SAND2016-7037C

Exceptional service in the national interest

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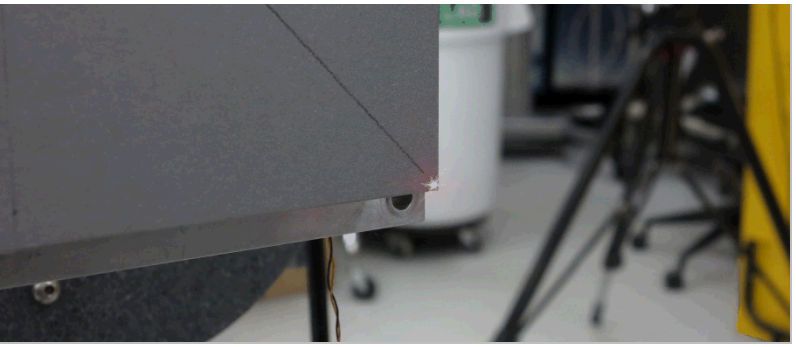

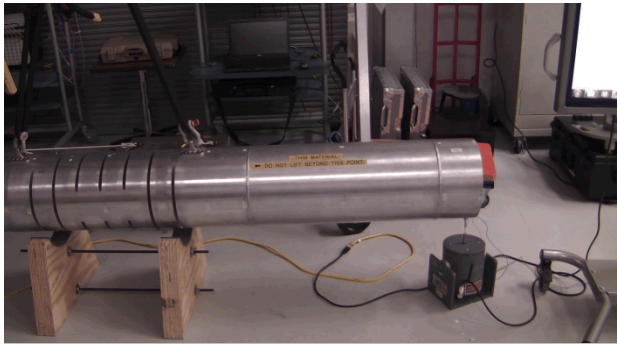

What we've been doing with the 3D SLDV

Dan Rohe

Dept. 1522, Structural Dynamics

U.S. DEPARTMENT OF ENERGY

National Nuclear Security Administration

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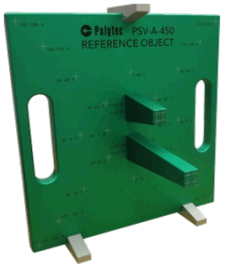
Our Laser System

- Polytec PSV-500 3D H/V
- Hybrid System with High and Low Frequency Capabilities
  - 100 kHz, 8 measurement channels + 3 vibrometer channels, 4 uncorrelated output channels
  - 25 MHz, 4 channels including vibrometer channels, 1 output channel
- Other Accessories
  - External Camera
  - Mirror Set
  - Reference Object
  - Desktop Stand



3D SLDV experiences this past year

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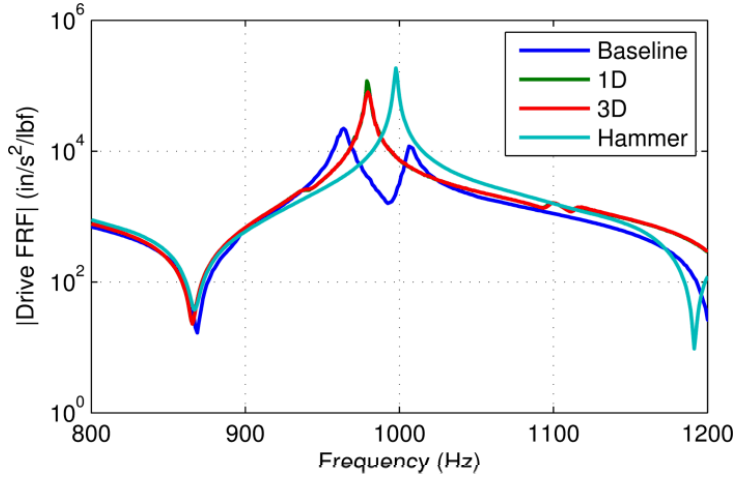
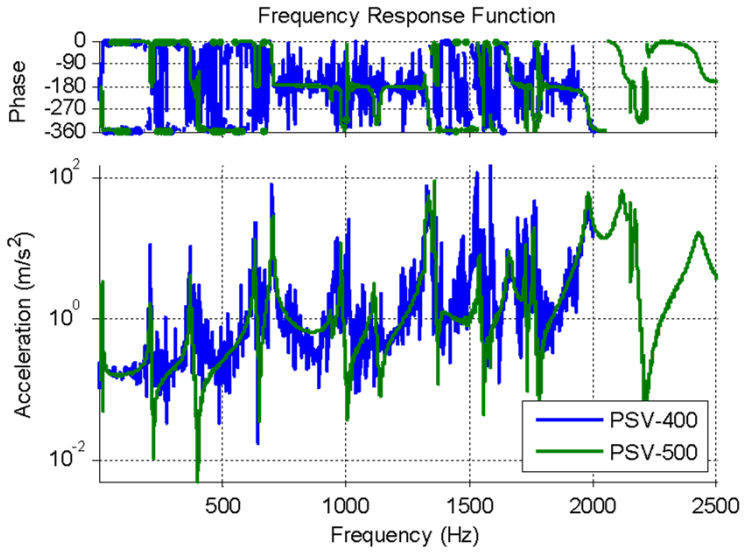
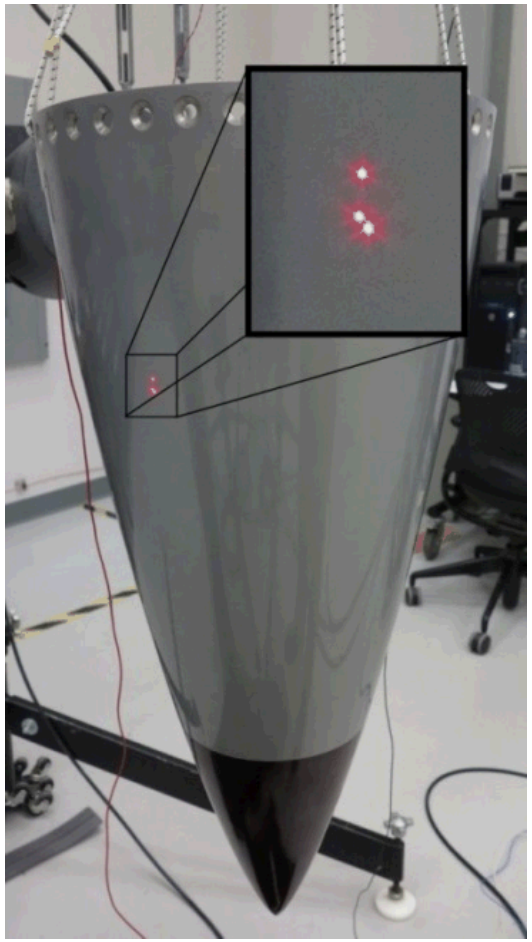
- Modal Testing
  - Large Structures: Large Tubes/Cylinders, wind turbines
  - Medium Parts: Plates, beams, cones, cylinders
  - Small Parts: Connectors, Springs, Gears, Ultrasonic Test Articles
- DIC Comparison/Strain Investigation
- Macros written to improve/enhance testing capabilities

