THE MONTE CARLO SIMULATION OF MINISPD STAND

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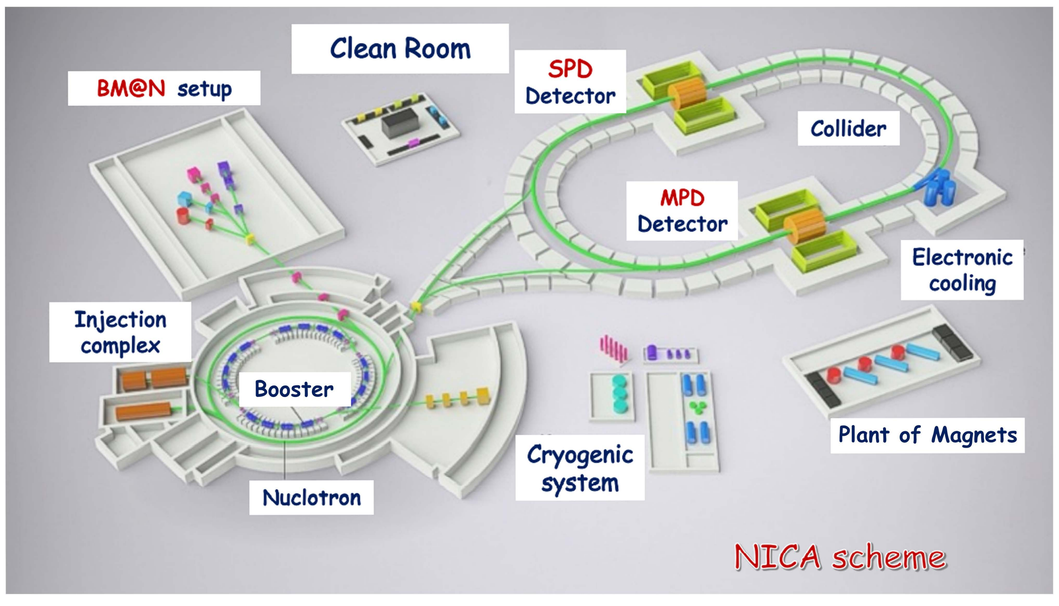
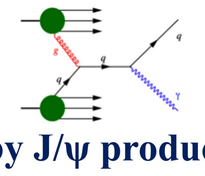
NICA (Nuclotron based Ion Collider fAcility)

Spin is one of the fundamental properties of elementary particles. It cannot be explain by a static view of the proton: total spin = s(q) + s(g) + angular momentum = 1/2. It's not just the number 1/2. It is the result of interaction between quarks and gluons, more probably gluons. The origin of matter is a fundamental question of physics. Our SPD (Spin Physics Detector) project is aimed at study spin properties of nucleons and light nuclei. How are quarks and gluons, their spins distributed in space and on momentum inside the nucleon?

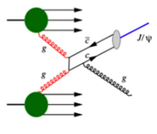


The main tasks of SPD project:

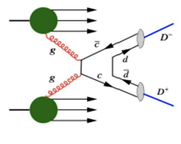
Direct photons



Nucleon PDFs by J/ψ production



Open charm production: D^0, $\bar{D}^0$, $D^{+/-}$, Λ_c, ...



