

Stanford



Matthias C. Hoffmann

Lead Scientist, SLAC National Accelerator Laboratory

Bio

BIO

Education

Physik Diplom 2001, University of Freiburg, Germany,

Studies in Physics, Technical University of Denmark, Lyngby, Denmark,

Dr. rer. Nat. in Physics 2006, University of Freiburg, Germany

Appointments

2006-2009, Massachusetts Institute of Technology, Cambridge, MA, Postdoctoral Associate

2009-2011 Research Scientist, Center for Free Electron Laser Science, Hamburg, Germany

2011-present SLAC National Accelerator Lab, Staff Scientist, LCLS,

CURRENT ROLE AT STANFORD

Staff scientist in the LCLS Laser Science and Technology Division.

Develops and supports THz pump-X-ray probe experiments at LCLS and in-house research on ultrafast spectroscopy with intense THz pulses.

Professional

PROFESSIONAL AFFILIATIONS AND ACTIVITIES

- Senior Member, Optical Society of America (2016 - present)

Publications

PUBLICATIONS

- **The persistence of memory in ionic conduction probed by nonlinear optics.** *Nature*
Poletayev, A. D., Hoffmann, M. C., Dawson, J. A., Teitelbaum, S. W., Trigo, M., Islam, M. S., Lindenberg, A. M.
2024; 625 (7996): 691-696
- **Femtosecond Electronic and Hydrogen Structural Dynamics in Ammonia Imaged with Ultrafast Electron Diffraction.** *Physical review letters*

- Champenois, E. G., List, N. H., Ware, M., Britton, M., Bucksbaum, P. H., Cheng, X., Centurion, M., Cryan, J. P., Forbes, R., Gabalski, I., Hegazy, K., Hoffmann, M. C., Howard, et al
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- **Ultrafast X-Ray Scattering Reveals Composite Amplitude Collective Mode in the Weyl Charge Density Wave Material (TaSe₄)₂I.** *Physical review letters*
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 - **The 2023 terahertz science and technology roadmap** *JOURNAL OF PHYSICS D-APPLIED PHYSICS*
Leitenstorfer, A., Moskalenko, A. S., Kampfrath, T., Kono, J., Castro-Camus, E., Peng, K., Qureshi, N., Turchinovich, D., Tanaka, K., Markelz, A. G., Havenith, M., Hough, C., Joyce, et al
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 - **Rehybridization dynamics into the pericyclic minimum of an electrocyclic reaction imaged in real-time.** *Nature communications*
Liu, Y., Sanchez, D. M., Ware, M. R., Champenois, E. G., Yang, J., Nunes, J. P., Attar, A., Centurion, M., Cryan, J. P., Forbes, R., Hegazy, K., Hoffmann, M. C., Ji, et al
2023; 14 (1): 2795
 - **Measurement of femtosecond dynamics of ultrafast electron beams through terahertz compression and time-stamping** *APPLIED PHYSICS LETTERS*
Othman, M. K., Gabriel, A. E., Snively, E. C., Kozina, M. E., Shen, X., Ji, F., Lewis, S., Weathersby, S., Vasireddy, P., Luo, D., Wang, X., Hoffmann, M. C., Nanni, et al
2023; 122 (14)
 - **Terahertz-Driven Local Dipolar Correlation in a Quantum Paraelectric.** *Physical review letters*
Cheng, B., Kramer, P. L., Shen, Z. X., Hoffmann, M. C.
2023; 130 (12): 126902
 - **Ultrafast Optomechanical Strain in Layered GeS.** *Nano letters*
Luo, D., Zhang, B., Sie, E. J., Nyby, C. M., Fan, Q., Shen, X., Reid, A. H., Hoffmann, M. C., Weathersby, S., Wen, J., Qian, X., Wang, X., Lindenberg, et al
2023
 - **Lightwave-driven electron emission for polarity-sensitive terahertz beam profiling** *APL PHOTONICS*
Lange, S., Hoffmann, M. C., Jepsen, P.
2023; 8 (1)
 - **Terahertz Pump/X-ray Probe Experiments At LCLS**
Hoffmann, M. C., IEEE
IEEE.2023
 - **Spatiotemporal Imaging of Near-Fields from a Tilted Pulse Front THz Source**
Gabriel, A. E., Othman, M. K., Hoffmann, M. C., Nanni, E. A., IEEE
IEEE.2023
 - **Ultrafast modification of the electronic structure of a correlated insulator** *PHYSICAL REVIEW RESEARCH*
Granaes, O., Vaskivskiy, I., Wang, X., Thunstroem, P., Ghimire, S., Knut, R., Soederstroem, J., Kjellsson, L., Turenne, D., Engel, R. Y., Beye, M., Lu, J., Higley, et al
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 - **Observation of photo-induced plasmon-phonon coupling in PbTe via ultrafast x-ray scattering.** *Structural dynamics (Melville, N.Y.)*
Jiang, M. P., Fahy, S., Hauber, A., Murray, E. D., Savic, I., Bray, C., Clark, J. N., Henighan, T., Kozina, M., Lindenberg, A. M., Zalden, P., Chollet, M., Glowonia, et al
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 - **Spatiotemporal Measurement of THz Near-Fields Using Electro-Optic Sampling**
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IEEE.2022

