

DESY Test Beam

May 2-15, 2022

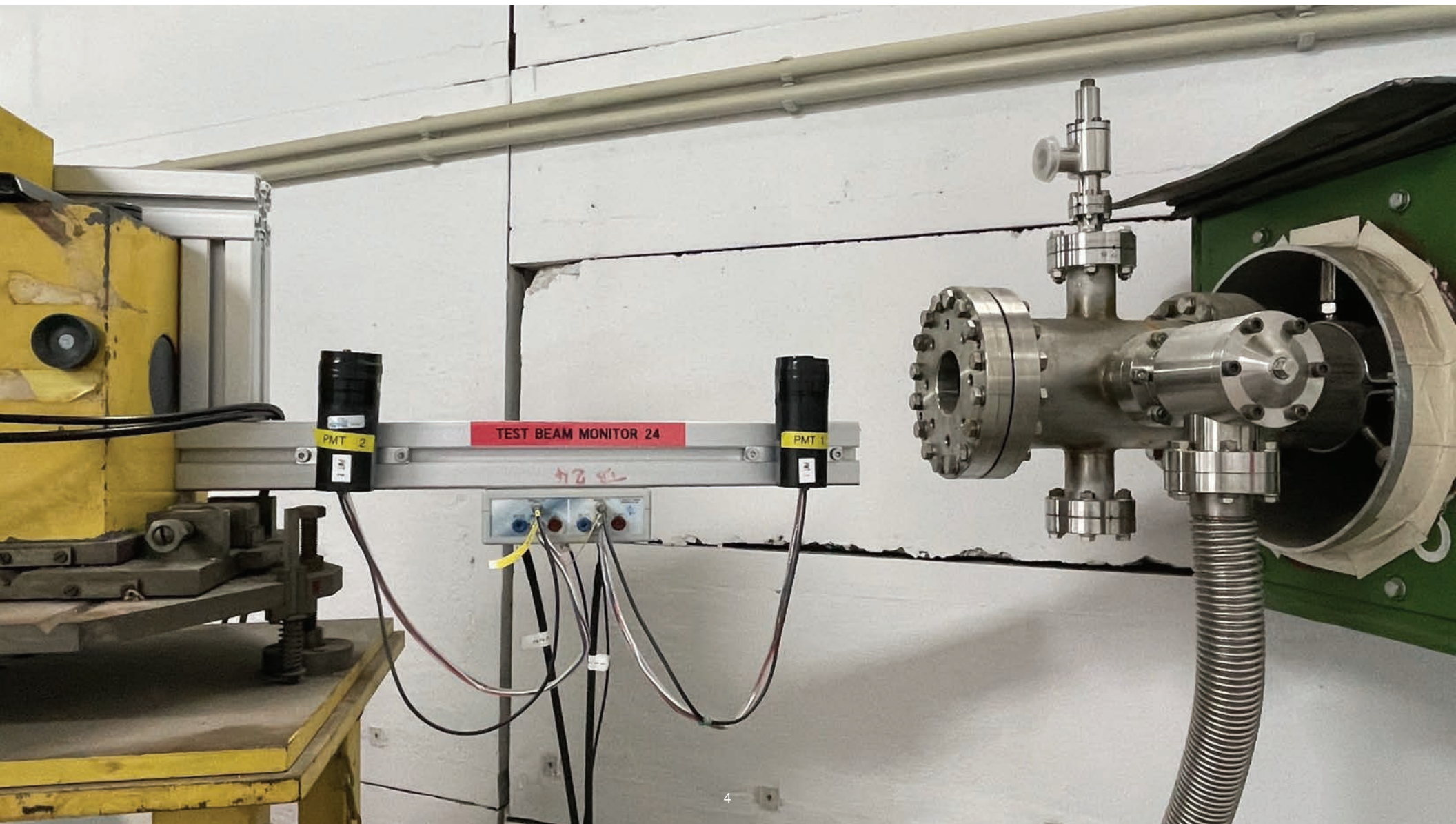
Douglas Hasell, May 13, 2022

Goals

- Streaming Readout Comparison
 - JLab FADC250 - streaming and trigger mode operated stand-alone
 - CAEN Digitizer (streaming) and QDC (triggered) operated in parallel
- TPEX prototype calorimeter
 - 5x5 lead tungstate calorimeter (PbWO₄ courtesy of Tanja Horn, CUA)
- EIC EMCal - Lead tungstate and scintillating glass
 - five 2x2x20 cm³ “crystals” (courtesy of Tanja Horn CUA)

Run Plan at 25°C, 10°C, -10°C, -25°C

- set PMT HV using 5.2 GeV beam centred on each crystal to position peak around channel 3500 on QDC (12 bit) after correcting for the pedestal
- centre beam on each crystal and collect 10,000 events at 2, 3, 4, and 5 GeV
- scan across calorimeter in discreet steps, 10,000 events, 2, 3, 4, and 5 GeV
- centre beam on central crystal with 10 mm Al + 0, 3.5, 7.0, or 14.0 mm Pb
 - 10,000 events, 2, 3, 4, and 5 GeV
- for 5x5 lead tungstate calorimeter
- replace central “ \oplus ” with scintillating glass

