

CURRICULUM VITAE

Personal data

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Date of Birth: April 24, 1952; **Citizenship:** Romanian; **Marital status:** Married

Languages: Romanian, English, French

	Education
Institution	University of Bucharest, Department of Physics
	1971-1976
Degree	B. Sc. Degree in Physics, M. Sc. Degree in Nuclear Physics
Institution	University of Bucharest, Department of Physics
	1992-1995
Degree	Ph. D. Degree in Physics (1995)
	Field: Quantum Optics

Present Appointment	Professor of Physics University of Bucharest, Department of Physical Chemistry
	POSITIONS HELD IN THE LAST YEARS
Positions held in the last years	- October 2000-present: Professor of Physics, Department of Chemistry, University of Bucharest - 1.04. 2011-present: Professor of Physics, Department of Physical Chemistry, University of Bucharest - 1998-2000- Associate professor of Physics - 1993-1998- Lecturer of Physics - 1990-1993- Teaching assistant of Physics

Institution	Polytechnica University of Bucharest, Department of Electronics, Group of Physics
1981-1990	
Position held	Teaching assistant of Physics
Research	Condensed matter physics
1976-1981	High-school teacher, Bucharest
Present Research	<p>In the last two decades my research work was concentrated in the fields of quantum optics (especially in the period 1990-2000) and quantum information processing beginning with 2001. Quantum optics was a pioneering research area in our country although the necessary theoretical background was generously given in Romanian Physics departments. In the last decade interest in non-classicality of one-mode states renewed owing to important applications in the emerging field of quantum information processing. Decoherence was in 2000's an incipient area of interest, especially for observing time evolution of some non-classical features of the states. What in recent papers is called "sudden death of non-classicality" was remarked earlier in our papers as the "destruction of any non-classical features by values of thermal mean occupancy exceeding the threshold $1/2$. We gave an appreciated description of one-mode Gaussian states (1992-1993) using various representations of their density operators (~175 citations).</p> <hr/> <p>Most of my recent scientific work lies at the intersection of quantum optics and information theory. Indeed, a lot of experiments in the area of quantum information processing (teleportation, cryptography) have been performed with light – either single photons, or beams of laser light. Therefore, when speaking about the continuous-variable quantum information one means the processing of the electromagnetic field. As the field is a quantum system we are inevitably dealing with concepts and methods of quantum optics. Fortunately, in quantum optics detecting and quantifying non-classicality is a well defined and explored issue, at least in the one-mode case. Quantifying non-classicality of one-mode states was at the heart of my research beginning with 2001. We used distance-type measures such as Bures and Hilbert-Schmidt distances (2002, 2004). Also important was our usage of relative entropy (2004) and quantum Chernoff bound (2009) as measures of non-classicality for one-mode Gaussian states. Our papers on such issues collected ~70 citations until present days.</p> <hr/> <p>The two-mode field is the prototype of a bipartite continuous-variable system. Theoretically, it is a perfect test-bed for studying entanglement or other kinds of correlations between the two modes. Experimentally, it is the most accessible</p>
Quantum Optics	
Quantum Information Theory	
Recent Interests:	

Quantum correlations

quantum system, especially when dealing with Gaussian states. After giving some explicit evaluations of the Gaussian entanglement in terms of Bures distance we succeeded to obtain a very important result on the entanglement of formation for the same states. A spectacular example of quantum information processing, teleportation in the continuous-variable systems is an application of the non-local character of quantum theory. We thus gave the simplest description of the teleportation protocol in the continuous variable settings. More recently, we derived an important formula for the Uhlmann fidelity between Gaussian states whose applications are already tackled in the estimation theory. Another important result through its generality is the proof that the relative entropy is an exact measure of non-Gaussianity.

Until very recently it was believed that in quantum information we are dealing with only two quantifiable kinds of information, classical information contained in classical correlations and quantum entanglement as the potential of quantum states to exhibit correlations that cannot be accounted classically. Entanglement was largely viewed as a useful but rather unique resource in quantum information processing. However, an alternative classification for correlations based on quantum measurements has arisen in recent years. In particular, the quantum discord as a measure of quantum correlations beyond entanglement is currently attracting increasing interest. It is this kind of correlations that we are now interested in. We are investigating geometric measures of discord for two-mode Gaussian states using Hellinger and Bures distances.

