



ATA

ATA's Nanoradian-Class Rotational Sensors

October 2010

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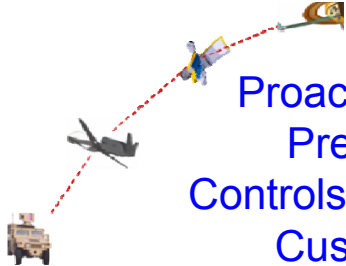
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About ATA



ATA's driving force is

Technology / Know-How



Proactively Leverage Our Leading-Edge Precision Sensing, Measurement and Controls Application Know-How into Viable Custom Solutions, Services and Tests

Successful Small Business

- Founded in 1975
- ~250 Employees
- Multiple National Small Business Awards
- ISO 9001:2008 Certified
- Approved Aerospace Vendor
- Space-Qualified Hardware

Operating Sites in New Mexico

- Albuquerque (HQ)
- Kirtland AFB Satellite I&T Facilities
- WSMR Test Facilities

ATA is a Proven Technology Company for Challenging Problems

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ATA Overview Cont'd

LOCKHEED MARTIN
MISSILES & SPACE CO.



Raytheon

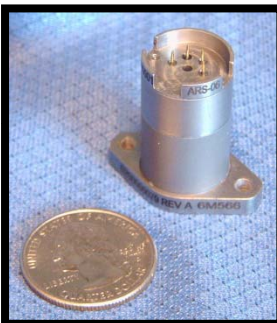
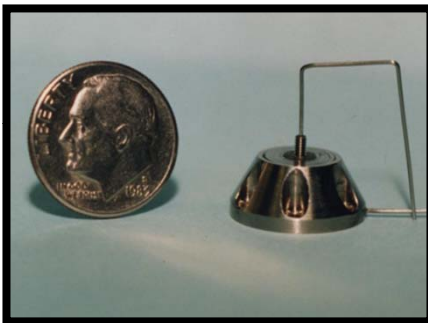


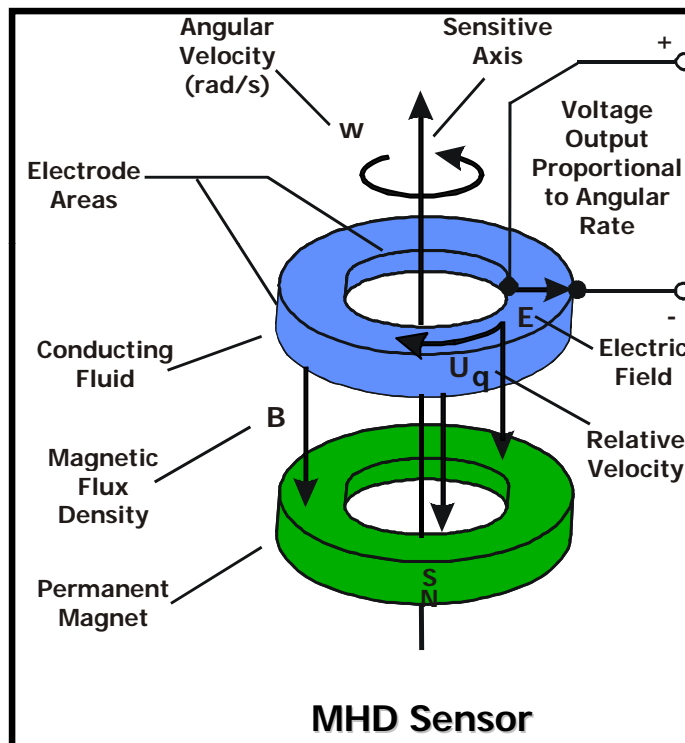
- ISO 9001 Certified
- Class 10,000 Clean Room
- Approved Vendor
 - Ball Aerospace
 - Lockheed Martin
 - Boeing
 - Raytheon
- Produced Space Qualified Hardware
 - Lockheed Martin
 - Boeing
 - Raytheon
 - Sandia National Laboratories

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Overview

- ATA has a History of Inventing Precision Angular Inertial Sensors in Response to Customer Requests or Internally Identified Needs





High Performance

High Bandwidth: $> 1,000$ Hz

Low Noise Floor: < 100 nrad NEA (1-1kHz)

High Dynamic Range: > 100 dB

Low Cross-Axis Sensitivity

Simple Design

Small Size: 1.0 x 1.0 x 1.3"

