Study on the Muon Lateral Distribution on the First Stage of LHAASO-KM2A

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For LHAASO Collaboration

July 31, 2019 (ICRC 2019)

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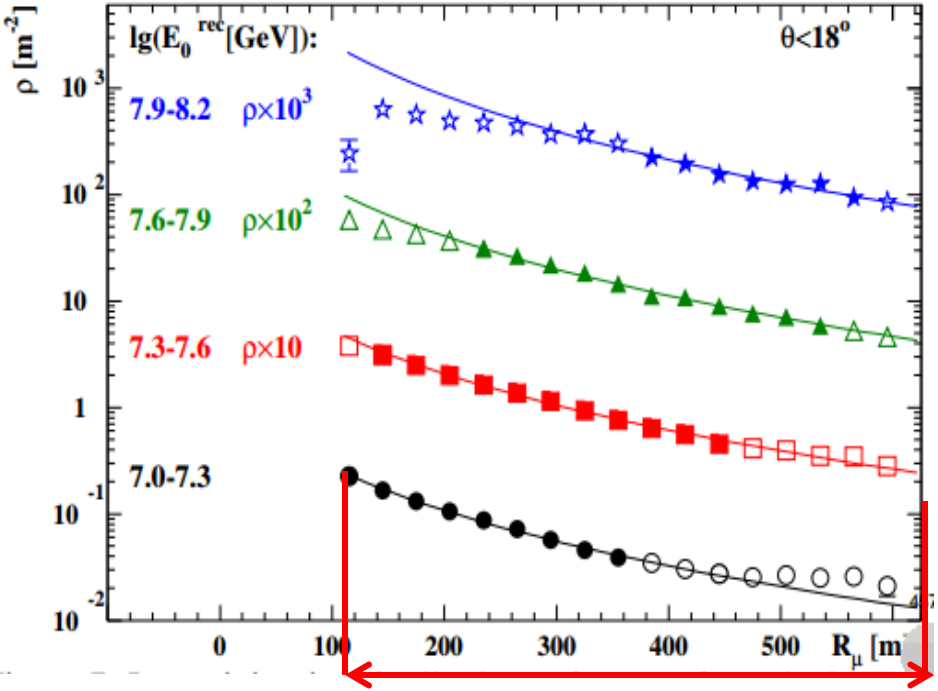
Content

- Some results of previous experiments
- LHAASO Introduction
- Result of this work
- Summary

Current Measurements of Muon Lateral Distribution

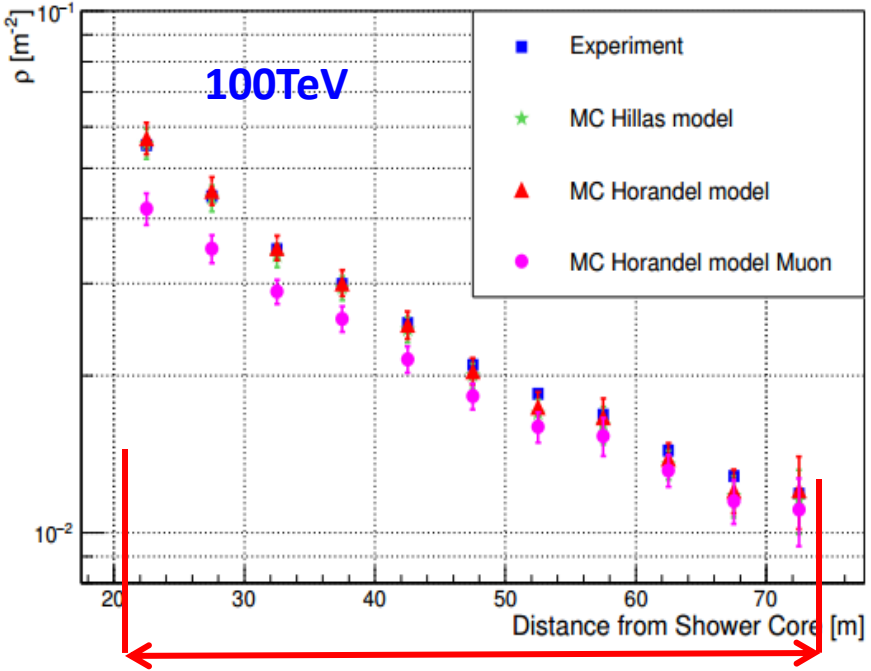
KASCADE-Grande



100 m - 600 m

10 PeV–100 PeV
zenith angle < 18°

YangBaJing Hybrid Array (YBJ-HA)

