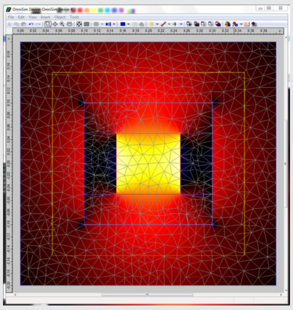
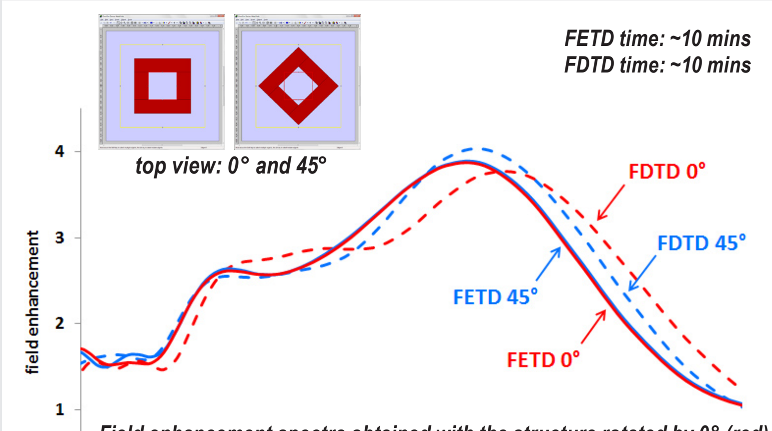
FETD (Finite Element Time Domain) Engine for OmniSim

☑ Body-conformal meshing

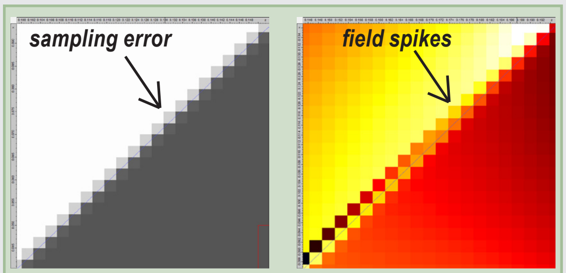
Thanks to its adaptive mesh, the FETD engine is much **less orientation-sensitive** than FDTD. This allows it to deal with slanted or curved interfaces with **no staircase approximation** and **no material averaging** at the surface. We simulated a gold nut structure with two different orientations and calculated the field enhancement in the centre of the hole. The FDTD engine displays erroneous discrepancies between the two orientations, caused by the staircase approximation of the diagonal interface at that resolution. For the same calculation time, the FETD engine gives almost identical results for both orientations for the entire spectrum.



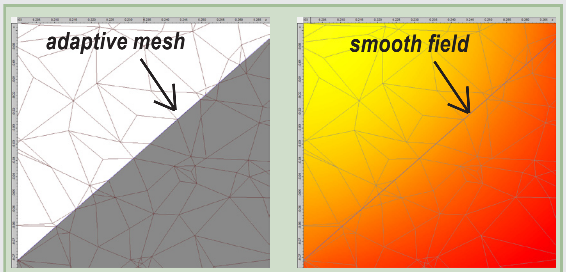
FETD: field in gold hole



Field enhancement spectra obtained with the structure rotated by 0° (red) and 45° (blue), calculated with FETD (solid lines) and FDTD (dashed lines)



FDTD: material alpha and Ez at interface

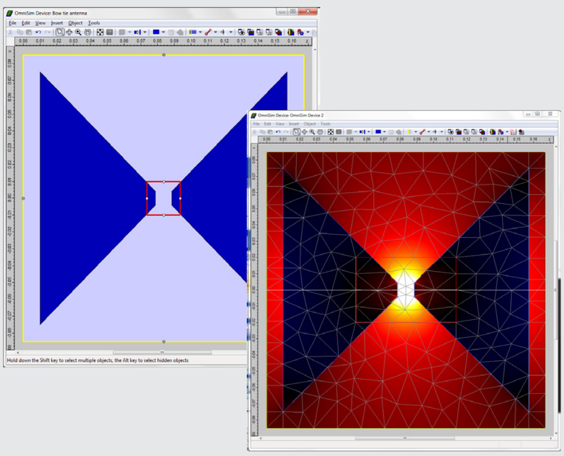


FETD: section of the 3D mesh and Ez at interface

☑ Superior convergence

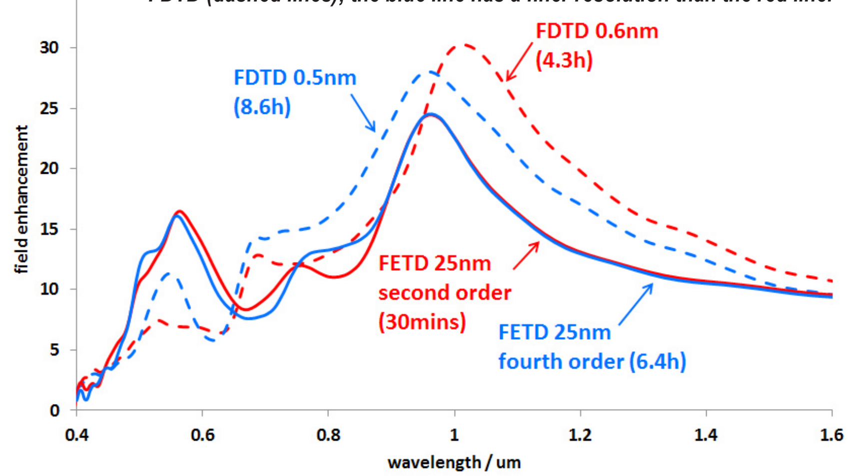
Modelling an inclined metal surface in 3D can be a major challenge for FDTD, as extremely small grids are required to obtain accurate results. In this example we measured electric field enhancement in the hole of a bow-tie antenna. **The FDTD simulation still had not converged after an 8h30 simulation** on a i7-860 CPU (4 cores) and was unable to locate the resonant wavelength and the amplitude of the resonant peak with precision.

On the same computer **the FETD algorithm converged with a calculation time of only 30 minutes!** Such efficiency is made possible by the use of higher order elements in the finite-element mesh and by the FETD's ability to avoid staircasing at the metal surface.



Central section of the bow tie antenna: design and Ez field. The metal plates are shown in blue.

Field enhancement spectra obtained with FETD (solid lines) and FDTD (dashed lines); the blue line has a finer resolution than the red line.



Photon Design Ltd
34 Leopold Street
Oxford, OX4 1TW
United Kingdom

Tel: +44 1865 324990
Fax: +44 1865 324991
Email: info@photond.com
Web: http://www.photond.com