

Stanford

David Reis

Professor of Photon Science and of Applied Physics

Photon Science Directorate

Bio

ACADEMIC APPOINTMENTS

- Professor, Photon Science Directorate
- Professor, Applied Physics
- Principal Investigator, Stanford Institute for Materials and Energy Sciences
- Principal Investigator, Stanford PULSE Institute

Teaching

COURSES

2025-26

- Principles of X-ray Scattering: APPPHYS 222 (Spr)

2024-25

- Advanced Topics in X-ray Scattering: APPPHYS 322 (Spr)
- Principles of X-ray Scattering: APPPHYS 222, PHOTON 222 (Win)

2023-24

- Principles of X-ray Scattering: APPPHYS 222, PHOTON 222 (Win)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Jiaxuan Guo, Rafi Hessami, Khaled Younes

Postdoctoral Faculty Sponsor

Gal Orenstein, Huaiyu Wang

Doctoral Dissertation Advisor (AC)

Ernesto Flores, Simai Jia, Tatiana Smorodnikova, Jade Stanton, Leon Zhang

Doctoral Dissertation Co-Advisor (AC)

Jack Hirschman, Sara Irvine, Pranav Kakhandiki, Kaden Loring, Catherine Weibel

Doctoral (Program)

Ernesto Flores, Dongyu Liu, Pranav Mahaadev, Gabriel Mintzer, Csaba Nemeth, Javin Ohara, Avi Parrack, Harrison Pasquinilli, Madison Singleton, Mason Stobbe, Yaoju Tam, Benny Weng

Publications

PUBLICATIONS

- **Nonthermal Bonding Origin of a Novel Photoexcited Lattice Instability in SnSe.** *Physical review letters*
Huang, Y., Teitelbaum, S., Yang, S., De la Peña, G., Sato, T., Chollet, M., Zhu, D., Niedziela, J. L., Bansal, D., May, A. F., Lindenberg, A. M., Delaire, O., Trigo, et al
2023; 131 (15): 156902
- **Ultrafast X-Ray Scattering Reveals Composite Amplitude Collective Mode in the Weyl Charge Density Wave Material (TaSe₄)₂I.** *Physical review letters*
Nguyen, Q. L., Duncan, R. A., Orenstein, G., Huang, Y., Krapivin, V., de la Peña, G., Ornelas-Skarin, C., Reis, D. A., Abbamonte, P., Bettler, S., Chollet, M., Hoffmann, M. C., Hurley, et al
2023; 131 (7): 076901
- **Ultrafast lattice disordering can be accelerated by electronic collisional forces** *NATURE PHYSICS*
de la Pena Munoz, G. A., Correa, A. A., Yang, S., Delaire, O., Huang, Y., Johnson, A. S., Katayama, T., Krapivin, V., Pastor, E., Reis, D. A., Teitelbaum, S., Vidas, L., Wall, et al
2023
- **In situ high-harmonic microscopy of a nanostructured solid** *OPTICA*
Korobenko, A., Rashid, S., Naumov, A., Villeneuve, D. M., Reis, D. A., Berini, P., Corkum, P. B., Vampa, G.
2023; 10 (5): 642-649
- **Influence of local symmetry on lattice dynamics coupled to topological surface states** *PHYSICAL REVIEW B*
Sobota, J. A., Teitelbaum, S. W., Huang, Y., Querales-Flores, J. D., Power, R., Allen, M., Rotundu, C. R., Bailey, T. P., Uher, C., Henighan, T., Jiang, M., Zhu, D., Chollet, et al
2023; 107 (1)
- **High-harmonic generation from artificially stacked 2D crystals** *NANOPHOTONICS*
Heide, C., Kobayashi, Y., Johnson, A. C., Heinz, T. F., Reis, D. A., Liu, F., Ghimire, S.
2023
- **Floquet engineering of strongly driven excitons in monolayer tungsten disulfide** *NATURE PHYSICS*
Kobayashi, Y., Heide, C., Johnson, A. C., Tiwari, V., Liu, F., Reis, D. A., Heinz, T. F., Ghimire, S.
2023
- **Introduction to the Topical Issue high field QED physics.** *The European physical journal. D, Atomic, molecular, and optical physics*
Yu, T., Pegoraro, F., Sarri, G., Reis, D. A.
2023; 77 (4): 55
- **Intense infrared lasers for strong-field science** *ADVANCES IN OPTICS AND PHOTONICS*
Chang, Z., Fang, L., Fedorov, V., Geiger, C., Ghimire, S., Heide, C., Ishii, N., Itatani, J., Joshi, C., Kobayashi, Y., Kumar, P., Marra, A., Mirov, et al
2022; 14 (4): 652-782
- **In-Situ Nanoscale Focusing of Extreme Ultraviolet Solid-State High Harmonics** *PHYSICAL REVIEW X*
Korobenko, A., Rashid, S., Heide, C., Naumov, A., Reis, D. A., Berini, P., Corkum, P. B., Vampa, G.
2022; 12 (4)
- **Probing topological phase transitions using high-harmonic generation** *NATURE PHOTONICS*
Heide, C., Kobayashi, Y., Baykusheva, D. R., Jain, D., Sobota, J. A., Hashimoto, M., Kirchmann, P. S., Oh, S., Heinz, T. F., Reis, D. A., Ghimire, S.
2022
- **Probing electron-hole coherence in strongly driven 2D materials using high-harmonic generation** *OPTICA*
Heide, C., Kobayashi, Y., Johnson, A. C., Liu, F., Heinz, T. F., Reis, D. A., Ghimire, S.
2022; 9 (5): 512-516
- **Observation of a Novel Lattice Instability in Ultrafast Photoexcited SnSe** *PHYSICAL REVIEW X*
Huang, Y., Yang, S., Teitelbaum, S., De la Pena, G., Sato, T., Chollet, M., Zhu, D., Niedziela, J. L., Bansal, D., May, A. F., Lindenberg, A. M., Delaire, O., Reis, et al

