Oral presentation (general slots) Last update on 12/5

Kazuhiro Bamba

Title: Inflationary universe in a conformally-invariant two-scalar-field theory with an R^2 term

Abstract:
We investigate inflationary cosmology in a theory where there exist two scalar fields which non-minimally couple to the Ricci scalar and an additional R^2 term, which breaks the conformal invariance. In particular, we explore the slow-roll inflation in the case of one dynamical scalar field and that of two dynamical scalar fields. It is explicitly shown that the spectral index of the curvature perturbations and the tensor-to-scalar ratio of the density perturbations can be compatible with the recent Planck results. We also demonstrate that the graceful exit from inflation can be realized. Reference: K. Bamba, S. D. Odintsov and P. V. Tretyakov, Eur. Phys. J. C 75,344 (2015) [arXiv:1505.00854 [hep-th]].

Alvero de la Cruz-Dombriz

Title: Limitations of cosmography in extended theories of gravity

Abstract:
Model-independent methods in cosmology have become an essential tool in order to deal with an increasing number of theoretical alternatives for explaining the late-time acceleration of the Universe. In principle, this provides a way of testing the Cosmological Concordance model under different assumptions and to rule out whole classes of competing theories. One such model-independent method is the so-called cosmographic approach, which relies only in the homogeneity and isotropy of the Universe on large scales. We show that this method suffers from many shortcomings, providing biased results depending on the auxiliary variable used in the series expansion and is unable to rule out models or adequately reconstruct theories with higher-order derivatives in either the gravitational or matter sector. Consequently, in its present form, this method seems unable to provide reliable or useful results for cosmological applications.

Alessandro Codello

Title: Covariant Effective Field Theory of Gravity

Abstract:
Using covariant methods we construct the effective field theory of gravity as a loop expansion in inverse powers of the Planck mass, distinguishing classical, leading and next-to-leading quantum corrections. We then compute the leading corrections in a curvature expansion to quadratic order. We specialize the effective action to FRW spacetimes and we derive the related effective Friedmann equations.
We show that for particular values of the parameters we recover many different non-local modifications of general relativity recently proposed that are able to describe both early and late time cosmology.

Tatsuo Kobayashi

Title: New forms of potential for string axion inflation

Abstract:
We discuss axion inflation within the framework of type IIB superstring theory. New forms of inflation potential are derived. We also study their implications.

Kenji Kadota

Title: CMB probes on generally correlated axion isocurvature perturbations

Abstract:
We explore the possible cosmological consequence of the coupling between the inflaton and axion-like fields. As concrete examples, we illustrate that there is a preference for the existence of the correlated isocurvature modes for the axion monodromy inflation while the natural inflation disfavors such isocurvature modes. We also show the sensitivity of the forthcoming CMB (lensing and polarization) data on such (scale-dependent) cross-correlations and how the generally correlated isocurvature parameters can affect the estimation of the conventional Lambda CDM parameters.

Gaetano Lambiase

Title: f(R) cosmology and dark matter

Abstract:
The cosmic evolution of the Universe, as well as the thermal history of particles, is modified with respect to the standard cosmology if the cosmological background is described by f(R) theories. In this framework it is discussed the evolution of relics particles (WIMPs) and the connection to the PAMELA experiment.

Digesh Raut

Title: Running Non-Minimal Inflation with Stabilized Inflaton Potential

Abstract:
In the context of the Higgs model involving gauge and Yukawa interactions with the spontaneous gauge symmetry breaking, we consider λ?4 inflation with non-minimal gravitational coupling, where the Higgs field is identified as inflaton. Since the inflaton quartic coupling is very small, once quantum corrections through the gauge and Yukawa interactions are taken into account, the inflaton effective potential most likely becomes unstable. In order to avoid this problem, we need to impose stability conditions on the effective inflaton potential, which lead to not only non-trivial relations amongst the particle mass spectrum of the model, but also correlations between the inflationary predictions and the mass spectrum. For concrete discussion, we investigate the minimal B−L extension of the Standard Model with identification of the B−L Higgs field as inflaton. The stability conditions for the inflaton effective potential fix the mass ratio amongst the B−L gauge boson, the right-handed neutrinos and the inflaton. This mass ratio also correlates with the inflationary predictions. In other words, if the B−L gauge boson and the right-handed neutrinos are discovered in future, their observed mass ratio provides constraints on the inflationary predictions.

