CDEX-1B Data Analysis Status

- ✓CDEX-1B System setup
- ✓Background Spectrum
- ✓Pulse Shape Discrimination
- ✓Summary

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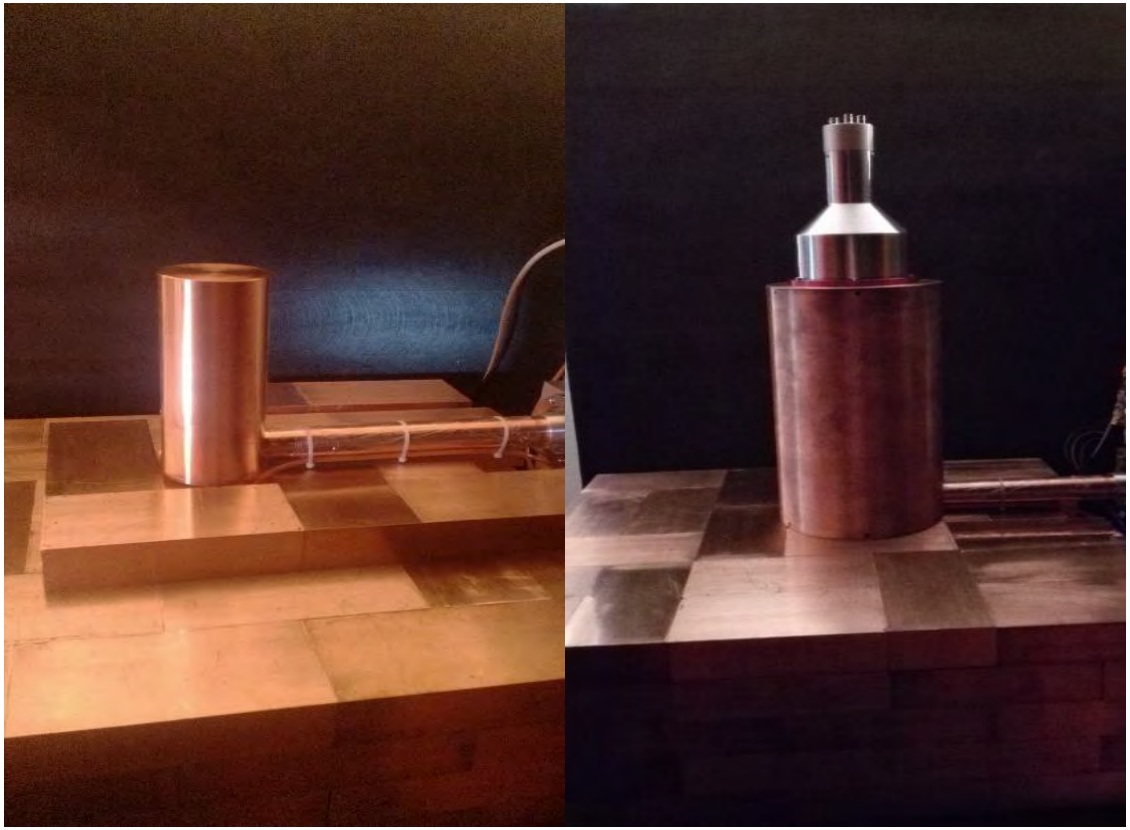
Oct. 21, 2015

Sino-German GDT symposium @Ringberg Castle

CDEX-1B: the second P-PCGe detector

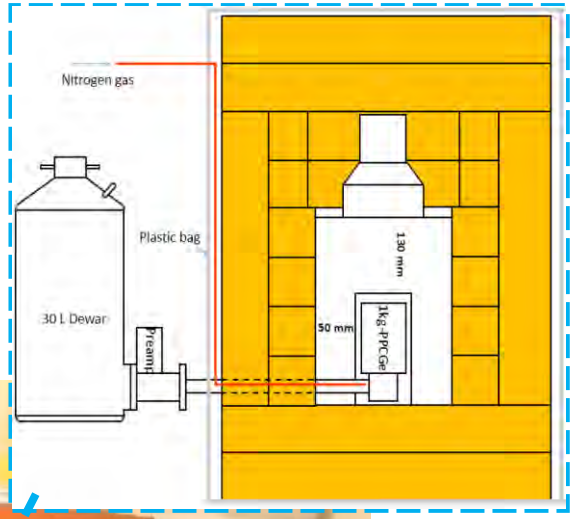
- ✓ CDEX-1A: Large-mass p-PPCGe “prototype”
- ✓ CDEX-1B: Improved to get lower energy threshold;
- ✓ Study the background source, for further depressing background level.

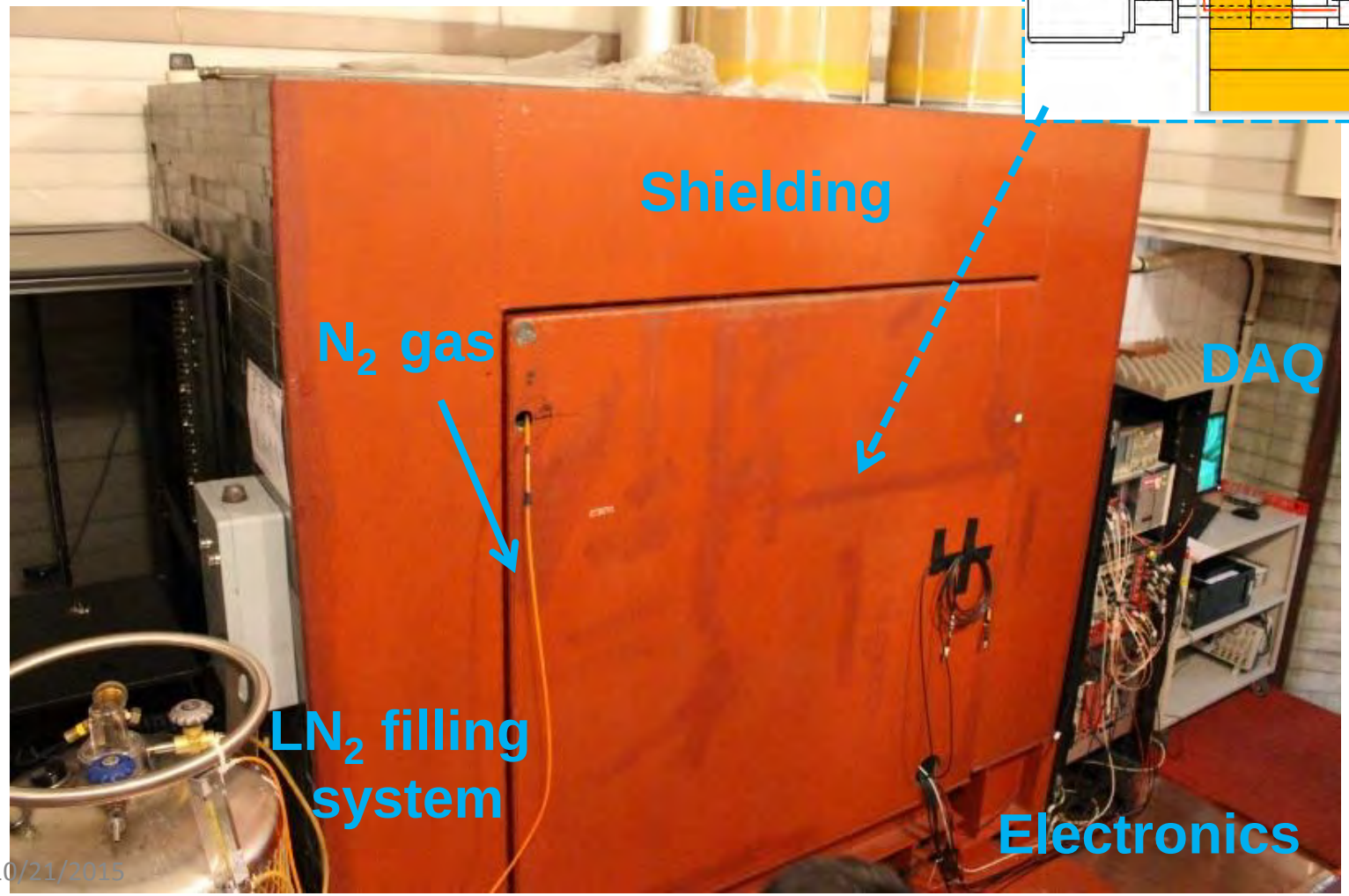
- Crystal type： p-type
- Diode: $\phi 62 \times 62mm$
- Total Mass: 994g
- Pulse feedback charge sensitive preamplifier
- Active shielding technology: Low-level radioactive, low threshold NaI(Tl) as anti-Compton detector



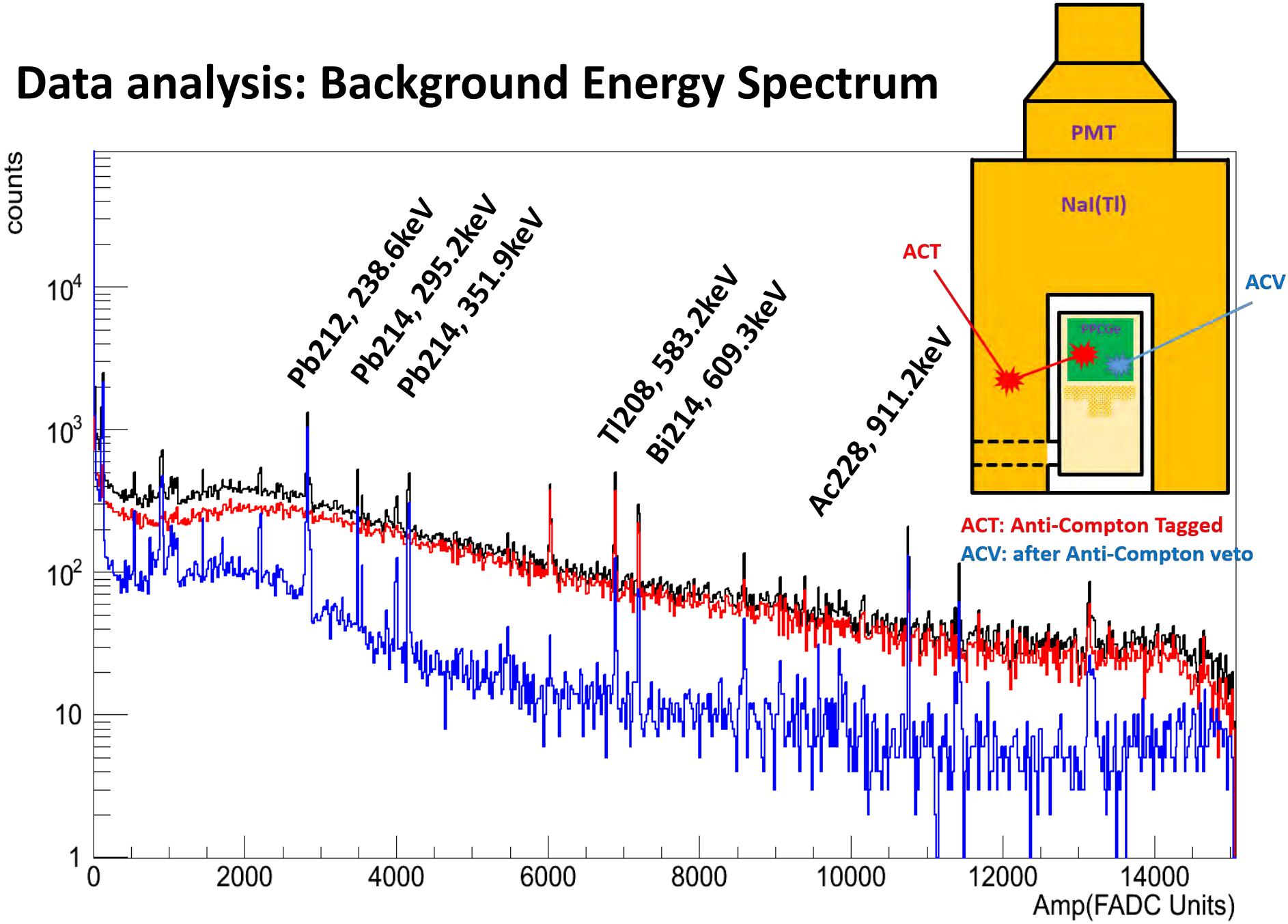
CDEX-1B: Shielding System

Rock →	PE →	Pb →	PE(B) →	Cu →	NaI
2400m	1m	20cm	20cm	20cm	~5cm



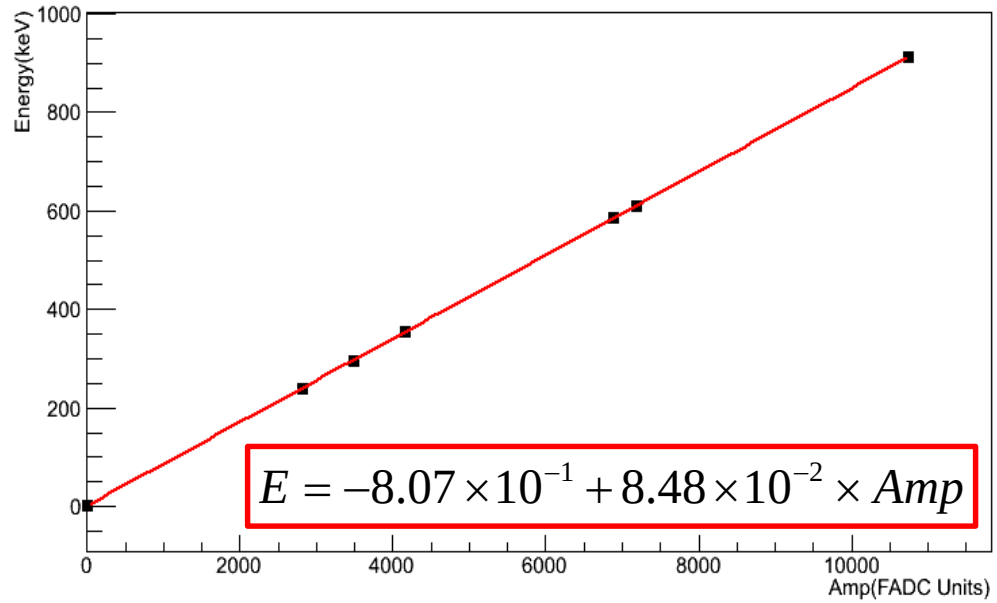


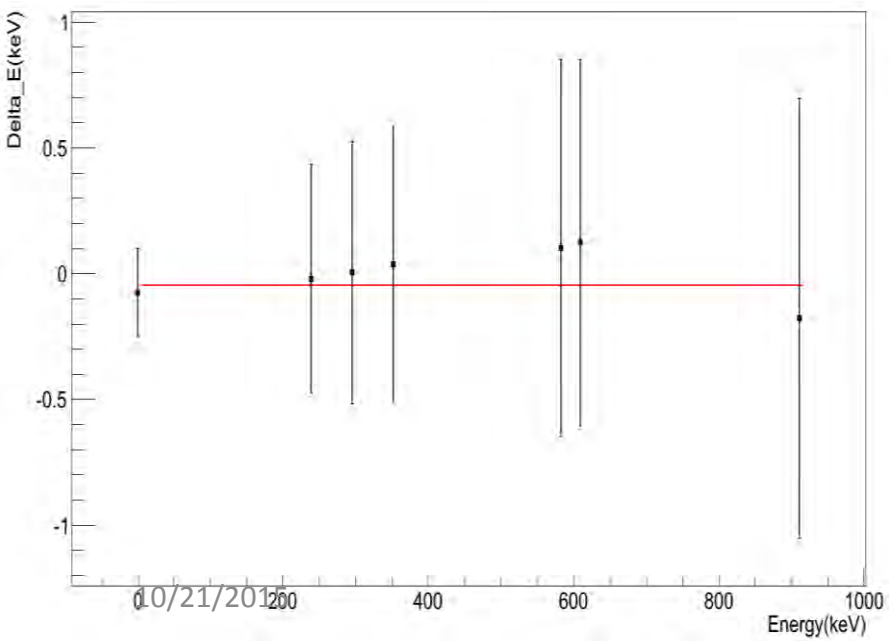
Data analysis: Background Energy Spectrum

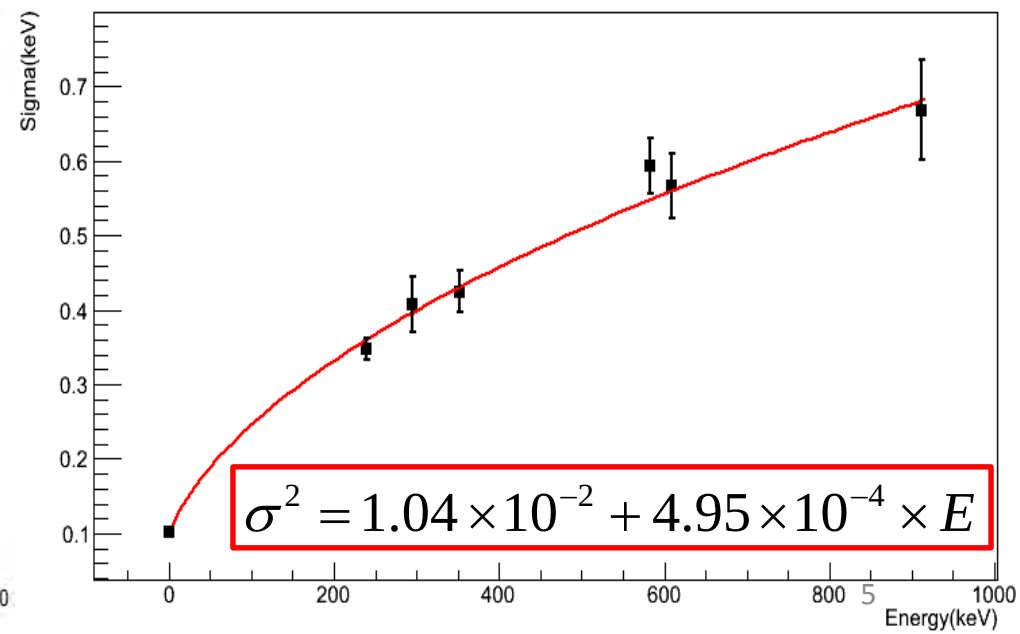


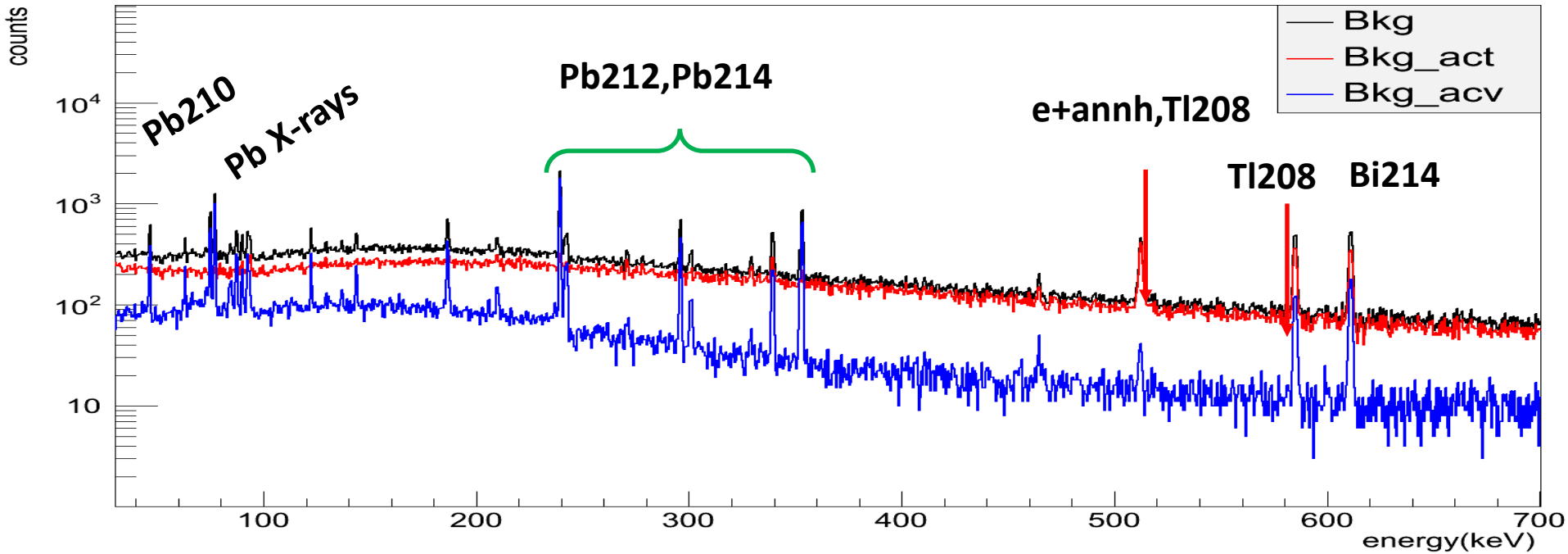
Data analysis: Energy Calibration

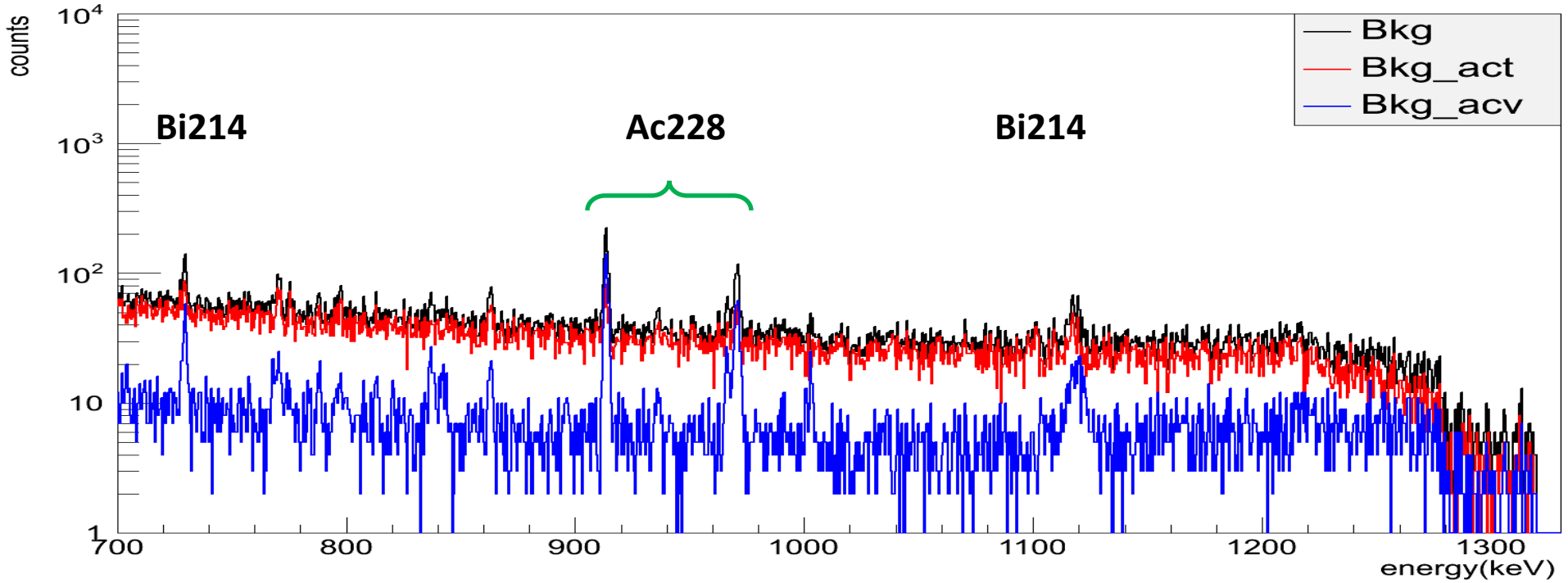
Source	True Energy(keV)
Pb212	238.6
Pb214	295.2
Pb214	351.9
Tl208	583.2
Bi214	609.3
Ac228	911.2





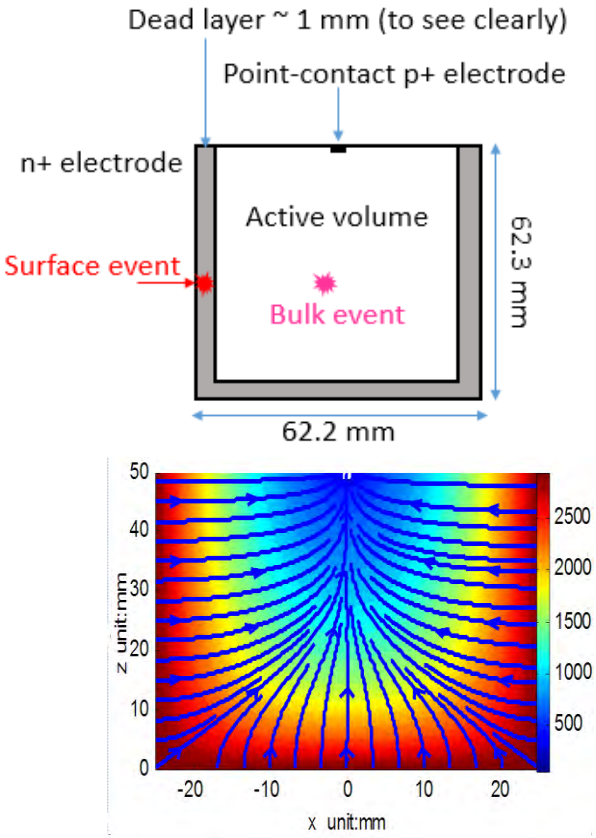


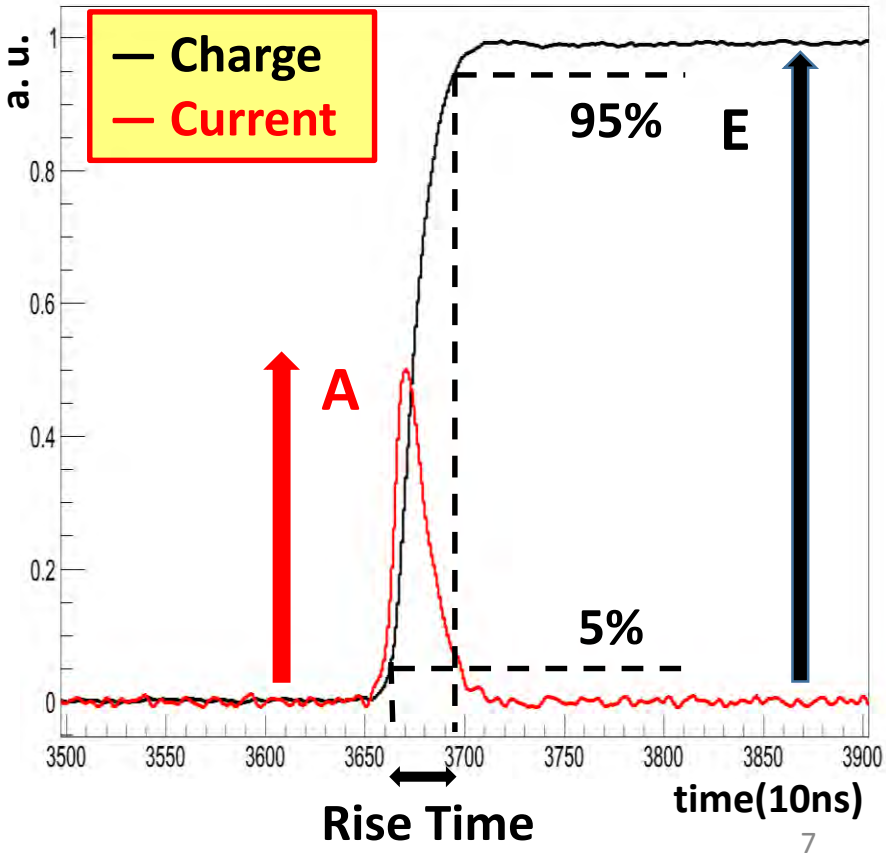

counts
Bkg
Bkg_act
Bkg_acv
Pb210
Pb X-rays
Pb212,Pb214
e+annh,Tl208
Tl208
Bi214
energy(keV)

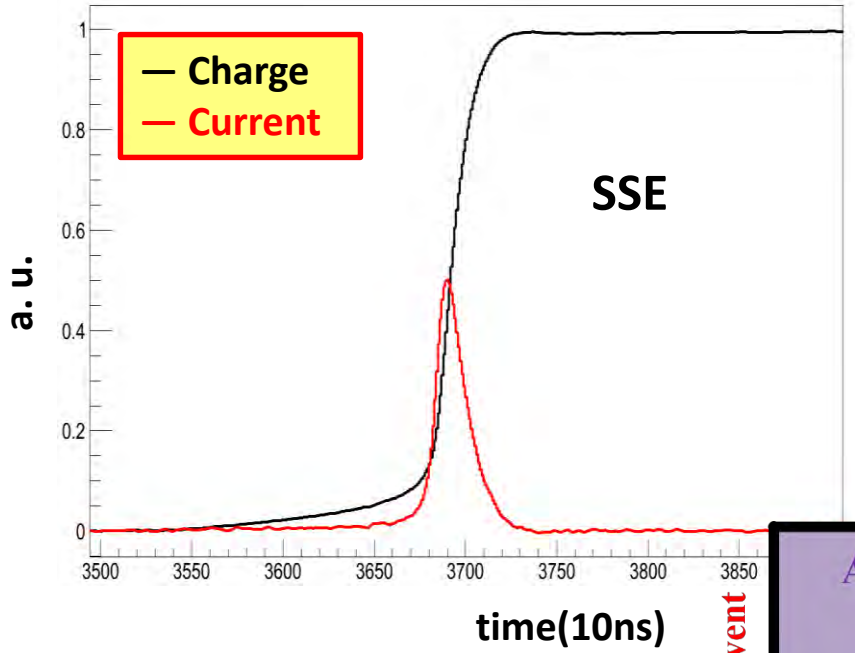

counts
Bkg
Bkg_act
Bkg_acv
Bi214
Ac228
Bi214
energy(keV)

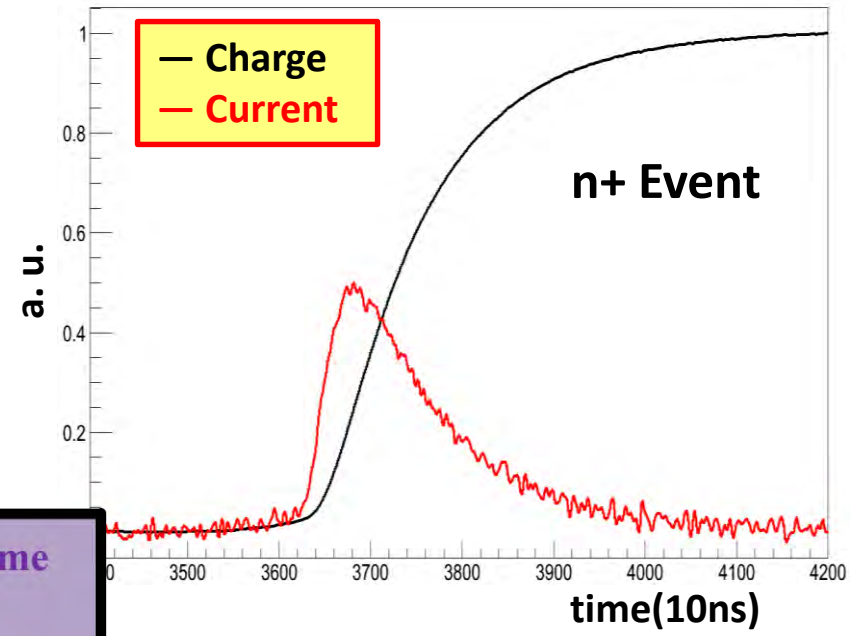
PSD: Parameter Definition

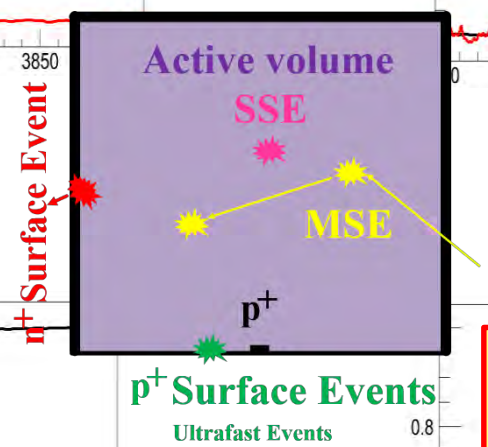
- **Rise Time:** time width of 5% - 95% amplitude of charge pulse
- **A:** amplitude of current pulse
- **E:** energy calibrated with amplitude of charge pulse

