Gravitational Wave Probes of Physics Beyond Standard Model

Report of Contributions

https://indico.nitep.omu.ac.jp/e/130

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

What is the source of the gravitational waves detected by NANOGrav and other PTA experiments?

Monday, 6 November 2023 09:50 (40 minutes)

The most conservative interpretation of the nHz gravitational waves discovered by NANOGrav and other Pulsar Timing Array (PTA) Collaborations is astrophysical, namely that they arise from supermassive black hole (SMBH) binaries. However, alternative cosmological models have been proposed, including cosmic strings, phase transitions, domain walls, primordial fluctuations and "audible" axions. We compare how well these different hypotheses fit the NANOGrav data, both in isolation and in combination with SMBH binaries, and address the questions: Which interpretations fit the data best, and which are disfavoured? We also discuss experimental signatures that can help discriminate between different sources of the PTA GW signal, including fluctuations in the signal strength between frequency bins, individual sources and how the PTA signal extends to higher frequencies.

Presenter: ELLIS, John (King's College London)

Session Classification: Opening & Morning session

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

Search for cosmological phase transitions through their gravitational wave signals

Monday, 6 November 2023 10:30 (30 minutes)

We are currently witnessing the dawn of a new era in astrophysics and cosmology, started by the first LIGO/Virgo/KAGRA observations of Gravitational Waves (GW). Very recently, also the detection of a stochastic background of GWs at very low frequencies was announced by the Pulsar Timing Array collaborations. In this talk, I will discuss how such signals are produced in cosmological phase transitions examine the possible implications of current data for this source as well as the prospects for detection in the upcoming next generation of GW experiments.

Presenter: LEWICKI, Marek (University of Warsaw)

Session Classification: Opening & Morning session

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

Electroweak baryogenesis, gravitational Waves and collider physics

Monday, 6 November 2023 11:30 (30 minutes)

We discuss physics of a model for electroweak baryogenesis, which satisfies theoretical and current experimental bounds. We then discuss how the model can be tested at future experiments at space-based gravitational wave interferometers, future colliders and also observation of primordial black holes.

Presenter: KANEMURA, Shinya (Osaka University)

Session Classification: Phase Transition

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

Gravitational Waves from Feebly Interacting Particles in a First Order Phase Transition

Thursday, 9 November 2023 15:20 (20 minutes)

First order phase transitions are well-motivated and extensively studied sources of gravitational waves (GWs) from the early Universe. The vacuum energy released during such transitions is assumed to be transferred primarily either to the expanding walls of bubbles of true vacuum, whose collisions source GWs, or to the surrounding plasma, producing sound waves and turbulence, which act as GW sources. In this Letter, we study an alternative possibility that has so far not been considered: the released energy gets transferred primarily to feebly interacting particles that do not admit a fluid description but simply free-stream individually. We develop the formalism to study the production of GWs from such configurations, and demonstrate that such GW signals have qualitatively distinct characteristics compared to conventional sources and are potentially observable with near-future GW detectors.

Presenter: JINNO, Ryusuke (RESCEU, The University of Tokyo)

Session Classification: Topological Defects

Contribution ID: **20** Type: **not specified**

Opening

Monday, 6 November 2023 09:40 (10 minutes)

Presenters: ITOYAMA, Hiroshi (NITEP); SUZUKI, Mitsuyo (Osaka Metropolitan University)

Session Classification: Opening & Morning session

Contribution ID: **21** Type: **not specified**

Relation between higher-dimensional gauge theories and gravitational waves from first-order phase transitions

Monday, 6 November 2023 12:00 (20 minutes)

In this work, we investigate the relation between higher-dimensional gauge theories and stochastic gravitational wave (GW) spectrums caused by their potential. It is known that the higher-dimensional gauge theories can induce the spontaneous symmetry breaking of the gauge symmetry. If the spontaneous symmetry breaking induces the first-order phase transition, the stochastic GW can be observed in fu- ture interferometers. Through our numerical calculations, we reveal that distinctive parameters in the theories, like the compact scale, can change the GW spectrums dynamically. We also discuss the verifiability of the theories through the GW ob- servations.

