The differential cross section in the dp-elastic scattering at the energies from 500 to 1000 MeV/nucleon

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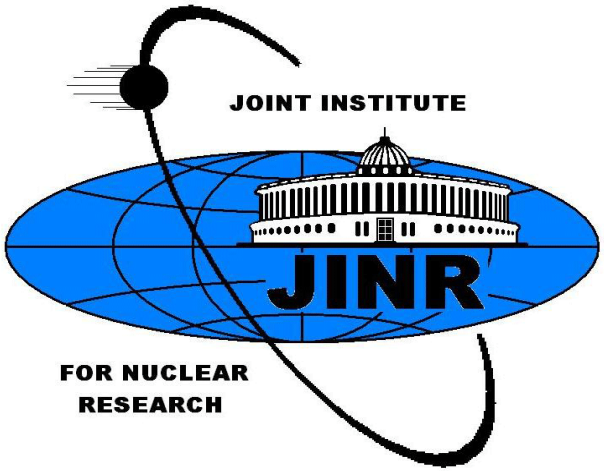


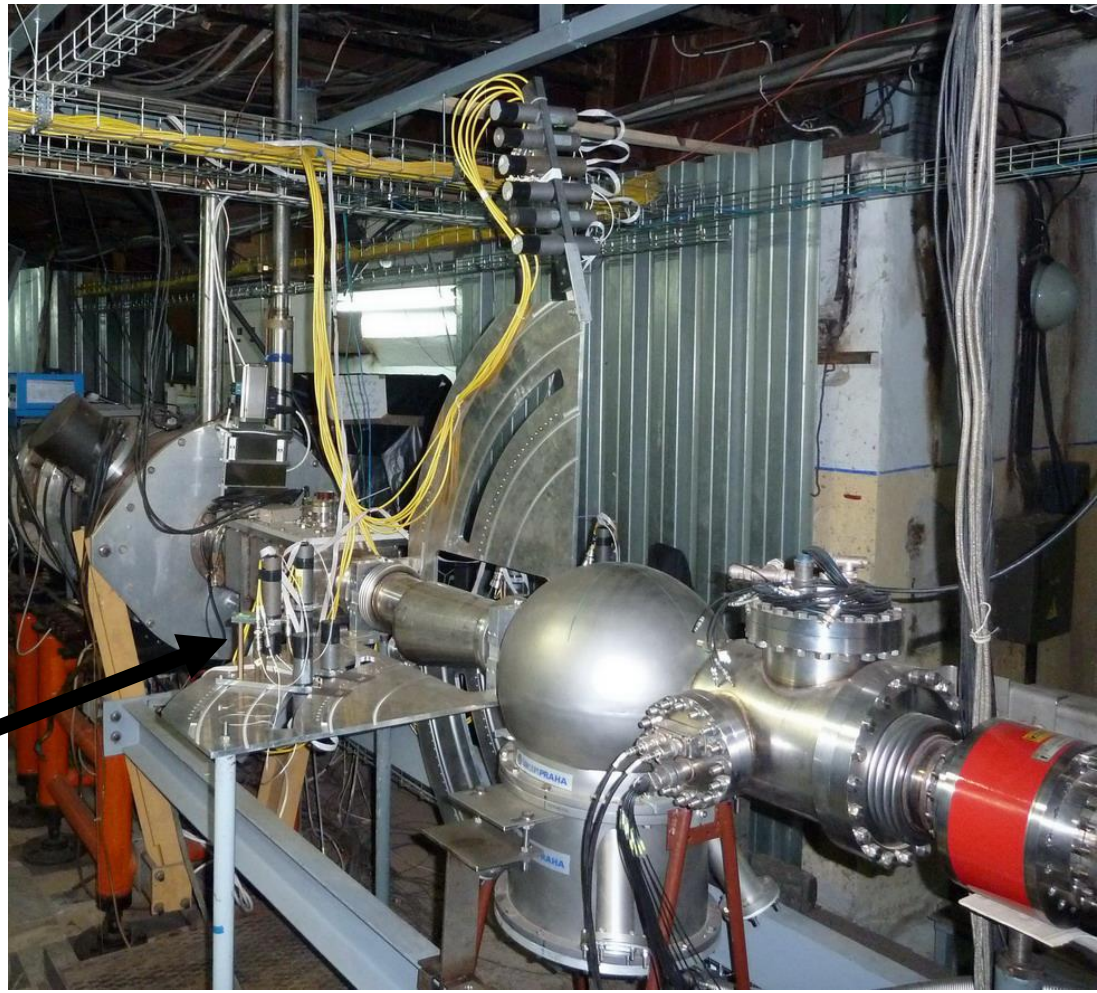
Introduction

The purpose of DSS (Deuteron spin structure) project is the broadening of the energy and angular ranges of measurement of different observables in processes including 3-nucleon systems. The study of the dp-elastic scattering at various energies in large angle range is one of directions in this domain.

