Thesis Changes Log

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PhD Program: Physics

Title of Thesis: Dynamics of exceptional states in many-body systems

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Co-Supervisor: Oleg Lychkovskiy

The thesis document includes the following changes in answer to the external review process.

The majority of changes were performed in accordance with the recommendations of PhD Jury Members.

General changes

Several proofreads were performed, the vast amount of typos and language errors were eliminated.

Fixed many markup issues such as not-working links to formulas or figures, wrongly displayed quotes throughout the paper, etc.

Fixed a mistake in the bibliography, which led to wrong spelling of a few last names.

Abstract.

The abstract was slightly modified. Some statements which were too general now are more specific. For example: ".. revivals in quantum many-body systems.." changed to ".. revivals in quantum spin systems.." as it more narrowly describes the content of the thesis.

Introduction.

The fact that integrable systems can relax to the Generalized Gibbs Ensemble (GGE) is now mentioned in the introduction.

Fixed errors noticed by referees, in particular:
- Removed unfinished sentence in the subsection 1.1.4
- The caption to Fig. 1-1 is edited. "Uniform" was replaced to "Close to uniform."
- deleted a sentence where ETH is mistakenly referred to as an approach
- "it can obey ETH" changed to "there are spin systems which satisfy ETH with great precision."

Other small corrections regarding grammar and word selection were made.

Chapter 2.

The introduction was renamed to "Preliminary remarks" to avoid overlap with the actual introduction.

Lyapunov exponents are now properly introduced in the beginning.

Removed a paragraph that was overlapped with the introduction.

Entanglement entropy is properly introduced before the discussion of the results.

Caption 2-15, fixed mistake. "Horizontal" —> "Vertical"

Section 2.4 was moved to the end of the Chapter.

The caption to Fig. 2-1 added a sentence: "All the data shown in introduction will be discussed further in detail."

The outline of the results is now a separate section which is split into two subsections for classical and quantum results. This section moved to the end.

Discussion section renamed to Summary and discussion

Rewritten for clarity. "the majority of trajectories" —> "the majority of randomly selected trajectories"

"Scar-eigenstates" —> "scar-like eigenstates"

Added a sentence that explains why we have anisotropy in the Hamiltonian: "The anisotropy in the XY plane is responsible for the robust absence of quantum integrability and for the existence of the intermediary quasiperiodic classical regime, which will be introduced further."

In the beginning of 2.5.2 added a proper specification of Entanglement Entropy and that we compute it for the bipartite division.

In 2.5 specified that: "(periodic boundary conditions are implied same as in classical case)"

Mistake in formula 2.10 (now 2.11). max changed to argmax

Fig 2.10 added information that Dynamics of infinite temperature state is calculated for $L=7$.

As suggested by a referee added a Figure displaying a very long time dynamics of spin projection to prove that quasiperiodic regime is indeed stable.

As suggested by a referee added a Figure displaying r-value for the Hamiltonian 2.1, to prove that this system is robustly non-integrable.

Fixed a mistake in a footnote at page 49

Chapter 3:

Fixed a mistake in equation 3.9

Fixed link to a wrong Hamiltonian in the captions to Fig 3-4 and 3-5.

A few statements which seemed to be too broad were reworked or deleted.

Chapter 4:

Page 72-74, fixed missed numbers of the equations.

Chapter 5:

Removed unnecessary division to subsubsections

Deleted a few too broad or too unclear statements.

The discussion is slightly reworked in order to bypass some sharp corners.