Wireless experts create multiuser, multiantenna scheme to make most of UHF band

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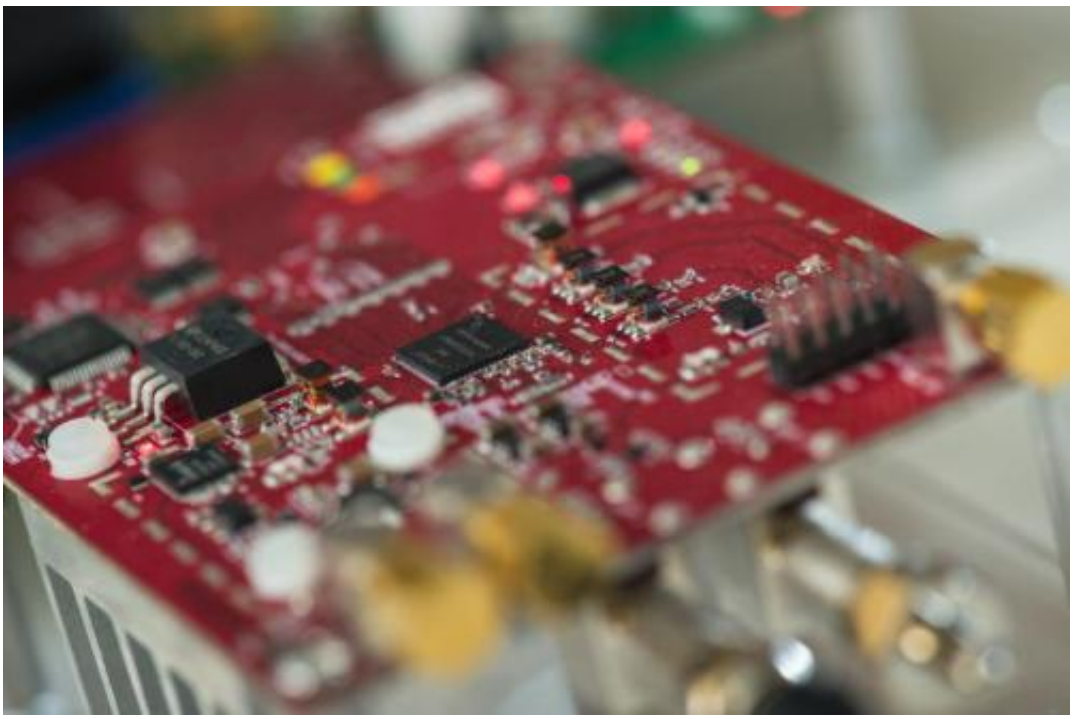


Researchers used the Rice Wireless Network Group's popular 'wireless open-access research platform' to build the world's first open-source multiple-input, multiple- output test system capable of serving multiple users over UHF. Credit: Jeff Fitlow/Rice University

Rice University wireless researchers have found a way to make the most of the unused UHF TV spectrum by serving up fat streams of data over

wireless hotspots that could stretch for miles.

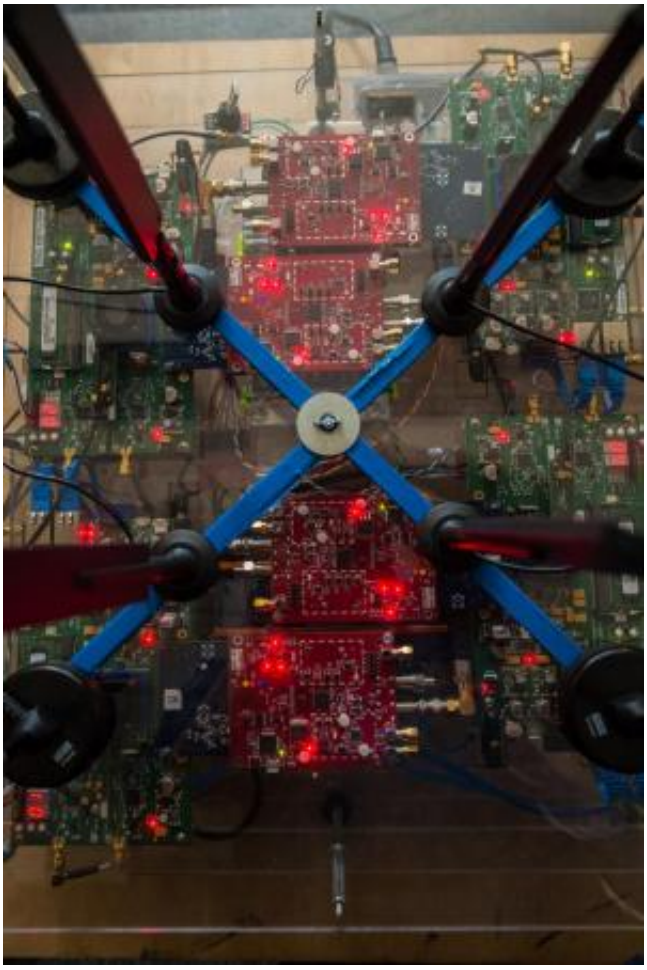
In a presentation today at the Association for Computing Machinery's MobiCom 2014 conference in Maui, Hawaii, researchers from Rice's Wireless Network Group will unveil a multiuser, multiantenna transmission scheme for UHF, a portion of the radio spectrum that is traditionally reserved for television broadcasts.