Presenter: HIROSE, Takuya (Kyushu University)

Session Classification: Phase Transition

Contribution ID: **22** Type: **not specified**

Inflation, primordial black holes, and gravitational wave background

Monday, 6 November 2023 14:00 (40 minutes)

I describe difficulty of primordial black hole formation in single field inflation and its relevance to stochastic gravitational wave observation.

Presenter: YOKOYAMA, Jun'ichi (RESCEU, The University of Tokyo)

Session Classification: Inflation

Contribution ID: **23** Type: **not specified**

Induced gravitational waves from inflaton oscillons

Monday, 6 November 2023 14:40 (30 minutes)

We present a new way to study cosmic inflation with gravitational waves. The gravitational signal is generated thanks to nonlinear structures in the inflaton field, called oscillons. This novel probe allows us to test models of inflation which are challenging to test with CMB experiments.

Presenter: LOZANOV, Kaloian (Kavli IPMU)

Session Classification: Inflation

Contribution ID: **24** Type: **not specified**

Gravitational waves from Gauss-Bonnet-corrected single-field inflation

Monday, 6 November 2023 15:10 (20 minutes)

I shall discuss gravitational wave signatures coming from a single-field inflation model in which the inflaton couples to the Gauss-Bonnet term. When the scalar potential term and the Gauss-Bonnet coupling term have different signs, a nontrivial fixed point arises, effectively inducing ultra slow-roll inflation. In this case, primordial black holes can form, together with enhanced scalar-induced gravitational waves. When the scalar potential term and the Gauss-Bonnet coupling term have same signs, on the other hand, there may exist a region where the Gauss-Bonnet term briefly dominates. In this case, the primordial inflationary gravitational waves can be enhanced. The detectability of the gravitational wave signals shall be discussed as well.

Presenter: KIM, Jinsu (Tongji University)

Session Classification: Inflation

Contribution ID: **25** Type: **not specified**

Gravitational Waves in Gauss-Bonnet Cosmologies

Monday, 6 November 2023 15:30 (20 minutes)

Gravitational Waves are an excellent way to probe the evolution of the universe way back before BBN. In particular, they offer a unique way to test modified Einstein equations. At the level of the equation of motion, the simplest example of Horndeski's theory containing higher-curvature terms is the dilaton-Einstein-Gauss-Bonnet (dEGB) the- ory, obtained by adding a specific quadratic combination of the curvature non-minimally coupled to a scalar field. In 2303.05813 we used the Weakly Interacting Massive Particle (WIMP) thermal decoupling scenario to explore dEGB theories. We now study the consequences of the modification of the propagation of GW when there is a different equation of state other than radiation. In some of the scenarios studied 2303.05813 we can put limits on the reheating temperature of the universe.

Presenter: VELASCO-SEVILLA, Liliana (Sogang University)

Session Classification: Inflation

Contribution ID: **26** Type: **not specified**

Closing in on primordial black holes

Tuesday, 7 November 2023 09:00 (30 minutes)

Observational constraints have closed off all but one mass-window for primordial black holes making up all of the dark matter, and there are some specific conditions required for their production in the first place. However, they remain a tantalising dark matter candidate because they require no new beyond the standard model particles and they would additionally provide a lot of information about the very early universe, particularly about inflation, if found. I will highlight some key recent results in the literature, with a focus on gravitational wave constraints, that describe how the viable parameter space for primordial black holes making up all of the dark matter is closing up, but also why it's worth checking every last window for signatures of their existence.

Presenter: COLE, Philippa (University of Milano-Bicocca)

Session Classification: Primordial Black Hole

Contribution ID: **27** Type: **not specified**

Primordial black hole formation from cosmological perturbations

Tuesday, 7 November 2023 09:30 (30 minutes)

After briefly reviewing the basics of primordial black holes, I would like to talk recent interesting works on this topic, mainly focused on those of our own.

