First results on the study of dp→ppn reaction at Internal Target Station at Nuclotron.

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on behalf of DSS collaboration.

Dubna,4 – 9 October 2010

Collaboration

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- Institute of Physics Slovak Academy of Sciences, Bratislava, Slovakia
- Saitama University, Saitama, Japan
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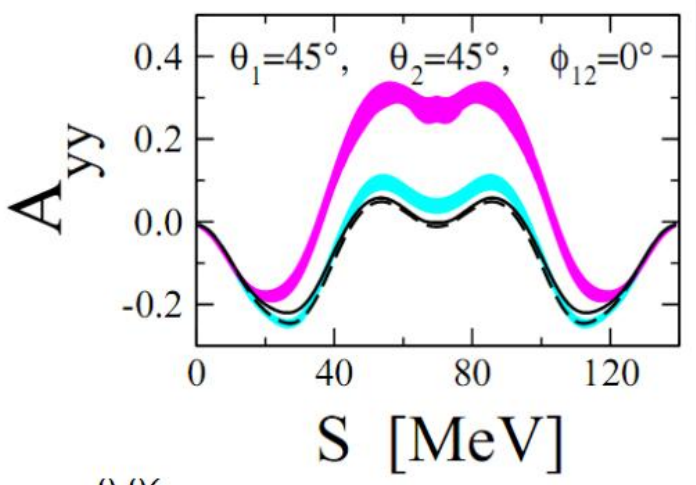
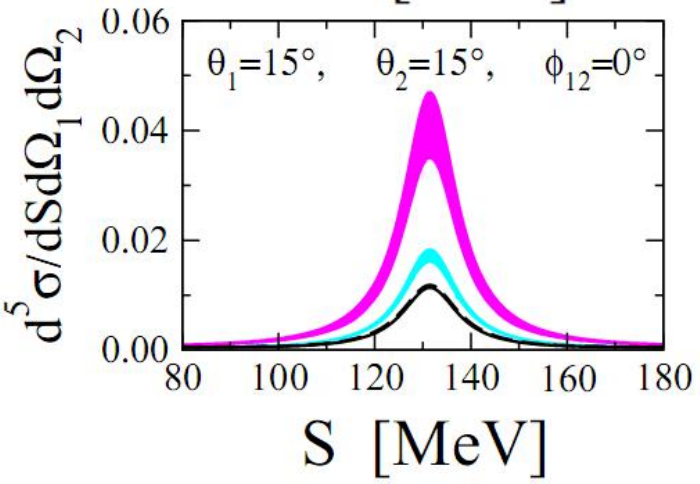
DSS Deuteron Spin Structure

The purpose of this experimental program is to obtain the information about spin – dependent part of the 3NF from two processes:

1. dp-elastic scattering;
2. dp-breakup with registration of two protons at energy 300 - 500 MeV.

dp breakup reaction.





This slide presents tensor analyzing power Ayy (top) and differential cross section in selected breakup configurations at 200 MeV (bottom).

- The light shaded band (blue) contains the theoretical predictions based on CD-Bonn, AV18, Nijm I, II and Nijm 93.
- The darker band (magenta) represents predictions when these NN forces are combined with the TM 3NF.
- The solid line is for AV18+Urbana IX and the dashed line for CD Bonn+TM

One can see that the inclusion of 3NF have great impact on the values of analyzing power and cross section.

