GALACTIC AND GALACLIC: 2 VLASOV SOLVERS FOR THE TRANSVERSE AND LONGITUDINAL PLANES

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Abstract

- GALACTIC = GArnier-LAclare Coherent Transverse Instabilities Code => Was used for instance to shed light on the destabilising effect of resistive transverse dampers such as in the LHC (IPAC18)
- GALACLIC = GArnier-LAclare Coherent Longitudinal Instabilities Code => Helped understanding the details of the mode-coupling behind some longitudinal microwave instabilities (IPAC19)

- 2 similar approaches solving the linearised Vlasov equation:
  - Laclare obtained an eigenvalue system to solve but with the unknown frequency inside the matrix to be diagonalised
  - Garnier proposed to use a decomposition on the low-intensity eigenvectors to obtain an eigenvalue system with the unknown frequency outside the matrix to be diagonalised

=> I followed Garnier’s approach, which I compared to Laclaire (in black below): 4 Vlasov solvers are thus discussed here and a good agreement has been reached in both transverse and longitudinal planes

GALACTIC

- Constant inductive impedance

GALACLIC

- BBR, above transition, without taking into account PWD

\[ X = \frac{\text{Im}(Z(0)) e I_p}{4 \pi \gamma m_0 c Q_0 B \omega_s} \]

\[ X = \frac{\text{Im}(Z(0))}{\frac{4 I_p}{\pi^2 B^2 \nu_T h \cos \phi_s}} \]

- BBR, above transition, taking into account PWD

\[ \frac{Q}{Q_0} = \frac{Q}{Q_s} \times F_{PWD} \quad \text{with} \quad F_{PWD} = \frac{Q_s}{Q_0} = \frac{1}{\sqrt{4 \pi x}} \]