Mitglied der Helmholtz-Gemeinschaft

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Update to day-1 experiment

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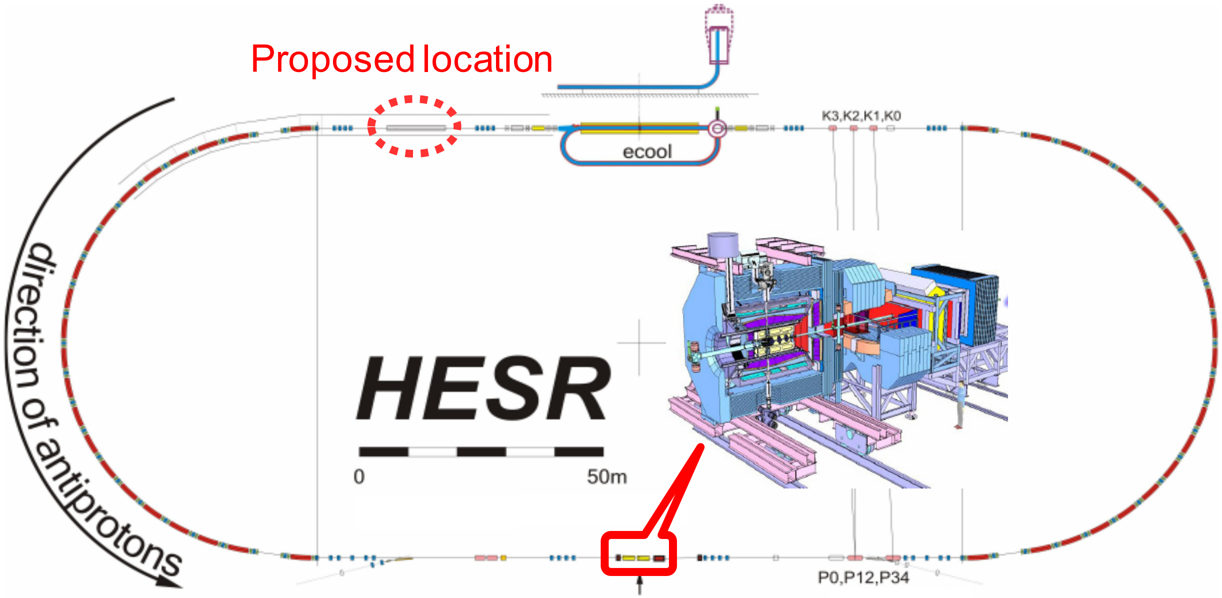
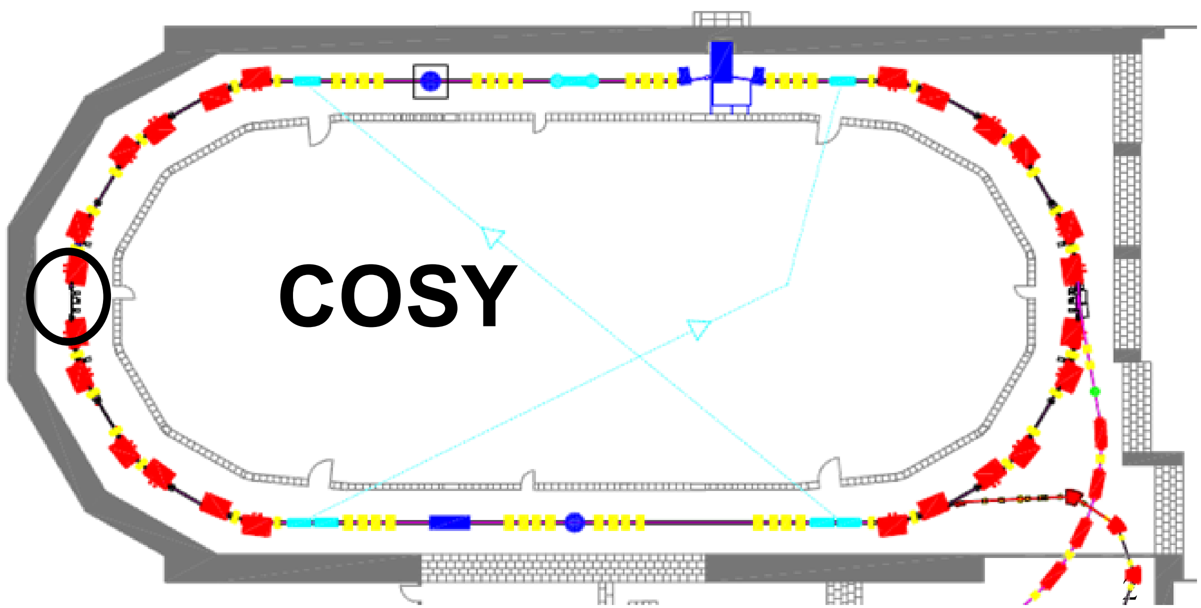
2011/9/6

