

# SARAS: a precision system for measurement of the cosmic radio background and signatures from the epoch of reionization

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**Abstract** SARAS is a correlation spectrometer purpose designed for precision measurements of the cosmic radio background and faint features in the sky spectrum at long wavelengths that arise from redshifted 21-cm from gas in the reionization epoch. SARAS operates in the octave band 87.5–175 MHz. We present herein the system design arguing for a complex correlation spectrometer concept. The SARAS design concept provides a differential measurement between the antenna temperature and that of an internal reference termination, with measurements in switched system states allowing for cancellation of additive contaminants from a large part of the signal flow path including the digital spectrometer. A switched noise injection scheme provides absolute spectral calibration. Additionally, we argue for an electrically small frequency-independent antenna over an absorber ground. Various critical design features that aid in avoidance of systematics and in providing calibration products for the parametrization of other unavoidable systematics are described and the rationale discussed. The signal flow and processing is analyzed and the

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