2022; 12 (1)

- **Dynamically Tunable Terahertz Emission Enabled by Anomalous Optical Phonon Responses in Lead Telluride** *ACS PHOTONICS*
Guzelturk, B., Trigo, M., Delaire, O., Reis, D. A., Lindenberg, A. M.
2021; 8 (12): 3633-3640
- **All-Optical Probe of Three-Dimensional Topological Insulators Based on High-Harmonic Generation by Circularly Polarized Laser Fields.** *Nano letters*
Baykusheva, D., Chacon, A., Lu, J., Bailey, T. P., Sobota, J. A., Soifer, H., Kirchmann, P. S., Rotundu, C., Uher, C., Heinz, T. F., Reis, D. A., Ghimire, S.
2021
- **Measurements of nonequilibrium interatomic forces using time-domain x-ray scattering** *PHYSICAL REVIEW B*
Teitelbaum, S. W., Henighan, T. C., Liu, H., Jiang, M. P., Zhu, D., Chollet, M., Sato, T., Murray, E. D., Fahy, S., O'Mahony, S., Bailey, T. P., Uher, C., Trigo, et al
2021; 103 (18)
- **Strong-field physics in three-dimensional topological insulators** *PHYSICAL REVIEW A*
Baykusheva, D., Chacon, A., Kim, D., Kim, D., Reis, D. A., Ghimire, S.
2021; 103 (2)
- **On the Use of Multilayer Laue Lenses with X-ray Free Electron Lasers**
Prasciolu, M., Murray, K. T., Ivanov, N., Fleckenstein, H., Domaracky, M., Gelisio, L., Trost, F., Ayyer, K., Krebs, D., Aplin, S., Awel, S., Boesenberg, U., Belsak, et al
edited by Bleiner, D.
SPIE-INT SOC OPTICAL ENGINEERING.2021
- **The effect of photo-carrier doping on the generation of high harmonics from MoS₂**
Heide, C., Kobayashi, Y., Liu, F., Ghimire, S., Heinz, T. F., Reis, D. A., IEEE
IEEE.2021
- **Beating absorption in solid-state high harmonics** *COMMUNICATIONS PHYSICS*
Liu, H., Vampa, G., Zhang, J., Shi, Y., Buddhiraju, S., Fan, S., Vuckovic, J., Bucksbaum, P. H., Reis, D. A.
2020; 3 (1)
- **Attosecond synchronization of extreme ultraviolet high harmonics from crystals** *JOURNAL OF PHYSICS B-ATOMIC MOLECULAR AND OPTICAL PHYSICS*
Vampa, G., Lu, J., You, Y., Baykusheva, D. R., Wu, M., Liu, H., Schafer, K. J., Gaarde, M. B., Reis, D. A., Ghimire, S.
2020; 53 (14)
- **Disentangling interface and bulk contributions to high-harmonic emission from solids** *OPTICA*
Vampa, G., Liu, H., Heinz, T. F., Reis, D. A.
2019; 6 (5): 553–56
- **Anomalous behavior of nonequilibrium excitations in UO₂** *PHYSICAL REVIEW B*
Rittman, D. R., Teitelbaum, S. W., Reis, D. A., Mao, W. L., Ewing, R. C.
2019; 99 (13)
- **Time-dependent QED approach to x-ray nonlinear Compton scattering** *PHYSICAL REVIEW A*
Krebs, D., Reis, D. A., Santra, R.
2019; 99 (2)
- **Interferometry of dipole phase in high harmonics from solids** *NATURE PHOTONICS*
Lu, J., Cunningham, E. F., You, Y., Reis, D. A., Ghimire, S.
2019; 13 (2): 96-+
- **Characterization of high-harmonic emission from ZnO up to 11 eV pumped with a Cr:ZnS high-repetition-rate source** *OPTICS LETTERS*
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2019; 44 (2): 259–62
- **High-harmonic generation from solids** *NATURE PHYSICS*

Ghimire, S., Reis, D. A.
2019; 15 (1): 10–16

● **Mapping spin-correlations with hard X-ray free-electron laser**

Zhong, Y., Epp, S., Krasniqi, F., Foucar, L., Trigo, M., Jian, C., Reis, D., Wang, H., Zhao, J., Lemke, H., Zhu, D., Ullrich, J., Schlichting, et al
edited by Cerullo, G., Ogilvie, J., Kartner, F., Khalil, M., Li, R.
E D P SCIENCES.2019

● **High-Harmonic Generation from Topological Insulators**

Baykusheva, D., Lu, J., Sobota, J. A., Soifer, H., Rotundu, C. R., Kirchmann, P. S., Reis, D. A., Ghimire, S., IEEE
IEEE.2019

● **Femtosecond x-ray diffraction reveals a liquid-liquid phase transition in phase-change materials.** *Science (New York, N.Y.)*

Zalden, P. n., Quirin, F. n., Schumacher, M. n., Siegel, J. n., Wei, S. n., Koc, A. n., Nicoul, M. n., Trigo, M. n., Andreasson, P. n., Enquist, H. n., Shu, M. J., Pardini, T. n., Chollet, et al
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● **Theory of x-ray scattering from laser-driven electronic systems** *PHYSICAL REVIEW B*

Popova-Gorelova, D., Reis, D. A., Santra, R.
2018; 98 (22)

● **Frequency-selective excitation of high-wavevector phonons** *APPLIED PHYSICS LETTERS*

Teitelbaum, S. W., Henighan, T., Liu, H., Jiang, M. P., Kozina, M., Zhu, D., Chollet, M., Sato, T., Glowonia, J. M., Trigo, M., Reis, D. A.
2018; 113 (17)

● **Enhanced high-harmonic generation from an all-dielectric metasurface** *NATURE PHYSICS*

Liu, H., Guo, C., Vampa, G., Zhang, J., Sarmiento, T., Xiao, M., Bucksbaum, P. H., Vuckovic, J., Fan, S., Reis, D. A.
2018; 14 (10): 1006–+

● **Direct Measurement of Anharmonic Decay Channels of a Coherent Phonon.** *Physical review letters*

Teitelbaum, S. W., Henighan, T., Huang, Y., Liu, H., Jiang, M. P., Zhu, D., Chollet, M., Sato, T., Murray, É. D., Fahy, S., O'Mahony, S., Bailey, T. P., Uher, et al
2018; 121 (12): 125901

● **Direct Measurement of Anharmonic Decay Channels of a Coherent Phonon** *PHYSICAL REVIEW LETTERS*

Teitelbaum, S. W., Henighan, T., Huang, Y., Liu, H., Jiang, M. P., Zhu, D., Chollet, M., Sato, T., Murray, E. D., Fahy, S., O'Mahony, S., Bailey, T. P., Uher, et al
2018; 121 (12)

● **Probing periodic potential of crystals via strong-field re-scattering** *JOURNAL OF PHYSICS B-ATOMIC MOLECULAR AND OPTICAL PHYSICS*

You, Y., Cunningham, E., Reis, D. A., Ghimire, S.
2018; 51 (11)

● **Roadmap of ultrafast x-ray atomic and molecular physics** *JOURNAL OF PHYSICS B-ATOMIC MOLECULAR AND OPTICAL PHYSICS*

Young, L., Ueda, K., Guehr, M., Bucksbaum, P. H., Simon, M., Mukamel, S., Rohringer, N., Prince, K. C., Masciovecchio, C., Meyer, M., Rudenko, A., Rolles, D., Bostedt, et al
2018; 51 (3)

● **Ultrafast disordering of vanadium dimers in photoexcited VO₂.** *Science (New York, N.Y.)*

Wall, S., Yang, S., Vidas, L., Chollet, M., Glowonia, J. M., Kozina, M., Katayama, T., Henighan, T., Jiang, M., Miller, T. A., Reis, D. A., Boatner, L. A., Delaire, et al
2018; 362 (6414): 572–76

● **Orientation dependence of temporal and spectral properties of high-order harmonics in solids** *PHYSICAL REVIEW A*

Wu, M., You, Y., Ghimire, S., Reis, D. A., Browne, D. A., Schafer, K. J., Gaarde, M. B.
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● **Anisotropic high-harmonic generation in bulk crystals** *NATURE PHYSICS*

You, Y. S., Reis, D. A., Ghimire, S.
2017; 13 (4): 345-349

- **High-harmonic generation from an atomically thin semiconductor** *NATURE PHYSICS*
Liu, H., Li, Y., You, Y. S., Ghimire, S., Heinz, T. F., Reis, D. A.
2017; 13 (3): 262-?
- **Phase-coherence of high-order harmonics from bulk crystals using homodyne detection**
Cunningham, E., You, Y., Reis, D. A., Ghimire, S., IEEE
IEEE.2017
- **High-order harmonics from bulk and 2D crystals**
You, Y., Ndabashimiye, G., Liu, H., Li, Y., Heinz, T. F., Reis, D. A., Ghimire, S., IEEE
IEEE.2017
- **Visualization of Atomic-Scale Motions in Materials via Femtosecond X-Ray Scattering Techniques** *ANNUAL REVIEW OF MATERIALS RESEARCH, VOL 47*
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- **Nonsequential two-photon absorption from the K shell in solid zirconium** *PHYSICAL REVIEW A*
Ghimire, S., Fuchs, M., Hastings, J., Herrmann, S. C., Inubushi, Y., Pines, J., Shwartz, S., Yabashi, M., Reis, D. A.
2016; 94 (4)
- **Control of two-phonon correlations and the mechanism of high-wavevector phonon generation by ultrafast light pulses** *PHYSICAL REVIEW B*
Henighan, T., Trigo, M., Chollet, M., Clark, J. N., Fahy, S., Glowonia, J. M., Jiang, M. P., Kozina, M., Liu, H., Song, S., Zhu, D., Reis, D. A.
2016; 94 (2)
- **Solid-state harmonics beyond the atomic limit** *NATURE*
Ndabashimiye, G., Ghimire, S., Wu, M., Browne, D. A., Schafer, K. J., Gaarde, M. B., Reis, D. A.
2016; 534 (7608): 520-?
- **Generation mechanism of terahertz coherent acoustic phonons in Fe** *PHYSICAL REVIEW B*
Henighan, T., Trigo, M., Bonetti, S., Granitzka, P., Higley, D., Chen, Z., Jiang, M. P., Kukreja, R., Gray, A., Reid, A. H., JAL, E., Hoffmann, C., Kozina, et al
2016; 93 (22)
- **Resonant squeezing and the anharmonic decay of coherent phonons** *PHYSICAL REVIEW B*
Fahy, S., Murray, E. D., Reis, D. A.
2016; 93 (13)
- **Ultrafast electron diffraction from non-equilibrium phonons in femtosecond laser heated Au films** *APPLIED PHYSICS LETTERS*
Chase, T., Trigo, M., Reid, A. H., Li, R., Vecchione, T., Shen, X., Weathersby, S., Coffee, R., Hartmann, N., Reis, D. A., Wang, X. J., Duerr, H. A.
2016; 108 (4)
- **Ultrafast resonant soft x-ray diffraction dynamics of the charge density wave in TbTe₃** *PHYSICAL REVIEW B*
Moore, R. G., Lee, W. S., Kirchman, P. S., Chuang, Y. D., Kemper, A. F., Trigo, M., Patthey, L., Lu, D. H., Krupin, O., Yi, M., Reis, D. A., Doering, D., Denes, et al
2016; 93 (2)
- **The origin of incipient ferroelectricity in lead telluride.** *Nature communications*
Jiang, M. P., Trigo, M., Savic, I., Fahy, S., Murray, É. D., Bray, C., Clark, J., Henighan, T., Kozina, M., Chollet, M., Glowonia, J. M., Hoffmann, M. C., Zhu, et al
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- **Anomalous nonlinear X-ray Compton scattering** *NATURE PHYSICS*
Fuchs, M., Trigo, M., Chen, J., Ghimire, S., Shwartz, S., Kozina, M., Jiang, M., Henighan, T., Bray, C., Ndabashimiye, G., Bucksbaum, P. H., Feng, Y., Herrmann, et al
2015; 11 (11): 964-970
- **Phonon spectroscopy with sub-meV resolution by femtosecond x-ray diffuse scattering** *PHYSICAL REVIEW B*
Zhu, D., Robert, A., Henighan, T., Lemke, H. T., Chollet, M., Glowonia, J. M., Reis, D. A., Trigo, M.

