CURRICULUM VITAE

NAME: Tuğrul Hakioğlu

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ACADEMIC DEGREES:

- Ph.D. — Theoretical Physics, 1992
  The University of Arizona, Tucson, AZ, U.S.A.
  Thesis: Characterization of the One Dimensional Fractal Structures by Correlations, Cumulants and Moments as Applied to Hadronic Rapidity Correlations,
  May 1992
  Supervisor: P. Carruthers, Prof. Dr. and M.D. Scadron, Prof. Dr.
- M.S. — Physics, 1986
  Virginia Polytechnic Institute and State University, Blacksburg, VA, U.S.A.
- B.S. — Electronics and Communication Engineering, 1983
  Istanbul Technical University, Istanbul, Turkey

SCHOLARSHIPS AND AWARDS:

- 9/82–7/83 — The Scientific and Technical Research Council of Turkey TÜBITAK National Research Fellowship
- 1983 — Atomic Energy Commission Award for International Graduate Study
- 2001 — National S. Simavi Award for Basic Natural Sciences: Second largest award for all natural sciences in Turkey *For the contribution in the field of quantum phase, action-angle representation, and action-angle Wigner Function in Quantum Mechanics*

PROFESSIONAL AFFILIATIONS:

- Founder and the Director of the Institute of Theoretical and Applied Physics (Est: March 2006) (http://itap-academic.org)
- Founder and Curriculum Creator of the ITAP Physics Olympiad School for High School Physics Teachers (Est: 2009)

- Founder of the ITAP Science Laboratory for Highschool Students (Est: 2013).
- Founder and the President of the KUVANTEK Bilimsel ve Teknolojik Araştirma, Organizasyon, Eğitim ve Sanayii Ltd. Şti. (KUVANTEK Ltd. Company for Scientific and Technological Research, Organization, Training, Industry, Trade) (Est: 2012)
- The American Physical Society
- Associate of Argonne National Laboratory, Division of High Energy Physics

Employement History:

- 07/2019-09/2019 Visiting Scholar
  Northeastern University, Department of Physics, USA
- 07/2018-09/2018 Visiting Professor
  Boston University, Department of Physics, USA
- 07/2017-08/2017 Visiting Professor
  MIT, Department of Physics, USA
- 08/2015- Professor of Physics and Renewable Energy
  Energy Institute, İstanbul Technical University
- 5/2001-7/2003 Visiting Faculty
  Department of Electrical and Electronical Engineering, University of Liverpool, U.K.
- 1/2001-5/2001 Visiting Faculty
  Dynamical Systems and Accelerator Theory group, Physics Department, University of Maryland, USA
- 8/2000-1/2001 Visiting Scholar
  High Energy Physics Div., Argonne National Laboratory, Illinois, USA
- 7/99-8/99 Visiting Faculty
  International Center for Science Cuernavaca, Mexico
- 2006- Founder and Director
  Institute of Theoretical and Applied Physics
- 1993-2014 Permanent faculty, professor of physics
  Department of Physics, Bilkent University, Ankara
- 1992–1993 Postdoctoral Fellow
  Department of Physics, The University of Arizona
- 1987–1991 Instructor and Research Assistant
  Department of Physics, The University of Arizona
- 6/89–7/89 Visiting Scientist
  T-8 Division, Los Alamos National Labs., Los Alamos, NM, U.S.A.

- 7/87–10/87 Visiting Scientist
  T-10 Division, Los Alamos National Labs.
- 1986-1987 Teaching Assistant
  The University of Arizona
- 6/84–8/84 Research Assistant
  Arecibo Radio Observatory (Operated by the D.O.E. and Cornell University), Arecibo, Puerto Rico

Edited books:

1. T. Hakioğlu and A.S. Shumovsky, "Quantum Optics and Spectroscopy of Solids: Concepts and Advances" (Kluwer, Amsterdam, Jan. 1997) 248 pages

Articles

2. T. Hakioglu, R. Markiewicz, D. Erbahar, F. Ozaydin, S. Sevim, E. Ozgun, "Thermal Phonon Hall effect in monolayer insulator transition-metal-di-chalcogenides", *under preparation*, , (2024).

3. S. Sevim, S. Mardanya, R. Markiewicz, T. Hakioglu, J. Nieminen, C. Sanga and A Bansil, "The unconventional CDW driven by LO-LA mixed phonon softening in $NbSe_2$", *under preparation*, , (2024).

4. F. Ozaydin, O.E. Mustecaplioglu and T. Hakioğlu, "Powering quantum Otto engines only with q-deformation of the working substance", *Phys. Rev. E*, **108**, 054103 (2023).

5. Wei-Chi Chiu, S. Mardanya, R. S. Markiewicz, J. Nieminen, B. Singh, T. Hakioglu, A. Agarwal, T.-R. Chang, H.S. Lin and A. Bansil, "Topological charge density wave in monolayer $NbSe_2$", *arXiv: 2104.14634*, , submitted (2022).

6. T. Hakioglu, Wei-Chi Chiu, R. S. Markiewicz, B. Singh, and A. Bansil, "Non-orthogonal spin-momentum locking", *Phys. Rev. B*, **108**, 155103 (2023).

7. E. Ozgun, T. Hakioglu and E. Ozbay, "Scattering of Spin-1/2 Particles from a PT-symmetric Complex Potential", *EPL*, **131**, 11001 (2020).

8. T. Hakioğlu, "Effect of the electron-phonon interaction on the spin texture in $Bi_{2-y}Sb_ySe_xTe_{3-x}$ (arXiv:1901.10136)", *Phys.Rev. B*, **100**, 165407 (2019).

