

# From Quantum Flagship to Quantum Fleet: the EU Programmes in Quantum Technologies

Yasser Omar

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& PQI – Portuguese Quantum Institute



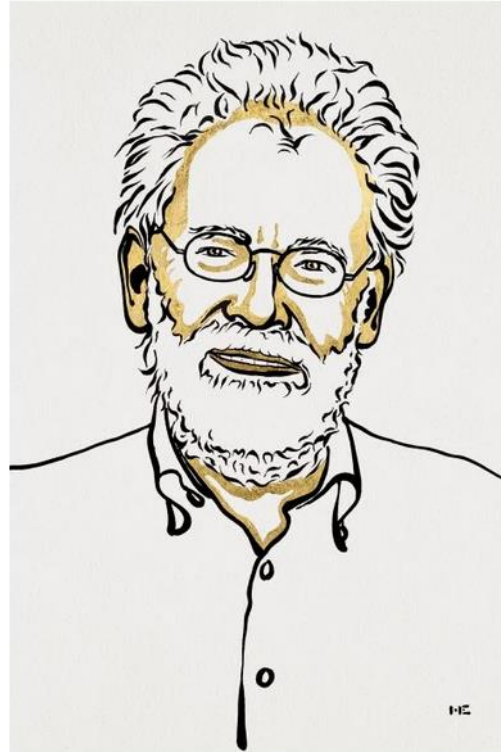
# The Nobel Prize in Physics 2022



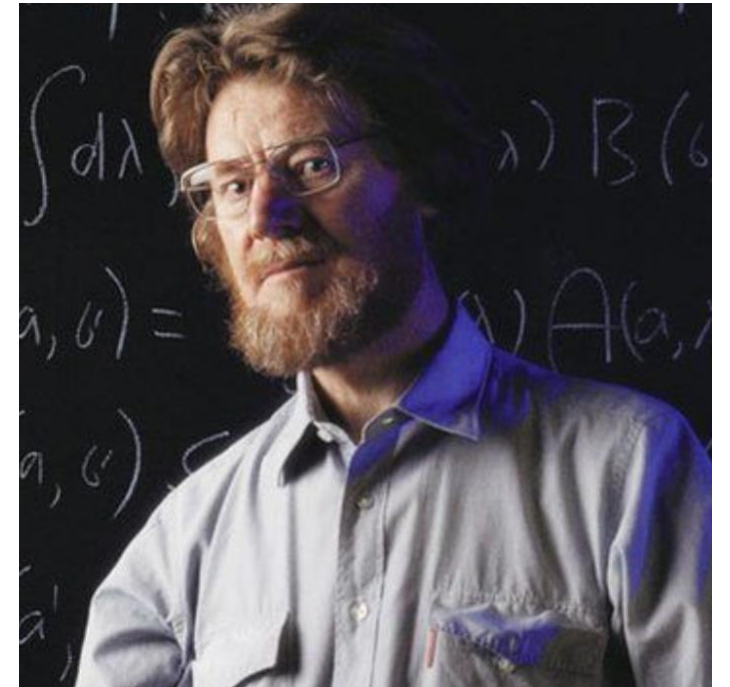
Ill. Niklas Elmehed © Nobel Prize Outreach  
**Alain Aspect**



Ill. Niklas Elmehed © Nobel Prize Outreach  
**John F. Clauser**



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**Anton Zeilinger**



**John Bell**



## LAUREATES

[Breakthrough Prize](#)

[Special Breakthrough Prize](#)

[New Horizons Prize](#)

[Physics Frontiers Prize](#)

[2023](#)

[2022](#)

[2021](#)

[2020](#)

[2019](#)

[2018](#)

[2017](#)

[2016](#)

[2015](#)

[2014](#)

[2013](#)

[2012](#)



[Charles H. Bennett](#)



[Gilles Brassard](#)



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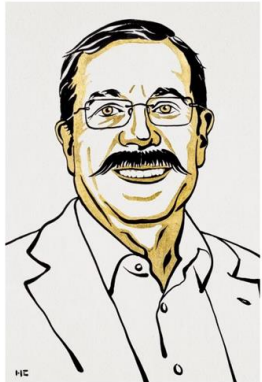


[Peter W. Shor](#)

For foundational work in the field of quantum information.

# A much deserved recognition to the pioneers of Quantum Information Science and Technology!

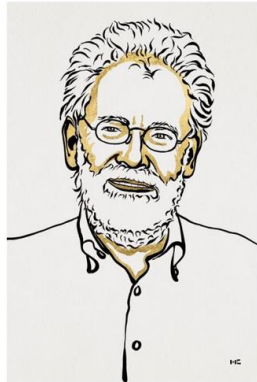
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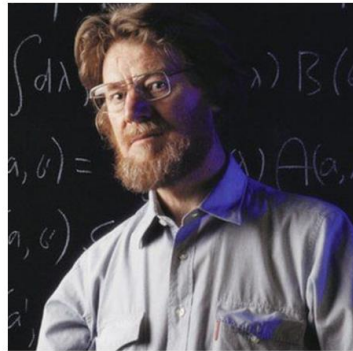
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## The programme

# QuantERA ERA-NET Cofund in Quantum Technologies

The QuantERA Programme is a leading European network of 39 Research Funding Organisations from 31 countries.

QuantERA supports excellent Research and Innovation in Quantum Technologies.

### The Programme's goals are:

- successfully providing the European quantum community with Calls for Proposals in QT
- promoting excellent research in QT
- encouraging transnational collaborations in QT
- networking research funders in QT
- mapping national, regional & European public policies in QT
- spreading research excellence across the European Research Area (ERA).



**77**

funded projects



**400**

research teams



**€89million**

total funding

# The future is Quantum.

The Second Quantum Revolution is unfolding now, exploiting the enormous advancements in our ability to detect and manipulate single quantum objects. The Quantum Flagship is driving this revolution in Europe.

## Quantum Flagship in a nutshell.



01

**1b €**

Quantum Technology will be funded with at least one billion Euro by the European Commission.

