The Charge Calibration of LHAASO-WCDA

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LHAASO-WCDA

1.1 Water Cherenkov detector array (WCDA)

- ground-based air-shower detector array based on water cherenkov technique
- 3 ponds
- 78000 m^2
- 3120 cells (**6240 PMTs**)
  - Combination of 1.5-inch PMT and 8-inch PMT in WCDA-1
  - 3-inch PMT and 20 inch PMT in WCDA-2 and WCDA-3
- VHE gamma-ray astronomy
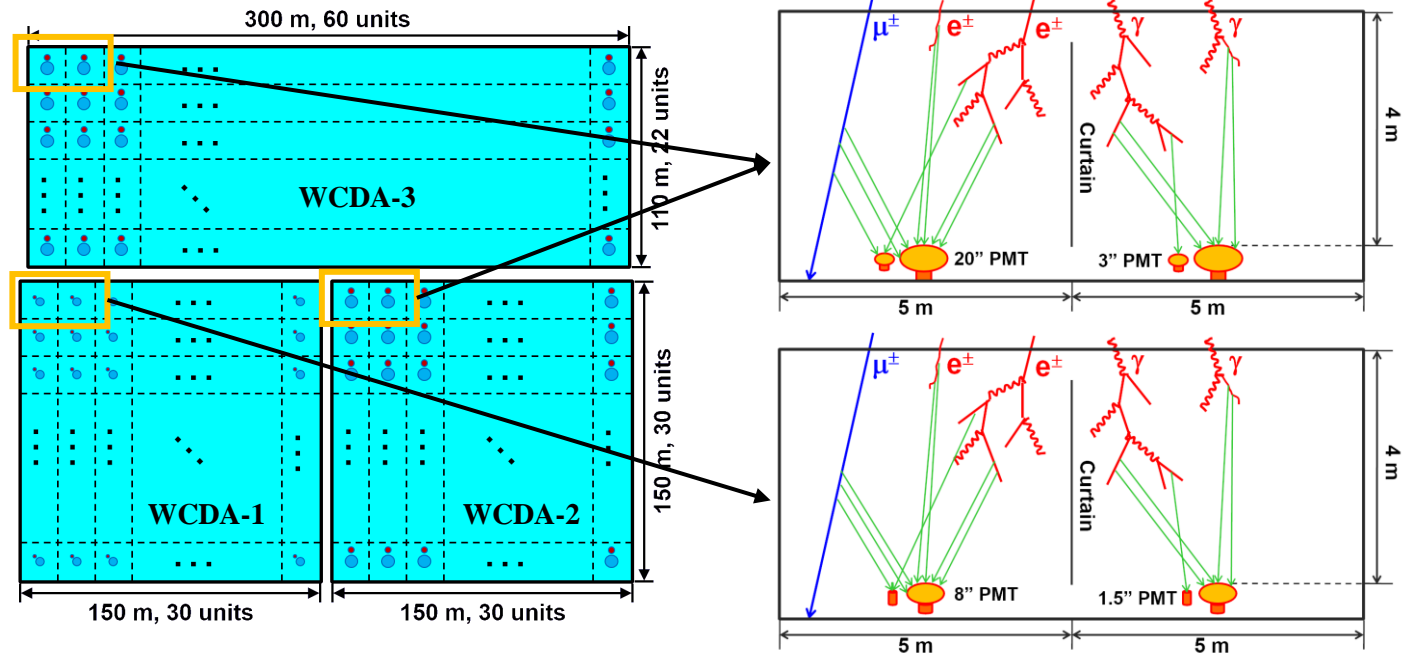
1.2 Calibration of detection efficiency on secondary particles

WCDA-1
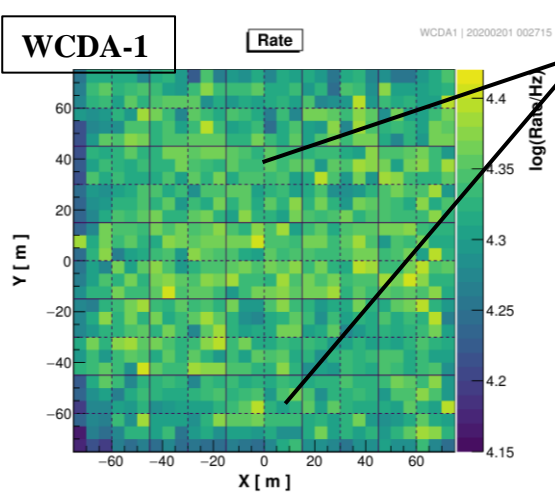
PMTs:
difference in quantum efficiency and collection efficiency

Water:
Attenuation length changes over time

Detection efficiency needs to be calibrated to reduce the effect of inhomogeneity and instability of efficiency on subsequent physical analysis, such as light curve and energy spectrum of VHE gamma-ray sources.

