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The investigation of photons energy distribution changing in ignition condition of equimolar deuterium- tritium fuel

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Abstract

At the beginning of thermonuclear ignition in fusion plasma, the bremsstrahlung radiation is dominant phenomenon, the photons distribution function is Planckian and plasma is considered as optically thick one. But at a certain energy, the bremsstrahlung radiation and Compton scattering losses rates become equal and plasma makes a transition from optically thick to optically thin and photons distribution switches from Planckian to a Bose-Einstein one. Dominating the Compton scattering and conservation of photon number density in this event, cause to increase the photons temperature and to decrease the negative role of Compton scattering in electrons balance equation. In this paper the photons distribution change effect in calculating of critical burn-up parameter by using of a Fortran programming code is investigated and the results are compared with a typical case where the photons have Planckian distribution throughout the ignition.

Keywords: Compton scattering, bremsstrahlung radiation, dilution factor, critical burn-up parameter

For full article, refer to the Persian section