

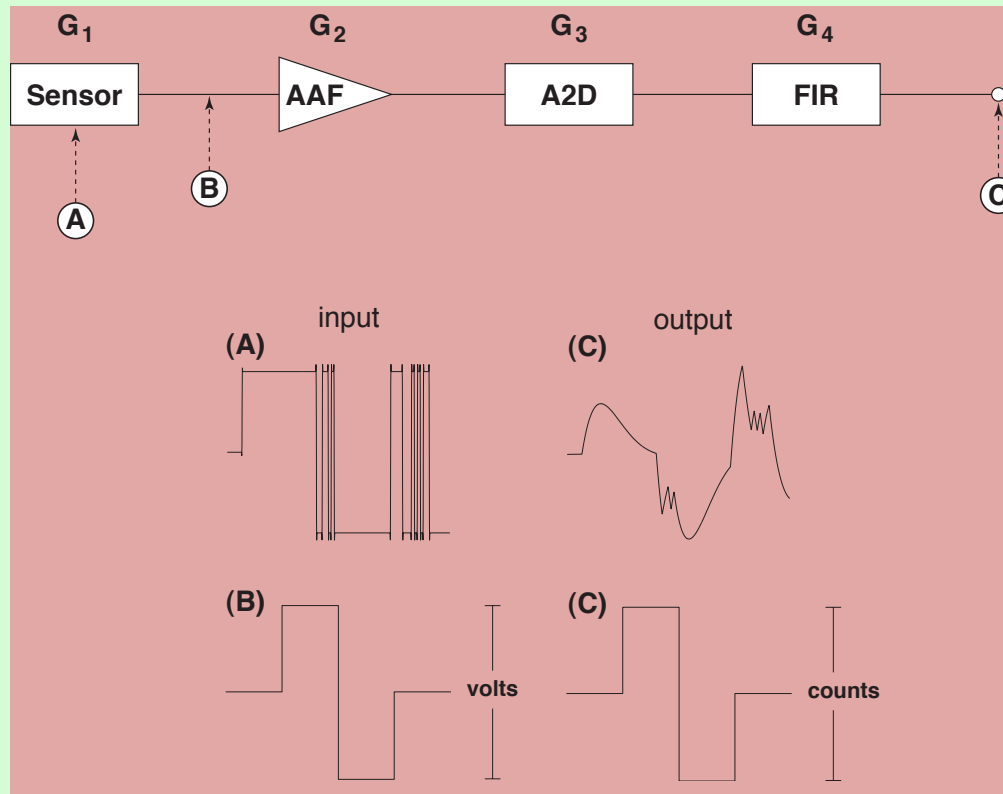
IDA GSN Calibration Procedures and Sensor Testing



