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-17 HF/VHF/UHF TECHNOLOGY

The title of Student Design Competition:

Wideband Baluns

Submission Deadline: Friday, 31 March 2017

Sponsors:

MTT-17 HF/VHF/UHF Technology

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

Robert Caverly (main contact)	r.caverly@ieee.org	610-519-5660
Marc Franco	mfranco@ieee.org	
Murat Eron	murat.eron@ieee.org	

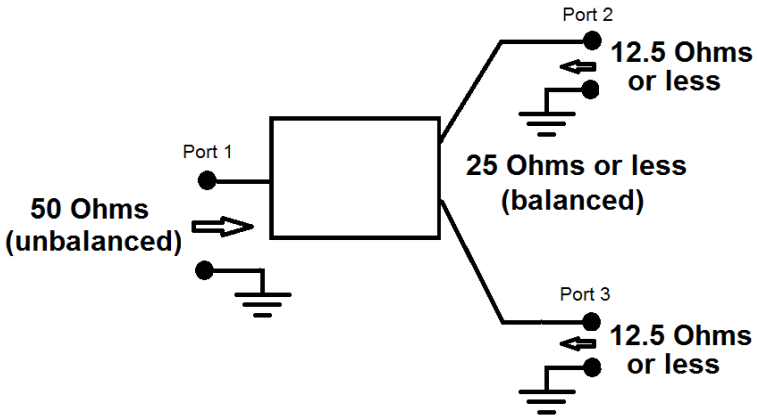
A short abstract or summary describing the competition:

MTT-17 announces the sixth student balun design contest that will take place at IEEE IMS2017. The competitors are required to design, construct and test a passive wideband balun covering the widest possible frequency range below 1 GHz. The winner will be the design that meets all the specifications across the widest bandwidth measured in octaves between 300 KHz and 1 GHz with a maximum impedance transformation of 1/2 (25 Ω or less on the balanced side in a 50 Ω. system)

There is a need in industry for amplifiers in the high frequency (HF-VHF-UHF) region that cover several octaves of bandwidth. Differential circuits using solid-state devices are ideally suited for these applications, but often require wideband baluns to both transform the differential balanced output to a single-ended unbalanced output, and to also provide impedance transformation. This competition provides the opportunity for students to find interesting solutions to this problem.

Design Specification/Rules:

1. Female SMA connectors used to terminate all three ports (one for the unbalanced port, two for the balanced port).
2. Maximum impedance transformation ratio of ½ (25 Ω or less on the balanced side in a 50 Ω. system; must be specified by the student before measurement).
3. Minimum bandwidth of 1 octave
4. Unbalanced port impedance must be 50 Ohms.
5. Maximum VSWR of 2:1 at all ports.
6. Insertion loss of less than 1 dB.
7. Common mode rejection ratio of more than 25 dB.
8. Imbalance of less than 1 dB and 2.5 degrees.
9. The balun must be completely passive.
10. The balun must be packaged in such a way so that the judges can visually examine its physical details.
11. The design must be documented, including schematics and a bill of materials. All the main components need to be identified by manufacturer and part number. If ferrites are used, their main characteristics must be included. The use of commercially built baluns or commercial balun modules is not permitted.
12. Detailed information at: http://rcaverly.ece.villanova.edu/balun/balun.html.



Evaluation Criteria:

The winner will be the design that can meet all the specifications detailed above across the widest bandwidth measured in octaves contained between 300 KHz and 1 GHz.

Examples:

If all the specifications are met from f_1=20 MHz to f_2=1 GHz, the bandwidth in octaves would be $\log_2(f_2/f_1)$, or 5.64. If the coverage is 1 MHz to 540 MHz, the bandwidth would be 9.07 octaves. If the balun meets the specifications from 500 MHz to 2.5 GHz, it will be measured from 500 MHz to 1 GHz, resulting in a bandwidth of 1 octave.

Prizes:

The prize will be the standard MTT-S $2000 award. Single competition with 'winner (or winning team) takes all'.