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Antenna Report – CorivaTag Plus

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Antenna development and original report by IRK – Dresden



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Preliminary clarification

This antenna report uses parts of the original antenna report from IRK - Dresden. It is a translation of the original German version, with some irrelevant information omitted.

Editor of original report: Dr. R. Klukas

Publication date: 26/06/2022

Used software and devices

Simulation software: Wipl-D

CDA construction: VariCAD

Network analyzer: Anritsu Wiltron 37347C

1. Simulation model of the housing

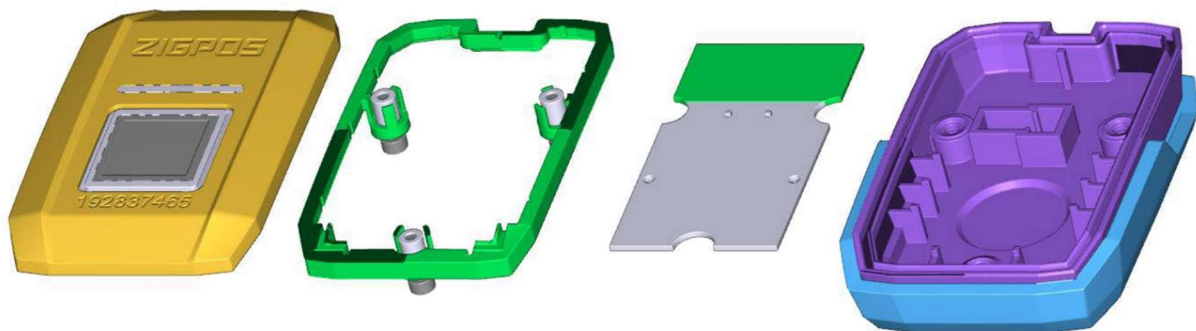


figure 1 - initial model

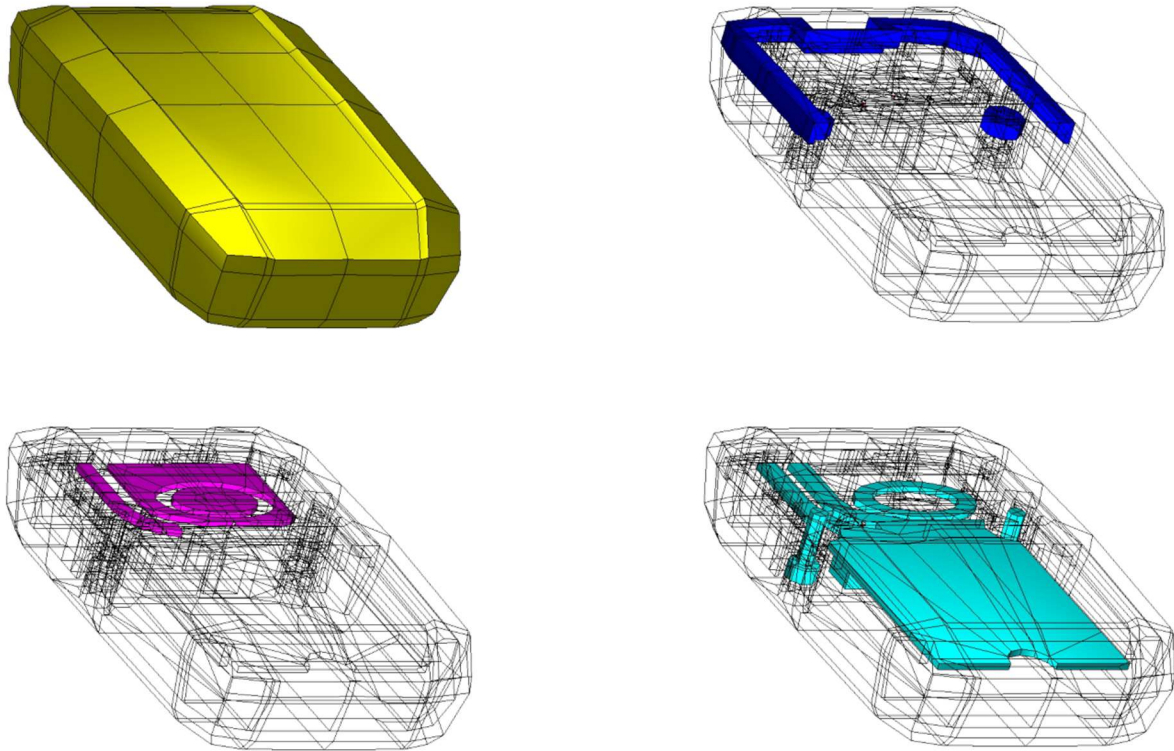


figure 2 - simulation model

The housing data was supplied in .stp format. The data was processed and simplified in WIPL-CAD. Details not required for the calculations, such as lettering, small corners or edges, were removed. The individual parts were assembled in WIPL-D, material properties were assigned and the actual antenna structures were programmed parametrically. The housing (yellow) was assumed to be a PC material. The blue parts are rubber seals made of TPU material. The parts of the FR4 circuit board material are shown in magenta. Green parts are ideal electrically conductive surfaces. The screws, a vibration motor and the electronics board were included in the model.

2. UWB antenna

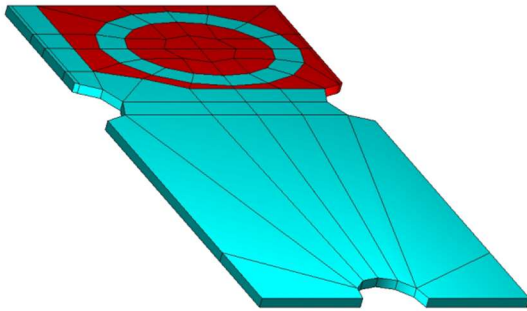


figure 3 - UWB antenna simulation model

The UWB antenna was designed as a ring antenna over a base plate. The structure can be printed on the top and bottom of a printed circuit board and plated through at the edges. The antenna is earthed at one point. At the same time, the design was calculated to create a ground plane for the ISM / OOB antenna on the left-hand side of the antenna.

