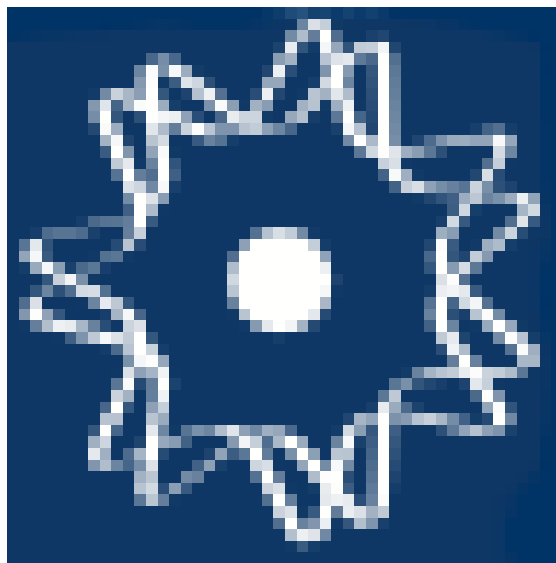


Portoroz 2015: Particle Phenomenology From the Early Universe to High Energy Colliders



Report of Contributions

Contribution ID: 0

Type: **Planary Talk**

Factorization properties of three-body non-leptonic B decays

Tuesday, 7 April 2015 11:51 (23 minutes)

Three body non-leptonic decays of B mesons have been studied at B factories and at the LHC, and will become a benchmark for flavor and CP studies at Belle II. I will discuss the QCD properties of three body hadronic B decays in the different regions of phase space and their interconnection, matching the different factorization descriptions in each regime, in an attempt to reconstruct the whole Dalitz plot differentially from QCD.

Primary author: VIRTO, Javier (Universitat Siegen)

Presenter: VIRTO, Javier (Universitat Siegen)

Session Classification: Flavour

Contribution ID: 2

Type: **Planary Talk**

A flavoured invisible axion

Tuesday, 7 April 2015 16:53 (23 minutes)

The Peccei-Quinn mechanism is perhaps the most compelling solution we have for the strong-CP problem. The mechanism predicts the existence of a pseudo-Goldstone boson, the axion, which could account for the dark matter content of the Universe. The smallness of active neutrino masses can also be explained in axion models via a type-I see-saw mechanism, providing a dynamical origin for the heavy see-saw scale.

I will present a class of invisible axion models with tree-level FCNCs controlled by the fermion mixing matrices. I will discuss the axion phenomenology in these models taking into account: rare kaon and muon decays, astrophysical considerations and axion searches relying on the axion coupling to photons. Some of the models considered have a domain-wall number equal to one and avoid the domain-wall problem, unlike the DFSZ invisible axion model. I will also discuss possible solutions to the hierarchy problem in these models which do not invoke supersymmetry.

Primary authors: CELIS, Alejandro (IFIC CSIC-Universitat de Valencia); SERODIO, Hugo (IFIC); FUENTES, Javier (Instituto de Fisica Corpuscular)

Presenter: CELIS, Alejandro (IFIC CSIC-Universitat de Valencia)

Session Classification: BSM

Contribution ID: 3

Type: **Planary Talk**

Searches for WIMP dark matter with astrophysical probes

Wednesday, 8 April 2015 11:00 (28 minutes)

The quest to detect the non-gravitational signals from dark matter particles is now more than 50 years old and is reaching its culmination with the latest generation detectors. In this talk I will review most recent results from the so called indirect searches, which look for dark matter signals in the rich astrophysical data.

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

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

Session Classification: Dark matter

Contribution ID: 4

Type: **Planary Talk**

Lepton-nonuniversality and flavor in rare decays

Thursday, 9 April 2015 14:53 (23 minutes)

Lepton-nonuniversality in rare b decays provides opportunities to diagnose BSM physics at the weak scale. We discuss correlations and give directions for flavor patterns in model-specific realizations with leptoquarks.

Primary author: HILLER, Gudrun (Technische Universitaet Dortmund (DE))

Presenter: HILLER, Gudrun (Technische Universitaet Dortmund (DE))

Session Classification: Flavour

Contribution ID: 5

Type: **Planary Talk**

Rare exclusive radiative decays of Z, W and Higgs bosons in QCD factorization

Tuesday, 7 April 2015 14:53 (23 minutes)

TBA

Primary author: Prof. NEUBERT, Matthias (Johannes Gutenberg Universitat Mainz)

Presenter: Prof. NEUBERT, Matthias (Johannes Gutenberg Universitat Mainz)

Session Classification: Higgs

Contribution ID: 6

Type: **Planary Talk**

Waiting for New Physics

Friday, 10 April 2015 12:09 (28 minutes)

I will report on recent analyses of rare K and B decays done at TUM-IAS which with improved data should provide in this decade some insight into the dynamics at the LHC scales and beyond them.

Primary author: BURAS, Andrzej (Munich)

Presenter: BURAS, Andrzej (Munich)

Session Classification: BSM

Contribution ID: 7

Type: **Planary Talk**

The Higgs Portal

Wednesday, 8 April 2015 10:09 (23 minutes)

I will discuss the role of the Higgs field as a probe of the hidden sector and its implications for cosmology.

Primary author: LEBEDEV, Oleg (University of Helsinki)

Presenter: LEBEDEV, Oleg (University of Helsinki)

Session Classification: Higgs

Contribution ID: 8

Type: **Plenary Talk**

DM@LHC: Status and Outlook

Wednesday, 8 April 2015 11:51 (23 minutes)

I will give an overview of the present status of dark matter searches at the LHC. I will discuss the validity of the effective field theory approach and the possible search strategies for getting the most out of the next collider run.

