



Contribution ID: 136

Type: **Talk**

Kinetic simulations of electron-positron induced streaming instability in the context of gamma-ray halos around pulsars

Monday 21 July 2025 16:05 (15 minutes)

We conduct 1D particle-in-cell (PIC) and particle-in-cell-magnetohydrodynamic simulations of a hot super-Alfvénic electron-positron (ee) beam pervading a cold electron-proton (ep) background. We investigate the growth and saturation of the resonant streaming instability triggered by the ee beam. We confirm quasi-linear growth rates and a saturated amplitude of waves to be consistent with a momentum exchange criterion between the decelerating beam and growing magnetic waves. We discuss how these results transpose to the case of ee confinement around evolved pulsars showing a gamma-ray halos like GEMINGA or Monogem.

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Session Classification: CRD

Track Classification: Cosmic-Ray Direct & Acceleration