

Test case X: RCS of a circular metal/FSS plate under a nose cone radome

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This test case is built to encourage the use of reduced-order models. The performance indicators are:

- the accuracy of the results;
- the total CPU time needed for the primary RCS evaluations (used as learning dataset);
- the total CPU time needed to build the reduced-order model;
- the CPU time needed to evaluate the reduced-order model.

Geometry

The CAD files exist and are provided upon request to the chairman.

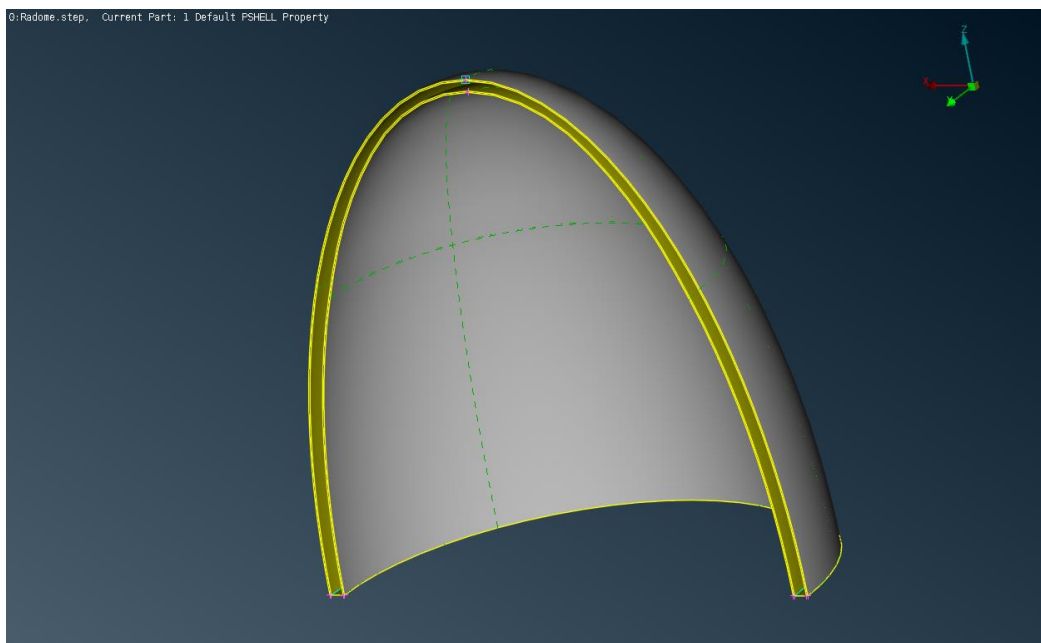
Metal plate

It consists in a circular ground plane. The metal plate has a thickness of 15 mm and a diameter of 300 mm. The position of the center of the metal plate for the +Z face is (0, 0, -0.51).

FSS plate

It consists in a 2-screen FSS.

Nose cone radome



It is a 3-layer structure, with the following **nominal** material characteristics:

- Outer layer: epsilon= 3.5, tg delta= 0.01, thickness= 1 mm.
- Spacer: epsilon= 1.1, tg delta= 0.001, variable thickness
- Inner layer: epsilon= 3.5, tg delta= 0.01, thickness= 1 mm.

It is a body of revolution around the axis $\hat{z}$. The axes are also set in the CAD files.

Sub test case #A

It consists in the radome and the metal plate. The parameter that varies is the relative permittivity of the outer and inner layers, which are considered non-lossy.

Frequency

8.75 GHz

Permittivity

$\varepsilon = 1.1$ to 5.5 ; steps of 0.1

Incident plane waves

2 planes and 2 polarisations (E along $\hat{u}_\theta$ and $\hat{u}_\phi$)

$\phi=0^\circ$ (plane xOz) and $\phi = 90^\circ$.

$\theta=0^\circ$ to 90° by steps of 0.1°

NB: (θ, ϕ) are taken according to the [common ISO definition](#) ; the time harmonic convention is $e^{-j\omega t}$.

Results

Monostatic RCS arranged in a ASCII file containing 10 columns and 45x901 rows, as indicated below:

ε	θ	$\sigma_{\theta\theta}$	$\sigma_{\theta\phi}$	$\sigma_{\phi\phi}$	$\sigma_{\phi\theta}$	$\sigma_{\theta\theta}$	$\sigma_{\theta\phi}$	$\sigma_{\phi\phi}$	$\sigma_{\phi\theta}$
		for $\phi = 0^\circ$				for $\phi = 90^\circ$			

The participants should also give indications about the methodology and performance of their simulation:

- methods used;
- computation infrastructure (processors...);
- total CPU time needed for the primary RCS evaluations (used as learning dataset);
- total CPU time needed to build the reduced-order model;
- CPU time needed to evaluate the reduced-order model.

Sub test case #B

It consists in the radome and the FSS plate. The parameter that varies is the frequency.

Frequency

6 GHz to 12 GHz by steps of 0.1 GHz

Incident plane waves

2 planes and 2 polarisations (E along $\hat{u}_\theta$ and $\hat{u}_\phi$)

$\phi=0^\circ$ (plane xOz) and $\phi = 90^\circ$.

$\theta=0^\circ$ to 90° by steps of 0.1°

NB: (θ, ϕ) are taken according to the [common ISO definition](#) ; the time harmonic convention is $e^{-j\omega t}$.

Results

Monostatic RCS arranged in a ASCII file containing 10 columns and 61x901 rows, as indicated below:

f	θ	$\sigma_{\theta\theta}$	$\sigma_{\theta\phi}$	$\sigma_{\phi\phi}$	$\sigma_{\phi\theta}$	$\sigma_{\theta\theta}$	$\sigma_{\theta\phi}$	$\sigma_{\phi\phi}$	$\sigma_{\phi\theta}$
		for $\phi = 0^\circ$				for $\phi = 90^\circ$			

The participants should also give indications about the methodology and performance of their simulation:

- methods used;
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- total CPU time needed to build the reduced-order model;
- CPU time needed to evaluate the reduced-order model.

Input files

List of .stp files.