

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

21 July 2022

## 12CQ quantum device modelling shows compatibility with existing fabrication processes

### Highlights

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- Advanced semiconductor device modelling supports Archer's 12CQ quantum devices' compatibility with existing industrial foundry processes.
  - The results will be used to determine which commercial foundries Archer will engage with regarding future fabrication.
  - Integrating qubit materials with complex electronics compatible with industrial-scale fabrication is a significant challenge in quantum computing.
  - Archer is the only ASX listed company and one of few players in the world developing qubit processor technology.
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Archer Materials Limited ("Archer", the "Company", "[ASX: AXE](#)") is pleased to provide shareholders with a technical progress update on Archer's 12CQ quantum computing chip technology ("12CQ chip").

To scale the fabrication of Archer's 12CQ chip devices and components, the Company will need to work with industrial-scale manufacturers in the global semiconductor supply chain<sup>†</sup>. The Company must use sophisticated device modelling and simulations to determine which commercial foundries could address the Company's future fabrication.

Archer has performed state-of-the-art 3D Electrostatic Finite Element Modelling in conjunction with in-house software development relevant to the Company's qubit material. The modelling simulates quantum electronic device ("QED") architectures related to qubit *control* and *readout* to obtain a precise estimate for the lower-bound on the devices' critical feature size.

The complex simulations resulted in a minimum requirement for QED feature sizes that would be specifically compatible with existing standard industrial-foundry processes, including Extreme Ultra Violet Photolithography.

Current quantum computing qubit architectures rely on custom made fabrication<sup>‡</sup>, unlike modern classical computing circuits which are primarily silicon-based and are manufactured in, and using, well-established industrial semiconductor facilities. Integrating qubit materials with complex *control* and *readout* electronics compatible with existing industrial-scale foundries is a significant challenge in developing quantum processors.

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<sup>†</sup> <https://www.chiefscientist.nsw.gov.au/independent-reports/australian-semiconductor-sector-study>

<sup>‡</sup> <https://www.nature.com/articles/ncomms12232>

Archer's <sup>12</sup>CQ chip innovation aims to integrate its unique qubit material with mobile-compatible devices that are in a form suitable for industrial-scale semiconductor nanofabrication (ASX ann. [30 May 2022](#), [20 June 2022](#), and [1 Feb 2022](#)).

**Commenting on the <sup>12</sup>CQ technology progress, Archer CEO Dr Mohammad Choucair said:** "The results of the advanced simulations provides Archer with an initial avenue to designing qubit devices in a form suitable for scalable processing, and importantly, using existing chip production equipment found in many industrial semiconductor manufacturing foundries.

"Archer intends to use this modelling to determine which commercial semiconductor manufacturers to engage with regarding future fabrication."

### Further information on Archer's global competitive advantage and tech differentiation

The scientific breakthrough made in 2016 to realise Archer's <sup>12</sup>CQ qubit material is available online in the peer-reviewed scientific journal [Nature Communications](#), which reports the advantages, technological trade-offs, and the technological barriers that have been overcome towards realising practical quantum computing, over several other qubit proposals.

Patent information related to the <sup>12</sup>CQ chip qubit and proposed device(s) is available online, including examiner reports, through the [WIPO website](#).

### About Archer

Archer is a technology company developing advanced semiconductor devices, including processor chips that are relevant to quantum computing. Archer is developing the <sup>12</sup>CQ chip, a world-first qubit processor technology, that could potentially allow for quantum computing powered mobile devices ('QPMDs').

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

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