

SDD status at KEK

E17 meeting 28/May/2009

Current situation

- Brought one SDD + preamplifier set from SMI to Japan (one of two sets)
- Things to be studied are
 - ✓ Confirmation whether preamp works inside vacuum
(starts with putting preamp outside of the chamber)
 - ✓ Optimization of the operation parameters (temperature, HV, etc)
 - ✓ Installation and test in the cryostat
(also for the final check for the target operation)

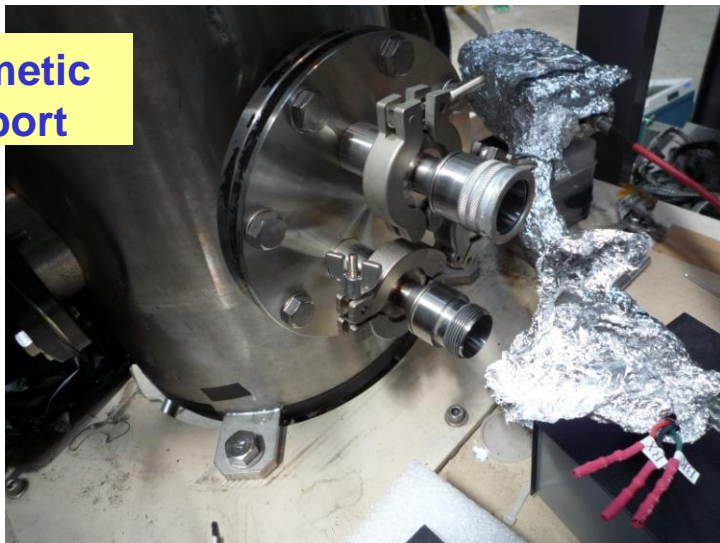
Setup of the test bench

Cryostat for test bench

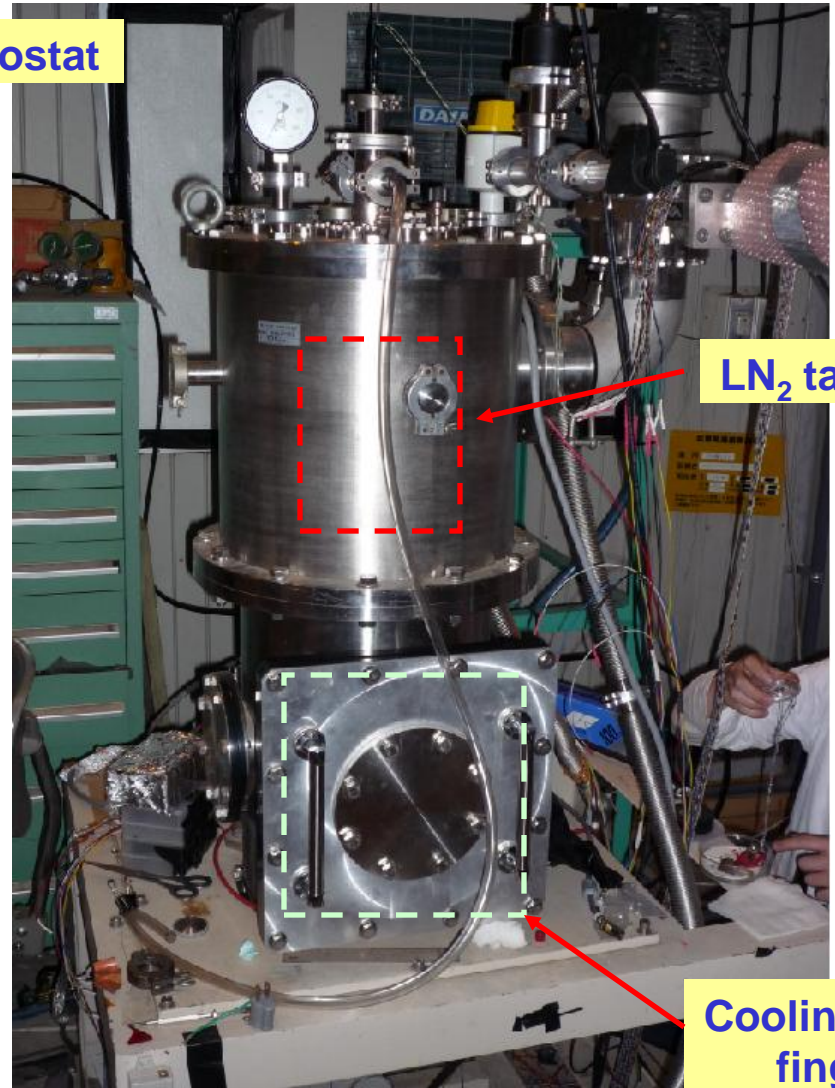
- ✓ TMP + fore pump
- ✓ LN₂ tank
- ✓ Cooling finger from LN₂ temperature
- ✓ Temperature control (Lakeshore 340, max 30 W)

3 hermetic port (10 pins/port)

hermetic port



cryostat

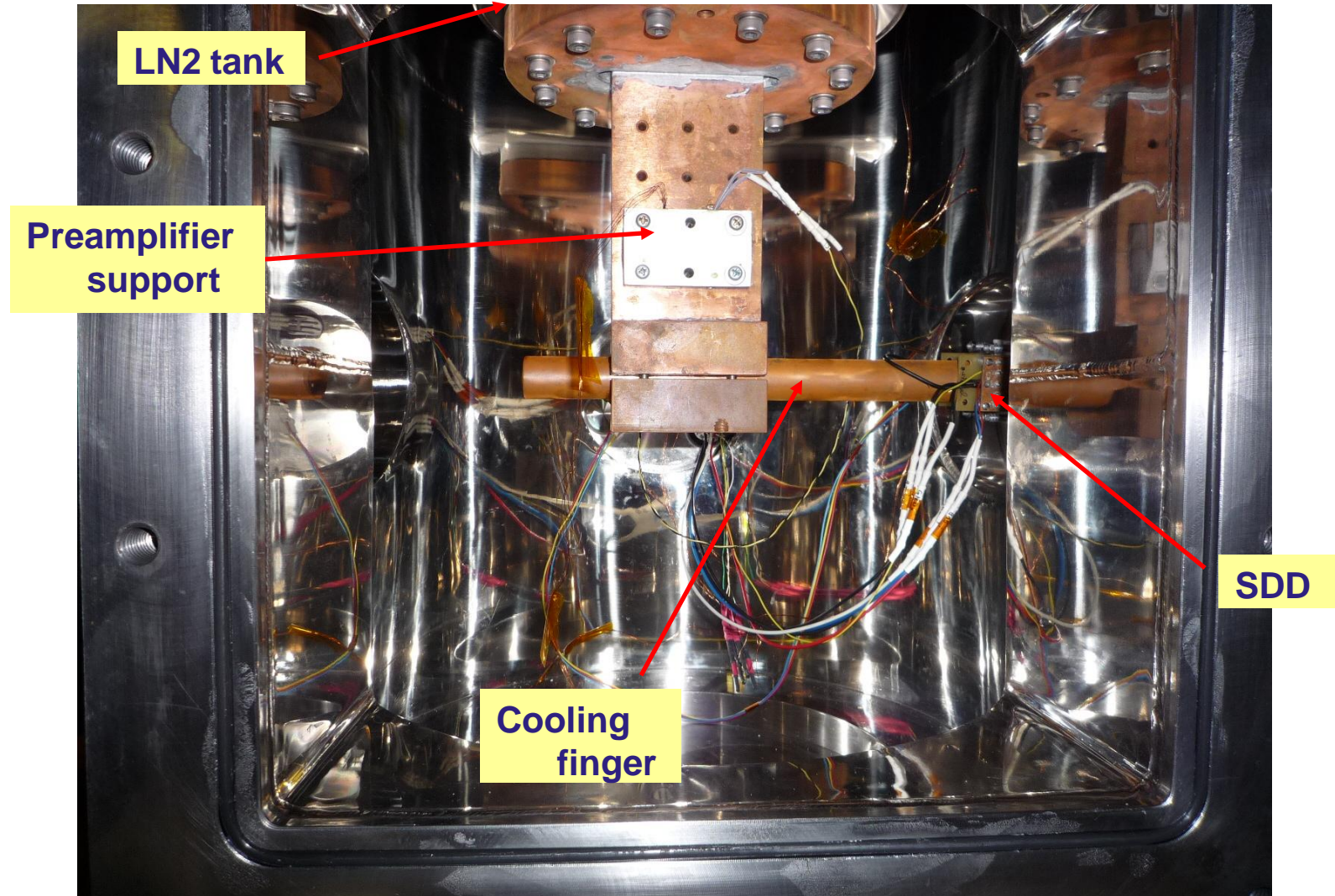


LN₂ tank

Cooling finger

Setup of the test bench

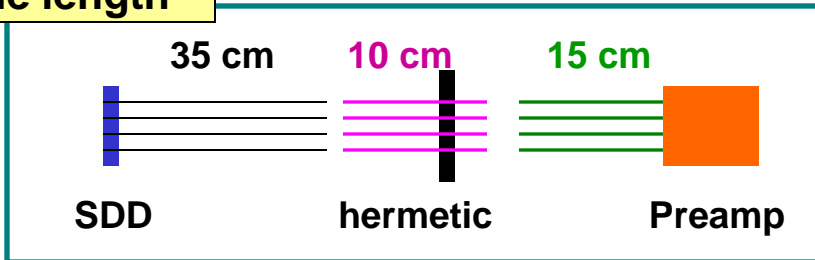
Inside of the vacuum chamber



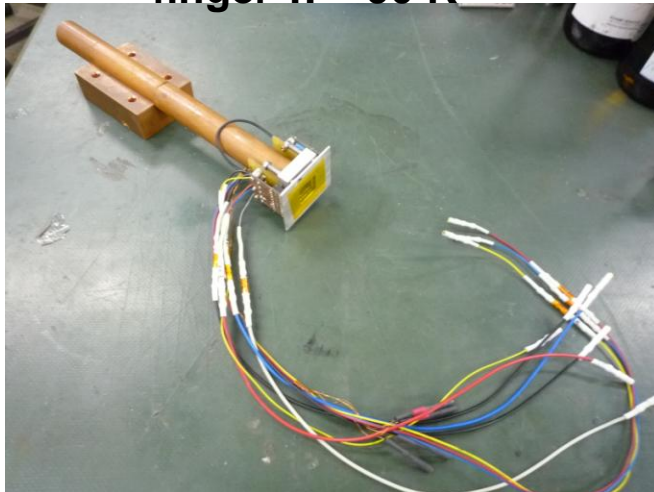
Check with E570 SDD + E570 preamp (outside)

- ✓ Already installed inside the test cryostat (from the X ray attenuation test of MICTRON)
- ✓ Check for the electronics after the preamplifier
- ✓ Check for achievable (reference) resolution with current noise level

Cable length

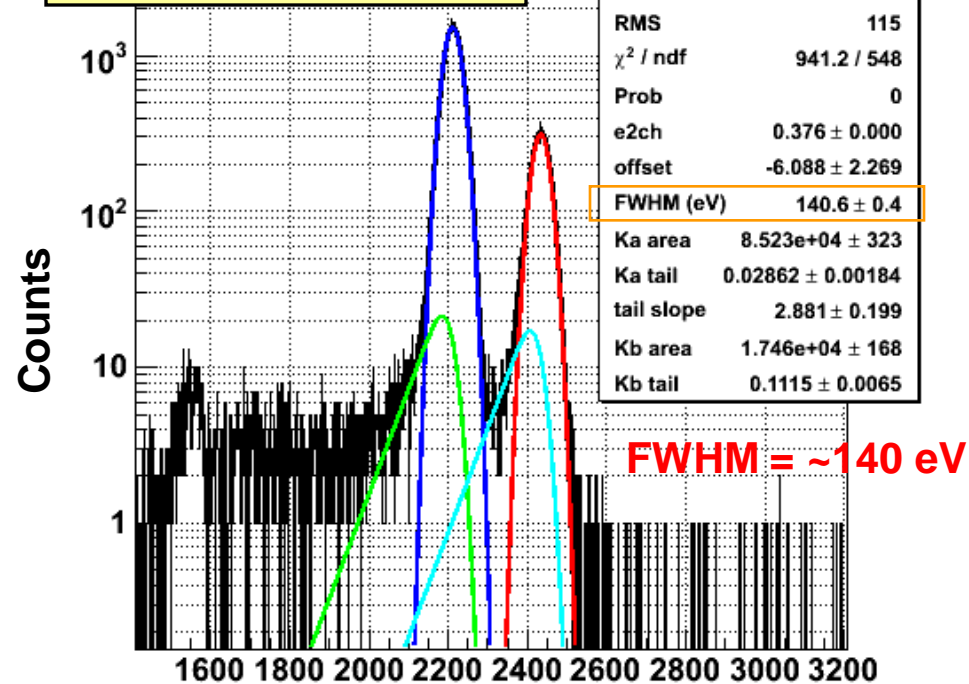


finger T: ~ 90 K



E570 SDD & cables inside vacuum chamber

Gauss+tail for $K\alpha / K\beta$ (common σ , tail slope)



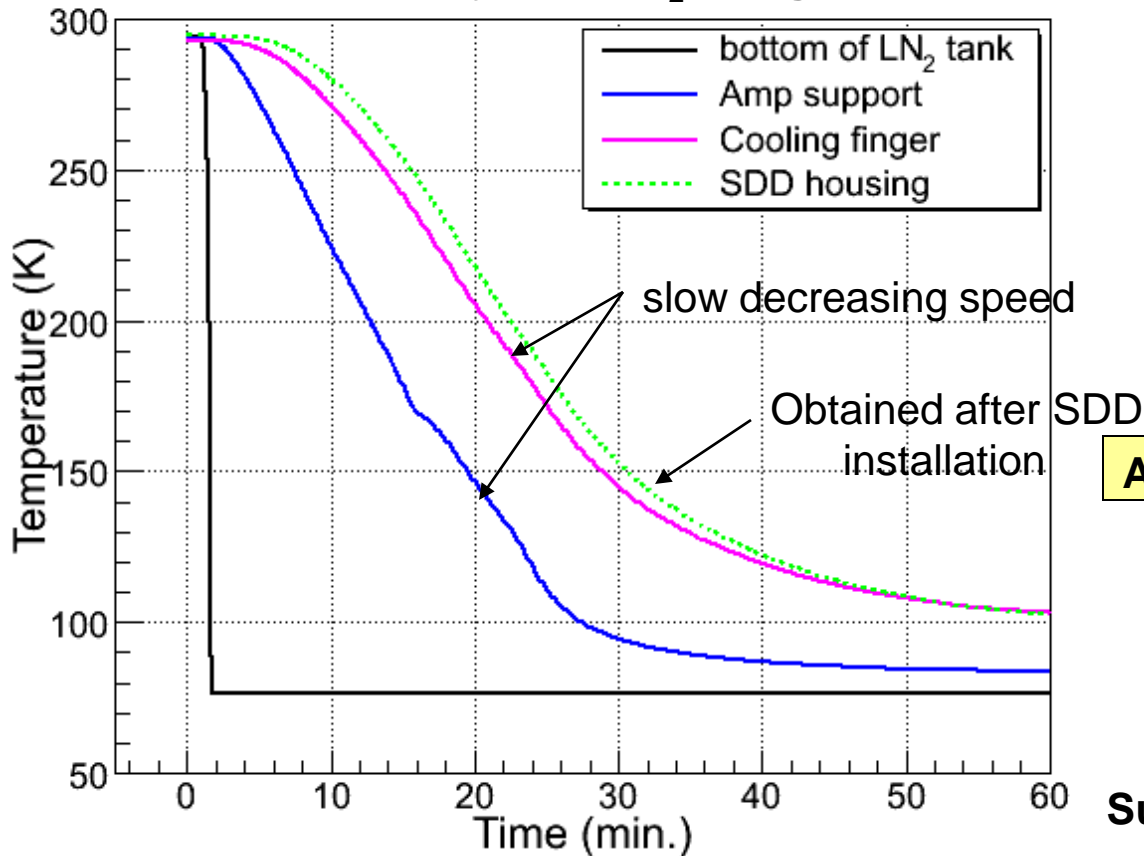
spectrum with ^{55}Fe (ch)

OK → Switch to **E17 SDD/ preamplifier** test

Cooling test of the cryostat

- ✓ Check for temperature decreasing speed
without SDD and preamp
← To avoid extremely quick temperature change

Time history after LN₂ filling



Lakeshore 340:
temperature control

ADVANTECH R6144 :
current for 4-Wire RTD

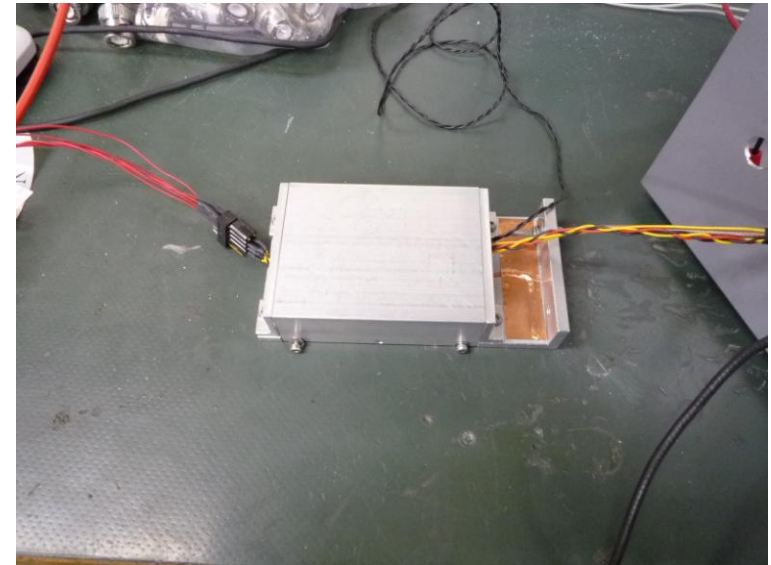
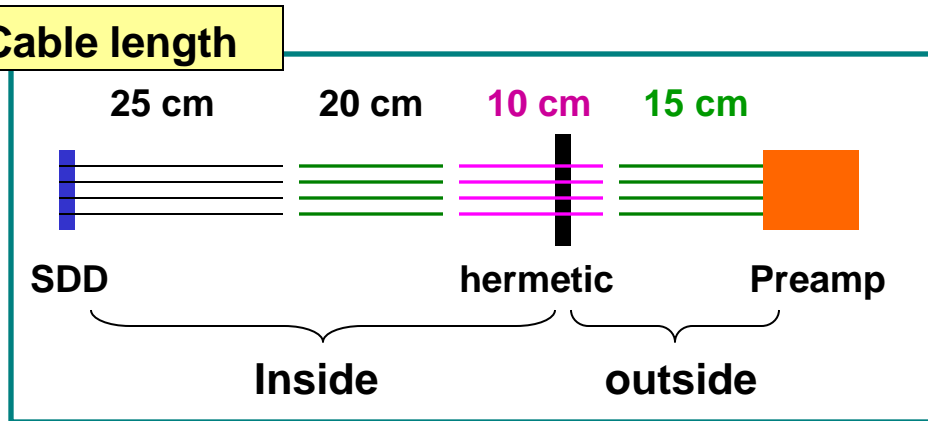
Achieved temperature