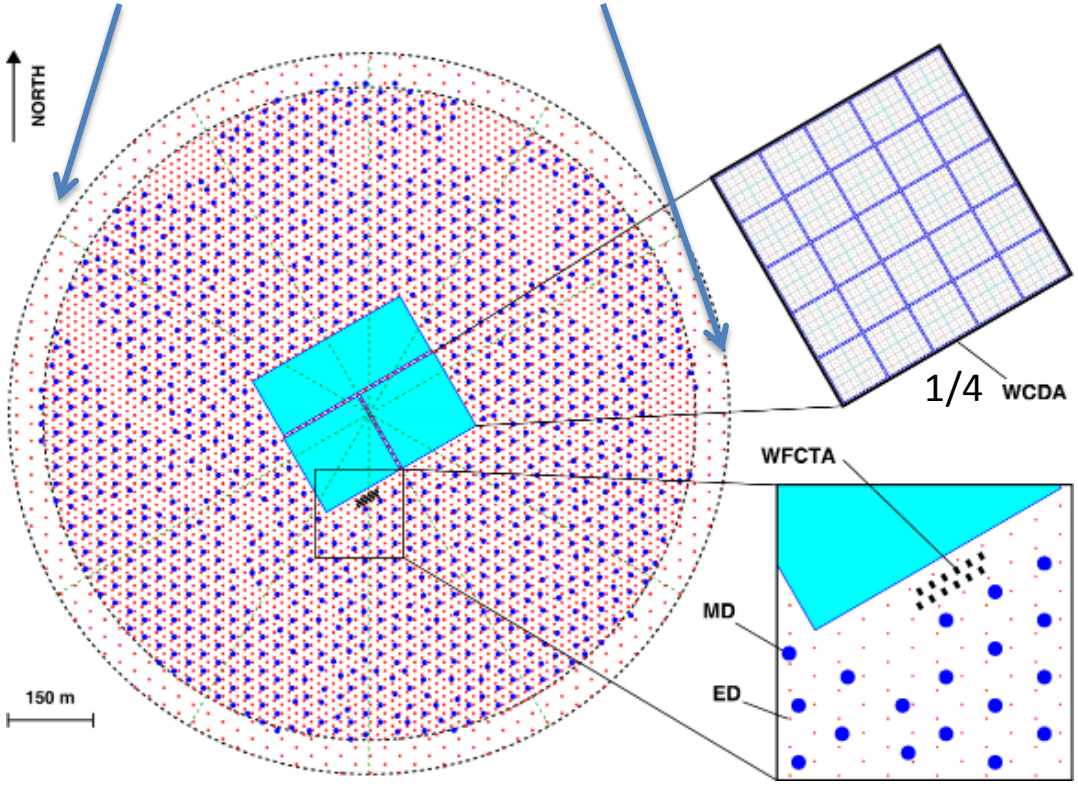


20m-75m

50 TeV – 300 TeV
Zenith Angle < 15°

LHAASO： Large High Altitude Air Shower Observatory

KM2A: One km² Array



5195 Electromagnetic particle Detectors(EDs)

- 1 m² each
- 15 m spacing

1171 Muon Detectors(MDs)

- 36 m² each
- 30 m spacing

3120 Water Cherenkov Detectors (WCDs)

- 25 m² each

18 Wide Field of view Cherenkov Telescopes(WFCTs)

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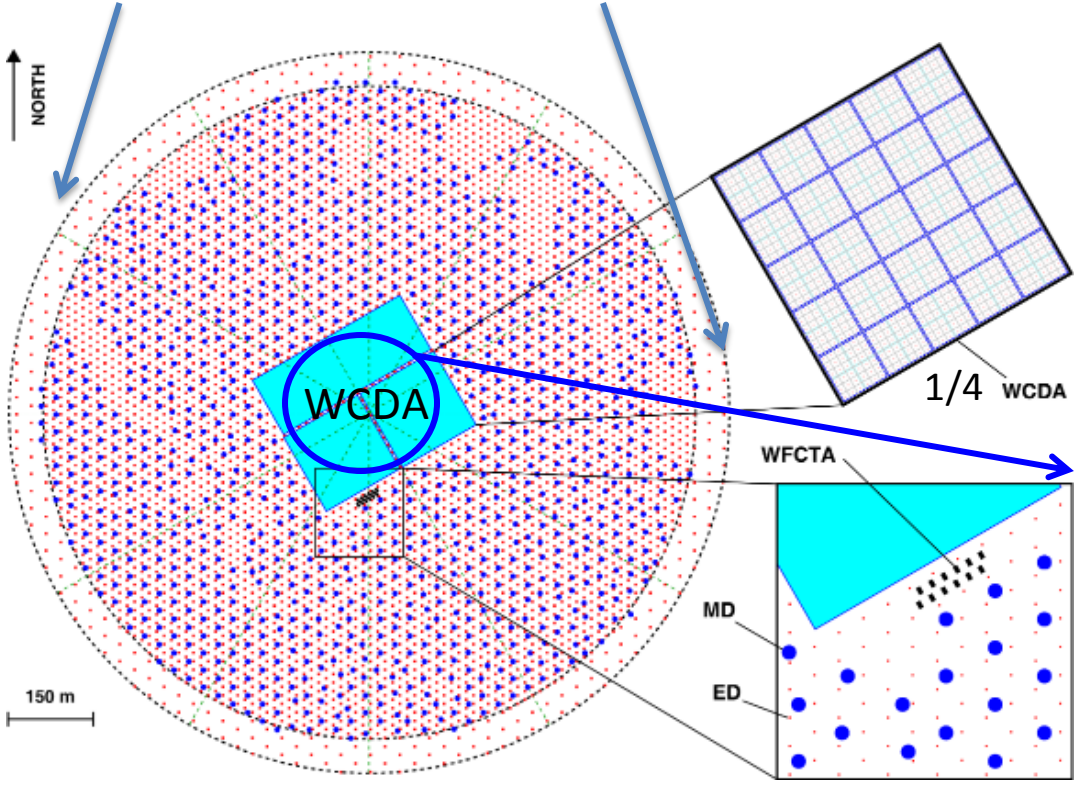

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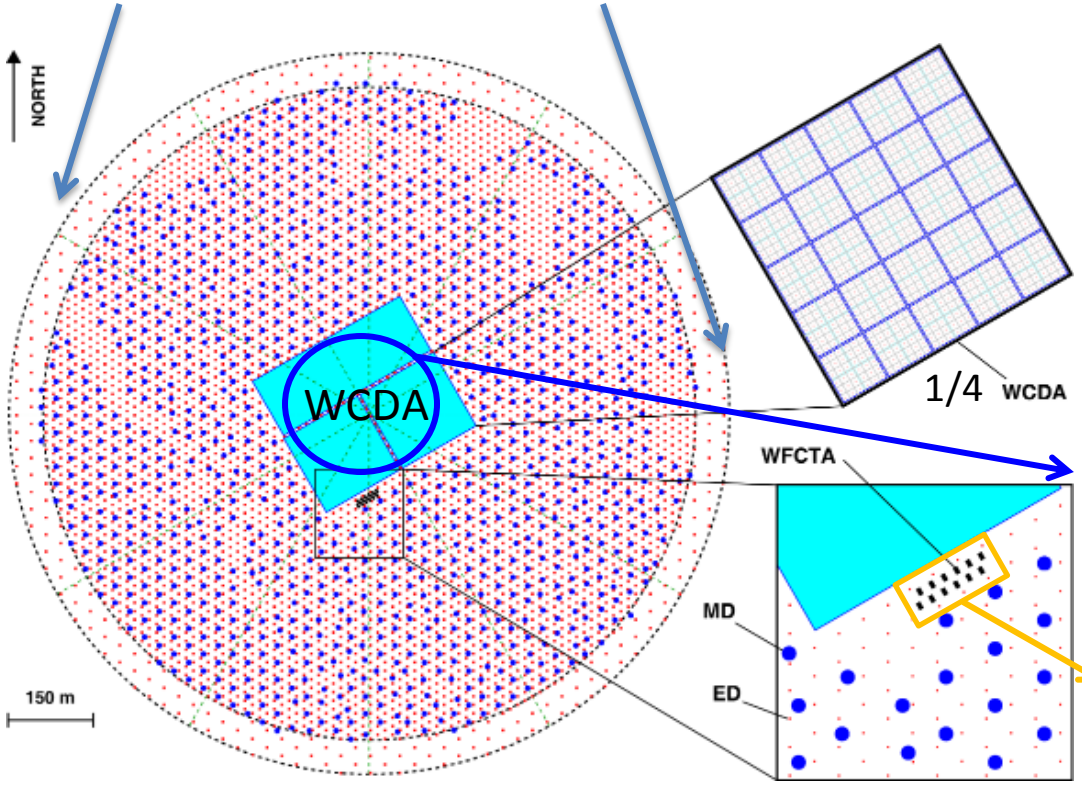

