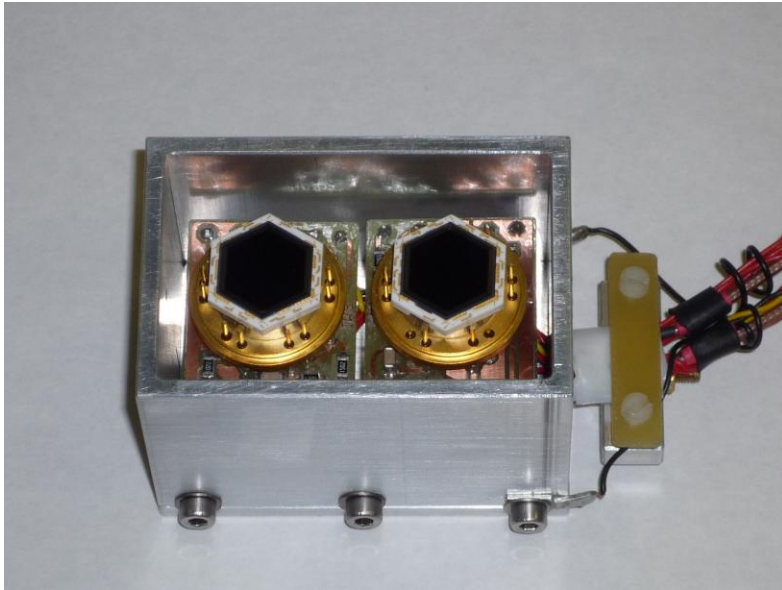


SDD status

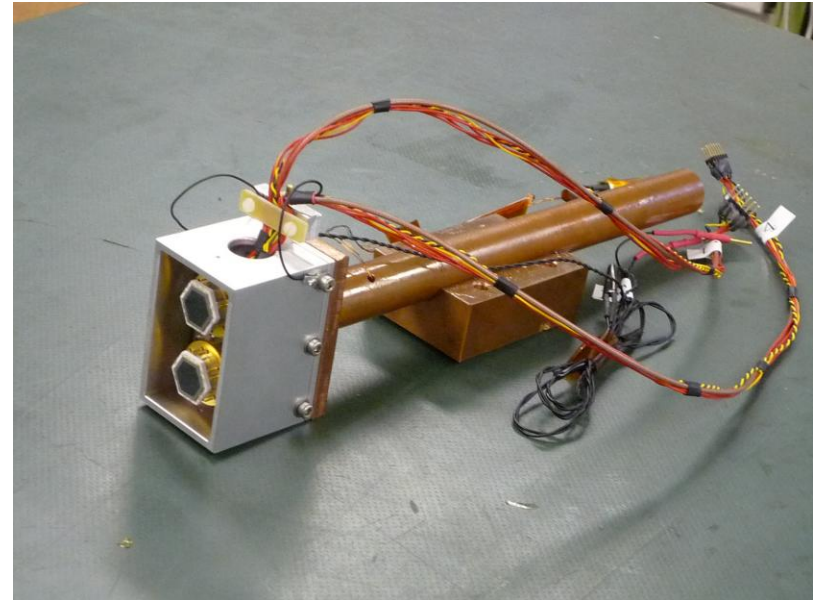
E17 meeting 27/Aug./2009

New SDDs from SMI



SDD w/ housing

4 SDDs and 2 housing



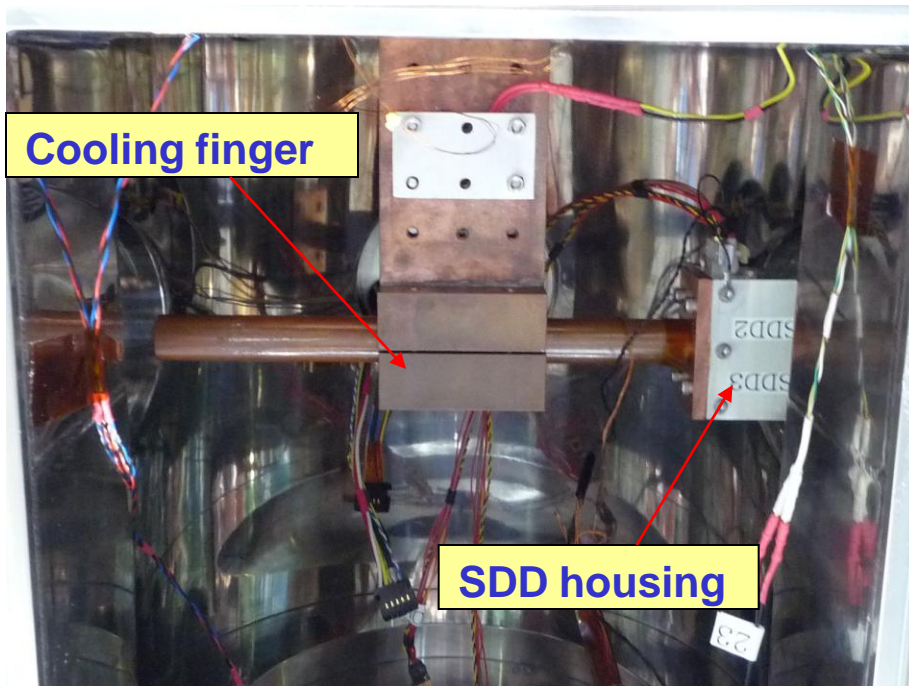
Mounted onto cooling finger

SDDs in KEK (5 in total)

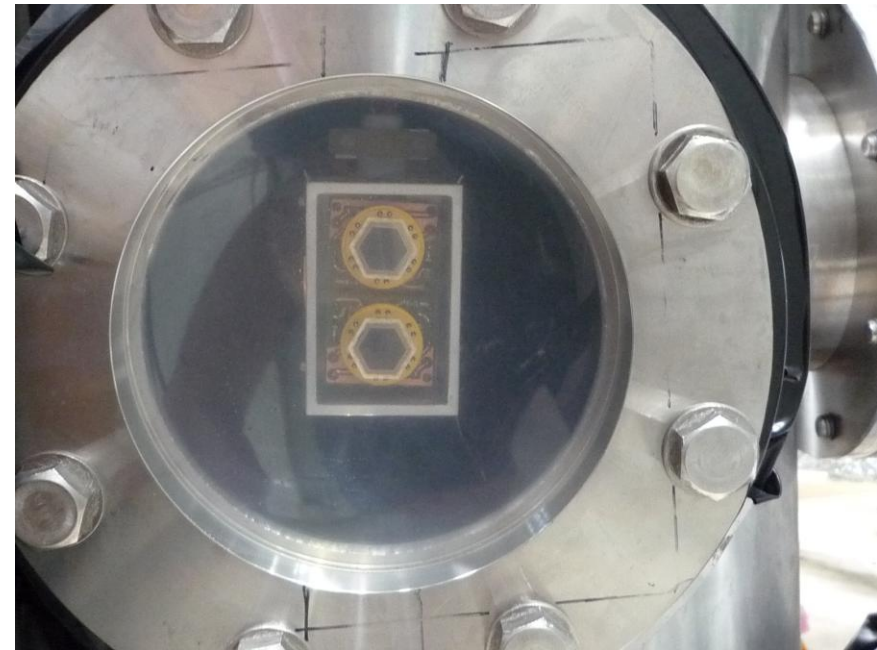
SDD ID	preamp voltage	remarks
0	± 24 V	Brought to Japan in May
1 ~ 4	± 12 V	Brought to Japan in July

