

# **QC4HEP Working Group Annual Meeting**

## **Report of Contributions**

Contribution ID: 1

Type: **not specified**

# Welcome

*Friday 24 January 2025 09:00 (5 minutes)*

**Presenter:** Dr VALLECORSA, Sofia (CERN)

Contribution ID: 2

Type: **not specified**

## **State-of-the-art of the field (HEP)**

*Friday 24 January 2025 09:05 (30 minutes)*

Contribution ID: 3

Type: **not specified**

## State-of-the-art of the HW

*Friday 24 January 2025 10:35 (15 minutes)*

Contribution ID: 4

Type: **not specified**

## Highlights 1 TH

*Friday 24 January 2025 09:35 (5 minutes)*

Contribution ID: 5

Type: **not specified**

## Highlights 2 TH

*Friday 24 January 2025 09:40 (5 minutes)*

Contribution ID: 6

Type: **not specified**

## Highlights 3 TH

*Friday 24 January 2025 09:45 (5 minutes)*

Contribution ID: 7

Type: **not specified**

## Highlights 4 TH

*Friday 24 January 2025 09:50 (5 minutes)*



Contribution ID: **8**

Type: **not specified**

## Discussion TH

*Friday 24 January 2025 09:55 (10 minutes)*

Contribution ID: 9

Type: **not specified**

## Highlights 1 EXP

*Friday 24 January 2025 10:05 (5 minutes)*

Contribution ID: **10**

Type: **not specified**

## Highlights 2 EXP

*Friday 24 January 2025 10:10 (5 minutes)*

Contribution ID: **11**

Type: **not specified**

## Highlights 3 EXP

*Friday 24 January 2025 10:15 (5 minutes)*

Contribution ID: 12

Type: **not specified**

## Highlights 4 EXP

*Friday 24 January 2025 10:20 (5 minutes)*

Contribution ID: 13

Type: **not specified**

## Discussion EXP

*Friday 24 January 2025 10:25 (10 minutes)*

Contribution ID: 14

Type: **not specified**

## **Challenges: round table with a moderator - Topic: what are the challenges and how to overcome them in the next years**

*Friday 24 January 2025 11:15 (1h 15m)*

Theory: Karl J. & Martin S, & Jad A. & Alessandro R.;  
Experiments: Sofia V., Michele G., Andrea D.)

Contribution ID: 15

Type: **not specified**

## General assembly (all together)

*Friday 24 January 2025 17:00 (1 hour)*

- Organization: future virtual and in-person meetings (chairperson: SteerCo)
- Identify needs (enablement required, ...)
- Conduct guidelines (enrolment process, publication policy ...) (chairperson: Ivano)
- Summary of the discussions and outlook (chairperson: SteerCo)



Contribution ID: 16

Type: **not specified**

## Parallel sessions: Theory

*Friday 24 January 2025 14:00 (2h 30m)*

Potential topics to discuss:

o Optimization: static calculations (phase transition) (chairperson: Name)

Topic: Beyond VQE(?); Martin's "scaling" ansatz; Quantum subspace expansion (Laurin, Julian)

o Dynamics (chairperson: Stefan K. and Jad H.)

Topic: Scattering: how large can we scale? Can we reach utility scale?

o What else than Trotter? QDRIFT inspired ansatz, (chairperson: Alessandro R.).

o Scaling from 1D+1 to 2D+1 and possibly 3D+1 (HW dependences) –near-term vs fault-tolerant (what kind of chip topology will be needed?) (chairperson: Uwe W. and Karl J. and Arianna C.)

o Possible new research directions (all). Consolidate and/or start working teams working around selected topics.

Contribution ID: 17

Type: **not specified**

## Parallel sessions: Experiments

*Friday 24 January 2025 14:00 (2h 30m)*

Some potential topics for discussion:

- o Parallelization of quantum classical workflow (chairperson: Andrea D.)
- o (Large) data encoding and compression schemes (such as PCA) that can keep quantum correlation (chairperson: Miriam)
- o Quantum Monte Carlo generators (chairperson: Vincent P.)
- o QAOA (chairperson: Andrea)
- o QML ((chairperson: Koji)
- o Quantum generative models (can we make use of quantum data) (chairperson: Vincent C.)
- o Role of quantum sensing (chairperson: Yacine)

Possible new research directions (all). Consolidate and/or start working teams working around selected topics.