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- **Imaging transient melting of a nanocrystal using an X-ray laser** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
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2015; 112 (24): 7444-7448
- **High-harmonic generation from Bloch electrons in solids** *PHYSICAL REVIEW A*
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2015; 91 (4)
- **Strong-field and attosecond physics in solids** *JOURNAL OF PHYSICS B-ATOMIC MOLECULAR AND OPTICAL PHYSICS*
Ghimire, S., Ndabashimiye, G., DiChiara, A. D., Sistrunk, E., Stockman, M. I., Agostini, P., DiMauro, L. F., Reis, D. A.
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- **Below gap optical absorption in GaAs driven by intense, single-cycle coherent transition radiation** *OPTICS EXPRESS*
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2014; 22 (14): 17423-17429
- **Measurement of transient atomic displacements in thin films with picosecond and femtometer resolution** *STRUCTURAL DYNAMICS-US*
Kozina, M., Hu, T., Wittenberg, J. S., Szilagyi, E., Trigo, M., Miller, T. A., Uher, C., Damodaran, A., Martin, L., Mehta, A., Corbett, J., Safraneck, J., Reis, et al
2014; 1 (3)
- **X-ray second harmonic generation.** *Physical review letters*
Shwartz, S., Fuchs, M., Hastings, J. B., Inubushi, Y., Ishikawa, T., Katayama, T., Reis, D. A., Sato, T., Tono, K., Yabashi, M., Yudovich, S., Harris, S. E.
2014; 112 (16): 163901-?
- **X-Ray Second Harmonic Generation** *PHYSICAL REVIEW LETTERS*
Shwartz, S., Fuchs, M., Hastings, J. B., Inubushi, Y., Ishikawa, T., Katayama, T., Reis, D. A., Sato, T., Tono, K., Yabashi, M., Yudovich, S., Harris, S. E.
2014; 112 (16)
- **Evidence for photo-induced monoclinic metallic VO₂ under high pressure** *APPLIED PHYSICS LETTERS*
Hsieh, W., Trigo, M., Reis, D. A., Artioli, G. A., Malavasi, L., Mao, W. L.
2014; 104 (2)
- **Fourier-transform inelastic X-ray scattering from time- and momentum-dependent phonon-phonon correlations** *NATURE PHYSICS*
Trigo, M., Fuchs, M., Chen, J., Jiang, M. P., Cammarata, M., Fahy, S., Fritz, D. M., Gaffney, K., Ghimire, S., Higginbotham, A., Johnson, S. L., Kozina, M. E., Larsson, et al
2013; 9 (12): 790-794
- **Time- and momentum-resolved probe of heat transport in photo-excited bismuth** *APPLIED PHYSICS LETTERS*
Chen, J., Trigo, M., Fahy, S., Murray, E. D., Sheu, Y. M., Graber, T., Henning, R., Chien, Y. J., Uher, C., Reis, D. A.
2013; 102 (18)
- **Real-Time Manifestation of Strongly Coupled Spin and Charge Order Parameters in Stripe-Ordered La_{1.75}Sr_{0.25}NiO₄ Nickelate Crystals Using Time-Resolved Resonant X-Ray Diffraction.** *Physical review letters*
Chuang, Y. D., Lee, W. S., Kung, Y. F., Sorini, A. P., Moritz, B., Moore, R. G., Patthey, L., Trigo, M., Lu, D. H., Kirchmann, P. S., Yi, M., Krupin, O., Langner, et al
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- **Real-Time Manifestation of Strongly Coupled Spin and Charge Order Parameters in Stripe-Ordered La_{1.75}Sr_{0.25}NiO₄ Nickelate Crystals Using Time-Resolved Resonant X-Ray Diffraction** *PHYSICAL REVIEW LETTERS*
Chuang, Y. D., Lee, W. S., Kung, Y. F., Sorini, A. P., Moritz, B., Moore, R. G., Patthey, L., Trigo, M., Lu, D. H., Kirchmann, P. S., Yi, M., Krupin, O., Langner, et al
2013; 110 (12)
- **Free-carrier relaxation and lattice heating in photoexcited bismuth** *PHYSICAL REVIEW B*
Sheu, Y. M., Chien, Y. J., Uher, C., Fahy, S., Reis, D. A.

