



QUANTO
NATION

Developing European industrial capabilities in quantum technologies

A quantum startup perspective

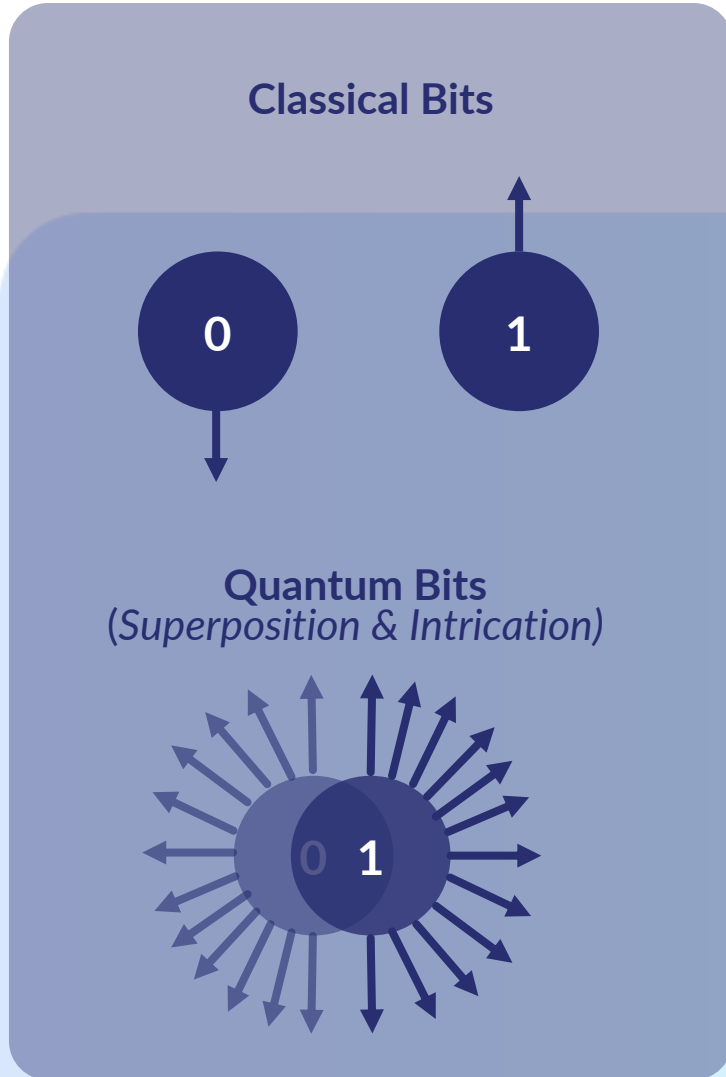
Olivier Tonneau, Partner

Oct. 12th 2022 – European Parliament

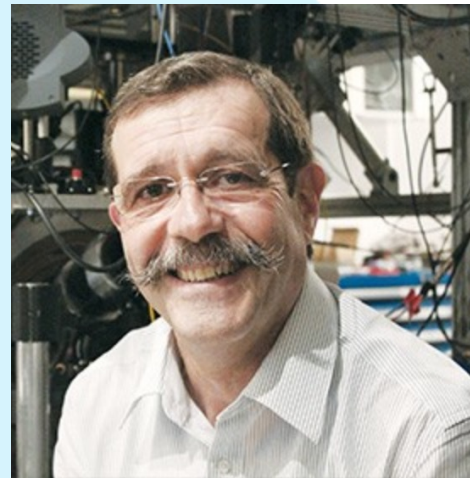


QUANTUM COMPUTING ALLOWS NEW PARADIGMS

Quantum effects such as superposition and entanglement are at the core of Quantum Bits



- ❖ Classic bits have only two possible states: 0 or 1
- ❖ Superposition allows a quantum bit (qubit) to be in any superposition of 0 and 1 at the same time
- ❖ 1 additional qubit doubles the computation power
- ❖ Entanglement allows linking of qubits regardless of the distance between them



Prof. Alain Aspect
2022, Physics Nobel Prize

Those properties were demonstrated experimentally by Prof. Alain Aspect, 2022 Physics Nobel Prize forty years ago and are the foundation of the second quantum revolution



WHY EUROPE CAN'T AFFORD TO MISS THE QUANTUM REVOLUTION

A unique Economical opportunity
(\$800B MARKET IN 2050⁽¹⁾)



