Microstrip Patch Antenna – Verification by Measurement

Microstrip patch antennas are among the most popular antennas, used in various application areas. Modelling of such antennas is typically straight forward and can be done in WIPL-D general-purpose 3D modeler WIPL-D Pro. More advanced geometries or geometries provided by CAD file can be made simulation ready in AW Modeler or WIPL-D Pro CAD. A simple microstrip patch antenna is simulated and the simulated results are verified with measurements performed by WIPL-D team.

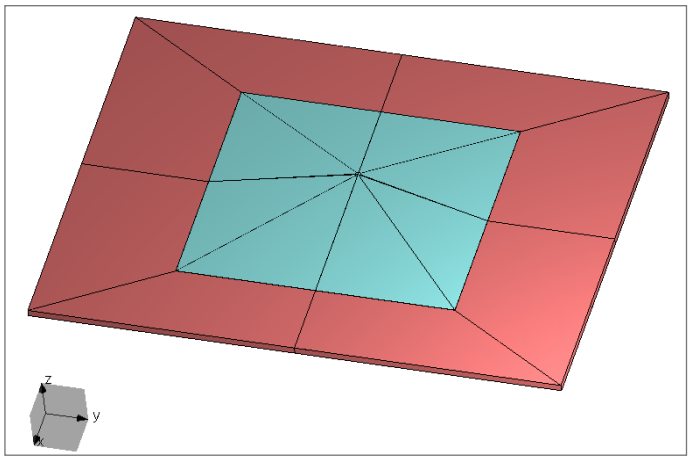

Figure 1. WIPL-D Model of Patch Antenna

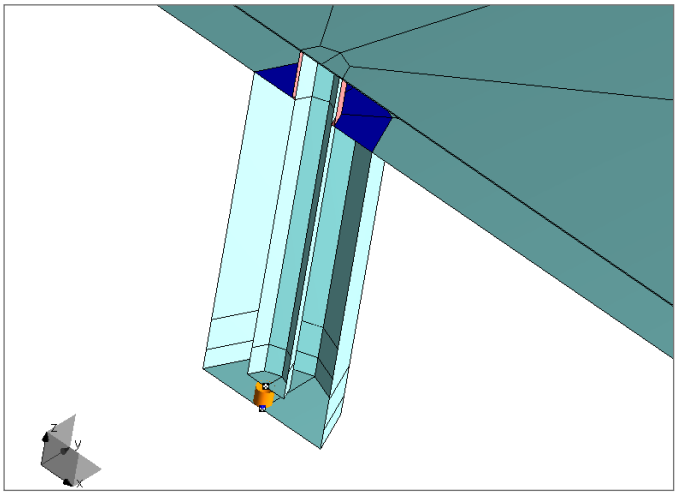

Figure 2. Coaxial Feed of the Antenna

The antenna is printed at RT Duroid 5880 substrate (1.5748 mm thick) with complex permittivity:

$$\varepsilon_r = 2.2 \cdot (1 - j \cdot 0.0004)$$

The model is made at a finite substrate and over finite ground plane (Fig. 1). The copper conductor is taken with finite conductivity of σ = 19 MS/m, to account for surface roughness. The antenna is fed by a probe that is extended to a coaxial line. A part of the coaxial line is included in WIPL-D model to simulate effects of realistic coaxial feed (Fig. 2).

The prototype (Fig. 3) is fed from the back side, by a probe which is connected to coax line via standard SMA connector.

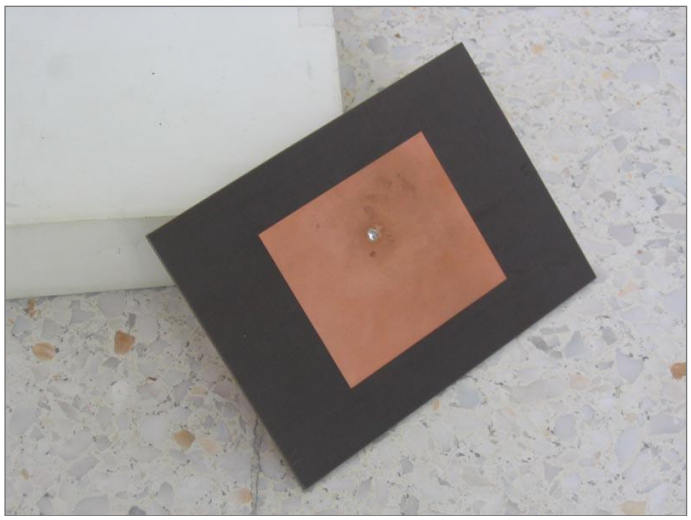

Figure 3. Front Side of Antenna Prototype

The simulated and measured S-parameters (Fig. 4), and radiation pattern in E-plane (Fig. 5) agree excellently.

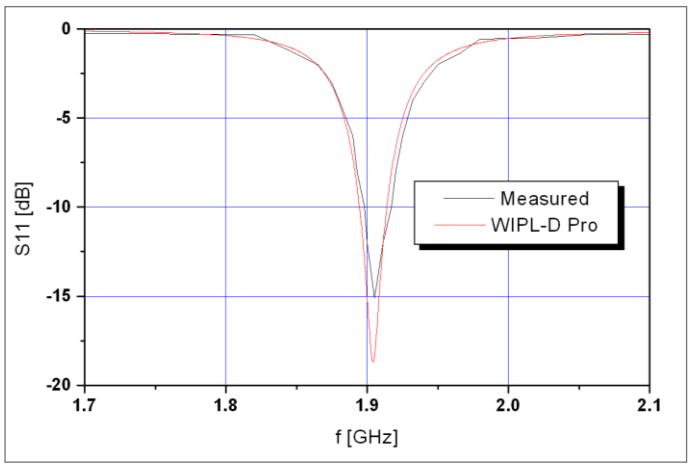

Figure 4. S11 of the coaxially fed patch antenna

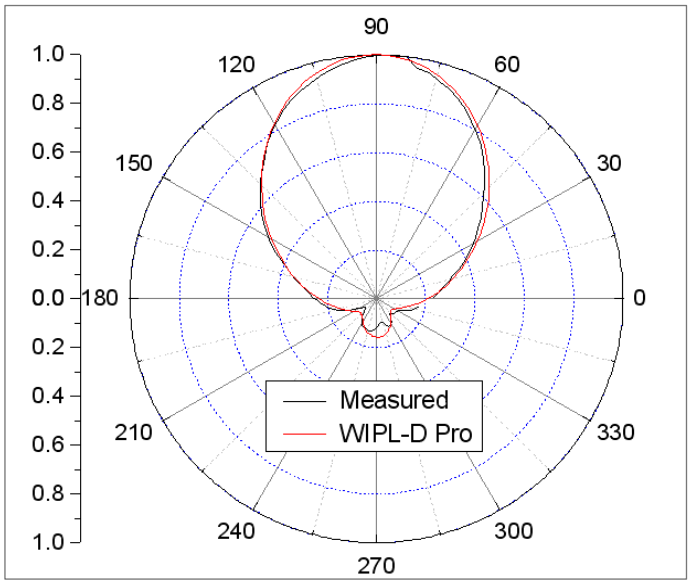

Figure 5. Radiation pattern in E-plane

Conclusion

The **software predicted** the resonance at **1.905 GHz**, while **measurements** pointed to **1.906 GHz**. The simulated bandwidth is **19.35 MHz** while the measured one is **19.3 MHz**. The relative discrepancy is **0.05 %** for resonant frequency and **0.25 %** for bandwidth.

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