Validation of the ABT scattering prediction method for the analysis of complex environment.

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Characterising antenna performances in real environments is a need in most applicative areas and the capability of assessing the effects of antenna interaction with the environment during design phases is becoming crucial in several of them. In particular, for space applications the problem of assessing interference levels on platforms are often addressed by resorting to lengthy measurement campaigns taking place in the later stages of the satellite development resulting in high costs and significant programmatic risks or on dedicated models when the information is needed during antenna development.

A new approach to the problem, based on the tight combination of measurement and prediction tools has been developed by combining fast and relative inexpensive near field measurements capabilities (P.O. Inversen, *et al., IEEE Antennas an Propagation Magazine*, 43, 90-94, 2000) with an efficient algorithm for GTD analysis (E. Di Giampaolo *et al., J. Electromagnetic Wave Applications*, 15, 439-460, 2001). The Astigmatic Beam Tracer (ABT) is a forward ray racer technique based on a complete angular partition of 3-D space with beams able to trace the propagation of radiated energy starting from the description of outgoing waves on a closed surface surrounding the sources of the electromagnetic field.

This approach offers the possibility to obtain almost real time numerical assessment of the antenna behaviour in its final operational complex environment from near field measurement of the isolated real antenna. Fundamental aspects to be assessed in this context are the accuracy of the system predictive component and the time efficiency of the combined process (measurement + analysis).

Accuracy and time efficiency aspects are validated by measurements on appropriate breadboards. In order to achieve the desired objective these breadboard models are designed to probe the most delicate aspects of GTD/UTD based algorithms, rather than focusing only on overall accuracy in a realistic reconstruction of typical operational environments. In this way it is possible to individually assess the various sources of error, compare it with error estimates based on the algorithm characteristics and use this information to build an overall error budget, also including the measurement error.

In the frame of this work the methodology and results of the validation activity will be presented.