



AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2016

Turno de acceso general

Nombre: FEIST, JOHANNES
Referencia: RYC-2016-20756
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: johannes.feist@uam.es

Título:

Modification of Molecular Structure Under Strong Coupling to Confined Light Modes

Resumen de la Memoria:

My research explores a broad range of physical phenomena with multidisciplinary character, tied together by the framework of light-matter interactions. It is supported by the development and use of state-of-the-art computational techniques.

My PhD thesis (2009) under the supervision of Prof. J. Burgdörfer (TU Wien) was focused on the observation and control of correlated electron motion in atoms and molecules on its natural timescale. This was motivated by the current major developments and investments in intense and short-pulse light sources, as exemplified by attosecond pulse generation and free-electron lasers. While maintaining my collaborations on these topics during my postdoctoral fellowship at ITAMP (Harvard), I started a new research line in a completely different field: nanophotonics and nanoscale quantum optics. These investigations are driven by the goal to bring (quantum) optics to the nanoscale, i.e., to manipulate and control light and matter on sub-wavelength scales. For example, I collaborated with Prof. M. D. Lukin (Harvard University) on optically trapping and manipulating cold atoms close to nanostructures.

Since 2012, I am working as a senior postdoc in the group of Prof. F. J. García Vidal (Universidad Autónoma de Madrid), funded by his ERC Advanced Grant. In this capacity, I have studied a wide array of new topics within the overarching framework of strong light-matter coupling. This second post-doctoral stay gave me the opportunity to further my experience as a research leader, including the direct supervision of PhD students and attraction of external funding, such as a Marie Curie Career Integration Grant (2014-2017) and a grant from the MINECO (2015-2017) where I am (co-)principal investigator. My recent work has led to the development of an independent research line on the modification of molecular structure under strong coupling to confined light modes, which has been recognized by the award of an ERC Starting Grant that will allow me to start my own research group in 2017.

Resumen del Currículum Vitae:

In 2009, I obtained my PhD with distinction as a student of Prof. J. Burgdörfer at the Vienna University of Technology, and as a member of the International Max Planck Research School on Advanced Photon Science (IMPRS-APS) of the Max-Planck Institute of Quantum Optics, LMU Munich, TU Munich and Vienna UT. After that, I was granted the post-doctoral fellowship of the Institute for Theoretical Atomic, Molecular and Optical Physics (ITAMP) at Harvard-Smithsonian Center for Astrophysics and Harvard Physics Department (2009-2012), after which I joined the group of F. J. García Vidal at the Departamento de Física Teórica de la Materia Condensada, Universidad Autónoma de Madrid (since Oct 2012). In 2006, I did short stays at NIST, the National Institute of Standards and Technology and at the Los Alamos National Laboratory, starting a collaboration with B. I. Schneider and L. A. Collins, through which I gained expertise on large-scale parallel computing techniques. Between 2006-2008, I co-supervised four 3-month student projects and two diploma theses, and I am currently supervising two PhD students, one funded by myself.

International grants: From 2008-2014, I have been a participant and later co-PI on TeraGrid and XSEDE computational projects for a total of 70 million CPU hours (monetary value around ~3.5 million US\$). In 2014, I obtained a Marie Curie Career Integration Grant on Strong Coupling of Organic Molecules and Plasmons (StroCOMP), providing 87,500 for research expenses over 3.5 years. In 2015, I obtained a grant on "Quantum Phenomena in Plasmonics" from the materials science section of the Spanish Ministerio de Economía y Competitividad. In 2016, I obtained an ERC Starting Grant on "Modification of Molecular Structure Under Strong Coupling to Confined Light Modes", providing 1.5 million over a duration of 5 years.

Publications: According to Web of Knowledge/Google Scholar, my h-index is 20/24, with a total number of 1406/2062 citations, with an increasing number of citations each year since the start of my research career. I have published articles in the following high-impact journals: 2 Science, 1 Nature, 1 Nature Nanotechnology, 1 Nature Photonics, 1 Nature Physics, 1 Nature Communications, 1 Physical Review X, 12 Physical Review Letters. I have given invited talks at 17 international conferences, among them the most prestigious international conferences in the various fields I have worked in, and have been invited to visit several universities in order to give seminars about my research.



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Nombre: PAPITTO , ALESSANDRO
Referencia: RYC-2016-20613
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: alessandro.papitto@oa-roma.inaf.it

Título:

Millisecond pulsars in binary systems as laboratories for fundamental physics

Resumen de la Memoria:

Determining the behaviour of matter at supra-nuclear densities, and understanding why accretion of gas onto compact objects is often accompanied by outflows of matter, are two of the most pressing questions in high-energy astrophysics. I tackled these challenges mainly through multi-wavelength (X-rays, radio, optical, gamma-rays) observations of millisecond pulsars in binary systems. These neutron stars are the solid-surface bodies in which the most extreme conditions of gravity, density, rotational velocity and magnetization are realized. When they are part of a binary system they may strip matter from their companion star. In this case, several observable phenomena shed light on the physics of mass accretion and NS magnetosphere, as well as the production of high energy radiation and coherent pulsations. Millisecond X-ray pulsars that accrete mass from their donor are also thought to be the evolutionary progenitors of the most numerous radio millisecond pulsars, that are instead powered by the rotation of their intense magnetic field. The most distinguished achievement of my research are:

(II) the discovery of 25% of the population of accreting X-ray millisecond pulsars currently known, and measured their spin and orbital parameters thanks to a pulsar timing analysis software that I developed;

(III) the demonstration that broad iron emission lines seen in the X-ray spectrum can be used to estimate where a pulsar magnetosphere truncates the accretion disk, deriving a crucial test for theories of accretion around fast magnetized rotators;

(I) the discovery of the prototype of millisecond pulsars that switch between an X-ray and radio pulsar behaviour on time-scales of few weeks (transitional millisecond pulsars; Papitto et al. 2013, Nature, 501, 517). It proved the evolutionary scenario proposed to explain the spin up of millisecond pulsars, and opened up a brand new line of investigation to observe how the disk-magnetosphere interaction regulates accretion and ejection of plasma.

(IV) the discovery of the first neutron star accreting mass from a low-mass companion star, that is also a gamma-ray emitter. I developed a model that successfully explained this behaviour in terms of a rapidly spinning millisecond pulsars that prevent disk mass accretion because of its rapid rotation.

(V) timing X-ray observations and models developed to bridge different populations in the zoo of neutron stars, involving millisecond pulsars, gamma-ray binaries, magnetars and ultra-luminous X-ray sources.

My current Marie Skłodowska Curie research project aims at exploiting the new observational possibilities opened by the discovery of transitional millisecond pulsars. I now aim at building my own research group, and the support of a long term Ramón y Cajal fellowship would be crucial to keep my research career progressing. This would allow me to fully develop my lines on research focused on the determination of the neutron star equation of state with transitional millisecond pulsar, the investigation of the coupling between the phenomena of accretion and ejection of plasma by compact objects, through the exploitation of new facilities for and X-ray (Athena, LOFT, eXTP) astronomy. I would also be interested in continuing to use ESO telescopes from Spain, and supporting a putative SKA Spanish affiliation.

Resumen del Currículum Vitae:

I obtained my PhD in Italy in 2009 (best thesis for the Italian Astronomical Society) at the University of Roma Tor Vergata, and spent 3 years at University of Cagliari with a Sardinia young researchers fellowship.

In 2012 I moved to Space Science Institute (ICE CSIC-IEEC) of Barcelona with a Juan de la Cierva fellowship under the supervision of prof. D. F. Torres, receiving a special mention of the CSIC for scientific merit in 2014-2015.

In 2016 I moved to the Astronomical Observatory of Rome with a Marie Skłodowska Curie individual fellowship project on transitional millisecond pulsars. These 8 years of post-doctoral research experience allowed me to develop a pronounced independence in my research, as well as a diffuse network of collaborations with scientists coming from ~ten different countries. I also had a number of experiences in mentoring master thesis and PhD students.



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My publication record (73 refereed papers, 18 as the first author, H-index=23, all in small groups of co-authors) show the impact of my research on the astrophysics scientific community. My most influential paper describes the discovery of the first millisecond pulsar observed to swing between radio and X-ray pulsar regime (Papitto et al. 2013, Nature, 501, 517). It received 150 citations in 3.5 years, and started a new line of research on newly discovered transitional millisecond pulsars.

The 13 invited talks given in international conferences (among which a plenary talk at the prestigious ESA X-ray Universe 2014 Symposium), 18 contributed talks, 5 invited seminars, the organization of three symposia in large international conferences (Texas Symposium, EWASS), the leadership of an international team funded by the International Space Science Institute (ISSI), the young researcher Città di Cefalù prize in 2014, all prove the recognition of my work by the international pulsar astrophysics community.

I am member of the international collaborations supporting the Athena X-ray Telescope, LOFT, eXTP and XIPE. I am the PI of 23 guest observer and target of opportunity observations with the major observing facilities in the X-ray, optical and radio bands. I am the PI of an ASI (Italian Space Agency)-INAF research grant, and co-I of several projects. I was member of the XMM-Newton time allocation committee in 2015 and 2016, and since 2014 of the working group of XMM-Newton Calibration Requirements. Since 2010 I am a reviewer for The Astrophysical Journal and Monthly Notices of the Royal Astronomical Society.



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Nombre: ALVAREZ GONZALEZ, BARBARA
Referencia: RYC-2016-21220
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: barbara.alvarez.gonzalez@cern.ch

Título:

HEP data analysis and instrumentation by Barbara Alvarez Gonzalez

Resumen de la Memoria:

Physics Analyses at CDF:

During my thesis at the CDF experiment at the Tevatron, I developed a new analysis aiming to the search for the SM Higgs boson using a Matrix Element technique that improved the sensitivity of the already existing results. I had a leading position in this analysis, working on the optimization of the several areas of the analysis (described later) reaching, at that time, the most sensitive individual exclusion limits for Higgs boson masses below 135 GeV.

This work was published in Phys. Rev. D. 85 (2012) 072001 and was combined with other analyses to increase the sensitivity at low Higgs boson masses published in Phys. Rev. Lett. 103 (2009) 101802.

