CURRICULUM VITAE

OLGA KOCHAROVSKAYA

EDUCATION

Dr. Habilitation, 1996, Institute of Applied Physics, Russian Academy of Sciences

Ph.D. 1986, N. I. Lobachevsky State University

Master Degree 1978, N. I. Lobachevsky State University, Nizhny Novgorod, Russia

ACADEMIC EXPERIENCE

Texas A&M University, Department of Physics and Astronomy:
Distinguished Professor 2007 – Present; Professor 2001 – 2007; Associate Professor 1998 – 2001
Institute of Applied Physics of the Russian Academy of Sciences: Leading Research Scientist 1996–2001; Senior Research Scientist 1992–1996; Research Scientist 1986 – 1991
Universite Libre de Bruxelles: Visiting Research Scientist 1990 – 1996
N. I. Lobachevsky State University, Nizhny Novgorod, Russia:
Ph.D. Student 1984 – 1986; Junior Research Scientist 1978 – 1984

HONORS

- The Herbert Walther Award of the German Physical Society (Deutsche Physikalische Gesellschaft) and Optica (formerly Optical Society of America) in quantum optics, atomic physics, and leadership in the international scientific community, 2024
  Citation: "For field-opening contributions to lasing without inversion and electromagnetically induced transparency, and for theory and experiments that initiated the field of gamma-ray quantum optics."
- The Norman F. Ramsey Prize in Atomic, Molecular and Optical Physics, and in Precision Tests of Fundamental Laws and Symmetries of the American Physical Society, 2023
  Citation: "For pioneering work in quantum coherence and x-ray quantum optics".
- The Distinguished Scientist Award of the Texas A&M University Chapter of Sigma Xi, 2012
- The University Distinguished Professor Award of the Texas A&M University, 2011
- Fellow of the American Physical Society, 2005
- The Distinguished Achievement Award in Research of the Association of Former Students and Texas A&M University, 2005
- The Distinguished Lecturer, Department of Physics, the University of Texas at Austin, 2005
- The Willis Lamb Award for Laser Physics and Quantum Electronics, Physics of Quantum Electronics Winter Symposium, 1998

- Fellow of the Optical Society of America (OSA), 1996
- Outstanding Young Dr. Habilitation (Dr. of physical and mathematical sciences) of the Russian Federation, Personal Grant of the President of the Russian Federation administrated by the Russian Academy of Sciences, 1996

SELECTED SYNERGISTIC ACTIVITIS

Scientific Advisory Board, Max Planck Institute of Nuclear Physics, Heidelberg, Germany, 2013-present
The Norman F. Ramsey Prize Committee (APS), 2012- present
The Charles Hard Townes Medal Committee, Optica (OSA), 2020-present, 2022 – Chair
Editorial Board of the International Journal "Laser Physics Letters", 2013 -present
Editorial Board of the International Journal "Laser Physics", 2013-present
Editorial Board of the International Journal "Photonics", 2023-present
Editorial Board of the MDPI Photonics 2023
Program Chair of the PQE conference (Winter Colloquium on the Physics of Quantum Electronics), Snowbird, Utah, 2015-present
Co-Organizer of the Annual International Workshop "Laser Physics", 2008-present.
Co-Organizer of the International Conference "Frontiers of Nonlinear Physics", 2001-2019
Program Committee of the International Conference on X-ray Lasers, 2014-present
College of Arts & Science Executive Distinguished Professor Committee, 2019 – present, 2020-2023, Chair
Texas A&M University Executive Distinguished Professor Committee, 2020-present
Texas A&M University Distinguished Professors Selection Committee , 2024-present.

Grants in support of research

2024-2027 PI, NSF "New Horizons in Quantum Nuclear X-ray Optics", Total: $582,920.

2023-2024 PI, NSF Supplemental funding for NSF grant "Quantum X-ray optics with ultra-narrow nuclear resonances in solids" Co-PI Yuri Shvydko, ANL. Total=$85,233.

2020-2023 PI, NSF grant "Quantum X-ray optics with ultra-narrow nuclear resonances in solids"
Co-PI Yuri Shvydko, ANL, Total = $426,176.00.

2018-2021 Co-PI, NSF "New Color Centers in Diamond: Towards Broadband Quantum Memories", PI: Alexey Akimov, Co-PI: O.K. and Phil Hemmer
Total = $339,846.00
2013-2017 PI, NSF grant:
"Quantum Interface between Gamma-Photons - Nuclear Ensembles", $266,150.

2017 Co-PI of the Grant of the Weismann Institute -Texas A&M Collaboration Program: "Quantum storage of spatially structured light" (PI: Nir Davisdon (WIS)), Total: $50,000, TAMU share: $8000.

2013-2017 –Principal Investigator of the NSF Grant:
"Dynamical Control of Light-Matter Interactions", $225, 000.

2009 – 2013 – Principal Investigator of the NSF Grant
"Control of atoms-light and nuclei-X-ray photons interactions in solids via quantum interference"

NSF, Total Funding: $380,000.

2006 – 2009 – Principal Investigator of the NSF Grant
"Atomic and Nuclear Interference in Solids"
NSF, Total Funding: $300,000.

2005 – 2008 – Principal Investigator of the AFOSR Grant
"Laser Manipulation of Nuclear Transitions"
Total Funding: $526,946.

2007 – 2009 – Principal Investigator of the U.S. Civilian Research and Development Foundation (CRDF) Cooperative Grants Program
"Coherent Control of the Fundamental Optical Processes in Solids via Atomic Interference"
Total Funding: $63,100 (U.S. Team: $12,620).

2005 – 2006 – Principal Investigator of the DURIP AFSOR Grant
"Instrumentation for Laser Manipulation of Nuclear Transitions"
Total Funding: $215,587.

2003 – 2006 – Principal Investigator of the NSF Grant
"Coherent Control of Nuclear Transitions"
NSF, Total Funding: $335,000.

2004 – 2006 – Principal Investigator of the U.S. Civilian Research and Development Foundation (CRDF) Cooperative Grants Program, "Quantum Interference Phenomena with Gamma-Photons in Solids Doped by Mossbauer Nuclei"
Total Funding: $88,382 (U.S. Team $15,000).

2001 – 2005 – Co-Principal Investigator of the AFOSR Grant
"Spin-based Lattice-Gas Quantum Optics in Solids Using Optical Addressing"
PI – Marlan Scully, Total Funding: $1,028,767.

2002 – 2004 – Principal Investigator of the ONR Grant
"Interference Phenomena at Gamma-Ray Nuclear Transitions"
Total Funding: $150,000.

2002 – 2004 – Principal Investigator of the Texas Advanced Research Program Grant
'Multiple Raman Scattering in solids for the new sources of ultra-short pulses"
Total Funding: $150,000.

2001 – 2003 – Principal Investigator of the DARPA Grant
"Mossbauer Gamma-Ray Laser with an Optical Driving"
Total Funding: $283,000.

2001-Principal Investigator of the AFOSR Grant
"Laser modification of Mossbauer spectra in Eu: CaS"
Total Funding $300,000

2000-2001- Principal Investigator of the ONR grant
"Modification of Mossbauer Spectra by laser radiation"
Total funding: $200,000 in rare earth ions doped compounds"

2000-2001 Principal Investigator of the Texas Advanced Research Program grant "Electromagnetically induced transparency and lasing without inversion"
Total funding: $ 185,960.

Ph. D. students and their current positions

Yevgeny Radeonychev, Ph. D. 1999; Associate Professor, Nizhny Novgorod State University

Roman Kolesov, Ph. D. 2003; Lecturer, University of Stuttgart, Germany

Elena Kuznetsova, Ph. D. 2005; Research Scientist, Russian Quantum Center, Moscow

Petr Anisimov, Ph. D. 2008; Scientist, Los Alamos National Laboratory

Chris O'Brien, Ph. D. 2011; NAWCWD, China Lake, Branch Head D552400, Sensors, Seekers, and Countermeasure Branch

Vladimir Antonov, Ph. D. 2012; Senior Scientist, Institute of Applied Physics, RAS

Xiwen Zhang, Ph. D. 2016, postdoc, Univ. Toronto, Canada, postdoc TAMU

Timur Akhmedzhanov, Ph. D. 2017, Geophysicist, DownUnder Geosolutions, Houston

Mohit Khurana, Ph. D. 2023, postdoc TAMU

Jiaxuang Wang, Ph D. 2024, postdocTAMU

Yanli Shi – current student, TAMU,

Former Assistant Research Scientists and Postdocs and their current positions

Alexey Belyanin, Assistant Research Scientist: 1999-2003; Professor TAMU

Farit Vagizov, Assistant Research Scientist: 2002-2022, retired.

