

Intermediate Silicon Tracker in sPHENIX at RHIC

Cheng-Wei Shih for the sPHENIX Collaboration

National Central University & RIKEN

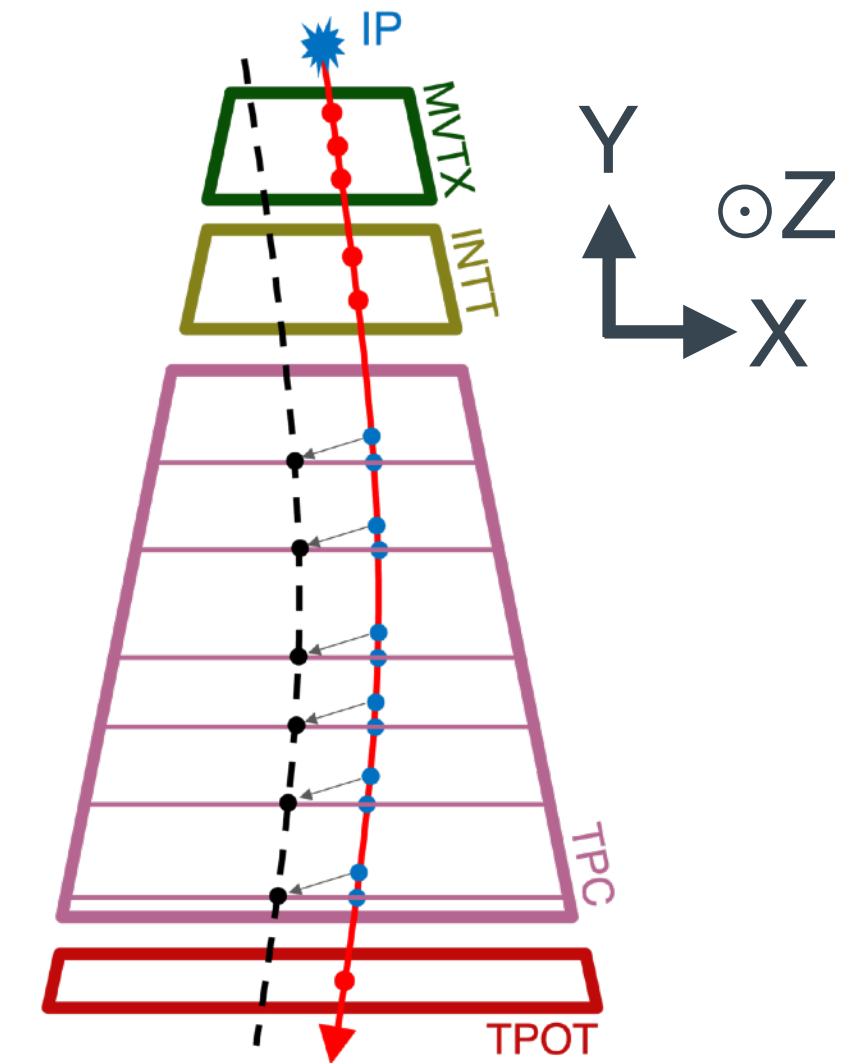
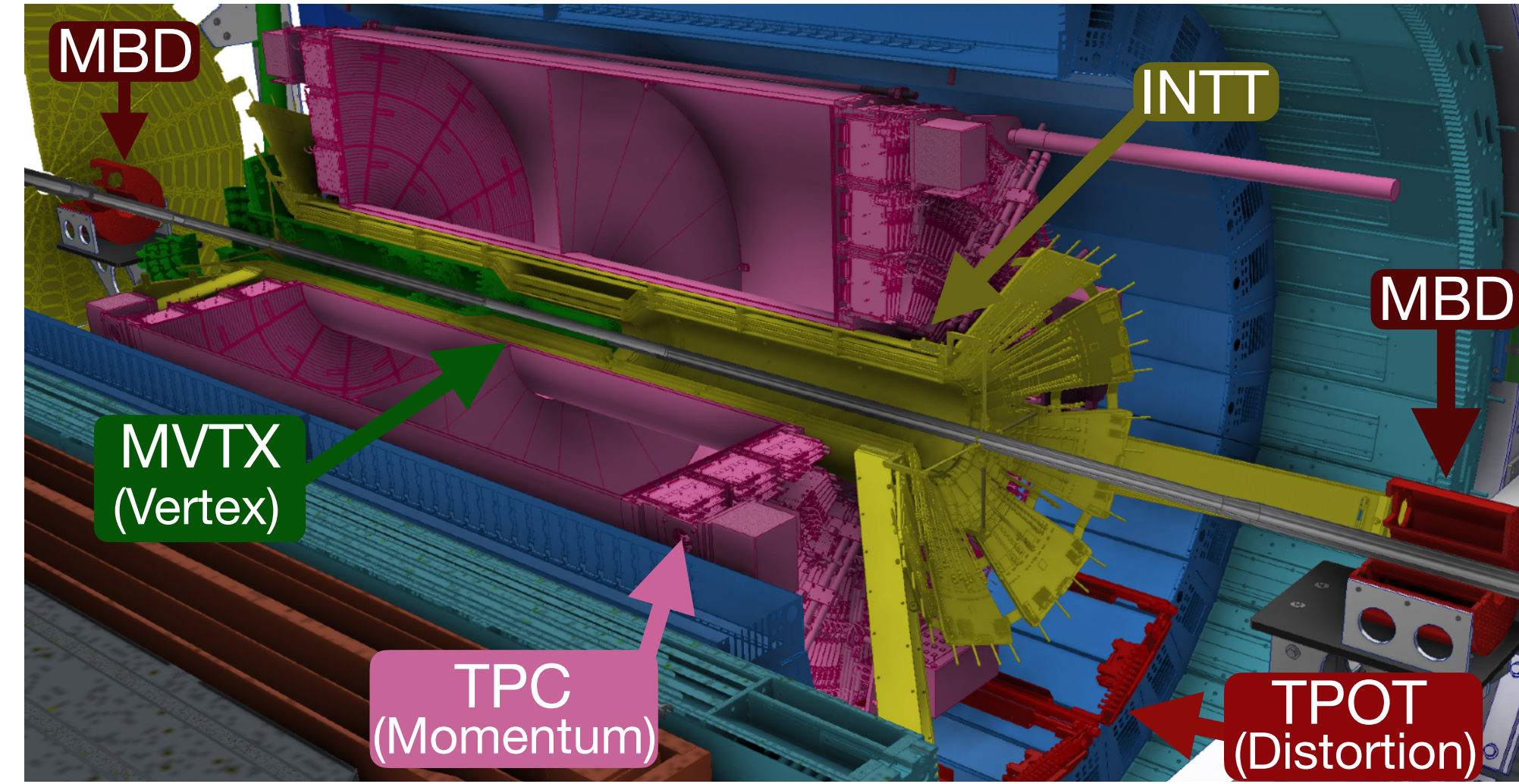
[Poster #309]

