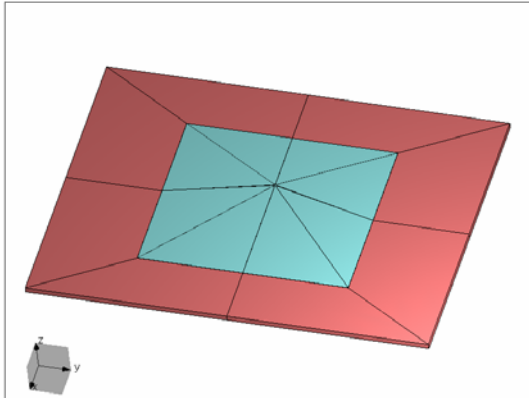


Rectangular Microstrip Patch Antenna on Finite Substrate Simulation vs. Measurements

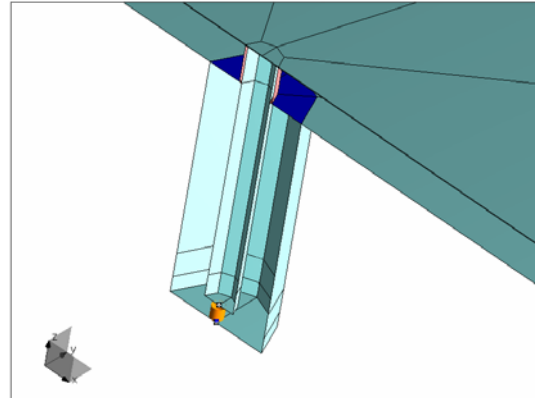
The scope of this application note is to give comparison between results of simulation in WIPL-D Pro and measurements for a simple probe fed rectangular microstrip patch antenna. The antenna is printed on RT Duroid 5880 substrate of height 1.5748 mm and of complex permittivity $\epsilon_r = 2.2 (1-j 0.0004)$.

WIPL-D Model

The model is made on a finite substrate and over finite ground plane. The dielectric is taken into analysis with its relative dielectric constant and losses, while copper conductor is taken with finite conductivity of $\sigma = 19 \text{ MS/m}$. The antenna is fed by a probe that is extended to a coaxial line. The part of coaxial line is included in WIPL-D model to simulate effects of realistic coaxial feed. The model and coaxial feed are shown in pictures below.



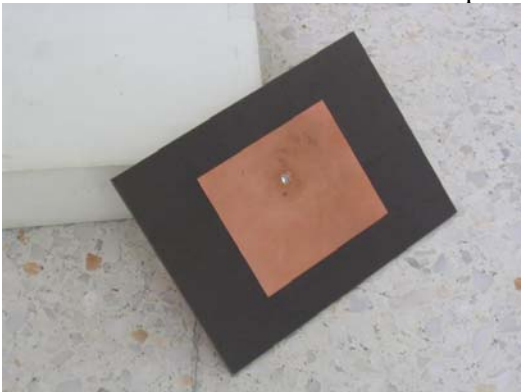
WIPL-D Model of Patch Antenna



Coaxial Feed of the Antenna

Prototype

The prototype is made with same dimensions as WIPL-D model. It is feed by a probe which is connected to coax line via standard SMA connector. The prototype looks like below.

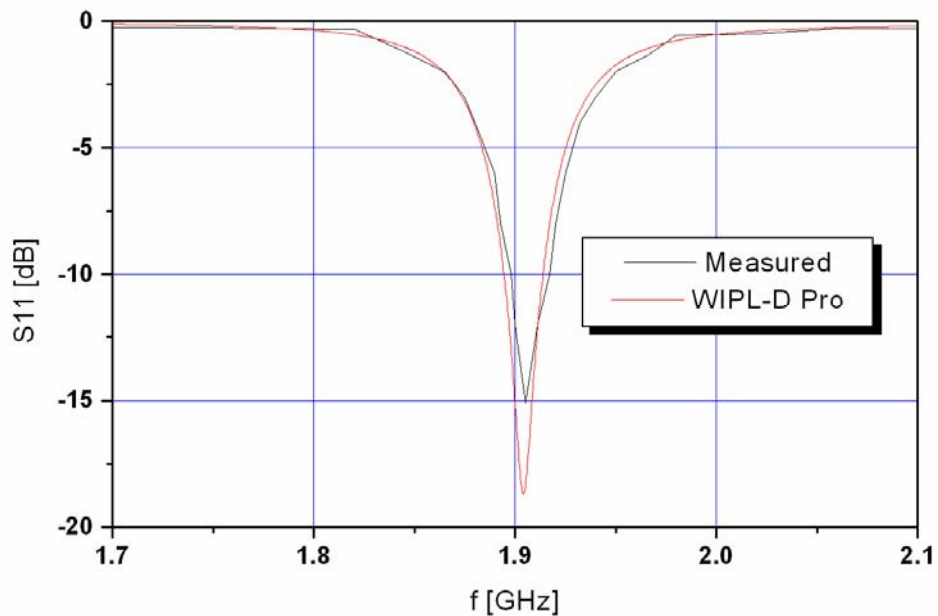


Front Side of Antenna Prototype

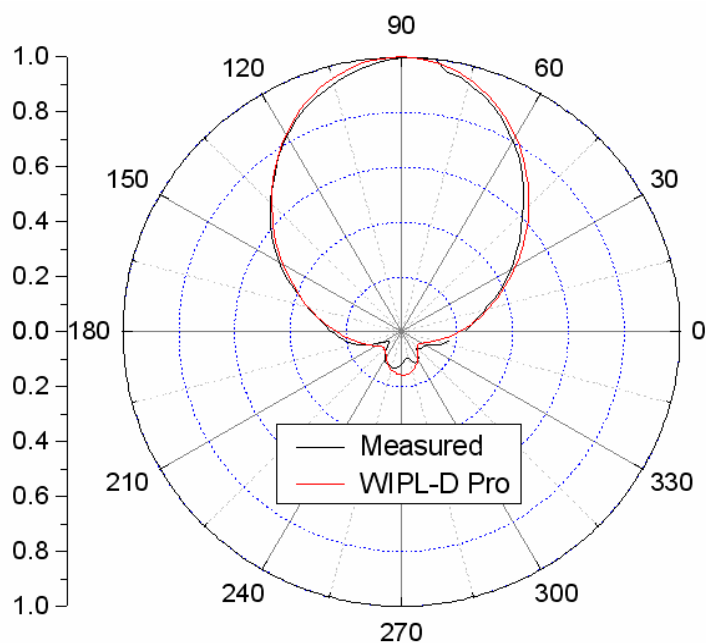


Back Side of Antenna Prototype

Measurement vs. Simulation – Return Loss and Radiation Pattern



Return Loss



Radiation Pattern in E-plane

	Measurements	WIPL-D Pro Simulation with 1488 unknowns
Resonance [GHz]	1.906	1.905
Bandwidth [MHz]	19.3	19.35

WIPL-D offers very accurate simulation results. Compared to measurements relative error is 0.05 % for resonant frequency, while error for bandwidth is 0.25 %.