

Wal-Mart Seeks UHF for Item-Level

During a recent webinar, the retailer's RFID solutions architect explained his company's criteria for successful item-level tagging.

By Mary Catherine O'Connor

Mar. 30, 2006—Speaking yesterday to an audience attending *RFID Journal's* webinar entitled "Item-Level Tagging Using UHF Gen 2", Richard Ulrich, solutions architect on Wal-Mart Stores's RFID strategy team, laid out a number of requirements his company has identified as being crucial to the success of item-level tagging. There is a need for low-cost tags and infrastructure that benefit from economies of scale, he said, and a tag used to identify goods at the item level must have a narrow read range to ensure that interrogators built into point-of-sale terminals read only those tags on items being purchased. At the same time, tags on stacked items must be readable so goods sitting on shelves can be read simultaneously.

In addition, since television sets and other large consumer items are packed and sold in single-item cases, they must be read from a distance as they move through portal readers while in transport, and again at short range at the point of sale. Any tag used at the item level must also follow a globally accepted protocol, since goods move between many countries and regulatory environments.

Before defining a strategy around item-level tagging, however, Ulrich said the industry must develop a common approach not only to what technology standards it will use, but also to how it will categorize the goods to be tracked at the item level. For example, he asked, "if Wal-Mart considers aspirin a fast-moving consumer good, and CVS calls it a pharmacy item, how will that impact the manufacturer?" If the pharmaceutical industry decides to use HF tags to identify products, but retailers require only UHF tags at the item level, this could put some manufacturers of goods sold in both retail and pharmacies in a difficult position.

"Gen 2 tags are performing very well at the case and pallet level, but can UHF Gen 2 be used at the item level? If it can, then that's what we need," Ulrich explained. "There are two technology standards for electronic article surveillance, so DVD makers need to use both types of EAS tags. We don't want that same type of thing to happen with RFID."

Chris Diorio, chairman, founder and vice president of RFID engineering at the Seattle-based RFID chipmaker Impinj, and Ian Forster, technical director of RFID for tagmaker Avery Dennison, also spoke during the webinar, which was sponsored by Impinj. Both men expressed their belief that Gen 2 UHF tags can be used at the item level, and presented to webinar attendees the reasons they believe this possible.

The approach is simple, they said: Without altering the Gen 2 chips or the air-interface protocol, manufacturers can use tag and interrogator antennas specifically tuned for near-field operation, which uses the magnetic energy field between the tag and reader antenna to communicate data, thereby shrinking the tag's read range and making the reader's interrogation zone more targeted.

Diorio said the near-field prototype tags and readers Impinj demonstrated last month performed as well as

high-frequency tags when placed on items containing water or metal—notorious for causing RF interference with conventional UHF tags designed for far-field transmissions, or those using the electromagnetic energy field. In fact, he added, Impinj has demonstrated a number of its near-field UHF Gen 2 tags being read while submersed in liquid. This is because the near-field tags transmit through the magnetic field, and their transmissions are unaffected by dielectrics—materials that cannot conduct electricity—whereas the RF signals reflected by far-field UHF tags, which use the electromagnetic field, are attenuated by dielectrics.

Many end users, especially those in the pharmaceutical industry, are testing and using HF tags in pilots because they find that HF offers better performance than the UHF tags on the market today.

ODIN Technologies, a systems integrator based in Dulles, Va., released this week the results of a benchmarking test showing that HF tags outperformed UHF tags in both lab tests and use-case scenarios involving pharmaceutical products tagged at the item level (see Study Says HF Rules for Pharma Items). During the webinar, Diorio said the ODIN report was based on a foregone conclusion because ODIN used only commercially available tags and, therefore, compared HF tags with far-field UHF tags, which are not designed to work at close range. Diorio says tags using UHF Gen 2 chips and antennas designed for near-field RF communication—which he said are months away from being commercially available—are very well suited for the item-level tagging of pharmaceutical products.

In fact, said Diorio, near-field UHF tags have an advantage over HF tags when used in the supply chain, where goods need to be interrogated while in motion, because the higher frequency facilitates faster encoding and reading than HF tags do. Moreover, he said, UHF tag antennas can be built more cheaply and quickly than HF antennas since UHF tags can contain an antenna that is a less precisely designed and conductive.

According to Diorio, Impinj has developed a tag antenna design called the Satellite, which has a small loop antenna in the center, linked to a larger antenna surrounding the loop. The Satellite is designed for both far- and near-field reading. When presented to a near-field reader antenna, it transmits in the magnetic field, and when presented to a far-field reader antenna, it functions like a far-field tag, using the electromagnetic field.

Forster says Avery Dennison has been working with Impinj to develop EPC Gen 2 inlays using near-field antennas. Exploiting a UHF tag's near-field capacity is nothing new, he explained—RFID printer-encoders such as those manufactured by Avery Dennison use near-field reader antennas to encode and verify the UHF tags embedded in smart labels. Avery Dennison also uses near-field reader antennas in its tag-testing machinery. According to Avery Dennison senior business development manager Andy Holman, two inlays in the company's recently expanded Gen 2 portfolio (see Avery Dennison Unveils New Gen 2 Inlays) use near-field antenna designs. Specifically, the AD-811 and AD-812 inlays for pharmaceutical applications contain an antenna designed solely for near-field transmissions, while the AD-820 and AD-821 inlays for apparel and other item-level applications contain an antenna designed for both near- and far-field.

If using UHF tags to track goods at the item level requires nothing more than new antenna designs, if none of the air-interface or chip specifications need to change, and if printer-encoders already use near-field to produce smart labels, then why is the concept of a near-field UHF tag for item-level tagging just now coming to the fore?

"Nobody was asking the questions," explained Diorio. "Everyone was too focused on case- and pallet-level tags. But the technology was there—it only took us about four weeks of experimentation to make our first prototype."