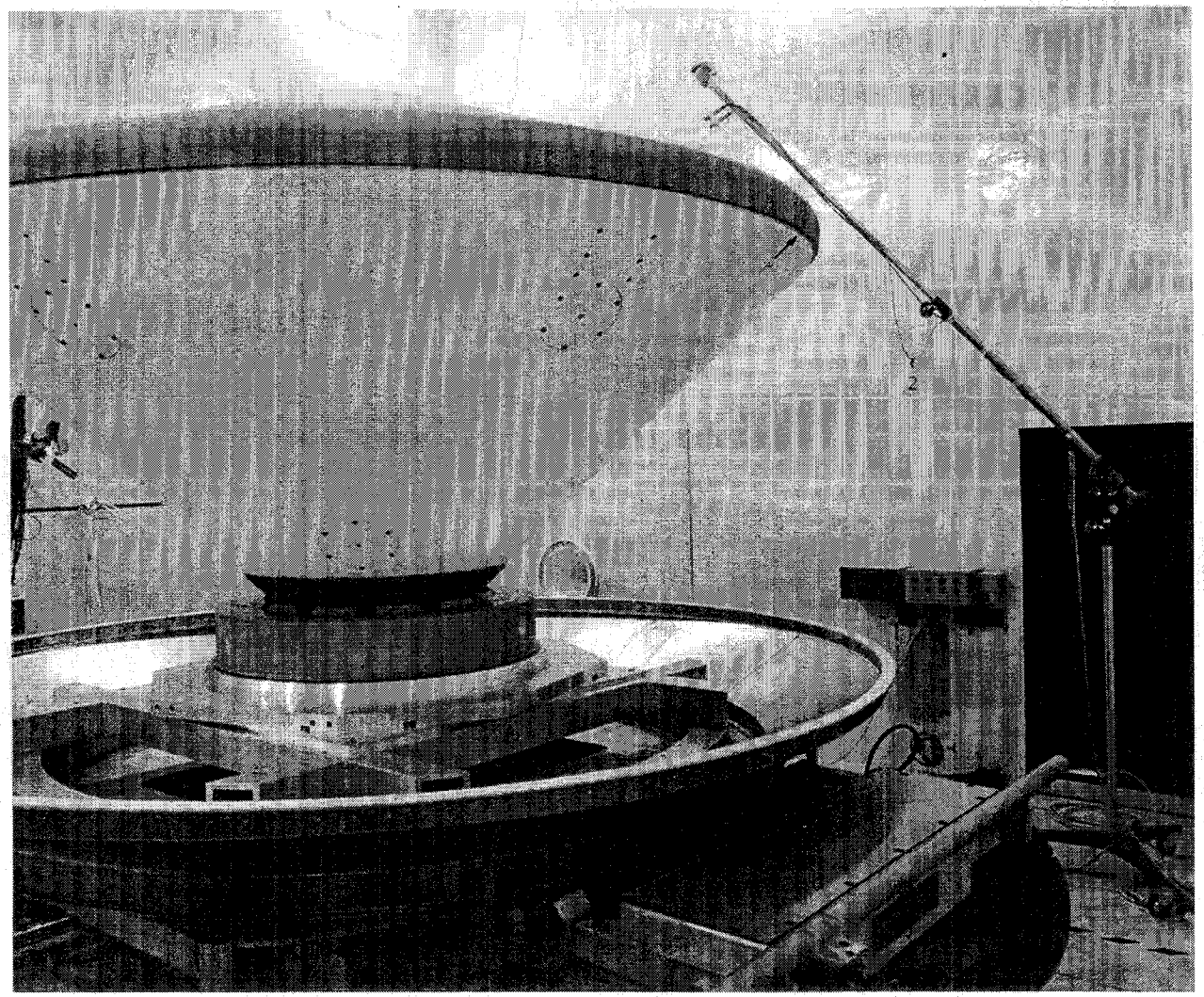
Prediction and Validation of Random Vibration Responses of Mars Pathfinder Spacecraft Due to Acoustic Launch Load Using Statistical Energy Analysis

