

## Physics perspectives

After its completion, the Antares detector has become the largest neutrino telescope in the Northern hemisphere. The sensitivity of the data collected so far exceeds that of the Macro and Super-Kamiokande experiments by a factor of at least 2.

The Galactic centre and large parts of the Galactic plane are visible to Antares 70% of the time. This region is a major source of high energy gamma radiation (0.1 - 10 TeV) as demonstrated by the HESS. observations. Neglecting possible attenuation of high energy photons, calculations of neutrino fluxes based on these measurements show that the detection of these sources is probably beyond the sensitivity of the Antares detector, though dedicated analyses leave room for improvements in the effective area or optimisation of the signal to background ratio. On the other hand, since strong gamma-ray absorption or cascading in some of the discovered sources are not excluded or even are likely to occur, the Galactic plane represents a highly interesting, exclusive target for observations with the Antares detector. Finally, one shouldn't discard the possibility of the existence of high energy neutrino sources that have eluded observations with other messengers up to now. A likely location of such sources would be the Galactic plane.

Recent measurements by Auger indicate a correlation between high-energy cosmic rays and Active Galactic Nuclei (AGN). These AGN are visible to Antares about 70% of the time. Due to the cosmic distances involved, the possibility of a individual discovery is expected only in particular theoretical models. Another possibility is to measure the cumulative diffuse flux of neutrinos, looking for an excess of high energy events in the energy spectrum over the background of the atmospheric neutrinos. Theoretical models constrain the neutrino diffuse flux coming from different extra-Galactic sources. The upper bounds are derived from the observation of the diffuse fluxes of gamma-rays and UHE cosmic rays. One of them (Waxman-Bahcall) is generally used as the reference limit. Monte Carlo simulations indicate that after 3 year of data taking Antares can set an upper limit for diffuse fluxes of neutrinos very close to the Waxman-Bahcall upper limit.

A possible neutralino will be searched for by looking at high-energy neutrinos from the Sun. Designated triggers and offline analyses are being developed for this.

A Gamma-Ray Burst (GRB) trigger that listens to the Swift (and will listen soon to GLAST as well) satellite is operational. With this trigger, all raw data are stored on disk during a GRB event. These data are then processed off-line. Since the start of operation, about 90% of the satellite triggers have been recorded this way (missing only those that occurred during periods of deployment operations etc.).

Monte Carlo simulations have shown that it is possible to detect Magnetic Monopoles even below the Cherenkov limit. For this, one uses the characteristic time-position correlations of the Cherenkov light produced by delta-electrons created by a passing monopole. The expected lower limit of the speed of a detectable monopole corresponds to about  $\beta \approx 0.55$ .

There is a large background of atmospheric muon bundles produced by cosmic ray interactions in the atmosphere above the detector. The multiplicity of muons is correlated to the composition of the cosmic rays. Preliminary studies have shown that the muon multiplicity can be measured with the Antares detector. In addition, separate Bremsstrahlung-showers can be identified in these events. These measurements are possible thanks to the properties of the sea water and excellent time resolution of the detector.

The current status can be summarised as follows. The analysis of the data of the first detector line has been completed and a draft paper has been written. The analysis of the 5-line data is in progress, the angular distribution of atmospheric muons is reasonably well described by the Monte Carlo simulations (both in terms of shape and normalisation) and some 100 neutrino events have been identified. The number of neutrino events is lower than expected by a factor of about 2 because a more severe cut has to be applied to select a pure sample of neutrinos. The neutrino detection efficiency will increase by improvements of time-, position- and charge-calibrations. Other corrections, like the walk effect, have been implemented already. The analysis of the 10- and 12-line detector has been started. The first neutrino events have been identified.