Log-Periodic Dipole Antenna in AW Modeler

This application notes illustrates how to model LPDA antenna in WIPL-D software suite. Results of simulation at different operating frequencies are also presented.

Antenna Model

Log-Periodic Dipole Antenna with 52 printed dipoles is created in WIPL-D AW Modeler and then simulated in WIPL-D Pro. Because LPDA antenna is symmetrical, only half of the structure is simulated. Antenna is printed on 0.813 mm thick dielectric substrate with dielectric permittivity 2.33. Entire antenna is around 261 mm long and it is placed 4.25 mm away from the metallic circle with diameter 248 mm. The longest arm of the antenna is around 76.2 mm long and length of the shortest one is around 1.53 mm.

In order to have very accurate results, WIPL-D Edge feature is included in all projects.

Antenna is presented in Fig 1. The model is fed at the top of the antenna (Fig. 2).
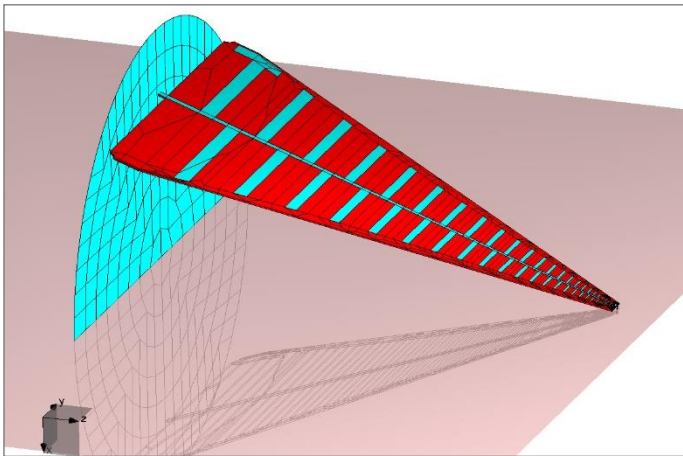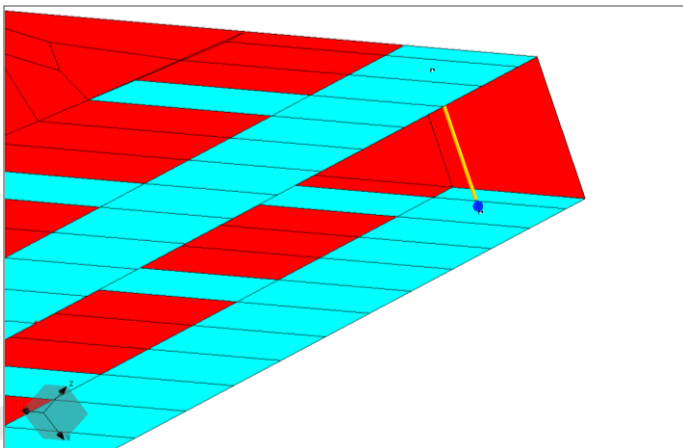

Figure 1. LPDA Antenna

Figure 2. Feeding of the LPDA Antenna

Simulation and Results

Simulation times and number of unknowns needed for simulating LPDA antenna at different operating frequencies in the frequency range from 1 GHz to 18 GHz, are presented in Table 1. The computer used for these calculations is Intel® Core(TM) i7 CPU 7700@3.60 GHz, 32 GB RAM, 1 GPU card Nvidia GeForce GTX 1080.

This is a standard desktop quad core CPU, enhanced by more RAM memory and a low end CUDA enabled GPU card. For the electrically larger problems (at higher frequencies), the use of GPU shows tremendous speed up compared to CPU simulation.

Table 1. Simulation times and required number of unknowns

Frequency [GHz]	Number of unknowns	CPU time [s]	GPU time [s]
1	7 884	37	35
3	9 849	45	41
5	13 026	65	52
8	19 990	135	80
12	29 655	312	132
18	47 456	1 028	265

Radiation pattern at different frequencies in the horizontal plane of radiation, for different operating frequencies, is shown in Figs 3-8.
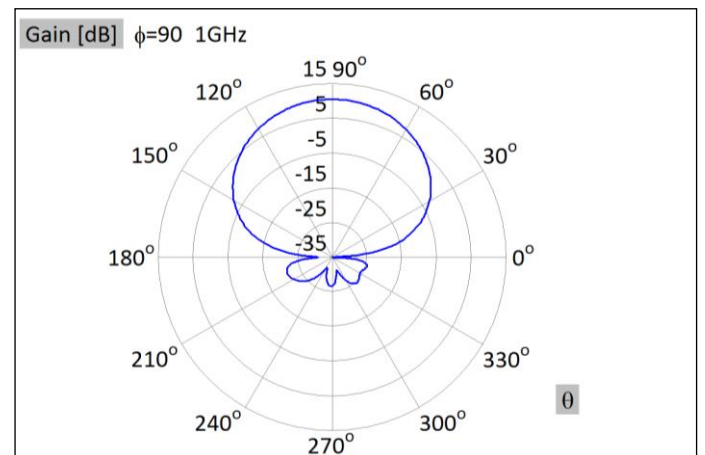

