SPECTRAL LINE BROADENING BY RELATIVISTIC ELECTRONS IN PLASMAS: COLLISION OPERATOR SPECTRAL LINE BROADENING BY RELATIVISTIC ELECTRONS

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Regarding the electron broadening of the line in plasma, we have calculated the amplitude of the collision operator. This calculation takes into an account the relativistic mass of the free plasma electrons in the description of the dynamics. First, we have assumed that the relativistic free electron moves in the Coulomb potential due to an impurity ion with a net charge (+Ze): we compute the electron trajectory around this impurity and the electric autocorrelation function on the same impurity is derivated. At the second stage, the free relativistic electrons are assumed to move in the effective potential that we have calculated in the mean field approximation: again, the trajectory, around the impurity ion, of the relativistic free electron and the the electric auto-correlation function are computed. In both cases, the amplitude of the collision operator is calculated. The comparison between the relativistic and the classical calculations are done for all the relevant quantities.

PHOTO-IONIZATION IN THE IONOSPHERIC D REGION INDUCED BY THE SOLAR Ly-α LINE EMISSION

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The hydrogen Ly-α line has a dominant influence in photo-ionization processes in the unperturbed terrestrial ionospheric D region. In this paper, we present a procedure to calculate the rate of photo-ionization induced by Ly-α photons during periods after solar X-flare occurrences. This theory is applied to the case of a flare from May 5, 2010 and conditions typical of the upper half of the D region where all other perturbers have a negligible influence. The necessary data on low ionospheric plasma parameters were collected by the very low frequency (VLF) radio-wave technics. The electron concentration is calculated from the amplitude and phase of the VLF signal emitted by the DHO transmitter in Germany and recorded by a receiver located in Serbia, while the introductory data on the X radiation intensity in the wavelength range 0.1 - 0.8 nm were registered by GOES-14 satellite.