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Heavy impurity in a two-component Bose-Einstein condensate near phase separation¹ RYAN KALAS, D. BLUME, Dept. of Physics and Astronomy, Washington State University, EDDY TIMMERMANS, T-4 Theory Division, Los Alamos National Laboratory — We propose the use of a neutral impurity atom to probe the phase separation transition in a two-component Bose-Einstein condensate. Utilizing a Feshbach resonance, a two-component BEC mixture can be brought near phase separation. The long range fluctuations associated with this quantum phase transition can significantly alter the properties of a neutral impurity, i.e., a distinguishable third type of particle, inserted into the two-component mixture. We show, for instance, that near the phase separation the effective mass of the impurity becomes large. We discuss experiments that use the heavy impurity to probe the underlying quantum phase transition physics.

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Doerte Blume
Washington State University

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