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-5 MICROWAVE HIGH-POWER TECHNIQUES

The title of Student Design Competition:

13th High Efficiency Power Amplifier Student Design Competition (IMS2017 – 13th HEPA-SDC)

Submission Deadline: Monday, 3 April 2017

Sponsors:

MTT-5 Microwave High-power Techniques

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

Dr. Joe Staudinger joseph.staudinger@nxp.com	MTT-5 Chair & HEPA-SDC Judge Tel: 480-413-4456 (office), 480-570-7306 (cell).
Dr. Kiki Ikossi ikossi@ieee.org	HEPA SDC Coordinator & Past MTT-5 Chair Tel: 703 960 0261 (home), 202 413 5755 (cell).
Dr. Joe Qiu joe.qiu@ieee.org	HEPA-SDC Judge & Past MTT-5 Chair 919 549 4297 (Office), 703 407 3989 (cell).
Dr James Komiak james.j.komiak@baesystems.com	HEPA-SDC Judge & Past MTT-5 Chair 603-885-6910 (office).

HAWAI`I 5G Catch the Wave!

A short abstract or summary describing the competition:

MTT-5 (High Power Amplifier Components and Techniques Committee) is pleased to announce the thirteen High Efficiency Power Amplifier (HEPA) Student Design Competition (SDC) will take place at the 2017 IEEE MTT-S International Microwave Symposium (IMS) in Honolulu, Hawaii on Tuesday, 6 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 PAs having both high efficiency and linearity. The competitors are required to design, construct, and measure a high efficiency PA with linearity at a frequency of their choice between 1 GHz and 10 GHz. To qualify for the linearity test, the PA must produce an output power of at least 5 watts, but no more than 100 watts, when excited by a single carrier at the frequency of test. All linearity testing will be conducted using two equal amplitude carriers spaced 5 MHz apart. To qualify for the linearity measurement, with 0 dBm per tone input, carrier-to-intermodulation ratio (C/I) must be greater than 30 dB*.

The winner will be the PA that demonstrates the highest frequency weighted power added efficiency (PAE), when producing a two-tone carrier-to-intermodulation ratio (C/I) of 30 dB*.

A representative of the design group must be present at the testing to assist with the evaluation. Each team is limited to a maximum of two entries.

Questions can be sent to Dr. Kiki Ikossi at <ikossi@ieee.org>.

Design Specification/Rules:

1. The power amplifier (PA) design may use any type of technology, but must be the result of new effort, both in the amplifier design and fabrication.
2. The PA mechanical design should allow for internal inspection of all relevant components and circuit elements. The RF ports should be SMA female connectors. Bias connections should be banana plugs. A maximum of two dc power sources are allowed.
3. The PA must operate at a frequency of between 1 GHz and 10 GHz, and have an output power level when excited by a single carrier of at least 5 watts, but no more than 100 watts at the frequency of test.

4. All PAs should require less than 25 dBm of input power to reach their maximum output level when excited with a single carrier.
5. All PAs should require less than 22 dBm per tone of input power to reach their C/I level when excited with two carriers.
6. The PA should require a maximum of two dc supply voltages for operation.
7. PA entries should be submitted with measured data, including frequency of operation, maximum output power (single carrier), dc voltage and current supply requirements for maximum output power, RF drive for maximum output power level, output power for a C/I of 30 dB*, and PAE defined as (RFout-RFin)/dc. Linearity measurements will be under CW operation with two equal amplitude carriers spaced 5 MHz apart at room ambient conditions into a 50 ohm load. Only the power at the two fundamental carrier frequencies will be included in the measurement of output power.
8. The winner will be based on the amplifier's PAE measured during official testing, multiplied by a frequency weighting factor having the form (GHz)^0.25.
9. A student group may enter a maximum of 2 PAs, but can receive an award for only one PA.
10. The decision of the judges will be final. Awards from IMS and industry will be presented at the Student Awards Luncheon.
11. Student contestants must notify the MTT-S committee by e-mailing to Dr. Kiki Ikossi <ikossi@ieee.org> of their intention to compete in the contest before Saturday, 1 April, 2017. This notification should include information on the University or educational affiliation of the entry, the name and contact information of the group's adviser, and the PA's approximate power level, dc voltage requirements and frequency of operation. Dr. Ikossi may also be of assistance in obtaining device samples.

* C/I is based on the ratio expressed in dB between the amplitude of either carrier and the highest intermodulation product. PAE will be measured at the first output power with increasing Pin from 0 dBm where this ratio falls below 30 dB.

Prizes:

The team with the winner PA design, as measured at IMS, will receive a prize of $2,000, and will be invited to submit a paper describing the design for the MTT-S Microwaves Magazine.

Modelithics, will give their high precision PA model software awards to the top three (3) PA teams.

National Instruments (formerly AWR Corporation) will award 1-year complimentary licenses of its NI AWR Design Environment software to the top three (3) placing teams.

Modelithics, Agilent and National Instruments offer design software assistance to the competitors.

EMC Technology / Florida RF Labs offers a high frequency passive component kit consisting of couplers, terminations, resistors, and attenuators to each student team.

RFMW offers discounts for PAs and components to the student competitors.