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Precise control of a strong X-Y coupling beam transportation for J-PARC muon g-2/EDM experiment

Monday 8 May 2023 16:30 (2 hours)

To explore the beyond standard model of elementary physics, we proceed a new fundamental physics experiment, J-PARC muon g-2/EDM experiment. To realize very precise measurement of the muon spin precession frequency in the level of sub-ppm, a relativistic energy of muon beam is injected into a precisely adjusted storage magnet of sub-ppm uniformity by applying medical MRI magnet technologies.
Three-dimensional spiral beam injection scheme is intended to storage in 0.66 m diameter compact ring, we have carefully studied of a spatial distribution of a radial magnetic field of the storage magnet and required beam phase space, especially for a strong X-Y coupling. In this presentation, we will discuss about a strategy to precise control of the X-Y coupling at the beam transport line: how to detect X-Y coupling from a beam phase space, how to control X-Y coupling with eight independent rotatable quadrupole magnets. We also discuss about how to apply fine-tuning of the beam trajectory without disturbing the magnetic field in the beam storage volume, by use of active shield multipole coils.
Finally, we will report detailed studies of X-Y control at a demonstration beam line in KEK which proves the three-dimensional injection scheme is realistic one, as well as further challenges towards the original beam line at J-PARC.

Funding Agency

Footnotes

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Yes

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