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FOR IMMEDIATE RELEASE

No. 3334

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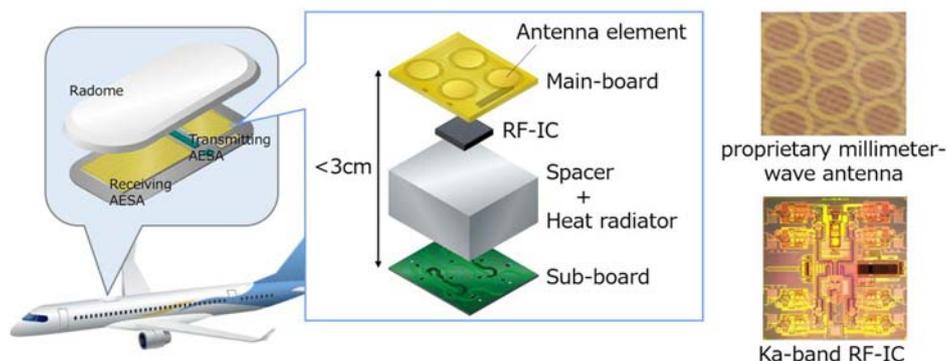
Mitsubishi Electric Develops Extra-thin Antenna Technology for Inflight Connectivity

New antenna and RF-IC will enable future high-speed internet access even in small aircraft

TOKYO, February 6, 2020 – [Mitsubishi Electric Corporation](http://www.mitsubishielectric.com) (TOKYO: 6503) announced today that in collaboration with Japan’s National Institute of Information and Communications Technology (NICT) it has developed technology for an extra-thin Ka-band (27 to 40 GHz) active electronically steered array antenna (AESA) featuring the world’s thinnest* profile, less than three centimeters, to deliver high-speed inflight connectivity services via satellites at data rates beyond 100 Mbps. The company also announced that it has developed the antenna elements and, in collaboration with Tohoku University and Tohoku MicroTec Co., developed a radio-frequency integrated circuit (RF-IC) for an envisioned millimeter-wave V-band (40 to 75 GHz) AESA that will be capable of delivering inflight connectivity at even faster speeds.

*According to internal research as of February 6, 2020.

Mitsubishi Electric’s new Ka-band AESA is thin and small enough to be installed in any aircraft, regardless of its size, and it can operate even at high latitudes, which will allow passengers to enjoy on-demand streaming and other high-speed internet services on flights worldwide. Following further testing and demonstrations, the company plans to commercialize its Ka-band AESA after 2023 and a V-band AESA after 2027.

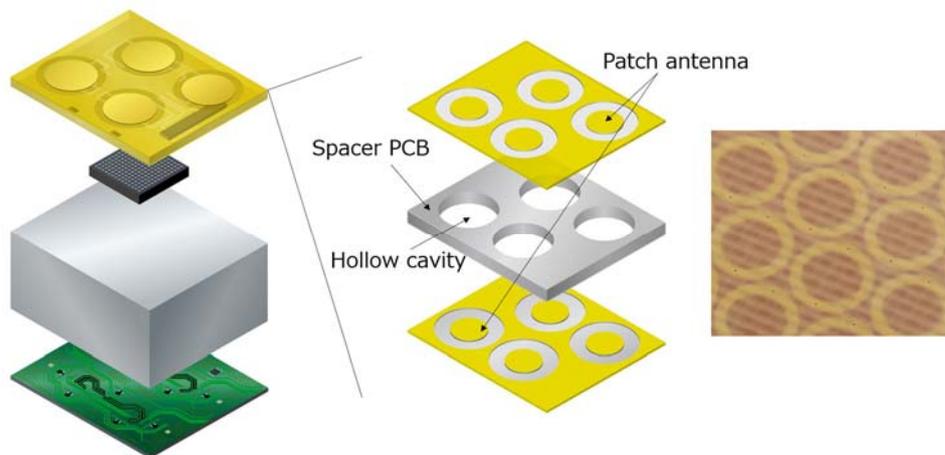


Rendition of Mitsubishi Electric’s AESA

Features

1) *Extra-thin AESA for high-speed satellite communication even at high latitudes in diverse aircraft*

