ACTIVIDADES IFIC-TEO 2013
UNIVERSITAT DE VALÈNCIA & CSIC

Juan M Nieves

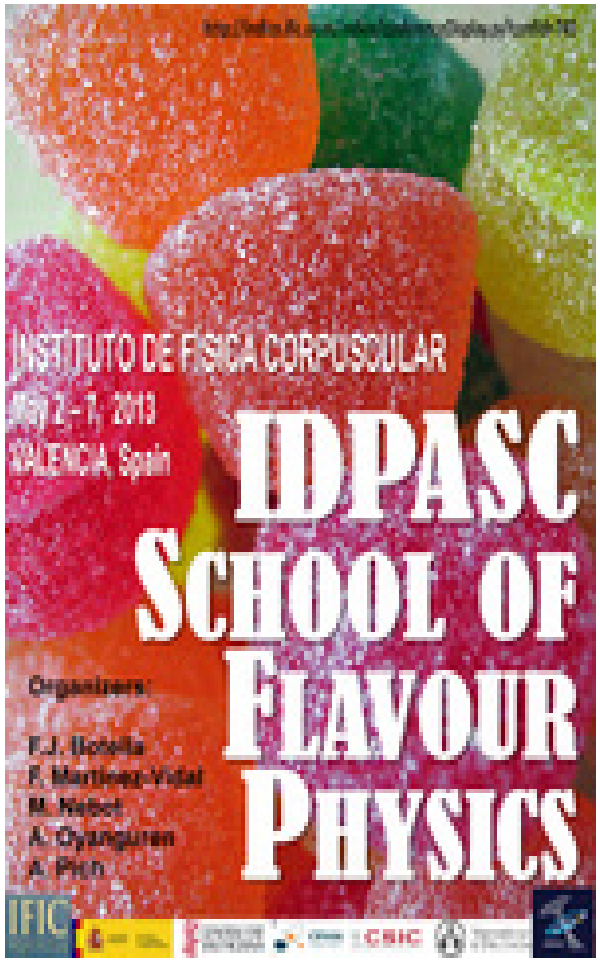
20 Dic 2013

- José Adolfo de Azcárraga Feliu: Presidente de la RSEF
- Miguel Angel Sanchis Lozano: Vicepresidente de la RSEF
- Albert Aparici Benages: Premio Opinion Innovadora organizado por la UV y el diario Las Provincias
- Gonzalo J. Olmo: group of Outstanding Referees of the Physical Review and Physical Review Letters journals (2013)
- Jorge Martín Camalich: Premio Extraordinário Doctorado 2013 (la tesis doctoral también fue premiada por la división nuclear de la EPS en el área de física nuclear y teórica)
- Andrea Donini: Se ha incorporado definitivamente en la RPT del IFIC

• DFT ha participado activamente en el Programa de Seminarios (IVICFA) & Colloquia del IFIC

• Participado en la organización de:


XXXIV
REUNIÓN BIENAL DE LA
REAL SOCIEDAD
ESPAÑOLA DE FÍSICA
R.S.E.F.
VNIVERSITAT DE VALÈNCIA
UNITAT D'IGUALTAT
VNIVERSITAT DE VALÈNCIA
GENERALITAT VALENCIANA
CONSELLERIA D'EDUCACIÓ, CULTURA I ESPORT
VALENCIA, del 15 al 19 de julio de 2013
Patrocinadores:
CPAN
Ingenio 2010
Sidilab
100 YEARS PHYWE
VLC/CAMPUS
VALENCIA, INTERNATIONAL CAMPUS OF EXCELLENCE
3B Scientific
A worldwide group of companies
oerlikon
leybold vacuum
23.º ENCUENTRO IBERICO PARA LA ENSEÑANZA DE LA FÍSICA


INSTITUTO DE FÍSICA CORPUSCULAR
May 2 – 7, 2013
VALENCIA, Spain
IDPASC
SCHOOL OF
FLAVOUR
PHYSICS
Organizers:
F.J. Botella
F. Martínez Vidal
M. Nebot
A. Oyanguren
A. Pich
IFIC
CSIC


CosmoRENATA 2013
Cosmology Conference


NSTAR 2013 Workshop

PROJECT FPA2011-23897

Estudios perturbativos y no perturbativos del modelo estándar y sus extensiones

Local members of the project:

- Vicent Giménez Gómez (IP)
- Arcadi Santamaría Luna
- Armando Pérez Cañellas
- Jorge Vidal Perona
- Nuria Carrasco (Postdoc INFN Roma III)
- Alberto Aparici (PhD December 2013)
- Margarida Hinarejos (Prometeo contract)

PROJECT FPA2011-23897

Estudios perturbativos y no perturbativos del modelo estándar y sus extensiones

External researchers of the project:

- Stefano Bertolini (INFN SISSA)
- José Wudka (U. California, Riverside)
- Gabriel González-Sprinberg (U. de la Republica, Uruguay)
- Alejandro Romanelli (U. de la Republica,Uruguay)
- Mari Carmen Bañuls (Max-Planck-Ins. für Quantenoptik)
- Vittorio Lubicz (U. di Roma III)
- Silvano Simula (INFN-Roma III)
- Federico Mescia (U. de Barcelona)
- Roberto Frezzotti (U. di Roma II)
- David Palao (U. Frankfurt)

PROMETEO 2009-128

ValènciaPLQ
Particles, Lattices and Qbits

Estudios perturbativos y no perturbativos del modelo estándar y sus extensiones

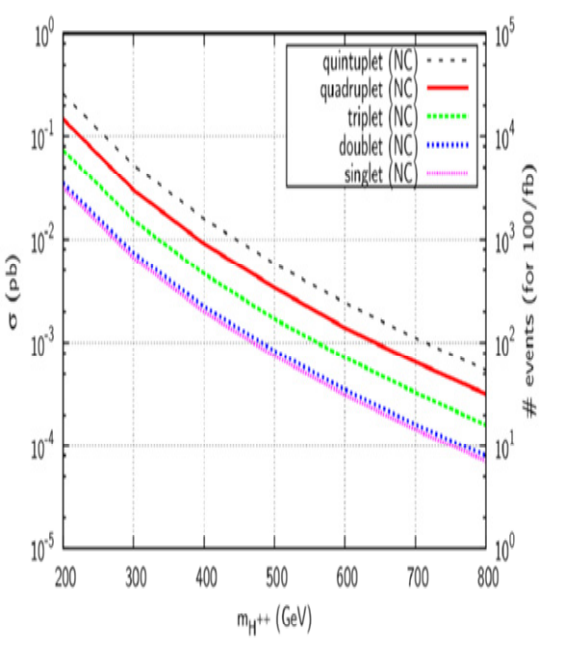
Members of the project:

- Arcadi Santamaría Luna (IP)
- Vicent Giménez Gómez
- Armando Pérez Cañellas
- Jorge Vidal Perona

Doubly charged scalars at LHC

A. Santamaria

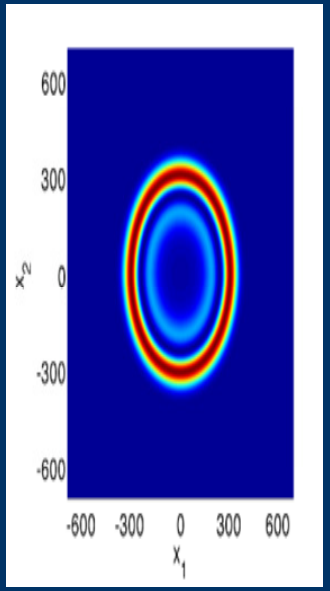
Doubly charged scalars can be produced and detected at LHC
They can belong to different multiplets.
Can one discriminate them at the LHC?
F. del Aguila, M. Chala, AS, J. Wudka, Phys.Lett. B725 (2013) 310-315



Quantum Walks

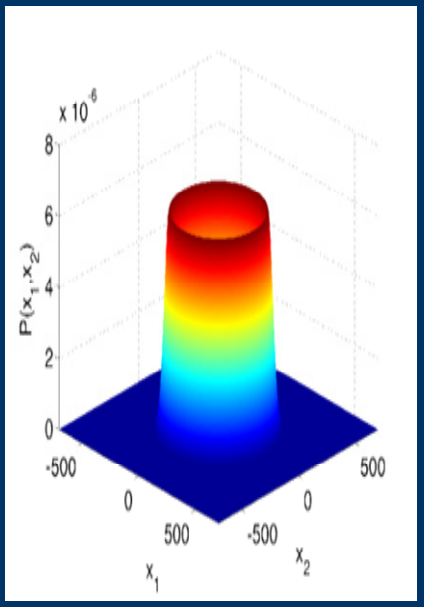
M. Hinarejos and A. Perez

Quantum walks in 2D and 3D
New J. Phys. 15 073041 (2013)

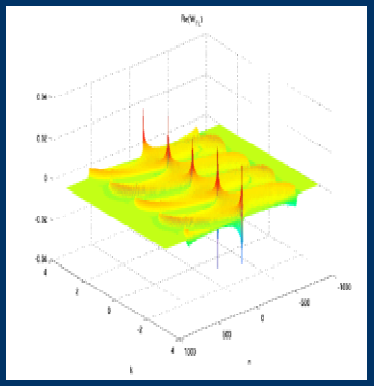


Wigner function representation of the Quantum Walk

Journal of Computational and Theoretical Nanoscience
Vol. 10, 1–8, 2013



A quantum walk showing Poggendorff Rings due to a conical dispersion relation (as in graphene)



Kaon mixing beyond the SM from Nf=2 tmQCD and model independent constraints from the UTA

N. Carrasco and V. Giménez

First unquenched, continuum limit, LQCD results for the ΔS=2 weak Hamiltonian matrix elements describing neutral kaon oscillations in extensions of the SM. Owing to the accuracy of our calculation, we are able to provide a refined UT analysis improving the bounds coming from model independent constraints on New Physics.

JHEP 03 (2013) 089, arXiv:1207.1287 [hep-lat].

Exemples of NP models:

Warped five-dimensional extensions: Randall-Sundrum scenario.
The mass of the Kaluza-Klein excitation of the gluon is (95% c.l.) **M > 43 TeV**

Gauge-Higgs unification (GHU) models. **M > 65 TeV**

B-physics from Nf=2 tmQCD: the Standard Model and beyond

N. Carrasco and V. Giménez

Unquenched Nf=2, continuum limit, LQCD computations of the b-quark mass, the B and Bs decay constants and the B-mixing bag parameters for the ΔB=2 weak Hamiltonian matrix elements describing neutral B-meson oscillations in the SM and beyond. We simulate four values of the lattice spacing with pion masses ranging from 280 to 500 MeV. Extrapolation from the charm to the bottom quark region has been carried out on ratios of physical quantities that have an exactly known infinite mass limit.

arXiv:1308.1851 [hep-lat].

Results:

mb(mb,MS)=4.29(12) GeV

fBs=228(8) MeV	fB=189(8) MeV	fBs/fB =1.206(24)
fDs=250(7) MeV	fD=208(7) MeV	fDs/fD =1.201(21)
ξ =1.225(31)	fBd √B1=216(10)	fBs √B1=262(10)

By using our results for the bag parameters we are able to provide a refined UTA improving the bounds coming from B(s) – B mixing constraints on New Physics.

ASTROPARTICLES

Astroparticles and High Energy Physics Group

FPA2011-22975

J. W. F. Valle, M. Hirsch, S. Pastor, R.Lineros, M. Tórtola, F. A. Pereira dos Santos, R. Fonseca, L. Reichert*, V. de Romeri*, S. Boucenna, C. Arbeláez, D. Vanegas, L. Dorame, J. Palacio, C. Bonilla

External: Romao, Kovalenko, Porod, Miele, Magro, Semikoz, Éboli, Raffelt, Pisanti, Nunokawa, de Campos, Miranda, Lesgourgues, Fornengo, Bartl

MULTIDARK CSD2009-00064

EU network UNILHC PITN-GA-2009-237920 2009-2013

GENERALITAT VALENCIANA

PROMETEO/2009/091

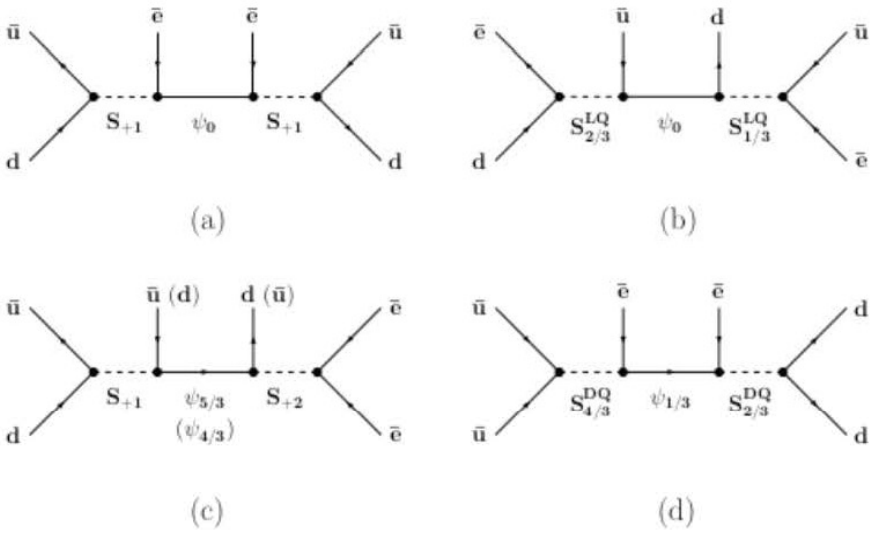
21 publications + 6 Auger

1 PhD + 1 Master Thesis

Organization of Workshop on DM tools and Hands-on Fermi Data Analysis. April 2013

LNV @ LHC

ASTROPARTICLES
Astroparticles and High Energy Physics Group

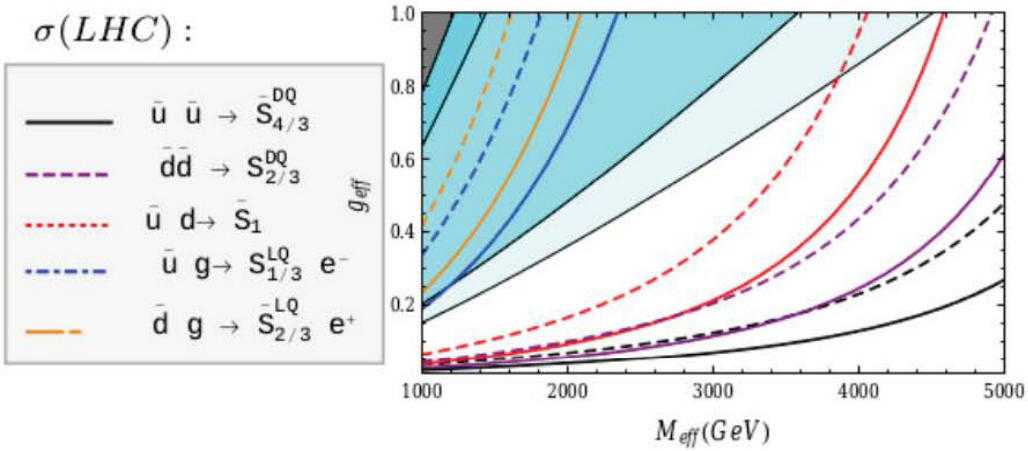


Violación de numero leptonico:
Comparación $0\nu\beta\beta$ con LHC

J.C. Helo et al.
PRD **D88**

$0\nu\beta\beta$:
cyan $\Rightarrow$
$T_{1/2}^{0\nu\beta\beta} \geq 10^{27}$ y

$\sigma(LHC)$:



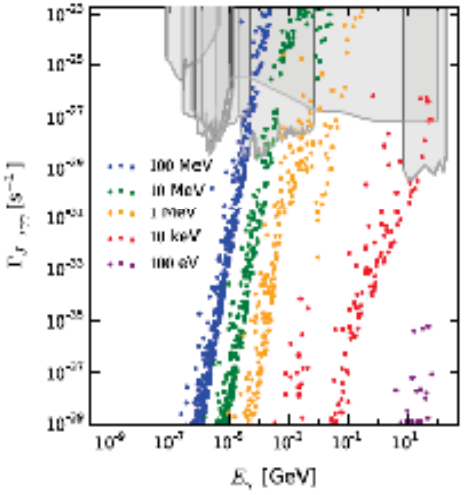
ASTROPARTICLES
Astroparticles and High Energy Physics Group

DARK MATTER

Majoron dark matter

Lattanzi et al, PRD88 (2013)

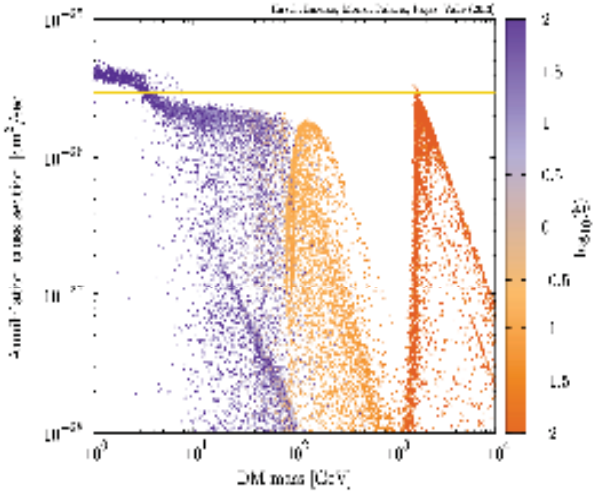
$$\Gamma_{J\to\gamma\gamma} = \frac{\alpha^2 m_J^3}{64\pi^3}\left|\sum_f N_f Q_f^2 \frac{2v_3^2}{v_2^2 v_1}(-2T_3^f)\frac{m_f^2}{12m_f^2}\right|^2,$$



Monoenergetic emission line detectable in X and gamma rays observatories

WIMP DM and neutrino mass

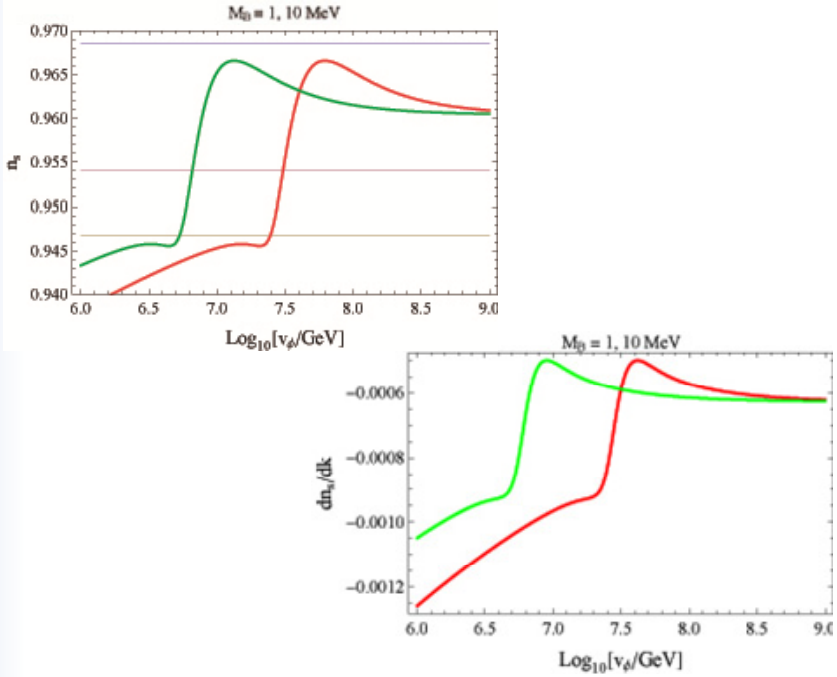
Hirsch et al. JHEP 1310 (2013) 149



WIMP DM can participate in the neutrino mass generation at one loop

PROMETEO

Coleman-Weinberg Inflation in light of Planck



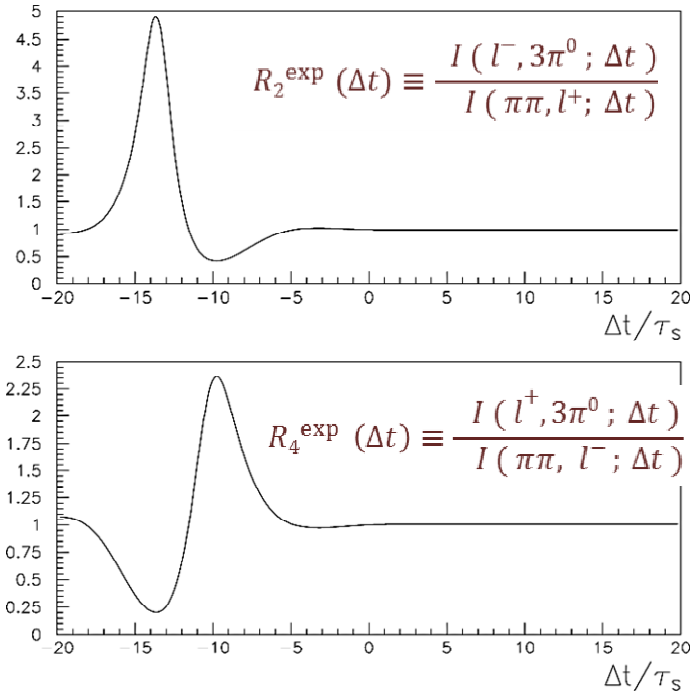
The spectral index and its running are shown in terms of the brane scale for (two) fixed symmetry breaking scales in each panel. The upper two horizontal lines in the first panel shows index spectral within the 1(2) sigma range of the Planck data .

G. Barenboim, E. J. Chung, H. M. Lee,
arXiv: 1309.1695 [hep-ph], PLB (2013)

Beyond the discovery with B-Bbar : "Direct test of T in the entangled K-Kbar at a phi-factory"

The conceptual basis includes the quantum properties

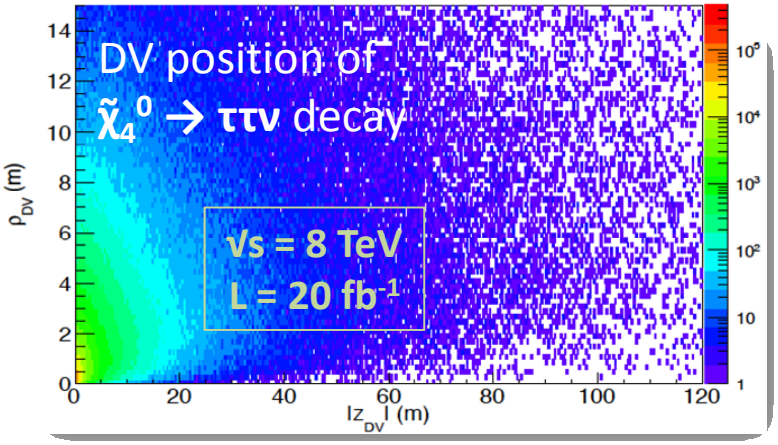
- Entanglement of K-Kbar until the first decay.
- The two decays as filtering measurements.



J. Bernabeu, A. Di Domenico, **P. Villanueva-Perez**,
Nuclear Physics B 868 (2013) 102-119

μνSS and displaced vertices @ LHC

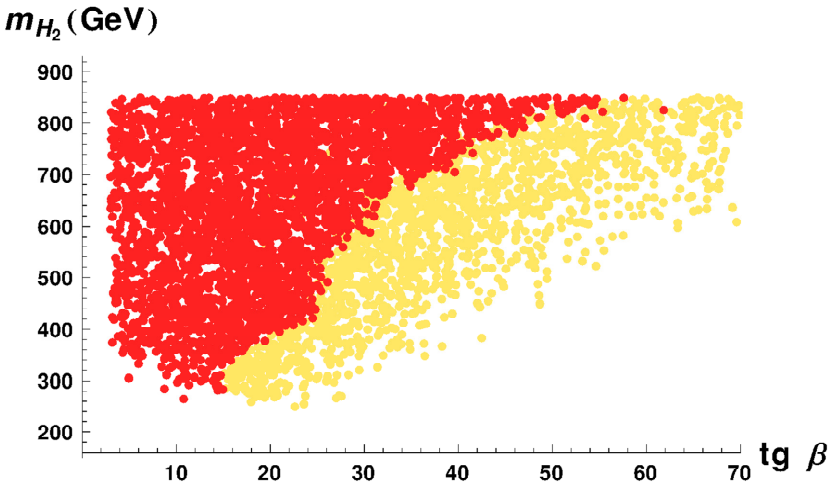
- μ-from-ν Supersymmetric SM
  - R-parity breaking terms
  - → **neutrino masses**
  - → enlarged Higgs sector → **125-GeV Higgs**
- Very rich phenomenology @ LHC
  - long neutralino lifetimes → **displaced vertices (DV)**
  - many leptons/taus → **multileptons**



Ghosh, López-Fogliani, **Mitsou**, Muñoz, **Ruiz de Austri**, **Phys. Rev. D88 (2013) 015009**

Improved τ-weapons for Higgs Hunting

Allowed Higgs masses in the plane (tan β, M_{H2}) taking into account the diphoton signal strength, b—› s γ and ττ constraints.



G. Barenboim, C. Bosch, M.L. Lopez-Ibanez, O. Vives, JHEP 1311 (2013) 051 and arXiv:1311.7321

LHCPHENO

FPA2011-23778

PrometeoII

2013/007

CPAN Ingenio 2010

LHCphenOnet

FP7

A. Pich, F. Campanario, G. Chachamis, M. Deak, L. Hosekova, J. Lu, A. Maiezza, I. Malamos, V. Mateu, J. Portolés, G. Rodrigo, I. Rosell, P. Ruiz-Femenía, G. Sborlini

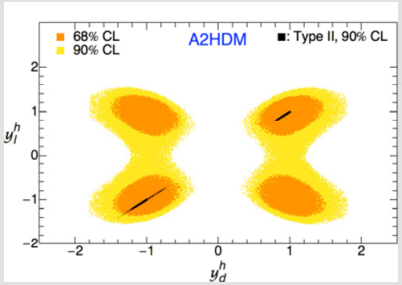
Doctorandos: S. Buchta, A. Celis, J. Fuentes, V. Ilisie, A. Lami, J. Santos, M. Zahiri Abyaneh

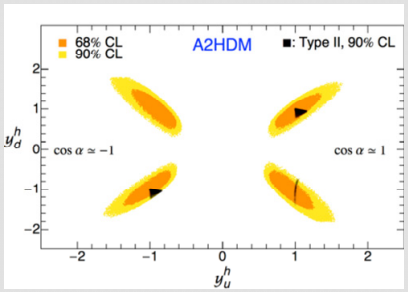
▪ Phenomenology of Electroweak Processes: Effective Field Theories, Flavour Physics

A. Celis, V. Ilisie, A. Pich

I. LHC constraints on two-Higgs doublet models, JHEP 1307 (2013) 053

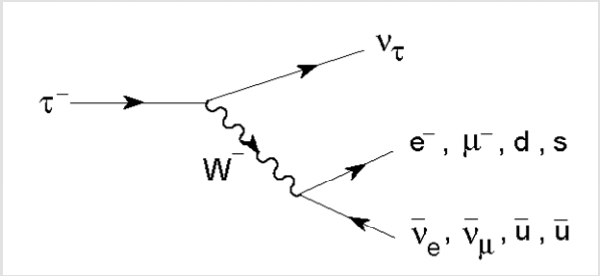
II. Towards a general analysis of LHC data within two-Higgs-doublet models, arXiv1310.7941 (Accepted in JHEP)





A. Pich

Precision Tau Physics, arXiv:1310.7922 (Required by Prog.Part.Nucl.Phys.)

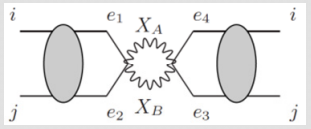


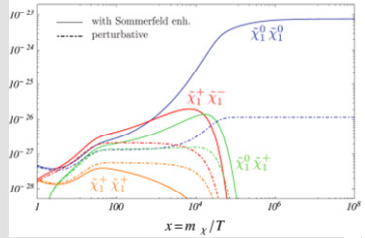
M. Beneke, C. Hellmann, P. Ruiz-Femenía

Non-relativistic pair annihilation of neutralinos and charginos

I. General framework and S-wave annihilation, JHEP 1303 (2013) 148

II. P-wave and next-to-next-to-leading order S-wave coefficients, JHEP 1308 (2013) 084

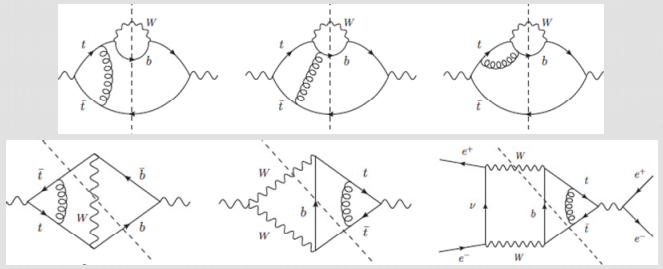




B. Jantzen, P. Ruiz-Femenía

NNLO non-resonant corrections to threshold top-pair production,

PRD 88 (2013) 054011



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FPA2011-23778

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CPAN Ingenio 2010

LHCphenOnet

FP7

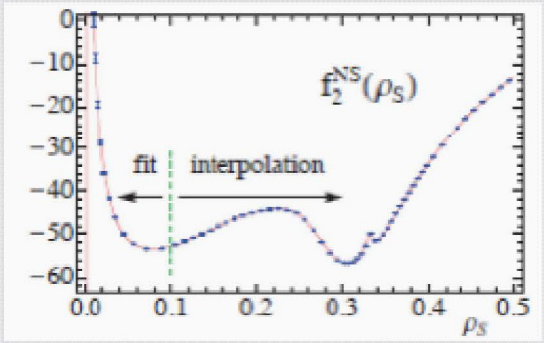
A. Pich, F. Campanario, G. Chachamis, M. Deak, L. Hosekova, J. Lu, A. Maiezza, I. Malamos, V. Mateu, J. Portolés, G. Rodrigo, I. Rosell, P. Ruiz-Femenía, G. Sborlini

Doctorandos: S. Buchta, A. Celis, J. Fuentes, V. Ilisie, A. Lami, J. Santos, M. Zahiri Abyaneh

▪ Phenomenology of Quantum Field Theories: Perturbative QCD

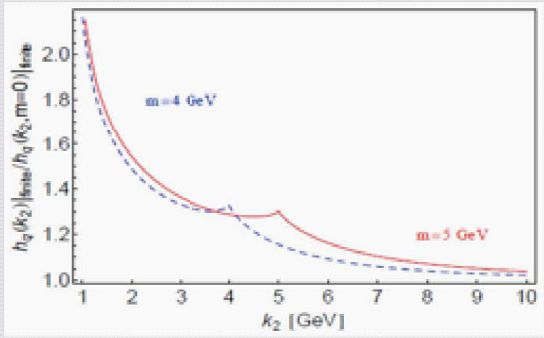
V. Mateu, G. Rodrigo,
JHEP 1311 (2013) 030

Oriented event shapes at N³LL + O (α_S^2)



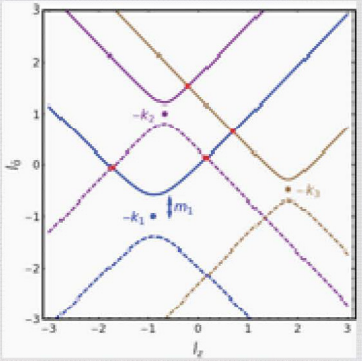
M. Deak, G. Chachamis, G. Rodrigo,
JHEP arXiv:1310.6611

Heavy quark impact factor in kT-factorization



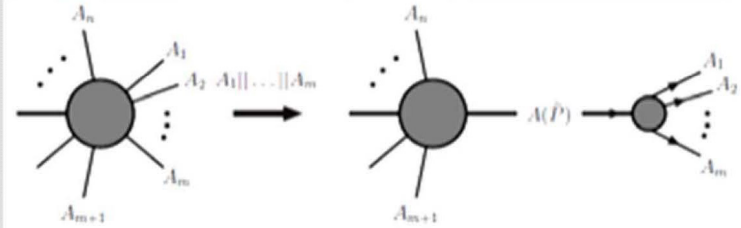
S. Buchta, G. Chachamis, I. Malamos, G. Rodrigo, in preparation

Loop singularities in the loop-tree duality theorem are restricted to a **finite region** of the loop momentum space



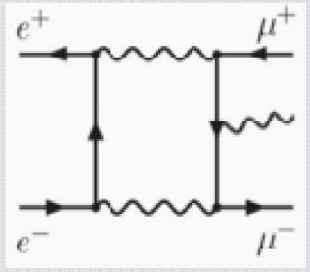
G. Sborlini, D. de Florian, G. Rodrigo,
JHEP arXiv:1310.6841

Double collinear splitting amplitudes at NLO



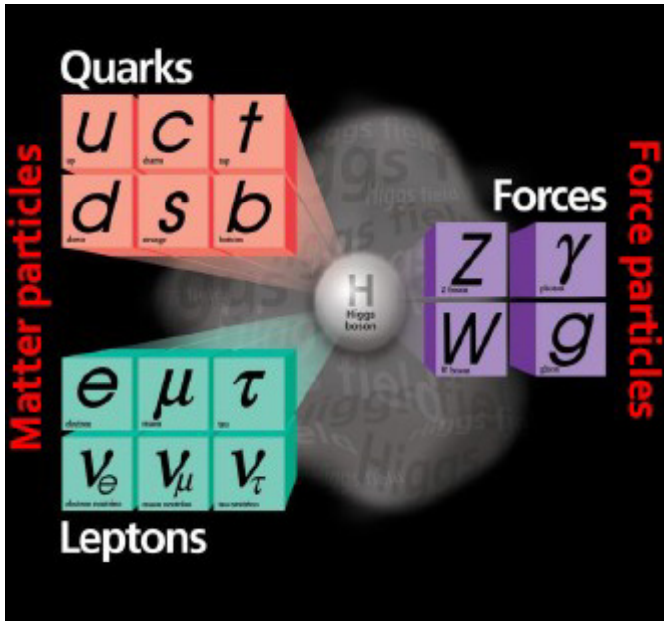
F. Campanario, H. Czyz, J. Gluza, M.Gunia,
T. Riemann, G. Rodrigo, V. Yundin, arXiv:1312.3610

QED NLO contributions to the reaction $e^+e^- \longrightarrow \mu^+\mu^-\gamma$ and their implementation in the event generator PHOKHARA



Hadron Physics and Fundamental Interactions 2013

Pedro González, Santiago Noguera, Alexandr Pimikov, Vicente Vento and Javier Vijande.

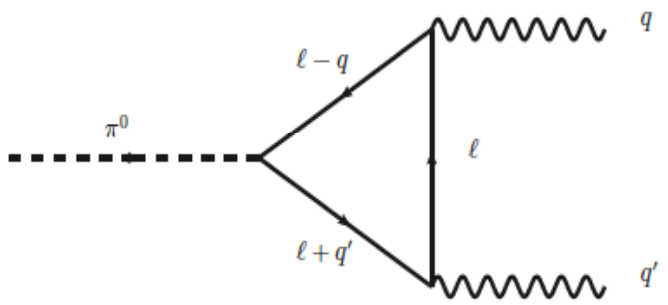


The project has two fundamental lines of research: **hadrons**

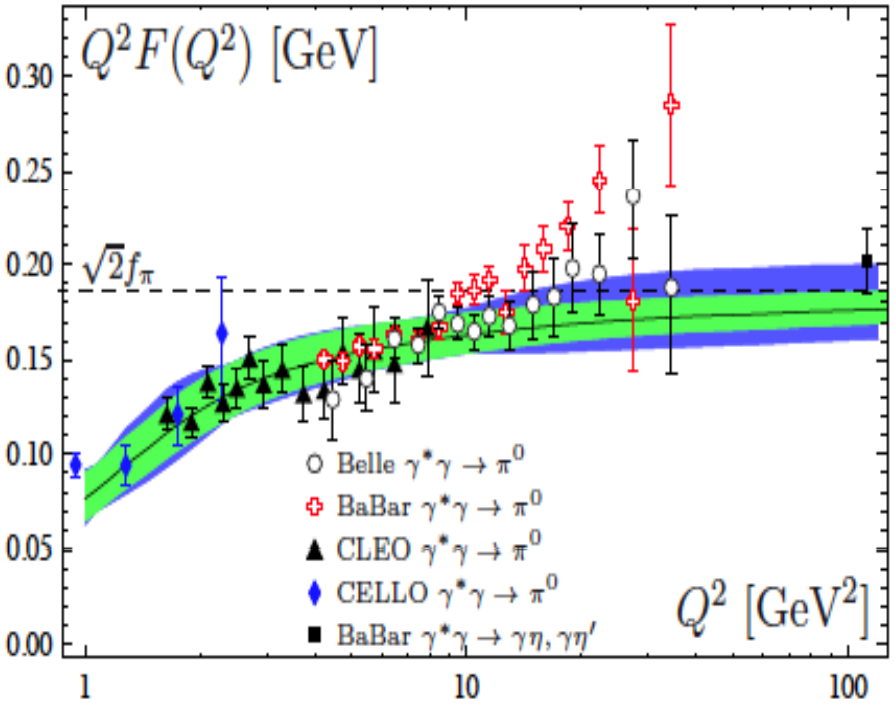
i) hadron structure, specially for those hadrons associated with heavy quarks: charm and bottom; ii) the structure and phenomenology of exotic hadrons, multiquarks and glueballs; iii) deep inelastic scattering properties of nucleons and mesons; iv) nuclear interaction inside a medium; v) the behavior of hadrons at high temperatures and densities.

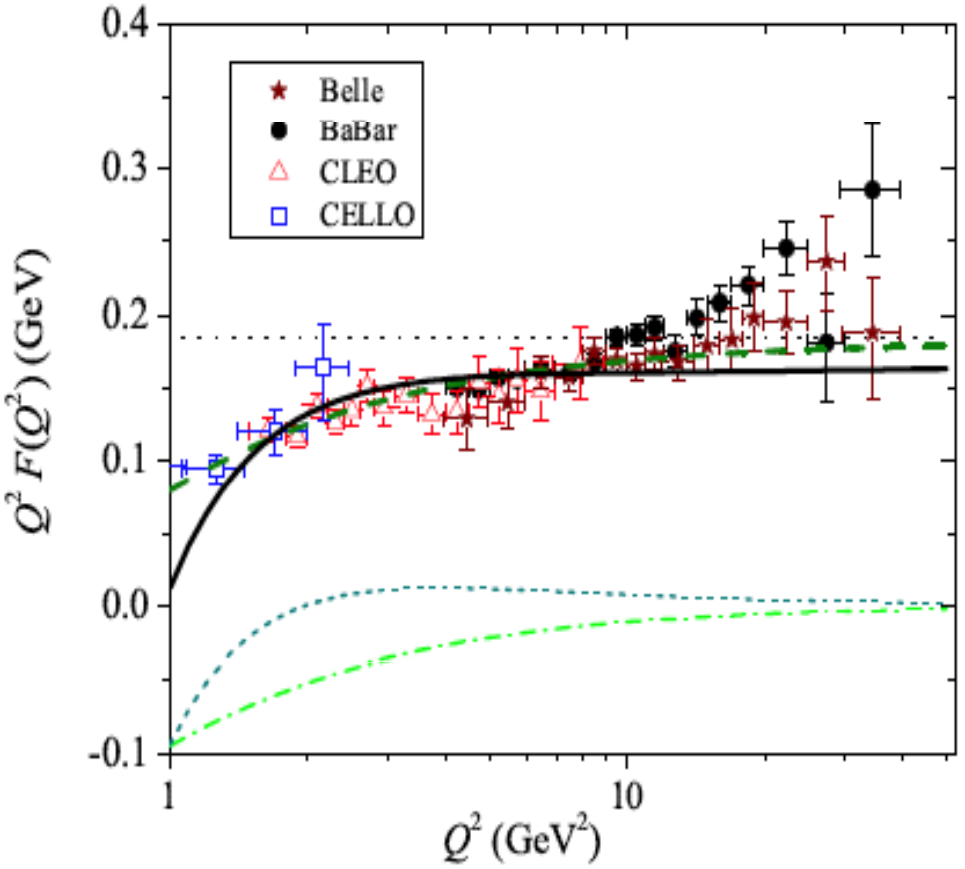
… **and monopoles** study of magnetic monopoles and their detection. Gran Unified Theories and Strings allow for the existence of magnetic monopoles. We have studied recently the structure of monopoles from the theoretical point of view and their impact in the present LHC experiments **(Vicente Vento, Valentina Mantovani Sarti, arXiv:1306.4213 [hep-ph])**

Pion transition formfactor



A. V. Pimikov et al.,, Phys. Rev. D 87, 094025 (2013). using sum rules





Noguera et al., arXiv: 1311.3595 [hep-ph]using nonlinear models

As matter gets compressed density ~ $1/R^3$ quarks in the lowest band mix with quarks in the first excited band leading to a delocalization of baryon number called B= ½ phase, further compression leads to deconfinement **(Valentina Mantovani Sarti, Vicente Vento., arXiv:1309.0639 [nucl-th]. Phys. Lett. B in press)**

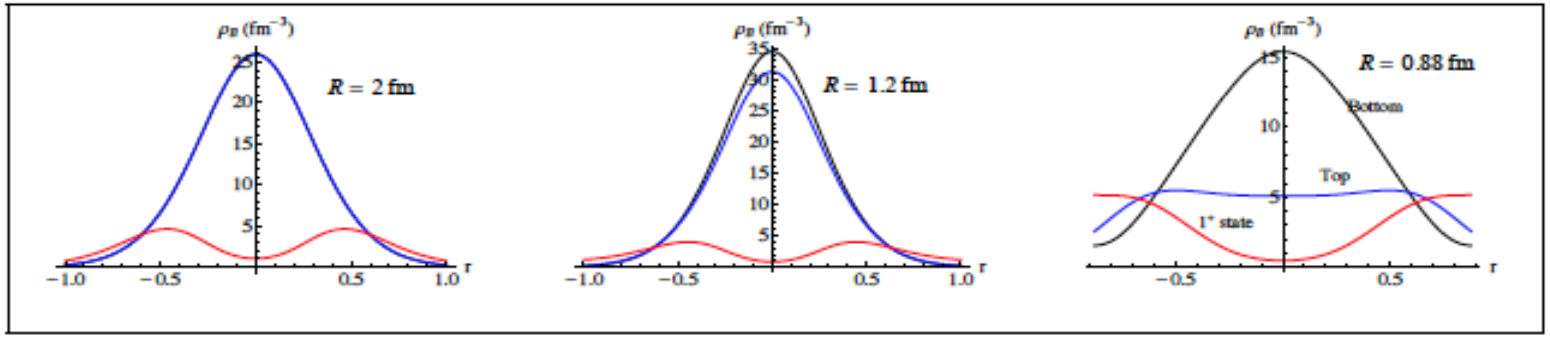
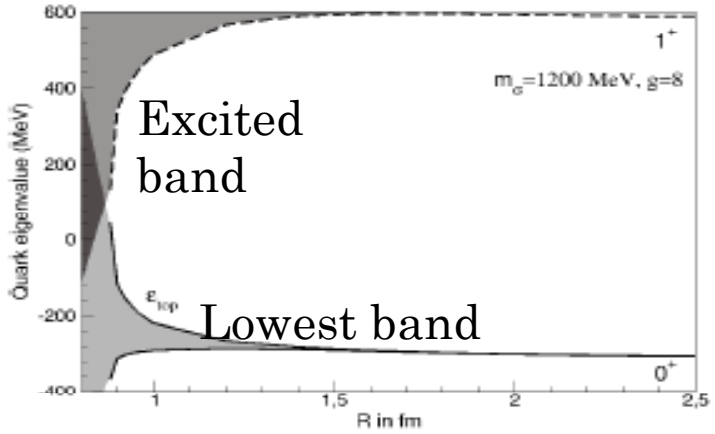
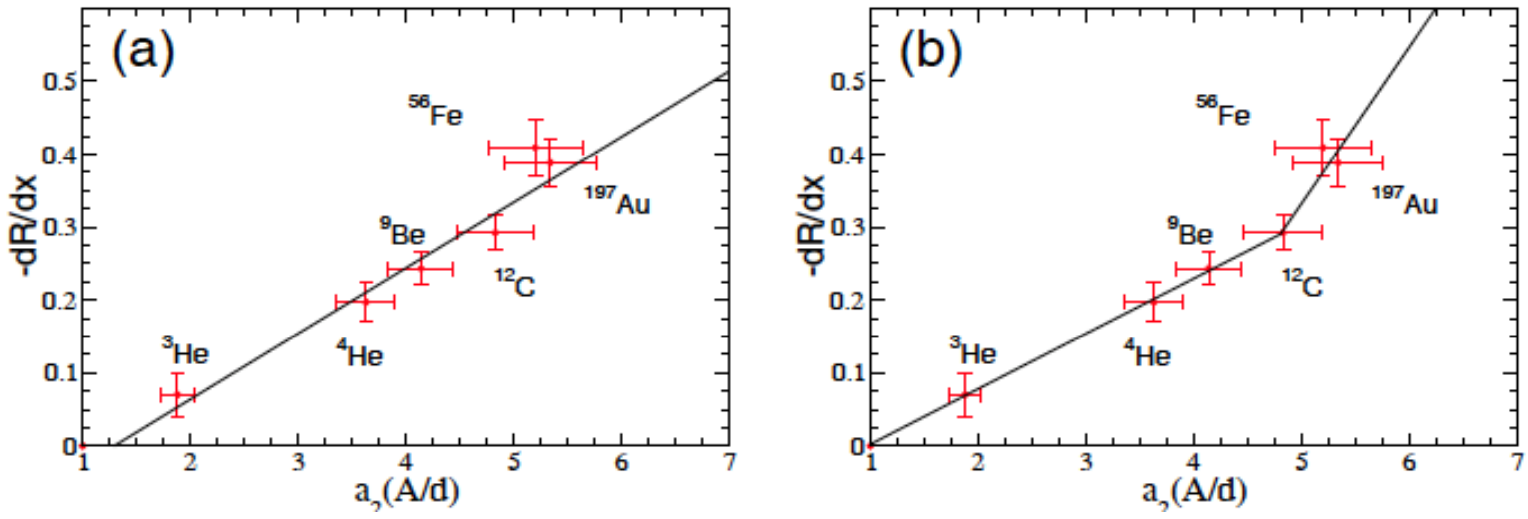


Figure 3. Baryon density profiles inside the Wigner-Seitz cell, for several values of R. The profiles are shown for the ground state 0^+ (black line), the top of the lower band (blue line) and the first excited state $G = 1^+$ (red line). The three panel are chosen in order to show, going from the left to right, the confined $B = 1$ phase ($R \geq 2$ fm), the delocalized $B = 1/2$ phase ($R \leq 1.2$ fm) and finally the deconfined phase ($R \leq 0.9$ fm).

