The Fly's Eye: A Search for Millisecond Radio Pulses using the Allen Telescope Array

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A variety of possible sources of millisecond radio pulses have been suggested in the last several decades, among them such exotic events as evaporating primordial black holes (Rees, Nature 266, 333, 1977), hyper-flares from neutron stars (Popov & Postnov 2007, astro-ph/0710.2006), and emissions from cosmic strings (Vachaspati 2008, arXiv:0802.0711), but to-date few wide-field searches have been conducted capable of detecting them. The recent announcement by Lorimer et al. of the detection of a powerful (~30 Jy) and highly dispersed (DM ~ 375 pc cm^{-3}) radio pulse in Parkes multi-beam survey data has fueled additional interest in such phenomena. Further, the generally unexplored nature of the millisecond radio parameter space presents the tantalizing possibility of uncovering hitherto completely unknown phenomena as well.

We will present the design, construction, data analysis and some preliminary results of the Fly's Eye, a field programmable gate array (FPGA) based fast readout spectrometer designed to detect and elucidate powerful dispersed radio transients using the Allen Telescope Array (ATA). The Fly's Eye processes 44 independent signal paths, each with a bandwidth of 209 MHz (at L-band), and produces 128-channel (8 bit/channel) spectra, accumulated for 0.6ms, to give a total data rate of 32 GB/hour. Independent antenna-pointings of the current 42-dish ATA, along a strip of constant declination, yields a maximum total field-of-view of approximately 198 square degrees.

The Fly's Eye was successfully installed at the ATA in December of 2007, and to-date approximately 450 hours of observation has been performed. We have detected three pulsars (B0329+54, B0355+54, B0950+08) and six giant pulses from the Crab pulsar in our diagnostic pointing data. We have not yet detected any other convincing bursts of astronomical origin in our survey data.