JUSTUS-LIEBIG-UNIVERSITÄT GIESSEN

GCS GIESSEN COSMIC STATION

ATLAS PANDA HERMES AG Düren

Giessen Cosmic Station - Status Update

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Online PANDA Meeting

March 10, 2020

Overview

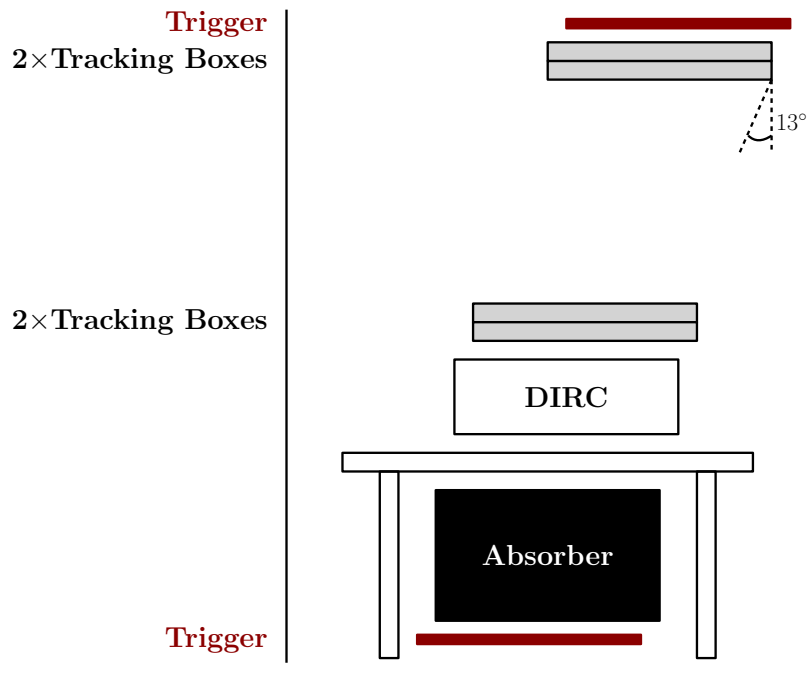
Track Reconstruction

- Track reconstruction via position measurement in two planes

Components

The test stand consists of

- Two scintillating plates defining a trigger
- Four layers of scintillating bars (track reconstruction)
- About 45 cm of lead in between the trigger plates (energy selection)



Tracking Boxes

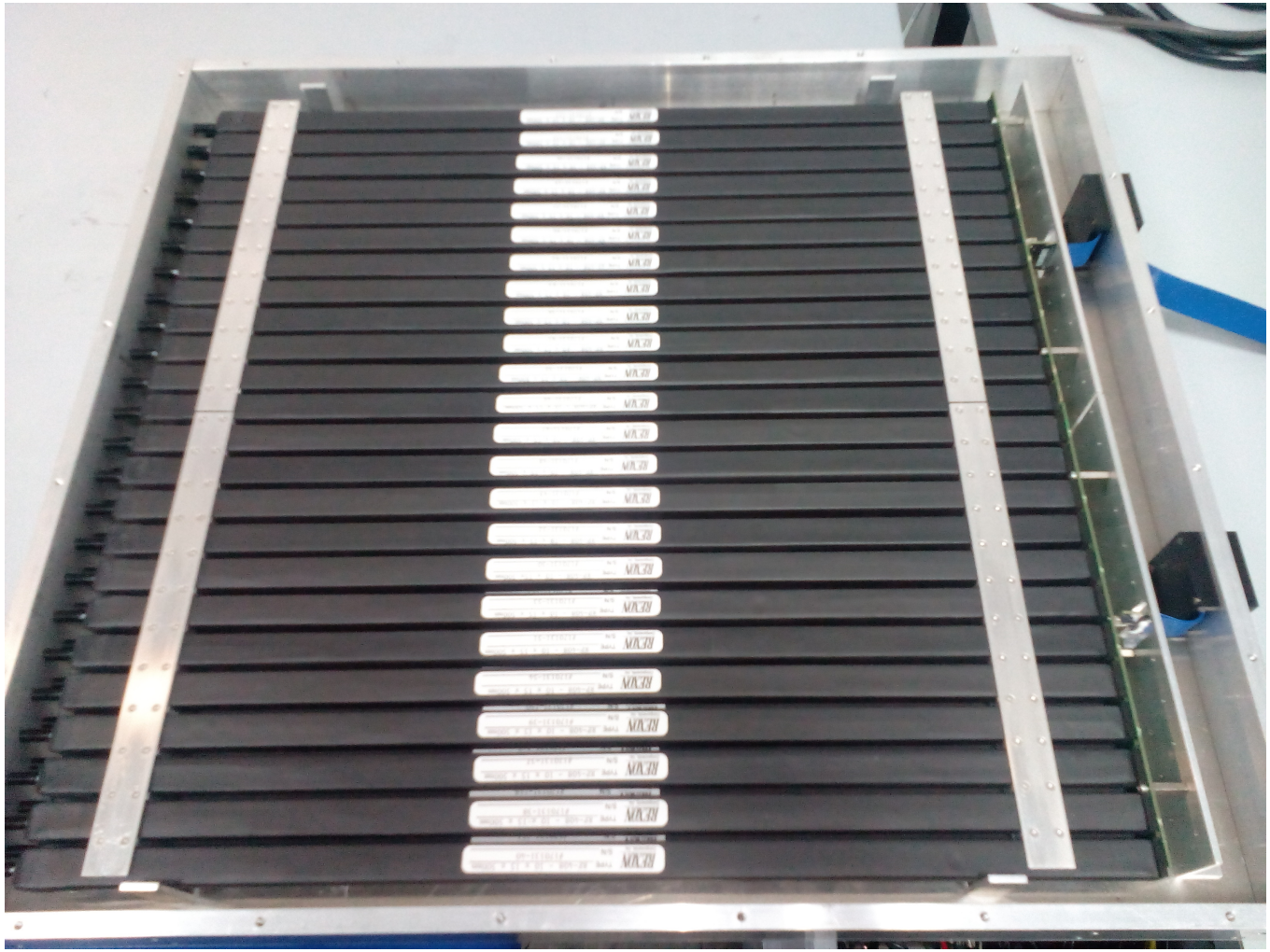
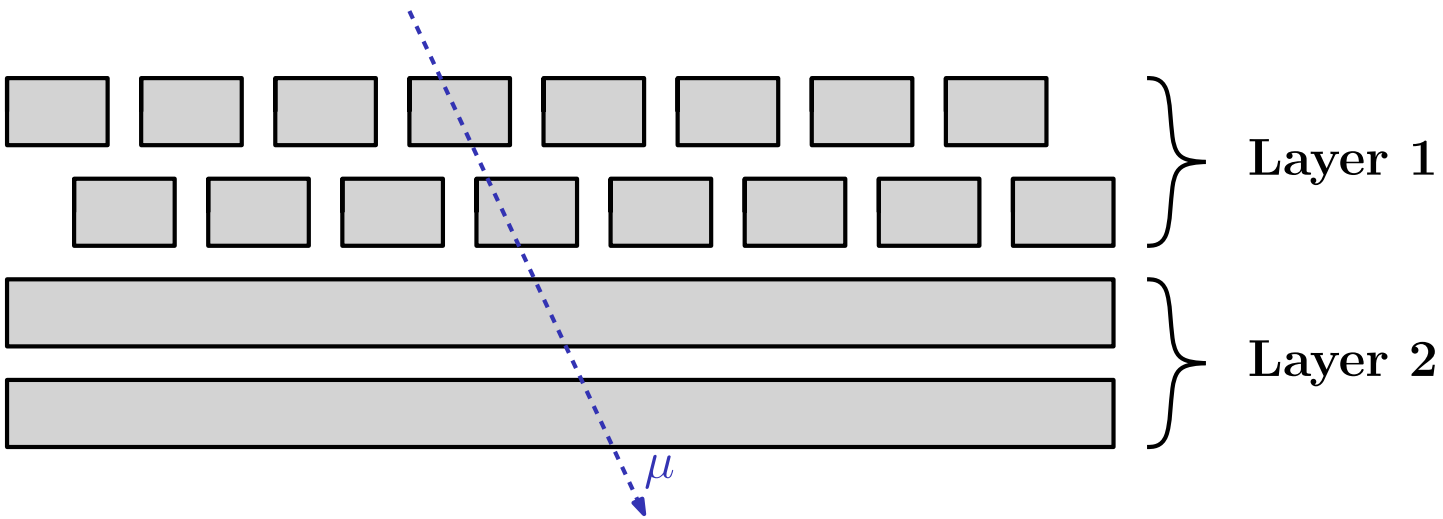