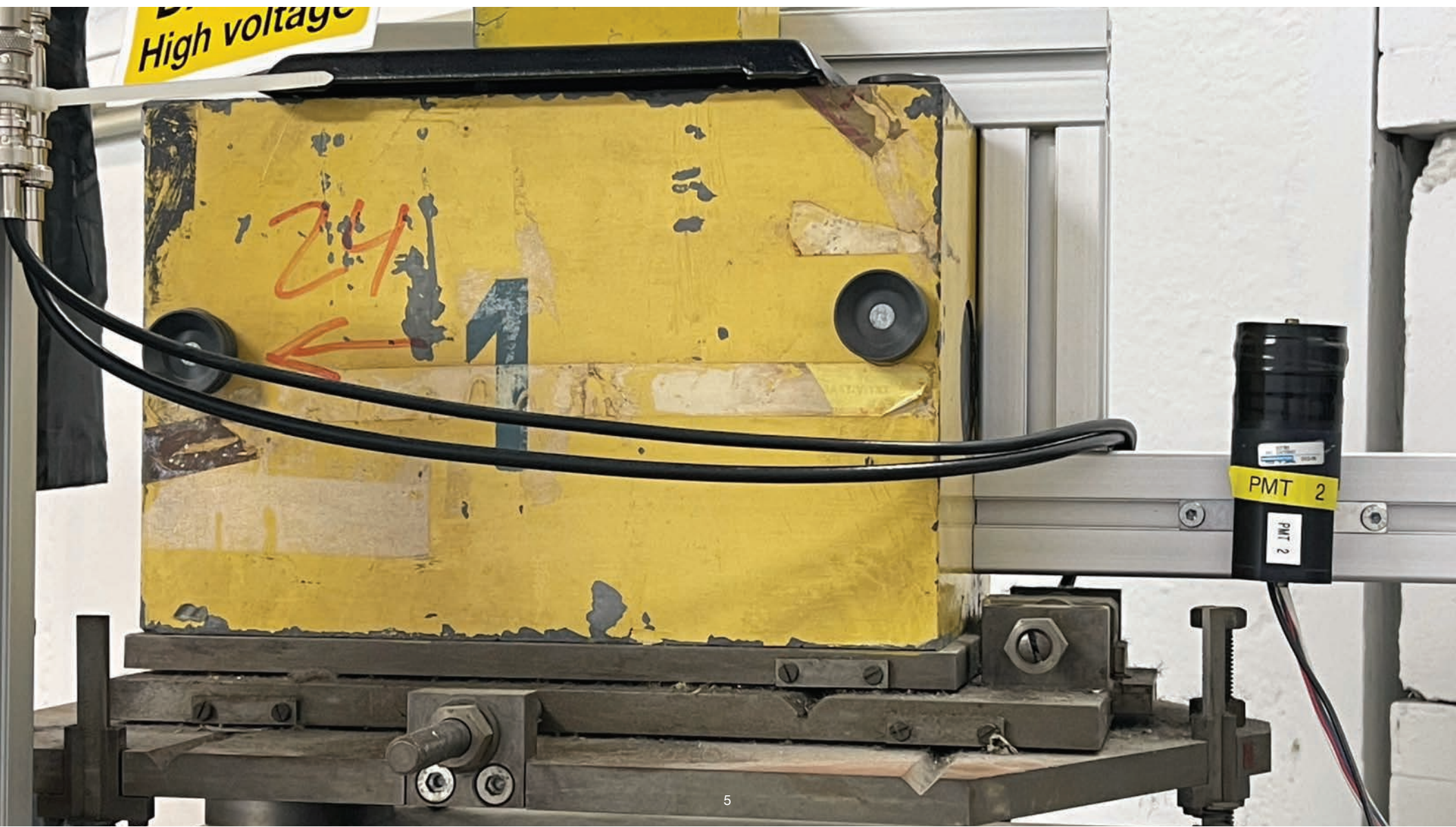


High voltage

24
←

PMT 2

PMT 2







7
Warnung













Phone Numbers 040 8998-...
Emergency Call 2500
Technical Emergency Call 5555
Accelerator Control Room 3500

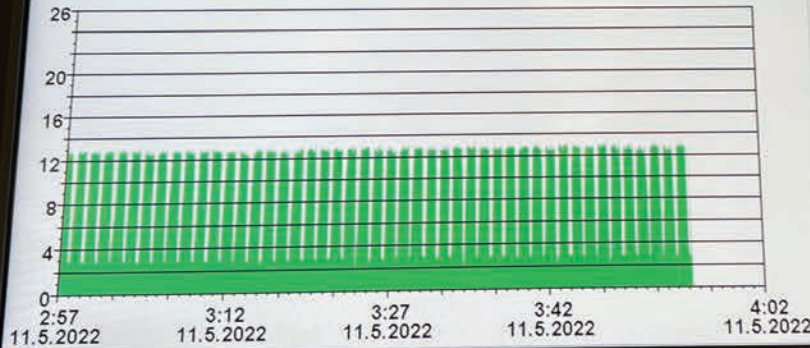
Wednesday, 2022-05-11
03:55:20 (CEST)

**TB 24
On**

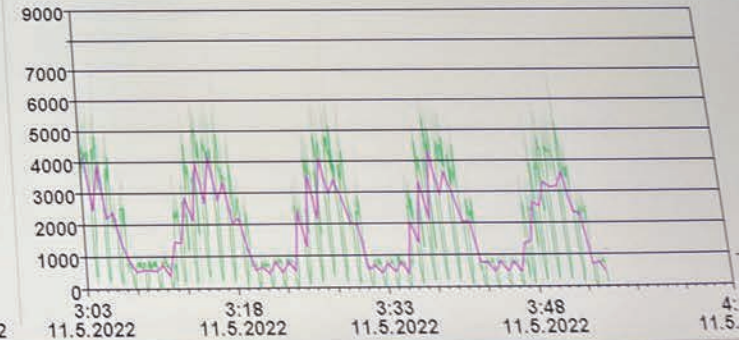
Machine State

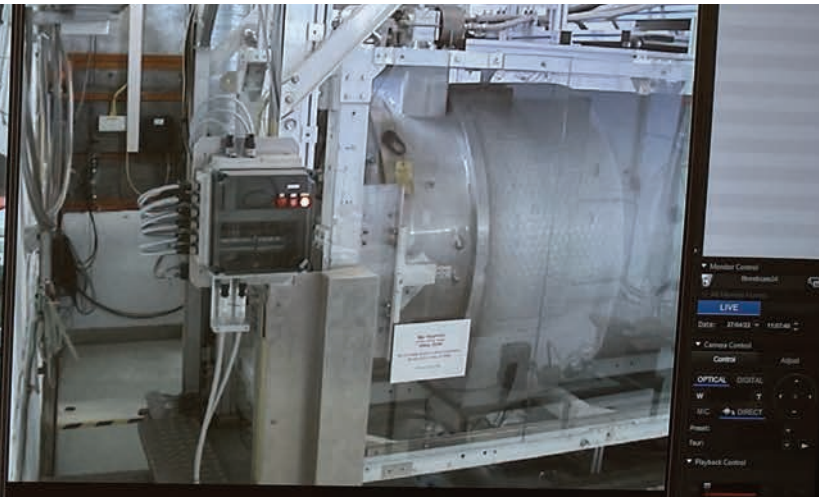
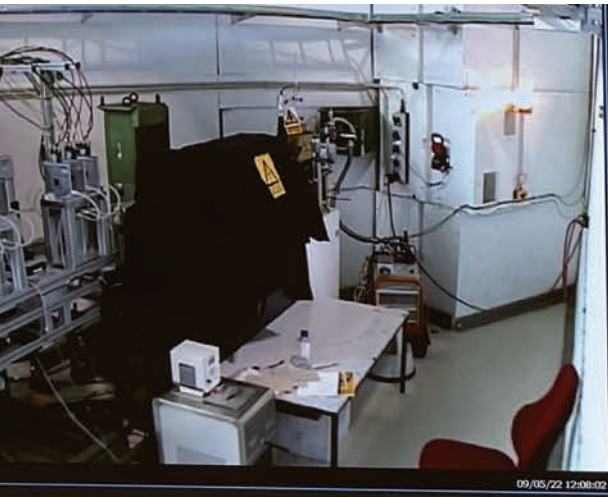
User Operations->Testbeam