The experimental setup at internal target station (ITS) at Nuclotron allows us to obtain the different observables at angle range 60-140^{o} in the c.m.s. We shown in this presentation preliminary data of differential cross section for dp-elastic scattering at 500, 650,750 and 1000 Mev/n, obtained at ITS Nuclotron.

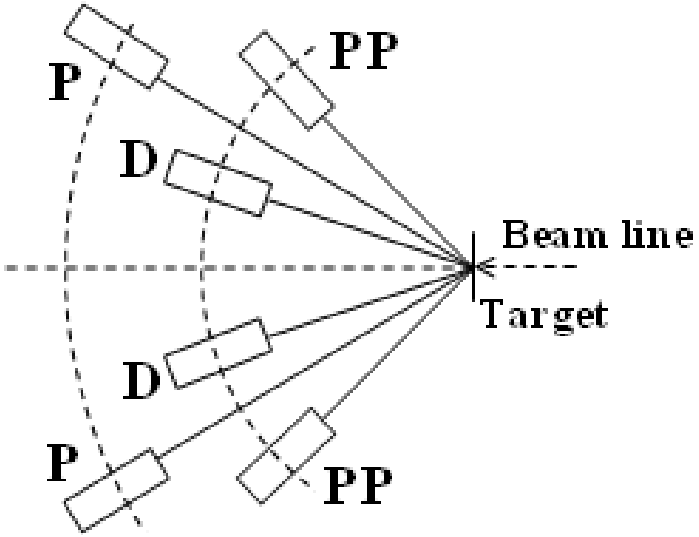
Energy, MeV/n	Engle range in c.m.s.	Cite
425	27.87 - 180	Booth,1971
470	91 - 163	Alder,1972
580	30 - 180	Vincent,1970
582	16.9 – 166.2	Boschitz,1972
590	92.7 – 163.8	Alder,1972
594	60 - 150	Albrow,1971
641.3	34.89 – 115.22	Culmez,1991
792.7	34.43 – 139.78	Culmez,1991
796 (dsigma/dt)	7.97 – 22.80	Irom,1983
800	14.1 – 153.5	Winkelmann,1980
1000	10-180	Bennett, 1967

