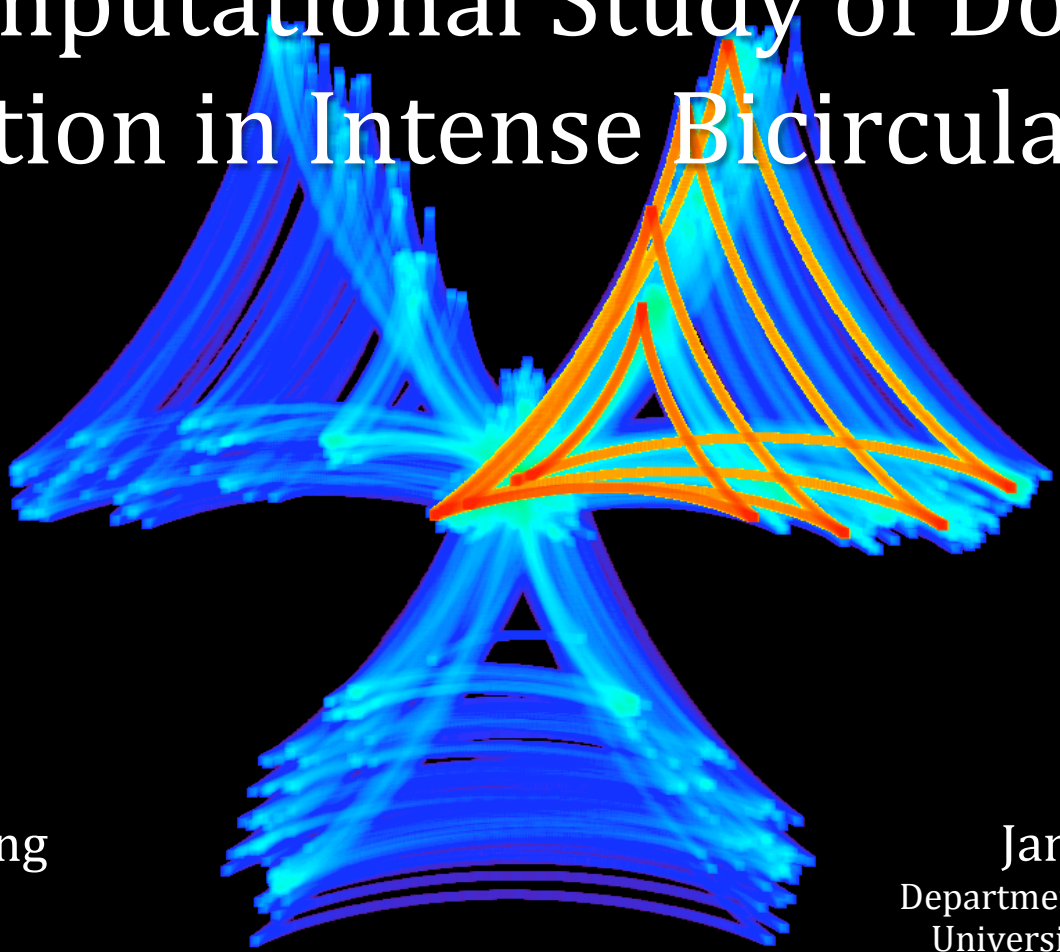
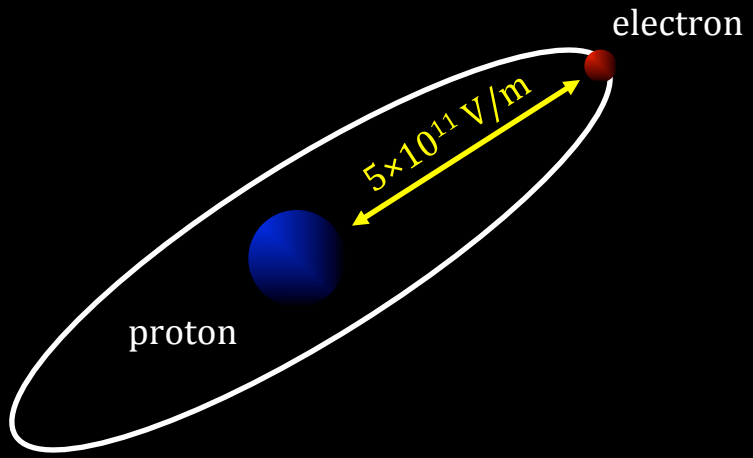
Computational Study of Double Ionization in Intense Bicircular Fields

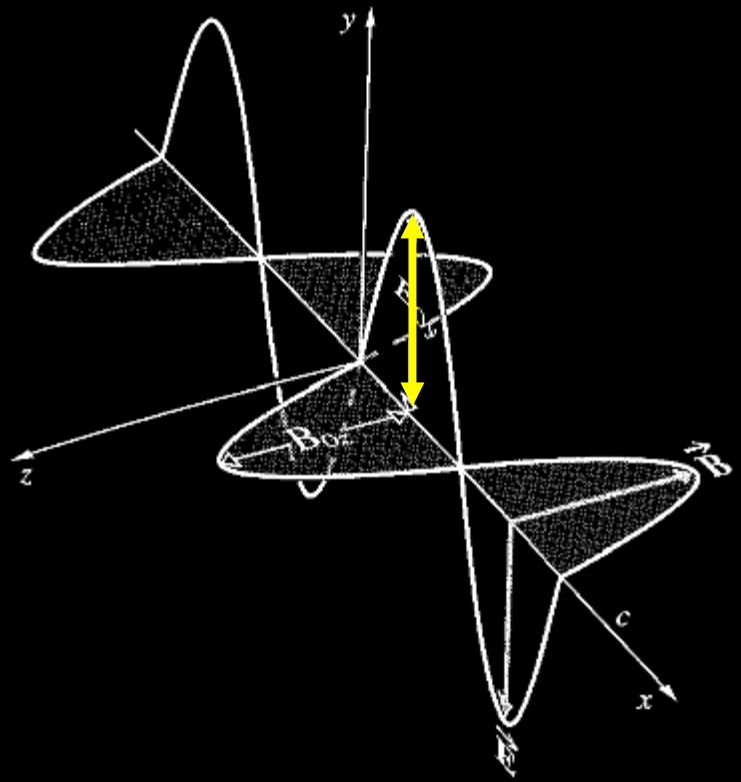


APS April Meeting
Denver, CO
16 April 2019

Jan L. Chaloupka
Department of Physics & Astronomy
University of Northern Colorado

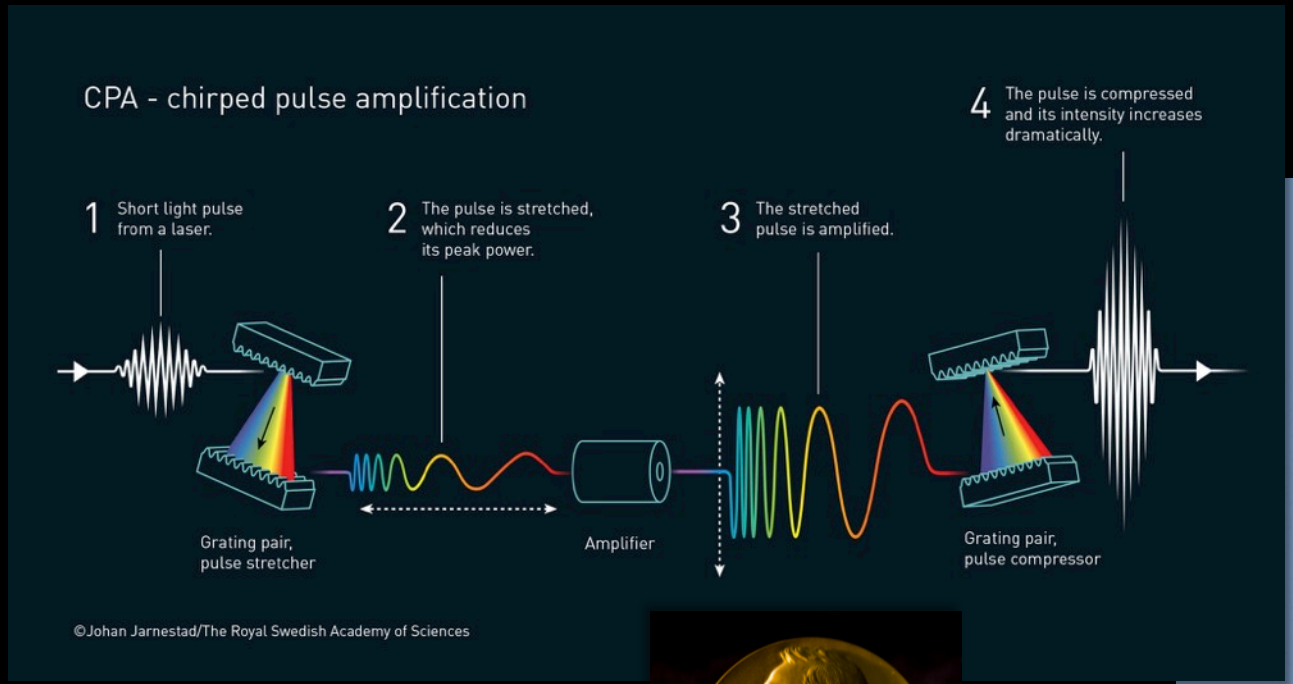
atomic unit of intensity

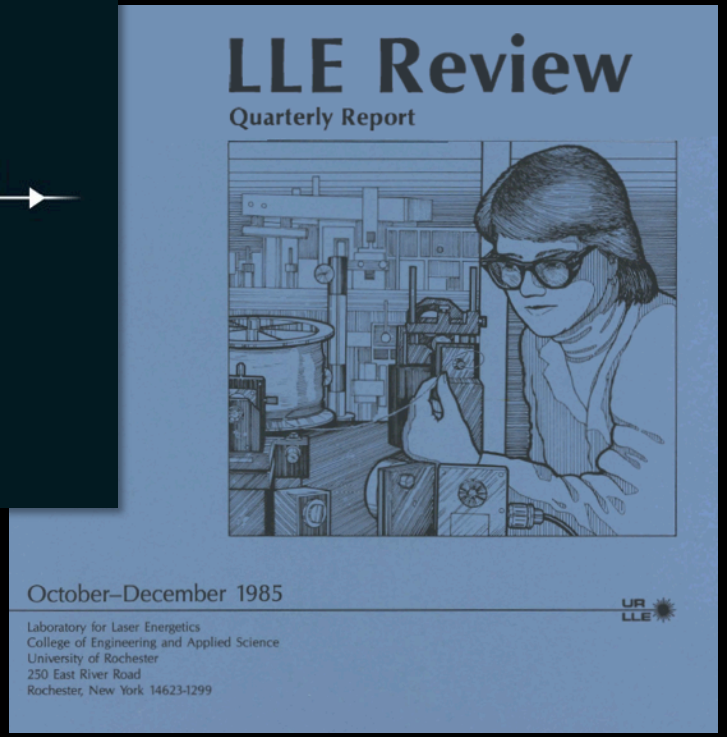




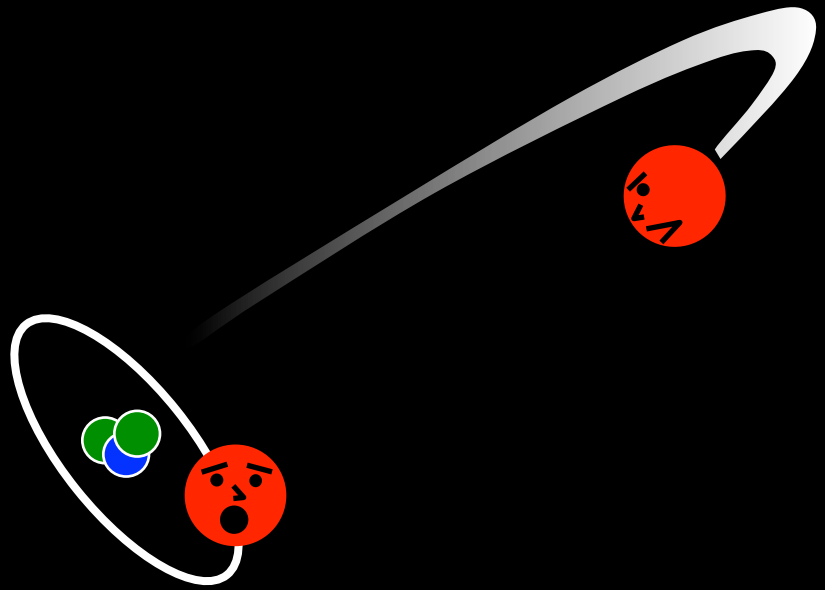
3.5×10^{16} W/cm^2

chirped pulse amplification

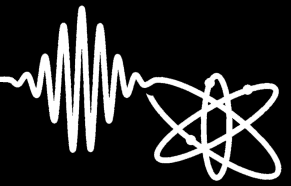




rescattering



HHG with two-color, counter-rotating fields



nature photonics

ARTICLES

PUBLISHED ONLINE: 8 DECEMBER 2014 | DOI: 10.1038/NPHOTON.2014.293

Generation of bright phase-matched circularly-polarized extreme ultraviolet high harmonics

Ofer Kfir[1]*, Patrik Grychtol[2], Emrah Turgut[2], Ronny Knut[2,3], Dmitriy Zusin[2], Dimitar Popmintchev[2], Tenio Popmintchev[2], Hans Nembach[2,3], Justin M. Shaw[3], Avner Fleischer[1,4], Henry Kapteyn[2], Margaret Murnane[2] and Oren Cohen[1]*

RAPID COMMUNICATIONS

PHYSICAL REVIEW A VOLUME 51, NUMBER 5 MAY 1995

Polarization-dependent high-order two-color mixing

H. Eichmann, A. Egbert, S. Nolte, C. Momma, and B. Wellegehausen
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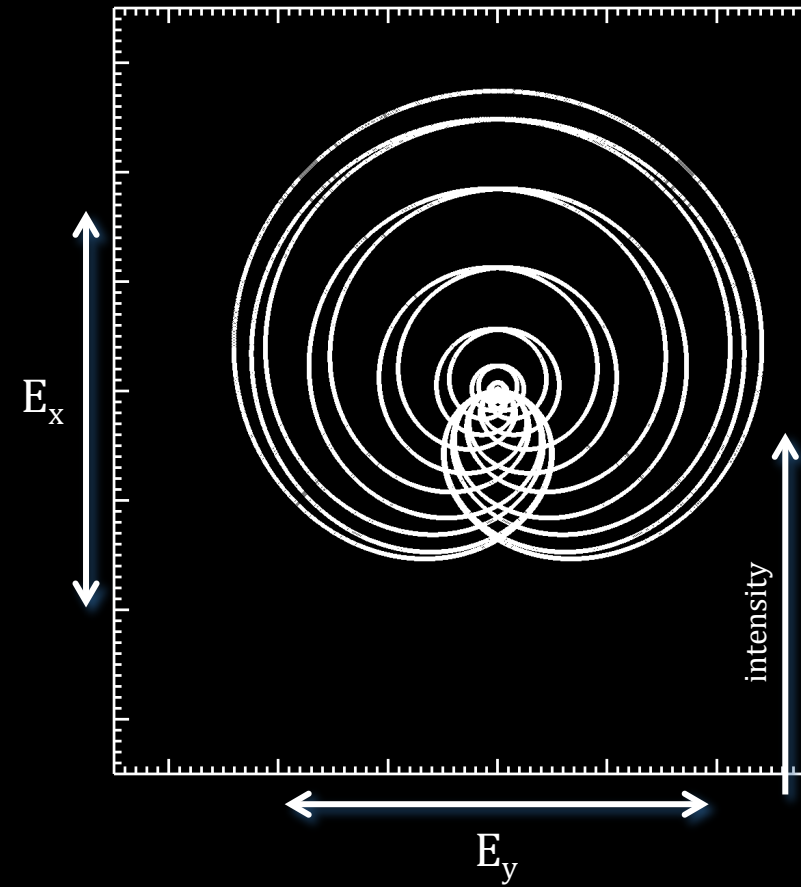
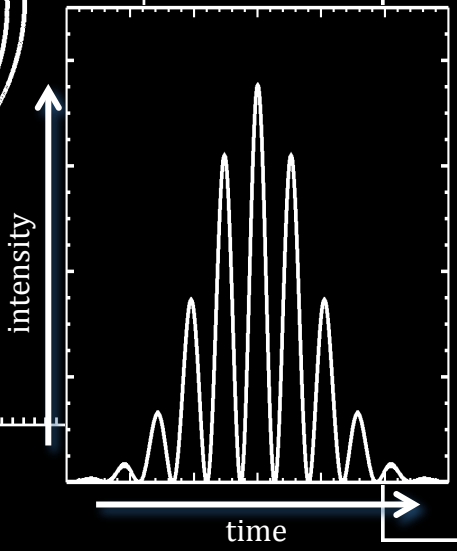
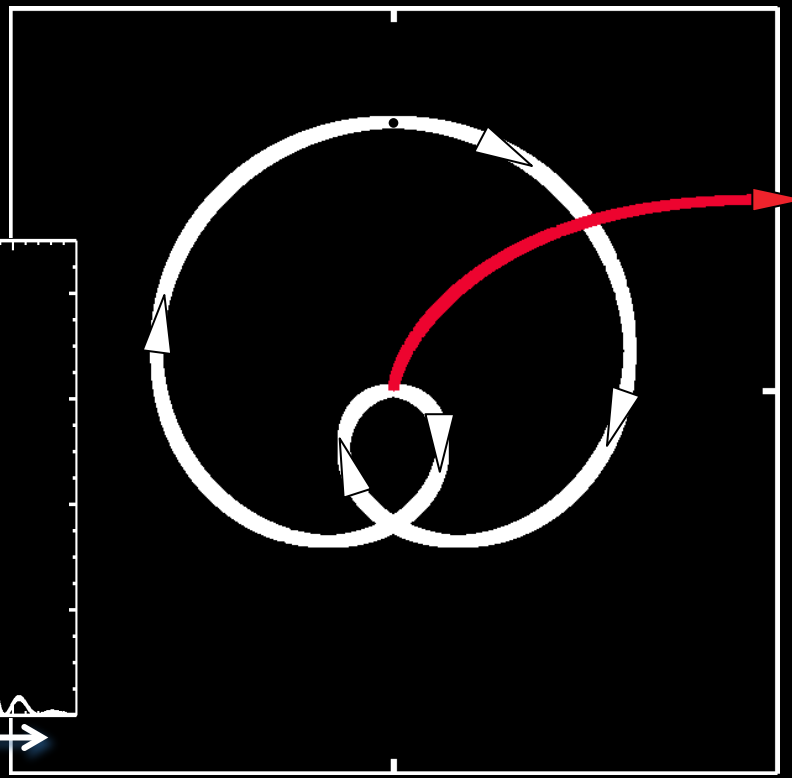
W. Becker,* S. Long, and J. K. McIver
Center for Advanced Studies, Department of Physics and Astronomy, University of New Mexico, Albuquerque, New Mexico 87131
(Received 1 December 1994)

High-order frequency mixing experiments using the radiation of a high-power Ti:sapphire laser and its second harmonic are described and discussed. Linearly and circularly polarized light fields with comparable intensities have been used. For the theoretical description a three-dimensional quantum-mechanical calculation with a δ-function potential has been applied, showing quite good agreement with the experiments.

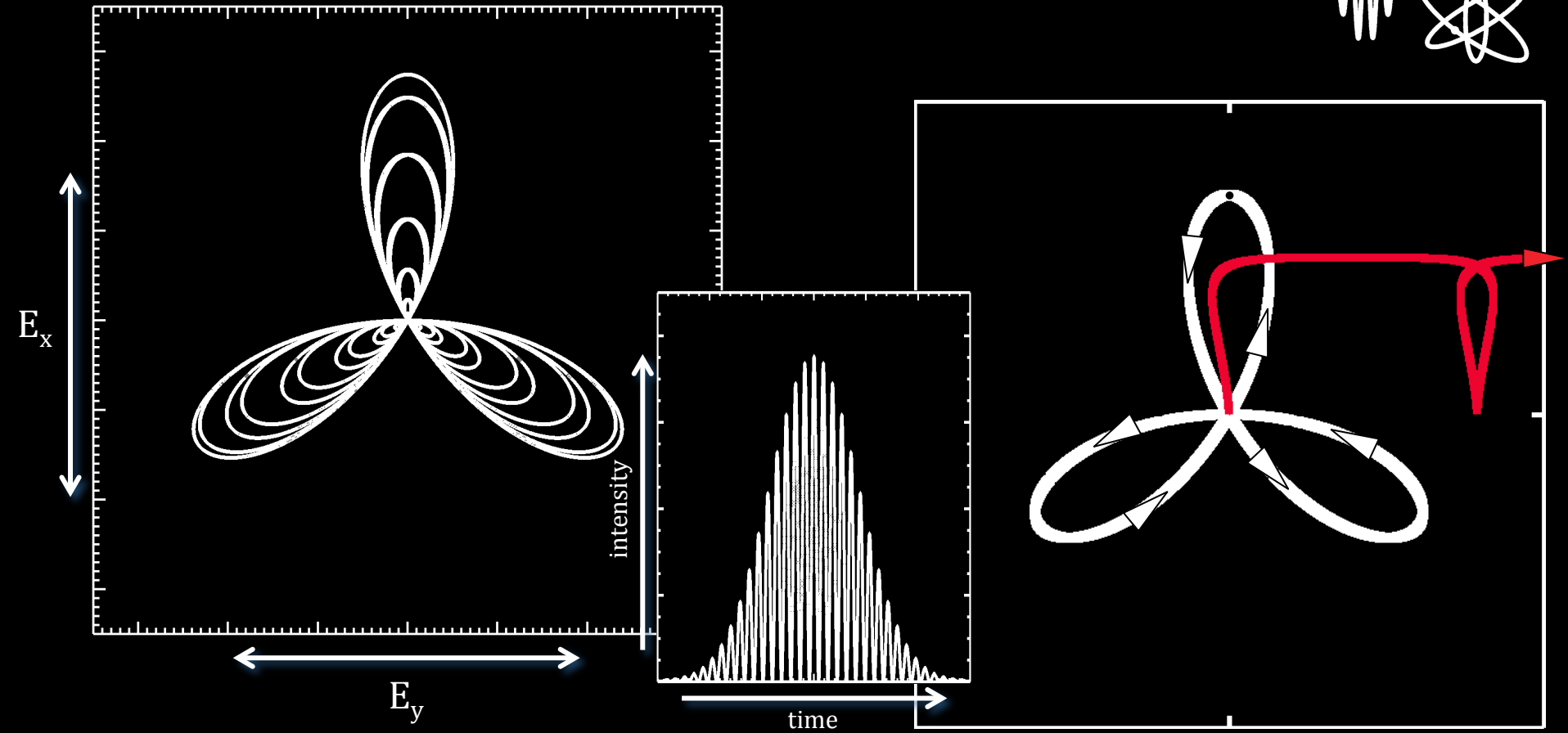
two-color co-rotating fields



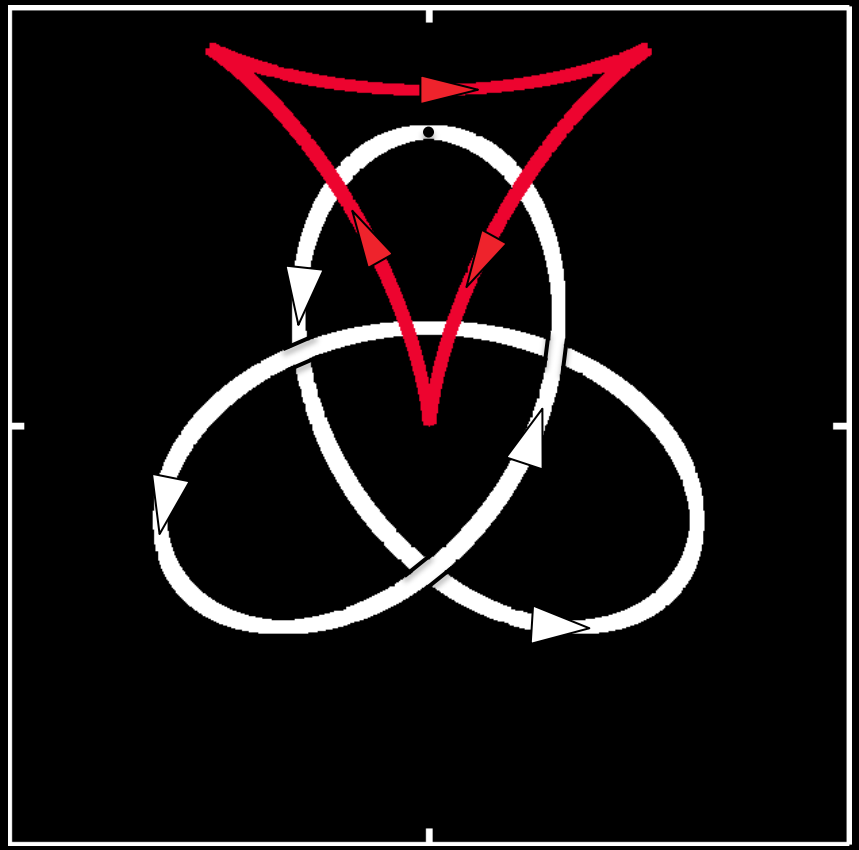




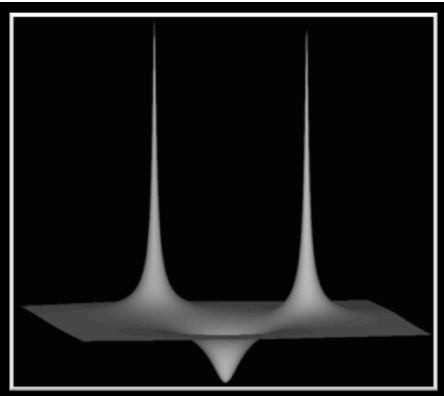
two-color counter-rotating fields

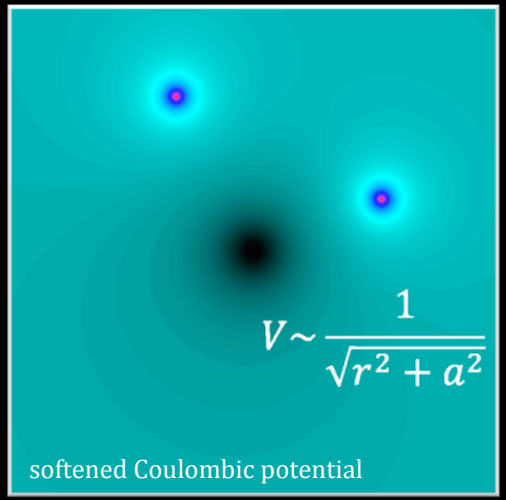


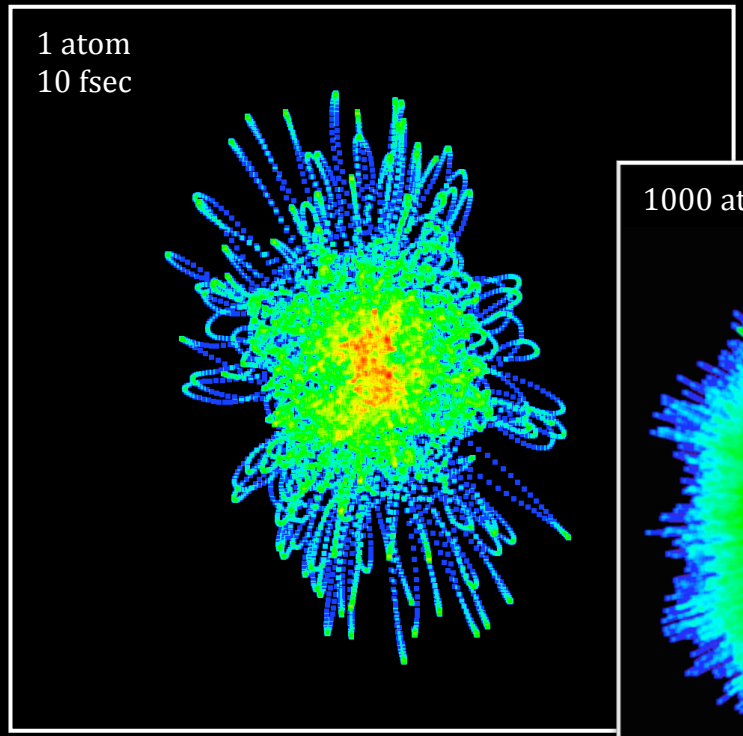
simple returning trajectory

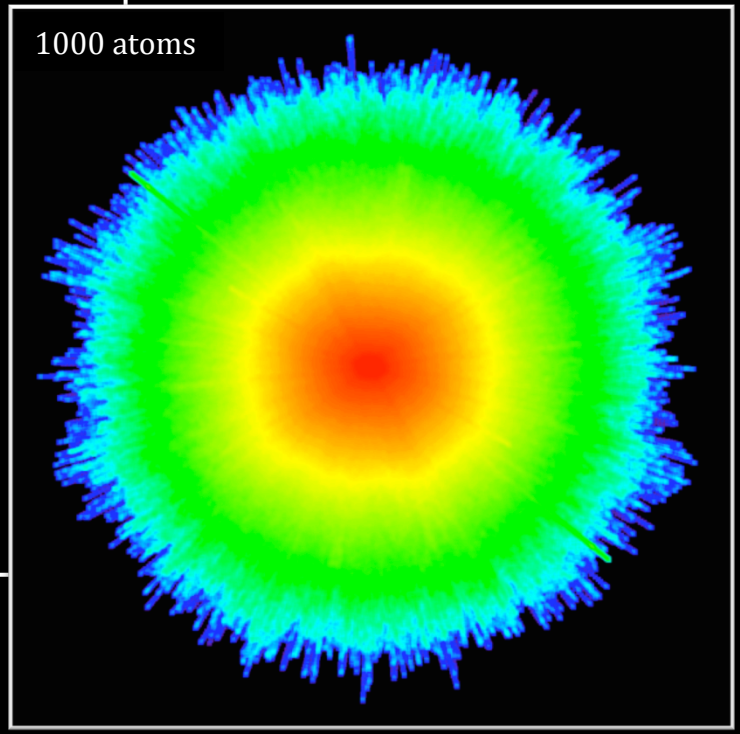


classical ensemble approach

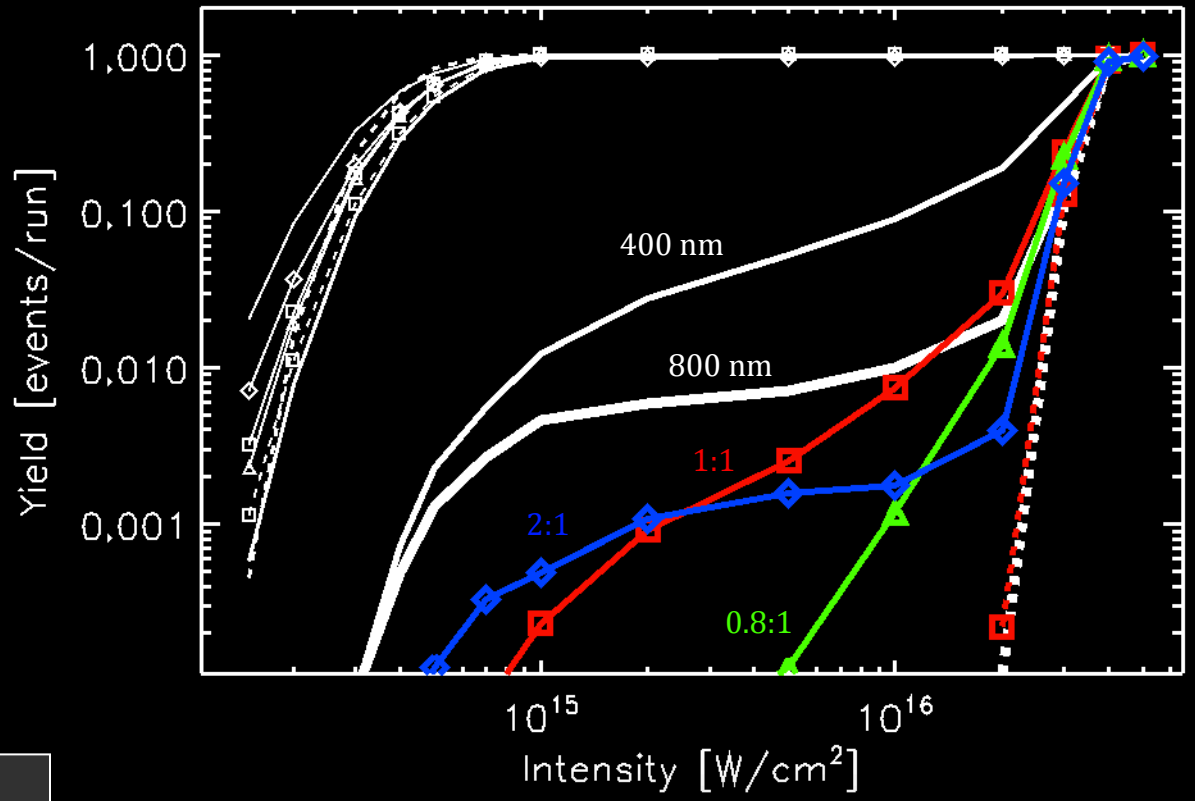








helium ionization yield curves



10^5 runs/point
1.4×10^6 runs/curve
9.8×10^6 runs total

Chaloupka & Hickstein, *Physical Review Letters* (April 2016)

