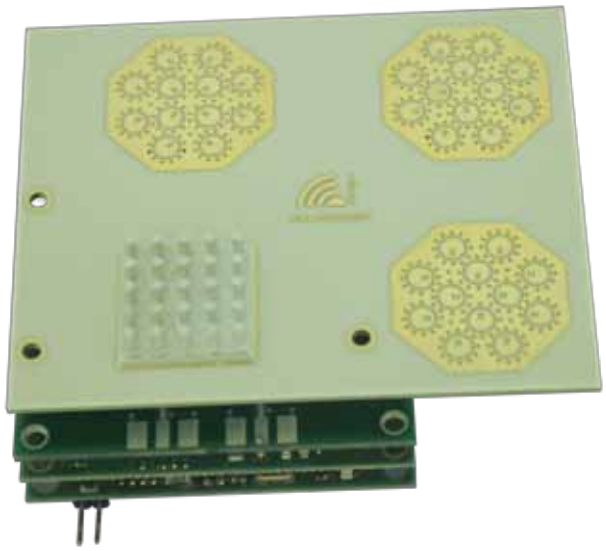
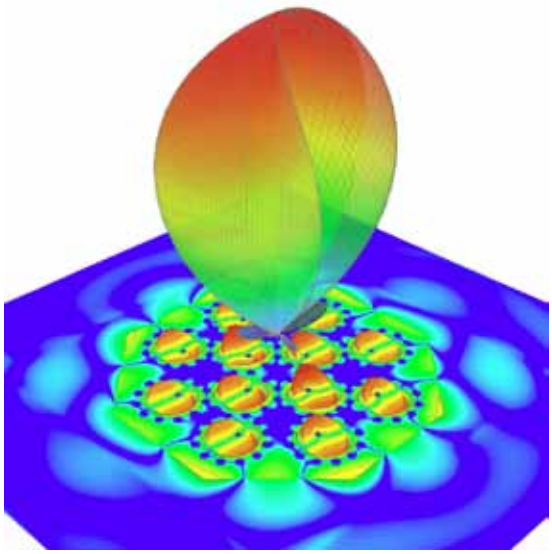
RADAR APPLICATION NOTE

