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Book of Abstracts

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Quarkonia and quarkonia-like spectroscopy at LHCb

Author: Maddalena Frosini[1]

[1] *Universita & INFN, Firenze-Unknown-Unknown*

Corresponding Author: maddalena.frosini@fi.infn.it

The latest years have seen a resurrection of interest in searches for exotic states motivated by tantalising observations by Belle and CDF. Using the data collected at pp collisions at 7 and 8 TeV by the LHCb experiment we present studies of the X(3872) properties as well as preliminary studies and prospects for studies of putative states such as the Z(4430)+

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Charm mixing and CP violation

Author: Mark Elliot Smith[1]

[1] *University of Manchester (GB)*

Corresponding Author: mark.elliot.smith@cern.ch

LHCb has collected the world's largest sample of charmed hadrons. This sample is used to search for direct and indirect CP violation in charm, and to measure D0 mixing parameters. Preliminary measurements from several decay modes are presented, with complementary time-dependent and time-integrated analyses

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Rare decays at LHCb

Author: Jose Angel Hernando Morata[1]

[1] *Universidade de Santiago de Compostela (ES)*

Corresponding Author: jose.angel.hernando-morata@cern.ch

Rare decays of beauty and charm hadrons and lepton flavour/number violating decays of tau leptons test the flavour structure of the underlying theory at the level of quantum corrections. They provide information on the couplings and masses of heavy virtual particles appearing as intermediate states. A review of recent results obtained by LHCb on these topics will be presented.

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Measurement of φs at LHCb

Author: Francesca Dordei[1]

[1] *Ruprecht-Karls-Universitaet Heidelberg (DE)*

Corresponding Author: francesca.dordei@cern.ch

The study of CP violation in Bs oscillations is one of the key goals of the LHCb experiment. Effects are predicted to be very small in the Standard Model but can be significantly enhanced in many models of new physics. We present the world's best measurement of the CP-violating phase φs using B0s ⟶ J/ψφ and B0s ⟶ J/ψππ decays, and a first study of mixing-induced CP violation in the decay B0s ⟶ φφ.

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Measurement of γ from B⟶DK decays

Author: Stefania Ricciardi[1]

[1] *STFC - Science & Technology Facilities Council (GB)*

Corresponding Author: stefania.ricciardi@stfc.ac.uk

The angle γ of the CKM unitarity triangle remains the least precisely measured parameter of the CKM mixing matrix. The precision measurement of this parameter is one of the main goals of the LHCb experiment. We present a wide range of measurements of CP violation and partial rates in B⟶DK decays, as well as the latest LHCb measurement of γ combining all the individual inputs.

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Studies of charmless B decays

Author: Adlene Hicheur[1]

[1] *CBPF - Brazilian Center for Physics Research (BR)*

Corresponding Author: adlene.hicheur@cern.ch

Decays of B hadrons without charmed particles in the final state offer rich opportunities to test the Standard Model. For example, CP violation in charmless charged two-body and three-body B decays provides ways to measure the CKM angle γ and to search for New Physics. The angular distributions of decays to vector-vector final states provide additional interesting observables. We present the latest results on hadronic charmless B decays from LHCb

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Measurement of semileptonic asymmetries in the B system at LHCb

Author: Thomas Michael Bird[1]

[1] *University of Manchester (GB)*

Corresponding Author: thomas.bird@cern.ch

LHCb has recorded large samples of semileptonic B decays. These provide potential to study CP violation effects in the B0 and Bs0 systems. Decay time-integrated or time-dependent asymmetries between charge-conjugate final states probe CP violation in B(s)0 mixing through the measurement

of the parameter Afs (sometimes referred to as Asl). These measurements rely on data-driven techniques to obtain excellent control of systematic uncertainties. We present the status of the analyses.

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Searches for Higgs and Higgs-like particles at LHCb

Author: Valdir Salustino Guimaraes[1]

[1] *Univ. Federal do Rio de Janeiro (BR)*

Corresponding Author: valdir.salustino.guimaraes@cern.ch

The LHCb detector is a forward single arm spectrometer designed primarily for the study of CP-violation and other rare phenomena in the decays of beauty and charm particles. LHCb is very powerful in probing New Physics by performing indirect searches. Nevertheless, a program of direct searches for Higgs and Higgs-like particles also exists. Here we present some recent results and perspectives.

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The Long-Baseline Neutrino Experiment

Author: Christopher Mauger[1]

[1] *Los Alamos National Laboratory*

Corresponding Author: cmauger@lanl.gov

The Long-Baseline Neutrino Experiment is a broad scientific program being developed in the United States as an international partnership. LBNE consists of an intense neutrino beam produced at Fermi National Accelerator Laboratory (Fermilab), a highly capable set of neutrino detectors on the Fermilab campus, and a large underground liquid argon time-projection chamber (TPC) at Sanford Underground Research Facility (SURF) in the state of South Dakota. The high-intensity neutrino beam will allow LBNE to make high precision measurements of neutrino and anti-neutrino mixing separately. LBNE will make detailed studies of neutrino oscillations including measurements of the mass hierarchy and CP violation that take advantage of the 1300 km baseline afforded by this arrangement. At the near site, the high-statistics neutrino scattering data will allow for many cross-sections measurements and precision tests of the standard model. At the far site, the large underground detector will open a new window to the search for nucleon decay, supernova neutrinos, and interesting astrophysical phenomena. In this talk, we describe the beam and detectors and outline the broad physics program of LBNE.

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The latest results from T2K on the neutrino oscillation

Authors: Benjamin Still[1]; Takuya Hasegawa[2]

[1] *Queen Mary, University of London*

[2] *KEK*

Corresponding Author: b.still@qmul.ac.uk

The Tokai to Kamioka (T2K) experiment is a long baseline neutrino oscillation experiment situated in Japan. A high intensity neutrino beam is produced at the Japan Proton Accelerator Research Complex, in Tokai, Japan. A near detector complex, situated 280 m from the neutrino production target, and the far detector at 295 km, are used to detect the neutrinos from this beam. This talk will present the latest T2K results on the neutrino oscillation, using the data collected up to summer 2013.

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Recent results from T2K on neutrino interaction measurements

Authors: Takuya Hasegawa[1]; Tatsuya Kikawa[2]

[1] *KEK*

[2] *Kyoto University*

Corresponding Author: kikawa@scphys.kyoto-u.ac.jp

The Tokai to Kamioka (T2K) experiment is a long baseline neutrino oscillation experiment situated in Japan. A high intensity neutrino beam is produced at the Japan Proton Accelerator Research Complex, in Tokai, Japan. The near detector of the T2K experiment is designed to provide a good knowledge of the neutrino beam before the neutrinos oscillate, including measuring the backgrounds and their energy dependence. Moreover this system is capable of investigating various category of neutrino interaction in detail. This talk will present recent results from T2K on neutrino interaction measurements.

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First Data from the NOvA experiment

Author: Denis Perevalov[1]

[1] *Fermi National Accelerator Laboratory*

Corresponding Author: denis@fnal.gov

NOvA is an off-axis long baseline neutrino experiment searching for $\nu_\mu \to \nu_e$ oscillations using an upgraded NuMI neutrino beam from Fermilab, Batavia, IL.
The main physics goal is a measurement of the CP violation and establishing the neutrino masses hierarchy.
A large 14 kton Far detector, comprised of liquid scintillator contained in extruded PVC cells, will also provide an opportunity for other non-accelerator physics searches.
A large portion of the Far detector has been built with the first neutrino beam data expected by July 2013. As both Far detector mass and beam power increase throughout 2013 and 2014, the reach for the physics results grows as well.

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SOX: Short Distance Neutrino Oscillations with Borexino

Author: Collaboration Borexino[1]

[1] *LNGS*

Corresponding Author: marco.pallavicini@ge.infn.it

The Borexino is a an excellent and well understood detector for both low energy sub-MeV neutrinos (as proven by the solar neutrino results) and anti-neutrinos.
The European Community has recently approved a project for the construction of a neutrino or an anti-neutrino source which will allow to confirm or unambiguously reject the long standing neutrino anomalies suggested by the LSND experiments, by solar neutrino Gallium experiments and by reactors experiments.
The talk will outline the project and discuss the sensitivity of three different phases of the experiment.

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Recent solar and terrestrial neutrino results from Borexino

Authors: Collaboration Borexino[1]; Livia Ludhova[2]

[1] *LNGS*

[2] *INFN Milano*

Corresponding Authors: livia.ludhova@mi.infn.it, marco.pallavicini@ge.infn.it

Borexino is a solar neutrino and geoneutrino detector currently running at the Laboratori del Gran Sasso in Italy.
The first phase of the experiment has been completed in 2010 and, after a successful purification campaign which have brought down the background further, a second phase is now in progress.
The talk will report on the Phase I final results and on the first results of the Phase II, namely a new measurement of the geoneutrino flux and the detection of annual modulation of solar neutrinos.
Finally, perspectives for the Phase II on solar neutrinos will be given.

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Results from MINOS Full Data Set & Plans for MINOS+

Author: Samuel Robert Childress[1]

[1] *Unknown*

Corresponding Author: childress@fnal.gov

Neutrino oscillation is studied in the MINOS experiment with the NuMI beam line by measuring neutrino and anti-neutrino interactions with magnetized near and far detectors. We report on results obtained with our complete beam exposure of 1.56 x 10ˆ21 POT from 2005 to 2012, and also 37.88 kton-years of atmospheric neutrinos. Presented are the most precise measurements to date of mass splittings for muon neutrinos and anti-neutrinos, the first joint analysis of atmospheric and accelerator neutrinos in the same experiment, and results for both electron neutrino and anti-neutrino appearance in muon neutrino and anti-neutrino beams. We also discuss plans for MINOS+ which should accumulate more than 10,000 muon neutrino events in the 4-10 GeV energy range over the next three years.

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The MicroBooNE Experiment

Author: Andrzej Szelc[1]

[1] *Yale University*

Corresponding Author: andrzej.szelc@yale.edu

Liquid Argon Time Projection Chambers are quickly becoming one of the most promising detector technologies in neutrino
physics. They offer very good 3D and calorimetric resolution and allow relatively straight forward construction of large mass
detectors making them a great candidate for current and future precision neutrino measurements. A prime example is the
MicroBooNE experiment set to run on the Booster Beam line at Fermilab in 2014. MicroBooNE will use the superior
Particle Identification capabilities of the LArTPC to understand the origin of the excess of electromagnetic events observed
in MiniBooNE, measure neutrino interactions in argon, and pave the way for future, larger detectors planning to use
this technology. The physics goals of the experiment will be presented together with the current status of the detector
construction and preparations.

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The Majorana Demonstrator

Author: Estanislao Aguayo[1]

[1] *P*

Corresponding Author: ertanito@gmail.com

The Majorana collaboration is searching for neutrinoless double beta decay using 76Ge, which has been shown to have a number of advantages in terms of sensitivities and backgrounds. The observation of neutrinoless double-beta decay would show that lepton number is violated and that neutrinos are Majorana particles and would simultaneously provide information on neutrino mass. Attaining sensitivities for neutrino masses in the inverted hierarchy region, 15⊠50 meV, will require large, tonne-scale detectors with extremely low backgrounds, at the level of 1 count t⊠1 y⊠1 or lower in the region of the signal. The Majorana collaboration, with funding support from DOE Oce of Nuclear Physics and NSF Particle Astrophysics, is constructing the Demonstrator, an array consisting of 40 kg of p-type point-contact high-purity germanium (HPGe) detectors, of which 30 kg will be enriched to 86% in 76Ge. The Demonstrator is being constructed in a clean room laboratory facility at the 4850' level (4160 m.w.e.) of the Sanford Underground Research Facility (SURF) in Lead, SD. It utilizes a compact graded shield approach with the inner portion consisting of ultra-clean Cu that is being electroformed and machined underground. The primary aim of the Demonstrator is to show the feasibility of a future tonne-scale measurement in terms of backgrounds and scalability.

