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A Model for the Ion Velocity Distribution at a Target in a Grazing-Angle Magnetic Field ALESSANDRO GERALDINI, University of Maryland, College Park and EPFL — Ions in the vicinity of a planar target are typically accelerated towards the target in a thin boundary layer, known as the Debye sheath, whose thickness is a few Debye lengths. Moreover, in fusion devices, where the magnetic field typically reaches divertor targets at grazing angles, the electric field distorts the approaching Larmor orbits at distances of a few ion sound gyro-radii from the target. If the Debye length is much smaller than the ion sound gyro-radius, the region where ion orbits are distorted is quasineutral and known as the magnetic presheath. The effect of the magnetic presheath on the velocity distribution of ions reaching the target is non-trivial, but crucial to calculate sputtering rates. A model for the ion distribution function reaching the target that includes the effect of gyro-orbit distortion is presented. Electrons are assumed to be adiabatic, with a negligible gyro-radius. The model ion distribution function is compared to numerical solutions of the magnetic presheath and Debye sheath, showing good agreement for large ion temperature. Important features such as the average angle of incidence and approximate shape of the energy-angle distribution are captured by the model also when the ion and electron temperatures are comparable.

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