Modelling the propagation of random electromagnetic emissions

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Wave Modelling Group

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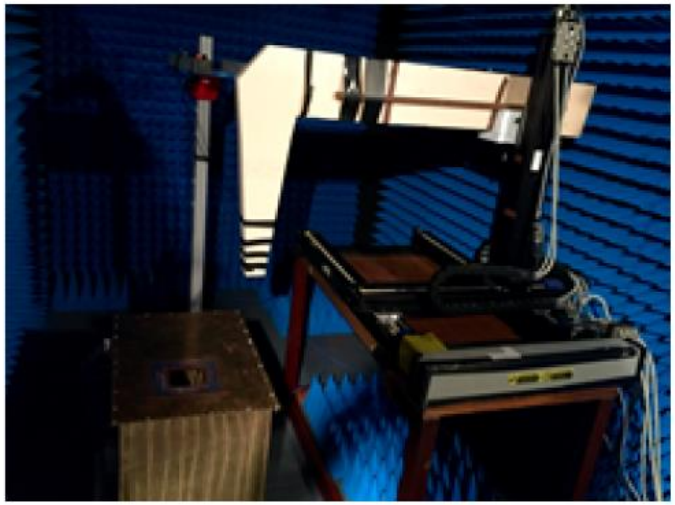
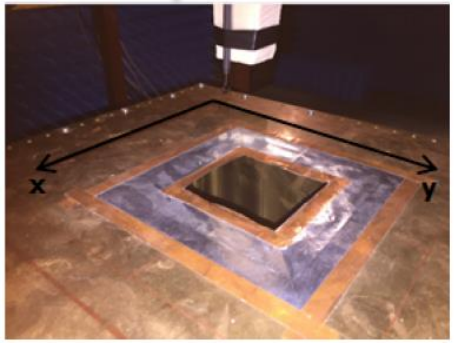
EPSRC

Experiments: emission from enclosures

The George Green Institute scanner

Scanner has been operated inside an anechoic chamber[*]





10 mm probe, high sensitivity,
Magnetic field selective, electric field immune,
low interferences

[*] G. Gradoni *et al.* Wigner function approach to propagate the correlation of random emissions, *to be submitted* IEEE TEMC (COST Ack).

