凝縮系物理学ゼミナール

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場所：理学部5号館　413号室

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「Weakly interacting Bose gas in a random environment」

The zero temperature properties of a dilute weakly interacting Bose gas in a random potential are studied. We calculate geometrical and energetic characteristics of the localized state of a gas confined in a large box or in a harmonic trap. Different regimes of the localized state are found, depending on the ratio of two characteristic length scales of the disorder, the Larkin length and the disorder correlation length. For low densities repulsing bosons are trapped in deep potential wells of extension much smaller than the distance between them. Tunneling between these wells is exponentially small. For larger densities the gas transits from the localized to a coherent superfluid state. The critical density is calculated in terms of the disorder parameters and the interaction strength. For atoms in traps four different regimes are found, only one of it is superfluid. The theory is extended to lower (1 and 2) dimensions. Its quantitative predictions can be checked in experiments with ultracold atomic gases and dirty superconductors.