ABSTRACT OF RESEARCH NTERESTS AND ACTIVITIES
ZARAGOZA U. GROUP
M. Asorey

Our group is interested in the study of effects of boundary conditions on the low energy behaviour of Quantum Field Theories.

Casimir effect, vacuum energy, gravity and cosmology

1. In particular, we have deeply studied the effect of boundary conditions on the attractive of repulsive character of the Casimir. We have explored the most general type of boundary condition and found that always both types of interactions are possible. We are investigating the possibility of implementing some of those boundary conditions by means of nanostructured materials.

2. We also analyzed the dependence of the quantum vacuum energy on the space topology. In particular we point out the transition between contractive and repulsing regimes in popular cosmological backgrounds..

3. We also have analysed the possible appearance of quantum phase transitions in gauge theories due to the presence of topological perturbations. The phase transitions are associated to the breaking of CP symmetry. This is done in collaboration with M. Aguado from MPI, Garching.

4. We also studied the nature of quantum fluctuations in a non-trivial vacuum originated by the topological defects known as kinks and the finite size effects due to the presence of boundaries with non-trivial boundary conditions. This is being done in collaboration with Leipzig and Salamanca groups leaded by M. Bordag and J. Mateos, respectively.

Repulsive & lateral Casimir forces

5. We are also analyzing the lateral Casimir force between two corrugated plates interacting with an electromagnetic field extending previous results for scalar field theories. This is being done in collaboration with the Oklahoma group leaded by K. Milton.

GROUP MEMBERS

M. Asorey, I. Cavero, F. Falceto, J. V. Esteve, J.M. Munoz-Castaneda and A. Santagata.

Recent publications:

M. Asiorey, and J. Clemente-Gallardo and J. M. Munoz-Castaneda, **Boundary Conditions: The Path Integral Approach,** J. Phys. Conf. Ser. 87{2007) 012004

M. Asiorey, G. Marmo and J. M. Munoz-Castaneda ,**Vacuum Structure and Boundary Renormalization Group,**J. Phys. A: Math. Gen. 41}(2008) 164043

M. Asiorey, and J. M. Munoz-Castaneda Vacuum Boundary Effects, J. Phys. A: Math. Theor. 41 (2008) 304004

M. Asiorey, G. Marmo and J. M. Munoz-Castaneda, **The world of boundaries without Casimir effect,** In *The Casimir effect and Cosmology,* Ed. Odintsov et al. Tomsk State Ped. Univ. Press (2009) 153-160

M. Asiorey and M. Aguado, **Vafa-Witten theorem and Lee-Yang singularities,** Phys. Rev. D 80, (2009) 127702

P. Parashar, K.A. Milton, I. Cavero-Pelaez, K.V. Shajesh,.
Electromagnetic Non-contact Gears: Prelude., e-Print: **arXiv:1001.4105** [cond-mat.other]

I. Cavero-Pelaez,, J. Mateos Guilarte, **Local analysis of the sine-Gordon kink quantum fluctuations.**,Contributed to 9th Conference on Quantum Field Theory under the Influence of External Conditions (QFEXT 09): Devoted to the Centenary of H. B. G. Casimir, Norman, Oklahoma, 21-25 Sep 2009.
e-Print: **arXiv:0911.4450** [hep-th]

K. A. Milton, P. Parashar, J. Wagner, I. Cavero-Pelaez, **Multiple Scattering Casimir Force Calculations: Layered and Corrugated Materials, Wedges, and Casimir-Polder Forces.**.
To appear in the proceedings of Casimir 2009: Workshop on Casimir Forces and Their Measurement, New Haven, Connecticut, 10-11 Aug 2009.
e-Print: **arXiv:0910.3215** [hep-th]