- **Subterahertz collective dynamics of polar vortices.** *Nature*
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- **Ultrafast structural dynamics of strongly-THz-driven materials**
Hoffmann, M. C., IEEE
IEEE.2021
- **Enabling high repetition rate nonlinear THz science with a kilowatt-class sub-100 fs laser source** *OPTICS EXPRESS*
Kramer, P. L., Windeler, M. R., Mecseki, K., Champenois, E. G., Hoffmann, M. C., Tavella, F.
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- **Ultrafast Dynamics of a Terahertz Dual-Fed Relativistic Electron Bunch Compressor**
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IEEE.2020
- **THz-driven bunch compression for varying electron beam energy**
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IEEE.2020
- **Generation of high-field single-cycle terahertz pulses at 100 kHz**
Kramer, P. L., Hoffmann, M. C., Tavella, F., IEEE
IEEE.2020
- **Nonlinear Magnetization Dynamics Driven by Strong Terahertz Fields.** *Physical review letters*
Hudl, M., d'Aquino, M., Pancaldi, M., Yang, S., Samant, M. G., Parkin, S. S., Durr, H. A., Serpico, C., Hoffmann, M. C., Bonetti, S.
2019; 123 (19): 197204
- **Dynamical Slowing-Down in an Ultrafast Photoinduced Phase Transition.** *Physical review letters*
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2019; 123 (9): 097601
- **Dynamical Slowing-Down in an Ultrafast Photoinduced Phase Transition** *PHYSICAL REVIEW LETTERS*
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- **Terahertz-pump Experiments On Complex Solids at X-ray FELs**
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- **Parallel-Plate THz Waveguides for Relativistic Electron Bunch Compression**
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- **THz-Pump UED-Probe on a Topological Weyl Semimetal**
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2018; 9 (12): 3538–43
- **Anti-reflection coating design for metallic terahertz meta-materials** *OPTICS EXPRESS*
Pancaldi, M., Freeman, R., Hudl, M., Hoffmann, M. C., Urazhdin, S., Vavassori, P., Bonetti, S.
2018; 26 (3): 2917–27
- **Development of a THz Pump MeV Ultrafast Electron Diffraction Probe Apparatus**
Ofori-Okai, B. K., Hoffmann, M. C., Reid, A. H., Li, R., Shen, X., Yang, J., Zheng, Q., Park, S., Mannenbach, E. M., Weathersby, S. P., Edstrom, S., Polzin, W., Lindenberg, et al
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- **Single-Shot Electro-Optic Measurement of Mid-Infrared Pulses**
Kozina, M. E., Hoffmann, M. C., IEEE
IEEE.2018
- **Anti-reflection coating design for metallic terahertz meta-materials**
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Russell, B. K., Ofori-Okai, B. K., Chen, Z., Hoffmann, M. C., Tsui, Y. Y., Glenzer, S. H.
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Lange, S. L., Iwaszczuk, K., Hoffmann, M., Broeng, J., Jepsen, P. U., IEEE

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- **Direct observation of lattice motion driven by strong THz pulses**
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IEEE.2016
- **Ultrafast Terahertz Gating of the Polarization and Giant Nonlinear Optical Response in BiFeO₃ Thin Films** *ADVANCED MATERIALS*
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- **Ultrafast Terahertz Gating of the Polarization and Giant Nonlinear Optical Response in BiFeO₃ Thin Films.** *Advanced materials (Deerfield Beach, Fla.)*
Chen, F., Goodfellow, J., Liu, S., Grinberg, I., Hoffmann, M. C., Damodaran, A. R., Zhu, Y., Zalden, P., Zhang, X., Takeuchi, I., Rappe, A. M., Martin, L. W., Wen, et al
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- **Direct observation of ultrafast collective motions in CO myoglobin upon ligand dissociation** *SCIENCE*
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- **Nonlinear THz Optics and Control in Complex Solids**
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IEEE.2015
- **Intense THz pulses for condensed matter physics**
Hoffmann, M. C., Vodopyanov, K. L.
SPIE-INT SOC OPTICAL ENGINEERING.2015
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- **THz Light Source at SLAC FACET User Facility**
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- **Selective THz excitation of collective modes in underdoped YBCO**
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- **Terahertz Nonlinear Optics in Semiconductors**

- Turchinovich, D., Hvam, J. M., Hoffmann, M. C., IEEE
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 - **Terahertz Kerr effect** *APPLIED PHYSICS LETTERS*
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