Portoroz 2013: Probing the Standard Model and New Physics at Low and High Energies

Monday 15 April 2013 - Thursday 18 April 2013

Portoroz, Slovenia

Book of Abstracts

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Top quark I / 0

The Top-Quark Charge Asymmetry with a Jet Handle

Author: Susanne Westhoff[1]

[1] *University of Pittsburgh, PITT-PACC*

Top-quark physics provides us with a portal to potential physics beyond the standard model. To date, the only evidence of an anomaly in top-quark physics is the large charge asymmetry observed at the Tevatron. Shedding light on this anomaly by measuring a charge asymmetry at the LHC, however, is a difficult endeavor. I will discuss the prospects to observe a charge asymmetry in top-antitop production in association with an energetic jet. This "jet handle" can further help to discriminate between new-physics scenarios that attempt to explain the Tevatron anomaly.

Neutrinos and DM I / 1

A model for light sterile neutrinos (TBC)

Author: Stéphane Lavignac[1]

Co-author: Enrico Bertuzzo [1]

[1] *IPhT Saclay (CEA, France)*

Corresponding Author: stephane.lavignac@cea.fr

Some experimental anomalies suggest the possible existence of light sterile neutrino(s) mixing with the active ones. In this talk, we discuss a scenario in which the sterile neutrino is the fermionic partner of the pseudo-Goldstone boson associated with the spontaneous breaking of an approximate global symmetry.

Neutrinos and DM II / 2

Selected news in the astroparticle field: DM and cosmic neutrinos

Author: Marco Cirelli[1]

[1] *IPhT Saclay,CNRS & CEA*

Corresponding Author: marco.cirelli@cern.ch

I will briefly discuss some recent results and anomalies in the field of Cosmic Neutrinos, Dark Matter Direct Detection, Dark Matter Indirect Detection and (possibly) High Energy Cosmic Rays, with an emphasis on the implications on particle physics model building.

Higgs and EW I / 3

Quark and Lepton Flavor Symmetry and the 126 GeV Higgs Boson

Author: Ernest Ma[1]

[1] *University of California, Riverside*

Corresponding Author: ma@phyun8.ucr.edu

A successful flavor symmetry for quarks and leptons should have a good explanation of why the observed 126 GeV Higgs boson is very close to that of the standard model. Such a model based on the discrete symmetry S(3) was already proposed in 2004, but this issue was not studied. To support the S(3) symmetry, this model has three Higgs doublets, but the lightest one is naturally almost the same as the standard-model one.
The phenomenology of this model in the quark sector is discussed.

Beyond the Standard Model I / 4

Light color octet scalars in the minimal SO(10) grand unification

Author: Michal Malinsky[1]

Co-authors: Luca Di Luzio [2]; Stefano Bertolini [3]

[1] *IPNP, Charles University in Prague*

[2] *Institut fur Theoretische Teilchenphysik, KIT, Karlsruhe*

[3] *INFN, Sezione di Trieste, SISSA*

We analyze the correlation between the present and foreseen limits on matter instability and the upper bounds on the mass of an intermediate-to-EW-scale color octet scalar in the minimal non-supersymmetric SO(10) grand unification. A dedicated two-loop analysis reveals a tight correlation between the octet mass and the unification scale which either requires the octet to be within the reach of the LHC or, alternatively, a proton lifetime accessible to the forthcoming megaton-scale experiments.

Beyond the Standard Model I / 5

Towards gauge coupling unification in minimal SU(5) at three-loop accuracy

Authors: Luca Di Luzio[1]; Luminita Mihaila[1]

[1] *Karlsruhe Institute of Technology*

Corresponding Author: diluzio@kit.edu

It was shown recently that the original SU(5) theory of Georgi and Glashow, augmented with an adjoint fermionic multiplet, is compatible both with neutrino masses and gauge coupling unification. In particular, the latter predicts the existence of light O(TeV) electroweak triplet states. We compute the correlation between the triplet masses and the unification scale at the NNLO level. Such an order of accuracy is needed in order to match the experimental precision on the determination of the electroweak gauge couplings.

Beyond the Standard Model I / 6

SUSY after the LHC

Author: Giovanni Villadoro[1]

[1] *ICTP*

I will present the implication of the latest LHC results for natural and unnatural SUSY models.

Flavor and CP I / 7

Recent progress in semileptonic B decays

Author: Paolo Gambino[1]

[1] *Universita e INFN (IT)*

Corresponding Author: gambino@to.infn.it

I summarize recent progress in the determination of the CKM matrix in semileptonic B decays.

Flavor and CP II / 8

Probing New Physics with Bˆ0_s -> mu+ mu-

Author: Robert Fleischer[1]

[1] *Nikhef and Vrije Universiteit Amsterdam*

Corresponding Author: r.fleischer@vu.nl

The rare decay $B_s \to \mu^+\mu^-$ plays a key role for the testing of the Standard Model. It is discussed that the sizable decay width difference $\Delta\Gamma_s$ of the B_s-meson system affects this channel. As a consequence, its calculated Standard Model branching ratio has to be upscaled by about 10% to $(3.56 \pm 0.18) \times 10^{-9}$. This prediction is the reference value for the comparison with the time-integrated experimental branching ratio, where LHCb has recently reported $(3.2^{+1.5}_{-1.2}) \times 10^{-9}$ corresponding to the first evidence for $B_s \to \mu^+\mu^-$. The sizable $\Delta\Gamma_s$ makes a new observable through the effective $B_s \to \mu^+\mu^-$ lifetime accessible, which probes New Physics in a way complementary to the branching ratio and adds an exciting new topic to the agenda for the high-luminosity upgrade of the LHC.
Further probes of New Physics are offered by a CP-violating rate asymmetry. Correlations between these observables and the
$B_s \to \mu^+\mu^-$ branching ratio are illustrated for specific models of New Physics.

