Dr. Ram Shanker Patel
Professor of Physics,
Birla Institute of Technology and Science Pilani (BITS) - K K Birla Goa Campus,
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EDUCATION / PROFESSIONAL EXPERIENCE

- Ph. D. in Physics (1998 – 2005), Dept. of Physics, IIT Kanpur Kanpur, India.
- 2006 – 2007, Post-doctoral fellow at Max-Planck Institute of Microstructure Physics, Halle, Germany.
- 2007 – 2009, Post-doctoral Scientist at *MESA*$^+$ Institute of Nanotechnology, University of Twente, the Netherlands.
- 2009 - 2018, Assistant Professor of Physics, BITS Pilani - K K Birla Goa Campus.
- 2018 - 2023, Associate Professor of Physics, BITS Pilani - K K Birla Goa Campus.
- 2023 - present, Professor of Physics, BITS Pilani - K K Birla Goa Campus.

RESEARCH INTERESTS

Spintronics, Device Physics, Thin films and multilayers: preparation and characterization by transport and magnetization studies.

TEACHING INTERESTS

Multidisciplinary and physics courses at undergraduate level (B. E. / M. Sc. students). Promoted class-room demonstration experiments for the courses.

- Mechanics, oscillations and waves
- Electronic devices
- Thermodynamics
- Electromagnetic theory
- Mechanics, oscillations and waves Lab
- Solid State Physics
- Physics of Semiconductor Devices
- Atomic and molecular physics
- Electricity and Magnetism Lab
- Modern Physics Lab
- Advanced Physics Lab

RESEARCH PROJECTS

Executed/Executing following research projects; Promoted in-house developed experimental set-ups as they bridge teaching and research:

- Development of interactive classroom demonstration experiments for introductory Physics courses and study of its effectiveness on student learning
  Principal Investigator: Ram Shanker Patel
  Co-investigators: Radhika Vathsan, Arun V Kulkarni, Swastibrata Bhattacharyya, Arnab Roy, Yuriy Petenev, Aabhaas Vineet Mallik
  Funding Agency: Teaching Learning Center (TLC), BITS Pilani - K K Birla Goa Campus.
  Funding amount: Rs 1.9 Lakh
  Project Duration: 2024 - 2025.

- Exploring the role of electrons' spin in enhanced hydrogen production using chiral/magnetic electrocatalysts
  Principal Investigators: Dr. Kiran Vankayala and Dr. Ram Shanker Patel
  Funding Agency: Cross-Disciplinary Research Framework (CDRF) scheme of Birla Institute of Technology & Science Pilani
  Funding amount: Rs 20 Lakh
  Project Duration: 2023 - 2025 (24 months)

- Spin Seebeck Effect in novel heterostructures
  Principal Investigator: Dr. Ram Shanker Patel
  Co-investigators: Dr. Pratap Kumar Sahoo and Dr. Kartik Senapati (NISER Bhubaneshwar)
  Funding Agency: Department of Science and Technology, Govt. of India, under Science and Engineering Research Board programs
  Funding amount: Rs 51 Lakh
  Project Duration: 2017 - 2020 (36 months)

- Magneto-transport in magnetic tunnel junctions.
  Principal Investigator: Dr. Ram Shanker Patel
  Co-investigator: None
  Funding Agency: Department of Science and Technology, Govt. of India, under Nanomission program
  Funding amount: Rs 52.65 Lakh
  Project Duration: 2012 - 2016 (48 months)

- Development of low-temperature magnetization measurements set-up.
  Principal Investigator: Dr. Ram Shanker Patel
  Co-investigator: Dr. Teny John, Dr. Halan Prakash
  Funding Agency: Council of Scientific and Industrial Research. Govt. of India.
  Funding amount: Rs 13.85 Lakh
  Project Duration: 2012 - 2014 (24 months)

INSTITUTIONAL RESPONSIBILITIES

- Faculty in-charge, Central Sophisticated Instrumentation Facility (July 2018 - Aug 2021).
- Nucleus Member, Academic Undergraduate Studies Division (Feb 2023 -)
- Member, Departmental Committee on Academics (Nov 2016 - Sept 2018).
- Organizer, Workshop on effective teaching and learning, July 18-20, 2015, BITS Pilani - K K Birla Goa Campus, Goa.
- Member, Quality Assurance & Assessment imperative team (April 2014 - Nov 2015, under university's Mission 2015 | Vision 2020 project).
- Member, University Research Board (Aug 2013 - Dec 2015).
- Member, Departmental Research Committee (May 2011 - July 2013; Nov 2017 - Oct 2019).

INFRASTRUCTURE DEVELOPMENT

- Coordinator for setting-up and manual preparation for Physics Laboratory I (Re-designed compulsory lab course for all 1st year students; Later became the 1st Instructor-in-charge of the course in 2nd Semester 2011-12).
- Coordinator for setting-up and manual preparation for Advanced Physics Laboratory (Compulsory lab course for M. Sc. (Physics) 3rd year students; later became 1st Instructor-in-charge of the course in 2nd Semester 2013-14).
- Coordinator for establishing a Central Liquid Nitrogen Facility (Plant is operational since Nov. 2013).
- Coordinator for BITS + DST FIST Physical Property Measurement System (PPMS) Central Facility.