Pete Davis, IGPP

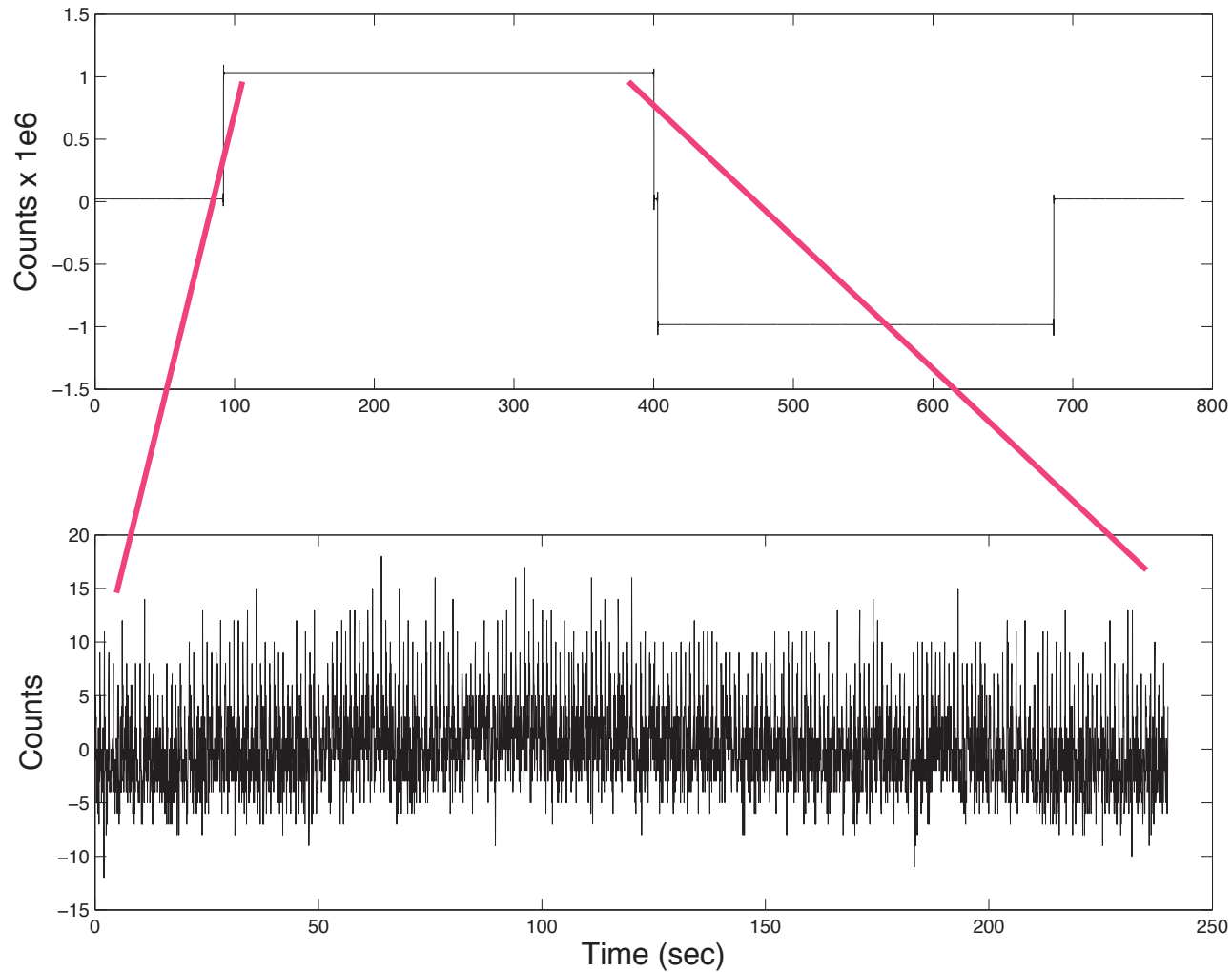
INTERNATIONAL DEPLOYMENT OF ACCELEROMETERS

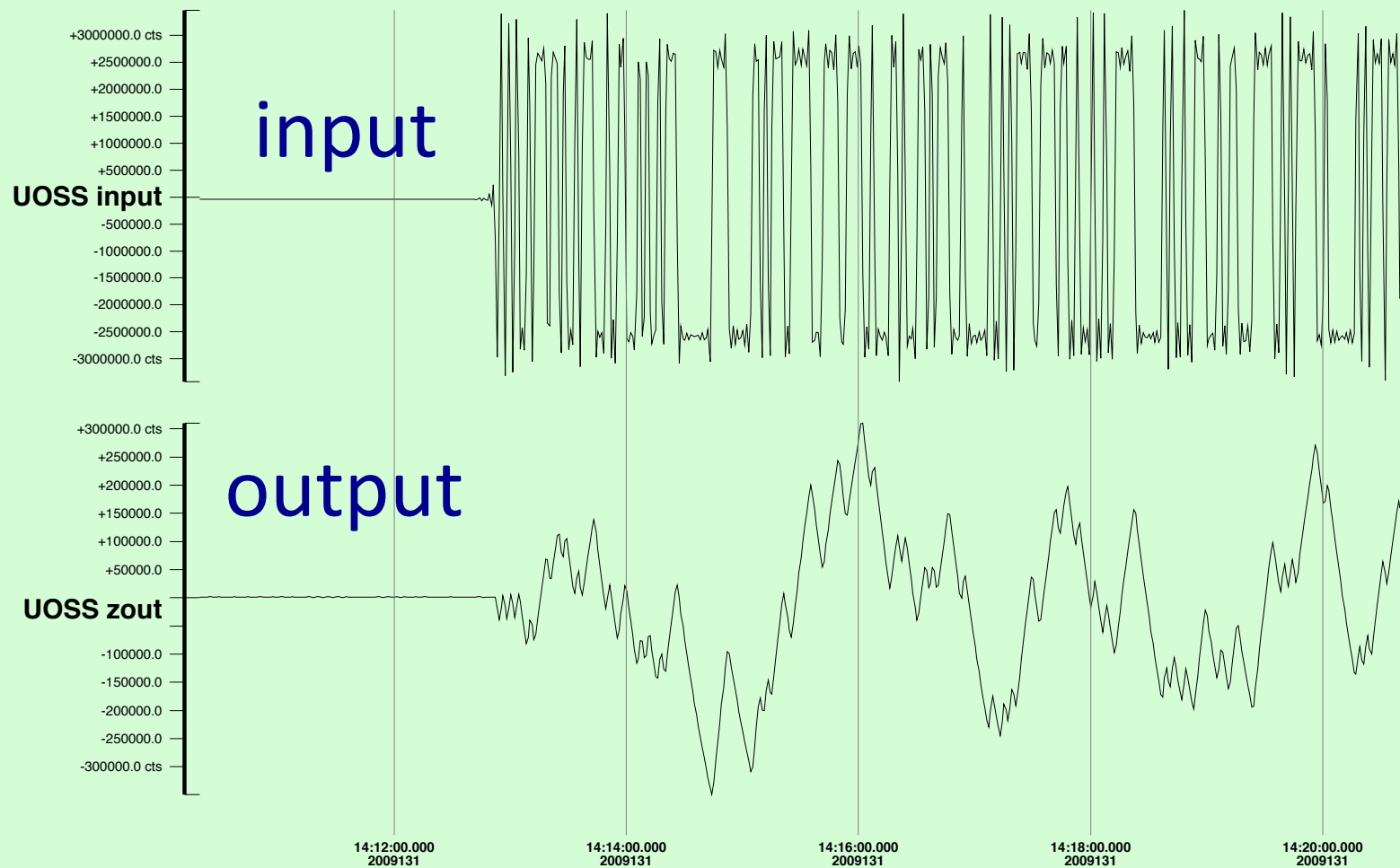
Metadata Accuracy



Traditional calibration procedures verify the DAS sensitivity and measure shape of system response.

DC Calibration Test



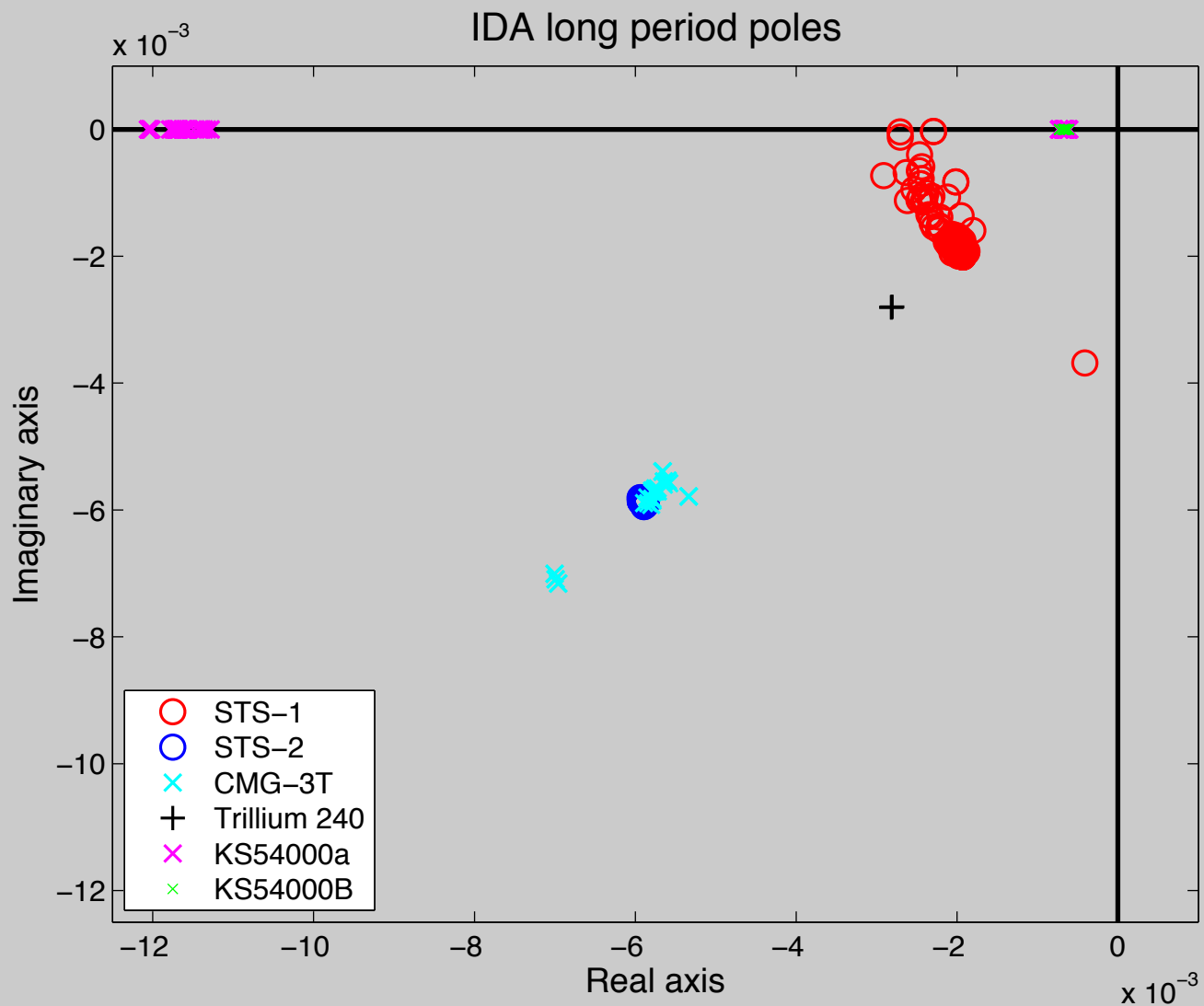


Filter: None, Amp: Auto

BRTT dbpick: rbtest /scr/day/pdavis/voo.ps pdavis Thu Jun 3 14:39:19 2010

$$(\text{Input}) * (\text{model}) - (\text{Output}) \\ = (\text{residual})$$

1. Choose manufacturer's model to start.
2. Change model to minimize residual.
3. If modeled output matches observed output within specification, accept model.



Outcome of pole-fitting at long periods.

What these tests measure:

- Random binary test determines shape of response curve within 1%
- Step input to digitizer determines DAS sensitivity to $> 0.1\%$
- Manufacturer provides value of sensor generator constant to within 1%



Nanometrics
compact Trillium
120 and Taurus
digitizer



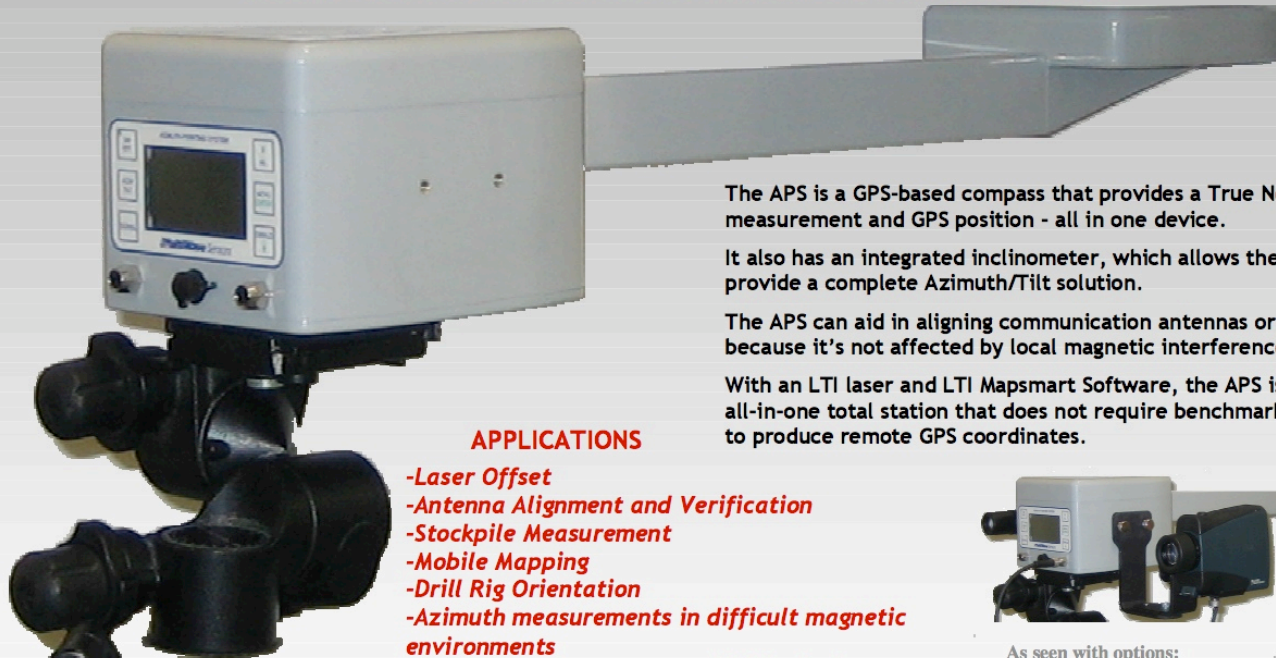
SenSorLoc Kit:

