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Dr. Vasileios Lempesis CV

Name: Vasileios

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Present address: Physics Dept, College of Science, King Saud University,
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Nationality Greek

Post-School Education:

1985-1990: Bsc Physics in the Physics Department of the University of Athens (Greece)

1990- 1993: PhD in Theoretical Physics at Essex University in UK. The supervisors of my PhD thesis were Pr. R. Loudon and Pr. M. Babiker. The title of my thesis was '*Mechanical and Statistical Effects of Laser Radiation on Two-Level Atoms*'. My PhD was supported by a grant from the Science and Engineering Research Council (SERC) of UK.

Academic Career:

1993-1994: Research Assistant in the Computational Non-Linear Optics Group at Strathclyde University (Glasgow UK).

1994-1995: Research Assistant in the Group led by Pr. M. Babiker and Pr. L. Allen at Essex University (UK).

2001-2002: Lecturer at the Technical University of Crete.

2005-2007: Senior Researcher in the group "QUBIT"

(<http://www.science.tuc.gr/ellinas/qubit.htm>) at the Technical University of Crete.

2011-Present: Assist. Professor, Dept. of Physics, King Saud University

3.Teaching:

1990-1993: As a PhD student at Essex University I was employed by the University as a General Physics and Maths tutor for the first year students of both the Physics and Electronic Engineering Departments of the University.

1999-2003: I taught "Vibrations and Waves", "General Physics I (Mechanics)", "General Physics II (Electromagnetic Theory)" and "Modern Physics" in "The College of Southeastern Europe-The American University of Athens". Teaching Language: English. (Teaching language English)

September 2004-February 2011: Part-time lecturer at The College of New York (Athens Branch). Courses: Maths, Exploring the Universe, Scientific World, History of Science, Calculus I, Calculus II. (Teaching language English)

September 2006-June 2008: Part-time lecturer at Athens Metropolitan College. Courses: Physics I, Chemistry. (Teaching language English)

February 2011-Present: Assistant Professor at Department of Physics and Astronomy KSU. Courses: PHYS 145 (General Physics for Medicine students),

PHYS 454 (Quantum Mechanics I), PHYS 502 (Mathematical Physics, MSc Course), PHYS 302 (Complex Analysis), PHYS 551 (Quantum Mechanics, MSc Course), PHYS 103 (General Physics I for engineers), PHYS 500 (Research Methodology, MSc Course), PHYS 505 (Advanced Quantum Mechanics, MSc Course) (Teaching language English)

4. Research:

Research Visits Abroad:

- Short visit to Essex University 9th-15th of May 2000 for collaboration with Pr. R. Loudon. The short visit was fully supported by a grant from the European Science Foundation (Quantum Information Technology network)
- Short visit to University of York 24/4-2/5 2002 for collaboration with Pr. M. Babiker. The short visit was fully supported by a grant from the European Science Foundation (Quantum Information Technology network)
- Short visit to University of York 20/8-20/9 2003 for collaboration with Pr. M. Babiker. The short visit will be fully supported by a grant from the European Science Foundation (Bose-Einstein Condensation and Beyond network)
- Short visit to University of Bonn 3/7-30/7 2006 for collaboration with Pr. D. Meschede. The short visit has been fully supported by a grant from the European Science Foundation (Bose-Einstein Condensation and Beyond network)
- Short visit to University of Glasgow 17/7-23/7 2007 for collaboration with Pr. M. Padgett. The short visit has been fully supported by a grant from the European Science Foundation (Bose-Einstein Condensation and Beyond network)
- Short visit to University of York 3/7-30/7 2008 for collaboration with Pr. M. Babiker. The short visit has been fully supported by a grant from the European Science Foundation (Quantum Degenerate Dilute Systems network)
- Short visit to University of York, 8/7-14/7 2012 for collaboration with Pr. M. Babiker. The short visit has been fully supported by a grant from the European Science Foundation (POLATOM network).
- Short visit to University of York, 6/7-13/7 2013 for collaboration with Pr. M. Babiker. The short visit has been fully supported by a grant from the European Science Foundation (POLATOM network)
- Short visit to University of York, 21/6-26/6 2014 for collaboration with Pr. M. Babiker and Pr. Y. Juin. The short visit has been fully supported by a grant from the EPSRC.

