COMPARSION OF POLARIMETRIC CALBRATION TECHNIQUES AND THEIR APPLICATIONS

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ABSTRACT

Polarimetric Calibration is performed by applying distortion matrices acting on transmit and receive. Many methods or algorithms to determine these distortion matrices are developed these years. Whitt developed an algorithm using three point-targets, whose scattering matrices is known [1]. Sarabandi had developed an algorithm using distributed-target whose scattering matrices or stokes matrices is known [2]. Van Zyl gave a method using distributed-targets to calibrate the phase and crosstalk and a point-target to calibrate the imbalance [3]. Klein gave a improved algorithm using distributed-targets to calibrate the crosstalk, but this iterative algorithm is too complex and may gives none resolutions [4]. Quegan developed a non-iterative algorithm to determine the crosstalk, but this algorithm omits some items of the equations, which reduce the accuracy of the results [5]. Ainsworth gave a method to determine the crosstalk and cross-imbalance using none point-target or distributed-target, but only scattering reciprocity [6].

Based on experiments, this paper will give a comparison of these methods and algorithms on the complexity, accuracy, and applicability. The comparison will be shown as table 1.

Table 1 Comparison of different Calibration methods or algorithms

	Complexity	Assumption	Targets needed	Accuracy	applicability
Whitt	Simple	none assumption	3 suitable point-targets		
Sarabandi	Simple	none assumption	Distributed-targets		
Van Zyl	Simple	Scattering reciprocity and system symmetry	1 point-target and 2 suitable distributed-target		
Klein	complex	Scattering reciprocity	Distributed-target		
Quegan	Simple	Scattering reciprocity	Distributed-target		

Ainsworth	complex	Scattering reciprocity	None target		

The blanked items need more experiments and will be filled later.

To compare the accuracy of these methods, we will give a comparison of statistics of the relative error of distortion matrices elements.

To compare the applicability, we will use all of these methods to calibrate a group of distorted full Polarimetric images, and then apply the calibrated images to all kinds of Polarimetric applications, such as polarization decomposition and classification, POLinSAR. As different applications require different accuracy of phase calibration, crosstalk calibration and imbalance calibration, it's significant to find a more suitable calibration method to different applications.

Reference:

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