Primary author: DE SIMONE, Andrea (SISSA)

Presenter: DE SIMONE, Andrea (SISSA)

Session Classification: Dark matter

Contribution ID: 9

Type: **not specified**

Of Contact Interactions and Colliders (why not fit form factors?)

Thursday, 9 April 2015 12:09 (23 minutes)

At the LHC, New Physics could be better parametrised with form factors than with contact interactions, if the New Physics scale is similar to the LHC energy. As a toy example, I consider the process $pp \rightarrow l+l^-$, fit the high-energy tail to a function, and show that the resulting limits can be analytically translated to a wide variety of models (no event simulation required).

Primary author: DAVIDSON, Sacha (Universite Claude Bernard-Lyon I (FR))

Presenter: DAVIDSON, Sacha (Universite Claude Bernard-Lyon I (FR))

Session Classification: Collider

Contribution ID: 10

Type: **Planary Talk**

Neutrinoless Double Beta Decay and Particle Physics

Thursday, 9 April 2015 16:30 (23 minutes)

Physics implications of neutrinoless double beta decay are summarized. Both the standard approach of light neutrino exchange as well as non-standard interpretations in terms of TeV scale physics will be discussed. Tests of the mechanisms at colliders and with lepton flavor violation are presented. It is pointed out that left-right symmetric mechanisms can have testable consequences also in single beta decay.

Primary author: RODEJOHANN, Werner (MPIK, Heidelberg)**Presenter:** RODEJOHANN, Werner (MPIK, Heidelberg)**Session Classification:** Neutrinos

Contribution ID: 11

Type: **Planary Talk**

Boosted Dark Matter

Wednesday, 8 April 2015 12:14 (23 minutes)

We show that the high energy events observed in the IceCube detector - usually interpreted as evidence for an astrophysical neutrino flux - could also be a signal of highly boosted dark matter particles scattering on nucleons. This scenario is for instance realized in models featuring a super-heavy DM particle which decays into a much lighter dark sector species. We show that, besides explaining the total rate, energy spectrum and track vs. shower ratio of the IceCube events, such a scenario could also easily accommodate the Fermi gamma ray excess if the light dark sector species has a non-negligible relic abundance and annihilates into Standard Model particles.

Primary author: KOPP, Joachim (University of Mainz)

Co-authors: LIU, Jia (University of Mainz); WANG, Xiaoping (University of Mainz)

Presenter: KOPP, Joachim (University of Mainz)

Session Classification: Dark matter

Contribution ID: 12

Type: **Plenary Talk**

Recent news in heavy flavor semileptonic decays

Tuesday, 7 April 2015 11:05 (23 minutes)

I will review a few recent result in the field of semileptonic decays of bottom and charm hadrons, including both exclusive as well as inclusive decays.

Primary author: MANNEL, Thomas (Siegen University)

Presenter: MANNEL, Thomas (Siegen University)

Session Classification: Flavour

Contribution ID: 13

Type: **Planary Talk**

Explaining the LHC flavour anomalies

Tuesday, 7 April 2015 14:30 (23 minutes)

By now the LHC found three deviations from the SM expectations in the flavour sector: $B \rightarrow K^* \mu \mu$, $B \rightarrow K \mu \mu / B \rightarrow K e e$ and $h \rightarrow \tau \mu$. I discuss a 2HDM with ganged $L_{\mu} - L_{\tau}$ and vector-like quarks which can explain these anomalies. Charging also the baryons under a new $U(1)'$ symmetry, the introduction of vector-like quarks can be avoided and interesting correlations with LHC searches arise.

Primary author: CRIVELLIN, Andreas (CERN)**Presenter:** CRIVELLIN, Andreas (CERN)**Session Classification:** Higgs

Contribution ID: 14

Type: **Planary Talk**

Extending 2HDM by a singlet scalar field - the Case for Dark Matter

Tuesday, 7 April 2015 17:16 (23 minutes)

We extend the two-Higgs doublet models of Type I and Type II by adding a real gauge-singlet scalar S which is the Dark Matter (DM) candidate (2HDMS models). We impose theoretical constraints derived from perturbativity, stability, unitarity and correct electroweak symmetry breaking and require that one of CP-even Higgs bosons fit the LHC data for the ~ 125.5 GeV state at the 68% C.L. after including existing constraints from LEP and B physics and LHC limits on the heavier Higgs bosons. We investigate properties of the model and discuss possibilities to fit experimental data on dark matter.

Primary authors: DROZD, Aleksandra (King's Coll. London); GRZADKOWSKI, Bohdan (University of Warsaw); GUNION, Jack (University of California Davis (US)); JIANG, Yun (UC Davis)

Presenter: GRZADKOWSKI, Bohdan (University of Warsaw)

Session Classification: BSM

Contribution ID: 15

Type: **Planary Talk**

A Precision Determination of the CKM Element V_{cb}

Tuesday, 7 April 2015 11:28 (23 minutes)

Including the recently computed $O(\alpha_s^2)$ corrections, we perform an extraction of the magnitude of the Cabibbo-Kobayashi-Maskawa matrix element V_{cb} and the most relevant parameters of the heavy quark expansion from the data of inclusive semileptonic B decays. Using a recent determination of the charm quark mass, we obtain $|V_{cb}| = (42.21 \pm 0.78) \times 10^{-3}$ and the bottom quark mass in the kinetic scheme at 1 GeV of $m_b = (4.553 \pm 0.020)$ GeV. We also perform and discuss a careful estimate of the residual theoretical uncertainty.

