Realization of the Nuclotron-NICA project

A.Sidorin, on behalf of the NICA team

PP PAC, JINR, Dubna, 22 January 2024

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Applied research infrastructure

SIMBO (**S**tation for **I**nvestigation of **M**edical **B**iological **O**bjects)

E.Syresin

Vacuum systems, Belgorod

Applied research infrastructure

ISCRA (**I**rradiation **S**tation of **C**omponents of **R**adioelectronic **A**pparatus)

E.Syresin

ITEP, MEPhI (Moscow)

Applied research infrastructure

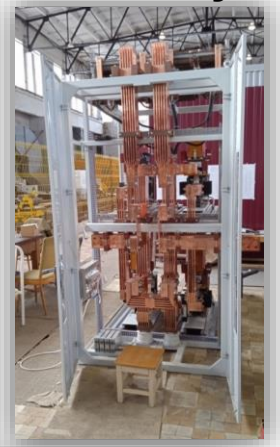
Particle strip detector

E.Syresin

Status of the collider construction

V.Karpinsky

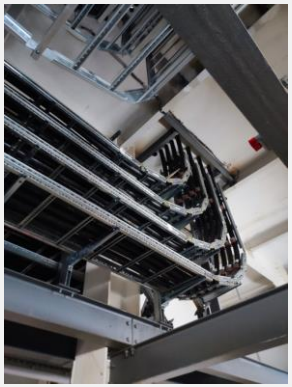
Energy evacuation keys

Main power supply units



Cable traces
> 300 m, 11 kA


Ready for commissioning

Status of the collider construction

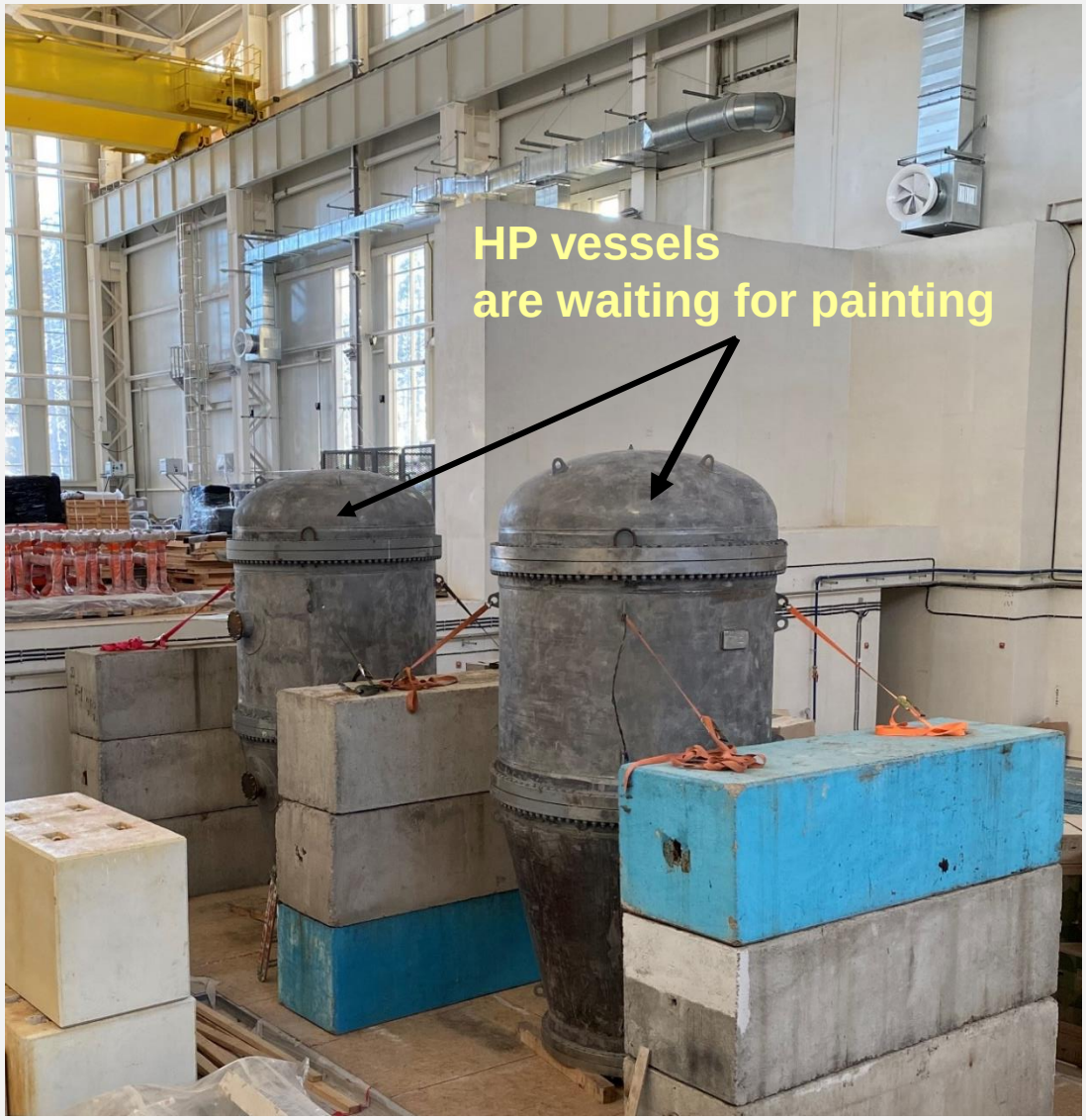
A.Galimov

Assembly and vacuum baking of RF1 and **RF2**

Status of the collider construction

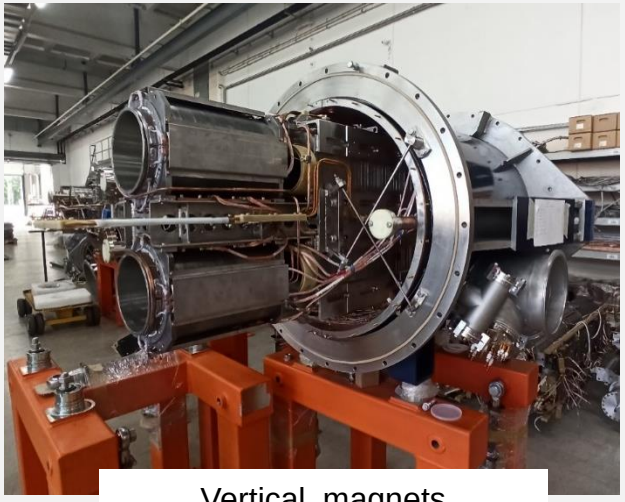
Electron cooling system:
Since November of 2022 – transportation to JINR

I.Meshkov, A.Sergeev

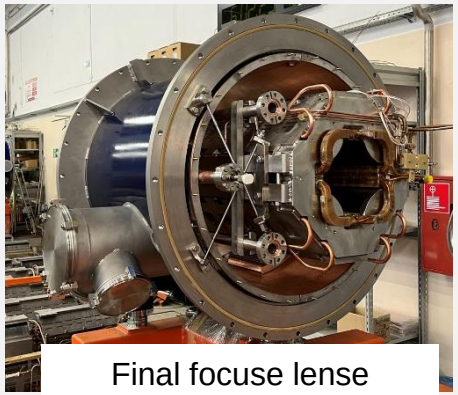


Straight sections: magnets

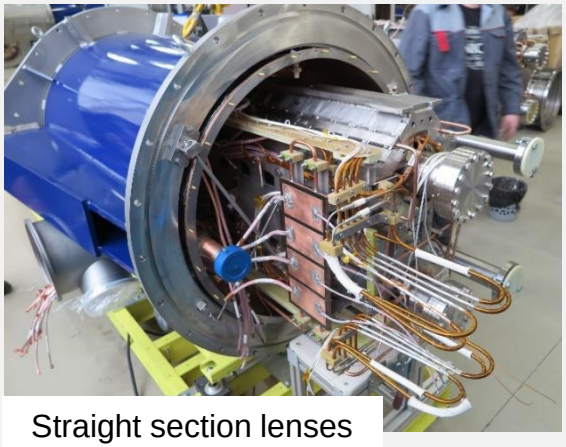