Start R&D with test cryostat

Installation into the test cryostat



Side view



view from Mylar window

→ Start measurement setting preamp **outside of vacuum chamber**

Start R&D with test cryostat

Measurement setting preamp **outside of vacuum chamber**

combination : SDD #1 and preamp #1

SDD #0 setting

$V_{sub} = -6.5V$ / $V_{reset} = 1.0V$ / $T = 140 K$

$R1/RX/Back = -20.2/-130.2/-59.1 V$

(HVs = **-200 V @ HV supply**)

→ Trigger rate < **~1 Hz**

Increase HV as
a trial



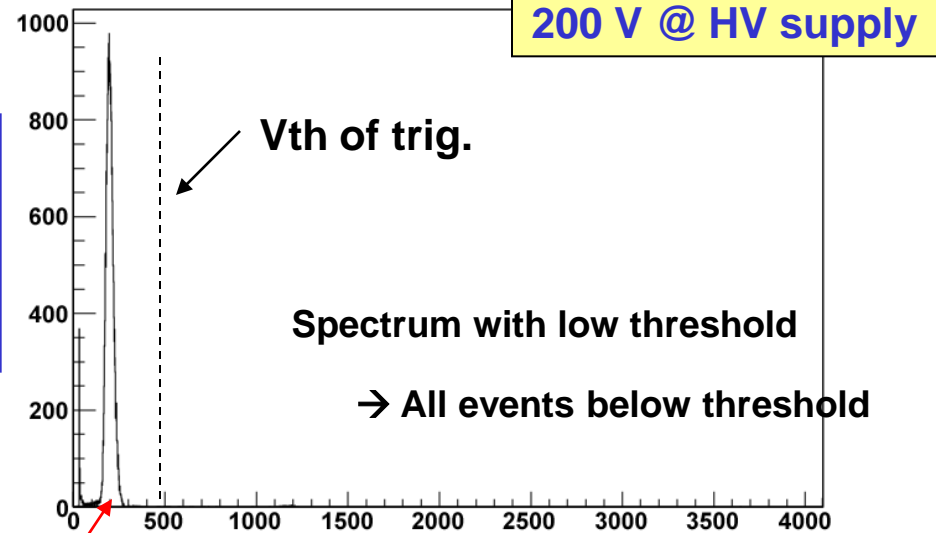
$R1/RX/Back = -20.6/-133.2/-60.4 V$

(HVs = **-205 V @ HV supply**)

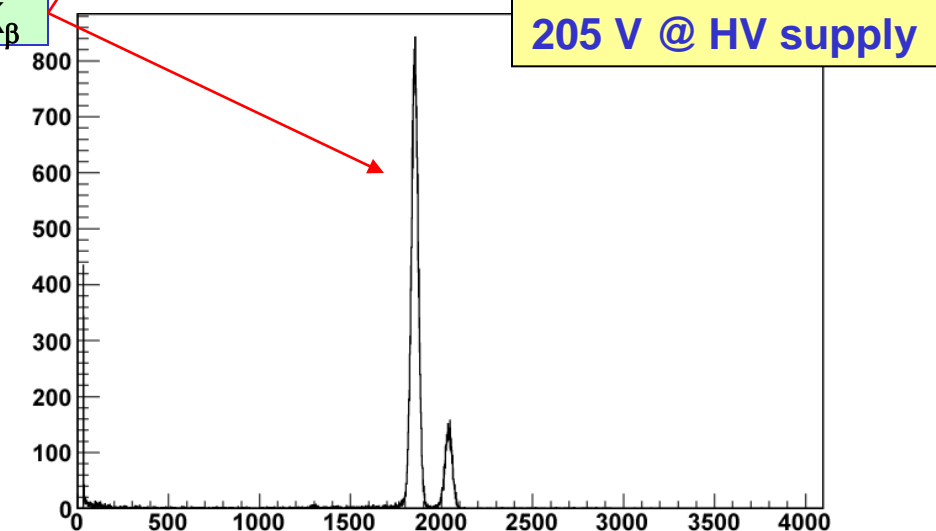
→ Trigger rate **~40 Hz**

Normal value

→ **check HV dependence**



Mn K_{α} , K_{β}



Back voltage dependence

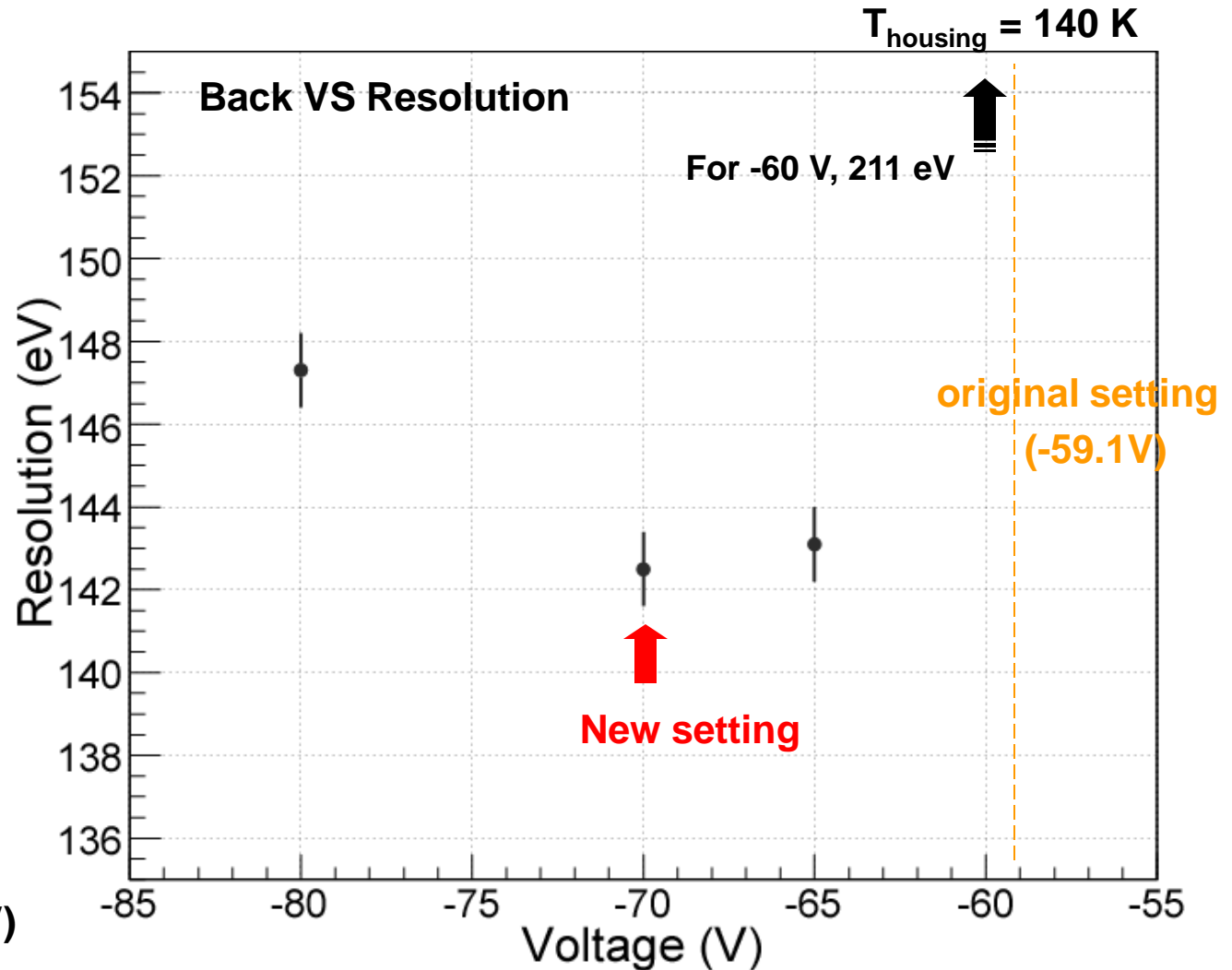
Ring 1 = -20 V
Ring X = -130 V

Change Back V
-60/-65/-70/-80 V

large dependence

Set to be -70 V
(original value is ~-60 V)

More precise measurement : show later



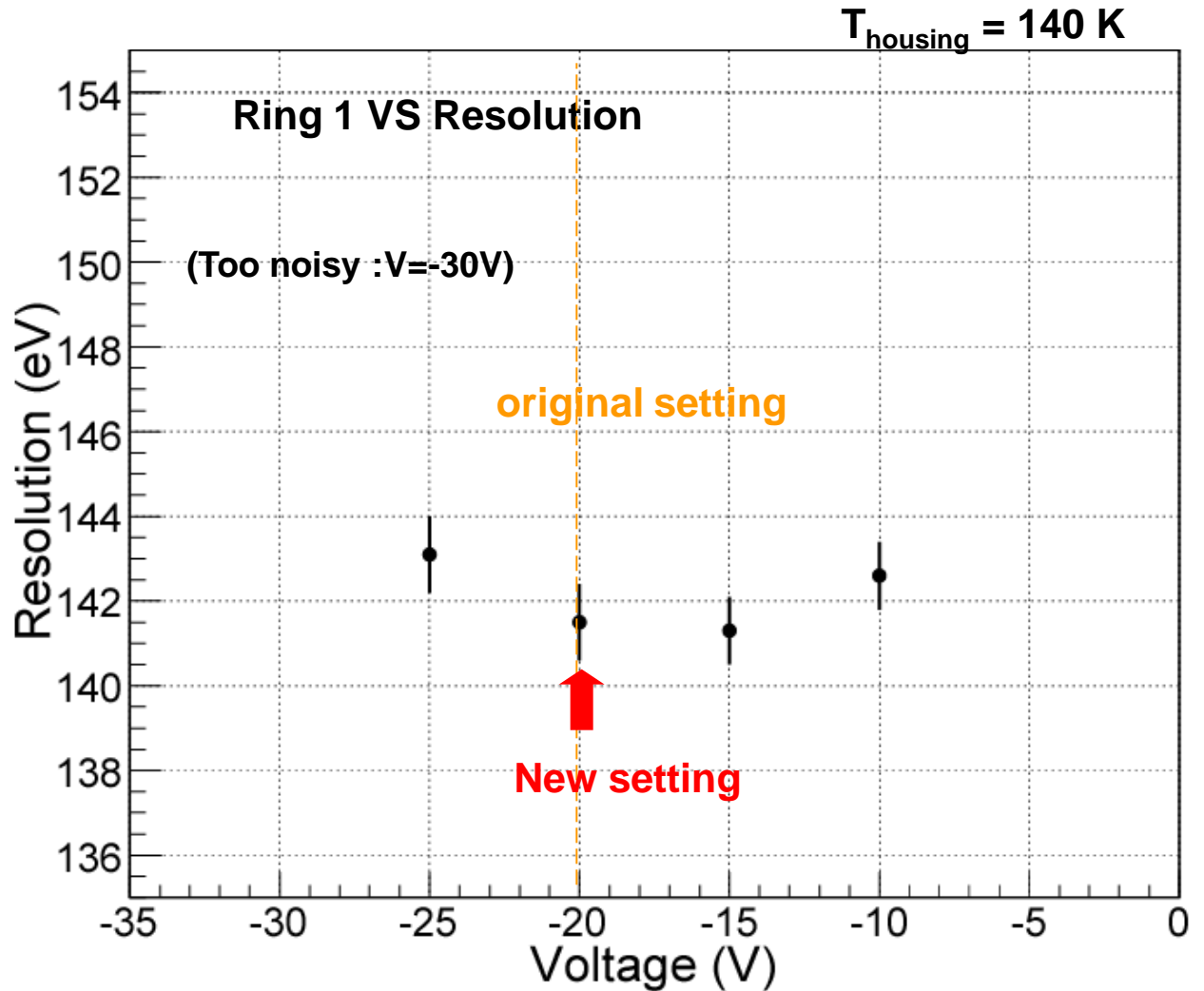
Ring 1 voltage dependence

Ring X = -130 V
Back = -70 V

Change Ring1 V
 ± 10 V (5V step)

No dependence
(or negligible dependence)

Set to be -20 V
(original value)



