

54th Schladming Winter School of Theoretical Physics



Report of Contributions

Contribution ID: 3

Type: **not specified**

Sondenheimer – Nonperturbative RG flow of the Higgs potential

Monday, 22 February 2016 16:45 (20 minutes)

We reanalyze the conventional arguments that relate a lower bound for the Higgs mass with vacuum stability in the framework of the functional renormalization group as well as in the light of exact results for the regularized fermion determinant. In both cases, we find no indication for vacuum instability nor metastability induced by top fluctuations if the cutoff is kept finite but arbitrary for standard bare actions which are perturbatively renormalizable. We show that a finite infrared Higgs mass range emerges naturally from the renormalization group flow itself. Higgs masses outside the resulting bounds cannot be connected to any conceivable set of bare parameters within the class of quartic bare potentials. However, the lower bound can be relaxed considerably by more general forms of the bare potential without necessarily introducing new metastable minima.

Presenter: Mr SONDENHEIMER, René (FSU Jena)

Session Classification: Contributed talks

Contribution ID: 4

Type: **not specified**

Mati – Critical scaling in the large-N $O(N)$ model in higher dimensions and its possible connection to quantum gravity

Wednesday, 24 February 2016 19:00 (20 minutes)

The critical scaling of the large-N $O(N)$ model in higher dimensions using the exact renormalization group equations has been studied, motivated by the recently found non-trivial fixed point in $4 < d < 6$ dimensions with metastable critical potential. Particular attention is paid to the case of $d=5$ where the scaling exponent of the correlation length has the value $1/3$, which coincides with the scaling exponent of quantum gravity in one fewer dimensions. Convincing results show that this relation could be generalized to arbitrary number of dimensions above five. Some aspects of AdS/CFT correspondence are also discussed.

Presenter: Dr MATI, Peter (ELI-ALPS)

Session Classification: Contributed talks

Contribution ID: 5

Type: **not specified**

Christiansen – Local Quantum Gravity

Monday, 22 February 2016 17:25 (20 minutes)

I investigate the ultraviolet behaviour of quantum gravity within a functional renormalization group approach. In particular, the scale- and momentum-dependence of the graviton propagator and the graviton three-point function are studied and the fixed point structure of the theory is analyzed.

Moreover, a novel locality property as an essential feature of a well-defined renormalization group flow is introduced and locality in quantum gravity is discussed.

Presenter: Dr CHRISTIANSEN, Nicolai (Institute for Theoretical Physics, Heidelberg University)

Session Classification: Contributed talks

Contribution ID: 6

Type: **not specified**

Loose

Monday, 22 February 2016 17:05 (20 minutes)

Experimental findings in semileptonic B decays by LHCb, Belle and BaBar hint at a possible violation of lepton universality. We investigate an explanation of this anomaly within leptoquark scenarios and point out correlations which arise from flavor symmetries that are known to be capable of describing the observed mixing of quarks and leptons.

Presenter: Mr LOOSE, Dennis (TU Dortmund)

