

Welcome to EPSRC Quantum Technologies Community Webinar

1st of July, 2021



UK NATIONAL
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PROGRAMME

Things to note:

- EPSRC is currently looking for applications for Strategic Advisory Team members in the area of Quantum Technologies for ICT:

<https://epsrc.ukri.org/about/governance/recruitment/membershipsab/>

- Link to register for the NQCC Quantum Town Talk:

<https://www.eventbrite.co.uk/e/nqcc-quantum-towntalks-tickets-161085439887>

- Pre-announcement of the EPSRC QT fellowship call:

[Pre-announcement: quantum technology career development fellowships – UKRI](#)

Acronyms used:

- BEIS: Department for Business, Energy & Industrial Strategy
- CDT: Centres for Doctoral Training, cohort-training approach with doctoral studentships associated
- Dstl: Defence Science and Technology Laboratory
- DTP: Doctoral training partnership, studentship funding allocation by EPSRC according to EPSRC grant income of research organisations
- EDI: Equality, Diversity and Inclusion
- EPSRC: Engineering and Physical Sciences Research Council
- FLF: Future Leaders Fellowship
- GCHQ: Government Communications Headquarters
- iCASE: Industrial Cooperative Awards in Science & Technology, providing doctoral studentship funding with industrial involvement
- ICT: Information and Communications Technology
- ISCF: Industrial Strategy Challenge Fund
- MoD: Ministry of Defence
- NCSC: National Cyber Security Centre
- NPL: National Physical Laboratory
- NQCC: National Quantum Computing Centre
- NQTP: National Quantum Technologies Programme
- QC: Quantum Computing
- QT: Quantum Technologies
- RRI: Responsible Research and Innovation
- SR: Spending Review
- SPF: Strategic Priorities Fund
- STFC: Science and Technology Facilities Research Council
- TRL: Technology Readiness Level
- UKRI: UK Research and Innovation

Agenda

- Welcome- Anke Davis
- Overview of UKRI and EPSRC with Liam Blackwell
- Handover to Anke Davis & Katharine Dunn
- Introducing the QT Team
- Overview of NQTP
- QT Portfolio and Priorities
- Break
- Q&A Session

EPSRC Quantum Technologies webinar

Liam Blackwell

Deputy Director, Cross Council Programmes
EPSRC, UK Research and Innovation



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This slide gives an overview of the UKRI structure and how EPSRC fits within it.

Launched in April 2018, UK Research and Innovation is a non-departmental public body sponsored by the Department for Business, Energy and Industrial Strategy (BEIS). We work with the government to invest over £7 billion a year in research and innovation by partnering with academia and industry to make the impossible, possible. Through the UK's nine leading academic and industrial funding councils, we create **knowledge with impact**. Funding overall comes from Treasury into BEIS and is then allocated to UKRI.

UKRI Corporate Plan

Our vision



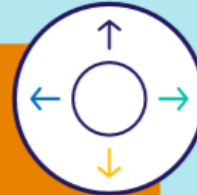
...is for an outstanding research and innovation system in the UK that gives everyone the opportunity to contribute and to benefit, enriching lives locally, nationally and internationally.

Our mission



...is to convene, catalyse and invest in close collaboration with others to build a thriving, inclusive research and innovation system that connects discovery to prosperity and public good.

convene and catalyse



We will convene and catalyse, by listening to and connecting diverse communities to create new combinations, working in partnership with others. And we will help to make things happen, catalysing new activities through our work and investment.

incentivise



We will incentivise the development of a research and innovation system that realises our vision through all the choices we make, how we behave, and in our policies and activities.

conduct



We will conduct high-quality research and innovation and provide critical national capabilities through our centres, units, and institutes.

invest



We will invest in people, ideas and infrastructure, through a portfolio of investments that ensures public benefit from the system as a whole, informed by engagement and evidence. We will fund well – efficiently and effectively.

EPSRC priorities

• UKRI Corporate Plan- EPSRC priorities

Beyond 2020–21

We aim to make the UK the global destination of choice for the highest quality and most creative researchers to deliver world-leading engineering, mathematical and physical sciences research.