Large t-range measurement at HESR

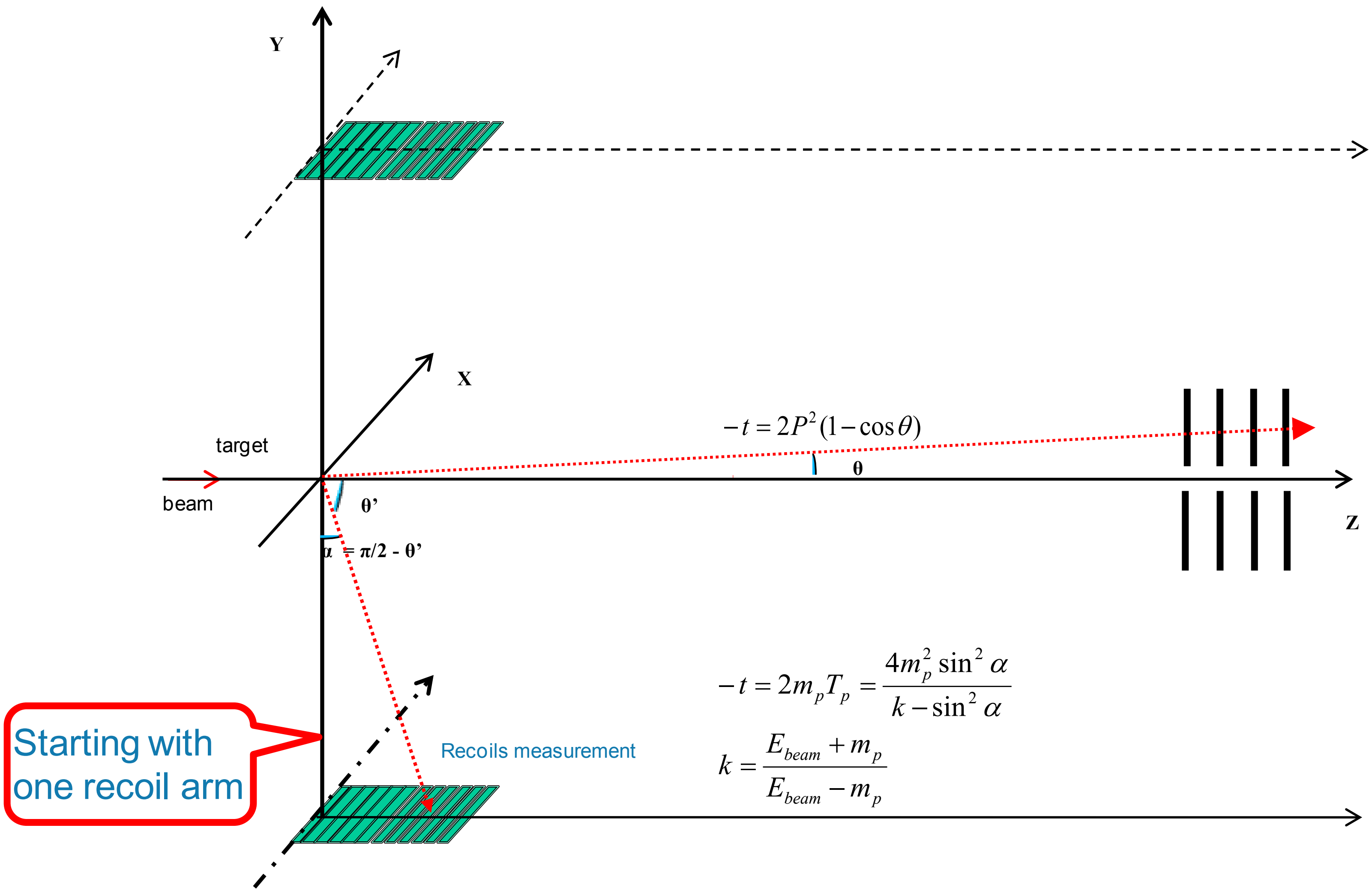


- Large t-range:
  0.0008-0.1 GeV^2

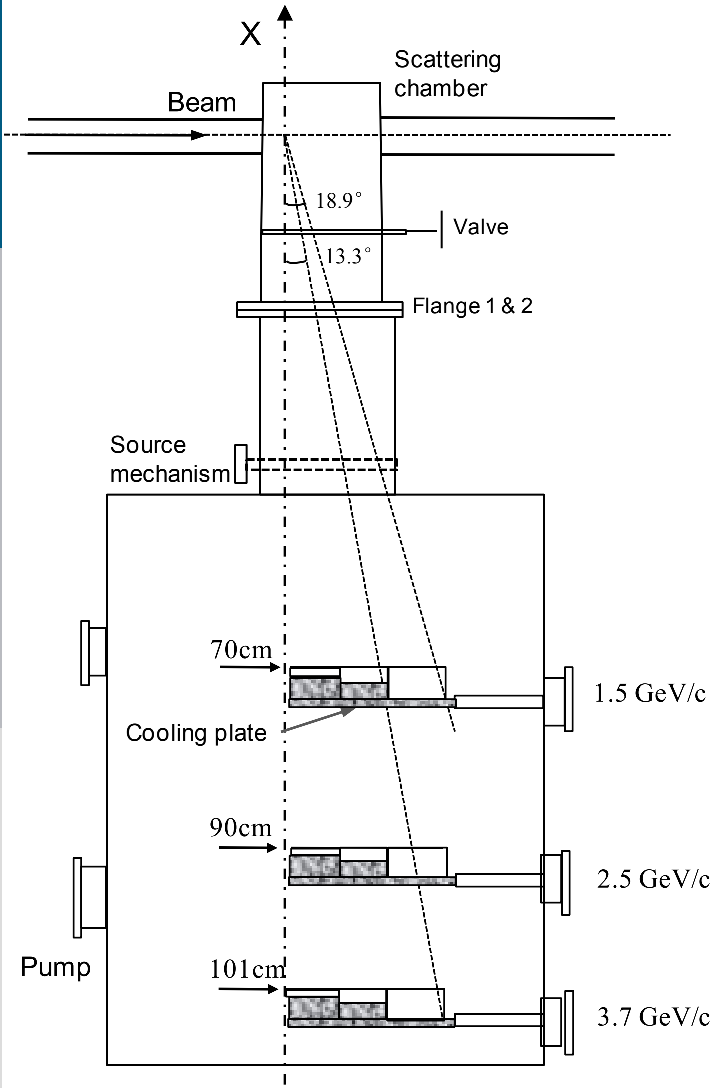
Proposed commissioning location



Sketch of day-one experiment design



Schematic view of recoil arm

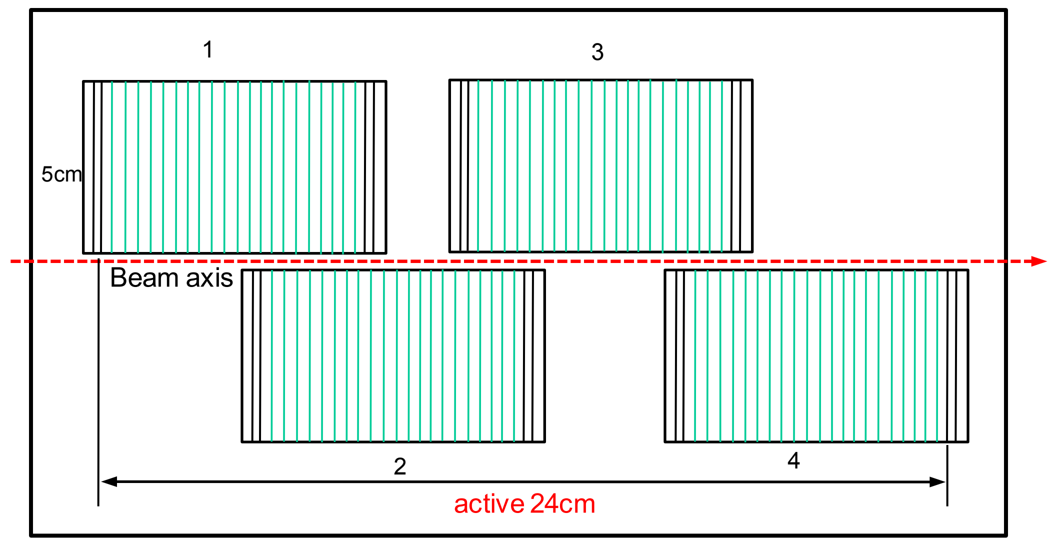


Design requirements:

- **Subtending angle**, i.e. recoil angle up to18.9° @1.5 GeV/c
- **Nearest distance** 70cm (IP to detector surface)
- **Proton energy**: 0.4-60MeV
- **Windowless cluster jet target**

Single sided strip detectors:

- No. 1 and 2 Si : 7.68cm x 5cm x 1mm (64ch, 1.2 mm pitch)
- No. 3 and 4 Ge: 8.04cm x 5cm x 4 &10mm (67ch,1.2mm pitch)



Commissioning with 160 channels

Status of recoil arm construction

- **Part1: Detector**
  - Orders for Si sensors (Micron) and Ge sensors (Semikon) done
  - Sensor design has been confirmed
- **Part2: FEE**
  - mesytec MADC32 has been checked
  - mesytec MUX16 verification in ongoing
- **Part3: DAQ & test system**
  - DAQ procedures for MADC32 has been partially created
  - The verification test of FEE has been partially done
- **Part4: Mechanical**
  - Design of vacuum chamber/detector plate is getting started
- **Part5: Cluster jet target**
  - Funding for new stuffs
- **Part6: Accessories**
  - Quotation for HV is available (Iseg)
  - Cooling system for Germanium sensor (typical cooling, LN2)

