East Asia Joint Symposium on Fields and Strings 2021

Report of Contributions

Contribution ID: **5**   Type: **Invited talk**

Digital quantum simulation of the Schwinger model with topological term

Wednesday, 24 November 2021 11:30 (30 minutes)

Presenter: HONDA, Masazumi (YITP)

Contribution ID: **6**   Type: **Invited talk**

Finite-N superconformal index via the AdS/CFT correspondence

Tuesday, 23 November 2021 14:00 (30 minutes)

We propose a prescription to calculate the superconformal index of the N=4 U(N) supersymmetric Yang-Mills theory with finite N on the AdS side. The finite N corrections are included as contributions of D3-branes wrapped around three-cycles in S5, which are calculated as the index of the gauge theories realized on the wrapped branes.

Presenter: IMAMURA, Yosuke (Tokyo Inst Tech)

Contribution ID: **7**   Type: **Invited talk**

Anomaly of subsystem symmetry and anomaly inflow

Monday, 22 November 2021 15:15 (30 minutes)

Presenter: YAMAGUCHI, Satoshi (Osaka U)

Contribution ID: **8** | Type: **Invited talk**

Effective Theory Breaks Down at Scrambling Time

Friday, 26 November 2021 17:30 (30 minutes)

For the background of a gravitational collapse, we calculate the amplitudes for infalling matter to radiate outgoing massless particles through higher-derivative interactions. The amplitudes are found to grow exponentially with time, leading to the breakdown of the effective theory at the scrambling time.

Presenter: HO, Pei-Ming (National Taiwan U)

Contribution ID: **9**   Type: **Invited talk**

How to multiply, add and expand amplitudes in theory space

Tuesday, 23 November 2021 10:00 (30 minutes)

Presenter: HE, Song (ITP)

Contribution ID: **10**   Type: **Invited talk**

Penrose Limit: A Stringy Regime in Holography

Tuesday, 23 November 2021 11:00 (30 minutes)

Penrose limit provides a promising avenue to the stringy regime in the AdS/CFT holography, giving rise to the pp-wave background. Recently, we proposed a novel entry of the pp-wave holographic dictionary, which equated the Berenstein-Maldacena-Nastase (BMN) two-point functions in free Yang-Mills theory with the norm squares of the quantum unitary transition amplitudes between the corresponding tensionless strings in the infinite curvature limit. If our proposal is correct, it would not only provide first examples of systematic calculations of the higher genus critical superstring amplitudes, but may also in principle gives exact complete results for any string coupling, due to the convergence of genus expansion.

Presenter: HUANG, Min-xin (USTC)

Contribution ID: **11**　　　　　　　　　　　　　　　　　　　Type: **Invited talk**

Anisotropic Holography

Thursday, 25 November 2021 15:30 (30 minutes)

Strongly coupled anisotropic systems have significantly richer structure than the isotropic ones. This is especially evident in the transport coefficients and in the phase diagram of anisotropic theories. We discuss such holographic theories, we comment on their observables and demonstrate how the isotropic universal relations are violated in presence of anisotropies. We also propose c-function candidates for the anisotropic RG flows and show that their monotonicity is not any more guaranteed by the energy conditions but depends on the theory characteristics.

Presenter: GIATAGANAS, Dimitrios (National Sun Yat-sen U)

Contribution ID: **12**   Type: **Invited talk**

Conformal boundary condition and AdS/BCFT

Monday, 22 November 2021 09:45 (30 minutes)

Conformal boundary condition was previously considered in the context of AdS/BCFT, wherein the equation of motion of the end-of-the-world was derived and emphasized. In this talk, I will discuss some other further consequences of the conformal boundary condition in AdS/BCFT. We derive the boundary central charges of the holographic Weyl anomaly. We analysis the metric perturbation on the end-of-the-world brane with different boundary conditions. Our results reveal that there are non-trivial gravitational dynamics from extrinsic curvatures on the conformal and Dirichlet branes, which may have interesting applications to the island.

Presenter: CHU, Chong-Sun (National Tsing-Hua U)

Contribution ID: **13**   Type: **Invited talk**

Twisted Compactification of 6d SCFTs

Tuesday, 23 November 2021 09:30 (30 minutes)

In this talk, we consider the circle compactification of 6d superconformal field theories with twist. Especially, we focus on how to obtain their Omega-deformed partition functions and take their Cardy limit. We comment on its relation to the black hole physics.

Presenter: LEE, Kimyeong (KIAS)

Contribution ID: 14   Type: **Invited talk**

Bounds on gravitational S matrix

Thursday, 25 November 2021 14:00 (30 minutes)

Presenter: HUANG, Yu-tin (National Taiwan U)

Contribution ID: **15**   Type: **Invited talk**

Machine Learning Exploration of Continuous Symmetries in Physical Systems

Thursday, 25 November 2021 14:30 (30 minutes)

Presenter: CHEN, Heng-Yu (National Taiwan U)

Contribution ID: **16**   Type: **Invited talk**

Weak Cosmic Censorship for Higher Derivative Gravity Theories

Monday, 22 November 2021 17:30 (30 minutes)

In this talk I will discuss how the weak cosmic censorship conjecture (WCCC) constrains the higher derivative gravity theories based on Wald's gedanken experiment by throwing the matter into the extremal or near-extremal black holes. We find that even though the WCCC still holds for the extremal black hole for the extremal black holes of quartic gravity theories, it can be violated for the near-extremal cases.

Presenter: LIN, Feng-Li (National Taiwan Normal U)

Contribution ID: **17**   Type: **Invited talk**

Anomalies and Supersymmetry

Monday, 22 November 2021 13:45 (30 minutes)

Presenter: YI, Piljin (KIAS)

Contribution ID: **18**   Type: **Invited talk**

Quantum black holes from matrix models

Tuesday, 23 November 2021 13:30 (30 minutes)

I will explain the microscopic studies of BPS black holes in AdS from matrix models

Presenter: KIM, Seok (Seoul National U)

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Contribution ID: **19**   Type: **Invited talk**

Yang-Baxter sigma models from 4D Chern-Simons theory

Monday, 22 November 2021 10:15 (30 minutes)

Recently, a 4D Cherns-Simons (CS) theory has been proposed by Costello and Yamazaki as a unified theory of 2D classically integrable field theories. In this talk, I will explain how to derive Yang-Baxter sigma models from this 4D CS theory.

Presenter: YOSHIDA, Kentaroh (Kyoto U)

Contribution ID: **20**   Type: **Invited talk**

Heavy-Heavy-Light Three-Point Functions from D-branes Revisited

Friday, 26 November 2021 17:00 (30 minutes)

We study correlation functions of D-branes and a supergravity mode in AdS, which are dual to structure constants of two sub-determinant operators with large charge and a BPS single-trace operator. Our approach is inspired by the large charge expansion of CFT and resolves puzzles and confusions in the literature on the holographic computation of correlation functions of heavy operators. In particular, we point out two important effects which are often missed in the literature; the first one is an average over classical configurations of the heavy state, which physically amounts to projecting the state to an eigenstate of quantum numbers. The second one is the contribution from wave functions of the heavy state. To demonstrate the power of the method, we first analyze the three-point functions in N=4 super Yang-Mills and reproduce the results in field theory from holography, including the cases for which the previous holographic computation gives incorrect answers. We then apply it to ABJM theory and make solid predictions at strong coupling. Finally we comment on possible applications to states dual to black holes and fuzzballs. This talk is based on work done with Peihe Yang, Yunfeng Jiang and Shota Komatsu.

Presenter: WU, Jun-Bao (Tianjin University)

Contribution ID: **21**

Type: **Invited talk**

Conformal anomalies a vs c

Tuesday, 23 November 2021 15:30 (30 minutes)

Presenter: SONG, Jaewon (KAIST)

Contribution ID: **22**   Type: **Invited talk**

Defect Extremal Surface and Partial Reduction

Friday, 26 November 2021 13:30 (30 minutes)

Presenter: ZHOU, Yang (Fudan U)

Contribution ID: **23**   Type: **Invited talk**

Compactness, Finiteness, and the Swampland

Friday, 26 November 2021 09:30 (30 minutes)

We demonstrate the validity of the String Lamppost Principle – that all consistent theories of quantum gravity are in the String Landscape – for supersymmetric theories in d > 6 using compactness and connectedness of the moduli space of small instantons, as well as the classification of the associated Coulomb branch. We also argue that some of the swampland conjectures are viewed as the prism of the finiteness of black hole entropy.

Presenter: HAMADA, Yuta (Harvard)

Contribution ID: **24**   Type: **Invited talk**

Emergent Supersymmetry on the Edges

Wednesday, 24 November 2021 09:30 (30 minutes)

Presenter: LEE, Sungjay (KIAS)

Contribution ID: **25**   Type: **Invited talk**

On Galilean Conformal Bootstrap

Monday, 22 November 2021 11:15 (30 minutes)

In the past decade, the renaissance of conformal bootstrap has enriched our understanding of conformal field theory and AdS/CFT correspondence. It would be interesting to develop the bootstrap program for other field theories with conformal-like symmetries. In this talk, I will introduce our studies on Galilean conformal bootstrap in the past few years.

Presenter: CHEN, Bin (PKU)

Contribution ID: **26**   Type: **Invited talk**

M2-branes & Quantum Curves

Thursday, 25 November 2021 11:00 (30 minutes)

Presenter: MORIYAMA, Sanefumi (Osaka City U)

Contribution ID: **27**   Type: **Invited talk**

FZZT branes in JT gravity and topological gravity

Tuesday, 23 November 2021 17:00 (30 minutes)

Presenter: OKUYAMA, Kazumi (Shinshu U)

Contribution ID: **28** Type: **Invited talk**

3D rank 0 N=4 SCFTs and Non-unitary TQFTs

Tuesday, 23 November 2021 17:30 (30 minutes)

Presenter: GANG, Dongmin (Seoul National U)

Contribution ID: **29**   Type: **Invited talk**

What happens when conifold transitions occur at the conifold singularities associated with matter generation in F-theory?

