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Supersonic flow and electric potential of argon arc jet along open-field magnetic line HIROSHI AKATSUKA, YOH NAGAHARA, KAZUYUKI YOSHIDA, TOMOHIKO SHIBATA, HARUAKI MATSUURA, ATSUSHI NEZU, Tokyo Tech. — We report plasma parameters of argon arc jet along open-field magnetic line. The argon arc plasma is generated under atmospheric pressure, and ejected through an anode-nozzle into a rarefied wind tunnel continuously with a uniform magnetic channel of 0.16 T. The anode-nozzle is sufficiently choked to flow the plasma at its acoustic velocity. The plasma is further accelerated into supersonic flow through the open-field line. We experimentally measure ion acoustic Mach number, 2-dimensional ion velocity, plasma space potential, electron temperature and density by a para-perp and a 4-tip Mach probes. We find electric potential drop, increase in ion Mach number up to about 3, and following velocity reduction to subsonic flow. We conducted numerical modeling, where we assume the divergence of the magnetic field was equivalent to the increase in the cross sectional area of flowing channel. We introduced the deceleration model with collisions between ions and neutral particles. The model simulates the deceleration of the plasma at downstream region much better than isentropic model.

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