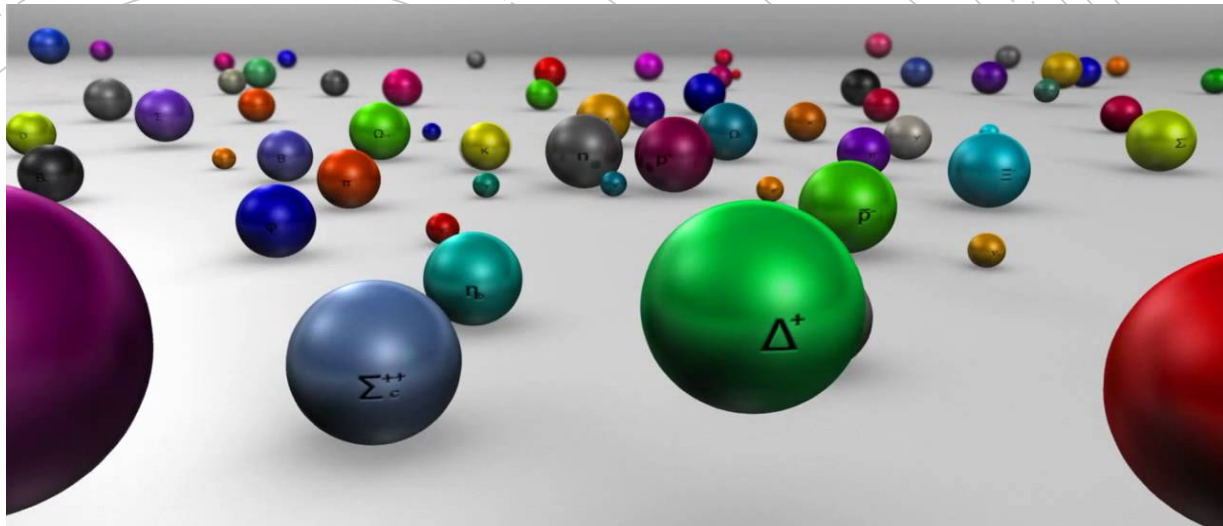


PARTICLE PHYSICS





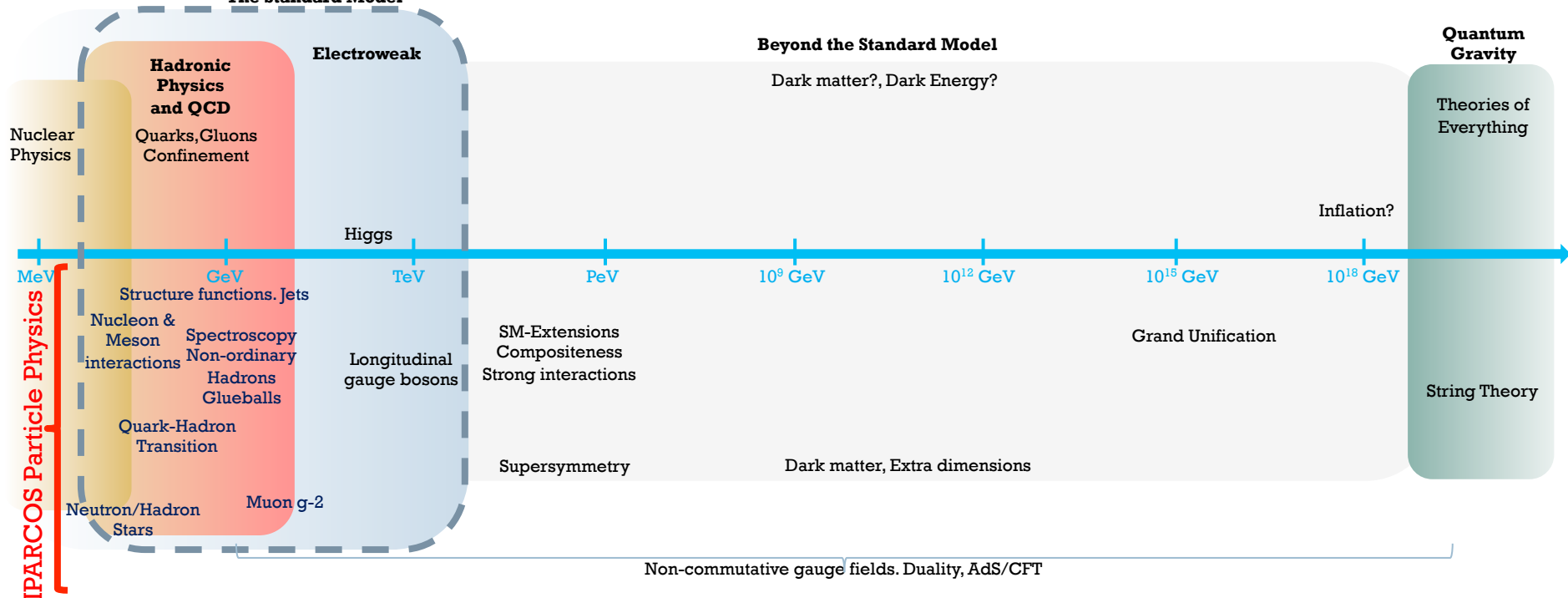
Our research covers the whole Particle Physics energy spectrum

