Plots from INTT

Genki Nukazuka (RIKEN/RBRC),
Maya Shimomura (NWU),
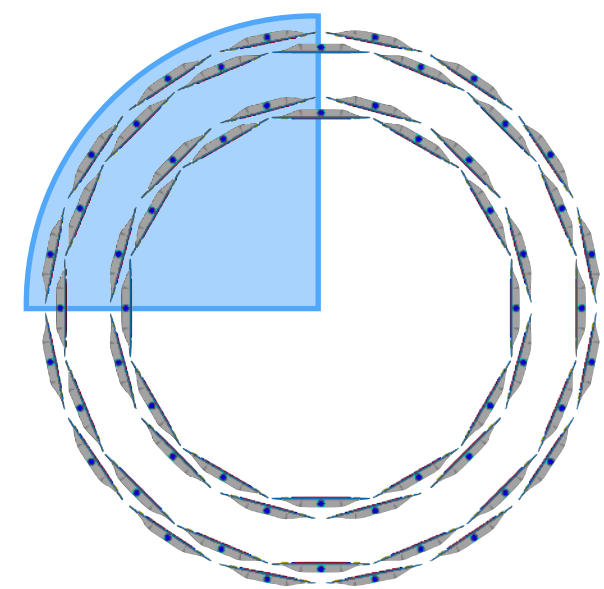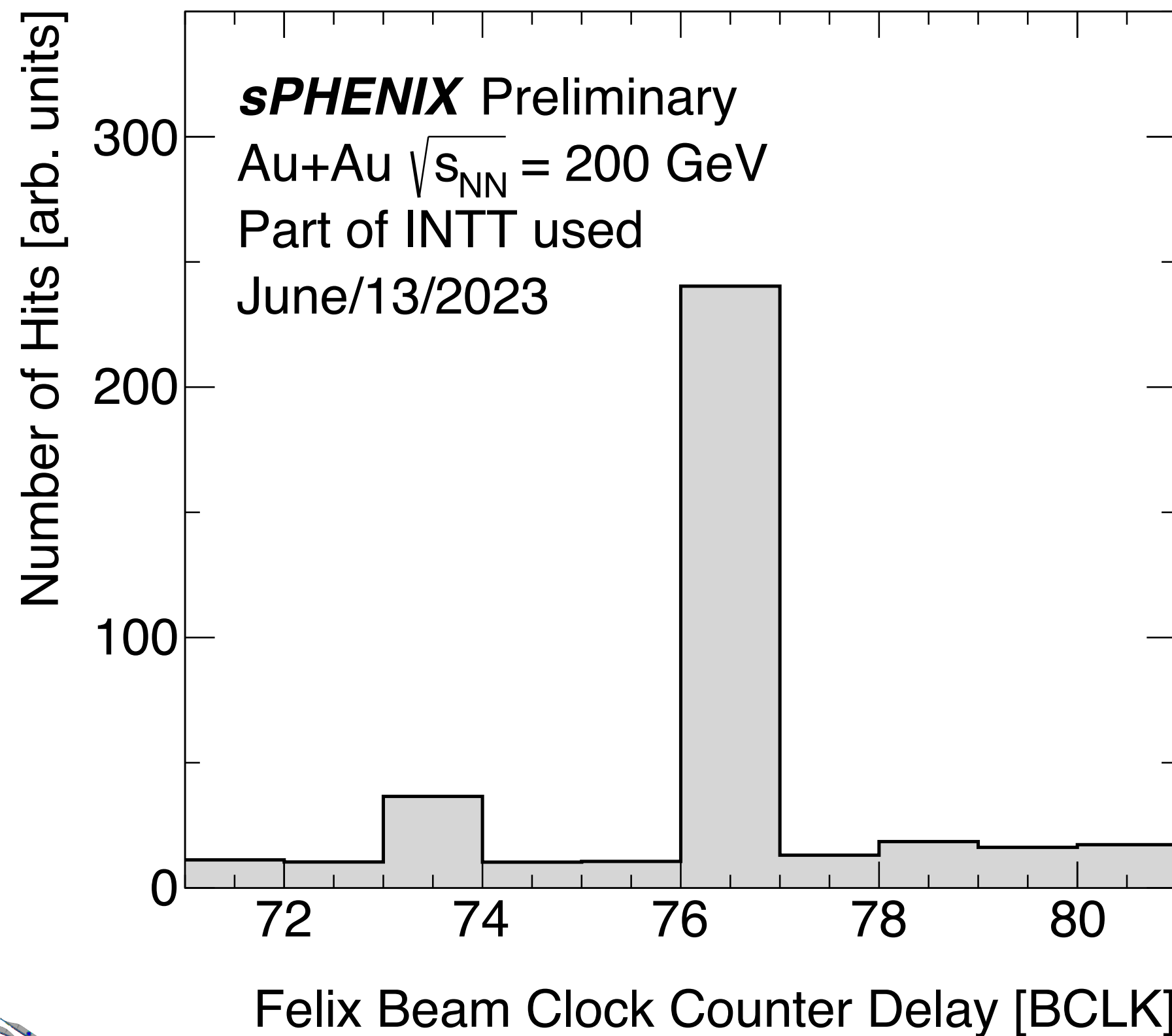Mai Kano (NWU),
Takashi Hachiya (NWU)
on behalf of the INTT collaboration