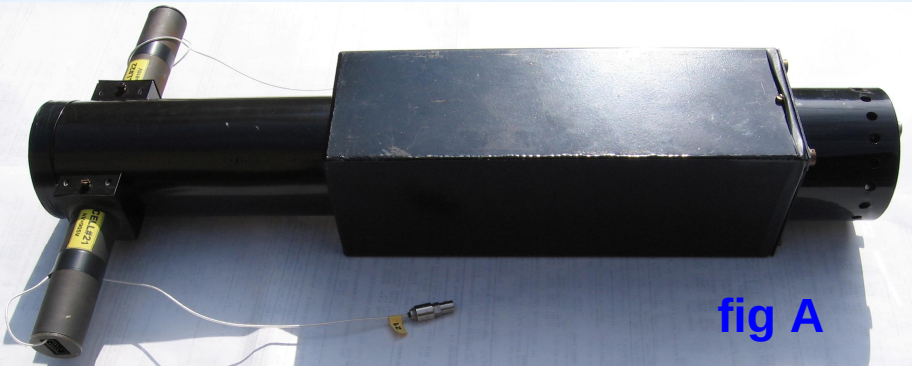
Θ_1 – polar angle of the 1-st proton.

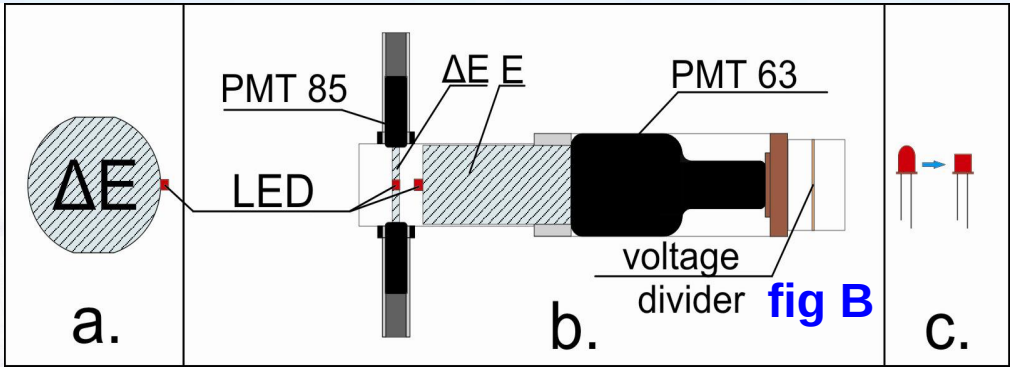
Θ_2 – polar angle of the 2-nd proton.

S – arc length along the kinematical curve.

Φ_{12} – azimuth angle with respect to the horizontal plane.

ΔE – E detector.



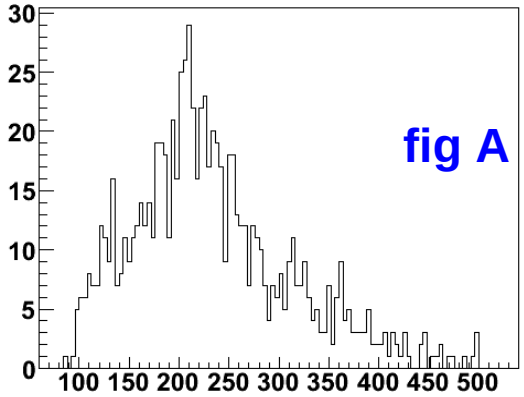


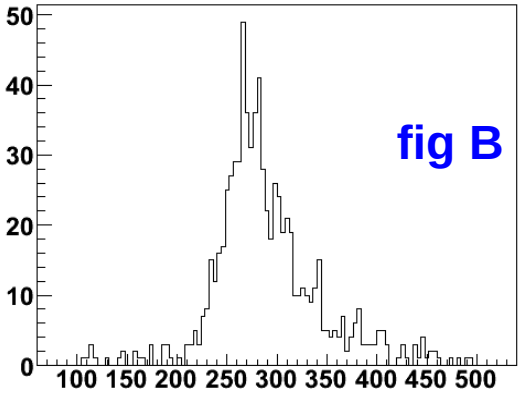
Photography (fig A) and a schematic view (fig B) of the detection system.

