Portorož 2019: Precision era in High Energy Physics

Report of Contributions

https://indico.cern.ch/e/737360

Contribution ID: **1** Type: **not specified**

The CKM matrix in the SMEFT

Wednesday 17 April 2019 12:15 (25 minutes)

The extraction of the CKM matrix from flavour observables can be affected by physics beyond the Standard Model. I will present a general roadmap to take this into account, applied to the SMEFT. This approach allows one to perform general SMEFT analyses in a consistent fashion, independently of any assumptions about the way new physics affects the flavour observables that are used to fix the CKM parameters. I'll discuss a few examples illustrating how this approach can be implemented in practice.

Primary author: VIRTO, Javier (MIT)

Presenter: VIRTO, Javier (MIT)

Session Classification: Flavor

Track Classification: Flavor

Contribution ID: **2** Type: **not specified**

Loop Effects solutions to B anomalies

Tuesday 16 April 2019 15:30 (25 minutes)

In this talk I will show how one can account for the observed anomalies in $b \to s\mu^+\mu^-$ via loop effects with new scalars and fermions. Allowing for couplings to left- and right-handed quarks and leptons, we calculate the contributions to $b \to s\mu^+\mu^-$, $B - \bar{B}$ mixing and the anomalous magnetic moment of the muon.
I will show how, in a specific model in which we supplement the SM with a 4^{th} generation of vector-like fermions and a real scalar field, one can address at the same time the observed anomalies in $b \to s\mu^+\mu^-$ and the anomalous magnetic moment of the muon.

Primary authors: FEDELE, Marco (ICC Barcelona); MESCIA, Federico; CRIVELLIN, Andreas (Paul Scherrer Institut (CH)); ARNAN, Pere (Universitat de Barcelona)

Presenter: FEDELE, Marco (ICC Barcelona)

Session Classification: Flavor

Track Classification: Flavor

Contribution ID: **11** Type: **not specified**

The Conformal Realization of the Neutrino Option and its Gravitational Wave Signature

Thursday 18 April 2019 11:25 (25 minutes)

It was recently proposed that the electroweak hierarchy problem is absent if the generation of the Higgs potential stems exclusively from quantum effects of heavy right-handed neutrinos which can also generate active neutrino masses via the type-I seesaw mechanism. Hence, in this framework dubbed the "neutrino option", the tree-level scalar potential is assumed to vanish at high energies. Such a scenario therefore lends itself particularly well to be embedded in a classically scale-invariant theory. In this talk we demonstrate that the minimal scale-invariant framework compatible with the "neutrino option" requires the Standard Model to be extended by two real scalar singlet fields in addition to right-handed neutrinos. We present the parameter space of the model for which a phenomenologically viable Higgs potential and neutrino masses are generated, and for which all coupling constants remain in the perturbative regime up to the Planck scale. In addition, we show that the phase transition connected with radiative scale symmetry breaking is of strong
first order with a substantial amount of supercooling. This yields a sizable gravitational wave signal, so that the model can be fully tested by future gravitational wave observatories. In particular, most of the parameter space can already be probed by the upcoming LIGO science run starting in early 2019.

Primary authors: BRDAR, Vedran (MPIK Heidelberg); Dr HELMBOLDT, Alexander (MPIK Heidelberg); LINDNER, Manfred (Max Planck Institut fuer Kernphysik, Heidelberg, Germany); KUBO, Jisuke (Kanazawa University)

Presenter: BRDAR, Vedran (MPIK Heidelberg)

Session Classification: Astroparticle and cosmology

Track Classification: Astroparticle and cosmology

Contribution ID: **13** Type: **not specified**

The Short Baseline Neutrino Oscillation Anomalies

Wednesday 17 April 2019 09:00 (25 minutes)

We discuss the various anomalies reported in short-baseline neutrino oscillations, in particular from the LSND and MiniBooNE experiments and from reactor neutrino detectors. We critically assess explanations of these anomalies within the Standard Model and beyond. In particular, we discuss the benefits and drawbacks of models with eV-scale sterile neutrinos.

Primary author: KOPP, Joachim (CERN)

Presenter: KOPP, Joachim (CERN)

Session Classification: Neutrinos

Track Classification: Neutrinos

Contribution ID: **14** Type: **not specified**

Z' explanation for RK(*)

Thursday 18 April 2019 09:00 (25 minutes)

We shall review simplified Z' models as explanations for discrepancies between measurements of certain neutral current B meson decays and Standard Model predictions. We provide estimates of LHC and future collider sensitivity. Then a more complete model is introduced: The Third Family Hypercharge Model, which also explains some coarse features of the fermion mass spectrum.

Primary author: Prof. ALLANACH, Ben (University of Cambridge)

Presenter: Prof. ALLANACH, Ben (University of Cambridge)

Session Classification: BSM

Track Classification: BSM

Contribution ID: **15** Type: **not specified**

Heavy Neutrinos with Dynamic Jet Vetoes

Tuesday 16 April 2019 11:45 (25 minutes)

Heavy neutrinos (N) are commonly hypothesized in low-scale neutrino mass models and may be accessible at experiments such as LHC, or its potential successors like the 27 TeV HE-LHC or 100 TeV VLHC. We show how collider searches for such objects employing an usual (dynamic) jet veto scheme can radically improve sensitivity to EW- and TeV-scale heavy N. The new scheme is applicable to searches for other new, colorless particles. QCD properties of the dynamic jet veto and anticipated sensitivities at future facilities are also presented.

Primary author: RUIZ, Richard (Universite Catholique de Louvain)

Presenter: RUIZ, Richard (Universite Catholique de Louvain)

Session Classification: Collider

Track Classification: Collider

Contribution ID: **16** Type: **not specified**

b->sll' and l->l'gamma in 2HDMs

Tuesday 16 April 2019 15:05 (25 minutes)

In this talk I discuss the calculation of b->sll' and l'->l'gamma transitions in 2HDMs (including right-handed neutrinos) and its phenomenological implications.

