

## A Dual Band Antenna for GSM Applications

### 1. Description

We report a single-feed microstrip antenna for operation in the GSM band (900/1800 MHz). Simulation and measured results are presented for return loss and some antenna parameters. Originally, the equilateral single triangle behaves like a 1.8 GHz resonator; However, the introduction of two spurs along two of its sides - as presented in the following figure-, provides another resonance at a lower mode, observed at 0.8 GHz. The simulated results are very close to the measured ones which can be consulted in [1].

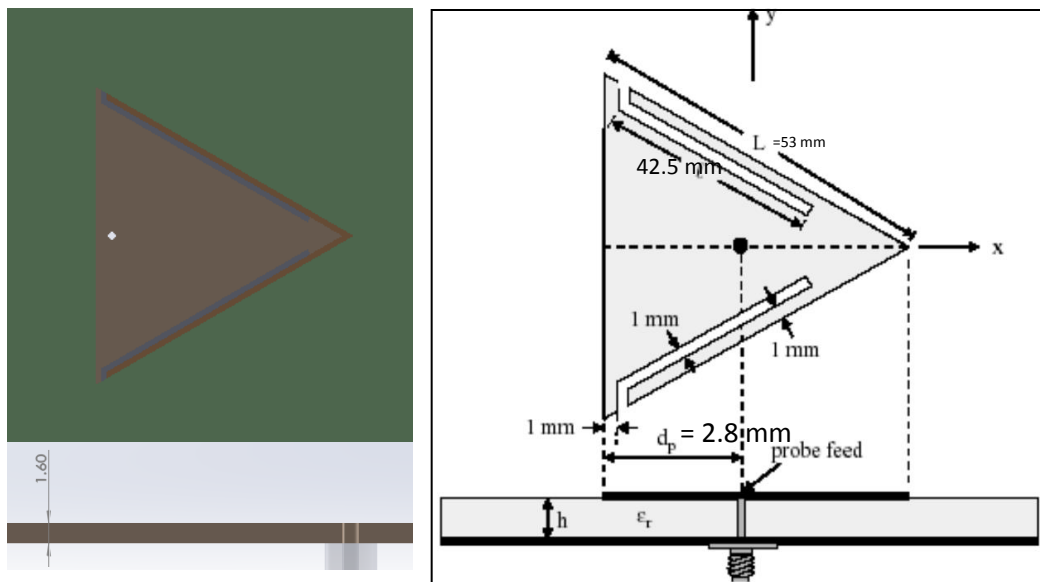


Figure 1: Top and Front views of the model [1]

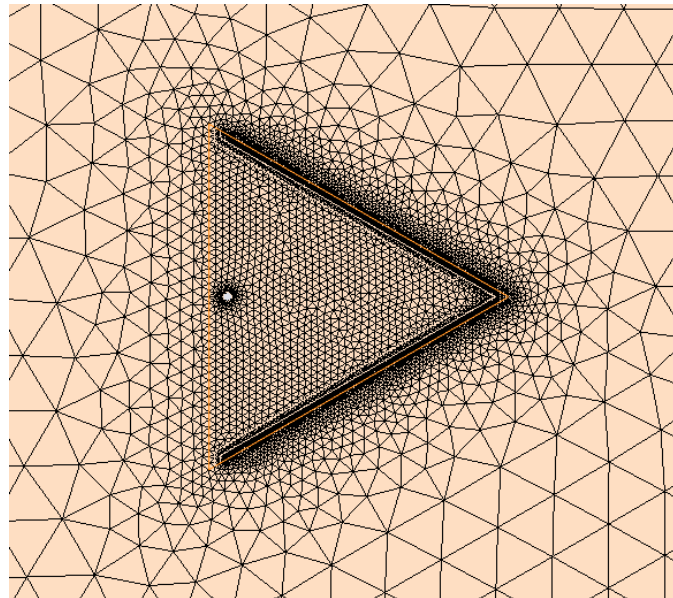
### 2. Simulation

We prepare an antenna study with a fast sweep plan. Preferably, the center frequency should be around one of the resonance modes. As we are only interested in the return loss measurement for a first step (the other parameters will be computed in a further step), we may put bigger steps for Theta and Phi in order not to waste much time on computing the antenna parameters. In addition, we may also profit from the shape's symmetry and put a PMCS plane cutting the triangle into identical halves: this could reduce the simulation time.