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Non-decoupling SUSY in LFV Higgs decays: a window to high m_{SUSY} at the LHC

Author: Ernesto Arganda[1]

Co-authors: Miguel Arana-Catania [2]; maria herrero [2]

[1] *IFLP-CONICET*

[2] *Universidad Autonoma de Madrid*

Corresponding Author: ernesto.arganda@fisica.unlp.edu.ar

The recent discovery of a SM-like Higgs boson at the LHC, with a mass around 125-126 GeV, together with the absence of results in the direct searches for supersymmetry, is pushing the SUSY scale ($m_{\rm SUSY}$) into the multi-TeV range. This discouraging situation from a low-energy SUSY point of view has its counterpart in indirect SUSY observables which present a non-decoupling behavior with $m_{\rm SUSY}$. This is the case of the one-loop lepton flavor violating Higgs decay rates induced by SUSY, which may remain constant or even increase as $m_{\rm SUSY}$ grows, depending on the class of intergenerational mixing in the slepton sector which are taken into account (LL, LR, RL or RR). In this work we focus on the LFV decays of the three neutral MSSM Higgs bosons h, H, $A \to \tau\mu$, considering the four types of slepton mixing (δ_{23}^{LL}, δ_{23}^{LR}, δ_{23}^{RL}, δ_{23}^{RR}), and show that all the three channels could be measurable at the LHC. The most promising predictions for the present and future LHC stages are also included.

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Neutrino-hadron cross-section at high densities and ultrahigh energies

Author: Victor Gonçalves[1]

Co-author: Diego Gratieri [1]

[1] *UFPel*

Corresponding Author: diego.gratieri@gmail.com

The high parton density present at high energies and large nuclei is expected to modify the lepton-hadron cross section and the associated observables. In this paper we analyse the impact of the high density effects in the average inelasticity and the neutrino - nucleus cross section at ultra high energies. We compare the predictions associated to the linear DGLAP dynamics with those from the Color Glass Condensate formalism, which includes non-linear effects. Our results demonstrated that the non-linear effects reduce the average inelasticity and that the predictions of the distinct approaches for the neutrino - nucleus cross section at ultra-high energies are similar.

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Stochastic Neutrino Mixing Mechanism

Author: Marcelo M. Guzzo[1]

Co-authors: Eduardo Zavanin [1]; Orlando L.G. Peres [1]; Pedro C. Holanda [1]

[1] *UNICAMP*

Corresponding Author: guzzo@ifi.unicamp.br

We propose a mechanism which provides an explanation of the Gallium and antineutrino reactor anomalies. Differently from original Pontecorvo's hypothesis, this mechanism is based on the phenomenological assumption in which the admixture of neutrino mass eigenstates in the moments of neutrino creation and detection can assume different configurations around the admixture parametrized by the usual values of the mixing angles θ_{12}, θ_{23} and θ_{13}. For simplicity, we assume a Gaussian distribution for the mixing angles in such a way that the average value of this distribution is given by

the usual values of the mixing angles and the width of the Gaussian is denoted by α. We show that the proposed mechanism provides a possible explanation for very short-baseline neutrino disappearance, necessary to accommodate Gallium and antineutrino reactor anomalies, which is not allowed in usual neutrino oscillations based on Pontecorvo's original hypotheses. We also can describe high-energy oscillation experiments, like LSND, Fermi and NuTeV, assuming a weakly energy dependent width parameter, $\alpha(E)$, that nicely fits all experimental results.

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Phenomenology of MaVaN's Models in Reactor Neutrino Data

Author: Mateus Carneiro[1]

[1] *Estate University of Campinas*

Corresponding Author: mateusfcarneiro@gmail.com

Mass Varying Neutrinos mechanisms were proposed to link the neutrino mass scale with the dark energy density, addressing the coincidence problem. In some scenarios this mass can present a dependence on the baryonic density felt by neutrinos, creating an effective neutrino mass that depends both on the neutrino and baryonic densities. In this work we study the phenomenological consequence of {\it MaVaN's} scenarios in which the matter density dependence is induced by Yukawa interactions of a light neutral scalar particle which couples to neutrinos and matter. Under the assumption of one mass scale dominance, we perform an analysis of KamLAND neutrino data which depends on 4 parameters: the two {\it standard} oscillation parameters, $\Delta m^2_{0,21}$ and $tan^2\theta_{12}$, and two new coefficients which parameterize the environment dependence of neutrino mass. We introduce an Earth's crust model to compute precisely the density in each point along the neutrino trajectory. We show that this new description of density does not affect the analysis with the {\it Standard Model} case. With the MaVaN model we observe a first order effect in lower density, which lead to an improvement on the data description. The analysis allow us to place constraints on the parameters with environment dependence.

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Exploiting atmospheric neutrino data of IceCube to probe new physics in neutrino sector

Author: Arman Esmaili[1]

[1] *UNICAMP*

Atmospheric neutrino data collected by huge neutrino detectors, such as IceCube, provide the opportunity to probe new physics unprecedentedly, both due to high statistics and also to the high energy range. In this talk we discuss various new physics scenarios that can be probed by these data including: active-sterile neutrino mixing, non-standard neutrino interactions and violation of equivalence principle. We present the current constraints on new physics parameters obtained from IC-40 and IC-79 data sets and also the sensitivity prospect of the IceCube/DeepCore detector.

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First Indication of Terrestrial Matter Effects on Solar Neutrino Oscillations

Author: Michael Smy[1]

[1] *UCI*

Corresponding Author: msmy@uci.edu

We present a strong indication that the elastic scattering rate of solar ^{8}B neutrinos with electrons in the Super-Kamiokande detector is larger when the neutrinos pass through the earth during night time. We determine the day/night asymmetry to be -3.2$\pm$1.1(stat)$\pm$0.5(syst)\% which deviates from zero by 2.7σ. A non-zero Super-Kamiokande day/night asymmetry implies that the flavor oscillations of solar neutrinos are affected by the presence of matter within the neutrinos' flight path. Super-Kamiokande's day/night asymmetry is consistent with neutrino oscillations for $4 \cdot 10^{-5}\mathrm{eV}^2 \le \Delta m^2_{21} \le 8 \cdot 10^{-4}\mathrm{eV}^2$.
The recoil electron spectrum shape is consistent with no distortions due to neutrino oscillation within 0.9σ. The impact of the measurements of the average elastic scattering rate, the day/night asymmetry, and the recoil electron spectrum shape is discussed.

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The European Spallation Source Neutrino Super Beam

Authors: Elena Wildner[1]; Marcos Dracos[2]

Co-author: Tord Johan Carl Ekelof [3]

[1] *CERN*

[2] *IPHC/IN2P3-Strasbourg*

[3] *Uppsala University (SE)*

Corresponding Author: elena.wildner@cern.ch

The European Spallation Source (ESS) linac with 5 MW proton-power has the potential to become the proton driver of - in addition to the world's most intense pulsed spallation neutron source - the world's most intense neutrino beam. The physics performance of that neutrino Super Beam in conjunction with a megaton Water Cherenkov neutrino detector installed 1000 m down in a mine at a distance of 500 km from ESS will be described. In particular, the superior potential of such a neutrino experiment to discover the lepton CP violation in order to explain the matter-antimatter asymmetry in Universe and also the neutrino mass hierarchy will be discussed. In addition, the choice of such detector will extent the physics program to proton-decay, atmospheric neutrinos and astrophysics searches. The ESS proton linac, the target station optimization and the physics potential will be discussed.

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Particle Physics with the Pierre Auger Observatory: p-air cross section at $\sqrt{s} = 57$ TeV per nucleon

Author: Edivaldo Moura Santos[1]

[1] *Universidade Federal do Rio de Janeiro*

Corresponding Author: emoura@if.ufrj.br

The Pierre Auger Observatory has measured the proton-air cross section for particle production at the CM energy per nucleon of 57 TeV using the extensive air showers produced when ultra-high energy (E > 1018:5 eV) protons smash Nitrogen and Oxygen nuclei at the top of Earth's atmosphere. We describe here the details of this measurement, with special attention to the systematics affecting it. A (model
dependent) determination of the proton-proton inelastic cross section will also be presented together with a comparison with extrapolations from measurements done at LHC energies.

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Recent results from Belle

Author: Martin Sevior[1]

[1] *University of Melbourne (AU)*

After completing data taking in 2010, Belle has entered an intensive data analysis phase to complete the physics program for the experiment. This presentation will report preliminary results for the Branching Ratio and Direct CP violation for B–> pi0 pi0 together with final results for Belle's measurements of Direct and Indirect CP violation for B–> pi+ pi-. Taken together these results place additional constraints on the CP-violation parameter phi_2/alpha. This presentation will also report preliminary results for the Branching Ratio and CP violation parameters of the decay B0–> phi (K pi)0.

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Probing Dissipation and Majorana CP phase with MINOS Experiment

Author: Roberto Leandro Neves de Oliveria[1]

Co-author: Marcelo M. Guzzo [2]

[1] *Universidade Estadual de Campinas*

[2] *UNICAMP*

Corresponding Author: robertol@ifi.unicamp.br

In this work, we apply quantum dissipation to analyze the MINOS data. We perform this analysis considering neutrino and antineutrino beam and the global hypothesis where neutrinos are equivalents to antineutrinos. In the analysis, we use two different quantum dissipation models, where the first take into account only decoherence effects and second considers more general dissipative effects. In this approach, dissipative effects are described for only one parameter. However, when we consider Majorana neutrinos in the second dissipative model, there is possible to study CP Violation phase even in two neutrino families. Interesting enough, our global analysis show that considering a certain energy dependence on dissipative parameter, the CP violation phase has a non-zero value.

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Neutrinos, BBN and Nuclear Astrophysics

Author: Carlo Gustavino[1]

[1] *INFN*

Big Bang Nucleosynthesis (BBN) theory describes the formation of light isotopes such as D, 3He, 4He, 6Li and 7Li in the first minutes of cosmic time. Their abundance only depends on the baryonic density, on particle physics and on nuclear astrophysics, through the competition between the universal expansion rate and the yields of relevant nuclear reactions. As the expansion rate depends on the number of active neutrino families (and any other relativistic species), the comparison between computed and observed abundances of light isotopes allows to constrain the number of neutrinos species, provided that the knowledge of the relevant nuclear processes is accurate enough.
Starting from the present uncertainty of the relevant parameters (i.e. baryonic density [1,2], observed abundance of isotopes [3,4] and BBN nuclear cross sections [5]), it will be shown that a renewed study of several nuclear reactions, possibly with existing or proposed underground accelerator facilities [6], is essential to improve the accuracy of computed abundances of light isotopes, providing the BBN theory a powerful probe of particle physics beyond the standard model [7]. In particular, it will be shown that the accurate measurement of the D(p,gamma)3He reaction at BBN energies (50-500 keV), is of primary importance to constrain the number of active neutrinos and/or the lepton degeneracy in the neutrino sector [7,8].

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Recent Results from RENO

Author: Hyunkwan Seo[1]

[1] *Sungkyunkwan University (KR)*

Corresponding Author: hyunkwan.seo@cern.ch

Reactor Experiment for Neutrino Oscillation(RENO) started data-taking from August, 2011 and has observed the disappearance of reactor electron antineutrinos, consistent with neutrino oscillations. The experiment has made unprecedentedly accurate measurement of reactor neutrino flux, and performed a definitive measurement of the smallest neutrino mixing angle theta_13 based on the disappearance. Antineutrinos from six reactors at Yonggwang Nuclear Power Plant in Korea, are detected and compared by two identical detectors located at 294 m and 1383 m, respectively, from the reactor array center. In this talk, a new result from RENO will be presented based on the further reduction of backgrounds and several improvements in the analysis. A precise measurement of reactor neutrino flux and spectrum will be also presented in comparison with expectations.