02

**10+ yrs**

Flagship's timescale

03

**5000+**

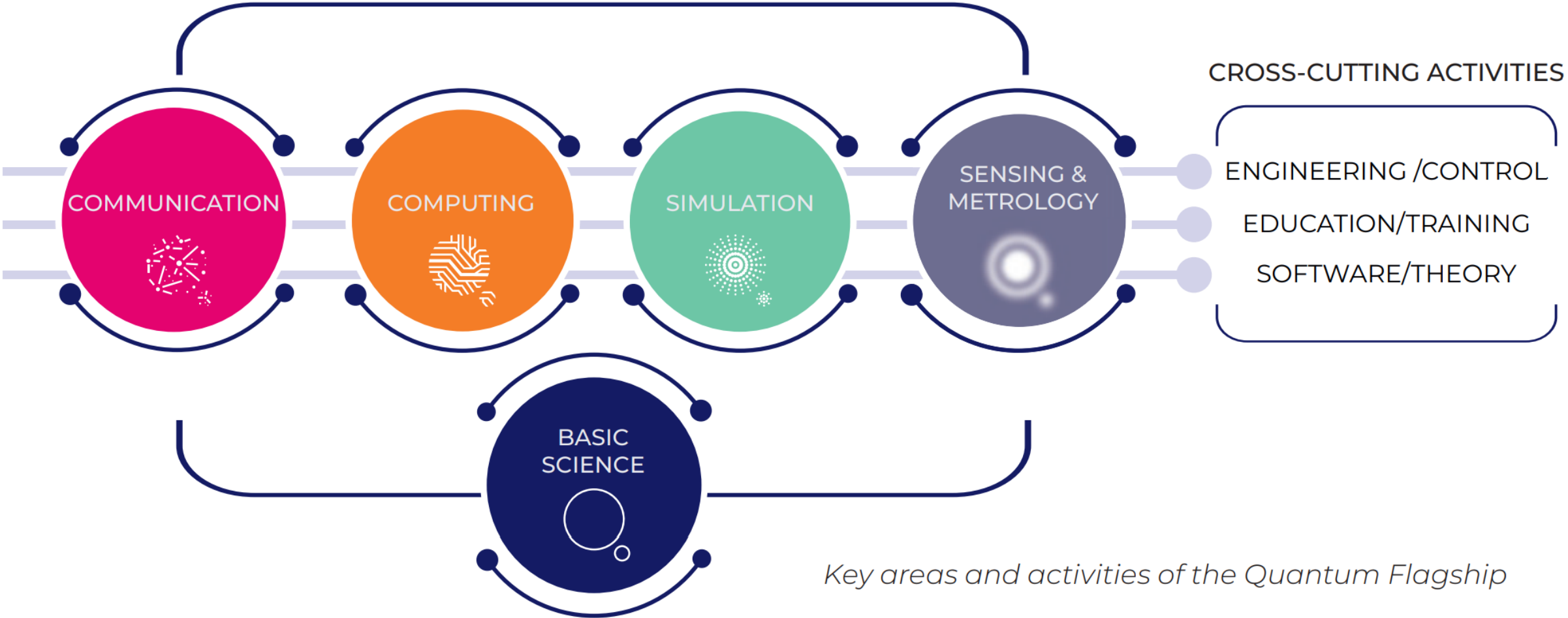
researchers residing in all EU and associated countries involved

04

**140**

Research and Innovation Actions (RIA) proposals submitted in response of the first Quantum Flagship call

APPLICATION AREAS



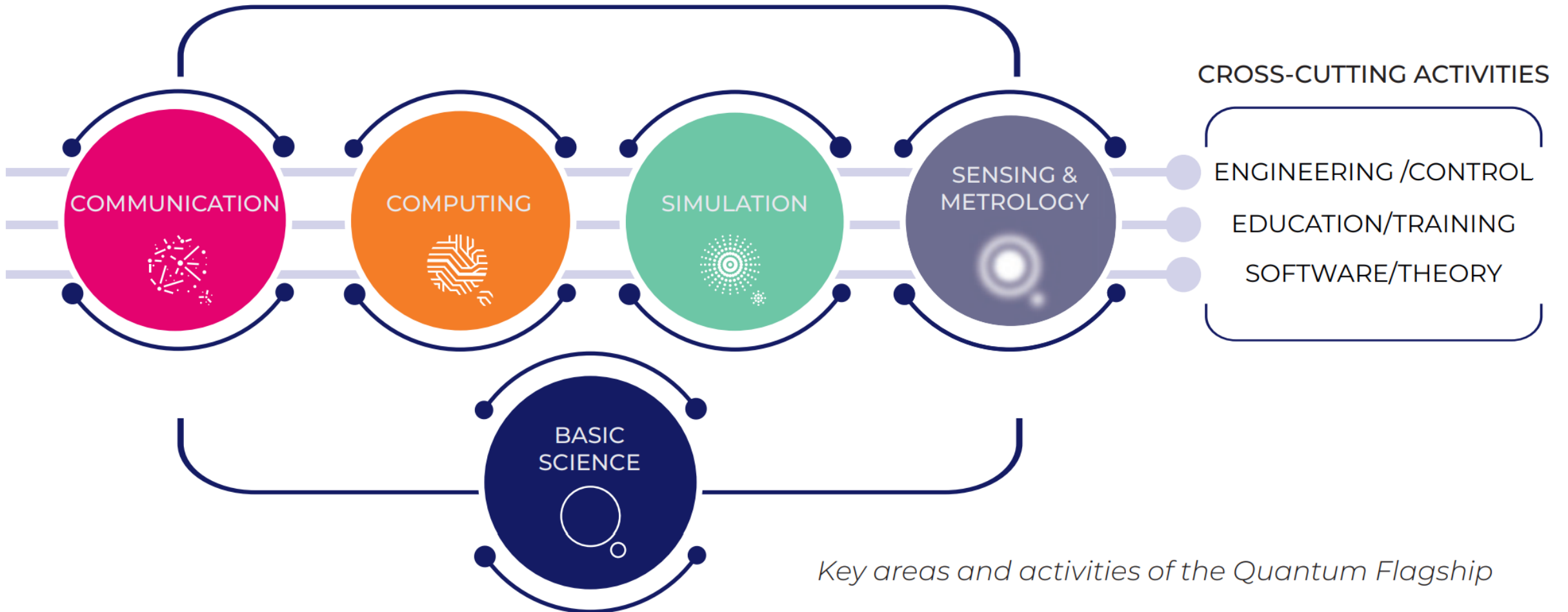
*Key areas and activities of the Quantum Flagship*





# Ramp-up phase: 2018-2021

## APPLICATION AREAS



*Key areas and activities of the Quantum Flagship*

# A community-driven research and innovation vision



[https://ec.europa.eu/newsroom/dae/document.cfm?doc\\_id=65402](https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=65402)

# Key Performance Indicators for Quantum Technologies in Europe

October 2022



## KPI Scorecard

### KEY

- Ahead of schedule | >>10%
- On schedule | -10%
- Needs progress | <10%
- Behind schedule | <<10%

KPI Ecosystem	2021 value	2030 target	progress (%)
Investment (b€)	n.a.	1	
Lab-to-market	79	250	31,6 <span style="color: green;">●</span>
Lab-to-fab	1	10	10,0 <span style="color: green;">●</span>
Job Creation	n.a.	n.a.	
Patent Creation/IP Retention (rank)	n.a.	top 2	
Supply Chain & Strategic autonomy	0	10	0,0 <span style="color: yellow;">●</span>

KPI Quantum Communication	2021 value	2030 target	progress (%)
Performance	2	20	10,0 <span style="color: green;">●</span>
European Technical Leadership (km)	1,3	500	0,3 <span style="color: yellow;">●</span>
Deployment (areas; nodes)	1; 8	10; 50	10,0 <span style="color: green;">●</span>
Adoption	5	30	16,7 <span style="color: green;">●</span>

KPI Quantum Computing	2021 value	2030 target	progress (%)
Performance	0	3	0,0 <span style="color: yellow;">●</span>
European Technical Leadership (q volume)	32	655	4,9 <span style="color: green;">●</span>
European Impact Leadership	70	500	14,0 <span style="color: green;">●</span>
Accessibility	0	10	0,0 <span style="color: yellow;">●</span>

