# EFFECTS OF DISORDER ON ELECTRON HEATING IN ULTRACOLD PLASMAS

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Starting from the beginning of their research in the early 2000's, the ultracold plasmas were considered as a promising tool to achieve considerable values of the Coulomb coupling parameter for electrons [1]. Unfortunately, this was found to be precluded by a sharp spontaneous increase of temperature, which was often attributed to the so-called disorder-induced heating (DIH) [2]. It is the aim of the present report to quantify the effect of spontaneous heating as function of the initial ionic disorder and, thereby, to estimate the efficiency of its mitigation, *e.g.*, by the two-step formation of ultracold plasmas, involving the intermediate stage of the blockaded Rydberg gas in a "quasi-crystalline" state [3].

As a result of the performed simulations [4], we found that dynamics of the electrons exhibited a well-expressed transition from the case of a quasi-regular arrangement of ions to the disordered one; the magnitude of the effect being about 30%. Thereby, the two-stage formation of ultracold plasmas can really serve as a tool to increase the degree of Coulomb coupling, but the efficiency of this method is moderate.

Yet another interesting finding of our study is that the spontaneous heating remains considerable (by an order of magnitude) even if the initial arrangement of ions was almost regular. Therefore, the disorder-induced heating can hardly be the dominant effect in this situation. A much more reasonable explanation could be based on the effect of "virialization" [5], which was suggested even before DIH but was not taken into account for a long time.

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