

# Pradeep Kumar

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## EDUCATION

**Ph.D. in Physics (2007-2014): Indian Institute of Science (IISc), Bangalore, India.**

**M.Sc. in Physics (2005-2007): School of Physical Sciences, Jawaharlal Nehru University (JNU), Delhi, India. CGPA: 7.56 / 9.0**

**M.S. Project title:** Study of Field Emission from Ag Nanoparticles.

**B.Sc. (Physics Hons.) (2002 - 2005): Hansraj College, University of Delhi, Delhi, India.**  
First Class; **74.2%**

## EMPLOYMENT

**2014-present: Assistant Professor (Visi.),** School of Basic Sciences, Indian Institute of Technology Mandi (IIT Mandi).

**2007-2014: Graduate Research Assistant,** Indian Institute of Science (IISc), Bangalore, India.

## TEACHING

Teaching Undergraduate, Postgraduate and Graduate students for the last three and half years.

### **Courses Taught:**

Thrice taught course on *Advanced Condensed Matter Physics*,

Twice taught course on *Quantum Mechanics*,

Once taught course on *Mechanics of Particles and Waves*,

Twice guided course on *Design Practicum* and *Research Projects*.

Average feedback on courses: 4.3/5.

Some comments in feedback: *Teacher provided good motivation towards the subject. Introduced many research problems. Very fine teaching skills, happy to take any course you will float related to Condensed matter physics. Crystal clear concepts. Your demonstration like double pendulum and young double slit experiment were very good, You always exerted some extra effort to make us understand you know how to teach you join the league of TAG and Oruganti after first sem I enjoyed some course. Teaching with illustrations was best part of this course, learned some new concepts of physics like Lagrangian and oscillatory mechanics which changed the way i think about the universe, Great and helpful course taught with dedication, Thanks a lot. Course was good and increased the level of thinking.*

## **Professional Service**

Referee for the journals **PRB, Journal of Applied Physics.**

Organizer of the national conference on **Spectroscopy of emerging functional materials** (SEFM) at IIT Mandi -2017.

Organizer of the national conference on **Physics of strongly correlated electron systems** (PSCES) at IIT Mandi-2018.

## **PUBLICATIONS**

1. S. Sharma and **Pradeep Kumar**, “Tuning the thermoelectric properties of YNiBi half-Heusler alloy” **Mater. Res. Express** **5**, 046528 (2018).
2. A. K. Yadava, A. Verma , B. Singh, D. Kumar , S. Kumar , V. Srihari , H. K. Poshwal, **Pradeep Kumar**, Shun-Wei Liu, S. Biring, S. Sen, “(Pb<sub>1-x</sub>Bi<sub>x</sub>)(Ti<sub>1-x</sub>Mn<sub>x</sub>)O<sub>3</sub>: competing mechanism of tetragonal-cubic phase on A/B site modifications” **Jour. of Alloys and Comp.** **765**, 278-286, (2018).
3. T. Pareek, B. Singh, S.Dwivedi, A. K. Yadav, Anita, S. Sen, **Pradeep Kumar** and S. Kumar “Ionic conduction and vibrational characteristics of Al<sup>3+</sup> modified monoclinic LiZr<sub>2</sub>(PO<sub>4</sub>)<sub>3</sub>” **Electro. Acta** **263**, 533 (2018).
4. B. Singh and **Pradeep Kumar**, “Unconventional Iron-Based Superconductor CsCa<sub>2</sub>Fe<sub>4</sub>As<sub>4</sub>F<sub>2</sub>: A First-Principle Study”. **AIP Confer. Proceed.** **1953**, 120019 (2018).
5. S. Sharma, B. Singh and **Pradeep Kumar**, “A Comparative Study Of Thermoelectric Properties Of CuGaTe<sub>2</sub> By Using PBE and MBJ Potentials”. **AIP Conf. Proce.** **1942**, 140036 (2018).
6. S. Sharma, B. Singh and **Pradeep Kumar**, “Doping effect on the thermoelectric properties of chalcopyrite CuGaTe<sub>2</sub>”. **AIP Confer. Proceed.** **1942**, 140036 (2018).
7. Deepu Kumar, B. Singh, S. Kumar and **Pradeep Kumar**, “Phonon dynamics in LiZr<sub>1.9</sub>Al<sub>0.1</sub>(PO<sub>4</sub>)<sub>3</sub>: A temperature dependent Raman study”. **AIP Conf. Proce.** **1942**, 140035 (2018).
8. Birender Singh, G. A. Cansever, T. Dey, A. Maljuk, S. Wurmehl, B. Büchner and **Pradeep Kumar**, “Orbiton-Phonon coupling in Ir<sup>5+</sup>(5d<sub>4</sub>) double perovskite Ba<sub>2</sub>YIrO<sub>6</sub>”. **arXiv** 1702.00724 (2017).
9. Sonu Sharma and **Pradeep Kumar**, “Quaternary semiconductors Cu<sub>2</sub>MgSnS<sub>4</sub> and Cu<sub>2</sub>MgSnSe<sub>4</sub> as potential thermoelectric materials”. **J. Phys. Commun.** **1** 045014 (2017).
10. Sonu Sharma and **Pradeep Kumar**, “Investigation of electronic, magnetic and transport properties of full-Heusler alloys Fe<sub>2</sub>TiX (X = As and Sb)”. **Chin. Jour. of Phys.** **55**, 1972 (2017).