Test 1: ADC verification

CAEN V785 AE & mesytec MADC32

mesytec MADC32

32 channels peak sensing ADC
Data transfer modes: D16 (registers), D32,BLT32, MBLT64, CBLT, CMBLT64
DNL: <1%@4k

Input range: 4V,8V,10V selectable
Bit resolution: 11-13bit (2k,4k,8k)
Conversion time for 32ch:

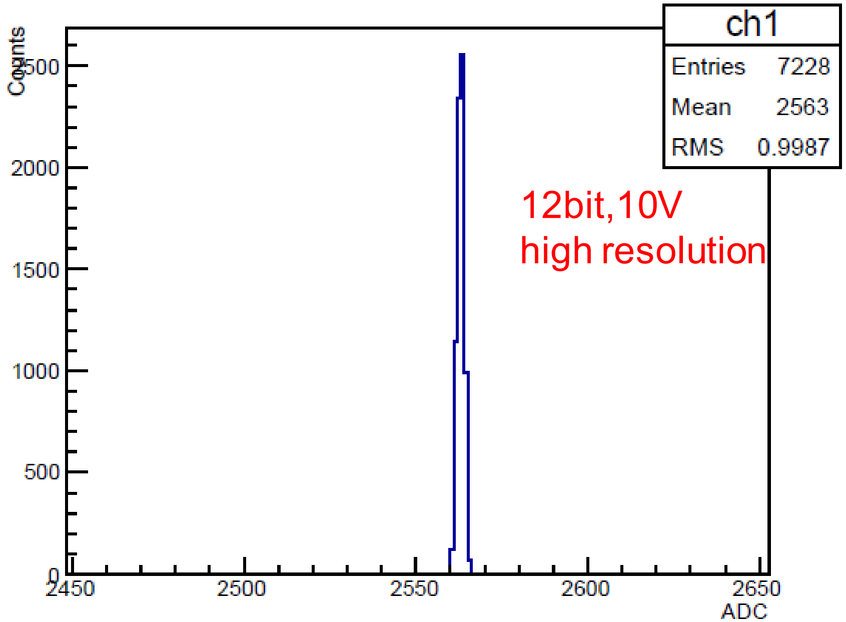
2k : 800ns
4k : 1.6us   4k(hires): 3.2us
8k : 6.4us   8k(hires):12.5us

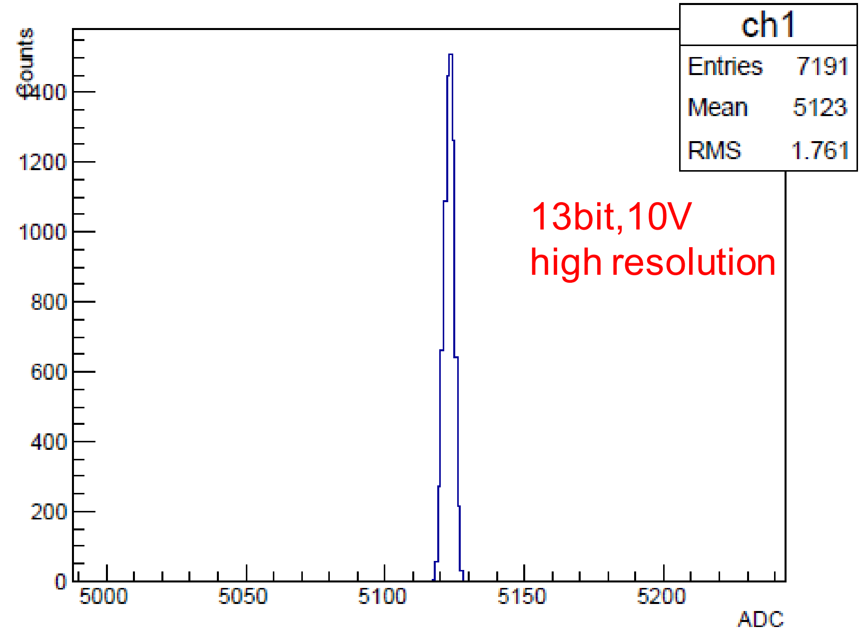
CAEN V785(AE)

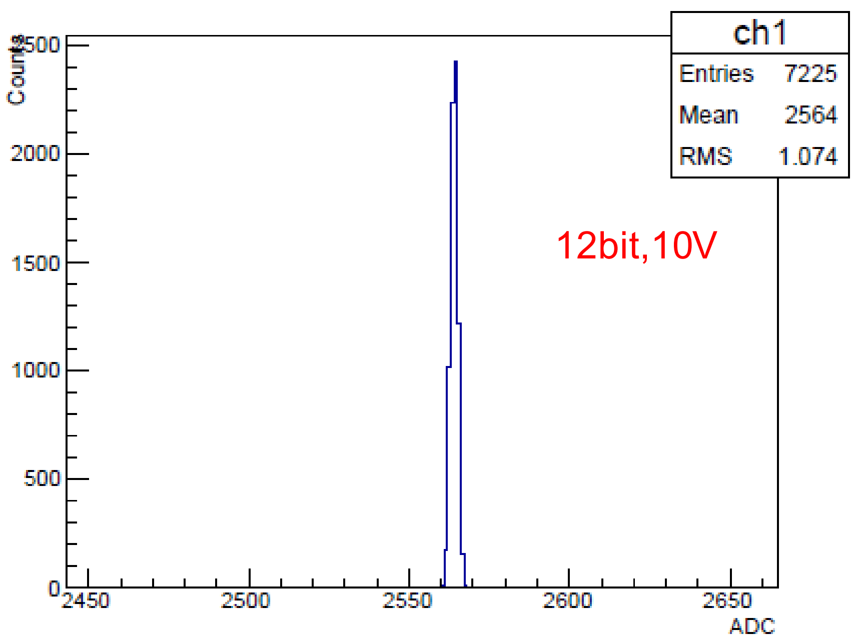
32 channels peak sensing ADC
Data transfer modes: D16 (registers), D32,BLT32, MBLT64, CBLT, CMBLT64
DNL: 1.5%

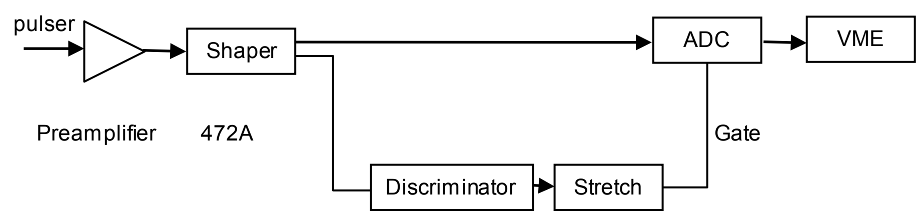
Input range: 8V (type AE)
Bit resolution: 12bit(4k)
Conversion time for 32ch:

4k : 5.7us

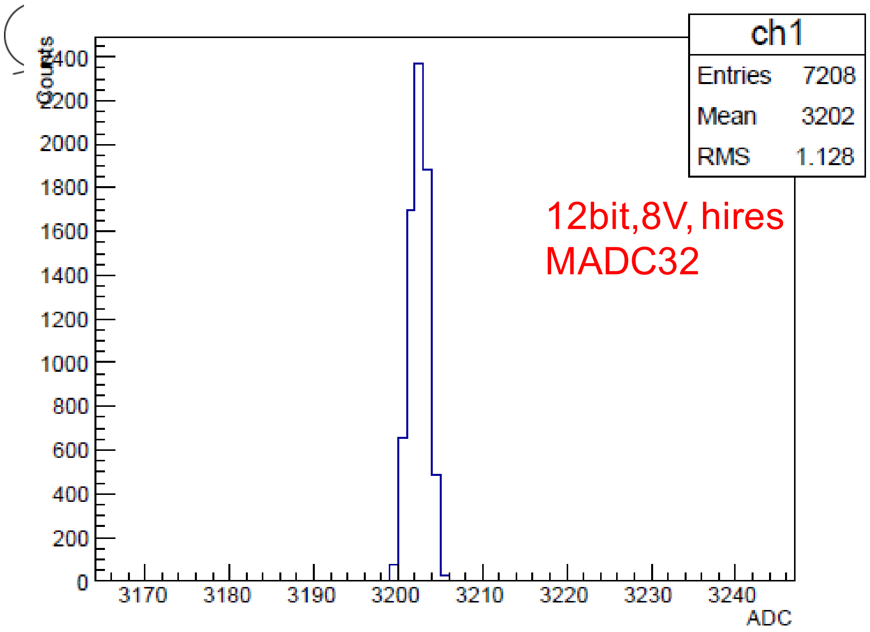


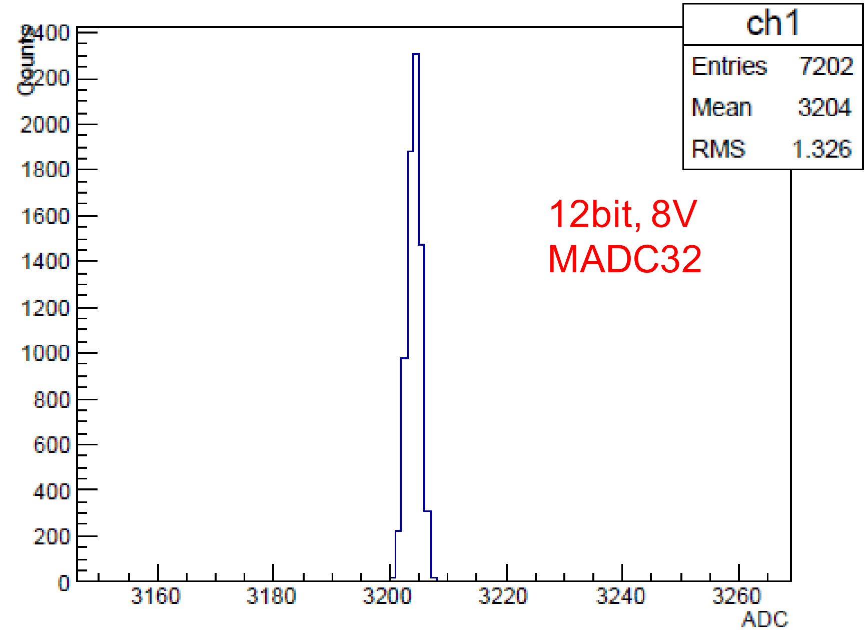




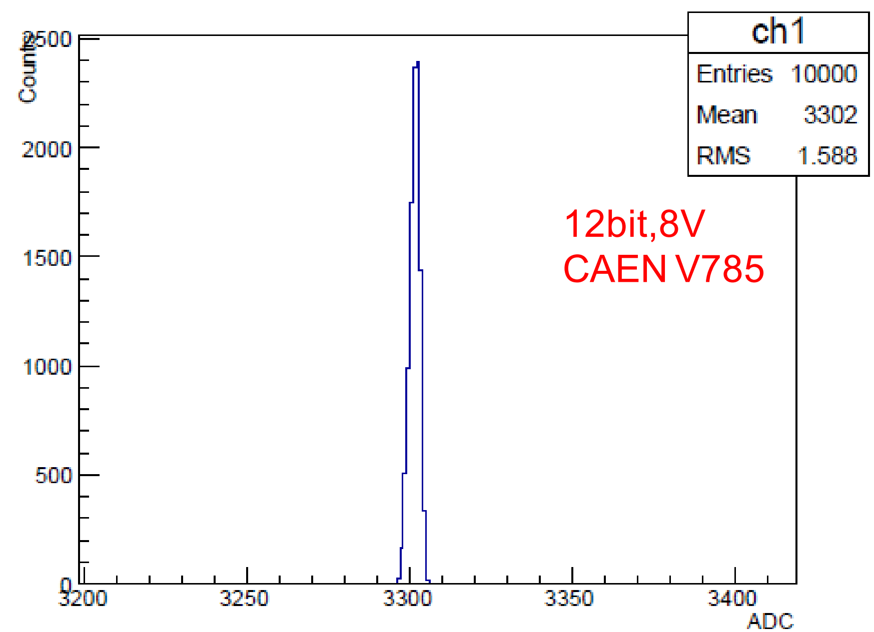


Pulser ADC spectrum (mesytec MADC32 with different modes)