KPI Quantum Simulation	2021 value	2030 target	progress (%)
Performance	0	8	0,0 <span style="color: yellow;">●</span>
Market Readiness	0	12	0,0 <span style="color: yellow;">●</span>
European Technical Leadership	200	200	100,0 <span style="color: green;">●</span>

KPI Quantum Sensing and Metrology	2021 value	2030 target	progress (%)
Market Readiness	3	20	15,0 <span style="color: green;">●</span>
Next-generation Technologies	0	7	0,0 <span style="color: yellow;">●</span>

KPI Education	2021 value	2030 target	progress (%)
Outreach	7	100	7,0 <span style="color: green;">●</span>
Education	0	180	0,0 <span style="color: yellow;">●</span>
Adopting	1	225	0,4 <span style="color: yellow;">●</span>
Diversity and Equity	0	90	0,0 <span style="color: yellow;">●</span>

# KPI Scorecard




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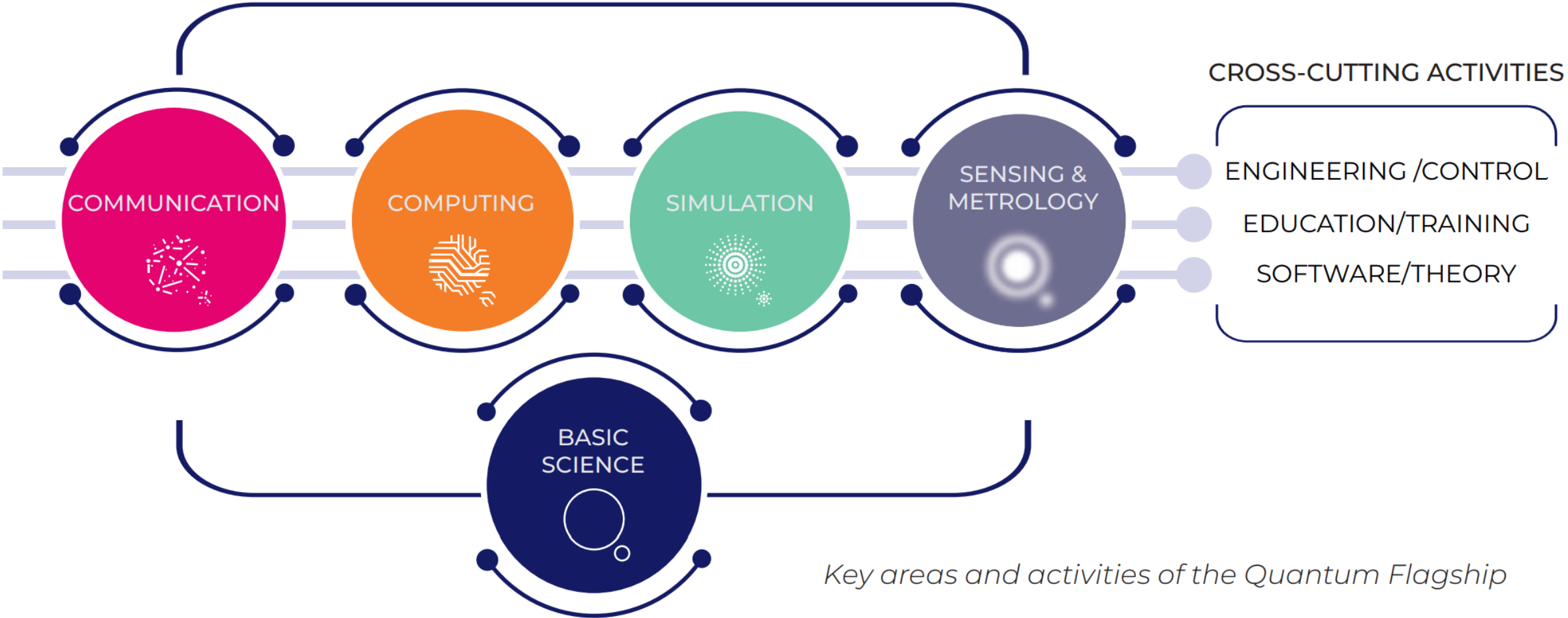
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# FPA's: 2022-2029, RIAs: 2022-2025

## APPLICATION AREAS



*Key areas and activities of the Quantum Flagship*

# EuroQCI: EU Quantum Communication Infrastructure

## DECLARATION ON A QUANTUM COMMUNICATION INFRASTRUCTURE FOR THE EU

### All 27 EU Member States

have signed a declaration agreeing to work together to explore how to build a quantum communication infrastructure (QCI) across Europe, boosting European capabilities in quantum technologies, cybersecurity and industrial competitiveness.

@FutureTechEU #EuroQCI



# Joint European HPC & QCS White Paper (02/2022)

## EuroQCS

### European Quantum Computing & Simulation Infrastructure

Authors: D. Binosi<sup>1,2</sup>, T. Calarco<sup>2\*</sup>, G. Colin de Verdière<sup>3</sup>, S. Corni<sup>4</sup>, A. Garcia-Saez<sup>5</sup>, M.P. Johansson<sup>6</sup>, V. Kannan<sup>7</sup>, N. Katz<sup>8</sup>, I. Kerenidis<sup>9</sup>, J.I. Latorre<sup>5</sup>, Th. Lippert<sup>2\*</sup>, R. Mengoni<sup>10</sup>, K. Michielsen<sup>2\*</sup>, J.P. Nominé<sup>3</sup>, Y. Omar<sup>11</sup>, P. Öster<sup>6</sup>, D. Ottaviani<sup>10</sup>, M. Schulz<sup>12,13</sup>, L. Tarruell<sup>14</sup>.

1. European Centre for Theoretical Studies in Nuclear Physics and Related Areas (ECT\*), Italy
2. Forschungszentrum Jülich (FZJ), Germany
3. Commissariat à l'énergie atomique et aux énergies alternatives (CEA), France
4. University of Padua and CNR Institute of Nanoscience, Modena, Italy
5. Barcelona Supercomputing Centre (BSC), Spain
6. CSC – IT Center for Science, Finland
7. Irish Centre for High-End Computing (ICHEC), Ireland
8. The Hebrew University of Jerusalem, Israel
9. Centre National de la Recherche Scientifique (CNRS), France
10. Consorzio Interuniversitario del Nord est Italiano Per il Calcolo Automatico (CINECA), Italy
11. University of Lisbon, Portugal
12. Leibniz Supercomputing Centre (LRZ), Germany
13. Technical University of Munich (TUM), Germany
14. Institute of Photonics Science (ICFO), Spain







# EuroQCS: EU Quantum Computation and Simulation

PRESS RELEASE | Publication 04 October 2022

## EU deploys first quantum technology in six sites across Europe



The EuroHPC JU has selected six sites across the European Union to host and operate the first EuroHPC quantum computers in:

-  Czechia
-  France
-  Germany
-  Italy
-  Poland
-  Spain



**2030**  
**DIGITAL**  
**DECADE**

**POLICY PROGRAMME:**  
**A PATH TO THE DIGITAL DECADE**



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# European Quantum Industry Consortium

QuIC's mission is to boost the European quantum-technology industry's competitiveness and economic growth, and bolster value creation across the continent.



