To the memory of Prof. A.A.Vorobyev

Scientific path

20.12.1931 – 2.11.2021

A.Dzyuba at Memorial session at AMBER Collaboration Meeting

22.11.2021

Alexey Alexeevich Vorobyev (1931 – 2021)

- Experimental physicist (Nuclear and Particle Physics)
- Corresponding member of Russian Academy of Science
- Head of High Energy Physics Division of PNPI
- Former director of LNPI (1986 – 1992)
- Doctor of Science
- Professor / Teacher

In this contribution I'll try to show his scientific path

Many thanks to Margarita F. Sobolevskay for materials she provided, as well as to my students Maria and Vladimir, who were searching for electronic copies of papers of Prof. Vorobyev

Map

- Alexey Vorobyev was born 20th of December 1931 in Selizharovo
- Graduated in 1955 (Leningrad Polytechnic Institute)
- Work in Ioffe Physical-Technical Institute (1955-1971)
- From 1971 in Leningrad Nuclear Physics Institute (now PNPI NRC KI)

Selizharovo, where Alexey was born in 1931

Photo of 1903 (more)

Selizharovo

- Selizharovo at Volga river was first mentioned in 1504 (Trinity Monastery)
- In 1547 Tsar Ivan the Terrible gave it to the Simonov Monastery which was located in Moscow
- 1908 city school / 1916 railway
- Population of around 4000 citizens in 1930.
- Occupied in winter 1941-42. Largely destroyed.
- Nowadays population of Selizharovo is around 5000

Leningrad Polytechnic Institute

- Now called as Peter the Great St. Petersburg Polytechnic University
- Founded in 1899
- Physics and mechanics faculty was founded in 1919

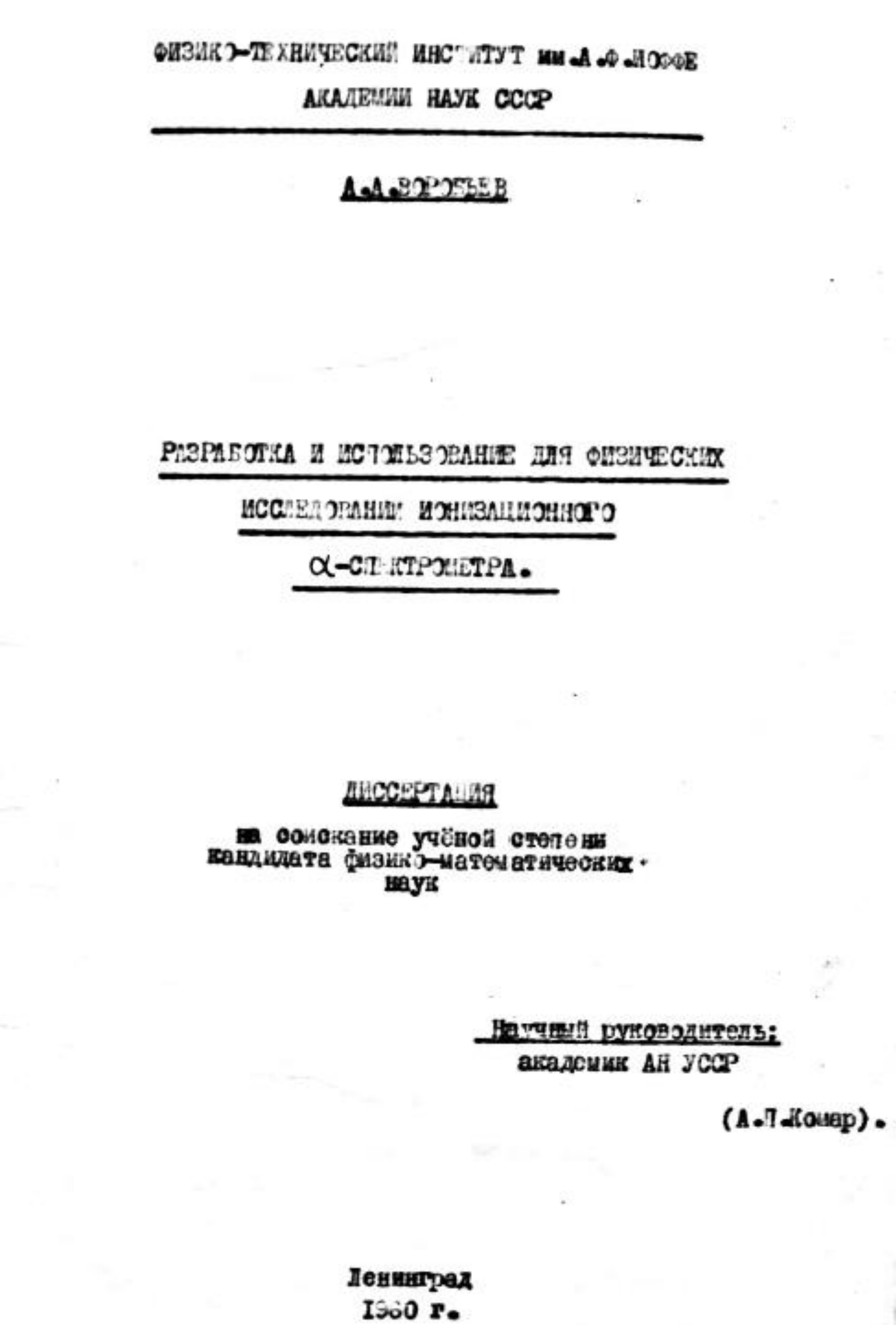
- In 1955 Alexey Vorobyev graduated with honors LPI

Ioffe Physical-Technical Institute of the Russian Academy of Sciences

Laboratory of X- and gamma rays

Anton P. Komar (1904 – 1985)

- The first scientific works of Prof. Komar were related to the physics of metals
- In Sverdlovsk in 1946 A.P. Komar, together with its employees, launched the first betatron in USSRy. At the end of the 1940s, together with V.I. Veksler, he participated in the creation of electron accelerators.
- The laboratory of X-rays and gamma rays, organized by him, has become one of the leading laboratories in the country for the study of photonuclear reactions.
- 1950 - 1957 - was the director of the Physico-Technical Institute and from 1957 to 1963 the head of the X-ray and gamma-ray laboratory. From 1963 he worked in Gatchina.
- Supervisor of Alexey Vorbyev thesis


ФИЗИКО-ТЕХНИЧЕСКИЙ ИНСТИТУТ им. А.Ф. ИОФФЕ
АКАДЕМИИ НАУК СССР

А.А. ВОРОБЬЕВ

РАЗРАБОТКА И ИСПОЛЬЗОВАНИЕ ДЛЯ ФИЗИЧЕСКИХ
ИССЛЕДОВАНИЙ ИОНИЗАЦИОННОГО
α-СПЕКТРОМЕТРА.

ДИССЕРТАЦИЯ
на соискание учёной степени
кандидата физико-математических
наук

Научный руководитель:
академик АН УССР
(А.П. Комар).

Ленинград
1960 г.

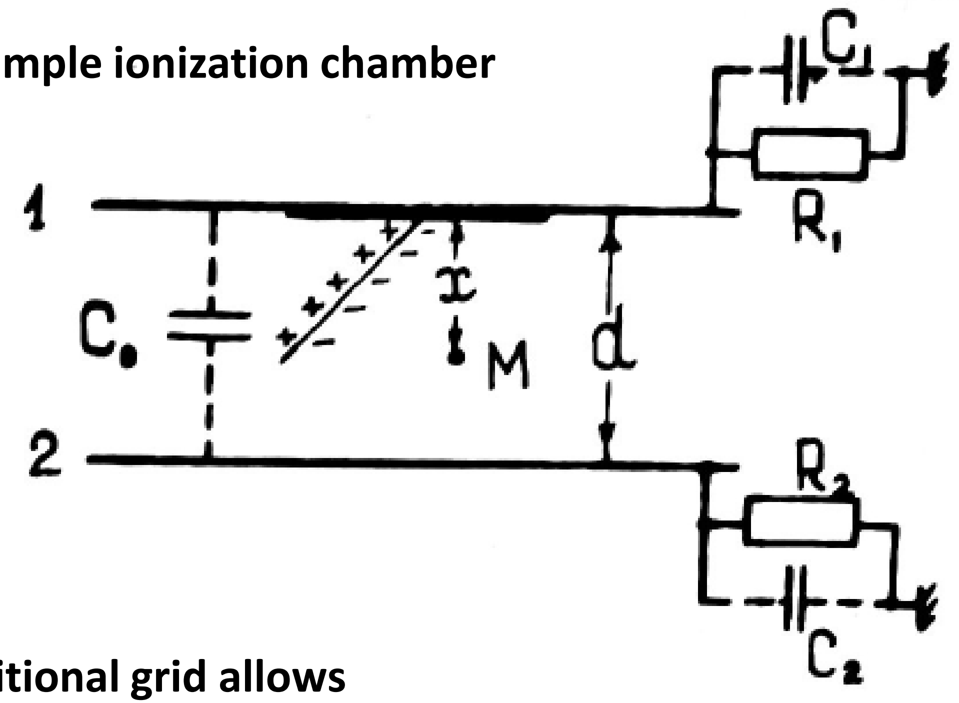
PhD theses of Alexey Vorobyev

- "Development and use for physical measurements of an ionization α-spectrometer" / Leningrad, 1960
- Supervised by Anton Komar
- Defended in 1961

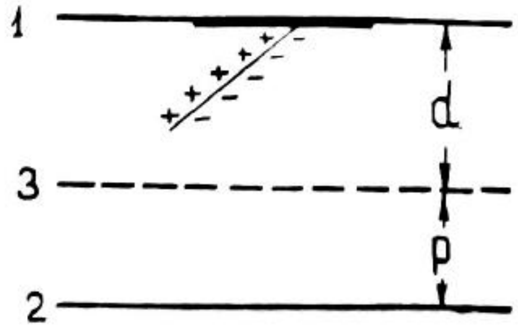
Ionization chamber for α-spectrometry

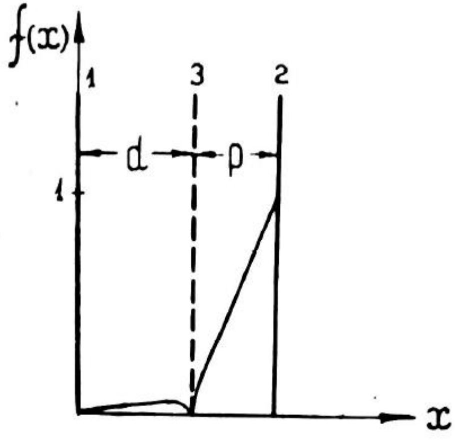
- Goal of the work was to make a high-precision α-spectrometer on a base of ionization chamber
  - Increase energy resolution
  - α-γ correlations (including angular)
  - Go to higher rates
- Before FWHM for α-line for these type of detectors was 28-30 keV
- Actually, this type of chamber will be used for AMBER PRM studies

Simple ionization chamber



Additional grid allows screening of the signal from positive ions





Potential between electrodes

ЗАКЛЮЧЕНИЕ.

Перечислим основные результаты работы.

I. Разрешающая способность спектрометра.

I) Среднеквадратичная флуктуация радиотехническ
нашем спектрометре составляет 4,7 кэв (I75 е). Дости
уровень шумов в I,5 – 2 раза ниже, чем аналогичных у
Снижение уровня шумов осуществлено за счёт выбора поло
пускания усилителя, правильного учёта величины сеточных
а также за счёт уменьшения ёмкости входа.

2) Снижение уровня шумов, а также устранение влияния в
разрешающую способность других факторов позволило увеличить
разрешающую способность почти в 2 раза по сравнению с лучши
из существующих ионизационных спектрометров (полуширина α–
при $E_\alpha \simeq 6{,}0$ мэв составляет I7 кэв).

