



Morgan Mitchell (ICFO)

October 13, 2025 to October 17, 2025

Instituto de Fisica, UNAM (Mexico)

Lecture B2

"Quantum Optics with Light and Atoms: Quantum states with macroscopic numbers of particles"

Abstract:

I will introduce the so-called "continuous-variable" description of quantum optics, starting with real optical fields, and then extending the picture to the states of material systems like atoms. The more formal discussion will be illustrated with applications in quantum sensing of gravitational waves, of magnetic fields, and of gravity.

Lecture B4

"Does quantum mechanics place a limit on detection of fields? Perspectives from atomic quantum optics"

Abstract:

Since about 1977, when Claudia Tesche and John Clarke (Nobel prize 2025) analyzed the sensitivity of dc SQUIDs (superconducting magnetic field detectors) and found it was limited to (in appropriate units) \hbar , the Planck constant, there has been a question about whether there was a quantum limit to field sensing in general. Atomic quantum optics, in particular an ICFO-UNAM collaboration, has made important steps in resolving this question. I will try to explain the nature of the problem using concepts from continuous-variable quantum optics and also present the experiment that for the first time showed a sensitivity beyond \hbar .

Bio:

Prof. Dr. Morgan Mitchell ICREA Professor at ICFO - The Institute of Photonic Sciences. He obtained his PhD in Physics from the University of California at Berkeley in 1999, and has led the Atomic Quantum Optics research group at ICFO since 2004. His research interests include atomic sensors for biomedical and chemical physics research, tabletop searches for physics beyond the Standard Model, quantum random number generation, and experimental studies of quantum nonlocality. He teaches quantum optics and quantum sensing in Barcelona.