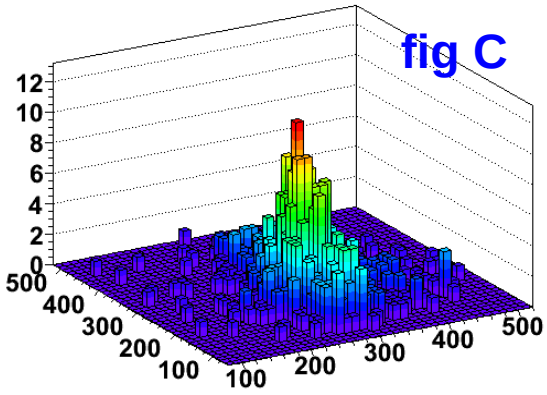
The dp breakup reaction will be investigated in another experiment using ΔE − E technique for the detection of protons.

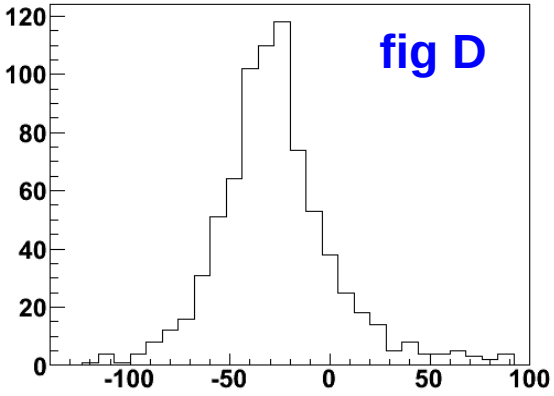
Each detector consists of 2 scintillation counters: the first one with a thin scintillator (1 cm) and the second with 20 cm in length. The diameter of the E-counter scintillator is 10 cm. Useful events will be selected by the time of flight difference and ΔE − E information for the detected particles.

Cosmic rays test for ΔE- E detectors.









Data shown were collected on cosmic muons.

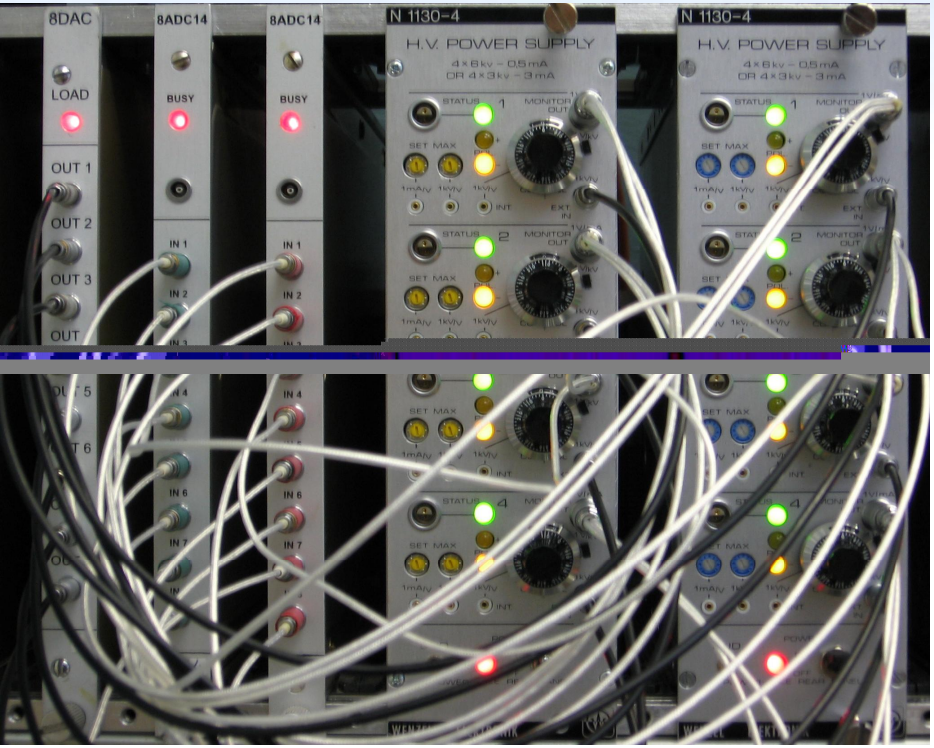
fig A is the amplitude from one PMTs 85.

fig B is the amplitude from PMTs 63.

fig C is the correlation of these amplitudes.

fig D – the time-of-flight difference for ΔE and E detectors.

