Application notes on a lossy medium model in the method of auxiliary sources and solving of eigenvalue problems

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Abstract—This paper describes numerical solving of the Laplace operator 's eigenvalue problem for domain with space periodic boundaries, based on the Method of Auxiliary Sources (MAS) and with a lossy medium model. It discusses space periodic green function's representation in different sum and their convergence properties. A lossy medium model in the MAS is analyzed and assessed its applicability solveing eigenvalue problems in case of periodic boundaries of arbitrary shape.

Keywords- MAS, Eigenvalues, Lossy medium.

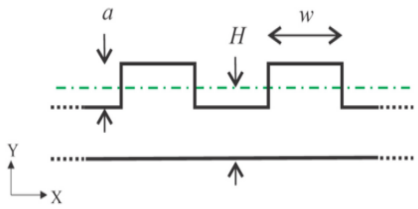

Figure 1.
Geometry of structure and parameters

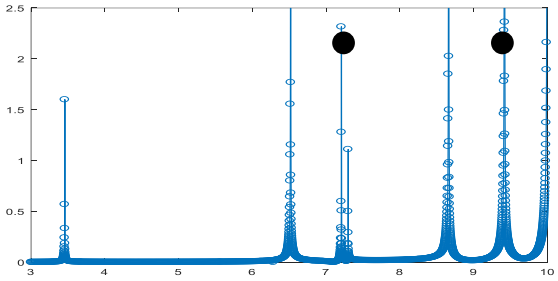

Figure 2.
Characteristic curve

References

[1] M. A. Aleksidze, Fundamental functions of mathematical-physics equations in approximate solutions of boundary problems. Part I. Tbilisi State University Publisher, 1989 (in Russian).

[2] R. S. Zardze, D. D. Karkashadze, J. S. Khatiashvili, Method of Auxiliary Sources for investigation of along-regular waveguides, Tbilisi State University Publisher, 1985 (in Russian).

[3] Kupradze, "About Approximates Solution Mathematical Physics Problem," Success of Mathematical Sciences, vol. 22, no. 2, pp. 59-107, 1967.

[4] D. Kakulia, K. Tavzarashvili, G. Ghvedashvili, D. Karkashadze, and Ch. Hafner, "The Method of Auxiliary Sources Approach to Modeling of Electromagnetic Field Scattering on Two-Dimensional Periodic Structures," Journal of Computational and Theoretical Nanoscience, vol. 8, pp. 1609-1618, 2011.

[5] Tavzarashvili K, Hafner C, Cui XD, Kakulia D., Ghvedashvili G., Karkashadze D." Method of auxiliary sources and model-based parameter estimation for the computation of periodic structures Journal of Computational and Theoretical Nanoscience, vol, 4, no. 3, pp. 667-674, May 2007.

[6] R. Lampe, P. Klock and P. Mayes, "Integral transforms useful for the accelerated summation of periodic, free-space Green's functions," IEEE Transactions on Microwave Theory and Techniques, vol. 33, no. 8, pp. 734-736, August 1985.