



IEEE Queensland Section presents AGM Dinner Lecture for 2006

Speaker: PROF. ROBERT CALDERBANK, Director, Program in Applied and Computational Mathematics, Princeton University, NJ, USA.

Title: QUANTUM COMPUTING AND CELLULAR PHONES

Abstract: Multiple antennas are transforming the rate, reliability and reach of wireless systems. The speaker, Robert Calderbank is a co-inventor of space-time codes which improve the reliability of communication over wireless channels by correlating signals across different transmit antennas. Improvements in link reliability translate directly to larger cells and lower infrastructure cost; the WiMax standards body (IEEE 802.16) is counting on multiple antennas to deliver data rates up to 75 MB/s over a 20 MHz bandwidth in a cell radius of 6 miles. Space-time codes make all of this possible with end to end signal processing complexity that is essentially the same as single antenna systems. Quantum computers are calling into question the security of cryptosystems where security rests on the presumed intractability of factoring. Dr. Calderbank developed the group theoretic framework for quantum error correction together with Peter Shor and colleagues at AT&T Labs. This concept has changed the way physicists view quantum entanglement, and is the foundation for fault tolerant quantum computation.

The two breakthrough technologies are connected by a common mathematical foundation and Dr. Calderbank will describe how the wireless industry is making use of mathematics developed by number theorists about a hundred years ago.



Biography: Dr. Robert Calderbank is a Professor of Electrical Engineering and Mathematics at Princeton University where he directs the Program in Applied and Computational Mathematics. He joined Princeton from AT&T where he was Vice President for Research and responsible for designing the first Research Lab in the world where the primary focus is data. Inventions by Dr. Calderbank in his career at Bell Labs and AT&T have transformed communications practice in voiceband modems, advanced read channels for magnetic recording, and wireless systems. He also created the framework for fault tolerant quantum computation together with Peter Shor.

Awards: Dr. Calderbank was honored by the IEEE Information Theory Prize Paper Award in 1995 for his work on the Z_4 linearity of Kerdock and Preparata Codes (joint with A. R. Hammons Jr., P. V. Kumar, N. J. A. Sloane and P. Sole), and again in 1999 for the invention of space-time codes (joint with V. Tarokh and N. Seshadri). He became an AT&T Fellow in 2000, received the IEEE Millennium Medal in 2000, and was elected to the National Academy of Engineering in 2005.