TEST CASE 4: Frequency Selective Surface (FSS)

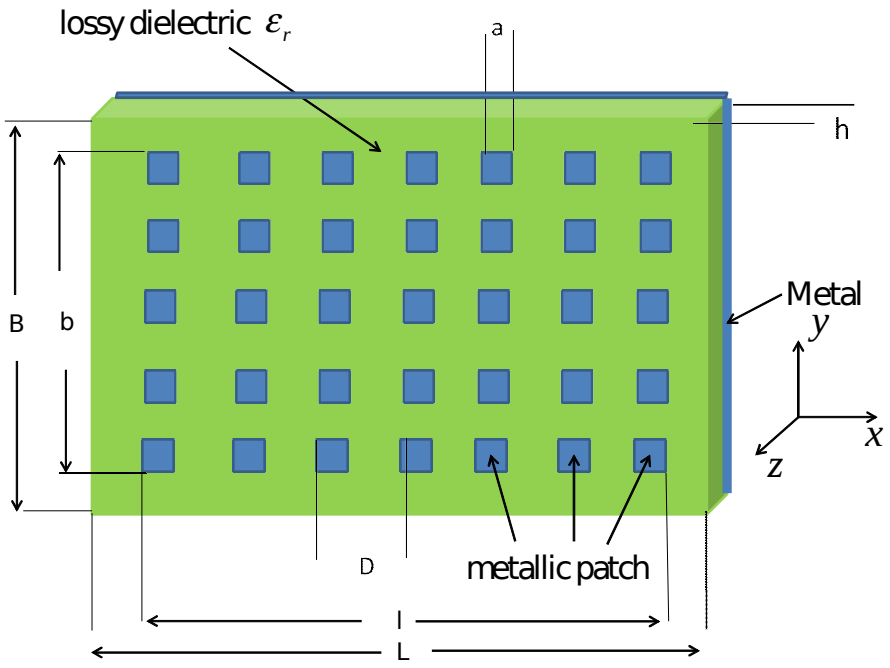
Monostatic and bistatic RCS

Chair: Frank Weinmann, Fraunhofer, FHR
Jens Nitschkowski, Fraunhofer FHR

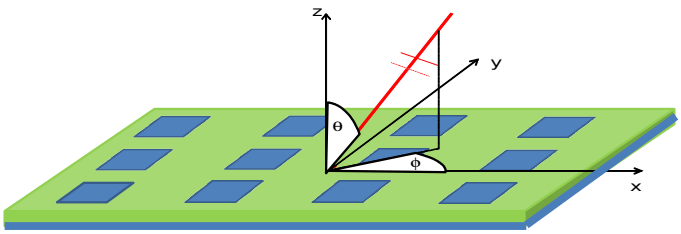
Contact: frank.weinmann@fhr.fraunhofer.de
jens.nitschkowski@fhr.fraunhofer.de

1. Definition of the Geometry

The target is a dielectric sheet with periodic metallic patches on one side and backed with a metallic (PEC) sheet. The orthogonal axis of the sheet is the *z*-axis of the coordinate system.



The scattering geometry is represented in the following picture:



2. *Simulation Parameters*

The time dependency is assumed to be given as $\exp(j\omega t)$.

The sheet is assumed to be made of FR4 material with relative permittivity ε_r = 4.32 - j 0.1037. Its thickness h is 1.5 mm. The areal dimension of the whole plate is $B = L$ = 150 mm. The patched area is $b = l$ = 136.7 mm (25x25 patches). The thickness of the metallic patches is 18 µm.

The dimension a of a single square patch is a = 4.7 mm and the periodic distance D of the patches is D = 5.5 mm.

For the FSS described above, the monostatic RCS shall be simulated in the frequency range between f_1 = 26.5 GHz and f_2 = 40 GHz. Also bistatic calculations shall be performed for selected frequencies.

2.1. Case (a): Monostatic RCS

For the target described above, the monostatic RCS shall be simulated in the frequency range between f_1 = 26.5 GHz and f_2 = 40 GHz with Δf = 50 MHz and in the angular range (θ) between 0° and 180° with $\Delta\theta = 0.25°$ ($\phi = 0$, i.e., in the *xz*-plane). The polarisation of the impinging wave is specified as TE-polarisation (or θ-polarization)

2.2. Case (b): Bistatic RCS

The bistatic calculations for the above geometry shall be performed for the following 4 cases (for all cases $\phi = 0°$):

i) $\theta = 0°$; f = 30.5 GHz

ii) $\theta = 0°$; f = 38.0 GHz

iii) $\theta = 60°$; f = 34.0 GHz

iv) $\theta = 60°$; f = 28.0 GHz

The bistatic RCS shall be calculated for the reflected angle $0° \le \theta' \le 360°$, $\Delta\theta' = 0.25°$.

3. *Data Formats*

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

- *test_case_4_mono_CONTRIBUTOR_NAME.txt*

- *test_case_4_bi1_CONTRIBUTOR_NAME.txt*

- *test_case_4_bi2_CONTRIBUTOR_NAME.txt*

- *test_case_4_bi3_CONTRIBUTOR_NAME.txt*

- *test_case_4_bi4_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,…

The monostatic file (*“test_case_mono_...”)* should be written in the format:

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

where θ is the angle in degrees, and σ_{VV} is the monostatic RCS in m² in $\theta\theta$-polarisation.

The bistatic files should have the format:

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

where θ is the angle in degrees, and σ_{VV} is the bistatic RCS in m² in $\theta\theta$-polarisation.

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),…