3) Низкий уровень шумов позволил провести измерение ве
ны флуктуации ионизации в аргоне и показать, что при наполн
камеры аргоном предельно достижимым значением полуширины
линии являются I3 – I4 кэв (при $E_\alpha = 6{,}0$ Мэв).

4) Показана возможность уменьшения величины флуктуаций
ионизации в смесях благородных газов с некоторыми легкоиони
ми примесями и доведения предельной полуширины α–линии до
4 – 6 кэв.

5) Применение двукратного дифференцирования позволило
устранить влияние микрофонного эффекта и использовать ионизац
ный спектрометр в условиях повышенного уровня механических коле
баний без ухудшения разрешающей способности.

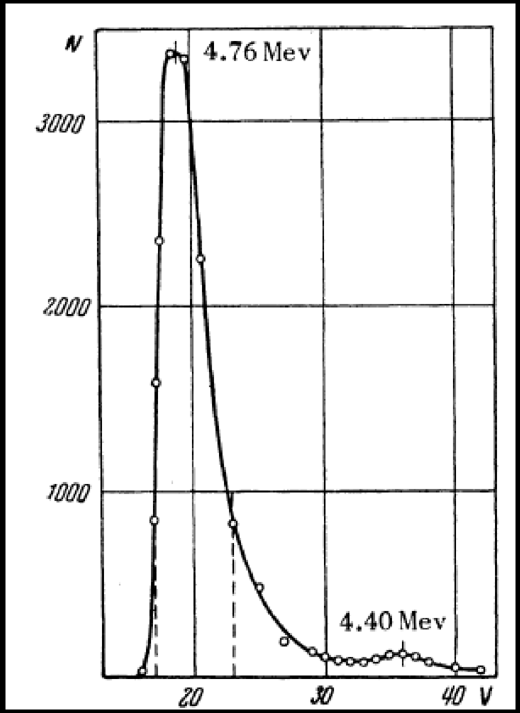
6) Разработана система автоматической стабилизации спектро
метра, благодаря которой достигнутая разрешающая способность

Results

- Obtained resolution was factor 2 better wrt. Previous devices of this type
  - Expected 4-6 keV FWHM
- 3 keV precision for alpha–line position
- Un to 10^3 – 10^4 rates
- Alpha-gamma correlation (see next slide)
- Thesis were used as a kind of textbook in LHEP!

Physics

- Precise measurements of alpha-lines (JETP, 1961, 70)
- Internal Conversion coefficient of the 53 keV Gamma-Radiation on the L shell of ^{230}Th (JETP, 1957, 623)
- Alpha spectrum of the natural samarium isotope mixture (JETP, 1960, 546)
  - Estimation of the upper limit of ^{146}Sm abundance in natural mixture



Alpha from ^{234}U at IC

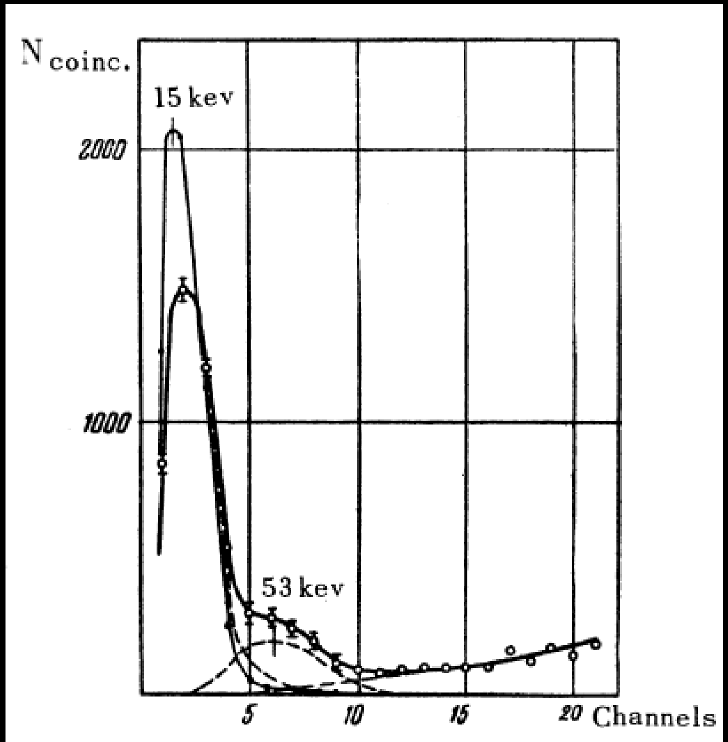


FIG. 2.

Gamma in coincidence (using NaI)

MEASUREMENT OF THE ENERGY OF ALPHA PARTICLES

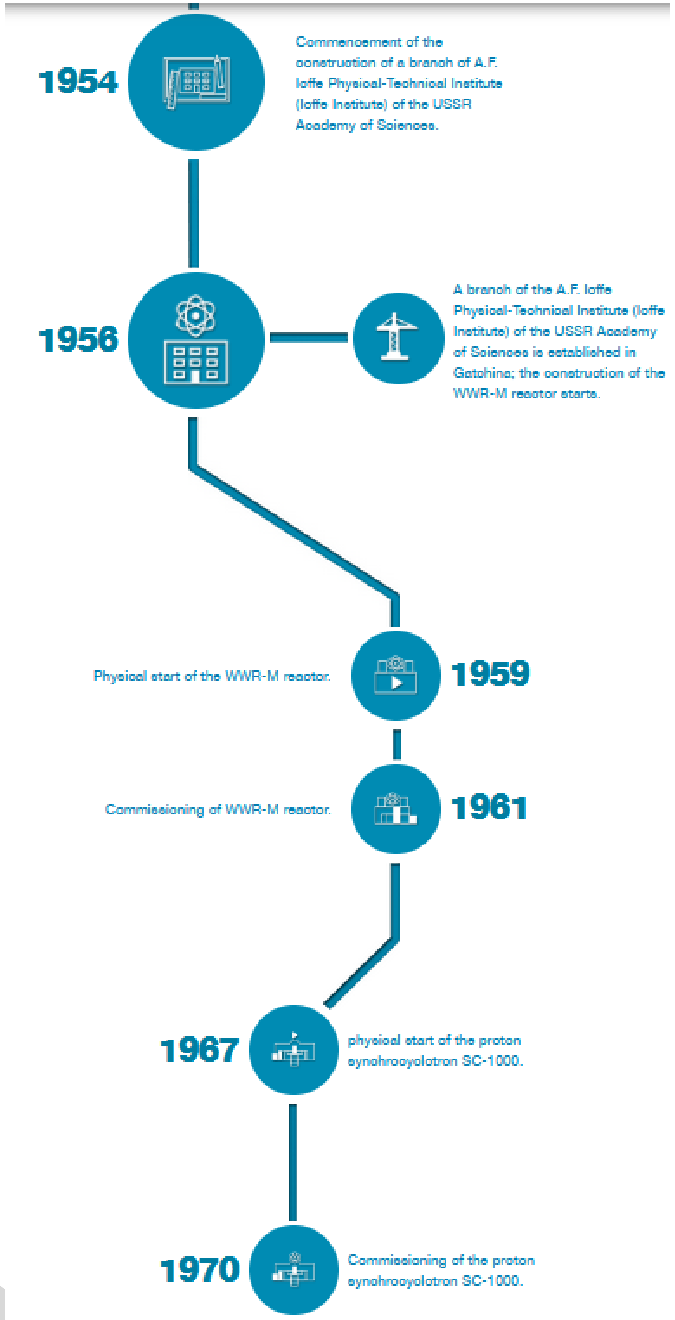
TABLE II

Element	E_{α}, (Mev)	
	our data	data of other authors
At^{217}	7,064±0.005	7.00±0,05 [3]; 7.05 ±0.01 [4]; 7,023±0.01 [5]
Fr^{221}	6,336±0.005	6.30±0.05 [3]; 6.332±0.01 [4]; 6.298±0.01 [5]
Po^{213}	8,368±0.010	8.34±0.01 [3]; 8.35 ±0.01 [4]; 8.336±0.005 [5]
U_{I}^{235}	4,396±0,003	4,354 [6]; 4.40 [7]
U_{II}^{235}	4.211±0.003	4.117 [6]; 4.20 [7]
U^{238}	4,190±0.005	4.195 [1]; 4.18 [9]

LNPI as a branch of Ioffe Institute

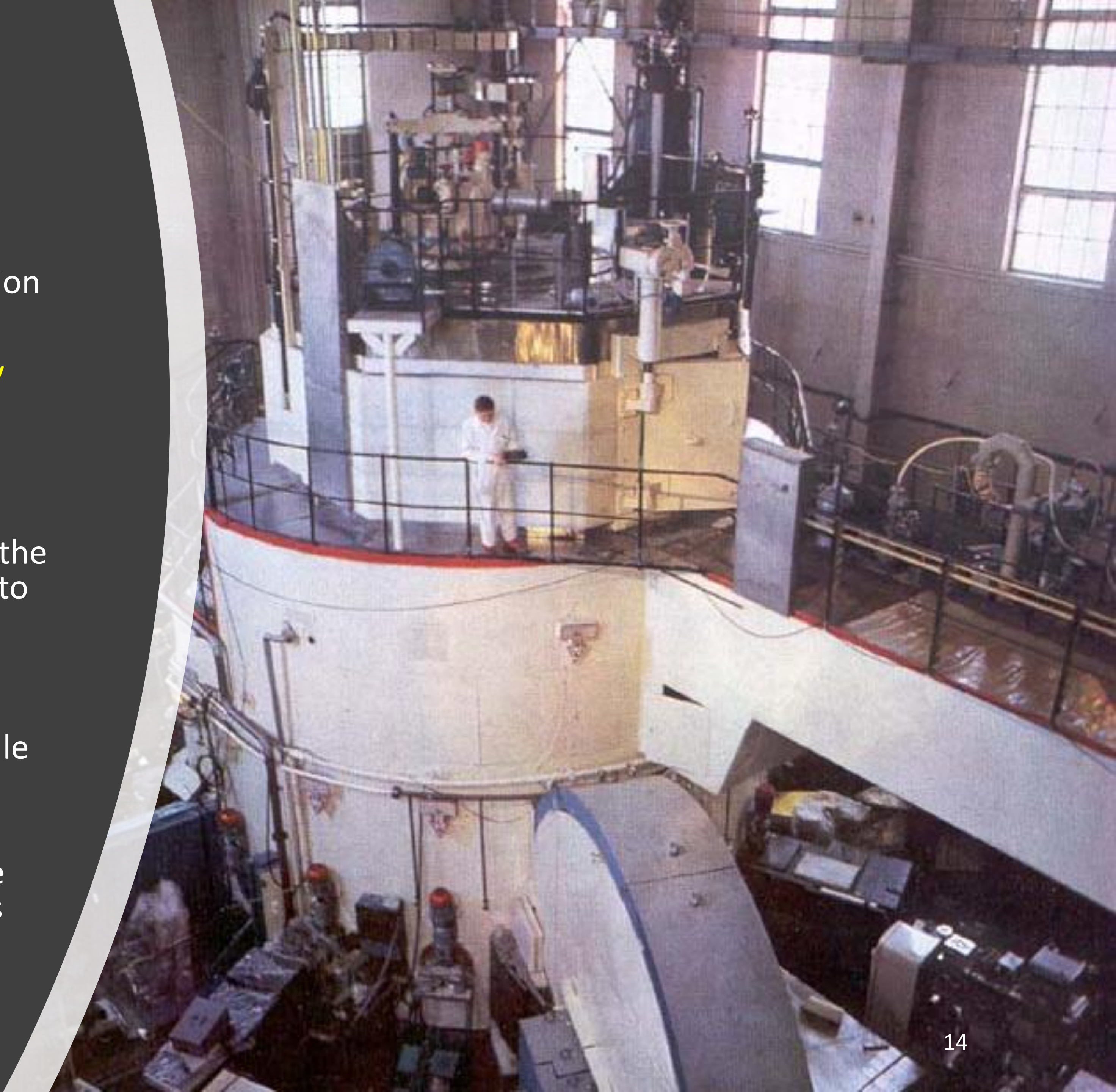
- Reactor and accelerator lab in Gatchina
- 5 years to build and run WWR-M reactor from the scratch
- 1000 MeV proton accelerator commissioned in 1970

- To organize research at the synchrocyclotron, the Laboratory of High Energy Physics was established in 1963, the basis of which was the team of the laboratory of X-rays and gamma rays of the Leningrad Physics Institute
- Just 15 people
- The following scientific subdivisions were formed:
    - "Mesons and Mesoatoms“
    - "Nucleus Structures" - Head of Sector A.A. Vorobyov,
    - "Deep Fission Nucleus Spectroscopy“
    - "Mesonuclear reactions“
    - “Direct nuclear interactions "



Reactor WWR-M

- The reactor was intended for the production of isotopes, research in neutron physics and radiation materials science
- A cycle of experiments to investigate the ternary (triple) fission of ^{233}U, ^{235}U, ^{239}Pu, ^{242m}Am on thermal neutrons
- Spontaneous ternary fission of ^{252}Cf.
- A large number of ternary fission channels with the emission of light nuclei from hydrogen isotopes to ^{20}O have been discovered.
- A detailed study of these fission channels made possible to draw a conclusion about the nonequilibrium nature of descent from the saddle point (one of fundamentals for constructing a theory of nuclear fission).
- The main measurements were carried out at the WWR-M reactor using a specially designed mass spectrometer with record sensitivity.



LIGHT NUCLEI FROM ^{235}U NEUTRON FISSION

A. A. VOROBYOV, D. M. SELEVERSTOV, V. T. GRACHOV, I. A. KONDUROV, A. M. NIKITIN, N. N. SMIRNOV and Yu. K. ZALITE
Leningrad Institute of Nuclear Physics, Gatchina, USSR

Received 24 April 1972

Ternary fission / PLB 40, 102

In previous papers [1,2] we reported the yields and energy spectra of light particles with $Z = 1$-4 emitted in ^{233}U and ^{235}U thermal neutron fission. The aim of the present experiment was to detect particles heavier than Be. The experimental technique was essentially the same as that described in refs. [1,2]. A 0.7 mg/cm^2 $^{235}U_3O_8$ target was irradiated in a reactor neutron flux of 10^{13} cm^{-2}sec^{-1}. A magnetic mass spectrometer with time-of-flight and energy determination has been used. In addition, dE/dx was measured with a thin ionization chamber placed in front of the E-detector. The sensitivity of the spectrometer has been increased by some improvements in the electronics. The mass and charge resolution of the spectrometer was enough to resolve the isotopes with $Z \leq 8$.

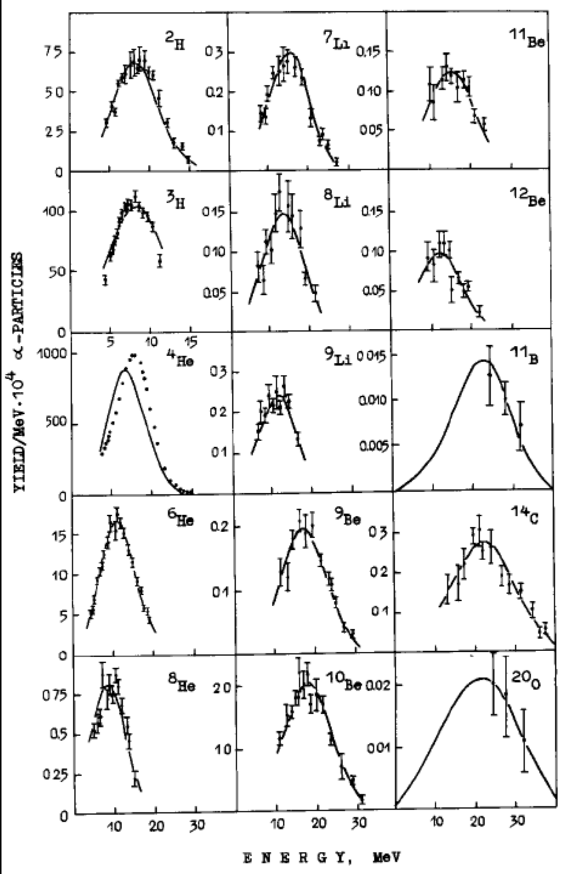


Fig. 1. Energy spectra of light nuclei from ^{235}U neutron fission. The solid lines represent calculating spectra.

SC-1000

- November 5, 1967 at the branch of the P.I. A.F. Ioffe (now NRC "Kurchatov Institute" - PNPI) performed the physical launch of the 1000 MeV proton accelerator
- Still, this is the world's largest accelerator facility of this class.
- At SC-1000, outstanding scientific results have been obtained that have enriched world science:
  - studies of small-angle scattering (IKAR),
  - diffraction and quasi-elastic scattering by nuclei;
  - research into exotic atoms;
  - meson lifetime studies.

АКАДЕМИЯ НАУК СССР

ЕНИНГРАДСКИЙ ИНСТИТУТ ЯДЕРНОЙ ФИЗИКИ им.Б.П.КОНСТАНТИНОВА

А.А.Воробьёв

КСПЕРИМЕНТАЛЬНОЕ ИССЛЕДОВАНИЕ ПРОСТРАНСТВЕННОГО РАСПРЕДЕЛЕНИЯ ЯДЕРНОЙ МАТЕРИИ МЕТОДОМ УПРУГОГО РАССЕЯНИЯ ПРОТОНОВ С ЭНЕРГИЕЙ I ГэВ НА ЯДРАХ

Диссертация на соискание учёной степени доктора физико-математических наук

(0I.04.I6 - физика атомного ядра и космических лучей)

Ленинград
I976

Main results

- Alexey Vorobyev succeed to make his doctor habilitation in 1976
- Main results on pA-scattering were obtained in PNPI and Saclay (France)
- Differential cross sections for pA scattering at an energy of 1 GeV were measured in a wide range of nuclear masses from ^{3}He to ^{208}Pb.
- It is shown that the experimental data are well described by the Glauber-Sitenko theory.
- As a result, precision data were obtained on the spatial distribution of nucleons in nuclei.

Experimental setup

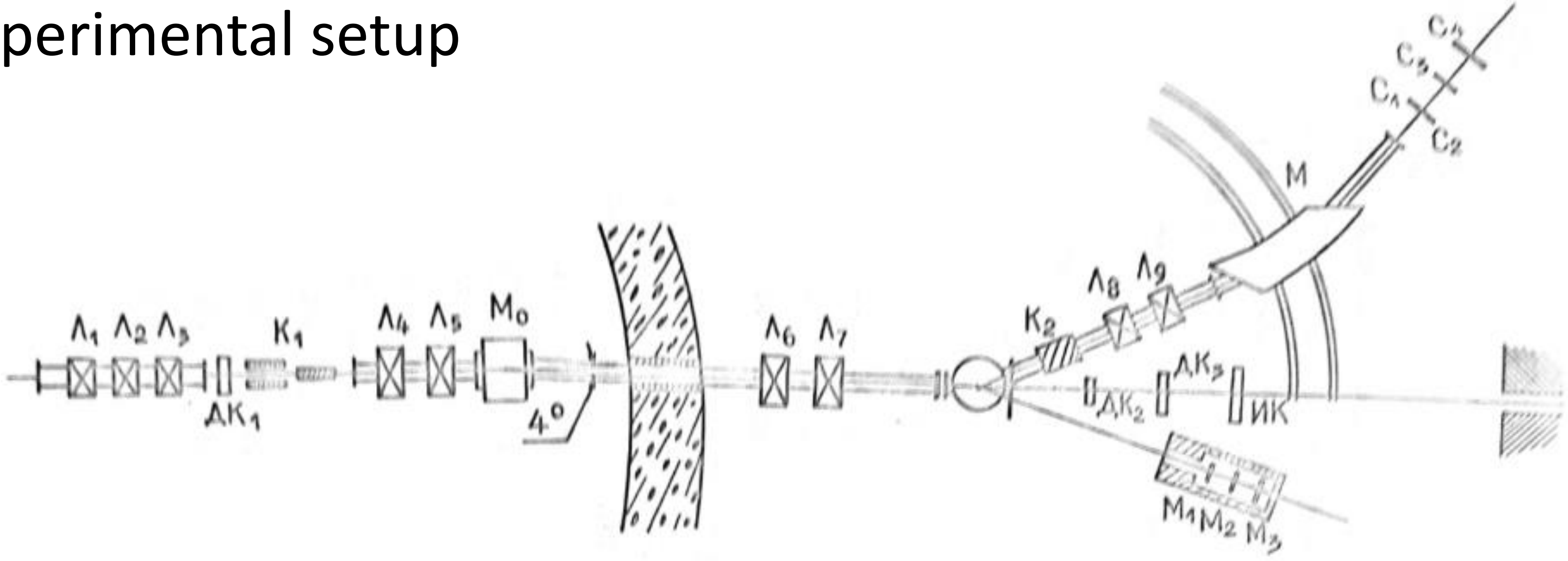
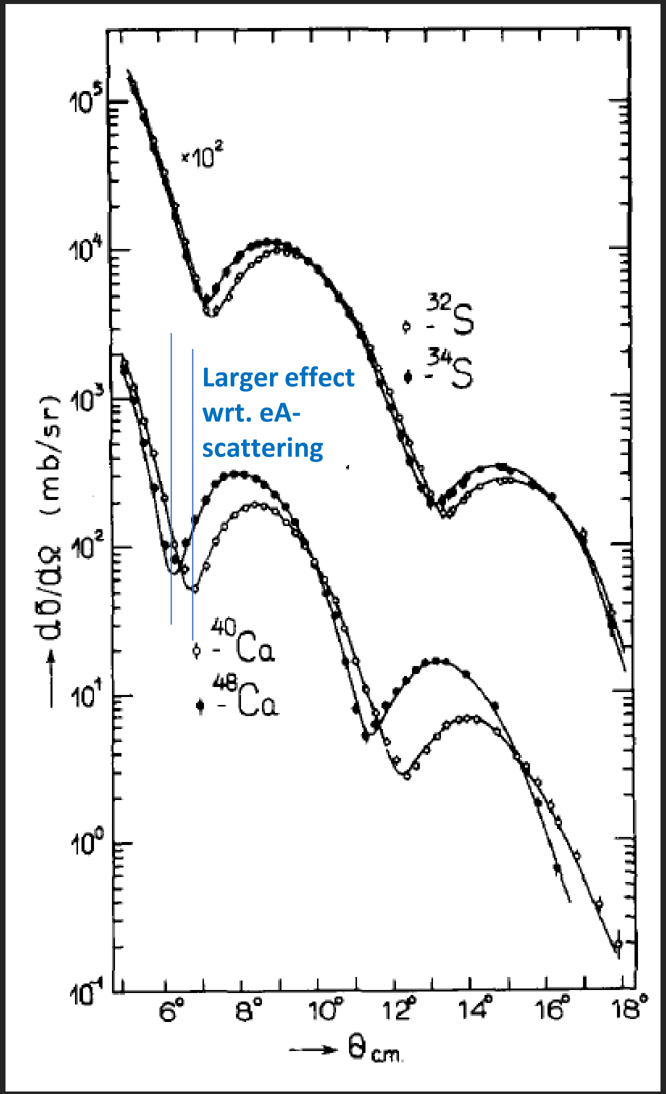
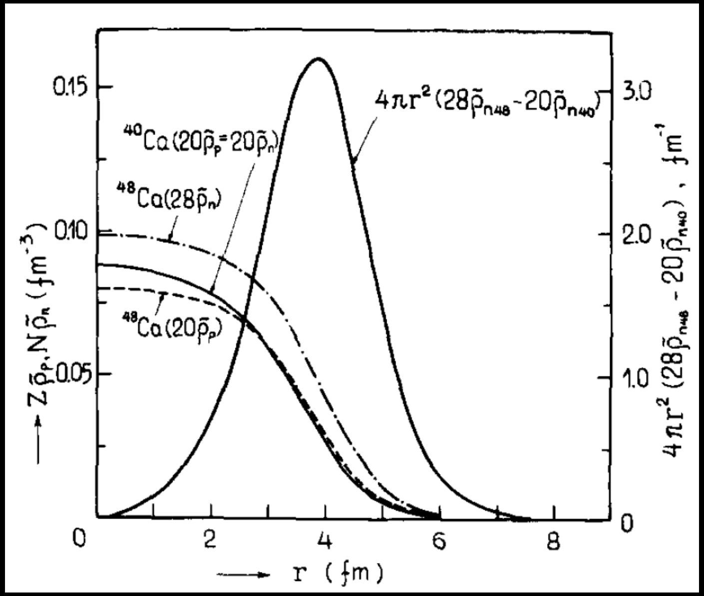


