MINISTERIO DE CIENCIA, INNOVACIÓN Y UNIVERSIDADES

# CURRICULUM VITAE (maximum 4 pages)

| CV date | 28/11/2019 |
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## Part A. PERSONAL INFORMATION

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|---|---|---|---|
| First and Family name | José Antonio Lay Valera | | |
| Social Security, Passport, ID number | 47508774C | Age | 34 |
| Researcher numbers | Researcher ID | P-1689-2014 | |
| | Orcid code | 0000-0002-8457-1649 | |
| | Scopus Author ID | 35746439700 | |

### A.1. Current position

| | | | |
|---|---|---|---|
| Name of University/Institution | Universidad de Sevilla | | |
| Department | Dep. Física Atómica, Molecular y Nuclear | | |
| Address and Country | Apdo. 1065, 41080 Sevilla (Spain) | | |
| Phone number | +34 954559993 | E-mail | lay@us.es |
| Current position | Prof. Contratado Doctor | From | 14/01/2019 |
| Espec. cód. UNESCO | 220717 - Nuclear reaction and scattering | | |
| Palabras clave | Physics - Theoretical nuclear physics | | |

### A.2. Education

| PhD | University | Year |
|---|---|---|
| PhD in Nuclear Physics | Universidad de Sevilla | 2012 |

### A.3. JCR articles, h Index, thesis supervised…

The following indicators are based on the data from Thompson Reuters' Web of Science

Total Citations: 367 (Last 5 years: 276)
Citations/year: 40,78
Publications in Q1: 14
Publications in T1: 21
Publications in D1: 4
h-index: 12
Number of publications with more than 10 citations: 12

Merits equivalent to a “sexenio” in the period 2014-2019 (as shown in the list of articles included below).

In the last 5 years:

- 8 Final Bachelor projects directed and 1 Master's project.
- 6 Invited oral contributions.
- Referee of Physical Review C, European Journal of Physics A, Journal of Physics G, Journal of Physics Communications, and Chinese Journal of Physics (2016 Outstanding Referee Prize).

## Part B. CV SUMMARY *(max. 3500 characters, including spaces)*

My research is focused on the study of nuclear structure and reactions at low energies. Particularly, it is devoted to the understanding of exotic nuclei, those with a large asymmetry between the number of neutrons and protons. They represent a theoretical and experimental challenge and an opportunity to deepen our knowledge of the nuclear force. In addition, these nuclei are present in astrophysical scenarios playing a particular role in nucleosynthesis.

Being yet an undergraduate, I contacted professors A. M. Moro and J. M. Arias at the Department of Atomic, Molecular, and Nuclear Physics (FAMN) of the U. of Seville. I got funded by the Ministry of Education with a Collaboration Grant for the description of the

continuum of exotic nuclei. The last neutrons in these nuclei are so barely bound that they dissociate easily from the rest of the nucleus, so-called core, in collisions with other nuclei. This breakup is represented in quantum mechanics by a continuum of possible states. Our prescription for the treatment of the continuum has been fruitfully adopted by other authors [PRC88 (2013) 014327].

I finished my degree in Jul. 2008 obtaining the national award to the best marks in Physics among others similar prizes. In Jan. 2009, I started the PhD at the FAMN Department of the U. of Seville under the direction of professors A. M. Moro and J. M. Arias. First, I obtained a PhD grant funded by the U. of Seville (PIF). In Aug. 2009, I received the FPU grant by the Ministry of Education. A fingerprint of my independent thinking is the fact that I decided to change the topic of my thesis, motivated by some interesting findings concerning the role of dynamic core excitations in reactions with weakly-bound nuclei. This study gave rise to a proposal for a new method of constraining spectroscopic factors from the analysis of resonant breakup reactions [PRL109 (2012) 232502]. I defended my thesis in Dec. 2012 cum laude. I received the extraordinary prize of doctorate to the best theses in 2012/13 awarded by the U. of Seville and an accesit in the ATI SISTEMAS prizes to the best theses in Nuclear Physics in 2012 by the Nuclear Physics Group (GEFN) of the Real Sociedad Española de Física.

Then, I moved to Padova to work with Profs. L. Fortunato and A. Vitturi. I obtained a Marie-Curie Piscopia grant with a project entitled: "Exotic Nuclei: Structure and Reactions of Weakly Bound Systems" (WeBS). Here I profit from my knowledge of the treatment of the continuum to apply it to a different but timely problem: pairing in weakly bound nuclei. This project is an attempt to merge few-body and many-body features, towards the general goal of searching for a unified approach in Nuclear Physics.

In January 2017, I come back to the Univ. of Seville with as a Juan de la Cierva - Incorporación fellow, where I am currently Prof. Contratado Doctor.

Along this way, I have extensively interacted with experimentalists. I am an active part of an international collaboration led by Sevilla (USE), Madrid (IEM), and Huelva (UHU) nuclear physics groups [PRL109 (2012) 262701, 110 (2013) 142701]. I was contacted by Dr. J. Lee (HKU) for the analysis of proton-neutron transfer. Regarding transfer reactions, I participate in different proposals and Letters of Intent with MUGAST and at NSCL. Nowadays, I am in contact with F. Cappuzzello (LNS) for the study of double charge exchange reactions and its relation with neutrino masses.

