ABOVE THRESHOLD COULOMB EXPLOSION

B.D. Esry and I. Ben-Itzhak

J.R. Macdonald Laboratory and Department of Physics
Kansas State University, Manhattan, KS 66506, USA

We present an explanation of a qualitatively new mechanism of molecular ionization near the ionization appearance intensity that produces a sequence of peaks in the nuclear kinetic energy release (KER) spectrum separated by the photon energy. Our interpretation is based on an internally consistent model for the nuclear motion during an intense laser pulse. Within this model, the same concepts and language can be used for both dissociation and ionization, leading to a more unified understanding of the dynamics [1].

We apply our model to ionization from both H_2 (Fig. 1 and Ref. [2]) and H_2^+ (Fig. 2 and Ref. [1]). We have also applied our model to the H_2^+ ionization data of Pavičić *et al.* [3] and will discuss the results at the meeting. As can be seen in the figures, our model gives a very good fit of the experimental data over a wide range of conditions including polarization, intensity, and wavelength of the laser as well as the isotope of the target. Because our model does fit the spectra well, we can infer the qualitative time-dependent evolution of the system and extract information about the nuclear dynamics.

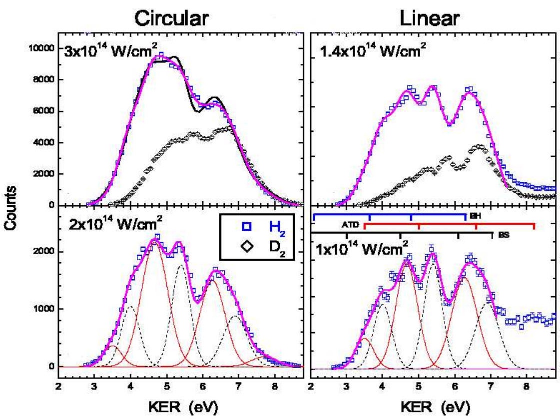

Fig. 1. H_2 and D_2 Coulomb explosion KER spectra from Staudte *et al.* [2]. The solid lines indicate our model fit for both individual peaks and the total spectrum.

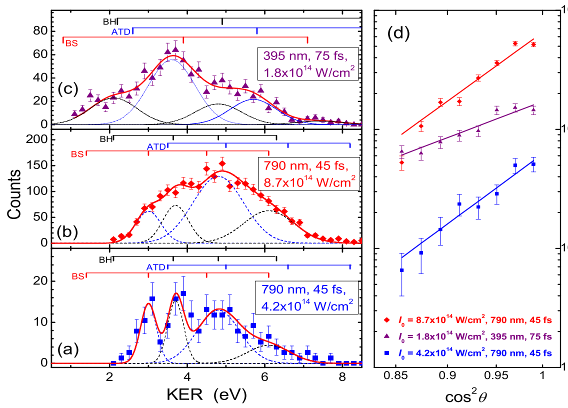

Fig. 2. (a)–(c) Experimental ionization KER spectra. The vertical bars indicate the predicted KER peak locations, grouped by initiating mechanism. The lines indicate our model's fit, both to individual peaks and the total spectrum. (d) Experimental log-log angular distributions corresponding to the spectra (a)–(c); θ is the angle between the nuclear axis and the laser polarization. (Adapted from Ref. [1].)

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References

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