Study of Electric-Field-Shear Effects on Turbulence Suppression with Confinement Improvement using X-ray Diagnostics in GAMMA 10

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Experimental investigation in the effects of radially sheared electric-field (or potential) formation in plasmas is one of the most critical issues in plasma confinement improvements. A remarkable characteristic advantage in open-ended mirror devices is an easy control of a radial potential profile due to locally heated electron axial flow from a plug region into a machine end region along lines of magnetic force. This potential control ability in mirrors provides flexible experimental studies of relations between radially produced electric shear profiles and the suppression of fluctuation driven radial losses (or transverse plasma confinement), as the importance of such relations is commonly noted in several confinement-improvement investigations.

Recent experimental findings of the shear formation effects on the suppression of not only coherent drift waves but turbulent fluctuations are made when electron-cyclotron heatings (ECH) for ion-confining potential formation are applied in association with a significant rise in an absolute value of the central-cell potential and the resulting formation of a strong shear of electric fields on the order of 10 kV/m2 in the radial direction of the plasma column (dEr/dr) in GAMMA 10. Those effects are investigated by using X-ray diagnostics.