Finger & housing : ~ 100 K
Amp support : ~ 85 K
(without heater control)

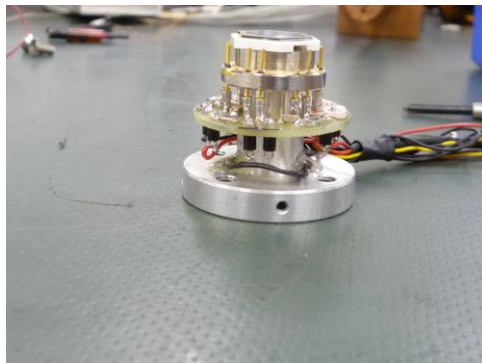
Sufficiently slow decreasing speed

Installation of E17 SDD+preamp (outside)

- ✓ SDD directly attached onto the cooling finger
- ✓ preamp outside of the vacuum chamber



preamplifier



SDD (W/O cover)

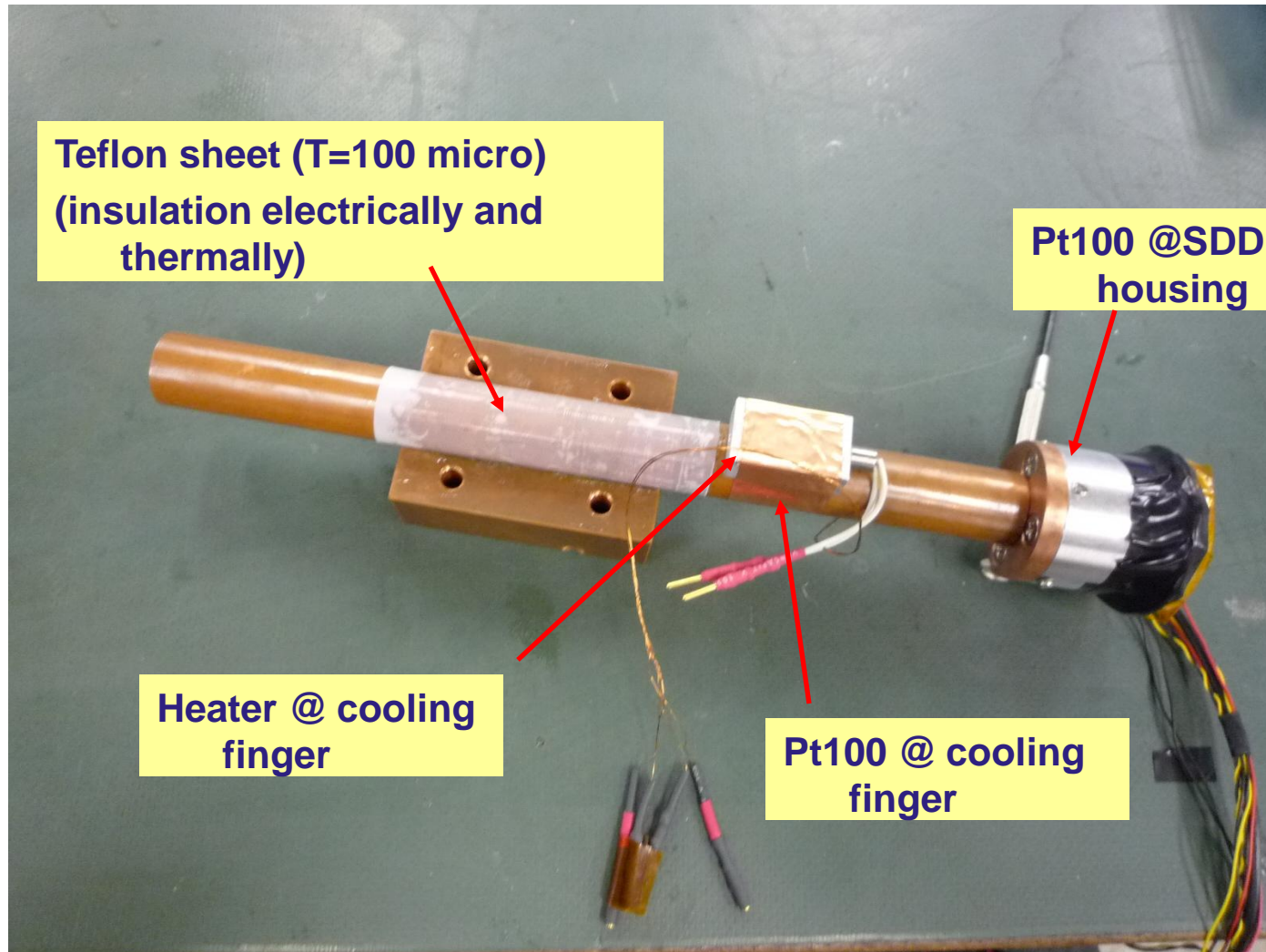


Hermetic port

- ✓ 10 cm longer than previous (E570 SDD) setting
- ✓ When install amp inside, SDD-amp length: 30 ~ 40 cm

