Поляриметр для прецессирующей поляризации.

Today Projects

PHYSICS OF ELEMENTARY PARTICLES
AND ATOMIC NUCLEI. EXPERIMENT

Strategies for Probing *P*-Parity Violation in Nuclear Collisions at the NICA Accelerator Facility

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Abstract—Possible approaches to experimentally detecting *P*-parity violation in polarized proton or deuteron interactions with an unpolarized target are discussed. Within the first approach, a polarized proton or deuteron beam is scattered on a thick internal target deployed in one of rings of the NICA collider, and the spin state of the circulating beam is transformed to the mode of precession in the horizontal plane using an RF spin flipper. In this case, parity-violating effects can be probed by measuring the correlation between the interaction cross section and the particle spin direction. In an alternative experimental approach, beam-particle spins are rotated into the horizontal plane using a spin flipper, and then the beam is extracted to a beamline at a definite stage of spin precession. In this experimental scheme, which can be viewed as more traditional, one then collides the extracted beam with a dense external target and compares the measured cross sections for particles with opposite helicities passing through the target.

Precessing vs longitudinal polarization

$$\langle P_z \rangle = \frac{1}{\pi} \int_{-\pi/2}^{\pi/2} \cos\phi \, d\phi \simeq 0.64$$

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New method for a continuous determination of the spin tune in storage rings and implications for precision experiments

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COZY 2017_2

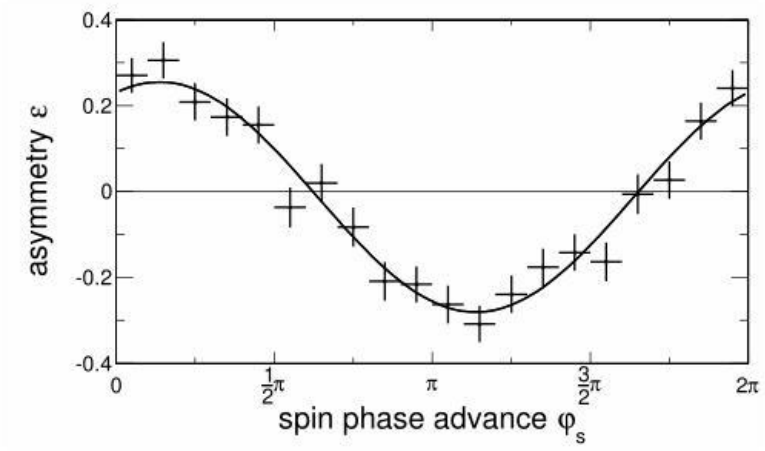
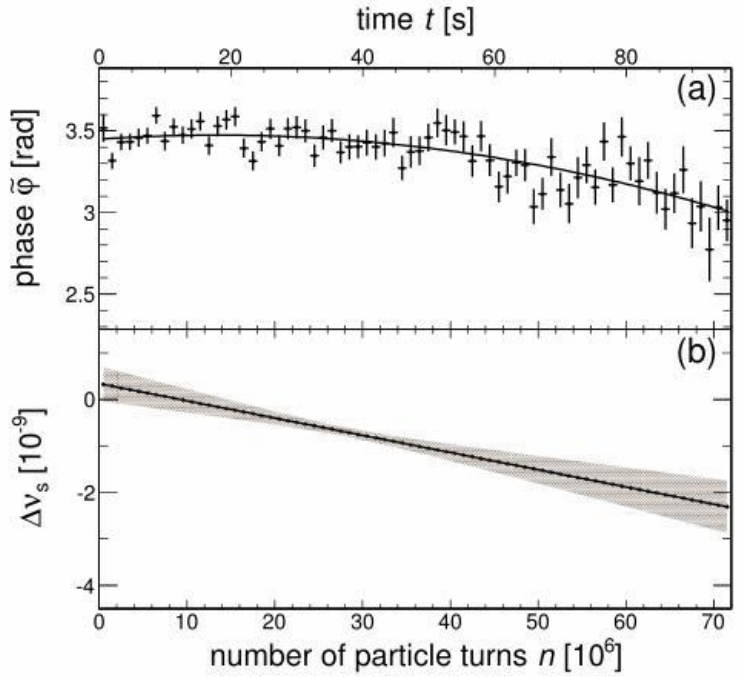


FIG. 2. Measured asymmetry $\epsilon(\varphi_s)$ of Eq. (7) fitted with $\epsilon(\varphi_s)$ of Eq. (8) to extract amplitude $\tilde{\epsilon}$ and phase $\tilde{\varphi}$, using the yields $N^{+,-}_{U,D}(\varphi_s)$ of Fig. 1 (b) for a single turn interval of $\Delta n = 10^6$ turns at a measurement time of $2.6\,\mathrm{s} < t < 3.9\,\mathrm{s}$.