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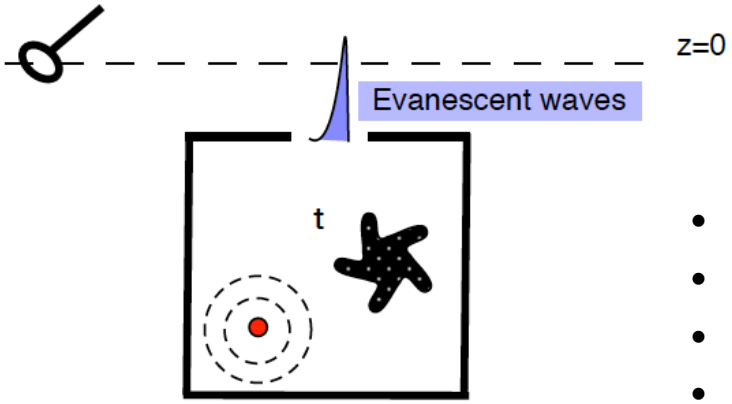
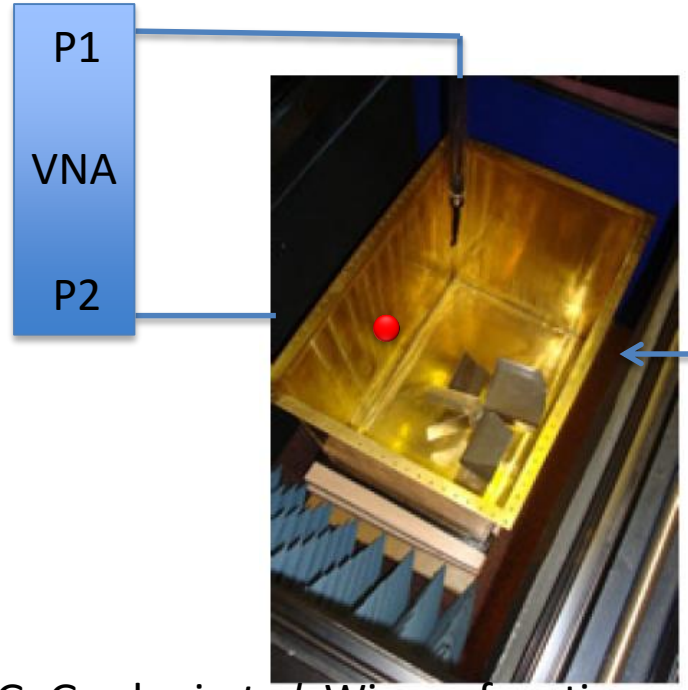
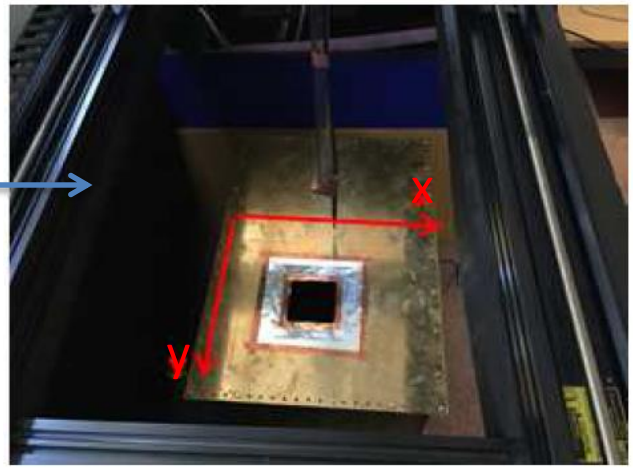
Experiments in free space



- Aperture dimensions 8 cm X 8 cm
- RC dimensions 1 m X 1 m X 0.5 m
- Langer EMV-Technik RF R50-1 magnetic field probe
- Agilent E5062A VNA



Top plate with a square aperture



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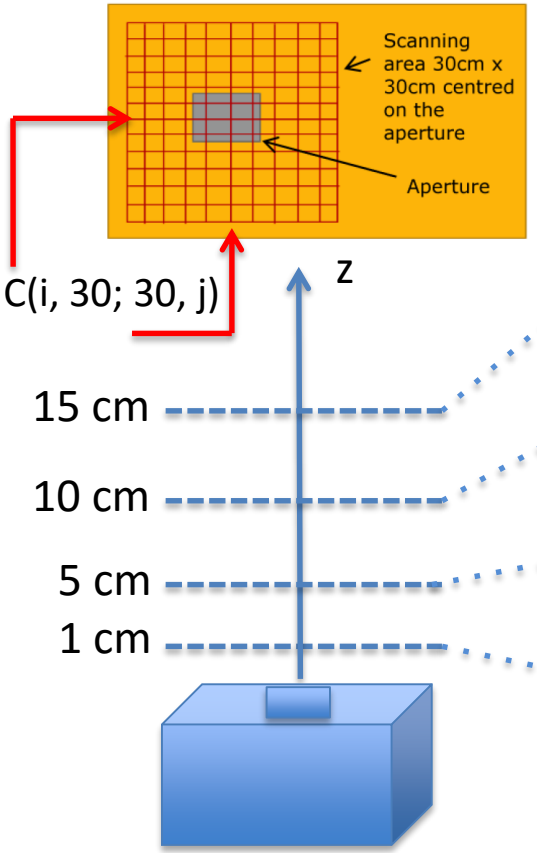
Experiments: emission from enclosures