THESIS SUPERVISION

1. Dr. Dhavala Suri (2018)
   Ph. D. Thesis - A study of electronic and thermal transport properties of transition metal dichalcogenides for device applications
   After thesis submission - Postdoctoral Associate, Plasma Science and Fusion Center, Massachusetts Institute of Technology (MIT), MA, USA.
2. Ms. Sharvari Pradeep Kulkarni (Since July 2018)
   Project - Spin Seebeck Effect
3. Ms. Sreelakshmi Nair (Since October 2020)
   Project - Magnetism in 2D layered materials
4. Mr. Piyush Mahesh Mirani (Since Aug 2024)
   Project - Spin torque phenomena
5. Vishakha Gupta (2016)
   M. Sc. Thesis - Study of transition metal ferromagnet based spin-caloritronic devices
   After thesis submission - Graduate Student, Department of Physics, Cornell University, USA.

REVIEWER / REFEREE

2D Materials, Nanotechnology, Nanoscale, Journal of Physics: Materials, Journal of Physics D: Applied Physics, Journal of Physics: Condensed Matter, Physica Scripta, Solid State Communications, Scientific Reports.

PUBLICATIONS

1. Pore Engineering in $\gamma-Fe_2O_3$ Nanoparticles: Hierarchical Pores by Controlled Lixiviation Using Citrate Ligands
   Ankita Singh, Sharvari P. Kulkarni, Ram S. Patel, R. Aravinda Narayanan, Balaji Gopalan
   J. Phys. Chem. C **129**, 627 (2025).
2. Spin-flop phase transitions in vdW antiferromagnet $MnPSe_3$
   Sreelakshmi M. Nair and R. S. Patel
   Appl. Phys. Lett. **125**, 092405 (2024).

3. A study of electron and thermal transport in layered Titanium Disulphide single crystals
Dhavala Suri, S. Vantari, S. Joshi, K. Senapati, P. K. Sahoo, S. Varma and R. S. Patel
Journal of Physics: Condensed Matter **29**, 485708 (2017).

4. Electron and thermal transport transport via variable range hopping in $MoSe_2$ single crystals
Dhavala Suri and R. S. Patel
Appl. Phys. Lett. **110**, 233108 (2017).

5. Spin polarized tunneling through chemical vapor deposited multilayer Molybdenum disulfide
Andre Dankert, M. Venkata Kamalakar, R. S. Patel, S. P. Dash et al
ACS Nano **11**, 6389 (2017).

6. Tunnel magnetoresistance with atomically thin two- dimensional hexagonal boron nitride barriers
Andre Dankert, M. Venkata Kamalakar, Abdul Wajid, **R. S. Patel**, and Saroj P. Dash.
Nanoresearch (Springer) **8**, 1357 (2015).

7. Temperature dependence of the giant magnetoresistance in Fe–Cr multilayers - Intralayer and interlayer exchange energies.
R. S. Patel and A. K. Majumdar.
J. Magn. Magn. Mater. **323**, 646 (2011).

8. Electrical creation of spin polarization in silicon at room temperature.
Saroj P. Dash, Sandeep Sharma, **Ram S. Patel**, Michel P. de Jong, and Ron Jansen.
Nature **462**, 491 (2009).

9. Magnetic tunnel contacts to silicon with low-work-function ytterbium nanolayers.
R. S. Patel, S. P. Dash, M. P. de Jong, and R. Jansen.
J. App. Phys. **106**, 016107 (2009).

10. Electron pair emission from a W (001) surface: photon versus electron excitation.
M. Muñoz-Navia, C. Winkler, **R. S. Patel**, M. Birke, F. O. Schumann, and J. Kirschner.
J. Phys.: Condens. Matter **21**, 355003 (2009).

11. Relaxation of thermo-remanent magnetization in Fe-Cr GMR multilayers.
R. S. Patel, A. K. Majumdar, and A. K. Nigam.
J. Magn. Magn. Mater. **309**, 256 (2007).

12. Role of heterostructure and multiple magnetic phases in the low-field magnetization of Fe-Cr GMR multilayers.
R. S. Patel, A. K. Majumdar, A. K. Nigam, D. Temple, and C. Pace.
J. Appl. Phys. **100**, 123914 (2006).

13. Swift heavy ion induced mixing in Fe/Ni multilayer.
S. K. Srivastava, R. Kumar, A. Gupta, **R. S. Patel**, A. K. Majumdar, and D. K. Avasthi.
Nucl. Instrum. Methods Phys. Res., Sect. B **243**, 304 (2006).

14. Evidence of spin-wave demagnetization in Fe-Cr GMR multilayers.
R. S. Patel, A. K. Majumdar, A. F. Hebard, and D. Temple.
J. Appl. Phys. **97**, 033910 (2005).

