CURRICULUM VITAE

PERSONAL INFORMATION

Name and Surname : Özay GÜRTUĞ

Date of Birth : 1 August 1965

Place of Birth : Lefkoşa/KKTC

Citizenship : TC/KKTC

Academic Status : Professor of Physics

Address : Physics Department, Eastern Mediterranean University (EMU)

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ACADEMIC QUALIFICATIONS

Ph.D.	:	Physics, EMU (1997)
Theses	:	New Extensions of the Colliding Wave Solutions in General Relativity
M.Sc.	:	Physics, EMU (1992)
Theses	:	Study on the Feasibility of a Capacitative Transducers
B.Sc.	:	Electric and Electronic Engineering, EMU (1997)

RESEARCH INTERESTS

- Nonlinear interaction of gravitational waves
- Singularities in black holes and colliding gravitational wave spacetimes
- Analysis of timelike naked singularities with quantum fields
- Nonlinear electrodynamics

CHRONOLOGY

- September 1999 – April 2004, Assistant Professor, Department of Physics (EMU)
- April 2004 –February 2005, Associate Professor, Department of Physics (EMU)
- March 2005 – September 2005, Visiting Scholar, Boğaziçi University
- September 2005 – April 2011, Associate Professor, Department of Physics (EMU)
- April 2011 – To date, Professor , Department of Physics (EMU)

TEACHING EXPERIENCE

Taught Courses

- PHYS 101 (Physics I, mechanics)
- PHYS 102 (Physics II, electricity, magnetism and thermodynamics)
- PHYS 1001 (Physics I, mechanics, Marmara University)
- PHYS 1002 (Physics II, electricity and magnetism, Marmara University)
- MATH 255 (Differential Equations: Marmara University)
- PHYS 106 (Physics for Architectures)
- PHYS 522 (Electromagnetic Theory I)
- PHYS 511 (Advanced Mathematical Methods For Engineers and Scientists I)
- PHYS 611 (Advanced Mathematical Methods For Engineers and Scientists II)
- PHYS 612 (Mathematical Methods for Physicists II)
- PHYS 622 (Electromagnetic Theory II)

SUPERVISED Ph. D and M.Sc. THESES

Ph. D. Theses

1. "**Quantum Singularities in (2+1)- Dimensional Matter Coupled Black Hole Spacetimes**" (with O. Unver, completed in December 2011)
2. "**Exact Solutions and their Physical Properties in a model of f(R)-Gravity**" (with T. Tahamtan, completed in February 2013)

M.Sc. Theses

1. "**A Solution of Source Free Maxwell Equation in the Background Field of a Stationary Cosmic String**". (with Hanifa Teimourian, graduated in February, 2008).
2. "**Low Frequency Electromagnetic Fields and Its Possible Effects on Health**". (with Ali Dayı, graduated in January 2011).
3. "**Self-Adjoint Extensions of the Operators and their Applications in Physics**", (Kıymet Emral, graduated in September 2012).
4. **"Seismic AVO Attributes and Rock Physics in Hydrocarbon Exploration",** (Vajiheh Jalali ,graduated in January 2014).
5. **"The Effect of Probe Pressure on In Vivo Single Fiber Reflectance Spectroscopy",** (Ali Akbar Shakibaei, graduated in January 2014).
6. **"Effect of Extremely Low Frequency Magnetic Field on the Growth Rate of Bacteria",** (Akhink Akram Hassan, graduated in September 2015).

ATTENDED NATIONAL/INTERNATIONAL SCHOOLS AND WORKSHOPS

- 10^{th} Brazilian School, Cosmology and Gravitation. Rio de Janeiro, Brazil, 2002
- Advanced School and Conference on Sources of Gravitational Waves, ICTP, Trieste, Italy, 2003.
- Quantization, Dualities and Integrable Systems, Ankara University, Ankara-Turkey, 23-25 April, 2009.
  Title of My Presentation: Quantum Singularities in Higher Dimensional Einstein-Yang-Mills-Dilaton Black Holes
- Gravity - New Perpespectives from Strings and Higher Dimensions, Centro de Ciencias de Benasque Pedro Pascual, Benasque-Spain, 12-24 July, 2009.
- Quantization, Dualities and Integrable Systems, Yeditepe University, Istanbul-Turkey, 23-25 April, 2010.