Spin-dependent effects on elastic pp, pd and dd scattering

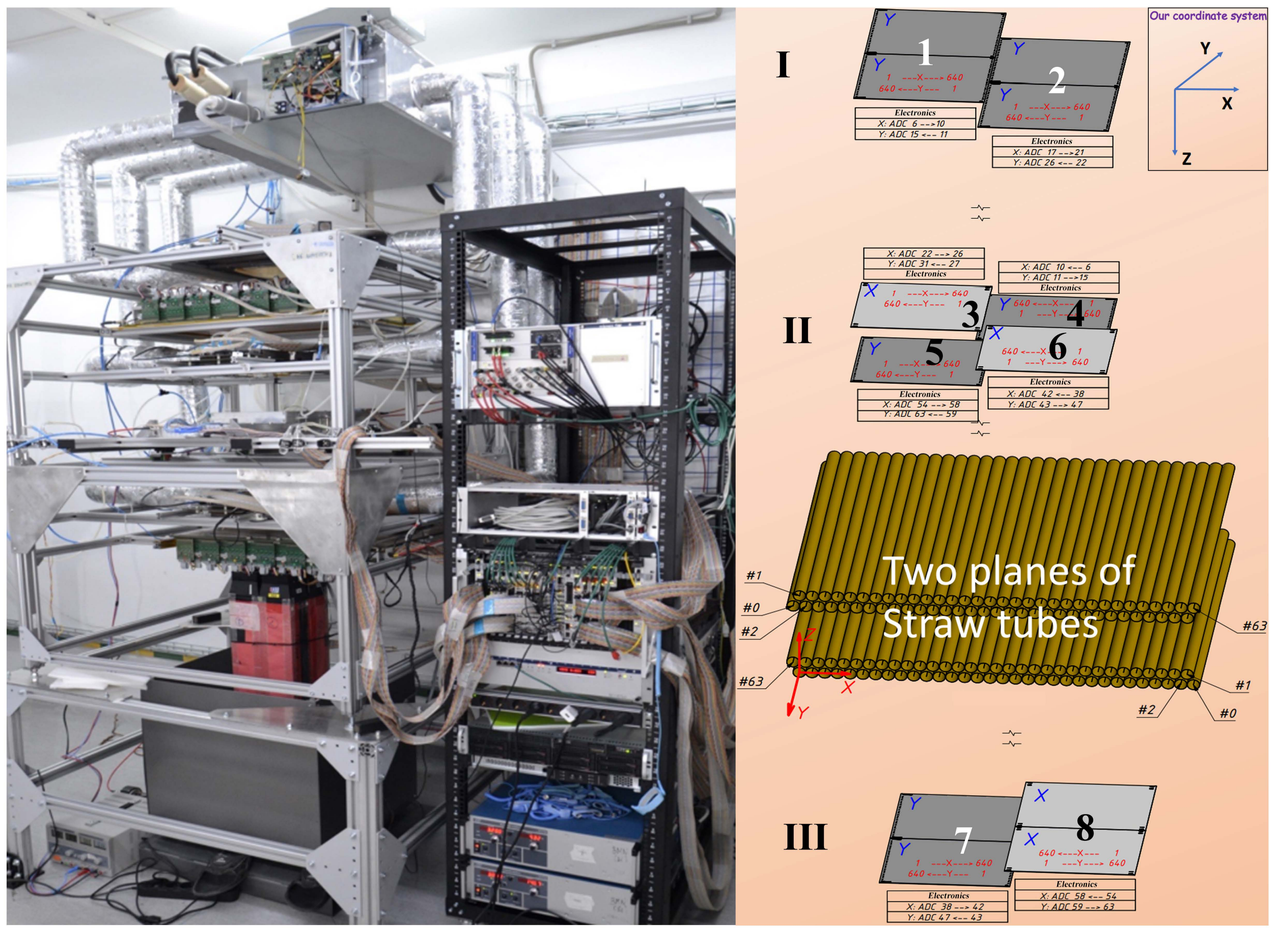
Start of construction: 2013

This accelerator complex is being created at the JINR, LHEP (Dubna, RF). Its main aims are studying:

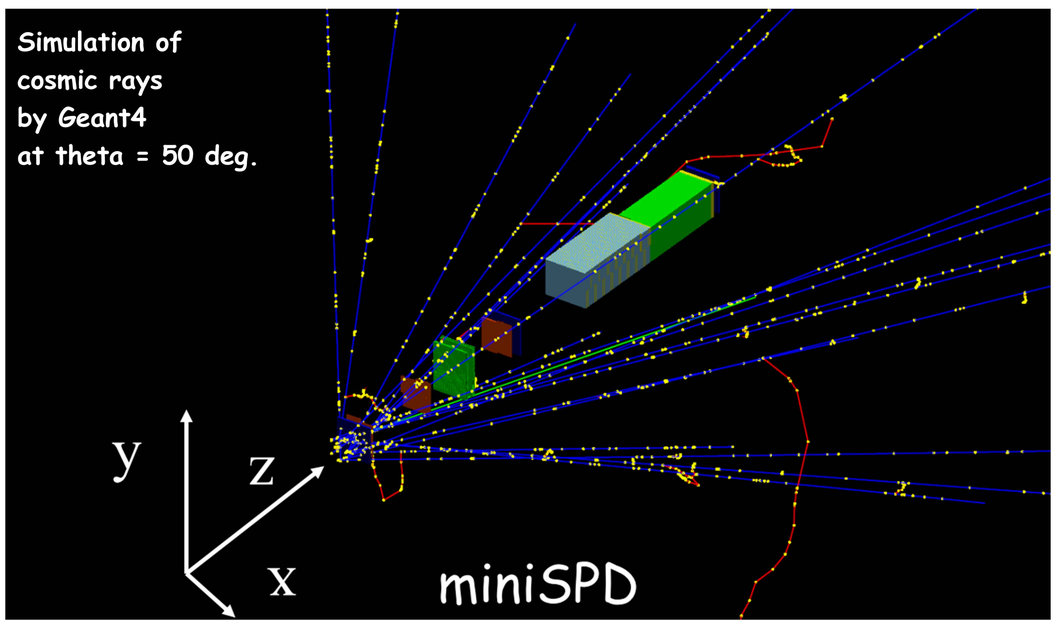
1) the properties of dense baryonic matter, a special state of matter in the first moments after the Big Bang, formation of quark-gluon plasma (MPD);

2) gluon structure of proton (deuteron) (SPD).

