LAUNCH VEHICLE SKIN-TO-BULKHEAD TRANSMISSIBILITY

By Tom Irvine
Email: tomirvine@aol.com

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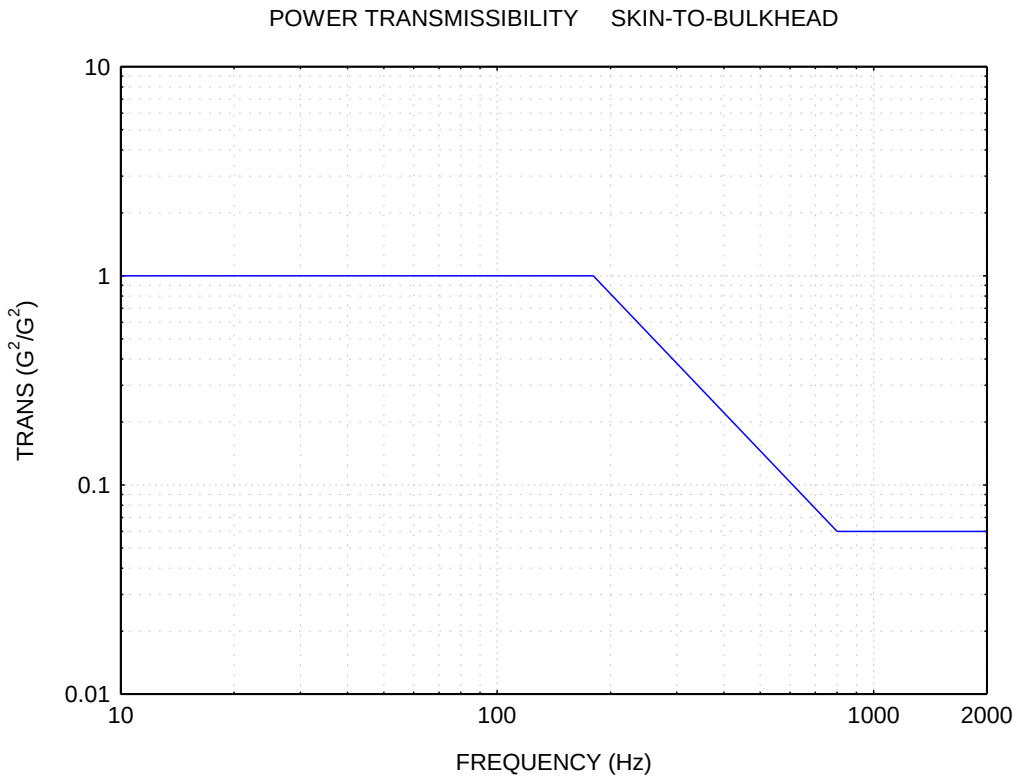

Figure 1.

Table 1. Skin-to-Bulkhead Transmissibility	
Frequency (Hz)	Ratio (G^2/ G^2)
10	1
180	1
800	0.06
2000	0.06

Launch Vehicle Skin Vibroacoustic Environment

Launch vehicles are subjected to external acoustic pressure excitation during liftoff. They are also subjected to aerodynamic flow excitation during the transonic and maximum dynamic pressure events.

These pressure loads are predicted via empirical methods prior to a vehicles launch's flight.

The resulting skin random vibration level can then be estimated from the external pressure using separate empirical techniques. The key variables are the cylindrical shell diameter and the skin thickness and material.

The next task is to determine the resulting random vibration on bulkheads, instrument shelves, and other secondary structures in the same zone as the skin location. The common approach is to derive a single, conservative level which covers all axes.

Power Transmissibility

A power transmissibility function is thus needed to represent the bulkhead response relative to the skin level.

This transmissibility function depends on numerous variables including geometry, joint type, materials, and mass-loading effects from the avionics components. Test data for the given launch vehicle modules can be used to determine the transmissibility. But this test data is usually unavailable when the initial vibroacoustic levels are needed.

The power transmissibility function in Figure 1 can be used as a rough approximation for cases where test data is unavailable. It is based on the author's experience. It is intended to represent all response axes.

It must be used with caution, however. The actual transmissibility will vary for a specific vehicle depending on structural details, damping, linearity, etc.