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Rotational invariance and IBS in circular modes

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Flat beams are preferred at high energies due to their ability to achieve high intensity and luminosity, as one of the transverse emittances is smaller. However, at low energies, collective effect such as space charge becomes dominant in the smaller dimension. Intra-beam scattering(IBS) effect is dominant when local beam density is high, from medium to high energies. Circular mode beams, which have equal beam sizes in both planes and are intrinsically flat, can help mitigate these effects while maintaining intrinsic flatness. Circular mode beams can be transformed from and to flat beams, enabling the beam to bypass collective effects while maintaining the intrinsic flat beam state. Angular momentum conservation is crucial for maintaining the circular mode, and we will present rotation-invariant systems that can conserve angular momentum. Additionally, we will investigate the effects of IBS on circular modes and different beams.

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