Comparison between PSV-400/500







Mass loading and vibration absorber due to stinger.

Plate Test/Comparison to DIC

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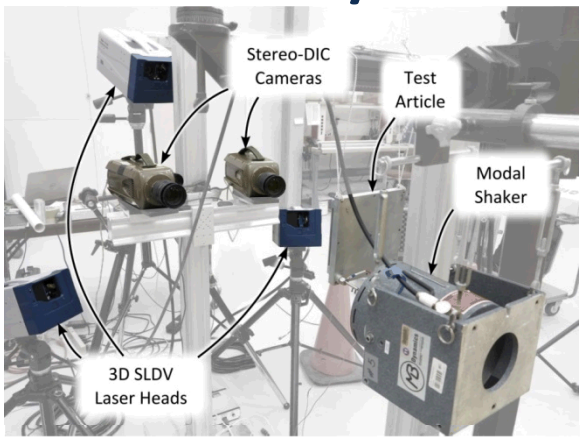

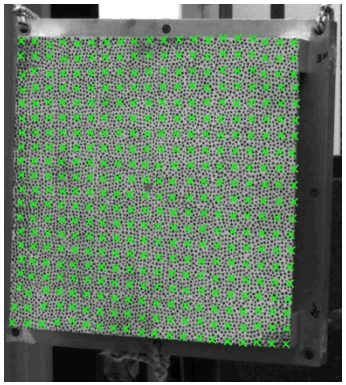

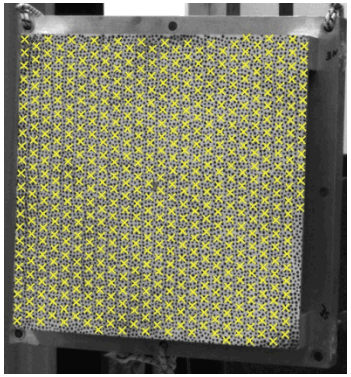

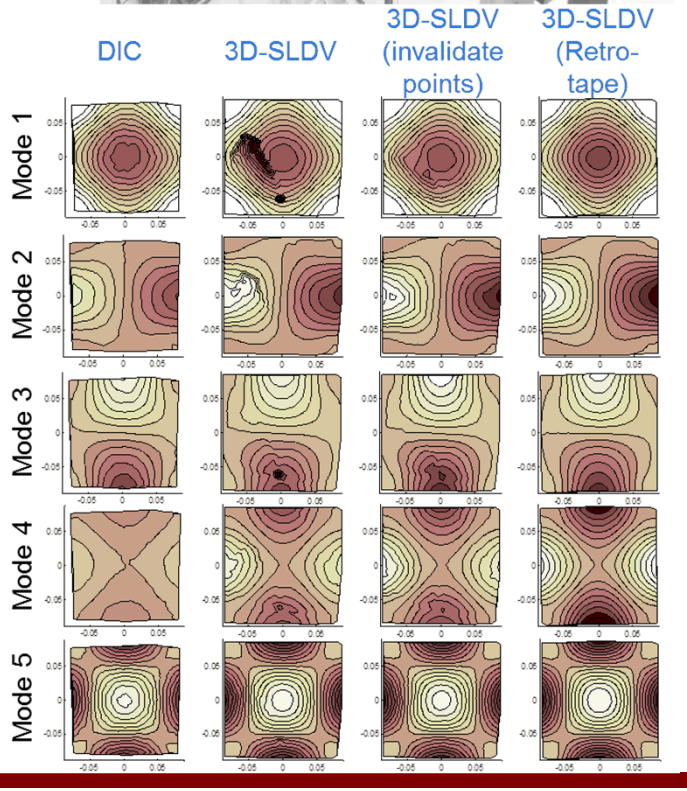

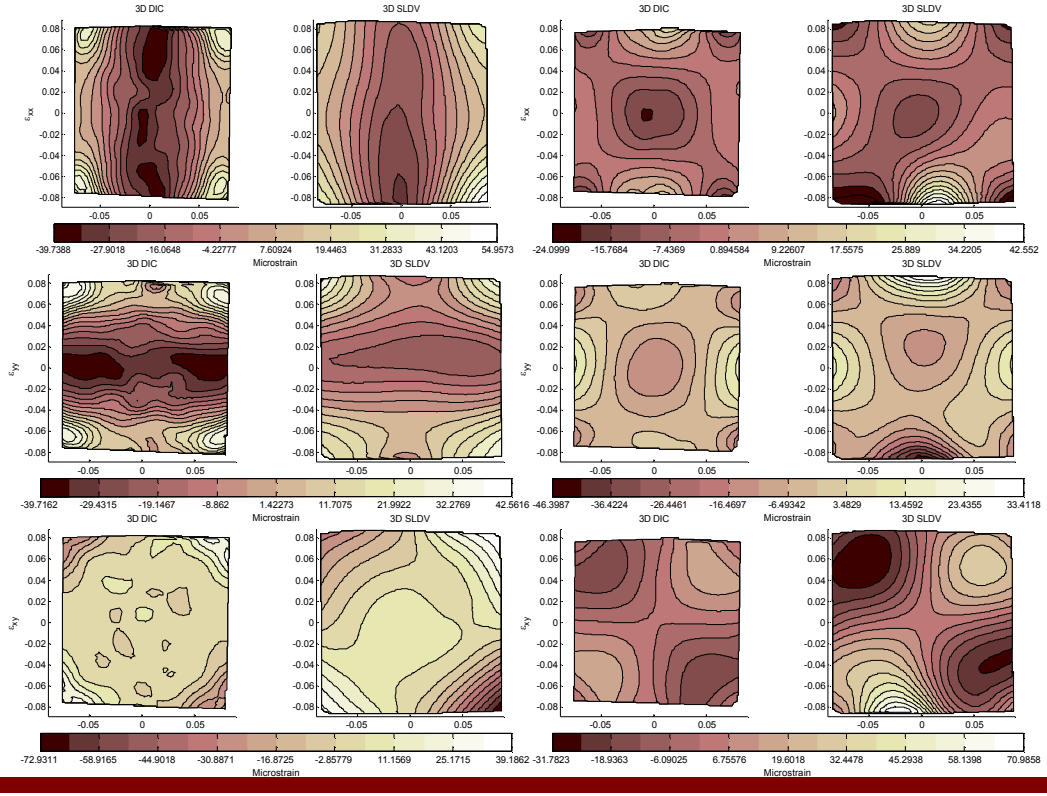

Mode 1

Mode 5

Increasing the frequency band using Impacts

