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Evaluation of Synchrotron Radiation in a Reactor-Grade Tokamak Plasma[1] MASAYASU SATO, AKIHIKO ISAYAMA, Japan Atomic Energy Agency — Recent research on synchrotron radiation from a magnetically confined plasma has pointed out that the synchrotron radiation makes a significant contribution to the local electron power balance of a high temperature fusion plasma such as ITER's. In this study, synchrotron radiation in a reactor-grade tokamak plasma has been evaluated taking account of relativistic treatment, magnetic structure, propagation direction and torus shape. An extended Trubnikov's equation for the spherically symmetric relativistic Maxwellian velocity distribution [1] is used for the emissivity in the oblique propagation. It is found that synchrotron radiation of extraordinary mode increases with the angle (ϕ) between the propagation direction and the magnetic field monotonically, and that the synchrotron radiation of ordinary mode has peaks around ϕ=60–75°, because the emissivity decreases and the temperature in passing plasma region increases with the ϕ. Calculation also shows that the total synchrotron radiation is proportional to the 0.5th power of electron density.

[1] M. Sato and A. Isayama, Fusion Sci. Technol. 52 (2007) 169.

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