

Gauge theories in 5 and lower dimensions: string perspective, holographic avatars and exact results

PROJECT DETAILS

Funding Programme:
7th Framework Programme (FP7)
Sub-Programme:
People
Funding Scheme:
Marie Curie Actions: Support for training and career development of researcher (CIG)
Project Reference:
618459;
UE-14-GT5LD2013-618459
Project Duration:
48 Months (from 2014-03-01 to 2018-02-28)
Total Project Value:
€ 100.000
EU Grant-Aid:
€ 100.000
Funding to UniOvi:
€ 100.000

PROJECT DESCRIPTION

Quantum field theory is an absolutely central tool in our understanding of Nature, with applications ranging from condensed matter physics to particle physics. It is therefore urging to understand its most deepest secrets as much as possible. This is specially important in strongly coupled situations in which traditional tools cannot be applied.

This proposal strives to develop new understanding of quantum field theories in diverse dimensions, specially in strongly coupled situations. In particular, it addresses the up-to-now poorly explored case of five-dimensional gauge theories.

Although naively non-renormalizable and hence dependent on their particular UV completion, it turns out that under certain circumstances they can be at fixed points with remarkable properties, such as exceptional enhanced symmetries. Besides, it has very recently been argued that in some cases 5d theories can incorporate in their non-perturbative spectra their own UV completion. In fact, it has been suggested that such completion, for the maximally supersymmetric case, is the mysterious 6dN=(2, 0) conformal field theory. By making extensive use of the gauge/gravity duality as well as the newest developed tools for the study of supersymmetric gauge theories (in particular indices and exact partition functions), I plan to advance in the understanding of gauge theories, in particular in 5d and their connections with other dimensions.

The success of this proposal will not only help towards the deeper understanding of gauge theories in various dimensions, but will also contribute to the development of the community. Indeed, an integral part of the proposal is both the dissemination of science for the general public as well as teaching at undergraduate and graduate level. Thus, by supporting this proposal the european community in general and the region where it will take place --Asturias, Spain-- will benefit from the high degree of expertise and training of the researcher.

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