

Double-layered Water Cherenkov Detector for the Southern Wide-field Gamma-ray Ob- servatory (SWGGO)

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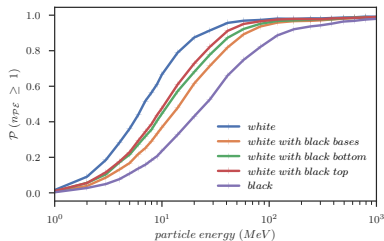
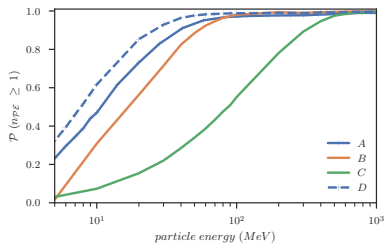
on behalf of the SWGGO collaboration

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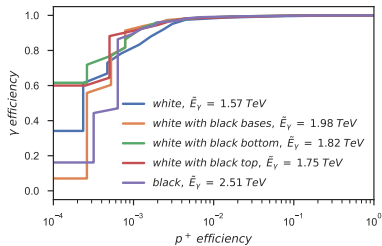
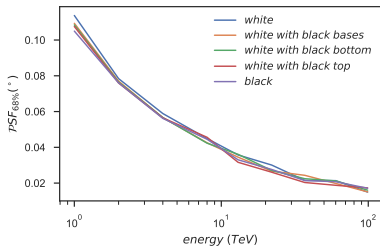


Unit Design

- Upper Chamber.
A light-tight chamber with combination of reflective and non-reflective surfaces, and a single upward-facing light sensor. Provides timing information and an estimate of total local particle energy per unit area.
- Lower Chamber.
A light-tight chamber with a highly reflective lining and a single light sensor facing downwards. Enables μ^\pm tagging.



[A] white cylindrical DLWCD unit ($\pi \times 1.91^2 \times 2.5 \text{ m}^3$) with a black top and an 8" PMT, a [B] HAWC - like design ($\pi \times 3.65^2 \times 4 \text{ m}^3$) with black walls, a central 10" PMT and 3x8" PMTs', a [C] LHAASO - like black unit ($5 \times 5 \times 4.5 \text{ m}^3$) with an open top and an 8" PMT and a [D] white cylindrical DLWCD unit ($\pi \times 1.71^2 \times 3 \text{ m}^3$) with a black top and an 8" PMT.



Array simulated layout of cylindrical DLWCDs with a dense inner array ($> 80\%$) and sparser outer array ($\sim 8\%$).

- The Southern Wide-field-of-view Gamma-ray Observatory (SWGGO) will use the well-established and cost-effective technique of detecting Cherenkov light produced in water-filled detection units for TeV gamma-ray astronomy.
- The double-layered WCD leverages material and aspect-ratio to enhance sensitivity, achieve excellent angular resolution and gamma hadron separation.