Primary authors: Dr HEALEY, Kristopher (Università di Torino); GAMBINO, Paolo (Università di Torino)

Co-authors: ALBERTI, Andrea (Università di Torino); NANDI, Soumitra (Università di Torino)

Presenter: Dr HEALEY, Kristopher (Università di Torino)

Session Classification: Flavour

Contribution ID: 16

Type: **Planary Talk**

Cornering Scalar Leptoquarks at LHC

Tuesday, 7 April 2015 09:28 (23 minutes)

I will address implications of large lepton-quark-leptoquark couplings for direct leptoquark searches at Large Hadron Collider. It will be shown that flavour physics constraints allow for sizeable couplings of leptoquarks to the Standard Model fermions if these interact exclusively with charged leptons and quarks of the same generation. The leptoquark production mechanisms at LHC will be thoroughly discussed to demonstrate the importance of inclusion of a t-channel pair production and, in particular, a single leptoquark production if and when the leptoquark couplings are large. I will finally present a recast of an existing CMS search at LHC for the second generation leptoquark that yields the best direct limit to date on Yukawa coupling of the second generation leptoquark that couples to a muon and a strange quark.

Primary author: Prof. DORŠNER, Ilja (University of Split)

Co-authors: GRELJO, Admir (Institute Jozef Stefan); FAJFER, S (Univ. of Ljubljana and Inst. J. Stefan)

Presenter: Prof. DORŠNER, Ilja (University of Split)

Session Classification: Collider

Contribution ID: 18

Type: **Planary Talk**

Tree-level constraints on 2HDMs

Friday, 10 April 2015 09:00 (23 minutes)

We investigate the constraints on Two-Higgs-Doublet Models stemming from precision measurements of tree-level decays. We focus on leptonic and semileptonic meson decays, but also consider bounds from recent searches at ATLAS and CMS.

Primary author: JUNG, Martin (TU Dortmund)

Co-authors: CELIS, Alejandro (IFIC CSIC-Universitat de Valencia); PICH, Antonio (University of Valencia); Dr LI, Xin-Qiang (Institute of Particle Physics, Central China Normal University)

Presenter: JUNG, Martin (TU Dortmund)

Session Classification: Flavour

Contribution ID: 19

Type: **Planary Talk**

Neutrino $R\nu$ MDM-Mass-Model at Three-Loop Level

Thursday, 9 April 2015 16:53 (23 minutes)

We propose a three-loop radiative neutrino ($R\nu$) mass model realized with BSM fields, including minimal-dark-matter (MDM) candidates. These, in conjunction with the 2HDM fields on top of which the model is built, lead to an accidental Z_2 symmetry protecting the fermion quintuplet as a DM candidate. We assess the potential fingerprints of the Majorana quintuplet on present and future pp colliders.

Primary author: Prof. PICEK, Ivica (University in Zagreb)

Presenter: Prof. PICEK, Ivica (University in Zagreb)

Session Classification: Neutrinos

Contribution ID: 20

Type: **Planary Talk**

The impact of flavour on scalar triplet leptogenesis

Thursday, 9 April 2015 17:39 (23 minutes)

Leptogenesis is an appealing framework to explain the baryon asymmetry of the universe. In its standard realization involving right-handed neutrinos, it has been shown that, if right-handed neutrinos are hierarchical, the flavour structure of Boltzmann equations describing the evolution of the lepton asymmetry simplifies a lot. When the charged lepton Yukawa are negligible, that is when the temperature of the universe is above 10^{12} GeV, the problem can be studied in the one-flavour approximation, whereas a full computation involving the 3 flavours is needed only below 10^9 GeV. In the intermediate regime where only the tau-Yukawa is non-negligible, a 2-flavour computation is sufficient.

On the other hand, we show that leptogenesis with a scalar triplet should always be studied in a fully flavoured framework. In particular, above 10^{12} GeV the correct treatment involves a 3×3 density matrix describing the lepton asymmetry in a flavour-covariant way, which generalizes the one-flavour approximation. We derived the Boltzmann equation satisfied by this matrix, and showed that flavour effects can affect the result significantly. As a consequence, the parameter space available for successful leptogenesis is enlarged.

Primary authors: SCHMAUCH, Benoit (IPhT); LAVIGNAC, Stephane (IPhT Saclay)

Presenter: SCHMAUCH, Benoit (IPhT)

Session Classification: Neutrinos

Contribution ID: 21

Type: **Planary Talk**

Accidental matter at the LHC

Tuesday, 7 April 2015 17:39 (23 minutes)

In this talk I will discuss weak-scale extensions of the Standard Model which automatically preserve the accidental and approximate symmetry structure of the Standard Model and which are hence invisible to indirect low-energy probes. By requiring the consistency of the effective field theory up to scales of $\Lambda_{eff} = 10^{15}$ GeV and after applying cosmological constraints, there is only a finite set of possibilities left. One of the most striking signatures of such a framework is the presence of new charged and/or colored particles which are stable on detector scale.

Primary authors: F. KAMENIK, Jernej (Jozef Stefan Institute); DI LUZIO, Luca; NARDECCHIA, Marco; GROEBER, Ramona (INFN)

Presenter: GROEBER, Ramona (INFN)

Session Classification: BSM

Contribution ID: 22

Type: **Planary Talk**

From asymptotic freedom to asymptotic safety in particle physics

Tuesday, 7 April 2015 16:30 (23 minutes)

We study the high-energy behaviour of interacting non-Abelian gauge fields, fermions, and scalars. In a regime where asymptotic freedom is absent, we find that the three types of fields cooperate to develop an interacting UV fixed point, strictly controlled by perturbation theory. The key features of asymptotic safety for UV model building and particle phenomenology are discussed.

