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On the estimation of realistic growth rates for Langmuir instability in Pulsar plasma

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There is strong observational evidence that coherent radio emission from pulsars are excited by curvature radiation from charge bunches in relativistically streaming plasma along the open dipolar magnetic field lines, and detaches the pulsar magnetosphere below 10% of the light cylinder radius. The formation of charge bunches requires growth of instabilities in the plasma, however the exact mechanism of formation of stable charge bunch has remained an unresolved problem in pulsar physics. One popular choice for the plasma instability is the Growth of Langmuir mode driven by two stream instability, where the system can be driven from linear to non-linear regimes, where eventually stable charge bunches can form. However so far growth rates for realistic pulsar parameters and how the system is driven from linear to nonlinear regime from first principles is not available in the literature. In this talk I will present the growth rates for Langmuir instability for realistic pulsar plasma parameters for the very first time. Three different physical scenarios will be explored- that due to high energy positron/ion beam, longitudinal drift in secondary plasma and cloud-cloud overlap of secondary plasma due to non-stationary discharges at the polar gap. I will demonstrate that only the cloud-cloud scenario can facilitate the entry of the Langmuir mode from linear to non-linear regime.

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