



Blasting Triatomic Molecules



Lana Chaleunrath-Pham
KState REU 2022

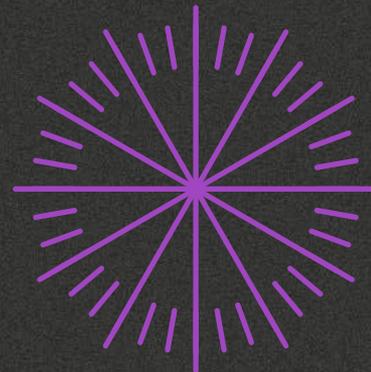
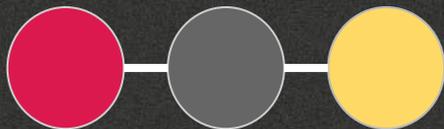




What? Why?

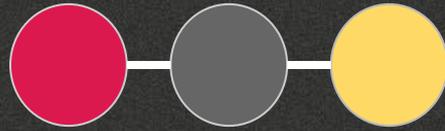


- Figure out geometries of molecules
- Coulomb Explosion Imaging (CEI)



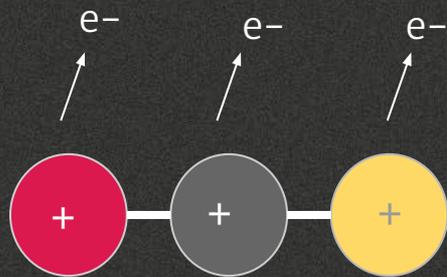


Coulomb Explosion





Coulomb Explosion

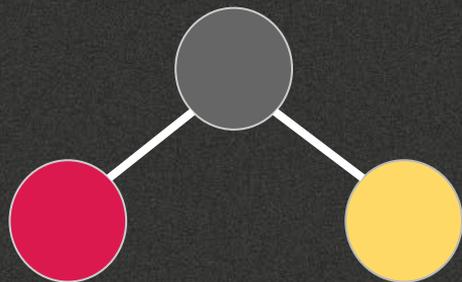


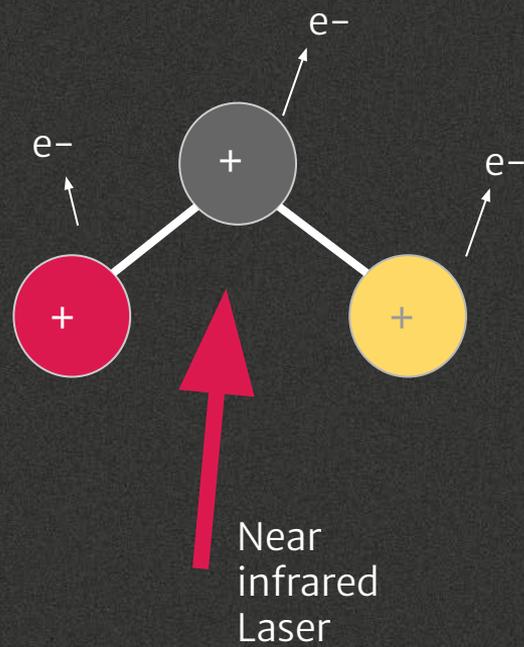
Near
infrared
Laser

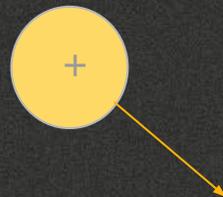
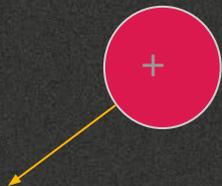


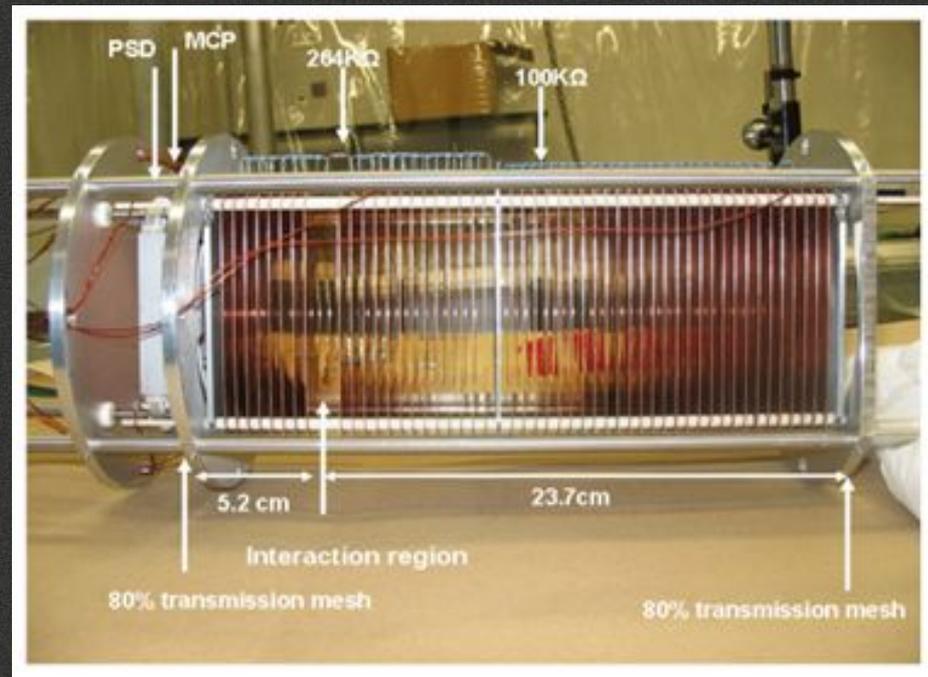
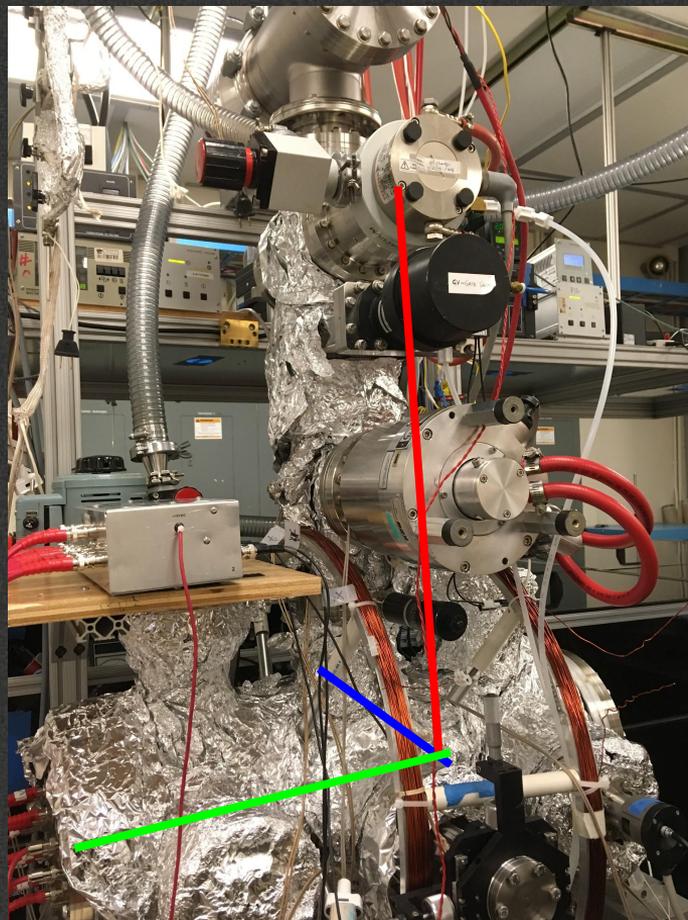
Coulomb Explosion

