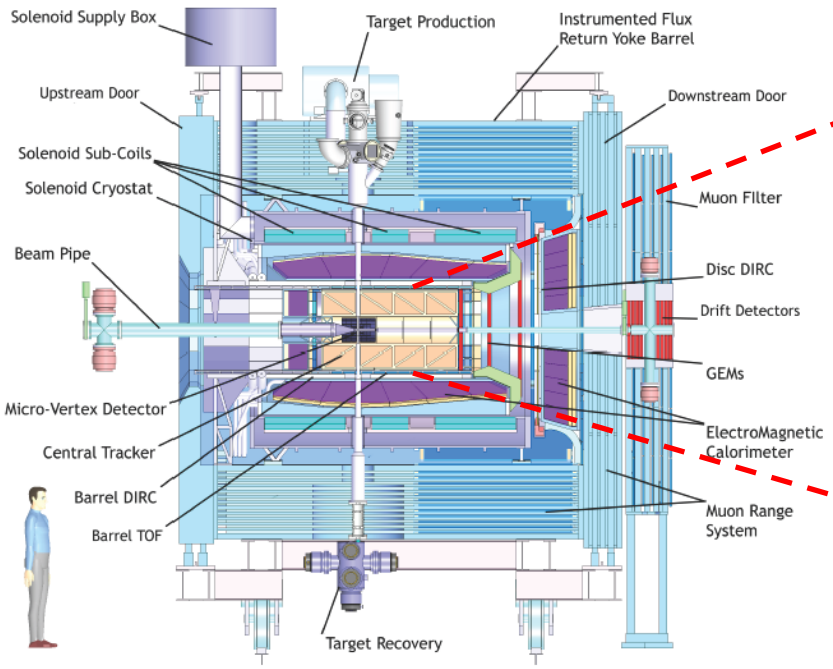
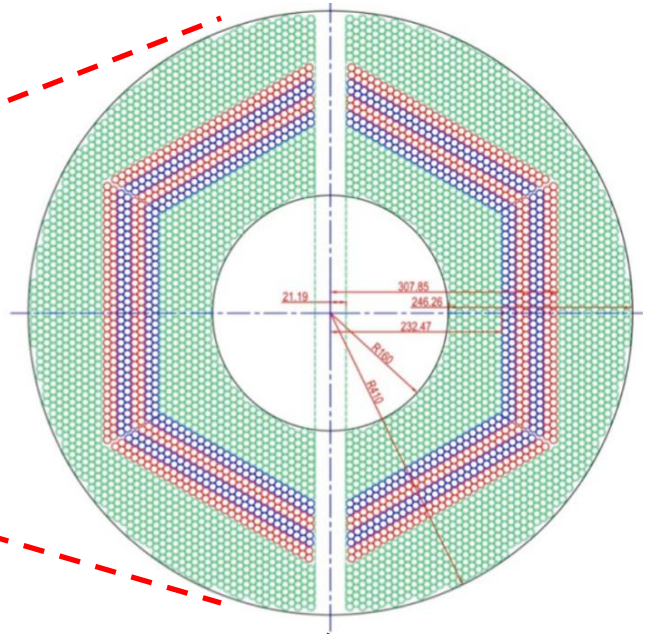
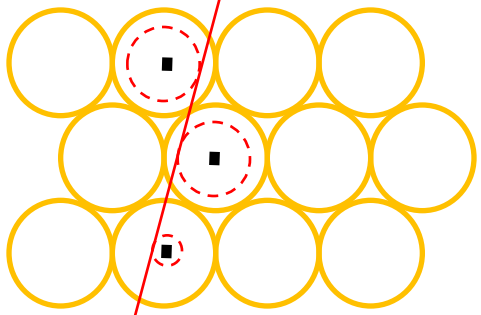
# Straw Tube Tracker(STT)



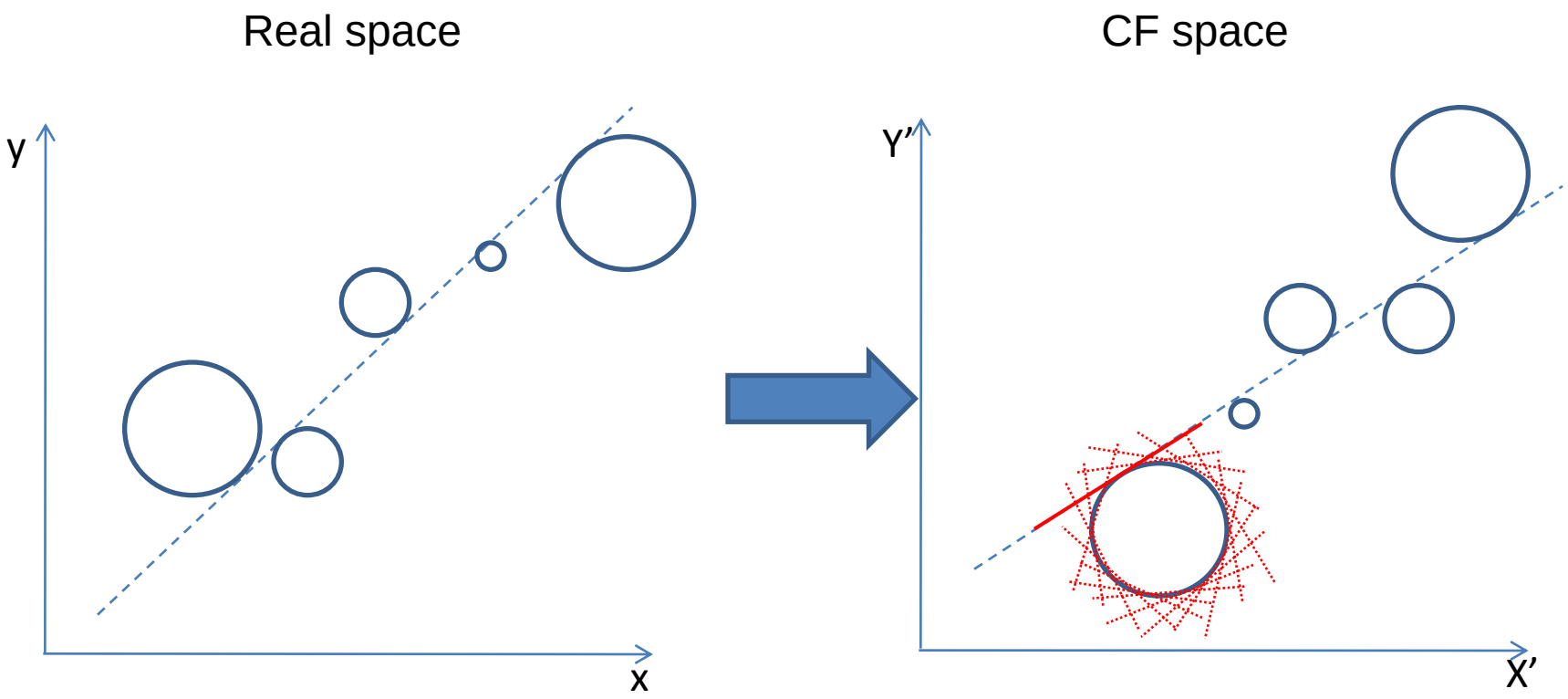



- ➢4636 Straw tubes
- ➢23-27 planar layers
- 15-19 axial layers(green) in beam direction
- 4 stereo double-layers for 3D reconstruction, with ±2.89 skew angle(blue/red)

From STT : Wire position + drift time

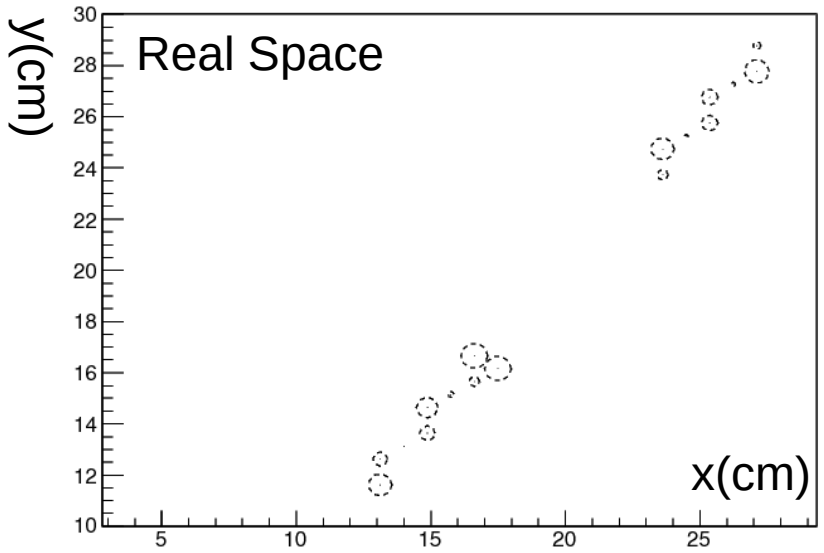
# How to include the drift circle of STT in transform?

