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EFFECT OF ASPECT RATIO OF THE DEVICE ON THE CHOICE OF MICROWAVE LAUNCH GEOMETRY INTO T-15MD TOKAMAK ^{*)}^{1,2}Kirneva N.A., ¹Kislov D.A., ¹Borshchegovsky A.A., ¹Kuyanov A.Yu., ¹Pimenov I.S.,
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Electron-cyclotron heating (ECH) with a total power of 8 MW will be used in the T-15MD tokamak for additional plasma heating and non-inductive current drive along with other heating methods [1]. To solve a wide range of physical problems, ECH can be used for both on-axis and off-axis heating. A feature of the T-15MD is a low aspect ratio, $A \sim 2.2$, which leads to an increase in the effects associated with trapped particles, including ones in off-axis non-inductive current drive.

Simulation of EC power absorption and EC current drive (ECCD) for various geometry of power launch (Fig. 1) was performed using OGRAY code [2]. Calculations showed that in a tokamak with an aspect ratio of $A \sim 2.2$, the decrease in the on-axis current drive efficiency when the resonance zone is shifted from the high field side (HFS) to the low field side (LFS) is more pronounced than in tokamaks with a higher value of A . Moreover, in case of power absorption on the magnetic surface with $\rho \geq 0.5$, the direction of the EC current changes sign. Thus, HFS power absorption is preferred for off-axis current drive. It should be noted that the small aspect ratio of the T-15MD tokamak leads to the simultaneous existence of two resonant layers at 2nd and 3rd harmonics of the EC frequency in some operational modes. In these cases, the use of equatorial launch for off-axis ECCD on the high field side at second harmonic of ECR is hampered by parasitic absorption (up to 100% at $T_e(0) > 3$ keV) at the third harmonic. To solve the problem, it is proposed to use a vertical power launch (Fig. 1). The vertical launch geometry turns out to be favorable for the implementation of plasma heating at the third harmonic of the EC frequency [3], which may be necessary in high density modes, including one with the simultaneous use of electron-cyclotron and injection heating.

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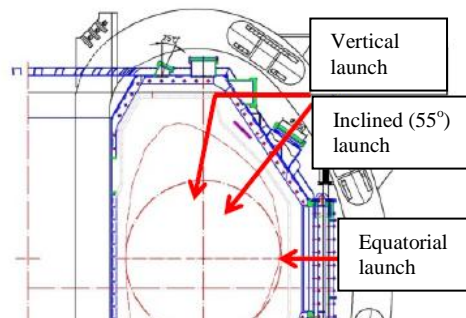


Fig. 1 Possibilities of microwave power launch to the T-15MD

References

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