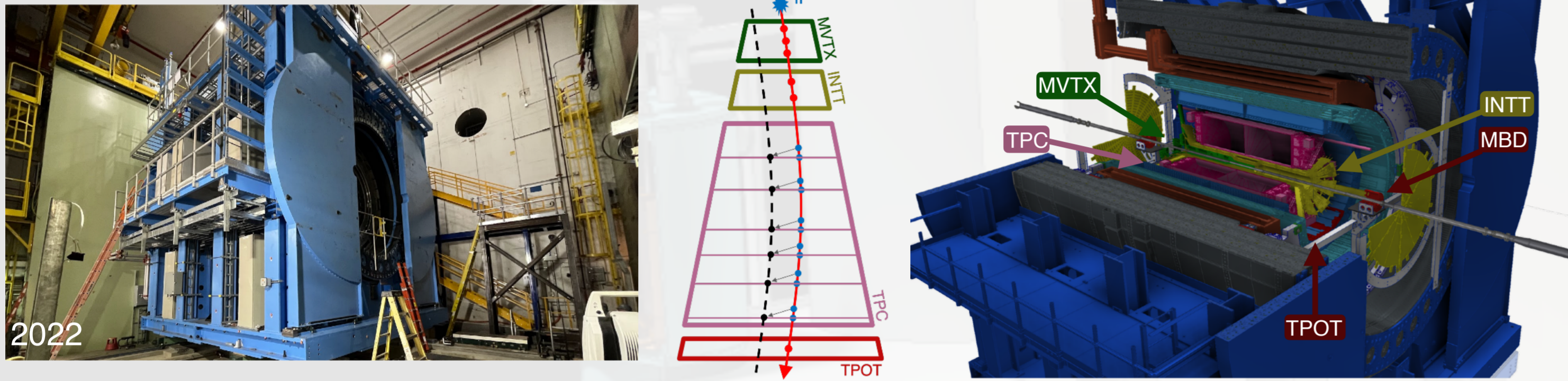


## sPHENIX : Full barrel calorimeters, 1.4 T solenoid and excellent tracking system

### Tracking system :

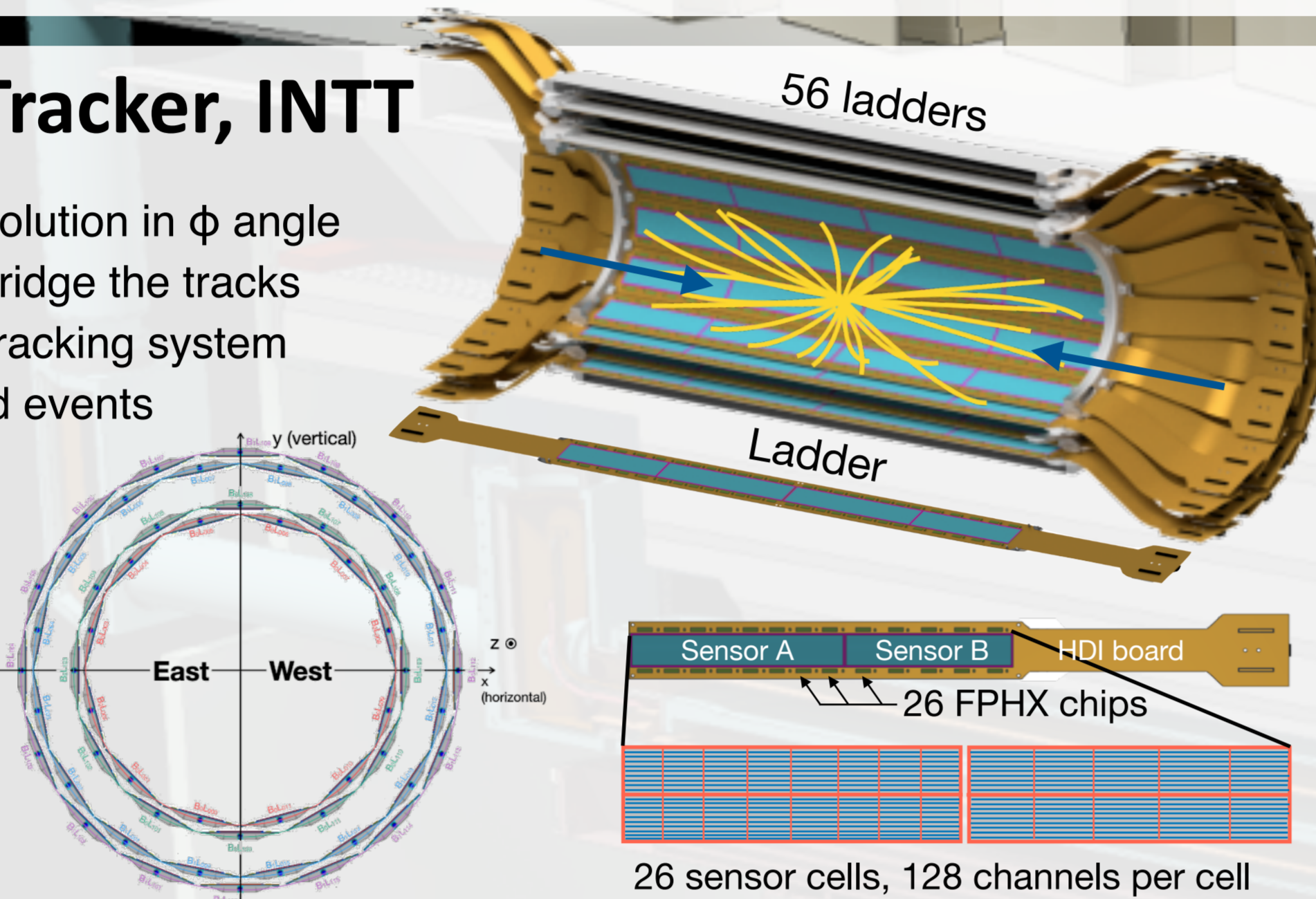
1. MVTX : MAPS-based Vertex Detector
  - Precise vertex measurement → Heavy flavor
2. INTT : Intermediate Silicon Tracker
  - Superb timing resolution → Proton spin
3. TPC : Time Projection Chamber
  - Precise momentum measurement → Upsilon  $\Upsilon(3S)$
4. TPOT : TPC Outer Tracker
  - Additional space point outside TPC → TPC distortion