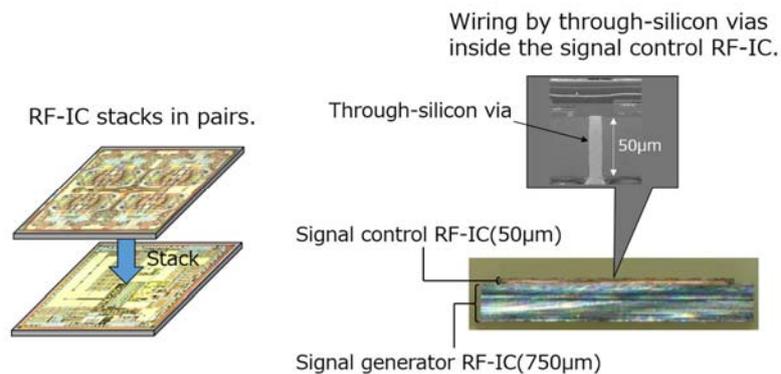
- Conventionally bulky antennas for satellite communication are not easily installed in small and midsize aircraft because of the space required for the antennas and the devices that mechanically drive them. Mitsubishi Electric has now solved this problem by incorporating antenna elements newly developed by NICT and Mitsubishi Electric’s RF combiner/divider and RF-ICs into a single circuit board, and then combining them in a Ka-band AESA featuring the world’s thinnest profile of less than three centimeters.
- Mitsubishi Electric also has newly developed a proprietary millimeter-wave antenna with a hollow cavity inside a printed circuit board, which improves the antenna’s circular-polarization quality and electric-power efficiency. The proprietary antenna ensures high performance even when beam steering at an elevation angle of as low as 20 degrees, thereby enabling operation in the high latitudes .



Structure of Mitsubishi Electric’s millimeter-wave antenna

2) *Ka- and V-band RF-ICs for inflight connectivity via next-generation high-throughput satellites*

- High-power and low-noise amplifiers for transmission/reception circuitry are needed to miniaturize satellite-communication antennas as well as improve their performance. Mitsubishi Electric’s new Ka-band RF-IC incorporates a high-power amplifier boasting an unprecedented power-added efficiency rating of 29.1% (when converting DC input power to RF output signals), 1.8 times that of an existing RF-IC made by Mitsubishi Electric. Also, the RF-IC’s low-noise amplifier achieves an unprecedentedly low noise figure of just 1.8dB, about 20 percent lower than that of a conventional model.
- For Mitsubishi Electric’s next-generation V-band AESA, RF-ICs are being miniaturized for arraying at narrower intervals than in the case of the Ka-band AESA. Mitsubishi Electric, in collaboration with Tohoku University and Tohoku MicroTec Co., Ltd., has developed the world’s first three-dimensionally integrated millimeter-wave RF-IC, which it stacks in pairs using a through-silicon vias.



Mitsubishi Electric's three-dimensionally integrated millimeter-wave RF-IC

Background

Together with existing Ku-band satellite communication services, higher-throughput Ka-band services are being increasingly deployed to keep up with the growing demand for high-speed internet in aircraft and ships. Further, to make low-latency high-speed internet services available anywhere worldwide, new satellite communication systems, such as low-orbit satellite constellations and extra-high-frequency V-band systems, are now being developed. Until now, mechanically driven antennas have been used to deliver inflight connectivity via satellites, but their use has been limited to bigger aircraft due to their sizes. The ongoing development of smaller-profile antennas will pave the way for inflight connectivity even in small and midsize aircraft.

Some developments covered in this news release are the results of a project started in 2017—research and development on narrow band frequency technology using active electronically scanned array (AESA) antenna that can be installed on small aircraft—commissioned by Japan's Ministry of Internal Affairs and Communications.

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About Mitsubishi Electric Corporation

With nearly 100 years of experience in providing reliable, high-quality products, Mitsubishi Electric Corporation (TOKYO: 6503) is a recognized world leader in the manufacture, marketing and sales of electrical and electronic equipment used in information processing and communications, space development and satellite communications, consumer electronics, industrial technology, energy, transportation and building equipment. Embracing the spirit of its corporate statement, Changes for the Better, and its environmental statement, Eco Changes, Mitsubishi Electric endeavors to be a global, leading green company, enriching society with technology. The company recorded a revenue of 4,519.9 billion yen (US\$ 40.7 billion*) in the fiscal year ended March 31, 2019. For more information visit:

www.MitsubishiElectric.com

*At an exchange rate of 111 yen to the US dollar, the rate given by the Tokyo Foreign Exchange Market on March 31, 2019