

# prof. dr. Rok Žitko

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## Work address:

F-1 - Theoretical physics

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Foto: Marjan Verč

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Personal web site: [auger.ijs.si/nano/](https://auger.ijs.si/nano/) (full annotated bibliography, research and teaching activities, and software projects)

Born 12. 4. 1978 in Ljubljana, Slovenia.

## **Current positions:**

2021-: Research councillor ("znanstveni svetnik") at F1, Department of Theoretical Physics, Jožef Stefan Institute, JSI

## **Employments:**

2023-2024: Full professor at UL FMF

2021-: Research councillor at F1 JSI

2017-2022: Associate professor at UL FMF

2016-2021: Senior research fellow at F1 JSI

2012-2017: Assistant professor at UL FMF

2011-2016: Research fellow at F1 (Theoretical physics) JSI

2009-2011: Assistant with PhD at F5 JSI

2009-2012: Assistant at UL FMF

2008: Postdoctoral fellow, Institute for theoretical physics at University of Göttingen, Germany

2003-2007: Research assistant at F5 (Condensed matter physics) JSI

## **Education:**

2008: Postdoctoral fellow, Uni. Göttingen(with prof. Thomas Pruschke)

2007: Doctor's degree, UL FMF

2002: Bachelor's degree, UL FMF

**Awards and grants:**

2022: "Zoisovo priznanje" (Zois distinction) for developing the theory of nanoscopic quantum systems

2022-: P1-0416 "Physics of quantum technologies", research programme funded by Slovenian research agency (ARRS), 2.5 FTE for three years, programme leader Rok Žitko

2021-2024: V1-2119 "Cryptographically safe random number generator", research project funded by National security agency (UVTP) and Slovenian research agency (ARRS), 1.6 FTE for three years, PI Rok Žitko

2021-2024: J1-3008 "Coulombic subgap states in superconducting quantum devices", research project funded by Slovenian research agency (ARRS), 1.2 FTE for three years, PI Rok Žitko

2016-2018: J1-7259 "The multi-impurity problem", research project funded by Slovenian research agency (ARRS), 1,3 FTE for three years, PI Rok Žitko

2009-2011: Z1-2058 "Single magnetic atoms and magnetic nanostructures on metal surfaces", postdoctoral project funded by Slovenian research agency (ARRS), 1 FTE for two years, PI Rok Žitko

2008: "Zlati znak Jožefa Stefana" award for outstanding contributions made to science in the Doctoral thesis

2002: "Univerzitetna Prešernova nagrada" award for undergraduate students

**Teaching:**

2024: Lectures "Solid state theory" at UL FMF

2013-2023: Lectures "Computer technologies" at UL FRI

2009-2013: Teaching assistant: Experimental Lab 3, Dynamical systems, Classical mechanics; UL FMF

2008: Teaching assistant: Introduction to programming in natural sciences; Univ. of Göttingen, Germany

Supervised 8 master theses (Don Rolih, Luka Pavešić, Amina Alić, Nejc Rozenstein, Marion van Midden, Tina Arh, Tadej Mežnaršič, Žiga Osolin) and 1 diploma thesis (Marjan Maček)

**Supervision of graduate students:**

2022-: Don Rolih, UL FMF

2021-: Katja Gosar, UL FMF (coadvisor; advisor dr. Peter Jeglič)

2019-2023: Luka Pavešić, UL FMF

2017-2022: Tadej Mežnaršič, UL FMF (coadvisor; advisor dr. Peter Jeglič)

2012-2016: Žiga Osolin, UL FMF

2012-2014: Denis Golež, UL FMF (coadvisor; advisor prof. dr. Janez Bonča)

