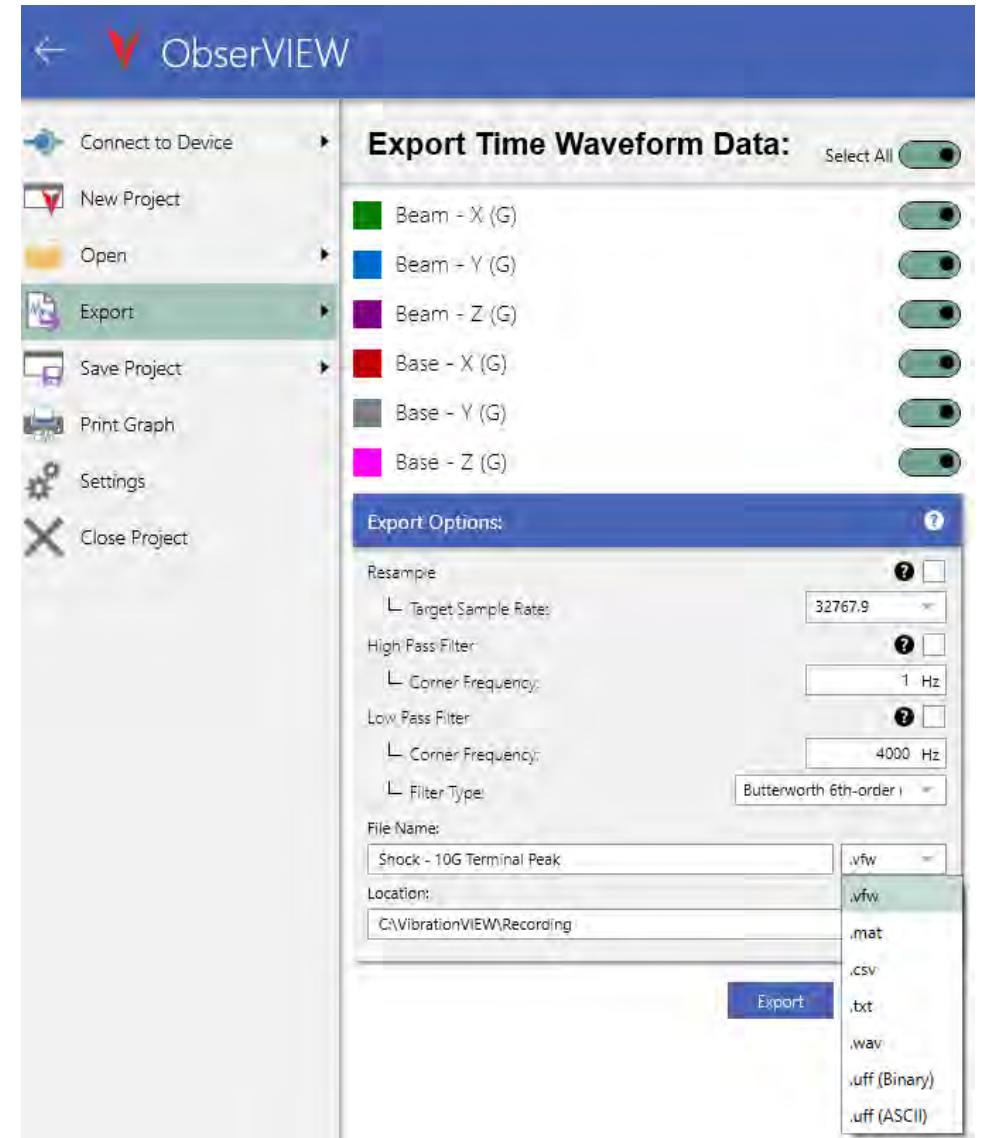
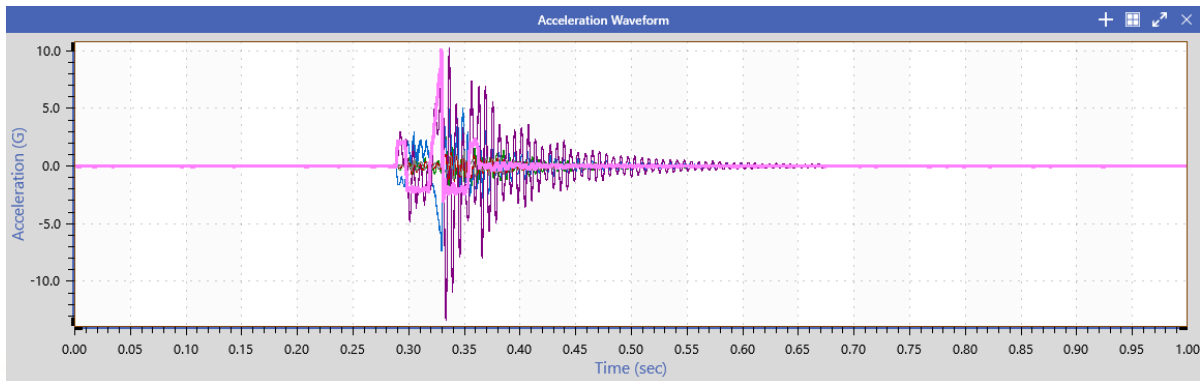