Dr. Ho-Jin Hwang
NASA Jet Propulsion Laboratory
California Institute of Technology

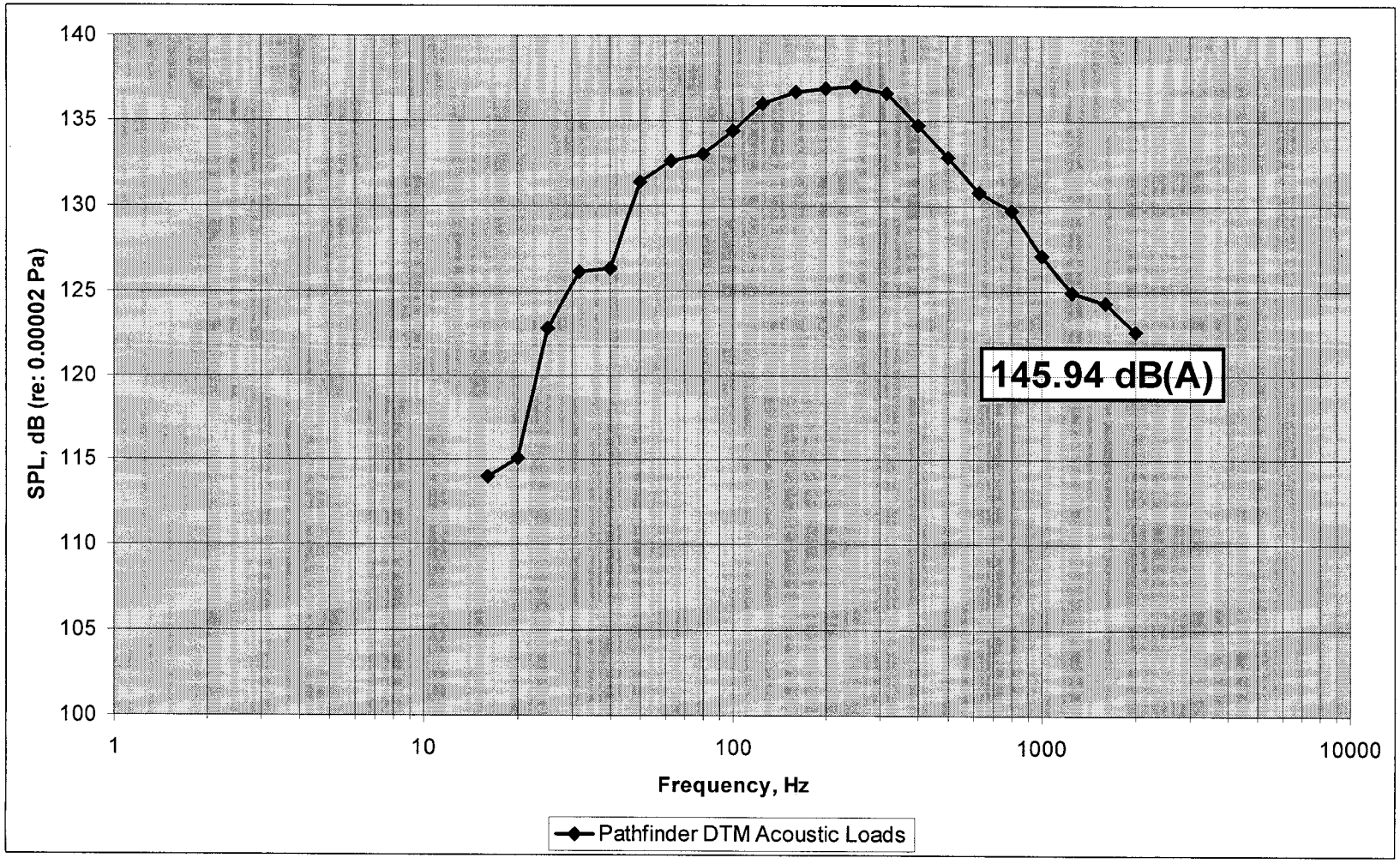
Analysis Background