Number of Particles in 10^9 12.9



Beam Rate in Hz 714.1





Mon 12:08

File View Help

1048 18/7/18.7.119 TLEES (ptuser@tribl1.desy.de: LPTPC_start.xml)

Gas System Motor Control Magnet Control

IV Anode IV Cathode Subsystem, Detector

TPC DAQ LCD Server

BeamMain.exe

Machine Name: PETRA Particle Type: Electrons Energy: 5.3093 GeV Number of Particles in 10¹⁰: 1.19462 Machine Status: User Operations -> PETRA

Machine Number Accelerator Section Beam: 1000

Operation for: PETRA Particle Type: Electrons Energy: 5.3093 GeV Number of Particles in 10¹⁰: 1.19462 Machine Status: User Operations -> PETRA

Magnet Current Permission: Available

LNAC2 Permission State: Available

Option: Available

State Readiness: Compressed

Main State: Active

Attention, Information Preliminary!
Do not use for safety purposes!

T21 Off T22 Off T24 On

Number of Particles in 10¹⁰

Time	Number of Particles in 10 ¹⁰
9:21 2.5.2022	12
9:24 2.5.2022	12
9:27 2.5.2022	12
9:30 2.5.2022	12
9:33 2.5.2022	12
9:36 2.5.2022	12
9:39 2.5.2022	12
9:42 2.5.2022	12

Beam Energy [GeV]: 5.0

Magnet Status

Beam ID	Beam Energy [GeV]	Magnet Status
Beam2401	334.7...	Null Pos. Position Null Size
Beam2402	187.2...	Null Pos. Position Null Size

Select Beam Energy [GeV]: 5.0

Switch Magnet(s) on / off

Startup

Test BEAM 24 Magnets / Pk Control Test BEAM 24

PK Control

Beam ID	PK	Status	SW	10 Run
Beam2401	On	OK	1.34 107%	0.1813
Beam2402	On	OK	187.2900	-0.0153

BKR10D2CONMEA03

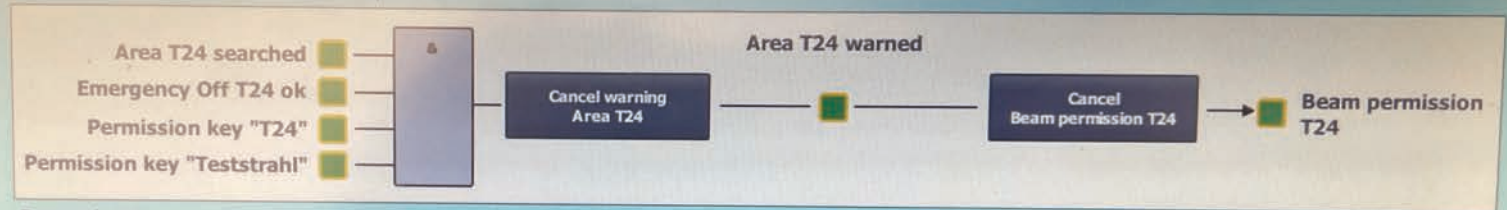
login | buser | password | camTEuser



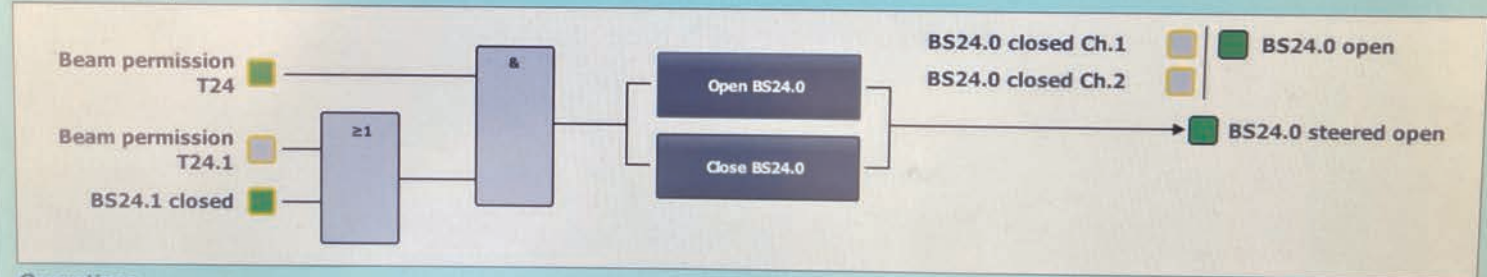
Logicview + Operation: Testbeam T24

09.05.2022 10:54:22 SPS ●

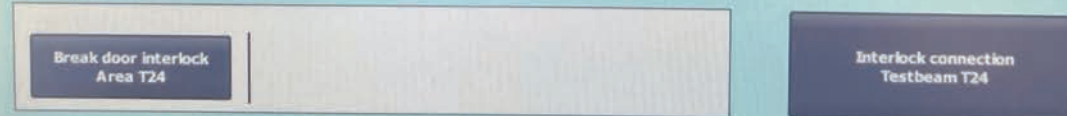
Beam permission



Beamshutteroperation



Operations



TEST BEAM 24

2 3 4 5 6 7 8 9 10 11

V
H

0	1	2	3	4
43.4	43.4	43.4	43.4	43.4
-40.9	-20.0	1.3	23.1	43.4
5	6	7	8	9
23.3	23.3	23.3	23.3	22.3
-41.4	-19.7	3.5	23.0	44.5
10	11	12	13	14
1.1	1.1	1.1	1.1	1.1
-41.8	-19.4	3.4	23.0	44.8
15	16	17	18	19
-19.5	-19.5	-19.5	-19.5	-19.5
-40.4	-20.3	-2.4	23.7	43.8
20	21	22	23	24
-39.8	-39.8	-39.8	-39.8	-39.8
-40.7	-18.8	-1.6	23.5	45.1

V
H

STEUERUNG
ZÄHLERSTAND 1000 Kg

DOWN

γ_{ds}

V

DOWN

forw.

chnell

rückw.

