

Words of Welcome

Dear colleagues and fellow scientists,

On behalf of the Local Scientific Committee, it is my pleasure to welcome you to VI International Conference " **Advances in Atomic, Nuclear and Laser Optics and Spectroscopy**"(**ANLOS**) during December 25-27, 2022 in Odessa. The organizer of the conference is the Odessa State Environmental University under one roof.

We have set up an exciting program covering a wide variety of cutting edge research topics ranging from method developments to applications pushing the limits of modern theoretical and computational Atomic, Nuclear and Laser Optics and Spectroscopy.

Even though we are sure that the many excellent lectures will make it difficult to decide which of the sessions to select, we hope you will enjoy **ANLOS** 2022 in Odessa.

Sergey Stepanenko	Rector of Odessa State Environmental University, Professor
Alexander Glushkov	Head of Department of Mathematics and Quantum Mechanics, Professor
Andrey Svinarenko	Professor of Department of Mathematics and Quantum Mechanics
Olga Khetselius	Professor of Department of Mathematics and Quantum Mechanics

Local Organizing Committee

Stepanenko S.M., Dr.Sci., Prof., Rector of University (**Honorary Chair**)

Glushkov A.V., Hab.Dr., Prof., Prof., Head. of Department of Mathematics and Quantum Mechanics (**Chair**)

Svinarenko A.A., Hab.Dr., Prof., Prof. of Department of Mathematics and Quantum Mechanics (**Co-Chair**)

Khetselius O.Yu., Hab.Dr., Prof., Prof., Prof. of Department of Mathematics and Quantum Mechanics (**Co-Chair**)

Ignatenko G.V., Hab.Dr., Ass.-Prof., Prof. of Department of Mathematics and Quantum Mechanics

Dubrovskaya Yu.V., PhD Dr., Assoc.-Prof. of Department of Mathematics and Quantum Mechanics

Afanasyeva V.V., Secretary, Department of Mathematics and Quantum Mechanics

Локальна робоча група:

Степаненко С.М., д.ф.-м.н, проф, ректор ОДЕКУ, *Почесний Голова Оргком.*

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Дубровська Ю.В., к.ф.-м.н., доц. кафедри математики та квантової механіки,

Афанасьєва В.В., стар. викл. кафедри математики та квантової механіки

Секретар Оргкомітету

**Contact: 65016, Odessa, Odessa State Environmental University,
Department of Mathematics and Quantum Mechanics L'vovskaya
str. 15, bld 1, room 408**

E-mail: math.odeku@gmail.com

odeku.intsci@gmail.com

Phone: +380-48-2326739

TOPICS:

- **Quantum optics and laser physics**
- **Atomic optics and spectroscopy**
- **Optics and spectroscopy of relativistic atoms and multicharged ions**
- **Optics and spectroscopy of atoms and molecules in the electromagnetic field (Satellite Symposium)**
- **Intense resonant interactions in quantum electronics**
- **Electron-atomic and molecular spectroscopy due to collisions**
- **Molecular optics and spectroscopy (Satellite Symposium)**
- **Quantum geometry and spectroscopy and resonance dynamics**
- **Fractal geometry and chaos theory for quantum systems**
- **Autoionization and Auger spectroscopy of atoms, molecules, solids**
- **Laser spectroscopy**
- **Solid state optics and spectroscopy**
- **Optics and spectroscopy of the atmosphere and ocean**
- **Computational methods of dynamics of quantum and laser systems (Satellite Symposium)**

PROGRAM OF THE CONFERENCE

Conference meetings will be held remotely, in the form of a Zoom conference. The time and details of access to the conference have been sent by e-mail.

Засідання конференції будуть проводитися дистанційно, у вигляді конференції Zoom. Час проведення та реквізити доступу до конференції надіслані електронною поштою.

December 24 (Saturday):

- 17:00 – Registration of participants of the conference
Регістрація учасників конференції

December 25 (Sunday):

- 10:00 – Opening Ceremony. Congratulations to the Chair Prof. Glushkov
Церемонія відкриття конференції Голови оргкомітету конференції
“Optics and spectroscopy of atoms and molecules in the electromagnetic field”
- 11.00 – J. Maruani *“New Advances in Quantum Physics and Biology”*
- 12.00 – O. Khetselius *“Quantum Structure of Electroweak Interaction in finite heavy Fermi-Systems”*
13:00 – Dinner / Dinner / Обід
- 14.00 – L Mammino *“Spectroscopy of multiatomic molecules: DFT calculations”*
- 14.45 – M.A. Naschimento *“New models in quantum theory of scattering”*
- 15.45 – A. Svinarenko *“Spectroscopy of Rydberg Autoionization States of heavy Atoms: New Achievements”*

December 26 (Monday):

