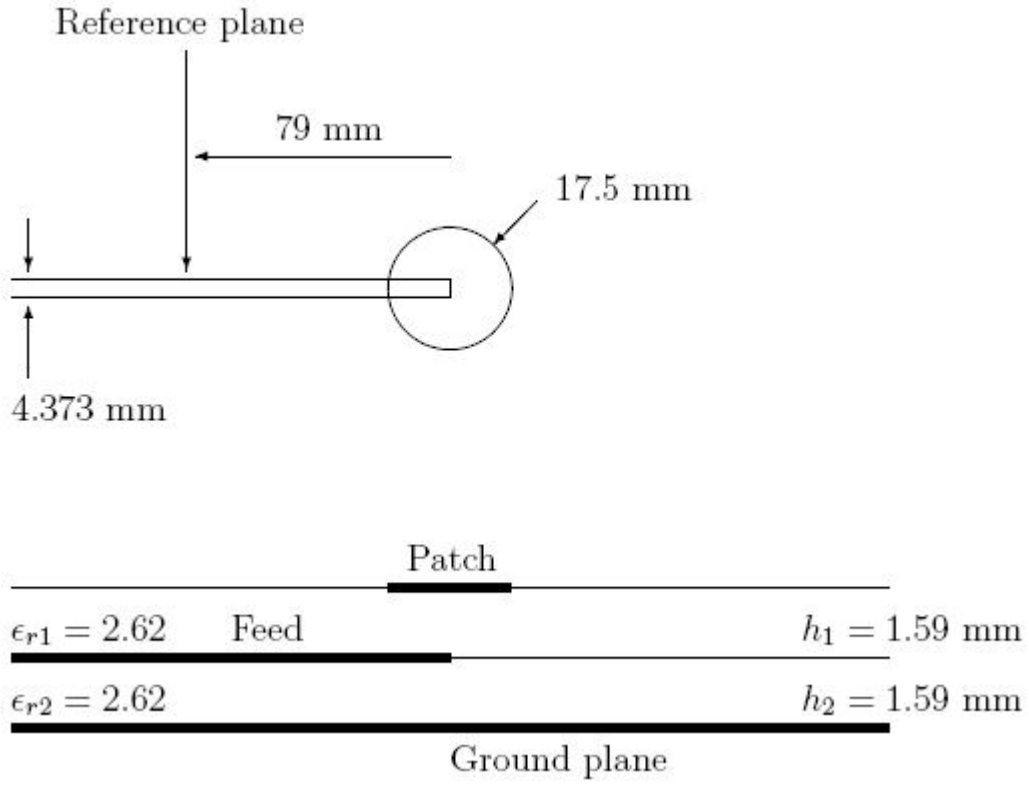
Proximity Coupled Circular Patch Antenna

An example of how a proximity coupled circular patch antenna may be simulated with FEKO.
Davidovitz [1] and Alonso-Monferer [2] independently analyzed a circular microstrip patch antenna with proximity coupling. A simple FEKO simulation was constructed and compared with their results for the input impedance of the proximity coupled patch. Figure 1 presents the model that was simulated.

Figure 1: Proximity coupled circular antenna model

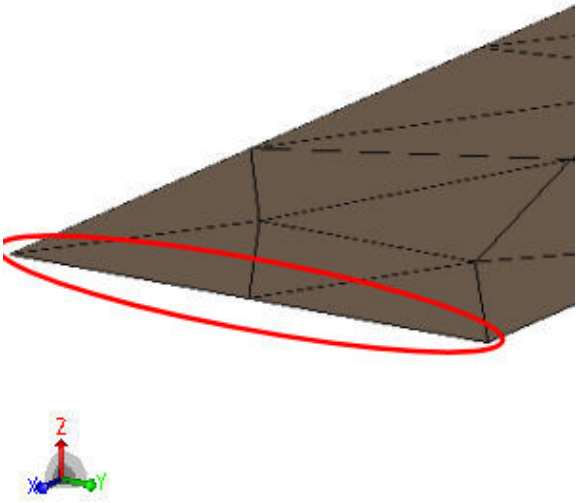


Feed approximations

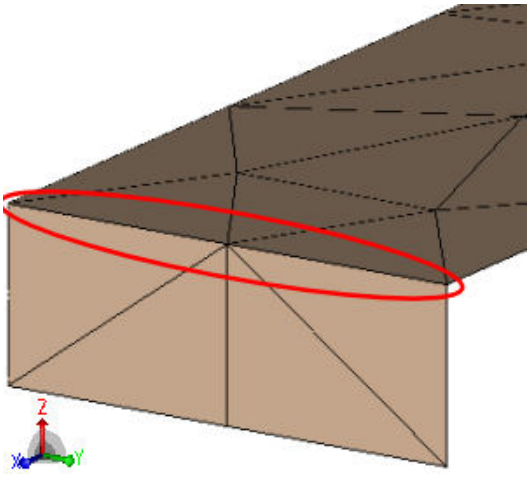
In measurement and simulation it is critically important to consider the effects of any particular feed configuration on the electrical properties of the structure. Before any simulation or measurement is undertaken, it should be established exactly where the reference plane is and whether this definition influences the applicability of the chosen feed configuration. In this experiment four different feed configurations were tested in simulation. These feed constructions were all applied directly to the reference plane and are depicted in Figure 2. These feed configurations were all used to simulate the proximity coupled patch. Figure 3 compares the results from these simulations.

