and Fermi) provide more information on short GRB afterglows and high energy photon fluences.

However, when the photon fluxes reach the level of a few photons per square meter, satellites observations are no longer possible and one has to design ground based experiments. A classical method to use is called the single particle technique (Morelo et al. 1984) where the detectors are used to count individual particles. When high energy photons from a GRB reach the atmosphere, they produce a cosmic ray cascade with secondaries at ground level that can be detected. The energies are usually too low to produce many particles detectable in coincidence at ground level (even at high altitudes). However, as a lot of these photons are expected to arrive during the burst, some of them could produce a shower which would give one or a few hits in a ground based detector, on a time scale of one second. One would therefore see an increase of the background rate on all the detectors of a ground array on this time scale. This technique has already been applied in EAS-TOP (Morelo et al. 1984) in Italy, INCA (Cabrera et al. 1999) in Bolivia and ARGO (Bacci et al. 1999) in Tibet. A general study of this technique can be found in (Vernetto 2000). It has not been applied in the past to arrays of Water Cherenkov Detector (WCD). The main advantage of using the water Cherenkov technique over the usual scintillator/RPC detectors is the WCD sensitivity to photons, which represent up to 90% of the particles at ground level for high energy photon initiated showers. This significantly increases the efficiency of detection, as reported in (Bertou & Allard 2005).

This method has been implemented since March 2005 in the Pierre Auger Observatory (Thomas 2009). The Pierre Auger Observatory (Abraham et al. 2004) is the largest cosmic ray observatory in operation. It is composed among other detectors by 1600 WCD located in Malargüe, in Argentina. Despite its low altitude (1440 m.a.s.l.), its large collecting surface (16000 m^2) and sensitivity to secondary photons makes it a possible competitor to higher altitude experiments.

The Large Aperture GRB Observatory (LAGO) has been a spin-off from the Pierre Auger Observatory, aiming at reaching a similar sensibility to GRB with the Geiger technique by operating WCD similar to the Auger ones but at high altitude mountain sites and with an optimized calibration and DAQ for the Geiger technique. It started in 2005 as a collaboration between groups from Argentina, Bolivia and Mexico and has in 2010 extended to Venezuela, Peru and Colombia. Brazil, Chile and Guatemala are likely to join the LAGO collaboration in 2011.

Fig. 1. Current LAGO sites.

2. PRESENT STATUS

2.1. *LAGO Sites*

In order to provide a relevant sensitivity to GRB search, a candidate site must be at high altitude, typically above 4500 m.a.s.l. A good infrastructure and easy access are obviously serious factors to consider when choosing a site. If high altitude sites are not available, a low altitude site can be used to operate the detector for solar physics studies.

The LAGO project has three sites (see Figure 1) with detectors in operation:

- Sierra Negra, Mexico, 4550 m.a.s.l.: this is the first LAGO site, in operation since 2007. It is nearby the Large Millimetric Telescope (LMT) and above the HAWC site. Three 4 m^2 and two 1 m^2 WCD have been in operation at the site. Currently, new detectors of 40 m^2 are being considered.
- Chacaltaya, Bolivia, 5250 m.a.s.l.: this is the highest site of LAGO as well as the one with the best infrastructure. Three WCD are in operation, two of 4 m^2 and one of 1 m^2. The detectors are housed in the Chacaltaya Cosmic Ray Observatory. They have been taking data since 2008.
- Marcapomacocha, Peru, 4450 m.a.s.l.: this is the last LAGO site to be in operation, with one 2 m^2 WCD taking data since 2010. It is expected to take data for about one year during which higher sites in Peru are investigated.

Various other WCD are installed or being installed: