

CURRICULUM VITAE

IMPORTANT – The Curriculum Vitae cannot exceed 4 pages. Instructions to fill this document are available in the website.

| Part A. PERSONAL INFORMATION | | CV date | 03/06/2024 |
|--|---------------------|-------------------------|------------|
| First name | Asier | | |
| Family name | Lopez Eiguren | | |
| Gender (*) | Male | Birth date (dd/mm/yyyy) | 20/04/1989 |
| Social Security, Passport, ID number | 45669757-Z | | |
| e-mail | asier.lopez@ehu.eus | URL Web | |
| Open Researcher and Contributor ID (ORCID) (*) | 0000-0002-1696-3579 | | |

(*) Mandatory

A.1. Current position

| | | | |
|-------------------|--|----------------|-----------|
| Position | Assistant Profesor (Profesor Adjunto) | | |
| Initial date | 01/09/2022 | | |
| Institution | University of the Basque Country | | |
| Department/Center | Physics | | |
| Country | Spain | Teleph. number | 946012919 |
| Key words | Cosmology, Topological Defects, Field Theory, Phase Transitions, Helium 3, Quantum Materials | | |

A.2. Previous positions (research activity interruptions, see call)

| Period | Position/Institution/Country/Interruption cause |
|-----------------------|--|
| 01/09/2020-31/08/2022 | Postdoctoral Researcher – Tufts University - USA |
| 01/01/2018-31/08/2020 | Postdoctoral Researcher–University of Helsinki - Finland |
| 07/07/2017-31/12/2017 | Postdoctoral Researcher–University of the Basque Country |
| 01/01/2013-31/05/2017 | Predocctoral Researcher – University of the Basque Country |

A.3. Education

| PhD, Licensed, Graduate | University/Country | Year |
|---|----------------------------------|------|
| PhD in Cosmology | University of the Basque Country | 2017 |
| Masters in Quantum Science and Technology | University of the Basque Country | 2012 |
| Graduate Degree in Physics | University of the Basque Country | 2011 |

Part B. CV SUMMARY

Scientific Contributions

A quick analysis over my publications shows that all of them are based on large field-theoretical simulations, simulations that require high amount of preparation as well as huge computational power. The capacities needed for leading a project in the area are twofold; on one side, a deep understanding of the field theoretical models under consideration is necessary and in the other, a precise control over technicalities of numerical simulations is indispensable. It is worth mentioning that the preparation of numerical simulations and the subsequent analysis take a very long time.

During my research career I have published 12 scientific articles indexed in the Journal Citation Reports (JCR). I have also written two proceedings and a comment, which can be found at inspireHEP. The published articles appeared in Journals indexed in the first quartile



(Q1) in the year of publication. Following inspireHEP I have 277 citations and my h index is 8. All these works have been presented in more than 24 international conferences.

I must be clarified that in cosmology the authors in a paper are ordered alphabetically and a different order suggest that the first author has led the project and performed most of the work. Taking this into account it is indispensable to mention that three out of five articles published during my PhD are as a first author, showing that even in the early stages of my research career I was assuming the leading role.

After my doctoral studies I started leading my own research line “Axion Dark Matter: Physical properties from field simulations”. This project merges the knowledge I acquired on field theoretical simulations and a most viable dark matter candidate, the axion. Understanding the production and properties of this particle is indispensable for state-of-the-art detectors, which can be only done using field theoretical simulations. If the axion particle is detected it would be a major breakthrough in particle physics because it not only will solve the dark matter mystery, the strong CP problem will be also solved.

This type of studies requires a well-stablish and smooth-running collaboration. In order to succeed with the research project, I have created an international collaboration with very well-known researchers from Finland, Spain, UK, USA; each one helping in different aspects of the project.