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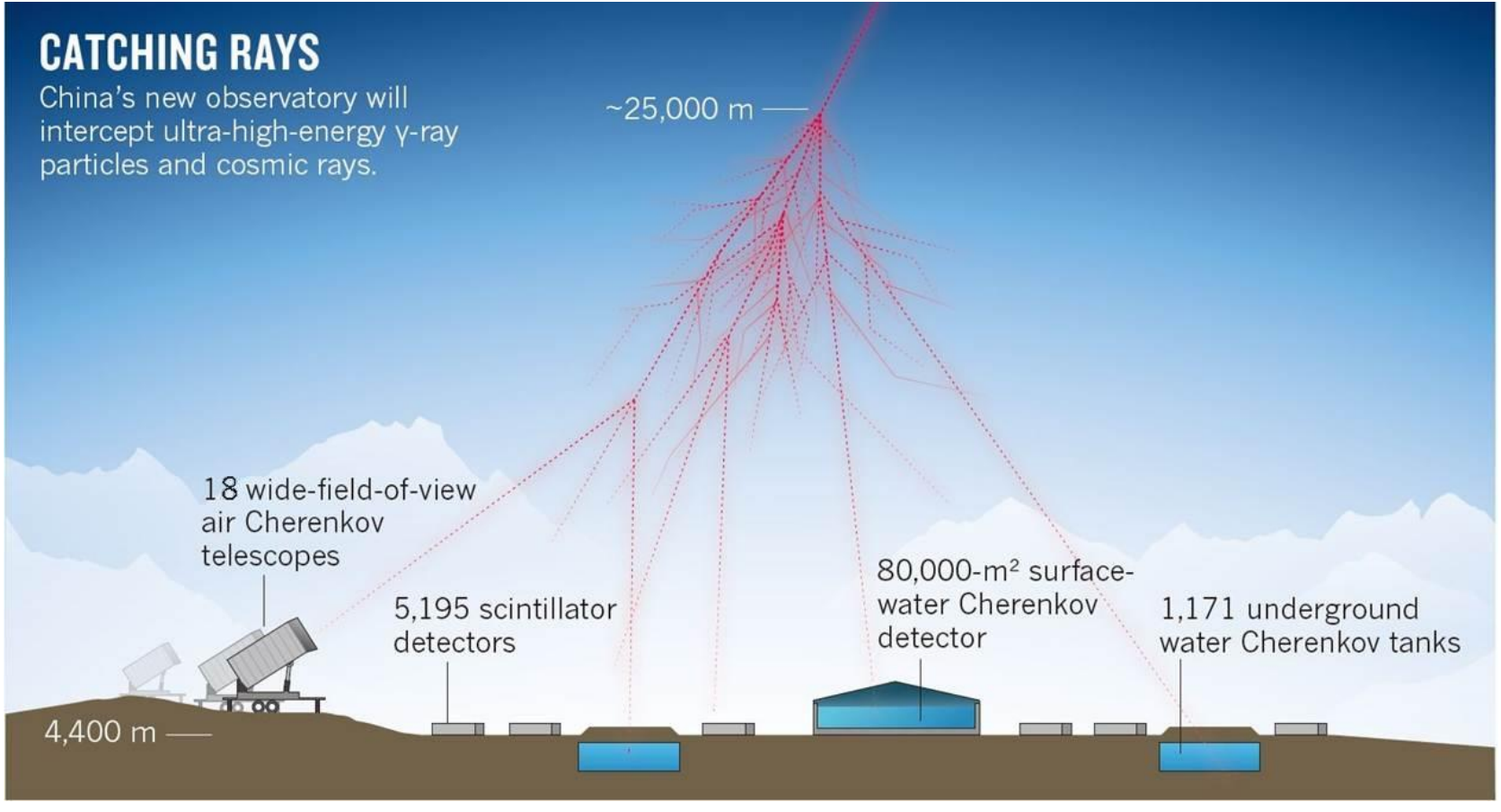
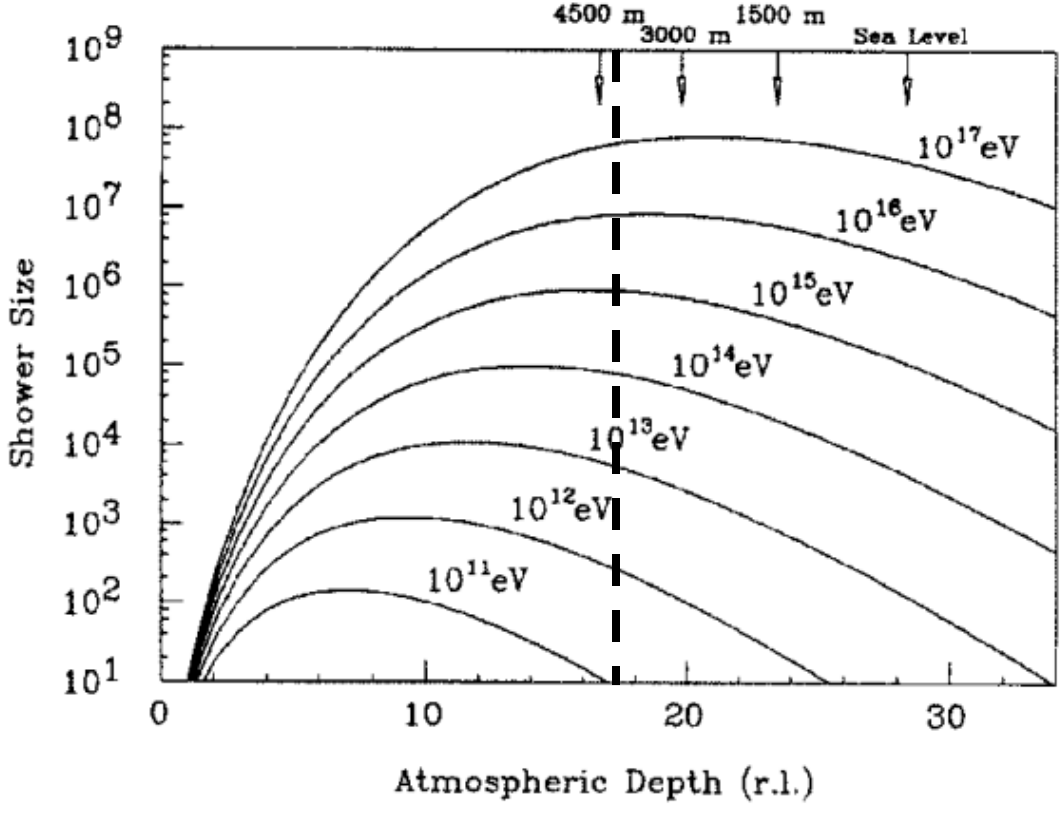
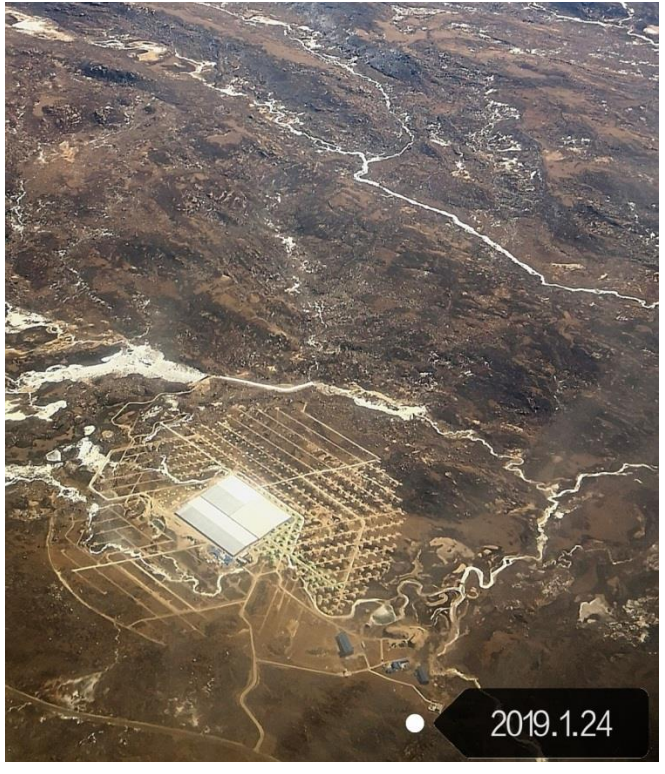
Hybrid Detection of EASs by LHAASO



