



**Second international workshop on
HADRONIC CONTRIBUTIONS
TO NEW PHYSICS SEARCHES**

Purpose of the meeting

Along with the direct searches of new particles at the LHC, low-energy phenomenology offers many complementary ways to search for physics beyond the Standard Model. The low-energy searches, however, are often hindered by the insufficiently precise knowledge of hadronic contributions. The last decade has witnessed tremendous progress towards ab-initio and model-independent determinations of these contributions. The purpose of this meeting is to cross-examine the empirical and theoretical progress in this field and the implications in beyond-the-SM physics.

The 2nd Edition of Hadronic Contributions to New Physics searches (HC2NP 2019) will take place in **Puerto de la Cruz (Tenerife) from September 23 to 28** and will focus on the following SUBTOPICS:

- Muon and electron $g-2$: To review theoretical progress on the predictions in light of the upcoming measurement of the Muon $g-2$ FNAL experiment. To review also BSM in the context of a broader paradigm of LFUV or new experimental proposals.
- Long-distance contributions to meson FCNCs: Long-distance contributions in B, K decays and their mixing are crucial to interpret the flavor anomalies. We aim at reviewing relevant lattice and phenomenological calculations, including the status of electromagnetic corrections, and the BSM implications of this program.
- Baryon structure: Cross-examine lattice and phenomenological determinations of nucleon and nuclear structure and their interplay with direct searches of DM, searches of New Physics or neutrino experiments. Specific applications include BSM ideas related to the neutron lifetime, radiative corrections to nuclear β decays and the proton-charge radius puzzle.

The soul of the meeting (1): Scientific Diversity

“An expert is a person who avoids the small errors while sweeping on to the grand fallacy.” – S. Weinberg

- Bring together **recknowned experts** of different fields and make them discuss **interesting physics** ...
 - ▶ **Theorists** and experimentalists
 - ▶ High energy phenomenology
 - ▶ Lattice field theory
 - ▶ Nuclear & hadron physics
 - ▶ Atomic physics
 - ▶ Astrophysics
 - ▶ ...

- ▶ (Theoretical) systematics in precision calculations
- ▶ Search of new phenomena (**New Physics!**)

- **Special Mention:** Student talks (6!)

The soul of the meeting (2): Stimulating environment

Leisure time can be as (or more) productive than time at talks
Intense Social Program in Tenerife!

