Summary of the 2007 Run and Plans for 2008.

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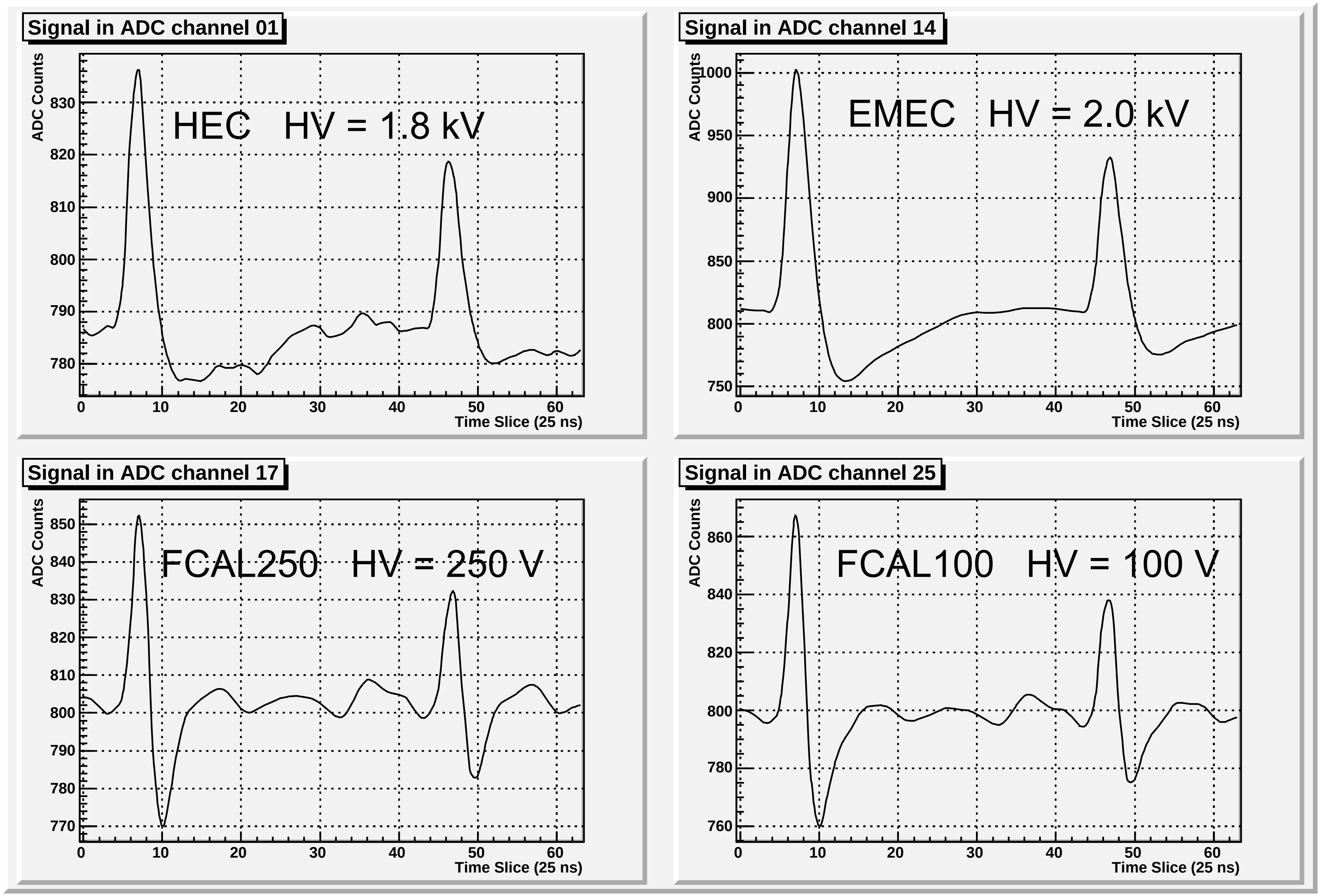
Short Summary of the Run