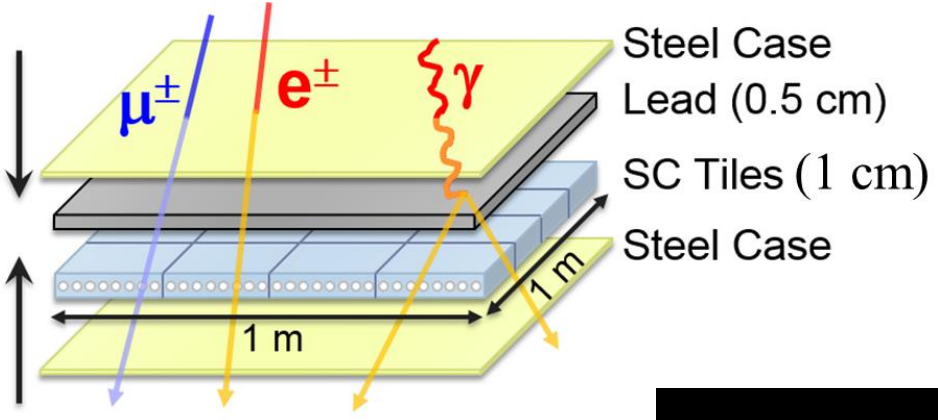
Measurement of EASs at High Altitude

- **Mt. Haizi (4410 m a.s.l., 29°21’ 27.6” N, 100°08’19.6” E), Sichuan, China**

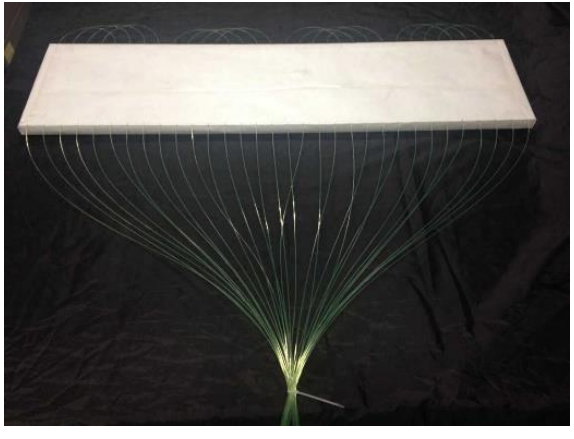




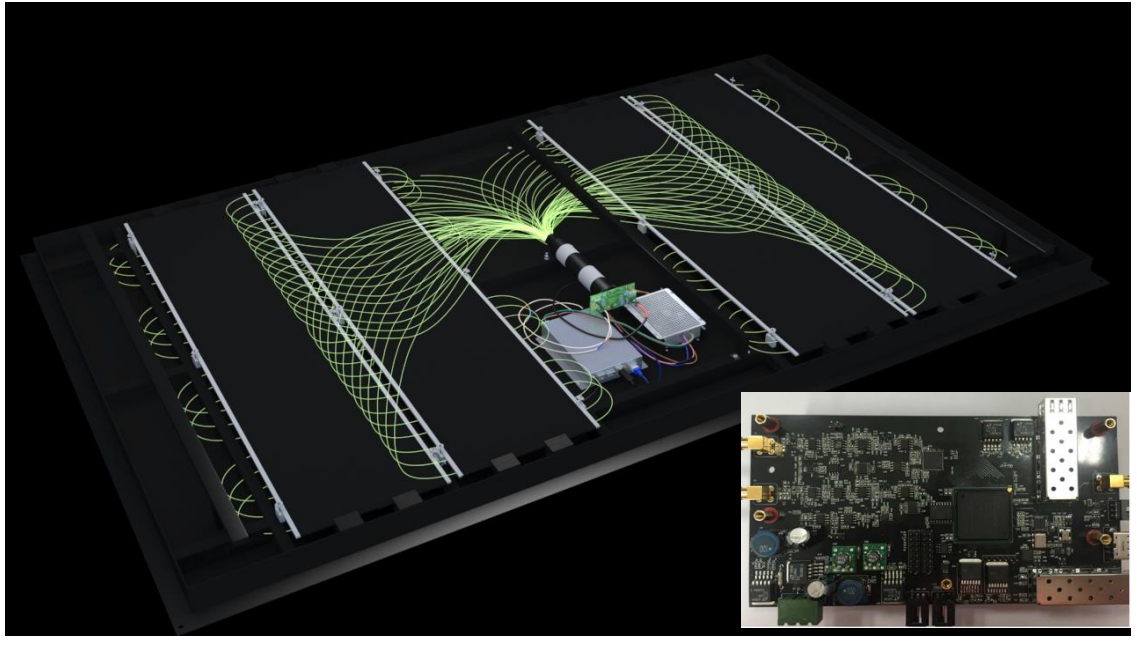
ED: Electromagnetic Particle Detector



- **Uniformity for 5195 units: < 10%**
- **Stability within ±25°C: ±5%**

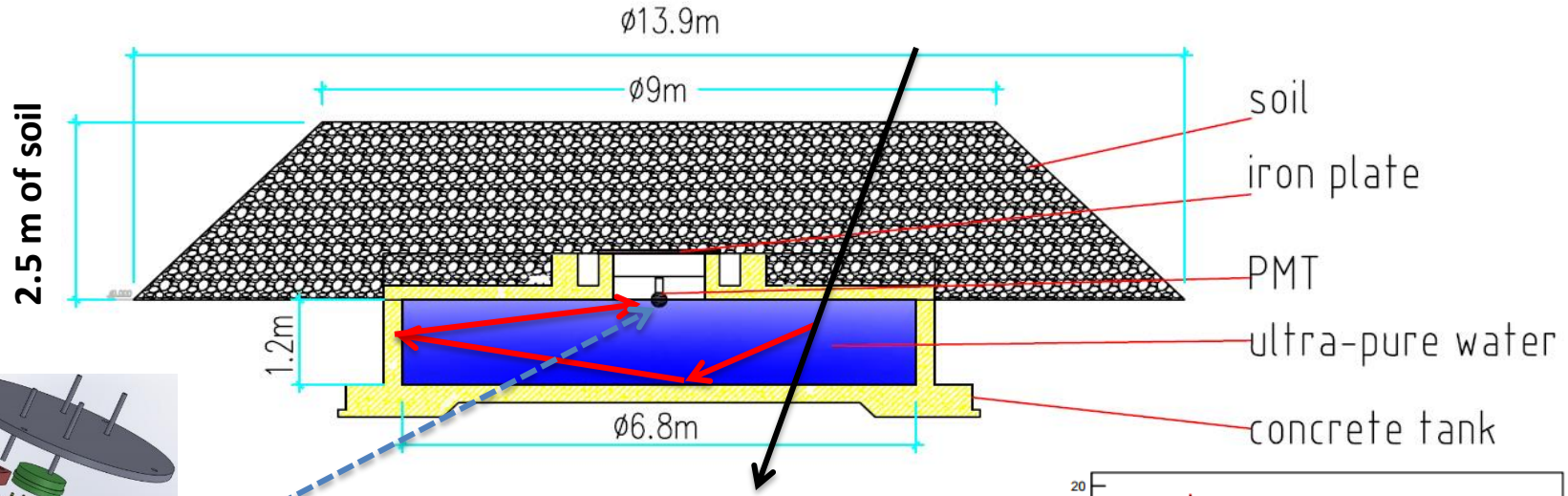


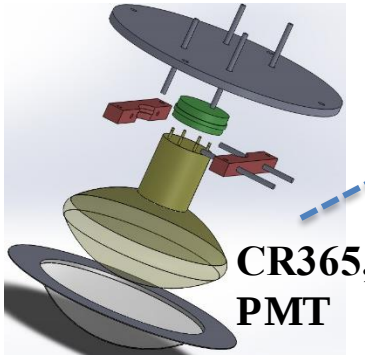
fiber to PMT



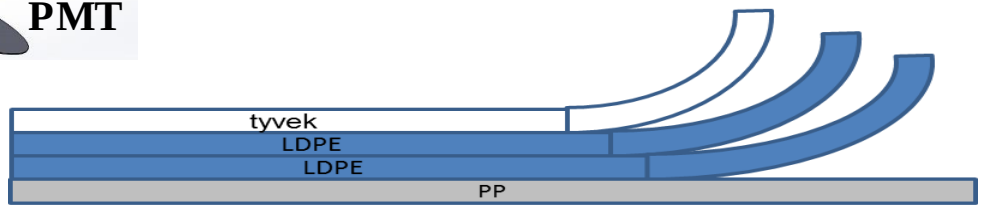
MD: Muon Detector

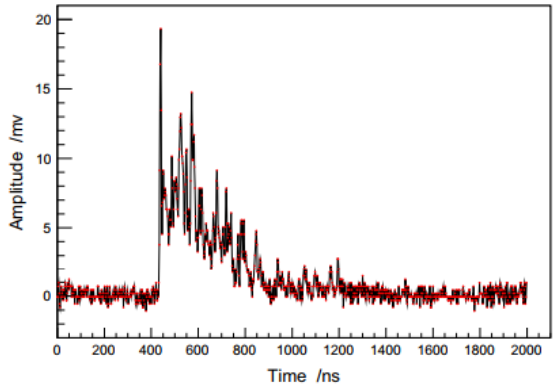
- **Water Cherenkov detector underneath soil**