Straight section



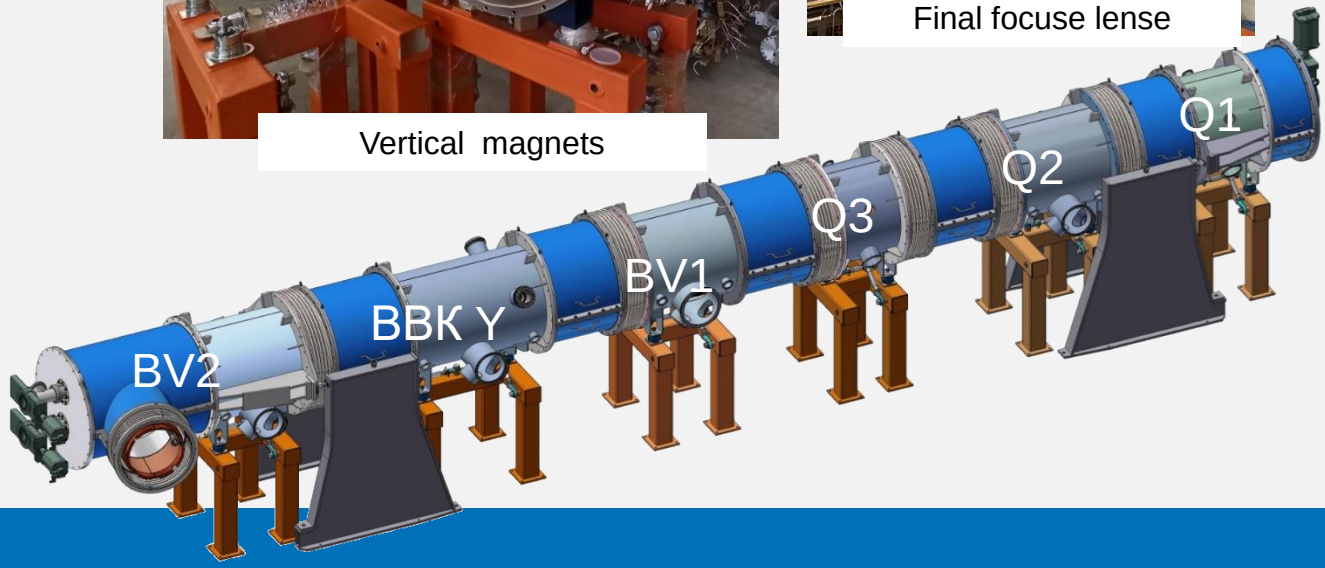
Vertical magnets



Final focuse lense

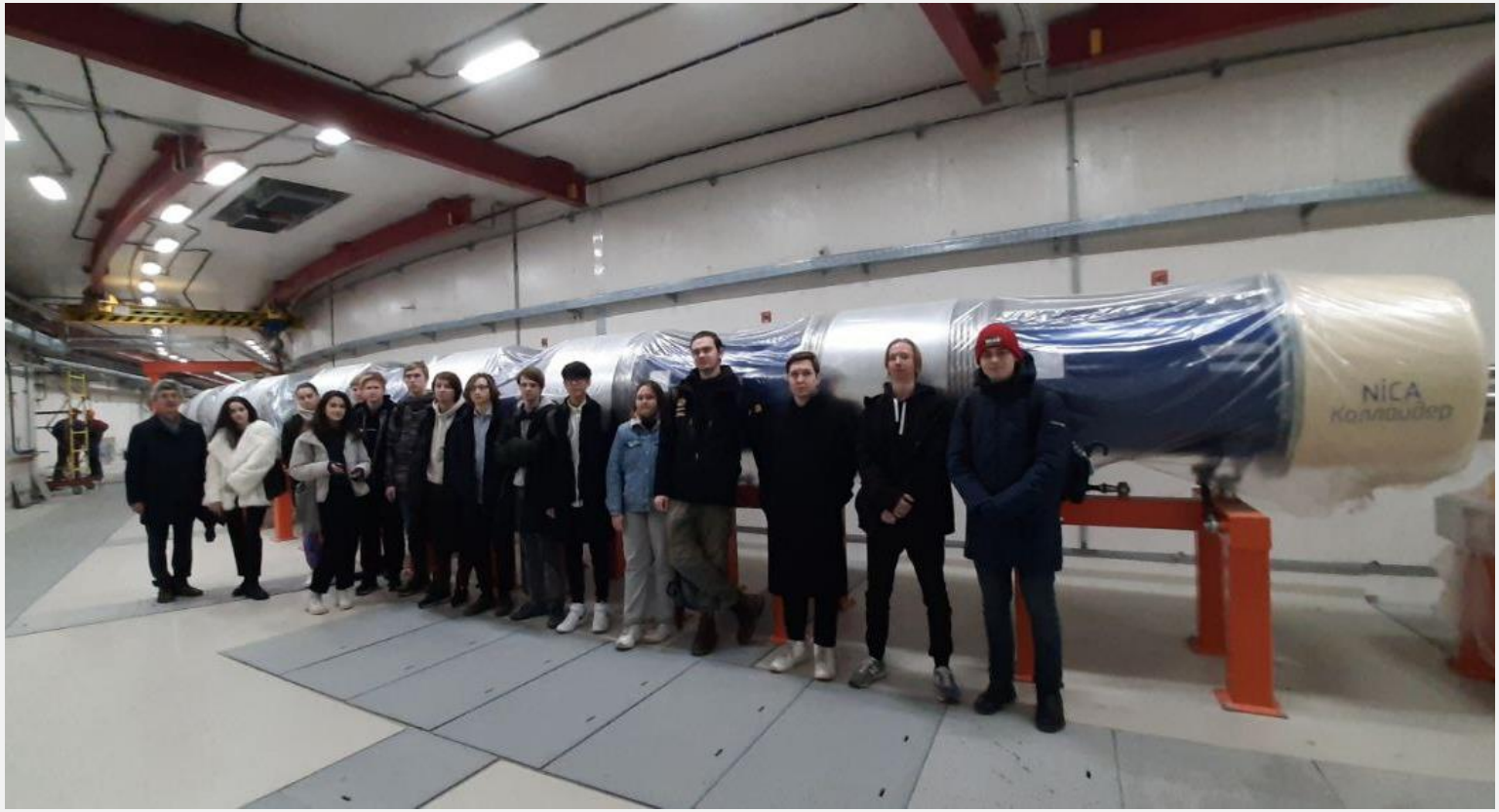


