

News Release

FOR IMMEDIATE RELEASE

Successful prototyping of a rotating polarized wave receiver for high-quality wireless communication in manufacturing environments

To contribute to increasing reliability of IoT systems

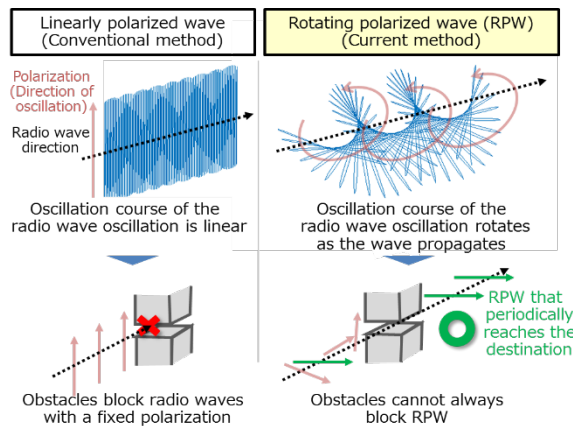


Figure 1: Comparison of waves in linear and rotating polarization

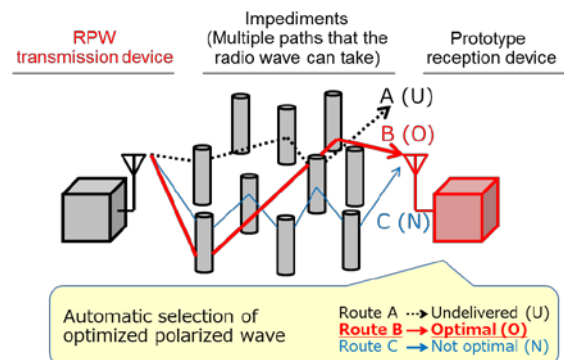


Figure 2: Image of the prototype receiving an optimal polarized wave

Tokyo, September 11, 2017 --- Hitachi, Ltd. (TSE: 6501, Hitachi) today announced the successful prototyping of a rotating polarized wave (RPW) receiver that ensures high-quality wireless communication even in manufacturing environments which have poor reception due to the presence of many physical structures such as those made of metal or concrete which obstruct radio communications. RPW differs from conventional wireless communication (with linearly polarized wave⁽¹⁾) as it employs an original transmission method developed by Hitachi whereby rotating the oscillation direction (polarization) of the radio waves enables the waves to reach their destination even in environments where there are many impediments (Figure1). High-quality communication can be achieved with the prototype wireless receiver developed, as the optimal rotated wave for reception is automatically selected from among the transmitted RPW (Figure2). A field test conducted in a Hitachi factory floor environment (270m×30m×20m) that had several impeded reception points⁽²⁾ with conventional wireless methods due to the radio waves being reflected by metallic structures and other impediments, confirmed that good communication⁽³⁾ was possible at all points with the prototype. Hitachi will accelerate the development and practical application of RPW wireless communication technology through further field tests, for use in IoT⁽⁴⁾ systems which demand a high level of reliability.

In recent years, the adoption of IoT systems that use sensors installed in equipment and wireless networks to monitor and control operations, is increasing in order to achieve highly efficient operations. However, as linearly polarized waves that can only transmit waves oscillating in fixed directions are used in current wireless communication, there are certain points where reception is impeded due to the layout of the manufacturing floor or position of the receiving devices. To resolve this, Hitachi proposed a new method of wireless communication using RPW in 2010, and independently verified the principle. However, as the rotating waves reached the receiver from multiple directions, it was difficult to efficiently receive and demodulate⁽⁵⁾ signals.

To address this, Hitachi then selected the optimal polarized wave by evaluating the reception status of the RPW arriving from the multiple routes (propagation channels) to the receiver, and developed the demodulation technology. Specifically, the reception status is evaluated on the arrival of the data header (packet) sent by radio wave, and then the direction of the polarized wave which provides the best communication quality is selected. Then, in receiving the following data transmission, only the polarized waves in the direction selected are extracted and demodulated. Applying this technology to wireless receivers, Hitachi developed a prototype receiver that can maintain good quality communication regardless of the presence or absence of impediments, or layout.

Hitachi aims to promote the use of RPW wireless communication technology in IoT systems through further field validation tests.

A part of this research will be presented at The Institute of Electronics, Information and Communication Engineers (IEICE) Society Conference to be held from 12th to 15th September 2017 at the Tokyo City University in Tokyo, Japan.

- (1) Linearly polarized wave: A radio wave that does not change oscillation direction.
- (2) Impeded wireless communication: Wireless communication with an error rate of 0.1 or higher. The error rate refers to the ratio of packets that were sent by the transmitting device but could not be demodulated by the receiving device.
- (3) Good quality of communication: Wireless communication with an error rate under 0.01.
- (4) IoT: Internet of Things
- (5) Demodulation: Restoring a sent radio signal to the original signal (data).

About Hitachi, Ltd.

Hitachi, Ltd. (TSE: 6501), headquartered in Tokyo, Japan, delivers innovations that answer society's challenges. The company's consolidated revenues for fiscal 2016 (ended March 31, 2017) totaled 9,162.2 billion yen (\$81.8 billion). The Hitachi Group is a global leader in the Social Innovation Business, and it has approximately 304,000 employees worldwide. Through collaborative creation, Hitachi is providing solutions to customers in a broad range of sectors, including Power / Energy, Industry / Distribution / Water, Urban Development, and Finance / Government & Public / Healthcare. For more information on Hitachi, please visit the company's website at <http://www.hitachi.com>.

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