

# Summary of the Evaluations of ISED Funding to the Perimeter Institute and the Institute for Quantum Computing

Audit and Evaluation Branch  
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## Program Context

### Perimeter Institute

### Institute for Quantum Computing

*The PI and the IQC are components of the ‘Quantum Valley’, a vision aimed at fostering an extensive scientific and technology ecosystem in Waterloo, Ontario. This vision brings together world-class researchers, state-of-the-art facilities and infrastructure, and industry to support quantum research in the region.*

In 2000, the Perimeter Institute (PI) for Theoretical Physics was officially launched as an independent, not-for-profit organization in Waterloo, Ontario by creator of BlackBerry, Mike Lazaridis. The PI aims to conduct research, attract top-tier researchers, train the next generation of researchers, and build literacy and interest in theoretical physics in Canada. Innovation, Science and Economic Development Canada (ISED) has been providing funding to support the PI since 2002. The Science Research Sector (SRS) at ISED is responsible for managing the funding agreement with the PI.

The PI focuses on nine research areas:

- Cosmology
- Mathematical Physics
- Particle Physics
- Quantum Fields and Strings
- Quantum Foundations
- Quantum Gravity
- Quantum Information
- Quantum Matter
- Strong Gravity



In close proximity to the PI, Mike Lazaridis established the Institute for Quantum Computing (IQC) in 2002 within the University of Waterloo. The IQC conducts research in quantum information science and technology, recruits leading researchers, provides students with opportunities to apply their knowledge, and promotes the applications of quantum research to Canadians. The IQC has been supported by ISED funding since 2009. The funding agreement with the IQC is managed by ISED’s SRS.

The IQC has four multidisciplinary research areas:

- Quantum Communication
- Quantum Computing
- Quantum Materials
- Quantum Sensing

Research in the ‘Quantum Valley’ is concentrated on building knowledge in quantum theory; conducting experiments in quantum information science; and developing and commercializing quantum technologies.

## Evaluation Approach, Scope, and Objectives

*A joint evaluation approach was used to improve efficiency in evaluation resources and provide a strategic view of ISED’s support to the research landscape in Waterloo, Ontario.*

The evaluations assessed the PI and the IQC using common outcome areas such as outreach and engagement, capacity building and training, and research advancement and application. Although the evaluations were conducted jointly, each organization was assessed independently. The evaluations covered the period from 2016-17 to 2019-20 for the PI and from 2014-15 to 2019-20 for the IQC, which builds from the period examined in their previous evaluations. The objectives of these evaluations were to assess the PI and the IQC in accordance with the Treasury Board Secretariat *Policy on Results*. The evaluations examined the relevance, performance, and efficiency of ISED’s funding to the PI and the IQC.

Multiple lines of evidence were used to support the evaluation:

- Case Studies
- Comparative Analysis
- Data Analysis
- Document and Literature Review
- Interviews
- Surveys



# Results at a Glance

## Perimeter Institute

## Institute for Quantum Computing

*There is a continued need to support theoretical physics and quantum research in order to advance technology development and maintain Canada's competitiveness in these fields relative to other countries.*

The PI is unique in its breadth of theoretical physics research areas, role in connecting physics researchers, and distinct research environment. With its focus on theory, it plays a complementary role in quantum research relative to the IQC and their physical proximity facilitates collaboration and partnership.



The IQC plays a leading role in Canada's efforts to develop quantum technologies, conducting multidisciplinary research in quantum information science (QIS) that includes a combination of work in theory and experiments. Its research is unique in the 'Quantum Valley' ecosystem and complements the strengths that have emerged at institutes in other regions of Canada.

*The PI and the IQC have demonstrated results in outreach and engagement; capacity building and training; and research advancement and application.*

The PI continues to deliver effective outreach and engagement programs that target diverse audiences in Canada and internationally. It has also prioritized promoting physics to youth in an effort to grow interest in this field and build a diversified talent pool of next-generation researchers. The PI has been effective in leveraging diverse Canadian and international talent through its ability to cross-appoint researchers in collaboration with partnering institutions and its offering of unique recruitment programs. It continues to build its research capacity and provide world-class training in theoretical physics. The PI has contributed to major scientific breakthroughs in theoretical physics and continues to advance the field. Further, its research in quantum theory is leading to applications in artificial intelligence and supporting start-up companies in quantum computing, with an increasing number of PI researchers applying their knowledge in the private sector.



The outreach and engagement programs at the IQC are effective at raising interest in quantum information science among the Canadian general public, particularly diverse high school and undergraduate students. Further, the IQC's outreach with the business community is primarily focused on pre-commercialization activities. The IQC has been effective at building its capacity to undertake research through its access to state-of-the-art infrastructure and the 'Quantum Valley' ecosystem. It continues to attract diverse talent, support the training of next-generation quantum researchers, and facilitate international collaboration in QIS. Although quantum technology development is in early stages, the IQC has made experimental advances in QIS. Start-up companies, patents and quantum products have also emerged as a result of research at the IQC, particularly in areas such as quantum computing and quantum sensing.

*The public-private partnership is an effective and efficient approach for supporting theoretical physics and quantum research in Canada.*

ISED funding has supported the PI in attracting financial investments from the private sector. Further, ISED funding has provided the PI with flexibility to pursue new research initiatives, thereby making the public-private partnership an effective approach for supporting research in theoretical physics.



ISED funding has supported the IQC in advancing its research objectives and establishing expertise. Further, the public-private partnership is an effective approach for supporting quantum research in Canada.

## Recommendations

*The findings from the evaluations produced two recommendations.*



*ISED SRS should collaborate with the PI to develop metrics for tracking and reporting its impacts on experimental research and private sector applications.*



*ISED SRS should monitor the quantum research landscape in Canada more broadly, including the complementary strengths that are evolving at research institutes across Canada.*