Glitch detected in the pulsar PSR J0908−4913

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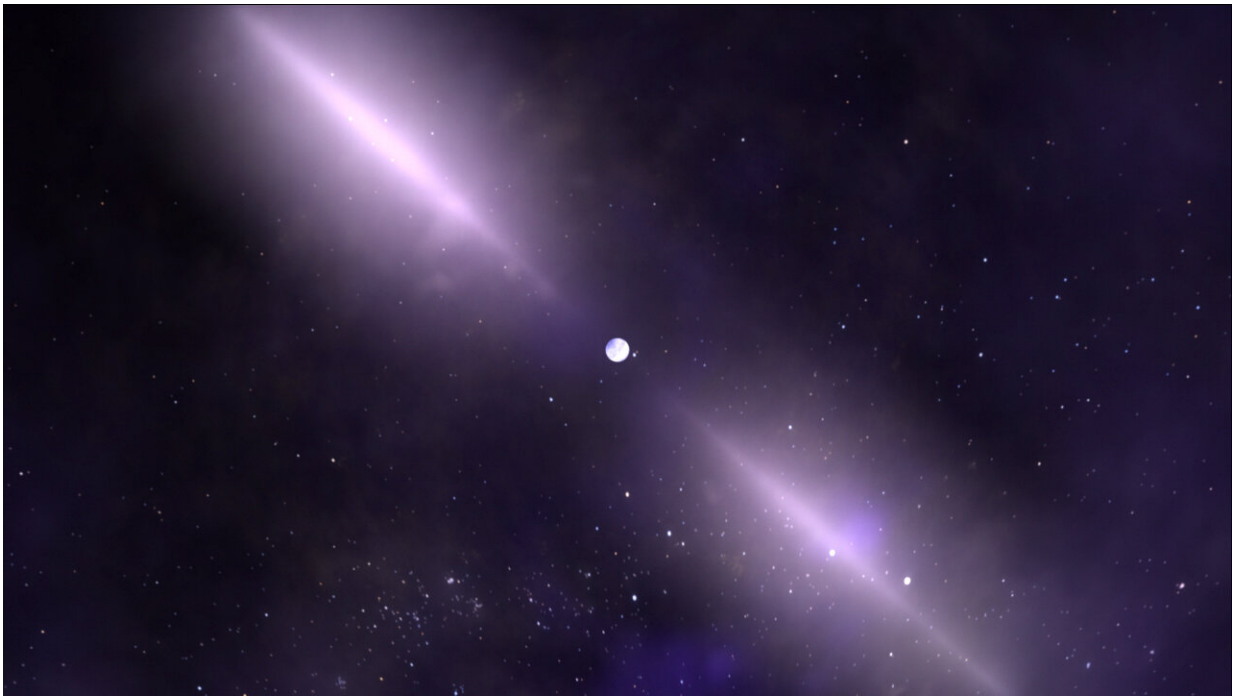

Artist's rendering of a pulsar. Credit: NASA’s Goddard Space Flight Center.

Using the Molonglo Observatory Synthesis Telescope (MOST), astronomers have detected a glitch in the radio pulsar PSR J0908−4913. The finding, detailed in a paper published December 18 on the arXiv preprint server, could be helpful in shedding more light on the properties and nature of this pulsar.

Extraterrestrial sources of radiation with a regular periodicity, known as pulsars, are usually detected in the form of short bursts of radio emission. Radio pulsars are generally described as highly magnetised, rapidly rotating neutron stars with a lighthouse beam of radiation that produces the pulsed emission.

Glitches are sudden changes of the pulsar's spin rate. The exact cause of the glitches is still unknown, however, they are believed to be caused by an internal process within the pulsar. The most popular hypotheses suggest that the glitches can originate from either a transfer of angular momentum from the core to the crust via the unpinning of superfluid vortices or cracking of the star's crust. Identifying and studying new glitches could therefore be crucial to improve our understanding of their origin and the nature of pulsars in general.

Now, a team of astronomers led by Marcus Lower of Swinburne University of Technology in Australia, reports the discovery of a glitch in PSR J0908−4913. It is a bright pulsar with a spin period of 107 milliseconds and dispersion measure of 180.37 parsecs/cm^3, detected with MOST in 1988. Lower's team identified the glitch during regular timing observations with MOST under the UTMOST project—aimed at probing the radio transient sky in real time, monitoring pulsars and magnetars, and searching for fast radio bursts.

"We report the first detection of a glitch in the radio pulsar PSR J0908−4913 (PSR B0906−49) during regular timing observations by the Molonglo Observatory Synthesis Telescope (MOST) as part of the UTMOST project (Bailes et al. 2017)," the astronomers wrote in the paper.

According to the study, the glitch occurred on October 9, 2019. It had a permanent change in spin-frequency of approximately 0.203 μHz with no evidence for a change in spin-down or spin recovery to date. In

general, observations show that glitches are sometimes associated with a change in spin-down. Moreover, in some cases, the change in spin frequency is known to recover exponentially toward the pre-glitch value.

The research found that the glitch in PSR J0908−4913 had an amplitude of 0.0217 μHz. This, according to the astronomers, makes the glitch similar to those seen in pulsars with similar spin-down rates.

The authors of the paper added that many questions about the newly detected glitch remain unanswered; therefore, they continue to monitor the pulsar. For instance, additional post-glitch observations could be essential in order to better constrain any changes in spin-down or recovery.

"Continued monitoring of this pulsar is being undertaken by UTMOST. Attempts to measure any long-term recovery and pulse shape changes will be the subject of future works," the researchers noted.

More information: Detection of a glitch in PSR J0908−4913 by UTMOST, arXiv:1912.10827 [astro-ph.HE] arxiv.org/abs/1912.10827

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