Straight section lenses



Staff education

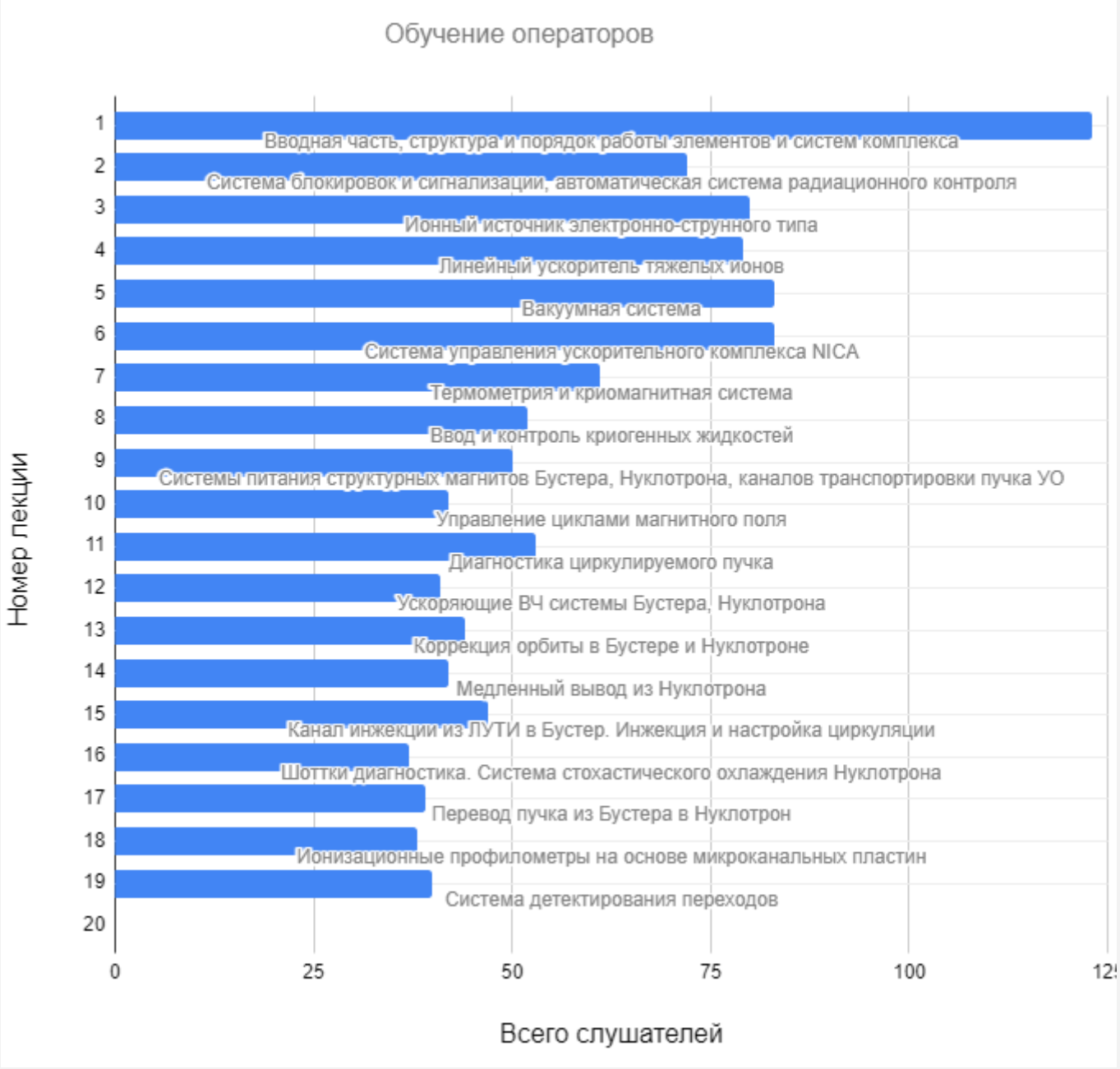
Assembly of the cryo-magnetic system A.Galimov



