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DEVELOPMENT OF GEOSTATIONARY INTERFEROMETRIC MICROWAVE SOUNDER (GIMS) IN PREPARING FOR CHINA'S FY-4M MISSION

Abstract

The dream of launching a microwave radiometer into geostationary orbit (GEO) for atmosphere sounding has lasted for over four decades. Several concepts have been proposed by NASA and ESA, such as the GEM, GeoSTAR, and GAS, but none of them has come into reality by now. China has released the planning of launching a microwave GEO meteorological satellite FY-4M for atmospheric sounding. The concept of GIMS (Geostationary Interferometric Microwave Sounder) has been proposed by the National Space Science Center (NSSC), Chinese Academy of Science (CAS), and aims for being the main payload of FY-4M. A proof-of-concept prototype of GIMS had been successfully developed in 2011. Now a second generation of new functional and full scaled prototype GIMS-II has been successfully developed. This work is to introduce the detailed GIMS concept and the recent progress of the development of GIMS-II including its system design and imaging performance.

GIMS-II utilizes a new concept of aperture synthesis with an optimized rotational circular antenna array. The traditional real aperture microwave radiometer is facing the challenging of carrying a quit large reflector antenna and also the requirement of rapid scanning subsystem. The synthetic aperture radiometer as a newly emerged technique can avoid such problems. With a more advanced rotational circular antenna array, GIMS can further increase the calibration precision and reduce the hardware complexity as well, and hence from our point has the best reliability among all the concepts that has been proposed ever.

The system parameters of GIMS-II are designed to meet the requirements of retrieving atmospheric temperature profiles and continuously investigate the internal structure of tropical cyclones. GIMS-II has the abilities of full earth disc coverage, i.e. a FOV of 17.3, with a ground resolution of 50 km. The operation frequency is the Oxygen absorption frequency which spanned from 50 to 56 GHz with 7 frequency channels Each channel has a bandwidth of 320 MHz. The radiometric resolution is 0.8 K at an integration time of 5 minutes.