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【534】Superstatistical energy distributions of an ion interacting with a neutral buffer gas

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An ion held in a radiofrequency trap interacting with an ultracold buffer gas enables studying two- and many-body physics in a regime of intermediate interaction strengths, including collisions and chemical reactions at very low energy. During elastic ion-atom collisions energy is transferred between the thermal motion of the ion and the RF field, leading to multiplicative fluctuations of the ion's energy and a power-law tail in the energy distribution. We present an analytical model of this process derived through the formalism of superstatistics and compare the predicted power-law exponent to the results of numerical simulations, confirming the ability to fine-tune the energy distribution of the ion by altering experimental parameters.

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