Primary author: LITIM, Daniel**Presenter:** LITIM, Daniel**Session Classification:** BSM

Contribution ID: 23

Type: **Planary Talk**

Massive neutrinos and invisible axion minimally connected

Thursday, 9 April 2015 09:00 (23 minutes)

I will discuss few minimal scalar extensions of the standard electroweak model that provide a simple setup for massive neutrinos in connection with an invisible axion. The presence of a chiral U(1) a la Peccei-Quinn drives the pattern of Majorana neutrino masses while providing a dynamical solution to the strong CP problem and an axion as a dark matter candidate. Such a renormalizable framework is paradigmatically applied to type-II seesaw and to two viable models for neutrino oscillations where neutrino masses arise at one and two loops, respectively. I will comment on the naturalness of the effective setups as well as on their implications for vacuum stability and electroweak baryogenesis.

Primary authors: KOLESOVA, Helena (IPNP Charles University, Prague); Dr DI LUZIO, Luca (Genoa University and INFN, Genoa); Dr MALINSKY, Michal (IPNP Charles University, Prague); Dr BERTOLINI, Stefano (INFN and SISSA, Trieste)

Presenter: Dr DI LUZIO, Luca (Genoa University and INFN, Genoa)

Session Classification: GUT

Contribution ID: 24

Type: **Planary Talk**

"Hadronic Effects and Observables in $B \rightarrow \pi \ell^+ \ell^-$ decay"

Wednesday, 8 April 2015 16:58 (23 minutes)

I will present new results

on the theory of the rare flavour-changing neutral-current decay $B \rightarrow \pi \ell^+ \ell^-$ in the region of large recoil of the pion.

Nonlocal hadronic effects

in this decay are treated in a systematic way, combining QCD calculation with hadronic dispersion relation including the vector meson contributions.

The effective addition to the Wilson coefficient C_9 is calculated in the region $0 \leq q^2 \leq m_{J/\psi}^2$ of the lepton-pair invariant mass. This result, together with the updated $B \rightarrow \pi$ form factor from light-cone sum rules, is used to predict the rate, CP -asymmetry and isospin-asymmetry in $B \rightarrow \pi \ell^+ \ell^-$ in the Standard Model.

The influence of hypothetical new physics in $b \rightarrow d \ell^+ \ell^-$ transitions on these observables, as well as the expectations for similar exclusive FCNC decays will be also discussed.

Primary author: KHODJAMIRIAN, Alexander (University of Siegen)

Presenter: KHODJAMIRIAN, Alexander (University of Siegen)

Session Classification: Flavour

Contribution ID: 25

Type: **Planary Talk**

Flavour correlations in RSc model

Friday, 10 April 2015 11:46 (23 minutes)

Rare b decays are investigated in the Randall Sundrum model with custodial symmetry. Correlations among the observables are studied, and predictions for unobserved modes are presented.

Primary author: COLANGELO, Pietro (Unknown)

Presenter: COLANGELO, Pietro (Unknown)

Session Classification: BSM

Contribution ID: 26

Type: **Planary Talk**

Long-lived Colored Scalars at the LHC

Tuesday, 7 April 2015 10:14 (23 minutes)

We study the collider signatures of a long-lived massive colored scalar transforming trivially under the weak interaction and decaying within the inner sections of a detector such as ATLAS or CMS. In our study, we assume that the colored scalar couples at tree-level to a top quark and a stable fermion, possibly arising from a dark sector or from supersymmetric extensions of the Standard Model. After implementing the latest experimental searches for long-lived colored scalars, we observe a region of parameter space consistent with a colored electroweak-singlet scalar with mass between 100 – 200 GeV and a lifetime between 0.1 – 10 mm/ c together with a nearly degenerate dark fermion that may be probed at the $\sqrt{s} = 13$ TeV LHC. We show that our simplified model may naturally arise from the light-stop window regime of the Minimal Supersymmetric Standard Model, where a light mostly right-handed stop has a mass slightly larger than the lightest neutralino and decays through a four-body process.

Primary author: DE LA PUENTE, Alejandro (TRIUMF)**Presenter:** DE LA PUENTE, Alejandro (TRIUMF)**Session Classification:** Collider

Contribution ID: 27

Type: **Planary Talk**

News on Penguin Effects in CP Violation Benchmark Decays

Tuesday, 7 April 2015 12:14 (23 minutes)

Measurements of CP violation in $B_d^0 \rightarrow J/\psi K_S^0$ and $B_s^0 \rightarrow J/\psi \phi$ decays play key roles in testing the quark-flavour sector of the Standard Model. The theoretical interpretation of the corresponding observables is limited by uncertainties from doubly Cabibbo-suppressed penguin topologies. With continuously increasing experimental precision, it is mandatory to get a handle on these contributions, which cannot be calculated reliably in QCD. In the case of the measurement of $\sin 2\beta$ from $B_d^0 \rightarrow J/\psi K_S^0$, the U -spin-related decay $B_s^0 \rightarrow J/\psi K_S^0$ offers a tool to control the penguin effects. As the required measurements are not yet available, data for decays with similar dynamics and the $SU(3)$ flavour symmetry are used to constrain the size of the expected penguin corrections. Predictions of the CP asymmetries of $B_s^0 \rightarrow J/\psi K_S^0$ and are given and a scenario is presented to fully exploit the physics potential of this decay, emphasizing also the determination of hadronic parameters and their comparison with theory. In the case of the benchmark mode $B_s^0 \rightarrow J/\psi \phi$ used to determine the B_s^0 - \bar{B}_s^0 mixing phase ϕ_s the penguin effects can be controlled through $B_d^0 \rightarrow J/\psi \rho^0$ and $B_s^0 \rightarrow J/\psi K^*$ decays. The LHCb collaboration has recently presented pioneering results on this topic. I will discuss their implications and present a roadmap for controlling the penguin effects.

