

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

3 September 2024

Archer produces two proof of concept devices to improve ¹²CQ chip spin detection

Highlights

- Archer has manufactured and characterised two proof-of-concept electrical devices which will improve the readout of its ¹²CQ quantum chip spin material.
 - The circuits consist of up to eight superconducting resonators with each one capable of simultaneously reading out separate electron spin material.
 - The superconducting circuits demonstrate sufficient resilience to high magnetic fields at -269 degrees Celsius.
 - The devices build on the recently developed next-generation film-based spin material that improves manufacturability, while potentially providing longer spin lifetimes.
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Archer Materials Limited ("Archer", the "Company", "ASX: AXE"), a semiconductor company advancing the quantum technology and medical diagnostics industries, has manufactured two proof-of-concept electrical devices which have improved the readout (the output of data, information) of its spin materials and enhanced manufacturability of the ¹²CQ quantum chip.

Archer's quantum team developed two complementary superconducting spin readout circuits, consisting of up to eight resonators. Each circuit resonator can simultaneously readout separate spin material.

This result moves us closer to the future scaled manufacture of the ¹²CQ chip, which seeks to enable quantum computing for use in mobile applications. It builds on the next-generation film-based spin material, highlighted in the ASX announcement of 18 July 2024, that was developed to improve manufacturability, while potentially providing much longer spin lifetimes.

Archer created and characterised the devices by using simulation software developed by US-based international software company, Sonnet Precision Electromagnetics, and is partnering with academic researchers at The University of New South Wales. The group used the simulation software to optimise the resonator design and performed measurements over three campaigns that involved testing superconducting readout circuits at temperatures below -269 degrees Celsius and at magnetic fields of up to 1.5 Tesla.

This development provides the necessary groundwork for the future measurement of very small quantities of Archer's quantum spin material (down to a single CNO).

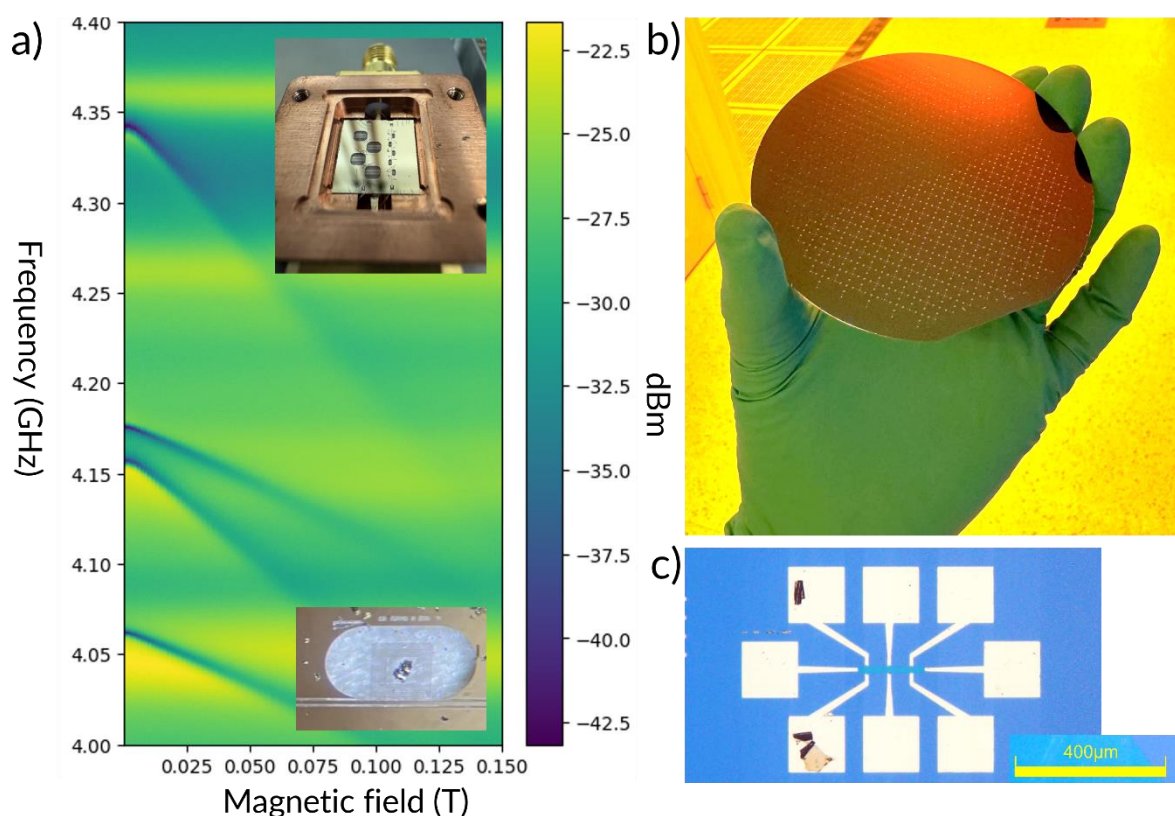


Image 1. a) Demonstration of the microwave measurement of the superconducting spin readout circuit under the application of magnetic field. Top insert shows one superconducting spin readout circuit mount for measurement. Bottom insert, the spin reference material, mounted in position in the centre of a superconducting resonator, in preparation for spin detection measurements. **b)** A wafer prepared for automated scanning electron microscope image capture. The fine structure that can be seen is the precision alignment markers to assisting in locating suitable device material with nanometre precision. **c)** Proof-of-concept device fabricated from Archer's next-generation film-based spin material, allowing enhanced manufacturability, significantly decreased electrical resistance, and potentially increased spin lifetimes.

Commenting on the ^{12}CQ development, Greg English, Executive Chair of Archer, said,

"The ^{12}CQ project continues to make significant steps towards functionality. To be functional, the chip needs to be able to have the ability to detect the input of quantum information, and output information, or display it, known as control and readout, respectively.

"The two proof-of-concept electrical devices brings us closer to readout, or the reading out of electron quantum spin information, and bolsters the manufacturability of the qubit material.

"This development is another example of the team doing important work with our partners to bring the next phase of computing to life through the ^{12}CQ , quantum."

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

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About Archer

Archer is a technology company that operates within the semiconductor industry. The Company is developing advanced semiconductor devices, including chips relevant to quantum computing and medical diagnostics. Archer utilises its global partnerships to develop these technologies for potential deployment and use across multiple industries.
www.archerx.com.au