**Deterministic State-Carving for scalable quantum technologies**

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The state-carving protocol is a great way to create high-quality entangled states between atoms and light, but it usually only works half the time. This limitation makes it hard to use for many applications. We found a simple way to improve this protocol so that it creates entanglement reliably, almost every time. Instead of using two photons, which led to unavoidable losses, our method uses just one photon that interacts with the atoms twice. This trick boosts the efficiency dramatically. Our improved protocol opens the door to building larger, more complex quantum systems, such as those needed for advanced quantum computing.