

Companies License RFID Technology

This spring, ITTC's Office for Applied Technology has inked two licensing agreements for the KU-Tag, an innovative antenna and radio frequency identification (RFID) system. In March, Container Technology, Inc., obtained the tag to improve monitoring of its liquid containers. The following month, Kansas City-based Starport Technologies, LLC, bought the right to manufacture and market the KU-Tag system.

"KU has a mission to move innovations stemming from our research into the marketplace," says **Jim Roberts**, KU's vice provost for research. "These licenses stem from ITTC investigator **Dan Deavours'** RFID research and are tremendous examples of the process."

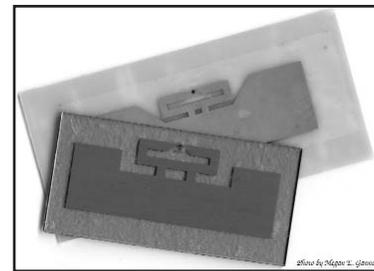
RFID identifies tagged items through radio communication between electronic readers and tags that contain data on microchips. Multiple tags can be scanned simultaneously without readers' needing to "see" the tags—one of the many advantages RFID has over traditional bar codes.

However, when RFID tags are placed on or near metal or liquids, performance degrades to the point where tags are no longer usable. Metals and water interfere with the operation of the RFID tag antenna.

The KU-Tag was designed to solve this problem. ITTC Research Assistant Professor Deavours developed a RFID system whose performance is independent of its mounting surface. The KU-Tag,

which can be read up to 30 feet away, employs four U.S. patent-pending technologies. It is one of the best-performing, thinnest, least costly RFID tags specifically designed to work near metal or liquids.

According to **Gary Clancy**, managing director of Container Technology, the KU-Tag will increase his



Two KU-Tag prototypes are shown above. The ITTC system is one of the best-performing, thinnest, and least costly RFID tags specifically designed to work near metal or liquids.

company's profitability and security by improving the return rate on the reusable containers. The KU-Tag will also reduce

warehouse and labor costs as remote electronic

readers replace time-consuming manual scans.

The second licensee, Starport, will introduce two new RFID tags that leverage the KU technology this summer.

"The KU-Tag is another important tool in our expanding range of RFID solutions," said **Jeff Nedblake**, managing partner of Starport Technologies. "ITTC researchers found an innovative solution to address the metal/liquid problem, which is a common problem we keep hearing from customers." ■

Newest Lab Grows in Faculty, Prestige

Prasad Kulkarni will join ITTC's growing Computer Systems Design Laboratory (CSDL) this fall. The new EECS assistant professor comes to KU with expertise in compiler optimization sequences for specific applications. Kulkarni will also be performing research in embedded systems, machine learning, and computer architecture.

Kulkarni is the latest addition to CSDL, ITTC's

newest lab. Formally established in 2004, CSDL has secured 11 federal grants during its short existence. Since its creation, CSDL faculty and students have published peer-reviewed articles in five journals and in 24 conference proceedings. They have presented their work at 18 invited talks.

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It is said that change is inevitable but that growth is intentional. We have overseen unprecedented growth—11 new investigators in four years—at ITTC. While we carefully planned the new additions, unplanned changes are inevitable. Some of those who have helped make the Center a success are leaving ITTC. While we are sad to see them go, we wish them only the best in their new positions.

Tim Johnson, ITTC's executive director, will be joining the IDEA Center, which provides institutions of higher learning with products and services to assess and improve teaching, learning, and administrator performance. Tim has been at the University for 16 years. In 1996, Tim helped form ITTC. He has spent the last decade directing ITTC's applied technology and commercialization efforts. Licensing and royalty fees have earned KU more than \$1 million. The Center has supported 48 Kansas companies and commercialized 38 technologies in the State. As Tim has said, his final commercialization transfer activity for ITTC/KU will be transferring himself out to the Kansas company.



Director Victor Frost

Susan Gauch, director of ITTC's ISL, will become the Department Head of Computer Science and Computer Engineering (CSCE) at the University of Arkansas. Her husband, EECS Associate Professor and ITTC investigator **John Gauch**, will join the CSCE department as a full professor. Since joining KU in 1993, the prolific researchers have developed a number of innovative technologies that have been commercialized. For example, Susan developed ProFusion, one of the original meta search providers, which was sold to IntelliSeek. John created software that enables broadcasting companies to monitor how the programming they sell is used by the stations that buy it. The Gauches formed a start-up company, called Veatros, to market the system, called Vidwatch.

