

Curriculum Vitae – M. J. Iqbal

Version 14 Sep 2018



Personal Data

Full Name: Muhammad Javaid Iqbal
Current Position: Assistant Professor (TTS)
Citizenship: Pakistani
Phone: +92-42-99233133-5 ext. 104
Postal Address: Centre of Excellence in Solid State Physics, University of the Punjab.
Email address: javaid.cssp@pu.edu.pk / javaid2k@gmail.com

Academic Background

- 2013- to date **Assistant Professor** at Centre of Excellence in Solid State Physics, University of the Punjab, QAC, Lahore-54590, Pakistan
- 2012-2013 **Postdoc** in the group Physics of Nanodevices, University of Groningen, the Netherlands.
- 2007-2012 **Ph.D.** in experimental Physics from the University of Groningen, the Netherlands. Research position in the group of Prof. dr. ir. C. H. van der Wal and Prof. dr. ir. B. J. van Wees. Thesis title: *Electron many-body effects in quantum point contacts*. Ph.D. advisor: Prof. dr. ir. C. H. van der Wal.
- 2007 Recipient of HEC overseas-scholarship for Ph.D.
- 2005-2007 **M.Phil.** (Course work and research) in Microelectronics Engineering and semiconductor Physics, University of the Punjab Lahore, Pakistan.
- 2004-2005 **Lecturer** in Physics at Pakistan College of Science and Technology, Qasur.
- 2002-2004 **M.Sc.** in Physics, G.C. University Lahore, Pakistan.
- 2000-2002 **B.Sc.** in Physics and Mathematics (double course), Punjab University, Lahore, Pakistan.

Research Work accomplished and Current Research Interests

During my studies I have always been intrigued by the physical phenomena at the nanoscale level. For my Ph.D. research I performed experiments that aimed at improving the understanding of physics in nanoscale electronic devices. The work was on the electrical transport properties of Quantum Point Contacts (QPCs), with a focus on electron many-body states that can form in these devices. These have a significant influence on the transport properties, and a well-known expression of these effects is the

so-called *0.7 anomaly*. Explaining these effects is a long-standing puzzle (since 1996) in this field. To solve this puzzle, I adopted in my Ph.D. research a new approach by developing QPCs with an *in-situ* tuning of the length of the transport channel (publication 3). Our measurements with these devices led to the discovery of a periodic dependence of the 0.7 anomaly on the channel length, and provide evidence that the origin of the *0.7 anomaly* lies in emergent electron localization due to electron many-body effects (publication 2).

Nanoscience has the potential to revolutionize the world and I want work at the forefront of research that explores the new physical phenomena that provide the foundations of this development.

At present I'm working as an assistant Prof. in the Centre of Excellence in Solid State Physics, University of the Punjab, Lahore, Pakistan. My job responsibilities here are to teach MS students and conduct research work. Currently I'm working on few research projects. First one is to study the gas and vapor sensors of different nanotubes and particles (e.g. ZnO, FeO, Carbon etc). Secondly we are working on different field effect transistor devices made of clusters of nanotubes and nanoparticles of various materials like carbon, Silver and Gold and Organic materials.

For the last one year I am working on the Organic Field Effect Transistors (OFETs). I am using solution processing techniques to deposit the channel materials on the OFETs. The goals in this direction are to explore various ways to increase the charge carrier mobility, reduce threshold voltage, increase on/off ratio, and make the devices air- and bias stable over long periods of times. In this direction, our focus is to use various ways to align the organic polymers in order to enhance the performance parameters of the OFETs.

Expertise and Skills

I am an experimentalist with expertise on electrical transport measurements on micro- and nanoscale devices. My expertise are in micro- and nano-fabrication techniques that are based on optical beam lithography, electron-beam lithography, structures with shadow masking, wet-etching of semiconductors, metal deposition by electron-beam evaporation, optical and electron microscopy and other clean-room techniques.

I am also using solution processing techniques to make room temperature Organic Field Effect Transistors.

Software Skills

- MS Office
- Latex
- Matlab
- Mathematica
- Origin
- Labview

Equipment used/Handled

- Extensive Clean room experience

- Chemical bench
- Wet Etching
- Optical microscope
- Phase contrast microscope
- SEM
- Height profilometer
- Ovens and RTA for annealing and processing
- Cryogenic handling (Nitrogen and Helium) and measurements with cryostats
- Dil/Fridge with superconducting magnet for very low temperature (up to 80mK) Magneto transport measurements
- Kethleys and lock-in for low noise phase-locked measurements
- SCS4200 Device analyzer.
- Probe station
- E-beam lithography
- Photo-Lithography
- Metal deposition with e-beam evaporator
- Wire bonding
- Scriber for sample cutting
- Ultrasonic bath
- Scanning Kelvin Probe

Selected Conferences and Presentations

- FOM @ Physics Veldhoven (Netherlands), 18-19 Jan. 2012 (plenary talk in Nanoscience session).
Talk title: Tunable single and paired quasi-localized states and related Kondo physics in quantum point contacts (M. J. Iqbal, E. J. Koop, J. B. Dekker, J. H. M. van der Velde, J. P. de Jong, D. Reuter, A. D. Wieck, R. Aguado, Y. Meir and C. H. van der Wal).
- ICPS 2012, 31st International Conference on the Physics of Semiconductors, Zurich (Switzerland), 29 July-3 Aug. 2012.
Talk title: Tunable electron many-body physics with single and paired localized states in quantum point contacts (C. H. van der Wal, M. J. Iqbal, E. J. Koop, J. B. Dekker, J. H. M. van der Velde, J. P. de Jong, D. Reuter, A. D. Wieck, R. Aguado, and Y. Meir).
- International workshop on spin-dynamics and Kondo effects in STM and Nanodevices, Hamburg, (Germany), 15-16 Dec. 2011 (invited talk).
Talk title: Tunable single and paired Kondo states in clean semiconductor quantum point contacts (C. H. van der Wal, M. J. Iqbal, E. J. Koop, J. B. Dekker, J. H. M. van der Velde, J. P. de Jong, D. Reuter, A. D. Wieck, R. Aguado, and Y. Meir).
- Quantum Spintronics Workshop-II, Sardinia (Italy), Oct. 2011 (poster presentation).