Publications:

PAPERS IN REFEREED JOURNALS:

1. **“Theory of radiation forces and momenta for mobile atoms in light fields”**, V.E. Lembessis, M. Babiker, C. Baxter, R. Loudon, *Physical Review A*, Vol. 48, No 2, p.1594, August 1993.
2. **“Atomic motion in light beams possessing orbital angular momentum”**, W. L. Power, L. Allen, M. Babiker, V.E. Lembessis, *Physical Review A*, Vol. 52, No1, p.479, July 1995.
3. **“ Doppler cooling of ion cyclotron motion in counter-propagating Laguerre-Gaussian beams”**,

M. Babiker, V.E. Lembessis, W.K. Lai, L. Allen, *Optics Communications* 123 (1996) 523-529.

4. **“ Non-local effects in the resonance fluorescence from a two-level system”**

V. E. Lembessis, *Optics Communications* 124/3-4 (1996) 244-250.

5. **“ Atom dynamics in multiple Laguerre-Gaussian beams”**,

L. Allen, M. Babiker, W.K. Lai, V.E. Lembessis,) *Physical Review A*, Vol.54 No5, p.4259 (1996).

6. **“ Spin-orbit coupling in free-space Laguerre-Gaussian light beams”**,

L. Allen, V.E. Lembessis, M. Babiker, *Physical Review A*, Vol. 54, p.2419 (1996).

7. **“A Mobile Atom in a Laguerre-Gaussian laser beam”**, V. E Lembessis, *Optics Communications*, 159 (1999) 243-247.

8. **“Optical dipole trapping beyond rotating wave approximation: The case of large detuning”**

V. E. Lembessis, D. Ellinas. *J. Opt. B: Quantum Semiclass. Opt.*, 7 (2005) 319-322

9. **“ Optical ferris wheel for ultracold atoms”**, S. Franke-Arnold, J. Leach, M.J. Padgett, V.E. Lembessis, D. Ellinas, A. J. Wright, J. M. Girkin, P. Ohberg, A. S. Arnold. *Optics Express*, Vol. 15, Issue 14, pp. 8619-8625, 2007. και στο arXiv:physics/0611154 v1 15 Nov 2006.

10. **«Optical Stern Gerlach Effect beyond the rotating wave approximation»**, *Phys. Rev. A*, A 78, 043423 (2008) and at V.E. Lembessis - Arxiv preprint arXiv:0709.3902, 2007 - arxiv.org. Also selected for the November 2008 issue of Virtual Journal of Ultrafast Science (<http://www.vjultrafast.org>).

11. **"Surface optical vortices"**, V. E. Lembessis, M. Babiker and D. L. Andrews. *Phys. Review A* 79, 011806(R) (2009).

12. **“Spatio-temporal polarisation gradients in phase-bearing light”**, V. E.

Lembessis and M. Babiker, *Phys. Review A* 81, 033811 (2010).

13. **“ Surface plasmons with phase singularities and their effects on matter”**, D.

L. Andrews, M. Babiker, V. E. Lembessis, S. Al-Awfi, *Physica Status Solidi (RRL) - Rapid Research Letters*, 4, No. 10 , 241-243 (2010).

14. **“Light-induced torque for the generation of persistent current flow in atomic gas BECs”**, V. E. Lembessis, M. Babiker. *Phys. Rev. A*, 82, 051402(R) (2010).

15. **“Plasmonic surface optical vortices (PSOVs) and their influence on atoms”**,

V. E. Lembessis, S. Al-Awfi, M. Babiker and D. L. Andrews, *J. Opt.* 13 (2011) 064002 (8pp)

16. **“Azimuthal Sisyphus effect for atoms in a toroidal all-optical trap”**

V. E. Lembessis, D. Ellinas, and M. Babiker, *Phys. Rev A*, 84, 043422 (2011)

17. **“Deflection of a lamda-type three level atom by a light field: a mechanical demonstration of the coherent population trapping effect”**, Omar M. Al-Dossary,

