STS-1-VBB Sensor Replacement Program

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VBB Sensor Design and Status

Non-Galperin architecture (separate H and V sensor designs)

Very similar to original STS-1

Factory-leveled sensor elements: no field leveling required (ala STS-2)

Triaxial package with "warpless" design and kinematic sensor mounting

External electronics (slightly modified version of STS1-E300)

Modern, "volume-manufactured" design with adequate production throughput

High-level of modularity:

Sensors, electronics, and cabling can be swapped out during field maintenance

Individual components can be replaced by Metrozet

Rather than returning entire system for repair

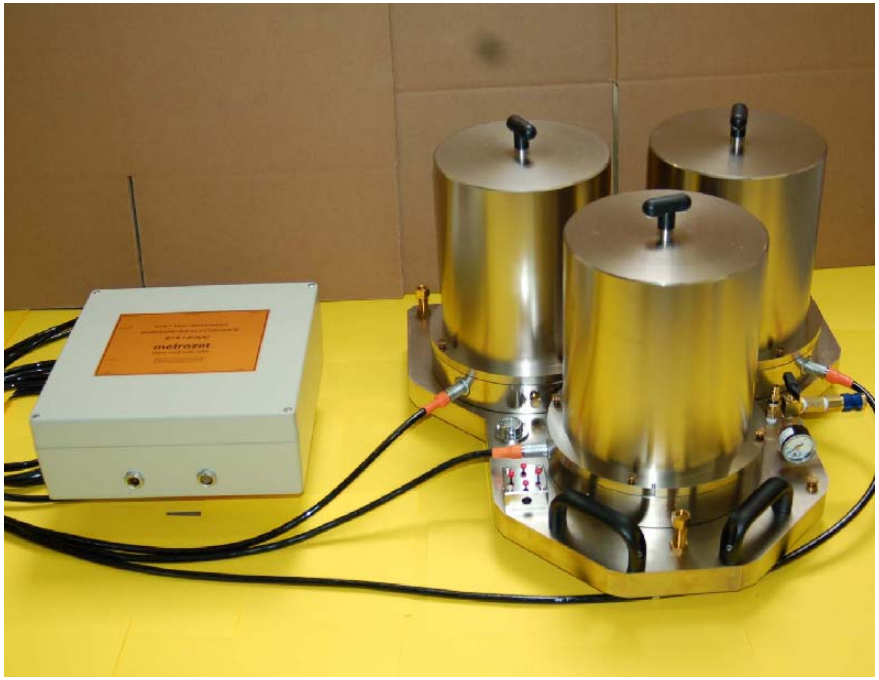
2008-2009 development testing at UC Berkeley (BKS) indicated sensor performance similar to BKS STS-1 sensors

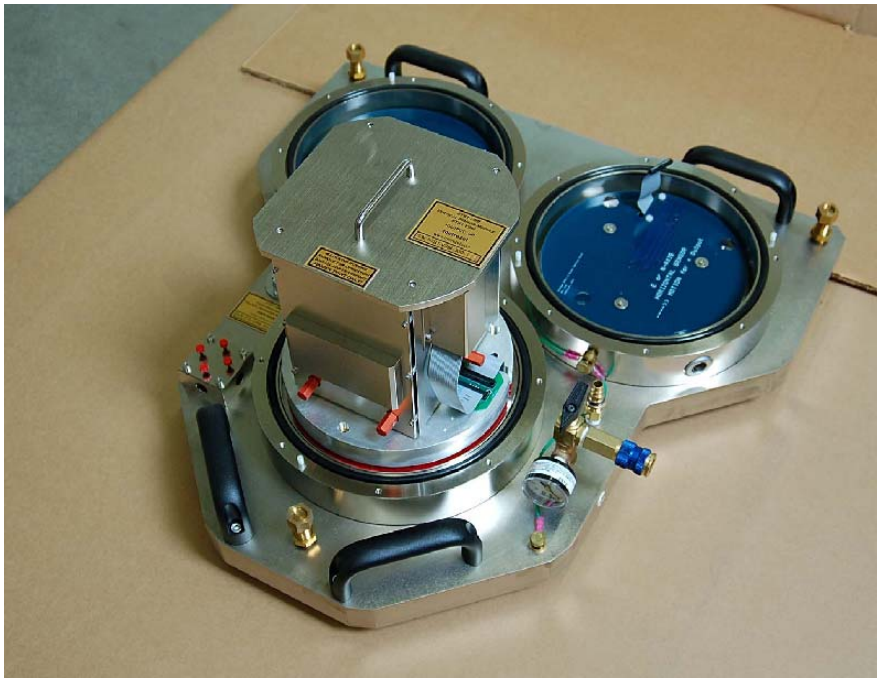
2010 Has focused on development of VBB commercial prototypes:

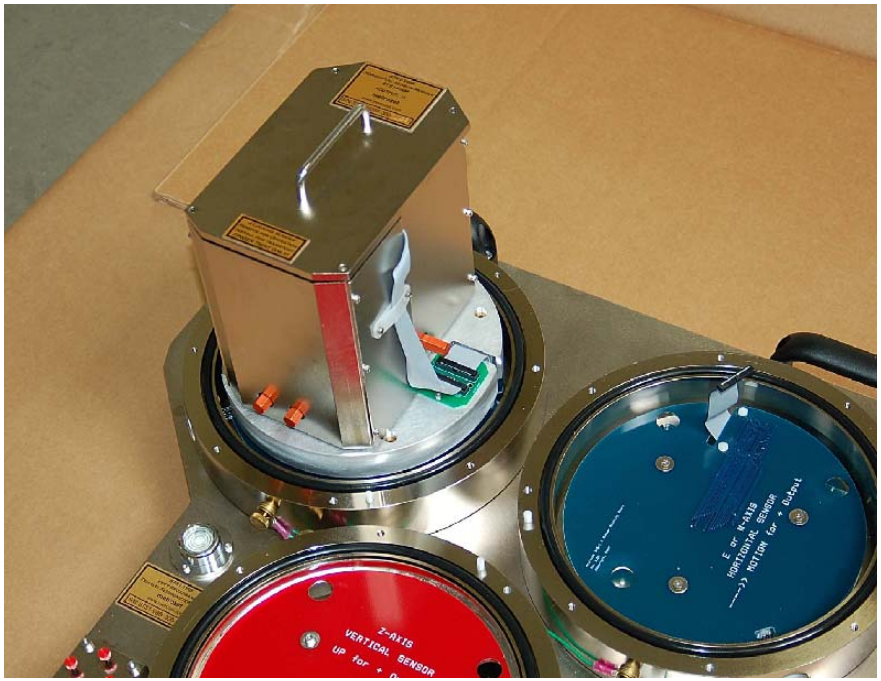
12 triaxial packages

12 sets of modified electronics,

15 triaxial sets of sensor elements


metrozet




Z-AXIS
VERTICAL SENSOR

VBB Commercial Prototype Testing

Initial functional test at Byerly Vault (BKS)
- Began in April, 2010
- 8 systems evaluated to date

Longer-term performance testing at HRV
- May, 2010 through January, 2011
- 6 triaxial packages and 7 triaxial sensor sets evaluated to date
  - 2 to 3 month measurement period
- Cross-comparison with HRV GSN STS-1 sensors in vault