Comparison test with pulser signal for MADC32 and CAEN V785 AE



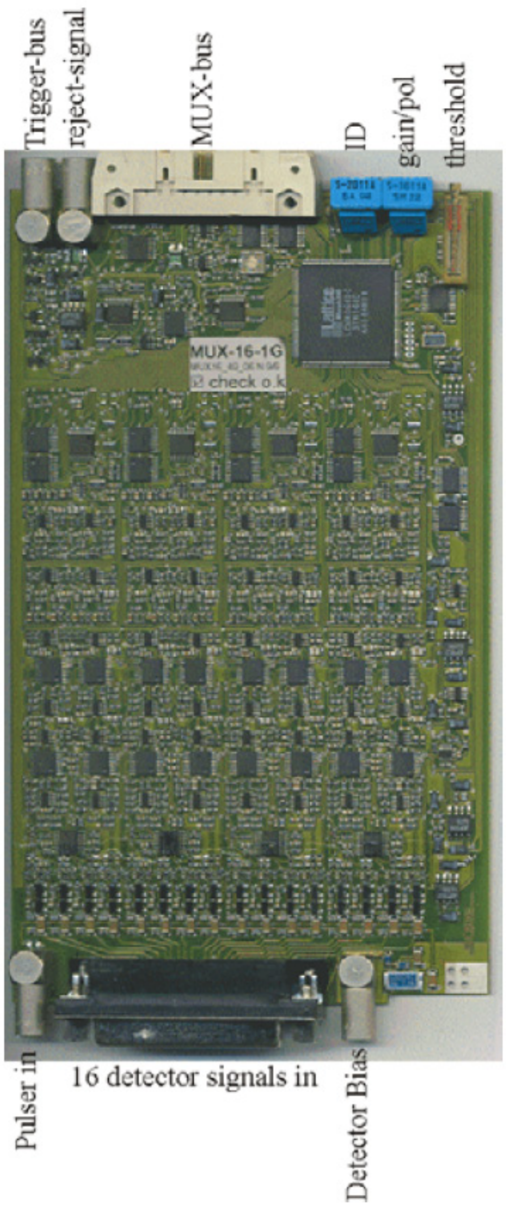
Test 2: Comparison test of

MUX16 + MADC32
Ortec + MADC32

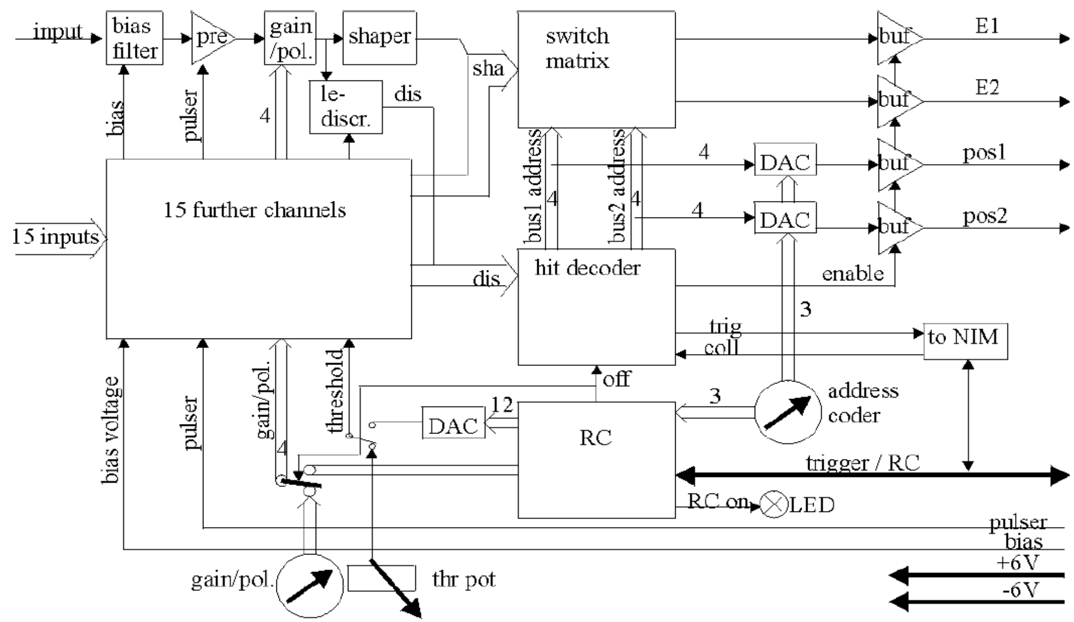
mesytec MUX16 typical features:

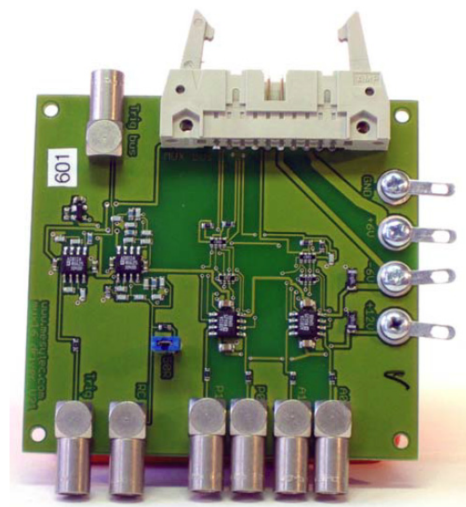
- ✓ 16 channel preamplifier, shaper, discriminator combination
- ✓ Up to 2 channels output simultaneously (taking 4 ADC channels)
- ✓ Up to 128 channels (8 modules) can be connected to one bus
- ✓ Polarity and gain adjustable
- ✓ 100MeV type

MUX16 functioning scheme



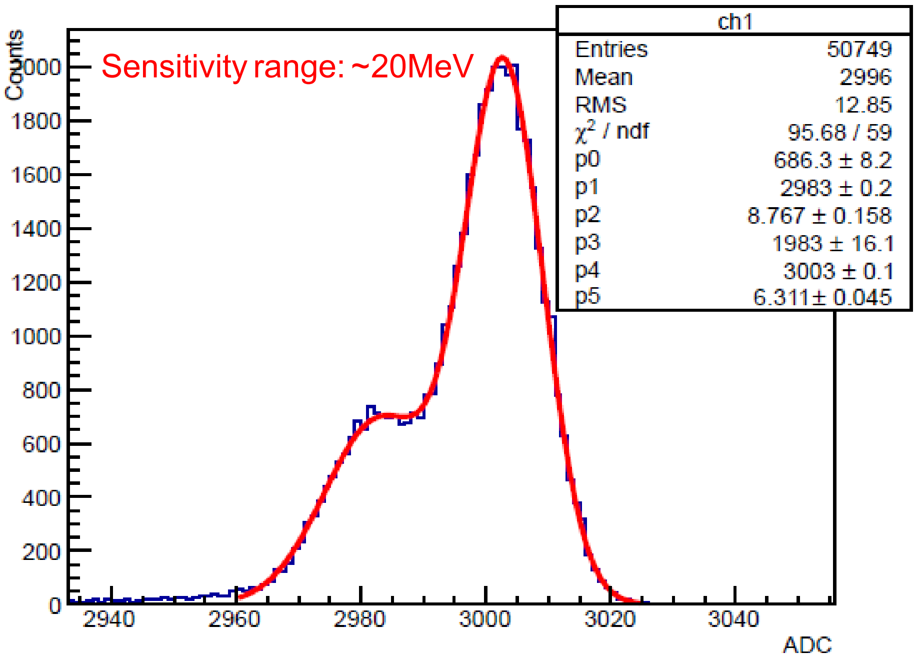
Schematics:

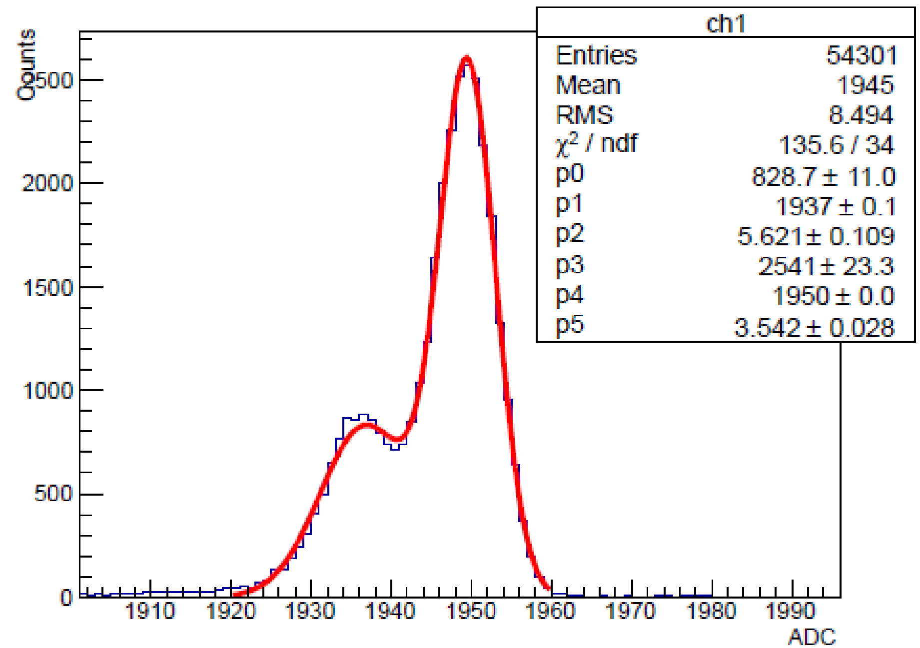




(Ortec 142AH+Ortec 472A) and MUX16

with MADC32, 40cm cable



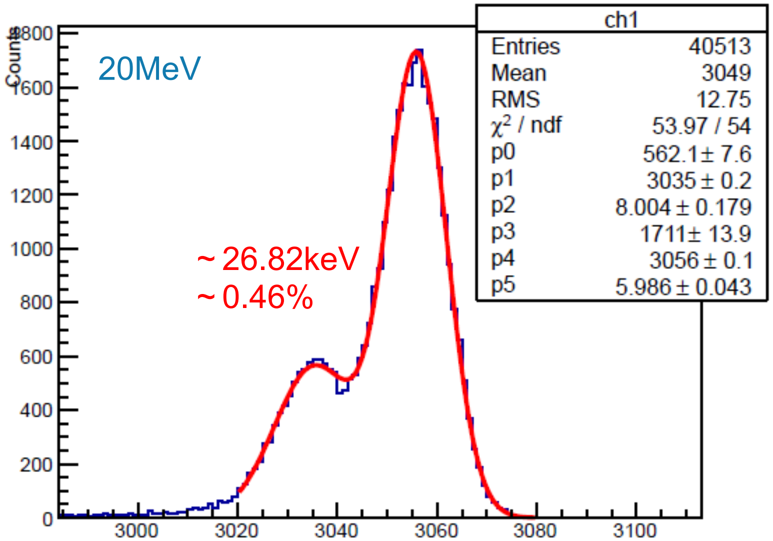


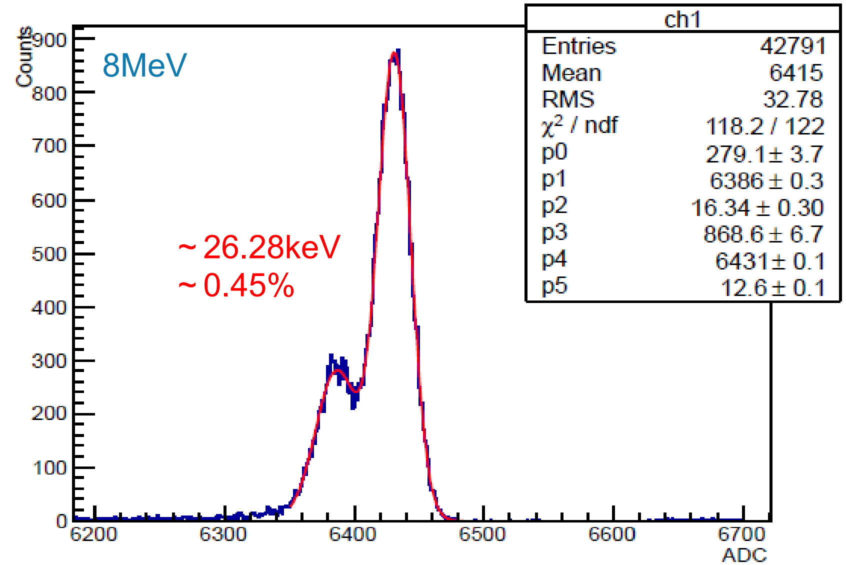
MUX16
Sensitivity of preamplifier : 14mV/MeV

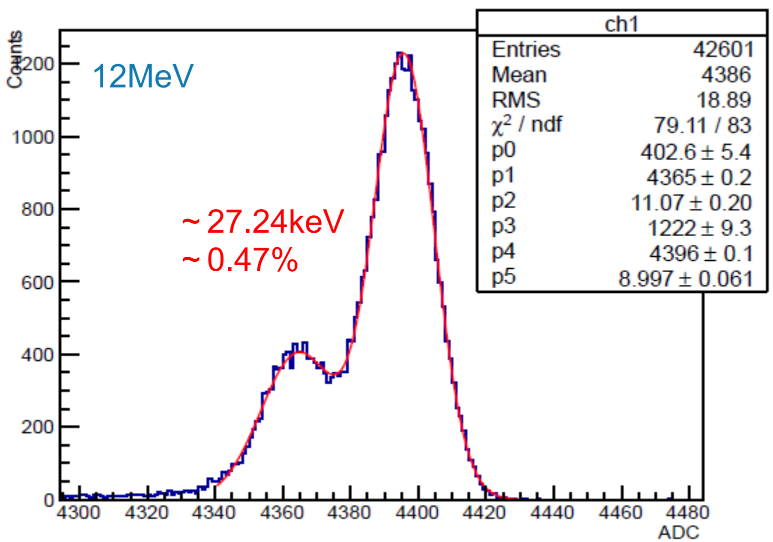
Ortec 142AH+ 472A
~25.6 keV (FWHM)
Sensitivity of preamplifier : 20mV/MeV

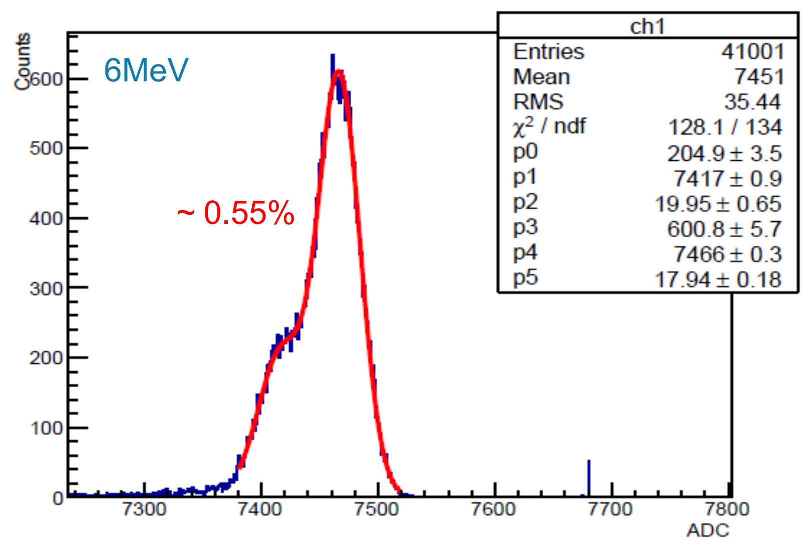
The sensitivity of preamplifier is a dominant factor!

