# Surface Integral Equation Discontinuous Galerkin (IEDG) Method with Impedance Boundary Condition

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With the employment of Quadrature-by-Expansion (QBX) and/or Reverse Operation Self-Consistent Evaluation (ROSE), the hyper-singular kernels in surface integral equations (SIEs) can be adequately addressed. As a consequence, the SIEs, particularly the electric field integral equation (EFIE) does not require the conventional integration-by-part trick to reduce the order of singularity in the integration kernels. Subsequently, there would be no need for the vector basis functions to be "conformal", namely, the normal components of the vector basis functions do not need to be continuous. Moreover, the vector basis functions also can be simply polynomial complete and enjoy the same error-convergence-rate as in the interpolation theory.

In this work, we have employed constant vector basis functions over discretizations that are made of both triangular and quadrilateral elements. We shall demonstrate the accuracy of the constant vector basis functions will enjoy the same error-rate-of-convergence as the conventional conformal RWG basis functions. The flexibility of mixing different types of elements within the same discretization offers great potentials in complex electromagnetic problems. In this regard, we shall use the impedance boundary condition (IBC) as an example. The use of the non-conformal DG method, the formulation of the impedance boundary condition can be fairly straightforward and no additional memory, except some overheads, will be required as compared to the PEC scattering problems.