Cross Spiral Antenna (CSA)

This white paper presents model and results published in the following paper "A multi-polarization multi-band cross spiral antenna for mobile communication devices", ISAP 2012 International Symposium.

CSA simulations and measurements

The device under simulation and measurement is shown in Figure 2. The antenna exhibits good performances at 3 frequency bands so it is supposed to be used as combined RFID, mobile-phone (UMTS) and GPS band device - 1.0 GHz, 1.8 GHz and 1.67 GHz, respectively.

The dimensions of the structure are shown in Figure 1, while the important parameters are listed in Table 1.

Figure 1. CSA dimensions

Figure 2. CSA (WIPL-D Pro model)

Table 1. CSA important parameters (dimensions and substrate properties)

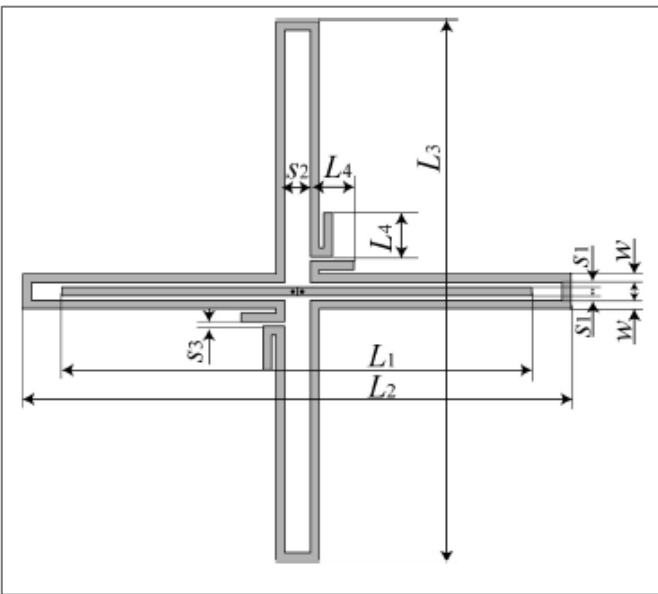| Parameter	Value
w	1 mm
L1	52.2 mm
L2	60.8 mm
L3	59.8 mm
L4	5 mm
s1	0.5 mm
s2	3 mm
s3	0.5 mm
Er	4.4
Hsub	1.6 mm

Feeding area of the structure was done in two completely different ways. One was via a very simple wire bridge. The second feed area included coaxial feeders and connector with all the details.
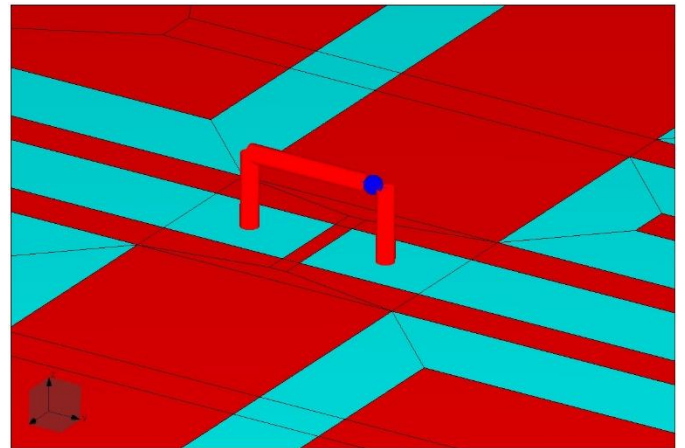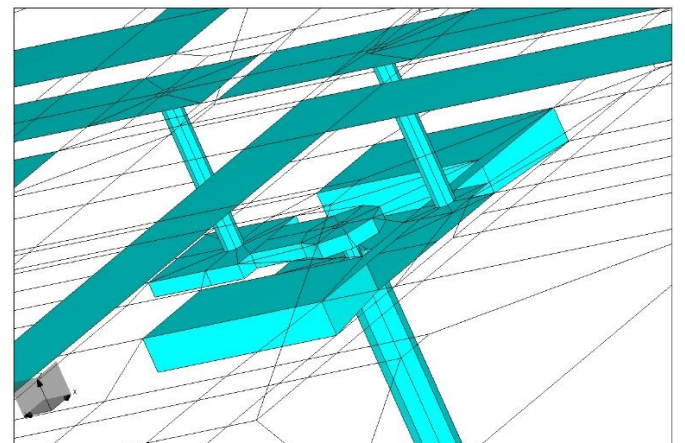