Calibrate with
independent, portable
sensor:



Azimuth Pointing System (APS)

A unique device that produces True North Azimuth measurements from a dual GPS receiver system



The APS is a GPS-based compass that provides a True North Azimuth measurement and GPS position - all in one device.

It also has an integrated inclinometer, which allows the system to provide a complete Azimuth/Tilt solution.

The APS can aid in aligning communication antennas or satellite dishes because it's not affected by local magnetic interference.

With an LTI laser and LTI Mapsmart Software, the APS is a powerful all-in-one total station that does not require benchmarks or backsights to produce remote GPS coordinates.

APPLICATIONS

- Laser Offset
- Antenna Alignment and Verification
- Stockpile Measurement
- Mobile Mapping
- Drill Rig Orientation
- Azimuth measurements in difficult magnetic environments
- Azimuth measurements at high latitudes
- Marine Mapping from a boat/ship



As seen with options:
Laser Technology Inc. TruPulse Laser and
Alignment Scope

For more information visit our website or contact us at :

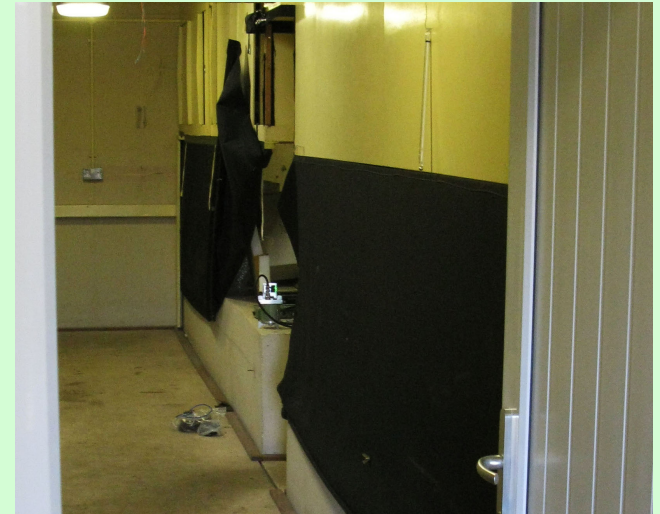
Multiwave Sensors Inc. 8510 Torbram Road, Unit #67,
Brampton, Ontario, Canada L6T 5C7
phone: 905 458 9060 email: info@multiwavesensors.com