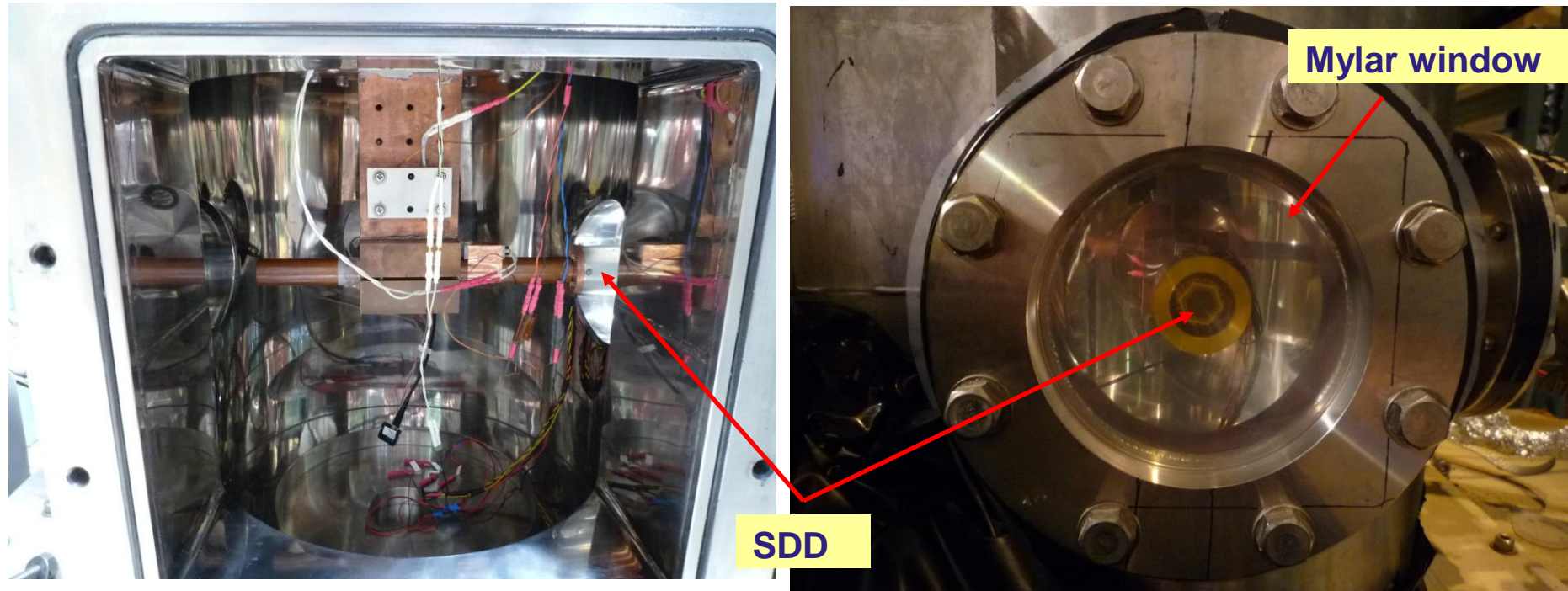
Installation of E17 SDD

Mount onto the cooling finger (view from the top)



Installation of E17 SDD

Installation into the cryostat



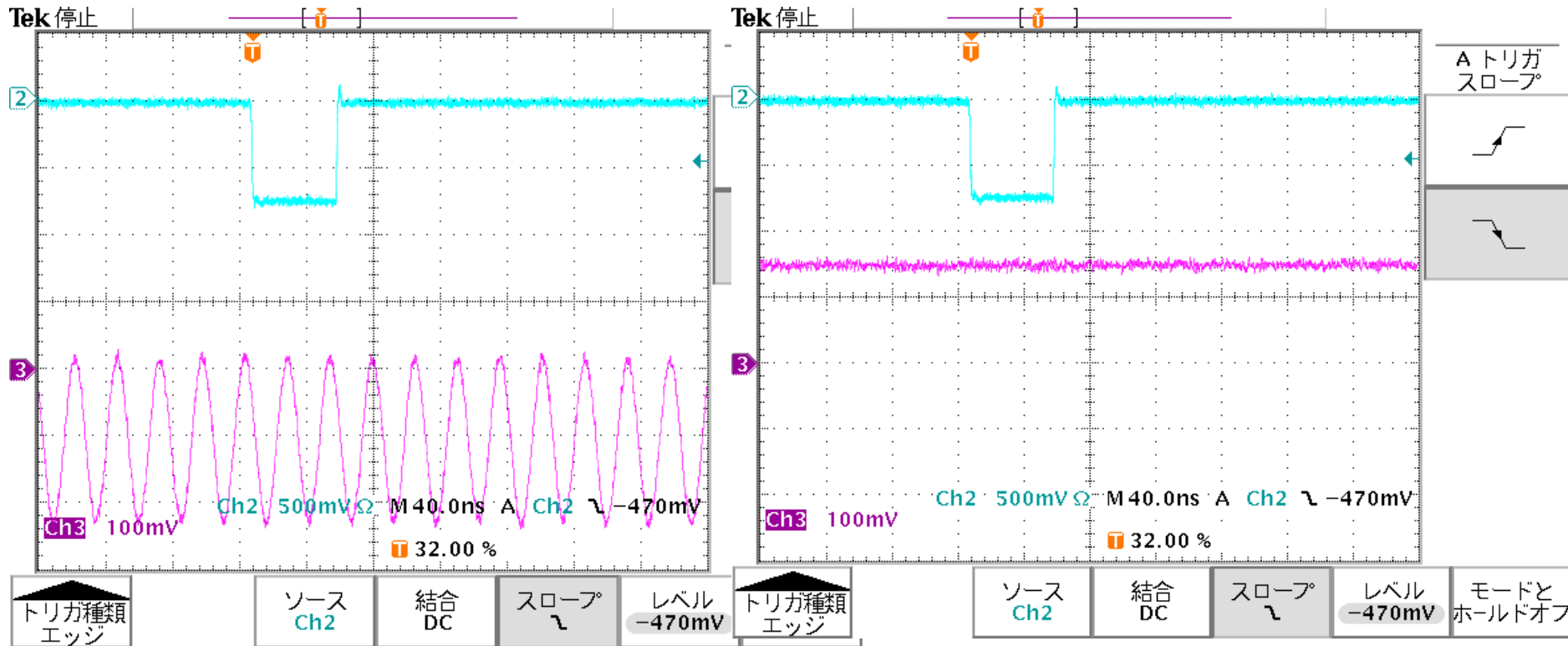
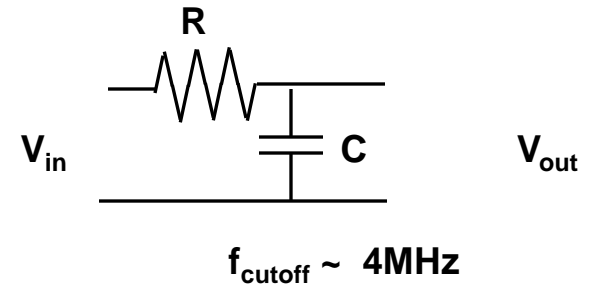
Mylar window for ^{55}Fe source

Snapshot of oscilloscope

Preamp output : ramp signal
Large noise: 400 ~ 500 MHz

Still can not find the source of the noise

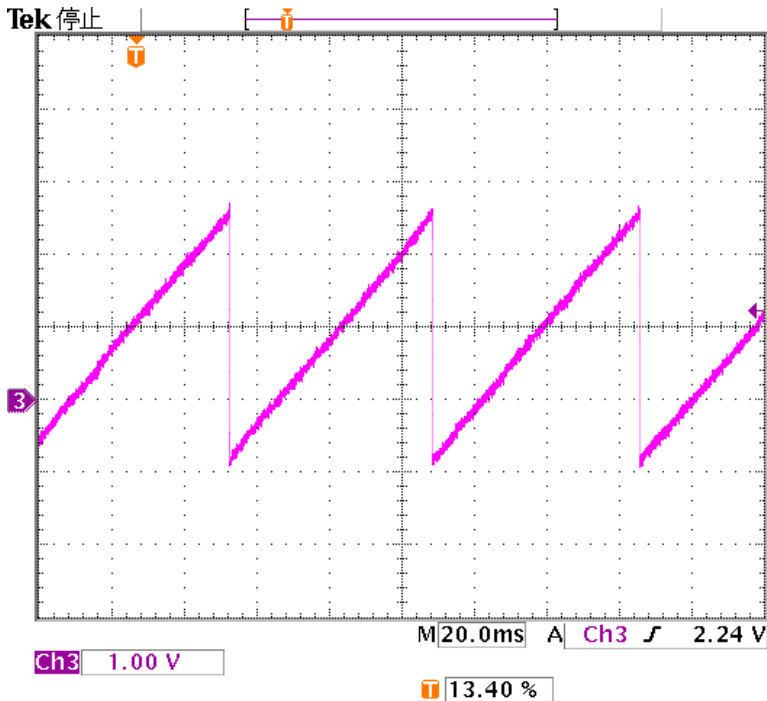
low-pass filter



Snapshot of oscilloscope

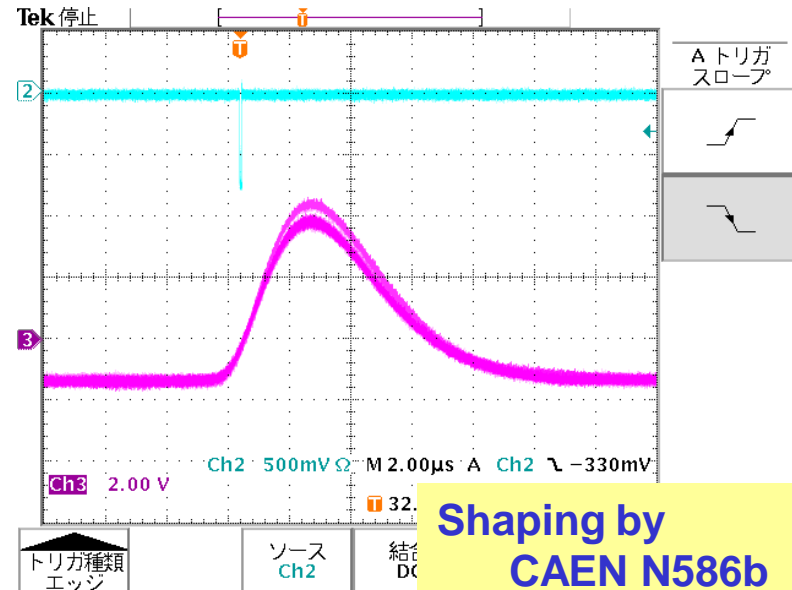
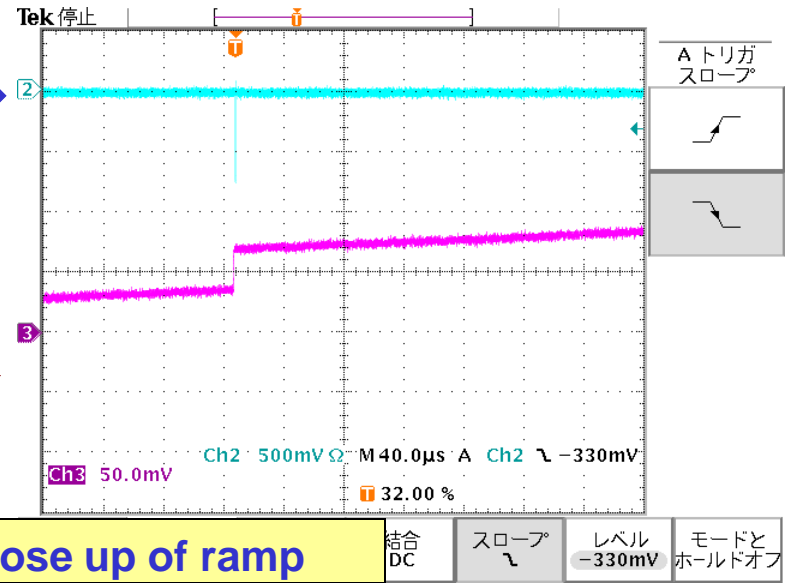
Trigger: OUT x RESET →

Preamp out : ramp signal



$V_{reset} 1.1 V, V_{SUB} -7.1V$

27 May 2009
17:58:13



Obtained spectrum with ^{55}Fe

spectrum with E17 SDD & preamp set

- ✓ preamp put outside
- ✓ fitted with Gauss+tail for $K\alpha$ / $K\beta$
(common σ & tail slope)

Resolution: 170 eV (FWHM)

parameters

SDD housing T: ~ 104 K

preamp T: ~ 295 K (room T)

