Strokovsky E.A.

Year 2016

Runs 52 and 53 of the Nuclotron (total duration: ≈2070 hours)

The Nuclotron run coordinator report

Run 52 of the Nuclotron *planned: 02.06.2016 – 08.07.2016,*

the main ring in fact: 02.06.2016 – 01.07.2016

The ultimate goal of the run was twofold:

1) to revive the polarized deuteron beams in the multi-GeV energy region

(the immediate consequence is the appearance of polarized quasi-monochromatic beams of neutrons and protons in this energy region, available for users);

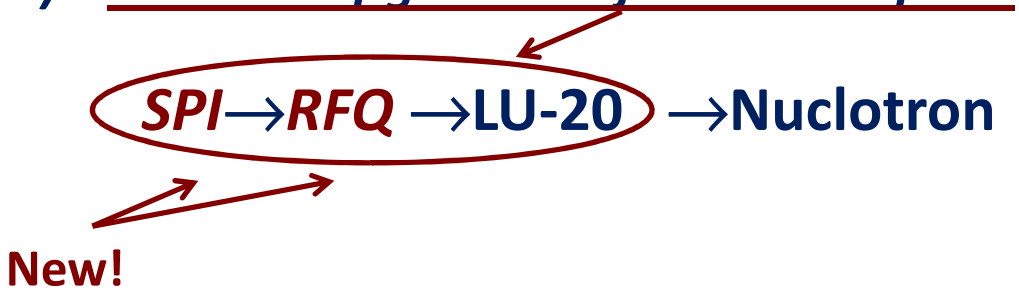
2) *to revive physical measurements with polarized nucleons and deuterons*

(within the framework of the JINR topical plan (theme 1097)).

All this has to be done:

1) with the new Source of Polarized Ions (SPI),

2) with the upgraded injection complex:



This run was the "technical one" first of all.

Physics part of the run (in case of a good luck)

Experiments at extracted beams: 5 experiments:

Data taking for physics: 1 experiments (ALPOM-2) (polarized beam!)

R&D and calibrations: 4 experiments (FAZA, BM@N, MPD, HyperNIS)

Time requested by users (total, d): ≈768 hours

Time scheduled for users (total, d): ≈ 456 hours

Time obtained by users (total, d): ~120 hours

(including unexpected machine stops)

Good results:

SPI* (unpolarized mode) → *RFQ* → LU-20 → Nuclotron *OK!

Polarimeters were prepared for measurements
(the Low Energy Polarimeter (after LU-20) and the ITS polarimeter at the internal beam).

SPI* (vector polarized mode) → *RFQ* → LU-20 → LEP → *OK!

(01.07.16 - 7.07.16)

vector polarization – as expected ~ (+/- 0.5), but:

one sign – direct measurements,

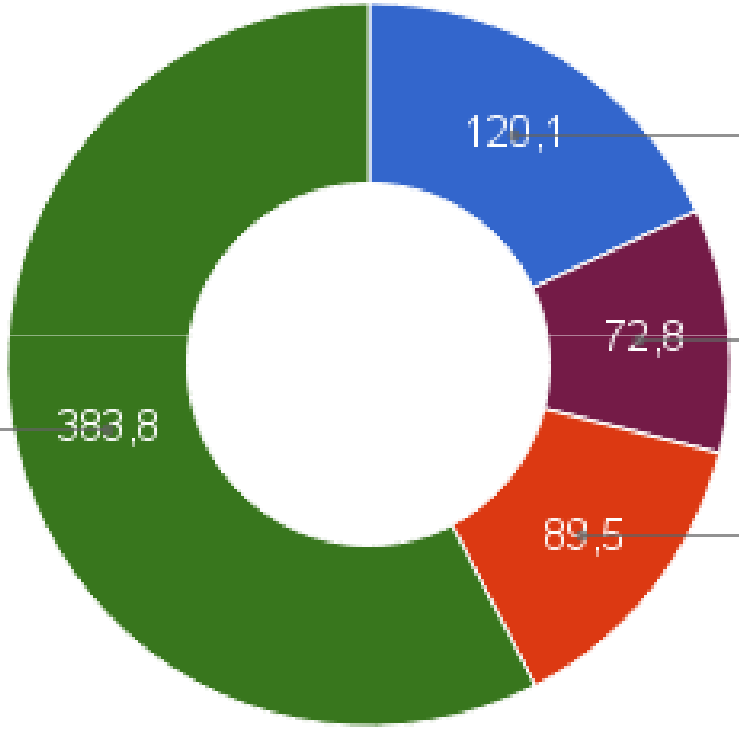
another sign: indirect measurements

(by measurements of the tensor polarization).

Run 52 of the Nuclotron (02.06.2016 – 08.07.2016)

Main ring → ***01.07.2016***

The total run duration: ≈670 hours



cooling 18%

preparation 10,9%

repairing 13,4%

accelerator physics and R&D of user 57,6%

users: ~ 1/3 of this time (unpolarized d)

"ALPOM-2", "Test-beam MPD";
unexpected machine stop after BM@N started…

Run 53 of the Nuclotron (27.10.2016 – 25.12.2016):

The ultimate goal of the run was
physics with polarized deuteron beam

1) ALPOM-2 with vector polarized deuteron beam:
measurements of analyzing powers for polarized protons and neutrons
in the multi-GeV energy region

2) ***measurements of cross sections and analyzing powers of***
deuteron scattering at CH2 and C targets (tensor polarized deuterons)
(the DSS project)

3) Works with unpolarized deuteron beam (methodics)

