Development of a Small-Aperture Radio Telescope Network for Continuous Real-Time Detection of Transient Radio Signals

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The dynamic radio sky exhibits transient phenomena on timescales from seconds to days, yet sustained monitoring is hindered by the limited number of large observatories. This project investigates whether geographically separated small-aperture radio telescopes can detect transient signals near the neutral hydrogen (HI) 21 cm line while suppressing local radio-frequency interference (RFI) through coincidence-based analysis. Two co-pointed, one-meter-class meridian transit telescopes separated by 37 km were operated at 1420.4 MHz, producing one-second cadence continuum power time series from 1024 spectral channels. A custom pipeline identified coincident transient candidates using sliding-window statistics with dual thresholds: correlated-power significance and Pearson cross-correlation coefficient. Across seven consecutive nights, six multi-site coincident candidates were identified on five separate nights. False-positive characterization using artificial time offsets yielded a mean rate of 3.5 × 10?³ detections per 180-second window. Synthetic Gaussian burst injections confirmed recovery of strong signals, while sub-threshold injections produced no triggers. These findings demonstrate that coincidence filtering substantially reduces spurious detections and enables statistically grounded candidate identification. Although signals remain unclassified pending follow-up, this work establishes the feasibility of scalable, low-cost radio arrays for continuous monitoring of the transient radio sky.

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