Measurements on the Internal target station



Layout of the counters with respect to the beam direction

500-900 MeV/n

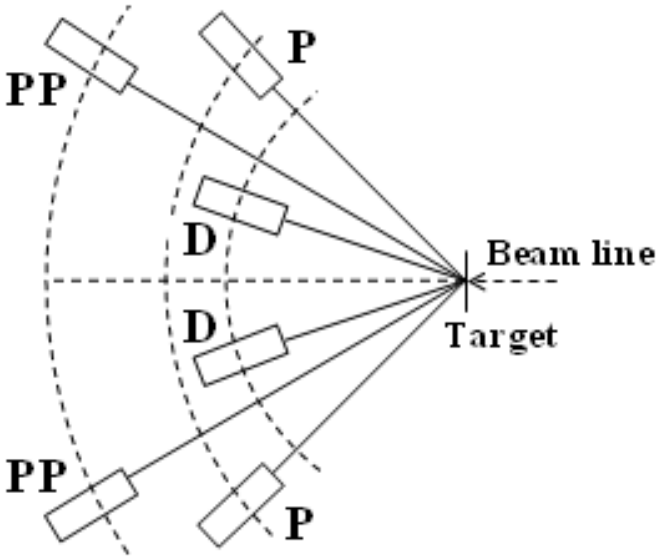


P = 20x60x20 mm^3

D = 10x40x24 mm^3

PP = 50x50x20 mm^3

1000 MeV/n



P = 20x60x20 mm^3

D = 50x50x20 mm^3

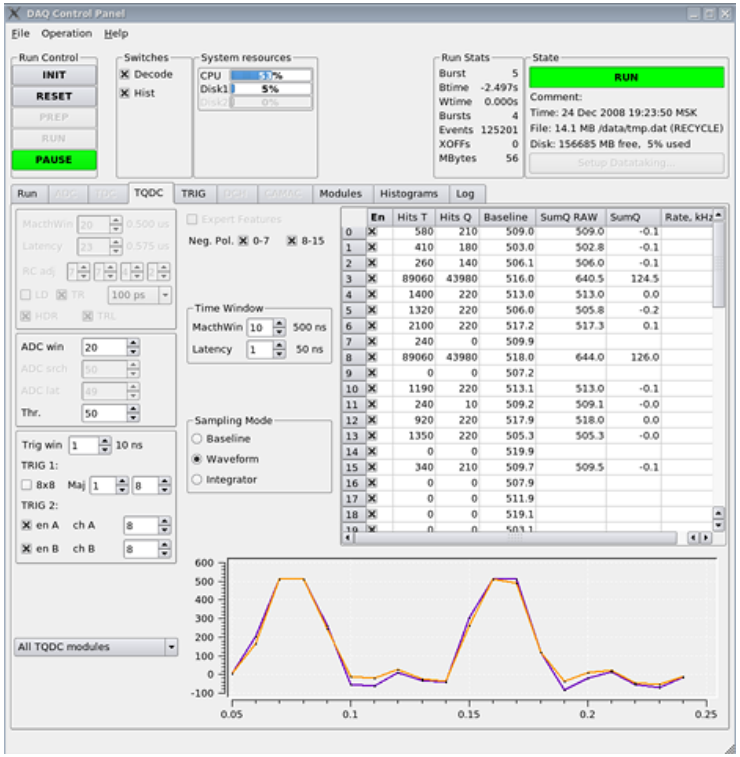
PP = ϕ100x200 mm^3

VME Data Acquisition System

The VME based data acquisition system was used for the data taking from scintillation detectors.

