Dual Polarized 7.2:1 Bandwidth Phased Array with 60^o Scanning

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In space-borne applications like NASA Space, Near-Earth and Deep-Space Networks, there is a need for UWB arrays to cover all bands of interest simultaneously, including S (2-4GHz), C (4-8GHz), X (8-12GHz) and Ku (12-18GHz). But, traditional Ultra-wide Bandwidth (UWB) array, such as Vivaldis, are bulky and not suitable for airborne applications. As such, a low profile antenna with at least 6:1 bandwidth (3 to 18GHz) is required.

In this paper we present a dual linear polarized UWB phased array that employs a tightly coupled dipole array (TCDA) topology. The array includes the following novelties: (a) UWB performance from 2.5GHz to 18GHz, and (b) wide scanning down to 60^o and across a 7.2:1 bandwidth with VSWR< 2.5 at 30^o and VSWR<4 at 60^o, (c) low profile structure with a total array height less than $\lambda_{Low}/10$ (i.e. 12mm) at the lowest operational frequency. This is achieved by integrating the array with a folded marchand balun for the feeding network incorporates an impedance transformer. Additionally, to improve scanning, the traditional dielectric superstrate is replaced with a frequency selective surface (FSS). Further, by using a new printing topology, the entire array structure can be printed on a single PCB board, to form low cost arrays.

To our knowledge, this is the first dual linear polarized TCDA that can achieve 7.2:1 bandwidth and scanning down to 60^o. Full wave simulations will be presented to demonstrate the design.