

Mini-Vita of K. V. SHAJESH

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Contact Information

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Education and Experience

2010 - 2012: Post Doctoral Associate at Rutgers University, Newark, New Jersey, USA.

2008 - 2010: Physics Instructor at Saint Edward's school, Florida, USA.

2008: Ph.D. in Theoretical High Energy Physics from The University of Oklahoma, USA.

Academic Awards

1. Awarded the Neilsen Prize for the best Ph.D. thesis by Homer L. Dodge Department of Physics and Astronomy, University of Oklahoma.
2. My Ph.D. thesis was nominated for the University of Oklahoma Provost's Dissertation Prize.
3. My article titled "Quantum mechanics using Fradkin's representation" (item [17] in list of publications) is listed in "The Net Advance of Physics", which is a collection of review articles and tutorials in an encyclopedic format, supported by The Massachusetts Institute of Technology.
4. Gold medalist in the National Graduate Physics Examination (N. G. P. E.) conducted by the Indian Association of Physics Teachers (I. A. P. T.).

Research topics and related publications ¹ (Total publications = 23)

Casimir Repulsion: Repulsive long-range forces between anisotropic atoms and dielectrics was studied in [2]. We obtained closed analytic expressions for the case of a polarized atom above a dielectric plate with an aperture.

Many-Body Green's Functions: In [3] we used multiple scattering formalism to extract irreducible N -body parts of Green's functions and Casimir energies describing the interaction of N objects. We illustrated and applied the technique to various examples. Significance of three-body contributions to Casimir energies has been emphasized in [1].

Non-Contact Gears: In [10] we have designed non-contact gears consisting of corrugated concentric cylinders. We have calculated the Casimir torque between two such cylinders for the scalar case. In [11] we have calculated the lateral Casimir force between corrugated parallel plates in the next-to-leading order. This work has been further reported in [6, 7]. We are currently extending these results for real materials [4]. This will decisively reduce the theoretical error sufficiently for comparison with the experiments, and will have applications in the next generation of nano-machines.

¹Citations refer to list of publications.

How Does Casimir Energy Fall? In [16] we have demonstrated that Casimir energy for parallel plates gravitates like conventional mass. In the sequel[15] we have shown that the divergent parts of the Casimir energy of parallel plates serve to renormalize the bare masses of the plates. This work has been extended for arbitrary orientation of plates in [13]. This work has been further reported in [14, 8].

Magnetic Monopoles: Trying to develop an approximation method to study processes involving magnetic monopoles. A pedagogical report has been compiled in [17]. More work is in progress.

PT-Symmetric Quantum Electrodynamics: Hamiltonians that are not Hermitian but are PT-symmetric are being investigated in quantum mechanics recently. We are trying to study the field theoretical analog of the same. Published 2 papers [18, 12].

Euler-Heisenberg Lagrangians and Vacuum Pair Production: Most recently worked on the paper “Vacuum polarization induced coupling between Maxwell and Kalb-Ramond fields,” [19] with N. D. Hari Dass. Published 3 papers[19, 20, 22] on related topics.

Unitary Irreducible Representations: We have reexamined the character problems of SU(2) and SU(1,1) from the standpoint of a physicist. Published 2 papers[21, 23] with Debabrata Basu and Subrata Bal.

Teaching experience

Competent to teach all graduate and undergraduate courses in Physics.

1. **Teaching positions:** Physics instructor at Saint Edward’s School, Vero beach, Florida, USA.
2. **Teaching assistant positions:** Many semesters of experience as teaching assistant in Physics.

References

1. Kimball A. Milton, George Lynn Cross Research Professor of Physics, Department of Physics and Astronomy, University of Oklahoma, Norman, OK - 73019, USA. Email: milton@nhn.ou.edu.
2. Martin Schaden, Professor of Physics, Department of Physics, Rutgers, The State University of New Jersey, Newark, NJ - 07102, USA. Email: mschaden@andromeda.rutgers.edu.
3. Iver H. Brevik, Department of Energy and Process Engineering, Norwegian University of Science and Technology, N-7491 Trondheim, Norway, Email: iver.h.brevik@ntnu.no.

List of publications

1. K. V. Shajesh and M. Schaden, “Significance of many-body contributions to Casimir energies,” arXiv:1112.1383 [hep-th].
2. K. V. Shajesh and M. Schaden, “Repulsive long-range forces between anisotropic atoms and dielectrics,” Phys. Rev. A **85**, 012523 (2012), arXiv:1112.1348 [physics.atom-ph].
3. K. V. Shajesh and M. Schaden, “Many-body contributions to Green’s functions and Casimir energies,” Phys. Rev. D **83**, 125032 (2011), arXiv:1103.3048 [hep-th].
4. P. Parashar, K. A. Milton, I. Cavero-Pelaez and K. V. Shajesh, “Electromagnetic non-contact gears: Prelude,” Quantum field theory under the influence of external conditions (QFEXT09), devoted to the centenary of H. B. G. Casimir (pp 48-54), proceedings of the ninth conference, University of Oklahoma, USA, (2010), arXiv:1001.4105 [cond-mat.other].
5. K. A. Milton, P. Parashar, J. Wagner and K. V. Shajesh, “Exact Casimir energies at nonzero temperature: Validity of proximity force approximation and interaction of semitransparent spheres,” Doing physics: A festschrift for Thomas Erber, edited by Porter Johnson, Illinois Institute of Technology Press (2010), arXiv:0909.0977 [hep-th].
6. I. Cavero-Pelaez, K. A. Milton, P. Parashar and K. V. Shajesh, “Leading- and next-to-leading-order lateral Casimir force on corrugated surfaces,” Int. J. Mod. Phys. A **24**, 1757 (2009) [arXiv:0810.1787 [hep-th]].
7. I. Cavero-Pelaez, K. A. Milton, P. Parashar and K. V. Shajesh, “Lateral Casimir forces on parallel plates and concentric cylinders with corugations,” J. Phys. Conf. Ser. **161**, 012008 (2009) [arXiv:0810.1786 [hep-th]].
8. K. A. Milton, P. Parashar, J. Wagner, K. V. Shajesh, A. Romeo and S. Fulling, “How Does Quantum Vacuum Energy Accelerate?,” arXiv:0810.0081 [hep-th].
9. K. V. Shajesh, “Casimir effect: An avatar of the quantum vacuum,” Ph. D. Thesis, The University of Oklahoma, 2008, 153 pages. Available under ‘Open Access publishing’, a service offered by UMI Dissertation Publishing, at (<http://pqdtopen.proquest.com/#abstract?dispub=3315897>).
10. I. Cavero-Pelaez, K. A. Milton, P. Parashar and K. V. Shajesh, “Non-contact gears: II. Casimir torque between concentric corrugated cylinders for the scalar case,” Phys. Rev. D **78**, 065019 (2008), arXiv:0805.2777 [hep-th].
11. I. Cavero-Pelaez, K. A. Milton, P. Parashar and K. V. Shajesh, “Non-contact gears: I. Next-to-leading order contribution to lateral Casimir force between corrugated parallel plates,” Phys. Rev. D **78**, 065018 (2008), arXiv:0805.2776 [hep-th].
12. K. A. Milton, I. Cavero-Pelaez, P. Parashar, K. V. Shajesh and J. Wagner, “PT-Symmetric Quantum Electrodynamics–PTQED,” arXiv:0712.0045 [hep-th]. Revised version published in Int. J. Theor. Phys. **50**, 963 (2011).
13. K. V. Shajesh, K. A. Milton, P. Parashar and J. A. Wagner, “How does Casimir energy fall? III. Inertial forces on vacuum energy,” J. Phys. A: Math. Theor. **41**, 164058 (2008), arXiv:0711.1206 [hep-th].
14. K. A. Milton, S. A. Fulling, P. Parashar, A. Romeo, K. V. Shajesh and J. A. Wagner, “Gravitational and Inertial Mass of Casimir Energy,” J. Phys. A: Math. Theor. **41**, 164052 (2008), arXiv:0710.3841 [hep-th].

15. K. A. Milton, P. Parashar, K. V. Shajesh and J. Wagner, “How does Casimir energy fall? II. Gravitational acceleration of quantum vacuum energy,” *J. Phys. A: Math. Theor.* **40**, 10935 (2007), arXiv:0705.2611 [hep-th].
16. S. A. Fulling, K. A. Milton, P. Parashar, A. Romeo, K. V. Shajesh and J. Wagner, “How does Casimir energy fall?,” *Phys. Rev. D* **76**, 025004 (2007), arXiv:hep-th/0702091.
17. K. V. Shajesh and K. A. Milton, “Quantum mechanics using Fradkin’s representation,” [arXiv:hep-th/0510103].
18. C. M. Bender, I. Cervero-Pelaez, K. A. Milton and K. V. Shajesh, “PT-symmetric quantum electrodynamics,” *Phys. Lett. B* **613**, 97 (2005) [arXiv:hep-th/0501180].
19. N. D. Hari Dass and K. V. Shajesh, “Vacuum polarization induced coupling between Maxwell and Kalb-Ramond fields,” *Phys. Rev. D* **65**, 085010 (2002) [arXiv:hep-th/0107006].
20. K. V. Shajesh, “Effective Lagrangian for the pseudoscalars interacting with photons in the presence of a background electromagnetic field,” [arXiv:hep-th/0008187].
21. D. Basu, S. Bal and K. V. Shajesh, “The Character of the Exceptional Series of Representations of $SU(1,1)$,” *J. Math. Phys.* **41**, 461 (2000) [arXiv:hep-th/9906066].
22. J. A. Grifols, E. Masso, S. Mohanty and K. V. Shajesh, “Pair production of light pseudoscalar particles in strong inhomogeneous fields by the Schwinger mechanism,” *Phys. Rev. D* **60**, 097701 (1999) [Erratum-ibid. *D* **65**, 099905 (2002)] [arXiv:hep-ph/9906255].
23. S. Bal, K. V. Shajesh and D. Basu, “A Unified Treatment of the Characters of $SU(2)$ and $SU(1,1)$,” *J. Math. Phys.* **38**, 3209 (1997) [arXiv:hep-th/9611236].