Generation of discrete ELF/VLF emissions in magnetospheric cyclotron masers

A. G. Demekhov and V. Y. Trakhtengerts *(Institute of Applied Physics, 46 Ulyanov st., 603950 Nizhny Novgorod, Russia andrei@appl.sci-nnov.ru)*

Nonlinear theory of generation of chorus-type discrete ELF/VLF emissions in magnetospheric cyclotron masers (MCM) is developed. The model considered is based on the MCM operation in the regime of a backward wave oscillator (BWO). This regime takes place if sharp gradients appear at the distribution function of energetic electrons in the field-aligned velocity component. Its manifestation is a periodic or stochastic succession of quasimonochromatic whistler-wave packets with rising frequency. The succession period depends on the geomagnetic field inhomogeneity and the wavelength and varies from 0.1 s up to several seconds under magnetospheric conditions. The necessary sharp gradient in the velocity space has a step-like shape and appears in the process of the cyclotron instability development related to the generation of hiss emissions. Such a gradient corresponds to the boundary between resonant and nonresonant energetic electrons. The model allows one to explain quantitatively many features of chorus emissions. In this paper, we consider discrete and continuous models for chorus generation in the BWO regime and discuss their predictions for emission properties in the source region.