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The CAPTAIN detector and physics program

Author: Christopher Mauger[1]

[1] *Los Alamos National Laboratory*

Corresponding Author: cmauger@lanl.gov

The Cryogenic Apparatus for Precision Tests of Argon Interactions with Neutrinos (CAPTAIN) program is designed to make measurements of scientific importance to long-baseline neutrino physics and physics topics that will be explored by large underground detectors. CAPTAIN began as part of a Los Alamos National Laboratory (LANL) Laboratory Directed Research and Development (LDRD) project and has evolved into a multi-institutional collaboration. The CAPTAIN detector is a liquid argon time-projection chamber (TPC) deployed in a portable cryostat. Five tons of liquid argon are instrumented with a 2,000 channel TPC and a photon detection system. The cryostat has ports that can hold optical windows for laser calibration and for the introduction of charged particle beams. Assembly of the detector is underway. In this talk, we discuss the status of detector commissioning the physics program for CAPTAIN. The first stage of the program involves impinging a well-characterized neutron beam on the detector to take neutron data in a liquid argon TPC for the first time. The subsequent phase includes exposures to intense neutrino beams.

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Status of the NEXT experiment

Authors: Jose Angel Hernando Morata[1]; Juan Jose Gomez Cadenas[2]

[1] *Universidade de Santiago de Compostela (ES)*

[2] *Universidad de Valencia (ES)*

Corresponding Authors: jose.angel.hernando-morata@cern.ch, juan.jose.gomez.cadenas@cern.ch

NEXT is an experimental program to search for neutrino double beta decay events using a High Pressure Gas Xenon Chamber with electroluminescence readout. The first phase of the experiment will use 100 kg of Xenon gas enriched to 91% in the 136Xe isotope. NEXT-100 is currently under construction at Canfranc Underground Laboratory (Spain). The detector is an asymmetric time projection chamber with a plane of PMTs and a tracking plane of SiPMs located after an Electro-Luminiscence grid. It boasts an excellent energy resolution, 0-5–0.7% FWHM at the Q value of the 136Xe, and event topological information to identify signal and background. The status of the project, as well as the results obtained with NEXT large EL prototypes (NEXT-DBDM and NEXT-DEMO) will be presented, as well as the prospects to extrapolate the technique to the ton scale.

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Stochastic Neutrino Mixing Mechanism

Author: Eduardo Zavanin[1]

Co-authors: Marcelo M. Guzzo [2]; Orlando L. G. Peres [3]; Pedro Holanda [4]

[1] *Unicamp*

[2] *UNICAMP*

[3] *State University at Campinas*

[4] *U*

Corresponding Author: zavanin@gmail.com

Using the phenomenological hypothesis that flavor states are not composed by a single mixing of mass states, we developed a mechanism that supports an possible explanation to the Reactor Antineutrino Anomaly and the Gallium Anomaly. Noticing a possible dependence of the free parameter demanded by the mechanism, we also identified a way to explain the appearance phenomena observed in LSDN and MINIBOONE. The poster is a discussion about the results obtained in the paper published in the Physical Review D (87(9):093003).

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Latest results of the OPERA experiment

Author: Eduardo Medinaceli[1]

[1] *Padova University & INFN*

OPERA (Oscillation Project with Emulsion-tRacking Apparatus) was built to prove muon to tau neutrino oscillations in appearance mode, through the direct observation of tau neutrinos coming from a pure muon neutrino beam produced at CERN.
OPERA is a modular hybrid detector with a high target mass, instrumented with electronic sensors to identify the interaction type and position inside the detector. Where using nuclear emulsions a sub-micrometric tracking is performed, capable to register both the
production and decay vertices of the short lived tau leptons
(10ˆ-13 s).
The experiment has been recording data since 2008, and the analysis is ongoing. The latest oscillation results of the experiment will be presented, including the leading tau neutrino channel and the sub-dominant electron neutrino channel.

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Recent results from EXO-200

Author: David Moore[1]

[1] *EXO Collaboration*

Corresponding Author: dcmoore@stanford.edu

The Enriched Xenon Observatory (EXO) is an experimental program searching for neutrinoless double beta decay using Xe-136. Observation of this lepton number violating decay would demonstrate that neutrinos are Majorana particles and allow determination of the absolute neutrino mass scale. The first stage of the experiment, EXO-200, consists of an extremely low background time projection chamber containing ˜150 kg of liquid xenon enriched to 80% Xe-136. EXO-200 has been taking data continuously since May 2011 and has previously reported the first observation of two neutrino double beta decay (2vbb) in Xe-136 as well as stringent constraints on the neutrinoless mode. We will present recent results from EXO-200, including an improved measurement of the 2vbb half-life in Xe-136, which is the most precisely measured half-life for any 2vbb decay reported to date. We will also discuss the status of nEXO, the planned multi-tonne scale successor to EXO-200.

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Measurements with electroweak gauge bosons at LHCb

Author: Marta Calvi[1]

[1] *Universita & INFN, Milano-Bicocca (IT)*

Corresponding Authors: murilo.rangel@cern.ch, marta.calvi@mib.infn.it

We report measurements of electroweak boson production in the forward region, using data collected at the LHCb experiment with a centre of mass energy of √s=7 TeV with an integrated luminosity of up to 1.0 fb–1. W and Z bosons are reconstructed in leptonic decay channels, and their cross-sections determined using data-driven techniques. All results are compared to NNLO predictions.

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Results from the ArgoNeuT Experiment

Authors: Jonathan Asaadi[1]; Mitchell Soderberg[1]

[1] *Syracuse University*

Corresponding Authors: jasaadi@fnal.gov, msoderbe@syr.edu

Liquid argon time projection chambers provide an extraordinary level of information about the interactions of neutrinos. The Argon Neutrino Teststand, or ArgoNeuT, experiment deployed a relatively small detector in the NuMI neutrino beamline at Fermilab, and the data collected during that endeavor is now being used to measure neutrino and antineutrino interaction cross-sections. This talk will include discussion of recent results and ongoing analyses from ArgoNeuT.

Working Group 2 / 39

Status and commissioning of the Karlsruhe Tritium Neutrino Experiment KATRIN

Author: Thomas Thuemmler[1]

[1] *Karlsruhe Institute of Technology*

Corresponding Author: thomas.thuemmler@kit.edu

Neutrino properties and especially the determination of the neutrino mass play an important role at the intersections of cosmology, particle physics and astroparticle physics.
The KArlsruhe TRItium Neutrino experiment (KATRIN) investigates single beta decay electrons close to their kinematic endpoint in order to determine the neutrino mass by a model-independent method.
Applying an ultra-luminous molecular windowless gaseous tritium source and an integrating high-resolution spectrometer of MAC-E filter type, KATRIN allows beta spectroscopy close to the kinematic endpoint with unprecedented precision and will reach a sensitivity of 200 meV/c2 (90% C.L.) on the neutrino mass.
This talk will give an overview about the present status and the recent progress of the major components.
Since the commissioning of the main spectrometer has been started end of 2012, the focus will be on first measurement results in combination with an angular resolving electron gun and the detector section.

Working Group 2 / 40

Sterile neutrino oscillations: the global picture

Authors: Joachim Kopp[1]; Michele Maltoni[2]; Pedro A N Machado[3]; Thomas Schwetz-Mangold[1]

[1] *Max Planck Institut für Kernphysik, Heidelberg, Germany*

[2] *IFT-UAM/CSIC*

[3] *Universidade de Sao Paulo (BR)*

Corresponding Author: accioly@fma.if.usp.br

Neutrino oscillations involving eV-scale neutrino mass states are investigated in the context of global neutrino oscillation data including short and long-baseline accelerator, reactor, and radioactive source experiments, as well as atmospheric and solar neutrinos. We consider sterile neutrino mass schemes involving one or two mass-squared differences at the eVˆ2 scale denoted by 3+1, 3+2, and 1+3+1. We discuss the hints for eV-scale neutrinos from nu_e disappearance (reactor and Gallium anomalies) and nu_mu to nu_e appearance (LSND and MiniBooNE) searches, and we present constraints on sterile neutrino mixing from nu_mu and neutral-current disappearance data. An explanation of all hints in terms of oscillations suffers from severe tension between appearance and disappearance data. The best compatibility is obtained in the 1+3+1 scheme with a p-value of 0.2% and exceedingly worse compatibilities in the 3+1 and 3+2 schemes.

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GADZOOKS!

Author: Takatomi Yano[1]

[1] *Okayama University*

GADZOOKS! is a upgrade project for Super-Kamiokande
with a new neutrino detection method using gadolinium-loaded water.
In this method, events due to anti-neutrino charged-current interactions on protons (i.e., inverse beta decay) are identified by the coincident detection of a prompt positron signal and a delayed gamma-ray signal from neutron capture on gadolinium which is dissolved in the water. By introducing this method to a large water Cherenkov detector, Super-Kamiokande, we expect to achieve the first detection of the supernova relic neutrinos.

The test facility EGADS has been conducting detailed studies on the gadolinium-loaded water since 2011.
EGADS consists of a cylindrical stainless steel tank holding 200 tons of dissolved Gd solution, two hundred forty 20-inch PMTs, and special water circulation systems for pre-treatment, filtration, and gadolinium recovery. It is designed to evaluate the impact of dissolving Gd sulfate on water transparency and detector materials. Since 2011, we have tested the performance of water circulation system. In summer 2013 we installed PMTs into the detector tank. We will start water quality testing with PMTs and detector commissioning.
The current status and plan of GADZOOKS! and the test facility EGADS will be presented.

Working Group 3 / 42

Status of SuperKEKB and Belle II

Author: Pedro Podesta Lerma[1]

[1] *Centro Invest. Estudios Avanz. IPN (MX)*

Corresponding Author: pedro.podesta@cern.ch

Belle II, a next-generation B-factory experiment, will search for new physics effects in a data sample about 50 times larger than the one collected by its predecessor, the Belle experiment. The upgraded accelerator, SuperKEKB, is designed to have the maximum luminosity
of 8 × 10ˆ35 cmˆ−2sˆ−1, a factor 40 higher than the current world record.
The status of the collider SuperKEKB and the Belle II detector is presented.

Working Group 4 / 43

Where do UHECR results lead us ?

Author: Esteban Roulet[1]

[1] *C*

Corresponding Author: roulet@cab.cnea.gov.ar

I will review the main results on UHECRs, including the observed suppression at the highest energies, the different spectral breaks observed, the inferred trends on the composition, bounds on photons and neutrinos and the different hints on anisotropies to discuss the possible astrophysical scenarios they could be suggesting and the strategies to further test them.

Working Group 4 / 44

Identification of Cosmic Rays: searches of ultra high energy neutrinos, photons and nuclear elements at the Pierre Auger Observatory

Author: Hernan Pablo Wahlberg[1]

Co-author: Collaboration Pierre Auger [2]

[1] *Universidad Nacional de La Plata (AR)*

[2] *Pierre Auger Collaboration*

The Pierre Auger Observatory is a unique instrument that combines a surface array of water cherenkov detectors and fluorescence
telescopes. Both techniques allow to search and discriminate between photons, neutrinos and nuclear elements. Recent measurements and
searches on the different species will be presented.

Working Group 2 / 45

\theta_23 and \delta can be measured accurately at the same time

Author: Hisakazu Minakata[1]

Co-authors: Pilar Coloma [2]; Stephen Parke [3]

[1] *PUC-Rio*

[2] *Virginia Tech University*

[3] *Fermi National Accelerator Lab. (US)*

In precision measurement era the uncertainty of the leptonic CP violating phase \delta will be dominated by error of \theta_23. We argue that the right strategy is to determine \theta_23 and \delta at the same time by using \nu_e appearance channels. We discuss the nature of such measurement including new degeneracy, the \theta_23 intrinsic degeneracy. A detailed simulation with a few selected setup is ongoing, and the results due WIN13 will be reported.

