Highlights of Spanish Astrophysics VII, Proceedings of the X Scientific Meeting of the Spanish Astronomical Society held on July 9 - 13, 2012, in Valencia, Spain. J. C. Guirado, L.M. Lara, V. Quilis, and J. Gorgas (eds.)

The accreting X-ray pulsar MXB 0656-072

Elisa Nespoli[1,2] **and Pablo Reig**[3,4]

[1] Observatorio Astronómico de la Universidad de Valencia, Calle Catedrático Jose Beltran 2, 46980 Paterna, Valencia, Spain
[2] European Space Astronomy Centre (ESA/ESAC), Science Operations Department, Villanueva de la Cañada (Madrid), Spain
[3] Foundation for Research and Technology – Hellas, IESL, Voutes, 71110 Heraklion, Crete, Greece
[4] Physics Department, University of Crete, 710 03 Heraklion, Crete, Greece

Abstract

The hard X-ray transient MXB 0656-072 is a poorly studied member of high-mass X-ray binaries. Based on the transient nature of the X-ray emission, the detection of pulsations, and the early-type companion, it was classified as a Be X-ray binary. However, the flaring activity covering a large fraction of a giant outburst is somehow peculiar. In this work, we investigate the multiwavelength variability of the system: we carry out optical spectroscopy and analyze all RXTE archive, performing a detailed X-ray color, spectral, and timing analysis of a giant (type II) outburst from the source. The characterization of the Be/XRB system relies on Balmer lines in emission in the optical spectra and long-term X-ray variability. The peculiar feature that distinguishes the type-II outburst is flaring activity, which occurs during the whole outburst peak, before a smoother decay. We interpret it in terms of magneto-hydrodynamic instability. Spectral analysis reveals a hardening of the spectrum as the flux increases. We also explored the aperiodic X-ray variability of the system for the first time, finding a correlation of the central frequency and *rms* of the main timing component with luminosity, which extends up to a "saturation" flux of 1×10^{-8} erg cm^{-2} s^{-1}. A correlation between timing and spectral parameters was also found, pointing to an interconnection between the two physical regions responsible for both phenomenologies. These findings impose tight constrains to the models that seek to explain the spectral and timing variability in accretion-powered pulsars.