Day	Time Slot	Event / Session
26 Sep 2019	09:30	Registration and Welcome
26 Sep 2019	10:30	Plenary session (Lect 10-1)
26 Sep 2019	11:00	Report session (Lect 10-1a)
26 Sep 2019	11:30	Workshop on Quantum Entanglement
26 Sep 2019	12:00	Lunch break
26 Sep 2019	13:00	Plenary session (Lect 10-2)
26 Sep 2019	14:00	Workshop on Quantum Entanglement
26 Sep 2019	15:00	Lunch break
26 Sep 2019	16:00	Plenary session (Lect 10-3)
26 Sep 2019	17:00	Workshop on Quantum Entanglement
26 Sep 2019	18:00	Lunch break
26 Sep 2019	19:00	Plenary session (Lect 10-4)
26 Sep 2019	20:00	Workshop on Quantum Entanglement
26 Sep 2019	21:00	Lunch break
26 Sep 2019	22:00	Plenary session (Lect 10-5)
26 Sep 2019	23:00	Workshop on Quantum Entanglement
27 Sep 2019	08:30	Excursion (starts at 8:30 AM)
27 Sep 2019	12:00	Lunch break
27 Sep 2019	13:00	Plenary session (Lect 11-1)
27 Sep 2019	14:00	Workshop on Quantum Entanglement
27 Sep 2019	15:00	Lunch break
27 Sep 2019	16:00	Plenary session (Lect 11-2)
27 Sep 2019	17:00	Workshop on Quantum Entanglement
27 Sep 2019	18:00	Lunch break
27 Sep 2019	19:00	Plenary session (Lect 11-3)
27 Sep 2019	20:00	Workshop on Quantum Entanglement
27 Sep 2019	21:00	Lunch break
27 Sep 2019	22:00	Plenary session (Lect 11-4)
27 Sep 2019	23:00	Workshop on Quantum Entanglement
28 Sep 2019	09:30	Registration and Welcome
28 Sep 2019	10:30	Plenary session (Lect 12-1)
28 Sep 2019	11:00	Report session (Lect 12-1a)
28 Sep 2019	11:30	Workshop on Quantum Entanglement
28 Sep 2019	12:00	Lunch break
28 Sep 2019	13:00	Plenary session (Lect 12-2)
28 Sep 2019	14:00	Workshop on Quantum Entanglement
28 Sep 2019	15:00	Lunch break
28 Sep 2019	16:00	Plenary session (Lect 12-3)
28 Sep 2019	17:00	Workshop on Quantum Entanglement
28 Sep 2019	18:00	Lunch break
28 Sep 2019	19:00	Plenary session (Lect 12-4)
28 Sep 2019	20:00	Workshop on Quantum Entanglement
28 Sep 2019	21:00	Lunch break
28 Sep 2019	22:00	Plenary session (Lect 12-5)
28 Sep 2019	23:00	Workshop on Quantum Entanglement
29 Sep 2019	09:30	Registration and Welcome
29 Sep 2019	10:30	Plenary session (Lect 13-1)
29 Sep 2019	11:00	Report session (Lect 13-1a)
29 Sep 2019	11:30	Workshop on Quantum Entanglement
29 Sep 2019	12:00	Lunch break
29 Sep 2019	13:00	Plenary session (Lect 13-2)
29 Sep 2019	14:00	Workshop on Quantum Entanglement
29 Sep 2019	15:00	Lunch break
29 Sep 2019	16:00	Plenary session (Lect 13-3)
29 Sep 2019	17:00	Workshop on Quantum Entanglement
29 Sep 2019	18:00	Lunch break
29 Sep 2019	19:00	Plenary session (Lect 13-4)
29 Sep 2019	20:00	Workshop on Quantum Entanglement
29 Sep 2019	21:00	Lunch break
29 Sep 2019	22:00	Plenary session (Lect 13-5)
29 Sep 2019	23:00	Workshop on Quantum Entanglement
30 Sep 2019	08:30	Social Program (starts at 8:30 AM)
30 Sep 2019	12:00	Lunch break
30 Sep 2019	13:00	Plenary session (Lect 14-1)
30 Sep 2019	14:00	Workshop on Quantum Entanglement
30 Sep 2019	15:00	Lunch break
30 Sep 2019	16:00	Plenary session (Lect 14-2)
30 Sep 2019	17:00	Workshop on Quantum Entanglement
30 Sep 2019	18:00	Lunch break
30 Sep 2019	19:00	Plenary session (Lect 14-3)
30 Sep 2019	20:00	Workshop on Quantum Entanglement
30 Sep 2019	21:00	Lunch break
30 Sep 2019	22:00	Plenary session (Lect 14-4)
30 Sep 2019	23:00	Workshop on Quantum Entanglement

- ▶ Starting relatively late in the morning 9.30
- ▶ Lunch breaks ~ 3 hours
- ▶ Full day excursion on Wednesday (**starts at 8.30!**)
- ▶ Ends on Sat early afternoon

The soul of the meeting (2): Stimulating environment

Leisure time can be as (or more) productive than time at talks

Intense Social Program in Tenerife!

