

Abstract Submitted  
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**Impurity crystal in a Bose-Einstein condensate** DAVID ROBERTS,  
Los Alamos National Laboratory, SERGIO RICA, Ecole Normale Superieure — We investigate the behavior of impurity fields immersed in a larger condensate field. The conditions for stability and collapse of this system will be presented. We discuss the localization of a single impurity field within a condensate and note the effects of surface energy. We derive the functional form of the attractive interaction between two impurities due to mediation from the condensate in 1, 2, and 3 dimensions. Generalizing the analysis to  $N$  impurity fields, we show that within various parameter regimes a crystal of impurity fields can form spontaneously in the condensate. Finally, we show the system of condensate and crystallized impurity structure to have nonclassical rotational inertia, which is characteristic of superfluidity, i.e. the system can be seen to exhibit supersolid behavior.

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