Air duct with engine fan
Case x

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Target description

The target is an air duct ended with an engine fan as shown on Figure 1. This fan, with a cone at its center, is not directly seen from the rectangular cross section aperture of the air duct.

The end of the duct, where is located the fan, has a circular cross section.
The IGES geometrical CAD definition is provided.

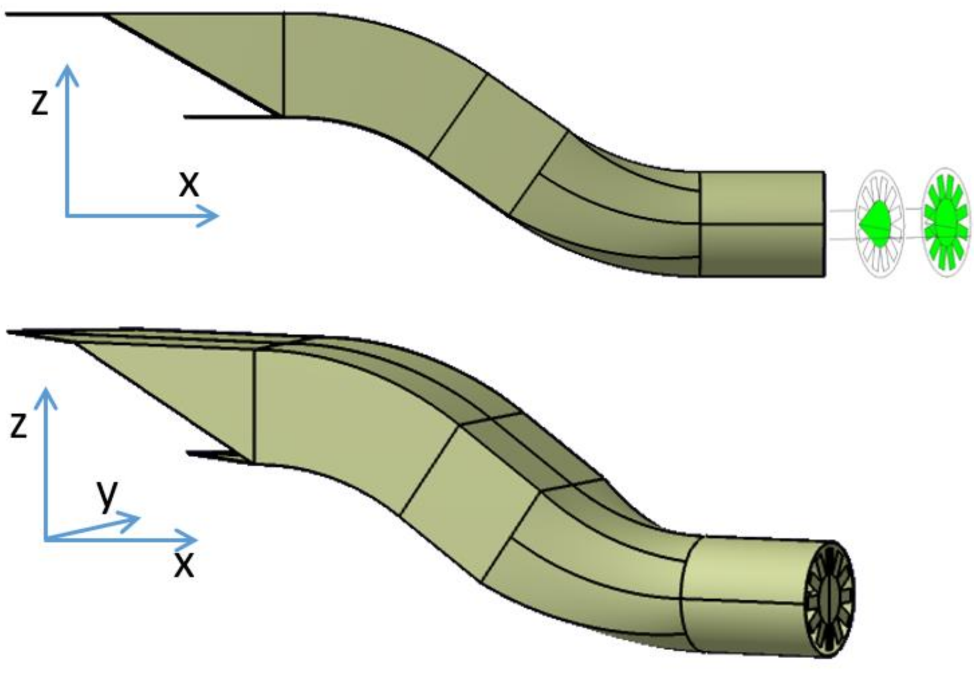

Figure 1: air duct ended with an engine fan

The purpose of this case is to study the radar cross section (RCS) for a range of frequency.

Two subcases are considered:

- The first subcase is perfectly conducting.
- For the second one, the internal side of the duct walls is coated with an absorbing material and the fan cone is dielectric.

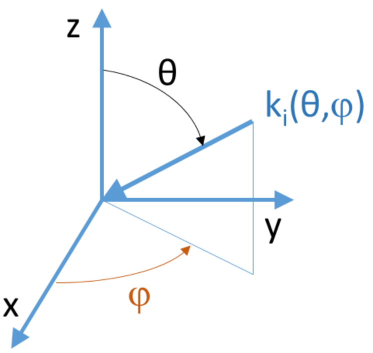

Figure 2: angular convention

Subcase 1 – PEC duct and fan

The whole structure is perfectly conducting.

Frequencies:
6 to 18 GHz with a 0.5 GHz frequency step (i.e. 25 frequency points).

Incident plane wave:
The incident plane wave (fixed and only one for each polarization) is a plane wave, whose wavevector k_i is defined by **φ_i =180° and θ_i = 120°.** Consequently, the fan is not directly seen from the source.

Results:
The **bistatic** scattering coefficient ρ (defined here as $\sigma=|\rho|^2$ in which σ is the radar cross section) for **both co-polarizations (VV and HH)** for **θ=120°**, and for **φ spanning 135° to 180° with an angular step of 0.5°**.

Results shall be given in two ASCII files (one for VV polarization and one for HH polarization) organized as follows:

- ✓ The first line will contain the values of the frequency (skip the first column)
- ✓ The 91 following lines will contain the phi value in the first column followed by the real and imaginary parts of the scattering coefficient for each frequency. There will be consequently 2 columns per frequency point and a total of 1 + 50 columns.

Subcase 2 – Duct with absorbing materials and dielectric cone

The geometry is the same than for subcase 1 except that:

- the cone is made of a dielectric with relative permittivity **ε_r=2.1+j0** (and relative permeability μ_r=1+j0), its base is perfectly conducting (metal with zero thickness).
- and the internal side of the PEC duct walls is coated with an absorbing material with relative permittivity **ε_r=10+j5** and relative permeability **μ_r=1.2+j0.6** with **1 mm thickness**.

Same results than in subcase n°1 in a second file with the same file format.