



Rev. 2016-10-26

IMS2017 Student Design Competition Rules

As part of the technical program, the Student Design Competition (SDC) is one of the most energetic parts of IMS. The SDCs have proven to be very successful events in the past 12 years, as evidenced by the ever increasing student participation and the support it has enjoyed from the organizers, both logistically and financially. The IMS2017 in Honolulu will continue the legendary tradition of enthusiasm with a very strong SDC program.

TC number and name:

MTT-22 SIGNAL GENERATION AND FREQUENCY CONVERSION

The title of Student Design Competition:

High Dynamic Range Mixer

Submission Deadline: Friday, 31 March 2017

Sponsors:

MTT-22 Signal Generation and Frequency Conversion

Primary contact name(s), email address, and phone number (of host or competition leader(s)):

Mr. Bert Henderson	b.henderson@ieee.org	408-500-9316
Dr. Edmar Camargo	ecamargo@ieee.org	408-334-5789

A short abstract or summary describing the competition:

Technical committee MTT-22 is pleased to announce the first High Dynamic Range Mixer Student Design Contest, which will take place at the 2017 IEEE MTT-S International Microwave Symposium (IMS) in Honolulu, Hawaii in June 2017. This competition is open to all students, both undergraduate and graduate, registered at a recognized educational establishment. This year's contest will focus on obtaining wide dynamic range performance in a balanced mixer. Student Design competitors

are required to design, construct, measure, and demonstrate a mixer having the following performance requirements:

- RF Frequency: 10 - 11 GHz
- LO Frequency: 11 - 12 GHz
- IF Frequency: 1 GHz \pm 50 MHz
- LO power: +13 dBm maximum
- Conversion Loss 8 dB max (1)
- Noise Figure, FdB 9 dB max (1)
- Two Tone Input IIP3 +19 dBm min (2)
- P1dB at input: +10 dBm min (1)
- L-R Isolation 30 dB goal (1)
- Passive mixer Diode, FET, or BJT based; low voltage/current DC bias is allowed
- Connectors SMA female for RF, LO, and IF ports
- Size 2 inch x 2 inch x 0.5 inch maximum as a goal
- Figure of Merit, **FOM { IIP3 – FdB + (LR_isolation – 30)/4 } (3)**
 - (1) Over the specified RF, LO, IF freq ranges.
 - (2) Over RF, LO, IF freq ranges, with RF1 & RF2 each at -10dBm separated by 10 MHz
 - (3) RF1=10.00 GHz, RF2=10.01 GHz, LO=11 GHz, RF1 and RF2 each at -10dBm

Design Specification:

The students are expected to design the mixer themselves and provide a design that is completely their own work product. The mixer may have a cover on it during operation, but it must be removable for inspection of the circuitry by the judges. The mixer can be in any technology (chip and wire, surface mount, MMIC, etc) and can use any type of nonlinear device (FET, BJT, diode), low voltage / current bias to gate or base is allowed. Small size is desirable, and should be kept less than the specified size goal.

Measurement equipment is planned to be supplied by one or more companies that still need to be firmed up, and consist of LO and RF sources, spectrum analyzer, noise figure meter, and power supplies.

Evaluation Criteria:

- Mixer must meet the conversion loss, P1dB, IIP3, and isolation requirements over the specified frequency ranges.
- The mixer meeting the above requirements and having the highest figure of merit (FOM) as defined above will be the winner.

A mixer entry may be designed by an individual student or by a design group consisting of up to four (4) students. A representative of the design group must be present at the testing to assist the judges with the evaluation. Each team can submit one mixer design entry. The decision of the judges will be final. Awards will be presented at the Student Awards Luncheon.

Application Process:

Student contestants are encouraged to notify Bert Henderson (b.henderson@ieee.org) and/or Edmar Camargo (ecamargo@ieee.org) of their intention to compete in the contest before Friday, 31 March 2017. This notification should include information on the University or educational affiliation of the entry, the name and contact information of the group's advisor, and a basic description of the proposed mixer design approach, status, and expected performance. The student design group must sign up for the competition at the IMS2017 website; a link to download the registration application and instructions will be provided. The submission deadline is Friday, 31 March 2017.

Prizes:

This will be a one level contest, with the prize being \$1500 to the winning team, and \$500 to the 2nd place team. Total prize money is \$2000 to be provided by IEEE MTT-S. We will try to obtain additional award funds from companies that produce mixer products. The winning team will also be invited to submit a paper describing the design for an issue of the IEEE Microwave Magazine.