MiniSPD stand

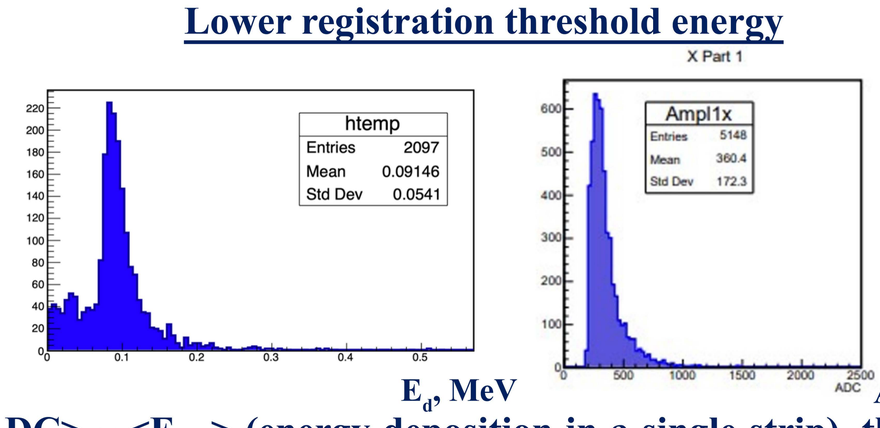


Modules of two-sided Si-plates: dark color indicates oblique (U, 2.5) strips, light - vertical (X) strips. The top (I) module consists of two parts: left (1) and right (2)plates. The middle (II) module consists of 4 parts. We numerate them 3, 4, 5 and 6 parts from left to right. III.The bottom (III) module is similar to I with numeration of left and right: 7 and 8.



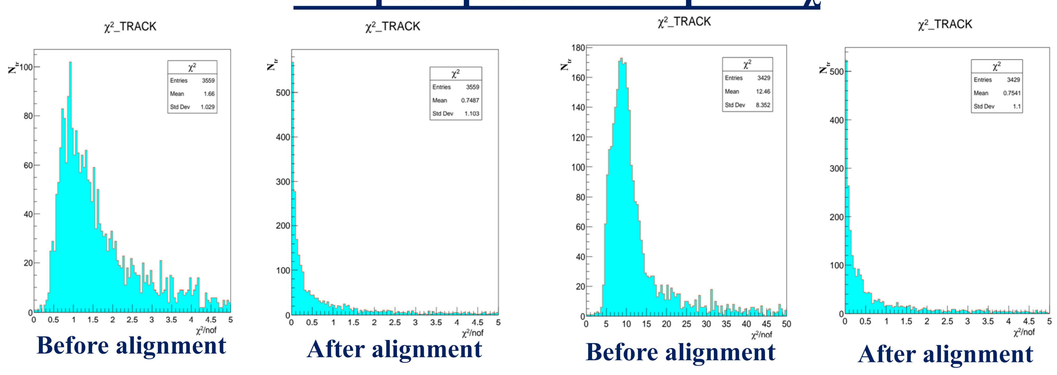
We compare our MC simulation of 50 000 muons with experimental data (~ the same number) obtained at operation of two scintillator triggers and Si-plates for miniSPD stand.

Lower registration threshold energy

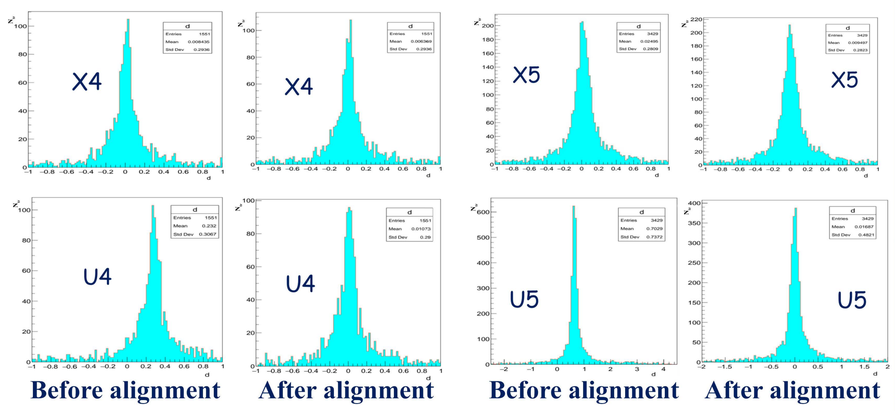


<ADC> ~ <E_{dep}> (energy deposition in a single strip), the lower threshold of ADC ~ the lower threshold registration of energy deposition (E_{cut}). Using good planes (X1, X6, U2, U8) we get 30 keV < E_{cut} < 60 keV and its average value is equal ~ 55 keV.

Millipede procedure improves χ^2



Residual distribution



Conclusion:

Monte Carlo simulation of two-sided Si-plates of miniSPD stand is carried out.

Comparison Monte Carlo simulation with data allows to estimate the lower threshold on energy for a single strip operation.

Work of all parts (1-8) and their X and U sides of Si-detectors was analyzed and compared with MC simulation. Alignment task is solved for the middle (II) module.

The distributions on residuals and χ^2 of their parts are obtained.