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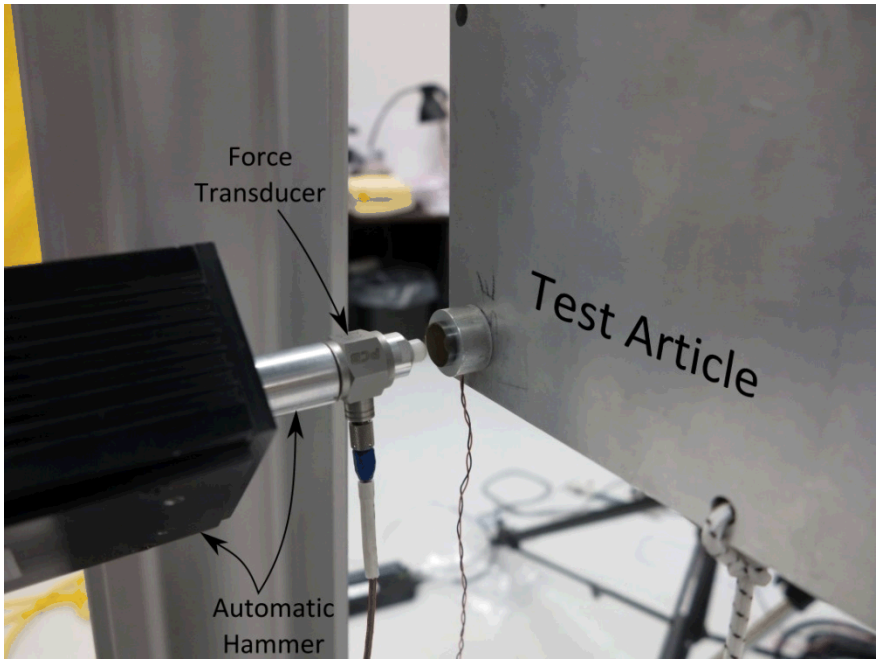
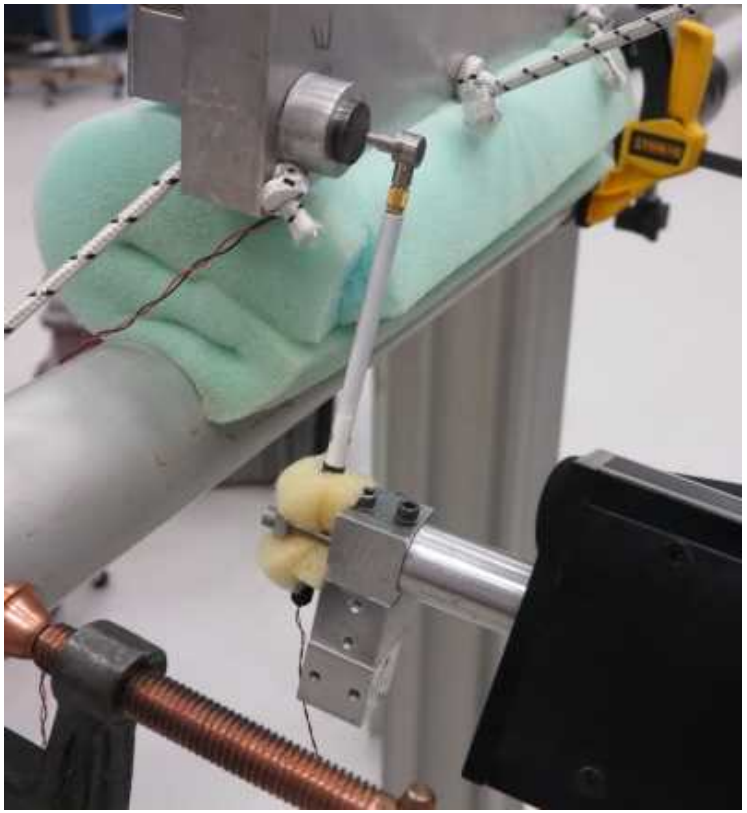
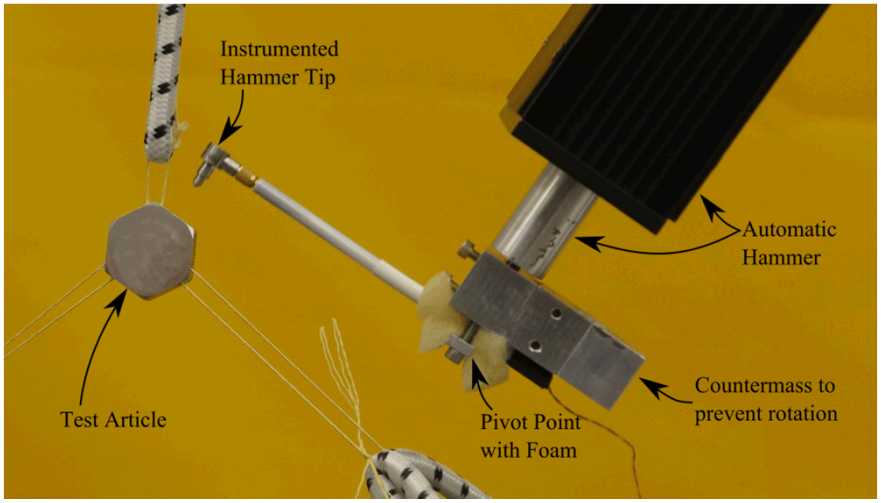
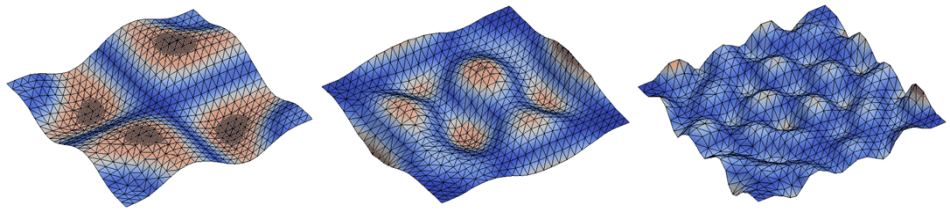
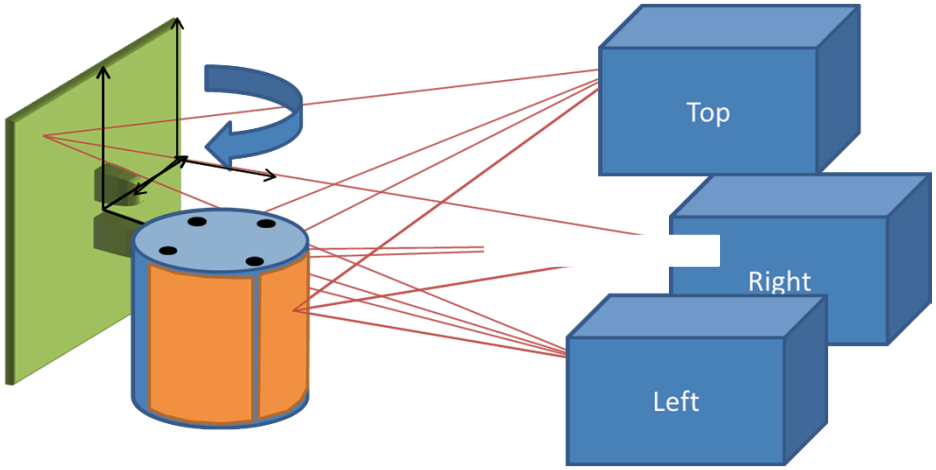






