

# S Mathimalar

Postdoctoral Researcher  
Department of Condensed Matter Physics,  
Weizmann Institute of Science, Rehovot, Israel.  
Web: <https://mathimalar.github.io/>



## EMPLOYMENT

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### Post-Doctoral Fellow

[Weizmann Institute of Science](#)

May 2019 - Present

Supervisor : [Prof. Haim Beidenkopf](#)

Area of study : Probing nodal line semimetal using scanning tunneling spectroscopic methods, topological nanowire growth.

### National Post-Doctoral Fellow

June 2017 - April 2019

[Tata Institute of Fundamental Research, Hyderabad](#)

Supervisor : [Dr. Karthik V Raman](#)

Area of study : Signature of gate-controlled magnetism and localization effects at  $\text{Bi}_2\text{Se}_3/\text{EuS}$  interface.

### Post-Doctoral Fellow

Sept 2015 - May 2017

[Tata Institute of Fundamental Research, Hyderabad](#)

Supervisor : [Dr. Karthik V Raman](#)

Area of study : Thin film growth (Instrumentation).

## EDUCATION

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### PhD in Physics

2015

[The India-based TlN detector \(TlN.TlN\)](#)

[India-Based Neutrino Observatory \(INO\)](#)

[Tata Institute of Fundamental Research, Mumbai](#)

Supervisor : Prof. R. G. Pillay.

Area of study : [NTD Ge sensor development for superconducting bolometers.](#)

### MSc in Physics

2009

[Bharathidhasan University, Trichy, Tamilnadu](#)

### BSc in Physics

2007

[Seethalakshmi Ramaswamy College, Trichy, Tamilnadu](#)

## RESEARCH INTERESTS

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- Proximity Induced Superconductor
- Topological Insulator
- Majorana Fermion
- Detector Physics
- Low Temperature Physics

## INSTRUMENTATION SKILLS

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- Designed and automated 4K cryo-insert for low-temperature resistance measurement.
- Molecular Beam Epitaxial (MBE) growth system
- Designed and built single target Sputtering setup
- Worked on 8 source multitarget sputtering setup
- Experience with both DC and RF sputtering
- Experience with Wet/dry dilution refrigerator
- Experience with 1.5K/300mK refrigerator
- Low temperature cryogen-free STM
- Reflection high-energy electron diffraction (RHEED)

## PROFESSIONAL SKILLS/ ABILITIES

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- **Dilution refrigerator/300mK refrigerator:** In my PhD I was working with **wet and dry dilution refrigerators**. A 30 year old wet dilution fridge was left unused for nearly a decade. I had been given a task of refurbishing the dilution fridge along with a couple of students. A complete rewiring and He-3 addition were done on the fridge. Hence I do come up with an in-depth knowledge of dilution refrigerator system. I am also working with He-3 refrigerator (300 mK) in my current lab.
- **He-4 Cryo Insert/Dip stick:** I had designed and built an He-4 cryo insert for four probe resistance measurement from room temperature down to 4K. This insert can fit in the He-4 dewar with little modification on the refilling line of the dewar without significant loss of He-4. The insert consists of a heater, sample space and a calibrated Cerenox sensor. I had also built a dip stick which can be used for a quick sample transport measurement down to He-4 temperature.
- **MBE/UHV system:** I have ample experience with handling the ultra high vacuum (UHV) system. I have also experience in working with a custom designed Molecular Beam Epitaxial (MBE) growth chamber.

- **Sputtering Chamber:** I have designed and built a single target sputtering chamber using commercially available CUSP sputtering source. I am also involved in the assembly of 8 targets sputtering chamber, with the possibility of thin film growth by co-evaporation of two targets. I have worked with both **RF/DC sputtering** systems.
- **Cryogen free STM:** I am currently working on fabricating superconducting thin films. Using STM the conductance plot of fabricated thin films are studied. Both Scanning Tunneling Microscope (STM) and Scanning Tunneling Spectroscopy (STS) are used in the lab.
- **Laser Lithography:** I had the training of using laser lithography using CLEWIN software and soon will be using in making my devices.
- **Experience with software:** I had automated the cryo-insert for resistance measurement using the Labview interface with a Lakeshore resistance bridge.
- **Ability to train others/leading the team:** During my post-doc position, I get the opportunity to train MSc/PhD students. I had worked in a lab with a group of PhD students, Postdocs and project students. I have developed a skill of easily getting along with any of the colleagues, understanding them, learn from them and leading them when necessary. I also possess the character of working alone/ as well in a group according to the need.