9. T. Hakioğlu, "Interaction Approach to Anomalous Spin Texture in Warped Topological Insulators", *Phys. Rev. B*, **97**, 245145 (2018).

10. M. Günay, T. Hakioğlu, and H.H. Somek, "Weakly Anisotropic Noncentrosymmetric Superconductors with Radial Line Nodes and the Origin of the Anomalous Thermodynamic Data", *J. Phys. Soc. Jap.*, **86**, 034713 (2017).

11. T. Hakioğlu, M. Günay, "Unconventional pairings and radial line nodes in inversion symmetry broken superconductors", *Physica C*, **528**, 48 (2016).

12. Ege Özgün and T. Hakioğlu, "CDW-Exciton condensate competition and a condensate driven force", *J. Phys. Soc. Jap.*, **85**, 084706 (2016).

13. T. Hakioğlu, Ege Ozgun and Mehmet Gunay, "A Measurable Force Driven by Excitonic Condensate in DQWs", *App. Phys. Lett.*, **104**, 162105 (2014).

14. T. Hakioğlu, Ege Ozgun and Mehmet Gunay, "Robust Ground State and Artificial Gauge in DQW Exciton Condensates under Weak Magnetic Field", *Physica E*, **62**, 10 (2014).

15. T. Hakioğlu and Ege Ozgun, "Radiative Dar-Bright Instability and the Critical Casimir Effect in DQW Exciton Condensates", *Sol.State Comm.*, **151**, 1045 (2011).

16. T. Hakioğlu, M.A. Liberman, S.A. Moskalenko and I. Podlesny, "The Influence of the Rashba Spin-Orbit Coupling on the Two Dimensional Magnetoexcitons", *J. Phys. C*, **23**, 345405 (2011).

17. M. Ali Can and T. Hakioğlu, "Unconventional Pairing in Excitonic Condensates under Spin Orbit Coupling", *Phys. Rev. Lett.*, **103**, 086404 (2009).

18. T. Dereli, Adnan Teğmen and T. Hakioğlu, "Canonical Transformations in three Dimensional Phase Space", *I. J. Mod. Phys. A*, **24**, 4769 (2009).

19. T. Dereli, T. Hakioğlu and Adnan Teğmen, "Quantum Canonical Transformations in Weyl-Wigner-Groenewold-Moyal Formalism", *I. J. Mod. Phys. A*, **24**, 4573 (2009).

20. T. Hakioğlu, "A Controlable Spin Prism", *J. Phys. Condens. Matt.*, **21**, 026016 (2009).

21. K. Guven, A. Siddiki, P. Krishna and T. Hakioglu, "A self -consistent microscopic model of Colomb interaction in a bilayer system as an origin of Drag effect phenomenon", *Physica E*, **40**, 1169 (2008). also: cond-mat/0707.1141

22. P. Krishna, A.Siddiki, K. Guven and T. Hakioglu, "Local current distribution at large quantum dots : A self consistent screening model", *Physica E*, **40**, 1142 (2008). also: cond-mat/0707.1228

23. A. Siddiki, E. Cicek, D. Eksi, I. Mese, S. Aktas and T. Hakioglu, "Where are the edge states near the point contacts? A self consistent approach", *Physica E*, **40**, 1160 (2008). also: cond-mat/0707.1244

24. A. Siddiki, E. Cicek, D. Eksi, I. Mese, S. Aktas and T. Hakioglu, "Theoretical investigation of the electron velocity in Quantum Hall bars in the out of linear response regime", *Physica E*, **40**, 1217 (2008). also:cond-mat/0707.1229

25. A. Siddiki, A.E. Kavruk, T. Ozturk, U. Atav, M. Sahin and T. Hakioglu, "A self consistent calculation of the edge states at QHE based Mach-Zehnder interferometry", *Physica E*, **40**, 1398 (2008). also/cond-mat/0707.1125

26. D. Ekşi, E. Çiçek, A. İ. Meşe, Ş. Aktaş, A. Siddiki, T. Hakioğlu, "The effect of sample properties on the electron velocity in quantum Hall bars", *Phys. Rev. B*, **76**, 075334 (also cond-mat/0612519).

27. T. Hakioğlu, A. Teğmen and B. Demircioğlu, "$\hbar$-independent universality of the Quantum-Classical Canonical Transformations", *Phys. Lett. A*, **360**, [501-506] (2007). [also quant-ph/0608180]

28. T. Hakioğlu and M. Şahin, "Complex Excitonic Gap via Spin-Orbit coupling and BEC-BCS Crossover", *Phy. Rev. Lett.*, **98**, 166405 (2007). [also cond-mat/0701751]

29. T. Hakioğlu, K. Savran, H. Sevinçli and E. Meşe, "Non Markovian decoherence: A critique of the two-level approximation", *Journal of Magnetism and Magnetic Material*, **300**, 579 (2005).

30. Kerim Savran, T. Hakioğlu, E. Meşe and H. Sevinçli, "The relevant time scale of decoherence is Gaussian: A critique of the Two-Level Approximation", *J. Phys. C*, **18**, 345 (2006).

31. T. Hakioğlu and Kerim Savran, "The role of the environmental spectrum in the decoherence and dephasing of multilevel systems", *Phys. Rev.*, **B 71**, 115115 (2005).