Ring X voltage dependence

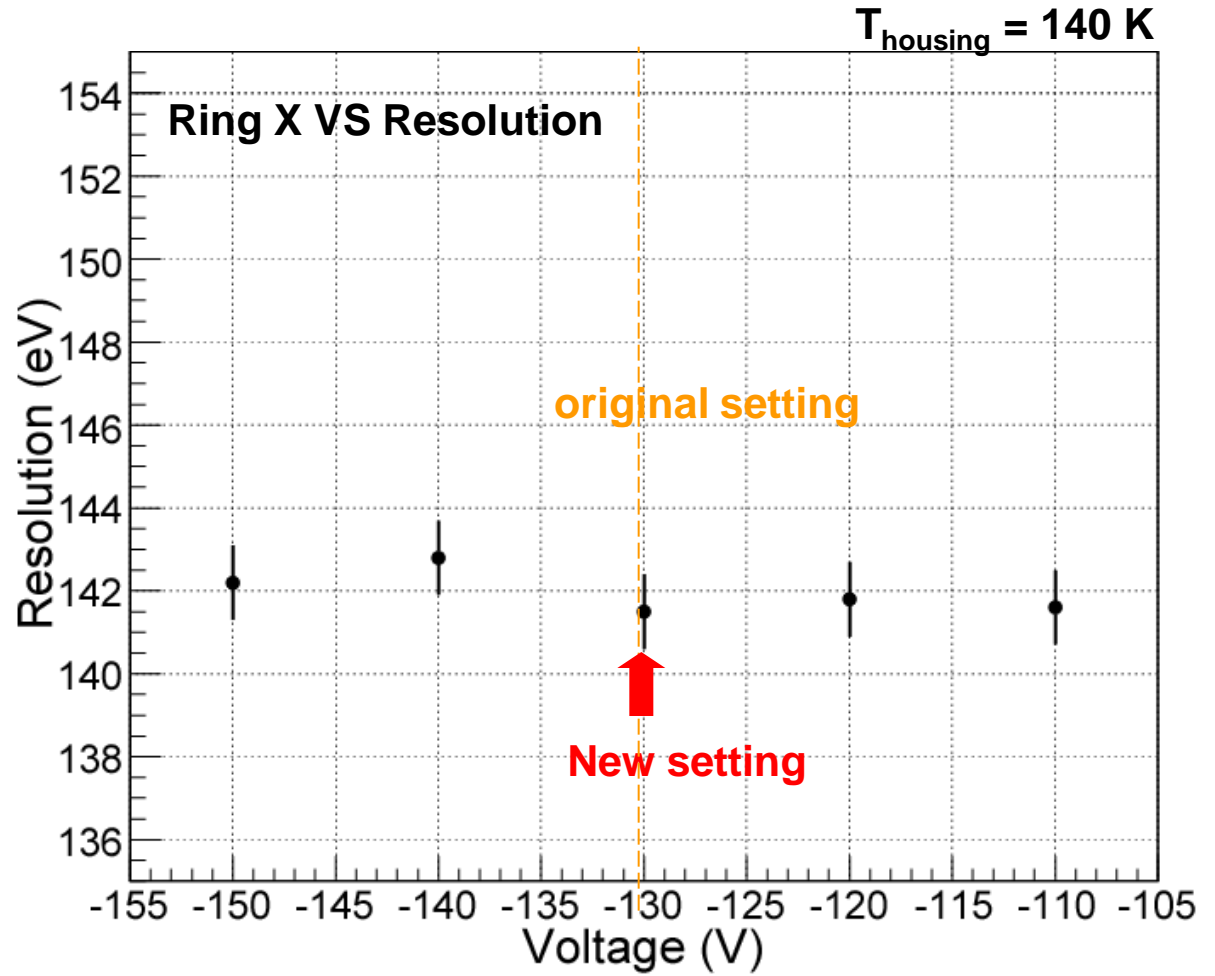
HV setting

Ring1 = -20 V
Back = -70 V

Change Ring X voltage
 ± 20 V (10 V step)

No dependence

Set to be -130 V
(original value)



Spectrum with new SDD (#1)

HV setting

Ring 1 = - 20 V
Ring X = - 130 V
Back = - 70 V

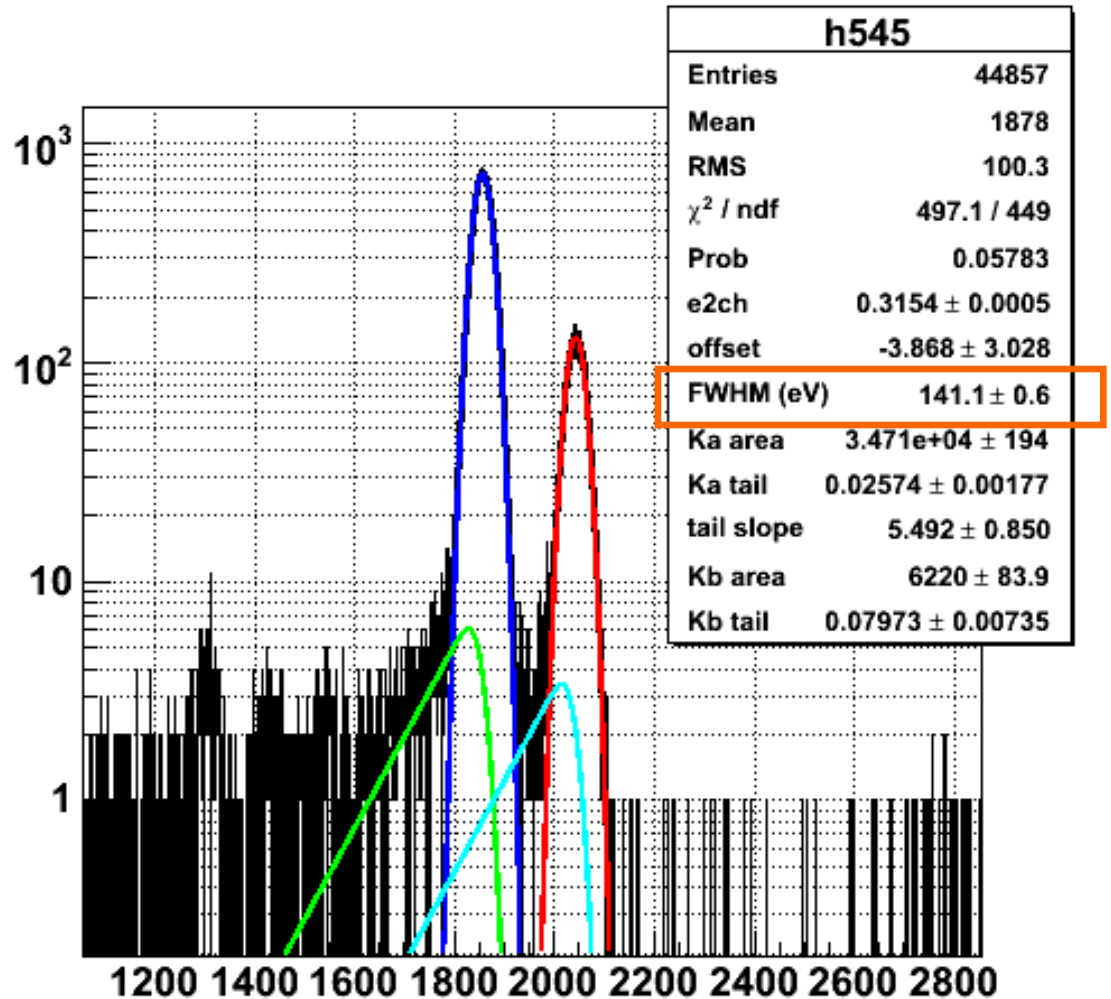
Preamp setting

Vsub = - 6.5 V
Vreset = 1.0 V

SDD temperature

Thousing = 140 K

Resolution ~ 140 eV



Check other dependence (V sub, SDD temperature)

V substrate dependence

HV setting

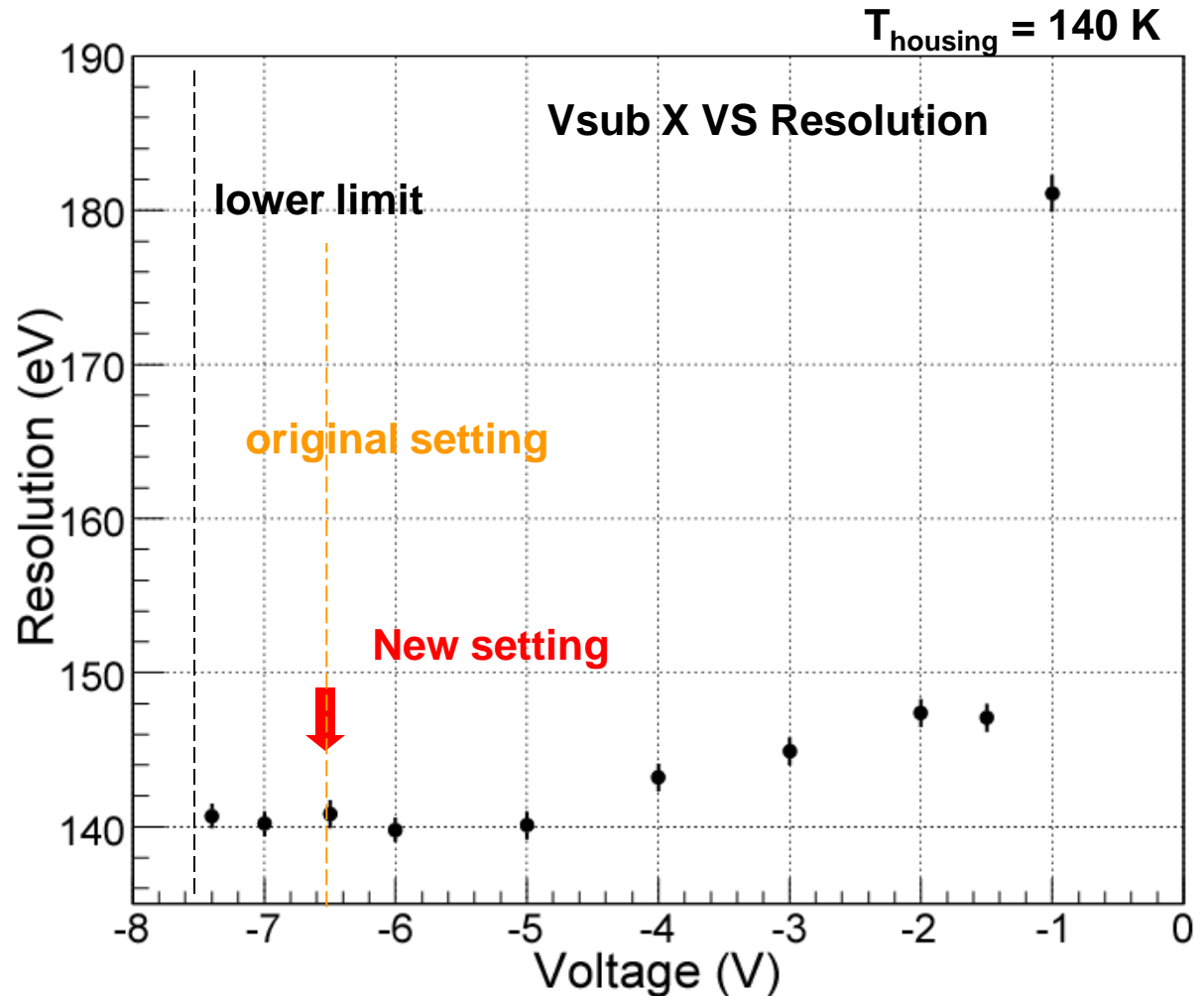
Ring1 = -20 V
Ring X = -130 V
Back = -70 V

