

Problem Type: **Inhomogeneous thin layer coats a homogeneous scatterer in a homogeneous space.**

General Approaches:

1. Use surface IE for the homogeneous core and background. Use volume IE for the region where $\epsilon(x)$ and $\mu(x)$ vary (volume-surface integral equation [VSIE]).

- <https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2002RS002610>

Your unknowns are a surface current on inner/outer boundary and a volume current in the inhomogeneous region.

2. Pure SIE approach. If the layer is electrically thin ($kt \ll 1$), you can use asymptotic analysis to collapse the IE into a surface operator on the core surface. Could QBX have any advantage here?

- https://www.researchgate.net/publication/29605526_High_Order_Generalized_Impedance_Boundary_Conditions_in_Electromagnetic_Scattering_Problems

3. Meta-surfaces ($t \ll \lambda$) [takes into account discontinuous changes of the tangential components]

- <https://ietresearch.onlinelibrary.wiley.com/doi/10.1049/mia2.70012>

The surface itself has a impedance and susceptibility.