Primary author: CRIVELLIN, Andreas (Paul Scherrer Institut (CH))

Presenter: CRIVELLIN, Andreas (Paul Scherrer Institut (CH))

Session Classification: Flavor

Track Classification: Flavor

Contribution ID: **17** Type: **not specified**

CLIC potential for new physics

Tuesday 16 April 2019 11:20 (25 minutes)

I will describe direct and indirect searches for new physics that can be carried out at a multi-TeV e+e- collider, with specific results for the energies, up to 3 TeV center of mass energy, and luminosities foreseen for the CLIC future collider project. I will focus on the searches and interpretations that aim at the discovery of new dynamics able to address some of the fundamental issues left open in the Standard Model.

Primary author: FRANCESCHINI, Roberto (Rome 3 U.)

Presenter: FRANCESCHINI, Roberto (Rome 3 U.)

Session Classification: Collider

Track Classification: Collider

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

Continuum Naturalness

Thursday 18 April 2019 17:55 (25 minutes)

Searches at the LHC have placed the naturalness paradigm under pressure. In this talk I will introduce a novel class of composite Higgs models in which the top and gauge partners responsible for cutting off the Higgs quadratic divergences form a gapped continuum. The new continuum states in this scenario cannot be described as Breit-Wigner resonances, drastically changing their LHC phenomenology, and may require precision studies in high energy physics. I will present a concrete example based on a warped extra dimension with a linear dilaton, where this finite gap arises naturally, and show that naturalness is improved compared to the case with usual resonance type of top partners for the same KK scale (say top partner mass around 2 TeV).

Primary author: LEE, Seung J. (Korea University)

Presenter: LEE, Seung J. (Korea University)

Session Classification: BSM

Track Classification: BSM

Contribution ID: **19** Type: **not specified**

Flavored mono-tau searches at the LHC

Tuesday 16 April 2019 12:10 (25 minutes)

I will discuss the crossing-symmetry relation between $b \to c\tau\nu^-$ decay and $bc^- \to \tau\nu^-$ scattering. At low energies, this allows one to correlate New Physics contributions to the semitauonic B decays to the B(c) lifetime. At high energies, one derives direct correlations to the mono-tau signature at the LHC ($pp \to \tau hX$ + MET). I will discuss the impact of these considerations in New Physics explanations addressing the R(D*) anomalies and, more in general, the potential of the LHC to provide relevant inputs for Flavor Physics.

Primary author: MARTIN CAMALICH, Jorge (Inst. Astrophys. of Canary Islands (ES))

Presenter: MARTIN CAMALICH, Jorge (Inst. Astrophys. of Canary Islands (ES))

Session Classification: Collider

Track Classification: Collider

Contribution ID: **20** Type: **not specified**

Vector dark matter from inflation

Wednesday 17 April 2019 15:15 (25 minutes)

I describe a non-thermal mechanism, taking place at the end of inflation, to generate the dark matter relic abundance in the form of dark photons, whose mass can range between micro-eV to GeV. This dark matter candidate can have unusual features, possibly useful for signatures in direct and indirect detection.

Primary authors: BASTERO-GIL, Mar; SANTIAGO, Jose; LORENZO UBALDI, Lorenzo; VEGA--MORALES, Roberto

Presenter: LORENZO UBALDI, Lorenzo

Session Classification: Astroparticle and cosmology

Track Classification: Astroparticle and cosmology

Contribution ID: **21** Type: **not specified**

Implications of Symmetries in the Scalar Sector (CP Properties and Mass Degeneracies)

Thursday 18 April 2019 09:25 (25 minutes)

We explore some aspects of models with two and three SU(2) scalar doublets that lead to mass degeneracies among some of the physical scalars. We also study the CP properties of some models in the presence of discrete symmetries.

Primary author: Dr REBELO, Gui Nesbitt (CFTP/Ist, U. Lisboa)

Presenter: Dr REBELO, Gui Nesbitt (CFTP/Ist, U. Lisboa)

Session Classification: BSM

Track Classification: BSM

Contribution ID: **22** Type: **not specified**

General correlations to R(K(*)) anomalies from a rank condition

Thursday 18 April 2019 15:30 (25 minutes)

In this talk I would like to present a work, close to conclusion, done in collaboration with V. Gherardi, M. Nardecchia, and A. Romanino. We derive general correlations of bsμμ anomalies with other flavour and high-pT observables, under the assumption that the flavour matrix of the relevant operators is of rank-one. This condition is automatically realised in a large class of UV models, including all single-leptoquark scenarios. We find that a sizeable part of the parameter space in this scenario is already excluded, and future measurements by LHCb and Belle-II will test it almost entirely.

Primary author: MARZOCCA, David (INFN Trieste)

Presenter: MARZOCCA, David (INFN Trieste)

Session Classification: Flavor

Track Classification: Flavor

Contribution ID: **23** Type: **not specified**

$\epsilon'/epsilon$: 2019

Wednesday 17 April 2019 11:25 (25 minutes)

I will review the present status of the CP-violating ratio $\epsilon'/epsilon$ within the SM using first dual Dual QCD (DQCD) framework and confronting it both with Lattice QCD and Chiral Perturbation Theory. DQCD is presently the only framework which allowed to calculate
all $K \to \pi\pi$ hadronic matrix elements of BSM operators which opened the road for the general study of $\epsilon'/epsilon$ in the context of the SM effective theory (SMEFT). One of the highlights of my talk will be a master formula for $\epsilon'/epsilon$ valid in any extension of the SM. This formula should facilitate the search for new physics responsible for the $\epsilon'/epsilon$ anomaly hinted by 2015 results from lattice QCD and DQCD. I hope that by the time of Portoroz 2019 new lattice QCD results, improved isospin breaking corrections and NNLO QCD corrections to QCD penguins will be avaible so that a new estimate of $\epsilon'/epsilon$ within the SM will be possible. If time allows it, links of $\epsilon'/epsilon$ to rare decays $K \to \pi\nu\bar{\nu}$ will be presented.