  Title of My Presentation: Theorem to Generate Einstein - Nonlinear Maxwell Fields.
- Quantization, Dualities and Integrable Systems, Koç University, Istanbul-Turkey, 19-20 April, 2014.

  Title of My Presentation: Remarkable Consequences of Colliding Gravitational and Electromagnetic Plane Waves in general relativity.

NATIONAL AND INTERNATIONAL CONFERENCES

1. **"Üniversite Birinci Sınıf Öğrencilerinde Maddenin Yapısı ile İlgili Kavramlar ve Yanılgılar"**, I. Semiz, A.Bilsel ve **O. Gurtug,** IV. Ulusal Eğitim Bilimleri Kongresi, Eskişehir, 10-12 Eylül 1997.
2. **"Effect of NUT Parameter on the Analytic Extension of the Cauchy Horizon that Develop in Colliding Wave Spacetimes"**, **O. Gurtug,** V. Topical Conference on Elementary Particles, Astrophysics and Cosmology, Miami 2008, Fort Lauderdale, Florida, 16-21 December 2008.
3. **"2+1 Dimensional Magnetically Charged Solutions in Einstein - Power - Maxwell Theory"**, **O. Gurtug,** VII. Topical Conference on Elementary Particles, Astrophysics and Cosmology, Miami 2010, Fort Lauderdale, Florida, 14-19 December 2010.
4. **"A wavy way leading to the Kerr metric and its quantum singularity analysis", O. Gurtug**, Topical Conference on Theoretical Physics, Iran IPM, 2015

ADMINISTRATIVE DUITIES

- Feb. 2003 – Feb 2005. Coordinator of the Academic Affairs of the Rector's Office.
- Elected member of Senate (2003-2005 Academic Years)
- Academic Advisor, North Cyprus Education Foundation, Board of Trustees (from September 2006 - October 2009)
- Rector Advisor, (from October 2009- October 2014)
- Member, Techno-Park Governing Board, (from February 2012 – To date)
- Elected member of Senate (2013-2015 Academic Years)
- Elected member of Senate (2015-2017 Academic Years)

PUBLICATIONS IN PEER REVIEWED JOURNALS

1. M.Halilsoy and **O. Gurtug**, "***On Some Properties of NUT-Curzon Space Time***". Il Nouvo Cimento, Vol: **109 B**, No:9, pp: 963-971, (1994).
2. **O. Gurtug,** "**A New Extension of The Ferrari-Ibanez Colliding Wave Solution**". General Relativity and Gravitation Vol: **27**. No : 6, pp:651-655, (1995).
3. **O.Gurtug** and M. Halilsoy, "**New Colliding Wave Solutions in the Einstein-Abelian Gauge and Einstein-Maxwell-Dilaton Theories**". Il Nouvo Cimento Vol. **113 B**, No:1, pp: 69-80, (1998).
4. **O.Gurtug** and M. Halilsoy, " **Effect of Sources on the Inner Horizon of Black Holes.**" Physical Review **D** . Vol: **64** , 084023, (2001).
5. **O.Gurtug** and M. Halilsoy, " **Failure of a Stability Conjecture in General Relativity**". Il Nuovo Cimento Vol: **117 B** , No: 5, pp: 493 – 499, (2002).
6. **O.Gurtug** and I. Sakalli, " **Cosmic Strings Coupled With a Massless Scalar Field"**, International Journal of Theoretical Physics, Vol. **42**, No: 8, pp:1863 – 1876, (2003).
7. **O. Gurtug**, M. Halilsoy and I. Sakalli, " **New Singular and Nonsingular Colliding Wave Solutions in the Einstein – Maxwell – scalar Theory**", General Relativity and Gravitation, Vol.**35**, No: 12, pp:2159 – 2170, (2003).