32. T. Hakioğlu, Kerim Savran and E. Meşe, "Questioning the validity of the two-level approximation", *Proceedings of the Conference Macroscopic Quantum Coherence and Computing, Kluwer Publications*, , (**2004**). Eds. P. Silvestrini, P. Delsing, C. Granata, Yu. Pashkin and B. Ruggiero

33. I.O. Kulik , T. Hakioglu and A. Barone, "Quantum Computational Gates with Radiation Free Couplings", *Europ. J. Phys.*, **B 30**, 219 (2002). also: [cond-mat/0203313]

34. T. Hakioglu, J. Anderson, F. Wellstood, "Single and double bit quantum gates by manipulating degeneracy", *Phys.Rev.*, **B 66**, 115324 (2002). also: [cond-mat/0109100]

35. T. Hakioglu, "Nonlocal, noncommutative picture in quantum mechanics and distinguished canonical maps", *Physica Scripta*, **66**, 345-353 (2002). [hep-th/0108125]

36. T. Hakioglu and A. Dragt, "The Moyal-Lie theory of phase space quantum mechanics [quant-ph/0108081]", *J. Phys.*, **A**, 6603 (2001).

37. T. Hakioglu, "Extended covariance under nonlinear canonical transformations in Weyl quantization", *ANL-HEP-PR-00-119*, , [quant-ph/0011076] (2001). (non-refereed)

38. T. Hakioğlu, "The polar representation of the Wigner function and its applications in linear optics and engineering", *Feature issue on phase space in optics, J. Opt. Soc. Am.*, **A17**, 2411 (Dec. 2000).

39. T. Hakioğlu and E. Tepedelenlioğlu, "Action angle Wigner function: A discrete and algebraic phase space approach", *J. Phys.*, **A 33**, 6357 (2000).

40. T. Hakioğlu and K.B. Wolf, "Canonical Kravchuk basis for discrete quantum mechanics", *J. Phys.*, **A 33**, 3313 (2000).

41. L. Barker, Ç. Candan, T. Hakioğlu, A. Kutay and H. Özaktaş, "The discrete harmonic oscillator, Harper's equation and the discrete fractional Fourier transform", *J. Phys.*, **A33**, 2209 (2000).

42. T. Hakioğlu, V.A. Ivanov and M. Ye Zhuravlev, "$SU(2)$-path integral investigation of Holstein Dimer", *Physica*, **A**, 172 (2000).

43. T. Hakioğlu, "Linear canonical transformations and quantum phase: A unified canonical and algebraic approach", *J. Phys.*, **A32**, 4111 (1999).

44. V.A. Ivanov, M. Ye. Zhuravlev, V.S. Yarunin and T. Hakioğlu, "Exactly soluble coherent state path integral with non-polynomial action", *J. Phys.*, **A32**, L361 (1999).

45. T. Hakioğlu, "Operational Approach in the weak field measurement of polarization fluctuations", *Phys. Rev.*, **A 59**, 1586 (1999).

46. V.A. Ivanov, E.A. Ugolkova, M.Ye. Zhuravlev and T. Hakioğlu, "Electronic Structure, Insulator-Metal Transition and Superconductivity in $\kappa - ET_2X$ Salts", *Adv. Mater. Opt. Electron.*, **8**, 53 (1998).

47. T. Hakioğlu and M. Ye. Zhuravlev, "Dynamical properties of the two dimensional Holstein-Hubbard model in the $T = 0$ normal state: A fluctuation based effective moment approach", *Phys. Rev.*, **B 58**, 3777 (1998).

48. T. Hakioğlu, "Finite dimensional Schwinger basis, deformed symmetries, Wigner function and an algebraic approach to quantum phase", *J. Phys.*, **A 31**, 6975 (1998).

49. T. Hakioğlu, "Admissible cyclic representations and an algebraic approach to quantum phase", *J. Phys.*, **A 31**, 707 (1998).

50. T. Hakioğlu and H. Türeci, "Correlated Phonons and T_c dependent dynamical phonon anomalies", *Phys. Rev.*, **B 56**, 11174 (1997).

51. T. Hakioğlu, M. Arık, "Quantum Stereographic Projection and the Homographic Oscillator", *Phys. Rev.*, **A 54**, 52 (1996).

52. T. Hakioğlu, V. A. Ivanov, "Isotope Effect in Borocarbides and Boronitrides", *Doğa Fizik/TÜBİTAK*, **22**, 863 (1998).

53. T. Hakioğlu, V.A. Ivanov, A.S. Shumovsky and B. Tanatar, "Phonon Squeezing via Correlations in the Superconducting Electron-Phonon Interaction", *Phys. Rev.*, **B 51**, 15363 (1995).

54. T. Hakioğlu, V.A. Ivanov, A.S. Shumovsky and B. Tanatar, "Phonon Squeezing in the Superconductivity of Borocarbides", *Physica*, **C 235-240**, 2343 (1994).

55. T. Hakioğlu, V.A. Ivanov, A.S. Shumovsky and B. Tanatar, "Phonon Squeezing in Superconducting Borocarbides", *Physica*, **C 234**, 167 (1994).

56. T. Hakioğlu, A.S. Shumovsky and O. Aytür, "Operational Approach to Quantum Limits on Polarization Measurement", *Phys. Lett.*, **A 194**, 304 (1994).

57. B. Tanatar and T. Hakioğlu, "Possibility of Superconductivity of two-dimensional Electrons on the Surface of Liquid Helium Films", *Sol. State Comm.*, **88**, 115 (1993).

58. T. Hakioğlu, "What can We Learn About Hadronic Intermittency by Studying Fractal Sets?", *Phys. Rev*, **D 45**, 3079 (1992).

59. P. Carruthers and T. Hakioğlu, "The Power Spectrum of Hadronic Rapidity Distributions", *Phys. Rev.*, **D 45**, 4046 (1992).

