

prof. RNDr. Jan Peřina, Jr., Ph.D.

Personal information

Name: Jan Peřina, prof., RNDr., Ph.D.

Address: Západní 62, 779 00, Olomouc

Born: September 19, 1969, in Olomouc, Czech Republic

Marital status: single

Education:

- 1993 - Mgr. in physics: Quantum optics and optoelectronics, Faculty of Mathematics and Physics, Charles University, Prague,
- 1996 - Ph.D. in Quantum optics and optoelectronics, Faculty of Mathematics and Physics, Charles University, Prague,
- 2003 - habilitation, Faculty of Natural Sciences, Palacký University, Olomouc.
- 2018 - professorship, Faculty of Mathematics and Physics, Charles University, Prague.

Employment

1995 - present: scientific worker in Joint Laboratory of Optics, Palacký University and Institute of Physics of Academy of Sciences of the Czech Republic in Olomouc.

2019 - present: professor in Joint Laboratory of Optics, Palacký University.

Expertise and research interests

I specialize in theoretical research in quantum optics with emphasis to nonclassical properties of optical fields such as the generation of entangled photon pairs, twin beams composed of many photon pairs, generation of squeezed light and light with sub-Poissonian photon-number statistics. I have devoted a great deal of attention to the process of parametric down-conversion both in bulk nonlinear crystals and modern photonic structures (nonlinear layered media, nonlinear waveguides, nonlinear photonic-band-gap crystals). I have paid attention to photon-number statistics and other non-classical properties of entangled optical fields (twin beams) generated in this process. I have studied the generation of squeezed light and light with sub-Poissonian photon-number statistics both in nonlinear couplers and nonlinear photonic structures. Recently, I concentrate my attention to the analysis of nonclassical light generation in nonlinear systems with amplification and damping. I have also been interested in simple auto-ionization systems and their quantum correlations. I am an author or coauthor of 130 impacted scientific papers, 3 review chapters and 41 contributions to proceedings from conferences (WOS author identifier G-5700-2014). They are 2250 times cited, my H-index is 28.

Scientific activities in the last five years

I focused my attention to properties of both individual photon pairs and fields composed of many photon pairs that are emitted in nonlinear photonic structures. I investigated nonclassical properties of twin beams composed of many photon pairs both in the mesoscopic and macroscopic regimes including quantum photon-number correlations, negative quasi-distributions of integrated intensities, violation of classical inequalities and spatio-spectral coherence of intense twin beams. I have developed methods for reconstructing weak twin beams from the data provided by photon-number resolving detectors. Based on the Schmidt decomposition of a two-photon spectral amplitude, I have developed a quantum model describing the evolution of spatio-spectral coherence in intense twin beams. I have also studied non-classical properties of light emitted in two-mode PT-symmetric nonlinear systems with the Kerr nonlinearity including squeezing of fluctuations and entanglement.

Scientific experience from abroad

- 1997-1998: 18 months in Quantum Imaging laboratory at Boston university (Profs. Teich and Saleh), Boston, USA.
- 2003-2007: short-term stays in overall duration of 7 months at University La Sapienza in Rome (Dipartimento di Energetica, Profs. Bertolotti and Sibilìa).
- 2012-2018: short-term stays in overall duration of 5 months at Dipartimento di Scienze e Alta Tecnologia of University degli Studi dell'Insubria in Como, Italy (Prof. Andreoni, Dr. Bondani).
- 2011-2022 - short-term stays in overall duration of 3 months at Institute of Physics of University in Zielona Gora, Poland (Prof. Leonski).
- 2022 – 3 month stay at Institute of Spintronics and Quantum Information, Adam Mickiewicz University, Poznan, Poland (Prof. Miranowicz).
- Participation at 40 international conferences in quantum optics.

Participation in projects

I participated in the solution of 11 scientific projects. I was the principal investigator of 4 projects and co-investigator of 1 project:

- US Army European Research Office, ERO-ARO, N62558-05-P-0421 Nonclassical properties of pulsed second-subharmonic generation in photonic-band gap structures, 2005-2007.
- COST OC P11.003, Physics of linear, nonlinear and active photonic, Ministry of Education of the Czech Republic, 2003-2006.
- COST 09026, Photonic-band-gap nonlinear structures as sources of non-classical light, Ministry of Education of the Czech Republic, 2009-2012.
- GAČR 15-08971S New nonlinear and magneto-optical effects in periodic structures, Grant Agency of the Czech Republic, 2015-2017.
- GAČR 18-22102S Advanced spin-photonic and quantum nonlinear sources of light, Czech Grant Agency, 2018-2020 (co-investigator).
- OP JAK CZ.02.01.01/00/22_008/0004596 SENDISO Sensors and detectors for future information science, MŠMT, 2024-2028 (group leader).

Prizes

Bolzano Award, 1996, Faculty of Mathematics and Physics, Charles University, Prague.

Otto Wichterle Award, 2006, Academy of Sciences of the Czech Republic

Other Activities

Teaching in pregraduate, graduate and doctoral courses at Faculty of Sciences of Palacký University in Olomouc.

Member of the Scientific Board of Faculty of Sciences of Palacký University.

Member of Doctoral board of Applied physics at Faculty of Sciences of Palacký University.

Guarantor of Master and Doctoral studies of Applied Physics at Faculty of Sciences of Palacký University.

Reviewer for 10 international impacted journals.

Chairmen of the XI. International Conference on Squeezed States and Uncertainty Relations and IV. Feynman festival.

In Olomouc, January 14, 2025

Jan Peřina, Jr.