Roman Kolesov, postdoc: 2003-2005, Lecturer, University of Stuttgart, Germany

Shaoyan Gao, postdoc 2008-2009; Professor Xian University, China

Alexey Kalachev, postdoc: 2010-2011, Prof., Correspondent Member of the Russian Academy of Sciences, Director of the *Kazan* Scientific Center of the Russian Academy of Sciences

Chris O'Brien, postdoc: 2014-2015, NAWCWD, China Lake, Branch Head D552400, Sensors, Seekers, and Countermeasure Branch

Elena Kuznetsova, postdoc 2018-2019; Research Scientist, RQC, Russia

Xiwen Zhang, postdoc 2022 – present.

Plenary, key-note and invited talks at the scientific conferences

1. XXth *Solvay Conference* in Physics on Quantum Optics, 6 -9 Nov. 1991*,* plenary talk.
2. International Workshop on Strong Field Physics, Heraklion, Crete, Greece, July 1993, invited talk.
3. XV International Conference on Coherent and Nonlinear Optics (ICONO), St.-Petersburg, June 1995, invited talk.
4. International Conference "Laser Physics", Moscow-Yaroslavl, August 1995, invited talk.
5. International Workshop on Gamma-Ray Lasers, Predeal, Romania, August 1995, invited talk.
6. International Conference on Atomic Coherence and Inversionless Amplification, R.P. China, September 1995, invited talk.
7. International School "Nonlinear Waves" Nizhny Novgorod, Russia, Sept.1995, invited talk.
8. International Conference on Laser Physics, Moscow, July 1996, invited talk.
9. International Workshop on Induced Gamma-emission, Predeal, Romania, August 1997, invited talk.
10. International Conference "Laser Optics," St. Petersburg, June 1998, invited talk.
11. 16th International Conference on Coherent and Nonlinear Optics (ICONO), Moscow, July 1998, invited talk.
12. 29th Winter Colloquium on Physics of Quantum Electronics, Snowbird, Utah, January 1999, invited talk.
13. International Workshop on Novel Optical Materials, TAMU, College Station, Texas, January 1999, invited talk.
14. International Conference "Laser Physics," Budapest, July 1999, invited talk.
15. International Workshop on Coherent Optics, Jackson Hole, July 1999, invited talk.
16. International Workshop "Modern Trends in Quantum Optics," Munich, Max-Plank Institute for Quantum Optic, June 1999, invited talk.
17. 30th Winter Colloquium on Physics of Quantum Electronics, Snowbird, Utah January 2000, plenary talk.
18. International Workshop on Quantum Control in Atoms, Molecules, Solids and Nuclei, TAMU, College Station, Texas, January 2000, invited talk.
19. International Workshop on Slow Light, Harvard University, April 2000, invited talk.
20. International Workshop on Quantum Nucleonics, Leuven University, Belgium, May 2000, invited talk.
21. EOARD Workshop on Directional Gamma-Ray Induced Emission, London, May 2000, May 2000, invited talk.
22. International Mossbauer Conference "Mossbauer Effect: Magnetism, Modern Materials, Gamma Optics," Kazan, July 2000, invited talk.
23. 31st Winter Colloquium on Physics of Quantum Electronics, Snowbird, Utah, January 2001, invited talk.
24. International Workshop "From Gamma-Ray Optics to Semiconductor Laser Dynamics," Brussels, Belgium, April 2001, invited talk.
25. 17th International Conference on Coherent and Nonlinear Optics (ICONO), Minsk, Belarus, June 2001, invited talk.
26. International Conference "Frontiers in Nonlinear Physics," Nizhny Novgorod, July 2001, invited talk.
27. 22nd Solvay Conference on Physics: The Physics of Communication, Delphi, Greece, November 2001, invited talk.

