Stanford



Sheikh Rubaiat Ul Haque

Postdoctoral Scholar, Photon Science, SLAC

Bio

BIO

Rubaiat received his undergraduate degree in Applied Physics from the University of Tokyo in 2017. He then moved to the University of California San Diego where he finished his PhD in Physics under Professor Richard Averitt in 2023. During his PhD, he discovered light-induced terahertz parametric amplification and photonic time crystal state in excitonic insulator candidate Ta2NiSe5. His discovery has been featured in multiple media outlets including UCSD Today, Max Planck Institute Newsletter, EurekAlert! and Phys.org. He has also demonstrated a novel extreme-efficient nonresonant nonlinear magnon generation mechanism in Mott insulating Heisenberg antiferromagnet Sr2IrO4.

Currently, Rubaiat is a postdoctoral scholar at Stanford University investigating terahertz field-induced ultrafast dynamics in van der Waals materials under Professors Tony Heinz and Aaron Lindenberg. At Stanford, he has discovered terahertz-driven transition to a hidden magnetic state in van der Waals (vdW) antiferromagnet MnPS3. He has recently extended his research to subdiffractive THz spectroscopy of 2D vdW materials. His research interests also broadly include Floquet engineering, ultrafast microscopy, and cavity control of quantum materials. In the long term, Rubaiat aims to continue investigating quantum materials that may provide promising platforms for light-driven emergent phenomena and programming light-matter interactions, serving as a bridge between next-generation photonics and materials science.

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Member, American Physical Society (2017 - present)
- Member, Optica (2020 - present)

PROFESSIONAL EDUCATION

- PhD, University of California San Diego , Physics (2023)
- B.E., The University of Tokyo , Applied Physics (2017)

STANFORD ADVISORS

- Tony Heinz, Postdoctoral Faculty Sponsor
- Aaron Lindenberg, Postdoctoral Research Mentor

Publications

PUBLICATIONS

- **Terahertz field-induced giant symmetry modulations in a van der Waals antiferromagnet** *Nature Communications*
  Haque, S., Cross, M. J., Rajpurohit, S., Haber, J. B., Ciccarino, C. J., Zimmerman, A. C., Sealey, I. J., Kulichenko, V., Tie, M., Wang, H., Philip, S. S., Seo, C., Koralek, et al

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- **Dressing with visible light** *NATURE PHOTONICS*
  Haque, S., Kobayashi, Y.
  2024; 18 (10): 1002-1003
- **Photonic time-crystalline behaviour mediated by phonon squeezing in Ta2NiSe5** *Nature Communications*
  Michael, M. H., Haque, S., Windgaetter, L., Latini, S., Rubio, A., Averitt, R. D., Demler, E.
  2024; 15
- **Terahertz parametric amplification as a reporter of exciton condensate dynamics** *Nature Materials*
  Haque, S., Michael, M. H., Zhu, J., Zhang, Y., Windgaetter, L., Latini, S., Wakefield, J. P., Zhang, G., Zhang, J., Rubio, A., Checkelsky, J. G., Demler, E., Averitt, et al
  2024; 23 (6): 796-802
- **Ultrafast high-harmonic spectroscopy of solids** *Nature Physics*
  Heide, C., Kobayashi, Y., Haque, S., Ghimire, S.
  2024
- **Generalized Fresnel-Floquet equations for driven quantum materials** *PHYSICAL REVIEW B*
  Michael, M. H., Foerst, M., Nicoletti, D., Ul Haque, S., Zhang, Y., Cavalleri, A., Averitt, R. D., Podolsky, D., Demler, E.
  2022; 105 (17)
- **Broadband Terahertz Silicon Membrane Metasurface Absorber** *ACS PHOTONICS*
  Huang, Y., Kaj, K., Chen, C., Yang, Z., Ul Haque, S., Zhang, Y., Zhao, X., Averitt, R. D., Zhang, X.
  2022; 9 (4): 1150-1156
- **Structural tuning of nonlinear terahertz metamaterials using broadside coupled split ring resonators** *AIP ADVANCES*
  Keiser, G. R., Karl, N., Ul Haque, S., Brener, I., Mittleman, D. M., Averitt, R. D.
  2021; 11 (9)
- **On-chip terahertz modulation and emission with integrated graphene junctions** *APPLIED PHYSICS LETTERS*
  Island, J. O., Kissin, P., Schalch, J., Cui, X., Ul Haque, S., Potts, A., Taniguchi, T., Watanabe, K., Averitt, R. D., Young, A. F.
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