

Wideband UHF Apertures on Textile Substrates for Space Applications

Jorge A. Caripidis Troccola^{*}, Alexander D. Johnson, Vignesh Manohar,
Satheesh B. Venkatakrisnan, and John L. Volakis
Florida International University, College of Engineering and Computing
Florida, 33174, <https://www.fiu.edu/locations/engineering-center>

It is well known that VHF/UHF frequencies are desired for long distance communications. These low frequencies are also associated with lower propagation losses, longer propagation distances, and ease of fabrication. A disadvantage of antenna arrays at these bands is their large size, reaching a couple of meters. Consequently, integration and deployment of VHF/UHF arrays as a single unit become a major challenge, especially for space and aerospace applications. To address the size issue, we need antenna arrays that can be easily stored and deployed. A desirable approach is to develop packable and foldable arrays that are textile-based. Textile substrates have already been shown to operate well up to 6 GHz. As such, they are well suited for foldable VHF/UHF arrays.

In this paper, we propose a cost-effective, packable, and fully flexible ultra-wideband (UWB) tightly coupled dipole array (TCDA) implemented into denim fabrics. The unique and simple design of TCDA allows their fabrication on flexible substrates without major difficulty. The subject TCDA was designed to operate from 0.5 to 3GHz, delivering an impedance bandwidth of 6:1 with a VSWR < 3.0 across the entire bandwidth. Two different prototypes of this TCDA were fabricated using two types of metallization methods. The first technique consisted in embroidering conductive threads onto the textile substrate, and the second entailed placing copper tape onto the denim fabric. Initial measurements of the fabricated prototypes showed a VSWR \sim 3.0. At the conference, we will present the analysis, simulations, fabrication techniques and measurements of the proposed TCDA.