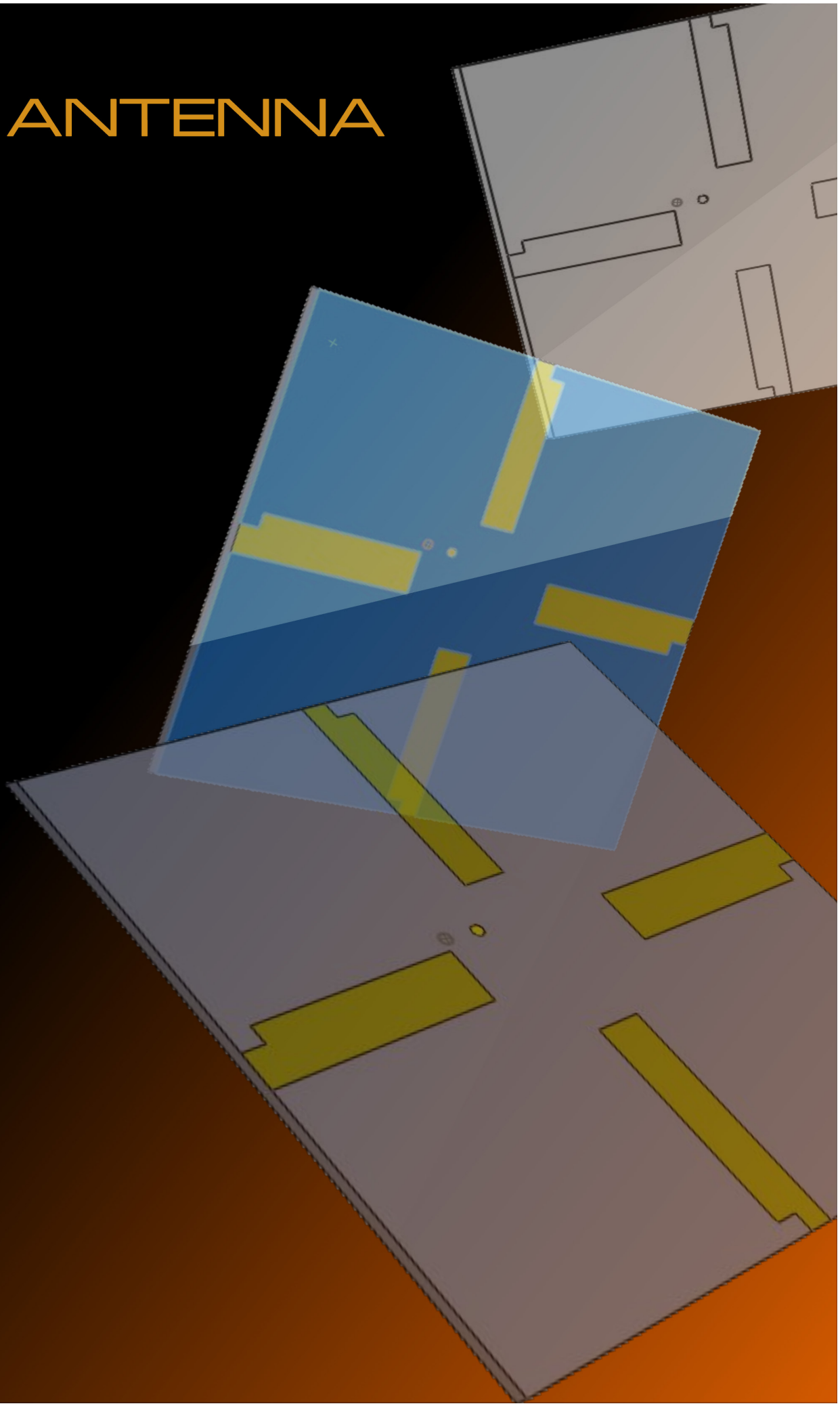
GPS ANTENNA



Electro Magnetic Works

GPS
