63rd meeting of the PAC
for Particle Physics

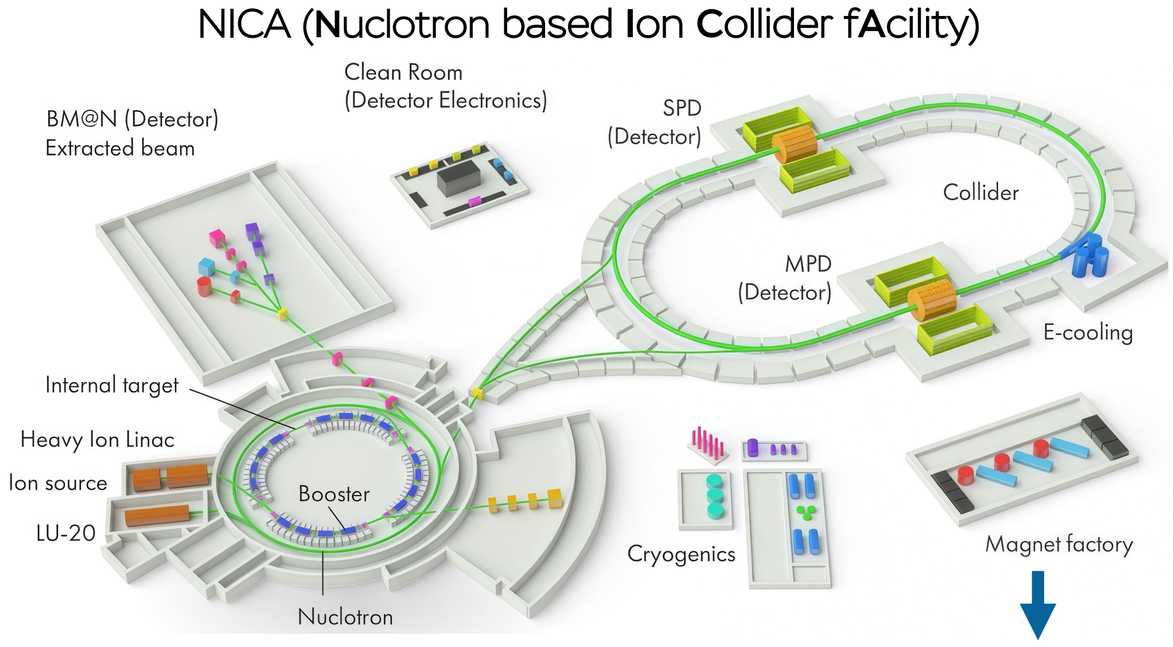
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им. В.И. Векслера и А.М. Балдина

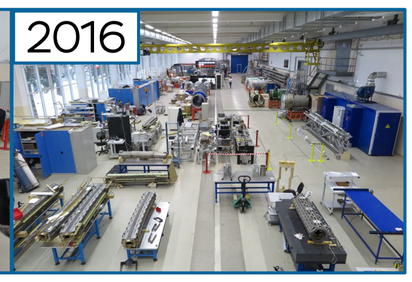
MAGNETIC MEASUREMENTS OF THE NICA COLLIDER SUPERCONDUCTING MAGNETS

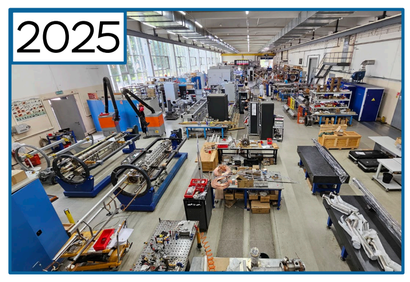
Introduction The Lattice of the NICA Collider includes 324 superconducting (SC) magnets. The assembly and testing of magnets were carried out in the scientific and experimental department of superconducting magnets and technologies (SC magnets factory). Result of the magnetic measurements is the most important parameter of quality of the manufactured magnets. A complex of magnetic measurement systems (MMS) for magnetic measurements at an ambient and operating (4.5 K) temperatures, based on rotating harmonic coils method, was developed and successfully applied.

