

A new chipless RFID transponder made of nano-resonant fibers could be invisibly integrated into packaging and labels to enable authentication and thwart counterfeiting.

By Jonathan Collins

March 26, 2004—[Tapemark](#), a manufacturer of packaging and packaging materials, says it will use a new technology, called Chipless ID, to embed RFID transponders into packaging, paper or film. Invisible to the eye, each transponder emits a unique signal that cannot be forged, making the technology particularly suitable for authentication, anticounterfeiting and security applications.

Each Chipless ID transponder consists solely of a passive antenna. The process to make the antennas is proprietary, but the company says they consist of very small fibers (which Tapemark calls nano-resonant structures) as small as 5 microns in diameter and 1mm in length. By using a combination of these structures, Tapemark says, it can build antennas with distinct spatial differences that can be detected by specialized readers. Like radar, the readers work by sending out a coherent pulse or radio waves toward a transponder and receiving an interference pattern back that is processed and identified. The frequencies used by Tapemark range from 24 GHz to over 60 GHz—well above conventional UHF frequencies and the 2.4GHz microwave frequency set out by EPCglobal. Nevertheless, the company says that it can see uses for the technology in the supply chain, although the most immediate interest in the technology is for covert and security applications.



Ralph Omohundro

Tapemark did not develop the Chipless ID technology itself, but has licensed it from another company. Stressing the security and potentially covert nature of Chipless ID and its possible uses, Tapemark is unwilling to reveal the company it is licensing the technology from or the name of its only customer using the technology in a trial. Indeed, Tapemark will not even divulge the customers it already has for some of its existing secure inks and packaging products.

However, it does say that it foresees applications for the technology that could see single customers buying the tags in quantities "in the billions." By doing away with the need for a chip, the company believes that adoption of the licensed Chipless ID technology will be driven by the significantly lower cost of its antennas.

"We should be able to produce tags at more than 50% less than tags with chips," says Ralph Omohundro, security products manager at Tapemark, which is based in West St. Paul, Minn. Depending on the volume sales and the size of the antennas required by an application, the company says it can see its Chipless ID tags priced at five cents each.

Using the technology, Tapemark can embed fibers in paper labels to create passive antennas

undetected to the eye, making them particularly suitable for authentication or product and package security applications. Since each Chipless ID antenna is physically unique and thereby creates a unique interference pattern, it can be assigned a unique serial number that can be tracked and traced from creation of the product through distribution. The read range can be up to five feet in the lab but in most applications, the read range required will likely be no more than a few inches, according to the company.

Tapemark's Chipless ID will help ensure a product or package's authentication and security by adding RFID capabilities overtly or covertly into the product label or packaging. The U.S. Food and Drug Administration has recommended that product manufacturers use anticounterfeiting technology whereby items carry some kind of unique identification to ensure they are genuine. The company stresses that the technology it has licensed will be particularly suited for this job because the spatial pattern of nano-resonant structures in each transponder is randomly generated when the tag is created and therefore unique. Consequently, the signal it generates when read by a reader is unique. In addition, that unique signal in turn is converted into a random number in related software. "Because the number is random, there is no code or duplicate number that can be copied. The original database generated and tracked cannot be compromised because you cannot predict what numbers it contains," says Omohundro.

Tapemark says it will turn to systems integrator partners to help deploy its Chipless ID offerings for customers, and that readers for the technology have to be custom developed with regard to the each application that uses the technology. The company says it is currently targeting the medical, pharmaceutical and consumer products industries as potential markets for its technology.

Tapemark, however, is not the only company offering chipless transponders. Last month, an Israeli startup named CrossID announced it had developed a chipless RFID system that uses 70 different chemicals, each of which emits its own distinct radio frequency when bombarded with electromagnetic waves from a reader. (See [Firewall Protection for Paper Documents](#).)