# Ish Dhand

Curriculum Vitae

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## Personal details


- Office Address: 2500 University Drive NW, SB306 University of Calgary, Calgary, AB, Canada, T2N 1N4
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- Date of Birth: 04 February, 1990
- Citizenship: Indian
- Gender: Male

## Education

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|---|---|---|
| 2015 | Ph.D., Physics (expected Dec. 2015) | University of Calgary, Canada |
| 2013 | M.Sc., Physics (switched to Ph.D.) | University of Calgary, Canada |
| 2012 | B.Tech., Computer Science | Indian Institute of Technology Kanpur |

## Peer-reviewed publications

2015 Ish Dhand, Abdullah Khalid, He Lu, and Barry C. Sanders. Accurate and precise characterization of linear optical interferometers. *Journal of Optics*, 2015. (accepted) arXiv:1508.00283

2015 Hubert de Guise, Dylan Spivak, Justin Kulp, and Ish Dhand. $\mathcal{D}$-functions and immanants of unitary matrices and submatrices. *Journal of Physics A: Mathematical and Theoretical*. (accepted) arXiv:1511.01851

2015 Ish Dhand, Barry C. Sanders, and Hubert de Guise. Algorithms for SU($n$) boson realizations and $\mathcal{D}$-functions. *Journal of Mathematical Physics*, 56:111705, 2015. (featured article) arXiv:1507.06274

2015 Ish Dhand and Sandeep K. Goyal. Realization of arbitrary discrete unitary transformations using spatial and internal modes of light. *Physical Review A*, 92:043813, 2015. arXiv:1508.06259

2014 Ish Dhand and Barry C. Sanders. Stability of the Trotter-Suzuki decomposition. *Journal of Physics A: Mathematical and Theoretical*, 47:265206, 2014. (featured article) arXiv:1403.3469

## Submitted and in-preparation manuscripts

2015 Ish Dhand, Hubert de Guise, and Barry C. Sanders. Group thoretic methods for simulation of linear optics. *Manuscript in preparation*

2015 He Lu, Ish Dhand, Luo-Kan Chen, Zheng-Da Li, Abdullah Khalid, Barry C. Sanders, Yu-ao Chen, and Jian-Wei Pan. Experimental verification of accurate and precise characterization of linear optics. *Manuscript in preparation*

## Talks and conference participation

2015 Ish Dhand, Abdullah Khalid, He Lu, and Barry C. Sanders, Accurate and Precise Characterization of Linear Optical Interferometers *(contributed talk)*, Canadian Association of Physics (CAP) Congress, Edmonton, Alberta, Canada. 18 June 2015.

2015 Ish Dhand, Barry C. Sanders, and Hubert de Guise, Group-Theoretic Methods in Multi-Photon Interferometry. *(contributed poster)*, Canadian Association of Physics (CAP) Congress, Edmonton, Alberta, Canada. 18 June 2015.

2015 Ish Dhand, Hubert de Guise and Barry C. Sanders, Algorithms for Boson Realizations of SU($n$) *(contributed talk)*, Theory Canada 10, Calgary, AB, Canada. 12 June 2015.

2015 Ish Dhand, Hubert de Guise, Abdullah Khalid, He Lu and Barry C. Sanders, Design, Characterization and Simulation of Linear Optical Devices *(invited talk)*, Workshop on Multi-Photon Interferometry, Shanghai, China. 8 May 2015.

2015 Ish Dhand, Hubert de Guise and Barry C. Sanders, Group-theoretic Algorithms for Multiphoton Interferometry *(contributed poster)*, Quantum Information Processing (QIP), Sydney, NSW, Australia. 12 January 2015.

2014 Ish Dhand and Joydip Ghosh, Quantum Simulation and Implementations *(invited poster)*, Alberta Quantum-Nano Workshop, Red Deer, Alberta, Canada. 14 July 2014.

2013 Ish Dhand and Barry C. Sanders, Finite precision in Trotter-Suzuki decomposition *(contributed talk)*, Canadian Quantum Information Students' conference, Calgary, Alberta, Canada. 24 Jun 2013 - 29 Jun 2013.

2013 Ish Dhand and Barry C. Sanders, Finite precision in Trotter-Suzuki decomposition *(invited talk)*, Institute for Quantum Computing, University of Waterloo, Waterloo, Ontario, Canada. 6 Jun 2013

2013 Ish Dhand and Barry C. Sanders, Finite precision in Trotter-Suzuki decomposition *(contributed talk)*, CAP Congress 2013, Montreal, Quebec, Canada. 27 May 2013 - 31 May 2013.

Presenter underlined

## Competitive awards and achievements

2015 DAMOPC Best Student Oral Presentation Award by Division of Atomic, Molecular and Optical Physics, Canadian Association of Physicists. 3 out of 50 graduate students who enter the competition in the field of atomic, molecular and optical physics are awarded.