TTCM

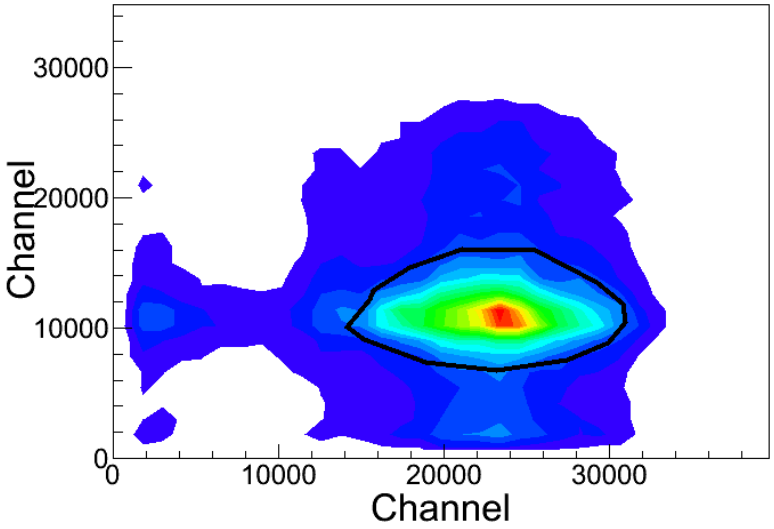
TQDC-16



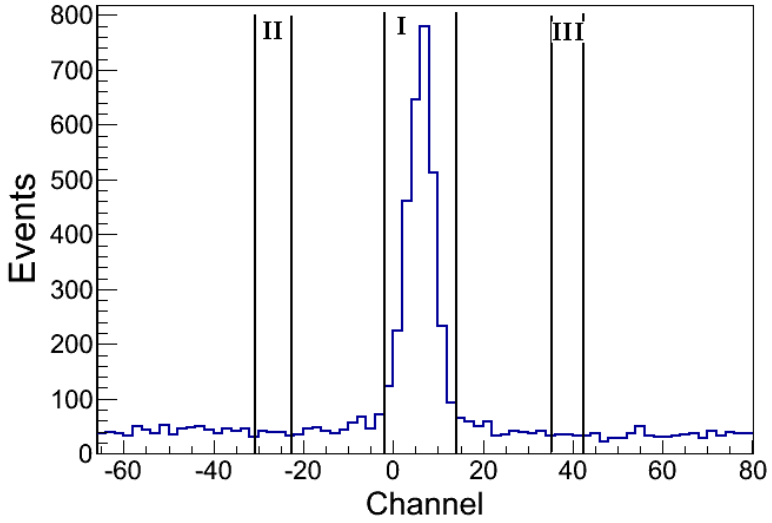
GUI Controls

TQDC-16 – 16 - channel time and charge digitizer

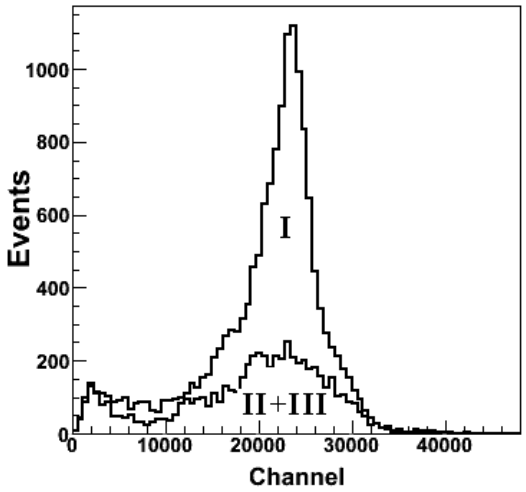
Data analysis

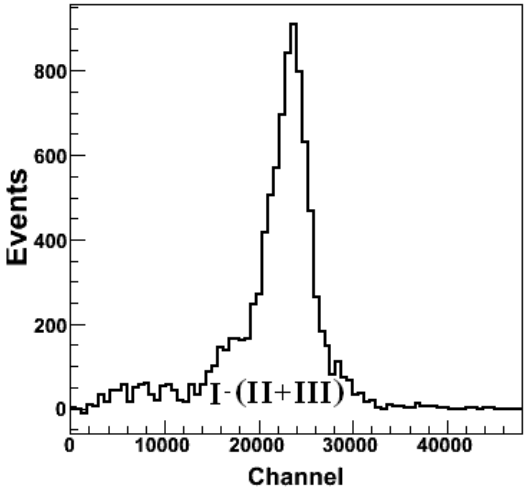


The signal amplitudes correlation for D and P detectors.



The subtraction of the time signal from D- and P- counters.





I - (II+III) Subtraction

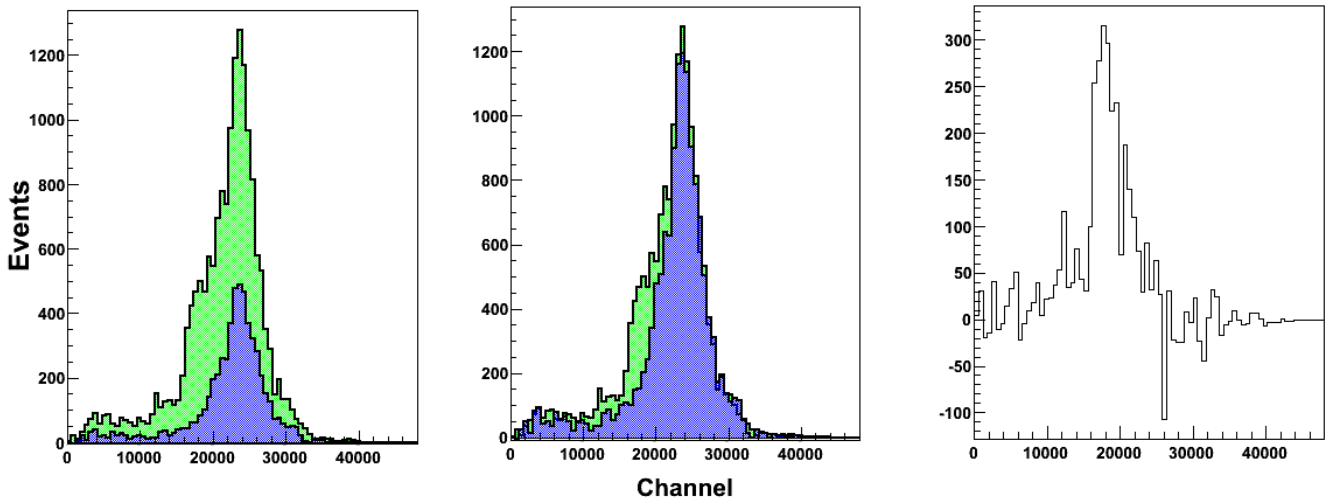
CH2-C subtraction

The next stage is the CH_2-C subtraction procedure. Carbon background subtraction deduced from the normalization in the interval $a_{min}<a<a_{max}$, were a - channels of CH_2- and C-amplitude distributions. I.e.