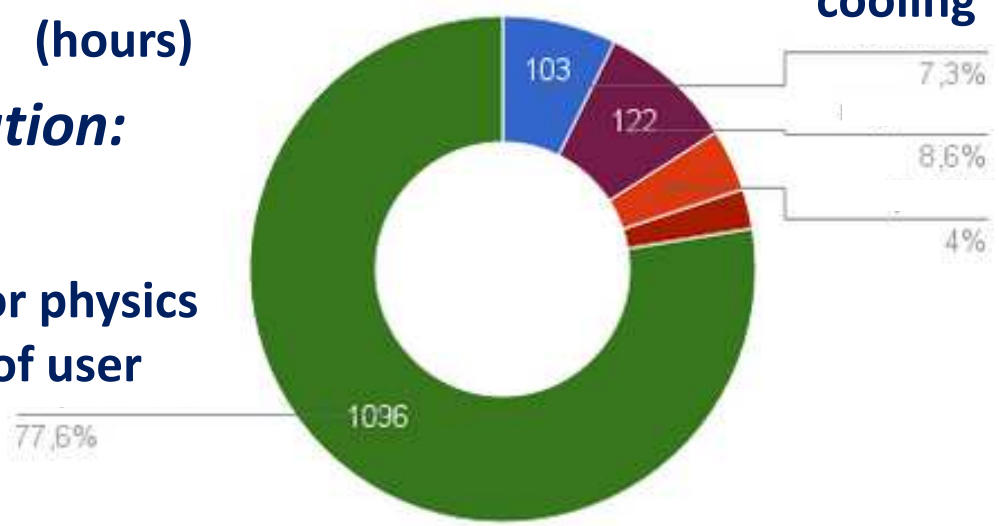
All the works were performed according
the JINR topical plan.

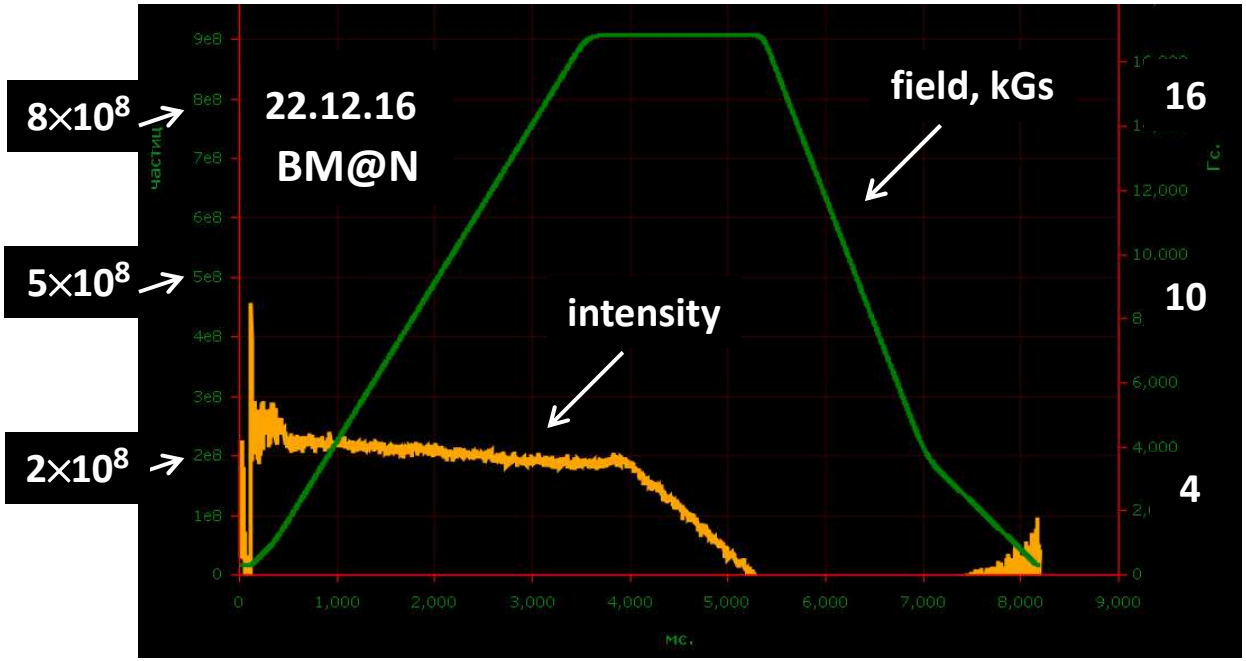
Run 53 of the Nuclotron (27.10.2016 – 25.12.2016)

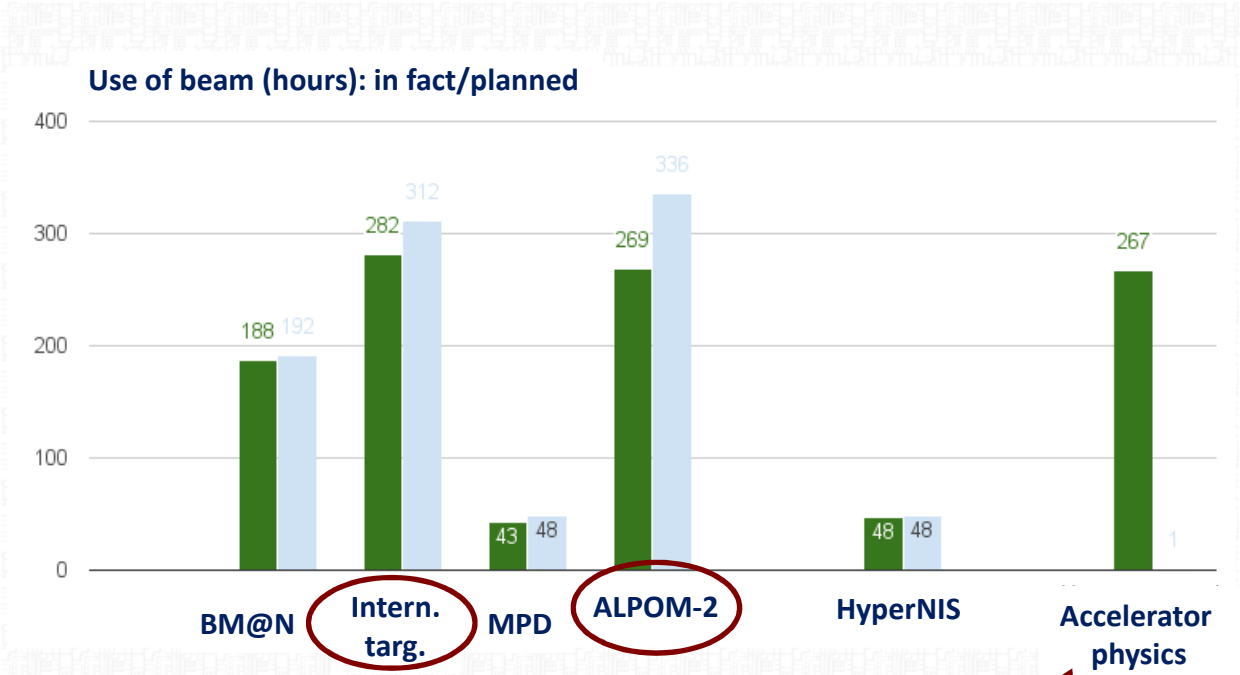
Beam time (hours)

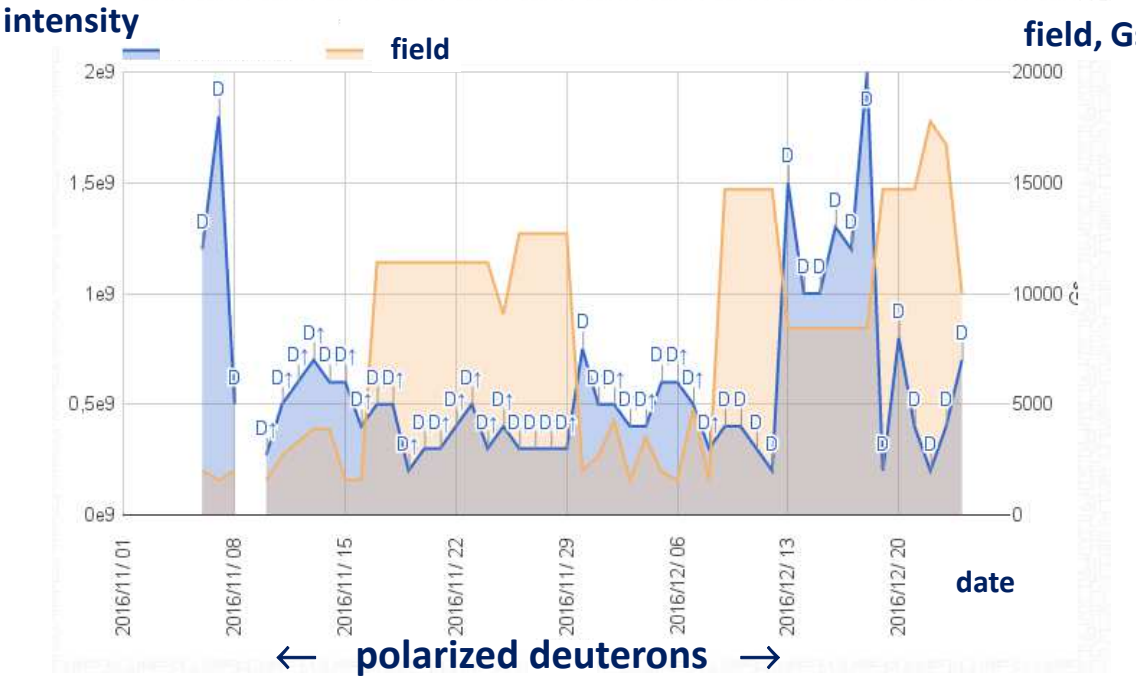
The total run duration:

≈1400 hours






Use of beam (hours): in fact/planned
400
300
200
100
0
188
192
282
312
43
48
269
336
48
48
267
1
BM@N
Intern. targ.
MPD
ALPOM-2
HyperNIS
Accelerator physics
(including polarimetry)

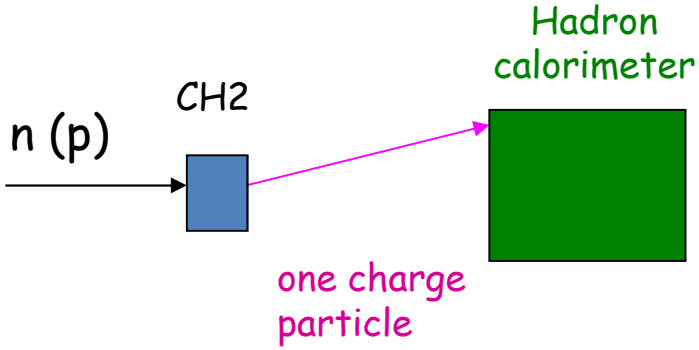

intensity
field
field, Gs
2e9
1,5e9
1e9
0,5e9
0e9
20000
15000
10000
5000
0
2016/11/01
2016/11/08
2016/11/15
2016/11/22
2016/11/29
2016/12/06
2016/12/13
2016/12/20
date
← polarized deuterons →

Selected results

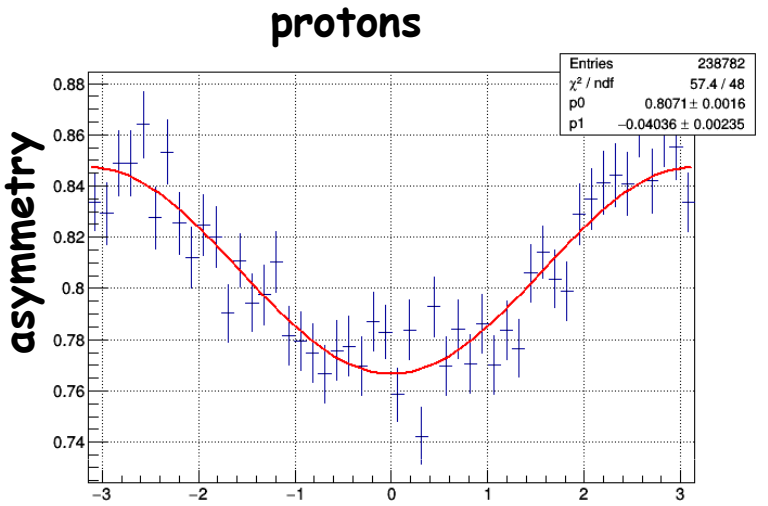
(all the data are preliminary, data analysis is in progress)

