

# QUANTUM INFORMATION THEORY

## Moscow Institute of Physics and Technology (National Research University)

Degree or qualification is awarded: **PhD (Candidate of Science)**

Language of study: **English**

Mode of study:

Duration: **4 years**

Availability of free education: **yes**

Price: **375 000 RUB**

Programme webpage at the university website: <https://eng.mipt.ru/programs/quantum-information-theory/>

Programme curator: **Denis Ustyuzhaninov**

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### Entry requirements:

- Master's degree / equivalent in a related field
- B2 level of English
- Good track record of publications related to the topic of the intended research
- Strong research proposal 1,500 - 3,500 words

### Research supervisor:

[Sergey Filippov](#)

PhD, Head of the Laboratory of  
Quantum Information Theory

### Supervisor's research interests:

- Quantum Technologies.
- Quantum Measurements.
- Quantum Information Theory.
- Entanglement and Separability.
- Dynamics of Open Quantum Systems.
- Quantum Channels.
- Geometry of Quantum States.
- Quantum Computers and Computing.
- Tensor Networks.
- Machine Learning.

### Research highlights:

World-leading research with publications in the best journals in the field of Quantum Physics and Mathematical Physics such as Physical Review Letters, Physical Review A, Journal of Mathematical Physics. A broad network of collaborators in Finland, Poland, Slovakia, and Czech Republic.

### Supervisor's specific requirements:

Exceptionally good knowledge of linear algebra and quantum mechanics.

## **.Main publications:**

- I.A. Luchnikov, S.V. Vintskevich, D.A. Grigoriev, S.N. Filippov. Machine learning non-Markovian quantum dynamics // *Physical Review Letters* 124, 140502 (2020).
- S.N. Filippov and K.V. Kuzhamuratova. Quantum informational properties of the Landau-Streater channel // *J. Math. Phys.* 60, 042202 (2019)
- I.A. Luchnikov, S.V. Vintskevich, H. Ouerdane, and S.N. Filippov. Simulation Complexity of Open Quantum Dynamics: Connection with Tensor Networks // *Physical Review Letters* 122, 160401 (2019).
- S.V. Vintskevich, D.A. Grigoriev, S.N. Filippov. Effect of an incoherent pump on two-mode entanglement in optical parametric generation // *Physical Review A* 100, 053811 (2019).
- S.N. Filippov, V.V. Frizen, D.V. Kolobova. Ultimate entanglement robustness of two-qubit states against general local noises // *Physical Review A* 97, 012322 (2018).
- S.N. Filippov, T. Heinosaari, L. Leppajarvi. Simulability of observables in general probabilistic theories // *Phys. Rev. A* 97, 062102 (2018).
- S.N. Filippov, D. Chruscinski. Time deformations of master equations // *Phys. Rev. A* 98, 022123 (2018).
- S.N. Filippov. Lower and upper bounds on nonunitary qubit channel capacities // *Reports on Mathematical Physics* 82, 149-159 (2018).
- S.N. Filippov, K. Yu. Magadov. Positive tensor products of qubit maps and n-tensor-stable positive qubit maps // *J. Phys. A: Math. Theor.* 50, 055301 (2017).
- I.A. Luchnikov, S.N. Filippov. Quantum evolution in the stroboscopic limit of repeated measurements // *Phys. Rev. A* 95, 022113 (2017).
- F. Benatti, D. Chruscinski, S. Filippov. Tensor power of dynamical maps and positive versus completely positive divisibility // *Phys. Rev. A* 95, 012112 (2017).
- S.N. Filippov, J. Piilo, S. Maniscalco, M. Ziman, Divisibility of quantum dynamical maps and collision models // *Phys. Rev. A* 96, 032111 (2017).

## **Specializations within this programme**