Neutrinos and DM I / 9

Bilinear R-parity violating sneutrino heavy decay modes

Author: Diego Aristizabal[1]

[1] *Universite de Liege*

Corresponding Author: daristizabal@ulg.ac.be

In bilinear R-parity violation (BRpV), in which the superpotential includes a bilinear term between the lepton doublet and the up-type Higgs superfields, a sneutrino LSP can decay into pairs of heavy standard model states: W's, Z's, tops or Higgs bosons. These finals states can dominate over the traditionally considered bottom pair final state, yielding unique and novel supersymmetric signals with each supersymmetric event possibly producing two pairs of these heavy standard model fields. In this talk, after a brief review of BRpV models, I will discuss this possibility. In particular how from the observation of these final decay modes BRpV might be excluded as the sole generator of neutrino masses.

Beyond the Standard Model II / **11**

Three-generation baryon and lepton number violation at the LHC

Authors: Christopher Smith[1]; Fabio Maltoni[2]; Gauthier Durieux[2]; Jean-Marc Gérard[2]

[1] *LPSC Grenoble*

[2] *CP3 - UCLouvain*

Corresponding Author: gauthier.durieux@uclouvain.be

While stringent constraints have been obtained at low energies, systematic and direct tests of the baryon and lepton number conservations have not been carried out at the current energy frontier. We observe that the flavour symmetries of the Standard Model gauge sector, broken as they are in the Standard Model Yukawa one, naturally suppress baryon and lepton number violation at low energy and, simultaneously, make it accessible at the LHC through resonant processes involving at least six fermions, from all three generations. We establish a model independent classification of such transitions and identify two classes that give rise to particularly clean LHC signatures, namely [t mu+ e+] and [tbar tbar + jets].

Higgs and EW I / **12**

Characterizing new physics effects in gauge boson pair production

Author: Oscar Cata[1]

[1] *LMU Munich*

Corresponding Author: oscar.cata@physik.uni-muenchen.de

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Flavor and CP II / **13**

The anatomy of quark flavour observables in the flavour precision era

Author: Fulvia De Fazio[1]

[1] *INFN - Sezione di Bari*

Corresponding Author: fulvia.defazio@ba.infn.it

I shall discuss strategies towards the indirect detection of new physics from flavour observables.

Top quark I / **14**

The charming stop

Author: Monika Blanke[None]

Corresponding Author: monika.blanke@cern.ch

While the presence of top partners below the TeV scale is predicted by naturalness, the search at ATLAS and CMS for these states has so far been unsuccessful. Focussing on supersymmetry, we show that a large mixing between the right-handed charm and top squarks
(i) is allowed by low-energy flavour constraints;
(ii) reduces the experimental bound on the stop mass;
(iii) has a mild, but bene?cial, eff?ect on ?ne-tuning;
(iv) leads to interesting signatures at the LHC
not presently investigated by experiments.
We estimate the current bound on the stop mass, in presence of flavour mixing, and discuss the new collider signatures.

Flavor and CP II / **15**

CP phases from non-abelian discrete symmetries

Author: Claudia Hagedorn[1]

[1] *University of Padua and SISSA*

Corresponding Author: hagedorn@pd.infn.it

I will discuss possibilities to predict CP phases in the lepton sector with the help of non-abelian discrete flavour symmetries (and CP symmetries). I will show that the breaking of a non-abelian discrete flavour group to residual symmetries in the charged lepton and neutrino sectors not only allows for predictions of the mixing angles, but also of the Dirac phase. Furthermore, I will present an approach in which a non-abelian discrete flavour group and a CP symmetry are broken in such a way that the residual symmetry in the neutrino sector is Z2 x CP. In the latter case, all three CP phases, the Dirac and the two Majorana phases, are given in terms of a single parameter. Also lepton mixing angles turn out to be a function of only this parameter. Thus the latter approach is very predictive.

Flavor and CP IV / **16**

b-> s transitions and Lattice QCD

Author: Federico Mescia[1]

[1] *Universitat de Barcelona*

Corresponding Author: mescia@lnf.infn.it

This year, LHC provided a very stringent bound on Br(Bs->mu+mu-), bringing it closer to the value predicted by the Standard Model (SM). Bs->mu+mu- was believed to be the golden mode at LHCb to find SUSY because a large enhancement was expected in the regime of moderate and large values of tanb. Other scenarios are still possible and a correlation with other decay channels is needed. We show that a complementary information on New Physics (NP) can be obtained model-independently from the B-> K(*) l+l- decay mode. To this purpose, information from lattice QCD is needed to calculate the hadronic uncertainties entering b-> s sector.