Wednesday, 24 November 2021 10:00 (30 minutes)

A conifold is a singular Calabi-Yau 3-fold of the simplest type, and has played important roles in various aspects of string theory. In fact, in F-theory, conifold singularities are quite commonplace; conifold singularities typically appear, in "split models", in most places where charged matter is generated. We show that the split/non-split transition is, except in certain exceptional cases, a conifold transition from the resolved to the deformed side, associated with the conifold singularities emerging where the codimension-one singularity is enhanced to D_{2k+2} ($k \geq 1$) or E_7. This clarifies the origin of nonlocal matter in the non-split models, which has been a mystery for many years.

Presenter: MIZOGUCHI, Shun'ya (KEK)

Contribution ID: **30**   Type: **Invited talk**

5d/6d Wilson loops from blowups

Thursday, 25 November 2021 09:30 (30 minutes)

Presenter: KIM, Hee-Cheol (POSTECH)

Contribution ID: **31**   Type: **Invited talk**

Gravitational Positivity Bounds and the Standard Model

Thursday, 25 November 2021 10:00 (30 minutes)

Positivity bounds on low-energy scattering amplitudes provide a criterion for a low-energy effective theory to have a standard UV completion. When applied to gravitational theories, they are expected to imply non-trivial quantum gravity constraints on quantum field theory models, i.e., swampland conditions. In this talk I will introduce recent developments on positivity bounds in gravitational theories and their implications for the Standard Model of particle physics.

Presenter: NOUMI, Toshifumi (Kobe U)

Contribution ID: **32**   Type: **Invited talk**

Topological pseudo entropy

Friday, 26 November 2021 10:00 (30 minutes)

Presenter: NISHIOKA, Tatsuma (YITP)

Contribution ID: **33**   Type: **Invited talk**

Causal Shadow and modular flow in AdS/CFT: the degenerate case

Friday, 26 November 2021 11:30 (30 minutes)

Presenter: WANG, Huajia (KITP)

Contribution ID: **34**   Type: **Invited talk**

Kramers-Wannier-like duality defects in (3 + 1)d gauge theories

Friday, 26 November 2021 15:00 (30 minutes)

The 1+1d Majorana fermion has a chiral Z2 symmetry, which is "broken" after gauging the non-chiral fermion parity due to their mixed anomaly. However, it is better to think that the symmetry is preserved even after gauging, in the form of topological defect, and the defect implements the Kramers-Wannier self-duality of the Ising CFT. In this talk I will talk about an analogue of this story for some examples of (3+1)d continuum QFTs. In particular I will explicitly construct topological defects associated to self-dualities under gauging a one-form (aka center) symmetry of QFTs.

Presenter: OHMORI, Kantaro (U of Toyo)

Contribution ID: **35**　　　　　　　　　　　　　　　　　　Type: **Invited talk**

A BMS-invariant free scalar model

Friday, 26 November 2021 15:30 (30 minutes)

The BMS (Bondi-van der Burg-Metzner-Sachs) symmetry arises as the asymptotic symmetry of flat spacetime at null infinity, suggesting a holographic duality between Einstein gravity and some quantum field theory with BMS invariance. In particular, the BMS algebra in three dimensions is generated by super-rotation generators which form a Virasoro sub-algebra, together with mutually-commuting super-translation generators. In this talk, I will first review flat holography in three dimensions, and then describe a free scalar model in two dimensions exhibiting BMS symmetry.

Presenter:　SONG, Wei (Tsinghua U)

Contribution ID: **36**   Type: **Short talk at the venue**

Order defect in 4D Chern-Simons theory

Monday, 22 November 2021 11:45 (15 minutes)

The 4D Chern-Simons (CS) theory is a unifying framework of 2D integrable field theories and lattice models. Derivations of integrable field theories from 4D CS theories are based on two classes: order and disorder defects. We develop the aspect of order defects, and derive integrable field theories such as the Faddeev-Reshetikhin model. This approach further admits integrable deformations of the model by adopting appropriate boundary conditions.

Presenter: FUKUSHIMA, Osamu (Kyoto University)

Session Classification: Short talks

Contribution ID: **37** Type: **Short talk online (Zoom)**

The AdS5×S5 superstring from 4D Chern-Simons theory

Monday, 22 November 2021 12:00 (15 minutes)

Recently, a unified picture to describe integrable systems has been established by Costello, Witten and Yamazaki. In the case of 2D integrable field theories, Costello and Yamazaki proposed that by starting from a certain 4D Chern-Simons (CS) theory, one can construct classically integrable field theories systematically by taking a meromorphic 1-form and adopting an appropriate boundary condition. In this talk, I will explain how the AdS5×S5 supercoset sigma model and its integrable deformations can be reproduced from a 4D CS theory by generalizing the procedure for the 2D principal chiral model developed by Delduc et al [arXiv:1909.13824].
This talk is based on works (2003.07309, 2005.04950) with Osamu Fukushima and Kentaroh Yoshida in Kyoto University.