Presenter: HARADA, Tomohiro (Rikkyo University)

Session Classification: Primordial Black Hole

Contribution ID: **28** Type: **not specified**

Probing the Origin of Primordial Black Holes using Gravitational Waves

Tuesday, 7 November 2023 10:00 (20 minutes)

In this article we investigate the cumulative stochastic gravitational wave spectra as a tool to gain insight on the creation mechanism of primordial black holes. We consider gravitational waves from the production mechanism of primordial black holes and from the gravitational interactions of those primordial black holes among themselves and other astrophysical black holes. We specifically focus on asynchronous bubble nucleation during a first order phase transition as the creation mechanism. We have used two benchmark phase transitions through which the primordial black holes and the primary gravitational wave spectra have been generated. We have considered binary systems and close hyperbolic interactions of primordial black holes with other primordial and astrophysical black holes as the source of the secondary part of the spectra. We have shown that this unique cumulative spectra have features which directly and indirectly depend on the specifics of the production mechanism.

Presenter: KUMAR BANERJEE, Indra (IISER Berhampur)

Session Classification: Primordial Black Hole

Contribution ID: **29** Type: **not specified**

Gravitational waves and physics of compact objects

Tuesday, 7 November 2023 10:50 (30 minutes)

Gravitational-wave observations have delivered a lot of information about black holes and neutron stars. Although most features are consistent with our current understanding about standard physics, severe astronomical uncertainties leave the room of possible deviations. Future detectors with high sensitivity will also allow us to investigate more extreme conditions, e.g., ultrahigh density. In this talk, I will review current knowledge and discuss possible future directions.

Presenter: KYUTOKU, Koutaro (Kyoto University)

Session Classification: Astrophysics

Contribution ID: **30** Type: **not specified**

Insight into the black holes in the Universe using Gravitational Waves

Tuesday, 7 November 2023 11:20 (30 minutes)

Gravitational waves are a new observational probe that can enable data-driven tests of the fundamental laws of physics that govern the Universe. I will discuss how this avenue can explore new frontiers that can shape our understanding of astrophysics and cosmology. I will show some latest findings using the current gravitational wave data and discuss novel techniques for discovering new physics from the upcoming multi-band gravitational wave observatories in synergy with the electromagnetic observations in the coming years.

Presenter: MUKHERJEE, Suvodip (Tata Institute of Fundamental Research)

Session Classification: Astrophysics

Contribution ID: **31** Type: **not specified**

PTAs: where we are and where we are going

Tuesday, 7 November 2023 11:50 (30 minutes)

By tracking the arrival times of radio pulses from a collection of pulsars in the Milky Way, several pulsar timing array collaborations have found evidence for a background of gravitational waves permeating our galaxy. In this talk, I will present this evidence and discuss possible paths forward to discriminate between astrophysical and cosmological interpretations of this background.

Presenter: MITRIDATE, Andrea (DESY)

Session Classification: Astrophysics

Contribution ID: **32** Type: **not specified**

Solitinic gravastars in a U(1) gauge-Higgs model

Tuesday, 7 November 2023 12:20 (20 minutes)

It is known that black holes have unsolved problems such as the singularity problem and the information loss problem. To solve these problems, as one of the black hole mimicker, gravastar is proposed. Gravastar is filled by cosmological constant, and therefore metric is de-Sitter inside the star. In usual, gravastar solutions are constructed by using Israel's junction condition. By the way, in classical field theories with global U(1) symmetry, it is known that there are classical solutions called nontopological solitons which the fields are spatially localized. Recently, we have found that there exists a nontopological soliton (NTS) in the coupled system of a complex scalar field, a U(1) gauge field, and a complex Higgs field. The NTSs are filled with the cosmological constant. In this presentation, we will show that a gravastar solution can be realized by coupling a gravitational field to this NTS solution and discuss its properties.

Presenter: OGAWA, Tatsuya (Rikkyo University)

Session Classification: Astrophysics

Contribution ID: **33** Type: **not specified**

Fundamental Physics via Gravitational-Wave Observations

Tuesday, 7 November 2023 14:00 (30 minutes)

I will review constraints on fundamental physics that have been inferred from observations of gravitational waves, and look forward to see what new results might be obtained in the near future, and what might be possible with future generations of gravitational-wave detectors.