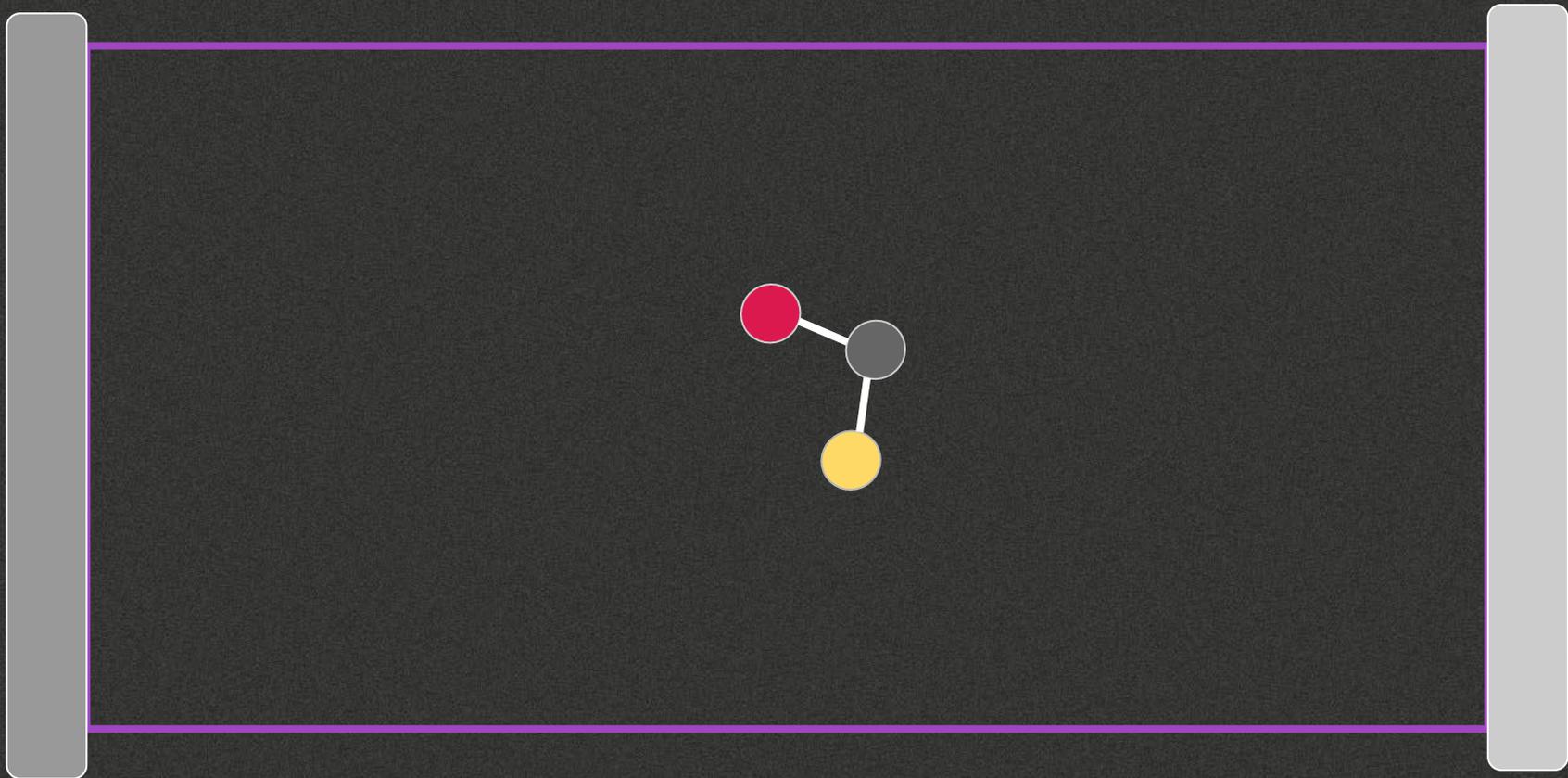




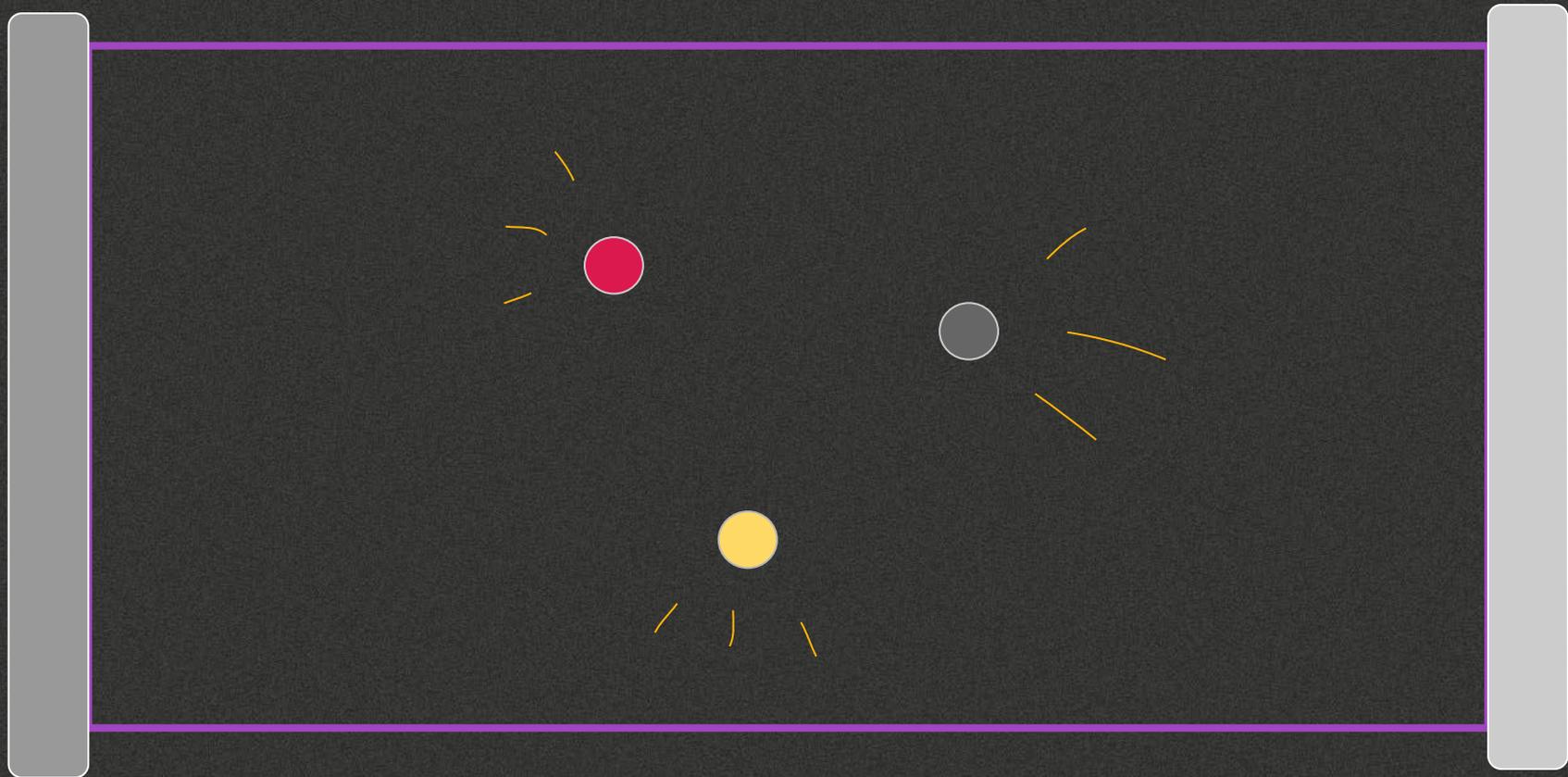




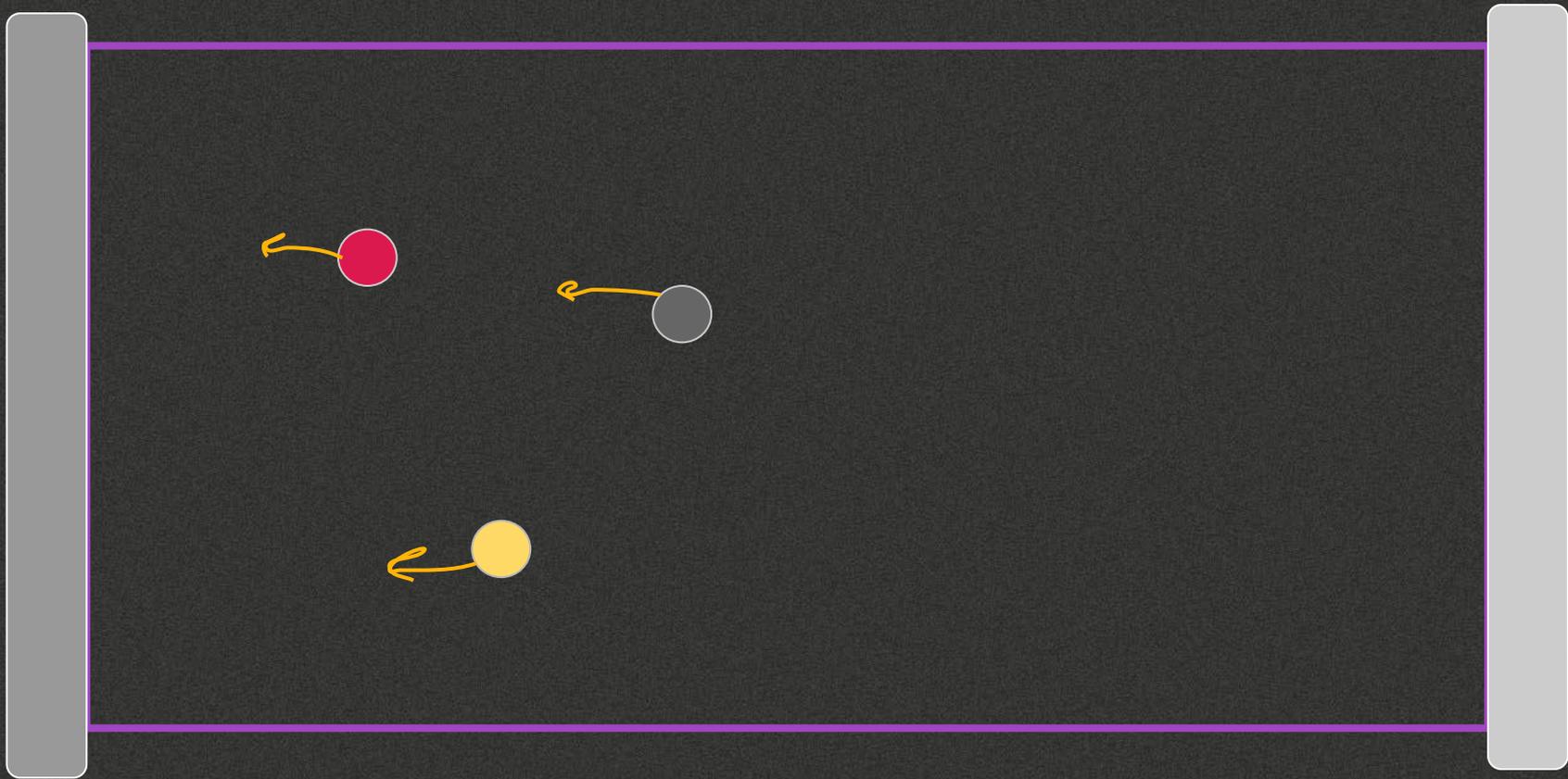




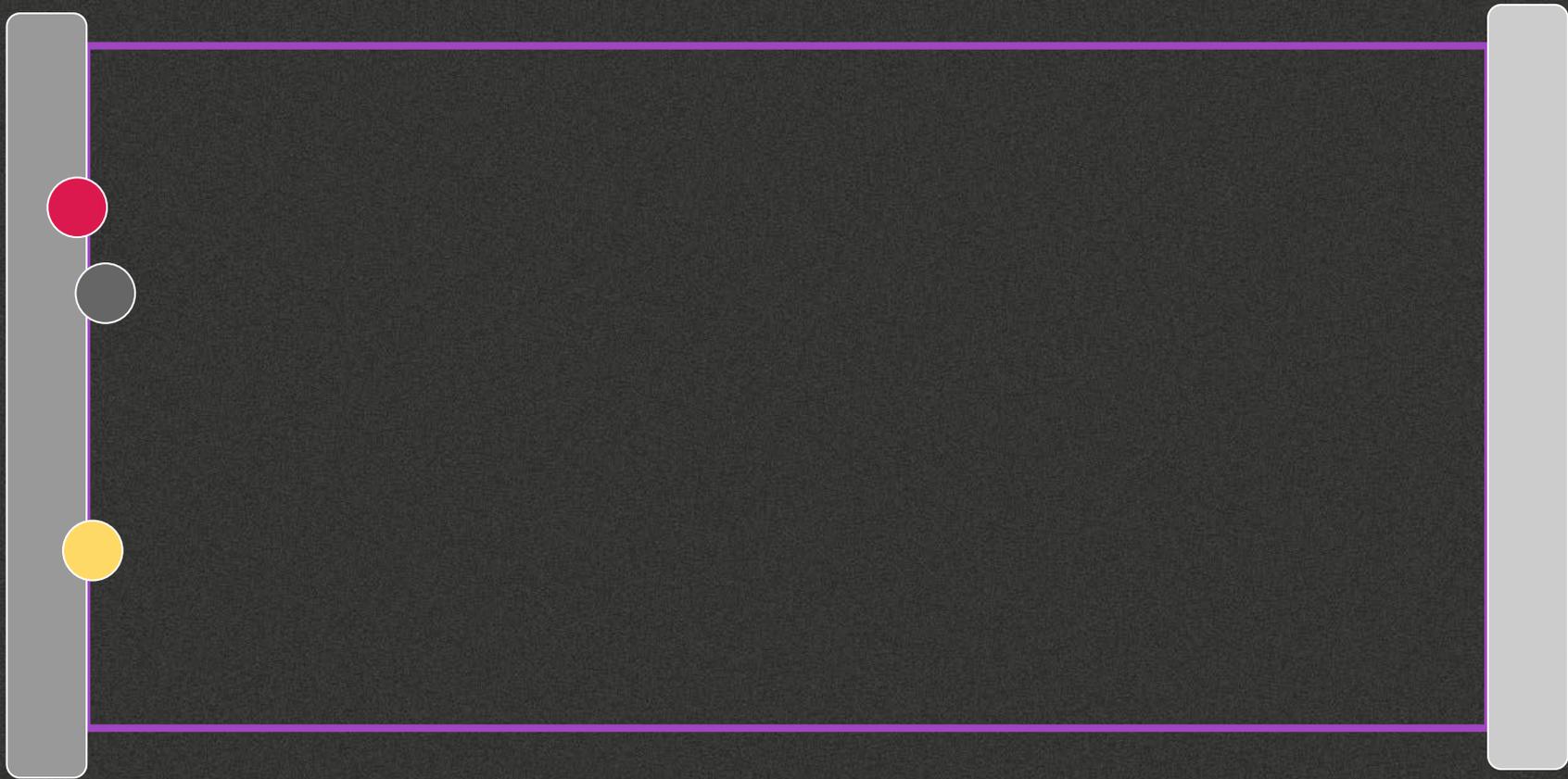
← Electric field



← Electric field



← Electric field



← Electric field



Parameters



Four settings:

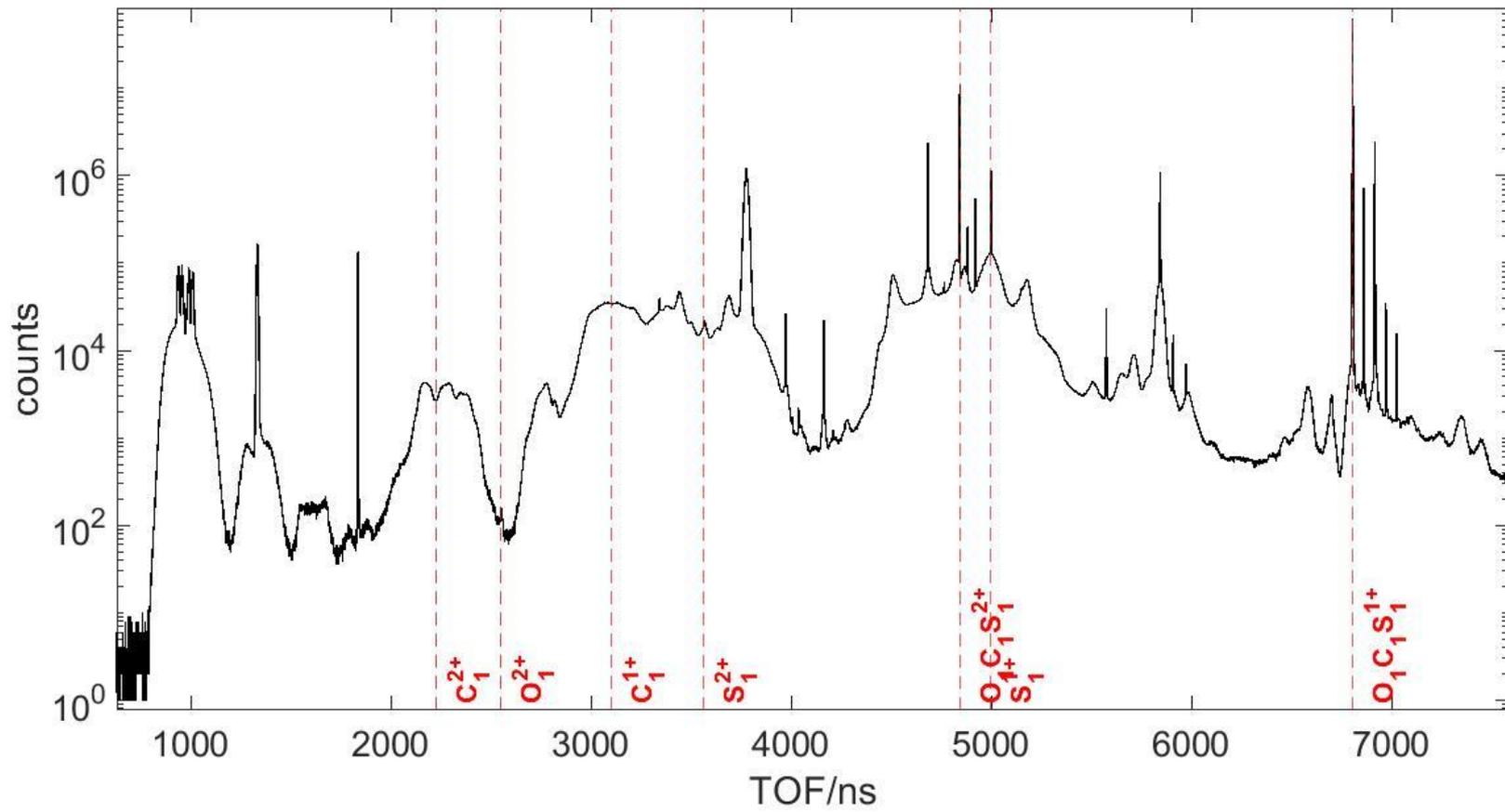
- Two pulse durations: 28fs & 56fs
- Two laser powers: 125mW & 250mW

Do these factors change coulomb explosion patterns?

Comparing Carbonyl Sulfide (OCS) data from 250mw
28fs and 56fs

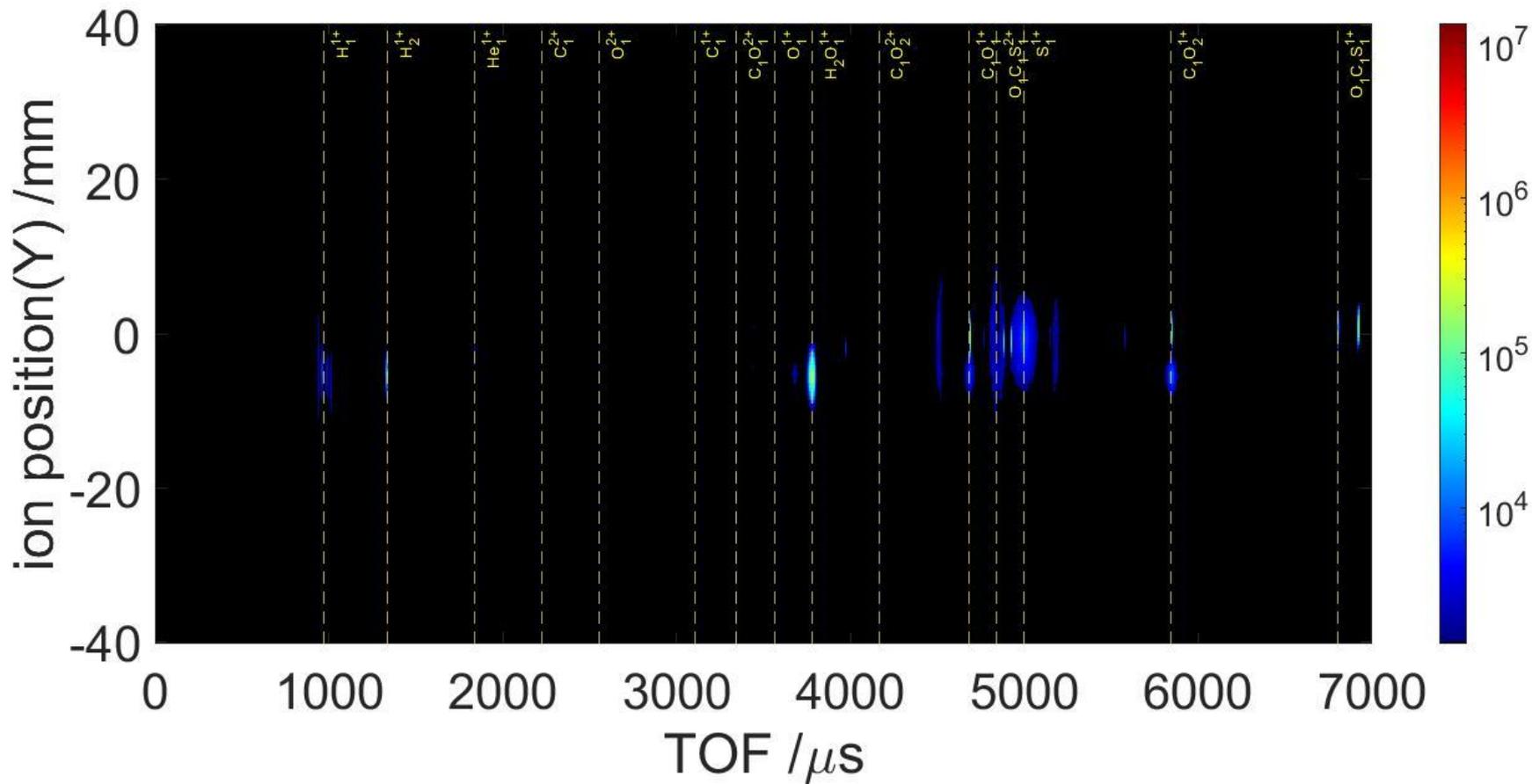


Time Of Flights (TOF) at 250mW, 28fs



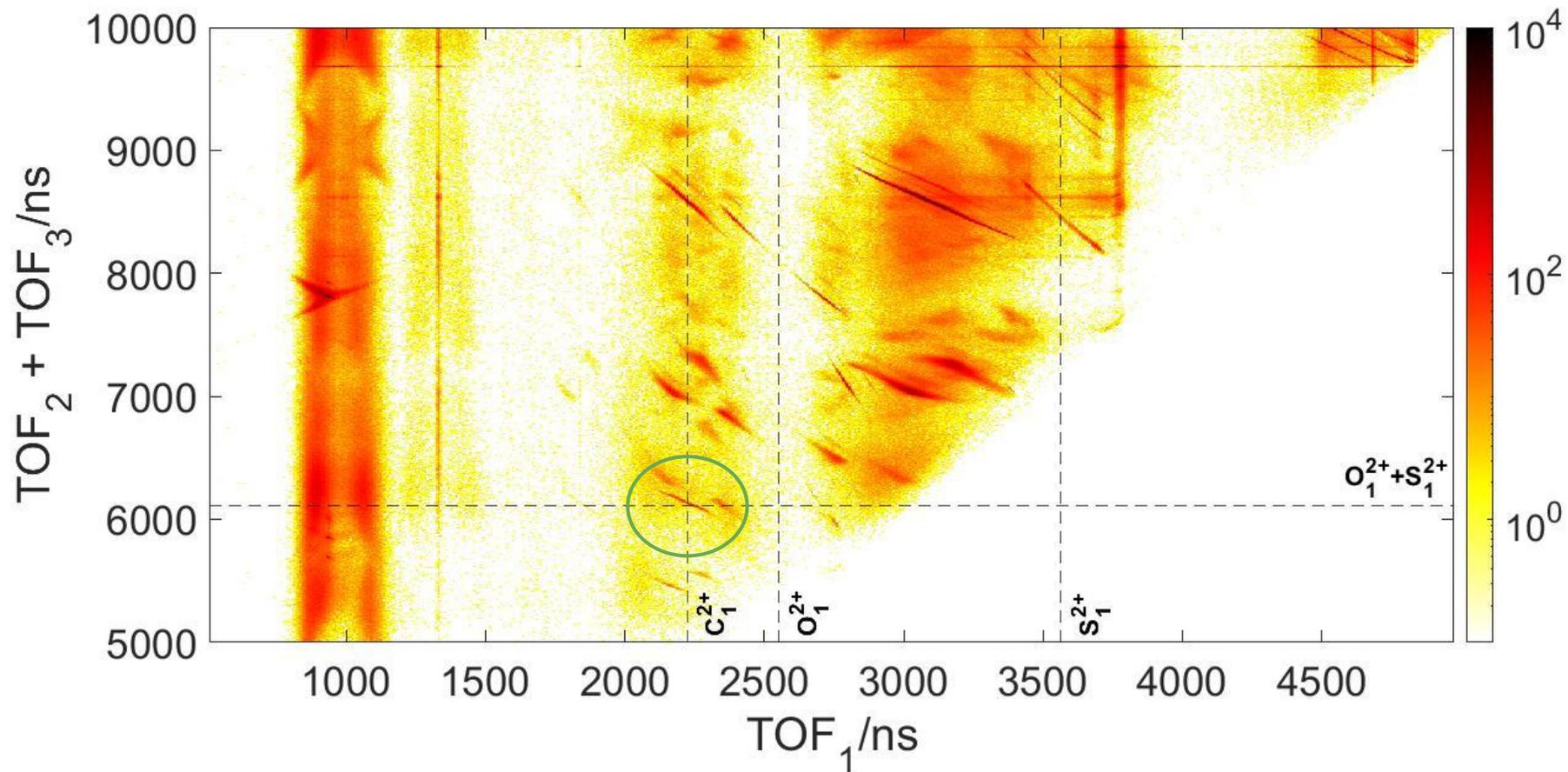


Y positions (at 250mW, 28fs)



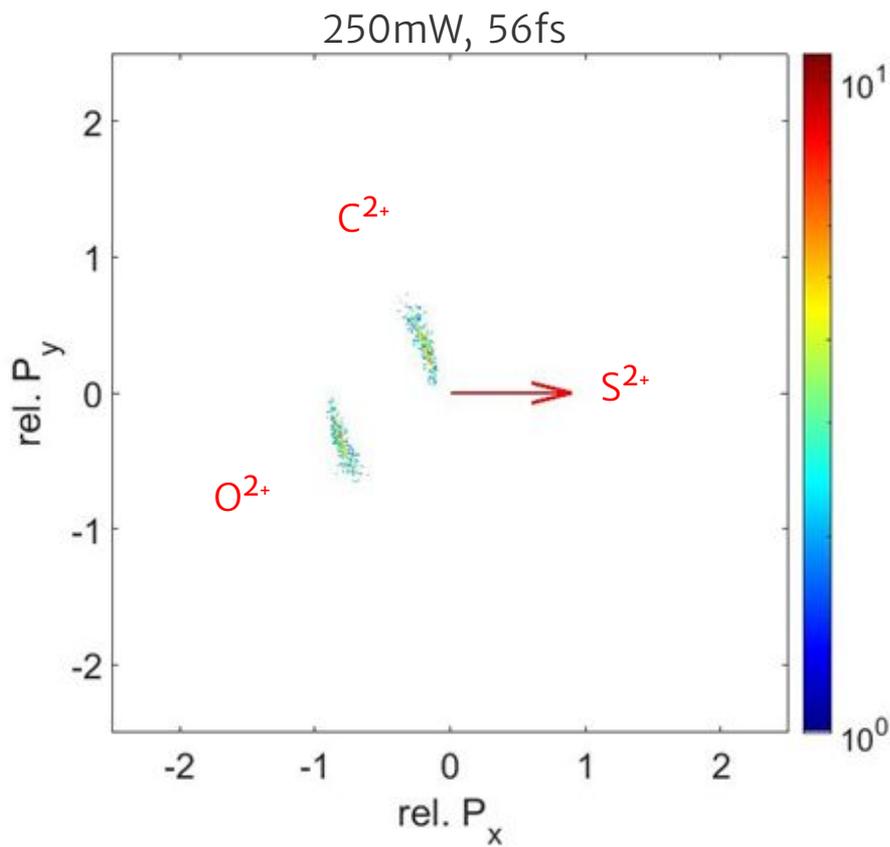
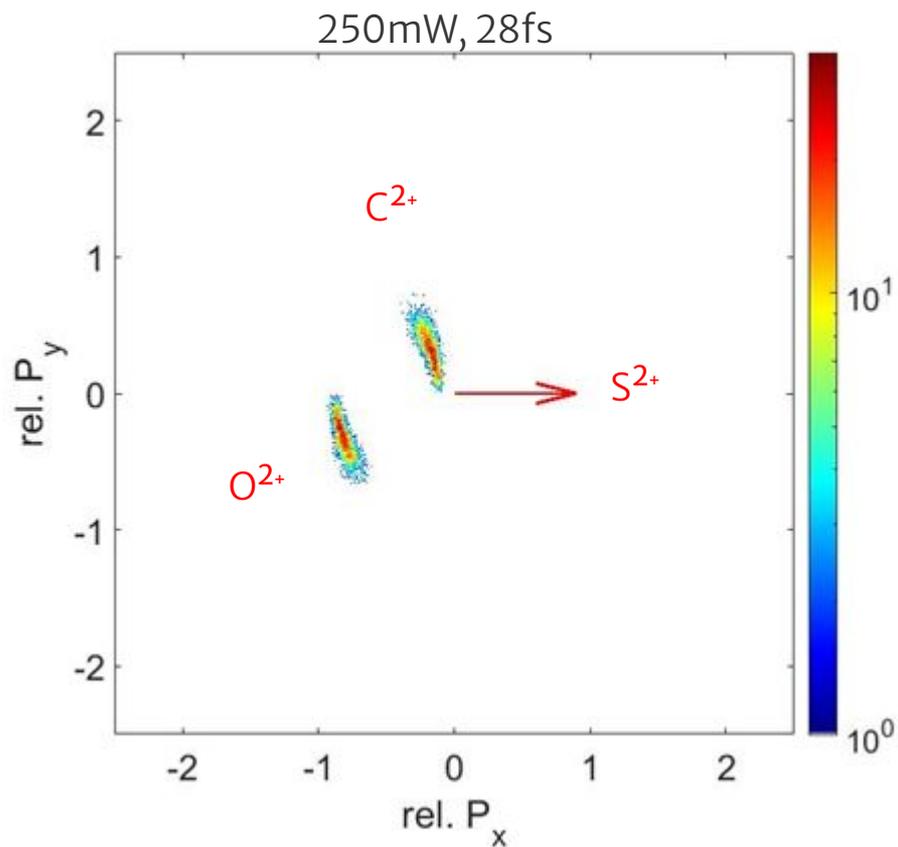