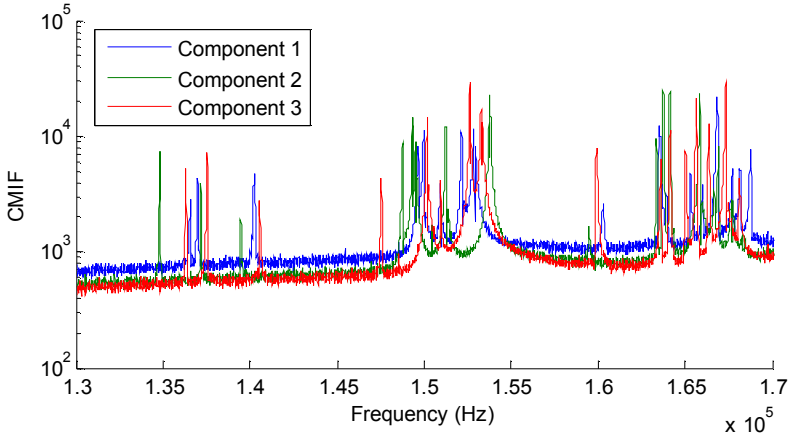


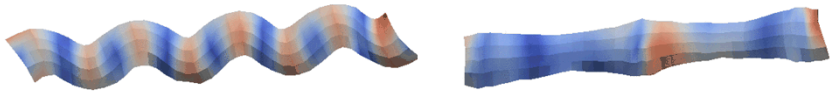
Cylinder Testing

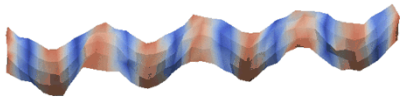


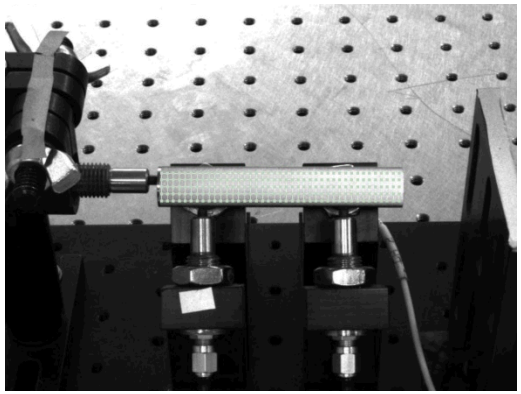
Ultrasonic Testing

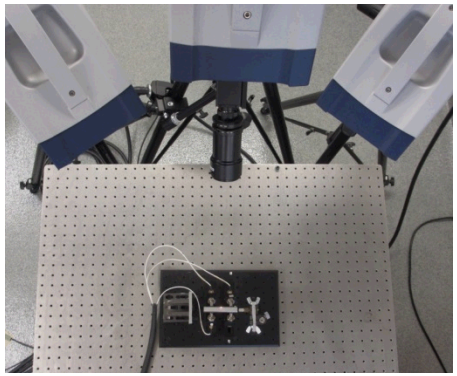
- Data was taken out to 200 kHz
- When you do ultrasonic testing, how do you measure the input?