Primary author: Prof. BURAS, Andrzej (TUM Institute for Advanced Study)

Presenter: Prof. BURAS, Andrzej (TUM Institute for Advanced Study)

Session Classification: Flavor

Track Classification: Flavor

Contribution ID: **24** Type: **not specified**

Cosmosettology

Thursday 18 April 2019 11:00 (25 minutes)

The potential of pseudo Nambu-Goldstone bosons can have two or more local minima e.g. at antipodal positions in the coset space. This happens in many models of composite Higgs and of composite Dark Matter. In this talk, I will discuss some unusual cosmological features of trigonometric potentials, which can lead to domain-wall structures, to supermassive primordial black holes, to vacuum/thermal decays and to a high-temperature phase of broken $SU(2)_L$, possibly interesting for baryogenesis.

Primary author: DI LUZIO, Luca (Pisa University)

Presenter: DI LUZIO, Luca (Pisa University)

Session Classification: Astroparticle and cosmology

Track Classification: Astroparticle and cosmology

Contribution ID: **25** Type: **not specified**

Unbroken flavour symmetries vs lepton masses and mixings

Wednesday 17 April 2019 09:50 (25 minutes)

We identify all flavour groups and representations providing an approximate description of lepton masses and mixings in the symmetric limit. Assuming the symmetry constrains the Weinberg operator, neutrinos turn out to be always either anarchical or inverted hierarchical. We investigate whether the flavour theory predictions obtained within the Weinberg operator description are equivalent to those obtained within a full UV theory, using type I seesaw as an example. That is not always the case, and the conditions for the equivalence are found. If the hint of a normal hierarchical neutrino spectrum were confirmed, we would conclude that either the symmetry breaking effects play a primary role in the understanding of neutrino flavour observables, or the UV flavour theory does not provide the same predictions as the effective one.

Primary authors: ROMANINO, Andrea; REYIMUAJI, Yakefu

Presenter: ROMANINO, Andrea

Session Classification: Neutrinos

Track Classification: Neutrinos

Contribution ID: **26** Type: **not specified**

What do we learn from the measure of RK? and what's next?

Tuesday 16 April 2019 15:55 (25 minutes)

In this talk we discuss the present situation of global fits after the new measurement of RK. We make special emphasis on what we learn concerning disentangling scenarios and what should be the next step. Also the importance that Lepton Flavour Universal New Physics can have in the near future is discussed.

Primary author: Prof. JOAQUIM, Matias (UAB/IFAE)

Presenter: Prof. JOAQUIM, Matias (UAB/IFAE)

Session Classification: Flavor

Track Classification: Flavor

Contribution ID: **27** Type: **not specified**

Precision diboson measurements at hadron colliders

Thursday 18 April 2019 17:30 (25 minutes)

We discuss the measurements of the anomalous triple gauge couplings at Large Hadron Collider focusing on the contribution of the O3W and O3W˜ operators. These deviations were known to be particularly hard to measure due to their suppressed interference with the SM amplitudes in the inclusive processes, leading to approximate flat directions in the space of these Wilson coefficients. We present the prospects for the measurements of these interactions at HL-LHC and HE-LHC using exclusive variables sensitive to the interference terms and taking carefully into account effects appearing due to NLO QCD corrections.

Primary author: Dr AZATOV, Aleksandr (SISSA and INFN Trieste)

Presenter: Dr AZATOV, Aleksandr (SISSA and INFN Trieste)

Session Classification: Collider

Track Classification: Collider

Contribution ID: **28** Type: **not specified**

Upper limits on lepton number violating particles from neutrino masses

Friday 19 April 2019 11:25 (25 minutes)

In this talk I will discuss a model-independent framework to classify and study the plethora of neutrino mass models and their phenomenology. The idea is to introduce one particle beyond the Standard Model which couples to leptons and carries lepton number, together with the lowest-dimensional lepton number violating operator, which contains this particle. Demanding the generation of neutrino masses it is possible to obtain generic and robust upper bounds on the mass of the new particle. I will also discuss the less robust ones from Higgs naturalness, as well as the model-dependent lower bounds from direct searches, lepton flavor violation, wash-out arguments and in some cases baryon number violation.

Primary author: HERRERO-GARCIA, Juan (INFN/SISSA, Trieste)

Presenter: HERRERO-GARCIA, Juan (INFN/SISSA, Trieste)

Session Classification: Neutrinos

Track Classification: Neutrinos

Contribution ID: **30** Type: **not specified**

Recent developments in Kaon physics

Wednesday 17 April 2019 11:00 (25 minutes)

I review rare kaon decays in the LHC era: we discuss interplay with B-anomalies and possible New Physics in direct CP violation in K 8594; 2 pi : very rare kaon decays like K 8594; pi nu nu are very important to this purpose We discuss also the decays K0 8594; mu mu due to the LHCB measurement

Primary author: D'AMBROSIO, Giancarlo

Presenter: D'AMBROSIO, Giancarlo

Session Classification: Flavor

Track Classification: Flavor

Contribution ID: **31** Type: **not specified**

Double Beta Decay and TeV Scale Physics

Friday 19 April 2019 11:00 (25 minutes)

Neutrinoless double beta decay can significantly help to shed light on the issue of non-zero neutrino mass, as observation of this lepton number violating process would imply neutrinos are Majorana particles. However, the underlying interaction does not have to be as simple as the standard neutrino mass mechanism. The entire variety of neutrinoless double beta decay mechanisms can be approached effectively. In this talk I will focus on a theoretical description of short-range effective contributions to neutrinoless double beta decay, which are equivalent to 9-dimensional effective operators as well as a novel mode with a Majoron-like scalar particle emitted in the decay.

Primary author: Dr DEPPISCH, Frank (University College London)

Presenter: Dr DEPPISCH, Frank (University College London)

Session Classification: Neutrinos

Track Classification: Neutrinos

Contribution ID: **32** Type: **not specified**

Lepton flavor universality tests in the angular observables of $B \to D^{(*)}\ell\bar{\nu}$

Wednesday 17 April 2019 17:15 (25 minutes)

We construct angular observables in the decay of B meson to a pseudoscalar (vector) $D^{(*)}$ meson. We combine these observable in order to build tests of lepton flavor universality violation, complementary to the ratios $R(D^{(*)})$. We then make the predictions for these observables within the standard model and new physics scenarios.