03 Sep 2019		04 Sep 2019		05 Sep 2019		06 Sep 2019		07 Sep 2019		08 Sep 2019	
08:00	Introduction to HCP2019 (1)	08:30	Plenary abstracts (1st 10:30 (1))	09:00	Evaluation to talk and/or lecture	09:30	Registration (1st 10:30 (1))	09:30	Plenary abstracts (1st 10:30 (2))	09:30	Plenary abstracts (1st 10:30 (3))
08:30	Bayesian inference (1st 10:30 (1))	09:00	New prospects for BSM physics: One hidden Dimension Search (1)	09:30	Status of theory prediction for BQ (1): Thomas Tait (University of Leicester) (1)	09:30	Overview of machine experiments: An experiment and a case study: Andrew Stirling (The University of Edinburgh) (1)	09:30	QED corrections to Muon Charge in Lattice QCD: Chris Marshall (University of Liverpool) (1)	09:30	QED corrections to Muon Charge in Lattice QCD: Chris Marshall (University of Liverpool) (1)
09:00	Science at the Frontier of Neutronium in Cosmos: Quasar EMAG 2019 (1)	09:30	Overview of ATLAS and CMS results and prospects in Physics: Sandra Maltoni (University of Milan-Brescia and INFN) (1)	09:30	Status of the Muon by 20 Experiment at Fermilab: Matt Lake (CERN) (1)	09:30	Search for Axion-Like Particles (ALPs): Luca Di Luzio (University of Padua) (1)	09:30	Dark Matter Halo Structure in Milky Way: Mads Spring (University of Copenhagen) (1)	09:30	Dark Matter Halo Structure in Milky Way: Mads Spring (University of Copenhagen) (1)
09:30	Neutrino physics phenomenology: Flux Quanta Entropy and Neutrino Oscillation (1)	09:30	Modeling proton of Nuclei: ADR Code (1)	09:30	Measurement of the free neutron cross section at the n_TOF facility: Jeremy Park (ISIS) (1)	09:30	Search for Dark Matter: Dark Matter (1)	09:30	Dark Matter Halo Structure in Milky Way: Mads Spring (University of Copenhagen) (1)	09:30	Dark Matter Halo Structure in Milky Way: Mads Spring (University of Copenhagen) (1)
10:00	High and Nuclear Physics Experiments: Neutrino Oscillation (1)	10:30	Colloquium	10:30	Registration (1st 10:30 (2))	10:30	Machine Learning: Service Portal (University of Liverpool) (1)	10:30	Dark Matter Halo Structure in Milky Way: Mads Spring (University of Copenhagen) (1)	10:30	Dark Matter Halo Structure in Milky Way: Mads Spring (University of Copenhagen) (1)
10:30	Bayesian inference (1st 10:30 (2))	11:00	Outstanding open problems: James T. Keenan (Lancaster University) (1)	11:00	Status of Big 20 in lattice QCD: Thomas Blum (University of Connecticut & FNANL) (1)	11:00	Colloquium	11:00	Bayesian inference from Lattice QCD: George Bell (University of Edinburgh) (1)	11:00	Bayesian inference from Lattice QCD: George Bell (University of Edinburgh) (1)
11:00	QFT for condensed matter: Juan Pablo University of Granada (1)	11:30	LHC results on CP violation: Agnese Avola (University of Padua, INFN) (1)	11:30	Hadronic vacuum polarization contributions to the muon magnetic moment from lattice QCD: Alessandro Lattanzi (CERN) (1)	11:30	Machine Learning: Service Portal (University of Liverpool) (1)	11:30	Dark Matter Halo Structure in Milky Way: Mads Spring (University of Copenhagen) (1)	11:30	Dark Matter Halo Structure in Milky Way: Mads Spring (University of Copenhagen) (1)
