

IEA PBH#2

**Rapport sur les
contributions**

ID de Contribution: 1

Type: **Non spécifié**

Alireza Talebian: Stochastic effects of electromagnetic fields in the early universe

lundi 9 novembre 2020 14:00 (45 minutes)

We extend the stochastic formalism to the setup of the models containing a $U(1)$ gauge field such as anisotropic inflation and Primordial magnetogenesis during inflation. In this talk, we show that the stochastic noises of the electromagnetic perturbations have significant effects on the dynamics of the system. These effects can not be neglected even in the leading order in contrast with the stochastic noises of the scalar fields.

ID de Contribution: 2

Type: **Non spécifié**

Aritra De & Rafid Mahbub: Numerically modelling stochastic inflation

lundi 9 novembre 2020 14:45 (45 minutes)

We present a complete numerical treatment of inflationary dynamics under the influence of stochastic corrections from sub-Hubble modes. We discuss how to exactly model the stochastic noise terms arising from the sub-Hubble quantum modes that give rise to the coarse-grained inflaton dynamics in the form of stochastic differential equations. The stochastic differential equations are solved event-by-event on a discrete time grid. We then compute the power spectrum of curvature perturbations that can be compared with the power spectrum computed in the traditional fashion using the Mukhanov-Sasaki equation by canonically quantizing the inflaton fluctuations. