Structural Analysis

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GUVI Mechanical Design Requirements:

- Reference: SEM-2-1450 Rev B, 7/19/96, 'TIMED Structural Design and Test Requirements'.
- Quasi-Static Limit Loads (G):
  - All Assemblies: ± 25 G's [Loads applied separately at assy c.g. in 3 orthogonal axes]
- Design Loads:
  - Mat'L Yield = 1.4 X Max Expected Load
  - Mat'L Ultimate = 1.875 X Max Expected Load
- Stiffness: > 30 Hz Lateral; > 50 Hz Thrust
- Operational, Test & Survival Temperatures: Covered under the Thermal Analysis presentation.
- Pressure Change: < 0.5 psi/sec.
- Mass: < 20.17 Kg.
- Redundant Load Paths, Non-Critical Fasteners.
- Low Outgassing, Low SCC Materials.
- Alignment:
  - Boresight alignment accuracy: 1.0 deg.
  - Boresight alignment knowledge: 0.05 deg.
- 2 year lifetime.

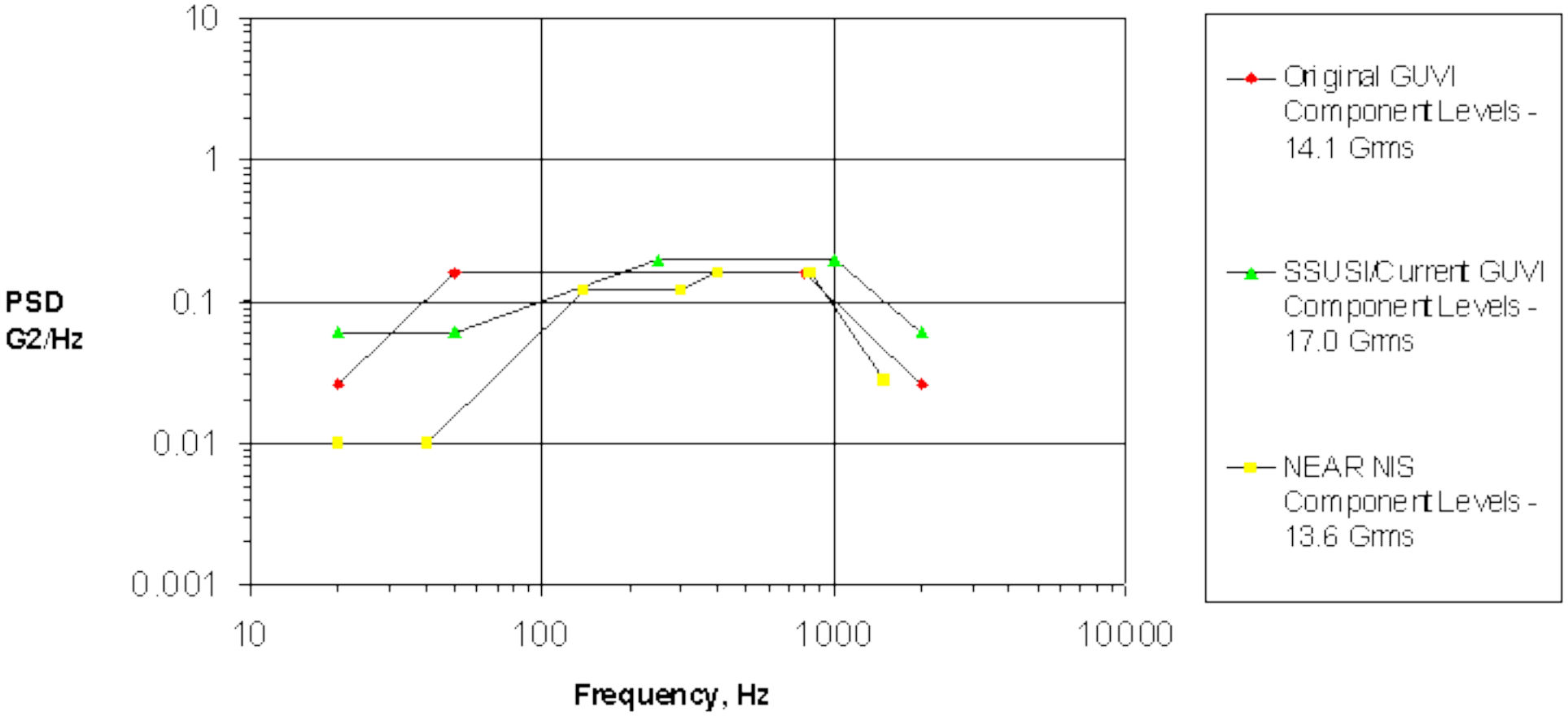
Spectrometer Developments Since PDR:

- Mounting foot design complete:
  - Each foot is a 3 piece Ti assembly.
- ↑ Housing design complete:
  - Ribs added to stiffen housing near scan motor.
  - Radiator design complete.
- Random vibration levels:
  - GUVI component random specification set equal to previous SSUSI levels to reduce responses below 160 Hz.
- Scan settling time test:
  - Settling time testing completed 9/29-30/97 by SSG using GUVI scan profile on retro-fitted SSUSI SIS protoflight unit. Settling times measured for 7 events, all meet requirements.

Spectrometer Developments Since PDR (cont.)

- MSX bellows motor life extension testing:
  - P. Chang of Aerospace Corp established plan for bellows motor life extension testing consistent with DOD-E-83578A, per SEM-2-774, 10/14/97. Testing complete 12/17/97.
- ↑ GUVI pin puller updated to the NEAR NIS configuration:
  - Harder surface finish of spring seats and added bore lubrication.
- ↑ Cover-to-sunshade clearance improved.
- ↑ > 90° cover opening angle under consideration.

Revised GUVI Protoflight Random Component Levels



Spectrometer Structural Analysis Summary:

- SSG structural FEM: 1502 nodes, 1958 elements.
- FEM results:
  - Structural modes: 79.5 Hz (rot X), 90.2 Hz (tran X).
  - Minimum MS: +0.41 - Ti feet under 3 sigma random input.
- Mechanisms
  - Scan assembly is an exact duplicate of the SSUSI SIS.
    - SIS required lifetime: 4.3 x 10^6 cycles (3 years)
    - GUVI required lifetime: 4.2 x 10^6 cycles (2 years).
  - Slit mechanism is an exact duplicate of the SSUSI SIS.
  - Pop-up assembly is an exact duplicate of the SSUSI SIS.

GUVI Mechanical Test Plan:

- Final SSUSI Unit:
  - -Run scan mirror at higher GUVI rate to evaluate settling time per step.
- First GUVI Detector Tubes:
  - -Thermal cycle testing of new lead routing and stress relief.
  - -3 axis sine and random vibration attached to SIS mass model to evaluate HV bias board changes and new lead attachments.
- GUVI Flight Unit:
  - -100 hr. minimum run-in test of scan assembly to smooth out gearbox and journal bearing torques (SSG).
  - -Baseline cover door deployment test (SSG and APL).
  - -Sine and random vibration (SSG and APL w / detector tubes).
  - -Powered thermal vacuum test (SSG and APL w / detector tubes).
  - -Cover door TV deployment test (performed during cold cycle by SSG)