Presenter: SAKAMOTO, Junichi

Session Classification: Short talks

Contribution ID: **38**   Type: **Short talk online (Zoom)**

A physicist-friendly reformulation of the APS index (on a lattice)

Monday, 22 November 2021 14:15 (15 minutes)

The Atiyah-Singer(AS) index theorem on a closed manifold is well understood and appreciated in physics. On the other hand, the Atiyah-Patodi-Singer(APS) index, which is an extension to a manifold with boundary, is physicist-unfriendly, in that it is formulated with a nonlocal boundary condition. Recently we (3 physicists and 3 mathematicians) proved that the same index as APS is obtained from the domain-wall fermion Dirac operator. Our theorem indicates that the index can be expressed without any nonlocal conditions, in such a physicist-friendly way that application to the lattice gauge theory is straightforward. The domain-wall fermion provides a natural mathematical foundation for understanding the bulk-edge correspondence of the anomaly inflow.

Presenter: FUKAYA, Hidenori (Osaka U)

Session Classification: Short talks

Contribution ID: **39**   Type: **Short talk at the venue**

Chaotic string dynamics in deformed [1,1]

Monday, 22 November 2021 14:30 (15 minutes)

Recently, Arutyunov, Bassi and Lacroix have shown that 2D non-linear sigma model with a deformed T1,1 background is classically integrable. This background includes a Kalb-Ramond two-form with a critical value. Then the sigma model has been conjectured to be non-integrable when the two-form is off critical. With a winding string ansatz, the system is reduced to a dynamical system described by a set of ordinary differential equations. Then we find classical chaos by numerically computing Poincaré sections and Lyapunov spectra for some initial conditions.

Presenter: KUSHIRO, Shodai (Kyoto U)

Session Classification: Short talks

Contribution ID: **41**   Type: **Short talk at the venue**

Topological defect junctions in 4-dimensional pure Z2 gauge theory

Monday, 22 November 2021 15:45 (15 minutes)

Recently, there are many studies about expanding concepts of symmetries and its applications. One of the directions is to treat non-invertible objects as ""symmetry"". We explicitly constructed a non-invertible defect of duality and a 1-form center symmetry defect in 4D lattice pure Z2 gauge theory. In this talk, we will describe the junction that occurs where the two defects overlap. The duality operator is non-invertible, so it is not necessary to be invariant under deformations that change the topology. We can make the topological relational closed for such deformations including 1-form center symmetry defects and junctions. This work is in collaboration with M.koide and S.Yamaguchi.

Presenter: NAGOYA, Yuta (Osaka U)

Session Classification: Short talks

Contribution ID: **42**

Type: **Short talk online (Zoom)**

Three-Body Effective Potential in General Relativity at 2PM and Resulting PN Contributions

Monday, 22 November 2021 16:00 (15 minutes)

In this talk, I will talk about the Post-Newtonian expansion of the gravitational three-body effective potential at the 2nd Post-Minkowskian order. At order 2PM a formal result is given in terms of a differential operator acting on the maximal generalized cut of the one-loop triangle integral. We perform the PN expansion unambiguously at the level of the integrand. Finding agreement with the 2PN three-body potential after integration, we explicitly present new $G^2 v^4$-contributions at order 3PN and outline the generalization to $G^2 v^{2n}$. The integrals that represent the essential input for these results respect a non-local Yangian symmetry and are obtained by applying the recent bootstrapping method directly to their ε-expansion around three dimensions. The coordinate space Yangian generator that we employ to obtain these integrals can be understood as a special conformal symmetry in a dual momentum space. If time permits, I will also talk about our work in progress on finding such integrals of generic half-integer propagator powers.

Presenter: WANG, Tianheng (Institute of Theoretical Physics of the Chinese Academy of Science, Humboldt University of Berlin)

Session Classification: Short talks

Contribution ID: **43**   Type: **Short talk online (Zoom)**

On compatibility between Conformal symmetry and Continuous higher-form symmetries

Monday, 22 November 2021 17:00 (15 minutes)

We will discuss the compatibility between the conformal symmetry together with the unitarity and the continuous higher-form symmetries. We show that the d-dimensional unitary conformal field theories are not consistent with continuous p-form symmetries for certain (d,p), assuming that the corresponding conserved current is a conformal primary operator. We further discuss several dynamical applications of this constraint. In particular, we show that some gapless, scale invariant quantum field theories are not CFTs.

