

NEXT GENERATION OF MULTI BEAM ROTATING ANTENNA ON SWIM SCATTEROMETER

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In the frame of the development of the instrument SWIM (Surface Waves Investigation and Monitoring) on the CFOSAT program (Chinese French Oceanographic Satellite) funded by CNES, Thales Alenia Space is currently developing a new multi beam rotating antenna in Ku Band. This antenna based reflector includes a rotating feed including 6 beams.

The SWIM instrument is the first ever space radar concept that is mainly dedicated to the measurement of ocean waves directional spectra ([1-2]) and surface wind velocities through multi-azimuth and multi-incidence observations. Orbiting on a 500 km sun-synchronous orbit, its multiple Ku-band (13,575 GHz) beams illuminating from nadir to 10° incidence and scanning the whole azimuth angles (0-360°) provide with a 180 km wide swath and a quasi global coverage of the planet between the latitude of -80 and 80° ([3]).

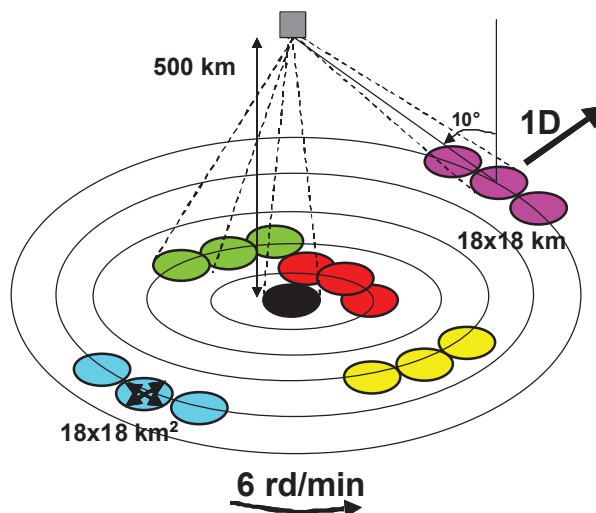


Figure 1 SWIM geometry of observation.

Such a wide range of observations requiring high range resolution (about 20 m on the ground) have led to design an instrument whose architecture and technology goes beyond what has been done on altimeter and scatterometer systems.

At antenna subsystem level, multi-azimuth and multi-incidence observations requirements have led to design an ambitious antenna subsystem that rotates at 6 rotations per minute while transmitting high power RF signals towards 6 different beams.

Thales Alenia Space started in January 2009 under CNES contract phase B studies on the design of the this multi beam rotating antenna in order to contribute to the System Preliminary Design Review held in January 2010.

The preliminary antenna design is depicted below.

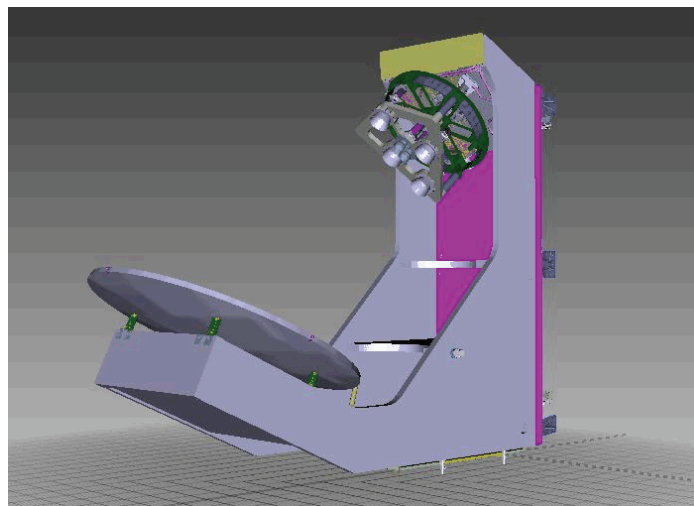


Figure 2 SWIM overall antenna design.

The complex multi beam antenna includes in particular :

- A composite mechanical structure supporting a reflector and a rotating feed
- A rotating feed including :
 - A complex rotary mechanism assembly composed of a RF rotary join, a motor, a collector, an optical coder, two bearings, and a Hold And Release Mechanism system
 - A Switch Matrix in ferrite technology with associated drivers able to switch between the 6 antenna beams in Transmit and Receive Modes
 - 6 horns
- A passive calibration system allowing to calibrate in Flight conditions the 6 antenna Beams
- An antenna thermal control

This paper aims at giving an overview of the SWIM antenna preliminary architecture and performances.

In parallel to this paper, the SWIM instrument will be described in a side-paper submitted to the same conference [5].

Keywords: radar, antenna, scatterometer, multi beam, rotating feed, rotating antenna, calibration; RF rotary joint,

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