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Evaluation of Ion Specific Heat Ratio in a Transonic Plasma Flow AKIRA ANDO, MASAAKI INUTAKE, KUNIHIKO HATTORI, TAKAHIRO MAKITA, HIROKAZU ISOBE, Department of Electrical Engineering, Tohoku University — Dynamics of a fast-flowing plasma in a magnetic field are important to clarify a variety of MHD phenomena in space-, fusion- and also in electric propulsion-plasmas. Although an ion specific heat ratio γ_i is one of the key parameters in plasma dynamic behaviors, it has not been measured yet in laboratory plasmas. In a high density plasma with a weak magnetic field, electrons are magnetized and restricted by a magnetic field, besides ions are not magnetized and behaves as ion fluid surrounded by the field-restricted electrons. In this case, ion Mach number changes according to the one-dimensional (1D) isentropic flow model. When a compressible flow passes through a Laval nozzle, Mach number becomes unity at the nozzle throat. We measured an ion Mach number M_i by a Mach probe in a transonic plasma flow passing through a Laval type magnetic nozzle. The ion specific heat ratio γ_i was evaluated for the first time by comparing the spatial profile of M_i with 1D flow model.

Akira Ando
Department of Electrical Engineering, Tohoku University

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