Newer faculty **Weichao Wang** and **Alex Wyglinski** will be moving to the East Coast after two years at ITTC. Weichao is joining the University of North Carolina at Charlotte as an assistant professor. He helped EECS gain federal certification for its information assurance program (see page 4). Alex has received a tenure track position at the Worcester Polytechnic Institute in Massachusetts. Alex has made substantial contributions to our wireless research program (see both articles on page 3).

As we move forward, ITTC will build upon the foundation laid by these dedicated researchers. ■

Newest Lab Grows in Faculty, Prestige

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CSDL faculty have mentored 15 Ph.D. students and five visiting international scholars.

Two veteran CSDL researchers are participating in international collaborations.

In addition to presenting his work in conferences in Spain, Sicily, and Portugal, EECS Professor **David Andrews** has given invited talks in Switzerland and Germany. His research focuses on embedded systems, distributed systems, and computer architecture. Andrews has also served as the international expert on a Ph.D. committee at EPFL Switzerland, a prestigious technical university, and as a reviewer for the National Science Foundation, Israeli National Science Foundation, and Swiss National Science Foundation. Andrews has hosted international scholars and, this fall, will mentor a visiting student from Germany.

CSDL investigator **Perry Alexander** is chairing the IEEE P1699 Rosetta Working Group, which is developing a standard for the system-design language, which Alexander helped develop. Rosetta enables designers to ensure that individual pieces are complementary to the other parts of complex electronic systems. In 2006, the EECS professor had his textbook, *System-Level Design with Rosetta*, published.

The preparation that CSDL students receive at ITTC allows them to obtain superior jobs after graduation. Students not only gain hands-on research experience but also hone presentation skills through journal publications and conference presentations. Successful CSDL alumni include Ph.D. graduates **Cindy Kong**, now with Intel, and **Eric Akers**, who will be joining the University of Southern California's Information Sciences Institute East research organization this summer. ■

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Researchers Attend, Present at DySPAN Event

In the United States, the Federal Communications Commission (FCC) and the National Telecommunications and Information Administration (NTIA) regulate the licensing and use of radio frequency spectrum. Military and public safety organizations are provided spectrum based on their needs, and commercial entities purchase available spectrum either outright or through an auction process. Because of this static allocation process, there is an emerging problem of “spectrum scarcity.” Premium portions have been licensed, leaving little available spectrum for new services.

ITTC researchers and other scientists are developing radios and networks that can nimbly navigate this crowded medium by using dynamic spectrum access (DSA). DSA techniques will more efficiently utilize available spectrum by detecting unused spectrum, or “white space,” in licensed bands. Licensees could then lease their white space to secondary users.

Investigators creating next-generation wireless technologies and advocating new spectrum policies attended the Dynamic Spectrum Access Networks (DySPAN) conference this April in Dublin, Ireland. ITTC investigators **Joseph Evans** and **Gary Minden** and graduate research assistants **Jordan Guffey**, **Tim Newman**, **Rory Petty**, **Rakesh Rajbanshi**, and **Ted Weidling** represented the Center at DySPAN.



From left to right: Rakesh Rajbanshi, Ted Weidling, Joseph Evans, Gary Minden, Tim Newman, Rory Petty, and Jordan Guffey attend the Dynamic Spectrum Access Networks (DySPAN) conference in April. DySPAN focuses on the devices and networks that utilize spectrum on a dynamic basis.

Evans chaired the “Dynamic Spectrum Technology Enabling Policy” session. The FCC is currently considering regulations that would permit unlicensed access to unused TV channels for WiFi, local wireless broadband services, and other devices.

ITTC researchers presented findings from their “Feasibility of Dynamic Spectrum Access in Underutilized Television Bands” paper. The study found that portable, low-power unlicensed devices could send data over unoccupied television channels without interfering with television viewing on other channels (see article below for more about this research).

They also presented a paper, “KU Agile Radio (KUAR): A Flexible Software-Defined Radio Development Platform,” along with a technology demonstration of its hardware. KUAR serves as a platform for testing DSA techniques. ■

ITTC Spectrum Study Gains National Attention

ITTC research was cited in comments submitted this spring to the Federal Communications Commission’s *Proceedings on Unlicensed Operation in the TV Broadcast Bands*. The FCC is considering opening unused frequencies in the television band of the radio frequency (RF) spectrum to unlicensed wireless devices. By giving secondary users access to TV band spectrum, regulators would ease congestion in urban areas and enable greater access to wireless broadband in rural areas. This could solve the “last mile” problem.

