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**Real-time dynamics of electron localization observed in dissociating  $\text{N}_2^{3+}$**  IGOR LITVINYUK, IRINA BOCHAROVA, DIPANWITA RAY, SANKAR DE, LEW COCKE, Kansas State University — When a diatomic molecule (molecular ion) dissociates, the end result is a pair of well separated non-interacting atomic (ionic) fragments. One intriguing question is: when during dissociation do the electrons choose a specific nucleus as their final location? We attempt to answer that question experimentally by measuring dependence of yields and kinetic energies for symmetric (2,2) and asymmetric (3,1) dissociation channels of quadruple-ionized  $\text{N}_2$  on time delay between few-cycle 800 nm pump and probe pulses. The pump pulse produces a dissociating molecular tri-cation from which the time-delayed probe pulse removes the fourth electron. That may result in either (2,2) or (3,1) final dissociation channel. We observe that the asymmetric (3,1) channel is produced only for delays up to 20 fs and completely suppressed for longer delays. The symmetric (2,2) channel is efficiently produced for all studied delays. We interpret that observation as an indication that the unpaired electron in dissociating  $\text{N}_2^{3+}$  is completely localized on one of the ions after 20 fs. After this localization completes, the probe pulse can only further ionize  $\text{N}^+$  as the other ion ( $\text{N}^{2+}$ ) has a much higher ionization potential. Such electron localization is an important step in the mechanism of charge-resonant enhanced ionization (CREI).

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