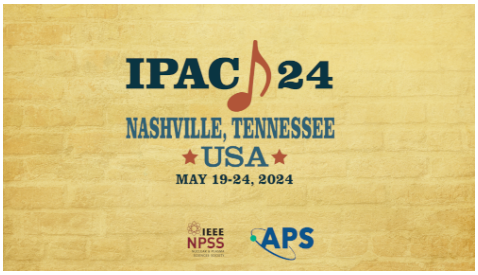

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Optimizing the sextupole configuration for simultaneous correction of third order resonances at the recycler ring

Monday, 20 May 2024 16:00 (2 hours)

For the Recycler Ring at Fermilab, space charge tune shifts of almost 0.1 will have to be dealt with under the Proton Improvement Plan (PIP-II) framework. This will lead to the excitation of third order resonances. The minimization of Resonance Driving Terms (RDTs) allows to mitigate the harmful effect of these betatron resonances. Past work has shown that previously-installed sextupoles can compensate the RDTs of individual third order resonance lines, thus reducing particle losses in these operational regimes. Nevertheless, trying to compensate multiple resonances of the same order simultaneously with these existing sextupoles is limited due to current constraints in the magnets. The following study showcases the procedure to install additional sextupoles in order to aid the compensation of multiple resonances. This includes the optimization of the new sextupoles' locations in order to cancel out multiple RDTs while minimizing the currents needed. This is followed by a verification of their effectiveness by means of the RDT response matrix.

Footnotes

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