

# Pablo Villanueva Domingo

## Personal data

Present position PhD student at Instituto de Física Corpuscular (IFIC) - Universitat de València (UV).  
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Github <https://github.com/PabloVD>

Research interests Cosmology, Dark Matter, 21 cm cosmology, Reionization, Primordial Black Holes, Large scale structure, CMB, Big Bang Nucleosynthesis, Astroparticles, Neutrinos, Machine Learning, Deep learning.

## Education

- 2016-2020 **PhD in Physics**,  
Instituto de Física Corpuscular (IFIC) - Universitat de València (UV).  
PhD project: *Dark Matter and 21 cm Cosmology*.  
Advisors: Olga Mena Requejo, Sergio Palomares Ruiz..
- 2015-2016 **Master in Advanced Physics**, Speciality in theoretical physics.  
Universitat de València (UV).  
Master thesis: *21 cm Cosmology, Warm Dark Matter and Reionization*.  
Advisor: Olga Mena Requejo.
- 2011-2015 **Bachelor of Physics**,  
Universitat de València (UV).  
Bachelor thesis: *Non-standard cosmology: relativistic species in the early universe*.  
Advisor: Olga Mena Requejo.

## Fellowships & awards

- 2017-2020 PhD fellowship *Ayuda para contrato predoctoral para la formación de doctores (FPI)*, Ref. SEV-2014-0398-16-3 . Instituto de Física Corpuscular (IFIC). Advisors: Olga Mena Requejo, Sergio Palomares Ruiz.
- Dec. 2016 1st prize, in collaboration with Jaime Bautista Navío, in the *XXVII edición del Premio Rotary al Fomento del Trabajo Experimental en Física* awarded by the Rotary Club Valencia-Centro. Advisor: Vicent J. Martínez.  
Title of the work: *Medida del brillo superficial límite con corrientes de marea*.
- 2016-2017 PhD contract *Sabor y origen de la materia (SOM).CPI-16-242. PROMETEU per a grups d'investigació d'Excel·lència de la Conselleria d'Educació, Cultura i Esport. CPI-16-242* . Instituto de Física Corpuscular (IFIC). Advisors: Olga Mena Requejo, Sergio Palomares Ruiz.
- 2016 Research introduction fellowship *Iniciación a la investigación Severo Ochoa*. Instituto de Física Corpuscular (IFIC). Advisor: Olga Mena Requejo.

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## Seminars

- Dec. 6 2019 *Constraining Dark Matter scenarios through 21 cm cosmology.* Université Libre de Bruxelles, Brussels, Belgium.
- Oct. 14 2019 *Constraining Primordial Black Hole scenarios with 21 cm cosmology.* Department of Astrophysical Sciences, Princeton University, USA.
- May 6 2019 *Exploring Dark Matter scenarios through 21 cm Cosmology.* Instituto de Física Corpuscular (IFIC).
- Dec. 7 2018 *Constraints on Dark Matter scenarios through 21 cm Cosmology.* Instituto de Física Corpuscular (IFIC).
- Oct. 25 2018 *Constraining astrophysical and Dark Matter scenarios with EDGES and Reionization data.* University of Nagoya, Japan.
- Oct. 23 2018 *Constraining astrophysical and Dark Matter scenarios with EDGES and Reionization data.* Kavli IPMU, University of Tokyo, Japan.

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## Conferences & workshops

- Jun. 2019 *Invisibles19 Workshop.* Jardí Botànic de la UV, València. **Member of the local organizing committee.**  
• **Talk and poster:** *Local 21 cm signal from Primordial Black Holes.*
- Mar. 2019 *Symposium Data science symposium, bridging fundamental research and industry.* Universidade do Minho, Braga, Portugal.
- Sep. 2018 *IGM 2018: Revealing Cosmology and Reionization history with the Intergalactic Medium.* Kavli IPMU, University of Tokyo, Japan.
- May 2018 *Statistical Challenges in 21st Century Cosmology.* Universitat de València (UV).
- Nov. 2017 *Physics opportunities with a new universe's view: the SKA radio telescope.* Instituto de Física Corpuscular (IFIC).  
• **Talk:** *Warm dark matter and cosmic reionization.*
- Sep. 2017 *Meeting on Fundamental Cosmology.* Centro de Estudios de Física del Cosmos de Aragón (CEFCA).  
• **Talk:** *Warm dark matter and the ionization history of the Universe.*
- Apr. 2017 *IberiCOS 2017.* Universitat de València (UV).
- May 2016 *Planck 2016.* Universitat de València (UV).