Physics Analyses at ATLAS:

I have been working at CERN having a leading role in several physics analyses of the data recorded by the ATLAS detector at all center-of-mass energies 7, 8 and 13 TeV provided by the LHC since it started in 2010. The list is extensive: measurements of the t-channel cross section, searches for the s-channel single top, for the W' boson in the Inub decay channel, and for single top quark produced in association with large missing energy, the measurement of the top-antitop cross-section in the dilepton channel and the measurements of top-quark pair to Z-boson cross-section ratios.

In addition, as a new project, I have recently started working in a new SM analysis on W-boson events to measure the polarization angular coefficients which I will conduct for the next months until its completion.

HEP instrumentation:

As a side project of my dissertation topic, I was also in charge of the offline calibration of the Time of Flight (TOF) detector at the CDF experiment used in the offline processing of the CDF data.

Later at ATLAS, I contributed as High Level Trigger data quality monitoring and offline trigger expert during two years and currently I am participating in detector tests and validation activities, in particular for what concerns aging and irradiation tests at the CERN Gamma Irradiation Facility (GIF++).

Leadership positions:

I have become an expert in top quark physics and I am currently acting as contact for top-antitop cross-section combination between ATLAS and CMS.

I have gained a large experience in group collaboration, I have proved to be able to lead big working teams. I have shown this during my work in ATLAS where I have been assigned for several leadership positions. I was contact person between the Top ATLAS group and the W+jets sub-group. I have also worked as convener of the Single Top ATLAS group.

My involvement in the R&D project of irradiation studies of some prototype chambers for the future upgrade project of the ATLAS Muon detector has allowed me to become the responsible of the ATLAS MicroMegas activities at GIF++. As a consequence of my reliable work, I turned out to be appointed as the contact person for ATLAS MicroMegas New Small Wheel upgrade project in the GIF++ community.

Mentoring and Outreach:

I recognize the importance of the educational role of our job. As part of my job I have supervised two undergraduate students, three CERN summer students and four Ph.D students; one of them will graduate in 2017 and I am personally participating in his thesis committee. I participated in many outreach projects and I am still involved in several on-going outreach activities.

Resumen del Currículum Vitae:

My career in science can be summarized as follows: at the end of my physics degree I was awarded with the 'Premio Extraordinario Fin de Carrera 2005', best record award from the Universidad de Oviedo. This award is given to the student with the best graduation record. Thanks to my marks and this award I obtained a FPU scholarship from the Education and Science Ministry of Spain to do the Ph.D. I joined the Universidad de Oviedo High Energy Physics group in June 2006 as a graduate student for the CDF (Collider Detector at Fermilab) experiment. During my dissertation research, as part of the CDF collaboration at the Fermilab laboratory where I was based, I focused on the search for the Higgs boson within the context of the Standard Model; one of the most important targets of the high energy physics



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experiments during that time.

After graduating, I joined 'Michigan State University' as a postdoctoral researcher in June 2010 to work on the ATLAS experiment at the LHC. During that period I was based at CERN with a leading role in several physics analyses using the data recorded by the ATLAS detector at a center-of-mass energy of 7 and 8 TeV: measurements of the t-channel cross section, searches for the s-channel single top, for the W' boson and for single top quark produced in association with large missing energy. They have provided me with a wide knowledge of analysis strategies, object reconstruction tools, and methods of background estimation that would benefit my future career.

Currently, since February 2015, I am working as a COFUND-CERN Research Fellow in the ATLAS CERN team. As a fellow, I am actively working in physics analyses (mainly precision measurements), in detector tests and validation, in particular for what concerns aging and irradiation tests at the CERN Gamma Irradiation Facility (GIF++), and supervising and guiding the younger colleagues of the CERN ATLAS Muon group.

Obtaining the COFUND-CERN Research fellow has been a great achievement in my professional career, it is a very prestigious fellowship that only 10% of the CERN Research fellows receive. This fellowship has allowed me to work in several projects, in particular my favorite project is an R&D project of irradiation studies of some prototype chambers for the future upgrade project of the ATLAS Muon detector. My involvement in this work has allowed to become the responsible of the ATLAS MicroMegas activities at the CERN GIF++.

I consider myself an experienced, responsible and self-motivated researcher, I have experience in group collaboration, I really enjoy working in big groups of people and I can lead big teams. I have shown that during my work in ATLAS where I had several leadership positions. I was contact person between the Top ATLAS group and the W+jets sub-group, organizing and coordinating the efforts for the W+jets background estimation. I have also worked as convener of the Single Top ATLAS group which is made of around 50 people, the main tasks were interacting on a day-to-day basis with the analysis teams, coordinating the publication process, interaction with many other ATLAS physics groups and preparing and chairing the weekly meetings.

Finally, I also have experience supervising students. I supervised two undergraduate students, three summer students and four Ph.D students; one of them will graduate in 2017.



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Nombre: ROLDAN TORO, RAFAEL
Referencia: RYC-2016-20663
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: rroldan@icmm.csic.es

Título:

Electronic, optical and elastic properties of 2D materials

Resumen de la Memoria:

The different periods of my research career can be summarized as follows:

(2002-2003) Research assistant in the Department of Physics at Universidad de Extremadura, under the supervision of J. D. Solier. Experimental study of dielectric response of colloidal suspensions.

(2003-2007) PhD student at the Instituto de Ciencia de Materiales de Madrid ICMM-CSIC, under the supervision of M. Pilar López Sancho. My thesis was devoted to the study of electronic, magnetic, structural and superconducting properties of layered materials that present strong electron correlations, focusing on ruthenates and high temperature cuprate superconductors. During this period I did stays of few months at Boston University (2004), University of California Riverside (2005) and ETH Zurich (2006).

(2007-2009) Post-doctoral fellow at Laboratoire de Physique des Solides, Université Paris-Saclay (France), in the group of Mark O. Goerbig. During this period I worked on the electronic properties of graphene in the presence of a strong magnetic field. I developed a full description of collective plasmon excitations in this material.

(2009-2011) Post-doctoral fellow at the Institute for Molecules and Materials, Radboud University of Nijmegen (Netherlands), in the group of Mikhail I. Katsnelson. This position gave me the chance to open two different lines of research. 1) Elastic and thermodynamic properties of 2D crystalline membranes, and 2) electronic and optical properties of disordered graphene.

(2011-2015) Post-doctoral fellow at the ICMM-CSIC and IMDEA Nanociencia (Madrid) in the group of Francisco Guinea. During this period, besides continuing my collaborations with the Paris and Nijmegen groups, I started new lines of research for the investigation of the mechanical, electronic and optical properties of the new families of 2D semiconducting materials, with several pioneering contributions in the field of transition metal dichalcogenides and black phosphorus.

(2015-Present) Principal investigator of the project FIS2014-58445-JIN at ICMM-CSIC, devoted to the study of mechanical, optoelectronics and plasmonics properties of 2D materials. A relevant part of this project is dedicated to investigate routes to exploit, by means of strain engineering methods, the exceptional elastic properties of these materials. Controlling these properties constitutes an exciting avenue for tailoring optoelectronic materials, opening the door for a variety of applications including photovoltaics, quantum optics and flexible optoelectronic devices. The study of the excitation and control of plasmons in 2D crystals, needed in order to develop novel high speed optical devices able to operate in different frequency ranges (from terahertz to the visible), is also among the objectives of the project.

Resumen del Currículum Vitae:

My research work focuses on the study of materials at the nanoscale and their heterostructures, with contributions that extend from the electronic, optical, elastic, magnetic and superconducting properties of strongly correlated electron materials, graphene, and more recently, the new family of two-dimensional (2D) materials like the transition metal dichalcogenides (as MoS₂ or WS₂), Boron Nitride or Black Phosphorus. These materials, on which I have several pioneering contributions (some of them in collaboration with recognized experimental groups), are attracting a great interest because of their potential application in nanoelectronics and photovoltaics.

I work at the Instituto de Ciencia de Materiales de Madrid (ICMM-CSIC). I am the Principal Investigator of the project FIS2014-58445-JIN: Physical properties and emerging applications for 2D crystals: optoelectronics, plasmonics and strain engineering (2015-2018, 10.38% success rate in the corresponding area). Previously I received a Juan de la Cierva fellow (2012-2015).

I have spent more than four years abroad in internationally recognized institutes. From 2009-2011 I joined the Institute for Molecules and Materials (Radboud University of Nijmegen, The Netherlands), and from 2007-2009 I joined the Laboratoire de Physique des Solides (Université Paris-Saclay, France). During my PhD, that I carried out at the ICMM-CSIC supervised by M. Pilar López Sancho in 2003-2007, I did several stays at the Boston University (USA), at the University of California Riverside (USA), and at the ETH Zurich (Switzerland).

My research work has led to 43 scientific articles (+ 4 under review) in international peer-reviewed journals (e.g. Adv. Mater., Nano Lett., PRX, PRL, Phys. Reports, PRB, etc.) and one invited book chapter (Cambridge University Press). I am the first and/or corresponding author



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of 30 articles. The average number of authors of my publications is 4.5. My articles have received 1644 citations (Google Scholar) and I have a citation h-index=25. The number of scientific collaborators (more than 50 co-authors in 15 different countries) corresponds to the diversity of subjects in which I have worked. A relevant part of my scientific articles (~15%) is in collaboration with experimental groups. I have participated in 12 research projects, including several international.

I have participated in more than 30 international conferences, 5 as invited speaker and 15 with contributing talks. I have given 14 invited seminars in international research centres. I have co-organised the colloquium "Theory and Simulation of 2D materials" during the 26th Condensed Matter Division conference of the European Physical Society.

I am Guest Editor in a special issue at 2D Materials journal on "Strain Engineering in 2D materials". I am co-organiser of the Seminar series at ICM. Coordinator of the Spanish Network for 2D Materials (<https://sp2.es>). Involved in popular science projects through the program Ciudad Ciencia (CSIC).

I act as a referee for more than 20 journals, including Nat. Photon., Nat. Phys., Adv. Mater., Nano Lett., Nat. Comm., Adv. Func. Mater., PRL. I have been selected as 2015 Distinguished Referee of the European Physical Journal. I have evaluated International Research Proposals.



