6A – Electrical Measurements |
Technology and Design Advancements in Transconductance Amplifier Laboratory Standards
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Abstract:
Transconductance Amplifiers use an input voltage signal to drive an output current signal, typically at the same frequency but at higher current levels (i.e. voltage controlled current source). The design of a wide-band transconductance amplifier (i.e. DC to 1 MHz) with output currents up to 100 A is especially challenging. The challenges include: stability and accuracy of output currents at DC, at low frequencies, and at frequencies up to 1 MHz; handling a noise floor for low output currents; and handling inductive loads which grow with higher output currents and higher frequencies. To extend wide-band operation to accommodate higher output currents and higher output power levels (e.g. 100 A with compliance voltages of 8 Vrms or higher) requires a unique architecture and design.

This presentation will provide an overview of key design components and attributes of a transconductance amplifier and describe manufacturing issues and operational challenges. This includes: developing a modular architecture that combines output currents placed in parallel; ensuring that the parallel output current paths have the same length; removal of all wires in the output current path; and innovative heat reduction techniques including the use of 3-D printing to control air flow. Additional techniques include the use of internal heat monitoring to optimize functionality and avoid having to restrict the operational range in terms of output current, output compliance voltage, and output frequency. The presentation will also describe patented technologies that have been implemented to overcome many of the issues that have prevented the development of high output power wide-band transconductance amplifiers.

Learning Objectives:
1. Understand Principles of Transconductance Amplifier Operation.
2. Understand best practices for ac Amplifier design, measurements and the theory behind these practices.
3. Understand the parasites affecting ac Current Measurements.
Instructor Curriculum Vitae (CV):
With 20 years of experience, Mark Evans is a Senior Designer and leads the development of many of Guildline’s new and flagship products including those related to resistance measurements. He is highly recognized world-wide within the electrical Metrology community for his knowledge and skills. His responsibilities cover both software development and electrical design. Having authored and presented several papers and courses pertaining to best measurement practices in the field of electrical and temperature metrology, Mark is well established as a professional trainer and solution provider and integrator. He often called upon to give training in primary and national laboratories around the world as well as presentations and workshops on many different aspects of metrology at international conferences and seminars.