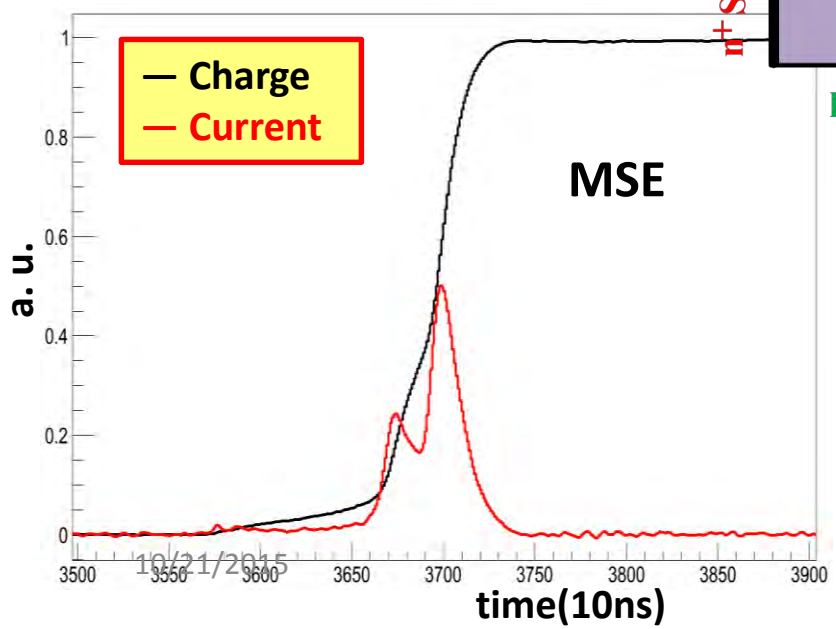


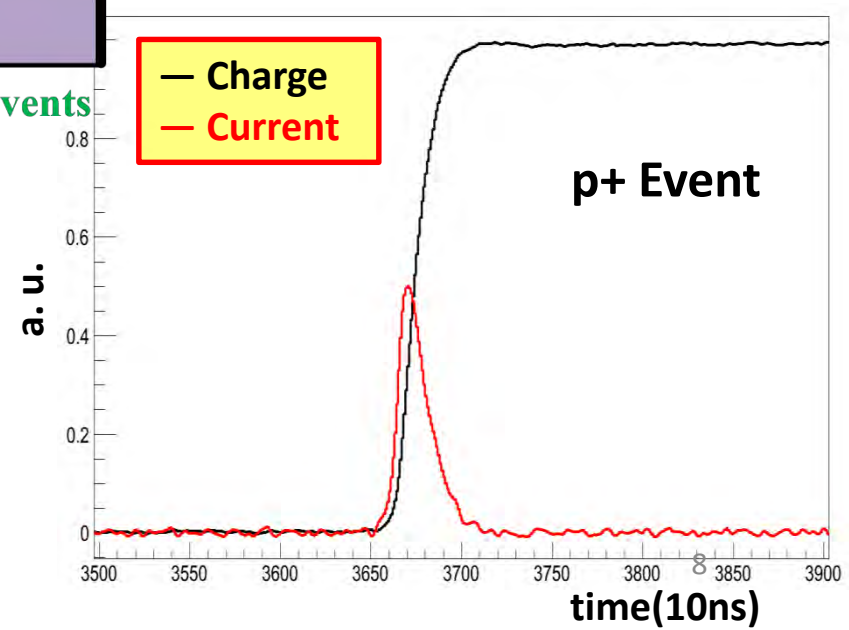



— Charge
— Current
SSE
a. u.
time(10ns)

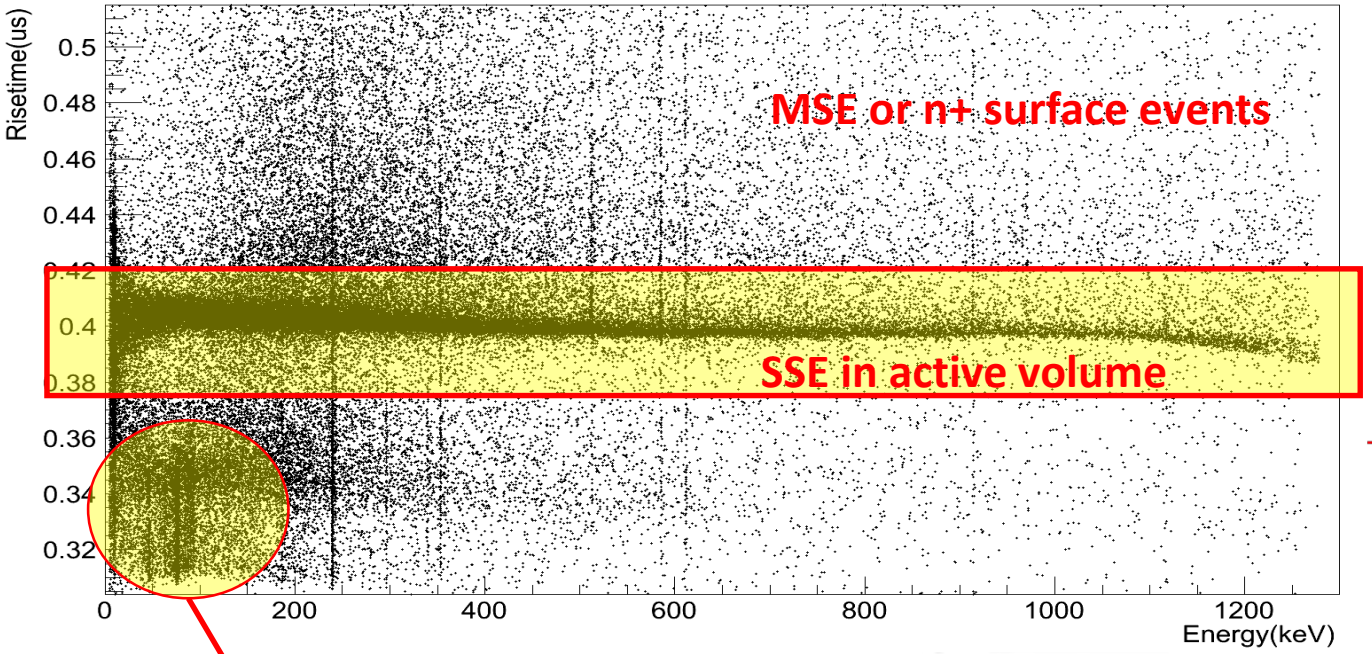

— Charge
— Current
n+ Event
a. u.
time(10ns)

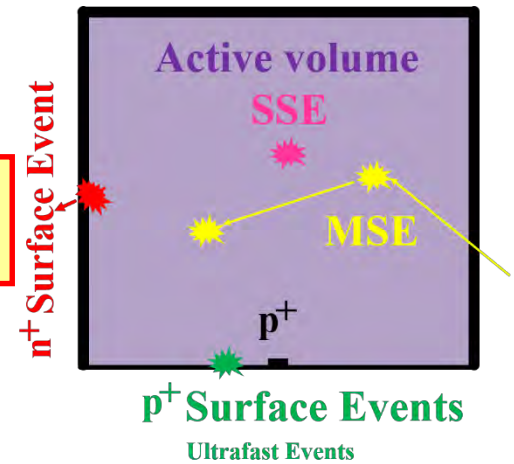

Active volume
SSE
MSE
n+ Surface Event
p+
p+ Surface Events
Ultrafast Events

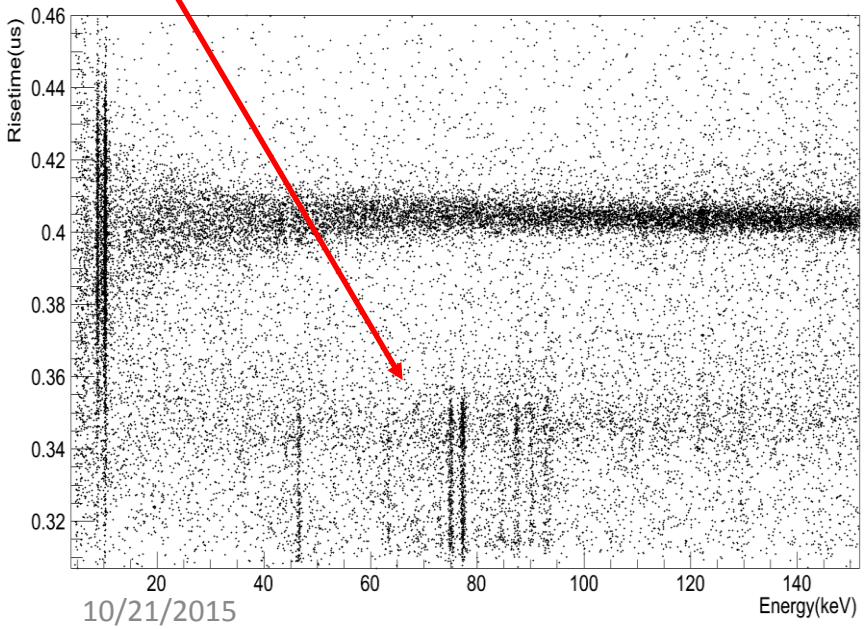

— Charge
— Current
MSE
a. u.
time(10ns)

