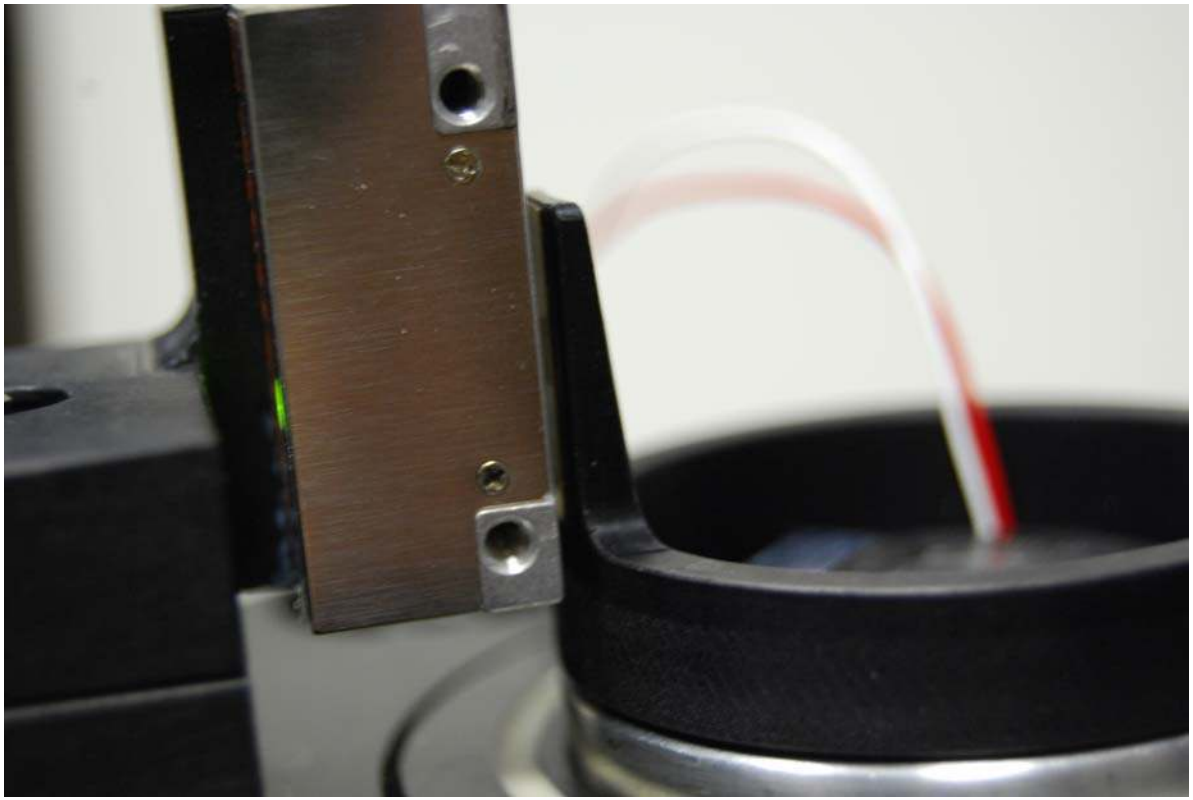
9155D-775/778 Optical Encoder Product Overview



