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Bose-Einstein condensation of metastable helium-4 quantum entanglement experiments

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ABSTRACT:

I will report on the realisation of Bose-Einstein condensation of metastable helium-4 atoms. To achieve a Bose-Einstein condensate, a sequence of well-controlled manipulation and cooling steps has been designed, developed, implemented and characterised. In an experimental cycle that be as short as 4 seconds, we routinely produce a condensate consisting of typically a few 10^6 atoms at a temperature of $1\mu\text{K}$. We expect our setup to allow for the direct demonstration of momentum entanglement in a scenario equivalent to the Einstein-Podolsky-Rosen Gedankenexperiment. For this purpose a high-resolution, delay-line detector has been installed. This detector allows for a three dimensional reconstruction of the atomic cloud.