WCDA-1

from 2019/12/01 to 2020/08/14
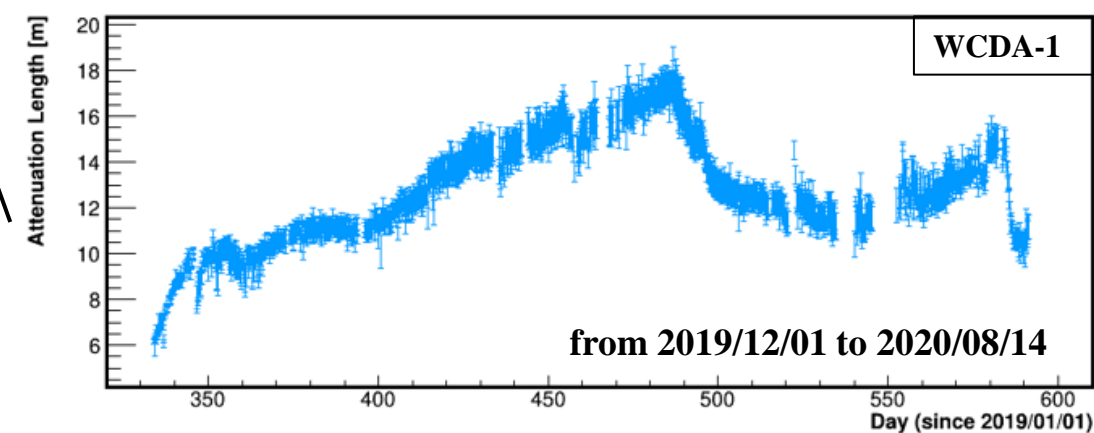
Key point: Charge calibration between pools
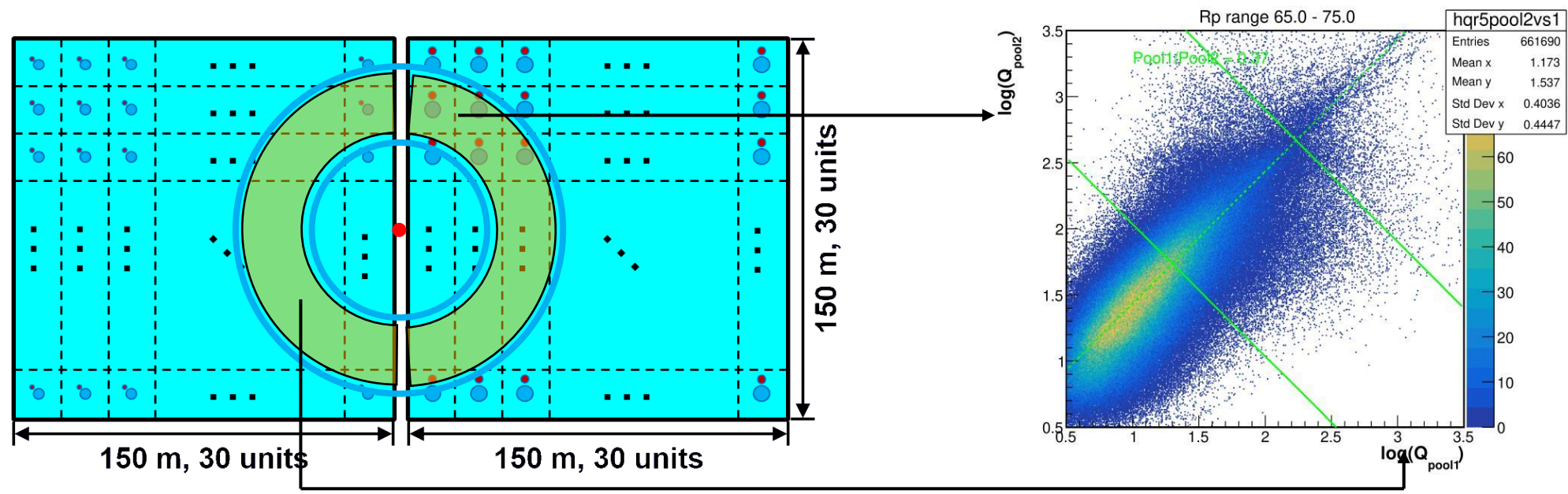
Step 1 : Hits of an air shower event are divided into nine groups according to the distance from the core. Each group of hits falls within the same loop centered on the core.

Setp2 : For each pool, hits within the same loop are sorted by amount of charge of signals and tagged with *rank* from 0 to 1.

Step3 : Hits with same *rank* are paired. *log10(NPEs)* of pairs of hits in the same loop are filled in a histogram. The ratio in each loop is obtained by linear fitting of the corresponding histogram.

Step4 : The final result is an average of the five closest of the nine ratios.