Flavor and CP IV / 17

Violation of lepton universality: impact of new physics for R_K and R_pi

Author: Ana M. Teixeira[1]

[1] *LPC Clermont*

Corresponding Author: ana.teixeira@clermont.in2p3.fr

In view of the expected experimental precision, light meson leptonic decays have a unique potential to probe deviations from the Standard Model estimates on lepton flavour universality, and thus signal the presence of New Physics.
We briefly review supersymmetric contributions to the ratio R_K, which are in general unable to saturate the current experimental bounds due to a strong tension with different flavour observables. We then focus on the SM minimally extended by sterile neutrinos, where a tree-level enhancement of lepton flavour universality violation in light meson decays arises from modified W-l-nu couplings. We illustrate these effects in the context of the inverse seesaw, showing that one can saturate the current experimental bound on Δr_K (and Δr_π), in agreement with the different experimental and observational constraints.

Flavor and CP IV / 18

B->Vll at small dilepton invariant mass, power corrections, and new physics

Author: Sebastian Jaeger[1]

[1] *University of Sussex (GB)*

The angular distribution in the rare decay B->V l l provides powerful probes of new physics. I present a new treatment of long-distance effects that is more conservative and robust than the prevailing procedure based on QCD factorization alone; nevertheless we find that a certain helicity hierarchy survives and implies that two observables constructed from the angular distribution remain theoretically extremely clean. This is especially so close to the lower endpoint of the dilepton invariant mass spectrum. I discuss the excellent sensitivity to right-handed currents that this implies.

Flavor and CP IV / 19

Constraining new physics with charmless B –> M_1 M_2 decays in QCD factorisation

Author: Christoph Bobeth[1]

[1] *Technical University Munich*

Corresponding Author: christoph.bobeth@ph.tum.de

CP asymmetries and branching ratios in QCD and QED penguin dominated charmless B −> M_1 M_2 decays can provide important constrains on non-standard effects. We use current experimental data and discuss the impact of future Belle II measurements of the systems B_(d,s) −> (K pi,K eta', K K, pi pi) and B −> (K rho, K phi, K omega, pi K^*) to explore new physics scenarios mediated by Z-penguin and dipole operators including complementary constraints from b −> s (gamma, gluon, ell^+ ell^-). The large QCD model dependence that arises in the framework of QCD factorisation at sub-leading order from weak annihilation contributions is accounted for by the inclusion of the according phenomenological parameter into the fit in addition to new physics parameters. We discuss also the fit results of the phenomenological parameter in the Standard Model.

Beyond the Standard Model II / **20**

Leptoquark mass limit in SU(5)

Author: Ilja Doršner[1]

[1] *University of Sarajevo*

Corresponding Author: dorsner@fesb.hr

I address the issue of model dependence of partial proton decays due to exchange of a single scalar leptoquark within a minimal viable SU(5) framework. The minimal setup predicts a flavor part of the proton decay widths for channels with anti-neutrinos in the final state to depend solely on the known masses and mixing parameters of the quark sector and one extra phase. I accordingly establish an accurate lower limit on the mass of the scalar leptoquark in connection with the relevant experimental constraints on the matter stability. The ratio of proton decay widths for channels with the positive pion and the positive kaon in the final state turns out to be phase independent and predicts strong suppression of the former width with respect to the latter one. These results offer a possibility to test the minimal scenario if and when proton decay is observed.

Higgs an EW II / **22**

Constraints from Rare Higgs Decays on the TeV-scale Neutrino Mass Model

Author: Ivica Picek[1]

Co-author: Branimir Radovcic [1]

[1] *University of Zagreb*

Corresponding Author: picek@phy.hr

The loop-mediated higgs decays constrain the model parameter space
of the neutrino mass mechanism based on the fermionic quintuplet
in conjunction with the scalar quadruplet. The most significant increase to the higgs to diphoton decay width comes from a doubly charged scalar component, which should be the lightest component in the scalar quadruplet. There is an anti-correlation to the h −> Z gamma decay width, a mild suppression by a factor 0.9 − 0.7 in the part of the parameter space where the h −> gamma gamma decay width is enhanced by a factor 1.25 − 2.

Beyond the Standard Model II / 23

A natural framework for baryonic R-parity violation in GUT

Author: Marco Nardecchia[None]

Corresponding Author: marco.nardecchia@gmail.com

We investigate the possibility of obtaining large (up to O(1)) R-parity- and baryon-number- violating couplings in supersymmetric GUT. Since quarks and leptons are embedded into the same grand-unified multiplets, the natural expectation is that baryonic R-parity violation is always associated with similar-size lepton-number-violating couplings. Being the simultaneous presence of both types of couplings severely constrained by matter stability, the idea of grand unification may appear incompatible with the existence of large baryonic R-parity-violating interactions. On the other hand, an asymmetry between baryon- and lepton-number violating couplings can be generated after the grand-unified symmetry breaking. We study the natural implementation of such a mechanism in SU(5) and SO(10) models and comment on their phenomenological implications.

