Student Design Competition

Wide passband BSF

TC5 - Filters

Introduction:

Wideband systems have gained significant momentum in recent years. One of the major hurdles behind deploying them at a large scale, however, is the high probability of encountering in-band interferers, which dictates the use of Bandstop Filters (BSF). While rejecting a specific band might be a straightforward task, ensuring the rest of the band of interest is practically intact could be challenging.

In this competition, students are expected to design a planar BSF that rejects a single frequency, but maintains low insertion loss and good matching over the rest of the wideband.

Design Specifications and Rules:

The project should be the result of the students' best effort. The following specifications and rules must be followed for a device to qualify for the competition:

1. The design will be fabricated on a single PCB with a maximum of two patterned metal layers. Thru hole vias and slots are allowed.
2. Two SMA female connectors need to be used on the board for testing purposes.
3. No other components are allowed. The design shall be made within the PCB.
4. No restrictions on the PCB substrate material or thickness.
5. The 10-dB rejection bandwidth must be within the range of 2.2—2.7 GHz.
6. The measurement will start at 1 GHz, and the band 1—2.2 GHz shall be matched and low loss $|S_{11}|$ < -10dB, $|S_{22}|$ < -10dB, and $|S_{21}|$ > -3dB.

Evaluation Process:

The design will be judged based on the filter's stop band and pass band, as follows:

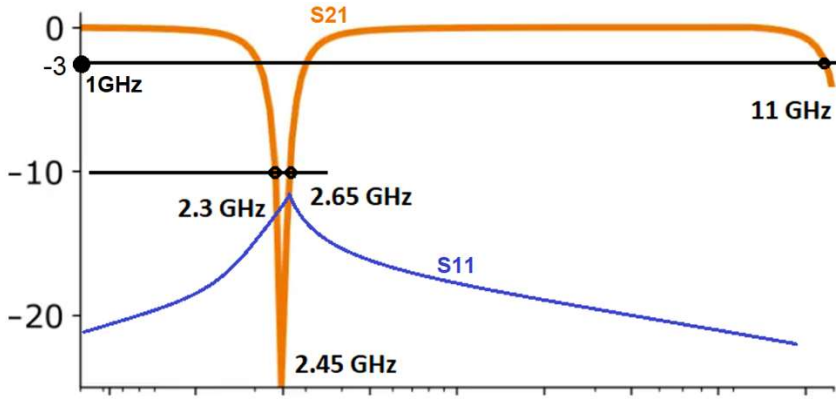
$$Score = f_{Max}(GHz) \text{x} BW\ (GHz)$$

Where f_{Max} is the maximum frequency above 2.7 GHz where $|S_{11}|$ < -10 dB, $|S_{22}|$ < -10 dB, and $|S_{21}|$ > -3 dB (all three conditions must be satisfied simultaneously). [a maximum of 18 GHz]

BW is the BSF's 10 dB rejection bandwidth. [a maximum of 0.5 GHz]

The team with the highest score wins.

Example: A design achieves the measured results below.



f_{Max} = 11 GHz

BW = 2.65-2.3 = 0.35 GHz

Score = 11 x 0.35 = 3.85

How to Participate:

Competing teams will be required to register for the IMS Student Design Competition according to the rules posted on the IMS-2025 homepage.

Participation estimate:

This is a new competition. Based on historical filters-based competition, we anticipate at least 4—6 teams.

Contacts to invite:
Hjalti Sigmarsson, University of Oklahoma
Juseop Lee, Korea University
Charles Baylis, Baylor University
Zoya Popovic, University of Colorado Boulder
Dimitrios Peroulis, Purdue University
Rifaat Mansour, University of Waterloo

Equipment information:

This competition requires a **Network Analyzer** covering at least 1—18 GHz.

Contact Information:

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