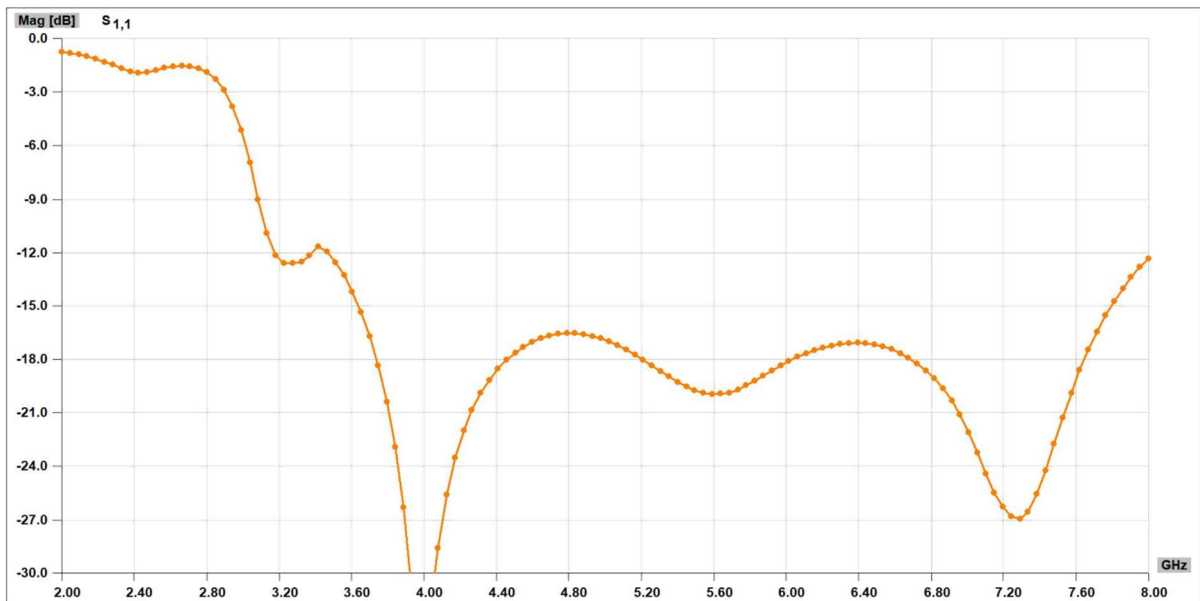


figure 4 - UWB antenna: computed matching

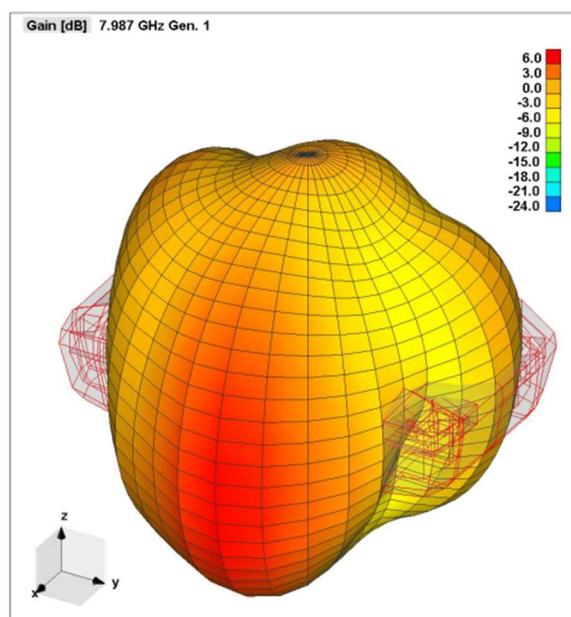
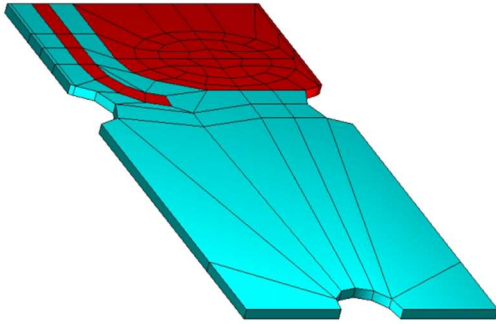


figure 5 - UWB antenna: computed emission for UWB channel 9 in dBi

3. ISM / OOB antenna



The ISM / OOB antenna was designed as a type of slotted radiator. A $\frac{1}{4}$ wavelength deep cut into a metal plate represents an open circuit at the edge of the plate and a short circuit at the end of the cut. The 50 Ohm matching point for feeding with a microstrip can be found between the two states. The antenna is naturally earthed.

