# IBM Research Report

# Privacy-Enhancing Radio Frequency Identification Tag: Implementation of the Clipped Tag

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# Privacy-Enhancing Radio Frequency Identification Tag: Implementation of the Clipped Tag*

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## Introduction – Enhanced Privacy for Item-level RFID

As the implementation of radio frequency identification, RFID, tagging of pallets and cases for the retail supply chain proceeds, attention is being given to the possibility of RFID tagging for individual retail items.  The sale of tagged retail goods gives rise to measures to enhance consumer privacy.  Ultra-high frequency tags may be read by wireless means of distances up to around 30 feet (10 meters).  High frequency tags also may be read wirelessly, but generally at a shorter range.

Mechanisms have been proposed to address enhanced consumer privacy upon the introduction of item-level tagging.  One of them is the use of "Blocker Tags" [1] proposed by RSA Laboratories, a security and privacy organization.  These tags interfere with the reading of other RFID tags. They must be carried by the consumer. Another mechanism is the EPCglobal Gen2 protocol "Kill" command [2] which deactivates tags permanently. The Kill command is executed by the retailer at the point-of-sale.  Killed tags cannot be revived.

The privacy-protecting tag, called the "Clipped Tag" has been suggested by IBM as an additional consumer privacy mechanism [3]. The Clipped Tag puts the option of privacy protection in the hands of the consumer. It provides a visible means of enhancing privacy protection by allowing the transformation of a long-range tag into a proximity tag that still may be read, but only at short range – less than a few inches or centimeters. This enables later use of the tag for returns, recalls or recycling.
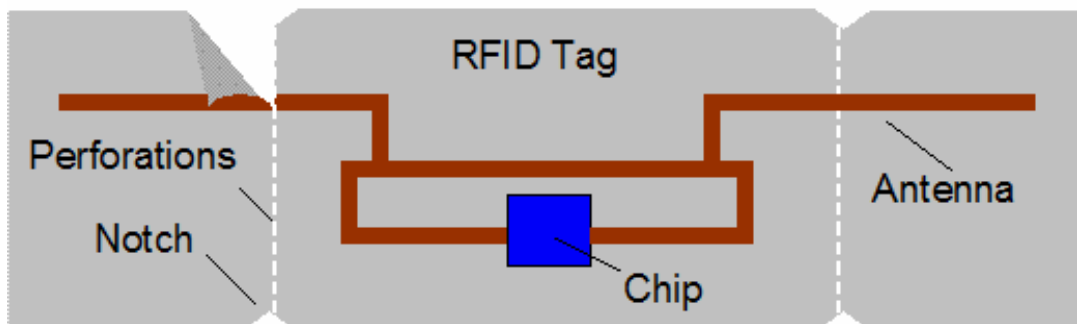


**Figure 1.  Schematic diagram of privacy-enhancing RFID tag (Clipped Tag).**

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The Clipped Tag proposal suggests ways in which a portion of the antenna may be removed by a consumer after the point-of-sale. Figure 1 shows a schematic of the tag. A notch or slit has been placed on the edge of the plastic film, providing a means for tear initiation, similar to the slits placed in ketchup packets or snack-food bags. The tear may be directed by the use of additional perforations. The result of the tear is to remove a portion of the antenna. An implementation of the Clipped Tag for a garment hang tag label is shown below.

**Implementation of the Tag**

Marnlen RFiD, a leading manufacturer of RFID labels, designed and manufactured samples of garment hang tags. The starting point was the Alien Technology, ALL-9440 (Squiggle 2.2) Gen2 UHF RFID tag inlay. This tag may be read at distances of 30 feet (10 meters).
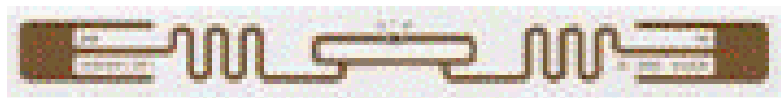