Figure 2: Feed configuration at the reference plane

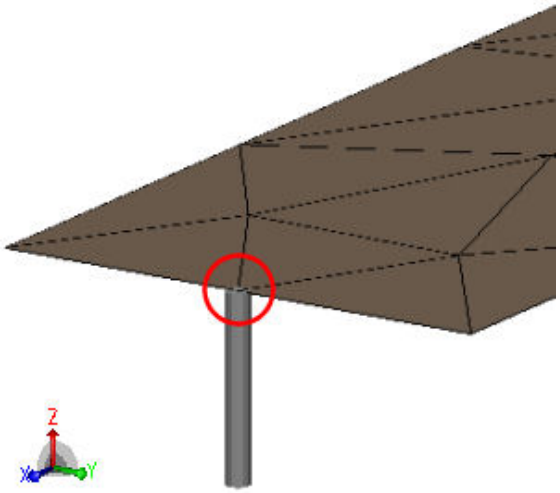
(a) Stripline



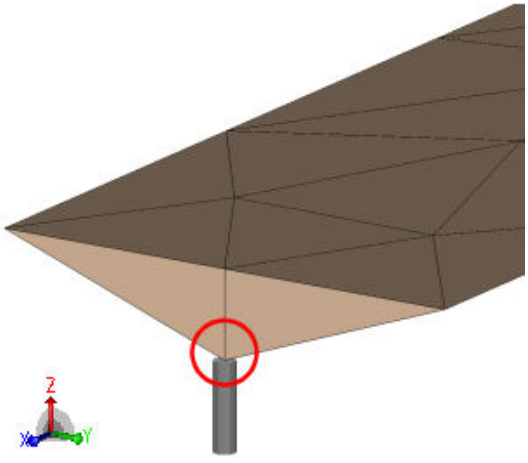
(b) Edge feed



(c) Pin feed



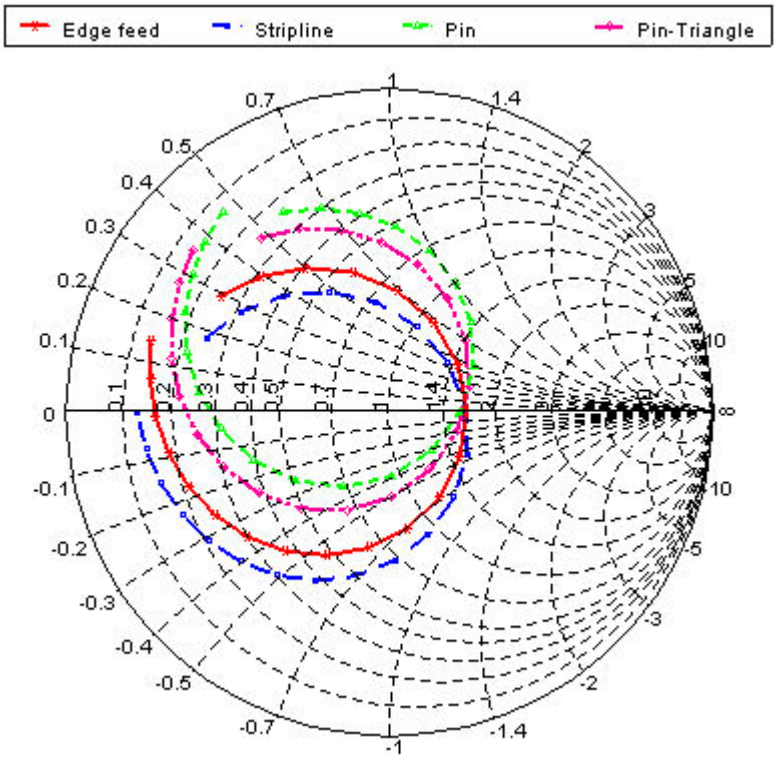
(d) Half pin and triangle



Result comparison

Figure 3 compares the input impedance for the four feed approximations. It is clear that the small differences between the feed methods have significant impact on the inductance of the feed structure, revolving the impedance locus around the Smith chart. Comparison of these curves with [1, Figure 6, 17.5mm] and [2, Figure 8] shows good comparison between the *edge feed* simulation result and the published results.

Figure 3: Input impedance comparison for different feed approximations



References

[1]	M. Davidovitz and Y. T. Lo, "Rigorous analysis of a circular patch antenna excited by a microstrip transmission line," IEEE Trans. on Antennas and Propagation, vol. 37, pp. 949–958, Aug. 1989.
[2]	F. Alonso-Monferrer, A. A. Kishk, and A. W. Glisson, "Green's functions analysis of planar circuits in a two-layer grounded medium," IEEE Trans. on Antennas and Propagation, vol. 40, pp. 690–696, June 1992.