High Cross Polarized Ku-Band OMT Design for SNG Vehicles

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In certain radio applications, frequency bandwidth is limited due to the proliferation of satellite communications. This constraint raises the importance of transmission of electromagnetic signals, using the orthogonal polarization property of electromagnetic waves. In waveguide networks, the two different polarizations are distinguished by a waveguide component called orthomode transducers (OMT) without reducing the Tx/Rx quality of the signals. There are various types of different OMT's but ordinarily two design considerations are crucial: 1) High cross polarization isolation between orthogonal ports and 2) losses due to discontinuities inside the waveguide. In this paper, we describe the design of a Ku-Band orthomode transducer that operates in a linearly cross polarized communication system for a Satellite News Gathering (SNG) vehicle. Basic waveguide structures are defined to obtain matched transitions in waveguide discontinuities by using small reflection theory and broadband impedance matching techniques. Regarding to these parameters, a basic 3D model has been developed, simulated and optimized. For the simulation and optimization, WASP.NET 7.1 has been used. The OMT designed particularly in this study consists of three different ports, one circular and two rectangular cavities. The Circular port, also known as a common port, operates between frequencies of 10.7 GHz and 14.5GHz and the corresponding waveguide flange for this port is C120 (WC69). One of the rectangular ports operates between frequencies of 13.75 GHz and 14.5 GHz and is adjusted to receive only the dominant TE_{10} mode signal (WR75). The other rectangular port operates between frequencies of 10.7 GHz and 12.75 GHz and is adjusted to receive only the TE_{01} mode signal. Our simulation results of the new design of this OMT yields cross polarization isolation less than -50dB, these values are inline with commonly accepted cross-polarization isolation between ports.

Keywords: Microwave, Orthomode Transducer, OMT, Ku-Band, Polarization