First Paper

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Particles and Nuclei, Letters. 2002. No. 2[111]

УДК 621.384, 634.25, 539.172.13

PRECESSING DEUTERON POLARIZATION

I. M. Sitnik[1], *V. I. Volkov, D. A. Kirillov, N. M. Piskunov, Yu. A. Plis*

Joint Institute for Nuclear Research, Dubna

The feasibility of the acceleration in the Nuclotron of deuterons polarized in the horizontal plane is considered. This horizontal polarization is named precessing polarization. The effects of the main magnetic field and synchrotron oscillations are included. The precessing polarization is supposed to be used in studying the polarization parameters of the elastic *dp* back-scattering and other experiments.

Рассматривается возможность ускорения в нуклотроне дейтронов, поляризованных в горизонтальной плоскости. Эта горизонтальная поляризация называется прецессирующей поляризацией. Включены эффекты ведущего магнитного поля и синхротронных колебаний. Прецессирующую поляризацию предполагается использовать для изучения поляризационных параметров в упругом *dp*-рассеянии назад и для других экспериментов.

T20 in dp backward

Physics Letters B
Volume 391, Issues 1–2, 9 January 1997, Pages 22-28



Tensor analyzing power T_{20} in backward elastic *dp* scattering and breakup at 0° between 3.5–6.5 GeV/c ☆

L.S. Azhgirey [a] ✉, E.V. Chernykh [a], A.P. Kobushkin [b], V.P. Ladygin [a], S. Nedev [c], L. Penchev [d], C.F. Perdrisat [e], N.M. Piskunov [a], V. Punjabi [f], I.M. Sitnik [a], G.D. Stoletov [a], E.A. Strokovsky [a], A.I. Syamtomov [b], V.V. Vikhrov [g], L. Vizireva [c], S.A. Zaporozhets [a]

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Abstract

The tensor analyzing power T_{20} for the $p(d,pd)$ and $p(d,p)pn$ reactions $\theta_{cm}^{p} = 180°$ have been measured at incident deuteron momenta from 3.5 to 6.5 GeV/c. For both reactions T_{20} remains negative up to internal momentum $k \simeq 0.85$ GeV/c and show a rich structure beyond the region where T_{20} is expected to be determined by the S- and D-states of the deuteron. The T_{20} data for deuteron breakup without pion production, close to the backward elastic kinematics, were obtained simultaneously with the elastic data.

First prize for T20 in backward dp



BES - project

JINR-LHE-0941 BES-Project

Date approved: 1995 Date started: 1995
Accelerator: nuclotron
Target: Movable Polarized Proton Target
Apparature: Magnetic Spectrometer with straws

Measurement of Spin Correlation in Backward Elastic dp Scattering (revised version)

Azhgirey L.S., Atanasov I., Borisov N.S., Bushuev Yu.P., Glagolev V.V., Golovanov L.B., Grebenuk V.M., Zhmyrov V.N., Kirillov A.D., Kirillov D.A., Korovin P.P., Kostyaeva N.V., Krasikova T., Lazarev A.B., Lukhanin A.A., Maniakov P.K., Maksimenkova V.I., Matafonov V.M., Matushevsky E.A., Musinsky J., Motina Z.P., Nedev S., Orlova V.V., Pavlova V.V., Parfionov A.N., Pentchev L., Perdrisat C.F., Povtoreyko A.,A., Punjabi V., Piskunov N.M., Plis Yu.A., Rukoyatkin P. A., Sapozhnikov A.P., Sitnik I.M., Stoletov G.D., Usov Yu.A., Shilov S.M., Schelev O.N., Vichrov V.