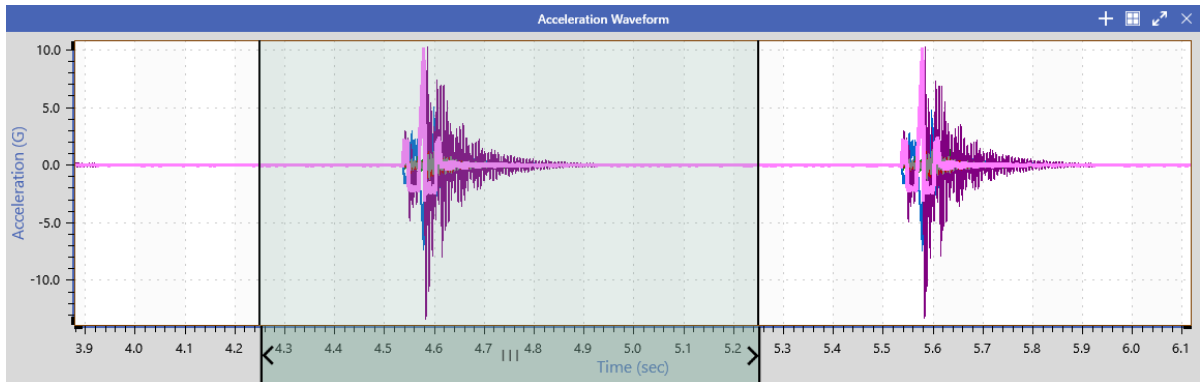
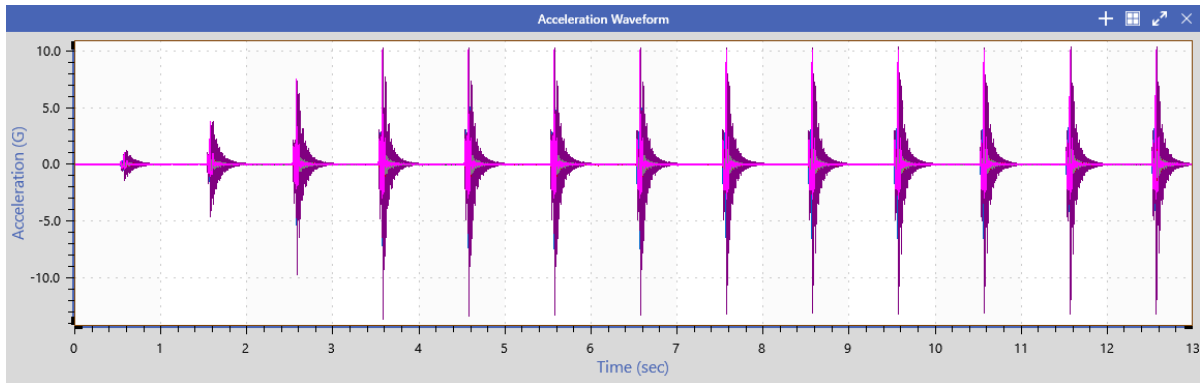
End Frequency: 100Hz