## Intermediate Silicon Tracker, INTT

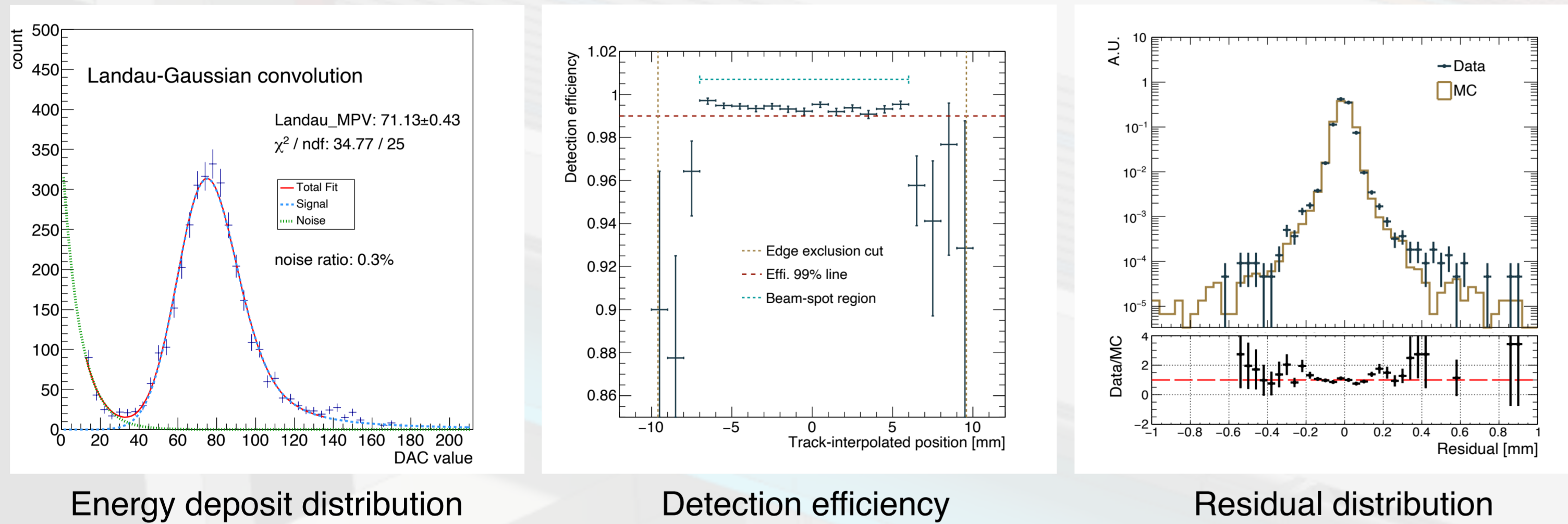
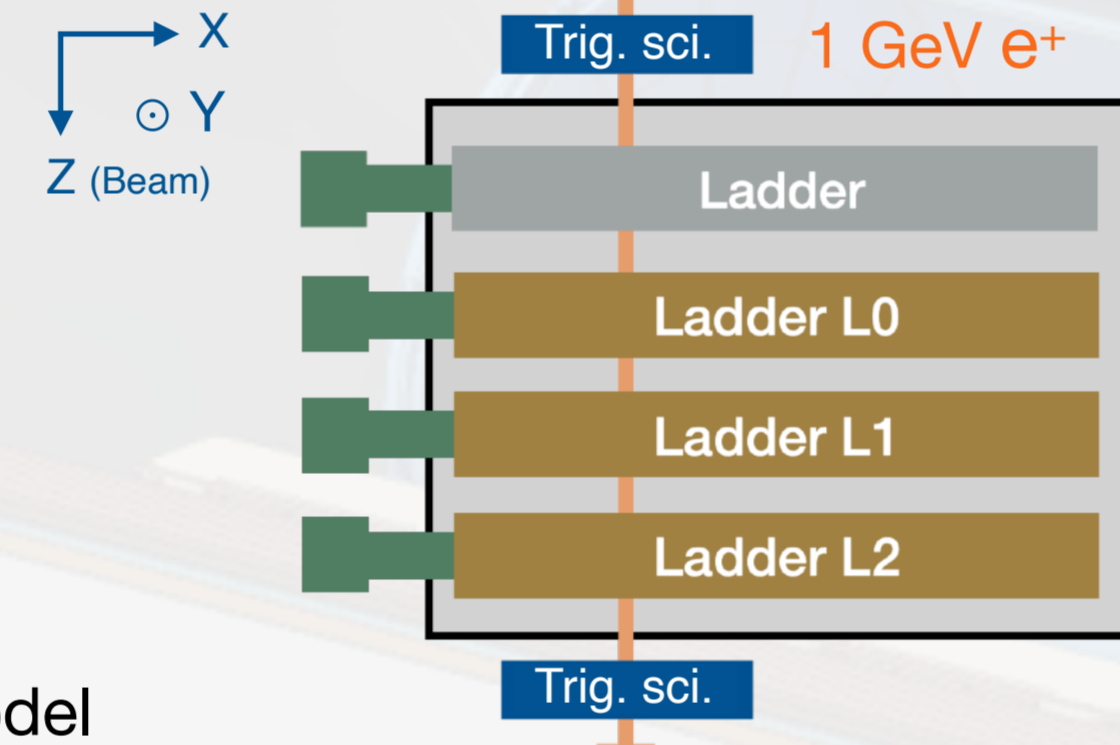
- Strip width 78  $\mu\text{m}$  → Excellent resolution in  $\phi$  angle
- Between the MVTX and TPC → Bridge the tracks
- Timing resolution 106 ns, best in tracking system → Associate individual tracks and events

Element	Value	Unit
Material budget	1.08%	$X/X_0$
Radius	7.5 or 10	cm
Strip length	16 or 20	mm
Total channels	~ 370k	channel
Readout servers	8	FELIX



## INTT beam test 2021 @ ELPH : INTT ladder performance evaluation

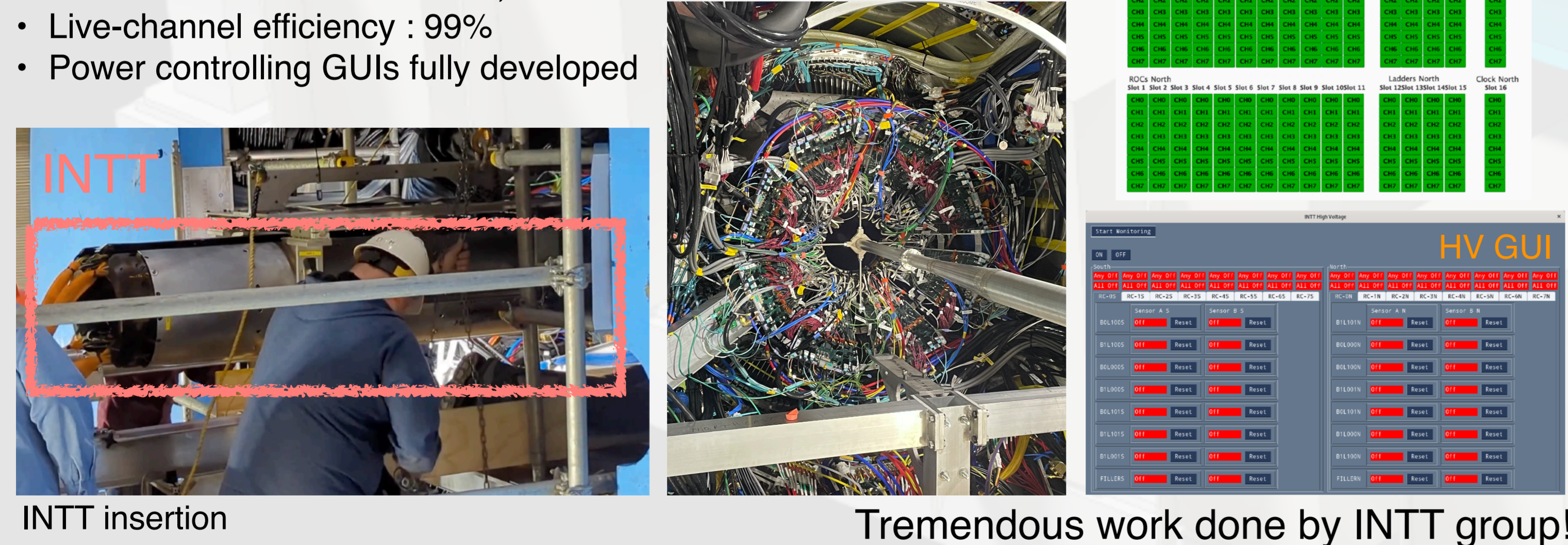
- Ladder energy deposit :
  - MPV :  $71.13 \pm 0.43$  ADC
  - 0.3% noise contamination in signal region
- Detection efficiency  $\frac{N(L_0 \cap L_1 \cap L_2)}{N(L_0 \cap L_2)} \times 100\%$  :
  - $99.33 \pm 0.04(\text{stat.}) \pm 0.06(\text{sys.})\%$
  - Uniformly excellent along the sensor
- Residual distribution :
  - Good agreement with customized Geant model



## INTT installation & system testing

- INTT barrel insertion : Feb 28, 2023
- Live-channel efficiency : 99%
- Power controlling GUIs fully developed

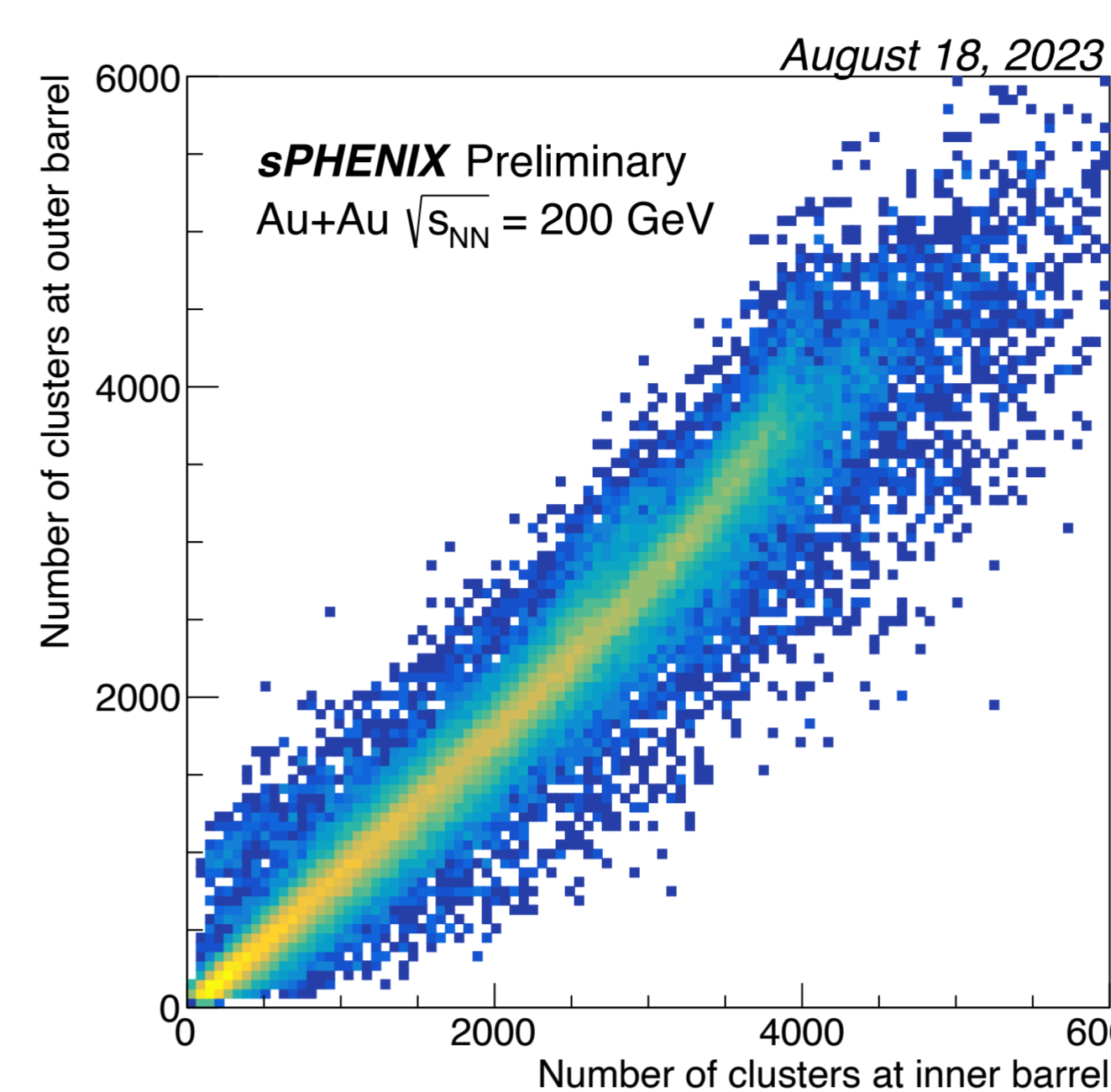
### INTT ROCs, post cabling



## Conclusion

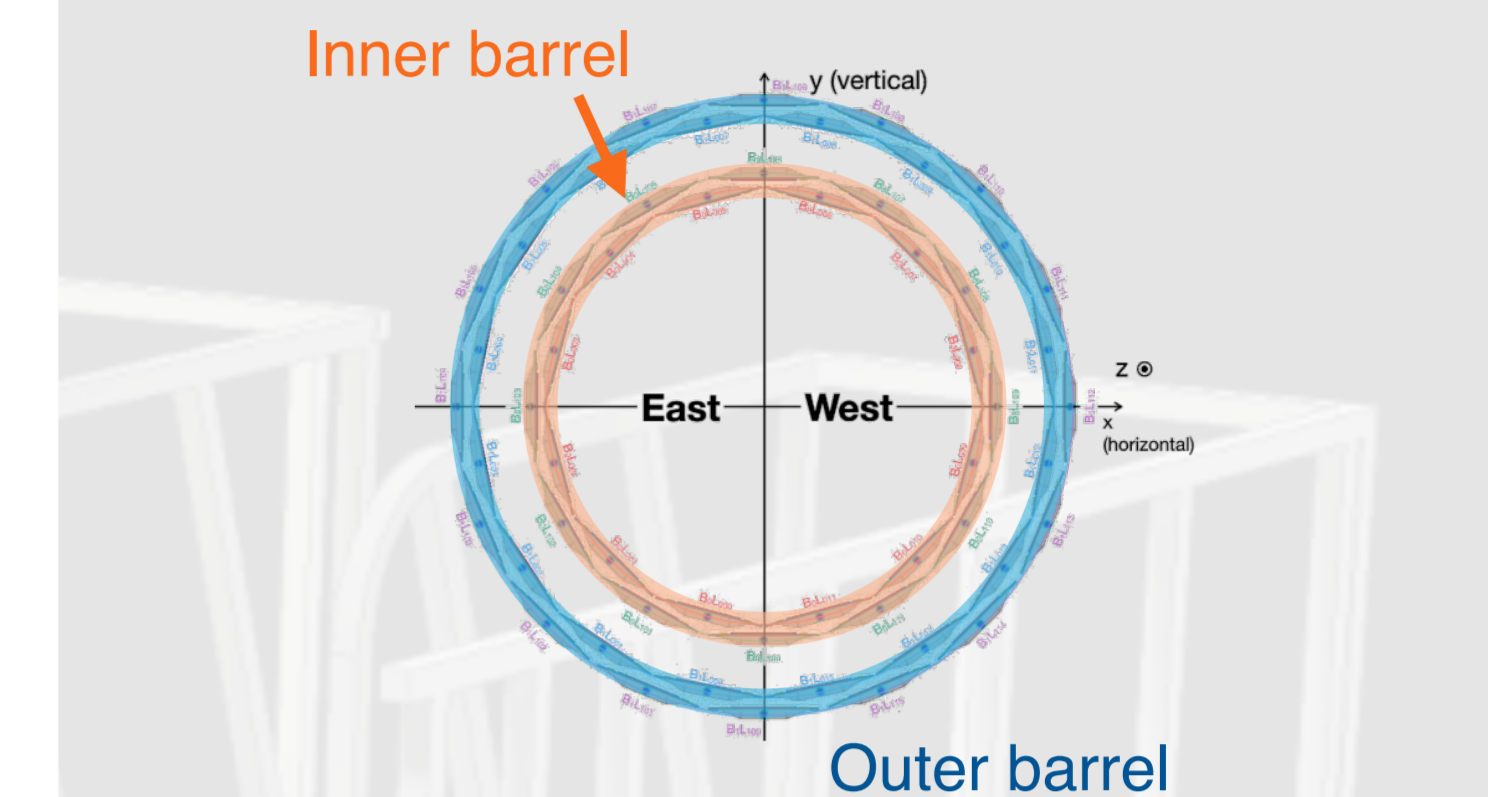
The INTT plays a unique role in the sPHENIX tracking system. Its precise timing resolution is capable of associating individual tracks and events, which is essential to cold-QCD physics. A ladder detection efficiency of over 99% was observed in beam test experiment. After INTT insertion, the INTT group confirmed the barrel live-channel efficiency 99%. With collisions, a clear multiplicity correlation was observed between the INTT inner and outer barrels, as well as between the INTT and MBD. With cosmic rays, the cosmic track candidates were seen by sPHENIX full tracking system. INTT was confirmed to be in good shape! The INTT commissioning is nearing completion and moving towards the readiness for physics data taking!

## INTT commissioning with Au+Au collisions

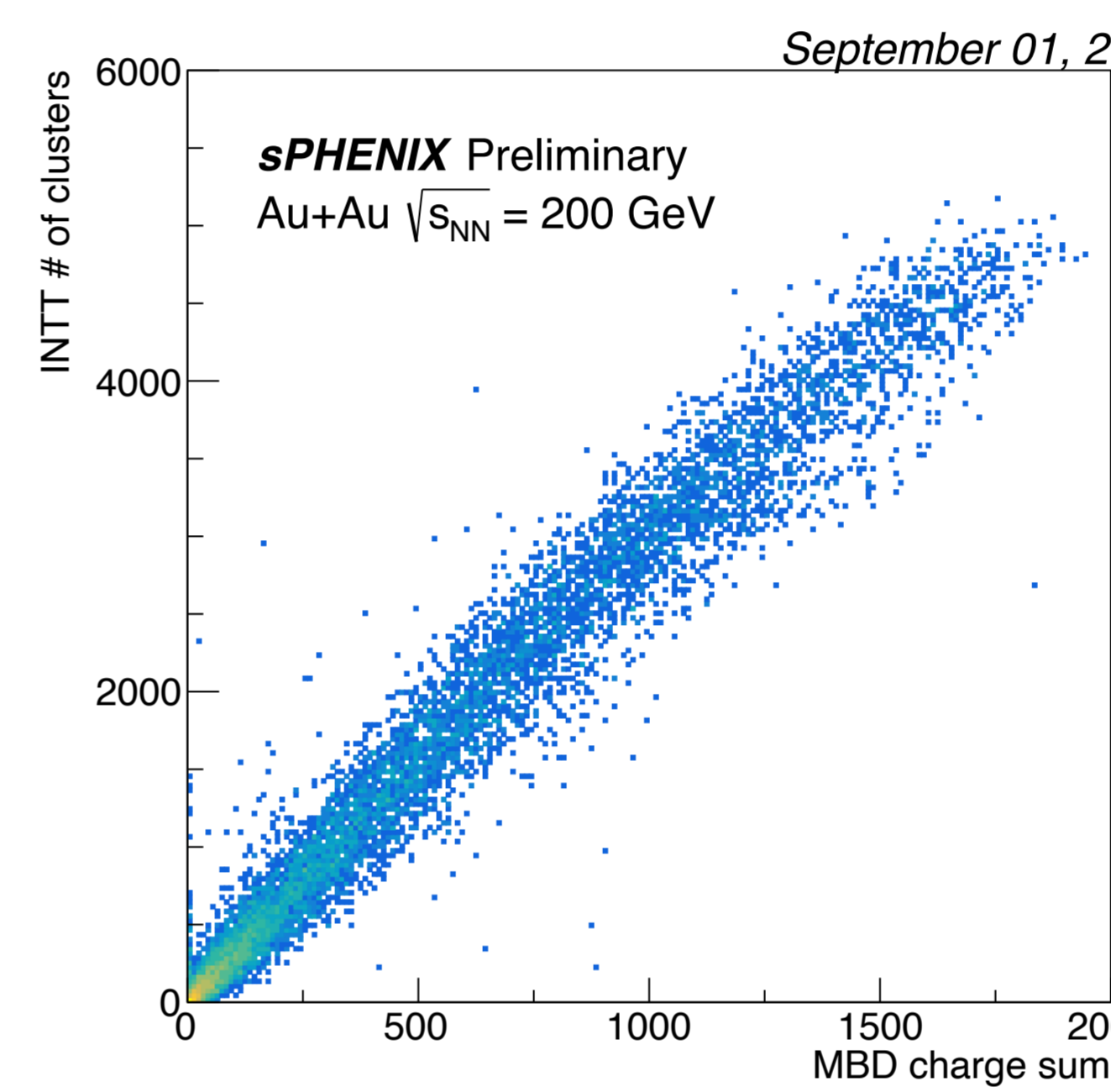


### First, saw the collisions with INTT!

Cluster multiplicity correlation between the inner barrel and outer barrel

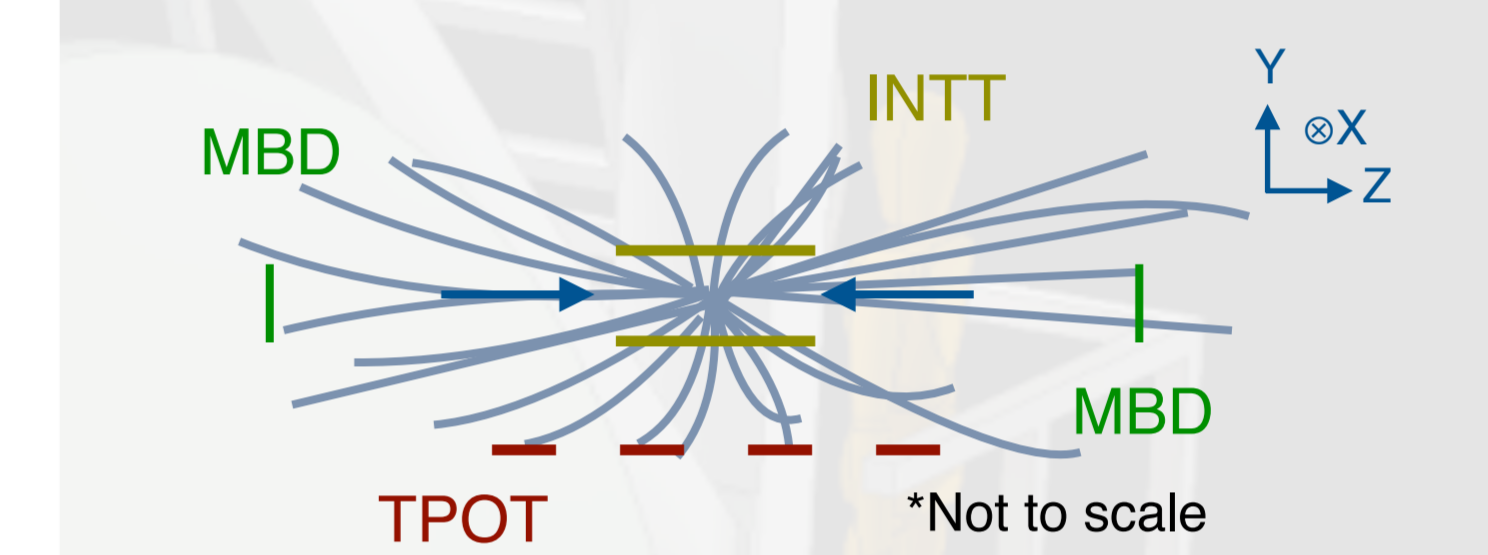


Clear multiplicity correlation observed → INTT is in good shape!