Working Group 2 / 46

Neutrino mass models and the LHC

Author: Raymond Volkas[1]

[1] *The University of Melbourne*

Corresponding Author: raymondv@unimelb.edu.au

After briefly reviewing current LHC bounds on the type II and III see-saw models of neutrino mass, I shall discuss a systematic approach to radiative Majorana neutrino mass models based on effective, gauge-invariant standard model operators that violate lepton number by two units. The exotic particles that occur in these models can be searched for at the LHC.

Working Group 1 / **47**

Is the 125 GeV scalar the neutrino superpartner?

Author: Carla Biggio[1]

[1] *Università di Genova, Italy*

The scalar particle recently discovered at the LHC has the same gauge quantum numbers as the neutrino, so that one can ask if they can be one the superpartner of the other. In this talk I will discuss such a possibility, discussing a model where this is realised. This model has an interesting phenomenology at the LHC.

Working Group 2 / **48**

Neutrinoless double beta decay versus lepton number violation at LHC

Author: Juan Helo[1]

[1] *USM*

Corresponding Author: juan.heloherrera@gmail.com

Lepton number violation (LNV) mediated by short range operators can manifest itself in both neutrinoless double beta decay and in processes with same sign dilepton final states at the LHC. We derive limits from existing LHC data at 8 TeV and compare the discovery potential of the forthcoming 14 TeV phase of the LHC with the sensitivity of current and future doble beta decay experiments, assuming the short-range part of the double beta decay amplitude dominates. We focus on the first of two possible topologies triggered by one fermion and two bosons in the intermediate state. In all cases, except for the pure leptoquark mechanism, the LHC will be more sensitive than double beta decay in the future. In addition, we propose to search for a charge asymmetry in the final state leptons and to use different invariant mass peaks as a possibility to discriminate the various possible mechanisms for LNV signals at the LHC.

Working Group 1 / **49**

Composite Two Higgs doublet Models

Author: Enrico Bertuzzo[1]

[1] *CEA-Saclay*

After a brief introduction on the physical motivation for Composite Higgs models, I will discuss cosets leading to Composite Two Higgs Doublet Models. I will analyze in detail the problem of tree level custodial symmetry breaking and how this problem can be solved, as well as the specific embedding for fermion fields that allow to avoid Higgs mediated Flavor Changing Neutral Currents.

Working Group 4 / 50

Determining the neutrino mass hierarchy with PINGU

Author: Alexander Kappes[1]

[1] *Humboldt University / DESY*

The determination of the neutrino mass hierarchy is among the most fundamental questions in particle physics. The recent measurement of a large mixing angle theta_13 and the first observation of atmospheric neutrino oscillations at tens of GeV with neutrino telescopes opens the intriguing new possibility to exploit matter effects in neutrino oscillation to determine the mass hierarchy in the neutrino sector. The IceCube Neutrino Observatory, located at the geographic South Pole, is currently the world's largest neutrino telescope with an instrumented volume of 1 km^3. Completed in December 2010, the detector's high energy neutrino program was augmented with the low-energy DeepCore extension that provides a neutrino energy threshold near 10 GeV and enabled first promising measurements of oscillation parameters with IceCube. Currently under consideration is a new in-fill array, the Precision IceCube Next Generation Upgrade (PINGU), that aims at further lowering this threshold to a few GeV, thereby gaining access to an energy range with high sensitivity to the neutrino mass hierarchy. In this talk I will report on the current status of PINGU and its prospects to determine the mass hierarchy.

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Raman spectroscopy for the windowless gaseous tritium source of the KATRIN experiment

Author: Simone Rupp[1]

[1] *Institute of Experimental Nuclear Physics, Karlsruhe Institute of Technology, Germany*

Corresponding Author: simone.rupp@kit.edu

Using high-precision spectroscopy of tritium beta decay electrons close to their kinematic endpoint, the KArlsruhe TRItium Neutrino experiment (KATRIN) is targeted to measure the neutrino mass in a model-independent way with a sensitivity of 200 meV/c^2 (90% C.L.).
For this purpose, ~ 10^11 electrons per second are generated in a windowless gaseous tritium source (WGTS) and adiabatically guided to the high-resolution electrostatic spectrometer and the detector for energy analysis. The key parameters of the WGTS have to be stabilized to the 0.1% level and accordingly monitored in order to reach the design sensitivity on the neutrino mass. An example for one of the various high-precision monitoring systems used in the WGTS is a laser Raman system which continuously determines the source gas composition in-line before the gas is injected into the source tube. Using a tritium test circulation loop, the capability of this system to meet the stringent KATRIN requirements were shown, and important information about fluctuations of the tritium gas composition in the WGTS were obtained in a long-term run.
This poster presents an overview of the WGTS and the Raman system in use.

Working Group 4 / 52

Antiproton constraints on Dark Matter

Author: Gaëlle Giesen[1]

Co-author: Marco Cirelli [1]

[1] *IPhT- CEA Saclay*

Corresponding Author: gaelle.giesen@cea.fr

The current antiproton data from PAMELA imposes constraints on annihilating and decaying DM which are similar to (or even slightly stronger than) the most stringent bounds coming from Fermi gamma rays, for hadronic channels and with fiducial choices for the astrophysical parameters. The implications of the most recent data by AMS-02 will be discussed. In fact, these constraints can be improved by slightly less than one order of magnitude and even able to probe the thermal relic DM in the range 30-200 GeV, for hadronic channels. I then explore the capabilities of early AMS-02, data to reconstruct the underlying DM properties in the case of a positive detection of a significant excess (attributed to DM annihilations) over the background.

Working Group 3 / 53

"Recent precision measurements in EWK physics" (from CDF)

Author: Arie Bodek[1]

[1] *University of Rochester*

We report on precision measurement of the electroweak mixing angle and an indirect measurement of the W mass extracted from the forward-backward asymmetry of e+e- and mu+mu- Drell-Yan events at CDF.

Working Group 2 / 54

Transverse Enhancement and Meson Exchange Current Contributions to Quasielastic Neutrino Scattering on Nuclear Targets

Author: Arie Bodek[1]

Co-authors: Eric Christy [2]; Howard Budd [3]; Thir Sharma [4]

[1] *University of Rochester (US)*

[2] *Hapton University*

[3] *University of Rochester*

[4] *Hampton University*

Corresponding Author: bodek@pas.rochester.edu

We use quasielastic electron scattering data on nuclear target to update our parametrization of the enhancement to the transverse response functions in nuclear targets. This enhancement has been attributed to meson exchange currents in nuclei. We parametrize both the overall magnitude of

the enhancement and the contribution to the width of the quasielastic peak. The model is in good agreement with recent measurements of MiniBooNE and MINERvA

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Latest Results from the Daya Bay Reactor Neutrino Experiment

Author: J. Pedro Ochoa-Ricoux[1]

[1] *Berkeley*

The Daya Bay Reactor Neutrino Experiment was designed to measure θ13, the smallest mixing angle in the three-neutrino mixing framework, with unprecedented precision. The experiment consists of multiple identical detectors placed underground at different baselines from three pairs of reactors, a unique configuration that minimizes systematic uncertainties and cosmogenic backgrounds. In 2012 Daya Bay made the first definitive observation of a non-zero value of θ13, a result that opened the door for a rich program of future neutrino oscillation physics. With a growing dataset that to date comprises about one million recorded neutrino interactions, Daya Bay is able to greatly improve the precision on θ13 and to perform a number of other groundbreaking measurements, such as an independent determination of the effective mass splitting in the electron antineutrino disappearance channel. The most recent results from Daya Bay will be discussed in this talk, alongside the current status and future prospects of the experiment.

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Searches for Dark Matter with radio and gamma lines

Author: Marco Taoso[1]

[1] *IPhT Saclay Paris*

Corresponding Author: marco.taoso@gmail.com

Annihilations of Dark Matter in the form of WIMPs produce photon fluxes ranging from radio wavelengths to gamma-rays. In particular, low energy emissions are associated with the interactions of the WIMPs annihilation products with the intergalactic medium.
I will present constraints on the WIMPs properties from current radio surveys and I will discuss the prospects for detection with future radio data.
I will review the status of DM searches with gamma-ray spectral features and I will investigate DM models which can naturally lead to large line signals.

Working Group 3 / 57

Recent results on CP and T Violation in B-meson decays from BaBar

Author: Martino Margoni[1]

[1] *Universita e INFN (IT)*

We present the observation of Time-reversal asymmetry as well
as a selection of recent results on CP violation effects
in B-meson decays using a data set of about 430 fb-1 collected
at the peak of the Y(4S), with the BABAR detector at SLAC.
They include the measurements of processes sensitive to the angles
of the Unitarity Triangle; studies of direct CP violation, and
measurements of mixing-induced CP asymmetries.

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Searching for Sterile Neutrinos and CP Violation: The IsoDAR and Daedalus Experiments

Author: Michael Shaevitz[1]

[1] *Columbia University*

Corresponding Author: shaevitz@nevis.columbia.edu

The IsoDAR experiment uses a novel isotope decay-at-rest (DAR) source of electron antineutrinos using protons from a 60 MeV cyclotron. Paired with KamLAND, the experiment can observe over 800 thousand inverse beta-decay events in five years and do a decisive test of the current hints for sterile neutrino. Daedalus is a phased program leading to a high-sensitivity search for CP violation. The experiment uses a set of high-intensity 800 MeV cyclotrons to produce pion DAR neutrino sources at several locations (1.5km, 8km, and 20km) going to a single ultra-large, underground detector with free protons such as Hyper-K or LENA. The Daedalus experiment will provide a high-statistics antineutrino data set with no matter effects that can be combined with long-baseline data sets to provide enhanced sensitivity to CP violation and matter effects.

Working Group 2 / 59

Neutrino physics with the SNO+ detector

Author: nasim fatemighomi[1]

[1] *Queen's University*

Corresponding Author: nasim.fatemighomi@rhul.ac.uk

SNO+ is a multi-purpose neutrino experiment in the final phase of construction at SNOLAB. It is the successor to the SNO experiment that replaces heavy water with liquid scintillator in the detector. Its main scientific goal is to search for neutrinoless double beta decay. In addition, SNO+ will detect and study low energy solar neutrinos, anti-neutrinos from nearby reactors and from the Earth's national radioactivity; SNO+ will also look for neutrinos from supernovae. SNO+ will use Te-loaded organic liquid scintillator to search for neutrinoless double beta decay. The main advantage of SNO+ is the possibility of loading large quantities of double beta decay isotope in the detector, achieving very good sensitivity. This talk will present the physics goals and current status of the project.

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Will the neutrino mass hierarchy be determined at future oscillation experiments?

Author: Pilar Coloma[1]

Co-authors: Mattias Blennow [2]; Patrick Huber [3]; Thomas Schwetz-Mangold [4]

[1] *Virginia Tech University*

[2] *Royal Institute of Technology*

[3] *Virginia Tech*

[4] *Max-Planck-Gesellschaft (DE)*

Corresponding Author: pcoloma@vt.edu

With the large value of θ_{13} recently discovered, the measurement of the neutrino mass ordering (hierarchy) may be accesible at non-beam experiments. Moreover, the present generation of long baseline experiments is expected to see at least a hint for this parameter, while phase I of the LBNE project is expected to obtain a significance between 3 and 5σ. However, the neutrino mass hierarchy is a discrete parameter and therefore it is not clear if the confidence of the measurement coincides with the gaussian case. We explore this problem and pay special attention to the interplay between the mass hierarchy and the value of the CP-violating phase δ, rather relevant for long baseline experiments.

Plenary Session / 61

Cosmological parameters from the Planck satellite

Author: Silvia Galli[None]

Corresponding Author: gallis@iap.fr

The universe as pictured by the recent data release of the Planck satellite is remarkably "simple", well described by a LCDM model. However, few anomalies are present in the data, that might hint towards interesting developments.
I will present the constraints on cosmological parameters as obtained from the recent data release of the Planck collaboration, focusing on the most interesting results.