60. T. Hakioğlu and M.D. Scadron, "Vector Meson Dominance, One Loop Quark Graphs and the Chiral Limit", *Phys. Rev.*, **D 43**, 2439 (1991).

61. T. Hakioğlu and M.S. Scadron, "Field Theory Calculations of the Pion Mass at the One-Loop Level", *Phys. Rev.*, **D 42**, 941 (1990).

62. T. Hakioğlu and M.D. Scadron, "Theory of Low Dimensional Peierls Transitions for Metal-Insulators and Superconductors", *Re. of Sol. St. Sci.*, **1**, 337 (1987).

Chapters in books or monographs:

63. T. Hakioğlu and K.B. Wolf, "Canonical Kravchuk basis for discrete quantum mechanics", in *Developments of the mathematical ideas of Mykhailo Kravchuk*, ed. by N. Virchenko, I. Katchanovski, V. Haidey, R. Andrushkiw and R. Voronka (Press of The National Technical University of Ukraine and Shevchenko Scientific Society (USA), 2004, NewYork,) pp. 177-187.

64. K. Savran and T. Hakioğlu, "Environmental spectrum in decoherence and dephasing of realistic systems", in *Proceedings of the International Symposium Mesoscopic Superconductivity and Spintronics: In the light of quantum computation*, ed. by Hideaki Takayanagi (World Scientific Publishers, 2004,) pp. .

65. T. Hakioğlu, "Interaction of two-level atomic system with a single-mode Radiation Field", in *Proceedings of the Summer School on Quantum Optics and Spectroscopy of Solids*, ed. by T. Hakioğlu and A.S. Shumovsky (Kluwer Academic Publishers, January 1997,) pp. 121-138.

66. T. Hakioğlu, V.A. Ivanov, A.S. Shumovsky and B. Tanatar, "Phonon Squeezing in Superconducting Borocarbides", in *Proceedings of the International Conference on Materials and Mechanisms $M^2S - HTSC$: High Temperature Superconductivity,Grenoble July 5-9 1994*, ed. by P. Wyder (Elsevier, 1995, 1-5) pp.

67. ., "T. Hakioğlu", in *Hadronic Intermittency and Correlation Distributions from a Chaotic Map*, ed. by Proceedings of the Santa Fe Workshop (F. Cooper, R.C. Hwa and I. Sarcevic, World Scientific, Singapore) pp. March 1990. 353-361

68. T. Hakioglu and M.D. Scadron, "Linear Sigma Model in One-Loop order", in *Proceedings of the 25. International High Energy Physics Conference*, ed. by (World Scientific, Singapore, 1990) pp. 775.

69. T. Hakioğlu and M.D. Scadron, "Theory of Low Dimensional Peierls Transitions for Metal-Insulators an Superconductors", in *Proceedings of the Drexel International Conference on High Temperature Superconductivity*, ed. by S.M. Bose and S.D. Tyagi (World Scientific, Singapore, 1987) pp. 191-196.

• Articles in Non-refereed Scientific Journals

1) T. Hakioğlu, *A Young Institute of Physics in Eurasia: Institute of Theoretical and Applied Physics (ITAP)*, Yearly bulletin of the Asia-Pasific Center for Theoretical Physics, **25-26** Dec. 2010. (by invitation).

2) T. Hakioğlu, *Centenary of The Discovery of Superconductivity*, TÜBİTAK, Journal of Science and Technology, Superconductivity special issue, March 2011 (by invitation).

3) T. Hakioğlu, *Centenary of the Theory of Relativity and the World Year of Physics*, The Diplomatic Newsbridge, **9** March 2005. (by invitation).

4) T. Hakioğlu, *Recollections of the World Year of Physics 2005* (in Turkish), Bilim ve Ütopya Dergisi, Mart 2005 (by invitation).

5) T. Hakioğlu, *Topological Materials: New Physics and Gateway to New Critical Technologies* (in Turkish), Monthly journal of the Ministry of Science, Industry and Technology, Jan. 2013 (by invitation).

6) T. Hakioğlu, *2023 Goals and ITU's Ecosystem of Excellence in Science and Engineering* (in Turkish), Journal of the ITU Foundation, Oct. 2016 (by invitation).

• Signed Institutional Agreements:

1) Agreement for Cooperation between ITAP and the TATA Institute for Fundamental Research/India (to be signed in spring 2013)

2) Agreement for Cooperation between ITAP and the Academia Sinica of Taiwan (January 2013)

3) Agreement for Cooperation between ITAP and the Ilia State University, Tbilisi Georgia (October 2012)

4) Agreement for Cooperation between ITAP and the Georgian National Academy of Sciences, Tbilisi Georgia (October 2012)

5) Agreement for Cooperation between ITAP and the Institute of Physics of the Chinese Academy of Sciences (October 2012)

6) ITAP-ICTP Eurasia-Balkan Regional Institute project for Research and Research Training (under review by the Turkish Government and State Funding Agencies)

7) Institutional agreement between the Abdus Salam International Center for Theoretical Physics (ICTP) and ITAP (May 2011)

8) Institutional agreement between the Brazilian Center for Physics Research, National Institute for Science and Technology for Complex Systems (INCT-CS) and the Institute of Theoretical and Applied Physics (ITAP), (October 2010)

9) Institutional agreement between Asia Pasific Center for Theoretical Physics and the Institute of Theoretical and Applied Physics (ITAP), (March 2010)

10) Institutional agreement between Moldavian Academy of Sciences and the Institute of Theoretical and Applied Physics (ITAP), (January 2010)

Talks and Presentations:

- Invited talks:

    1. "Interaction driven Spin Texture Anomalies in Hexagonally Warped Topological Insulators"Izzet Baysal University, *Bolu, Turkey*, 17 January, 2019.

