

Check on cosmic-ray without magnetic field
combined MDC and CGEM

Run: 84713, 84714, 84716

Method:

1. The cosmic ray track is fitted as two separate straight tracks using ODC hits.
2. **Match** CGEM clusters with the tracks (The nearest cluster to the tracks).
3. **Incorporate** the matched CGEM clusters into the straight-line track fitting to obtain the **updated** track parameters.
4. Calculate the **intersection points** of the new track with each section of the CGEM detector.
5. The **residuals** are defined as the positions of the corresponding CGEM clusters **minus** the intersection point positions.

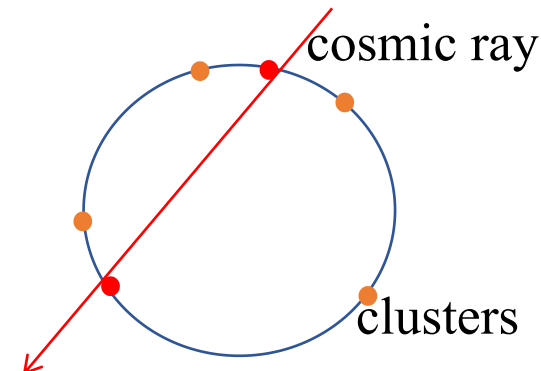
✓ Efficiency:

$$\varepsilon = \frac{N_{has\ cluster\ with\ 10\sigma}}{N_{All\ expected}}$$

$N_{All\ expected}$: The updated track intersects with the CGEM.

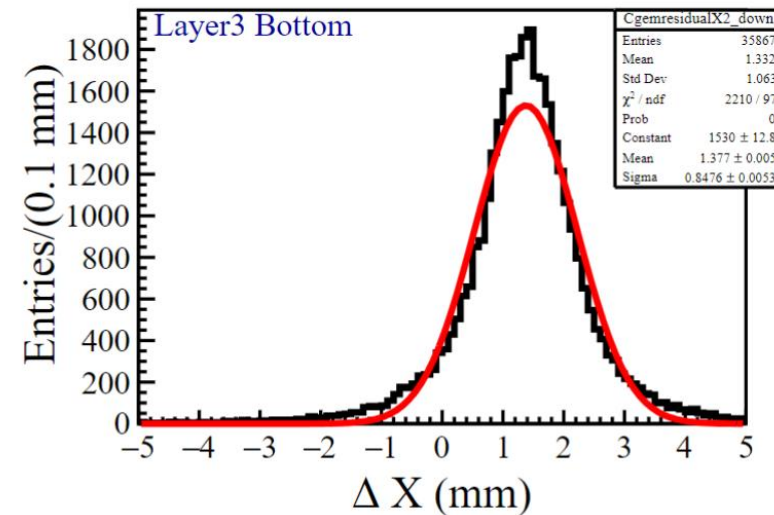
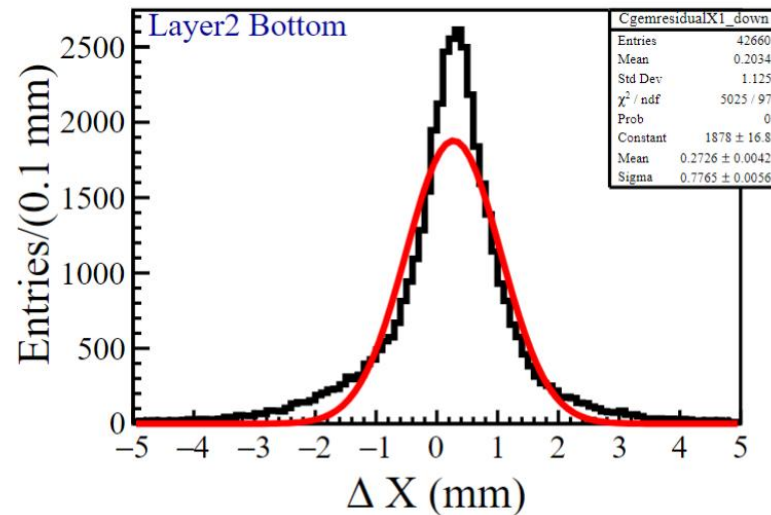
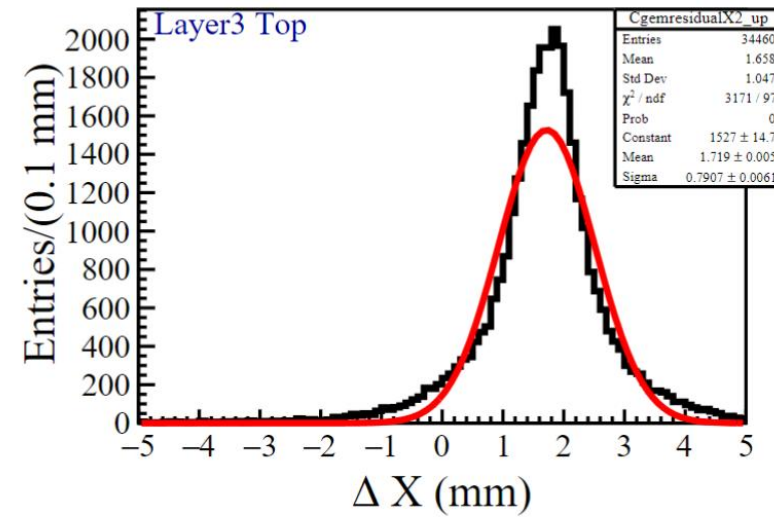
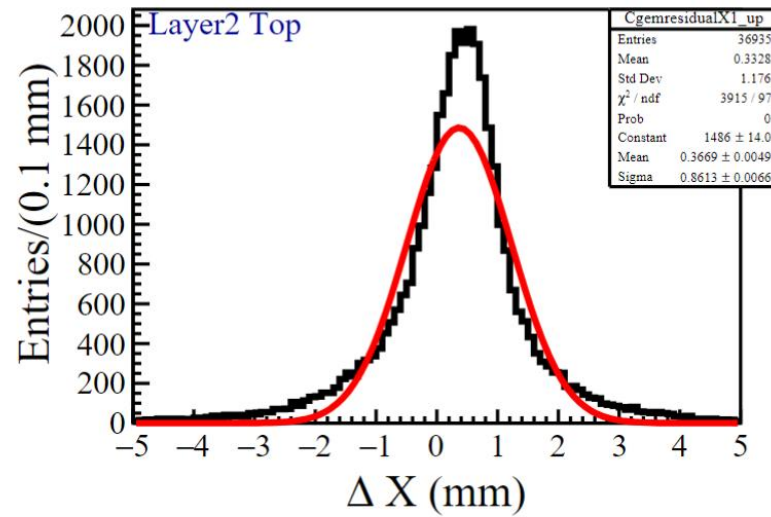
$N_{has\ cluster\ with\ 10\sigma}$: The nearest cluster is located within 10σ range of the intersection point.

- Track finding based on ODC hit.
- An ideal geometry without alignment.



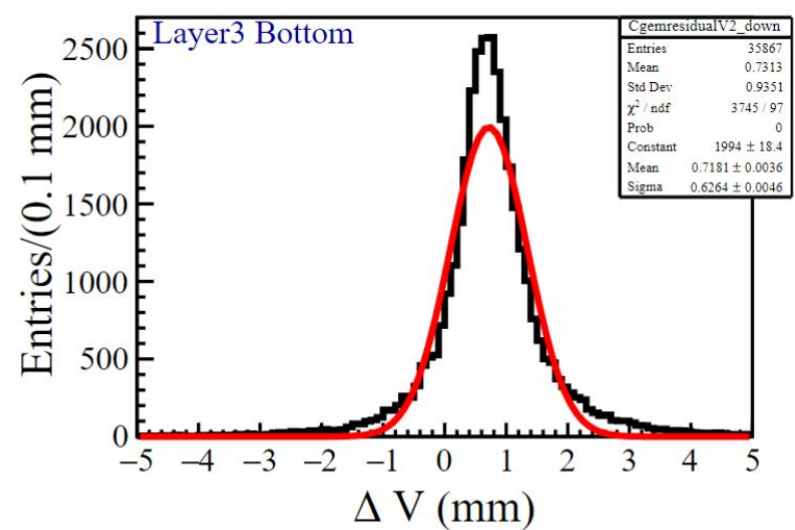
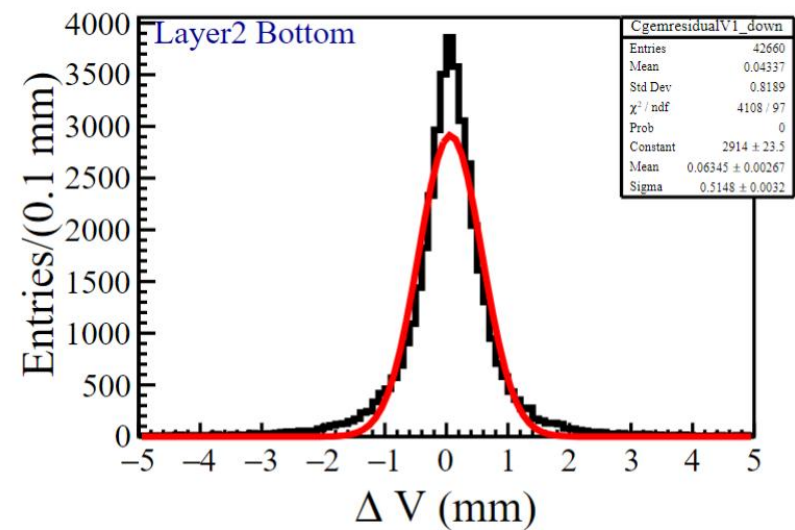
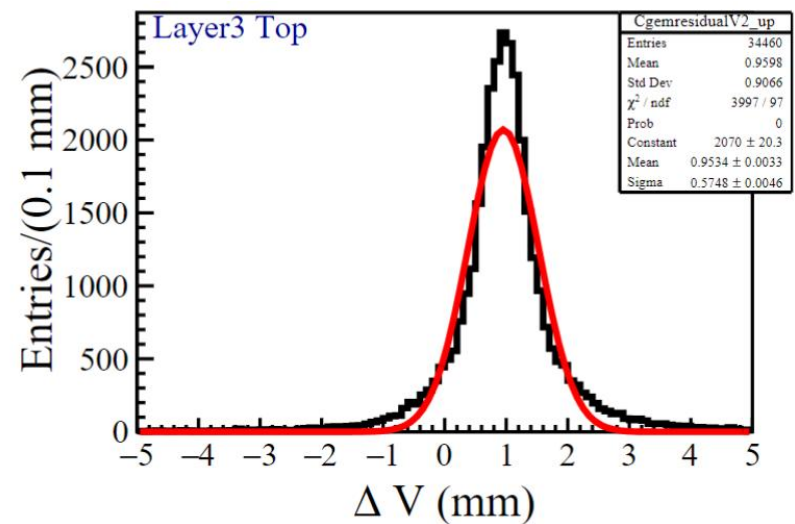
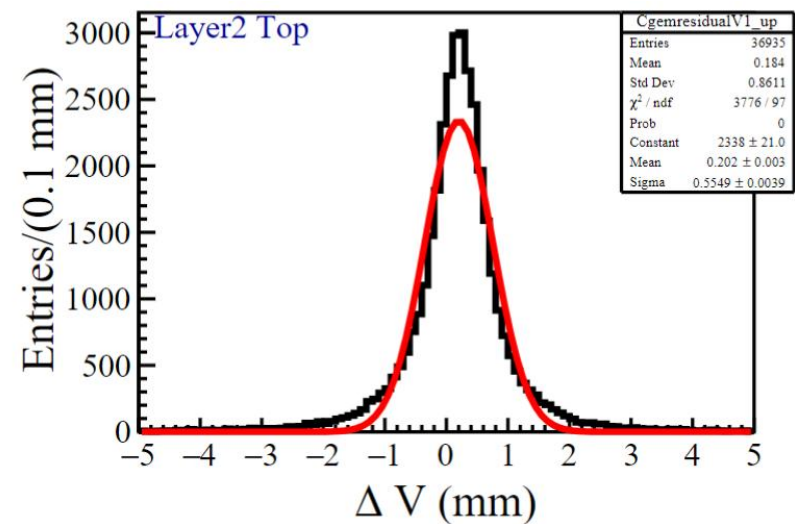
Residual: X

A cosmic ray track is fitted as two separate straight tracks.
Track parameters obtained from fit combining ODC and CGEM .



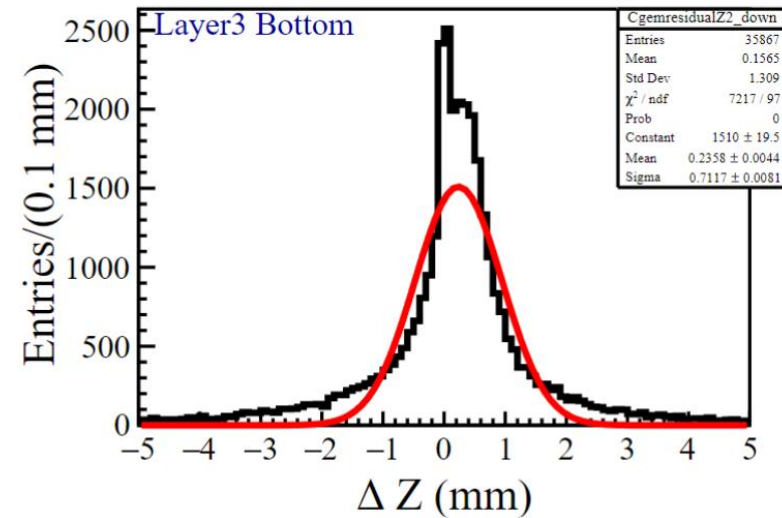
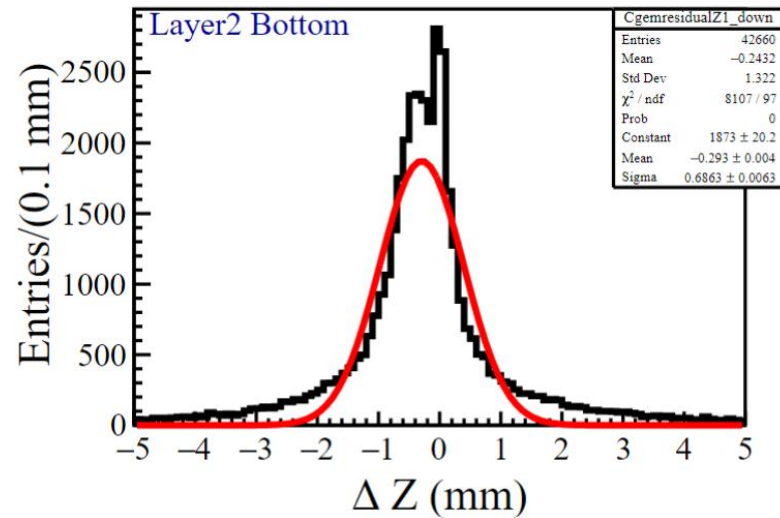
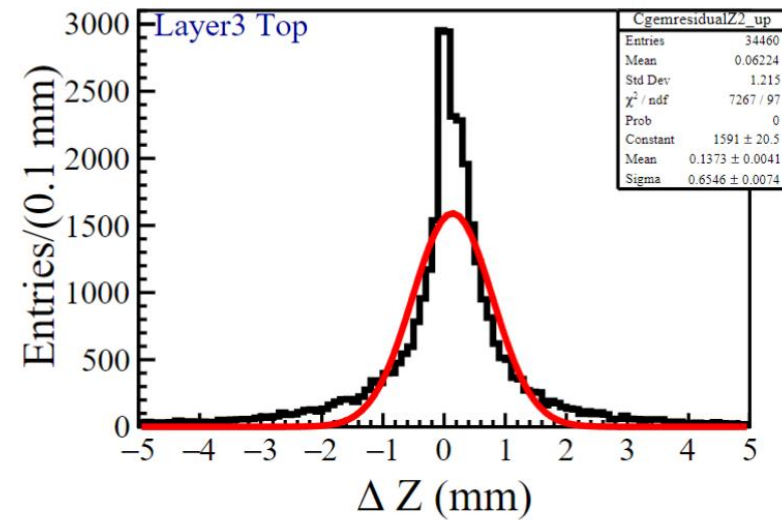
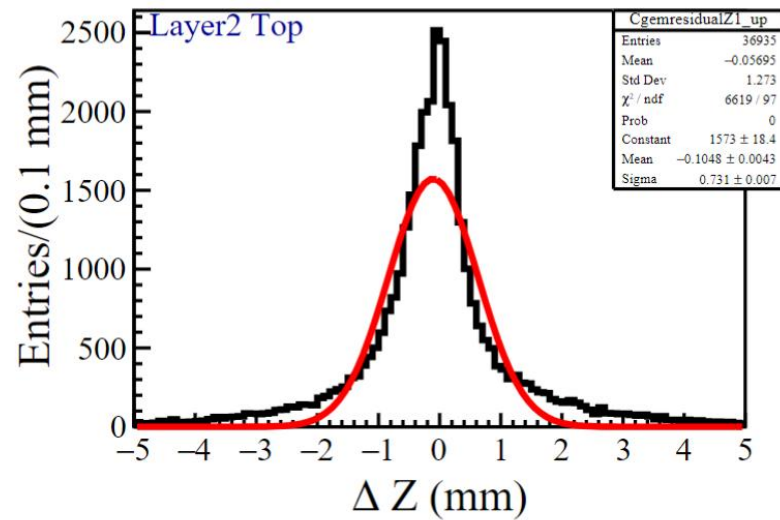
Residual: V

A cosmic ray track is fitted as two separate straight tracks.
Track parameters obtained from fit combining ODC and CGEM .



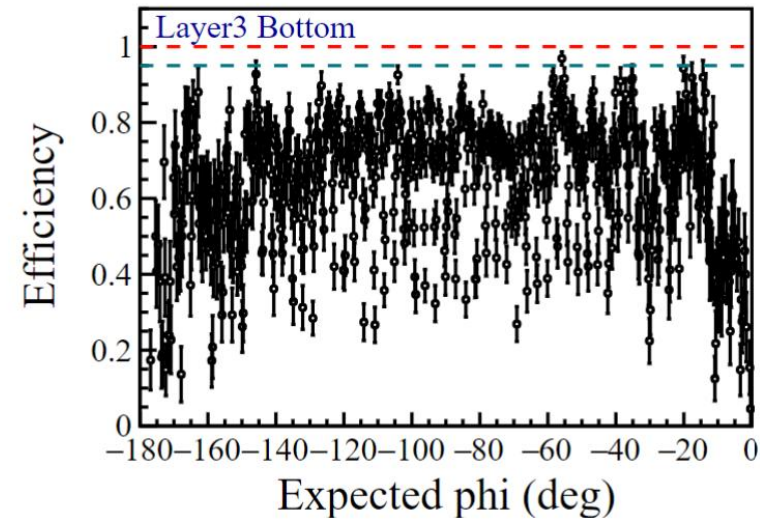
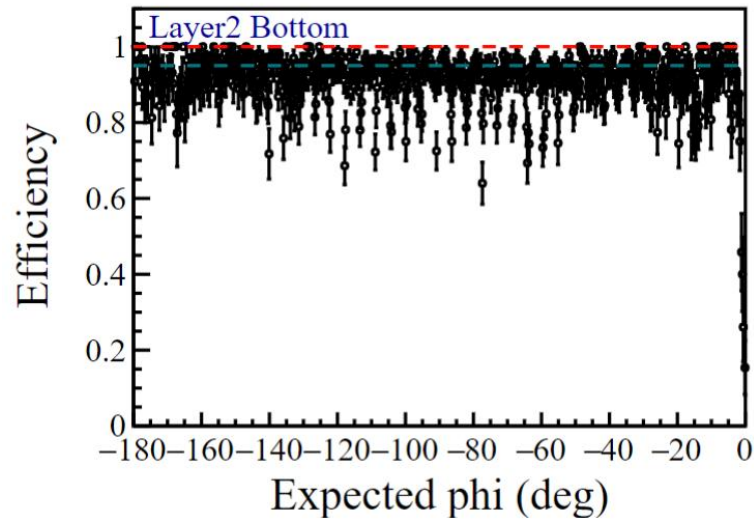
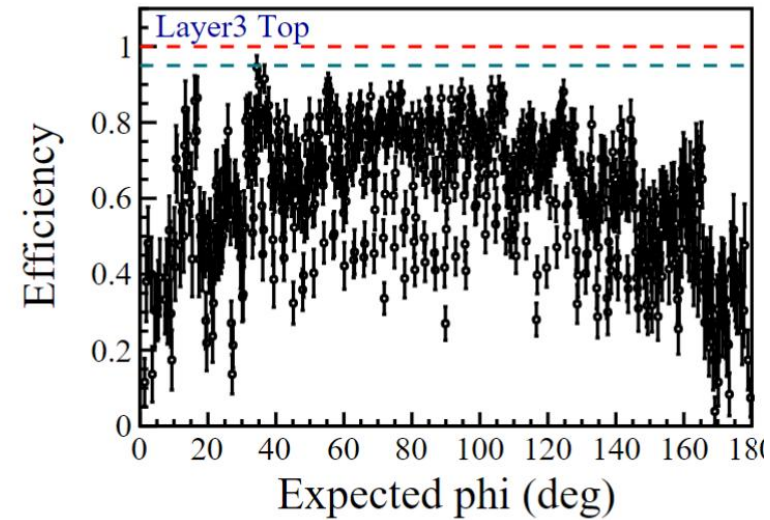
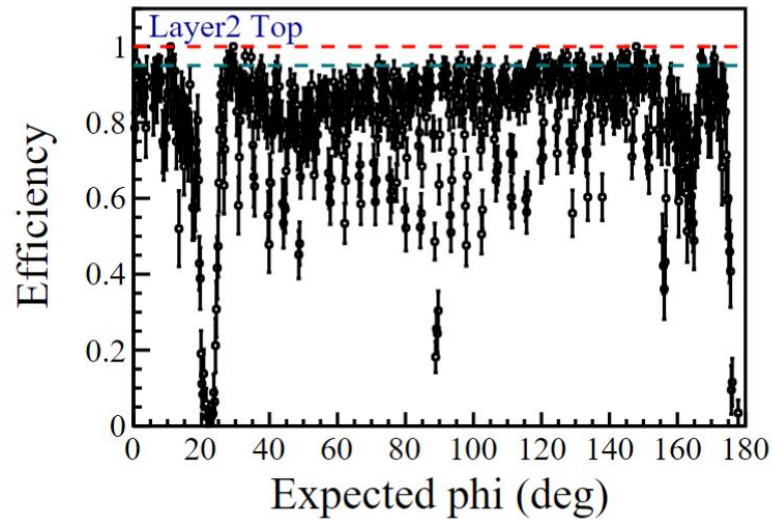
Residual: Z

A cosmic ray track is fitted as two separate straight tracks.
Track parameters obtained from fit combining ODC and CGEM .



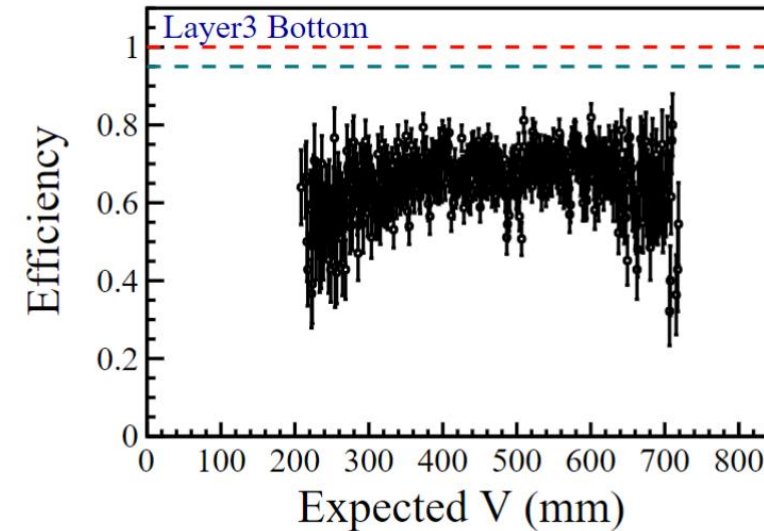
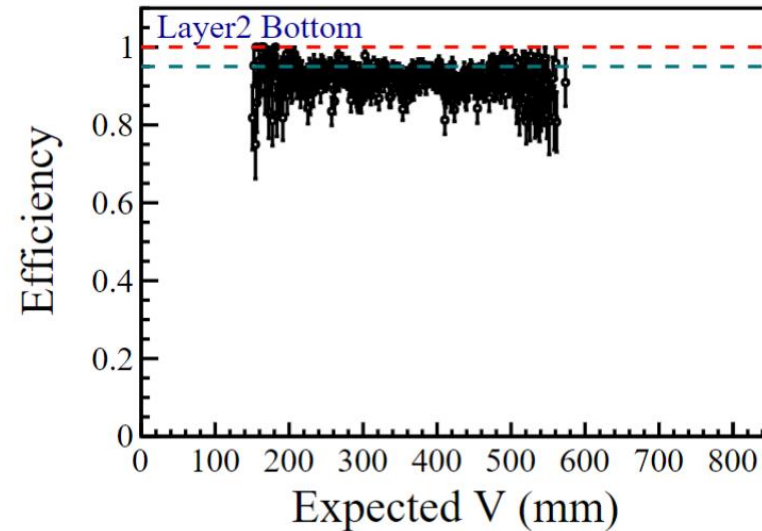
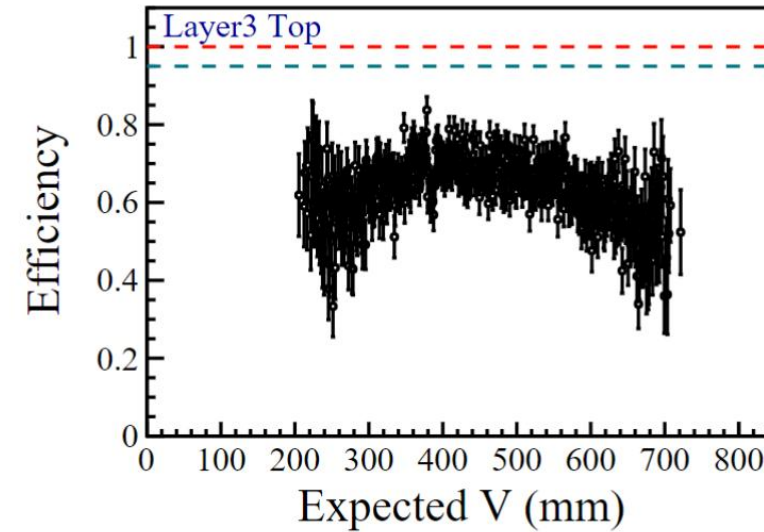
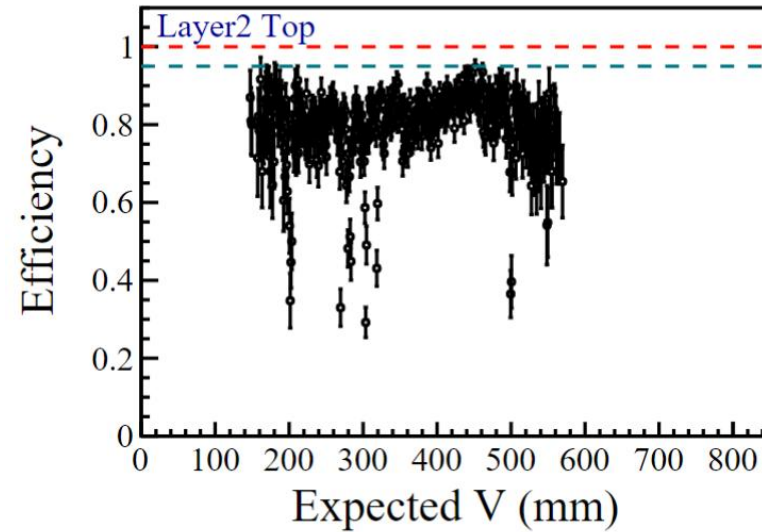
2D cluster Efficiency vs X