Low Weight: 100 grams

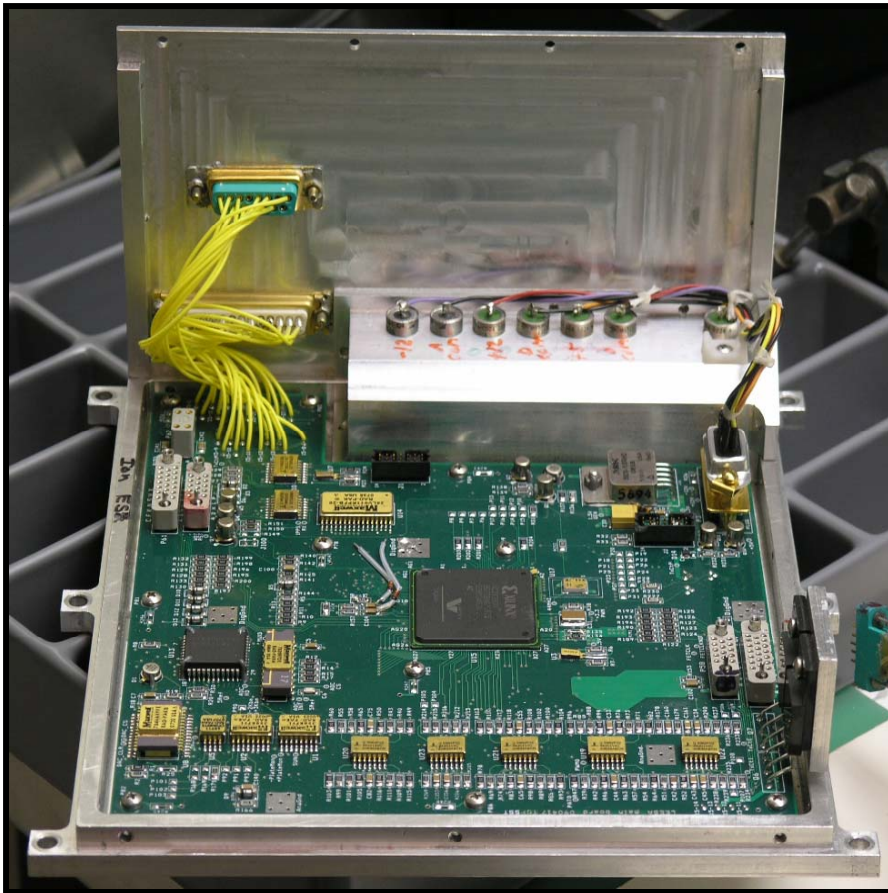
Low Power: < 0.3 Watts

Rugged Design: $> 1,000$ g

- The MHD Concept Resulted From an Air Force Request for Alternate Angular Sensing Techniques

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Augmenting Sensors with Other Technologies

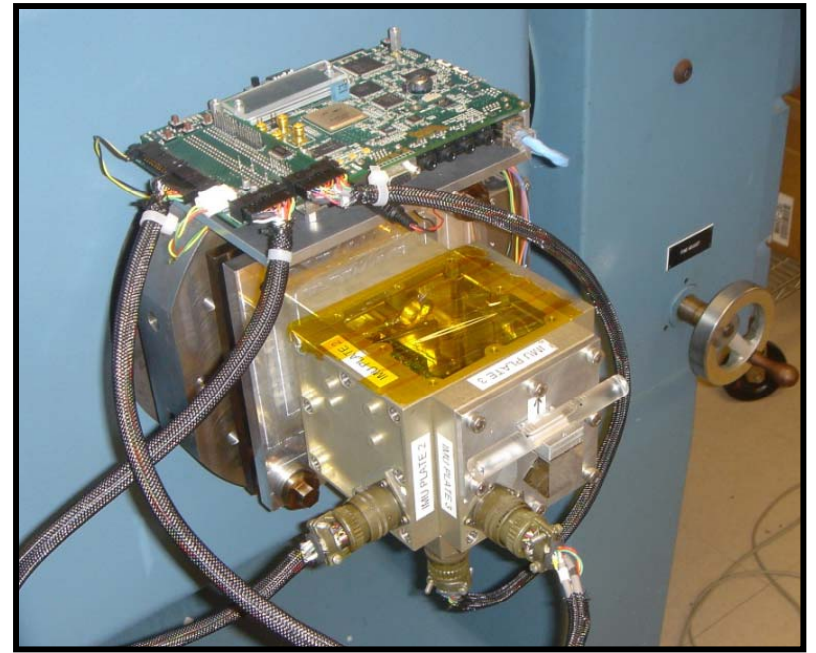
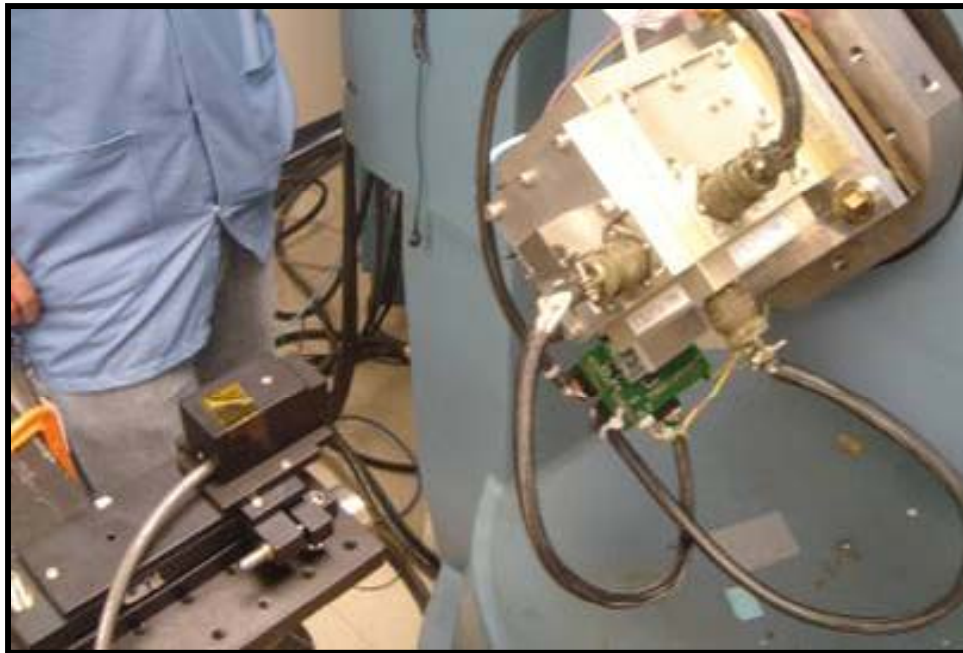


- Radiation-Tolerant Design (100Krad Environment)
- ATA Designed and Implemented FPGA Processing Architecture, Collaborated in Board Design