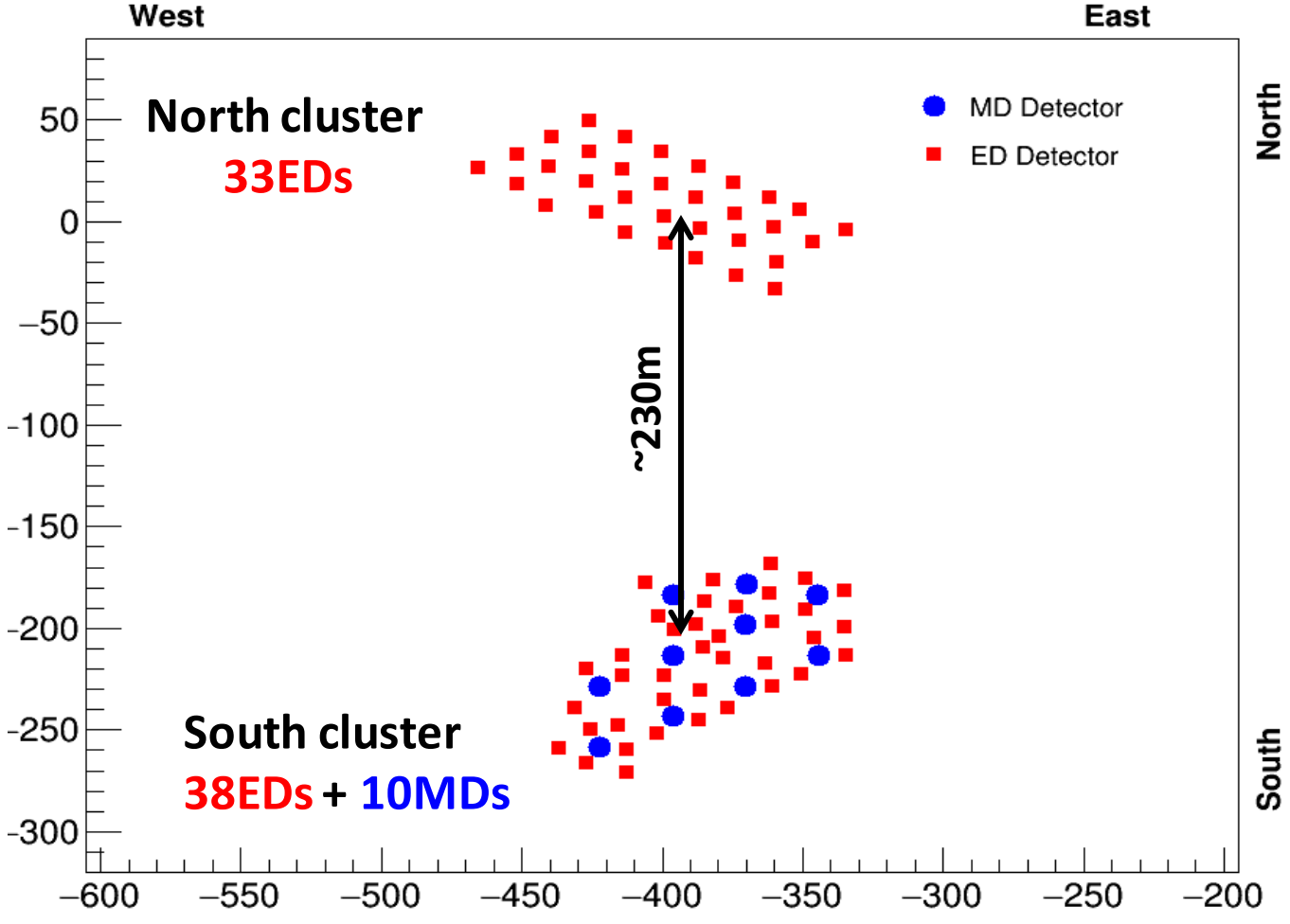


CR365, 8”
PMT

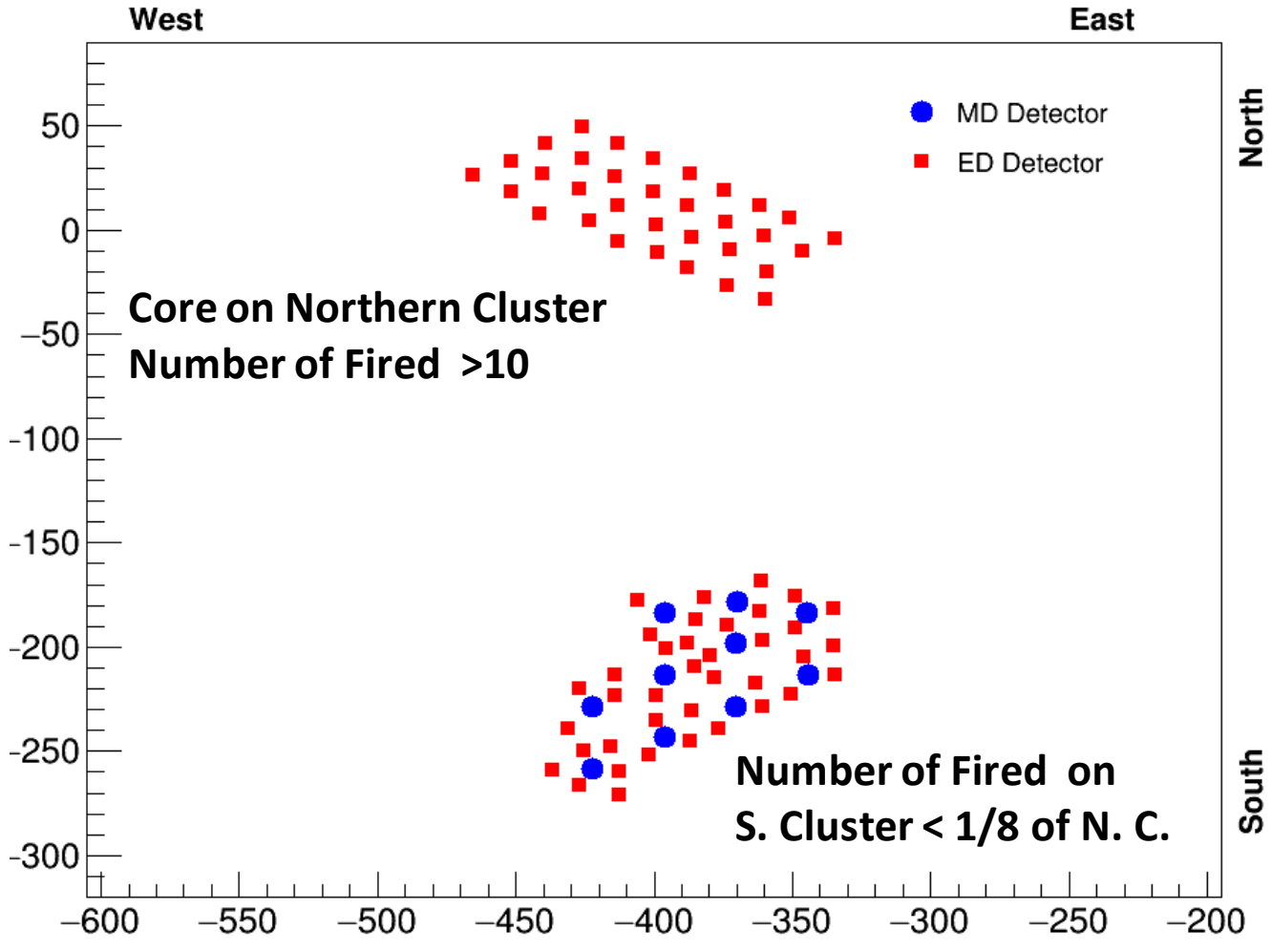




LHAASO-KM2A first stage experimental layout



Events Selection 1