Three-Body Plot



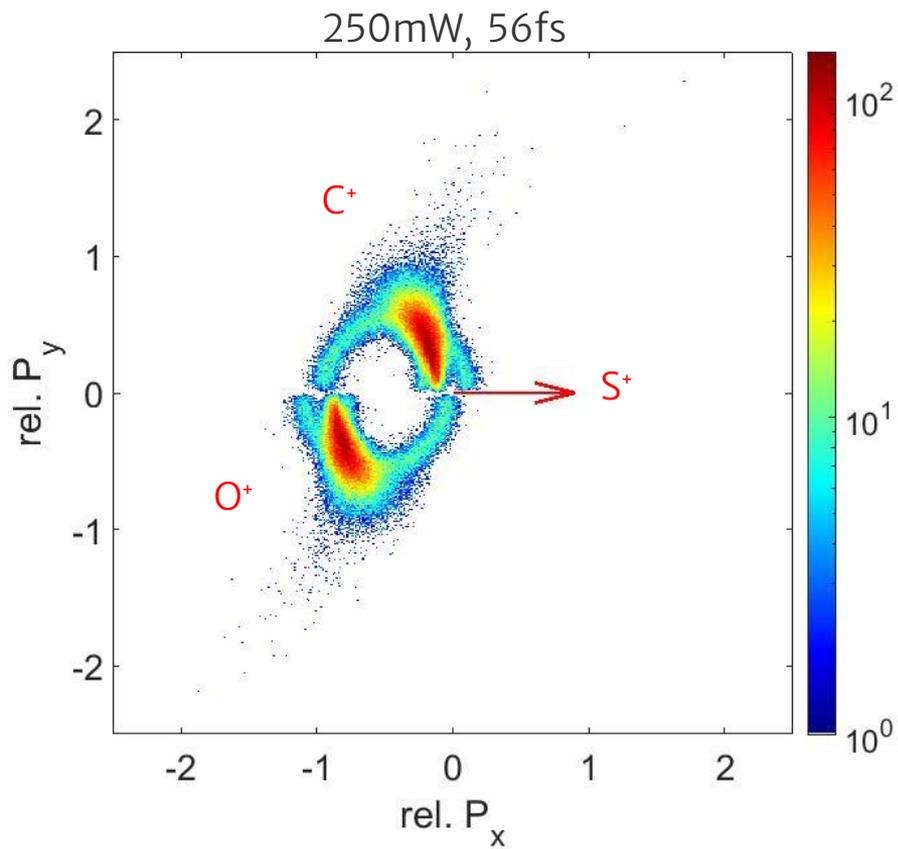
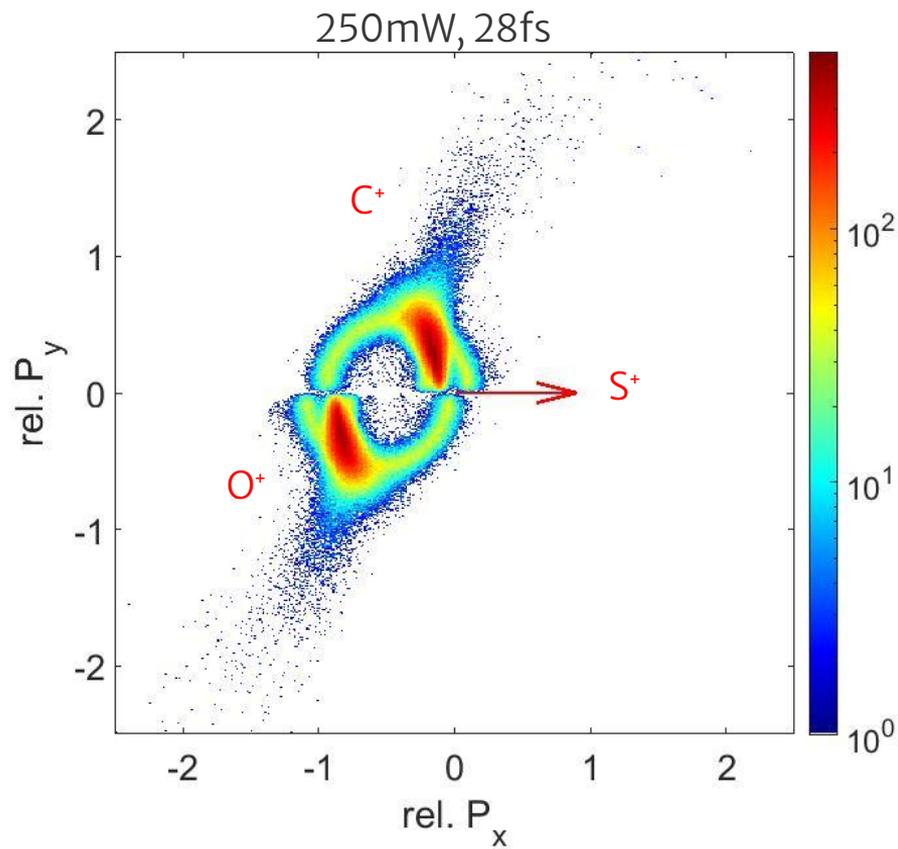


Newton Plots (C^{2+} O^{2+} S^{2+})