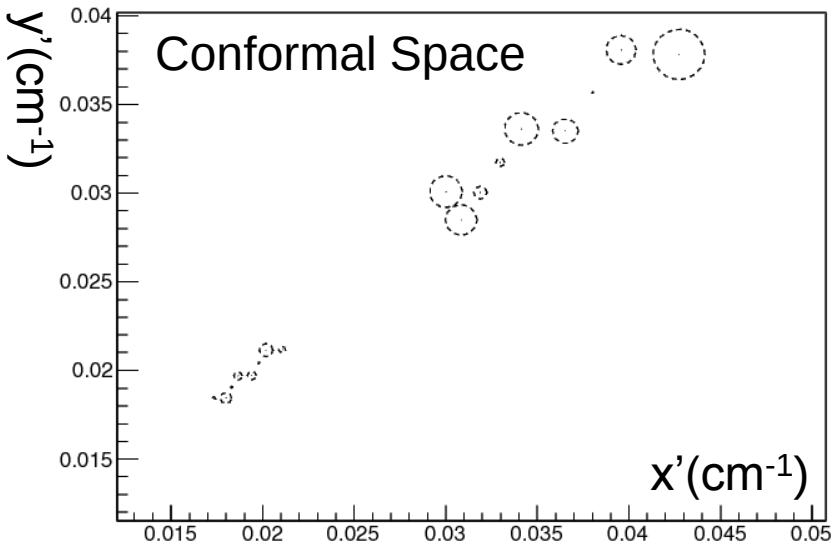


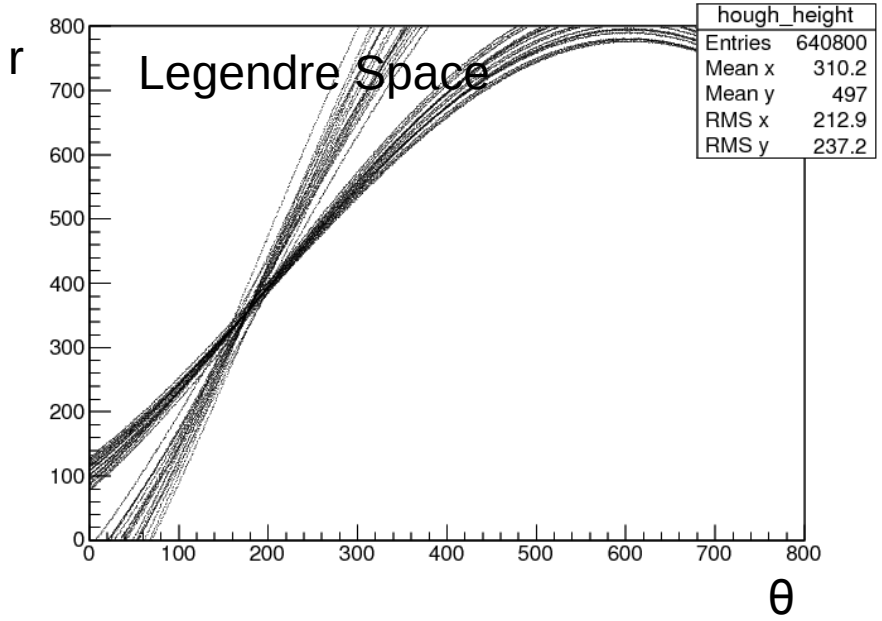

- Transform the drift circle to CF space.
- Draw lines around the “circle” in CF space.
- Fill the line parameter into the Hough space.