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Search for the Higgs boson in VH(bb) and in the tau tau channel using the ATLAS detector

Author: Garoe Gonzalez Parra[1]

[1] *IFAE - Barcelona (ES)*

Corresponding Author: garoe.gonzalez.parra@cern.ch

Since the discovery of a Higgs-like boson by the ATLAS and CMS experiments at the LHC, the emphasis has shifted towards measurements of its properties and the search for the search in the less sensitive channels in order to determine whether the new particle is the Standard Model (SM) Higgs boson. Of particular importance is the direct observation of the coupling of the Higgs boson to b-quarks, the top-quark and leptons. In this presentation a comprehensive review of ATLAS results in the search for the Higgs boson in b-quark pair decay channel and in the VH and ttH will be given. A comprehensive review of ATLAS results in the search for the Higgs boson in the tau-tau decay channel and in various production modes will be also given.

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Measurements of the Higgs Boson Main Coupling Properties using the ATLAS Detector

Author: Stefan Gadatsch[1]

[1] *NIKHEF (NL)*

Corresponding Author: stefan.gadatsch@cern.ch

The combined measurements of the coupling properties of the recently discovered Higgs boson using the ATLAS detector and up to 25 fb-1 of 7 TeV and 8 TeV pp collision data collected in 2011 and 2012 are presented.

Working Group 1 / 64

Probing the spin and parity of the Higgs Boson with the ATLAS Detector

Author: Manuela Venturi[1]

[1] *Albert-Ludwigs-Universitaet Freiburg (DE)*

Corresponding Author: manuela.venturi@cern.ch

The spin and parity of the recently discovered Higgs boson using the ATLAS detector and up to 25 fb-1 of 7 TeV and 8 TeV pp collision data collected in 2011 and 2012, was probed in the diboson ($\gamma\gamma$, WW and ZZ) channels. These results and their combinations are presented.

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Beyond-the-Standard Model Higgs Physics using the ATLAS Experiment

Author: Pamela Ferrari[1]

[1] *NIKHEF (NL)*

Corresponding Author: pamela.ferrari@cern.ch

The discovery of a Higgs-like boson with a mass of about 125 GeV has prompted the question of whether or not this particle is part of a much larger and more complex Higgs sector than that envisioned in the Standard Model. In this talk, searches for the charged Higgs and additional Higgs bosons in the MSSM and the NMSSM are presented.

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Search for high mass Beyond-the-Standard-Model Higgs bosons using the ATLAS Experiment

Author: Pamela Ferrari[1]

[1] *NIKHEF (NL)*

Corresponding Author: pamela.ferrari@cern.ch

The discovery of a Higgs-like boson with a mass of about 125 GeV has prompted the question of whether or not this particle is part of a much larger and more complex Higgs sector than that envisioned in the Standard Model. In this talk, the searches for additional Higgs bosons at high mass in the WW and ZZ and interpretations in 2HDM models are presented.

Working Group 1 / 67

Measurement of multi-boson production and limits on anomalous gauge boson couplings

Author: Stephen Grahame Cole[1]

[1] *Northern Illinois University (US)*

Corresponding Author: stephen.cole@cern.ch

ATLAS measurements of multi-boson production involving combinations of
W, Z and isolated photons are summarized. Measurements using data at 7 TeV as well as new results using data at 8 TeV are presented. The measurements are performed using leptonic
decay modes, including the invisible decay Z–> nunu, as well as semileptonic channels.
Differential and total visible cross sections are presented and are used to place constraints on anomalous gauge boson couplings.
An overview of these results is given.

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Phenomenology of MaVaN's Models in Reactor and Solar Neutrino Data

Author: Pedro Holanda[1]

Co-author: Mateus Carneiro [2]

[1] *U*

[2] *Estate University of Campinas*

Corresponding Author: holanda@ifi.unicamp.br

Mass Varying Neutrinos (MaVaN's) mechanisms were proposed to link the neutrino mass scale with the dark energy density, addressing the coincidence problem. In some scenarios this mass can present a dependence on the baryonic density felt by neutrinos, creating an effective neutrino mass that depends both on the neutrino and baryonic densities. In this work we study the phenomenological consequence of MaVaN's scenarios in which the matter density dependence is induced by Yukawa interactions of a light neutral scalar particle which couples to neutrinos and matter. Under the assumption of one mass scale dominance, we perform an analysis of KamLAND neutrino data which depends on 4 parameters: the two standard oscillation parameters, $\Delta m^2_{0,21}$ and $tan^2\theta_{12}$, and two new coefficients which parameterize the environment dependence of neutrino mass. We found a region in parameter space where the effect is of first order compared with the usual mass-induced oscillation. We analyse this new region in the light of solar neutrino data.

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Constraining Active and Sterile Neutrino Masses and Mixing from Mass Observables

Author: Alexander Quiroga[1]

Co-authors: Fabio Pereira dos Santos [2]; Hiroshi Nunokawa [3]

[1] *PUC-Rio*

[2] *AHEP-Universitat de Valencia*

[3] *Pontificia Universidade Catolica do Rio de Janeiro*

Corresponding Author: alarquis@fis.puc-rio.br

We assume that in the near future, the positive results of three mass observables, namely, non-zero value of sum of neutrino masses from cosmological data, efective masses from neutrinoless double beta decay, and tritium beta decay experiments, will be obtained. We further assume that these results are in conflict with the standard three flavor neutrino framework which implies the presence of sterile neutrino. Then we study to which extent one can constrain sterile neutrino mass and mixing as well as the absolute mass scale of active neutrinos only from these three mass observables without using oscillation data.

Working Group 3 / 70

B-physics: status, and outlook after LS1 and LS2

Author: Diego Guadagnoli[1]

[1] *LAPTh Annecy*

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

I present an overview of the (major) progress recently made by experiment on various Bd- and Bs-meson decays, long awaited by theory.

I also provide an outlook after LHC's LS1 and LS2 of the perspectives on these decays, as well as on novel related observables that will become accessible.

Working Group 2 / 71

Measurement of muon neutrino disappearance with the completed IceCube detector

Author: Juan-Pablo Yanez[1]

[1] *DESY*

Corresponding Author: yanezjua@ifh.de

We present preliminary results on neutrino oscillations with the first year of data of the completed IceCube detector. IceCube is a cubic kilometer ice Cherenkov high-energy neutrino detector. DeepCore, a region of denser instrumentation in the lower center of IceCube, permits the detection of atmospheric neutrinos with energies as low as 10 GeV.

The disappearance pattern of muon neutrinos was measured by analyzing the shape of their 2-dimensional energy-zenith angle distribution. The study benefits from the development of tools to recover the direction of the muon and total visible energy of the neutrino, allowing reliable reconstruction of events at the detector's threshold. The main background is atmospheric muons, which are removed using the IceCube strings of detectors that surround the DeepCore sub-array as a veto. A sample of high-quality neutrino events that start within DeepCore is selected, with the aim of diminishing the impact of uncertainties in the ice properties and other detection effects. In 343 days of data, we find 1487 neutrino events. This corresponds to a deficit of about 800 events compared to the non-oscillation expectation. In the two flavor approximation, the resulting oscillation parameters are $\sin^2(2\theta_{23}) = 1(> 0.93)$ and $|\Delta m^2_{32}| = 2.4 \pm 0.4 \cdot 10 - 3$ eV^2. Future steps and projections are also discussed.

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Lepton Flavour Violation after the LHC searches.

Author: Oscar M. Vives[1]

[1] *IFIC and U: Valencia*

Corresponding Author: oscar.vives@uv.es

We review the role of LFV experiments in the search of new physics after the first LHC results. We highlight the importance of charged lepton flavour violation to look for new physics and improve our understanding on the physics of flavour. New sources of LFV are generally present in new physics beyond the Standard Model and because of the high sensitivity of LFV processes, LFV experiments remain complementary to direct searches at the LHC.

Working Group 2 / 73

Neutrino mixing in a model with a discrete A4 flavor symmetry after Daya Bay result

Author: David Vanegas Forero[1]

Co-authors: Jorge Romao [1]; Jose Valle [2]; Stefano Morisi [3]

[1] *Instituto Superior Técnico de Lisboa*

[2] *AHEP Group, Institut de Física Corpuscular C.S.I.C./Universitat de Valencia*

[3] *Institut fur Theoretische Physik und Astrophysik, Universitat Wurzburg*

Corresponding Author: david.vanegas@ist.utl.pt

The measurement of the non-zero reactor mixing angle has established a new challenge for the theoretical understanding of the lepton mixing. The use of discrete symmetries to successfully explain that mixing is still possible. As an example, we have modified the so called Babu-Ma-Valle model in such a way that we account for the current
neutrino mixing values at 3 sigma. In particular, we have obtained not only compatibility with non zero reactor mixing angle, but also a non-maximal atmospheric mixing angle.

Working Group 4 / 74

Leptogenesis: status, recent ideas and perspectives

Author: Jean Racker[1]

[1] *IFIC*

Corresponding Author: juandiego.racker@gmail.com

Leptogenesis from the decay of very heavy neutrinos (M > 10ˆ8 GeV) is arguably the most attractive explanation to the origin of the cosmological baryon asymmetry. However this scenario cannot be proved in foreseeable experiments. Therefore we will give an overview of leptogenesis with emphasis on testability vs. plausibility of different models. In connection with this, we will present some results on mass bounds for thermal baryogenesis from particle decays.

Working Group 2 / 75

Minimal lepton flavour structures lead to non-maximal 2-3 mixing

Author: Michele Frigerio[1]

[1] *Laboratoire Charles Coulomb*

Corresponding Author: michele.frigerio@um2.fr

Lepton flavour observables provide precise pieces of information about physics beyond the Standard Model.
I will briefly review our present knowledge of lepton masses and mixing angles,
and investigate to what extent we can explain the data in terms of an underlying flavour symmetry.
I will show that viable flavour models exist, that are sufficiently minimal to provide sharp predictions for future observables.

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Pseudo Nambu-Goldstone bosons as dark matter candidates

Author: Michele Frigerio[1]

[1] *Laboratoire Charles Coulomb*

Corresponding Author: michele.frigerio@um2.fr

I will argue that, besides the axion, there are other pseudo Nambu-Goldstone bosons that are suitable candidates for the dark matter.
Their mass and interactions can be connected to the electroweak scale, and in this case the dark matter properties
are interlaced with the properties of the Higgs boson.
In particular, I will discuss the possibility that both the Higgs and the dark matter are composite states,
showing how compositeness modifies the usual WIMP phenomenology.

Plenary Session / 77

Higgs at the LHC

Author: Petra Van Mulders[1]

[1] *Vrije Universiteit Brussel (BE)*

A review of Higgs at the LHC.

Working Group 1 / 78

Scalar Couplings Measurements of the 126 resonance at CMS

Author: Stefano Casasso[1]

[1] *Universita e INFN (IT)*

The measurements of the couplings of the 126 GeV resonance performed by CMS are presented, together with the perspectives at the LHC and future colliders.

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Spin-parity measurements of the 126 resonance at CMS

Author: Kalanand Mishra[1]

[1] *Fermi National Accelerator Lab. (US)*

The spin and parity measurements of the 126 GeV resonance performed by CMS are presented, together with the future perspectives at the LHC and future colliders.

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Search for additional higgs-like resonances with heavy masses at CMS

Author: Daniel Dominguez Vazquez[1]

[1] *Centro de Investigaciones Energ. Medioambientales y Tecn. - (ES*

Searches for additional Higgs-like resonances, besides the 126 GeV, performed by CMS are presented, together with the perspectives at the LHC and future colliders.

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Searches for BSM Higgs signatures at CMS

Author: Gianni Masetti[1]

[1] *Universita e INFN Bologna (IT)*

Searches for signatures of beyond-the-standard-model higgs-like processes (eg charged higgs, double Higgs, A->Zh, ttbar, mumu), performed by CMS are presented, together with the perspectives at the LHC and future colliders.