Presenter: ZHENG, Yunqin (Kavli IPMU, ISSP, U.Tokyo)

Session Classification: Short talks

Contribution ID: 44   Type: **Short talk online (Zoom)**

Multi-Soliton Dynamics of Anti-Self-Dual Gauge Fields

Monday, 22 November 2021 17:15 (15 minutes)

We study dynamics of multi-soliton solutions of anti-self-dual Yang-Mills equations for G = GL(2, C) in four-dimensional spaces. The one-soliton solution can be interpreted as a codimension-one soliton in four-dimensional spaces because the principal peak of action density localizes on a three-dimensional hyperplane. We call it the soliton wall. We prove that in the asymptotic region, the n-soliton solution possesses n isolated localized lumps of action density, and interpret it as n intersecting soliton walls. More precisely, each action density lump is essentially the same as a soliton wall because it preserves its shape and ""velocity"" except for a position shift of principal peak in the scattering process. The position shift results from the nonlinear interactions of the multi-solitons and is called the phase shift. We calculate the phase shift factors explicitly and find that the action densities can be real-valued in three kind of signatures. Finally, we show that the gauge group can be G = SU(2) in the Ultrahyperbolic space U (the split signature (+,+,-,-). This implies that the intersecting soliton walls could be realized in all region in N=2 string theories. It is remarkable that quasideterminants dramatically simplify the calculations and proofs.

Presenter: HUANG, Shan-Chi (Nagoya U)

Session Classification: Short talks

Contribution ID: **45**   Type: **Short talk online (Zoom)**

Regge conformal blocks from the Rindler-AdS black hole and the pole-skipping phenomena

Tuesday, 23 November 2021 11:30 (15 minutes)

We study a holographic construction of conformal blocks in the Regge limit of four-point scalar correlation functions by using coordinates of the two-sided Rindler-AdS black hole. As a generalization of geodesic Witten diagrams, we construct diagrams with four external scalar fields in the Rindler-AdS black hole by integrating over two half-geodesics between the centers of Penrose diagrams and points at the AdS boundary. We demonstrate that late-time behaviors of the diagrams coincide with the Regge behaviors of conformal blocks. We also point out their relevance with the pole-skipping phenomena by showing that the near-horizon analysis of symmetric traceless fields with any integer spin in the Rindler-AdS black hole can capture the Regge behaviors of conformal blocks.

Presenter: NISHIDA, Mitsuhiro (Gwangju Institute of Science and Technology)

Session Classification: Short talks

Contribution ID: **46**　　　　　　　　　　　　　　　　Type: **Short talk online (Zoom)**

Aspects of 5d Seiberg-Witten Theories on S^1

Tuesday, 23 November 2021 11:45 (15 minutes)

We study the 5D N=1 Yang-Mills theory compactified on a circle, focusing on the Coulomb branch. The compactified theory has a very complicated wall-crossing pattern, but on the other hand, there seems to be no wall-crossing for 5d theory. In this talk, I will keep track of the wall-crossing phenomenon from compactified theory to its 5d limit, and see how the wall-crossing turns off. We find the elliptic genera of magnetic BPS strings do wall-cross and retain the memory of 4d wall-crossings.

Presenter: JIA, Qiang (KIAS)

Session Classification: Short talks

Contribution ID: **47**   Type: **Short talk online (Zoom)**

E-strings, E_8 Weyl invariant Jacobi forms and Conway invariant Jacobi forms on Leech lattice

Tuesday, 23 November 2021 14:30 (15 minutes)

In 1992 Wirthmuller showed that for any root system of type A,B,C,D,G,F and E6,E7, the ring of weak Jacobi forms invariant under Weyl group is a polynomial algebra. However, it has recently been proved that for E8 the ring is not a polynomial algebra. I will present how to describe E8 Weyl invariant Jacobi forms properly, both weak and holomorphic, and also how to used them in the modular bootstrap of elliptic genera of E-strings. For example, we prove that for any Weyl invariant E8 Jacobi form \phi_t of index t the function E4^[t/5]\Delta^[5t/6]\phi_t can be expressed uniquely as a polynomial in E4, E6 and Sakai's nine Ai, Bj forms. This is based on a joint work with Haowu Wang arXiv:2109.10578.

Presenter: SUN, Kaiwen (KIAS)

Session Classification: Short talks

Contribution ID: 48   Type: **Short talk online (Zoom)**

Wall-crossing of TBA equations and WKB periods for the higher order ODE

Tuesday, 23 November 2021 14:45 (15 minutes)

We study the WKB periods for the $(r+1)$-th order ordinary differential equation (ODE) with polynomial potential which is obtained by the Nekrasov-Shatashvili limit of (A_r, A_N) Argyres-Douglas theory in Omega background. We derive the thermodynamic Bethe ansatz (TBA) equations governing the exact WKB periods, which provides a generalization of the ODE/IM correspondence. Varying the moduli space parameters of the potential, one observes the wall-crossing of the TBA equations. When the potential is monomimal type, we show the TBA equations obtained from the (A_2, A_2) and (A_2, A_3)-type ODE lead to the D_4 and E_6-type TBA equations respectively. This talk is based on the work (hep-th/2104.13680) in collaboration with Katsushi Ito, Takayasu Kondo and Kohei Kuroda and the work in progress.