Рис.27. Схема расположения экспериментального оборудования. Л_I-Л_7 – система магнитных квадрупольных линз тракта проводки пучка; М_0 – отклоняющий магнит; К_1 – коллиматор с регулируемым зазором; К_2 – коллиматор спектрометра; Л_8,Л_9 – линзы спектрометра; ДК_I-ДК_3 – дифференциальные ионизационные камеры; ИК – интегральная ионизационная камера; М_I-М_3 – счётчики монитора; С_I-С_4 – счётчики спектрометра.

Proton and neutron distribution in nuclei

- A kind of textbook measurements.
- Key idea is that protons are sensitive to both proton and neutron distributions of nuclei.
- Comparison of different isotopes gives a sensitivity to such effects as nuclear skin and halo.





Another experimental method

- Use ionization chamber in the active target regime
- Recoil particles go at large angles and Q^2 can be calculated via their energy deposit
- IKAR Time Projection Chamber

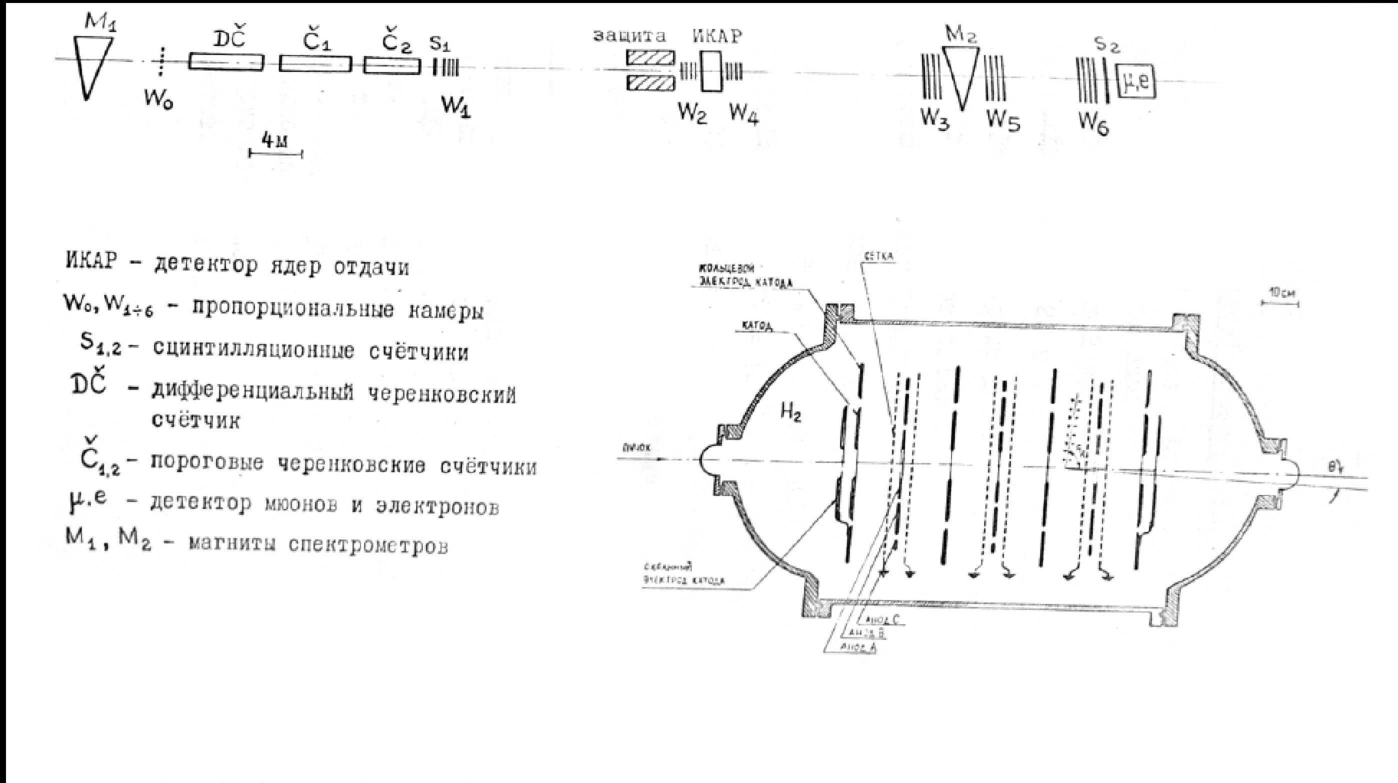
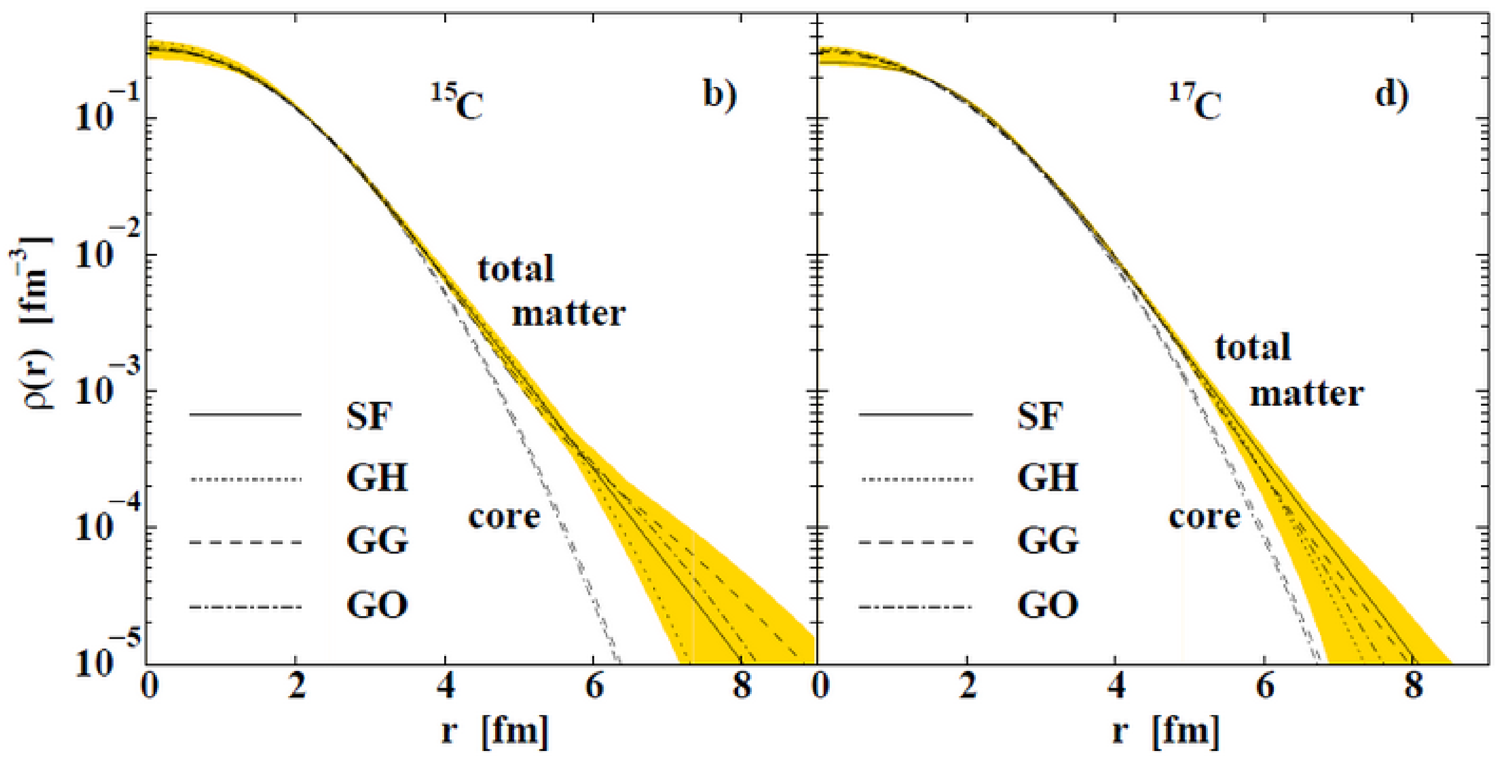


Рис.81. Схема эксперимента по изучению рассеяния адронов на малые углы на ускорителе SPS в ЦЕРНе.

Recent results obtained with IKAR in GSI



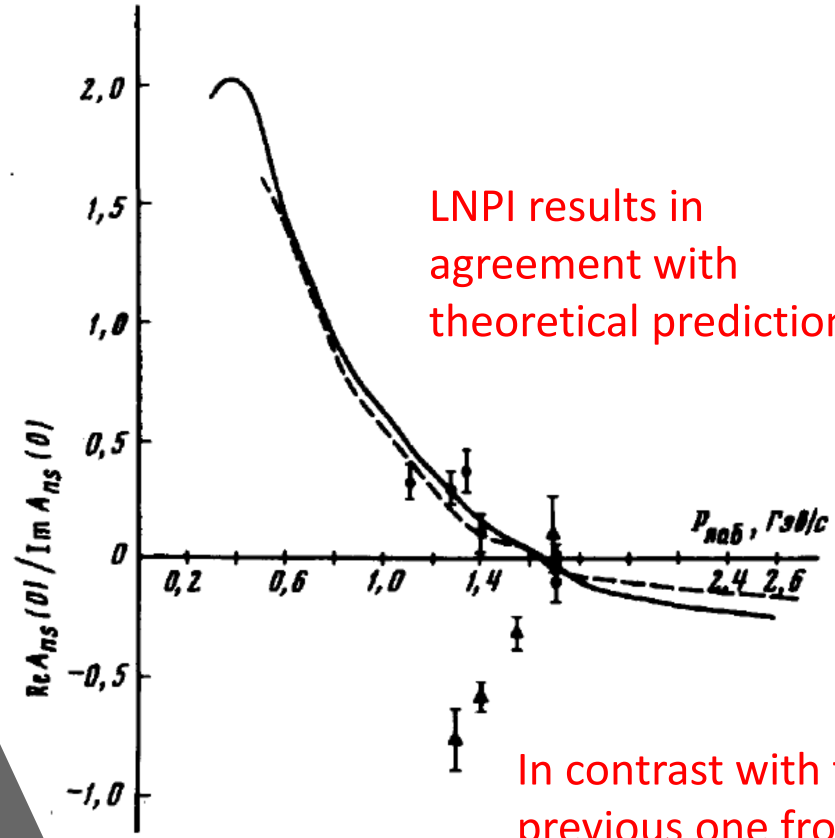
- Beams of radioactive isotopes from SIS-FRS
- Inverse kinematics
- Halo for ^{15}C
- Nuclear Physics A, 2021, 122154

Small angle scattering of pions and protons

Рис.90. Общий вид установки ИКАР на пучке π-мезонов в ИФВЭ (Серпухов).

pp-scattering

- Proton-proton scattering in a region of interference of Coulomb and strong scattering allows to study precisely amplitudes of scattering
- Decelerating of 1GeV protons from SC-1000 using copper plates
- Resolving puzzle with ReA_{pp} / ImA_{pp} spin-dependent amplitude
- It has been shown that spin-spin amplitude is negligibly small at T_p=1GeV



LNPI results in agreement with theoretical predictions

In contrast with the previous one from another group

CERN

In the late 1960s, Aleksey Alekseevich, as part of a PNPI delegation, visited the Niels Bohr Institute in Copenhagen and the European Center for Nuclear Research in Geneva (CERN).