ANTENNA SIMULATION

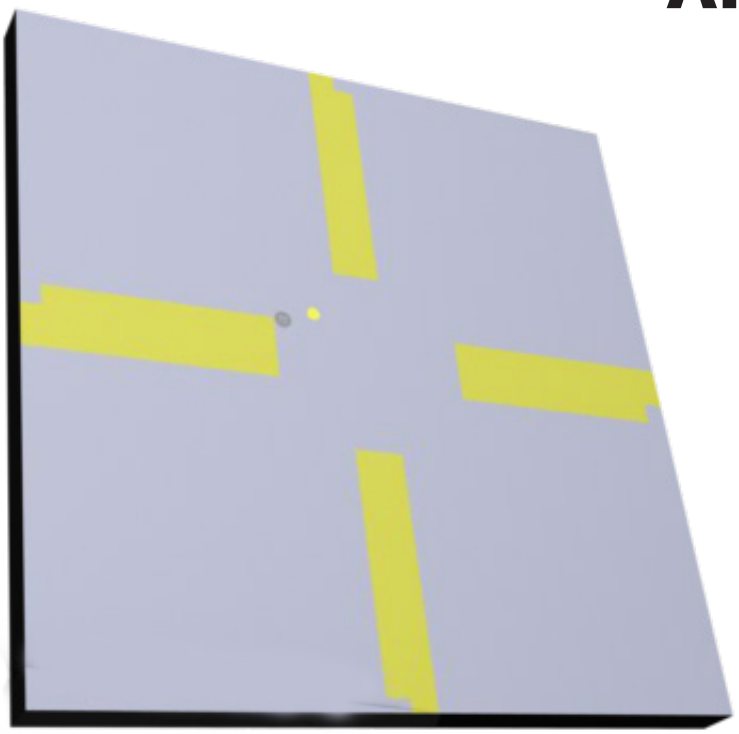
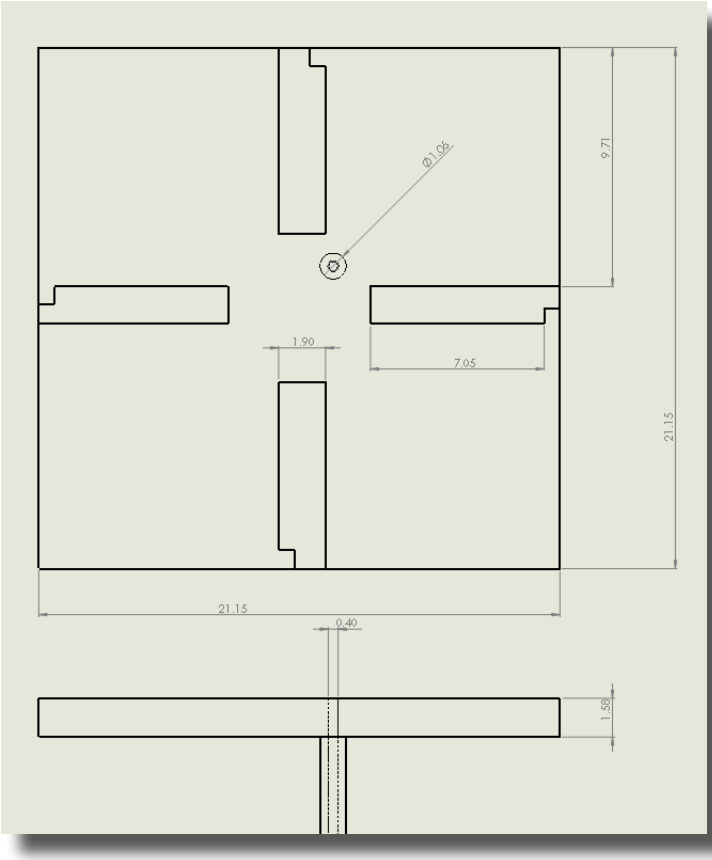