### 3. Load/ Restraint

As specified in [1], the feed needs to be connected via an SMA connector to the patch. We are free to build the connector in our own way, keeping in consideration the dimensions of the shape.

We come afterwards to the mesh preparation: the mesh is like what the simulator sees in the shape. So if we need the spurs to be perfectly seen, we have to apply a fine mesh control in that area; over meshing irrelevant surfaces would cause the simulation time to be very long.



### 4. Results

To validate the simulation's accuracy, we can have a look at the return loss curve. The curve shows that the simulator captures perfectly the two resonance modes. As mentioned in the beginning of the report, the fast sweep plan is used in this example. The discrete sweep gives more accurate results. The following figures show the simulated and measured curves

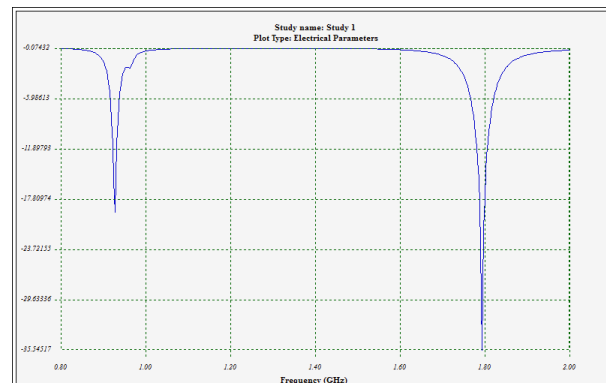


Figure 2: Simulated Return loss in HFWorks

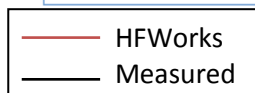
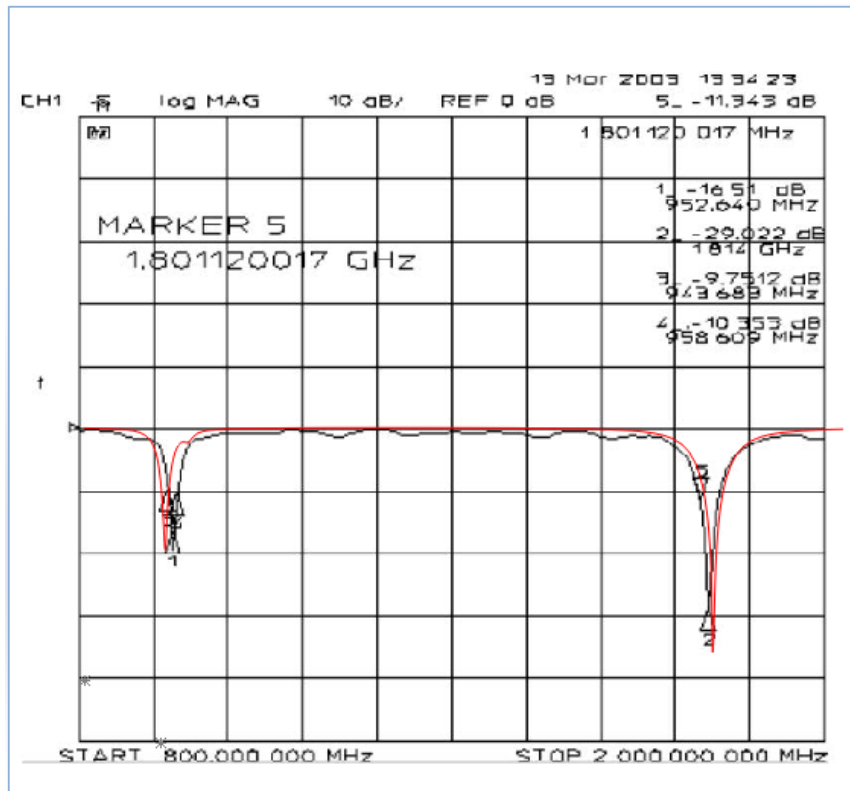


Figure 3: HFWorks and measurements' curves

We can view 3D plots for the electric and magnetic fields amongst other parameters.