The George Green Institute scanner

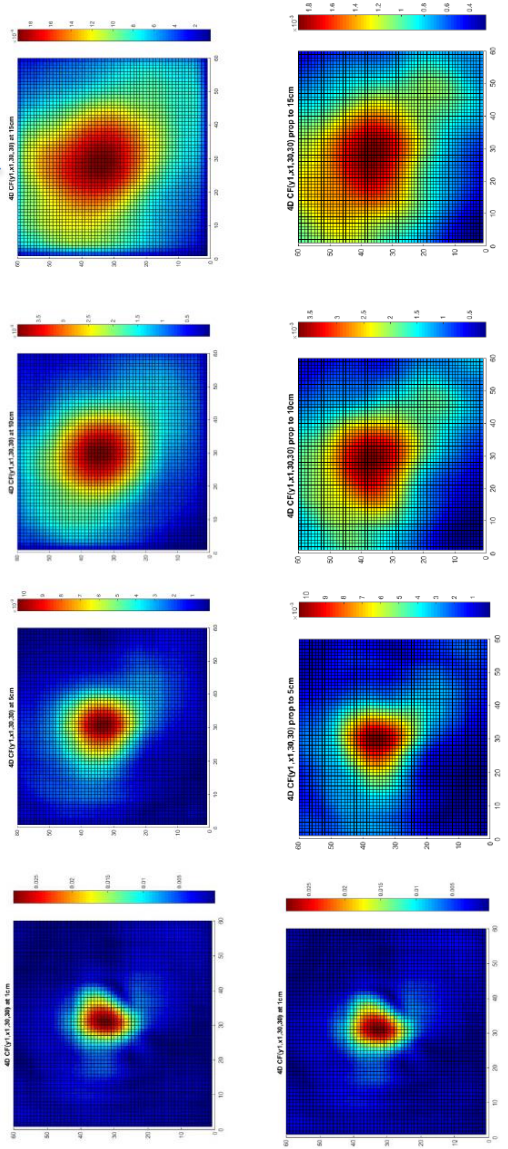
Scanning performed:

- Over an area of dimensions 30 cm X 30 cm
- At heights z = 1, 5, 10, 15 cm
- With step of 1 cm at 3 GHz
- For 16 paddle positions



Experiments

Theory FP



Same scales!

Input for WG4

Relevance for Radiated Emission Standards

CISPR 16-1, 1993 "Specifications of methods and measuring apparatus for radio-electric disturbances and immunity from radio-electric disturbances", parasitic field radiated by an AUT in the field 30 MHz to 1 GHz

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Statistical Modal Analysis Applied to Near-Field Measurements of Random Emissions

Benoît Fourestié, *Member, IEEE*, Zwi Altman, *Senior Member, IEEE*, Jean-Charles Bolomey, Joe Wiart, *Member, IEEE*, and Françoise Brouaye

Absence of phase reference motivates the use of *Correlation Functions*

I. Introduction

NEAR-FIELD (NF) techniques have been widely used to accurately determine fields radiated from scatterers, antennas and other devices under test (DUT) in either frequency or time domain [1]–[3]. When considering antenna or scattered field measurements in the frequency domain, the source is synthesized and the phase reference is given by the source. On the contrary, when the emissions are random and the source is beyond control, no phase reference is defined, making the use of conventional NF frequency-domain techniques impractical. Random emissions do not allow any type of synchronization to be established between the DUT and the measuring devices. To