Neutrinos and DM III / 24

Correlations among Dark Matter signals

Author: Andrea De Simone[1]

[1] *CERN & SISSA*

Corresponding Author: andrea.desimone@sissa.it

It has been recently pointed out the great relevance of including electroweak radiation effects for indirect searches of Dark Matter. One inevitable consequence of including electroweak corrections is inducing correlations among the predicted particle fluxes targeted by the various experiments. In this talk I will focus on the correlations between different data from a single experiment: AMS-02. The soon-to-be released positron data will be confronted with the projected anti-proton data to be published in summer: interesting conclusions can be drawn on the Dark Matter interpretation of the positron excess.

Neutrinos and DM III / 25

Testing light neutralino dark matter with multi-tau signals at the LHC

Author: Lorenzo Calibbi[1]

[1] *ULB, Brussels*

Corresponding Author: lcalibbi@ulb.ac.be

Light neutralino dark matter in the MSSM is only consistent with WMAP observations in a corner of the parameter space with peculiar features,
which imply that other SUSY particles must be light, in particular the lightest stau and higgsino-like neutralinos and charginos. These states can be copiously produced at the LHC via electro-weak Drell-Yan and lead to peculiar multi-tau and missing E_T signatures. We discuss the LHC potential of fully testing the light neutralino parameter space and the complementary information one can obtain from constraints of the invisible Higgs branching ratio.

Top quark I / **26**

t tbar charge asymmetry, family and friends

Author: Juan Antonio Aguilar Saavedra[1]

[1] *University of Granada, University of Coimbra, LIP and IFCA*

Corresponding Author: juan.antonio.aguilar.saavedra@cern.ch

We present the current status of the Tevatron charge asymmetry and its sister asymmetry at the LHC. The relation between both is elucidated, using as framework the collider-independent asymmetries they originate from. Other related observables, such as the t tbar differential distribution and top polarisation, are also discussed.

Flavor and CP III / **27**

On Bs to μμ within well-motivated theory frameworks, including the SM

Author: Diego Guadagnoli[1]

[1] *LAPTh Annecy*

Corresponding Author: diego.guadagnoli@lapth.cnrs.fr

The Bs to μμ decay is one of the milestones of the flavor program at the LHC. I will touch on certain aspects of the connection between the experimental and the theoretical observable. I will then discuss the impact of this observable on SM extensions, focusing on minimally model-dependent frameworks such as MFV or partial compositeness. It turns out that its constraining power is, depending on the framework, either comparably strong or strikingly stronger than that of Z-peak observables measured at LEP.

Neutrinos and DM II / **28**

Minimal lepton flavor violating realizations of minimal seesaw models

Authors: Audrey Degée[1]; Diego Aristizabal[2]; Jernej Kamenik[3]

[1] *University of Liège*

[2] *Universite de Liege*

[3] *Jozef Stefan Institute*

Corresponding Author: audrey.degee@ulg.ac.be

We study the implications of the global $U(1)_R$ symmetry present in
minimal lepton flavor violating implementations of the seesaw mechanism for neutrino masses. In the context of minimal type I seesaw scenarios with a slightly broken $U(1)_R$, we show that, depending on the R-charge assignments, two classes of generic models can be identified. Models where the right-handed neutrino masses and the lepton number breaking scale are decoupled, and models where the parameters that slightly break the $U(1)_R$ induce a suppression in the light neutrino mass matrix. We show that within the first class of models, contributions of right-handed neutrinos to charged lepton flavor violating processes are severely suppressed. Within the second
class of models we study the charged lepton flavor violating

phenomenology in detail, focusing on $\mu \to e\gamma$, $\mu \to 3e$ and $\mu - e$ conversion in nuclei. We show that sizable contributions to these processes are naturally obtained for right-handed neutrino masses at the TeV scale.

Flavor and CP III / 29

Rare B decays at the NNLO in QCD

Author: Mikolaj Krzysztof Misiak[1]

[1] *University of Warsaw (PL)*

Recent contributions to the evaluation of B -> Xs gamma and Bs -> mumu
branching ratios at the next-to-next-to-leading order in QCD will be
described. They include matching calculations at the electroweak scale as well as matrix element determination at the low energy scale.

Higgs and EW IV / 30

The flavor of Higgs

Author: Yosef Nir[1]

[1] *Weizmann Institute of Science (IL)*

Corresponding Author: yosef.nir@weizmann.ac.il

Measurements of the Yukawa couplings of the recently discovered boson h to fermion pairs will provide a new arena for studying flavor physics. We analyze the lessons that can be learned by measuring the h decay rates into the charged lepton pairs, $\tau^+\tau^-$, $\mu^+\mu^-$ and $\tau^\pm\mu^\mp$. We demonstrate how this set of measurements can distinguish in principle between various classes of flavor models such as natural flavor conservation, minimal flavor violation, and Froggatt-Nielsen symmetry.

Flavor and CP I / 31

CP averaged and CP violating observables for B-> K* l+ l- in the full kinematic region

Author: Joaquim Matias[1]

[1] *Universitat Autonoma Barcelona*

Corresponding Author: matias@ifae.es

We present a complete and comprehensive analysis of the $B \to K^*(\to K\pi)\ell^+\ell^-$ decay, focusing on clean CP-averaged and CP-violating observables both at large and low hadronic recoil. For that purpose we define a complete set of clean CP-asymmetries (P_iˆ{CP}) related to the clean observables Pi. We present predictions within the Standard Model for all the relevant observables
of interest, integrated over the appropriate bins including lepton mass corrections. We identify an optimal basis of observables that combines theoretical and experimental advantages, which will guide the New Physics searches in flavor in the short term.
We discuss some New Physics opportunities of the observables in the basis,
which exhibit

a better sensitivity to New Physics than other observables. Finally, we present first bounds on the S-wave contribution to the distribution coming from the B\to K^*_0 \ell^+\ell^- decay, which must be held under control in order to interpret correctly the data.