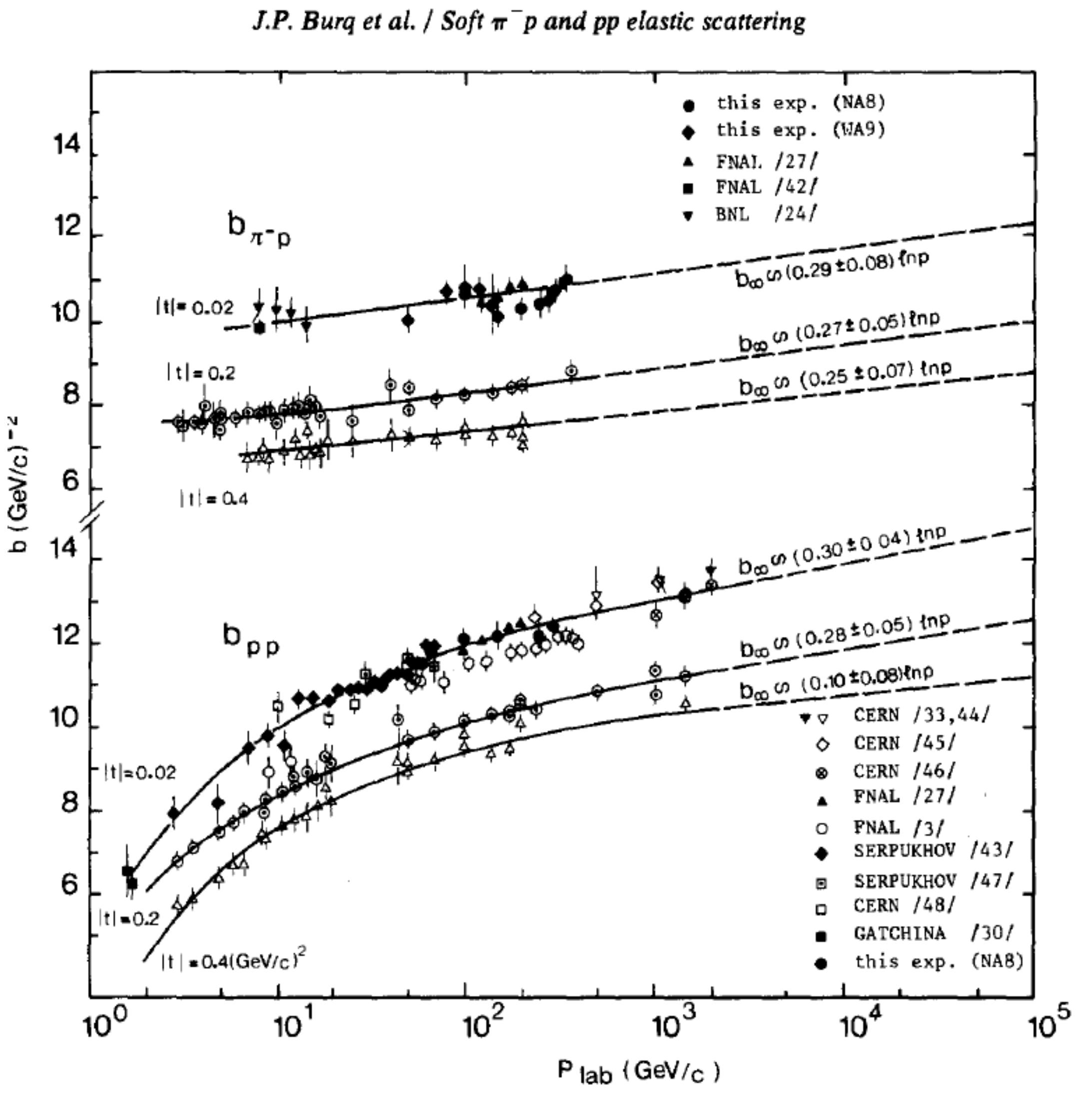
As a result of these visits, an agreement was signed to conduct joint research at the synchrocyclotrons of PNPI and CERN.

They laid the foundation for a series of international experiments.

One of such projects was experiments on elastic scattering of elementary particles at small angles.

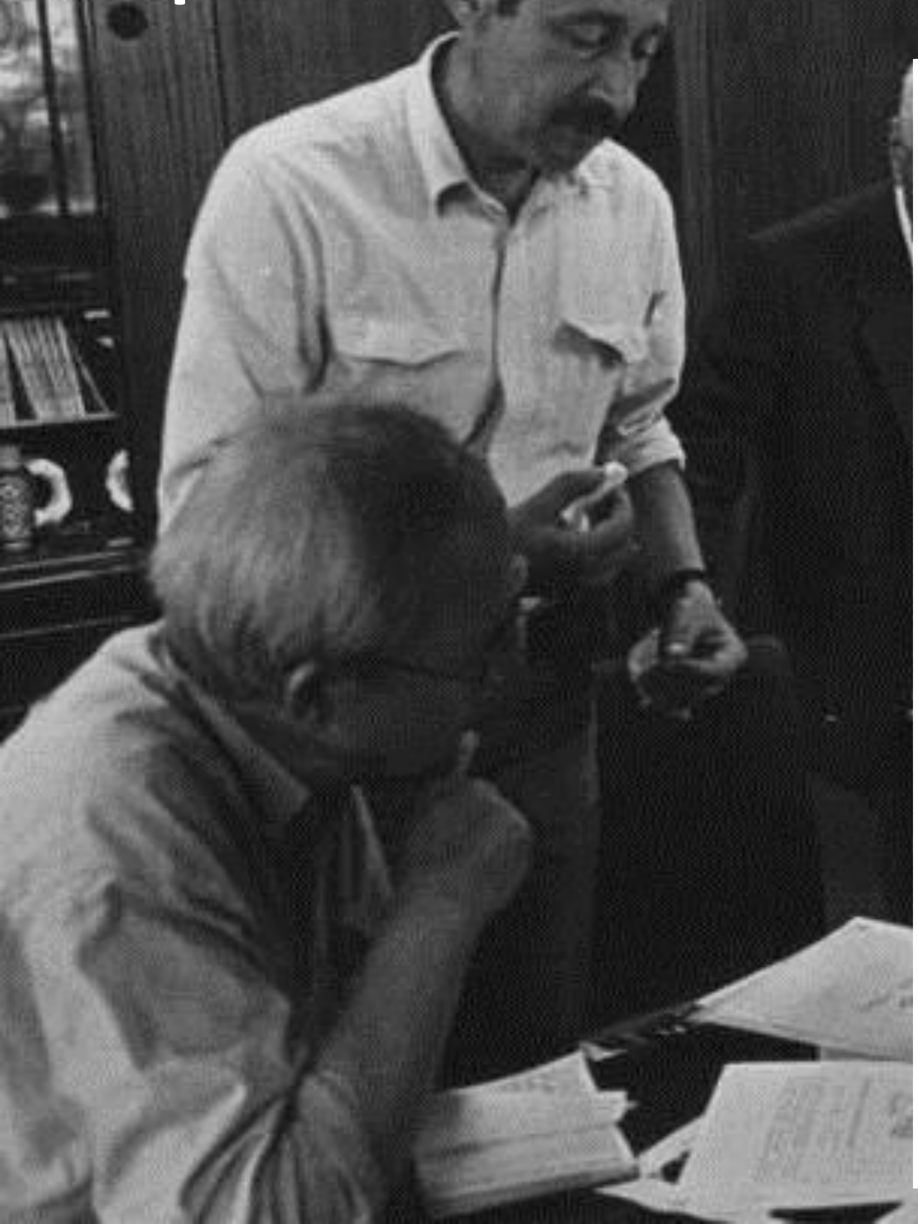
Work in CERN

- A high-precision method for studying the scattering of high-energy hadrons in the region of Coulomb-nuclear interference has been developed.
- Investigations of *πp* and *pp* scattering in the range 1-400 GeV have been carried out at the accelerators of PNPI, IHEP, CERN (experiments WA9 and NA8).
- The validity of the dispersion relations in the studied energy range is proved. It is concluded that the total *πp*-interaction cross section increases in the energy range up to 2000 GeV.
- A conclusion is drawn about the universal character of the shrinkage of the diffraction cone in hadron scattering.
- The results were included in a series of works marked by the State Prize for 1983



- An effective method for studying *dd* and *dt* fusion has been developed.
- A series of experiments was carried out at the PNPI and PSI accelerators
- Practically all the main parameters of *dd* synthesis have been measured with high accuracy, which now constitute the main database for comparison with the theory of mesocatalysis.
- The probability of muon sticking in *dt* fusion has been measured, which is a critical parameter in assessing the total energy released in the mesocatalytic cycle.
- An epithermal mechanism for the formation of *dt*-molecules in a ternary H / D / T mixture was discovered, which provides an extremely high rate of *dt* fusion at normal temperature.

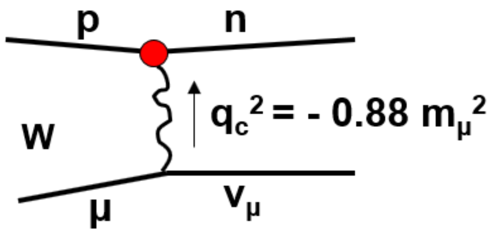
Pioneers of muon capture experiments (related to pseudoscalar form factor of nucleon)



Muon Capture on Proton

$$\boxed{\mu^- + p \rightarrow \nu_\mu + n}$$

$$\boxed{\begin{aligned} V_\alpha &= g_V(q^2)\,\gamma_\alpha + \frac{i\, g_M(q^2)}{2M_N}\,\sigma_{\alpha\beta}\, q^\beta \\ A_\alpha &= g_A(q^2)\,\gamma_\alpha\gamma_5 + \frac{g_P(q^2)}{m_\mu}\, q_\alpha\gamma_5 \end{aligned}}$$



