MHD studies in low-*A* RFP with SXR imaging diagnostic

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Three-dimensional (3-D) effects on MHD phenomena in axisymmetric systems such as reversed field pinches (RFPs) have attracted much attention. In the RFP, for example, recent progress has shown the importance of helically deformed RFP configuration where the single helical magnetic axis state is self-organized [1]. In a low-aspect-ratio (low-*A*) RFP machine RELAX (R = 0.51 m/a = 0.25 m (A = 2)) [2], a quasi-periodic transition to quasi-single helicity (QSH) state has been observed. During the QSH state, the fluctuation power concentrates in the dominant $m = 1/n = 4$ mode, and a 3-D helical structure has been observed with radial array of magnetic probes [3]. Modeling of the self-organization process has been in progress for the low-*A* RFP configuration, and results from the nonlinear 3-D MHD simulations have shown remarkable formation of the n=4 structure [4]. In order to identify the emission structures associated with dominant MHD instabilities in the RFP, two-dimensional (2-D) high-speed soft X-ray (SXR) imaging diagnostics were developed [5,6]. In the present study, SXR images associated with magnetic fluctuations obtained with edge magnetic probes and phase locking of the dominant m =1 modes have been studied using 2-D imaging diagnostics. The 2-D image analyses have shown that MHD instabilities strongly depend on reversal parameter F. In shallow reversal discharge ($F \sim 0$), helical deformed structures tend to appear. On the other hand, in deep reversal discharge ($F \sim$ -1.5), oscillating hollow SXR and visible emissivity distribution has been observed. The 3-D structures associated with MHD studies will be reported.

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