Cannot lower
below -7.5V

(same situation
w/ SDD 0)

Resolution is stable
against $V_{\text{substrate}}$

Set to be -6.5 V
(original value)



Tendency looks same with previous one

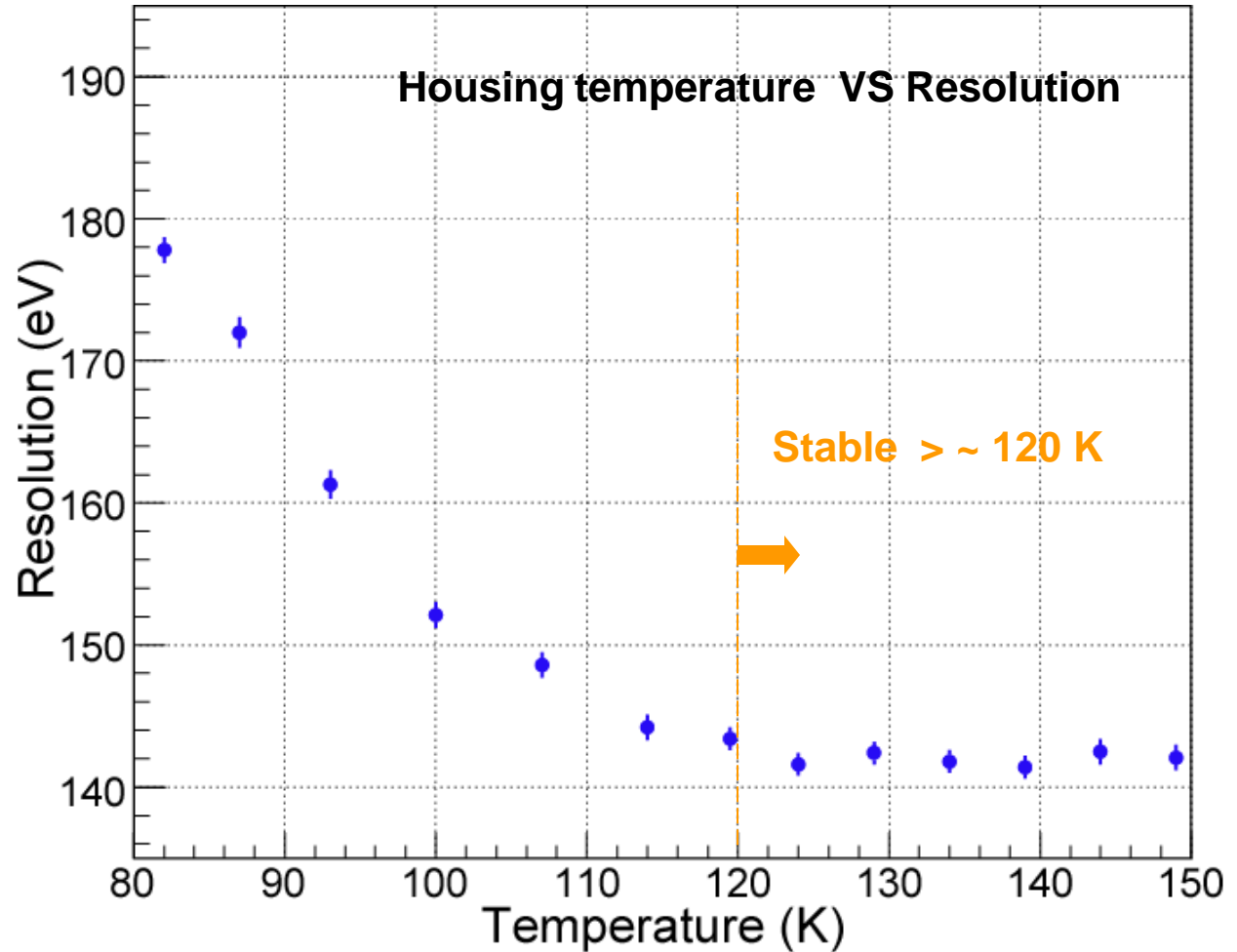
Temperature dependence

setting

Ring1 = -20 V
Ring X = -130 V
Back = -70 V
Vsub = -6.5 V

Same tendency with
previous one

Optimum is around
130 ~ 150 K



(minimum effect to the target)

Switch to another SDD (#4)

SDD # 1 → #4 (the other one in the same housing)
with same preamplifier (preamp #1)