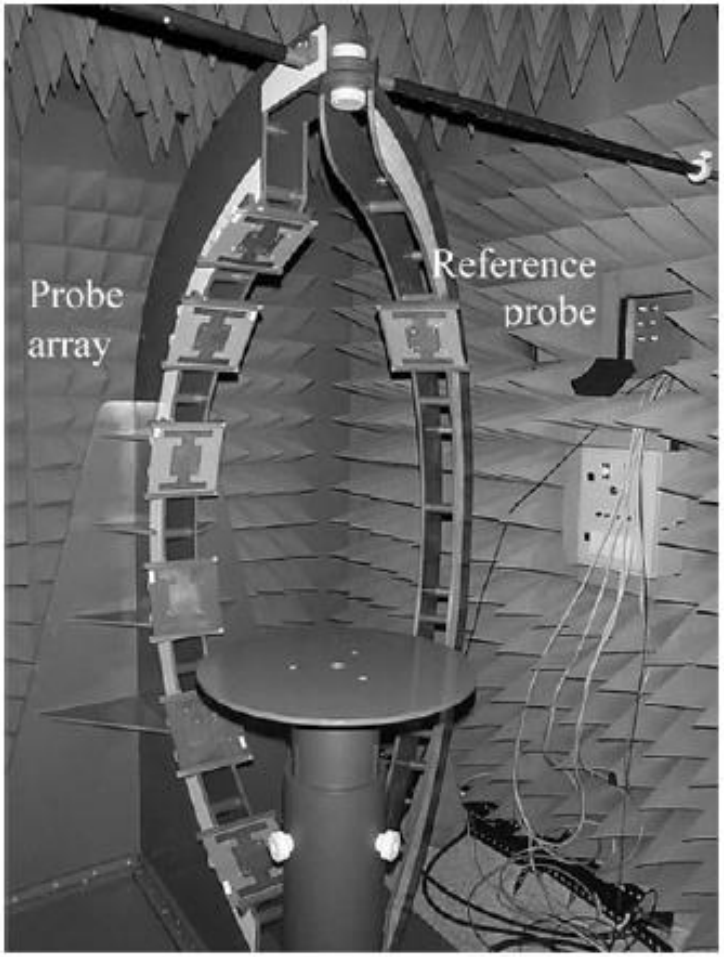
tances. The DUT can be modeled as a sum of narrow-band uncorrelated sources inside a finite volume. It is interesting to note that the same hypothesis is made in EMC standards, namely that signals are filtered in a 100-kHz bandwidth. At a given observation point, the radiated field can be considered as a stochastic process. Under the assumption that the radiated fields are weakly stationary in time and in space, it is possible to define the coherence function of the fields at two different locations at a particular frequency [6]. The proposed technique is well suited to the characterization of NF random emissions for which no phase reference can be given [7]. It provides an accurate and

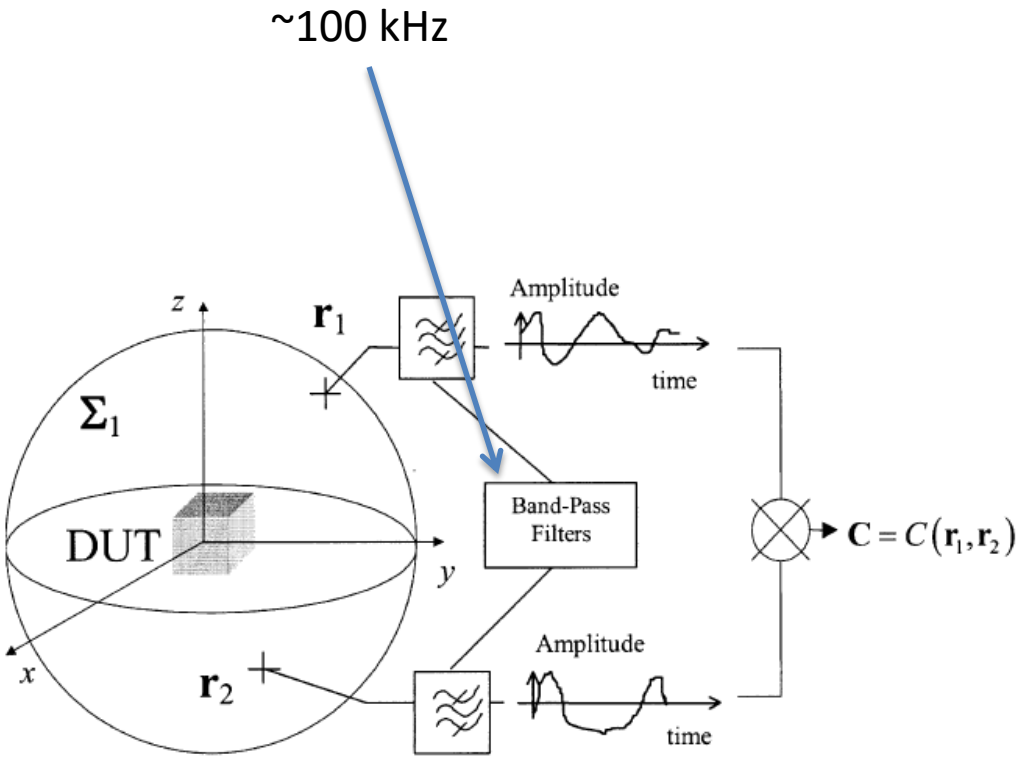
Broadband random emissions?

