# Ultra High Frequency Panel Antenna

Ultra High Frequency panel antennas (UHFP antennas) are used in UHF band. UHFP antennas consist of radiating surfaces and a reflector. They have frequently been used in past in TV systems.

Main characteristics of UHF panel antenna are:

- Almost hemi-spherical radiation pattern,
- Reduced dimension and easier implementation than many other UHF antennas.

## WIPL-D Simulation

A WIPL-D Pro model of a UHFP antenna is shown in (Fig. 1). Symmetry is used so only one quarter of the antenna is modeled (Figs 2-3). Note that the dielectric cover is marked with red colored plates, while all the metallic parts (considered to be perfectly conducting) are colored in cyan.

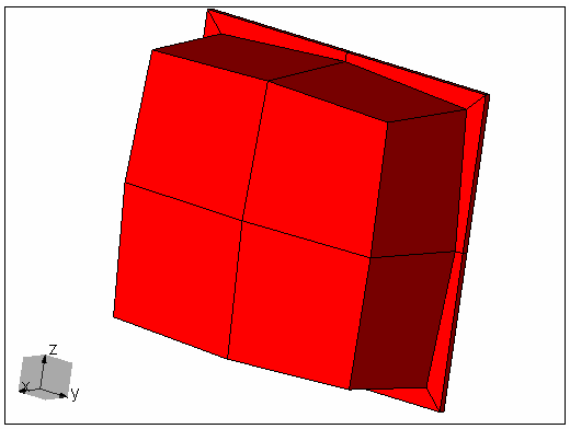


**Figure 1. UHFP antenna**

The antenna consists of various parts with different geometries. We can see that:

- Antenna is covered by a dielectric radome of a certain thickness,
- Finite-size reflector is used,
- Coaxial cable is used for feeding the panels,
- Panels are primary radiating elements.

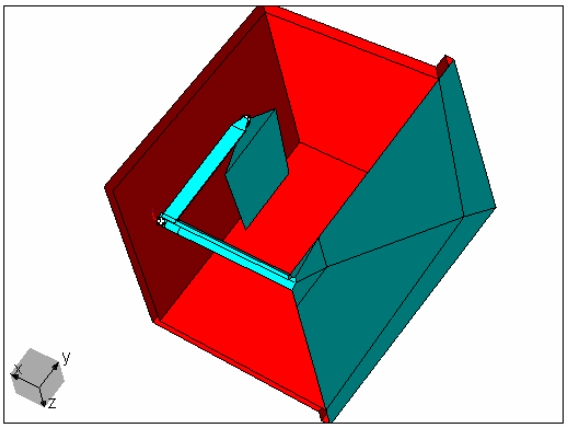


**Figure 2. UHFP antenna, quarter model**

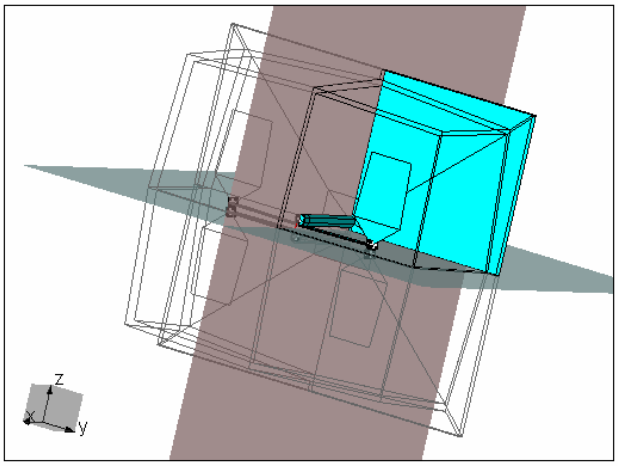


**Figure 3. UHFP antenna, metallic parts in quarter model**

Antenna gain and near fields are both calculated at the frequency of 0.56 GHz.