Primary author: FLEISCHER, Robert (CERN)

Presenter: FLEISCHER, Robert (CERN)

Session Classification: Flavour

Contribution ID: 28

Type: **Planary Talk**

Electric dipole moments generated from flavor changing scalars

Friday, 10 April 2015 11:23 (23 minutes)

I comment shortly on various mechanisms for electric dipole moments. I also comment on recent calculations of two loop diagrams for electric dipole moments generated by flavor changing scalars.

Primary author: EEG, Jan O. (University of Oslo)

Presenter: EEG, Jan O. (University of Oslo)

Session Classification: BSM

Contribution ID: 29

Type: **Planary Talk**

Composite leptoquarks and anomalies in B-meson decays

Thursday, 9 April 2015 15:16 (23 minutes)

I will discuss the possibility to explain recent anomalies in semileptonic B decays at LHCb via a composite Higgs model, in which both the Higgs and a triplet leptoquark arise as pseudo-Goldstone bosons of the strong dynamics. Fermion masses are assumed to be generated via the mechanism of partial compositeness, which largely determines the leptoquark couplings and implies non-universal lepton interactions. The latter are needed to accommodate tensions in the $b \rightarrow s\mu\mu$ dataset and to be consistent with a discrepancy measured at LHCb in the ratio of $B^+ \rightarrow K^+\mu^+\mu^-$ to $B^+ \rightarrow K^+e^+e^-$ branching ratios.

Primary authors: GRIPAIO, Ben (University of Cambridge (GB)); NARDECCHIA, Marco; RENNER, Sophie (CERN)

Presenter: NARDECCHIA, Marco

Session Classification: Flavour

Contribution ID: 30

Type: **Planary Talk**

Higher order effects in the minimal SO(10) grand unification

Thursday, 9 April 2015 09:23 (23 minutes)

I will review the recent progress in the attempts to improve the accuracy of the existing proton lifetime estimates in the realm of the minimal non-supersymmetric SO(10) grand unified model and argue that a significant portion of its parameter space consistent with all existing constraints may be testable at the existing or near future experimental facilities.

Primary author: MALINSKY, Michal (IPNP, Charles University in Prague)

Co-author: Mrs KOLEŠOVÁ, Helena (FNSPE, Czech Technical University)

Presenter: MALINSKY, Michal (IPNP, Charles University in Prague)

Session Classification: GUT

Contribution ID: 33

Type: **Planary Talk**

Top mass from the bottom (at NLO)

Thursday, 9 April 2015 11:46 (23 minutes)

In this talk I will briefly review the present status and motivations for an accurate measurement of the top quark mass. In particular I will outline future strategies and possible outcomes for a global combination of top quark masses measurement at hadron colliders. I will discuss the role that new types of measurement can play to clarify the issues of present precision top quark measurements. In this context, I will present a distinctly new strategy for the top quark mass measurement based on properties of energy spectra, which can be applied both to b-jets and (under several guises) to B-hadrons observables, resulting in a sub-percent top quark mass determination.

Primary authors: KIM, Doojin (University of Maryland); AGASHE, Kaustubh (University of Maryland); SCHULZE, Markus Christian (CERN); FRANCESCHINI, Roberto (CERN)

Presenter: FRANCESCHINI, Roberto (CERN)

Session Classification: Collider

Contribution ID: 34

Type: **Planary Talk**

Resurrecting the minimal renormalizable supersymmetric SU(5) model

Thursday, 9 April 2015 09:46 (23 minutes)

The minimal renormalizable supersymmetric SU(5) GUT model has long been proclaimed ruled out on the account of colour Higgs triplet being either too heavy to allow for the gauge coupling unification or too light to satisfy the proton decay bounds. We have managed to prove that for large trilinear supersymmetry breaking terms and only a slightly heavier superpartner spectrum the perturbative model is still alive and can be reconciled with all phenomenological constraints from accommodating the measured Higgs boson mass and the correct mass relations among light fermions at the low scale to proton decay bounds, vacuum metastability and unification.

Primary authors: , Borut Bajc (J. Stefan Institute, Ljubljana); LAVIGNAC, Stephane (IPhT Saclay); MEDE, Timon (IPNP, Prague)

Presenter: MEDE, Timon (IPNP, Prague)

Session Classification: GUT

Contribution ID: 36

Type: **Planary Talk**

Discerning new physics in charm meson leptonic and semileptonic decays

Friday, 10 April 2015 09:23 (23 minutes)

Current experimental information on the charm meson decay observables in which the $c \rightarrow s\ell\nu_\ell$ transitions occur is well compatible with the Standard Model (SM) predictions. Recent precise lattice calculations of the D_s meson decay constant and form factors in $D \rightarrow K\ell\nu$ decays offer a possibility to search for the small deviations from the SM predictions in the next generation of the high intensity flavour experiments. We revisit the constraints from these processes on the new physics (NP) contributions in the effective theory approach. In the case of $D \rightarrow K\ell\nu$ we identify observables sensitive on NP contribution coming from the scalar Wilson coefficient, namely the forward-backward and the transversal muon polarization asymmetries. We also identify the allowed deviations from the lepton flavour universality using the ratio of the branching fractions involving muons and electrons in the final state.

Primary author: NISANDZIC, Ivan (TU Dortmund)

Co-authors: FAJFER, S (Univ. of Ljubljana and Inst. J. Stefan); ROJEC, Ursa (University of Ljubljana)

Presenter: NISANDZIC, Ivan (TU Dortmund)

Session Classification: Flavour

Contribution ID: 37

Type: **Planary Talk**

A minimal supersymmetric E6 Unified Theory

Thursday, 9 April 2015 10:09 (23 minutes)

We explicitly show that the model with a Higgs breaking sector $27 + 27_{\text{bar}} + 351' + 351'_{\text{bar}} + 78$ provides a realistic scenario for an E6 SUSY Grand Unified Theory. Although the 78 is not necessary for obtaining a Standard Model vacuum, doublet-triplet splitting cannot be performed in the simplified case, where the 78 is omitted. We study in detail the Yukawa sector of the model, where three “fermionic” copies of the 27 couple to the Higgs breaking sector via two terms with symmetric Yukawa matrices. The low energy fields turn out to be those of the MSSM, and their low energy mass matrices are computed. Finally, a successful fit of the second and third generation of these particles to the low energy data is obtained. The model is thus the best realistic candidate for a minimal renormalizable supersymmetric E6 theory.

