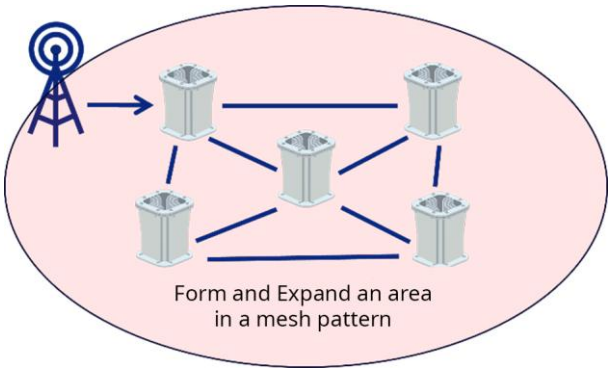
Press information

KDDI and Kyocera succeeded in developing wireless relay technology that dramatically expands millimeter-wave coverage

28 GHz road coverage in the Shinjuku area in Tokyo, Japan expanded from 33% to 99%, accelerating the utilization of high-frequency bands.

Kyoto/Tokyo/London, 4th March 2025. KDDI Corporation and Kyocera Corporation announced that for the first time in the world, they had developed a new wireless relay technology that dramatically expands the millimeter-wave (28 GHz band) coverage in urban field testing, significantly enhancing the potential of 5G communications.[1] This new technology implemented in miniaturized repeaters was deployed in Tokyo's Nishi-Shinjuku area in October 2024, and initial testing tripled the millimeter-wave street coverage from 33% to 99%, compared to the absence of repeaters. Testing will continue through March 31, 2025, toward a goal to commercialize this technology within 2025 for stable, high-speed communication in dense service areas such as urban centres, transit stations, and stadiums.

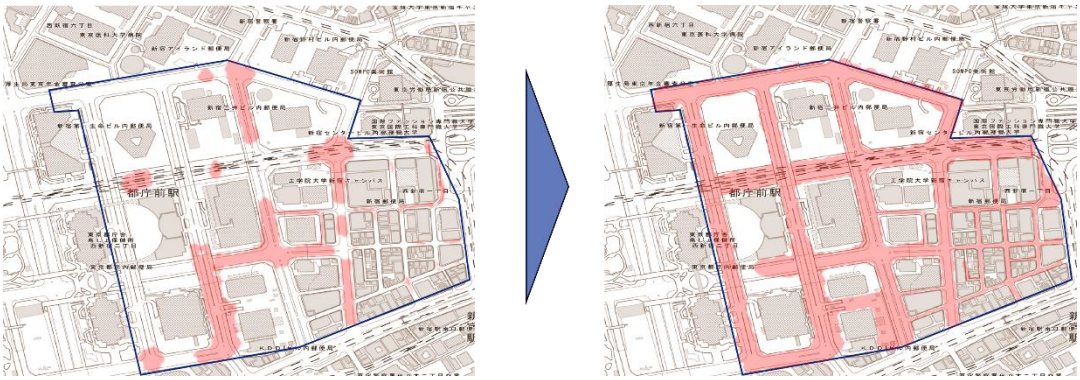
Repeaters employing the KDDI/Kyocera technology enable the formation of a network in a mesh pattern autonomously to expand the coverage area. This solution replaces the conventional concept of independent "transmit" and "receive" functions of repeaters by dynamically switching roles between transmission and reception and adapting seamlessly to the wireless environment. This realizes autonomous and continuous coverage area formation in collaboration with other millimeter-wave base stations.



Wireless relay technology to expand millimeter-wave area

[1] World's first millimeter-wave relay technology that autonomously forms and reshapes coverage areas, as of December 16, 2024; according to KDDI's research.

Repeater installation in Nishi-Shinjuku area (Tokyo, Japan)



Expanding street coverage from 33% to 99% before and after repeater installation

Created by KDDI based on a map from the Geospatial Information Authority of Japan

With its high-speed communication capabilities, the millimeter-wave band holds immense potential for expanding 5G deployment, especially in high-traffic areas such as railway platforms, stadiums, and meeting points. However, due to the strong directivity of millimeter-wave signals and their susceptibility to interference from buildings and trees, when antennas are installed on building rooftops, as is the case with other frequency bands, the millimeter-wave coverage tends to be formed in small, scattered areas, requiring significant investment in base stations for continuous and dense deployment. Overcoming these challenges is crucial to unlocking the full potential of millimeter-wave technology.

