

ASX Announcement ([ASX: AXE](#))

16 September 2020

Quantum computing webinar update

Archer Materials Limited (“Archer”, the “Company”, “[ASX: AXE](#)”) is pleased to provide an update on its joint webinar with International Business Machines Corporation (“IBM”, “[NYSE: IBM](#)”) on the topic of quantum computing (“Webinar”) which took place online on 15 September 2020.

Over 320 people attended the Webinar, which focused on the opportunities and economic drivers behind quantum computing and included an in-depth Q&A session that was addressed by speakers from Archer and IBM.

The recorded Webinar can be found [here](#) and Archer’s Webinar presentation is appended to this announcement.

About Archer

A materials technology company developing materials in quantum computing, biotechnology, and lithium-ion batteries, and exploring for minerals in Australia. The Company has strong intellectual property, broad-scope mineral tenements, world-class in-house expertise, a unique materials inventory, and access to over \$300 million of technology development infrastructure.

The Board of Archer authorised this announcement to be given to ASX.

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Website:

<https://archerx.com.au/>

Twitter:

<https://twitter.com/archerxau?lang=en>

YouTube:

<https://bit.ly/2UKBBmG>

Medium:

<https://medium.com/@ArcherX>

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/ Company Webinar

ARCHER

Quantum Technology: ^{12}CQ
September 2020

**IBM Q
Network**

/ Disclaimer

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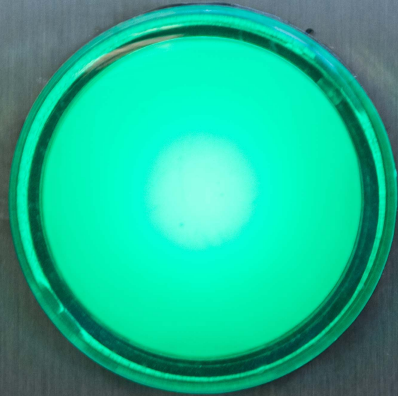
This document may contain forward-looking statements with respect to the financial condition, results of operations, and business strategy of the Archer Group. These forward-looking statements are based on estimates, projections and assumptions made by the Archer Group about circumstances and events that have not yet taken place. Although the Archer Group believes the forward-looking statements to be reasonable, they are not certain. Forward-looking statements involve known and unknown risks, uncertainties and other factors that are in some cases beyond the Archer Group’s control, and which may cause actual results, performance or achievements to differ materially from those expressed or implied by the forward-looking statements (and from past results). The Archer Group makes no representation or warranty as to the accuracy of any forward-looking statements in this presentation and undue reliance should not be placed upon such statements. Forward-looking statements may be identified by words such as “aim”, “anticipate”, “assume”, “continue”, “could”, “estimate”, “expect”, “intend”, “may”, “plan”, “predict”, “should”, “will”, or “would” or the negative of such terms or other similar expressions that are predictions of or otherwise indicate future events or trends. The forward-looking statements included in this presentation speak only as of the date of this presentation. The Archer Group does not intend to update the forward-looking statements in this presentation in the future.

This presentation contains information which was reported in ASX announcements lodged between 1 October 2017 and 1 Sept 2020 (together the “Announcements”). All material assumptions and technical parameters set out in the Announcements continue to apply and have not materially changed. The Announcements can be viewed online at <https://www.archerx.com.au>.

Certain statistical and other information included in this presentation is sourced from publicly available third party sources and has not been independently verified.



SYSTEM
HEALTHY



/ Company Overview

Archer is a materials technology company listed on the Australian Securities Exchange (ASX:AXE).

\$8.1m

Cash in bank
(30 Jun 2020)

\$0.60

Share price
(11 Sept 2020)

\$135m

Market capitalisation
(11 Sept 2020)

+460%

1-year return
(Sept 2019-2020)

+ No corporate debt (as of 15 Sept 2020)

+ For more corporate and investor related information visit: www.archerx.com.au/investors



Part of an Electron Beam Evaporator in the chip foundry Archer uses to build ¹²CQ prototypes.

Archer staff and affiliates working in semiconductor chip foundry facilities.

/ Webinar Overview

Archer's commercial strategy involves developing innovative deep technology for quantum computing, human health, and reliable energy.