$g_V(q_c^2) = 0.9755(5)$

$g_M(q_c^2) = 3.5821(25)$

values and q^2 dependence known from EM form factors via CVC

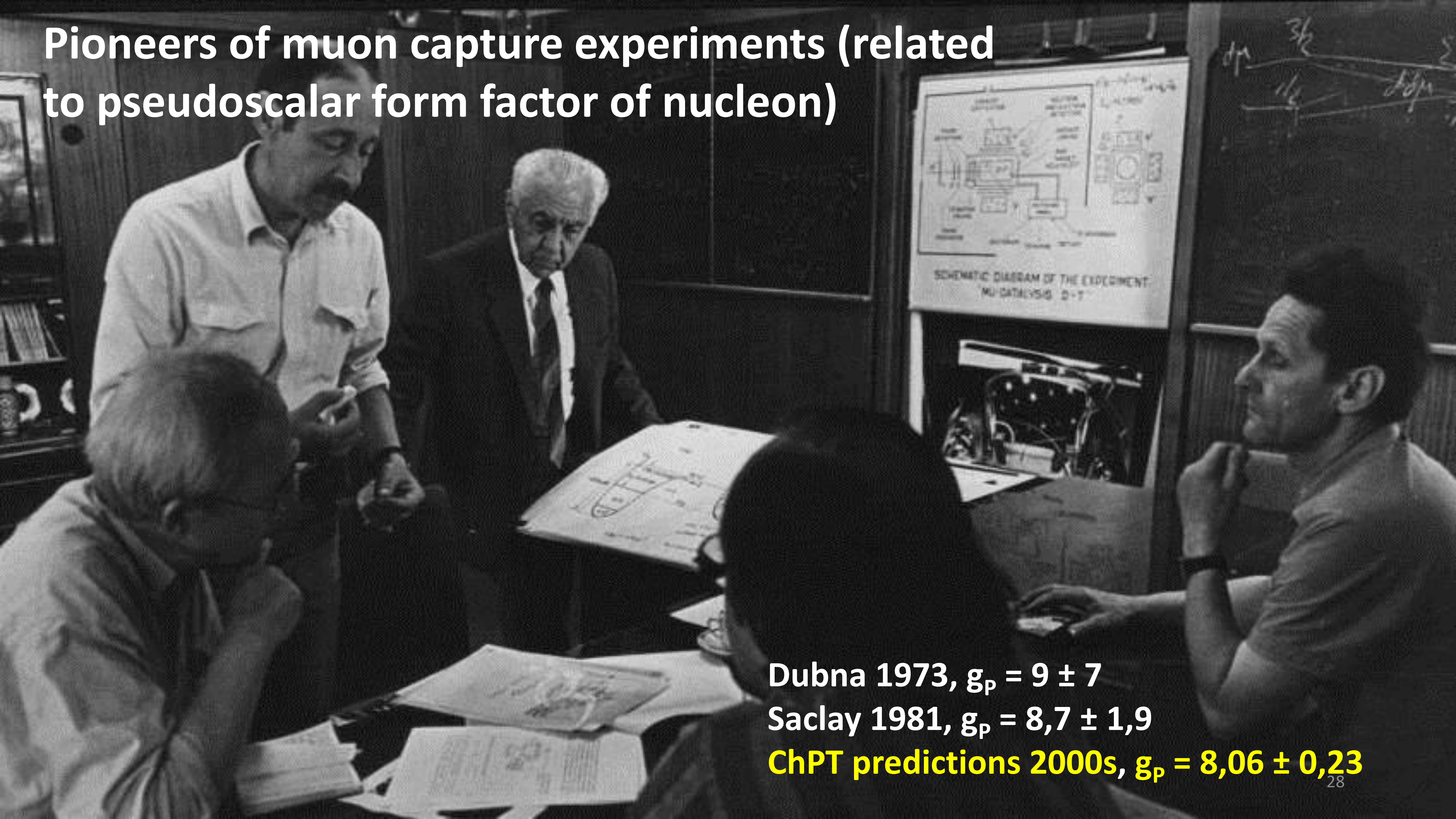
$g_A(q_c^2) = 1.251(4)$

$g_A(0)=1.2701(25)$ from neutron β-decay, q^2 dependence from neutrino scattering

g_P(expt) = ?

μp-capture offers a unique way to determine $g_P(q_c^2)$

Pioneers of muon capture experiments (related to pseudoscalar form factor of nucleon)

