

# *Emerging Precision Technologies for Subatomic Physics*

## Quantum Sensors, AMO and Superconductors

## A contribution to the Long Range Plan 2027-2034

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- This is a vision for exploiting emerging technologies in SAP
- We are seeking endorsement from the SAP community
- Collectively making a case for growing the SAP envelope
- This is not a (single) project
- This is not a research proposal

It emphasizes the strong potential impact of **quantum sensors, AMO techniques and superconducting devices** in probing phenomena beyond the Standard Model.

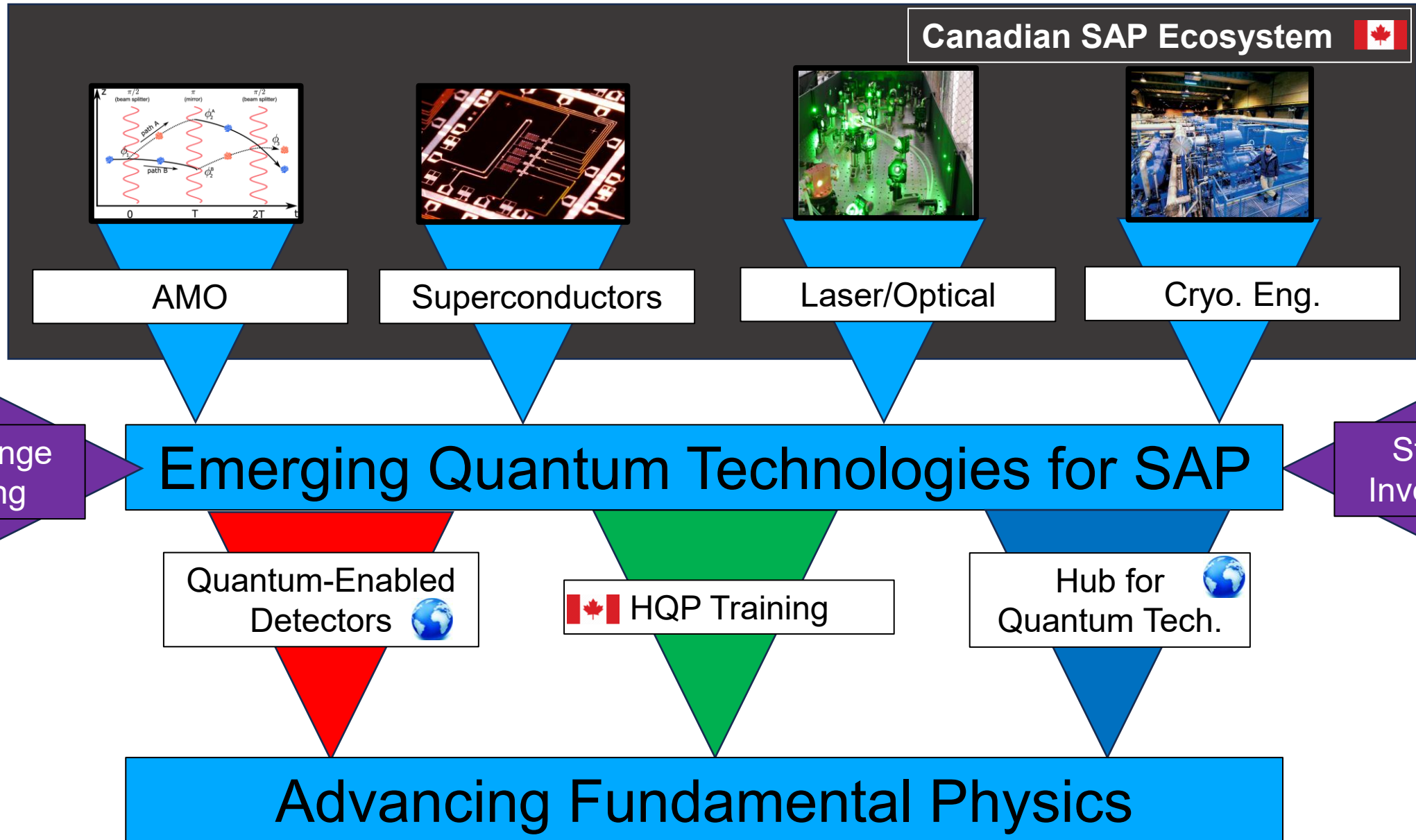
- **Also submitted to IPP call**
- **15+ signatories, 8+ institutions**

# Selected Contributions from LRPC Briefs

- TUCAN → Ramsey method to measure nEDM
- EDM<sup>3</sup> → Many-body system to measure eEDM
- RadMol → Radioactive molecules to measure nuclear-EDM
- ALPHA → Antihydrogen spectroscopy
- *ab-initio* nuclear theory → Development quantum algorithms
- BeEST → Microcalorimetry for exotic particle search
- HTS magnets → High-Temp superconductivity to enable new science
- ...

**The appetite for *emerging quantum technologies* is supported by a strong community**

# Outline of the Vision



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The new CINF report may contain a dedicated section *New opportunities with Emerging Quantum Technologies*

Thank you  
Merci

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## Quantum sensing

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Quantum sensing is typically used to describe one of the following:

- (I) Use of a quantum object to measure a physical quantity (classical or quantum). The quantum object is characterized by quantized energy levels. Specific examples include electronic, magnetic or vibrational states of superconducting or spin qubits, neutral atoms, or trapped ions.
- (II) Use of quantum coherence (i.e., wavelike spatial or temporal superposition states) to measure a physical quantity.
- (III) Use of quantum entanglement to improve the sensitivity or precision of a measurement, beyond what is possible classically.