MU Radar Developed by Mitsubishi Electric and Kyoto University Receives IEEE Milestone

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World’s first active phased array system for atmospheric radar has made important contributions to atmospheric science and radar engineering

Mitsubishi Electric Corporation (TOKYO: 6503) and Kyoto University announced today that a middle and upper atmosphere radar (MUradar) that they jointly developed in 1984 has been presented with an IEEE Milestone by the Institute of Electrical and Electronic Engineers (IEEE), the world’s largest academic society. The award recognizes the MU radar as the first large-scale mesosphere,

stratosphere and troposphere (MST) radar with a two-dimensional active phased array antenna system, and for its contributions to atmospheric science and radar engineering.

Kyoto University began design work on large atmospheric radars in the 1970s. Work focused initially on an incoherent scatter (IS) radar for observing the upper atmosphere for the first time in Asia. Studies then showed that radars offering specific features are required to observe the middle atmosphere, which was referred to as “the unknown region” in those days. Research thereafter targeted designing a radar that could be used primarily to observe the middle atmosphere and part of the upper atmosphere, which led to the development of the MU radar.
Kyoto University adopted the active phased array radar technique for high-resolution observation of important wave motions in the atmosphere. Mitsubishi Electric started jointly developing the radar system, which was partially completed in 1983. The design featured 57 antennas with an output power of 120 kW. An entire system with 475 antennas (103 m in diameter) and an output power of 1 MW was completed in 1984. Researchers and engineers from Mitsubishi Electric and Kyoto University have conducted technical meetings on a regular basis since the beginning of the MU radar’s development. The radar system, which has been continually refined, has produced useful results for many scientific fields, including space and atmospheric physics, meteorology, astronomy, electrical and electronic engineering, and astrophysics. The MU radar, now one of the world's best atmospheric radars, has contributed much to science and engineering.

IEEE established the Milestones Program in 1983 to recognize achievements in the 20th century, or the “Century of Giants,” in which the professions and technologies represented by IEEE were developed. Each milestone recognizes a significant technical achievement that occurred at least 25 years ago and had a regional impact. To date, more than 100 Milestones have been dedicated around the world. Japanese entities have already received Milestones for a directive short wave antenna, the Mount Fuji Radar System and the Tokaido Shinkansen (bullet train).

The IEEE Milestone plaque has been installed at the Shigaraki MU Observatory at Kyoto University’s Research Institute for Sustainable Humanosphere located in Koka, Shiga Prefecture.

About the Institute of Electrical and Electronic Engineers (IEEE)

IEEE was established in 1963 with the merger of the American Institute of Electrical Engineers (AIEE; founded in 1884) and the Institute of Radio Engineers (IRE; founded in 1912). As the world’s biggest academic society, it covers the fields of electricity, electronics, information and communications. It is based in the U.S.A. IEEE membership exceeds 420,000 people from more than 190 countries (as of 2012), with more than half based outside the U.S.A. There are nine branches and 14,298 members in Japan (as of November 2014).

MU Radar Specifications

Product	MU radar (Middle and Upper Atmosphere Radar)
Location	Sigaraki MU Observatory Research Institute for Sustainable Humanosphere Kyoto University Kouyama, Sigaraki, Koka, Siga 529-1812, Japan
Center Frequency	46.5MHz
Bandwidth	3.5MHz
Antenna	475 sets of three sub-element crossed Yagi antennas
Structure	Circular antenna array measuring 103m in diameter
Function	Electronic beam steering
Beam width	3.6º (half-power full width)
Output power	1 MW (peak-envelope power)
URL	http://www.rish.kyoto-u.ac.jp/mu/en/

Aerial view of MU radar

Antenna area of MU radar