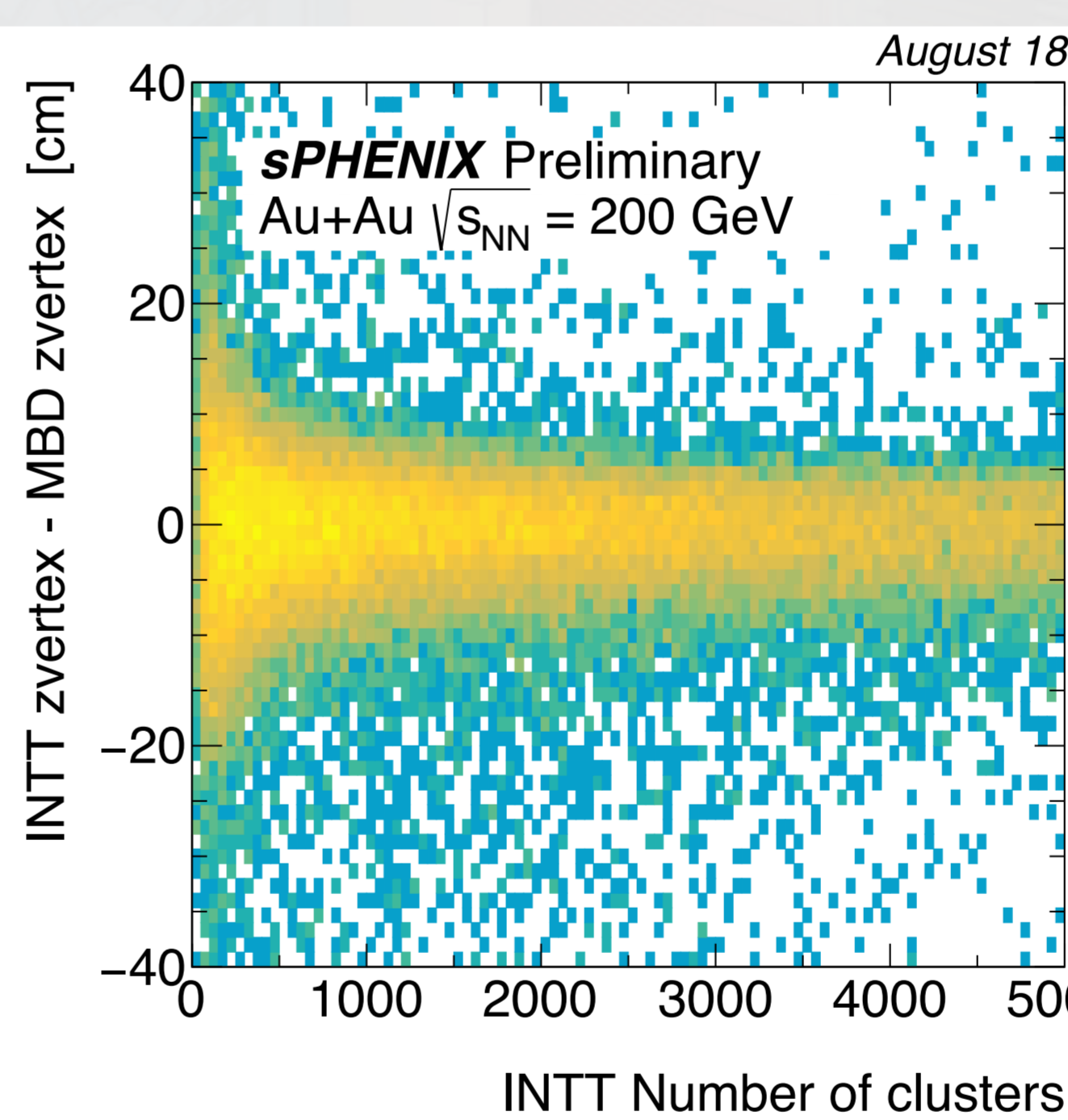


### Next, cross-check with other systems!

INTT full cluster multiplicity correlates with MBD charge multiplicity

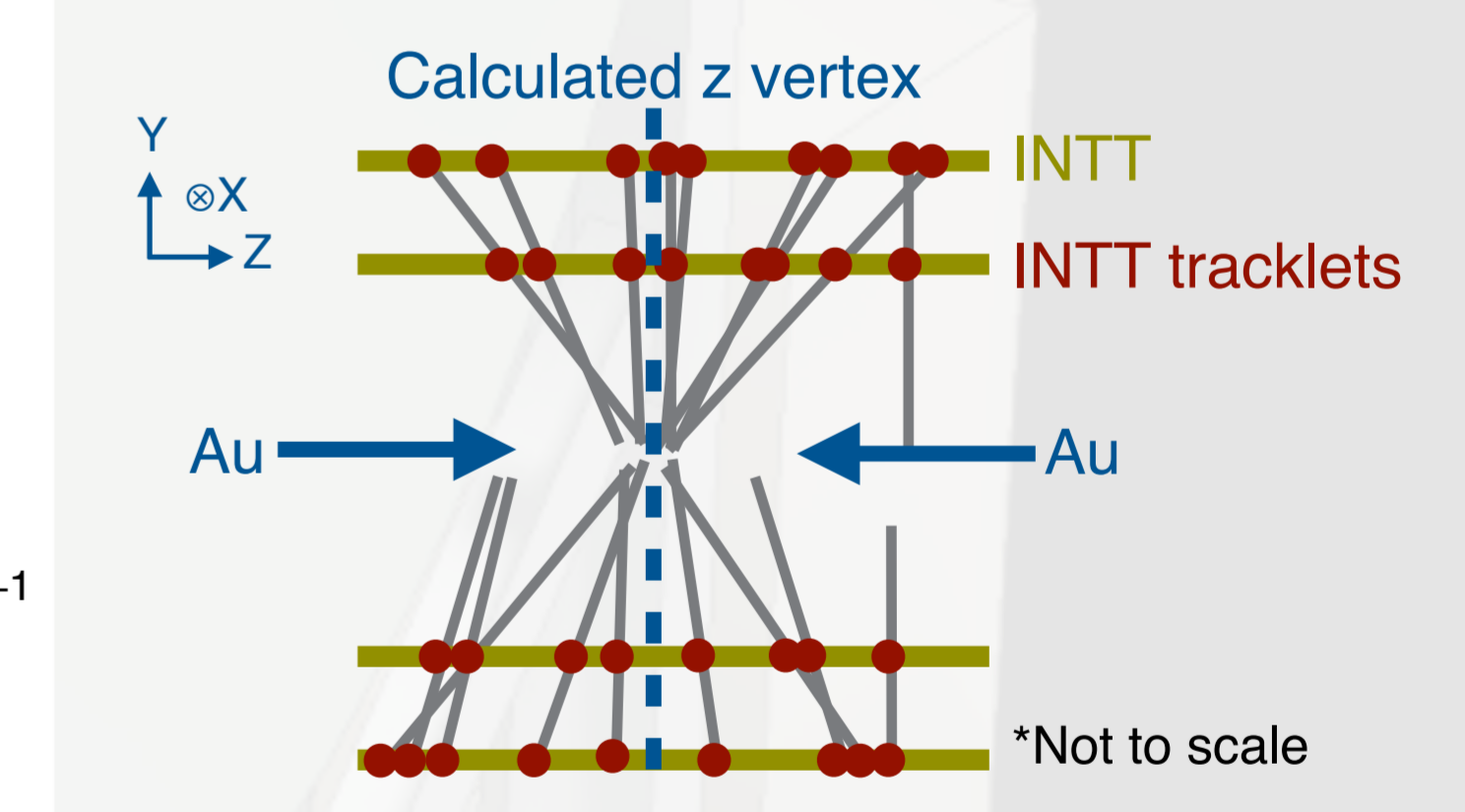


