May 25, 2018: Last day to submit entry forms

Student Design Competition, June 12, 2018 https://ims2018.org/technical-program/competitions/student-design	
Title:	**Tunable Low Phase Noise X-Band (8-12 GHz) Voltage Controlled Oscillator**
Define the eligibility criteria for the participating students	- Enrollment in university or colleges - It is open to both undergraduate and graduate students - Groups of up to four members are admitted
Design Specifications:	- The oscillator circuit shall allow for internal inspection of the circuit schematic and layout. Students must also submit the CAD simulation file with simulated data using any CAD tools or theoretical simulation software (ADS, Ansoft, Serenade, AWR, and others). - Size of the planar PCB: < 8 inch square package - DC power consumption: < 500 mW - Supply Voltage (DC): < 10 Volt - Supply Current (DC): < 100 mA - Operating frequency: (≅ 12 GHz), ± 1% frequency accuracy - Harmonics: < 10 dBc - Output Power: > 5 dBm into a 50-ohm load impedance - Competitors are required to design, construct, measure, and demonstrate **ONE** tunable oscillator; phase noise measurement is done at room temperature. The PN (phase noise performance) and figure of merit (FOM) evaluation will be determined with all participants attending at the competition. - The students can attend the measurements of their individual device. - Use of commercial discrete transistors, varactors, diodes, integrated semiconductors, and passive components is allowed. - Used of printed circuit board with different thickness and dielectric constant are allowed. Use of multilayer board is permitted. - The oscillator shall be tested for the completion at room temperature (22^{o} C +/- 5^{o}) at IMS 2018. However, contestants are encouraged to bring the measured results from their home and show to coordinators/judges. The decision will be based on the performance checked at **room temperature only**. - The oscillator circuit will utilize a 3.5 mm SMA or compatible connector. - The prime DC power shall be totally derived from a single supply with a voltage of up to 15 Volts DC (either polarity) employing two wires. The maximum current shall be less than 100 mA. A metered power supply will be provided at IMS 2018 by the organizers. However, use of internal power supply from phase noise measurement equipment's (Keysight, R&S, Noise XT, Holzworth) is

	encouraged to minimize the noise from external DC power supply (if any). - No internal batteries may be used.
Evaluations Criteria:	• The performance of the oscillator circuits is based on the FOM parameters as measured with a phase noise analyzer. A separate voltage source may be used for the tuning voltage measurements. • The decision will be based on a Figure of Merit (FOM), which is given as [2] $FOM\|_{f_{offset}} = \left[£(f_{offset}) - 20\log_{10}\left(\frac{f_o}{f_{offset}}\right) + 10\log_{10}\left(\frac{P_{DC}}{1mW}\right)\right] \quad (\frac{dBc}{Hz})$ • Where f_o is the oscillation frequency, $£(f_{offset})$ is the phase-noise at the offset frequency f_{offset}, and P_{DC} is the total consumed DC power in milli-watts. • Students are encouraged to refer the formula [1] in their design process for evaluating Q factor of passive resonator part; the larger value of loaded Q-factor may lead to lower phase noise. The oscillator with the best calculated FOM will be the winner of the competition. In the situation where contestants obtain the same figure of merit (FOM), the one with the lowest spot phase noise at 10 kHz offset will be selected as winner.
How To Participate:	**The eligibility criteria for the participating students:** They should be active students from university (part-time or full-time), they should be IEEE members and the competition is open to undergraduate, graduate students, part-time employed students, etc. The students are required to submit the design summary with circuit schematic on or before 1 April, 2018 for participating in the competition. The maximum number of students in a team is 4, and 2-prototype circuits or modules are required, students may bring measured data for evaluation and verification of their measurement.
State what materials the student teams need to submit prior to IMS	- A short description of the modules is to be provided. A schematic and layout of the circuit shall be brought to the IMS - The module shall be accessible to inspection on-site.
Awards:	- The winner(s) will receive a cash prize and will be invited to submit a paper describing his/her project to the IEEE Microwave Magazine.
Important Dates:	- May 25, 2018: Last day to submit entry forms

	- June 12, 2018: Competition at IMS 2018
Include the space requirement to run the proposed competition.	- 4 regular tables with multiple power cords to enable parallel measurements - The set-ups for this SDC should be located as remote as possible from the SDCs doing high power microwave in free space, e.g. radar and harvesting in order to minimize EMI.
Define what equipment is needed for your competition and which company is going to bring the equipment.	- Rohde and Schwarz FSWP and Keysight E5052B. The organizers will arrange contacts, as in the previous years. - Good contacts are available to **Keysight** and **R&S** from the previous competitions - RF-Cables etc. will be provided by **Keysight** and **R&S**

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