Hit Rate as a Function of Beam Clock Delay in FELIX
— Evidence of Time-in —

sPHENIX Preliminary
Au+Au $\sqrt{s_{NN}}$ = 200 GeV
Part of INTT used
June/13/2023

Number of Hits [arb. units]

Felix Beam Clock Counter Delay [BCLK]

List of half-ladders used in this analysis

B0L006S	B0L106S	B1L008S	B1L108S
B0L007S	B0L107S	B1L009S	B1L109S
B0L008S	B0L108S	B1L010S	B1L110S
		B1L011S	B1L111S

Note: 1/8 of all ladders analyzed.

The cross-section seen
from the south side.

Condition
- Date: May/30/2023
- Run: 8116 - 8125
- Beam: $\sqrt{s}$ = 200 GeV, 56 × 56 bunches
- DAQ: GL1 trigger
- Parameters
  - Number of BCLK tags to be recorded: 1 [BCLK]
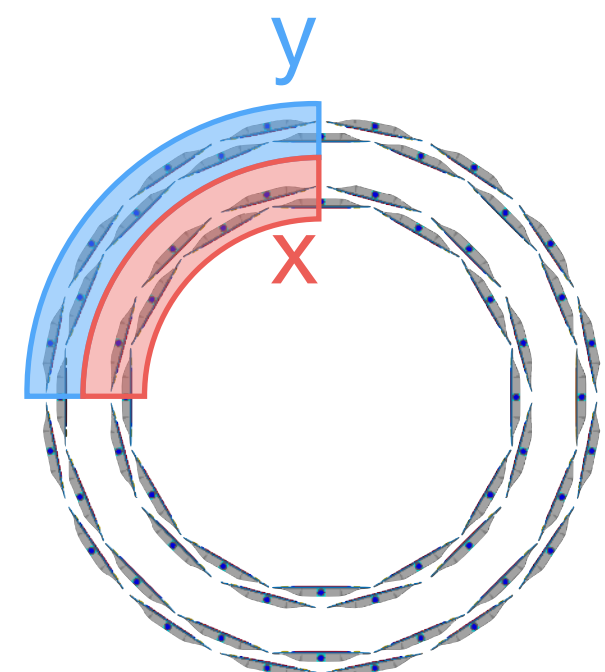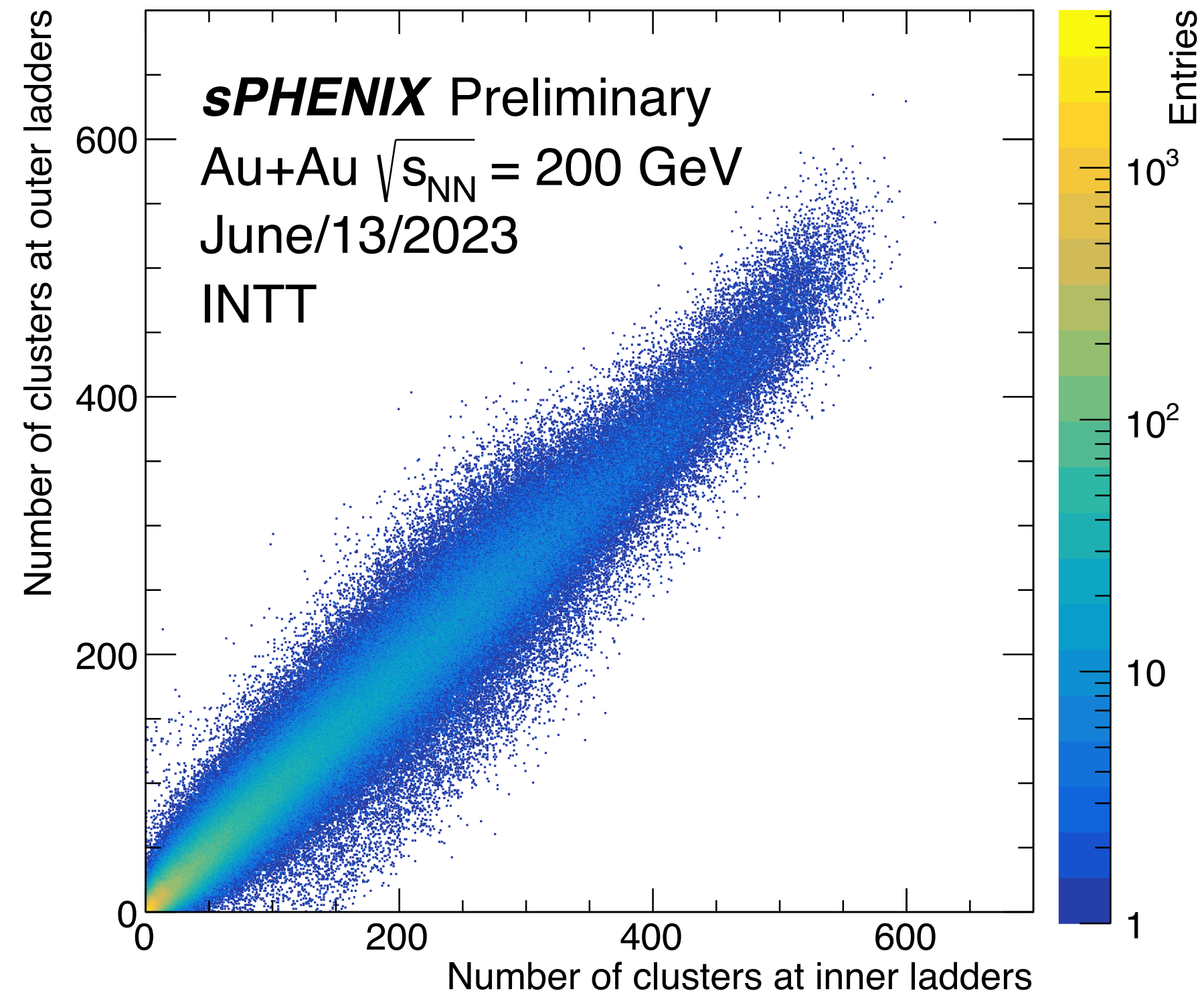 - L1 Delay: 25 [BCLK]
  - DAC0 threshold: 23 [ch]

Axes
- x: Delay of the beam clock counter in the FELIX
- y: Hit rate
  - The number of hits on chip1-13 of all 14 ladders connected to INTT FELIX Server 2 per event

Explanation
Hit rate measurements with various values of the delay shows a hot spot at 76 BCLK. The hits originate from the beam. Timing resolution was confirmed to be less than 1 BCLK as designed.

Multiplicity Correlation Between the Inner and the Outer Ladders

sPHENIX Preliminary
Au+Au $\sqrt{s_{NN}}$ = 200 GeV
June/13/2023
INTT

(x axis: Number of clusters at inner ladders; y axis: Number of clusters at outer ladders; color scale: Entries)

Condition

- Date: June/05/2023
- Run: 9328
- Beam: $\sqrt{s}$ = 200 GeV, 56 × 56 bunches
- No magnetic field
- DAQ: GL1 trigger
- Parameters
  - Number of BCLK tags to be recorded: 5 [BCLK]
  - L1 Delay: 25 [BCLK]
  - Delay of the beam clock counter in the FELIX: 78 [BCLK]
  - DAC0 threshold: 15 [ch]

Axes

- x: Multiplicity of 6 inner half-ladders connected to a FELIX
- y: Multiplicity of 8 outer half-ladders connected to the FELIX
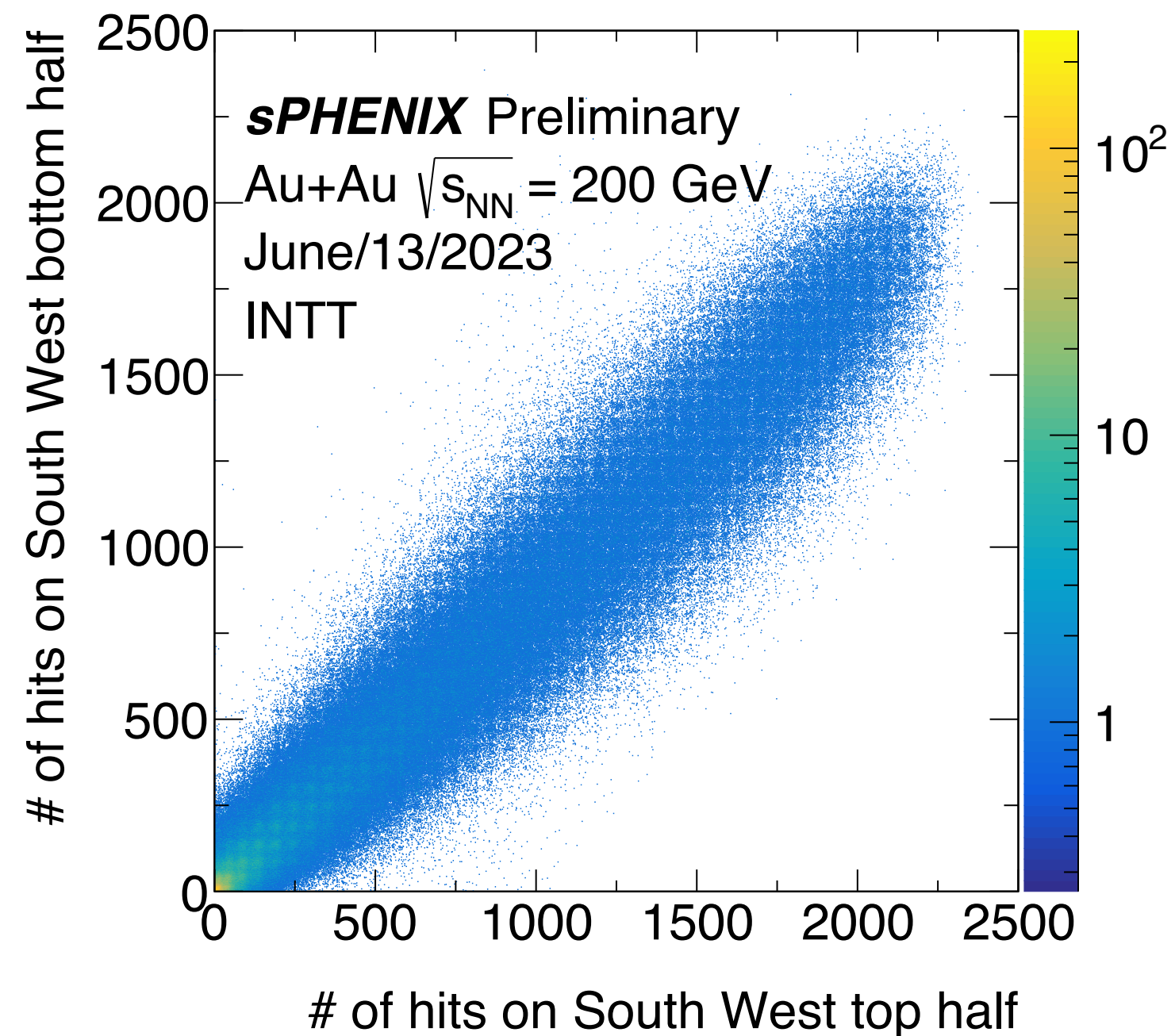- here, multiplicity is the number of hit clusters per event.

Explanation

A multiplicity of the inner correlates to that of the outer barrel. It agrees with a naive physics picture: if a particle penetrates the inner barrel, it also goes through the outer barrel. It proves that hits are correlated and not random within a FELIX server.

List of half-ladders used in this analysis

B0L006S	B0L106S	B1L008S	B1L108S
B0L007S	B0L107S	B1L009S	B1L109S
B0L008S	B0L108S	B1L010S	B1L110S
		B1L011S	B1L111S

Note: 1/8 of all ladders analyzed.

The cross-section seen from the south side.

Number of Hits Correlation Between Two FELIXs
— Confirmation of Event Synchronization—

sPHENIX Preliminary
Au+Au $\sqrt{s_{NN}}$ = 200 GeV
June/13/2023
INTT

x-axis: # of hits on South West top half
y-axis: # of hits on South West bottom half

Condition
- Date: June/05/2023
- Run: 9328
- Beam: $\sqrt{s}$ = 200 GeV, 56 × 56 bunches
- No magnetic field
- DAQ: GL1 trigger
- Parameters
  - Number of BCLK tags to be recorded: 5 [BCLK]
  - L1 Delay: 25 [BCLK]
  - Delay of the beam clock counter in the FELIX: 78 [BCLK]
  - DAC0 threshold: 15 [ch]

Axes
- x: The number of hits of 14 half-ladders connected to INTT2
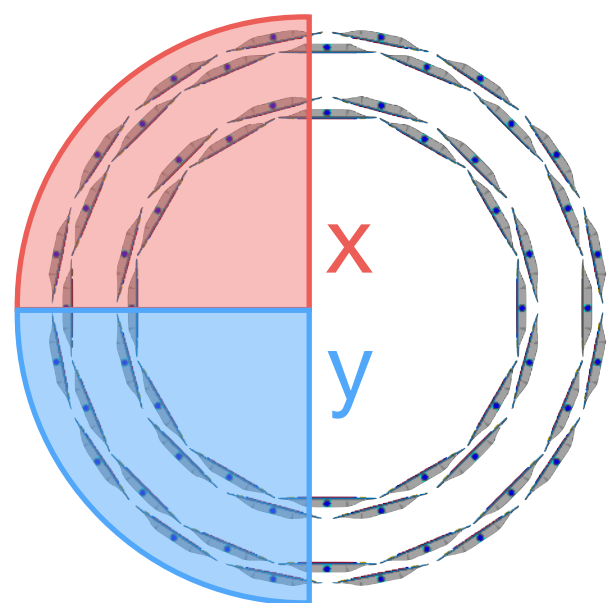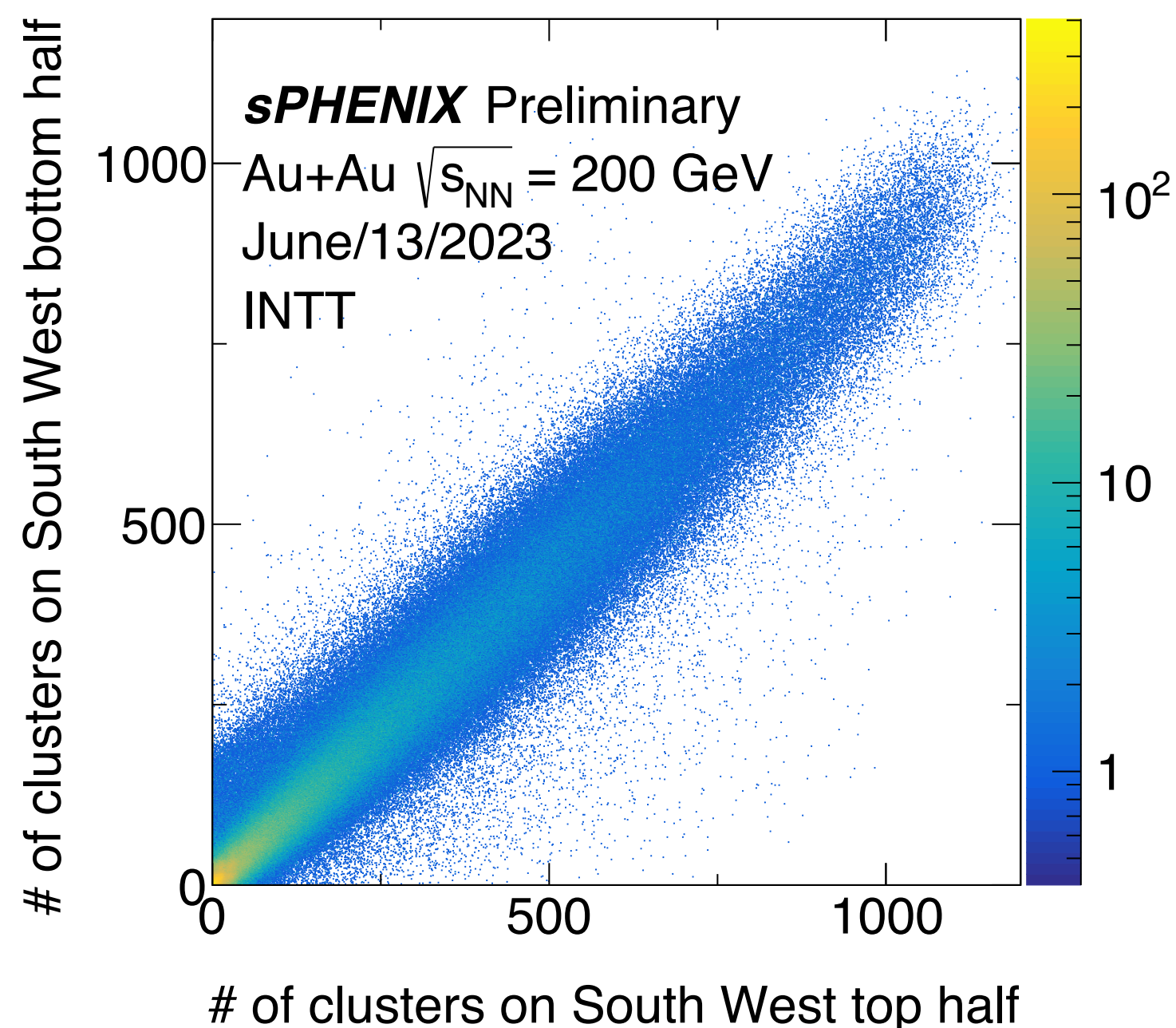- y: The number of hits of 14 half-ladders connected to INTT3