Runs	Intensity	HV points	FCAL	EMEC	HEC	Absorb.	Events
1-3	**Beam Detectors Calibration (no DAQ)**					-	-
36-37			250	+	-	-	5100
38-47	**Seeking for signals**						1000
49-59	$2.61 \cdot 10^{7}$	7	250	-	+	1	5000-
60-62	$2.28 \cdot 10^{8}$	3	250	-	+	1	5000
63-65	$1.16 \cdot 10^{9}$	3	250	-	+	1	5000
66-68	$2.43 \cdot 10^{9}$	3	250	-	+	1	5000
70-76	$3.13 \cdot 10^{9}$	5	250	-	+	1	10000-
77-80	$2.31 \cdot 10^{9}$	3	100	-	+	1	10000-
81-87	$1.52 \cdot 10^{8}$	7	100	+	+	1+2	5000
88-90	$4.57 \cdot 10^{9}$	3	100	+	+	1+2	5000
91-93	$1.29 \cdot 10^{10}$	3	100	+	+	1+2	5000
94-96	$3.48 \cdot 10^{10}$	3	100	+	+	1+2	5000
97	$2.15 \cdot 10^{11}$	HV off	100			1+2	1800

Absorber_1 – 8 sheets before FCAL, Absorber_2 – 19 sheets after FCAL

Detectors Signals (run_81)



Three modes of accelerator operation are possible and have been tested during the run:

- Fully debunched beam
- Fully bunched beam
- Mixed mode – first part of the spill is in bunch mode

Detectors used for beam intensity monitoring:

- Ionization chamber (Beam Division)
- Two profile secondary emission chambers (BD)
- Scintillation counters S1-S3 in the beam
- Large angle scintillation counters S4-S6
- Scintillation hodoscope

Challenges:

- Wide range of intensity (10^7- $5 \cdot 10^{11}$)
- Scintillation detectors are not suitable for intensity measurement in the bunched beam mode (without amplitude measurements)

Calibration of Ionization and Secondary Emission Chambers – Foils Activation Measurements

Three Al foils were irradiated at intensities ~$7.1 \cdot 10^{10}$, $1.36 \cdot 10^{11}$, $2.44 \cdot 10^{11}$.

Gamma spectra of activated foils were measured using pure Ge spectrometer.

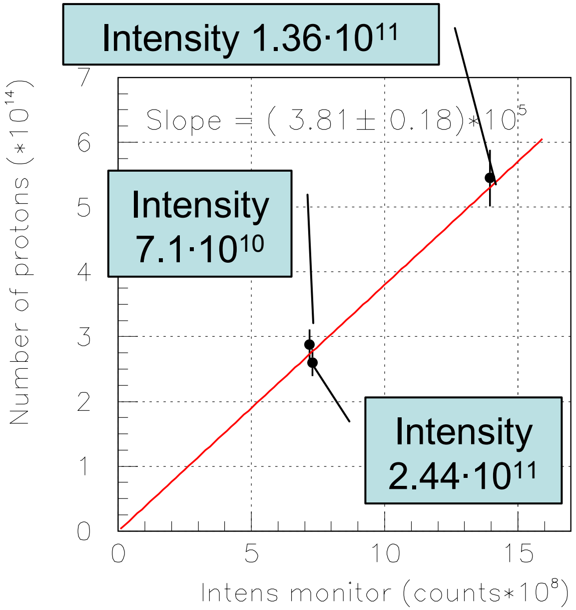
Peak at E_γ = 1275 keV from ^{22}Na decay (0.999 gammas per decay) was used.