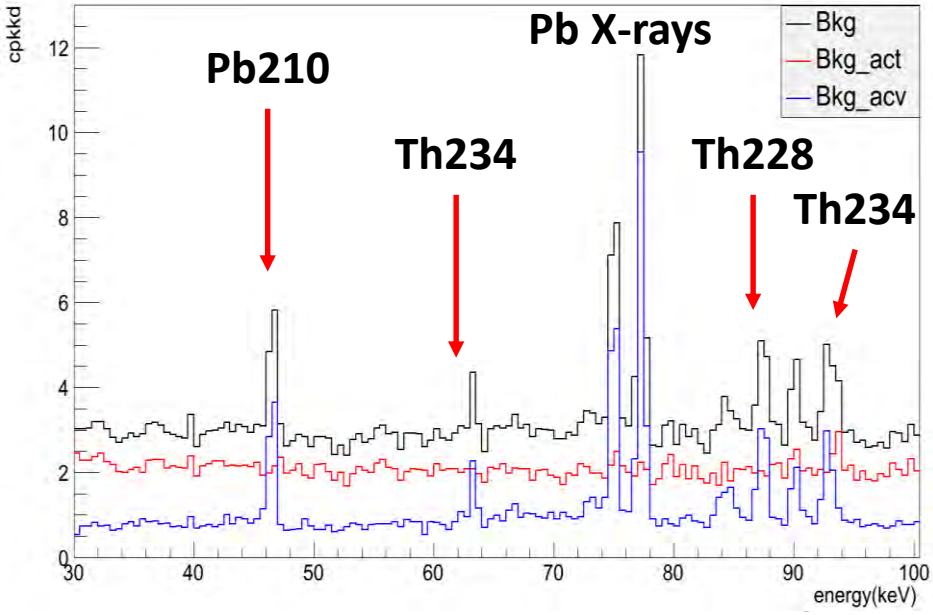

— Charge
— Current
p+ Event
a. u.
time(10ns)

