

Gamma/hadron discrimination using a small-WCD with four PMTs

Executive Summary



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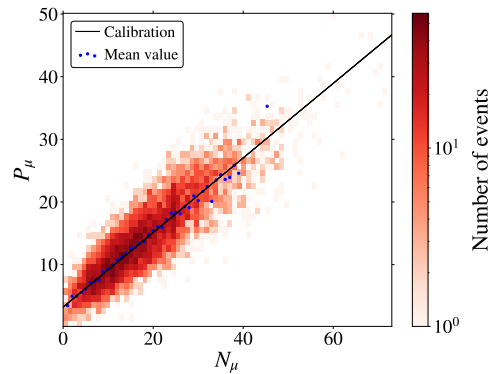
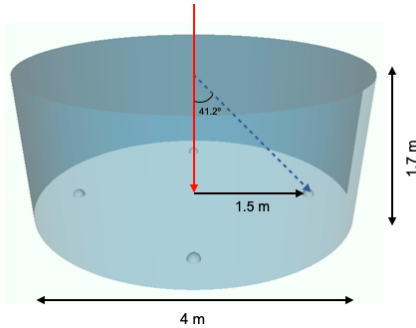
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What is this contribution about?

We present a single water Cherenkov detector (WCD) concept with a reduced water height and four PMTs at the bottom and shown that an excellent gamma/hadron discrimination can be reached for showers with energies around 1 TeV.

Why is it relevant/interesting?

The studied WCD would be a good candidate for the future Southern Wide-field Gamma-ray Observatory given its structural simplicity, modular nature (dense vs sparse array) and cost savings in material and water transport to high-altitudes.



What has been done?

An end-to-end simulation has been made to assess the capability to tag/count the presence of muons in the WCD by exploring the PMT signal time trace with convolutional neural networks.

What is the result?

This study demonstrates that it is possible to identify/count muons with a high precision (20% of resolution for showers with 20 muons) and get a gamma/hadron discrimination of $S/\sqrt{B} \sim 4$ similar to those reached at ~ 1 TeV, by successful gamma-ray observatories, such as HAWC. Moreover, it was shown that these findings do not depend on the shower inclination nor the array fill factor.