

TanDEM-X SAR System Verification

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Abstract:

The **TanDEM-X** mission (**T**erraSAR-X **a**dd-on for **D**igital **E**levation **M**easurement) comprises two nearly identical SAR satellites, TSX and TDX. Both satellites serve two different German SAR missions: TerraSAR-X which started already 2007 and TanDEM-X which started 2010. The TerraSAR-X mission provides high-resolution SAR images in flexible mode configurations for commercial and scientific users. The primary mission goal of TanDEM-X is the generation of a global, high resolution digital elevation model.

The TanDEM-X commissioning phase was divided into two parts: the monostatic and bistatic commissioning phase. Before entering the close formation the two satellites were flying in distance of 20 km, the so-called pursuit monostatic phase. During this phase the instrument and SAR performance of the TDX satellite were verified and calibrated to fulfill the TerraSAR-X mission requirements. As both satellites were able to acquire the same data with a time distance of 3 seconds, a direct comparison of performance parameters from both SAR sensors was possible. This paper presents commissioning phase results of the TDX instrument front-end, SAR data take and quality parameters, and satellite orbit and attitude accuracy. It can be shown, that both sensors have the same excellent quality.

After the successful verification of the TDX satellite and entering the close formation with TSX at distances of down to 200 m, the bistatic commissioning phase started. Before nominal SAR operation could be started, several safety mechanisms had to be verified to reduce the risk of mutual illumination which might damage the satellites. The tests performed on exclusion zones and the Sync-Warning mechanism will be presented in more detail.

To deal with the slightly different frequencies of TSX USO (**U**ltra-**S**t**a**ble-**O**scillator) and TDX USO the performance of synchronization pulses, which are exchanged between both satellites during an acquisition, is verified during the bistatic commissioning phase, too. First results will be presented in the paper.