

SATELLITE-BORNE TRUE-TIME-DELAY ULTRA-WIDEBAND PHASED ARRAY ANTENNA SYSTEM USING DIGITAL SIGNAL PROCESSING TECHNOLOGY (SAMRAI)

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Recent advances in digital technology have enabled the realization of microwave radiometers (MWRs) capable of receiving ultra-wideband microwaves and measuring their spectra. Hyperspectral observations by such MWRs can distinguish and separate microwaves emitted from natural objects and emitted from artificial devices, enabling microwave remote sensing even under advanced radio usage. Based on this concept, we investigated a satellite-borne hyperspectral MWR that can operate stably over a long period of time, and came up with the idea of using a phased array antenna (PAA) consisting of ultra-wideband antennas (elements) at the front end.

We have named such a hyperspectral MWR, Scanning Array for hyper-Multispectral RAdiowave Imaging (SAMRAI), and have been conducting research and development since 2021 with the aim of launching it on a satellite in 2027. Following the development of two new elemental technologies (an ultra-wideband antenna capable of receiving frequencies from 1 to 41 GHz and ultra-high-speed AD conversion equivalent to 80 GSPS), we have realized SAMRAI which can observe the spectra of horizontally and vertically polarized microwave signals from 1 to 41 GHz at 27 MHz intervals. Here, we present SAMRAI's concept and the research and development status to date.