
Photonic detection beyond single photons

Sponsor

National Research Council of Canada (NRC)

For More Information

For more information visit the [challenge website](#) [1].

Description

NRC's Security and Disruptive Technologies (SDT) research centre hosts photonic quantum technology research with focus on solid-state sources, interfaces, and ultrafast quantum optics, with applications in secure quantum communications, quantum sensing, and quantum computation. Photon detection technologies are an essential component in the development of photonic quantum technologies. This has so far been limited to single photon detection with superconducting nanowire detectors, avalanche photodiodes, and single photon cameras. Resolving photon number states is critical to unlock many possibilities in photonic quantum technologies. Photon-number-resolving (PNR) detectors will enable NRC scientists to pursue exciting new approaches to quantum sensing, communication, and processing. From a sensing perspective, researchers will be able to make phase measurements approaching the Heisenberg limit – nature's absolute limit of sensitivity. Researchers will be able to validate the creation and use of exotic number states, and entangled states, which are a necessary resource for quantum networks and processing.

In this challenge, NRC is seeking demonstration of photon-number-resolving detection technology at rates in excess of 200kHz and wavelengths around 800nm and 1550nm. NRC is particularly interested in integrated systems that include automated calibration software and hardware, and automated data collection and analysis software for a user-friendly operation with ability to operate 12 detectors simultaneously. To harness the potential of PNR detection, NRC will require photon-number-resolution capability of at least 5-10 photons per detector. In addition, demonstration of high-rate sources of photons at both 1550nm and 800nm, integrated with the detection system, is required for consideration of phase 2 procurement. True PNR detectors have been demonstrated only in research laboratories using Transition Edge Sensors (TES), with operation rates on the order of 100 kHz. At present, these demonstrations require significant time for manual calibration, preventing scaling up to simultaneous operation of multiple detectors. Moving from research grade detectors to a user-friendly commercial product is a significant scientific and technical challenge.

Eligibility

Solution proposals can only be submitted by a **small business** that meets all of the following criteria:

- for profit
- incorporated in Canada (federally or provincially)
- 499 or fewer full-time equivalent (FTE) employees*
- research and development activities that take place in Canada
- 50% or more of its annual wages, salaries and fees are currently paid to employees and contractors who spend the majority of their time working in Canada*
- 50% or more of its FTE employees have Canada as their ordinary place of work*
- 50% or more of its senior executives (Vice President and above) have Canada as their principal residence*

* Calculations must take into account and include affiliated businesses, such as parent companies and subsidiaries, that are either in or outside of Canada.

Funding Availability

Multiple grants could result from this Challenge.

- Estimated number of Phase 1 grants: Two
- Estimated number of Phase 2 grants: One

Maximum Project Value

The maximum funding available for any Phase 1 Grant resulting from this Challenge is **\$150,000.00 CAD for up to 6 months**.

The maximum funding available for any Phase 2 Grant resulting from this Challenge is **\$1,000,000.00 CAD for up to 24 months**. Only eligible businesses that have completed Phase 1 could be considered for Phase 2.

Project Duration

- Phase 1 projects have a maximum duration of 6 months.
- Phase 2 projects have a maximum duration of 24 months.

Special Notes

Please refer to the [Office of Research COVID 19 web-page](#) [2] for directives related to research activities at the University of Guelph.

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Deadlines

If College-level review is required, your College will communicate its earlier internal deadlines.

Type	Date
External Deadline	Thursday, January 14, 2021 - 2:00pm

How to Apply

Eligible companies are required to submit their application through the [Innovative Solutions Canada Website](#) [1].

For Questions, please contact

Please refer to the tender notice for this challenge on [Buy and Sell](#) [3].

All incoming questions regarding this specific challenge should be addressed to SIC-ISC@pwgsc.gc.ca [4]

You can also consult the [Frequently asked questions](#) [5] about the Innovative Solutions Canada Program.

A [glossary](#) [6] is also available.

Alert Classifications **Category:**

Funding Opportunities and Sponsor News

Disciplines:

Physical Sciences and Engineering

Source

URL: <https://www.uoguelph.ca/research/alerts/content/photonic-detection-beyond-single-photons>

Links

[1] <https://www.ic.gc.ca/eic/site/101.nsf/eng/00123.html>

[2] <https://www.uoguelph.ca/research/article/2019-novel-coronavirus-information>

[3] <https://buyandsell.gc.ca/procurement-data/tender-notice/PW-20-00934538>

[4] <mailto:SIC-ISC@pwgsc.gc.ca>

[5] <https://www.ic.gc.ca/eic/site/101.nsf/eng/00004.html>

[6] <https://www.ic.gc.ca/eic/site/101.nsf/eng/00005.html>