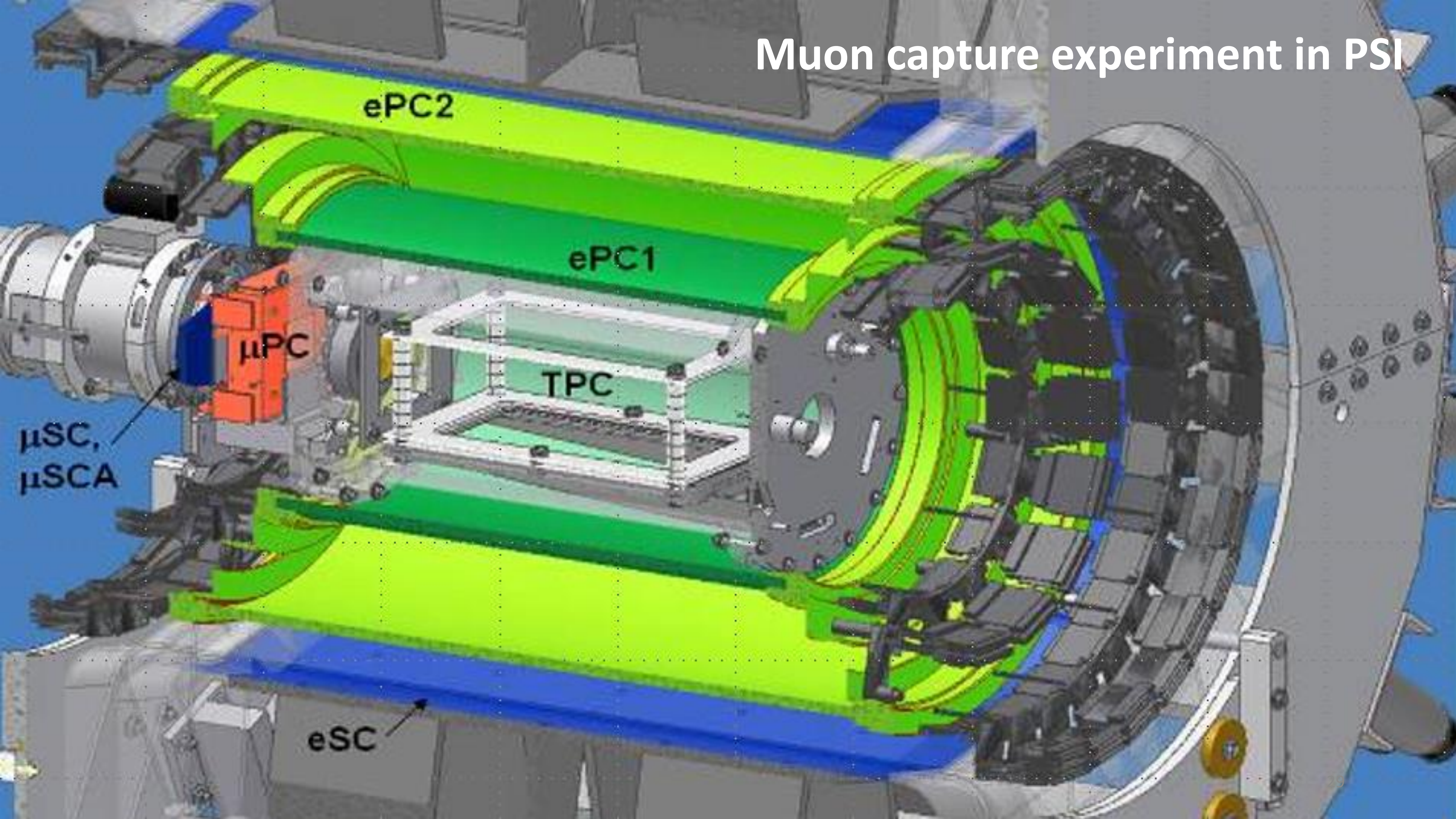


Dubna 1973, $g_P = 9 \pm 7$

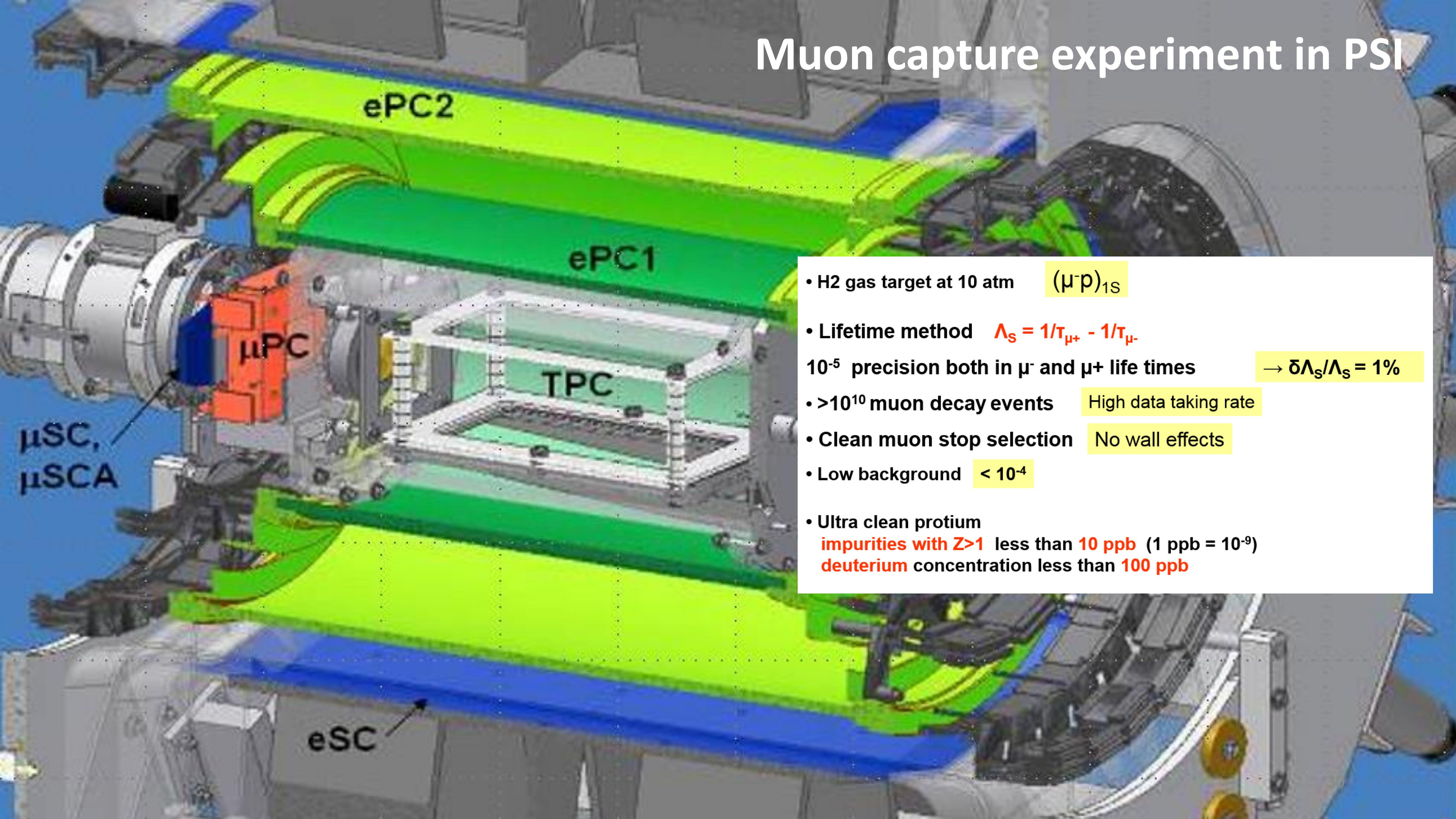
Saclay 1981, $g_P = 8{,}7 \pm 1{,}9$

ChPT predictions 2000s, $g_P = 8{,}06 \pm 0{,}23$

Muon capture experiment in PSI



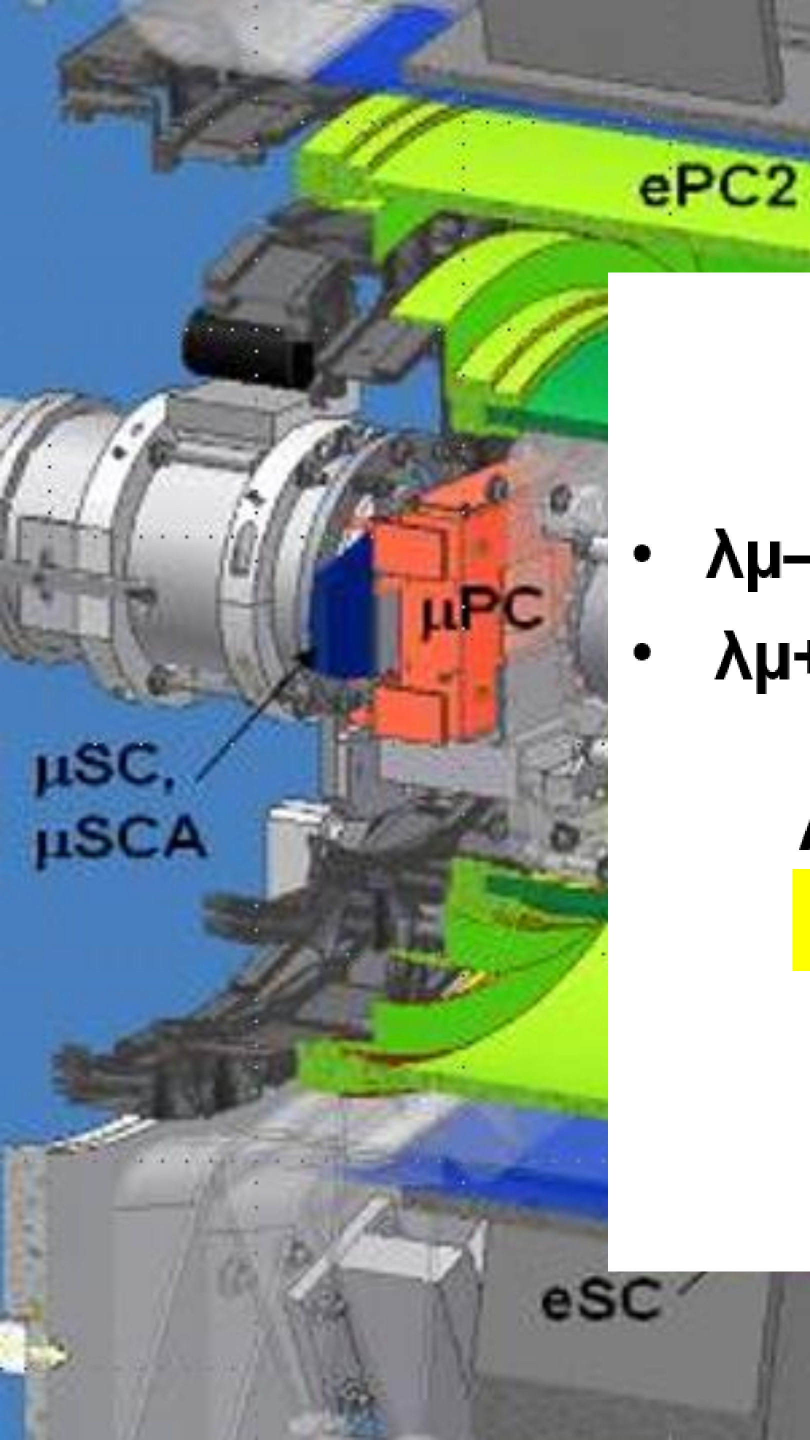
Muon capture experiment in PSI



- H2 gas target at 10 atm $(\mu^- p)_{1S}$
- Lifetime method $\Lambda_S = 1/\tau_{\mu+} - 1/\tau_{\mu-}$

10^{-5} precision both in μ^- and μ+ life times $\rightarrow \delta\Lambda_S/\Lambda_S = 1\%$

- $>10^{10}$ muon decay events — High data taking rate
- Clean muon stop selection — No wall effects
- Low background $< 10^{-4}$
- Ultra clean protium
  impurities with Z>1 less than 10 ppb (1 ppb = 10^{-9})
  deuterium concentration less than 100 ppb



Final result

- $\lambda_{\mu-}$ = 455854.6 ± 5.4stat ± 5.1syst s^{-1} (MuCap)
- $\lambda_{\mu+}$ = 455170.05 ± 0.46 s^{-1} (μLAN experiment),

$$\Lambda_S^{MuCap} = 714.9 \pm 5.4\text{stat} \pm 5.1\text{syst } s^{-1} .$$

$$g_P^{MuCap}(q_c^2) = 8.06 \pm 0.48 \pm 0.28 \; ^{*})$$

MuCap collaboration, Phys. Rev. Lett. **110**, 022504 (2013).

$$g_P^{\ HBCPT} = \ 8.26 \pm 0.23$$

V. Bernard, L. Elouadrhiri, and U.-G. Meissner, J. Phys.G28, R1 (2002).

Experiments in Fermilab

- Experiments E715 and E761 (spokesman A.A. Vorobyov) were performed at the Fermi National (FNAL, USA) at the suggestion of PNPI. The main task was to elucidate the reasons for the widely discussed discrepancies in experimental results in the study of beta decay of Σ^- -hyperon and radiative decay Σ^+-hyperon with theoretical concepts.
- The measurements were performed at a qualitatively new level thanks to the use of a transition radiation detector developed at PNPI.
- The early 1980s saw the height of the Cold War between the USSR and the United States. Therefore, joint experiments took place in unusually difficult political conditions and were one of the last threads that personified cooperation between physicists of the two countries.

Experiments in Fermilab

- The asymmetry in beta decay of Σ^- -hyperon was measured with high accuracy. In contrast to the previously available data, the new result turned out to be in exact agreement with the predictions of the SU3 Cabibbo model.
- New measurements have reliably established the asymmetry in the radiative decay of the Σ^+-hyperon, which has not yet found a rigorous theoretical explanation. In the same experiments, the magnetic moments of Σ^-, Σ^+, Σ^--bar, Ξ^- hyperons were measured with high accuracy.
- The polarization of anti-hyperons produced in proton-nuclear collisions has been discovered, which forces us to reconsider the existing understanding of the polarization process.

A bit of biography

- In 1971, he was elected head of LHEP (now it is institute division).
- In 1977 he defended his doctoral dissertation.
- In 1979 he was awarded the academic title of professor.
- From 1986 to 1992 - Director of the St. Petersburg Institute of Nuclear Physics named after B. P. Konstantinov of the Academy of Sciences of the USSR, made a great contribution to the creation of the high-flux nuclear reactor PIK.
- In 1991 - was elected a corresponding member of the Russian Academy of Sciences

Reactor PIK

- The construction of the complex began in 1976.
- By 1986, the buildings were completed, a significant part of the installation work was completed, the adjustment of individual systems began, the reactor complex was more than half ready.
- However, after the accident at the Chernobyl nuclear power plant (1986), the standards for the safety of nuclear reactors were tightened [and construction work was stopped.
- In 1988, the construction of the reactor was resumed.
- In private communication Prof. Vorobyev told me that this requires a lot of his efforts.

Large experiments

- Alexey Vorobyev: “All accelerators in the world should be our facilities”
- Since 1986, HEPD has been actively involved in research at high-energy particle colliders, making a significant contribution to the creation of detector facilities, to the operation of these facilities, and to the analysis of experimental data.
- 1986 - 2000 - Experiment L3 at the LEP electron-positron collider at CERN.
- 1996 - 2013 - Experiment D0 at the Tevatron proton-antiproton collider at the National Laboratory. E. Fermi (FNAL, USA).
- Since 1998 - PHENIX experiment at the RHIC relativistic nucleus collider at Brookhaven National Laboratory (BNL, USA).
- Since 1997 - Experiments ATLAS, CMS, LHCb, ALICE at the Large Hadron Collider (LHC) at CERN.

Large experiments

- Thus, PNPI was contributing to all discoveries done at these facilities
- Prove of SM at electron-positron collisions (L3)
- Study a top quark (D0)
- Quark-gluon plasma discovery (PHENIX)
- Higgs boson discovery (ATLAS and CMS)
- Around 50 new hadronic states discovered by LHCb

- Prof. Vorobyev was one of fathers of LHCb spectrometer – dedicated experiment for beauty and charm physics at LHC.
- The concept of the muon system of the LHCb detector was formulated thanks to the ideas of Aleksey Alekseevich.
- The design of the muon chambers of the LHCb experiment was developed and more than 600 muon chambers were manufactured at PNPI.
- 70% of LHCb papers (including famous lepton universality ones) relays to muon measurements

FIRST PROTOTYPE OF THE MUON CHAMBER ON THE BEAM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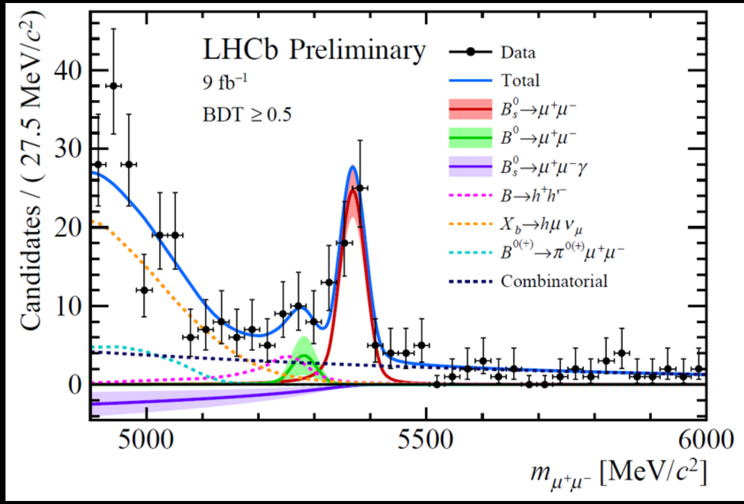
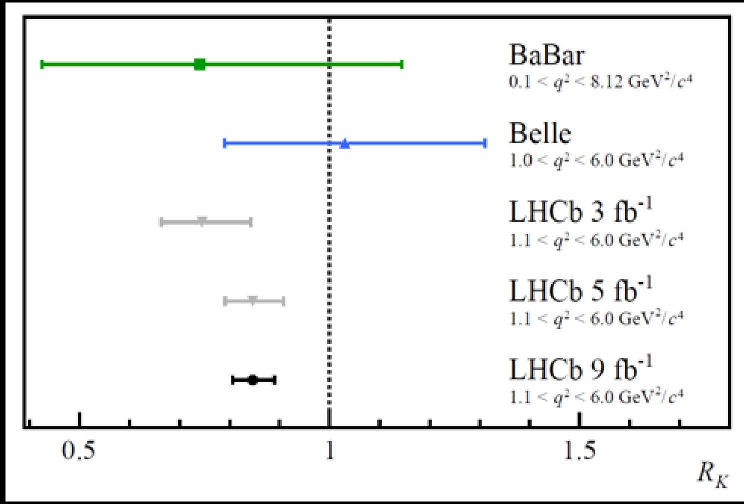
6
2005. LHCB MUON CHAMBERS ARRIVED TO CERN.





Physics with muons

- Very rare $B_s^0 \to \mu^+\mu^-$ decay. The measured branching fraction $(3.09^{+0.46}_{-0.43}{}^{+0.15}_{-0.11})\text{x}10^{-9}$ is in agreement with the Standard Model (SM) prediction of $(3.66\pm0.14)\text{x}10^{-9}$. It is the most precise single experiment measurement to date.
- The analysis is performed in the range $1.1<q^2<6.0$ GeV^2, where q^2 is the invariant mass of the $\mu^+\mu^-$ or e^+e^- pair. The value of R_K is measured to be $\mathbf{0.846^{+0.044}_{-0.041}}$, and is shown in the figure to the left as a black point with error bars. This is the most precise measurement to date and is **3.1σ** (3.1 standard deviations) away from the SM prediction, providing evidence for the violation of lepton universality. A lot of other channels demonstrate same pattern.