Hard Probes 2024 Flash Talks Session, Nagasaki, Japan, September 27th, 2024

Intermediate Silicon Tracker, INTT

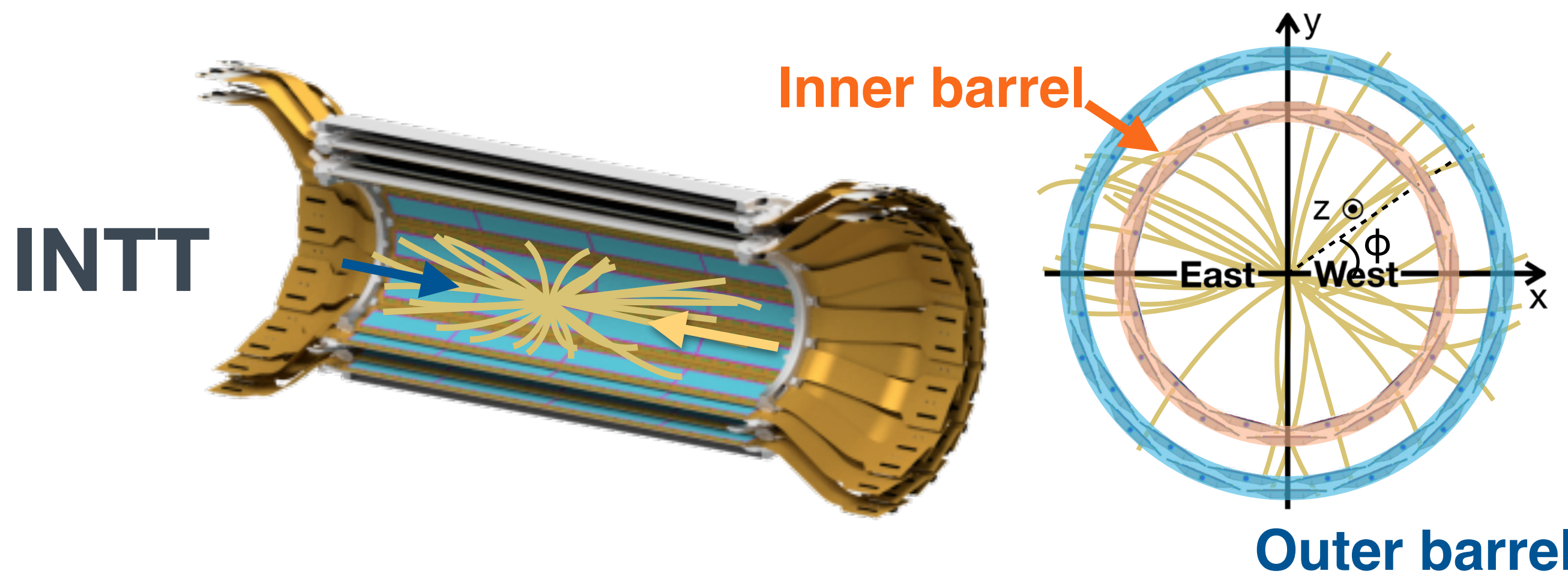
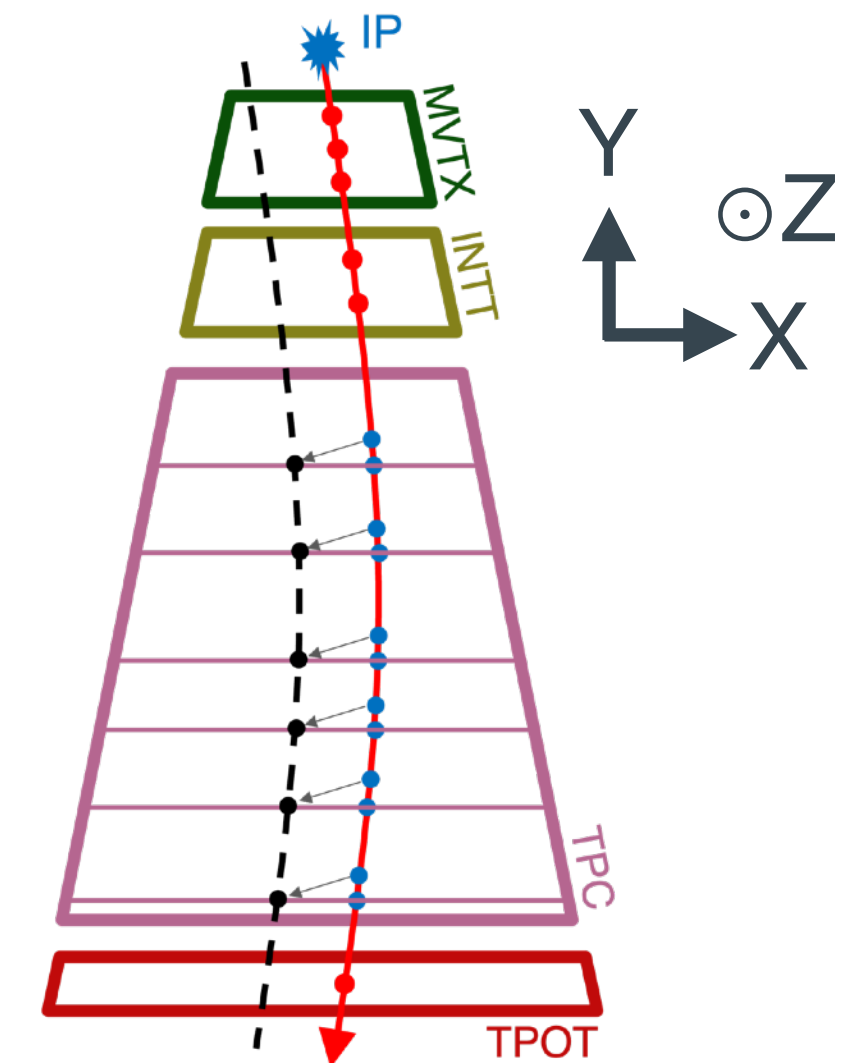
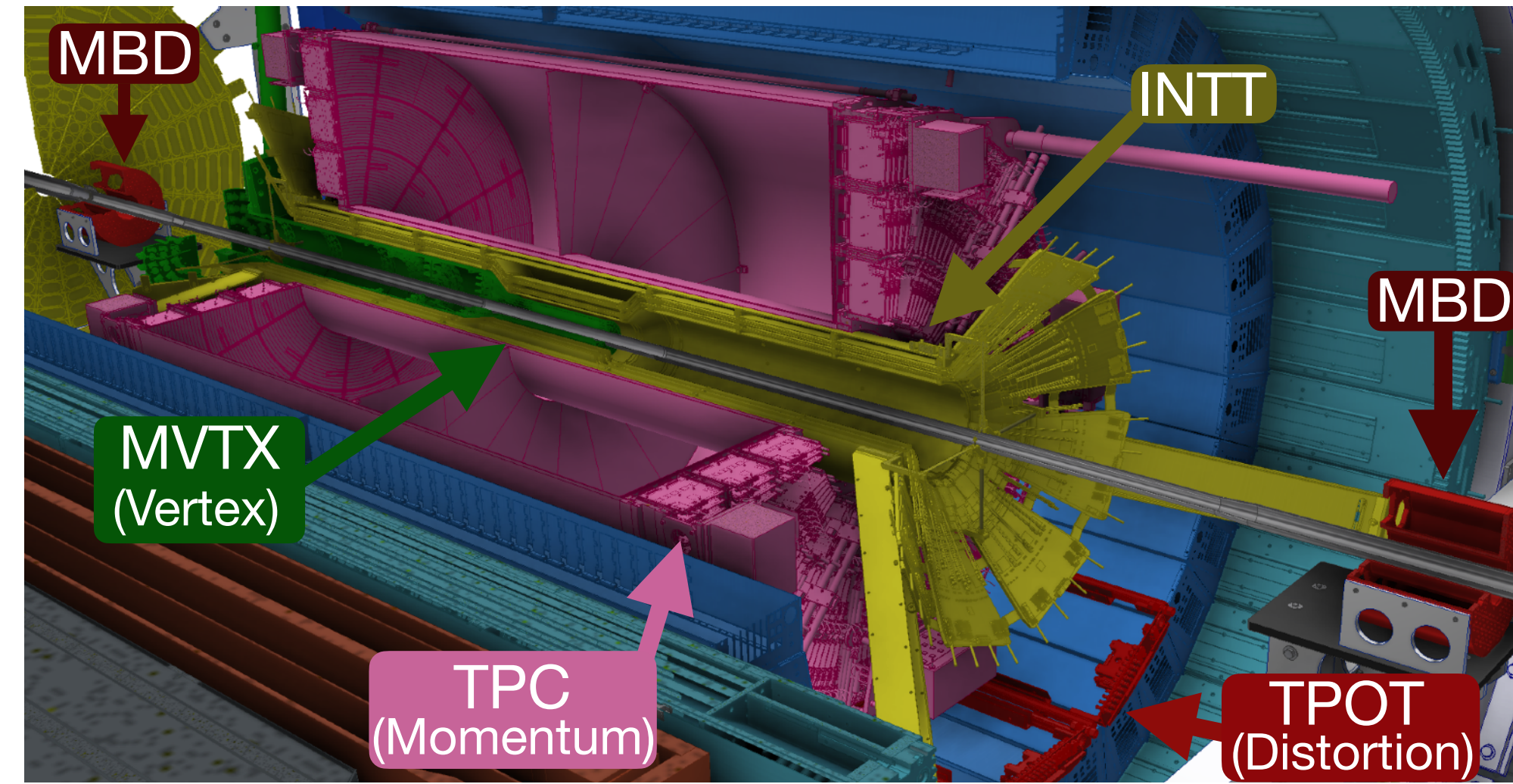


sPHENIX @ RHIC: Full barrel calorimeters, 1.4 T solenoid and excellent tracking system