8. **O. Gurtug,** M. Halilsoy and O. Unver, "**Reflection of Electromagnetic Waves From Mixtures of Plane Gravitational and Scalar Waves**" Physical Review **D** . Vol: **74** , 044020, (2006).
9. M.Halilsoy and **O. Gurtug**, " **Search For Gravitational Waves Through The Electromagnetic Faraday Rotation.**" Physical Review **D** . Vol: **75** , 124021, (2007).
10. **O. Gurtug** and M.Halilsoy, "**Colliding Wave Solutions in a Symmetric Non-Metric Theory**." International Journal of Theoretical Physics, Vol. **48**, pp:139 – 149, (2009).
11. **O. Gurtug** and M.Halilsoy, "**Effect of NUT Parameter on the Analytic Extension of the Cauchy Horizon that Develop in Colliding Wave Space – Times**", Int. Jour. Mod. Phys. **A**, Vol:24, pp:3171-3190, (2009) .
12. **O. Gurtug** and M.Halilsoy,"**Restricted Class of Colliding Einstein – Yang – Mills Plane Waves**", Int. Jour. Mod. Phys. **A**, Vol:24, pp:5579-5585, (2009).
13. S. Habib Mazharimousavi, **O. Gurtug** and M. Halilsoy, " **Generating Static, Spherically Symmetric Black Holes in Lovelock Gravity**", Int. Jour. Mod. Phys. **D**, Vol:18, pp:2061-2082, (2009).
14. S. Habib Mazharimousavi, M. Halilsoy, İ. Sakalli and **O. Gurtug " Dilatonic Interpolation between Reissner-Nordstrom and Bertotti-Robinson Spacetimes with Physical Consequences**", Classical and Quantum Gravity, **27**, 105005, (2010).
15. S. Habib Mazharimousavi, M. Halilsoy and **O. Gurtug** " **Theorem to generate Einstein-nonlinear Maxwell fields** ", Classical and Quantum Gravity, **27**, 205022, (2010).
16. O.Unver and **O. Gurtug**, **" Quantum singularities in (2+1)- dimensional matter coupled black hole spacetimes.**" Physical Review **D** . Vol: **82** , 084016, (2010).
17. S. Habib Mazharimousavi, **O. Gurtug** , M. Halilsoy and O. Unver, "**2+1 dimensional magnetically charged solutions in Einstein - Power - Maxwell theory**" Physical Review **D** . Vol: **84** , 124021, (2011).
18. **O. Gurtug,** S. Habib Mazharimousavi, and M. Halilsoy, "**2+1-dimensional electrically charged black holes in Einstein - Power - Maxwell theory**" Physical Review **D** . Vol: **85** , 104004, (2012).
19. **O. Gurtug** and T. Tahamtan, "**Quantum singularities in a model of f(R) gravity**", European Physical Journal **C**, Vol:**72**, 2091, (2012).
20. M. Halilsoy, **O. Gurtug** and S. Habib Mazharimousavi, "**Rindler Modified Schwarzschild Geodesics",** General Relativity and Gravitation. Vol. 45, 2363 (2013).
21. S. Habib Mazharimousavi, M. Halilsoy and **O. Gurtug** "**A new Einstein-nonlinear electrodynamics solution in 2+1-dimensions",** Eur. Phys. J. C 74, 2735 (2014).
22. **O. Gurtug,** M. Halilsoy and S. Habib Mazharimousavi, "**Quantum probes of timelike naked singularities in the weak field regime of f(R) global monopole spacetime**", Journal of High Energy Physics, 01, 178, (2014).
23. M. Halilsoy, S. Habib Mazharimousavi and **O. Gurtug,** " **Emergent cosmological constant from colliding electromagnetic waves** " Journal of Cosmology and Astroparticle Physics, 11, 010, (2014).
24. M. Halilsoy, **O. Gurtug** and S. Habib Mazharimousavi, " **Modified Rindler acceleration as a nonlinear electromagnetic effect** ", Astroparticle Physics 68, 1 (2015).
25. **O. Gurtug,** M. Halilsoy and S. Habib Mazharimousavi, "**Quantum probes of timelike naked singularities in 2+1- dimensional power-law spacetimes**", Advances in High Energy Physics, dx.doi.org/10.1155/2015/684731 (2015).