28. 32nd Winter Colloquium on Physics of Quantum Electronics, Snowbird, Utah, January 2002, invited talk.
29. International Quantum Electronics Conference (UQEC), Moscow, June 2002, invited talk.
30. 33rd Winter Colloquium on Physics of Quantum Electronics, Snowbird, Utah, January 2003, plenary talk.
31. 34th Winter Colloquium on Physics of Quantum Electronics, Snowbird, Utah, January 2004, invited talk.
32. International Conference "Frontiers of Nonlinear Physics," Nizhny Novgorod, St. Petersburg, July 2004, plenary talk.
33. 35th Winter Colloquium on Physics of Quantum Electronics, Snowbird, Utah, January 2005, invited talk.
34. Quantum Optics Symposium, TAMU, College Station, Texas, January 2005, invited talk.
35. AFOSR Workshop on Isomers and Quantum Nucleonics, Dubna, Russia, June 2005, key note talk.
36. 36th Winter Colloquium Physics of Quantum Electronics, Snowbird, Utah, January 2006, plenary talk.
37. International Conference "Coherent Control of the Fundamental Processes in Optics and X-ray Optics," Nizhny Novgorod- Kazan, July 2006, plenary talk.
38. 11th International Conference on Quantum Optics, Minsk, Belarus, June 2006, invited talk.
39. TAMU Molecular Physics and Quantum Optics Symposium, 2007, invited talk.
40. International Conference "Frontiers of Nonlinear Physics," Nizhny Novgorod, Saratov, July 2007, invited talk.
41. 16th International Laser Physics Workshop, Leon, Mexico, August 2007, invited talk.
42. 18th International Conference on Coherent and Nonlinear Optics (ICONO), Minsk, May 2007, invited talk.
43. 37th Winter Colloquium Physics of Quantum Electronics, Snowbird, Utah, January 2007, invited talk.
44. TAMU Workshop on Quantum Coherence, Jan, 2007, invited talk.
45. Princeton-TAMU Symposium on Quantum Mechanics, Informatics and Control, Princeton, March 2007, invited talk.
46. 38th Winter Colloquium Physics of Quantum Electronics, Snowbird, Utah, January 2008, invited talk.
47. TAMU Physics of Quantum Electronics Symposium, January 2008, invited talk.
48. Workshop on the storage and manipulation of quantum information in optically-addressed solids, Bozeman, Montana, January 2008, invited talk.
49. 17th International Laser Physics Workshop, Trondheim, Norway, July 2008, invited talk.
50. 39th Winter Colloquium Physics of Quantum Electronics, Snowbird, Utah, January 2009, plenary talk.
51. TAMU Physics of Quantum Electronics Workshop, January 2009, invited talk.
52. 18th International Laser Physics Workshop, Barcelona, July 2009, invited talk.
53. 40th Winter Colloquium Physics of Quantum Electronics, Snowbird, Utah, January 2010, plenary talk.
54. TAMU Physics of Quantum Electronics Workshop, January 2010, invited talk.
55. International Symposium on Optical Manipulation of Quantum Information in Solids, Institute Henri Poincare, May 2010, invited talk.
56. The 19th International Laser Physics Workshop, Iguazu Falls, Brazil, July 2010.

57. The 4th International Conference "Frontiers of Nonlinear Physics," Nizhny Novgorod, St. Petersburg, Russia, July 2010, plenary talk.
58. 41st Winter Colloquium Physics of Quantum Electronics, Snowbird, Utah, January 2011, plenary talk.
59. TAMU Physics of Quantum Electronics Workshop, January, 2011, invited talk.
60. 20th International Laser Physics Workshop, Sarajevo, Bosnia, Herzegovina, July 2011, invited talk.
61. The 1st International Conference on Quantum Technologies, Moscow, July 2011, plenary talk.
62. 42nd Winter Colloquium Physics of Quantum Electronics, Snowbird, Utah, January 2012, invited talk.
63. TAMU Physics of Quantum Electronics Workshop, January 2012, invited talk.
64. 21st International Laser Physics Workshop, Calgary, Canada, July 2012, invited talk.
65. 43d Winter Colloquium Physics of Quantum Electronics, Snowbird, Utah, January 2013, plenary talk.
66. TAMU Physics of Quantum Electronics Workshop, January, 2013, invited talk.
67. 21st International Laser Physics Workshop, Prague, Czech. Republic, July, 2013, invited talk.
68. 5th International Conference, Frontiers of Nonlinear Physics, Nizhny Novgorod-Kazan-Nizhny Novgorod, Russia, July, 2013, invited talk.
69. FiO/LS, Orlando, Florida, October, 2013, invited talk.
70. 4th International Workshop "Quantum Optics", Jeju, S. Korea, Nov., 2013, key-note talk.
71. 44th Winter Colloquium Physics of Quantum Electronics, Snowbird, Utah, Jan. 5-9, 2014, plenary talk.
72. TAMU Physics of Quantum Electronics Workshop, January, 2014, invited talk.
73. International Conference on X-ray Lasers (ICXRL), Fort Collins, CO, May 26-30, 2014, invited talk.
74. The 17th Gordon Research Conference on Multiphoton Processes, Bentley University, Waltham, MA, June 15-20, 2014, invited talk.
75. 23d International Laser Physics Workshop, Sophia, Bulgaria, July 14-18, 2014, invited talk.
76. SPIE Photonics Asia, Beijing, China, Oct. 9-11, 2014, invited talk.
77. 45th Winter Colloquium on Physics of Quantum Electronics, Snowbird, Utah, January 4-8, 2015, plenary talk.
78. Princeton Workshop "Classical-Quantum Interface", Princeton University, May 27-29, 2015, invited talk.
79. Summer School on Quantum Optics, Casper, Wyoming, July 5-11, 2015, invited talk.
80. The 3rd International Conference on Quantum Technologies (ICQT-2015), Moscow, July 13-17, 2015, plenary talk.
81. 24th International Laser Physics Workshop, Shanghai, China, Aug.21-25, 2015.
82. The 33rd International Conference on the Applications of the Mössbauer Effect (ICAME2015) Hamburg, Germany, Sept. 13-18, 2015, plenary talk.
83. 46th Winter Colloquium, Physics of Quantum Electronics, Snowbird, Utah, January 4-8, 2016.
84. TAMU PQE Follow-up Workshop, Jan.12-13, 2016, invited talk.

