



ID de Contribution: 142

Type: Non spécifié

Gamma-ray bursts in the multi-messenger era

jeudi 30 mars 2023 14:00 (25 minutes)

Gamma-ray bursts are the brightest electromagnetic phenomena known in the universe. They are associated with an ultra-relativistic jet emitted by a newly formed accreting black hole following the collapse of a massive star or the coalescence of a binary neutron star system. Several new observational windows have recently opened for these extreme phenomena: the first multi-messenger observation of a binary neutron star merger associated with a short gamma-ray burst (170817) and, since 2018, several detections of gamma-ray bursts at very high energy (TeV). Hopefully, we will also see in the coming years the detection of high-energy neutrinos associated with a gamma-ray burst. I will show in this talk how these recent detections allow important progress in the understanding of these phenomena, in particular for the physics of the jet and its emission. I will also discuss the prospects for new multi-messenger and/or very high energy detections in the short and mid-term. Finally, I will discuss the applications of such observations to related fields such as stellar physics in binary systems of massive stars or cosmology.

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Classification de Session: Session

Classification de thématique: High Energy Astrophysics