    2. "Topology Preserving Interaction Processes in Strong Topological Insulators and Skyrmion Anomalies"Saint Petersburg State University, *Saint Petersburg* Russia, 19 April, 2018.

    3. "Topology Preserving Interaction Processes in Strong Topological Insulators and Skyrmion Anomalies"Lomonosov Moscow State University, *Moscow* Russia, 16 April, 2018.

    4. "The Topology of the Radial Nodes in Unconventional Superconductivity"Loughborough University, *Loughborough* United Kingdom, 16 November, 2016.

    5. "Unconventional Pairings and Nodal Topology in Inversion Symmetry Broken Superconductors"Quantum Metamaterials Conference, *AKSS* Spetses, Greece, 1-5 June 2015.

    6. "Yoğun Madde Fiziğinde yeni Topolojik yapılar"Istanbul Physics Week, *Istanbul Technical University,*27 January 2014, ,

    7. "."Topolojik Egziton Yoğuşkanı,, *Istanbul Technical University*Istanbul, 8 November 2013, .

    8. "Physics always gives: Topological Materials as new areas of exciting research for young scientists of all interests"Istanbul University,, *Istanbul*15 February 2013, ,

    9. "."Topological Materials: New Physics and New Critical Technologies of the Future, *Sabanci University,*Istanbul, 6 November 2012, .

10. "New Areas of Collaborative Research between Turkey and Georgia in Topological Insulators and Superconductors"Ilia State University, *Georgia*29 October 2012, ,

11. "."An Outlook Into Some of the Recent Nonconventional Trends in Condensed Matter Physics, *Tata Institute of Fundamental Research (TIFR)*Mumbai, India, 7 October 2012, .

12. "Supporting Science Education in Turkey and the role of ITAP"Homi Bhabha Center for Science Education TIFR, *Mumbai, India*8 October 2012, ,

13. "."Unconventional Pairing in DQW Exciton Condensation, *6.th International Conference on Materials Science and Condensed Matter Physics*Chisinau, Moldova, 11-14 September 2012, .

14. "Contributing to ICTP's mission in Eurasia-Pacific Region: The past, the present and the future of The Institute of Theoretical and Applied Physics-ITAP"Advances and Perspectives of Basic Sciences in Caucasus and Central Asian Region, *Tbilisi, Georgia*1-3 November 2011, ,

15. "."The role of the Fundamental Symmetries in Exciton condensation, *Moscow International Symposium on Magnetism*Lomonosov State University, Moscow, 21-25 August 2011, .

16. "Radiative Dark-Bright Instability and the Critical Casimir Effect in DQW Exciton Condensates"Turkish Physical Society Meeting, *Bodrum*6-9 September 2011, ,

17. "."Unconventional Pairing in Exciton Condensation, *Asia Pasific Center for Theoretical Physics*Pohang, Korea, March/6 2010, .

18. "Fundamental Symmetries in Exciton Condensates in Double Quantum Wells"Academy of Sciences of Moldova, Chisinau, Moldova, Jan./11/2010,

19. "."Time Reversal Symmetry and the role of Spin in Unconventional Excitonic Pairing, *Institute of Applied Physics of the Academy of Sciences of Moldova*, Kishinev, Moldova, 26/November 2009.

20. "Unconventional Pairing in Excitonic Condensates under Spin Orbit Coupling"Proceedings of the International Conference on Advanced Optoelectronics and Lasers, Alushta, Ukraine, 29/September-4/October 2008,

21. "."Excitonic Condensation under Spin-Orbit Coupling, *10'th International Conference on Squeezed States and Uncertainty Relations*, Bradford, UK, 31/March-4/April 2007.

22. "Short time non Markovian Decoherence: Criticizing the Two-Level Approximation", *Moscow International Symposium on Magnetism (MISM)Dedicated to the 250'th anniversary of the Lomonosov Moscow State University*, Moscow State University/ Moscow/Russia, June 25-30 2005.

23. "Non-perturbative ground state properties of the 2-D Holstein-Hubbard model", *Andronikashvili School and Workshop on Modern Problems in Condensed Matter Physics*, E. Andronikashvili Institute of Physics, Georgian academy of Sciences/Tbilisi/Georgia, 15 October-23 October 2000.

24. "Five lectures on Continuous and discrete quantum phase space: A unified approach a la canonicality and covariance", *Research semester on current problems in Quantum Field Theory*, Feza Gürsey Institute, Kandilli, Istanbul, June 16-21 2000.

25. "Quantum Mechanics on the discrete phase space ", *Mathematical Physics IX*, International Conference, Feza Gürsey Institute, Kandilli, Istanbul. Aug.9-15 1999

26. "Wigner function in discrete quantum mechanics ", *Optical systems in phase space and their Wigner functions*, International Workshop, Centro Internacional de Ciencias/Universidad Nacional Autonoma de Mexico. July 1999

27. "A Canonical and Algebraic Perspective into the Quantum Phase Space", *Eskişehir Anadolu Univ.*, Workshop, 29 Oct. 1998.

28. "Finite Dimensional Schwinger basis and algebraic quantum phase", *Quantum Groups and contractions*, International Workshop, Boğaziçi Univ.. 14-17 Sept. 1997

29. "Kaos ve Karmaşıklıkta Matematiksel Yöntemler", *Hacettepe Univ.*Biyolojik Kaos, Panel Discussion, 17 Jan. 1997.

