

Saga-Yonsei Joint Workshop XXI

Report of Contributions

Contribution ID: 1

Type: **not specified**

Registration

Monday, 4 November 2024 17:00 (1 hour)

Session Classification: Registration and Welcome

Contribution ID: 2

Type: **not specified**

Welcoming Reception

Monday, 4 November 2024 18:20 (2 hours)

Session Classification: Registration and Welcome

Contribution ID: 3

Type: **not specified**

Lecture 1 Study of QCD matter -Nambu meets BCS-

Tuesday, 5 November 2024 10:00 (1h 30m)

Presenter: Prof. MOTOI, Tachibana (Saga Univ.)

Session Classification: Lecture 1 and seminar

Contribution ID: 4

Type: **not specified**

Seminar: Physics highlights from Belle II

Tuesday, 5 November 2024 11:30 (30 minutes)

Presenter: Prof. KWON, Youngjoon (Yonsei Univ.)

Session Classification: Lecture 1 and seminar

Contribution ID: 5

Type: **not specified**

Lecture 2 (Title TBA) on astroparticle physics experiment

Tuesday, 5 November 2024 14:00 (1h 30m)

Presenter: Prof. ROH, Chang Dong (Sungkyunkwan Univ.)

Session Classification: Lecture 2 and Discussions

Contribution ID: 6

Type: **not specified**

Lecture 3 Is our understanding of dark energy getting sharpened?

Wednesday, 6 November 2024 10:00 (1h 30m)

Presenter: Prof. TAKAHASHI, Tomo (Saga Univ.)

Session Classification: Lecture 3 and Seminar

Contribution ID: 7

Type: **not specified**

Seminar (Title TBA)

Wednesday, 6 November 2024 11:30 (30 minutes)

Presenter: Dr CHO, Yongsoo (Yonsei Univ.)

Session Classification: Lecture 3 and Seminar

Contribution ID: 8

Type: **not specified**

Lecture 4 (Title TBA) on dark matter physics

Thursday, 7 November 2024 10:00 (1h 30m)

Presenter: Prof. PARK, Jong-Chul (Choongnam National Univ.)

Session Classification: Lecture 4 and Seminar

Contribution ID: 9

Type: **not specified**

Lecture 5 The String Landscape and the Swampland Program

Thursday, 7 November 2024 14:00 (1h 30m)

Presenter: Dr LEE, Seung-Joo (IBS/CTPU)

Session Classification: Lecture 5 and discussions

Contribution ID: **10**

Type: **not specified**

Lecture 6 Forward physics with ALICE FoCal detector

Friday, 8 November 2024 10:00 (1h 30m)

The forward calorimeter for the LHC ALICE experiment is being prepared and will be installed by 2029. The expected physics with FoCal and the detector development are introduced.

Presenter: Prof. FUSAYASU, Takahiro (Saga Univ.)

Session Classification: Lecture 6

Contribution ID: 11

Type: **not specified**

Student presentation award ceremony

Friday, 8 November 2024 11:30 (15 minutes)

Session Classification: Closing

Contribution ID: 12

Type: **not specified**

Closing remarks

Friday, 8 November 2024 11:45 (15 minutes)

Session Classification: Closing

Contribution ID: 13

Type: **not specified**

[Opening talk] Can A.I. understand Hamiltonian Mechanics?

Monday, 4 November 2024 18:00 (20 minutes)

In an era where Artificial Intelligence is advancing at an unprecedented pace across all fields, a fundamental question arises: Can AI truly understand physics? This presentation offers a partial answer by demonstrating AI's capability to comprehend Hamiltonian mechanics. We reformulated Hamilton's equations as an operator learning problem, developing a neural network that directly maps potential functions to their corresponding phase space trajectories. While mathematical constraints required us to limit our study to 1D bounded potentials with fixed initial conditions, we developed novel methodologies for generating suitable training data and proposed MambONet, a new network architecture specifically designed for this task. The trained network demonstrates genuine understanding of Hamiltonian mechanics by generating accurate time-dependent position and momentum functions from arbitrary potential inputs. Notably, our approach prevents error propagation, unlike traditional numerical methods where errors accumulate through iterations. When tested on physically significant potentials - including harmonic oscillators, double-well potentials, and Morse potentials - our method significantly outperformed conventional numerical approaches, suggesting that AI can indeed grasp fundamental physical principles.

Presenter: Mr KIM, Tae-Geun (Yonsei Univ.)