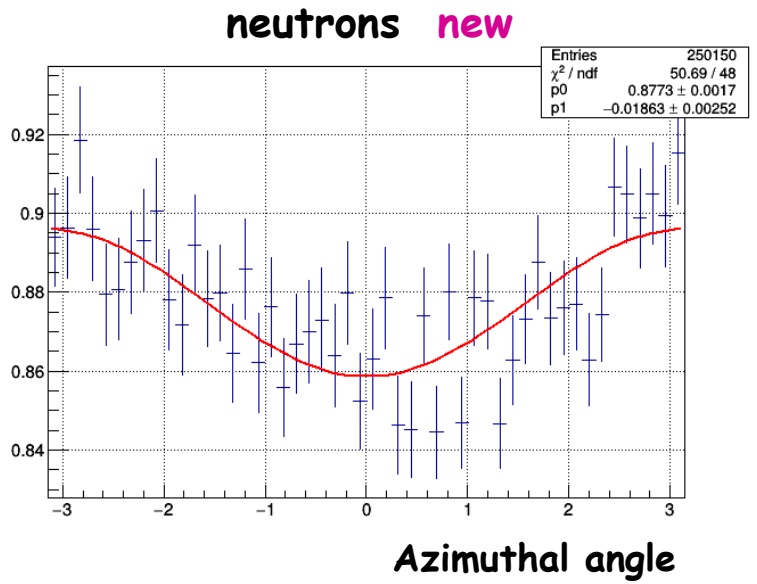
ALPOM-2 in the run 53 Data status: *preliminary*; analysis is in progress

Measurement of analyzing powers for the reaction p + CH2 up to 7.5 GeV/c and n + CH up to 4.5 GeV/c at the Nuclotron (ALPOM2 proposal)

