Hybridization of the IPO method with the FEM to compute RCS of cavities with complex termination

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The Iterative Physical Optics (IPO) method has been developed to compute Radar Cross Section (RCS) of open-ended cavities. There are several acceleration methods to increase efficiency of the IPO. One of them is the Segmented-IPO method.

One of the limitations of the IPO method is the geometry of the termination. The IPO method allows computing RCS of slowly varying geometries. In the case of an aircraft inlet, for example, the termination has a complex geometry and the IPO method is not adapted to compute such termination. Methods such as MoM or FEM could be used to compute the RCS of arbitrarily geometries but the complexity of these methods increased significantly with frequency and target 's dimensions. Consequently, one solution to solve the problem is to hybridize the IPO method with the FEM. The principle of the S-IPO method is used.

The computation is made as follows:

1. The IPO method is used to compute the electric current on the inner walls S_C of the cavity (Figure 1) when the termination is not present. This electric current radiated an EM field $\left\{\vec{E}_N^-;\vec{H}_N^-\right\}$ in the exchange surface S_N with the termination.
2. The FEM is used to compute the EM field $\left\{\vec{E}_N^+;\vec{H}_N^+\right\}$ scattered in the exchange surface S_N by the termination when it is excited by the EM field $\left\{\vec{E}_N^-;\vec{H}_N^-\right\}$.
3. Finally a generalized reciprocity integral could be evaluated over the exchange surface 'N' to obtain the amplitude of EM field scattered at the observation point P such as:

$$E_d^{S_N}(P) = \frac{2}{F\mu_0}\int_{S_N}(\vec{E}_N^+ \wedge \vec{H}_N^- - \vec{E}_N^- \wedge \vec{H}_N^+)\cdot\hat{n}dSc$$

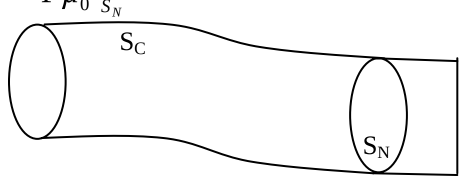

Figure 1