## ACADEMIC ACHIEVEMENTS

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- Selected for Entrepreneurship program by Feinberg Graduate School at Weizmann Institute of Science, Israel (among 20 out of 120 applications) - 2019.
- Feinberg Post-Doctoral Fellowship at Weizmann Institute of Science, 2019.
- Awarded National Post Doctoral Fellowship (NPDF) by Science and Engineering Board, Government of India - 2017
- Presented an Invited talk at IEEE-Bombay symposium - 2015
- Conference paper got selected for Oral presentation at WOLTE 11 - 2014
- Won best poster award in National Symposium on Particle Detector and Instruments for the poster "Development of sensors for Bolometric Application" - 2012.
- Awarded DAE Fellowship under India-Based Neutrino Observatory (INO) Graduate Training Program 2009.
- Selected for Indian Academy of Sciences - summer research fellowship at Indian Institute of Science (IISc., Bangalore) for summer internship - 2009.
- Secured all India rank 236 in IIT-JAM, All India Entrance Examination - 2007.
- Constructed a model "Vehicle Toppling Indicator" as my dream engine and secured STATE LEVEL FIRST prize in it, in the year 2006.

## LIST OF PUBLICATIONS

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- 2021 A low noise cryogen-free scanning tunneling microscope–superconducting magnet system with vacuum sample transfer. *Review of Scientific Instruments* 92, 023906 (2021). Saurabh Chaudhary, Janmey Jay Panda, Suman Mundlia, **S. Mathimalar**, Aathif Ahmedof, and Karthik V. Raman.
- 2020 Signature of gate-controlled magnetism and localization effects at Bi<sub>2</sub>Se<sub>3</sub>/EuS interface. *npj Quantum Materials* 5 1. **Subramanian Mathimalar**, Satyaki Sasmal, Archit Bhardwaj, Sekar Abhaya, Rajasekhar Pothala, Saurabh Chaudhary, Biswarup Satpati, Karthik V Raman.
- 2019 Observation of zero-bias conductance peak in topologically-trivial hybrid superconducting interfaces. *Journal of Physics Communications* 3 4. S. Mohapatra, **S. Mathimalar**, S. Chaudhary, Karthik V. Raman.
- 2016 Development of NTD Ge Sensors for Superconducting Bolometer. *Journal of Low Temperature Physics* 184 609. Abhijit Garai, **S. Mathimalar** et al.
- 2015 Estimation of low energy neutron flux ( $E_n \leq 15$  MeV) in India-based Neutrino Observatory cavern using Monte Carlo techniques. *Journal of Instrumentation* 10 T12005. N. Dokania, V. Singh, **S. Mathimalar** et al.
- 2015 Specific Heat of Teflon, Torlon - 4203 and Torlon - 4301 in the range of 30 - 400 mK. *Cryogenics* 67 15. V. Singh, A. Garai, **S. Mathimalar** et al.
- 2015 Study of radioactive impurities in neutron transmutation doped Ge. *Nuclear Instruments and Methods in Physics Research Section A* 774 68. **S. Mathimalar** et al.
- 2015 Characterization of neutron transmutation doped (NTD) Ge for low temperature sensor development. *Nuclear Instruments and Methods in Physics Research Section B* 345 33. **S. Mathimalar** et al.
- 2014 Characterization of a low background HPGe detector. *Nuclear Instruments and Methods in Physics Research Section A* 745 119. N. Dokania, V. Singh, **S. Mathimalar**, V. Nanal, S.Pal, R. G. Pillay.
- 2014 Study of neutron induced background and its effect on the search of  $(\nu\bar{\nu}\beta\beta)$  decay in <sup>124</sup>Sn. *Journal of Instrumentation* 9 P11002. N. Dokania, V.Singh, **S. Mathimalar**, et al.
- 2014 Heat capacity setup for superconducting bolometer absorbers below 400mK. *Journal of Low Temperature Physics* 175 604. V. Singh, **S. Mathimalar**, et al.
- 2013 Cryogen Free Dilution Refrigerator for bolometric search of neutrinoless double decay  $(\nu\bar{\nu}\beta\beta)$  in <sup>124</sup>Sn. *Pramana – Journal of Physics* 81 719. V. Singh, **Mathimalar. S.**, et al.

[The list of publications including proceedings are available in Google Scholar.](#)