

International Workshop "Dawn of Gravitational-wave Cosmology and Theory of Gravity"

Program

	Mar. 2 Wed	Mar. 3 Thu	Mar. 4 Fri	
				Mar. 2 afternoon (30min)
				Volodymyr Takhistov
9:00				Mar. 2 evening (40min*3)
9:30				Vincent Vennin
10:00				Matteo Fasiello
10:30		3 talks 30minutes*3 chair : kimura	3 talks 30minutes*3 chair : naruko	Ema Dimastrogiovanni
11:00				Mar. 3 morning (30min*2)
11:30				Ryo Saito
12:00			Closing by naruko	Naritaka Oshita
12:30		break	break	Atsushi Naruko
13:00				Mar. 3 afternoon (30min*3)
13:30			Onsite discussion chair : kimura	Junsei Tokuda
14:00		3 talks 30minutes*3 chair : namba	break	Kimihiro Nomura
14:30				Daisuke Yoshida
15:00	Organizer Meeting			Mar. 3 eveninging (40min*3)
15:30		break	Onsite discussion chair : namba	Scott Melville
16:00	Connection test			Guillem Domènech
16:30	1 talk 30minutes chair : naruko			A. Emir Gümrükçüoğlu
17:00				Mar. 4 morning (30min*3)
17:30	3 invited talks 40minutes*3 chair : namba	3 invited talks 40minutes*3 chair : kimura		Katsuki Aoki
18:00				Paul Martens
18:30				Shin'ichi Hirano
19:00		discussion with invited speakers chair : naruko		
19:30				
20:30				

International Workshop

“Dawn of Gravitational-wave Cosmology and Theory of Gravity” (Online)

Date: March 2, 2022-March 4, 2022

Venue: Tohoku Forum for Creativity

Wednesday, March 2, 2022

15:00-16:00 Organizer Meeting (Atsushi Naruko, Rampei Kimura and Ryo Namba)

16:00-16:25 Connection Test

16:25-16:30 Welcome Address by Atsushi Naruko (Kyoto University)

16:30-17:00 [1 talk] Chair: Atsushi Naruko (Kyoto University)

Volodymyr Takhistov (Kavli IPMU)

Title: New Signatures of Primordial Black Holes

17:00-19:00 [3 invited talks] Chair: Ryo Namba (RIKEN)

Vincent Vennin (CNRS - APC)

Title: Quantum diffusion during cosmic inflation

Matteo Fasiello (IFT UAM-CSIC)

Title: Probing the Early Universe with Gravitational Waves

Ema Dimastrogiovanni (University of Groningen)

Title: Testing inflation with small-scale anisotropies

Thursday, March 3, 2022

10:30-12:00 [3 talks] Chair: Rampei Kimura (Waseda University)

Ryo Saito (Yamaguchi University)

Title: Angular correlations of the inflationary stochastic gravitational wave background

Naritaka Oshita (RIKEN)

Title: Black hole ringing and multi-mode excitation

Atsushi Naruko (Kyoto University)

Title: Spatial gradient expansion approach for generic scalar-tensor theories

12:00-14:00 Lunch

- 14:00-15:30 [3 talks] Chair: Ryo Namba (RIKEN)
Junsei Tokuda (Kobe University)
Title: Swampland conditions from positivity bounds
Kimihiro Nomura (Kobe University)
Title: Quasinormal modes of black holes in nonlinear electrodynamics
Daisuke Yoshida (Kobe University)
Title: Classification of initial singularity
- 15:30-17:00 Break
- 17:00-19:00 [3 invited talks] Chair: Rampei Kimura (Waseda University)
Scott Melville (University of Cambridge)
Title: Cosmological effective field theories: How to distinguish the good, the bad and the ugly
Guillem Domenech (INFN, Padova)
Title: Gravitational waves from primordial fluctuations
A. Emir Gümrükçüoğlu (University of Portsmouth)
Title: Dark energy from massive gravity, redux
- 19:00-20:30 Discussion with invited speakers
Chair: Atsushi Naruko (Kyoto University)

Friday, March 4, 2022

- 10:30-12:00 [3 talks] Chair: Atsushi Naruko (Kyoto University)
Katsuki Aoki (Kyoto University)
Title: The Effective Field Theory of Vector-Tensor Theories
Paul Martens (Kyoto University)
Title: Reheating after relaxation of some large cosmological constant
Shin'ichi Hirano (Nagoya University, **Zoom**)
Title: Effective Field Theory of Large Scale Structure in modified gravity
- 12:00-12:10 Closing for hybrid workshop by Atsushi Naruko (Kyoto University)
- 12:10-13:30 Lunch
- 13:30-15:00 Onsite discussion
Chair: Rampei Kimura (Waseda University)
Discussion Title: Future prospect of modified gravity

15:00-15:30 Break

15:30-17:00 Onsite discussion

Chair: Ryo Namba (RIKEN)

Discussion Title: Inflationary scenario and beyond

Title & Abstract for invited talks

Ema Dimastrogiovanni (University of Groningen)

Title: Testing inflation with small-scale anisotropies

Abstract:

Inflation predicts a stochastic background of gravitational waves. In this talk I will discuss how anisotropies in the gravitational wave energy density can be a powerful tool in characterizing the inflationary gravitational wave background and potentially distinguishing it from backgrounds due to other sources.

