Monitoring Gamma-Ray Burst VHE emission with SWGO

The purpose of this contribution is to present the opportunities that a new ground-based VHE monitoring facility, like the one proposed by the Southern Wide-field-of-view Gamma-ray Observatory (SWGO), can offer to the investigation of Gamma-Ray Bursts (GRB). The emission of VHE radiation from GRBs, indeed, is predicted by different theoretical models and it represents a critical parameter to distinguish between various radiation mechanisms. Its existence could be well anticipated, based on *Fermi*-LAT detection of high energy photons in the spectra of some GRBs ($E > 10\,\mathrm{GeV}$ and up to 94 GeV, in the case of GRB 130427A, at $z = 0.34$), and it was eventually confirmed by the MAGIC and H.E.S.S. observations of a VHE signal, in the energy range $0.3\,\mathrm{TeV} \leq E \leq 1\,\mathrm{TeV}$, associated with the afterglow of a few of these events.

We expect that next-generation instruments, such as CTA, will further expand the possibility to investigate the VHE properties of GRBs, providing new insights on questions like the jet structure and evolution. However, the rather small FoV of Cherenkov telescopes, combined with the necessity to operate only in clear, dark nights, limits the ability of these instruments to cover short transients and, therefore, to observe many potential targets. In particular, since a VHE follow-up first requires the detection and localization of the GRB by some other monitoring program, all the information connected with the burst prompt emission and early evolution would be missed, due to the unavoidable telescope triggering and repointing time lags. These problems can be naturally solved using Extensive Air Shower (EAS) detector arrays, which have the possibility to operate continuously and to scan a larger FoV ($\sim 1\,\mathrm{sr}$), although having the limitations of lower resolution, stronger background noise, and the further requirement to be located in high altitude sites ($\geq 4500\,\mathrm{m}$ a.s.l.).

Here we present a study of the potential capabilities of a VHE monitoring instrument, such as SWGO, based on the high energy GRB properties, observed by *Fermi*-LAT in 10 years of survey campaign. Using the spectral and temporal evolution of the high energy emission of LAT detected events, we estimate the possible VHE properties of GRBs, taking into account the effects of EBL opacity for different source redshifts. We show that solutions able to operate on a spectral window extending below the TeV scale, down to approximately 100 GeV, have excellent possibilities to provide early time VHE triggers. The combined FoV of SWGO and LHAASO, in particular, would result in a nearly all-sky monitoring program, adding VHE coverage to the quickly evolving framework of time domain and Multi-Messenger Astrophysics.