## Part C. RELEVANT MERITS

### C.1. Selected publications (including books) (last five years)

1. **Scientific paper**. A. Spatafora.; et al. (49/5). 2019. *20Ne+76Ge elastic and inelastic scattering at 306* Physical Review C. American Physical Society. 100, pp.034620.
2. **Scientific paper.** Lenske, Horst; et al. (5/4). 2018. *Theory of single-charge exchange heavy-ion reactions* Physical Review C. American Physical Society. 98-4, pp.044620. ISSN 2469-9985.
3. **Scientific paper.** Cappuzzello, F; et al. (71/42) 2018. *The NUMEN project: NUclear Matrix Elements for Neutrinoless double beta decay* EUROPEAN PHYSICAL JOURNAL A. 54-5, pp.72. ISSN 1434-6001.
4. **Scientific paper.** Ayyad, Y.; et al. (26/4). 2017. *Investigating neutron-proton pairing in sd-shell nuclei via (p,3He) and (3He,p) transfer reactions* Phys. Rev. C. American Physical Society. 96-2, pp.021303-1-021303-6.
5. **Scientific paper**. Pesudo, V.; et al. (38/4). 2017. *Scattering of the Halo Nucleus 11Be on 197Au at Energies around the Coulomb Barrier* Phys. Rev. Lett.American Physical Society. 118, pp.152502-152502.
6. **Scientific paper**. Lay, J. A.; et al. (5/1). 2016. *Evidence of strong dynamic core excitation in C-19 resonant break-up* PHYSICAL REVIEW C. AMER PHYSICAL SOC. 94-2, pp.021602(R). ISSN 2469-9985.
7. **Scientific paper**. J. A. Lay; et al. (4/1). 2016. *Continuum discretized BCS approach for weakly bound nuclei* Journal of Physics G. IOP Publishing. 43, pp.085103.

8. **Scientific paper**. Raj Kumar; J. A. Lay; A. Vitturi. (3/2). 2015. *Nuclear fusion as a probe for octupole deformation in 224Ra* Physical Review C. American Physical Society. 92-5, pp.054604.
9. **Scientific paper**. Fernández-García, J. P.; et al. (25/15). 2015. *Simultaneous analysis of the elastic scattering and breakup channel for the reaction 11Li+208Pb at energies near the Coulomb barrier* Physical Review C. American Physical Society. 92, pp.044608-044608.
10. **Scientific paper.** Mazzocco, M.; et al. (30/11). 2015. *Direct and compound-nucleus reaction mechanisms in the 7Be+58Ni system at near-barrier energies* Physical Review C. American Physical Society. 92, pp.024615.
11. **Scientific paper.** R. de Diego; et al. (4/3). 2014. *Continuum-discretized coupled-channels calculations with core excitation* Physical Review C. American Physical Society. 89, pp.064609.
12. **Scientific paper.** J. A. Lay; L. Fortunato; A. Vitturi. (3/1). 2014. *Investigating nuclear pairing correlations via microscopic two-particle transfer reactions: The cases of Sn-112, Mg-32, and Ni-68* Physical Review C. American Physical Society. 89, pp.034618.
13. **Scientific paper.** Raj Kumar; J. A. Lay; A. Vitturi. (3/2). 2014. *Enhanced subbarrier fusion for proton halo nuclei* Physical Review C. American Physical Society. 89, pp.027601.
14. **Scientific paper.** J. A. Lay; et al. (4/1). 2014. *Semi-microscopic folding model for the description of two-body halo nuclei* Physical Review C. American Physical Society. 89, pp.014333.
15. **Scientific paper.** Strano, E.; et al. 2017. *Discrimination Of Processes And Optical Model Analysis In The O-17+Ni-58 Collision Around The Coulomb Barrier* Acta Physica Polonica B. Jagiellonian Univ Press. 48-3, pp.615-618. ISSN 0587-4254.
16. **Scientific paper.** Strano, E.; et al. (33/22). 2016. *O-17+Ni-58 scattering and reaction dynamics around the Coulomb barrier* Physical Review C. Amer Physical Soc. 94-2, pp.024622. ISSN 2469-9985.
17. **Scientific paper.** Ermamatov, M. J.; et al. (16/12). 2016. *Two-neutron transfer analysis of the O-16(O-18, O-16)O-18 reaction* Physical Review C. Amer Physical Soc. 94-2. ISSN 2469-9985.
18. **Scientific paper.** Moro, A. M.; et al. (7/7). 2016. *Recent Developments for the Calculation of Elastic and Non-elastic Breakup of Weakly-bound Nuclei* Acta Physica Polonica B. 47, pp.821-832.
19. **Scientific paper.** V. Pesudo; et al. (38/24). 2014. Reaction Of The Halo Nucleus Be-11 On Heavy Targets At Energies Around The Coulomb Barrier Acta Physica Polonica B. Jagiellonian Univ Press. 45, pp.375-382.