Kohei Kamada

Title: Standard Model Higgs in the Inflationary Universe

Abstract:
Recent results of collider physics suggests that the Standard Model Higgs potential is metastable if there are no physics beyond the Standard Model. If it is really metastable, high scale inflation is problematic since the Standard Model Higgs is destabilized during inflation and falls down to the unwanted true vacuum. Here I consider the nontrivial interaction of the Standard Model Higgs to generate additional mass term for it during inflation. I show that this helps for the our electroweak vacuum to be selected. Moreover, I point out that the additional mass term does not have to be larger than the Hubble parameter during inflation.

Carlotta Pittori

Title:Dark matter signatures in a mostly unexplored gamma-ray energy window

Abstract:
One of the major scientific objectives of gamma-ray instruments is the search for dark matter (DM) by means of the production of secondary gamma-rays after the annihilation or decay of the DM particle candidates.
The Galactic Center is still expected to be the brightest source of DM annihilations in the gamma-ray sky by several orders of magnitude. Resolving the inner region of our Galaxy in the MeV - GeV domain remains one of the outstanding problems of modern astrophysics.
The energy range 0.3 MeV - 100 MeV between Compton and pair production regimes in particular is unique for studying matter evolution, antimatter generation, very energetic phenomena in compact objects and massive black holes, but it is notoriously difficult to study.
It would require an efficient instrument working both in the Compton scattering regime from 0.1 MeV up to about 15 MeV, and in the electron-positron pair production regime at higher energies, with excellent background subtraction capability.
Until now, instruments in this energy range lacked the sensitivity for a breakthrough.
The e-ASTROGAM Mission (M. Tavani, V. Tatischeff et al.) to be proposed to ESA M5 Call for a Medium-size Mission will add the as yet unexplored MeV - GeV range to Dark Matter investigations with excellent angular resolution and exposure. Models will be tested in a spectral range not currently studied in order to disentangle the possible DM contribution from the diffuse background, the point sources contribution and the other possible explanations.

Hong-Bo Jin

Title: Spectra of cosmic ray electrons and diffuse gamma rays with the constraints of AMS-02 and HESS data

Abstract:
Recently, AMS-02 reported their observed results of cosmic rays(CRs). In addition to the AMS-02 data, we add HESS data to estimate the spectra of CR electrons and the diffuse

gamma rays above TeV. In the conventional diffusion model, a global analysis is performed on the spectral features of CR electrons and the diffuse gamma rays by GALRPOP package. The results show that the spectrum structure of the primary component of CR electrons can not be fully reproduced by a simple power law and the relevant break is around hundred GeV. The spectrum of CR electrons does not need to add TeV cutoff to match the features of HESS data too. Based on the difference between the fluxes of CR electrons and the primary component of them, the predicted excess of CR positrons is consistent with the interpretations as pulsar or dark matter. In the analysis of the Galactic diffuse gamma rays with the indirect constraint of AMS-02 and HESS data, it is found that the fluxes of Galactic diffuse gamma rays are consistent with GeV data of Fermi-LAT in the high latitude regions. That strongly constrains the production of the gamma rays from the annihilation or decay of dark matter in the Galaxy.

Ki-Young Choi

Title:

Abstract:
The isocurvature perturbation of WIMP can be generated during the early matter-dominated era at small scales. This mode is not erased during the kinetic decoupling and remains large enough to make a substantial contribution to the formation of small scale structures.
I will talk about the generation of the isocurvature perturbation for the WIMP dark matter and the implications.

Yue-Lin Suming Tsai

Title: Searching for Singlet- Doublet Mixing Majorana DM

Abstract:
Dark Matter searching is usually model-dependent.
However, with simple assumptions, it is still possible to character DM from current DM experimental data, including cosmology, DM direct detection, DM indirect detection, and colliders. I will fist review our result for pure Singlet Majorana DM and then present our updated result for Singlet- Doublet Mixing Majorana DM.

Tsuguo Aramaki (CDMS)

Title: Recent results from the second CDMSlite run and overview of the SuperCDMS

Abstract:
The CDMS low ionization threshold experiment (CDMSlite) uses Ge detectors operated at a relatively high bias voltage, where the enhanced phonon signal from the Neganov-Luke effect allows us to lower the energy threshold. The recent results of 70kg-days exposure in the second CDMSlite run exclude new parameter space for low-mass dark matter particles, in the dark matter mass range of 1.6 - 5.5 GeV. The SuperCDMS collaboration is moving forward with the design and construction of the SuperCDMS SNOLAB project. Overview of the project and our progress to date will also be presented.