Figure 1: GPS antenna 3D structure

Global Positioning System is increasingly getting melt in our everyday life. In order to keep the GPS devices low-profile and portable, designers often resort to printed antennas. GPS applications use a very narrow bandwidth around 1.575 GHz, since they cannot afford any interference. For this purpose, we present in this example an HFWorks simulation for a patch microstrip antenna operating at 1.575 GHz with a very narrow band. The dimension of the patch is almost 2*2 cm which is convenient to integration in a portable device. The Perfect Electric Conductor surfaces of the antenna are built thanks to the Split line feature of Solidworks.

DIMENSIONS



All dimensions are in mm. As we can see, the size of the antenna is very small which makes it a good condidate for the nature of the intended applications (GPS for mobile devices).

BOUNDARY CONDITIONS

The feed of the antenna is located beneath the board of the four split surfaces. We select its bottom surface for the port assignment. The dielectric of the board is TMM 13 and the feed coax is assigned the material Duroid 5880. We model an air box above the board to provide us with the radiation surfaces which should be located not less than one wavelength away from the antenna's surfaces.

MESHING

The mesh of this example must be accurate enough on the signal paths which means the coax feed and the PEC surfaces. HFWorks gives special meshing feature to treat examples with curved parts: "Accurate curvature .

RESULTS

The meshing being realized, we run an antenna simulation in the frequency range from 1.5 GHz to 1.65 GHz to precisely visualize the behavior of the antenna around the intended frequency 1.575 GHz of the GPS application. In this figure, we see that the return loss increases rapidly from 0.3 dB to above 20 dB at the desired frequency.

