PNU workshop on Composite Higgs : Lattice study and all

Report of Contributions

Contribution ID: **1**   Type: **not specified**

Registration

Monday 19 February 2024 14:00 (30 minutes)

Primary author: HONG, Deog Ki (Pusan National University (KR))

Presenter: HONG, Deog Ki (Pusan National University (KR))

Session Classification: afternoon 1

Contribution ID: **2**   Type: **not specified**

Non-perturbative aspects of composite Higgs models

Monday 19 February 2024 14:30 (1 hour)

Abstract: We live in a golden age for the study of non-perturbative aspects of field theories. Developments in effective field theory, gauge-gravity dualities, and lattice field theories make it possible to study with unprecedented accuracy models of new physics with strongly coupled origin, with relevant examples taken from the literature on composite Higgs models. We discuss in particular the current programme of exploration of lattice Sp(2N) gauge theories, highlighting some of its results, and proposing future directions of study.

Primary author: Prof. PIAI, Maurizio (Swansea)

Presenter: Prof. PIAI, Maurizio (Swansea)

Session Classification: afternoon 1

Contribution ID: **5**   Type: **not specified**

Vacuum misalignment for electroweak symmetry breaking

Tuesday 20 February 2024 09:30 (1 hour)

Abstract: We discuss ways to trigger vacuum misalignment in strongly coupled gauge theories of interest to electroweak symmetry breaking. In these models the Higgs boson is realized as a pseudo-Nambu-Goldstone boson and acquires a vacuum expectation value due to the interaction of the Standard Model fermions with the fermionic bound states of the strong sector. We present sum rules that can be used to identify the cases where vacuum misalignment occurs with an eye on possible applications to lattice simulations.

Primary author: FERRETTI, Gabriele

Presenter: FERRETTI, Gabriele

Session Classification: morning 1

Contribution ID: 6   Type: **not specified**

TBA

Tuesday 20 February 2024 11:00 (1 hour)

Primary author: HASENFRATZ, Anna (university of colorado boulder)

Presenter: HASENFRATZ, Anna (university of colorado boulder)

Session Classification: morning 2

Contribution ID: **7**   Type: **not specified**

Composite Dark Matter Models from Sp(2N) Gauge Theory

Tuesday 20 February 2024 14:30 (1 hour)

Primary author: ZIERLER, Fabian (Swansea University)

Presenter: ZIERLER, Fabian (Swansea University)

Session Classification: afternoon 3

Contribution ID: **8**   Type: **not specified**

Free discussions

Tuesday 20 February 2024 16:00 (2 hours)

Primary author: FERRETTI, Gabriele

Presenter: FERRETTI, Gabriele

Session Classification: afternoon 4

Contribution ID: **9**   Type: **not specified**

Lattice simulations with domain wall fermions

Wednesday 21 February 2024 09:30 (1 hour)

We present the basics and the current status of dynamical ensemble generation and measurements with Domain Wall Fermions. Experiences in controlling the extent of the 5th dimension and the residual symmetry breaking is discussed.

Primary author: JUNG, Chulwoo (Brookhaven National Laboratory)

Presenter: JUNG, Chulwoo (Brookhaven National Laboratory)

Session Classification: morning 3

Contribution ID: **10**   Type: **not specified**

Reproducibility efforts in Sp(2N)

Wednesday 21 February 2024 11:00 (1 hour)

Abstract: Explicit reproducibility—the ability for others to obtain the same results by analysing the same data using the same techniques—is becoming an increasing requirement from funders and journals. For the last two years, our collaboration has sought to provide with each journal publication associated data and software, such that the plots and tables presented in the paper can be regenerated precisely from the corresponding data. In this talk, after motivating this effort, I will describe the process we have followed to date and the releases that have been published, including some of the challenges that this approach has raised. I will then discuss possible future directions of travel, to improve both the efficiency and the effectiveness of this process.

Primary author: BENNETT, Ed

Presenter: BENNETT, Ed

Session Classification: Morning 4

Contribution ID: **11** Type: **not specified**

TBA

Wednesday 21 February 2024 14:30 (1 hour)

Primary author: Dr LEE, Jong-Wan (IBS-CTPU)

Presenter: Dr LEE, Jong-Wan (IBS-CTPU)

Session Classification: Afternoon 5

Contribution ID: **12** Type: **not specified**

Discussions

Wednesday 21 February 2024 16:00 (1 hour)

Primary author: PIAI, Maurizio (Swansea)

Presenter: PIAI, Maurizio (Swansea)

Session Classification: Afternoon 6

Contribution ID: **13**   Type: **not specified**

Phenomenology of composite resonances in a realistic composite Higgs model

Thursday 22 February 2024 09:30 (1 hour)

Abstract: Composite Higgs models have been proposed and classified based on a confining gauge interactions and two species of fermions. The spectrum of such theories can be studied on the Lattice. I will discuss the phenomenology of various types of resonances which are always present in such models. Many states feature exotic quantum numbers and interesting final states that can be searched for at the LHC and future colliders.

