

Efficient Calibration and First Results of TerraSAR-X

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Abstract

The paper presents the approach for the in-orbit calibration of TerraSAR-X, dedicated activities performed during the commissioning phase and discuss latest results.

The main goal after launch of TerraSAR-X, a complex SAR system with tight performance requirements and due for launch in 2007, is to provide calibrated and verified SAR data products as soon as possible. Thus, a strategy has been established for an efficient but robust in-orbit calibration procedure. Due to the high degree of flexibility of TerraSAR-X, e.g. the large number of operation modes (StripMap, Spotlight, ScanSAR, left/right looking, etc.) and possible antenna beams, the in-orbit calibration procedure of TerraSAR-X is based on a novel antenna model approach. This novel antenna model developed and validated on ground is verified in orbit by measuring only a few selected beams using deployed ground receivers and the Amazon rain forest. Absolute calibration, yielding an absolute calibration factor by measuring the radar system against reference ground targets, requires precise and sophisticated ground equipment.

The success or failure of the mission is essentially dependent on the calibration of the TerraSAR-X system ensuring the product quality and the correct in-orbit operation of the entire SAR system. To account for the restricted time of calibration campaigns the number of passes and places of test sites is optimised versus cost and time effort by calibrating several beams and polarisation modes with the same test site. Therefore, corresponding test site configurations have been established.

The in-orbit calibration procedure realised for TerraSAR-X is applicable to other advanced SAR sensors coping with a multitude of operational modes as well as subsequent calibration campaigns.