Intermediate Silicon Tracker, INTT

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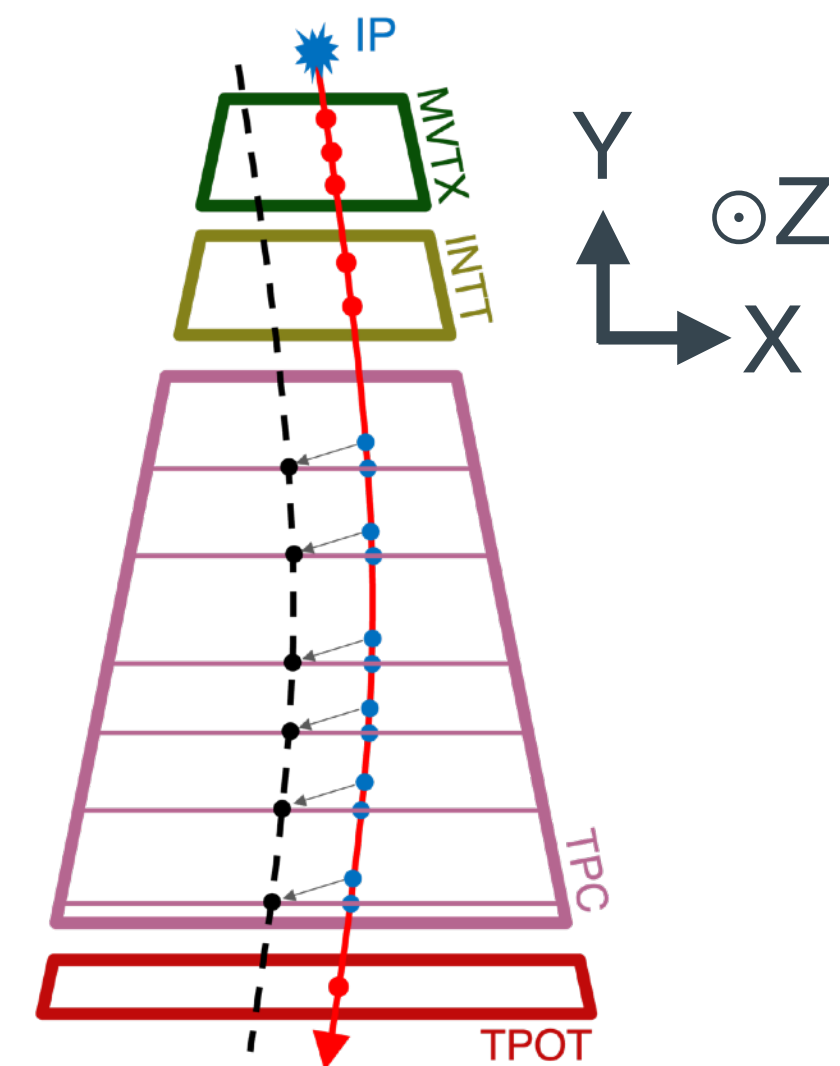
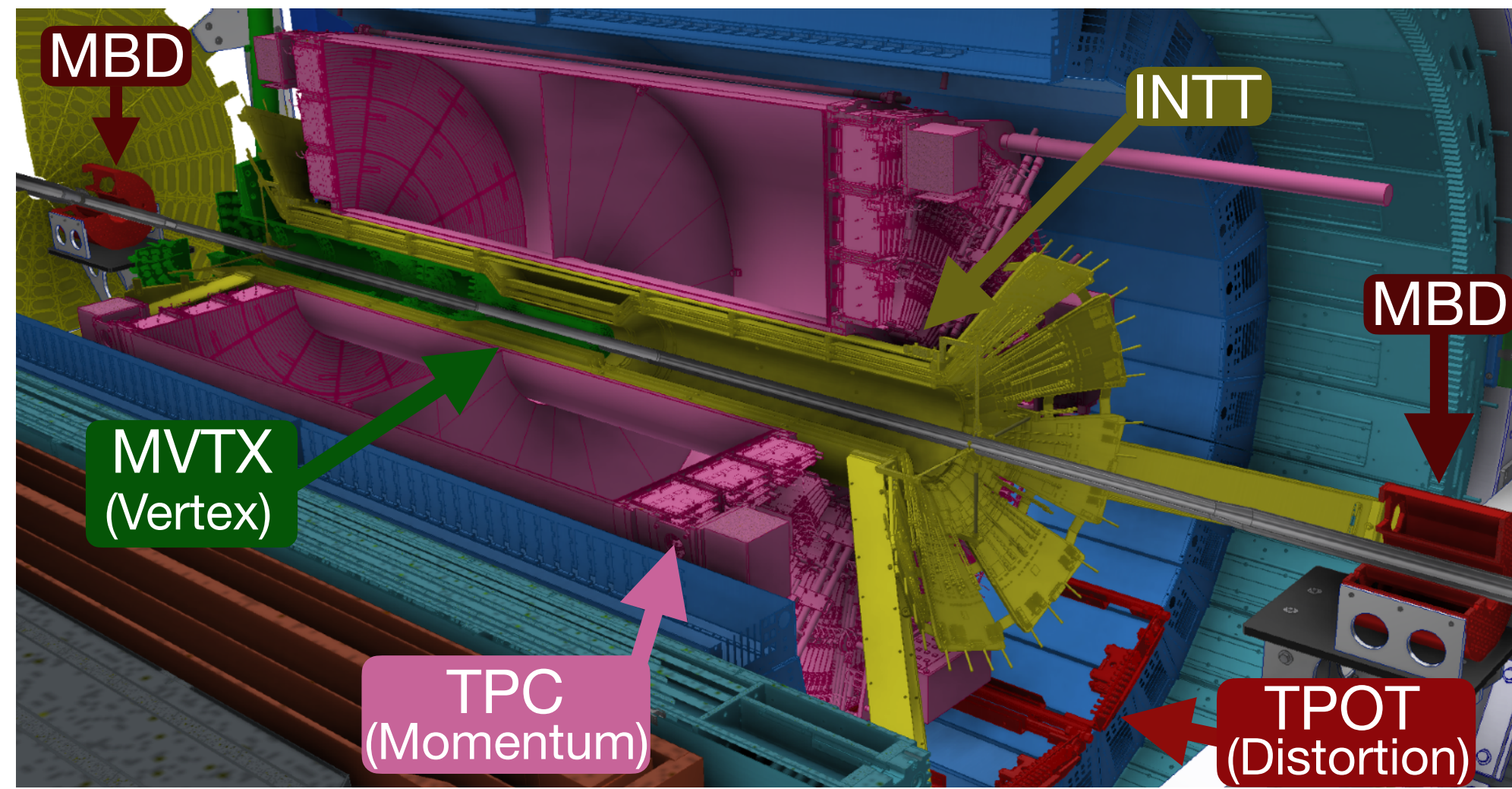
- Two-layer barrel strip tracker between MVTX and TPC
→ Bridge the MVTX and TPC tracks!
- Strip width 78 μm
→ Excellent resolution in azimuthal (ϕ) angle
- Single-bunch-crossing (106 ns) timing resolution
→ Associate the individual tracks and events

Intermediate Silicon Tracker, INTT

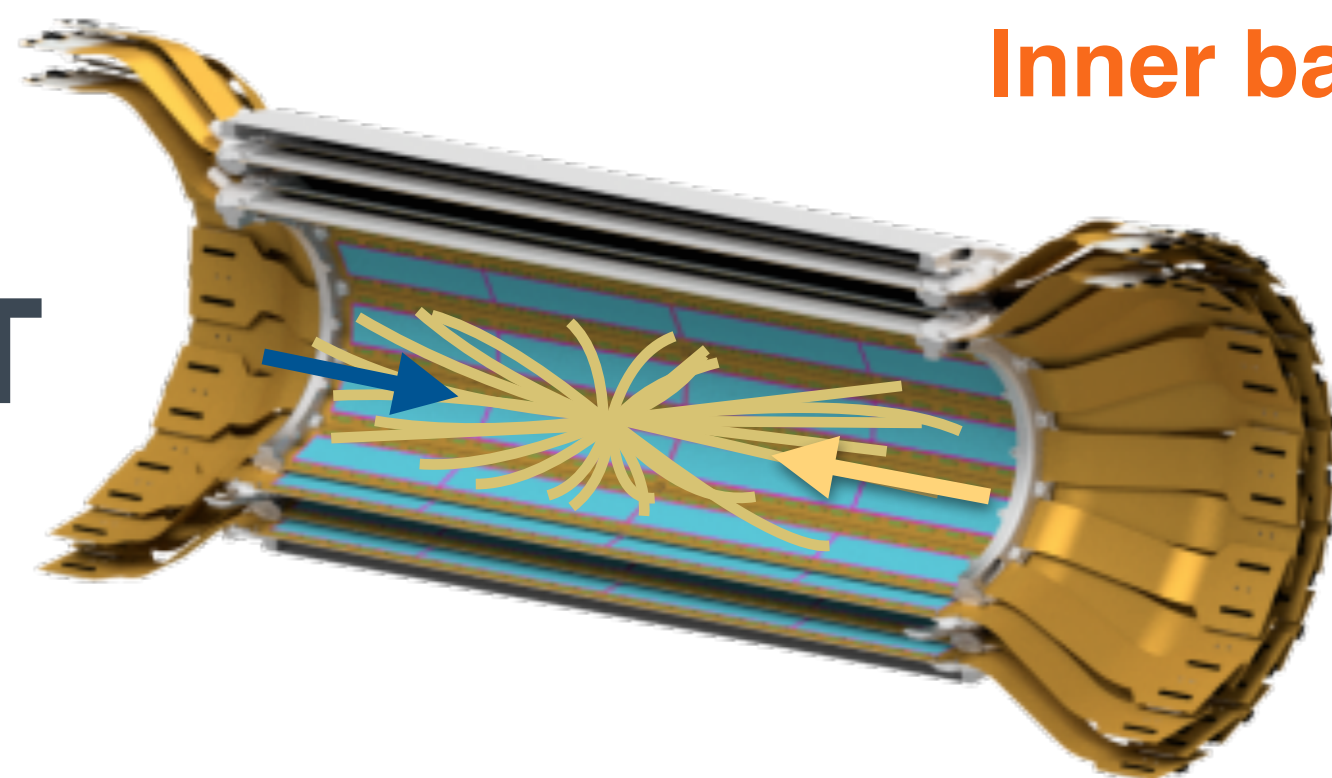
sPHENIX @ RHIC: Full barrel calorimeters, 1.4 T solenoid and excellent tracking system



