



## **INTEGRATED CIRCUITS AND SYSTEMS GROUP (ICSG)**

### **THE ICS SEMINAR SERIES**

**Prof. Byunghoo Jung**  
Dept. of Electrical and Computer Engineering,  
Purdue University

### **Ultra Wideband Transceiver for Indoor Location-aware Applications**

Motivated by the enormous success of outdoor location tracking systems, significant attention has focused on wireless indoor positioning systems for many promising location-aware applications such as emergency management, asset tracking, inventory management, home automation, health monitoring, and sensor networks. Various types of wireless indoor positioning systems have been developed mostly based on WLAN, Bluetooth or ZigBee networks.

Unfortunately the typical ranging accuracy of the WLAN and WPAN based systems (about 2-3m in optimal conditions) is not enough for many projected indoor location-aware applications. To mitigate the limited ranging accuracy issue, a few proprietary ranging systems based on IR-UWB have been investigated. Although the IR-UWB based ranging systems have demonstrated better accuracy than WLAN and WPAN based systems, the universal compatibility issue, which is important for wide deployment and robust operation, has not been properly addressed. To overcome the problems of non-standardized approaches, a new low-rate WPAN standard, 802.15.4a, aiming <30cm indoor ranging accuracy has been launched. We will present an implementation example of an integrated transceiver (RF front-end + baseband) that is fully compatible with the standard. The implemented transceiver achieves <18cm ranging accuracy and -79dBm sensitivity, the best ever reported, demonstrating the feasibility of reliable and standardized indoor location tracking. The issues in the transceiver architecture design and the approaches for improving the ranging distance and accuracy will be discussed.

#### **Biography:**

Byunghoo Jung received the B.S. degree from Yonsei University, Korea, in 1990, the M.S. degree from KAIST, Korea, in 1992, and the Ph.D. degree from the University of Minnesota, Twin Cities, in 2005. From 1992 to 1999, he was with Samsung Electronics, Korea, where he was involved in the design of video signal driver circuits for flat panel displays. Following receipt of his PhD in January 2005, he was with Qualcomm in San Diego as a Senior RF IC Design Engineer until he joined the School of Electrical and Computer Engineering at Purdue University as an Assistant Professor in August 2005. His research interests include analog, RF, and mixed-signal circuit design for wireless and wired communications and bio-medical systems. He is the first place winner of the 2002-2003 SRC SiGe BiCMOS Design Challenge (as a lead designer) and the 2007-2008 SRC/SIA IC Design Challenge (as a lead faculty), and holds 10 US patents. He has been serving as a Co-Chair of the DAC/ISSCC Student Design Contest (SDC) since 2006, as an Associate Editor of the IEEE Transactions on VLSI Systems since 2009, and as a member of the Analog Signal Processing Technical Program Committee (ASPTPC) in the IEEE Circuits and System Society since 2006.

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