

Martino Bernard

Presentazione: Sono un ricercatore curioso ed entusiasta. Mi piace il mio lavoro e trovo soddisfazione nell'affrontare problemi sempre nuovi. Attualmente sto sviluppando circuiti fotonici integrati per le tecnologie quantistiche presso la Fondazione Bruno Kessler di Trento. Questa posizione mi permette di mettere a frutto le mie competenze trasversali che ricoprono tutte le fasi della realizzazione di un chip fotonico: simulazione, progettazione, fabbricazione e caratterizzazione ottica ed elettronica, e di collaborare con gruppi di ricerca con background e competenze molto diversi.

● ESPERIENZA LAVORATIVA

15/02/2019 – ATTUALE – Trento, Italia
RICERCATORE R3 – FONDAZIONE BRUNO KESSLER

Principal Investigator per il progetto Quantum at Trento Q@TN Q-PIXPAD Quantum Photonic Circuits with monolithically integrated Silicon Single Photon Detectors. Tra le principali attività vi sono quella di simulare, progettare, fabbricare e caratterizzare circuiti ottici integrati (PIC) per l'ottica quantistica, da realizzarsi in omointegrazione con detector a singolo fotone (SPAD), un tecnologia ben consolidata all'interno di FBK. Coordino inoltre l'attività con gli altri gruppi di ricerca per questo progetto, in particolare MNF e IRIS. Nel 2019 ho vinto un bando Q@TN a quattro mani per uno studente di dottorato che collabora al progetto, e che attualmente co-supervisiono.

01/09/2017 – 31/08/2018 – Brescia, Italia
ASSEGNISTA DI RICERCA – UNIVERSITÀ DEGLI STUDI DI BRESCIA

Ricercatore post-dottorato incaricato di svolgere simulazioni di strutture per la generazione non-lineare di pettini di frequenza in microrisonatori ottici nell'ambito del progetto PRIN NEMO. Assieme all'attività simulativa, ho svolto anche l'attività di fabbricazione dei dispositivi presso la Fondazione Bruno Kessler e la caratterizzazione ottica dei dispositivi presso l'Università degli studi di Trento.

Post-doc researcher in charge of the simulation and design of structures for the non-linear generation of frequency-comb in optical microresonators within project PRIN NEMO. Together with the design activity I fabricated the devices in the facility of FBK and the optical characterization of the devices in the NL labs of the University of Trento

<https://sites.google.com/view/prin-nemo/home>

15/05/2017 – 31/08/2017 – Trento, Italia
RICERCATORE R3 – FONDAZIONE BRUNO KESSLER

Sviluppo di un circuito fotonico integrato per tecnologia ibrida III-V / Silicio per lo sviluppo di un laser eterointegrato nel quadro del progetto SiQuro

16/02/2015 – 30/09/2015 – Trento, Italia
ESERCITATORE UNIVERSITARIO – UNIVERSITÀ DEGLI STUDI DI TRENTO

Esercitatore per il corso di Laboratorio di Fisica I

05/03/2014 – 30/09/2014 – Trento, Italia
ESERCITATORE UNIVERSITARIO – UNIVERSITÀ DEGLI STUDI DI TRENTO

Esercitatore per il corso di Laboratorio di Fisica I

28/03/2013 – 30/09/2013 – Trento, Italia
TUTOR UNIVERSITARIO – UNIVERSITÀ DEGLI STUDI DI TRENTO

Tutor per gli studenti del primo anno della laurea triennale in Fisica

2007 – 2009 – Sen Jan de Fascia, Italia
COMMESSO SPECIALIZZATO – SKI RENT CINCELLI MARCO

Commesso addetto al noleggio e manutenzione dell'attrezzatura da sci e snowboard.