Optimization

\$110-210B



Finance

Portfolio optimization



Logistics

Route optimization



Large Optimisations

Logistic optimization



Simulation

\$175-330B



Health industry

Drug discovery



Energy

New energies



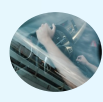
Aerospace

Flow simulation



Machine learning

\$95-250B



Mobility

Autonomous vehicles



Finance

Fraud and risk detection



Marketing / Growth

Ads optimization

Sovereignty

Capacity to break classical encryption

Retain lead on strategic industries: Pharma, Finance, Energy, Communications

5

(1) BCG estimates



QUANTONATION IS THE WORLDWIDE LEADER OF INVESTMENT IN QUANTUM TECH

QUANTONATION 1 FPCI

1ST

€91M

Early stage fund dedicated to Quantum¹

Total Size



€44m

Quantonation 1 total Paid-in Capital³

23

Companies in 7 countries (Europe / Canada / USA)

2

Exits

€200m

Raised by portfolio

400+

Employees in portfolio companies

16

Different nationalities among the LPS

150

Coinvestors Including



entrada

OXFORD SCIENCE ENTERPRISES

daphni

MMNES



XAnge Siparex Group

matterwave® ventures

bpi france

[1] Source: Forbes, in terms of number of investments in the field

[2] TVPI= NAV of the portfolio / Capital invested

[3] Quantonation 1 total Paid-In capital represents fund's commitment draw down through capital calls as of 31/05//2022



Q1 PORTFOLIO: CATEGORY LEADERS READY TO TRANSITION TO GROWTH AND MARKET LEADERSHIP

QUANTUM COMPUTING



QUANTUM NETWORKS



QUANTUM SENSING



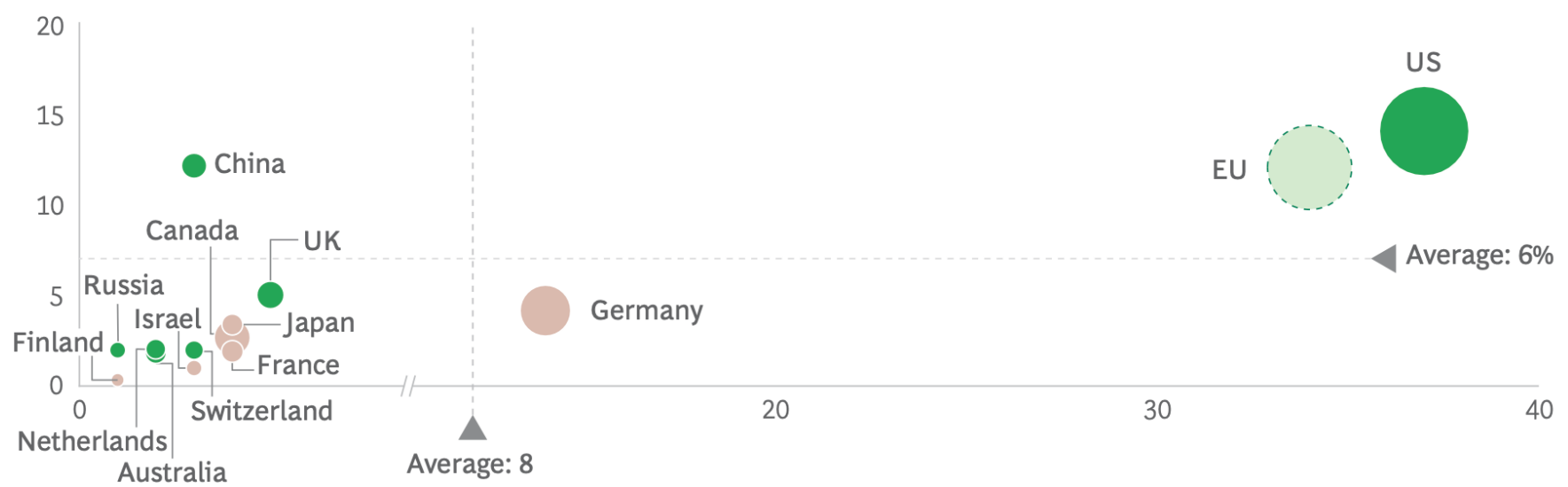
DEEP PHYSICS





Academic Leadership: Europe close to the US

Scientific articles on quantum computing, by country, in 2021 (%)



Number of universities ranked in the Top 100 for quantum computing

● Countries with policies that target quantum education ● Number of students in universities 250,000

Sources: EduRank; Web of Science; Literature search; BCG analysis.