System of high voltage



Photography of voltage system based on module "Wenzel Electronik N-1130"

Photomultiplier tube (PMT 85) is controlled by module connected with computer through the bus RS232. The module was designed at LHEP JINR.

The high voltage system for Photomultiplier tube (PMT 63) is based on "Wenzel Electronik", whose voltage is adjusted and checked online through DAC and ADC modules CAMAC.

High voltage control system

MIDAS experiment "hv" | Wed Jun 24 17:15:55 2009

ODB | Status | Help

Equipment: **HV**

Groups: **All** Default

fig A

Names	Demand	Measured	Current
CH 0	2200	2198.49	1305.54
CH 1	2100	1582.03	926.514
CH 2	1700	803.223	21.3623
CH 3	1500	229.492	6.10352
CH 4	0 Set	4.27246	3.05176
CH 5	0	5.49316	3.05176
CH 6	0	4.27246	2.44141
CH 7	0	5.49316	3.66211

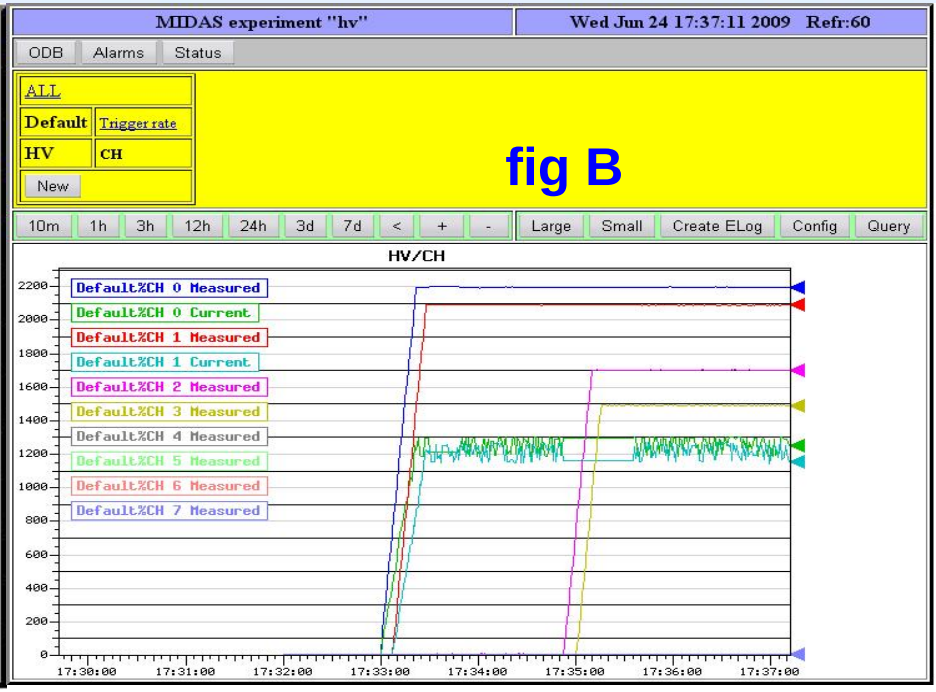
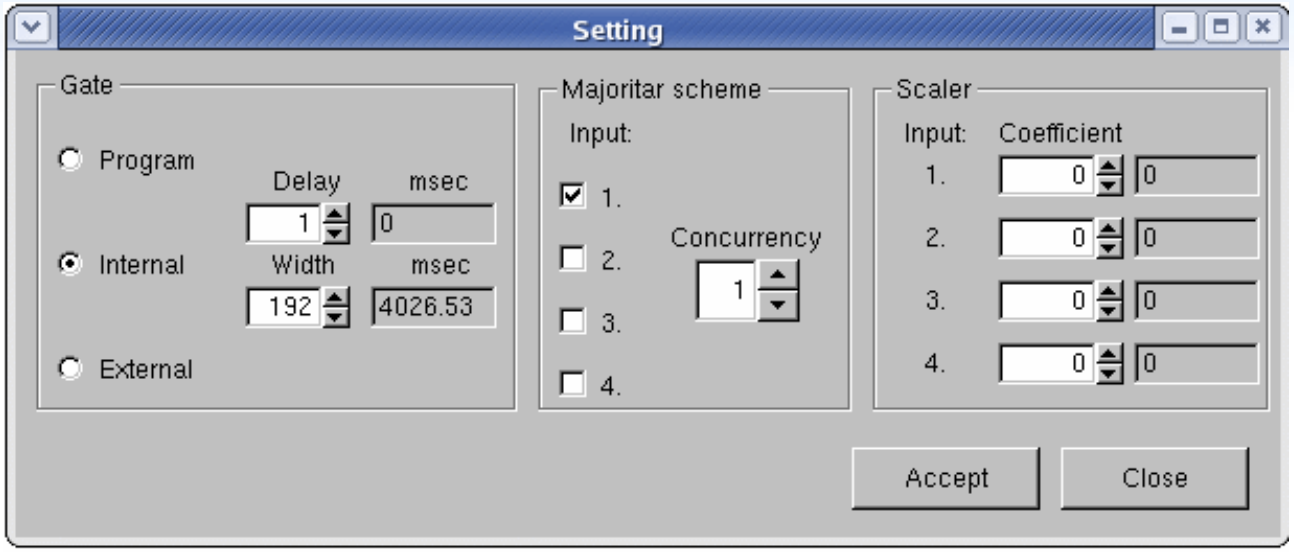