2015 Awarded $2275 Departmental Graduate Student Excellence Award by Department of Physics and Astronomy, University of Calgary.

2014 Awarded $2300 Departmental Graduate Student Excellence Award by Department of Physics and Astronomy, University of Calgary.

2013 Awarded $3600 Queen Elizabeth II Fellowship, 2013 by University of Calgary.

2012 Awarded $7200 Departmental Fellowship, 2012-2013 by the Department of Physics and Astronomy, University of Calgary.

2010 Academic Excellence Award at Indian Institute of Technology Kanpur. 7% of the students with the highest GPA across all departments in the institute are awarded

2009 Awarded $6000 Aditya Birla Scholarship by Aditya Birla Group. 10 out of 10,000 incoming students to the Indian Institutes of Technology receive the Aditya Birla Scholarship.

2008 Stood 22$^{nd}$ all over India in the Joint Entrance Examination out of the 600,000 candidates. Examination conducted by the Indian Institutes of Technology.

2008 Awarded the Indian Physics Association prize for the Best Solution to a Challenging Theoretical Problem by Indian Physics Association. Awarded to 1 out of the 35 gold medalists in the Indian National Physics Olympiad.

2008 Awarded Gold Medal in Indian National Physics Olympiad. Awarded to 35 out of 30,000 participants in the Indian National Physics Olympiad.

2007 Represented India at the 8$^{th}$ Asian Physics Olympiad at Shanghai. 2 students were chosen to participated in the olympiad out of 30,000 participants in the Indian National Physics Olympiad.

2006 Awarded the National Child Award by the Prime Minister of India on behalf of Ministry of Human Resource Development, Government of India. One high-school student is nominated for this award from each state of India.

2004 Awarded National Bal Shree for creative scientific innovation by the President of India on behalf of Ministry of Human Resource Development, Government of India. Awarded to 20 out of 20,000 participants nationally.

## Teaching experience

2015 Instructor, one day course on *A first encounter with quantum mysteries* at University of Calgary Continuing Education.

2015 Teaching assistant, *Quantum mysteries and paradoxes*. Designed and delivered two lectures.

2015 Teaching assistant, *Electromagnetic theory I*. Designed and delivered two review lectures.

2013 Teaching assistant, *Senior physics laboratory*.

2012 Teaching assistant, *Freshman mechanics*.

## Supervision and Service

2015 Organizer of Workshop on Multi-Photon Interferometry at Shanghai, China during 7-11 May 2015.

2014 Supervised summer undergraduate student on multi-photon interferometry at IQST Calgary.

2013 Organizer of CQISC, Canadian Quantum Information Students' Conference held in June 2013 at Calgary.

2012 Organizer of PHAS Lunches, fortnightly lunch talks in the physics department at University of Calgary.
2011 Editor of the science and technology magazine of IIT Kanpur.
2010 Organizer and chair of ICARUS-2010, undergraduate research conference organized at IIT Kanpur.

## Active collaborations

- Yu-ao Chen, University of Science and Technology China, Shanghai on experimental implementations of multi-photon interferometer.
- Sandeep K. Goyal, University of Calgary, Calgary, on linear optical realizations of arbitrary unitary transformations is multiple degrees of freedom.
- Hubert de Guise, Lakehead University, Thunder Bay, Canada on group theoretic methods in multi-photon interferometry.
- Barry C. Sanders, University of Calgary, Calgary, Canada on complementarity in multi-photon interferometry.
- Urbasi Sinha, Raman Research Institute, Bangalore, India on novel implementations of linear optics.

## Referees

- **Barry C. Sanders**
  Professor, Department of Physics & Astronomy, University of Calgary
  *Office Address*: SB 303, University of Calgary, 2500 University Dr. NW, Calgary, AB, Canada, T2N 1N4
  *Email*: sandersb@ucalgary.ca

- **Hubert de Guise**
  Professor, Department of Physics, Lakehead University
  *Office Address*: CB 4033, Lakehead University, 955 Oliver Road, Thunder Bay, ON, Canada, P7B 5E1
  *Email*: hubert.deguise@lakeheadu.ca

- **Christoph Simon**
  Assoc. Professor, Department of Physics & Astronomy, University of Calgary
  *Office Address*: SB 313, University of Calgary, 2500 University Dr. NW, Calgary, AB, Canada, T2N 1N4
  *Email*: csimo@ucalgary.ca

- **David W. Hobill**
  Assoc. Professor, Department of Physics & Astronomy, University of Calgary
  Office *Address*: SB 539, University of Calgary, 2500 University Dr. NW, Calgary, AB, Canada, T2N 1N4
  *Email*: hobill@ucalgary.ca