Guillem Domènech (INFN, Padova)

Title: Gravitational waves from primordial fluctuations

Abstract:

The evolution of primordial fluctuations in the early universe is accompanied by a production of gravitational waves. The so-called induced gravitational waves are the cosmic messenger of primordial fluctuations on the smallest scales, which may have been generated during cosmic inflation. In this talk, I will discuss how they may be used to explore the early universe's initial conditions and expansion history. This includes gravitational waves induced by oscillatory features in the primordial spectrum, early isocurvature fluctuations and a primordial black hole dominated universe.

Matteo Fasiello (IFT Madrid, UAM-CSIC)

Title: Probing the Early Universe with Gravitational Waves

Abstract:

Some of our best ideas on early universe physics are about to be put to the test by an unprecedented array of cosmological probes. The data these will collect span a vast range of scales, from the CMB to large scale structure, from pulsar timing arrays all the way to laser interferometers. This combined wealth of new information holds the potential to transform not just our understanding of cosmology, but also particle physics. Probing the earliest accessible epoch, the accelerated expansion known as inflation, is crucial: inflation can provide a cosmological portal to otherwise inaccessible energy scales. The spectacular success of the inflationary paradigm in explaining the origin of cosmic structure demands that we tackle a number of compelling questions still in need of an answer: what is the energy scale of inflation? What fields were active during inflation?

In this talk I will review recent progress on the inflationary field content. I will survey different approaches to address the most pressing challenges and provide examples including axion-inflation models and, if time permits, the so-called effective theory approach. I will then focus on the key observables, starting with primordial gravitational waves, and discuss their prospects for detection.

A. Emir Gümrükçüoğlu (University of Portsmouth)

Title: Dark energy from massive gravity, redux

Abstract:

Recent observations of binary mergers with multiple messenger signals severely constrain models in scalar-tensor theories and we are still lacking a consistent (and convincing) theoretical basis for dark energy. This motivates revisiting some of the ideas that were left behind, such as massive gravity. In this talk, I will discuss a new class of Lorentz invariant massive spin--2 field theories with 5 degrees of freedom, for which de Rham-Gabadadze-Tolley (dRGT) theory is only a special case. Within this large theory class, I will focus on a minimal example and present a proof-of-principle model with: i. none of the pathologies of the vanilla dRGT cosmology; ii. a late time cosmic acceleration; iii. potentially observable (and distinguishable from scalar-tensor theories) deviations from standard cosmological model at linear order; iv. a new, yet successful, screening mechanism.

Scott Melville (University of Cambridge)

Title: Cosmological effective field theories: How to distinguish the good, the bad and the ugly

Abstract:

When searching for small deviations from General Relativity on cosmological scales, Effective Field Theory (EFT) is often the framework of choice, in which small corrections are systematically added to the theory with undetermined coefficients that can be fit to data in a model-independent way.

But this approach presents a problem: there is no guarantee that all values of these parameters are physical, and we may be fitting our data with values that are secretly inconsistent (i.e. values that could never actually be realised in any healthy model).

This talk reviews recent progress in charting the landscape of consistent effective field theories. In particular, recent advances in particle physics (so-called "positivity bounds") have shown that not all low-energy EFTs can be embedded into a consistent high-energy completion (one compatible with locality, causality and unitarity), and therefore the landscape of consistent EFTs is much smaller than one might naively assume. Much of this technology can be imported into cosmology, where these positivity bounds provide a new theoretical prior which can be used to remove unphysical regions of parameter space and thus improve the constraining power of our data.

As concrete examples, I will discuss how these bounds can impact the speed of gravitational waves, the clustering of dark energy and which vacua can exist in our cosmological EFTs.

Vincent Vennin (CNRS-APC)

Title: Quantum diffusion during cosmic inflation

Abstract:

When primordial inhomogeneities are produced with sufficiently large amplitude in the early universe, they may subsequently collapse into primordial black holes. I will explain why the effect of quantum diffusion during inflation needs to be taken into account in such a case, and how the statistics of cosmological fluctuations can be predicted within the formalism of stochastic inflation.