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Papers, related to BES

Physics Letters B
Volume 356, Issue 4, 24 August 1995, Pages 434-438



Study of *T*-odd asymmetry in backward elastic *dp* scattering as a method to identify the reaction mechanism

M.P. Rekalo [a], I.M. Sitnik [b]

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https://doi.org/10.1016/0370-2693(95)00754-9 Get rights and content

Abstract

Recent measurements of the polarization observables in the $dp \rightarrow pd$ reaction at Dubna and Saclay have shown that a consideration of this reaction in the framework of the one nucleon exchange mechanism is inadequate. The *T*-odd effects due to the polarization of both colliding particles are considered. It is shown that the new polarization observable is especially sensitive to the mechanism of the reaction. The paper is inspired by the fact that a polarized proton target, which can provide a polarized deuteron beam, is now installed at the Dubna synchrophasotron.

Such measurements are feasible also at COSY.

Papers, related to BES

Few-Body Systems 23, 187–200 (1998)

Few-Body Systems

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Printed in Austria

Complete Experiment for *d-p* and ^{3}He-*d* Backward Elastic Scattering

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Abstract. The problem of a complete experiment in backward elastic scattering of particles with spins of 1 and $\frac{1}{2}$ is considered. For the first time all possible effects induced by polarization of one or two initial and one final particles are touched upon. The minimal set of measurements allowing to reconstruct all of four amplitudes describing this process is proposed. Some observables are expected to be sensitive to hitherto largely unexplored deuteron properties, such as a possible *P*-wave component. The technique developed is a good tool to calculate easily impulse-approximation predictions for any observables. Accelerator facilities suitable for fulfilling the complete experiment are listed.

Грант РФФИ 00-02 16189

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$$\sigma(t) = k[1 + A(1 + cos(\omega t) + \varphi_0)]$$

Here k, A, ω, φ_0 - parameters.

