

Poster Abstract

Title : Studying the aperiodic X-ray variability in the M82 Galaxy

Collaborators : Dr. Matteo Bachetti (INAF-OAC), & Prof. Silvia Columbu (University of Cagliari).

Quasi-periodic oscillations (QPO) are narrow-bandwidth variability phenomena routinely observed in a wide range of X-ray sources, including neutron star X-ray binaries and stellar black holes. They are often detected as Lorentzian features in periodograms, on top of wide-bandwidth (power-law or broken power law-like) variability. The Cigar Galaxy M82 has two Ultraluminous X-ray sources : one is powered by an accreting neutron star, and the other, reportedly, by an intermediate-mass black hole. The observed region that includes these bright sources shows routinely a quasi-periodic oscillation (QPO). We have studied the variability of this QPO (which appears in the frequency domain of the M82 X-ray flux) by applying statistical techniques of modelling estimation on the results of the systematic Fourier analysis of ~ 33 observations of the M82 galaxy taken by the NASA satellite NuSTAR between 2014 and 2022. We fitted the power density spectrum (PDS) using a combination of some common densities (controlled by different parameters) that would describe parts of this PDS. Since we do not have an informative prior knowledge about data to perform a Bayesian or Variational inference, we used the MLE method for parameter estimation and the bootstrap technique to improve the measure of uncertainty (standard errors and confidence intervals). As a result, we have got an important characterization of the QPO phenomena associated with the target source.

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