Computational electromagnetics with ASERIS-BE™

[1]Benoît Chaigne*, [2]Christos Liontas
[1]IMACS,
[2]BETA CAE Systems

KEYWORDS -
BEM, Surface Mesh, H-matrix, FMM, EMC

ABSTRACT
ASERIS-BE(TM) is a simulation software developed by Airbus and IMACS dedicated to Electromagnetics based on the resolution of Boundary Integral Equations (BIE) derived from Maxwell's equations in the frequency domain. It is used for a wide variety of industrial applications such as antenna design, antenna siting, Electromagnetic Compatibility applications, Lightning Indirect Effects (LIE) or High-Intensity Radiated Fields (HIRF)…

Approximation of the BIEs by a conforming H(div) finite element method leads to the so-called Boundary Element Method (BEM). It offers many advantages appreciated by engineers: using the Green's kernel, the numerical approximation is very accurate and only requires the meshing of the interfaces between different homogeneous domains where we look for equivalent electric and magnetic currents. Electric and magnetic fields can then be deduced using the integral representation formulas in a post-processing phase.

This approach can handle perfect or imperfect conductors, dielectric materials, resistive or composite sheets, electric wires, ground plane and symmetries, voltage sources, lumped elements, waveguides, incident plane waves, point sources… The number of degrees of freedom grows with the frequency and the complexity of the object under study. As the BEM matrix is dense, the problem can quickly become unworkable with traditional linear solvers. ASERIS-BE(TM) implements efficient parallel fast solvers like H-matrix or Fast Multipole Method (FMM). Thus, preparation of the model with the appropriate interface properties and an optimal mesh is essential for complex simulations. We will present some use cases leveraging the recently developed ASERIS plugin in ANSA for an optimised setup of the simulation.