Erratum: Low-power ECR heating in the T-10 tokamak [JETP Lett. 53, No. 11, 561–565 (10 June 1991)]

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Estimates of the losses associated with electrons trapped in the ripples of a toroidal field of a T-10 tokamak showed that these losses may become appreciable after the electron temperature in this device is raised to 5–6 keV.[1] To determine the effect of these losses on the observable losses in T-10, in particular, the dependence $\tau_E \sim P_{\text{tot}}^{-0.6}$ for $P_{\text{tot}}/P_{\text{OH}}^0 = 3 - 10$ $P_{\text{tot}}/P_{\text{ECH}} + P_{\text{OH}}$ [(where P_{OH}^0 is the ohmic heating before switching on of the electron–cyclotron heating (ECH)], it was necessary to accurately compare the results of the calculations with the measured $T_e(r)$ profiles and the energy times τ_E at various levels of rf power. In the first place, it was of interest to determine whether τ_E remains constant when the rf power is reduced to $\sim 2P_{\text{OH}}^0$. Such a test was shown to be possible in Ref. 1, and also in experiments with the electron–cyclotron heating in a T-7 tokamak,[3] where it was shown that $\tau_{Ee}/\bar{n}_e$ remains constant under conditions of ohmic and auxiliary heating.

Experimental conditions

The electron–cyclotron heating at low power in T-10 tokamak was studied under typical working conditions with a plasma current $I_p \simeq 216$–220 kA, limiter radius $a_L = 28$ cm, magnetic field $B_0 \simeq 29.9$ kG, and $\bar{n}_e \sim 1.5 \times 10^{13}$ cm^{-3}. In the ohmic regime Z_{eff} had values of < 2, and the radiation losses did not exceed 50 kW ($\sim 0.25 P_{\text{OH}}^0$). The automatic adjustment of the gas supply maintained the average plasma density when the ECH was turned on. The length of the discharge pulse was ~ 0.8 s.

The experiment with ECH was carried out with a single gyrotron which produced a central heating at the first harmonic of ECH of power up to 380 kW ($\lambda = 3.69$ mm, length of the rf pulse was ~ 0.1 s and its rise time was 0.3 ms). According to the data on the diamagnetic measurements, the energy content in the plasma during the ECH increases to ~ 10 kJ ($\beta_p = 0.29 \pm 0.05$ for pulse No. 49965). The ion temperature $T_i(0)$, measured from the charge-exchange atoms, remained virtually constant during the ECH and amounted to ~ 550 eV.

