MODULAR RADAR CORE FOR AIRBORNE AND SPACE APPLICATIONS

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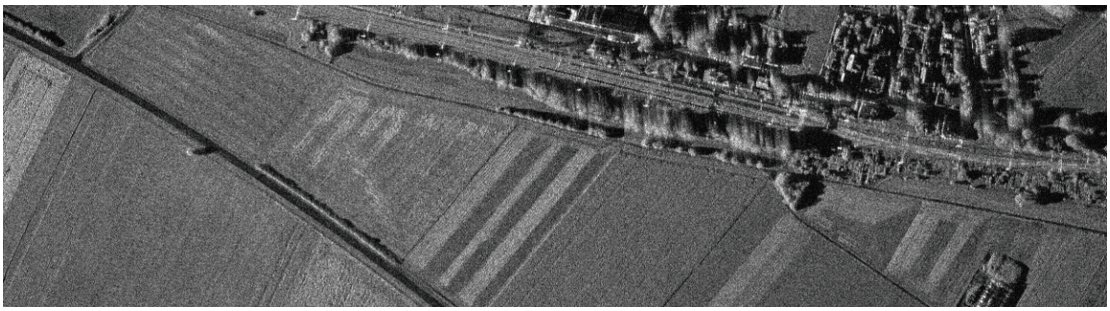
INTRODUCTION

The development of Radar Core electronics for any air- and spaceborne radar units has a long space heritage at EADS in Friedrichshafen. It encompasses the spaceborne radars SIR-C/ X-SAR, SRTM, TerraSAR-X, TanDEM-X, and the oncoming PAZ mission and many airborne missions. These missions demonstrated successfully the high end radar electronics performances.

EADS initiated a product development program called SmartRadar (Scalable modular aerospace radar technology) for the next generation airborne and space radars. The Radar Core development is one step in the SmartRadar development road map at EADS.

To summarise the status of the development: the new hardware and related software have been flown in a demonstration flight campaign in summer 2009. For this campaign the frequency band was chosen to be at X-Band to use an available Reflector Antenna and Travelling Wave Tube Amplifier (TWTA) and Front end equipment. Synthetic Aperture Radar (SAR) image results are of very good quality and performance parameters analysed from the recorded raw data match or exceed the chosen design parameters.



REQUIREMENTS FOR THE RADAR CORE DEVELOPMENT

The SmartRadar Radar Core features a modular design to cope with the challenging requirements of a modern SAR & MTI sensor which makes the Radar Core easily adaptable to

- various performance requirements
- air and space environmental conditions
- L-, C-, X- and Ku-band operating frequencies

and is operational with

- selectable bandwidths
- selectable number of receive channels
- multiple operating modes, including simultaneous modes

The Radar Core consists of a Radio Frequency Electronics (RFE) and a Digital & Control Electronics (DCE), which is depicted in figures 1 and 2.

The present Radar Core has an inherent bandwidth of more than 600 MHz which fits to the latest ITU regulations at X-Band for civil use. However, if needed, an even larger bandwidth can be generated. The number of receiver channels can be selected according to the special needs of the mission (1 or 2 polarisations; multiple phase centres; etc). In the present design, 1 Tx and a configurable number of 1 to 6 Rx channels are provided. A substantial size and mass reduction has been achieved with respect to previous missions.
Due to the engineering experience from the above given space projects, the design was carried out in such a manner, that it can be used for airborne and space borne applications. For the relevant application it has to be decided whether commercial, military, or space hardened components have to be used.

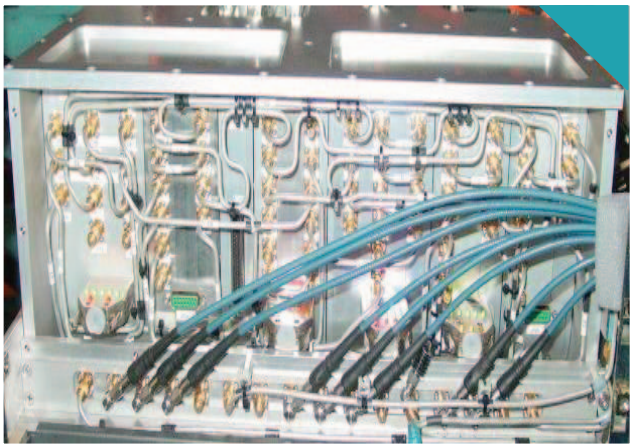


Fig. 1: Radio Frequency Electronics (RFE)

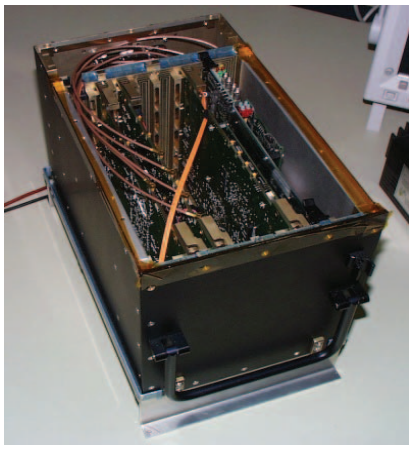


Fig. 2: Digital & Control Electronics (DCE)

The SmartRadar initiative has a widely platform independent design with very flexible features in terms of performance and applications.

In order to verify the design of the modular Radar Core a flight program was carried out in summer 2009. The aircraft was provided by the German WTD61 office and was operated under BWB/MoD contract.

Remarkable results have been achieved during the SmartRadar flight campaign in Summer 2009.
The sensor has proven all its important design criteria, like: bandwidth selectability from low to ultra high resolutions. Key advantage is the scalable and modular design with selectable number of receiving channels and multiple operating modes which supports new SAR system designs with multiple antenna phase centers.
The SmartRadar Radar Core is designed for the next generation air- and space-borne SAR radar instruments in all possible frequency bands from L- to Ku-band.