LATVIJAS UNIVERSITĀTE
ATOMFIZIKAS UN SPEKTROSKOPIJAS INSTITŪTS

UNIVERSITY OF LATVIA

MSCA Staff Exchange project Q-DYNAMO: bridging scientists in quantum optics across the globe

Teodora Kirova

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Q-DYNAMO

European Commission
Marie Skłodowska-Curie Actions

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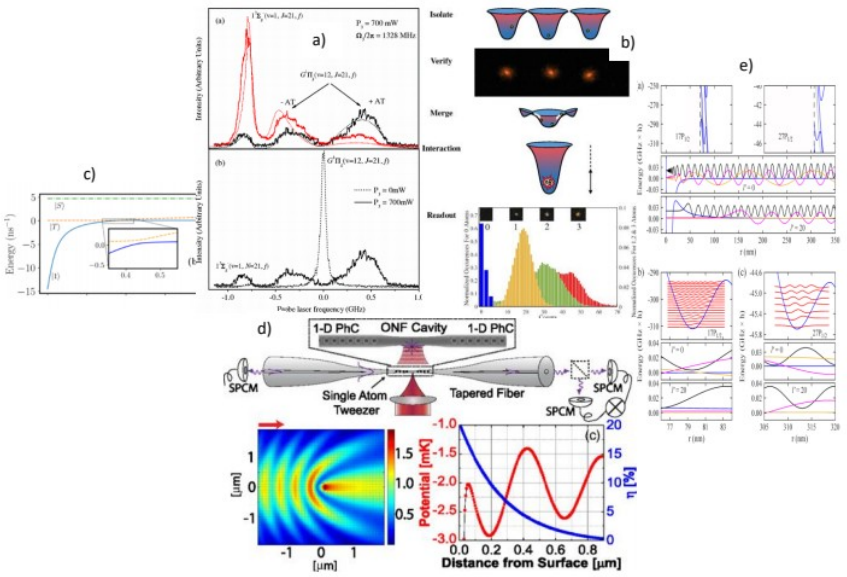
"Quantum Dynamic Control of Atomic, Molecular and Optical Processes" (2024-2027)



Q-DYNAMO's objectives:

- conduct **state-of-the-art research** in the field of **experimental/theoretical quantum control** via development of novel quantum control protocols for all-optical switch, molecular orientation, spin-entangled cold atoms, control of ultracold chemical reactions, Rydberg-ion molecules via manipulation by external fields, e.g. lasers, radio frequency and microwave fields, quantum emitters coupled to optical nano-fibers and cavities;

- provide **Early Stage Researchers (ESRs)** with high **quality training** in modern theoretical/experimental approaches in the field of quantum optics and quantum control via **transfer of knowledge** from experts in the field to the young participants;

-**strengthen old** and **establish new collaborations** among the international participating teams by using the possibilities offered by the SE scheme to promote networking between all partners via sharing and transfer of knowledge and ideas between teams with different expertise;

- **communicate and disseminate** research results to the **scientific community and the general public**, as well as to coordinate **future technical applications** by negotiating with industry partners.

Participating Organizations

Beneficiaries (EU)

T. Kirova
(theory, coordinator)

S. M. Wimberger
(theory)

D. Ciampini
(experiment)

J. H. Denschlag
(experiment)

Associated partners (non-EU)

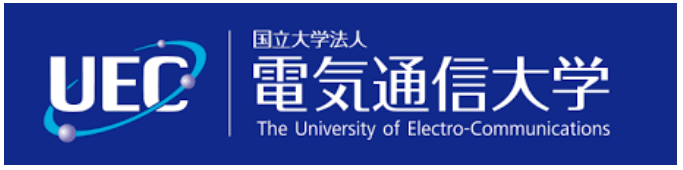
A. M. Lyyra
(experiment)

G. Raithel
(experiment)

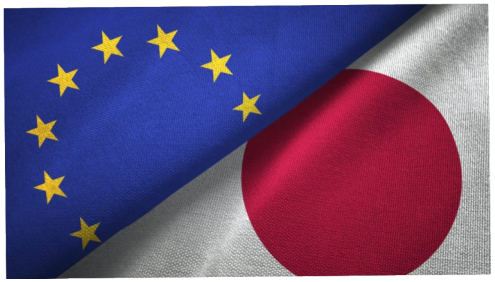
J. P. D'Incao
(theory)

M. Andersen
(experiment)

M. Sadgrove
(experiment)



K. P. Nayak
(experiment)

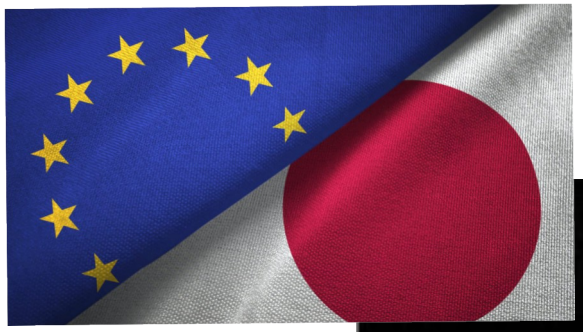


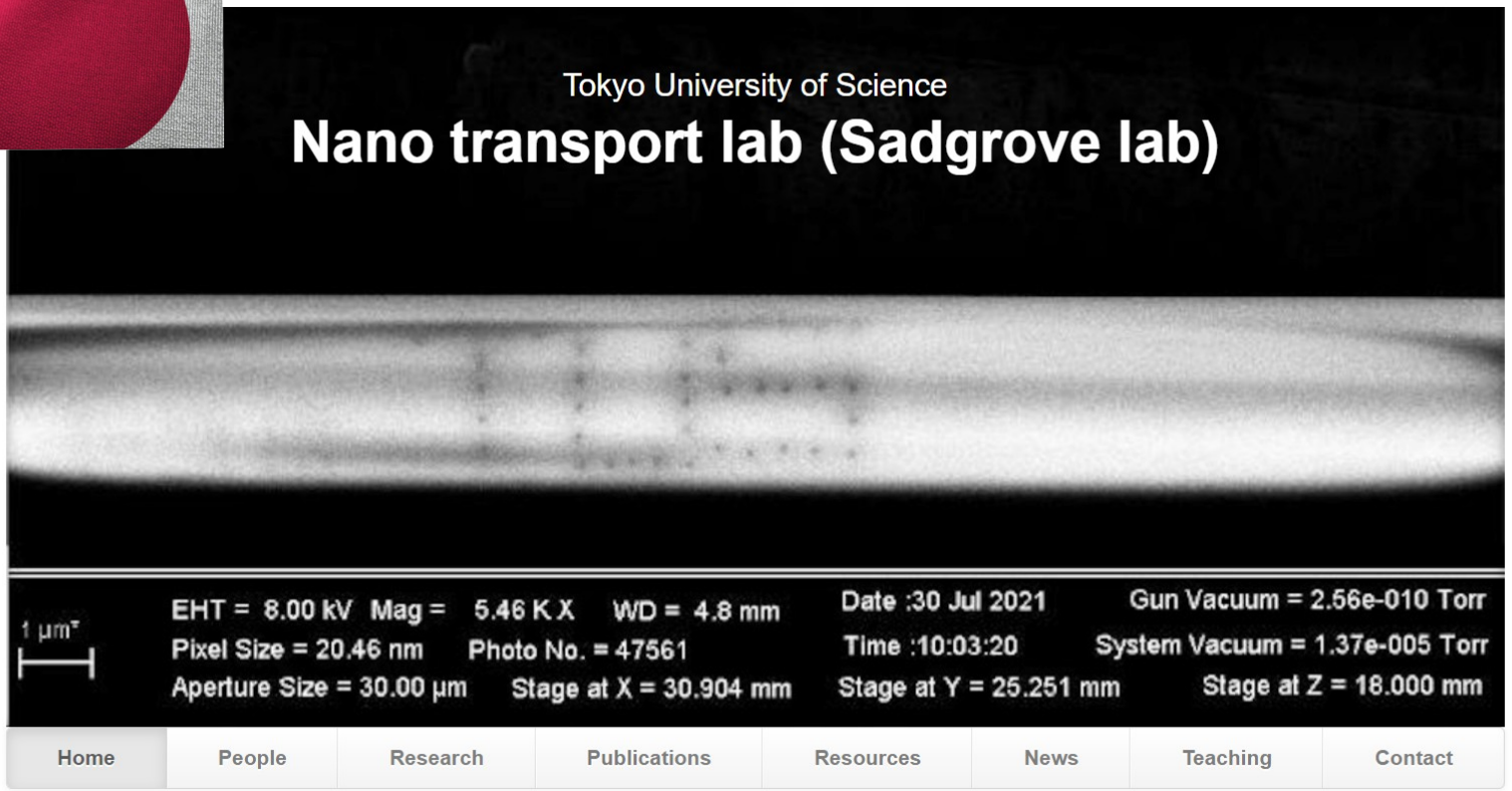
Participating Organizations from Japan

-Contact with Japan was established by our partner at University of Parma

TUS is one of the oldest private universities of science and technology in Japan, striving to solve global challenges and make the world a better place through science. It has 19,033 students and 1722 faculty members, spread over 390 laboratories. The university is known for its rigorous education and research activities, and graduates have a 96% placement success rate. In terms of physics research, TUS is one of the homes of superconducting qubit research in Japan. It also has strong connections to the HITOMI satellite astrophysics collaboration, and other Japan based astrophysics research.

UEC wth around 500 faculty members and more than 3500 students specialize in a wide range of fields in basic science, engineering and applications, e.g. physical engineering, material science, life science, optical science, electronics, robotics, mechanical engineering, and media. It is currently ranked among the 800-1000 best universities in the world. The mission of UEC is creation and achievement of knowledge and skill to contribute to the sustainable development. It aims at education and research at the cutting-edge of science and technology, cultivating international researchers and technologists for the pioneering era of science and technology. It also strongly promotes industrial collaboration, diversity and gender equality.