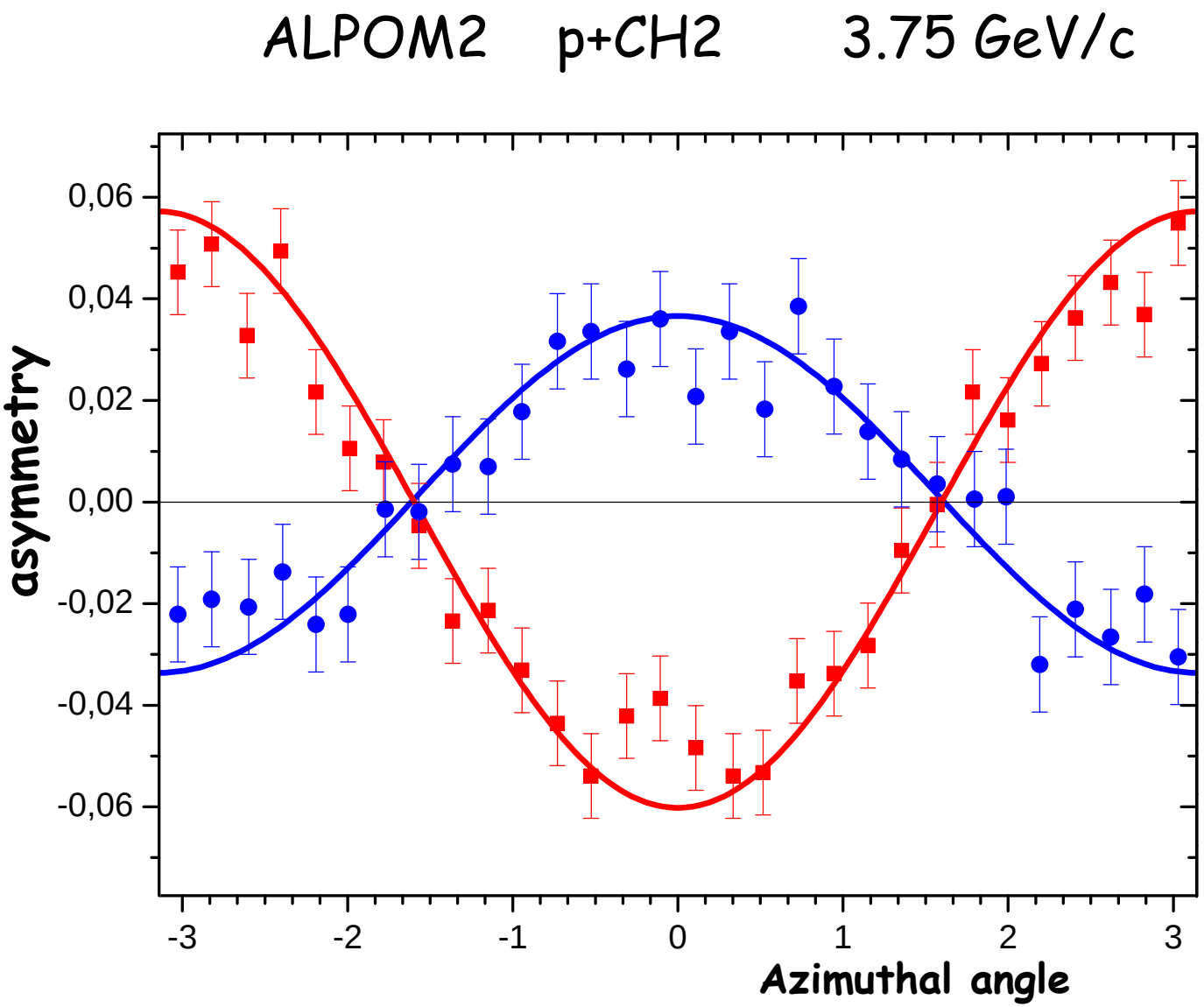


JINR-Slovakia-USA-France-United Kingdom

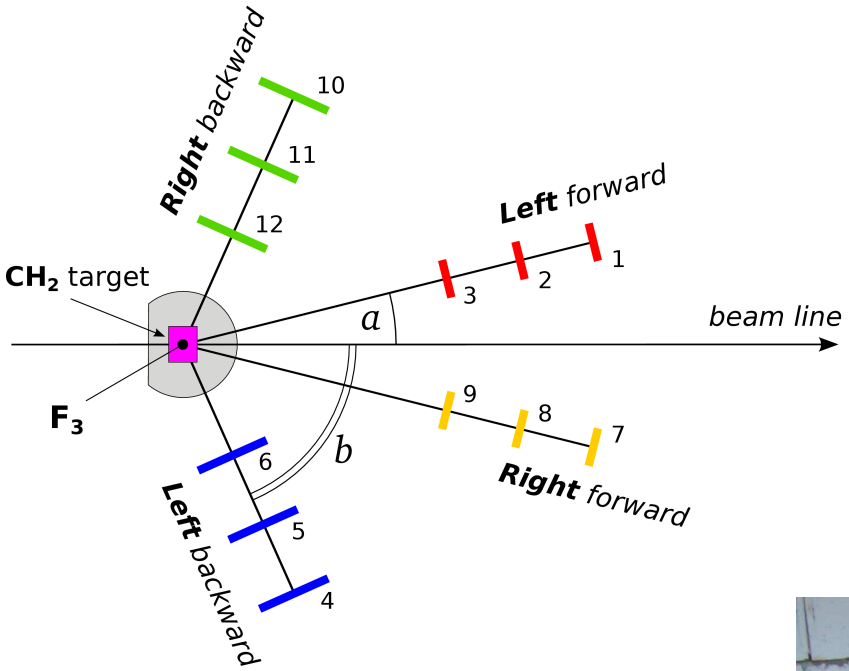




ALPOM-2 in the run 53. Data status: *preliminary*; analysis is in progress



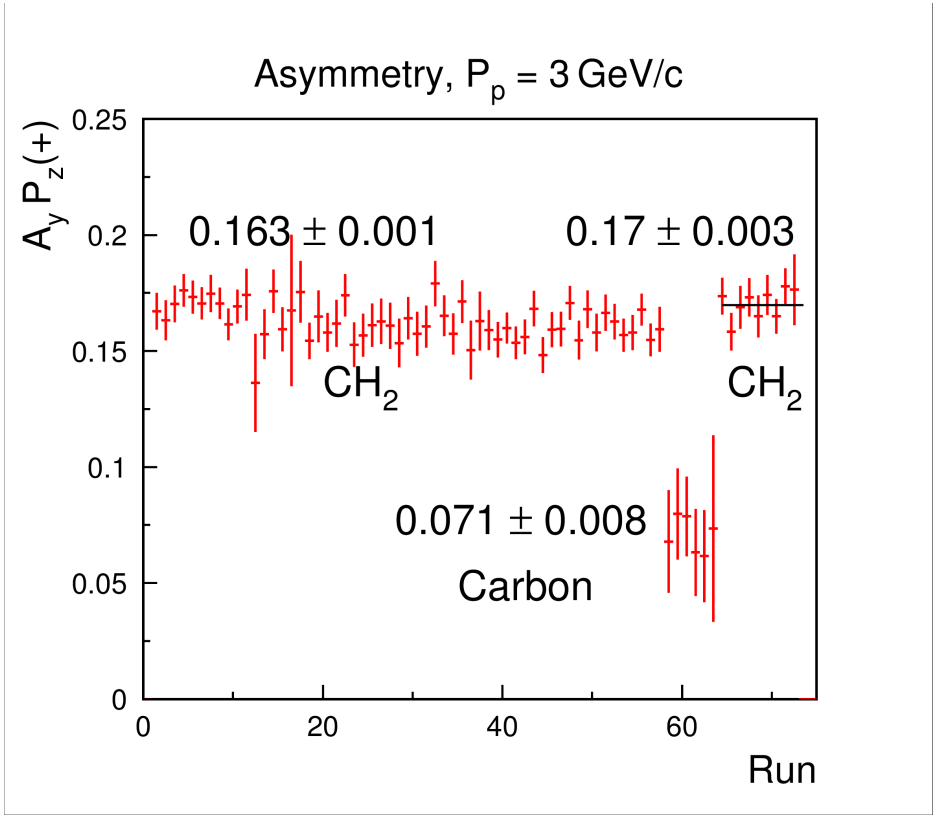
Polarimeter at the extracted beam (F3 focus)

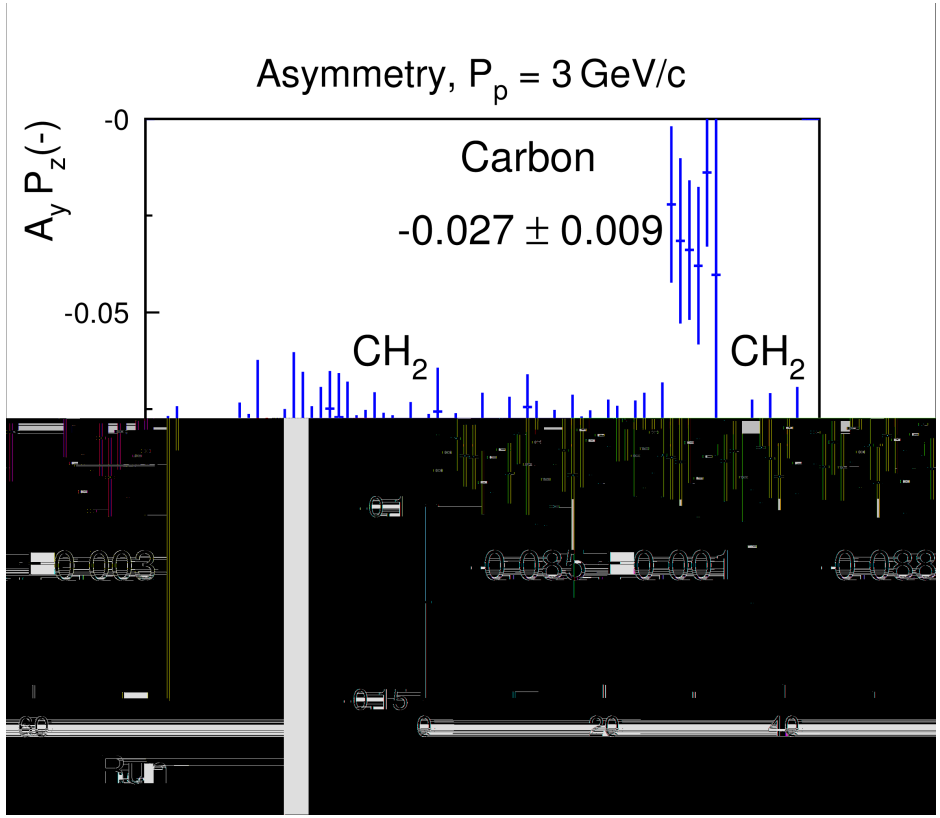


beam

Polarimeter at the extracted beam (F3 focus)