SPbSU - JINR student seminar dedicated to control system

Staff education

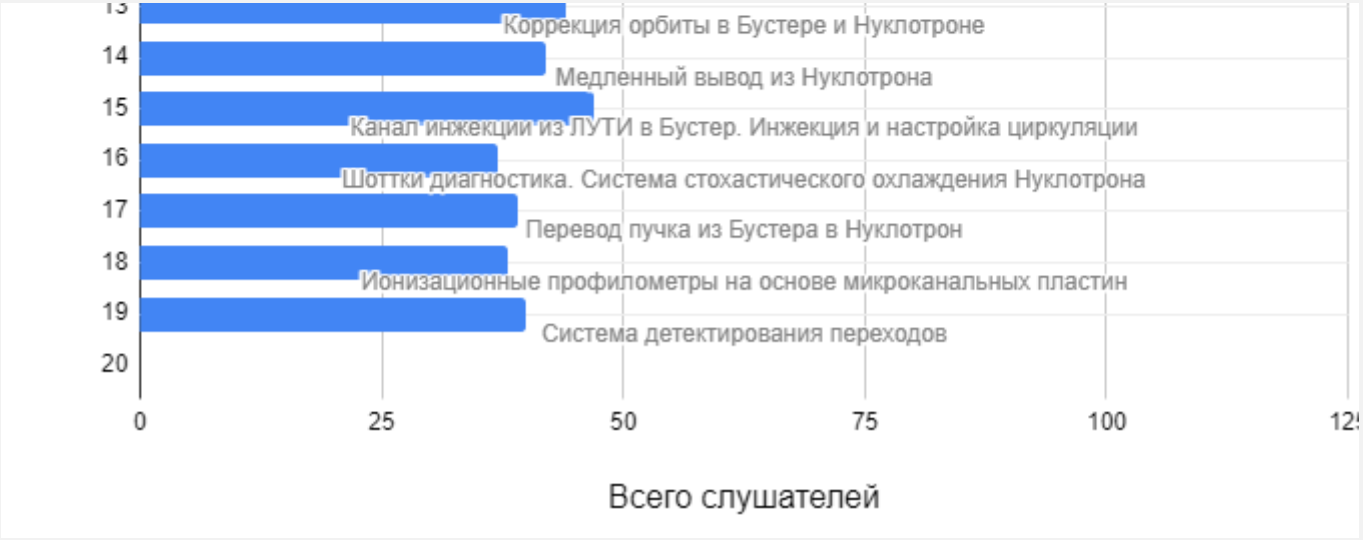
V.Lebedev, A.Sidorin



Staff education

V.Lebedev, A.Sidorin

From September 27 to December 25 2023:
23 lectures were dedicated to all systems of the facility
More than 30 participants



