SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Fixed and Broadcast Communications (6)

Author: Mr. Muhammad Latif
SUPARCO, Pakistan

DESIGN AND REALIZATION OF MICROWAVE QUASI ELLIPTICAL TRANSMIT REJECT FILTER BY IMPEDANCE MATCHING AND OPTIMIZATION

Abstract

In VSAT systems, same antenna is used for transmission and reception. The received signal is has very low power compared to transmit band signal. Transmit reject filter (TRF) is employed to provide necessary isolation between these links. Keeping in the view of technology advancement, typical requirements for a TRF include low insertion loss in passband, reduced size while keeping high rejection in transmit band.

The filter synthesis process starts from prototype low pass chebychev filter. To meet the rejection requirements, the prototype filter is transformed into quasi elliptic configuration. Transmission zeros at desired frequency can be realized to increase the near band rejection. The transformation depends upon the technology used for realization, for instance, series LC resonators are easier to implement with planar technology whereas parallel LC resonators are usually implemented in waveguide. For planar realization, parallel capacitors of prototype circuit are transformed into series LC resonators whereas series inductors are transformed to parallel LC resonators for waveguide realization. The transformation takes place by matching the impedance at the desired cutoff frequency and by setting resonance frequency of each resonator at transmission zeros. Rest of the circuit can be easily optimized by the optimizer available with commercial circuit simulators. Reduced height waveguide with T-junction and T-junction with stepped impedance LC resonator realize a basic unit cell of TRF in waveguide and planar technology respectively. This paper describes the realization of an L-ba nd TRF implemented on planar technology and a Ku-band TRF based on waveguide technology. L-band TRF designed and developed is of 7th order with four transmission zeros with roll-off factor 250 dB/GHz in the stopband. The scheme implemented helped reduce filter size to 31 mm x 31 mm only on Roger's RT Duroid 5880 substrate. Similarly, Ku-band TRF was designed and developed. The design is based on 21st order waveguide based filter with 10 transmission zeros and has roll-off factor of 150 dB/GHz. The scheme implemented helped reduce the filter size to 63 mm only with WR-75 interface. The measured results of both filters are in close agreement with simulation results.