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Curriculum detailed description

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Dear Madam or Sir,

Having always been interested in technical and technological developments provided in the medical field, I obtained a [PhD](#)¹ in nuclear physics in 2011 at the University of Nantes, in the laboratory [Subatech](#)². My PhD work focused on production cross-section measurements of ⁴⁷Sc and ⁶⁷Cu, two β^- isotopes of interest for the vectorized internal therapy. This work was the first physics experiment run on the cyclotron [ARRONAX](#)³ of Saint-Herblain (France). To do this, I designed and attended the realization of the device, determined irradiation and measurement protocols and validated it all by means of Monte Carlo simulations (GEANT₄). These simulations required that I reproduced realistically the device geometry and define the different physical processes covering our range of energy (up to 70 MeV). Subsequently and after realizing all γ -spectrometry measures on a HP-Ge detector, I was able to analyze and extract the evolution of cross-sections on our energy range for forty different reactions.

Following this thesis, I joined the team [ImaBio](#)⁴ of IPHC in Strasbourg (France) to participate in the development of proton tomography, which is of strong interest in the case of a coupled-use with hadron-therapy. I used and improved my knowledge to extract from the GEANT₄ code the electromagnetic hadronic processes on an energy range up to 200 MeV/U. The aim was to develop a stand-alone simulation code making the most of the computational power of GPU architecture. I continued this work with the [LaTIM](#)⁵ team of Brest (France), where I improved my code by implementing the physics of electrons and positrons and allowing the integration of complex geometries (voxelization). *De facto* this code makes it possible to monitor dosimetry in voxelized volumes commonly used in medical application (scan imaging).

After that, I was assigned, always at the LaTIM, to the development of a modeled source of a LINAC used in Brest. This required me to build some accelerator parts by using a 3D modeling software (Blender) and to implement them on GEANT₄ simulations. During my last year at Brest, I mostly worked in collaboration with a research group at the [Clemson University](#)⁶ (USA) to contribute to the developement of a new γ -treatment device, by building the complete GEANT₄ simulation. I joined this group after the end of my contract with the LaTIM as an exchange visitor to pursue and improve my work on this project and build other different tools used to efficiently perform all the tests required to define the best design for this new device.

Since October 2016 I'm part of the MIA (Medical and industrial applications) group at the [LPC](#)⁷ of Caen (France). I work on deployment of DOSION III, a new dose tracking detector for particle accelerators, in physics centers that request it – ARRONAX, CYRCE (Strasbourg) and CPO (Orsay). I have to ensure its implementation and its proper functioning by performing the necessary calibration measurements and interact with researchers from these centers to meet their expectations and develop new techniques around this device. This work requires me to acquire instrumentation and

electronic skills, both for use and development, and to be able to apply them alone.

In the course of these nine years, I have developed an expertise on Monte Carlo simulations, more specifically on GEANT₄, on a wide range of energy (up to 200 MeV/U). I also acquired important experimental skills in nuclear physics, especially on the suitable energy range for medical applications. I learned to use and develop some instrumental tools, and to perform complete analysis on a wide variety of results, both numerical and experimental. This was made possible by showing scientific rigor and high autonomy which enabled me to easily adapt to different laboratories and teams. Also, I am able to supervise researches, as I have done previously with PhD students and I have teaching experience with the supervision of several practical work during my PhD thesis.

Yours faithfully,

Eric Garrido

Links:

- 1: <https://tel.archives-ouvertes.fr/tel-00662649>
- 2: <http://www-subatech.in2p3.fr/fr/recherche/nucleaire-et-sante/prisma/presentation>
- 3: <http://www.cyclotron-nantes.fr/spip.php?rubrique85>
- 4: <http://www.iphc.cnrs.fr/-ImaBio-.html>
- 5: <http://latim.univ-brest.fr/>
- 6: <http://www.clemson.edu/ces/takacs/medical.html>
- 7: <http://www.lpc-caen.in2p3.fr/article371.html>