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Ion flow velocities at the sheath edge in a plasma with two warm ions species NONG XIANG, JING OU, Institute of Plasma Physics, Center for Magnetic Fusion Theory, Chinese Academy of Sciences — How to determine the ion flow velocities at the sheath edge in a plasma containing two positive ion species with finite temperatures is still an open question. In additional to the well known Bohm criterion $N_1/u_1^2 + N_2/u_2^2 = 1$ (here N_1 and N_2 are the ion concentrations, u_1 and u_2 are the ion flow velocities normalized to the individual sound speed), a second constraint is required to determine the flow velocity for each ion species at the sheath edge. In this work, the flow velocities are determined by numerically solving the time-dependent fluid equations for electrons as well as ions. The second constraint is obtained and it is shown that the constraint depends not only on local plasma parameters at the sheath edge, but weakly on parameters in the plasma region. The ion flow velocities at the sheath edge deviate slightly from each individual sound speed.

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