Figure: One of the tracking boxes without lid.

Tracking Boxes

Geometry of the bars

- 48 bars ($15 \times 10 \times 500$ mm) in two half-layers shifted against each other
- Second layer rotated by 90° for position resolution along the other axis
- Every layer in a separate light-proof box



Trigger Plates

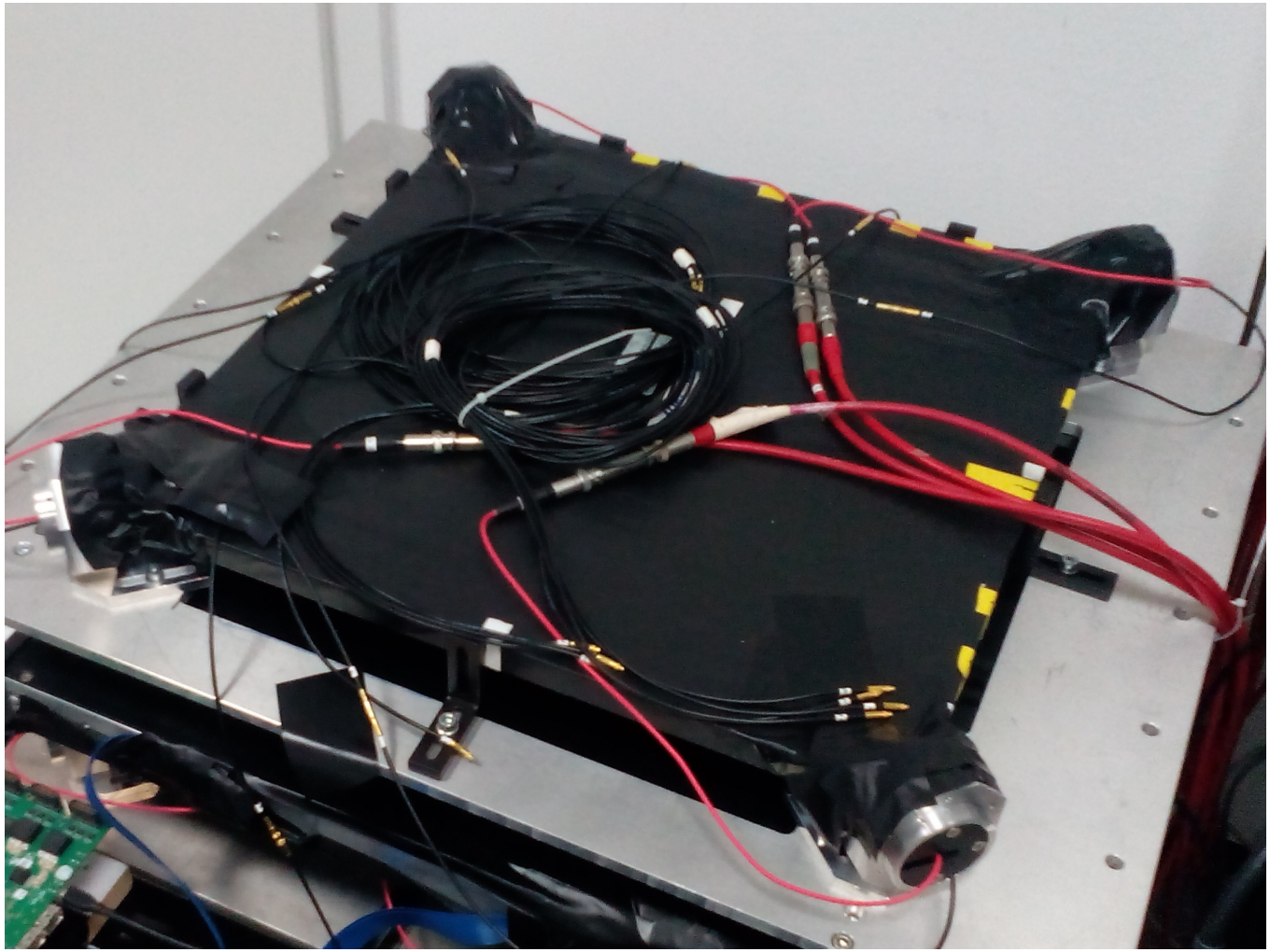
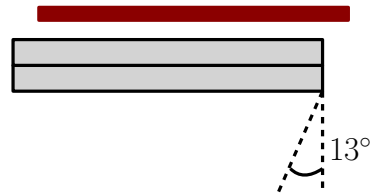


