

# Curriculum Vitae

Mario Arnolfo Ciampini

**Date of Birth:** 5th October 1989

**Place of birth:** Brasilia **Languages:** Italian (Mothertongue), English (Proficient), Portuguese (Basic)

## HIGH SCHOOL EDUCATION

**Institution:** LSS "Augusto Righi".

**October 2003- July 2008.**

**Final score** 100/100

**Final dissertation title:** *Artificial Intelligence*

## BACHELOR DEGREE

**Institution:** Sapienza Università di Roma.

**October 2008-November 2011.**

**Degree:** 110/110 cum laude.

**Bachelor Degree Dissertation Title:** *Quantum Cryptography using entangled photons*

**Supervisor:** Prof. Fabio Sciarrino

In this Bachelor Degree Dissertation, the problem of the secure key distribution in criptography is investigated, and quantum algorithms that exploits the properties of correlation and entanglement of the qubits are analyzed in order to compare the advantages of quantum vs classical criptography.

## MASTER DEGREE

**Institution:** Sapienza Università di Roma.

**October 2011-September 2013.**

**Degree:** 110/110 cum laude.

**Master's Degree Thesis Title:** *Multiparameter Quantum Estimation*

**Supervisor:** Prof. Fabio Sciarrino **Co-supervisor:** Prof. Paolo Mataloni

While two-modes/one phase interferometry has been throughly explored in both theoretical and experimetal physics, multi-mode/multi-phase interferometry is still widely unknown. In this Master thesis the simultaneous estimation of two phases in a Mach-Zehnder like multimode interferometer has been investigated, focusing in finding the limits on the precision of the parameters estimation changing the input states in the interferometer and the measurement method. A multi-step adaptive estimation protocol has been implemented in order to simulate an experimental environment.

## PHD ACTIVITY

**Period:** November 2013-Present. **PhD supervisor:** Prof. Paolo Mataloni, Sapienza Università di Roma.

During the first year of the PhD activity in the quantum optics group of Sapienza, Università di Roma, under the supervision of Prof. Fabio Sciarrino, the theoretical aspects of multimode quantum interferometry are being investigated. Under the supervision of Prof. Paolo Mataloni, both an experiment in which we are trying to observe hyperentanglement on a chip and one in which we are trying to create entanglement from noise in a classical environment is underway.

## SKILLS IN QUANTUM OPTICS AND QUANTUM INFORMATION

During the Master's thesis and the current PhD activity, I had the opportunity to get skilled in the following experimental techniques within the context of experimental quantum optics:

- Detection of single photon states through single photon detectors (Avalanche photo-diodes).
- Detection of macroscopic quantum states of the electromagnetic field through photomultipliers.
- Generation of polarization-entangled photonic states through type-II spontaneous parametric down conversion sources.
- Using source of hyperentangled photons in both path and polarization
- Performing experiments using integrated photonics devices
- Manipulation of photonic fields in the polarization degree of freedom by exploiting experimental schemes based on electro-optical crystals, i.e. Pockels cells.

While investigating the theoretical aspects of my researches I acquired the following skills:

- Analysis of bibliographical resources to understand the background and the state-of-the-art of scientific literature regarding the current work
- Modelling of the theoretical problem in a known mathematical framework
- Using high-end multipurpose mathematical softwares (Wolfram Mathematica, R) to perform analyses and simulations

## COMPUTER SCIENCE RELATED SKILLS

During my studies, I gained proficiency in the following programming languages:

- C/C++ (expert)
- Pascal (scholastic)
- HTML (amateur)
- Perl (scholastic)
- Pspice and MaxPlus II (scholastic)
- Wolfram Mathematica (version 9.0) (expert)
- R (scholastic)

I'm proficient in the use of both Windows and Unix environment and in writing scientific paper with LaTeX.

The basic tools for scientific programming have been studied during the following courses: Laboratory course in Calculus (Laboratorio di Calcolo), Laboratory course in Computational Physics I (Laboratorio di Fisica Computazionale I), Laboratory course in Computational Physics II (Laboratorio di Fisica Computazionale II), General Electronics (Elettronica generale) and Digital Electronics (Elettronica Digitale).

## SCIENTIFIC SCHOOLS AND CONFERENCES

- 26-29 May 2014, Varenna. Scientific School in integrated photonic manipulation - Poster: Hyperentanglement on chip
- 15-20 June 2014, Sevres. Quantum Physics and Computer Science School - Talk: Multiparameter quantum estimation, Poster: Hyperentanglement on chip.

- 15-19 September 2014, Salerno. Italian Quantum Information Science Conference - Poster: Hyperentanglement on chip
- 24 September 2014, Pisa. 100o National Congress of Italian Physics Society - Talk: Multiparamenter quantum estimation.

#### TEACHING AND RELATED EXPERIENCE

- From 2007 onward I tutored dozens of students in both Mathematics and Physics that ranged from high school to the first year of university (Analysis I and Physics I courses in Computer Engineering and Physics I in Biological Science).
- From September 2014 to December 2014 I tutored first-year university students in high-school-level mathematics (OFA courses) who lacked necessary knowledge to access advanced analysis courses. The link for the selection promoted by the department of Mathematical, Physical and Natural Sciences of University "La Sapienza, Università di Roma" can be found at: <http://fac-scienzemfn.unisapienza.cineca.it/sites/fac-smfn/files/Bando%20%20NR%2013%20FA%202013.pdf>