TEST CASE 1: Dielectric Prism

Monostatic RCS

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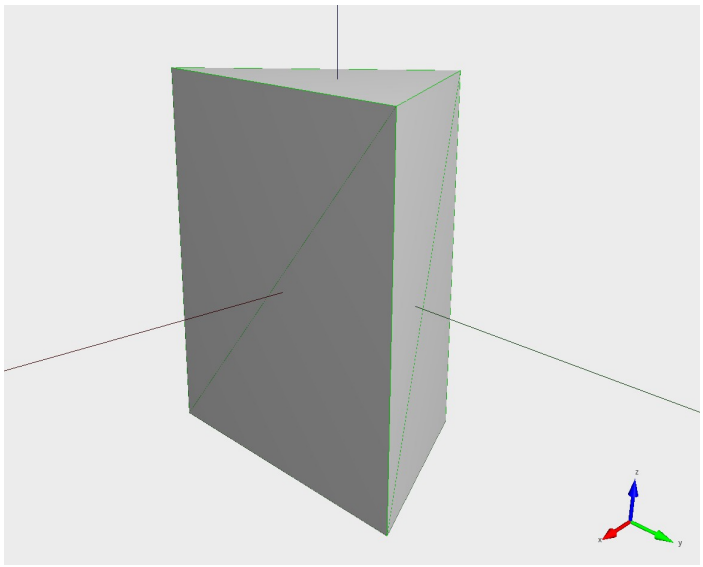
1. Definition of the Geometry

The target is a dielectric prism of height 20 cm with triangular cross section. The vertical axis of the prism is the *z*-axis of the coordinate system and the largest face (width: 16.73 cm, height: 20 cm) is perpendicular to the *x*-axis. The other two faces have widths of 15 cm and 12.25 cm. The mass centre of the prism and the phase centre are 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).

Two versions of the prism shall be studied, a fully metallic (PEC) version and a version made of PVC material with relative permittivity $\varepsilon_r = 2.7 - j\ 0.02$.

For the target described above, the monostatic RCS shall be simulated at the frequencies $f_1 = 10$ GHz and $f_2 = 30$ GHz.

2.1. Case (a): PEC model, 10 GHz

The monostatic RCS shall be simulated for a metallic (PEC) version of the prism at the frequency $f_1 = 10$ GHz in the azimuth plane ($z = 0$, $\phi = 0°…360°$, $\Delta\phi = 1°$) for both vertical

polarisation ($\theta\theta$-polarisation, i.e. **E** perpendicular to the *xy*-plane) and horizontal polarisation ($\phi\phi$-polarisation, i.e. **E** field in the *xy*-plane).

2.2. Case (b): dielectric model, 10 GHz

The monostatic RCS shall be simulated for the dielectric prism at the frequency $f_1 = 10$ GHz in the azimuth plane ($z = 0$, $\phi = 0°…360°$, $\Delta\phi = 1°$) for both vertical polarisation ($\theta\theta$-polarisation, i.e. **E** perpendicular to the *xy*-plane) and horizontal polarisation ($\phi\phi$-polarisation, i.e. **E** field in the *xy*-plane).

2.3. Case (c): PEC model, 30 GHz

The monostatic RCS shall be simulated for a metallic (PEC) version of the prism at the frequency $f_2 = 30$ GHz in the azimuth plane ($z = 0$, $\phi = 0°…360°$, $\Delta\phi = 0.5°$) for both vertical polarisation ($\theta\theta$-polarisation, i.e. **E** perpendicular to the *xy*-plane) and horizontal polarisation ($\phi\phi$-polarisation, i.e. **E** field in the *xy*-plane).

2.4. Case (d): dielectric model, 30 GHz

The monostatic RCS shall be simulated for the dielectric prism at the frequency $f_2 = 30$ GHz in the azimuth plane ($z = 0$, $\phi = 0°…360°$, $\Delta\phi = 0.5°$) for both vertical polarisation ($\theta\theta$-polarisation, i.e. **E** perpendicular to the *xy*-plane) and horizontal polarisation ($\phi\phi$-polarisation, i.e. **E** field in the *xy*-plane).

3. Data Formats

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

- *test_case_1a_CONTRIBUTOR_NAME.txt*
- *test_case_1b_CONTRIBUTOR_NAME.txt*
- *test_case_1c_CONTRIBUTOR_NAME.txt*
- *test_case_1d_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 :

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

where ϕ is the angle in degrees, $\sigma_{\theta\theta}$ and $\sigma_{\phi\phi}$ are the co-polar RCS in dBsm in $\theta\theta$-polarisation and $\phi\phi$-polarisation, $\sigma_{\theta\phi}$ and $\sigma_{\phi\theta}$ are the cross-polar RCS components (e.g., $\sigma_{\theta\phi}$ means ϕ-polarisation for transmit and θ-polarisation for receive).

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),…