We will deliver this through six priorities:

Engineering Net Zero for a Resilient Future – working in close partnership with our colleagues in government, business, regulators and charities to decarbonise our economy and society, creating an alternative energy future and developing truly circular economies

The Physical and Mathematical Sciences

Powerhouse – enabling curiosity driven discovery, with boundless potential

Future Computing Paradigms – delivering next generation computational capability

AI, Digitalisation and Data – secure data and systems powering transformative change

Frontiers in Engineering and Technology – unleashing our productivity potential

Transforming health and healthcare – improving quality of life through innovative technological solutions

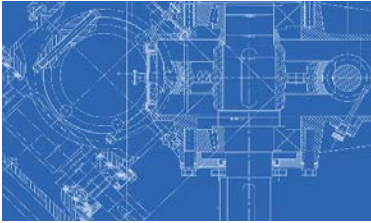
Through these priorities we will ensure that the engineering and physical sciences community fully play their part in building back a better post-Covid world.

<https://www.ukri.org/wp-content/uploads/2020/10/UKRI-091020-CorporatePlan2020-21.pdf>



A Snapshot of Our Portfolio

engineering



materials



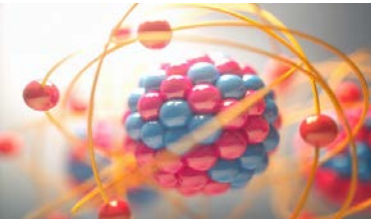
mathematics



chemistry



physics



healthcare technologies



digital economy



cybersecurity



ICT



quantum technologies



manufacturing



energy



EPSRC Remit

- Our remit covers engineering and the physical sciences: we fund research into chemistry, engineering, information and communications technologies, materials, mathematical sciences and physics.
- The majority of research we support must be in engineering and the physical sciences.

UKRI allocations- 21/22

Summary table showing allocations by council and budget, 2021-22 (£ million)

	AHRC	BBSRC	EPSRC	ESRC	IUK	MRC	NERC	RE	STFC	UKRI	Total
Research and Innovation Budgets	110	364	946	183	667	709	352	1,772	554	37	5,693
Science Infrastructure Capital		65	145	36		82	60	282	213	51	934
Strategic Programmes	30	34	128	38	508	124	33	362	66	34	1,354
ODA										139	139
Corporate Funding	2	7	5	1	4	7	4	5	4	111	151
Total	142	471	1,224	257	1,215	921	449	2,421	836	373	7,908¹⁶



Spending Review 2021

- Spending Review in autumn of this year
- Announcement due in Nov/Dec 2021
 - for BEIS allocation, UKRI allocation likely to take some more time
- Likely will 'only' include funding over and above the 3-year baseline announced in the Spending Review 2020

QT as a priority for EPSRC

- Quantum Technologies is a transformative technology with high potential to impact the UK economy
- There is an aspiration for the EPSRC QT portfolio to grow and diversify, recognising the importance of the applications and the evolving landscape
- The recent investment of £93m in the NQCC recognises the potential of quantum and the necessary scale of activity needed to ensure the UK can continue to remain competitive

EPSRC Quantum Technologies webinar

Anke Davis & Katharine Dunn

Joint Heads of Quantum Technologies
EPSRC, UK Research and Innovation



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What we will cover

- Introduction to the QT Team
- Introduction to the National QT Programme
- The NQTP Strategy Refresh
- The National Quantum Computing Centre
- Priorities for EPSRC in QT
- The EPSRC QT portfolio
- Future Opportunities