figure 6 - OOB antenna simulation model

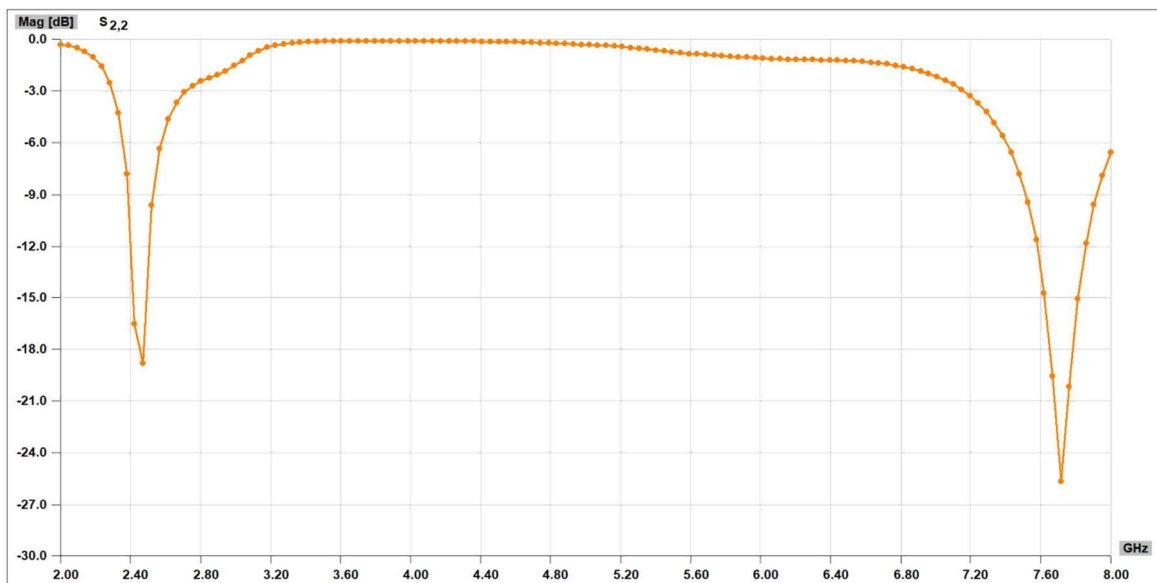


figure 7 - OOB antenna: computed matching

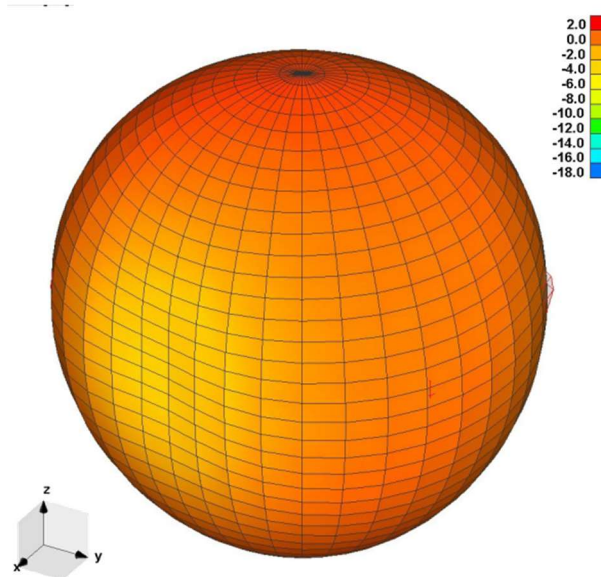


figure 8 - OOB antenna: computed emission @2.45Ghz in dBi

4. Antenna integration

Combining all individual emitters into one model and optimizing the matching considering the interactions and the radome.