**Current research projects and interests:**

- Quantum impurity physics, numerical renormalization group, magnetic anisotropy, spin-orbit coupling, multi-orbital and multi-channel problems
- Method development, numerics, computer algebra
- Heterogeneous strongly correlated systems and ensembles of many impurities, real-space DMFT, impurity-impurity coupling
- Transport properties of nanostructures and strongly correlated electron systems
- Subgap states in nanostructures coupled to superconducting contacts, charge-conserving models for superconducting islands, modelling of experimental devices
- New qubit designs, Andreev (spin) qubits, quasiparticle effects
- Cold atoms, Bose-Einstein condensates, interaction modulation, Bose fireworks
- Superconducting quantum electronics, circuit quantum electrodynamics, microwave resonators, transmons
- Quantum computing hardware, control electronics, FPGAs
- True random number generators (classical and quantum)
- Quantum communications, post-processing, integration

**Institutional responsibilities:**

- 2023-: Member of the Scientific council (Znanstveni svet) of JSI.
- 2021-: Member of IJSplus committee
- 2020-: Coordinator for the topic of Quantum simulations within QUTES, Slovenian interest group on quantum technologies
- 2011-: Responsible for high performance computing facilities of the department F1 at JSI; this involves planning expansions, integrating systems, managing computing, storage and network elements (4000 CPU cores, 1+ PB storage capacity on ZFS and Ceph, 40/100 GbE & Infiniband HDR100 network), infrastructure (cooling, power distribution), and software stack (CentOS, Rocks cluster, Slurm, Lmod, Singularity, EasyBuild, toolchains). Successful applications for ARRS cofunding: packages 17, 18, 19, 20.

**Commissions of trust:**

2022-2024: chair of the Slovenian Committee for physics, Association of Mathematicians, Physicists and Astronomers of Slovenia (DMFA Slovenije)

2019-2024: deputy member of Quantum Community Network (QCN) representing Slovenia in EU Quantum Flagship project.

- Project application evaluator for DFG (Germany), HRZZ (Croatia), Comision Nacional de Investigacion Cientifica y Tecnologica (Chile), ERC, MSCA IF
- Reviewer for Phys. Rev. Lett. and Phys. Rev. B (about 10 papers per year), occasionally other journals (Nano Letters, Nature, Nature Nanotech., Eur. Phys. Lett., Scientific Reports, J. Phys.: Condens. Matter, New J. Phys., Communications Physics, SciPost Phys.)

## **Collaborations:**

- Multiple ongoing projects with local experimental groups at Jozef Stefan Institute (P. Jeglič, E. Zupanič, M. Klanjšek, A. Zorko, D. Arčon, D. Mihailović)
- J. Paaske, G. Steffensen, J. Nygard, K. Grove-Rasmussen, J. C. Estrada Saldana (QDev, NBI, Copenhagen): hybrid superconductor-semiconductor devices
- D. Tanasković, J. Vučičević, IP Belgrade: superconductivity and strong correlation physics, orbital magnetic response in correlated systems, transport properties

## **Organization of scientific events:**

- Meeting of the members of Slovenian society of mathematicians, physicists and astronomers (Občni zbor DMFA Slovenije), 11 Nov 2022
- BOSSA - Bound states in superconductors and interfaces, MPIPKS, Dresden, Germany, 8-10 Apr 2019
- NGSCES - New generation in strongly correlated electron systems, Trogir, Croatia, 14-18 Sep 2015

## **Public engagement**

- Radiosfera (radio), interview on quantum technology (QT), Apr 2025
- Kvantni dan na Valu 202, interview on QT, Apr 2025
- STAsience, opinion piece on quantum research in Slovenia, Apr 2025
- Podobe znanja (radio), interview, Mar 2023
- Frekvenca X (radio/podcast), three-part series on QT, Jan 2021
- European Quantum Week - public lecture on QT, Nov 2020
- Frekvenca X (radio/podcast), interview on semiconductor chips, Sep 2020
- Ugriznimo znanost (TV), guest, topology in physics, 2016
- Intelektka (radio), interview, 2016
- Portal STAznanost, interview, 2015

## **Outreach**

- Organization of yearly World quantum day events (2022-2025)