

High Performance Computing and Quantum Computing – Sixth Edition

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HPCQC Organizing Committee

Local Organizers: Christian Fiori¹

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Day One: 14/12/2023

09:30 – 10:30 Registration

10:30 – 10:45 Sanzio Bassini – CINECA

Welcome

10:45 – 11:30 David DiVincenzo – JSC

Engineering the Quantum Computer

Session 1: European and Italian initiatives – Chairperson: Daniele Ottaviani

11:30 – 12:00 Sabine Mehr – GENCI

EUROQHPC-I: European prospects for HPC-QC integration

12:00 – 12:30 Simone Montangero – University of Padova

Quantum Computing activities of the National Center - Fondazione ICSC

12:30 – 13:35 Lunch

Session 2: Building quantum computers – Chairperson: Riccardo Mengoni

13:35 – 14:00 Jani Heikkinen – IQM

IQM's approach to HPC market and integration

14:00 – 14:25 Federico Mattei – IBM

IBM Quantum Computing: new steps towards quantum advantage

14:25 – 14:50 Andy Mason - D-Wave

Production Use Cases

14:50 – 15:15 Krisztian Benyo – Pasqal

How to get tangible results with a PASQAL machine today

15:15 – 15:45 Coffee Break

Session 3: Hybrid HPC-QC software and Quantum Start-ups – Chairperson: Sara Marzella

15:45 – 16:10 Julien Mellaerts – Eviden

Towards an High Performance Hybrid Computing

16:10 – 16:35 Esperanza Cuenca Gómez, Nvidia

Programming Quantum-Accelerated Supercomputers with CUDA Quantum

16:35 – 16:50 Guido Masella – Qperfect

Large scale quantum for everyone

16:50 – 17:05 Marco Arzeo – SeeQC

Chips-based Quantum Computing for better integration with High-Performance Computing

Day Two: 15/12/2023

Session 4: Universities and Research Centers – Chairperson: Enrico Prati

- 09:00 – 09:15 Antonella Guidazzoli – CINECA Visit Lab
Unraveling Quantum Computing: A CG Video Guide for Diverse Audiences
- 09:15 – 09:30 Sara Marzella – CINECA Quantum Computing Lab
HPC Quantum Computing Emulators on Leonardo – The “Quantum Suite”
- 09:30 – 09:45 Amer Delilbasic – Forschungszentrum Jülich / University of Iceland
Quantum Computing for Earth Observation (QC4EO) Study
- 09:45 – 10:00 Gonzalo Ferro – CESGA
The NEASQC Benchmark Suite (TNBS)
- 10:00 – 10:30 Marco Govoni – University of Modena and Reggio Emilia
Simulating condensed systems on quantum computers with quantum embedding

10:30 – 11:00 Coffee Break

- 11:00 – 11:15 Matteo Flocco – LINKS Foundation/Polytechnic University of Turin
Solving Graph Coloring with 256 qubit neutral atoms platform
- 11:15 – 11:30 Sebastiano Corli – UniMi
A Max K-Cut Implementation for QAOA: comparing HPC simulation of gate-based and measurement-based quantum computing architectures
- 11:30 – 11:45 Manuel Peracci – Polytechnic University of Milan
Neutral atom quantum computing scheduling by deep reinforcement learning
- 11:45 – 12:00 Simone Tibaldi – University of Bologna
Bayesian Optimization for QAOA
- 12:00 – 12:30 Leonardo Guidoni – University of L’Aquila
Low-depth Variational algorithms for Chemistry
- 12:30 – 12:45 Filippo Caruso – University of Florence
Machine learning based noise characterization and correction on neutral atoms NISQ devices
- 12:45 – 13:00 Luca Asproni – Data Reply; Christian Mattia – Intesa Sanpaolo
Diversifying Investments and Maximizing Sharpe Ratio: a novel QUBO formulation

13:00 – 14:00 Lunch

Session 4: Universities and Research Centers II – chairperson: Gabriella Bettonte

- 14:00 – 14:15 Filippo Orazi – University of Bologna
Hybrid Quantum Technologies for Quantum Support Vector Machines
- 14:15 – 14:30 Matteo Vandelli – Leonardo S.p.a.
Challenges to gate-based quantum optimization algorithms for industrial use-cases
- 14:30 – 14:45 Gabriele Cenedese – University of Insubria & INFN Milano
Targeting quantum many-body scars with shallow variational quantum circuits
- 14:45 – 15:00 Luca Nigro – University of Milan
Application of hybrid quantum-classical computing algorithms for quantum simulation of nuclear physics processes
- 15:00 – 15:15 Tommaso Fioravanti – IBM
Towards An End-To-End Approach For Quantum Principal Component Analysis
- 15:15 – 15:30 Giuliana Siddi Moreau – CRS4
Two quantum adiabatic optimization use cases for the energy sector
- 15:30 – 15:45 Marco De Pascale – LRZ
Upscaling QC simulators on HPC Systems
- 15:45 – 16:00 Marco Ballarin – University of Padova
Qmatchatea: a tensor network emulator for quantum circuits on Leonardo