Quantum Technologies Theme Contacts

Team member	Responsibilities (as of July 2021)	Contact email
Anke Davis	Joint Head of Quantum Technologies Theme- Budget holder International strategy lead, emerging QT areas	Anke.Davis@epsrc.ukri.org
Katharine Dunn	Joint Head of Quantum Technologies Theme- Budget holder Training & Skills strategy lead, NQCC contact	Katharine.Dunn@epsrc.ukri.org
Helen Hunt	Senior Portfolio Manager; Oversight of QT Hubs , Trusted Research lead, Monitoring & Evaluation	Helen.Hunt@epsrc.ukri.org
Joseph Westwood	Senior Portfolio Manager; International activity delivery; Secretariat for UKNQTP Programme Board and UKNQTP Strategic Advisory Board	Joseph.Westwood@epsrc.ukri.org
Amanda Howes	Portfolio Manager; Quantum computing and simulation; Quantum communications; Programme grants	Amanda.Howes@epsrc.ukri.org
Sarah Stacey	Portfolio Manager; Quantum imaging; Skills and Training delivery; Cross-cutting areas	Sarah.Stacey@epsrc.ukri.org
Adam Oliver	Portfolio Manager; Quantum sensing and timing; Quantum components, Infrastructure; EDI / RRI	Adam.Oliver@epsrc.ukri.org
Cameron Ross	Portfolio Support Manager; Impact and case studies, External engagement lead, ICT contact	Cameron.Ross@epsrc.ukri.org
Charlotte Hiett	Delivery support	Charlotte.Hiett@epsrc.ukri.org

The QT Team

Two joint Heads of the QT Theme:

- Enables strong engagement with stakeholders across the whole QT domain, and the formation of rich new partnerships
- Gives increased leadership capacity for shaping our QT portfolio and contributing to the success of the NQTP
- Allows greater Theme level focus and attention on key QT projects and programmes

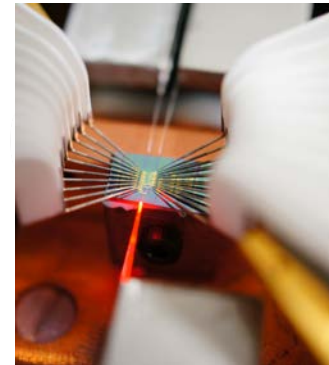
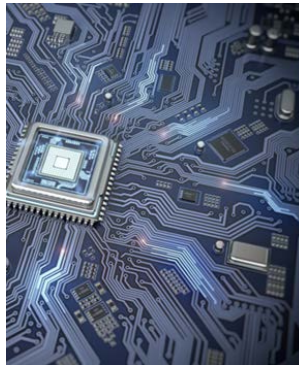
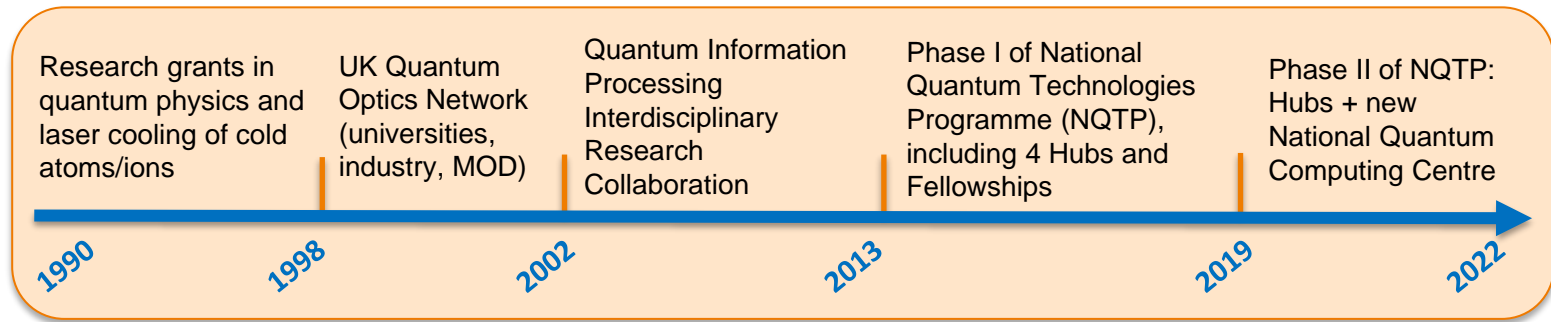
The National Quantum Technologies Programme

