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Development of a method for visualizing the magnetic axis of multipole magnets

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Accelerator technology development requires an increase in the precision of both the manufacturing of magnetic elements and their positioning during accelerator installation. In order to monitor the quality of the magnetic elements created, various methods are used. Most of the methods involve the use of precision stands, so magnetic elements are typically measured immediately after production and the data obtained is used for positioning. However, subsequent possible parameter changes are not taken into account. This work is dedicated to the study of an alternative optical magnetic measurement method*. The method is based on the magneto-optical phenomenon of light polarization plane rotation in optically active media, which allows visualizing the magnetic field projection in a given transverse direction. The use of a geodesic laser tracker as a light source could allow us to apply this method directly during accelerator component positioning, solving the aforementioned problem. Our main goal was to verify the feasibility of the method for determining magnetic axes in multipole magnets. A method for creating an optically active medium was developed, the sensitivity of the technique to magnetic fields was studied, and experiments to verify its accuracy on magnetic components produced for the SKIF photon source were conducted. The results of this study provide insight into the potential of this method and indicate directions for its future development.

Footnotes

*M.A. Goldman, R.E. Sikora, and T.J. Shea, "Preliminary Studies on a Magneto-Optical Procedure for Aligning RHIC magnets", IEEE Proceedings 1993, Washington DC May 17-20, pp.2916-2918.1

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