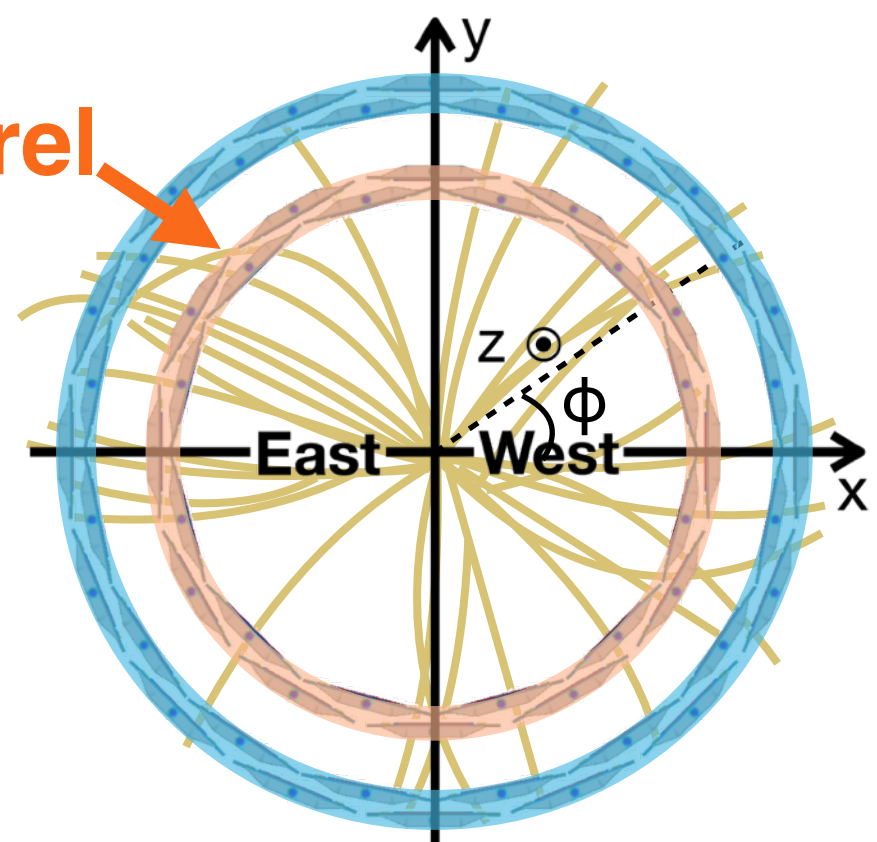
sPHENIX in 2022



INTT



Inner barrel

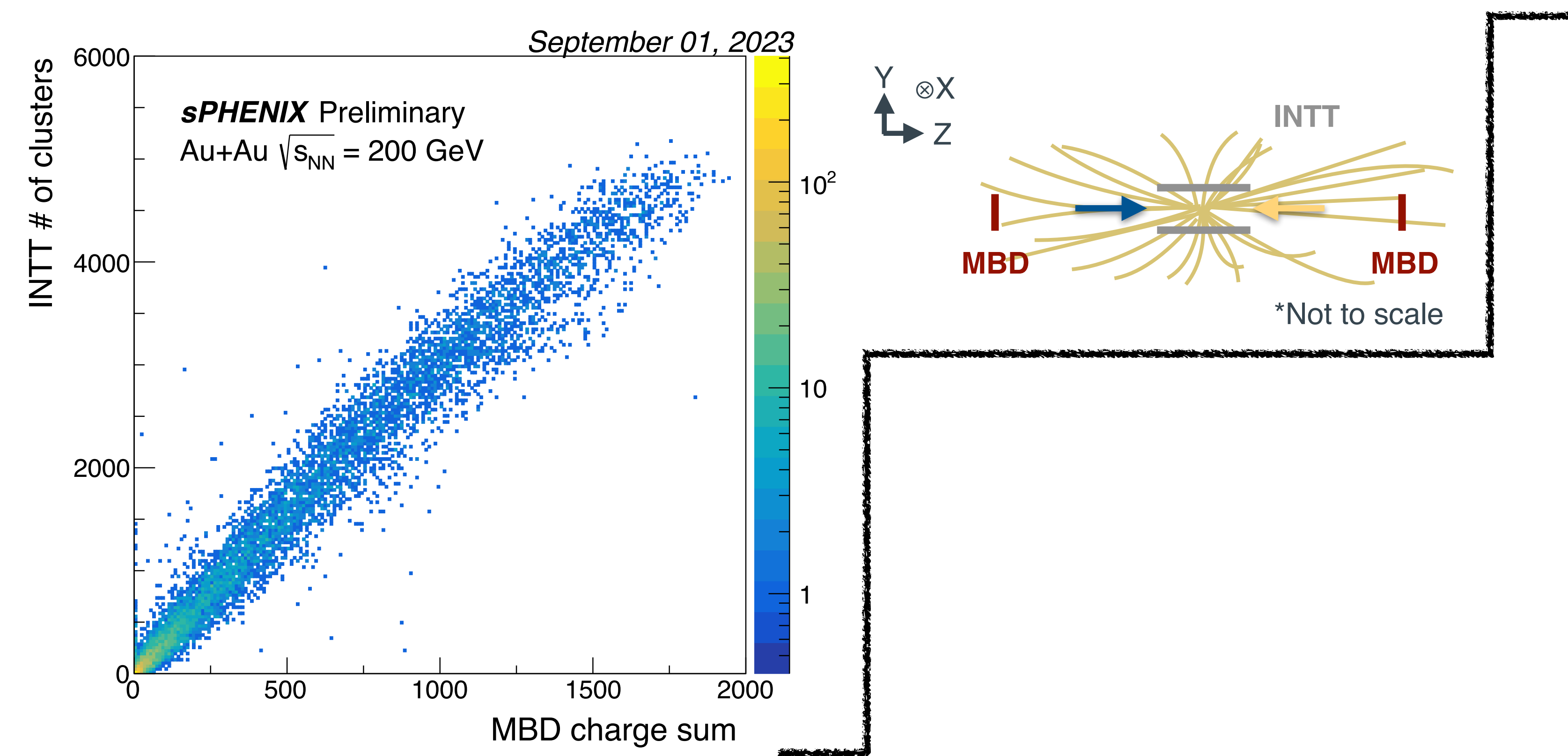


Outer barrel

- Two-layer barrel strip tracker between MVTX and TPC
→ Bridge the MVTX and TPC tracks!
- Strip width 78 μm
→ Excellent resolution in azimuthal (ϕ) angle
- Single-bunch-crossing (106 ns) timing resolution
→ Associate the individual tracks and events

After more than 10 years of preparation, sPHENIX started to take the collision data in May 2023!

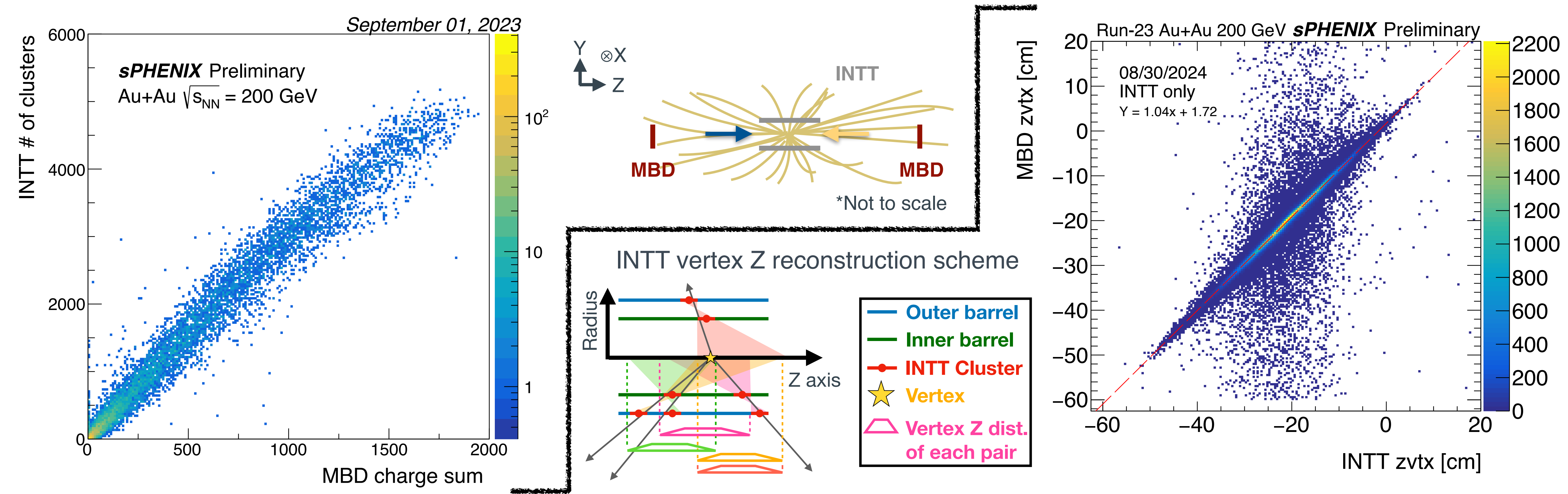
INTT was operating in **triggered readout mode**



- Positive multiplicity correlation \rightarrow INTT sees real signal! And systems are working well and synchronized!