Presenter: CANNON, Kipp (The University of Tokyo)

Session Classification: Laser Interferometric GW observatories

Contribution ID: **34** Type: **not specified**

Ground-based gravitational-wave detector KAGRA – status and future prospects –

Tuesday, 7 November 2023 14:30 (30 minutes)

KAGRA is a ground-based interferometric gravitational-wave detector with kilometer-scale arms as well as LIGO and Virgo. There are two unique features in KAGRA: one is constructed at the underground site and the other is using cryogenic sapphire mirrors for the main mirrors. Underground site provides a quite environment and is effective to reduce the seismic noise. Utilizing cryogenic sapphire mirrors reduce thermal noise of mirrors and their suspensions, which is one of problematic and fundamental noises for the interferometric gravitational-wave detectors. These two features are also important for the next-generation ground-based gravitational-wave detectors, so KAGRA is considered as the prototype of the next-generation detectors. KAGRA joined the fourth international observing run (O4) in May, 2023 for one month. After that, KAGRA once stopped the observing run and restarted interferometer commissioning for improving sensitivity. In this talk, Current status of KAGRA and its future prospects are reported.

Presenter: USHIBA, Takafumi (ICRR, the University of Tokyo)

Session Classification: Laser Interferometric GW observatories

Contribution ID: **35** Type: **not specified**

Gravitational Wave Constraints on Properties of Exotic Compact Objects

Tuesday, 7 November 2023 15:00 (20 minutes)

Gravitational waves from compact binary coalescences provide a unique laboratory to test properties of compact objects. As alternatives to the ordinary black holes in general relativity, various exotic compact objects have been proposed. Some of them have largely different values of the tidal deformability and spin-induced quadrupole moment from those of black holes, and their binaries could be distinguished from binary black hole by using gravitational waves emitted during their inspiral regime. We analyze gravitational waves from low-mass merger events in the GWTC-3 catalog events, detected by Advanced LIGO and Advanced Virgo. Focusing on the influence of tidal deformability and spin-induced quadrupole moment in the inspiral waveform, we provide model-independent constrains on deviations from the standard binary black hole case. We find that all events that we have analyzed are consistent with the waveform of binary black hole in general relativity. Bayesian model selection shows that the hypothesis that the binary is composed of exotic compact objects is disfavored by all events.

Presenter: NARIKAWA, Tatsuya (ICRR, The University of Tokyo)

Session Classification: Laser Interferometric GW observatories

Contribution ID: **36** Type: **not specified**

Space gravitational wave antenna DECIGO and B-DECIGO

Tuesday, 7 November 2023 15:20 (20 minutes)

The DECi-hertz Interferometer Gravitational-wave Observatory (DECIGO) is a future Japanese space gravitational-wave antenna. There are many science targets that DECIGO aims to achieve, including the detection of primordial gravitational waves, direct measurement of the acceleration of the Universe, the revelation of the formation of massive black holes, and many others. DECIGO consists of four clusters of spacecraft, and each cluster consists of three spacecraft with three Fabry-Perot Michelson interferometers. As a pathfinder/science mission of DECIGO, we plan to launch B-DECIGO to demonstrate the technologies necessary for DECIGO and to lead to fruitful multimessenger astronomy. B-DECIGO is a small-scale version of DECIGO with sensitivity good enough to provide frequent detection of gravitational waves. In this talk, I will explain the targeted sciences, the mechanical and optical design, and the current status of DECIGO and B-DECIGO.

Presenter: KAWAMURA, Seiji (Nagoya University)

Session Classification: Laser Interferometric GW observatories

Contribution ID: **37** Type: **not specified**

Evidence of Nano-Hertz Gravitational Wave Background from Pulsar Timing Array

Thursday, 9 November 2023 09:00 (30 minutes)

Pulsar timing array is an experiment to detect gravitational waves with a frequency of nanohertz by accurate long-term observation of pulsars. The pulsar timing array has various systematic errors such as dispersion delays caused by interstellar plasma and uncertainty in the position and motion of solar system objects, which inhibit detection of gravitational wave signals. Recently, there have been signs of gravitational wave background through appropriate modeling of systematic errors and correlation between pulsars. The estimated power spectrum of gravitational wave background is consistent with one from supermassive black hole binaries, but other possibilities such as secondary generation from density fluctuations and inflation are not excluded. In this talk, I cover the principles of pulsar timing arrays, data analysis methods and the physical interpretation of recent results. In addition, I introduce the Indian Pulsar Timing Array, which is a joint project by India and Japan.

