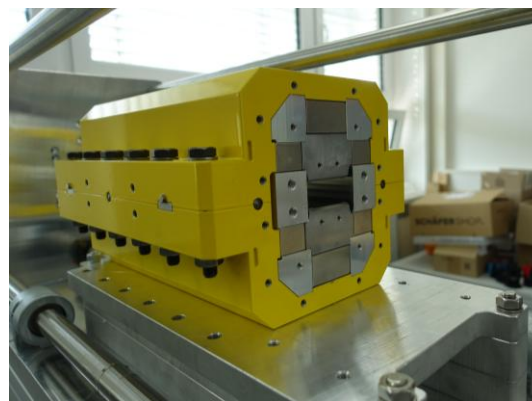
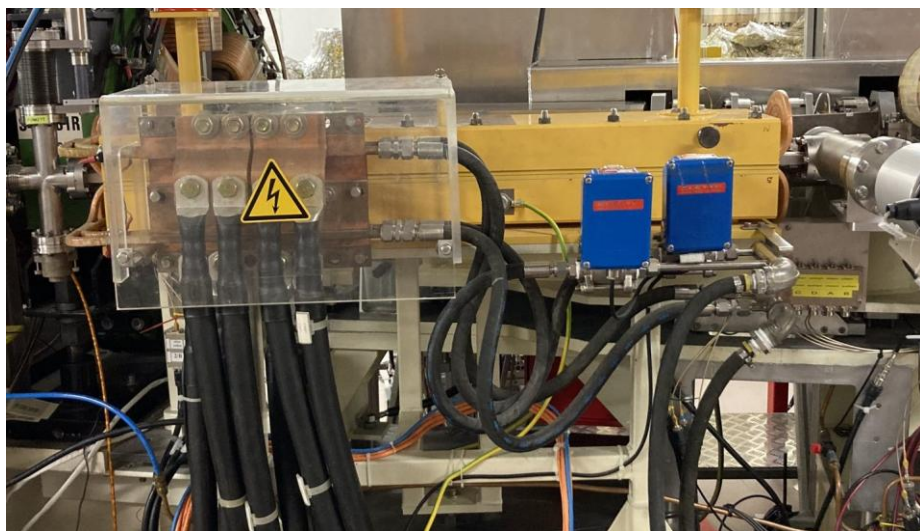


I. Asparuhov for Magnet Group @ Helmholtz Zentrum Berlin

BESSYII → BESSYII+ → BESSYIII

BESSYII+ bridge upgrade for BESSYII prior to 2.5-GeV 4th-gen. low-emittance BESSYIII → 2 permanent-magnet (PM) projects:

- PM storage ring dipoles to replace 2/32 BMs as metrology SR sources.
- **Compact bending magnet triplet for transfer line (B2PT) to replace present 30-kW 1.6-kA electro-dipole (1st PM-based magnet at BESSYII).**



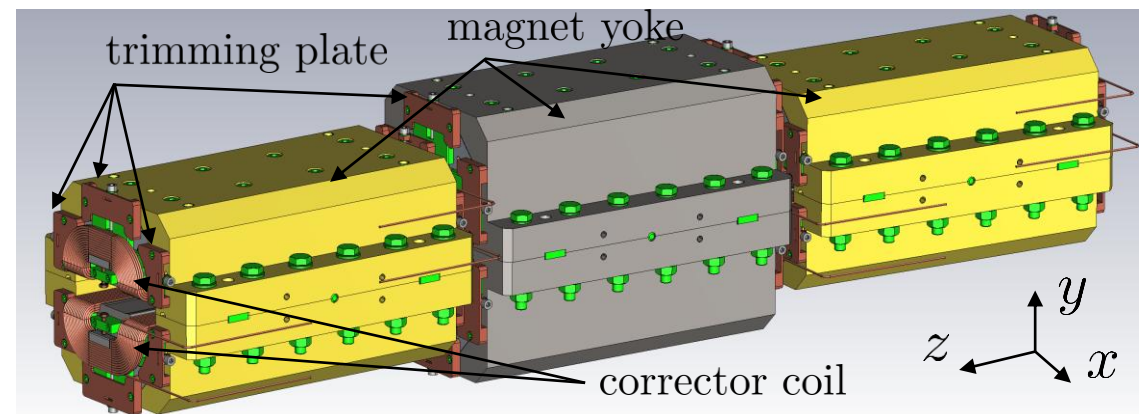
Magnetic field by PM blocks in steel structure (yoke + pole pieces).

