

# B.Prasanna Venkatesh

## Curriculum Vitae

Indian Institute of Technology Gandhinagar  
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### Education

- 2008-2013 **Ph.D. in Physics**  
Thesis: *Bloch oscillations of cold atoms in a cavity*  
Supervised by Prof. Duncan O'Dell, McMaster University, Hamilton (Canada)
- 2006-2008 **M.Sc Physics**  
Thesis: *Bloch-Zener oscillations of a cold atom in an optical cavity*  
Supervised by Prof. Duncan O'Dell, McMaster University, Hamilton (Canada)
- 2003-2006 **B.Sc (Hons) Physics**  
Chennai Mathematical Institute, Chennai (India)

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### Employment

- 10/2018-Present Assistant Professor at the [Indian Institute of Technology, Gandhinagar \(India\)](#)
- 06/2018-08/2018 Post-doctoral fellow in the [research group](#) of Prof. Helmut Ritsch at the Institute for Theoretical Physics, Innsbruck (Austria)
- 05/2015-04/2018 Post-doctoral fellow in the [research group](#) of Prof. Oriol Romero-Isart at the Institute of Quantum Optics and Quantum Information, Innsbruck (Austria)
- 06/2013-05/2015 Research Fellow in the group of [Prof. Gentaro Watanabe](#) at the [Asia Pacific Center for Theoretical Physics](#), Pohang (South Korea)

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### Research Interests

- Quantum optics
- Theory of ultracold atoms
- Quantum thermodynamics

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### List of Publications

#### Pre-prints

1. Optimization of Asymmetric Quantum Otto Engine Cycles  
Rahul Shastri, B. Prasanna Venkatesh  
[arXiv:2204.04782](#)
2. Quantum transport in quasi-periodic lattice systems in presence of BÄijttiker probes  
Madhumita Saha, B. Prasanna Venkatesh, and Bijay Kumar Agarwalla  
[arXiv:2202.14033](#)

3. Two-stroke Quantum Measurement Heat Engine  
M. Sahanawaz Alam and B. Prasanna Venkatesh  
[arXiv:2201.06303](#)

### **Published Original Articles**

1. Read-out of Quasi-periodic Systems using Qubits  
Madhumita Saha, Bijay Kumar Agarwalla, and B. Prasanna Venkatesh  
[Phys. Rev. A \*\*103\*\*, 023330](#)
2. Quantum Statistical Enhancement of the Collective Performance of Multiple Bosonic Engines  
Gentaro Watanabe, B. Prasanna Venkatesh, Peter Talkner, Myung-Joong Hwang, Adolfo del Campo  
[Phys. Rev. Lett. \*\*124\*\*, 210603 \(2020\)](#)
3. Generalized energy measurements and quantum work compatible with fluctuation theorems  
K. Ito, P. Talkner, B. Prasanna Venkatesh, and G. Watanabe  
[Phys. Rev. A \*\*99\*\*, 032117 \(2019\)](#)
4. Collective effects in Casimir-Polder forces  
K. Sinha, B. Prasanna Venkatesh, and P. Meystre  
[Phys. Rev. Lett. \*\*121\*\*, 183605 \(2018\)](#)
5. Bistability in a Mesoscopic Josephson Junction Array Resonator  
P.R. Muppalla, O. Gargiulo, S.I. Mirzaei, B. Prasanna Venkatesh, M.L. Juan, L. Grünhaupt, I.M. Pop, and G. Kirchmair  
[Phys. Rev. B \*\*97\*\*, 024518 \(2018\)](#)
6. On-Chip Quantum Interference of a Superconducting Microsphere  
H. Pino, J. Prat-Camps, K. Sinha, B. Prasanna Venkatesh, and O. Romero-Isart  
[Quantum Sci. Technol. \*\*3\*\*, 025001 \(2018\)](#)
7. Cooperative Effects in Closely Packed Quantum Emitters with Collective Dephasing  
B. Prasanna Venkatesh, M. L. Juan, and O. Romero-Isart  
[Phys. Rev. Lett. \*\*120\*\*, 033602 \(2018\)](#)
8. Quantum Performance of Thermal Machines over Many Cycles  
G. Watanabe, B. Prasanna Venkatesh, P. Talkner, and A. del Campo  
[Phys. Rev. Lett. \*\*118\*\*, 050601 \(2017\)](#)  
**Marked as Editors' suggestion**  
**Featured in: [Physics](#), [APA](#), [derStandard](#)**
9. Attraction-induced dynamical stability of a Bose-Einstein condensate in a nonlinear lattice  
R. Dasgupta, B. Prasanna Venkatesh, and G. Watanabe  
[Phys. Rev. A \*\*93\*\*, 063618 \(2016\)](#)
10. In situ observation of optomechanical Bloch oscillations in an optical cavity  
H. Keßler, J. Klinder, B. Prasanna Venkatesh, C. Georges, and A. Hemmerich  
[New J. Phys. \*\*18\*\*, 102001 \(2016\)](#), [Fast track communication](#)  
**Commisioned perspective on the paper: [Taking a peek at Bloch oscillations](#)**

