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UNIFICATION IN THE LHC ERA

Reporting

Project Information

UNILHC

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Project closed

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End date

30 September 2013

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Specific programme "People" implementing the Seventh Framework Programme of the European Community for research, technological development and demonstration activities (2007 to 2013)

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€ 3 673 966,60

EU contribution

€ 3 673 966,60

Coordinated by

ECOLE POLYTECHNIQUE

 France

Final Report Summary - UNILHC (UNIFICATION IN THE LHC ERA)

The main research theme of the network is the theoretical interpretation of results coming from LHC (Large Hadron Collider) and other experimental and observational sources. The aim is to identify the physics Beyond the Standard Model of strong, weak and electromagnetic forces and ultimately to provide a fully unified description of the fundamental states of matter and their interactions. Basic topics of investigation are the nature of electroweak symmetry breaking, the origin of masses and their hierarchies and the

quantization of the gravitational interaction. The methodology is based on three main ingredients: Symmetry, including supersymmetry and symmetries related to flavor, string unification and new space dimensions.

The research objectives are: (a) Probing the origin of mass at the LHC; (b) search for supersymmetry; (c) the physics of flavor in the LHC era; (d) exploring extra dimensions; (e) cosmological and astrophysical challenges for physics beyond the Standard Model; (f) string theory, string phenomenology and quantum gravity.

The main network goal is to offer excellent initial training to young researchers. It should appoint 456 person-months of Early-Stage Researchers (often Ph. D. students) and 108 person-months of Experienced Researchers (often postdocs), and develop a training program both at the individual and at the network-wide level. The network is structured to develop the research and complementary skills of the young researchers, to ensure their mobility and to widen their career prospects. In this way, it is hoped to increase the pool of European researchers at the highest level of scientific excellence, and to make a significant contribution to the development of European fundamental research.

Achievements:

Progress has been made in essentially all main directions of the work plan. In summary, the main scientific areas where breakthroughs were obtained (in each of the research objectives) are:

- (a) - New ways of addressing the mass hierarchy problem
- (b) - Fermion masses and neutrino oscillations from non-abelian discrete symmetries
- (c) - New proposals and investigation of dark matter candidates
- (d) - New discrete symmetries in Standard Model extensions
- (e) - New inflationary models and density perturbations
- (f) - Effective field theories of string compactifications

During the reporting period, the results of the network research were published in about 1400 scientific papers, out of which 379 were joint (involved at least two different nodes). They have received several thousands of citations in the scientific literature. Out of these publications, 113 involved young researchers hired by the network (ESR or ER), while 47 of those were joint. Besides publications, network members disseminated the results in more than 500 European and international scientific events: conferences, workshops and schools. In more than 170 of them, there was (often active) participation of early-stage and experienced researchers.

The network employed in total 44 young researchers: 37 ESR (19 long-term and 18 short-term at CERN) and 7 ER. Besides the young researchers, the network hired 6 visitor scientists (VS) staying one month each, shared in two different nodes. It delivered 594.4 person-months appointments (478.4 ESR, 110 ER and .5 VS), over-achieving its goal by 105%.

During the four years of the contract, there were five main network meetings, organized during the four network conferences (Planck series: From the Planck scale to the electroweak scale) and the first school in Corfu that was followed by the mid-term meeting. Moreover, the network organized one more network

school in Valencia and three training courses on science communication organized by the industrial associated partner SISSA Medialab. In addition, there were 50 `peripheral' meetings organized and partly funded by the network.

Further information on the network, such as detailed description, links to the nodes, reports, network meetings and activities, as well as job openings, regularly updated, can be found on its web page:

http://www.cpht.polytechnique.fr/rtn_aef/Web_page_UNILHC/itn.html 

Last update: 7 August 2014

Permalink: <https://cordis.europa.eu/project/id/237920/reporting>

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