

## **SK Firoz Islam**

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Department of physics  
Jamia Millia Islamia  
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## **Contact Information**

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### **Research interests:**

The broad range of my research interest is *Theoretical Condensed Matter Physics* in which I investigate

- Different aspects of 2D or 3D Dirac-like materials [like graphene, silicene, borophene, Weyl and nodal-line semi-metal etc] including the electronic, transport and topological properties subjected to time-reversal symmetry breaking external time-dependent periodic perturbation or magnetic field.
- Electron-hole conversion phenomena across the interface of normal-superconductor hybrid junction: Andreev Reflection, Crossed Andreev reflection, Cooper pair splitter
- Magnetic exchange interaction (RKKY) between two-magnetic impurities embedded into an fermionic system
- Periodically modulated quantum Hall systems: Weiss oscillation
- Collective excitation: Plasmon
- Spin-Hall effect and it's related phenomena.
- Microscopic theory of superconductivity of 2D Dirac materials, twisted layered materials like twisted bilayer graphene
- Light transmission through photonic graphene

## **Education and research experience**

*Postdoctoral Research Associate* (01/11/2022-30/04/2023)  
North Carolina Central University, Durham-NC  
USA

*Postdoctoral Fellow* (18/02/2019-31/08/2022)  
Aalto University, Espoo  
Finland

*Postdoctoral Fellow* (15/09/2016-14/09/2018)  
*Visitor* (15/09/2018-14/10/2018)  
Institute of Physics Bhubaneswar  
India

*Research Associate* (01/04/2015-31/07/2016)  
National Institute of Science Education and Research,  
Bhubaneswar, India

*PhD in Physics* (21/06/2008-18/06/2014)  
Indian Institute of Technology-Kanpur, India

*MSc in Physics* (01/07/2005-24/12/2007)  
Jadavpur University, Kolkata, West Bengal, India

*BSc with Physics, Chemistry and Mathematics* (01/08/2002-01/06/2005)  
Midnapur College (Affiliated to Vidyasagar University), West Bengal, India

*10+2 with Physics, Chemistry, Mathematics, Biology, English and Bengali* (01/07/2000-02/07/2002)  
West Bengal Council of Higher Secondary Education, India

*10-th standard with Physical science, Life Science, Mathematics, History, Geography, English and Bengali*  
(-27/06/2000)  
West Bengal Board of Secondary Education, India

## List of Publications

- Articles submitted and under preparation:
  1. Theory of light diffusion through disordered amplifying photonic lattice.  
[SK Firoz Islam](#) and Alexander. A. Zyuzin  
**arXiv preprint: 2008.12675**
- Articles published in refereed journal:
  1. Unconventional superconductivity with preformed Cooper pairs in twisted bilayer graphene.  
[SK Firoz Islam](#), A. Yu Zyuzin and Alexander. A. Zyuzin  
**Physical Review B Letter** 107, L060503 (2023)  
**American Physical Society**
  2. Collective modes in an imbalanced nodal line semimetal.  
[SK Firoz Islam](#) and Alexander. A. Zyuzin  
**Physical Review B** 104, 245301 (2021)  
**American Physical Society**
  3. Photoinduced spin-Hall resonance in a  $k^3$ -Rashba spin-orbit coupled two-dimensional hole system.  
Ankita Bhattacharya and [SK Firoz Islam](#)  
**Physical Review B Letter** 104, L081411 (2021)  
**American Physical Society**
  4. signatures of topological interfacial chiral modes via RKKY exchange interaction in Dirac and Weyl semimetal.  
Ganesh C. Paul, [SK Firoz Islam](#), Paramita Dutta and Arijit Saha  
**Physical Review B** 103, 115306 (2021)  
**American Physical Society**
  5. Propagation of light through amplifying honeycomb photonic lattice.  
[SK Firoz Islam](#), Pascal Simon and Alexander A. Zyuzin  
**Physical Review A** 102, 043504 (2020)  
**American Physical Society**
  6. Photoinduced interfacial chiral modes in threefold topological semimetal.  
[SK Firoz Islam](#) and Alexander. A. Zyuzin  
**Physical Review B** 100, 165302 (2019)  
**American Physical Society**
  7. Enhancement of thermoelectric performance of a nanoribbon made of  $\alpha - \mathcal{T}_3$  lattice.  
Mir Waqas Alam, Basma Souayeh and [SK Firoz Islam](#)  
**Journal of Physics: Condensed Matter** 31 485303 (2019), ISSN No. 1742-6588  
**IOP Publisher**
  8. Fingerprints of tilted Dirac cones on RKKY exchange interaction in 8-Pmmn borophene  
Ganesh C Paul, [SK Firoz Islam](#) and Arijit Saha  
**Physical Review B**, 99, 155418 (2019)  
**American Physical Society**

9. Driven conductance of an irradiated semi-Dirac material  
[SK Firoz Islam](#), and Arijit Saha  
**Physical Review B** **98**, 235424 (2018)  
**American Physical Society**
  
10. Probing decoupled edge states in zigzag phosphorene nanoribbon via RKKY interaction  
[SK Firoz Islam](#), Paramita Dutta, Arijit Saha and A. M. Jayannavar  
**Physical Review B** **97**, 235424 (2018), ISSN No. 2469-9969  
**American Physical Society**
  
11. Magnetotransport properties of 8-Pmmn borophene: effects of Hall field and strain  
[SK Firoz Islam](#)  
**Journal of Physics: Condensed Matter** **30** 275301 (2018), ISSN No. 1742-6588  
**IOP Publishing**
  
