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Angle Dependent Ionization of Small Molecules[1]

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The ionization probability and both the direct and re-scattered photoelectron momentum spectrum are all sensitive to the angle of a molecule with respect to the laser field. We experimentally measure the sensitivity of the ionization probability to molecular alignment using H_2 the simplest molecule as well as N_2, O_2, and CO_2. Concentrating on O_2 and N_2 we then demonstrate the natural quantum interference that occurs when the electron tunnels from perpendicularly aligned O_2, contrasting it with N_2. We show that the direct electrons preserve the symmetry of the orbital from which they tunnel, filtered through the momentum filter of the tunnel. Finally we show that the re-scattered electrons are also sensitive to molecular alignment, writing the molecular structure onto their angular distribution.

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