# Rice Transmits Data On Active UHF Channels

Tech aimed at developing super Wi-Fi

posted by Deborah D. McAdams · Jul 13, 2015

**HOUSTON**—Rice University engineers say they have demonstrated a system that enables wireless data transmissions over UHF channels during active TV broadcasts. The technology “could significantly expand the reach of so-called ‘super Wi-Fi’ networks in urban areas,” the university said.

Edward Knightly, professor and department chair of electrical and computer engineering and director of the Rice Wireless Network Group, noted that the 400-700 MHz UHF spectrum is coveted for its signal propagation characteristics. He said that UHF could carry Wi-Fi signals much farther than the higher frequencies typically used.

The Federal Communications Commission allows secondary users to transmit wireless data on unlicensed UHF channels—aka “white spaces”—provided that the transmissions do not interfere with TV broadcasts in any part of the UHF spectrum.

“Unfortunately, in the most densely populated areas of the country, where the need for additional wireless data services is the greatest, the amount of available white space is extremely limited,” Knightly said. “In our most recent tests in Houston, one channel is open in parts of the city and none are available in others. This is fairly typical of a large U.S. urban area.”

Knightly, pictured left, and Rice graduate student Xu Zhang developed a technology called “Wi-Fi in Active TV Channels,” or WATCH, and received FCC approval to test it at the Rice campus in 2014.

WATCH requires no coordination with or changes to legacy TV transmitters, the university said. TV signals are broadcast as normal and the WATCH system actively monitors whenever a nearby TV is tuned to a channel to avoid interfering with reception. One aspect of WATCH monitors TV broadcasts on a channel and uses signal-canceling techniques to insert wireless data transmissions into the same channel, which eliminates TV broadcasts from interfering with the super Wi-Fi data signals being sent to computer users, Knightly said.

The other aspect of WATCH is dedicated to making certain that data transmissions do not interfere with TV reception. This part of the technology would require TVs to report when they are being tuned to a UHF channel, Knightly said. In practice, this could be accomplished with either smart TV remotes or next-generation TV sets. In the tests at Rice, Zhang constructed a smart-remote app that reported whenever a test television in the lab was tuned to a UHF channel. When that happened, the WATCH system automatically shifted its data transmissions to another part of the UHF spectrum that wasn’t being used.

“Our tests showed that WATCH could provide at least six times more wireless data compared with situations where we were limited only to the traditionally available white-space spectrum,” Knightly said. With WATCH in use, Knightly said it took a fraction of a second longer than normal to tune in a UHF TV broadcast on the test television—less than a 5 percent increase.

Zhang and Knightly’s report on the research, titled “WATCH: Wi-Fi in Active TV Channels,” won best-paper honors last month at Association of Computing Machinery’s MobiHoc 2015 conference in Hangzhou, China.

The research is supported by the National Science Foundation, Cisco Systems and the Keck Foundation. Zhang and Knightley’s paper on WATCH is available here. Also see Doug Lung’s coverage of Rice’s white-spaceMIMO experiements.

*Story images by Jeff Fitlow of Rice University. Cover image provided by Rice.*

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