UP

WEST

γ_{ds}

H

DOWN

forw.

chnell

rückw.

EAST

DESY - MEA

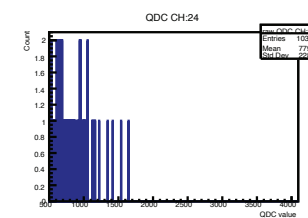
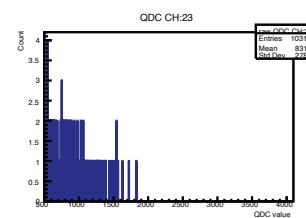
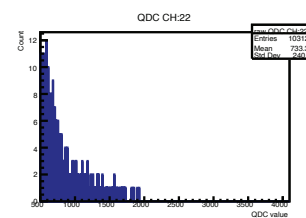
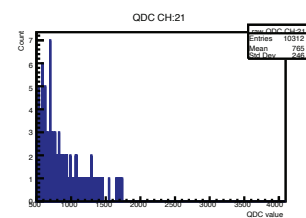
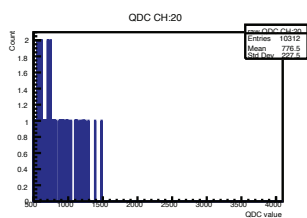
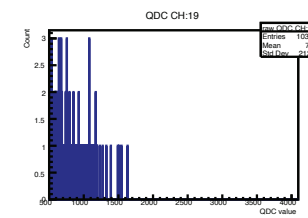
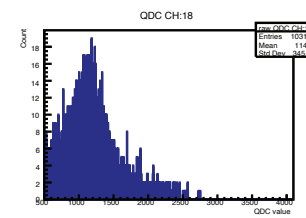
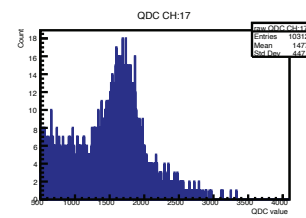
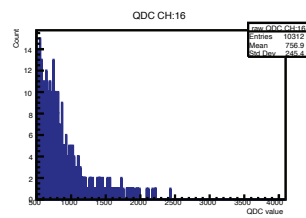
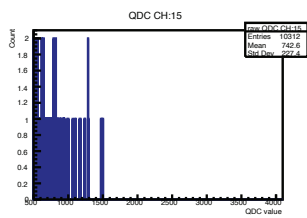
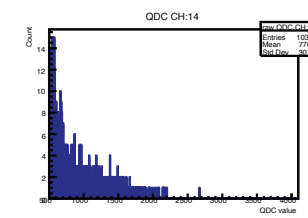
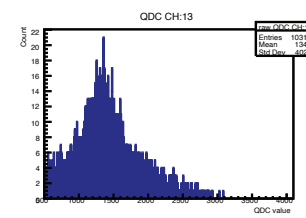
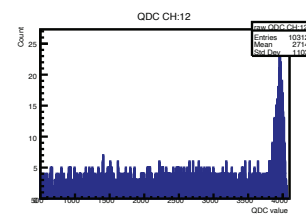
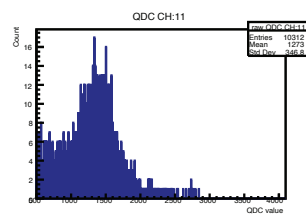
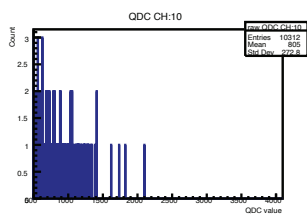
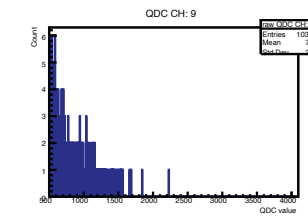
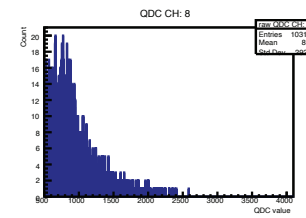
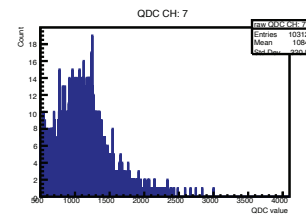
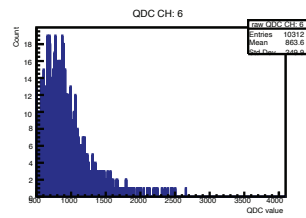
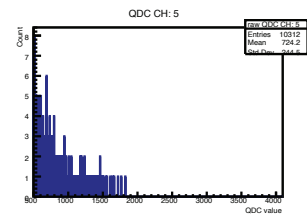
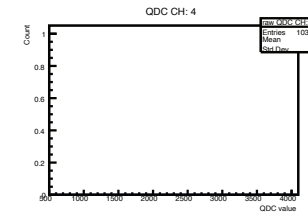
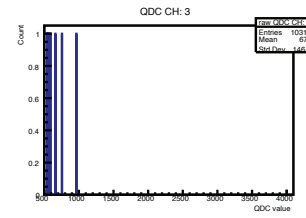
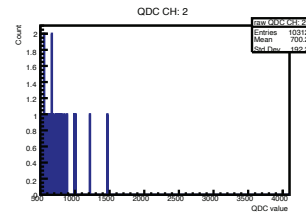
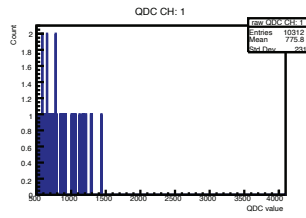
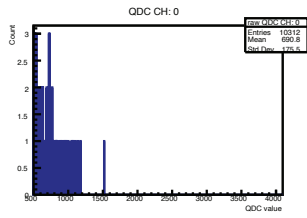