Primary authors: , Borut Bajc (J. Stefan Institute, Ljubljana); BABU, Kaladi (Oklahoma State University); SUSIČ, Vasja (Jožef Stefan Institute)

Presenter: SUSIČ, Vasja (Jožef Stefan Institute)

Session Classification: GUT

Contribution ID: 38

Type: **Planary Talk**

Light Sparticles from a light Singlet in Gauge Mediation

Wednesday, 8 April 2015 14:53 (23 minutes)

I will discuss a simple and predictive model that combines the NMSSM and Gauge Mediation. Originally proposed by Delgado, Giudice and Slavich, we have re-analyzed this model and found new interesting regions in the parameter space with a light singlet state that mixes with the SM-like Higgs at 125 GeV. This mixing is small enough to evade LEP and LHC constraints, but large enough to give a substantial contribution to the tree-level Higgs mass. This allows to reduce the required mass scale of supersymmetric particles, making them accessible at the early phase of LHC Run II. Essentially only a single parameter is left undetermined that controls the gravitino phenomenology and can lead to novel collider signatures.

Primary author: ZIEGLER, Robert**Presenter:** ZIEGLER, Robert**Session Classification:** SUSY

Contribution ID: 39

Type: **Plenary Talk**

The State of New Physics in Rare B Decays

Thursday, 9 April 2015 14:30 (23 minutes)

I will present results of global fits of all relevant experimental data on rare $b \rightarrow s$ decays. Significant tensions between the Standard Model predictions and the data are observed that could be explained by unexpectedly large hadronic effects or by new physics.

Assuming hadronic uncertainties are estimated in a sufficiently conservative way, I will discuss the implications of the experimental results on new physics, both model independently as well as in the context of models with flavor-changing Z' bosons.

Primary author: ALTMANNSHOFER, Wolfgang (Perimeter Institute)

Presenter: ALTMANNSHOFER, Wolfgang (Perimeter Institute)

Session Classification: Flavour

Contribution ID: 40

Type: **Planary Talk**

Two-loop induced neutrino masses: A model-independent approach

Thursday, 9 April 2015 17:16 (23 minutes)

Majorana neutrino masses can originate either at the tree level (type-I, II or III seesaws) or can be radiatively induced. The latter option naturally requires order TeV BSM fields, thus leading to testable neutrino mass generation mechanisms. Based on a two-loop systematic classification of the dimension five effective Weinberg operator, in this talk I will discuss the different realizations one can envisage for neutrino mass generation at the two-loop order.

Primary author: ARISTIZABAL, Diego (Universite de Liege)

Presenter: ARISTIZABAL, Diego (Universite de Liege)

Session Classification: Neutrinos

Contribution ID: 41

Type: **Planary Talk**

Explaining the $b \rightarrow s$ anomalies with a dark sector

Thursday, 9 April 2015 15:39 (23 minutes)

The LHCb collaboration has recently reported on some anomalies in $b \rightarrow s$ transitions. In addition to discrepancies with the Standard Model (SM) predictions in some angular observables and branching ratios, an intriguing hint for lepton universality violation was found. Here we propose a simple model that extends the SM with a dark sector charged under an additional $U(1)$ gauge symmetry. The spontaneous breaking of this symmetry gives rise to a massive Z' boson, which communicates the SM particles with a valid dark matter candidate, while solving the $b \rightarrow s$ anomalies with contributions to the relevant observables.

Primary author: VICENTE, Avelino (Université de Liège)

Presenter: VICENTE, Avelino (Université de Liège)

Session Classification: Flavour

Contribution ID: 42

Type: **Planary Talk**

What do we know about the light-fermion Yukawas?

Tuesday, 7 April 2015 15:16 (23 minutes)

In this talk I present direct and indirect constraints on the interaction of the Higgs boson with electrons and light quarks. In addition, I briefly discuss the size of deviations from standard-model predictions that are expected in different models of flavor, and the impact on dark-matter direct detection.

Primary author: BROD, Joachim (Johannes-Gutenberg-Universitaet Mainz)

Presenter: BROD, Joachim (Johannes-Gutenberg-Universitaet Mainz)

Session Classification: Higgs

Contribution ID: 43

Type: **Planary Talk**

Review of LHC Experimental Highlights

Tuesday, 7 April 2015 09:00 (28 minutes)

An overview will be given of the high-pT-physics highlights from the Run I of the LHC. ATLAS and CMS have an extensive physics program of high-precision measurement and searches for physics beyond the Standard Model. The talk will cover Higgs boson, electroweak physics and top quark physics, as well as searches for hints of new phenomena that attempt to address the open questions we are facing in particle physics - in particular the naturalness of the Higgs mass scale, dark matter, neutrino masses, and the incorporation of gravity into the particle picture. The new physics models considered include Supersymmetry, composite Higgs models, extra dimensions, technicolor, hidden valley and many more. The corresponding new signatures range from spectacular new resonances and excesses in various final states to subtle changes in kinematic distributions.