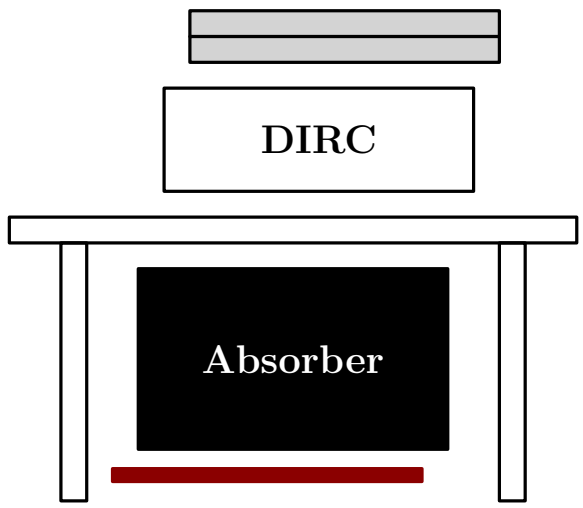
Figure: One of the 50×50 cm^2 trigger plates with PMT-Readout.

Absorber

Role of the absorber

- Flight distance in combination with timing resolution insufficient for momentum selection
- Therefore energy discrimination via absorption in 45 cm lead





Absorber

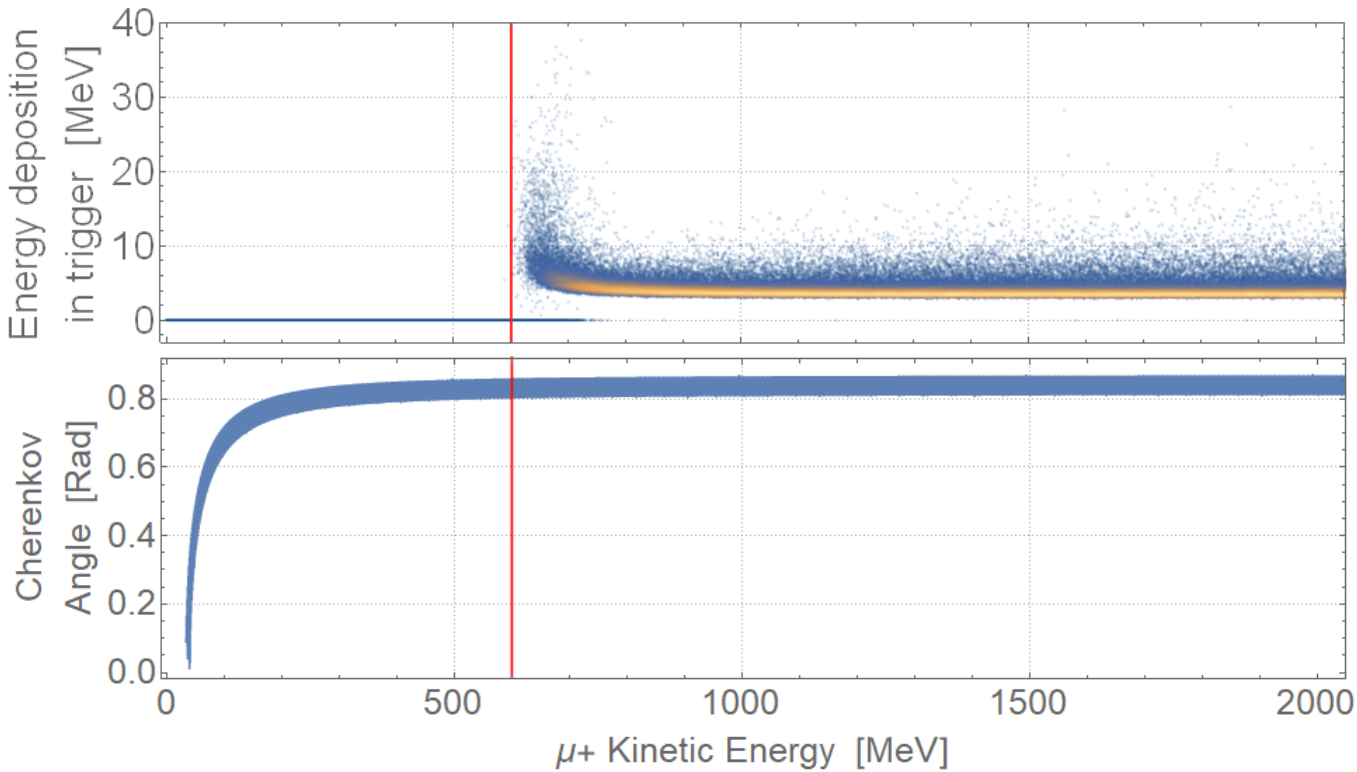


Figure: Energy deposition in the trigger after passing though the lead (top), the Cherenkov angle range (bot) and the estimated threshold (red).

