

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

23 February 2022

## European patent granted for <sup>12</sup>CQ quantum computing chip

### Highlights

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- Archer expands on its <sup>12</sup>CQ chip technology patent protection in the US, China, South Korea, and Japan, with a European patent grant providing protection in a further 12 countries including the UK, France, and Germany.
  - The granted patents protect a proposed qubit processor chip that offers a path to realise practical quantum computing.
  - The patent grant is a significant step in the Company's efforts to participate in Europe's multi-billion dollar quantum computing ecosystem.
  - Archer is the only ASX listed company and one of a few players in the world developing qubit processor chip technology in the semiconductor industry<sup>†</sup>.
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Archer Materials Limited ("Archer", the "Company", "[ASX: AXE](#)") is pleased to announce the granting of the European Patent associated with Archer's <sup>12</sup>CQ quantum computing chip technology ("<sup>12</sup>CQ chip").

Patents protecting the <sup>12</sup>CQ chip have now been granted in Japan (ASX ann. [20 Jan 2021](#)), South Korea (ASX ann. [10 Aug 2021](#)), China (ASX ann. [11 Aug 2021](#)), the US (ASX ann. [22 Sept 2021](#)), and Europe (Exhibit 1). The patent application process and procedures for the additional patent applications in the jurisdictions of Australia and Hong Kong are ongoing.

The granting of the European Patent<sup>‡</sup> (Patent No. 3383792) represents a significant early-stage milestone in Archer's development of the <sup>12</sup>CQ chip. The countries in which the European Patent is to have effect ("the Jurisdictions") are Belgium, Switzerland & Liechtenstein, Germany, Spain, France, the United Kingdom, Italy, Turkey, the Netherlands, Sweden, and Ireland.

The Company considers the Jurisdictions as critical strategic markets to protect and potentially commercialise its IP. European Patent protection is required for any possible future commercialisation operations in the Jurisdictions, and also provides Archer with access to Europe's largest economies to exploit IP rights related to the <sup>12</sup>CQ chip.

**Commenting on the grant of the European patent, Archer CEO Dr Mohammad Choucair said:** "The Company has achieved a strategic milestone with the granting of a European Patent related to our <sup>12</sup>CQ chip technology.

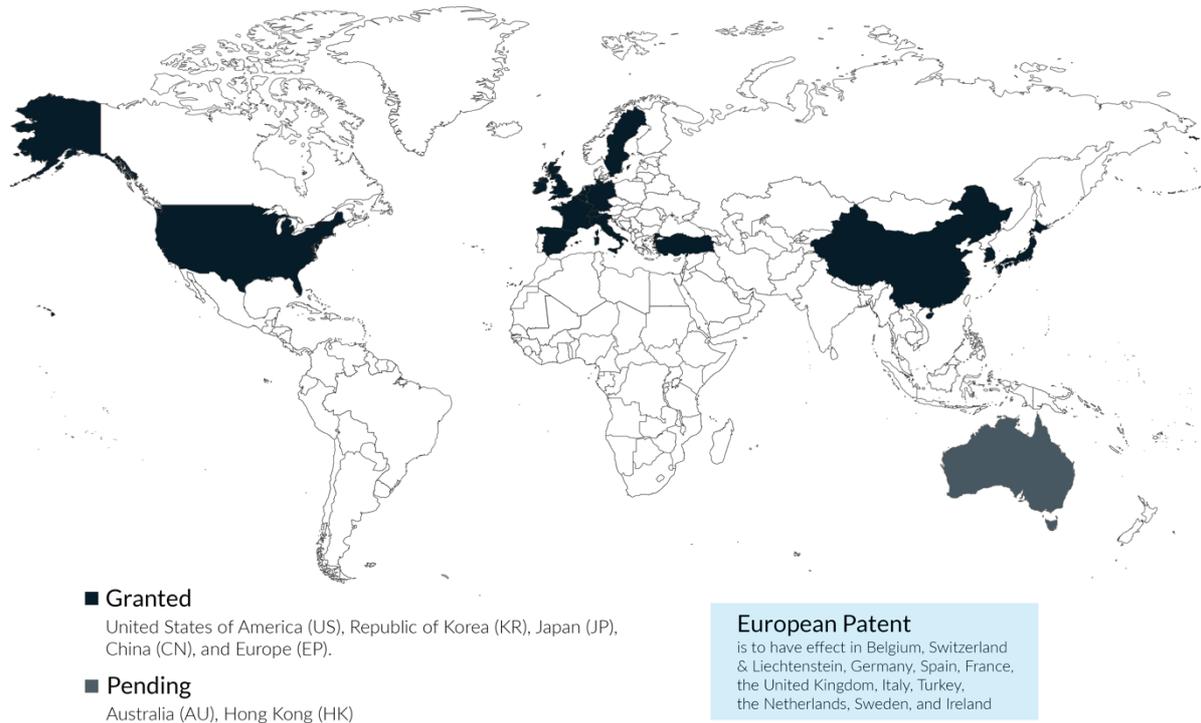
"The patent will cover Europe's largest economies, including the UK, France, and Germany, and significantly expands on Archer's recent patent grants in the US, China, South Korea, and Japan."