HV setting

Ring 1 -20 V
Ring X -130 V
Back -70 V

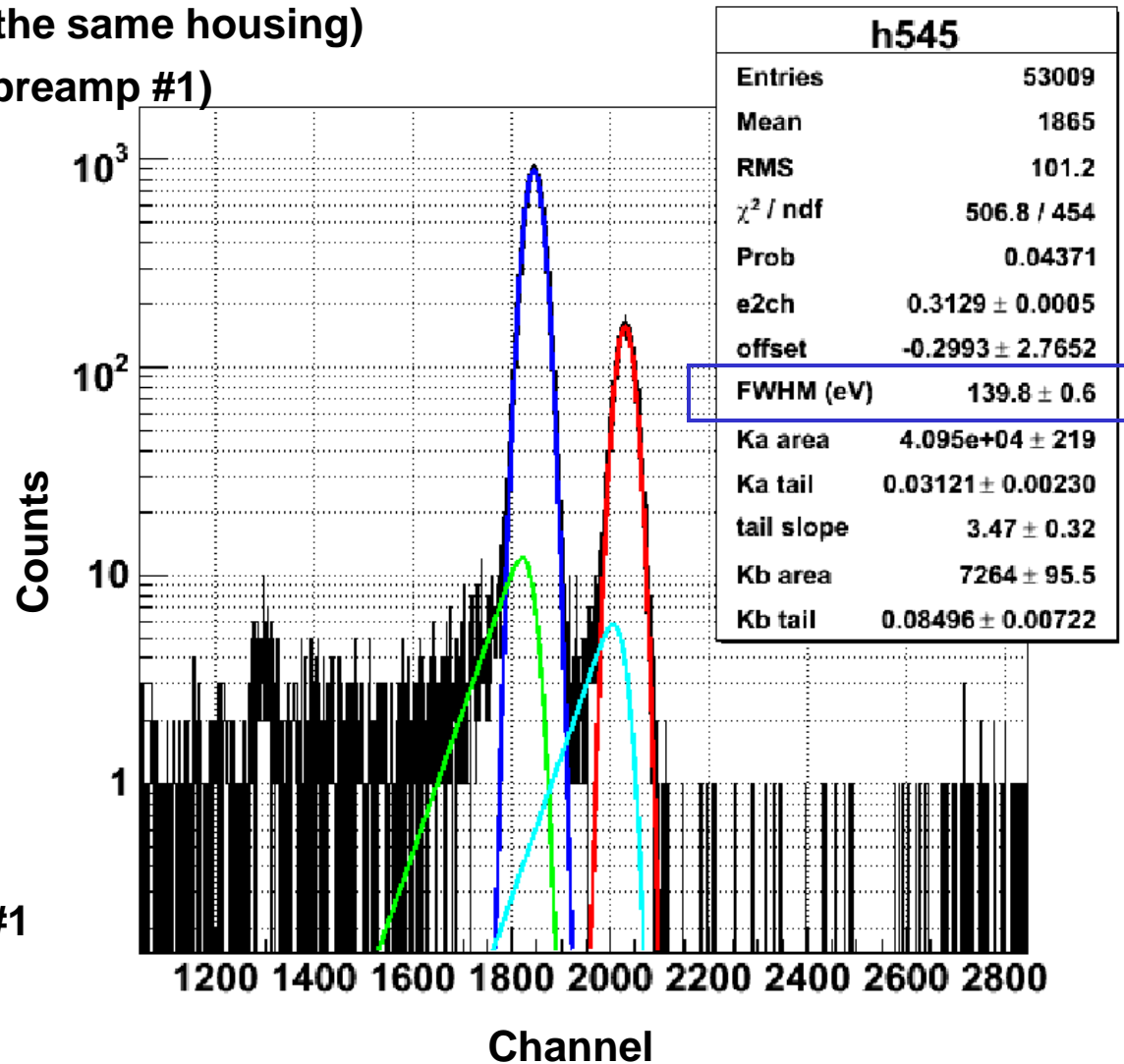
SDD temperature

Housing : 140 K

Preamplifier setting

V sub : -6.5 V
V reset : 1 V

Settings are same with SDD #1

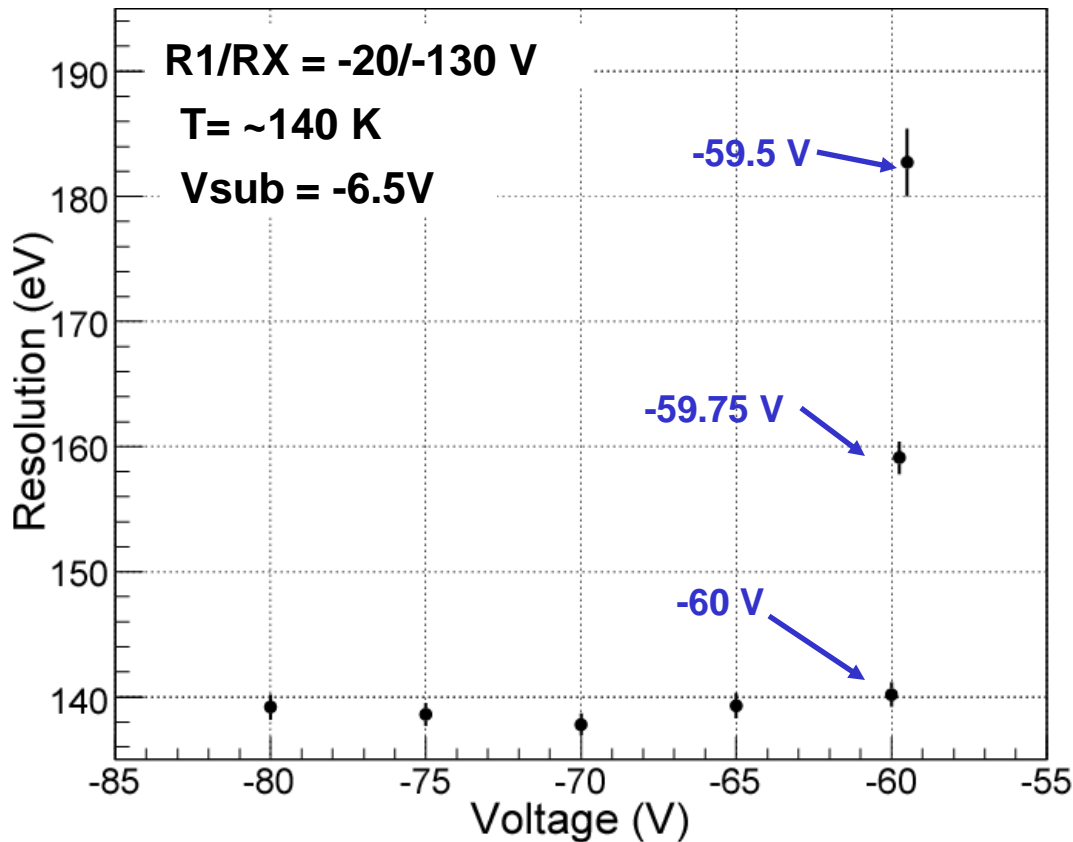


Resolution ~ 140 eV

V_{BACK} dependence (SDD #4)