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Nombre: MARTINEZ GONZALEZ, MARIA JESUS
Referencia: RYC-2016-21228
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: marian@iac.es

Título:

Solar and stellar magnetism through spectro-polarimetry

Resumen de la Memoria:

My research career is all about answering fundamental questions on solar and stellar magnetic fields. How do they form and evolve? How does a dynamo actually work? What mechanism/s underlie coronal heating? To answer such important questions, my scientific profile comprises both Solar and Stellar Physics. Such a broad profile is rather unique. In my work (46 refereed papers, 19 as first author, 781 citations), I made important contributions in both fields and I built the bridge between the great knowledge gathered from solar observations and modelling, and the diversity of stars. I am the leading author of my most cited paper (a two-author paper; 83 citations). For this article, I was awarded the JOSO prize for an outstanding paper of a young solar physicist.

I did my PhD in Solar Physics at the Instituto de Astrofísica de Canarias (finalist of the biannual prize of the Sociedad Española de Astronomía) and then I moved for a two-year PostDoc at the Paris-Meudon Observatory. I am now a consolidated member at the IAC after obtaining very prestigious PostDoc contracts: a Juan de la Cierva, and two 5-year Advanced Severo Ochoa Fellowships. Since 2015, I am the principal investigator of the research project Spectro-polarimetry: a window to stellar magnetism funded by the Spanish Ministry of Economy and Competitiveness. I am pioneer in the field of stellar spectro-polarimetry in Spain.

I am a scientist with a high international reputation. I have established stable collaborations with members of the most important institutes and universities for Solar Physics. I have 7 invited reviews on Solar Physics at international meetings and 1 on Stellar Magnetism in a national conference. I have served in various commissions and committee related to state-of-the-art instruments and telescopes (e.g. the ESO Observing Programmes Committee) and acted as referee for several agencies (e.g. the Scientific Commission of the Plan Estatal de I+D+I). I am also a member of the MIRADAS instrument (GTC in 2019) working group leading the spectro-polarimetry science case.

Outreach is an important ingredient in my career. Among my most relevant projects I want to highlight Coffee Break: Señal y Ruido, a weekly Science podcast that has an average of 30.000 downloads per week. Together with Dr. Héctor Socas, I am the director of some episodes.

Resumen del Currículum Vitae:

* PhD at the Universidad de La Laguna supervised by Drs. Manuel Collados and Basilio Ruiz. Finalist in the biannual prize of the Sociedad Española de Astronomía (SEA).

* 2007-2009, CNRS fellow at the Paris-Meudon Observatory (2 years). 2009, Juan de la Cierva fellow at the IAC. After that, I have been granted in the IAC two times another very highly competitive position, a 5-year Advanced Severo Ochoa fellowship (2013 and 2016).

* Research visits: Max Planck Institute for Solar System Research (4months), Instituto de Astrofísica de Andalucía (3 months), Catania University (2 weeks), Stockholm University (1 week). I maintain active collaborations with members of these institutions.

* Other active international collaborations: Dr. Frank Grundahl (AARHUS Univ.), Dr. Martin Leitinger (Graz University), and Tom Schad (National Solar Observatory).

MAIN ACHIEVEMENTS:

* Productivity: 46 papers in leading international peer-reviewed journals. Editor of the proceedings of the IAUS 305. Author of a chapter for the IAC Winter School Book, as well as Editor.

* Scientific leadership: Main contributor in 42 papers (4 as third author, 19 as second author, 19 as first author). 83% of my papers do not include my thesis supervisors.

Since 2015 I am the PI of the project Spectro-polarimetry: a window to stellar magnetism (AYA2014-60833-P), funded by the Spanish Ministry of Economy and Competitiveness. The funds allowed hiring PostDocs.

I am the PI of the IAC research project Stellar spectro-polarimetry.

* Impact: My published refereed papers collect 781 citations (477 as first author), with an average of 92 citations/year over the five past years. My h-index is 17, 11 as first author. Leading author of my most cited paper (a two-author paper with 83 citations). For this article, I was awarded the JOSO prize for the best paper of a young solar physicist.

* Invited reviews: 7 in international meetings and 1 in a national conference.

* Committees: Member of the Critical Science Plan of the future 4-m Daniel K. Inouye Solar Telescope. Member of panel D Stellar



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Evolution of the Observing Programmes Committee of the ESO (P99 and P100). Leader of the spectro-polarimetry working group for the MIRADAS instrument (GTC in 2019). In 2016, member of the Scientific Commission of the Plan Estatal de I+D+I of the Spanish MEC. This year, referee for the Agencia Nacional de Promoción Científica y Técnica of the República Argentina. For 4 years, member of the Board of Directors of the SEA. Member of the thesis committees of Carlos Quintero Noda (Universidad de La Laguna), Iker S. Requerey and Milan Gosic (Universidad de Granada). For two years, member of the IAC Research Committee. One of the tasks was to participate in the tribunals to hire PostDocs.

* Student training: Co-director of one PhD and main director of another one. Supervisor of 4 research works of graduate/undergraduate students.

* Meeting organisation: Member of the SOC of the IAUS 305. Chair of the SOC of an EWASS Symposium, and a splinter session in the Cool Stars 17 meeting. Co-organiser of the XXV IAC Winter School. Co-chair of the SOC and of the LOC of the 4th Solarnet meeting.

*Outreach: I am very active. Highlight the Science podcast Coffee Break: Señal y Ruido in which I am one of the directors. It is the top Science podcast in Spanish and has an average of 30.000 downloads per week.



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Nombre: MEGIAS FERNANDEZ, EUGENIO
Referencia: RYC-2016-20678
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: eugenio.megias@ehu.eus

Título:

Physics of the Fundamental Interactions at Zero and Finite Temperature: Field Theory and Holography

Resumen de la Memoria:

My expertise is in the area of nuclear, particle and theoretical physics, in particular Finite Temperature Field Theories as well as AdS/CFT methods applied to the study of their strong coupling regimes. The principal thrust of my research has been a comprehensive study, from a theoretic perspective, of the perturbative and non-perturbative nature of fundamental interactions at zero and finite temperature and chemical potential. I have made a consistent impact on research fields ranging from Quantum Chromodynamics (QCD) to AdS/CFT, string theory and phenomenology, including applications of AdS to describe QCD and the Quark Gluon Plasma (QGP), hydrodynamics, Higgs physics and LHC phenomenology, beyond the Standard Model (SM) and condensed matter.

In my PhD I worked in quantum field theory at finite temperature and curved space-time, QCD and effective field theories, with emphasis on nuclear matter under extreme conditions: high temperatures and densities. In my subsequent postdocs I increased my interests. In Brookhaven National Laboratory I worked on the equation of state of QCD and transport properties of the QGP. In Heidelberg I started to work with Prof. H.J.Pirner on the AdS/CFT duality applied to the physics of heavy quarks and QCD thermodynamics.

In Madrid I joined the String Theory group of IFT UAM/CSIC and worked with Prof. K.Landsteiner on the hydrodynamics of relativistic fluids and the role played by anomalies, in field theory (1 PRL) and holography. Quantum anomalies are one of the most subtle effects in relativistic field theories, and they are responsible for some transport phenomena in the QGP: one of them is the chiral vortical effect, characterized by the generation of an electric current induced by a vortex in the plasma. Apart from their effects in heavy ion collisions, these anomalies can be realized also in condensed matter systems like Weyl semimetals.

In Barcelona I continued my research on hydrodynamics, heavy quarks (1 PRL), and started a new collaboration with Profs. M.Quiros and O.Pujolas on holographic studies of the Higgs boson, extra-dimensional models and dilatons. After the experimental discovery of the 125GeV Higgslike resonance at the LHC in 2012, there is nowadays an increasing interest to study its nature, as this will provide very likely one of the most important indications for new physics beyond the SM. My research has focused on the study of a dilaton extension of the SM, and the possible description of the Higgs and other possible new resonances found at LHC as a dilaton: the Goldstone boson of scale invariance spontaneously broken.

In MPI für Physik, Munich, apart from extending my research on extra-dimensions as well as on hydrodynamics and condensed matter, I started a new research line on the study of far-from-equilibrium dynamics and entanglement entropy properties, in collaboration with the String Theory group of Prof. J.Erdmenger. Currently in Bilbao I continue with my research on these topics, and I opened a new line with local people on AdS/CFT and QCD thermodynamics.

My research experience in top-ranked institutions and my interaction with so many groups, has provided me a background in many timely topics in nuclear, particle and theoretical physics. My research has important implications for heavy ion physics (RHIC, LHC), physics beyond the SM, condensed matter and cosmology.

Resumen del Currículum Vitae:

Born in Granada, Spain, 14.5.1978. Gold Medal at the VII Spanish Physics Olympiad (Madrid, April 1996), and Honourable Mention at the XXVII International Physics Olympiad (Oslo, July 1996). I finished my Degree in Physics (Theoretical Physics) at the U. Granada (2001), mark 3.783 out of 4, and obtained the 2nd Spanish National Award for Graduate Students in Physics. After my degree I did two short research stays: Institute of Astrophysics of Canarias IAC (Jul-Sep 2001) and Institute of Astrophysics of Andalusia IAA (Sep-Dec 2001) with two grants for introduction to research. I did my PhD at the Department of Modern Physics of the U. Granada (30.6.2006), under the supervision of Profs. E.Ruiz Arriola and L.L.Salcedo. Qualification: Excellent cum laude by unanimity, and Special Doctorate Award (UGR 2009). During my career I have been awarded very prestigious grants: FPU grant (ref. AP2001-4082) for my doctoral degree (2002 - 2005), MEC and Fulbright Postdoctoral Research Fellowship for my first postdoc at Brookhaven National Laboratory, USA, ref. FU2006-1412 (2007 - 2009); Alexander von Humboldt Postdoctoral Research Fellowship at the Institute for Theoretical Physics of the U. Heidelberg, Germany (2009 - 2010); postdoctoral research fellowship of the Spanish National Centre for Particle, Astroparticle and Nuclear Physics, CPAN, at the Institute for Theoretical Physics IFT CSIC/UAM, Madrid (2010 - 2011); Juan de la Cierva contract at the U. Autònoma Barcelona (2011-2014); Marie Curie Intra-european fellowship (216.952,80 euros) at the Max Planck Institut für Physik, Munich, Germany (2014-2016). I am currently a Visiting Professor at the U. Pais Vasco, Bilbao, Spain (2016-present) under a full-time contract (salary equivalent to Profesor Investigador



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Turno de acceso general

Doctor Permanente a Tiempo Completo).

I have 73 publications (53 as first author), including 1 invited review and 2 books. Most of my articles have been published in very high impact journals: 2 PRL, 7 JHEP, 12 PRD, among others. 7 single authored publications, and 3 publications with a PhD student as co-author. h-index=19, 1516 citations, 41.9 citations/paper in peer-reviewed journals, 230 citations/year in last 3 years. My works have been presented in 66 conferences. I have given 54 of the 77 presentations of my works in international conferences: 43 talks (28 as invited speaker) and 11 posters; and given 23 invited seminars in EU and American institutions. Referee 48 times of PRD, PRL, JHEP, J. Cosm. & Astroparticle Phys., J. Physics G, and EPJC. I have participated in 24 research projects (5 internationals). In addition to the Marie Curie IEF project as PI, I have been awarded two other international research projects as PI: 1) Perturbative and Non Perturbative QCD at zero and finite temperature , at the U.F. Santa Maria, Chile, under FONDECYT Regular 2011 Program, for 3 years, 93.333 euros, 2) Nonextensive properties of hadronic systems , with collaboration of Max Planck Institut für Physik, U. Sao Paulo, U. Cape Town, among others, financed by FAPESP in Brazil. I have supervised a master thesis, and I am currently supervising two PhD students in collaboration with Profs. M.Quiros and O.Pujolas. I have organized an international conference "EMMI International Workshop on String Theory approach to QCD-thermodynamics and kinetics" held at the U. Heidelberg (Germany), in 2010. 47 research stays. Habilitation for Professor Agregat by AQU-Catalunya (equivalent to Profesor Titular).



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Turno de acceso general

Nombre: TAGLIACOZZO , LUCA
Referencia: RYC-2016-20594
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: luca.tagliacozzo@strath.ac.uk

Título:

Quantum field theories and lattice gauge theories from entanglement using tensor networks

Resumen de la Memoria:

I am an expert in Tensor Networks and quantum simulation of many-body quantum systems. I have published 34 papers including 1 Nature Physics, 2 Nature Communications, 1 Science, 1 Physical Review X, 3 Physical Review Letters and 3 Physics Letters B. His h-index is 18 and my work has attracted more than 1200 citations (Google Scholar).

Tensor Networks (TN) have originally been formulated in the context of quantum information as a tool to address strongly correlated systems, that are hard to address with Monte Carlo techniques, such as frustrated anti-ferromagnets and fermionic systems.

They are now considered as a unifying framework to address and understand collective emergence in the context of many body quantum systems.

Since 2008 I have applied TN network techniques to a different context, by studying with them quantum field theories (and in particular conformal field theories) and lattice gauge theories. I have obtained several seminal results in this field by for example formulating the finite entanglement scaling hypothesis for CFT described with tensor networks, that allows to extract precise universal information by performing a simple scaling analysis in terms of the rank of the tensors, and the first variational studies of 2D lattice gauge theories.

In parallel I understood that TN are still limited when used to describe the out-of-equilibrium dynamics and that quantum simulators could provide a viable alternative to TN in this context.

I have thus proposed several simulation protocols for lattice gauge theories using quantum simulators and discussed several approaches that one could use to validate the results obtained through those platforms. The corresponding papers are considered seminal contributions since they provide the proof of principle that AMO techniques are relevant also to high energy physics.

Recently I started to address the issue on how to connect Tensor Networks and quantum simulations by providing one of the first proposals on how to measure entanglement (a key ingredient in all tensor network construction) in scattering experiments.

I am currently focusing on the out-of-equilibrium dynamics of both lattice gauge theories and generic many body systems, and on designing better tensor network algorithms to perform it.

At the same time I am addressing fundamental issues such as how to constructively define a quantum field theory from a discrete TN construction.

I am part of a very active international network working both on TN and quantum simulators, involving leading scientists such as Prof. I. Cirac, Prof. G. Vidal and Prof. F. Verstraete, Prof. M. Lewenstein and Prof. P. Zoller and my multi-disciplinary background allow me to publish in several areas, such as hep-th, hep-lat, cond-mat and quant-ph.

Resumen del Currículum Vitae:

I obtained my degree at Università di Torino (110/110 cum laude) in 2000 with a thesis supervised by Prof. Gliozzi, after having spent 6 months at CERN in 1999, through the prestigious CERN Summer School Scholarship. I have two P.h.D.s. in high energy physics, one from the Politecnico di Torino in January 2006 and one from the Universidad de Barcelona in fall 2006 scoring excelente cum laude a la unanimidad (the highest possible) and obtaining the European Doctor mention (supported by an FPU scholarship). During my P.h.D. I established fruitful collaborations with the group of Prof. DiGiacomo in Pisa and Genova.

After the P.h.D. my scientific achievements allowed me to work with some of the best scientists in my field, including Prof. Latorre (Barcelona), Prof. Calabrese (Pisa), Prof. Lewenstein (ICFO), Prof. Verstraete (Viena), and Prof. Vidal (PI Waterloo). I have obtained three post-doctoral contracts, partly supported via an ERC grant and a Marie Curie IIF fellowship. During the first Post-Doc, in the quantum information group of Prof. Latorre at the University of Barcelona (2006-2008), I have formulated the well known, Finite Entanglement Scaling hypothesis. During the second one in the Quantum Simulations group of Prof. Vidal at the University of Queensland, Australia, (2008-2010) I have become one of the world experts in Tensor Networks methods (TN) by both applying them to one and two dimensional strongly correlated quantum many body systems.

From 2010 to 2015 I have been working in the Quantum Optics theory group of Prof. Lewenstein at ICFO.

Since 2015 I am a lecturer and Chancellor's Fellow at the University of Strathclyde, where I am building my own research group, and I am responsible for the research lines on the characterization of correlations in quantum many body systems.

During my career, I have obtained a strong record of high-quality publications, on a vast range of topics ranging from high-energy physics to statistical mechanics, quantum information, condensed-matter physics and quantum-optics theory often merging them together. My papers, well known in the scientific community, are published in major journals such as Science, Nature Comm, PRX, PRL, PLB, PRB, PRD, JSTAT, ROPP, Ann. Phys, and NPB and have been presented as invited contributions to international conferences.

I focus on the emergence of collective behaviors in many body quantum systems. In particular I have pioneered the use of TN and quantum simulations in the context of both conformal field theories and LGT, obtaining important results in both fields.



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From 2011 to 2013 I have obtained a prestigious Marie-Curie International Incoming Fellowship whose outcome has opened the route to the simulation of real time dynamics in LGT. From 2015 I have been part of Prof. Lewenstein's ERC financed team working on QUAGATUA. Recently I have been awarded the prestigious Chancellor Fellowship from the University of Strathclyde (UK) in order to set up a new group working on proposing new experiments to measure entanglement in many body systems and I am part of large Programme Grant (5.2M GBP) including Strathclyde Oxford and Cambridge working on the out-of-equilibrium dynamics of quantum systems. Along my career I have been very active in both supervising PhD students and lecturing at all levels. I am now ready to become faculty member in Spain.



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Turno de acceso general

Nombre: OROZCO SUAREZ, DAVID
Referencia: RYC-2016-20150
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: orozco@iaa.es

Título:

Spectropolarimetry of solar magnetic fields from the ground and from space: SO/PHI and IMAx+

Resumen de la Memoria:

Born in Seville (Spain) on October 3, 1976. I obtained a PhD title by the University of Granada, Spain in 2008 with a thesis awarded the biennial prize (2008-09) of the Spanish Astronomical Society for the best national PhD thesis in astronomy. The work was carried out at the Instituto de Astrofísica de Andalucía (IAA-CSIC). Later, I spent a three years and a half period at the National Astronomical Observatory of Japan (NAOJ), with a grant from the Japanese Society for the Promotion of Science, and four years at the Instituto de Astrofísica de Canarias (IAC) as a post-doc. The latter two years were funded by an ERC's Marie Curie fellowship. Currently, I am back at the IAA-CSIC.

My thesis dealt with spectropolarimetric measurements of the quiet Sun magnetic fields. The most relevant results of my work contributed greatly to break the paradigm of a quiet Sun void of magnetic fields. An illustration of its impact is that one of the papers coming out from the thesis has been cited more than 150 times so far. As a consequence, I have been invited regularly to give keynote talks at the most relevant international meetings of the field and I am a coauthor of a recent review paper by invitation in Living Reviews in Solar Physics (to appear in 2017; IF 19.3 in 2015).

Besides the quiet-Sun magnetism, I have been interested in the magnetic coupling of the solar atmosphere. Specifically, I have pioneered the observation and analysis of the He I triplet at 1083 nm, which is sensitive to atomic level polarization and the Hanle and Zeeman effects. A number of important contributions have been produced with this study like the first characterization of the vector magnetic field in solar filaments, prominences, and spicules or the first spectropolarimetric detailed study of the Rayleigh-Taylor instability in prominences.

Since the times of my PhD thesis I have also been involved in instrumentation development. I have contributed to the design of the Imaging Magnetograph eXperiment (IMaX) that flew aboard the stratospheric balloon-borne mission Sunrise (a collaboration between the German space agency, DLR, the American agency, NASA, and the Spanish Programa Nacional de Espacio) and to the Polarimetric and Helioseismic Imager (SO/PHI; as a co-Investigator) for the ESA-NASA Solar Orbiter mission. In fact, I served as a PI of the IAC contribution to these two instruments for two years. Currently, I am Project Scientist of a 3rd flight (in 2020) of Sunrise with a renewed IMAx+ instrument. I worked as chief observer for the Japanese Hinode mission at the Institute of Space and Astronautical Science (ISAS-JAXA). I have also served for the "Optimum Polarization Calibration and its Application" working group for the American DKIST telescope and participated in the setup and commissioning phases of the GRIS instrument at the German GREGOR telescope.