`Wavelength cut:` $200\ \mathrm{nm} < \lambda < 800\ \mathrm{nm}$ `// Energy deposition obtained from Monte Carlo.`

Reconstruction - Acceptance

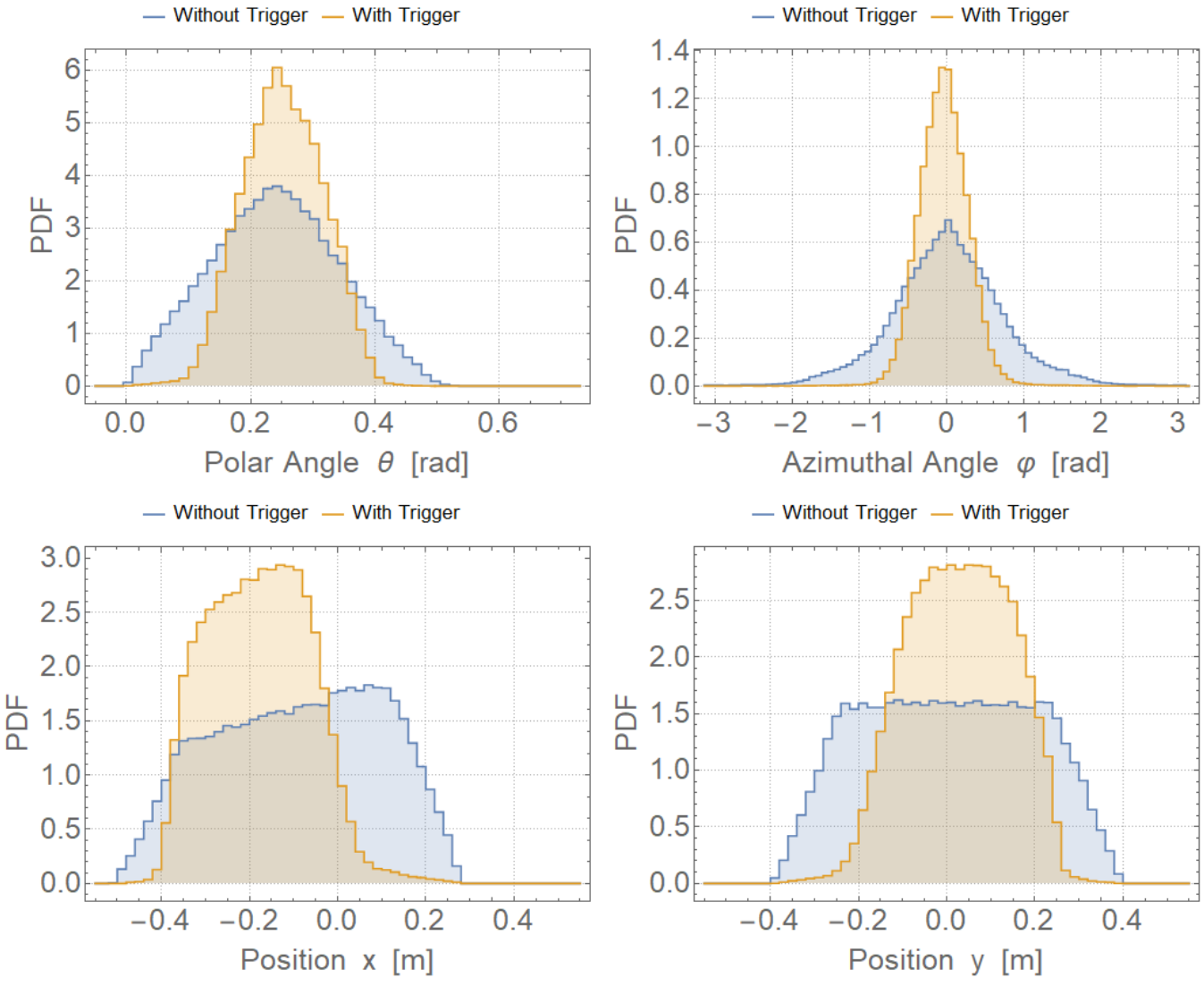


Figure: Angular acceptance with and without trigger.

