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Energy dependence of PS main unit harmonics

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CERN Proton Synchrotron (PS) is featured with 100 C-shaped combined-function Main Units (MUs) magnets with a complicated pole shape. The operation and the modelling of the PS-MUs has been historically carried out with empirical beam-based studies. However, it would be interesting to understand whether, starting from a proper magnetic model and using the predicted harmonics as input to optics simulations, it is possible to accurately predict the beam dynamics behavior in the PS, and assess the model accuracy with respect to beam-based measurements. To evaluate the magnetic model quality and its predictions, bare-machine configurations at different energies were prepared, where only the Main Coil is powered and the additional circuits are off. In this paper, a comparison of tunes and chromaticity measurements with the predicted optics is reported, showing the saturation of the quadrupolar and sextupolar components at high energy, which affect these quantities.

Footnotes

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