As for my teaching activities, I can mention I was invited as a lecturer at the EU funded 3rd SOLARNET School entitled "Solar magnetic fields: modeling and measuring techniques". I have been PhD supervisor of Carlos Quintero Noda with a thesis "High speed magnetized flows in the quiet Sun" at the University of La Laguna, Spain. I have also given several outreach talks to the open public both in Japan and Spain.

Finally, I am regularly asked by the Spanish Agencia Nacional de Evaluación y Prospectiva (ANEP).

Resumen del Currículum Vitae:

- 55 publications (51 in the first quartile, 15 as first author, one with 154 citations) in peer review journals with 916 citations following NASA/ADS (573 WoS). H-index is 17 in NASA/ADS (13 WoS). One accepted in a high IF journal (19.3 ISI). Total of 18.48 citations per paper with a mean of 75 citations/y in the last five years (WoS).

- 9 invited talks at international conferences, one review talk, and an invited seminar at the university of Cambridge (UK).

- Lecturer at the 3rd SOLARNET School: Solar magnetic fields: modeling and measuring techniques, Granada (Spain) 2015.

- Awarded the biennial prize (2008-09) of the Spanish Astronomical Society for the best national PhD thesis in astronomy.

- Awarded a Marie Curie fellow by the European Union (FP7-PEOPLE-2012-IIF ID:327419) from 01/2014 to 12/2015.

- Principal Investigator of:

1) MasFiPro project (European Union Research Council: The three-dimensional Magnetic Structure of solar Filaments and Prominences. Amount: 173,370.60).

2) IAC contribution to the Solar Orbiter Polarimetric and Helioseismic Imager (MINECO; ESP2013-47349-C6-6-R. Amount: 78.650).

3) Celostato para verificación de Solar Orbiter PHI (UE Feder funds: IACA13-4E-2627. Amount: 46.581).



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- Co-I (at ESA) of the Polarimetric and Helioseismic Imager for the ESA/NASA Solar Orbiter Mission and Project Scientist of the IMAx+ and SCIP instruments.
- Evaluator for the Spanish ANEP system (The National Agency for Assessment and Forecasting) and regular referee of Astronomy and Astrophysics and The Astrophysical Journal.
- Participation in international committees:
 - (1) Member of the ESA/NASA Solar Orbiter Science Operations Working Group and Calibration Working Group for SO/PHI.
 - (2) Member of the Solar-C mission sub-working group for the Measurement of Chromospheric Magnetic Field.
 - (3) Investigator in the EPIC (European Participation In solar-C) proposal for the M4 medium-size mission opportunity in ESA's science program.
 - (4) Investigator in the set-up and commissioning of the GRIS instrument at the GREGOR telescope (Izaña Observatory, Canary Islands, Spain).
 - (5) Invited investigator in the Optimum Polarization Calibration and its Application to the DKIST working group, 2015 (Boulder, USA).
- Participation in the development of the SOPHI Electronic Inversor of the Radiative Transfer Equation in FPGAs at the IAA.
- Participation in the development of compression algorithms for SOPHI in FPGAs with a FPU student from the Universidad de La Laguna.
- Responsible investigator of the development of the gain table calibration firmware and of the onboard polarimetric calibration of SOPHI.
- Engaged in the drafting of the SO/PHI instrument user manual as a reviewer, and in the PHI Science Performance Report as editor, as well as in other technical reports as the FDT flat-fielding strategy ,
 - In-flight polarimetric calibration , or Polarimetric calibration of the Heat Rejection Entrance Windows .
- 1 thesis supervised. Student: Carlos Quintero Noda. Title: High speed magnetized flows in the quiet Sun . Universidad de La Laguna. Defense: 15/06/2014.
- Examination board member of two doctoral theses.
- Mentor of two students of the University of La Laguna (Mathematics faculty) as trainees at the Instituto de Astrofísica de Canarias.
- Participation in the JSPS Science Dialogue Program as a lecturer.



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Turno de acceso general

Nombre: CID VIDAL, XABIER
Referencia: RYC-2016-20073
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: xcidvidal@gmail.com

Título:

Full exploitation of the LHCb detector in the quest for New Physics

Resumen de la Memoria:

As an experimental physicist, my research interests have revolved mainly around LHCb during my whole career. However, I can truly say that I have many different topics of interest.

Concerning physics, I have been able to make relevant contributions to analyses covering very different physics topics: from flavour physics (rare decays, CP-violation related analyses) to Higgs, Exotica and EW bosons measurements. If I had to highlight only one aspect, it would be expanding the scope of LHCb. In this regard, the possibility to extend the capacities of a detector conceived initially with another purpose is very important and well received within the community. I was able to do this already during my PhD, proposing doing kaon physics at LHCb (and at the LHC as a whole). Although this was received initially skeptically, now LHCb has become one of the main players in kaon physics. Now I am trying to do the same as convener of the QEE working group. We cover a rather unique phase space region, so we are the only experiment sensitive to certain signatures. This concerns not only direct exotic searches, but also Higgs physics or analyses involving EW bosons.

One of the crucial aspects that I have been able to understand during my career is that the progress of an experiment is not possible without a coherent effort both on physics analysis and on more technical aspects. Because of this, I have always tried to be involved in different technical work. This is of particular interest at the moment, since at the end of Run 2 of the LHC, in 2019, LHCb will undergo a major upgrade in which most of the detector will be replaced and in which the readout rate will be increased to 40 MHz, allowing in practice a full software trigger. This will have a lot of implications for the experiment and it means that we are at the moment at a turning point for its future. During my PhD I worked in trigger and particle identification, and later, as post-doctoral researcher, I became interested in the upgrade of the Vertex Locator of LHCb and in simulation. These topics are all of interest to me and I would be interested to continue working on them in the future.

Furthermore, in the last years I have also become very interested in Machine Learning (ML), an area in which I find a huge room for improvement and a bright future ahead. An effort is being carried out at the moment to increase the synergy between ML and High Energy Physics (HEP) for mutual benefit, something to which I have tried to contribute. This has allowed me to establish contacts with different companies that address similar problems to those of HEP, but from a different perspective. I intend to further pursue this effort in the years to come. Moreover, I have several ideas in mind to try new approaches to profit even more the capabilities of ML in HEP.

As a final aspect to remark, I am also interested in outreach, teaching and tutoring. I find all of them complementary ways to achieve a similar purpose: involve the young generations in our research and prepare them for the future and to continue our work. I have very relevant contributions to all of these topics, and I find all of them essential for my future research career.

Resumen del Currículum Vitae:

My research career started in 2007, when I began working at LHCb. I have been member of the collaboration since then. In this period, I have been able to make contributions not only to analysis, but also to more technical aspects, such as trigger, particle identification, simulation and work in detector development.

My research has taken place mainly at the University of Santiago (USC), where I performed my PhD and I am currently a Juan de la Cierva-Incorporación Fellow, and at CERN (Geneva, Switzerland), where I was a Research Fellow for three years, in the period 2013-2015, and where I spent around two years before the end of my PhD. Apart from my post-doctoral grants, I was also awarded with two pre-doctoral grants, the FPU (2008-2012) and the equivalent grant from the Xunta de Galicia (in 2009).

Concerning physics analysis, I am currently the convener of the QEE Working Group at LHCb. I am the only scientist having become convener of a LHCb physics WG as member of a Spanish institution. I would also like to highlight that I have been one of the main contributors to the search for $B_s \rightarrow \mu\mu$, the most cited group of papers at LHCb, and one of the key results of the LHC as a whole. Moreover, I was the first to propose doing kaon physics at LHCb. Following this, LHCb has currently become one of the key players for the future of kaon physics.

As stated above, I have also contributed to different technical aspects, among which I would like to highlight my contributions to the upgrade of the LHCb Vertex Locator, which is probably the most important sub-detector of LHCb.

According to the Web of Science, I am currently the author of more than 300 articles, with an h-index of 35. Most of these publications are related to LHCb, and I have made my most relevant contributions to at least 15 of them. I would also like to remark that I am currently an external reviewer for the European Physics Journal C.

I have been very active presenting the results of my work in different meetings, workshops and conferences. I have given more than 350 talks at different LHCb events, and 17 more outside LHCb, including some invited talks. Moreover, I have been involved in the organization of several workshops and conferences.



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As a final research aspect, I would like to emphasize that I am currently part of the effort to establish collaborations beyond High Energy Physics for Machine Learning development, which has allowed me to be in contact with several companies and experts from other areas. Concerning the supervision of students, I supervised 5 CERN summer students during my time as a Research Fellow at CERN. Furthermore I supervised an end-of-degree project at USC in 2013 and I am presently doing the same with two more. In parallel to my scientific research, I have performed several activities in outreach to bring the world of High Energy Physics to the general public. These include talks in High Schools, work on a web page and more than 15 articles. Moreover, during my CERN Fellowship I became a guide for LHCb, and in 2016 I collaborated in a CERN Master Class at the USC. Finally, in the periods 2010-2012 and 2016-2017 I have had teaching responsibilities at the USC, summing up to 180 hours. Thanks to this, and to my research experience, the ANECA agency has accredited me as a Profesor Contratado Doctor .



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Turno de acceso general

Nombre: BERMUDEZ CARBALLO, ALEJANDRO
Referencia: RYC-2016-20066
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: bermudez.carballo@gmail.com

Título:

Quantum Technologies for Quantum Information and Quantum Simulations

Resumen de la Memoria:

My research focuses on the theoretical assessment of the capabilities of certain emerging quantum technologies: experimental setups that aim at profiting from quantum effects to improve the functionalities of classical devices. The possibility of controlling and even designing technologies at the quantum level, exploiting their quantum features in our benefit, has outstanding prospects. Among other technological applications, these range from building more powerful computers, to developing secure communications, precise sensors, or coherent conductors. In addition to this functionality-driven research, these technologies offer a unique opportunity to address old theoretical challenges from a totally new perspective. The possibility of controlling a system composed of many particles, while preserving its quantum features, yields a new approach to quantum many-body physics. Rather than searching for a microscopic model that can explain a certain many-body effects (e.g. high-Tc superconductivity), and address fundamental questions that have remained unsolved for decades by a so-called quantum simulation.