Presenter: TAKAHASHI, Keitaro (Kumamoto University)

Session Classification: Pulsar Timing Arrays

Contribution ID: **38** Type: **not specified**

Phase transition during inflation and the gravitational wave signal at pulsar timing arrays

Thursday, 9 November 2023 09:30 (20 minutes)

We explore the possibility that the new results from the pulsar timing array (PTA) observations could come from the secondary gravitational wave sourced by curvature perturbations generated by a first-order phase transition during the inflation. Based on the results of a field-theoretic lattice simulation of the phase transition process, we show that the gravitational wave signal generated through this mechanism can naturally account for the new results from the PTAs. The Bayes analysis shows that our model can well fit the power spectrum of the signal observed by NANOGrav.

Presenter: AN, Haipeng (Tsinghua University)

Session Classification: Pulsar Timing Arrays

Contribution ID: **39** Type: **not specified**

Hellings-Downs curve deformed by ultralight vector dark matter

Thursday, 9 November 2023 09:50 (20 minutes)

Pulsar timing arrays (PTAs) provide a way to detect gravitational waves (GWs) at nanohertz frequencies. To ensure the detection of GWs, observational data must exhibit the Hellings-Downs angular correlation. It is also known that PTAs can probe ultralight dark matter. In this talk, we consider possible contamination of the Hellings-Downs angular correlation by the ultralight dark matter. We will show that ultralight vector dark matter can give rise to the deformation of the Hellings-Downs correlation curve. Thus, the Hellings-Downs correlation curve could contain information on ultralight dark matter with a spin.

Presenter: OMIYA, Hidetoshi (Kobe University)

Session Classification: Pulsar Timing Arrays

Contribution ID: **40** Type: **not specified**

f^2 scaling of the PTA signals, induced gravitational waves, and primordial black holes

Thursday, 9 November 2023 10:10 (20 minutes)

The recent pulsar timing array (PTA) data show evidence of the stochastic gravitational wave (GW) background around the nanohertz frequency range. With the power-law fit, the data, particularly those of the NANOGrav, favor the spectral index of the cosmological strength of the GWs, Omega_GW(f), around 2. We discuss explanations of the PTA data by GWs induced by curvature perturbations. In particular, we interpret the f^2 scaling of the induced GWs in three ways, focusing on two of them in which the infrared tail of the GW spectrum fits the data. In the first scenario, we assume a sharp peak of the power spectrum of the curvature perturbations, and the induced GWs are associated with primordial black holes (PBHs) with O(10^(-4)) solar mass. Mergers of these PBHs emit the GW signals at higher frequencies and provide us the possibility for testing the scenario by future GW observations if PBHs are not overproduced. In the second scenario, we consider a cosmological era dominated by fluid with its stiff (w=1) equation of state. An advantage of this scenario is that PBH overproduction is much less likely. Thus, the PTA data offer us a clue on a resonance-like phenomenon during inflation or a non-minimal cosmological era before the big-bang nucleosynthesis.

Presenter: TERADA, Takahiro (Institute for Basic Science)

Session Classification: Pulsar Timing Arrays

Contribution ID: **41** Type: **not specified**

Gravitational Wave from Metastable SUSY Breaking

Thursday, 9 November 2023 11:00 (30 minutes)

We examine the cosmological evolution of the vacuum structure in the Intriligator-Shih-Seiberg (ISS) model of metastable supersymmetry breaking by taking into account the constraints on reheating temperature, which is needed to avoid the overproduction of gravitinos. It turns out that the desired phase transition from a supersymmetric vacuum to a metastable vacuum is allowed only in the light gravitino mass region. That is achieved by either rolling down a potential or tunneling processes depending on the reheating temperature. We show that abundant gravitational waves could be produced if a tunneling process is realized in our universe. They are detectable with the future gravitational wave interferometers like LISA and DECIGO.

