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Equilibrium statistical mechanics of self-consistent wave-particle system YVES ELSKENS[1], umr6633 CNRS-univ. Provence, Marseilles (FR) — The equilibrium distribution of N particles and M waves (e.g. Langmuir) is analysed in the weak-coupling limit for the self-consistent hamiltonian model $H = \sum_r p_r^2/(2m) + \sum_j \omega_j I_j + \varepsilon \sum_{r,j} (\beta_j/k_j) \cos(k_j x_r - \theta_j)$ [1]. In the canonical ensemble, with temperature T and reservoir velocity $v < \inf_j \omega_j/k_j$, the wave intensities are almost independent and exponentially distributed, with expectation $\langle I_j \rangle = k_{\rm B} T/(\omega_j - k_j v)$. These equilibrium predictions are in agreement with Monte Carlo samplings [2] and with direct simulations of the dynamics, indicating equivalence between canonical and microcanonical ensembles.
[1] Y. Elskens and D.F. Escande, Microscopic dynamics of plasmas and chaos (IoP publishing, Bristol, 2003).
[2] M-C. Firpo and F. Leyvraz, 30th EPS conf. contr. fusion and plasma phys., P-2.8 (2003).

[1]elskens@up.univ-mrs.fr

Yves Elskens
umr6633 CNRS-univ. Provence, Marseilles (FR)

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