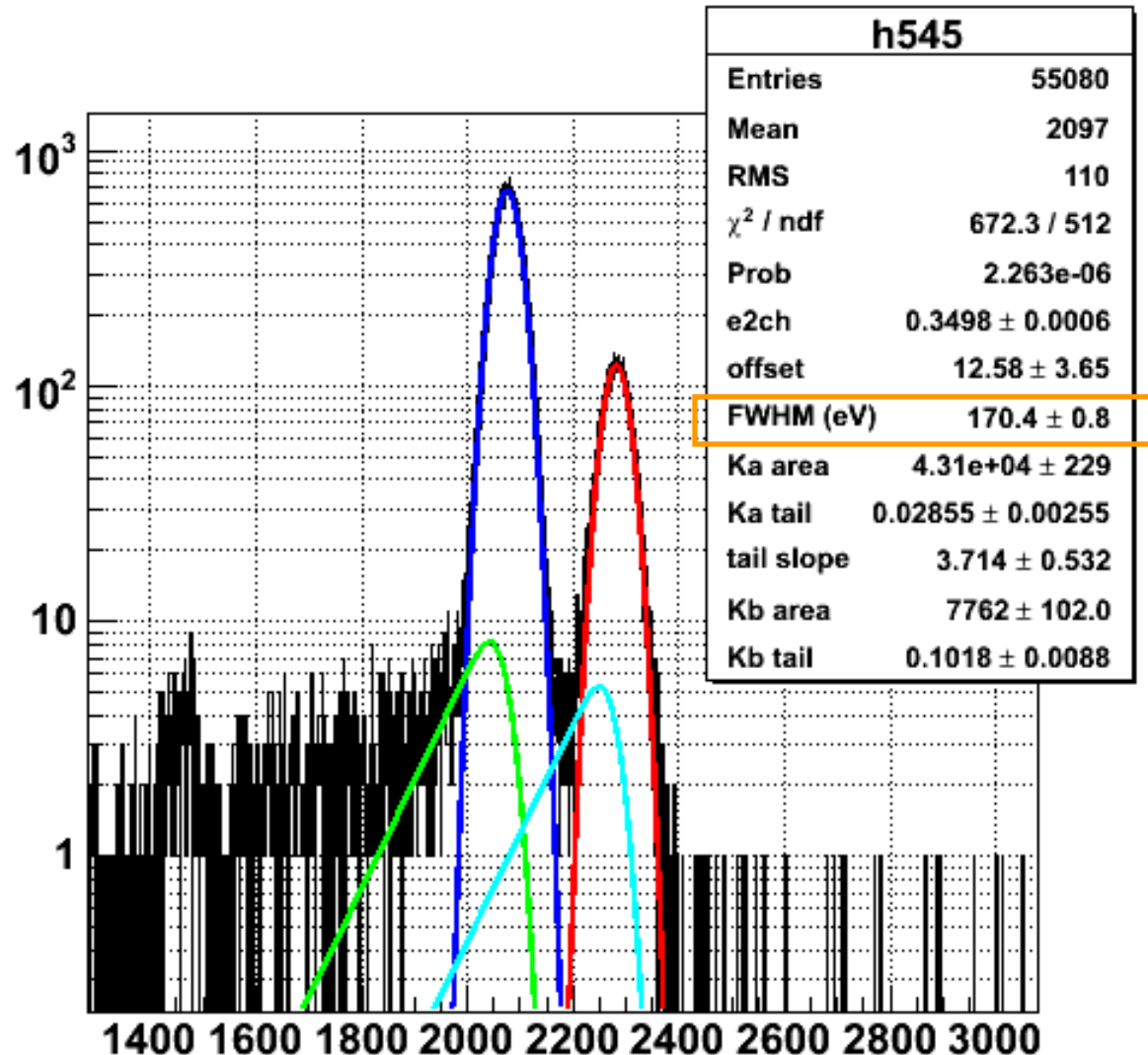
R1 : - 20 V

RX: -130 V

Back: -60 V

← not tuned,

Same with manual values

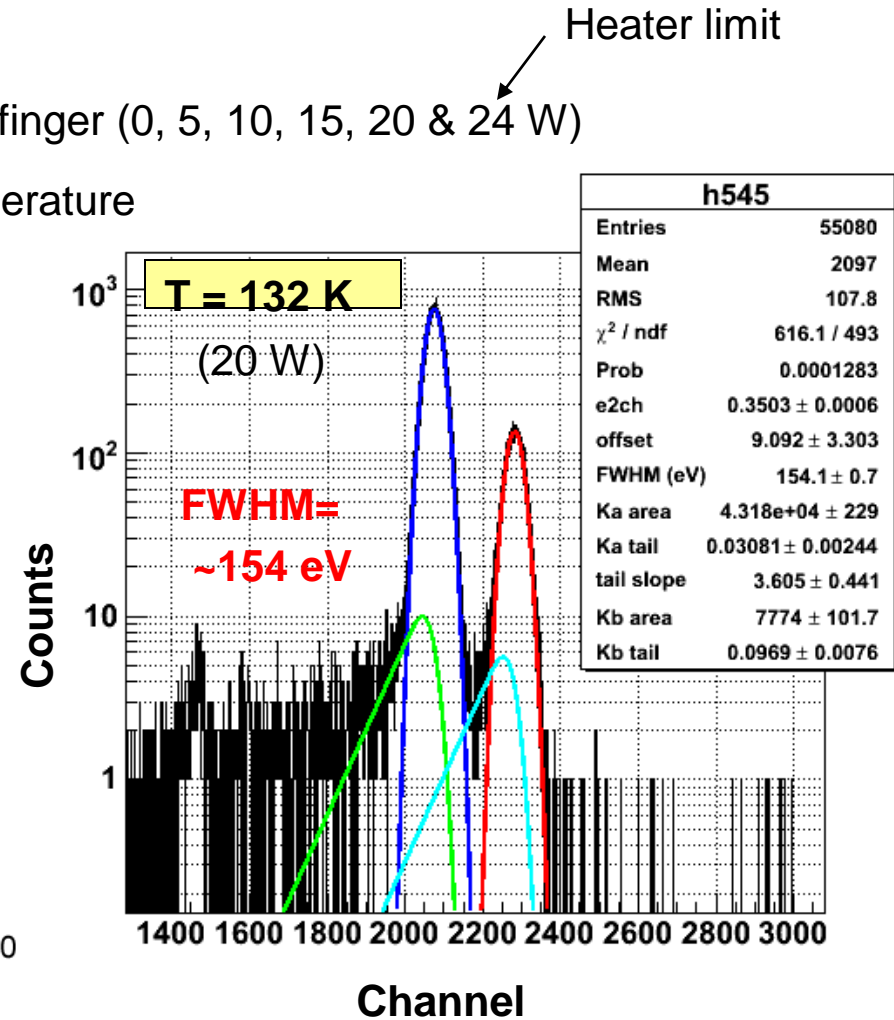
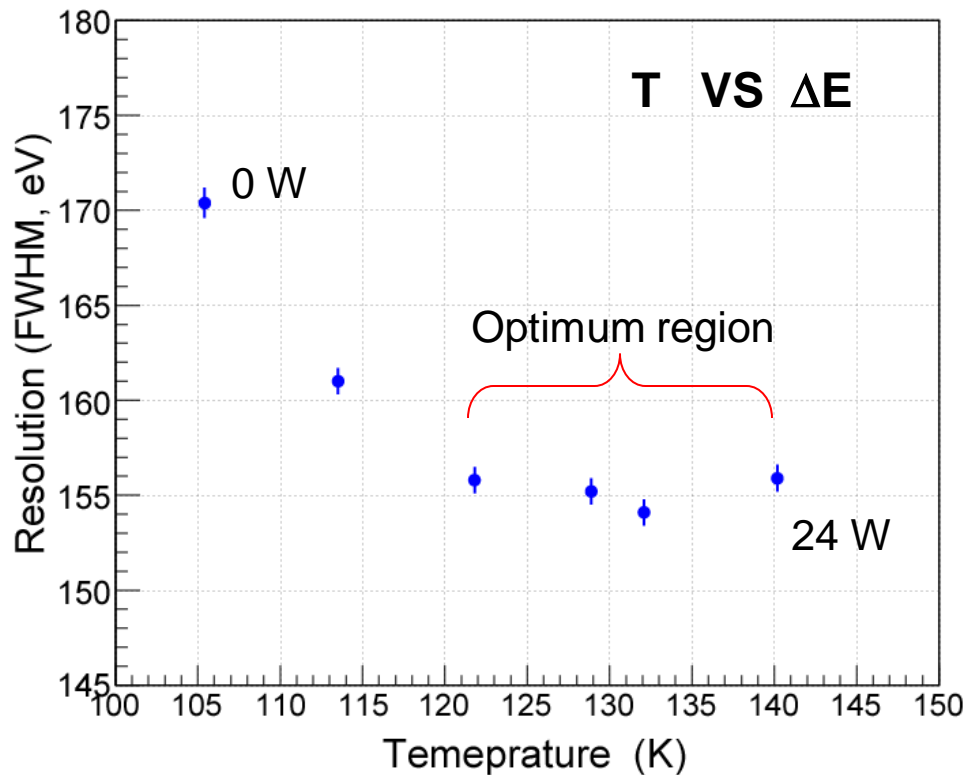