30. "Phase Space Analysis of Interacting Systems, Wigner Function, Quantum State Tomography", *Fizikte Geometri ve Topoloji Kiş Okulu*, Izzet Baysal Univ. Bolu and TÜBITAK, 29 Ocak-2 Şubat 1996.

31. "Quantum groups, Quantum Deformations and invertible non-linear maps", *Group Theory in Physics: Barut Memorial*, Conference, International Center for Physics and Applied Mathematics (ICPAM) Edirne. 21-27 Dec. 1995

32. "Operational Quantum Limits on Polarization Measurement", *Electron Theory and Quantum Electrodynamics*, NATO-ASI, International Center for Physics and Applied Mathematics (ICPAM) Edirne, Turkey. January 1994

33. "Phase in Quantized Angular Momentum Representation of the Free Electromagnetic Field", *Frontiers in Mathematical Physics*, International Center for Physics and Applied Mathematics (ICPAM) Edirne, Turkey, January 1994.

34. "Quantized Phase States of SU(2)", *3rd. International Wigner Symposium*, Oxford,England, September 1993.

35. "Intermittency versus Non-Intermittency in High Energy Collisions", *Workshop on Intermittency in High Energy Collisions*, Center for Complexity, Santa Fe U.S.A.. April 1990

- Other talks and presentations:

36. "Interband Radiative Instability and Critical Casimir Effect in Exciton Condensates in Coupled Quantum Wells"International Conference on Spontaneous Coherence in Excitonic Systems in Ecole Polytechnique Federale de Lausanne, *Lausanne, Switzerland*, to be held between 7-11/February 2011, .

37. "Lectures on Condensed Matter Field Theory"Institute of Theoretical and Applied Physics, *Turunc Marmaris,Turkey*, 15-30 July 2009, .

38. "Unconventional Pairing and Fundamental Symmetries in Exciton Condensates"Cambridge University-ITAP Workshop for Young Scientists: Electronic/Optical Coherence in Low Dimensional Semiconductors and Atomic Gases, *Institute of Theoretical and Applied Physics (ITAP)*Turunc Marmaris,Turkey, 19-29 September 2009,

39. "."Excitonic Condensation under perturbative magnetic field and spin-orbit coupling, *International Conference on Semiconductor Materials and Optics*, Warsaw, Poland, 18-21 October 2007.

40. "Macroscopic Quantum Coherence, Groundstate degeneracy and Gauge Invariance", *Istanbul Technical University, Dept. of Physics*, 2 Nov. 2001,

41. "."Phase space in Mechanics, Argonne National Laboratory, Argonne, IL 60439, USA, , 9 October 2000..

42. "A canonical-Algebraic formulation of the quantum phase problem: A phase space approach", *Feza Gürsey Institute/Istanbul*, 25 March 1999,

43. "."The Quantum Canonical Transformations and the quantum Phase: A canonical-algebraic approach, Math. Dept. Bilkent Univ., , 12 Nov. 1998.

44. "The Quantum Phase: A dream of Dirac", *Phys. Dept. Bilkent Univ.*, 14 Oct.1998,

45. "."Quantum phase space, M.E.T.U., Physics Dept., , Dec. 10 1997.

46. "Finite Dimensional Schwinger basis and algebraic quantum phase", *M.E.T.U., Physics Dept.*, 15 Nov. 1998,

47. "."The Homographic Oscillator and its cyclic representations, Physical Applications of Quantum Groups Winter School, , Izzet Baysal Univ.. Jan. 1997

48. "Dynamical Effects of Low Temperature Anharmonicity in High T_c", *Koç Univ.*, Istanbul, . April 1996

49. "Phase Space Tomography in Fundamental Quantum Mechanics", *Middle East Technical Univ.*, Ankara, . March 1996

50. "Phase Probability Distributions in Weak Field Polarization Measurement", *Rochester Conf. on Quantum Optics*, Rochester, June 1995.

51. "Homographic Oscillator Basis for Quantum Phase Problem", *Rochester Conf. on Quantum Optics*, Rochester, June 1995.

52. "Operational Approach to Quantum Phase in Atom Field Interaction", *Rochester Conf. on Quantum Optics*, Rochester, June 1995.

53. "Dynamical Phonon Corelations in Solids", *TFD-15*, Kaş, . Oct. 26-29, 1995

54. "Phonon Squeezing in Conventional and High Temperature Superconductors I-II", *Middle East Technical University*, Ankara, October 1994.

55. "Phonon Squeezing in Superconductivity", *Istanbul Technical University*, Istanbul, May. 1994

56. "Properties of the Quantum Mechanical Phase in SU(2)", *Boğaziçi University*, Istanbul, December 1993.

57. "Chaos and Complex Systems", *Bilkent University Colloquium*, Ankara, November 1993.

58. "Wavelets:An Introduction", *Bilkent University*, Ankara, September 1992.

59. "Wavelets and Their Importance in Physics", *The University of Arizona*, Tucson, AZ U.S.A., April 1992.

60. "Long Range Behaviour of Hadronic Rapidity Correlations and Sum Rules", *The University of Arizona*, Tucson, AZ U.S.A., January 1991.

61. "A Field Theory Model with Constraints:An Analogy to Polymers", *The University of Arizona*, Tucson, AZ U.S.A., November 1990.

62. "Peierls Transitions and Low Dimensional Superconductivity", *The University of Arizona*, Tucson, AZ, U.S.A., May 1987.