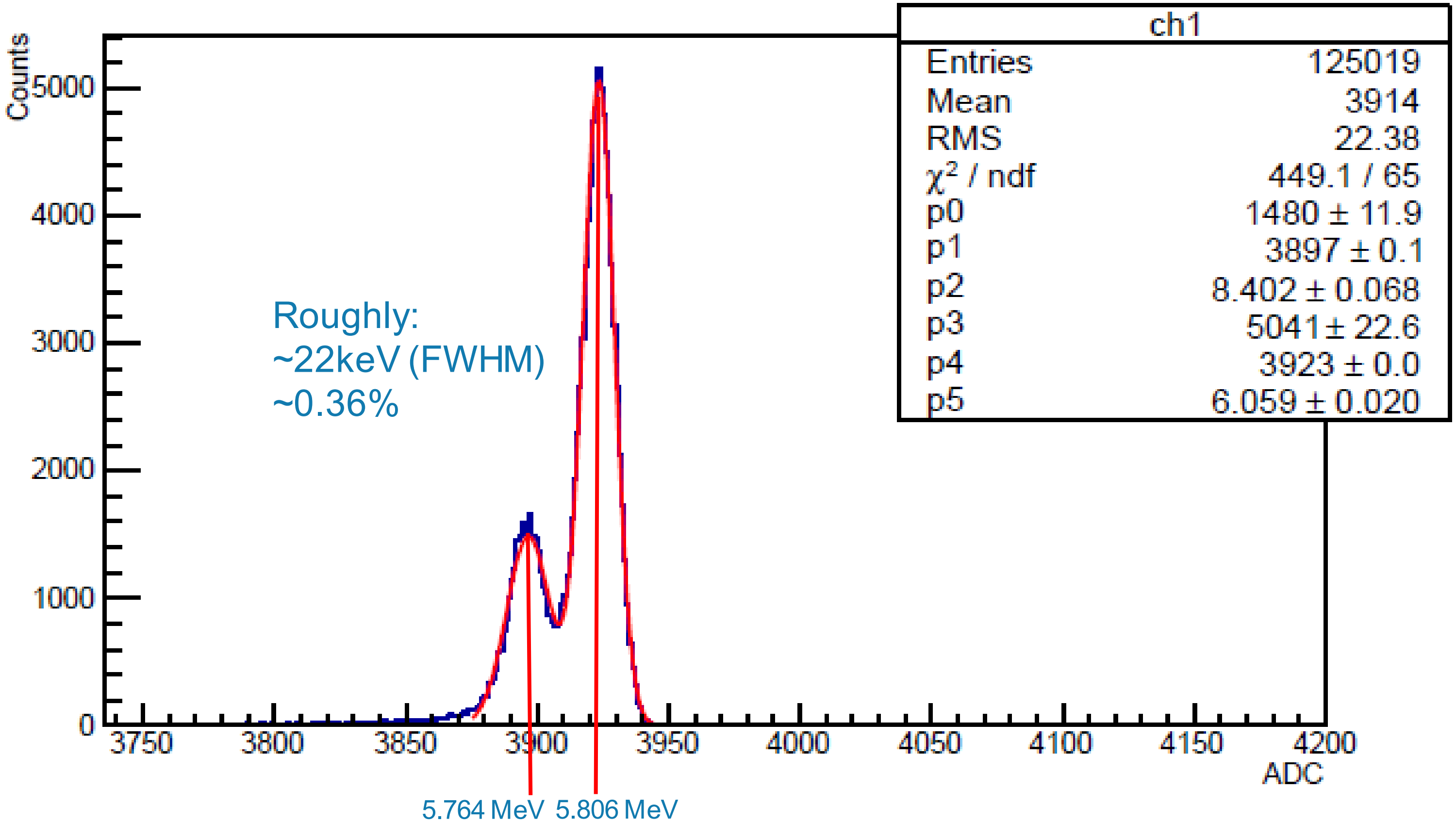
MUX16 in vacuum with 20cm cable











Best case with Cm244 source

- -- Ortec 1000um, 50mm^2 silicon
- -- 20cm cabling
- -- Ortec 142AH, preamplifier
- -- Ortec 472A, shaping amplifier
- -- MADC32 (13bit, 8V)

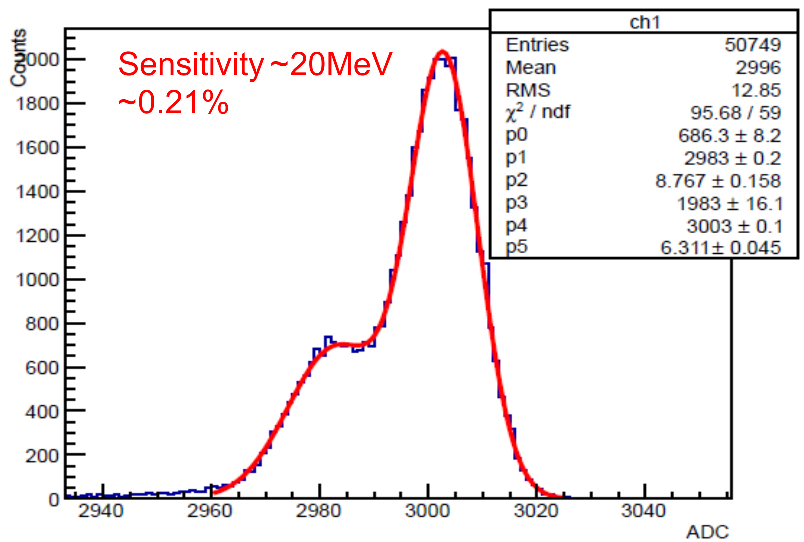
What to be done

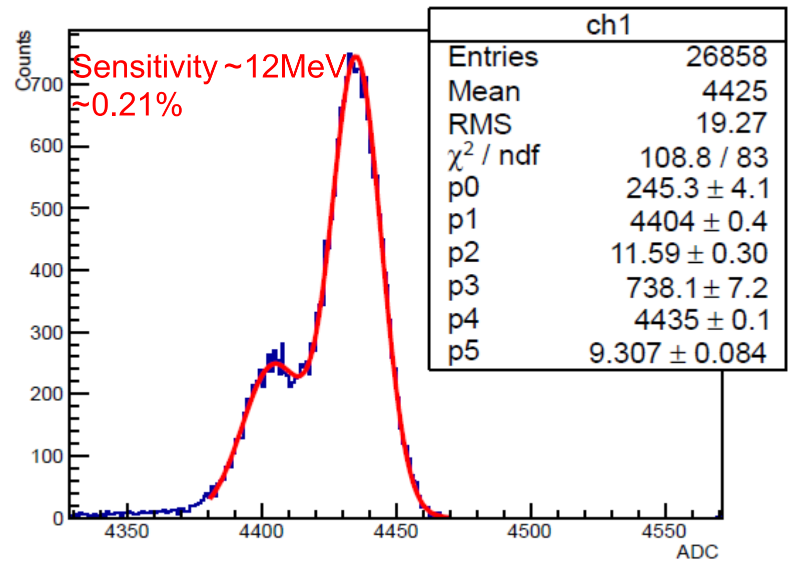
- **Part1: Detector**
  - Detector holder design, detector readout PCB design
  - Detector test and integration
- **Part2: FEE**
  - Further study for MUX16 to verify it is possible to meet experiment requirements
- **Part3: DAQ & test system**
  - Optimization for MADC32 DAQ procedures
  - Codes for online display/offline analysis
- **Part4: Mechanical**
  - Mechanical design for commissioning (including Vacuum chamber for detector, FEE enclosure?)
- **Part5: Cluster jet target**
  - Muenster group will steer
- **Part6: Accessories**
  - Further investigation of HV system combined with cooling system to realize automatic self-protection (e.g. over-temp shutdown or over-current shutdown)
  - LN2 cooling requirements