Deuteron beam momentum: 3 GeV/c



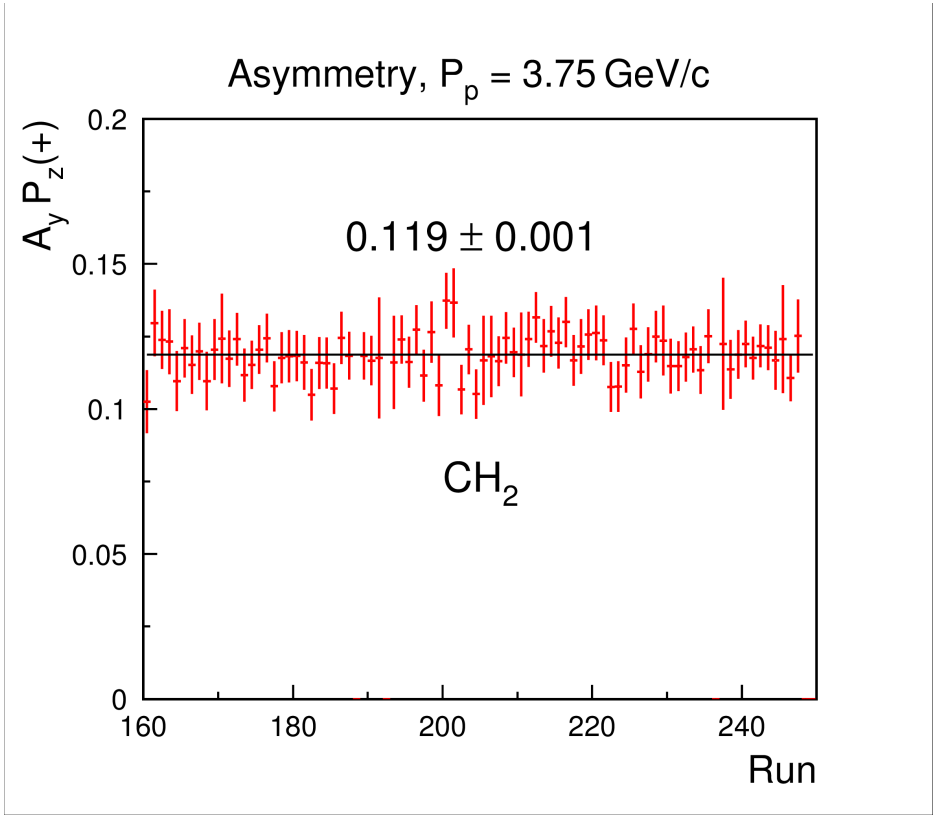


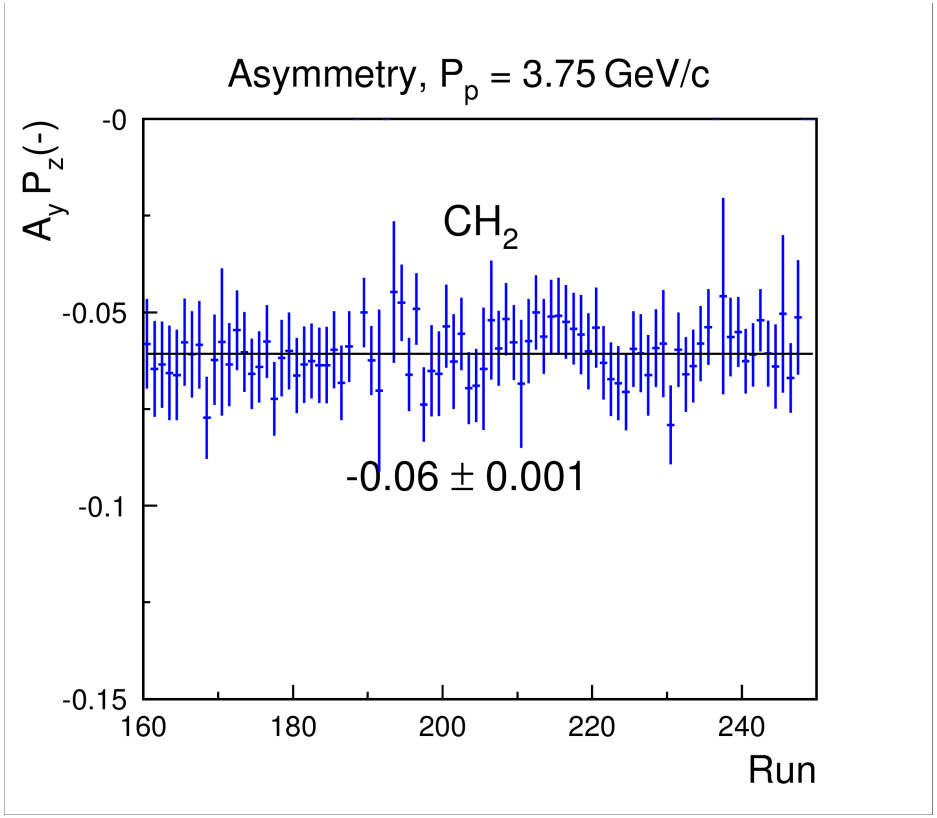
Vector polarization of the beam *(preliminary!)*

$P_z(+) = \mathbf{0.652} \pm 0.004 \pm 0.052$ $P_z(-) = \mathbf{-0.343} \pm 0.005 \pm 0.027$

Polarimeter at the extracted beam (F3 focus)