Explanation
Timing synchronization among FELIX servers is crucial for the best timing resolution over the whole acceptance. By selecting events with the same beam clock count, The plot shows the clear multiplicity correlation between the clusters of one Felix(INTT2) and that of another (INTT3). This means we see the signal from collisions.

The cross-section seen from the south side.

List of half-ladders used in this analysis

intt2		intt3	
B0L006S	B1L009S	B0L009S	B1L013S
B0L007S	B1L010S	B0L010S	B1L014S
B0L008S	B1L011S	B0L011S	B1L015S
B0L106S	B1L108S	B0L109S	B1L112S
B0L107S	B1L109S	B0L110S	B1L113S
B0L108S	B1L110S	B0L111S	B1L114S
B1L008S	B1L111S	B1L012S	B1L115S

Note: 1/4 of all ladders analyzed.

Number of Clusters Correlation Between Two FELIXs
— Confirmation of Event Synchronization—

Condition
- Date: June/05/2023
- Run: 9328
- Beam: $\sqrt{s}$ = 200 GeV, 56 × 56 bunches
- No magnetic field
- DAQ: GL1 trigger
- Parameters
  - Number of BCLK tags to be recorded: 5 [BCLK]
  - L1 Delay: 25 [BCLK]
  - Delay of the beam clock counter in the FELIX: 78 [BCLK]
  - DAC0 threshold: 15 [ch]

Axes
- x: The number of hit clusters of 14 half-ladders connected to INTT2
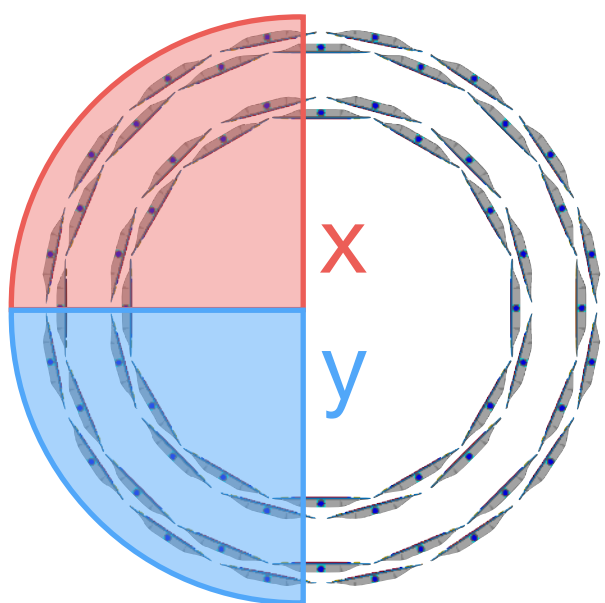- y: The number of hit clusters of 14 half-ladders connected to INTT3

Explanation
Timing synchronization among FELIX servers is crucial for the best timing resolution over the whole acceptance. By selecting events with the same beam clock count, The plot shows the clear multiplicity correlation between the clusters of one Felix(INTT2) and that of another (INTT3). This means we see the signal from collisions.

The cross-section seen from the south side.

List of half-ladders used in this analysis

intt2		intt3	
B0L006S	B1L009S	B0L009S	B1L013S
B0L007S	B1L010S	B0L010S	B1L014S
B0L008S	B1L011S	B0L011S	B1L015S
B0L106S	B1L108S	B0L109S	B1L112S
B0L107S	B1L109S	B0L110S	B1L113S
B0L108S	B1L110S	B0L111S	B1L114S
B1L008S	B1L111S	B1L012S	B1L115S

Note: 1/4 of all ladders analyzed.