# University of Kansas' Tag for Metal, Liquids

Researchers at the school claim that their EPC Gen 2 RFID tag offers a long read range and can be used for tracking metal- or liquid-bearing assets and containers.

By Claire Swedberg

Apr. 19, 2006—Researchers with the University of Kansas' Information and Telecommunication Technology Center (ITTC) have developed an RFID tag that they claim offers superior performance when applied directly to objects containing metal or liquid. The tag's thickness—about 1.5 millimeters (0.059 inch)—qualifies it as one of the thinnest RFID tag designed to operate well when attached to metals or containers of liquid.

The KU-Tag could be a good solution for industries that want to tag products containing metal or liquid, says KU-Tag creator and research assistant professor at University of Kansas Daniel Deavours.

The KU-Tag includes a rectangular microstrip, or "patch," antenna and a foil ground plate, with a plastic substrate that separates the foil from the antenna in the middle. The foil ground plate is a thin metal sheet that serves to isolate the antenna from any other metal or fluid that can lower the read range of RFID tags. Because the antenna cannot make contact with the foil ground plate, the substrate between them must be thick enough to fully separate the two. On average, an RFID tag with a metal ground plate for isolating the antenna is about 5 millimeters (0.20 inch) thick, almost four times thicker than the KU-Tag.

The researchers developed two versions of the tag: one that measures 4 inches by 6 inches and the other, 3 inches by 5 inches. Both versions use a 96-bit Impinj RFID chip based on the EPC Class 1 Gen 2 standard.

Deavours tested the KU-Tag at the RFID Alliance Lab, a nonprofit RFID testing facility located on the University of Kansas campus and founded jointly by the ITTC, private RFID systems integrator Rush Tracking Systems and *RFID Journal* . In a test of the KU-Tag at the Alliance Lab, a competitor's tag in the presence of metal or liquid was readable at maximum distance of 2.5 feet to 8 feet from an interrogator's antenna, while the KU-Tag's was readable as far as 17 to 21 feet away, Deavours reports.

According to the University of Kansas, the tests showed that the KU-Tag was not only thinner but had a greater read range and performed considerably better when in contact with metal. Those competitor tags included the Avery Dennison passive Metal Track UHF tag, which contains an EPC Class 0 Gen 1 chip and is 5.5 inches long, 1 inch wide and 0.3 inches deep (about 140mm by 25mm wide by 8mm) and offers a read range of up to 20 feet, according to Avery Dennison (see Avery Designs Passive UHF Tag for Metal). Several of Avery Dennison's new Gen 2 passive UHF inlays are also designed to work on products with either metallic or water content, including the AD-420 and AD-421, which are 3.70 inches long, 1.26 inches wide and only 0.011 inch (0.292 millimeter) thick and offer 96 bits of memory (see Avery Dennison Unveils New Gen 2 Inlays). Although the University of Kansas did not test the new Gen 2 inlays, which are thinner than the KU-Tag, Deavours asserts that the KU-Tag is the only tag of that thickness that will perform properly when directly attached to metal or a container of liquid.

"I want to point out that we're not trying to announce a new product," Deavours says. "We're announcing a

new technology that can be turned into products."

The university intends to discuss the KU-Tag at its Alliance Lab booth at RFID Journal LIVE! conference and exhibit being held in Las Vegas on May 1-3.

Applications for the KU-Tag could include placement on computers, electronics equipment and machinery so those assets could be tracked, or on liquid-filled containers such as those storing medical supplies and blood. Deavours believes the tags would also be useful on reusable containers in which liquids or metals are often transported.

The researcher reports he is continuing research into an even thinner tag. "I hope [for something] under 1 millimeter," he says. "This may be the thinnest RFID tag of its kind, but we are still working to get it thinner."

Deavours intends the tag to be inexpensive, although how inexpensive cannot be determined before it is licensed and manufactured. "We designed it so that there would be lots of flexibility so that manufacturing could be inexpensive and material could be commoditized," he explains. "A lot will be driven by volume." The University of Kansas is in contact with companies who are considering licensing the tag, Deavours says.

Although the tag's testing was done at the Alliance Lab, the ITTC funded the tag's research and development.