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GENERATION OF SEVERAL NON-THERMAL ELECTRON POPULATIONS IN
TJ-IU Upgrade TORSATRON

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Experiments have been carried out in TJ-IU Upgrade ($I=1$, $m=6$, $R=0.6$ m, $\langle a \rangle = 0.1$ m, $B = 0.5+0.7$ T). During this experimental campaign the magnetic configuration is characterised by a rotational transform, ι , of about 0.2, with negligible shear, and magnetic well depth of 6.9%. ECRH plasmas (X mode, 2nd harmonic, $P = 90+250$ kW, pulse length ≈ 25 ms) have been produced at 37.5 GHz [1]. Since power absorption is low (20% in single pass absorption) and not well localised, absorption by suprathermal electrons at high magnetic field is expected. Typical line average electron densities, n_e , are about $0.2-0.5 \times 10^{19} \text{ m}^{-3}$ and electron temperature, T_e , ranges between 100-200eV. X-ray spectra have been recorded using a Si(Li) detector (1 keV to 20 keV) and a NaI(Tl) one (over 10 keV). The Si(Li) detector views a radial chord while the NaI(Tl) detector looks at the plasma tangentially through a glass window. Two additional NaI(Tl) detectors working in current mode are monitoring total hard X-ray (HXR) flux.

High HXR fluxes, related to runaway electrons generated during magnetic field ramp-up and down, have been controlled using appropriate gas puffing rates [2]. Nevertheless, during ECR plasma production and heating, moderated HXR fluxes are also detected. Different HXR flux behaviours are observed. Depending on the ECRH power absorption, HXR fluxes present a "tokamak-like" time evolution behaviour or right the opposite, with density. It has been seen that the increase of absorption while the density raise, is accompanied by an increase in the HXR flux up to the cut-off density, due to the perpendicular diffusion in momentum space caused by EC-waves. But, under other plasma conditions, for example, when gas puffing is switched off and density decreases, again an increase of HXR flux appears, related to acceleration in the magnetic field direction.

In the present work, three energies of suprathermal electron populations generated by off-axis resonant absorption have been measured. These energies are typically 0.8 keV, 3 keV and 20 keV.

The influence of the magnetic ripple and the ι variation on the generation of non thermal electrons will be also studied, taking advantage of the flexibility of TJ-IU.

1-Ascasibar E. et al, Proceedings of the 15th IAEA Conf. on Plasma Physics and Controlled Nuclear Fusion Research in Seville (September 1994), **1**, 749, IAEA Vienna (1995).

2-Ascasibar E. et al, Transactions of Fusion Technology, **27**, 198, (1995).