
Dust scattering halo of the peculiar black hole binary 4U 1630-47

Emrah Kalemci^{*1}, Thomas Maccarone², John Tomsick³, and Ersin Gogus¹

¹Faculty of Engineering and Natural Sciences (Sabanci University) – Tuzla İstanbul 34956, Turkey

²Department of Physics [Texas Tech] – Texas Tech University Broadway and Boston Lubbock, TX
79409-1042, United States

³Space Sciences Laboratory [Berkeley] (SSL) – 7 Gauss Way, Berkeley, CA 94720, United States

Abstract

4U 1630-47 is a peculiar source which has had a large number of outbursts allowing us to compare the source spectral evolution in different outbursts. At least one well-studied outburst follows the typical hysteresis pattern, however, most other outbursts have shown complex evolution. In the 2010 outburst decay, using Swift/XRT, our group has discovered a very low luminosity soft state (0.03% Eddington Luminosity). Apart from the erratic outburst behavior, another peculiarity is the apparent baryonic content of the jet. The baryonic jet interpretation is based on modeling the iron line features observed simultaneously with radio originated from a local jet, though this interpretation has been challenged. We relate the peculiar behavior of this source to the presence of a strong dust scattering halo (DSH) present in the line of sight. In this talk, we will first discuss under which conditions that the DSH could explain the low luminosity soft spectrum and baryonic jets, and then show results from our Chandra and Swift campaign of the evolution of the shape of the dust scattering halo during the decay of the 2016-2017 outburst. Finally, we will interpret the halo profiles and discuss the impact of the DSH on timing and spectral observations of certain sources by the collimated instruments such as NICER.

Keywords: 4U 1630, 47, dust scattering halo

*Speaker