Session Classification: Contributed talks

Contribution ID: 7

Type: **not specified**

Barabanov – Perspective Study of Exotics and Baryons with Charm and Strangeness

The spectroscopy of exotics states with hidden charm together with the spectroscopy of charmed and strange baryons is discussed. It is a good testing tool for the theories of strong interactions, including: QCD in both the perturbative and non-perturbative regimes, LQCD, potential models and phenomenological models [1, 2, 3]. An understanding of the baryon spectrum is one of the primary goals of non-perturbative QCD. In the nucleon sector, where most of the experimental information is available, the agreement with quark model predictions is astonishingly small, and the situation is even worse in the strange and charmed baryon sector. The experiments with antiproton-proton annihilation and proton-proton collisions are well suited for a comprehensive spectroscopy program, in particular, the spectroscopy of exotic states and flavour baryons. Charmed and strange baryons can be produced abundantly in both processes, and their properties can be studied in detail [1, 2, 3]. For this purpose an elaborated analysis of charmed hybrids and tetraquark spectrum together with spectrum of charmed and strange baryons is given. The recent experimental data from different collaborations are analyzed. A special attention was given to the XYZ-particles. The attempts of their possible interpretation are considered [4, 5]. Some of these states can be interpreted as higher-lying charmonium and tetraquarks with a hidden charm. It has been shown that charge/neutral tetraquarks must have their neutral/charged partners with mass values which differ by few MeV. This hypothesis coincides with that proposed by Maiani and Polosa [6]. Many heavy baryons with charm and strangeness are expected to exist. But much more data on different decay modes are needed before firmer conclusions can be made. These data can be derived directly from the experiments using a high quality antiproton beam with momentum up to 15 GeV/c planned at FAIR and proton-proton collisions with momentum up to 26 GeV/c planned at NICA. [1] W. Erni et al., arXiv:0903.3905v1 [hep-ex] (2009) 63 [2] N. Brambilla et al., European Physical Journal C 71:1534, (2011) 1 [3] J. Beringer et al., Review of Particle Physics, Physical. Review, D 86, (2012) [4] M.Yu. Barabanov, A.S. Vodopyanov, Physics of Particles and Nuclei Letters, V.8, N.10, (2011) 1069 [5] M.Yu. Barabanov, A.S. Vodopyanov, S.L. Olsen, Physics of Atomic Nuclei, V.77, N.1, (2014) 126 [6] L. Maiani, F. Piccinini, A.D. Polosa, V. Riquer, Phys. Rev. Lett. 99 (2007) 182003

Presenter: Dr BARABANOV, Mikhail

Contribution ID: **8**

Type: **not specified**

Ihl

Holographic Anyons and the virial expansion. Some recent progress on strongly coupled anyons will be discussed.

Presenter: Dr IHL, Matthias (Centro de Física do Porto, FCUP, Universidade do Porto)

Contribution ID: 9

Type: **not specified**

Schnabl

Monday, 22 February 2016 19:00 (20 minutes)

I will review the subject of topological defects in 2d CFT and discuss the novel aspects which arise in presence of boundaries. I will mention applications to open string field theory.

Presenter: Dr SCHNABL, Martin (Institute of Physics AS CR)

Session Classification: Contributed talks

Contribution ID: 10

Type: **not specified**

Kitamura – Tree-level Unitarity and Renormalizability in Lifshitz Scalar Theory

Monday, 22 February 2016 19:20 (20 minutes)

I studied the equivalence between tree unitarity and renormalizability in Lifshitz scalar theory. Tree-level unitarity and renormalizability are believed to be equivalent in field theories. No counterexample is known in relativistic field theories. However, the question whether the equivalence holds true for more generic field theories, such as non-relativistic theories is obscure. In my study, I discussed the equivalence between tree-level unitarity and renormalizability and showed that the equivalence holds true in Lifshitz (non-relativistic) scalar field theory. It can be inferred that tree-level unitarity is useful to investigate renormalizability in a large class field theories, such as Horava-Lifshitz gravity.

Presenter: Mr KITAMURA, Tomotaka (Waseda University)

Session Classification: Contributed talks

Contribution ID: 11

Type: **not specified**

Karateev – Some Recent Developments in 4D CFTs

Monday, 22 February 2016 19:40 (20 minutes)

In this short talk I will briefly summarise non-perturbative non-lagrangian formulation of CFTs and the philosophy of conformal bootstrap. I will then focus on 4D CFTs and discuss 3- and 4- point functions of operators with arbitrary spin: their computation, importance and future applications for conformal bootstrap.

Presenter: Mr KARATEEV, Denis (SISSA)

Session Classification: Contributed talks

Contribution ID: 12

Type: **not specified**

Gold – Probing astrophysical black holes with gravitational waves and light

Tuesday, 23 February 2016 16:45 (20 minutes)

Presenter: Dr GOLD, Roman (University of Maryland)

Session Classification: Contributed talks

Contribution ID: 13

Type: **not specified**

Huber – A non-perturbative study of the correlation functions of three-dimensional Yang-Mills theory

Tuesday, 23 February 2016 17:05 (20 minutes)

Functional equations like the functional renormalization group, Dyson-Schwinger equations or n-PI methods are useful tools which provide insight into the non-perturbative regime of quantum field theories. The basic objects are Green functions which can be calculated non-perturbatively. However, while the underlying equations are exact, approximations have to be introduced for the actual calculations. I will discuss the effects of such approximations in the case of three-dimensional Yang-Mills theory. This theory is UV finite. As a consequence, some technical ambiguities of the four-dimensional theory are absent which can cloud the effects of truncations.

Presenter: Dr HUBER, Markus (University of Graz)

Session Classification: Contributed talks

Contribution ID: 14

Type: **not specified**

Mitter – Yang-Mills correlation functions from the functional renormalization group

Tuesday, 23 February 2016 17:25 (20 minutes)

We investigate SU(3)-Yang-Mills theory in a systematic vertex expansion scheme for the effective action. Particular focus is put on the dynamical creation of the gluon mass gap at non-perturbative momenta and the consistent treatment of quadratic divergences. The gluon and ghost propagators as well as the momentum-dependent ghost-gluon, three-gluon and four-gluon vertices are calculated self-consistently and the apparent convergence of the expansion scheme is discussed by comparing to corresponding lattice QCD results.

Presenter: Dr MITTER, Mario (University of Heidelberg)

Session Classification: Contributed talks

Contribution ID: 15

Type: **not specified**

Hiller – BSM Flavor Physics with Charm, Beauty and Leptons

Tuesday, 23 February 2016 18:00 (20 minutes)

Flavor physics is highly sensitive to beyond the standard model (BSM) physics and vice versa. In this talk we demonstrate this explicitly in the example of bottom-up leptoquark extensions of the Standard Model.

Recent anomalies in rare B-meson decays into leptons hinting at lepton non-universality are addressed.

The talk is based on recent works arxiv:1408.1627, 1503.01084 and 1510.00311, all hep-ph.

Presenter: Prof. HILLER, Gudrun (TU Dortmund)

Session Classification: Contributed talks

Contribution ID: 16

Type: **not specified**

Bond – Renormalisation group flow of perturbative field theories

Tuesday, 23 February 2016 18:20 (20 minutes)

Renormalisation group flow of perturbative field theories

Presenter: Mr BOND, Andrew (University of Sussex)

Session Classification: Contributed talks

Contribution ID: 17

Type: **not specified**

Maas – Physical spectra and new physics

Tuesday, 23 February 2016 18:40 (20 minutes)

Experimentally observable particles require a gauge-invariant description. In non-Abelian gauge theories this implies that only composite operators, and thus bound states, can be physical.

Though bound states are genuine non-perturbative objects, the Froehlich-Morcchio-Strocchi mechanism nonetheless provides a possibility to determine the masses of Higgs, W, and Z using perturbation theory.

After describing this mechanism, and its ramifications for the standard model, the situation for new physics models will be discussed. The implications for the 2-Higgs doublet models, grand-unified theories, and technicolor will be presented. Special attention will be paid to the question where a breakdown of this mechanism could occur.

Presenter: Prof. MAAS, Axel (University of Graz)

Session Classification: Contributed talks

Contribution ID: **18**Type: **not specified**

Fumagalli – Predictiveness of inflation with the Higgs boson

Wednesday, 24 February 2016 19:20 (20 minutes)

The predictions of (Standard model) Higgs inflation are in excellent agreement with the Planck data, without needing new particles beyond the ones we know. Nevertheless, introducing some threshold corrections is demanded by the consistency of the theory. This raises the question: how sensitive the CMB predictions are to the UV completion? I will show that as long as the UV corrections do not affect the inflaton potential at tree level but only enter at loop level via corrections to the renormalization group equations, the inflationary predictions are (almost) unaffected.

Presenter: Mr FUMAGALLI, Jacopo (NIKHEF)

Session Classification: Contributed talks

Contribution ID: 19

Type: **not specified**

Cherkas – Quantum mechanics allows setting initial conditions at a cosmological singularity: Gowdy model example.