12. Signature of tilted Dirac cones in Weiss oscillations of 8 – *Pmmn* borophene,  
[SK Firoz Islam](#), and A. M. Jayannavar  
**Physical Review B** **96**, 235405 (2017), ISSN No. 2469-9969  
**American Physical Society**
  
13. Enhancement of crossed Andreev reflection in a normal-superconductor-normal junction of thin topological insulator,  
[SK Firoz Islam](#), Paramita Dutta and Arijit Saha  
**Physical Review B** **96**, 155429 (2017), ISSN No. 2469-9969  
**American Physical Society**
  
14. Valley polarized magnetoconductivity and particle-hole symmetry breaking in a periodically modulated  $\alpha$ - $T_3$  lattice  
[SK Firoz Islam](#) and Paramita Dutta  
**Physical Review B** **96**, 045418 (2017), ISSN No. 2469-9969  
**American Physical Society**
  
15. Amplification of Cooper pair splitting current in a graphene based Cooper pair beam splitter geometry,  
[SK Firoz Islam](#), and Arijit Saha  
**Physical Review B** **96**, 125406 (2017), ISSN No. 2469-9969  
**American Physical Society**
  
16. A scheme to realize quantum spin-valley Hall effect in graphene,  
[SK Firoz Islam](#) and Colin Benjamin  
**CARBON** **110**, 304 (2016), ISSN No. 0008-6223  
**Elsevier**
  
17. Topologically induced fractional Hall steps in integer quantum Hall regime of monolayer of  $MOS_2$ ,  
[SK Firoz Islam](#) and Colin Benjamin  
**Nanotechnology** **27**, 385203 (2016), ISSN No. 0957-4484  
**IOP Publishing**

18. Adiabatically twisting a magnetic molecule to generate pure spin current in graphene,  
[SK Firoz Islam](#) and Colin Benjamin,  
**Journal of Physics: Condensed Matter** 28 035305 (2016), ISSN No. 1742-6588  
**IOP Publishing**
19. Beating pattern in quantum magnetotransport coefficients of spin-orbit coupled Dirac fermions in gated silicene,  
[SK Firoz Islam](#) and Tarun Kanti Ghosh,  
**Journal of Physics: Condensed Matter** 26 335303 (2014), ISSN No. 1742-6588  
**IOP Publishing**
20. Thermoelectric properties in an ultra-thin topological insulator.  
[SK Firoz Islam](#) and Tarun Kanti Ghosh,  
**Journal of Physics: Condensed Matter** 26 165303 (2014), ISSN No. 1742-6588  
**IOP Publishing**
21. In-plane electric field effect on a spin-orbit coupled two-dimensional electron system in presence of magnetic field.  
[SK Firoz Islam](#) and Tarun Kanti Ghosh,  
**Journal of Applied Physics** 113 183710 (2013), ISSN No. 0021-9002  
**American Institute of Physics**
22. Modulation effect on spin Hall resonance.  
[SK Firoz Islam](#),  
**Modern Physics Letters B** 27 1350129 (2013), ISSN No. 0217-9849  
**World Scientific**
23. Thermoelectric probe of Rashba spin-orbit interaction strength in a two dimensional electron gas.  
[SK Firoz Islam](#) and Tarun Kanti Ghosh,  
**Journal of Physics: Condensed Matter** 24 345301 (2012), ISSN No. 1742-6588.  
**IOP Publishing**
24. Magnetotransport properties of a magnetically modulated two dimensional electron gas with spin-orbit interaction.  
[SK Firoz Islam](#) and Tarun Kanti Ghosh,  
**Journal of Physics: Condensed Matter** 24 185303 (2012),ISSN No. 1742-6588.  
**IOP Publishing**
25. Zero-field spin splitting in a two dimensional electron gas with spin-orbit interaction revisited.  
[SK Firoz Islam](#) and Tarun Kanti Ghosh,  
**Journal of Physics: Condensed Matter** 24 035302 (2012), ISSN No. 1742-6588.  
**IOP Publishing**
26. Thermodynamic properties of magnetically modulated monolayer graphene.  
[SK Firoz Islam](#), Naveen Kumar Singh and Tarun Kanti Ghosh,  
**Journal of Physics: Condensed Matter** 23 445502 (2011), ISSN No. 1742-6588.  
**IOP Publishing**

## Conferences and Schools attended

- International Conference on Material Science and Technology, Kochi, India, June 06th to June 14th, 2012
- Emerging Trends in Advanced Functional Materials, Institute of Physics, Bhubaneswar, India, January-18th to January-22nd, 2016
- School on Nanoscale Electronic Transport and Magnetism, Harish-Chandra Research Institute, Allahabad, India, February-22nd to March-02nd, 2016
- XXIV International Summer School 'Nicolás Cabrera'. Quantum Transport in Topological Materials, Instituto Nicolas Cabrera, Madrid, SPAIN, September-4th to September-8th, 2017
- Young Investigator Meet on Quantum Condensed Matter Theory, S. N. Bose Institute for Basic Science, Kolkata, INDIA on 26-17 Oct., 2017.
- Summer School "Quantum Connection-2019" (10.06.2019-22.06.2019), NORDITA, Stockholm, Sweden

## Software Skills

- Mathematica, Matlab
- Writing reports and other scientific documents with Latex

## References

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