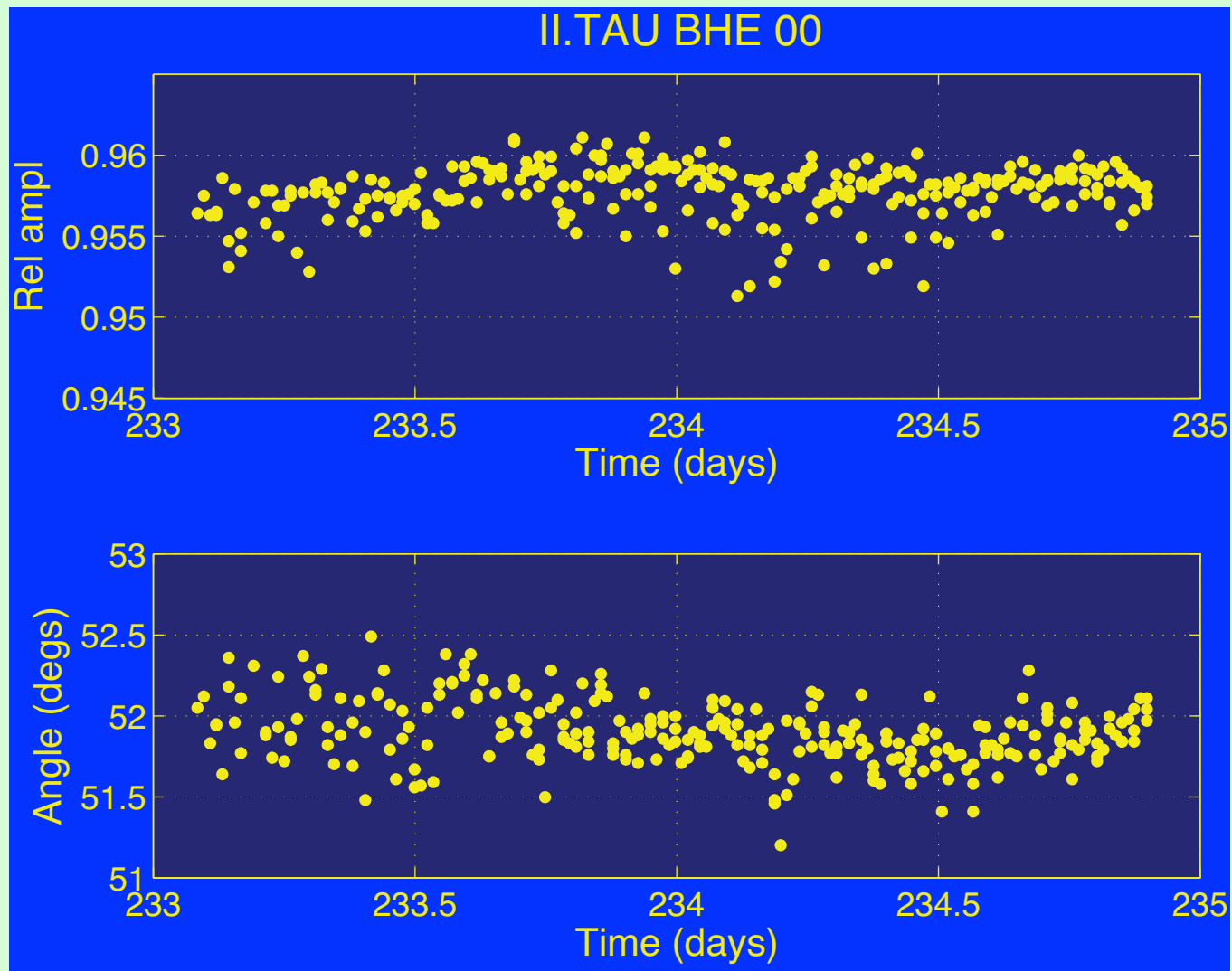
MultiWave Sensors

LASER
TECHNOLOGY
Measurably Superior™

Orient using Differential GPS Compass

APS used to measure orientation of Trillium



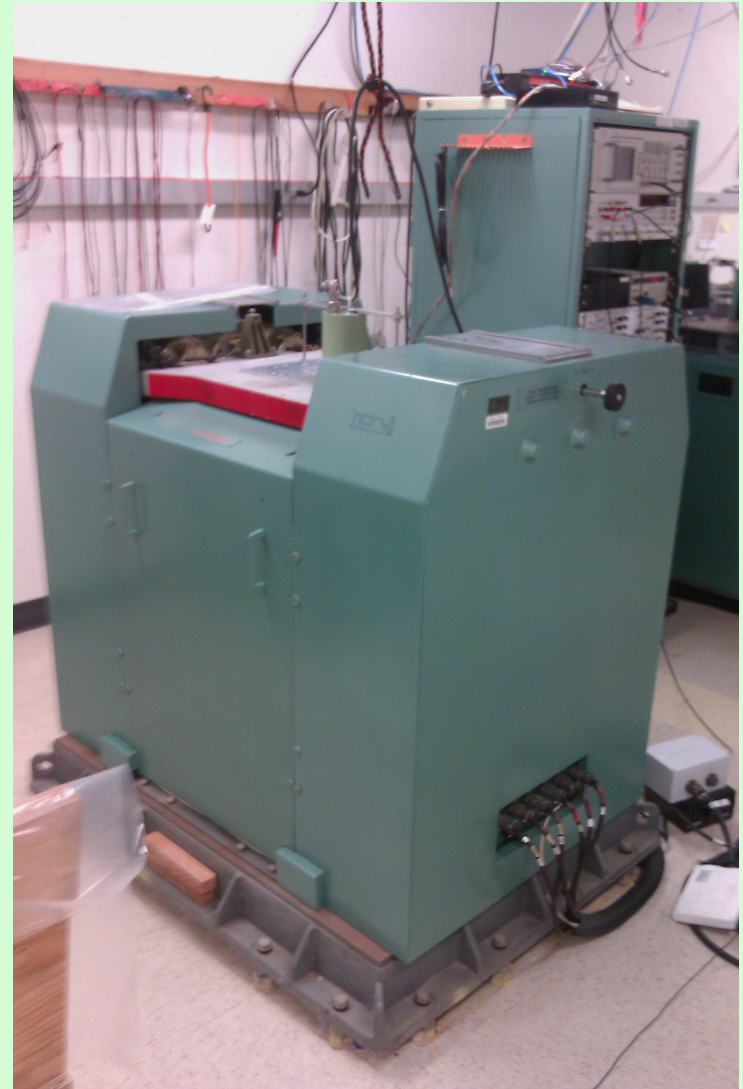


Analysis of microseisms yields relative amplitude accurate to $< 1\%$, orientation < 1 deg

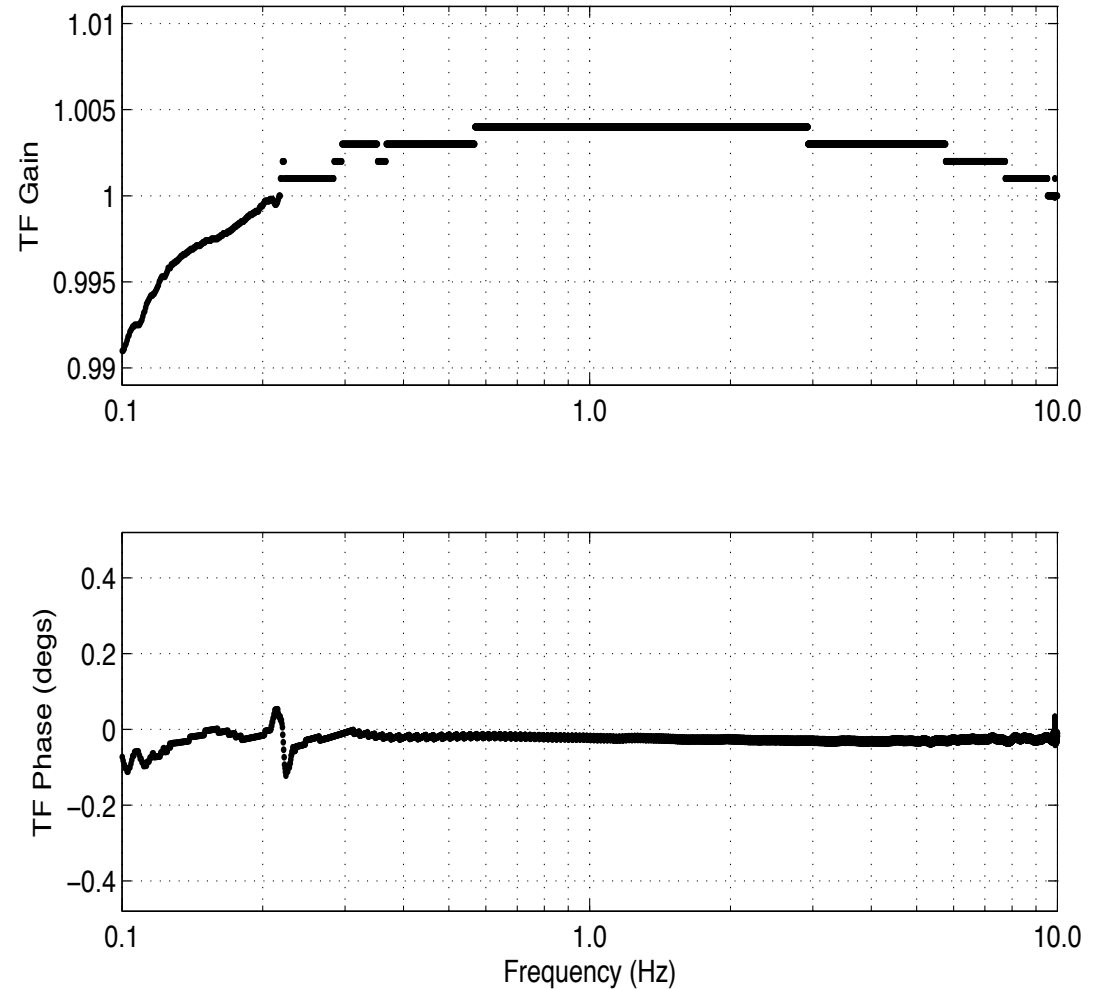


Shaketable at IGPP

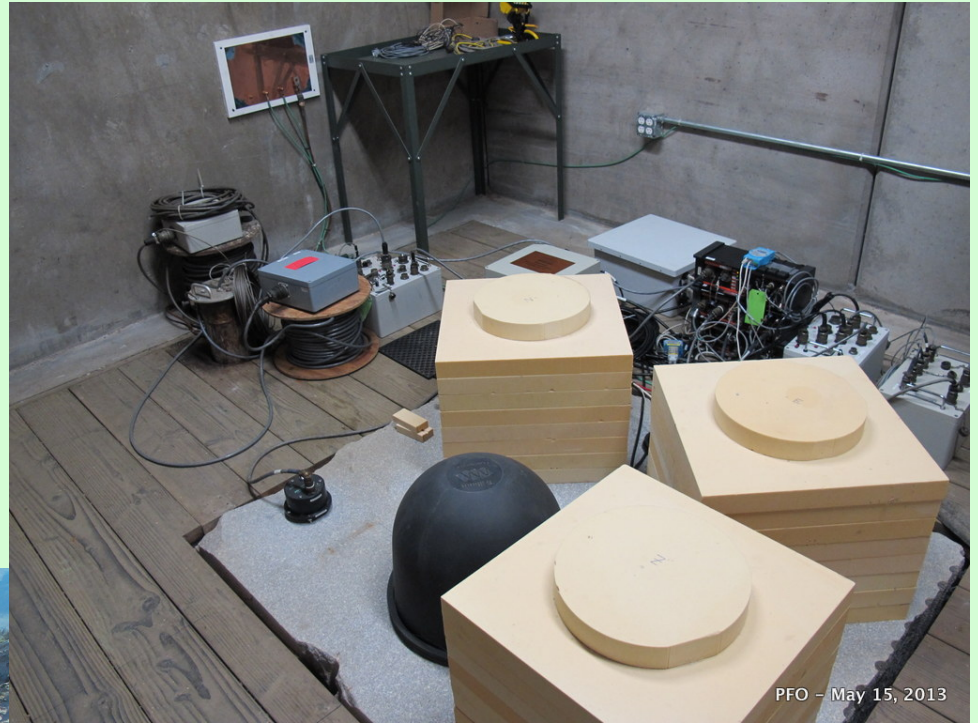
- Calibrated optically within $>0.5\%$



Shaketable results for the Compact Trillium seismometer



Testing Facility at Piñon Flat:



- Borehole next to GSN sensors

When under construction

Installation:



Old – KS54000 in 2013

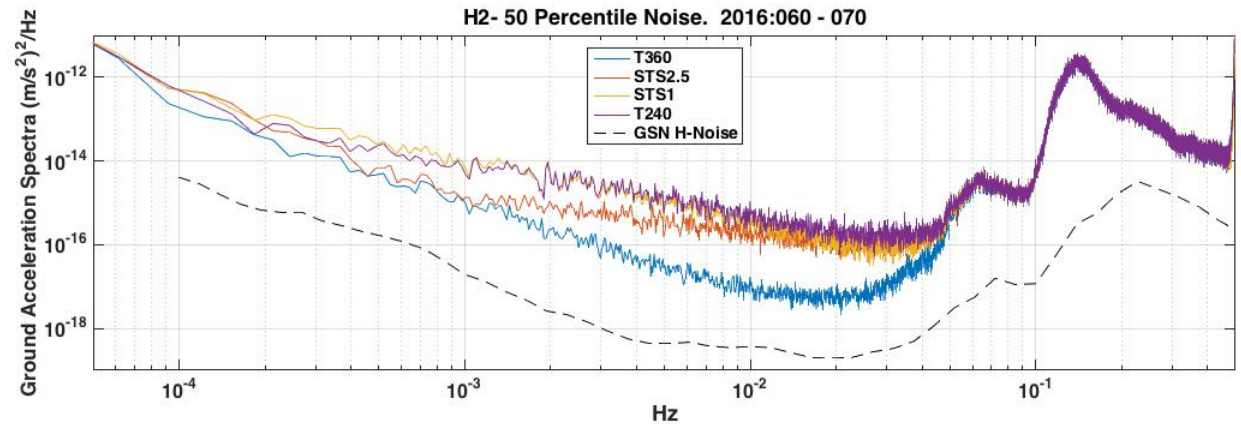
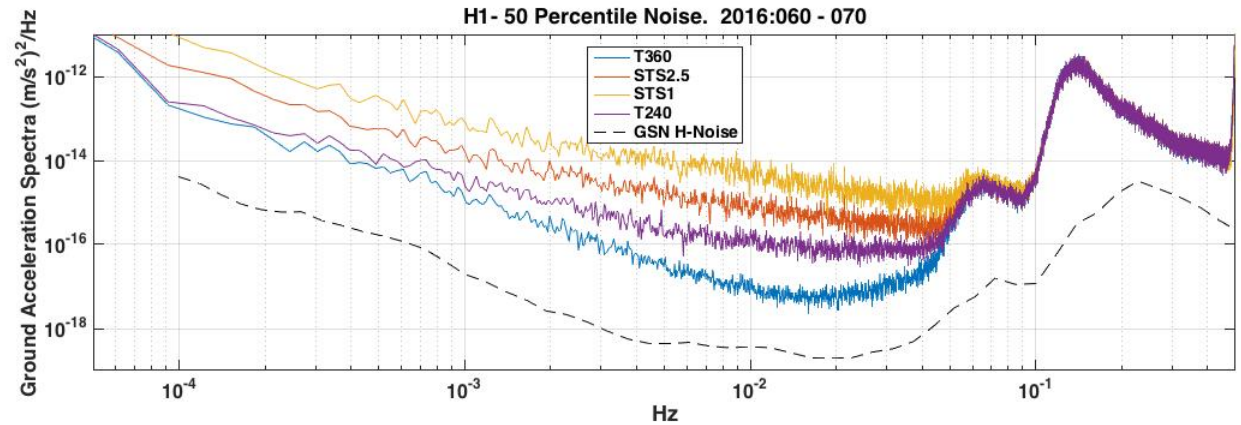
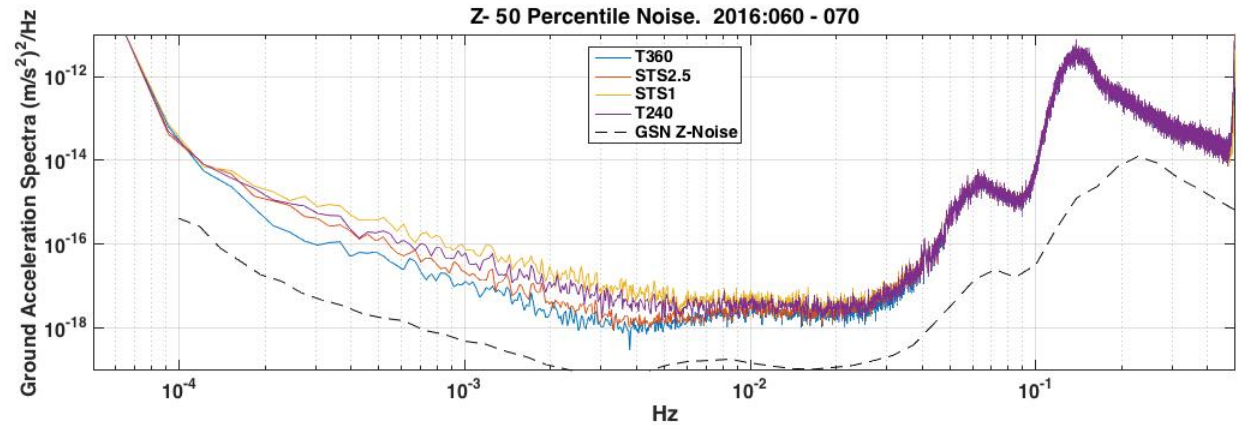
Not Guy Masters



New – TR360BH in 2016

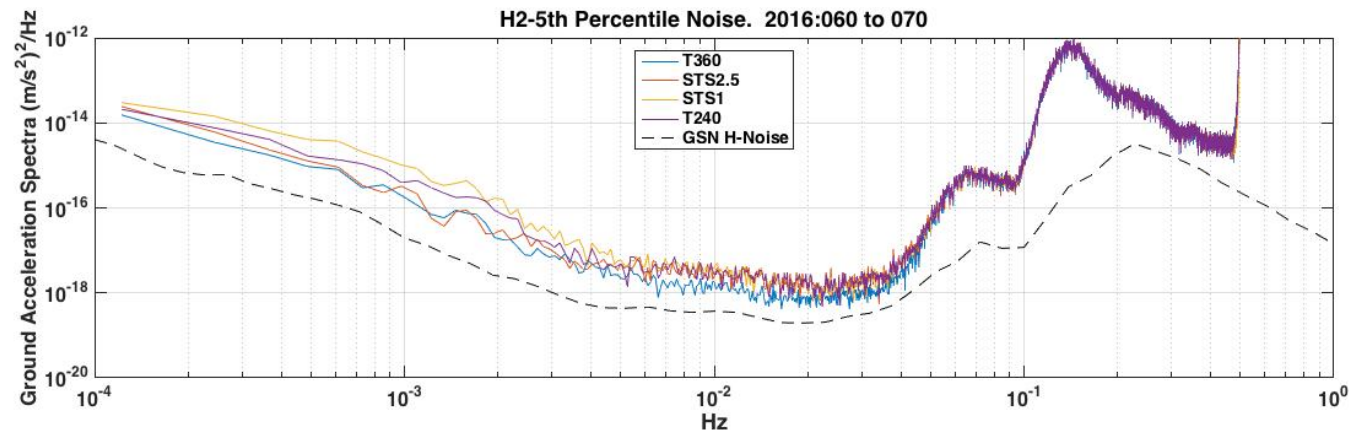
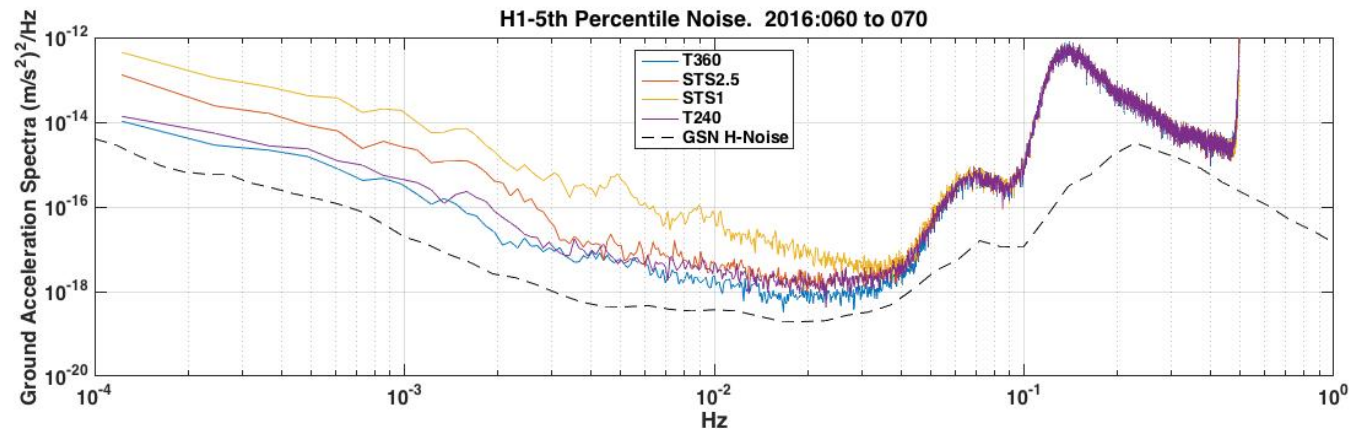
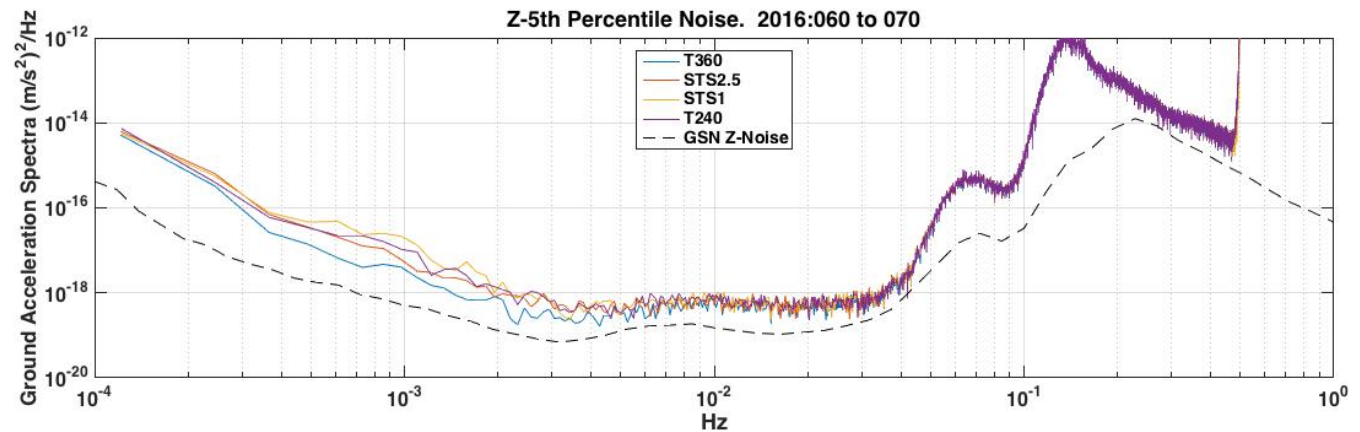
Noise test:

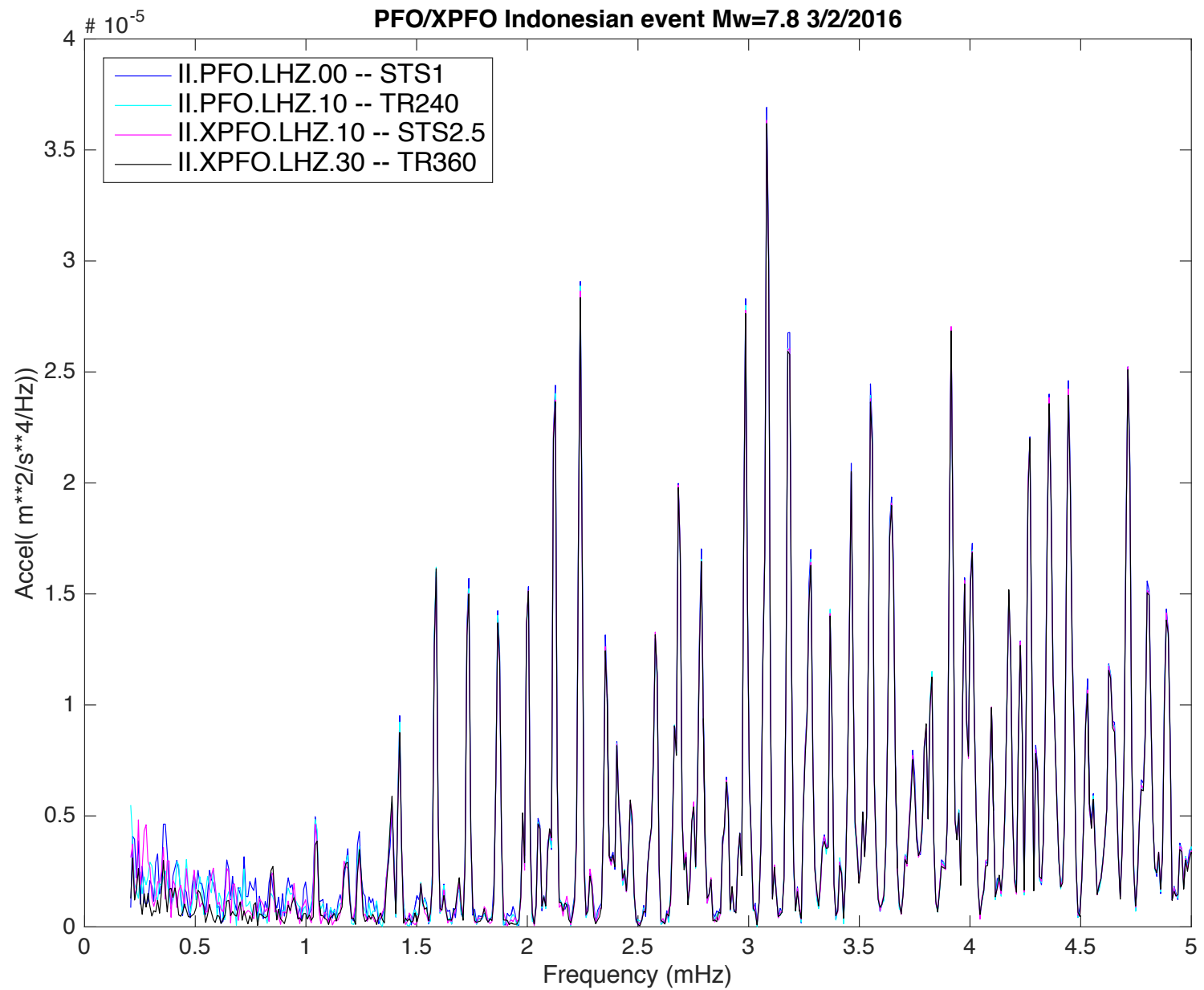
50th Percentile

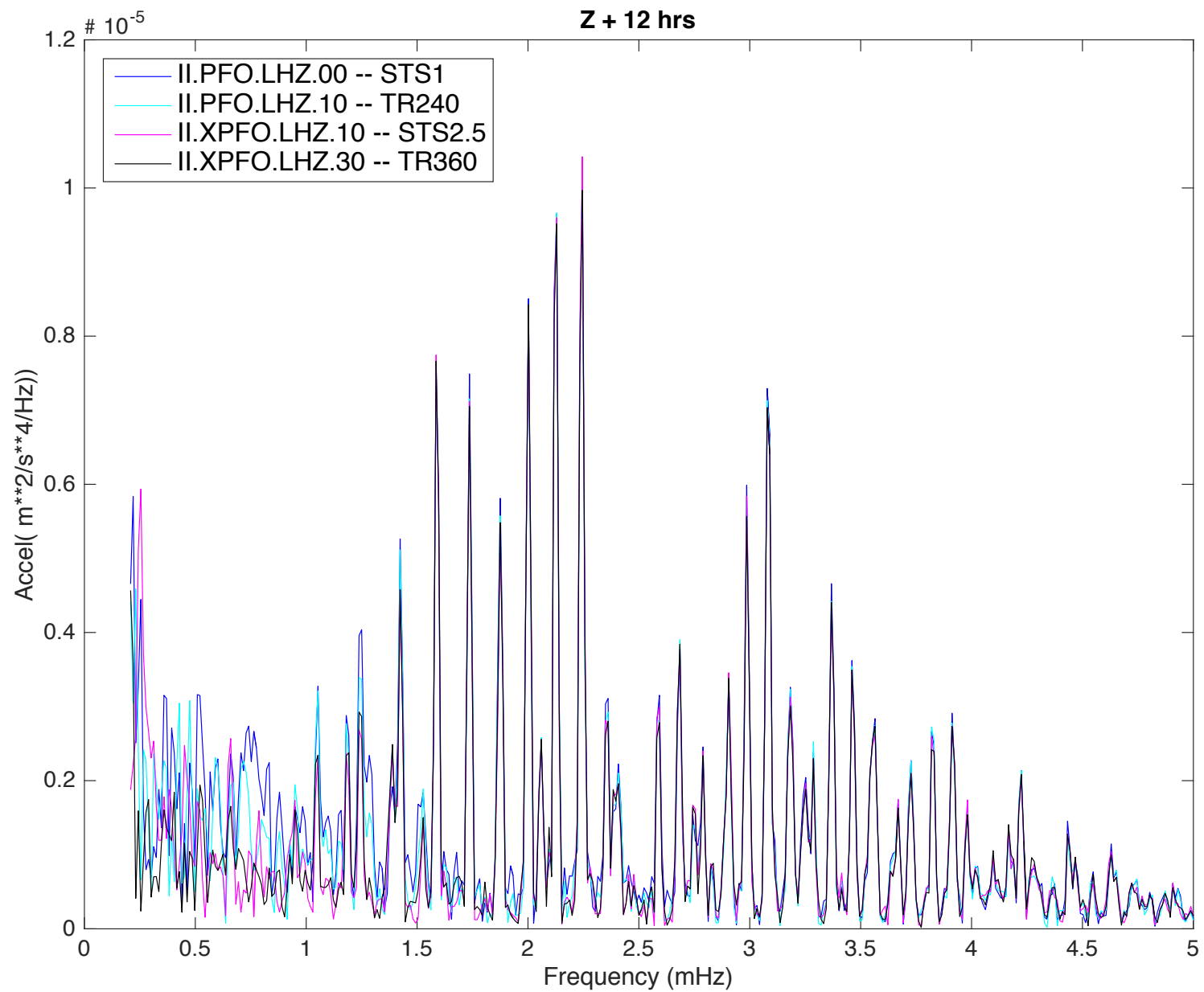


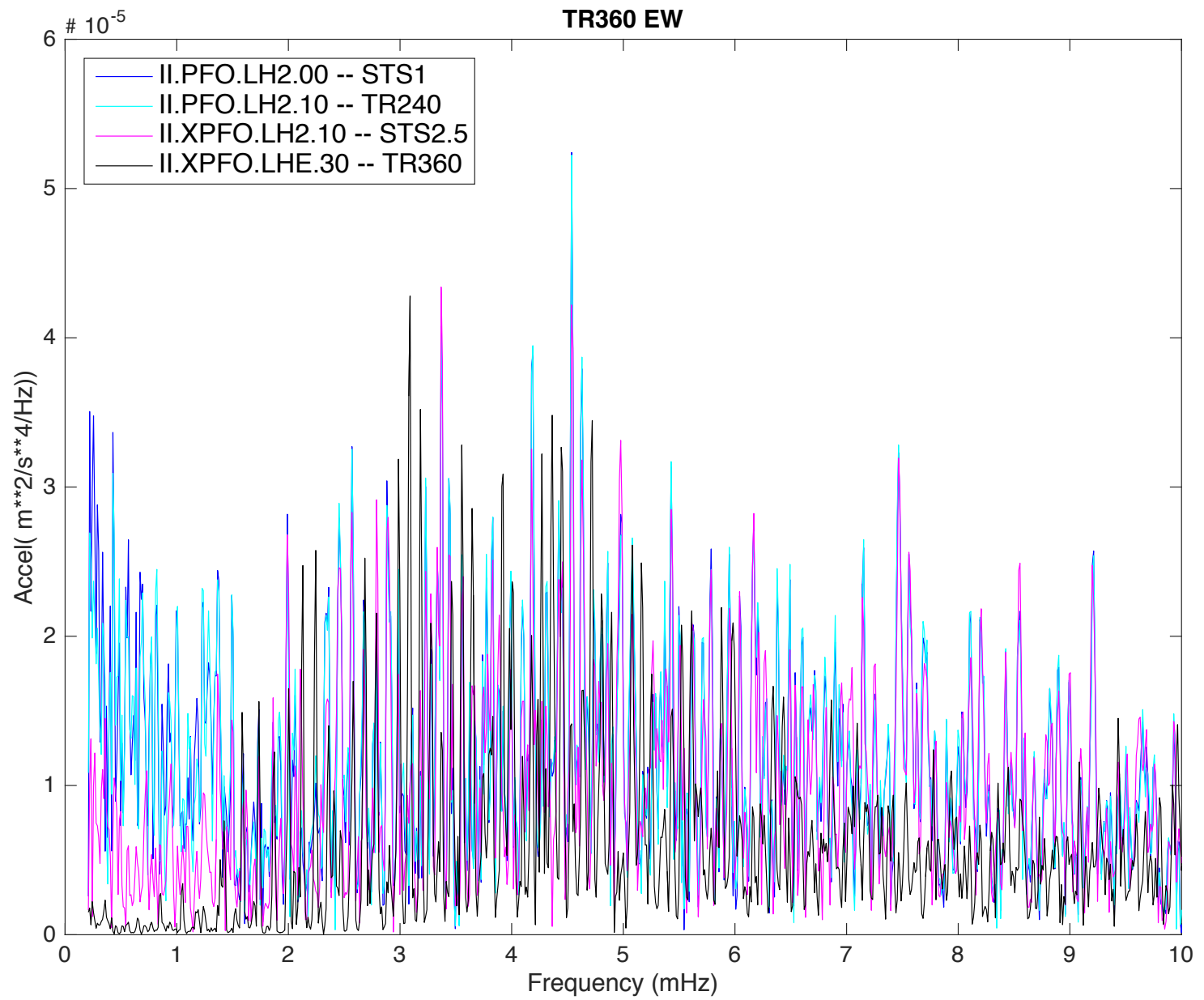