**No digital  
without chips**



**The European  
Chips Act**

#DigitalEU #EUChipsAct

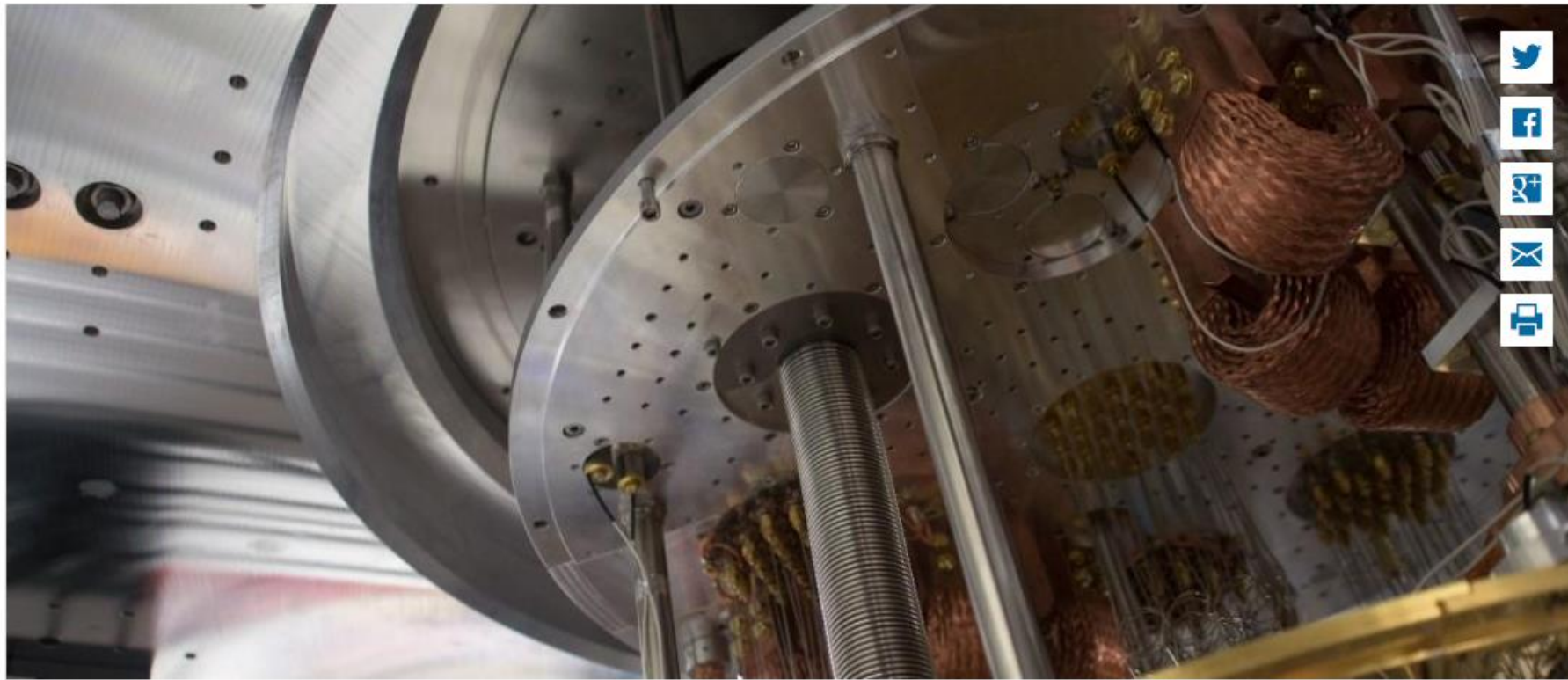
# NQIs: National Quantum Initiatives

11 Feb 2021 | News

## France and Germany line up for quantum leap

*Emmanuel Macron lays out a €1.8B strategy to slingshot the country into becoming a quantum powerhouse, as Germany draws up a €2B programme of quantum research as part of its pandemic recovery plan*

By [Éanna Kelly](#)





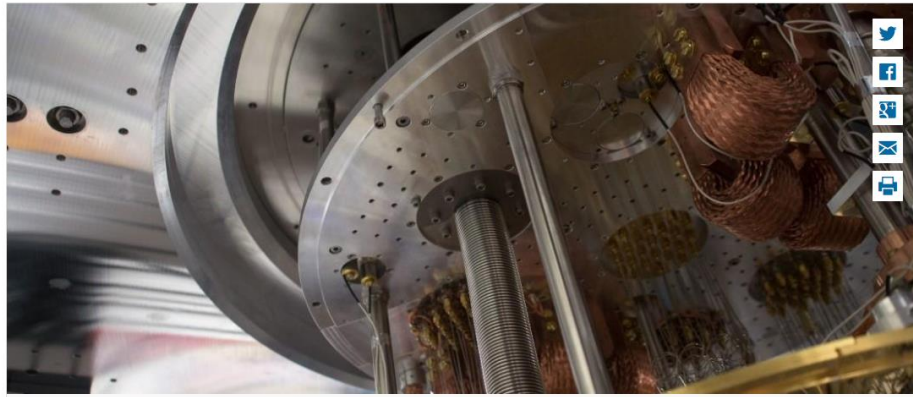
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HOME SERVICES NEWS EDUCATION ABOUT US

## Quantum Delta NL Awarded 615 Million Euro from Netherlands' National Growth Fund to Accelerate Quantum Technology

*Funds will be used to train 2,000 researchers and engineers, to scale 100 start-ups to host three corporate R&D labs in the Netherlands by 2027*

