Stanford



# Craig Levin

Professor of Radiology (Molecular Imaging Program at Stanford/Nuclear Medicine) and, by courtesy, of Physics, of Electrical Engineering and of Bioengineering

Radiology - Rad/Molecular Imaging Program at Stanford

NIH Biosketch available Online


### CONTACT INFORMATION

- **Alternate Contact**

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## Bio

### BIO

Dr. Craig S. Levin is a Professor of Radiology and, by Courtesy, of Physics, Electrical Engineering, and Bioengineering at Stanford. He is a founding member of the Molecular Imaging Program at Stanford, and Principal Investigator and Director of the NIH-NCI funded T32 Stanford Molecular Imaging Scholars postdoctoral training program. He received his M.S., M.Phil, and Ph.D. degrees in Physics from Yale University. An internationally recognized researcher in the field of molecular imaging he has nearly 200 peer-reviewed publications and 40 patents awarded or pending. He directs a 20-member laboratory that explores new concepts in instrumentation and software algorithms for molecular imaging, introduces these new tools into clinical and pre-clinical imaging studies of cancer, heart disease and neurological disorders, and partners with industry to disseminate some of these technologies into products used for patient care throughout the world. To support his research, he has generated substantial NIH funding as Principal Investigator in addition to numerous grants from other government, industry, and private institutions. He lectured in a Nobel symposium in 2007, and was elected into the American Institute for Medical and Biological Engineering's College of Fellows and was given the Academy of Radiology Research Distinguished Investigator Recognition Award.

### ACADEMIC APPOINTMENTS

- Professor, Radiology - Rad/Molecular Imaging Program at Stanford
- Professor (By courtesy), Electrical Engineering
- Professor (By courtesy), Physics
- Professor (By courtesy), Bioengineering
- Member, Bio-X
- Member, Cardiovascular Institute
- Member, Wu Tsai Human Performance Alliance
- Member, Stanford Cancer Institute

### ADMINISTRATIVE APPOINTMENTS

- Director and PI of the Stanford Molecular Imaging Scholars Postdoctoral Training Program, Stanford University, (2009-2026)

- Chair of Faculty Search Committee, Department of Radiology, (2009-2010)
- Chair of Faculty Search Committee, Department of Radiology, (2008-2009)
- Chair of Faculty Search Committee, Department of Radiology, (2007-2008)
- Chair of Faculty Search Committee, Department of Radiology, (2006-2007)
- Co-Director, Stanford Center for Innovation in In Vivo Imaging, (2004- present)

### HONORS AND AWARDS

- Phi Eta Sigma National Honors, University of California at Los Angeles (1981)
- Physics, Mathematics, and College Honors Programs, University of Calfornia at Los Angeles (1981-5)
- Stanford Linear Accelerator Center Undergraduate Fellowship, University of California at Los Angeles (1983)
- Phi Beta Kappa National Honors, University of California at Los Angeles (1984)
- Marilyn F. Lohr Award in Physics, University of California at Los Angeles (1984)
- E. Lee Kinsey Award in Physics, University of Calfornia at Los Angeles (1985)
- Sherwood Prize in Mathematics, University of California at Los Angeles (1985)
- B.S. Summa Cum Laude, University of California at Los Angeles (1985)
- Sigma Pi Sigma National Honors in Physics, University of California at Los Angeles (1985)
- Full Tuition and Research Fellowship, Yale University (1985-93)
- Bates Graduate Fellowship, Jonathan Edwards College, Yale University (1987-91)
- National Research Service Award, National Institutes of Health (1993-5)
- Pilot Research Award, Society of Nuclear Medicine (1996)

### PROFESSIONAL EDUCATION

- Ph.D., Yale University , Physics (1993)
- M.Phil., Yale University , Physics (1987)
- M.S., Yale University , Physics (1987)
- B.S., UCLA , Physics and Mathematics (1985)

### LINKS

- Molecular Imaging Instrumentation Laboratory: http://miil.stanford.edu

## Research & Scholarship

### CURRENT RESEARCH AND SCHOLARLY INTERESTS

Molecular Imaging Instrumentation Laboratory

Our research interests involve the development of novel instrumentation and software algorithms for in vivo imaging of cellular and molecular signatures of disease in humans and small laboratory animal subjects. These new cameras efficiently image radiation emissions in the form of positrons, annihilation photons, gamma rays, and light from molecular probes developed to target molecular signals from deep within tissue of live subjects. The goals of the instrumentation projects are to push the sensitivity and spatial, spectral, and/or temporal resolutions as far as physically possible. The algorithm goals are to understand the physical system comprising the subject tissues, radiation transport, and imaging system, and to provide the best available image quality and quantitative accuracy. The work involves computer modeling, position sensitive sensors, readout electronics, data

acquisition, image formation, image processing, and data/image analysis algorithms, and incorporating these innovations into practical imaging devices.

The ultimate goal is to introduce these new imaging tools into studies of molecular mechanisms and treatments of disease within living subjects.

### CLINICAL TRIALS

- Clinical Translation of a Novel Brain PET Insert for Simultaneous PET/MR, Recruiting
- Efficacy of Gamma Camera Used Intraoperatively for ID of Sentinel Lymph Nodes w/ Lymphoscintigraphy, Not Recruiting
- Pilot Breast-Dedicated PET Camera With 1 Millimeter Spatial Resolution, Not Specified

## Teaching

### COURSES

**2026-27**

- Physics and Engineering Principles of Multi-modality Molecular Imaging of Living Subjects: BIOE 222, BMP 222, RAD 222 (Aut)
- Physics and Engineering of Radionuclide-based Medical Imaging: BIOE 221, BMP 221, RAD 221 (Win)

**2025-26**

- Physics and Engineering Principles of Multi-modality Molecular Imaging of Living Subjects: BIOE 222, BMP 222, RAD 222 (Aut)
- Physics and Engineering of Radionuclide-based Medical Imaging: BIOE 221, BMP 221, RAD 221 (Win)

**2024-25**

- Physics and Engineering Principles of Multi-modality Molecular Imaging of Living Subjects: BIOE 222, BMP 222, RAD 222 (Aut)

**2023-24**

- Physics and Engineering Principles of Multi-modality Molecular Imaging of Living Subjects: BIOE 222, BMP 222, RAD 222 (Aut)

### STANFORD ADVISEES

**Postdoctoral Faculty Sponsor**

Meysam Dadgar, Wen He, Wesley Williams

**Doctoral Dissertation Advisor (AC)**

West Foster, Sarah Zou

**Doctoral Dissertation Co-Advisor (AC)**

Sofia Helpert

### GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Bioengineering (PhD Program)
- Biophysics (PhD Program)

## Publications

### PUBLICATIONS

- **Regularization in multiplexed PET image reconstruction.** *Medical physics*
  Foster, J. W., He, W., Chinn, G., Levin, C. S.
  2026; 53 (11)
- **Macrocycle Chelator Conjugation on the C3 Hydroxyl Group of 17β-Estradiol reduces Estrogen Receptor Binding.** *Molecular imaging and biology*
  Cheung, P., Pandrala, M., Moses, A., Landry, M., Levin, C. S., Beinat, C.
  2026

- **Comparison of deep learning and particle smoother EM methods for estimation of Rb-82 myocardial perfusion PET kinetic parameters.** *Medical physics*
  Chin, M., Zou, S. J., Chinn, G., Levin, C. S.
  2026; 53 (6): e70512
- **Influence of scintillation light confinement on depth-of-interaction measurement performance in a single-Ended readout PET detector.** *Physics in medicine and biology*
  Shim, H. S., Cho, M. J., He, W., Lee, M. S., Levin, C. S., Lee, J. S.
  2026
- **Maximum likelihood estimation yields accurate line-of-response assignment for positron + prompt gamma ray events in multiplexed PET (mPET).** *Biomedical physics & engineering express*
  Zou, S. J., Chinn, G., Ullah, M. N., Levin, C. S.
  2026
- **Strong ultrafast nonlinear optical response from megaelectronvolt electrons in semiconductors.** *Nature photonics*
  Jeong, D., Hopper, T. R., Kim, Y., Shen, X., Kramer, P. L., Hoffmann, M. C., Coffee, R., Fejer, M., Lindenberg, A. M., Levin, C. S.
  2026; 20 (6): 686-692
- **Strong ultrafast nonlinear optical response from megaelectronvolt electrons in semiconductors** *NATURE PHOTONICS*
  Jeong, D., Hopper, T. R., Kim, Y., Shen, X., Kramer, P. L., Hoffmann, M. C., Coffee, R., Fejer, M., Lindenberg, A. M., Levin, C. S.
  2026
- **Detector design for a high-resolution and high-sensitivity breast-dedicated multiplexed PET (mPET) scanner.** *Physics in medicine and biology*
  He, W., Levin, C. S.
  2026
- **Using multimodal PET+MR data as conditional generative adversarial network inputs improves pseudo-CT and attenuation correction estimates for brain PET/MR.** *American journal of nuclear medicine and molecular imaging*
  Fisher, J., Anaya, E., Chinn, G., Levin, C. S.
  2026; 16 (1): 44-54
- **Generative deep learning synthesizes high signal-to-noise ratio sensitivity maps for PET from low count direct normalization data.** *Physics in medicine and biology*
  Jafaritadi, M., Groll, A., Chin, M., Chinn, G., Fisher, J., Innes, D. R., Levin, C. S.
  2026
- **Image SNR Enhancement for a Short Axial FOV Brain PET System Using Generative Deep Learning** *IEEE TRANSACTIONS ON RADIATION AND PLASMA MEDICAL SCIENCES*
  Nazari-Farsani, S., Jafaritadi, M., Fisher, J., Chin, M., Chinn, G., Khalighi, M., Zaharchuk, G., Levin, C. S.
  2026; 10 (1): 41-50
- **Self-thresholding, 48:2 multiplexed readout circuit for a 3D position sensitive, 100 ps CTR TOF-PET detector.** *Physics in medicine and biology*
  Pourashraf, S., Cates, J. W., Innes, D. R., Shah, Y. B., Levin, C. S.
  2025
- **Front-End Electronics Design for 3-D Position Sensitive TOF-PET Detector That Achieves #120-ps CTR and #1.2-mm DOI Resolution** *IEEE TRANSACTIONS ON RADIATION AND PLASMA MEDICAL SCIENCES*
  Zhao, Z., Huang, Q., Levin, C. S.
  2025; 9 (6): 736-746
- **Triplexed PET: Methods to Image Three Distinct Isotopes in a Single PET Imaging Session**
  Zou, S. J., Ullah, M. N., Innes, D., Shah, Y., Chinn, G., Houson, H., Lapi, S., Levin, C.
  SOC NUCLEAR MEDICINE INC.2025
- **Labeling of estradiol with a positron plus prompt gamma ray emitting radiometal for multiplexed positron emission tomography (mPET) imaging of breast cancer**
  Cheung, P., Pandrala, M., He, W., Levin, C., Beinat, C.
  SOC NUCLEAR MEDICINE INC.2025

- **A fast and accurate image reconstruction method for multiplexed PET (mPET)**
  He, W., Foster, J., Levin, C.
  SOC NUCLEAR MEDICINE INC.2025
- **Ultra-High Spatial Resolution Clinical Positron Emission Tomography (PET) Systems** *APPLIED SCIENCES-BASEL*
  Chin, M., Ullah, M., Innes, D., Levin, C. S.
  2025; 15 (9)
- **Comparison of UV-enhanced SiPM technologies for estimating 511 keV photon arrival time using BGO Cherenkov Luminescence** *NUCLEAR ENGINEERING AND TECHNOLOGY*
  Gonzalez-Montoro, A., Pourashraf, S., Merzi, S., Gola, A., Levin, C. S.
  2025; 57 (4)
- **A Method to Locate Radio-Frequency Coils Using a CT-Based Template for a More Accurate Photon Attenuation Correction in PET/MRI** *IEEE TRANSACTIONS ON RADIATION AND PLASMA MEDICAL SCIENCES*
  Anaya, E., Schleyer, P., Levin, C.
  2025; 9 (2): 182-190
- **A magnetic field compatible readout circuit for enhanced coincidence time resolution in BGO Cherenkov radiation-based TOF-PET detectors.** *Medical physics*
  Pourashraf, S., Cates, J. W., Levin, C. S.
  2025
- **QUANTITATIVE IMAGING OF <SUP>55</SUP>CO AND <SUP>18</SUP>F-LABELED TRACERS IN A SINGLE "MULTIPLEXED" PET IMAGING SESSION**
  Zou, S. J., Lim, I., Foster, J. W., Chinn, G., Houson, H. A., Lapi, S. E., Rao, J., Levin, C. S., IEEE
  IEEE.2025
- **Comparison of simulated and measured coincidence time resolution and energy resolution of scintillation crystals coupled to SiPM device** *JOURNAL OF INSTRUMENTATION*
  Nagai, A., Foster, J., Barry, C., Bellis, S., Cashman, E., Couglan, B., Dolinsky, S., Foley, S., Herbert, D. J., Perry, M., Pourashraf, S., Levin, C. S.
  2024; 19 (12)
- **Study of modulation in complex refractive indices induced by ultrafast relativistic electrons using infrared and THz probe pulses.** *Physics in medicine and biology*
  Jeong, D., Bark, H. S., Kim, Y., Shin, J., Kim, H. W., Oang, K. Y., Jang, K., Lee, K., Jeong, Y. U., Baek, I. H., Levin, C. S.
  2024
- **PETcoil: first results from a second-generation RF-penetrable TOF-PET brain insert for simultaneous PET/MRI.** *Physics in medicine and biology*
  Dong, Q., Ullah, M. N., Innes, D. R., Watkins, R. D., Chang, C., Zou, S. J., Groll, A., Sacco, I., Chinn, G., Levin, C. S.
  2024
- **Self-normalization for a 1-mm3resolution clinical PET system using deep learning.** *Physics in medicine and biology*
  Chin, M., Jafaritadi, M., Franco, A. B., Ullah, M. N., Chinn, G., Innes, D. R., Levin, C. S.
  2024
- **Context-Aware Transformer GAN for Direct Generation of Attenuation and Scatter Corrected PET Data** *IEEE TRANSACTIONS ON RADIATION AND PLASMA MEDICAL SCIENCES*
  Jafaritadi, M., Anaya, E., Chinn, G., Rosenberg, J., Liang, T., Levin, C. S.
  2024; 8 (6): 677-689
- **Context-Aware Transformer GAN for Direct Generation of Attenuation and Scatter Corrected PET Data.** *IEEE transactions on radiation and plasma medical sciences*
  Jafaritadi, M., Anaya, E., Chinn, G., Rosenberg, J., Liang, T., Levin, C. S.
  2024; 8 (6): 677-689
- **Deep generative denoising networks enhance quality and accuracy of gated cardiac PET data.** *Annals of nuclear medicine*
  Jafaritadi, M., Teuho, J., Lehtonen, E., Klen, R., Saraste, A., Levin, C. S.
  2024

- **Toward "super-scintillation" with nanomaterials and nanophotonics.** *Nanophotonics*
  Carr Delgado, H., Moradifar, P., Chinn, G., Levin, C. S., Dionne, J. A.
  2024; 13 (11): 1953-1962
- **Toward "super-scintillation" with nanomaterials and nanophotonics** *NANOPHOTONICS*
  Delgado, H., Moradifar, P., Chinn, G., Levin, C. S., Dionne, J. A.
  2024
- **A Scalable Dynamic TOT Circuit for a 100 ps TOF-PET Detector Design to Improve Energy Linearity and Dynamic Range** *IEEE TRANSACTIONS ON RADIATION AND PLASMA MEDICAL SCIENCES*
  Pourashraf, S., Cates, J. W., Levin, C. S.
  2024; 8 (3): 237-247
- **PET System Technology: Theoretical Aspects and Experimental Methodology.** *Methods in molecular biology (Clifton, N.J.)*
  Gonzalez-Montoro, A., Levin, C. S.
  2024; 2729: 343-369
- **Front-End Electronics for a 100 ps Coincidence Time Resolution TOF-PET Detector with 24-fold LVDS Timing Channel Multiplexing** *IEEE Transactions on Instrumentation and Measurement*
  Pourashraf, S., Cates, J. W., Innes, D., Levin, C. S.
  2024
- **Compact FPGA-Based Data Acquisition System for a High-Channel, High-Count-Rate TOF-PET Insert for Brain PET/MRI** *IEEE TRANSACTIONS ON INSTRUMENTATION AND MEASUREMENT*
  Dong, Q., Sajedi, S., Cui, K., Levin, C. S.
  2024; 73
- **MRI compatibility study of a prototype radiofrequency penetrable oval PET insert at 3 T.** *Japanese journal of radiology*
  Akram, M. S., Nishikido, F., Levin, C. S., Takyu, S., Obata, T., Yamaya, T.
  2023
- **A simulation of a high-resolution cadmium zinc telluride positron emission tomography system.** *Medical physics*
  Stanford-Hill, R., Groll, A., Levin, C. S.
  2023
- **Simulation of ionization charge carrier cascade time and density for a new radiation detection method based on modulation of optical properties.** *Medical physics*
  Jeong, D., Tao, L., Song, X. R., Adams, Z., Zhang, X., Wang, J., Levin, C. S.
  2023
- **Design and Characterization of the Detector Readout Electronics Used in PETcoil: an RF-Penetrable TOF-PET Insert for PET/MRI** *IEEE TRANSACTIONS ON RADIATION AND PLASMA MEDICAL SCIENCES*
  Dong, Q., Sacco, I., Chang, C., Levin, C. S.
  2023; 7 (8): 819-829
- **Study on the radiofrequency transparency of partial-ring oval-shaped prototype PET inserts in a 3 T clinical MRI system.** *Radiological physics and technology*
  Akram, M. S., Levin, C. S., Nishikido, F., Takyu, S., Obata, T., Yamaya, T.
  2023
- **Sparse SiPM Pixel Arrangement for a TOF-PET Detector Design that Achieves 100 ps Coincidence Time Resolution** *IEEE TRANSACTIONS ON RADIATION AND PLASMA MEDICAL SCIENCES*
  Cates, J. W., Levin, C. S.
  2023; 7 (7): 665-672
- **Investigation of Faraday cage materials with low eddy current and high RF shielding effectiveness for PET/MRI applications.** *Physics in medicine and biology*
  Dong, Q., Adams, Z., Watkins, R. D., Chang, C. M., Lee, B. J., Levin, C. S.
  2023

- **The PETcoil project: PET performance evaluation of two detector modules for a second generation RF-penetrable TOF-PET brain dedicated insert for simultaneous PET/MRI.** *Physics in medicine and biology*
  Dong, Q., Chang, C., Lee, B. J., Sacco, I., Sajedi, S., Adams, Z., Fischer, P., Levin, C. S.
  2023
- **Study of compatibility between a 3T MR system and detector modules for a second generation RF-penetrable TOF-PET insert for simultaneous PET/MRI.** *Medical physics*
  Dong, Q., Adams, Z., Watkins, R. D., Lee, B. J., Chang, C. M., Sacco, I., Levin, C. S.
  2023
- **Design considerations for PET detectors with 100 picoseconds coincidence time resolution** *NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH SECTION A-ACCELERATORS SPECTROMETERS DETECTORS AND ASSOCIATED EQUIPMENT*
  Gonzalez-Montoro, A., Pourashraf, S., Lee, M. S., Cates, J. W., Levin, C. S.
  2023; 1045
- **Predicting final ischemic stroke lesions from initial diffusion-weighted images using a deep neural network.** *NeuroImage. Clinical*
  Nazari-Farsani, S., Yu, Y., Armindo, R. D., Lansberg, M., Liebeskind, D. S., Albers, G., Christensen, S., Levin, C. S., Zaharchuk, G.
  2022; 37: 103278
- **Study of Annihilation Photon Pair Coincidence Time Resolution Using Prompt Photon Emissions in New Perovskite Bulk Crystals** *IEEE TRANSACTIONS ON RADIATION AND PLASMA MEDICAL SCIENCES*
  Tao, L., He, Y., Kanatzidis, M. G., Levin, C. S.
  2022; 6 (7): 804-810
- **Promising Detector Concepts to Advance Coincidence Time Resolution for Time-of-Flight Positron Emission Tomography**
  Levin, C. S.
  POLISH ACAD SCIENCES INST PHYSICS.2022: 422-427
- **Study of Annihilation Photon Pair Coincidence Time Resolution Using Prompt Photon Emissions in New Perovskite Bulk Crystals.** *IEEE transactions on radiation and plasma medical sciences*
  Tao, L., He, Y., Kanatzidis, M. G., Levin, C. S.
  2022; 6 (7): 804-810
- **Advances in Detector Instrumentation for PET.** *Journal of nuclear medicine : official publication, Society of Nuclear Medicine*
  Gonzalez-Montoro, A., Ullah, M. N., Levin, C. S.
  2022; 63 (8): 1138-1144
- **Investigation of Electronic Signal Processing Chains for a Prototype TOF-PET System With 100-ps Coincidence Time Resolution.** *IEEE transactions on radiation and plasma medical sciences*
  Pourashraf, S., Gonzalez-Montoro, A., Lee, M. S., Cates, J. W., Won, J. Y., Lee, J. S., Levin, C. S.
  2022; 6 (6): 690-696
- **Cherenkov Radiation-Based Coincidence Time Resolution Measurements in BGO Scintillators** *FRONTIERS IN PHYSICS*
  Gonzalez-Montoro, A., Pourashraf, S., Cates, J. W., Levin, C. S.
  2022; 10
- **Investigation of Electronic Signal Processing Chains for a Prototype TOF-PET System with 100 ps Coincidence Time Resolution** *IEEE Transactions on Radiation and Plasma Medical Sciences*
  Pourashraf, S., Gonzalez-Montoro, A., Lee, M., Cates, J. W., Won, J. Y., Lee, J. S., Levin, C. S.
  2022; 6 (6): 690 - 696
- **Application of Artificial Intelligence in PET Instrumentation.** *PET clinics*
  Ullah, M. N., Levin, C. S.
  2022; 17 (1): 175-182
- **Study of optical reflectors for a 100ps coincidence time resolution TOF-PET detector design.** *Biomedical physics & engineering express*
  Gonzalez-Montoro, A., Pourashraf, S., Lee, M. S., Cates, J. W., Levin, C. S.
  2021
- **Reduced Acquisition Time Per Bed Position for PET/MRI Using 68Ga-RM2 or 68Ga-PSMA11 in Patients With Prostate Cancer: A Retrospective Analysis.** *AJR. American journal of roentgenology*

