

Test case 7: Patch antenna on an electrically large launcher

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Goal:

Simulate a C-band patch antenna on a very large launcher.

1. Antenna description

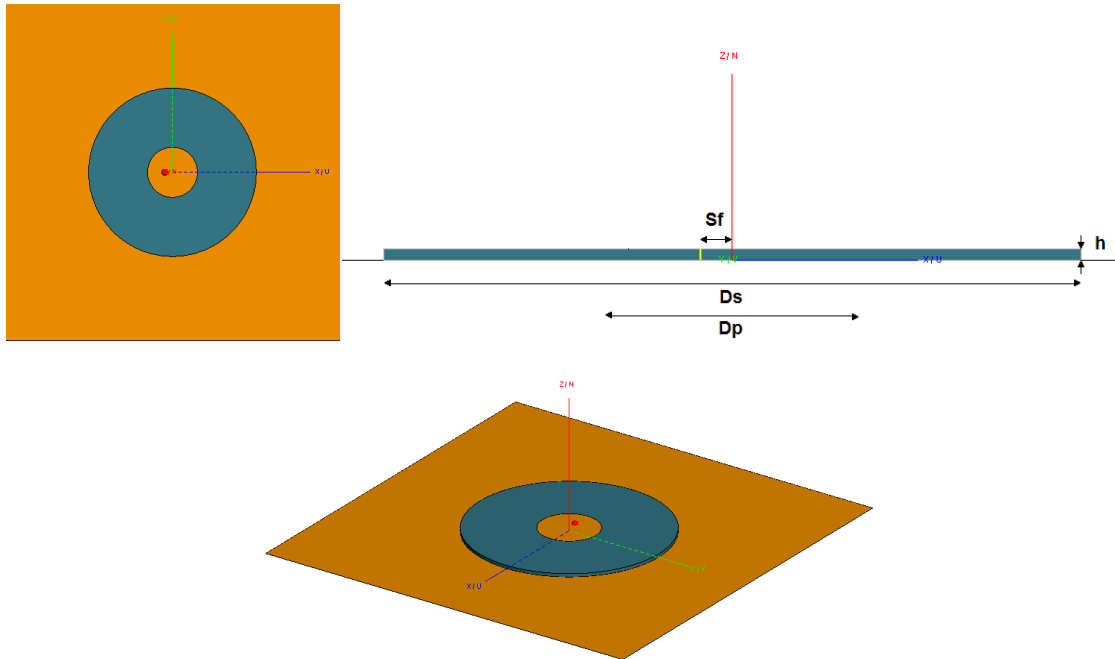


Figure 1 : Antenna views

The antenna is a circular patch with the following characteristics:

- Frequency: 6GHz
- Geometry:
 - Substrate diameter: $D_s = 50\text{mm}$
 - Substrate height: $h = 813\mu\text{m}$
 - Patch diameter: $D_p = 14.95\text{mm}$
 - Feed position: $S_f = 2.5\text{mm}$
- Substrate: Rogers RO4003C ($\epsilon_r=3.55$ and $\tan \delta = 0.0024$)
- Feed type: single via (modelled by a thin wire)

It can be noticed that the case has a symmetry plan, which is not a realistic assumption (circular polarization, for instance, would break symmetry). Some participants may feel more comfortable to benchmark their methods with the assumption of symmetry; however, it is not encouraged (to better suit real case constraints) and should be necessarily reported with the results.

2. Launcher description

Views of the launcher are presented hereafter (dimensions specified at $f = 6$ GHz):

