New PTA-Caliber Millisecond Pulsars from the GBNCC Survey

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orbit, thus producing the first pulsar timing constraints on the stochastic background that are robust against ephemeris error. We present this work and comment on the prospects for pulsar timing data to be used in conjunction with direct observations to enhance our understanding of the orbits of Solar System bodies.

149.20 — New PTA-Caliber Millisecond Pulsars from the GBNCC Survey

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One of the main science goals of the Green Bank North Celestial Cap (GBNCC) pulsar survey is to find new millisecond pulsars (MSPs) and rapidly assess their suitability for inclusion in pulsar timing arrays (PTAs). The International Pulsar Timing Array (IPTA) currently monitors about 100 MSPs with sub-microsecond RMS residuals in an effort to detect low-frequency gravitational waves from merging supermassive black hole binaries. One of the best ways to improve our sensitivity to the stochastic gravitational wave background is to add high-caliber MSPs to PTAs. Over the past two years, ten MSPs have been discovered in the GBNCC pulsar survey and several have already been added to the North American Nanohertz Observatory for Gravitational Waves (NANOGrav) PTA, and these sources will likely be incorporated into regular monitoring programs by other IPTA member groups soon. In this poster, we will describe the vetting process for new GBNCC MSPs and the timing properies of the latest discoveries incorporated into NANOGrav and other PTAs.

149.21 — Limits on Gravitational Waves from Individual Supermassive Black Hole Binaries from the NANOGrav 11-year Data Set

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We have searched the North American Nanohertz Observatory for Gravitational Waves (NANOGrav) 11-year dataset for GWs from individual supermassive black hole binaries (SMBHBs). As we find no evidence for GWs in the the data, we present upper limits on the GW strain amplitude for GW frequencies between 3 and 300 nHz, and show how our sensitivity varies with sky location due to the distribution of pulsars in our array. We use these limits to constrain the luminosity distance to individual sources and to place constraints on the mass-ratios of SMBHBs in local galaxies. We use simulations of local SMBHBs to estimate the expected number of detectable sources with our current strain upper limits. We also show advanced noise modeling and detection techniques that we have developed to distinguish between true GW signals and other spurious signals in the residuals.

149.22 — Recipe for a Pulsar: Using the NANOGrav Pulsar Signal Simulator as a Teaching Tool

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As ground-based gravitational wave detectors continue to detect signals, pulsar timing arrays are now sitting on the cusp of their first detection. The North American Nanohertz Observatory for Gravitational waves (NANOGrav) is a group of scientists that use an array of pulsars to detect ultra-low frequency gravitational waves. NANOGrav is working to create a software tool to model signals sent by a pulsar. The Pulsar Signal Simulator (PsrSigSim), aims to test various analysis software packages and techniques by generating simulated signals with known parameters. This software tool is also being used for teaching. With fine parameter control that the PsrSigSim will achieve, the implementation of software that a user can easily manipulate to visualize the resulting data becomes possible. Along with a Graphical User Interface (GUI), the PsrSigSim can provide a gentle introduction into the subject of Pulsar Timing.