Even though the project is still running, there are several aspects that show its relevance and the knowledge that is generating and will generate. On one hand, we have the article publish in Physical Review Letters (PRL) which already have 81 citations. On the other hand, we have obtained three research projects to perform large scale field theoretical simulations. In the first one I was the principal investigator, in the next two I could not be because I moved out of the University of Helsinki, however, I had the main role preparing them and conducting the simulations. The resources obtained are equivalent to 500.000 euros.

It is important to mention that I am an active referee for several journals that rank at top positions at JCR, such as PRD, PRL, JHEP and others.

Contributions to Society

The most advance research can sometimes be disconnected from the society, and it is a very important aspect in a research career to maintain a link between them. In my case, I work in this aspect from two different approaches.

On one side, I work on making the most advance research results accessible to the public. For this purpose, I write outreach articles but, in my opinion, a closer contact helps on this job. Therefore, I am more active in outreach events, such as talks, exhibitions or fairs. Moreover, I also teach a general cosmology course for elders.

On the other side, it is very important to motivate young students and show them the possible ways they can take in their future career. Therefore, I am very active in orientation talks and fairs.

Training and Mentoring

As I have mentioned before I am very active in the orientation of young students that can be part of the research world in the future. In the same way, I try to give the best opportunities to young researchers that are starting their careers. That is, I have been mentoring young researchers throughout different stages of their academic and research career. During my postdoc at the University of Helsinki I was the supervisor of a Bachelor Thesis, and I had two students working with me during a summer internship.

Moreover, now as an assistant professor I had three students working on their Bachelor Thesis with me, as well as, a Master student in Helsinki. This year I have a Master student.



I was also selected to be a member of an evaluation committee for a Master Thesis at the University of Porto.

Part C. RELEVANT MERITS

C.1. Publications

- C.1.1. A-B transition in ^3He and Cosmological phase transitions**
QUEST-DMC Collaboration, Accepted in JLTP
- C.1.2. Nambu-Goto dynamics of field theory cosmic string loops**
J. J. Blanco-Pillado, D. Jiménez-Aguilar, J. Lizarraga, A. Lopez-Eiguren, K. D. Olum, A. Urío, y J. Urrestilla
JCAP 05 (2023) 035
- C.1.3. Hubble-induced phase transitions on the lattice with applications to Ricci reheating**
D. Bettoni, A. Lopez-Eiguren y J. Rubio
JCAP 01 (2022) 01, 002
- C.1.4. Approach to scaling in axion string networks**
M. Hindmarsh, J. Lizarraga, A. Lopez-Eiguren, J. Urrestilla
Phys.Rev.D 103 (2021) 10, 103534
- C.1.5. Scaling Density of Axion Strings**
M. Hindmarsh, J. Lizarraga, A. Lopez-Eiguren, J. Urrestilla
Phys.Rev.Lett. 124 (2020) 2, 021301
- C.1.6. Scaling in necklaces of monopoles and semipoles**
M. Hindmarsh, A. Kormu, A. Lopez-Eiguren y D. J. Weir
Phys.Rev.D 98 (2018) 10, 103533
- C.1.7. Cosmic Microwave Background constraints for global strings and global monopoles**
A. Lopez-Eiguren, J. Lizarraga, M. Hindmarsh, J. Urrestilla
JCAP 07 (2017) 026
- C.1.8. Evolution of Semilocal String Networks: II. Velocity estimators**
A. Lopez-Eiguren, J. Urrestilla, A. Achúcarro, A. Avgoustidis, C.J.A.P. Martins
Phys.Rev.D 96 (2017) 2, 023526
- C.1.9. Measuring Global Monopole Velocities, one by one**
A. Lopez-Eiguren, J. Urrestilla, A. Achúcarro
JCAP 01 (2017) 020, JCAP 06 (2017) E01
- C.1.10. Evolution of semilocal string networks: Large-scale properties**
A. Achúcarro, A. Avgoustidis, A.M.M. Leite, A. Lopez-Eiguren, C.J.A.P. Martins, A.S. Nunes, J. Urrestilla
Phys.Rev.D 89 (2014) 6, 063503
- C.1.11. Gravitating cosmic strings with flat directions**
B. Hartmann, A. Lopez-Eiguren, K. Sousa, J. Urrestilla
JHEP 03 (2013) 152