NICA complex and SC magnets factory





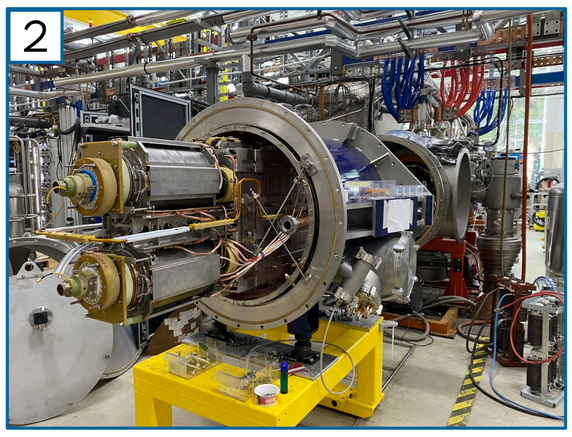




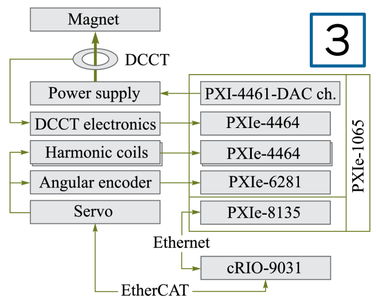
2026 – decade of the superconducting magnets factory

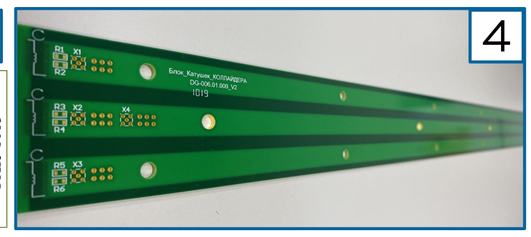
Magnetic measurement system







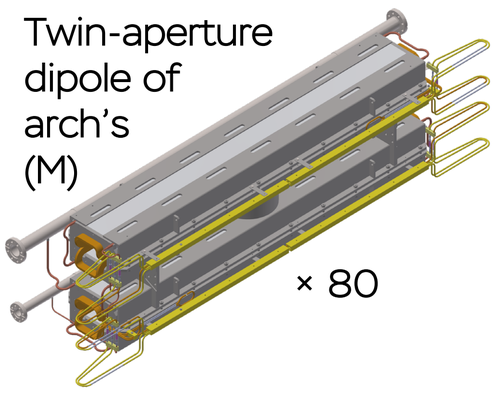


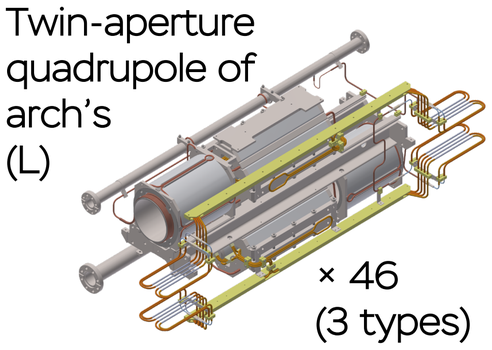


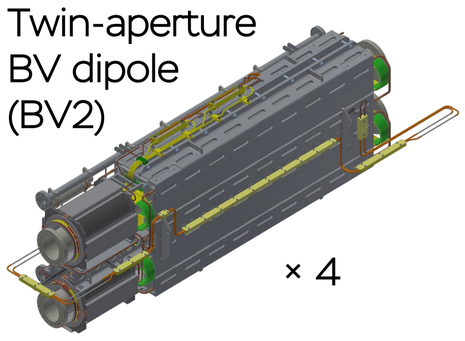
1 – «warm» magnetic measurement stand
2 – «cold» magnetic measurement stand
3 – data collection and management system
4 – harmonic coil for dipole magnet

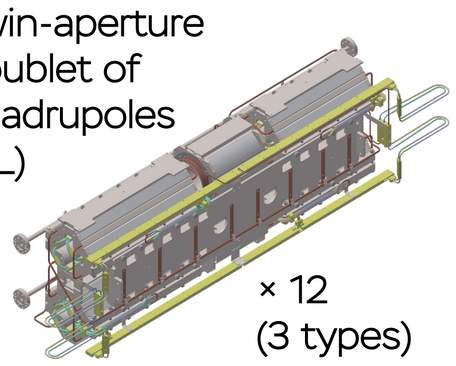
Relative repeatability of measurement results is better than 5×10^{-5}