Primary author: CACCIAPAGLIA, Giacomo (Centre National de la Recherche Scientifique (FR))

Presenter: CACCIAPAGLIA, Giacomo (Centre National de la Recherche Scientifique (FR))

Session Classification: morning 5

Contribution ID: **14**   Type: **not specified**

Uncovering doubly charged scalars with dominant three-body decays using machine learning

Thursday 22 February 2024 11:00 (1 hour)

Abstract: Many underlying models of a composite Higgs predict additional composite scalar resonances which can be searched for at the LHC. In this talk we present a survey of experimental constraints on pair-produced scalar resonances with decay channels motivated by underlying models of a composite Higgs. In the second part, we focus on a particular signature – pair-produced doubly-charged scalars with dominant three-body decays – and show how machine-learning based search strategies can improve the discovery reach at the LHC.

Primary author: FLACKE, Thomas Dieter (Korea Advanced Institute of Science and Technology (KR))

Presenter: FLACKE, Thomas Dieter (Korea Advanced Institute of Science and Technology (KR))

Session Classification: Morning 6

Contribution ID: **15**   Type: **not specified**

Lattice investigations of the chimera baryon spectrum in the Sp(4) gauge theory

Thursday 22 February 2024 14:30 (1 hour)

Abstract: We study the Sp(4) gauge theory coupled to hyperquark matter fields. This theory potentially serves as an ultraviolet completion of the Standard model in the framework of composite Higgs models that utilise partial compositeness to generate the top-quark mass. We focus on the spectroscopy of chimera baryons, which are composite states composed of two fundamental and one antisymmetric hyperquarks. The chimera baryons having the same quantum number as the top quark are the top partners, which effectively lift the mass of the top quark by mixing with it. Specifically, we investigate, in the quenched approximation, the three lowest-lying parity-even states: Λ_{CB}, Σ_{CB} (both with spin 1/2), and Σ^*_{CB} (spin 3/2). The spin-1/2 states are considered as top partner candidates. We extrapolate our results to the continuum and massless limits by applying an effective treatment inspired by Wilson chiral perturbation theory. This study sets the stage for our ongoing lattice simulations with the dynamical hyperquarks.

Primary author: Mr HSIAO, Paul (NYMCTU)

Presenter: Mr HSIAO, Paul (NYMCTU)

Session Classification: Afternnon 7

Contribution ID: **16**   Type: **not specified**

Finite volume spectroscopy on the lattice using the HLT method

Thursday 22 February 2024 16:00 (1 hour)

Abstract: Spectroscopy is a fundamental matter in lattice gauge theories. In this talk, I will inspect a new technique used to perform finite volume spectroscopy, by fitting spectral densities. This will be shown, giving an overview of how one provides an estimate for spectral densities, and how to fit them. This will be done focusing on a mixed representation (fundamental and two-index antisymmetric fermions) Sp(4) gauge theory as a case study. Systematic sources of errors and comparisons with GEVP results will be discussed as well.

Primary author: Mr FORZANO, Niccolo (Swansea)

Presenter: Mr FORZANO, Niccolo (Swansea)

Session Classification: Afternoon 8

Contribution ID: **17**   Type: **not specified**

Discussions

Thursday 22 February 2024 17:00 (1 hour)

Primary author: Dr LEE, Jong-Wan (IBS-CTPU)

Presenter: Dr LEE, Jong-Wan (IBS-CTPU)

Session Classification: Afternoon 8

Contribution ID: 18   Type: **not specified**

Gauging the Maximal Compact Subgroup of a Simple Lie Group

Monday 19 February 2024 16:00 (1 hour)

Abstract: I will consider a class of theories where the gauge group K is the maximal compact subgroup of a non-compact simple group G (e.g., K=U(1) and G=SU(1,1)). The matter fields are fermions in a unitary representation of G which decomposes to an infinite sum of irreps of K. The Zeta-function method regularizes the infinite sum over the fermions in loop diagrams. Some of these gauge theories (even the abelian one!) are asymptotically free and have an IR stable fixed point. Could Quarks and leptons be bound states of such a gauge theory?

Primary author: RAJEEV, Sarada (University of Rochester)

Presenter: RAJEEV, Sarada (University of Rochester)

Session Classification: afternoon 2

Contribution ID: **19** Type: **not specified**

Zoom presentations

Wednesday 21 February 2024 17:00 (1 hour)

Primary authors: LUCINI, Biagio; Prof. LIN, C.-J. David (National Yang Ming Chiao Tung University); VADACCHINO, Davide

Presenters: LUCINI, Biagio; Prof. LIN, C.-J. David (National Yang Ming Chiao Tung University); VADACCHINO, Davide

Session Classification: Afternoon 6