

Quantum Materials Science Unit FY2023 Annual Report

1. Member

1.1 Staff

- Associate Prof. Yoshinori Okada
- Dr. Yuita Fujisawa, Postdoctoral scholar
- Dr. Tomonori Nakamura, Postdoctoral scholar
- Dr. Chia Hsiu Hsu, Postdoctoral scholar
- Dr. Ryan Brady, Research Unit Technician

1.2 Graduate Students

- Mr. Barnaby Smith
- Mr. Markel Pardo Almanza
- Ms. Anjana Krishnadas
- Mr. Takatsugu Onishi (Narita Unit)
- Mr. Dyon van Dinter
- Mr. Monika Eggenberger
- Ms. Nanami Tomoda
- Mr. Vadim Samardak

1.3 Visiting Scientist/student

- Dr. Tessui Nakagawa (Visiting Scientist, Ryukyu University)
- Mr. Hirokazu Sato (Visiting Research Student, Keio University)
- Ms. Shion Yamada (Visiting Research Student, Toho University)

1.4 Intern Student

- Mr. Ping Wu (University of Science and Technology of China)
- Mr. Yitian Ma (University of Science and Technology of China)
- Mr. Yen-Yu Lai (National Yang Ming Chiao Tung University, Taiwan)
- Mr. Wei-Tung Liu (National Yang Ming Chiao Tung University, Taiwan)
- Ms. Aytul Senu (Yildiz Technical University, Turkey)

1.5 Rotation student

- Mr. Mitsuyuki Oshiro (May-August)
- Mr. Sandeep Vijayan (May-August)
- Ms. Makiko Emori (September-December)
- Mr. Kaeda Kawaguchi (September-December)
- Mr. Tatsunosuke Hanano (January-May)

2. Collaborations-

2.1 Oxide electronics

- Dr. Takayuki Harada (NIMS, Japan)

2.2 Magnetic Imaging

- Dr. Anjan Soumyanarayanan (A-Star, Singapore)

2.3 Device Fabrication

- Prof. Yasuhiro Niimi (Osaka University, Japan)

2.4 Photoemission Experiments

- Prof. Takeshi Kondo (The University of Tokyo, Japan)
- Prof. Masaki Kobayashi (The University of Tokyo, Japan)
- Prof. Kenta Kuroda (Hiroshima University, Japan)

2.5 First Principle Calculations

- Prof. Feng-Chuan Chuang (National Sun Yet-sen University, Taiwan)
- Dr. Hsin Lin (Academia Sinica, Taiwan)
- Dr. Khoong Hong Khoo (A-Star, Singapore)

2.6 Scanning Probe Microscopy Experiments

- Dr. Tadashi Machida (RIKEN, Japan)

2.7 Thermal Management Project (JST-CREST)

- Prof. Tsunehiro Takeuchi (Toyota Technological Institute, Japan)
- Prof. Katsumi Tanigaki (Tohoku University, Japan)
- Prof. Fuyuki Shimojo (Kumamoto University, Japan)
- Prof. Kazunori Sato (Osaka University, Japan)

2.8 X-ray absorption spectroscopic Experiments

- Prof. Chang-Yang-Kuo (National Chiao Tung University, Taiwan)

2.9 Nanoelastronics

- Prof. Daichi Chiba (SRIS, Tohoku University /Osaka University)
- Dr. Ryuhei Kono (SRIS, Tohoku University)

3. Publications

3.1 Journals

1. Y. Fujisawa, A. Krishnadas, C.H. Hsu, T. Takeda, S. Liu, M. Pardo-Almanza, Y. Obata, D. van Dinter, K. Yamagami, G. Chang, M. Kobayashi, C.Y. Kuo, Y. Okada, “*Imaging emergent exotic quasiparticle state in a frustrated transition metal oxide*”
arXiv:2306.06708 (PREPRINT)



2. Y. Fujisawa, A. Krishnadas, C. H. Hsu, B. Smith, M. Pardo-Almanza, Y. Obata, D. van Dinter, G. Chang, Y. Nagai, T. Machida, Y. Okada, “*Visualizing magnetic field-induced rotational electronic symmetry breaking in a spinel oxide superconductor*”
arXiv:2306.06711 (PREPRINT)
3. T. Ohta, K. Kurokawa, N. Jiang, K. Yamagami, Y. Okada, N. Niimi “*Enhancement of spin-flop-induced magnetic hysteresis in van der Waals magnet (Fe_{1-x}Co_x)₅GeTe₂*”
Appl. Phys. Lett. 122, 152402 (2023)

3.2 Books and other one-time publications

Nothing to report.

