

European Microwave Week 2018

Student Design Competition – Thrust 3

Title of the competition: **Planar Filter Design at C-band**

Primary contact names:

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Description:

This competition aims for the design of a competitive bandpass filter at C band. This band has been highly used for well-established communication systems, such as WiFi, WiMAX and some satellites applications, and it will also have an important role for the new generation of nano- and pico- satellites orbiting in Low Earth Orbits (LEO). The typical requirements for a high-performance filter are that, apart from fulfilling the specifications regarding the passband bandwidth and center frequency, it has a low insertion loss level, a highly selective and spurious-free response, an in-band flat group delay along with a small footprint. However, it is well known that most of these characteristics go in the opposite sense, thus, a trade-off is normally required. This contest tries to motivate the students for the design and implementation of such a filter able to get an outstanding performance at this particular band, where different implementation technologies, such as microstrip, coplanar, multilayer microstrip, substrate integrated waveguide SIW (and its variations) and some others can be effectively employed. The winner will be determined by considering a figure of merit (FoM) defined by the insertion loss level, selectivity, spurious-free response and size.

Design specifications and rules:

- Center frequency: 5 GHz.
- Passband bandwidth: 400 MHz.
 - o Measured at 5 dB points (absolute) of the insertion loss IL response.
- A 2% variation of the aforementioned values is accepted.
- Return loss higher than 12 dB from 4.9 to 5.1 GHz.
- The implemented filter should be suitable for visual inspection. No sealed casing is allowed.
- 3.5 mm SMA female connector at input and output.
- Before the competition day, a detailed report including measured data and a photograph of the implemented filter should be submitted to the organization committee.
- Testing and judging of the implemented filter will be performed at the European Microwave Week 2018. A member of the design group must be present at the testing to assist with the evaluation.

Evaluation criteria:

The FoM that will determine the winner (the higher, the better) is defined as follows:

$$\text{FoM} = \frac{S_{21}(5 \text{ GHz}) \times k_1 \times k_2 \times k_3}{A}$$

where $S_{21}(5 \text{ GHz})$ is the measured S_{21} parameter (in linear units) at 5 GHz, A is the surface area in mm^2 (without including the feeding lines), which will be defined by the imaginary rectangle covering the filter, and k_1 , k_2 and k_3 are related to the rejection levels and are determined as

IL (dB) at 4.5 GHz	k_1
IL < 10	0.1
$10 \leq \text{IL} < 20$	0.5
$20 \leq \text{IL} < 25$	1.0
$25 \leq \text{IL} < 30$	1.5
IL ≥ 30	2.0

IL (dB) at 5.5 GHz	k_2
IL < 10	0.1
$10 \leq \text{IL} < 20$	0.5
$20 \leq \text{IL} < 25$	1.0
$25 \leq \text{IL} < 30$	1.5
IL ≥ 30	2.0

Minimum IL (dB) from 6.0 up to 12 GHz	k_3
IL < 10	0.5
$10 \leq \text{IL} < 20$	0.8
$20 \leq \text{IL} < 25$	1.0
$25 \leq \text{IL} < 30$	1.5
IL ≥ 30	2.0

How to participate:

- Submit an entry form to m.sanchez.soriano@ieee.org & roberto.gomezg@uah.es by 1 September 2018 giving names and affiliations.
- Provide a support letter by your advisor/professor stating that you are working on this project and that at least one person will be able to join EuMW 2018.
- A short description of the devices is to be provided with the application. A schematic of the circuit shall be brought to the EuMW.
- All devices shall be accessible for inspection on-site.
- Participants are required to attend EuMW the full Wednesday: The presentation of the winning team is on Thursday in the closing session.