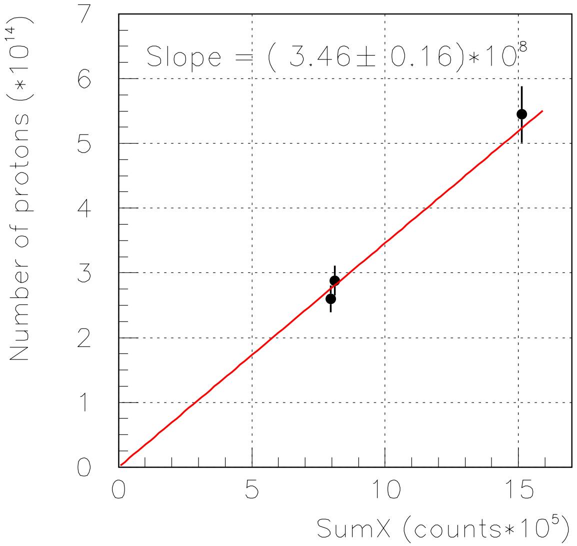
22Na was produced in $^{27}Al(p,3p3n)^{22}Na$ reaction with cross-section of 10.6 mb.

Foil	Intensity	Number of protons	Error
DEN6	$2.44 \cdot 10^{11}$	$2.88 \cdot 10^{14}$	5%
DEN8	$7.1 \cdot 10^{10}$	$2.60 \cdot 10^{14}$	5%
DEN9	$1.36 \cdot 10^{11}$	$5.45 \cdot 10^{14}$	5%

Errors include statistical and spectrometer calibration uncertainties

Calibration of Ionization and Secondary Emission Chambers – Results





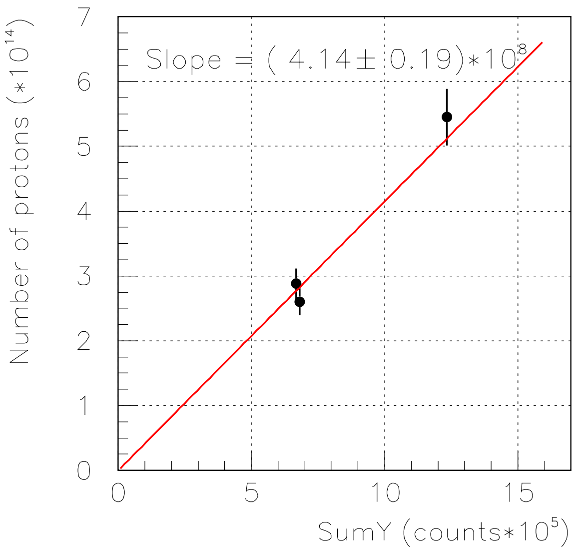
Fit results:

Intens: $(3.81 \pm 0.18) \cdot 10^5$

X profie: $(3.46 \pm 0.16) \cdot 10^8$

Y profie: $(4.14 \pm 0.19) \cdot 10^8$

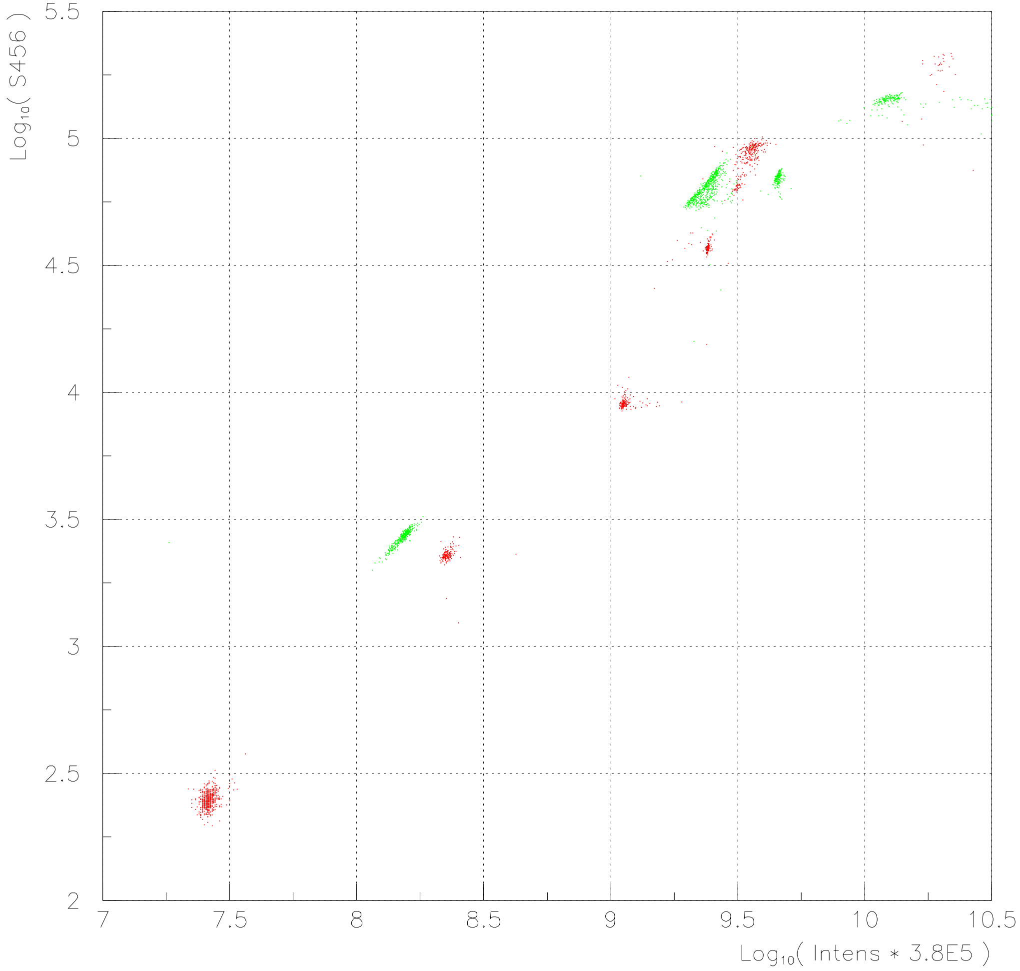
(protons/count)



These results do not include 10% systematic error from the cross-section of $^{27}Al(p,3p3n)^{22}Na$ reaction used for foils activation measurements

Detectors are linear at intensities $7 \cdot 10^{10}$ – $2.5 \cdot 10^{11}$

Large Angle Scintillation Telescope S4-S6 – comparison with ionization chamber data



Red dots – runs 49-73 (Absorber 1)

Green dots – runs 74-96 (Absorber 1+2)

S456 counts are more or less proportional to the intensity up to 10^{10} even in the bunched beam

It looks like the ionization chamber is **linear at intensities 10^7 - 10^{10}**

Conclusions

- Ionization chamber covers the widest range of intensity (~$2 \cdot 10^7$-$2 \cdot 10^{11}$) and seems to be linear
- At high intensity (above ~$5 \cdot 10^9$) profile secondary emission chambers could also be used as intensity monitor
- The coincidence of large angle counters S4-S6 could be used up to ~10^{10} for the cross-checking.
  It seems that its count depends on the beam position.
- Scintillation counters S1-S3 and scintillation hodoscope could hardly be used in the bunched mode without amplitude measurement

We had several problems with C&C during the beam run. They were discussed at the meeting in IHEP on November 22 and the following improvements/changes were proposed to avoid these problems in the next run:

1. To improve the cryostats cleanness the new pump will be used, vacuum line will be shortened and a device to measure vacuum level will be placed near the cryostats. This gives us a possibility to pump cryostats down to 10^{-4} torr and control outgasing of the inner parts of the cryostats.

2. The only leak we have is connected with the safety valves. The leakage is rather low and probably not dangerous but nevertheless we are going to investigate a possibility to change them for the vacuum tight valves.

3. It would be good to measure the argon gas purity before filling the cryostats and evaporated argon with <1 ppm accuracy.

4. It would be important to measure the level of liquid argon in the cryostats during cooling for example to know when purity probes are covered with LAr. We are going to do this by measuring the volume of liquified argon with high precision pressure meter taking into account the volume of parts inside the cryostats.

5. The new heating system will be designed and constructed to avoid ice/snow on the upper flanges of the cryostats.

6. One of the argon valves was damaged a bit during transportation and should be replaced.

7. PS for the heaters inside the cryostats will be improved.

All proposed changes and improvements can be done without opening cryostats and within 3 months.

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