Plans for the collider commissioning

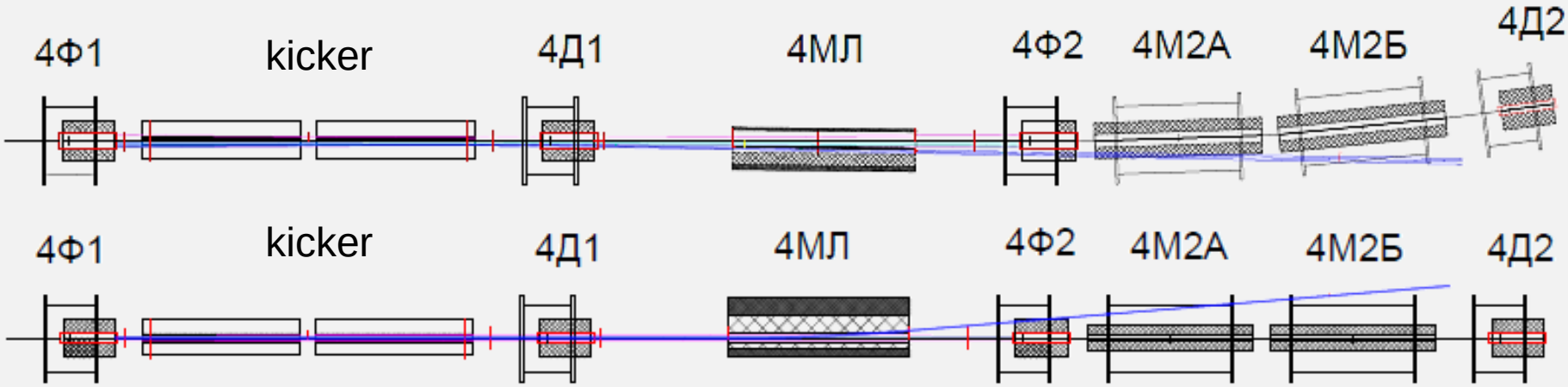
Jan. – May of 2024:
preparations of KRION and HILAC
for beam accumulation in Booster

Autumn 2024:
Beam run - accumulation in Booster, test of ISCRA&SIMBO
Collider technological run
Main limitations –
Completion of engineering infrastructure bld. 17
Commissioning of compressor station

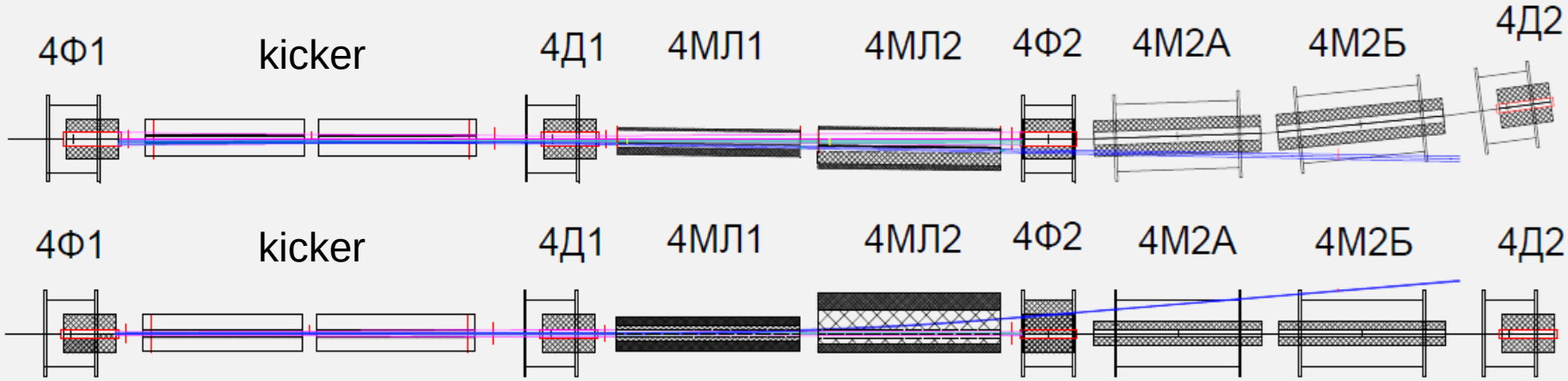
2024 - 2025: first beam run
- Fast extraction from the Nuclotron
- Assembly of the Nuclotron-Collider beam line
- Injection into Collider
- RF & synchronization system

Nuclotron extraction system

Start configuration (magnetic rigidity up to 29 T·m)



Full configuration (magnetic rigidity up to 38.5 T·m)



Application of one extraction Lambertson magnet permits to reach the maximal kinetic ion energy 2.5 GeV/n in first Collider beam runs