Note: The number of articles and universities for the EU represents the sum of the individual totals for each EU country.

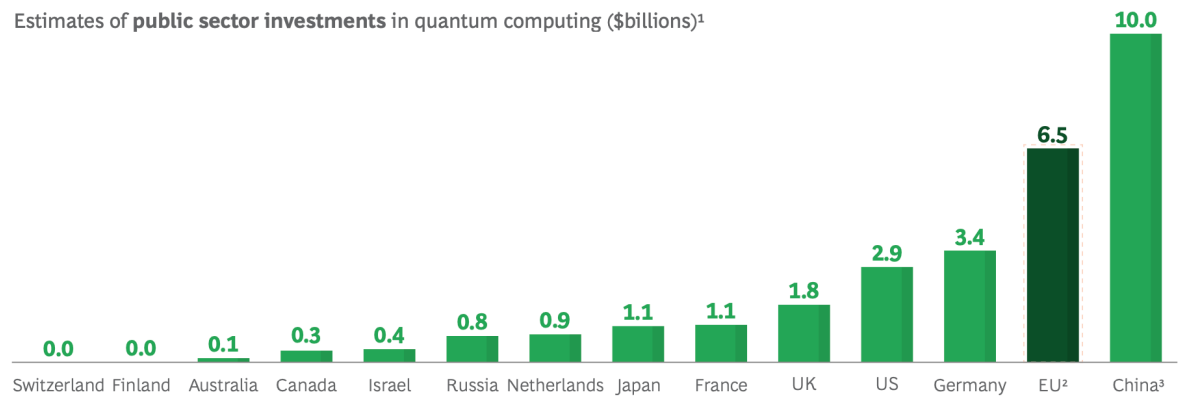


Europe is in the race for startups and government funding



+€10Bn invested by European Initiatives

Estimates of public sector investments in quantum computing (\$billions)¹



Sources: Literature search; BCG analysis.

¹The data in this exhibit represents public announcements made after 2013; investments may be made for different time horizons.

²Investments made centrally by the EU (~\$1.1 billion) as well as those made by Germany, France, the Netherlands, and Finland.

³Public investment figures for China are non-official estimations based on experts and media sources.

