



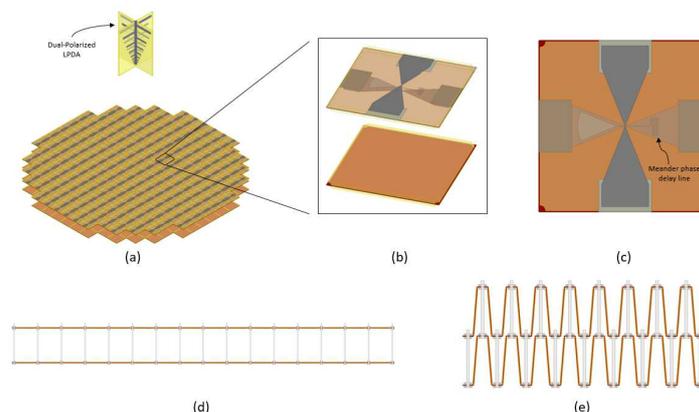
## Deployable Low-Profile Ultra-Wideband Tightly Coupled Dipole Reflectarray Antennas

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In recent years, there has been strong interest in developing deployable and high gain antennas to enable remote sensing and deep space communications for small satellites. Some typical types of antennas suitable for these applications include mesh reflectors and reflectarrays. However, large mesh reflectors suffer from substantial stowage volumes and deployment complexity. While reflectarrays aim to solve these issues by folding flat reflecting surfaces with hinges, they still suffer from low efficiency and narrow bandwidths.

In this work, we present a deployable, low-profile, and dual-polarized, ultra-wideband (UWB) tightly coupled dipole reflectarray antenna. This reflectarray antenna is implemented into a multilayer, origami-based and hinge-free, rigid-flexible substrate to realize effortless folding and deployment [1]. The profile of the proposed reflectarray is reduced by a factor of two as compared to previous designs [2]. This is accomplished by employing horizontal dipoles with meander phase/time delay lines instead of vertical dipoles and delay lines. Dual linear polarization is achieved by placing the dipoles orthogonal to each other, along the x and y axes. In addition, UWB performance is realized by inducing coupling between adjacent elements and feeding the reflectarray with a wideband aperture. Furthermore, by controlling the phase variation/difference of individual reflectarray elements and between reflectarray elements, large bandwidth can be achieved. It will be shown that the reflectarray efficiency can be drastically improved by minimizing the phase errors of the antenna. The proposed reflectarray operates across 0.4-2.4 GHz with VSWR < 2. The design and simulation of the proposed antenna will be presented at the conference.



**Figure 1.** Proposed deployable, low-profile, UWB tightly coupled dipole reflectarray antenna. (a) Deployed 16x16 array with feed antenna. (b) Side view of the unit cell. (c) Top view of the unit cell. (d) Side view of the deployed reflectarray. (e) Side view of the folded reflectarray.

1. M. Carvalho and J. L. Volakis, "Deployable Rigid-Flexible Tightly Coupled Dipole Array (RF-TCDA)," in *IEEE Open Journal of Antennas and Propagation*, vol. 2, pp. 1184-1193, 2021, doi: 10.1109/OJAP.2021.3127631.

2. W. Li, S. Gao, L. Zhang, Q. Luo and Y. Cai, "An Ultra-Wide-Band Tightly Coupled Dipole Reflectarray Antenna," in *IEEE Transactions on Antennas and Propagation*, vol. 66, no. 2, pp. 533-540, Feb. 2018, doi: 10.1109/TAP.2017.2772311.