Efficient full-wave assessment of high gain transmit-array antennas

Jorge P. Teixeira[1], Sérgio A. Matos[1], Jorge R, Costa[1], Carlos A. Fernandes[2]

[1]*Instituto de Telecomunicações (IT), Instituto Universitário de Lisboa (ISCTE-IUL)*
[2]*Instituto de Telecomunicações, Instituto Superior Técnico, Universidade de Lisboa*

With the continuous exploration of millimeter waves, fomented by next generation of mobile and satellite communications, new low-cost beam antenna designs are still required for the massification of this technology. Transmit-arrays (TAs) are being intensely investigated as a possible cost-effective solution for a wide variety of applications. Underlying these studies is the need to have an efficient method of simulating this type of antennas. Performing full-wave simulation of TA antennas can be quite challenging, especially when high gain is required. This is mainly due to the large volume occupied by these type of antennas (comprising the feed and lens) and the fine subwavelength details of the unit cells that populate the TA. Based on the experience gained when designing TA for Ka-band [1] [2], we will present an overview on the numerical techniques used to perform the full-wave analysis of different TA antennas. In Figure 1, we depicted one of the methods that proved to be more effective on reducing the numerical complexity of the problem without compromising significantly the accuracy of the results.

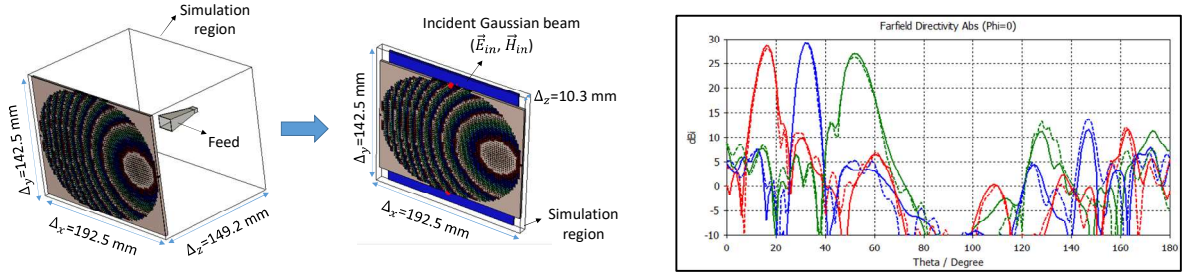

Fig.1 – Method used to reduce the simulation time and memory required to perform the full-wave evaluation of a TA fed by a horn antenna.

References

[1] - E. B. Lima, S. A. Matos, J. R. Costa, C. A. Fernandes and N. Fonsenca, "Circular polarization wide-angle beam steering at Ka-band by in plane translation of a plate lens antenna," *IEEE Trans. Antennas and Propag.*, Vol. 63, No. 12, pp. 5443-5455, Dec. 2015.

[2] - S. A. Matos, E. B. Lima, J. S. Silva, J. R. Costa, C. A. Fernandes, N. J. G. Fonseca, and J. R. Mosig, "High gain dual-band beam-steering transmit array for satcom terminals at Ka-Band," *IEEE Trans. Antennas Propaga*, vol. 65, no. 7, pp. 3528-3539, Jul. 2017.

Acknowledgment

This work was partially supported by grant ISTA-BM-2016 and by the European Space Agency under contract no. 4000109111/13/NL/AD.