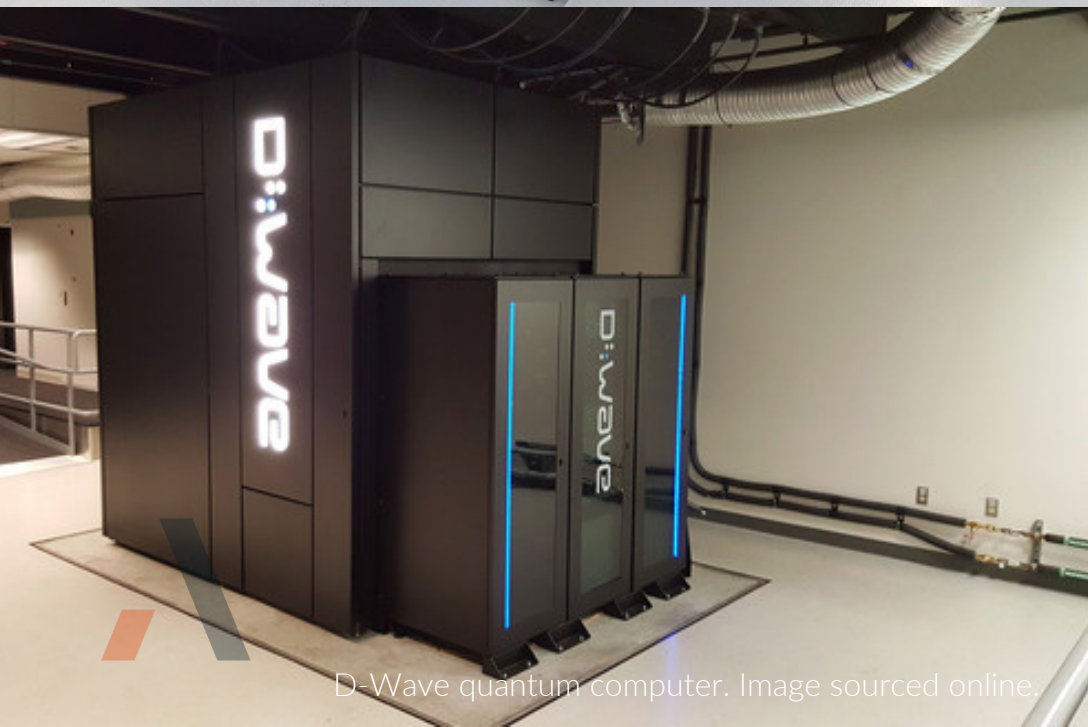
This presentation is focused on the Company's quantum technology related activities, specifically:

- + The technological development of Archer's ^{12}CQ quantum computing qubit processor chip.
- + Engagement in the global IBM Q Network and plans to use IBM's quantum software platform, Qiskit.





IBM Summit Supercomputer. Image sourced online.



D-Wave quantum computer. Image sourced online.

/ Powerful Computing

Classical and quantum computing fundamentally differ in operation. However, conceptual parallels exist in infrastructure requirements & hardware integration:

- + Current, early-stage quantum computers are limited in practicality and ownership.
- + There is no standard quantum computing processor architecture: they differ by qubit materials used.
- + Quantum computing represents the future of powerful computing[†].
- + Archer's ¹²CQ technology has the proven potential to enable integration in portable devices that could allow for widespread ownership and use.

[†] <https://www.bcg.com/en-au/publications/2018/next-decade-quantum-computing-how-play.aspx>

/ Deep Dive: Qubits

Quantum information is encoded in *qubits* (quantum bits); the elementary building block of *any* quantum computer, and are extremely fragile:

- + The physical mechanisms determining qubit operation and robustness are *intrinsically* dependent on the materials used.
- + Qubits are represented in a variety of materials, with different properties and limitations.
- + Interactions within the qubit material, heat, and light cause a loss of quantum information in qubits.
- + Archer's qubit material is robust at room temperature, unlike most qubit materials that require cooling to very low temperatures to enable operation.



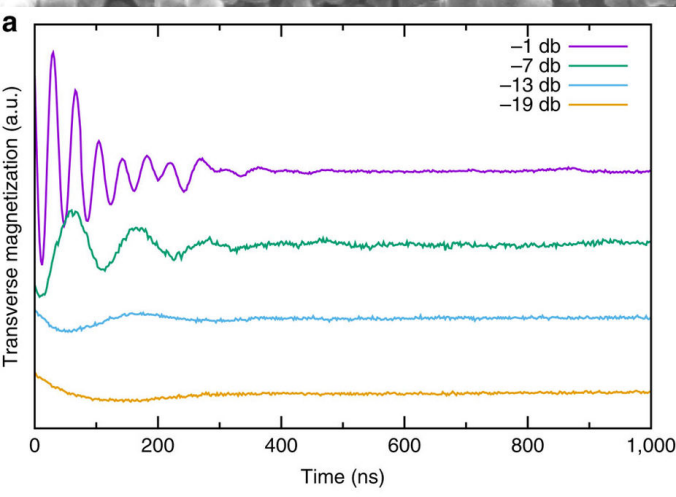
Heads or tails qubit analogy: Protecting the superposition of quantum states is critical in quantum computing operation.



