JONATHAN LOZANO MAYO

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EDUCATION

National Autonomous University of Mexico, Mexico City *August 2015 - January 2020*
Bachelor of Science: Physics
Highest honors (GPA: 9.39 out of 10.0)

Four and a half year long bachelor involving general physics courses and including selected topics in advanced physics from which I took two courses in **quantum field theory** and a course in **differential geometry and topology for physicists** among others.

My BSc thesis titled "*Spontaneous symmetry breaking and extended configurations in a scalar theory subject to a potential with two families of vacuum states*" regarded the study of the consequences of spontaneous symmetry breaking in a scalar field theory with two families of vacuum states, a generalization the ϕ^4 theory. Besides, I studied the non-perturbative extended configurations that arise when the fully non-linear field equations of the generalized theory are considered. Furthermore, the possibility of vacuum decay when the two vacua have different energy was studied.

PUBLICATIONS

- **J. L. Mayo** and M. Torres, (2021) J. Phys. Commun. https://doi.org/10.1088/2399-6528/abdd83
- **J. L. Mayo** and M. Torres, (2022). *Static multikink solutions in deformed models.* **(In preparation)**

PROFESSIONAL PRESENTATIONS

J. L. Mayo.*Multi-solitones en teorías escalares de campo con vacíos no-degenerados: el modelo doble de Sine-Gordon* LXVI National Physics Congress. Mexican Physical Society **October 2021**

RESEARCH EXPERIENCE

Static Multikink solutions in deformed models **2021-2022**

Advisor: Dr. Manuel Torres Labansat

We studied the phenomenology of the formation of static structures with n kinks in deformed models. In order to study the validity of our analysis I performed numerical simulations in the programming language Julia. We are planning to extend the consequences of this study to higher dimension topological solitons.

One-loop quantum renormalization of the kink masses, forces between kinks and virial relations **2020-2021**

As a continuation of my BSc thesis research I studied the emergent phenomena in the behavior of the kink and vortex configurations arising from the topology of a generalized ϕ^4 potential. The project is intended to lead to at least three scientific publications in the near future.

Photon wave function **2018-2019**

This project objective was to study the possibility of having a well-defined photon wave function. Moreover, the research aimed to obtain a formalism for the photon wave function and develop the consequences of the theory. As a result I wrote a **manuscript** titled "*A survey on the photon wave function*" which helped me to fulfill the social service requirement of my BSc degree. I worked under the tutelage of Dr.Manuel Torres Labansat at the Physics Institute of the National Autonomous University of Mexico.

Mass spectrometry **2019**

A collision between protons and air particles was produced using a Low-Energy linear collider. The products of the reaction were analyzed using the time of flight mass spectrometry technique under the tutelage of Dr.Juan Lopez Patiño at the Science Faculty of the National Autonomous University of Mexico.
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AWARDS AND DISTINCTIONS

DPG/IAPS-PLANCKS Munich Travel Grant **2022**

- Awarded a travel grant to attend to the PLANCKS competition in Munich

Winner of the PLANCKS 2022 mexican preliminary **2022**

- Placed **1st** in the mexican tournament of physics.

Awarded the 2021 *Juan Manuel Lozano Mejia* Diploma **2022**

- Given by the Institute of Physics of the National Autonomous University of Mexico to the students with the most outstanding achivements during their thesis research.

Top 10 in the international theoretical physics competition PLANCKS Porto **2021**

- Placed **7th** out of 50 participant teams

Winner of the PLANCKS 2021 mexican preliminary **2021**

- Selected as member of the **first mexican team** to attend to the PLANCKS competition after winning the preliminary. `https://www.iaps.info/plancks/what-is-plancks/`

Winner of the national TMF **Nov 2020-Feb 2021**

- Placed **1st** in the mexican tournament of physics for bachelor's and master's students (Torneo Mexicano de Física).

"Honorific mention", Physics Thesis defense (UNAM) **2021**

- Achieved the highest honor after succesfully defending my BSc thesis. *Note: I finished my thesis in January 2020, however, due to the pandemic the university took a whole year to allow me to defend my thesis in March 2021.*

IF-UNAM research assistant **2019**

- Enrollment as research assistant at the Physics Institute of the National Autonomous University of Mexico.

IF-UNAM associate student **2018**

- Enrollment as associate student at the Physics Institute of the National Autonomous University of Mexico.

AMC-Scholarship **2018**

- Mexican Academy of Sciences scholarship to attend to the XXVIII Scientific research summer.

ICF-UNAM Scholarship **2018**

- Physical Sciences Institute of the National Autonomous University of Mexico scholarship to attend to the VII Experimental Physics School.

IF-UNAM Scholarship **2017**

- Physics Institute of the National Autonomous University of Mexico scholarship to attend to the XXV Physics School.

ACADEMIC EXPERIENCE

Teaching assistant

Undergraduate *Nuclear and sub-nuclear physics* teaching assistant at the Science Faculty of the National Autonomous University of Mexico. **2019**

Teaching assistant

Undergraduate *Thermodynamics* teaching assistant at the Science Faculty of the National Autonomous University of Mexico. **2022**

VOLUNTEER WORK

Reviewer

Reviewed an article for the *Journal of physics G: Nuclear and Particle physics.* `https://orcid.org/0000-0002-9638-5173` **2022**

Teacher

Physics and mathematics teacher in an undergraduate preparation course at the Humanities and Sciences School of the National Autonomous University of Mexico. **2017**

RESEARCH INTERESTS

- False vacuum decay
- Extended field configurations (Kinks, Vortex, Domain walls)
- Quantum Field Theory, Effective field theory
- Physics beyond the standard model

ADDITIONAL TRAINING

- **Bad Honnef Physics School - DPG** **2021**
  Methods of Effective Field Theory and Lattice Field Theory
- **VII Mexican School on String Theory and supersymmetry (MSSS)** **2021**
- **Mexican Astro-Particle School (MAPS)** **2021**

TECHNICAL SKILLS

Data analysis and Programing	Julia, Python, Mathematica, QtiPlot, Origin, Tracker
Software	Latex, Ms Office, Inkscape

LANGUAGES

English	***C1***
Spanish	***Native Speaker***
German	***A2***