85. Princeton-TAMU Symposium on Quantum Noise Effects in Thermodynamics, Biology and Information, Princeton University, April 14-16, 2016, invited talk.
86. 25th International Laser Physics Workshop, Yerevan, Armenia, July 11-15, 2016. ”Towards attosecond X-ray plasma lasers in a “water window”, invited talk.
87. 6th International Conference, Frontiers of Nonlinear Physics, Nizhny Novgorod-St. Petersburg, Russia, July 17-23, 2016, plenary talk.
88. TAMU-Princeton-Baylor Summer Symposium “Quantum Biophotonics”, Casper College, Casper, Wyoming, July 25-29, 2016, invited talk.
89. 47th Winter Colloquium, Physics of Quantum Electronics, Snowbird, Utah, January 8-13, 2017, plenary talk.
90. TAMU PQE Follow-up Workshop, Jan.17-18, 2017, invited talk
91. Topical Meeting “Isotope-Based Energy Sources”, May 15-16, 2017, The George Washington University, Washington, DC, invited talk.
92. Princeton-TAMU Symposium on Quantum Noise Effects in Thermodynamics, Biology and Information, Princeton University, June 15-17, 2017, invited talk.
93. 26 th International Laser Physics Workshop, Kazan, Russia, July,17-21, 2017, invited talk.
94. School on Quantum Science and Engineering, Casper, WY, July 23-29, 2017, invited talk.
95. Workshop on Trends in Ultrafast Laser Science, JILA and University of Colorado, Boulder, CO, Aug. 16-18, 2017, invited talk.
96. The 48th Winter Colloquium, Physics of Quantum Electronics, Snowbird, Utah, January 8-13, 2018, plenary talk.
97. The HIAS-IQSI Symposium Celebrating Applied Physics, featuring Steven Chu” , TAMU, Jan. 19, 2018, invited talk.
98. The 27 th International Laser Physics Workshop, Nottingham, UK, July, 16-20, 2018, invited talk.
99. TAMU-Princeton-Baylor Wyoming Summer School on Quantum Science and Engineering, Casper, WY, July 22-28, 2018, invited talk.
100. The 8th International Symposium “Modern Problems in Laser Physics”, Novosibirsk, Russia, August 25-30, 2018, plenary talk.
101. Ultrafst Imaging and Tracking Instrumentation, Methods and Applications, (ULITIMA-2018), Argonne National Laboratory, Chicago, IL, Sept.11-14. 2018, invited talk.
102. The 16th International Conference on X-ray Lasers (ICXRL), Prague, Czech Republic, October 7-12, 2018, plenary talk.
103. The 49th Winter Colloquium, Physics of Quantum Electronics (PQE 2019), Snowbird, Utah, 1/10/2019, invited talk.
104. The II Symposium on Quantum Computing and Quantum Optics, Hangzhou, China, 5/23/2019, invited talk.
105. The VII International Conference on Frontiers of Nonlinear Physics, Nizhny Novgorod-Saratov-Nizhny Novgorod, Russia, 6/30/2019, plenary talk.
106. Frontiers of Quantum and Mesoscopic Thermodynamics, Prague, Czech Republic, 7/16-20/2019, plenary talk.