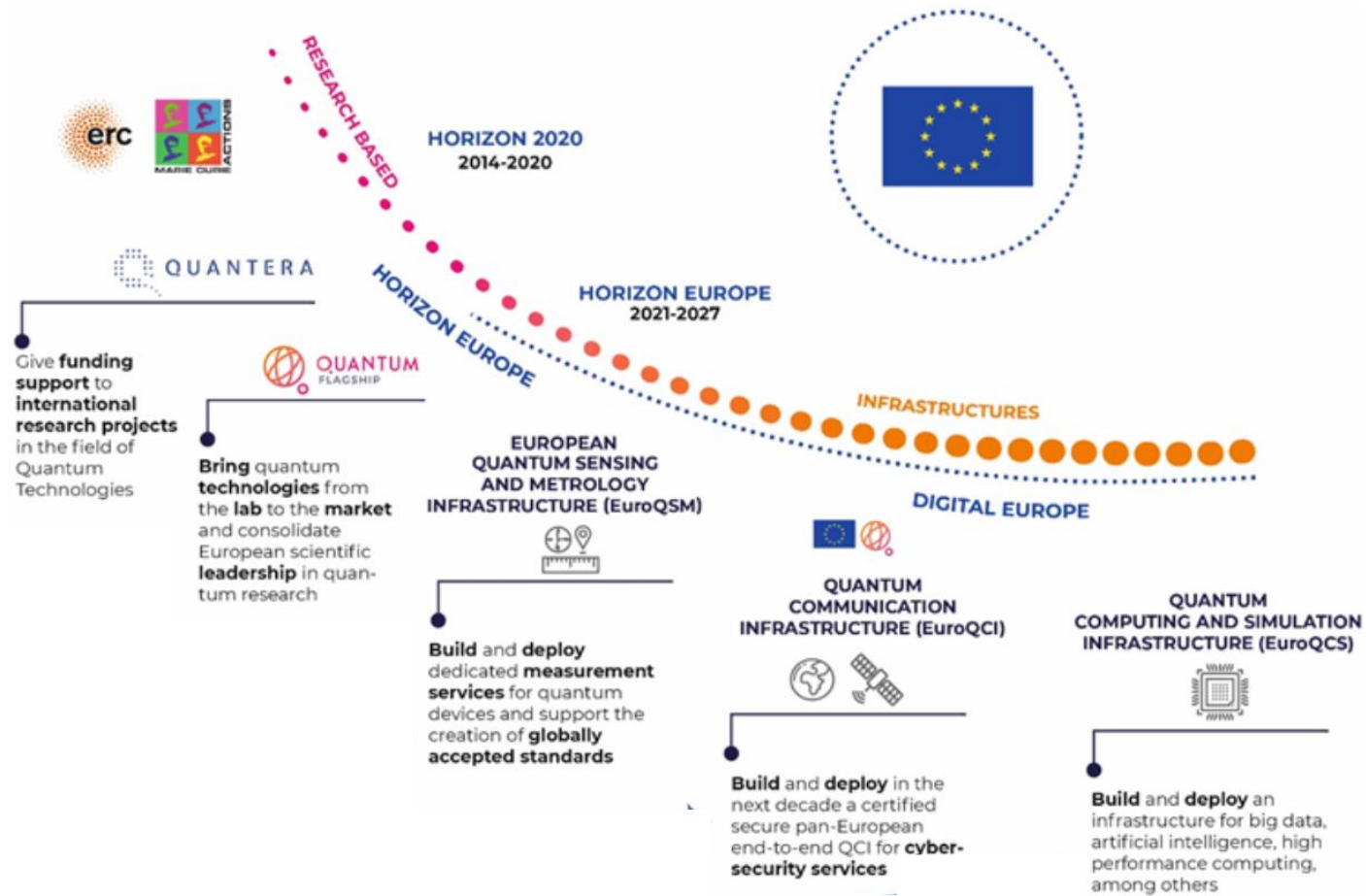
April 12, 2021 09:00 AM Eastern Daylight Time

**NQIs:** Belgium, Bulgaria, Czech Republic, Finland, France, Greece, Hungary, Italy, Latvia, Netherlands, Slovakia, Switzerland, and the United Kingdom.

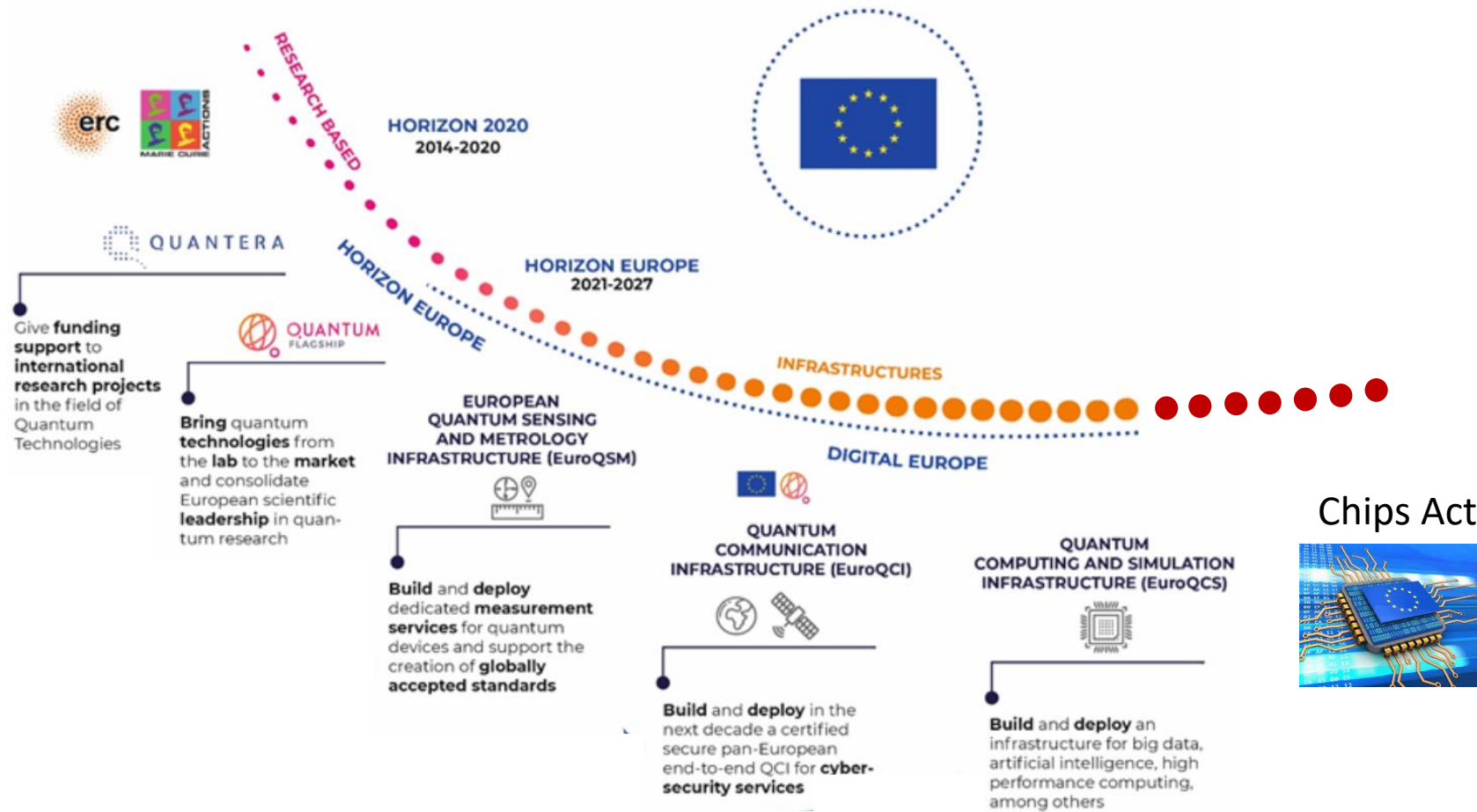
**Private foundations:** Denmark, Sweden.

