Contribution ID: **33** Type: **not specified**

Insight-HXMT discovery of the highest energy CRSF from the first Galactic ultra-luminous X-ray pulsar Swift˜J0243.6+6124

Thursday, 16 June 2022 11:15 (15 minutes)

Measuring the cyclotron resonance scattering feature (CRSF) is the only way to measure directly and reliably the magnetic field near the surface of a neutron star (NS). With the broad energy coverage and large hard X-ray collection area of Insight-HXMT, we have discovered so far the highest energy CRSF up to about 146 keV during the 2017 outburst of the first galactic ultra-luminous X-ray (ULX) pulsar Swift J0243.6+6124. In comparison, the two previous records of highest energy detection of CRSF with more than 5 sigma significance were also both set by Insight-HXMT: the 90 keV fundamental CRSF from GRO J1008-57 and the 100 keV first harmonic of CRSF from 1A 0535+262. During the outburst of Swift J0243.6+6124, the CRSF was significantly detected when the outburst peaked at luminosity 2*10^39 erg/s. The CRSF was seen in a spin phase region of the main peak, and its centroid energy evolves with phase from 120 to 146 keV, which we identify as the fundamental CRSF since no spectral feature exists at 60-70 keV. This is the first unambiguous detection of electron CRSF from ULXs, and a surface magnetic field 1.6*10^13 G is estimated for Swift J0243.6+6124. Such a strong dipole magnetic field prevents the spherization by radiation pressure in its accretion disk even during its outburst peak, which has been speculated as the source of outflows in NS ULX systems. Without outflows, the observed high luminosity should be intrinsic and not particularly beamed in a small solid angle as proposed previously.

Topic

X 射线双星

Primary author: 孔令达 (IHEP)

Presenter: 孔令达 (IHEP)

Session Classification: Session II