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Modeling of High-Q Cavity with Surface Integral Equation Discontinuous Galerkin (IEDG) Method

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This paper presents an investigation of the computational analysis of a high-Q cavity with surface integral equation discontinuous Galerkin (IEDG) methods. Owing to the structural resonance, the system matrix is extremely ill-conditioned. The IEDG formula, especially for the interior penalty stabilization, will need to be adjusted in order to obtain an accurate answer.

We have implemented the IEDG formulation with both the half-RWG basis and linear order basis functions for the discretization of the problem domain, which allows to model charges on the edge and also on the surface. To adequately address the hyper-singular integration in dyadic Green's functions, the integration by part is applied. For the effective frequency sweeping, we have applied rational interpolation, which is an appropriate method due to the nature of the resonance phenomenon of the high-Q cavity. Finally, impedance boundary condition (IBC) is added to account for the finite conductivity. To validate our analysis, we show in Fig. 1(a) the shielding effectiveness of a center slotted conductive cylinder with finite thickness at a probe location within the cavity using different mesh densities; a surface current distribution at the resonance frequency is shown in Fig. 1(b).

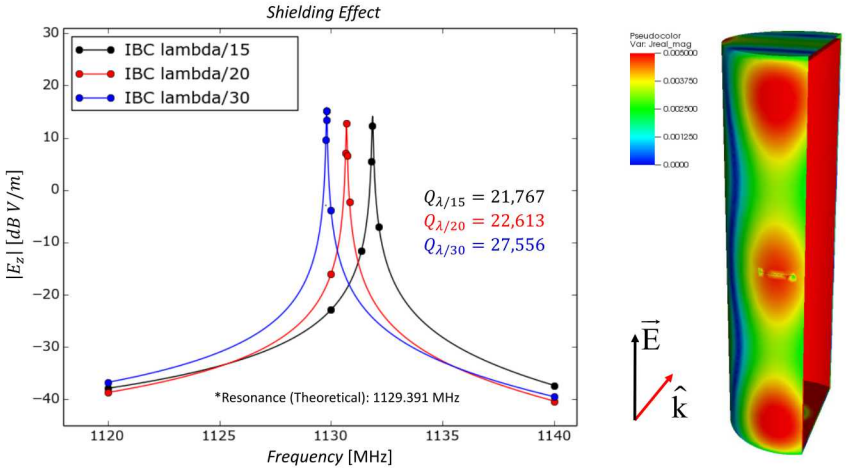

Figure 1: (a) Shielding Effectiveness (b) Surface Current Distribution.

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