

**VIBROACOUSTIC ANALYSIS AND EXPERIMENTAL VALIDATION OF THE  
STRUCTURAL RESPONSES OF NASA MARS EXPLORATION ROVER  
SPACECRAFT DUE TO ACOUSTIC LAUNCH LOAD**

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**ABSTRACT**

Structural responses of a spacecraft during liftoff are dominated by the intense acoustic pressure field impinging on the exterior of the launch vehicle. Statistical Energy Analysis (SEA) model of the NASA Mars Exploration Rover spacecraft has been developed and the model was analyzed to predict the vibroacoustic responses of the spacecraft under the diffuse acoustic environment. The spacecraft was also subjected to the broadband acoustic excitation in JPL reverberant chamber simulating the acoustic input to the spacecraft during launch. The measured structural responses at various locations of the spacecraft have been correlated with the SEA results. Analytical responses of various hardware articles mounted on the spacecraft were predicted with a single degree of freedom system with SEA base input to the model. Comparisons were made between the SEA responses and the acoustic test data and good agreements were observed at various locations of the spacecraft.