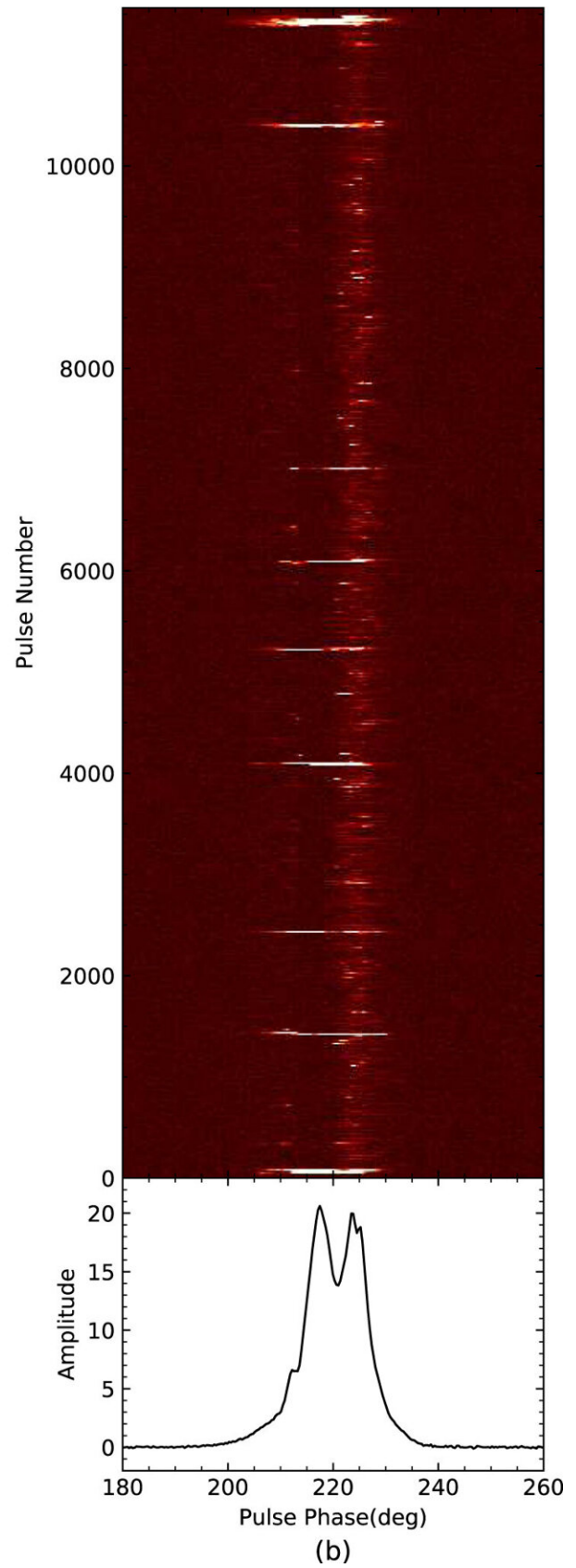
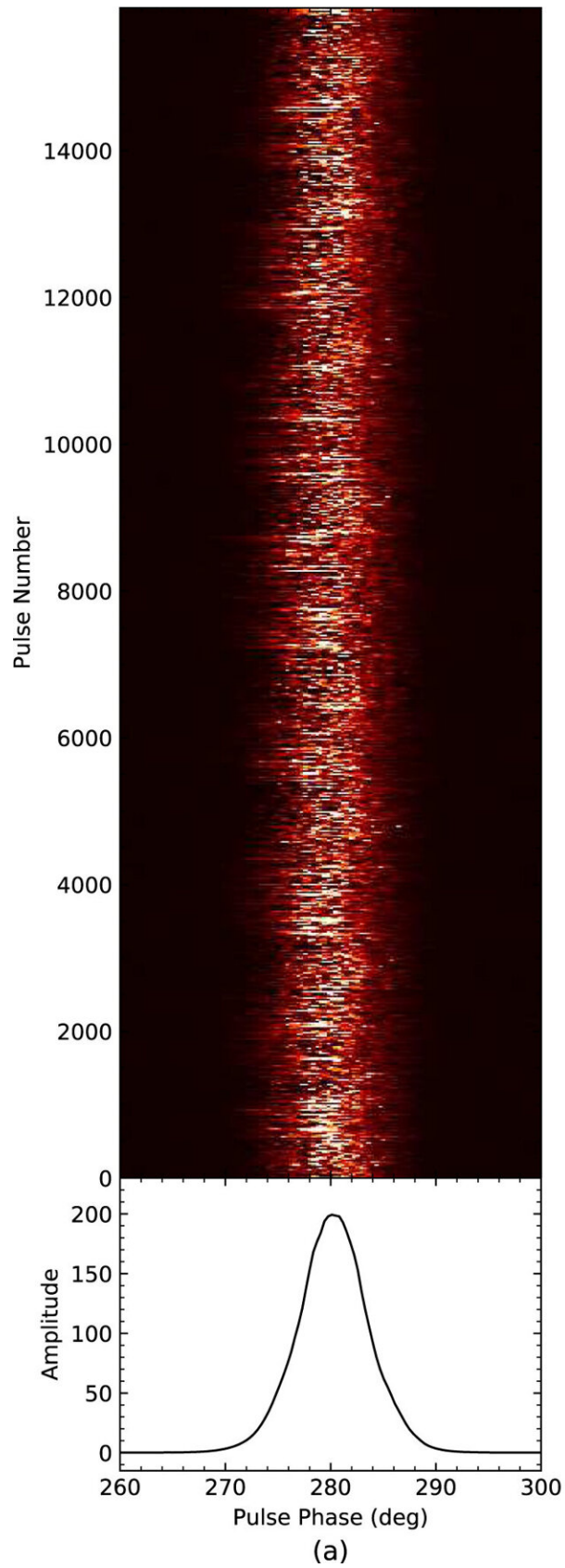


