A Broadband Spectro-Temporal View of NS LMXBs – A Hunt for Soft QPOs

PhysCOS Second Early Career Workshop

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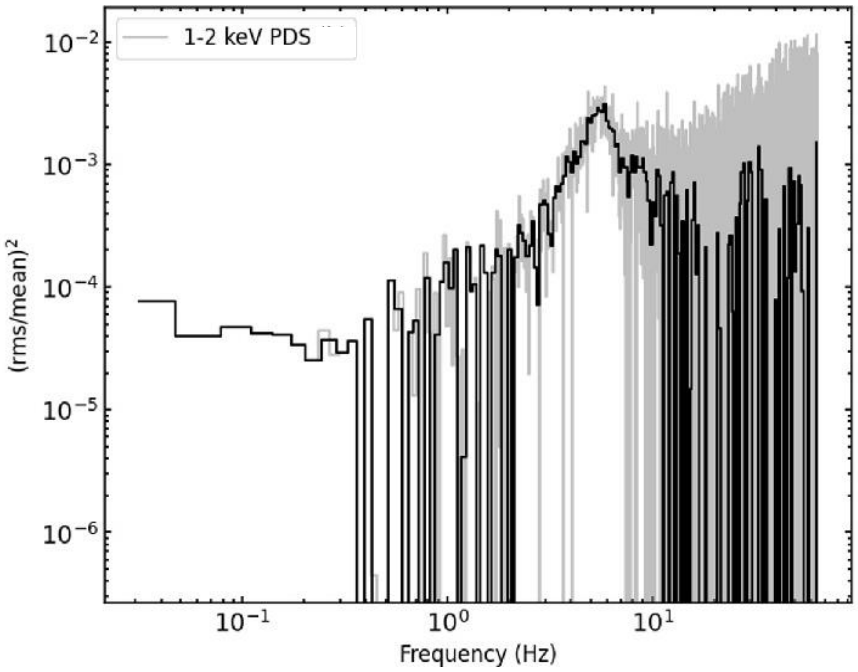
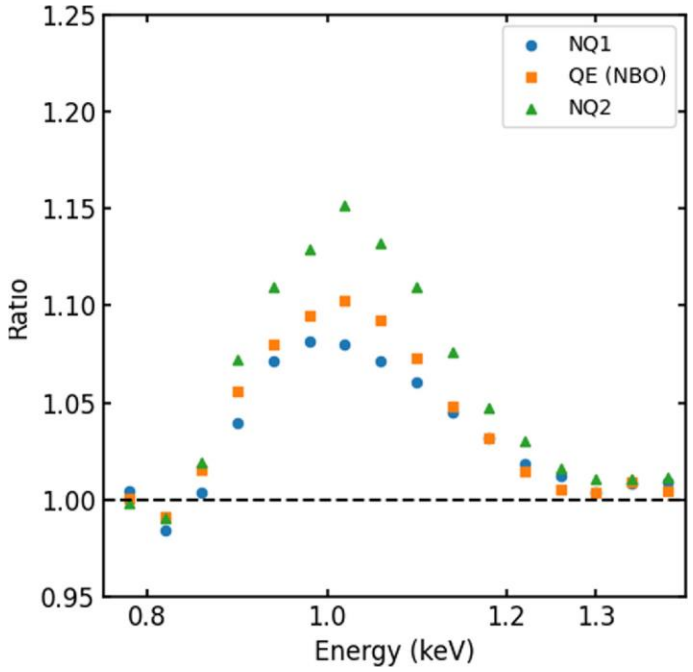
Investigating the origins of Quasi-Periodic Oscillations (QPOs) to indirectly map accretion dynamics and emission regions, to result in a unified model for QPOs and NS LMXB classification. Compile spectro-temporal analyses of several NS LMXBs, enabling systematic studies of QPOs and spectral features.





Study of Cyg X-2: 6 Hz QPO in the 0.5-3 keV soft energy band of NICER; absent in the >3 keV harder energy band of NICER and NuSTAR. QPO found in the normal branch of the color-color diagram.

QPO peaked in the 1-2 keV energy band, coinciding with the presence of an iron L line in the energy spectrum.

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- NBOs: A radiation hydrodynamic model -- oscillations of optical depth in the accretion flow. Theoretically, the oscillations at a radius of ~ 300 km from the NS is expected to produce the ~ 6 Hz QPOs (Fortner et al. 1989). Here, these oscillations are possibly associated with a lower temperature region of the disk rather than the BL/Corona.
- Fe L transition line : originating from the photoionized plasma far from the central source. Due to density fluctuations caused by the radiation pressure feedback of the central source (Vrtilek et al 1986).
- Optical depth of the radial flow region increases as the source moved down the NB. The optical depth variation could be leading to ionization changes --- Fe L emission variation.
- Disk parameters are found to be the only component parameters that differentiates the QPO epoch from the no- QPO epochs.
- There could be an association between the radius at which the emission of the ~ 1 keV feature happens and the QPO originates.

Future

- Investigate the spectro-temporal variation: Different spectral components associated with QPOs.
- Simultaneous X-ray polarimetric studies of QPOs to differentiate between different possible emission geometries of such systems.