Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Fragmented Many-Body states of definite angular momentum and stability of attractive 3D Condensates MARIOS C. TSATSOS, ALEXEJ I. STRELTSOV, OFIR E. ALON, LORENZ S. CEDERBAUM, Heidelberg University — We consider a 3D Bose-Einstein Condensate (BEC), with attractive interparticle interactions, embedded in a harmonic, spherically symmetric trap. This system is metastable only if the total number of bosons N and the interaction strength $lambda_0$ do not exceed some critical values. Otherwise the system collapses. Gross-Pitaevskii (GP) theory predicts the maximum (critical) number of bosons N_{cr}^{GP} that, for a given λ_0, can be loaded to the system, without its collapse. But, what happens to the excited states? To investigate the structure and stability of these states we must go beyond GP theory; these states have definite values of angular momentum (AM) L, are highly fragmented and can support number of bosons much greater than N_{cr}^{GP}. Secondly, we investigate the impact of external rotation of the trap to the AM and stability of the gas. We find that, for all allowed values of rotation frequency no significant stabilization occurs. The symmetry of the ground state does not change and no AM is transferred to the gas. This behaviour is attributed to the attractive nature of the interparticle interaction.

Marios Tsatsos
Heidelberg University

Date submitted: 29 Nov 2011 Electronic form version 1.4