## **About Quantum Brilliance**

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**GENERAL** 

### Quantum is key to solving complex problems



Discover and develop new pharmaceuticals



Explore chemical reactions and develop new materials



Better understand biological processes



Artificial intelligence and machine learning



Disruptive functionality in the financial sector



Build climate models and forecast weather



### **Infrastructure and Deployability Barriers**

How can quantum can go from mainframe  $\rightarrow$  mainstream?





### **Our Technology: Diamond QPUs**



#### **Quantum Chip**

Containing integrated microwave guides, optical structures, electromagnets and other electrical componentry sitting on top of our implanted diamond wafers. Packaged up for environmental control allowing ruggedized deployment.

#### **Simple Optics**

Based on common 'offthe-shelf' diodes and drivers.



#### RF/MW Electronics



**QUANTUM** BRILLIANCE

#### Based on signal generation technology used in 5G, 7<sup>th</sup> Gen Wi-Fi and Radar.

#### Diamond Die

10nm

Synthetic scientific grade, ultra-pure diamond, grown in specialist reactors.

#### Qubit Array

Fabricated with our propriety atomic scale fabrication techniques, uniquely enabling Quantum Brilliance to scale room-temperature diamond quantum computers.

#### **Control Board**

Designed around existing industry standards for maximum compatibility.

#### Microprocessor

946 CS

Quantum control operations can be handled by 'off-the-shelf' SoC modules widely available in the market.

### **Competitive Advantages**



 Best room temperature quantum coherence of any solid-state system (>1ms)
No cryogenics, vacuums or complex lasers
Pathway to Quantum Systems-on-Chip

- × Requires cryogenics and complex control systems
- × Expensive, high cost and maintenance
- × Inaccessible in remote or edge scenarios





### Our systems can be deployed everywhere





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# Future hardware will be a mix of complementary technologies occupying distinct roles





### **Technology Roadmap**



### **Development Kit**

- Low barrier to host on-site
- Systems integration
- Build and test applications



Quantum Accelerator

- Integrated into complex systems
- Deployable in all environments
- High volume

2026+



World Class Emulator

- Enables co-processing of hybrid classicalquantum algorithms
  - Supports multiple quantum programming languages



#### Future releases

- Flagship application plugins for select industries
- Platform for commercial and research QC applications development



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### **Diamond QPUs have distinctive advantages** ...

... seamlessly integrated, our quantum accelerators will become a critical component of any compute environment



- ✓ Best room temperature quantum coherence of any solid-state system (>1ms)
- ✓ No cryogenics, vacuums or complex lasers
- ✓ Pathway to Quantum Systems-on-Chip



Notes: (1) Heterogeneous computing refers to system which uses more than one type of computing cores, such as CPU, GPU, FPGA, ASIC or QPUs. It is widely recognized the data centres of tomorrow will be made up of heterogeneous systems. Co-processing will become critical to leverage the strengths of different computer architectures which will greatly accelerate computing speed and accuracy. For example, with the development of AI and deep learning, combining GPUs and CPUs has proven to be effective to process vast amount of data to graphical forms.



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### **Evolution of Quantum Computing for HPC** ...



Notes: T.S. Humble and K. A. Britt, Software systems for high-performance quantum computing



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### Example of Software Collaborations

Signal Processing

Problem: Speech to Text conversion Solution: Take into account all possible sequences using a Quantum Decoder

### **Database Optimisation**

Problem: Speed up queries and transactions Solution: Learn the best policy for join orders using a Quantum Al

**Place and Route Problem:** Place a set of *n* facilities on *n* given **Solution:** QAOA on massively parallelised Quantum Accelerators









# Thank you for your attention

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