**Spectra analysis of runaway electrons synchrotron radiation for the recent EAST runaway experiment**

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**Аналіз спектрів синхротронного випромінювання втікаючих електронів для нещодавнього експерименту на токамаці EAST**

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Generation of runaway electrons during disruptions poses a potential threat to the safe operation of large tokamaks. The energy of these electrons can reach as high as tens of MeV, which could lead to serious damage of plasma-facing-component (PFC) surfaces in large devices like ITER [1]. Therefore, an effective monitoring of the runaway electrons is an important task. The most powerful diagnostic for runaway monitoring is diagnostic based on their synchrotron radiation. The theoretical background for such type of diagnostic was developed in [2-3].

Recently, investigation of runaway electrons generation was started in the EAST tokamak [4]. It was used synchrotron radiation diagnostic for runaway monitoring. In ref. [5] it was provided more detail analysis of synchrotron radiation spectra for the recent EAST experiment.

The theoretical analysis of the synchrotron radiation of runaway electrons with taking into account features of the relativistic electron motion in tokamak was carried out in [3], where it was derived the expression for instantaneous spectral density of the emitted power:

 (1)

where

   

c – speed of light, e and me are the charge and mass of electron, λ – wavelength, Γ≫1 is the relativistic factor, R – major radius of runaway electrons position, B – local value of confinement magnetic field, v∥, v⊥ are longitudinal and transversal components of velocity with respect to confinement magnetic field (v∥>>v⊥), I0,1(z) – modified Bessel function.

Spectra analysis can be simplified by using asymptotic approximation of integral (1). Integral (1) can be integrated by saddle point method when ξ≫1. When the saddle point is  the asymptotic expression becomes:

. (2)

This expression correctly describes spectra in the case of EAST. In [4], expression (2) was used for spectra analysis and on the base of synchrotron radiation spectra and synchrotron radiation spot shape joint analysis it was deduced that the energy of runaways was E=30MeV and pitch angle was θp = 0.16 (shot #28957). In [5], precise expression (1) was used in order to validate and detail results of [4]. It was confirmed the validity of using (2) for spectra analysis in the case of EAST.

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