

THE SENTINEL-1 C-SAR INSTRUMENT DESIGN

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1. INTRODUCTION

In the frame of the GMES programme, ESA is undertaking the development of the European Radar Observatory Sentinel -1, a European polar orbiting satellite system for the continuation of SAR operational applications. Sentinel-1 is an imaging radar mission in C-band, aimed at providing continuity of data for user services, in particular with respect to the ESA ERS and Envisat missions.

The Sentinel-1 space segment is designed and build by an industrial consortium with Thales Alenia Space Italia as prime contractor and EADS Astrium GmbH as C-SAR instrument responsible. Phase B2 has been completed by the Preliminary Design Review (PDR) in July 2008. The on-going Phase C will be concluded by a Preliminary Design Review (PDR) in July 2009.

2. C-SAR INSTRUMENT DESIGN

The C-SAR instrument for the Sentinel-1 mission is composed of two major subsystems :

- the SAR Electronics Subsystem (SES)
- the SAR Antenna Subsystem (SAS)

The radar signal is generated at baseband by the chirp generator and up-converted to C-band within the SES. This signal is distributed to the High Power Amplifiers inside the EFE Transmit/Receive Modules via the beamforming network of the SAS.

TABLE I :INSTRUMENT KEY PARAMETERS

Parameter	Value
Centre Frequency	5.405 GHz
Bandwidth	0 ... 100 MHz (programmable)
Polarisation	HH-HV, VV-VH
Antenna Size	12.3 m x 0.84 m
RF Peak Power (sum of all EFE TRMs, at TRM output)	4368 W
Pulse Width	5-100 us (programmable)
Transmit Duty cycle	12 % max
Receiver Noise Figure at Module Input	3 dB
Pulse Repetition Frequency	1000- 3000 Hz (programmable)
Data Compression	Selectable according to EC-BAQ

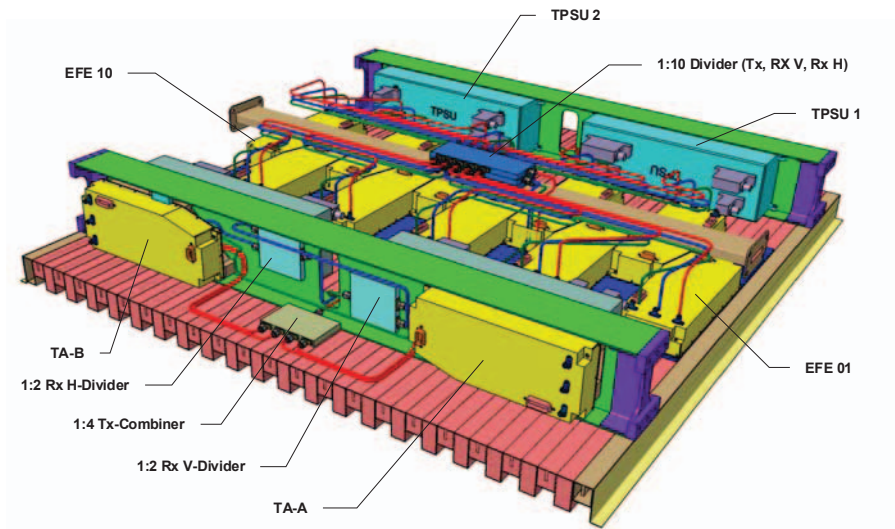


FIGURE I THREE-DIMENSIONAL VIEW OF THE SAS TILE LAYOUT

Signal radiation and echo reception is realized with the same antenna using slotted waveguide radiators. In receive, the echo signal is amplified by the low noise amplifiers inside the EFE Transmit/Receive Modules and summed up using the same network as for transmit signal distribution. After filtering and down conversion to baseband inside the SES, the echo signal is digitised and formatted for recording.

Table I provides a brief overview on the instrument key parameters. A three-dimensional view of the SAS Tile, which is the elementary building block of the SAR Antenna Subsystem, is given in Fig. I. Figure II shows the accommodation of the SAS antenna (comprising 14 tiles) on the S1 spacecraft (stowed configuration).

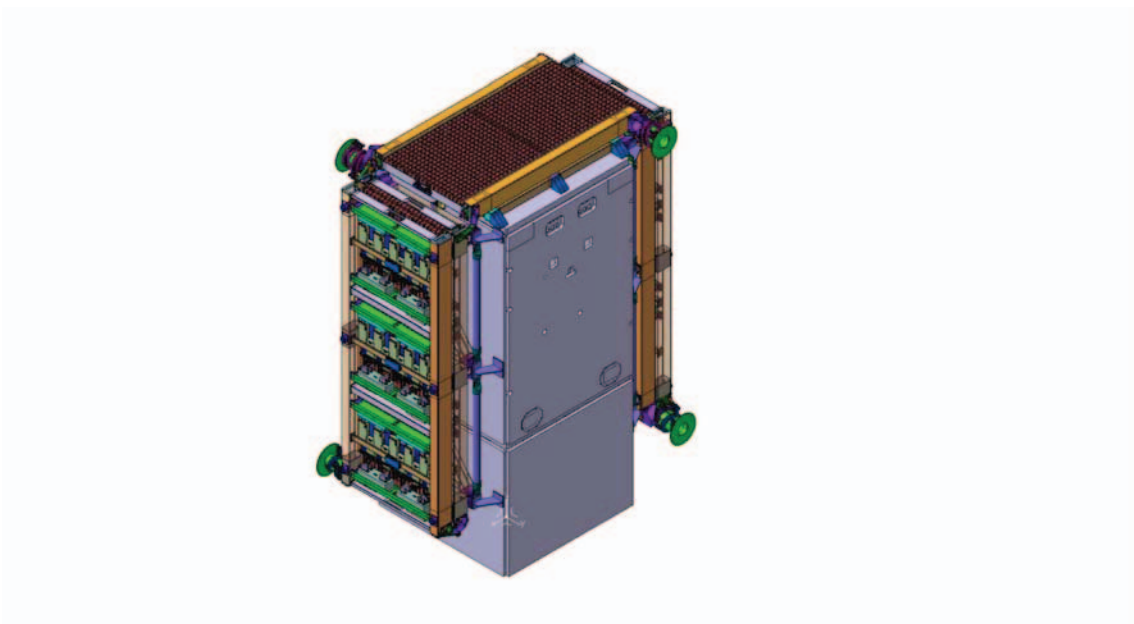


FIGURE II ACCOMMODATION OF THE SAR INSTRUMENT ON THE S1 SPACECRAFT (STOWED CONFIGURATION)