The accreting X-ray pulsar MXB 0656-072

E. Nespoli\textsuperscript{1, 2} and P. Reig\textsuperscript{3, 4}

\textsuperscript{1} Observatorio Astronómico de la Universidad de Valencia, Calle Catedrático Agustín Escardino Benítez 7, 46980 Paterna, Valencia, Spain
\textsuperscript{2} European Space Astronomy Centre (ESAC), Villanueva de la Cañada, Madrid, Spain
\textsuperscript{3} Foundation for Research and Technology – Hellas, IES, Voutes, 71110 Heraklion, Crete, Greece
\textsuperscript{4} Physics Department, University of Crete, 710 03 Heraklion, Crete, Greece

X-rays

The profile of the giant outburst of the system (Fig. 1) is characterized by unusual flaring activity. This can be explained by magneto-hydrodynamic instabilities at the inner edge of the accretion disk producing oscillations in the accreting flow. We found a correlated behavior of both the soft and the hard color with flux (Fig. 1), which corresponds to a general hardening of the spectra as the flux increases.

The hardening of the spectrum at high flux is confirmed by spectral analysis (Fig. 3): from simultaneous spectral fitting of PCA and HEXT spectra, we found a clear anti-correlated behavior of the spectral index with flux. This spectral hardening can be understood in terms of Comptonization of soft photons injected in the accretion flow from the neutron star’s thermal mound, by high-energy electrons of the accreting matter.

Optical

We classified the optical counterpart to MXB 0656-072 as a O9.5Ve star.

Its spectrum (Fig. 2) is strongly affected by emission, with the first three lines of the Balmer series (H\textalpha, H\beta, and H\gamma) showing an emission profile, while the next two (H\delta and H\epsilon) are partially filled-in with emission. This extra emission is thought to arise from the equatorial disk around the Be star. The picture described by optical spectroscopy is fully consistent with the so-called “Be-phenomenon” and confirms that the system is a Be/XRB.

Conclusions

We have performed a detailed X-ray and optical analysis of the poorly studied hard X-ray transient MXB 0656-072. All the available observational data indicate that MXB 0656-072 is a member of the class of massive X-ray binaries known as Be/X-ray binaries. X-rays are produced in the vicinity of the compact object, while the optical variability comes from the young and massive companion. Detailed analysis and results can be found in Nespoli et al., 2012, A&A submitted.