- **Acoustic Data from Pathfinder DTM Test (Inter-Office Memorandum 352D-96-028)**
  - Reverberation Diffuse Acoustic Loading, 145.94 dB(A)
- **Statistical Energy Analysis (SEA) Model Developed from the Pathfinder Finite Element Analysis (FEA) Model**
- **1% Structural Damping Loss Factor for All Structural Subsystems**
- **Non-Structural Mass Incorporated into Structural Subsystems**

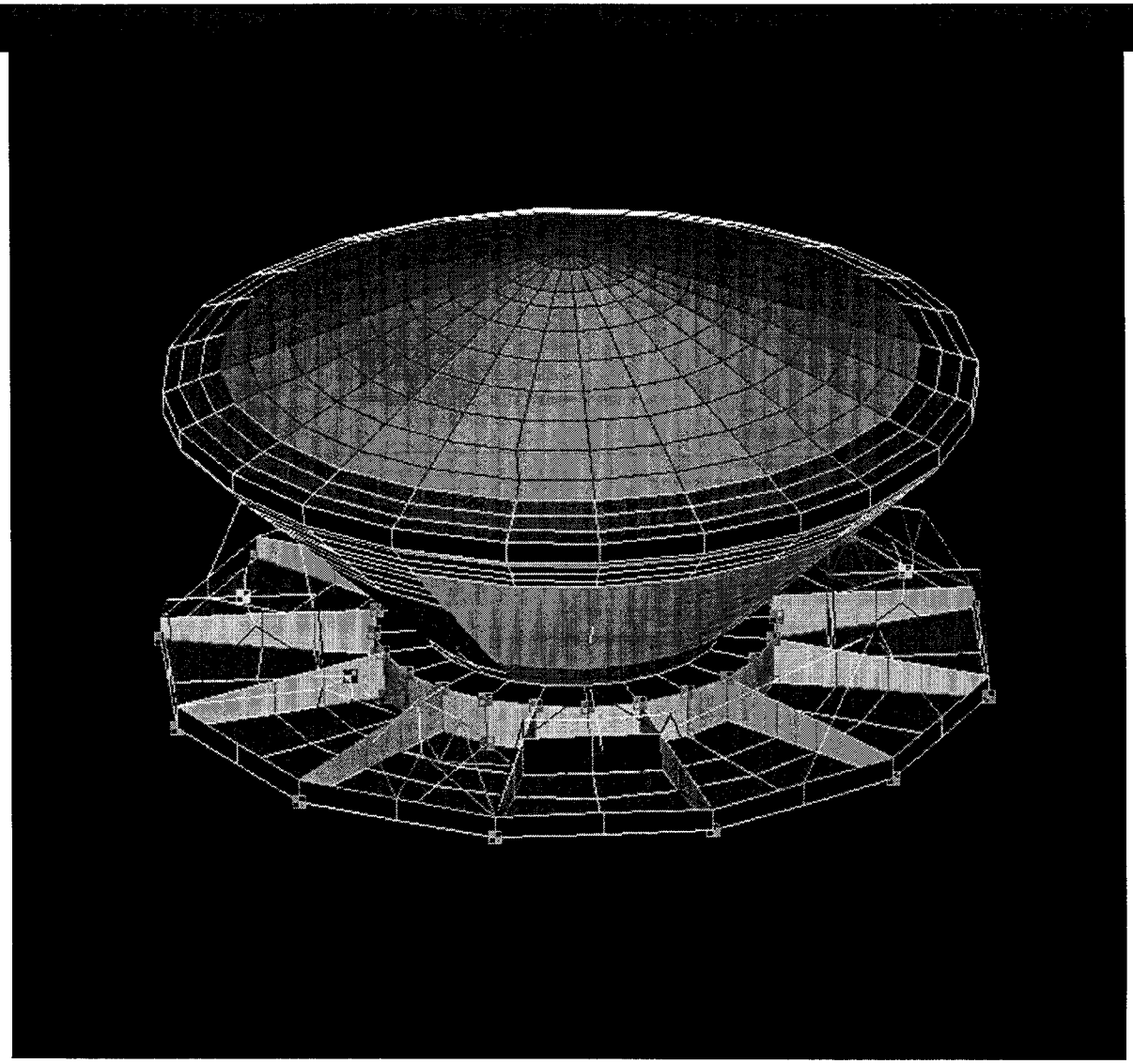
Pathfinder DTM Acoustic Test



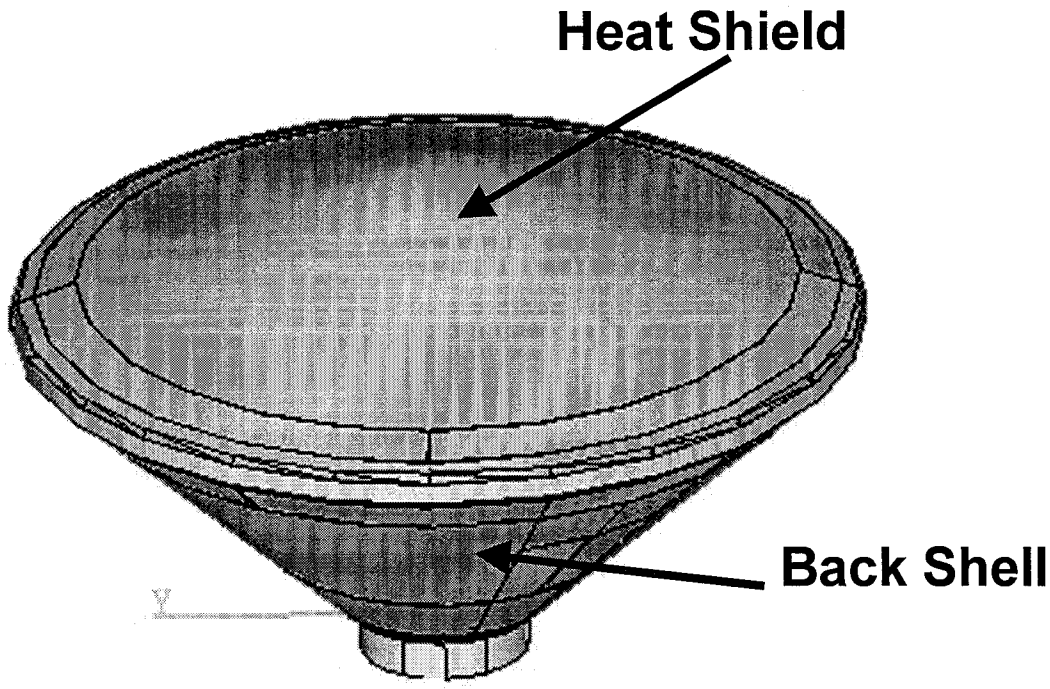
Pathfinder DTM Acoustic Load