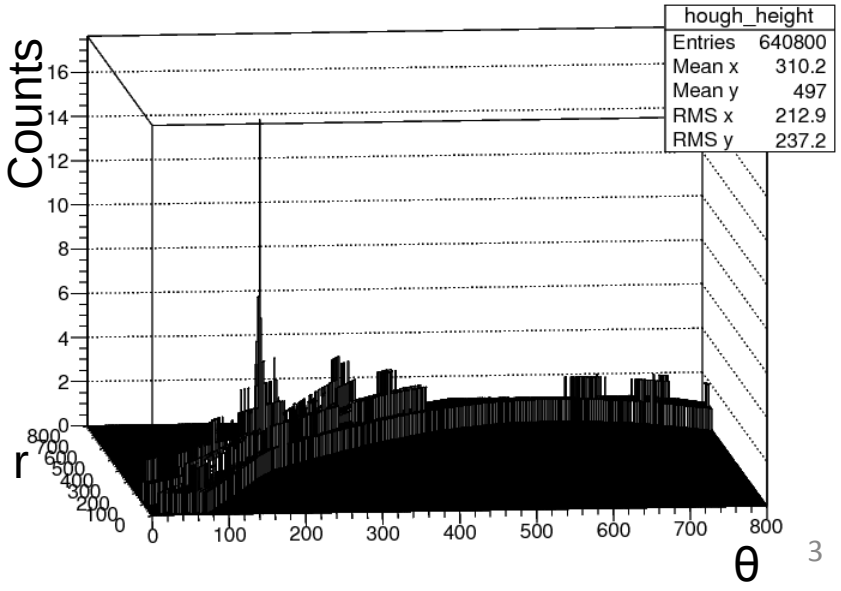
Legendre transformation

# A look at one example event

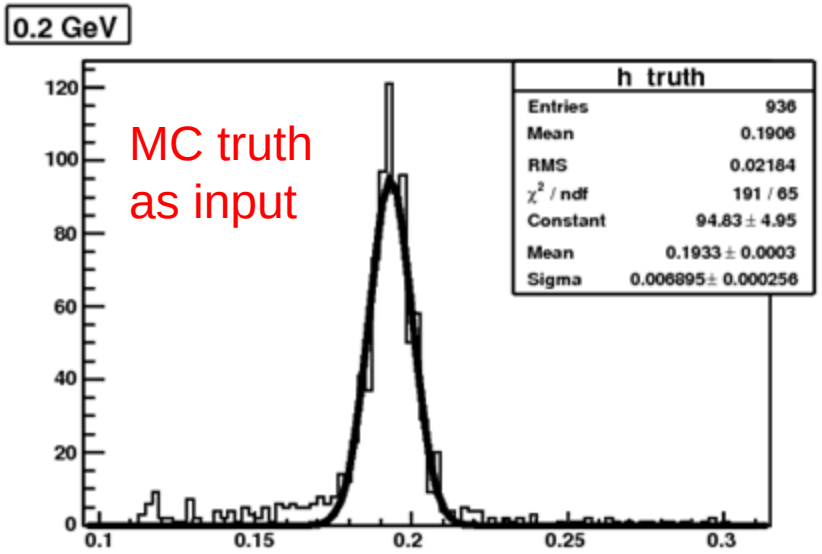


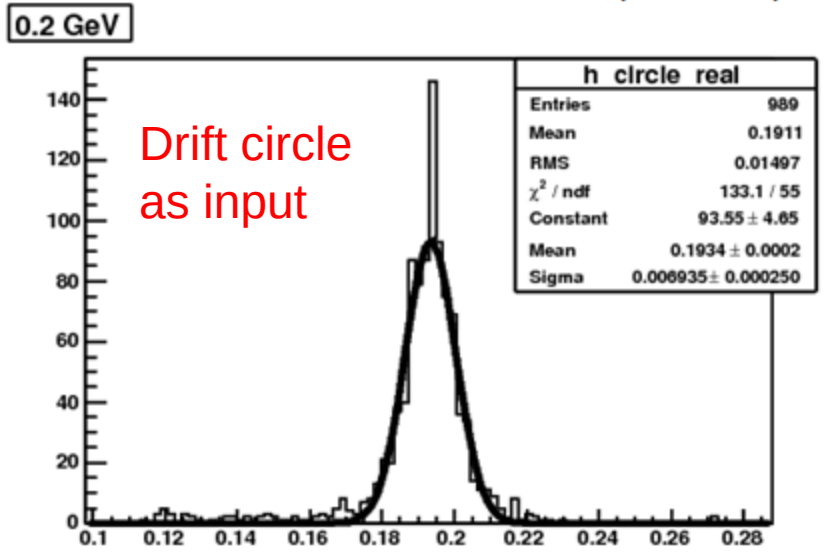



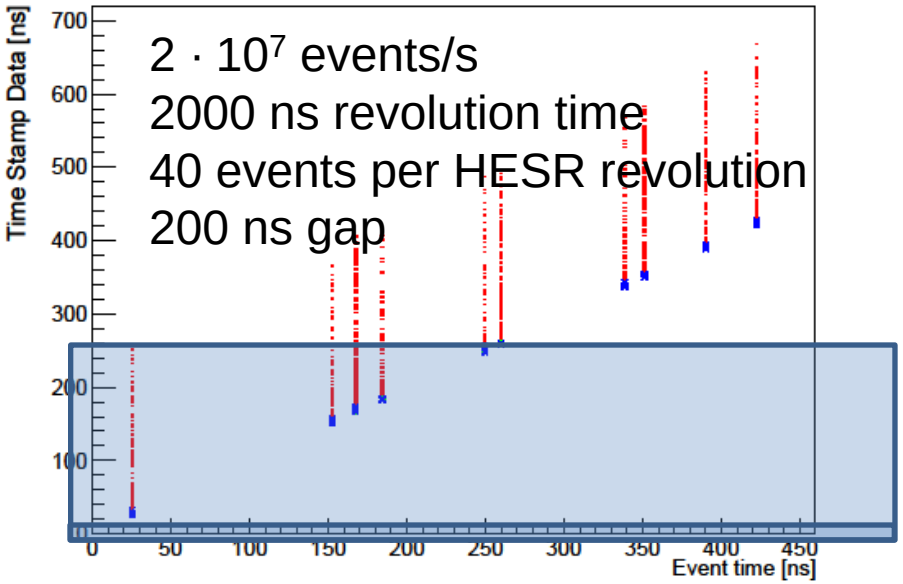
# Momentum resolution



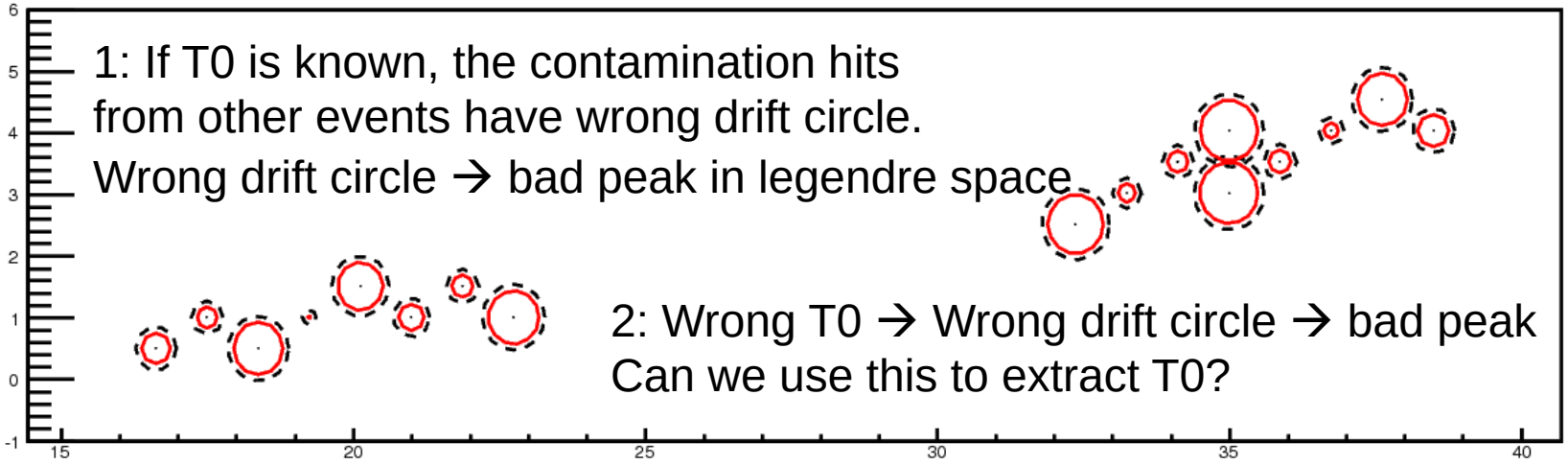

| σ: | 0.2 GeV/c | 1 GeV/c | 2 GeV/c |
|---|---|---|---|
| Truth: | 3.45% | 3.685% | 5.0% |
| Realistic: | 3.47% | 3.694% | 5.3% |

# Can we extract the event start time?




- Need fast detector to provide T0.
- With T0, are the overlapped hits problem?