Reconstruction - Expected Angular Resolution

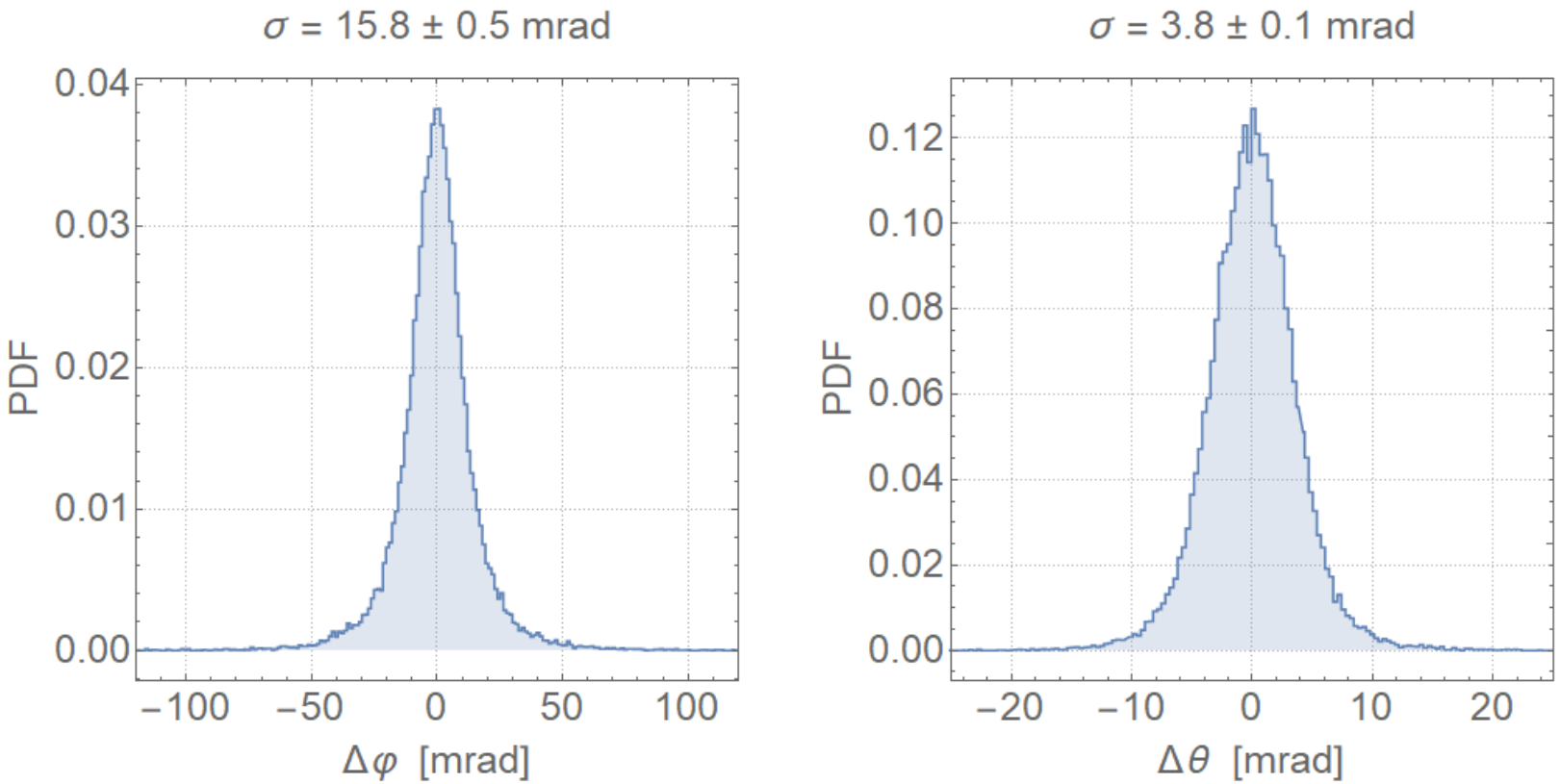


Figure: Expected angular resolution (Monte-Carlo-Estimate).

Reconstruction - Expected Spatial Resolution

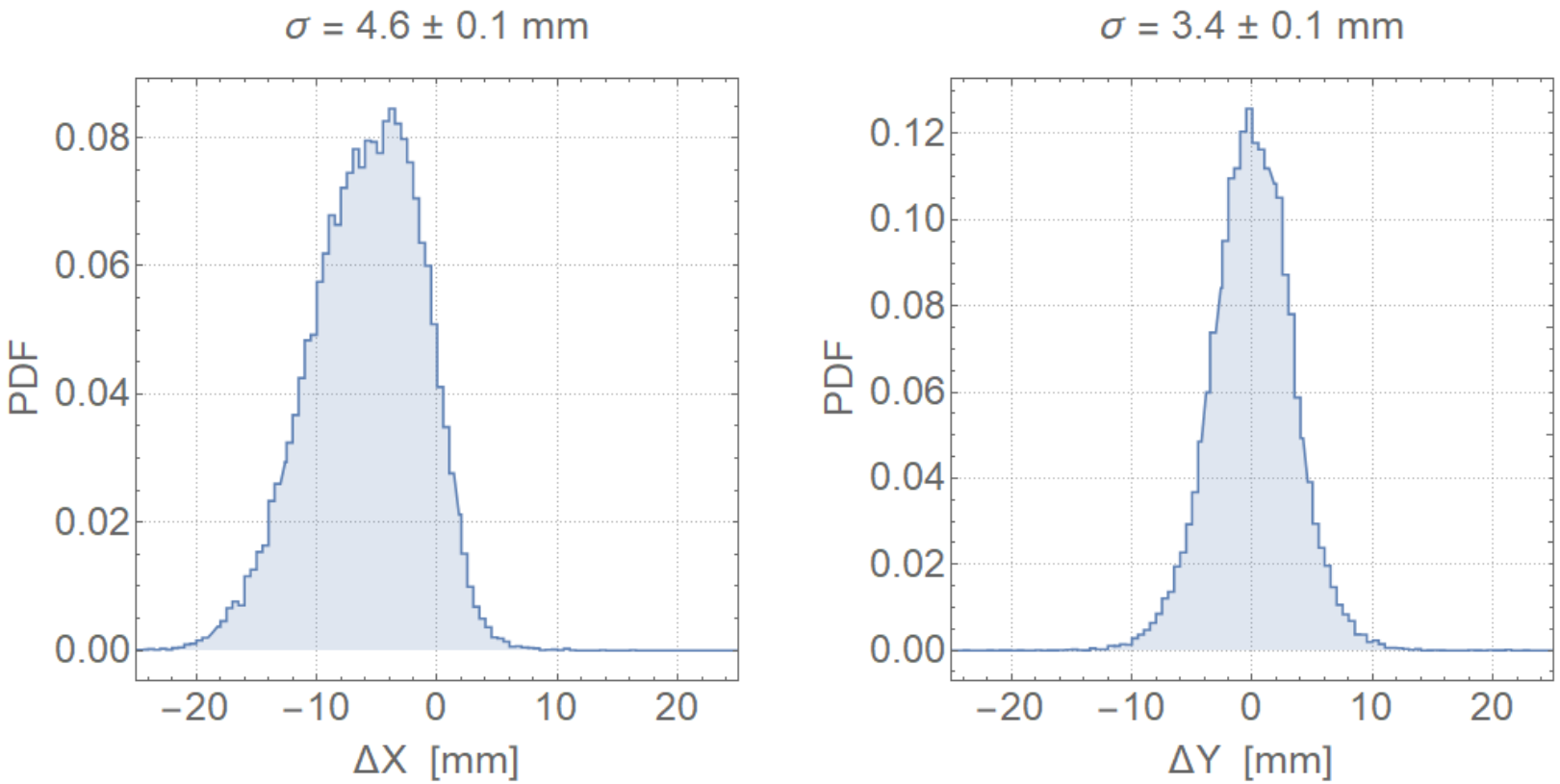


Figure: Expected spatial resolution (Monte-Carlo-Estimate).