11:30	Machine learning for dark matter: Boris Meißner (University of Bamberg) (1)	12:00	Proton RM positions in BSM mixing and relations to BSM searches: Nicola Sarno (INFN) (1)	12:00	Search for Dark Matter: Dark Matter (1)	12:00	Machine Learning: Service Portal (University of Liverpool) (1)	12:00	Dark Matter Halo Structure in Milky Way: Mads Spring (University of Copenhagen) (1)	12:00	Dark Matter Halo Structure in Milky Way: Mads Spring (University of Copenhagen) (1)
12:00	New Neutrinos and New Physics: Wolfgang Rodejans (ICREA) (1)	12:30	CP violation: Steve Bhaumik (University of Liverpool) (1)	12:30	Search for Dark Matter: Dark Matter (1)	12:30	Machine Learning: Service Portal (University of Liverpool) (1)	12:30	Dark Matter Halo Structure in Milky Way: Mads Spring (University of Copenhagen) (1)	12:30	Dark Matter Halo Structure in Milky Way: Mads Spring (University of Copenhagen) (1)
12:30	Machine learning in new physics: Susana Wehrhoff (University of Liverpool) (1)	13:00	Colloquium	13:00	Search for Dark Matter: Dark Matter (1)	13:00	Machine Learning: Service Portal (University of Liverpool) (1)	13:00	Dark Matter Halo Structure in Milky Way: Mads Spring (University of Copenhagen) (1)	13:00	Dark Matter Halo Structure in Milky Way: Mads Spring (University of Copenhagen) (1)
13:00	Plenary lunch (10:30)	13:30	Registration (1st 10:30 (2))	13:30	Machine Learning: Service Portal (University of Liverpool) (1)	13:30	Machine Learning: Service Portal (University of Liverpool) (1)	13:30	Dark Matter Halo Structure in Milky Way: Mads Spring (University of Copenhagen) (1)	13:30	Dark Matter Halo Structure in Milky Way: Mads Spring (University of Copenhagen) (1)
14:00	Status and prospects of QFT measurements at LHC: Muel Van Leeuwen (University of Liverpool) (1)	14:30	The High Energy Scale: New energy phenomena: Ulrich Acharya (University of Liverpool) (1)	14:30	Status and prospects of QFT measurements at LHC: Muel Van Leeuwen (University of Liverpool) (1)	14:30	The High Energy Scale: New energy phenomena: Ulrich Acharya (University of Liverpool) (1)	14:30	The High Energy Scale: New energy phenomena: Ulrich Acharya (University of Liverpool) (1)	14:30	The High Energy Scale: New energy phenomena: Ulrich Acharya (University of Liverpool) (1)
14:30	Flavor phenomenology of the QCD sector: Robert Ziegler (INFN) (1)	15:00	Utilization and measurement in WW scattering at the LHC: Domenico Bortone (University of Birmingham) (1)	15:00	Flavor phenomenology of the QCD sector: Robert Ziegler (INFN) (1)	15:00	Utilization and measurement in WW scattering at the LHC: Domenico Bortone (University of Birmingham) (1)	15:00	Utilization and measurement in WW scattering at the LHC: Domenico Bortone (University of Birmingham) (1)	15:00	Utilization and measurement in WW scattering at the LHC: Domenico Bortone (University of Birmingham) (1)
15:00	Dark Matter and Dark Energy: Dark Matter (1)	15:30	Comptonization and Physics Beyond the Standard Model: George Panagiotou (University of Liverpool) (1)	15:30	Dark Matter and Dark Energy: Dark Matter (1)	15:30	Comptonization and Physics Beyond the Standard Model: George Panagiotou (University of Liverpool) (1)	15:30	Comptonization and Physics Beyond the Standard Model: George Panagiotou (University of Liverpool) (1)	15:30	Comptonization and Physics Beyond the Standard Model: George Panagiotou (University of Liverpool) (1)