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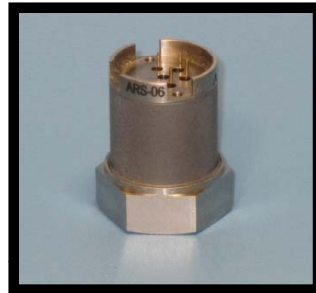
Microradian-Class Testing

- ATA has Developed Test Facilities and Techniques Suitable for High Precision Motion Testing



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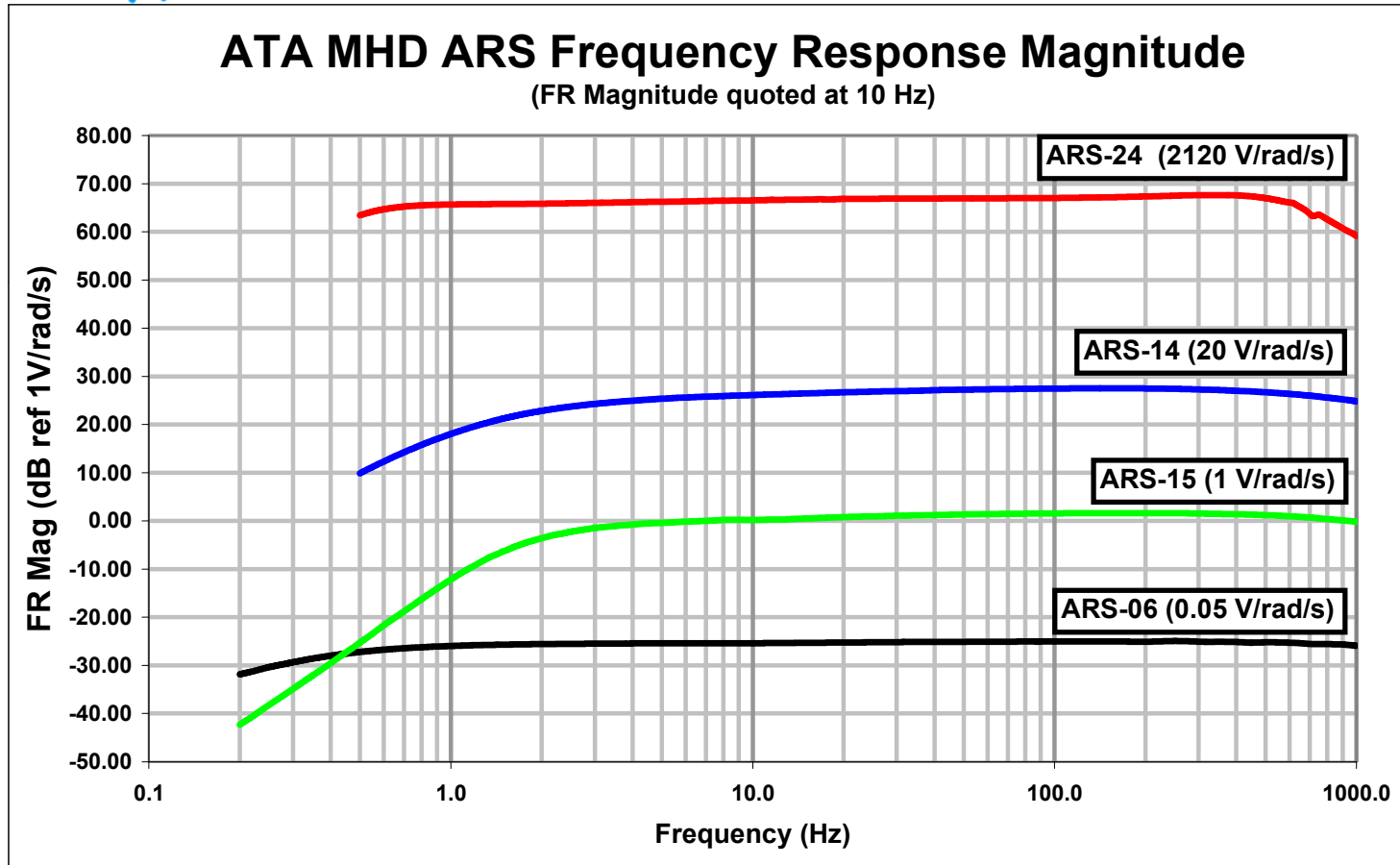
ARS Specifications



Model	ARS-06	ARS-15	ARS-14	ARS-24
Range	± 200 rad/s	± 10 rad/s	± 0.5 rad/s	± 0.005 rad/s
Scale Factor	50mv/rad/s	1 V/rad/s	20 V/rad/s	2120 V/rad/s
-3dB Bandwidth	0.4 - 1kHz	4 - 1kHz	1 - 1 kHz	1 - 675 Hz
Rate Noise, 1-1kHz	4.7 mrad/s	27 μ rad/s	2.8 μ rad/s	0.36 μ rad/s
Displ. Noise, 1-1kHz	50 μ rad	0.8 μ rad	40 nrad	5 nrad
Dimensions (inches)	0.7 x 1	0.8 x 0.8 x 1.2	1 x 1.3 x 2.9	2 x 2 x 4
Mass (grams)	35	60	200	2000

