

# Combination of ICEPIC and FDxD for Analyzing HPM System with Extended Feed Line

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Our previous paper reported the development of an interface between ICEPIC (ICEPIC User Reference Manual 20110215-653-gd028ed8, Aug. 2010, Air Force Research Lab) and FDxD (Boeing internally developed FDTD software) for analyzing HPM sources on electrically large platforms (H. Z. Zhang, P. Tulyathan, J. H. Morrill & Q. H. Nguyen, 2014 IEEE AP-S). In this paper, we report the improvement of the interface for analyzing HPM system with feeds cutting through the FDxD Huygens source box.

The combination of ICEPIC and FDxD is achieved through a Huygens box. Traditionally, the Huygens box is an enclosed box which contains electric and magnetic field exported from another source. However, for some applications, the electrical size of the HPM source is too large to be used as a Huygens source. To overcome this problem, we developed a special technique that allows a hole to cut through the Huygens box such that an antenna feed structure can protrude outside the box. In this way, the Huygens box needs to contain the radiating elements only. This is shown in shown in Figure 1, which is a model of the A6 relativistic magnetron system. FDxD takes Huygens source field from ICEPIC as an input, and then performs finite differencing to recalculate the field distribution over a larger area. As shown in Figure 2, the combination of ICEPIC and FDxD for the electric field received by the probes at the front and side of the horn shows good agreement with those obtained from ICEPIC only.

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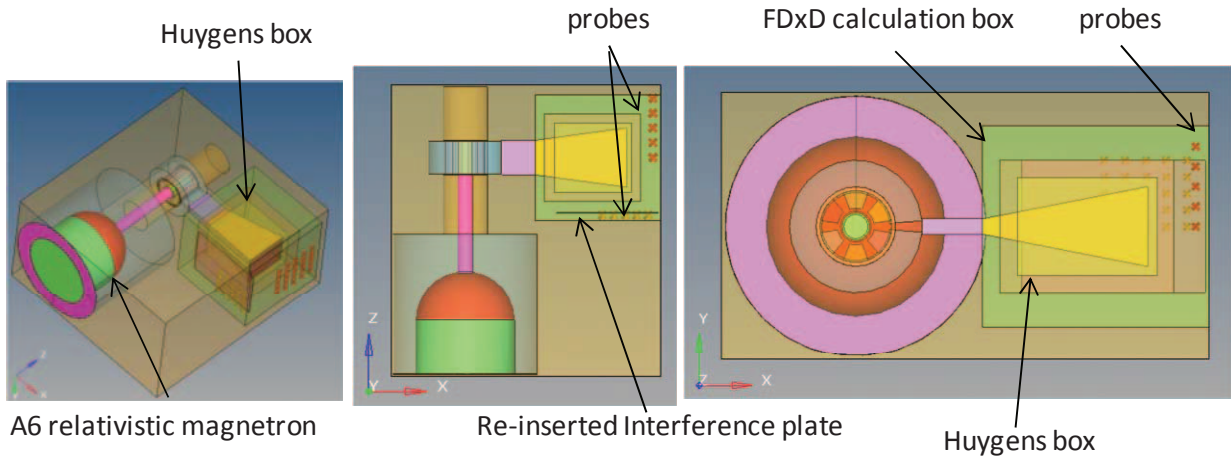


Figure 1 A6 relativistic magnetron and a horn enclosed by a Huygens box with extended waveguide feed.

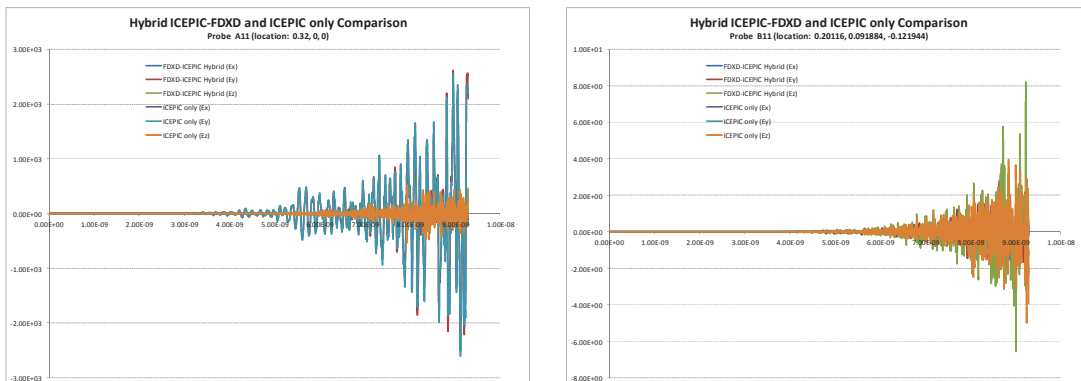


Figure 2 Comparison of electric field for the probes at the front and side of the horn.