



Dependence of VLF Chorus Parameters on the Observation Location in the Presence of Geomagnetic Field Distortions

Andrei G. Demekhov⁽¹⁾

(1) Institute of Applied Physics of the Russian Academy of Sciences, Nizhny Novgorod, Russia; e-mail:
andrei@ipfran.ru

The results of numerical modeling the very-low frequency (VLF) chorus generation by using the backward wave oscillator (BWO model [1-4] will be presented. The dependence of generated waves dynamic spectrum on the position of the observer within the generation region will be discussed. Earlier It was shown [5] that the asymmetry of the generation process with respect to the geomagnetic equator (magnetic field minimum) yields a frequency shift of discrete chorus elements propagating in opposite directions if they are observed away from the geomagnetic equator. In this case, the waves propagating towards the equator are weaker and have slightly higher frequency than the elements propagating away from the equator.

In this paper, the variations in the dynamic spectrum of chorus emissions in the presence of quasi-static sinusoidal variations of the geomagnetic field profile are considered. The generation of both rising and falling tones is possible under such conditions. The dynamic spectrum of chorus elements can significantly and even qualitatively depend on the observer position within the generation region. The numerical results will be compared with existing models of chorus spectrum formation.

This work has been supported by the Russian Science Foundation, project No. 21-12-00416.

References

- [1] V. Y. Trakhtengerts, “Magnetosphere cyclotron maser: Backward wave oscillator generation regime,” *Journal of Geophysical Research*, **100**, 9, September 1995, pp. 17,205–17,210. doi:10.1029/95JA00843.
- [2] A. G. Demekhov and V. Y. Trakhtengerts, “Dynamics of the magnetospheric cyclotron ELF/VLF maser in the backward-wave -oscillator regime. II. Influence of the magnetic-field inhomogeneity,” *Radiophysics and Quantum Electronics*, **51**, 11, November 2008, pp. 880–889, doi:10.1007/s11141-009-9093-3.
- [3] A. G. Demekhov, “On the generation of VLF emissions with increasing and decreasing frequency in the magnetospheric cyclotron maser in the backward-wave oscillator regime,” *Radiophysics and Quantum Electronics*, **53**, 11, May 2011, pp. 609–622, doi:10.1007/s11141-011-9256-x.
- [4] A. G. Demekhov, U. Taubenschuss, and O. Santolík, “Simulation of VLF chorus emissions in the magnetosphere and comparison with THEMIS spacecraft data,” *Journal of Geophysical Research: Space Physics*, **122**, 1, January 2017, pp. 166–184, doi:10.1002/2016JA023057.
- [5] A. G. Demekhov, U. Taubenschuss, M. Hanzelka, and O. Santolík, “Frequency dependence of very low frequency chorus Poynting flux in the source region: THEMIS observations and a model,” *Geophysical Research Letters*, **47**, 6, March 2020, art. no. e2020GL086958, doi:10.1029/2020GL086958.