T0 + 220ns window size

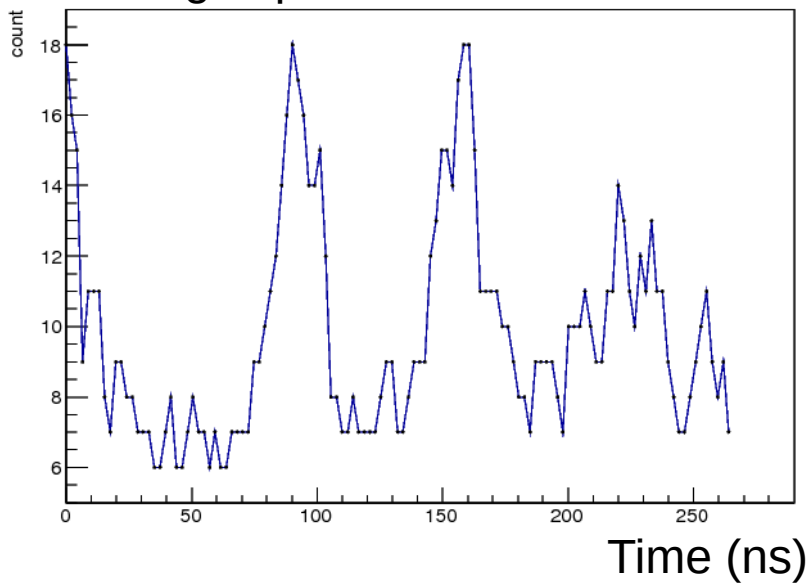


# T0 extraction

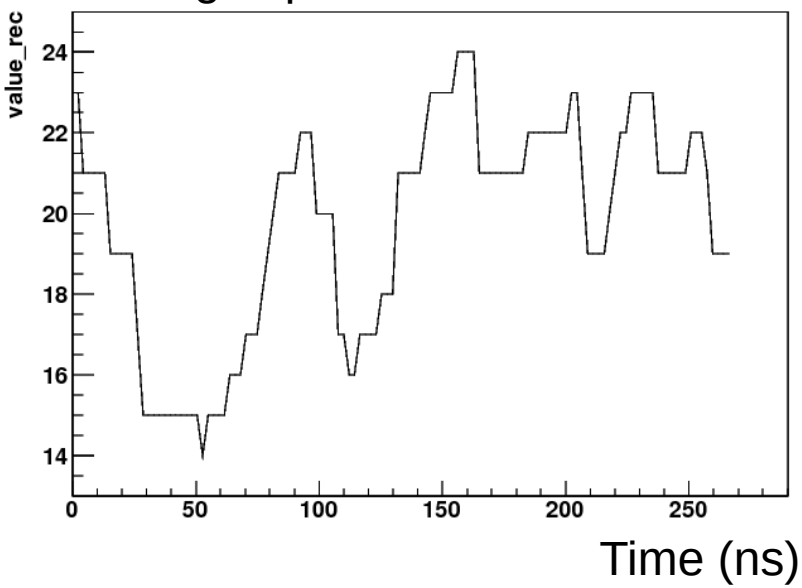
Time based simulation:
1) 4 events (single track) in one burst.
2) T0 (0, 90,160, 220) ns