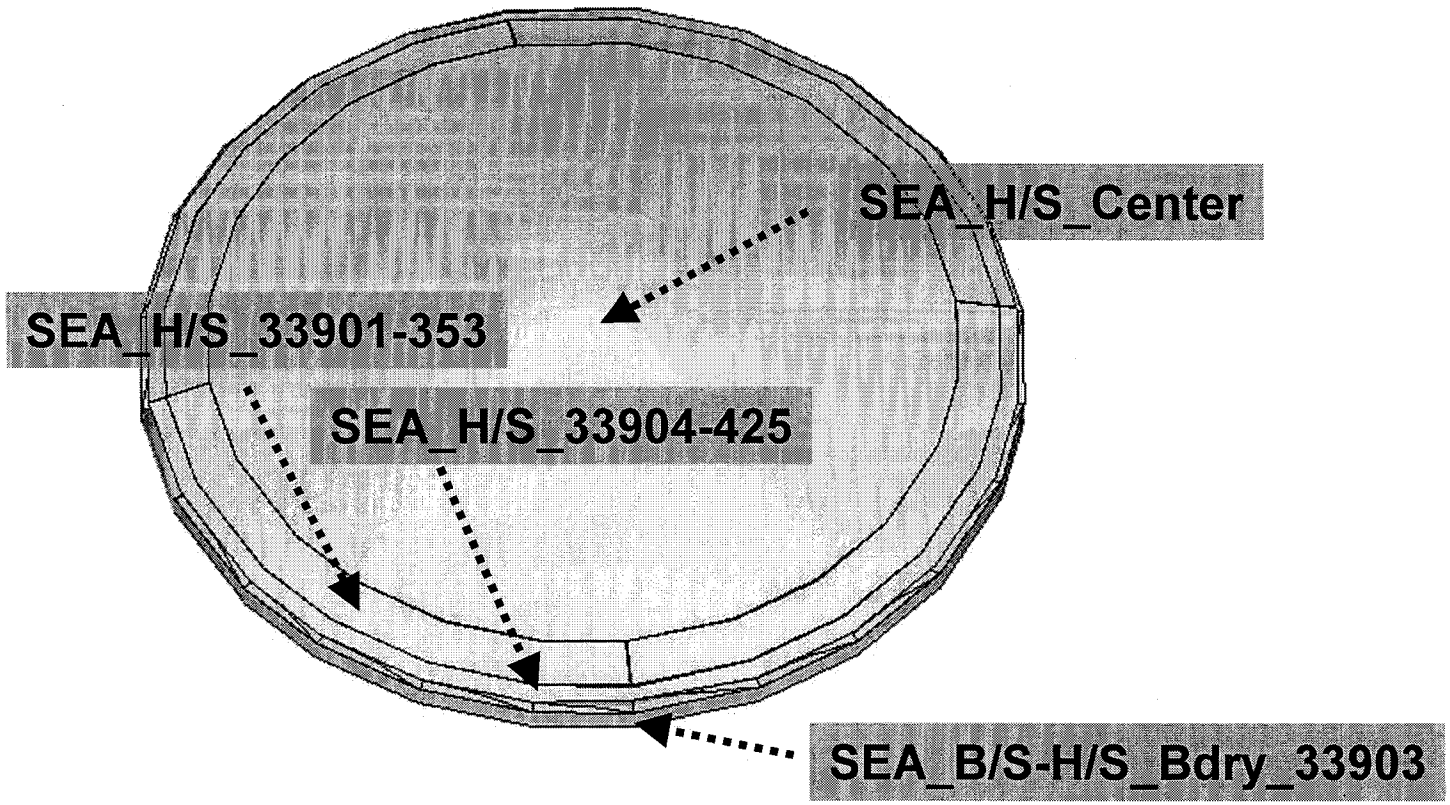
Pathfinder FEM Model



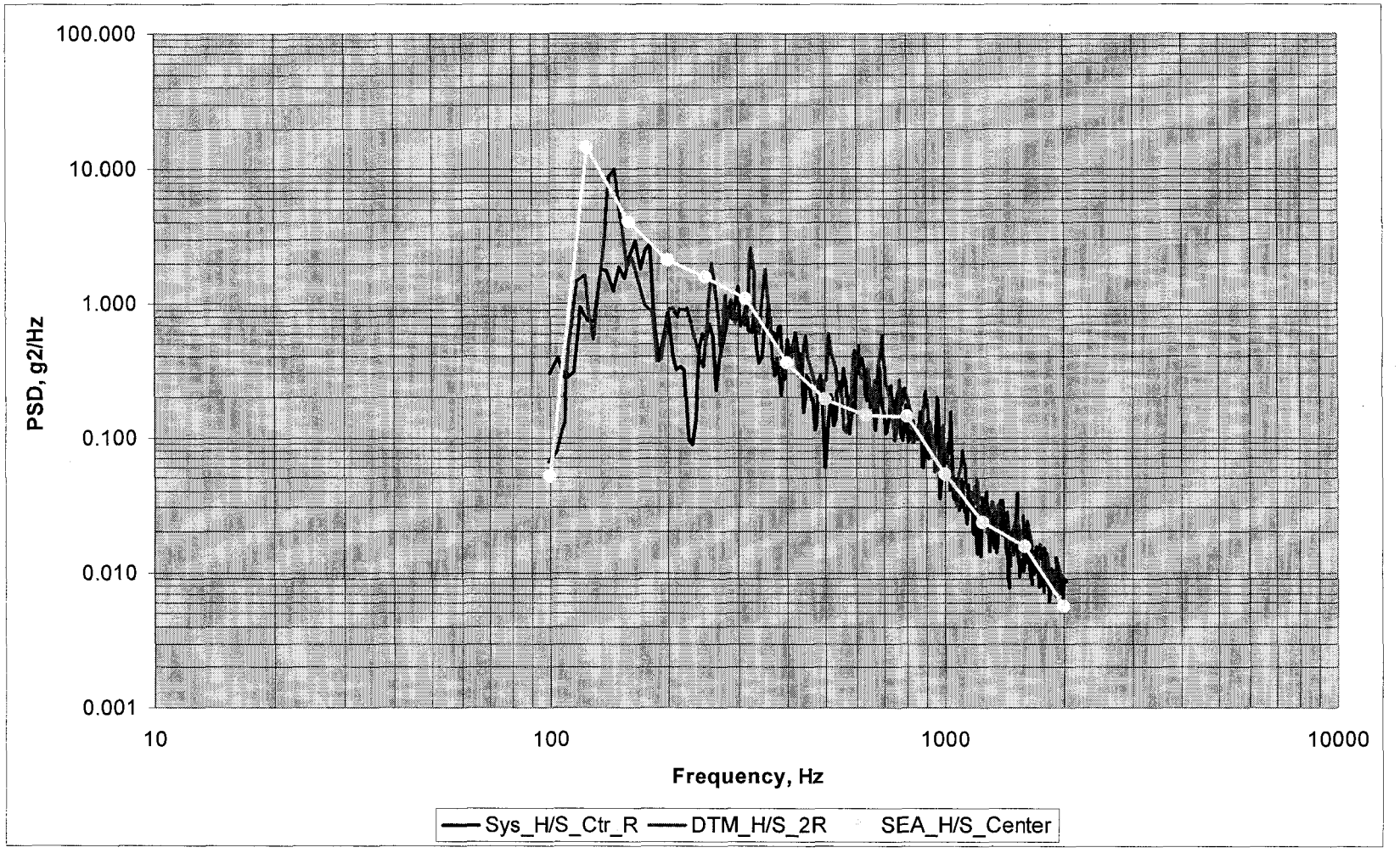
Pathfinder DTM SEA Model



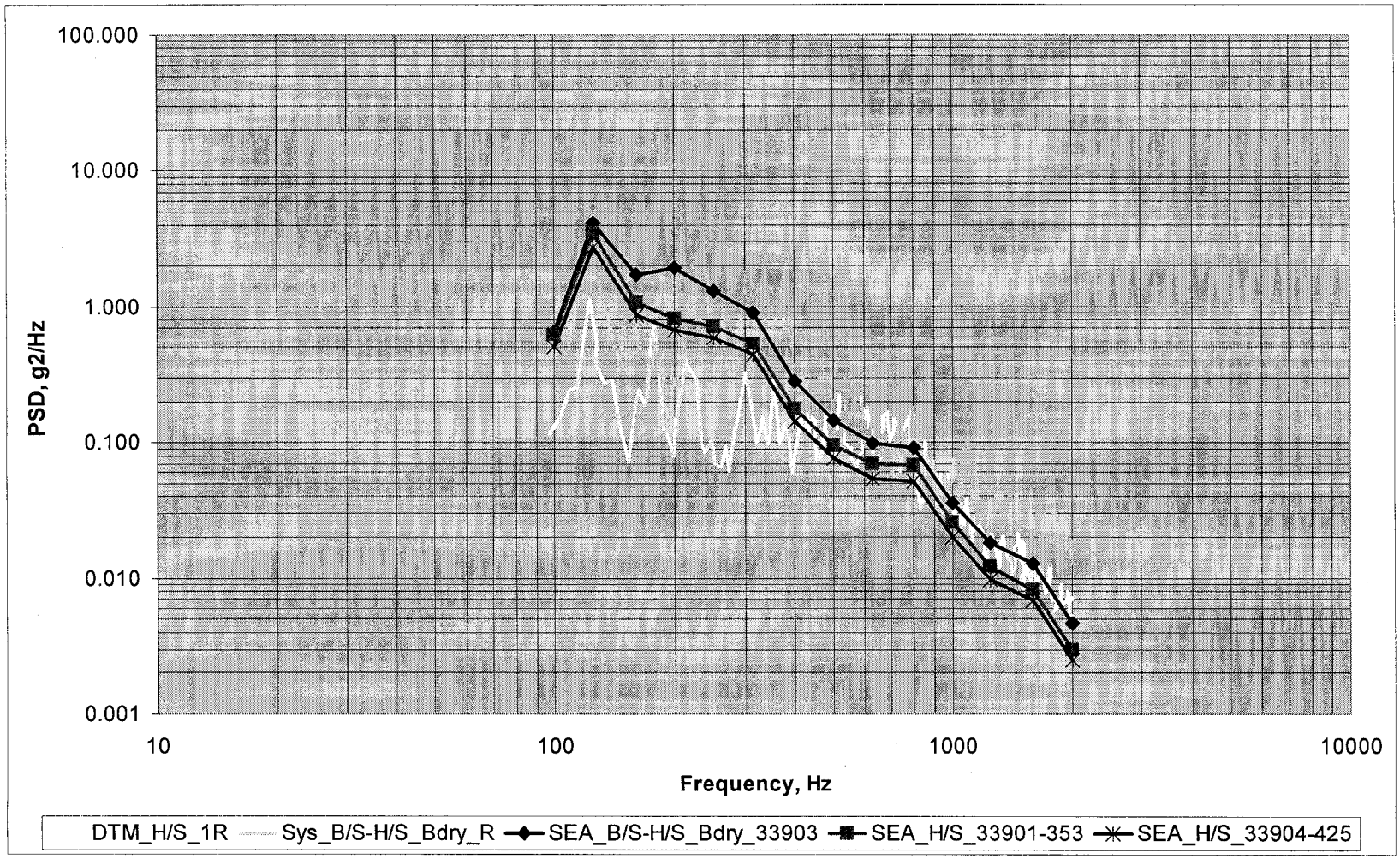
