Accurate Passive Targets for Radiometric and Polarimetric SAR System Calibration

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While transponders provide very large RCSs at compact design, passive reflectors are still the most widely used reference targets for SAR calibration. In fact, trihedral corner reflectors with their known RCS of $\frac{4}{3}\pi\frac{l^4}{\lambda^2}$ (1) and analytically derived from geometric optics solution, are the reference for almost every absolute radiometric SAR calibration. Even the absolute RCS of transponders is derived from trihedral corner reflectors measurements [1]. Hence it is of great importance to know the absolute RCS of trihedral corner reflectors accurately and being able to assess the uncertainty associated with the derived RCS value.

It is already known for a long time [2], that eq. (1) neglects some effects and is hence not very accurate. E.g. it assumes infinite large corner plates, i.e. edge effects are neglected. It also assumed perfectly manufactured corner reflectors, i.e. exactly 90° between the plates and no deformation of the plates. Both assumptions fail on real corner reflectors as they are never perfectly manufactured and deviate more or less from the ideal geometry.

DLR tries to tackle this issue by measuring the actual geometry of each trihedral corner reflector using an optical surface measurement system and to simulate the RCS for each corner reflector based on an appropriate model. The measurement and simulation approach as well as first results of this effort will be presented.

While trihedral corner reflectors are the most prominent passive targets, they are not the only ones: dihedral corner reflectors provide exciting properties for polarimetric calibration, but they are presumed to be hard to align. It will be shown~~,~~ the effects of misalignment on the polarimetric signature and how to align dihedral corner reflectors precisely. Measurements of dihedrals using the TerraSAR-X satellite justify the simulation results.

[1] Raab, Sebastian and Döring, Björn J. and Jirousek, Matthias and Reimann, Jens and Rudolf, Daniel and Schwerdt, Marco (2014) *Comparsion of Absolute Radiometric Transponder Calibration Strategies.* In: Proceedings of the European Conference on Synthetic Aperture Radar (EUSAR), Seiten 382-385. European Conference on Synthetic Aperture Radar (EUSAR), 2014-06-02 - 2014-06-06, Berlin, Germany

[2] Peters, L. (1962) *Passive bistatic radar enhancement devices*, Proceedings of the IEE - Part C: Monographs, 109, (15), p. 1-10, DOI: 10.1049/pi-c.1962.0001