Ramp: 2%

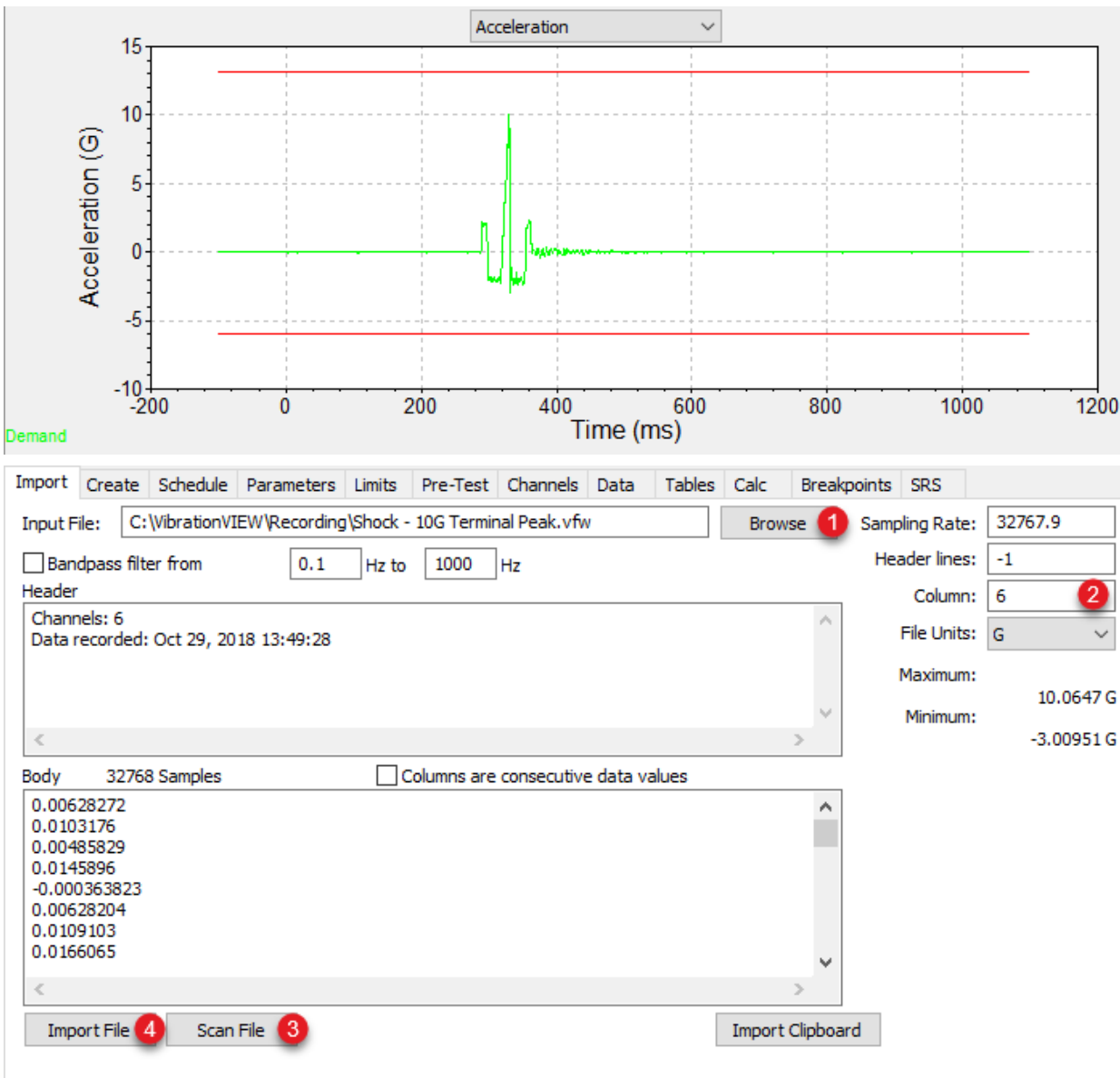
Import a Transient Waveform/Short Duration Recording

- GOAL: Time Waveform Control
 - Very short duration waveforms, typically < 30 seconds
 - Control Similar to Classical Shock
 - Requires Startup Pulses or Iterations
 - Able to memorize the Drive Signal required to generate the full level pulses
 - SRS Analysis is often used to validate

Generate the Waveform from Recording



Import the Recording into VibrationVIEW



- Select a Time History File
 - Supported File Types
 - .txt, .csv, .log, .asc, .dat, .vtd, .uff, .vfw
- Select the “Column”
 - Which Channel from the Recording
- Scan File
 - Scan the File and Calculate Statistics
- Import File
 - Convert the File

 Schedule Tab

Schedule Tab

- Set the Test Schedule
 - Enter a Form
 - Used to Memorize Drive Signal
 - Run 1 Full Level Pulse
 - Able to start using Memorized Drive
 - Enter Form
 - Generate a Report

