Towards a fast simulation of a water Cherenkov detector for gamma ray and cosmic ray experiments

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Motivation

Water Cherenkov Detectors (WCD) have been successfully used in cosmic rays and gamma rays experiments. Detailed simulations of the WCD signals are computationally time consuming, so a fast simulator is desirable.

Method

Full detailed GEANT4 simulations of a WCD were used to obtain a parametrization of the signal response. We can build a fast simulator using this parameterization to generate approximate signals which match the signals generated by the full detector simulation.

Results

As a first approach to the model the signal distribution function, we fit the detailed simulations with a combination of two Landau functions with 5 free parameters that will depend on the energy, zenith angle and type of particle.
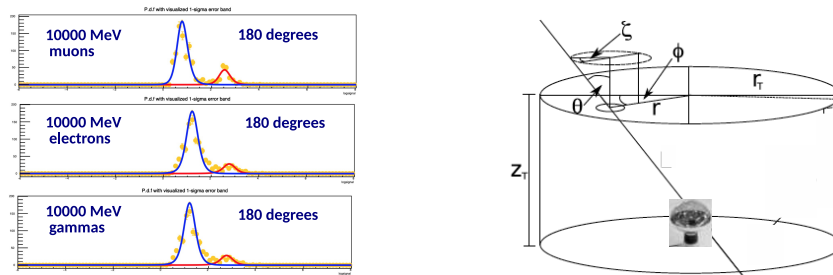

Figure 1: Average signal distribution for 10000 MeV muons, electrons and gammas for 180 degrees zenith angle(left). Detector geometry(right).