HARMAN PREET SINGH

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Google Scholar ◇ ORCID ◇ Github ◇ LinkedIn

ACADEMIC EMPLOYMENT

Eberhard Karls University Tübingen *Nov. 2025 - Present*
Post-doctoral researcher in the groups of Marius Lemm and Stefan Teufel Tübingen - Germany

Scuola Internazionale Superiore di Studi Avanzati (SISSA) *Oct. 2021 - Oct. 2025*
Ph.D. student in the group of Marcello Porta Trieste - Italy

EDUCATION

Scuola Internazionale Superiore di Studi Avanzati (SISSA) *Oct. 2021 - Oct. 2025*
Ph.D. in Geometry and Mathematical Physics Trieste - Italy
`Advisor:` Marcello Porta (Mathematics Area)
`Thesis:` *Large-scale response theory for gapless Fermi systems in low dimensions*
`Final Mark:` Ph.D. awarded cum laude

Università degli Studi di Padova *Oct. 2019 - Sep. 2021*
M.Sc. in Physics Padova - Italy
`Advisors:` Antonio Ponno & Lorenzo Zanelli (Mathematics Department)
`Thesis:` *A rigorous derivation of the Bogoliubov-Gross-Pitaevskii equation for superfluids*
`Final Mark:` 110/110 cum laude

Università degli Studi di Padova *Oct. 2016 - Sep. 2019*
B.Sc. in Physics Padova - Italy
`Advisor:` Pieralberto Marchetti (Physics Department)
`Thesis:` *Quantum Mechanics in phase space: non-classical properties*

RESEARCH INTERESTS

My research interests focus on the mathematical analysis of transport in quantum many-body systems, performed by employing techniques drawn from Quantum Field Theory and equilibrium Statistical Mechanics. Further, I am keen on the emergence of topological and geometrical invariants parameterising robust phases of matter.

During my PhD, I worked on the proof of validity of linear response, encoded in Kubo formula, for *gapless* lattice fermionic systems in low dimensions, via rigorous Renormalisation Group techniques.

Currently, I am investigating the extension of these results to higher dimensional models. Furthermore, I am studying the locality propagation properties of fermionic systems in the continuum setting.

PUBLICATIONS AND PREPRINTS

2. M. Porta, G. Scola, and H. P. Singh, *Large scale dynamical response of interacting* 1*d Fermi systems*, (2025) arXiv: 2509.08665 [math-ph]

1. M. Porta, and H. P. Singh, *Large Scale Response of Gapless* 1*d and Quasi*-1*d Systems*, Annales Henri Poincaré (2025) https://doi.org/10.1007/s00023-025-01600-z

CONFERENCE TALKS AND POSTER SESSIONS

13/2/25 **Mathematical Challenges in Quantum Mechanics**, GSSI, L'Aquila, Italy.
Contributed talk: *Large scale edge response for 2d topological insulators*

16/12/24 **127th Statistical Mechanics Conference**, Rutgers University, Piscataway, New Jersey, USA.
Contributed talk: *Validity of edge linear response for 2d topological insulators*

29/8/24 **Rigorous Renormalization Group Analysis of Collective Phenomena in Fermionic Quantum Systems**, Como, Italy.
Contributed poster.

13/8/24 **Quantissima in the Serenissima V**, Venice, Italy.
Contributed talk: *Validity of edge linear response for 2d topological insulators*

SEMINAR TALKS

15/12/25 **Junior SFB Coffee Talk**, online seminar
Validity of Kubo formula for 1d and quasi-1d lattice fermionic systems

13/11/25 **Mathematical Physics Oberseminar**, Eberhard Karls Universität, Tübingen, Germany
Large-scale response theory for gapless lattice Fermi systems in low dimensions

30/1/25 **Mathematical Physics Oberseminar**, Eberhard Karls Universität, Tübingen, Germany
Large scale response of gapless 1d and quasi-1d fermionic systems

13/3/23 **Junior Geometry and Mathematical Physics Seminar**, SISSA, Trieste, Italy
A geometric picture of topological phases of matter

1/6/22 **Renormalization Group seminar**, SISSA, Trieste, Italy
Determination of the RG fixed point via tree expansion

31/5/22 **Seminar-exam**: Riemann surfaces and integrable systems, SISSA, Trieste, Italy
The canonical ensemble of the periodic Toda lattice

SCIENTIFIC VISITS

University of Zürich (UZH) *May 2024*
Hosted by: B. Schlein and M. Porta 1 week

University of Zürich (UZH) *March 2024*
Hosted by: B. Schlein and M. Porta 1 week

University of Zürich (UZH) *Nov.-Dec. 2023*
Hosted by: B. Schlein and M. Porta 1 week

LANGUAGES

Italian	Native
Punjabi	Native
English	Fluent (level C1 on the CEFR for Languages)
Hindi	Fluent
French	Basic knowledge

Last updated: Trieste, 26 - 2 - 2026.