IPARCOS

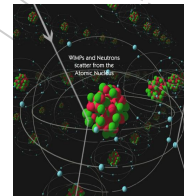
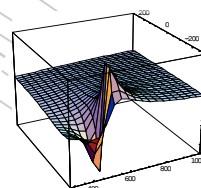
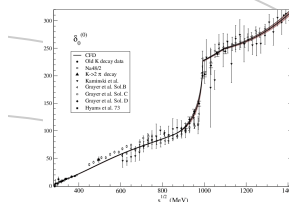
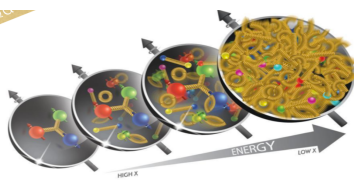
The Standard Model

Beyond the Standard Model

Quantum Gravity

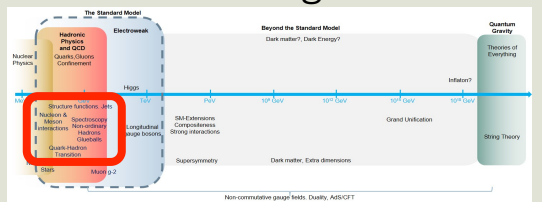


The Particle Physics group within IPARCOS cover both **phenomenological** and **formal** aspects.



FPA2016-75654-C2-2-P.

Hadron Physics and QCD: From low energies to LHC.



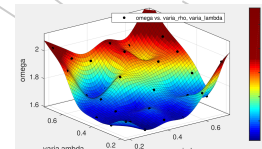
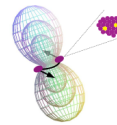
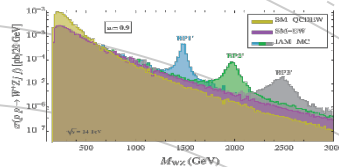
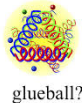
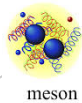
Research Lines: Mostly Phenomenology

- Interactions of Nucleons and Mesons
- Hadron Spectroscopy. Non-ordinary mesons.
- Quark-hadron phase transition. High temperature and density
- Nucleon Structure
- Tools: Effective Theories. Dispersion Theory
- Applications to experiments (LHC...).

Collaborations: Spanish Hadron Excellence Network, MIT Jlab, Indiana, Bonn, Bern, Pavia, Regensburg, NIKHEF, Los Alamos, Colombia

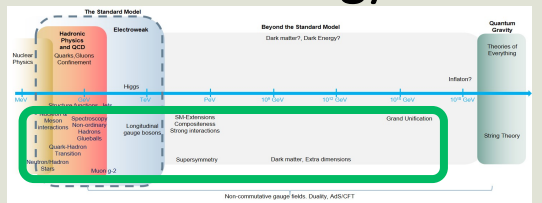
Members

- Profs:** A. Gómez Nicola, J.R. Peláez (IP), I. Scimemi (IP).
- Postdocs:** J.M. Alarcón. Soon: R. Molina, V. Matthieu (All Talento Program CAM).
- PhD:** D. Gutiérrez (UCM), S. Leal, A. Rodas (UCM), A. Vioque.



FPA2016-75654-C2-1-P.

Effective Theories in Particle Physics and Cosmology



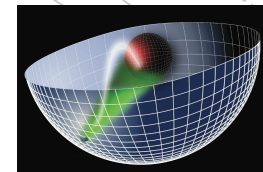
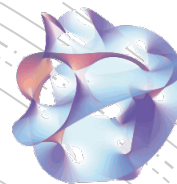
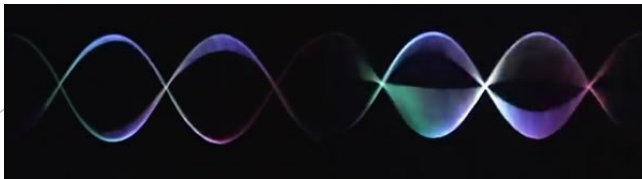
Research Lines: Mostly Phenomenology

- Higgs Nature. Standard Model Extensions
- Glueballs and non-ordinary hadrons
- Quiral Quark Model. Grand Unified Models
- Neutron Stars, Hadrons at finite density. Equations of State
- Theory Tools: Effective Theories (ChPT, Electroweak EFT). MonteCarlo Simulations for LHC detection. Unitarization

Collaborations: Cost action CA16108 (VBScan). Spanish Hadron Excellence Network, CERN, Cape Town,

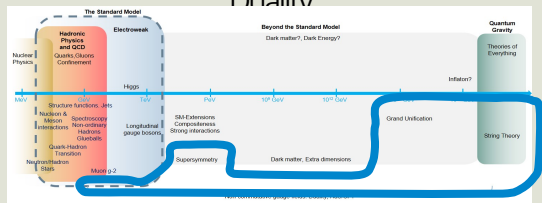
Members

- Prof.: A. Dobado (IP), F.J. Llanes Estrada (IP), J.J. Sanz Cillero
- Visiting Postdoc.: A. Guevara (Conacyt-Mexico),
- PhD: C.A. Quesada (FPI), A. Casado, A. Salas, E. Lope



