Advanced Research in Electrical and Electronic Engineering
p-ISSN: 2349-5804; e-ISSN: 2349-5812 Volume 4, Issue 1 January-March, 2017, pp. 32-32

http://www.krishisanskriti.org/Publication.html

Study of Electromagnetic Ion Cyclotron Waves in Magnetosphere of Saturn

Rajbir Kaur*, Jyoti Kumari and R.S. Pandey

Department of Physics, Amity Institute of Applied Sciences, Amity University, Sector-125, Noida, U.P., India
rkaur2@amity.edu; rspandey@amity.edu

Abstract—*In present work, we investigate the electromagnetic ion cyclotron (EMIC) waves in the magnetosphere of Saturn propagating obliquely to the magnetic felid direction. The observations made by space probes - Voyager 1, 2 and Cassini, launched by NASA, showed that charged particles are trapped in planet's magnetic field lines. EMIC waves present in background space plasma interact with these particles leading to damping or growth of waves by exchange of energy. Therefore, we investigate this wave-particle interaction to analyze growth of EMIC waves in presence of AC field in magnetosphere of Saturn. Following kinetic approach, expression for dispersion relation is derived by using the method of characteristics. Magnetic field strength at various points along magnetic field line has also been considered to calculate growth rate and real frequency of EMIC waves analytically. The work has been performed for bi-Maxwellian as well as Loss-cone distribution of particles in Saturn's magnetosphere. The graphs plotted between growth rate and wave number, analyzing the effect of various parameters show that temperature anisotropy, number density of electrons and angle of propagation support the growth rate of EMIC waves. It is found that temperature anisotropy act as source of free energy. It has been shown that EMIC waves have grown due to loss of perpendicular kinetic energy of electrons. Thus the results are of importance in analyzing observed VLF emissions over wide spectrum of frequency range in Saturnian magnetosphere. The analytical model developed can also be used to study various types of instabilities in planetary magnetospheres.*

Keywords*: Magnetosphere of Saturn, Ion Cyclotron Waves, Growth rate of waves.*