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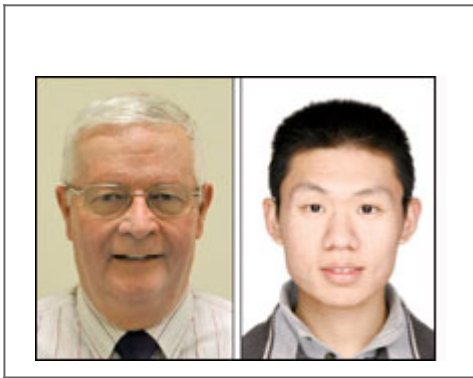
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## Securing Small Shipments

Currently, most shipping containers are secured with mechanical seals that employ simple bolt or cable-lock mechanisms. But a bolt or lock can be removed and replaced without the shipper's knowledge. Some companies have begun to use electronic seals that have physical protection, such as a bolt, as well as a sensor that can monitor for tampering, or some other electronic way to ensure goods are protected. And

some e-seals include active or passive radio-frequency technologies to secure containers, as well as provide supply-chain visibility.

But these RFID e-seals are not designed for small boxes or cases. The Wi Protect Company, an RFID solutions provider in Sydney, Australia, recently asked the Auto-ID Lab at the University of Adelaide to develop an electronically readable tag to secure small shipping cases, such as ammunition, file or medical boxes. Another objective was to make the RFID e-seal cost-effective to deploy, which could best be achieved with shipping boxes that have a fixed chamber.



We designed the RFID tag to have an “off-on-off” function. The first “off” means that before the RFID-enabled e-seal is attached to a box, the tag cannot be detected by an RFID reader. The “on” means that when the e-seal is attached to the box, the tag becomes readable and can be monitored remotely. The second “off” means the tag cannot be detected by a reader, and occurs when the e-seal has been compromised or broken to gain access to the box.

It may seem that the first “off” is not very important in the overall protection scheme, but it is required to prevent an unscrupulous person from improperly attaching the e-seal to the box, allowing the tag to be read although the seal was not secured. Consequently, the tag’s status in the view of the reader would always be “on,” even though the box might have been opened.

In our design, the first “off” is realized by disconnecting the antenna from the tag microcircuit while simultaneously placing a short circuit across the antenna to render it ineffective. So unlike other e-seals, when the reader is moved close to the tag, the tag cannot be read before it is attached on the box. The final “off” operation occurs when an intruder or legitimate user breaks the seal to open the box, thereby disconnecting the tag antenna and chip.

The e-seal, which measures roughly 70 millimeters by 45 millimeters (2.8 inches by 1.8 inches), has a read range of 500 millimeters (20 inches). We believe a much longer read range could be obtained in a future version using modified materials.

Wi Protect patented the RFID-enabled e-seal, which works only with boxes that have a permanently attached chamber. The next step is to develop this solution for shipping bags.

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