- 10:00 – E. Brandas *“A Universe in our Brain: Carnot’s Engine & Maxwell’s Demon”*
- 11:00 - P. Kondratenko *“Spectroscopy, electron structure and relaxation processes in multiatomic molecules in the highly excited states”*
- 12:00 - A. Glushkov *“Nuclear Quantum Optics – New Advances and data”*
13:00 – Dinner / Dinner / Обід
- 14:00 - V. Ternovsky *“Spectroscopy of heavy atomic systems: Lanthanides”*
- 14:30- A Ignatenko *“Relativistic spectroscopy of diatomic molecules”*
- 15:00 – Yu. Lopatkin *“Computational methods in modern quantic chemistry: Spectroscopic Studies”*
- 15:30 - O Khetselius *“Hyperfine interactions spectroscopy”*

December 27 (Tuesday):

- 10:00 – Yu. Dubrovskaya “*A relativistic Spectroscopy of pionic atomic systems with accounting for the relativistic, radiative and nuclear effects*”
- 10:20 – A. Nesterenko, *Relativistic theory of spectra and radiative transitions for Tm-like ions*”
- 10:40 – O.L. Mykhailov, *Relativistic theory of spectra of lithium-like multi-charged ions*”
- 11:00 – M.P. Makushkina, *Ultrafine structure of spectra of heavy atoms and ions*”.
- 11:20 – E Ternovsly, *Relativistic calculation of oscillator strengths of multicharged ions in the Debye plasmas*”
- 11:40 – O. Antoshkina, *Relativistic theory of calculation of Auger characteristics and autoionization states in complex atoms*
- 12:00 – A. Tsudik, *Radiation spectrum of a relativistic backward-wave tube with elements of optical chaos*
- 12:20 - M. Smischenko, *Relativistic theory of calculation of the characteristics of radiative transitions in the spectra of Ne-like ions*
- 12:40 – A. Belodonov, *Relativistic energy approach to calculating the characteristics of autoionization resonances in complex atomic systems*
- 13:00 – Dinner / Dinner / Обід
- 14:00 – V. Afanas’eva, *Relativistic theory of calculation of spectra, spectral and radiation characteristics of Mg-like ions*
- 14:20 – M. Makushkina, “*Hyperfine structure of atomic spectra*”
- 14:40– E. Efimova, *Relativistic theory of computing the Auger decay Parameters in heavy atoms*”
- 15:00– I. Bilan, *Optical chaos in spectroscopy and dynamics of molecular systems*
- 15:20 – E. Shevchenko, stud. (Sci. Adv. Prof. O. Khetselius), *Spectroscopy of atmospheric gases system*
- 15:30 – D. Shelingovskyi, stud. (Sci.Adv. Prof. A. Glushkov), *Modeling the evolution of complex radiation-ecological systems based on the theory of integral equations and a complex field*
- 15:40 A.Filenko, stud. (Sci. Adv. Prof. A. Svinarenko) *Method of Sturm expansions for accounting for the states of the continuous spectrum in the calculations of autoionization resonances*
- 15:50 – G. Mizgulin, stud. (Sci.Adv. Prof. A. Glushkov), *A new mathematical algorithm for calculating beta decay characteristics using the optimized Dirac-Fock-Slater method*
- 16:00 – Closing Session (A. Glushkov, O. Khetselius, A. Svinarenko,)

MASTER-CLASS (for BrD, MsD, PhD 104 Students and PostDocs)

ATOMIC, MOLECULAR AND LASER OPTICS AND SPECTROSCOPY

**Lecturers: Prof. A. Glushkov; Prof. O. Khetselius; Prof. A. Svinarenko;
Assoc.-Prof. Yu. V. Dubrovskaya**

28 December 2022 TOPICS (Chapters):

- Current problems and new methods of atomic spectroscopy
- Current problems and new methods of nuclear spectroscopy
- Current problems and new methods of laser spectroscopy
- Spectroscopy of Rydberg atoms and ions;
- Spectroscopy of heavy diatomic and multiatomic molecules
- Spectroscopy of radiative and autoionization processes in heavy atoms and ions
- Electron- β -nuclear spectroscopy of atoms and molecules and chemical bond effect on the β -decay parameters
- Consistent quantum theory of the recoil induced excitation and ionization in atoms during capture of neutron
- New quantum relativistic approach in theory of cooperative muon -gamma-nuclear processes: negative muon capture and metastable nucleus discharge
- Optics and spectroscopy of cooperative laser-electron nuclear effects in the finite fermi-systems (atomic and molecular systems)
- Operator perturbation theory to atomic and molecular systems in a strong electromagnetic field
- Hyperfine interactions spectroscopy
- Quantum Structure of Electroweak Interaction in finite heavy Fermi-Systems
- Modern spectroscopy and the Standard Model