Primary authors: NIŠANDŽIĆ, Ivan; FEDELE, Marco (ICC Barcelona)

Presenter: FEDELE, Marco (ICC Barcelona)

Session Classification: Flavor

Track Classification: Flavor

Contribution ID: **33** Type: **not specified**

Global Bounds on Type III Seesaw

Wednesday 17 April 2019 09:25 (25 minutes)

We derive general bounds on the Type-III Seesaw parameters from a global fit to flavor and electroweak precision data. We will explore and compare three Type-III seesaw realizations: a general scenario, where an arbitrary number of heavy triplets is integrated out without any further assumption, and the more constrained cases in which only 3 or 2 additional heavy states are included and the light neutrino masses and mixing as measured in neutrino oscillations experiments are generated. The latter assumption implies non-trivial flavor correlations in the Yukawa flavor structure of the model and thus qualitative differences can be found with the more general scenario. In particular, we find that the constraints on the simplest model with 2 triplets are much stronger than the ones in the general and 3 triplet scenarios. The relevant processes analyzed in the global fit include searches for Lepton Flavour Violating (LFV) decays, probes of the universality of weak interactions, CKM unitarity bounds and electroweak precision data.

Primary author: LOPEZ PAVON, Jacobo (IFIC, CSIC-Universitat de València)

Presenter: LOPEZ PAVON, Jacobo (IFIC, CSIC-Universitat de València)

Session Classification: Neutrinos

Track Classification: Neutrinos

Contribution ID: **34** Type: **not specified**

Dark pion DM : WIMP vs. SIMP

Wednesday 17 April 2019 15:40 (25 minutes)

Scale invariant extension of the SM with QCD-like strongly interacting hidden (dark) sector is interesting, since the dimensional transmutation and chiral symmetry breaking in the hidden sector could be the origin of electroweak symmetry breaking (EWSB), and all the masses of the SM particles as well as dark pions and dark baryons that could be good cold dark matter candidates. In this talk I discuss dark pion DM as WIMP vs. SIMP. Ignoring the West-Zumio-Witten (WZW) interaction, I first discuss dark pion as a WIMP using two different approaches, the chiral perturbation theory (ChPT) and AdS/QCD. Then I include the WZW interaction and discuss dark pion within SIMP scenario. However, the analysis based on ChPT indicates that the viable parameter space for SIMP seems to be outside the validity region of ChPT. I show that this problem can be resolved if we include dark vector mesons, and the SIMP idea can be realized in the dark pion sector.

Based on :
arXiv:1103.2571 WIMP scenario within Chiral perturbation (PRL)
arXiv:1606.02969 WIMP scenario within AdS/QCD (JHEP)
arXiv:1801.07726 SIMP scenario including dark vector mesons
and Wess-Zumino-Witten term (PRD)

Primary author: Prof. KO, Pyungwon (Korea Institute for Advanced Study (KIAS))

Presenter: Prof. KO, Pyungwon (Korea Institute for Advanced Study (KIAS))

Session Classification: Astroparticle and cosmology

Track Classification: Astroparticle and cosmology

Contribution ID: **35** Type: **not specified**

Strong decays of excited heavy mesons: Implications for spectroscopy

Friday 19 April 2019 09:00 (25 minutes)

I discuss strong decays of excited charmed and beauty mesons into a light meson, exploiting the effective field theory based on heavy quark symmetries for heavy mesons, chiral symmetry for light pseudoscalars and on the hidden gauge symmetry to incorporate light vector mesons. The approach has already been successfully employed to classify several heavy-light mesons.
After a brief review of these results, I present a new analysis aimed at the classification of the latest observed heavy-light mesons.

Primary author: DE FAZIO, Fulvia (INFN Bari)

Presenter: DE FAZIO, Fulvia (INFN Bari)

Session Classification: Flavor

Track Classification: Flavor

Contribution ID: **36** Type: **not specified**

Probing the flavor of New Physics with dipoles

Wednesday 17 April 2019 11:50 (25 minutes)

Dipole operators encode a rich variety of phenomena, such as radiative decays and electric dipole moments in both quark and lepton sectors, which probe physics beyond the Standard Model up to very high energy scales. Through renormalization, non-dipole operators mix into dipole ones, thus possibly generating observable effects that can be investigated by those phenomena. I will discuss the calculation of this mixing in cases where the leading order effect happens at two-loops, and the phenomenological consequences for flavor and CP violation coming from generic New Physics.

Primary author: VALE SILVA, Luiz

Presenter: VALE SILVA, Luiz

Session Classification: Flavor

Track Classification: Flavor

Contribution ID: **37** Type: **not specified**

Revisiting the vector leptoquark explanation of the B-physics anomalies

Thursday 18 April 2019 15:05 (25 minutes)

A thorough investigation of the vector leptoquark (LQ) hypothesis for a combined explanation of the B-physics anomalies is presented. This hypothesis is discussed both using an Effective Field Theory approach and in the context of a complete ultraviolet completion of the Standard Model (SM) based on the hypothesis of flavour non-universal gauge interactions (which could provide an explanation of the SM flavour puzzle). The impact of recent results from both high-pT searches and B-physics are discussed in detail: the vector LQ hypothesis turns out to be in good agreement with all available data. The implications of this hypothesis for a series of key low-energy observables, namely Bs $\longrightarrow \tau\tau$ and $\tau \longrightarrow \mu$ Lepton Flavour Violating processes both in τ and in B decays, are discussed in detail.

