Improved Mirror-Plasma Regime Guarded by Coaxially Nested Intense E×B Radially Sheared Flow Having a Peaked-on-Axis Sheared Vorticity

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Coaxially nested intense E×B sheared flow having a peaked-on-axis sheared high vorticity profile realizes an upgraded stable mirror-plasma regime in GAMMA 10 [1-3].

The plasma temperatures produced by ion-cyclotron heating (ICH) with auxiliary central-mirror-cell electron-cyclotron heating (ECH) increase significantly; that is, a bulk central-cell electron temperature increases to ≈ 0.75 keV [*i.e.,* an order-of-magnitude increase with 250 kW central-cell ECH] along with the central magnetically confined ions to ≈ 7 keV.

Such radially sheared flow having peak-on-axis high vorticity guards and improves whole core plasma confinement, and is actively controlled by upgraded peaked-on-axis ≈ 2.5 kV ion-confining ambipolar potential formed by plug ECH application.

This high performance plasma is maintained only when *coaxially nested intense E×B sheared flow* is actively formed due to plug ECH control. In fact, when the peaked-on-axis sheared flow is terminated, such a high performance plasma is migrated out radially *just like a loss of the on-axis "rotational shaft"*.

Such a performance shot also provides an achievement of a larger stored energy for axially *potential-confined ions* exceeding that (i.e., diamagnetism) for ≈ 6.5 keV central-mirror magnetically confined ions for the first time with the on-axis estimated energy drag (confinement) time τ_{E0} (from *central-mirror-confined ions* to electrons) ≈ 0.14 s, which approaches to Pastukhov's energy confinement time ≈ 0.2 s due to plug potentials.

Furthermore, ECH controlled hot-layer formation facilitates plasma-rotation profile formation with a radially localized high-vorticity layer. In the vicinity of the layer, a radial transport barrier is formed [1], showing similar properties to ITB in toroidal plasmas. X-ray imaging of the suppression of intermittent turbulent structures will be shown [1-3].

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