TEST CASE 2: Dielectric Truncated Cone

Monostatic and Bistatic RCS Simulations

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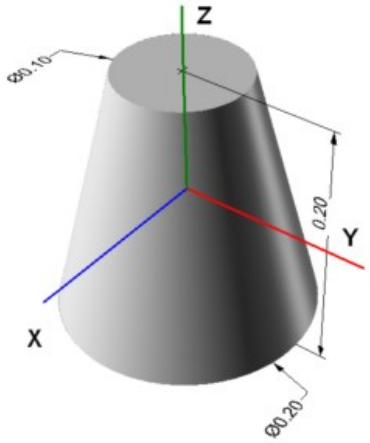
1. *Definition of the Geometry*

The target is a dielectric truncated cone of height 20 cm. The phase centre is assumed to be located at $(x,y,z) = (0,0,0)$. A CAD model is also available and can be obtained by email from the chair.



2. *Simulation Parameters*

The time dependency is assumed to be exp(jωt).

The dielectric truncated cone shall be assumed to be made of Teflon material with relative permittivity $\varepsilon_r = 2.08 - j\ 0.00208$.

Given the coordinate system of the CAD model (see above) and the usual definition of angles:

- Elevation angle Theta, θ: starting from the positive $+z$ axis,
- Azimuth angle Phi, θ: starting from the positive $+x$ axis,

the following sub-cases are proposed.

2.1. Case (a2): Dielectric model, X-Band (Monostatic RCS)

The co-polar monostatic RCS for both polarizations is required in an angular sweep that starts from the smaller base of the truncated cone and ends in the bigger one. This needs to be obtained for a certain number of equally spaced frequency points.

- Frequency: f = [8 GHz, 12 GHz], Δf = 100 MHz
- Angular Sweep: $\phi = 0^o$, $\theta = [0^o, 180^o]$, $\Delta\theta = 0.5^o$

- Polarizations: Both co-polar, i.e. Theta-Theta and Phi-Phi

2.2. Case (b2): Dielectric model, Ku-Band (Monostatic RCS)

The co-polar monostatic RCS for both polarizations is required in an angular sweep that starts from the smaller base of the truncated cone and ends in the bigger one. This needs to be obtained for a certain number of equally spaced frequency points.

- Frequency: f = [12 GHz, 18 GHz], Δf = 100 MHz
- Angular Sweep: $\phi = 0^o$, $\theta = [0^o, 180^o]$, $\Delta\theta = 0.5^o$
- Polarizations: Both co-polar, i.e. Theta-Theta and Phi-Phi

2.3. Case (c2): Dielectric model, C-Band (Bistatic RCS)

This sub-case requires co-polar bistatic RCS for both polarizations. The truncated cone is always illuminated from the smaller base and then, an angular sweep that starts from the smaller base of the truncated cone and ends in the bigger one is demanded for the reception. This needs to be obtained for a certain number of equally spaced frequency points.

- Frequency: f = [2 GHz, 4 GHz], Δf = 100 MHz
- Angular Sweep:
    a. Illumination: $\theta = 0^o$, $\phi = 0^o$.
    b. Reception: $\phi = 0^o$, $\theta = [0^o, 180^o]$, $\Delta\theta = 0.5^o$
- Polarizations: Both co-polar, i.e. Theta-Theta and Phi-Phi

3. *Data Formats*

The results will be stored in ASCII files, labelled as:

- *test_case_2a_CONTRIBUTOR_NAME.txt*

- *test_case_2b_CONTRIBUTOR_NAME.txt*

- *test_case_2c1_CONTRIBUTOR_NAME.txt*

where “CONTRIBUTOR_NAME” should be replaced by the name of the contributing institution, if necessary followed by a postfix indicating the method used for the simulations, e.g., Contributor1_FDTD, Contributor1_MoM,…

Each file will contain on each row the data :

$$\theta \quad f \quad \mathrm{Re}(E_{\theta\theta}) \quad \mathrm{Im}(E_{\theta\theta}) \quad \mathrm{Re}(E_{\phi\phi}) \quad \mathrm{Im}(E_{\phi\phi})$$

where θ is the angle in degrees, f is the frequency in GHz, $E_{\theta\theta}$ and $E_{\phi\phi}$ are the complex co-polar scattered fields in $\theta\theta$-polarisation and $\phi\phi$-polarisation. $E_{\theta\theta}$ and $E_{\phi\phi}$ shall be normalized so that the RCS can be calculated as $\sigma_{\theta\theta/\phi\phi} = 10*\log10(4\pi\,|E_{\theta\theta/\phi\phi}|^2)$, where σ is the RCS in dBsm.

4. *Additional Information*

Each *.txt*-file should be accompanied by a *.info*-file, stating additional information relevant for the simulation, e.g., short description of the method used, CPU time, memory usage, number of unknowns, characteristics of simulation hardware (number of cores, processor speed),…