To check whether V_{BACK} dependence is peculiar for SDD #1

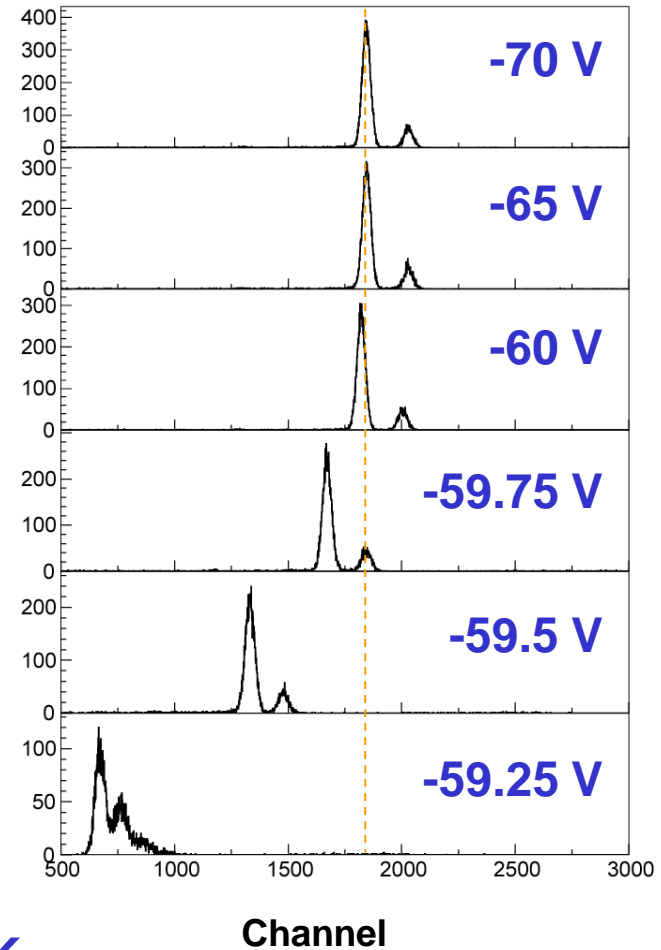
Back voltage VS Resolution



Tendency is same with
SDD #1

Setting $V = -70$ V is OK

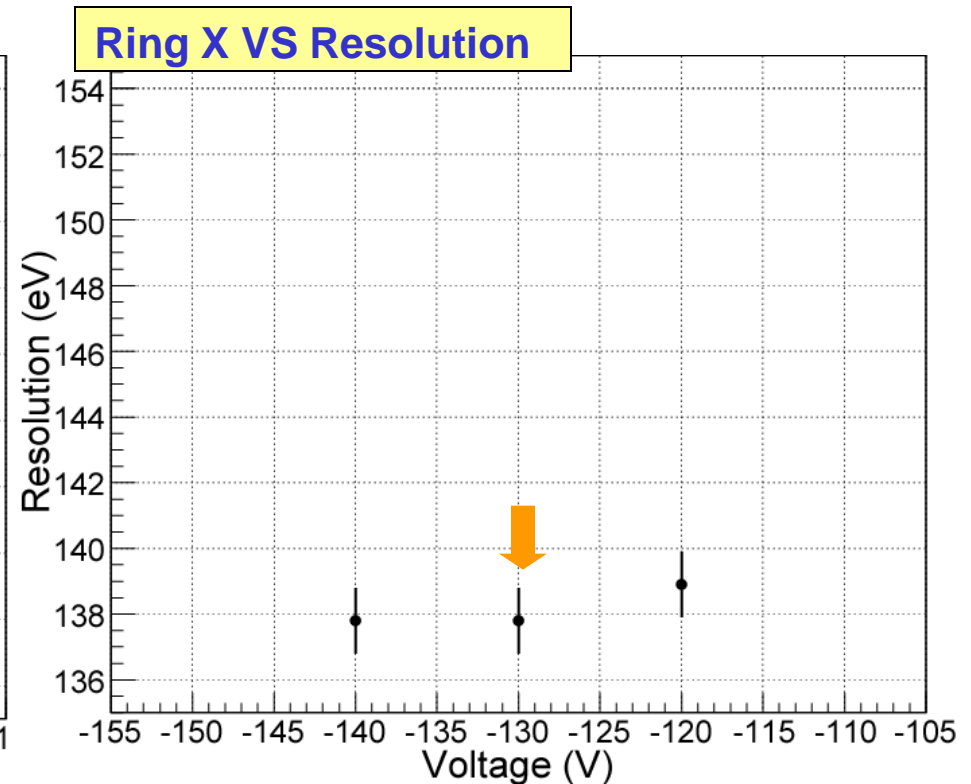
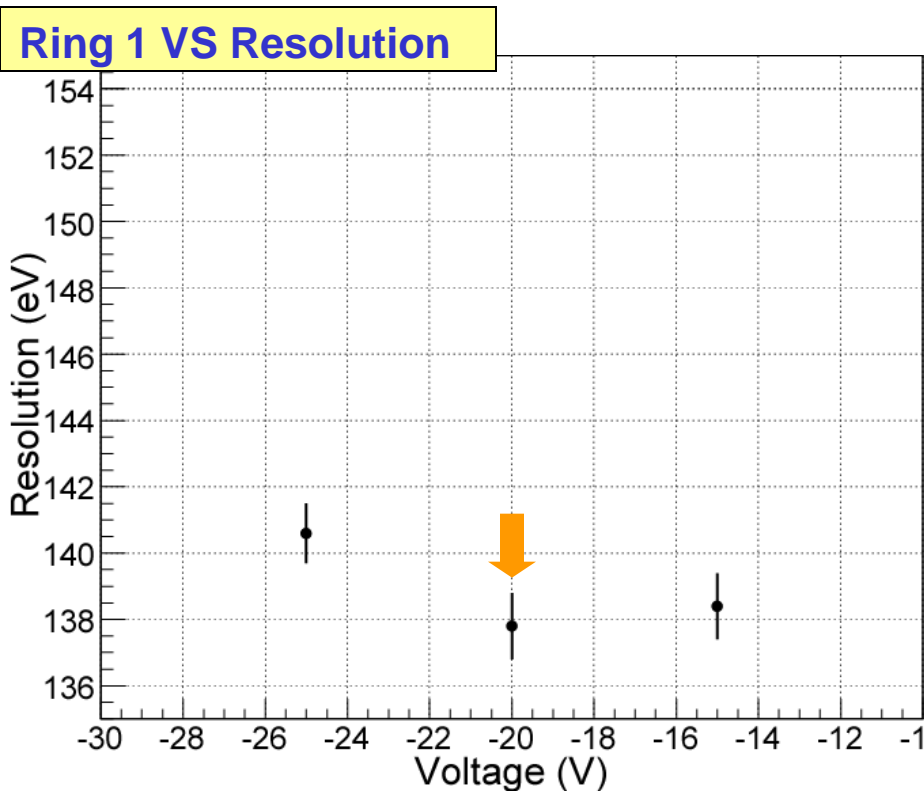
spectrum shape VS V_{BACK}



Ring 1/ Ring X dependence (SDD #4)

Check Ring 1 and Ring X dependence (for confirmation)

± 5 V for Ring 1 / ± 10 V for Ring X



No dependence (as same with SDD 1)

