PREFACE

This volume contains the Proceedings of the 10th International Conference on Quantum Field Theory Under the Influence of External Conditions (QFEXT11) held at the Pedro Pascual Science Center in Benasque (Spain), 18–24 September 2011.

The series of Workshops on Quantum Field Theory Under the Influence of External Conditions was started in 1989 by D. Robaschik and continued since 1995 by M. Bordag. The meetings have taken place mainly in Leipzig (1995, 1998, 2001, 2007), but also in Oklahoma (2003, 2009) and Barcelona (2005).

One hundred and six leading scientists and junior researchers attended the Conference held in Benasque. Most of the world leading specialists on the subjects discussed participated in the meeting and presented new developments. The conference focussed on the following topics:

1. Casimir and van der Waals forces; theoretical and experimental aspects, with applications at the nanoscale.
2. Quantum vacuum effects in quantum field theory, with applications to particle physics, condensed matter physics, laser and atomic physics.
3. Quantum field theory in strong external fields and in curved space-time.
4. Vacuum energy in gravity, cosmology and astrophysics.
5. Mathematical physics techniques for quantum vacuum studies.

The main subjects addressed during the meeting were:

1. Experiments with attenuated Casimir force due to the effects of UV radiation on the boundaries.
2. Recent experiments reporting measures of thermal Casimir forces with special attention to the techniques involved in the removal of electrostatic patch effects.
3. The status of the forthcoming experiments devoted to point out the existence of non-linear QED corrections under the effect of strong electromagnetic fields using very high-power lasers.
4. New bounds on Yukawa-type gravitational interactions which are becoming very stringent and fully enter into the realm of Casimir interactions.
5. The effect of changes of geometry on the layers by the introduction of nanostructured ones, giving rise to interesting experimental results.

6. A new striking theoretical conjecture about the superconducting behaviour of the quantum vacuum of strong interactions under the effect of very strong magnetic fields.
7. A presentation of the PVLAS experiment and new techniques to measure the magnetic birefringence of the vacuum.
8. New theoretical results on the Casimir effect with geometries generating attractive forces and new dynamical Casimir effects.
9. The discovery of graphene boosted the analysis of its striking physical properties. Several sessions were devoted to this subject and specially to the connections with field theory in bidimensional spaces. Graphene physics opens a new avenue for the study of the Casimir effect and possible relevance of the different theoretical models.
10. There were also very interesting presentations and discussions on the effects related to gravitational interactions ranging from the sub-micrometric scale to quantum corrections with feasible astrophysical and cosmological implications.
11. Finally, the relevance of the different theoretical models was quite controversial and was the subject of very hot discussions in some of the sessions.

The organization into plenary and parallel talks proved to be useful since it allowed the presentation of the outlines of the main contributions in the plenary ones and to devote the parallel sessions to a more detailed account of technical details. This configuration also allowed a larger number of people, especially younger researchers, to present their own perspectives of their works.

The QFEXT11 conference also helped to broaden the interest of Spanish groups working on quantum field theory under background fields and cosmology. In particular, the conference pointed out the existence of a large Spanish community working on these topics. As a result, some more Spanish scientists have newly joined the Casimir European Network.

A special session was devoted to analyse recent progress on the line of the seminal work by Euler and Heisenberg on the occasion of the 75th anniversary of their highly influential paper. Another session was devoted to Stuart Dowker for his important contributions to the development of the field, in special through zeta-function regularization. During the Conference especial attention was paid to junior researchers and their oral or poster presentations. A Conference Committee awarded the prize as the best junior presentation to A. Canaguier-Durand (Paris).

The articles contained in the present volume reflect the contents of the talks delivered at the meeting. We thank the referees of all papers submitted, who contributed to keep high standards and helped to improve the final form of many of the manuscripts.

The organizers of the Conference thank the Centro de Ciencias de Benasque Pedro Pascual for providing a charming environment, and especially the staff of the Center (Tracey, Anna and David) for their support in administrative and technical

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