V. E. Lembessis, *J. Phys. B: At. Mol. Opt. Phys.* 45 (2012) 115502 (8pp)

18. **“Enhanced quadrupole effects in twisted beams”**

V. E. Lembessis, and M. Babiker, *PRL* 110, 083002 (2013).

19. **“Two atom system as a directional frequency filter”**, V. E. Lembessis, A Al Rsheed, OM Aldossary, Z Ficek - *SPIE Optics+ Optoelectronics*, 877310-877310-6

20. **“Two-atom system as a nano-antenna for mode switching and light routing”**,

V. E. Lembessis, A. AlRsheed, O. M. AlDossary and Z. Ficek, *PRA*, 88, 053814 (2013).

21. **“Atom Vortex Beams”**, V. E. Lembessis, D. Ellinas, Omar M. Al-Dossary, and M. Babiker. *Phys. Rev. A* 89, 053616 – Published 15 May 2014.

22. **“Evanescent Artificial Gauge Potentials for Neutral Atoms”**, V. E. Lembessis, JOSA B Vol. 31, Iss. 6, pp. 1322–1329 (2014) and at arXiv:1310.7106.

23. **“Atom mirrors for a lamda-type three level atom”**. N. Felemban, O. M. Aldossary and V. E. Lembessis, J. Phys. B: At. Mol. Opt. Phys. 47 (2014) 185005 (12pp). [doi:10.1088/0953-4075/47/18/185005](https://doi.org/10.1088/0953-4075/47/18/185005)

PAPERS SUBMITTED FOR PUBLICATION

“Electron vortex beams subject to static magnetic fields”, M. Babiker, J. Yuan and V. E. Lembessis, submitted to PRA

PAPERS UNDER PREPARATION

“A system of two identical two-level emitters as a nanoantenna for mode switching and light routing”, V. E. Lembessis, A Al Rsheed, OM Aldossary, A. Lyras and Z Ficek.

CHAPTERS IN BOOKS

Theory of atoms in twisted light, M. Babiker, D. L. Andrews and V. E. Lembessis in THE ANGULAR MOMENTUM OF LIGHT, M. Babiker and D. L. Andrews (eds), Cambridge University Press, Cambridge July 2012,

OTHER PAPERS

“P. N. Lebedev and the Light Radiation Pressure”, V. E. Lembessis, Europhysics News, January 2001.

PAPERS PRESENTED IN CONFERENCES:

1. **“ Optical Molasses and the orbital Angular Momentum of Light”**, M. Babiker, V. E. Lembessis and L. Allen, *paper submitted and presented at the Quantum Coherence Annual Conference 1995 held in Rochester USA., Coherence and Quantum Optics VII, p.367.*

2. **“ Orbital Angular Momentum Effects of Light on Atoms; A Density-Matrix Theory”**, V. E. Lembessis, L. Allen, M. Babiker, *paper submitted and presented at the Quantum Coherence Annual Conference 1995 held in Rochester USA, Coherence and Quantum Optics VII, p. 369.*

3. **“ Non-local effects in the resonance fluorescence from a two-level system”** E. Lembessis, paper presented in the conference of the Hellenic Physical Soc. in Ancient Olympia 28-31 January 1999 and in TMR School on Quantum Computation and Quantum Information in Torino 12-27 July 1999.

4. **“ Effects of a laguerre-gaussian laser beam on a mobile atom”**, poster in ESCOLAR’ 99 conference (Euroconference on Slow Collisions between LAseR manipulated systems 1-5 May 1999) in Elounda Crete.