**C.2. Main research projects and grants (last 5 years):**

1. FIS2017-88410-P, Estudios de Procesos de Dispersion Fuerte y Electrodebil con Nucleos a Energias Bajas e Intermedias, Ministerio de Economía y Hacienda. Spanish National Programme. ANTONIO MATÍAS MORO MUÑOZ. (Universidad de Sevilla). 01/01/2018-31/12/2020. 90.000 €. As part of the Researcher Team.
2. European Nuclear Science and Application Research 2 (ENSAR2) - Subtask: Theoretical Support for Nuclear Facilities in Europe (TheoS) Comisión Europea. Antonio M. Moro Muñoz. (Universidad de Sevilla). 01/03/2016-29/02/2020. As part of the Researcher Team.
3. CPDA154713, Interdisciplinary applications of Nuclear Theory: from atoms and molecules to stars Ateneo di Padova. PRAT 2015. Lorenzo Fortunato. (Università di Padova). 01/01/2016-31/12/2017. 67.000 €. As part of the Researcher Team.
4. FIS2014-53448-C2-1-P, Estructura de Núcleos, Moléculas y Hadrones y su Dinámica en Procesos de Dispersión Fuerte y Electrodébil Ministerio de Economía y Hacienda. Spanish National Programme. Antonio Matías Moro Muñoz. (Universidad de Sevilla). 01/01/2015-31/12/2017. 72.600 €. As Collaborator.
5. P11-FQM-7632, La Física Nuclear Fuera del Valle de Beta-Estabilidad: Sus Implicaciones en Astrofísica Junta de Andalucía. Proyectos de Excelencia, Junta de Andalucía. Manuel Luis Lozano Leyva. (Universidad de Sevilla). 26/03/2013-01/09/2017. As part of the Researcher Team.

6. CPDA145301, Investigation of the heavy-ion fusion hindrance with the facility EXOTIC Ateneo di Padova. PRAT 2014. Marco Mazzocco. (Università di Padova). 17/02/2015-16/02/2017. 60.000 €. As part of the Researcher Team.
7. PISCQXGQIZ, Exotic Nuclei: Structure and Reactions of Weakly Bound Systems (WeBS) Università di Padova; Comisión Europea. Marie Curie - Piscopia. José Antonio Lay Valera. (Universidad de Padova). 01/11/2014-31/10/2016. 7.000 €. As Principal investigator.
8. FIS2013-41994-P, Desarrollos en teoría de reacciones y cálculos para la interpretación de experimentos con núcleos exóticos Ministerio de Economía y Hacienda. Spanish National Programme. Antonio Matías Moro Muñoz. (Universidad de Sevilla). 01/01/2014-30/06/2016. 15.000 €. As collaborator.
9. Struttura nucleare e dinamica delle reazioni nell'era dei fasci radioattivi (Ex-Sassenta) Universtiy of Padova. Silvia Lenzi. (University of Padova). 01/01/2014-31/12/2014. As part of the Researcher Team.

**C.5 Participations in Committees (last 5 years):**

1. International Summer School on Nuclear Physics: Basic concepts in Nuclear Physics: theory, experiments and applications. La Rábida (Huelva, Spain) 18$^{th}$-22$^{th}$ June 2018. *(Organizing Committee)*
2. International Workshop: Recent advances and challenges in the description of nuclear reactions at the limit of stability. ECT* (Trento, Italy) 5$^{th}$-9$^{th}$ March. *(Organizing Committee)*

**C.8 Outreach publications (last 5 years):**

1. J. A. Lay Valera, "Agujeros de Gusano: Los túneles espacio-temporales del Universo". Editorial RBA; Col. Desafíos de la Ciencia. (2018) ISBN: 978-84-473-9369-5 *[Book]*
2. J. A. Lay Valera, "Fósiles Cósmiscos: Ruta Arqueólogica por el espacio". Editorial RBA; Col. Un paseo por el cosmos. (2017) ISBN: 978-84-473-9088-5 *[Book]*

**C.9 Other merits, main awards and prizes:**

- Best Talk Award Conference on Neutrino and Nuclear Physics CNNP2017 (Catania, Italy) to the talk *Double charge-exchange reactions and the effect of transfer*. (2017)
- Outstanding Referee Award: Chinese Journal of Physics, Ed.: Elsevier (2016).
- Prize to best theses "Premio extraordinario de doctorado" within the academic course 2012-2013 (2015).
- First accessit ATI Sistemas prizes to theses in Nuclear Physics in 2012 by the "Grupo Especializado Física Nuclear" of the RSEF (2014).
- Best Participant Award in the 6th TALENT Course "Theory for exploring nuclear reaction experiments". Organizing Committee of 2013 TALENT Course at GANIL (Dec. 2013).
- 1$^{st}$ National Award for Excellence in Academic Performance, Degree in Physics, given by the Ministerio de Educación, Política Social y Deporte (2010).