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Engineering & Scientific Consulting

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Professional Profile

Dr. Macias is an experimental physicist and Scientist in Exponent's Electrical Engineering and Computer Science practice with 10 years of experience in complex instrumentation systems, sensor and detector readout, troubleshooting, QA/QC methods, and system-level performance validation. His background includes hands-on work with detector instrumentation, electronic systems, controls, data acquisition, high-voltage interfaces, cryogenic systems, and commissioning.

Dr. Macias has worked in major accelerator-facility environments, including the European Organization for Nuclear Research (CERN) and Fermi National Accelerator Laboratory (Fermilab), supporting the development, integration, and operation of large-scale detector systems. His experience spans subsystem installation, test planning, operational readiness, and technical decision-making under schedule, safety, and performance constraints.

Within the Deep Underground Neutrino Experiment, a large international particle physics experiment, Dr. Macias served in technical coordination and subsystem-management roles supporting charge readout plane assembly, integration planning, commissioning readiness, and multi-site production workflows. He helped translate design requirements into reproducible procedures, acceptance criteria, and documentation used by engineers, technicians, scientists, and operations teams.

Dr. Macias has investigated complex system behavior across interacting electronics, controls, mechanical interfaces, and sensor systems. His troubleshooting approach combines structured testing, data analysis, physical inspection, operational context, and corrective-action documentation to identify likely failure mechanisms, evaluate competing explanations, and support reliable system operation.

Prior to joining Exponent, Dr. Macias held research roles at Yale University, the University of Iowa, California Institute of Technology, Indiana University, and CERN, including technical leadership responsibilities within large international detector programs. He earned his Ph.D. in Astrophysics from Indiana University, where his research focused on photon detection instrumentation for liquid argon neutrino detectors, including silicon photomultiplier readout, wavelength-shifting optical components, detector calibration, and full-system integration.

Academic Credentials & Professional Honors

Ph.D., Astrophysics, Indiana University Bloomington, 2022

M.A., Astronomy, Indiana University Bloomington, 2018

B.S., Physics, California State Poly University, Pomona, 2014

Academic Appointments

Visiting Research Scientist, CERN, Geneva, Switzerland, 2021-2025

Visiting Ph.D. Researcher, California Institute of Technology, 2019-2020

Visiting Graduate Researcher, CERN, Geneva, Switzerland, 2018-2019

Associate Instructor, Department of Astronomy, Indiana University, 2015-2018

Teaching Assistant, Department of Physics and Astronomy, California State Polytechnic University, Pomona, 2012-2013

Prior Experience

Associate Research Scientist, Yale University, 2023-2025

Postdoctoral Research Scholar, University of Iowa, 2021-2023

Graduate Research Assistant, Indiana University, 2015-2022

Professional Affiliations

CERN User, European Organization for Nuclear Research, 2018-2026

Fermilab Visitor, Fermi National Accelerator Laboratory, 2016-2025

Publications

Abd Abud A, ... Macias C, et al. [Doping liquid argon with xenon in ProtoDUNE Single-Phase: effects on scintillation light](#). Journal of Instrumentation 2024; 19(8):P08005.

Abd Abud A, ... Macias C, et al. [The DUNE far detector vertical drift technology](#). Technical Design Report. Journal of Instrumentation 2024; 19(8):T08004.

Abi B, ... Macias C, et al. [Design, construction and operation of the ProtoDUNE-SP liquid argon TPC](#). Journal of Instrumentation 2022; 17:P01005.

Abi B, ... Macias C, et al. [First results on ProtoDUNE-SP liquid argon time projection chamber performance from a beam test at the CERN Neutrino Platform](#). Journal of Instrumentation 2020; 15:P12004.

Totani D, ... Macias C, et al. [A measurement of absolute efficiency of the ARAPUCA photon detector in liquid argon](#). Journal of Instrumentation 2020; 15(6):T06003.

Abi B, ... Macias C, et al. [Deep Underground Neutrino Experiment \(DUNE\), Far Detector Technical Design Report, volume III: DUNE Far Detector Technical Coordination](#). Journal of Instrumentation 2020; 15:T08009.

Mufson S, ... Macias C, et al. [Differences in the response of two light guide technologies and two readout technologies after an exchange of liquid argon in the dewar](#). Nuclear Instruments and Methods in Physics Research Section A 2020; 976:164240.

Howard B, ... Macias C, et al. [A novel use of light guides and wavelength shifting plates for the detection of scintillation photons in large liquid argon detectors](#). Nuclear Instruments and Methods in Physics Research Section A 2018; 907:9–21.

Full publications list: <https://inspirehep.net/authors/1614967>

Selected Technical Reports and Documentation

Muraz JF, Macias C, Tufanli S, Duchesneau D. DUNE FD2 CRP Quality Control Plan. DUNE Experiment 2025.

Wilhelmi J, Macias C. DUNE FD2 Bottom CRP Factory. DUNE Experiment 2025.

Muraz JF, Macias C, Tufanli S. DUNE FD2 Top and Bottom CRP Assembly. DUNE Experiment 2024.

Muraz JF, Macias C, Tufanli S. DUNE FD2 CRP Parts Identifier. DUNE Experiment 2024.

Macias C, Tufanli S. DUNE FD2 Bottom CRP and CRP Components Test Procedure. DUNE Experiment 2023.

Macias C, Tufanli S. DUNE FD2 Top and Bottom CRP Anode Panels Assembly & Test Procedure. DUNE Experiment 2023.

Macias C, Muraz JF, Tufanli S, Duchesneau D. DUNE FD2 CRP Lessons Learned. DUNE Experiment 2023.

Presentations

Macias C. On the path to building the largest monolithic liquid argon neutrino detector, DUNE. Invited Seminar, University of Mississippi, 2024, DUNE-doc-25628.

Macias C. Bottom CRP prototype updates and installation in Module0. Invited Presentation, DUNE Conference, 2023.

Macias C. Bottom CRP#4 assembly and tests. Invited Presentation, DUNE Conference, 2023.

Macias C. CRP#2 production summary. Invited Presentation, DUNE Conference, 2022.

Macias C. CRP#1b evolution and status. Invited Presentation, DUNE Conference, Vertical Drift CRP Consortium, 2022.

Macias C. Status of CRP#1b testing: hardware configuration. Invited Presentation, DUNE Conference, TPC Cold Electronics, 2022.

Macias C. On the path to building the largest monolithic liquid argon neutrino detector, DUNE. Invited Seminar, University of Iowa, 2022, DUNE-doc-25532.

Macias C. CRP-1 inspections and modifications for FD2-VD. Invited Presentation, DUNE Conference, 2022.

Macias C. Photon detection system for ProtoDUNE single phase. Invited Talk, Light Detection in Noble Elements, 2019, DUNE-doc-15818.