Analysis of semi-global L-H transitions in the different regimes of ECCD in T-10 tokamak [[1]](#footnote-1)\*)

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At the moment of non-local (“global”) L-H transitions found in various regimes of JET and JT-60U tokamaks earlier [1-3], the rise of Te,i and ne starts simultaneously in the spatial zone ≈0.3<r/a<1, heat and density fluxes fall simultaneously in the same region. At the ITB-events in JT-60U and T-10, heat and density fluxes fall in narrower internal spatial zone within ≈50% of minor radius, see details in [3-5]. At the moment of new transitions discussed below (W limiter with Li-coating), Te starts to rise at 0.2 r/a<0.6 similar to its behavior at ITB-event. The density rises in the wider zone ≈0.3<r/a<1, similar to a non-local L-H transition and diffusivity coefficient De decreases in the same zone. Let us call this phenomenon a “semi-global” L-H transition. Spontaneous transitions, including a quasi-periodical one, occur at simultaneous co+counter ECCD only (one case was briefly described in [6]). The triggers of the transitions are spontaneous drop of the Li-containing flakes in various regimes of ECCD [7] and neon gas puffing in the experiments described in [8-9]. An abrupt increase of energy confinement time at the moment of the transition is equal to 10%-20%.

The main goal of the present report is to obtain the profiles of the variation of the electron heat diffusivity coefficient δχe (r) and diffusion δDe (r) at the time of the transition. In a contrast with [1-5], the rise of density is not a correction only. The convection part of the heat flux equal to YTΓn (Γn – density flux) is also not well defines since Y=2.5 is usual suggestion. Nevertheless, the experiments of TFTR and JET show that Y=1.5 in the cases with high ion temperature. The new analytical expressions allow us to analyze δχe (r) in the case of Y=2.5 and (part of Te rise is explained by the reduction of Γn ) and Y=1.5 (Te rise is absent and the absolute value of δχe (r) is higher).

Modelling of L-H transitions with ASTRA transport code linked with OGRAY code is under the way. The quantities and profiles of the absorbed EC power and driven current were calculated by the solution of Fokker-Plank equation with code OGRAY [10]. The work was supported by ROSATOM Corporation

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