A Novel High Quality Factor Tunable Band-stop Filter for Microwave Applications

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I. Objective: The proposed Barium Strontium Titanate varactor-tuned Band-stop Filter is designed to achieve >30 dB rejection at 2-8GHz with <5dB pass-band insertion loss and high selectivity (unloaded Quality Factor of ~100 at 1GHz).

II. Motivation: A tunable band-stop filter is used to adaptively remove a narrow band of frequencies from the signal path of a receiver or transmitter. It largely reduces component size and cost compared to traditional filter-banks.

III. Design: The basic design concept is to use the inductive spiral signal line and capacitive varactor to form a series LC circuit, resulting in a band-stop behavior.

IV. Fabrication: The device were fabricated on 4” diameter Silicon and Sapphire wafer using standard photo-lithography and deposition techniques.

V. Results: The single unit device achieve 25-30dB rejection with unloaded Q of 70-100 at 2-8GHz, while the cascaded device have >100 of Q factor and ~40dB rejection at the same frequency range.

VI. Summary: A set of miniaturized high-Q tunable Band-stop filters have been designed using inductive spiral lines and BST varactors on Coplanar Waveguide transmission line. The fabrication process has started and the design concept will be verified shortly.