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RELAX RFPにおけるMHD緩和に伴う電子温度変化

Change in electron temperature associated with MHD relaxation event in RELAX RFP

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RELAX (REversed-field pinch Low Aspect eXperiment) is a reversed field pinch (RFP) machine whose major radius *R* is 0.5 m, and the minor radius *a*, 0.25 m. The aspect ratio A is as low as 2, which defines the basis of the research objectives of RELAX as geometrical optimization of the RFP configuration. The discharge parameters attained to date are as follows; plasma current I_p ~100kA, discharge duration τ_D ~3ms. The central electron temperature T_e (0) is measured by YAG:Nd laser Thomson scattering; the double-filter technique provides soft-X-ray temperature also.

In some medium-current (Ip~50-60 kA), deep-reversal (F~-1.0) discharges, it is observed that a rapid growth of the magnetic fluctuations occurs as a series of discrete events. Θ (=Bp(a)/<Bt>) and F (=Bt(a)/<Bt>) also change rapidly, followed by slow recovery to the initial values, where Θ is the pinch parameter and F, the field reversal parameter, with poloidal field Bp and toroidal field Bt. Time evolution of the (Θ, F) trace indicates that a rapid re-distribution of the current profile takes place at each event. The electron temperature determined by double-filter technique also shows a rapid decrease followed by slow recovery, as shown in Fig.1.

Since the SXR temperature is determined from the line-of-sight intensity of SXR emission measurement, we have applied another method to estimate the electron temperature evolution at the event. The Thomson temperature in RELAX is geometrical center in space and single-point in time. We re-plotted the Thomson temperature with time axis relative to the rapid change in magnetic fluctuation amplitude over discharges having almost identical Theta and F values and incremental fluctuation amplitudes. Figure 2 shows time evolution of the Thomson temperature before and after the rapid increase of the magnetic fluctuation, t=0 in the time axis corresponds to the start of the event. We can identify a trend of higher temperature before the event, which indicates rapid electron thermal diffusion at the event.

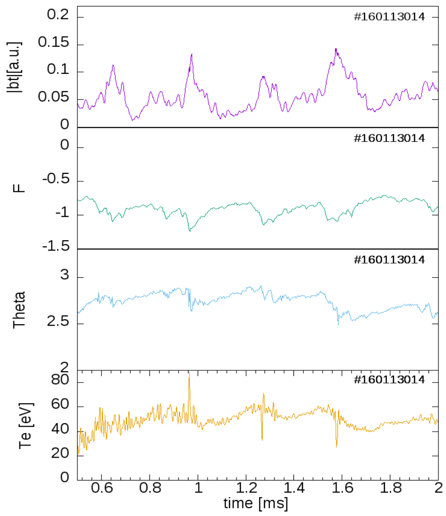

Fig.1. Time evolution of magnetic fluctuation, F, theta, electron temperature from SXR during flattop of plasma duration.

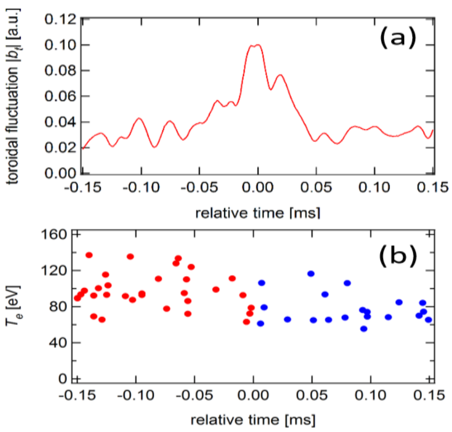

Fig.2. (a) Time evolution of a MHD relaxation; (b) Electron temperature from Thomson scattering which are ensemble-averaged relative to a MHD relaxation.

REFERENCES

[1] R. Ueba et al., PFR 9, 1302009 (2014)
[2] G. Bateman : MHD Instabilities, p.194, The MIT Press(October 19, 1978)