Full Wave 2D Theory of LH Grills Suitable for Large Structures*

J. Preinhaelter[1], J. Urban[1], L. Vahala[2], G. Vahala[3], M. Záruba[1]
[1] *Institute of Plasma Physics AS CR, v.v.i., Prague, Czech Republic, Association EURATOM/IPP.CR*
[2]*Old Dominion University, Norfolk, VA 23529, USA,*
[3]*College of William & Mary, Williamsburg, VA 23185, USA*

A fast algorithm for full wave description of lower hybrid wave-guide grills is developed. Propagation of waves in a collisional cold plasma is solved by a finite elements method with adaptive mesh refinement and automatic solution domain. Extensive number of 2D integrals in *k*-space, needed to determine the coupling admittances, is handled by splitting the integrand into a plasma related part and a part containing Fourier amplitudes of *y*- and *z*-dependent waveguide modes. Application of high order Gaussian quadrature in the accessibility region and trapezoidal quadrature with iteratively tabulated integrand in the inaccessibility region enables using only a single *k*-mesh for the plasma related parts of the integrands. Full-wave solutions on this mesh are independent of the grill parameters and hence can be used for arbitrary structures. We have found a curve in the *k*-space where the plasma-dependent parts of the coupling admittances integrands are singular and a way to treat these problems. In particular, the radiated power contained in the standing waves in the inaccessible region is accurately calculated, conserving the total energy. Our method is able to calculate the full electric field in front of the grill.

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