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Flow Velocity Measurement with Mach Probe and Laser-Induced Fluorescence in the Un-magnetized Ar Plasma HYUN-JONG WOO, KYU-SUN CHUNG, Hanyang University, TAIHYEOP LHO, National Fusion Research Center — The Mach probe (MP), composed of two opposite-directional electric probes, is generally used for the measurement of plasma flow velocity in edge of magnetic fusion devices, space propulsion systems, processing plasmas, sheath and pre-sheath regions. Although several un-magnetized MP theories are available, they have not been completely calibrated and should be checked by comparative (or simultaneous) measurement with another diagnostic tools such as laser-induced fluorescence or optical emission spectroscopy. Most of the previous calibrations have been done in the low Mach number (say, less than 0.5), where the existing theories predict the very similar numbers, so that the validity of the calibration is still in doubt. In this work, the plasma flow velocity is measured via MP and LIF in un-magnetized Ar plasma generated by LaB₆ cathode, one of two sources of Diversified Plasma Simulator (DiPS). For meaningful comparison of MP and LIF, we increase the plasma flow velocity over the $0.5C_s$, where C_s is the ion sound velocity, by generating a steep density gradient from diverging magnetic field and measure the flow velocity flat magnetic field near the diverging magnetic field. Although magnetic field are applied in plasma, the ion gyro-radius is still less than the probe radius. Hence, the MP results is analyzed by un-magnetized probe theories and these are compared to LIF results.

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