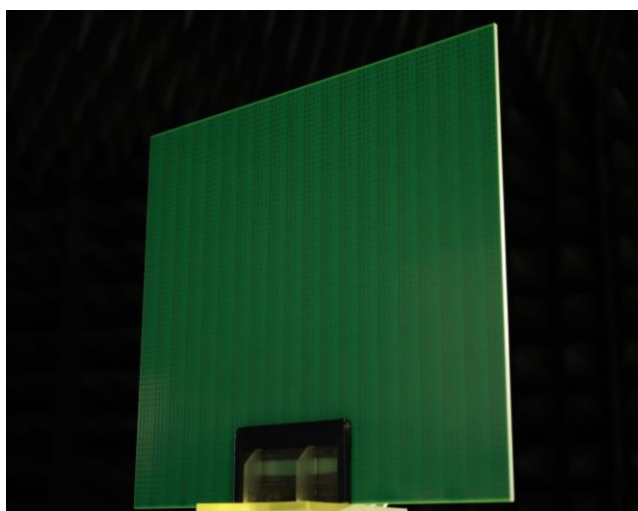


## Press Information

### **KYOCERA Develops Transmissive Metasurface Technology That Redirects Wireless Signals for Improved 5G and 6G Performance**

**Kyoto/London, 20. April 2022.** Kyocera Corporation (President: Hideo Tanimoto) has developed a Transmissive Metasurface technology that can redirect wireless network signals in a specific direction to improve the coverage area and performance of 5G and eventually 6G networks. The Transmissive Metasurface will help deliver high-frequency millimeter-wave 5G and 6G to places where communication is impossible due to obstacles, expanding service areas beyond the capability of conventional Reflective Metasurface technologies used today.<sup>1</sup>



**Transmissive Metasurface (Prototype)**

#### **Development Background**

The 28 GHz band used in 5G networks, and the higher frequency band being studied for 6G, have a high degree of rectilinear propagation. Signals often cannot reach locations where a direct line of sight to the base station is obstructed. Reflective Metasurface technology offers a very limited ability to change the direction of a signal to reach these areas. To solve this issue and expand performance, Kyocera developed a new Transmissive Metasurface technology that can redirect radio waves at smaller angles to extend targeted network coverage.

---

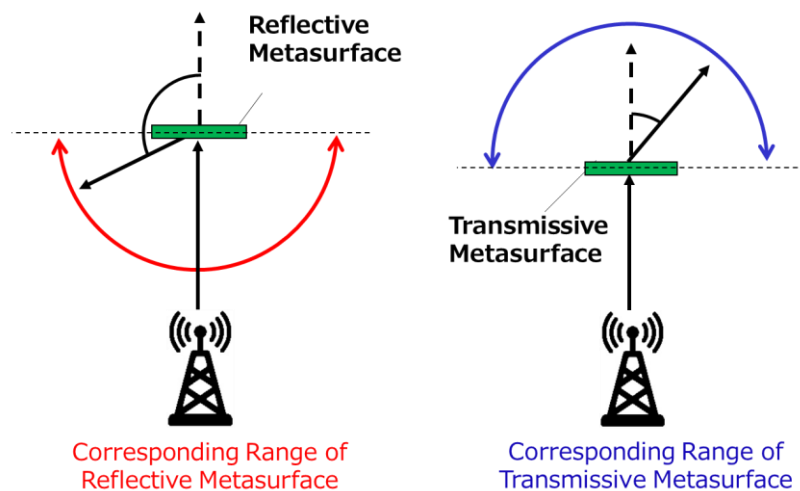
<sup>1</sup> For further information, please watch: [Kyocera Develops Transmissive Metasurface Technology](#) (Japanese language only)



## Features: Transmissive Metasurface Technology

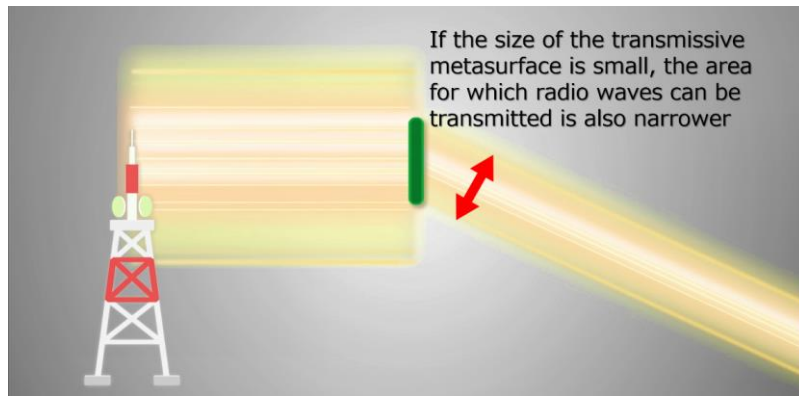
### 1) Kyocera expands the direction in which radio signals can be redirected

Radio waves striking a conventional Reflective Metasurface device can be redirected at a wide angle, but not at narrow angles beyond the metasurface. Kyocera's new Transmissive Metasurface technology is able to bend at narrow angles in order to avoid obstacles that may block transmission, expanding 5G and eventually 6G coverage even further. For example, a large building may block 5G network transmission, but Kyocera's Transmissive Metasurface device can redirect the signal downward to reach smaller buildings behind and below for better coverage.



