

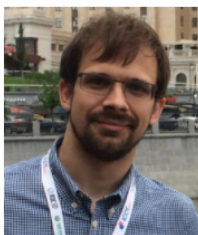
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NITheP Colloquium Thursday, 21 January 2021

Anton Trushechkin | Steklov Mathematical Institute of Russian
Academy of Sciences

"Unified master equation of weak-coupling limit type"



Quantum master equations are at the heart of theory of open quantum systems. Many present-day works are devoted to the correct form of quantum master equation for a system weakly interacting with the bath. A known rigorous mathematic derivation leads to an equation (often referred to as the "global" mater equation) in the form of Gorini–Kossakowski–Lindblad–Sudarshan (GKLS). It has good properties (preservation of positivity, agreement with the second law of thermodynamics), but is too restrictive to cover all possible physical situations. Namely, all Bohr frequencies are assumed to be well separated from each other.

If this is not the case, the Redfield equation with the so called non-secular terms and the so called local mater equation are often used. However, the Redfield equation violates the positivity of the density operator and the local master equation violates the second law of thermodynamics.

In the talk, a rigorous derivation of a unified master equation of weak-coupling limit type, which, in the general case, includes secular, non-secular, and local terms, will be presented. This equation has the GKLS form (hence, preserves positivity) and is in agreement with the second law of thermodynamics.

BIOGRAPHY

Anton Trushechkin is a researcher at the Steklov Mathematical Institute of Russian Academy of Sciences. He received a PhD in mathematical physics from the Steklov Mathematical Institute in 2009 under the supervision of Prof. Igor Volovich. Since 2011, he has worked at the same institute.

His current research focuses in two fields:

- (i) Theory of open quantum systems, especially derivation of quantum master equations and applications to excitation energy transfer in photosynthetic systems, and
- (ii) Quantum cryptography.

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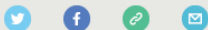
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