WIRE TECHNIQUES APPLICATION FOR MAGNETIC AXIS MEASUREMENT OF NICA COLLIDER QUADRUPOLES

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ABSTRACT

Wire techniques are precise methods for main magnetic field parameters measurement of accelerators magnets. Vibrating wire method was used for magnetic axis position determine of NICA Collider quadrupoles (JINR, Dubna). Measurement results are used for correct magnets alignment at accelerator ring. Main results of carried out measurement and studies are presented. Closed orbit modelling shows emphasize practical value of obtained measurement data for magnets alignment.

MEASUREMENT SYSTEM FOR NICA QUADRUPOLES

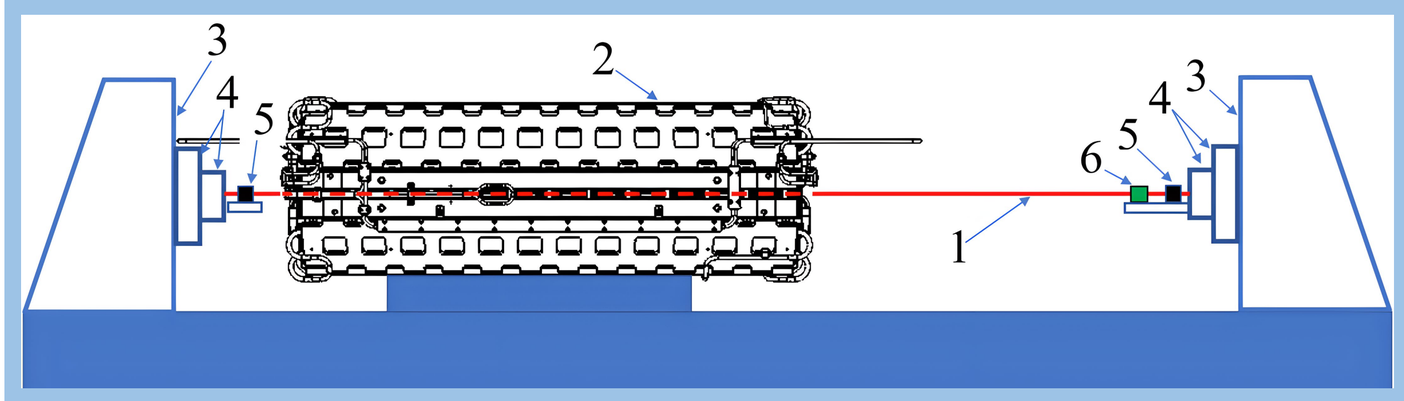

Figure 1. Measurement system scheme: 1 – wire; 2 – quadrupole; 3 – support racks; 4 – wire moving system; 5 – wire stretching system (tensometer and motor); 6 – vibration detecting system (horizontal and vertical optocouples).

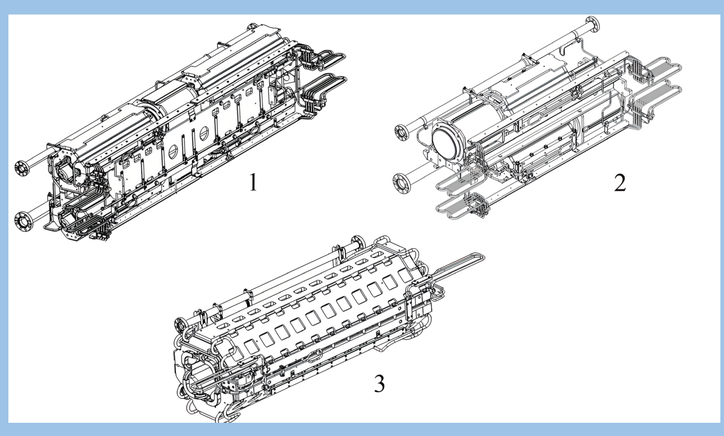

Figure 2. NICA Collider quadrupole types: 1 – doublet of quadrupoles; 2 – arch's quadrupole; 3 – final focusing quadrupole.

MEASUREMENT PRINCIPLE

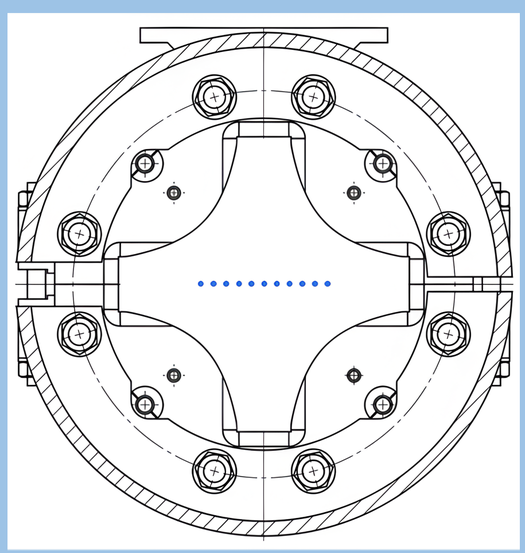

Figure 3. Wire moving trajectory at measurements.

