TEST CASE 3: Rotating Wind Turbine

2D field analysis and time-variant height scan

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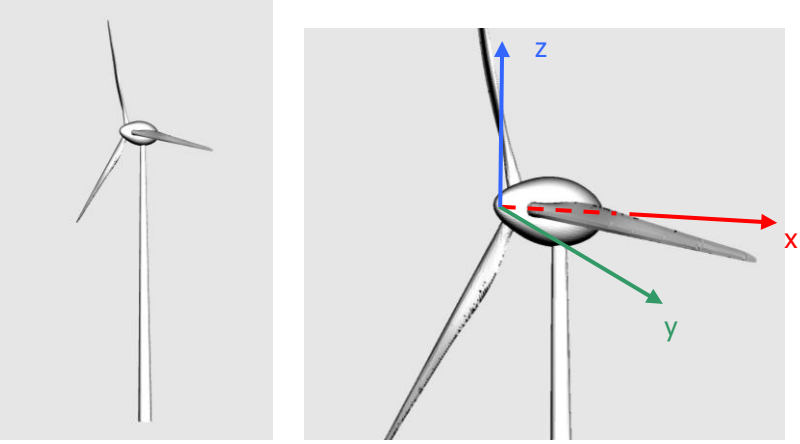
1. *Definition of the Geometry*

The target is a generic wind turbine with metallic material properties (PEC), with a rotor diameter of 96 m and total height of 150 m (see following picture). The tip of the nacelle defines the origin of the coordinate system, at (x, y, z) = (0, 0, 0). A CAD model of the wind turbine can be obtained by email from the chair.



2. *Simulation Parameters*

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

A point source is placed at the point (x, y, z) = (-20 km, 0, 0). The frequency used in the simulation is f = 3 GHz.

2.1. Case (a): 2D field distribution

The field distribution behind the wind turbine shall be simulated for a 2D array of receiving points for both vertical transmit polarisation (electric field parallel to z-axis) and horizontal polarisation (electric field parallel to y-axis). The 2D array of receiving points is defined as: x = -5.000 m to +20.000 m (Δx = 50 m), y = -500 m to +500 m (Δy = 5 m), z = 0.

2.2. Case (b): Height scan

The field distribution on a height scan shall be simulated for a 1D array of receiving points defined as: x = 5.000 m, y = 10 m, z = -100 m to +200 m (Δz = 1 m). Both vertical transmit polarisation (electric field parallel to z-axis) and horizontal polarisation (electric field parallel to y-axis) shall be simulated.

2.3. Case (b): Time-variant height scan

The same configuration as in Case (b) shall be assumed with a time-variant scenario. The blades of the wind turbine shall be assumed to rotate around the positive *x*-axis with an angular step of $\Delta\alpha = 0.1°$ (angular range from 0° to 120°, 0° corresponds to the static configuration in Case (a)).

3. Data Formats

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

- *test_case_3a_h_CONTRIBUTOR_NAME.txt*

- *test_case_3a_v_CONTRIBUTOR_NAME.txt*

- *test_case_3b_h_CONTRIBUTOR_NAME.txt*

- *test_case_3b_v_CONTRIBUTOR_NAME.txt*

- *test_case_3c_h_CONTRIBUTOR_NAME.txt*

- *test_case_3c_v_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 labels "h" and "v" denote horizontal and vertical transmit polarisation.

Each file will contain on each row the data :

$$x \quad y \quad z \quad \mathrm{Re}(E_x) \quad \mathrm{Im}(E_x) \quad \mathrm{Re}(E_y) \quad \mathrm{Im}(E_y) \quad \mathrm{Re}(E_z) \quad \mathrm{Im}(E_z)$$

where (x, y, z) describe the location of the observation point.

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),…