Test Case 2: Coated Air Duct

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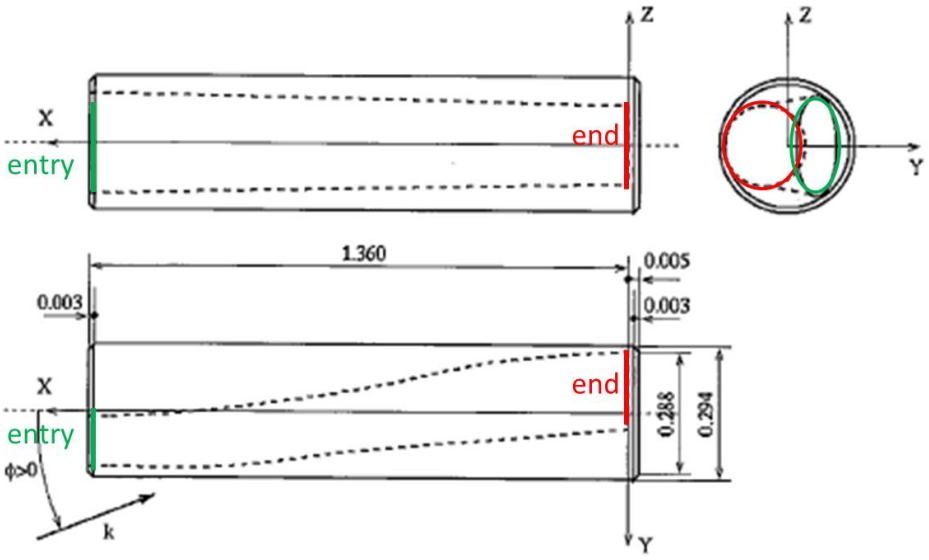
CAD file: geometrical files (IGES format) is available

Definition of the geometry

The geometry of this case is an evolutive air duct enclosed in a circular cylinder The entry of the channel has an elliptic section, the end of the channel at x=0 has a circular section. The geometry is defined by the following figure, all dimension in meters, perfectly electric conducting case (PEC) :



- The location of (y_s,z_s) center of the section is a function of x :

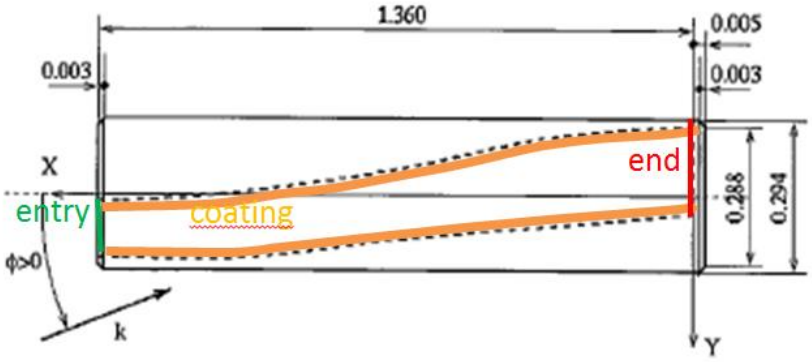
$$y_S = -0.04878 + 0.116\, sin^2\left(\frac{\pi}{2}\frac{x}{1.360}\right)\ ;\ z_s=0$$

- The elliptic section is also a function of x :

For 0 ≤ x ≤ 1.300: $\left(\frac{z-zs}{0.11803+0.02568\frac{x-1.300}{1.300}}\right)^2 + \left(\frac{y-ys}{0.05877-0.03358\frac{x-1.300}{1.300}}\right)^2 = 1$

For 1.300 ≤ x ≤ 1.360 : $\left(\frac{z-zs}{0.11803}\right)^2 + \left(\frac{y-ys}{0.05877}\right)^2 = 1$

- Coated case: the medium has a constant **thickness of 0.002m** along the channel (no medium at the end).



Simulation Parameters

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

Frequency and angular definitions:

- F=12GHz
- Φ=-20° azimut angle
- θ≥0 elevation angle
- Polarizations φφ and θθ
- Electric incident field amplitude = 1V/m at the phase origin (center of the end of the channel)

3 subtest cases:

- 2a) PEC channel
- 2b) coated channel (the medium has **a constant thickness of 0.002m** along the channel (no medium at the end) with relative permittivity **ε=1.5-0.1j** and permeability **μ=2.5-1.8j.**
- 2c) PEC closed external circular cylinder

Data Formats

Monostatic results:

- θ from 0° to 90° with 0.2°step.
- Radar cross section for φφ and θθ polarizations.
- Outputs will be 2 ASCII files with 3 columns : θ (degrees), RCSφφ and RCSθθ (dB.m²) :
  - RCS(2a(θ) – 2c(θ)) with filename case2a-2c_rcs.txt
  - RCS(2b(θ) – 2c(θ)) with filename case2b-2c_rcs.txt

EM field results:

- F=12GHz
- Φ=-20° & θ=0°
- φφ polarization

- x from 0 to 1.360m with 0.001m step.
- Total electric field E(x) along (y_s, z_s) the center of the section for φφ polarization.
- Outputs will be 2 ASCII files with 7 columns : x (meter), Re(Exφφ), Im(Exφφ), Re(Eyφφ), Im(Eyφφ), Re(Ezφφ), Im(Ezφφ) (V/m) :
  - E_a(x) with filename case2a_field.txt
  - E_b(x) with filename case2b_field.txt

Others

Participants must provide, in addition to the result file, a document containing at least:

- Method used (with pertinent parameters),
- Number of degrees of freedom,
- Total computation time,
- Number and type of processors.