

Publication

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Characterizing many-body systems through the quantum correlations between their constituent particles is a major goal of quantum physics. Although entanglement is routinely observed in many systems, we report here the detection of stronger correlations—Bell correlations—between the spins of about 480 atoms in a Bose-Einstein condensate. We derive a Bell correlation witness from a many-particle Bell inequality involving only one- and two-body correlation functions. Our measurement on a spin-squeezed state exceeds the threshold for Bell correlations by 3.8 standard deviations. Our work shows that the strongest possible nonclassical correlations are experimentally accessible in many-body systems and that they can be revealed by collective measurements.

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