*MBD: Minimum Bias Detector

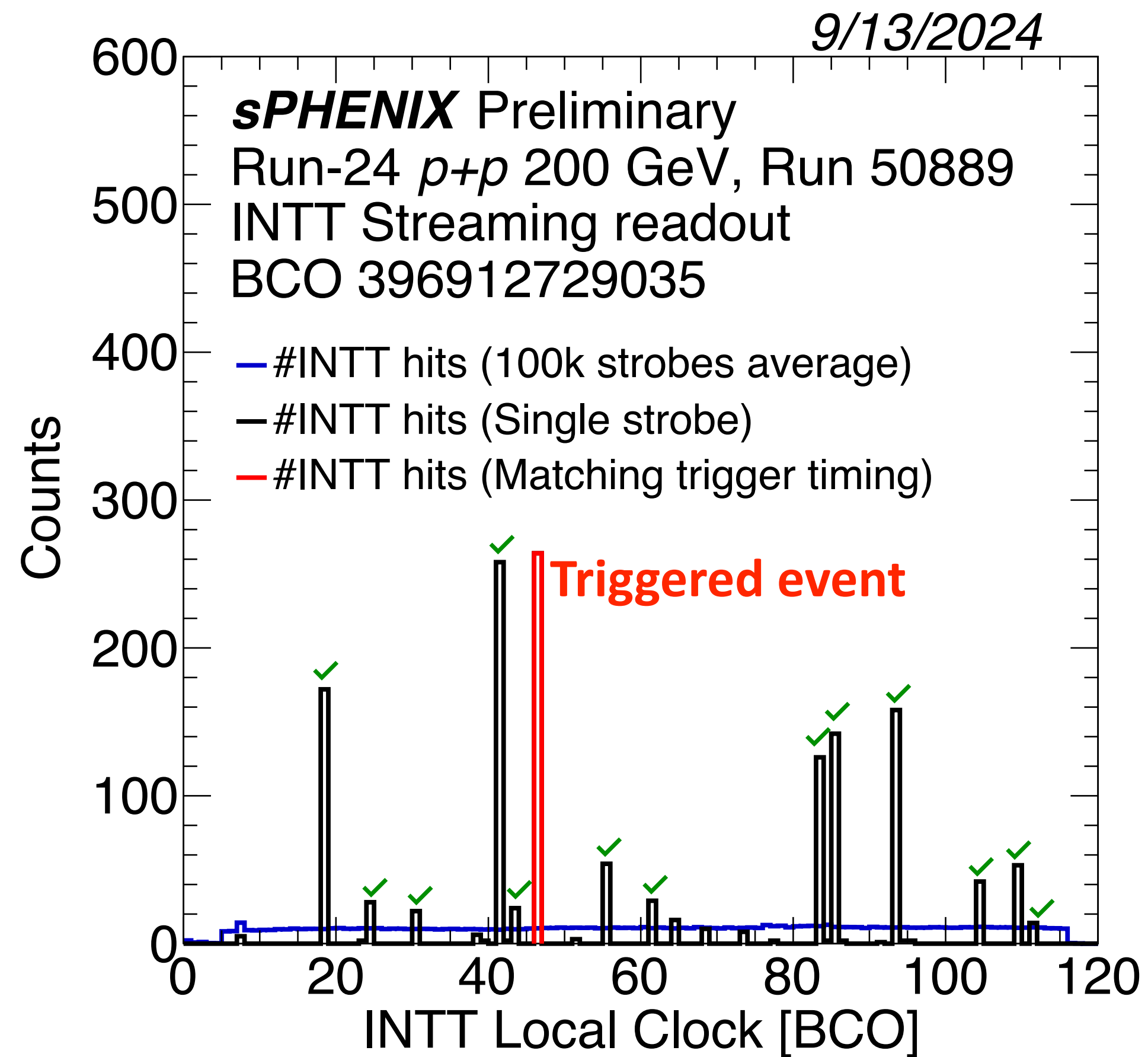
INTT was operating in **triggered readout mode**



- Positive multiplicity correlation \rightarrow INTT sees real signal! And systems are working well and synchronized!
- Z vertices reconstructed by INTT and MBD shows a positive correlation with a slope close to unity!

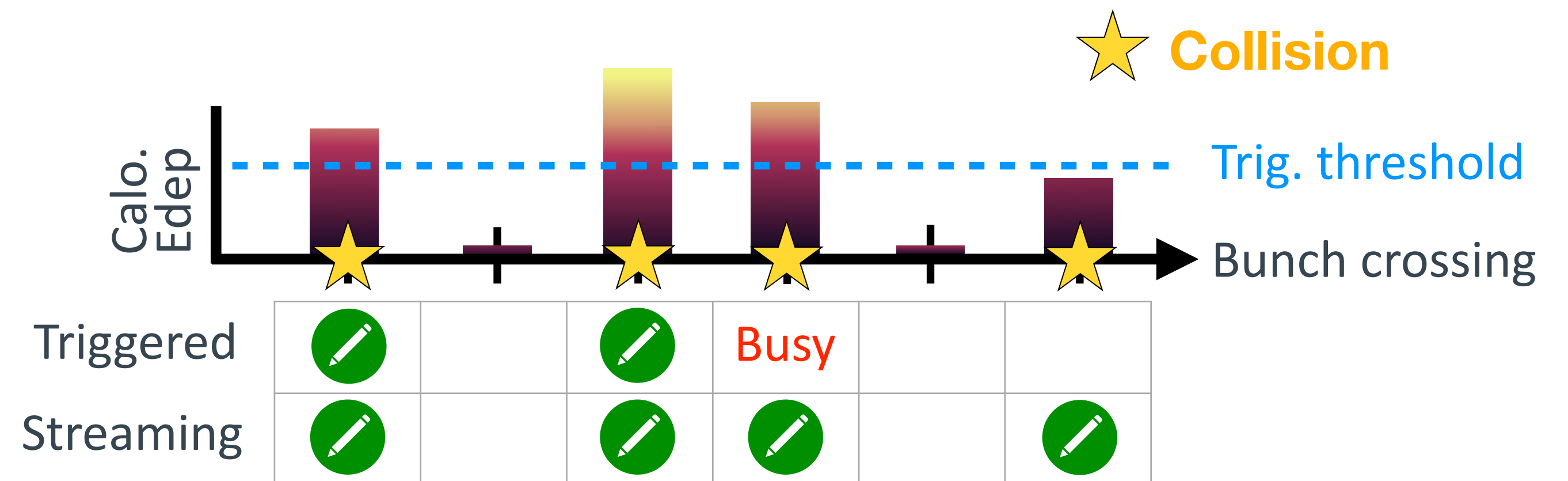
*MBD: Minimum Bias Detector

INTT switched to streaming (continuous) readout mode during Run 2024



Triggered mode: Record events only if the triggers are fired (e.g., photon/jet triggers)

