

Author: Lorenzo Amati (INAF – OAS Bologna, Italy)

Title: Cosmology and fundamental physics with cosmic Gamma-Ray Bursts

Abstract

The huge luminosity, the redshift distribution extending at least up to $z \sim 10$ and the association with the explosive death of very massive stars make cosmic Gamma-Ray Bursts (GRB) extremely powerful probes for shedding light on main open issues in modern cosmology. In particular, the correlation between radiated energy and spectral photon peak energy ("Amati relation") is subject of intensive investigations for "standardizing" GRBs and using them for measuring cosmological parameters, investigating the nature and evolution of "dark energy" and testing non-standard cosmological models. As well, the combination of extreme distances, the huge number of photons emitted over about three orders of magnitude in photon energy and the variability down to few ms makes GRB a uniquely powerful and promising tool for testing Lorentz Invariance Violation (LIV) with unprecedented accuracy. I will review the status and perspectives of using GRB as probes for cosmology and fundamental physics, including the concepts and expected performances of space mission projects aiming at fully exploiting these unique potentialities of the GRB phenomenon.