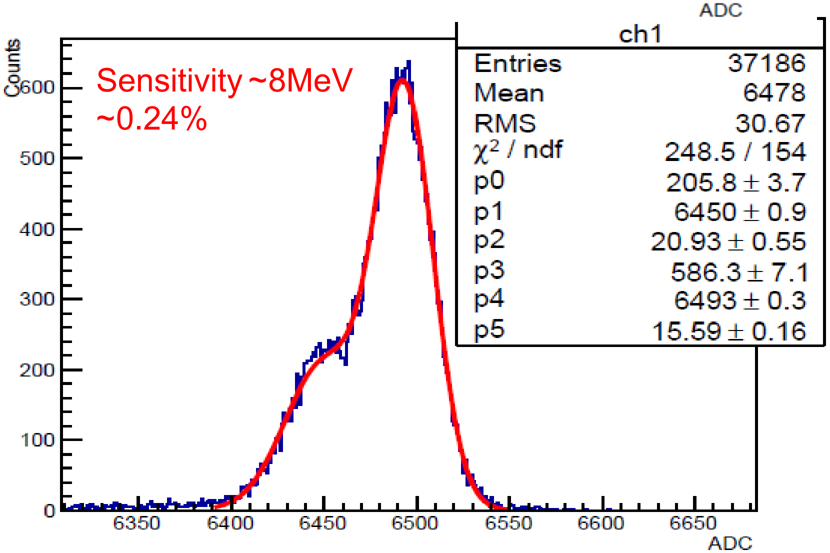
Thanks for your attention!

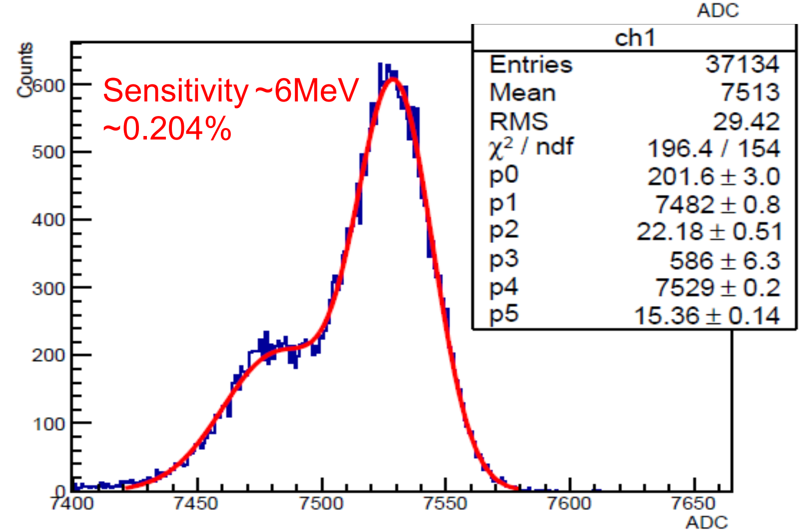
MUX16 + MADC32

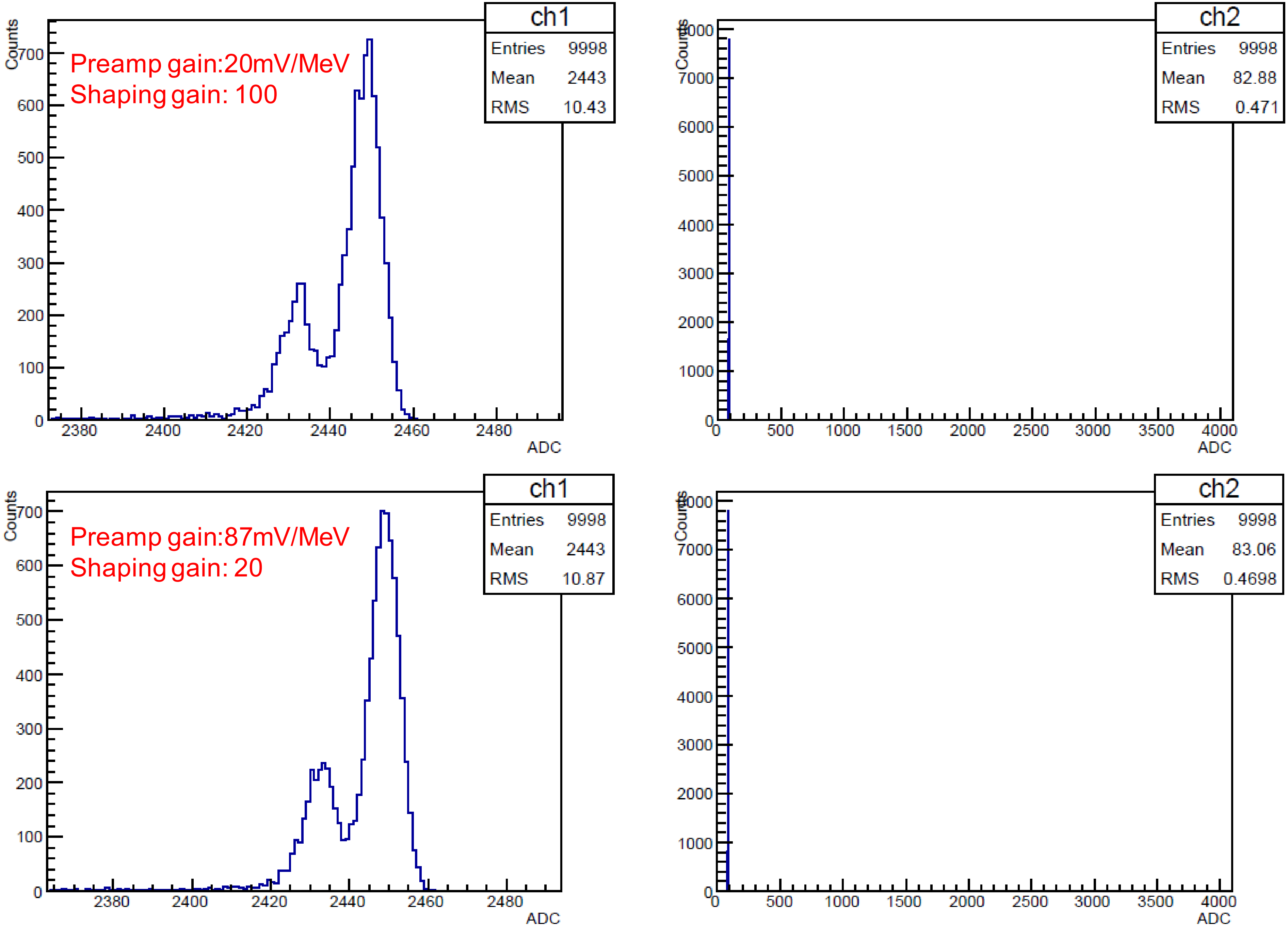
10cm cable inside vacuum
30cm cable outside vacuum










ch1
Entries 9998
Mean 2443
RMS 10.43
Preamp gain:20mV/MeV
Shaping gain: 100
Counts
ADC
ch2
Entries 9998
Mean 82.88
RMS 0.471
Counts
ADC
ch1
Entries 9998
Mean 2443
RMS 10.87
Preamp gain:87mV/MeV
Shaping gain: 20
Counts
ADC
ch2
Entries 9998
Mean 83.06
RMS 0.4698
Counts
ADC