Research Statement

My research interests cover the most challenging topics of Einstein's Theory of Relativity. These are gravitational waves, black holes and singularities.

One of the important predictions of Einstein's Theory of Relativity was the gravitational waves. The first experimental evidence of such waves has recently announced by the LIGO Scientific Collaboration and Virgo Collaboration on 11 February 2016. With this achievement gravitational waves are no more theoretical subject of the Einstein's theory. Gravitational waves are described by the ripples in the space-time. The possible sources of gravitational waves are moving stars, orbiting binary neutron stars, black hole collisions or supernova explosions. These waves, unlike the electromagnetic waves in linear Maxwell theory, produce significant results as they pass through each other. The reason is that Einstein's equations which describe gravitational waves are highly non-linear. Hence, as the waves pass through each other, they interact nonlinearly and produce significant interaction. During my Ph.D. studies, I investigated the collision of plane gravitational waves and studied their physical properties. The remarkable feature of the collision of gravitational waves is that, due to the mutual focusing, after the collision in a finite time and a position an inevitable curvature singularities develop. Curvature singularities in gravity represent the location where the physical quantities like the gravitational fields becomes infinite.

Another important prediction of Einstein's theory is the black holes which are known to have strong gravitational attraction so that even the light cannot escape. Black holes may develop when a star is dying. This is known as gravitational collapse. Singularity also exists in black holes. But outside observes cannot see this singularity because it is hidden by the event horizon of a black hole. If this singularity is not hidden then it is called *naked* singularity.

The mathematical theory of black holes and of colliding gravitational waves are structurally similar. Because of these similarities, my collaborators and I have managed to join the two seemingly distinct topics. Investigating the nature of the structure of the curvature singularities, especially the naked singularities, constitutes my major research interest in recent years. Understanding and the resolution of naked singularities in general relativity remain one of the most challenging problems to be solved. It is widely believed that the scales where this singularity forms, classical attempts toward the resolution should be replaced by the quantum theory of gravity. This motivates me to investigate the formation and stability of naked singularities within the framework of quantum mechanics. This is achieved by probing the singularity with waves obeying the Klein-Gordon, Maxwell and Dirac fields.

I completed two Ph.D. projects in this field. Static spherically symmetric systems are considered in 2+1 and 3+1 dimensions. Now, I am working to extend this study to static cylindrically symmetric systems. Another project is to extend this study for stationary systems. Besides my major field of research, I am also interested in working on obtaining new solutions to the field equations of Einstein – Nonlinear Maxwell theory.

Administrative Experiences

I have been involved in various administrative duties since 2003. I was initially an academic coordinator for the vice rector of academic affairs. Later, I became the advisor for the North Cyprus Education Foundation, Board of Trustees.

I have been involved in many committees. The important ones are academic planning, strategic planning, quality in education, curriculum, performance evaluation of academic staff, budgeting and developing/improving academic assessment criterions.

Finally, I was an advisor to the Rector of Eastern Mediterranean University. I had represented the rector in many important committees that aimed for the development of the university (both in academic and administrative). During this period, I was also in charge of the preparation of the protocols on behalf of the university to be settled with other universities, ministries or other organizations.