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Mitsubishi Electric Develops High-performance Injection-molded-resin Slotted Waveguide Array Antenna

*Will offer important advantages for weather, airport and remote-sensing radar and
satellite communication*

TOKYO, January 25, 2019 – [Mitsubishi Electric Corporation](http://www.MitsubishiElectric.com) (TOKYO: 6503) announced today that it has developed a slotted waveguide array antenna made of injection-molded resin which have been demonstrated to outperform conventional patch array antenna in side-lobe characteristics*, cross-polarization characteristics** and electric power efficiency***, as well as offer reduced weight and cost. Mitsubishi Electric's new antenna will enable radar systems to achieve enhanced observation range and accuracy and wireless communication systems to achieve greater communication capacity and speed. The company will now begin deploying the antenna for various applications, including as weather, airport radar remote-sensing radar and satellite communications.

* Index of radio-wave emissions in unnecessary directions

** Index of radio-wave amplitude with unnecessary polarization

*** Ratio of electric power input to radiated power



Prototype of resin-injection-molded waveguide array antenna

The antenna is made with resin injection molding for reduced weight and low cost. Resin, however, is easily distorted by heat compared to metal, so resin-molding waveguide parts must be secured with screws, which require screw-holes that can degrade the antenna’s electric performance. Mitsubishi Electric solved this problem with a proprietary “boss-iris structure,” which incorporates small, round “boss” protuberances for screw holes and an “iris” diaphragm waveguide to adjust electrical characteristics (part of the boss and the rib structure serve as the iris). The antenna also achieves industry-leading performance thanks to the proprietary structures: “boss-iris structure” and “novel ridge structure” which is a fence meandering along the waveguide to control finely the radiation from the slots. As a result, the new antenna’s injection-molded design maintains high performance as well as weighs 40 percent less and costs 90 percent less than conventional metallic versions.

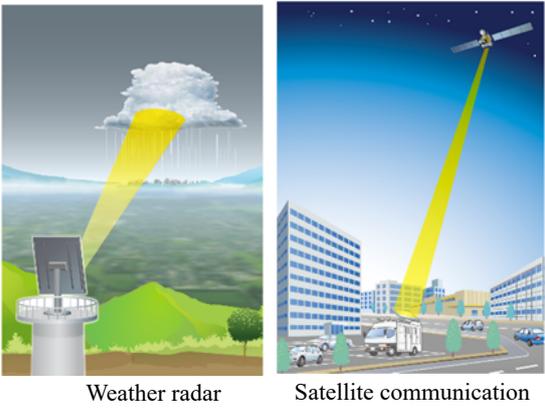
Mitsubishi Electric developed the antenna with Hiroshima Institute of Technology, and received support from the Japan Science and Technology Agency’s A-STEP program under a project entitled “Development of a novel resin ridge waveguide antenna with eminent low sidelobe.” For the project, a large-scale array antenna prototype consisting of about 2,000 elements was manufactured and evaluated. In tests, the antenna demonstrated high performance, including 60 percent suppression of sidelobe, 90 percent reduction of cross polarization, and 10 percent greater electric power efficiency compared to conventional patch array antenna.

Background

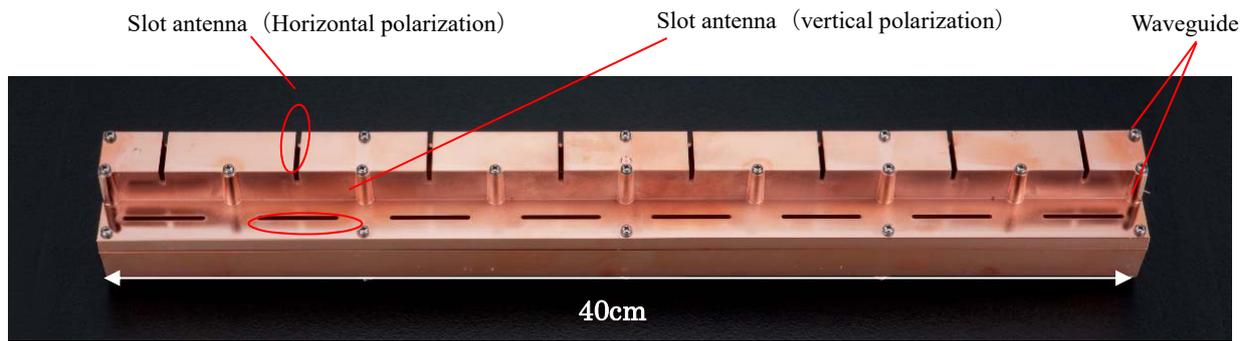
Dual-polarized antennas, which use horizontally polarized and vertically polarized radio waves for low sidelobe, high efficiency and low cross-polarization, are in demand to help improve the observational range and observation accuracy of radar systems and the communication capacity and speed of wireless communication systems. Patch array antennas are mainly used in conventional antenna systems, but they do not offer efficient electric-power and cross-polarization characteristics. Though conventional metallic waveguide slot-array antennas offer excellent performance, including high efficiency and low cross-polarization, they are heavy and expensive because they are made with machining processes, so their use has been limited.

	Patch array	Slotted Waveguide (metal)	Slotted Waveguide (resin)
Image			
Efficiency	x	✓	✓
Cost	✓	x	✓
Weight	✓	x	✓

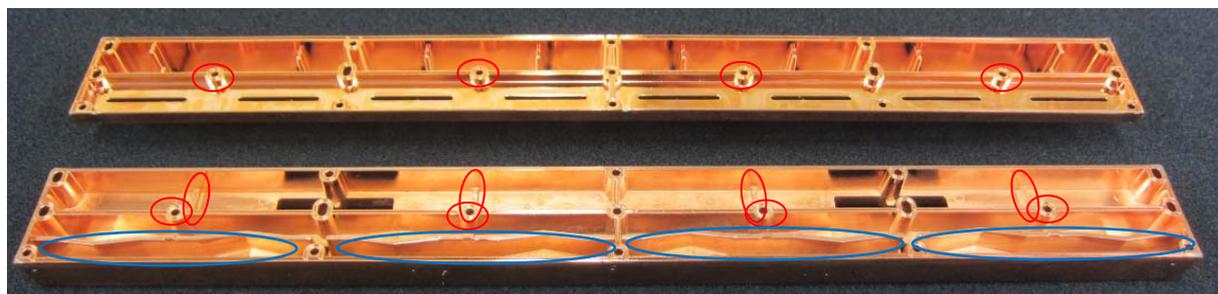
Comparison of antennas



Applications



Close-up of slotted waveguide array antenna



○ Boss-iris structure ○ Novel ridge structure

Inside of Close-up of slotted waveguide array antenna

Patents

Patents in this news release number four in Japan and four outside of Japan.

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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 consolidated group sales of 4,444.4 billion yen (in accordance with IFRS; US\$ 41.9 billion*) in the fiscal year ended March 31, 2018. For more information visit:

www.MitsubishiElectric.com

*At an exchange rate of 106 yen to the US dollar, the rate given by the Tokyo Foreign Exchange Market on March 31, 2018