11. An optomechanical elevator: Transport of a Bloch oscillating Bose-Einstein condensate up and down an optical lattice by cavity sideband amplification and cooling  
B. Prasanna Venkatesh, J. Goldwin, and D.H.J. O'Dell  
[Atoms](#) **4,2** (2016)
12. Scaling Law for Irreversible Entropy Production in Critical Systems  
D-T. Hoang, B. Prasanna Venkatesh, S. Han, J. Jo, G. Watanabe, and M-S. Choi  
[Scientific Reports](#) **6**, 27603 (2016)
13. Quantum fluctuation theorems and power measurements  
B. Prasanna Venkatesh, G. Watanabe, and P. Talkner  
[New J. Phys.](#) **17**, 075018 (2015)
14. Backaction driven transport of Bloch oscillating atoms in ring cavities  
J. Goldwin, B. Prasanna Venkatesh, and D. H. J. O'Dell  
[Phys. Rev. Lett.](#) **113**, 073003 (2014)
15. Generalized energy measurements and modified transient quantum fluctuation theorems  
G. Watanabe, B. Prasanna Venkatesh, and P. Talkner  
[Phys. Rev. E](#) **89**, 052116 (2014)  
**Marked as Editors' suggestion**
16. Quantum fluctuation theorems and generalized measurements during the force protocol  
G. Watanabe, B. Prasanna Venkatesh, P. Talkner, M. Campisi, and P. Hänggi  
[Phys. Rev. E](#) **89**, 032114 (2014)
17. Transient quantum fluctuation theorems and generalized measurements  
B. Prasanna Venkatesh, G. Watanabe, and P. Talkner  
[New. J. Phys](#) **16**, 015032 (2014)
18. Bloch oscillations of cold atoms in a cavity: Effects of quantum noise  
B. Prasanna Venkatesh, and D. H. J. O'Dell  
[Phys. Rev. A](#) **88**, 013848 (2013)
19. Band-structure loops and multistability in cavity QED  
B. Prasanna Venkatesh, J. Larson and D. H. J. O'Dell  
[Phys. Rev. A](#) **83**, 063606 (2011)
20. Atomic Bloch-Zener oscillations for sensitive force measurements in a cavity  
B. Prasanna Venkatesh, M. Trupke, E. A. Hinds and D. H. J. O'Dell  
[Phys. Rev. A](#) **80**, 063834 (2009)

### Reviews

1. Nonlinear Phenomena of Ultracold Atomic Gases in Optical Lattices: Emergence of Novel Features in Extended States  
G. Watanabe, B. Prasanna Venkatesh, and R. Dasgupta  
[Entropy](#) **18**, 118 (2016)

### Conference Proceedings

1. Cooperative effects between color centers in diamond: applications to optical tweezers and optomechanics  
C. Bradac, B. Prasanna Venkatesh, Benjamin Besga, Mattias Johnsson, Gavin Brennen, Gabriel Molina-Terriza, Thomas Volz, and Mathieu L. Juan  
[Proc. SPIE 10347, Optical Trapping and Optical Micromanipulation XIV, 103471I \(2017\)](#)

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## Grants

- DST-SERB Start-up research grant, 2019-2021
- DST India-Austria Travel Grant 2021-2023

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## Scholarships/Awards

### IIT Gandhinagar

Awarded DST Ramanujan Fellowship for 2019, found ineligible due to position at IIT Gandhinagar

Awarded DST SRG Grant in September 2019.

### McMaster University

Ontario Graduate Scholarship, 2011-12

American Physical Society travel grant enabling participation in DAMOP APS meeting in May 2010

Graduate Student Association travel grant enabling participation in DAMOP APS meeting in May 2009

The Desmond.G.Burns Scholarship in Theoretical Physics, 2007-2008, McMaster University, Hamilton, ON, Canada

### Chennai Mathematical Institute

Fully funded Undergraduate education with stipend, as a result of having cleared the institute's national entrance examination

Chennai Mathematical Institute medal of excellence, awarded for having topped the graduating class

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## Mentoring Experience

At IIT Gandhinagar  
(2018-)

Supervised six M. Sc. thesis students so far.

Two Ph.D. students (Mr. Rahul Shastri and Ms. Ipsita Bar) currently working with me.

Post-doctoral fellows: Dr. Madhumita Saha (currently an NPDF at IISER Pune) from 2020-21; Dr. Chinmayee Mishra (IITGN Early Career Fellow) (2020-present).