$$k = \frac{N_{CH_2}(a_{min}<a<a_{max})}{N_C(a_{min}<a<a_{max})}$$

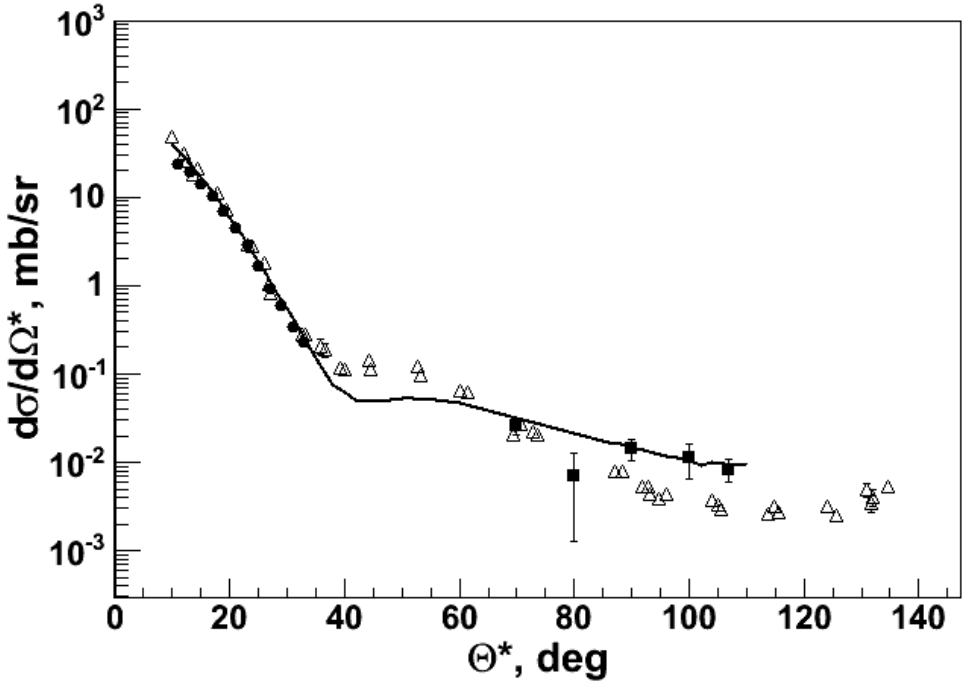
were k - normalization coefficient, N_{CH2} and N_C - CH_2- and C-amplitude distributions integrals in a-interval. The carbon background can be subtracted as:

$$N_{dp} = N_{CH_2} - k(\epsilon$$



CH2-C subtraction for amplitude specters of P-counter.

Differential cross section at 1000 MeV/n



Squares – new data

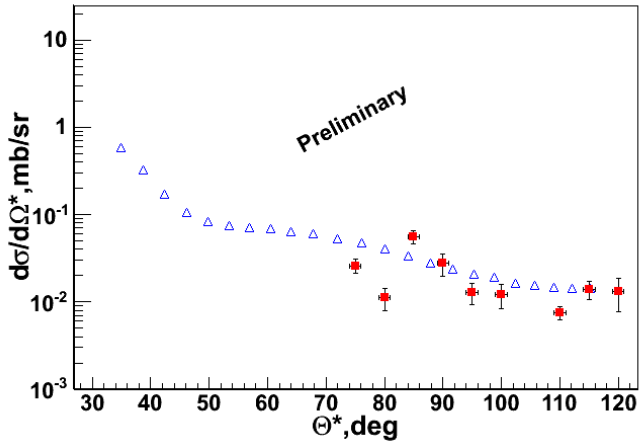
Circles – the data obtained early for forward angles [Terekhin A.A. et al. EPJ A48, 2012. P.182.]

