



A High Spectral and Temporal Resolution ROACH-based Digital Back-end for Low Radio Frequency Spectro-Polarimetry

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We have designed a new ROACH-based digital back-end for the existing Gauribidanur RAdio Spectro-Polarimeter (GRASP) for observation of the solar corona in the frequency range 400–50 MHz, which corresponds to 1.05–2.0 R_{\odot} on the solar surface. It is well established that the solar radio bursts at our interest of frequencies are found to be circularly polarized. This system consists of a Cross Polarised Log-Periodic Dipole Antenna (CLPDA), which is a combination of two orthogonally oriented LPDAs. The sum of auto-correlation of the two orthogonal signals corresponds to Stokes–I, and the sum of imaginary components of the cross-correlations corresponds to Stokes–V. The RF signals from CLPDA, after passing through a bandpass filter are directly digitized using iADC at its Nyquist rate (800 MHz). The Fourier analysis of this digitized signal is done by a four tap Poly-phase Filter Bank (PFB) to suppress the side-lobes and a 8192 point FFT is computed. In order to correct the polarisation leakage the real component of the cross-correlation is also computed. The performance of the new digital back-end will be compared with the existing spectrum analyser based back-end. The detailed characterization of the digital back-end, calibration of the system using lab test, observations of Galactic Center (GC) and preliminary results will be discussed

1. Hickish, Jack, et al. "A Decade of Developing Radio-Astronomy Instrumentation using CASPER Open-Source Technology." *Journal of Astronomical Instrumentation* 5.04 (2016): 1641001.

2. Kishore, P., et al. "A low-frequency radio spectropolarimeter for observations of the solar corona." *Solar Physics* 290.9 (2015): 2409-2422.