Reconstruction - Resolution Verification

Testsetup ...

- Cross of two small scintillating bars
- Overlapping area of approx. $1,8 \times 1,8$ cm^2

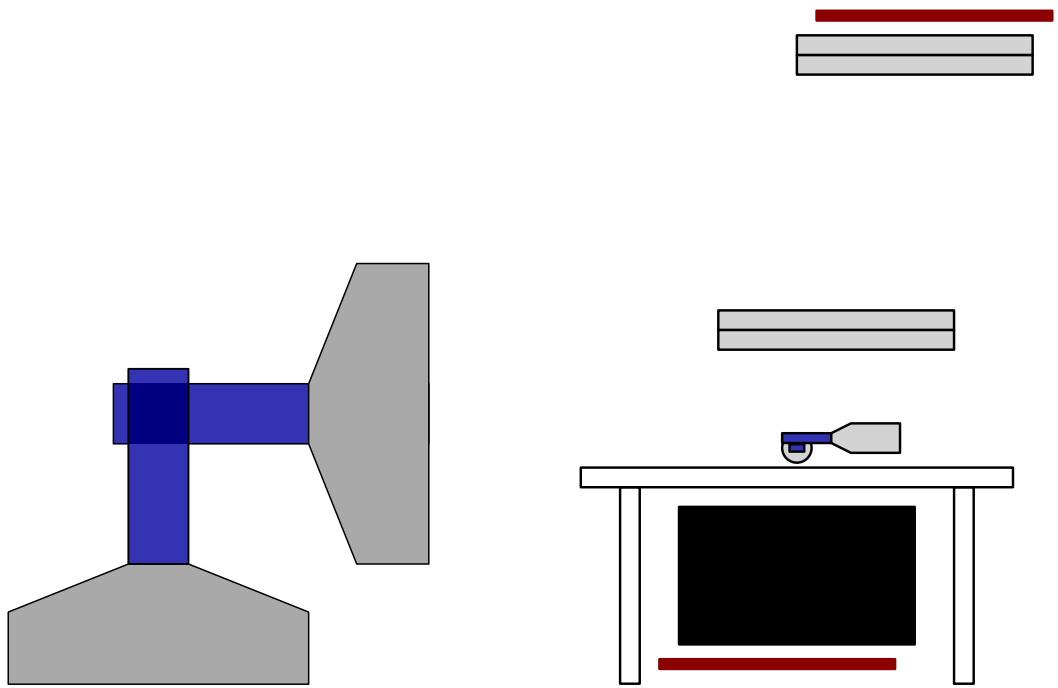


Figure: Schematic drawing of the finger counters and placement.

Reconstruction - Resolution Verification

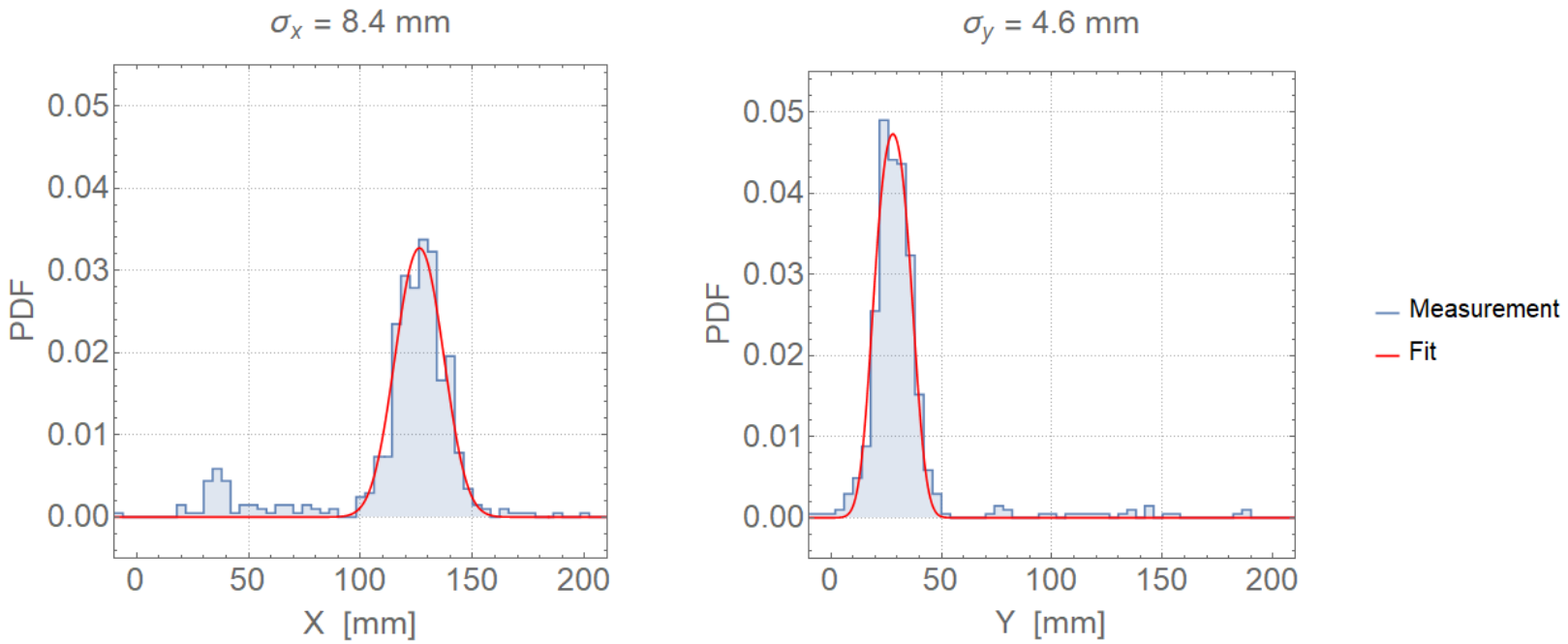


Figure: Fit of the finger hits with a convoluted normal distribution.

