ON-GROUND TEST AND MEASUREMENTS OF THE PASSIVE ADVANCED UNIT SYNTHETIC APERTURE (PAU-SA)

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1. INTRODUCTION

The Passive Advanced Unit (PAU) for ocean monitoring [1] 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. PAU-SA [2] is the synthetic aperture version of PAU concept composed by Y-shaped array of 8 antennas per arm, plus one in the center. The main purpose of PAU-SA is to test some possible improvements over the current Microwave Imaging Radiometer by Aperture Synthesis (MIRAS) instrument design for future Soil Moisture and Ocean Salinity operational system (SMOSops) missions [3].

2. PAU-SA'S CONTRIBUTIONS

These contributions are focused on the replacement of analog by digital subsystems such as: I/Q down-conversion, digital filtering, full-matrix correlation (V, H and VH) and power estimation implemented in a FPGA. Due to the large number of these elements in the instrument, it is recommended to obtain quasi-perfect matching, mass reduction and no temperature and frequency drifts. All these errors can be neglected using digital techniques. Moreover, PAU-SA provides others improvements such as: non-sequential full-polarization receivers design, a dummy antenna at the end of each arm to improve the inter-antenna pattern similarity, reduction in the antenna spacing to increase the alias-free Field of View, use of a centralized reference clock with internal Local Oscillator (LO) generated in each receiver to minimize offsets, and the potential use of Pseudo-Random Noise (PRN) signals instead of a centralized noise source for calibration purposes [4,5].

3. PAU-SA'S VALIDATION TEST

Over the last three years the instrument has been successfully assembled been in the last state. Once the instrument finished it will be submit to an exhaustive test process in order to validate the hardware and software operation. Concerning the hardware validation all the devices has been checked independently and in conjunction to detect internal interferences. Acquisition modes will be evaluated by checking the receiver internal switches. Moreover, other tests such as: stability (or drifts), the radiometric sensitivity, the angular resolution and control temperature will be checked. To test the global instrument, several measurements with point and extended sources through the flat target response [6] will be carried out obtaining the error budget. Due to in the PAU-SA's simulator is possible to set all the parameters independently it will be use to improve the error budget of the instrument.

4. INSTRUMENT LOCATION AND MEASUREMENT CAMPAIGN

At present, PAUSA instrument is in the final state of assembly for the last calibration and validation tests (see Fig. 1) before placed in the mobile unit (see Fig. 2). The PAUSA instrument will be located in a truck sharing place with a multifrequency radiometer called MERITXELL [7]. As despite in Fig. 2, the mobile unit only has one elevator tower with eight meters height, and azimuth and elevation movements, so that only one is able to operate. A microwave absorber area has been placed inside the mobile unit for calibrations purposes. Finally, a ground-based campaign will be carried out in order to test all the system.

Fig. 1 PAU-SA instrument during integration process.

Fig 2 Mobile unit to locate PAU-SA and MERITXELL instruments.

5. REFERENCES

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