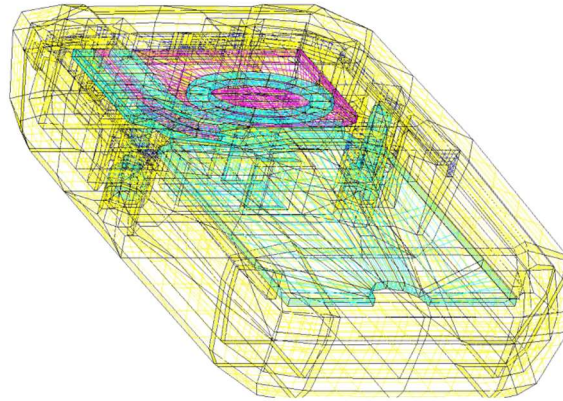


figure 9 - simulation layout of the interconnection as a mesh representation

5. Design of prototype



figure 10 - parts of prototype



figure 11 - assembly

6. Measurement of the matching

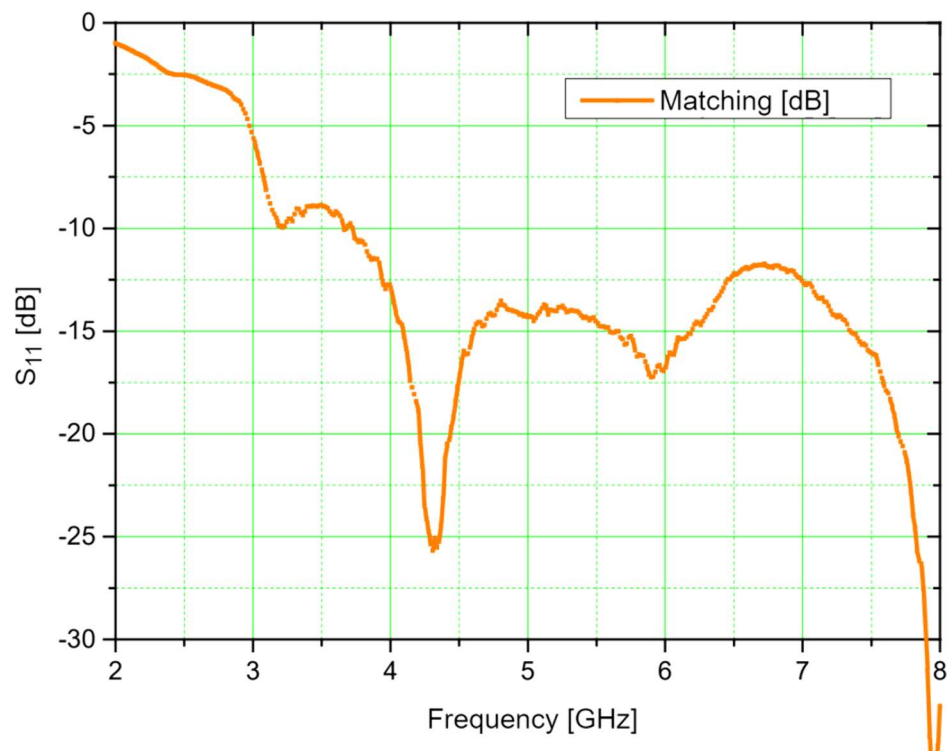


figure 12 - measured matching UWB antenna