3.3 Oral and Poster Presentations-

1. Yoshinori Okada, “*Rich electronic emergence in low dimension*” Materials of Tomorrow: Harnessing Responsiveness, Intelligence, and Sustainability, UCSB – OIST Workshop, OIST, 26 March 2024
2. Tomonori Nakamura, Yuita Fujisawa, B. R. M. Smith, Ping. Wu, Daichi Ueta, Ryutaro Okuma, Yoshinori Okada, “走査トンネル顕微鏡を用いた希土類三テルル化物 RTe₃ の電子物性計測” Condmat Kanazawa 2024, Kanazawa University Satellite Office, 15 March 2024
3. Yoshinori Okada, “*Rich electronic emergence in low dimensional material*”, OIST X Kyudai Joint Symposium Series 1: Bio-Inspired Wonders and Energy Innovations, OIST, 29 February 2024
4. Yoshinori Okada “スピネル酸化物超伝導体の電子状態イメージング”, Superconductors Division, Japan Society of Applied Physics (JSAP), AIST Tokyo Waterfront, 19 December 2023
5. Yoshinori Okada, “二次元層状物質とナノエラストロニクスへの展望”, The 1st Nanoelastronics Workshop(Co-organized by SRIS), OIST, 20 November 2023
6. Kohei Yamagami, Yoshinori Okada, “*Resonant soft X-ray photoemission spectroscopy for van der Waals itinerant ferromagnet (Fe_{1-x}Co_x)₅GeTe₂*”, 78th Annual Meeting, Physical Society of Japan (JPS), Tohoku University, 16-19 September 2023 (POSTER)
7. Kei Maruyama, Zhenya Zhang, Fumiya Sekiguchi, Yuita Fujisawa, Yoshinori Okada, Yoshihiko Kanemitsu, and Hideki Hirori, “*Optical response of magnetic topological material Cr_{1+δ}Te₂ in THz region*”, 78th Annual Meeting, Physical Society of Japan (JPS), Tohoku University, 16-19 September 2023 (POSTER)



8. Tomonori Nakamura, Nanami Tomoda, Thomas J. Hasiweder, Yuita Fujisawa, Yoshinori Okada, *“The band structure and many-body effect in $LaTe_3$ by Landau-level spectroscopy”*, 78th Annual Meeting, Physical Society of Japan (JPS), Tohoku University, 16-19 September 2023
9. Yuita Fujisawa, Tomonori Nakamura, Nanami Tomoda, Daichi Ueta, Barnaby R. M. Smith, Thomas J. Hasiweder, Yoshinori Okada *“Imaging new CDW orders associated with the hidden Fermi surface nesting in the antiferromagnetic phase of $CeTe_3$ ”* 78th Annual Meeting, Physical Society of Japan (JPS), Tohoku University, 16-19 September 2023
10. Dyon van Dinter, Markel P. Almanza, Anjana Krishnadas, K. Harada, Yuita Fujisawa, Yoshinori Okada, *“Interface-enhanced superconductivity in monolayer $FeSe$ on $SrVO_3$ ”*, 78th Annual Meeting, Physical Society of Japan (JPS), Tohoku University, 16-19 September 2023
11. Takuya Kawada, Koji Fujiwara, Tomoharu Ohta, Nikaido Natsumi, Kohei Yamagami, Yoshinori Okada, Nan Jiang, Yasuhiro Niimi, *“Magnetostriction measurement of van der Waals magnet $(Fe_{1-x}Co_x)_5GeTe_2$ using surface acoustic waves”*, 78th Annual Meeting, Physical Society of Japan (JPS), Tohoku University, 16-19 September 2023
12. Ryotaro Asama, Tomo Higashihara, Ryoya Nakamura, Mori Watanabe, Nan Jiang, Nanami Tomoda, Kenji Watanabe, Takashi Taniguchi, Yoshinori Okada, Yasuhiro Niimi, *“Magnetotransport properties in van-der-Waals antiferromagnet $TbTe_3$ thin films”*, 78th Annual Meeting, Physical Society of Japan (JPS), Tohoku University, 16-19 September 2023
13. Nanami Tomoda, Yuita Fujisawa, Satoru Hayami, Barnaby R. M. Smith, Tomonori Nakamura, Yoshinori Okada, *“Imaging a new CDW order in the antiferromagnetic phase of $TbTe_3$ ”*, 78th Annual Meeting, Physical Society of Japan (JPS), Tohoku University, 16-19 September 2023
14. Tomo Higashihara, Ryotaro Asama, Ryoya Nakamura, Mori Watanabe, Daichi Ueta, Yoshinori Okada, Nan Jiang, Yasuhiro Niimi, *“Magnetotransport properties in van-der-Waals antiferromagnet $CeTe_3$ thin films”*, 78th Annual Meeting, Physical Society of Japan (JPS), Tohoku University, 16-19 September 2023 (POSTER)
15. Tomoharu Ohta, Nan Jiang, Yasuhiro Niimi, Kohei Yamagami, Yoshinori Okada, Yoshichika Otani, Kouta Kondou, *“Spin Hall effect in van der Waals ferromagnet Fe_5GeTe_2 measured by spin-torque ferromagnetic resonance”*, 78th Annual Meeting, Physical Society of Japan (JPS), Tohoku University, 16-19 September 2023