/ Archer's Carbon Qubit Material

Archer uses a unique carbon-based qubit material that has the proven potential to enable chip operation at room-temperature and integration onboard modern electronic devices^f:

- + Conducting carbon nanospheres ~35 nanometres in size are easily produced, processed, and handled with workable dimensions for building quantum devices.
- + Archer exploits quantum states known as electron spins as qubits, which demonstrate a robustness at room temperature that arises from the carbon-based material.
- + Impracticalities of other qubit systems are overcome, like low temperatures, well-defined crystals, atomic manipulation, photonics, or metals to enable operation.



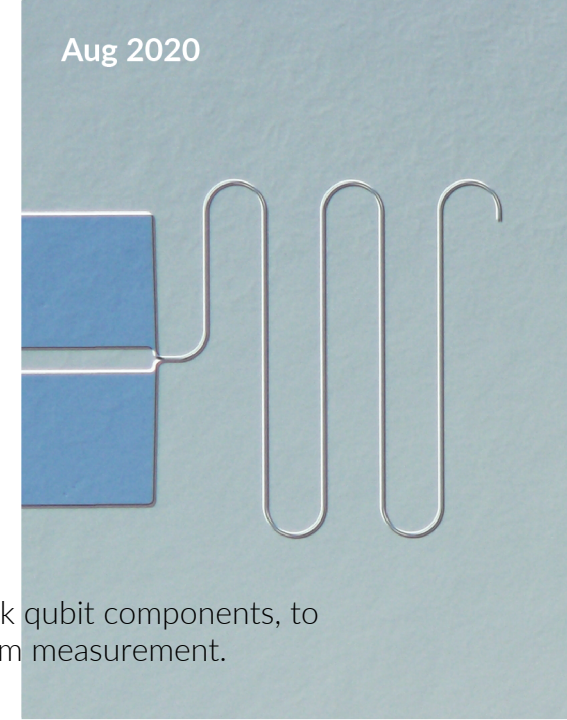
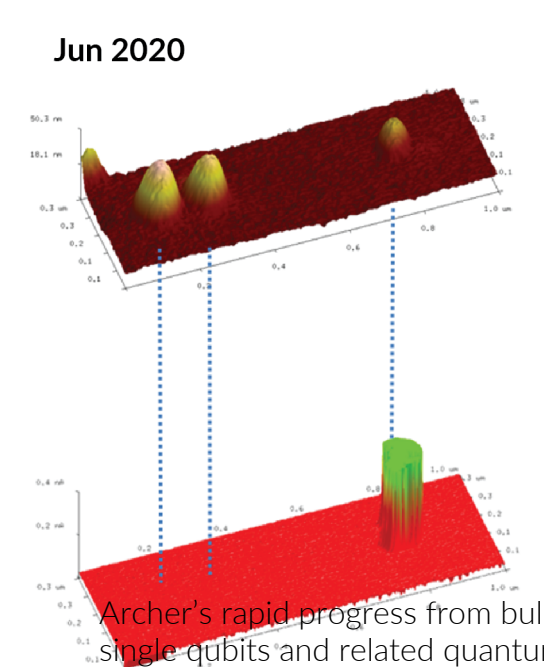
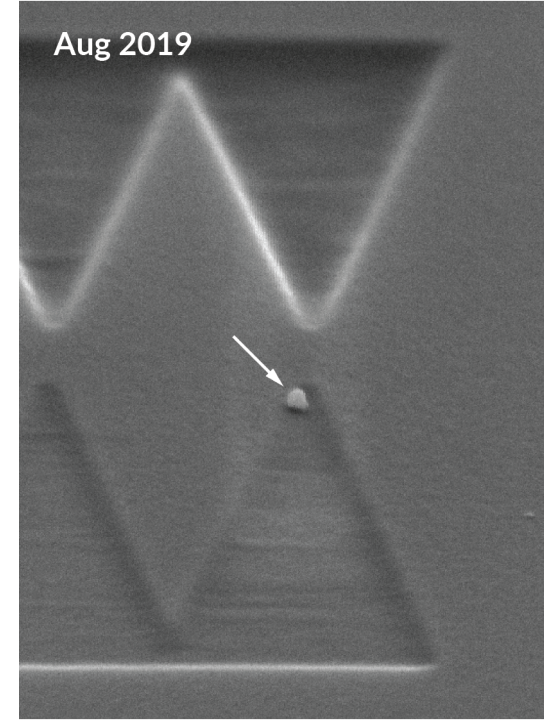
Microscopy image of thousands of carbon-based qubits from bulk powder form. Inset *a*: Experimental proof of qubits' robust properties at room-temperature.

