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A STUDY OF ELECTROMAGNETIC ENVIRONMENTAL EFFECTS ON SPACE LAUNCH SYSTEMS
BY MEANS OF REVERBERATION CHAMBER

Abstract

As a part of the environment met by a launcher during the ascent phase and during the on orbit operations, the electromagnetic radiation (EM) can interact with space systems. Such an interaction can affect the on board operations with negative response on the systems. It seems so necessary to protect the complex systems on the launcher from the EM radiation. The protections have to be properly designed to limit the amount of interference to sensitive systems such antennas and electronic devices. In fact launch ranges often presents numerous radio transmitters, which can be potential threats to communications and telemetry systems and also to electro-initiated devices, such as squibs or explosive bolts. In this frame an assessment of the radio frequency environment is mandatory. Protection systems are nowadays commonly used on stages of launchers and on nozzles as well against vacuum, vibrations and thermal-mechanical stresses. The same protection systems could be used in order to protect the respective items and their internal sensitive electronic devices against EM radiation. The Reverberation Chamber is a new methodology that can be used to study the Electromagnetic behavior of materials subdue to an electromagnetic environment in the radiofrequency range. In such a test system different protection components, used in different environmental conditions as launch, ascent, staging and orbiting, and thus built in different ways, can be studied, evaluating their Absorption Cross Section (ACS), that is the capability of a material to absorb or reflect EM waves. The use of composite materials can be helpful to face EM protection problems in particular, EM shielding capability if structures , and also hybrid composite materials with a layered structure of metal and composites could be of great interest in such an application. In this paper a numerical and experimental approach to the protection problem, by mean of Reverberation Chamber is proposed.