Natsumi Nagata

Title: Probing gaugino coannihilation with displaced vertex searches

Abstract:
It has been widely known that bino-like dark matter in the supersymmetric theories in general suffers from over-production. The situation can be drastically improved if another gaugino has a mass slightly heavier than the bino dark matter as it reduces the dark matter abundance through coannihilation. In this work, we consider such a bino-gaugino coannihilation scenario in high-scale supersymmetric models and study the prospects for exploring this bino-gaugino coannihilation scenario at the LHC. We show that searches for long-lived particles with displaced vertices offer a strong tool to test this scenario in collider experiments.

Feng Luo

Title: Gluino Coannihilation

Abstract:
Some variants of the minimal supersymmetric extension of the Standard Model (MSSM) feature a strip in parameter space where the lightest neutralino is identified as the lightest supersymmetric particle (LSP), the gluino is the next-to-lightest supersymmetric particle (NLSP) and is nearly degenerate with the LSP, and the relic cold dark matter density is brought into the range allowed by astrophysics and cosmology by coannihilation with the gluino NLSP. We calculate the relic density along this gluino coannihilation strip in the MSSM, including the effects of gluino-gluino bound states, and taking into account the decoupling of the gluino and LSP densities that occurs for a squark to gluino mass ratio larger than order of 100. We find that the LSP may weigh up to ~ 8 TeV with the correct dark matter density.

Sang Hui Im

Title: Realizing the relaxion with multiple axions and its UV completion with high scale supersymmetry

Abstract:
We discuss a scheme to implement the relaxion solution to the hierarchy problem with multiple axions, and present a UV-completed model realizing the scheme.
All axions phi_i (i=1, 2, ..., N) in our model are periodic with similar decay constants well below the Planck scale. In the limit of a large number of axions N >> 1, the relation phi corresponds to an exponentially long flat direction in the N-dimensional compact field space of phi_i, which is shaped by a series of mass mixings between nearby axions.
Those mass mixings cause a multiplicative helical windings of flat direction, yielding a relaxion field range $Delta phi$ = 2pi f_eff ~ 2pi n_1 n_2 ... n_{N-1} f, where the model-dependent integers n_i are all bigger than the unity.
Both the scalar potential driving the evolution of phi during the inflationary epoch and the phi-dependent Higgs boson mass vary with an exponentially large periodicity of O

(f_eff), while the back reaction potential stabilizing the relaxion has a periodicity of O(f). A natural UV completion of our scheme can be found in high scale or (mini) split supersymmetry (SUSY) scenario with the axion scales generated by SUSY breaking as f_i ~ (m_{SUSY} M_*)^{1/2} where the soft SUSY breaking scalar mass m_{SUSY} is well above the weak scale, but much lower than the fundamental scale M_* which may be identified as the Planck scale or the GUT scale.

Takaaki Nomura

Title: SU(2)$_L \times$SU(2)$_R$ minimal dark matter with simplified Higgs sector

Abstract:
We construct the minimal dark matter models in the left-right symmetric extensions of the standard model (SM), where the gauge symmetry SU(3)$_C\times$SU(2)$_L\times$SU(2)$_R\times$U(1)$_{B-L}$ is broken into its subgroup SU(3)$_C imes$U(1)$_{ m em}$ by nonzero VEVs of a SU(2)$_R$ doublet H_R and a SU(2)$_L\times$ SU(2)$_R$ bidoublet H. A possible candidate of dark matter is explored in the framework of minimal dark matter considering SU(2)$_{L, R}$ multiplet scalar bosons and fermions. Then we focus on SU(2)$_R$ quintuplet fermions with $B-L$ charges 0, 2 and 4 as the minimal dark matter candidates and investigate phenomenology of them. We show that the dark matter in the model can provide observed relic density with 2 TeV W' boson which is motivated by the ATLAS diboson excess and CMS $eejj$ excess. The possible mass of dark matter is predicted for each $B-L$ charge. We then estimate the scattering cross section of dark matter with nucleon and production cross section of charged components in the quintuplets at the LHC.