-20/-130/-70 V (Same setting with SDD 1) looks fine

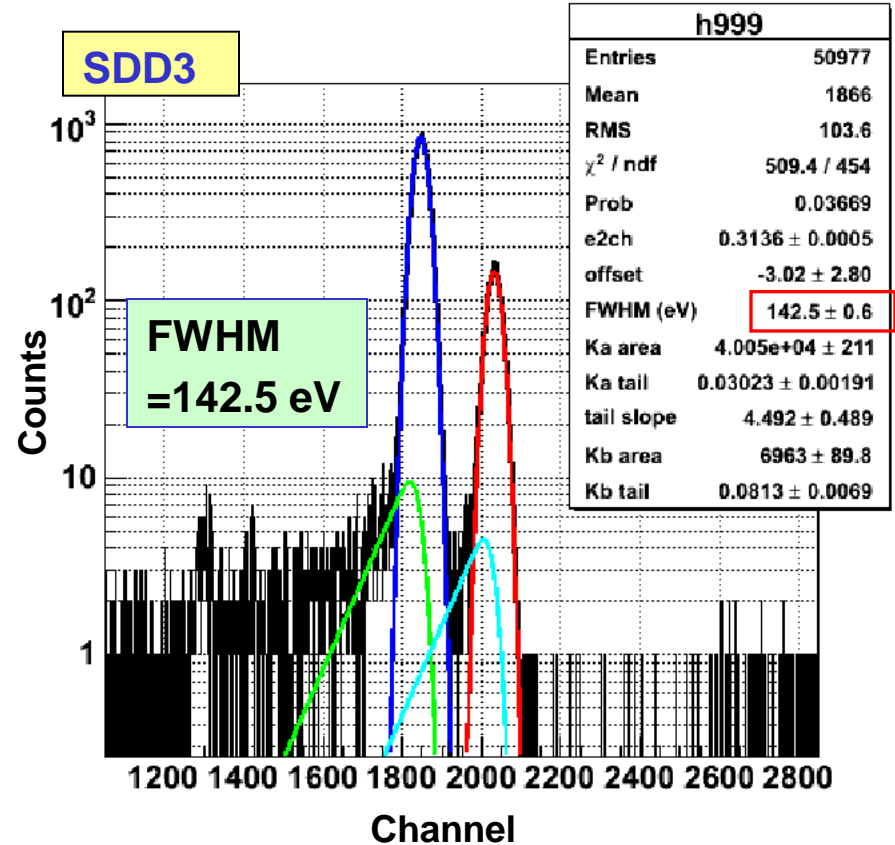
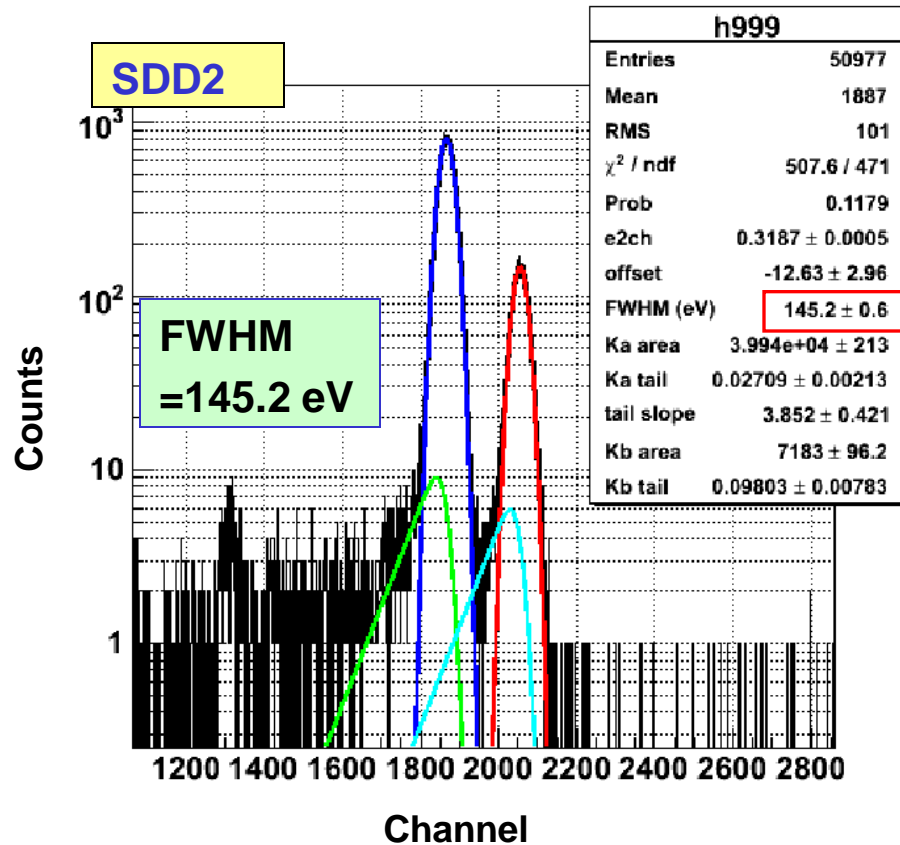
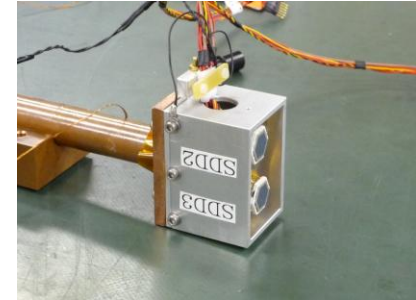
Check other 2 SDDs (SDD #2 and #3)

Check w/ same preamplifier (preamp #1)

HV : R1/RX/BK = -20/-130/-70 V, $V_{sub} = -6.5$ V

Temperature = 140 K

2nd housing
(SDD 2 & 3)



All 4 SDDs are working w/ FWHM < 150 eV

Problem preamp #4

To switch to preamp #4

Cannot increase V_{reset} value (typically $\sim +1\text{ V}$)
by potentiometer

→ $\sim 0\text{V}$

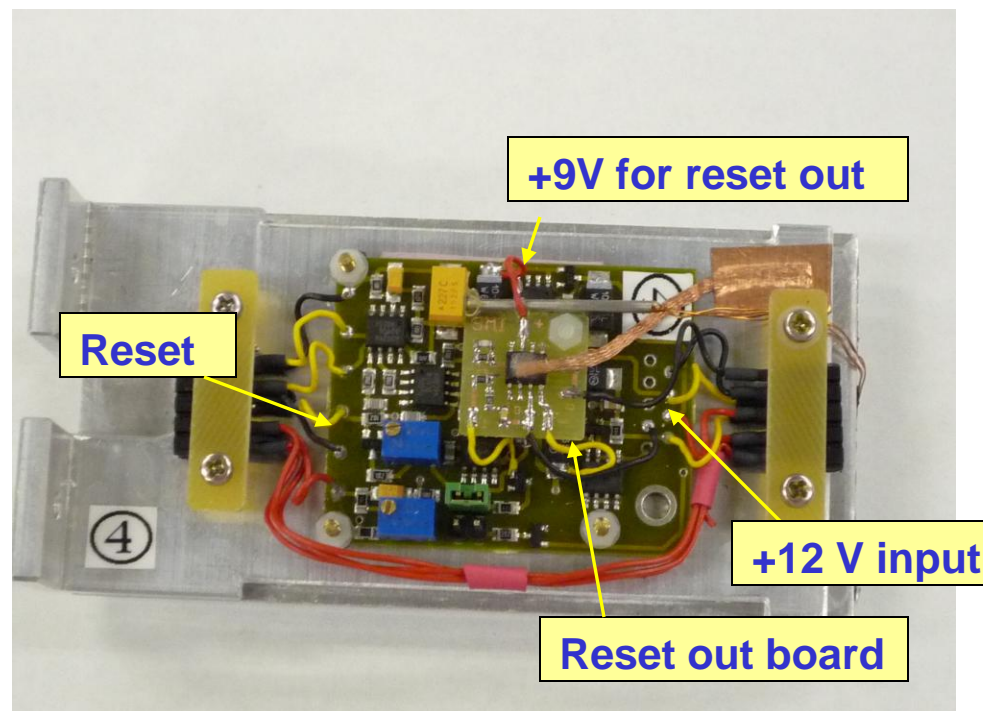
+9 V line for mini reset-out board

→ -0.9V

Replacing preamp with #2 works



preamp #4 maybe broken.
(+12 V line is suspect)



For preamp #2 & #3, V_{sub} and V_{reset} are correctly supplied.

→ to be tested with SDD

Summary for new SDD R&D @ test bench

- ✓ **Checked SDD HV dependence**
high BACK voltage (>-60V) deform spectrum
stable for R1 and RX
- ✓ **Checked SDD Vsub and temperature dependence**
Almost same tendency with previous (SDD #0)
- ✓ **Checked 4 SDDs (test bench / preamp (#1) outside)**
All SDDs are healthy (FWHM < 150 eV)
- ✓ **One preamp (#4) is strange (maybe broken at +12V line)**
Possible to repair? (send back to SMI?)
If we have only 8, need backup preamp (4?, 8?)