Import		Create	Schedule	Parameters	Limits	Pre-Test	Channels	Data	Tables	Calc	Breakpoints	SRS						
		Pulses	Modifier	Pulse Interval	Negative Pulses	Mem. Drive	Open Loop	Hold Pulse	Digital Outputs									
									0	1	2	3	4	5				
» 1	Enter Form	Pre-Test.html							Browse	☐	☐	☐	☐	☐	☐			
2	Run Pulses	1	100	%	1	sec	☐	☐	☐	☐	☐	☐	☐	☐				
3	Run Pulses	50	100	%	1	sec	☐	☒	☐	☐	☐	☐	☐	☐				
4	Enter Form	Post-Test.html							Browse	☐	☐	☐	☐	☐				
5	View Report	Form Report.rtf							Browse	☐	☐	☐	☐	☐				

☐ Use this schedule for all control loops

Insert Delete

Drive not memorized

Use current drive for first level

Total Time at Level 0:01:01

Select level type for schedule step.

Parameters Tab

- Key Shock Parameters
 - Startup Pulse Interval
 - Feedback Control
 - Minimum Frequency
 - Maximum Frequency
 - Corner Frequencies
 - Only useful when calculating Velocity or Displacement from Acceleration Input
 - End of Pulse Padding
 - Record the motion of the product after the completion of the primary pulse
 - Transfer Function Parameters
 - Part of VR9607-Analyzer Functions

The screenshot shows the 'Parameters' tab of a software interface. The top menu bar includes 'Import', 'Create', 'Schedule', 'Parameters', 'Limits', 'Pre-Test', 'Channels', 'Data', 'Tables', 'Calc', 'Breakpoints', and 'SRS'. The main content area is divided into several sections:

- Startup pulse interval:** A text box containing '1' followed by 'Seconds'.
- Feedback control:** A section with a 'Feedback gain' text box containing '0.3', and two rows: 'Minimum Frequency' with a text box containing '3' and a 'Hz' unit, and 'Maximum Frequency' with a text box containing '13762' and a 'Hz' unit. Each frequency row has a checked checkbox on the right.
- Corner frequencies:** A section with 'Integration filter' (text box '1', 'Hz' unit, checked checkbox) and 'Differentiation filter' (text box '8192', 'Hz' unit, checked checkbox).
- Sample Rate:** A section with 'Sample rate' (dropdown menu showing '32767.9', 'Hz' unit, checked checkbox).
- End of Pulse padding:** A section with 'Capture additional' (text box '0', 'ms' unit).
- Transfer Function Parameters:** A section on the right with 'Average' (text box '100', 'Pulses' unit), 'Algorithm' (dropdown menu showing 'H1'), and 'Window function' (dropdown menu showing 'Rectangular').

At the bottom, there is a note: 'Pulse output rate during equalization. (Typical 1 Second)'.

- Input Filter Options

- Antialias

- No additional filtering

- FIR

- Finite Impulse Response Filter
- Applied AFTER control is processed
- Filtered Data is processed and displayed but has no effect on CONTROL

- Butterworth, Chebyshev, Elliptical

- Applied BEFORE control is processed
- Filtered Data is processed, displayed prior to control being calculated

The screenshot shows the 'Channels' tab in a software interface. At the top is a menu bar with options: Import, Create, Schedule, Parameters, Limits, Pre-Test, Channels, Data, Tables, Calc, Breakpoints, SRS. Below the menu is a table with columns: Control Channel, Transducer, Input Filter (Hz) Min, Input Filter (Hz) Max, System Limits, Enable, Pulse Peak Limits Max, Pulse Peak Limits Min, and a unit dropdown.

Control Channel	Transducer	Input Filter (Hz) Min	Input Filter (Hz) Max	System Limits	Enable	Pulse Peak Limits Max	Pulse Peak Limits Min	Unit
1 ☒ Ch1	10 mV/G		16384	☒	☐			G
2 ☐ Ch2	10.2 mV/G		16384	☐	☐			G
3 ☐ Ch3	10 mV/G		16384	☐	☐			G
4 ☐ Ch4	10 mV/G		16384	☐	☐			G

Below the table is an 'Input Filter Settings' dialog box. It has a dropdown menu with 'Antialias' selected. Other options include FIR, Butterworth 2nd-order, Butterworth 4th-order, Butterworth 6th-order, Chebyshev Type-1 5th-order (0.05dB), Chebyshev Type-2 5th-order (40dB), and Elliptical 5th-order (0.05dB/40dB). To the right of the dialog is a 'System Limits' section with values: Accel=9999 G, Vel=9999 in/s, Disp=9999 in. There is a 'Browse' button below this section. At the bottom of the dialog are 'OK', 'Cancel', 'Apply', and 'Help' buttons.