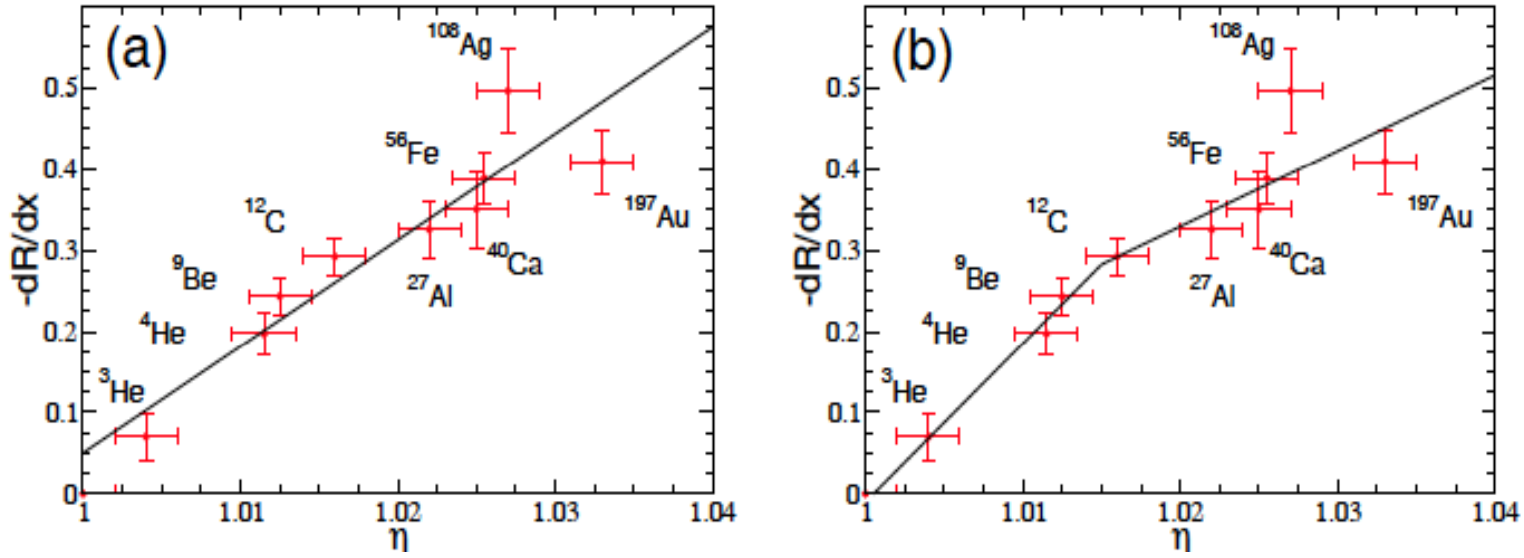


Valentina Mantovani Sarti, Byung-Yoon Park, Vicente Vento. Int.J.Mod.Phys. A28 (2013) 27, 1350136

Figure 2. Quark eigenvalue as a function of the cell radius R in the CDM. The shaded area represents the band estimated following Ref. [36]. The first excited state 1^+ and the corresponding lower part of the band are also shown.



Observation: linear relation between EMC slope and short range correlations is too confirmed from a x-rescaling analysis



C.A. García Canal, T. Tarutina, Vicente Vento. Eur.Phys.J. A49 (2013) 105

MEMORIA (2013) DEL PROYECTO:
"AGUJEROS NEGROS CUANTICOS, SUPERGRAVEDAD Y COSMOLOGIA", IP: María Antonia Lledó

MIEMBROS: A. Fabbri (RyC), M.A. Lledó (TU), J. Navarro-Salas, (CU), G. Olmo (JAE doc, IFIC), I. Agulló (Marie Curie Fellow, DAMTP, Cambridge, UK), F. Nadal (JAE), P. Galli (FPI)

- **Hawking radiation in acoustic black holes and white holes:**

- R. Balbinot, I. Carusotto, A. Fabbri, C. Mayoral and A. Recati, *Understanding Hawking radiation from simple models of atomic Bose-Einstein condensates*, Book chapter of the book *Analogue Gravity Phenomenology* (SIGRAV School, Como (Italy) 2011), *Lect. Notes. Phys.* **870** (2013), 181-219
- R. Balbinot, A. Fabbri and C. Mayoral, *Hawking effect in BECs acoustic white holes*, *EPJ Plus* **128** (2013), 16
- P. Anderson, R. Balbinot, A. Fabbri and R. Parentani, *Hawking radiation correlations in Bose-Einstein condensates using quantum field theory in curved space*, *Phys. Rev.* **D87** (2013), 124018
- E. Babichev and A. Fabbri, *Instability of black holes in massive gravity*, *Class. Quant. Grav.* **30** (2013), 152001 (Fast Track Communication)
- A. Fabbri, *Observing Hawking radiation in Bose-Einstein condensates via correlation measurements*, arXiv:1212.5392 [gr-qc] (**second prize** at SIF2012, Astroparticle Physics, Astrophysics and Cosmology section), *// Nuovo Cimento* **C36** - Colloquia and Communications in Physics - (2013), 99

- **Massive gravity:**

- E. Babichev and A. Fabbri, *Instability of black holes in massive gravity*, *Class. Quant. Grav.* **30** (2013), 152001 (Fast Track Communication)

-**QFT and cosmology**

- A. Landete, J. Navarro-Salas and F. Torrenti, *Adiabatic regularization for spin-1⁄2 fields*, Phys. Rev. D88, 061501(R), (2013)
- A. Landete, J. Navarro-Salas and F. Torrenti, *Adiabatic regularization and particle creation for scalar and spin-1⁄2 fields*, arXiv:1311.4958
- I. Agullo and J. Navarro-Salas, *Conformal anomaly and primordial magnetic fields* arXiv:1309.3435

-**Quantum Gravity and cosmology**

- I.Agullo, A.Ashtekar and W.Nelson, *Extension of the quantum theory of cosmological perturbations to the Planck era*, Phys.Rev. D87 (2013) 4, 043507
- I.Agullo, A.Ashtekar and W.Nelson, *The pre-inflationary dynamics of loop quantum cosmology: Confronting quantum gravity with observations*, Class.Quant.Grav. 30 (2013) 085014

-**Supergravity**

- P. Galli, K. Goldstein, J. Perz. 'On anharmonic stabilisation equations for black holes'. JHEP 1303 (2013) 036.
- P. Galli, T. Ortín, J. Perz, C. S. Shahbazi. 'Black hole solutions of N=2, d=4 supergraviity with a quantum correction, in the H-FGK formalism'. JHEP 1304 (2013) 157.
- P. Galli, Patrick Meessen, T. Ortín. 'The Freudenthal gauge symmetry of the black holes of N=2,d=4 supergravity'. JHEP 1305 (2013) 011
- P. Galli, Kevin Goldstein, Stefanos Katmadas, Jan Perz. 'Non-supersymmetric Extremal Black Holes: First-Order Flows and Stabilisation Equations' 2013. 11 pp.Published in Springer Proc.Phys. 144 (2013) 221-231

- P. Galli, G. Onandia .'Static, spherically symmetric, charged black holes in four-dimensional N = 2 supergravity' 11 pp. iConference: C12-10-17, Barcelona Postgrad Encounters on Fundamental Physics. Proceedings. p.165-176

-**Modified gravity**

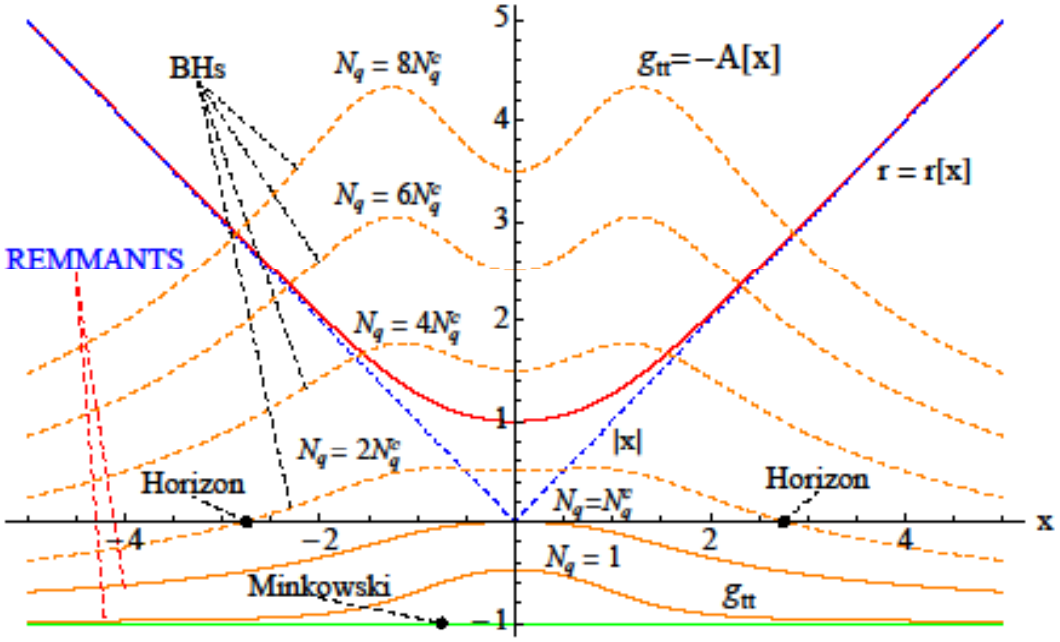
- F. S. N. Lobo, G. J. Olmo and D. Rubiera-Garcia, "Quadratic Palatini gravity and stable black hole remnants," proceedings of the Karl Schwarzschild Meeting 2013, arXiv:1311.6487 [hep-th].
- F. S. N. Lobo, J. Martinez-Asencio, G. J. Olmo and D. Rubiera-Garcia, "Planck scale physics and topology change through an exactly solvable model," arXiv:1311.5712 [hep-th].
- G. J. Olmo, D. Rubiera-Garcia and H. Sanchis-Alepuz, "Geonic black holes and remnants in Eddington-inspired Born-Infeld gravity," arXiv:1311.0815 [hep-th].
- S. Capozziello, T. Harko, T. S. Koivisto, F. S. N. Lobo and G. J. Olmo, "Galactic rotation curves in hybrid metric-Palatini gravity," Astroparticle Physics **50-52C** (2013) , pp. 65 [arXiv:1307.0752 [gr-qc]].
- E. I. Guendelman, G. J. Olmo, D. Rubiera-Garcia and M. Vasihoun, "Nonsingular electrovacuum solutions with dynamically generated cosmological constant," Phys. Lett. B **726** (2013) 870 [arXiv:1306.6769 [hep-th]].
- G. J. Olmo and D. Rubiera-Garcia, "Semiclassical geons at particle accelerators," arXiv:1306.6537 [hep-th].
- G. J. Olmo and D. Rubiera-Garcia, "Importance of torsion and invariant volumes in Palatini theories of gravity," Phys. Rev. D **88** (2013) 084030 [arXiv:1306.4210 [hep-th]].
- F. S. N. Lobo, G. J. Olmo and D. Rubiera-Garcia, "Semiclassical geons as solitonic black hole remnants," JCAP **1307** (2013) 011 [arXiv:1306.2504 [hep-th]].
- S. Capozziello, T. Harko, F. S. N. Lobo and G. J. Olmo, "Hybrid modified gravity unifying local tests, galactic dynamics and late-time cosmic acceleration," Int. J. Mod. Phys. D **22** (2013) 1342006 [arXiv:1305.3756 [gr-qc]]. This paper received an ***Honorable Mention*** in the Gravity Research Foundation Essay Competition (2013).
- J. Martinez-Asencio, G. J. Olmo and D. Rubiera-Garcia, "Black holes in extended gravity theories in Palatini formalism," proceedings of the Spanish Relativity Meeting in Portugal (ERE2012), arXiv:1301.2921 [gr-qc].
- G. J. Olmo and D. Rubiera-Garcia, "Nonsingular Black Holes in Palatini Extensions of General Relativity," proceedings of the 13th Marcel Grossmann Meeting, arXiv:1301.2430.
- S. Capozziello, T. Harko, T. S. Koivisto, F. S. N. Lobo and G. J. Olmo, "Hybrid f(R) theories, local constraints, and cosmic speedup," proceedings of the 13th Marcel Grossmann Meeting, arXiv:1301.2209 [gr-qc].
- G. J. Olmo and D. Rubiera-Garcia, "Charged black holes in Palatini $f(R)$ theories," proceedings of the 13th Marcel Grossmann Meeting, arXiv:1301.2091 [gr-qc].
- S. Capozziello, T. Harko, T. S. Koivisto, F. S. N. Lobo and G. J. Olmo, "The virial theorem and the dark matter problem in hybrid metric-Palatini gravity," JCAP **07** (2013) 024 [arXiv:1212.5817 [physics.gen-ph]].
- S. Capozziello, T. Harko, T. S. Koivisto, F. S. N. Lobo and G. J. Olmo, "Cosmology of hybrid metric-Palatini f(X)-gravity," JCAP **1304** (2013) 011 [arXiv:1209.2895 [gr-qc]].

