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SPEAKER: Peter Grant, University of Edinburgh

DATE: Thursday, May 21st

TIME: *5:30 pm Doubleheader

TITLE: MIMO: Propagation, Testbeds and Receiver Designs

ABSTRACT: This presentation will cover the design of Multiple Input Multiple Output (MIMO) wireless systems which deploy more than one transmit and more than one receive antennas. These are now standardised for: IEEE 802.11 WLAN; 802.16 WiMAX; and 3GPP LTE cellular system operation, as well as deployed in many other systems. MIMO systems will first be described to highlight the theoretical increase in data throughput capacity which can be achieved by deploying MIMO techniques. MIMO systems are heavily dependent on the existence of a rich multi-path environment so several sets of off air radio channel multi-path measurements from Bristol and Ilmenau will be described to highlight the benefits and limitations of MIMO operation. Examples are provided of MIMO transmitter and receiver hardware from laboratories and companies in Europe, USA and Japan. Finally spatial modulation, a technique developed in Edinburgh and Bremen, will be introduced as a possible new method for designing future MIMO systems. In spatial modulation only one MIMO transmitting antenna is used at a time. The incoming data stream is thus partitioned for both antenna selection and signal constellation point selection. Trellis Coded Spatial Modulation (TCSM) partitions the transmit antenna array into sets using TCM, with each set having the maximum spatial separation distance between its antennas, to reduce the effect of correlations between the antennas. The performance of TCSM is compared to coded V-BLAST with the sphere decoder (SD) algorithm in realistic channel conditions (ideal, Ricean and spatially correlated). Simulations indicate that, under the presence of line-of-sight and spatial correlation, a 2 - 5 dB gain in signal to noise ratio (SNR) can be achieved with TCSM.

BIO: Prof Peter Grant has been on staff at Edinburgh since 1971 and was appointed as the first head to form and integrate the School of Engineering at University of Edinburgh, leading it from 2002 - 2008. Before that he served as Head of Electronics from 1999 - 2002. He holds three "doctorates", a PhD from the University of Edinburgh in 1975, an honorary DEng (Doctor of Engineering) from the Heriot-Watt University in Edinburgh in 2006 and another honorary DEng from Napier University, Edinburgh in 2007. He holds five Fellowships from: IEEE, IEE/IET, Royal Academy of Engineering, Royal Society of Edinburgh and he was elected one of the first four fellows of the European Association for Speech, Signal and Image Processing (EURASIP), having previously served there as President 2000-2002. He was also awarded in 2004 the 82nd IEE Faraday Medal. Professor Grant was in 2007 appointed to be the 8th Regius Professor of Engineering at The University of Edinburgh. "Regius" i.e. regal chair appointments are conferred by the Queen of Great Britain.

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