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DESIGN AND OPTIMIZATION OF A COMBLINE FILTER HAVING HELICAL RESONATOR

Abstract

Filters are one of the most commonly used RF elements. The fact that these filters are easy to construct and provide excellent results justify the reason they are used extensively. The geometry of any cavity filter is of prime importance as the performance of the filter is determined by its geometry. Obtaining the proper geometric dimensions that provide the required response is quite a hassle even though the filter structure can be tuned. Nevertheless, multiple iterations have been done to design a frequency-division multiplexer. The authors propose a Comblin filter wherein the cylindrical resonating element is replaced by a helical structure and then staggered with metal iris as an upgrade to the existing models. This upgrade can hopefully result in a much more idealistic response to the S-parameters with higher power efficiency. The materials used in the rigging up of the outer cavity, the resonator or the iris are common metals and hence the expense in building a helical filter can be reduced. The design process starts with using ideal elements and the existing filter theory. Optimization techniques are used to achieve the required response. The software used for designing the helical filter or any Comblin filters used in the paper are CST Design Environment or the Ansys HFSS. The starting dimensions are calculated in lieu with that of a Comblin filter and the dimensions are then fine-tuned with the helical coil and the tuning screw. The optimization techniques, once completed, will enable the proposed design to demonstrate the working of the desired Chebyshev response of a Bandpass Filter. The results of this research will hopefully help in building filters, diplexers and multiplexers.