Introduction

This year, a single theme is proposed in which cross-knowledge is necessary to perform the required design specifications. The idea is to study and build a single band radio transmitter at the ISM Band of 5.8 GHz for the sake of remote empowering of passive receivers. For this study, it is necessary to design a power amplifier, a band pass filter and a high gain antenna. A list of components to achieve this design will be given in advance to the day of the competition, and we advise to do a preliminary study before the competition.

Figure of merit

The quality of the design will be judged on the separated performances of each single element as follow:

1. The filtering circuit:
   - The insertion loss at 5.8 GHz.
   - The level of rejection at 5.725 GHz and 5.875 GHz.
2. The power amplifier
   - The output power at 5.8 GHz
   - The 1dB compression point
   - The reflection losses in input
3. The antenna
   - The reflection losses at 5.8 GHz
   - The maximum gain in linear polarization

Then the whole system will be evaluated in terms of level of received signal at a fixed distance (5 m) for an input power of 0 dBm at 5.8 GHz.

Description of the competition day

The realization of the transmitter will be done during the competition. For that, we provide all materials necessary, which are, the components (RF transistors, lumped capacitors and inductors), soldering facilities, RF substrate with SMA connectors already soldered. The routing of strips will be achieved with copper tape, thus train yourself with this rapid prototyping realization technique, and because of this constraint, no through via hole is possible. The competition will take place during the conference week, in a special event on Tuesday 8th September 2015. Required test equipment for the evaluation measurements will be provided by Keysight Technologies to the participants.

Material

1. Each team will be provided with three printed circuit boards (PCB) having already soldered SMA connectors:
   - One grounded PCB for the amplifier having dimensions of 50x30mm$^2$. A transistor ATF-58143 (Farnell: 1704032) is already soldered. The matching circuit will have to be realized.
   - One grounded PCB for the filter having dimensions of 100x30mm$^2$. 
• One ungrounded PCB for the antenna having size of 300x300mm².

2. To build microstrip lines, copper tape (which can be soldered) and knife are provided.
3. For the antenna realization, insulating tape and stiff conducting wires are also provided.
4. We provide SMD (size 605) reactive lumped components such as capacitors for filtering, biasing, and matching purposes.
5. Several soldering irons are proposed for the realization of the design.

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