5. **"Dark atom traps and the orbital angular momentum of light"**, paper presented in TMR School on Quantum Computation and Quantum Information in Torino 18-30 June 2001.
6. **"Atom trapping and manipulation at dielectric surfaces using twisted light"**, V. E. Lembessis, A. C. Carter, M. Babiker and D. L. Andrews paper presented at "PHOTON 2008" Edinburgh, August 2008.
7. **"Optical Surface Vortices and Their Use in Nanoscale Manipulation"**, M. Babiker, V. E. Lembessis, and D. L. Andrews in International Conference on Transport and Optical Properties of Nanomaterials, Allahabad India, 5-8 January 2009.
8. **"Plasmon Surface Optical Vortices"**, M. Babiker, V. E. Lembessis, S. Al-Awfi and D. L. Andrews in International Conference on Angular Momentum, York, 23-25 March 2010.
9. **"Polarization Gradients in Phase-Bearing Light"**, V. E. Lembessis and M. Babiker, in International Conference on Angular Momentum, York, 23-25 March 2010.
10. **"Optical vortex singularities and atomic circulation in evanescent waves,"** by V.E. Lembessis, D.L. Andrews, M. Babiker and S. Al-Awfi, in *Complex Light and Optical Forces*, edited by D.L. Andrews, E.J. Galvez and J. Glückstad, *Proc. SPIE* **7950**, 795007 (2011) (6 pages) doi: 10.1117/12.874926.
11. **"Generation of Surface Optical Screw Dislocations by Evanescent Plasmonic Modes"**, S. Al-Awfi, M. Babiker, V.E. Lembessis and D. L. Andrews Saudi International Electronics, Communications and Photonics Conference Riyadh, Saudi Arabia April 23rd - 26th 2011.
12. **"Two atom system as a directional frequency filter"**, V. E. Lembessis, A Al Rsheed, OM Aldossary, Z Ficek - SPIE Optics+ Optoelectronics, Prague, April 15th - 18th 2013.

Participation in Conferences:

- Scottish Universities Summer School in Theoretical Physics, August 1994 Stirling (Scotland, UK). My participation at that school was supported by a NATO grant.
- Paper contributor to the Quantum Coherence Annual Conference at Rochester (USA) 1995.
- Paper presented in the conference of the Hellenic Physical Soc. in Ancient Olympia 28-31 January 1999.
- Participation and poster presentation in ESCOLAR' 99 (Euroconference on Slow Collisions between LASeR manipulated systems, 1-5 May 1999) in Elounda Crete
- Participation and poster presentation in TMR School on Quantum Computation and Quantum Information in Torino 12-27 July 1999.
- Participation and paper presentation in TMR School on Quantum Computation and Quantum Information in Torino 18-30 June 2001.
- Participation and talk in the International Conference on Angular Momentum, York, 23-25 March 2010.
- Saudi International Electronics, Communications and Photonics Conference Riyadh, Saudi Arabia April 23rd - 26th 2011.
- KACST 3rd Meeting on Quantum Optics and Informatics, King Abdul Aziz City of Science and Technology (KACST), Riyadh, May 21, 2011. Talk entitled *"Optical Ferris wheels: a novel light configuration for controlling atomic motion"*.

STUDENTS COMPLETED PHD

1. **Mrs. Nuha Felemban.** She passed successfully her PhD viva on the 11th of September 2014. She is the first woman with a PhD in theoretical quantum optics in the history of the Kingdom of Saudia Arabia. Part of her work is included in my publication No 23 given above. The title of her thesis was: *The use of evanescent mode atomic mirrors for three-level atoms.*

STUDENTS UNDER SUPERVISION

2. **Mr. A. Al-Rasheed.** He has about one year to finish. He works on applications of Optical Ferris Wheels on atomic physics.

4. Proffesional Contribution:

Translations-Publishing-Editing

In collaboration with “Leader Books Editions S.A” (Athens, Greece) he has translated the following book:

“*Feynman, I dialeksis gia tous ypologistes,*”, Leader Books S.A., 2006 Athens Greece, ISBN 960-7901-60-6, original title “*Feynman Lectures on Computation*”, by R. P. Feynman, Perseus Publishing.

Collaboration as an article writer and correspondent with top Greek computer magazine “RAM” (<http://www.4pi.gr/ram/2010/11/>), with greek science magazine “Discovery & Science” and with the special edition “GEOTROPIO” and “IATRIKA” (“The Medicals”) of the Greek daily newspaper “ELEFTHEROTYPIA” (www.enet.gr) on science advances.

Collaboration as lemma writer for the greek edition of the General Encyclopedia for Kids edited by National Geographic Society (in circulation since October 2010). I was responsible for all the science lemmas.

Foreign languages

- English, German, French

5. OTHER ACTIVITIES:

- Member of the Hellenic Physical Society
- Member of the Institute of Physics (U.K).
- Member of Optical Society of America

