

Public announcement of Collaborative Research, Phase 1

2023.05.25

Research Theme	Direct observation of the internal multiple-carrier dynamics of photo-switchable nanolasers		
Research Period	Jan. 1, 2021 - Dec. 31, 2022		
Researcher Information	Technion		Ido Kaminer Associate Professor Faculty of Electrical and Computer Engineering
	Tokushima Univ.		Tetsuro Katayama Assistant Professor Institute of Post-LED Photonics
Publication List (Published Papers, conference, presentations, etc)	a) Joint outcomes: • <i>J. Chem. Phys.</i> https://doi.org/10.1063/5.0101300, 2022 A. Furube, ...and T. Katayama • K. Wang, N. Rivera, R. Dahan, and I. Kaminer, "Ultrafast free-electron probing of photon statistics inside a laser cavity," in Conference on Lasers and Electro-Optics, Technical Digest Series (Optica Publishing Group, 2022), paper FTh5B.7. • T. Katayama, ...I. Kaminer, et al. "Observation of electronic spectra modulation in a CH₃NH₃PbBr₃ crystal by utilizing transient absorption microscopy" <i>Jpn. J. Appl. Phys.</i> 2023, 62 SG1030, DOI 10.35848/1347-4065/acbc29 • Phot-switchable nanolaser :the patent application number: 2022-19143 b) Independent outcomes: Publication <u>Technion : (Basic researches of UTEM in 2021-)</u> Nature Physics 19, 551–561, 2023, "Light emission from strongly driven many-body systems" A. Pizzi, A. Gorlach, N. Rivera, A. Nunnenkamp, I. Kaminer Nature Materials 22, 345–352, 2023, "Tunable photon-induced spatial modulation of free electrons", S. Tsesses, R. Dahan, K. Wang, O. Reinhardt, G. Bartal, I. Kaminer Acs Nano 17, 3645–3656, 2023 "Ultrafast Electron Microscopy of Nanoscale Charge Dynamics in Semiconductors", M. Yannai, R. Dahan, A. Gorlach, Y. Adiv, K. Wang, I. Madan, S. Gargiulo, F. Barantani, E. J. C. Dias, G. M. Vanacore, N. Rivera, F. Carbone, F. J. García de Abajo, I. Kaminer npj Quantum Inf. 8, 510, 2022, "Free Electrons Can Induce Entanglement Between Photons", G. Baranes, R. Ruimy, A. Gorlach, I. Kaminer Phys. Rev. X 11, 041042, 2021, "Quantum nature of dielectric laser accelerators", Y. Adiv, K. Wang, R. Dahan, P. Broaddus, Y. Miao, D. Black, K. Leedle, R. L. Byer, O. Solgaard, J. England, I. Kaminer <u>Tokushima Univ.: (Basic photochemical researches in 2021-2022)</u> • <i>Chemistry of Materials</i> 34 ,1315, 2022. " Polymorph-derived Diversification of Crystal Actuation by Photoisomerization and the Photothermal Effect" , Shodai Hasebe, <u>Tetsuro Katayama</u>, Hideko Koshima et al. • <i>Chemistry - An Asian Journal</i> -, "Effect of Phenolic Substituent Position in Boron Complexes of Imidazo[1,5-a]pyridine" in press: https://doi.org/10.1002/ajoc.202200040 • <i>Journal of the American Chemical Society</i>, 143, 8866, 2021. "Photothermally Driven High-Speed Crystal Actuation and Its Simulation" Shodai Hasebe, <u>Tetsuro Katayama</u>, Hideko Koshima et al.		

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- ***RSC Advances***, 11, 26403, 2021. "Two-photon excitable boron complex based on tridentate imidazo[1,5-a]pyridine ligand for heavy-atom-free mitochondria-targeted photodynamic therapy", Keita Hoshi, Tetsuro Katayama, Fumitoshi Yagishita et al.
- ***Journal of Photochemistry and Photobiology A: Chemistry***, 411, 113208, 2021. "Charge separation dynamics in $\text{In}_2\text{Se}_3/\text{ZnO}/\text{Au}$ ternary system for enhanced photocatalytic degradation of methylene blue under visible light" Dhongade Siddhant, Tetsuro Katayama, Akihiro Furube et al.
- ***International Journal of Modern Physics B***, 35, 2140007, 2021. "Laser assisted synthesis of WS_2 nanorods by pulsed laser ablation in liquid environment" Pankaj Koinkar, Tetsuro Katayama, Akihiro Furube et al.

Conference

Technion : (Basic researches of UTEM)

- [1] K. Wang, I. Kaminer, "Ultrafast Electron Microscopy for Nanophotonics", PIERS, Hangzhou, China, December 2021.
- [2] I. Kaminer, "Extreme light-matter interactions in the ultrafast transmission electron microscope", M&M, Pittsburg, Pennsylvania, August 2021
- [3] I. Kaminer, "Does an electron wavefunction collapse when interacting with light?", ICFO-Weizmann Frontiers School, July 2021
- [4] I. Kaminer, "Extreme light-matter interactions in the ultrafast transmission electron microscope", Microscience Microscopy Congress (MMC), Manchester Central, England, July 2021
- [5] I. Kaminer, "Free-Electron Quantum Optics", CLEO, San Jose, California, May 2021
- [6] I. Kaminer PICO, "Extreme light-matter interactions in the ultrafast transmission electron microscope", Vaals, Netherlands, May 2021,

Tokushima Univ.: (Basic researches of lasing dynamics in perovskite materials)

- [1] 11th Asian Photochemistry Conference, (on line) Nov. 2021. P-04-23 "Polarization Dependence of Lasing Dynamics in a Lead Halide Perovskite Crystal Revealed by Femtosecond Transient Absorption Microscopy" Yuma Fujita, Yuichiro Akagi, Tetsuro Katayama, Akihiro Furube
- [2] The 82nd JSAP Autumn Meeting 2021, Sep. 2021. 12p-S201-5 "Charge Transfer Dynamics in Plasmon Materials and Perovskite Single Crystals" Akihiro Furube, Tetsuro Katayama
- [3] Annual Meeting on Photochemistry 2021, Sep. 2021. 3P55 "Excitation polarization dependence of lasing dynamics in a $\text{CH}_3\text{NH}_3\text{PbBr}_3$ crystal revealed by femtosecond transient absorption microscopy" Yuma Fujita, Tetsuro Katayama, Yuichiro Akagi, Akihiro Furube.
- [4] Annual Meeting on Photochemistry 2021, Sep. 2021. 3A13, "Observation of carrier and polarization dynamics in a lead halide perovskite crystal by femtosecond transient absorption microscopy" Tetsuro Katayama, Yuma Fujita, Yuichiro Akagi, Akihiro Furube.
- [5] The 101st CSJ Annual Meeting, Mar. 2021. A05-3pm-05, "Carrier dynamics of a $\text{CH}_3\text{NH}_3\text{PbBr}_3$ crystal by utilizing transient absorption microscopy" Yuma Fujita, Yuichiro Akagi, Tetsuro Katayama, Akihiro Furube
- [6] The 101st CSJ Annual Meeting, Mar. 2021. P04-1am-04, "Non-linear emission dynamics of a $\text{CH}_3\text{NH}_3\text{PbBr}_3$ microcrystal measured by femtosecond transient absorption microscopy" Tetsuro Katayama, Yuma Fujita, Yuichiro Akagi, Akihiro Furube.