^f <https://www.nature.com/articles/ncomms12232>

/ Hallmarks of Deep Tech

Archer has made rapid, internationally recognised progress building the ^{12}CQ chip over the past year, towards a viable qubit processor chip technology:

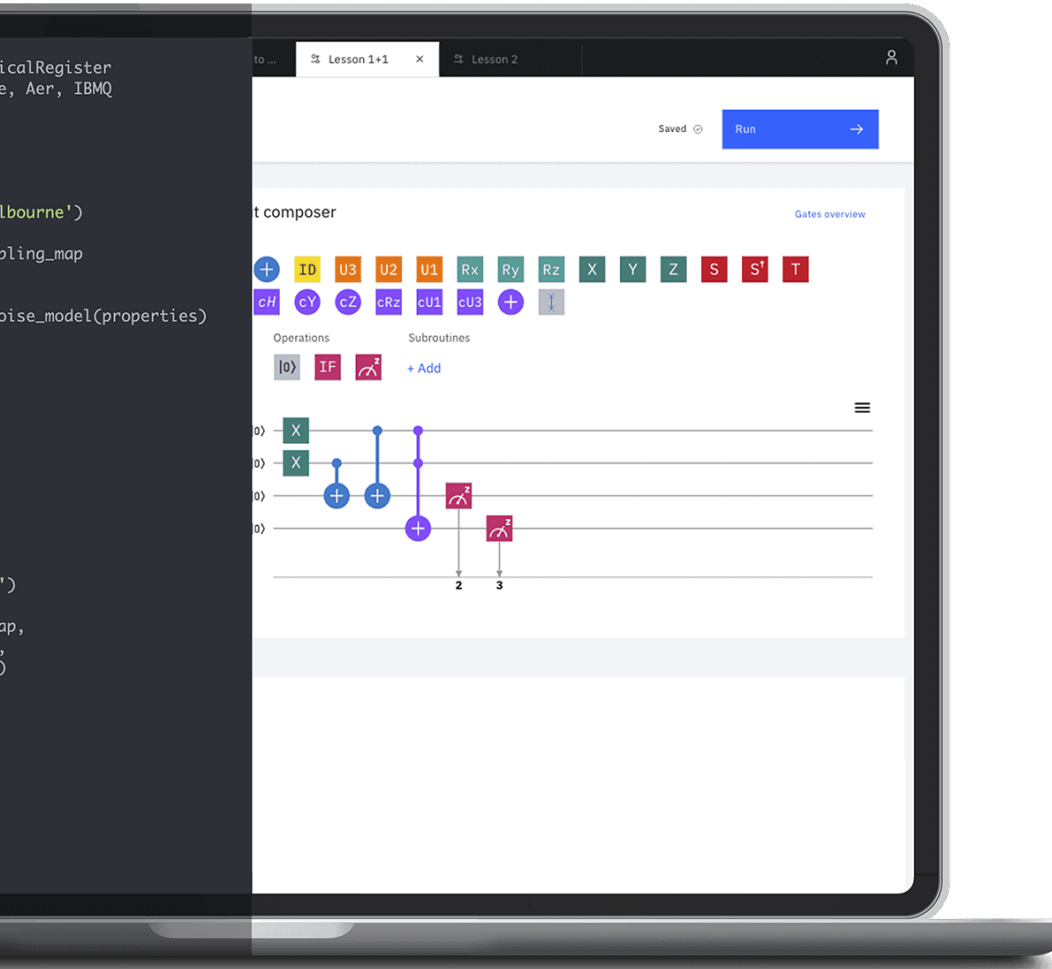
- + Archer has commercial access to chip foundries (Australia & Switzerland), and collaborative partnerships (85+ personnel) needed to build prototypes of the ^{12}CQ qubit processor chip.
- + International patent applications protecting Archer's global competitive advantage are currently advancing in the EU, US, Australia, China, Japan, Hong Kong, and South Korea.
- + Single and few-qubits have been nanofabricated into arrays; single qubit component conductivity completed; and qubit control devices recently built: key early-stage quantum computing chip development success factors.



/ Qiskit: Quantum Software

Archer entered into an agreement with IBM to collaborate on the advancement of quantum computing, supporting:

- + Archer's plans to use Qiskit as the software stack for ^{12}CQ processors and to participate in the global IBM Q Network[†].
- + The Company's access to the IBM Quantum Computation Center, which includes the most advanced quantum computers available to explore practical applications.
- + The demonstration of Qiskit's flexibility, integrating with different quantum hardware (e.g. ^{12}CQ) to accomplish the goal of enabling *practical* quantum computing applications.



IBM's Qiskit interface showing a quantum computing gate compiler. Image sourced from IBM website.

[†] https://archerx.com.au/src/uploads/2020/05/20200505_Quantum-computing-agreement-with-IBM-ASX-Release.pdf

[‡] <https://www.ibm.com/quantum-computing/>

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