A Compact and Low Cost Elementary Radiating Cell for Satellite Broadcasting Automotive Receiving Arrays

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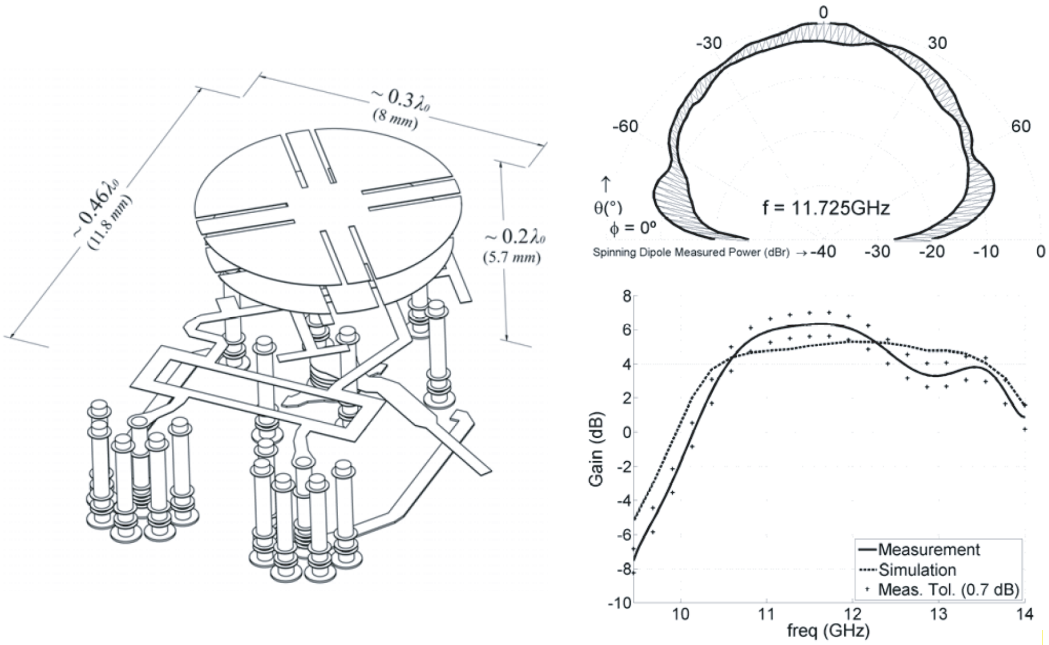
Abstract— In this communication, the printed circuit board implementation of a complete elementary radiating cell for a low profile Ku-band array antenna with full electronic beam steering and polarization control capabilities is presented. The implementation effectively strikes a balance between cost, electromagnetic performance and aesthetics, as required by automotive consumer applications providing satellite broadcasting reception capabilities [1].

At the expense of a high level of integration of the required functionalities into a complex multilayered structure, such compromise has already been tackled at basic radiating element level, which allowed for both concept proofing [2] and mature design prototyping [3]. This compromise led to a miniaturized aperture coupled microstrip patch antenna type radiating element, with stripline feeding and dual linear polarization. The goal of this communication is, therefore, to illustrate the way this mature radiating element is integrated within the final multilayer buildup to become a programmable array cell and to demonstrate its standalone performance.

As shown in Figure 1(a), the elementary cell comprises, within the real state imposed by the actual array grid, the linearly polarized element, a stripline branch-line hybrid, a couple of long signal vias connecting the hybrid terminals to the microstrip layer where the active components are to be mounted and, finally, a power combiner joining the stripline feeding network to the outputs of the active components. The electromagnetic performances of the cell, although constrained by the aforementioned technological and dimensional factors (see Figure 1(b)), are very promising. Moreover, an overall performance improvement is expected to take place at array level once the benefits of the foreseen sequential rotation are effectively exploited.



(a) Structure (b) Performance

Figure 1: Elementary radiating cell.

REFERENCES

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