SUPPLEMENTARY INFORMATION

Quantum dynamics of the temporary capture of light atoms by superfluid helium nanodroplets at very low collision energies (≈1-13 meV). The case of the hydrogen atom and its isotopes

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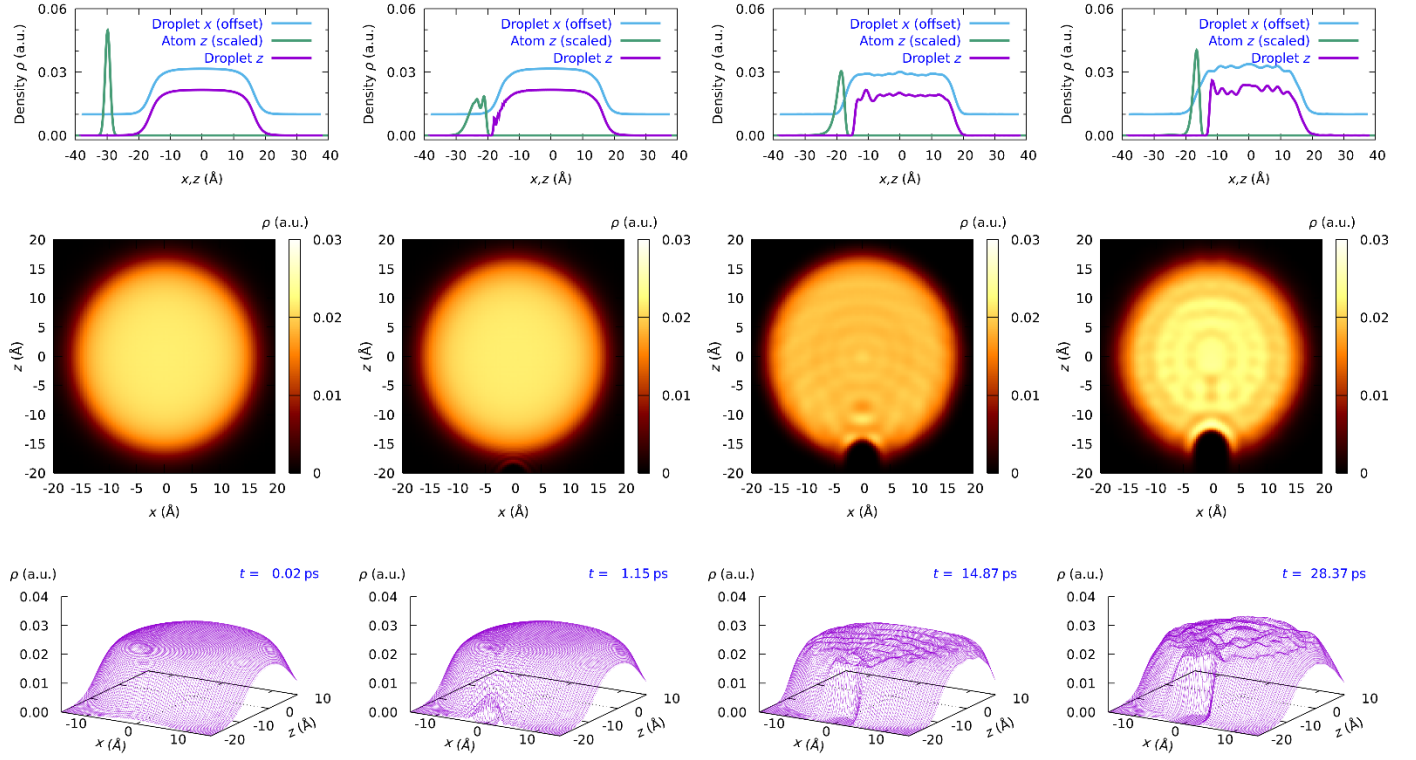## Supplementary Information Contents

Figure S1. Snapshots of the atomic WP probability density and helium density for the D atom at $E_{k,0}$ = 42.52 K (condition of Movie 4) at four representative times (initial, collision with the surface, in the dimple and also in the dimple): WP probability density and helium density along the z axis (top); helium density (2D) in the xz plane (middle); helium density (3D) in the xz plane (bottom). A H---HeND collision complex with a lifetime higher than 40 ps is observed.
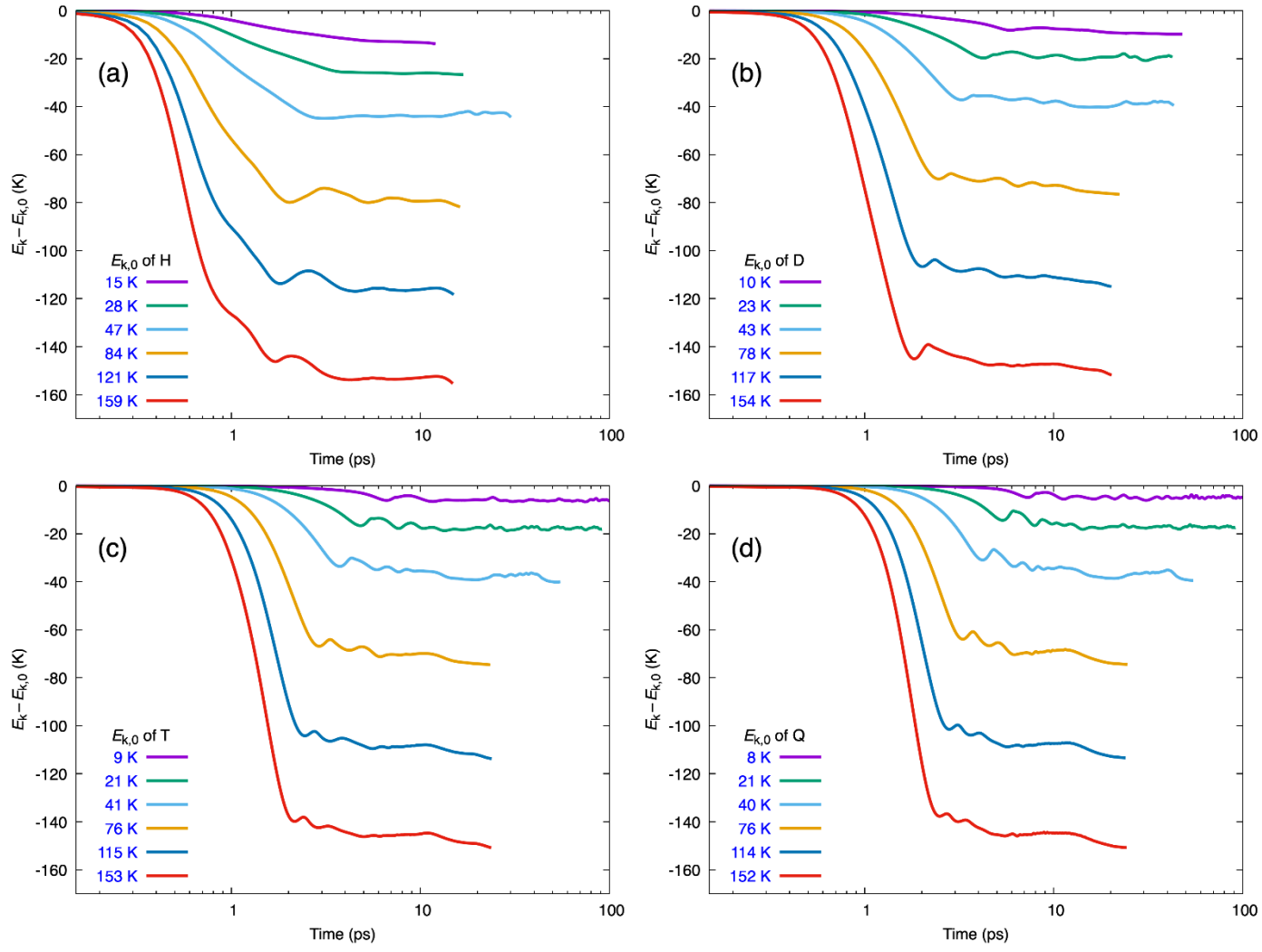
Figure S2. Time evolution of the change in the kinetic energy of the atom with respect to the initial value (E_k-$E_{k,0}$), for the four isotopic variants (H, D, T and Q).
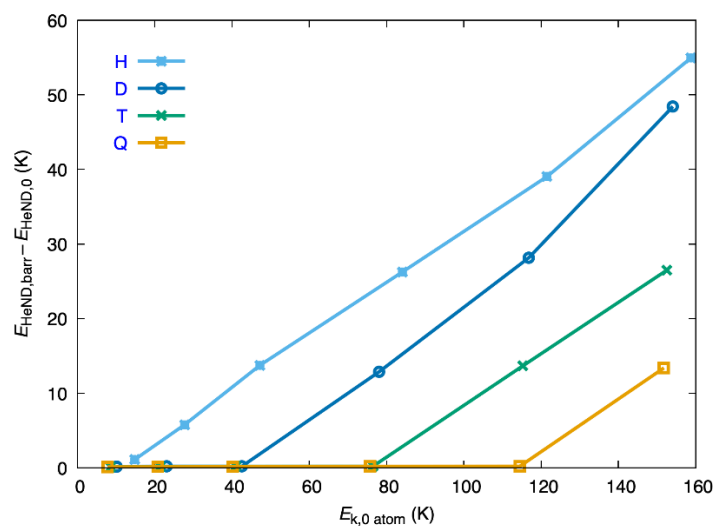
Figure S3. Change in the energy of the HeND, at the dynamical barrier, as a function of the initial kinetic energy of the atom, for the four isotopes.
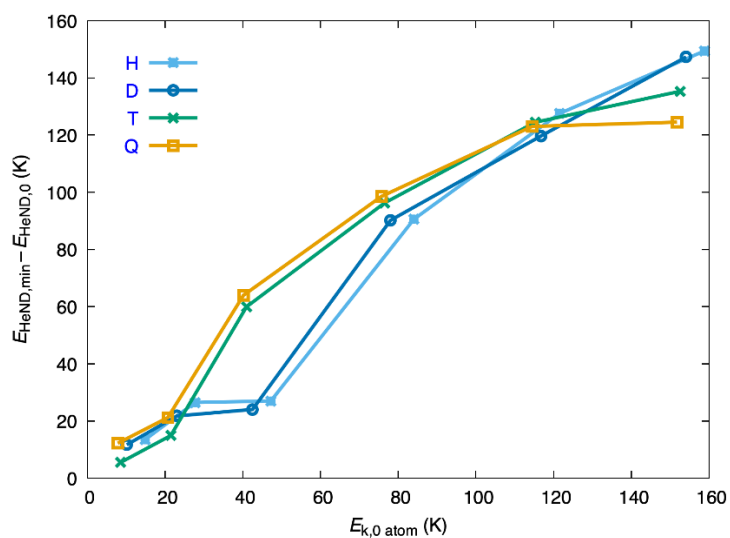

Figure S4. Change in the energy of the HeND, at the minimum, as a function of the initial kinetic energy of the atom, for the four isotopes.
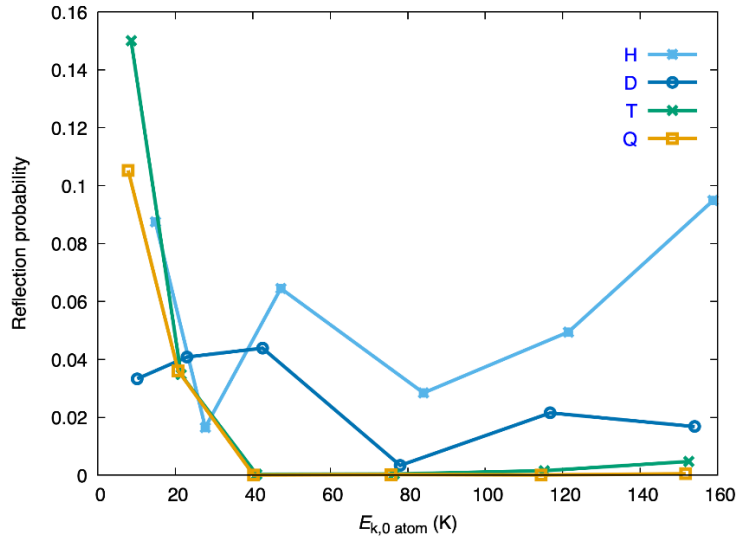
Figure S5. Reflection probability of the atomic WP, as a function of the initial kinetic energy of the atom, for the four isotopes.

Movie 1. Time evolution of the atomic WP probability density and helium density for the H atom at $E_{k,0} = 27.73$ K, where the formation of a H---HeND collision complex with a lifetime of 1.3 ps is observed. Top left: helium density in the xz plane (3D). Top right: WP probability density and helium density along the z axis. Bottom left: helium density in the xz plane (2D). Bottom right: Interaction energy atom-HeND and atomic WP norm. Simulated time interval represented ≈0-17 ps. See the file "Movie1_H_28".

Movie 2. Time evolution of the atomic WP probability density and helium density for the H atom at $E_{k,0} = 47.23$ K, where the formation of a H---HeND collision complex with a lifetime of 4.3 ps is observed. Same comments as for Movie 1. Simulated time interval represented ≈0-30 ps. See the file "Movie2_H_47".

Movie 3. Time evolution of the atomic WP probability density and helium density for the D atom at $E_{k,0} = 23.04$ K, where the formation of a D---HeND collision complex with a lifetime > 40 ps is observed. Same comments as for Movie 1. Simulated time interval represented ≈0-43 ps. See the file "Movie3_D_23".

Movie 4. Time evolution of the atomic WP probability density and helium density for the D atom at $E_{k,0} = 42.52$ K, where the formation of a D---HeND collision complex with a lifetime > 40 ps is observed. Same comments as for Movie 1. Simulated time interval represented ≈0-43 ps. See the file "Movie4_D_43".