

## CommScope and Cadence

Inverted-F Antenna with AWR Software

### Key Challenges

Johannes Steigert, an RF engineer at CommScope, was challenged to develop an inverted-F antenna (Figure 1) for a mobile communications sub-1GHz band. The specifications for the mechanical dimensions of the PCB severely limited the available space for the antenna. Consequently, difficult tradeoffs from the state-of-the-art theoretical design had to be made regarding antenna gain, efficiency, and broadband performance.

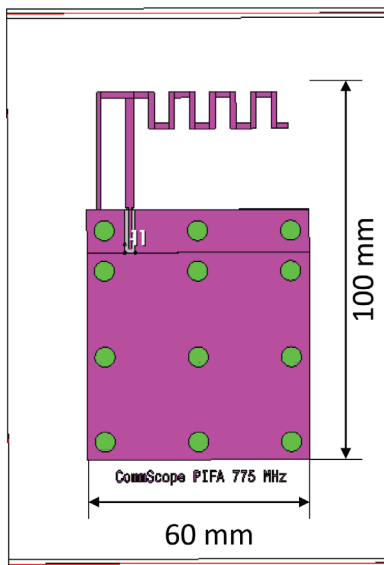


Figure 1: Planar inverted-F antenna

### Application

- ▶ Antenna

### Software

- ▶ Cadence® AWR Design Environment® Software Portfolio, including:
  - Cadence AWR® Microwave Office® Circuit Design Software
  - Cadence AWR AXIEM® Planar Electromagnetic (EM) Simulator

### Benefits

- ▶ Ease of use
- ▶ Simulation speed
- ▶ Technical support

## Solution

The CommScope design team chose Cadence’s AWR Design Environment platform for the development of their inverted-F antenna with stringent specifications. The sophisticated capabilities of AWR Microwave Office circuit design software combined with the speed of the AWR AXIEM EM simulator helped the team cut the number of various prototype design spins and delivered a first-time-right solution for the given problems. The software detected the influence of the mechanical tradeoffs and helped the team compensate for those problems during the simulation phase.

Figure 2 is an AWR AXIEM EM simulation of the roughly donut-shaped radiation pattern, while Figure 3 shows the current distribution of the antenna. Figure 4 displays the simulated inverted-F antenna pattern.

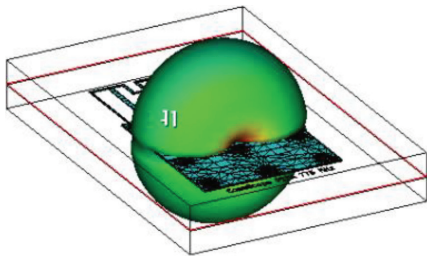


Figure 2: AWR AXIEM simulation of the inverted-F antenna

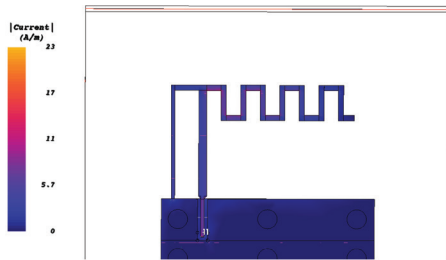


Figure 3: Current distribution plot

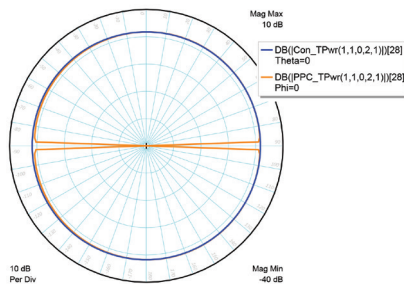


Figure 4: Simulated inverted-F antenna pattern

AWR Microwave Office software and the AWR AXIEM EM simulator optimizer functionality were used to match the antenna for the LTE Band 13. Figure 5 is the yield analysis as verification of the LTE Band 13 matching performance. Variation of relative permittivity was between 4.0-5.0. The graph shows the simulation with random C and L values was in between the real component tolerances. The antenna S11 under all circumstances was within the desired 10dB over the full bandwidth.

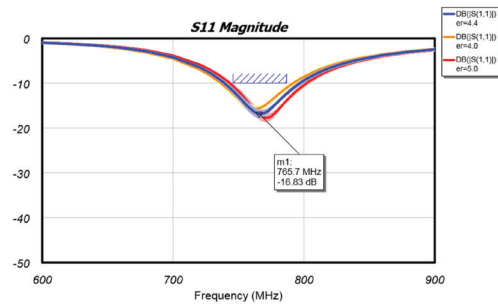



Figure 5: Yield analysis used to verify the LTE Band 13 matching performance

## Summary

Steigert found that AWR software, in comparison to similar products, provided the best models of the real antenna, thus saving significant development time and costs compared to conventional prototyping approaches. He highlighted the ease of use of the software combined with its simulation speed and ability to deliver highly complex solutions in a short time as key benefits of using AWR software. Of particular note were the outstanding technical support, exhaustive examples, and widespread knowledgebase.

  
*Cadence’s AWR software combines simplicity with the ability to deliver highly-complex solutions in less time compared to conventional development approaches.*  
 Johannes Steigert, CommScope



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