

The Parkes Multibeam Pulsar Survey

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We are carrying out a large-scale survey of the Galactic Plane using the 13-beam 20-cm receiver with 288 MHz bandwidth on the 64-m telescope at Parkes, Australia. The search covers the region $260^\circ < l < 50^\circ$, $|b| < 5^\circ$, and each pointing lasts 35 minutes, leading to a nominal sensitivity of 0.2 mJy for pulse periods in the range 0.1 – 2 s and dispersion measures (DMs) less than 300 pc cm^{-3} . The search processing includes the standard elements of summing the data at many trial DMs, taking Fourier Transforms at each DM to search for peaks in the power spectra, and summing harmonics to increase the sensitivity to short-duty-cycle pulsars. As a 35-minute pointing could in principle cover a significant fraction of a binary orbit, an incoherent acceleration search is also employed, in which the pointing is divided into 16 segments and checked for signals that drift in frequency. Other algorithms search for very slow pulsars, strong single pulses, and extremely fast binary systems. Survey observations were taken from 1997 August through 2002 March, and all pointings are currently being reprocessed with the full code including acceleration searches and improved interference excision techniques.

Over 625 pulsars have been discovered to date from this survey, with candidates (including high-quality millisecond and binary candidates) still appearing in the reprocessing outputs. We have adopted the practice of timing each new pulsar for a full year after its discovery, in order to correctly determine positions and period derivatives. Most of this follow-up timing is done at Parkes and the 76-m Lovell Telescope at Jodrell Bank, U.K., with a small number being timed using the 305-m Arecibo Telescope in Puerto Rico. Highlights of the new pulsars include several young objects, some with very high magnetic fields or plausible associations with supernova remnants or unidentified EGRET point sources, and 15 new binary systems, with companion types ranging from white dwarf to neutron star to massive main-sequence star.