2013; 87 (7)

- **Optical Probing of Ultrafast Electronic Decay in Bi and Sb with Slow Phonons** *PHYSICAL REVIEW LETTERS*
Li, J. J., Chen, J., Reis, D. A., Fahy, S., Merlin, R.
2013; 110 (4)
- **Photon-Counting Detectors for Pump-Probe Science** *60th IEEE Nuclear Science Symposium (NSS) / Medical Imaging Conference (MIC) / 20th International Workshop on Room-Temperature Semiconductor X-ray and Gamma-ray Detectors*
Kenney, C. J., Dragone, A. B., Segal, J. D., Hasi, J., Mehta, A., Reis, D. A., Markovic, B., Caraguillo, P., Carini, G., Herrmann, S. C., Lindenberg, A. M., Haller, G.
IEEE.2013
- **X-ray and optical wave mixing** *NATURE*
Glover, T. E., Fritz, D. M., Cammarata, M., Allison, T. K., Coh, S., Feldkamp, J. M., Lemke, H., Zhu, D., Feng, Y., Coffee, R. N., Fuchs, M., Ghimire, S., Chen, et al
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- **Temporal cross-correlation of x-ray free electron and optical lasers using soft x-ray pulse induced transient reflectivity** *OPTICS EXPRESS*
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2012; 3
- **Generation and propagation of high-order harmonics in crystals** *PHYSICAL REVIEW A*
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2012; 85 (4)
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- **Ultrafast Photovoltaic Response in Ferroelectric Nanolayers** *PHYSICAL REVIEW LETTERS*
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2012; 108 (8)
- **Ultrafast pump-probe measurements of short small-polaron lifetimes in the mixed-valence perovskite Cs₂Au₂I₆ under high pressures** *PHYSICAL REVIEW B*
Trigo, M., Chen, J., Jiang, M. P., Mao, W. L., Riggs, S. C., SHAPIRO, M. C., Fisher, I. R., Reis, D. A.
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Ghimire, S., Ndabashimiye, G., DiChiara, A. D., Sistrunk, E., Szafruga, U., Agostini, P., DiMauro, L. F., Reis, D. A.
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- **High-order harmonic generation in solid argon** *Conference on Lasers and Electro-Optics (CLEO)*
Ghimire, S., Ndabashimiye, G., Reis, D. A.
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- **Scaling of High-Order Harmonic Generation in the Long Wavelength Limit of a Strong Laser Field** *IEEE JOURNAL OF SELECTED TOPICS IN QUANTUM ELECTRONICS*
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