A cosmic ray track is fitted as two separate straight tracks.
Track parameters obtained from fit combining ODC and CGEM .



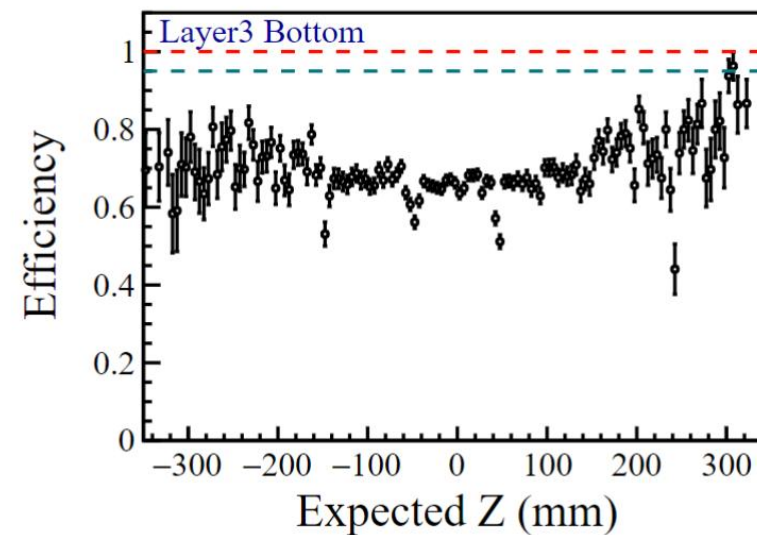
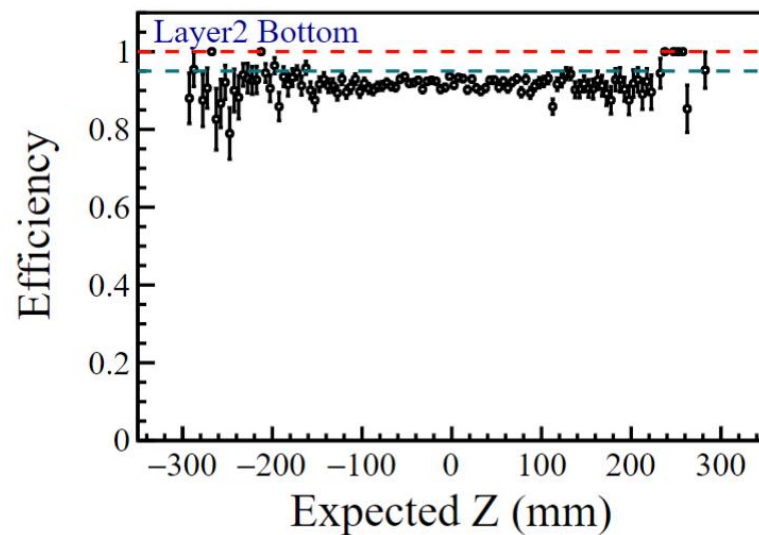
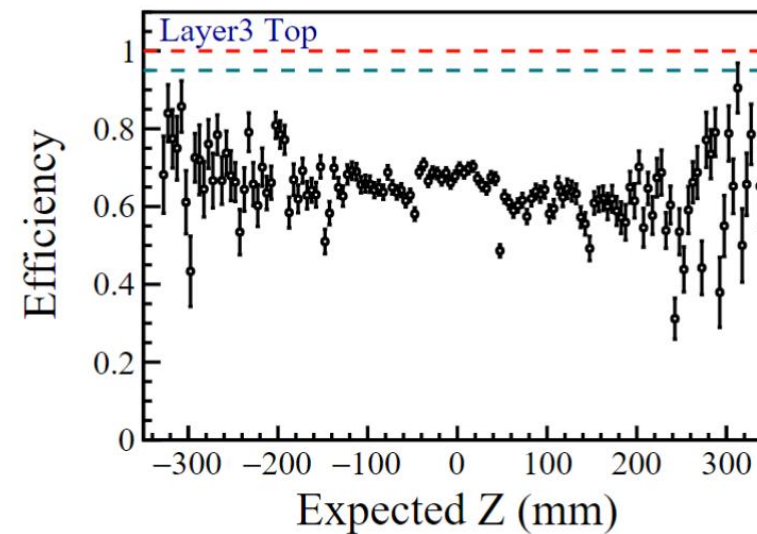
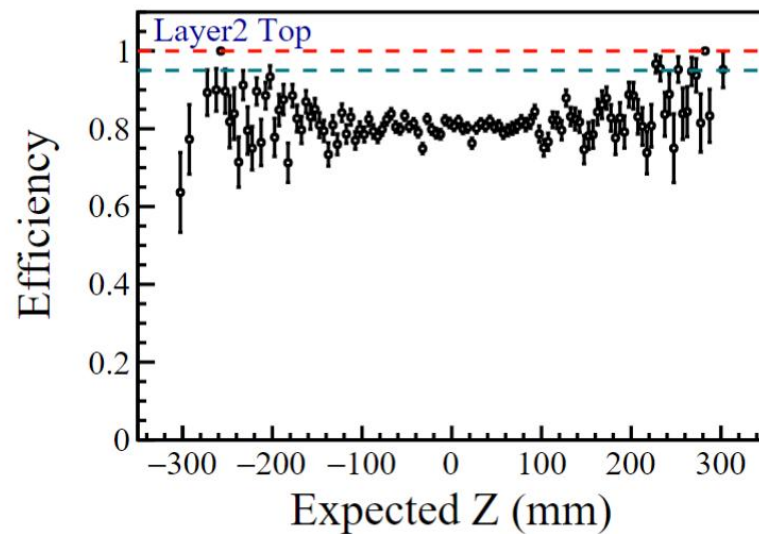
2D cluster Efficiency vs V