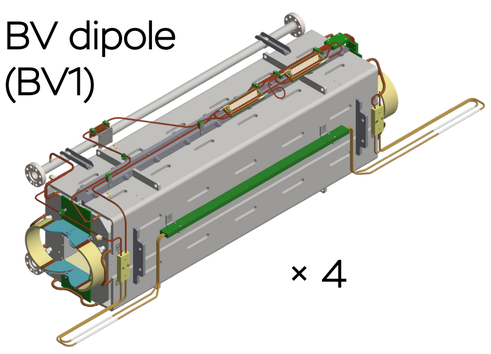
SC magnets for the NICA Collider

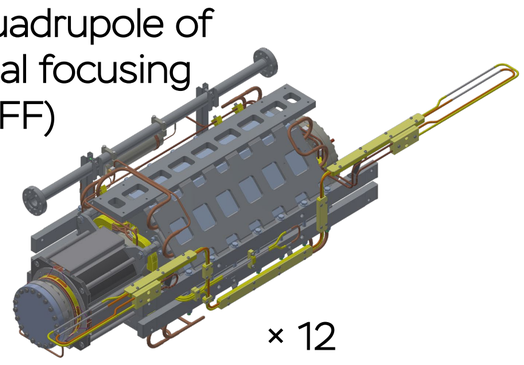




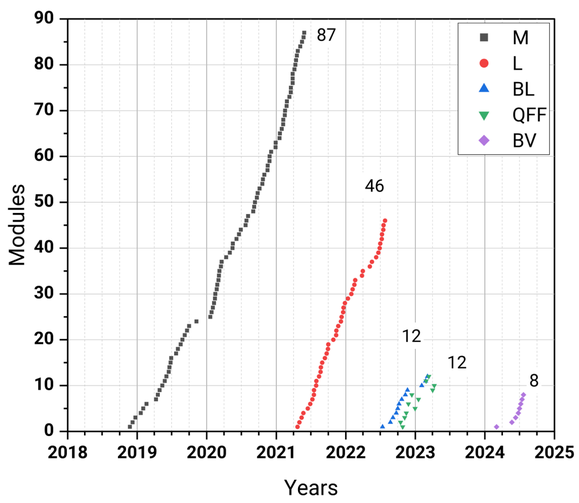


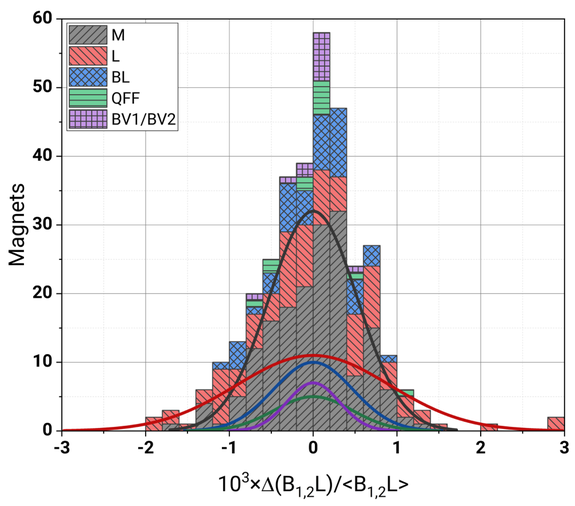




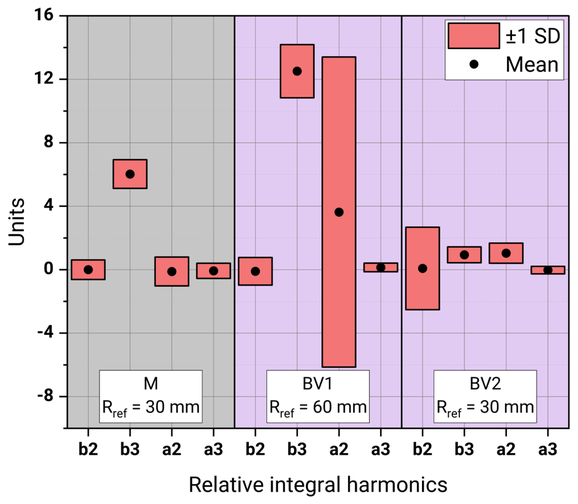


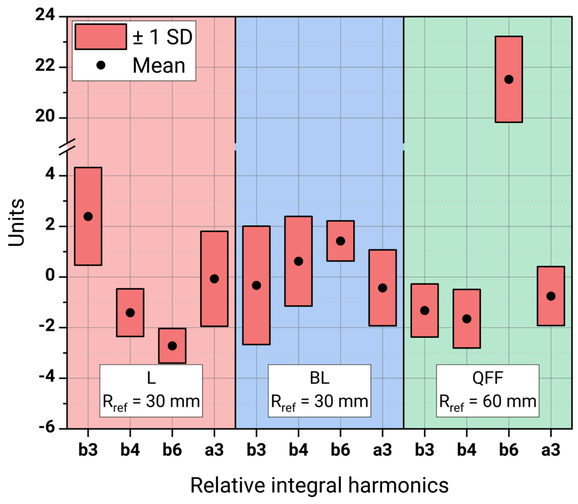
Results of magnetic measurements





Progress of cold magnetic measurements and Distribution of relative deviations of the magnetic-field integrals





Relative integral harmonics for dipoles and quadrupoles at max working current

Conclusion 18 MMS of various configurations were created and put into operation. From 2018 to 2025, the magnetic field parameters for 324 SC magnets were determined. Measured parameters were used for magnets arrangement in the NICA Collider. Experience in development of MMS was used for creating new MMS for FAIR project, SC Lambertson magnet and FRDM for HIAF (IMP). New MMS for magnetic measurements of SC modules of New Nuclotron will be developed based on existing systems.