A Search for Low-Frequency Radio Transients at 330 and 235 MHz

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We are conducting a search for low frequency radio transients toward the Galactic center (GC) using monitoring and archival radio observations taken with the Very Large Array (VLA) and the Giant Metrewave Radio Telescope (GMRT) at 330 MHz and 235 MHz, respectively. Although transient radio emission has been detected from many previously discovered X-ray transient sources, there have been very few radio-initiated surveys for highly variable or transient sources. The high density of stars in the GC region, the steep spectra of known radio transients, and the wide field-of-view (~2° x 2°) of low frequency observations increases the likelihood for detection of transient and variable radio sources. Recent improvements in data reduction techniques at low frequencies (e.g., excision of radio frequency interference, self-calibration, and wide-field, multi-faceted imaging), together with automated search methods for short timescale intra-observation transients, have enabled us to search more efficiently for transient radio sources.

We present results of our decade-long transient search program including the 330 MHz VLA detection of GCRT J1745-3009, a transient source which exhibited five 10-min bursts separated by 77-min in 2002 and isolated bursts in 2003 and 2004 (Hyman et al. 2005, Nature, 434, 50-52; Hyman et al. 2007, Astroph. J., 660, L121-L124). The observed properties of GCRT J1745-3009 suggest that it may represent the discovery of a new class of coherent radio emitters. We also present preliminary results of a new radio transient detected in the GC region by the GMRT at 235 MHz and active for at least 6-months. These discoveries bode well for the detection of many more transient sources with the new generation of low frequency radio telescopes currently being developed including LOFAR, the Low Frequency Array (LWA), and the MIRA Widefield Array (MWA).

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