11. Birender Singh and **Pradeep Kumar**, “Structural and electronic properties of LaPd<sub>2</sub>As<sub>2</sub> superconductor: First-principle calculations”. **AIP Conf. Proce.** 1832, 130061 (2017).
12. Sonu Sharma and **Pradeep Kumar**, “Understanding the transport properties of YNiBi half- Heusler alloy: An Ab-initio study”. **AIP Conf. Proce.** 1832, 110048 (2017).
13. Birender Singh, P. M. Shirage, A. Iyo and **Pradeep Kumar** “Iron Isotope effect in SmFeAsO<sub>0.65</sub> and SmFeAsO<sub>0.77</sub>H<sub>0.12</sub> superconductors: A Raman study”. **AIP-Advance** **6**, 105310 (2016).
14. **Pradeep Kumar**, K.P. Ramesh and D.V.S. Muthu, “Evidence for phase transitions and pseudospin phonon coupling in K<sub>0.9</sub>(NH<sub>4</sub>)<sub>0.1</sub>H<sub>2</sub>AsO<sub>4</sub>”. **AIP-Advance** **5**, 037135 (2015).
15. **Pradeep Kumar**, D.V.S. Muthu, L. Harnagea, C. Hess, S. Wurmehl, S. Singh, B. Buchner and A.K. Sood, “Phonon anomalies, Orbital-ordering and electronic Raman Scattering in iron-pnictide Ca(Fe<sub>0.97</sub>Co<sub>0.03</sub>)<sub>2</sub>As<sub>2</sub>: Temperature-dependent Raman Study”. **J. Phys. : Cond. Matter** **26**, 305403 (2014).
16. **Pradeep Kumar**, S. Ghara, B. Rajeshwaran, D.V.S. Muthu, A. Sundaresan and A.K. Sood, “Temperature dependent magnetic, dielectric and Raman studies of partially disordered La<sub>2</sub>NiMnO<sub>6</sub>”. **Solid State Commun.** **184**, 47 (2014).
17. **Pradeep Kumar**, D.V.S. Muthu, J. Prakash, A.K. Ganguli and A.K. Sood, “Raman Evidence for Coupling of Superconducting Quasi-Particles with a Phonon and Crystal Field Excitation in Superconductor Ce<sub>0.6</sub>Y<sub>0.4</sub>FeAsO<sub>0.8</sub>F<sub>0.2</sub>”. **AIP Confer. Proce.** **1591**, 1098 (2014).
18. **Pradeep Kumar**, G. Sriprakash, G. Rukmani, K.P. Ramesh and D.V.S. Muthu, “Anomalous optical phonons in Cs<sub>0.9</sub>(NH<sub>4</sub>)<sub>0.1</sub>H<sub>2</sub>AsO<sub>4</sub> : A temperature-dependent Raman Study”. **AIP-Advance** **6**, 062123 (2013).
19. **Pradeep Kumar**, A. Bera, D.V.S Muthu, P.M. Shirage, A. Iyo and A.K. Sood, “Superconducting fluctuations and anomalous phonon renormalization much above superconducting transition temperature in Ca<sub>4</sub>Al<sub>2</sub>O<sub>5.7</sub>Fe<sub>2</sub>As<sub>2</sub>”, **Appl. Phys. Lett.** **100**, 222602 (2012).
20. **Pradeep Kumar**, A. Bera, D.V.S. Muthu, S.N. Shirodkar, R. Saha, A. Shireen, A. Sundaresan, U.V. Waghmare, A.K. Sood and C.N.R. Rao, “Coupled phonons, magnetic excitations and ferroelectricity in AlFeO<sub>3</sub>: Raman and First-principles Studies”, **Phys. Rev. B** **85**, 134449 (2012).
21. G.K. Pradhan, A. Bera, **Pradeep Kumar**, D.V.S. Muthu and A.K. Sood, “Raman signature of pressure induced electronic topological and structural transition in Bi<sub>2</sub>Te<sub>3</sub>”, **Solid State Commun.** **152**, 284 (2012).
22. **Pradeep Kumar**, A. Bera, D.V.S. Muthu, A. Kumar, U.V. Waghmare, L. Harnagea, C. Hess, S. Wurmehl, S. Singh, B. Buchner and A.K. Sood, “Raman evidence for superconducting gap and spin-phonon coupling in superconductor Ca(Fe<sub>0.95</sub>Co<sub>0.05</sub>)<sub>2</sub>As<sub>2</sub>”, **J. Phys. : Cond. Matter** **23**, 255403 (2011).
  - Also selected by IOP Pub. for celebrating “*National Science Day -2014*”.