Teaching Experience:

- Graduate courses:
  - ITU-FIZ606E Condensed Matter Physics II (To be delivered in the Spring 2024)
  - ITU-FIZ509E Condensed Matter Physics I (Fall 2022, Fall 2023)
  - ITU-EBT617E Theoretical and Computational Condensed Matter Physics For Physicists, Material Scientists and Engineers (Course-II on Quantum Technologies graduate program, Spring 2022)
  - ITU-EBT617E Solid State Technologies from Quantum Mechanics to Quantum Engineering (Course-I on Quantum Technologies graduate program, 2019)

- ITU-EBT617E Advanced Topics in Energy Science and Technology (Course-IV on Quantum Technologies graduate program): Quantum Thermodynamic Systems and Engines for Physicists and Engineers (2019)
- ITU-FIZ667E Special Topics in Condensed Matter Physics II (Course-III on Quantum Technologies graduate program): Modern Condensed Matter Physics with Applications in Coherent Quantum Optomechanical Devices (2018)
- ITU Prepared a package curriculum for an eight-course advanced graduate program for "Quantum Technologies in Energy" (2015)
- PHYS 544 Advanced Graduate Quantum Mechanics, spring 2012 (Bilkent)
- PHYS 561 Special Topics in Condensed Matter Physics Part-I, spring 2011 (Bilkent)
- ITAP Advanced Lectures on Field Theoretical Methods in Condensed Matter Physics, Institute of Theoretical and Applied Physics, 2009
- Workshop on Field Theoretical Methods in Condensed Matter Physics-2006-Part I 15 January-3 February 2006 Feza-Gursey Institute/Istanbul
- Workshop on Field Theoretical Methods in Condensed Matter Physics-2005-Part I: 28 August-4 September 2005
- Workshop on Field Theoretical Methods in Condensed Matter Physics III: 20 March-15 April 2005
- ITAP Workshop on Field Theoretical Methods in Condensed Matter Physics II 31 August-10 September 2004
- Workshop on Field Theoretical Methods in Condensed Matter Physics I 1-23 July 2004
- PHYS557 Special Topics in Mathematical Physics (Bilkent)
- PHYS 548 Advances in Condensed Matter Physics II (Bilkent)
- PHYS541-542 Theory of Electromagnetism I-II (Bilkent)
- PHYS 553 Methods in Mathematical Physics (Bilkent)
- PHYS 551 Analytical Mechanics (Bilkent)

• Undergraduate courses:

- FIZ431E Condensed Matter Physics - I (ITU Physics Dept.)
- PHYS 405 Theory of Special Relativity (Bilkent)

- PHYS 205-206 Classical Mechanics I-II (Bilkent)

- PHYS 449 Group Theory (Bilkent)
- PHYS 334 Statistical Mechanics (Bilkent)
- PHYS 244-245 Methods of Mathematical Physics I-II (Bilkent)

- PHYS 256 Introduction to Quantum Physics (Bilkent)
- PHYS 453 Fundamentals of Nuclear and Particle Physics (Bilkent)
- PHYS 471 Numerical Computations in Physics (Bilkent)

Theses Supervised:

- Ph.D.:

1. E. Özgün, "Exciton Condensation in Semiconductor DQWs", August 2015. Assist. Prof. of Physics at Hacettepe University.
2. Mehmet Günay, "Creating Synthetic Gauge Fields for Exciton Condensates in semiconductor DQW heterostructures", August 2016.
3. K. Savran, "Nonresonant Decoherence an dissipation in multilevel Quantum Computational Systems", June/2006. He works in a R&D software company..
4. C. Fırat (Energy Institute, Istanbul Technical University), "External dissertation advisor for the thesis entitled Nanoscopic effects in thermodynamic properties of quantum gases", June/2008.
5. Z. Fatih Öztürk (Energy Institute, Istanbul Technical University), "External dissertation advisor for the thesis entitled Nanoscale effects in the transport of quantum gases", June/2008.

- M.S.:

1. Cem Sanga, "A first-principles study on the unconventional CDW and phonon softening in transition metal dichalcogenides", expected: May 2024.
2. M. Yönaç, "Derivation of the Hartree-Fock phase diagram of the 2-D Hubbard Model", May 2005. PhD from U. of Rochester.
3. A. Siddiki, "Low Temperature Thermodynamics of the Finite-Discrete Quantum Quartic Oscillator in One Dimension", September 1999. PhD Max-Planck Institute. He is now a faculty member at Istanbul Univ.
4. Hakan Türeci, "Electron-Anharmonic Phonon Interactions in High Temperature Superconductors", September 1996. PhD Yale Univ. He is now a faculty member at Princeton Univ.

- U.G. (Senior Project):

    1. Ahmet Seha Alpsoy, "*Thermal Phonon Hall Effect in insulating Transition-Metal di-Chalcogedines*", ITU Physics Department Senior Project, Expected: June 2024.

    2. Ahmet Seha Alpsoy, "*Simulating Physical Models with Topoelectric Circuits*", ITU E.E. Department Senior Project, August 2023.

    3. Fikret Gencer, "*Developing a Numerical Code for a General Tight-Binding Approach*", ITU Physics Department Senior Project, June 2019.