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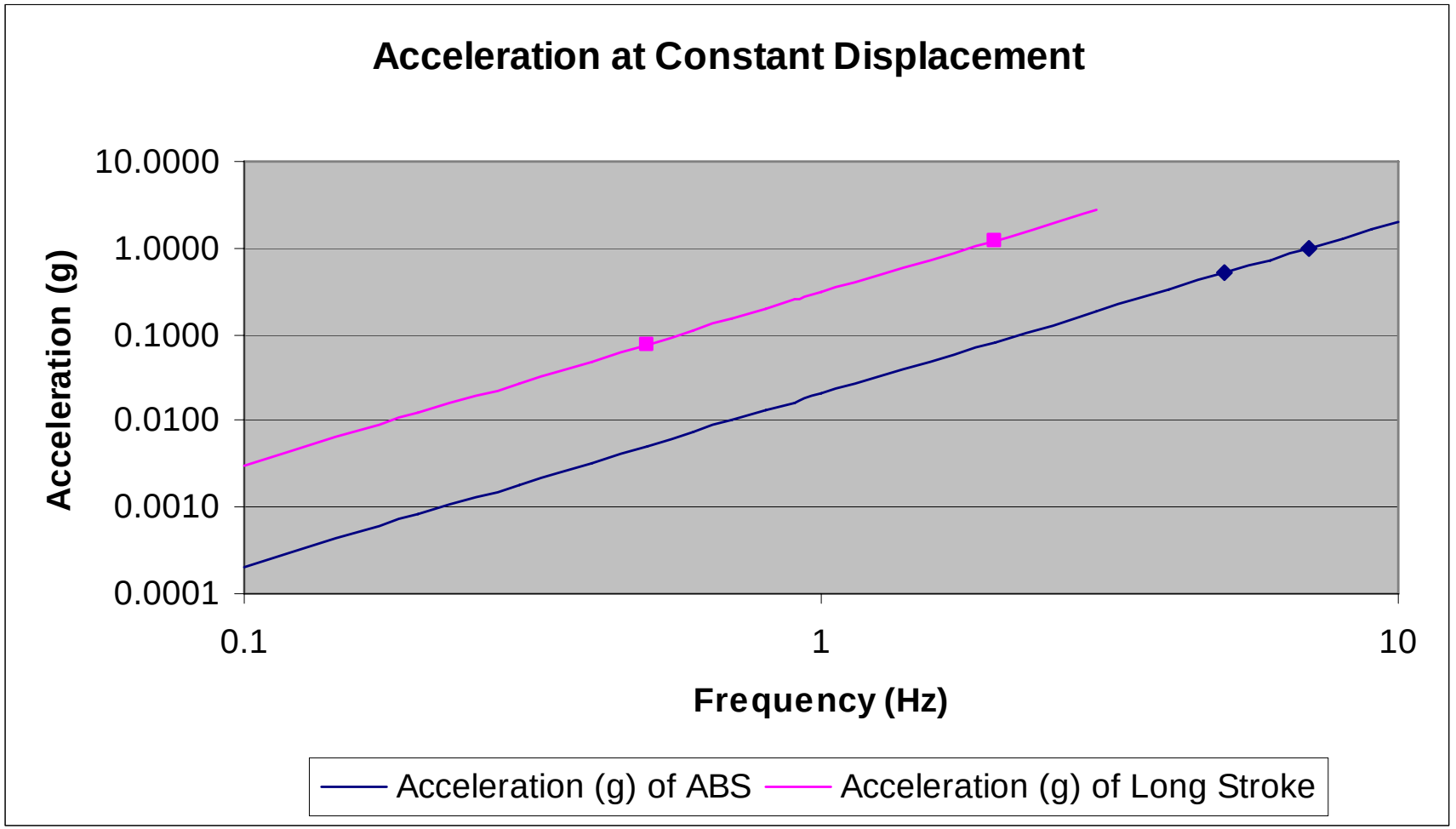

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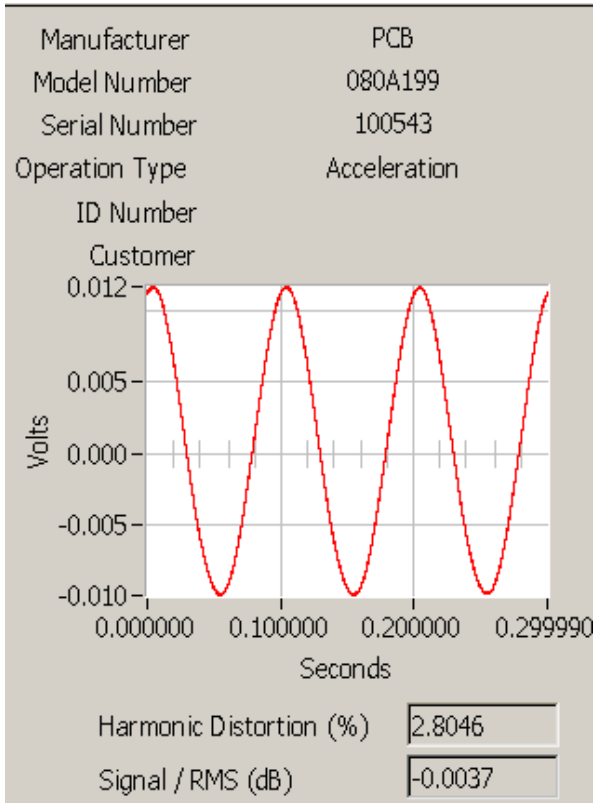
Reference Accelerometer