- Workshop on functional nano-materials and devices, Zernike Institute and international collaborators, at Vlieland (Netherlands), Apr. 2011 (poster presentation).
- FOM @ Physics Veldhoven (Netherlands), Jan. 2011 (poster presentation).
- Workshop on functional nano-materials and devices, Zernike Institute and international collaborators, at Vlieland (Netherlands), May. 2009 (poster presentation).
- FOM @ Physics Veldhoven (Netherlands), Jan. 2009 (poster presentation).
- FOM @ Physics Veldhoven (Netherlands), Jan. 2008 (poster presentation).
- Workshop on Electron beam lithography in Dusseldorf, Germany, 2008.
- International conference on Solid State Physics, Lahore (Pakistan) 1-6 Dec. 2013 (Invited talk)
Talk Title: Robust recipe for low-resistance ohmic contacts to a two-dimensional electron gas in GaAs/Al_xGa_{1-x}As heterostructures, (M. J. Iqbal, D. Reuter, A. D. Wieck and C. H. van der Wal).
- An invited Seminar at the department of Physics, LUMS University (Pakistan) 27 Feb. 2013
Title: Electrical transport properties of Quantum Point Contacts
- International conference on Solid State Physics, Lahore (Pakistan) 13-17 Dec. 2015 (Invited talk)
Talk Title: Influence of lateral channel shifting on localized electron many-body states in quantum point contacts, (M. J. Iqbal, D. Reuter, A. D. Wieck and C. H. van der Wal).
- 5th International Symposium on Biomedical Materials: Clinical Requirements and Regulatory Affairs (14 - 16 December 2016)
- International conference on Solid State Physics, Lahore (Pakistan) 10-14 Dec. 2017 (Invited talk)
Talk Title: Achieving higher charge carrier mobility in organic field effect transistors by long range orders in polymer films using solution-processing techniques
M. Javaid Iqbal, Mujeeb Ullah, Kashif Saghir, Saira Riaz and Shahzad Naseem

Research Student Supervision

Sr#	Type and Institute	Name	Title	Year
1	Bachelor Project University of Groningen, The Netherlands	Jakko de Jong	Realizing in-situ tunable length for split gate QPC's using triple gated QPC's	Feb. 2010

2	Bachelor Project University of Groningen, The Netherlands	Jordi Dekker	Tunable two-impurity Kondo effect in a tunable quantum point contact	Feb. 2011
3	Top Master:Scientific Paper University of Groningen, The Netherlands	Aisha Aqeel	Kondo Effect and the 0.7 Anomaly in Quantum Point Contacts	June 2011
4	Top Master Project University of Groningen, The Netherlands	Jasper Van der Velde	The Influence of Many- Body Interactions on Quantum Electron Transport	June 2011
5	M.Phil Thesis University of the Punjab, Pakistan	Faiza Arshad	Fabrication of Gold Nanoparticles Based Multiple Tunnel Junction Field Effect Transistors (MTJFETs)	Oct. 2016
6	M.Phil Thesis University of the Punjab, Pakistan	Kiran Idress	Synthesis and Characterizations of Graphene Based PH Sensors	Oct. 2016
7	M.Phil Thesis University of the Punjab, Pakistan	Fida Ali	Fabrication and Characterization of ZnO Nanotubes Based Solar Cells	Oct. 2016
8	M.Phil Thesis University of the Punjab, Pakistan	Iqra Haroon	Fabrication and Characterization of Carbon Nanostructures Based Gas Sensors	Nov. 2016
9	M.Phil Thesis University of the Punjab, Pakistan	Rana Ali Ahmad	Fabrication and Characterization of Carbon Nanostructures Based Field Effect Transistors	Nov. 2016
10	M.Phil Thesis University of the Punjab, Pakistan	Shehla Jabeen	Fabrication of Silver Nanoparticles Based Multiple Tunnel Junction Field Effect Transistors (MTJFETs)	Dec. 2016
11	M.Phil Thesis University of the Punjab, Pakistan	Sundus Yasin	Fabrication and Characterization of Carbon Nanotubes Based Cholesterol detection Sensors	April 2017
12	M.Phil Thesis University of	Tehmina Afzal	Fabrication and Characterization of	Feb. 2018

	the Punjab, Pakistan		Sputtered ZnO Based p- type Thin Film Transistor	
13	M.Phil Thesis University of the Punjab, Pakistan	Waqas Aslam	Fabrication And Characterization Of Zinc Oxide Thin Film Transistor	April 2018
14	M.Phil Thesis University of the Punjab, Pakistan	Fatima Irshad	Optically Tuning the Threshold Voltage for DPPDTT based Photo- transistors	Sep. 2018

- I have currently 5 M.Phil students under my supervision, all working on the various projects on Organic and metal-oxide electronics.
- I have taught courses on Semiconductor Electronics Devices, Solid State Electronics devices and Semiconductor Nanostructures and Optoelectronics devices to MS and PhD students.