Flavor and CP IV / **32**

The electric dipole moment of the neutron as a probe of new physics

Author: Thomas Mannel[1]

[1] *Siegen University*

Corresponding Author: mannel@physik.uni-siegen.de

I will discuss the calculation of the electric dipole moment of the neutron in the standard model, identifying contributions which have not been discussed yet. Depending on the size of the unknown hadronic matrix elements these contributions could significantly enlarge the electric dipole moment compared to the previous estimates. The impact on the search for effects beyond the standard model is discussed.

Beyond the Standard Model I / **33**

Charged LFV in a low-scale seesaw mSUGRA model

Author: Amon Ilakovac[1]

Co-authors: Apostolos Pilaftsis [2]; Luka Popov [1]

[1] *Faculty of Science, University of Zagreb*

[2] *School of Physics and Astronomy, University of Manchester*

Corresponding Author: ailakov@phy.hr

Charged lepton flavour violaton (LFV) is studied in the low-scale see saw models of minimal supergravity and with large Yukawa couplings realized through approximate lepton number symmetries. The models have two sources of LFV, one originating from the soft
supersymmetry-breaking sector, and the other entirely supersymmetric one originating from the supersymmetric Yukawa sector. These sources of LFV are carefully studied on dominant LFV processes. Opposed to the dominance of the photon-penguin contributions in the high-scale see saw supersymmetric models of minimal supergravity, we found that supersymmetry breaking Z-boson-penguin and heavy neutrino box contributions dominate the three-body decay LFV amplitudes.

Neutrinos and DM I / **34**

Status of Three-Neutrino Mixing and Beyond

Author: Carlo Giunti[1]

[1] *INFN*

Corresponding Author: giunti@to.infn.it

In the first part
I briefly review the phenomenology of three neutrino mixing
and
I describe the status
of neutrino oscillation experiments
and
of the experiments measuring neutrino masses
in the framework of three neutrino mixing.
In the second part
I review the experimental indications in favor of
short-baseline neutrino oscillations
and I discuss their
interpretation in the framework of neutrino mixing schemes with one or more sterile neutrinos with masses at the eV scale.

Higgs an EW II / 35

Combining Z' and W' searches at the LHC

Author: Manuel Perez-Victoria[1]

[1] *University of Granada*

I will discuss an effective Lagrangian description of new vector bosons giving resonant leptonic signals at the LHC. Gauge invariance imposes relations on the couplings and masses of charged and neutral vector bosons. I will show that a combined analysis of di-lepton and lepton-plus-missing-energy data takes advantage of such relations and improves the existing limits.

Flavor and CP III / 36

Constraints on Wilson Coefficients from radiative B decays in a frequentist approach

Author: Sébastien Descotes-Genon[1]

[1] *LPT*

Corresponding Author: descotes@th.u-psud.fr

I discuss the constraints on the Wilson Coefficients of the effective Hamiltonian from B radiative decays within the frequentist approach developed by the CKMfitter group. A particular attention will be paid to the treatment of hadronic inputs and the sensitivity of observables (currently measured or planned to be) on this issue.

Higgs an EW II / 38

Higgs Production in association with a hadronic jet at NNLO in QCD

Author: Radja Boughezal[1]

[1] *Argonne National Laboratory*

Corresponding Author: rboughezal@anl.gov

In this talk, we will present new results for the differential cross-section of Higgs
boson production in gluon fusion in association with a hadronic jet at next-to-next-to-leading order (NNLO) in perturbative QCD.
This result is urgently needed in order to reduce the theoretical uncertainties hindering a precise extraction of the Higgs properties at the LHC. Currently, the theoretical errors in the one-jet bin comprise one of the largest systematic errors in the Higgs analyses
at the LHC, particularly in the WW final state. Our new NNLO QCD corrections significantly reduce the residual scale dependence of the cross-section.

Neutrinos and DM I / **39**

From Majorana to Dirac in the Minimal Left-Right Model

Author: Miha Nemevsek[1]

[1] *ICTP*

The discovery of the Higgs boson allows us to test the origin of masses by observing the Higgs decay rates which are unambiguously predicted in the Standard model. In the case of neutrinos, the couplings to the SM Higgs cannot always be determined, as is the case in the conventional see-saw scenario with singlets. We show that in the left-right symmetric model the symmetry of the theory removes such ambiguities and one can directly relate neutrino masses to the Higgs vacuum couplings. Possible measurements of heavy neutrino masses and mixings at the LHC suffice to predict Dirac masses and the associated phenomena. These include subdominant decays of heavy neutrinos, neutrinoless double beta decay rates and the size of the electric dipole moment of the electron.

