

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

10 May 2021

Qubit control progress with advanced device modelling

Highlights

- The Company progresses its ¹²CQ chip development by applying advanced semiconductor device modelling to build sophisticated qubit control devices.
 - Detecting and manipulating quantum information in miniaturised chip devices is required for ¹²CQ chip operation.
 - Archer operates in the semiconductor industry, developing a world-first quantum computing chip and securing the related intellectual property in global markets[†].
 - Archer is one of only a few players developing a qubit processor chip in the emerging multibillion-dollar quantum computing industry[‡].
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Archer Materials Limited (“Archer”, the “Company”, “[ASX:AXE](#)”) is pleased to provide shareholders with a technical progress update on its ¹²CQ quantum computing processor chip. The Company is currently developing qubit control devices based on various semiconductor technologies that integrate control electronics with ¹²CQ chip qubits. The qubit control devices that Archer is building are state-of-the-art.

Controlling qubits in Archer’s ¹²CQ chip requires the design of new and highly complex quantum information control electronics to integrate with ¹²CQ chip qubits. The Company is now at a stage of development where these advanced designs can be (and are being) developed from first principles, modelled using specialised software, built and tested, all in an end-to-end process.

Archer’s ¹²CQ chip development has progressed to utilising [Electromagnetic Finite Element Modelling](#) to build qubit control devices (Image 1a). The sophisticated modelling facilitates achieving qubit control of few and single qubits, which are key milestones in validating ¹²CQ chip viability. Without this, ¹²CQ chip operation would not be possible.

The Archer team and collaborators use semiconductor fabrication processes in a A\$150 million [research and prototype foundry](#) in Sydney, to build the new and complex qubit control architectures onto a chip integrating the ¹²CQ qubits (Image 1b). Testing and optimisation of these qubit control devices is performed using multimillion dollar, custom built, qubit control infrastructure (ASX ann. [19 Nov 2020](#)).

Commenting on Archer’s ¹²CQ chip development, Archer CEO Dr Mohammad Choucair said “We are progressing with our ¹²CQ chip development by iterating new qubit control device designs and upgrading existing [control] prototypes to integrate with ¹²CQ chip qubits. Advanced device modelling is required to do this work, especially as we have the opportunity to account for qubit scalability early on, which is a key advantage over other qubit proposals”.

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

[‡] <https://www.nature.com/articles/s42254-020-00247-5>; also <https://www.ibm.com/quantum-computing/network/members/>

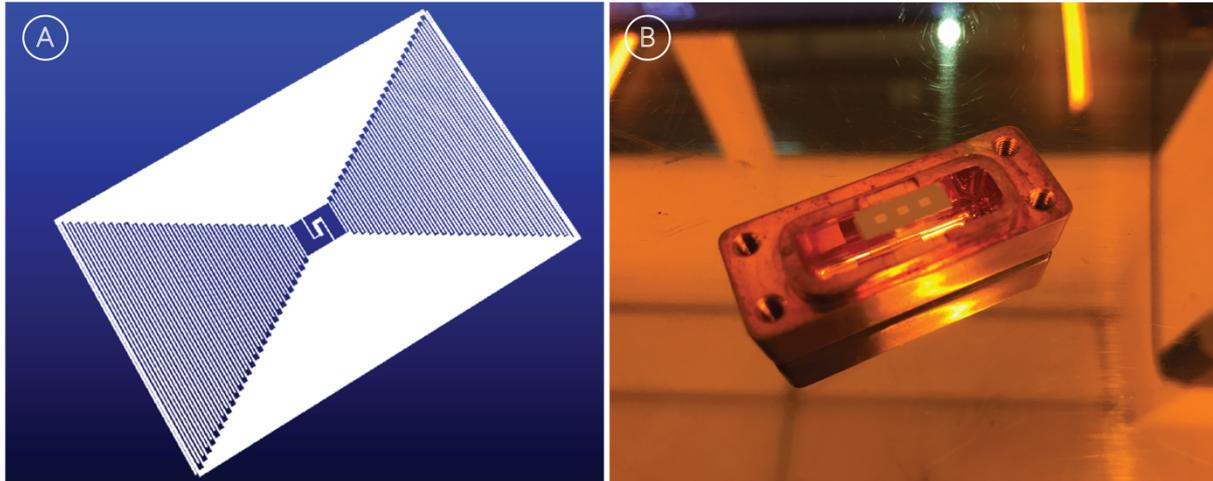


Image 1. Use of specialised software to model qubit control circuitry and devices. **A** Example of model qubit control circuitry prepared for illustrative purposes. Actual designs remain commercial-in-confidence and intellectual property of Archer. **B** Example of a qubit control device fabricated by the Archer team with integrated model circuitry on the mounting chip (three rectangles in the centre of the block) measuring 11 mm x 4 mm. The control circuitry in **B** is not visible to the eye at the image magnification.

About the semiconductor industry

Semiconductor devices are commonly referred to as ‘chips’ and enable almost all technology applications. The global market for manufacturing chips is valued at US\$400+ billion and by some estimates is forecast to reach US\$1 trillion by 2030. Chips currently address end markets valued at US\$4+ trillion, that include processor, sensor, and memory devices[†].

About Archer

Archer is a technology company that builds advanced semiconductor devices, including processor chips that are relevant to quantum computing. Archer’s ¹²CQ is a world-first qubit processor technology that would allow for mobile quantum computing powered devices. For more information, please view Archer’s [webinar](#) with IBM.

¹²CQ® is a registered trademark of Archer Materials Limited.

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

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