AX J1910.7+0917 is the slowest X-ray pulsar, study finds

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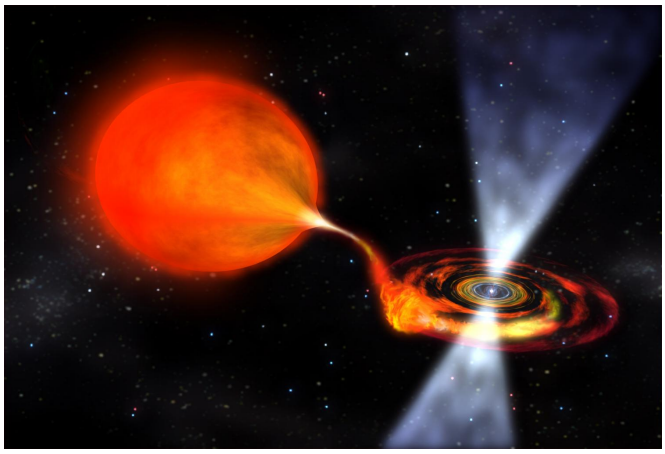

An artist's rendering of an X-ray pulsar. Credit: NASA

European astronomers have found that an X-ray pulsar designated AX J1910.7+0917 has the slowest spin period among other objects in this class. The research team, led by Lara Sidoli of the National Institute for Astrophysics and Space Physics (INAF) in Milan, Italy, presented the new findings in a paper published May 4 on arXiv.org.

X-ray pulsars (also known as accretion-powered pulsars) are sources displaying strict periodic variations in X-ray intensity, consisting of a magnetized neutron star in orbit with a normal stellar companion. In these binary systems, the X-ray emission is powered by the release of gravitational potential energy as material is accreted from a massive companion. X-ray pulsars are among the most luminous objects in the X-ray sky.

AX J1910.7+0917 was detected by Japan's Advanced Satellite for Cosmology and Astrophysics (ASCA) in 2001 as part of the ASCA Galactic Plane Survey (AGPS). It was initially classified as a relatively faint and poorly known X-ray source. Due to the fact that this source lies at a projected distance of about 12? from the supernova remnant W49, it was the target of many observations. Pulsations from this source were discovered in 2011 during observations conducted with NASA's Chandra X-ray Observatory.

Recently, Sidoli's team has thoroughly analyzed the available data provided by the observations of AX J1910.7+0917 with ASCA, Chandra and ESA's X-ray Multi-Mirror Mission (XMM-Newton) spacecraft. The study revealed more details about this high mass X-ray pulsar.

"Pulsations from the high mass X-ray binary AX J1910.7+0917 were discovered during Chandra observations performed in 2011 (Israel et al. 2016). We report here more details on this discovery and discuss the source nature," the researchers wrote in the paper.

The scientists found that the spin period of the X-ray signal is 36,200 seconds, with a pulsed fraction of 63 percent. Such a long period makes it the slowest X-ray pulsar known so far.

"This discovery makes AX J1910.7+0917 the pulsar with the slowest spin period," the paper reads.

The researchers assigned this long periodicity to the rotation of the pulsar's neutron star. They assume that a very long neutron star spin period can be explained within a quasi-spherical settling accretion model, that applies to low luminosity, wind-fed, X-ray pulsars.

"A quasi-spherical settling accretion model (Shakura et al. 2012) is able to explain this superslow pulsation, even adopting a typical neutron star surface magnetic field of about 10^{12}," the authors wrote.

However, this hypothesis cannot be confirmed until other source parameters like orbital period and the

velocity of the wind outflowing from the massive donor, are measured. Moreover, the team calls for future sensitive spectroscopy observations above 10 keV, which will be needed in order to detect cyclotron resonant scattering features and obtain a direct measurement of the neutron star's magnetic field.

More information: AX J1910.7+0917: the slowest X-ray pulsar, arXiv:1705.01791 [astro-ph.HE] arxiv.org/abs/1705.01791