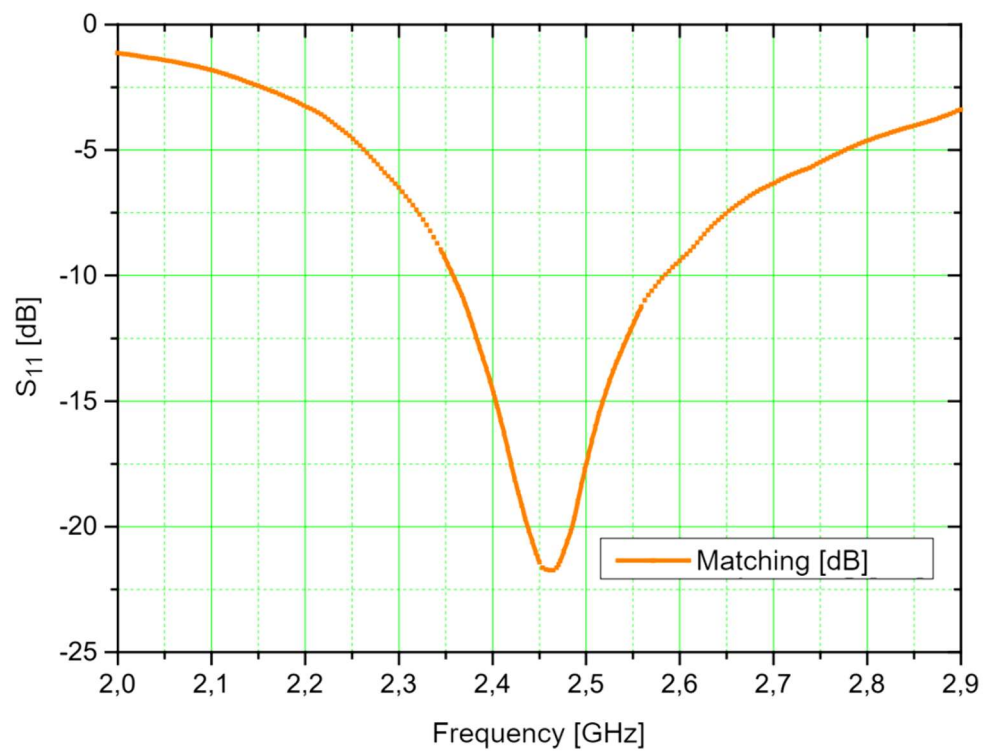


figure 13 - measured matching OOB antenna

7. Measurement of the emission

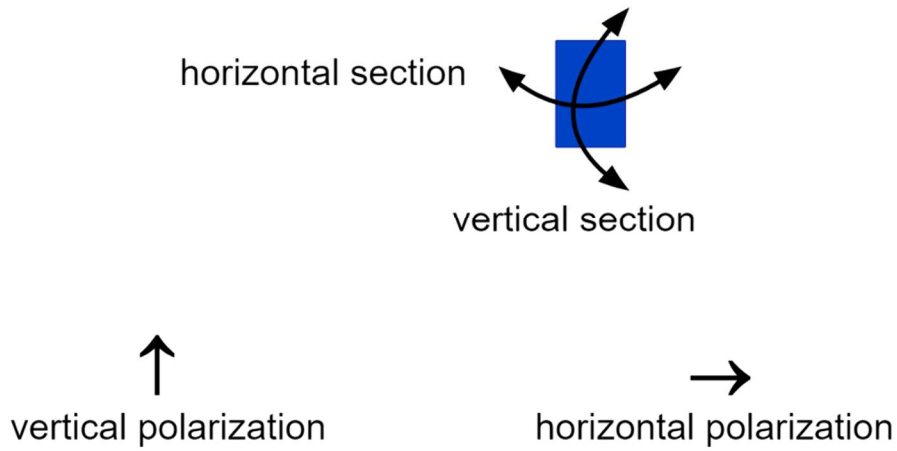


figure 14 - orientation of the diagrams and polarizations

The main beam direction corresponds to the 0° orientation in the measurement diagrams.