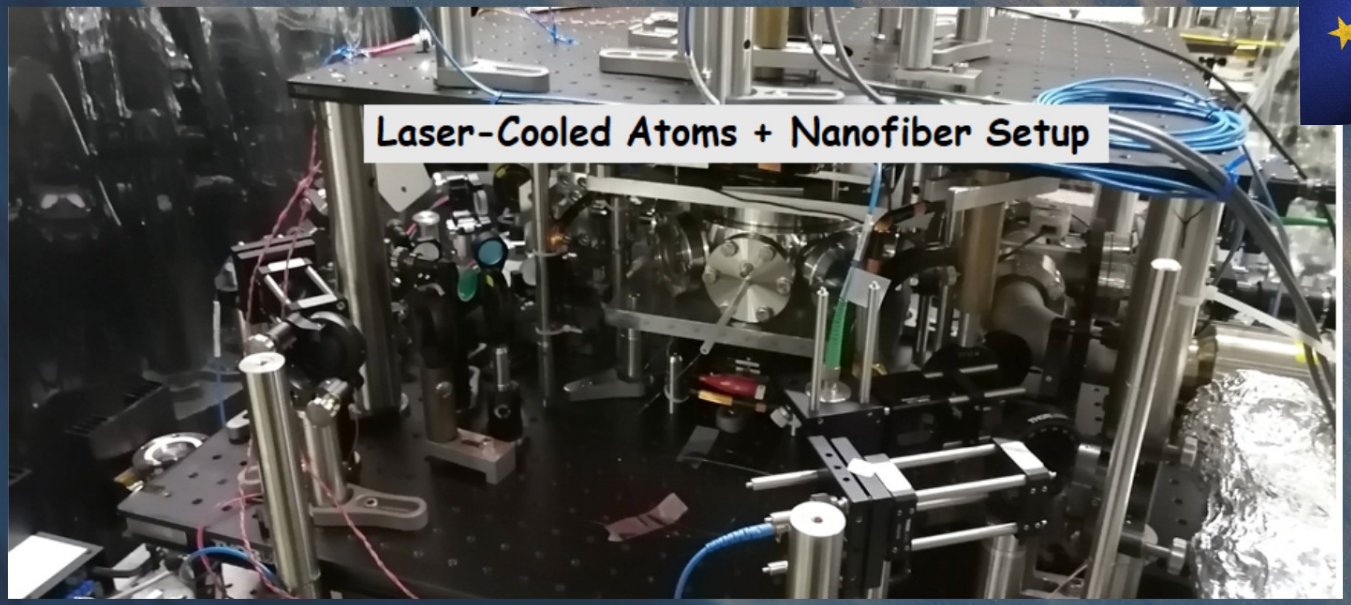


“Nano transport lab” investigates control of the motion of nanoscale objects using light in nanoscale structures. Their interest is in expanding the techniques for control of motioin in nanoparticles, photons in nanostructures, and atoms near nanostructures.

The lab is equipped with nanofiber manufacturing equipment, microscopes for single photon generation, particle manipulation, a customized scanning electron microscope with optical fiber inputs, Rb laser cooling equipment, and a mechanical workshop.

東京理科大学
TOKYO UNIVERSITY OF SCIENCE

Graduation of the class of 2023! Congratulations!



Research

研究テーマ：ナノフォトニック量子インターフェースの開発

多方面に応用できる全ファイバー型の量子フォトニクスプラットフォームの実現に向け、ナノファイバーと呼ばれるサブ波長のくびれを持つテーパファイバー上での光と物質の量子的な相互作用を研究しています。この技術の主たる特徴は、エバネッセント領域中の媒質との強い相互作用を可能にしつつ、ガイドされた光電場が横方向に強く閉じ込められることです。これにより、単一原子とファイバーにガイドされた光子の操作ができるようになります。私たちは、捕獲された、つまりレーザー冷却された単一原子とファイバーにガイドされた光子間における量子的なインターフェイスを開発しています。さらに、ナノファイバー中に置かれ、クライオ温度（3.7 K）まで冷却された単一量子ドットのハイブリットシステムを用いたファイバー型量子光源の開発も行っています。

Our main research interest is to explore novel atom-photon interactions using nanophotonic devices. The key challenge is to achieve the ultimate control of single atom/photon and to engineer atom-photon/photon-photon/atom-atom interactions to realize efficient optical (ideally fiber-coupled) quantum interfaces. The quantum interfaces will be implemented as building blocks for quantum processors and due to the use of optical photons as information carriers they will be easily integrated to the quantum networks.

国立大学法人
電気通信大学
The University of Electro-Communications

Members of K. Nayak's "Quantum Nanophotonics Lab"

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Activities within Q-DYNAMO

Total Cost: 404, 800 Euro
Planned Secondments: 118 of which 88 by EU partners

Work Packages:

WP1,2,3 "Research": Theoretical and experimental investigations of quantum control schemes in thermal, Rydberg cold and ultracold atoms/molecules

WP4 "Training": ESRs will be trained in modern theoretical/experimental approaches in quantum optics; provided during the ESRs' secondments within the research WPs, and during 4 annual summer schools; complementary skills planning research activities, presentation of scientific results, preparing conference abstracts/manuscripts for publication

WP5 "Dissemination and Management": project webpage, social media (Youtube, Facebook, Linkedin, Twitter), short TV programs and interviews; "Scientist Night" event organized every year by LU; participation in conferences/seminars in Europe, USA, Japan, New Zealand to report the results from the project; 2 Q-DYNAMO workshops hosted by Latvia (2nd year) and Italy (4th year); 4 summer schools for ESRs

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https://cordis.europa.eu/project/id/101131418

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