Triangles - Bennett G. W. et al. Phys. Rev. Lett. 1976. V.19 P. 387-390.

Line - the theoretical calculations without DS term [Ladygina N.B. et al. EPJ A42, 2009. P.91.]

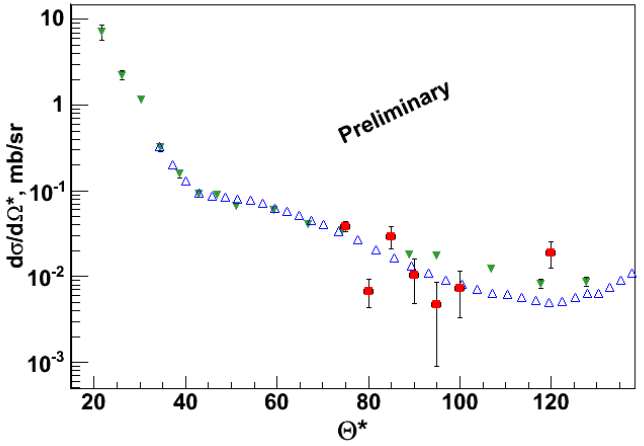
Differential cross section

650 MeV/n



Triangles – data at 641.3 MeV/n (Culmez E. Phys.Rev.C, V43, №5, 1991)

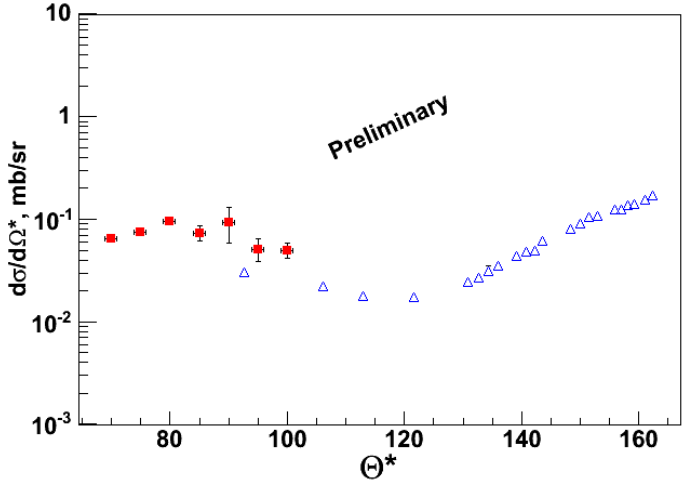
750 MeV/n



Blue triangles – data at 792.7 MeV/n (Culmez E. Phys.Rev.C, V43, №5, 1991)

Green triangles – data from 800 MeV/n (Winkelmann E. Phys.Rev.C, V21, №6, 1980)

500 MeV/n



Blue triangles – data at 470 MeV/n (Alder J.C Phys.Rev. C6 (1972) 2010-2019)

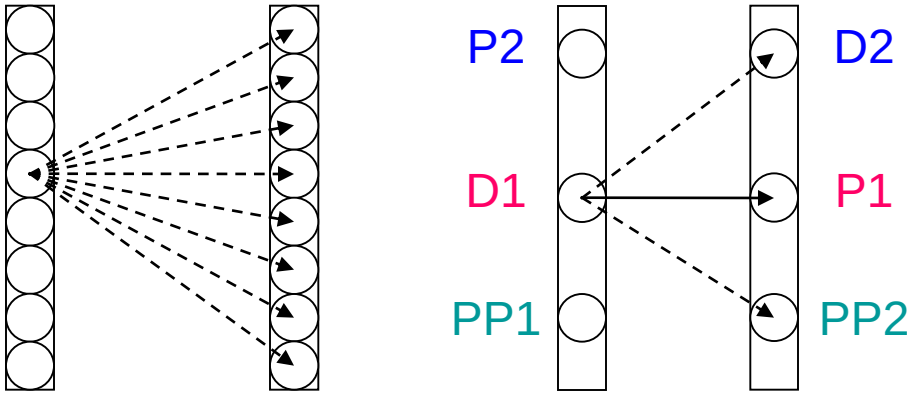
Conclusion

- The procedure of data analysis to obtain of differential cross section is shown. The preliminary differential cross section data for dp-elastic scattering at 500,650,750 and 1000 MeV/n are obtained. The results was compared with existing data for similar values of energies.