Tesis Doctorales

- P. Galli, 'Quantum black holes attractors', Universitat de València, Septiembre 2013. Sobresaliente Cum Laude. Directora: María A. Lledó

Black Hole Remnants in Palatini Gravity

- **Main result:** a theory with **Black Holes**, Wormholes, and Remnants.
- The theory: $S=\frac{1}{16\pi G}\int d^4x\sqrt{-g}\left[R+l_P^2\left(aR^2+R_{\mu\nu}R^{\mu\nu}\right)\right]-\frac{1}{16\pi}\int d^4x\sqrt{-g}F_{\mu\nu}F^{\mu\nu}$
- The metric: $ds^2=-A(x)dt^2+\frac{1}{A(x)}dx^2+r^2(x)d\Omega^2$
- The bounce of the radial function $r^2(x)$ signals a Wormhole geometry.



- For charges below $N_q^c\equiv\sqrt{\frac{2}{\alpha_{em}}}\approx 16.55$ there is No Event Horizon!!!
- **No horizon** ⇒ No Hawking instability ⇒ Stable Black Hole Remnants.
- Relevant for quantum information loss, dark matter, . . .

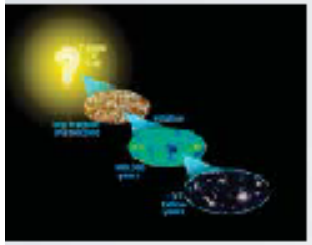
● This extension of General Relativity modifies the interior structure of black holes replacing the singularity by a wormhole. This smooths out the geometry and regularizes the energy of the electric field. The charge of these objects is generated by the electric flux through the nontrivial topology (no sources for the electric field are thus necessary). Their mass is given by the (finite!) energy stored in the electric field. This provides the first explicit realization of the old idea of charge without charge and mass without mass introduced by Wheeler. The existence of black hole remnants in the lowest part of the mass and charge spectrum was not expected. They provide a natural resolution to the information loss paradox and suggest that new kinds of stable massive particles could exist due to quantum gravitational effects. More details in several papers by Gonzalo J. Olmo - D.Rubiera-Garcia - F.S.N. Lobo - J. Martinez-Asencio - H.Sanchis-Alepuz

PARTICLE CREATION IN DE SITTER INFLATION

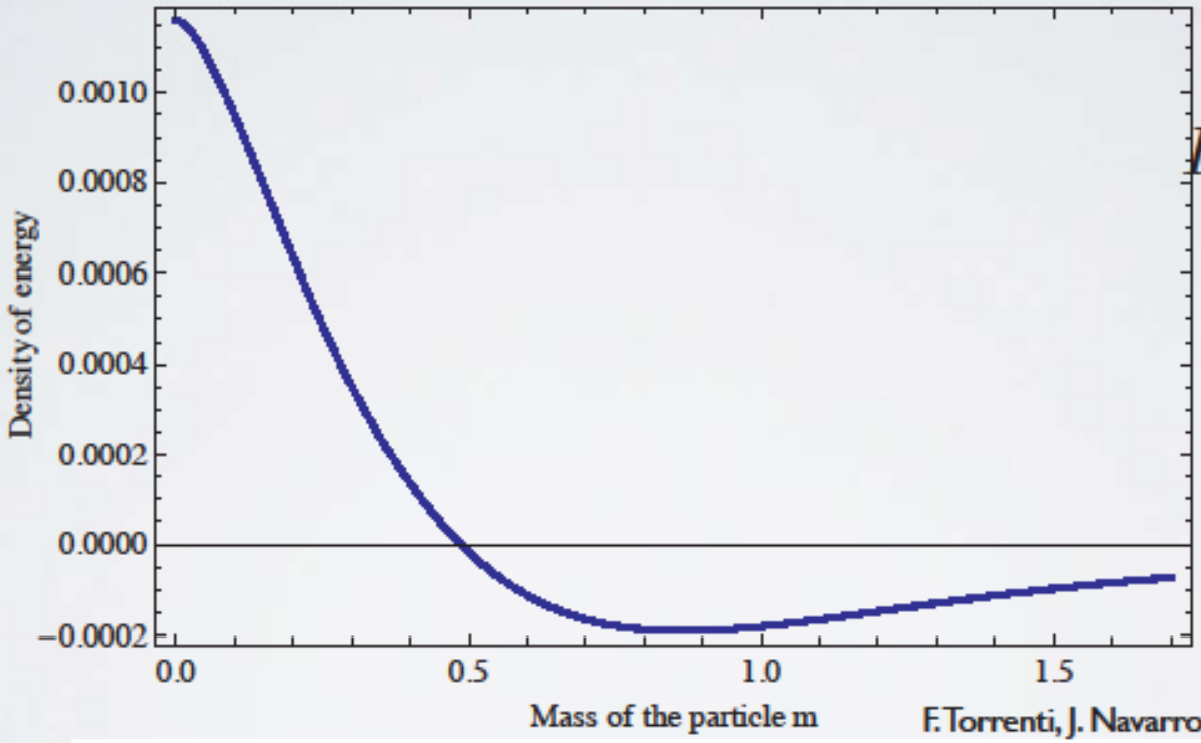
- We have introduced a new regularization/renormalization method for spin-1/2 particles in Expanding universes
- We have been able to calculate, for the first time, the energy-density for created Dirac fermions in de Sitter inflation

$$a(t) = e^{Ht}$$

$$H \sim 10^{14} GeV$$



Units H=1



F. Torrenti, J. Navarro-Salas, A. Landete PRD 2013

$$\langle T^{\mu\nu} \rangle_r = \frac{1}{960\pi^2} g^{\mu\nu} \left(11H^4 + 130H^2 m^2 + \right. \qquad (151)$$
$$\left. 120 m^2 (H^2 + m^2) \left(\log\left(\frac{m}{H}\right) - \mathfrak{Re} \left[\psi\left(-1 + i\frac{m}{H} \right) \right] \right) \right)$$

Flavor and Origin of Matter

Sabor y Origen de la Materia

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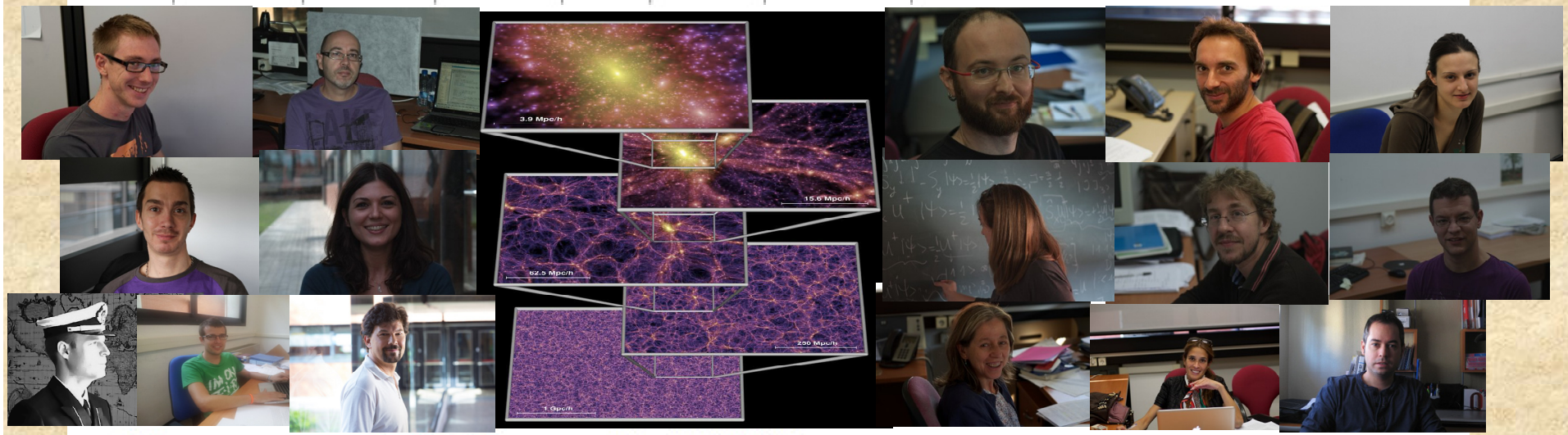

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SOM Menu

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SOM News

1 2

Trailer: Three Stories in Science, Three Stories

Flavor and Origin of Matter - Sabor y Origen de la Materia

SOM (We are) is one of the leading theoretical particle physics groups in Spain, and includes IFIC members from the University of Valencia and CSIC. Our group has a broad research program in flavor physics with active work in Lattice QCD, neutrino phenomenology and leptogenesis. Members of the group also carry out research in cosmology and fundamental physics. While we have a strong theoretical component to our research, some of us are involved in large collaborations in neutrino physics (Euronu) and cosmology (SDSSIII).

The group organizes weekly discussions in particle physics and cosmology (La Trobada and Invisibles webinar).

Next Events

- Where have half the baryons gone?
  18-12-2013 / 10:45-11:45 h.
- IceCUBE: The most energetic neutrinos. Extragalactic?
  09-01-2014 / 12:00-13:00 h.
- Impact of massive neutrinos on the large scale structure of the universe.
  10-01-2014 / 10:45-11:45 h.
- Beyond the SM on the lattice
  15-01-2014 / 10:45-11:45 h.