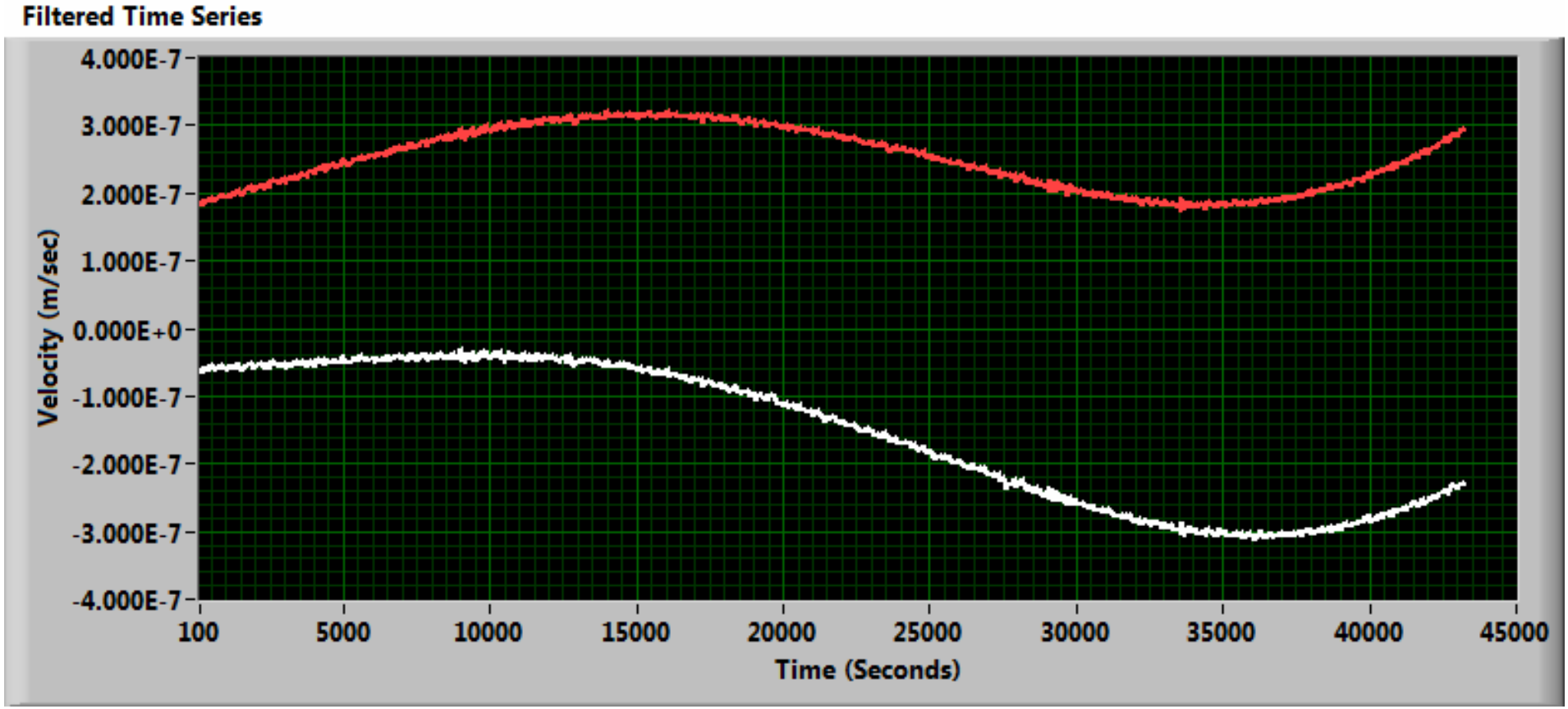
Partner/Customer evaluation at ASL: September 2010-February 2011
- 2 complete systems installed: one in cross-tunnel and one in outer vault
- Cross-tunnel system installed on granite slab with (unpackaged) STS-1H pair
- Sand-packed STS-1Z is on tunnel floor, adjacent to slab

One complete system (so-called "MET22") is now retained at ASL on semi-permanent basis

Another system (so-called "MET06") is now retained at BKS on semi-permanent basis