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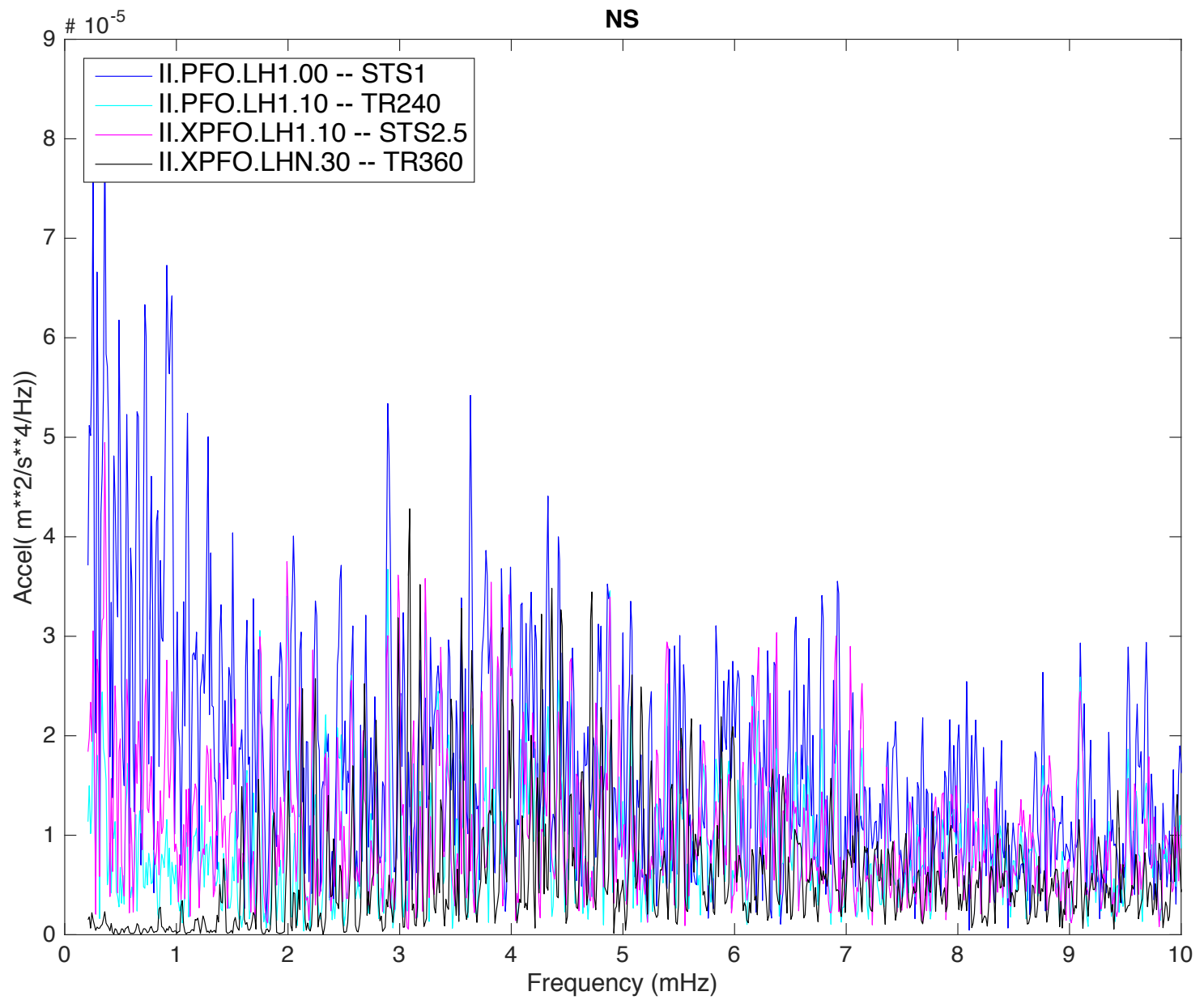
5 th Percentile