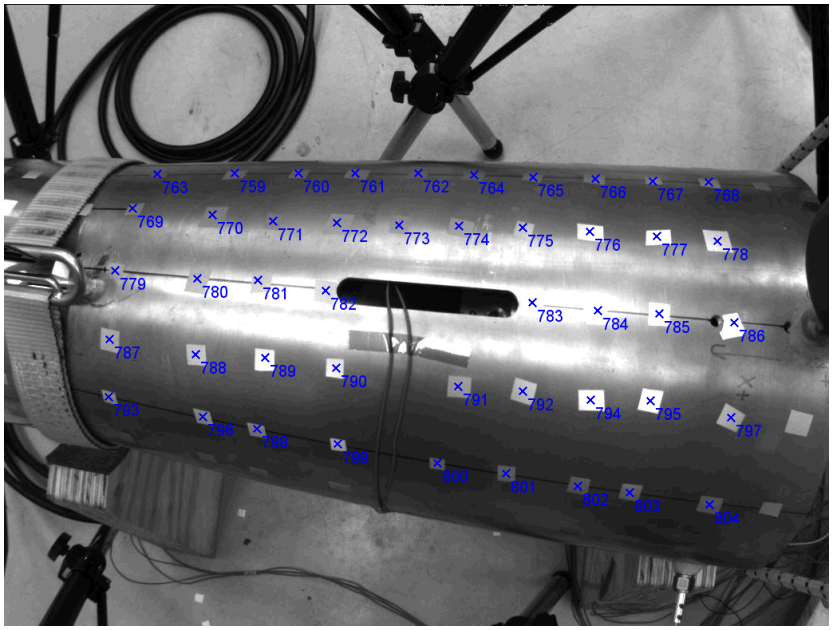


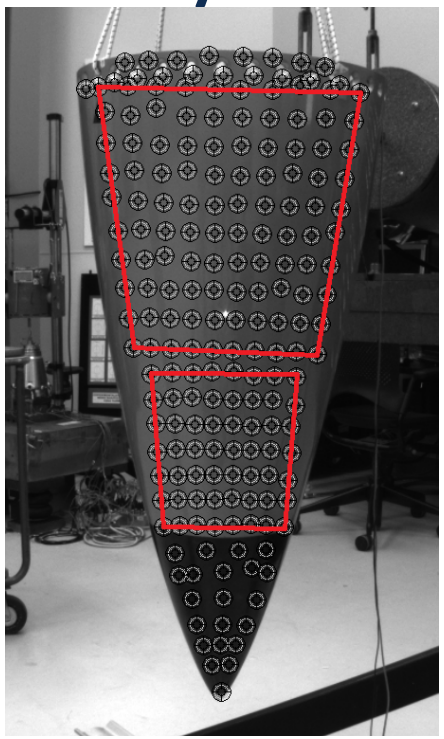


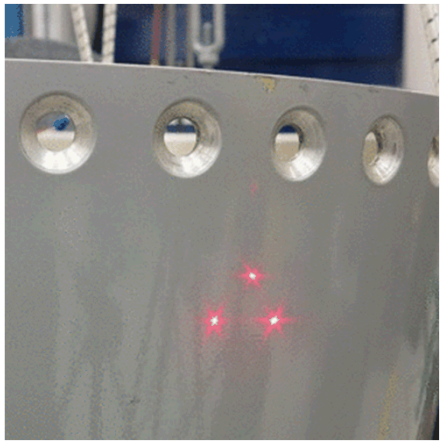


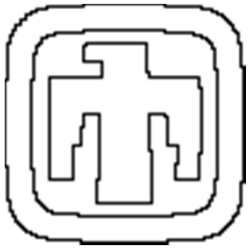
Scripting the 3D SLDV System

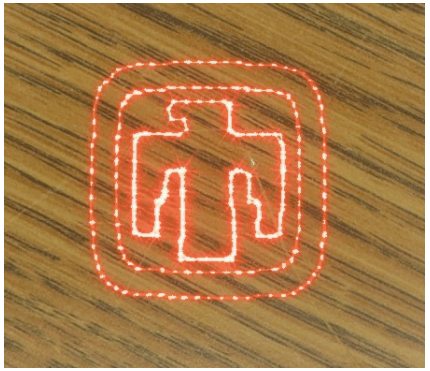
- Automatic 2D Alignment
- Triangulate Beams
- Drive lasers in 3D
- Automatic Documentation creation
- 3D SLDV Drawing
- What is best way to find the path to an object in the acquisition object?
- Are other tools (real-time video image, laser spot finder, etc) going to be opened up to users?



