3rd URSI AT-AP-RASC, Gran Canaria, 29 May – 3 June 2022

Wiener-Hopf Formulation of Scattering by a PEC Wedge Immersed in Anisotropic Media

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This work presents a novel formulation of the scattering problem constituted by a wedge immersed in anisotropic media with perfect electric conductor (PEC) boundary conditions. The technique is based on Generalized Wiener-Hopf Equations (GWHEs) obtained from functional equations in spectral domain after the imposition of the boundary conditions. This methodology takes origin from a revisited version of Bresler-Marcuvitz transversalization method [1] applied to angular regions filled by an arbitrary linear medium. It allows to get the GWHEs for wedges immersed in arbitrary linear media [2-3] and now we are developing solutions for physical engineering problems like the one of this work.

The efficacy of GWHEs in analyzing isolated impenetrable and penetrable wedge problem immersed in an isotropic medium is well demonstrated in literature, see for instance [4-5] and references therein. We recall that GWHEs differs from Classical Wiener-Hopf equations (CWHEs), because the plus and minus unknowns are defined into different complex planes that are related together. The methodology to get solutions from GWHEs is constituted by the application of a suitable spectral mapping (see [4] and references therein) that allows to transform the GWHEs into CWHEs amenable of approximate solutions via the Fredholm factorization technique [6]. The Fredholm factorization technique reduces the factorization problem to solution of Fredholm integral equations of second kind eliminating one kind of unknown (either plus or minus) by applying contour integration and Cauchy decomposition formula.

The selection of an arbitrary linear medium does not always allow the reduction of GWHEs to CWHEs but it is possible to work in multiple complex planes with Cauchy decomposition procedures. However, in the present work we investigate special cases of anisotropies that complicate the problem with respect to wedges in isotropic media but simply it with respect to wedges in arbitrary linear media.

These two cases are constituted of uniaxial and biaxial anisotropic media. In the first case we reduce the problem to have similar properties to isotropic media problem, while in the second case special spectral mapping and decoupling of spectral GWHEs are of help in developing solutions.
Further details on formulation, solution procedure and numerical results will be shown during the conference.

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This work is supported by the PRIN Grant 2017NT5W7Z GREEN TAGS