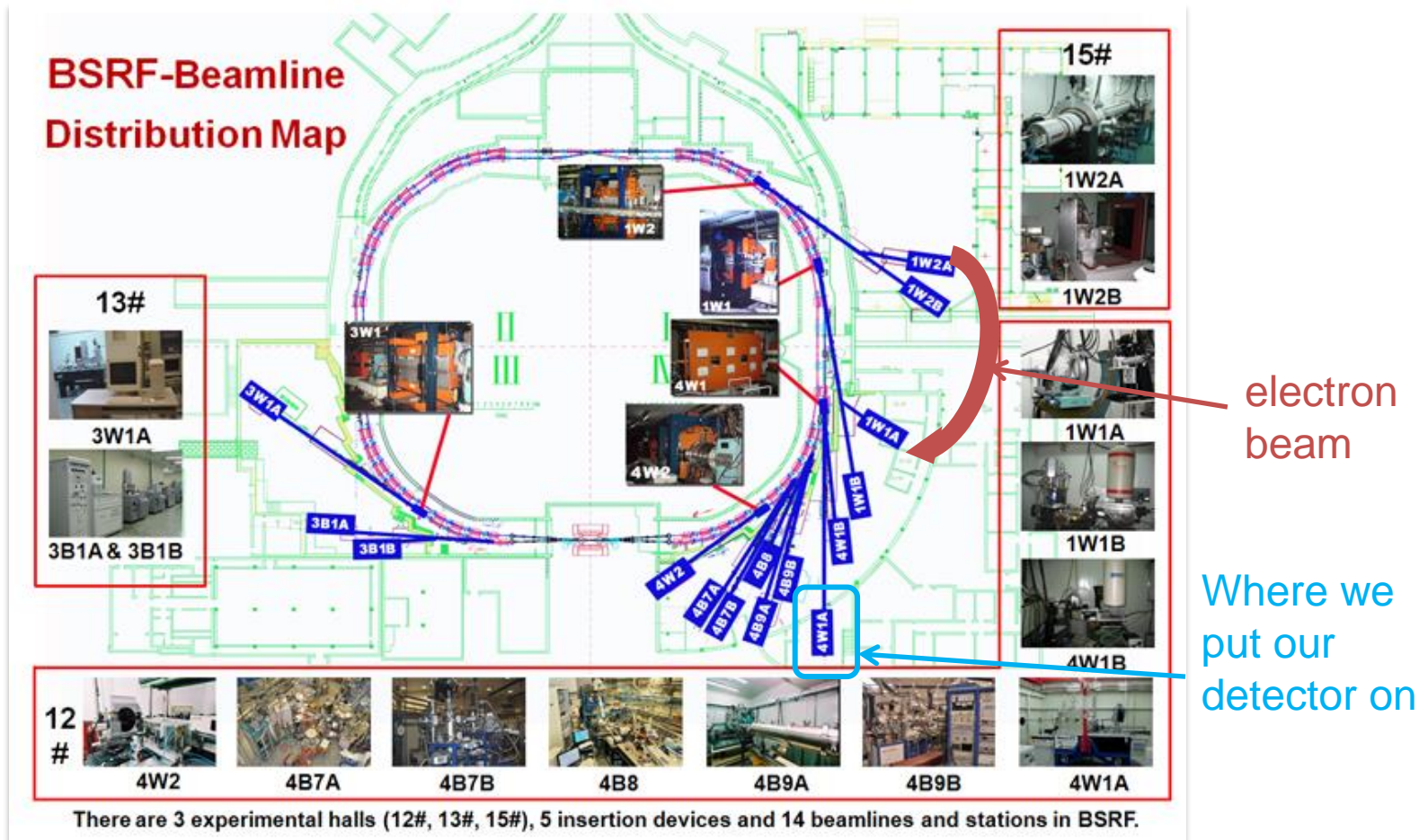


# Test Beam opportunity on BSRF

Yongsheng Huang, Zhijun Liang, Mengzhao Li, Bo Liu



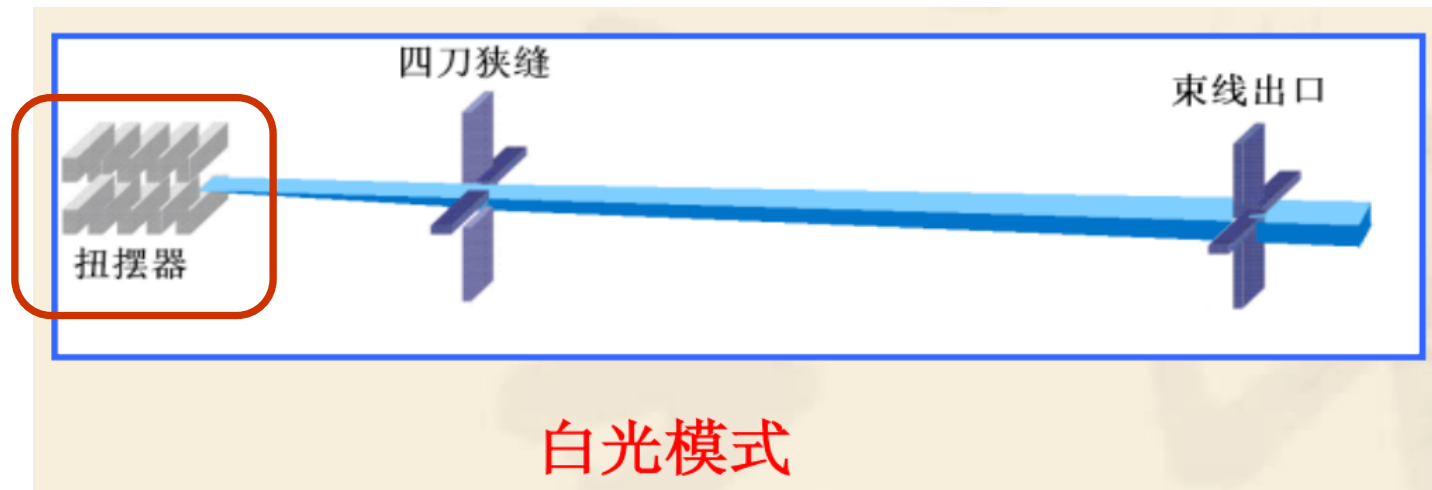
# Brief Introduction of BSRF



Currently, there are 3 experimental halls, 5 insertion devices, 14 beamlines and 14 experimental stations at BSRF. The synchrotron radiation light of BSRF covers the energy from vacuum ultraviolet to hard X-ray.

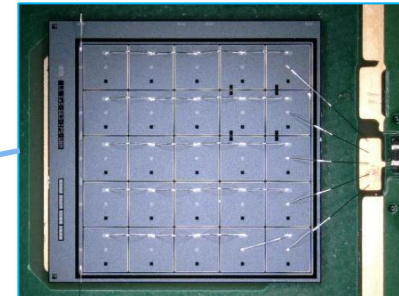
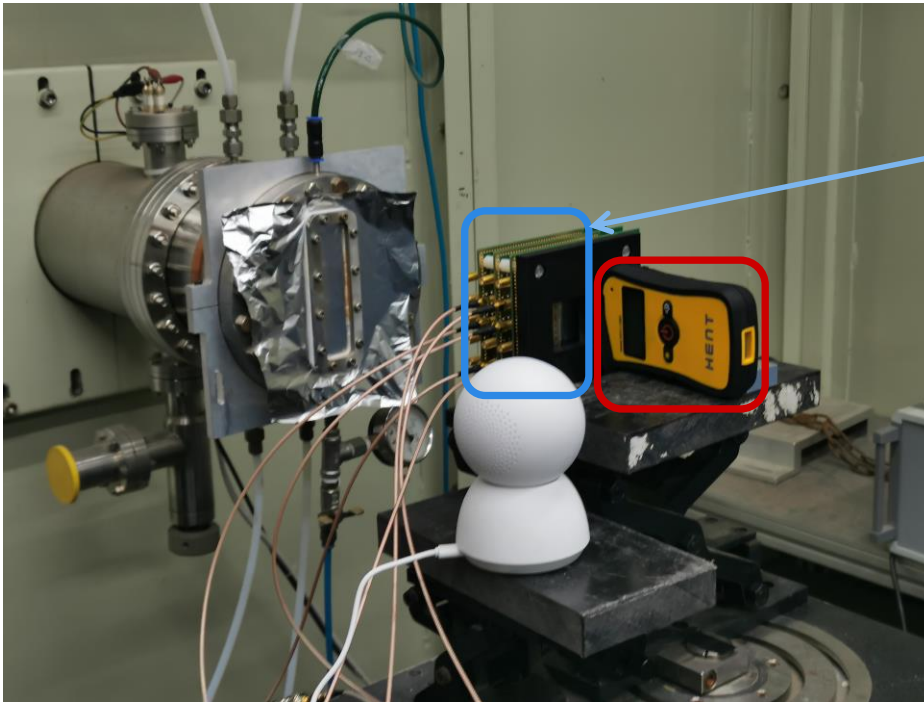
# Experiment Setup

- Setup silicon detector in BSRF line 4W1A
  - Along tangent line for BEPC
  - About 40m away from beam deflexion point
  - No magnet on **wiggler**
    - Not a standard x-ray operation status
    - Expected no x-ray in beam line



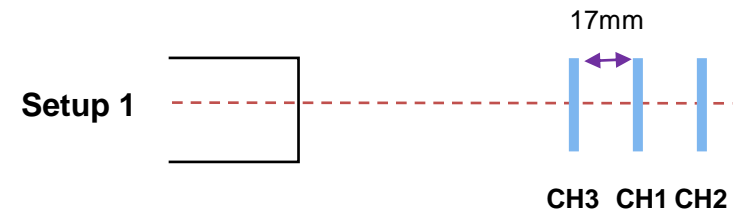
# Detectors

- Three layers of LGAD sensors (silicon) with active area of 6.5mm x 6.5mm
- Setup **dosimeter** for instant radiation dose measurement

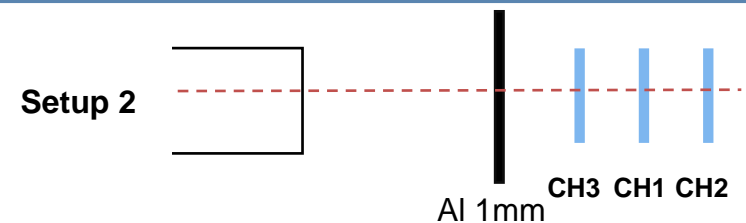


**CH1:** HPK type3-1 W37 P107 5\*5 **73.3ps@ 200V** 6.5mm\*6.5mm  
**CH2:** HPK type3-1 W37 P80 5\*5 **56.5ps@ 200V** 6.5mm\*6.5mm  
**CH3:** IHEP-IME W8-IV-E4-L4-15\_100 **41.2ps@ 180V** 3mm\*3mm

Use amplifier with gain=100



- CH3, **high event rate (Trigger on CH3)**
- CH1 & CH2 low event rate

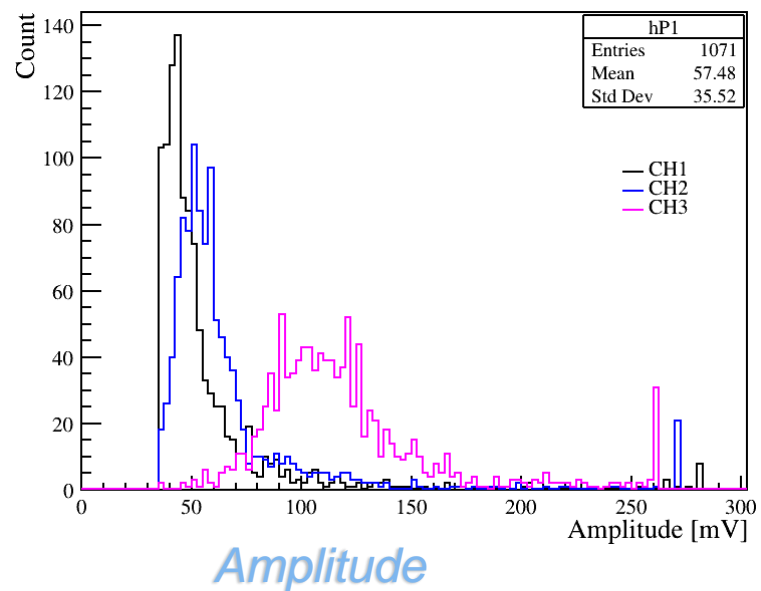
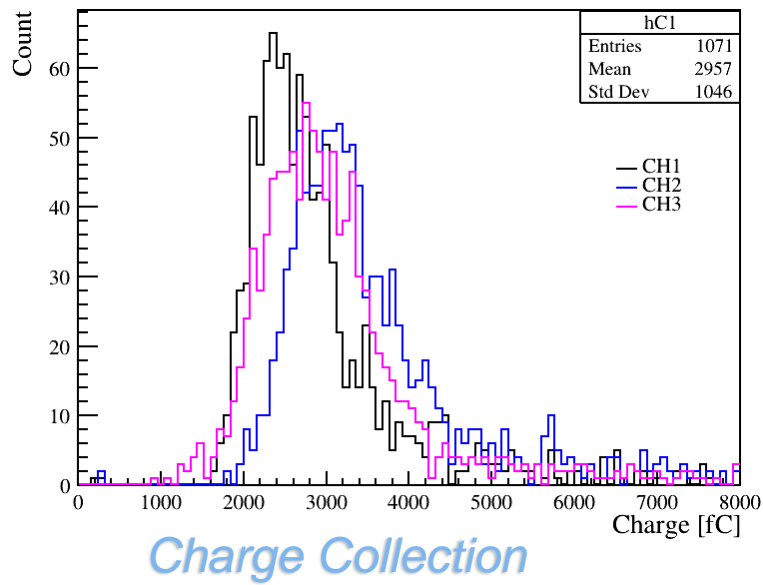
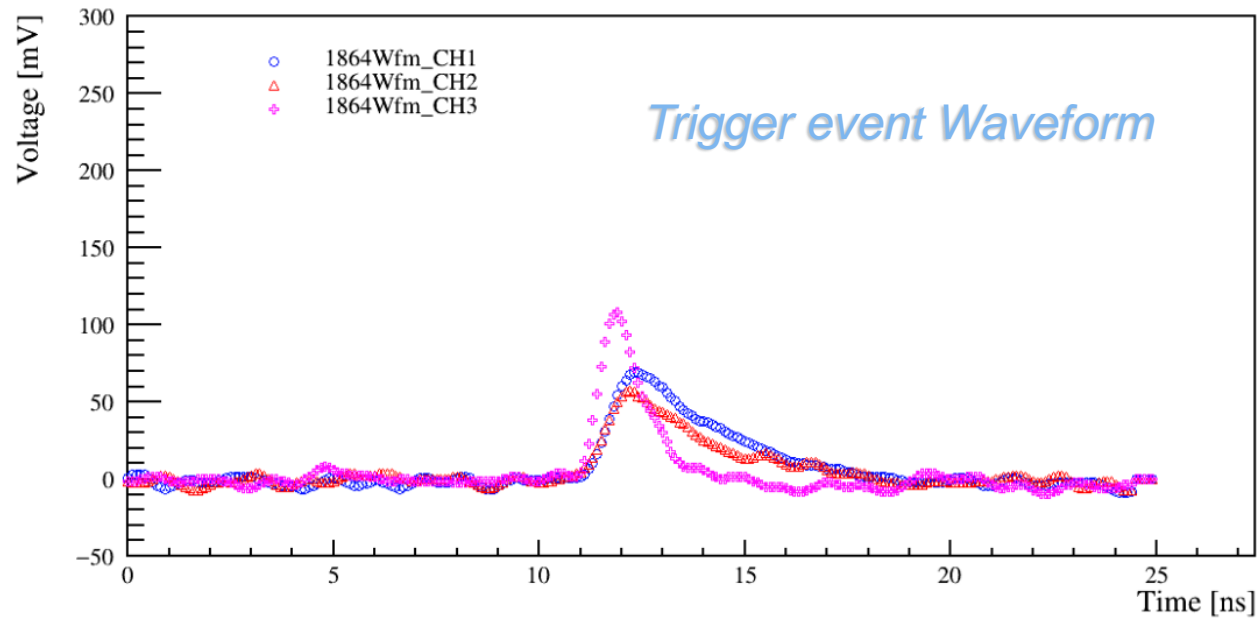


- CH3 & CH1 & CH2 **low event rate (Trigger on CH1)**
- Al 1mm -> 6mm, **event rate not changed** <sup>4</sup>

# Running summary

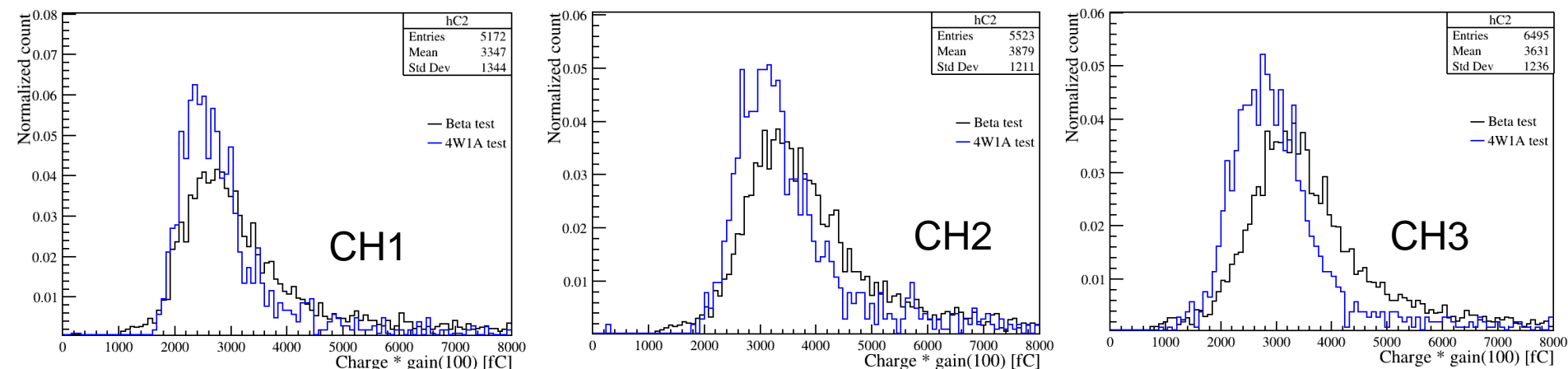
- Taking data with BEPC collision run ( $E_e=2.3765$  GeV)
- Setup since last Saturday, data taking until last night
- Instant radiation dose:
  - $10\mu\text{Sv/h}$  ( 200 times than background level  $\sim 0.05\mu\text{Sv/h}$ )
  - Almost no change with 6mm aluminum shield
  - First guess would be high energy electrons leaked from tunnel
- Event rate from LGAD detector is about 1Hz (**Low rate setup**)
  - Rate does not change with 6mm aluminum shield
  - Signal peak like single electron
- Extremely high rate event triggered on first layer (CH3)
  - Can not pass 1mm aluminum shield (even aluminum foil+sensor+PCB)
  - Not clear the origin and type

# Results (Low Rate)

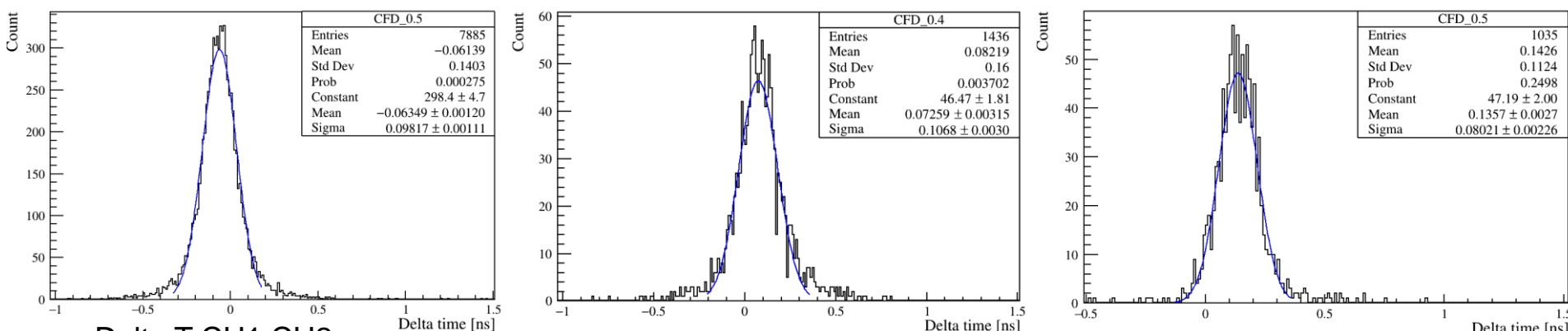


# Results (Low Rate)

Compared charge collection to beta source test results



Compared time resolution (Delta T) to beta source test results



Delta T CH1 CH2  
Sigma 98.2ps

92.5ps (beta source)