Primary author: ISIDORI, Gino (Universitaet Zuerich (CH))

Presenter: ISIDORI, Gino (Universitaet Zuerich (CH))

Session Classification: Flavor

Track Classification: Flavor

Contribution ID: **38** Type: **not specified**

The odd kink behind small fermion masses

Tuesday 16 April 2019 16:40 (25 minutes)

The flavor puzzle remains one of the outstanding questions in particle physics. Several mechanisms predicting large hierarchies among the different fermion masses with anarchic parameters exist on the market. Among them, models with warped extra dimensions stand out since they also address the quadratic sensitivity of the Higgs mass. However, up to now, fermion bulk masses controlling the localization of the different chiral modes – and therefore the different fermion masses – were ad-hoc parameters of the theory. In this talk, I will show the feasibility of dynamically generating fermion bulk masses with a bulk scalar in warped extra dimensions. As I will show, the bulk scalar acquires a kink background solution, odd under the orbifold symmetry, which gives rise to the fermion bulk masses through Yukawa-like interactions. I will discuss the phenomenological implications of the backreaction on the metric and the modified fermion profiles due to the bulk scalar field on electroweak precision and flavor observables.

Primary author: CARMONA BERMUDEZ, Adrian (Johannes Gutenberg Universitaet Mainz (DE))

Presenter: CARMONA BERMUDEZ, Adrian (Johannes Gutenberg Universitaet Mainz (DE))

Session Classification: BSM

Track Classification: BSM

Contribution ID: **41** Type: **not specified**

Flavor Phenomenology of the QCD Axion

Thursday 18 April 2019 09:50 (25 minutes)

I will discuss theoretical and phenomenological aspects of flavor-violating couplings of the QCD axion. Such couplings arise whenever SM fermions carry flavor non-universal Peccei-Quinn charges, and allow to look for the QCD axions also with high-precision flavor experiments, complementarily to usual searches with halo- and helioscopes.

Primary authors: CAMALICH, Jorge; ZUPAN, Jure; VUONG, Hoa; ZIEGLER, Robert

Presenter: ZIEGLER, Robert

Session Classification: BSM

Track Classification: BSM

Contribution ID: **42** Type: **not specified**

$\bar{B} \to D^*(D\pi, D\gamma)\ell^-\bar{\nu}_\ell$ modes and the search for New Physics

Friday 19 April 2019 09:25 (25 minutes)

The fully differential $\bar{B} \to D^*(D\pi, D\gamma)\ell^-\bar{\nu}_\ell$ angular distributions are considered to scrutinize the effects of the $B \to D^{(*)}$ form factor parametrizations.
The use of the angular coefficients to pin down deviations from SM is discussed, in particular concerning lepton flavour universality violation phenomena.
A possible connection between the tension in the inclusive/exclusive determinations of $|V_{cb}|$ and the $R(D^{(*)})$ anomalies is discussed.

Primary author: COLANGELO, Pietro (Universita e INFN (IT))

Presenter: COLANGELO, Pietro (Universita e INFN (IT))

Session Classification: Flavor

Track Classification: Flavor

Contribution ID: **43** Type: **not specified**

Charming asymmetry between matter and antimatter

Friday 19 April 2019 10:15 (25 minutes)

One of the conditions for creating a matter-dominated Universe is presence of interactions that differentiate between matter and anti-matter. Properties of such interactions can be probed at particle accelerators by studying decay patters of produced particles. On March 21, one of the CERN's experiments, the LHCb, announced observation of CP-violation in the decays of particles containing charm quark. I discuss theoretical implications of this important discovery, and why it took experimentalists such a long time to make this observation. I will also discuss why it would take even longer for theorists to discern it.

Primary authors: PETROV, Alexey (Wayne State University); Ms CONLIN, Renae (Wayne State University)

Presenter: PETROV, Alexey (Wayne State University)

Session Classification: Flavor

Track Classification: Flavor

Contribution ID: **44** Type: **not specified**

Constraints on EFT from neutrino oscillations

Wednesday 17 April 2019 10:15 (25 minutes)

We study constraints on the Standard Model Effective Field Theory (SMEFT) from neutrino oscillations in short-baseline reactor experiments. We calculate the survival probability of reactors antineutrinos at the leading order in the SMEFT expansion, that is including linear effects of dimension-6 operators. It is shown that, at this order, reactor experiments alone cannot probe charged-current contact interactions between leptons and quarks that are of the (pseudo)vector (V±A) or pseudo-scalar type. We also note that flavor-diagonal (pseudo)vector coefficients do not have observable effects in oscillation experiments. In this we reach novel or different conclusions than prior analyses of non-standard neutrino interactions. On the other hand, reactor experiments offer a unique opportunity to probe tensor and scalar SMEFT operators that are off-diagonal in the lepton-flavor space. We derive constraints on the corresponding SMEFT parameters using the most recent data from the Daya Bay and RENO experiments.

Primary author: FALKOWSKI, Adam (LPT Orsay)

Presenter: FALKOWSKI, Adam (LPT Orsay)

Session Classification: Neutrinos

Track Classification: Neutrinos

Contribution ID: **45** Type: **not specified**

New Results for inclusive $b \to c$ semileptonic transitions

Wednesday 17 April 2019 16:50 (25 minutes)

The talk consist of two parts. In the first part I present a new method for the extraction of V_{cb} which is based on a reduced set of non-perturbative parameters. This will eventually allow us to extract this CKM element up to order $1/m^4$ without relying on model for non-perturbative physics. in the second part I present the calculation of the QCD corrections to the $1/m^3$ contributions and present first results.

Primary author: MANNEL, Thomas (Siegen University)

Presenter: MANNEL, Thomas (Siegen University)

Session Classification: Flavor

Track Classification: Flavor

Contribution ID: **46** Type: **not specified**

Implications of new physics in $b \to c\tau\nu$ for polarisation observables and $\Lambda_b \to \Lambda_c\tau\nu$

Wednesday 17 April 2019 18:05 (25 minutes)

Data on $B \to D\tau\nu$ and $B \to D^*\tau\nu$ deviate from their Standard-Model expectations. I discuss how precise measurements of polarisation observables can discriminate between different new-physics interpretations. The branching fraction of $\Lambda_b \to \Lambda_c\tau\nu$ will instead serve as a model-independent cross-check of previous measurements, because it satisfy a sum rule holding in any model of new physics.

