



# FAULT TOLERANT QUANTUM COMPUTING CHALLENGES AND OUTLOOK

PANEL

WORKSHOP

Forum  
**TERATEC 25**

# Pannel of contributors

Chaired by Jean-Philippe Nominé, *HPC Strategic Collaborations Manager, CEA*

With the participation of :

- Anthony Leverrier, *Research, Inria*
- Frédéric Magniez, *Directeur de recherche, Laboratoire IRIF CNRS*
- Boris Bourdoncle, *secrétaire général du rapport, Quandela*
- Mamdouh Abbara, *Client Engagement Specialist, Alice & Bob*
- Cyril Allouche, *Head of Quantum Computing R&D, Head of Disruptive Innovation, Eviden*

**Frédéric Magniez**  
*Research Director*  
*CNRS, Université Paris Cité*



- Quantum computers are 40+ years old — in theory
- Quantum computers won't replace supercomputers — they'll complement them
- Quantum algorithms have already revolutionized science — and could soon transform industry

**Anthony Leverrier**  
*Researcher*  
**INRIA**



- *Solutions for quantum error correction and fault tolerance have been proposed almost 30 years ago.*
- *The first convincing experimental demonstrations are now finally taking place in the labs!*
- *The challenge ahead of us is to find better and more economical schemes that will speed up the development of useful quantum computers.*

**Mamdouh Abbbara**  
*Client Engagement Specialist*  
*Alice&Bob*



- *Alice & Bob develops “cat qubits”, a technology with inherent error-correction*
- *This reduces by up to two orders of magnitude the size required for a fault-tolerant quantum computer*



# Boris Bourdoncle

*General secretary of the Academy Report  
Head of Scalable architecture research at Quandela*



- Few groups are exploring the applications of fault-tolerant quantum computing, in particular in terms of resource estimation and optimisation
- We need to develop the systems engineering behind building fault-tolerant quantum computers
- Scaling will require interconnecting modules, which calls for both experimental and theoretical advances

# Cyril Allouche

*Head of Quantum Computing R&D  
Head of Disruptive Innovation,  
Eviden*



- FTQC is the first step toward LSQ « Large Scale Quantum Computing »
- LSQ implies convergence with HPC standards of heterogeneous computing