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An extended Froissart-Stora formula for changing crossing speed

Monday 2 June 2025 16:00 (2 hours)

When the closed-orbit spin tune is ramped linearly through an isolated spin-orbit resonance, the asymptotic polarization loss is well-approximated by the Froissart-Stora formula. However, it is often observed in accelerator simulations that the crossing speed, defined as the slope of the amplitude-dependent spin tune with respect to the machine azimuth, changes at the moment of resonance crossing. For example, the behavior of the amplitude-dependent spin tune in the vicinity of a higher-order spin-orbit resonance can often be reasonably approximated by such a piecewise-linear function. In this paper, we derive an extension to the Froissart-Stora formula which describes the asymptotic polarization loss in the case of changing crossing speed. We then demonstrate that this formula provides a good estimate of the polarization lost when crossing a higher-order spin-orbit resonance in both a toy model and simulations of RHIC.

Footnotes

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