Pathfinder Heat Shield Correlation



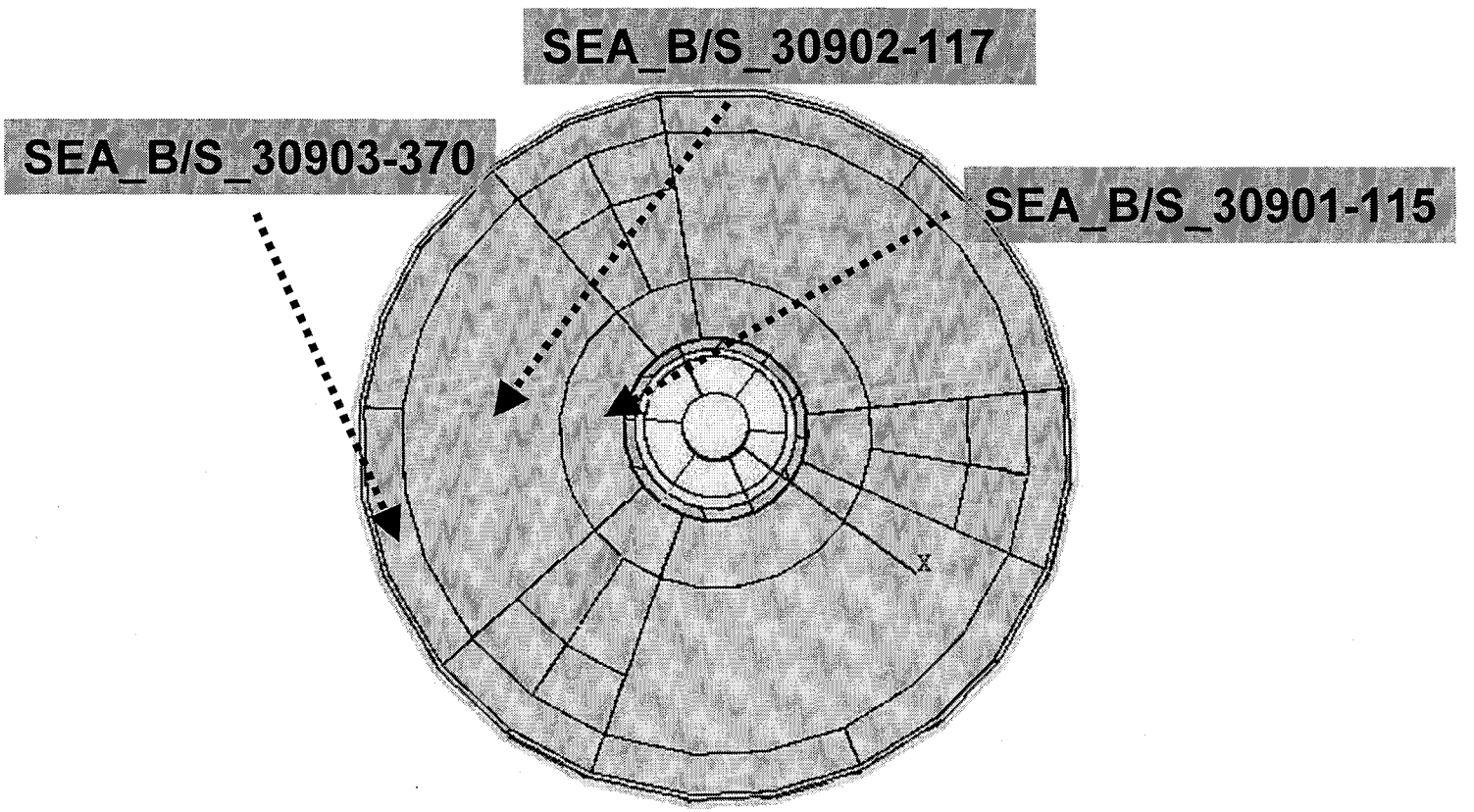
Heat Shield Center



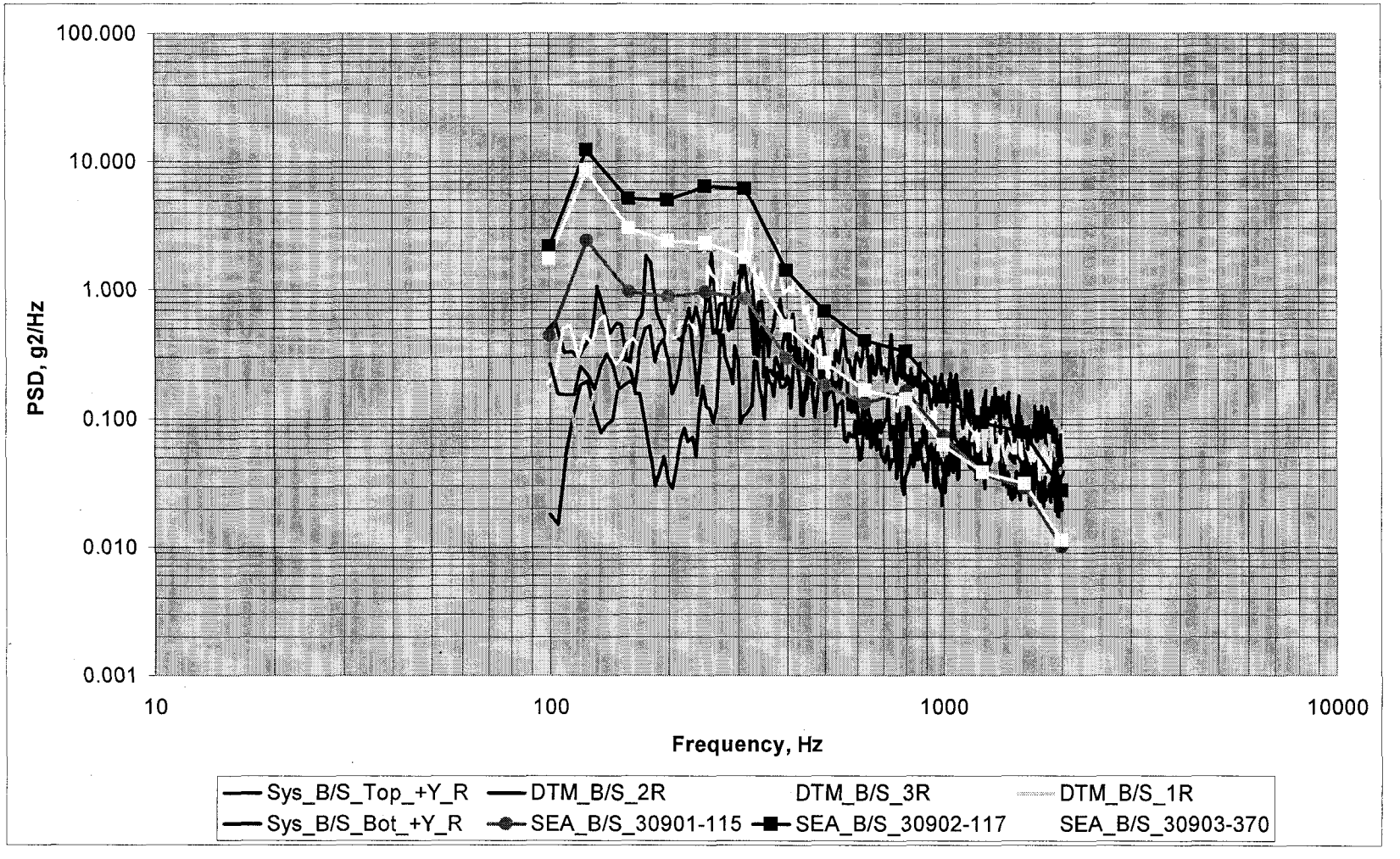
Heat Shield Boundaries



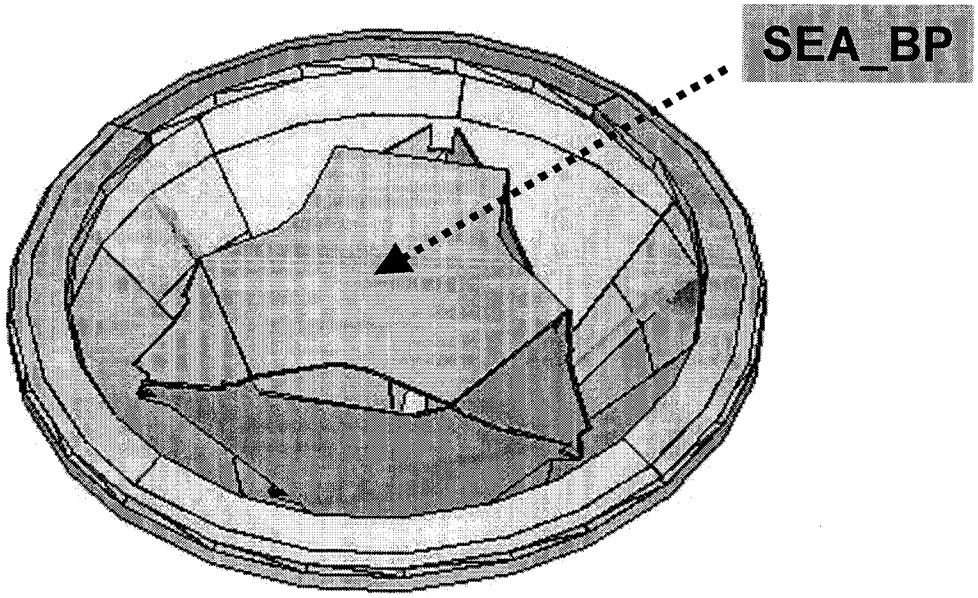
