

## SDC3 - Component-Less Bias Tee

### Detailed description and rules

#### Introduction

Bias Tees are essential in numerous RF components and systems, such as amplifiers. Advancements on lumped element fabrications made it easier to fabricate bias tees at higher frequencies. The size, cost, and possibly performance of the passive components, however, can be a limiting factor in designing those bias tees.

In this proposed competition, the students are asked to present a bias tee based on RF design, rather than technology selection. No components are allowed; only RF structures on a single-layer PCB (the bottom layer can either be solid ground or without copper if the team chooses so). No thru-hole vias are allowed either.

This seemingly simple competition is an excellent training project for students interested in building industry-standard skills in this area. It will soon be obvious to the students that this design is much more than just a series edge-coupled capacitance. The skills learned include EM/RF design, PCB fabrication limitations, and RF system-level specification.

#### Design specifications and rules

Rules to qualify:

1. Single patterned layer PCB with two SMA female connectors for the RF input and RF+DC output.
2. The DC port shall be a pad on the edge of the PCB.
3. DC short between the bias pad(s) and the RF+DC output.
4. DC open between the bias pad(s) and the RF input.

No restrictions on the materials, size, thickness, etc.

#### Evaluation process

The winning team is the one that will provide the widest operating frequency range within given loss and matching conditions (within 10 MHz up to 26 GHz, due to the available test equipment). The DC pad(s) will be

short during the RF measurement.

#### Scoring

**Score** =  $\text{freq}_{\text{High}}(\text{GHz}) / \text{freq}_{\text{Low}}(\text{GHz})$  Where  $|S_{11}| < -10$  dB,  $|S_{22}| < -10$  dB, and  $|S_{21}| > -3$  dB (all three conditions must be satisfied)

#### Name and number of supporting MTT-S Technical Committee

TC-4 Microwave Passive Components and Transmission Line Structures Committee

#### Contact information

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