Before joining IIT  
Gandhinagar  
(2015-18)

Undergraduate Thesis of Sergi Julià-Farré on 'Multimode Optomechanics' (visiting student at IQOQI from Universitat Autònoma de Barcelona) (co-supervised with Prof. Oriol Romero-Isart)

Undergraduate thesis of Daniele Giannandrea on 'Continuous quantum measurement' at University of Innsbruck (co-supervised with Prof. Oriol Romero-Isart)

Masters thesis of Sergi Julià-Farré on 'Cooling of a magnetically levitated nanoparticle' at University of Innsbruck (co-supervised with Prof. Oriol Romero-Isart)

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## Teaching Experience

2018-21 I have taught the following M.Sc (Physics) courses at IIT Gandhinagar so far:

Classical Mechanics

Quantum Mechanics I & II

Statistical Mechanics

Mathematical Methods of Physics

2006-12 During graduate studies at McMaster University, I was a Teaching Assistant working on a variety of courses in the Physics department. A sample set of courses I dealt with include:

First year Physics and Engineering courses that involved assisting students with laboratory work and one-to-one problem solving

*Big Questions*: A course designed to lead discussion sessions on fundamental aspects of modern physical sciences for non-science majors

Upper year undergraduate courses on Statistical Mechanics and Quantum Mechanics

Integrated Sciences course: An innovative course that forms the major component of an inter-disciplinary degree program emphasizing connections between different scientific disciplines such as Physics, Chemistry, Biology, Earth Sciences etc.

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## Peer-review Experience

Referee for:

Physical Review Letters

Physical Review E

Scientific Reports

Europhysics Letters

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## Research Presentations - Invited Talks

"Physics with trapped atoms, molecules and ions (hybrid)", Discussion Meeting, (May 09-13, 2022) at ICTS-TIFR, Bangalore, "Light-induced density wave in a dipolar Bose-Einstein Condensate"

"Non-Hermitian Physics" (Online), International Workshop/Conference, (March 22-26, 2021) at ICTS-TIFR, Bangalore, "Read-out of Quasi-periodic Systems using Qubits"

International Workshop "Open Quantum Dynamics and Thermodynamics" (online) organized by the PCS IBS in Daejeon, South Korea, March 22 - 26, 2021, "Quantum Statistical Enhancement of the Collective Performance of Multiple Bosonic Engines"

Quantum Optics Divisional Seminar, Physical Research Laboratory, "Cooperative Effects in Closely Packed Quantum Emitters with Collective Dephasing", June 2018

Talk, 2nd Alumni Symposium of Asia Pacific Center for Theoretical Physics, "Cooperative Effects in Closely Packed Quantum Emitters with Collective Dephasing", Nov 2018

Seminar, Institute of Mathematical Sciences, Chennai, "Cooperative Effects in Closely Packed Quantum Emitters with Collective Dephasing", May 2018

Seminar, Indian Institute of Technology Gandhinagar, "Cooperative Effects in Closely Packed Quantum Emitters with Collective Dephasing", May 2018

Seminar, Indian Institute of Science, Bangalore, "Cooperative Effects in Closely Packed Quantum Emitters with Collective Dephasing", May 2018

Seminar, Indian Institute of Science, Bangalore, "An invitation to ultracold atoms in a cavity - via Bloch oscillations", May 2018

Seminar, Raman Research Institute, Bangalore, "Cooperative Effects in Closely Packed Quantum Emitters with Collective Dephasing", May 2018

Seminar, Indian Institute of Technology Bombay, "Cooperative Effects in Closely Packed Quantum Emitters with Collective Dephasing", May 2018

Seminar, Indian Institute of Technology Madras, "Quantum Work fluctuation theorems and Cycle dependence of Work in a Quantum Heat Engine", August 2017

Seminar, Indian Institute of Technology Bombay, "Ultracold atoms in Cavities - Bloch oscillations, transport and Optomechanics ", January 2016

Special SFB Seminar, Institute for Laser Physics, Hamburg, "Transport of a Bloch oscillating Bose-Einstein condensate up and down an optical lattice by cavity sideband amplification and cooling", November 2016

Special SFB Seminar, Institut for Laser Physics, Hamburg, "Quantum Interference of a Microsphere", April 2016

Invited Talk, International Workshop on Cold Gases in Quantum Information, "Backaction driven transport of Bloch oscillating atoms in ring cavities", Bilbao, June 2015

Invited Seminar, Institute for Quantum Optics and Quantum Information, "Backaction driven transport of Bloch oscillating atoms in ring cavities", February 2015

Invited Seminar, Institute for Quantum Computing, Waterloo - "Backaction driven transport of Bloch oscillating atoms in ring cavities" and "Transient quantum fluctuation theorems and generalized measurements", November 2014