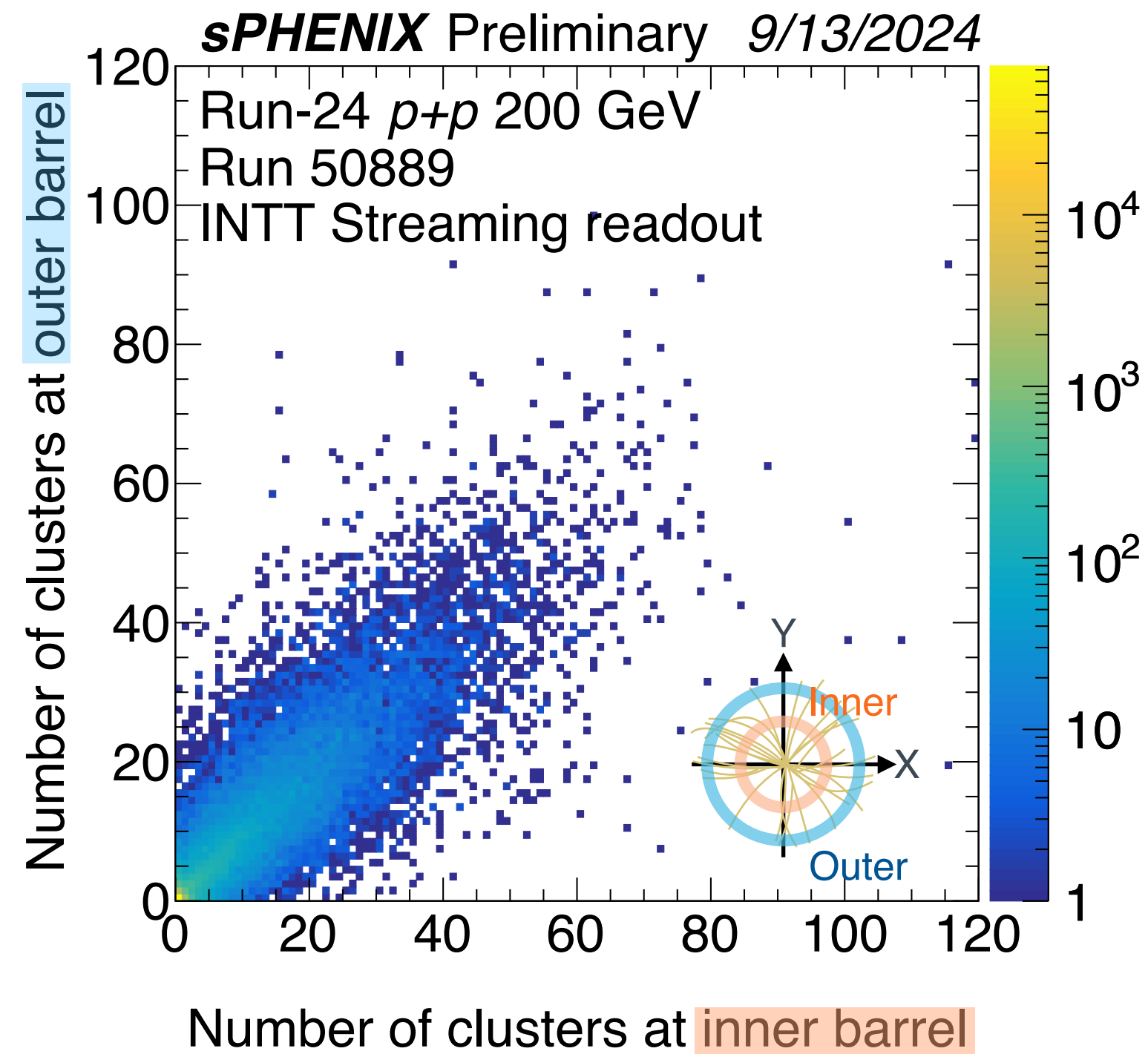
Streaming mode: Record events as long as the particle hits are detected by INTT → **Crucial for heavy-flavor physics!** (e.g., D^0 production)



13 additional collision events recoded by INTT in this time frame!

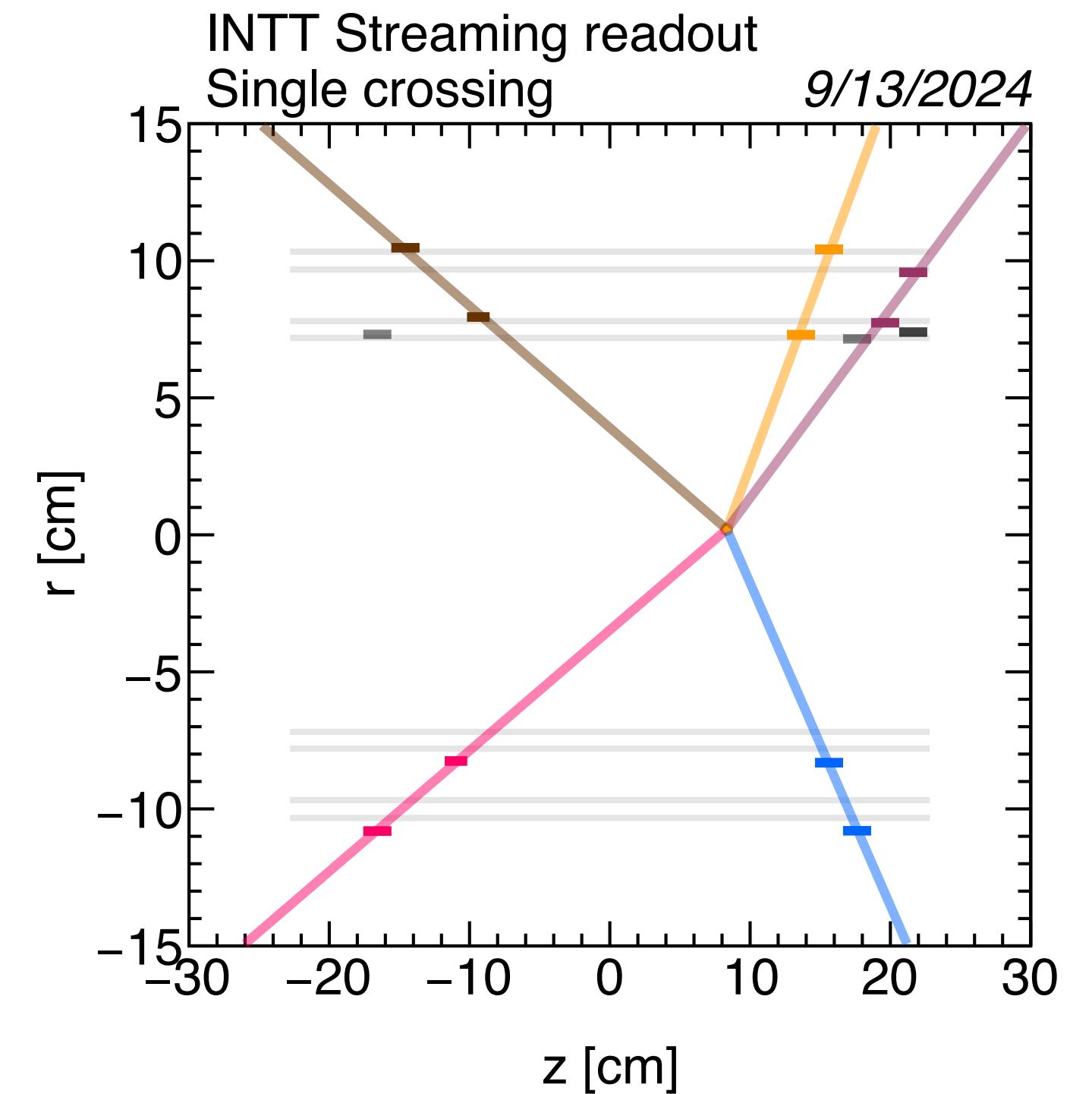
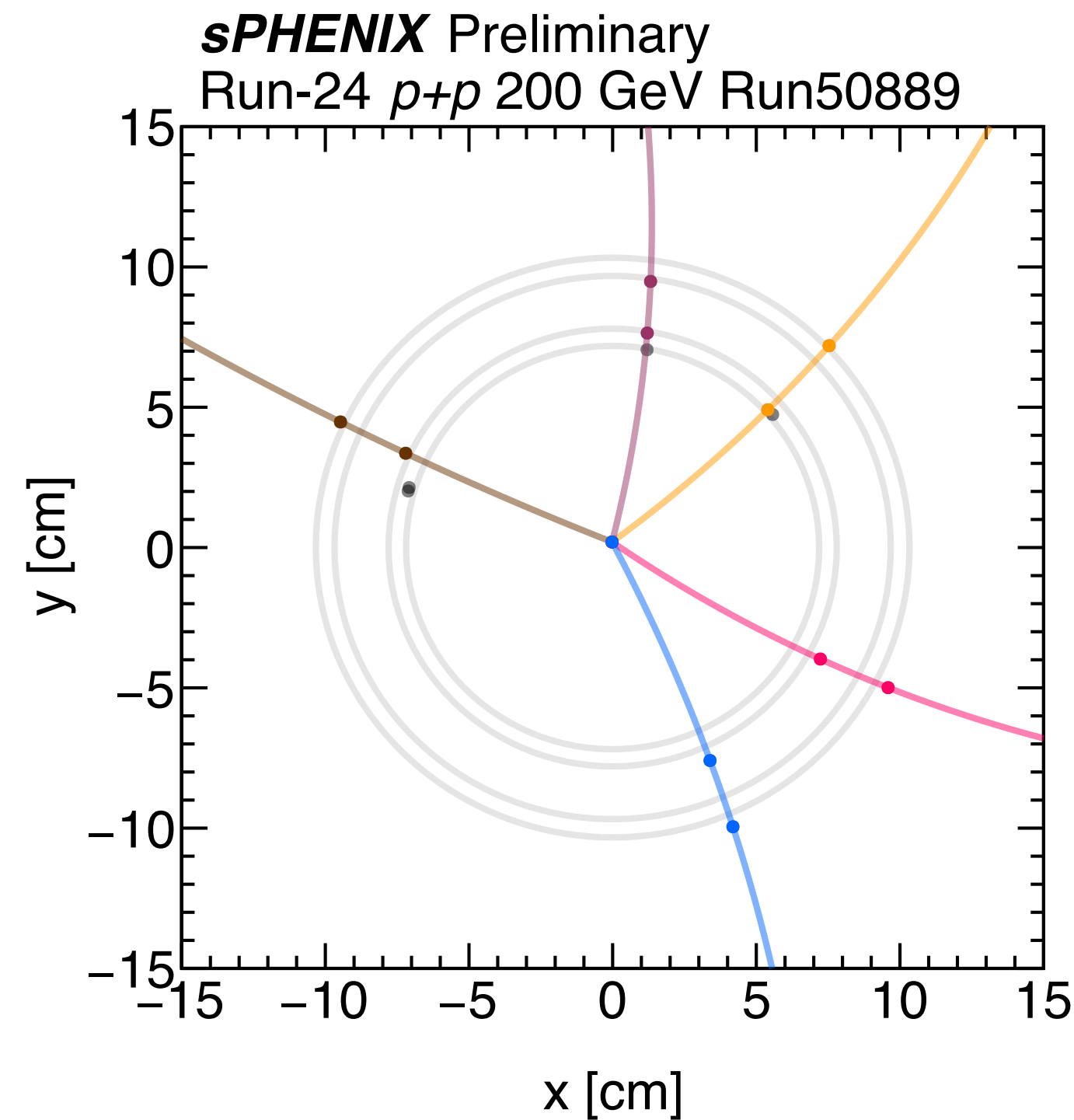
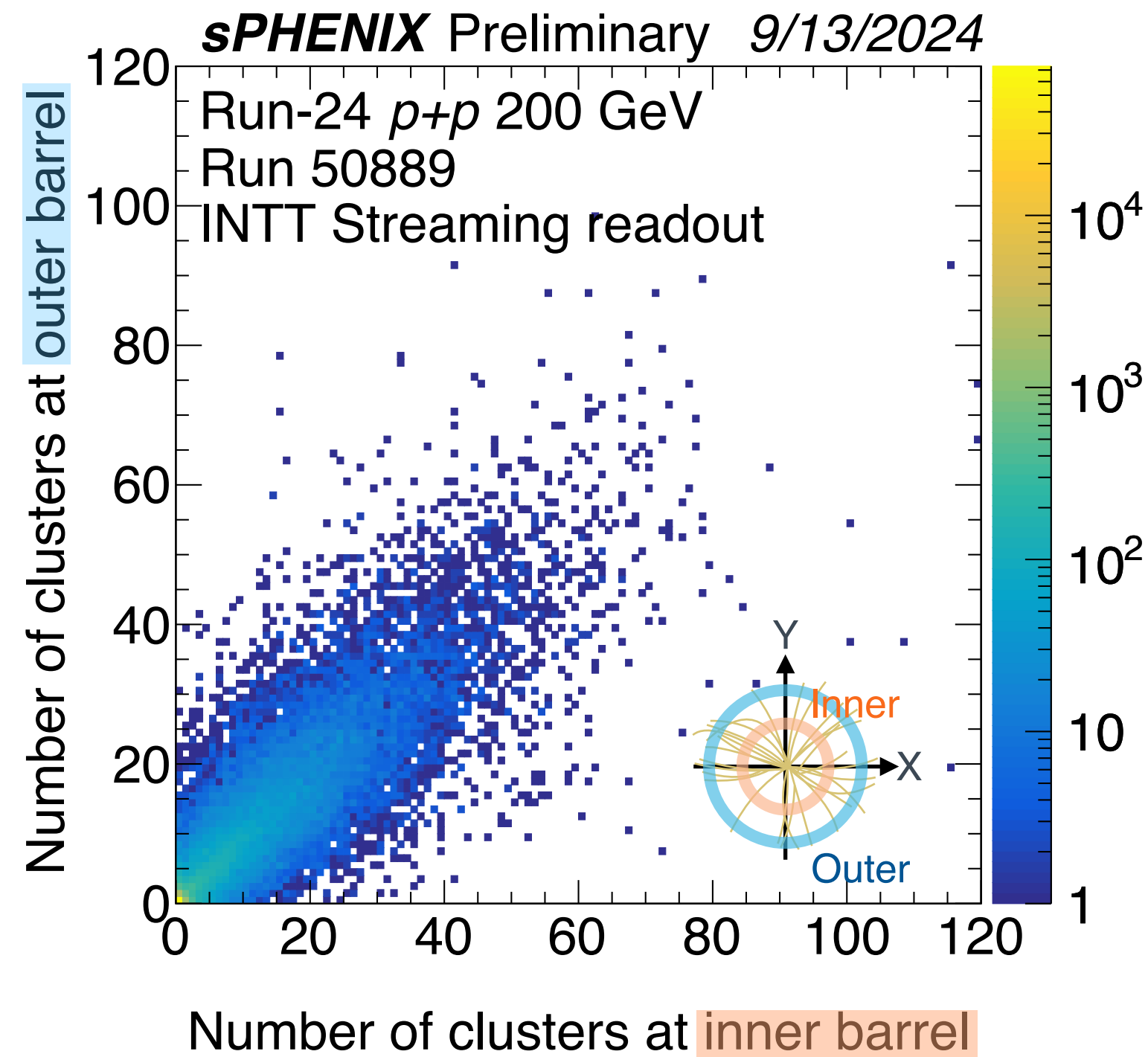
*One INTT time frame covers 111 bunch crossings