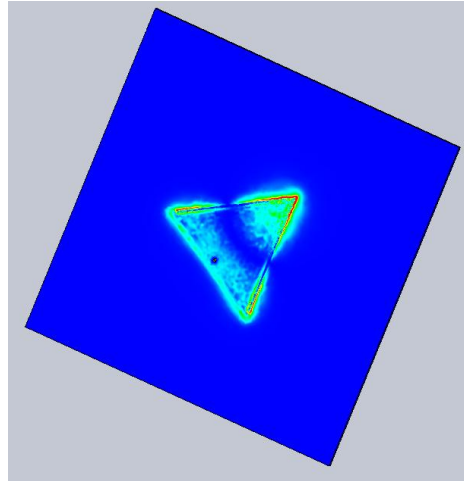


Figure 4: Near electric field distribution

Another study with a very fine angles' step (Theta and Phi) -less than 1°- could be run for the two resonant frequencies. This study will provide plots for some antenna's parameters (See further figures).

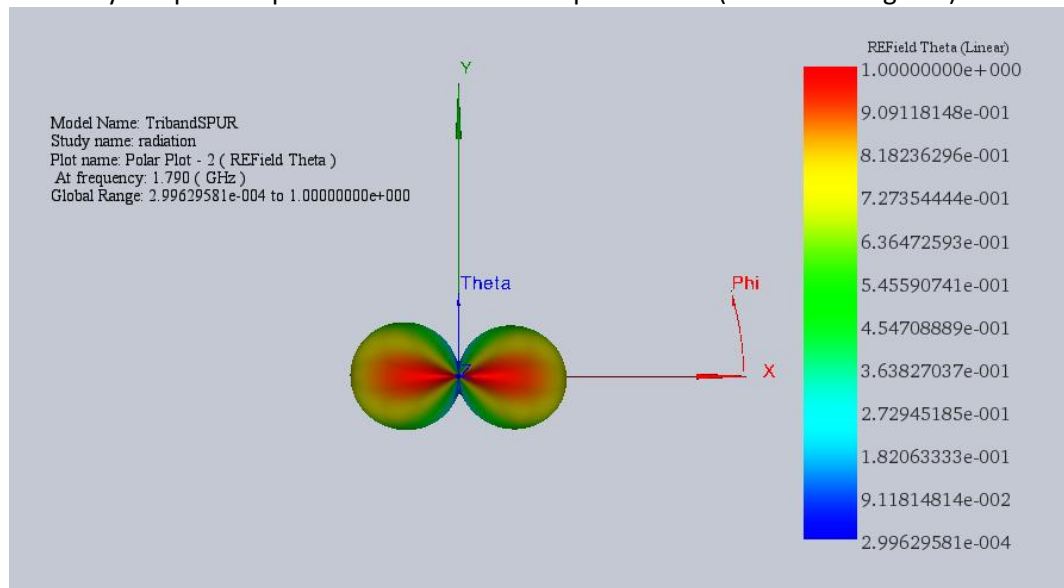


Figure 5: Radiated Electric Field Theta component

In this example, we were able to discover how to set up an Antenna study in pre and post simulation steps in HFWorks. The simulated model shows perfect agreement with measurements. It also outputs different electrical parameters in 3D plots. The dimensions and materials used in the model have been optimized for the intended band of frequency. The spurs introduced in the triangular patch should be well meshed in order to discover the lower resonance mode.



Electromagnetic Design Made Easy  
Powered by SolidWorks®



## 5. References

[1] "A Triple Band Antenna for GSM and GPS Application", Min Sze Yap, Lenna Ng, and Sheel Aditya