Lunch seminar, Université de Sherbrooke (Canada) - "Bloch oscillations in cold-atom cavity systems", August 2011

Seminar, Chennai Mathematical Institute (India), "Cold atoms in optical cavities: Bloch Oscillations & Band-Structure Loops", January 2011

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## Research Presentations - Contributed Talks

Talk, SFB FoQus Meeting, Vienna, "Cooperative Effects in Closely Packed Quantum Emitters with Collective Dephasing", October 2017

Open Quantum Systems Workshop, International Center for Theoretical Sciences, Bangalore, India, "Cooperative Effects in Closely Packed Quantum Emitters with Collective Dephasing", July 2017

Quantum Science: Implementations Workshop, Benasque (Spain), "Introduction to Nonequilibrium Work Fluctuation Theorems", July 2016

Seminar, International Center for Theoretical Sciences, "Work Fluctuation Theorems for Quantum Systems - The role of measurement", February 2016

Seminar, Indian Institute for Science Education and Research, Pune, "Ultracold atoms in Cavities - Bloch oscillations, transport and Optomechanics ", January 2016

Korean Physical Society Fall Conference, Gwangju (South Korea), "Generalized energy measurements and modified transient quantum fluctuation theorems", October 2014

45th American Physical Society DAMOP meeting, Madison, Wisconsin (USA), "Transient quantum fluctuation theorems and generalized measurements", June 2014

45th American Physical Society DAMOP meeting, Madison, Wisconsin (USA), "Backaction driven transport of Bloch oscillating atoms in ring cavities", June 2014

Korean Physical Society Spring Conference, Daejeon (South Korea), "Transient quantum fluctuation theorems and generalized measurements", April 2014

Pushing the Boundaries with Cold Atoms, NORDITA Conference, Stockholm, "Bloch oscillations of cold atoms in cavities", February 2013

40th American Physical Society DAMOP meeting, Charlottesville, Virginia (USA), "Bloch-Zener oscillations of an atom in an optical cavity", May 2009

CAP Congress 2010, Toronto (Canada), "Bistability in cold atom-cavity systems", June 2010

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## Research Presentations - Posters

Cooperative Effects in Closely Packed Quantum Emitters with Collective Dephasing, International Workshop "Novel Paradigms in Many-Body Physics from Open Quantum Systems", MPIPKS Dresden, Germany, March 2018

Cooperative Effects in Closely Packed Quantum Emitters with Collective Dephasing, Quantum Optics 2018 at University Center Obergurgl, Austria, February 2018

Quantum Interference of a Microsphere, Quantum Optics 2016 at University Center Obergurgl, Austria, February 2016

Back-action driven transport of Bloch oscillating atoms in ring cavities, 30th SFB-FoQus Meeting (University of Innsbruck) , July 2015.

Quo Vadis BEC? V , Bad Honnef, "Backaction driven transport of Bloch oscillating atoms in ring cavities", December 2014

Canadian Institute for Advanced Research Ultracold Atoms meeting, Banff (Canada) - "Bloch Oscillations of cold atoms in an optical cavity: *Beyond mean field theory*", February 2012

41st American Physical Society DAMOP meeting, Houston, Texas (USA) - "Bistability in cold atom-cavity systems", May 2010

Canadian Institute for Advanced Research Ultracold Atoms meeting, Halifax (Canada) - “Bloch-Zener oscillations of an atom in an optical cavity”, August 2009

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## Conference and Workshop Attendance

Quantum Technologies Conference IV, Warsaw (Poland), September 2013

Canadian Institute for Advanced Research Cold Atoms Meeting, Conference Reporter, Banff (Canada), February 2012

Canadian Institute for Advanced Research Quantum Simulation Workshop, Vancouver (Canada), February 2007

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## Research Visits

Research group of Prof. Andreas Hemmerich at the Institute for Laser Physics, University of Hamburg (Germany), November 2016

Research group of Prof. Andreas Hemmerich at the Institute for Laser Physics, University of Hamburg (Germany), April 2016

Research group of Prof. Mahn Soo Choi at Korea University (Seoul, South Korea), December 2014

Prof. Peter Talkner in the Research group of Prof. Peter Hänggi at the University of Augsburg (Germany), August 2014

Research group of Prof. Alexandre Blais at Université de Sherbrooke (Canada), August 2011

Research group of Prof. Krishnendu Sengupta at Indian Association for Cultivation of Sciences, Kolkata (India), May 2009

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## References

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Institute for Quantum Optics and  
Quantum Information,  
Technikerstrasse 21a,  
Innsbruck 6020, Austria.  
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### Additional Skills

Computing Matlab, Mathematica, C, Python, Latex  
Languages English, Tamil, Hindi, Telugu