The first application of HIBP for co-NBI plasma potential measurement in TUMAN-3M tokamak [[1]](#footnote-1)\*)

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Neutral beam injection (NBI) is an effective method of plasma heating, rotation generation and central fuelling of tokamak discharge. In previous experiments in TUMAN-3M tokamak the effect of counter-NBI (counter-directed with plasma current) on plasma confinement was investigated [1]. Counter-injection leads to high first orbit losses of fast particles, which on the one hand leads to decreased NBI effectiveness, and on the other hand facilitates transition to H-mode due to build-up of negative radial electric field. In the present time co-NBI scenarios are chosen to be main operational regime. Co-NBI is better for fast ion capture, though co-NBI effect on plasma confinement is governed by combined effect of positive Er generation from plasma rotation and negative Er generation due to fast ion losses.

The effect of co-NBI on radial electric field generation and plasma confinement in TUMAN-3M tokamak was investigated by means of heavy ion beam probe (HIBP) diagnostic. To achieve that HIBP complex on TUMAN-3M, initially constructed for counter-NBI measurements, underwent the modernization, which resulted in possibility to provide measurement in co-NBI regime.

In the series of discharges with low plasma density (< 1.2.1019 m-3) measurements of plasma potential evolution by means of HIBP were carried out. Potential evolution was investigated in reference ohmic discharges, in discharges with co-NBI and in discharges with additional gas puff which could initiate transition to H-mode. HIBP measurements have shown that in low density discharges co-NBI does not significantly affect plasma due to high fast particle losses, including shine-through losses; radial electric field generation of both signs was not observed. Also it was observed that combined co-NBI and additional gas puff result in initiation of transition to self-sustaining H-mode.

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References

1. S.V. Lebedev et al // Nucl. Fusion 2009 49 085029

1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/L/Mu/ru/BO-Belokurov.docx) [↑](#footnote-ref-1)