Figure 3. CSA simple feed (WIPL-D Pro model)
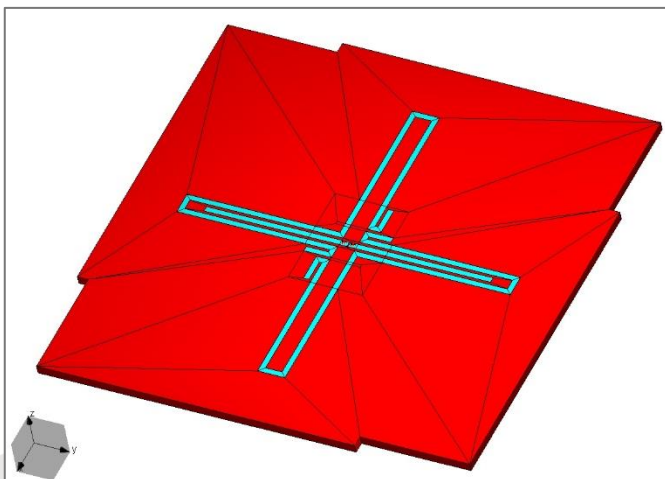

Figure 4. CSA complex feed (WIPL-D Pro model)

Although the model in WIPL-D was fed in two very different ways, results are very stable and similar.
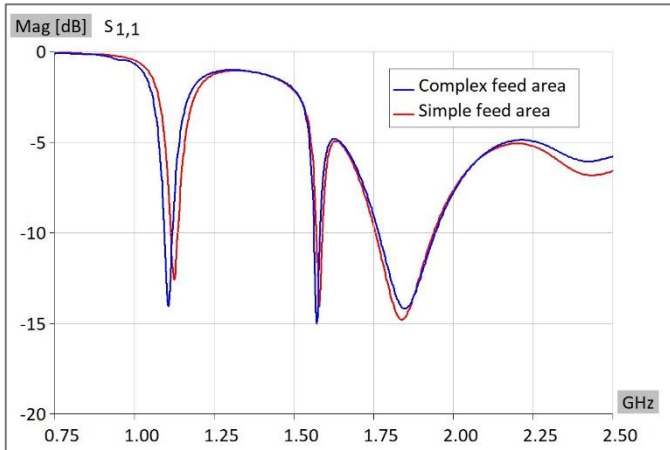

Figure 5. Two feed methods (WIPL-D Pro model)

The model with simple feed runs in 6 seconds with 2,304 unknowns required, while the complex feed model runs in 13 seconds with 4,221 unknowns required. The configuration used for simulations is a standard desktop Intel® Core™ i7-7700 CPU @ 3.60 GHz. Owing to the powerful built-in interpolation, the model requires up to 21 frequency point for the return loss precisely showing all the resonances.
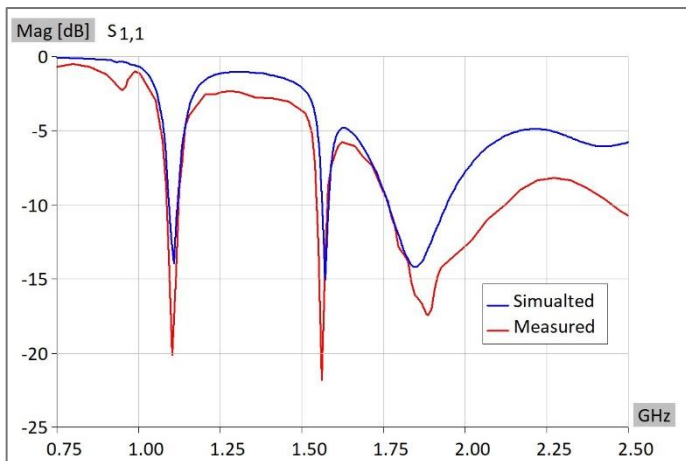
The agreement with measured results is shown in the last figure.

Figure 6. Measured and simulated result