Zhanybek Alpichshev

Assistant Professor
Institute of Science and Technology Austria
Am Campus 1
3400 Klosterneuburg, Austria

Phone: +43 2243 9000 2104
Email: alpishev@ist.ac.at
Homepage: https://ist.ac.at/.../alpichshev-group/
ORCID #: 0000-0002-7183-5203

Education

Ph.D. Physics, Stanford University, 2012.

Dissertation Title: "*STM and STS studies of electronic states near macroscopic defects in Bi_2Te_3 and Bi_2Se_3*"; Thesis Advisor: *Aharon Kapitulnik*.

B.S. Applied Physics and Mathematics, Moscow Institute of Physics and Technology (*MIPT*), 2004.

Department of General and Applied Physics; Landau Institute for Theoretical Physics.

Employment

Institute of Science and Technology (IST) Austria, *Assistant Professor*, 2018–present.

Max Planck Institute for Structure and Dynamics of Matter, *Visiting Scientist*, 2017–2018.

Massachusetts Institute of Technology, *Postdoc Researcher*, 2012–2017.

Stanford University, *Research Assistant*, 2005–2012.

Research

Research Interests

Strongly correlated electron systems; Quantum Criticality; Topological Materials; Lead-Halide Perovskites; Nonlinear Optics; Ultrafast Optics; Ultrafast study of soft interfaces;

Most important scientific results

Discovering the lack of backscattering of surface state electrons in Topological Insulators thereby providing an experimental proof of topological protection of the surface state.

Demonstration of robustness of the surface state in Topological Insulators against surface quality.

Observation of the formation of surface resonances near impurities in Topological Insulators. Surface state electrons are described by Dirac equation therefore the formation of such resonances near charged impurities indicate the analog of "atomic collapse" in nuclear physics.

Observation of spin liquid behavior and confinement-deconfinement transition in a frustrated magnetic Mott insulator Na_2IrO_3. This might shed light on the problem of "pairing glue" in high-temperature superconductors.

Development of a symmetry-based phenomenological model for the description low-energy physics of lead-halide perovskites.

Publications

1. *Dispersive effects in ultrafast non-linear phenomena*
   D. Lorenc and Z. Alpichshev,
   doi.org/10.48550/arXiv.2308.09216 (2023)

2. *Mid-infrared Kerr index evaluation via cross-phase modulation with a near-infrared probe beam*
   D. Lorenc and Z. Alpichshev,
   Applied Physics Letters **123**, 091104 (2023),
   doi.org/10.1063/5.0161713

3. *Bond polarizability as a probe of local crystal fields in hybrid lead-halide perovskites*
   Y. Wei,A. G. Volosniev, D. Lorenc, A. A. Zhumekenov, O. M. , M. Lemeshko, Z. Alpichshev,
   The Journal of Physical Chemistry Letters **14**, 6309 (2023),
   doi.org/10.1021/acs.jpclett.3c01158

4. *Spin-Electric Coupling in Lead Halide Perovskites*
   A. G. Volosniev, A. S. Kumar, D. Lorenc, Y. Ashourishokri, A. A. Zhumekenov, O. M. , M. Lemeshko, Z. Alpichshev,
   Physical Review Letters **130**, 106901 (2023),
   doi.org/10.1103/PhysRevLett.130.106901

5. *Effective model for studying optical properties of lead halide perovskites*
   A. G. Volosniev, A. S. Kumar, D. Lorenc, Y. Ashourishokri, A. A. Zhumekenov, O. M. , M. Lemeshko, Z. Alpichshev,
   Physical Review B **107**, 125201 (2023),
   doi.org/10.1103/PhysRevB.107.125201

6. *Universal transparency and asymmetric spin splitting near the Dirac point in HgTe quantum wells*
   V. Dziom, A. Shuvaev, J. Gospodarič, E. G. Novik, A. A. Dobretsova, N. N. Mikhailov, Z. D. Kvon, Z. Alpichshev, A. Pimenov,
   Physical Review B **106**, 045302 (2022),
   doi.org/10.1103/PhysRevB.106.045302

7. *Observation of exciton-exciton interaction mediated valley depolarization in monolayer $MoSe_2$*
   F. Mahmood, Z. Alpichshev, Y.-H. Lee, J. Kong, N. Gedik,
   Nano Letters **18**, 223 (2018),
   doi.org/10.1021/acs.nanolett.7b03953

8. *The origin of exciton mass in a frustrated Mott insulator Na_2IrO_3*
   Z. Alpichshev, E. J. Sie, F. Mahmood, G. Cao, N. Gedik,
   Physical Review B **96**, 235141 (2017),
   doi.org/10.1103/PhysRevB.96.235141

9. *Ultrafast dynamics in the presence of antiferromagnetic correlations in electron-doped cuprate $La_{2-x}Ce_xCuO_{4\pm\delta}$*
   I. M. Vishik, F. Mahmood, Z. Alpichshev, J. Higgins, R. L. Greene, N. Gedik,
   Physical Review B **95**, 115125 (2017),
   doi.org/10.1103/PhysRevB.95.115125

10. *Disorder enabled band structure engineering of a topological insulator surface*
    Y. Xu, J. Chiu, L. Miao, H. He, Z. Alpichshev, A. Kapitulnik, R. R. Biswas, L. A. Wray,
    Nature Communications 14081 (2017),
    doi.org/10.1038/ncomms14094

11. *Selective scattering between Floquet-Bloch and Volkov states in a topological insulator*
    F. Mahmood, C.-K. Chan, Z. Alpichshev, D. Gardner, Y. Lee, P. A. Lee, N. Gedik,
    Nature Physics **12**, 306 (2016),
    doi.org/10.1038/nphys3609

12. *The rate of quasiparticle recombination probes the onset of coherence in cuprate superconductors*
    J. P. Hinton, E. Thewalt, Z. Alpichshev, F. Mahmood, J. D. Koralek, M. K. Chan, M. J. Veit, C. J. Dorow,

N. Barišić, A. F. Kemper, D. A. Bonn, W. N. Hardy, R. Liang, N. Gedik, M. Greven, A. Lanzara, J. Orenstein,
Scientific Reports **6**, 23610 (2016),
doi.org/10.1038/srep23610

13. *Confinement-Deconfinement Transition as an Indication of Spin-Liquid-Type Behavior in Na_2IrO_3*
Z. Alpichshev, F. Mahmood, G. Cao, N. Gedik,
Physical Review Letters **114**, 017203 (2015),
doi.org/10.1103/PhysRevLett.114.017203

14. *STM Imaging of Impurity Resonances on Bi_2Se_3*
Z. Alpichshev, R. R. Biswas, A. V. Balatsky, J. G. Analytis, J.-H. Chu, I. R. Fisher, A. Kapitulnik,
Physical Review Letters **108**, 206402 (2012),
doi.org/10.1103/PhysRevLett.108.206402

15. *STM imaging of a bound state along a step on the surface of the topological insulator Bi_2Te_3*
Z. Alpichshev, J. G. Analytis, J.-H. Chu, I. R. Fisher, A. Kapitulnik,
Physical Review B **84**, 041104 (2011),
doi.org/10.1103/PhysRevB.84.041104

16. *STM Imaging of Electronic Waves on the Surface of Bi_2Te_3: Topologically Protected Surface States and Hexagonal Warping Effects*
Z. Alpichshev, J. G. Analytis, J.-H. Chu, I. R. Fisher, Y. L. Chen, Z. X. Shen, A. Fang, A. Kapitulnik,
Physical Review Letters **104**, 016401 (2010),
doi.org/10.1103/PhysRevLett.104.016401

`Google Scholar link`