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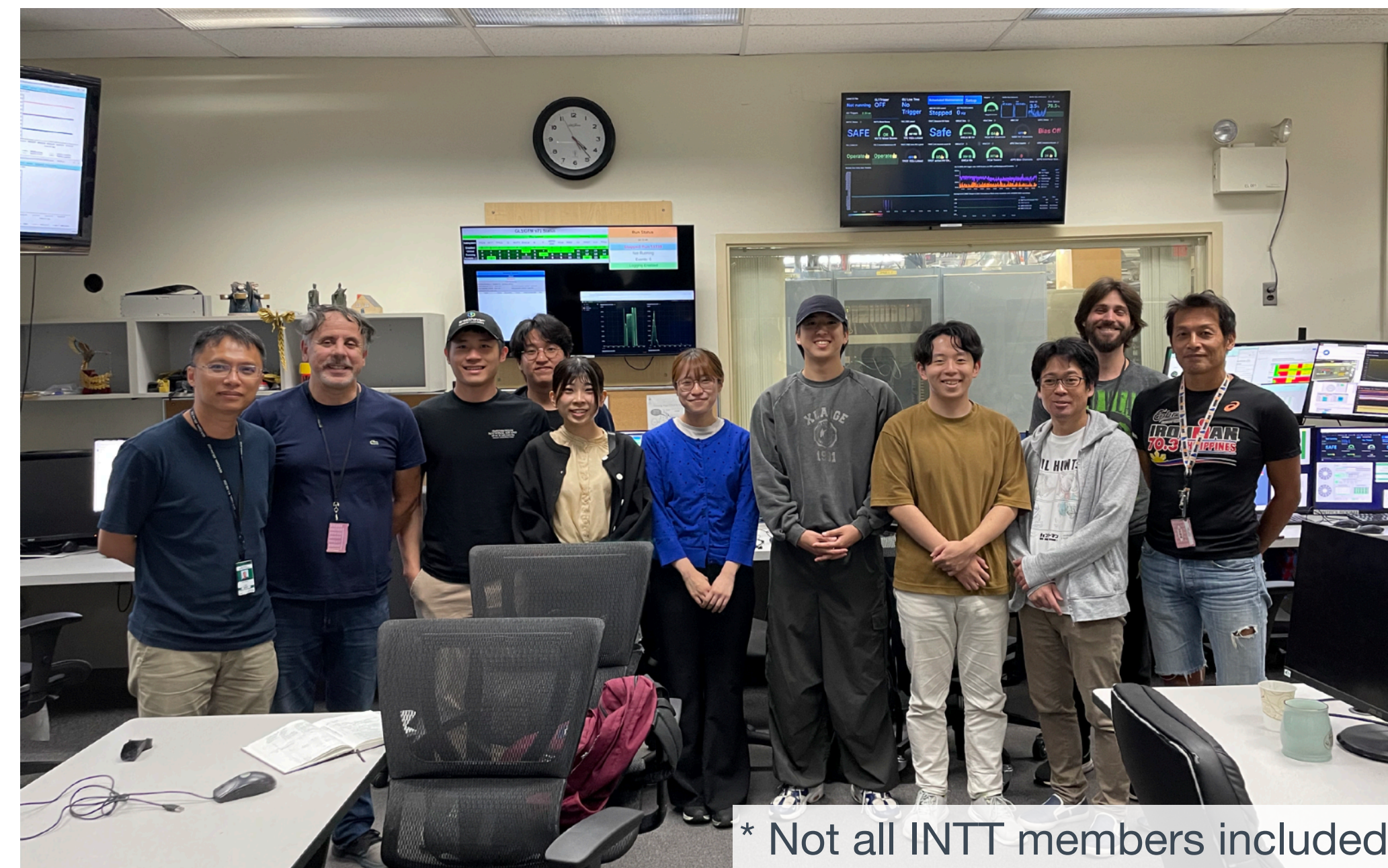
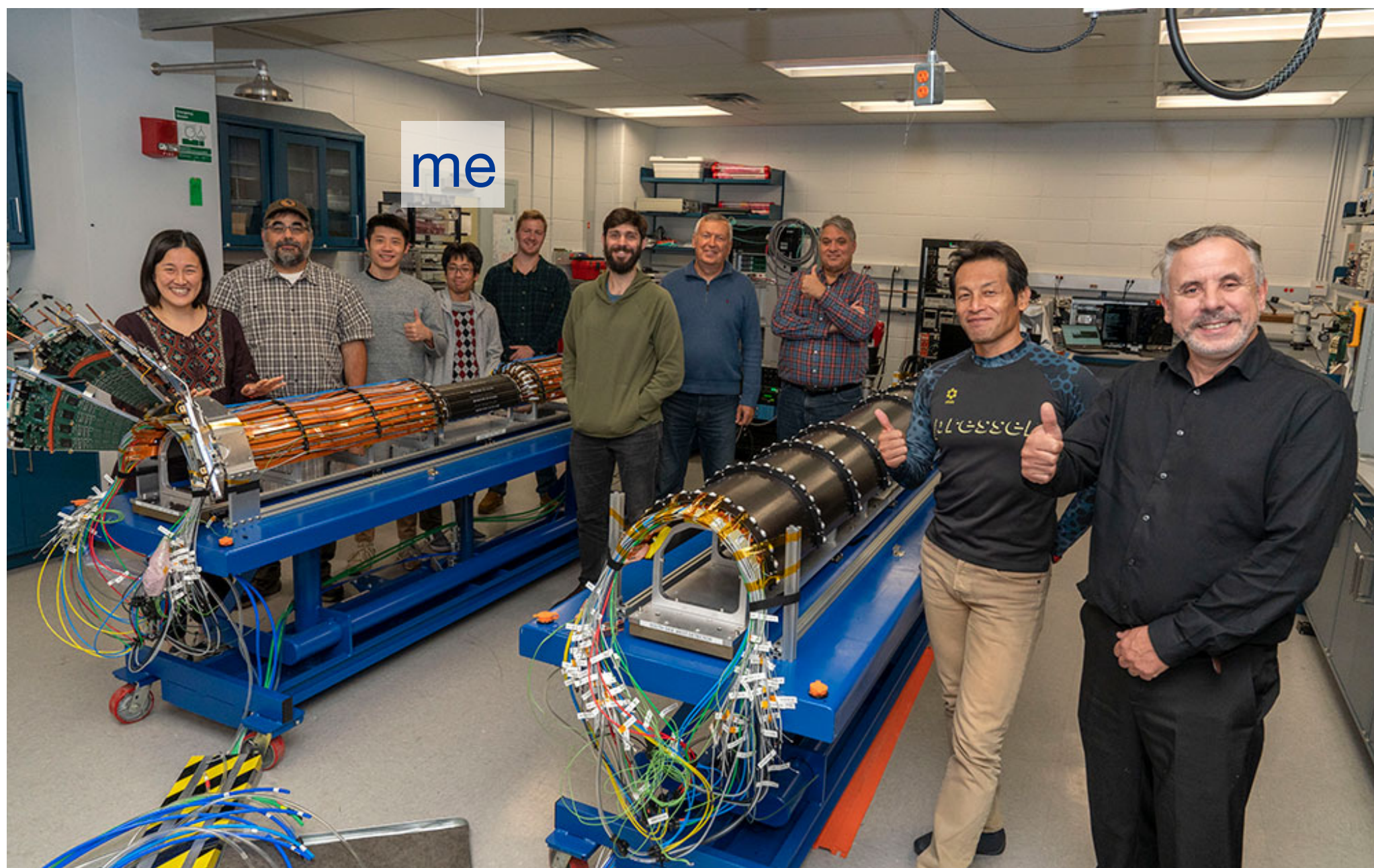
- Clear multiplicity correlation \rightarrow INTT is in good shape in streaming readout mode!

