

2026 年 9 月 9 日

Keio Research Institute at SFC

Japan Radio Co., Ltd

UPR Corporation

**World' s First Prototype of a New Wireless Tag
Integrating Active and Passive RFID
–Aiming to Enhance Logistics Convenience for Future
Use in Pallet Management Systems–**

Keio University, UPR Corporation, and Japan Radio Co., Ltd. (hereinafter referred to as “the three parties”) have jointly developed a prototype of a new wireless tag (provisionally named the “DXh tag”), which extends the functionality of the wireless tag (DX tag) used in UPR’s pallet management system “Smart Pallet,” a system utilizing wireless communication jointly developed and deployed by UPR and JRC. “Smart Pallet®” has been in operation for nearly ten years and is used by many customers. Going forward, the three parties will further promote research and development of the new tag based on this prototype and contribute to greater efficiency in future logistics operations.

The conventional DX tag is an active RFID device powered solely by a primary battery, , featuring long-range communication and long service life. In contrast, the DXh tag combines the DX tag with a passive RFID chip that enables battery-less wireless communication. This hybrid design realizes passive wireless communication that allows for fast data reading and writing without using a battery. Sensor-enabled RFID was approved as the international standard ISO/IEC 18000-65 in February 2026, and this is the world’s first 920 MHz-band active/passive hybrid tag.

By integrating the DXh tag into the Smart Pallet system, more flexible and advanced operation becomes easier. Major benefits include modifying various system parameters such as transmission radio frequencies, trigger ultra-low power wake-ups from sleep mode, facilitating joint collection of pallets that already carry standard UHF-band passive RFID tags, and streamlining cargo tracking by rapidly linking the pallet with the tagged cargo it carries.

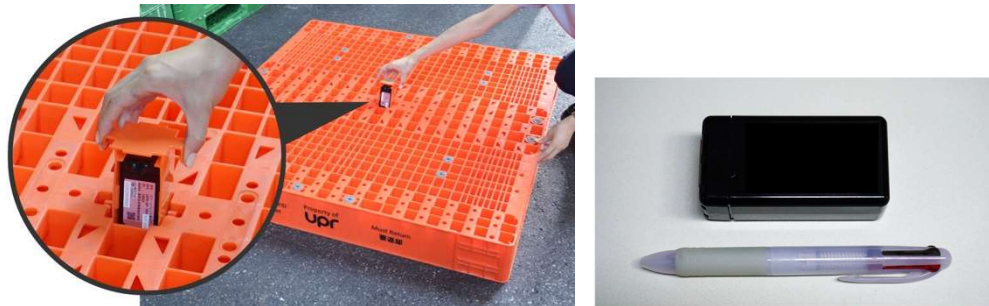
Background

Pallets are indispensable in logistics, with approximately 500 to 600 million units in use in Japan alone. While pallets circulate both domestically and internationally, their management—including storage, collection, cleaning, and location management—requires significant effort, and losses are not uncommon. In response to the need to reduce management burdens and address logistics challenges such as the “2024 problem,” the use of rental pallets has been steadily increasing.

UPR Corporation, which provides rental and management services for pallets and logistics equipment, developed “Smart Pallet” in 2015, a pallet information management system that attaches wireless tags developed by JRC, known as DX tags, to pallets in order to identify the location of logistics containers and streamline their collection, cleaning, and reuse. The active RFID devices incorporated in these DX tags are manufactured by Nagano Japan Radio Co., Ltd., and more than 500,000 units have been deployed to date, contributing to the automation and efficiency of pallet management operations.

DX tags are active RFID devices powered by primary batteries and capable of transmitting radio signals on their own. By limiting their operation to intermittent transmission and management

modes, they have achieved both a communication range up to 300 meters and a long operating life of approximately ten years without battery replacement. At the same time, other companies have also been pursuing the use of standard passive RFID tags in the UHF band. Although their communication range is limited to several meters, these tags enable rapid data reading and writing without the need for battery replacement.



DX tags incorporated in the central section of the Smart Pallet

Challenges of DX Tags

To enable long-term use of approximately ten years, DX tags employ a power-saving design based on intermittent transmission. At the same time, there was room to further improve operational convenience, including the time required for setting changes to take effect and location tracking according to battery status.

By combining the DX tag with a standard passive RFID tag in the UHF band, the system enables coordination with different pallet management environments and supports further efficiency in logistics operations, such as joint shipment and collection, as well as batch inspection that links cargo and pallets. In addition, by taking advantage of the respective characteristics of each type of RFID, it realizes flexible pallet management according to the purpose of use, from wide-area location tracking to detailed position identification on the order of several meters.

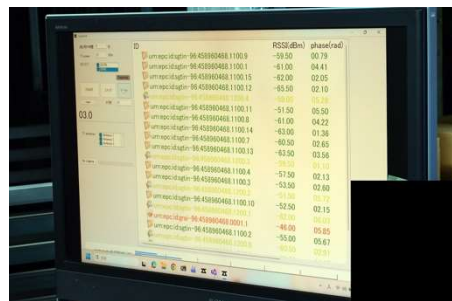
Solution through RFID Integration

To address these challenges, the three parties developed a prototype of the DXh tag by integrating into the DX tag a passive wireless chip compliant with ISO/IEC 18000-65, a new sensor-enabled RFID protocol being researched and developed by Keio University and others. The DXh tag enables data linkage through both active and passive wireless communication. This system represents the world's first practical demonstration of a pallet information management system compliant with ISO/IEC 18000-65.

In addition to the long-range, long-life active RFID functions of conventional DX tags, the DXh tag integrates passive communication functions that enable rapid data reading and writing without requiring a battery. This makes flexible and practical operation possible in situations that were previously difficult to handle, including on-site setting changes, tag confirmation after battery depletion, and joint collection operations. Specifically, the system enables changes to settings such as radio transmission frequency, ultra-low-power wake-up from sleep mode, joint pallet collection,

and cargo tracking management through rapid association of pallets with cargo carrying wireless tags.

The three parties constructed a demonstration system using the DXh tag at UPR's pallet depot in Ichihara City, Chiba Prefecture, and conducted evaluation testing in July 2026.



Smart Pallets equipped with DX tags
passing through a gate, with cargo
linked to the corresponding
ID read when passing through
the gate

This work includes the results of the research and development for expanding radio resources (JPJ000254) of the Ministry of Internal Affairs and Communications.

* As a 920 MHz-band tag compliant with the ISO/IEC 18000 series (according to a survey by the three parties as of July 29, 2026).

Related Links

SFC Research Institute Press Release

Inquiries regarding this matter

Japan Radio Co., Ltd. Connected Systems Division

Sales Department, Wireless Communications Sales Group

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Related Links

- Japan Radio Press Release

<https://www.jrc.co.jp/en/news/2026/0909-1>

- UPR Press Release (Japanese only)

<https://www.upr-net.co.jp/articles/news/pr/20260909/>

※This press release has been sent to the social affairs desks of newspapers.

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