

Hot topics in cold gases^{*}

A mathematical physics perspective

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Received: 30 May 2013 / Accepted: 12 June 2013

Published online: 24 September 2013

Communicated by: Yasuyuki Kawahigashi

Abstract. We present an overview of mathematical results on the low temperature properties of dilute quantum gases, which have been obtained in the past few years. The presentation includes a discussion of Bose–Einstein condensation, the excitation spectrum for trapped gases and its relation to superfluidity, as well as the appearance of quantized vortices in rotating systems. All these properties are intensely being studied in current experiments on cold atomic gases. We will give a description of the mathematics involved in understanding these phenomena, starting from the underlying many-body Schrödinger equation.

Keywords and phrases: quantum statistical mechanics, Bose–Einstein condensation, dilute Bose gas, superfluidity, excitation spectrum

Mathematics Subject Classification (2010): 82B10, 82-02, 46N50

^{*} This article is based on the 11th Takagi Lectures that the author delivered at the University of Tokyo on November 17 and 18, 2012.

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