2006 – Mazzin, Italia

● ISTRUZIONE E FORMAZIONE

01/11/2013 – 27/04/2017 – via Calepina, 14, Trento, Italia
DOTTORATO DI RICERCA IN FISICA – Università degli studi di Trento

Campi di studio

- Scienze naturali, matematiche e statistiche : *Fisica*

<https://www.unitn.it/>

20/09/2013 – Via Calepina 14, Trento, Italia
LAUREA MAGISTRALE IN FISICA – Università degli studi di Trento

Campi di studio

- Scienze naturali, matematiche e statistiche : *Fisica*

110/110 L | unitn.it

28/09/2011 – Via Calepina 14, Trento, Italia
LAUREA TRIENNALE IN FISICA – Università degli studi di Trento

Campi di studio

- Scienze naturali, matematiche e statistiche : *Fisica*

107/110 | unitn.it

01/09/2003 – 31/08/2008 – Via Gandhi, 1 , Cavalese, Italia
DIPLOMA DI MATURITÀ – Istituto d'istruzione La Rosa Bianca

Campi di studio

- Liceo Scientifico Tecnologico progetto Brocca

100/100 | <https://www.rosabianca.tn.it/>

● COMPETENZE LINGUISTICHE

Lingua madre: ITALIANO | LADINO

Altre lingue:

	COMPRESIONE		ESPRESSIONE ORALE		SCRITTURA
	Ascolto	Lettura	Produzione orale	Interazione orale	
INGLESE	C2	C2	C2	C1	C2

Livelli: A1 e A2: Livello elementare B1 e B2: Livello intermedio C1 e C2: Livello avanzato

● PUBBLICAZIONI

Unidirectional reflection from an integrated tajji microresonator

Photonics Research
<https://doi.org/10.1364/PRJ.393070> – 2020

On the origin of second harmonic generation in silicon waveguides with silicon nitride cladding

Scientific Reports
<https://doi.org/10.1038/s41598-018-37660-x> – 2019

Silicon Photonics Chip for Inter-modal Four Wave Mixing on a Broad Wavelength Range

Frontiers in Physics
<https://doi.org/10.3389/fphy.2019.00128> - 2019

Field-Induced Nonlinearities in Silicon Waveguides Embedded in Lateral p-n Junctions

Frontiers in Physics
<https://doi.org/10.3389/fphy.2019.00104> - 2019

Quadratic soliton combs in doubly resonant second-harmonic generation

Optics Letters
<https://doi.org/10.1364/OL.43.006033> - 2018

Permanent mitigation of loss in ultrathin silicon-on-insulator high-Q resonators using ultraviolet light

Optica
<https://doi.org/10.1364/OPTICA.5.001271> - 2018

Intermodal four-wave mixing in silicon waveguides

Photonics Research
<https://doi.org/10.1364/PRJ.6.000805> - 2018

Modulational instability of nonlinear polarization mode coupling in microresonators

J. Opt. Soc. Am. B
<https://doi.org/10.1364/JOSAB.35.000835> - 2018

Tuning the strain-induced resonance shift in silicon racetrack resonators by their orientation

Optics Express
<https://doi.org/10.1364/OE.26.004204> - 2018

Oblique beams interference for mode selection in multimode silicon waveguides

Journal of Applied Physics
<https://doi.org/10.1063/1.5003252> - 2017

Complete crossing of Fano resonances in an optical microcavity via nonlinear tuning

Photonics Research
<https://doi.org/10.1364/PRJ.5.000168> - 2017

Homodyne Detection of Free Carrier Induced Electro-Optic Modulation in Strained Silicon Resonators

Journal of Lightwave Technology
<https://doi.org/10.1109/JLT.2016.2628183> - 2016

Microring Resonators and Silicon Photonics

MRS Advances
<https://doi.org/10.1557/adv.2016.393> - 2016

Stimulated degenerate four-wave mixing in Si nanocrystal waveguides

Journal of Optics
<https://doi.org/10.1088/2040-8978/18/7/075801> - 2016

Formation of Mach angle profiles during wet etching of silica and silicon nitride materials

