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Recollision revisited: How far can we push the classical picture?[1]

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The double ionization probability of nobel gases in strong laser fields at intermediate intensities exceeds the probability that can be expected on grounds of an independent electron picture by *several orders of magnitude*. Electron-electron correlation is the well-known origin for this dramatic effect. We have revisited this so called nonsequential double ionization in the simplest 2-electron system, the Helium atom, and, using very high resolution coincidence techniques, we observe a surprising structure in the correlated electron momentum distribution. The structure can be interpreted as a signature of the microscopic dynamics in the recollision process, taking the analogy to the classical (e,2e) processes one step further. This interpretation is supported by inspecting the solution of the 2-body 3-dimensional time-dependent Schrödinger equation.

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