

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.

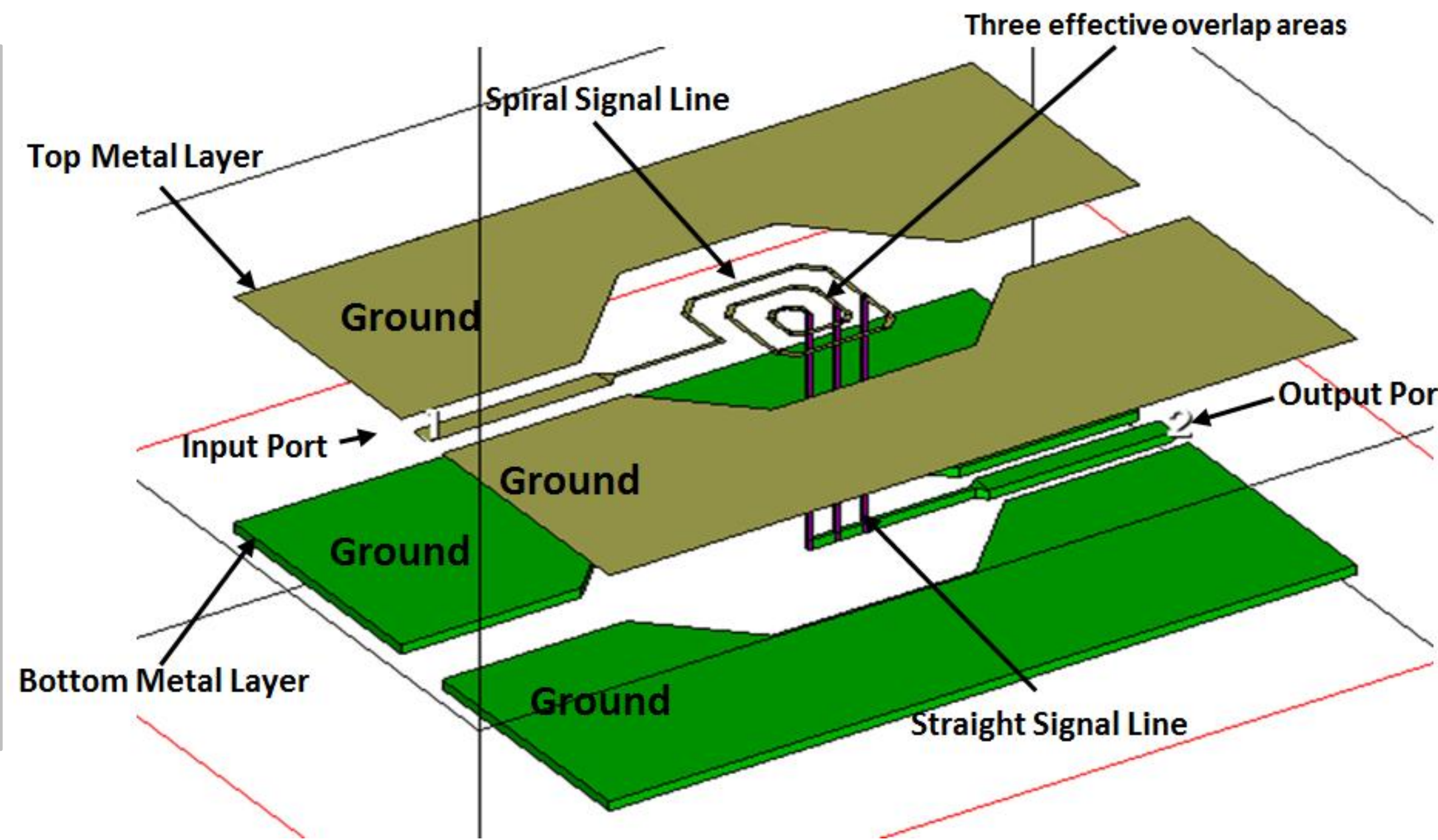


Fig. 1 3D view of the single unit structure with 3 spiral turns

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

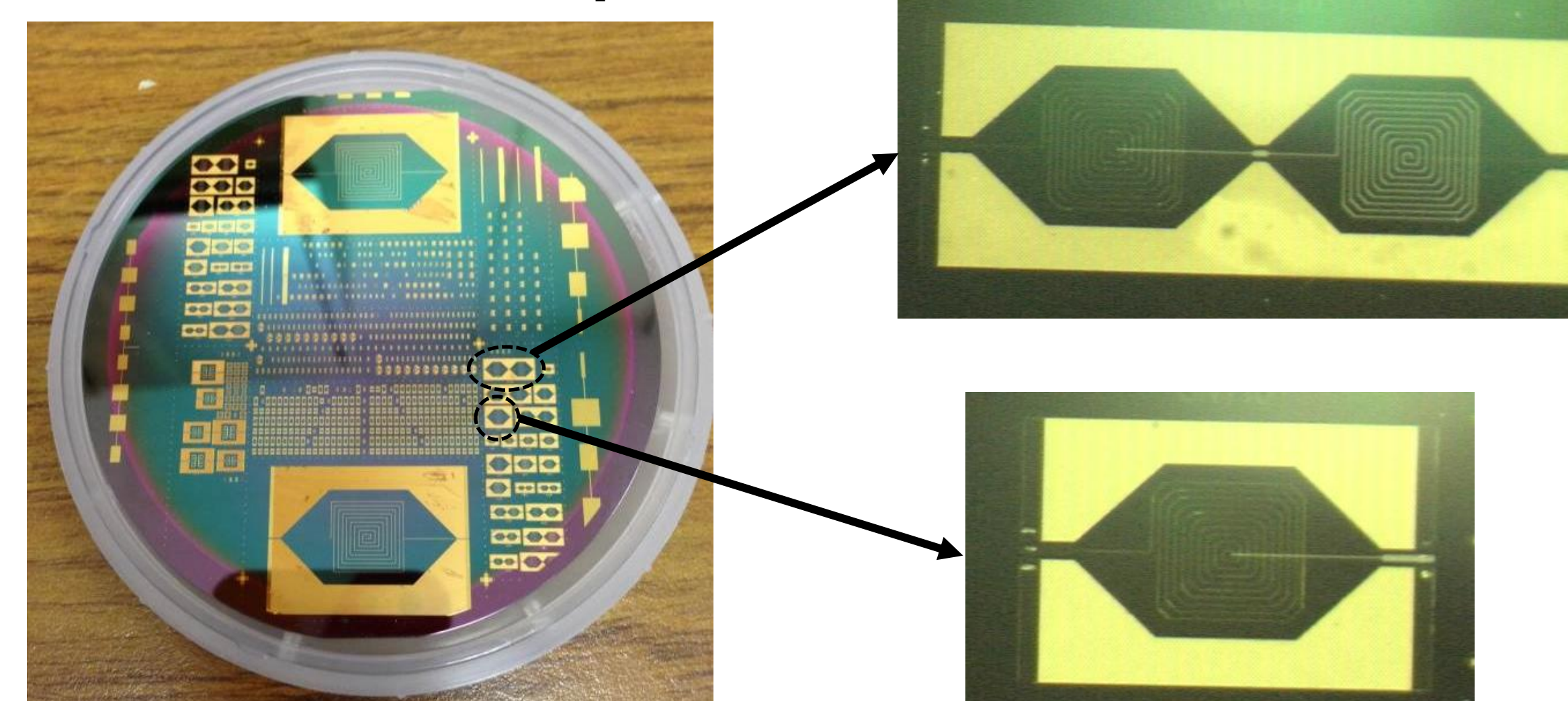


Fig. 3 Top view of the fabricated (a) 4" Silicon wafer (b) single unit structure and (c) cascaded structure with 10 spiral turns

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.

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.