6 PM rows/dipole @ max. 6 magnet blocks/row => max 36 PMs/dipole.

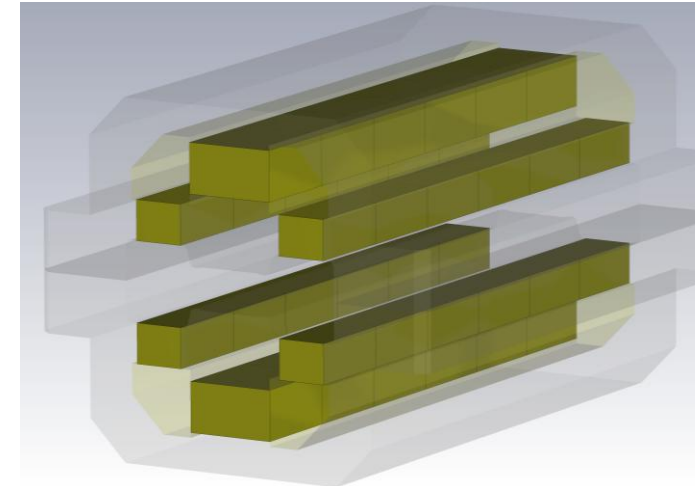
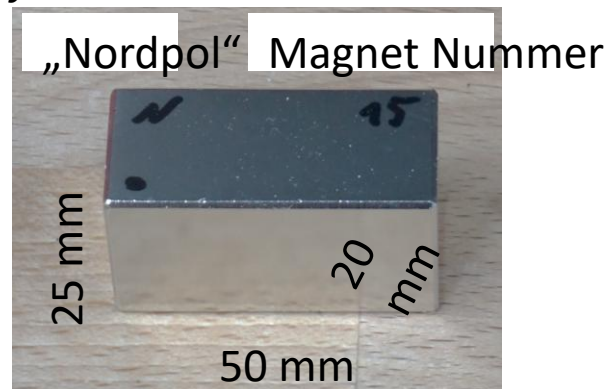
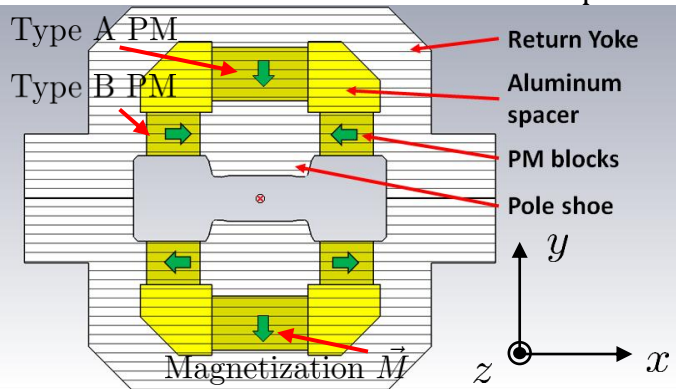
Hybrid permanent-magnet triplet B2PT @ 3 dipole units, 2 identical outer and 1 stronger inner one. Assembly start April 2025.

Goal → **Provide new bend angle for e⁻ beam** towards septum required by modified injection setup.

Power reduction (0.2 GWh/year) & enhanced magnet operation @ elimination of field ripple & vibration sources (power supplies & cooling channels).



NdFeB N42 PM material of $B_r = 1.3$ T easy-axis.