**Total: +5.7 billion Euro**

# From Quantum Flagship to Quantum Fleet

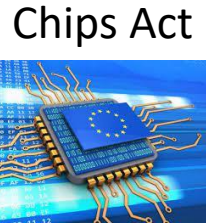
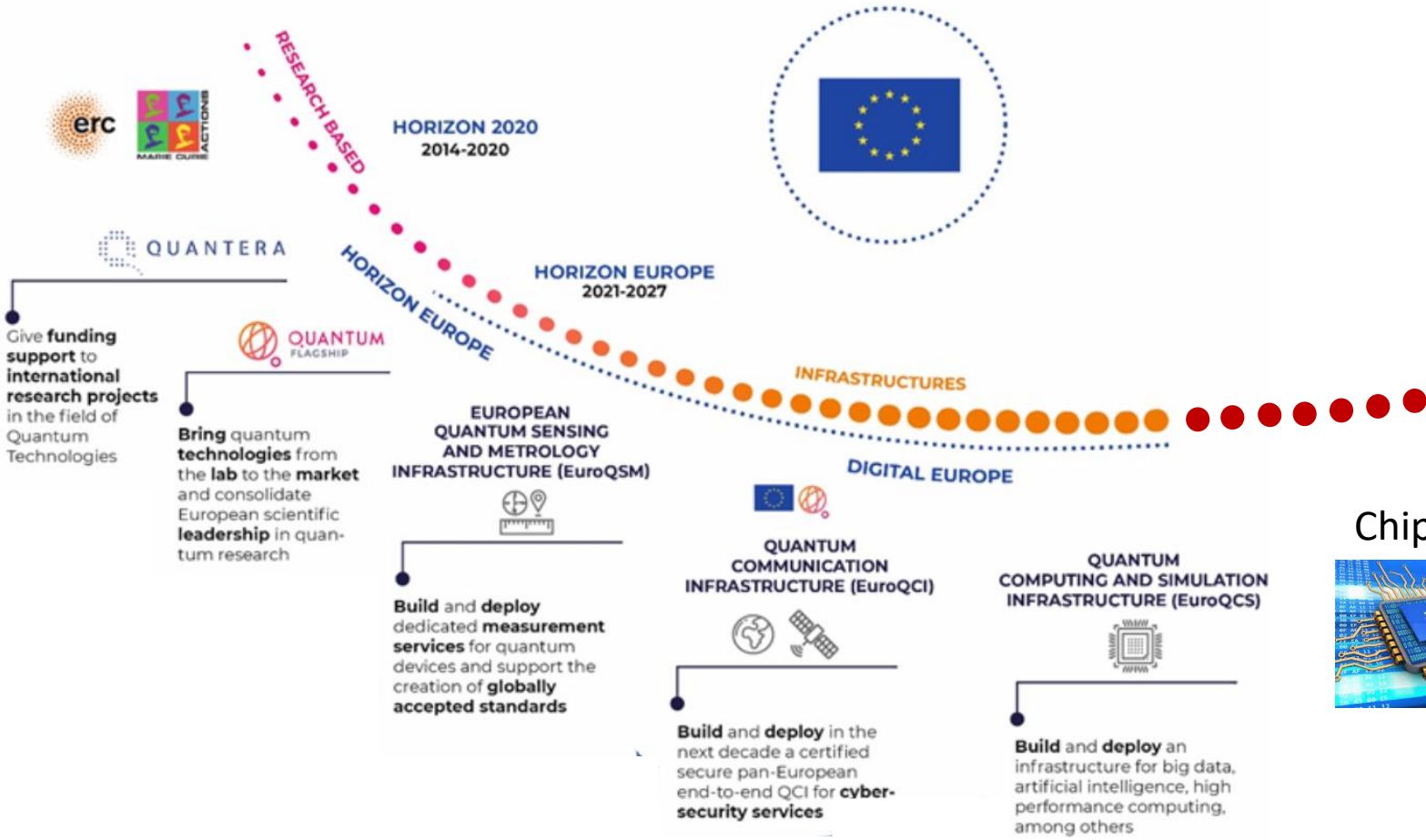


