

TC-7 ([Microwave and Millimeter-wave Solid State Devices](#)) with endorsement/support of TC-6 (Microwave and Millimeter-wave Integrated Circuits)

Title: 16 QAM Radio Design

Desc: The competitors are required to design, construct, measure, and demonstrate a 16 QAM wireless transmitter at 950 MHz. Tutorials on the design of each component can be found here. The participants will design a Wilkinson combiner, a branchline coupler, a double balanced mixer, a power amplifier and an antenna prior to arriving at IMS. Files from their designs will be sent to the contest contact prior to the conference for assistance in fabrication. During the contest at IMS, the students will fabricate their designs and test each component, and then their complete radio. A 16QAM baseband I and Q signal will be provided as well as a 10 dBm 950 MHz LO. Students will be able to adjust the LO and the amplitude of the baseband signal to optimize their radio's performance, including any "tricks" they can conceive of onsite. The performance metric will be received power/error vector magnitude.

For this SDC you will be designing only prior to IMS and building onsite at IMS during the competition.

Teaming: You will be building your radio **AT IMS**. We recommend two people attend for the fabrication, although one person can do the entire radio.

Software: The template provided is for AWR Microwave Office. You will receive a license for this SDC free of charge.

Materials: Will be provided onsite at IMS, free of charge. Please do not bring any materials with you or fabricate anything prior to IMS.

Rules:

1. Go to bits2waves.org website and register one member of your team. You will receive an email with details on software installation and license.
2. Design the 6 components of the radio: branchline coupler, Wilkinson divider, double balanced mixer (two), power amplifier and antenna according to the instructions sent to you from item #1 above.
3. The operating frequency is 950 MHz.
4. Email the .dxf file of your layouts as a single .zip file to the email provided in the registration in item #1 above.
5. You will have 3 hours to build your radio onsite at IMS. All materials will be provided. You will have to solder. You will have 1 hour to test.
6. You may test each component separately, however it is not required for the SDC.
7. You will assemble your radio and place it 30 cm from the receiving antenna. A receiver and demodulator will be provided.
8. You may adjust LO and I and Q powers to minimize Error Vector Magnitude.
9. FOM is EVM/L where L is the longest length of your antenna (either width or length, whichever is longer).