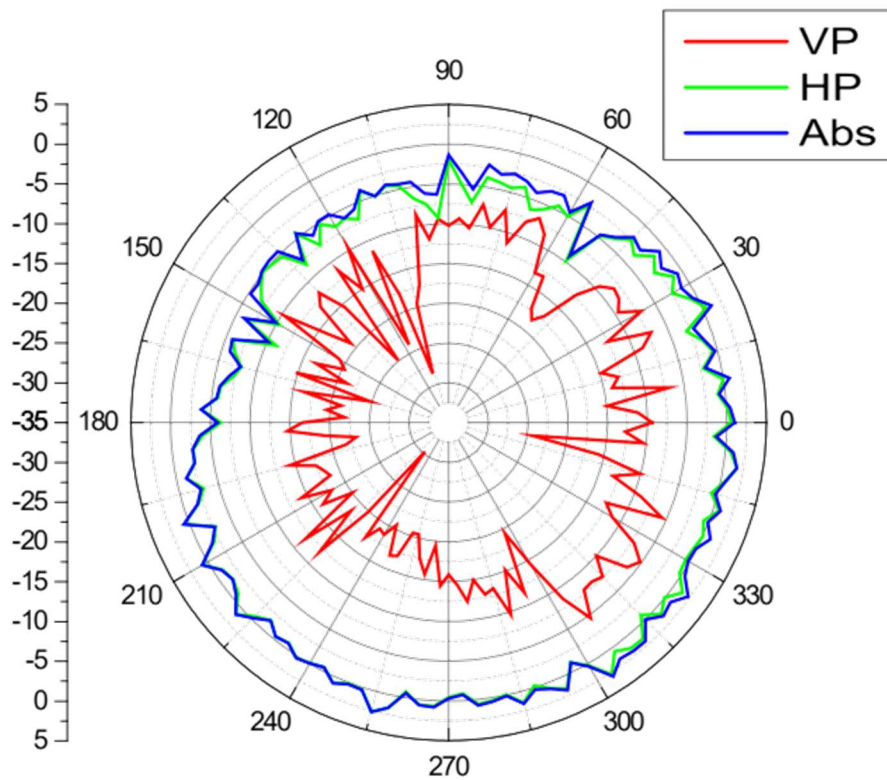


figure 15 - horizontal section UWB antenna ch9 @7.9872GHz

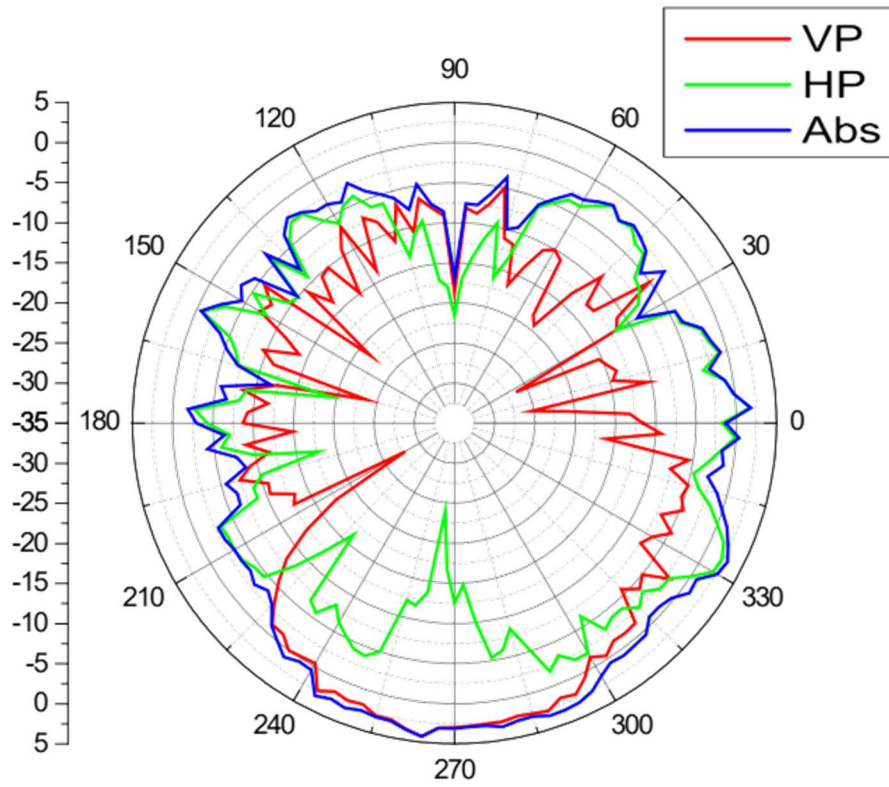


figure 16 - vertical section UWB antenna ch9 @7.9872GHz

