

§4. Analysis of Edge Plasma Turbulence Based on Two-dimensional Visible Image Measurement in Open Magnetic Field Configuration Plasmas

Nishino, N. (Graduate School of Engineering, Hiroshima Univ.)

The aim of this study is to measure peripheral turbulence in GAMMA 10 plasma and to compare it with turbulence in closed magnetic field configurations. Therefore, this study shed light on general characteristics of turbulence in magnetic confined plasma

Experimental setup

Fig.1 shows schematic of GAMMA 10 device and fast camera location. The fast camera (MEMRECAM GX-1 plus, NAC image technology) was installed at the central cell near the limiter. In this study no optical filter was used, because the light emission was almost H α line and GAMMA 10 plasma is usually dark due to low electron density.

Results and discussion

In the central ECH (c-ECH) experiment the diamagnetic signal increased, however when the strong light emission on the limiter was measured, the diamagnetic signal changed to decrease. Fig. 2(a) shows the fast camera image. The left side in the image the limiter was clearly seen (dashed white line). To make the time dependence of the light emission the streak camera image on the white line in Fig. 2(a) was shown in Fig. 2(b). At ~190ms the strong light emission was observed and the diamagnetic signal began to decrease. Using FFT the power spectra has ~6kHz peak. This low frequency turbulence depended on the antenna position, and the optimal position was defined.

In the c-NBI experiment the other low frequency turbulence of 8-12kHz was observed. Fig. 3 shows the power spectra of the light emission of pixel data on the limiter and DMCC(the diamagnetic signal)/ NeCC (the line integrated electron density). In the raw images this turbulence was seen as plasma rotation. During c-NBI both DMCC and NeCC almost increased, however, the end of c-NBI DMCC began to decrease. At this time the frequency of turbulence was seemed to increase. The plasma rotation was believed to relate to the energy/particle confinement, and these phenomena suggested that due to the change of the frequency the confinement would degrade and the recycling increased. Then the recycling induced the degradation of the confinement. That might be positive feed-back.

Future plan

Using two bundle fibers turbulence at central column

plasma will be measured by different views and hopefully three-dimensional images can be reconstructed. It will help to understand the physics of turbulence.

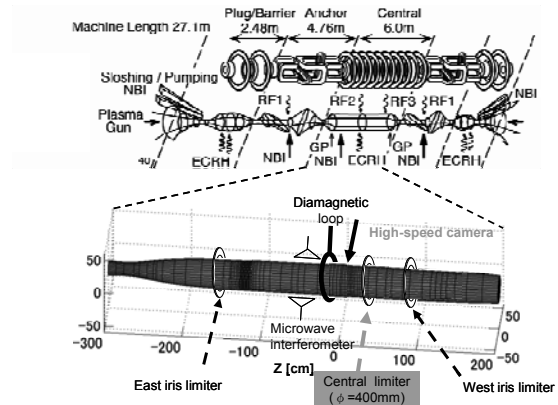


Fig.1 GAMMA 10 device and camera location

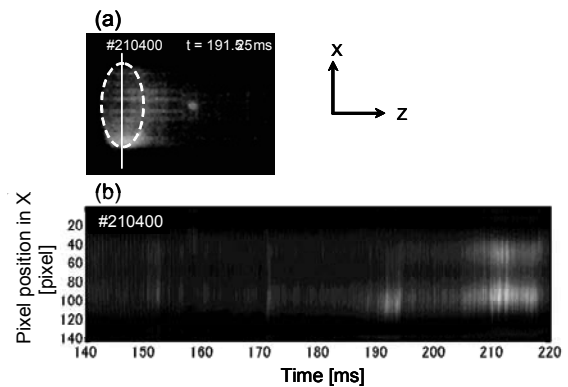


Fig.2 Fast camera image and its streak image during c-ECH experiment

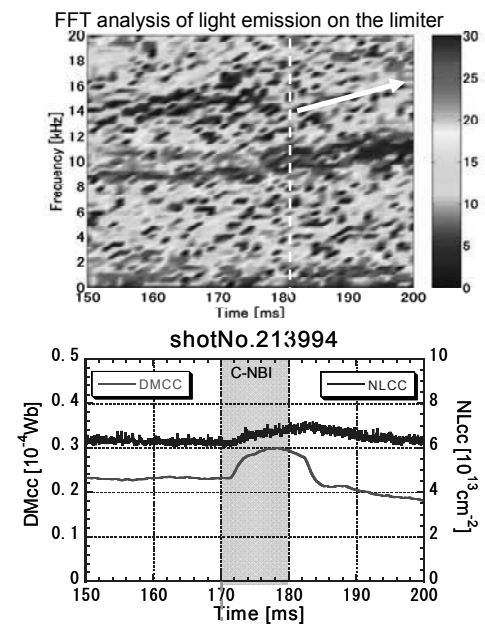


Fig.3 Power spectra of light emission on the limiter and DMCC/NeCC