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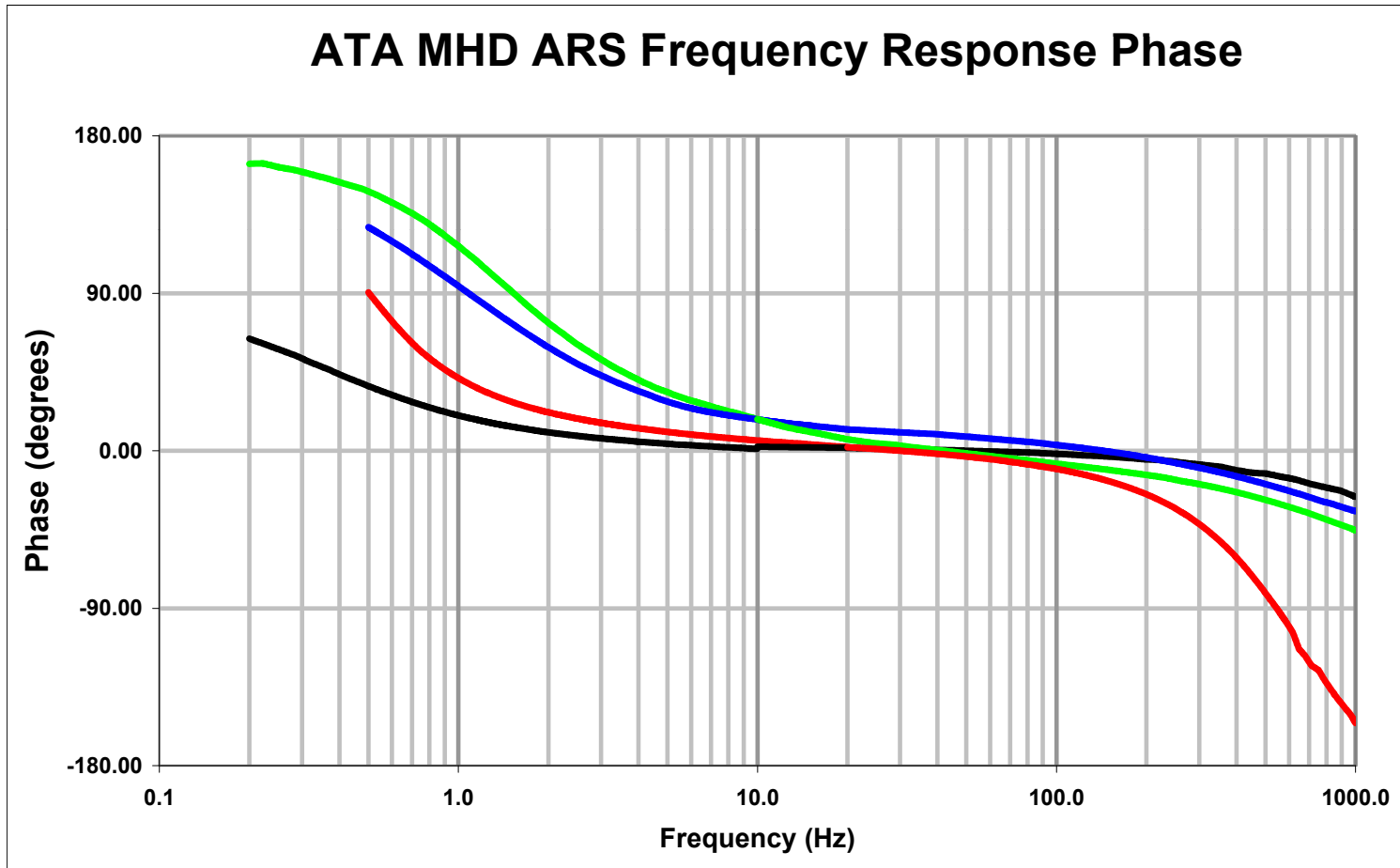
Frequency Response Magnitude

