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Investigations on Growth of Quasi –Longitudinal (QL) Whistlers with Energy Scaling of Energetic Electrons in LVPD

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Whistler waves are driven unstable by the runaway electrons generated in tokamak disruptions with serious consequences on reactor scale tokamaks and by relativistic electrons in space plasmas but with different electron distributions. In LVPD, we report observations on whistlers of Quasi Longitudinal (QL) nature. These are highly oblique in nature and have free energy source asssociated with anisotropic distribution of electrons, beams, loss cones, magnetic mirrors, ring currents, electron temperature anisotropy etc. Presence of large Electron Energy Filter (EEF) in LVPD divides plasma into three distinct regions of Source, EEF and Target plasmas. The source plasma, which is the focus of present investigations, is a region between the plasma source and the EEF. Transverse magnetic field of EEF(B_EEF~160G) modifies confining axial magnetic field(B_z ~6.2G) of LVPD and imaculates magnetic mirror configuration. Reflected energetic elctrons from the developed loss cone, results in the first laboratory observation of QL whistlers [1].

This paper will report on experimental observation of QL whistlers from an asymetrically localised, thin rectangular slab in source plasma, populated by energetic electrons. The observed whistlers are electromagnetic in nature and exhibits strong coupling of density with potential and magnetic field fluctuations. The turbulence is broadband in nature with frequency ordering between i.e. in lower hybrid range. The QL mode propagate highly obliquely (≈87°) with its perpendicular and parallel wave numbers as and respectively. These observations are in good agreement with theoretical predictions for reflected electron driven QL whistlers [2-4]. Analytical observations suggest that the growth of the instability has strong dependence on the plasma density and energy of the energetic electrons apart from the population of reflected electrons. Results on growth of instability with energy scaling of reflected energetic electrons will be presented.

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Author: Mr SANYASI, Amulya Kumar (Institute for Plasma Research)

Co-authors: Dr SHARMA, Devendra (IPR); Dr AWASTHI, Lalit Mohan (IPR); Mr SRIVASTAVA, Pankaj Kumar (IPR); Mr SRIVASTAV, Prabhakar (IPR); Mr SUGANDHI, Ritesh (IPR)

Presenter: Mr SANYASI, Amulya Kumar (Institute for Plasma Research)

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