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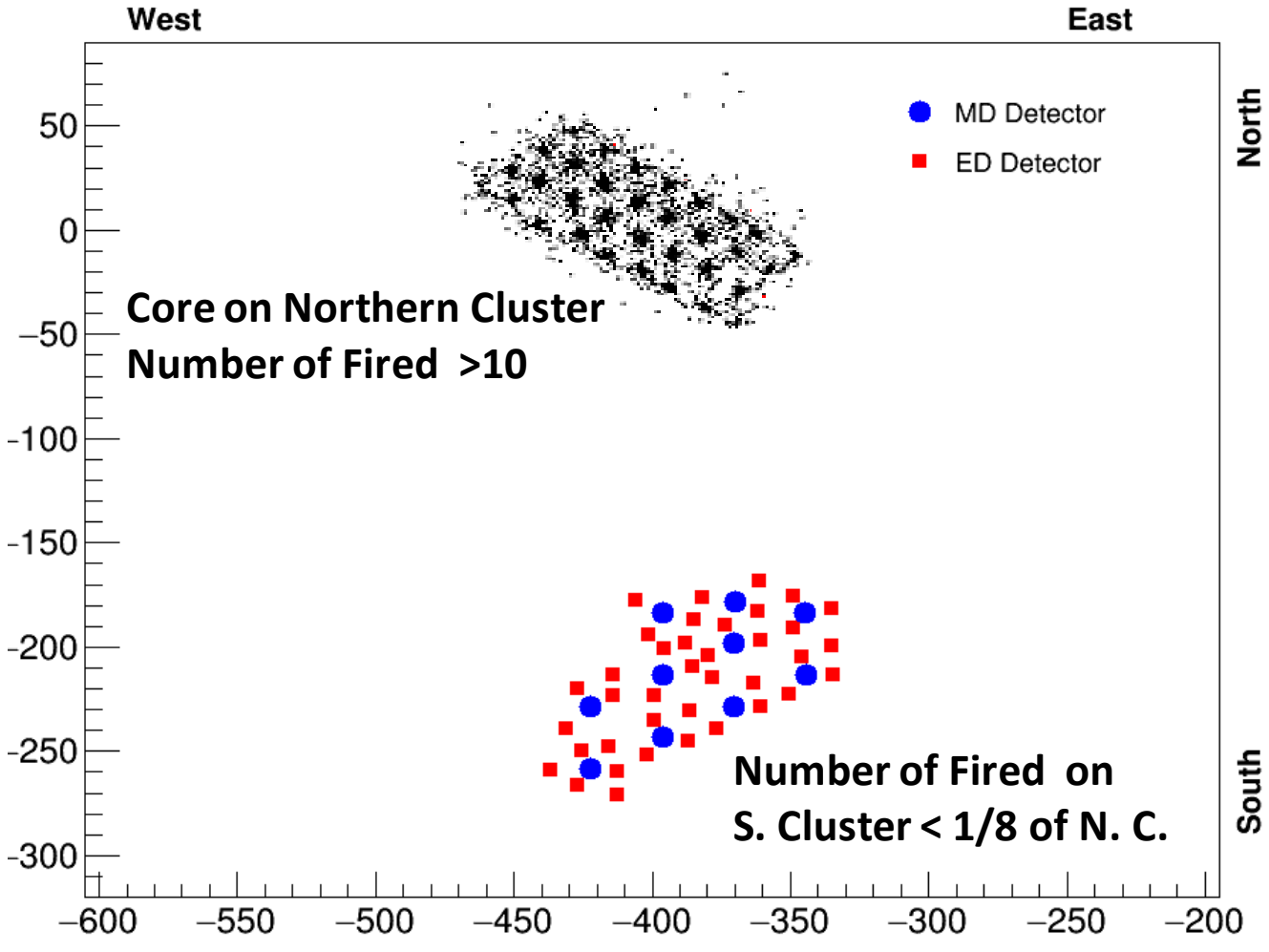
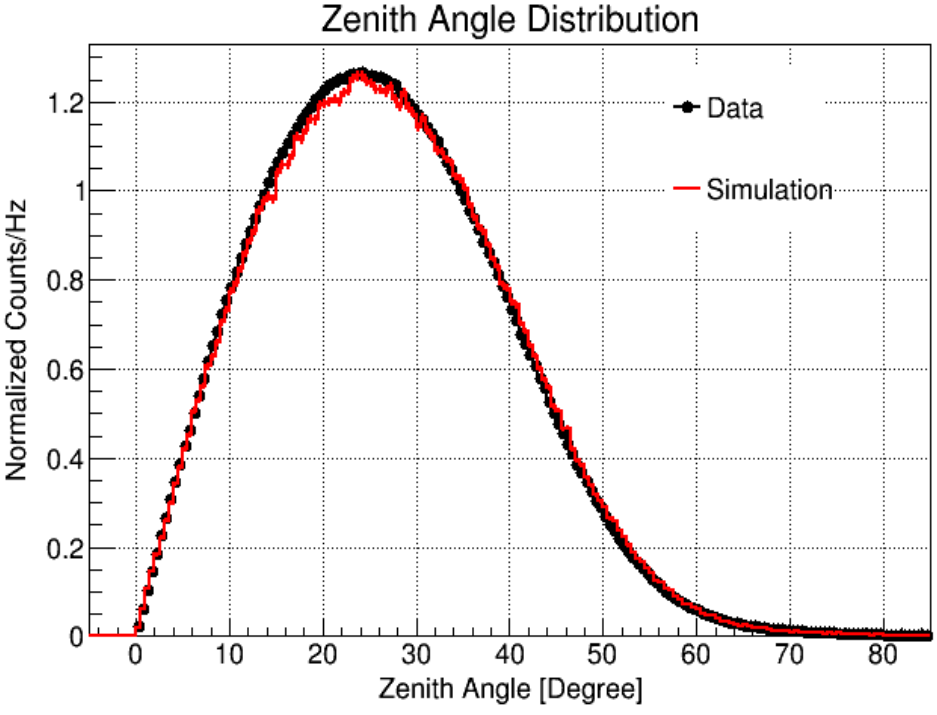
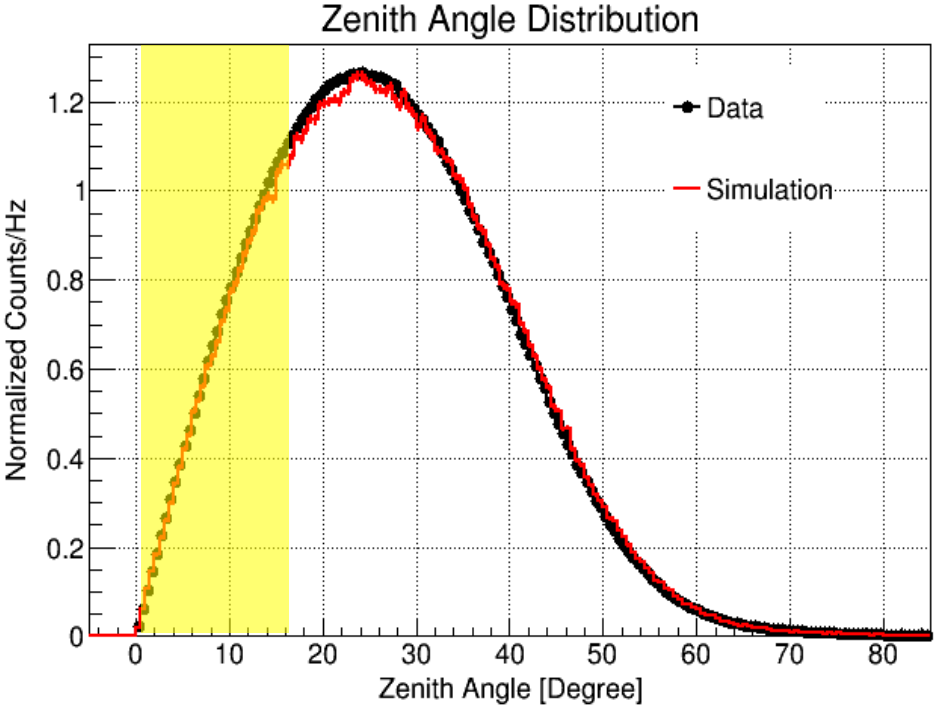