Presenter: CHU, Chong-Sun (NTHU)

Session Classification: BSM/DM

Contribution ID: **42** Type: **not specified**

Confinement Slingshot and Gravitational Waves

Thursday, 9 November 2023 11:30 (20 minutes)

In this talk, I will describe a quantum field theoretic phenomenon called the gauge "slingshot" effect. The effect occurs when a source, such as a magnetic monopole or a quark, crosses the boundary between the Coulomb and confining phases. The corresponding gauge field of the source, either electric or magnetic, gets confined into a flux tube stretching in the form of a string (cosmic or a QCD type) that attaches the source to the domain wall separating the two phases. The string tension accelerates the source towards the wall as sort of a slingshot. The slingshot phenomenon is also exhibited by various sources of other co-dimensionality, such as cosmic strings confined by domain walls or vortices confined by Z_2 strings. Apart from the field-theoretic value, the slingshot effect has important cosmological implications, as it provides a distinct source for gravitational waves. The effect is expected to be generic in various extensions of the standard model such as grand unification.

Presenter: ZANTEDESCHI, Michael (Tsung-Dao Lee Institute)

Session Classification: BSM/DM

Contribution ID: **43** Type: **not specified**

Exploring spin of ultralight dark matter with gravitational wave detectors

Thursday, 9 November 2023 11:50 (20 minutes)

In this study, we propose a novel method for distinguishing spin of ultralight dark matter (ULDM) through the ULDM search with interferometric gravitational wave detectors. ULDM, presenting potential spin states of 0, 1, and 2, induces distinctive signatures in GW signals. We found that the finite-time light-traveling effect dominates for spin-0 and spin-1 ULDM, resulting in unique overlap reduction functions (ORF) distinct from those of spin-2 ULDM. This allows us to distinguish spins of ULDM. Furthermore, our results suggest that the current constraint on the coupling constant of spin-1 ULDM to baryons becomes 30 times weaker.

Presenter: MANITA, Yusuke (Kyoto University)

Session Classification: BSM/DM

Contribution ID: **44** Type: **not specified**

Gravitational waves from an axion cloud around a rotating black hole

Thursday, 9 November 2023 12:10 (20 minutes)

The string theory suggests the possible existence of scalar fields with tiny masses called string axions. Such a scalar field grows around a rotating astrophysical black holes by extracting rotation energy of that black hole due to the mechanism called the superradiant instability and forms an axion cloud. The self-interaction of the scalar field becomes important at the final stage of that instability, and predicting the phenomena at this stage is a difficult problem. In this talk, I introduce our new formalism to calculate the long-term evolution of the axion cloud, and discuss the emission of gravitational waves from that system.

Presenter: YOSHINO, Hirotaka (Osaka Metropolitan University)

Session Classification: BSM/DM

Contribution ID: **45** Type: **not specified**

Gravitational waves from cosmic strings

Thursday, 9 November 2023 14:00 (30 minutes)

Cosmic strings, one-dimensional topological defects that may have formed in the early universe, predict a wide variety of gravitational wave features. I will provide an overview of the gravitational wave signatures associated with cosmic strings.

Presenter: KUROYANAGI, Sachiko (IFT UAM-CSIC)

Session Classification: Topological Defects

Contribution ID: **46** Type: **not specified**

Cosmic strings, Dark Matter, and Gravitational Wave Signatures from Pure Yang-Mills Theory

Thursday, 9 November 2023 14:30 (30 minutes)

I will explain the formation of cosmic superstrings following the confinement phase transition in pure Yang-Mills theory, without invoking string theory or extra dimensions, and their significance in the production of GWs. Moreover, in pure SO(2N) gauge theory, a "baryonic glueball" is predicted as a potential candidate for dark matter. This model offers a way to potentially explain both the observed dark matter abundance and the GW signals detected in pulsar timing arrays.

