INITIAL RESULTS OF A DIGITAL RADIOMETER WITH DIGITAL BEAMFORMING

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The Passive Advanced Unit (PAU) for ocean monitoring is a new instrument that combines in a single receiver and without time multiplexing a microwave radiometer at L-band (PAU-RAD) and a GPS-reflectometer (PAU-GNSS/R), which, in conjunction with an infra-red radiometer (PAU-IR) will simultaneously provide the sea surface temperature and –more important– the sea state information needed to accurately retrieve the sea surface salinity. In [1] a general overview of the PAU sistem was analyzed. Moreover, in [2] the first results on the calibration performance using a single receiver was provided. PAU-RAD is a digital radiometer with digital beamforming. To avoid the mechanical scan of the antenna, a digital beamformer with the 4x4 element array has been designed so that the beam can be steered up to ±20º from the array boresight (45º incidence angle) in 5º steps (incidence angle from 25º to 65º). Each element has a dual-polarization antenna (horizontal and vertical) and each polarization is thereafter divided in two using a Wilkinson power splitter. The receiver topology is described in detail in [3]: The input signals are demodulated at an intermediate frequency (IF) of 4.309 MHz and have a 2.2 MHz bandwidth. The analog signals are then digitalized at 8 bits at a sampling frequency of 5.745 MHz.

This paper has two parts. The first one discusses the technical aspects of PAU-RAD’s integration, and test the calibration of the 16 element array, an extension of the results presented in [4] will be presented. Moreover, PAU-RAD’s array factor will be measured in an anechoic chamber for all possible predetermined beams, to characterize the performance of the beamformer. This, to authors’ knowledge, is the first time it will be used on radiometry. The second point focuses on the radiometer performance in terms of radiometric sensitivity and stability. Finally, conclusions are extracted and discussed.

References: