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Laser Coulomb Explosion Imaging of molecular dynamics in CO_2 molecule FRANCOIS LEGARE, EMT-INRS, Varennes, QC, Canada, IRINA BOCHAROVA, IGOR LITVINYUK, Kansas State University, JOSEPH SANDERSON, REZA KARIMI, University of Waterloo, Waterloo, ON, Canada — Molecular structure dynamics and dissociation pathways of CO_2 molecule initiated by interaction with strong laser field were investigated by Laser Coulomb Explosion Imaging (LCEI) technique. Momentum imaging of ions in tree-body fragmentation break-up channels O^++C^++O^+ (1,1,1) and O^{2+}+C^{2+}+O^{2+} (2,2,2) was used to determine full geometry of CO_2 ionic states before explosion. Varying laser pulse length from sub-7 fs to 200 fs at the same laser field intensity we were able to follow the evolution of the molecular structure and observe dramatic change in total kinetic energy of O^{2+}+C^{2+}+O^{2+} channel with increasing pulse length. We observed significantly bent structure of parent ion and low kinetic energy of the (2,2,2) channel for long pulses, compared to the very close to linear geometry, and very high kinetic energy for sub-7 fs laser pulse. This observation supports the idea that a phenomenon known as enhanced ionization takes place for CO_2 molecule with the same mechanism as in hydrogen molecule. It also lets us put temporal and spatial limits on this process, and in the future, probing molecular structure within the critical distance range, establish connection between changing geometry and dissociation pathways.

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