Acknowledgements

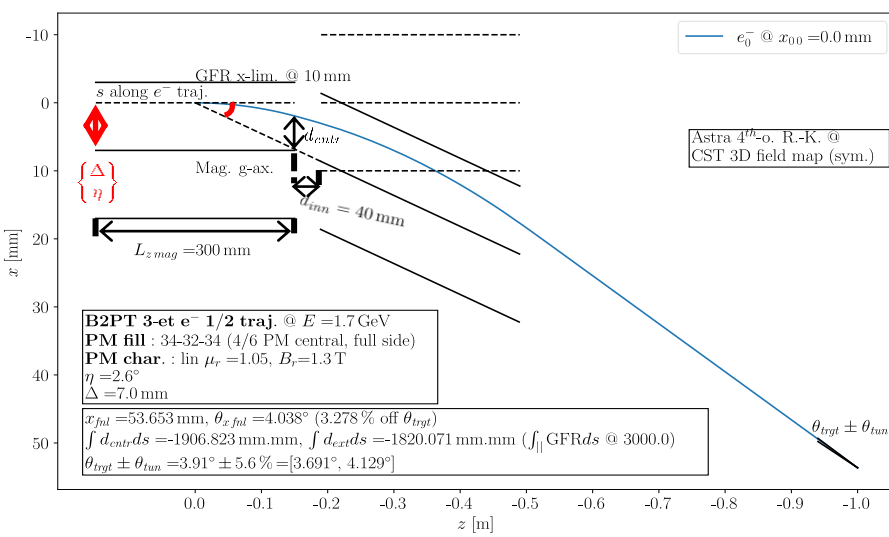
Daniel Böhlick
Volker Dürr
Marc Dirsat
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Nina Ohm
Fabian Pflockscho
Oliver Schappeit
Jens Völker
Nora Wunderer

PM blocks tested in Helmholtz Coil-Setup and Hall-Array.
Material, equipment & assembly tool cost amortized in 1.5 op. Years.

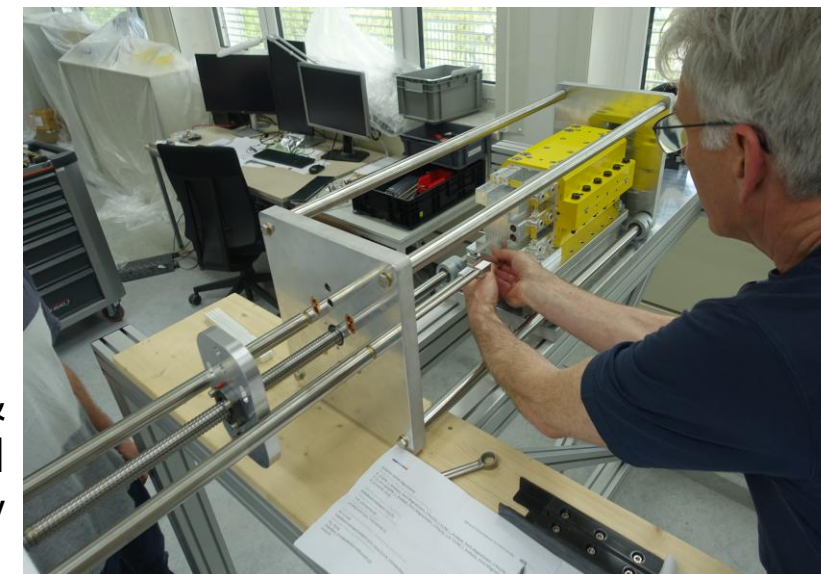
Field variation with low-current convection-cooled coils on outer dipoles.

Down-tuning via steel trim plates, 12 /dipole in 2 groups X 6.

Total field tuning $\approx 5.6\%$. PM block positioning with dedicated press-in tool.



Optimization of triplet PM block fill & geometry configuration for required beam trajectory taking constrained by technical capabilities for field tuning.



Triplet 3D field map with CST magnetic model ASTRA particle tracker.

PM-based triplet ready for full assembly with yokes & PM blocks delivered & unit dipole assembly tested – installation foreseen 2026.
Corrector coil production and tests started in house.