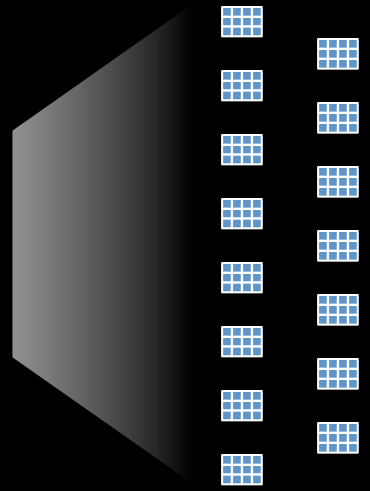
high-performance computing cluster

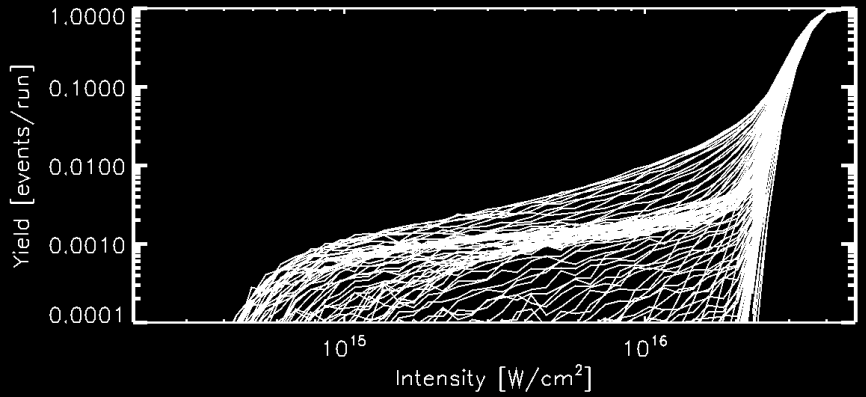
Intel Xeon ES-2620 v3 2.4 GHz

15 NODES
12 CORES/NODE

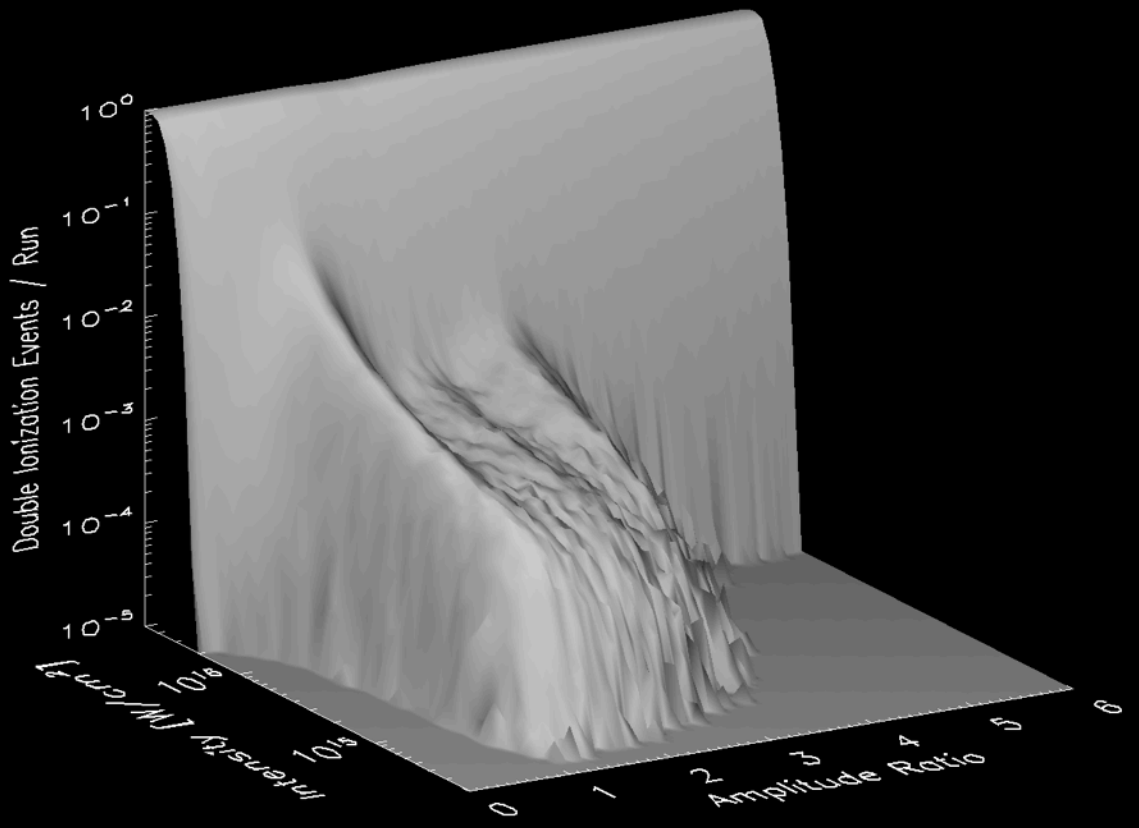
GFORTRAN

MESSAGE PASSING INTERFACE (MPI)



