New Ear Tags for Animals

Low-cost HF and UHF identification tags for cattle, pigs and chickens could speed up RFID adoption in the livestock industry.

March 31, 2008--Many governments are encouraging or mandating the use of RFID tags to track cattle, pigs and chickens, to protect their food supply from contamination and spoilage. Some livestock producers have been using low-frequency RFID ear tags for animal identification and weight monitoring. The LF ear tags are rugged and can withstand water and animal-generated damage, but many breeders say the tags are too expensive. The high price can be attributed to the antenna construction, which uses fine wire coils for coupling with RFID interrogators.

The Auto-ID Lab at Adelaide has been researching RFID antenna properties. This past year, with the increasing standardization of high- and ultrahigh-frequency Electronic Product Code technologies, we investigated whether these frequencies would allow production of lower-cost animal ID tags that would provide satisfactory performance. We defined satisfactory performance as the ability to read the tags and identify specific animals in a suitably confined area. Our research and testing was supported in part by the Australian Pork CRC.

We designed prototype HF and UHF animal ID tags using low-resolution lithography to print the antennas, which is less expensive than using wire coils. In addition, we used UHF EPC Gen 2 chips, which are manufactured in large quantities and are thus becoming relatively inexpensive.

We were concerned about performance, because both the HF and UHF tag antennas are small. A small tag antenna requires special properties to emit a strong reply signal. At HF, it needs to be sharply tuned. We designed the HF prototype tag with a frequency adjustment so the eventual production design would have the right tuning. At UHF, inexpensive built-in matching elements are needed to achieve an appropriate form of matching between antenna impedance and chip impedance. We designed the UHF tags so the matching could be achieved by antenna elements printed by low-resolution lithography.

To test the performance of both tags, we installed HF and UHF interrogators in a pig feeder in an interstate piggery. We fitted 26 HF ear tags and 30 UHF ear tags to pigs. The system operation was monitored remotely from the Auto-ID Lab in Adelaide.

Our test of the prototype tags in the piggery showed the HF tags to be highly but not completely reliable. Construction of more robust prototypes with better conductive glue would probably have provided complete reliability. We do not plan to do further testing with HF tags, mainly because EPCglobal HF standards are still in a state of flux, and low-cost HF chips are not likely to be available until standards for HF tags with wide application are defined.

But we were excited to find that the UHF tags were completely reliable. That's good news, because the tag antenna's interior structure and the matching network were easy and economical to construct. Since EPC Gen 2 chips are abundantly available, if RFID vendors manufacture tags based on the UHF prototype, livestock producers should find it more economical to RFID-tag animals.

Peter Cole is research director of the Auto-ID Lab at the University of Adelaide. He is also professor of RFID systems at the university's School of Electrical and Electronic Engineering.