

# TRIUMF x ICAP Session: Introduction

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on behalf of TRIUMF's  
AMO/Precision-Platform Task Force



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## TRIUMF: Canada's Particle Accelerator Centre

Our multidisciplinary community uses our world-class accelerator infrastructure to drive leading-edge research that delivers impact in **science, medicine, and industry**

## Member Universities

University of Alberta  
University of British Columbia  
Carleton University  
University of Calgary  
University of Guelph  
University of Manitoba  
McMaster University

Université de Montréal  
Queen's University  
University of Regina  
Simon Fraser University  
University of Toronto  
University of Victoria  
York University



# Centre for AMO, Precision & Quantum Measurements\* [\*name TBD]

- We propose creation of a new Centre for Precision and Quantum Measurements at TRIUMF
  - One of the new initiatives in the TRIUMF Five Year Plan 2025 – 2030
  - A focal point for atomic, molecular, quantum sensing activities at TRIUMF
  - Primary interest in fundamental physics, but will also explore societal applications
  - Serves the TRIUMF community and beyond
- Context
  - Worldwide interest in applications of AMO/Quantum techniques for fundamental physics, e.g. at FNAL, CERN
  - Lack of fundamental physics perspective in the current Canadian Quantum Strategy discussions

## Why AMO, Precision, Quantum at TRIUMF?

- Unique infrastructure as a national lab
  - Accelerators & beams, particle detectors, vacuum, cryogenics, electronics, data acquisition, magnets, project management etc
  - Enables AMO/quantum experiments of scale that are beyond single university
  - Longstanding expertise on precision measurements on exotic species (mesons, radioactive nuclei etc)
- Already, ~ \$100M funded or proposed direct investments in this area
  - E.g. **Francium Atomic Parity Violation\***, **Radioactive Molecules\***, **ALPHA/HAICU\***, Ultracold Neutron EDM, TRINAT, TITAN, Laser Ion Sources/Polarizer, etc. — Mix of projects of all scales [**\*today's talk**]

## Excerpts from TRIUMF 20 Year Vision

*“Next-generation breakthroughs in fundamental physics will require new theoretical ideas and the application of novel technologies such as new materials for future detectors or precision quantum sensing with atoms and molecules.”*

*“We will expand our cross-disciplinary expertise in precision measurements with quantum objects (e.g., radioactive ions, atoms, molecules, neutrons, muons, antimatter) to drive the development of new quantum measurement techniques for discovery in fundamental physics and applied research.”*

## Talks at TRIUMF x ICAP session

- Will highlight TRIUMF's existing and proposed involvements in Precision/AMO/Quantum measurements
  - General Gwinner (Manitoba): Atomic Parity Violation in Francium Atoms
  - Ronald Garcia Ruiz (MIT): Radioactive Molecules
  - Taka Momose (UBC): Antihydrogen & Hydrogen Fountains with ALPHA/HAICU
- We welcome input from the Canadian and International AMO community on our new initiative!