Higgs and EW III / **40**

Flavour physics in composite Higgs models

Author: David Straub[1]

[1] *Johannes Gutenberg-Universität Mainz*

Models with partial compositeness, like composite Higgs models or models with a warped extra dimension, generically predict tree-level corrections to electroweak precision observables and flavour-changing neutral currents. I will discuss flavour constraints on this class of models, considering several choices for the electroweak representations and comparing flavour-symmetric models to flavour-anarchic ones. Different predictions for the pattern of effects in rare B and K decays to be measured in the near future can help to distinguish between the various choices.

Flavor and CP I / **41**

Recent results from heavy flavour experiments

Author: Christoph Schwanda[1]

[1] *Austrian Academy of Sciences*

Corresponding Author: schwanda@hephy.oeaw.ac.at

In this talk we review recent results from the Belle, BaBar and LHCb experiments, relevant to the topic of this workshop. In particular we will examine the experimental situation of the Cabibbo-Kobayashi-Maskawa matrix elements |Vcb| and |Vub| and review new measurements of semileptonic and leptonic B meson decays involving a tau-lepton. Also new results in the Bs sector will be examined. The prospects for these measurements at the next generation of experiments, mainly Belle II, will be briefly discussed.

Flavor and CP III / **42**

Hadronic effects in the exclusive b -> s transitions

Author: Alexander Khodjamirian[None]

The search for new physics in the flavour-changing neutral-current
$b \to s\ell^+\ell^-$ transitions demands an accurate knowledge of the relevant hadronic parameters calculated in QCD.
For the exclusive semileptonic B decays, in addition to the
form factors, also the relevant nonlocal hadronic matrix elements
have to be estimated.
I will discuss the hadronic effects in B\to K ˆ(*)\ellˆ+\ellˆ-$ decays at large recoil, obtained within a systematic approach,
combining light-cone operator-product expansion, QCD sum rules and
hadronic dispersion relations.

Neutrinos and DM II / **43**

Closing in on mass-degenerate dark matter scenarios

Author: Alejandro Ibarra[None]

Corresponding Author: alejandro.ibarra@ph.tum.de

We consider a minimal framework which features a Majorana fermion as the dark matter particle and a scalar that mediates the coupling to light fermions. In this scenario the annihilation rate into two fermions and one gauge boson as well as the interaction rate with nuclei can be significantly enhanced while avoiding the strong limits on new physics from collider experiments. We discuss in this talk the limits on the parameters of the model from indirect, direct and collider dark matter searches as well as the prospects to probe this scenario in future experiments.

Flavor and CP II / **44**

B_q -> mu+ mu- and electroweak interactions

Author: Martin Gorbahn[1]

[1] *Liverpool University*

The B_q to muˆ+ muˆ- theory prediction is sensitive to the renormalisation scheme used for sin_W. The scheme ambiguity is the source of the dominant theory uncertainty in the standard

model. Additionally the renormalization is rather involved in new physics models where M_Z cos_W = M_W does not hold at tree level. In this talk I will present the results of a two-loop electroweak calculation which lifts the scheme ambiguities of the standard model and give an updated theory prediction for this decay. I will also discuss the necessary one-loop renormalisation for a generic class of spontaneously broken gauge theories.

Higgs and EW IV / **45**

Implications of Higgs discovery and other recent data for SUSY

Author: Leszek Roszkowski[1]

[1] *NCBJ (Warsaw)*

Both the ATLAS and the CMS experiments have discovered a Higgs boson with mass ˜126 GeV while setting new stringent lower limits on superpartner masses. The LHCb collaboration has for the first time measured BR(B_s -> mu+ mu-). I will present some implications of these results for supersymmetry and discuss ensuing prospects for SUSY searches at the LHC and in dark matter experiments.

Top quark I / **46**

Reconciliation of Tevatron A_fb and LHC A_C with s-channel and t-channel NP

Author: Jure Drobnak[1]

[1] *TUM, IJS*

Since the measured value of A_C at LHC seems to be compatible with the SM predicted value, many considered explanations of the anomalous A_FB measured at Tevatron fail to appropriately accommodate the experimental A_C value. In the talk I will present two distinct ways of reconciling the two measurements using new physics in t-tbar production. One includes an axi-gluon exchange in the s-channel with somewhat peculiar couplings to SM quarks while the other is presented on the basis of a simple Z-prime model with u-t couplings. The later idea is based on associated production of the Z-prime further decaying in a top and u quark and exploiting the fact that the measurements of the asymmetries are inclusive.

Beyond the Standard Model II / **47**

Gauge Mediation beyond MFV

Author: Robert Ziegler[1]

[1] *TUM*

Corresponding Author: robert.ziegler@ph.tum.de

I will discuss a modification of Gauge Mediation in which the messenger sector couples directly to the MSSM. These couplings are controlled by the same dynamics that explain the flavor hierarchies, and therefore are parametrically as small as the Yukawas. This setup gives rise to an interesting SUSY spectrum that is calculable in terms of a single new parameter. Due to large A-terms, the model can easily accommodate a 125 GeV Higgs with a relatively light SUSY spectrum. The flavor structure depends on the particular underlying flavor model, but flavor-violating effects are strongly suppressed and arise mainly in the up-sector. This structure allows for an implementation of SUSY flavor models with a built-in suppression of DeltaF=2 effects and provides an ideal framework to account for direct CP violation in D-meson decays.