Session Classification: Registration and Welcome

Contribution ID: 14

Type: **not specified**

Gravitational Waves from Flaton Fields in Thermal Inflation

Tuesday, 5 November 2024 15:50 (18 minutes)

We investigate the stochastic gravitational wave signatures produced during first-order phase transitions of flaton fields in thermal inflation. Thermal inflation, potentially occurring at energy scales ranging from supergravity-motivated scenarios ($>10^9$ GeV) to the electroweak scale, involves flaton fields characterized by large vacuum expectation values and nearly flat potentials. We analyze prototypical potential forms of these fields with two gauge group scenarios (U(1) and SU(2)) to explore how different particle content affects the gravitational wave spectrum. We identify parameter regions where these signals fall within the sensitivity range of future gravitational wave detectors, providing both a novel approach to probe thermal inflation models and specific predictions for the frequency spectrum and amplitude of the stochastic gravitational wave background produced in these scenarios.

Presenter: Ms PARK, Yeji (Yonsei Univ.)

Session Classification: Ahn Se-Hee Memorial Student Session

Contribution ID: 16

Type: **not specified**

Runaway Potential with Inverse Non-minimal Coupling to Unify Inflation and Late-Time Acceleration

Thursday, 7 November 2024 15:50 (18 minutes)

We considered a situation where a Ricci scalar R and the scalar field ϕ are inversely coupled each other by the term $1/2\xi\phi^{-n}R$, where ξ denotes the strength of non-minimal coupling. This term is motivated to make Einstein-frame inflationary potential flat in a small limit of scalar field value, to guarantee high number of e-folds during inflation to cure limitations that a standard Big Bang itself cannot resolve. (e.g. flatness problem, horizon problem, etc.) On the other hand, the potential $V(\phi) = V_0\phi^{-n}$ is one of simplest models for explaining late-time acceleration due to runaway behavior at the large field limit, which in addition possesses attractor-like solution and well motivated by particle physics models. These two facts motivated us to study a model where a scalar field ϕ is inversely non-minimally coupled to the gravitational sector with aforementioned runaway potential, to explain both inflationary observations and late-time cosmic acceleration. As an inflationary stage, it is confirmed that choosing most of parameter sets (V_0, ξ, n) enables us to satisfy inflationary constraints given by the latest observations from Planck-BICEP/Keck. Our setup can also explain late-time acceleration (especially showing behavior like cosmological constant in a neighborhood of current Universe ($w \approx -1$)) and is compatible with several constraints for successful Big Bang scenario for some suitable initial conditions. We especially discussed necessary theoretical criteria for choosing adequate initial conditions by the existence of Hubble drag, which plays a role to limit the velocity of a quintessence field during its evolution.

Presenter: Mr HYUN, Sang-Chul (Yonsei Univ.)

Session Classification: Arthur Becker Memorial Student Session

Contribution ID: 17

Type: **not specified**

**Seminar: Nuclear structure input to low-energy
precision tests of the Standard Model via
superallowed $0^+ \rightarrow 0^+$ Fermi beta decay**

Thursday, 7 November 2024 11:30 (30 minutes)

Presenter: Dr XAYAVONG, Latsamy (Yonsei Univ.)

Session Classification: Lecture 4 and Seminar

Contribution ID: **18**

Type: **not specified**

Relativistic Mean Field approach to investigate Neutron Star

Tuesday, 5 November 2024 16:44 (18 minutes)

Presenter: Mr NAM, Gihwan (Yonsei Univ.)

Session Classification: Ahn Se-Hee Memorial Student Session

Contribution ID: 19

Type: **not specified**

Skyrme Parameterization from Nuclear Matter and Neutron Star Data

Tuesday, 5 November 2024 17:02 (18 minutes)

Presenter: Mr JEONG, Seonghyun (Yonsei Univ.)

Session Classification: Ahn Se-Hee Memorial Student Session

Contribution ID: 20

Type: **not specified**

Pulsar glitch

Tuesday, 5 November 2024 16:08 (18 minutes)

The origin of glitch is usually thought to occur when superfluid vortices transfer to the outer crust by the catastrophic unpinning. In this study, I consider a physical microscopic model of this theory.

Presenter: SAKOBUN, Haruka (Saga Univ.)

Session Classification: Ahn Se-Hee Memorial Student Session

Contribution ID: 21

Type: **not specified**

Primordial black holes

Tuesday, 5 November 2024 16:26 (18 minutes)

Presenter: SATO, Kikuko (Saga Univ.)

