

CENTRE D'ETUDES NUCLÉAIRES DE BORDEAUX-GRADIGNAN

Mardi 26 Novembre 2013

à

11H00

Un café sera servi à partir de 10h45

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A New Model for GRB Prompt Emission Using Multiple Spectral Components

Gamma Ray Bursts (GRBs) are the most violent phenomena in the Universe. They are associated with the birth of stellar mass black holes either from the collapse of hypermassive stars or the merger of compact objects. The Fireball model is the most popular scenario to explain GRBs. In this theoretical framework, GRB central engines release collimated, bipolar and highly relativistic jets mainly composed of electrons, positrons, photons, and a small amount of baryons. During the first phase of the Fireball model, charged particles are accelerated and release non-thermal radiations. The Fireball model also predicts a thermal like component coming from the jet photosphere. This first phase would be responsible for the GRB prompt emission observed by gamma ray telescopes such as Fermi/GBM in the keV-MeV energy range and which is the only phase discussed in this talk.

Until now, GRB prompt emission spectra were considered as adequately fitted with the empirical Band function, which is a smoothly broken power law. However, its parameters are very often incompatible with the Fireball model predictions for both the thermal and non-thermal components. We will see that observation with the Fermi Gamma Ray Space Telescope breaks the paradigm of the Band function and that deviations from this function exist in many GRBs. Those deviations are adequately fitted with an additional thermal-like component -that we consider as the jet photosphere- and/or an additional power law. Importantly, with the three components together, theory and observations are much more in agreement. Finally, we will also see how this new model for prompt emission spectra may have an impact beyond the physics of GRBs. Indeed, this work may confirm a relation between the hardness of the GRB prompt emission and its luminosity which may be used to scale GRBs as standard-like candles for use in cosmology.

Salle des Séminaires du CENBG

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