



MARÇÀ BORONAT AREVALO

PhD Experimental Particle Physics. Accelerators Instrumentation.
Data Analyst Programmer.

WORK EXPERIENCE

CERN Senior Fellowship

Conseil Européen pour la Recherche Nucléaire (CERN)

Sept. 2020 – Aug. 2023 Geneva, Switzerland SY-RF-MKS

- **Operation and Integration manager** of the X-Band high gradient RF test stands for the CLIC project (**Xboxes**).
- **Data analysis** of the RF data produced by the CLIC test stands (Front-end with LabVIEW and back-end with Python): **Deep Neural Network for pattern recognition** of RF pulses (pyTorch), real-time pulse classification and advance breakdown localization methods.
- **Remarks:**
 - Test and data analysis completed in more than 14 state-of-the-art accelerator components, such deflectors, accelerator structures and 3D metal printed loads.
 - Integration and testing of a new concept of superconducting solenoid, which reduces the power consumption of the CPI 50 MW klystron-modulator system by 30 % (more than 18 kW/h).

Postdoctoral Fellowship APOSTD2018

Funded by Government of Valencia – Spain (Generalitat Valenciana)

Instituto de Física Corpuscular - Consejo Superior de Investigaciones Científica (IFIC-CSIC)

Jul. 2018 – Jul. 2020 Valencia, Spain GAP – Group Accelerator Physics

- Design, assembly, and integration of the **LLRF**, monitoring system, interlock system and the laboratory safety protocol.
- Integration and commissioning of the **High-Power RF** system (modulator, klystrons...)
- Dark current dynamics study and the radiation produced on the accelerating structures, **combining CST simulations and Geant4**.
- **Remarks:**
 - Design of the laboratory radiation protection measures, using Geant4 and FLUKA simulations.
 - Design and optimization of radiation detectors prototypes, based on plastic scintillators, which proposal was granted with the **Seal of Excellence MSCA – IF – 2019**.

Predocctoral Fellowship FPI

Funded by Government of Spain (Science and Innovation Ministry)

Instituto de Física Corpuscular - Consejo Superior de Investigaciones Científica (IFIC-CSIC)

Aug. 2011 – Apr. 2017 Valencia, Spain Munich, Germany Future Accelerators Group Belle II Group of the MPI

- Responsible for the design and implementation of the **quality test protocol** for the production of the **pixel modules for the Belle II**
- Major role on the characterization and test during the DEPFET prototyping process, especially on the test beam data analysis
- Definition of a **new observable** to measure **the top-quark mass**, in the continuum, using radiative events, at high energy electron-positron colliders.
- **Remarks:**
 - The **observable** is one of the most precise methods the measure the top-quark mass using radiative events, and the only one capable to observe the running of the mass. **Included, in both, CLIC and ILC physics program.**
 - The quality control test designed was implemented on each one of the pixel sensors installed on the inner tracker of Belle II

CONTACT INFORMATION

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CURRENT POSITION

Position Postdoctoral position
Company IFIC (CSIC-UV) - Instituto de Física Corpuscular
Group AITANA

LANGUAGES

Spanish Native languages
Catalan Native languages
English Proficient user (C1)
French Intermediate user (B1)

PROGRAMING LANGUAGES

Python 5 icons
C/C++ 5 icons
LabVIEW 5 icons
LabVIEW RT 5 icons
LabVIEW FPGA 5 icons
TwinCAT C++ 5 icons
Matlab 5 icons

ACCELERATORS AND INSTRUMENTATION SKILLS

High Power RF:

- Characterization and diagnostics of HP RF components (X-Band, S-Band): Network and Spectral Analyser and PSD (power spectral density).
- Preparation of HP RF components: tuning and input matching.
- Integration and installation on the test benches (incl. monitoring of temperature, pressure, water flow ...)

Klystrons and Modulators:

- Installation and integration of if high power RF sources (SSD, TWT and klystrons).
- Integration and operation of Scandinova and Jema modulators.
- Characterization and optimization of the operational point of X-Band 50 MW CPI klystron, Canon 6 MW, high-efficiency Canon 8 MW klystron...
- Integration and characterization of a superconducting solenoid on a X-Band CPI 50 MW klystron

Ultra-high Vacuum:

- Installation integration and operation of ionic pumps (Nextorr), gauges...
- Definition and application of vacuum procedures to optimize the performance of the vacuum components.

Low Level RF

- Design, construction, and integration of the LLRF stages.
- PLL programming, up-mixing, down-mixing and modulated RF generation.