It is shown, that initial conditions in the quasi-Heisenberg quantization scheme can be set at an initial cosmological singularity per se. This possibility is provided by finiteness of some quantities, namely momentums of the dynamical variables, at a singularity, in spite of infinity of the dynamical variables themselves. The uncertainty principle allows avoiding a necessity to set values of the dynamical variables at singularity, as a wave packet can be expressed through the finite momentums. Influence of the initial condition set in the singularity in such a way to amount of a matter under a vacuum state, arising during later evolution when the gravitational waves appear, is addressed as well. It is shown that, even choosing of some special state in the singularity minimizing late time expansion rate, some amount of matter under vacuum appear in the late time evolution.

Presenter: Dr CHERKAS, Sergey (Institute for Nuclear Problems, Belarusian State University)

Contribution ID: 20

Type: **not specified**

Ramírez Rodríguez – Do current data prefer a nonminimally coupled inflaton?

Wednesday, 24 February 2016 19:40 (20 minutes)

Inflation provides the most theoretically attractive and observationally successful cosmological scenario able to generate the initial conditions of our universe. From the theoretical viewpoint, this picture is usually understood as the dynamics of a single new scalar degree of freedom, the inflaton, minimally coupled to gravity. However, generally the inflaton is expected to have a nonminimal coupling to the Ricci scalar. While the minimally-coupled version of the chaotic model of inflation is ruled out at more than 99% confidence level (for 50 e-folds of inflation), in this talk we will see that the presence of such coupling, for the chaotic model, is highly favoured with respect to the latest analysis of Planck and BICEP2.

Presenter: Mr RAMÍREZ RODRÍGUEZ, Héctor (IFIC - University of Valencia)

Session Classification: Contributed talks

Contribution ID: 21

Type: **not specified**

Advances in Quantum Field Theory. Lecture I

Sunday, 21 February 2016 10:00 (1 hour)

Session Classification: Lecture

Contribution ID: 22

Type: **not specified**

Gravity and the Quantum. Lecture I

Sunday, 21 February 2016 16:45 (1 hour)

Session Classification: Lecture

Contribution ID: 23

Type: **not specified**

Models for the LHC and Beyond. Lecture III

Tuesday, 23 February 2016 11:00 (1 hour)

Session Classification: Lecture

Contribution ID: 24

Type: **not specified**

Models for the LHC and Beyond. Lecture IV

Wednesday, 24 February 2016 08:45 (1 hour)

Session Classification: Lecture

Contribution ID: 25

Type: **not specified**

Asymptotic Safety. Lecture I

Sunday, 21 February 2016 11:00 (1 hour)

Session Classification: Lecture

Contribution ID: 26

Type: **not specified**

Fundamental Theory Beyond the SM. Lecture II

Contribution ID: 27

Type: **not specified**

Gravity and the Quantum. Lecture III

Tuesday, 23 February 2016 08:45 (1 hour)

Session Classification: Lecture

Contribution ID: 28

Type: **not specified**

Advances in Quantum Field Theory. Lecture II

Monday, 22 February 2016 08:45 (1 hour)

Session Classification: Lecture

Contribution ID: 29

Type: **not specified**

Gravity and the Quantum. Lecture II

Monday, 22 February 2016 10:00 (1 hour)

Session Classification: Lecture

Contribution ID: **30**

Type: **not specified**

Models for the LHC and Beyond. Lecture I

Monday, 22 February 2016 11:00 (1 hour)

Session Classification: Lecture

Contribution ID: **31**

Type: **not specified**

Asymptotic Safety. Lecture IV

Friday, 26 February 2016 08:45 (1 hour)

Session Classification: Lecture

Contribution ID: 32

Type: **not specified**

Asymptotic Safety. Lecture II

Tuesday, 23 February 2016 10:00 (1 hour)

Session Classification: Lecture

Contribution ID: **33**

Type: **not specified**

Fundamental Theory Beyond the SM. Lecture I

Wednesday, 24 February 2016 10:00 (1 hour)

Session Classification: Lecture

Contribution ID: **34**

Type: **not specified**

Gravity and the Quantum. Lecture IV

Wednesday, 24 February 2016 11:00 (1 hour)