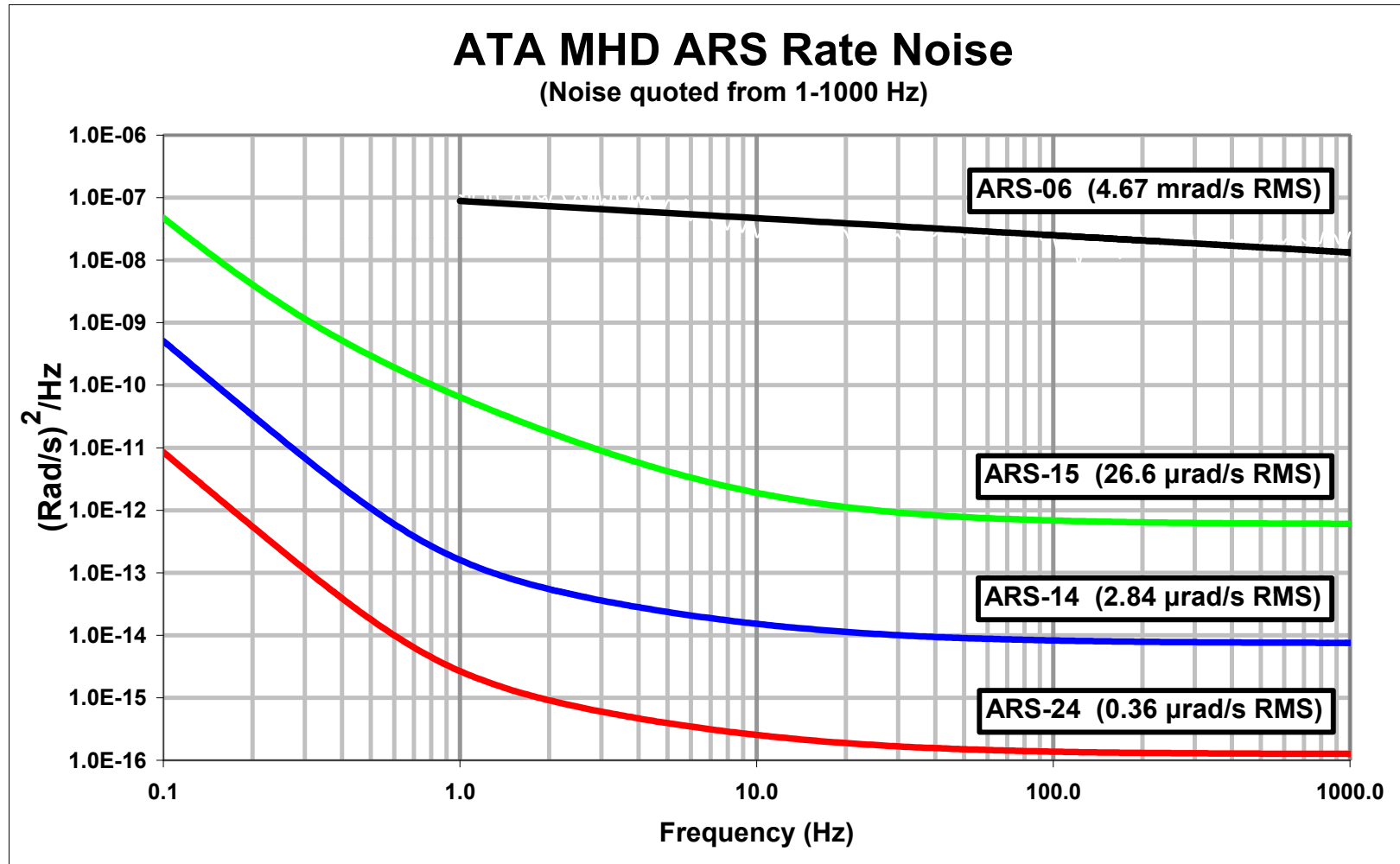


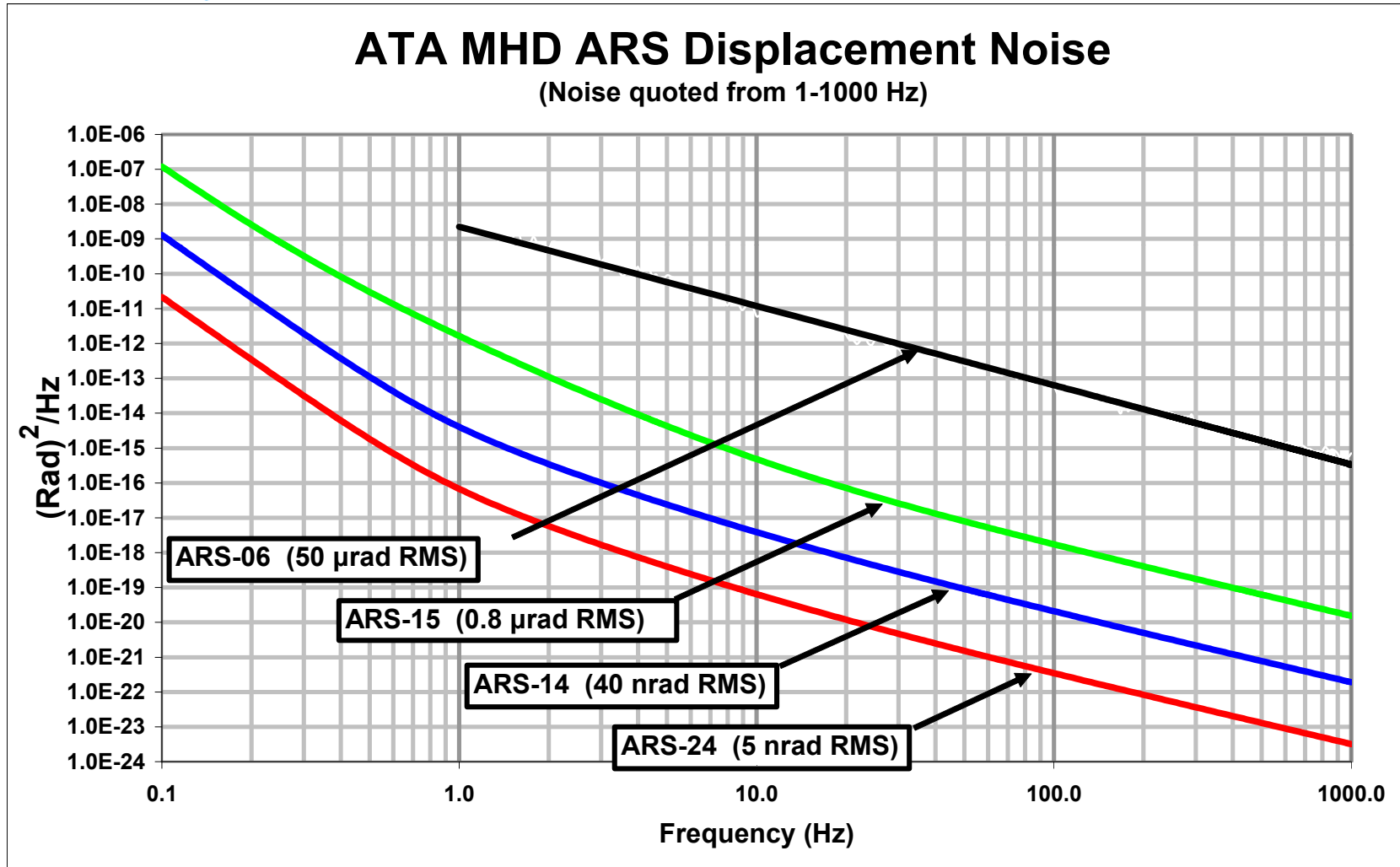
Sensor Scale Factor is Configurable

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Frequency Response Phase



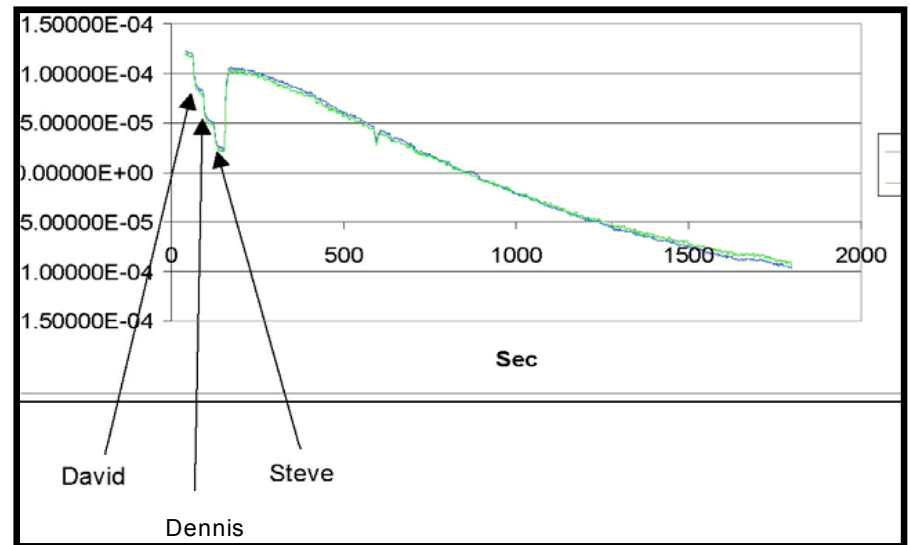
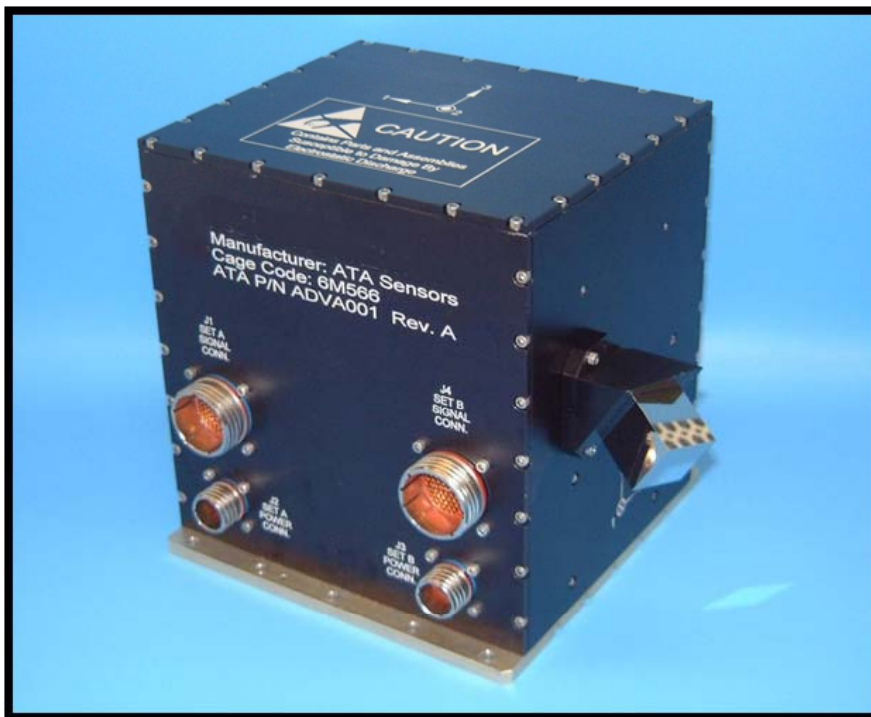
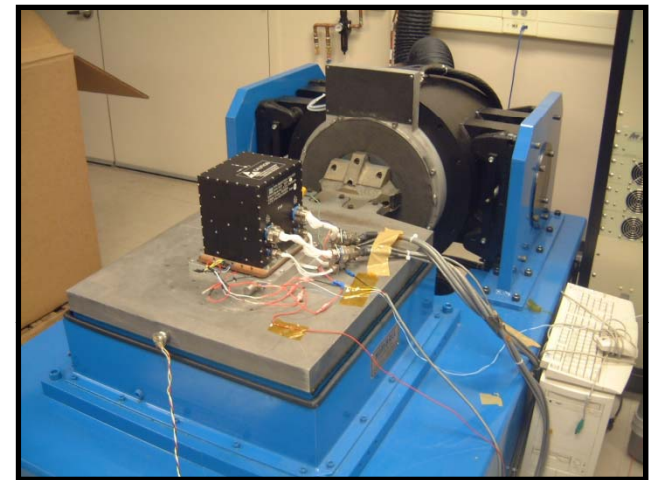