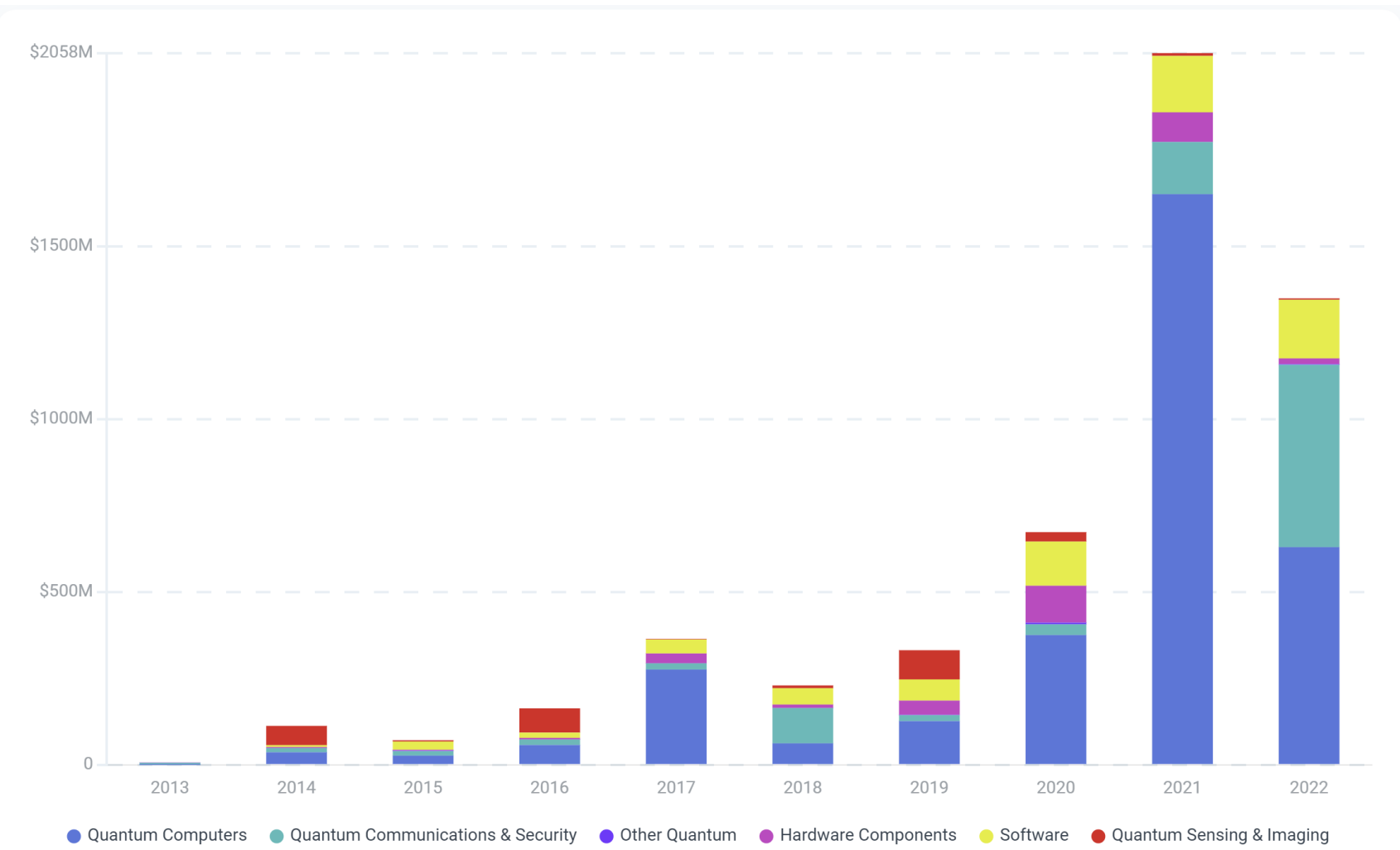


Europe can compete with China and the US, but will need a supranational approach

€1.8Bn : Country and amount of public support for Quantum Technologies



2021 and 2022 Record Years for private Investment in Quantum



\$1350M YTD 2022

Including \$625M SPAC PIPE in 2021 and \$100M in 2022 : Rigetti, IonQ, Arqit

M&A : CQC + Honeywell, Pasqal + Qu&Co, Cold Quanta + Super.tech, NKT Photonics + Hamamatsu



As of 06/16/2022



European startups will need to raise significant amounts to keep up with US startups

Leading US & Canadian QC hardware Startups

	Qubit Technology	Total funding	Creation date
PsiQuantum	Photons	\$665M	2015
IONQ	Ion traps	\$432M	2015
D:wave <small>The Quantum Computing Company™</small>	Annealing	\$296M	1999
rigetti	Superconducting	\$300M	2013
XANADU	Photons	\$136M	2016
atom computing	Cold atoms	\$81M	2018
ColdQuanta	Cold atoms	\$75M	2017

+ Leading Corporates



Leading European QC hardware Startups

	Qubit Technology	Total funding	Creation date
IQM	Superconducting	\$105M	2018
ALICE & BOB	Self corrected	\$33M	2020
PASQAL	Cold atom	\$30M	2018
QUANDELA	Photonics	\$13M	2018
OQC	Superconducting	\$45M	2017

+ other QC companies that have raised 15 M€ or less (Orca Computing, Quantum Motion, C12,...)



Challenges for European Quantum startups

• Well Structured Ecosystem:

- ✓ Strong research hubs
- ✓ EC / QUIC
- ✓ National plans
- ✓ Vivid Startup ecosystem
- ✓ Large Corporate gearing up for Quantum and collaboration with Startups (ENI, BMW, Total, Crédit Agricole, Siemens, Bosch, BASF,...)
- ✓ Early-stage VC engaged on Quantum Tech (such as Quantonantion, largest quantum investor Worldwide)
- ✓ Efficient Non dilutive financing schemes (EIC, Local or regional initiatives)
- ✓ Access to HPC Centers (GENCI, OVH, Cineca, Jülich,...)

• But...

- ✓ Need to accelerate in the **race for talents** (training more students in quantum, retaining / attracting students/ young researchers in Europe)
- ✓ More **agility required in public financing** (startups raise funds every 18-24 months – Public financing schemes must comply with that pace)
- ✓ Need to **raise large financing rounds** to keep the pace vs US startups (Important role of large Institutional investors, Corporate VC and Public Investments)
- ✓ **Public orders** rather than subventions! (Euro HPC example)
- ✓ **Norms and standards** required to support European Industry
- ✓ Need for **shared infrastructure** (Dilution fridges, chips fabs,...)
- ✓ Importance of supporting adjacent industries as well (chips, lasers, photonics, software, ...)