Observation of the Cabibbo-Suppressed Decay $\Xi_c^+ \to pK^-\pi^+$

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(SELEX Collaboration)

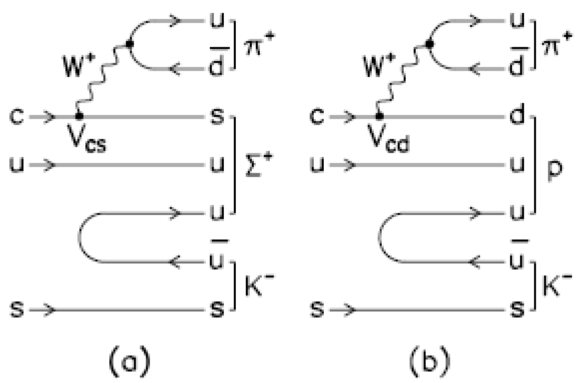

FIG. 1. An example of spectator diagrams for Ξ_c^+ decays, (a) CF $\Xi_c^+ \to \Sigma^+ K^- \pi^+$ and (b) CS $\Xi_c^+ \to pK^-\pi^+$.

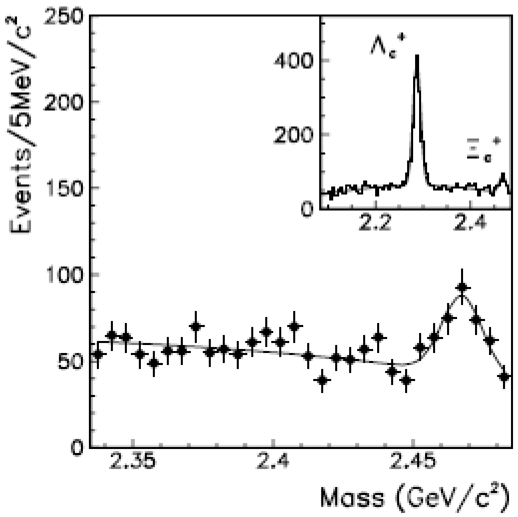

FIG. 2. The invariant mass distribution of $pK^-\pi^+$.

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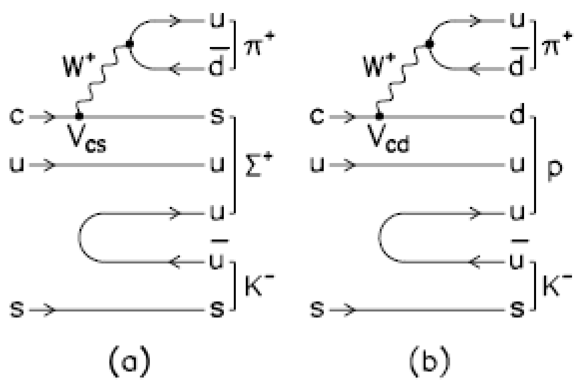

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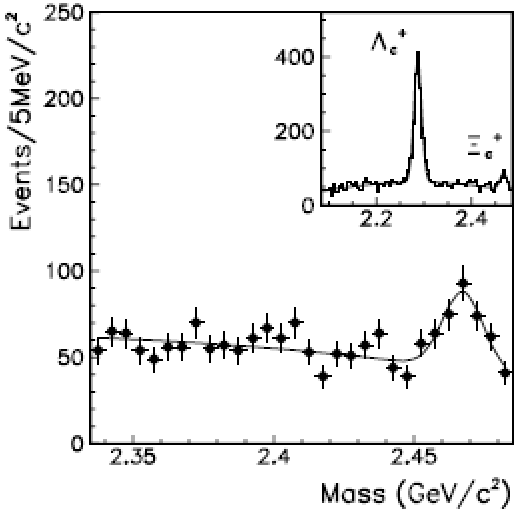

FIG. 2. The invariant mass distribution of $pK^-\pi^+$.

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LHCb-PAPER-2018-040
January 18, 2019

Observation of the doubly Cabibbo-suppressed decay $\Xi_c^+ \to p\phi$

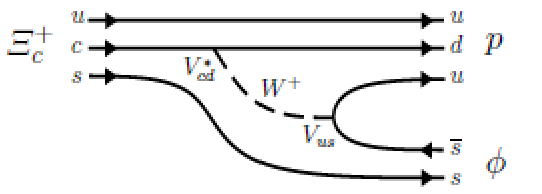
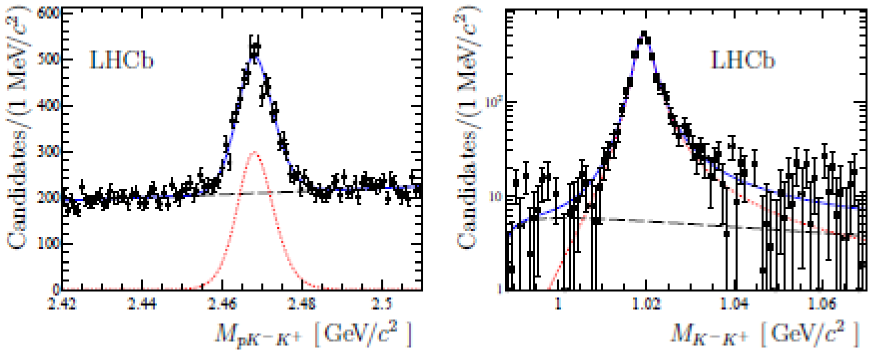


Figure 1: Tree quark diagram for the $\Xi_c^+ \to p\phi$ decay.



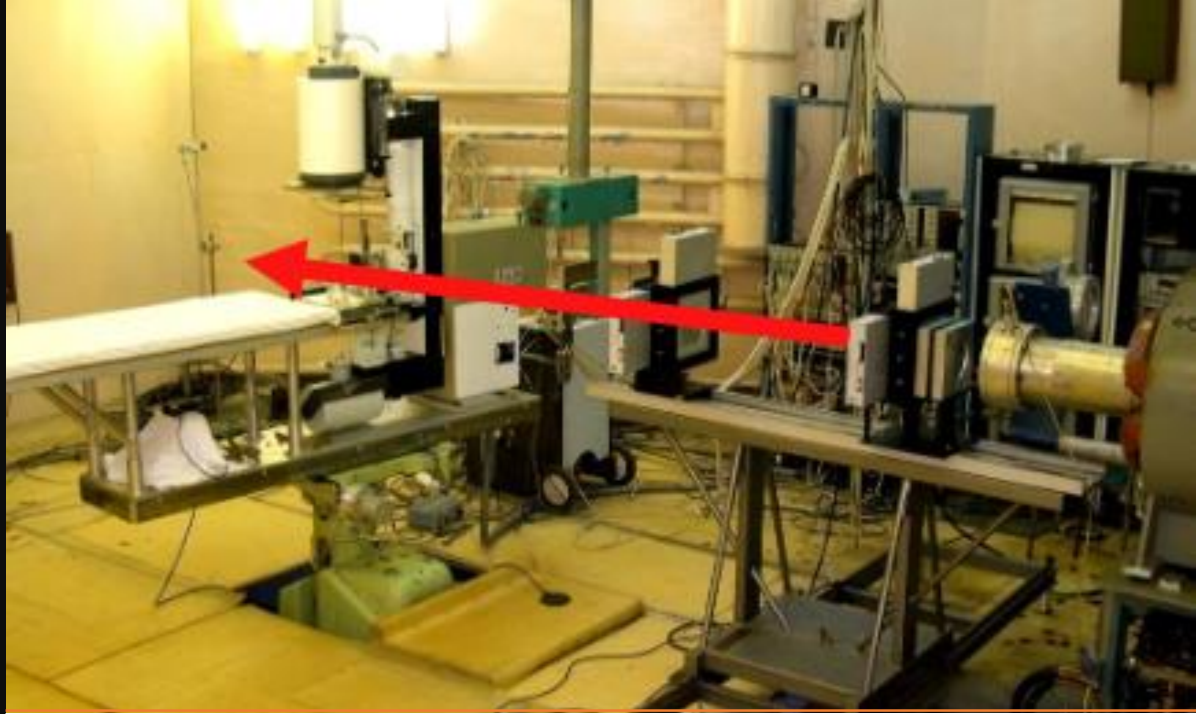
It was an honor for me to work on this paper together with Prof. Vorobyev.

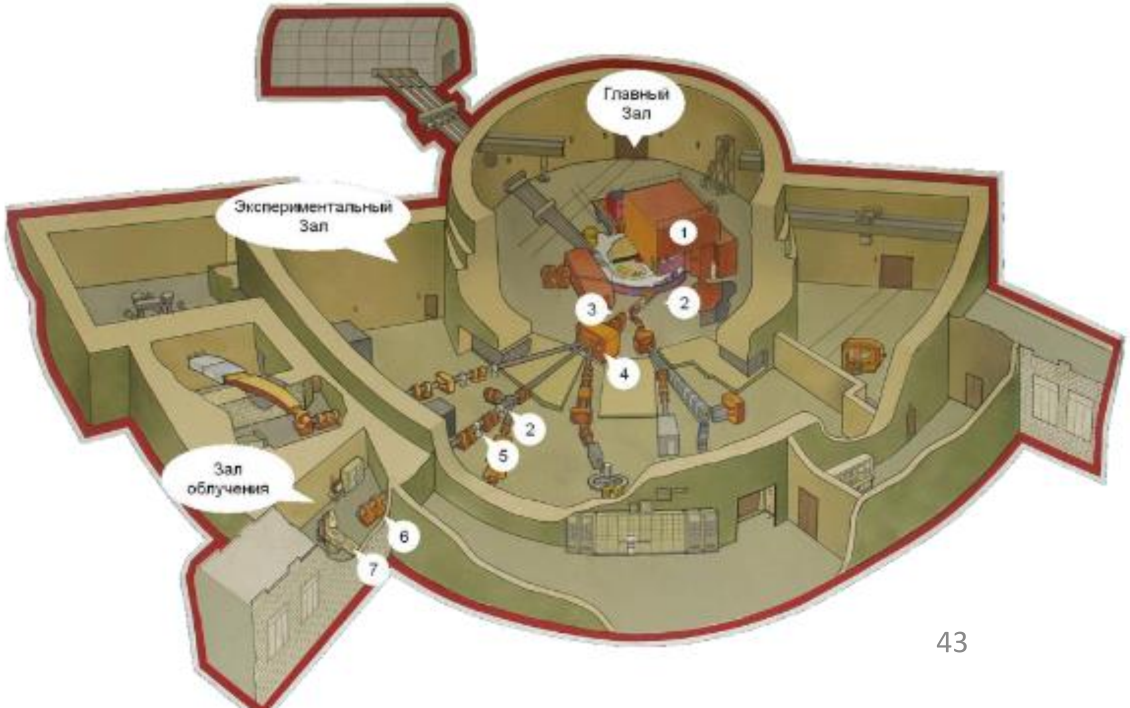
Proton therapy

The proton beam of the PNPI synchrocyclotron with an energy of 1GeV turned out to be successful for performing neurosurgical operations.

Developed at PNPI, with the active participation of Aleksei Alekseevich, together with the CRIRR , the method of proton therapy, which is now called the "Gatchina Method", has been successfully used for 38 years to treat the most complex brain diseases.

1975 to 2013 1394 patients underwent proton therapy at PNPI.





Alexey A. Vorobyev

- USSR State Prize in 1983 for his work "The diffraction scattering of protons at high energies."
- In 2003, A.A.Vorobyov was rewarded with an Ioffe Prize for the achievements in the field of physics and mathematics.
- Grant of the President of the Russian Federation for state support of the St. Petersburg school Experimental High Energy Physics. "Investigation of the structure of nuclei and elementary particle physics using accelerators."

Scientific path

- Enormous scientific path of Prof. Vorobyev, which cover all the aspects of Nuclear and Particle physics
- The last five years Alexey Alexeevich was developing experiments to solve proton radius puzzle.
- We must successfully finish these measurements, which will be our best contribution to the memory of this great scientist.