Radiation and Security

- Radiation protection assessment and definition of the protection measures, simulations with Geant4 and Fluka.
- Design, construction, and integration full interlock system based on PLCs (Beckhoff and Siemens).

PROGRAMING SKILLS

Data analysis

- Python and C++ advance analysis framework development
- Monte-Carlo modelling for beams and particles simulations
- Advanced RF analysis: edge recognition methods (DNN), FTT analysis ...
- Jet reconstruction development

Front-End and Back-End

- Front-End and GUI with QT and LabVIEW
- Advanced database integration with SQL

Machine Learning and DNNs

- Deep Neural Networks development for pattern recognition in RF pulses and pulse type classification

Microcontrollers

- Advanced usage of the working frameworks: Arduino, ESP32, ESP8266, RB Pi, Beaglebone, etc

PLC

- Advanced usage of the Beckhoff and Siemens working frameworks

Radiation-Matter interactions

- Advanced usage of the Geant4 and FLUKA working frameworks

LABVIEW

- Advanced usage of the LABVIEW, LABVIEW real-time and FPGA framework for real-time integrations with PXI and other applications

RF Simulations:

- CST Simulations of RF EM fields and particle tracking

MANAGEMENT EXPERIENCE

- Operation and integration of the X-Band HG-RF test stands for the CLIC project.
- Commissioning of the S-Band HG-RF laboratory at IFIC-CSIC (Valencia)
- Radiation protection and interlock system of the S-Band HG-RF laboratory at IFIC-CSIC (Valencia)
- Design and implementation of the quality test protocol for the production of the pixel modules for the Belle II inner tracker

GRANTS AND AWARDS

Seal of Excellence under the Horizon 2020

Marie Skłodowska-Curie actions

- 2020-MSCA-IF-2019: proposal 886946, DISSMON Discretized Scintillators Strip Monitor for High-Gradient Accelerator Applications)

CERN Senior Fellowship (2020)

- 3-year postdoctoral position at CERN

Postdoctoral Fellowship APOSTD2018 (2018)

- 2-year postdoctoral position at IFIC-CSIC funded by Government of Valencia – Spain

Predocctoral Fellowship FPI (2011)

- 4-year predocctoral position at IFIC-CSIC funded by Government of Spain

DESY summer student fellowship (2010)

SCIENTIFIC RECORDS

International papers and publications	37
Papers < 15 authors	17
Citations	1361
H-index	13
International Workshops attended	21
Oral Contributions	19

EDUCATION

PhD in Physics

University of Valencia

 Jul. 2017  Valencia, Spain

Thesis: Development of the quality test protocol for the DEPFET pixel detectors and top-quark mass measurement at high energy electron-positron colliders

Advisor: Prof. Juan A. Fuster Verdú

MSc in Advanced Physics

University of Valencia

 Nov. 2012  Valencia, Spain

Project: The spatial resolution of DEPFET active pixel detectors

Advisor: Dr. Marcel Vos

MSc in Training for High School, Middle School, Language Teaching and Sports Education

European University of Valencia

 May. 2018  Valencia, Spain

Project: Teaching methodology for physics on high school, based on scientific research strategies

Advisor: María Ángeles Caró Moreno

BSc in Physics (Licenciado en Física – 5-year degree)

University of Valencia

 Sept. 2012  Valencia, Spain

POSTGRADUATE SCHOOLS

CAS Introduction to Accelerator Physics

Conseil Européen pour la Recherche Nucléaire (CERN)

 Oct. 2021  Chavannes de Bogis, Switzerland

High Energy Physics School (TAE)

University of Zaragoza

 Sept. 2013  Benasque, Spain

SUPERVISOR EXPERIENCE

Laboratory studies of the signal propagation delays on radio-frequency resonant cavities

Student: Raúl Ortiz Fernandez

BSc in Physics - University of Valencia

 Jul. 2020  Valencia, Spain

Geant4 Simulation of Scintillator fibers to measure the dark current in high gradient accelerators

Student: Ana Catalan Benavent

MSc in Advanced Physics - University of Valencia

 Sept. 2019  Valencia, Spain

External Internships supervised:

- 2022: Study of power losses on X-Box 3 test stand, Karolina Kliment (CERN)
- 2021: Deep learning for pattern recognition in electrical pulses, Jose Bonet Faus (CERN)
- 2018: Simulation with FLUKA of the Effective dose in the S-Band High-Gradient Radio Frequency Laboratory at IFIC, Edith Franziska Baader (University of Valencia)