Mask Off Inc.

THE FUTURE OF SPACEFLIGHT TESTING

Northrop Grumman Vibration Testing

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Background

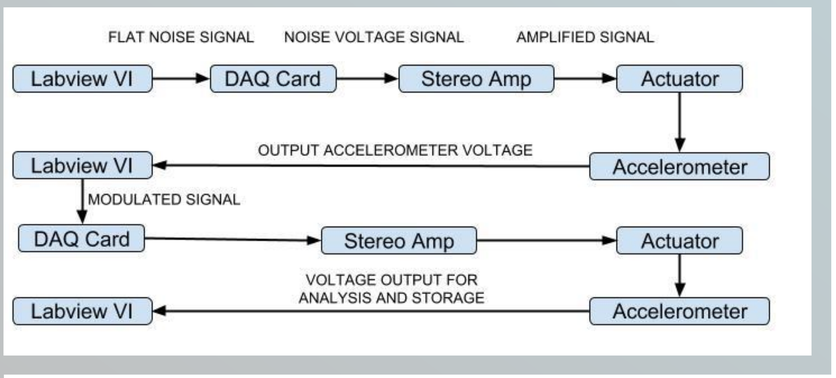
Mask Off has developed a robust and versatile vibration testing apparatus. This apparatus quickly assess the durability of newly designed circuit boards in a simulated spaceflight environment. The project integrates hardware trade-studies, design optimization, and a custom LabVIEW VI in order to hit industry standard specifications and cut the current market price by 85%.

Overview / Design Specs

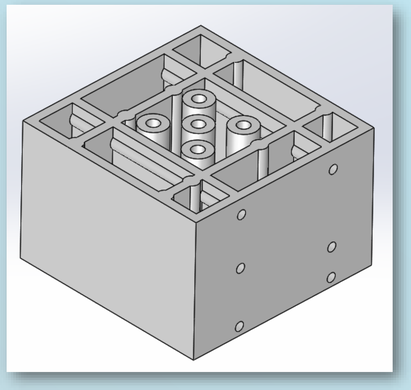
- Cheaper, quicker, less complicated apparatus
- Desktop, portable
- Narrower scope for testing

Engineering Characteristic	Target Specification	Achieved
Frequency Range	100-1000 Hz	100-1000 Hz
Natural Frequency of Fixture	>1000 Hz	1192 Hz
Power Spectral Density	Given Chart	Custom User Input
GRMS	16.96 g	9.52 g

Functional Flow Diagram

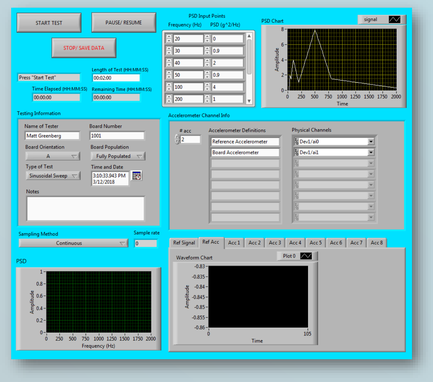


Final Fixture Design



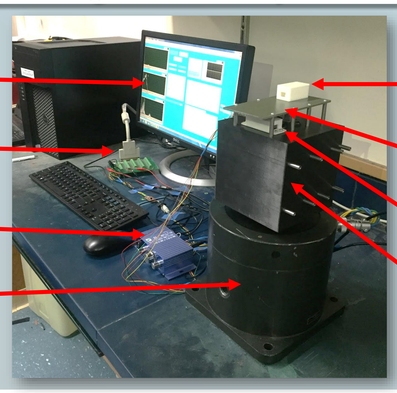
- 3D printed cubic structure made of polylactic acid
- Maximize stiffness with 6 sets of internal ribs
- Minimize weight with hollowed out interior

LabVIEW VI

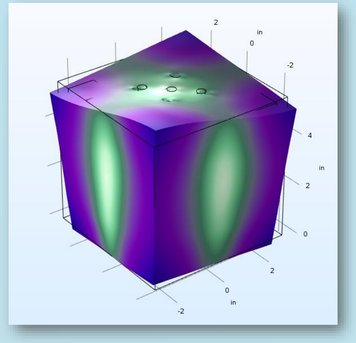


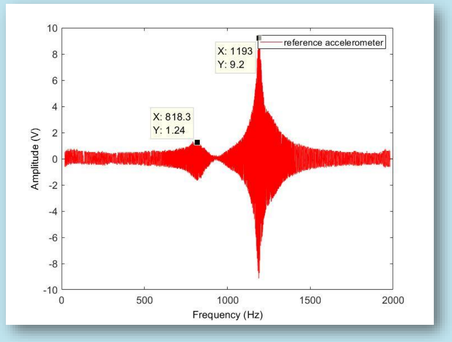
- Input PSD breakpoints
- Multiple signal generation capabilities
- Live plots of test data
- Multiple data acquisition methods
- Variable accelerometer channels
- Data exportation and storage

Integrated System



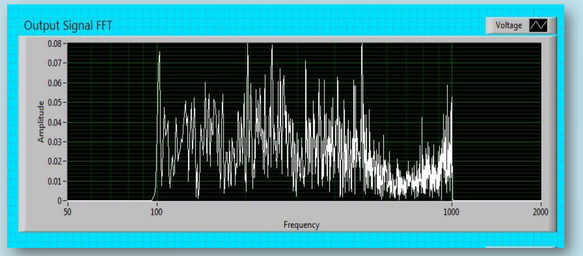
Fixture Resonance Test



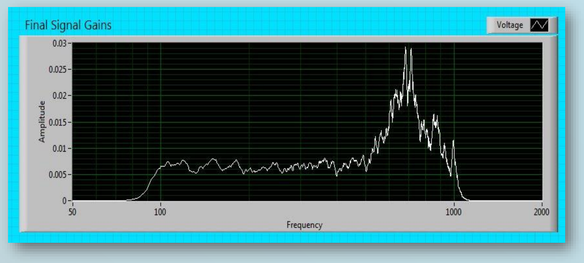


- COMSOL model (left) used to run eigenfrequency test
- Accelerometer output (right) from a sinusoidal sweep
- Peak resonance at 1192 Hz

PSD Output Confirmation



- Initial accelerometer output FFT, corresponding to specific gains at individual frequencies
- Equalized defined output signal sent to actuator



- PSD of final reference accelerometer outputs
- Compared to output FFT to calculated gains for signal equalization

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NORTHROP GRUMMAN

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