



Contribution ID: 129

Type: poster

Study on 3-inch Photomultipliers

Thursday, October 2, 2014 2:20 PM (20 minutes)

Several kinds of photomultipliers are widely used in astroparticle physics detectors to measure Cherenkov light in media like water or ice. In neutrino telescopes the key element of the detector is the optical module, which consists of one or more photodetectors inside a transparent pressure-resistant glass sphere. The glass sphere serves as mechanical protection while ensuring good light transmission. The KM3NeT collaboration has developed a new innovative prototype of a digital optical module composed by 31 photomultipliers of 3-inch diameter housed in a 17-inch glass sphere looking downwards and upwards. The performance of the telescope is largely dependent on the presence of noise pulses due to several causes.

A study of noise pulses was conducted on Hamamatsu 3-inch diameter photomultipliers measuring time and charge distributions of dark pulses, pre-pulses, delayed pulses, and after-pulses, focusing in particular on analysis on multiple after-pulses. Effects of Earth's magnetic field on 3-inch PMTs were also studied. We confront measurements of typical parameters with and without a magnetic shielding.

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Session Classification: Parallel Session I