fig A is MIDAS window for online control and checking of high voltage module. fig B is the “history” window of package MIDAS.

MIDAS is a versatile DAQ system for middle range physics experiments.

Trigger module LT320D



Screenshot of LT320D trigger module control program.

One of the important advantages of this module is the possibility to control online the status of majority coincidence circuit.

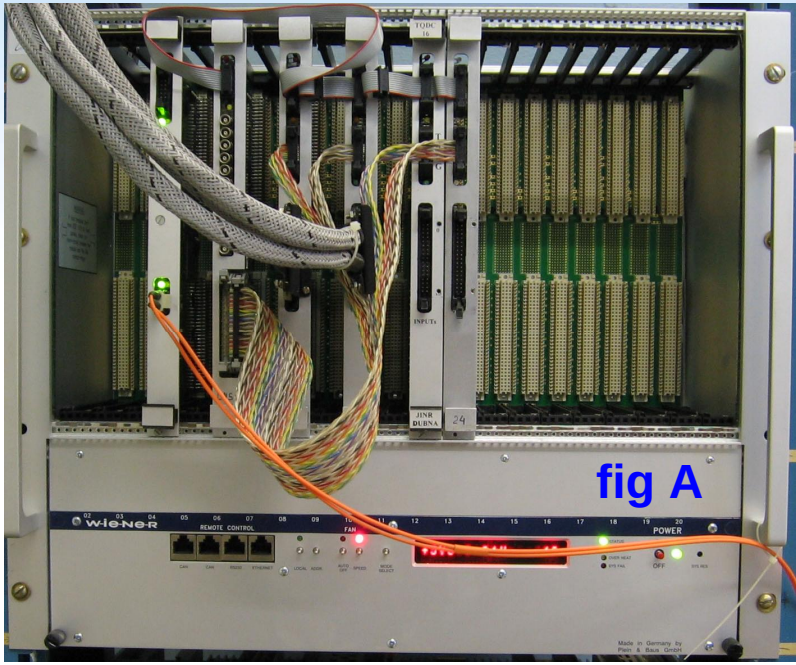
VME system.

