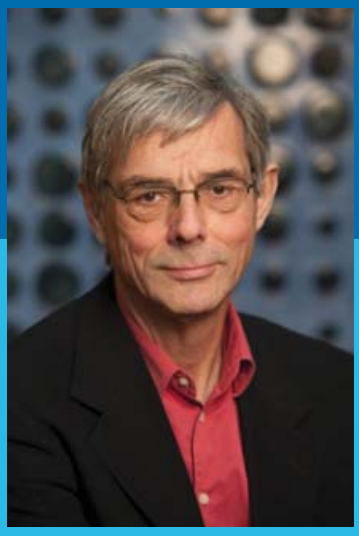
Centre for Quantum Technologies

NUS National University of Singapore

Guest lecture series by Jook Walraven



AY13/14, Sem 2, PC5239 Special Problems in Physics: Quantum Gases – Statistics and Interactions

Prof. Jook Walraven, Emeritus Prof. at the University of Amsterdam, spent a career pioneering quantum gases in experiment and theory. He is also known for his frequent appearances as a highly regarded teacher at various summer schools in this field. During his visit to CQT Prof. Walraven will teach a creditable, one-off lecture module. This course introduces basic concepts of the physics of ultra-cold quantum gases - low-density gases of neutral atoms studied at (sub)microkelvin temperatures. Quantum gases are important both from the fundamental point of view and for their potential application in quantum information processing. The course is focused on quantum collisions and quantum statistics as these phenomena provide the underpinning for the very existence of the field. A systematic introduction is given into the quantum mechanics of low-energy collisions and the consequences of the quantum statistical nature of the collision partners for the behavior of the gas. The students will learn to distinguish between varieties of collisional phenomena and understand their consequences both from the kinetic and the thermodynamic point of view. The course is optimized for experimentalists with a theoretical interest. Background in quantum mechanics and statistical mechanics is desired.

Keywords: classical versus quantum gas, evaporative cooling, short-range potentials (range, scattering length, effective range), s-wave scattering regime, s-wave resonances, shape resonances, Feshbach resonances, differential and total cross section, Ramsauer-Townsend minima, scattering of identical particles, interaction energy, chemical potential and mean field.

AY13/14, Sem 2, Tuesday and Thursday 10 am - 12 noon, S15-03-15, Docents: Visiting Prof. Jook Walraven (University of Amsterdam), Kai Dieckmann , credit: 4, inquries: A/P Kai Dieckmann (CQT), http://qmatter.quantumlah.org/