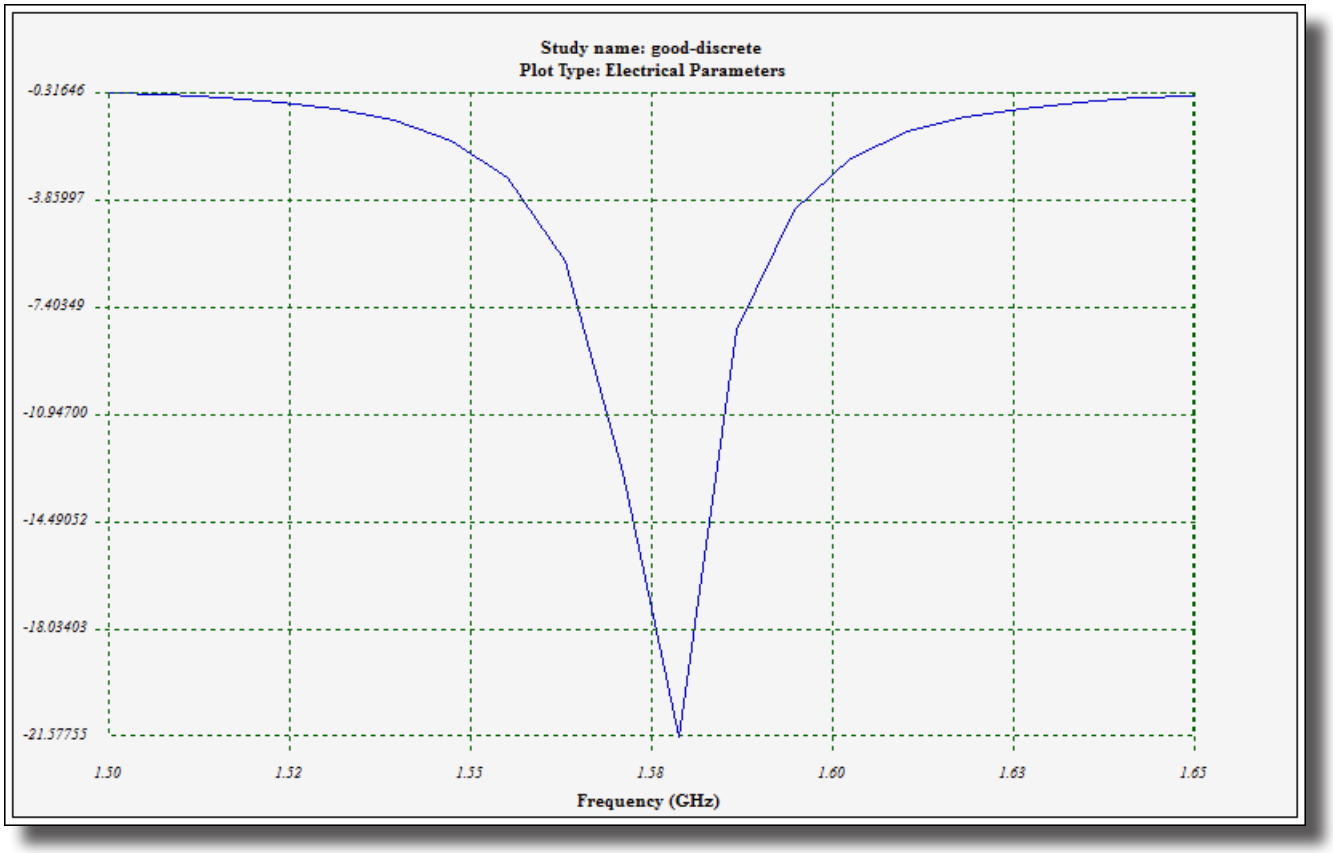


Figure 3: Reflection coefficient at port 1

In the next figure, we have the radiation of the total electric field in linear and dB situated in the Phi=0 plane.