My research is globally encompassed in the above field of quantum information processing and quantum simulations with quantum-optical technologies (crystals of trapped atomic ions, ultra-cold neutral atoms, nitrogen-vacancy centers in diamond, and quantum optics with superconducting circuits). With more than 9 years of research experience, and a strong expertise in quantum-optical many-body systems, I have made several contributions that range from the implementation of relativistic fermions and topological phases of matter with neutral atoms in optical lattices, to the use of trapped ions as a playground for non-equilibrium dynamics (e.g. quantum transport of energy), or the description of superconducting qubits coupled to transmission lines in terms of spin-boson models that yield a new type of spin-boson magnetic ordering. I have also developed some schemes to allow for precise quantum information processing even in the presence of external noise, some of which have been realised in experiments (e.g. robust entangling gate with noisy trapped ions).

Resumen del Currículum Vitae:

More than 9 years of research experience focused on quantum technologies:
Strong expertise on quantum optics and quantum information, and their application to quantum many-body systems, i.e. quantum simulations.

Relevant contributions in quantum information processing and quantum simulations: 37 papers in prestigious journals, e.g. 13 Phys. Rev. Lett.

Highly motivated researcher with a proven capacity of achieving planned research goals: first author in 23 papers with an average of 3 additional coauthors per paper.

Experience in leading research projects:
- co-supervision of 3 master thesis
- 4 papers as the last author designing and supervising the whole research project.

Technologically relevant research:
-collaboration with experimentalists of 5 groups on different quantum technologies (trapped ions, Nitrogen-Vacancy centers, and ultracold neutral atoms).
-technological transfer of 1 theoretical proposal, which has become a useful tool in a world-leading trapped-ion group (Prof. D. Wineland, NIST, Boulder).

Internationally recognized research:
-citations: Google Scholar 1576, ResearcherId 1157
-h-index: Google Scholar 21, ResearcherId 19
-press coverage: Phys.org: 1 cover story, Nature: 1 research highlight, APS: 1 Editor's suggestion with accompanying viewpoint, IOP: 3 highlights of the year, FP7 projects AQUTE and QESSENCE: 2 research highlights. -invited Speaker: 6 conferences and workshops, and 9 seminars in international groups and universities.

Wide research network in quantum technologies:
-collaborations with 39 different researchers of world-leading groups.
-numerous short scientific stays (typically one week) in the corresponding international institutions. -long scientific stays: Imperial college



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of London, 3 months, PhD;

Ulm University, above 2 years, Postdoc Sussex University, 1 month, Postdoc. Freiburg University, 2 weeks, Postdoc. Swansea University, 9 months. Postdoc.

Increasing experience in European projects:

-Named researcher in the proposal for eQual (IARPA project logiQ, USA intelligence army research)

-presenting research deliverables in scientific review meeting of the FP7 project PICC.

-writing the Ulm contribution to the quantum simulations workpackage of the FP7 project SIQS.

- Secondary proposer and member of the Spanish node in a COST Action Proposal OC-2015-2-20308" Trapped Ions: Progress in classical and quantum applications" (network of 37 international groups, under evaluation).



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Turno de acceso general

Nombre: HUERTAS-PORTOCARRERO COMPANY, MARC

Referencia: RYC-2016-20834

Área Científica: Física y Ciencias del Espacio

Correo Electrónico: marc.huertas@obspm.fr

Título:

GALAXY FORMATION IN THE BIG-DATA ERA

Resumen de la Memoria:

I am an assistant professor of the Paris Observatory. I am an expert in galaxy formation and evolution with main focus on massive galaxy formation and galaxy morphology for large surveys.

My main research lines, motivations as well as future work in Spain are summarized under the 3 following main topics:  

1. GALAXY MORPHOLOGY FOR LARGE SURVEYS I am a world leading expert in galaxy morphology. I have developed novel, original and innovative methods to estimate galaxy morphologies which have been applied to low and high redshift top-of-its class surveys (e.g SDSS, COSMOS, ALHAMBRA, CANDELS). These methods open a new window to classify galaxies in the era of extra-large surveys. They will be in fact implemented in the EUCLID pipeline. I am currently PI of the GAMOCCLASS and ASTROBRAIN projects aiming at developing new methods for future big-data surveys and head of the EUCLID morphology group. This experience places me in a privileged position to play a leading role in coming surveys in which Spain is playing a (leading) role.

 2. MASSIVE GALAXY FORMATION I have significantly contributed to the field of massive galaxy formation - a topic in which Spain has a strong international visibility - being the first in studying the galaxy mass-size relation between $z \sim 1.5$ to the present in different environments. In the last couple of years I have been investigating the link between quenching and bulge growth. The results of this work are reflected in 10 refereed papers in the last 3 years (among which 5 as first author and 2 as second with a PhD student).

3. FUTURE RESEARCH ACTIVITY IN SPAIN My research activity if granted with a RyC fellowship will be focused towards paving the route for the big-data era in astronomy. My insertion in the Spanish community is straightforward. I already entertain active collaborations with many of the extragalactic groups of the country and I am involved in future and current key projects for Spain (e.g EUCLID, J-PAS, WEAVE, SHARDS, ALHAMBRA). I summarize here the main expected research lines for the next 5 years related to points 1 and 2.

Resumen del Currículum Vitae:

-- I am a confirmed independent researcher (50+ referred papers, 20 first/second author, 1200+ citations, H-index 23) and professor (~200hr/year at university) with good international visibility (11 invited talks at international meetings).

-- I am involved in several of the main key projects for the next decade in my research field (EUCLID, E-ELT, J-PAS, WEAVE etc) in which I am leading working groups (e.g. EUCLID morphology, J-PAS morphologies). I also have a significant experience in research supervision (3PhDs, 8 Master students and 2 postdoctoral fellows) and management (PI of two national 200Keuros projects in 2015-2016 + an international project with the UCSC (US) funded by Google). My ERC Starting Grant proposal was ranked A at step 2 (interview) in 2016 and proposed for funding.

This experience will allow me to lead an independent research and build a research group in Spain very rapidly and efficiently.



AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2016

Turno de acceso general

Nombre: RODRIGUEZ , MARIA JOSE
Referencia: RYC-2016-21159
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: majo.rodriguez.b@gmail.com

Título:

Extreme black hole dynamics

Resumen de la Memoria:

My area of expertise is classical and quantum gravity and all aspects of black hole physics: from the generation of black hole solutions in higher dimensions, to the study of black hole jets using new analytic techniques. The current project hinges on the latter topic.

A long standing goal in modern physics and astronomy is to fully elucidate the mechanism driving one of the largest and more extreme energetic signals in the Universe: black hole jets.

Most galaxies show large scale jets of very fast moving plasma that are powered by a central black hole and presumably launched very close to their event horizon. Likewise, these emissions are only possible for rotating black holes with magnetospheres, and the faster the rotation, the stronger they become. Strikingly, general relativity implies that the dynamics of the near-horizon region of extreme (rapidly rotating) black holes is governed by an emergent conformal symmetry. Symmetries of physical systems in general may both usefully characterize and have remarkable consequences for observational data. Hence, I will undertake a systematic exploration of fundamental phenomenological consequences of the conformal symmetries of Nature that arise in the immediate environment of extreme black holes.

More precisely, the objectives of this proposal include firstly providing an action principle and determining the integrability of the black hole energy extracting models. Secondly, enlarging their solution space and domain of operation to identify observational predictions of the conformal symmetry of rapidly spinning black holes. Finally, developing explicit implications of the symmetries of extremal black holes with magnetospheres. These can give a precise account of black hole hair and thus be relevant for the information paradox.

Realizing these proposed goals will open a new window on the study of general relativity in the strong field regime and outflow processes at the edge of black holes. Combined with the unprecedented observational data that will soon become available the present interdisciplinary theoretical research has the potential to radically enhance our knowledge of the fundamental theory and to impact the astronomical measurements of spinning black holes.

Resumen del Currículum Vitae:

I am currently an Independent Group Leader at the Max Planck Institute for Gravitational Physics- Albert Einstein Institute (AEI), Potsdam, Germany, and an Assistant Professor of Physics at Utah State University, USA. I lead a group of postdocs and students in forefront research on black holes, theoretical astrophysics and quantum gravity. I have a Master Diploma of Advanced Studies as well as a Ph.D. (defended excellent cum laude in September 2008) with advisor Roberto Emparan from Universidad de Barcelona, Spain. I also have a wide managerial experience including tutoring students and postdocs and organizing international meetings. I have conducted postdoctoral research at top-tier institutions including Harvard and AEI funded with demanding fellowships like Marie Curie, and I have collaborated with some of the world leaders in the field, including Andrew Strominger and Lisa Randall at Harvard. As a Max Planck Group Leader and USU Assistant Professor, my research line is independent and solidly established.

My 26 publications published in international journals including Journal of High Energy Physics (JHEP, 2014 Impact Factor (IF): 6.111), Physical Review D (2014 IF: 4.643) or Classical Quantum Gravity (2014 IF: 3.168) collect almost 700 citations in INSPIRE with an average of 25 citations per paper. Two of my papers gather 100+ citations and have been classified by Inspire as very well-known. Two more gather 50+ citations and have been classified as well-known.



AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2016

Turno de acceso general

Nombre: RUIZ MARTINEZ, ARANZAZU
Referencia: RYC-2016-21240
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: aranzazu.ruiz.martinez@cern.ch

Título:

Standard Model measurements and searches for new particles in the ATLAS experiment at the LHC

Resumen de la Memoria:

I have developed my research career in the field of experimental high energy physics, working in the ATLAS experiment at the LHC accelerator at CERN. I was awarded with a four-year FPI grant and obtained my PhD from the University of Valencia in 2009 with Cum Laude honors. In this period, I was one of the main contributors to the ATLAS TileCal Read-Out Driver production, installation and integration during the commissioning phase of the ATLAS detector.

Later, as a postdoc based at CERN since 2009, I have made major contributions to physics analysis and have been selected for important management roles in a collaboration with more than 3000 physicists. All this work led me to obtain a CERN research fellowship, one of the most prestigious and competitive positions in the field.