Introduction to the NQTP

- In 2014 the UK launched a five year £270m National QT Programme
- Partnership between EPSRC, Innovate UK, Dstl, NCSC, NPL and BEIS
- To turn the UK's strengths in quantum science into a strength in quantum technologies, and make the UK the go to place to research, invest and innovate in QT

Strong Science Base Enables Short-Timescale to Commercialisation

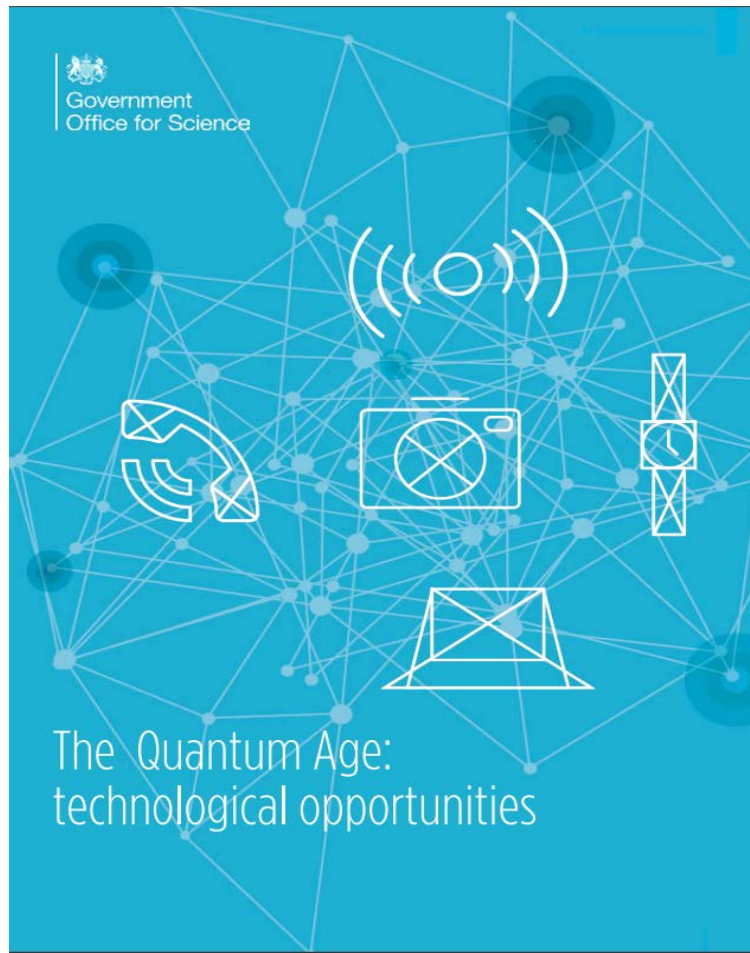
...from quantum science to quantum technology



Four main application areas

- Quantum sensors and timing
- Quantum imaging-gas sensing, imaging round corners, imaging through fog/rain/snow, brain imaging
- Quantum secured communications-post quantum security
- Quantum computing and simulation-potential to solve complex problems beyond the capabilities of conventional supercomputing
- <https://uknqt.ukri.org/>

Quantum Age-Blackett review



- Launched at the November 2016 National Quantum Technology Showcase.
- Recommended continuation of the strong UK National Quantum Technologies Programme to maintain our world-leading position in a promising and now globally emerging area of technology.
- Highlights specific applications where quantum technologies are expected to have a profound impact.

Successes of Phase 1 in numbers

Training a diverse workforce

150 students trained through Quantum Centres for Doctoral Training

14 Fellowships to support the most innovative individuals in quantum technology research and development

46 PhD projects funded through the Defence Science and Technology Laboratory

76 PhD students received funding from or hosted at the National Physical Laboratory

Connecting with businesses across the UK

Over 150 businesses partnered with the UK Quantum Research Hub network

170 businesses applied for ISCF funding, demonstrating huge appetite for collaboration



£20m

of government funding went to 25 businesses and 12 research organisations for ISCF wave 2 collaborative technology R&D projects in 2018