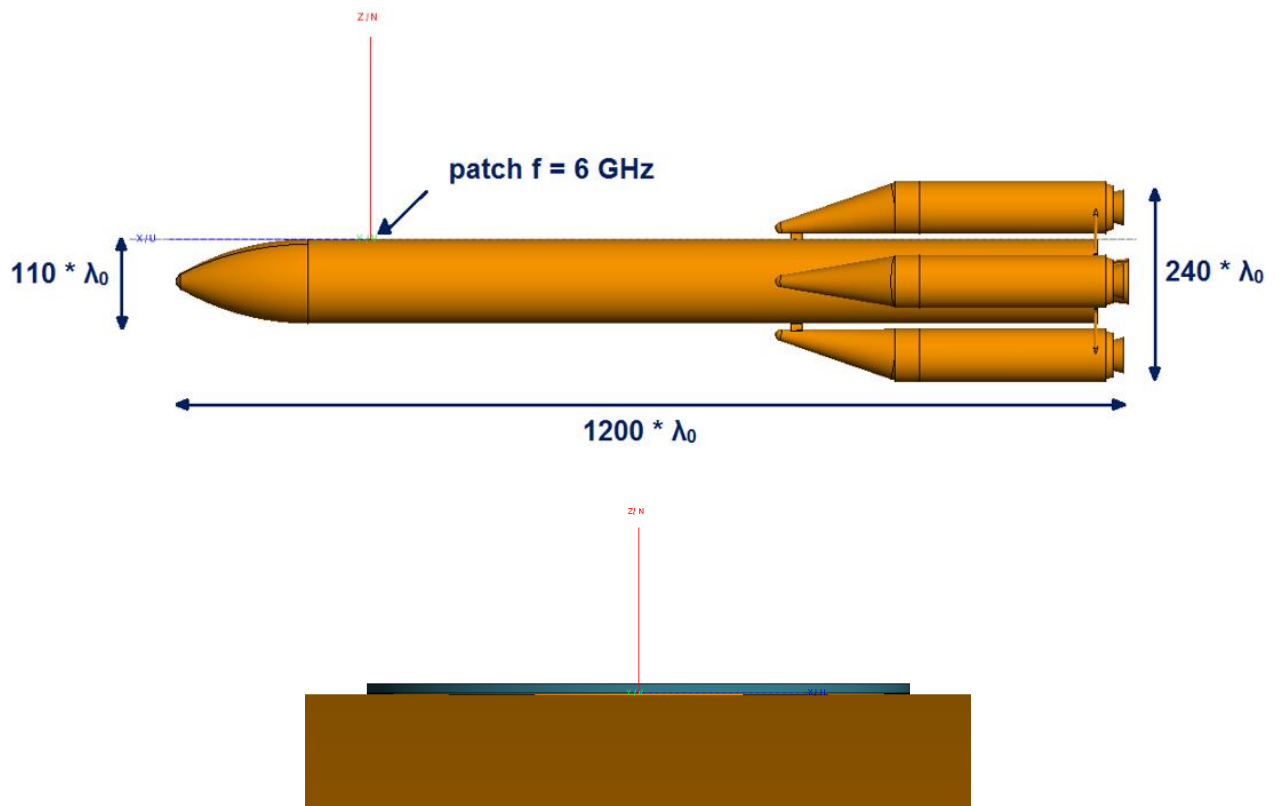


Figure 2 : Launcher views

3. Simulations

The simulations should be processed preferably without the assumption of symmetry, but this assumption can be used if the simulation is impossible otherwise. The use of this assumption should be reported alongside the results.

4. Expected results

It is requested to calculate the far field radiation pattern.

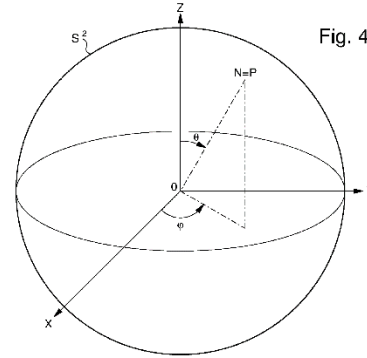
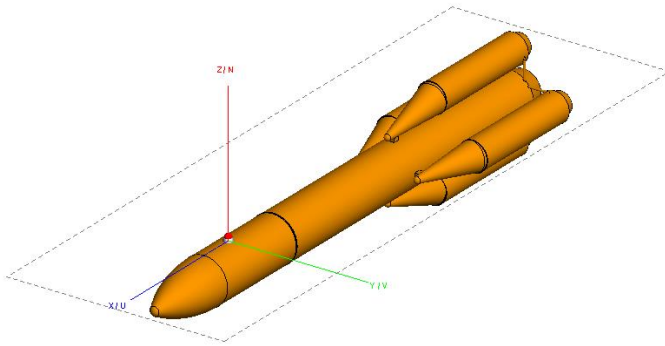


Figure 3 : Launcher and radiation pattern landmark

The characteristics of the radiation pattern are described hereafter:

- Pattern landmark center = Launcher landmark center
- Radiation pattern representation: Directivity [dBi]
- Thêta scanning: **-180° to +180° by 0.005° step**
- Phi cut = **0° ; 45° ; 90°**
- The pattern will be stored in columns, in an array, with the following form:

[Theta] _ [Phi] _ [20log(|E θ |)] _ [arg(|E θ |)] _ [20log(|E ϕ |)] _ [arg(|E ϕ |)]

Each column will contain a header.

The array will be stored in a CSV file.

N.B.: a normalization factor should be applied to the components of the radiated field (reference: isotropic antenna radiating the same power). Any method ensuring normalization can be applied (far field integration over sphere, unitary feed power...). Therefore, the 3rd and 5th columns are directivity.

A particular attention will be brought to the simulation time, the Random Access Memory used to treat the case and the architecture on which the computation has been done. Thus those pieces of information should be reported alongside the results as well, specifying in particular the **number of cores** used to compute the case, the **total elapsed time** and the **overall Random Access Memory**.