

HORIZON
2020

Indefinite Causal Structures on an Integrated Silicon Platform for Applications in Quantum Computing

Fact Sheet

Project Information

InCaSQuC

Grant agreement ID: 800306

[Project website](#) 

DOI

[10.3030/800306](https://doi.org/10.3030/800306) 

Project closed

EC signature date

9 March 2018

Start date

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End date

6 August 2020

Funded under

EXCELLENT SCIENCE - Marie Skłodowska-Curie Actions

Total cost

€ 185 076,00

EU contribution

€ 185 076,00

Coordinated by

CENTRE NATIONAL DE LA
RECHERCHE SCIENTIFIQUE
CNRS

 France

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Objective

Quantum computation achieves a speed-up by placing quantum bits (qubits) in superpositions of different states. However, it has recently been appreciated that quantum mechanics allows one to superimpose not only states but also operations. Furthermore, coherently controlling the operation order with a quantum system enables task completion with fewer operations than any known quantum algorithm. This striking and new way to manipulate the information has not been technologically exploited yet because it requires coherently controlling and simultaneously manipulating high-dimensional quantum systems and multiple degrees of freedom. However, recent progress on Silicon Photonics allows the generation and manipulation of photonic high-dimensional quantum states in the frequency domain fostering the implementation of new complex quantum architectures. The purpose of this project is to create high-dimensional quantum systems with superposition of operation orders exploiting a multi-color Si photon-pair source. The unique combination of expertise of the experienced researcher and host institution offer all the ingredients to significantly contribute to the transition to a new era in quantum computing where information is processed with indefinite operation order. The project will allow us to scale up superposition of operation orders in order to solve computational problems, and thus to contribute to the transition of the field from fundamental physics to application-oriented research.

Fields of science (EuroSciVoc)

[natural sciences](#) > [physical sciences](#) > [quantum physics](#)

[engineering and technology](#) > [electrical engineering, electronic engineering, information engineering](#) > [electronic engineering](#) > [computer hardware](#) > [quantum computers](#)

[natural sciences](#) > [chemical sciences](#) > [inorganic chemistry](#) > [metalloids](#)



Programme(s)

[H2020-EU.1.3. - EXCELLENT SCIENCE - Marie Skłodowska-Curie Actions](#)

MAIN PROGRAMME

[H2020-EU.1.3.2. - Nurturing excellence by means of cross-border and cross-sector mobility](#)

Topic(s)

[MSCA-IF-2017 - Individual Fellowships](#)

Call for proposal

[H2020-MSCA-IF-2017](#)

[See other projects for this call](#)

Funding Scheme

[MSCA-IF-EF-ST - Standard EF](#)

Coordinator



CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS

Net EU contribution

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Total cost

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Region

Ile-de-France > Ile-de-France > Hauts-de-Seine

Activity type

Research Organisations

Links

[Contact the organisation](#) 

[Website](#) 

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