My principal results in these fields published as a unique author or in collaboration can be cast in the following list:

- Characterization of one-mode Gaussian states. Quantifying non-classicality.
- Describing non-classical properties of single-mode non-Gaussian electromagnetic field states: squeezing or sub-Poissonian statistics
- Evolution of non-classicality of one-mode states under damping
- Measures of entanglement for two-mode Gaussian states.
- Continuous-variable teleportation protocol in the characteristic function description.
- Non-Gaussianity distance-type measures and their evolution under decoherence
- Dynamics of quantum correlations in open system description
- Quantum description of light polarization

Scientific Collaborators

- Professor Tudor A. Marian, Department of Physics, University of Bucharest
- Dr. Horia Scutaru, member of the Romanian Academy, Horia Hulubei National Institute of Physics and Nuclear Engineering (IFIN-HH), Bucharest

	<ul style="list-style-type: none"> • Dr. Madalina Boca, Department of Physics, University of Bucharest • Dr. Iulia Ghiu, Department of Physics, University of Bucharest • Professor Gunnar Bjork, Royal Institute of Technology (KTH), Stockholm, Sweden • Dr. Stefano Olivares, University of Milano. • Professor Luis Lorenzo Sanchez-Soto, Universidad Complutense, Madrid, Spain • Professor Andrei B. Klimov, Universidad de Guadalajara, Guadalajara, Jalisco, Mexico • Professor Ecaterina Niculescu, Politehnica University, Bucharest
Prizes 1993	<p>Recipient of the prize "Horia Hulubei" of the Romanian Academy for the group of papers:</p> <ol style="list-style-type: none"> 1. Paulina Marian and Tudor A. Marian: <i>Squeezed States with Thermal Noise. I. Photon- number Statistics</i> , Physical Review A 47, 4474-4486 (1993). 2. Paulina Marian and Tudor A. Marian: <i>Squeezed States with Thermal Noise. II. Damping and Photon Counting</i> , Physical Review A 47, 4487-4495 (1993).
Membership	<p>American Physical Society (since 1993). Referee for Physical Review A, Physical Review Letters, JOSA B, Physica Scripta</p>
Advisory Board Membership	<p>CEWQO 2007 (Palermo), CEWQO 2008 (Belgrad), CEWQO 2012 (Sinaia), CEWQO 2014 (Bruxelles). Programme Chair and Editor of the Proceedings of CEWQO 2012 (Sinaia). http://www.theory.nipne.ro/cewqo12/</p>
Citations	<p>~550 in refereed journals An updated list of citations can be seen here: http://barutu.fizica.unibuc.ro/caqp Hirsch index: 13</p>

<p>Seminars given</p>	<p>1) <i>Fidelity and Entanglement for Two-Mode Gaussian States</i>, seminar given at Harvard-Smithsonian Center for Astrophysics, Atomic and Molecular Physics Division Weekly Seminars, 14 August 2001: http://www.cfa.harvard.edu/itampsem/seminar.html</p> <p>2) <i>Teleportation of Mixed States of the Radiation Field</i>, seminar given at Harvard-Smithsonian Center for Astrophysics, Atomic and Molecular Physics Division Weekly Seminars, 11 August 2003. http://www.cfa.harvard.edu/itampsem/seminar.html</p> <p>3) <i>Measures of entanglement for 2-mode Gaussian states</i>, KTH/Nordita/SU seminar in theoretical physics, 2 June 2009, Stockholm, http://agenda.albanova.se/conferenceDisplay.py?confId=1341</p> <p>4) <i>Decay of non classicality in thermal reservoirs</i>, seminar given at the Workshop on Quantum Optics and Quantum Information, IFIN-HH Magurele, 11 Aprilie 2013.</p>
<p>Recent Talks given</p>	<p>1) Paulina Marian, <i>Gaussian entanglement of formation for two-mode Gaussian states</i> (co-authored with T.A. Marian), invited talk given at CEWQO 2007 (The 14th Central European Workshop on Quantum Optics, Palermo, Italy, June 1-5, 2007).</p> <p>2) Paulina Marian, <i>Quantum Chernoff bound as a measure of nonclassicality for Gaussian states</i> (co-authored with Madalina Boca, Iulia Ghiu, and TA. Marian) invited talk given at CEWQO 2008, (The 15th Central European Workshop on Quantum Optics, Belgrade, May 30-June 3, 2008).</p> <p>3) Paulina Marian, <i>Consistent entanglement measures for two-mode Gaussian states</i> (co-authored with T.A. Marian) talk given at ICSSUR & FF 2009 (11th International Conference on Squeezed States and Uncertainty Relations and Feynman 4th Festival, Olomouc, Czech Republic, June 2009).</p> <p>4) Paulina Marian, <i>Geometric measure of non-classicality</i> (co-authored with T.A. Marian), Plenary talk given at ICQI 2010 (International Conference on Quantum Information and Computation, Stockholm, October 4-8, 2010).</p> <p>5) Paulina Marian, <i>Quantum-to-classical transition of two-mode Gaussian states</i>, invited talk at the 20th Central European Workshop on Quantum Optics, Stockholm, Suedia, June 16 - 20, 2013.</p>

