WORKSHOP EM ISAE 2020

TEST CASE #4

FILLETED CONE WITH RAM

Chairman : Frédéric DEL CORSO (frederic.delcorso@ariane.group)
Co-chairman : Philippe Ratajczak (philippe.ratajczak@orange.com)

1. Description of the case

The target geometry is axisymmetric and consists of a filleted PEC cone of diameter 2h = 1432 mm, half angle α = 45° and fillet radius R = 66 mm. (Oz) is the revolution axis of the target, the cone points towards +z.

The filleted PEC cone is covered by a radar absorbing material of constant thickness e = 34 mm. The flat base of the target is in the (Oxy) plane.

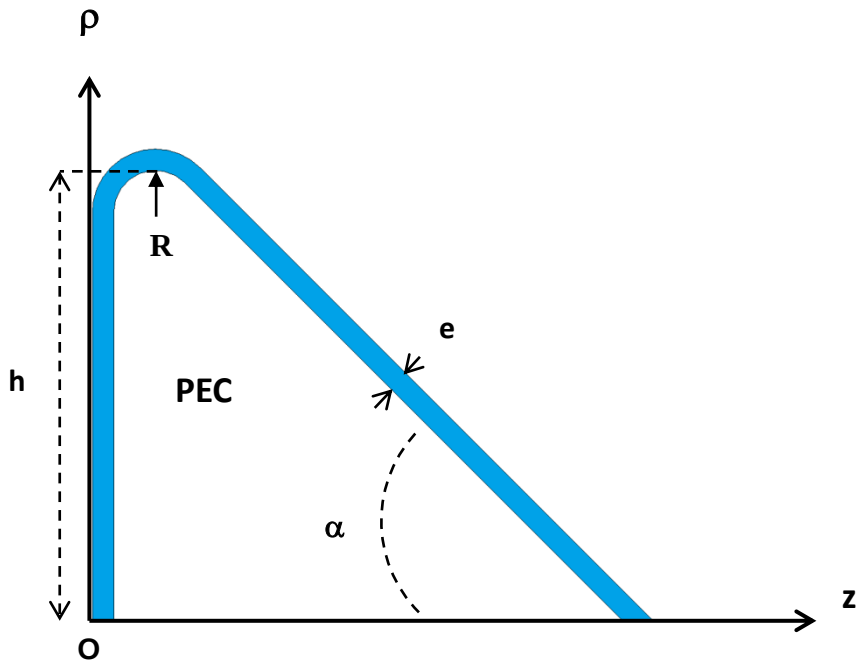

Figure 1 geometry of test case #4

The radar absorbing material is a dielectric material with relative electric permittivity ε = 2 + j 1 and relative magnetic permeability μ = 1, where harmonic time dependence using $e^{-j\omega t}$ is assumed.

2. Observable

2.1 Conventions

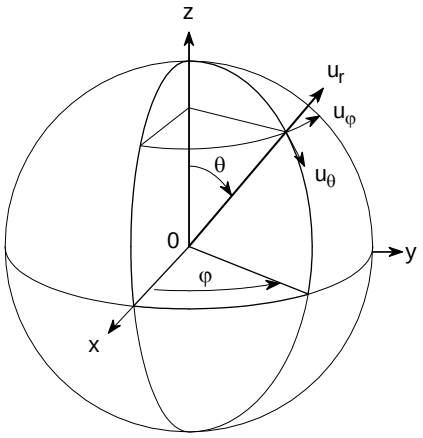

Figure 2 standard coordinate system

In the standard spherical coordinate system, we define the monostatic RCS σ_{pq} :

$$\sigma_{pq} = 4\pi \lim_{r\to\infty} r^2 \frac{\left|\vec{E}_p^s\right|^2}{\left|\vec{E}_q^i\right|^2}$$

- $\vec{E}_q^i$: electric field of the plane wave incident upon the target in the direction $-\hat{u}_r$, polarized along $\hat{u}_q$,
- $\vec{E}_p^s$: backscattered electric field in the direction $\hat{u}_r$ and polarized along $\hat{u}_p$,
- r : distance between the target and the point where E^s is measured.

2.2 Expected results

We are looking for the angular monostatic RCS $\sigma_{\theta\theta}$ and $\sigma_{\varphi\varphi}$ for θ ranging from 0° to 180° in the standard spherical coordinate system.

Two configurations shall be considered :

- frequency of 5 GHz, with an angular step $\delta\theta$ = 0.5°
- frequency of 10 GHz, with an angular step $\delta\theta$ = 0.25°

The results shall be stored in 2 ASCII files, one for each frequency :

Frequency	File name
5 GHz	Case4_5.txt
10 GHz	Case4_10.txt

Each file shall have 3 columns :

- First column for the angle θ in degrees,

- Second column for the RCS $\sigma_{\theta\theta}$ in dBm²,
- Third column for the RCS $\sigma_{\varphi\varphi}$ in dBm².