"The holy grail of wireless communications is to go both fast and far," said lead researcher Edward Knightly, professor and chair of Rice's Department of Electrical and Computer Engineering. "Usually, you can have one or the other but not both. Wireless local area networks today can serve data very fast, but one brick wall and they're done. UHF can travel far, but it hasn't had the high capacity of WiFi.

"This provides the best of both worlds," he said of the new technology.

Rice's technology combines several proven technologies that are already widely used in wireless data transmission. One of these is "multiple-input, multiple-output" (MIMO), a scheme that employs multiple antennae to boost data rates without the need for additional channels or transmitter power. In effect, MIMO allows for a larger wireless "pipeline," and the technology is standard in the latest generation of wireless routers and networking equipment.

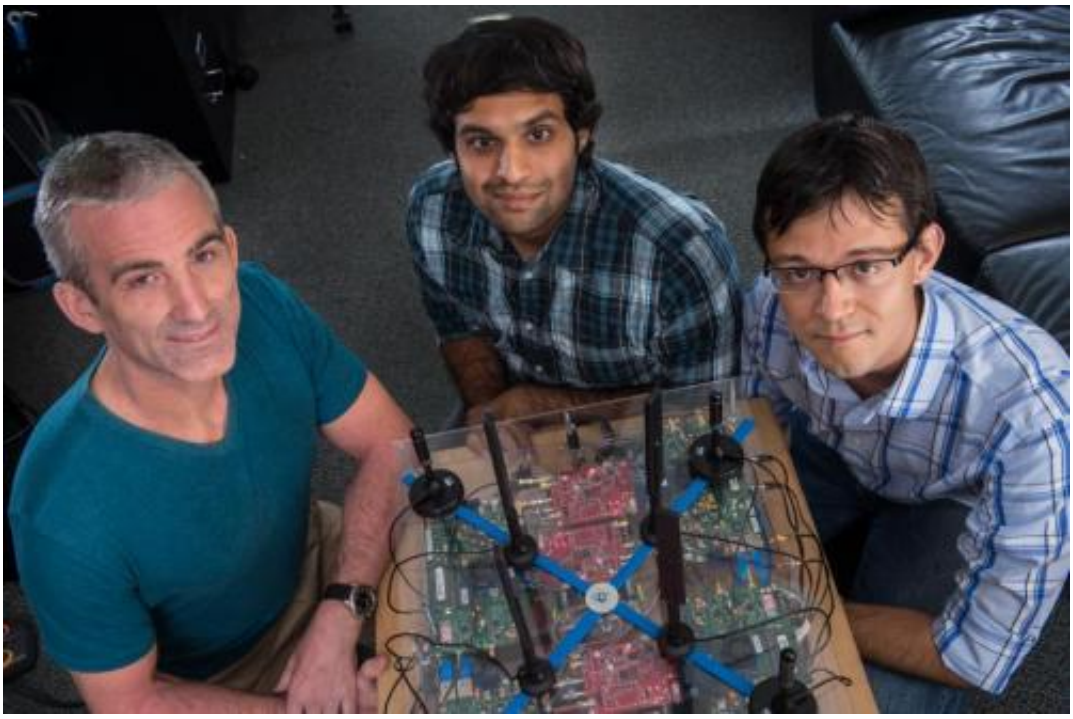
Parts of the UHF spectrum were opened after the recent switch to digital television, which has a smaller broadcast footprint than analog TV. UHF is often referred to as the "beach front" portion of the wireless spectrum because the signals travel for miles, and one popular idea for the liberated portion of the spectrum is for "open" wireless access points like those used for today's WiFi hotspots. Using UHF for broadband Internet is particularly appealing for rural areas where wired brandband is unavailable.



Rice University's Wireless Network Group has created a multiuser, multiantenna transmission scheme for UHF, a portion of the radio spectrum that could be useful for broadband Internet service in rural areas. Credit: Jeff Fitlow/Rice University

"When comparing UHF and WiFi, there's usually a tradeoff of capacity for range or vice versa," said Rice graduate student Narendra Anand, the lead author of the new study. "Imagine that the WiFi access point in your home or office sends data down a 100-lane highway, but it's only one mile long. For UHF, the highway is 100 miles long but only three or four lanes wide. And you cannot add any lanes.

"To be able to leverage the best characteristics of the UHF band, we need to be able to efficiently use the lanes that we have," Anand said. "One way to do that is with multiuser MIMO, a multiantenna transmission technique that serves multiple users over the same channel simultaneously."



From left to right, the Rice Wireless Network Group's Edward Knightly, Narendra Anand and Ryan Guerra. Credit: Jeff Fitlow/Rice University

Knightly, Anand and Rice graduate student Ryan Guerra designed the first open-source UHF multiuser MIMO test system. Based on Rice's "wireless open-access research platform," or WARP, the system allowed the team to perform a side-by-side comparison of multiuser MIMO for UHF and for both 2.4 gigahertz and 5.8 gigahertz WiFi.

"Based on over-the-air experiments in a range of indoor and outdoor

operating environments, we found that UHF-band multiuser MIMO compared favorably and produced high spectral efficiency as well as low-overhead wireless access," Knightly said.

Provided by Rice University