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P4.1080 Comparative lower hybrid ion heating experiments in hydrogen and deuterium high density plasma at FT-2 tokamak

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Investigations of lower hybrid heating (LHH) of plasma ion component very wide and active in 70th and 80th did not result in development of a reliable heating scheme. Excitation of parametric decay instabilities accompanied by ion acceleration observed at different tokamaks at densities exceeding a certain threshold value in majority of experiments did not lead to a substantial ion heating. Only few experiments had reported observation of ion temperature growth [1], therefor the main application of the LH frequency range RF power in tokamaks since that time was related to LH current drive, which is only effective at low plasma densities.
In the present paper we make an attempt to revisit the area of ion LHH in dense plasma. The experiment is performed at FT-2 tokamak (a=0.08 m, R=0.55 m, 19kA < Ipl <34 kA, 2T < BT < 2.5 T, q95~3-6) involved in studies of the interaction of LH waves (f = 920MHz, PRF 200kW) with plasma since early 80th. The exact magnetic field value BT =2.2 T in the experiment was chosen to satisfy the condition for the RF frequency f2=fcefcd, under which the LH resonance could appear in the deuterium plasma only at the highest achievable density values close to the Greenwald limit <ne res> ~ 1020m-3 [2]. This way the linear interaction of the LH power with ion component should concentrated in deuterium in the central plasma region, unlike hydrogen where it should be situated in the gradient zone at <ne LHres> ~ 3.5 1019m-3. Another important feature of the experiment is the effect of prolonged linear increase of the energy confinement time E(<ne>) with density recently discovered in deuterium ohmic heating regime. The so-called LOC mode persists up to <ne> ~ 1020m-3 and makes a transition at high density to the improved confinement mode [3]. For hydrogen plasma, on the contrary, there is a saturation of the dependence E(<ne>) already at <ne> ~ 5 1019m-3 (SOC mode).
As a result of the noted experimental features at the launched RF power PRF 75kW, <ne> 1.2 1020m-3 and Te 700eV for the first time the effective long lasting central LH heating of ions from Ti(0) = 250eV to 400 eV was observed in the dense deuterium plasma, in contrast to the hydrogen plasma of similar parameters where the heating effect was negligible.
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