Analytic Solutions

A number of analytic solutions have been implemented for the purposes of generating input model data for **field\_solve** such as impedance matrix calculation for layered structures, transfer impedance calculation for cable screens and cable inductance and capacitance matrix calculation. There are also solutions which are useful for validation such as cavity mode resonant frequencies, scattering from spherical geometries and propagation on multi-conductor transmission line geometries.

Solutions available are as follows:

CAVITIES

**Rectangular\_cavity**: Calculate the resonant frequencies of a rectangular cavity loaded with dielectric/ magnetic material

<rectangular_cavity.docx>

MLAYER

**Mlayer**: Calculate the S parameters and impedance parameters of a multi-layer stack of materials. The materials may be dielectric/ magnetic material layers or impedance boundaries. Layers may have frequency dependent properties. The stack is illuminated by a plane wave at a specified angle and polarisation.

<Mlayer.docx>

SPHERE

**Mie**: Near and far field calculation of fields scattered by dielectric/ PEC or impedance boundary spheres.

<sphere_scattering.docx>

**Near\_field\_convolution**: Near field data over a wide frequency band may be post processed to give time domain near field data by a convolution process.

<near_field_convolution.docx>

CABLE\_LC

**Twin\_conductor**: Calculate the inductance and capacitance of a parallel pair of cylindrical conductors

**Wire\_in\_square\_box**: Calculate the inductance and capacitance of a cylindrical conductor in a square metal box

**Wire\_over\_ground**: Calculate the inductance and capacitance of a cylindrical conductor over a ground plane

WIRE\_MODE\_SOLVE

**wire\_mode\_solve**: Calculate the inductance and capacitance matrices of cable configurations including shielded cables and dielectrics using a finite difference algorithm.

COAX\_COUPLING

**Coax\_coupling**: Calculate the coupling between parallel shielded cables terminated to metal plates. Dave Thomas’ analytic solution.

TRANSFER\_IMPEDANCE

**Transfer\_impedance**: Calculate the transfer impedance of coaxial cable using Vance, Tyni and Kley models

DIPOLE

**Dipole**: Calculate the impedance of a dipole antenna as a function of frequency.

MTL\_WIRE\_OVER\_GROUND\_PLANE

Analytic solution for coupling from a plane wave to a wire over a ground plane. Not yet implemented.

MTL\_PROP

Analytic solution for multi-conductor cable propagation. Not yet implemented

MTL\_CROSSTALK

Analytic solution for multi-conductor cable crosstalk. Not yet implemented