

Astronomers discover seven new pulsars

August 31 2022, by Tomasz Nowakowski

Average profile, dynamic spectra and (S/N) from dispersion measure of the pulsar J0146+3104

Using the Large Phased Array (LPA) radio telescope of Pushchino Radio Astronomy Observatory (PRAO) in Russia, astronomers have detected seven new pulsars and determined their basic parameters. The finding is reported in a paper published August 18 on the arXiv pre-print repository.

Pulsars are highly magnetized, rotating [neutron stars](#) emitting a beam of electromagnetic radiation. They are usually detected in the form of short bursts of radio emission; however, some of them are also observed via optical, X-ray and gamma-ray telescopes.

Now, a group of Russian astronomers led by PRAO's Sergey Tyul'bashev reports the detection of seven new pulsars. The discovery was made with LPA as part of a daily sky survey conducted in a test mode, covering a full day in right ascension and 50 degrees in declination. The new pulsars were detected at a frequency of 111 MHz.

"The [pulsar](#) search was started at the radio telescope LPA LPI at the frequency 111 MHz. The first results of a search for right ascension $0h - 24h$ and declinations $+21^\circ - +42^\circ$ are presented in the paper," the researchers wrote in the study.

All in all, the astronomers observed 34 pulsars, and it turned out that seven of them have been identified for the first time. The newfound sources have spin periods between 0.82 and 2.09 seconds, while their dispersion measures are within the range of $15-90 \text{ pc/cm}^3$. The pulsars have half-width of the average profile ranging from 20 to 400 milliseconds.

It was noted that so far only the parameters of five new pulsars (namely J0146+3104, J0220+3622, J0421+3240, J1242+3938 and J1721+3524) have been confirmed by follow-up observations with LPA. Two pulsars, designated J0220+3622 and J0421+3240, have broad average profiles

and therefore require further monitoring.

The researchers noted that their discovery demonstrates how useful is LPA in the search for new pulsars. They underline its high effective area, and therefore [high sensitivity](#), the possibility of simultaneous observations in many beams, and also the possibility of daily monitoring.

"The search for pulsars in the daily monitoring data on LPA LPI is especially advantageous for detecting rare objects: flashing pulsars, in which long periods of relative rest are replaced by a significant increase in the observed flux density, pulsars of the RRAT [rotating radio transient] type, pulsars of the Geminga type, pulsars with nullings, pulsars with giant pulses," the authors of the paper explained.

The [astronomers](#) expect that further LPA observations and the processing of recently collected data will yield the detection of at least several dozen new pulsars. In particular, they hope to find more new close pulsars, which, due to interstellar scintillation, can significantly change the observed flux density from day to day, as well as pulsars with very steep spectra.

More information: S.A. Tyul'bashev, V.S. Tyul'bashev, V.V. Oreshko, S.V. Logvinenko, Detection of new pulsars at the frequency 111 MHz. arXiv:2208.08839v1 [astro-ph.HE], arxiv.org/abs/2208.08839

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