Session Classification: Ahn Se-Hee Memorial Student Session

Contribution ID: 22

Type: **not specified**

Implications of the Dark Age Consistency ratio for models beyond Λ CDM

Thursday, 7 November 2024 16:08 (18 minutes)

We propose the new observable for the Dark Age 21 cm line global signal and show that the new observable can probe models beyond the standard model. We also discuss the possibility of parameter estimation using the new observable.

Presenter: OKAMATSU, Fumiya (Saga Univ.)

Session Classification: Arthur Becker Memorial Student Session

Contribution ID: 23

Type: **not specified**

Classification of inflation models using k-means method

Thursday, 7 November 2024 16:26 (18 minutes)

I performed clustering of the inflation model using the k-means method, which is a machine learning technique.

Presenter: OKADA, Nanoka (Saga Univ.)

Session Classification: Arthur Becker Memorial Student Session

Contribution ID: 24

Type: **not specified**

On uncertainties of the determination of reheating temperature

Thursday, 7 November 2024 16:44 (18 minutes)

This study analyzes the reheating process and the uncertainties in determining the reheating temperature after the inflation. We examine whether the Gamow criterion gives a good estimate for the reheating temperature depending on models of reheating.

Presenter: WATANABE, Natsumi (Saga Univ.)

Session Classification: Arthur Becker Memorial Student Session

Contribution ID: 25

Type: **not specified**

Estimation of cosmological parameters using the 21cm line at the cosmic dawn

Thursday, 7 November 2024 17:17 (18 minutes)

We verified what changes occur in cosmological parameters when various astro parameters are changed during the cosmic dawn period, and what effect this has on the 21cm line.

Presenter: TOMIYASU, Yusuke (Saga Univ.)

Session Classification: Arthur Becker Memorial Student Session

Contribution ID: 26

Type: **not specified**

Entanglement Witness of Primordial Perturbation

Thursday, 7 November 2024 17:35 (18 minutes)

Determining whether or not the primordial Perturbation generated during inflation has quantum-ness on the super-Hubble horizon based on entanglement witness used in quantum information theory.

Presenter: OSHIMA, Yuto (Saga Univ.)

Session Classification: Arthur Becker Memorial Student Session

Contribution ID: 27

Type: **not specified**

Monkey bias with velocity consistency relation

Thursday, 7 November 2024 17:53 (18 minutes)

Density fluctuations of a tracer, such as galaxies, are represented by a bias model. In order to study gravity theories, we need to investigate the relations between the bias parameters. In our study, by using Monkey bias theory formulated in [arXiv:2003:10114] and giving the velocity consistency relation derived in [arXiv:1606.03708], we discuss the new relation between the bias parameters.

Presenter: YAMASHITA, Sora (Saga Univ.)

Session Classification: Arthur Becker Memorial Student Session

Contribution ID: 28

Type: **not specified**

Understanding Background Events and Detector Energy Calibration for ALPs Search in EBES Experiments

Tuesday, 5 November 2024 17:35 (18 minutes)

Presenter: SHIMASAKI, Yuuta (Saga Univ.)

Session Classification: Ahn Se-Hee Memorial Student Session

Contribution ID: 29

Type: **not specified**

HGCROCv2 for ALICE Focal

Tuesday, 5 November 2024 17:53 (18 minutes)

Introduction to the ASIC used in the ALICE experiment upgrade plan, ALICE Focal, conducted at CERN in Europe.

Presenter: YOKOYAMA, Masato (Saga Univ.)

Session Classification: Ahn Se-Hee Memorial Student Session

Contribution ID: 30

Type: **not specified**

Orbifold Gauge Breaking in 5D and application to asymptotic GUTs

Thursday, 7 November 2024 18:11 (18 minutes)

The use of extra dimensions can address various problems of the Standard Model (SM) of particle physics. In all cases where gauge fields propagate in the bulk of the extra dimensions, a compactification based on an “orbifold” is required in order to consistently break the bulk gauge symmetry and ensure a chiral spectrum for the massless fermionic modes. We will study the various symmetry breaking patterns allowed by the orbifold in 5D and apply those results to build consistent asymptotic Grand Unified Theories (aGUTs).

Presenter: ISNARD, Wanda (ENS Lyon)

Session Classification: Arthur Becker Memorial Student Session