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Towards a four technique GGOS site: VLBI - DORIS compatibility tests at Wettzell

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Within the framework of a Global Geodetic Observing System (GGOS), co-location sites are of special importance for the evaluation and mutual control of the individual geodetic space techniques. At the Geodetic Observatory Wettzell a DORIS (Doppler Orbitography and Radiopositioning Integrated by Satellite) beacon could complete the geodetic instrumentation consisting of three Very Long Baseline Interferometry (VLBI) telescopes, two Laser Ranging (LR) systems and a number of multi- Global Navigation Satellite System (GNSS) stations.

Integrating all fourth geodetic instrumentation into one site generates new problems with Electromagnetic Compatibility (EMC). While the VLBI system is designed to receive very weak signals from quasars, the DORIS beacon emits strong signals in the UHF frequency band at 401.25 MHz and in the S band at 2036.25 MHz. During the observation of quasars with VLBI there is a high risk of coupling DORIS S band signals into the VLBI receiving chain generating spurious signal and, in the worst case, overloading receiving chain electronics and risking its damage. Before a DORIS beacon is operated at the Geodetic Observatory Wettzell, it must be ensured that it can be operated alongside the VLBI system without any risk of damage or degradation of the measurement.

Field tests under different setups were performed to assess the impact of the DORIS signal on the classical geodetic VLBI 20-m and the VGOS 13-m radio telescopes. Different locations on the observatory each at a distance of more than 100 m were occupied by the DORIS antenna. It has been shown that obstacles like buildings or earth mounds attenuate the signal up to 20 dB. However the power received at the input of the Low Noise Amplifiers (LNA) is still at a critical level when the radio telescope points towards the DORIS beacon. The quality of the correlated signals is not or barely affected at long baselines. At local baselines however, the DORIS emission as a common mode signal degrades the correlation result. Different strategies to minimize the impact of the DORIS beacon are discussed.