AGC
Your Dreams, Our Challenge

**News Release**

AGC Inc.
November 7, 2018

# AGC Collaborates with NTT DOCOMO to Creates World's First Product to Add Cellular Base Station Functions to Windows

AGC Inc. ("AGC") has announced a joint collaboration with NTT DOCOMO, INC. ("NTT DOCOMO"), which is expected to result in the successful development of the world's very first[*1] glass antenna that can be attached to the indoor surface of existing glass. This new product adds base station antenna functions to windows without spoiling the view to outside. The two companies aim to take advantage of this product to expand the mobile phone service area beginning in the first half of 2019.

The volume of mobile communication traffic continues to increase, making it essential to come up with solutions to deliver stable, high-speed communication. An important approach toward this goal is to deconcentrate the traffic in high-traffic areas by installing small-cell base stations[*2], and to achieve this, more antennas must be installed to serve as mobile phone base stations. The current practice is generally to install small-cell antennas onto building roofs or the walls of mid-to-low-rise buildings, but installation is often problematic due to limited availability of installable roofs or walls, and also due to the unsightly appearance of streets and neighborhoods littered with antennas. Therefore, installing antennas inside a building to form a service area was examined.

In order to install antennas inside a building, there were a number of challenges, such as the risk of spoiling the interior design of spaces and attenuation of radio waves through exiting window glass. To overcome those, both companies worked to develop a new antenna with AGC's ATTOCH™[*3] solution, which allows glass to be attached to the indoor surface of existing windows.

This newly-developed glass antenna is a combination of transparent conductive material and glass substrates which offers the following features:

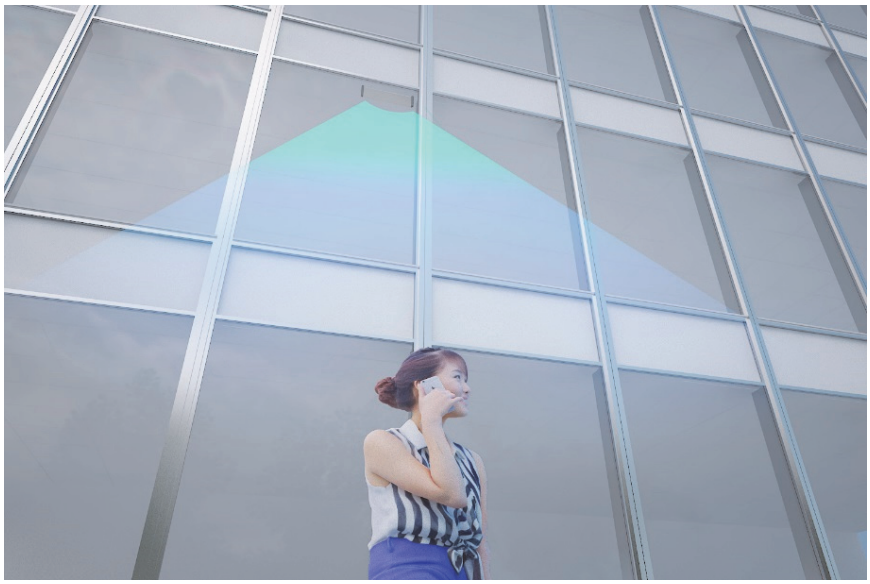
- ✓ **Takes advantage of the transparency of glass to be unobtrusive and avoid spoiling interior designs or the view from the window.**
- ✓ **Decreases attenuation and reflection of radio waves passing through existing window glass by using a newly-developed Glass Interface Layer**[*4]

AGC and NTT DOCOMO plan to roll out this product to LTE (the current mainstream) frequency-band base stations from the first half of 2019 onward. The two companies are also considering the development of 5G-compatible products.

AGC and NTT DOCOMO intend to continue leveraging their respective strengths to realize a communication environment that delivers even better stability and connectivity.

**Media inquiries**
AGC Corporate Communications & Investor Relations Division
(Contact: Ai Ota, Tel: +81-3-3218-5603, E-mail: info-pr@agc.com )

Notes
*1 Based on research by AGC and NTT DOCOMO.
*2 Base stations that create a small service area within the area of a regular base station, installed mainly in high-traffic areas.
*3 Method for adding functionality, such as energy conservation or soundproofing, to existing glass by attaching a glass product to their interior side
*4 Draws out the typical performance of antennas by mitigating the effects on performance caused by the proximity of glass antennas to existing window glass.



Radio wave emission by glass antenna (concept image)
* Radio waves are for illustrative purposes only

Appearance of an installed glass antenna (concept image)
*Wiring not shown

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**REFERENCE**

## ■ Glass Antenna Summary

### 1. Glass Antenna Details

・Does not spoil the appearance of streets or neighborhoods due to being a transparent glass antenna installed onto an existing window.