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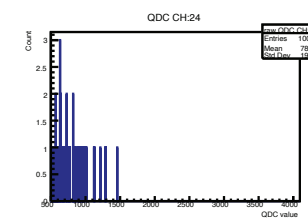
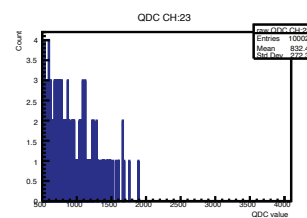
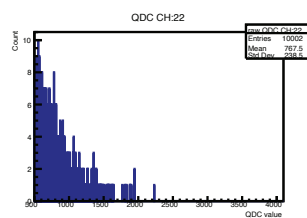
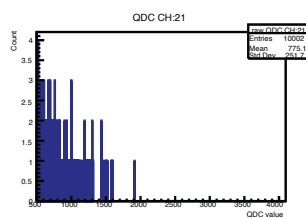
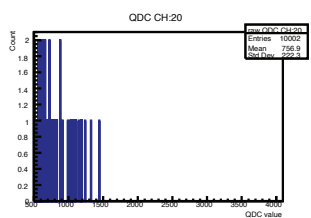
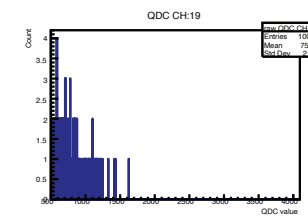
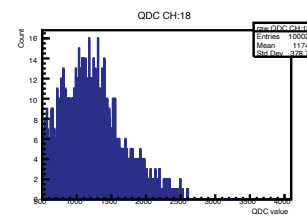
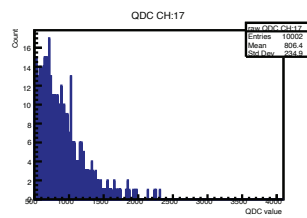
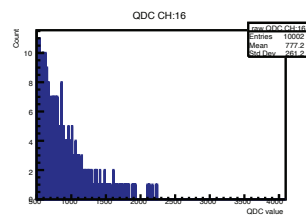
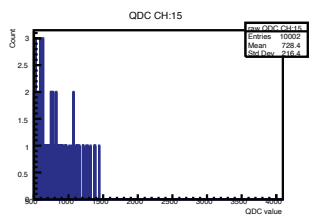
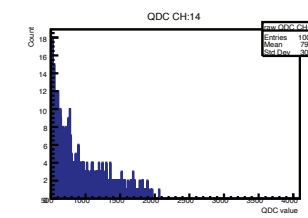
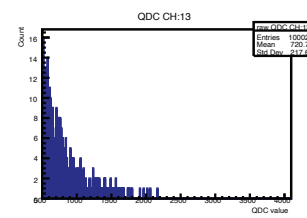
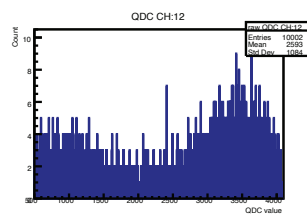
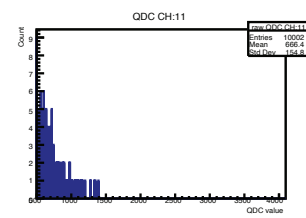
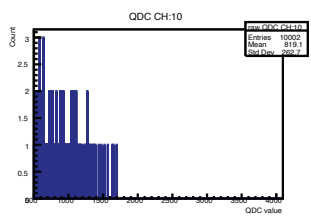
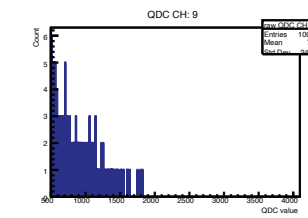
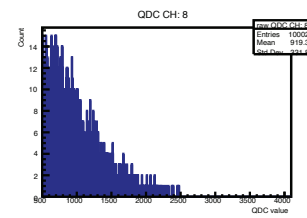
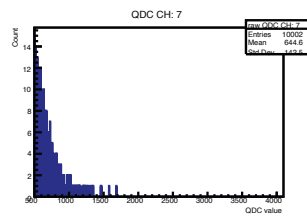
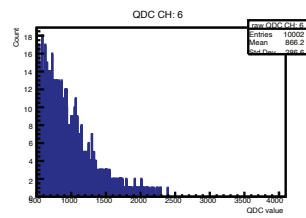
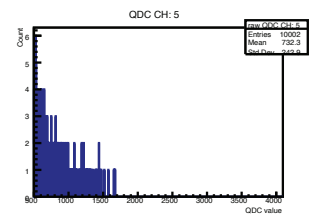
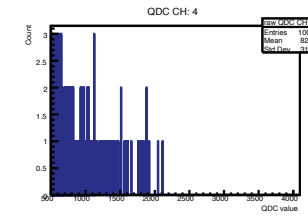
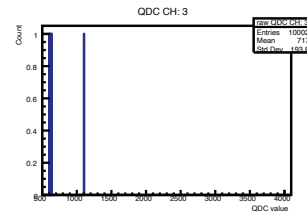
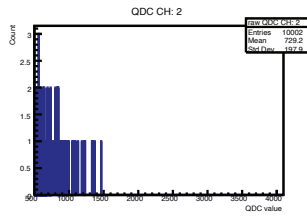
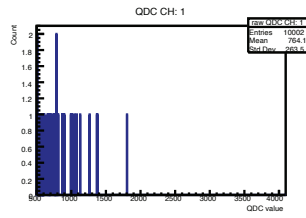
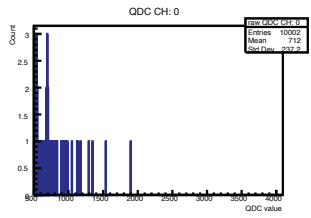
Desy stand