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## Courses & schools

- Jun. 2019 *Invisibles19 School.* Laboratorio subterráneo de Canfranc (LSC). **Member of the local organizing committee.**  
• **Poster:** *Local 21 cm signal from Primordial Black Holes.*
- Mar. 2019 *School Data science in (astro)particle physics and cosmology: the bridge to industry.* Universidade do Minho, Braga, Portugal.
- Jan. 2019 *Course Effective Field Theory.* Instituto de Física Corpuscular (IFIC).
- Jun. 2018 *School Cosmological Applications from First Stars, Reionization and 21-cm Observations.* Institut de Ciències del Cosmos Universitat de Barcelona (ICCUB).  
• **Talk and poster:** *EDGES result versus CMB and low-redshift constraints on ionization histories.*
- May 2018 *School 8th IDPASC School.* Instituto de Física Corpuscular (IFIC).

- May 2018 School *Astronomical Data Analysis school ADA IX*. Universitat de València (UV).
- Mar. 2018 Course *Anomalies in Quantum Field theory*. Instituto de Física Corpuscular (IFIC).
- Feb. 2018 Course *Theories of modified gravity*. Universitat de València (UV).
- Jan. 2018 Course *Constrained Hamiltonian systems*. Universitat de València (UV).
- Oct. 2017 School *Hot topics in cosmology*. Institut de Ciències del Cosmos - Universitat de Barcelona (ICCUB).
- Sep.-Dec 2017 Course *Group theory*. Universitat de València (UV).
- May 2017 Course *Computer tools in particle physics*. Instituto de Física Corpuscular (IFIC).
- Apr. 2017 Course *From QFT to holography and back*. Instituto de Física Corpuscular (IFIC).
- Mar. 2017 Course *Overview of Astrophysical Gas Dynamics and Numerical Simulations*. Institut de Ciències del Cosmos - Universitat de Barcelona (ICCUB).
- Mar. 2017 School *The IFT School on Cosmology Tools*. Instituto de Física Teórica (IFT).
- Feb. 2017 Course *Data analysis and machine learning -Python-*. Universitat de València (UV).
- Oct. 2016 Course *Transiciones de Fase y Fenómenos Críticos - Superconductividad*. Universitat de València (UV).
- May 2016 Course *Scientific Python*. Instituto de Física Corpuscular (IFIC).
- Apr. 2016 Course *Black holes in general relativity and beyond*. Universitat de València (UV).
- Feb. 2013 Course *Asymptotic methods*. Universitat de València (UV).

## Research stays

- Nov.- Dec. 2019 3 weeks at Service de Physique Théorique, Université Libre de Bruxelles, Brussels, Belgium.
- Sep.- Oct. 2019 1 month at Department of Astrophysical Sciences, Princeton University, New Jersey, USA.
- Sep.- Nov. 2018 2 months at Kavli IPMU, University of Tokyo, Japan, within the project *RISE InvisiblesPlus(69057–InvisiblesPlus–H2020–MSCA–RISE)*.
- Jun.- Jul. 2018 1 month at Institut de Ciències del Cosmos - Universitat de Barcelona (ICCUB), Barcelona, Spain.
- Apr.- May. 2018 1 month at Institut de Ciències del Cosmos - Universitat de Barcelona (ICCUB), Barcelona, Spain.
- Jun.- Aug. 2017 2 months at Fermi National Accelerator Laboratory (Fermilab), Illinois, USA, within the project *RISE InvisiblesPlus(69057–InvisiblesPlus–H2020–MSCA–RISE)*.

