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Research on design of a novel permanent quadrupole magnet

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Research on a novel permanent quadrpole magnet (PQM) design is introduced in this paper. It can make the quadrupole magnetic field gradient continuously adjustable by modulating several permanent magnet blocks. Four poles of the magnet inform an integral whole to ensure good structural symmetry, which is essential to obtain high-quality quadrupole magnetic field permanent quadrupole magnet. Series of simulation calculations have been done to study the effects of four distinct types of pole position coordinate errors on the central magnetic field. By juxtaposing these results with those derived from optimal design scenario of PQM, the study underscores the critical role that pole symmetry plays in this context. Two integrated design methodologies were proposed, with one of the designs undergoing processing and coordinate detection. The results indicate that this design, is capable of meeting the specified requirements. This design effectively addresses the issue of asymmetrical pole installation, thereby ensuring to a certain extent that well-machined pole can generate a high-quality magnetic field.

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