Tokushima International Science Institute

Public announcement of Collaborative Research, Phase 2

2025.04.16

Research Theme	Superfluorescence and quantum light based on perovskite nanolasers		
Research Period	Jan. 1, 2023 - Dec. 31, 2024		
Researcher Information	Technion		**Ido Kaminer** Professor Faculty of Electrical and Computer Engineering
	Tokushima Univ.		**Tetsuro Katayama** Associate Professor Institute of Post-LED Photonics
Publication List (Published Papers, conference, presentations, etc)	[1]**Tetsuro Katayama***, Fujita Yuma, Akagi Yuichiro, Wang Kangpeng, Dahan Raphael, Fishman Tal, **Kaminer Ido**, Pankaj Koinkar and Akihiro Furube, Observation of electronic spectra modulation in a $CH_3NH_3PbBr_3$ crystal by utilizing transient absorption microscopy, JJAP,Vol.62,SG1030-1-SG1030-4,2023. [2]Pizzi†, A. Gorlach†, N. Rivera, A. Nunnenkamp, and **I. Kaminer**, Light emission from strongly driven many-body systems, **Nature Physics** 19, 551–561 ,2023 [3] S. Tsesses†, R. Dahan†, K. Wang, O. Reinhardt, G. Bartal, and **I. Kaminer**, Tunable photon-induced spatial modulation of free electrons, **Nature Materials** 22, 345–352, 2023 [4] R. Ruimy†, A. Gorlach†, G. Baranes, and **I. Kaminer**, Superradiant Electron Energy Loss Spectroscopy, **Nano Lett.** 23, 779−787,2023 [5] 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, and **I. Kaminer**, Ultrafast Electron Microscopy of Nanoscale Charge Dynamics in Semiconductors, **ACS Nano** 17, 3645–3656,2023 [6] A. Gorlach†, M. E. Tzur†, M. Birk, M. Krüger, N. Rivera, O. Cohen, and **I. Kaminer**, High harmonic generation driven by quantum light, **Nature Physics**, 2023,19, 1689-1696 [7] N. Gutman, A. Gorlach, O. Tziperman, R. Ruimy, I. Kaminer, Universal Control of Symmetric States Using Spin Squeezing *Physical Review Letters*, 2024, 132(15), 153601 [8] **Tetsuro Katayama***, Shuto Ueda, Yuma Fujita, Yuichiro Akagi, Pankaj Koinkar, Yasufumi Umena and Akihiro Furube, Observation of energy transfer dynamics in a phycocyanin protein crystal by utilizing femtosecond transient absorption microscopy, JJAP,Vol.62,SG1045-1-SG1045-4,2023. [9] **Tetsuro Katayama***, Akira Yamamoto, Yuma Fujita, Yuichiro Akagi, Pankaj Koinkar and Akihiro Furube, Observation of carrier dynamics in MoS_2 thin layer by femtosecond transient absorption microscopy, JJAP,Vol.62,No.SG,SG1029-1-SG1029-3,2023. [10] Sunna Jung, Li Wang, Haruki Sugiyama, Hidehiro Uekusa, **Tetsuro Katayama**, Kenji Kamada, Toshiyuki Hamura and Naoto Tamai, Intramolecular Singlet Fission in Pentacene Oligomers via an Intermediate State, The Journal of Physical Chemistry B,Vol.127,No.20,4554-4561,2023. [11] Pankaj Koinkar, Daichi Nakayama, **Tetsuro Katayama**, Vinayak Shinde, Yasuyuki Maeda, Akihiro Furube, Gebeyehu Motora Kebena and Mou Chang Wu, Photocatalytic studies of tin		

	oxide nanostructures produced by different methods, Modern Physics Letters. B,Vol.37,No.16,2340003,2023. [12] Vinayak Shinde, Yasuyuki Maeda, **Tetsuro Katayama**, Akihiro Furube, Taka-aki Yano and Pankaj Koinkar, Tungsten suboxide (WO3x) petal-like nanosheets created by laser ablation method,Modern Physics Letters. B,Vol.37,No.16,2340005,2023. [13] **M. Masaki, T. Katayama and A. Furube,** Enhancement of Visible Light Response of TiO2 Photocatalyst by 3D-Deposited Ag Nanowires and Its Charge Separation Mechanism, *The Journal of Chemical Physics,* **Vol.161,** 014701, 2024 [14] Fumitoshi Yagishita, **Tetsuro Katayama***, Yuta Kawamura, Watanabe Guran, Abe Sota, Ogawa Itsuki, Atsushi Tabata, Yasushi Yoshida, Hyuma Masu, Shoko Ueta, Yukihiro Arakawa, Keiji Minagawa, Akihiro Furube *and* Yasushi Imada :Blue Luminescent Boron Complexes Based on N,N-Type Imidazo[1,5-a]pyridine Ligand for Mitochondrial Imaging, *Asian Journal of Organic Chemistry,* 2024. e202400189 [15]Photogenerated carrier dynamics of Mn^{2+} doped $CsPbBr_3$ assembled with TiO_2 systems: Effect of Mn doping content Luchao Du, Jie, An, **Tetsuro Katayama**, Yunpen, Wang, Akihiro, Furube. Journal of Chemical Physics, 2024, 160(16), 164713

Tokushima International Science Institute

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:** ・***J. Chem. Phys.* 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 $CH_3NH_3PbBr_3$ crystal by utilizing transient absorption microscopy " *Jpn. J. Appl. Phys.* 2023, **62** SG1030, **DOI** 10.35848/1347-4065/acbc29 ・Phot-switchable nanolaser :the patent application number: 2022-19143 **b) Independent outcomes:** **Publication** Technion：(Basic researches of UTEM in 2021-) **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** Tokushima Univ.: (Basic photochemical researches in 2021-2022) ・***Chemistry of Materials*** 34 ,1315, 2022. " Polymorph-derived Diversification of Crystal Actuation by Photoisomerization and the Photothermal Effect" , Shodai Hasebe, Tetsuro Katayama, Hideko Koshima et al. ・***Chemistry - An Asian Journal -***, "Effect of Phenolic Substituent Position in Boron Complexes of Imidazo[1,5-a]pyridine" in press: **https://doi.org/10.1002/ajoc.202200040** ・***Journal of the American Chemical Society***, 143, 8866, 2021. "Photothermally Driven High-Speed Crystal Actuation and Its Simulation" Shodai Hasebe, Tetsuro Katayama, Hideko Koshima et al.		

	・***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 In_2Se_3/ZnO/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 $CH_3NH_3PbBr_3$ 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 $CH_3NH_3PbBr_3$ 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 $CH_3NH_3PbBr_3$ microcrystal measured by femtosecond transient absorption microscopy" Tetsuro Katayama, Yuma Fujita, Yuichiro Akagi, Akihiro Furube.