This technology enables the repeater to autonomously form a relay network for the received base stations and efficiently expand the millimeter-wave area. Repeaters implementing this technology collaborate with each other and are connected in a mesh pattern, making it possible to dramatically expand the millimeter wave area.

The KDDI/Kyocera repeater requires only a power supply and does not require backhaul lines, offering easy installation and low operating costs. Its miniaturized enclosure and lightweight

simplify network expansion by allowing installation on existing infrastructure, including streetlights.

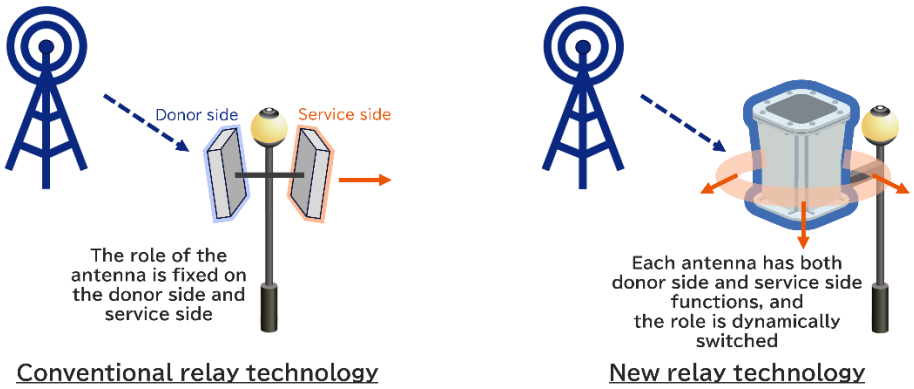
During the field testing, 22 repeaters were installed on streetlights and underground transit entrances owned by the Tokyo Metropolitan Government and Shinjuku Ward, utilized under the "Connected TOKYO" framework to promote 5G.[2] Testing began on October 29, 2024, and confirmed that street coverage tripled from 33% to 99% compared to the absence of repeaters in an approximately 600-meter square area in the Nishi-Shinjuku district.

New repeater benefits

Autonomous area formation

In conventional relay technology, antennas are designated as donor sides for receiving signals from base stations and service sides for transmitting. Area construction requires adjusting the roles and direction of each antenna. In contrast, this relay device allows each antenna to dynamically switch between donor and service functions, with the antenna receiving signals from the millimeter-wave base station acting as the donor side and the other antennas as the service side. This enables efficient millimeter-wave area formation and expansion, with devices interconnecting in a mesh pattern.

This feature eliminates the need for role adjustments and antenna alignment, offering greater installation flexibility and simplifying construction design.

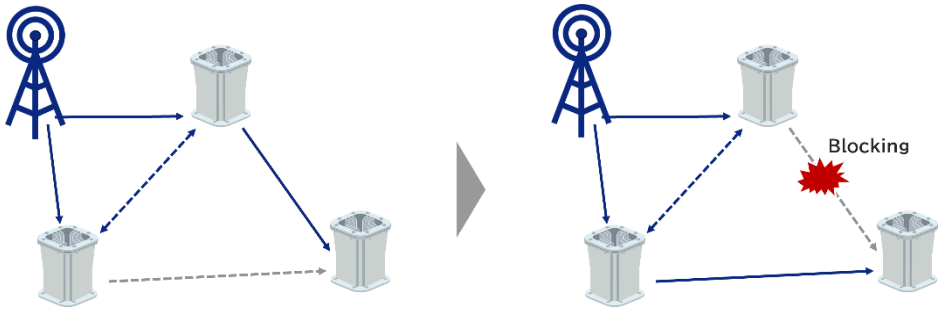


Comparison of conventional relay technology and new wireless relay technology with mini repeaters

[2] "Connected Tokyo" 3-year action plan (Tokyo Metropolitan Government) (in Japanese only).