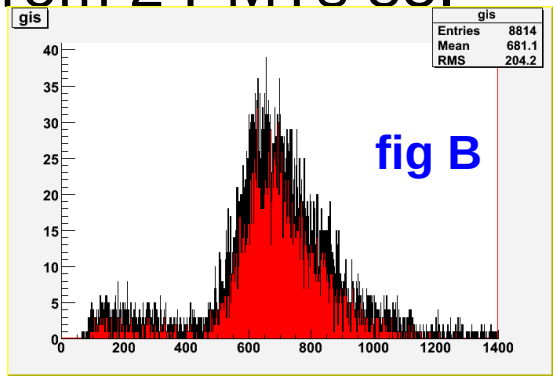
fig A – the DAQ system VME standart.

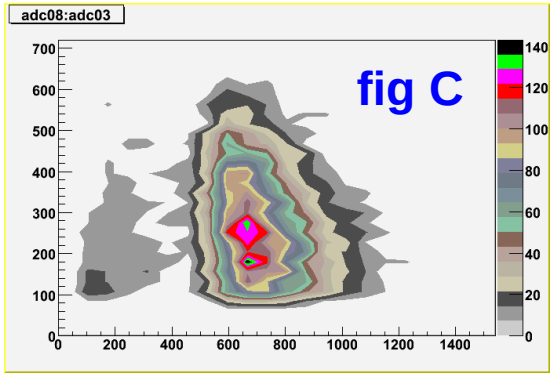
fig B – the amplitude from PMTs 85.

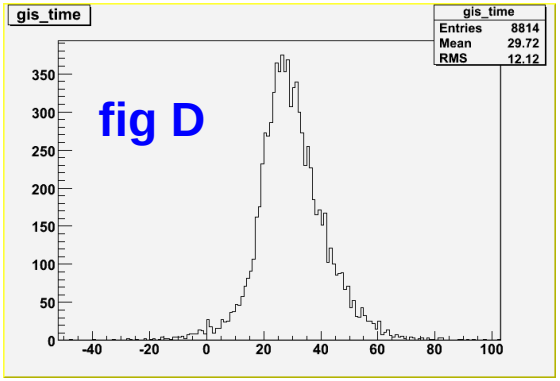
fig C – the correlation amplitudes from 2 PMTs 85.

fig D – the time-of-flight difference from 2 PMTs 85.



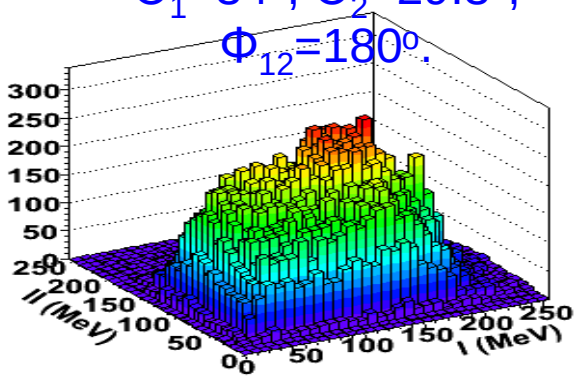




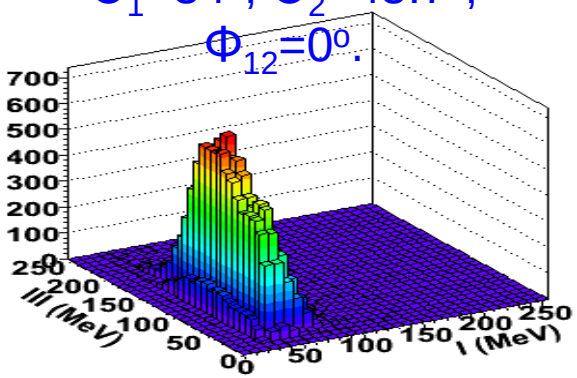


Testing of 4 ΔE-E detectors on the deuteron.