Research Stages Abroad	<p>α. Imperial College (Londra): 1998 (Quantum optics)</p> <p>β. ITAMP Harvard (Cambridge, MA, SUA) :1998 (Atomic Physics) 2001, 2003 (Quantum information processing)</p> <p>c. KTH Stockholm: 2009, 2010 (Quantum information processing)</p>
	Grants
Director of:	<p>1. Grant A :Purificare si inseparabilitate in Mecanica cuantica (cod 202 CNCSIS/1999)</p> <p>2-4. Grant A :Noi aplicatii ale teoriei sistemelor deschise in optica cuantica (durata 3 ani)</p> <p style="padding-left: 40px;">1. 2000 (Cod CNCSIS 1088) (valoare 23 milioane lei) 2. 2001 (Cod CNCSIS 245) (valoare 40 milioane lei) 3. 2002 (Cod CNCSIS 357) (valoare 30 milioane lei)</p> <p>5-7. Grant de tip A : Teleportarea si teleclonarea starilor cuantice: cod CNCSIS: 263 (durata 3 ani)</p> <p style="padding-left: 40px;">1. 2003: Teleportarea starilor gaussiene mixte(valoare 43 milioane lei) 2. 2004: Fidelitatea de teleportare a starilor mixte (valoare 110 milioane lei) 3. 2005 : Teleclonarea starilor cuantice ale sistemelor d-dimensionale (valoare 180 milioane lei)</p> <p>8. Grant PNII IDEI -- 2011: Quantum Correlations in Continuous-Variable Settings (Valoare 1 250 000 lei).</p>
Principal Investigator	<p>In other 9 grants: CERES nr 40/12.11.2002 (2002-2004), CNCSIS cod 1167 (2004-2006), CEEX 05-D11-68/11.10.2005 (2005-2007), PNII IDEI-995 (contract 141/1.10.2007) (2007-2010).</p>

Selected list of publications

a) ISI-papers

1. Iulia Ghiu, Paulina Marian, Tudor A. Marian, *Loss of non-Gaussianity for damped photon-subtracted thermal states* **Physica Scripta T160**, art. **014014 (2014)**.
2. Alessia Allevi, Maria Bondani, Paulina Marian, T. A. Marian and Stefano Olivares, *Characterization of phased-averaged coherent states*, **Journal of Optical Society of America B 30**, 2621-2627 (2013).
3. Paulina Marian and T. A. Marian, *Relative entropy is an exact measure of non-Gaussianity*, **Physical Review A 88**, 012322 (2013).
4. Iulia Ghiu, Paulina Marian and T. A. Marian, *Gaussification through decoherence*, **Physical Review A 88**, 012316 (2013).
5. Iulia Ghiu, Paulina Marian, Tudor A. Marian, *Measures of non-Gaussianity for one-mode field states*, **Physica Scripta T153**, art014028 (2013).
6. Paulina Marian and Tudor A. Marian, *Uhlmann fidelity between two-mode Gaussian states*, **Physical Review A 86**, 022340 (2012).
7. G. Bjork, J. Soderholm, L. L. Sanchez-Soto, A. B. Klimov, Iulia Ghiu, Paulina Marian, T. A. Marian, *Quantum degrees of polarization*, **Optics Communications 283**, 4440-4447 (2010).
8. 4. Iulia Ghiu, Gunnar Bjork, Paulina Marian, and Tudor A. Marian, *Probing light polarization with the quantum Chernoff bound*, **Physical Review A 82**, 023803 (2010).
9. Madalina Boca, Iulia Ghiu, Paulina Marian, and T. A. Marian, *Quantum Chernoff bound as a measure of nonclassicality for Gaussian states*, **Physical Review A 79**, 014302 (2009).