Clear correlation :  
 → Real signal!  
 → Systems synchronized!  
 → Systems working well!



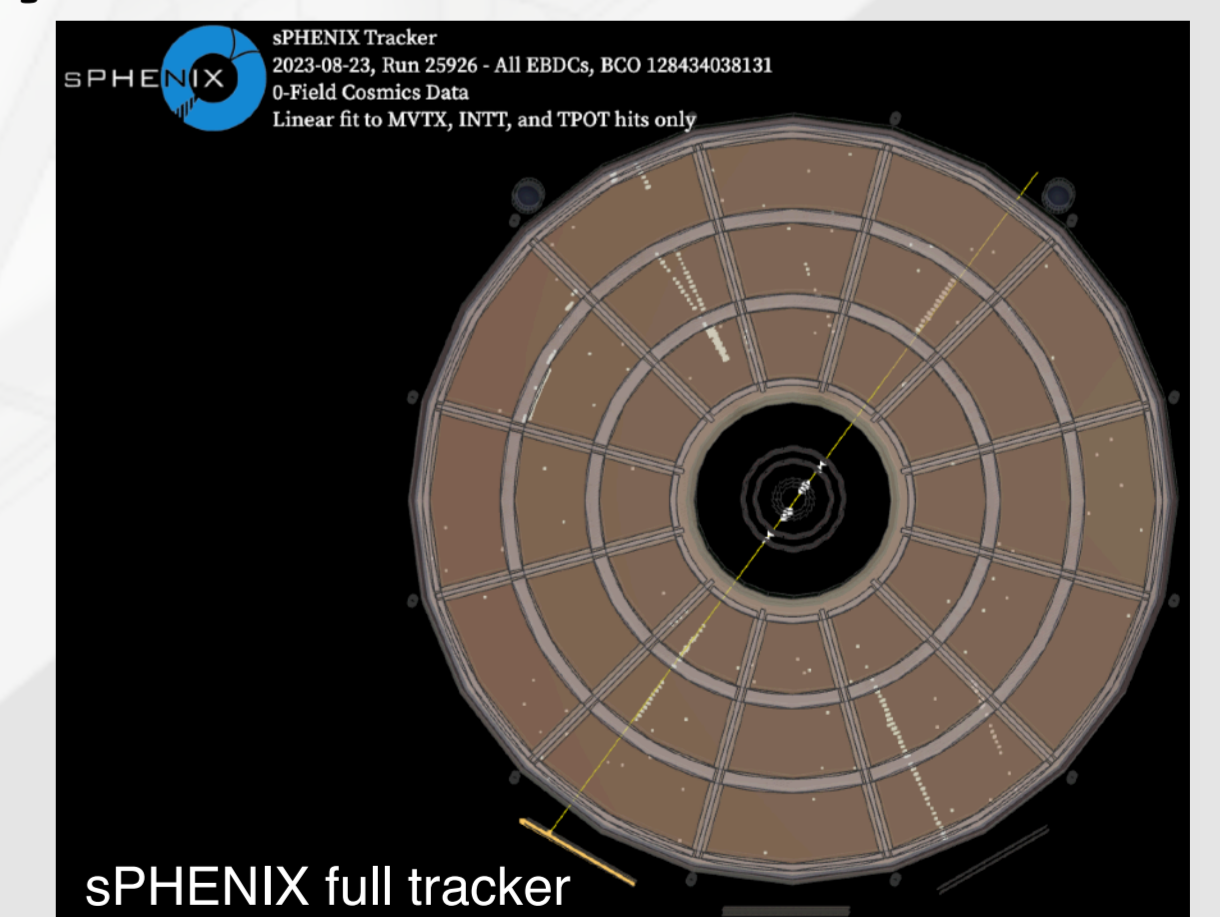
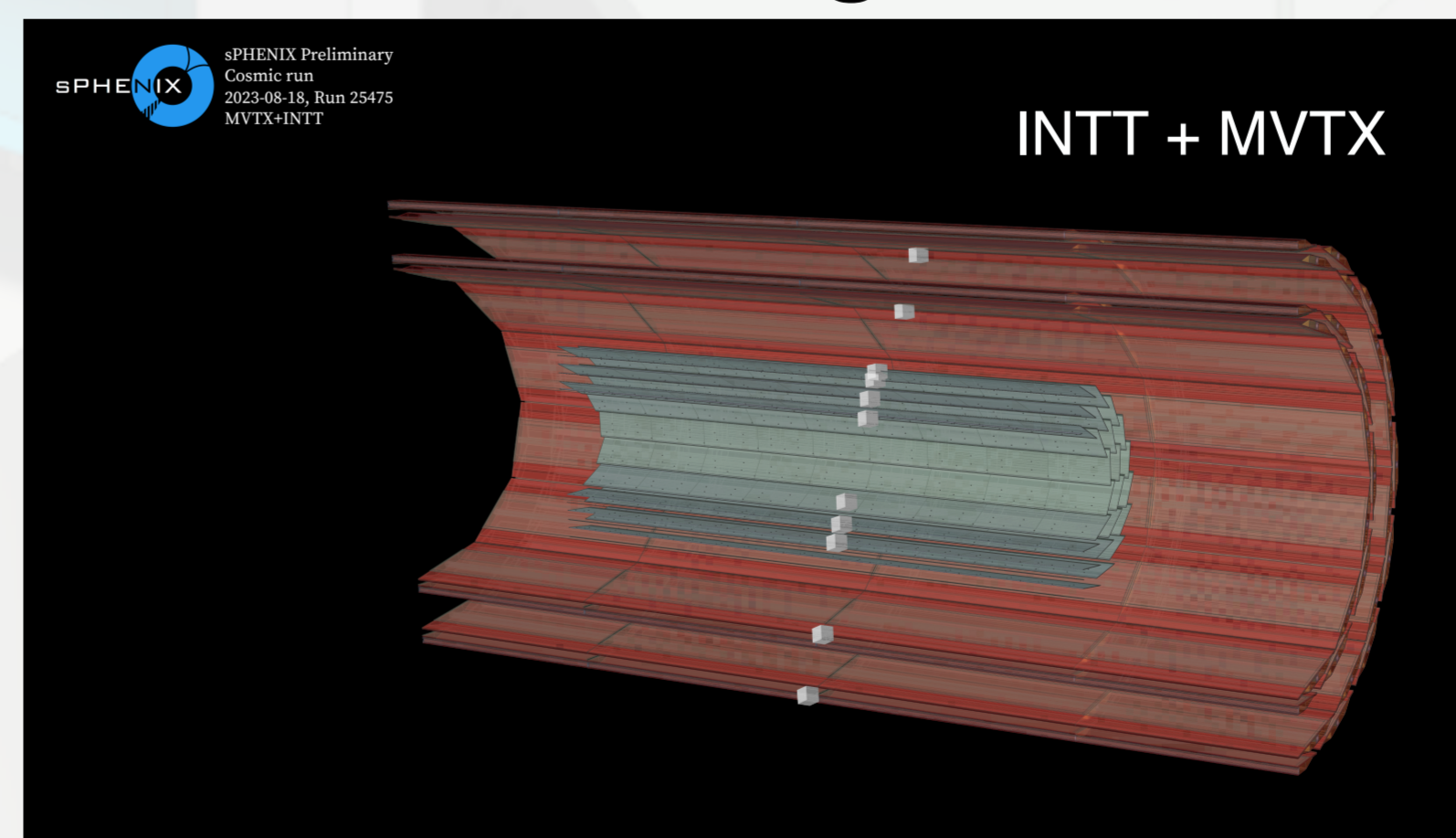
### Third, toward detailed analyses!