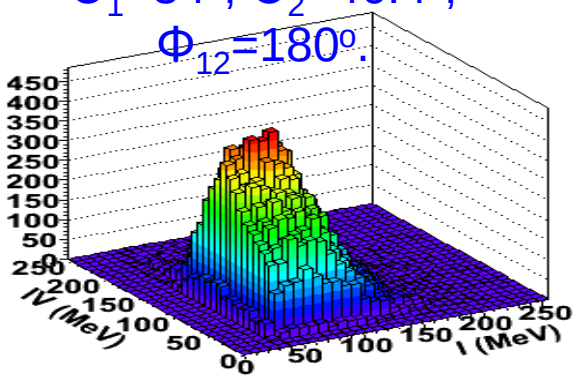
Θ_1=34°, Θ_2=29.3°, Φ_{12}=180°.



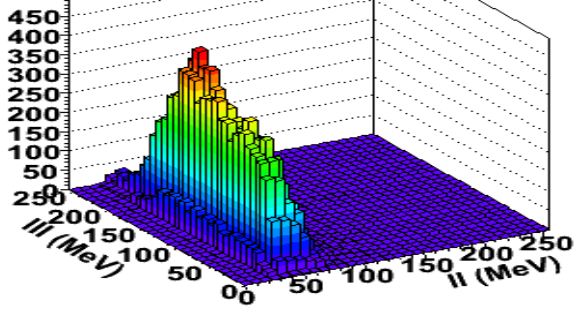
Θ_1=34°, Θ_2=45.7°, Φ_{12}=0°.



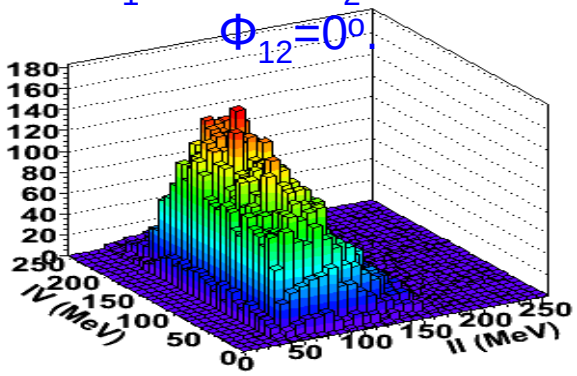
Θ_1=34°, Θ_2=46.4°, Φ_{12}=180°.



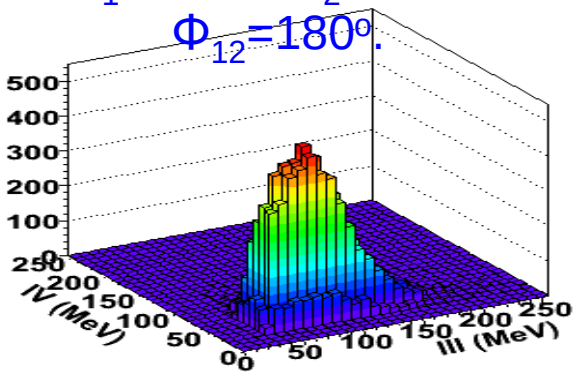
Θ_1=29.3°, Θ_2=45.7°, Φ_{12}=180°.



Θ_1=29.3°, Θ_2=46.4°, Φ_{12}=0°.



Θ_1=45.7°, Θ_2=46.4°, Φ_{12}=180°.



Data shown were acquired with deuteron energy 500 MeV on CH_2 target in March 2010 using DAQ of VME standart.

Conclusion

- The first results were obtained on the study of dp→ppn reaction at Internal Target Station at Nuclotron.
- The driver was written and compiled with package MIDAS for control high voltage system.
- The trigger module LT320D were used in DAQ system.
- Test of ΔE – E counters, high voltage system and DAQ system on the beam at the internal target station at Nuclotron-M and cosmic muon were organized.

THANK YOU FOR THE ATTENTION!