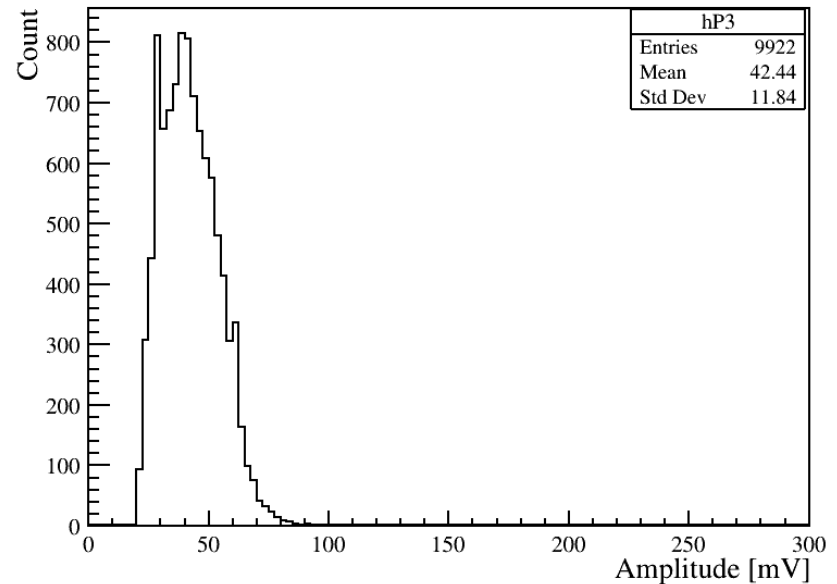
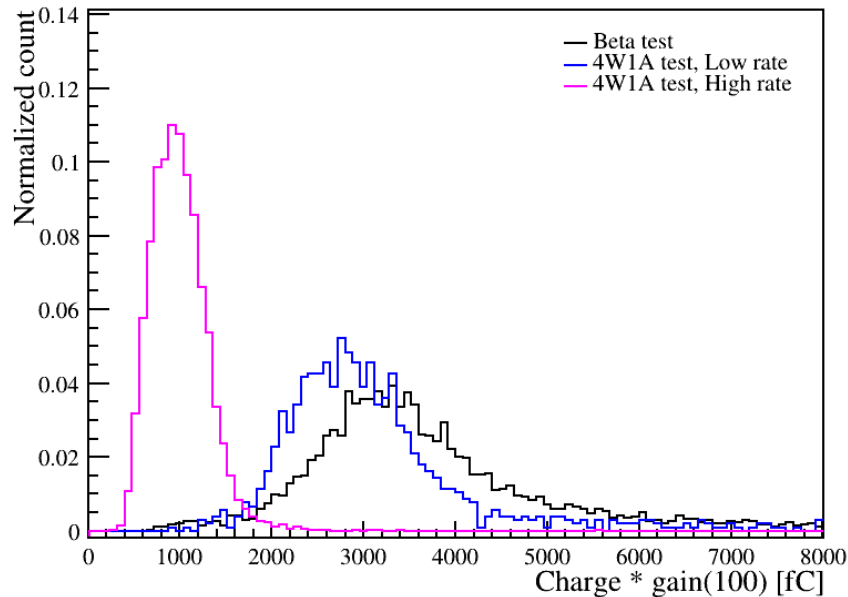
Delta T CH1 CH3  
Sigma 106.8ps

84.1ps (beta source)

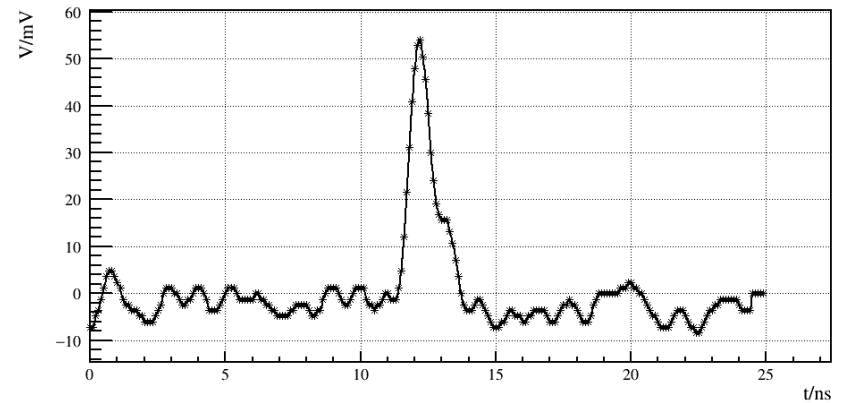
Delta T CH2 CH3  
Sigma 80.2ps

70.0ps (beta source)

# Results(High Rate)



- Only CH3 triggered with High rate events
  - First Layer
- Relative low charge collection and amplitude
- No sure the origin (X-ray? low energy secondary particles?)



# Summary

- With LGAD sensor, we detected high energy charged particles in 4W1A X-ray imaging station in BSRF
  - Those particles can be high energy electrons (2.3765 GeV) leaked from BEPC tunnel.
  - Obtain a reasonable event rate (1Hz)
    - 4W1A station is about 40m away
    - Currently using very small active area LGAD sensor (6.5x6.5mm<sup>2</sup>)
  - Better to have a closer station to confirm detected results
- It's a great opportunity to have the test beam facility setup using leaked electron from BEPC for CEPC silicon tracker and calorimeter projects.