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News and Editorial Services
 Kansas State University
 128 Dole Hall
 Manhattan, KS 66506
 785-532-2535
 785-532-7355 fax
 media@k-state.edu

Research collaboration aims to improve wireless technology, smartphones

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MANHATTAN -- Through a new research partnership, Kansas State University is helping Kansas businesses and the state's economy while improving the technology behind wireless communication systems and smartphones.

Kansas State University's [Electronics Design Laboratory](#) and Lawrence-based [Avatekh Inc.](#) are solving challenges that are caused by the rapid growth of wireless communications and sophisticated technologies in home, commercial and industrial environments. The work may help smartphones run faster and have better battery life.

The partnership includes Tim Sobering, director of the university's Electronics Design Laboratory, and Alexei V. Nikitin, founder and the chief science officer of Avatekh Inc. To support their work, the researchers recently received a Phase I Small Business Innovation Research grant from the National Science Foundation titled "Adaptive analog nonlinear circuits for improving properties of electronic devices."

The researchers are extending and commercializing hardware algorithms that can reduce electronic noise and interference in industrial and consumer products.

"While the majority of wireless communication systems transmit digital information, the actual signals are analog in nature," said Nikitin, a physicist with an interdisciplinary background. "What we have developed and patented are advanced nonlinear algorithms and circuits called adaptive nonlinear differential limiters, or ANDLs, which reduce the impact of noise and interference in a communication channel. What makes ANDLs unique is that they are implemented in the analog portions of transmitters and receivers and operate in real time. The result is an improvement in performance coupled with a reduction in size, complexity and power consumption when compared to conventional linear analog or digital processing techniques."

The technology may improve smartphones, which are compact packages with multiple radio frequency transmitters and receivers, such as Wi-Fi, Bluetooth, GPS and cellular. While each system uses a different part of the wireless spectrum, the systems can still interfere with each other because they are integrated in a hand-held device. This interference reduces the performance of the smartphone, said Sobering, an electrical engineer with extensive experience in analog hardware design and system engineering.

To improve the operating range, performance and battery life of smartphones, the researchers are using adaptive nonlinear differential limiters, or ANDLs.

"Worldwide and particularly in the United States, the wireless spectrum is crowded and allocating additional communication bands is expensive and sometimes prohibitive," Sobering said. "This crowding adds to the sources of man-made electrical noise that extends beyond conventional transmitters and includes industrial sources as well as electrical equipment and electronics in home and office."

Applications for ANDLs and similar technologies extend beyond wireless communication.

"ANDLs also have the potential for reducing intentional jamming, opening up applications in commercial navigation and military communications," Sobering said. "ANDLs provide improvements when conventional techniques fail, and also enable elegant and inexpensive real-time solutions to the man-made interference problems that may be used in addition, or as a low-cost alternative, to the state-of-art interference mitigation methods."

As more electronics became available in the home and industry for control and monitoring applications, there are more possibilities for electrical interference to cause performance degradation or economic losses. The technology may potentially improve any system where technogenic, or man-made, electrical noise is present, Sobering said.

The Electronics Design Laboratory is a multidisciplinary support center at Kansas State University and supports the research programs at Kansas Board of Regents institutions by providing expertise in the development of high-end electronics and computer-based data acquisition systems. The laboratory was founded in 1996 as a fully equipped state-of-the-art electronics development laboratory that includes industry standard computer-aided design tools to support analog and digital circuit design, system simulation, system testing, instrumentation and printed-circuit board design.

Avatekh Inc. is developing and commercializing its proprietary cutting-edge technology and research and development, with both military and consumer market applications. Industry stakeholders interested in learning more about ANDLs and their applications should contact Nikitin at avn@avatekh.com.

Source

Tim Sobering
 785-532-7826
 edl@k-state.edu

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Avatekh is AH-vah-tekH

Websites

[Electronics Design Laboratory](#)

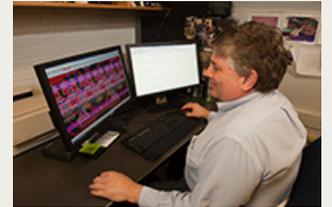
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Tim Sobering, director of the Electronics Design Laboratory, is collaborating with Alexei V. Nikitin, founder and the chief science officer of Lawrence-based Avatekh Inc. The researchers are improving the technology behind wireless communication systems and smartphones.



Written by

Jennifer Tidball
 785-532-0847
jtordine@k-state.edu

At a glance

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Notable quote

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- Tim Sobering, director of the Electronics Design Laboratory