Supporting new businesses

Over 25

spin-outs

emerged from, or supported by the Programme



Creating new knowledge

214 grants

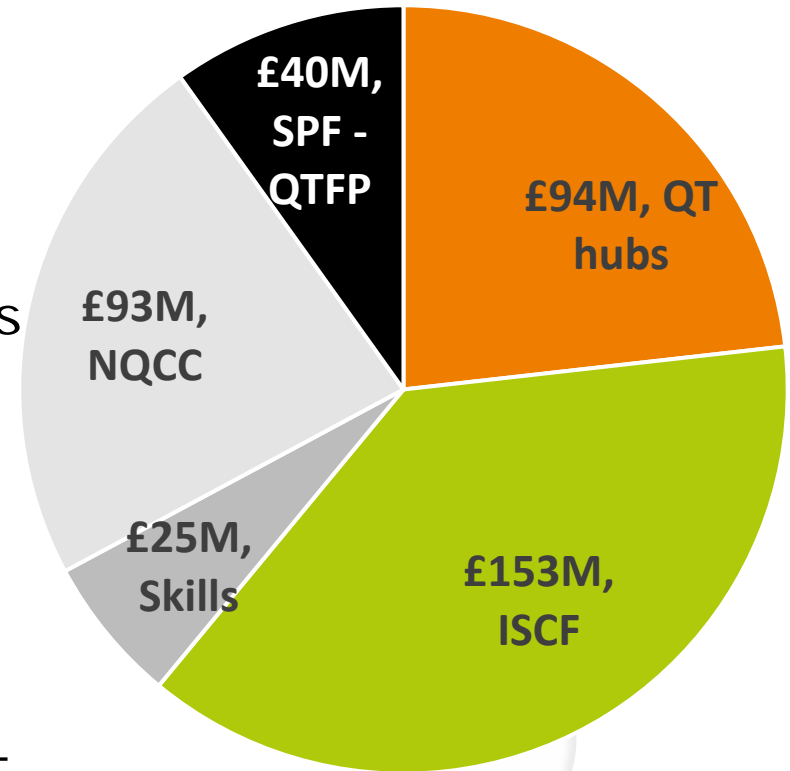
provided by EPSRC to support research in its quantum technology portfolio, totaling over £350 million

397 peer reviewed papers published by the UK research community



Evolution of the NQTP

- Increasing emphasis on innovation and industrially led activity
- New partners in the National Programme: STFC, MoD
- Widening awareness, understanding and take-up of quantum technologies in government, industry and academia
- A second 5 year phase of over £350m- including a refresh of the 4 QT Hubs
- Establishment of the NQCC in the QT landscape



NQTP Strategy Refresh- Phase 2 and onward

- Published in November 2020
- Highlights successes of NQTP Phase 1
- Sets strategic vision for next 10 years
- Overarching aim is to create quantum enabled economy
- 4 strategic objectives

Strategic Intent



1. Stimulate market growth, unleash innovation, and grow a thriving ecosystem

2. Maintain the UK's excellence in research and technology

3. Build a resilient network of national assets and mutually beneficial international relationships

4. Grow, attract and retain talent

How does this translate at the partner level?

Universal interest:

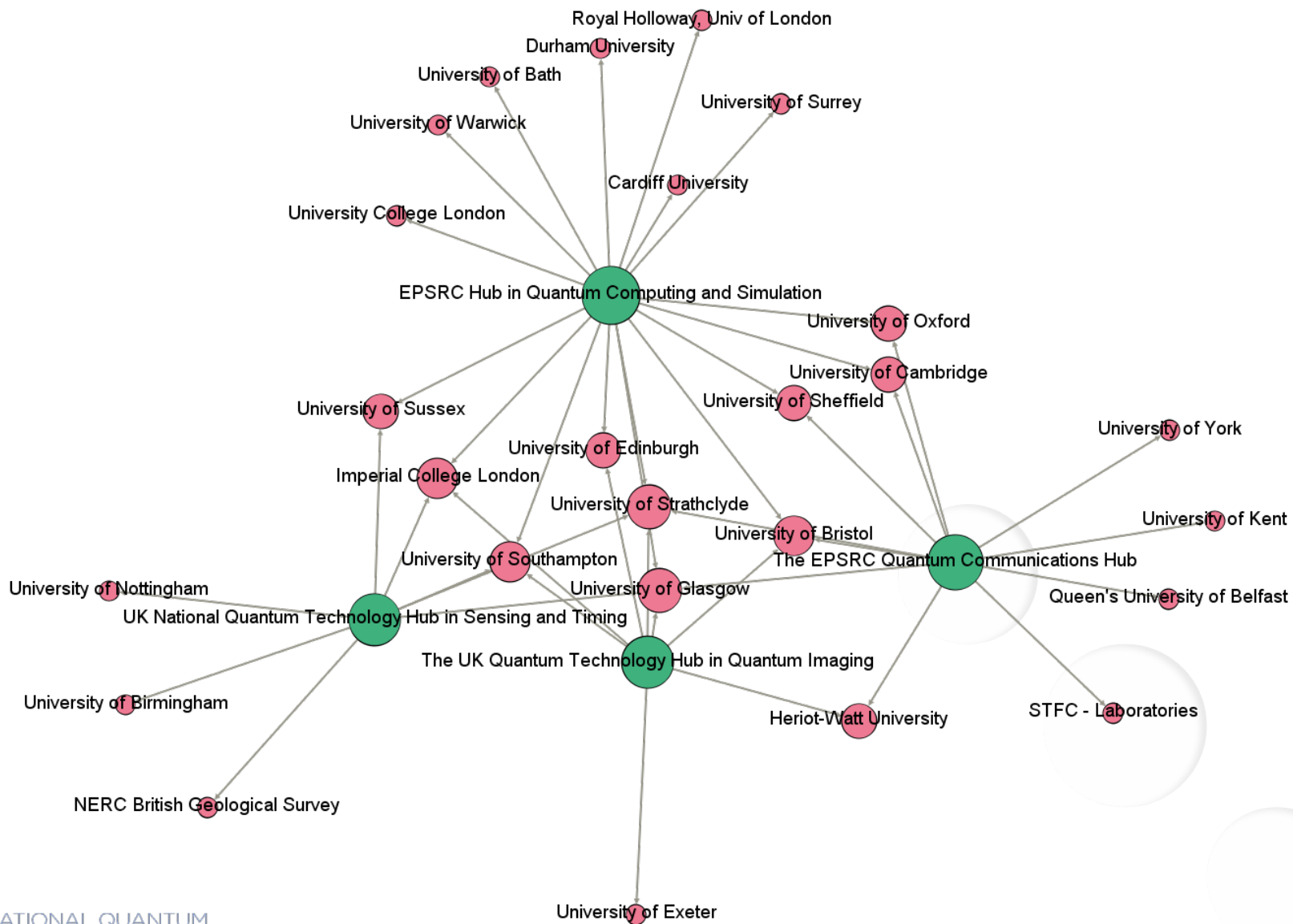
- Trusted Research
- Responsible Research and Innovation
- Infrastructure and facilities

EPSRC-specific focus:

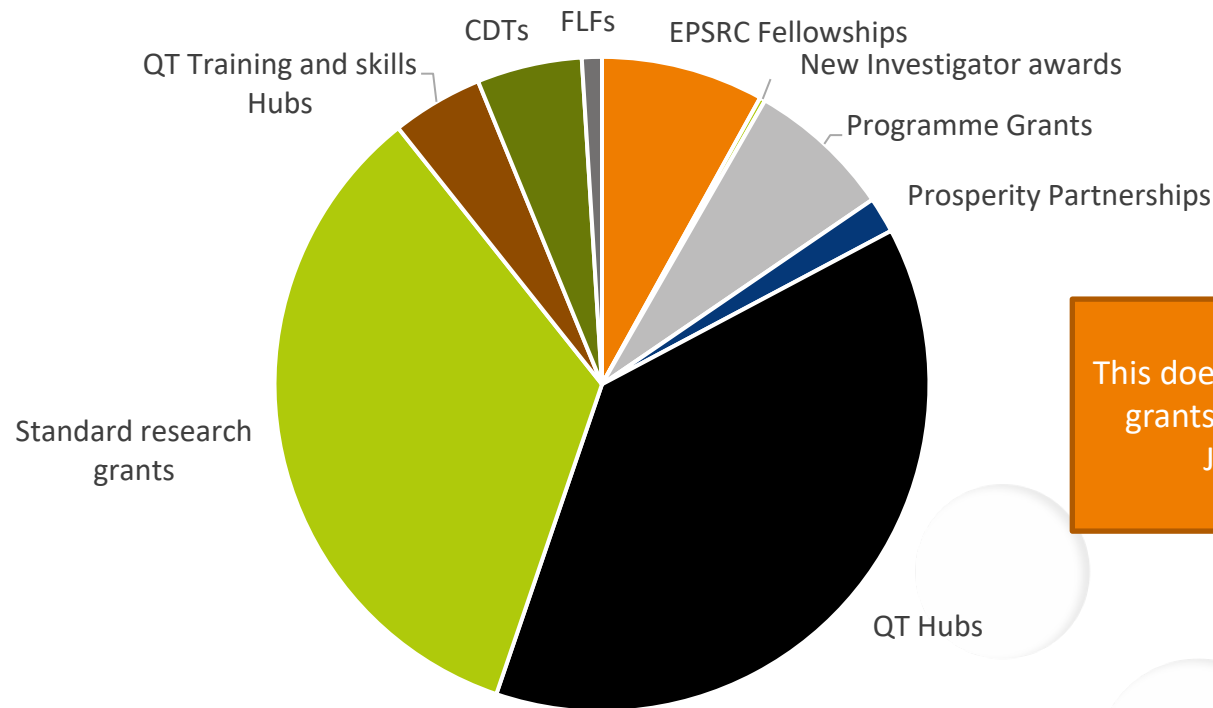
- Hub network and beyond
- Setting up the NQCC
- Quantum science to Quantum technologies pipeline
- Skills



Phase 2 Academic Hub Network



EPSRC investments of direct relevance to Quantum Technologies - £246M



This does not include any grants awarded after June 2020

- EPSRC Fellowships
- Prosperity Partnerships
- QT Training and skills Hubs
- New Investigator awards
- QT Hubs
- CDTs
- Programme Grants
- FLFs
- Standard research grants

The National Quantum Computing Centre



National Quantum Computing Centre

- **NQCC launched September 2020**
- Investment of £93m by UKRI over 5 years through EPSRC and STFC, part of the national programme
- Facility located at Harwell Campus – completion 2023
- Aim to work with government, industry and the research community to enable the delivery of quantum computing capabilities for the UK
- Focus on the challenge of scaling QC, and supporting growth of the wider UK ecosystem



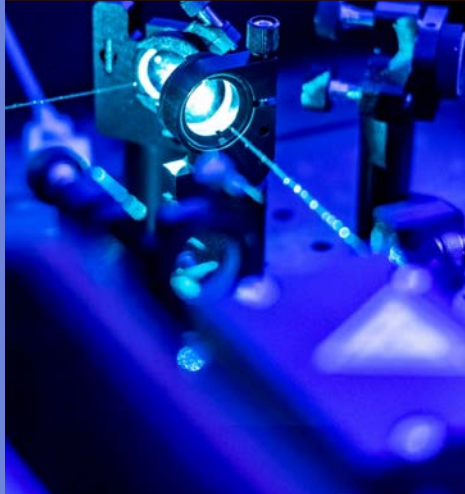
NQCC Strategic Intent

- Establish the NQCC as an assured authority on quantum computing
- Promote and drive QC within the UK economy
- Catalyse UK supply chain delivery into the QC sector
- Establish a focus for rapid development in the UK



National Quantum Computing Centre

Technology



Initial platform focus:

- Superconducting qubits
- Trapped ions

Near term roadmap complete

Long term outlook published

Strategic Intent on NQCC website

Tech projects – first tenders underway

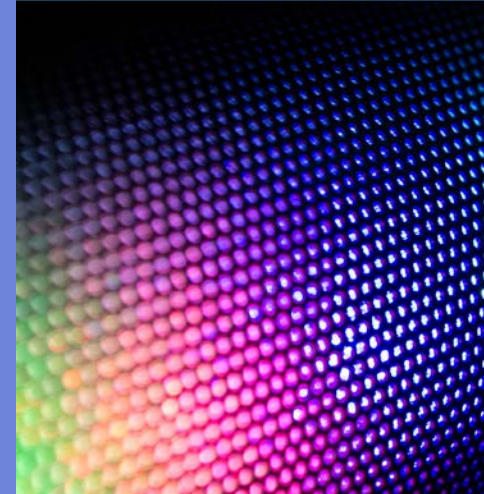
Facility



Facility Design:

- RIBA 2 Design freeze – Q3-2020
- RIBA 3 Design – Q4-2020
- RIBA 3 design freeze – Q1-2021
- Planning – Q1-2021
- Site clearance – Q2-2021
- Construction – Q3-2021
- Facility handover – Q1-2023

Engagement



Formal NQCC launch Q3-2020:

- Strategic Intent published
- Website launched
- Ministerial Roundtable hosted

Quantum Readiness developing

- Applications workstream
- Bridge from HPC to Quantum
- Training Next-Gen Workforce
- Access to prototypes

Eco-system participation

£93m over 5 years

Programme status:

- Outline Business Case Approved Q2-2020
- Full Business Case Approved Q1-2021
- **Permanent Leadership Team recruitment underway Q1- Q2 2021**
- **Phased recruitment, initial 10 roles, underway – Q1- Q2 2021**

* Current key activity

NQCC Quantum Town Talk to take place on 8th July – register here:

<https://www.eventbrite.co.uk/e/nqcc-quantum-towntalks-tickets-161085439887>

Priorities for EPSRC in Quantum Technologies

EPSRC Quantum Technologies Priorities

Planning priority activities for 21/22

- **Support the 4 QT Hubs** as part of Phase 2: maintaining the technological research leadership that the UK has established in QT
- **NQCC (delivered by EPSRC/STFC):** Delivering this critical UK national centre to build UK capability and leadership in Quantum Computing
- **Training and skills:** targeted fellowship support to attract and retain the best talent in QT
- **International collaboration:** to continue to accelerate research progress and knowledge sharing in new emerging areas across TRLs
 - Trusted Research - <https://www.cpni.gov.uk//trusted-research>

Longer term planning

- **Emerging quantum technology areas:** Delivering the next generation of quantum technologies to secure a pipeline of emerging areas
- **Quantum for science users:** Driving science through quantum technologies by working in partnership across research councils
- **Engineering quantum technology systems:** Overcoming engineering challenges such as reducing size, weight, power and cost of devices to meet user needs
- **Exploiting the Quantum Computing advantage:** Support for a breadth of QC research and skills programmes to complement the NQCC priorities

General funding opportunities

- EPSRC Standard Mode &
- Open Fellowship Scheme
 - Open all year round
 - Open to all proposals within EPSRC remit, including QT
 - QT proposals allocated to Physical Sciences, ICT or Engineering panels as appropriate
 - QT team guiding proposals through peer review
- Programme Grants
 - Address an EPSRC priority
- Prosperity Partnerships
 - Strong industrial contribution
 - Apply through a specific call for proposals

EPSRC QT funding opportunities in 2021/22

QT Fellowships

- **~£10m**
- Aimed at postdoctoral researchers
- 3-5 years duration
- Focus on career development
- Call opening in summer 2021

QT International Networking Call

- **~£5m**
- Aims to stimulate international collaborative ventures in QT
- Must be able to facilitate virtual collaboration
- Standard EPSRC eligibility applies
- Call opening in summer 2021

Quantum Computing/ICT Call

- **~£10m**
- Call opening in summer 2021
- For activities at the QC/ICT interface
- A workshop to identify potential challenges held on 28 June 2021

EPSRC Quantum Technologies Community Webinar

Thank you for attending and
please complete the feedback survey



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