15:30	Plenary lunch (10:30)	16:00	Registration (1st 10:30 (2))	16:00	Machine Learning: Service Portal (University of Liverpool) (1)	16:00	Machine Learning: Service Portal (University of Liverpool) (1)	16:00	Machine Learning: Service Portal (University of Liverpool) (1)	16:00	Machine Learning: Service Portal (University of Liverpool) (1)
16:00	QED corrections to muon g-2: Christoph Bobeth (Technical University of Munich) (1)	16:30	Living in the dark: Dark Matter (1)	16:30	QED corrections to muon g-2: Christoph Bobeth (Technical University of Munich) (1)	16:30	Living in the dark: Dark Matter (1)	16:30	QED corrections to muon g-2: Christoph Bobeth (Technical University of Munich) (1)	16:30	QED corrections to muon g-2: Christoph Bobeth (Technical University of Munich) (1)
16:30	Dark Matter and Dark Energy: Dark Matter (1)	17:00	Dark Matter and Dark Energy: Dark Matter (1)	17:00	Dark Matter and Dark Energy: Dark Matter (1)	17:00	Dark Matter and Dark Energy: Dark Matter (1)	17:00	Dark Matter and Dark Energy: Dark Matter (1)	17:00	Dark Matter and Dark Energy: Dark Matter (1)
17:00	Dark Matter and Dark Energy: Dark Matter (1)	17:30	Dark Matter and Dark Energy: Dark Matter (1)	17:30	Dark Matter and Dark Energy: Dark Matter (1)	17:30	Dark Matter and Dark Energy: Dark Matter (1)	17:30	Dark Matter and Dark Energy: Dark Matter (1)	17:30	Dark Matter and Dark Energy: Dark Matter (1)
17:30	Dark Matter and Dark Energy: Dark Matter (1)	18:00	Dark Matter and Dark Energy: Dark Matter (1)	18:00	Dark Matter and Dark Energy: Dark Matter (1)	18:00	Dark Matter and Dark Energy: Dark Matter (1)	18:00	Dark Matter and Dark Energy: Dark Matter (1)	18:00	Dark Matter and Dark Energy: Dark Matter (1)
18:00	Dark Matter and Dark Energy: Dark Matter (1)	18:30	Dark Matter and Dark Energy: Dark Matter (1)	18:30	Dark Matter and Dark Energy: Dark Matter (1)	18:30	Dark Matter and Dark Energy: Dark Matter (1)	18:30	Dark Matter and Dark Energy: Dark Matter (1)	18:30	Dark Matter and Dark Energy: Dark Matter (1)
18:30	Dark Matter and Dark Energy: Dark Matter (1)	19:00	Dark Matter and Dark Energy: Dark Matter (1)	19:00	Dark Matter and Dark Energy: Dark Matter (1)	19:00	Dark Matter and Dark Energy: Dark Matter (1)	19:00	Dark Matter and Dark Energy: Dark Matter (1)	19:00	Dark Matter and Dark Energy: Dark Matter (1)
19:00	Dark Matter and Dark Energy: Dark Matter (1)	19:30	Dark Matter and Dark Energy: Dark Matter (1)	19:30	Dark Matter and Dark Energy: Dark Matter (1)	19:30	Dark Matter and Dark Energy: Dark Matter (1)	19:30	Dark Matter and Dark Energy: Dark Matter (1)	19:30	Dark Matter and Dark Energy: Dark Matter (1)
19:30	Dark Matter and Dark Energy: Dark Matter (1)	20:00	Dark Matter and Dark Energy: Dark Matter (1)	20:00	Dark Matter and Dark Energy: Dark Matter (1)	20:00	Dark Matter and Dark Energy: Dark Matter (1)	20:00	Dark Matter and Dark Energy: Dark Matter (1)	20:00	Dark Matter and Dark Energy: Dark Matter (1)
20:00	Dark Matter and Dark Energy: Dark Matter (1)	20:30	Dark Matter and Dark Energy: Dark Matter (1)	20:30	Dark Matter and Dark Energy: Dark Matter (1)	20:30	Dark Matter and Dark Energy: Dark Matter (1)	20:30	Dark Matter and Dark Energy: Dark Matter (1)	20:30	Dark Matter and Dark Energy: Dark Matter (1)