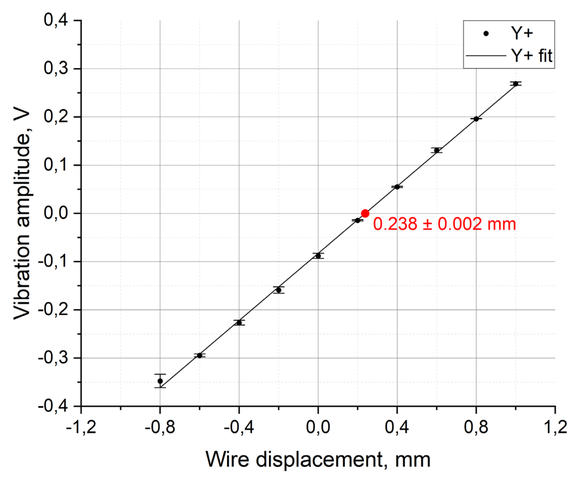

Figure 4. Experimental data, linear fit and magnetic axis position with fit accuracy.

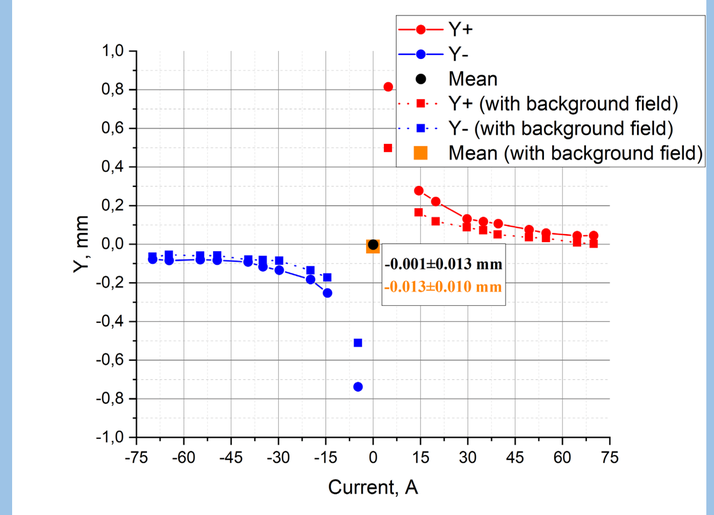

Figure 5. Measurement at two polarities of magnet's feed current with and without background field adding.

RESULTS

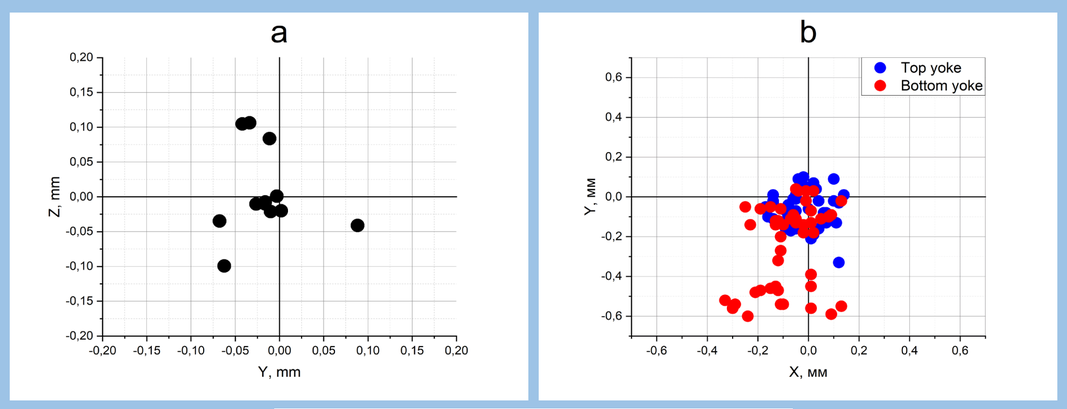

Figure 5. Magnetic axis transverse positions (measurement results): a – final focusing quadrupoles; b – arch's quadrupoles; c – doublets of quadrupoles.

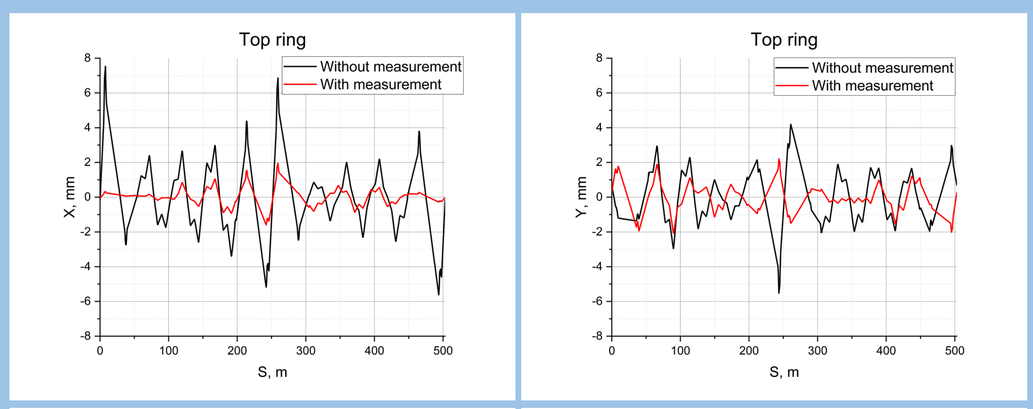

Figure 6. Closed beam orbit modelling results. Quadrupoles alignment with accounting results of magnetic axis measurement decrease perturbations of beam orbit.

CONCLUSIONS

Magnetic axis position has been determined for 152 NICA Collider quadrupoles. Wire magnetic measurement system was successfully developed and commissioned. Measurement results are used for correct magnets alignment at accelerator ring. Results of closed beam orbit modelling shows that alignment with taking into account measured magnetic axis positions of each quadrupole decreases orbit distortion on 2-6 mm.

REFERENCES

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