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SEARCHING FOR NEW MILLISECOND PULSARS WITH THE GBT INFERMI UNASSOCIATED SOURCES

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The launch of the *Fermi* satellite in 2008 revolutionized gamma-ray pulsar astronomy by enabling the discovery of many new millisecond pulsars (MSPs). The *Fermi* Pulsar Search Consortium (PSC) has organized hundreds of radio observations of pulsar-like Large Area Telescope (LAT) unassociated sources. Over the past seven years, the PSC has discovered more than 70 new MSPs, compared to the 75 MSPs found in the 25 years prior to *Fermi*. The National Radio Astronomy Observatory's Robert C. Byrd Green Bank Telescope (GBT) has played the key role in the project by discovering almost half (34) of the new MSPs.
In this talk, I present the discovery and analysis of 16 new MSPs, 10 of which were uncovered by me personally. The pulsars were found in GBT searches within the positional error boxes of 266 *Fermi* LAT sources, both at high Galactic latitudes and closer to the Galactic plane. All new pulsars have phase-connected radio timing solutions, and for 12 of them, gamma-ray pulsations were detected.
Twelve MSPs have Helium white dwarf (He-WD) companions and the other four are in so-called "spider" systems with compact orbits and non-degenerate companions. We investigated the relationship between radio and gamma-ray flux densities for all MSPs, confirming that there is almost no correlation between the two. We also investigated the orbital period vs. companion mass relation for MSPs with He-WD companions using a simple Monte Carlo technique, and found that the distribution of binary inclination angles is not random but possibly leans towards lower inclinations. For the four MSPs in compact orbits, we examined flux density variability, as well as their optical light curves. We found that all four MSPs are eclipsing and that two of them exhibit strong diffractive scintillation. Finally, we found optical counterparts for two MSPs, one of which shows ellipsoidal modulations in its light curve, suggesting that the companion is filling its Roche lobe.

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