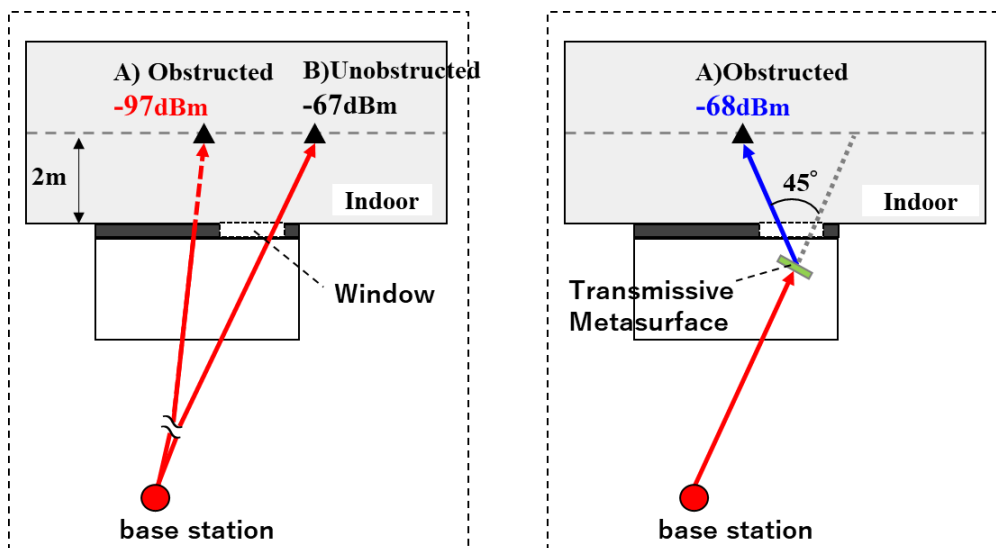
### 2) Proprietary Flexible Size Development

The area in which a Transmissive Metasurface can deliver signals is proportional to the size of the metasurface itself. Conventional technologies have been unable to develop a Transmissive Metasurface of sufficient size for practical use, but Kyocera can design any size using its proprietary technology, allowing greater flexibility. This makes it possible to install metasurfaces in more places, such as a home patio or apartment balcony.



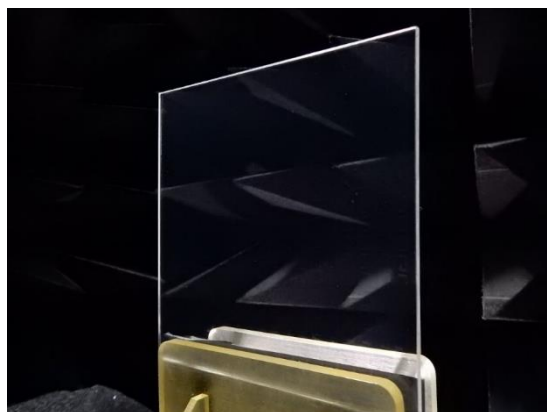
### 5G Test Results

Kyocera tested its new Transmissive Metasurface using a 28 GHz band local 5G environment at its Kagoshima Kokubu Plant (Kagoshima Prefecture, Japan). Terminals were installed at two locations: Location A (reception power: -97 dBm), where signal strength is weak due to walls obstructing line-of-sight to the base station; and Location B (reception power: -67 dBm), where signal strength is high due to an unobstructed line-of-sight to the base station through a window. When a Transmissive Metasurface was installed outside the window at Location A, signal strength was -68 dBm, about the same as at Location B with its clear line-of-sight.



Kyocera is developing a Transparent Transmissive Metasurface that is more landscape-friendly and incorporates technological improvements to focus radio waves in specific locations and improve signal strength further. Additionally, the Company is developing a Reconfigurable Intelligent Surface (RIS)<sup>2</sup> that can create a smart signal environment to change the signal direction adaptively depending on the devices in use.

<sup>2</sup> RIS is a technology that changes the direction of radio waves by electrically changing the phase of elements on a metasurface.



**Transparent Transmissive Metasurface (Prototype)**

For more information on Kyocera: [www.kyocera.co.uk](http://www.kyocera.co.uk)

## About Kyocera

Headquartered in Kyoto, Japan, KYOCERA Corporation is one of the world's leading manufacturers of fine ceramic components for the technology industry. The strategically important divisions in the KYOCERA Group, which is comprised of 307 subsidiaries (as of March 31, 2021), are information and communications technologies, products which increase quality of life, and environmentally friendly products. The technology group is also one of the most experienced producers of smart energy systems worldwide, with more than 45 years of know-how in the industry. The company is ranked #603 on Forbes magazine's 2021 "Global 2000" listing of the world's largest publicly traded companies.

With a global workforce of over 78,000 employees, Kyocera posted sales revenue of approximately €11,74 billion in fiscal year 2020/2021. The products marketed by the company in Europe include printers, digital copying systems, semiconductor-, fine ceramic-, automotive- and electronic components as well as printing devices and ceramic kitchen products. The KYOCERA Group has two independent companies in the United Kingdom: KYOCERA Fineceramics Ltd. and KYOCERA Document Solutions Ltd.

The company 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 (approximately €763,000\* per prize category).

\*Date of Survey: June 18<sup>th</sup>, 2021

---

### Contact

KYOCERA Fineceramics Ltd.

Daniela Faust

Manager Corporate Communications

Prospect House, Archipelago,

Lyon Way, Frimley, Surrey.

GU16 7ER United Kingdom

Tel: [+44 1276 693450](tel:+441276693450)

Fax: +44 1276 693460

Mobile: +49 175 72 75 70 6

E-mail: [daniela.faust@kyocera.de](mailto:daniela.faust@kyocera.de)

[www.kyocera.co.uk](http://www.kyocera.co.uk)