EXPERIMENTS WITH LITHIUM CAPILLARY POROUS STRUCTURE IN T-10 TOKAMAK WITH TUNGSTEN LIMITERS

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For a long period of time the T‑10 tokamak was equipped with rail and circular limiters made both of graphite. However the level of light impurities in the plasma was found to rise steeply when the ECRH power exceeded 2 MW. In order to reduce the impurity level in regimes with powerful heating and to get experience of operation with tungsten PFCs in 2015 both limiters were replaced with tungsten ones. However it is well known that high Z materials can have harmful consequence to the plasma operation due to neoclassical impurity accumulation. In order to mitigate negative influence of the tungsten a movable lithium limiter based on capillary porous structure [1] was mounted on the upper manifold. It can operate in two regimes. In the first regime the limiter is heated and lithium gettering is made by evaporation before the discharges. The limiter was removed from plasma during discharge in this case. In the second regime preheated limiter is set at the needed radius and it interacts with the plasma during discharge. The results of the first experiments were published in [2]. This report summarize previous and presents also new results.

Experiments showed that the use of Li limiter effectively reduces influxes of light impurities coming from the wall both in graphite and W configurations. The reduction of light impurities is connected with the Li deposit, but not with the fluxes. Li use not needed in clean conditions, except for the reduction of recycling. Strong rise of the Li fluxes with insertion of the Li limiter into plasma did not influenced W sputtering . So Li fluxes did not form stationary protection layer on the W limiter in a long time scale. In short time scale Li gettering before the experiment form protection film and reduces W influx. This reduction disappeared after 3-5 discharges. Experiments were conducted with the position of Li limiter at the radius of the main rail limiter with high Li fluxes. Absolute values of the radial distributions of LiII, LiIII lines in visible diapason and Li nucleus with CHERS were measured. The comparison of experiment and modeling of the lithium diffusion with the code SHTRAHL [3] will be presented in report.

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References

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