universität innsbruck

ANISOTROPIC INVERSE COMPTON IN CYGNUS X-1

Bachelorarbeit Thema - Sommersemester 2023

Subject: Astroparticle Physics

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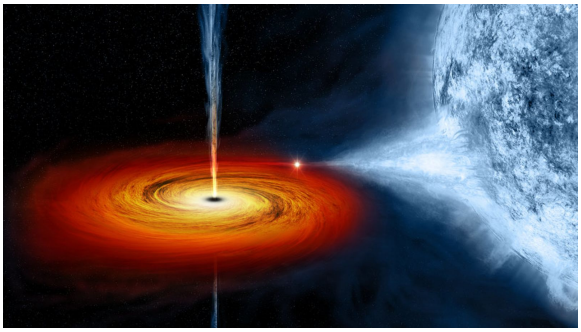
Abstract

Cygnus X-1 is one of the brightest X-ray sources in the sky, and the origin of its powerful emission has been debated since its discovery. For example, in the mid 1970s Stephen Hawking and Kip Thorne had a bet about it: is a black hole powering Cygnus X-1? Nowadays, we already know that the system is a *microquasar*: a black hole accreting matter from its stellar companion, leading to the production of relativistic jets able to accelerate charged particles. The non-thermal emission from those particles can be detected by the Large Area Telescope, a γ-ray detector onboard the *Fermi* satellite.



Participating in this project, you will learn how to analyse real γ-ray data from the *Fermi*-LAT detector. In particular, you will characterise the γ-ray emission from the microquasar Cyg X-1 during its flaring states, and employ time-series analysis to search for orbital modulation in its non-thermal radiation. If discovered, you will establish the non-thermal process behind the γ-ray emission of the system, which is still discussed.

Further Reading

- NASAs *Fermi* webpage: `https://fermi.gsfc.nasa.gov/`
- A *Fermi*-LAT time-series software: `https://pypi.org/project/wtlike/`
- *Gamma-ray binaries and related systems*, Dubus 2013. A&ARev, 21, 64

Image: Artistic representation of a Microquasar (credit to NASA / CXC / M.Weiss).

For further information, please feel free to contact us at guillem.marti-devesa@uibk.ac.at