The New America Foundation, a non-profit, non-partisan think tank, commissioned ITTC to conduct a feasibility study. Investigators evaluated the effects of secondary-user transmissions from proposed wireless devices on consumer digital television (DTV) receiver performance in the TV band. When wireless transmissions operate in close proximity to one another, signals have the potential to interact and negatively impact the recovery of desired signal content. Secondary use opponents have expressed concerns of such “harmful interference” to DTV channel reception.

ITTC investigators **Dan DePardo** and **Joe Evans** led experiments to determine critical operating parameters for unlicensed devices operating in TV bands. Secondary use will require the development of emissions specifications for TV band devices to prevent interference problems. The study, “Quantifying the Impact of Unlicensed Devices on Digital TV Receivers,” found that low-power unlicensed devices could transmit over unoccupied television channels without interfering with television viewing on other channels. Researchers suggested emission limits for secondary devices to protect DTV receivers.

Currently, licensees are granted exclusive rights to their spectrum, but proposed regulatory changes could allow wireless devices to access “empty pockets” within the TV band. For more on dynamic spectrum access (DSA) networks, see the above article.

To read the study, log on to www.newamerica.net/files/NAF%20Spectrum%20Technical%20Report%20_FINALSUBMITTED_0.pdf. ■

Achievements and Acclaim

ComputerWorld Highlights ITTC Research

ITTC investigator **Joseph Evans'** CogNet research was featured in the April 16th issue of *ComputerWorld* magazine. The article, "Future Watch: Wireless Wises Up," highlights the wireless communication protocols for cognitive networks being developed at ITTC as part of the "future Internet" initiative. To read the article, go to www.ittc.ku.edu/news.phtml. ■

Hui Gives Invited Talk at Nortel Workshop

EECS Associate Professor and ITTC investigator **Ron Hui** is among invited experts to present at Nortel Networks Agile All-Photonic Networks Annual Research Review on June 14-15. He will discuss optical performance monitoring using coherent detection. Hui also directs the Photonics and Device Technologies Program within the National Science Foundation. ■

Chen Serves on Journal's Editorial Board

Xue-wen Chen, EECS assistant professor, was asked to serve on the editorial board of the new peer-reviewed, online journal *Source Code for Biology and Medicine*. The journal will publish source code for free distribution, advancing biological and medical research. For more information, go to www.scfbm.org/. ■

KU Honors Faculty, Staff for Years of Service

Paula Conlin, facilities coordinator, and **Nancy Hanson**, program assistant for applied technology, were recognized for their 30 years with the University at the spring employee recognition ceremony on May 10. **Victor Frost**, ITTC director and EECS distinguished professor, marked 25 years, while **Robin Hinman**, research administration specialist, was acknowledged for 15 years with the University. ■

EECS Curriculum Receives National Certification

KU's Department of Electrical Engineering and Computer Science (EECS) has received federal certification for its information assurance (IA) curriculum. National IA standards are set by the Committee on National Security Systems (CNSS), which is chaired jointly by the Department of Defense and the Department of Homeland Security. CNSS sets national policy and operational preparedness for national security systems. IA methods will safeguard data and information systems that are critical to commercial, military, and intelligence activities.

ITTC investigators **Joseph Evans**, EECS distinguished professor and KU's director of research information technology, and **Weichao Wang**, EECS assistant professor, led the application process. The Information Assurance Courseware Evaluation (IACE) program verifies that CNSS



requirements are met. IACE certified EECS for standards 4011 and 4013: the National Training Standard for Information Systems Security (INFOSEC) Professionals and the National Information Assurance Training Standard for System Administrators, respectively. The National Security Agency's IACE program works to expand integration of IA standards throughout academia. Properly trained IA professionals will help ensure the authenticity, availability, confidentiality, and integrity of national security systems.

Evans will receive the official IACE certificates at the CNSS Awards Ceremony at the 11th Colloquium for Information Systems Security Education (CISSE) in Boston, Mass., this June. ■

ITTC LABORATORIES

Bioinformatics and Computational Life-Sciences Lab (BCLSL)

Communications and Networking Systems Lab (CNSL)

Computer Systems Design Lab (CSDL)

e-Learning Design Lab (eDL)

Intelligent Systems Lab (ISL)

Radar Systems and Remote Sensing Lab (RSL)



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