DLR's next Generation of fully Polarimetric Calibration Transponders

* Klaus WEIDENHAUPT[1], Matthias JIROUSEK[1], Jens REIMANN[1], Sebastian RAAB[1], Daniel RUDOLF[1], Marco SCHWERDT[1]

1. Microwaves and Radar Institute of the German Aerospace Center (DLR)
Münchener Straße 20, 82230 Weßling, Germany
klaus.weidenhaupt@dlr.de

* **Corresponding Author**

ABSTRACT

Since more than 25 years, DLR is playing a key role in the calibration of modern space borne SAR systems. It has established the DLR SAR calibration center, which is constantly developing analysis and evaluation tools and operates a SAR calibration facility composed of a large number of active and passive reference targets. An example for a recent contribution is DLR's independent system calibration of ESA's Sentinel-1A and Sentinel-1B satellites in the framework of the European Copernicus program. This includes calibration activities during the commissioning phase as well as ongoing long-term system monitoring during the routine operation of the Sentinel-1 satellites.

During the aforementioned campaigns, DLR's "Kalibri" calibration transponders have been widely used and proven to be an asset to a modern SAR calibration facility, especially in the scope of antenna pattern verification and absolute radiometric calibration. The "Kalibri" transponders are the result of DLR's extensive in-house development and are designed for multi mission support. Their fully remote-controlled operation permits regular short-interval calibration measurements and the digital recording of SAR pulses.

With upcoming SAR missions, complex imaging modes with fully polarimetric acquisitions, multiple frequency bands and increasing demands on image quality come into play. With regard to the design of suitable calibration transponders, we have focused on three target missions and identified the major challenges as:

- Support of missions at low frequencies, that is L-band aiming at DLR's Tandem-L mission and P-band in case of ESA's Biomass mission.
- Processing of high bandwidths up to 1.2 GHz as envisaged by HRWS (Airbus) at X-band.
- Fully polarimetric capabilities as foreseen by both, Tandem-L and Biomass.

All of these requirements are considered with DLR's "Kalibri Next Generation" project, a recently launched initiative dedicated to the development of next generation transponders. We introduce our "Kalibri Next Generation" project, the transponder concepts developed in this scope and present technical solutions to meet the challenges described above.

A recent focus of our development is a very compact dual-polarized corrugated horn antenna (called VeGA) for L-band transponders. Three versions of this antenna have been manufactured using innovative techniques such as 3D-printing and carbon fiber plastics and have been measured in DLR's compact test range. A detailed comparison of the performance of these antennas will be presented.