Direct Field Acoustic Noise Test
Power versus Control Strategy

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Abstract:

For many years, the antenna product line located at Thales Alenia Space, Toulouse, has been working to optimize its production process, which includes manufacturing activities, up to the qualification/acceptance of the equipment. This approach is part of a context of strong competitiveness in telecom products for which the speed of development, industrialization and testing is a major asset to ensure on-time delivery to the telecom operators.
Acoustic environment tests usually require a reverberation chamber which is available for Thales on the Cannes site. Thus, logistical operations are necessary to transport the antenna product from one site to another, extending the time of the test campaigns and increasing the risks associated with additional handling operations.
As a result, the acquisition of a Direct Field Acoustic Noise (DFAN) test solution at the Toulouse site makes it possible to secure production rates and minimize logistical risks on antenna products.

The acoustic levels specified for the acceptance of this means were based on multi-launcher spectra intended mainly for medium and big size telecommunications satellites. The acceptance test campaign had validated the ability of the system to provide the necessary power while respecting the requirements for homogeneity of the acoustic field.
After the validation of the DFAN system, a program dedicated to an ESA COPERNICUS altimetry mission, required a new multi-launcher acoustic spectrum of which certain bands exceeded the specified acceptance levels.
This publication describes the tools and the methodology which made it possible to demonstrate the ability of the system to achieve the new specified levels while guaranteeing the integrity of the DFAN setup devices, as speakers and amplifiers.
The first tool, DLM, provided by the DV2 company is used to verify and supervise the sound system. It makes it possible to assess the health of the speakers before, during and after the acoustic runs. It also indicates the level of “Headrooms”, that is to say the level of remaining margin that the system can provide in terms of power.
The second tool is part of the MIMO Random control solution integrated into the Test.Lab software from SIEMENS: the System Verification Pretest analysis module. It offers a multiple set of control strategy and indicates from the pre-test measurements (so called, System Identification), the predicted drive levels, as well as the expected responses, both on the acoustic field measurement microphones and on the responses of the specimen to be tested.
The methodology implemented to achieve the new acoustic spectrum while protecting the DFAN system hardware is presented.

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