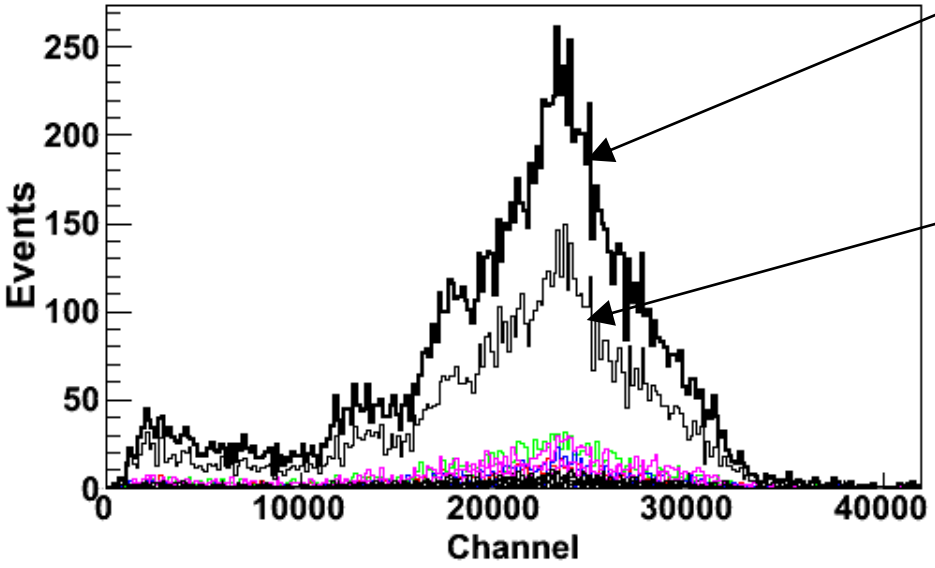
Thank you for attention!

TQDC16 module allows to measure the amplitude and time appearance of the signal.

Each module consists of two parts, with eight channels. We can make the trigger so that a signal from one part coincides with the signal from any channel of other part. Thus trigger is very soft. In our case the coincidences of signals of D1 and P1, D1 and D2, D1 and PP2 counters may be . As a result we have a lot of triple, four-fold and five-fold coincidences.