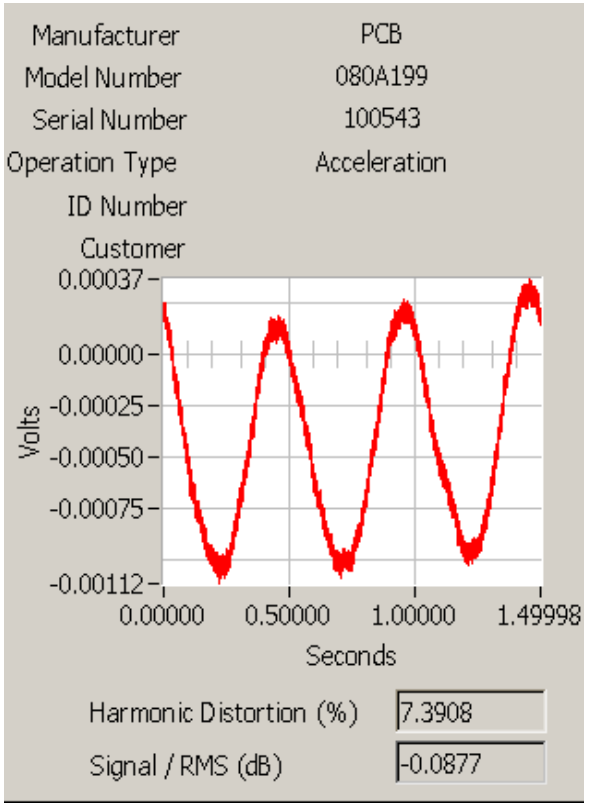
- Air-Bearing Shaker uses 10 mV/g quartz element
  - Approx 0.005g resolution
- Long-stroke uses 500 mV/g quartz element
  - Approx 0.00015g resolution
- Issues at low frequency
  - Amplitude limited by stroke
  - Low output from reference
  - Poor signal to noise ratio

Air-Bearing Shaker Reference at:

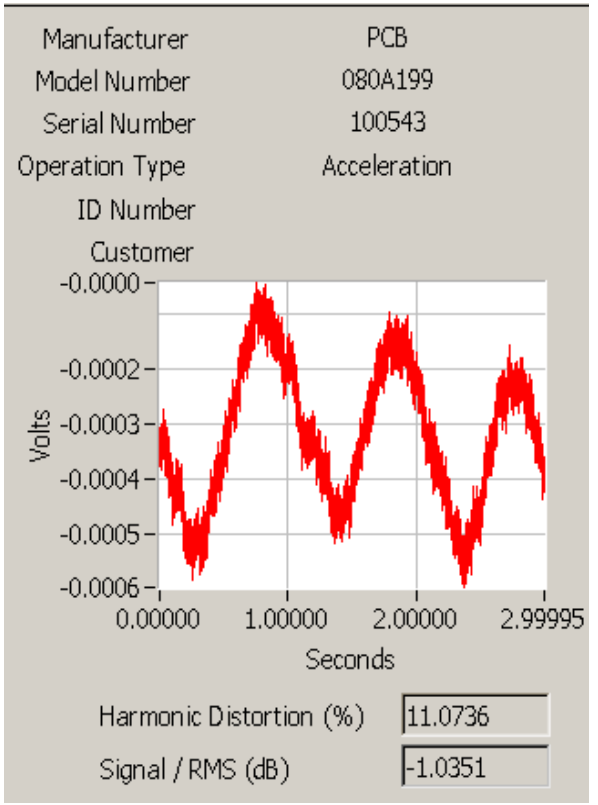
10 Hz



2 Hz



1 Hz



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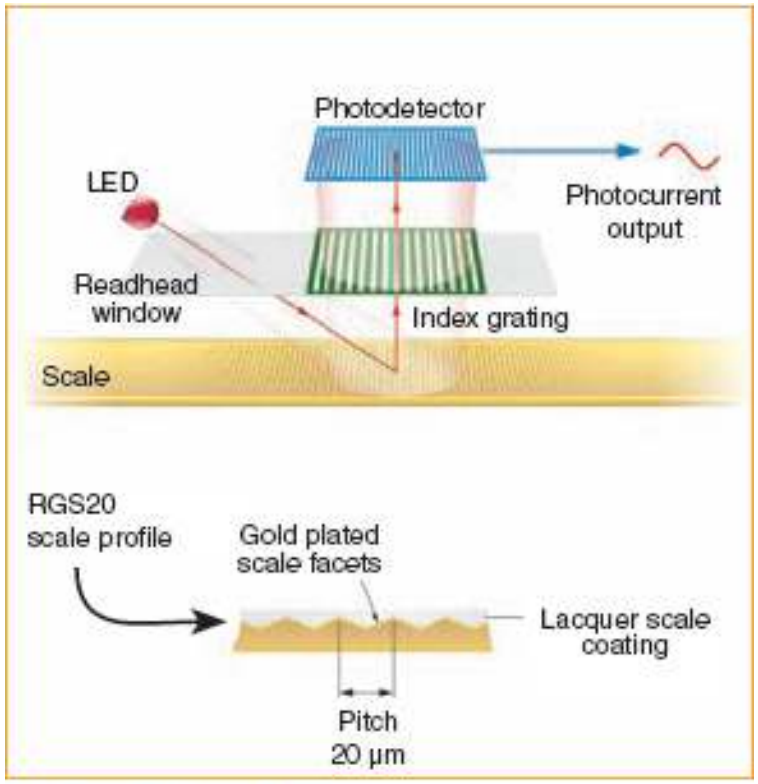
Optical Reference

- Input to the Photo Detector varies based on relative positioning between index grating and optical scale
- One cycle represents 20um of movement
- The cycles are reconstructed to determine the position (displacement) of the scale at a given point in time
- The derivative of displacement vs. time is taken twice to get acceleration
- Two encoders with a 90 degree offset are used to determine direction