Temperature dependence of the resolution

- ✓ Temperature dependence

Supply current onto the heater for cooling finger (0, 5, 10, 15, 20 & 24 W)

Measured @ Finger = SDD housing temperature



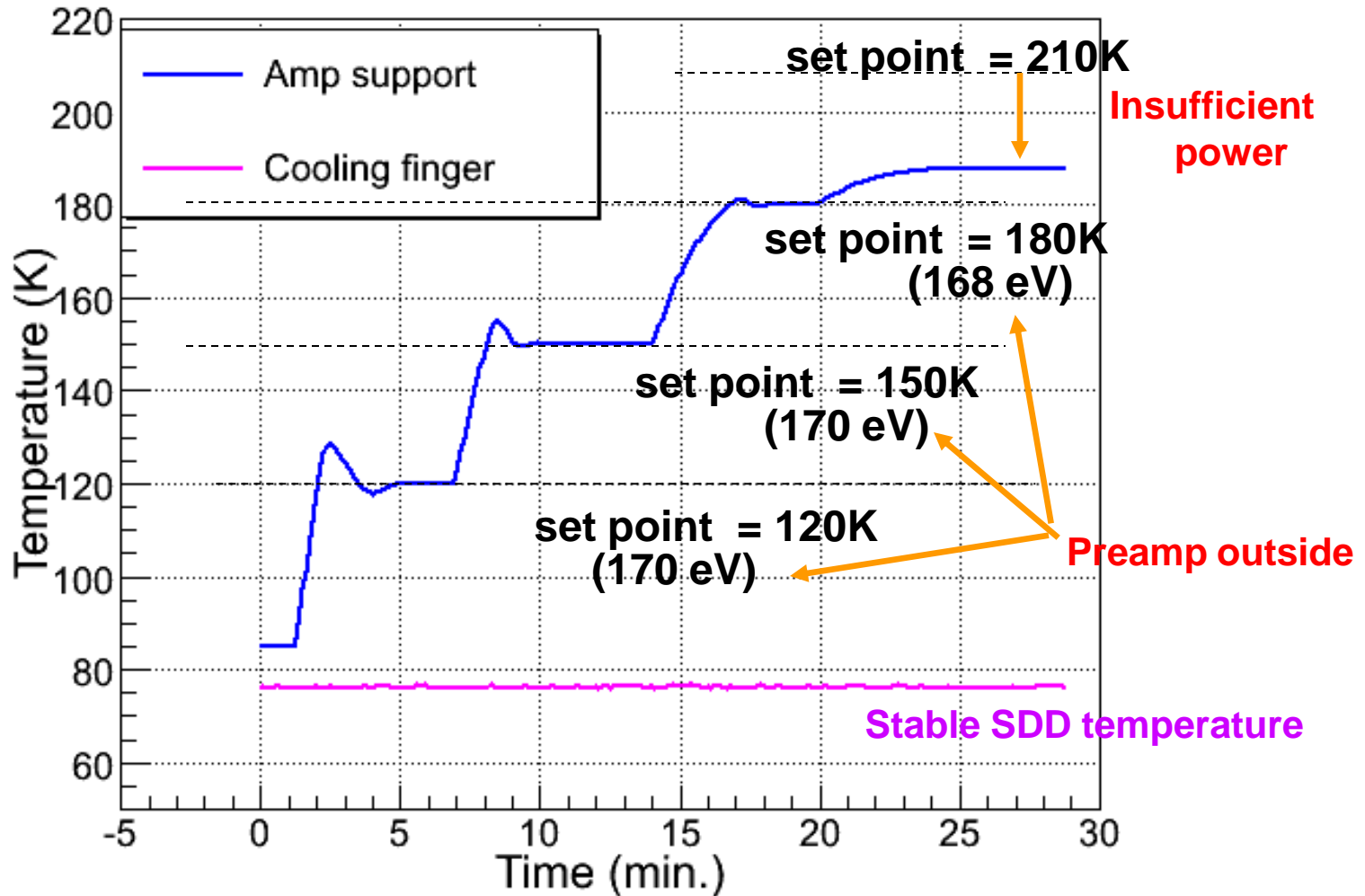
Optimum (SDD housing) temperature region 120 K – 140 K, not 80 K:

Consistent with Barbara's report

Cooling test for the preamp support

Before put preamp inside vacuum chamber, check the support temperature.

T_{support} : Controlled by Lakeshore 340



Can control T_{support} between 120 K – 190 K W/O effect to SDD temperature

Summary

- Brought back one SDD from SMI & started test at KEK
- Test with preamp outside (~ 170 eV @ $T_{\text{SDD}} = 100$ K)
- Temperature dependence of the resolution
→ improves to ~ 155 eV @ $T_{\text{SDD}} = 130$ K

Next things to do

- Installation preamp inside the vacuum chamber
 - ✓ Test external V_{SUB} supply, not preamp
 - ✓ Reduce heat contact of cooling finger to keep ~ 130 K W/O heater
- Optimization of the parameters (HV etc), check the stability