23. **Pradeep Kumar**, A. Kumar, S. Saha, D.V.S. Muthu, J. Prakash, U.V. Waghmare, A.K. Ganguli and A.K. Sood, “Temperature-dependent Raman study of CeFeAsO<sub>0.9</sub>F<sub>0.1</sub> superconductor: crystal field excitations, phonons and their coupling”, **J. Phys. : Cond. Matter** **22**, 255402 (2010).
- Also selected for the “*Lab Talk Section*” in J. Phys. : Cond. Matter entitled “*Phonons, quasiparticle excitations and their coupling in iron-pnictides*”.
24. **Pradeep Kumar**, A. Kumar, S. Saha, D.V.S. Muthu, J. Prakash, S. Patnaik, U.V. Waghmare, A.K. Ganguli and A.K. Sood, “Anomalous Raman scattering from phonons and electrons of superconducting FeSe<sub>0.82</sub>”, **Solid State Commun. (Fast Track)** **150**, 557 (2010).
25. **Pradeep Kumar**, S. Saha, D.V.S. Muthu, J.R. Sahu, A.K. Sood and C.N.R. Rao, “Raman evidence for orbiton-mediated multiphonon scattering in multiferroic TbMnO<sub>3</sub>”, **J. Phys. : Cond. Matter** **22**, 115403 (2010).
26. **Pradeep Kumar**, S. Saha, C.R. Serrao, A.K. Sood and C.N.R. Rao, “Temperature-Dependent infrared reflectivity studies of multiferroic TbMnO<sub>3</sub>: Evidence for spin-phonon coupling”, **Pramana J. Phys.** **74**, 281 (2010).
27. A. Kumar, **Pradeep Kumar**, U.V. Waghmare and A.K. Sood, “First-principles analysis of electron correlation, spin ordering and phonons in the normal state of FeSe<sub>1-x</sub>”, **J. Phys. : Cond. Matter** **22**, 385701 (2010).

## Conference Presentations/Talks/Schools attended

- **Poster** - Frontiers and Directions in Condensed Matter Physics (2009) at **Indian Institute of Science (IISc)**, Bangalore, India.
- **Poster** -Winter School on chemistry and physics of materials (2011) at **Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR)**, Bangalore, India.
- **Poster** -Winter School on chemistry and physics of materials (2012) at **JNCASR**, Bangalore, India.
- **Poster** -21<sup>st</sup> International Symposium on the Jahn - Teller Effect (JT-2012) at **University of Tsukuba, Japan. Selected for Best posters.**
- **Poster** -23<sup>rd</sup> International Conference on Raman Spectroscopy (**ICORS-2012**) at **Indian Institute of Science**, Bangalore, India.
- **Poster** -Winter School on Frontiers of materials science (2013) at **JNCASR**, Bangalore, India.
- **Poster** -In-House Symposium (2009,10,12,13) at Department of Physics, **IISc**, Bangalore, India.