k – normalization factor

A – analysing power

φ_0 – phase shift

ω – desired value

$$\omega = \mu H$$

μ – magnetic moment

H – magnetic field

the sequence of actions

$$0 < t < \infty$$

$$\varphi = \omega t$$

$$cosfi = cos(\varphi)$$

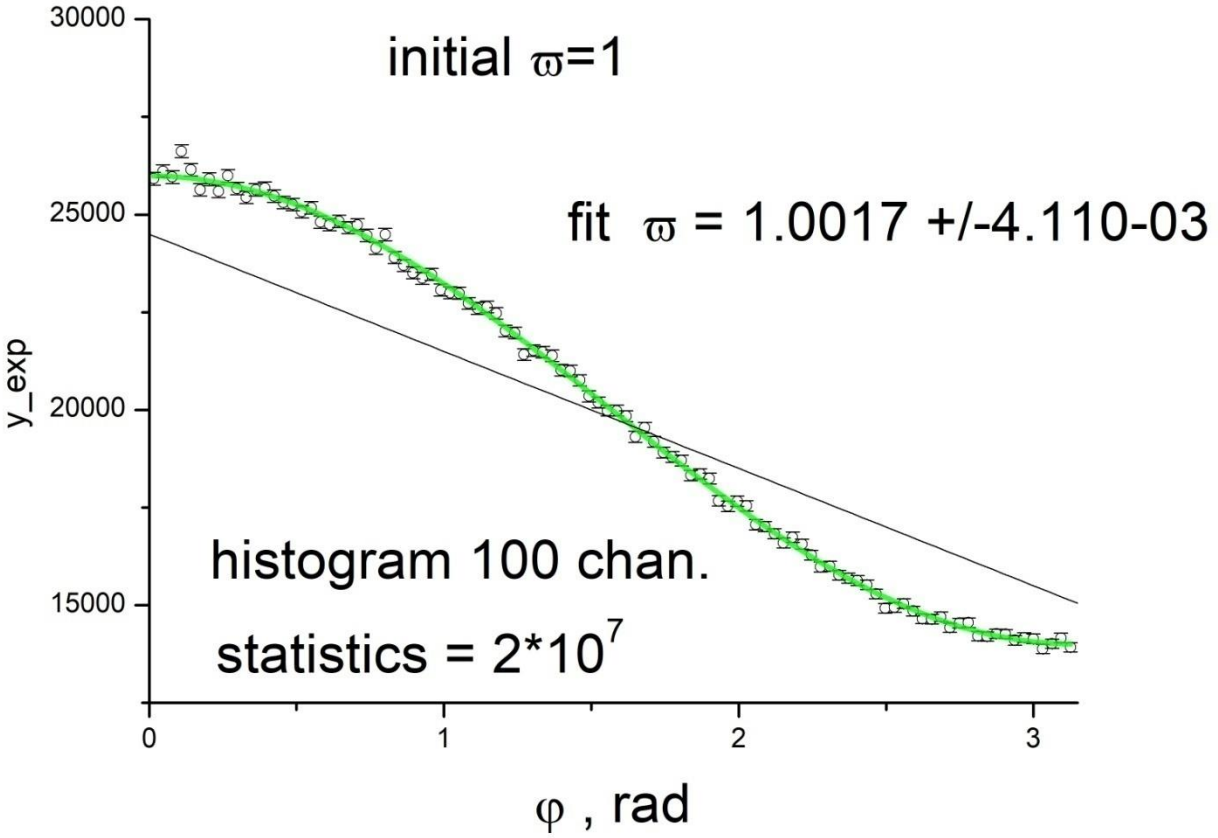
$$\varphi_e = acos(cosfi)$$

$$CALL\ ACCUM(N, \varphi_e)$$

$$Hisq = FUMILIM(N, A, UF)$$

N – Nora's object adress
A – parameters
UF – user function

Fit_1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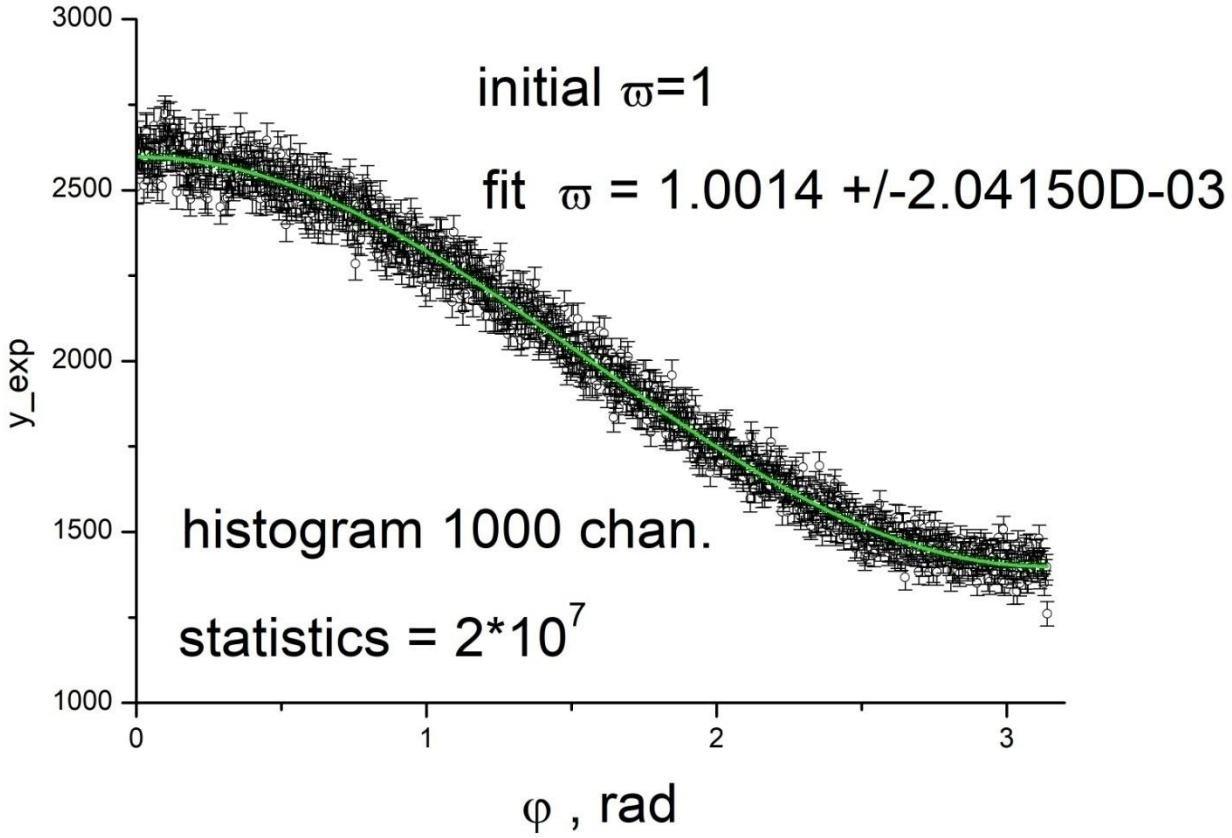
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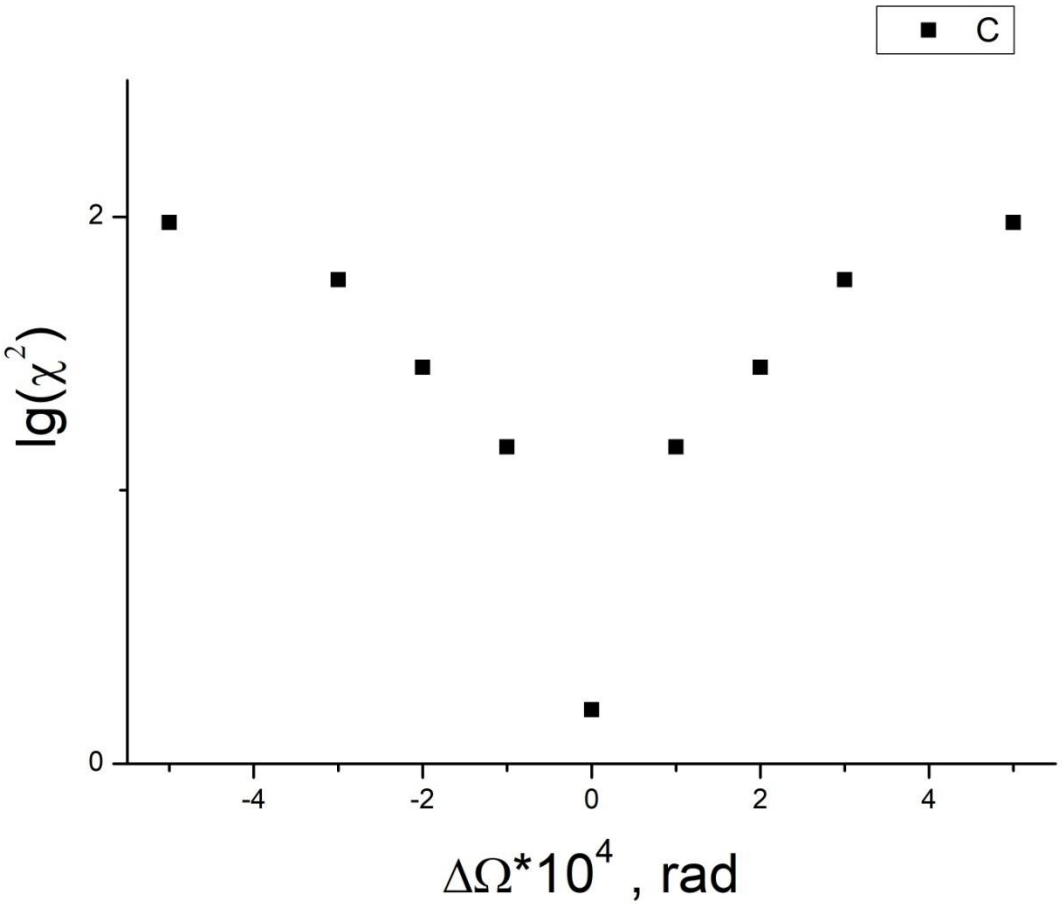

Used Programs

Debugging the FUMILIM minimization package

Citation Data: Computer Physics Communications, ISSN: 0010-4655
Publication Year: 2023

Metrics Details

USAGE	1,453
Views	1,282
Mendeley Data ↗	1,282
Downloads	171
Mendeley Data ↗	171

Dataset Description

The suggested package FUMILIM, based on famous FUMILI minimization package, has the following advantages. Unlimited number of parameters (multi-set tasks). Ability to work with multidimensional experimental points, described by a vector function. The preliminary scan is envisaged for complicated tasks. For heavy user's functions the parallel fit is envisaged with the help of OpenMP service. Multi-optional user interface, including the option to ignore wrong experimental points. The package contains popular intrinsic user's functions. All of them can be used without the definition of the parameter ini... is a package of fast track reconstruction progra...