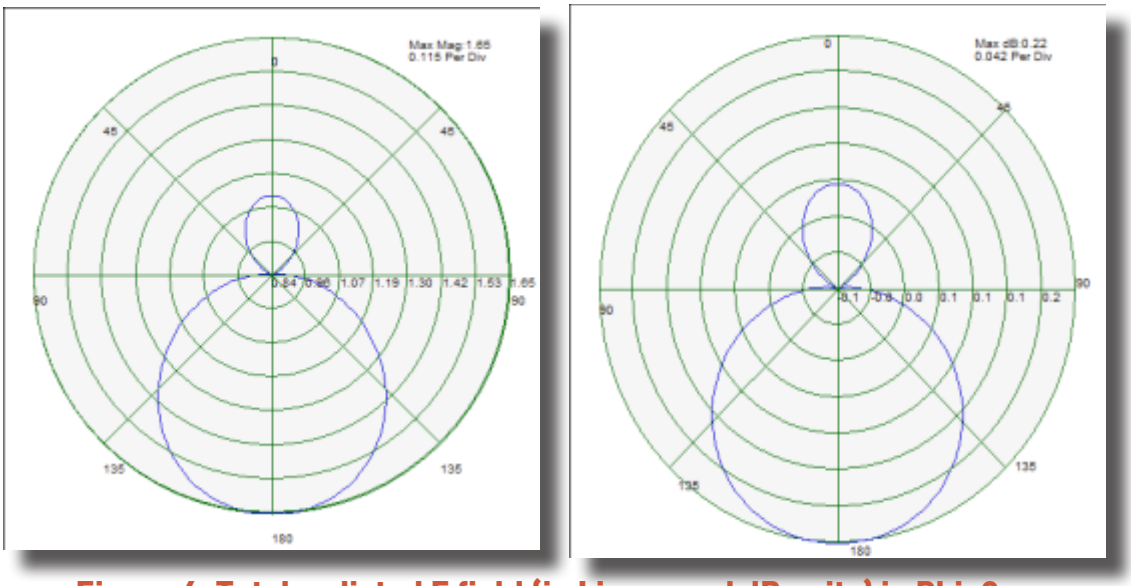
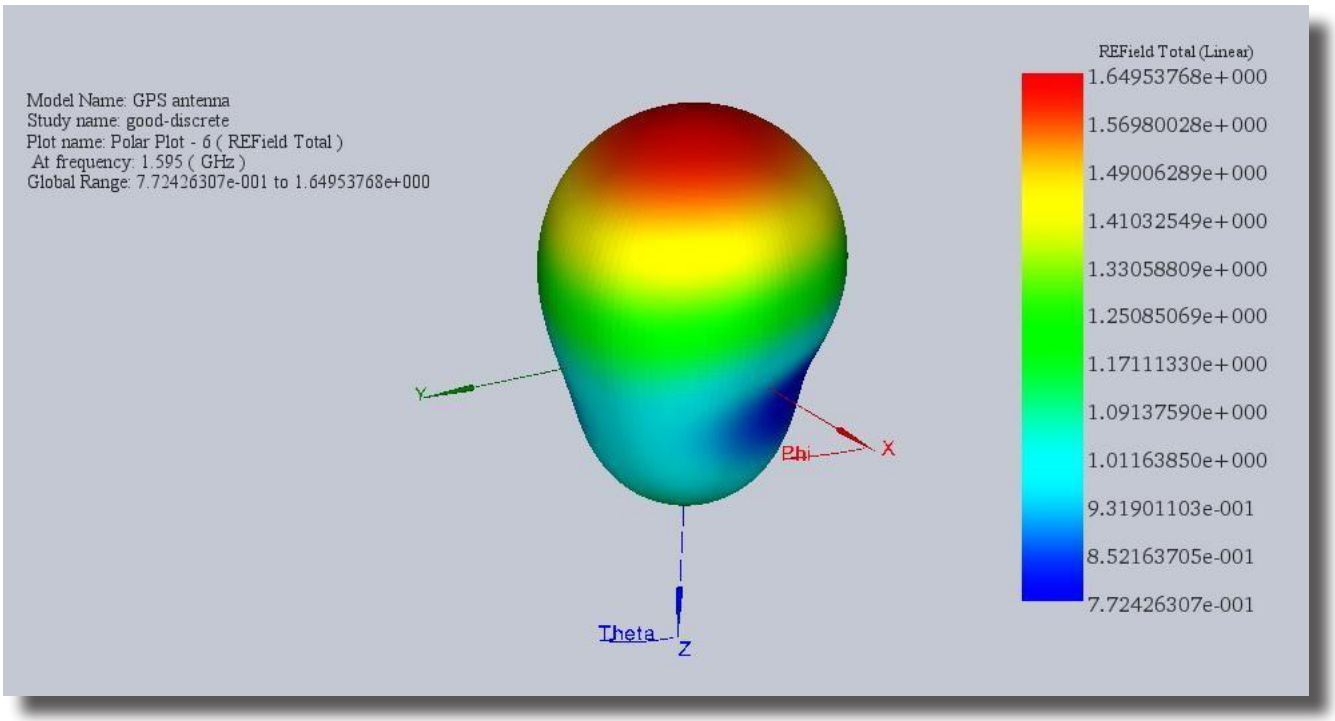