- Where data files are saved
- How often data is saved
- Where reports are saved
- Prompt for Run Name and Annotation Lines
- Use a saved graph layout

The screenshot shows the 'Data' tab in a software interface. The top menu bar includes 'Import', 'Create', 'Schedule', 'Parameters', 'Limits', 'Pre-Test', 'Channels', 'Data', 'Tables', 'Calc', 'Breakpoints', and 'SRS'. The 'Data' tab is active, displaying the following settings:

- Data storage directory:** D:\VibrationVIEW\Data\2018-11 (with a 'Browse' button).
- Data file name:** 2018Nov01-0848-0001 (with a 'Copy from test name' button).
- ☐ Save reports in Data storage directory.
- ☒ Use Data file name for report.
- Report storage directory:** D:\VibrationVIEW\Reports\2018-11 (with a 'Browse' button).
- Report file name:** 2018Nov01-0848-0001.
- Save data to disk:**
 - ☐ at end of level
 - ☒ at end of test
 - ☒ every 1 th pulse
 - ☐ pulses out of tolerance
 - ☐ startup pulses
- ☐ Prompt for Run Name and Annotation Lines when starting the test.
- ☐ Use this graph layout (with a 'Browse' button).
- Graph annotation lines:**

Prompts	Graph annotation lines (shown in data bottom and in reports)
Note 1	
Note 2	
Note 3	

Breakpoints and SRS Tabs

Enter Breakpoints for SRS Analysis

	Frequency	Amplitude	Slope dB/Oct	Tolerance (--)	Tolerance (+)
» 1	20 Hz	0.157246 G		0 %	100 %
2	128 Hz	1 G	> 6	0 %	100 %
3	1024 Hz	1 G	> 0	0 %	100 %
4	1290 Hz	0.708076 G	> -9	0 %	100 %
5	2300 Hz	0.708076 G	> 0	0 %	100 %

Insert Delete First Last Import... Synthesize ☒ Use the same Tolerance for all breakpoints

Set SRS Analysis Parameters

Import	Create	Schedule	Parameters	Limits	Pre-Test	Channels	Data	Tables	Calc	Breakpoints	SRS
SRS Analysis											
Damping = 5 %											
Q = 10											
SRS Analysis Frequencies											
1/N Octave Intervals											
SRS Analysis Frequency Range											
1 to 10000 Hz											
SRS Frequency Resolution:											
1 / 6 octave											
Create SRS test from pulse											

Run the Test

- Create Graphs

- Acceleration vs. Time, vs. Freq
- Velocity vs. Time
- Displacement vs. Time
- Transmissibility

- SRS Acceleration (VR9302)
- SRS Pseudo Velocity (VR9302)
- Transfer Function (VR9607)
- Coherence (VR9607)

Graph 1 Graph 2 Graph 3

Graph Type

	vs. Time	vs. Freq.	Peak History
Acceleration	☒	☐	☐
Velocity	☐	☐	☐
Displacement	☐	☐	☐
Output Drive	☐	☐	☐
Transmissibility	☐	☐	☐
SRS Acceleration	☐	☐	☐
SRS Pseudo Velocity	☐	☐	☐

Rear Inputs ☐

Drive vs Input ☐

Text Window ☐

Phase ☐

Transfer Function ☐

Coherence ☐

Control Loop

☒ Loop 1

Axis Limits

	Minimum	Maximum	Scale	Continuous Autoscaling
X-Axis	-200	1200	ms	☐
Y-Axis	-5	15	Linear	☒

Graph Traces

☒ Control Loop Traces

☒ Demand	---	
☒ Control	---	
☒ Tolerance	----	
☐ Abort		

☒ Input Channels

1 ☒ Ch1	---	
2 ☐ Ch2		
3 ☐ Ch3		
4 ☐ Ch4		

- User Defined Transient Applications
- Create and Run User Defined Test
 - Using a synthetic waveform
 - Sine Beat, Damped Sine Wave
 - Using a field recorded transient waveform
- UDT – Key profile parameters
- UDT – Available Graphs and Add-on Software

Any Questions?



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