Preliminary Program, IEEE WPTC 2015

	May 13 **Wednesday**	**May 14** **Thursday**	**May 14** **Friday**
8am – 9am		Keynote 2 (45min)	Panel 2
9am – 10am		Oral Session 2	Oral Session 6
10-10:15am		Coffee break	Coffee break
10:15am – 12:15am	11am: IEEE Distinguished Lecture	Oral session 3	Oral session 7
12:15am – 1:30pm		Lunch	**Closing remarks (15min)**
1:30 – 1:45	**Welcome**	Oral session 4	
1:45pm – 2:30pm	Keynote 1		
2:30pm – 3:30pm	Panel 1 (1h)	Oral session 5	
3:30pm – 3:45pm	Coffee break	Break	
3:45pm – 5:45pm	Oral session 1	Poster session	
6pm – 7pm	Welcome reception	Leave for dinner	

Distinguished lecture: *A Lucid View on What Role kQ Product Plays in Electric- and/or Magnetic-Coupling Wireless Power Transfer Systems*
Prof. Takashi Ohira, Toyohashi University of Technology, Japan

Harald Friis discovered the law of wave transfer via space in 1946. Claude Shannon revealed the law of data transfer via communication channel in 1949. There must be a certain law for any "transfer" via some medium. This special lecture explores what is the law of wireless power transfer via electric and magnetic couplers. We start with a basic exercise on how to find the maximum power transfer efficiency of a two-port black box that implies arbitrary contact-less coupling. Given that the box's immittance matrix is known, the input and output power are expressed in terms of the voltage vector. The efficiency, defined as output-to-input power ratio, is consequently expressed as a function of the voltage vector. One of Jacobian determinant zeros leads us to realization that product kQ exclusively dominates the maximum power transfer efficiency. We next touch on kQ for some typical electric and magnetic couplers to help the audience confirm their right understandings of the theory. Then, we introduce a convenient parameter called efficiency tangent. The parameter elegantly enables us to reach the law that we are looking for in this lecture. Finally, we see a couple of prototype WPT systems successfully optimized by employing the law. The lecture concludes with warm encouragement to every WTP engineers to exploit kQ, efficiency tangent, and the law we found as versatile pilotages for ongoing and future WPT system design and development.

Keynote 1: *Wireless Power Transfer: From Directional Power to Omni-directional Power,* Prof. Ron Hui, Imperial College London and Honk Kong University

In traditional wireless power transfer applications, wireless power is usually directed to the targeted loads placed in well-defined locations or regions. The power flow is usually directional, meaning the wireless power is controlled to flow from the transmitter to the receiver in one direction. Recently, research in transmitting power wireless in all directions on the 2-D and 3-D planes has been addressed. Omni-directional wireless power transfer in the past has low energy efficiency. The speaker will describe a new way of achieving omni-directional wireless power in an efficient manner. In this presentation, a brief update of new techniques for directional wireless power transfer is firstly presented. Then various omni-directional wireless power transfer techniques reported in the literature and their limitations will be described. Then, the use of the “non-identical current control” for generating magnetic field in an omni-directional manner will be explained. This patent-pending technology can be used to wirelessly charged a multiple of loads placed anywhere in the proximity of the omni-directional wireless power transmitter. This omni-directional wireless power transfer technology has been successfully demonstrated in both 2-D and 3-D systems. Practical results and video demonstration will be presented. The successful implementation of 2-D and 3-D omni-directional power transfer will be illustrated in video demonstration.

Keynote 2: *Development of Sandwich Conversion Modules for Space Solar Power*, Dr. Paul Jaffe, Naval Research Laboratory and Dr. James McSpadden, Raytheon

Solar power satellites are proposed as a source of energy for terrestrial use. Architectures suggested vary in orbit selection, means of wireless power transmission, and energy generation method; though most have focused on the combination of geosynchronous orbit, microwave wireless power transmission, and photovoltaics. Recent approaches emphasize highly modular schemes to exploit improved economies of scale inherent in mass production. A key element in many of these architectures is the sandwich module, which performs in its layers three functions: sunlight-to-DC conversion, DC-to-microwave conversion, and microwave radiation. A sandwich module prototyping and testing effort provided insight into how these layers are integrated to address thermal concerns, and offered possible avenues for implementation of the layers and the module as a whole given state-of-the-art efficiency and performance constraints. Matching of solar array characteristics with electronics performance at expected operating temperatures and under projected solar illumination levels proved critical. Because of the layer interdependence of parameters such as efficiency, output power level, and operating temperature, modeling expected performance of an actual hardware implementation is challenging. Accordingly, the ability to test an integrated sandwich module while maintaining access to the separate interfaces between layers, under space-like environmental and illumination conditions, was important in allowing for the determination of optimal operating points. These results may be generalized to modules employing similar architectures. Suggestions for future areas sandwich module research are delineated.

Panel 1:
Consumer Electronics Challenges & Opportunities (industry-led)

Panel 2:
Industrial, Scientific and Medical Challenges & Opportunities (industry-led)