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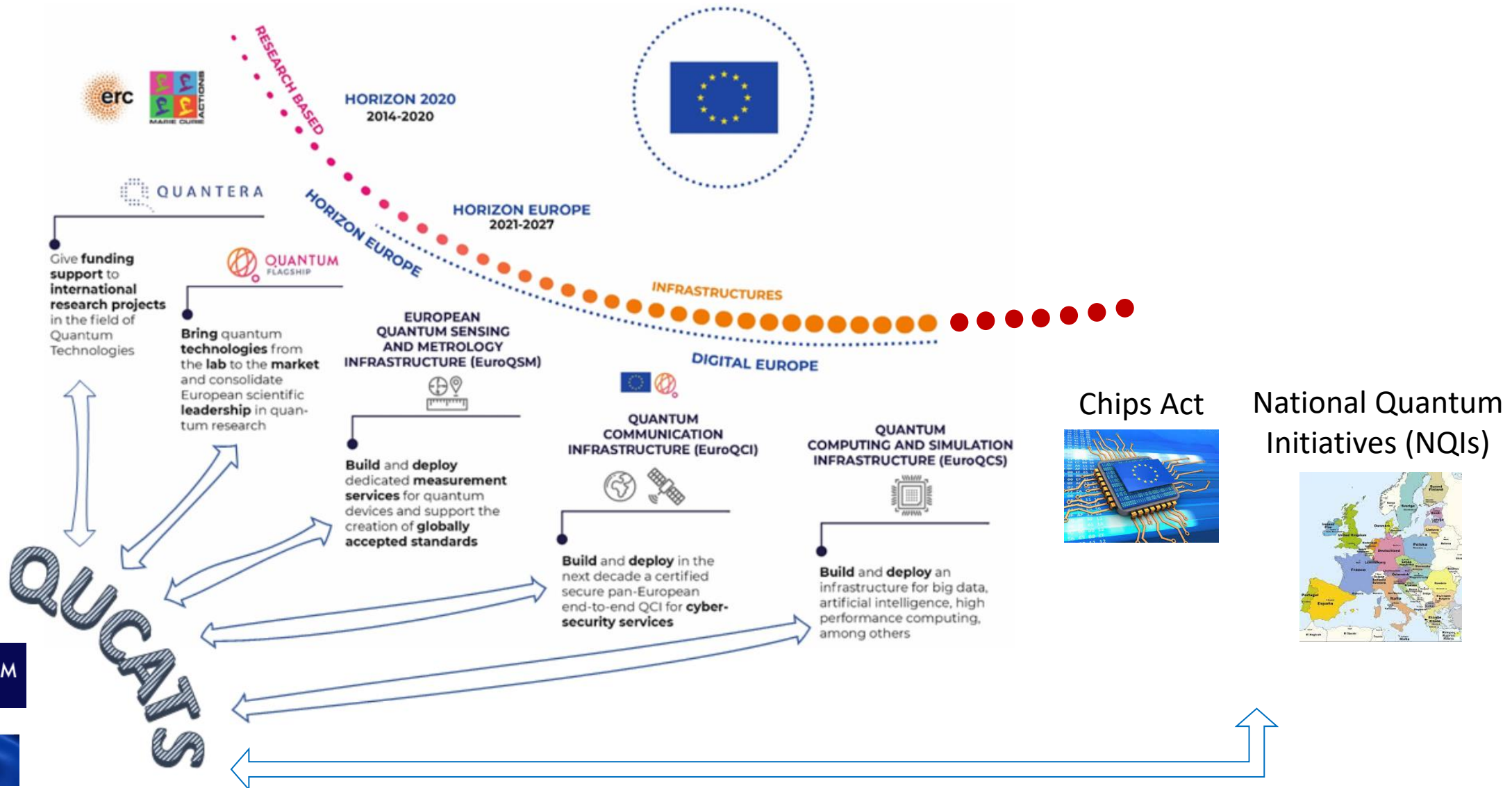
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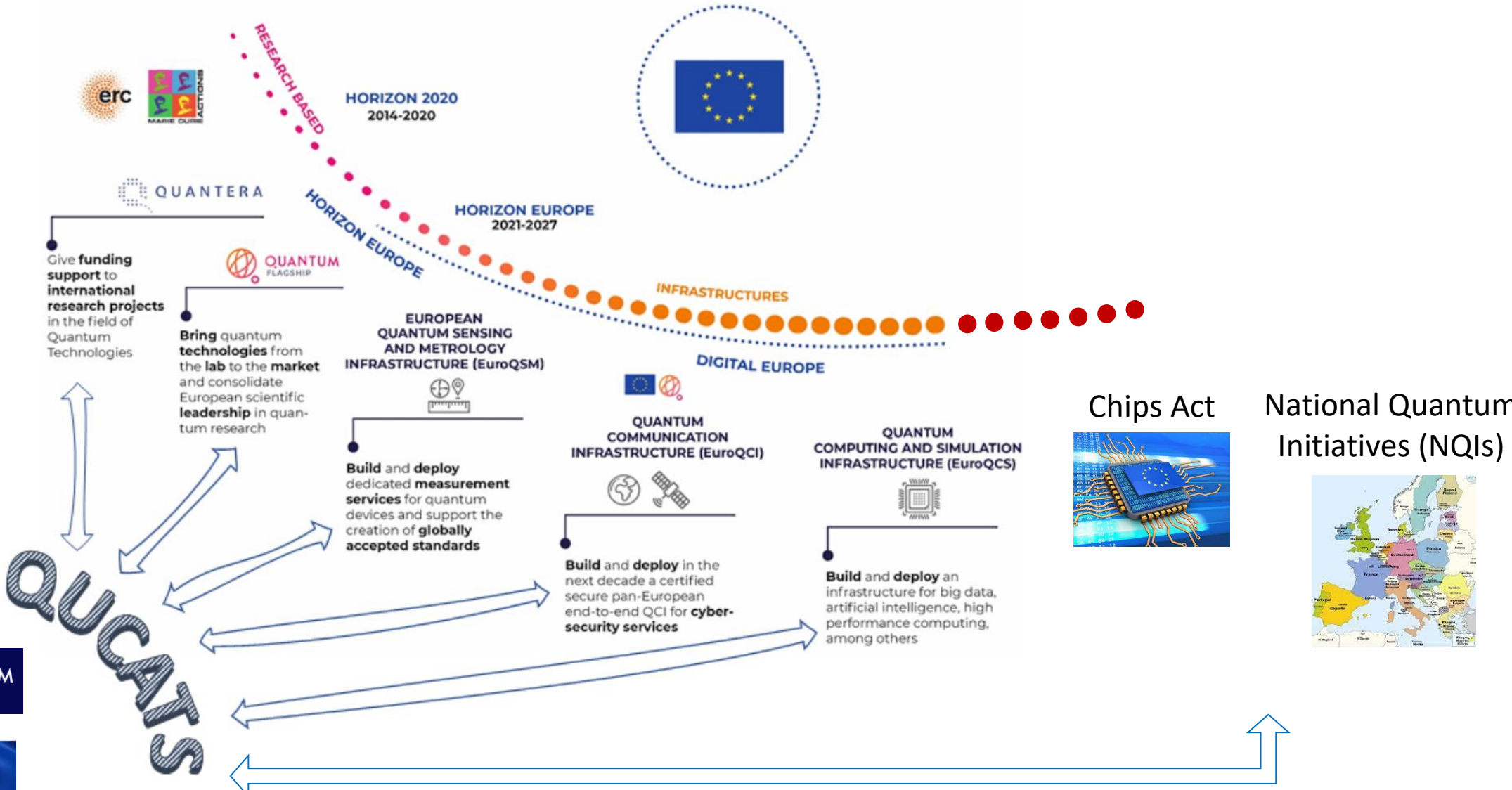
National Quantum Initiatives (NQIs)



# How to integrate all these efforts and investment?



# Bringing coherence to quantum initiatives in Europe



# QUCATS: GOALS & ACTIONS (2022-2025, ... AND BEYOND)

## **1. Strategy and growth**

1.1 Strategic roadmaps

1.2 Ecosystem growth

1.3 Synergies and funding

## **2. Outreach and cooperation**

2.1 Communication and Outreach

2.2 International cooperation

2.3 Trade & Export

## **3. Standardisation and benchmarks**

3.1 Intellectual Property

3.2 Standardization

3.3 Benchmarks & Use cases

## **4. Education and training**

4.1 Strategic educational infrastructures and services

4.2 QT in secondary and higher education

4.3 Professional trainings and mobility

4.4 Wide access to quantum

## **5. Project management and transversal activities**

5.1 Project management

5.2 Support to EU quantum activities



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# WORLD QUANTUM DAY

APRIL 14

- 200+ events covering Africa, the Americas, Asia, and Europe!
- Launched Quantum@School and Quantum@Museum projects.
- **Join QuCATS in celebrating the World Quantum Day in 2023!**
- 14 April: European Quantum Day?

WORLD QUANTUM DAY APRIL 14

EVENTS ~ HOW TO ENGAGE QUANTUM@ NEWS TRANSLATING WQD 14 APRIL

## Events celebrating quantum science and technology

- 200+ events
- 44+ countries
- 193+ cities
- 17+ languages

Tweet impressions > 43k  
Weibo likes > 10M

[worldquantumday.org](http://worldquantumday.org)

 [@WorldQuantumDay](https://twitter.com/WorldQuantumDay)



