Contribution ID: **311** Contribution code: **TUPB029** Type: **Poster Presentation**

Considerations and findings on beam vorticity dynamics

Tuesday 27 August 2024 16:00 (2 hours)

Rotation of beams is usually quantified through its angular momentum rather than through its vorticity. However, the difference of the two transverse eigen-emittance is linked more strongly to vorticity as to angular momentum. It has been found that the dynamics of vorticity has remarkable similarity to the dynamics of the beam envelope along channels of solenoids and quadrupole triplets. Transport matrices of vorticity, corresponding phase advances and Twiss parameters look very similar and are partially even identical to their counterparts concerning envelopes. Corresponding to emittance, the quantity of vortissance, being a constant of motion, is defined. Unlike emittance, for vorticity-dominated beams, it may take imaginary values causing imaginary Twiss parameters and negative or zero phase advances along a finite beam line section.

Footnotes

Funding Agency

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Session Classification: Tuesday Poster Session

Track Classification: MC1: Beam Dynamics, Extreme Beams, Sources and Beam-Related Technologies: MC1.1 Beam Dynamics, beam simulations, beam transport