28E16P

軟X線イメージングを用いた
低アスペクト比RFPにおける三次元構造の計測と評価
Measurement and Evaluation of 3D Structure on Low-aspect-ratio RFP with SXR Imaging Diagnostic

三瓶明希夫[1]，政宗貞男[1]，出口和明[1]，中木聖也[1]，田中裕之[1]，西村香苗[1]，比村治彦[1]，
大舘暁[2]，水口直紀[2]，秋山毅志[2]
A. Sanpei[1], S. Masamune[1], K. Deguchi[1], S. Nakaki[1], H. Tanaka[1], K. Nishimura[1], et al.

1)京工繊大，2)核融合研
1)Kyoto Inst. Tech., 2)NIFS

In a low-A RFP machine RELAX (R = 0.51 m/a = 0.25 m (A = 2)), a quasi-periodic transition to quasi-single helicity (QSH) state has been observed in shallow reversal discharge. During the QSH state, the fluctuation power concentrates in the dominant m = 1/n = 4 mode, and a (toroidally rotating) 3-D helical structure has been observed with radial array of magnetic probes[1]. We applied a high-speed (10-microsecond time resolution) soft-X ray (SXR) imaging diagnostic system to take SXR images during the QSH state, identifying the characteristic helical SXR structures which suggest hot or dense helical core[2]. The high-speed SXR imaging system has been extended to take the images from tangential and vertical directions simultaneously to observe 3-D dynamic structures of the SXR emissivity.

A schematic drawing of the dual imaging system is illustrated in Fig. 1. One unit is for the tangential imaging, and the other for the vertical imaging, with two synchronized high-speed cameras. Two cameras are synchronized with frame rates: from 50k to 150 kfps.

Figures 2 show the dependence of vertical and tangential SXR images on reversal parameter F. In vertical image, zonal structure becomes to be tilted as F becomes lager. In tangential image, while, a filament structure clearly appears in shallow reversal discharge. The structures in shallow F suggest helical SXR emissivity distributions associated with internal tearing mode. This result is consistent with F dependence of mode spectrum obtained from edge magnetic probes. The most recent results using synchronized two high-speed cameras will be presented, together with discussion on possible reconstruction methods for 3-D imaging.

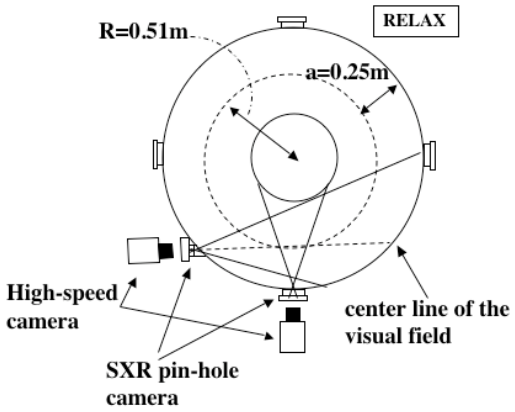
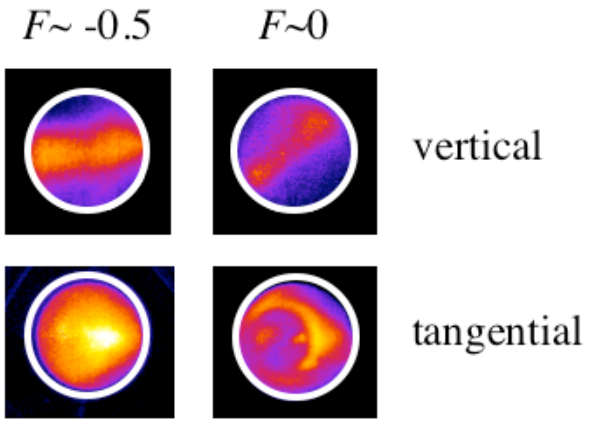


Fig.1: Top view of dual imaging system.



Figs.2: Snapshots shows dependence of vertical and tangential SXR images on reversal parameter F. Helical structure appears in shallow reversal discharge.

References
[1] K. Oki, et al., Plasma Fusion Res. **7**, 1402028 (2012).
[2] A. Sanpei et al., IEEE Transaction Plasma Science, **39**, 2410 (2011).