Rise Time Distribution





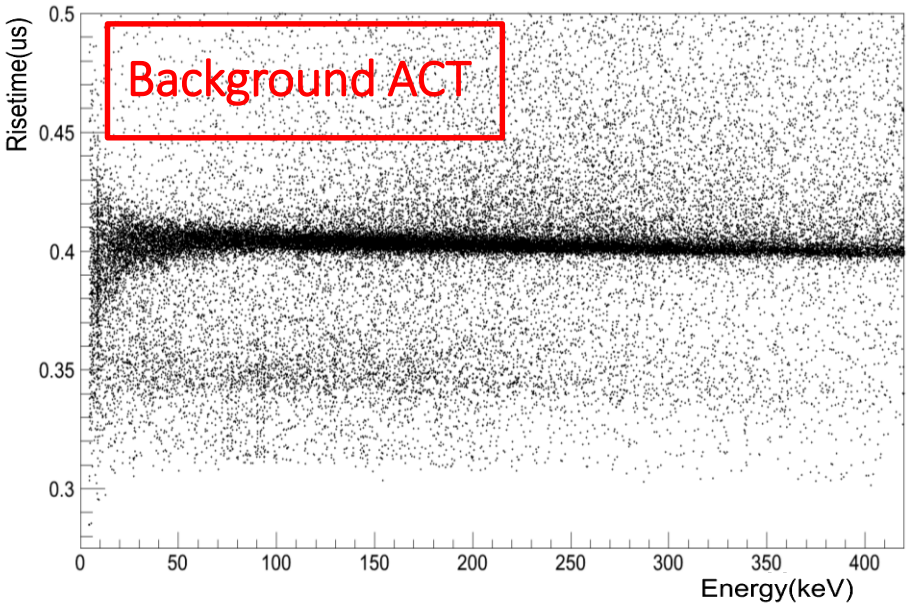


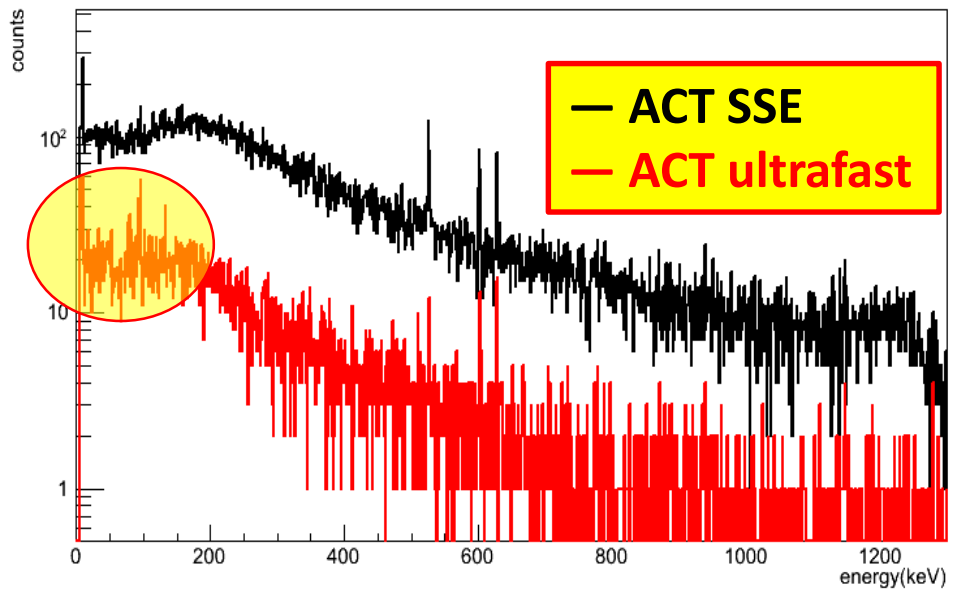


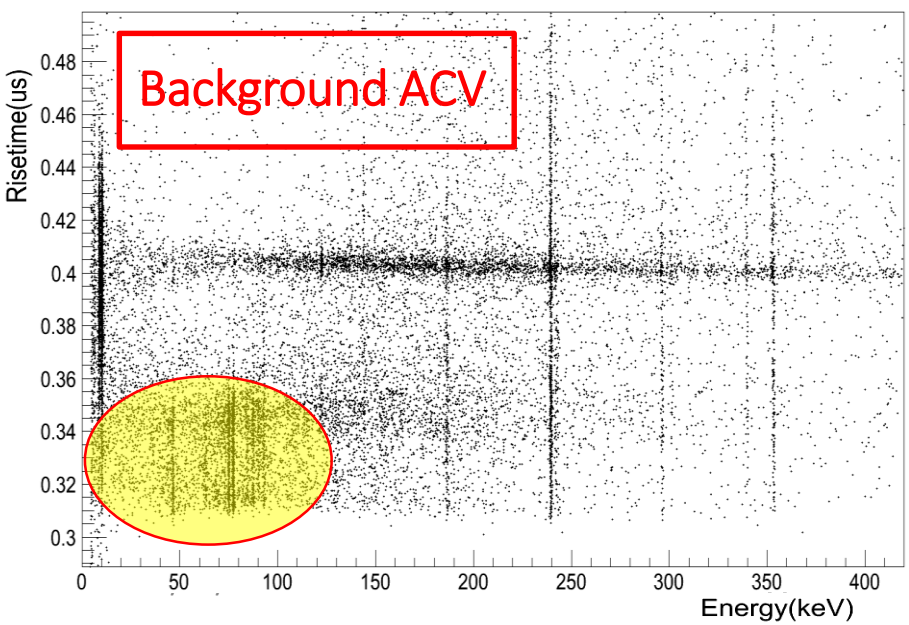
Rise Time Distribution

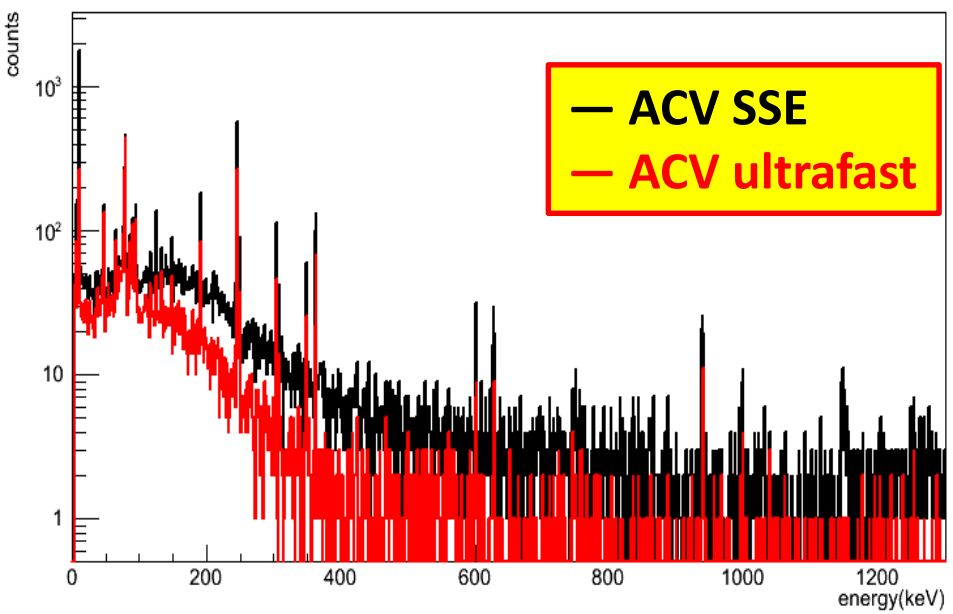
$ultrafast : riset < 0.38us$

$SSEband : 0.38us < riset < 0.43us$



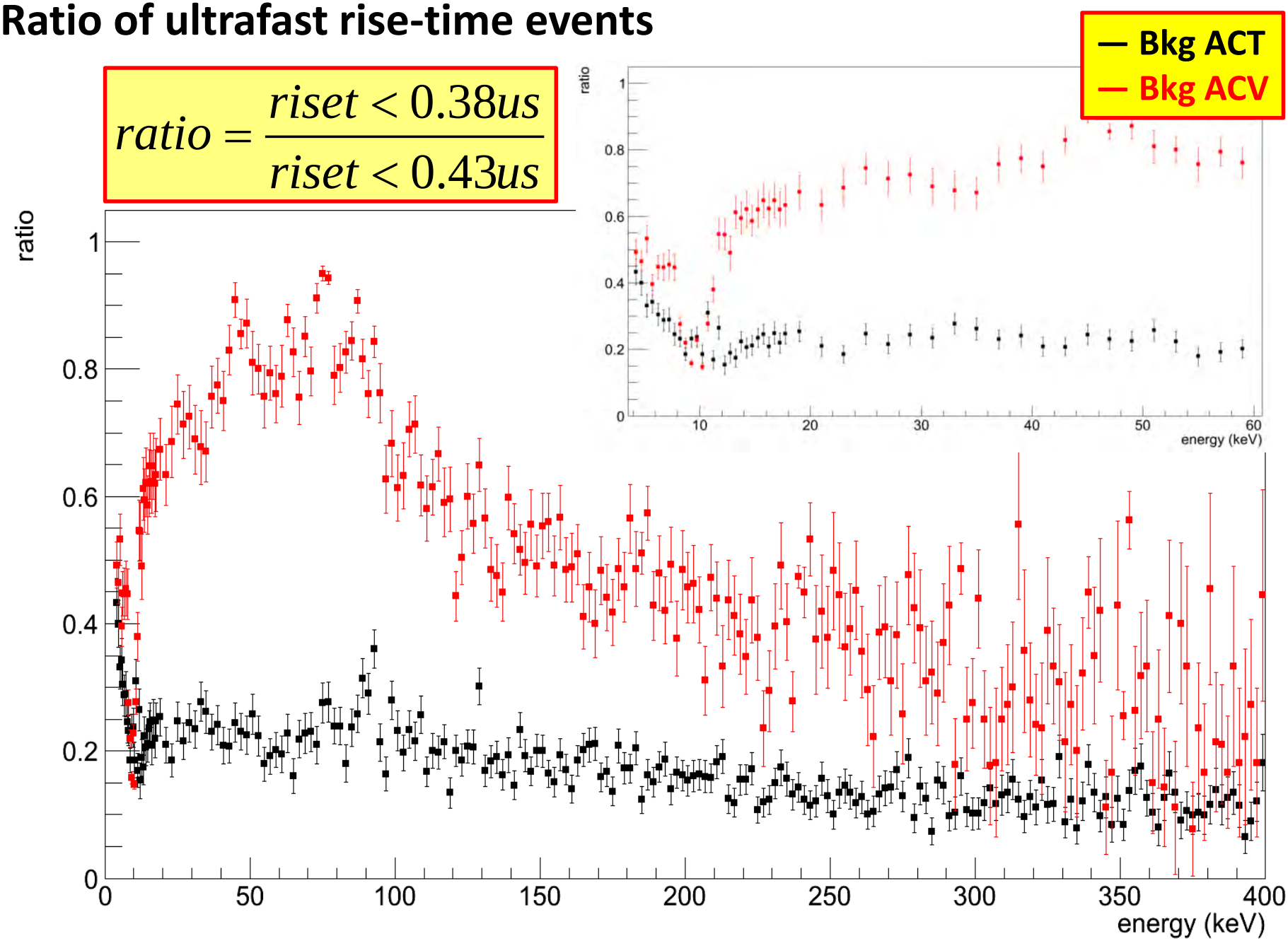






Ratio of ultrafast rise-time events

$$ratio = \frac{riset < 0.38us}{riset < 0.43us}$$



Summary and Prospects

- **CDEX-1B is running stably at CJPL;**
- **The background spectrum is obtained and under intensively study;**
- **After preliminary analysis of the background at high energy region, we realized that there are plenty of ultrafast events, which maybe come from site nearby the point electrode surface;**
- **We are developing the new method to differentiate the bulk/surface events;**
- **Next we will discuss with Canberra about how to further reduce the background.**

Thank you for your attention!