Presenter: SHU, Hongfei (Beijing Institute of Mathematical Sciences and Applications (BIMSA))

Session Classification: Short talks

Contribution ID: **49**

Type: **Short talk at the venue**

An alternative bulk construction by the flow equation

Tuesday, 23 November 2021 16:00 (15 minutes)

We propose a new method to construct the bulk theory in $d + 1$ dimensions from d dimensional field theory, using a so-called fundamental flow. We show that the conformal symmetry at the boundary is converted to the AdS isometry in the bulk even at the quantum level. We define the metric operators, whose VEV describes the AdS space. We derive the GKP-Witten formula for the bulk scalar field. We finally show that the metric becomes asymptotic AdS in the presence of the scalar primary at the boundary.

Presenter: AOKI, Sinya (YITP)

Session Classification: Short talks

Contribution ID: **50**   Type: **Short talk at the venue**

Free energy and defect C-theorem in free theory

Tuesday, 23 November 2021 16:15 (15 minutes)

We describe conformal defects of p dimensions in a free theory on a d-dimensional flat space as boundary conditions on the conformally flat space Hp+1×Sd−p−1. We classify two types of boundary conditions, Dirichlet type and Neumann type, on the boundary of the subspace Hp+1 which correspond to the types of conformal defects in the free theory. We find Dirichlet boundary conditions always exist while Neumann boundary conditions are allowed only for defects of lower codimensions. Our results match with a recent classification of the non-monodromy defects, showing Neumann boundary conditions are associated with non-trivial defects. We check this observation by calculating the difference of the free energies on Hp+1×Sd−p−1 between Dirichlet and Neumann boundary conditions. We also examine the defect RG flows from Neumann to Dirichlet boundary conditions and provide more support for a conjectured C-theorem in defect CFTs.

Presenter: SATO, Yoshiki (Tohoku U)

Session Classification: Short talks

Contribution ID: **51**   Type: **Short talk at the venue**

Nonvanishing finite scalar mass in flux compactification

Wednesday, 24 November 2021 11:00 (15 minutes)

We study possibilities to realize a nonvanishing finite Wilson line (WL) scalar mass in flux compactification. Generalizing loop integrals in the quantum correction to WL mass at one-loop, we derive the conditions for the loop integrals and mode sums in one-loop corrections to WL scalar mass to be finite. We further guess and classify the four-point and three-point interaction terms satisfying these conditions. As an illustration, the nonvanishing finite WL scalar mass is explicitly shown in a six dimensional scalar QED by diagrammatic computation and effective potential analysis. This is the first example of finite WL scalar mass in flux compactification.

Presenter: HIROSE, Takuya (Osaka City U)

Session Classification: Short talks

Contribution ID: **52**   Type: **Short talk at the venue**

Target space duality of non-supersymmetric string theory

Wednesday, 24 November 2021 11:15 (15 minutes)

The target space duality of string theory without spacetime supersymmetry, which is constructed by splitting the Narain lattice by a shift-vector with order 2, is investigated. We show that the duality symmetry of such a model is obtained by imposing a congruence condition on $O\left(d_L, d_R, \mathbb{Z}\right)$, that is, the non-supersymmetric string model is invariant under a congruence subgroup of $O\left(d_L, d_R, \mathbb{Z}\right)$.

Presenter: NAKAJIMA, Sota (Osaka City U)

Session Classification: Short talks

Contribution ID: **53**   Type: **Short talk online (Zoom)**

Basis decompositions of genus-one string integrals

Thursday, 25 November 2021 11:30 (15 minutes)

One-loop scattering amplitudes in string theories involve configuration-space integrals over genus-one surfaces with coefficients of Kronecker-Eisenstein series in the integrand. A conjectural basis of integrands under Fay identities and integration by parts was recently constructed out of chains of Kronecker-Eisenstein series. In this work, we decompose a variety of more general genus-one integrands into the conjectural chain basis. The explicit form of the expansion coefficients is worked out for infinite families of cases where the Kronecker-Eisenstein series form loops. Our results can be used to simplify multiparticle scattering amplitudes in supersymmetric, heterotic and bosonic string theories. The multitude of basis reductions in this work strongly validate the recently proposed chain basis.

Presenter: ZHANG, Yong (Perimeter institute)

Session Classification: Short talks

Contribution ID: **54**   Type: **Short talk online (Zoom)**

Worldsheet Variables for Cluster Configuration Spaces

Thursday, 25 November 2021 11:45 (15 minutes)

We introduce worldsheet variables for a certain moduli space associated with a Dynkin diagram of finite type. The construction is based on gluing a pair of A-type quivers. We find new nonlinear factors that characterize such spaces as hypersurface arrangement complement. We study various topological properties using a finite-field method and propose conjectures about quasi-polynomial point count, dimensions of cohomology, and Euler characteristics for the Dn space up to n=10. These new variables have applications for string integrals, cluster alphabets, etc.

