



**University
of Victoria**

Centre for
Advanced
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CAMTEC SEMINAR

TITLE: *An Interface Between Optical and Atomic Quantum States*

SPEAKER: **Andrew MacRae**, *Senior Lab Instructor*
University of Victoria

DATE: November 9, 2020

TIME: 11:30 am – 12:30 pm

LOCATION: via zoom (*see below*)

Abstract:

Hybrid quantum systems lay at the heart of much of today's emerging quantum technology. Quantum communication devices rely on optical "flying qubits" encoded in the quantum state of photons, whereas successful implementations of quantum computers have relied on microwave frequency, "transmon qubits" operating at tens of mK. This has led to an interest in understanding quantum interfaces between disparate physical systems: how may quantum information be mapped from one system to another?

In this talk I will discuss recent work and future plans to explore such an interface: the quantum state of the optical field and that of collective spin excitations in an atomic ensemble. I will describe experiments in which a non-linear optical process in Rubidium has been used to generate non-classical states of light such as squeezed light, single photons, and optical qubits. By employing a method known as optical homodyne tomography, the quantum wave function of these states has been measured. I will also describe experiments in which collective excitations in a Bose Einstein Condensate formed quasi-particles that were directly imaged and measured.

Finally, I will describe a recent effort at UVic, undertaken mostly by our physics undergrads, that has started a new push in this direction. I will outline how in the next few years, we aim to extend previous results, in order to fully engineer the optical, and collective atomic Hilbert spaces.

Please contact Peggy White for further information (camtec@uvic.ca).

Topic: CAMTEC Seminar

Time: Nov 9, 2020 11:30 AM Vancouver

Join Zoom Meeting

<https://uvic.zoom.us/j/83643665882?pwd=ZWlY3RycmpjN1BlWEFsZEkrN1pwQT09>

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