Use Case I - Radiator Plate

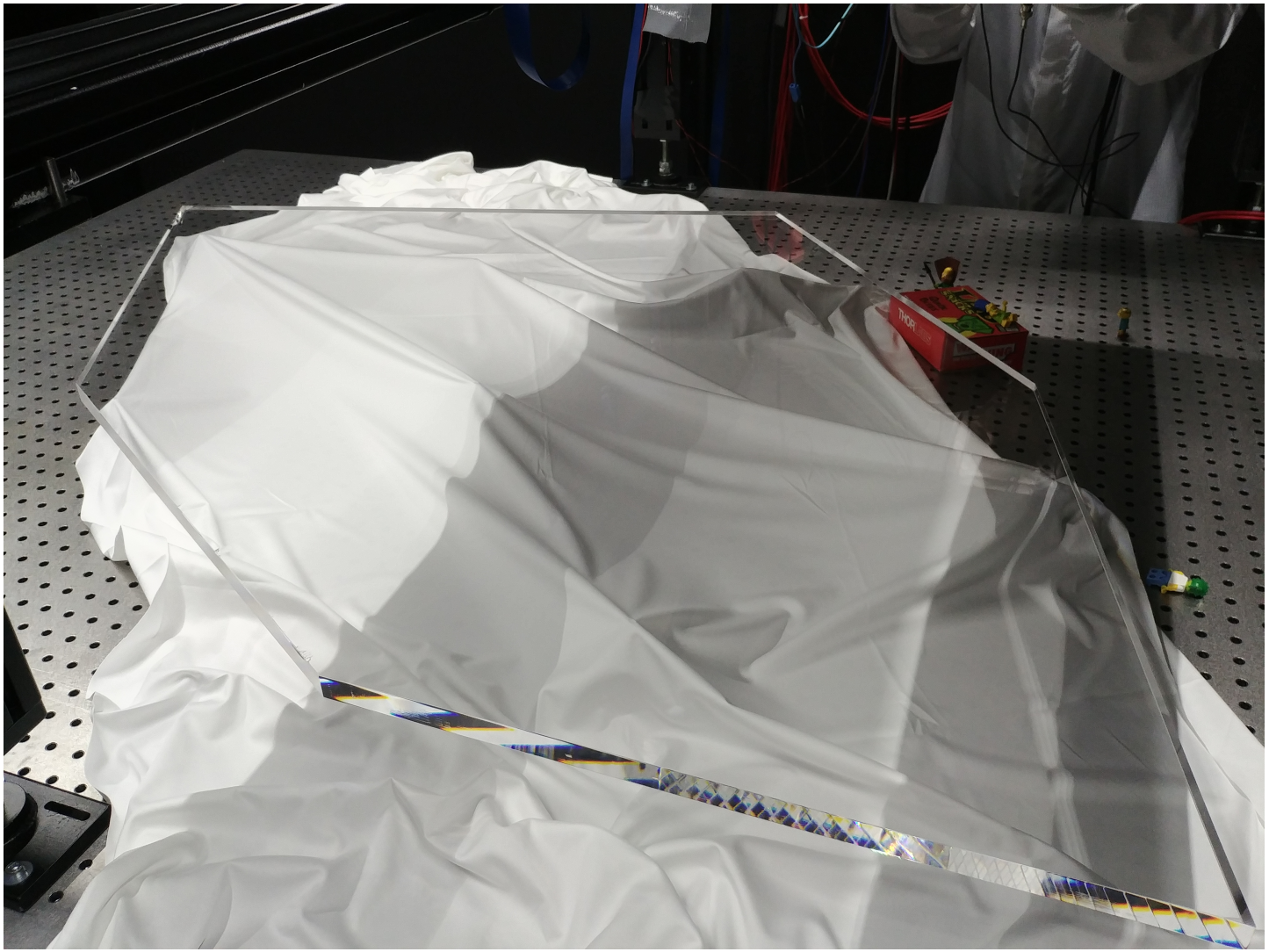


Figure: The new radiator plate in preparation for optical measurements.

Use Case II - SiPM Array With Radiator

Figure: Test setup with SiPM-Array and aerogel radiator.

Outlook

In the near future ...

- Improvement of the reconstruction algorithm
- Finish optical measurements, then cosmic tests with radiator and readout
- In parallel: Cherenkov measurements with SiPM array

Thank you for your attention!