Kaori Fuyuto

Title: Aspects of CP violation in electroweak baryogenesis

Abstract:
We discuss the aspects of CP-violating effects on electroweak baryogensis in models where an extra Higgs doublet, a singlet and electroweak-interacting fermions are added. It is found that one CP-phase that directly relates the baryon asymmetry of the Universe (BAU) to the electric dipole moment (EDM) exists. Moreover, it is obtained that the parameter region for the successful BAU can be verified by the electron EDM in near future.

Masato Yamanaka

Title: Leptogenesis in $E_6 \times U(1)_A$ SUSY GUT model

Abstract:
We study the thermal leptogenesis in the $E_6imes U(1)_A$ SUSY GUT model in which realistic masses and mixings of quarks and leptons can be realized. We show that the sufficient baryon number can be produced by the leptogenesis in the model, in which the mass parameter of the lightest right-handed neutrino is predicted to be smaller than 10^8 GeV. The essential point is that the mass of the lightest right-handed neutrino can be enhanced in the model because it has a lot of mass terms whose mass parameters are

predicted to be the same order of magnitude which is smaller than 10^8 GeV. We show that O(10) enhancement for the lightest right-handed neutrino mass is sufficient for the observed baryon asymmetry. Note that such mass enhancements do not change the predictions of neutrino masses and mixings at the low energy scale in the E_6 model which has six right-handed neutrinos. In the calculation, we include the effects of supersymmetry and flavor in final states of the right-handed neutrino decay. We show that the effect of supersymmetry is quite important even in the strong washout regime when the effect of flavor is included. This is because the washout effects on the asymmetries both of the muon and the electron become weaker than that of the tau asymmetry.

Chiristoph Toennis (ANTARES)

Title: The indirect search for dark matter with the ANTARES neutrino telescope

Abstract:
The indirect search for dark matter is is amongst the utmost important topics in neutrino telescopes. The ANTARES neutrino telescope has been installed on the bottom of the Mediterranean Sea in 2007 and has been taken data since then. In this talk the results of the different analyses for dark matter signals from different potential sources produced with different analysis methods will be presented. The specific advantages of neutrino telescopes in general and of ANTARES in particular will be explained. In particular the limits from the searches for dark matter annihilations in the Sun and the Galactic Center currently are amongst the best for neutrino telescopes.

Joe Sato

Title: MeV scale leptonic force for cosmic neutrino spectrum and muon anomalous

Abstract:
Characteristic patterns of cosmic neutrino spectrum reported by the IceCube collaboration and long-standing inconsistency between theory and experiment in muon anomalous magnetic moment are simultaneously explained by an extra leptonic force mediated by a gauge field with a mass of the MeV scale. With different assumptions for redshift distribution of cosmic neutrino sources, diffuse neutrino flux is calculated with the scattering between cosmic neutrino and cosmic neutrino background through the new leptonic force. Our analysis sheds light on a relation among lepton physics at the three different scales, PeV, MeV, and eV, and provides possible clues to the distribution of sources of cosmic neutrino and also to neutrino mass spectrum.

Arman Esmaili Taklimi

Title: Interpreting the IceCube events by decaying dark matter: hints and constraints

Abstract:
The observed events by IceCube, notably the PeV cascades accompanied by events at lower energies, are clearly in excess over the background of atmospheric flux and beg for an astroparticle physics explanation. I will discuss the possibility to interpret the IceCube data by PeV mass scale decaying Dark Matter. I discuss the generic signatures of this

scenario, including its energy spectrum distortion with respect to the benchmark expectation for astrophysical sources, as well as the 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 by EAS experiments, both by detecting the prompt gamma ray flux from decaying dark matter, or the induced anisotropies in the cosmic ray flux. Finally, I will discuss what we can learn about the properties of PeV-scale dark matter if the observed high energy neutrinos originate from conventional astrophysical sources.

Takashi Toma

Title: Self-interacting dark matter and monochromatic lines

Abstract:
We study the correlation between a monochromatic signal from annihilating dark matter and its self-interacting cross section. We apply our argument to a complex scalar dark sector, where the pseudoscalar plays the role of a warm dark matter candidate while the scalar mediates its interaction with the Standard Model. We combine the recent observation of the cluster Abell 3827 for self-interacting dark matter and the constraints on the annihilation cross section
for monochromatic lines. We also confront our model to a set of recent experimental analyses and find that such an extension can naturally produce a monochromatic keV signal corresponding to recent observations of Perseus or Andromeda while in the meantime predicts self-interacting cross section of the order of $sigma/m simeq 0.1 - 1~mathrm{cm^2/g}$ as recently claimed in the observation of the cluster Abell 3827.