10. Paulina Marian and T. A. Marian, *Entanglement of formation for an arbitrary two-mode Gaussian state*, **Physical Review Letters** **101**, art 220403 (2008).
11. Paulina Marian and T. A. Marian, *Bures distance as a measure of entanglement for symmetric two-mode Gaussian states*, **Physical Review A** **77**, 062319 (2008).
12. Paulina Marian and T. A. Marian, *Non-Gaussian continuous-variable teleportation*, **International Journal of Quantum Information** **6** Supplement, 721–726 (2008).
13. Paulina Marian and T. A. Marian, *Gaussian entanglement of symmetric two-mode Gaussian states*, **The European Physical Journal Special Topics** **160**, 281 (2008).
14. Paulina Marian and T. A. Marian, *Optimal purifications and fidelity for displaced thermal states*, **Physical Review A** **76**, 054307 (2007).
15. Paulina Marian and T. A. Marian, *Continuous-variable teleportation in the characteristic function description*, **Physical Review A** **74**, 042306 (2006).
16. Paulina Marian, T. A. Marian, and H. Scutaru, *Distinguishability and nonclassicality of one-mode Gaussian states*, **Physical Review A** **69**, 022104 (2004).
17. Paulina Marian, T. A. Marian, and H. Scutaru, *Bures distance as a measure of entanglement for two-mode squeezed thermal states*, **Physical Review A** **68**, 062309 (2003).
18. Paulina Marian, Tudor A. Marian and Horia Scutaru, *Quantifying nonclassicality of one-mode Gaussian states*, **Physical Review Letters** **88**, 153601 (2002).
19. Paulina Marian, T. A. Marian and H. Scutaru, *Inseparability of mixed two-mode Gaussian states generated with a $SU(1,1)$ interferometer*, **Journal of Physics A** **34**, 6969-6980, (2001), (Special issue: Quantum Information and Computation).
20. Paulina Marian and Tudor A. Marian, *Environment-induced nonclassical behaviour*, **The European Physical Journal D** **11**, 257-265 (2000).

21. Paulina Marian and Tudor A. Marian, *Evolution of mixing during the damping of a number state*, **Journal of Physics A** **33**, 3595-3603 (2000).
22. Paulina Marian, *Second-order squeezed states*, **Physical Review A** **55**, 3051-3058 (1997).
23. Paulina Marian and Tudor A. Marian, *Generalized characteristic functions for a single mode radiation field*, **Physics Letters A** **230**, 276-282 (1997).
24. Paulina Marian and Tudor A. Marian, *Superposition states in cavities fed by injected atoms*, **Journal de Physique II (Paris)** **7**, 1753-1760 (1997).
25. Paulina Marian and Tudor A. Marian: *Photon number and counting statistics for a field with Gaussian characteristic function*, **Annals of Physics (New York)** **245**, 98-112 (1996).
26. Paulina Marian and Tudor A. Marian, *Destruction of higher-order squeezing by thermal noise*, **Journal of Physics A: Math. Gen.** **29**, 6233-6245 (1996).
27. Paulina Marian and Tudor A. Marian: *Photo-count statistics of quantum-mechanical superpositions of coherent states*, **Physics Letters A** **198**, 163-166 (1995).
28. Paulina Marian and Tudor A. Marian, *Squeezed States with Thermal Noise. I. Photon-number Statistics*, **Physical Review A** **47**, 4474-4486 (1993).
29. Paulina Marian and Tudor A. Marian, *Squeezed States with Thermal Noise. II. Damping and Photon Counting*, **Physical Review A** **47**, 4487-4495 (1993).
30. Paulina Marian, *Higher-order squeezing and photon statistics for squeezed thermal states*, **Physical Review A** **45**, 2044-2051 (1992).
31. Paulina Marian: *Higher-order squeezing properties and correlation functions for squeezed number states*, **Physical Review A** **44**, 3325-3330 (1991).

32. Paulina Marian, *Squeezing in multiphoton absorption*, **Journal of Modern Optics** **37**, 285-293 (1990).

b) Articles published in journals of the Romanian Academy

33. Paulina Marian and Tudor A. Marian, *On a power series involving classical orthogonal polynomials*, **Romanian Journal of Physics** **55**, 631-644 (2010).

34. Paulina Marian and T. A. Marian, *Continuous-Variable Teleportation: a New Look* , **Romanian Journal of Physics** **53**, 1153-1164 (2008).

35. Paulina Marian, T. A. Marian, and H. Scutaru, *Entanglement and teleportation of Gaussian states of the Radiation Field*, **Romanian Journal of Physics** **48**, 727 (2003).

36. Ecaterina Niculescu, Paulina Marian, and Alexandru Glodeanu, *Calculation of ionization energy of interstitial impurities in Silicon*, **Romanian Journal of Physics** **31**, 249-256 (1986).

37. Ecaterina Niculescu, Paulina Marian, and Ion M. Popescu, *Calculation of the energy levels of the shallow and deep donors in Silicon*, **Romanian Journal of Physics** **30**, 779-787 (1985).

38. Ecaterina Niculescu, Paulina Marian, and Ion M. Popescu, *Energy levels of donors impurities in GaAs and GaP*, **Romanian Journal of Physics** **30**, 843-849 (1985).