

Ish Dhand  
Curriculum Vitae  
May 11, 2016

PERSONAL DETAILS

---

Office Address	Institute for Theoretical Physics, University of Ulm, Albert-Einstein-Allee 11, D - 89069 Ulm, Germany
Email, webpage	<a href="mailto:ishdhand@gmail.com">ishdhand@gmail.com</a> , <a href="http://ishdhand.me/">http://ishdhand.me/</a>
Date of Birth	04 February 1990
Citizenship	Indian
Gender	Male

RESEARCH EXPERIENCE AND EDUCATION

---

Apr. 2016 – current	Postdoctoral Research Associate Institute: University of Ulm, Germany Host: Martin Plenio
Sep. 2013 – Feb. 2016	Ph.D., Physics. Thesis: Multi-Photon Multi-Channel Interferometry for Quantum Information Processing. <a href="https://arxiv.org/abs/1603.07476">arXiv:1603.07476</a> Institute: University of Calgary, Canada Supervisor: Barry C. Sanders
Sep. 2012 – Aug. 2013	M.Sc., Physics (switched to Ph.D.) Institute: University of Calgary, Canada Supervisor: Barry C. Sanders
Jul. 2013 – Jun. 2012	B.Tech., Computer Science Institute: Indian Institute of Technology Kanpur, India

PEER-REVIEWED PUBLICATIONS

---

- 2016 Ish Dhand, Abdullah Khalid, He Lu, and Barry C Sanders. Accurate and precise characterization of linear optical interferometers. *Journal of Optics*, 18(3):035204. [arXiv:1508.00283](https://arxiv.org/abs/1508.00283)
- 2016 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*, 49(9):09LT01. (published as letter) [arXiv:1511.01851](https://arxiv.org/abs/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. (featured article) [arXiv:1507.06274](https://arxiv.org/abs/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. [arXiv:1508.06259](https://arxiv.org/abs/1508.06259)

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

---

#### 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 (Second Prize) by Division of Atomic, Molecular and Optical Physics, Canadian Association of Physicists.
- 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<sup>nd</sup> 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<sup>th</sup> Asian Physics Olympiad at Shanghai. 2 students were chosen to participate 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 in 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.

#### 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](mailto: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](mailto: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](mailto:csimo@ucalgary.ca)