POLARIMETRIC MEASUREMENTS WITH THE SR-1200 MODULAR RADAR SYSTEM





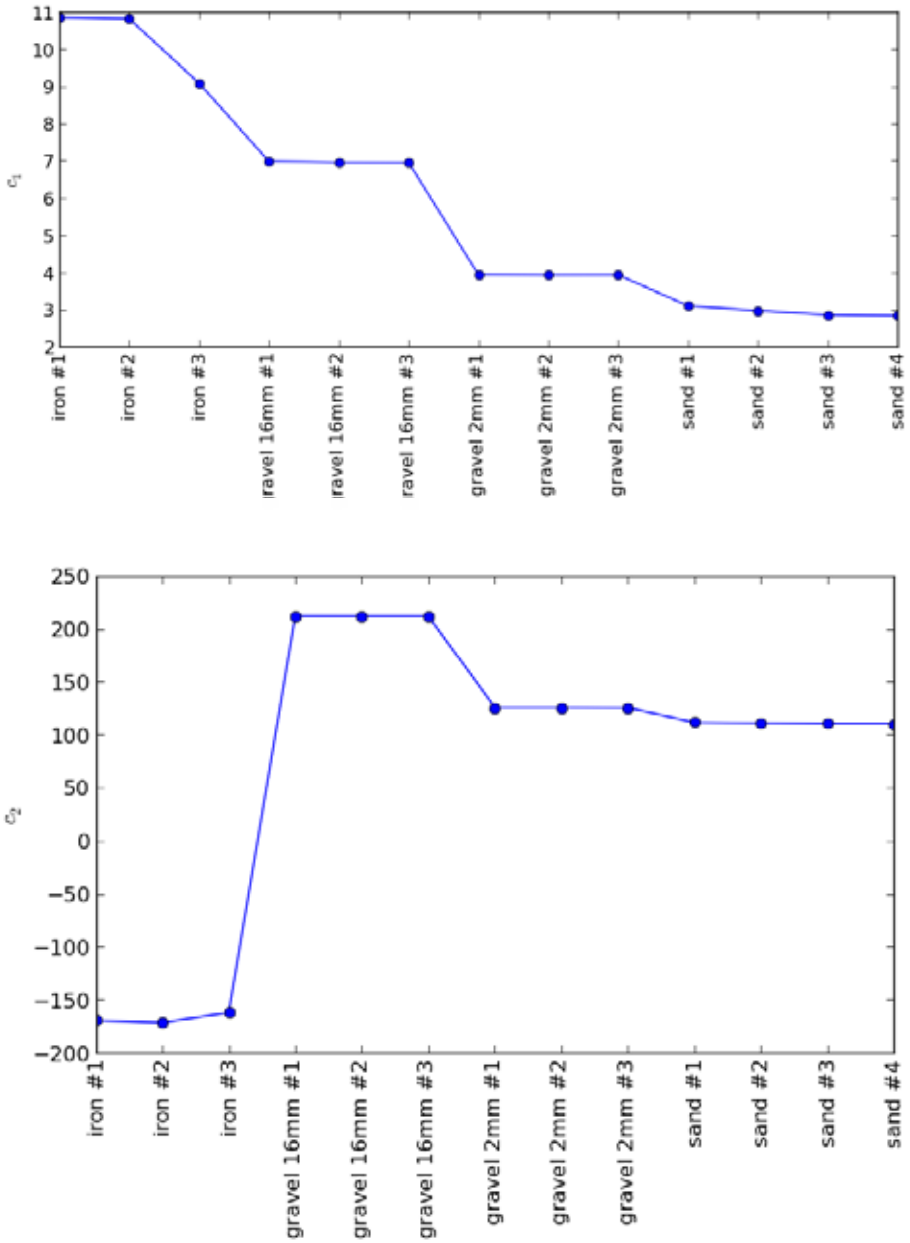
sR-1200-CP with circular polarized antennas

OVERVIEW

The polarization is a physical property of the electro-magnetic wave transmitted by the radarsystem. It is well known that material/target properties have an influence on the polarization of the reflected wave. Thus, polarimetric radars can be used to characterize or distinguish targets. The sR-1200-CP features a modified antenna front-end with circular polarization and 3-dB opening angle of 24 degrees. The transmit antenna (top left of the figure) uses left-hand polarization (LHP), while the receive antennas (on the right of the figure) use left- and right-hand polarizations (RHP) respectively. Both channels are demodulated by IQ mixers, resulting in the four analog channels that are typical for the sR-1200 series (I1, Q1, I2, Q2). Polarimetric experiments may be performed with our standard developer kit software suite. For the examples below, radar burst measurements with 100 shots were performed on different soils: Iron sheets, gravel sand with 16mm and 2mm pebble size and fine sand. Burst data was saved in csv/text format for post-processing. In order to eva-luate the polarimetric properties of the materials, so-called polarimetric parameters are calculated. The following notations are used:

$$XR(\Omega) = I1 + jQ1$$
$$XL(\Omega) = I2 + jQ2$$
$$SRR \approx |XR(\Omega)|$$
$$SLR \approx |XL(\Omega)|$$

EXEMPLARY RESULTS



It was found that evaluating the ratio of the two back scatter levels is sufficient to discriminate the investigated soil types. The first parameter is

$c_1 = 10 \log10(S_{RR} / S_{RR})$

The "Co-pol phase difference" is known to correlate with type, size and spacing of vegetation. It is defined as the average difference between the phase angles in the RR and LL channels.

Since the radar is using only one transmit polarization, only a "cross-pol phase difference", i.e. the phase difference between RR and RL channels, can be calculated

$c_2 = \varphi(XR(\Omega)) - \varphi(XL(\Omega))$

Extensive support for our specialist systems, as well as user-defined antenna patterns or polarizations is available.

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