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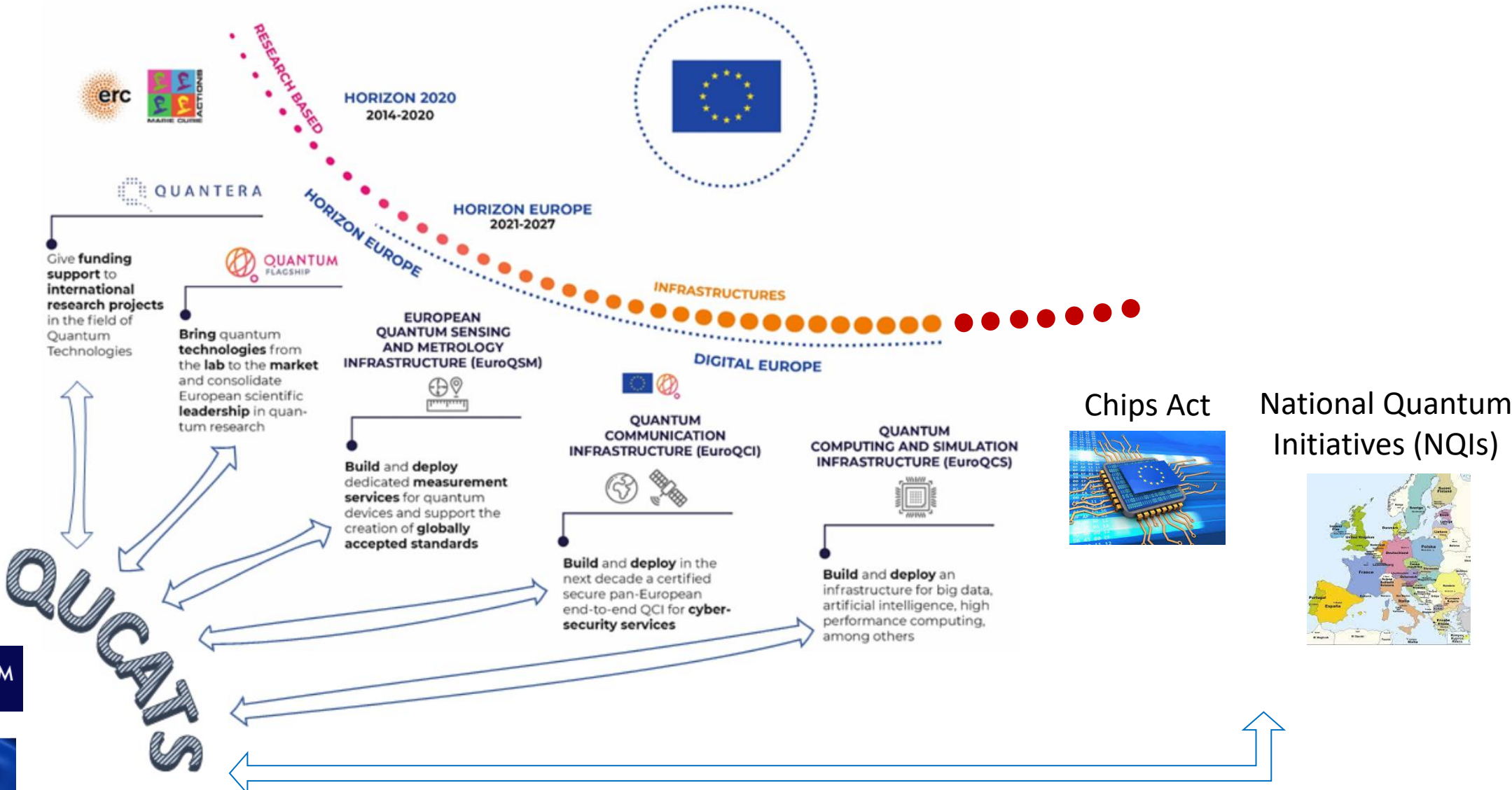
CERN | IQM QUANTUM TECHNOLOGY INITIATIVE

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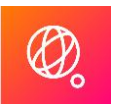
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# Making Europe autonomous in QT, open to IntCoop

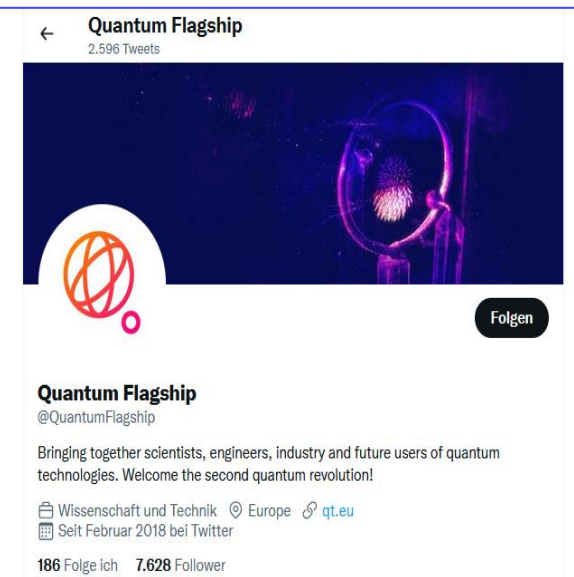
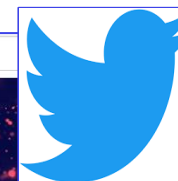
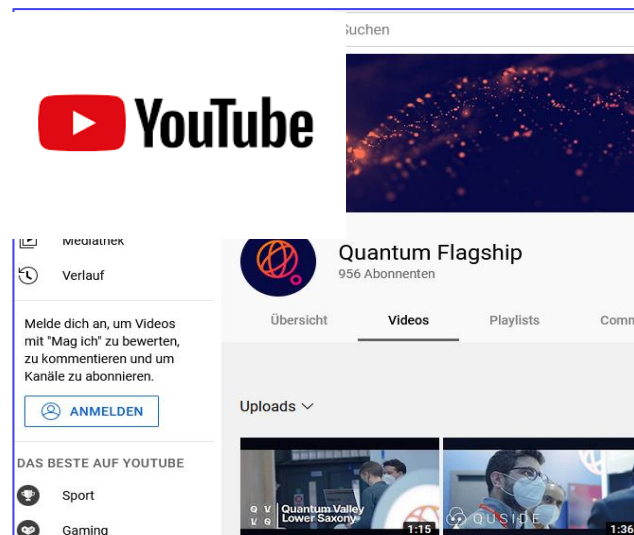
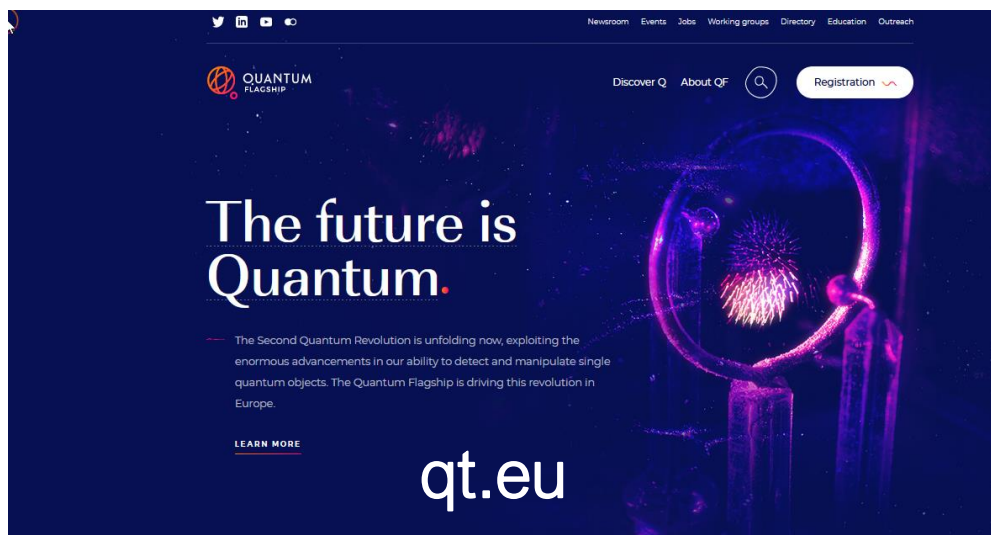






# Quantum Flagship

## Find information online:



**Feel free to contact me if I can be of help:**  
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