In my view, the priorities in the LHC physics program are twofold: direct searches for new physics and measurements of selected Standard Model (SM) observables that are essential for understanding the backgrounds to direct searches. I have played major roles in both areas:

- With early $\sqrt{s}=7$ TeV data acquired in 2010, I led the first LHC measurement of the D^* production in jets, which is one of the methods to study heavy flavor production and crucial for the understanding of the detector and Monte Carlo modeling in a new energy regime never explored before.

- Shortly after, I was appointed as convener of the SM Jet and Photon Physics group (2012-2013), where I coordinated more than 20 analyses that represented the Run-1 legacy for the measurements involving jets and photons.

- With $\sqrt{s}=8$ TeV data taken in 2012, I coordinated the search for exotic particles decaying to WW/WZ in the 1-lepton channel, using pioneering jet substructure techniques to identify boosted hadronically decaying gauge bosons, achieving the highest sensitivity and most stringent limits for high mass resonances at the time.

- With $\sqrt{s}=13$ TeV data taken in 2015, I led the differential cross-section measurement of the Z boson production in association with jets, which constitutes a powerful test of perturbative QCD, comparing the data for various key observables to the state-of-the-art generators and the hot off the press fixed-order $Z+1$ jet calculations at NNLO.

In parallel to my physics analysis activities I made strong contributions to several areas in the trigger (online event selection for data storage, which is of paramount importance since it is the first cut on any physics analysis) to define the ATLAS trigger strategy for Run-2 during the LHC shutdown and data taking in my roles as:

- Convener of the Calorimeter Trigger group (2013-2014)
- SM representative in the Trigger Menu Coordination group (2014-2015)
- Convener of the Electron/Photon Trigger Signature group (since 2016)

I participated in >630 peer-reviewed articles, for a total of about 64000 citations, and 33 conference contributions. My work has been widely recognized being invited as speaker and session chair in many international conferences and workshops, recently MoriondQCD 2017, and selected to give 7 high-profile presentations in plenary meetings of the collaboration. I also supervised CERN summer students and graduate students, and participated in outreach activities.

I have proved my ability to lead large research groups in an international environment, thanks to my scientific capabilities and communication skills.

Resumen del Currículum Vitae:

Research career

- Since 2016: Postdoctoral Research Associate, Carleton University
- 2014 - 2015: CERN Research Fellow
- 2009 - 2013: Postdoctoral Research Associate, Iowa State University
- 2004 - 2009: PhD Physics (awarded with FPI grant), University of Valencia



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Stays at R&D centers

- FPI stays as a PhD student at CERN (24 months)
- Based at CERN since 2009

Management roles in ATLAS

- Since 2016: Convener of the Electron/Photon Trigger Signature group
- 2014 - 2016: SM representative in the Trigger Menu Coordination group
- 2013 - 2014: Convener of the Calorimeter Trigger group
- 2012 - 2013: Convener of the SM Jet and Photon Physics group

Other positions of responsibility in ATLAS

- 2014 - 2016: Trigger menu expert on-call in Run-2
- 2010 - 2011: Egamma trigger software responsible and expert on-call in Run-1
- 2004 - 2006: TileCal Read-Out Driver production, installation and commissioning

Selected publications (>630 journal publications)

- Coordinator of "Measurement of the production cross section of a Z boson in association with jets in pp collisions at $\sqrt{s}=13$ TeV with the ATLAS detector", ATLAS-CONF-2016-046, paper to be submitted to EPJC.
- "Performance of the ATLAS Trigger System in 2015", arXiv:1611.09661 [hep-ex], submitted to EPJC.
- "Combined searches for WW, WZ, and ZZ resonances in pp collisions at $\sqrt{s}=8$ TeV with the ATLAS detector", PLB 755 (2016) 285.
- Coordinator of "Search for production of WW/WZ resonances decaying to a lepton, neutrino and jets in pp collisions at $\sqrt{s}=8$ TeV with the ATLAS detector", EPJC 75 (2015) 209.
- "Measurement of the cross-section of high transverse momentum vector bosons reconstructed as single jets and studies of jet substructure in pp collisions at $\sqrt{s}=7$ TeV with the ATLAS detector", New J. Phys. 16 (2014) 113013.
- Coordinator of "Measurement of $D^{*\pm}$ meson production in jets from pp collisions at $\sqrt{s}=7$ TeV with the ATLAS detector", PRD 85 (2012) 052005.

Assignments as analysis reviewer

- Member of 4 ATLAS Editorial Boards (such as arXiv:1612.05220 [hep-ex], JHEP 02 (2015) 15 and EPJC 74 (2014) 3023)

Selected talks (33 contributions to national and international conferences)

- "W and Z precision measurements at ATLAS", MoriondQCD2017
- "The Run-2 ATLAS Trigger System" plenary talk, ACAT2016
- "ATLAS - Early Run 2 results" review talk, BOOST2015
- "Jet production results (from LHC and Tevatron)" plenary talk, QCD@LHC2013
- Iowa State Seminar in 2012
- 7 high-profile plenary talks in "ATLAS Weekly" and "ATLAS Week" collaboration meetings (latest in ATLAS Week in New York in 2016)

Organization of R&D activities

- QCD@LHC2016
- ATLAS Standard Model Workshop, LAPP 2015
- Working Group on Electroweak precision measurements at the LHC, CERN 2012

Teaching/mentoring

- Since 2016: Technical supervisor of the ATLAS authorship qualification task of 2 PhD students
- 2014 - 2015: Supervisor of 2 CERN summer students
- 2007 - 2008: "Physics" lab at University of Valencia

Outreach

- ATLAS official guide since 2014
- Assistance of a filming crew led by the world-famous photographer Christoph Malin in 2014
- Interview at "El Mundo" in 2014
- Remote lecture from the ATLAS control room to the International University of La Rioja in 2015

Other merits

- Reserve list of the previous RyC call
- Shortlisted for interview to staff positions in prestigious R&D centers: DESY (2015), CERN (2016) and NIKHEF (2017)



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Turno de acceso general

Nombre: SANCHEZ RODRIGO, RAFAEL
Referencia: RYC-2016-20778
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: rafsanch@ing.uc3m.es

Título:

Electric and heat currents in quantum devices

Resumen de la Memoria:

My research lies in the theoretical description of quantum transport in the nanoscale. In particular, I explore non-equilibrium effects arising from electronic interactions in quantum coherent conductors. I support two main research lines, focused on the manipulation of heat in multiterminal configurations and the role of quantum superpositions in quantum transport. Three of my theoretical predictions:

- R. Sánchez, R. López, D. Sánchez, M. Büttiker, Phys. Rev. Lett. 104, 076801 (2010)
- R. Sánchez, M. Büttiker, Phys. Rev. B 83, 085428 (2011)
- B. Sothmann, R. Sánchez, A. N. Jordan, M. Büttiker, Phys. Rev. B 85, 205301 (2012)

have been recently confirmed experimentally.

In the last years, I have contributed to the development of the field of three-terminal heat engines. I introduced the concept of the separation of heat and charge fluxes, allowing for their independent manipulation. This mechanism leads to the design of highly efficient and powerful energy harvesters. It has been verified by three independent experiments, in one of which I was actively involved:

- H. Thierschmann, R. Sánchez et al., Nature Nanotech. 10, 854 (2015).

My contribution to this field also includes the formulation of novel effects such as chiral heat propagation, resulting in the proposal of an ideal heat diode in the quantum Hall regime or thermoelectric spin-polarized currents in topological insulators:

- R. Sánchez, B. Sothmann, A. N. Jordan, Phys. Rev. Lett. 114, 146801; New J. Phys. 17, 075006 (2015).

My second line pertains to exploring electron dynamics in quantum dot arrays, a configuration of main interest for quantum information architectures. My work emphasizes the detection of quantum state superpositions by transport measurements. I contributed to the first detection of long-range tunneling in triple quantum dots:

- R. Sánchez et al., Phys. Rev. Lett. 112, 176803 (2014)
- M. Busl et al., Nature Nanotech. 8, 261 (2013).

These experiments pave the way to the decoherence free transfer of quantum information. In further developments of the theory I defined novel interference phenomena in one-dimensional arrays mediated either by electron-electron interactions or by time-dependent modulations.

My career in the last years has been financed through JAE-Doc and Juan de la Cierva contracts, and awarded with two COST scientific missions. I was the first substitute in the Physics area in the 2014 Ramón y Cajal opening. I have been awarded with a Retos: Jóvenes Investigadores supporting my research in the next three years.

Resumen del Currículum Vitae:

My research field is the theoretical description of quantum transport in nanoscale systems. Non-equilibrium effects arising from particle-particle interactions in quantum coherent conductors are emphasized. Special attention is paid to how these effects manifest in measurements of the charge, spin or energy currents and their fluctuations.

In 2008, I completed my PhD in Madrid with the highest grade and European mention. My thesis describes time-dependent problems and noise in interacting systems.

As a postdoc in Geneva (2008-2010) I was the main contributor to works that opened the way to understand the physics of coupled conductors. I introduced concepts such as the mesoscopic Coulomb drag or the three-terminal nanoscale heat-engine, both verified experimentally recently. I was in charge of the department's participation in two European networks.

Awarded with JAE-Doc and Juan de la Cierva contracts, I started a second postdoc in Madrid in 2011, where I opened a new and independent line based on nanoscale heat engines and quantum thermoelectrics. I also investigated the role of coherent superpositions in transport experiments. I was the first substitute in the Physics area in the Ramón y Cajal 2014 call. Awarded with a Retos program I lead the quantum thermodynamics research in the Universidad Carlos III de Madrid.

I have three years of experience in international research institutions (as a visitor and as a postdoc). I have participated in 5 European networks and maintained fruitful collaborations with 18 groups in Europe and America. I am the first author of most of my 42 publications,



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including 2 reviews, 2 book chapters, 9 letters (2 Nature Nanotechnology, 4 Physical Review Letters) and 18 regular articles (6 invited) in high-impact journals. They have been cited more than 1080 times. I am co-inventor of an international patent (PCT) application. I have contributed to 97 presentations in conferences (20 invited) and given 22 invited seminars. I have reported as a referee for 18 journals and have several years of experience in teaching, seminar and conference organization, and project evaluation for international research commissions. I have co-supervised a PhD thesis and one final-degree project.