Data from ASL

Vertical Sensor: 2 Days after "final" installation of sensors in cross-tunnel

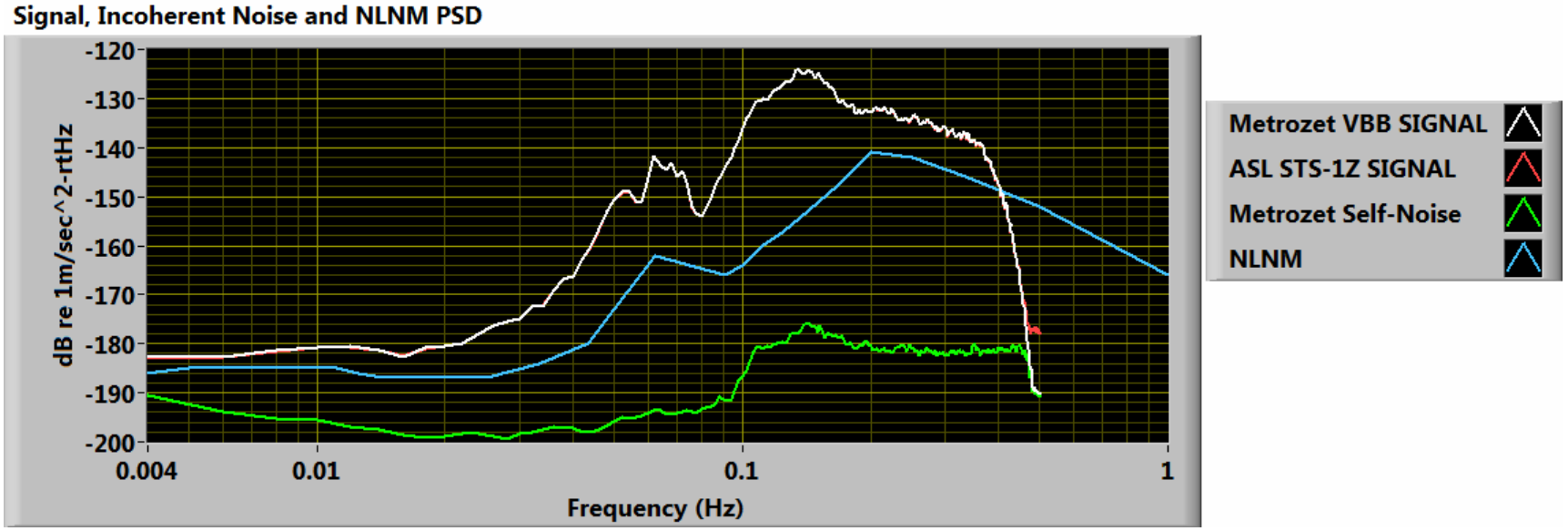


White: Metrozet Z Prototype in Triaxial Package
Red: ASL Reference STS-1Z Sand-Packed

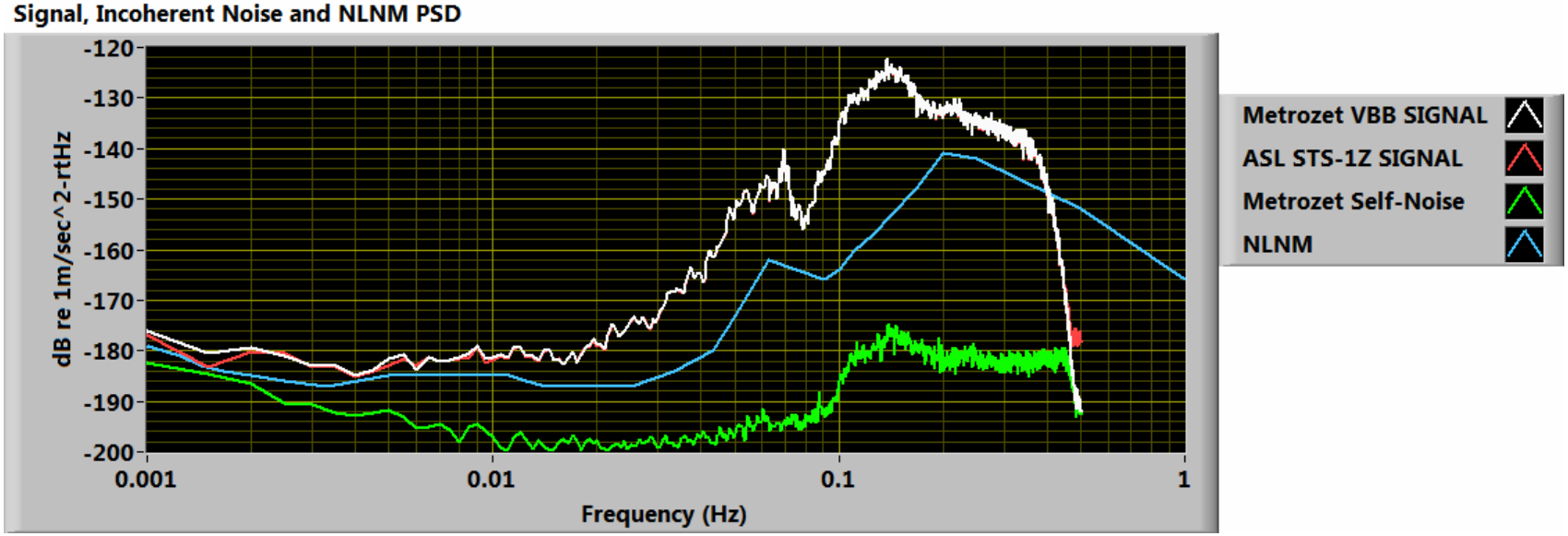
Day 274 data; 30 second LP Filtered; Scalar-Deconvolved Only;
Not Deconvolved of Poles/Zeros

Power Spectral Density (PSD) Analysis

ASL day 274 data: 500 Second Pieces, 80 averages, 0% overlap; equivalent sensor assumption



Same data: 2000 Second Pieces, 20 averages, % overlap; equivalent sensor assumption



Japan M9.0 Event Captured faithfully on systems installed at both UC Berkeley (BKS) and at ASL

For data or details, contact:

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BKS Data:
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Product Schedule

Late 2010: Address remaining technical issues and finalize commercial prototype sensors
Mid-2011: Release (sell) select prototype systems for customer evaluation
Late 2011: Expect to ship commercial systems in volume