Contribution ID: 11

Radiation-mediated shocks in GRB prompt emission

Monday, 5 May 2025 11:15 (30 minutes)

Gamma-ray bursts (GRBs) eject relativistic jets that are initially optically thick. The trapped radiation is released at the photosphere and could be responsible for the GRB prompt emission. For this to be feasible, subphotospheric dissipation should occur before the photons decouple from the plasma, with shocks being a likely dissipation mechanism. Due to the high radiation pressure, shocks below the photosphere are not collisionless but so called radiation-mediated shocks (RMSs), and the distinction is important for the resulting spectrum. In this talk, I present the first-ever fit of a prompt GRB spectrum with an RMS model. I also show that RMS spectra are in many ways similar to the observations, as they consist of a broad, soft power law across the sub-MeV-band with an additional break in X-rays. When synthetic spectra are fitted with a cutoff power-law function, we find that the catalogue distribution of low-energy slopes is naturally reproduced. Therefore, photospheric emission with properly modeled dissipation is a promising candidate for the prompt emission in GRBs.

Primary author: RYDE, Felix (KTH)
Co-authors: Dr ALAMAA, Filip (KTH); Mr WISTEMAR, Oscar (KTH)
Presenter: RYDE, Felix (KTH)
Session Classification: Monday morning

Track Classification: Gamma-ray bursts