Beyond the Standard Model I / **48**

Constraining two Higgs doublet Models

Author: Margarida Nesbitt Rebelo[1]

[1] *Instituto Superior Tecnico (IST)*

Corresponding Author: rebelo@ist.utl.pt

Suppression of HFCNC: NFC, Aligned, MFV
Comments on present situation taking into account
recent LHC data and data from B-factories.
Weak Basis invariants as a tool to study the flavour
sector of 2HDM.

Flavor and CP I / **49**

Invariants and Flavour Aspects of the SM and Beyond

Author: Gustavo Branco[1]

[1] *Instituto Superior Tecnico*

Corresponding Author: gbranco@ist.utl.pt

We illustrate how weak basis invariants can be a very useful tool
to study Flavour and CP Violation in the SM and Beyond.

Neutrinos and DM II / **50**

Prospects of two-loop neutrino mass model after theta_13 measurements and LHC data

Author: Julio [None]

Corresponding Author: julio@ijs.si

We analyze the two-loop neutrino mass model with singly- and doubly-charged scalars. By examining the behavior of loop integral and constraint on trilinear coupling, we are able to find the extremum condition for neutrino mass parameters. By utilizing the LFV constraints and recently measured \theta_{13}, we can determine the lowest masses of the scalars. We also discuss possible

connections between neutrino oscillation parameters and the decay patterns of the the scalar. Finally, we show how the perturbativity and boundedness of the scalar potential can be maintained all the way to Planck scale within this model.

Beyond the Standard Model III / **51**

Can minimal SUSY SU(5) scenario be made realistic?

Author: Timon Mede[1]

Co-authors: Borut Bajc [1]; Stephane Lavignac [2]

[1] *J. Stefan Institute, Ljubljana*

[2] *CEA/IRFU,Centre d'etude de Saclay Gif-sur-Yvette (FR)*

Can minimal renormalizable supersymmetric SU(5) GUT model be reconciled (up to neutrino masses) with all the phenomenological constraints like the proton decay bounds, the correct mass relations among light fermions, the recently measured Higgs mass and the LHC bounds on the sparticle spectrum, while remaining perturbative? All these experimental results confine the structure of the allowed superpartner spectrum. What we are proposing is a sort of a split SUSY scenario, where the down-sector quark masses are corrected through the supersymmetric threshold corrections (A-terms).
Preliminary results show that such model with the SU(5) invariant soft terms is still alive and quite predictive for the superpartner spectrum.

Beyond the Standard Model III / **52**

The MSSM in the decoupling limit

Author: Andreas Crivellin[1]

[1] *University Bern*

Corresponding Author: crivellin@itp.unibe.ch

In the first part of the talk I discuss the matching of the MSSM on the
two-Higgs-doublet model with focus on the Yukawa interactions. The
determination of the Yukawa couplings of the MSSM superpotential is
explained and the recently computed NLO corrections to quark-quark-Higgs couplings are presented.
The second part of the talk reviews the flavour phenomenology of the 2HDM with generic Yukawa interactions. I first discuss the constraints for FCNC processes and show that, respecting these constraints, the deviations from the SM expectations in the tauoinc B decays B->tau nu and B->D(^*)tau nu can be explained simultaneously.

Higgs and EW I / **53**

Review of SM Higgs and top results at LHC and Tevatron

Author: Marina Cobal[1]

[1] *Universita degli Studi di Udine (IT)*

Corresponding Author: marina.cobal@cern.ch

A review talk is given on the status of SM Higgs physics and top properties at ATLAS, CMS and Tevatron

Higgs and EW IV / **54**

General Composite Higgs Models

Author: Marco Serone[1]

[1] *SISSA*

Corresponding Author: serone@sissa.it

We construct pseudo-Goldstone composite Higgs models that are not necessarily of moose-type and characterize the main properties these models should have in order to give rise to a Higgs mass at around 125 GeV. We assume the existence of relatively light and weakly coupled spin 1 and 1/2 resonances. In absence of a symmetry principle, we introduce the Minimal Higgs Potential (MHP) hypothesis: the Higgs potential is assumed to be one-loop dominated by the SM fields and the above resonances, with a contribution that is made calculable by imposing suitable generalizations of the first and second Weinberg sum rules. We show that a 125 GeV Higgs requires light, often sub-TeV, fermion resonances. We also point out of a possible problem in finding UV completions of the partial compositeness paradigm, when extended to all SM fields, as necessary to alleviate current flavour bounds.

Top quark II / **55**

Composite t' triplets from QCD-like dynamics and t t-bar asymmetries

Author: Joachim Brod[1]

[1] *University of Cincinnati*

Corresponding Author: joachim.m.brod@gmail.com

The CDF and D0 experiments at Tevatron measure a top-quark forward-backward asymmetry significantly larger than the standard-model prediction. We construct a model which involves new strong interactions at the electroweak scale and can explain the measured asymmetry. Our model possesses a flavor symmetry which allows to evade flavor and collider constraints, while it still permits flavor-violating couplings of order 1 which are needed to generate the asymmetry via light t-channel vectors.