**Figure 2. Alien Technology© ALL-9440 (Squiggle 2.2) Gen2 UHF RFID tag.**

The Alien tag inlay was incorporated into a printable garment hang tag or label by Marnlen RFiD. The label contains notches for tear initiation and perforations to direct the tear, Figure 3.
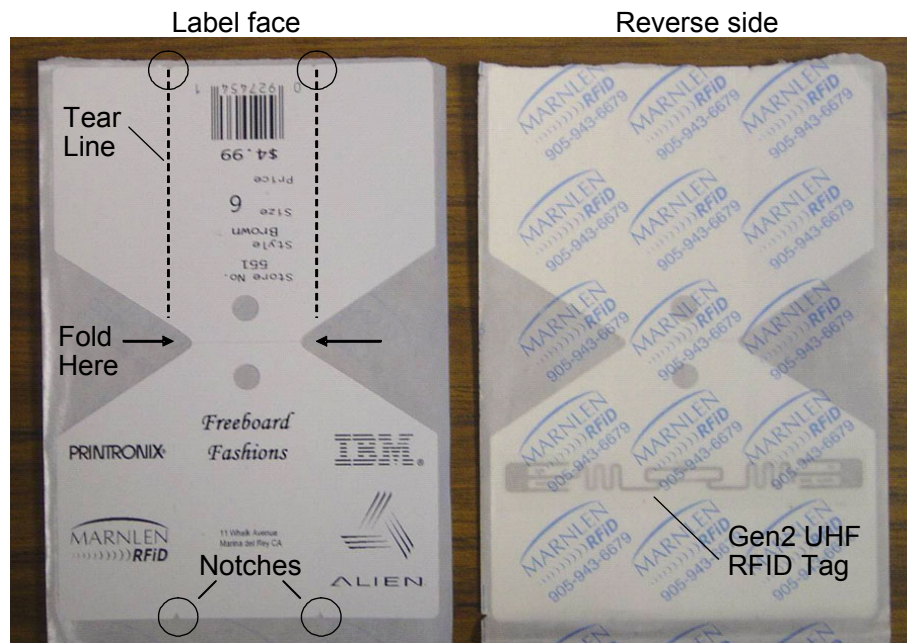


**Figure 3. Garment hang tag by Marnlen RFiD on printer roll.**

The tag design is consistent with the printing of graphics and the writing of tag information in a standard RFID printer. The tag shown in Figure 3 was used with a Printronix SL5000r MP2 RFID printer.

**Figure 4. Tags are printed on Printronix SL5000r MP2 RFID printer.**

The printed tags are pealed from the printer roll and folded to provide the garment hang tag shown in Figure 5.
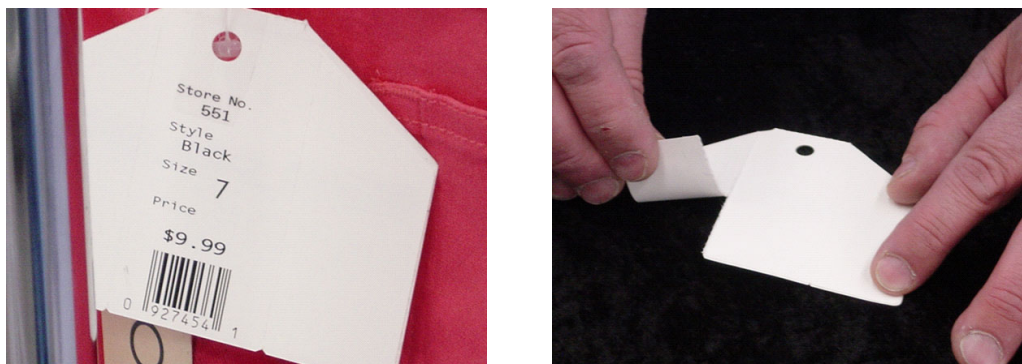


**Figure 5. (a) Garment hang tag and (b) process for partial antenna removal.**

The hang tags, Figure 5a, may be torn at the point-of-sale by the consumer to remove parts of the antenna, Figure 5b. The result is a reduction in tag read range from 30 feet (10 meters) to about 1 inch (2 cm) when the tags were read with an Alien ALR-9800 RFID reader. Similar results were obtained for Clipped Tags with hand held readers. Read distances of several meters were reduced to a few cm.

**Conclusions**

The privacy-protecting or Clipped Tag has been demonstrated to be a viable addition to the privacy mechanisms proposed for the use of RFID in the consumer space. The Clipped Tag labels may be manufactured using standard RFID inlays. The design of the tag is consistent with commercially available readers and printers. The use of the tag can put privacy protection in the hands of the consumer while providing the consumer with a visible confirmation that the tag has been modified. The tags may still be used after modification for returning items.

**References**

1. Ari Juels, Ronald L. Rivest, and Michael Szydlo, *The Blocker Tag: Selective Blocking of RFID Tags for Consumer Privacy*. In V. Atluri, ed. 8th ACM Conference on Computer and Communications Security, pp. 103-111. ACM Press. 2003.

2. EPCglobal Inc., *Class 1 Generation 2 UHF Air Interface Protocol Standard Version 1.0.9*, http://www.epcglobalinc.org/standards_technology/ratifiedStandards.html

3. Guenter Karjoth and Paul Moskowitz, *Disabling RFID Tags with Visible Confirmation*, WPES '05, Proceedings of the 2005 ACM Workshop on Privacy in the Electronic Society, pp. 27-30, Alexandria, VA, November 7, 2005, ACM Press, 2005.