15. Magnetic scattering in Fe-Cr multilayers in the ferromagnetic state at low temperatures.
R. S. Patel, A. K. Majumdar, A. F. Hebard, and D. Temple.
J. Appl. Phys. **93**, 7684 (2003).

16. Thermoremanent magnetization in Mn-rich $Cu_{100-x}Mn_x$ (x=73, 76, and 83) binary alloys
R. S. Patel, D. Kumar, and A. K. Majumdar.
Phys. Rev. B **66**, 054408 (2002).

CONFERENCE / WORKSHOP CONTRIBUTIONS:

1. Physical Property Measurement Systems
Synergistic Training Program Utilizing the Scientific and Technological Infrastructure (STUTI) September 26-October 2, 2022.
BITS Pilani, K K Birla Goa Campus, Goa, India.

2. Tunnel Magnetoresistance with layered materials.
National Symposium on 'Recent Trends in Condensed Matter Physics and Materials Science' 12-13th March, 2020
Organized by Goa University and Indian Institute of Technology Goa.

3. Electron and thermal transport studies in large $MoSe_2$ single crystals
Dhavala Suri and R. S. Patel
SpinTECH IX International School and Conference, June 4-8, 2017, Fukuoka, Japan.

4. Thermal hysteresis in Seebeck coefficient of $MoTe_2$ crystals.
Dhavala Suri, S. P. Dash, and R. S. Patel.
5th International Chalcogen Conference, 19-21 December 2016, Goa.

5. Electron-electron scattering dominance in $MoTe_2$ crystals at low temperatures.
Dhavala Suri, S. P. Dash, and R. S. Patel.
61st Annual conference on Magnetism and Magnetic Materials, New Orleans, Louisiana, October 31 - November 4, 2016.

6. Tunneling Magnetoresistance with Thin Hexagonal Boron Nitride Barriers.
A cluster of topical meetings on Current Trends in Condensed Matter Physics, National Institute of Science Education and Research (NISER), Bhubaneswar. February 19 – 22, 2015

7. Spin Hall Effect measurement techniques.
Dhavala Suri, and **R. S. Patel**
ICTP Workshop on Current Trends in Frustrated Magnetism, Jawaharlal Nehru University, New Delhi, India. February 9 – 13, 2015.

8. Spin-transport in Silicon using multi-terminal lateral devices.
S. P. Dash, **R. S. Patel**, M. P. de Jong, and R. Jansen.
5th International School and Conference on Spintronics and Quantum Information Technology, Cracow, Poland. July 7 – 11, 2009.

9. Spin-tunnel contacts to silicon using low-work-function CoGd alloys.
R. S. Patel, S. P. Dash, M. P. de Jong, R. Jansen.
Institute of Electrical and Electronics Engineers (IEEE) international magnetic conference, Sacramento, California, USA, May 4 - 8, 2009.

10. Electric field control of spins in a silicon two-dimensional electron gas.
R. Jansen, B.-C. Min, S. P. Dash, **R. S. Patel**, and M. P. de Jong. 2009
American Physical Society (APS) March Meeting (Focus Session on Spins in Group IV semiconductors), Pittsburgh, Pennsylvaniya, USA, March 16 - 20, 2009.

11. Engineering spin-tunnel junctions to Si using interfacial Yb nanolayers.
    R. S. Patel, S. P. Dash, M. P. de Jong, R. Jansen.
    NanoNed NanoSpintronics Workshop, Eindhoven, the Netherlands, June 26 - 27, 2008.

12. Tunnel spin-polarization of low-work-function ferromagnets.
    R. S. Patel, B.-C. Min, S. P. Dash, M. P. de Jong, R. Jansen.
    Institute of Electrical and Electronics Engineers (IEEE) international magnetic conference, Madrid, Spain, May 4 - 8, 2008.

13. Tunnel magnetoresistance of spin tunnel contacts to silicon.
    R. Jansen, B.-C. Min, **R. S. Patel**, S. P. Dash, and M. P. de Jong.
    American Physical Society (APS) March Meeting (Focus Session on Spin Injection in Si), New Orleans, Louisiana, USA, March 10 - 14, 2008.

14. Probing correlated electron-pair emission from a W(001) surface.
    M. Muñoz-Navia, C. Winkler, M. Birke, **R. S. Patel**, F. O. Schumann, and J. Kirschner.
    72th Annual Meeting of the Deutsche Physikalische Gesellschaft (DPG) and DPG Spring Meeting of the Condensed Matter Division, Berlin, Germany, February 25 - 29, 2008.

15. Low-field magnetization in Fe-Cr GMR multilayers.
    R. S. Patel and A. K. Majumdar.
    Condensed Matter Physics (CMP) Workshop, Department of Physics, IIT Kanpur, February 04 - 06, 2005.

16. Magnetic scattering in Fe-Cr multilayers in the ferromagnetic state at low temperatures.
    R. S. Patel, A. K. Majumdar, A. F. Hebard, and D. Temple.
    47th Annual Conference on Magnetism and Magnetic Materials at Tampa, Florida, USA, November 11 - 15, 2002.