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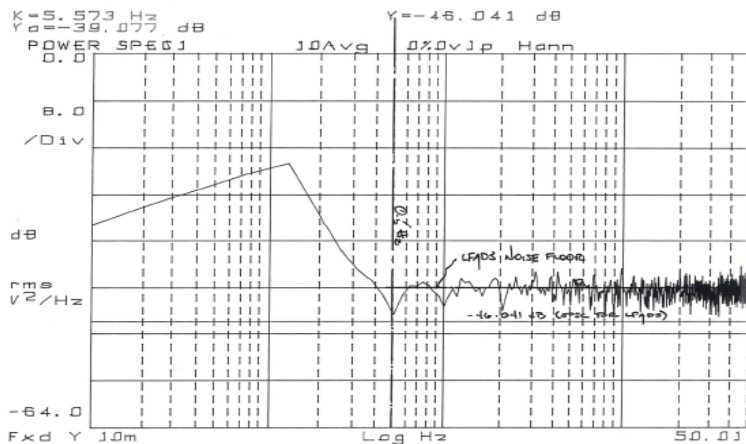
0.1 μG Accelerometer

- These Radiation Hardened Tri-axial DC Accelerometer Units can Measure Microradian-Level Tilts in the Presence of Strong Background Acceleration ($>0.25\text{g rms}$).

