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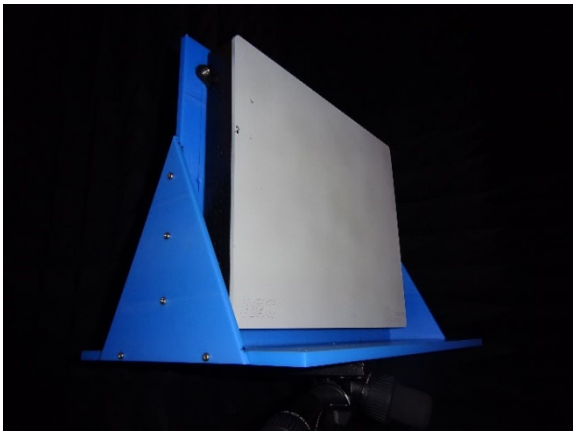
News Release

AGC Develops RIS Reflector to Improve Indoor 5G Areas

Tokyo, November 12, 2021- AGC (AGC Inc.; Headquarters: Tokyo, President: Yoshinori Hirai) has developed an RIS reflector* that can be installed on indoor walls and ceilings to switch the direction of radio wave reflection and thus improve the indoor area of the 5G millimeter wave (28GHz) band. The developed product features a low-loss circuit board made by AGC Multi Material America, Inc(former AGC Nelco America, Inc), a CCL manufacturing subsidiary, to which a phase controllable design has been applied to an artificial surface with a very fine periodic structure. This allows the reflective angle to be controlled electrically, setting it apart from conventional reflectors.



High-frequency radio waves, such as 5G millimeter waves, can transmit and receive large amounts of data at high speeds, but they are highly linear and easily attenuated, making it difficult for radio waves transmitted from base station antennas to reach the rear of buildings and other structures. Reflectors are expected to be one of the ways to mitigate this situation, but since conventional reflectors reflect radio waves only in a specific direction, they could not improve reception intensity over a wide area indoors.

AGC, in partnership with Greenerwave of France, has developed an RIS reflector by utilizing AGC's core technologies in low-loss circuit board materials and electromagnetic field design and evaluation together with Greenerwave's metasurface design technology. This RIS reflector was confirmed to be effective in improving the area in a joint experiment conducted by Nippon Telegraph and Telephone Corporation (NTT, Headquarters: Chiyoda-ku, Tokyo; President: Jun Sawada; hereinafter NTT) and NTT DOCOMO, Inc. (DOCOMO, Headquarters: Chiyoda-ku, Tokyo; President: Motoyuki Ii; hereinafter DOCOMO). The developed RIS reflector will be exhibited at the NTT R&D Forum - Road to IOWN 2021 to be held online from November 16.

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*Personal information is handled in accordance with our Privacy Policy

The AGC Group has positioned its Mobility and Electronics businesses as strategic businesses under its ***AGC plus 2.0*** management policy. In particular, AGC sees the practical application of 5G as a major business opportunity and will continue to develop and propose products that contribute to the development of next-generation high-speed communications.

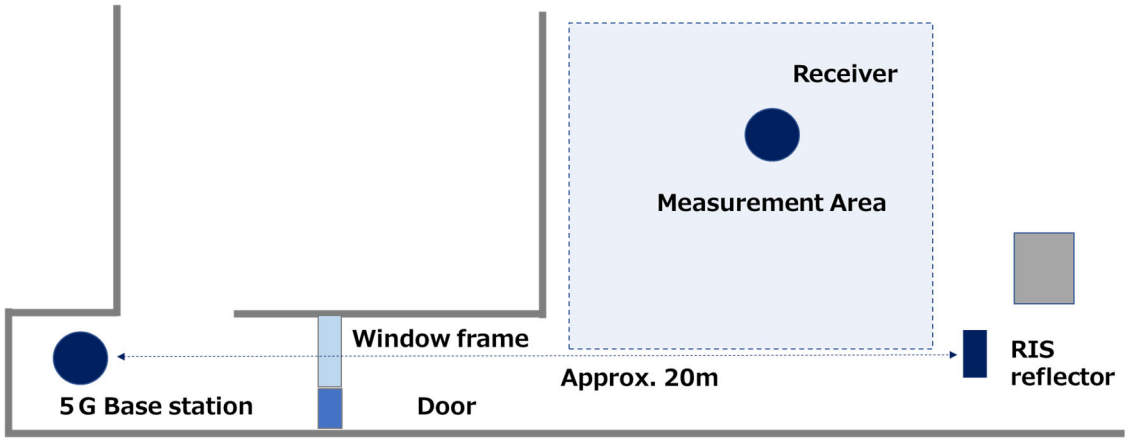
* RIS (Reconfigurable Intelligent Surface) is a metasurface technology that can adaptively change reflection direction by arranging electrically phase-switching elements on a reflector surface.

<Reference>

■ **Joint experiment conducted by NTT and DOCOMO**

This joint experiment was conducted at the NTT Yokosuka R&D Center in Yokosuka City, Kanagawa Prefecture. DOCOMO provided the indoor area design and base station operation and NTT's reflection control technology was applied to AGC's RIS reflector.

In this experiment, improvement of received power was verified when radio waves from a base station penetrated into the room through a window and was reflected to various directions in the room via an RIS reflector. In the experimental environment, it was confirmed that the received power in the 28GHz band improved by up to around 20 dB with the RIS reflector operated with the reflection control technology versus without. (The results will vary depending on the radio environment being evaluated.)



The experimental environment

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■ **Overview of NTT R&D Forum 2021**

Event name	NTT R&D Forum - Road to IOWN 2021
Overview	Lectures and exhibitions on the latest research results of R&D in the NTT Group
Venue	Online
Duration	November 16-19, 2021
Exhibition number	N13
URL	https://www.rd.ntt/e/forum/

■ **Overview of Greenerwave**

Location	6 rue Jean Calvin 75005 Paris
Representative	Timothee Laurent (Co-founder & CEO)
URL	https://greenerwave.com/

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