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A Gamma convergence result for the Gross Pitaevskii energy in $\mathbb{R}^3$

The Gross Pitaevskii energy is a functional often used to model Bose Einstein condensates trapped in a potential. We consider this energy in all of $\mathbb{R}^3$, under a mass constraint, and find its gamma limit as a certain parameter in the energy goes to infinity. Among other things this requires a (to the best of my knowledge) new regularity result for elliptic equations in a bounded, smooth domain that loose ellipticity on the boundary.