Higgs and EW IV / **56**

COMPOSITE TWO HIGGS DOUBLET MODELS

Author: Carlos Savoy[1]

[1] *CNRS*

Corresponding Author: carlos.savoy@cea.fr

Composite two Higgs doublet models, where the Higgs fields arise as composite pseudo Nambu-Goldstone modes from the breaking of global symmetries in a strong interacting sector, are described with emphasis on the crucial issues of anomalous contributions to the T parameter and to Flavor Changing Neutral Currents. The non linear Lagrangians of several models are explicitly derived and the contributions to T are identified. The embedding of the SM fermions in the theory are also discussed and implemented so to avoid large corrections to the Z coupling to the b quarks. We propose a model based on the breaking of SO(9) into SO(8) that is free from anomalous contributions to T, to FCNC and to the b quark neutral current.

Beyond the Standard Model II / **59**

On the structure of the charged lepton mass matrix

Author: Andrea Romanino[1]

[1] *SISSA*

TBA

Top quark II / **60**

Charm-Top Flavour Physics at the LHC(b)

Author: Paride Paradisi[1]

[1] *CERN*

Corresponding Author: paride.paradisi@cern.ch

We summarize the prospect of new physics searches through charm-top flavour physics in the light of the latest results at the LHC(b).

Higgs an EW II / **61**

Constraining new physics with the current Higgs data

Author: Admir Greljo[1]

Co-authors: Ilja Dorsner [2]; Ivana Mustac [3]; Jernej Kamenik [4]; S Fajfer [5]

[1] *Institute Jozef Stefan*

[2] *University of Sarajevo*

[3] *Institut Jozef Stefan*

[4] *Jozef Stefan Institute*

[5] *Univ. of Ljubljana and Inst. J. Stefan*

Corresponding Author: admir.greljo@ijs.si

Based on two model studies I will discuss how the recent Higgs measurements can be used to constrain new physics effects. The first example concerns colored scalars inherent to theories of matter

unification. Using existing Higgs data, nontrivial constraints on scalars with masses of a few hundreds of GeV can be obtained. The second study concerns vector-like fermions mixing with SM quarks. After considering electroweak and flavor constraints together with direct searches for such states, I will present the impact of Higgs data on the unconstrained parameter space of such models.

Flavor and CP II / **62**

New physics from B -> D* tau nu

Author: Ivan Nisandzic[1]

[1] *J. Stefan Institute*

Corresponding Author: ivan.nisandzic@ijs.si

Semi-leptonic B decays are important test of the Standard Model (SM) and present the possibility to explore the eects of physics Beyond Standard Model (BSM). Decays involving tau leptons in the nal state are interesting due to the tau mass eects which allow to probe the contributions to the decay rate which are not present in the decay containing light lepton in nal state. Recently, BaBar Collaboration observed deviations from the SM predictions in $B \to D^{(*)}\tau\nu$.
To account for the anomaly, we supplement the SM Hamiltonian with a set of low dimensional eective operators that can in
uence the b ! c transitions.
If conrmed, the deviation leads to some interesting implications which are the subject of our study.

Higgs and EW III / **63**

Impact of the Higgs discovery on two models of new physics

Author: Ulrich Nierste[1]

[1] *Karlsruhe Institute of Technology (KIT)*

A combined fit of electroweak precision data and data on Higgs decays lead to an exclusion of the Standard Model with a sequential fourth generation at the level of 5 standard deviations. In my talk I discuss the methodology of the corresponding statistical analysis, which involved so-called non-tested hypotheses. Then I discuss a supersymmetric GUT model, in which the atmospheric neutrino mixing angle affects b->s transitions. The model, originally proposed by Chang, Masiero and Murayama, is substantially affected by the measurement of the mass of the lightest neutral Higgs boson and measurement of the reactor neutrino mixing angle.

Flavor and CP III / **65**

Isospin in B->K^(*)ll in and beyond the SM

Author: Roman Zwicky[1]

[1] *edinburgh university*

Corresponding Author: roman.zwicky.ii@googlemail.com

I will discuss the isospin asymmetry in and beyond the SM at low q2 (large recoil).

Flavor and CP III / 69

Flavour changing matrix elements for physics beyond the SM

Author: Alessio Maiezza[None]

Co-authors: Fabrizio Nesti [1]; Jan Olav Eeg [2]; Stefano Bertolini [3]

[1] *University of L'Aquila*

[2] *University of Oslo*

[3] *SISSA*

Corresponding Author: alessio.maiezza@aquila.infn.it

Flavour changing neutral current and CP violating processes provide the testing ground for physics beyond the SM. The evaluation
of the relevant hadronic matrix elements is crucial for the precision of the theoretical predictions. While waiting for precise
lattice calculations we revisit the dipole and current-current K->pipi hadronic matrix elements in the framework of the phenomenological chiral quark model; these are relevant for the calculation of direct CP violation in K->pi pi decays in a left-right extension of the electroweak interaction. We discuss the
uncertainties of the calculation in view of the phenomenological character of the approach and provide the results for a direct comparison with forthcoming lattice evaluations.

Higgs an EW II / 70

Future of composite dynamics

Author: francesco Sannino[1]

[1] *CP3-Origins*

Corresponding Author: sannino@cp3-origins.net

I will discuss the impacts of the LHC findings on composite dynamics at the electroweak scale. I will show that current results are compatible with dynamical electroweak symmetry breaking once the electroweak radiative corrections are taken properly into account. I will then show some of the most relevant signatures for the LHC helpful to single out composite dynamics.