107. TAMU-Princeton-Baylor summer school on New trends in quantum optics: from quantum information science to x-ray optics and biophotonics, Casper College, Casper, Wyoming, 7/21-25/2019, invited talk.
108. The 28 th International Laser Physics Workshop, Gyeongju, S. Korea, 8/9/2019, invited talk.
109. SPIE Optics and Photonics, San Diego, 8/24-29/2019, invited talk.
110. TAMU-Princeton-Baylor Summer School on Quantum Optics, Casper, Wyoming, July 19-24, 2019, invited talk.
111. The 50th Winter Colloquium, Physics of Quantum Electronics (PQE 2020), Snowbird, Utah, Jan. 6-10, 2020. Plenary talk.
112. Quantum Optics Workshop dedicated to the memory of Roy Glauber, Harvard, Jan. 14-16, 2020. Invited talk.
113. TAMU-Princeton-Baylor Summer School on New Trends in Quantum Physics: From Quantum Optics to Biophotonics, July, 27-Augut, 1, 2020, invited talk.
114. International Conference on Modern Development of Magnetic Resonance, Kazan, Russia, Sept. 28 – Oct 2, 2020. Invited talk.
115. The 17th International Conference on X-ray Lasers (ICXRL 2020), Empa Dübendorf, Switzerland, December 8-10. Invited talk.
116. The 29 th International Laser Physics Workshop, July 19-23, 2021 online, invited talk.
117. Frontiers of Quantum Mesoscopic Thermodynamics, Prague, Czech Republic, 7/20-24/2021, invited talk.
118. TAMU-Baylor-Casper Summer School on Quantum Physics and Biophysics, Casper, Wyoming, July 25-30, 2021, invited talk.
119. The 51st Winter Colloquium, Physics of Quantum Electronics (PQE 2022), Snowbird, Utah, Jan. 10-14, 2022, plenary talk.
120. The Laser Congress, Barcelona, OPTOICA (formerly OSA) , Dec.11-15 2022.
121. The 30th International Workshop on Laser Physics, July 11-15, 2022, online.
122. Frontiers of Quantum and Mesoscopic Thermodynamics (FQMT) Prague, Czech Republic, July 17-23, invited talk.
123. The 52d Winter Colloquium, Physics of Quantum Electronics (PQE 2023), Snowbird, Utah, Jan. 9-13, 2023, plenary talk.
124. Topics in Classical and Quantum Engineering Sciences, Srinivasan Symposium, Texas A&M University, May 1-3, 2023, invited talk.
125. 54th Annual Meeting of the APS Division of Atomic, Molecular and Optical Physics, June 5-9, plenary talk.
126. The 31st International Workshop on Laser Physics (LPHYS'23), July 3-8, 2023. Online, invited talk.
127. The 18th International Conference on X-ray Lasers (ICXRL 2020), Shanghai, China, July 17-22, 2023, Keynote talk.
128. TAMU-Princeton-Casper Summer School on Quantum Physics and Biophysics, Casper, Wyoming, July 17-28, 2023, invited talk.
129. The 53d Winter Colloquium, Physics of Quantum Electronics (PQE 2023), Snowbird, Utah, Jan. 8-12, 2024, invited talk.
130. SPAE Photonics West, San-Francisco, Jan. 27-Feb. 1, 2024, invited talk.
131. Annual Meeting of the German Physical Society (DFG), Freiburg, Germany, March 11-15, 2024, DFG and Optica Herbert Walther Award talk.

132. German Mössbauer Workshop, Helmholtz Institute Jena und Friedrich-Schiller-Universität Jena, March 13-15, 2024, invited talk.
133. TAMU-Princeton-Casper Summer School on Quantum Physics and Biophysics, Casper, Wyoming, July 17-28, 2023, invited talk.
134. TAMU-Princeton-Casper-Baylor-CSU-UIUC Summer School "From Laser fusion to Quantum physics and Gravity, July 15-26, 2024, invited talk
135. SIBOR Workshop, Cook's Branch Conservancy, Texas, Nov. 20, 2024, invited talk.
136. The 54 Winter Colloquium, Physics of Quantum Electronics (PQE'25), Jan. 6-11, 2024, plenary talk.
137. SPAE Photonics West, San-Francisco, Jan. 24-29, 2025, invited talk.