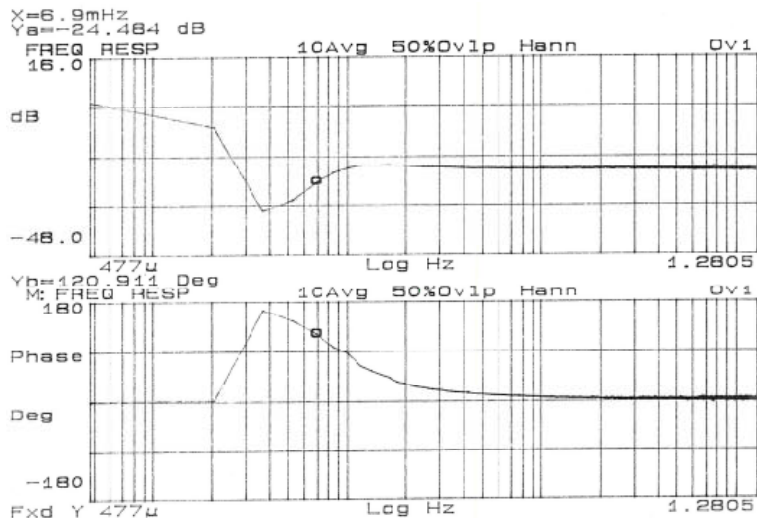


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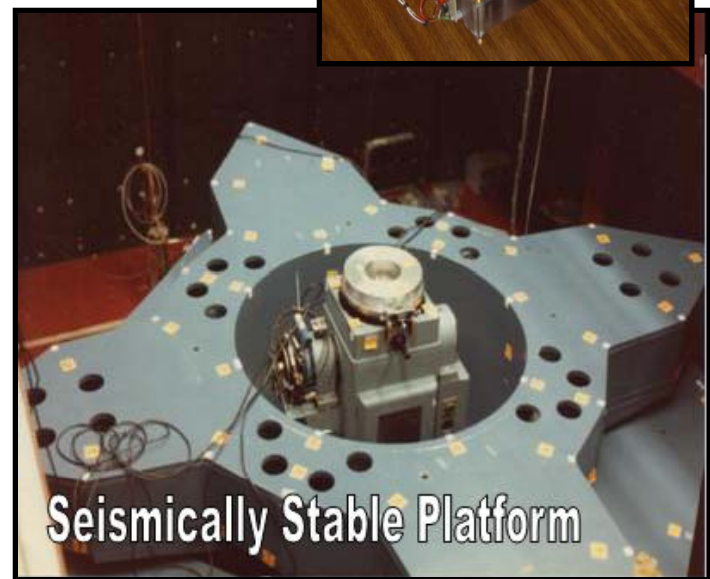
Seismically Stable Platform Tilt Sensor (1990)