Lorenzo Calibbi

Title: The Flavour Portal to Dark Matter

Abstract:
In this seminar, I will first review the main features of models of fermion masses and mixing based on new symmetries of flavour. I will then discuss how light the new flavour dynamics is allowed to be by the constraints from flavour-changing processes and possible UV completions of this kind of models.
I will then introduce dark matter (DM) as a fermionic singlet under the Standard Model (SM) gauge group that is however charged under the flavour symmetry. Interactions between DM and SM particles are then only mediated by the scalar fields that spontaneously break the flavour symmetry, the so-called flavons. In the case of gauged flavour symmetries, the interactions are also mediated by the flavour gauge bosons. I will discuss the construction and the generic features of this class of models and then the phenomenology of an explicit example.

Seungwon Baek

Title: Dark matter and muon (g-2) in an extended Ma model

Abstract:

We consider right-handed neutrino dark matter N_1 in local $U(1)_{L_mu-L_ au}$-extended Ma model. With the light $U(1)_{mu- au}$ gauge boson ($m_{Z'} sim {cal O}(100)$ MeV) and small $U(1)_{mu- au}$ gauge coupling ($g_{Z'}sim 10^{-4}-10^{-3}$) which can accommodate the muon $(g-2)$ anomaly and is still allowed by other experimental constraints, we show that we can get correct relic density of dark matter for wide range of dark matter mass ($M_1 sim 10-100$ GeV), although the gauge coupling constant $g_{Z'}$ is small. This is due to the fact that the annihilation cross section of dark matter pair is enhanced by $M_1^4/m_{Z'}^4$ in the processes $N_1 N_1 o Z' Z'$ or $N_1 N_1 o Z' H_2$. We also consider the constraints from direct detection, collider searches.

Yuji Omura

Title: Flavor violating Z' from SO(10) SUSY GUT in High-Scale SUSY

Abstract:
We propose an SO(10) supersymmetric grand unified theory (SUSY GUT), where the SO(10) gauge symmetry breaks down to SU(3)_c times SU(2)_L times U(1)_Y times U(1)_X at the GUT scale and U(1)_X is radiatively broken at the SUSY-braking scale. In order to achieve the observed Higgs mass around 126 GeV and also to satisfy constraints on flavor- and/or CP-violating processes, we assume that the SUSY-breaking scale is O(100) TeV, so that the U(1)_X breaking scale is also O(100) TeV. One big issue in the SO(10) GUTs is how to realize realistic Yukawa couplings. In our model, not only 16-dimensional but also 10-dimensional matter fields are introduced to predict the observed fermion masses and mixings. The Standard-Model quarks and leptons are linear combinations of the 16- and 10-dimensional fields so that the U(1)_X gauge interaction may be flavor-violating. We investigate the current constraints on the flavor-violating Z' interaction from the flavor physics and discuss
prospects for future experiments.

Kentarou Mawatari

Title: Dark matter study in the FeynRules/MadGraph5_aMC@NLO framework

Abstract:
We present recent development of simulation tools in the FeynRules/MadGraph5_aMC@NLO framework to study dark matter at colliders as well as in direct/indirect dark matter experiments. We show some results for simplified dark matter models as an example.
(The talk is based on arXiv:1508.05327.)

Seng Pei Liew

Title: Benchmark models for Dark Matter searches at the LHC

Abstract:
We introduce a minimal set of simplified Dark Matter models to facilitate the collider study of Dark Matter at the LHC. In particular, we focus on the interplay between missing energy plus X (mono-X) searches and other direct new particle searches within the framework of simplified models. Our systematic characterization of simplified Dark Matter models will

serve as a guideline for inventing and optimizing mono-X searches for Run-2 and future runs of the LHC.

Chaehyun Yu

Title: Mono-quarkonium production for dark matter search

Abstract:
We investigate the dark matter production associated with a heavy quarkonium for the dark matter search at colliders. We adopt the effective field theory approach for the interaction of dark matter with Standard Model (SM) particles. We discuss the dark matter with flavor-dependent couplings and show that the mono-quarkonium production could be more effective for the charm-philic or bottom-philic dark matter models. We also discuss the limitation of the EFT approach at colliders.