SuperGaussian distribution functions in inhomogenous plasmas

JEAN-PIERRE MATTE, INRS-EMT — In plasmas heated by a narrow laser beam, the shape of the distribution function is influenced by both the absorption, which tends to give a superGaussian (DLM) distribution function [1], and the effects of heat flow, which tends to make the distribution more Maxwellian, when the hot region is considerably wider than the laser beam [2]. Thus, it is only at early times that the deformation is as strong as predicted by our uniform intensity formula [1]. A large number of electron kinetic simulations of a finite width laser beam heating a uniform density plasma were performed with the electron kinetic code FPI [1] to study the competition between these two mechanisms. In some cases, the deformation is approximately given by this formula if we average the laser intensity over the entire plasma. This may explain why distributions were more Maxwellian than expected in some experiments [3].
[1] J.-P. Matte et al., Plasma Phys. Contr. Fusion 30, 1665 (1988) [2] S. Brunner and E. Valeo, Phys. Plasmas 9, 923 (2002) [3] S.H. Glenzer et al., Phys. Rev. Lett. 82, 97 (1999).

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