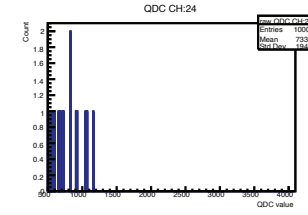
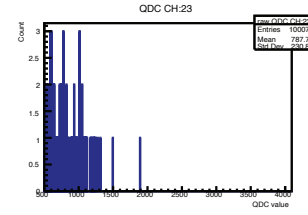
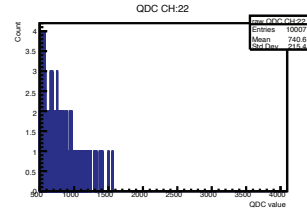
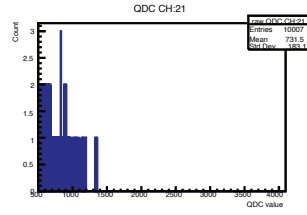
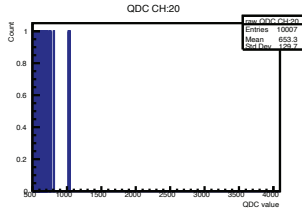
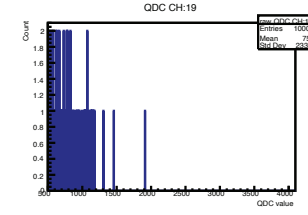
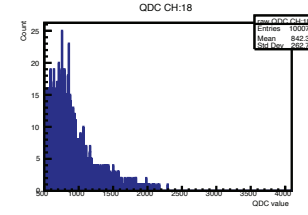
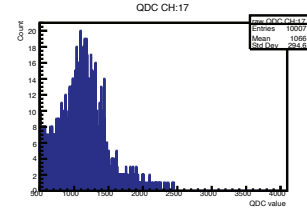
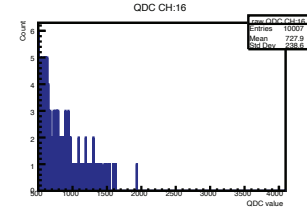
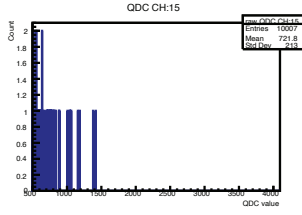
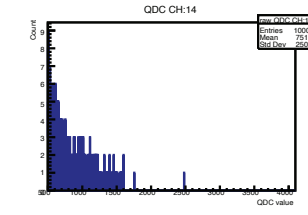
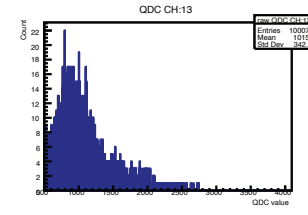
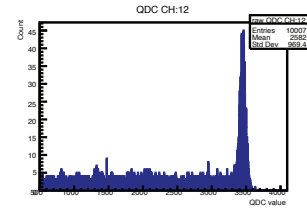
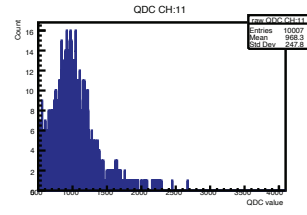
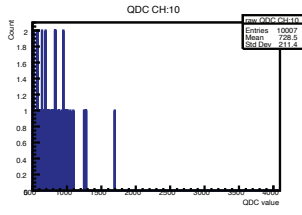
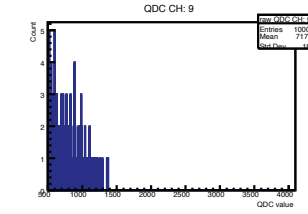
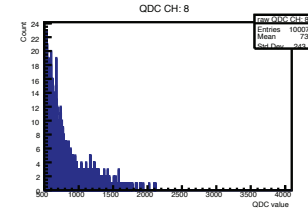
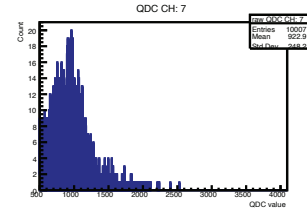
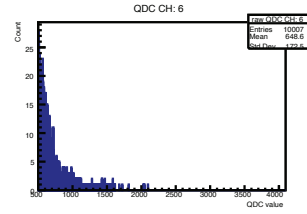
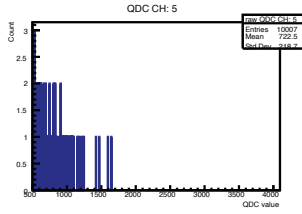
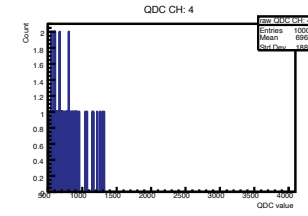
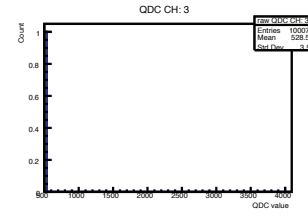
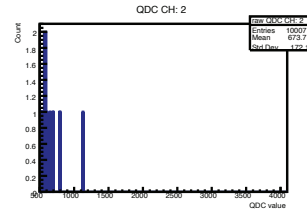
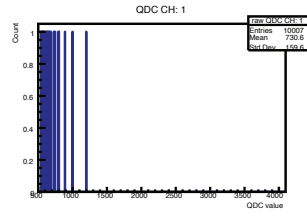
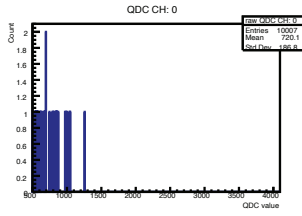
86

