Using a flexible reverberation chamber for in-situ interference testing of satellites

Collaboration between:

THALES-ALENIA SPACE
Toulouse
Marc Le Scour

THALES UNDERWATER SYSTEMS
Sophia-Antipolis
Bernard Grangier

THALES NETHERLANDS
Hengelo
Hans Schipper, Frank Leferink

Objective

To demonstrate RE/RS self-compatibility between RF leakage from high power units and sensitive co-frequency units inside the satellite communication module at useful frequency bands of the payload.

Problem

Every interconnection has to be tested for emission and susceptibility. This is the so-called “Sniff” and “Spray” test. Because every interface has to be tested at many frequencies it is very time consuming.

Solution

Hengelo: VIRC

TUS: using it, and and borrowed to TAS;

TAS: testing satellite

A Reverberation Chamber provides a periodic electromagnetic environment, which is
• randomly polarised, i.e. the phase between all waves is random, and
• spatially uniform, i.e. the energy density in the chamber is uniform everywhere and isotropic, i.e. the energy flow in all directions is the same

The electromagnetic fields are stirred such that it looks like a virtual antenna which is moving around the object.

Test method

1. Characterization of the RF tent
Measurement of the cavity loss factor “Xc” in the configurations of test (RF tent empty and loaded by the MGSE (dolly + actuators) & Payload)

2. Radiated Emission “RE” and Radiated Susceptibility “RS” test setup

- Radiated Emission test within the RF tent
  Measurement of the electrical field <E> in V/m

- Radiated Susceptibility test within the RF tent
  Measurement at repeater output of the <P spurious> coupled on the Payload

Conclusion

Coverage of all possible RF paths; More representative of RF behaviour within the CM cavity
E-field distribution law according the expected behaviour in an oversized cavity
RE and RS measurements simultaneously on all interfaces of the repeater path
Best correlation with EMC analysis (same approach than RE/RS tests)
Test time reduction to 1/3
Easy and quick localisation of the RF leakages by using different RF paths