Duan, H., Baratto, L., Hatami, N., Liang, T., Levin, C. S., Khalighi, M. M., Iagaru, A.
2021

- **High-resolution time-of-flight PET detector with 100 ps coincidence time resolution using a side-coupled phoswich configuration.** *Physics in medicine and biology*
  Lee, M. S., Cates, J. W., Gonzalez-Montoro, A., Levin, C. S.
  2021; 66 (12)

- **New PET technologies - embracing progress and pushing the limits.** *European journal of nuclear medicine and molecular imaging*
  Aide, N., Lasnon, C., Kesner, A., Levin, C. S., Buvat, I., Iagaru, A., Hermann, K., Badawi, R. D., Cherry, S. R., Bradley, K. M., McGowan, D. R.
  2021

- **Results of a Prospective Trial to Compare 68Ga-DOTA-TATE with SiPM-Based PET/CT vs. Conventional PET/CT in Patients with Neuroendocrine Tumors.** *Diagnostics (Basel, Switzerland)*
  Baratto, L., Toriihara, A., Hatami, N., Aparici, C. M., Davidzon, G., Levin, C. S., Iagaru, A.
  2021; 11 (6)

- **Evolution of PET Detectors and Event Positioning Algorithms Using Monolithic Scintillation Crystals** *IEEE TRANSACTIONS ON RADIATION AND PLASMA MEDICAL SCIENCES*
  Gonzalez-Montoro, A., Gonzalez, A. J., Pourashraf, S., Miyaoka, R. S., Bruyndonckx, P., Chinn, G., Pierce, L. A., Levin, C. S.
  2021; 5 (3): 282-305

- **Pseudo CT Image Synthesis and Bone Segmentation From MR Images Using Adversarial Networks With Residual Blocks for MR-Based Attenuation Correction of Brain PET Data** *IEEE TRANSACTIONS ON RADIATION AND PLASMA MEDICAL SCIENCES*
  Tao, L., Fisher, J., Anaya, E., Li, X., Levin, C. S.
  2021; 5 (2): 193–201

- **Further investigations of a radiation detector based on ionization-induced modulation of optical polarization.** *Physics in medicine and biology*
  Wang, Y., Tao, L., Abbaszadeh, S., Levin, C. S.
  2021

- **Ionizing photon interactions modulate the optical properties of crystals with femtosecond scale temporal resolution.** *Physics in medicine and biology*
  Tao, L. n., Coffee, R. N., Jeong, D. n., Levin, C. S.
  2021

- **Noninvasive and Highly Multiplexed Five-Color Tumor Imaging of Multicore Near-Infrared Resonant Surface-Enhanced Raman Nanoparticles In Vivo.** *ACS nano*
  Yu, J. H., Steinberg, I., Davis, R. M., Malkovskiy, A. V., Zlitni, A., Radzyminski, R. K., Jung, K. O., Chung, D. T., Curet, L. D., D'Souza, A. L., Chang, E., Rosenberg, J., Campbell, et al
  2021

- **Scalable electronic readout design for a 100 ps coincidence time resolution TOF-PET system.** *Physics in medicine and biology*
  Pourashraf, S. n., Gonzalez-Montoro, A. n., Won, J. Y., Lee, M. S., Cates, J. W., Zhao, Z. n., Lee, J. S., Levin, C. S.
  2021

