Lab Test Exposes EPC Tag Performance

A new report by the RFID Alliance Lab shows that there are significant differences in how tags of the same make and model perform.

May 23, 2005—A new report published by the RFID Alliance Lab, a nonprofit testing center based at the University of Kansas, reveals that there are significant variations in performance of UHF RFID tags based on EPCglobal's Class 1 and Class 0 specifications.

The Lab tested a total of 1,000 EPC tags composed of nine different commercially available models. The tag with the smallest variation in performance was the Squiggle tag (model number ALL-9238) made by Alien Technology, but even that model had a difference of 3.5 dB between the worst and best tags. That means that the worst-performing tag requires more than twice the amount of RF power from the reader to be read, or can be read at only 60 percent of the distance of the best-performing tag.

The I2010 and X2040 from Symbol Technologies have relatively poor (high) variation. This is offset by their high performance. But the reverse is also true: their high performance is offset by poor variance.

"An ideal tag model should give consistently good performance," says Daniel D. Deavours, research director of the RFID Alliance Lab, which was created by the Information and Telecommunication Technology Center (ITTC) at the University of Kansas, Rush Tracking Systems, a private RFID systems integrator, and *RFID Journal.* "Consistency is an important aspect of any process because the worst-performing tags will limit what you can do. Low variation in tag performance is desirable also, because it makes tag performance predictable."

Because of the variation in tag performance, the report tested all tags of each model to find one that performed at the average for that model, and then tested that average tag to see how a "typical" tag would perform. Overall, two Symbol Class 0+ tags, the i2010 and X2040, could be read at the farthest distance. The Rafsec 457 outperformed all other Class 1 tags in terms of read distance.

The lab also determined the percentage of "quiet" tags (those that performed so badly they could be read only rarely at full power) and dead tags (those that couldn't be read at all). It found that a random sample of 100 Symbol pharmaceutical tags (model i1030) all functioned properly. However, nearly 20 percent of the Symbol dipole (model i2010) and more than 11 percent of Avery Dennison DS1 tags were dead or quiet.

"Companies need to understand what percentage of tags are likely to be dead or quiet when they decide which tags to purchase," says Deavours, "and they may need to invest in ways to screen out dead and quiet tags."

The RFID Alliance Lab report includes data on how tags perform when they are read alone and when they are read with other tags in the read field. It also reports on how changing the amount of power the reader transmitted to the tag and the amount of power the reader received from the tag affect the performance of an RFID system.

"This report is the first detailed scientific look at the performance of batches of UHF EPC tags," says

Deavours. "It makes essential reading for anyone looking to deploy an RFID system that will perform consistently, and when combined with our first report, A Performance Analysis of Commercially Available UHF EPC Tags, it represents the most complete evaluation of EPC tag performance ever done."