Events Selection 2



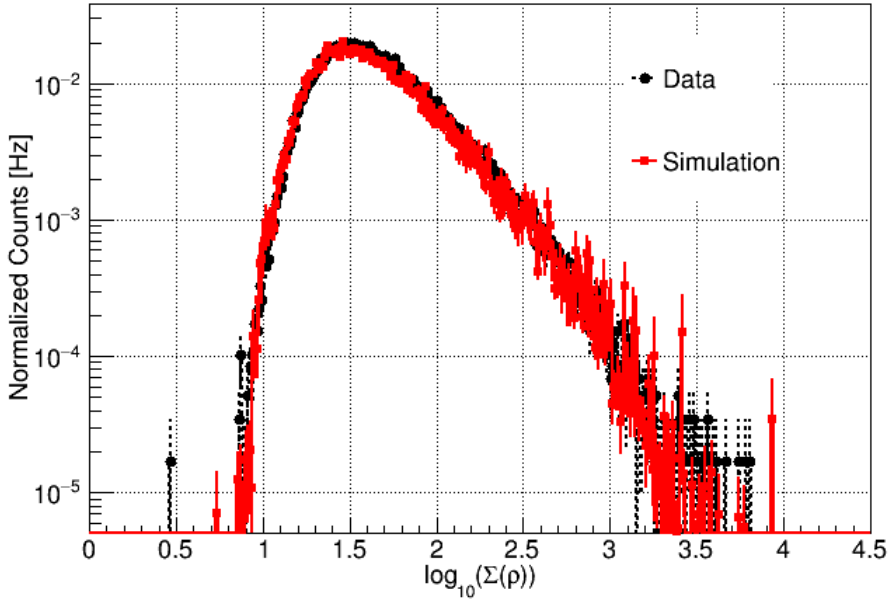
Events Selection 2



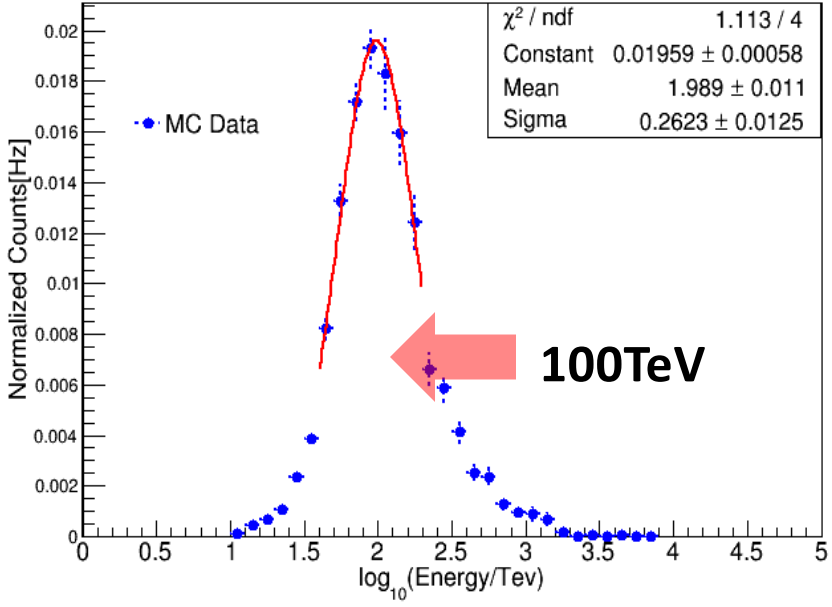
Zenith angle<15°

Events Selection 3

Sum of the particles



Primary Energy



$100 < \Sigma(\rho) < 300$ / m²

ρ: particle density

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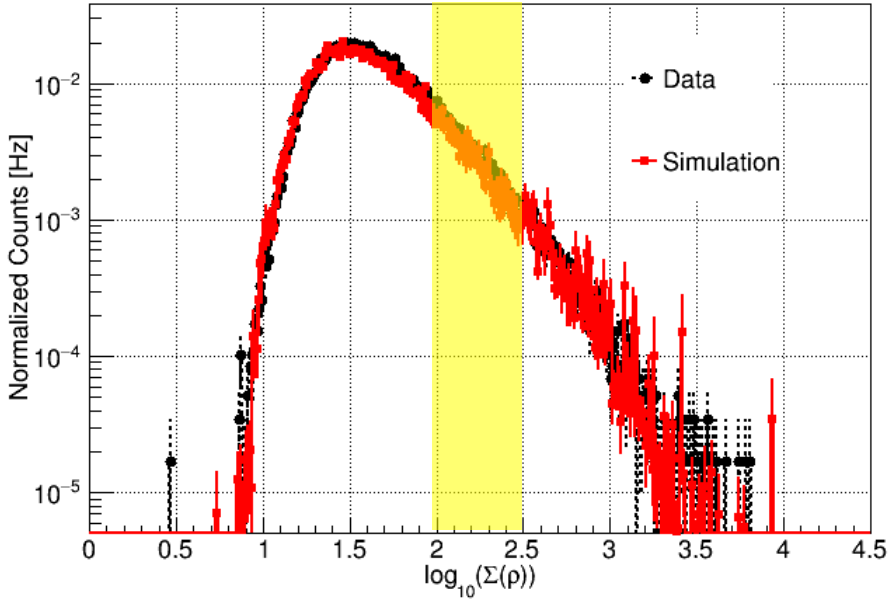

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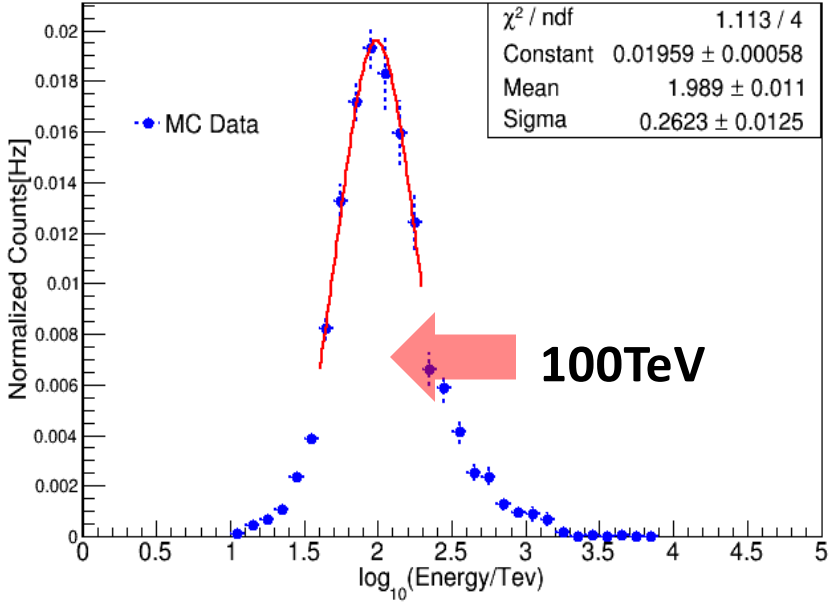

