CONCEPT-II

CONCEPT-II is a frequency domain method of moment (MoM) code, under development at the Institute of Electromagnetic Theory at the Technische Universität Hamburg-Harburg (www.tet.tuhh.de).

Overview of demo examples

The following demonstration examples for CONCEPT-II are discussed in detail ($CONCEPT: home directory of the package):

1. Wire loop, directory $CONCEPT/demo/example1-wire-loop
2. Cylindrical monopole antenna radiating over a finite ground plate, directory $CONCEPT/demo/example2-monopole-on-plate
3. Box with aperture and internal radiator, directory $CONCEPT/demo/example3-box-with-aperture
4. Dielectric sphere in a plane wave field, directory $CONCEPT/demo/example4-dielectric-sphere

Important: file names should never contain blanks.

Shortcuts: **Help** → **Navigation**

In order to find out how CONCEPT-II works it is recommended to start with example 1 (wire loop)

Example 4: Dielectric sphere

$CONCEPT/demo/example4-dielectric-sphere

It is assumed that the user is familiar with examples 1,2,3 already.

It is recommended to start with an empty directory and set up the simulation according to Fig 1.

It is recommended to study Sections 1.8.2.2 (Dielectric bodies), 3.1 (Dielectric bodies, types of surfaces) and Section 4 (Mathematical background) before continuing with this example.

The structure to be investigated is a dielectric sphere with $\epsilon_r = 4$ with a radius of R=0.1 m. The sphere is illuminated by a plane wave field of 1 V/m amplitude at a frequency of 900 MHz.