Input for WG4

Relevance for Radiated Emission Standards

``Near-field'' ring scanner – main application: mobile terminals





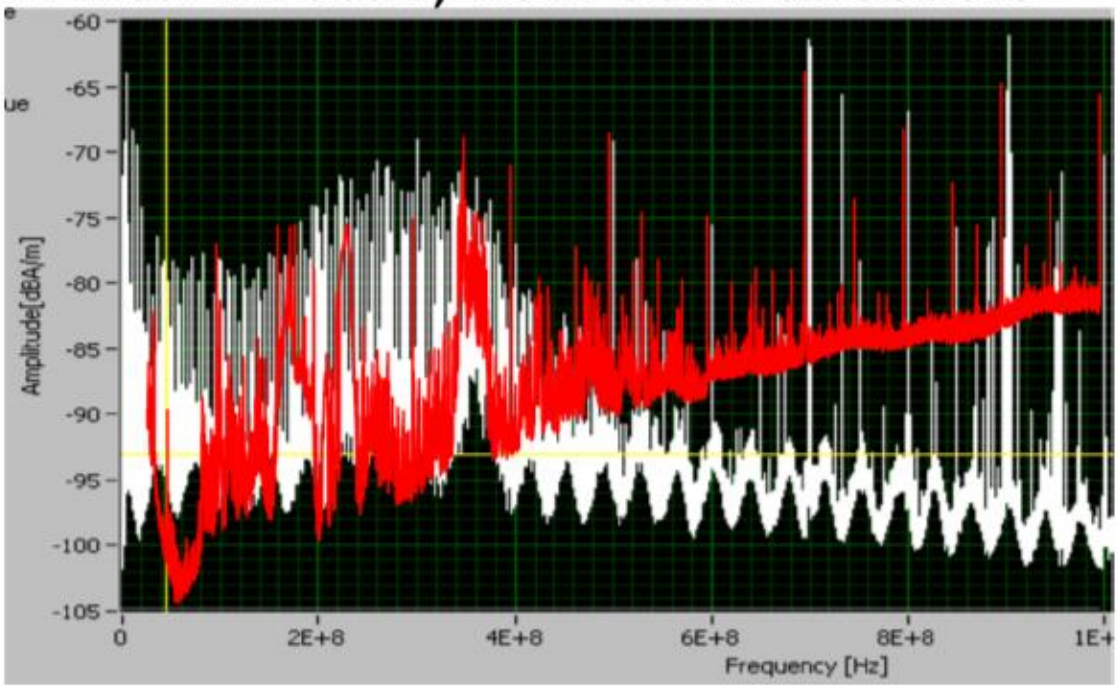
Input for WG4

Relevance for Radiated Emission Standards

Collaboration with UNIVPM. Addressing the question:
Are correlation based near-field methods able to capture and predict More spectral features than deterministic (standard) methods?

An interesting observation….

White: Nf scan, Red: Semi anechoic



Possible reasons and cures…

- Evanescent waves effect
- Transient events
- Anechoic near-field scanning
- Joint space-time-frequency
- Relate filters to correlation length: <> 100 kHz
- High spatial resolution and Dynamic filtering