

ITC CONFERENCE GRANT SCIENTIFIC REPORT

This report is submitted for approval by the grantee to the MC Chair.

Action number: CA15108

Conference title: Workshop on the Standard Model and Beyond

Conference start and end date: 31/08/2018 to 09/09/2018

Conference attendance start and end date: 31/08/2018 to 09/09/2018

Grantee name: Arkadiusz Bochniak

ACTIVITIES DURING YOUR ATTENDANCE AT THIS CONFERENCE:

During the attendance at this conference there was several talks on which recent results from the leading experiments was presented, e.g. research in QCD plasma in the ALICE experiment, Higgs studies in ATLAS and CMS, testing predictions from the Standard Model and its extensions (SUSY, THDM, leptoquarks models etc.) in ATLAS and CMS and also on non-perturbative level. The measurements related with the Vector Boson Scattering Processes was also discussed.

Moreover, searches for the CP and CPT violations (e.g. in the LHCb experiment and experiments with kaons) was presented and the theoretical possibilities was also discussed (e.g. consequences, in different frameworks, of the violation of some assumptions in the CPT theorem).

One day of the conference was dedicated to the problems related with neutrinos. It started with the review of recent measurements, then the seesaw mechanism, existence of Majorana neutrinos and matter-antimatter asymmetry in several approaches were discussed. Moreover, a lot of presentations was dedicated to the analysis of anomalies, e.g. flavour anomalies and B-physics anomalies.

A huge part of the conference was dedicated to the possible theoretical explanation of the Dark Matter phenomenon and the recent measurements together with several propositions for further searches was presented. Many different theoretical models that can possibly explain some aspects of these phenomena were discussed.

Few examples of theories of unification were presented and their consequences were discussed in details, e.g. Finite Unified Theories and their relations with SUSY, especially with the MSSM. Some possible applications of a string theory and its role in the unification process were also presented.

There were also presentations dedicated to the cosmological and astrophysical observations that can extent our knowledge about the particle physics, especially the neutrino physics and the Dark Matter physics. New analysis of cosmic microwave background radiation was presented together with possible application in Dark Matter searches.

In some of the talks the new and alternative theories were presented. Effective Field Theories together with their applications in the modified gravity models and the supersymmetric models. Moreover, the noncommutative models, including noncommutative geometry and noncommutative gauge theories, were discussed together with their relations with the BSM and gravity theories. More mathematical analysis was also presented, e.g. in the discussion about the group theoretic approach to fermion production and in the presentation dedicated to the perturbative moduli stabilization in the F-theory.

Furthermore, the future projects for research in the field of particle physics were presented.

There was a discussion about the High-Luminosity-LHC project, the International Linear Collider and the CLIC project.

IMPACT ON YOUR RESEARCH AND FUTURE COLLABORATIONS (if applicable)

Some of the presented information will be useful in my future research, especially in my PhD thesis that will be dedicated to the application of methods of noncommutative geometry to the description of the Standard Model and its possible extensions. In one part of my thesis I will make the reverse engineering of the SM Lagrangian from the spectral geometry point of view. As an input I will take relations between parameters in that model that were experimentally tested and therefore the news from recent measurements are important for my research. Moreover, recent results from neutrino experiments are also important for me, because the neutrino content is a crucial part of that model (e.g. existence of right handed neutrinos implies nonorientability of the geometry, Majorana neutrinos have an impact on possible Dirac operators etc.).

Moreover, I will probably in the forthcoming months also work on topics related to the noncommutative field theories and the problem of the renormalization of them, especially in case of the fuzzy spaces. Therefore the presentations on which new results in this field were discussed may have an impact on my future research. Some other presentations dedicated to the mathematical structure of unified theories may be also useful in my PhD thesis.