



## Singly-Fed Circularly Polarized Electromagnetically Coupled Patch Antenna

**A description of the FEKO model for an antenna presented at the ACES 2007 conference.**

### Model description

Hajiaboli and Popovic presented a paper on a novel circularly polarized patch structure at the ACES 2007 conference, [1]. The antenna consists of two metallic patches, the bottom patch fed with a pin and coupling capacitively to the top patch. The metallic patches are etched on identical substrates and are separated by a foam layer, with dielectric properties of air. The bottom patch has no ground-plane and another layer of the already defined substrate is glued to the bottom of this patch's substrate.

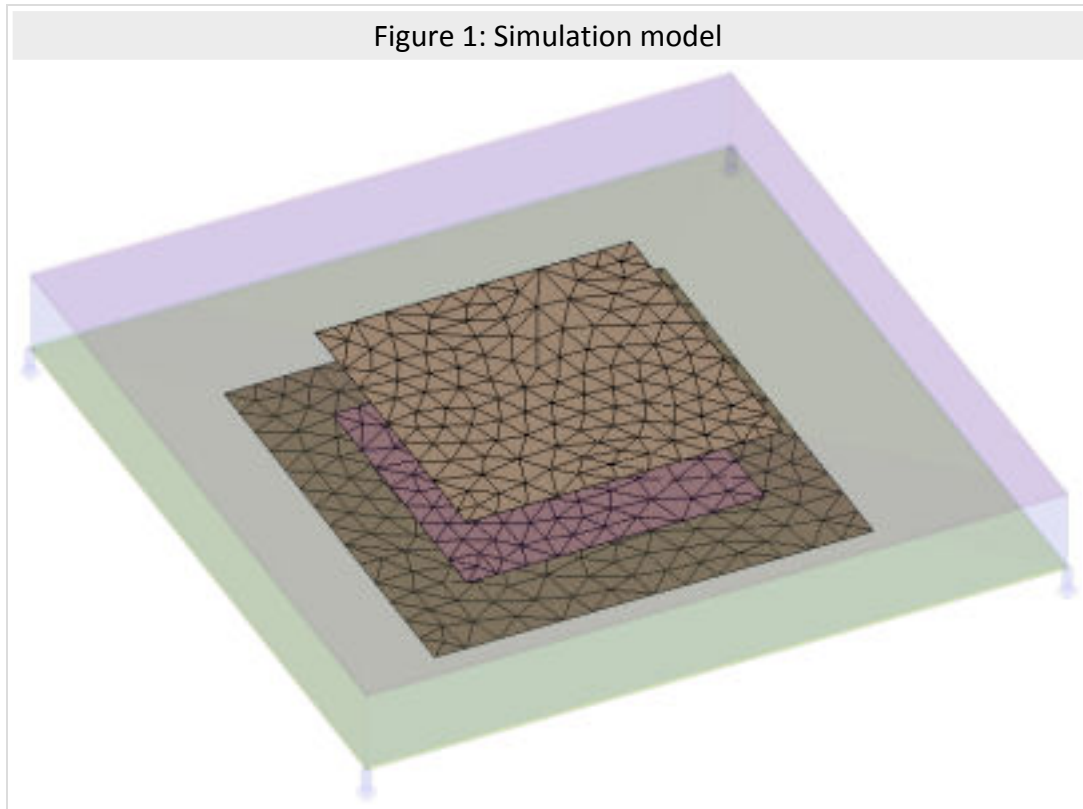
The antenna has to be modeled between 1 GHz and 2 GHz to characterize its reflection coefficient. The model consists of the following layers:

Layer	Thickness [mm]	(d)	Relative permittivity (er)	Dielectric loss factor (tan $\delta$ )
Capacitively coupled metallic patch	n/a		n/a	n/a
Dielectric layer 1	0.81		3.38	0.0027
Foam	variable		1	0
Driven metallic patch	n/a		n/a	n/a
Dielectric layer 2	0.81		3.38	0.0027
Glue	0.12		1	0
Dielectric layer 3	0.81		3.38	0.0027
Ground plane	n/a		n/a	n/a

