Generation Mechanism of Non-thermal Continuum Radiation

*Yoshiharu Omura[1], Miroslav Horky[1,2]

1. Reserach Institute for Sustainable Humanosphere, Kyoto University, 2. Department of Space Physics, Institute of Atmospheric Physics, Czech Academy of Sciences

We study a possible nonlinear mechanism which could be responsible for generation of the non-thermal continuum radiation. We propose a theoretical model and perform numerical simulations using a 2-D electromagnetic particle code (KEMPO2) [1] to verify the mechanism [2]. In the simulation system, we have density gradient and ring beam electrons in the dense region as a source of electrostatic waves through ring-beam instability. These electrostatic waves cause non-gyrotropy of the ring velocity distribution which is necessary for generation of the harmonic waves. Velocity component V_y together with magnetic field B_z of the generated Z-mode waves creates Lorentz force in the x-direction (along the magnetic field). Hence, oscillating energetic electrons work as an anntenna emiting O-mode waves to the low density region. Electromagnetic O-mode waves are emitted at harmonics of the cyclotron frequency up to the maximal plasma frequency of the high density region, and they are observed as non-thermal continuum radiation in the low density region.

References:
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