Session Classification: Lecture

Contribution ID: 35

Type: **not specified**

Particle Physics and Cosmology. Lecture I

Wednesday, 24 February 2016 18:00 (1 hour)

Session Classification: Lecture

Contribution ID: **36**

Type: **not specified**

Asymptotic Safety. Lecture III

Thursday, 25 February 2016 08:45 (1 hour)

Session Classification: Lecture

Contribution ID: 37

Type: **not specified**

Models for the LHC and Beyond. Lecture V

Thursday, 25 February 2016 10:00 (1 hour)

Session Classification: Lecture

Contribution ID: **38**

Type: **not specified**

Advances in Quantum Field Theory. Lecture III

Thursday, 25 February 2016 11:00 (1 hour)

Session Classification: Lecture

Contribution ID: **39**

Type: **not specified**

Particle Physics and Cosmology. Lecture II

Thursday, 25 February 2016 16:45 (1 hour)

Session Classification: Lecture

Contribution ID: 40

Type: **not specified**

Fundamental Theory Beyond the SM. Lecture II

Thursday, 25 February 2016 18:00 (1 hour)

Session Classification: Lecture

Contribution ID: 41

Type: **not specified**

Models for the LHC and Beyond. Lecture II

Monday, 22 February 2016 18:00 (1 hour)

Session Classification: Lecture

Contribution ID: 42

Type: **not specified**

Advances in Quantum Field Theory. Lecture IV

Friday, 26 February 2016 10:00 (1 hour)

Session Classification: Lecture

Contribution ID: 43

Type: **not specified**

Fundamental Theory Beyond the SM. Lecture III

Friday, 26 February 2016 11:00 (1 hour)

Session Classification: Lecture

Contribution ID: 44

Type: **not specified**

Particle Physics and Cosmology. Lecture III

Friday, 26 February 2016 16:45 (1 hour)

Session Classification: Lecture

Contribution ID: 45

Type: **not specified**

Poster Presenters

Tuesday, 23 February 2016 19:15 (1h 45m)

Natalia Alkofer – Spectral Dimensions from the Spectral Action –
Reinhard Alkofer: The Rotating Mass Shell: A counter-example to Mach's principle? –
Adrian Lorenz Blum – Symmetry-broken phase of ϕ^4 -theory from the FRG
Julia Borchardt – Global flow of the Higgs potential in a Yukawa model
Tugba Buyukbese –
Anton Konrad Cyrol – Yang-Mills correlation functions
from functional methods
Christian Ecker –
Guman Garayev –
Aaron Held –
Sergei Iurev –
Ju-Hyun Jung – The pion-dressing effect of Nucleon and Delta
Wolfgang Lucha – Janus-facedness of the pion: analytic instantaneous Bethe-Salpeter models
Wout Merbis –
Christoph Niehoff –
Tetiana Obikhod –
Sebastian Ohmer –
Hande Özçelik –
Jordi París López – SU(3)-Symmetric Sum Rules For B->PP Decays
Colin Poole –
Peter Posfay –
Manuel Reichert –
Chris Ripken: Curvature on the noncommutative tangent bundle –
Christian Rohrhofer – Angular momentum content of the $\rho(1450)$ from chiral lattice fermions
Wolfgang Schweiger –
Andrey Shkerin –
Tom Steudtner – Resummation of Logarithmic Enhanced Contributions to the Higgs Mass in FlexibleSUSY
Pascal Törek – Partially Higgsed Gauge Theory
Masatoshi Yamada – Electroweak and Dark matter scalegenesis from a bilinear scalar condensate
Felix Ziegler

Session Classification: Poster Session

Contribution ID: 46

Type: **not specified**

Fixed points in quantum gravity and cosmology

Friday, 26 February 2016 18:00 (1 hour)

Session Classification: Lecture

Contribution ID: 47

Type: **not specified**

Raum , Zeit, Universum - die Rätsel des „Beginns“

Thursday, 25 February 2016 20:00 (1 hour)

Session Classification: Public Lecture Wetterich