

Europe's Chip Moment: Terra Quantum revolutionizes AI world with new super transistor

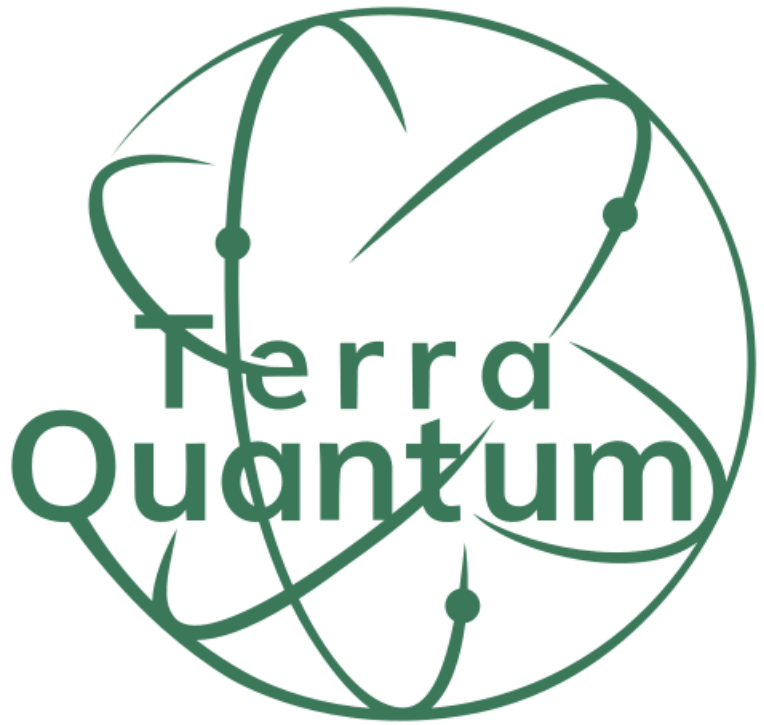
World-first: Terra Quantum builds the first foundry-grade NC-FET with standard CMOS materials.

MUNICH, BAVARIA, GERMANY, July 14, 2025 /EINPresswire.com/ -- This marks the beginning of a technological world revolution. Terra Quantum, a global leader in quantum technology, proudly announces the successful fabrication and validation of the world's first foundry-grade Negative Capacitance Field-Effect Transistor (NC-FET). A chip, such as a GPU, built on the NC-FET technology not only breaks the physical limits of silicon but forces a complete global rethink of AI infrastructure. With this breakthrough, the entire energy roadmap for global AI must be rewritten. Where massive

power plants were once required to fuel AI compute, now just 5% of that energy is enough. Data center strategies, cooling architectures, and national energy budgets must adapt to a radically new efficiency standard. Europe stands at the threshold of global AI leadership.

"The NC-FET marks a defining moment not just for Terra Quantum, but for the future of computing," said Markus Pflitsch, Founder and CEO of Terra Quantum. "In an era where performance scaling had stalled, we've not just reignited that curve, but accelerated it. This transistor opens the door to sovereign, energy-efficient, high-speed compute, and puts us in a position to lead the next wave of semiconductor innovation. Who owns this technology owns AI."

Terra Quantum's NC-FET prototype delivers internal voltage amplification and a switching slope of less than 30 millivolts per decade, breaking the '60 mV wall,' a long-standing barrier in silicon physics. It runs up to 40 times faster than today's chips while consuming nearly 20 times less energy per operation, as little as 0.5 femtojoules. That's faster, cooler, and dramatically more efficient.





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These advances are enabled not by exotic materials or theoretical constructs, but through the integration of ferroelectric materials into the transistor gate, a CMOS-compatible approach that delivers practical, scalable improvements within standard silicon processes. Unlike most academic NC-FETs, Terra Quantum's version is built on foundry-grade silicon using established deposition techniques and known ferroelectric materials. Compared

to state-of-the-art FinFETs, the device achieves five to ten times higher logic throughput.

As global demand for faster, greener, and more secure compute infrastructure accelerates, the market for next-generation transistor technologies is entering a pivotal phase. Terra Quantum's NC-FET opens access to a multi-billion-dollar opportunity in semiconductor IP, while directly supporting Europe's strategic sovereignty goals through a CMOS-compatible, export-friendly technology developed on EU soil.

The NC-FET offers transformative benefits across AI training, mobile edge computing, and secure sovereign infrastructure. Sub-milliwatt operation makes it ideal for mobile and wearable systems, while its speed and efficiency redefine what's possible in high-performance workloads.

"With our transistor, we are pushing the boundaries of silicon at an unprecedented scale," said Dr. Florian Neukart, Chief Product Officer at Terra Quantum. "This transistor delivers internal voltage gain, breaks the 60 mV/dec barrier, and reaches clock speeds once thought physically unreachable. This is not just an evolution, this is a revolution and a complete disruption."

This is not a research concept. Terra Quantum has fabricated and validated a standalone NC-FET stack, combining a CMOS FET with an integrated ferroelectric capacitor. Key achievements include polarization switching at room temperature, remnant polarization of $\sim 32 \mu\text{C}/\text{cm}^2$ across multiple dies, and verified low-leakage and domain stability, essential for manufacturability.

"For years, negative capacitance was a theoretical promise, now it's engineered and measurable," said Dr. Valerii Vinokur, Chief Technology Officer at Terra Quantum. "This is a rare moment in physics and engineering: a fundamental effect translated into functioning silicon. The NC-FET proves that we can control quantum-level materials to reshape classical computing at scale."

As part of the "Innovation through Research and Development" program, the NC-FET project is supported by the European Regional Development Fund (ERDF), administered through the Investitionsbank des Landes Brandenburg (ILB). This funding underscores the EU's commitment to advancing breakthrough technologies and fostering regional innovation.

Terra Quantum's commercialization model includes licensing NC-FET IP, joint development with

leading chipmakers, and selective fabless productization for strategic verticals such as AI and defense. With prototype samples now verified and structures fully simulated with standard tools, like Cadence Sentaurus, Terra Quantum is opening select access to NC-FET dies and transistor design IP.

About Terra Quantum

Terra Quantum Group is a leading quantum technology company based in Germany and Switzerland.

It provides “Quantum as a Service (QaaS)” in three core areas, the first one being “Quantum Algorithms as a Service”. Here, customers are provided access to an extensive library of algorithms, such as hybrid quantum optimization and hybrid quantum neural networks, which can be used for solving complex logistics problems or pattern recognition, among other things. Terra Quantum also develops new quantum algorithms for its customers or adapts existing algorithms to their specific needs. Secondly, through “Quantum Computing as a Service”, Terra Quantum offers its customers access to its proprietary high-performance simulated quantum processing units (QPU), the quantum ecosystem’s physical QPUs, while also developing native QPUs. The third division is “Quantum Security as a Service,” through which Terra Quantum offers its unique solutions for secure quantum and post quantum communications worldwide. Visit us on [LinkedIn](#) and our [webpage](#).

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