



## Polarization response of SKA1-LOW array antennas

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The polarization purity of radio instruments such as the SKA1-LOW (Square Kilometer Array (SKA) low-frequency instrument) [1] is a key requirement to meet in order to realize the ambitious science goals of SKA. With science cases ranging from the detection and study of signals originating from the Cosmic Dawn and Epoch of Re-ionization Hydrogen to the discovery and study of all the Pulsars in the Milky Way, SKA1-LOW will be a wideband ultra-sensitive interferometer with 512 stations of 256 elements each, made of antennas known as SKALA [2]. This instrument, the largest and most powerful of its type, aims to cover a large field of view ( $\pm 45$  deg. from zenith) that can be scanned electronically by the aperture arrays on the ground. Across a 7:1 band (50-350 MHz), this represents a design challenge for the array antennas. High levels of polarization purity are especially hard to achieve in large field of view scenarios and in the presence of strong mutual coupling, such as in the SKA1-LOW case. The SKALA antenna is an ultra-wideband antenna of the type log-periodic that has been developed by a consortium of universities and research centers (The Aperture Array Design Consortium) for the SKA over the last few years. The University of Cambridge, who has also partnered with the Universite catholique de Louvain in Belgium for the development of a numerical tool capable of full electromagnetic simulations of SKA1-LOW stations, has led the design of the antenna system.

In this presentation we will discuss the polarization performance of the SKA1-LOW stations (based on SKALA-4 antennas) and we will provide details on the metrics used to measure this polarization purity, the design trade offs and limitations and the expected performance. Furthermore, we will discuss the importance of polarimetric beam models in the instrument's calibration and will present a technique to realize these models in the case of SKA1-LOW arrays.

1. The Square Kilometre Array, [www.skatelescope.org](http://www.skatelescope.org)
2. E. de Lera Acedo et al., "SKALA, a log-periodic array antenna for the SKA-low instrument: design, simulations, tests and system considerations," *Exp. Astron.*, vol. 39, no. 3, pp. 567–594, Jul. 2015.