20th Conference on the Theory of Quantum Computation, Communication and Cryptography

TQC 2025, September 15–19, 2025, Indian Institute of Science, Bengaluru, India

Edited by

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Editors

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Preface

The 20th Conference on The Theory of Quantum Computation, Communication and Cryptography (TQC) was hosted by the Indian Institute of Science, Bengaluru in India, and held from September 15 to September 19, 2025. The TQC conference is a leading annual international conference for students and researchers working in the theoretical aspects of quantum information science. The scientific objective of TQC is to bring together the theoretical quantum information science community to present and discuss the latest advances in the field.

Areas of interest for TQC include, but are not restricted to: quantum algorithms, models of quantum computation, quantum complexity theory, the simulation of quantum systems, quantum cryptography, quantum communication, quantum information theory, quantum estimation and measurement, quantum error correction and fault-tolerant quantum computing, the intersection of quantum information and condensed-matter theory, and the intersection of quantum information and machine learning.

A list of the previous editions of TQC follows:

- TQC 2024, Okinawa Institute for Science and Technology, Japan
- TQC 2023, University of Aveiro, Portugal
- TQC 2022, University of Illinois at Urbana-Champaign, USA
- TQC 2021, University of Latvia, Latvia (virtual conference)
- TQC 2020, University of Latvia, Latvia (virtual conference)
- TQC 2019, University of Maryland, USA
- TQC 2018, University of Technology Sydney, Australia
- TQC 2017, Université Pierre et Marie Curie, France
- TQC 2016, Freie Universität Berlin, Germany
- TQC 2015, Université libre de Bruxelles, Brussels, Belgium
- TQC 2014, National University of Singapore, Singapore
- TQC 2013, University of Guelph, Canada
- TQC 2012, University of Tokyo, Japan
- TQC 2011, Universidad Complutense de Madrid, Spain
- TQC 2010, University of Leeds, UK
- TQC 2009, Institute for Quantum Computing, University of Waterloo, Canada
- TQC 2008, University of Tokyo, Japan
- TQC 2007, Nara Institute of Science and Technology, Nara, Japan
- TQC 2006, NTT R&D Center, Atsugi, Kanagawa, Japan

The conference consisted of invited talks, contributed talks and a poster session. The invited talks were given by André Chailloux (French Institute for Research in Computer Science and Automation), Stacey Jeffery (CWI), Rajendra Kumar (IIT Delhi), and Hayata Yamasaki (University of Tokyo).

Submissions were solicited for two tracks: With Proceedings (talk and proceedings) and Without Proceedings (talk only). There were 375 submissions. The program committee selected 77 submissions for talks, including 12 to be published in the With Proceedings track. I wish to thank the members of the Program Committee and all subreviewers for their incredible work which helped to form an excellent program. Also I wish to thank the Local Organizing Committee for all their efforts in organizing the conference and the Steering Committee for their guidance, as well as for maintaining the conference's high standards. Last but not least, I thank the authors of all the TQC 2025 submissions.

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Best Paper Prizes

The Program Committee selected as the TQC 2025 Best Paper Prize:

- *Polylog-time- and constant-space-overhead fault-tolerant quantum computation with quantum low-density parity-check codes*, by Shiro Tamiya, Masato Koashi, Hayata Yamasaki

The Program Committee selected as the TQC 2025 Best Student Paper Prize:

- *Quantum Purity Amplification: Optimality and Efficient Algorithm*, by Zhaoyi Li, Honghao Fu, Takuya Isogawa, Caio Silva, Isaac Chuang

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