Primary author: GOLLING, Tobias (Universite de Geneve (CH))

Presenter: GOLLING, Tobias (Universite de Geneve (CH))

Session Classification: Collider

Contribution ID: 44

Type: **Planary Talk**

EWSB meets flavor

Wednesday, 8 April 2015 09:00 (23 minutes)

Little is known about the physics responsible for EWSB. While we expect the LHC to soon provide the first signals of direct detection, indirect information can in the meantime be gathered by using EFTs. In this talk I will explore, in particular, the crosstalk between flavor processes and such EFTs and show to which extent flavor physics can shed light upon the mechanism of EWSB.

Primary author: CATA, Oscar**Presenter:** CATA, Oscar**Session Classification:** Higgs

Contribution ID: 45

Type: **Planary Talk**

Flavored U(1)s

Friday, 10 April 2015 11:00 (23 minutes)

Several aspects of the MFV implementation in the presence of global U(1) flavor symmetries will be discussed. Some generic implications for baryon number violation, lepton number violation and Majorana mass terms, and axion dynamics will be drawn.

Primary author: SMITH, Christopher (L)**Presenter:** SMITH, Christopher (L)**Session Classification:** BSM

Contribution ID: 46

Type: **Plenary Talk**

Searching for New Physics in Heavy Flavor Decays: Recent Results from the B Factories and LHCb, and Future Prospects

Wednesday, 8 April 2015 16:30 (28 minutes)

We review recent results in heavy flavor decays from the Belle, BaBar, and LHCb experiments. These measurements range from mixing parameters to CKM phases to various observables in electroweak penguin decays. The results are sensitive to new physics and thus constrain extensions to the Standard Model. Several inconsistencies between measured values and Standard Model expectations may point the way to uncovering new physics with more data. Both Belle and LHCb are now being upgraded in order to significantly increase the data sample sizes; these upgrade programs and their physics prospects are also discussed.

Primary author: SCHWARTZ, Alan (University of Cincinnati)

Presenter: SCHWARTZ, Alan (University of Cincinnati)

Session Classification: Flavour

Contribution ID: 47

Type: **Planary Talk**

QCD Effects on Direct Detection of Wino Dark Matter

Wednesday, 8 April 2015 11:28 (23 minutes)

We complete the calculation of the wino-nucleon scattering cross section up to the next-to-leading order in α_s . As a result, the uncertainties coming from the perturbative QCD are significantly reduced to be smaller than those from the nucleon matrix elements. The resultant scattering cross section is found to be larger than the leading-order one by about 70%, which is well above the neutrino background.

Primary author: HISANO, Junji (Nagoya university)

Presenter: HISANO, Junji (Nagoya university)

Session Classification: Dark matter

Contribution ID: 48

Type: **Planary Talk**

Flavor violation in tau decays

Friday, 10 April 2015 09:46 (23 minutes)

Lepton flavor-violating processes offer interesting possibilities to probe new physics at multi-TeV scale. We discuss those in the framework of effective field theory, emphasizing the role of gluonic operators. Those operators are obtained by integrating out heavy quarks that are kinematically inaccessible at the scale where low-energy experiments take place and make those experiments sensitive to the couplings of lepton flavor changing neutral currents to heavy quarks. We discuss constraints on the Wilson coefficients of those operators from the muon conversion $\mu^- + (A, Z) \rightarrow e^- + (A, Z)$ and from lepton flavor-violating tau decays with one or two hadrons in the final state, e.g. $\tau \rightarrow \ell \eta^{(\prime)}$ and $\tau \rightarrow \ell \pi^+ \pi^-$ with $\ell = \mu, e$. To illustrate the results we discuss explicit examples of constraining parameters of leptoquark models.

Primary author: PETROV, Alexey (Wayne State University)

Presenter: PETROV, Alexey (Wayne State University)

Session Classification: Flavour

Contribution ID: 49

Type: **Planary Talk**

Signatures of supersymmetry with underabundance of neutralino dark matter

Wednesday, 8 April 2015 14:30 (23 minutes)

Motivated by the absence, so far, of any signal for the coloured supersymmetric particles, we focus on the possibility that the electroweak sector may play the leading role in discovering supersymmetry. So far, the interest in the supersymmetric electroweak sector has often been linked to the fact that the LSP might account for the observed Dark Matter in the universe. The new LHC and direct detection limits cast, however some doubts on that possibility and it is possible that the LSP component in the observed DM is small, and the bulk of DM has different origin. We investigate the signatures of the supersymmetric electroweak sector with underabundance of neutralino dark matter and conclude that it is discoverable by the complementarity of dedicated collider experiments and future direct detection experiments.

Primary author: POKORSKI, Stefan (University of Warsaw (PL))

Co-authors: DELGADO, Antonio (University of Notre Dame (US)); SAKURAI, Kazuki (University of London (GB)); BADZIAK, Marcin; OLECHOWSKI, Marek (University of Warsaw, Faculty of Physics)

Presenter: POKORSKI, Stefan (University of Warsaw (PL))

Session Classification: SUSY

Contribution ID: 50

Type: **Planary Talk**

Emerging Jets

Thursday, 9 April 2015 11:23 (23 minutes)

TBA

Primary author: WEILER, Andreas (CERN)

Presenter: WEILER, Andreas (CERN)

Session Classification: Collider

Contribution ID: 51

Type: **Planary Talk**

Higgs in bosonic technicolor

Wednesday, 8 April 2015 09:23 (23 minutes)

TBA

Primary author: ZUPAN, Jure (University of Cincinnati)

Presenter: ZUPAN, Jure (University of Cincinnati)

Session Classification: Higgs

Contribution ID: 52

Type: **Planary Talk**

Higgs Coupling Measurements

Tuesday, 7 April 2015 15:39 (23 minutes)

Already during the last run of the LHC the measurement of Higgs couplings has played a key role in understanding the nature of the observed resonance. I will review the main results, discuss their challenges on the experimental and theoretical side, and discuss first tests of possible analyses during Run2. The main challenge will be to properly interpret Higgs measurements in terms of an effective field theory, with all its advantages and limitations.