- **Talk and Poster** -DAE-Solid State Physics Symposium (58<sup>th</sup> **DAE-SSPS** 2013) at Thapar University, Patiala, India (Oral and Poster presentation).
- 5<sup>th</sup> International Conference on Novel Oxides and low dimensional systems at **IISc**, Bangalore, India (2013).
- **Talk**- Delivered an invited talk at **INST, Mohali**, India (8 Dec. 2014).
- **Poster** - Gordon Research Conference: Unconventional Superconductivity: Materials and Mechanisms (2015), at The Chinese **University of Hong Kong**, Hong Kong.
- Symposium on Contemporary Issues in Condensed Matter Systems, at **IISc** Bangalore (2016).
- National Symposium on Nano Science and Technology, at **IISc** Bangalore (2016).
- **Talk** and chair a session at **IUMRS-ICYRAM held at IISc** Bangalore, Nov. 2016.
- **Poster** – DAE-Solid State Physics Symposium (61<sup>st</sup> **DAE-SSPS** 2016) held at KIIT University, Bhubaneswar, Odisha. India (Poster presented by B. Singh).
- **Talk**- Delivered an Invited talk at ICOPVS-2016 held at Lucknow during 5-8 Nov. 2016.
- **Poster** - DAE-Solid State Physics Symposium (61st **DAE-SSPS** 2016) held at KIIT University, Bhubaneswar, Odisha. India (Poster presented by S. Sharma).
- **Talk** -10th National Conference on solid state chemistry and allied areas (ISCAS-2017) at **Delhi Technical University**, Delhi, India.
- **Poster** - DAE-Solid State Physics Symposium (62st **DAE-SSPS** 2017) held at BARC Mumbai, India (Poster Presented by S. Sharma).
- **Poster** - DAE-Solid State Physics Symposium (62st **DAE-SSPS** 2017) held at BARC Mumbai, India (Poster Presented by D. Kumar).
- **Poster** - International conference on condensed matter and applied physics (**ICC**-2017) held at Bikaner, Rajasthan, India (Poster Presented by B. Singh).
- **Poster** - International conference on condensed matter and applied physics (**ICC**-2017) held at Bikaner, Rajasthan, India (Poster Presented by S. Sharma).
- **Poster** - Spectroscopy of Emerging Functional Materials (SEFM-2017) held at IIT Mandi. (Poster presented by B. Singh). **Was awarded best poster award.**
- **Talk** - Spectroscopy of Emerging Functional Materials (SEFM-2017) held at IIT Mandi.

## **Awards and Achievements**

1. Was awarded merit scholarship for third year of B.Sc. (Phys. Hons.) at Hansraj College, Delhi University (2005)
2. Qualified National Eligibility Test (**NET**) for Junior and Senior research fellowship (**JRF and SRF**) conducted by UGC-CSIR, (India), -2007.
3. Secured position among top ~ 0.2 % of all candidates (~ 10,000) appeared for NET examination in the field of physics and was selected for prestigious **Shyama Prasad Mukherjee (SPM) fellowship** examination held in 2007.
4. Was awarded **Jawahar Bhawan Trust Scholarship** for final year of M.S. at JNU for securing highest SGPA in 1<sup>st</sup> year of M.S.
5. Qualified exam for **KVPY** fellowship (the most prestigious fellowship for undergraduates in science by Dept. of Science and Technology, Govt. of India).
6. Secured **All India Rank (AIR) - 19** in Graduate Aptitude Test in Engineering (**GATE**) among ~ 6000 candidates in the field of Physics (2007).
7. Secured **AIR – 39** (99.04 percentile) in Joint Entrance Screening Test (**JEST**) among ~ 10,000 candidates, an exam jointly conducted by India's top 10 research institutes for graduate studies (2007).
8. **Selected for best poster** at - 21<sup>st</sup> International Symposium on the Jahn-Teller Effect (JT-2012) at University of Tsukuba, Japan.
9. Travel award by **University of Tsukuba** for attending the International Symposium on Jahn-Teller effect at University of Tsukuba, Japan (2012).
10. Paper selected for oral presentation at 58<sup>th</sup> DAE-SSPS Symposium held at Thapar University, Patiala, India (2013).
11. Our paper titled “Temperature-dependent Raman study of CeFeAsO<sub>0.9</sub>F<sub>0.1</sub> superconductor: crystal field excitations, phonons and their coupling”, was selected for the “**Lab Talk Section**” in J. Phys.: Cond. Matter entitled “**Phonons, quasiparticle excitations and their coupling in iron-pnictides**”.
12. Our paper titled “Raman evidence for superconducting gap and spin-phonon coupling in superconductor Ca(Fe<sub>0.95</sub>Co<sub>0.05</sub>)<sub>2</sub>As<sub>2</sub>”, was selected by IOP Publication for celebrating “**National Science Day -2014**”.
13. **INSPIRE Faculty Award** by DST, Govt. of India - 2014 (Session-II).
14. Nominated for best Ph.D. thesis award by Physics department at IISc Bangalore (2014).

15. International Travel Award by **SERB (DST)** - for attending Gordon Research Conference: Unconventional Superconductivity: Materials and Mechanisms (2015), held at The Chinese University of Hong Kong, Hong Kong.
16. Chaired a session at IUMRS- ICYRAM held at **IISc Bangalore**, Nov. 2016.
17. Selected as member of **Indian National Young Academy of Sciences (INYAS)** - 2018.

**Languages:** Hindi (native) and English.

**Other Interests**

Diary Writing, Reading (History, Philosophy), Basketball, Hockey.