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RYDBERG ATOMS: A SCALABLE PATH TO QUANTUM COMPUTING

How EuRyQa uses neutral atoms to build programmable, digital quantum processors

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What is a Rydberg atom?

Atoms excited to a **very high energy state** → large radius & strong, controllable interactions.
That **controllability** is why they're promising qubits.

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Why this platform matters?

Neutral-atom arrays have already demonstrated **>200 qubits** with strong interactions and a clear path to scale.
Translation: **evidence that the technology can grow**.

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EuRyQa's approach

Ultracold atoms trapped in optical tweezers arranged into reconfigurable arrays.

Goal: **processors that can reach 1,000+ qubits.**

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How the processor is built

Tweezers are generated by DMD/SLM devices (think: programmable light patterns).

They create the **2D array**—the “register” of qubits.

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How we control qubits

Optical fields steered by AOMs/AODs target specific atoms.

Result: **precise single- and multi-qubit operations**.

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The secret: interactions

Rydberg–Rydberg interactions (blockade spheres) let one excited atom influence its neighbors
→ **the basis for entangling gates.**

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What this unlocks

Programmable, digital quantum computing on a path to larger systems—
aiming at problems beyond today's classical supercomputers.

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Learn more: https://www.euryqa.eu/research/rydberg-atom-approach