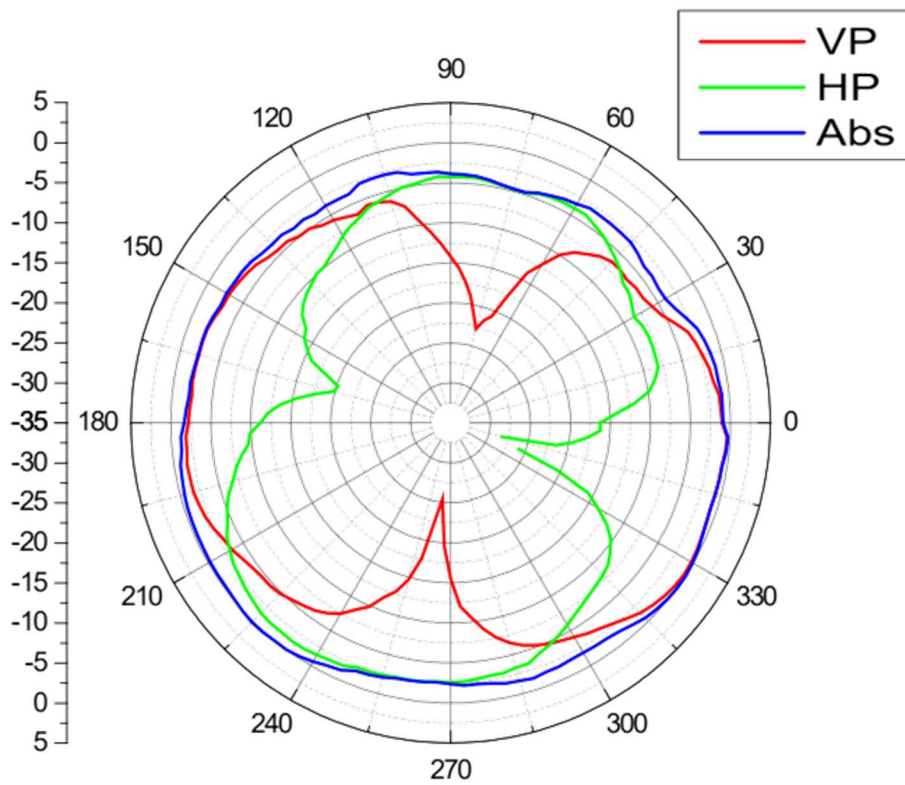


figure 17 - horizontal section OOB antenna @2.45GHz

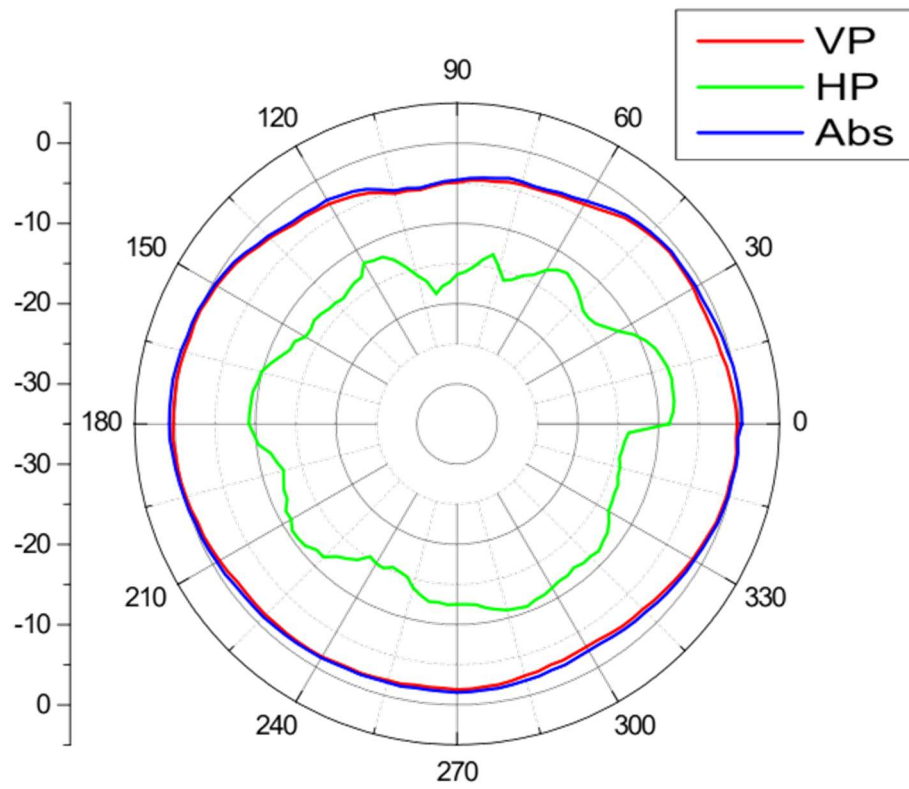


figure 18 - vertical section OOB antenna @2.45GHz