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## Errors and optics study of a permanent magnet quadrupole system

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Laser-based accelerators are gaining interest in recent years as an alternative to conventional machines. Nowadays, energy and angular spread of the laser-driven beams are the main issues in application and different solutions for dedicated beam-transport lines have been proposed. In this context a system of permanent magnet quadrupoles (PMQs) has been realized by INFN researchers, in collaboration with SIGMAPHI company in France, to be used as a collection and pre-selection system for laser driven proton beams. The definition of well specified characteristics, both in terms of performances and field quality, of the magnetic lenses is crucial for the system realization, for an accurate study of the beam dynamics and the proper matching with a magnetic selection system already realized. Hence, different series of simulations have been used for studying the PMQs harmonic contents and stating the mechanical and magnetic tolerances in order to have reasonable good beam quality downstream the system. In this contribution is reported the method used for the analysis of the PMQs errors and its validation. It will be also shown that the method is totally general and can be extended to any kind of magnet and/or error sources. Finally, the experimental characterization of the PMQ system, using real laser-accelerated beams, will be shortly presented.

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