Primary author: Prof. NIERSTE, Ulrich

Presenter: Prof. NIERSTE, Ulrich

Session Classification: Flavor

Track Classification: Flavor

Contribution ID: **47** Type: **not specified**

The Scalar Era: Listening for New Scalar Fields with Gravitational Waves

Thursday 18 April 2019 11:50 (25 minutes)

The stochastic background of primordial gravitational waves (GWs) carries information on the expansion history of the Universe throughout its entire evolution. This offers the exciting possibility to probe scenarios of new physics beyond the Standard Model (BSM) as well as the thermal history of our Universe prior to Big Bang nucleosynthesis in future GW experiments. In this talk, I will specifically consider the case of a generic BSM scalar field whose coherent oscillations dominate the energy budget of the Universe at very early times. Such a "scalar era" preceding the standard radiation-dominated era is expected to occur in a variety of BSM scenarios, with the scalar field being identified, e.g., with an axion-like field, a flavon, or a modulus in string theory. In my talk, I will discuss the impact of the scalar era on the spectrum of relic GWs across the entire viable parameter space, which will lead me to two fascinating conclusions: (i) A number of elusive BSM scenarios that are hard to test otherwise will eventually be probed in GW experiments. (ii) Finding conclusive evidence for a scalar era in the Universe is a realistic possibility thanks to the complementarity of different GW experiments across a vast range of frequencies. This talk is based on work in collaboration with Francesco d'Eramo at the University of Padua.

Primary author: Dr SCHMITZ, Kai (University of Padua)

Co-author: Prof. D'ERAMO, Francesco (University of Padua)

Presenter: Dr SCHMITZ, Kai (University of Padua)

Session Classification: Astroparticle and cosmology

Track Classification: Astroparticle and cosmology

Contribution ID: **48** Type: **not specified**

Axion like particles up to the QCD scale

Tuesday 16 April 2019 17:30 (25 minutes)

Axion like particles (ALPs) with coupling to photons or gluon have long been postulated as extension to the Standard Model.
In this talk we explore different probes of ALPs at different energy scales up to the QCD scale.
We ALPs at photon beam experiments and at superconducting radiofrequency cavities.

Primary author: SOREQ, Yotam (CERN)

Presenter: SOREQ, Yotam (CERN)

Session Classification: BSM

Track Classification: BSM

Contribution ID: **49** Type: **not specified**

Master Majorana neutrino mass parametrization

Friday 19 April 2019 11:50 (25 minutes)

After discussing the general form of a Majorana neutrino mass matrix I will introduce a master parametrization for the Yukawa matrices in agreement with neutrino oscillation data. This parametrization extends previous results in the literature and can be used for any model that induces Majorana neutrino masses with the seesaw mechanism). The application of the master parametrization will be illustrated in several example models, with special focus on their lepton flavor violating phenomenology.

Primary author: VICENTE, Avelino (IFIC - CSIC / U. Valencia)

Presenter: VICENTE, Avelino (IFIC - CSIC / U. Valencia)

Session Classification: Neutrinos

Track Classification: Neutrinos

Contribution ID: **50** Type: **not specified**

B-decay discrepancies: how the picture changed after Moriond 2019

Tuesday 16 April 2019 09:35 (25 minutes)

We discuss the theory picture emerging from several updates and new measurements recently made available, in particular LHCb's RK update and ATLAS's measurement of Bs → μ μ. Data continue to strongly prefer new effects in semi-leptonic Wilson coefficients over the Standard Model. Interestingly, a purely muonic contribution to the combination C9 = −C10, well suited to UV-complete interpretations, is now favoured with respect to a muonic contribution to C9 only. The less than perfect agreement between b → s μ μ data and lepton-flavour-universality (LFU) violating data (RK(*)) can be accounted for by a LFU shift in C9. Intriguingly, such a shift can be renormalization-group induced from four-fermion operators above the electroweak scale, in particular from semi-tauonic operators, able to account for the potential discrepancies in b → c transitions. Such picture turns out to be fulfilled quantitatively in the simplified U1 leptoquark model. [Based on Aebischer et al., 1903.10434]

Primary author: GUADAGNOLI, Diego

Presenter: GUADAGNOLI, Diego

Session Classification: Flavor

Track Classification: Flavor

Contribution ID: **51** Type: **not specified**

Seeking axion-like particles through flavor observables

Thursday 18 April 2019 16:40 (25 minutes)

Light pseudoscalars are predicted in several scenarios of physics beyond the SM. In this talk I will discuss how these particles, also known as axion-like particles (ALPs), can be probed in flavor-physics experiments. Particular emphasis will be given to ALP production at B-factories and to their contributions to FCNC mesons decays.

Primary author: Dr SUMENSARI, Olcyr (INFN Padova)

Presenter: Dr SUMENSARI, Olcyr (INFN Padova)

Session Classification: Flavor

Track Classification: Flavor

Contribution ID: **53** Type: **not specified**

The Z-Penguin in Generic Extensions of the Standard Model

Thursday 18 April 2019 10:15 (25 minutes)

The Z-Penguin is generated at one-loop level in the Standard Model and its renormalisation requires cancellations between involving triple gauge triple gauge couplings and fermion gauge couplings. In this talk I will discuss how the renormalisation can be extended to generic extensions of the Standard Model using models that fulfil perturbative unitarity constraints or, equivalently, models that emerge from spontaneously broken gauge theories.

Primary author: GORBAHN, Martin (Liverpool University)

Presenter: GORBAHN, Martin (Liverpool University)

Session Classification: BSM

Track Classification: BSM

Contribution ID: **54** Type: **not specified**

Recent highlights of CMS and ATLAS and prospects for future high energy collider experiments

Tuesday 16 April 2019 10:45 (35 minutes)

Recent experimental highlights from the ATLAS and CMS collaborations at the CERN Large Hadron Collider will be presented. The LHC Run 2 has just concluded, having delivered over 150 fb−1 of proton-proton collisions at 13 TeV to each experiment. These large data sets enable ATLAS and CMS to expand their already wide-range physics programs and to continue their ambitious exploration of physics at the TeV scale. Looking forward into the future, the outlook and prospects for high energy collider experiments at CERN will be discussed, with emphasis in the high luminosity upgrade of the LHC.

