

Cosmology with Gamma-Ray Burst

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Gamma-Ray Bursts constitute one of the most fascinating and relevant phenomena in modern science, with strong implications for several fields of astrophysics, cosmology and fundamental physics. In this review, I will focus on the perspective key-role of GRBs for cosmology. Indeed, 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 long GRBs (i.e., those lasting up to a few minutes) potentially extremely powerful probes for shedding light on main open issues in our understanding of the early Universe: star formation rate evolution up to the first generation of stars (pop-III), cosmic reionization, luminosity function and metallicity evolution of primordial galaxies up to the “cosmic dawn”. At the same time, interesting correlations between luminosity / radiated energy and spectral photon peak energy are 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. I will also report on the status, concepts and expected performances of space mission projects aiming at fully exploiting these unique potentialities of the GRB phenomenon, thus providing an ideal synergy with the large e.m. facilities of the future like LSST, ELT, TMT, SKA, CTA, ATHENA

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