Searching for Short Dispersed Pulses with LWA1

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The LWA1 radio telescope is an array of 258 dual-polarized dipoles, collocated with the VLA in Central New Mexico, operating in the 10–88 MHz range (Ellingson *et al.* (2012), arXiv: 1204.4816 [astro-ph.IM]). The instrument provides 4 independently-steerable beams utilizing digital true time delay beamforming, providing large instantaneous bandwidth (up to 16 MHz per beam), high intrinsic sensitivity (about 6 kJy zenith system equivalent flux density), and large field of view (about 3°–10°, depending on zenith angle and frequency). LWA1 currently hosts several time-domain and transient search observing projects (Taylor *et al.* (2012), arXiv: 1206.6733 [astro-ph.IM]). In this presentation, we describe a project underway since February 2012 in which we have collected hundreds of hours of Nyquist-sampled time domain beam data and have begun searching this data for evidence of short dispersed pulses that may be associated with aperiodic pulsar emission or a variety of as-yet undetected phenomena including mergers of exotic objects, gamma ray burst prompt emission, and explosions of primordial black holes. Data analysis is performed using a custom software package known as "Loa", which is designed specifically for processing of large volumes of beam output time-domain ("voltage") data on platforms ranging from single PCs to large high-performance computing clusters. Loa is being used at PC clusters located at LWA1 and Virginia Tech to perform characterization of LWA1 beam data, RFI characterization and mitigation, incoherent dedispersion, and detection of periodic as well as single-pulse emission. The survey achieves sensitivity of about 5 Jy/beam (16 MHz, 5 σ) for pulses with dedispersed width of 1 s. Dispersion measures (DM) up to about 800 pc/cm^3 are being searched with time resolution down to about 200 μs. The goal of the present effort is to establish robust "source agnostic" event rate-density limits for single pulse emission over the widest possible range of DM, pulse width, and wavelength accessible to LWA1. This presentation will provide a status report on the project, as well as discussing self-diagnostic procedures, methods of anticoincidence, RFI mitigation, and flux (sensitivity) calibration.