

Modification of the flowing cyclotron maser and inducing of pulsating aurora by artificial cloud release

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The theory of Flowing Cyclotron Maser (FCM) is based on a magnetic force tube containing a filament of enhanced plasma concentration and energetic electrons with anisotropic velocity distribution. These particles enter the FCM in the course of magnetic drift. They then switch on to cyclotron instability and emerge from the filament with isotropic velocity distribution. The model quantitatively explains pulsating energetic particle precipitation and auroral pulsations, which are correlated with pulsating VLF emissions.

There are some possibilities of artificial inducing of FCM. First one is artificial generation of VLF emission by ground based power heating transmitter facilities like HAARP or satellite transmitter in the RESONANCE project. Other is artificial ionization of the ionosphere region responsible for VLF wave reflection and conjugated with filament of cold plasma. Both ways are needed suitable auroral disturbances situation and its forecasting. The essential feature of FCM is a strong dependence of the reflection coefficient of the whistler mode on the ionization at the foot point of the filament in the ionosphere. Estimation of necessarily condition and plasma density for enhancement of VLF emission in the mirroring region is under discussion. Experimental evidences of reality of artificial inducing of FCM by reflection coefficient modification are presented. It is the close correlation of auroral pulsations and auroral VLF emissions that is the experimental basis of the theory. In this report we revised results of experiments with artificial Ba-clouds release, when auroral pulsations are apparently triggered. This effect has been observed during a Ba-release rocket campaign in Alaska. In this experiment, the stimulation of auroral pulsations generated by a Ba release during special auroral activity was clearly observed. Similar results were obtained during a Russian Ba-release experiment during rocket launch in the South Atlantic. It seems that changing the reflection coefficient is a main reason for the generation of auroral pulsations in both Ba release experiments. Thus the dependence of the cyclotron instability increment on the reflection coefficient of the FCM foot point parameters give us the possibility to modify FCM by creation ion clouds in the ionosphere. It can be realized in the RESONANCE project by using Poker Flat Research Range in Alaska to create an artificial ion cloud at the magnetic conjugate point of the satellite during its passage over Alaska. The details of the proposed experiment and the necessary geophysical situation are under discussion.