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Magnetic field modelling and symplectic integration of magnetic fields on curved reference frames for improved synchrotron design: first steps

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Compact synchrotrons, such as those proposed for cancer therapy, use short and highly bent dipoles. Large curvature drives non-linear effects in both body and fringe fields, which may be critical to control to obtain the desired dynamic aperture. Similarly to current practice, for straight magnet, our long-term goal is to aim at finding a parametrization of the field map that requires few terms to capture the relevant long term dynamical effects. This parametrization will then be used to optimize the performance of the synchrotron by long-term tracking simulations and, at the same time, drive the development of the magnet design by providing measurable quantities that can be computed from field maps. This paper presents the first steps towards the goal of representing the field with a few key parameters.

Footnotes

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