Antenna gain in 3D is shown in Fig. 4. We can see that maximum gain is about 10 dB. Antenna gain in a theta-cut is shown in Fig. 5. Please note that due to the orientation of the spherical coordinate system, theta=0° represents a cut through one of the two symmetry planes of the antenna.

Calculated near field is shown in Fig. 6. We can see the radiation mechanism in which the excited antenna generates a free space EM wave which then spreads forward. We should notice that only quarter of the antenna is shown in Fig. 6. Also, radiation in back direction is small because of reflector presence.

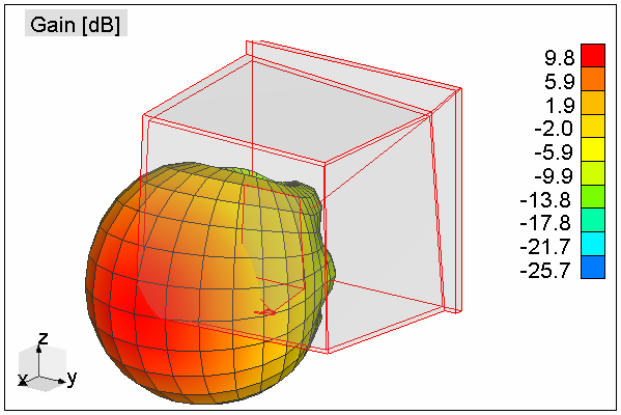


**Figure 3. Radiation pattern in 3D**

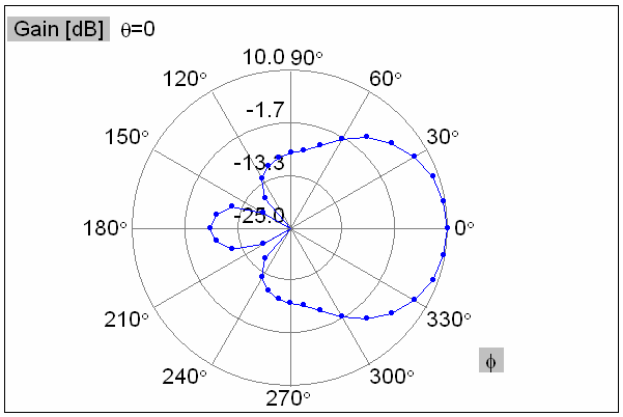


**Figure 4. Radiation pattern in theta cut**

Number of unknowns, memory requirements and simulation time at a single frequency are given in Tab. 1. Computer used for these calculations is Intel® Core2 Quad @ 2.83 GHz clock.

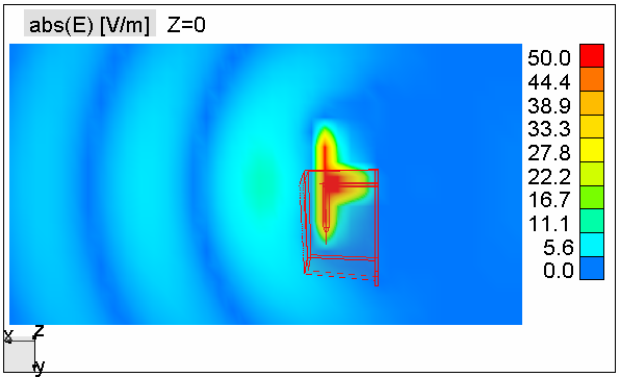


**Figure 5. Near field**

**Table 1. Analysis characteristics**

| No. of unknowns | Memory [MB] | Time [sec] |
|---|---|---|
| 353 | 1 | <1 |

## Conclusion

The panel antenna presented here consists of several geometrical shapes such as: radiating metallic panels, coaxial feeding line, finite-size reflector, dielectric radome (cover). This demands application of a versatile simulation tool to efficiently estimate the antenna performance. The state-of-the-art general purpose 3D EM solver WIPL-D Pro successfully simulates this antenna for only 4 seconds.