Primary author: PLEHN, Tilman (Heidelberg University)

Presenter: PLEHN, Tilman (Heidelberg University)

Session Classification: Higgs

Contribution ID: 53

Type: **Planary Talk**

CP asymmetries in bottom and charm decays

Friday, 10 April 2015 10:09 (23 minutes)

The standard way to measure the CP phases 2β and $2\beta_s$ uses $B_{d,s}$ decays into charmonium. The theoretical precision is limited by the unknown penguin contribution to the decay amplitude. I show that this contribution can be expressed in terms of the same matrix elements which constitute to the dominant tree amplitude. The second part of my talk addresses a global analysis of D meson decays into two pseudoscalar mesons and the predictions of CP asymmetries.

Primary author: NIERSTE, Ulrich (Karlsruhe Institute of Technology (KIT))

Presenter: NIERSTE, Ulrich (Karlsruhe Institute of Technology (KIT))

Session Classification: Flavour

Contribution ID: 54

Type: **Planary Talk**

SM challenges and BSM opportunities in rare B decays in the light of recent data.

Wednesday, 8 April 2015 17:44 (23 minutes)

I will discuss the problems and opportunities in disentangling SM and BSM effects in rare semileptonic and radiative decays, including electronic final states and lepton universality-violating observables. I will contrast SM and BSM effects in the context of (i) the LHCb anomaly, (ii) the search for right-handed currents, and (iii) lepton-universality violation.

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

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

Session Classification: Flavour

Contribution ID: 55

Type: **Planary Talk**

LHC as LNV Higgs Collider?

Thursday, 9 April 2015 11:00 (23 minutes)

I describe the way in which the mechanism responsible for the origin of neutrino masses may manifest itself as striking Lepton Number Violating decays of the Higgs. Majorana neutrinos in the tenths of GeV mass range, together with currently allowed nonstandard Higgs couplings leave ample space for this possibility, which can probe a scale of neutrino mass generation as high as ~ 20 TeV.

Primary author: Dr NESTI, Fabrizio (Rudjer Boskovic Institute)

Presenter: Dr NESTI, Fabrizio (Rudjer Boskovic Institute)

Session Classification: Collider

Contribution ID: 57

Type: **Planary Talk**

The Top/Higgs gateway to new physics

Tuesday, 7 April 2015 09:51 (23 minutes)

TBA

Primary author: MALTONI, Fabio (Universite Catholique de Louvain (UCL) (BE))

Presenter: MALTONI, Fabio (Universite Catholique de Louvain (UCL) (BE))

Session Classification: Collider

Contribution ID: 58

Type: **Planary Talk**

Pseudo-observables in Higgs decays

Wednesday, 8 April 2015 09:46 (23 minutes)

We define a set of pseudo-observables characterizing the properties of Higgs decays in generic extensions of the Standard Model with no new particles below the Higgs mass. The pseudo-observables can be determined from experimental data, providing a systematic generalization of the “kappa-framework” so far adopted by the LHC experiments. The pseudo-observables are defined from on-shell decay amplitudes, allow for a systematic inclusion of higher-order QED and QCD corrections, and can be computed in any Effective Field Theory (EFT) approach to Higgs physics. We analyze the reduction of the number of independent pseudo-observables following from the hypotheses of lepton-universality, CP invariance, custodial symmetry, and linearly realized electroweak symmetry breaking.

Primary author: GRELJO, Admir (Institute Jozef Stefan)

Presenter: GRELJO, Admir (Institute Jozef Stefan)

Session Classification: Higgs

Contribution ID: **60**

Type: **not specified**

TBA

Contribution ID: 61

Type: **Planary Talk**

How much SUSY does the Higgs boson need?

Wednesday, 8 April 2015 15:16 (23 minutes)

The idea of naturalness, in its original version, refers only to the finite renormalisation of the Higgs boson mass induced by the introduction of heavier states. It is still a powerful heuristic principle in model building beyond the SM. A compelling case is provided by the generation of neutrino masses. The right-handed sector responsible for the seesaw mechanism is made supersymmetric to comply with naturalness while the SM is left unchanged and non-supersymmetric. In the type-I seesaw, this implementation provides right-handed neutrino masses that are natural and consistent with baryogenesis.

Primary author: FABBRICHESI, Marco (INFN/SISSA)

Presenter: FABBRICHESI, Marco (INFN/SISSA)

Session Classification: SUSY

Contribution ID: 62

Type: **Planary Talk**

Lepton dipole moments in a SUSY low scale seesaw model

Wednesday, 8 April 2015 15:39 (23 minutes)

The results for anomalous dipole moment and electric dipole moment are presented in the MSSM extended by low scale heavy neutrinos. The analysis of possible contributions is presented, and found that the CP phase originates only for additional phase introduced in the model, leading to the electron EDM that can be observed in future experiments.

Presenter: , Amon Ilakovac (Univ. of Zagreb)

Session Classification: SUSY

Contribution ID: **63**

Type: **not specified**

TBA

Contribution ID: 65

Type: **Planary Talk**

Some hadronic contributions to B-VII

Wednesday, 8 April 2015 17:21 (23 minutes)

I will discuss recent progress on B->V form factors. This will for instance include the use of the equation of motion in reducing the uncertainty of tensor-to-vector form factors.

The latter is of primary importance for the zero crossing of helicity amplitudes which has major impacts on angular observables. I will discuss the impact of cc-resonances on determination of angular observables.

Primary author: ZWICKY, Roman (edinburgh university)

Presenter: ZWICKY, Roman (edinburgh university)

Session Classification: Flavour