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Design of a Ku-Band Power Divider Assembly with Integrated Output Isolators.

ABSTRACT - Masterthesis

Passive components are an indispensable part of a satellite subsystem. They represent more than 80 of the Electronic, Electrical and Electromechanical (EEE) parts of a spacecraft. The design and development of these components have to be in accordance with standard design specifications as well as meet customer demands, without a trade off in quality. With progressive advancement of satellite technology over the years, coupled with challenging customer demands, the design of components in satellite subsystems has transformed significantly. In the past, heavy, expensive and space consuming designs of passive components were developed with a compromise on interconnection losses and redundancy. To overcome these disadvantages, a more lighter, cost effective and compact design has been realized by implementing the microwave integrated circuit (MIC) technology, of integrating two or more components. This has resulted in better overall performances, among other advantages, in comparison to the discrete component assembly.

This thesis explores one such robust design of the integration of a power divider with two output isolators, in the Ku frequency band (10.7-12.75 GHz) for satellite applications. In general, a reflection less power divider and isolator assembly is realized by connecting the power divider with two externally connected isolators. The connections are made using SMA connectors. An integration of the two isolators with the power divider preferably in the same housing not only reduces the losses due to interconnects, but also sees a considerable reduction in the mass and volume. Parametric optimization and impedance matching techniques covering the approach for modeling is discussed in brief. The assembly performance is validated based on return and insertion losses that are analyzed using finite element method algorithms using an efficient 3D modeling software (Computer Simulation Technology). The work further presents a detailed investigation on the integration of the isolators into the assembly and a possible method to eliminate the effect of the interaction of the DC magnetic fields of the isolator biasing. An optimal design scheme for the Iso-divider assembly is deduced. The assembly performance is documented with reduced cross-talks and desirable S-parameter results.