Presenter: ZHAO, Peng (Institute of Theoretical Physics, Chinese Academy of Sciences)

Session Classification: Short talks

Contribution ID: **55**   Type: **Short talk at the venue**

Complex Langevin studies of the emergent space-time in the type IIB matrix model

Thursday, 25 November 2021 16:00 (15 minutes)

We perform numerical studies of the type IIB matrix model, which was proposed as a nonperturbative formulation of superstring theory in 1996. The complex Langevin method is used in order to overcome the sign problem, which occurs in applying Monte Carlo methods. In particular, we investigate how the signature of the space-time is determined dynamically in this model, and discuss the possibility of the emergence of the (3+1)D expanding universe.

Presenter: HATAKEYAMA, Kohta (KEK)

Session Classification: Short talks

Contribution ID: **56**   Type: **Short talk online (Zoom)**

Entanglement entropy in Schwarzschild spacetime

Friday, 26 November 2021 11:00 (15 minutes)

Recently, it is proposed that the Hawking radiation contains the information of a region inside the horizon called islands. In the calculation of the entanglement entropy of the Hawking radiation, the dominant contribution comes from the configuration with wormholes between replica geometries. Thus, the entanglement entropy of the Hawking radiation effectively includes the contribution from the island. In this talk, I will discuss the entanglement entropy in the Schwarzschild spacetime, and its relation to the vacuum state of matter fields.

Presenter: MATSUO, Yoshinori (Kyoto U)

Session Classification: Short talks

Contribution ID: **57**   Type: **Short talk at the venue**

Entanglement entropy in interacting field theories

Friday, 26 November 2021 11:15 (15 minutes)

Entanglement entropy (EE) in field theory has been discussed as a measure for quantum entanglement between spatially separated regions. While there are a lot of studies on EE in CFT and free theories, EE in general interacting field theories is of interest in an attempt to associate the effect of the entanglement with low-energy physics. In this talk, I introduce our study on EE in interacting field theories with a subregion of a half space. There, some contributions to EE can be expressed in terms of renormalized correlators of fundamental and composite operators. Moreover, by combining the result with the notion of the Wilsonian RG, we discuss the possibility that EE relevant to low-energy effective theories consists only of those contributions.
This talk is based on 2103.05303, 2105.02598, 2105.14834 and our recent work in progress.

Presenter: SAKAI, Katsuta (KEK)

Session Classification: Short talks

Contribution ID: **58**
Type: **Short talk at the venue**

Target space entanglement in quantum mechanics of fermions and matrices

Friday, 26 November 2021 14:00 (15 minutes)

I will introduce the notion of target space entanglement. Quantum entanglement is closely related to the structure of spacetime in quantum gravity. For quantum field theories or statistical models, we usually consider the base space entanglement. However, target space instead of base space sometimes directly connects to our spacetime, for example, perturbative string theories. We thus need target space entanglement. To define the target space entanglement, we have to generalize the definition of the conventional entanglement entropy. I will explain this generalization and apply it to the first quantized particles, in particular, fermions.

Presenter: SUGISHITA, Sotaro (Nagoya U)

Session Classification: Short talks

Contribution ID: **59**   Type: **Short talk at the venue**

Quantum information metric in the gauge/gravity correspondence

Friday, 26 November 2021 14:15 (15 minutes)

We study how information geometry is described by bulk geometry in the gauge/gravity correspondence. We consider a quantum information metric that measures the distance between the ground states of two field theories, where one is obtained by perturbing the other. We find a universal formula that represents the quantum information metric in terms of back reaction to the bulk geometry. This talk is based on JHEP 06 (2020) 107 (arXiv:2002.11365) and a forthcoming paper.

Presenter: YAMASHIRO, Kazushi (Shizuoka University)

Session Classification: Short talks

Contribution ID: **60**   Type: **Short talk online (Zoom)**

Ginzburg-Landau effective action for a fluctuating holographic superconductor

Friday, 26 November 2021 16:00 (15 minutes)

Under holographic prescription for Schwinger-Keldysh closed time contour for non-equilibrium system, we consider fluctuation effect of the order parameter in a holographic superconductor model. Near the critical point, we derive the time-dependent Ginzburg-Landau effective action governing dynamics of the fluctuating order parameter. In a semi-analytical approach, the time-dependent Ginzburg-Landau action is computed up to quartic order of the fluctuating order parameter, and first order in time derivative.