The difference of z component of vertex position measured by INTT and MBD  
 → INTT calculation by extrapolated tracklets  
 → The higher the multiplicity, the better the z vertex determination

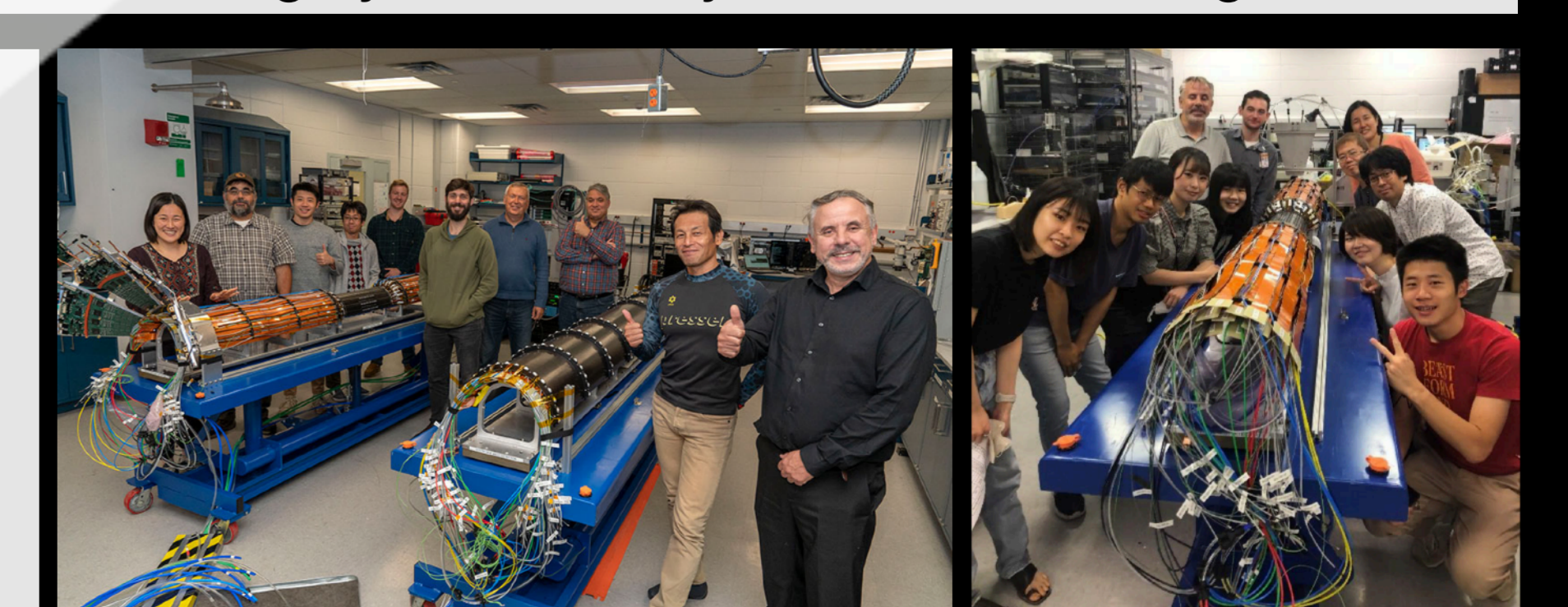


Stay tuned! More results from INTT are coming!

## INTT commissioning with cosmic rays



Clear tracks seen by all sPHENIX tracking systems → Systems are working well!



\* Not all INTT members included