20:30	Dark Matter and Dark Energy: Dark Matter (1)	21:00	Dark Matter and Dark Energy: Dark Matter (1)	21:00	Dark Matter and Dark Energy: Dark Matter (1)	21:00	Dark Matter and Dark Energy: Dark Matter (1)	21:00	Dark Matter and Dark Energy: Dark Matter (1)	21:00	Dark Matter and Dark Energy: Dark Matter (1)
21:00	Dark Matter and Dark Energy: Dark Matter (1)	21:30	Dark Matter and Dark Energy: Dark Matter (1)	21:30	Dark Matter and Dark Energy: Dark Matter (1)	21:30	Dark Matter and Dark Energy: Dark Matter (1)	21:30	Dark Matter and Dark Energy: Dark Matter (1)	21:30	Dark Matter and Dark Energy: Dark Matter (1)
21:30	Dark Matter and Dark Energy: Dark Matter (1)	22:00	Dark Matter and Dark Energy: Dark Matter (1)	22:00	Dark Matter and Dark Energy: Dark Matter (1)	22:00	Dark Matter and Dark Energy: Dark Matter (1)	22:00	Dark Matter and Dark Energy: Dark Matter (1)	22:00	Dark Matter and Dark Energy: Dark Matter (1)
22:00	Dark Matter and Dark Energy: Dark Matter (1)	22:30	Dark Matter and Dark Energy: Dark Matter (1)	22:30	Dark Matter and Dark Energy: Dark Matter (1)	22:30	Dark Matter and Dark Energy: Dark Matter (1)	22:30	Dark Matter and Dark Energy: Dark Matter (1)	22:30	Dark Matter and Dark Energy: Dark Matter (1)
22:30	Dark Matter and Dark Energy: Dark Matter (1)	23:00	Dark Matter and Dark Energy: Dark Matter (1)	23:00	Dark Matter and Dark Energy: Dark Matter (1)	23:00	Dark Matter and Dark Energy: Dark Matter (1)	23:00	Dark Matter and Dark Energy: Dark Matter (1)	23:00	Dark Matter and Dark Energy: Dark Matter (1)
23:00	Dark Matter and Dark Energy: Dark Matter (1)	23:30	Dark Matter and Dark Energy: Dark Matter (1)	23:30	Dark Matter and Dark Energy: Dark Matter (1)	23:30	Dark Matter and Dark Energy: Dark Matter (1)	23:30	Dark Matter and Dark Energy: Dark Matter (1)	23:30	Dark Matter and Dark Energy: Dark Matter (1)
23:30	Dark Matter and Dark Energy: Dark Matter (1)	24:00	Dark Matter and Dark Energy: Dark Matter (1)	24:00	Dark Matter and Dark Energy: Dark Matter (1)	24:00	Dark Matter and Dark Energy: Dark Matter (1)	24:00	Dark Matter and Dark Energy: Dark Matter (1)	24:00	Dark Matter and Dark Energy: Dark Matter (1)

Please, keep length of your talks in check!

- Longer talks: **25'+5'**
- Regular talks: **20'+5'**
- Student talks: **12'+3'**

Future of the meeting

- **First meeting organized in 2016**
- Next year organized in Crete by **Vladimir Pascalutsa (JGU-Mainz)**
(more weight on Hadron physics)

**3rd workshop on
Hadronic contributions to New Physics Searches
(HC₂NP 2020)**



Crete, September 24—30, 2020

- In 2021 **maybe** back to Tenerife (axions?...)

HC2NP 2019 organizing committees



Mattia Dallabrida



Jorge Martin Camalich

- **International Advisory Committee:** Andrzej Buras, Gilberto Colangelo, Ulrik Egede, Aida El-Khadra, Lisheng Geng, Paolo Gondolo, Benjamín Grinstein, Pilar Hernández, Marc Knecht, Mark Lancaster, Vladimir Pascalutsa, Antonio Pich, Chris Sachrajda, Marc Vanderhaeghen, Ross Young
- **Administrative support and funding from Instituto de Astrofísica de Canarias**

Welcome!

We hope you have a very fruitful stay in
Tenerife!