Nuclotron-Collider beam transport channel

Parameters of pulsed magnet elements

Magnetic element	Number	Effective length, m	Max. magnetic field (gradient), T (T/m)
Long dipole	21	2	1.5
Short dipole	6	1.2	1.5
Quadrupole Q10	22	0.353	31
Quadrupole Q15	6	0.519	31
Steerer	33	0.466	0.114

Magnets delivered in JINR in February 2021

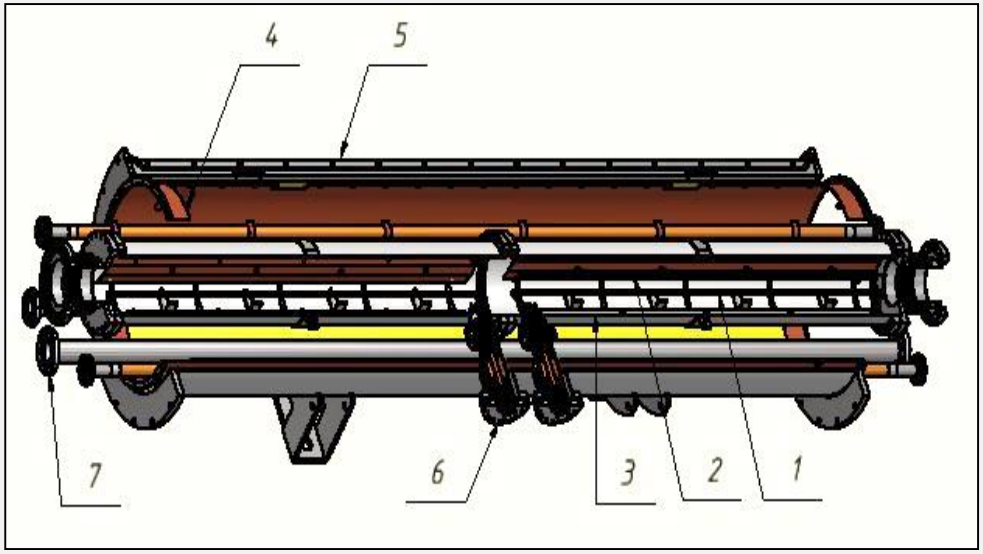
Nuclotron-Collider transfer line was contracted by France firm Sigma Phi

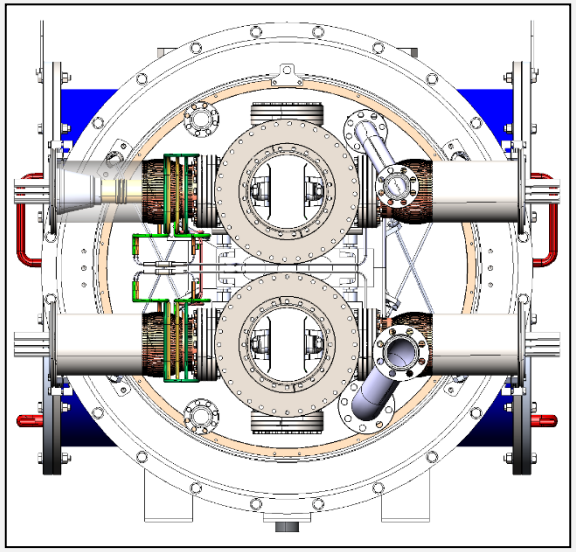
JINR can not obtain part of ready equipment: power supplies, beam diagnostics, vacuum chambers and support stands.

JINR restarts construction and production of this equipment in Summer 2023. We plan to produce this equipment in middle of 2024

Kickers for Nuclotron and Collider

	Extraction from Nuclotron	Injection into Collider
Effective length, m	2×1.3	3×1.3
Max. field, T	0.13	0.055
Bending angle, mrad	8.4	5
Pulse duration, ns: **rise** **plateau** **fall**	 550 200 600	 200 200 200
Current amplitude, kA	27	11

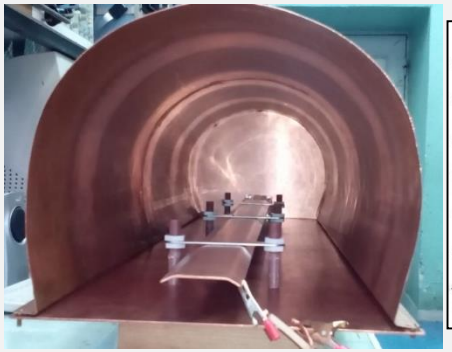


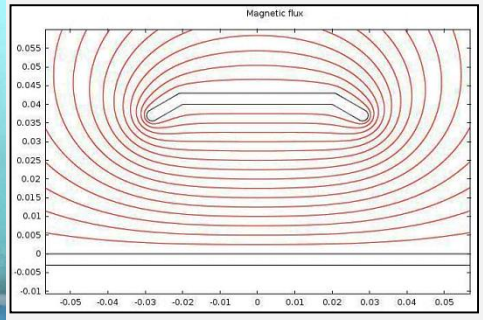


Extraction kicker – in production, injection kickers – start of fabrication, construction should be finished in middle of 2024