16. Kohei Aido, Ryutaro Okuma, Yuita Fujisawa, Nanami Tomoda, Yuyan Dong, Kaishu Kawaguchi, Ryo Mori, Yoshinori Okada, Takeshi Kondo, “*Direct observation of the electronic structure of GdGaI modified with K-doping, a new exciton insulator candidate material, by laser angle-resolved photoemission spectroscopy*”, 78th Annual Meeting, Physical Society of Japan (JPS), Tohoku University, 16-19 September 2023
17. Y. Kageyama, H. Fujiwara, A. Onishi, C. Bareille, Anjana Krishnadas, Yuita Fujisawa, T. Taniuchi, Yoshinori Okada, K. Hashimoto, T. Shibauchi, “*Laser-PEEM imaging of ferroelectric domain walls in multiferroic BiFeO₃*”, 78th Annual Meeting, Physical Society of Japan (JPS), Tohoku University, 16-19 September 2023
18. Yuita Fujisawa, “スピネル超伝導体 $LiTi_2O_4$ における新奇電子状態イメージ”, 「強相関電子系のフロンティア」 Nagoya University, 21-22 August 2023 (POSTER)
19. Tomonori Nakamura, “ランダウ準位分光による $LaTe_3$ のバンド構造の観測”, 「強相関電子系のフロンティア」 Nagoya University, 21-22 August 2023 (POSTER)
20. Yoshinori Okada, “*Exploration of Novel Electronic States in Low-Dimensional Materials and Their Contribution to Thermoelectric Effects*”, ELTC-NTM 2023, Toyota Technological Institute (TTI), Nagoya, 29 July 2023
21. Markel Pardo-Almanza, Yuita Fujisawa, Takatsugu Onishi, Alec LaGrow, Yoshinori Okada, “*Spectroscopic Investigation of Bi_2Te_3/Cr_2Te_3 Magnetic Heterostructures*”, The 25th International Conference on the Electronic Properties of Two-Dimensional Systems (EP2DS-25) and 21st International Conference on Modulated Semiconductor Structures (MSS-21), Grenoble, France, 9-14 July 2023
22. Krishnadas, “*Revealing the band folding in $YBa_2Cu_3O_{7-d}$ films with Calcium doping by ARPES*”, International Conference on Strongly Correlated Systems, Incheon, South Korea, 2-7 July 2023 (POSTER)

4. Intellectual Property Rights and Other Specific Achievements

Nothing to report.

5. Meetings and Events

1. The 1st Nanoelastronics Workshop
Venue : OIST C210
Co-organizer : International Center for Synchrotron Radiation Innovation Smart (SRIS) ,
Tohoku University



2. Lecture

Dr. Yasuyuki Hikita, Denso Corporation

Title : Designing functional materials for a carbon-neutral society

Date : 6 September 2023

6. Other

Nothing to report.