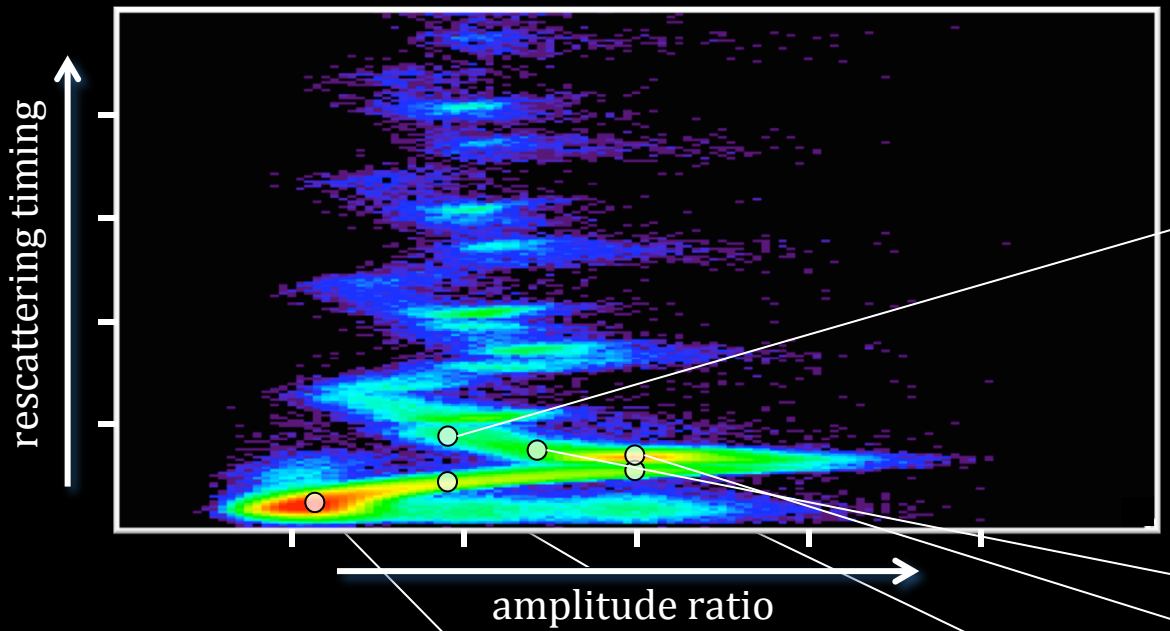


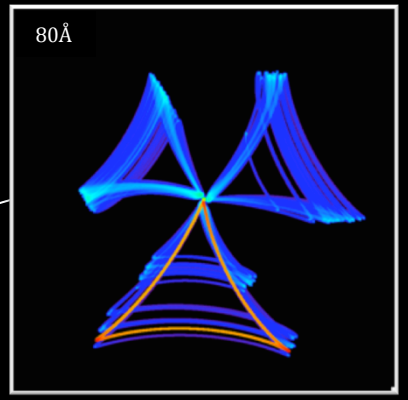
double ionization yield

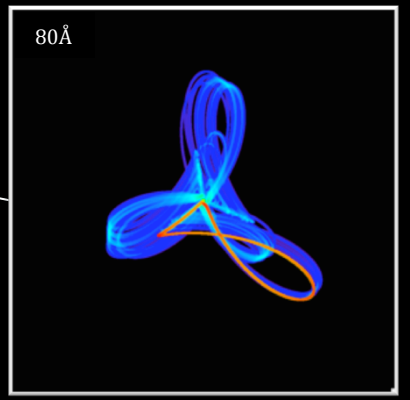


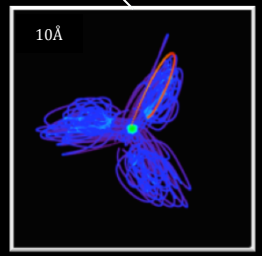
2×10^5 runs/point
10^7 runs/ratio
1.2×10^9 runs total