Working Group 1 / **82**

Multiboson production and searches for anomalous gauge couplings at CMS

Author: Lindsey Gray[1]

[1] *Fermi National Accelerator Lab. (US)*

Corresponding Author: qiang.li@cern.ch

We present studies of multiple boson production in pp collisions at 7 TeV and 8 TeV center-of-mass energy based on data recorded by the CMS detector at the LHC in 2011 and 2012. These include precision cross section measurements and investigation of kinematic distributions. The results are interpreted in terms of constraints on anomalous triple and quartic gauge couplings, together with future prospects for the LHC and future colliders

Working Group 1 / **83**

A Complete Model of Dirac Gauginos: Dynamics & Operator Analysis

Author: Yuri Shirman[1]

[1] *University of California, Irvine*

Corresponding Author: yshirman@uci.edu

After I presenting an analysis of the operators in supersoft SUSY breaking, I will discuss the requirements that must be satisfied by successful UV completions and the modifications of minimal supersoft mechanism needed to avoid negative mass squareds for adjoint scalars.
I will then present a complete model of dynamical supersymmetry breaking resulting in realistic superpartner spectrum with Dirac gaugino masses. I will conclude with a brief discussion of naturalness in this class of models.

Working Group 3 / **84**

A glance Beyond the Standard Model: the MEG experiment

Author: Simeone Dussoni[1]

[1] *INFN Pisa*

Corresponding Author: dussoni@pi.infn.it

The MEG experiment has been searching for the SM-supressed decay mu->e gamma with unprecedented sensitivity and recently improved down to 5.7*10-13 the upper limit on the branching ratio of the mu->e gamma decay. This can help in putting severe constraints on proposed SM extensions. Aiming to further improve this limit we are planning an upgrade to reach a sensitivity of* 510**-14.

Working Group 4 / 85

Recent Results and Prospects from CDMS

Author: Ben Loer[1]

[1] *Fermilab*

Corresponding Author: bloer@fnal.gov

The Cryogenic Dark Matter Search experiment employs ultra-cold germanium and silicon crystals to search for interactions with Weakly Interacting Massive Particles, and has recently published an analysis of data from silicon detectors that found three events that could be interpreted as arising from a low-mass WIMP. I will present an overview of semiconductor WIMP searches, with emphasis on the CDMS detector technology and analysis approach and provide details on the recent silicon analysis. I will also describe the updated SuperCDMS detectors, with greatly increased background rejection capabilities, and outline the upcoming SNOLAB phase of the experiment. I will conclude with a discussion of the predicted sensitivity of SuperCDMS and some other upcoming experiments to probe both the low-mass silicon region of interest and more conventional WIMP masses.

Working Group 2 / 86

The simulation of the Angra Neutrino Detector

Authors: Joao Anjos[1]; Pietro Chimenti[2]

[1] *Centro Brasileiro de Pesquisas Fisicas*

[2] *UFABC*

Corresponding Authors: janjos@cbpf.br, pietro.chimenti@ufabc.edu.br

We present the status of the simulation of the Angra Neutrino Project.
The project aims at measuring neutrinos from the Angra power plant.
The detector is being built at CBPF and will be installed in Angra later this year.
After a short review of the motivation, design and construction of the apparatus, the simulation is discussed.
The foreseen rates of the neutrino signal and of the major background components are presented together with the expected overall signal over noise rate.

Working Group 4 / 87

Dark matter searches with a focus on new techniques (Mono-X)

Author: James Douglas Pearce[1]

[1] *University of Victoria (CA)*

Corresponding Author: james.douglas.pearce@cern.ch

The quest to understand the nature of Dark Matter has never been so exciting. Vast improvements in direct detection sensitivity combined with tantalizing hints from astrophysical data have lead some to dub the 2010's as the "Dark Matter Decade". Today collider based experiments, such as ATLAS and CMS, offer a new vantage point in the search for non-gravitational dark matter interactions. If Dark Matter interacts weakly with the Standard Model it can be produced at the LHC and identified via the initial state radiation (ISR) of the incoming partons. The signature left in the detector is that of the ISR particle (jet, photon, Z or W) recoiling off of the invisible Dark Matter particles, which is manifest as a large momentum imbalance. Such collider based searches can be interpreted in terms of a higher dimensional effective field theory to place limits in the same parameter space as the direct detection and space-based experiments.

Working Group 3 / 88

K and D decays as probes of new physics

Author: Joachim Brod[1]

[1] *University of Cincinnati*

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

K and D decays provide important observables which allow for indirect searches for new particles. In this talk, I will review the status of the standard-model predictions and discuss new-physics contributions with a focus on rare decays and CP violation.

Working Group 2 / 89

Recent results from the ICARUS experiment

Author: Jan Kisiel[1]

[1] *University of Silesia, Katowice, Poland*

Corresponding Author: jan.kisiel@us.edu.pl

ICARUS-T600 is the first large-scale realization of the Liquid Argon Time Projection Chamber detection technology for neutrino physics and nucleon decay searches. It has been running in the underground Gran Sasso laboratory for three years (from May 2010 to June 2013) detecting both neutrinos from the CNGS beam and cosmics. The results obtained so far will be presented with special emphasis on: (1) the tests of possible existence of sterile neutrinos through the search for numu->nue oscillations in the CNGS beam with enlarged statistics, and (2) reconstruction performances of ICARUS-T600 including recent results on muon momentum measurement through Multiple Coulomb Scattering.

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Kinematical test of large extra dimension in KATRIN

Authors: Arman Esmaili Taklimi[None]; Orlando L. G. Peres[1]; Victor Basto-Gonzalez[2]

[1] *State University at Campinas*

[2] *IFGW-UNICAMP*

Corresponding Author: vsbasto@gmail.com

We consider a model with large extra dimensions where 3 right-hand neutrino can propagate in more than four dimensions, this full space-time is called bulk. These neutrinos have Yukawa couplings to the 3 active neutrinos in the 4-dimensional subspace, called brane. The role of large extra dimensions is provide a small Dirac neutrino mass. This mass is test in the forthcoming experiment

KATRIN, a experiment to measurement kinematically the neutrino mass using beta decay. The Kurie function of beta decay receives contributions of the Kaluza-Klein tower of neutrinos in large extra dimensions. We show that KATRIN can probe the compactification radius of extra dimensions down to 0.2 μm which is better, at least by a factor of two, than the upper limits from neutrino oscillation experiments.

Working Group 3 / 91

Top as a probe for New Physics

Author: Aurore Savoy Navarro[1]

[1] *Sezione di Pisa (IT) and CNRS/IN2P3*

Corresponding Author: aurore.savoy.navarro@cern.ch

As the heaviest particle of the Standard Model, the top has the largest coupling to the Higgs and is expected to play a special role in the theory of the electroweak breaking. For instance, the forward-backward asymmetry in t-tbar events recently observed at the Tevatron might be a signal of New Physics. A review of the many ways to look for New Physics through high precision measurements of top quark properties and BSM searches in events with top quarks performed at the hadron colliders is presented in this talk with the most recent results from the Tevatron and LHC

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Measurement of background at the Angra Neutrino laboratory

Author: Thamys Abrahão[1]

Co-author: João dos Anjos [2]

[1] *PUC-Rio*

[2] *CBPF*

Corresponding Author: thamys.abrahao@fis.puc-rio.br

The Angra II nuclear reactor, which has the 4 GW of thermal power, is located in the Angra dos Reis nuclear power plant in the State of Rio de Janeiro in Brazil. The large fission rate of $\sim 10^{20}$ per second produces about 5000 antineutrino interactions per day in a water Cherenkov detector with only 1 m^3 of fiducial volume at
the distance of 25 m from the reactor core. As the flux of antineutrinos is proportional to the thermal power delivered by the reactor, by measuring the interaction rate of antineutrinos in the detector, we expect to be able to monitor the thermal power generated by the reactor in quasi-real time as well as the time evolution of the composition of the nuclear fuel. However, in order to observe antineutrinos coming from the reactor, we have to veto muons, one of the most important background components, gamma rays and understant the noise produced by eletronic used in data acquisition.
Moreover, energetic muons can produce neutrons through the process of spallation that can mimic the neutrons generated by the neutrino interaction, increasing the background. In this work we have performed the measurement of the muon flux at sea level as these data are very
important to estimate the background level in the antineutrino detector and studied how to eliminate the noise on PMTs that will be used inside the detector.

Working Group 3 / 94

Unitarity Triangle Analysis within and beyond the SM

Author: Denis Derkach[1]

[1] *University of Oxford (GB)*

Corresponding Author: denis.derkach@cern.ch

We present the summer 2013 update of the Unitarity Triangle (UT) analysis performed by the UTfit Collaboration within the Standard Model (SM) and beyond. We include as input for our analysis all the measurements available by August 2013. We also present the generalisation of the UT analysis to investigate new physics (NP) effects, updating the constraints on NP contributions to DeltaF = 2 processes. Finally, based on the NP constraints, we derive upper bounds on the coefficients of the most general DeltaF = 2 effective Hamiltonian. These upper bounds can be translated into lower bounds on the scale of NP that contributes to these low-energy effective interactions.

Plenary Session / 95

The Alpha Magnetic Spectrometer on the International Space Statio5

Author: Sylvie Rosier[1]

[1] *Centre National de la Recherche Scientifique (FR)*

The AMS-02 detector is a wide acceptance high-energy physics experiment operating since May 2011 onboard of the International Space Station. It consists of six complementary sub-detectors providing measurement on the energy, the mass and the charge leading to an unambiguous identification of the cosmic rays. To date, 40 billion cosmic ray events have been collected. Performance of AMS in space will be overviewed as well as the first results based on data collected during the first two years of operations in space. Preliminary results on Proton, Helium fluxes and Boron-to-Carbon fluxes ratio will be presented. More details will be given on the published results on the positron fraction, individual fluxes of cosmic-ray electrons-positrons and positron anisotropy measurements.

Working Group 4 / 96

Status of GeV-TeV charged CR propagation models and observational results

Author: PIERRE SALATI[1]

[1] *LAPTh & Université de Savoie*

The discovery in 2008 of a cosmic ray (CR) lepton anomaly has raised the tremendous hope that WIMPs were not just a fantasy. The astronomical dark matter is believed to be made of these weakly interacting and massive species whose annihilations would produce an excess of positrons in the cosmic radiation. Alas, the dust has now settled down. Local pulsars are suggested as the probable explanation for the positron excess. Modeling correctly the propagation of galactic cosmic rays in the GeV-TeV range has proved to be crucial in the quest for the dark matter and is also an interesting question per se. I will discuss the status of the models and review the observations on which our description is based. I will pay particular attention to the astrophysical backgrounds inside which the putative dark matter signals could be hidden. I will finally explain why our current description of cosmic ray propagation – on which public codes like GALPROP, DRAGON or USINE are built – needs to be revisited in order to incorporate the Myriad approach. I will apply it to understand the fluxes of primary CR nuclei in the TeV range. As a concluding remark, I will discuss the proton and helium anomalies observed by PAMELA and CREAM as well as the recent AMS02 observations.

Working Group 2 / 97

Survey of Recent Measurements of Neutrino Nucleus Cross Sections including Nuclear Effects

Author: Jorge Morfin[1]

[1] *FNAL*

The interplay of neutrino cross sections on nucleons within a nucleus and the nuclear effects starting with the initial interaction followed by final state interactions are difficult to separate. A survey of recent neutrino nucleus experimental results and models attempting to perform this separation will be presented.