Reconstruction - Spatial Acceptance

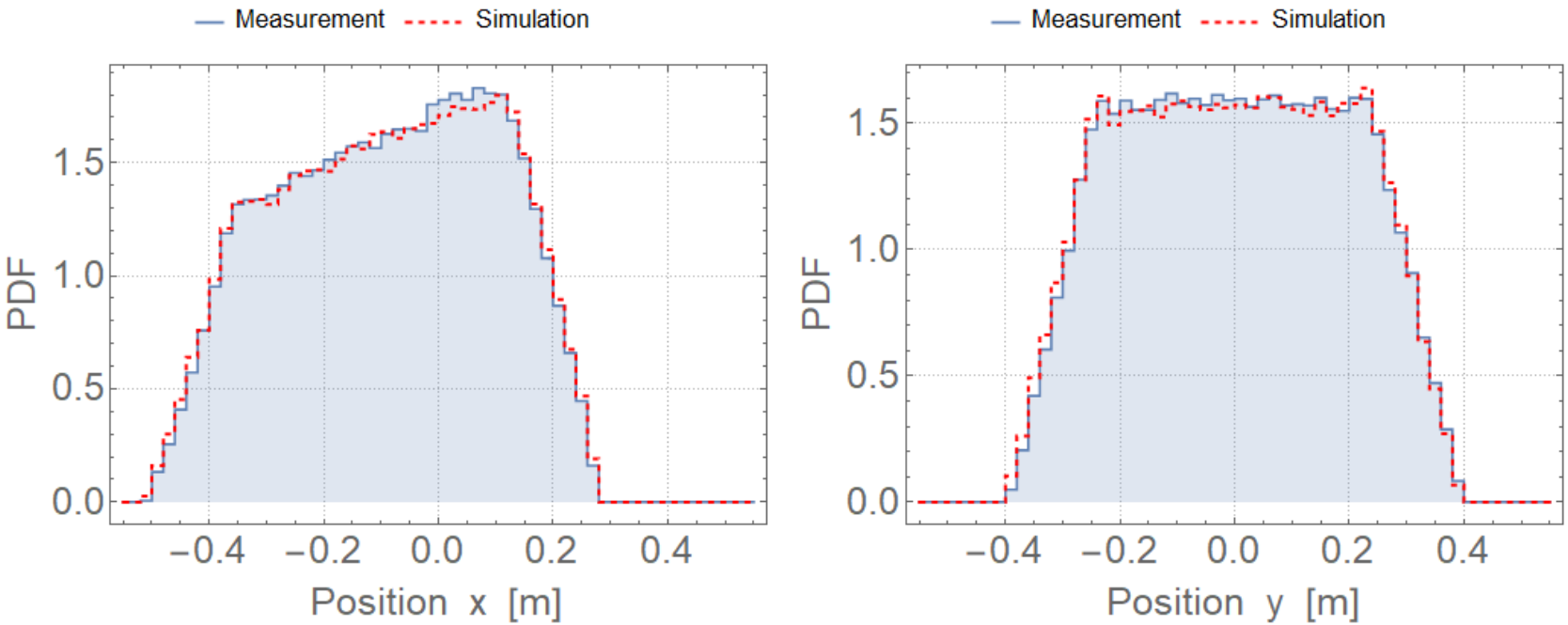


Figure: Spatial acceptance without trigger.

Simulation: Geant4 [1] with CRY [2] event generator.

[1] S.Agostinelli et al. (2007). Geant4—a simulation toolkit. Nuclear Instruments and Methods in Physics Research Section A.
[2] Hagmann, Chris& Lange, David & Wright, Douglas. (2007). Cosmic-ray shower generator (CRY) for Monte Carlo transport codes. IEEE Nuclear Science Symposium.

Reconstruction - Angular Acceptance

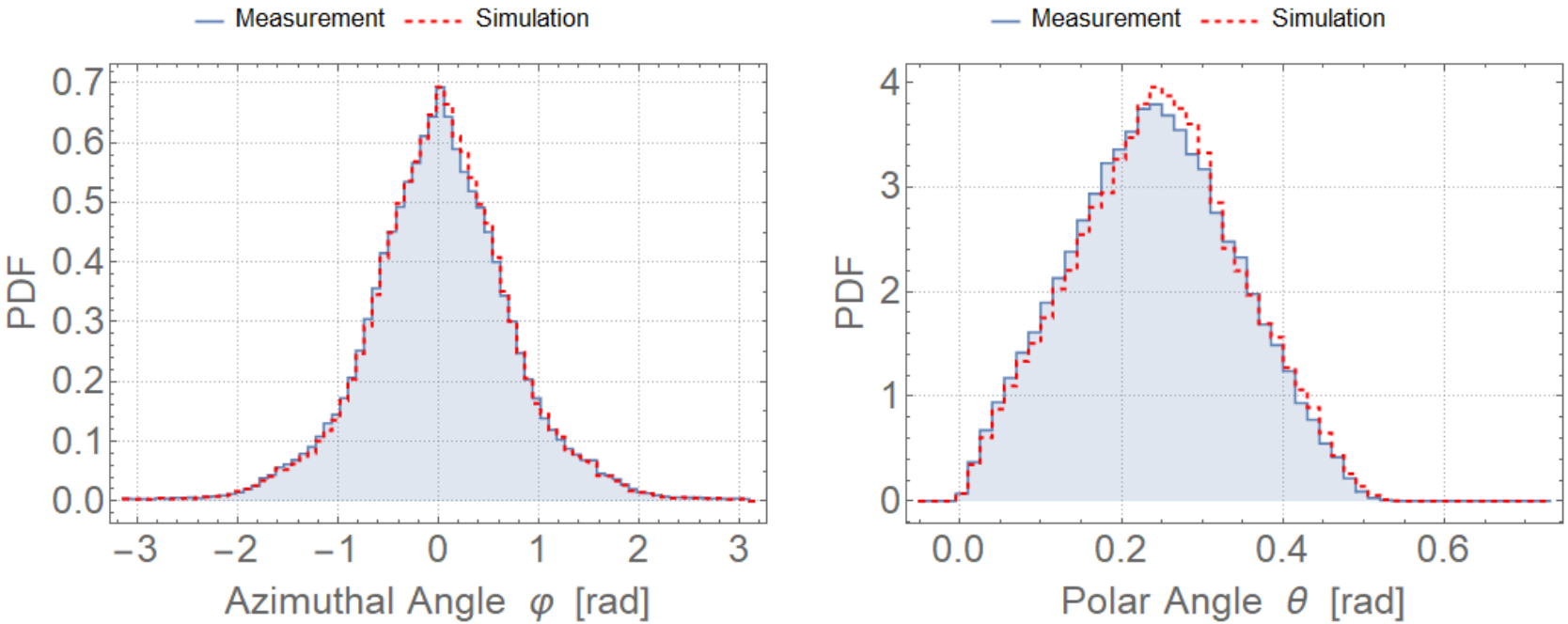


Figure: Angular acceptance without trigger.