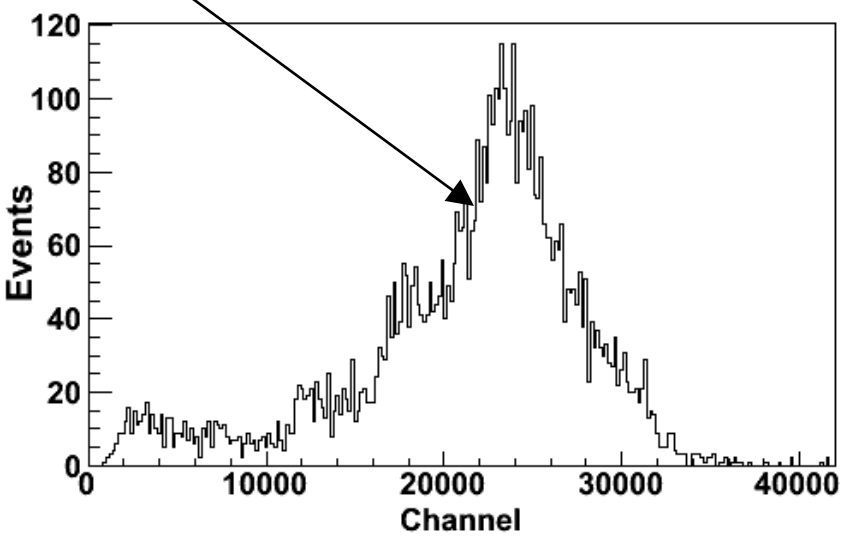
Amplitude of one of the proton counters



Double coincidence taking into account contributions other coincidences

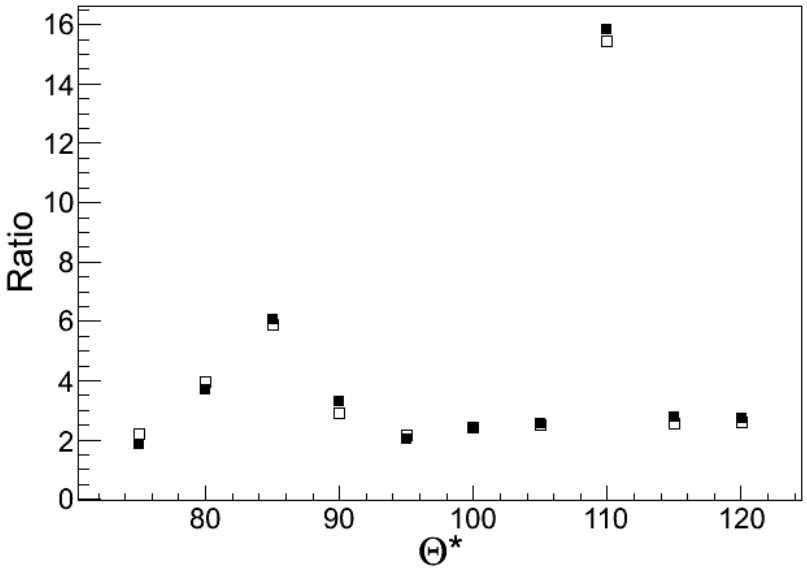
Sum of the remaining coincidences

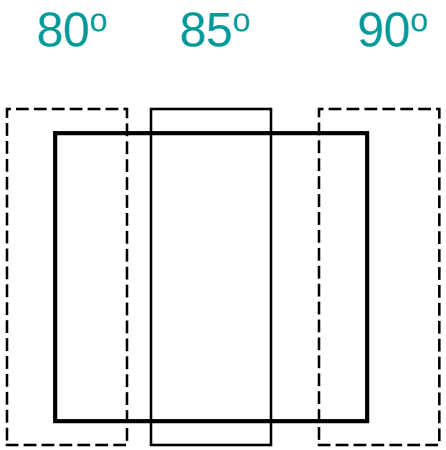
Subtraction (Only double coincidence)



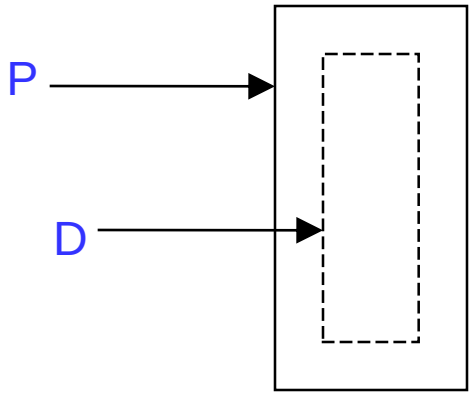
Ratio of the total events to events only double coincidence for both pairs of dp-detectors

650 MeV/n

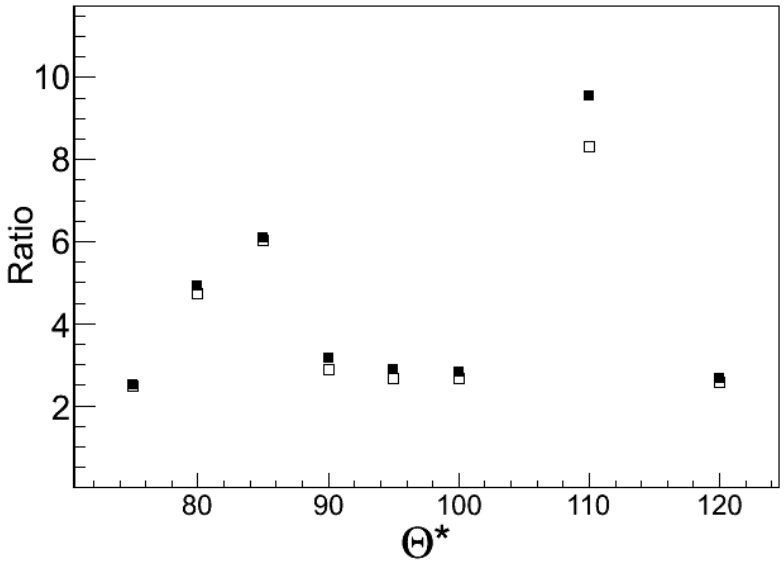




There is a peak in the region 85º. Perhaps, this is due to that the p-counter and pp-counter are wholly or partly overlap. Peak at 110º possibly due to the fact that the d-and p-counter counter overlap



750 MeV/n



500 MeV/n