Deuteron beam momentum: 7.5 GeV/c



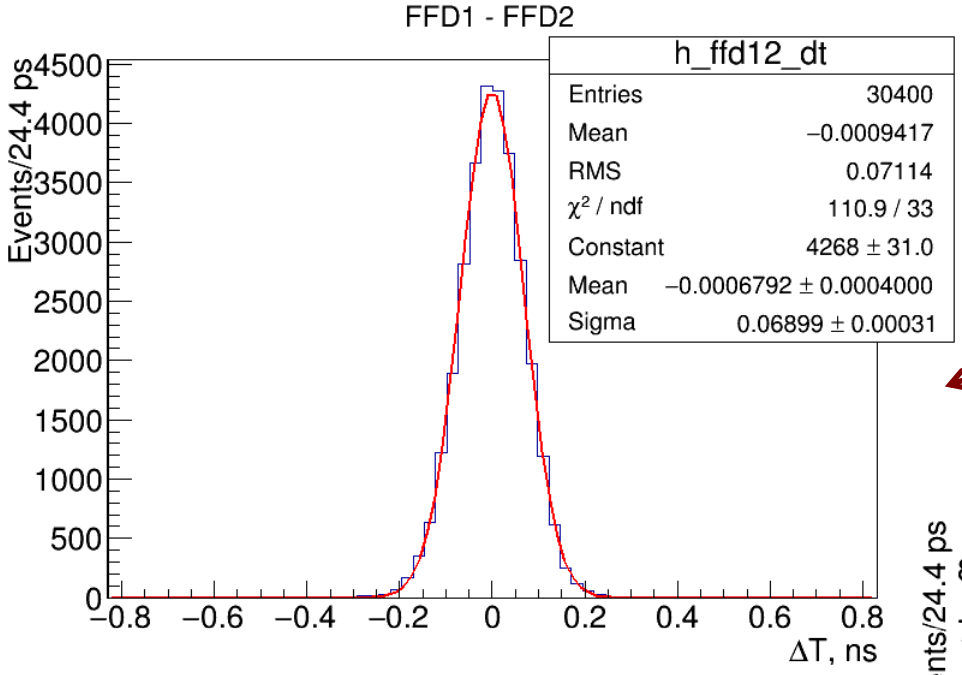


Vector polarization of the beam *(preliminary!)*

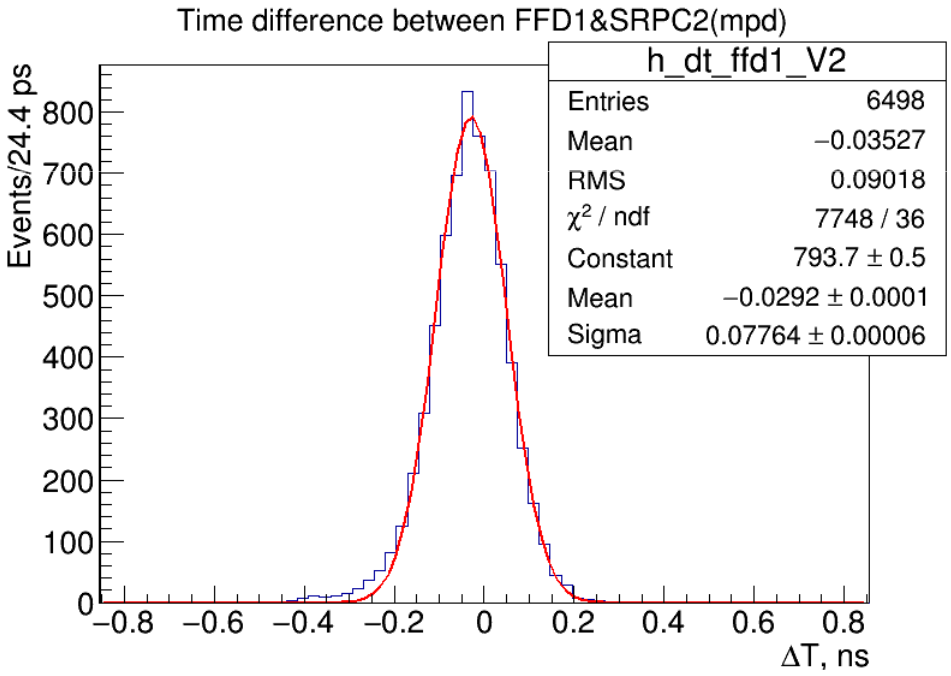
$P_z(+) = \mathbf{0.593} \pm 0.005 \pm 0.047$ $P_z(-) = \mathbf{-0.302} \pm 0.006 \pm 0.024$

Some R&D results
(preliminary)

"MPD test-beam" in the run 53

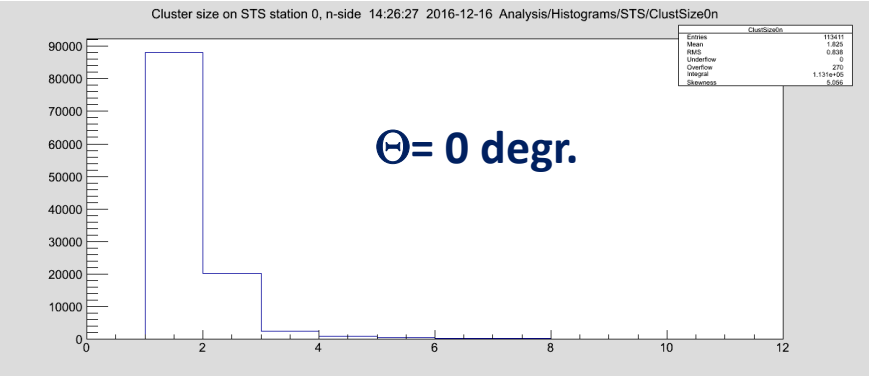


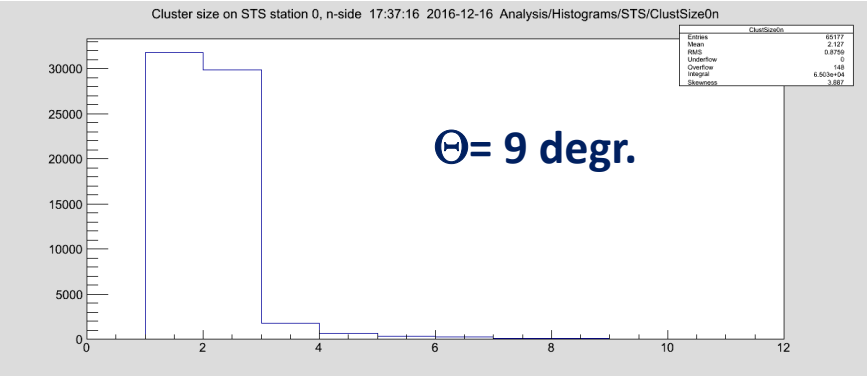
T0 detectors tested;
achieved time resolution: 49 ps