Working Group 4 / 98

Search for fundamental physics with HESS and CTA

Author: Christian Farnier[1]

[1] *Oskar Klein Centre, Stockholm University*

Corresponding Author: christian.farnier@fysik.su.se

The H.E.S.S. experiment of imaging atmospheric Cherenkov telescopes (IACT) operational since 2004, has discovered many new sources of cosmic-ray acceleration and searched for fundamental physics. In September 2012, a fifth and larger telescope was inaugurated, lowering the energy threshold and starting the second phase of the experiment. In the coming years, the Cherenkov Telescope Array (CTA) will be the first high energy gamma-ray observatory. Consisting of two arrays of several dozens of telescopes of different sizes, it aims at increasing the sensitivity of current experiments by one order of magnitude and enlarge the energy window from around 10 GeV to 100 TeV. In this presentation, I will discussed some results and prospects of these two experiments in the search of new physics.

Working Group 3 / 99

Beyond-SM searches in B -> D(*) tau nu and rare decays at BaBar

Author: Denis Derkach[1]

[1] *University of Oxford (GB)*

Corresponding Author: denis.derkach@cern.ch

We present the measurement of the B -> D(*) tau nu decay,
which is sensitive at tree level to New Physics in the form
of a charged Higgs boson.
The measured branching fraction is 3.4 sigma larger than
the SM predictions, and excludes the 2HDM of type 2 at
99.88% confidence for all tan(beta)/mHiggs values.
Additional studies of the momentum transferred to the
lepton system show that the result can be accommodated
by more general two-Higgs-Doublet models.

Searches for rare decays sensitive to New Physics, as
radiative and electroweak penguin decays are also reported.

Working Group 1 / 100

Linking Natural Supersymmetry to Flavour Physics

Author: Gero Gersdorff[1]

Co-authors: Emilian Dudas [2]; Robert Ziegler [3]; Stefan Pokorski [4]

[1] *ICTP-SAIFR*

[2] *Ecole Polytechnique*

[3] *TUM*

[4] *University of Warsaw*

Corresponding Author: gersdorff@gmail.com

With the aim of linking natural supersymmetry to flavour physics, a model is proposed based on a family symmetry G × U(1), where G is a discrete nonabelian subgroup of SU(2), with both F-term and (abelian) D-term supersymmetry breaking. A good fit to the fermion masses and mixing is obtained with the same U(1) charges for the left- and right- handed quarks of the first two families and the right-handed bottom quark, and with zero charge for the left-handed top-bottom doublet and the the right handed top. The model shows an interesting indirect correlation between the correct prediction for the Vub/Vcb ratio and large right-handed rotations in the (s, b) sector, required to diagonalise the Yukawa matrix. For the squarks, one obtains almost degenerate first two generations. The main source of the FCNC and CP violation effects is the splitting between the first two families and the right-handed sbottom determined by the relative size of F-term and D-term supersymmetry breaking. The presence of the large right-handed rotation implies that the bounds on the masses of the first two families of squarks and the right handed sbottom are in a few to a few tens TeV range. The picture that emerges is light stops and left handed sbottom and much heavier other squarks.

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Radiatively Induced Neutrino Masses and Mixings with Dark Matter

Authors: Jose M. No[1]; Maximiliano A. Rivera[2]; Michael Gustafsson[3]

[1] *Department of Physics and Astronomy, University of Sussex, BN1 9QH Brighton, United Kingdom*

[2] *Departamento de Física, Universidad Técnica Federico Santa María, Casilla 110-V, Valparaiso, Chile*

[3] *Service de Physique Théorique, Université Libre de Bruxelles, B-1050 Bruxelles, Belgium*

Corresponding Author: max.rivera@gmail.com

We present an extension of the standard model that naturally generate small neutrino masses and provide a dark matter candidate. The dark matter particle is part of a new scalar doublet field that plays a crucial role in radiatively generating neutrino masses. The symmetry that stabilizes the dark matter also suppresses neutrino masses to appear first at three-loop level. Without the need of right-handed neutrinos or other very heavy new fields, this offers an attractive explanation of the hierarchy between the electroweak and neutrino mass scales. The model has distinct verifiable predictions for the neutrino masses, flavor mixing angles, neutrinoless double beta decay, colliders and dark matter signals.

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An 3HDM with S_3 symmetry, dark matter and two inert doublets without FCNC

Authors: Ana Machado[1]; Vicente Pleitez[2]

[1] *UFABC*

[2] *IFT-UNESP*

Corresponding Author: a.c.b.machado1@gmail.com

We propose a new mechanism to suppress the flavor changing neutral currents in a three-Higgs doublet extension of the standard electroweak model. This mechanism has three ingredients: i) The three SU(2) Higgs scalar doublets transform as the reducible representation triplet of the discrete S3 symmetry that breaks to the irreducible representations, a doublet and a singlet; ii) an appropriate vacuum alignment and, iii) fermions transform as singlets of S3. The mass matrices in both, neutral and charged scalar sectors, have the same form and are diagonalized by the same unitary matrix. In some cases the latter matrix is of the tribimaximal type. However, the natural suppression of the flavor changing neutral processes does not depend on the form of this matrix.
We also consider in these model that due to the new charged scalars there is an enhancement in the two-photon decay while the other channels have the same decay widths that the SM neutral Higgs. Finally, considering the introduction of right-handed neutrinos we can have good dark matter candidates.

Working Group 4 / 105

The ANDES project and its impact on neutrino physics

Authors: Hiroshi Nunokawa[1]; osvaldo civitarese[2]

[1] *Pontificia Universidade Catolica do Rio de Janeiro*

[2] *U*

Corresponding Authors: osvaldo.civitarese@fisica.unlp.edu.ar, nunokawa@fis.puc-rio.br

The ANDES project aims at the construction of an underground laboratory in the Agua Negra tunnel between Argentina and Chile. The laboratory will consists of a series of halls, each of them able to accommodate state of the art experimental arrays dedicated to dark matter, double beta decay and neutrino oscillation measurements, as well as to other devices oriented to geological and biological searches. The place will enjoy the shielding of 4500 to 4800 mwe. In the first part of the talk I will address some technical issues related to the design of ANDES and about the CLES, which is the academic and administrative organization which will run the lab. Then, as an example of the physics of ANDES, I shall talk on the neutrino mass problem and relate it with recent experimental and theoretical results.

Working Group 2 / 106

Status of the CUORE and CUORE-0 experiments at Gran Sasso

Author: Sergio Di Domizio[1]

[1] *INFN and Universita' di Genova*

CUORE is a 741 kg array of TeO_2 bolometers for the search of neurinoless double beta decay in Te-130.
The detector is being constructed at the Laboratori Nazionali del Gran Sasso, Italy, where it will start taking data in 2014.
If the target background of 0.01 counts/(keV kg y) will be reached, in five years of data taking CUORE will have an half life sensitivity of about 10^{26} y.
CUORE-0 is a smaller experiment constructed to test and demonstrate the performances expected for CUORE.
The detector is a single tower of 52 CUORE-like bolometers that started taking data in spring 2013.
The status and perspectives of CUORE will be discussed, and the first CUORE-0 data will be presented.

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The XENON project: status and prospects

Author: Marco Selvi[1]

[1] *INFN*

Corresponding Author: selvi@bo.infn.it

Astronomical and cosmological observations indicate that a large amount of the energy content of the Universe is made of dark matter. Particle candidates under the generic name of Weakly Interacting Massive Particles (WIMPs) arise naturally in many theories beyond the Standard Model of particle physics, such as supersymmetry, universal extra dimensions, or little Higgs models.
The search for these particles continues with a variety of experimental approaches. In direct detection experiments, one attempts to observe the nuclear recoils (NRs) produced by WIMP scattering off nucleons. The recoil spectrum falls exponentially with energy and extends to a few tens of keV only.
In recent years, liquid xenon (LXe) particle detectors have achieved a large increase in target mass and a simultaneous reduction in backgrounds and are now among the leading technologies in the search for dark matter WIMPs.
The XENON project used a stage approach, with detectors of increasing mass and sensitivity.
The current detector, XENON100, in operation at LNGS is the most sensitive experiment for Dark Matter search in the world; with an active mass of 66 kg we obtained an exclusion limit of 2 x 10-45 cm2 at 50 GeV. The future project, XENON1T, with a x10 fiducial mass and a 100 times lower background, will be sensitive to WIMPs with cross section 2 x 10-47 cm2.
In the talk I'll present the recent measurement of XENON100, the current operation of the detector and the status of the construction of XENON1T together with its aimed background reduction and sensitivity reach.

Working Group 4 / 110

The LUX Dark Matter experiment

Author: Markus Horn[1]

[1] *Yale University*

Corresponding Author: markus.horn@yale.edu

The LUX (Large Underground Xenon) experiment aims at the direct detection of dark matter particles via their collisions with xenon nuclei. The 350 kg two-phase liquid xenon time projection chamber measures simultaneously the scintillation and ionization from interactions in the target. The ratio of these two signals provides very good discrimination between potential nuclear recoil signals and electronic recoils to set limits on WIMP-nucleus scattering cross sections. The detector has been operating since early 2013 at the Sanford Underground Research Facility (SURF) in South Dakota at 4850ft underground. An overview of the detector, including the xenon handling and water tank systems will be presented, along with an update on the status of the experiment and upcoming first results.

Working Group 3 / 114

Measurements of vector bosons and vector bosons plus jet production with the ATLAS detector

Author: Jane Theresa Cummings[1]

[1] *Yale University (US)*

Corresponding Author: jane.theresa.cummings@cern.ch

Neutral and charged current Drell-Yan processes at the LHC provide unique tool to study various QCD and EW effects. Measurements differential in invariant mass of the lepton pair and lepton or pair rapidity are sensitive to the parton density functions. Measurements of the transverse momentum of the Z boson study QCD radiation effects. Lepton forward-backward asymmetry in the NC process provides a measure of the weak mixing angle. The production of jets in association with a W or Z boson in proton-proton collisions at 7 TeV study multi-leg QCD diagrams and probe electroweak production via vector-boson fusion mechanism. Measurements of vectors bosons in association with heavy flavor, such as W+c and W+b production, have unique sensitivity to the heavy quark density of the proton. Differential cross sections are presented and compared to QCD predictions at NLO and NNLO.

Working Group 4 / 116

Dark Matter: room for new ideas?

Author: Laura Lopez Honorez[1]

[1] *V*

Corresponding Author: llopezho@vub.ac.be

Dark matter candidates are getting surrounded by direct, indirect detection searches and collider experiments. As of today, none of these experiments have obtained an indisputable proof of the existence of the dark matter particle and they are dreadfully digging into their viable parameter space. One could thus ask if there is still room for new ideas in the dark matter sector.
There has been interest recently on particle physics models that may give rise to sharp gamma ray spectral features from dark matter annihilation. Dark matter being supposedly electrically neutral, it is usually challenging to build WIMP models that may accommodate both a large cross section into gamma rays at, say, the Galactic center, and the right dark matter abundance. In my talk, I will discuss the case of scalar dark matter models actually giving rise to a significant bremsstrahlung emission and I will confront this scenario to the familiar case of a Majorana dark matter. I will show that the scalar dark matter case the virtual internal bremsstrahlung signal may be enhanced by a

factor of (up to) two orders of magnitude compared to the present limits.

Working Group 2 / 117

The Double Chooz experiment

Author: Luis Fernando Gomez Gonzalez[1]

[1] *IFGW-Unicamp / APC*

Corresponding Author: lfgomez@gmail.com

The Double Chooz experiment is one of the new generation reactor antineutrino disappearance experiments built to measure more precisely the mixing angle Theta 13.
For this, two identical liquid scintillator detectors located at two different baselines of the Chooz Power Plant reactor cores will be installed to make high accuracy measurements of the antineutrino flux and energy.
The value of Theta 13 can be investigated by searching for the flux and energy spectrum difference of electron antineutrinos in the far detector with respect to the antineutrinos flux measured in the near detector.
The Double Chooz experiment has started taking data with the far detector only in April 2011. Without the near detector, the reactor antineutrino spectrum and flux is computed using reactor cores simulations and the Bugey4 antineutrino flux measurement after correction for differences in the core composition. Comparing the expected and measured flux and energy spectrum we have obtained an indication of electron antineutrino disappearance consistent with neutrino oscillations. Among the new generation reactor experiments, the Double Chooz is the only one that currently uses the shape of the energy spectrum combined with the rate in the data analysis and has a background measurement with both reactors off.
At this conference, we propose to show the latest results of the Double Chooz experiment.