T0 scan with tracking algorithm:
Step size: 2ns

C++
Hough space: 800 X 800

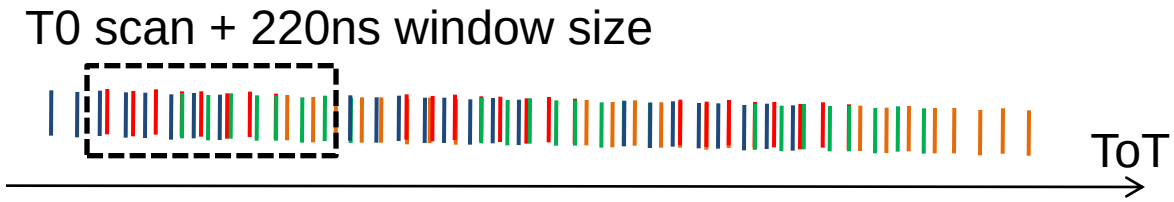



VHDL with ISim
Hough space: 128 X 128

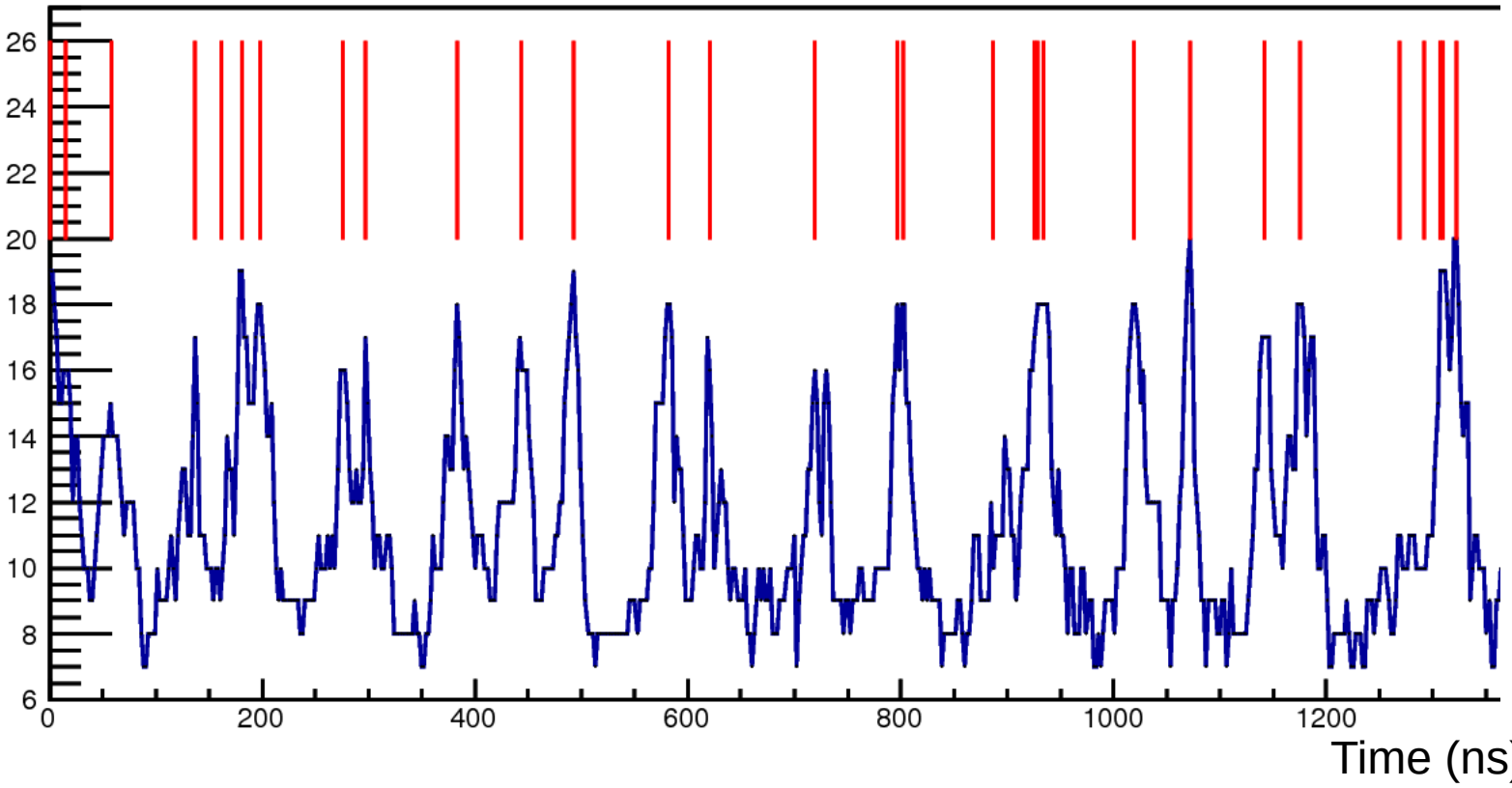


# T0 extraction — for large burst

If large burst:




Time based simulation of one burst with 50 events



# Summary and Outlook

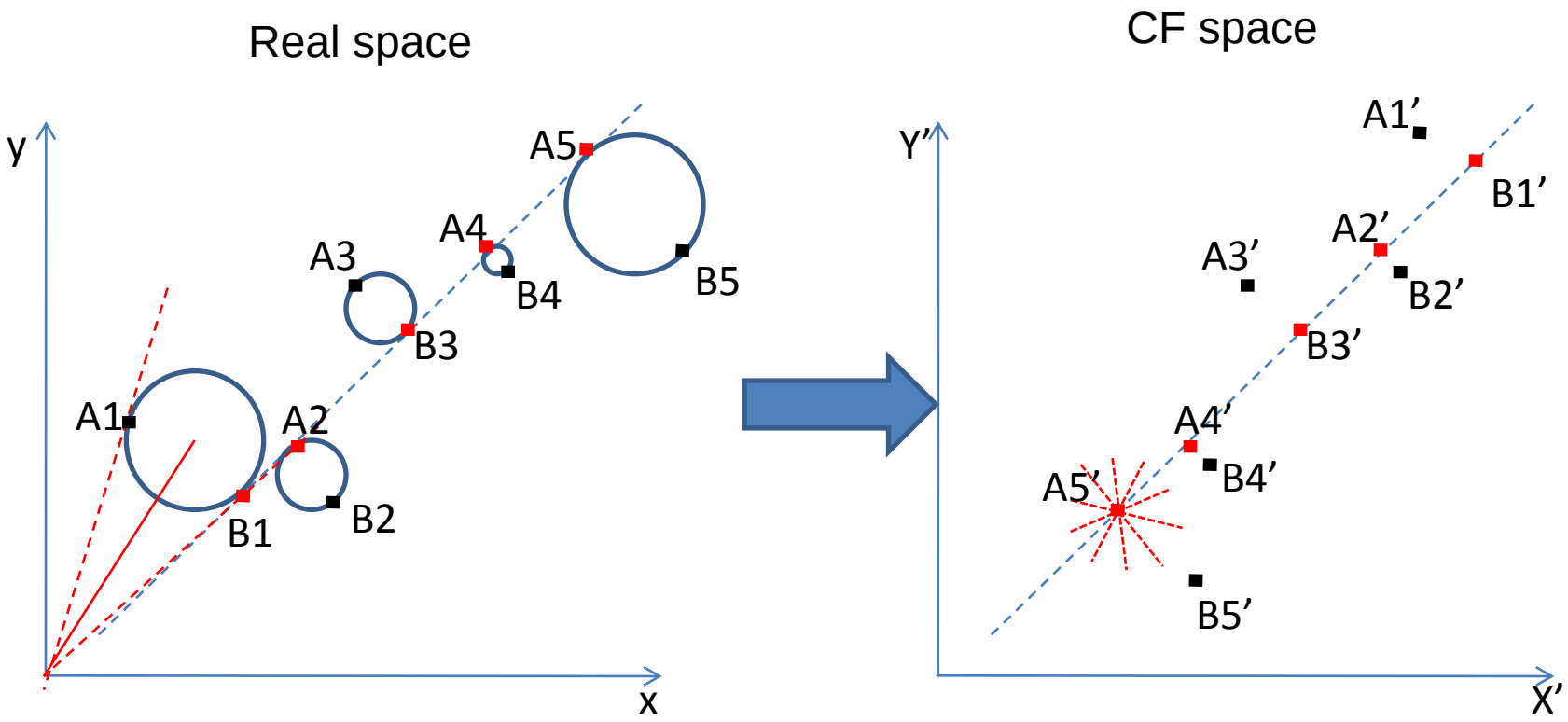
- Legendre transformation is used to handle the drift circles of STT. The performance is optimistic. More studies are needed.

- If T0 is provided, the contamination hits from the overlapped events have wrong radius and are not problem.

- T0 extraction using tracking algorithm is studied. “T0 scan” is feasible to extract T0. The problem is the dramatically increased computing time.

Thank you

# Previous method of Pt reconstruction with STT




- Pick up two points around the drift circle.
- Transform these two points to CF space.
- Draw lines around each point in CF space.
- Fill the line parameter into the Hough space.

Problem:
Bad for low momentum.

If T0 is known:
For each T0, all hits within the 220ns window size need to be considered.
Assume, we have 100 hits in this window, 2 clock-cycle per hit.

100 hits * 2 = 200 clock-cycle per event

If T0 is unknown:
We need a T0 scan.
Assume a step size of 2ns, average time between two events of 50ns.

(200 clock-cycle per event) * 50ns/2ns = 5000 clock-cycle per event