Applied Surface Science

<https://doi.org/10.1016/j.apsusc.2015.10.114> – 2015

Silicon nanocrystals for nonlinear optics and secure communications: Silicon nanocrystals for nonlinear optics and secure communications

physica status solidi (a)

<https://doi.org/10.1002/pssa.201532528> – 2015

High-frequency electro-optic measurement of strained silicon racetrack resonators

Optics Letters

<https://doi.org/10.1364/OL.40.005287> – 2015

Ultra-high-Q thin-silicon nitride strip-loaded ring resonators

Optics Letters

<https://doi.org/10.1364/OL.40.003316> – 2015

Intermode reactive coupling induced by waveguide-resonator interaction

Physical Review A

<https://doi.org/10.1103/PhysRevA.90.053811> – 2014

● CONFERENZE E SEMINARI

01/09/2020

Integrated Photonic Electronic platform for Quantum Technologies – INPEQUT

27/05/2020 – Scienza a ore Sei

Hai detto quantistico? Un salto nel mondo "quantum" e nelle sue tecnologie sempre più ambiziose.

Ospite invitato al podcast scientifico *Scienza a ore sei* per una puntata dedicata alle nuove tecnologie quantistiche ed alla percezione del *quantistico* nella vita quotidiana.

14/05/2020 – Integrated Photonics Platforms: Fundamental Research, Manufacturing and Applications

Electric field-induced second harmonic generation in silicon waveguide by interdigitated contacts

<https://www.spiedigitallibrary.org/conference-proceedings-of-spie/11364/113640L/Electric-field-induced-second-harmonic-generation-in-silicon-waveguide-by/10.1117/12.2555308.short>

11/05/2020 – 17th ACM International Conference on Computing Frontiers, Catania

Analysis of control and sensing interfaces in a photonic integrated chip solution for quantum computing

<https://dl.acm.org/doi/10.1145/3387902.3394034>

10/05/2020 – Conference on Lasers and Electro-Optics (2020), paper FTu4C.5

Mid infrared heralded single photons on a silicon chip

[10.1364/CLEO_QELS.2020.FTu4C.5](https://doi.org/10.1364/CLEO_QELS.2020.FTu4C.5)

09/03/2020 – Smart Photonic and Optoelectronic Integrated Circuits XXII

Intermodal four-wave mixing for heralded single-photon sources in the MIR (Conference Presentation)

<https://www.spiedigitallibrary.org/conference-proceedings-of-spie/11284/112841L/Intermodal-four-wave-mixing-for-heralded-single-photon-sources-in/10.1117/12.2543041.short>

04/03/2019 – Integrated Optics: Devices, Materials, and Technologies XXIII

Second order nonlinearities in silicon waveguides: from the physics to new applications (Conference Presentation)

<https://www.spiedigitallibrary.org/conference-proceedings-of-spie/10921/1092109/Second-order-nonlinearities-in-silicon-waveguides--from-the-physics/10.1117/12.2506030.short>

23/05/2018 – Nonlinear Optics and its Applications 2018

Intermodal four wave mixing in silicon waveguides for on-chip wavelength conversion and generation (Conference Presentation)

<https://www.spiedigitallibrary.org/conference-proceedings-of-spie/10684/1068407/Intermodal-four-wave-mixing-in-silicon-waveguides-for-on-chip/10.1117/12.2306375.short>

13/05/2018 – CLEO: QELS_Fundamental Science

Polarization Effects and Nonlinear Mode Coupling in Kerr Microresonators

https://www.osapublishing.org/abstract.cfm?uri=CLEO_QELS-2018-FTh1E.2

09/2017 – 2017 IEEE 14th International Conference on Group IV Photonics (GFP)

Broad wavelength generation and conversion with multi modal Four Wave Mixing in silicon waveguides

[10.1109/GROUP4.2017.8082195](https://doi.org/10.1109/GROUP4.2017.8082195)