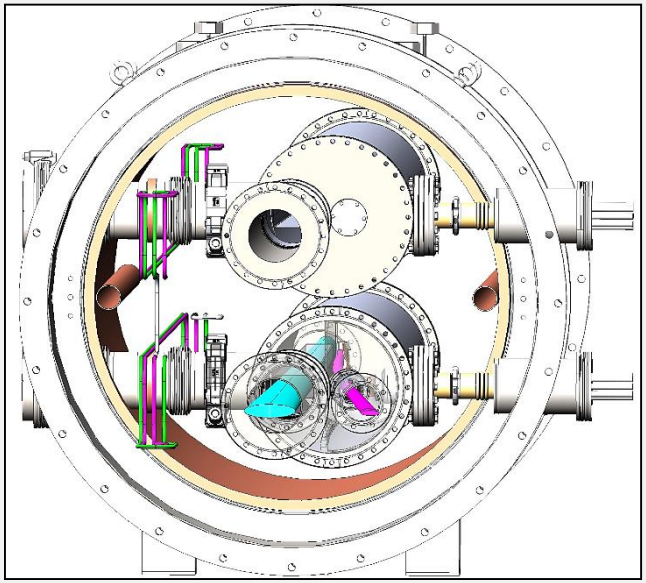
Collider beam injection septa

Effective length, m	2.5
Max. magnetic field, T	0.42
Bending angle, mrad	24
Gap, mm	30
Septum thickness, mm	3
Current, кА	50
Pulse duration, μs	10

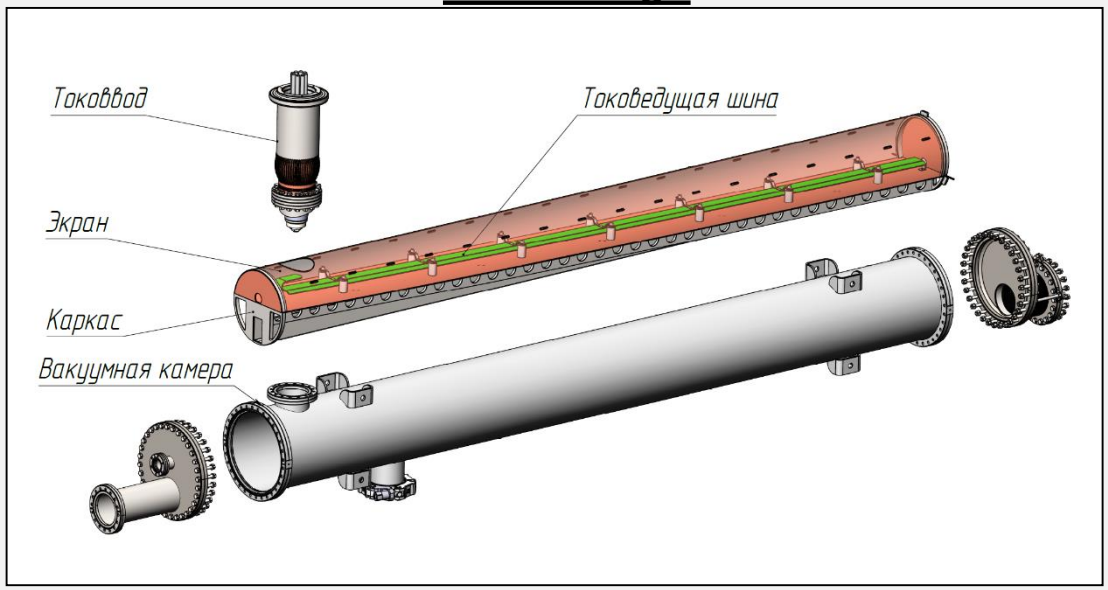




Septum cryostat module



Septum's internal chamber with feedthrough



End of 2024 - 2025: first beam run

Thank you for attention