View Full Calendar

Next IFIC Seminars

http://som.ific.uv.es

ACTIVIDAD CIENTÍFICA: Lattice QCD, Neutrinos, Physical Cosmology		
28 publicaciones en revistas con refereeing arXiv:1203.6594 (BOSS) ha sido citado 207 veces hasta la fecha	22 charlas en conferencias internacionales Teaching at International schools: ISAPP, Nordic Winter School, Trieste, TASI, Corfú	Miembros de las colaboraciones internacionales BOSS y nuSTORM y de los proyectos europeos LAGUNA-LBNO y INVISIBLES

ACTIVIDAD DIDÁCTICA Y ORGANIZATIVA		
PhD Theses	2 defendidas	4 en curso
Master Theses	1 defendida	2 en curso
Teaching	Undergraduate level (UV) and Master level (IFIC and IFT), tutorías en practicas externas	
PhD Courses organized by SOM	V. Sanz: “Collider physics: a case study” A.Ibarra: “Dark Matter” S. Bettini: “Ten lectures on subnuclear physics in the ‘70s” S. Davidson: “Lepton flavour violation”	
Organización de eventos	29 “trobadas” 19 “webinars” (INVISIBLES EU network) 3 organized workshops	
Outreach	Coordinación de eventos de divulgación de INVISIBLES 1 video de divulgación, 3 videos de simulaciones 1 canal en youtube: www.youtube.com/user/somific	

Física teórica nuclear y de muchos cuerpos

Members: E. Oset, J. Navarro, J. Ros, M. J. Vicente-Vacas, J. Nieves, L. Alvarez-Ruso (RyC), T. Ledwig (pdoc), T. Uchino (pdoc), J. Garzón (doc), F. Aceti (doc), En Wang (doc), C. Hidalgo (doc), C.W. Xiao (doc), A. Hiller (doc), J. Morais (doc)

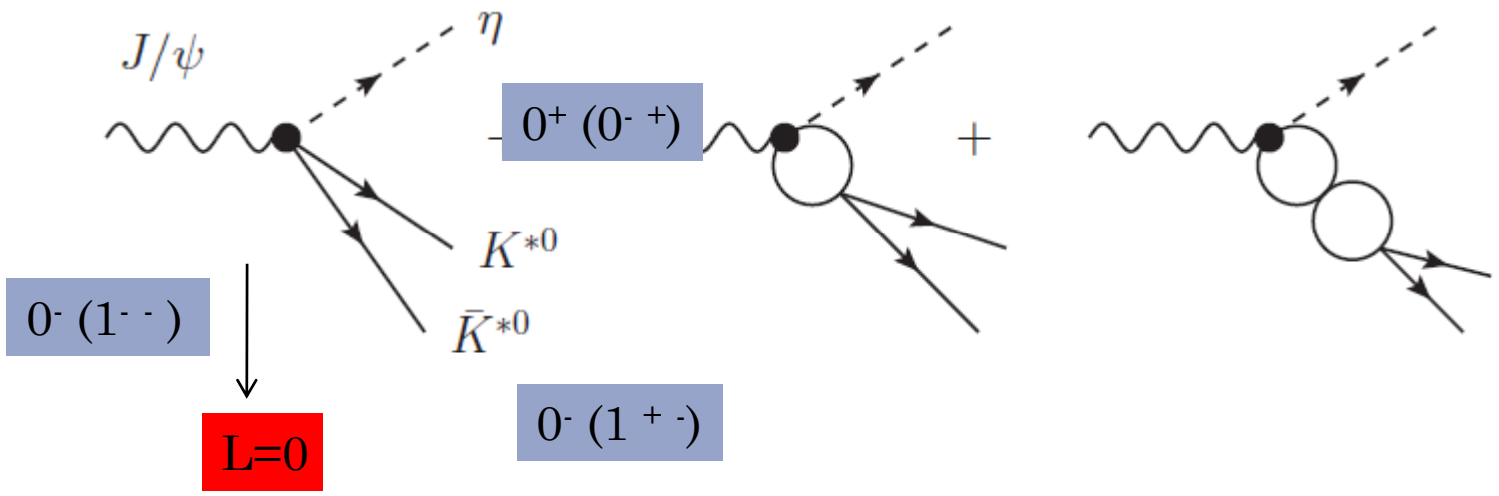
Topics:

- ✓ Dynamically generated three-hadron resonances
- ✓ Finite volume treatment of scattering of hadrons and limits to phase shifts extraction from lattice QCD
- ✓ Hadron properties (spectroscopy, magnetic moments, form factors) in the free space and in nuclei
- ✓ Neutrino-nucleon and neutrino-nucleus reactions
- ✓ Chiral perturbation theory with Δ states
- ✓ Heavy quark spin and flavor symmetries
- ✓ Dinámica no-lineal y sistemas complejos
- ✓ Función de respuesta en materia nuclear usando interacciones efectivas

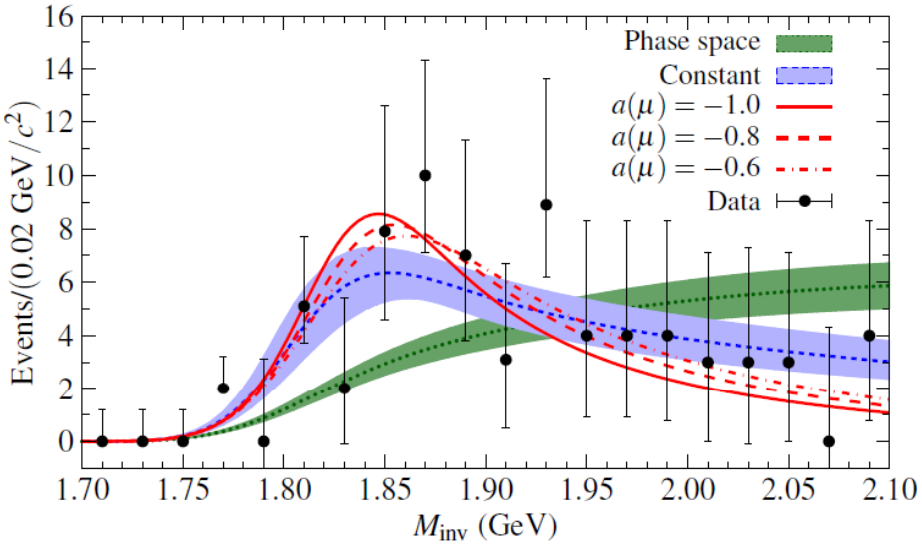
Collaborations:

Granada, Murcia, Salamanca, Barcelona, Córdoba, Madrid, Osaka, Beijing, Jülich, Nara, Kyoto, Bonn, Minesota…

Signature of an h_1 state in the $J/\psi \to \eta h_1 \to \eta K^{*0}\bar{K}^{*0}$ decay



Ju-Jun Xie, M. Albaladejo and E. Oset arXiv: 1306.6594 (PLB in print)



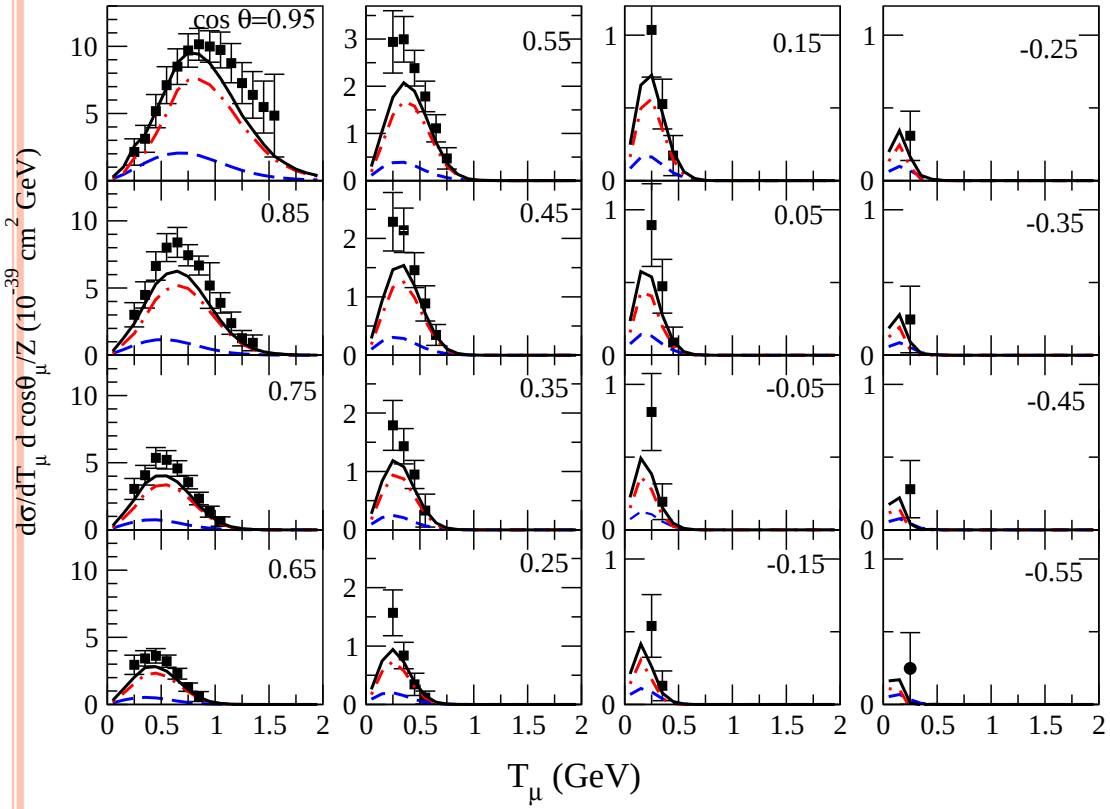
The local hidden gauge theory predicts a h_1 state around 1800 MeV from K* K*bar interaction. A BES experiment provides a K* K*bar distribution from this reaction with a clear peak which is interpreted as a h_1 resonance around 1830 MeV. The combination of the theory and experiment allows to extract a new resonance, $h_1(1830)$.

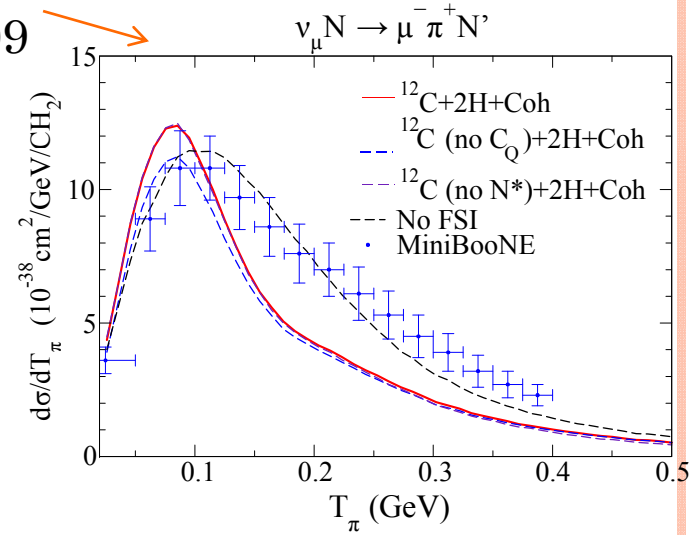
MINIBOONE CCQE, NCγ, π prod XSECTS

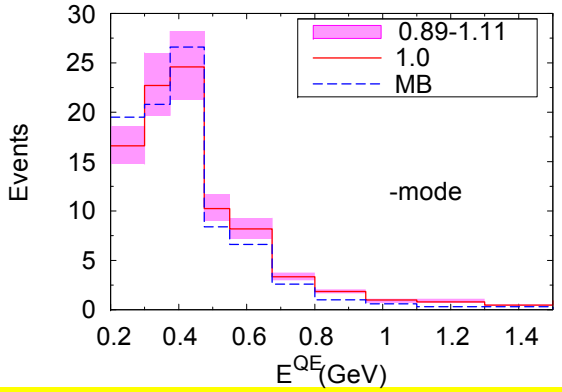
microscopical evaluation !

