Counter Current Toroidal Rotation Induced by Lower Hybrid Waves

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In certain Alcator C-Mod discharges, lower hybrid waves have been shown to induce a counter current change in toroidal rotation of up to 40km/s in the central region of the plasma (ρ ~<0.4). This modification of the rotation profile develops on a time scale comparable to the current redistribution time (~200ms) but slower than both the energy and momentum confinement times (~20ms). This separation of time scales suggests that it is the current drive (as opposed to the heating) provided by the lower hybrid waves that is responsible for the rotation profile modifications. Furthermore, changes in central rotation velocity during lower hybrid wave injection are well correlated with changes in normalized internal inductance (a measure of the peakedness of the current density profile). The magnitude of the change in rotation depends on the phasing of the launched lower hybrid waves. The nature and cause of this phase dependence is still under investigation, but likely factors include the shape of the lower hybrid current density profile and wave accessibility. Although the precise mechanism responsible for this phenomenon is not yet understood, these results open up the possibility of using lower hybrid waves as a mean of toroidal rotation profile control.