Primary author: CEPEDA, Maria (Centro de Investigaciones Energéti cas Medioambientales y Tecno)

Presenter: CEPEDA, Maria (Centro de Investigaciones Energéti cas Medioambientales y Tecno)

Session Classification: Collider

Track Classification: Collider

Contribution ID: **55** Type: **not specified**

EW wall to Higgs precision

Thursday 18 April 2019 17:05 (25 minutes)

I will discuss the interplay between EW and Higgs measurements at future colliders.

Primary author: GROJEAN, Christophe (DESY (Hamburg) and Humboldt University (Berlin))

Presenter: GROJEAN, Christophe (DESY (Hamburg) and Humboldt University (Berlin))

Session Classification: Collider

Track Classification: Collider

Contribution ID: **56** Type: **not specified**

Current status of the B-meson charged current anomalies

Tuesday 16 April 2019 10:00 (25 minutes)

In this talk, I will review the status of the various possible
new physics explanations of the B-meson charged current anomalies namely,
R_D and R_D*. Model-independent correlations/constraints with/from other
observables will be discussed. I will also make some general comments about
the composite Leptoquark explanations.

Primary author: GHOSH, Diptimoy

Presenter: GHOSH, Diptimoy

Session Classification: Flavor

Track Classification: Flavor

Contribution ID: **57** Type: **not specified**

Singleton Portals to the Twin Sector

Tuesday 16 April 2019 17:05 (25 minutes)

The mirror twin Higgs framework allows for a natural Higgs mass without the need for colored partners. This mechanism relies crucially on a discrete symmetry which relates each standard model field to a mirror partner. In the minimal realization, the twin Higgs scenario provides only one low-energy connection between the visible and twin sectors, the light Higgs boson. In this talk, I will present a new class of portals connecting the two sectors, using fields that have 'no twin' partner under the discrete symmetry. Scalar, fermion, and vector states may provide such 'singleton' portals. Each with unique features and experimental signatures. The vector portal, in particular, provides a variety of renormalizable interactions relevant for LHC phenomenology. I will discuss a concrete construction of these the vector portal and discuss its phenomenology.

Primary author: BISHARA, Fady Adibsamy (DESY)

Presenter: BISHARA, Fady Adibsamy (DESY)

Session Classification: BSM

Track Classification: BSM

Contribution ID: **58** Type: **not specified**

Astrophysical probes of dark matter particle properties

Wednesday 17 April 2019 14:40 (35 minutes)

In this talk I will discuss how high-energy astrophysical observations can be used to search for signs of the dark matter particle interactions with the standard model. I will focus in particular on the status of the WIMP search as well as on the prospects for detection of axion-like-particles with gamma rays.

Primary author: Dr ZAHARIJAS, Gabrijela (University of Nova Gorica)

Presenter: Dr ZAHARIJAS, Gabrijela (University of Nova Gorica)

Session Classification: Astroparticle and cosmology

Track Classification: Astroparticle and cosmology

Contribution ID: **59** Type: **not specified**

Recent experimental results in flavour physics

Tuesday 16 April 2019 09:00 (35 minutes)

I will present a summary of recent experimental results in flavour physics, with a focus on those most sensitive to possible effects of physics beyond the Standard Model.

Primary author: GERSHON, Timothy (University of Warwick (GB))

Presenter: GERSHON, Timothy (University of Warwick (GB))

Session Classification: Flavor

Track Classification: Flavor

Contribution ID: **60** Type: **not specified**

Probing multi-TeV new physics through b->c cbar s transitions

Wednesday 17 April 2019 17:40 (25 minutes)

I consider the flavour physics of the most general b->c cbar s effective hamiltonian at dimension six, comprising 20 independent contact interactions. These interactions can give sizable contributions to radiative B decay, rare semileptonic B decays (P5', right-handed currents, etc) and B-meson lifetime observables. I will present bounds on the relevant contact interactions, which generally correspond to scales of a few TeV to 10 TeV or more. For new physics in one of the SM operators, I consider the CP-violating case. Here I show how how, when including B->J/psi K data, one can both determine the (complex) Wilson coefficient and eliminate the most uncertain hadronic matrix elements, up to a discrete ambiguity.

Primary author: JAEGER, Sebastian (University of Sussex (GB))

Presenter: JAEGER, Sebastian (University of Sussex (GB))

Session Classification: Flavor

Track Classification: Flavor

Contribution ID: **61** Type: **not specified**

Leptonic Rare B Decays as Probes of New Physics

Tuesday 16 April 2019 14:40 (25 minutes)

Leptonic rare decays of neutral B mesons belong to the most favourable processes for testing the flavour structure of the Standard Model, with an outstanding sensitivity to possible new (pseudo)-scalar contributions. We discuss implications of the current data, discuss the use of new observables to probe New Physics, and make a comparison with leptonic decays of charged B mesons.

Primary author: FLEISCHER, Robert (Vrije Universiteit Amsterdam)

Presenter: FLEISCHER, Robert (Vrije Universiteit Amsterdam)

Session Classification: Flavor

Track Classification: Flavor

Contribution ID: **62** Type: **not specified**

On the Viable Leptoquark Models

Thursday 18 April 2019 15:55 (25 minutes)

We present the result of the updated study of the viability of the models in which the Standard Model is extended by a single leptoquark state at a TeV scale. We show that one cannot construct a model with one such scalar leptoquark state and be compatible with many constraints arising from the low energy flavor physics data, as well as from the direct LHC searches. Instead, one can combine
two and make a sound scenario, of which S1+S3 and R2+S3 are particularly interesting. In the latter case one can also show that the proposed model can be embedded in a viable SU(5) GUT scenario.

Primary author: BECIREVIC, Damir (CNRS et Universite Paris Sud)

Presenter: BECIREVIC, Damir (CNRS et Universite Paris Sud)

Session Classification: Flavor

Track Classification: Flavor

Contribution ID: **63** Type: **not specified**

Precision electron EDM limits and dark sector physics

Wednesday 17 April 2019 16:05 (25 minutes)

New limits on electron EDM call to re-evaluate its sensitivity to the dark sector physics: light neutral degrees of freedom coupled to the SM in a renormalizable way. I show the minimal models that induce largest electron EDMs, which happen to be right at the borderline of current sensitivity. In the second part of my talk, I evaluate the sensitivity of electron EDM to CP-violation in hadronic sector.