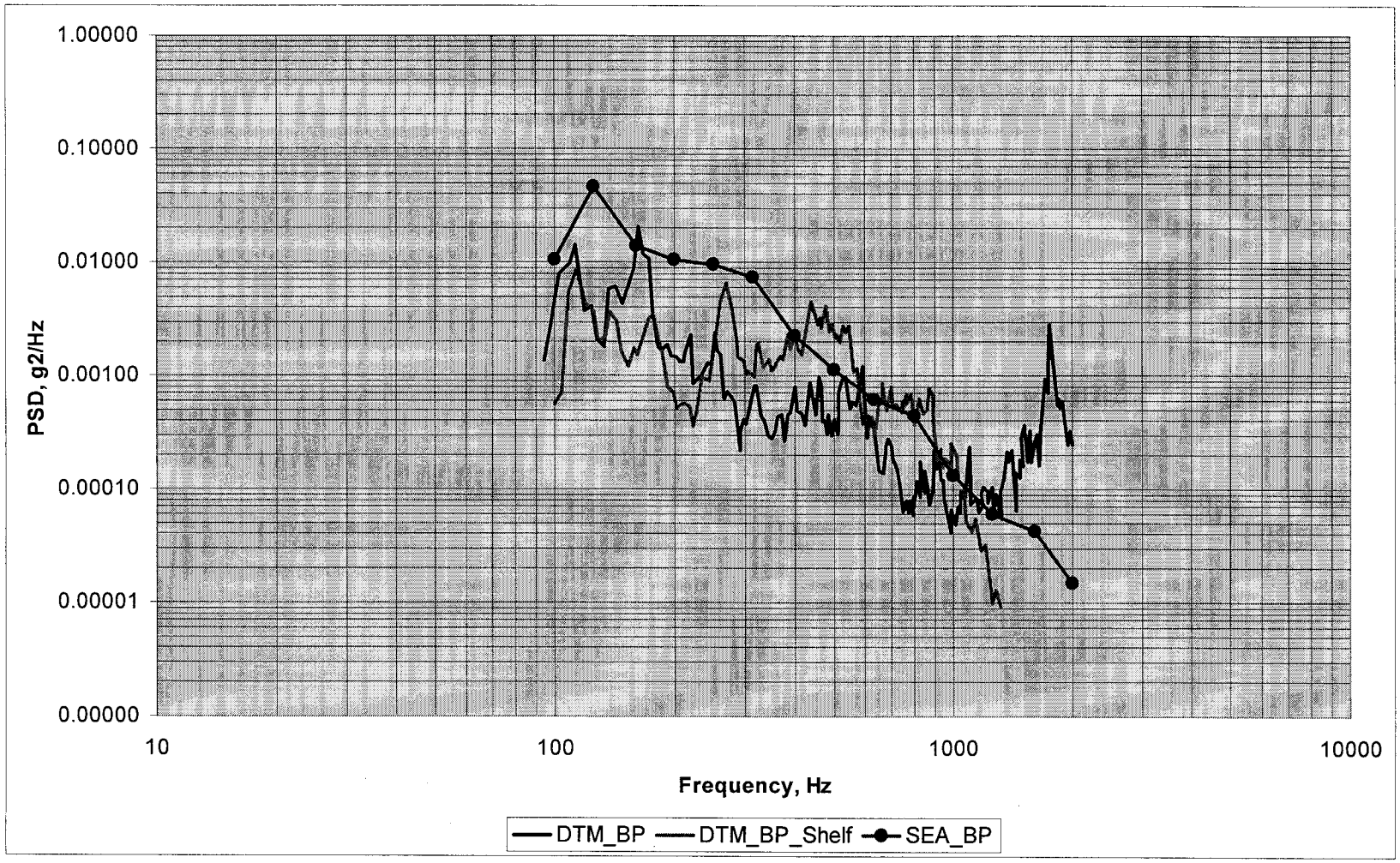
Pathfinder Back Shell Correlation



Back Shell Area



Pathfinder Base Petal and Shelf Correlation



Base Petal and Shelf