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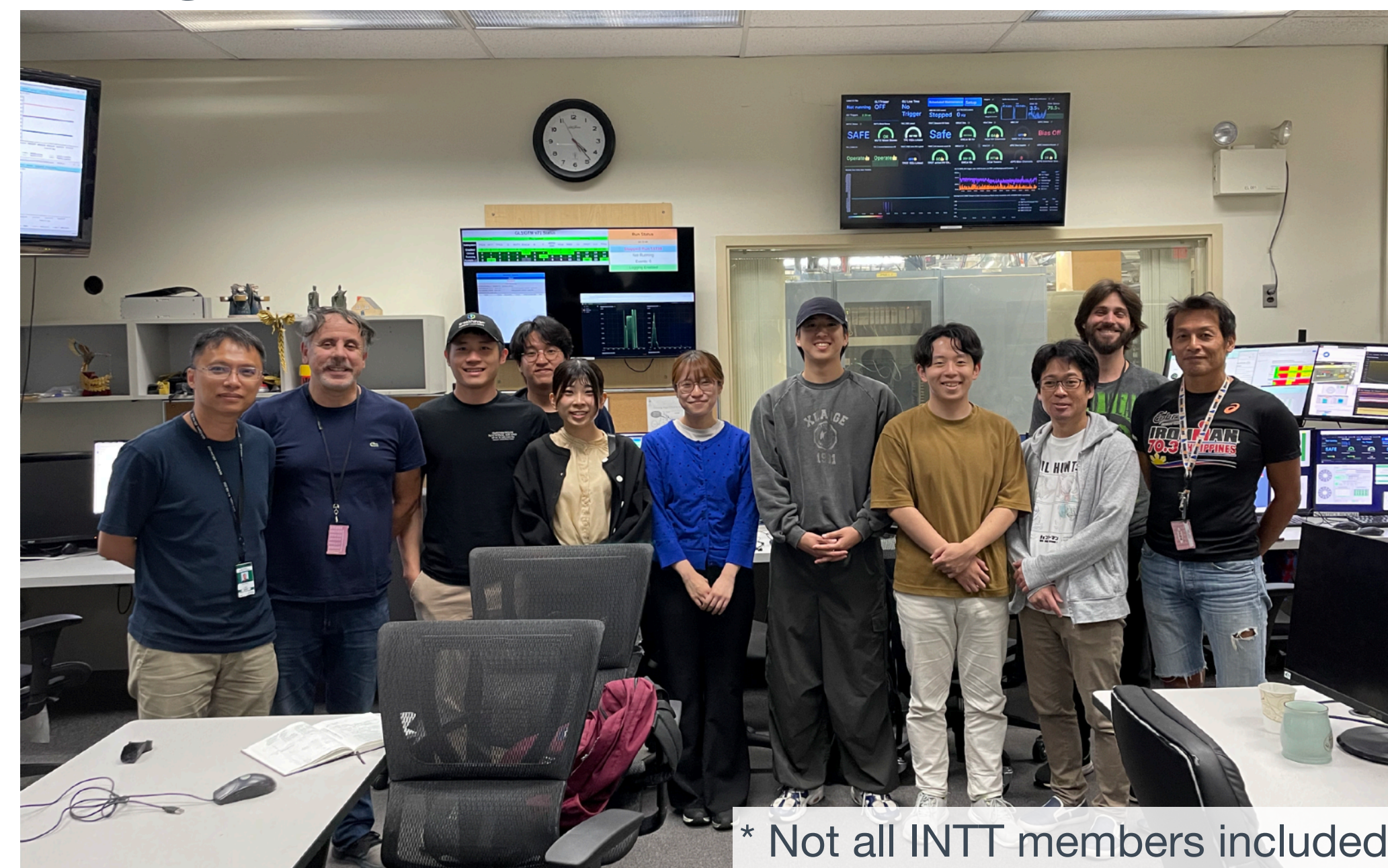
- Clear multiplicity correlation \rightarrow INTT is in good shape in streaming readout mode!
- The developed INTT tracklet analysis is able to reconstruct the particle tracks!

sPHENIX INTT group



- The intermediate silicon tracker, INTT, is a two-layer barrel strip tracker of sPHENIX
- With tremendous work carried out by the sPHENIX INTT group, INTT has been confirmed to be in good shape. And the INTT data is proved to be reliable in either triggered or streaming readout modes!
- With the substantial statistics collected, sPHENIX is going to deliver exciting physics results!

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