PHYSICS COLLOQUIA

1. Drexel University, Philadelphia, USA, Department of Physics, 1990.
2. Pavlov Optical Institute, St. Petersburg, 1990.
3. Moscow State University, 1990.
4. Universita di Pisa, Italie, Instituto de Fisica, 1990.
5. Bryn Mawr College, USA, Department of Physics, 1991.
6. Universitet P. Et M. Curie, Paris, France, Laboratory de Spectroscopie Hertzienne, 1991.
7. Universita di Pisa, Italie, Instituto de Fisica, 1991.
8. Moscow Theoretical Physics Seminar of Prof. V. L. Ginzburg, Lebedev Institute, 1991.
9. Univeristy of New Mexico, Albuquerque, USA, Center for Advanced Studies, 1992.
10. University of Texas at Dallas, USA, Department of Physics, 1992.
11. Texas A&M University, College Station, USA, Department of Physics, 1992.
12. Kurchatov Institute of Atomic Energy, Moscow, 1993.
13. North Western University, Evanston, USA, Department of Physics, 1993.
14. Alabama University, Huntsville, USA, Weapon Science Directorat and Physics Department, 1993.
15. University of Oregon, Eugine, USA, Physics Department, August 1993.
16. Imperial College of Science, Technology and Medicine, The Blackett Laboratory, London, UK, 1994.
17. Stanford University, Physics Department, 1995.
18. Texas A&M University, Physics Department, College Station, USA, 1995.
19. Prairie View University, Physics Department, 1995.
20. Jagelonsky University, Krakov, Poland, Institute of Physics, 1995.
21. Universite Libre de Bruxelles, Beligum, 1995.
22. Foundation Louis de Broglie, Paris, France, January 1996.
23. Max Plank Institute for Quantum Optik, Garching, Germany, 1996.
24. Texas A&M University, College Station, 1997.
25. Institute of Applied Physics, Russian Academy of Science, 1998.
26. University of Texas at Austin, Department of Physics, 1998.
27. Old Dominion University, Norfolk, 1999.
28. City College, New York, 1999.
29. Temple University, Philadelphia, 1999.
30. Imperial College, London, UK, 2000.
31. Texas A&M University, College Station, 2000.
32. Institute of Applied Physics, Russian Academy of Science, 2001.
33. University of California, Berkeley, AMO, 2002.

34. Niels Bohr Institute and Copenhagen University, Denmark, 2003.
35. University of Texas at Austin, Department of Physics, 2005.
36. Oklahoma State University, Department of Physics, 2008.
37. Louisiana State University, Department of Physics, 2008.
38. Louisiana State University, AMO, 2008.
39. Harvard University, Department of Physics and ITAMP, 2008.
40. University of Berkeley, Department of Physics, 2011.
41. Invited speaker at South Central Conference for Undergraduate Women in Physics, Jan., 2012, TAMU.
42. Sigma Xi Distinguished Scientist Lecture, TAMU, Dec. 2012
43. Institute of Applied Physics, RAS, Nizhny Novgorod, Russia, Dec. 2012.
44. University of Louisiana at Lafayette, Nov.2013
45. International Computational Center, Beijing, Oct. 2014.
46. Helmholtz Institute, Univ. of Mainz, Mainz, Germany, April 2017.
47. University of Kaiserslautern, Department of Physics, Germany, April 2017.
48. UCSD, Physics Department, San Diego, 2/7/2019.
49. Jiao-Tong Univ., Physics Department, Shanghai, China, 5/20/2019.
50. Chinese Univ. of Hong Kong, Physics Department, Hong Kong, 5/29/2019.
51. Jiao-Tong Univ., Physics Department, Xi'an, Xi'an, China, 5/22/2019.
52. University of Chicago, Department of Physics, April 13, 2023
53. Argonne National Laboratory, Advanced Photon Source, April 14, 2023
54. TAMU, Department of Soil and Crop Sciences, September 2023.
55. Collaborative Research Centre Transregio (TRR 306) of the universities of Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Johannes Gutenberg-Universität Mainz (JGU), and Universität des Saarlandes, Saarbrücken (UdS), https://www.qucolima.de/, Erlangen, Germany, March 14, 2024, distinguished lecture.

Research highlights

Theoretical prediction of lasing without population inversion (LWI)

O. Kocharovskaya, Ya.I. Khanin, Pis'ma Zh Eksp. Theor, Fiz. (cited also as JETP Lett., **48**, 630, 1988 or Sov. Phys. JETP **63**, 945 (1988)), 701 citations, Google Scholar). The same year this prediction was realized experimentally by three groups: Prof. Wolf Lange, Germany; Prof. Edward Fry, US; Prof. Ben H. van der Linden (Netherlands). LWI underlining physical mechanisms (O. Kocharovskaya, Phys. Rep., **219**, 175 (1992)), 638 citations. These works were followed by theoretical and experimental research in many laboratories worldwide. In 1992 LWI was highlighted by APS News, as one of 10 most important results of the year. It was twice highlighted also in Phys. Today. Currently the focus of LWI research is on realization of the far-infrared and THz generation in semiconductors as well as X-ray and gamma-ray lasing, the frequency ranges, where it is difficult to achieve population inversion. The phenomenon of "air lasing", widely studied experimentally, was recently explained as LWI independently by two groups (Prof. Mikhail Ivanov, Germany and Prof. Andre Mizirovich, France).