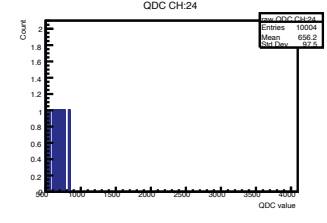
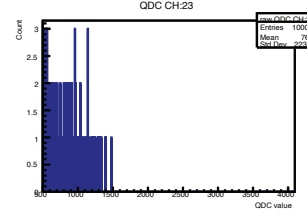
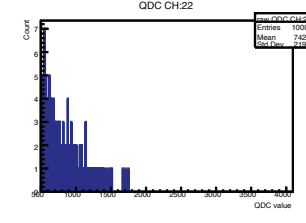
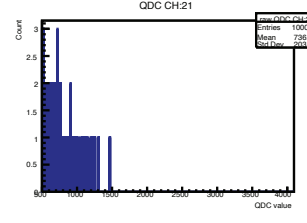
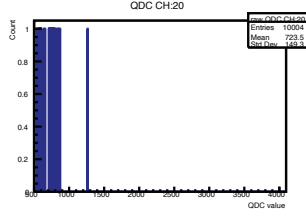
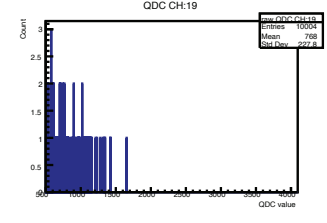
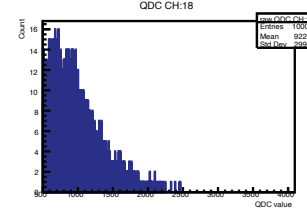
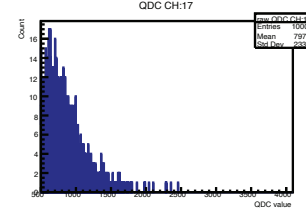
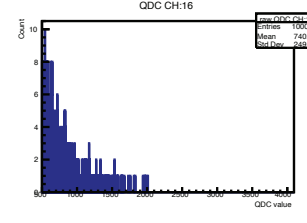
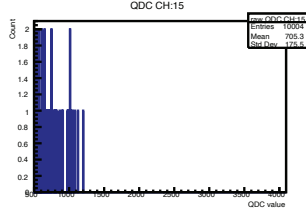
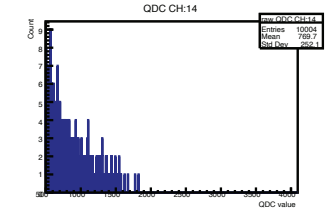
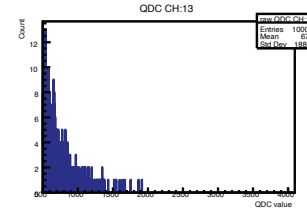
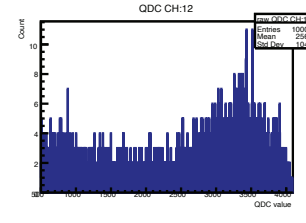
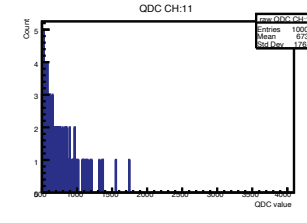
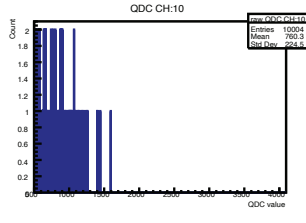
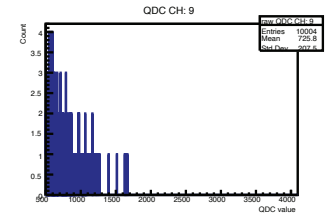
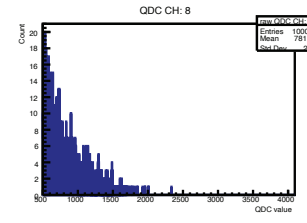
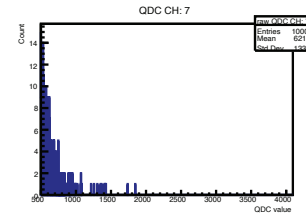
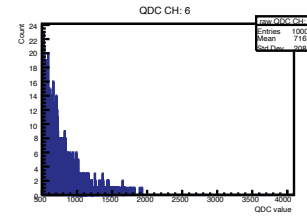
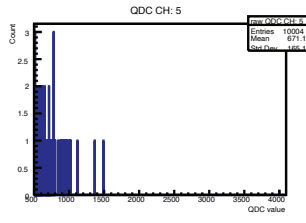
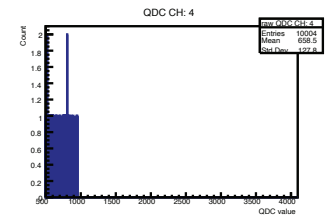
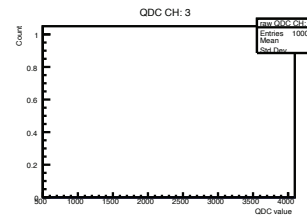
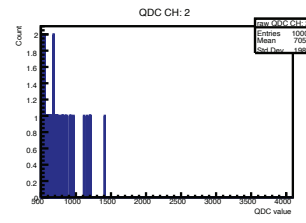
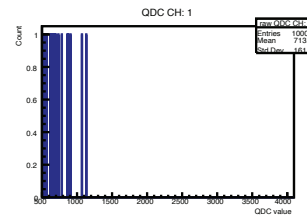
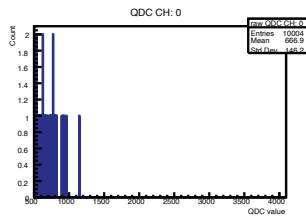
```
--:telnet (root) 10.42.0.10 ~ runboth.sh src: bash ~: bash ~: bash
Recorded 628 events, Event Rate 283.575000 -- 833022 empty reads
Recorded 924 events, Event Rate 294.520000 -- 966436 empty reads
Recorded 1235 events, Event Rate 309.445000 -- 1099419 empty reads
Recorded 1539 events, Event Rate 302.480000 -- 1232629 empty reads
Recorded 1891 events, Event Rate 350.240000 -- 1364445 empty reads
Recorded 2191 events, Event Rate 298.500000 -- 1497759 empty reads
Recorded 2526 events, Event Rate 327.355000 -- 1630213 empty reads
Recorded 2834 events, Event Rate 312.430000 -- 1763128 empty reads
Recorded 3152 events, Event Rate 316.410000 -- 1895890 empty reads
Recorded 3464 events, Event Rate 310.440000 -- 2028871 empty reads
Recorded 3788 events, Event Rate 322.300000 -- 2161470 empty reads
Recorded 4125 events, Event Rate 335.315000 -- 2293714 empty reads
Recorded 4432 events, Event Rate 305.465000 -- 2426762 empty reads
Recorded 4748 events, Event Rate 314.420000 -- 2559618 empty reads
Recorded 5053 events, Event Rate 303.475000 -- 2692772 empty reads
Recorded 5399 events, Event Rate 344.270000 -- 2824785 empty reads
Recorded 5703 events, Event Rate 302.480000 -- 2957969 empty reads
Recorded 6020 events, Event Rate 315.415000 -- 3090771 empty reads
Recorded 6331 events, Event Rate 309.445000 -- 3223760 empty reads
Recorded 6657 events, Event Rate 324.370000 -- 3356100 empty reads
Recorded 6958 events, Event Rate 299.495000 -- 3489432 empty reads
Recorded 7253 events, Event Rate 293.525000 -- 3622896 empty reads
Recorded 7506 events, Event Rate 331.335000 -- 3755261 empty reads
Recorded 7875 events, Event Rate 287.555000 -- 3888904 empty reads
Recorded 8189 events, Event Rate 312.430000 -- 4021774 empty reads
Recorded 8485 events, Event Rate 294.520000 -- 4155211 empty reads
Recorded 8813 events, Event Rate 326.360000 -- 4287721 empty reads
Recorded 9122 events, Event Rate 307.455000 -- 4420803 empty reads
Recorded 9429 events, Event Rate 305.465000 -- 4553897 empty reads
Recorded 9778 events, Event Rate 347.255000 -- 4685038 empty reads
Connection to 10.42.0.10 closed.
tpex@darkldai ~ $ ./runboth.sh hscan_05112022_-14.4x_-4.1y_2GeV
Starting v1725ctrl with /mnt/raid/data/spring2022/DIGI/05112022/hscan_05112022_-14.4x_-4.1y_2GeV.dat
Starting qdc record with /mnt/data/spring2022/QDC/05112022/hscan_05112022_-14.4x_-4.1y_2GeV.dat for 1000000

Press any key to stop
Recorded 0 events, Event Rate 0.000000 -- 1 empty reads
Recorded 310 events, Event Rate 308.450000 -- 132785 empty reads
Recorded 687 events, Event Rate 375.115000 -- 264030 empty reads
Recorded 1024 events, Event Rate 335.315000 -- 396391 empty reads
Recorded 1330 events, Event Rate 304.470000 -- 529660 empty reads
Recorded 1411 events, Event Rate 89.595000 -- 669320 empty reads
Recorded 1495 events, Event Rate 83.580000 -- 888033 empty reads
Recorded 1573 events, Event Rate 77.610000 -- 948687 empty reads
Recorded 1643 events, Event Rate 69.650000 -- 1080709 empty reads
Recorded 1740 events, Event Rate 96.515000 -- 1227936 empty reads
Recorded 1826 events, Event Rate 85.570000 -- 1367477 empty reads
Recorded 1895 events, Event Rate 68.655000 -- 1507484 empty reads
Recorded 1931 events, Event Rate 35.820000 -- 1648459 empty reads
Recorded 1957 events, Event Rate 25.870000 -- 1789663 empty reads
Recorded 1994 events, Event Rate 36.815000 -- 1930614 empty reads
Recorded 2013 events, Event Rate 18.905000 -- 2072044 empty reads
Recorded 2041 events, Event Rate 27.860000 -- 2213236 empty reads
Recorded 2068 events, Event Rate 26.865000 -- 2354452 empty reads
```