Emissions of different states are generated in different regions in pulsar magnetosphere

September 30 2022, by Li Yuan



The grayscale intensities of all the single pulse sequences observed in both pulsars: (a) PSR J0614+2229; (b) PSR J1938+2213. In the lower part of the figure, the average pulse profiles are shown. Credit: *The Astrophysical Journal* (2022). DOI: 10.3847/1538-4357/ac7c15

Mode changing is an emission phenomenon where the mean pulse profile abruptly changes between two or sometimes more stable states. In theory, the changes of the current flow in the inner acceleration region or pulsar magnetosphere geometry can result in mode changing.

Dr. Sun Shengnan from the Xinjiang Astronomical Observatory (XAO) of the Chinese Academy of Sciences (CAS), along with her collaborators, found that the emissions of different states can be generated in different regions in the pulsar magnetosphere by analyzing the polarization of PSR J0614+2229 and PSR J1938+2213 using FAST observations.

Related results were published in *The Astrophysical Journal*.

The researchers found that PSR J0614+2229 showed two distinct emission modes. The position angle (PA) swings of the two modes were different, which suggested that emission height might be changed in different modes. They found that the difference of the emission heights for the two modes was ≈ 90 km by rotating vector model fitting.

PSR J0614+2229 became much brighter during the switching of the two modes and such a phenomenon had never been seen in mode-changing pulsars before. The brighter emissions during the mode-switching may be related to the triggering mechanism of the changing of different modes.

Moreover, the PSR J1938+2213 appeared to consist of a weak emission state superposed by brighter burst emissions and the weak state was always present. The PA swings of the two states showed remarkable differences, and the burst state showed a sudden jump of about 90° , known as the orthogonal polarization mode (OPM) phenomenon. The OPM can only be seen in the burst state, rather than both states.

The results suggest that the emissions of two states are also generated in different regions in the [pulsar magnetosphere](#).

More information: S. N. Sun et al, Polarimetric Observations of PSR J0614+2229 and PSR J1938+2213 Using FAST, *The Astrophysical Journal* (2022). [DOI: 10.3847/1538-4357/ac7c15](https://doi.org/10.3847/1538-4357/ac7c15)

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