GRANTS OBTAINED

Sponsor:	Turkish Government
Project Title:	ITAP 2013 Summer Schools and Workshops
Date:	2013
Amount:	200.000 USD
Sponsor:	Academia Sinica
Project Title:	Eurasia-Pasific Summer School and Conference on Strongly Correlated Electrons (in ITAP 2012 program)
Date:	9-20July 2012
Amount:	15.000 USD
Sponsor:	Asia Pasific Center for Theoretial Physics, Korea
Project Title:	Eurasia-Pasific Summer School and Conference on Strongly Correlated Electrons (in ITAP 2012 program)
Date:	9-20July 2012
Amount:	10.000 USD
Sponsor:	Turkish Government
Project Title:	For supporting 2012 academic program in ITAP
Date:	300.000 TL
Amount:	
Sponsor:	Asia Pasific Center for Theoretial Physics, Korea
Project Title:	Eurasia-Pasific Summer School and Conference on Strongly Correlated Electrons
Date:	4-14July 2011
Amount:	10.000 USD
Sponsor:	ICAM (USA)
Project Title:	Cambridge University - ITAP Joint International School for Young Scientists
Date:	19-29/September 2009
Amount:	25000 USD
Sponsor:	UNESCO (Int)
Project Title:	Increasing the international participation in Institute of Theoretical and Applied Physics (ITAP) activities
Date:	1/July/2008-31/Dec./2009
Amount:	26000 USD

Sponsor:	Turkish Foundation for Scientific and Technological Research
Project Title:	Physics Olympiad School for High School Physics Teachers
Date:	1/Sept/2009-1/Sept/2014
Amount:	
Sponsor:	Deutscher Akademischer Austausch Dienst (DAAD) & TUBITAK
Project Title:	Nonlinear Screening in single and double layer Quantum Hall systems
Date:	1/Jan./2008-1/July/2008
Amount:	16000 USD
Sponsor:	National State Planning Organization
Project Title:	International Advanced Research School (IARS): A Joint 3-year graduate research training program between Bilkent Univ. ITAP and Feza Gursey Institute
Date:	1/Nov./2009-30/Jan./2012
Amount:	925.000 USD
Sponsor:	TUBITAK
Project Title:	Advanced Winter Research School on Nonlinear Screening in quantum Hall Systems
Date:	28 Jan/3 Feb. 2008
Amount:	8300 USD
Sponsor:	TUBITAK
Project Title:	Thomas-Fermi-Poisson Screening and the Incompressible Strips in Quantum Dots
Date:	1/June/2006-1/June/2008
Amount:	180.000 USD
Sponsor:	TUBITAK
Project Title:	Organizer: Advanced Research Training School on Condensed Matter Physics-2005
Date:	8 August-4 September 2005
Amount:	7000 USD
Sponsor:	Deutscher Akademischer Austausch Dienst (DAAD)
Project Title:	For the organization of the Advanced Research Training School on Transport in Low Dimensional Systems
Date:	21 March-15 April 2005
Amount:	6000 USD
Sponsor:	TUBITAK-Ankara University
Project Title:	For the organization of the Anvanced Research Training School on Condensed Matter Physics/Part II-Applications
Date:	August/23-Sept/10-2004
Amount:	10.000 USD

Sponsor:	TUBITAK-Feza Gürsey Institüte
Project Title:	For the organization of the Anvanced Research Training School on Condensed Matter Physics/Part I-Methodology
Date:	July/1-July/23-2004
Amount:	2000 USD
Sponsor:	TUBITAK-Feza Gürsey Institüte
Project Title:	For the Organization of The Summer School on Quantum Computation at the Atomic Scale
Date:	June 1-11 2003
Amount:	4000 USD
Sponsor:	TUBITAK
Project Title:	Quantum Computation with rf-SQUIDS and Josephson Junctions in the flux regime
Date:	1.2.2002-1.2.2004
Amount:	6000 USD
Sponsor:	University of Maryland and Bilkent University
Project Title:	Collaboration with Dynamical Systems and Accelerator Theory group headed by A. J. Dragt in the Physics Department , University of Maryland
Date:	Jan.1/2001-May.1/2001
Amount:	20000 USD
Sponsor:	UNESCO Venice Office, Andronikashvili Institute of Physics, Georgian Academy of Sciences
Project Title:	Invited talk at E. Andronikashvili school and workshop on modern problems in condensed matter physics
Date:	15 October-23 October 2000
Amount:	1000 USD
Sponsor:	TUBITAK/NATO-B2, Argonne Nat. Labs and Bilkent University
Project Title:	Collaboration with C. Zachos at Argonne N.L./High Energy Physics Div. on quantum phase space and Wigner function formalism
Date:	Aug.1/2000-Dec.30/2000
Amount:	20000 USD
Sponsor:	Centro Internacional de Ciencias, UNAM Mexico
Project Title:	Collaboration with K.B. Wolf and N. Atakishiev on Fractional Fourier-Kravchuk Transformation
Date:	1-29 July 1999
Amount:	5000 USD

Sponsor:	TUBITAK-NATO CP
Project Title:	Invitation for M. Ye. Zhuravlev, Kurnakov Institute for General and Inorganic Chemistry, Russian Academy of Sciences, Moscow/Russia
Date:	
Amount:	3000 USD
Sponsor:	TUBITAK
Project Title:	Director,for the Organization of *Quantum Optics and Spectroscopy* of Solids Summer School
Date:	July 2-10 1995
Amount:	9645 USD
Sponsor:	I.C.T.P. (Italy)
Project Title:	for the Organization of Quantum Optics and Spectroscopy of Solids Summer School
Date:	July 2-10 1995
Amount:	3000 USD
Sponsor:	TUBITAK
Project Title:	Collaboration with A. Miranowicz, Physics Dept., A. Mickiewicz Univ. Poznan, Poland
Date:	10-30 August 1996
Amount:	940 USD
Sponsor:	CNR-TUBITAK joint project
Project Title:	Amplification, Processing and Observation of Quantum Radiation in Phase Space
Date:	August 1996-August 1999
Amount:	6000 USD