

Computational Electromagnetics

ESL is actively pursuing research in Computational Electromagnetics (CEM), both in frequency and time domain methods. CEM algorithms are essential for providing highly accurate predictions of the electromagnetic performance of radio frequency (RF) systems, allowing more rapid design of RF systems to be achieved.

Integral Equation and Finite Element Methods

Frequency domain algorithms such as integral equation and finite element methods are being enhanced and applied by ESL researchers. New concepts such as multi-level fast multi-pole methods, adaptive mesh-refinement, and model order reduction techniques are all being utilized and expanded to allow for new capabilities in numerical simulations. ESL codes are being used to analyze RF circuit performance, scattering from large objects, and in the design of antenna and microwave systems, including those containing engineered materials and complex media.

Domain Decomposition Methods

Domain decomposition methods allow complex problems to be separated into smaller components without loss of accuracy in the numerical process. ESL researchers are developing improved methods for performing domain decomposition, including hybrid algorithms that exploit the advantages of a set of distinct numerical approaches.

Time Domain Methods

Numerical methods in the time domain allow for multiple frequency data to be obtained in a single simulation. ESL researchers are experts in both finite element (FE) and finite difference time domain (FDTD) algorithms, including hybrid implicit/explicit and hybrid FE/FDTD techniques.