## Additional work experience

- Apr. 2017 Collaboration in the organization of the scientific dissemination event *Feria-Concurso Experimenta*. València.
- May 2016 Collaboration in the organization of the scientific dissemination event *Feria-Concurso Experimenta*. València.
- Apr. - May 2016 Research work: *Baryonic acoustic oscillations and wavelets*. Observatorio Astronómico de la Universitat de València (OAUV). Advisors: Vicent J. Martínez, Pablo Arnalte Mur.
- Feb. - Jun. 2015 Introduction to research work: *Light nuclei in Big Bang Nucleosynthesis*. Instituto de Física Corpuscular (IFIC). Advisor: Olga Mena Requejo.

2013 Teacher of private math and physics lessons.

## Other skills

### Computation

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|-----------------------|---|
| Programming languages | Python (NumPy, SciPy, Matplotlib, Pytorch, Scikit-learn, pandas), Fortran, C, C++, SQL, HTML. |
| General software      | Mathematica, LaTeX, Gnuplot, MATLAB.  |
| Cosmological software | CLASS, CAMB, 21cmFAST, Recfast, CosmoRec, Ares.   |

### Languages

|            |               |
|------------|---------------|
| Spanish    | Mother tongue |
| Catalan    | Mother tongue |
| English    | Fluent        |
| Portuguese | Basics        |

## Publications

- Jun. 2020 Pablo Villanueva-Domingo and Francisco Villaescusa-Navarro.  
*Removing Astrophysics in 21 cm maps with Neural Networks.*  
[arXiv:2006.14305](#) (submitted to *MNRAS*)
- Apr. 2020 Pablo Villanueva-Domingo, Olga Mena and Jordi Miralda-Escudé.  
*Maximum amplitude of the high-redshift 21-cm absorption feature.*  
[Phys. Rev. D101\(8\):083502, 2020.](#)
- Aug. 2019 Olga Mena, Sergio Palomares-Ruiz, Pablo Villanueva-Domingo, and Samuel J. Witte.  
*Constraining the primordial black hole abundance with 21-cm cosmology.*  
[Phys. Rev., D100\(4\):043540, 2019.](#)
- Jan. 2019 Laura Lopez-Honorez, Olga Mena and Pablo Villanueva-Domingo.  
*Dark Matter microphysics and 21 cm observations.*  
[Phys. Rev., D99\(2\):023522, 2019.](#)
- Jun. 2018 Miguel Escudero, Laura Lopez-Honorez, Olga Mena, Sergio Palomares-Ruiz and Pablo Villanueva-Domingo.  
*A fresh look into the interacting dark matter scenario.*  
[JCAP, 1806\(06\):007, 2018.](#)
- May 2018 Samuel Witte, Pablo Villanueva-Domingo, Stefano Gariazzo, Olga Mena and Sergio Palomares-Ruiz.  
*EDGES result versus CMB and low-redshift constraints on ionization histories.*  
[Phys. Rev., D97\(10\):103533, 2018.](#)
- Apr. 2018 Pablo Villanueva-Domingo, Stefano Gariazzo, Nickolay Y. Gnedin and Olga Mena.  
*Was there an early reionization component in our universe?*  
[JCAP, 1804\(04\):024, 2018.](#)
- Jan. 2018 Pablo Villanueva-Domingo, Nickolay Y. Gnedin, and Olga Mena.  
*Warm Dark Matter and Cosmic Reionization.*  
[Astrophys. J., 852\(2\):139, 2018](#)

Nov. 2017 Laura Lopez-Honorez, Olga Mena, Sergio Palomares-Ruiz and Pablo Villanueva-Domingo.  
*Warm dark matter and the ionization history of the Universe.*  
[Phys. Rev., D96\(10\):103539, 2017.](#)

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## References

**Dr. Olga Mena Requejo**

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