Presenter: YAMADA, Masaki (Tohoku University)

Session Classification: Topological Defects

Contribution ID: **47** Type: **not specified**

Generalization of the Z string and its application

Thursday, 9 November 2023 15:00 (20 minutes)

Recent gravitational wave observations suggest the existence of cosmic strings except stable local strings. Embedded string are candidates of such the string, and the Z string is one of them. We have generalized the Z string for the case of $SU(N) \times U(1)$ gauge theory and found that classical stability of the string only depends on two mass ratios of Higgs and the gauge bosons. We show the application of the formation condition for some models and mention the implications from recent results of gravitational wave observations.

Presenter: KANDA, Yukihiro (Nagoya University)

Session Classification: Topological Defects

Contribution ID: **48** Type: **not specified**

Induced gravitational waves from a smooth crossover and their implications on the PBH scenario

Tuesday, 7 November 2023 17:00 (1 hour)

The induced gravitational wave signal can be affected by the modification of the sound speed c_s^2 and the equation of state parameter w at horizon reentry. Inspired by the occurrence of phase transitions in various theories beyond the Standard Model (SM), we conducted numerical simulations to assess the induced gravitational waves generated by a hypothetical smooth transition beyond the SM, that softens the sound speed and equation of state while considering the case of a flat scale-invariant power spectrum. We find that if the amplitude of the power spectrum is $\mathcal{A} \sim \mathcal{O}(10^{-3})$: i) future gravitational wave space-based detectors can detect the signal, ii) the signal is differentiated from the pure radiation case, and iii) compatibility with the hypothesis that primordial black holes constitute the entirety of dark matter. Specifically, we observe a mass function that exhibits a sharp peak at the maximum point of the crossover's softening.

Presenter: ESCRIVÀ, Albert (Nagoya University)

Session Classification: Poster Session

Contribution ID: **49** Type: **not specified**

Stochastic gravitational wave observation using circular polarized radiometry with global laser-interferometer network

Tuesday, 7 November 2023 17:00 (1 hour)

Circular polarized cosmological gravitational wave background may provide evidence of possible parity violation predicted by the e.g., Chern-Simon theory. However, Circular polarized astrophysical gravitational wave background may also exist with detectable amplitudes, if their source distribution is anisotropic. Therefore, we need to develop a method for all-sky search for possible circular polarized astrophysical background. In this poster, we display a new method using gravitational wave radiometry and simulation analysis was performed.

Presenter: KAKU, Izumi (Osaka Metropolitan University)

Session Classification: Poster Session

Contribution ID: **50** Type: **not specified**

Impact of the Global Correlated Magnetic Noise on Phase Transition SGWB Searches

Tuesday, 7 November 2023 17:00 (1 hour)

A stochastic gravitational wave background (SGWB) is a weak and persistent background of gravitational waves (GWs) and can provide valuable insights into the origins and evolution of the universe. To detect the SWGB with ground-based interferometric detectors, cross-correlations between multiple GW detectors are calculated and local noise is canceled; however, global coherent noises, such as the Schumann resonance, remain and affect the observation. We evaluate its effect on phase transition SGWB searches based on the Fisher matrix formalism.

Presenter: WASHIMI, Tatsuki (NAOJ)

Session Classification: Poster Session

Contribution ID: **51** Type: **not specified**

Estimation of Acoustic Newtonian Noise for Underground GW observatorie

Tuesday, 7 November 2023 17:00 (1 hour)

Newtonian noise (or gravity gradient noise) is one of the principal noises for ground-based GW detectors, especially below 10 Hz. In this study, we estimate the NN caused by the acoustic field inside an underground facility for the KAGRA and further detectors based on the infrasound sensors' data at the KAGRA site.

Presenter: WASHIMI, Tatsuki (NAOJ)

Session Classification: Poster Session

Contribution ID: **52** Type: **not specified**

Searching origin of binary black hole with gravitational wave observation

Tuesday, 7 November 2023 17:00 (1 hour)

In 2015, gravitational wave was first detected and it was from binary black hole. After this event, many gravitational wave events from binary black hole were detected. However, including first detected gravitational event, origin of binary black hole observed by gravitational wave is not solved. To solve this, first we made mass distribution of 1year gravitational wave observation and mass distribution of primordial black hole. In this poster presentation, I will present this result.

Presenter: UEMATSU, Masaki (Osaka Metropolitan University)

Session Classification: Poster Session