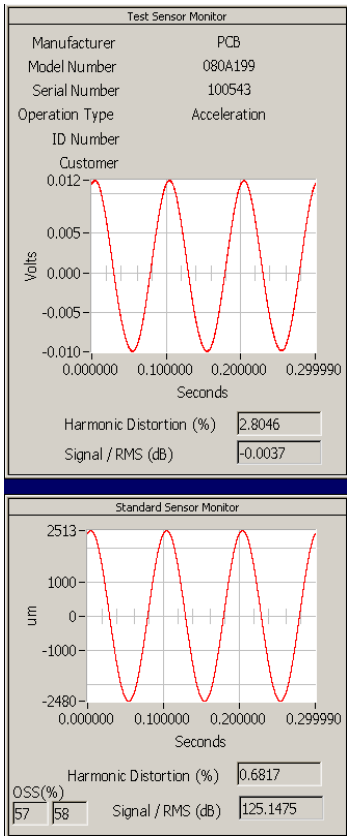
RG2 optical scheme

Optical Reference - Strengths

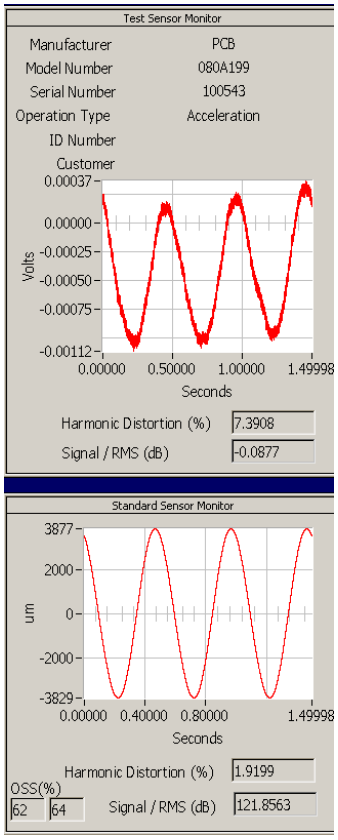
- Resolution of optical encoder is based on displacement
  - Best resolution at full stroke
- Frequency range response down to DC
- Superior uncertainties similar to those obtained by a laser interferometer

Optical Reference at:

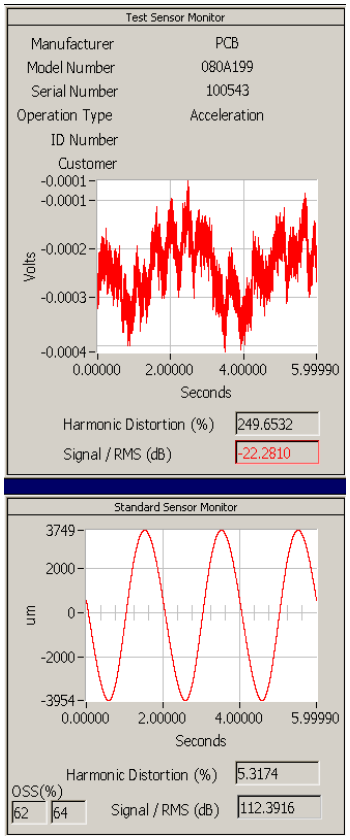
10 Hz



2 Hz



0.5 Hz



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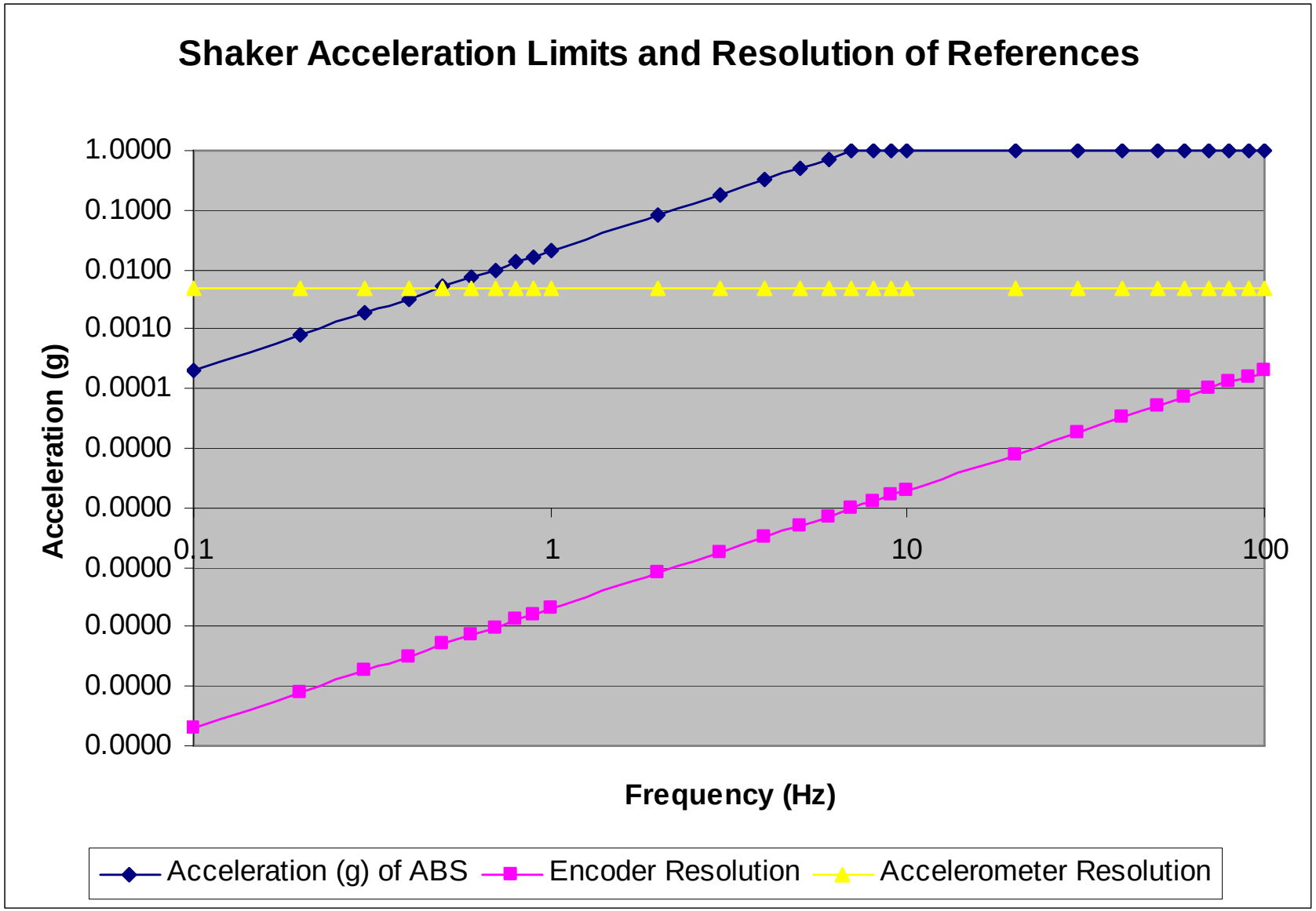
Optical Reference – Limitations