・Installation is carried out inside buildings, eliminating the need for scaffolding or foundation work.

・These glass antennas for small cells provide flexibility for area design due to their ability to be installed almost anywhere and their beam-forming technology.

### 2. Glass Antenna, Installed Base Station Specifications

Glass antenna

| | |
|---|---|
| Dimensions | 700 mm × 210 mm |
| Weight | 1.9 kg |

* Size and weight of antenna glass only. Excludes cables, existing glass fittings, and accessories.
Specifications contained in this news release are current at the time of release and subject to change without notice.

Base Station Specifications

| | |
|---|---|
| Method | TDD-LTE |
| Frequency | 3.5GHz band (BAND42) |
| Bandwidth | 40MHz |
| MIMO compliant | 4×4MIMO |
| Downlink modulation method | 256QAM |
| Maximum throughput | 588Mbps |

### 3. Roles of Each Company

| | |
|---|---|
| AGC | ・Develop and produce the glass antenna, and establish its installation method.<br>・Considering the effect of glass antennas on the existing window glass. |
| DOCOMO | ・Consider antenna characteristics from the viewpoint of radio wave protection and securing the communication area.<br>・ Ensure practicability of securing the communication area through verification testing. |

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## ■ Company Outlines

| AGC | |
|---|---|
| Company name: | AGC Inc. |
| Representative | Takuya Shimamura, CEO & Executive Officer |
| Address | 5–1, Marunouchi 1-chome, Chiyoda-ku, Tokyo |
| Capital | 90,873.00 million yen (as of December 31, 2017) |
| Established | September 8, 1907 |
| Number of employees | 6,401 non-consolidated, 53,224 consolidated (as of December 31, 2017) |
| Primary business activities | ・Glass business<br>・Electronic business<br>・Chemicals business<br>・Ceramics business<br>・Other businesses |

| NTT DOCOMO | |
|---|---|
| Company name | NTT DOCOMO, INC. |
| Representative | Kazuhiro Yoshizawa, President and CEO |
| Address | Sanno Park Tower, 11–1, Nagata-cho 2-chome, Chiyoda-ku, Tokyo |
| Capital | 949,679.50 million yen (as of March 31, 2017) |
| Business start date | July 1, 1992 |
| Number of employees | 7,767 non-consolidated, 27,464 consolidated (as of March 31, 2018) |
| Primary business activities | ・Telecommunications business<br>・Smart life business<br>・Other businesses |

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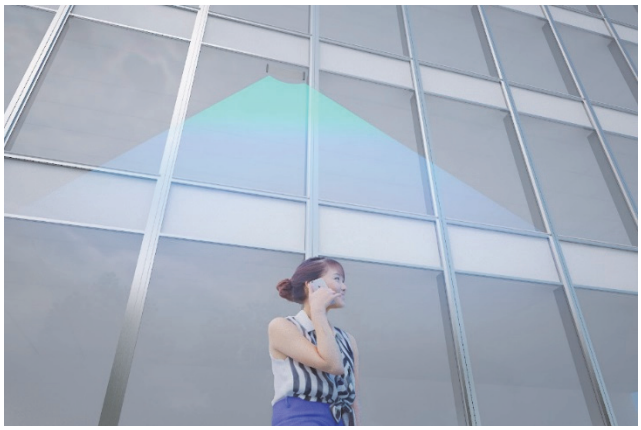
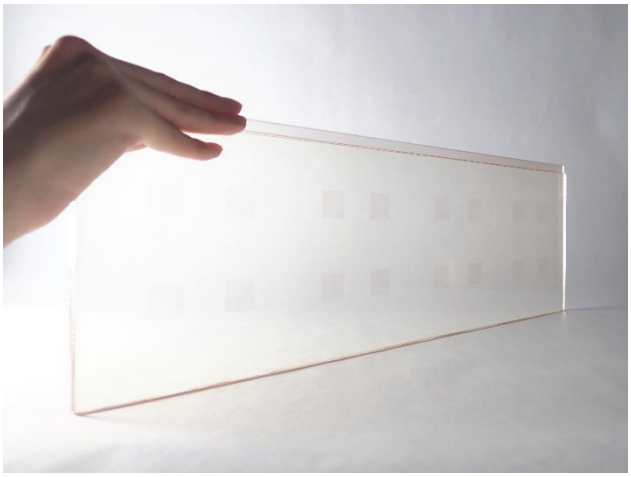
## ■ Download images



Radio wave emission by glass antenna (concept image)

Appearance of an installed glass antenna (concept image)



Glass antenna (photo)

Appearance of an installed glass antenna (photo)

Above images can be downloaded by visiting the URL or reading the QR code listed below.
https://agc2.box.com/s/uhga35ktnron2jb486hpshho7r8vaw7s

* There are no restrictions on image use.
* Please be sure to credit the source as follows when using: "Images provided by AGC"

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