Theoretical prediction of electromagnetically induced transparency (EIT)

O. Kocharovskaya, Ya.I. Khanin, Sov. Phys. JETP, **63**, 945 (1986); O. Kocharovskaya and P. Mandel, Phys. Rev. **A42**, 523 (1990). These two papers together received over 661 citations. EIT (called in those papers) coherent bleaching of 3-level medium is an elimination of the resonant absorption when

sufficiently intense two- or multi-component field propagates through a three-level medium under condition of a two-photon resonance. It was experimentally observed by Steve Harris in 1991 at Stanford, which was followed by hundreds of experimental demonstrations in different media and in different regimes. For the last three decades, EIT has remained the leading research topic in the fields of quantum, coherent and nonlinear optics. It found numerous applications such as the nonlinear optics at maximum atomic coherence, high precision magnetometry, atomic clocks, quantum memory and quantum information processing, etc.

Stopping of light via formation of an EIT polariton and EIT-line narrowing via spatial dispersion

O. Kocharovskaya, Yu. Rostovtsev, M.O. Scully, Phys. Rev. Lett. **86**, 628 (2001); A. Javan, O. Kocharovskaya, H. Lee, M.O. Scully, Phys. Rev. A **66**, 013805 (2002) which together received over 645 citations and were experimentally verified in several laboratories around the world. The same mechanism of the combined spatial and frequency dispersion was widely used later for slowing down the light pulses in the periodic photonic structures. Slowing and stopping of the single photon light pulses find applications in the controllable delay lines and quantum memories, required for long-distance quantum communication, quantum simulation and computation and in the demand single photon sources.

Coherent control of gamma-photon– nuclear ensemble interface: theory and experiment

with optical field **(**O. Kocharovskaya, R. Kolesov, Y. Rostovtsev, Phys. Rev. Lett. **82**, 3593 (1999)); with microwave field (R. Coussement, ..., O. Kocharovskaya, Phys. Rev. Lett. **89**, 107601 (2002)); with acoustic fields: F. Vagizov, V. Antonov, Y.V. Radeonychev, R.N. Shakhmuratov, O. Kocharovskaya, Nature **508**, 80 (2014) The last work was highlighted in Nature News &Views, Physics World and several other mass media in Germany, UK, Italy, Russia, China, etc. These three works together received over 395 citations and stimulated the development of a research field on the border of quantum optics and x-ray optics, namely, **quantum x-ray/gamma-ray nuclear optics.** Recent breakthroughs in this field include demonstration of Acoustically Induced Transparency (AIT): propagation of gamma-photons through the optically thick room-temperature solid-state resonant nuclear absorber without perturbation in its temporal/spectral shape, intensity, duration, and energy (Y. V. Radeonychev, I. R. Khairulin, F. G. Vagizov, O. Kocharovskaya, Observation of acoustically induced transparency for gamma –ray photon. *Phys. Rev. Lett.* **124**, 163602 (2020), Editor's choice, highlighted in Phys. World), theoretical proposal for realization of the nuclear quantum memory (X. Zhang, W.-T. Liao, A. Kalachev, R.N. Shakhmuratov, M.O. Scully, O. Kocharovskaya, Nuclear quantum memory and time sequencing of a single γ photon, Phys. Rev. Lett. **123**, 250504 (2019)) and its experimental demonstration at DESY, Germany in collaboration with the group of Prof. Ralf Röhlsberger (Helmholtz Inst., Uni. Jena, DESY) "Nuclear quantum memory for hard X-ray photons", S.Velten, …O. Kocharovskaya, R. Röhlsberger (Sci. Adv. **10**, eadn9825 (2024)). Highlighted on phys.org. scitechdaily, press releases at DESY, ESRF, TAMU, and other mass media.

Collaborative experimental work of the international team (including ANL and TAMU in US, the Helmholtz Inst., DESY, EuXFEL, MPI of Nuclear Physics in Germany and several other institutions ("Resonant X-ray excitation of the nuclear clock isomer Sc-45",Y. Shvyd'ko, R. Röhlsberger, O. Kocharovskaya, J. Evers, et al. *Nature* **622**, 471–475 (2023)) demonstrating was the first time resonant excitation of the 12.4keV long-lived (~0.5 s) Sc-45 isomer state, This work established Sc-45 nuclear isomer as a promising candidate for nuclear clock and provided a

basis for development of the quantum nuclear metrology. It was highlighted in CNN, Optics & Photonics News, Physik in unserer Zeit, DESY Annual Report, press-releases of NSF, XFEL, DESY, TAMU, ANL and other mass media.

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