Presenter: FUJITA, Mitsutoshi (Sun Yat-Sen University)

Session Classification: Short talks

Contribution ID: **61**   Type: **Short talk online (Zoom)**

Holographic β function in de Sitter space

Friday, 26 November 2021 16:45 (15 minutes)

We investigate infrared logarithms in inflationary Universe from holographic perspective. We derive gravitational Fokker-Planck and Langevin equations to investigate the time evolution of the de Sitter entropy $S = \pi/G_N H^2(t)$. $H(t)$ is the time dependent effective Hubble parameter and G_N is the Newton's constant. Our approach focuses on the conformal modes to respect local Lorentz symmetry. In term of the curvature perturbations , it is shown to be consistent with δN formalism. Under the Gaussian approximation, we obtain the dynamical β function of $g = 1/S$. The dimensionless gravitational coupling g is asymptotically free toward the future. It also possesses the ultraviolet fixed point indicating that the Universe begun with the de Sitter expansion at the Planck scale with $\epsilon = 0$. We further interpret inflationary Universes as the UV complete composite states. Since our analysis is trustable for small g, our conclusion is that inflationary universe is consistent in the semiclassical regime.

Presenter: KITAZAWA, Yoshihisa (KEK)

Session Classification: Short talks

Contribution ID: **62**   Type: **Poster presentation**

Hawking radiation from squashed Kaluza-Klein black holes with quantum gravity effects

Thursday, 25 November 2021 16:45 (1h 15m)

We study the Hawking radiation from the five-dimensional charged static squashed Kaluza-Klein black hole by the tunneling of charged fermions and charged scalar particles, including the phenomenological quantum gravity effects predicted by the generalized uncertainty principle with the minimal measurable length. We derive corrections of the Hawking temperature to general relativity, which are related to the energy of the emitted particle, the size of the compact extra dimension, the charge of the black hole and the existence of the minimal length in the squashed Kaluza-Klein geometry. We show that the quantum gravity effect may slow down the increase of the Hawking temperature due to the radiation, which may lead to the thermodynamic stable remnant of the order of the Planck mass after the evaporation of the squashed Kaluza-Klein black hole. We also find that the sparsity of the Hawking radiation may become infinite when the mass of the squashed Kaluza-Klein black hole approaches its remnant mass.

Presenter: MATSUNO, Ken (Osaka City University)

Session Classification: Poster Session

Contribution ID: **63**   Type: **Poster presentation**

Higher derivative extension of the functional renormalization group

Thursday, 25 November 2021 16:45 (1h 15m)

We study higher derivative extension of the functional renormalization group (FRG).We consider the general form of the FRG equations for a scalar field that include higher functional derivatives with respect to the field. We show that the epsilon expansion around the Wilson-Fisher fixed point is indeed reproduced by the local potential approximation of the general FRG equations.

Presenter: TANAKA, Gota (Shizuoka University)

Session Classification: Poster Session

Contribution ID: **64**   Type: **Poster presentation**

Holographic index calculation for Argyres-Douglas and Minahan-Nemeschansky theories

Thursday, 25 November 2021 16:45 (1h 15m)

We calculate the superconformal indices of the N=2 superconformal field theories realized on N coincident D3-branes in 7-brane backgrounds with constant axiodilaton via the AdS/CFT correspondence. We include the finite-N corrections as the contribution of D3-branes wrapped around 3-cycles in the internal space. We take only single-wrapping contributions into account for simplicity. We also determine the orders of the next-to-leading corrections which we do not calculate. The orders are relatively high, and we obtain many trustable terms. We give the results for N=1,2,3 explicitly, and find nice agreement with known results.
Reference: arXiv:2110.14897

Presenter: MURAYAMA, Shuichi (Tokyo Institute of Technology)

Session Classification: Poster Session

Contribution ID: **65**   Type: **Poster presentation**

Non-split singularities and conifold transitions in F-theory

Thursday, 25 November 2021 16:45 (1h 15m)

In F-theory, if a fiber type of an elliptic fibration involves a condition that requires an exceptional curve to split into two irreducible components, it is called "split" or "non-split" type depending on whether it is globally possible or not. In the latter case, the gauge symmetry is reduced to a non-simply-laced Lie algebra due to monodromy. We show that the transition from a split to a non-split model is, except in certain exceptional cases, a conifold transition from the resolved to the deformed side, associated with the conifold singularities emerging at the codimension-two loci where the codimension-one singularity is enhanced to $D_{2k+2}(k \geq 1)$ or E_7. This clarifies the origin of non-local matter in the non-split case, which has been a mystery for many years.
Reference: arXiv:2108.10136 [hep-th], 2008.09272 [hep-th]

Presenter: KURAMOCHI, Rinto (SOKENDAI/KEK)

Session Classification: Poster Session

Contribution ID: **66**   Type: **not specified**

Opening

Monday, 22 November 2021 09:30 (15 minutes)

Hiroshi Itoyama (Osaka City U)

Session Classification: Opening

Contribution ID: **67**   Type: **not specified**

Closing

Friday, 26 November 2021 18:00 (15 minutes)

Satoshi Iso (KEK) and Kimyeong Lee (KIAS)

Session Classification: Closing