### Simulation construction

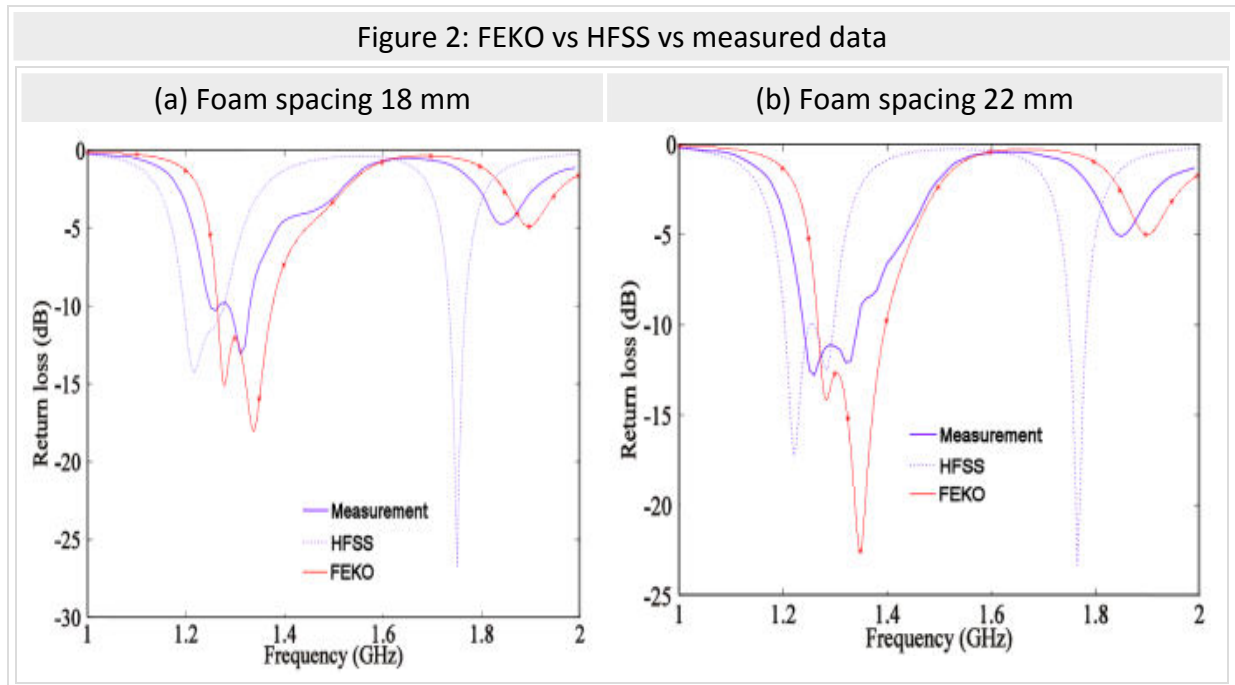
This structure is ideally suited to simulation with semi-infinite Green's function planes. Each dielectric layer is a Green's function layer in itself. Note that the feed pin that connects the bottom patch to the ground plane (provided by Green's function implementation) passes through 3 dielectrics and has to be split on the boundaries of the dielectrics as wire segments cannot span Green's function boundaries. The model is depicted in Figure 1.

In models such as these, care need to be taken when meshing the geometry. The very short feed pin section that passes through the glue layer should still conform to the thin wire approximation if wire elements are to be used. This approximation requires that wire segments have a length-to-diameter ratio of at least 2.5, which is realized in this model by using a small enough wire radius to satisfy this requirement.



## Simulation results

The models that were constructed in FEKO were simulated and the data compared with the simulated (HFSS) and measured data from [1]. Comparative graphs are presented in Figure 2.



## References

- [1] A. Hajiaboli, M. Popovic, "Singly-Fed Circularly Polarized Electromagnetically Coupled Patch Antenna", *23rd Annual Review of Progress in Applied Computational Electromagnetics*, March 19-23, 2007 - Verona, Italy



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