Shimon Machluf

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Education:

2008 – 2013	Ph.D. in Physics, Ben-Gurion University Supervisor: Prof. Ron Folman Title: *"Coherent Splitting of Matter-Waves on an Atom Chip Using a State-Dependent Magnetic Potential"* (PDF)
2006 – 2008	M.Sc. in Physics, Ben-Gurion University Supervisor: Prof. Ron Folman Final grade: 95/100
2001 – 2005	B.Sc. in Physics and Computer Science (double major), Ben-Gurion University
Languages	English (fluent, oral and written) and Hebrew (mother tongue)

Work Experience:

During my M.Sc., Dr. Plamen Petrov and I designed and built a new atom chip apparatus capable of producing Bose-Einstein condensation. Experiments began shortly after Dr. Petrov completed his post-doctoral fellowship, and I have run our experiments as the senior graduate student since then. I was also responsible for teaching M.Sc. and undergraduate students various aspects of the apparatus.

During my Ph.D., we investigated noise-induced transitions and coupling between external and internal atomic states (published in Phys. Rev. Lett.). I also developed, together with Dr. Yonathan Japha and Prof. Ron Folman, a new type of coherent beam-splitter for matter-waves that splits the BEC in momentum space but uses local potentials created by the atom chip (published in Nature Communications). In addition, as the only student in the experiment, I simulated a new experiment for splitting a BEC in a double-well potential and designed an atom chip to implement this experiment.

Atomic Physics	Ultra cold atoms, Bose-Einstein condensation on an atom chip Coherent manipulation of multi-level atoms (Rabi oscillations and Ramsey interference) Design of magnetic potentials, with applications to atom interferometers
Lab Experience	Design and construction of all aspects of a new BEC apparatus Hardware: UHV, diode lasers and electro-optics, magnetic trapping, imaging Software: experimental control and analysis (Matlab, C, C++, Java, LabView) Advanced atom chip designs for fabrication
Teaching Assistant	Introductory, intermediate, and advanced undergraduate Physics Laboratory

Research Interests:

My graduate research in the field of atomic physics focused on magnetic trapping and manipulation of a Bose-Einstein condensate with an atom chip. As a post-doctoral fellow, I would like to expand and deepen my knowledge in the field of atomic and cold-atom physics. Some of the subjects I find interesting are: molecules, interferometry, cavity QED, ions, and, of course, atom chips.

Publications:

- S. Machluf, Y. Japha and R. Folman, "Coherent Stern-Gerlach momentum splitting on an atom chip",Nature Communications **4**, 2424 (2013).
- S. Machluf, J. Coslovsky, P. G. Petrov, Y. Japha and R. Folman, "Coupling between Internal Spin Dynamics and External Degrees of Freedom in the Presence of Colored Noise", Phys. Rev. Lett. **105**, 203002 (2010).
- P. Petrov, S. Machluf, R. Macaluso, S. Youniss, Y. Japha, M. Keil, D. Groswasser, E. Joselevich, and R. Folman, "Trapping cold atoms using surface-grown carbon nanotubes", Phys. Rev. A **79**, 043403 (2009).

Fellowships and Prizes:

2009	Best M.Sc. Thesis in Physics, Zabey prize
2007 – 2008	Marie Curie Fellowship Early Stage Researcher in the "Atom Chips" RTN (European Union)

Conferences, Posters and Talks:

- International Conference on Laser Spectroscopy (ICOLS), Berkeley, CA, USA
  June 9-14, 2013 (poster)
- Stanford University, CA, USA
  June 5, 2013 (talk)
- Conference on Lasers and Electro-Optics and the International Quantum Electronics Conference (CLEO/EUROPE - IQEC), Munich, Germany
  May 12-16, 2013 (talk)
- Cold Atoms-Solid state interfaces, Nottingham, United Kingdom
  March 14, 2013 (invited talk)
- French-Israeli Symposium on Non-linear and Quantum Optics (FRISNO), Ein Gedi, Israel
  February 24 - March 1, 2013 (poster)
- Israel Physical Society (IPS), Hebrew University, Israel
  December 9, 2012 (talk)
- French-Israeli Symposium on Non-linear and Quantum Optics (FRISNO), Aussois, France
  March 28 - April 1, 2011 (poster)
- Israel Physical Society (IPS), Tel-Aviv University, Israel
  December 5, 2010 (talk)
- Minerva-Weizmann Workshop on Entanglement in Atomic Systems, Weizmann Institute, Israel
  November 21-25, 2010 (poster)
- Midland Ultracold Atom Research Center (MUARC)
  Summer school on Advanced Techniques in Atomic Physics, United Kingdom
  August 22-27, 2010 (summer school and poster)
- Imperial College, London, United Kingdom
  August 19, 2010 (talk)
- Young Atom Opticians (YAO), Vienna, Austria
  February 17-21, 2009 (poster)
- French-Israeli Symposium on Non-linear and Quantum Optics (FRISNO), Ein Gedi, Israel
  February 8-13, 2009 (poster)
- Israel Physical Society (IPS), Ben Gurion University, Israel
  December 28, 2008 (talk)

References:

- Prof. Ron Folman, Head of the Atom Chip group, Department of Physics, Ben-Gurion University
  folman@bgu.ac.il
- Prof. Peter Krüser, Midlands Ultracold Atom Research Centre, School of Physics and Astronomy, University of Nottingham
  peter.kruger@nottingham.ac.uk
- Prof. Baruch Horovitz, Department of Physics, Ben-Gurion University
  hbaruch@bgu.ac.il

Thesis Evaluations (extracts from two anonymous reviews):

- "[...]

  I therefore find this work to be highly suitable as a Ph.D. thesis.

  Beyond this, I highly value the effort and the high level of professionalism and perseverance required to construct such a complicated experimental setup from scratch. Achieving a BEC is a formidable task, considered even today to be a very challenging goal, and even more so a BEC on an atom-chip.

  The fact that Shimon played a key role in this achievement is quite noteworthy. Accordingly, I also recommend Shimon's Ph.D. work for any excellence awards you may find suitable."

- "[...]

  The experimental research of ultracold atoms using chip traps is very challenging. It requires the mastering of multiple techniques ranging from ultra-high vacuum technology to laser physics. It also requires deep understanding of atomic physics. The mere successful formation of a Bose-Einstein Condensate in a chip trap is an achievement to be proud of. In his research Shimon has, not only succeeded in achieving BEC, but also used it to conduct beautiful experiments in this highly non-trivial research area. The outcome of the research described in this thesis was, rightfully, published in high-profile journals, and is likely to have impact on our field. As an example, the development of a new matterwave beam splitter is likely to have far reaching consequences on matterwave interferometry – an experimental technique at the forefront of precision metrology. I also enjoyed reading Shimon's thesis. It is well written and clear.

  To summarize, I would like to congratulate Shimon on a successful thesis research and recommend the acceptance of his thesis for a Ph.D degree with distinction."