07/2016 – 2016 18th International Conference on Transparent Optical Networks (ICTON)

Time resolved electro-optic measurements in strained silicon racetrack resonators

<http://ieeexplore.ieee.org/document/7550556/>

01/06/2015 – SPIE Microtechnologies, 2015, Barcelona, Spain

Off-diagonal photonic Lamb shift in reactively coupled waveguide-resonator system

[10.1117/12.2178984](https://doi.org/10.1117/12.2178984)

2015 – Department of Physics, University of Trento

Proceedings of the event "Industrial Problem Solving with Physics 2015"

http://events.unitn.it/sites/events.unitn.it/files/download/ipsp2015/IPSP2015_proceedings_e-book_0.pdf

2015 – Frontiers in Optics 2015

Nonlinear Silicon Photonics

<http://www.osapublishing.org/abstract.cfm?URI=FO-2015-FM1D.1>

2014 – Department of Physics, University of Trento

Proceedings of the event "Industrial Problem Solving with Physics 2014"

http://events.unitn.it/sites/events.unitn.it/files/download/ipsp2014/IPSP-2014_proceedings_elettronico_ottimizzato-2_1.pdf

● PROGETTI

15/02/2019 – ATTUALE

Q-PIXPAD

Quantum Photonic Circuits with monolithically integrated Silicon Single Photon Detectors. In this project, where I took the role of principal investigator, I develop a platform in which a Photonic Integrated for quantum state manipulation is omogeneously integrated with Single Photon Avalance Diodes. I simulate, design, fabricate and test the devices, solving challenging technological problems and I coordinate the collaboration with the farious groups involved in the project.

2019 – ATTUALE

BO1

Development of the optical research laboratory of FMPS-CMM group in FBK. Together with [REDACTED] I designed the laboratory in each aspect: from the layout of the room to the choice, order, assembling, testing of the equipment, and safety assesment. I have developed ad-hoc solutions for the particular needs of the optical setup and I am currently working on the automation of the measurement processes together with my PhD student [REDACTED].

25/11/2019 – ATTUALE

PhotonPath collaboration

Industrial collaboration for the development of c-band photonic devices

ATTUALE

LESSO-ASI

I realized the optical simulations design and fabrication of a photonic integrated circuit for a heterogeneous laser featuring silicon oxynitride waveguides on a chip bonded with a YLF crystal provided by the University of Pisa which is a parthner in the collaboration. I also helped in the characterization phase, carried out both in FBK and in the Physics department of the University of Trento and in the development of the integrating PCB board collaborating with the industrial parthner ATOMSENSORS S.R.L. (AtomS).

31/10/2020

InPeQuT - ATTRACT

Integrated Photonic Electronic platform for Quantum Technologies I participated in this project with the design, simulation and fabrication of devices in collaboration with [REDACTED], PI of the project. I characterized the otical respose of the devices, that partially overlap with those of the Q-PIXPAD project, both in the BO1 laboratory of FBK and partially visiting the laboratories of ETH - Zurich, parthner in this collaboration.

10/06/2019 – 24/06/2019

FBK-Junior 2019

I mentored two high-school interns within the FBK-Junior program, developing a project of capacitive measurements on thin films of various materials fabricated in FBK.

01/09/2017 – 31/08/2018

NEMO - PRIN

Nonlinear dynamics of optical frequency combs. In this project I developed silicon nitride ring resonators for interacting second and third order non-linearity frequency comb generation. I developed the material platform obtaining a dispersion engineered ring resonator with Q-factor exeeding 200.000 . During this project I worked under the University of Brescia andI collaborated with the Bruno Kessler Foundation and the University of Trento, exploring all aspects of the device from the theoretical fundations of frequency combs to the actual fabrication and the non-linear optical characterization.

SiQuro

On silicon chip quantum optics for quantum computing and secure communications. I won a PhD grant under project SiQuro, where I worked in four WPs mostly developing the technological platform but also publishing works on novel physics.