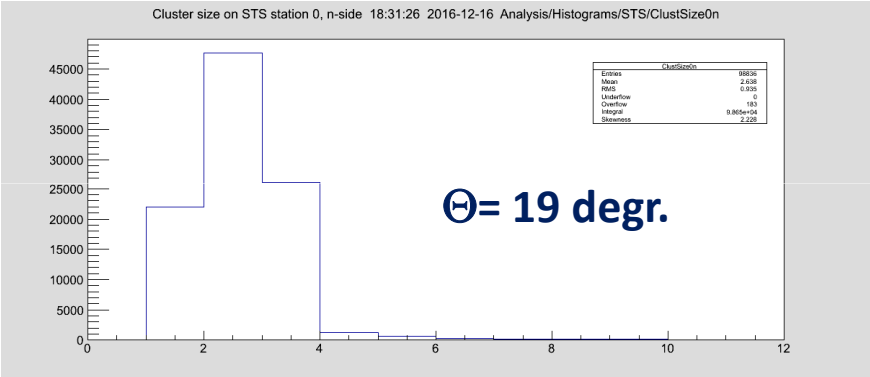


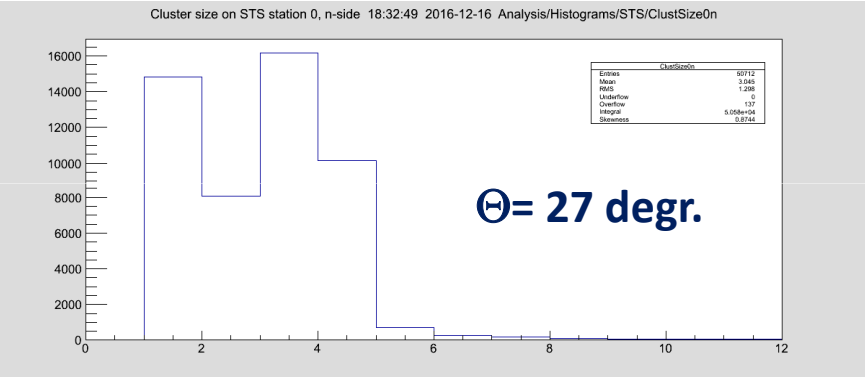
RPC prototypes tested:
achieved time resolution: ~60 ps

The first beam test of the microstrip detectors (STS) for BM@N and CBM





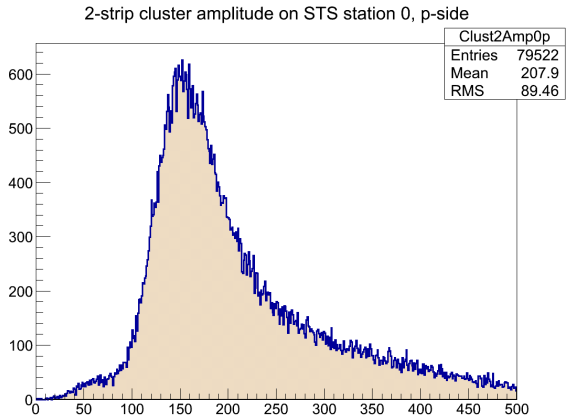




2 8 10 2 8 10

Dependence of the *cluster sizes* upon the *beam inclination angle* Θ

2-strip cluster amplitude on the STS station 0 (P-side)



Since the 2016 year
JINR has again, at the LHEP Nuclotron, the polarized deuteron beam with kinetic energy up to 5 GeV/nucleon

ДУБНА
НАУКА СОДРУЖЕСТВО ПРОГРЕСС

ЕЖЕНЕДЕЛЬНИК ОБЪЕДИНЕННОГО ИНСТИТУТА ЯДЕРНЫХ ИССЛЕДОВАНИЙ
Газета выходит с ноября 1957 года ♦ № 48 (3636) ♦ Пятница, 16 декабря 2002 года

● *Сообщение в номер*

Есть поляризованные дейтроны на нуклотроне!

7–9 декабря состоялся сеанс работы нуклотрона с источником ПОЛЯРИС. Впервые ускорен до энергии более 2 ГэВ/нуклон и выведен из нуклотрона пучок поляризованных дейтронов. Максимальная интенсивность пучка 1,35 · 10^8 частиц в цикле ускорения.

Поляризация пучка измерена физическими установками СФЕРА (внутренняя мишень); ПОЛЯРИМЕТР (измерительный павильон); АЛПОМ (корпус 205). Коэффициент поляризации более 0,5.

* * *

Директору ЛВЭ
имени В. И. Векслера и А. М. Балдина
профессору А. И. Малахову.

Примите самые сердечные поздравления с замечательным результатом – ускорением и выведением из нуклотрона пучка поляризованных дейтронов. Это важный шаг на пути освоения нуклотрона как пользовательской базовой установки ОИЯИ и его стран-участниц. Мы уверены, что научная общественность с большим вниманием отнесется к новым возможностям, открытым для исследований на нуклотроне.

Искренняя благодарность и поздравления всему коллективу лаборатории. Шлем всем наши новогодние поздравления и добрые пожелания.

В. Г. КАДЫШЕВСКИЙ,
А. Н. СИСАКЯН

* * *

Поздравляю с первым ускорением поляризованных дейтронов на нуклотроне. Я очень счастлив.

Наилучшие пожелания, Франтишек ЛЕГАР

На снимках: В. П. Ершов, ведущий инженер научно-исследовательского криогенного отдела ЛВЭ (снимок вверху) и начальник НИКО Ю. К. Пилипенко в сеансе ускорения поляризованных дейтронов. *Фото ЛВЭ.*

16.12.2002

Dubna newspaper about acceleration of polarized deuterons in the Nuclotron