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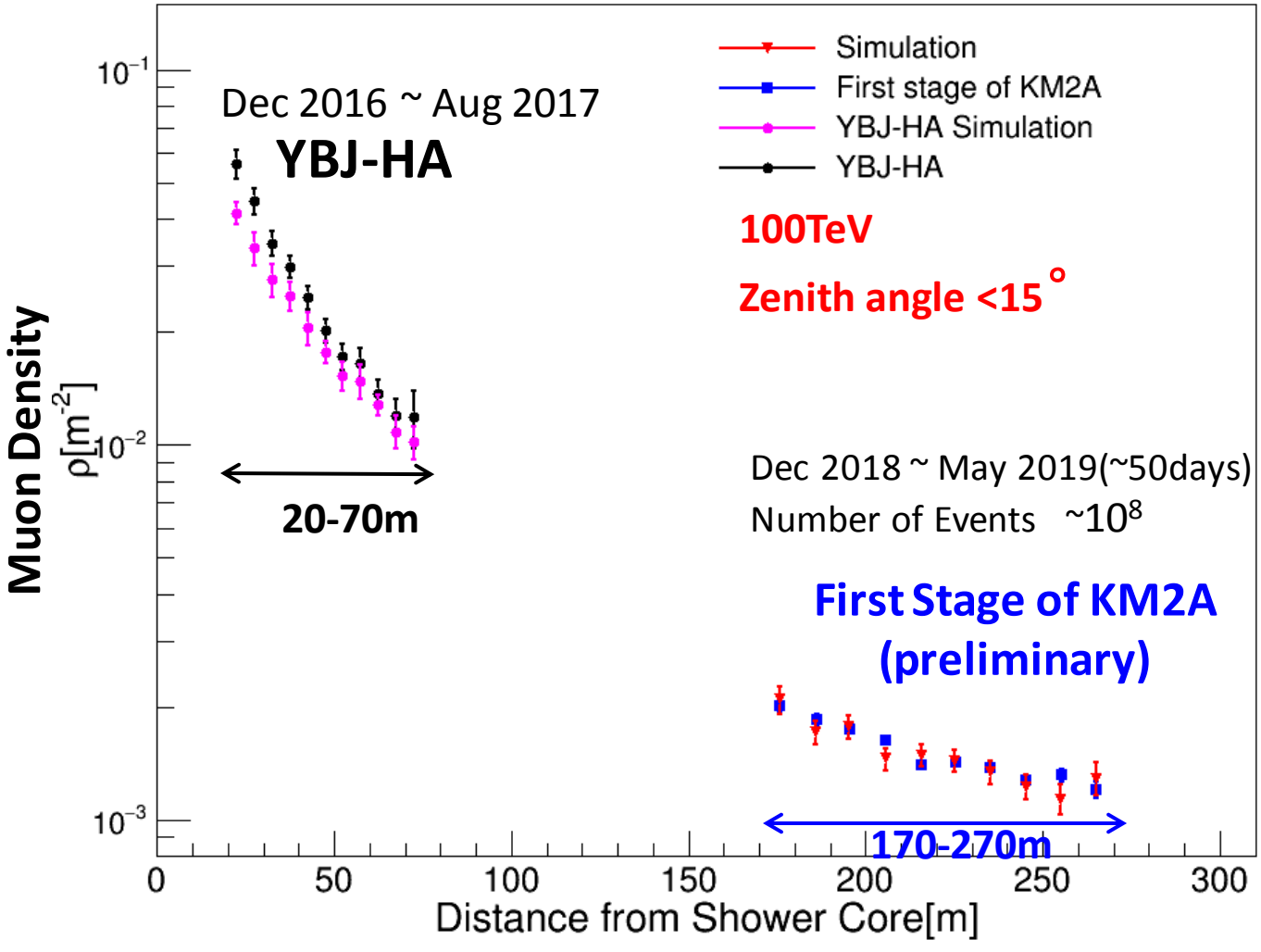
Result: Lateral Distribution of Muons



Summary

- ❑ We measured the lateral distribution of muons, based on the first stage of LHAASO-KM2A.
  - The result is in good agreement with YBJ-HA experiment.
- ❑ A quarter of the KM2A has been successfully deployed, a detailed analysis on the lateral distribution of muons would be implemented soon.
- ❑ LHAASO is still being completed , more exciting results are expected.