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Antennas arrays that can support very large scan angles are desirable in several communication and radar applications. For example, for aircraft-to-satellite communication, the arrays are often required to achieve angular coverage close to hemispherical, to be able to point to the satellites in any direction. To reduce the scan loss of planar antenna arrays, conformal arrays or multi-panel configurations can be used, but the height of the structure is still too large and affects the aircraft drag. A solution to obtain wide-scan capability while still maintaining a low antenna profile is the implementation of hybrid scanning methods. The idea is to implement an array that scans the beam from broadside to a positive, as high as possible, angle. The full coverage is then achieved by mechanical rotation of the array along the azimuth (F. Tiezzi et al., EuCAP, 2010).

In this work, we present a method of moments (MoM) analysis of linear arrays of tilted stacked dipoles. These elements can be designed to achieve asymmetric patterns by optimizing the distance between elements and the tilt angle. Based on the MoM analysis of the idealized antenna element in Fig. 1(a), a more realistic array design can be performed, resulting in the structure depicted in Fig. 1(b). This consists of tilted dipole element with a parasitic strip to increase the directivity, printed on a vertical printed circuit board and connected to a feeding structure. The tilted dipole elements exhibit simulated radiation patterns presented in Fig. 1(c), which has stable gain for angles between $-45°$ to $90°$, while low gain is obtained for angles in the range $-90° < \theta < -45°$. Thus, the proposed structure can be used to realize angular filters. The details of the optimized design and experimental results will be shown at the conference.

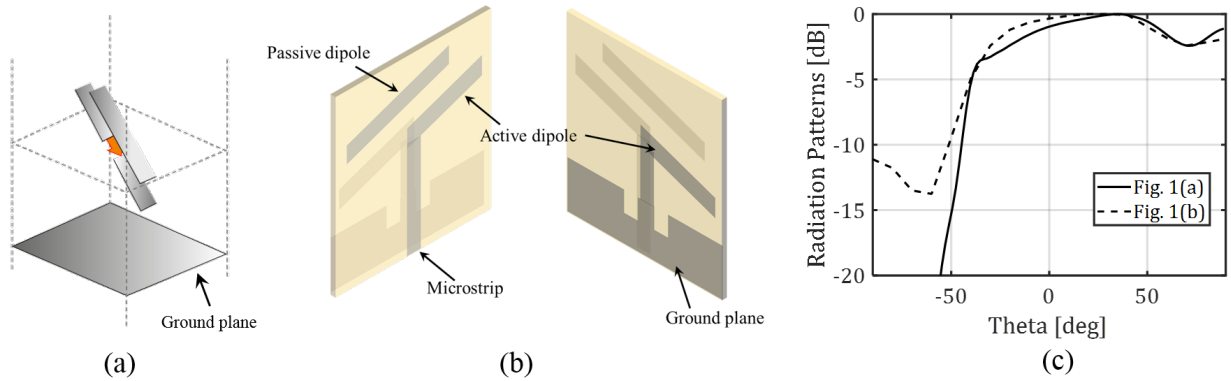

Figure 1: 3D view of the (a) ideal tilted stacked dipole antenna element and (b) printed circuit board implementation; (c) normalized gain versus scan angle for the ideal and real dipole arrays.