M.J. Vicente-Vacas, L. Alvarez-Ruso, E. Wang & J. Nieves (IFIC), E. Hernández (Salamanca), F. Sánchez (IFAE), R.Gran (Minesota)

PLB 721 (2013) 90 $\bar{\nu}_\mu + {}^{12}C$ PRD 87 (2013) 113009

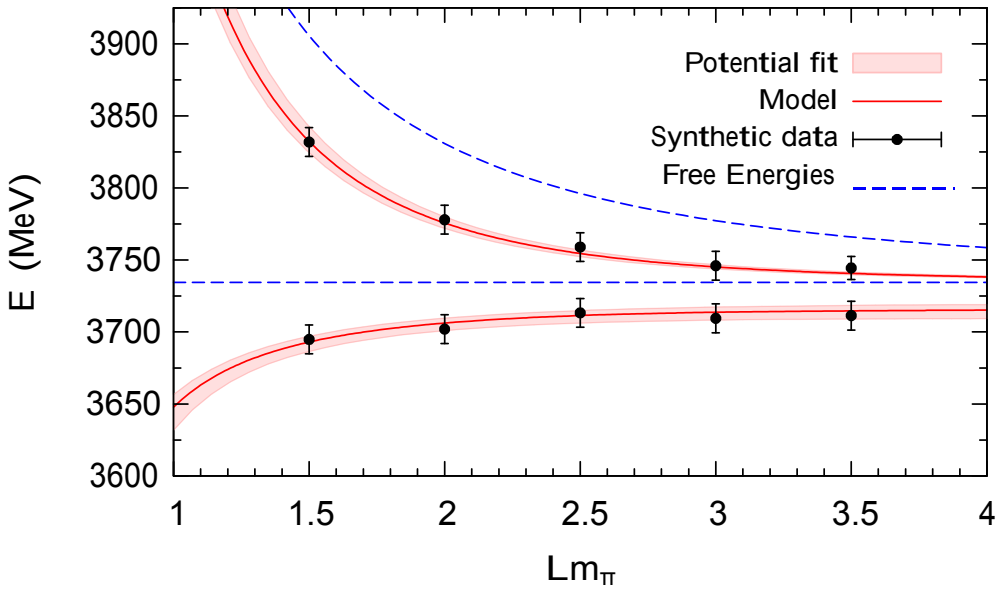






arXiv:1304.2701

Electroweak Nuclear Reactions at Intermediate Energies



D(*) Dbar(*) Molecules in a finite box !

Phys.Rev. D88 (2013) 014510

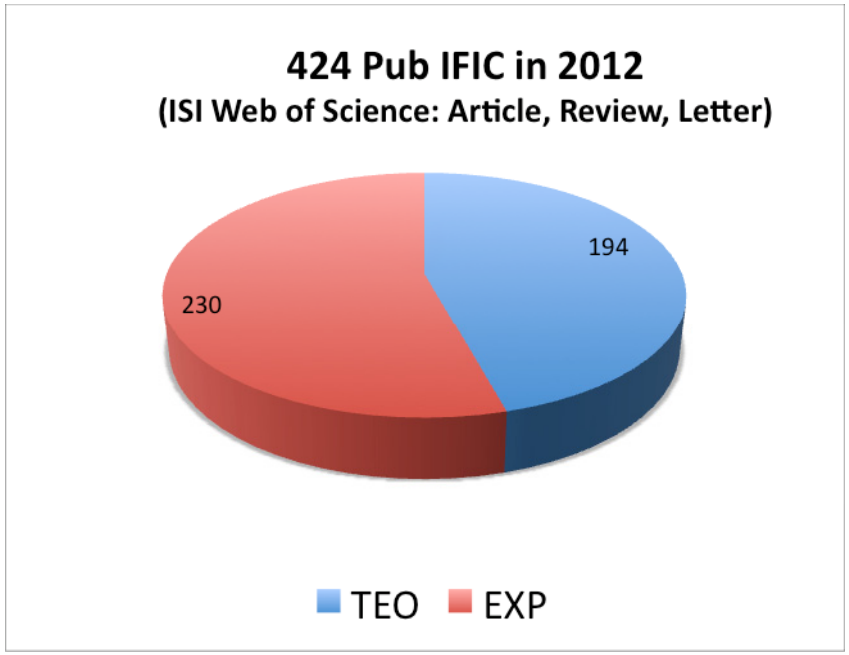
C. Hidalgo, E. Oset, J. Nieves (IFIC), F.K. Guo (Bonn), M. Pavón y M. Albaladejo (Paris)

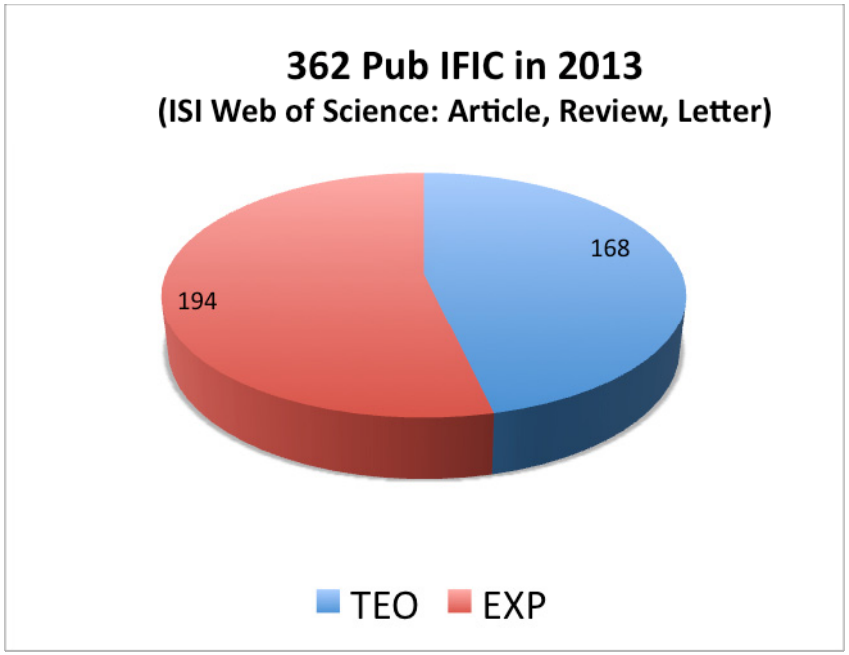
Consequences of Heavy Quark Symmetries for Hadronic Molecules

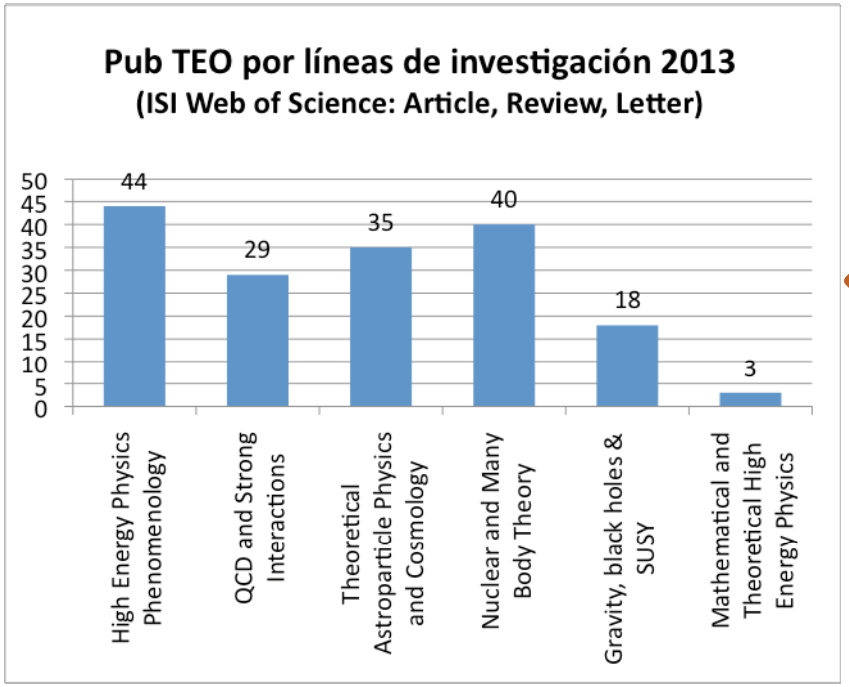
Phys.Rev. D88 (2013) 054007

TABLE II. Heavy meson–heavy meson combinations having the same contact term as the $X(3872)$ and $Z_b(10610)$, and the predictions of the pole positions, which are understood to correspond to bound states except if we write "V" in parenthesis for denoting a virtual state. When we increase the strength of the potential to account for the various uncertainties, in one case (marked with † in the table) the virtual pole evolves into a bound state. The masses are given in units of MeV.

V_C	$I(J^{PC})$	States	Thresholds	Masses ($\Lambda = 0.5$ GeV)	Masses ($\Lambda = 1$ GeV)	Measurements
C_{0X}	$0(1^{++})$	$\frac{1}{\sqrt{2}}(D\bar{D}^* - D^*\bar{D})$	3875.87	3871.68 (input)	3871.68 (input)	3871.68 ± 0.17 [34]
	$0(2^{++})$	$D^*\bar{D}^*$	4017.3	4012^{+4}_{-5}	4012^{+5}_{-12}	?
	$0(1^{++})$	$\frac{1}{\sqrt{2}}(B\bar{B}^* - B^*\bar{B})$	10604.4	10580^{+9}_{-8}	10539^{+25}_{-27}	?
	$0(2^{++})$	$B^*\bar{B}^*$	10650.2	10626^{+8}_{-9}	10584^{+25}_{-27}	?
	$0(2^{+})$	D^*B^*	7333.7	7322^{+6}_{-7}	7308^{+16}_{-20}	?
C_{0Z}	$1(1^{+-})$	$\frac{1}{\sqrt{2}}(B\bar{B}^* + B^*\bar{B})$	10604.4	10602.4 ± 2.0 (input)	10602.4 ± 2.0 (input)	10607.2 ± 2.0 [5]
	$1(1^{+-})$	$B^*\bar{B}^*$	10650.2	10648.1 ± 2.1	$10648.1^{+2.1}_{-2.5}$	10597 ± 9 [35] 10652.2 ± 1.5 [5] 10649 ± 12 [35]
	$1(1^{+-})$	$\frac{1}{\sqrt{2}}(D\bar{D}^* + D^*\bar{D})$	3875.87	3871^{+4}_{-12} (V)	3837^{+17}_{-35} (V)	$3899.0 \pm 3.6 \pm 4.9$ [24] $3894.5 \pm 6.6 \pm 4.5$ [25]
	$1(1^{+-})$	$D^*\bar{D}^*$	4017.3	4013^{+4}_{-11} (V)	3983^{+17}_{-32} (V)	4026.3 ± 2.6 [26].
	$1(1^{+})$	D^*B^*	7333.7	$7333.6^{\dagger}_{-4.2}$ (V)	7328^{+5}_{-14} (V)	?







7 Tesis doctorales

4 RyC: 30/11/2015
30/11/2016
30/09/2017
15/12/2017

Provisional Diciembre 2013

Gracias a José Valle por su dedicación durante todos estos años al frente de la Unidad !

Felices Fiestas