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Simulation of non-Maxwellian electron velocity distribution functions in the divertor region[1] IGOR D. KAGANOVICH, PPPL, DMYTRO SYDORENKO, Department of Physics, University of Alberta, Edmonton, AB, Canada, ALEXANDER V. KHRABROV, LEONID ZAKHAROV, MICHAEL A. JAWORSKI, PPPL — A single Maxwellian distribution is typically used in fluid-based simulations of scrape-off layer (SOL) plasmas, but recent experimental results indicate that kinetic effects in the SOL may be significant enough to call this approach into question. We performed particle-in-cell simulations of electron velocity distribution function (EVDF) for typical divertor plasma parameters. Simulations show that due to insufficient collisionality and large temperature gradients near the wall, the EVDF is non-Maxwellian and its energetic tail has temperature larger than the bulk of cold electrons. In the limit of no recycling and high electron temperature, the EVDF becomes strongly anisotropic, the sheath potential nearly vanishes and thus electrons are practically not confined and ions are not accelerated towards the walls. This strong modification of EVDF leads to the fact that the heat transmission factor of the sheath can reach a low value of about 2, compared to the conventional theoretical value of 7.

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