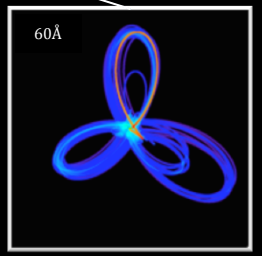
double ionization rescattering timing





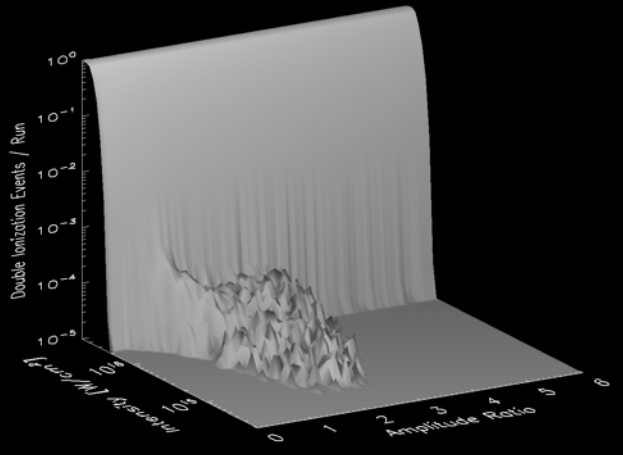


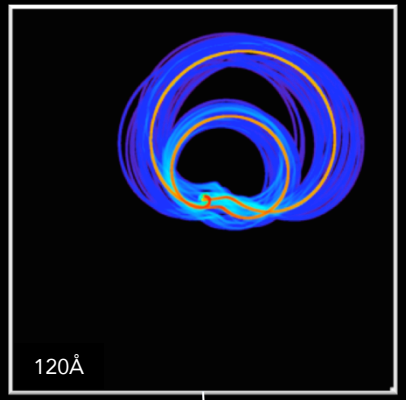


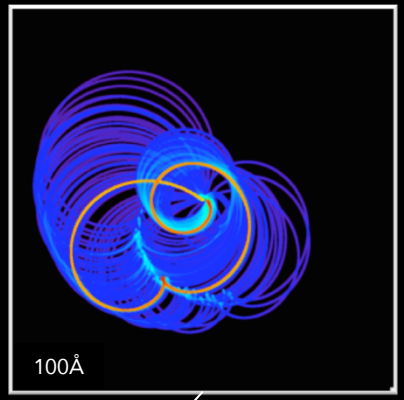


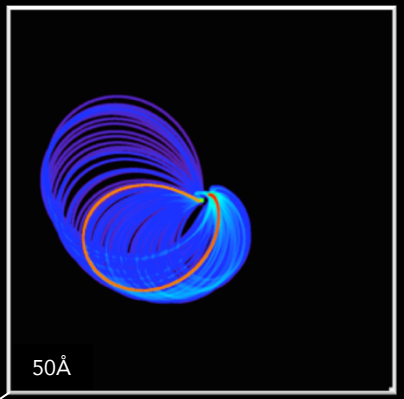
10^{16} W/cm^2
3.6×10^{8} runs total

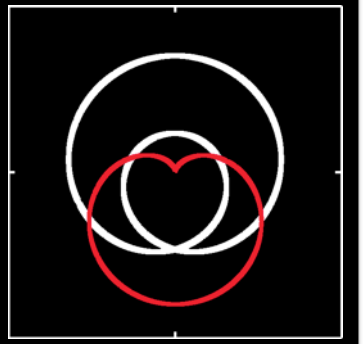
double ionization (co-rotating fields)

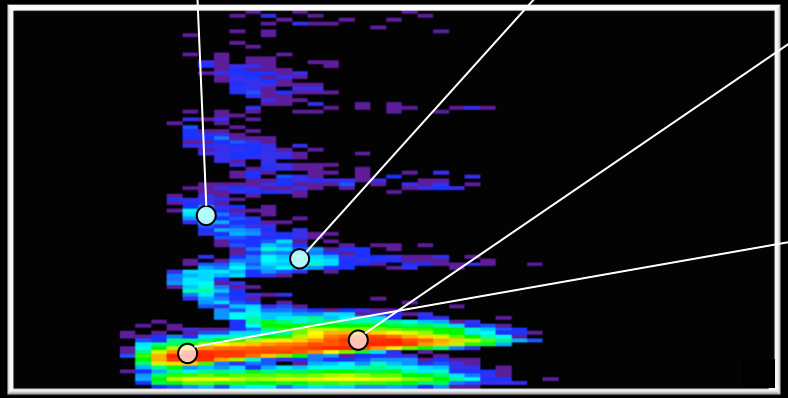


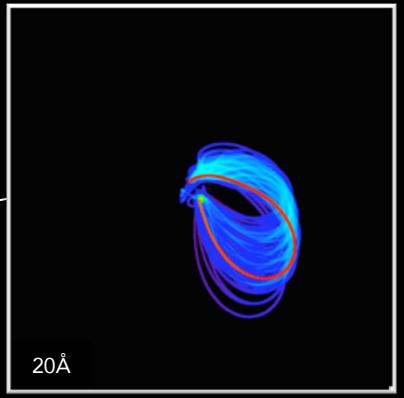












10^{16} W/cm^2
1.9×10^{9} runs total

thank you!