

Julian B. Muñoz, Ph.D.

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RESEARCH INTERESTS

I am a broadly trained physicist with expertise in cosmology and astrophysics. I have developed new techniques to find—and characterize—the cosmic dark matter and dark energy using the 21-cm hydrogen line, fast radio bursts, and the large-scale structure of our Universe. My research also involves understanding outstanding astrophysical events, such as gravitational waves from black-hole mergers and the formation of the first stars during cosmic dawn.

RESEARCH EXPERIENCE

- 2017 -** **Postdoctoral Fellow**, Department of Physics, Harvard University, Cambridge, MA
Faculty Advisor: Cora Dvorkin, Professor.
- 2013-17** **Ph.D. Student**, Physics & Astronomy Department, Johns Hopkins University, Baltimore, MD.
Faculty Advisor: Marc Kamionkowski, Professor.
- 2013** **Research Assistant**, Complutense University of Madrid, Spain.
Faculty Advisor: Gabriel Álvarez Galindo, Professor.
- 2012** **Research Intern**, Instituto Astrofísico de Canarias, Tenerife, Spain.
Faculty Advisors: Carlos Allende, Professor and Andrés Asensio, Ph.D.

EDUCATION

- 2017** **Ph.D. in Physics**, Johns Hopkins University.
Thesis: “New Cosmological Probes for Old Fundamental Questions”.
Faculty Advisor: Marc Kamionkowski, Professor.
- 2013** **Graduado en Física** (B.A. in Physics), Complutense University of Madrid.

SELECTED PRESENTATIONS

“*Fundamental Physics at Cosmic Dawn*”, Cornell Physics Seminar (2019).
“*Searching for Dark Matter at Cosmic Dawn*”. Fermilab Astrophysics Seminar (2018), IDM at Brown (plenary, 2018), Dark Matter at Santander (invited, 2018), CIPANP18 at Palm Springs (invited, 2018), Aspen Winter Conference (invited, 2019).
“*Has LIGO detected Dark Matter?*” SEAL seminar at Goddard (2016), COSMO at Ann Arbor (2016), INPA seminar at Berkeley (2016), Black Hole Initiative Colloquium (2017).
“*Light Relics and Missing Baryons with Cosmological Data*” IAS Astro Seminar (2018).

TEACHING & ADVISING EXPERIENCE

Teaching Assistant

Responsibilities included grading, supervising group discussions and laboratories, holding office hours, and developing assignments and exams.

- Physics 103. Fall 2013, Johns Hopkins University.
- Physics 104. Spring 2014, Johns Hopkins University.
- Graduate Quantum Mechanics. Fall 2015, Johns Hopkins University.
- Stars and the Universe. Spring 2016, Johns Hopkins University.

Guest lecturer

Cosmology with the hydrogen 21-cm line, Ay98 at Harvard, Fall 2018.

Substitute lectures for Quantum Mechanics and Cosmology at JHU and Harvard, respectively.

Advising Experience

Two graduate students at Harvard since 2018.

Pedagogical Training and Outreach

As a member of the graduate-student outreach group at JHU I participated in several outreach events, including the physics fair at JHU, demonstrations at Coppin State, and lectures at Pikesville High. Recently I have contributed with “Science for the Public”, a local Boston non-profit.

FELLOWSHIPS & AWARDS

Fellowships

Spanish Ministry of Education Research Fellowship 2012 (\$4k).

Summer Fellowship at the Instituto Astrofísico de Canarias 2012 (\$2k).

Academic Recognition

Dan David Prize Scholar 2017 (\$15k).

Travel awards

EJ Rhee travel award 2016 (\$1k).

Pitt PACC travel award 2017 (\$500).

PROFESSIONAL SERVICE

Refereeing

Nature Astronomy, PRL, PRD, ApJ, ApJ Letters, JCAP, MNRAS, Physics of the Dark Universe, and Nature Communications.

White Papers

Contributor to the CMB-S4 science book and thirteen Astro2020 decadal papers.

Professional Duties

Organizer of the high-energy physics seminar at Harvard (2018-2019).

Develop and maintain the codes 21cmFAST ([Git](#)) and RelicFast ([Git](#)).