IEEE Ottawa Antennas and Propagation Society and Microwave Theory & Techniques Society (AP/MTT) Joint Chapter, Electromagnetic Compatibility (EMC) Chapter, Components, Packaging and Manufacturing Technology (CPMT) Chapter, Communications Society, Broadcast Technology Society, and Consumer Electronics Society (ComSoc/BTS/CES) Joint Chapter, IEEE Ottawa Section (OS), and School of Electrical Engineering and Computer Science (EECS) at University of Ottawa are inviting all interested IEEE members and other engineers, technologists, and students to

IEEE Ottawa Summer Seminar

Dr. Zhenfei Song
EMC Laboratory, Information & Electronic Division
National Institute of Metrology (NIM) of China

Topic 1: Recent Progress in Microwave Antenna Precision Measurement at National Institute of Metrology (NIM) of China

Summary:
Accurate antenna standards are necessary to evaluate and verify the performance of communication, radar, navigation, remote sensing, and other systems that transmit or receive radiated electromagnetic energy. The National Institute of Metrology (NIM) has been dedicated to establishing a national antenna metrology infrastructure covering from a few kHz up to 110 GHz. A three antenna extrapolation range for gain calibration has been developed at NIM. Measurements made in the near-field are extrapolated to give the infinite range, far-field gain. The comparison of different digital filtering and curving fitting algorithms for removing antenna mutual coupling will be discussed. A detail uncertainty budget, taking the impedance-mismatch correction as an example will be presented. A typical expanded uncertainty of 0.05 dB ($k=2$) for standard gain horn (SGH) antenna measurement can be achieved.

Topic 2: Quantum Based Self-traceable RF E-field Sensing by Using Rydberg States

Summary:
Accurate electromagnetic field sensing is of great importance and necessity for exploring new materials, developing electronic devices and investigating electromagnetic effects. Ideally, RF field measurements
should be directly linked to SI units with low intrusion, high sensitivity, wide dynamic range and low uncertainty. The current state-of-the art is far short of this goal. It has been proved that quantum coherence effects in highly-excited Rydberg atoms could provide a revolutionary solution for RF field measurement. Applied E-field at energy level resonant frequencies causes a strong Rabi oscillation between high-lying Rydberg states, and by detecting Autler-Townes (AT) splitting within and electromagnetically induced transparency (EIT) spectroscopy, the field strength can be directly linked to the measured energy splitting and Planck’s constant. Some proof-of-concept experiments will be presented, which indicate the possibility of quantum based sensing, sub-wavelength sensing and self-traceable measurement. The effect of vapor cell containing Rydberg atoms will also be discussed as well. This work is of major significance for developing quantum-based RF field metrology.

**Speaker’s Bio**

Dr. Zhenfei Song received his Bachelor degree in Applied Physics from Shandong University, China, in 2006, and the Ph.D. degree in Electronics from Beihang University (BUAA), Beijing, China, in 2012. He is currently an Associate Research Fellow with the EMC laboratory, Information & Electronic Division of National Institute of Metrology (NIM). His research interests include microwave antenna calibration and E-field measurement.

**Time:** Thursday, July 14, 2016, 2:00 PM - 3:30 PM

**Location:**

University of Ottawa  
School of Electrical Engineering and Computer Science (EECS)  
SITE Building, Room SITE 5084  
Ottawa, Ontario, Canada K1N 6N5

**ADMISSION:**

Free. Registration required.  
To ensure a seat, please contact Dr. Qingsheng Zeng (qzeng@eecs.uottawa.ca)

**Refreshments will be served.**