Optimizing relay routes

The new repeaters select the relay route with the best signal quality among millimeter-wave signals from multiple directions, forming a network in a mesh pattern. The repeaters detect signal deterioration from the base station and other repeaters, instantly calculating the optimal relay route and switching. If one relay route is inhibited by environmental changes, such as the construction of buildings, trees, or large trucks blocking the signal, the repeaters continuously select more optimal relay routes.



Optimization of relay routes

Compact and lightweight

The new KDDI/Kyocera repeaters measure just 216 mm x 216 mm x 246 mm and weigh only 4.9 kg. Compared to conventional millimeter-wave base stations, they reduce size and weight by about 70%. This simplifies installation by allowing a new range of existing-mount options, including streetlight infrastructure, minimizing impact on the landscape and environment.

About the field testing of this technology

1. Overview

- To confirm the effect of expanding the millimeter-wave area with these repeaters, field tests were conducted by installing repeaters on assets owned by the Tokyo Metropolitan Government and Shinjuku Ward. A total of 22 repeaters were installed in the Nishi-Shinjuku building area, and confirmed that the street coverage expanded from 33% to 99% compared to the existing millimeter-wave coverage.
- It was confirmed that the signals transmitted by these repeaters do not interfere with the signals transmitted from the same base station, allowing the millimeter-wave area to be expanded without the need for interference design.

2. Field testing period

- From October 29, 2024, to March 31, 2025.

3. Field testing location

- Nishi-Shinjuku district, Shinjuku Ward, Tokyo, Japan.

4. Roles of each company

KDDI	Developing millimeter-wave relay technology; planning/executing field testing.
Kyocera	Developing millimeter-wave repeaters.

5. Acknowledgement

Tokyo Metropolitan Government	Providing access to streetlights owned by Tokyo Metropolitan Government in Nishi-Shinjuku district.
Shinjuku Ward	Providing access to streetlights owned by Shinjuku Ward in the Nishi-Shinjuku district.

Images are available for download by clicking on the following link:
https://spgroup.box.com/s/85kyagaw393x6bxqmfo4agqrx9hqv60v

For more information on Kyocera: uk.kyocera.com

About Kyocera

Kyocera has been successful in Europe for over 50 years. From its European headquarters in Esslingen am Neckar, KYOCERA Europe GmbH operates 28 sites including manufacturing facilities, with products ranging from fine ceramics, electronics, automotive, semiconductor and optical components to industrial tools, LCDs, touch solutions, industrial printing components, solar systems and consumer goods such as kitchen and office products.

KYOCERA Europe GmbH is a company of the KYOCERA Corporation headquartered in Kyoto/Japan, a world leader in semiconductor, industrial and automotive components as well as electronic components, printing and multifunction systems, and communications technology. The technology group is one of the world's most experienced manufacturers of smart energy systems, with more than 45 years of industry expertise. The Kyocera Group comprises 292 subsidiaries (31 March 2024). In England, Kyocera has a subsidiary in Frimley, KYOCERA Fineceramics Ltd. With around 79,200 employees, Kyocera generated net annual sales of around EUR 12.29 billion in the 2023/2024 fiscal year.

Kyocera is ranked 874 on Forbes magazine's 'Global 2000' list for 2024, and ranked as 'The 100 Most Sustainably Managed Companies in the World' according to the Wall Street Journal. For the second year in a row, Kyocera qualified for the Dow Jones Sustainability Index (Asia-Pacific). As well, Kyocera receives a Bronze rating on EcoVadis Sustainability Survey and was acknowledged as a 'Top 100 Global Innovator 2023' for the second consecutive year, being one of the world's leading innovators, for the eighth time by Clarivate.

Kyocera also takes an active interest in cultural affairs. The Kyoto Prize, a prominent international award, is presented each year by the Inamori Foundation — established by Kyocera founder Dr Kazuo Inamori — to individuals worldwide who have contributed significantly to the scientific, cultural, and spiritual betterment of humankind (equivalent to approximately €596,500 per prize category).

Contact
KYOCERA Fineceramics Ltd.
Allan Martin
General Manager
Prospect House, Archipelago,
Lyon Way, Frimley, Surrey.
GU16 7ER United Kingdom
Tel: +44 1276 693450
E-mail: PR@kyocera.de
uk.kyocera.com