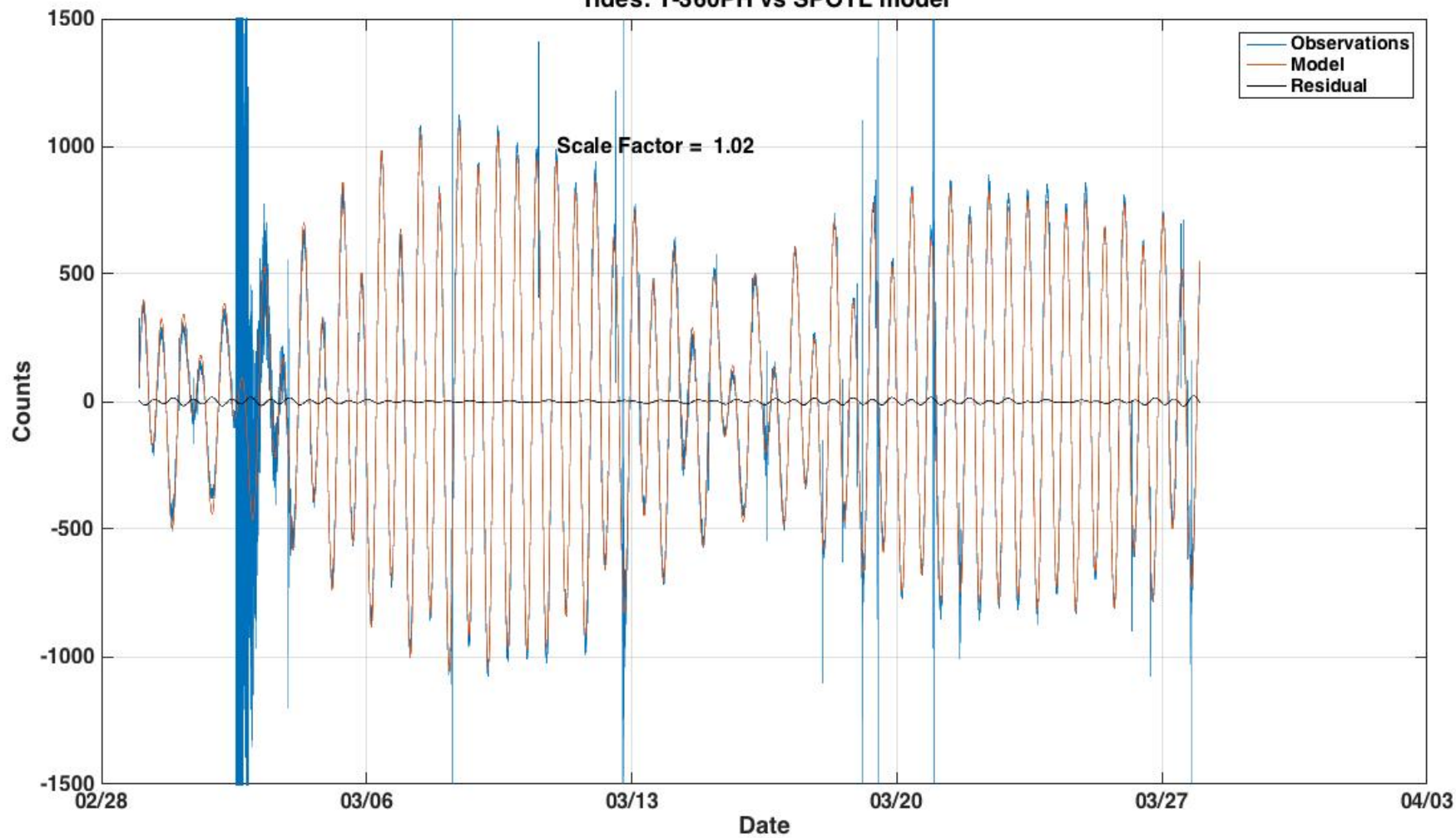




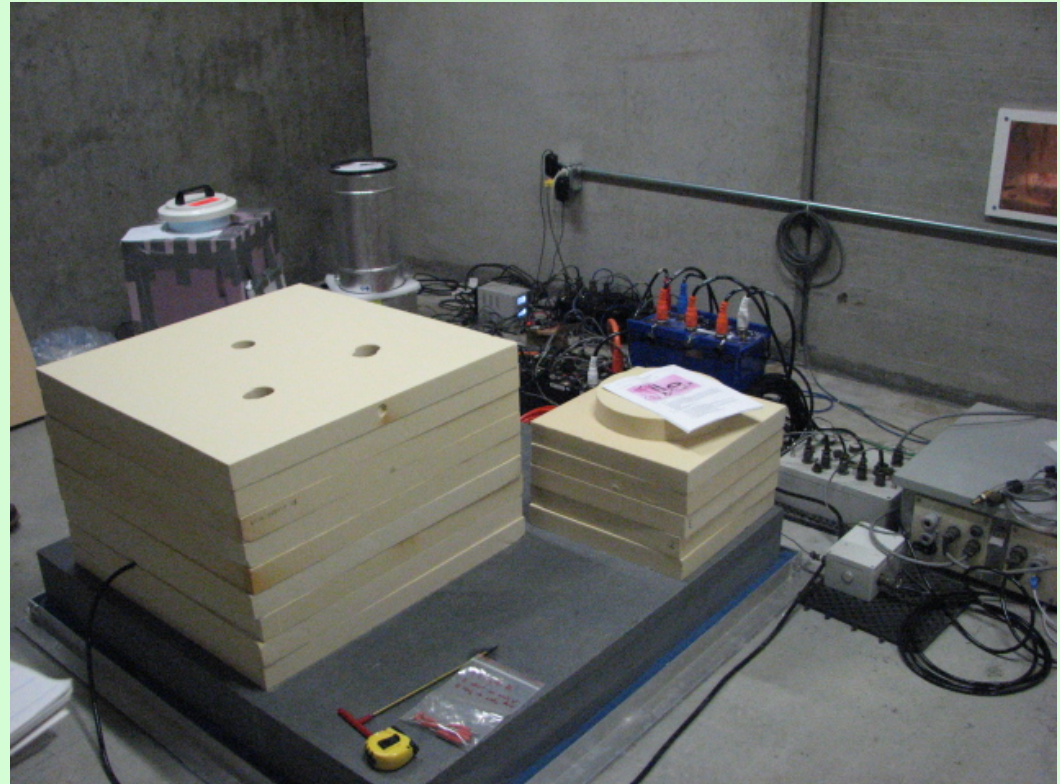




Tides: T-360PH vs SPOTL model



Testing Facility at Piñon Flat:



Testing Facility at Piñon Flat:



Data from STF now streamed to DMC:

- XPFO – 30 Trillium 360 BH
- XPFO – 10 Streckeisen STS2.5
- XPFO – 40 Streckeisen STS5
- PFO – 00 Streckeisen STS1
- PFO – 10 Trillium 240



INTERNATIONAL DEPLOYMENT OF ACCELEROMETERS