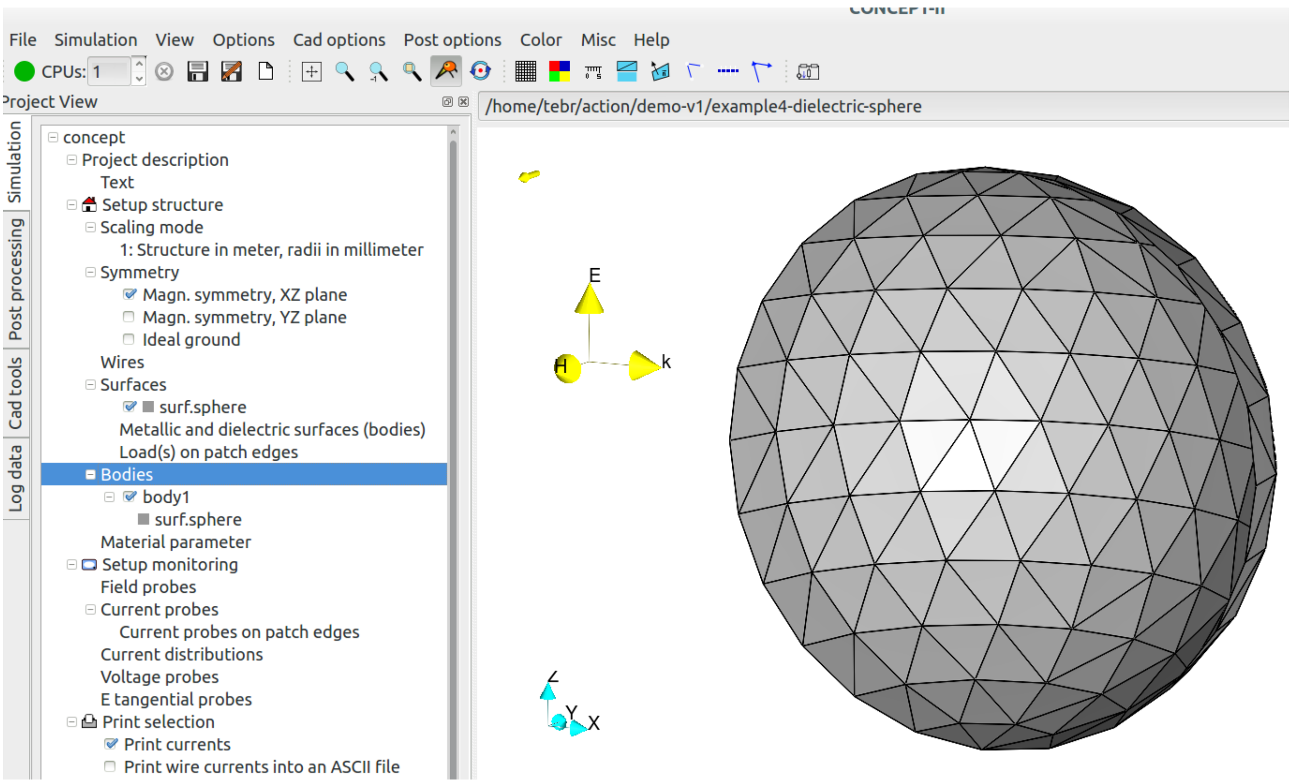


Fig 1: A dielectric sphere, illuminated by a plane wave field

Creating the sphere

Tab **Cad tools** →  → Radius = 0.1 m, default name *surf.sphere*, center: (0 m; 0 m; 0 m), frequency 900 MHz, patches per wavelength: 12, symmetry with respect to the x-z plane, click **OK** → discretized sphere is shown in the display area.

Setting up and running the simulation

Tab **Simulation** → right click on top entry of the project tree **concept** → **Load all files from 'CAD'** . Set a check mark on **Magn. Symmetry, XZ plane.**

Right click **Bodies** → **Add body** → the entry **body 1** appears in the project tree

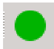
Right click **body 1** → **Surface selection by mouse** → select an arbitrary patch by a right click

Right click **body 1** → **Set material values** → Enter: Conductivity 0, Rel. permittivity 4, Rel. permeability 1 → **OK**

Right click on **surf.sphere** → **Set boundary condition** → 'Surface type' **Dielectric boundary**

Frequency → **Single frequency** → 900 MHz

Excitation → **Plane wave field** → set $\theta=270°, \Phi=0°, \Psi=0°$, E [V/m]: 1

Run the simulation 

Next steps, post processing

- Show the current distribution on the sphere, use . Note that now two different current distributions are available, one for the exterior region (free space, body 0) and one for the interior side (body 1). See Example 2 how to scale a current distribution.
- Show the 2D field distribution in the x-z plane by using  . See Example 1 how to do this.

An example of the computed E field distribution is illustrated in Fig 2. Notice the field vectors close to the interface between air and dielectric material. The boundary conditions $E_{\tan,1}=E_{\tan,2}$, $D_{n,2}=D_{n,2}$ are fulfilled.

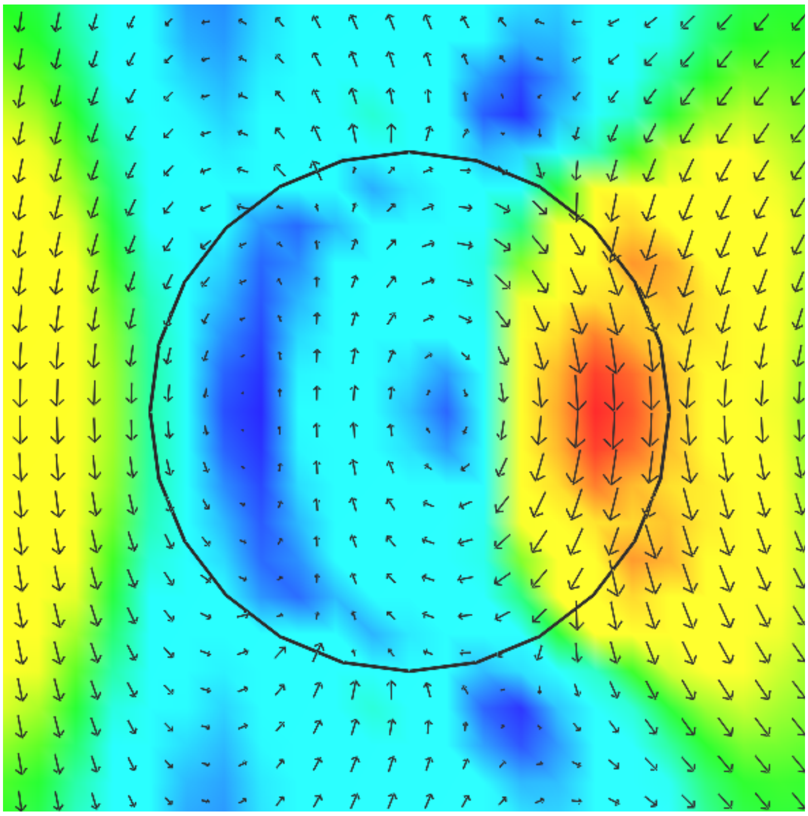


Fig 2: Distribution of the E field in the x-z plane at phase 0°