C.2. Congress

- C.2.1. Approach to scaling in axion string networks**
Talk; Sixteenth Marcel Grossmann Meeting MG16; Virtual Meeting
- C.2.2. The scaling density of axion strings**
Talk; 16th Patras Workshop on Axions, WIMPs and WISPs; Virtual Meeting
- C.2.3. Scaling Density of Axion Strings**
Talk; APS April Meeting 202; Virtual Meeting
- C.2.4. The Scaling Density of Axion Strings**
Invited Talk; DiRAC Day 2019; Leicester (UK)
- C.2.5. Evolution of Hybrid Networks**
Talk; Cosmic Topological Defects: Dynamics and Multi-Messenger Signature; Leiden (Netherlands)



- C.2.6. Cosmic Microwave Background Constraints for Global Defects**
Talk; Cosmo-18; Daejeon (South Korea)
- C.2.7. Evolution of semilocal string networks: length and velocities**
Talk; Cosmo-17; Paris (France)
- C.2.8. Chasing monopoles: measuring velocities of global monopoles, one by one**
Talk; Cosmic Strings@Brazil; Sao Carlos (Brazil)
- C.2.9. Chasing Monopoles**
Talk; Cosmo-15; Warsaw (Poland)
- C.2.10. Evolution of Semilocal String Networks**
Talk; Spanish Relativity Meeting ERE 2014; Valencia (Spain)

C.3. Research projects

- C.3.1. Fundamental Physics and Cosmology**
PHY-1820872, National Science Foundation, Alexander Vilenkin,
01/09/2018- 31/08/2021,
\$405.000,00 Researcher
- C.3.2. AXCESS: Axion dark matter from Exascale Simulations:**
462000084, CSC – IT CENTER FOR SCIENCE LTD., Kari Rummukainen,
03/05/2022- 29/09/2023,
1.1 million GPU hours Researcher
- C.3.3. ADMAS: Axion Dark Matter from Axion Strings**
462000010, CSC – IT CENTER FOR SCIENCE LTD., Mark Hindmarsh,
16/11/2021- 31/03/2022,
10 million CPU hours Researcher
- C.3.4. GravAS Gravitational Waves from Axion Strings**
2002879, CSC – IT CENTER FOR SCIENCE LTD, Asier Lopez-Eiguren,
03/04/2020- 05/01/2021, Two Million CPU hours
Principal Investigator
- C.3.5. Particle cosmology and gravitational waves**
Academy of Finland, Kari Rummukainen,
01/01/2020-31/08/2020 Researcher
- C.3.6. Searching for phase transitions in the early Universe**
Academy of Finland, Mark Hindmarsh,
01/01/2018-31/08/2019 Researcher
- C.3.7. Early Universe and fundamental physics (Grupo consolidado)**
IT979-16, Eusko Jaurlaritz/Gobierno Vasco, Jon Urrestilla,
01/01/2016-31/12/2020,
412.426,00 Euros Researcher
- C.3.8. Early Universe Cosmology probes to high energy physics and quantum field theory methods**
FPA2015-64041-C2-1-P, Ministerio de Economía y Competitividad, Jose Juan Blanco-Pillado,
01/01/2016-31/12/2018 Researcher
- C.3.9. Exploring the Physics of Inflation**
CSD2010-00064, Ministerio de Economía y Competitividad, Martínez González/Ruth Lazcoz Saez,
01/01/2010-31/12/2016,
142.222,86 Euros Researcher
- C.3.10. Early Universe Cosmology probes to high energy physics and quantum field theory methods**
FPA2012-34456; Ministerio de Economía y Competitividad, Juan Luis Mañes Palacios (UPV/EHU),
01/01/2013-31/12/2015,
44.694,00 Euros Researcher