Archer Materials
Technology

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ASX Announcement (ASX: **AXE**) 25 March 2024

Archer and EPFL co-develop a single chip integrated pulsed electron spin resonance microsystem

Highlights

- Archer Materials and research partner EPFL have developed a pulsed electron spin resonance chip, advancing Archer's ^{12}CQ quantum technology project.
- The new chip detects and analyses materials for important signs of quantum electron spin manipulation at a very small scale.
- The chip's features open potential opportunities for Archer to develop quantum sensors, miniaturised spectrometers, and analytical devices for precision sensing.
- The chip is smaller than 1 mm in size and is manufactured using a 130 nm SiGe BiCMOS technology.
- Archer is continuing to work with EPFL to build capability in radiofrequency devices and circuit design for potential applications in quantum technology.
- The technical details of the new chip will be made publicly available this week.

Archer Materials Limited ("Archer", the "Company", "ASX: AXE"), a semiconductor company advancing the quantum technology and medical diagnostics industries, has built a single chip integrated pulsed electron spin resonance ("p-ESR") microsystem, with its research partner École Polytechnique Fédérale de Lausanne ("EPFL") in Switzerland.

Archer and EPFL intend to use the p-ESR microsystem to perform complex measurements involving the potential electron spin manipulation of Archer's ^{12}CQ quantum materials. The measurements will be ongoing throughout CY2024. The miniaturisation and electron spin sensitivity of the p-ESR microsystem also allows Archer to explore opportunities in developing quantum sensors, advanced spectrometers, and analytical devices.

The p-ESR microsystem is a tiny, integrated device designed to detect and analyse the behaviour of unpaired electrons, that potentially carry spin quantum information, in materials at a very small scale. It measures 0.7 mm^2 in size and it includes integrated circuit components like micro coils, amplifiers, filters, and mixers, all working together to detect and amplify signals related to the behaviour of unpaired electrons (Image 1). Significant innovation is required to design, develop, and build an operational p-ESR microsystem.

The p-ESR chip is manufactured using a 130 nm SiGe BiCMOS technology (IHP SG13G2Cu). This follows research and development by Archer and EPFL on detecting electron spins in its quantum materials using continuous wave ESR ("cw-ESR") chips built with high electron mobility transistor ("HEMT") and complementary metal-oxide semiconductor ("CMOS") technology (ASX ann. 10 Oct 2022, 1 Feb 2022, and 20 Apr 2023). The new p-ESR chip technology is a significant advance over the HEMT and CMOS chips in both design and functionality.

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The technical details of the design, characterisation, and operation of the p-ESR chip will be made publicly available as a pre-print scientific article in an open-access repository this week.

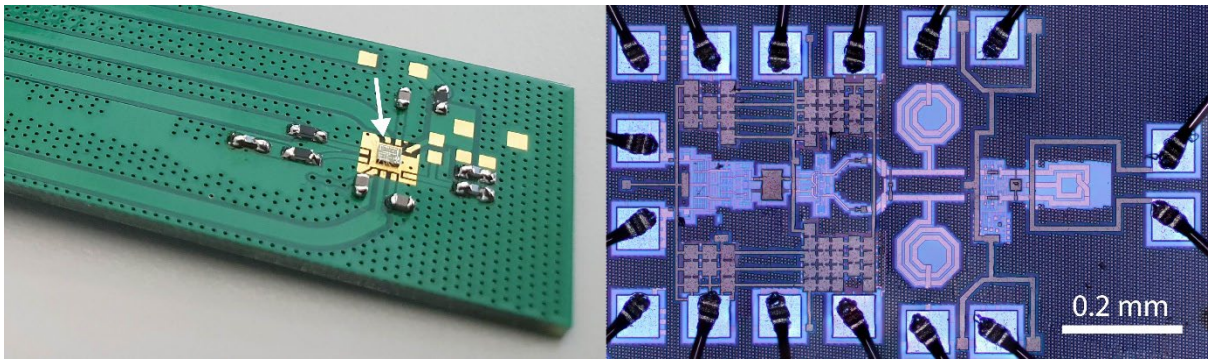

Image 1. *(Left)* The 0.7 mm^2 single chip integrated pulsed electron spin resonance microsystem, indicated by the arrow, which is glued on a printed circuit board and electronically connected by gold wire bonding. *(Right)* Photograph under magnification of the chip area showing some of the integrated micron sized components, including micro coils. The chip stands in contrast to traditional ESR instrument systems that often entail bulky and complex setups that require significant space and resources.

Commenting on the development of the p-ESR chip, Dr Mohammad Choucair, CEO of Archer, said,

"The engineering of a new pulsed ESR chip is a noteworthy achievement by the teams at Archer and EPFL. It is a valuable tool to advance Archer's ^{12}CQ chip project, and it opens a potential pathway toward precision sensing in integrated and portable electronic devices. Built on 130 nm SiGe BiCMOS technology, the p-ESR chip represents Archer's commitment to advanced semiconductor development.

"Archer is continuing to work with EPFL to build significant capability in radiofrequency devices and circuit design, which lay the groundwork to further develop radiofrequency circuits for potential applications in quantum technology.

"The p-ESR microsystem capabilities are an integral part of Archer's technology development and research in quantum materials and related technologies."

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 technology and medical diagnostics. Archer utilises its global partnerships to develop these technologies for potential deployment and use across multiple industries. www.archerx.com.au