Stanford



Kirk Larsen

Assoc Sci - Ultrafast Laser, LCLS - Linac Coherent Light Source

Bio

BIO

I am an associate scientist in the Laser Sciences Department of the Linac Coherent Light Source (LCLS) at SLAC National Accelerator Laboratory. I provide operational laser support and lead laser R&D for the Coherent X-ray Imaging (CXI) instrument at LCLS, performing time-resolved hard X-ray scattering experiments in gas and liquid phase. I work on developing tunable few-cycle UV light sources using soliton dynamics and resonant dispersive wave emission in hollow core fibers. I am involved in photoinjector research for LCLS-II, focusing on temporal X-ray pulse shaping to support the extension of attosecond capabilities to high repetition rate. I also work on developing plasma based attosecond VUV/EUV light sources at FACET-II.

CURRENT ROLE AT STANFORD

Coherent X-ray Imaging Instrument, Linac Coherent Light Source - Laser Scientist POC and SLSO

Ultrafast UV-Vis Sources Group, Laser Sciences Department - Tunable Few-Cycle Source Development

EDUCATION AND CERTIFICATIONS

- Postdoc, Stanford PULSE Institute (2022)
- PhD, University of California, Berkeley (2020)
- BS, University of Oregon (2014)

LINKS

- Google Scholar: https://scholar.google.com/citations?user=O9o-7K0AAAAJ&hl=en&oi=ao

Publications

PUBLICATIONS

- **Resolving Competing Ultraviolet Photoinduced Ring-Opening and Dissociation Pathways in Iodothiophenes by Ultrafast Electron Diffraction.** *The journal of physical chemistry letters*
  Ghrist, A. M., Bain, M., Liu, Y., Razmus, W. O., Bhattacharyya, S., Chen, K., Gabalski, I., Glownia, J. M., Green, A. E., Kaufman, B., Kramer, P. L., Larsen, K. A., Minitti, et al
  2026; 17 (45): 12921-12930

- **Real-space imaging of valence-electron bonding dynamics with ultrafast hard X-ray scattering.** *Faraday discussions*
  Wang, Y., Allum, F., Bhattacharyya, S., Britton, M., Champenois, E. G., Cheng, X., Forbes, R., Gabalski, I., Garratt, D., Ghrist, A. M., Glownia, J. M., Graßl, M., Green, et al
  2026

- **Resolving CompetingUltraviolet Photoinduced Ring-Openingand Dissociation Pathways in Iodothiophenes by Ultrafast ElectronDiffraction** *JOURNAL OF PHYSICAL CHEMISTRY LETTERS*

Ghrist, A. M., Bain, M., Liu, Y., Razmus, W. O., Bhattacharyya, S., Chen, K., Gabalski, I., Glownia, J. M., Green, A. E., Kaufman, B., Kramer, P. L., Larsen, K. A., Minitti, et al
2026

- **Nonlinear reversal of photoexcitation on the attosecond time scale improves ultrafast X-ray diffraction images.** *Nature communications*
  Ulmer, A., Ho, P. J., Langbehn, B., Kuschel, S., Hecht, L., Obaid, R., Dold, S., Driver, T., Duris, J., Lin, M. F., Cesar, D., Franz, P., Guo, et al
  2026; 17 (1)

- **Elucidating Norrish type I reactive pathways by ultrafast X-ray absorption spectroscopy.** *Chemical science*
  Graßl, M., Unzueta, P., Hillers-Bendtsen, A. E., Liu, Y., Hait, D., Green, A. E., Cheng, X., Allum, F., Driver, T., Forbes, R., Glownia, J. M., Isele, E., Larsen, et al
  2026

- **Attosecond response of molecules to impulsive ionization** *NATURE PHYSICS*
  Driver, T., Guo, Z., Isele, E., Grell, G., Ruberti, M., O'Neal, J. T., Alexander, O., Beauvarlet, S., Cesar, D., Duris, J., Garratt, D., Larsen, K. A., Li, et al
  2026

- **Revealing ultrafast proton-transfer-mediated autoionization as a source of low-energy electrons in hydrogen-bonded systems.** *Nature communications*
  Iskandar, W., Wang, Y. S., Suarez, V. A., Rohan, M. C., Larsen, K. A., Manis, J. Z., Severt, T., Williams, J. B., Ben-Itzhak, I., Orlando, T. M., Kretchmer, J. S., Slaughter, D. S., Weber, et al
  2026

- **Few-femtosecond time resolution in optically pumped hard X-ray scattering at a free-electron laser** *OPTICA*
  Weckwerth, E., Duran, M., Gabalski, I., Allum, F., Bain, M., Bhattacharyya, S., Brahms, C., Brenner, L., Britton, M. A., Carrascosa, A., Cheng, C., Cheng, X., Crane, et al
  2026; 13 (5): 863-866

- **Ray-tracing image simulations of transparent objects with complex shape and inhomogeneous refractive index** *PHYSICAL REVIEW FLUIDS*
  Kalita, A., Oller, B., Paula, T., Bussmann, A., Marte, S., Blaj, G., Sierra, R. G., Mous, S., Larsen, K. A., Cheng, X., Hayes, M. J., Banta, K., Lisova, et al
  2026; 11 (4)

- **Dynamic laser pulse shaping for future ultrafast electron and x-ray instrumentation**
  Zhang, H., Lemons, R., Hirschman, J., Neveu, N., Sudar, N., Robles, R., Franz, P., Britton, M., Borne, K., Zhang, Z., Larsen, K. A., Mencer, B., Baker, et al
  edited by Moses, J., Phillips, C. R.
  SPIE-INT SOC OPTICAL ENGINEERING.2026

- **Spectral broadening and post-compression of ahigh-repetition rate Yb-pumped OPA in the visibleand ultraviolet** *OPTICS LETTERS*
  Kaufman, B., Larsen, K. A., Allum, F., Britton, M., Castellanos, J., Wilson, R., Bradforth, S. E., Brahms, C., Travers, J. C., Robinson, J. S., Bain, M., Forbes, R.
  2025; 50 (24): 7464-7467

- **The UV Photoinduced Ring-Closing Reaction of Cyclopentadiene Probed with Ultrafast Electron Diffraction.** *The journal of physical chemistry. A*
  Lederer, J., Bertram, L., Huang, L., Bhattacharyya, S., Boutet, S., Cheng, X., Crane, S. W., England, R. J., Graßl, M., Heald, L., Ji, F., Kramer, P., Lam, et al
  2025

- **Attosecond X-Ray Core-Level Chronoscopy of Aromatic Molecules** *PHYSICAL REVIEW X*
  Ji, J., Guo, Z., Driver, T., Trevisan, C. S., Cesar, D., Cheng, X., Duris, J., Franz, P. L., Glownia, J., Gong, X., Hammerland, D., Han, M., Heck, et al
  2025; 15 (4)

- **Imaging Valence Electron Rearrangement in a Chemical Reaction Using Hard X-Ray Scattering.** *Physical review letters*
  Gabalski, I., Green, A., Lenzen, P., Allum, F., Bain, M., Bhattacharyya, S., Britton, M. A., Champenois, E. G., Cheng, X., Cryan, J. P., Driver, T., Forbes, R., Garratt, et al
  2025; 135 (8): 083001

- **Imaging Valence Electron Rearrangement in a Chemical Reaction Using Hard X-Ray Scattering** *PHYSICAL REVIEW LETTERS*

Gabalski, I., Green, A., Lenzen, P., Allum, F., Bain, M., Bhattacharyya, S., Britton, M. A., Champenois, E. G., Cheng, X., Cryan, J. P., Driver, T., Forbes, R., Garratt, et al
2025; 135 (8)

- **Characterizing few-cycle UV resonant dispersive waves through direct field sampling** *OPTICS LETTERS*
  Larsen, K. A., Lantigua, C., Kincaid, C., Allum, F., Britton, M., Castellanos, J., Kaufman, B., Neuhaus, M., Sylla, F., Kim, K., Bradforth, S. E., Kling, M. F., Robinson, et al
  2025; 50 (16): 4962-4965

- **Imaging the photochemistry of cyclobutanone using ultrafast electron diffraction: Experimental results.** *The Journal of chemical physics*
  Green, A. E., Liu, Y., Allum, F., Graßl, M., Lenzen, P., Ashfold, M. N., Bhattacharyya, S., Cheng, X., Centurion, M., Crane, S. W., Forbes, R., Goff, N. A., Huang, et al
  2025; 162 (18)

- **Spectrotemporal Shaping of Attosecond X-Ray Pulses with a Fresh-Slice Free-Electron Laser.** *Physical review letters*
  Robles, R. R., Larsen, K. A., Cesar, D., Driver, T., Duris, J., Franz, P., Garratt, D., Guo, V., Just, G., Lemons, R., Lin, M. F., Obaid, R., Sudar, et al
  2025; 134 (11): 115001

- **Experimental Generation of Extreme Electron Beams for Advanced Accelerator Applications.** *Physical review letters*
  Emma, C., Majernik, N., Swanson, K. K., Ariniello, R., Gessner, S., Hessami, R., Hogan, M. J., Knetsch, A., Larsen, K. A., Marinelli, A., O'Shea, B., Perez, S., Rajkovic, et al
  2025; 134 (8): 085001

- **Probing Electronic Coherence between Core-Level Vacancies at Different Atomic Sites** *PHYSICAL REVIEW X*
  Wang, J., Driver, T.
  2025; 15: 011008

- **The LCLS-II Photoinjector Laser System**
  Zhang, H., Gilevich, S., Miahnahril, A., Alverson, S., Brachmann, A., Durisi, J., Franz, P., Fry, A., Hirschman, J., Larsen, K., Lemons, R., Li, S., Lug, et al
  IEEE.2025

- **Design and performance of a magnetic bottle electron spectrometer for high-energy photoelectron spectroscopy.** *The Review of scientific instruments*
  Borne, K., O'Neal, J. T., Wang, J., Isele, E., Obaid, R., Berrah, N., Cheng, X., Bucksbaum, P. H., James, J., Kamalov, A., Larsen, K. A., Li, X., Lin, et al
  2024; 95 (12)

- **"Beam à la carte": Laser heater shaping for attosecond pulses in a multiplexed x-ray free-electron laser** *APPLIED PHYSICS LETTERS*
  Li, S., Zhang, Z., Alverson, S., Cesar, D., Driver, T., Franz, P., Isele, E., Duris, J. P., Larsen, K., Lin, M., Obaid, R., O'Neal, J. T., Robles, et al
  2024; 125 (19)

- **Quantitative x-ray scattering of free molecules** *JOURNAL OF PHYSICS B-ATOMIC MOLECULAR AND OPTICAL PHYSICS*
  Ma, L., Goff, N., Carrascosa, A., Nelson, S., Liang, M., Cheng, X., Yong, H., Gabalski, I., Huang, L., Crane, S. W., Green, A. E., Allum, F., Lenzen, et al
  2024; 57 (20)

- **Attosecond impulsive stimulated X-ray Raman scattering in liquid water.** *Science advances*
  Alexander, O., Egun, F., Rego, L., Gutierrez, A. M., Garratt, D., Cardenes, G. A., Nogueira, J. J., Lee, J. P., Zhao, K., Wang, R. P., Ayuso, D., Barnard, J. C., Beauvarlet, et al
  2024; 10 (39): eadp0841

- **Tracking ultrafast non-adiabatic dissociation dynamics of the deuterated water dication molecule.** *The Journal of chemical physics*
  Iskandar, W., Rescigno, T. N., Orel, A. E., Larsen, K. A., Severt, T., Streeter, Z. L., Jochim, B., Griffin, B., Call, D., Davis, V., McCurdy, C. W., Lucchese, R. R., Williams, et al
  2024; 161 (4)

- **Wavelength scaling and multicolor operation of a plasma-driven attosecond x-ray source via harmonic generation** *PHYSICAL REVIEW ACCELERATORS AND BEAMS*
  Hessami, R., Morgan, J., Robles, R., Larsen, K. A., Marinelli, A., Emma, C.
  2024; 27 (7)

- **The Linac Coherent Light Source II photoinjector laser infrastructure** *HIGH POWER LASER SCIENCE AND ENGINEERING*
  Zhang, H., Gilevich, S., Miahnahri, A., Alverson, S., Brachmann, A., Duris, J., Franz, P., Fry, A., Hirschman, J., Larsen, K., Lemons, R., Li, S., Lu, et al
  2024; 12

- **Terawatt-scale attosecond X-ray pulses from a cascaded superradiant free-electron laser** *NATURE PHOTONICS*
  Franz, P., Li, S., Driver, T., Robles, R. R., Cesar, D., Isele, E., Guo, Z., Wang, J., Duris, J. P., Larsen, K., Glownia, J. M., Cheng, X., Hoffmann, et al
  2024

- **Experimental demonstration of attosecond pump-probe spectroscopy with an X-ray free-electron laser** *NATURE PHOTONICS*
  Guo, Z., Driver, T., Beauvarlet, S., Cesar, D., Duris, J., Franz, P. L., Alexander, O., Bohler, D., Bostedt, C., Averbukh, V., Cheng, X., Dimauro, L. F., Doumy, et al
  2024

- **Attosecond-pump attosecond-probe x-ray spectroscopy of liquid water.** *Science (New York, N.Y.)*
  Li, S., Lu, L., Bhattacharyya, S., Pearce, C., Li, K., Nienhuis, E. T., Doumy, G., Schaller, R. D., Moeller, S., Lin, M. F., Dakovski, G., Hoffman, D. J., Garratt, et al
  2024: eadn6059

- **Compact single-shot soft X-ray photon spectrometer for free-electron laser diagnostics** *OPTICS EXPRESS*
  Larsen, K. A., Borne, K., Obaid, R., Kamalov, A., Liu, Y., Cheng, X., James, J., Driver, T., Li, K., Liu, Y., Sakdinawat, A., David, C., Wolf, et al
  2023; 31 (22): 35822-35834

- **Efficiency of charge transfer in changing the dissociation dynamics of OD⁺ transients formed after the photo-fragmentation of D₂O** *JOURNAL OF CHEMICAL PHYSICS*
  Iskandar, W., Rescigno, T. N., Orel, A. E., Severt, T., Larsen, K. A., Streeter, Z. L., Jochim, B., Griffin, B., Call, D., Davis, V., Mccurdy, C. W., Lucchese, R. R., Williams, et al
  2023; 159 (9)

- **Strongly coupled intermediate electronic states in one-color two-photon single valence ionization of O2.** *The Journal of chemical physics*
  Larsen, K. A., Bello, R. Y., Lucchese, R. R., McCurdy, C. W., Slaughter, D. S., Weber, T.
  2023; 158 (2): 024303

- **Step-by-step state-selective tracking of fragmentation dynamics of water dications by momentum imaging.** *Nature communications*
  Severt, T., Streeter, Z. L., Iskandar, W., Larsen, K. A., Gatton, A., Trabert, D., Jochim, B., Griffin, B., Champenois, E. G., Brister, M. M., Reedy, D., Call, D., Strom, et al
  2022; 13 (1): 5146

- **Mechanisms and dynamics of the NH2+ + H+ and NH+ + H+ + H fragmentation channels upon single-photon double ionization of NH3** *JOURNAL OF PHYSICS B-ATOMIC MOLECULAR AND OPTICAL PHYSICS*
  Larsen, K. A., Rescigno, T. N., Streeter, Z. L., Iskandar, W., Heck, S., Gatton, A., Champenois, E. G., Severt, T., Strom, R., Jochim, B., Reedy, D., Call, D., Moshammer, et al
  2020; 53 (24)

- **Role of dipole-forbidden autoionizing resonances in nonresonant one-color two-photon single ionization of N-2** *PHYSICAL REVIEW A*
  Larsen, K. A., Bello, R. Y., Lucchese, R. R., Rescigno, T. N., McCurdy, C., Slaughter, D. S., Weber, T.
  2020; 102 (6)

- **Photoelectron and fragmentation dynamics of the H+** *PHYSICAL REVIEW RESEARCH*
  Larsen, K. A., Rescigno, T. N., Severt, T., Streeter, Z. L., Iskandar, W., Heck, S., Gatton, A., Champenois, E. G., Strom, R., Jochim, B., Reedy, D., Call, D., Moshammer, et al
  2020; 2 (4)

- **Distinguishing resonance symmetries with energy-resolved photoion angular distributions from ion-pair formation in O-2 following two-photon absorption of a 9.3 eV femtosecond pulse** *JOURNAL OF CHEMICAL PHYSICS*
  Larsen, K. A., Lucchese, R. R., Slaughter, D. S., Weber, T.
  2020; 153 (2): 021103

- **Angle-resolved nonresonant two-photon single ionization of argon using 9.3-eV photons produced via high-order harmonic generation** *PHYSICAL REVIEW A*
  Larsen, K. A., Slaughter, D. S., Weber, T.

2020; 101 (6)

- **Symmetry breaking in the body-fixed electron emission pattern due to electron-retroaction in the photodissociation of H-2(+) and D-2(+) close to threshold** *PHYSICAL REVIEW RESEARCH*
  Heck, S., Gatton, A., Larsen, K. A., Iskandar, W., Champenois, E. G., Strom, R., Landers, A., Reedy, D., Dailey, C., Williams, J. B., Severt, T., Jochim, B., Ben-Itzhak, et al
  2019; 1 (3)
- **Tracing intermolecular Coulombic decay of carbon-dioxide dimers and oxygen dimers after valence photoionization** *PHYSICAL REVIEW A*
  Iskandar, W., Gatton, A. S., Gaire, B., Sturm, F. P., Larsen, K. A., Champenois, E. G., Shivaram, N., Moradmand, A., Williams, J. B., Berry, B., Severt, T., Ben-Itzhak, I., Metz, et al
  2019; 99 (4)
- **Ultrafast photodissociation dynamics and nonadiabatic coupling between excited electronic states of methanol probed by time-resolved photoelectron spectroscopy** *JOURNAL OF CHEMICAL PHYSICS*
  Champenois, E. G., Greenman, L., Shivaram, N., Cryan, J. P., Larsen, K. A., Rescigno, T. N., McCurdy, C., Belkacem, A., Slaughter, D. S.
  2019; 150 (11)
- **Ultrafast photodissociation dynamics and nonadiabatic coupling between excited electronic states of methanol probed by time-resolved photoelectron spectroscopy.** *The Journal of chemical physics*
  Champenois, E. G., Greenman, L., Shivaram, N., Cryan, J. P., Larsen, K. A., Rescigno, T. N., McCurdy, C. W., Belkacem, A., Slaughter, D. S.
  2019; 150 (11): 114301
- **Resonance signatures in the body-frame valence photoionization of CF4** *PHYSICAL CHEMISTRY CHEMICAL PHYSICS*
  Larsen, K. A., Trevisan, C. S., Lucchese, R. R., Heck, S., Iskandar, W., Champenois, E., Gatton, A., Moshammer, R., Strom, R., Severt, T., Jochim, B., Reedy, D., Weller, et al
  2018; 20 (32): 21075-21084
- **VUV and XUV reflectance of optically coated mirrors for selection of high harmonics** *OPTICS EXPRESS*
  Larsen, K. A., Cryan, J. P., Shivaram, N., Champenois, E. G., Wright, T. W., Ray, D., Kostko, O., Ahmed, M., Belkacem, A., Slaughter, D. S.
  2016; 24 (16): 18209-18216