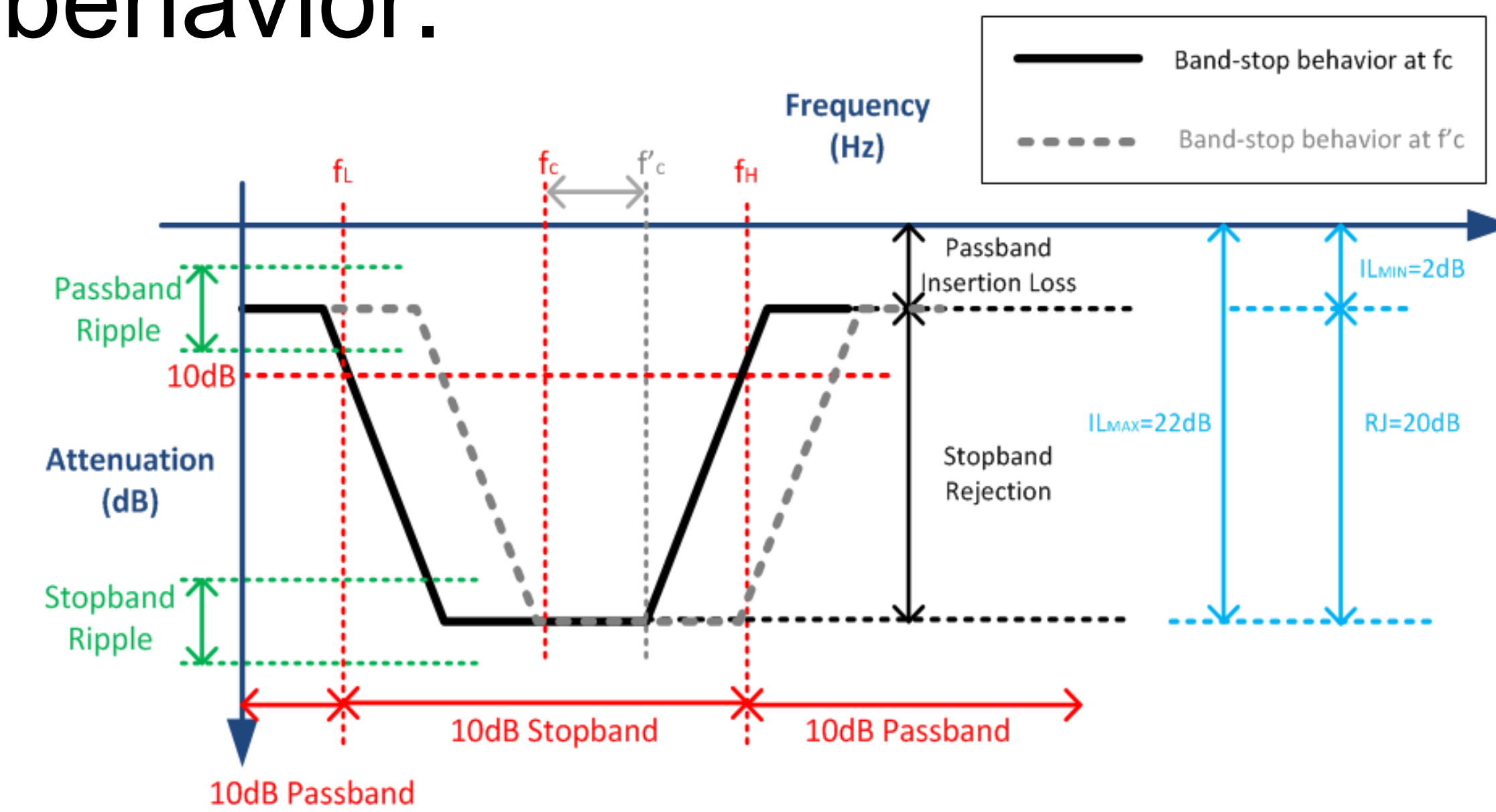


Fig. 2 Description of Band-stop behavior

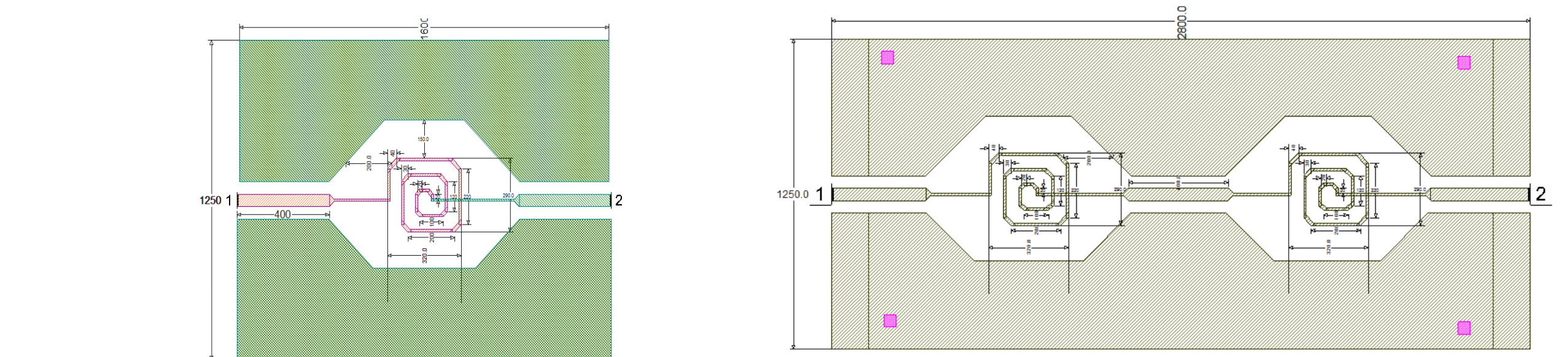


Fig. 4 Top view of the (a) single unit and (b) cascaded unit structure

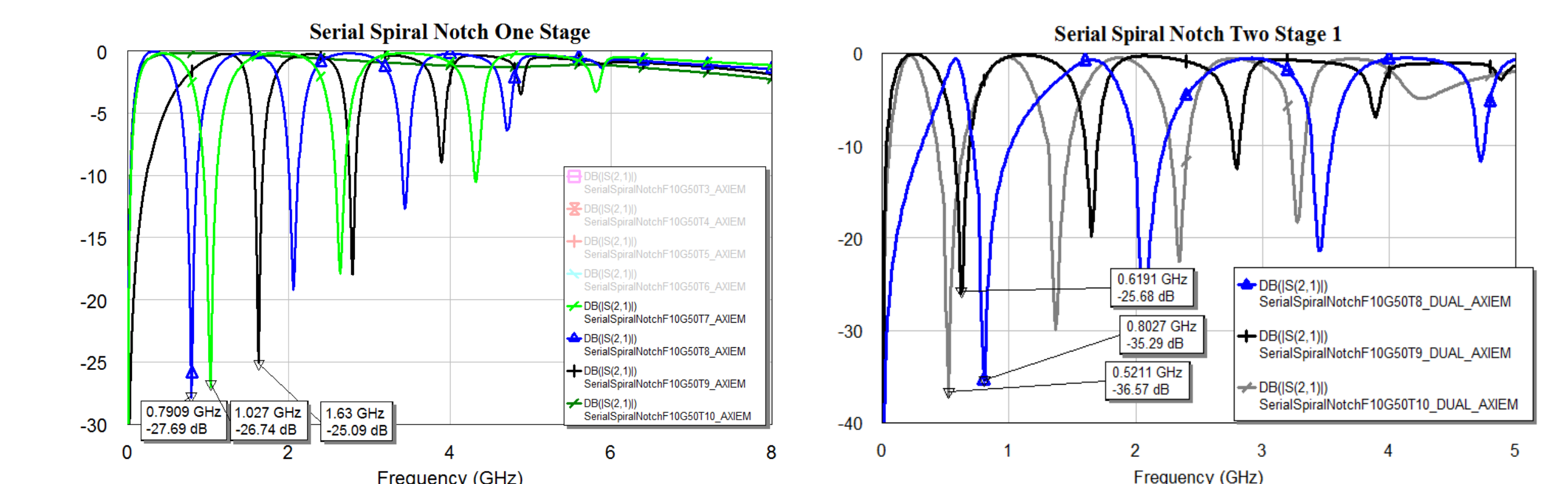


Fig. 5 Simulation results of (a) single unit structure and (b) cascaded unit with 8-10 spiral turns