

The analysis of complex antenna structures (like the ITER array) using TOPICA

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TOPICA (Torino Polytechnic Ion Cyclotron Antenna) code is an innovative tool for the 3D/1D simulation of Ion Cyclotron Radio Frequency (ICRF) antennas, i.e. accounting for realistic 3D antenna geometries and for accurate 1D plasma models. The tool calculates the antenna input parameters at the feeding ports given the exact port excitation. Moreover, it calculates the current distribution and electric field maps wherever specified.

The recent upgraded parallelized version of TOPICA permits the analysis of large and complex antenna structures in a reasonable simulation time (less than one day).

A detailed analysis of the performances of two ITER ICRF antenna geometries has been carried out, underlining the strong dependence and the asymmetries of the antenna input parameters due to plasma conditions. An optimization of the antenna dimensions has also been accomplished. Electric current distribution on conductors in the vacuum region and electric field distribution in the vacuum region and at the interface with plasma edge have been calculated as well.

The analysis shows the strong capabilities of the parallelized TOPICA code as a predictive tool and its usefulness to ICRF antennas final design.