The FDTD program is called like this:

fdtd_sw(mdl,exc,out,sw,nmax,n_disp);

'mdl' is geometry model for FDTD, 'exc' is excitation, 'out' is output, 'sw' is Schwarzschild parameters. These four arguments are all structures, and their fields are introduced as below. 'nmax' is the maximum time step, 'n_disp' is the time step interval for display in command window.

The fields of 'mdl', 'exc', 'out' and 'sw':

mdl 1 × 1 struct: Geometry model

mdl.**Nmedium** 1 × 1: Number of medium types except air and PEC. If Nmedium > 0, there should be two fields 'epsr' and 'mur':

mdl.**epsr** Nmedium × 1: Relative permittivity

mdl.**mur** Nmedium × 1: Relative permeability

mdl.**NXi** 1 × 1: Number of mesh node in x direction

mdl.**NYi** 1 × 1: Number of mesh node in y direction

mdl.**NZi** 1 × 1: Number of mesh node in z direction

mdl.**x** NXi × 1: Local x coordinates of mesh node (m)

mdl.**y** NYi × 1: Local y coordinates of mesh node

mdl.**z** NZi × 1: Local z coordinates of mesh node

The global coordinates are sw.X0+[mdl.x,mdl.y,mdl.z]

mdl.**tEx** NXi-1 × NYi × NZi: Medium type in Ex location

mdl.**tEy** NXi × NYi-1 × NZi: Medium type in Ey location

mdl.**tEz** NXi × NYi × NZi-1: Medium type in Ez location

mdl.**tHx** NXi × NYi-1 × NZi-1: Medium type in Hx location

mdl.**tHy** NXi-1 × NYi × NZi-1: Medium type in Hy location

mdl.**tHz** NXi-1 × NYi-1 × NZi: Medium type in Hz location

Type number: PEC=-1, air=0, medium=1~Nmedium

exc 1 × 1 struct: Excitation

exc.**f_dipole** logical: Is there dipole excitation? If f_dipole is true, there should be the field 'dipole':

exc.**dipole** 1 × 1 struct: Dipole excitation in z direction, and it occupies one grid

exc.dipole.**co** 3 × 1: Coordinates

exc.dipole.**wave** 1 × 1 struct: Waveform

exc.**f_v** 1 × 1: Is there voltage excitation? If f_v is true, there should be the field 'v':

exc.**v** 1 × 1 struct: Voltage excitation

exc.v.**dir** 1 × 1 char: Direction = 'X' or 'Y' or 'Z'

exc.v.**co** 4 × 1: Coordinates.

If dir='X', co(1:2) are x coordinates, co(3) is y coordinate, co(4) is z coordinate

If dir='Y', co(1) is x coordinate, co(2:3) are y coordinates, co(4) is z

coordinate
If dir='Z', co(1) is x coordinate, co(2) is y coordinate, co(3:4) are z coordinates

exc.v.**type** 1 × 1 char : 'S' or 'H'

exc.v.**wave** 1 × 1 struct: Waveform

exc.**f_iw** 1 × 1 Is there incident wave excitation? If f_iw is true, there should be the field 'iw'

exc.**iw** 1 × 1 struct: Incident wave excitation

exc.iw.**x** 3 × 1 Coordinates of excitationsource

exc.iw.**d** 3 × 1 Unit vector of polarization direction

exc.iw.**A** 1 × 1 Amplitude of the waveform

exc.iw.**BW** 1 × 1 Bandwidth

wave 1 × 1 struct: Waveform

wave.**type** string: Type of waveform: 'SINE', 'GAUSS', 'DIFFGAUSS' or 'MODGAUSS'

wave.**A** 1 × 1: Amplitude

if type='SINE', there should be :

wave.**F** 1 × 1: Frequency (Hz)

if type='GAUSS' or 'DIFFGAUSS' or 'MODGAUSS', there should be:

wave.**BW** 1 × 1: Bandwidth (Hz)

if type='MODGAUSS', there should be:

wave.**F0** 1 × 1: Center frequency (Hz)

out 1 × 1 struct: Output

out.**nv** 1 × 1: Number of output voltage, if nv > 0, there should be the field 'v':

out.**v** 1 × nv struct: output voltage

out.v.**dir** 1 × 1 char: Direction='X','Y','Z'

out.v.**co** 4 × 1: Coordinates, the same as exc.v.co

out.v.**fname** string: File name of the output file

out.**np** 1 × 1: Number of the output plane, if np > 0, there should be the field plane:

out.**plane** 1 × np struct: output plane

out.plane.**p** char: 'x','y','z'

out.plane.**co** 1 × 1: Coordinate

out.plane.**nt** n × 1: Time steps

out.plane.**e** string: 'Ex','Ey','Ez'. Output e in plane p=co at time step nt.

out.plane.**fname** string: File name of the output file

out.**f_far** 1 × 1 whether output far field? If f_far is true, there should be the field 'far':

out.**far** 1 × nfar struct: far field

out.far.**nf** 1 × 1 Number of far field points

out.far.**xf** 3 × nf Coordinates of far field points

out.far.**fname** string: Name of the output file

sw 1 × 1 struct: Schwarzschild parameters

sw.**Rs** 1 × 1: Schwarzschild Radius

sw.**X0** 3×1: The coordinates of origin of local coordinates system