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<sup>†</sup> IBM Quantum Network: <https://www.ibm.com/quantum-computing/network/members/>

<sup>‡</sup>The European Patent Office provides a single patent grant procedure. A patent granted by the EPO is not a single or unitary European Union patent or uniformly recognised Europe-wide patent, but one or several national patents.

Exhibit 1. Patent and patent applications related to the <sup>12</sup>CQ chip.



## Europe's quantum ecosystem

Archer works closely with world-leading Swiss technology institute EPFL to develop its <sup>12</sup>CQ chip and as the <sup>12</sup>CQ chip development progresses the Company will need access to overseas laboratories, people, partners, and customers and will look to collaborate with other European companies, institutions, and governments.

European countries lead globally in quantum research and development. Archer will need patent protection in Europe to participate in the quantum ecosystem and semiconductor industry across Europe. A few examples of quantum technology activity in Europe include:

- In the Netherlands, the National Growth Fund funnelled a €615 million investment through [Quantum Delta NL](#) in April 2021, a national hub, to support the further development and commercialisation of quantum technology. The Netherlands quantum and semiconductor ecosystem includes Microsoft, Intel, Google, ASML, and others.
- The German government [announced](#) a €2 billion quantum effort, supplementing EU plans for €1 billion [Quantum Flagship](#) investment through to 2028. Germany also houses IBM's first quantum computer outside of the US.
- Several [EU countries](#) have signed on to develop joint quantum communication infrastructure across the continent and major players in Europe's quantum industry have also expressed [strong support](#) for quantum infrastructure in Europe.
- The UK Government is investing to develop new products based on advances in quantum technologies that will have a significant impact on financial services. This is part of a larger investment in the [UK National Quantum Technologies Programme](#) which is set to deliver a £1 billion investment. The UK also entered into a trilateral security partnership with Australia and the US called '[AUKUS](#)', with a focus that includes quantum technologies.

## Towards practical quantum computation

Archer is the only ASX listed company and one of a few players in the world developing qubit processor chip technology in the semiconductor industry.

The European patent, and those granted in the US, China, South Korea, and Japan, protect a proposed qubit processor device(s) and an approach to quantum information processing using a unique nanomaterial to store a qubit, offering a path to realise practical quantum computing.

Quantum computing technology is a new way of computing that is distinct from current computing technologies (e.g., silicon-based transistor and memory chips including CPUs, GPUs, Flash/DRAM, 'neuromorphic' processors etc.).

A [qubit](#) processor ("Quantum Chip") is the most crucial hardware component of a quantum computer. Quantum Chips come in a variety of forms depending on the qubit type and materials used (in contrast to the modern computing industry dominated by silicon/semiconductors).

Many quantum computing proposals currently use Quantum Chips that require materials and qubits which operate at low temperatures and/or are difficult to integrate in modern electronics, which limits ownership and use of practical quantum devices.

## 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 (e.g. nitrogen-vacancy centre nanodiamonds, isotopically enriched fullerenes, quantum dots, molecular magnets, phosphorous in silicon, fullerenes, nanomagnets, superconductors, etc.).

Some of the advantages of Archer's <sup>12</sup>CQ chip qubit material include the *combination* of the potential use for room temperature quantum computing *and* integration with electronic devices. Archer's technology development advances continue to provide direct evidence to support this exciting possibility (ASX ann. [1 Feb 2021](#)).

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 allow for quantum computing powered mobile devices ('QPMDs'). For more information, please view Archer's [webinar](#) with IBM.

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

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