- Limited High Frequency Range
  - Resolution is a dependant on displacement
- Recoil of shaker body causes errors in measurement
- SUT must have adequate resolution to achieve adequate signal to noise ratio
- Typical sensitivities and resolution

  10 mV/g = 5 mg resolution
  100 mV/g = 0.5 mg resolution
  1000 mV/g = 0.05 mg resolution
  Seismic = 0.005 mg resolution



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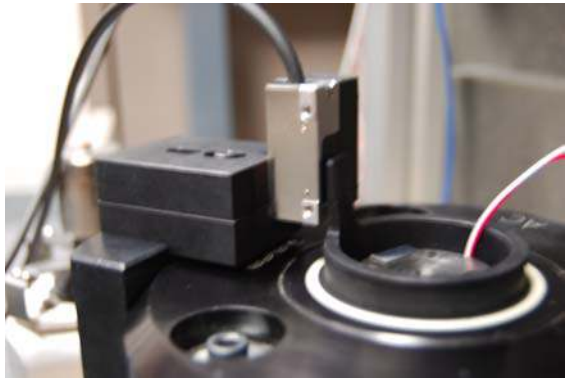
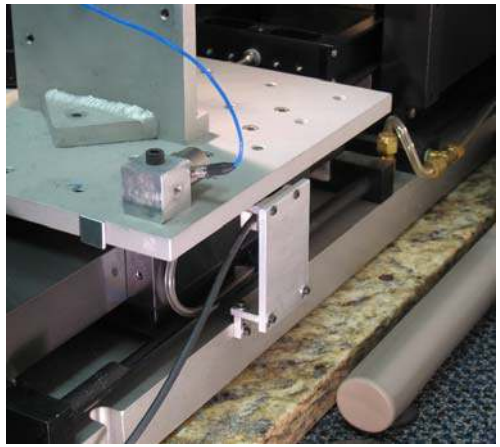
Optical Encoder Products

- 9155D-778
  - Retrofit to Air-Bearing Shaker
  - Adequate for high resolution test sensors



- 9155D-775
  - Mounts to APS long-stroke shaker
  - Provided as the low-frequency primary grade offering



Typical Users

- High Sensitivity Accelerometer Users
  - Particularly Seismic
- National Labs
- Primary Calibration Labs
- Regional Calibration Labs