2D High-Order IBC for Coated Bodies

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We consider the time harmonic Maxwell's eqations for the scattering problem from a 2-D objects that are PEC coated with thin dielectric layer (TDL). To solve this problem for arbitrary incidentwave angle, we consider first and second order impedance boundary conditions (IBC), using operator $L = L_D - L_R$. Where $L_D(V) = \nabla_{tg}(\nabla.V)$ and $L_R(V) = \nabla \times \{n(\nabla \times V)_n$[1]. So from Maxwell's Equations and HOIBC we obtain IE formulation, that we solve by FEM,

$$< [Z_0(B-S) + \frac{a}{2k^2}I + \frac{a'}{2k^2}L + \frac{a''}{2k^4}L^2](J), \psi_J > + < Q(jM), \psi_J > + < [\frac{jb}{2k^2}L + \frac{jb'}{2k^4}L^2](n \wedge jM), \psi_J >=< IE^i, \psi_J >$$

$$< Q(J), \psi_M > - < [\frac{ja'}{2ak^2}L + \frac{ja''}{2k^4}L^2](J), n \wedge \psi_M > + < [\frac{1}{2a}I + \frac{1}{Z_0}(B-S)](jM)), \psi_M > + < [\frac{b}{2ak^2}L + \frac{b'}{2ak^4}L^2](n \wedge jM), n \wedge \psi_M >= j < IH^i, \psi_M >$$

where B, S and Q are classical operators in IE formulation of Maxwell's equations [2]. We tested the numerical method using code of Dassault, which we had. at our disposal. Figure 1 show that SER for angles θ of incident waves on cylinder with thickness $1,5mm$ and $3mm$, for $\epsilon_r = 10 - 5j$ and $\mu_r = 1$, the frequency of the waves is $3,4GHz$.

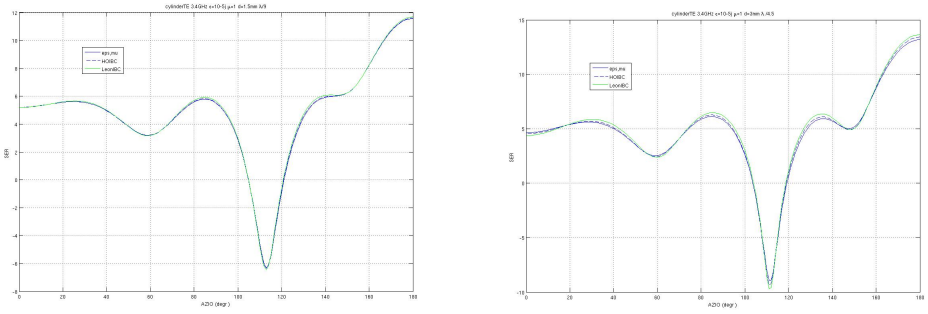

Figure 1: a)$CylinderTE3.4GHz \quad \epsilon = 10 - 5j \quad \mu = 1 \quad d = 1.5mmandd = 3mm$

Références

[1] B. Stupfel, Y. Pion, *Impedance Boundary Conditions for Finite Planar and Curved Frequency Selective Surfaces*, IEEE, Transactions on Antennas and Propagations, Vol 53, No 4? Avril 2005, pp 1415-1425.

[2] P. Soudais, F. Bangui, *Méthode numérique mixte équation intégrale-éléments finis pour la SER harmonique 3D. Algorithme multi-incidences, éléments minces et impédances de surface*, Rapport Technique ONERA n4/3745 RY 020 R, 1993.

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