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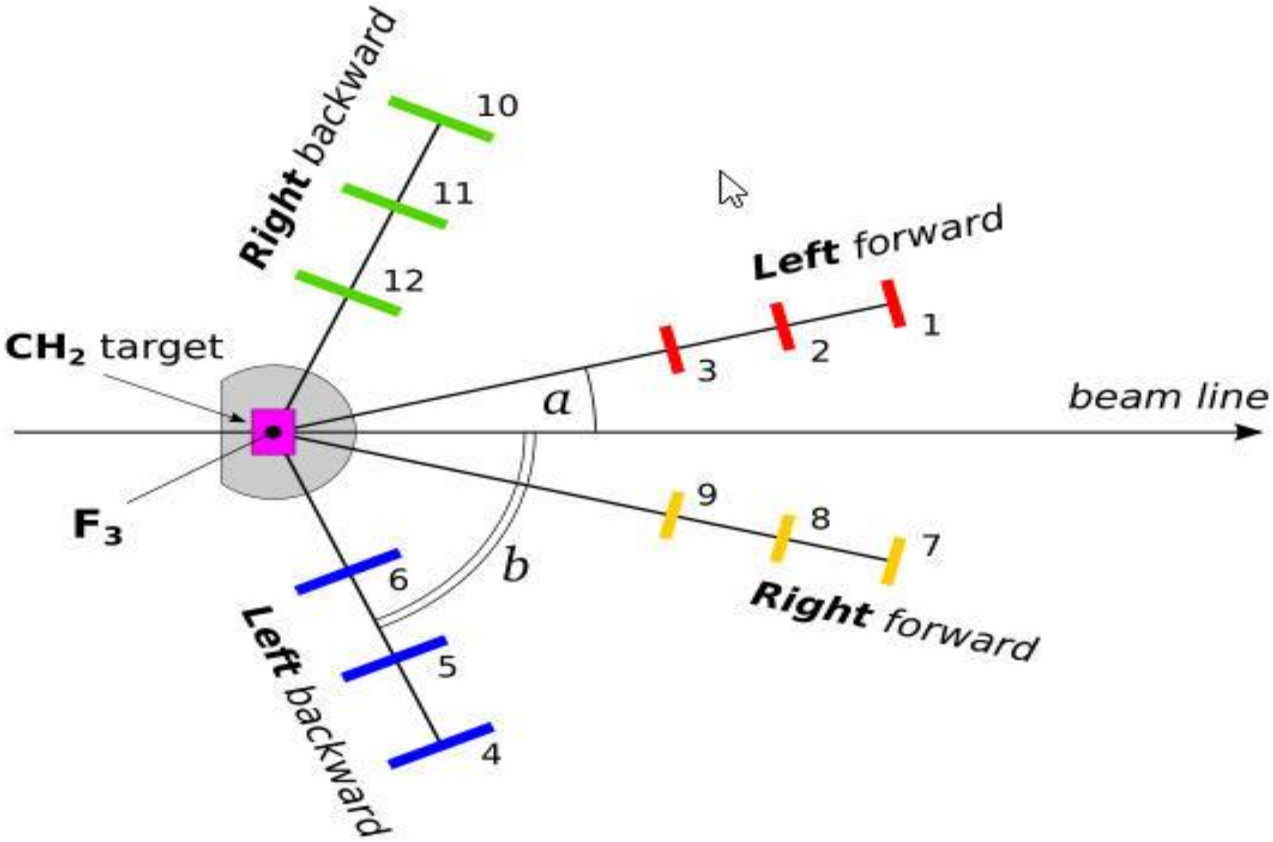
- https://inis.iaea.org/records/szp59-wh168
- http://www1.jinr.ru/Pepan_letters/panl_2_2002/03_sitnik.pdf

Polarimeter



Сухой остаток

1. Поляриметр нужен в экспериментах, где требуется продольная поляризация. Такие проекты существуют.
2. Измерение частоты прецессии может повысить на порядок точность данных об энергии ускоренного пучка.