# Illinois Center for Wireless Systems

## ICWS Seminar Series

### FROM LINEAR-OPTIMAL FASTER-THAN-NYQUIST TRANSMISSION TO SUM-RATE OPTIMAL MULTI-CODE DS-CDMA COMMUNICATIONS

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**Date:** Wednesday, October 26, 2011
**Time:** 4:00 - 5:00 pm
**Location:** 4269 Beckman Institute

**Abstract:** Given the number of users, the system bandwidth, the maximum number of multi-codes per user, and the power profile of users, the problem of finding the jointly optimal signature sequences and power allocation to maximize the sum rate still remains open. In this talk, this problem is examined and the solution is derived by establishing a series of links between the linear-optimal Faster-Than-Nyquist signaling scheme and the linear-optimal overloaded FDMA system design, between the FDMA system design and the joint signature design and power allocation for overloaded single-code DS-CDMA system, and finally between the bandwidth-constrained sum-rate optimal FDMA system design and the optimal multi-code DS-CDMA system design. It is shown that the generalized Welch-bound equality (GWBE) sequences often used in the design of optimal DS-CDMA systems are special case solutions obtainable by the multi-user constrained water pouring that has the optimal FDMA solution as a trivial one. The well-known notions of the effective bandwidth, the oversized and the non-oversized users of the optimal DS-CDMA systems are also re-examined.

**Biography:** Joon Ho Cho received the B.S. degree in electrical engineering from Seoul National University, Seoul, Korea, in 1995 and the M.S.E.E. and Ph. D. degrees in electrical and computer engineering from Purdue University, West Lafayette, IN, in 1997 and 2001, respectively.

From 2001 to 2004, he was with the University of Massachusetts at Amherst as an Assistant Professor. Since July 2004, he has been with Pohang University of Science and Technology (POSTECH), Pohang, Korea, where he is presently an Associate Professor in the Department of Electrical Engineering. He received the POSTECHIAN Teaching Award in 2010. He is also a Visiting Scholar at Purdue University during academic year 2011. His research interests include wideband systems, multiuser communications, adaptive signal processing, channel measurement and modeling, and information theory.

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