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Turno de acceso general

Nombre: REBASSA MANSERGAS, ALBERTO
Referencia: RYC-2016-20254
Área Científica: Física y Ciencias del Espacio
Correo Electrónico: alberto.rebassa@upc.edu

Título:

White dwarfs as astrophysical tools in modern astronomy

Resumen de la Memoria:

I graduated in Physics at the Universidad de La Laguna in June 2005 and I was then selected by the Instituto de Astrofísica de Canarias (IAC) to begin a joint Spanish-UK PhD at the University of Warwick (UK). I finished my PhD in December 2008 after publishing two first-author papers and writing my thesis entitled "Post-common envelope binaries from the Sloan Digital Sky Survey". During my PhD I became an expert in observational astrophysics and theory related to my work, I benefited from a three-month studentship at the European Southern Observatory (ESO) in Chile and I co-authored 5 papers (one published in the Science journal). Thanks to my productivity I was awarded a postdoctoral position at the Universidad de Valparaíso (Chile), starting in February 2009. I spent nearly four years in Chile funded by the ESO joint committee and the programme Fondecyt. I broadened my research fields and I strengthened both my observational and theoretical skills, I taught a course on optical spectroscopy to master students for two consecutive years (I was asked by the students themselves), and I supervised the final year undergraduate project of a student. I also started new collaborations with researchers from the Universitat Politècnica de Catalunya (UPC, Spain), where I was invited for a 14-day research stay.

After my productive time in Chile I moved to the Kavli Institute for Astronomy and Astrophysics (KIAA) at Peking University, the most prestigious research institution in China, to begin a LAMOST fellowship in January 2013. The fellowship allowed 50% of independent research time. I then realized I had become a successful researcher able of performing independent science without the need of supervision. Since then I boosted collaborations both within (e.g. Yunnan Observatories, NAOC) and outside China (e.g. Macquarie University in Australia, IAC, Universidad Autónoma de México in Mexico, NARIT in Thailand) and I actively maintained collaborations initiated in the past in Chile (Universidad de Valparaíso) and the UK (University of Warwick). I co-supervised one PhD thesis and one final year undergraduate project, I supervised the three-month visit of a PhD student from UPC as well as shorter visits of other two PhD students, I was awarded research grants in competitive calls to fund my projects (>60,000 Euros), I became the referee of four prestigious astronomical journals (A&A, ApJ and ApJ letters, AJ, RAA), I became an external reviewer of proposals submitted to the Chinese Telescope Access Program, and I was involved in outreach activities. I was also invited for short research stays at the Yunnan Observatories, the UPC, the Macquarie University in Australia and NARIT in Thailand.

After the LAMOST fellowship I moved to Mallorca, where I initiated a three-month collaboration with the Observatorio Astronómico de Mallorca. This involved lecturing a 30-hours course on Introduction to Astrophysics to the general audience and performing duties as support astronomer. In October 2015 I signed a contract with the UPC, where I am currently based until October 2017 as a postdoctoral research associate. At the UPC I have supervised the summer research project of a student, I have taught 6 hours of the subject "Fundamentos de Física" of the Aeronautical Engineering degree as replacement teacher and I have been for one week at the University of Warwick.

Resumen del Currículum Vitae:

CURRENT POSITION: Postdoctoral research associate at Universitat Politècnica de Catalunya (Spain: 01/11/2015-30/10/2017).

PREVIOUS POSITIONS: LAMOST Fellow at the Kavli Institute for Astronomy and Astrophysics, Peking University (China: 01/01/2013-30/06/2015). Two postdoctoral research associate positions at Universidad de Valparaíso (Chile: 02/09/2009-15/12/2012).

EDUCATION: joint Spanish-UK PhD programme in Physics awarded by the University of Warwick (UK: 01/10/2005-01/12/2008). Degree in Physics awarded by the Universidad de La Laguna (Spain). As part of my Ph.D., I was awarded a Studentship Programme at the European Southern Observatory (Chile: 01/08/2007-31/10/1007).

OBSERVATIONAL EXPERIENCE: I have in-depth experience in observational astronomy. I have been awarded large amounts of observational time at the most important telescopes in the two hemispheres (VLT, Gemini, Magellan, NTT, WHT, TNT, Calar Alto, etc.) as well as at the Hubble Space Telescope.

TEACHING EXPERIENCE: I have taught a 30-hour course on introduction to astronomy to general public at the Observatorio Astronómico de Mallorca (Spain: 08-09/2015). I have lectured a course on optical spectroscopy and observational techniques to master students at Universidad de Valparaíso for two years (Chile: 2011-2012). I am professor substitute of the subject "Fundamentos de Física" of the degree of aeronautical engineering at the Universitat Politècnica de Catalunya.



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SUPERVISION OF STUDENTS: I have co-supervised one PhD thesis, two final year undergraduate projects and one summer research project. Also, I have supervised the research stays (ranging from a few days to three months) of 3 PhD students.

PUBLICATIONS: I have a total of 48 papers published in key international refereed astronomical journals (SCI), 4 of which are currently under review. I have a total of 14 first-author publications (3 accepted in 2016) and I co-author a Science paper. The total number of citations I have is 1174 with a H index of 21. My 14 first-author publications have a total of 402 citations and an H index of 9. In the last five years my average citation rate per year has been 127.

CONFERENCES: I have attended 17 conferences at the international and national levels, where I presented results via 12 contributed talks and 6 posters. I have also been regularly invited to give seminars at several different institutions in Spain, Chile, China, Thailand and Australia.

COMMISSIONS OF TRUST: I am the referee of four top-tier astronomical journals (ApJ and ApJ letters, A&A and AJ, RAA), and I was an external evaluator of proposals submitted to the Chinese Telescope Access Program.

VISITS: I have been invited as visiting scientist by the Universitat Politècnica de Catalunya (Spain; twice), by the Yunnan Observatories (China; twice), by the Macquarie University (Australia) and by the University of Warwick (UK; once).

FINANCED PROJECTS IN COMPETITIVE CALLS. I have been awarded the following funds to finance my PI projects: 1- Fondecyt research fund (Chile; 4,000,000 CLP, equivalent to 5,000 Euros). 2- Second prize of the 53rd Chinese postdoctoral fund program (China; 50,000 RMB, equivalent to 7,000 Euros). 3- Research fund for international young scientists (China; 200,000 RMB, equivalent to 28,000 Euros). 4- 7th special postdoctoral fund program (China; 150,000 RMB, equivalent to 21,000 Euros).



AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2016

Turno de acceso general

Nombre: MARTIN CAMALICH, JORGE

Referencia: RYC-2016-20672

Área Científica: Física y Ciencias del Espacio

Correo Electrónico: camalich@ific.uv.es

Título:

Weak decays of hadrons as laboratories of New Physics and QCD

Resumen de la Memoria:

My thesis centered on the conceptual and technical development of a new approach to ChPT in the baryon sector that tackled some of the long-standing problems in the theoretical understanding of baryon structure. The work developed during my thesis has become a milestone for model-independent approaches to baryon structure and it is currently being extended to the description of nucleon-nucleon and nucleon-hyperon interaction in first-principles studies of (hyper)nuclear structure.

A successful application of these techniques was to improve the theoretical understanding of the scalar structure of the proton which is essential for the direct search of dark matter and of new-physics in low-energy experiments. Our determinations of these quantities in chiral perturbation theory have been validated by new more sophisticated or independent approaches and they have become a modern standard quoted, for example, in a re-edition of a classic textbook.

In recent years, I have carried out a vibrant research program in the field of flavor-physics phenomenology, also in the context of recent B-meson decay anomalies. My focus has been the model-independent analyses of the hadronic uncertainties (in relation to QCD) and of the possible new-physics effects (in relation to ultimate UV completions of the SM). An example of the former is a thorough and unprecedented anatomy of hadronic uncertainties in some of the decays in which the anomalies appear, that has been very influential in the field. An example of the latter is the use of symmetry arguments to reduce the basis of effective operators in the analyses of new physics and which clarify the interpretation of the so-called "R_K anomaly". This work was recommended by the Editors of Phys. Rev. Lett. and was covered by Science-news online sites. Some of my most recent investigations have led to creative exploits of the data or ideas for new observables that are motivating new experiments in hyperon, kaon and B-meson decays.

In October 2016 I started with a CERN fellowship and I am taking advantage of the excellent scientific environment at CERN. My main area of current activity are the B-meson decay anomalies and flavor physics. Paraphrasing C. Sagan, Extraordinary claims require extraordinary evidence. Thus, for the next few years I would like to continue contributing actively to the unambiguous confirmation (or refutation) of new physics in flavor observables. Needless to say, such discovery would be of historic relevance, with scientific and cultural implications that are difficult to anticipate.

Resumen del Currículum Vitae:

I have written 28 peer-reviewed papers in scientific journals of high impact gathering about 1300 iNSPIRE-HEP citations (~1000 excluding self-cites), with 5 (plus another one in press) in Physics Review Letters (one selected for a Editors choice). My thesis was awarded by the European Physical Society as the best PhD thesis defended in Europe (+associate countries) in the area of Nuclear Theory during the years 2009-2011 and the University of Valencia, I obtained a Postdoctoral Position at the University of Sussex, an International Outgoing Fellowship Marie-Curie and the prestigious CERN Fellowship. I am customarily invited to speak about my research in major scientific meetings, including 2 plenary talks in nuclear theory and 1 in the major flavor physics conference, CKM. All in all, I have participated as a speaker in 32 international conferences and as a Seminar speaker in more than 25 world-wide Centers. I am myself the organizer of a new series of biyearly high-profile, multi-disciplinary and international workshops in Tenerife centered on Hadronic Contributions to New Physics searches.

I have participated in 8 research projects, half of which are international, including an ongoing one with the Beihang University in Beijing. I have accumulated some post-graduate tutoring experience and I am currently co-supervising a PhD student. I am a referee for Phys. Rev. D, Phys. Lett. B, JHEP and Eur.J.Phys.C.