- **Simulation studies to understand sensitivity and timing characteristics of an optical property modulation-based radiation detection concept for PET.** *Physics in medicine and biology*
  Tao, L., Jeong, D., Wang, J., Adams, Z., Bryan, P., Levin, C. S.
  2020

- **Motion Correction for Simultaneous PET/MR Brain Imaging Using a Radiofrequency-Penetrable PET Insert.**
  Fisher, J., Groll, A., Levin, C.
  SOC NUCLEAR MEDICINE INC.2020

- **Deep learning based methods for gamma ray interaction location estimation in monolithic scintillation crystal detectors.** *Physics in medicine and biology*
  Tao, L., Li, X., Furenlid, L. R., Levin, C. S.
  2020

- **Robust Detector Calibration for a Novel PET System Based on Cross-Strip CZT Detectors** *IEEE TRANSACTIONS ON RADIATION AND PLASMA MEDICAL SCIENCES*
  Vernekohl, D., Abbaszadeh, S., Gu, Y., Levin, C. S.
  2019; 3 (6): 626–33
- **Fast gamma-ray interaction-position estimation using k-d tree search** *PHYSICS IN MEDICINE AND BIOLOGY*
  Li, X., Tao, L., Levin, C. S., Furenlid, L. R.
  2019; 64 (15)
- **Electronics method to advance the coincidence time resolution with bismuth germanate.** *Physics in medicine and biology*
  Cates, J. W., Levin, C. S.
  2019
- **Time Resolution Studies for a 1-mm Resolution Clinical PET System With a Charge Sharing Readout and Leading Edge Discrimination** *IEEE TRANSACTIONS ON RADIATION AND PLASMA MEDICAL SCIENCES*
  Hsu, D. F. C., Freese, D. L., Innes, D. R., Levin, C. S.
  2019; 3 (3): 285–91
- **Intercrystal scatter studies for a 1 mm(3) resolution clinical PET system prototype** *PHYSICS IN MEDICINE AND BIOLOGY*
  Hsu, D. C., Freese, D. L., Innes, D. R., Levin, C. S.
  2019; 64 (9)
- **Intercrystal scatter studies for a 1 mm<sup>3</sup> resolution clinical PET system prototype.** *Physics in medicine and biology*
  Hsu, D. F., Freese, D. L., Innes, D. R., Levin, C. S.
  2019
- **Fast gamma-ray interaction-position estimation using k-d tree search.** *Physics in medicine and biology*
  Li, X., Tao, L., Levin, C. S., Furenlid, L. R.
  2019
- **Performance evaluation of RF coils integrated with an RF-penetrable PET insert for simultaneous PET/MRI** *MAGNETIC RESONANCE IN MEDICINE*
  Lee, B. J., Watkins, R. D., Lee, K., Chang, C., Levin, C. S.
  2019; 81 (2): 1434–46
- **Bias Voltage Calibrations for a 1-millimeter Resolution Clinical PET System**
  Chin, M., Innes, D., Levin, C. S., IEEE
  IEEE.2019
- **Time-resolved Simulation of Optical Modulation from Ionization-induced Fast Charge Carriers**
  Jeong, D., Tao, L., Wang, J., Levin, C. S., IEEE
  IEEE.2019
- **Investigation of optical property modulation based ionizing radiation detection method for PET: two-crossed-polarizers based method**
  Wang, Y., Tao, L., Levin, C. S., Xu, J., IEEE
  IEEE.2019
- **Pulse Shape Discrimination and Energy Measurement in Phoswich Detectors Using Gated-Integrator Circuit**
  Pourashraf, S., Cates, J. W., Lee, M., Levin, C. S., IEEE
  IEEE.2019
- **Study of the Coincidence Time Resolution of New Perovskite Bulk Crystals**
  Tao, L., He, Y., Kanatzidis, M. G., Levin, C. S., IEEE
  IEEE.2019
- **Search for Ionization-Induced Modulation of Light Polarization for a New Direction to Improve Time Resolution of PET**
  Esmaeelpour, M., Tao, L., Levin, C. S., IEEE
  IEEE.2019
- **High-resolution PET detector with 100 ps coincidence time resolution using side-by-side phoswich design**

Lee, M., Cates, J. W., Levin, C. S., IEEE
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