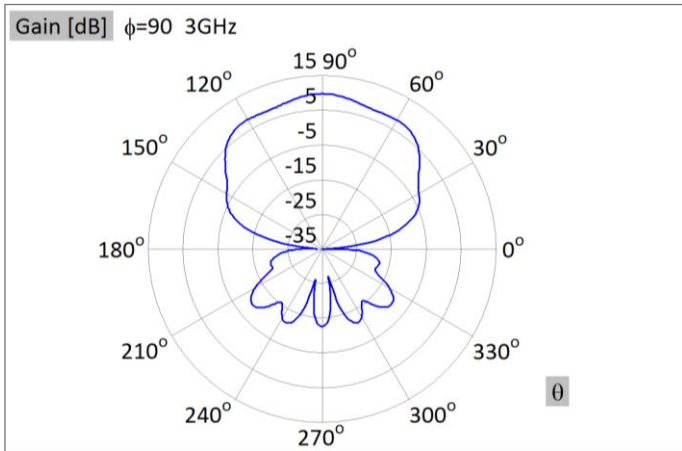**Figure 3. Radiation pattern in horizontal plane at 1 GHz**
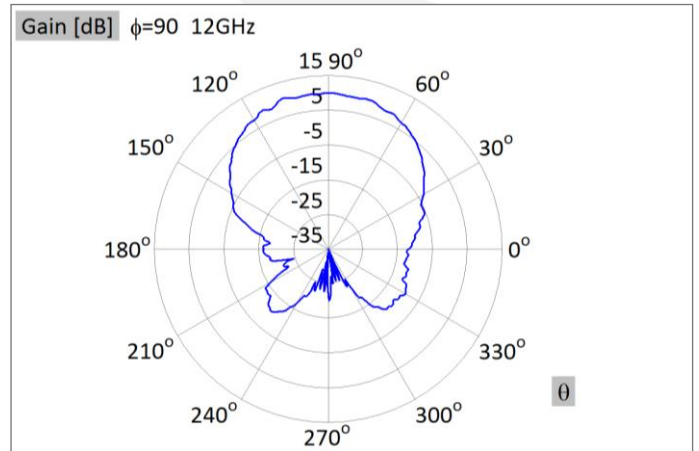
Figure 4. Radiation pattern in horizontal plane at 3 GHz

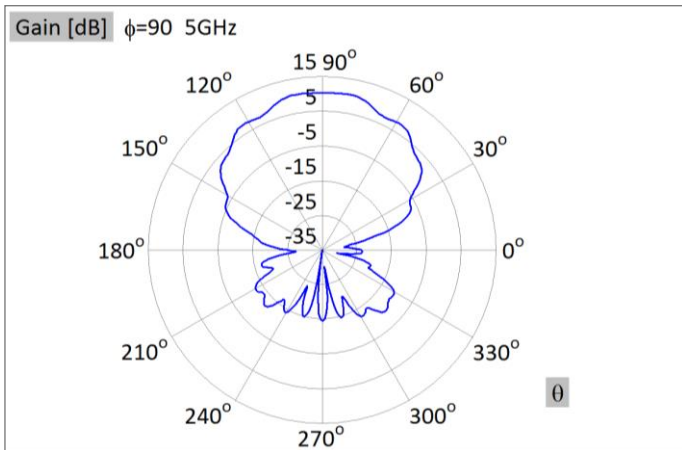**Figure 7. Radiation pattern in horizontal plane at 12 GHz**

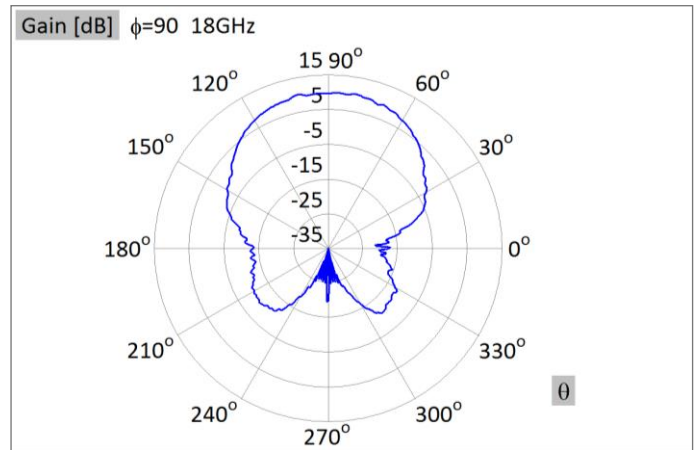**Figure 5. Radiation pattern in horizontal plane at 5 GHz**

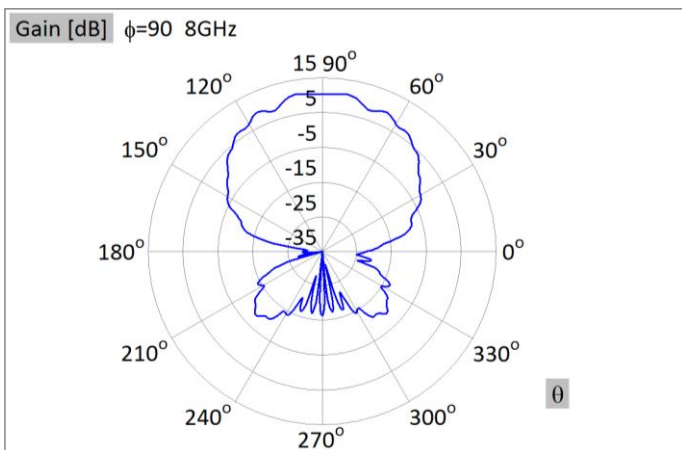**Figure 8. Radiation pattern in horizontal plane at 18 GHz**

Figure 6. Radiation pattern in horizontal plane at 8 GHz