Primary author: POSPELOV, Maxim

Presenter: POSPELOV, Maxim

Session Classification: Astroparticle and cosmology

Contribution ID: **64** Type: **not specified**

Cosmic phase transitions at the TeV scale

Thursday 18 April 2019 12:15 (25 minutes)

I will discuss phase transitions at the TeV scale, in particular the electroweak one (in extensions of the standard model). I will review the current status of how gravitational waves are generated during the phase transition, and show how the resulting gravitational wave signal can be obtained from key properties of the transition. Finally, I will discuss detection prospects at future interferometers, such as LISA. I also plan to speak on links to collider physics and baryogenesis.

Primary author: HUBER, Stephan (University of Sussex)

Presenter: HUBER, Stephan (University of Sussex)

Session Classification: Astroparticle and cosmology

Track Classification: Astroparticle and cosmology

Contribution ID: **65** Type: **not specified**

Vacuum Induced CP Violation Generating a Complex CKM Matrix with Controlled Scalar FCNC

Friday 19 April 2019 09:50 (25 minutes)

We propose a viable minimal model with spontaneous CP violation in the framework of a Two Higgs Doublet Model. The model is based on a generalised Branco-Grimus-Lavoura model with a flavoured $\mathbb{Z}_2$ symmetry, under which two of the quark families are even and the third one is odd. The lagrangian respects CP invariance, but the vacuum has a CP violating phase, which is able to generate a complex CKM matrix, with the rephasing invariant strength of CP violation compatible with experiment. The question of scalar mediated flavour changing neutral couplings is carefully studied. In particular we point out a deep connection between the generation of a complex CKM matrix from a vacuum phase and the appearance of scalar FCNC. The scalar sector is presented in detail, showing that the new scalars are necessarily lighter than 1 TeV. A complete analysis of the model including the most relevant constraints is performed, showing that it is viable and that it has definite implications for the observation of New Physics signals in, for example, flavour changing Higgs decays or the discovery of the new scalars at the LHC. We give special emphasis to processes like $t \to \mathrm{h}c, \mathrm{h}u$, as well as $\mathrm{h} \to bs, bd$, which are relevant for the LHC and the ILC.

Primary author: BRANCO, Gustavo (Instituto Superior Tecnico)

Presenter: BRANCO, Gustavo (Instituto Superior Tecnico)

Session Classification: Flavor

Track Classification: Flavor

Contribution ID: **66** Type: **not specified**

Workshop opening

Contribution ID: **67** Type: **not specified**

New physics fits to the latest bsll data

Thursday 18 April 2019 14:40 (25 minutes)

The LHCb experiment has made several measurements in b->s transitions which indicate tensions with the Standard Model predictions. Assuming the source of these tensions to be new physics, we present new global fits to all Wilson coefficients which can effectively receive beyond the Standard Model contributions, including also the latest results from Moriond 2019. We also discuss the role of hadronic uncertainties.

Primary author: MAHMOUDI, Nazila (Universite Claude Bernard Lyon I (FR))

Presenter: MAHMOUDI, Nazila (Universite Claude Bernard Lyon I (FR))

Session Classification: Flavor

Track Classification: Flavor

Contribution ID: **68** Type: **not specified**

Zb tetraquark channel and BB* interaction in Lattice QCD

Wednesday 17 April 2019 19:12 (6 minutes)

Presenter: BAHTIYAR, Huseyin (Istanbul Technical University (TR))

Session Classification: Wine & cheese poster session

Track Classification: Poster

Contribution ID: **69** Type: **not specified**

Towards three-loop SM corrections to the Z-boson decay

Wednesday 17 April 2019 19:06 (6 minutes)

Presenter: Mr GRZANKA, Krzysztof (University of Silesia in Katowice)

Session Classification: Wine & cheese poster session

Track Classification: Poster

Contribution ID: **70** Type: **not specified**

Multi-field False Vacuum Decay –Polygonal Bounces

Wednesday 17 April 2019 18:30 (6 minutes)

Presenter: Mr GUADA, Victor (Jozef Stefan Institute)

Session Classification: Wine & cheese poster session

Track Classification: Poster

Contribution ID: **71** Type: **not specified**

Uncovering Latent Jet Substructure

Wednesday 17 April 2019 18:36 (6 minutes)

Presenter: Dr DILLON, Barry (Jozef Stefan Institute)

Session Classification: Wine & cheese poster session

Track Classification: Poster

Contribution ID: **72** Type: **not specified**

Top-philic New Physics in B-decays

Wednesday 17 April 2019 18:42 (6 minutes)

Presenter: FAROUGHY, Darius (Jozef Stefan Institute)

Session Classification: Wine & cheese poster session

Track Classification: Poster

Contribution ID: **73** Type: **not specified**

Renormalization of Dimensionally Regularized Chiral Yang-Mills theory in Breitenlohner-Maison scheme

Wednesday 17 April 2019 18:48 (6 minutes)

Presenter: Mrs MAĐOR-BOŽINOVIĆ, Marija (Faculty of Science, University of Zagreb)

Session Classification: Wine & cheese poster session

Track Classification: Poster

Contribution ID: **74** Type: **not specified**

Probing the CP nature of the top Yukawa

Wednesday 17 April 2019 18:54 (6 minutes)

Presenter: SMOLKOVIČ, Aleks (Jozef Stefan Institute Ljubljana)

Session Classification: Wine & cheese poster session

Track Classification: Poster

Contribution ID: **75** Type: **not specified**

Treatment of γ5 in Dimensionally-Regularized Chiral Yang-Mills Theory with Scalar Fields

Wednesday 17 April 2019 19:00 (6 minutes)

Presenter: Dr BÉLUSCA MAÏTO, Hermès (Department of Physics, Faculty of Sciences, University of Zagreb)

Session Classification: Wine & cheese poster session

Track Classification: Poster

Contribution ID: **76** Type: **not specified**

Closing

Session Classification: Closing