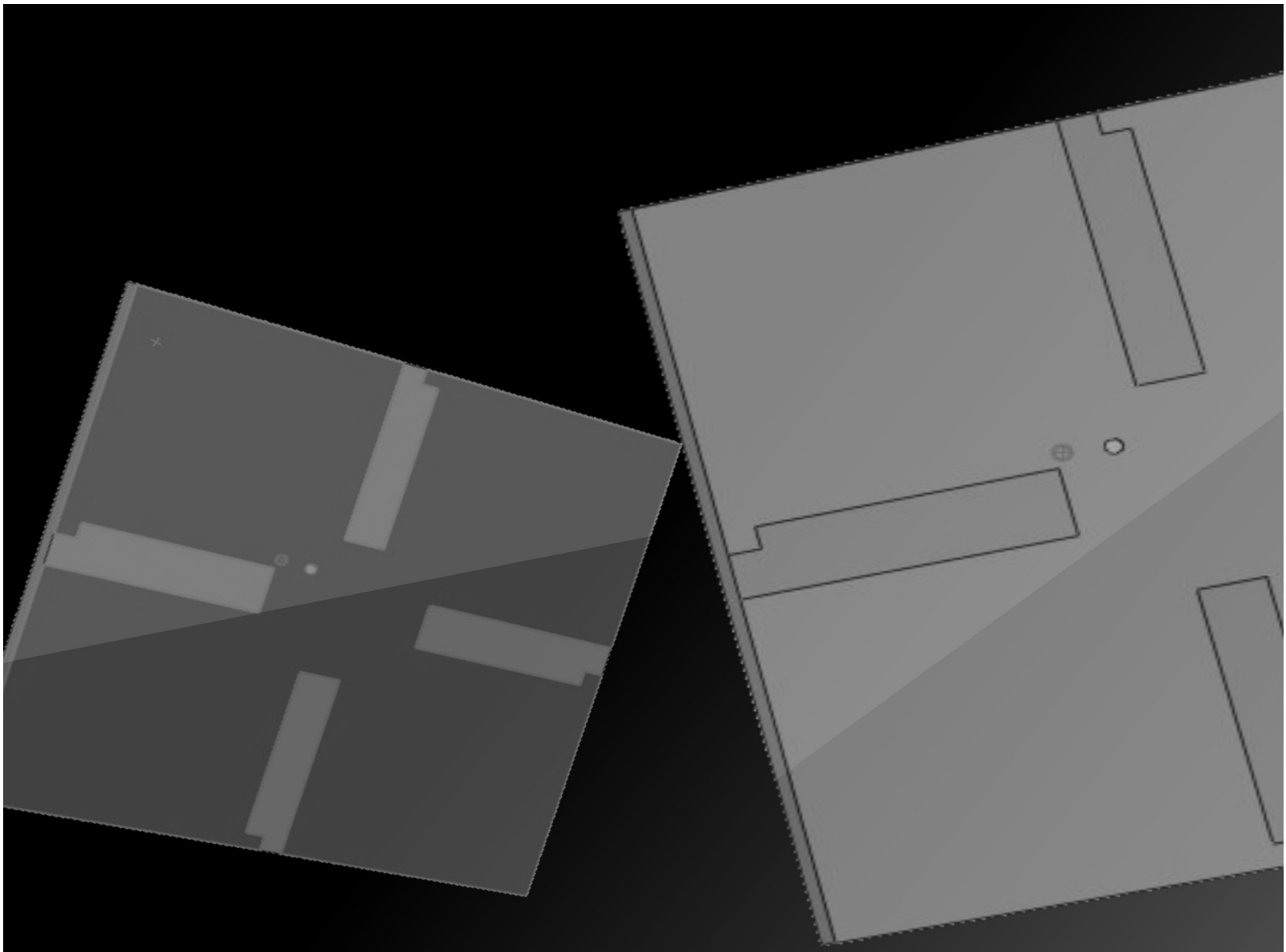
Figure 4: Total radiated E field (in Linear and dB units) in Phi=0 plane

We can refine the angles' steps during the creation of the study to get smooth plots whether in 2D or 3D. In this figure, we have plotted the 3D radiation of the electric field.



CONCLUSION

To conclude, we recall that the performance of any design always originates from how precise and adjusted the 3D design was created; of course good and regular assignments within the parameterization and the preparation of the studies (Materials, Restraints and Meshing) helps you get more accurate results but it always follows what the system has as an entry in the SolidWorks 3D model. This antenna has been optimized to respond to the specifications of the intended application and the portability character; as we have seen, the antenna shows acceptable performances by operating within the right frequency range and with good levels of return loss.



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