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Interference, Correlation and Entanglement in Molecular Double Ionization

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Photoionization of a diatomic resembles the situation of a traditional double slit. We present a series of experiments on double ionization of H_2, where we find evidence of this diffraction pattern in the angular distribution of the electrons in the molecular fixed frame. This interference is gradually lost as the momentum exchange of the electrons is increased, illustrating the transition from quantum to classical behavior. We show that the quantum interence is buried in the entangeld two body wavefunction and can be unraveled by imaging the full correlated multipartical final state phase space.