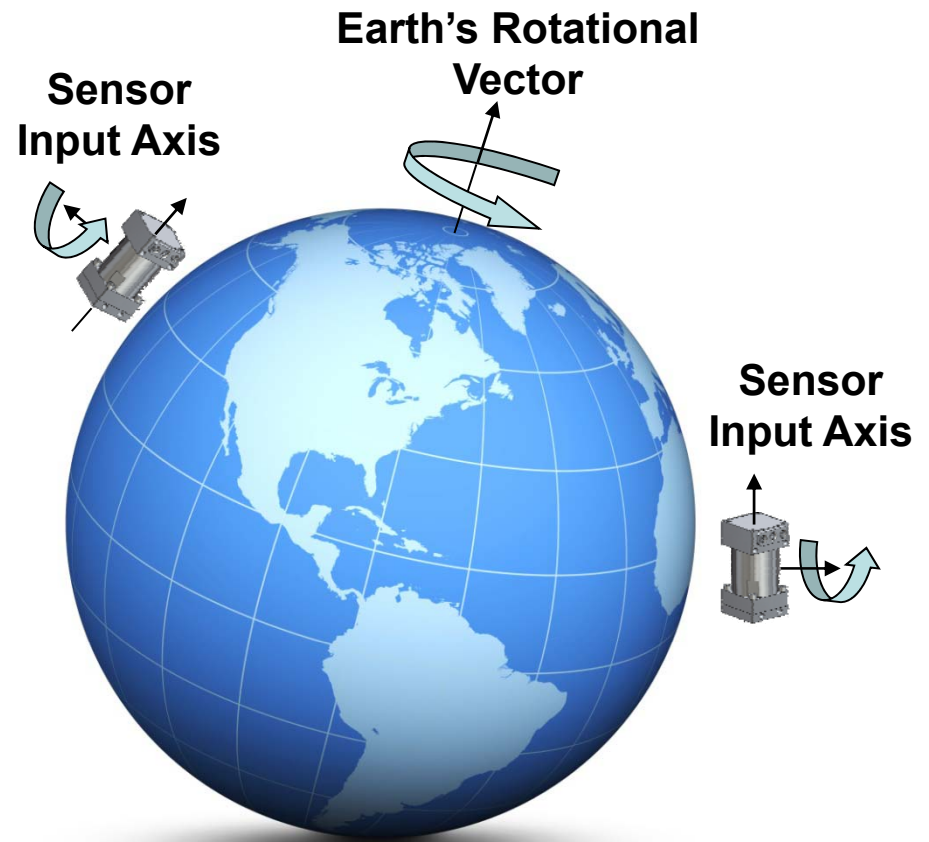
Noise
-174 dB rad



Corner
6.9 mHz



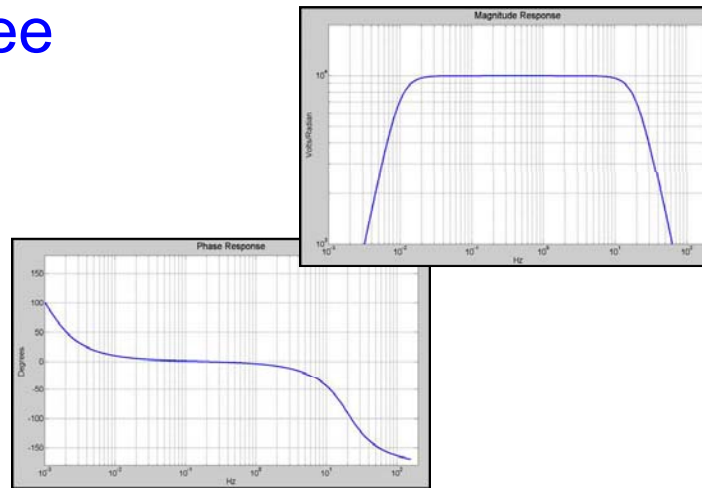
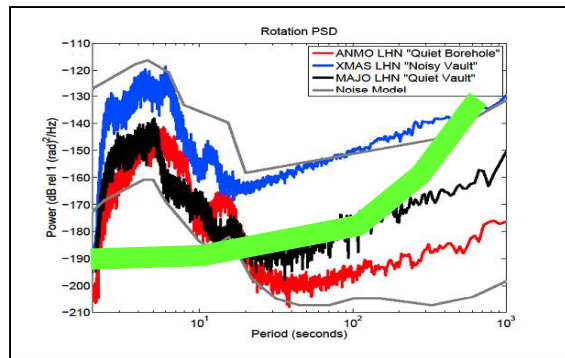
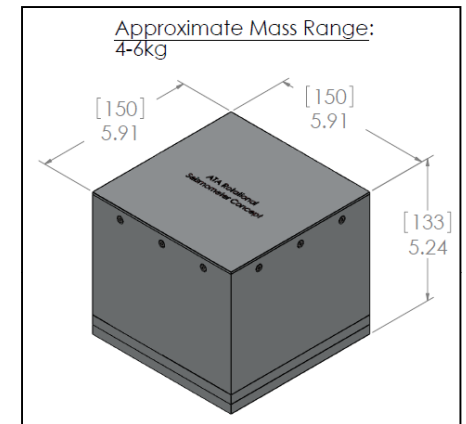
- Current Effort Underway to Develop a 1 mrad Northfinder
- At Any Given Orientation, the Sensor Measures the Projection of the Earth's Rotational Vector onto the Sense Vector



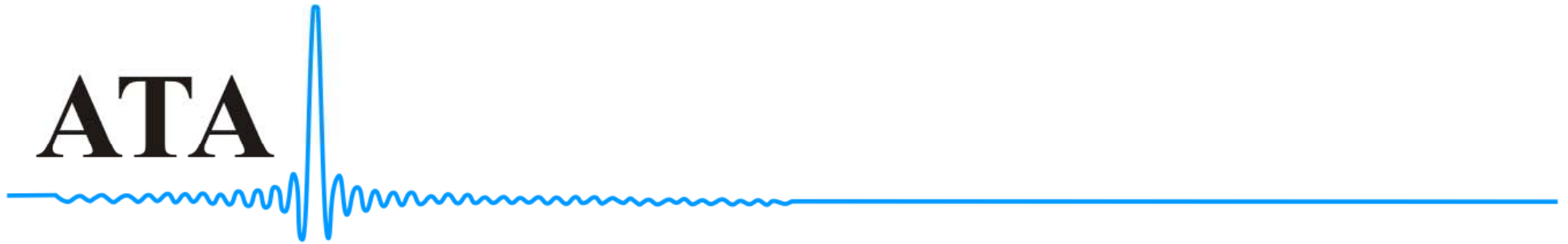
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Low Frequency Improved Torsional Seismometer

- Current Effort Underway to Develop Torsional Seismometer that
 - Directly Measures Rotation Angle
 - Is Insensitive to Translational Motion
 - Has High Sensitivity, Wide Frequency Band, and Low Power, is Rugged and is Maintenance Free



Low Frequency Improved Torsional Seismometer (LFITS) SPECIFICATIONS		
Parameter	Value	Units
GENERAL		
Resolution @ 1 Hz	< 1	nanoradians
Dynamic Range	> 120	dB
Noise Equivalent Angle (NEA)	< 1.5	nanoradians rms, 0.01 -20
Sensitivity	10 ⁶ Nom, 10 ³ to 10 ⁵	volts/radian
Frequency	0.01 to 20	Hz, -3dB points
Analog Output Signal Swing	±2.5 to ±10.0	Volts, adjustable output
Serial Digital Output Logic	Adjustable (1.2 to 5)	volts
Resolution	24	bits
Serial Data Stream Format	SPI or I ² C	
ENVIRONMENTAL		
Operational Temperature	-45 to +60	degrees C
Temperature Scale Factor	TBD	ppm/C
Shock Survival	TBD	g peak, 11 ms half sine
Vibration Survival	TBD	g ² /Hz, 1-1000 Hz
Humidity	TBD	% relative humidity
MECHANICAL		
Housing Standard	20L x 20W x 10D	cm
Weight (Al housing)	< 2.0	kilogram
Connector	TBD	
POWER		
Supply Voltage	9 to 14	volts dc
Supply Current	< 100	mA
Power Dissipation	~ 1 to 1.5	W



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