Working Group 1 / 118

Going beyond the MSSM: dirac gauginos and R symmetry

Author: Claudia Frugiuele[1]

[1] *FNAL*

Corresponding Author: claudiaf@fnal.gov

I will talk about SUSY extension of SM with Dirac gauginos discussing the main advantages respect to the MSSM focusing in particular on R symmetric models.
I will summarise the LHC phenomenology and how to obtain a 125 GeV Higgs in this framework.

Working Group 4 / 119

Results from the ANTARES Neutrino Telescope

Author: Alexis Dumas[1]

[1] *ANTARES / LPC Clermont-Ferrand*

Corresponding Author: alexis.dumas@clermont.in2p3.fr

ANTARES Neutrino Telescope is a 0.1 km3 instrumented volume installed in the french coast of Mediterranean Sea. It consists in 885 photo-multiplier tubes arranged in a 3D-array of 12 lines and oriented for up-going neutrino detection, having a complementary coverage to that of IceCube, with a full coverage of our galaxy centre.
Physics analysis performed in ANTARES collaboration will be presented including searches for magnetic monopoles, sources point-like sources, GRB, Fermi Bubbles as well as neutrino oscillations measurements. An emphasis will be done on searches for Dark Matter from the Sun, galactic centre, dwarf galaxies and the Earth.

Working Group 4 / 120

Dark Matter search at LHC

Author: Xuai Zhuang[1]

[1] *Chinese Academy of Sciences (CN)*

The existence of significant amount of dark matter in the Universe is one of the strongest motivations to have new physics beyond the Standard Model. Dark Matter search at LHC with a focus on conventional candidates and techniques (e.g. SUSY) in ATLAS and CMS experiments using data from 2011 and 2012 will be reviewed in the talk.

Working Group 2 / 121

MINERvA

Author: Joel Mousseau[None]

Neutrino beams provide a unique exposure of solely weakly interacting particles. The MINERvA experiment sits in the high intensity NuMI neutrino beam at Fermilab. MINERvA is equipped with neutrino targets of plastic, graphite, lead and iron which allow precise comparisons of neutrino interactions on a variety of nuclei. This talk will summarize the efforts of multiple charged-current analyses currently under study by MINERvA.

Working Group 3 / 122

Lattice QCD inputs to test the Standard Model in the flavour sector

Author: Benoit Blossier[1]

[1] *CNRS/Laboratoire de Physique Théorique d'Orsay*

Physics beyond the Standard Model can be tracked from direct measurements at the electroweak scale, for instance by searching new particles (Kaluza-Klein modes, supersymmetric particles, …). Low energy processes and rare events can also be highly sensitive probes of New Physics: they are either mediated by virtual loops in which exotic particles can circulate or they occur at tree level where new couplings can be involved. In other words, flavour physics is very helpful to put stringent constraints on New Physics scenarios. However any fruitful analysis of

experimental data in the quark sector needs the knowledge of theoretical inputs (hadronic form factors, decay constants) that encode the long-dynamics of QCD, in particular the confinement of quarks and gluons in hadrons. A perturbative approach to estimate them is not satisfying at the present experimental level of precision; the best method is lattice QCD. In this talk we will discuss recent works performed by the lattice community that are particularly relevant in flavour physics and tests of physics beyond the Standard Model: unitarity of the CKM matrix, Delta F=2 oscillations, b –> s transition, anomalous magnetic moment of the muon.

Working Group 2 / 132

Supernovae Neutrinos: Challenges and Possibilities

Author: Sovan chakraborty[1]

[1] *M*

Supernovae (SN) are one of the highest energetic astrophysical events. Almost all the enormous energy (10^(53) ergs) released during such an event is emitted in terms of neutrinos. These neutrinos while free streaming out of the SN will undergo flavor oscillations. Apart from the usual MSW oscillations the SN neutrinos will have nonlinear flavor evolution due to neutrino-neutrino interactions. These oscillations can generate unique signatures under different oscillation scenarios. Thus opening the possibility of rich phenomenology in the earth based neutrino detectors for a future galactic SN burst. Moreover, the absence of such a galactic event in near future will increase the importance of detecting the diffuse background of neutrinos from all past supernovae. Detection of such a relic background of SN neutrinos will push the frontier of astrophysical neutrinos to cosmic distances.

Working Group 2 / 133

Neutrino Factory: physics reach, R&D, design & staging scenarios

Author: Vittorio Palladino[1]

[1] *Universita e INFN (IT)*

Multi flavour neutrino beams from a muon storage ring have been established to be the most far reaching option to measure leptonic CPV and completely map the PNMS matrix and its unitarity properties. Their intensities and purity being far superior and better known than those of conventional facilities, that can not promise instead the ultimate necessary precision.
It is also clear however that much R&D and design work is still needed. And recent estimates of costs have indeed been quite sobering.
A realistic and affordable staging scenario, with both physics and R&D potential at each stage, is being developped to mantain this option for our longer term future. Its first step being a simple storage ring (Nustorm) to be built now.
The talk will report the most recent discussion at the late August NuFact 13 workshop.

Plenary Session / 135

Flavour and CP violation in the quark sector - a non-exhaustive theory overview

Author: Monika Blanke[1]

[1] *CERN*

Corresponding Author: monika.blanke@cern.ch

I present an overview of the theoretical status of flavour and CP violation. Emphasis is put on the route towards the discovery and identivication of BSM flavour structures by
1. determining the CKM elements from tree level decays
2. identifying benchmark observables with large BSM sensitivity
3. linking observations in various weak meson decays with each other as well as with high-p_T data in order to identify the underlying BSM scenario.

Working Group 1 / 136

Including theoretical uncertainties in Higgs fits

Author: Sylvain Fichet[1]

[1] *IIP, Natal, Brasil*

We review and develop consistent treatments of theoretical uncertainty (TU) in Higgs couplings fits, going beyond the current approximation of uncorrelated Gaussian TU. We emphasize two different conceptual lines in the treatment of TU either as a nuisance or as a bias. These two treatments are considered within both frequentist and Bayesian frameworks. We develop the bias approach in the Bayesian framework, which consistently supports and generalizes the already existing frequentist view. Examples of Higgs fits based on latest data available are given. We provide analytic expressions of the likelihood fully taking into account correlations, whose evaluation cost the same CPU power as for the uncorrelated Gaussian approximation.

Working Group 4 / 137

Dark matter searches and results linked to astroparticles physics from ATLAS and CMS

Author: Michele Weber[1]

[1] *Universitaet Bern (CH)*

n this talk we will present an overview of the searches for Dark Matter performed by the ATLAS and CMS collaborations.
Several models for new physics beyond the Standard Model which are probed at the LHC also include a Dark Matter candidate.
Additionally, searches for direct production of WIMP candidates will be shown, which look for events containing only a single object and large missing transverse momentum. For cosmic ray astro-particle physics the measurements of the pp cross section are relevant, as they can be used to constrain nuclear interaction models at highest energies available in the laboratory.

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Future perspective of Neutrino Physics

Author: Stephen Parke[1]

[1] *Fermilab*

Corresponding Author: parke@fnal.gov

The future prospects of Neutrino Physics will be discussed.

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Experimental Status of Neutrino Physics

Author: Masashi Yokoyama[1]

[1] *University of Tokyo*

Corresponding Author: masashi@phys.s.u-tokyo.ac.jp

Latest results from neutrino experiments will be summarized.

Plenary Session / 140

A modified naturalness principle and its experimental tests

Author: Alessandro Strumia[1]

[1] *Nat. Inst. of Chem.Phys. & Biophys. (EE)*

The naturalness principle motivated the theoretical expectation that light scalars cannot exist unless they come together with new physics that protects their lightness, such as supersymmetry. But LHC run I discovered the Higgs scalar without any sign of new physics. I review and reconsider the issue of naturalness, proposing a possible modification.

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Discussion Session: AUGER results

Corresponding Author: roulet@cab.cnea.gov.ar

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Discussion Session: PLANCK results

Corresponding Author: gallis@iap.fr

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Discussion Session: AMS-02 results

Corresponding Author: sylvie.lees-rosier@cern.ch

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Status of indirect searches for NP in Flavour Physics

Author: Frederic Teubert[1]

[1] *CERN*

Corresponding Author: frederic.teubert@cern.ch

The lack of evidence for NP in direct searches at the TeV scale, has increased the relevance of the indirect searches able to test much larger energy scales. In this talk I will review the status of the indirect searches in Charm and B-mesons decays and briefly discuss Lepton Flavour Violation decays.

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WG 1 - Theoretical Summary

Corresponding Author: eponton@phys.columbia.edu

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WG 1 - Experimental Summary

Corresponding Author: pietro.govoni@cern.ch

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WG 2 - Theoretical Summary

Corresponding Author: schwetz@mpi-hd.mpg.de

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WG 2 - Experimental Summary

Corresponding Author: schol@phy.duke.edu

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WG 3 - Theoretical Summary

Corresponding Author: tarantino@fis.uniroma3.it

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WG 3 - Experimental Summary

Corresponding Author: guy.wilkinson@cern.ch

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WG 4 - Dark Matter Summary

Corresponding Author: marco.cirelli@cea.fr

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WG 4 - LHC Summary

Corresponding Author: heidi.sandaker@cern.ch

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Do We Need Physics Beyond the Standard Model ?

Author: Gustavo Burdman[1]

[1] *University of Sao Paulo*

Corresponding Author: gustavo.burdman@gmail.com

I reflect on the need for physics beyond the standard model in light of the discovery of a Higgs particle that appears to be consistent with the standard model predictions.

Plenary Session / 154

Neutrinos: Theory

Author: Concepcion Gonzalez-Garcia[1]

[1] *State University of New York (US)*

I will summarize the status of the present determination of
the leptonic flavour parameters and some of the implications
for theory.

Plenary Session / 155

Status of particle dark matter theory

Author: Graciela Gelmini[1]

[1] *UCLA*

I will review recent developments in the theory of particle dark matter, with special attention to the distinction between cold, warm and self-interacting dark matter, the potential signals of "Light WIMPs" in direct dark matter detection experiments, the significance of some hints of dark matter in indirect detection and
LHC limits on dark matter particles.

Plenary Session / 156

Perspectives for New Physics in the Flavour Sector

Author: Gustavo Branco[1]

[1] *Instituto Superior Tecnico*

We review some of the open questions in the Flavour Sector
of the Standard Model and analyse the present and future Search for
New Physics.

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WG 4 - Cosmology Summary

Corresponding Author: rogerio.rosenfeld@cern.ch

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Tomography of the Earth by geo-neutrino emission

Author: Leonardo Tavares[1]

[1] *I*

We propose a method of inference to resolve the Earth's internal distribution of heat producing elements, known sources of geo-neutrinos. It incorporates experimental information given by multiple detectors around the globe via the Bayes' Theorem and uses a multigrid approach to iteratively reconstruct the Earth. We present some test results of the algorithm and questions we would like to answer in the near future using the proposed method.

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Are IceCube neutrinos unveiling PeV-scale decaying dark matter?

Author: Arman Esmaili Taklimi[None]

Recent observations by IceCube, notably two PeV cascades accompanied by events at energies ˜ (30-400) TeV, are clearly in excess over atmospheric background fluxes and beg for an astroparticle physics explanation. In this talk I will discuss the possibility to interpret the IceCube data by PeV mass scale decaying Dark Matter. I discuss generic signatures of this scenario, including its unique energy spectrum distortion with respect to the benchmark E_ν^{-2} expectation for astrophysical sources, as well as peculiar anisotropies. A direct comparison with the data show a good match with the above-mentioned features. I further discuss possible future checks of this scenario.