Cluster of Excellence Precision Physics, Fundamental Interactions and Structure of Matter
PRISMA

Mainz Institute for Theoretical Physics

The Future of BSM Physics

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The early LHC data have stimulated theorists to look for entirely new directions in physics beyond the SM, while abandoning some of the old scenarios. This scientific program was dedicated to reflecting the theoretical motivation of new physics and exploring radically new theoretical concepts for the current data-driven era of particle and astroparticle physics. New scenarios of NP have been proposed or revised, for instance some aspects of dynamical SUSY breaking. Particular emphasis was placed on extensions of the Standard Model, featuring light or very weakly coupled new particles. All talks were blackboard presentations with intense discussion sessions afterwards.

In the first week, axions were discussed in particular detail (talk by Filipo Sala) as well as axion-like particles (ALPS) in phenomenological connections with LHC and kaon factories data (Tien Tien Yu). The infrared structure of Nambu-Goldstone bosons was reanalyzed in the framework of effective actions for Nambu-Goldstone bosons (talk by Ian Low). Other probes of NP, which were object of discussions, were exotic sterile neutrinos (Bibhishan Shakya) and atomic physics (Claudia Frugiuele). Dark matter (DM) has been thoroughly investigated, in particular the concept of co-decaying dark matter (Eric Kuflik). Finally, the idea of femto-lensing of gamma ray bursts was revisited as an exciting possibility to probe exotic astrophysical objects such as small primordial black holes or ultra-compact dark matter minihalos (Andrey Katz).

The second week of the workshop started out with a discussion of effective field theories led by Dave Sutherland (focusing on particle physics aspects) and Javi Serra (focusing on massive gravity theories). The primary emphasis of the second week, however, was on new physics at low mass scales. This included a lively discussion of the MiniBooNE anomaly (which has recently reached a statistical significance of 4.8 sigma) led by Joachim Kopp, the prospects of ALP detection at kaon factories (Kohsaku Tobioka), connections between axion physics and gravitational waves (Ben Stefanek), and the appearance of light pseudo-scalars in composite Higgs models (Thomas Flacke). The topic of composite Higgs models was also taken up by Ramona Groeber, who discussed dark matter candidates in such models. The program was completed by talks on the search for new physics with particularly small coupling constants (Greg Landsberg) and on deriving the Affleck-Dine superpotential from monopoles (Yuri Shirman). Beyond the official program of the workshop, discussions centered around gravitational waves, various aspects of dark matter, early universe cosmology, and effective field theories.