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The Green Bank North Celestial Cap Pulsar Survey

A Decade of Discovery

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The Green Bank North Celestial Cap Pulsar Survey: A Decade of Discovery

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The Green Bank North Celestial Cap (GBNCC) pulsar survey is the most successful low-frequency pulsar survey ever carried out. Using the Robert C. Byrd Green Bank Telescope (GBT) to cover 85% of the celestial sphere at a center frequency of 350 MHz, the survey is optimized for finding bright, nearby pulsars, particularly millisecond pulsars (MSPs) in short-orbital period binary systems. Data-taking, which began in 2009, is 95% complete, and we expect to finish the survey in 2021. Here, we provide a broad overview and update of the GBNCC survey, with a focus on recent results. To-date, GBNCC has discovered 190 pulsars, of which 33 are MSPs. Ten MSPs have been included in the North American Nanohertz Observatory for Gravitational Waves with the goal of directly detecting low-frequency gravitational waves. Improvements in our single-pulse detection pipeline have also resulted in the discovery of the first fast radio burst in the survey. In partnership with the Canadian HI Intensity Mapping Experiment (CHIME), we are observing select GBNCC pulsars with an increased cadence, which is greatly accelerating our ability to derive timing solutions. The increased cadence has also allowed us to measure three post-Keplerian parameters in a highly relativistic double neutron star system, providing a test of general relativity that will steadily improve in precision with time. We expect that approximately 50 additional long-period pulsars and 3-8 MSPs will be discovered in the remaining survey regions. A full re-processing of the data using improved interference excision and candidate selection is planned, which may result in additional discoveries.