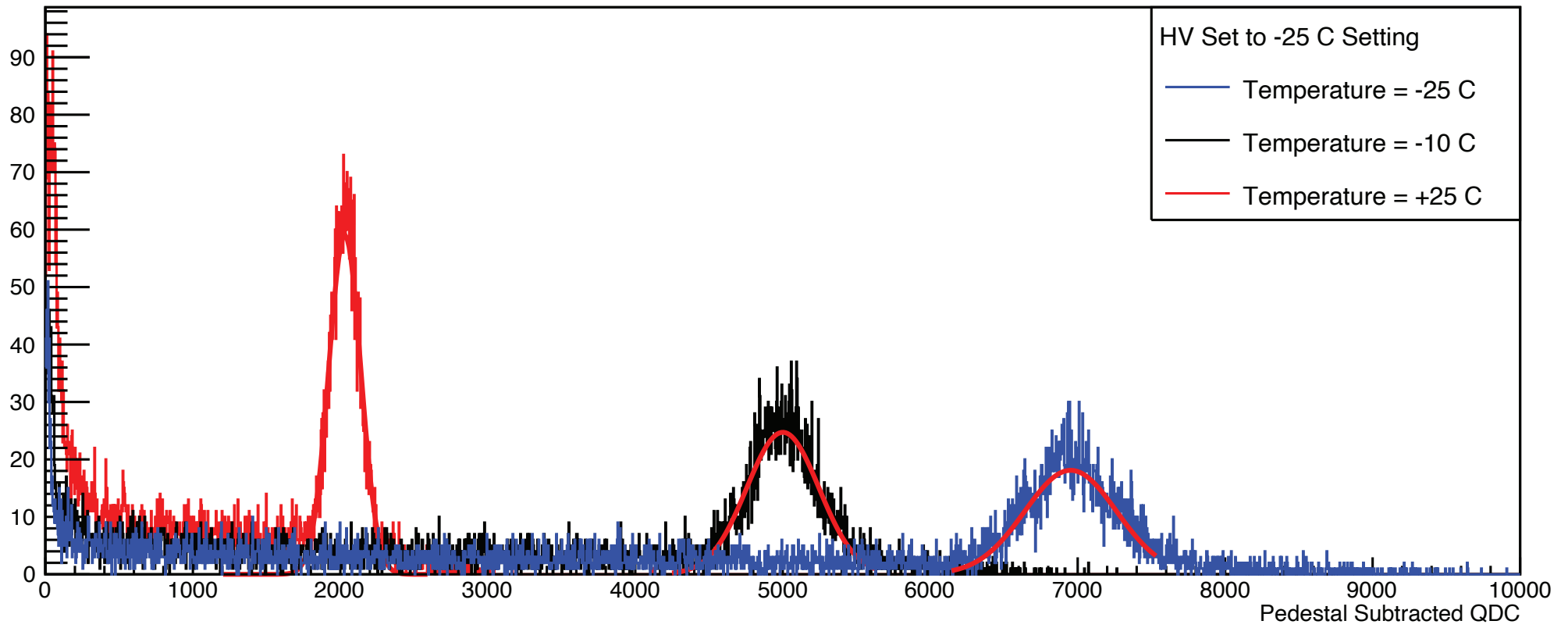








Energy Sum of Central 9



Early Impressions

- JLab FADC250 system worked very well in both triggered and streaming modes but does not play well with others
- CAEN QDC (triggered) and Digitizer (streaming) worked together in parallel very well
 - Digitizer saw more events
- Lead tungstate performed very well and improved at lower temperatures
 - condensation an issue but manageable
- Scintillating glass (current, early batch) not impressive
 - minor changes with temperature

Impressions

- DESY test beam facility very user friendly
 - well designed facility with lots of support
 - dipole magnets, solenoid magnets
 - 24/7 operation under user control
- Thanks to test beam coordinators and Uwe Schneekloth

- **Next test beam slot August 15-29, 2022**
 - **if no interest I will move my equipment back to MIT**

DESY Test Beam Crew

- Patrick Moran (MIT)
- Jan Bernauer (SBU)
- Ethan Cline (SBU) - thanks for the quick analysis and plots
- Ivica Friscic (Zagreb)
- David Abbott (JLab)
- Stefan Lunkenheimer (UMich)
- Zhuoheng Yang (UMich)
- Arthur Mkrtchyan (AANL)
- Gabriel Grauvogel (GWU)