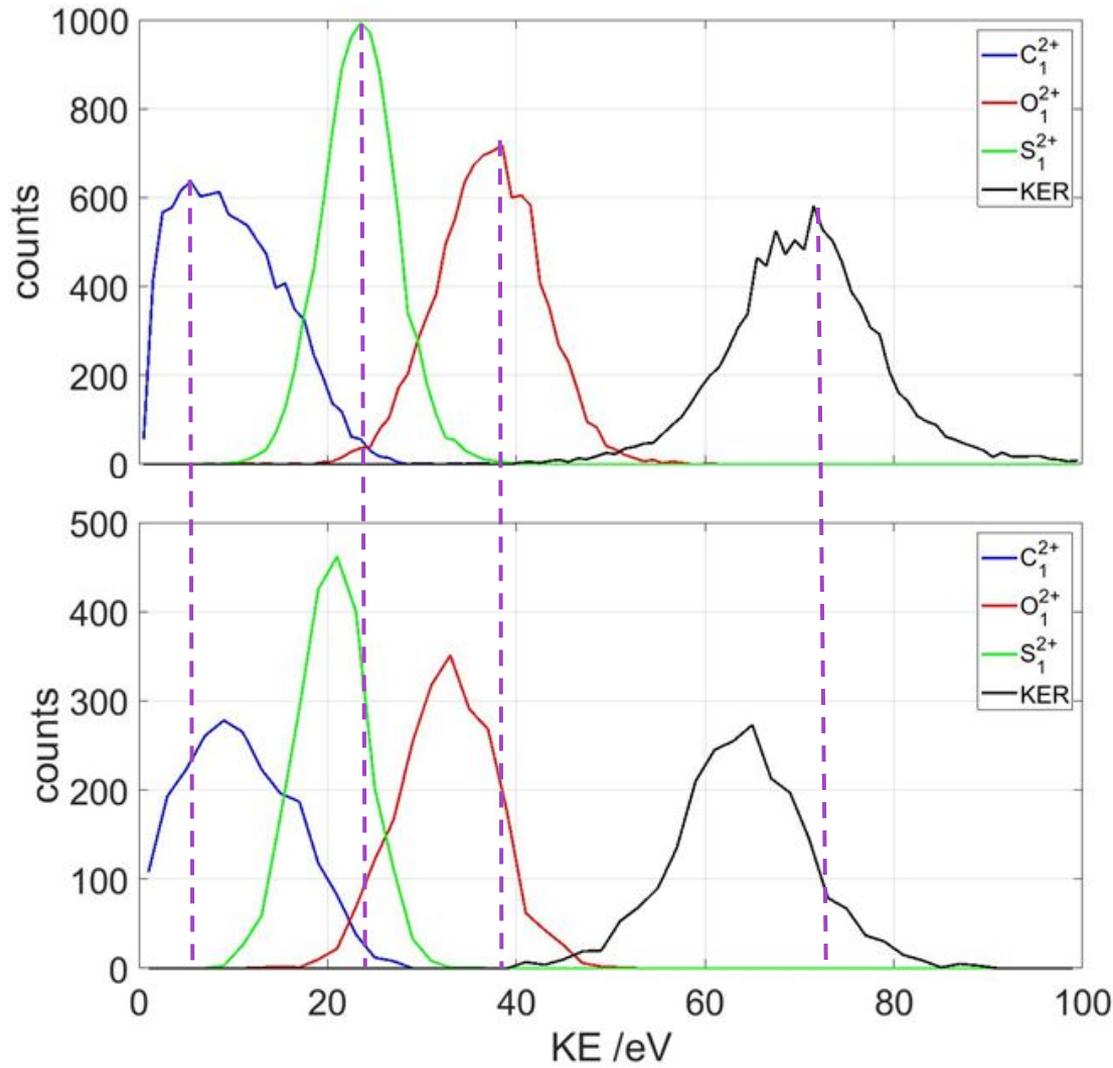
Newton Plots (C^+ O^+ S^+)



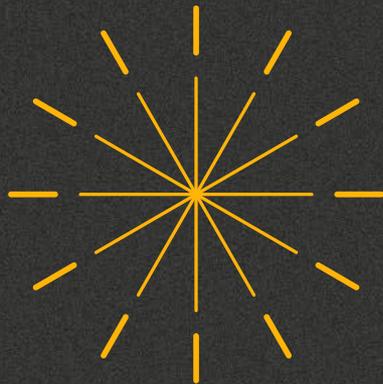
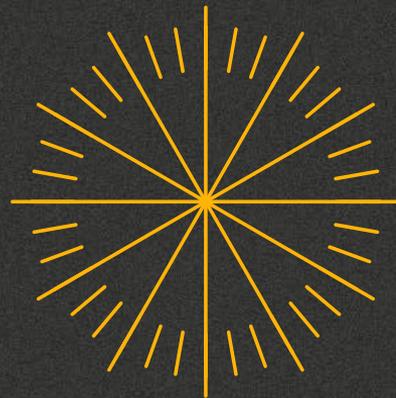
Kinetic Energy Release (KER)

Run1222, 250mW, 28fs

Run1222, 250mW, 56fs



WHOA!





Is that all?



- Yes
- Newton plots showing how the molecule breaks up
- OCS data analysis was fun
- Great time in the lab and witnessing how data collection works



Acknowledgements



- Daniel Rolles, Artem Rudenko
- Keyu Chen, Surjendu Bhattacharyya, Anton Khmelnitskiy
- Anbu Venkatachalam, Huynh Lam, John Searles, Zane Phelps
- Kim Coy, Bret Flanders, Loren Greenman
- James R MacDonald Laboratory
- National Science Foundation

KANSAS STATE

UNIVERSITY

Department of Physics



References



- Maharjan, C. M. (2007). *Momentum imaging studies of electron and ion dynamics in a strong laser field*. Kansas State University.
- Wales, B., Bisson, É., Karimi, R., Beaulieu, S., Ramadhan, A., Giguère, M., ... & Sanderson, J. (2014). Coulomb imaging of the concerted and stepwise break up processes of OCS ions in intense femtosecond laser radiation. *Journal of Electron Spectroscopy and Related Phenomena*, 195, 332–336.
- Wang, B., Han, J., Zhu, X., Wei, L., Ren, B., Zhang, Y., ... & Wei, B. (2021). Dissociative ionization of OCS induced by highly charged ion impact. *Physical Review A*, 103(4), 042810.

THANK YOU!

CREDITS: This presentation template was created by **Slidesgo**, including icons by **Flaticon**, infographics & images by **Freepik**

