



Enabling Technologies for High Performance Microwave and MM wave Interferometric Radiometers

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Interferometric imaging is an alternative passive imaging method developed originally from radio astronomy from 1960's. Comparing with the traditional real aperture system, interferometric synthetic aperture system can realize much better spatial resolution by using thinned array. Since 1980's, this technique had been introduced in earth observation community, aiming to realize the soil moisture and ocean salinity measurement at L-band from space [1]. From 2000's, several instrument concepts at millimeter wave (53GHz & 183GHz) had been proposed to support the next-generation geostationary orbit(GEO) meteorological satellites [2,3,4].

So far, although dozens of ground-based and airborne systems have been developed, verifying various instrument concepts and demonstrating unprecedented observation capabilities, the practical applications of interferometric radiometers are still limited. For space application, ESA's SMOS satellite launched in 2009 is still the only mission taken interferometric radiometer onboard [1]. The main reason is the system complexity. The overall performance (spatial resolution, radiometric resolution, field of view, etc) of an interferometric radiometer is largely constrained by system complexity, or number of receiving units. Enhancing system performance results in more antenna/receiver units, digital samplers and correlations, correspondingly high costs, power consumptions and risks.

In this paper, the enabling technologies for implementing microwave & MM wave interferometric radiometer in SWaP-C effective way will be introduced and discussed, including scalable system architectures, compact microwave & MM wave front-ends, digital correlators based on customized ADC ASICs. The application of these technologies for two space-borne instrument concepts will also be introduced, including the MICAP radiometer (an L/C/K tri-frequency 1-D interferometric radiometer) for Chinese Ocean Salinity Mission [5], and the GIMS concept for future geostationary meteorological mission [4].

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