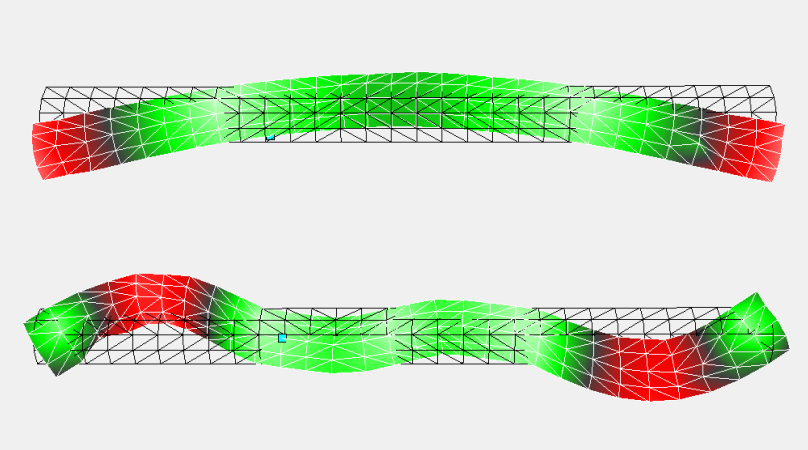


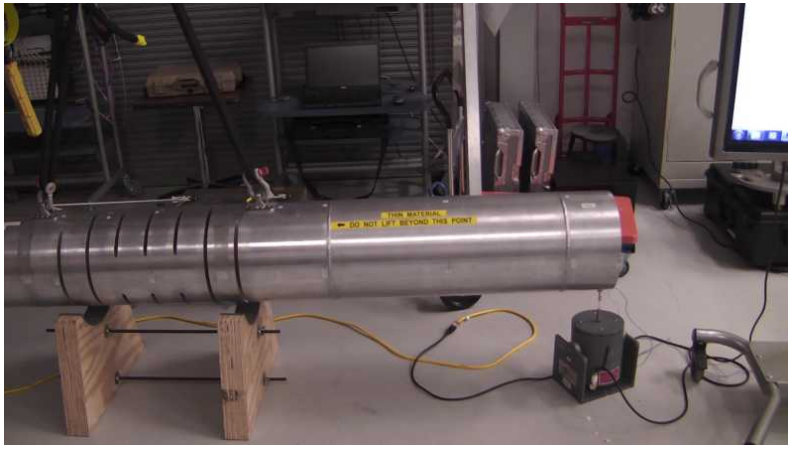


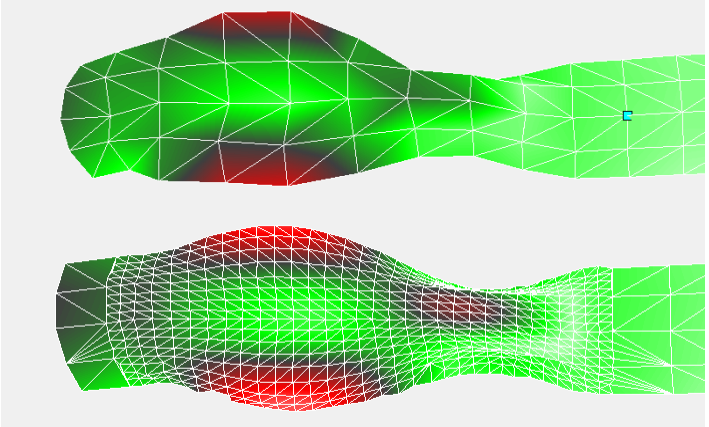


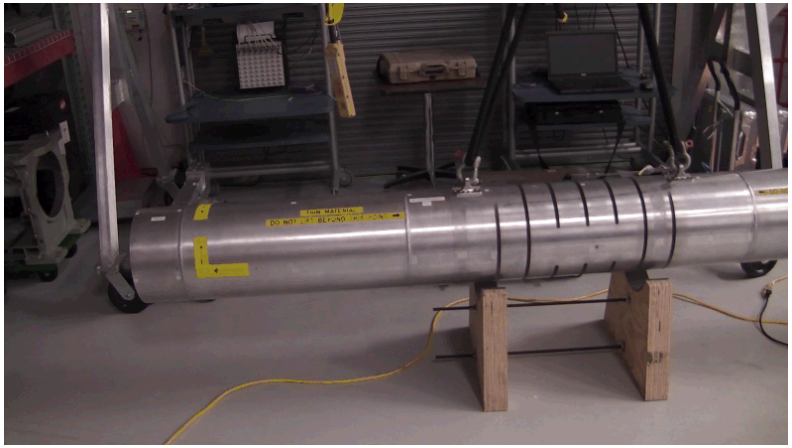


Big Cylinders From Far Away









Big Cylinders Using Mirrors

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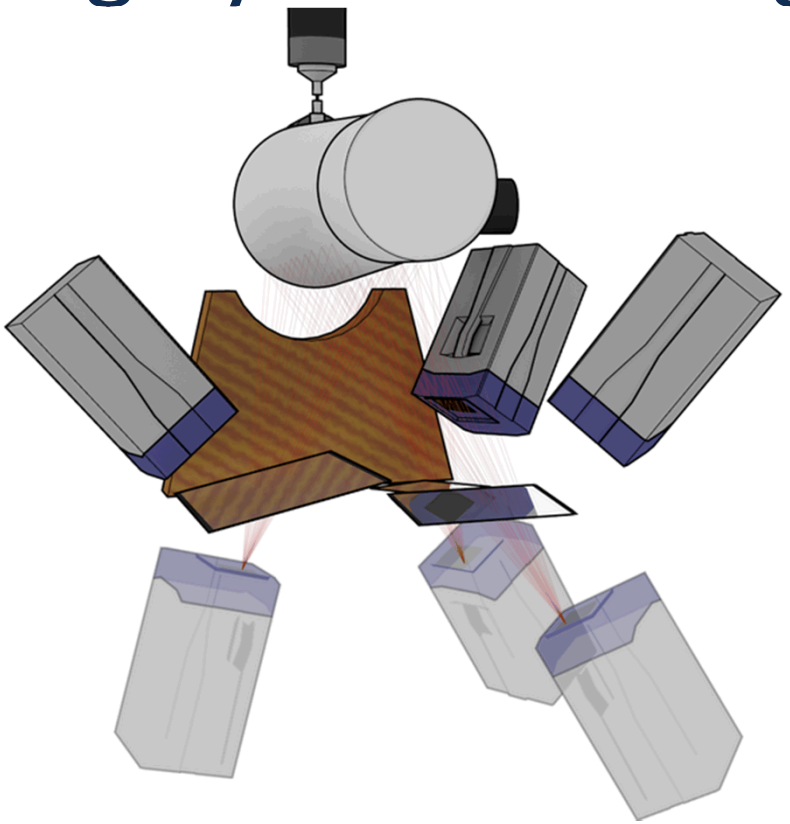

