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A New Generation of Micro Satellite Radiometers for Atmospheric Remote Sensing

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The need for low-cost, mission-flexible, and rapidly deployable space borne sensors that meet stringent performance requirements pervades the extreme weather monitoring programs, including especially the strong rainfall and typhoon.

New technologies have enabled a novel approach toward this science observational goal, and in this paper we describe recent technology develop efforts to address the challenges above through the use of radiometers on a Micro-sized Microwave Atmospheric Satellite (Microsat), which operates in the type of constellation, and enable the capabilities of rapidly progressing.

Recent work has involved the design and development of highly integrated radiometer component technologies that would enable the realization of a high-performance, multi-band sounder that would conform to the 3U CubeSat size (10 x 10 x 30 cm), weight, and power requirements.

This paper partly focuses on the constellation to realize a scalable CubeSat-based system that will pave the path towards improved revisit rates over critical earth regions, and achieve state-of-the-art performance relative to current systems with respect to spatial, spectral, and radiometric resolution.

As one of the important payloads on the platform, sub-millimeter radiometer is advised to house for providing atmospheric and oceanographic information all weather and all day.

The first portion of the radiometer comprises a horn-fed reflector antenna, with a full-width at

half-maximum (FWHM) beamwidth of 1.2º. Hence, the scanned beam has an approximate footprint diameter of 9.6 km at nadir incidence from a nominal altitude of 500 km. The antenna system is designed for a minimum 95% beam efficiency. Approximately 98 pixels are sampled for every scanning line, which covers a range of 1500km. The period of a round is about 94.47 minutes and re-visit period is four days.

For the radiometer, which is a passive cross-track-scanning microwave spectrometer operating near the 118.75-GHz oxygen absorption line and 183 water vapor line for more than 100 channels based on high-speed digital processing technique, with a calibration accuracy of 0.5K for each channel to ensure the capability of temperature and ice-cloud retrievals.

To meet the requirements of spatial and temporal specifications, a primarily concept of 41 Microsats in constellation are considered to achieve the retrievals in the resolution of 10km and 10 minutes.