Reduction in test effort for emissions measurements above 1 GHz by using statistical analysis

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A feasibility study was undertaken to investigate the use of statistical analysis of numerical modelling techniques to reduce the measurement time in EMC testing in the case of radiated emission above 1GHz.

At frequencies above 1 GHz, PC-sized devices become electrically large, giving rise to complex radiated emission distributions. Taking measurements over a hemi-spherical surface at sub-wavelength resolution is the only certain way to determine the peak emission from the *equipment under test* (EUT). However, performing hemi-spherical measurements is impractical as it is difficult to achieve and also very time consuming.

Exact modelling of this highly complex radiation structure is impossible, as even small deviations in the construction of the EUT will have a significant effect on the positioning of the lobes of emission. However, the statistics of modelled emissions are likely to be similar to the statistics of measured emissions and these can be used to reduce the measurement effort.

For the purpose of this investigation, a Representative Equipment Under Test (REUT) radiating over the frequency range 1GHz to 4GHz was designed and built. High resolution emission measurements of the REUT were performed and the field distribution was then analysed and fitted to various statistical distributions.

Modelling of the REUT was then performed using a full wave method (based on Transmission Line Modelling) and, more extensively, a point source model (based on a linear array approach). For this second model, statistical analyses of the field distribution were made and compared to the analyses of the measured results.

The talk will concentrate on the following results found in this study:

- Measurement results show that as the frequency is increased the emission pattern of the REUT becomes extremely complex.

- The use of statistical analyses can allow the prediction of the maximum emission with only a limited number of measurements in return for increased measurement uncertainty.
- Qualitative agreement can be achieved between measurements results and TLM based modelling for frequency up to 4GHz.