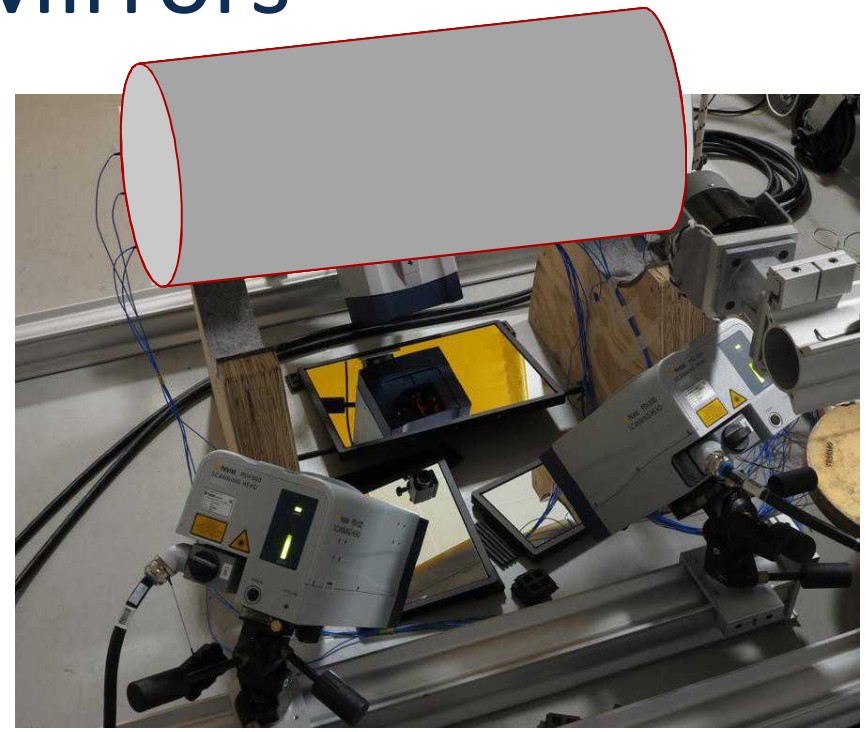

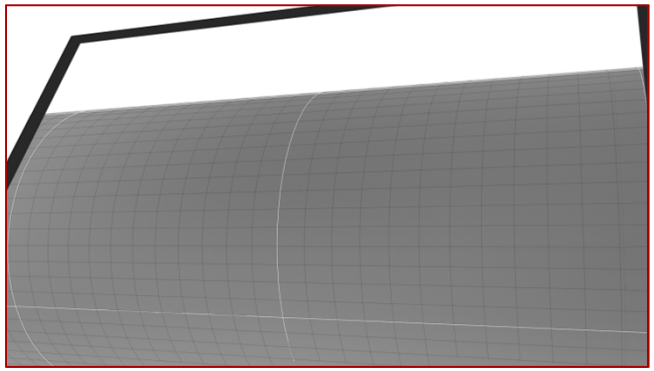

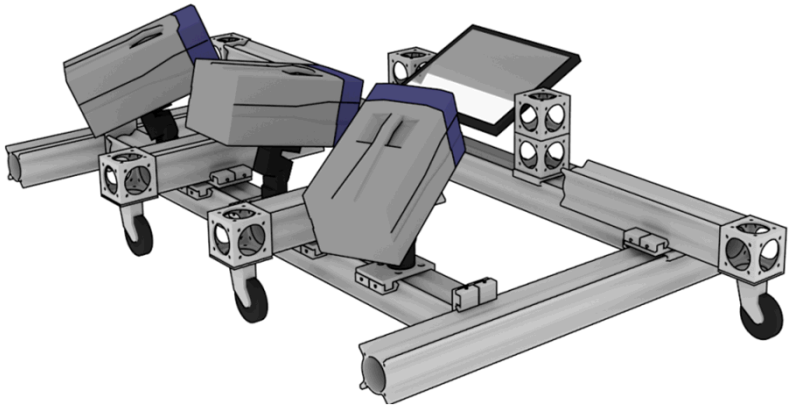

Where do we want to go?

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- Scanning mesoscale parts (very small springs, gears, etc.) perhaps requiring MSA
- Scanning large parts with large accelerometer channel count
- Scanning parts exposed to some environment (hot/cold parts)
- Incorporate high-frequency piezo-electric testing
- Automate more of the testing
  - Make a smarter 2D alignment macro
  - Automate 3D alignment perhaps using image recognition algorithms?