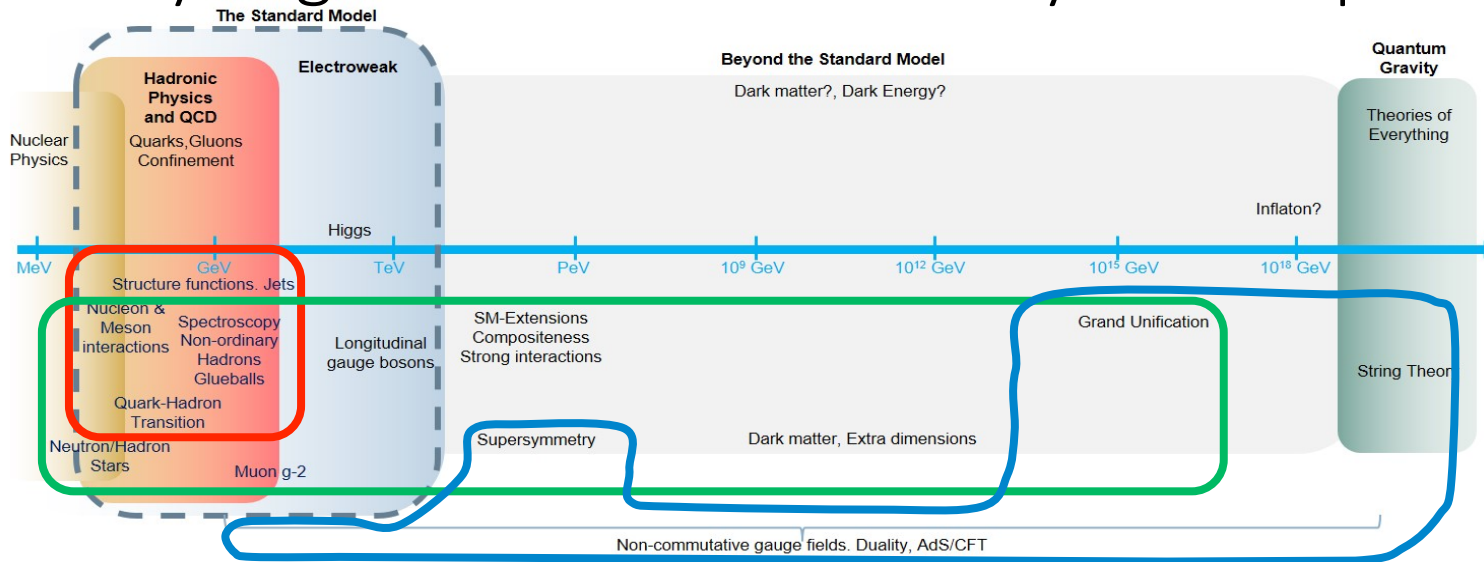
Non-Commutative Fields and Strings:

Scattering Amplitudes and Gauge/Gravity Duality



- **Research Lines: Mostly Formal**
 - String Theory and Supersymmetric Quantum Field Theories
 - Non Commutative Gauge Fields
 - Duality, Integrability and AdS/CFT correspondence
 - Grand Unified Theories
- **Collaborations: EU COST ACTION MP1405**
- **Members in IPARCOS:** from FPA2014-54154-P & UCM group “Campos y Cuerdas”
 - Profs: C. P. Martín (IP), R. Hernández
 - Postdoc. J.M.Nieto
 - PhD: R. Ruiz Gil

Synergies within the Particle Physics Groups



- □ □ Are **already coordinated** research grants:
 - Common Computational cluster
 - Common Journal Club
 - Joint organization of Conferences & Workshops: Hadron2017, QCHSX, QND06, XLVII International Meeting on Fundamental Physics (2018), etc...
 - Same UCM Research Group: “Effective Theories in Particle Physics **and Cosmology**”



IPARCOS

Nuclear
Physics

MeV

The Standard Model

**Hadronic
Physics
and QCD**
Quarks, Gluons
Confinement

Electroweak

GeV

Higgs

TeV

Structure functions. Jets

Nucleon &
Meson
interactions

Spectroscopy
Non-ordinary
Hadrons
Glueballs

Longitudinal
gauge bosons

Quark-Hadron
Transition

Neutron/Hadron
Stars

Muon $g-2$

SM-Extensions
Compositeness
Strong interactions

Supersymmetry

PeV

10^9 GeV

10^{12} GeV

Grand Unification

10^{15} GeV

Inflaton?

10^{18} GeV

Beyond the Standard Model

Dark matter?, Dark Energy?

**Quantum
Gravity**

Theories of
Everything

String Theory

Dark matter, Extra dimensions

Non-commutative gauge fields. Duality, AdS/CFT

Astrophysics

Nuclear Physics

Cosmology

Synergies with other IPARCOS lines

7

Promising prospects of future collaborations within IPARCOS