A cosmic ray track is fitted as two separate straight tracks.
Track parameters obtained from fit combining ODC and CGEM .



2D cluster Efficiency vs Z

A cosmic ray track is fitted as two separate straight tracks.
Track parameters obtained from fit combining ODC and CGEM .

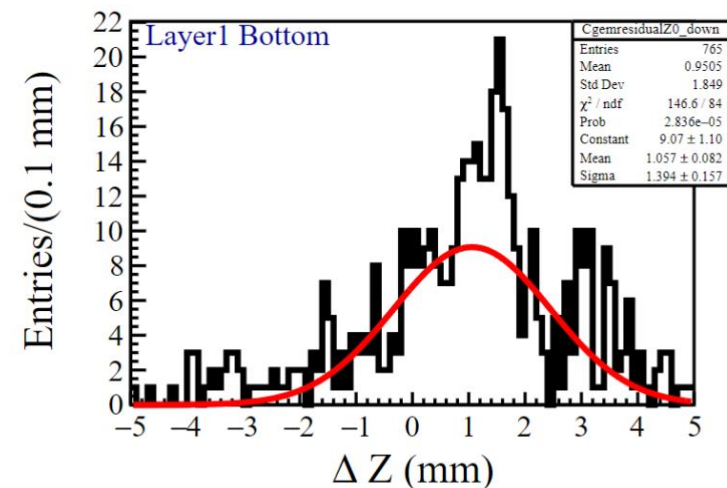
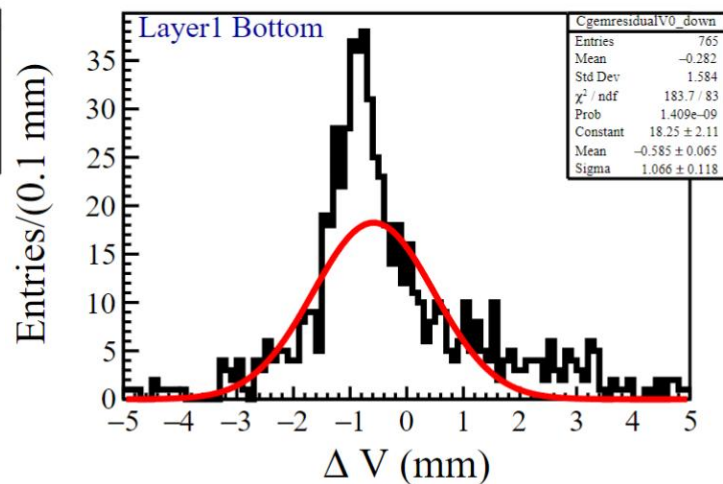
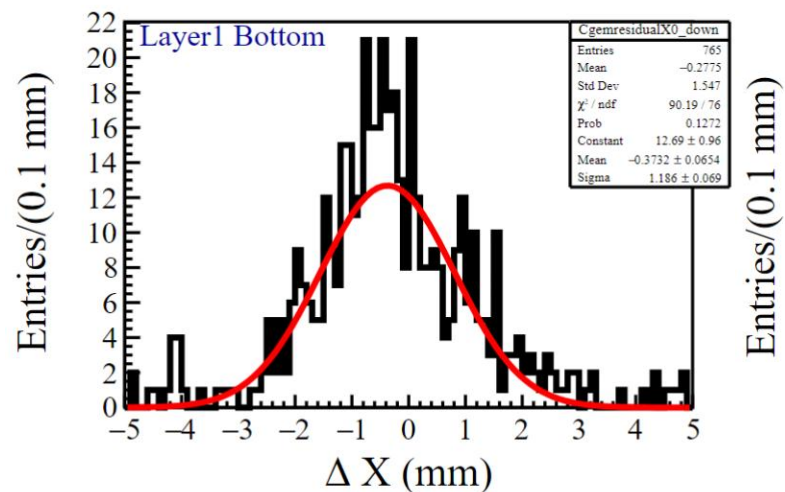
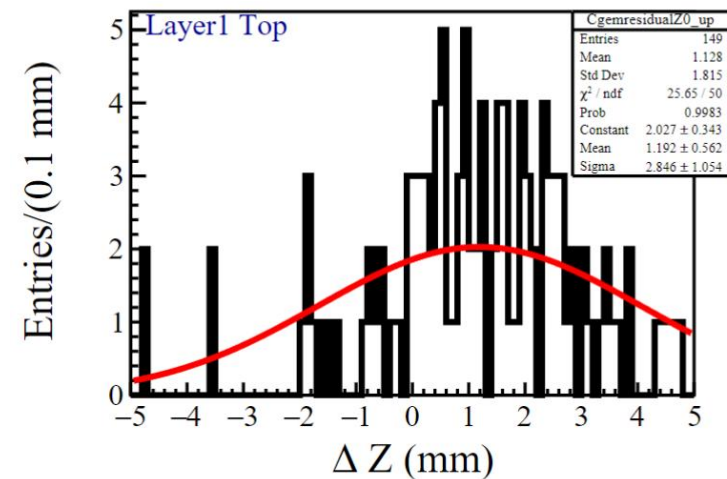
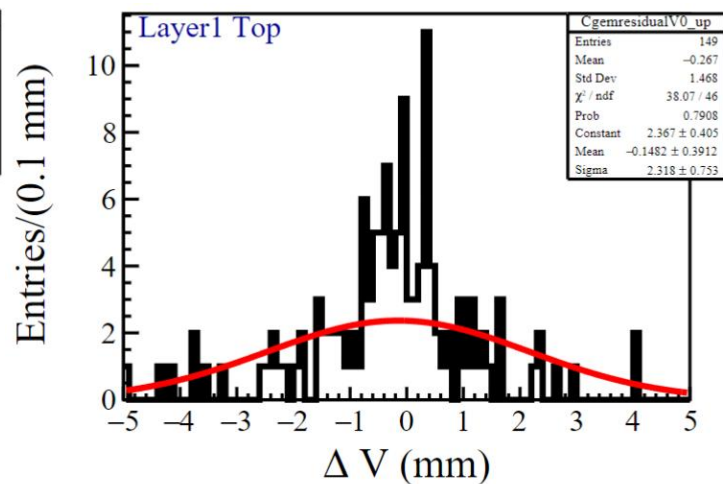
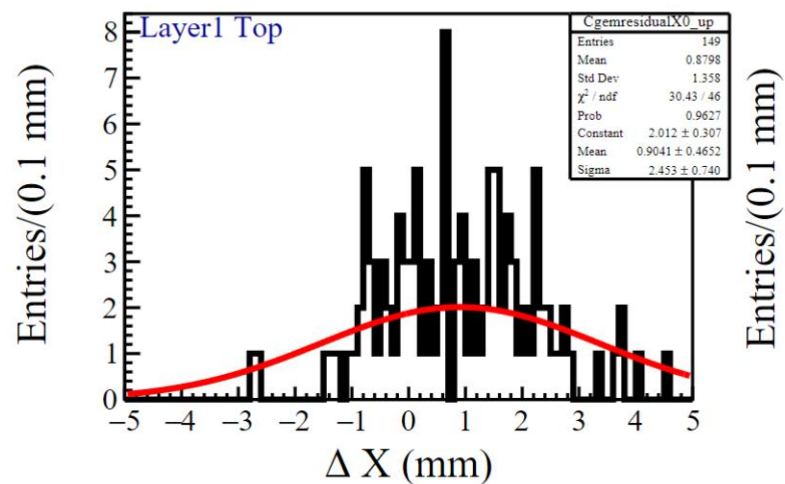


Summary

- This is an **independent validation** of the CGEM detector performance based on ODC track finding. The validation can cover the entire CGEM detector.
- In regions overlapping with the CGEM-only track finding checks (refers to Xinnan's report), the results **are consistent** between the two methods.
- Future efforts will focus on further algorithm optimization, which will also be used in subsequent alignment procedures.

Thank you for attention!!!

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