Smart Paper Makes Traceable Money Possible

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A simple act of cash changing hands could become a lot less private. U.S. researchers have developed a new way of embedding traceable chips within "smart" paper—raising the possibility of banks and governments guarding against counterfeiting and even tracking the usage of paper money.

The new method of embedding radio frequency identification chips (RFID) in paper came from North Dakota State University in Fargo. Researchers used a patent-pending technology—called Laser Enabled Advanced Packaging (LEAP)—to transfer and assemble the traceable RFID chips on paper. Such "smart" paper could lead to new types of banknotes, legal documents, tickets and smart labels.

"I believe our scheme is the first to demonstrate a functional RFID tag embedded in paper," says Val Marinov, an associate professor of industrial & manufacturing engineering at North Dakota State University, in a BBC News interview.

The idea of RFID technology enabling the future of smart money has also encouraged the European Central Bank and the Bank of Japan to launch separate projects based on that possibility. Saudi Arabian researchers have also begun their own efforts to embed RFID chips in Saudi Arabian currency.

Any effort to embed RFID chips in paper must overcome such challenges as keeping the RFID chip thin, making the chip durable enough to survive the rough-and-tumble life of cash, and being cheap enough to make the printing of smart money worthwhile. Such flexible but tough qualities could also prove useful in applications beyond smart paper.

Marinov says his team's laser method is twice as fast as fast as current manufacturing methods and is also cheaper. His group is presenting the work at the the IEEE RFID 2013 conference in Orlando, Fla., from April 30 to May 2. He also explains the method in additional detail in a press release:

We use our LEAP technology to embed ultra-thin, ultra-small semiconductor chips, including 350 µm/side, 20 µm thick semiconductor dice, in paper substrates with a thickness of <120 µm.

LEAP can quickly and precisely place ultra-thin semiconductor chips at specific locations and orientations on both rigid and flexible materials—an approach that could enable other chip-embedded devices such as smart clothing. Similar ideas for adapting electronics to flexible materials have emerged in Kovio's printable electronic ink and printable RFID tags developed by researchers at Sunchon National University in South Korea and Rice University in Houston.

If LEAP can deliver what it promises, the technology could enable the spread of RFID chips in applications as diverse as public transit smart cards and product labels—not to mention help make RFID chips cheaper overall. Such cheap, widely-deployed RFID technology could transform everything about doing business—all the way down to the cash changing hands.

Banks and governments have played up the idea of using the RFID chips to verify the authenticity of paper money in an effort to fight counterfeiting. Law enforcement agencies could also track smart money as part of its efforts to fight drug trafficking or other organized crime schemes.

But the applied RFID technology could also herald a future world where trackable banknotes further diminish the privacy of how people use money. For instance, the government might track the flow of money in the so-called "gray economy" that relies on mostly untraceable cash exchanges.

Photo: NDSU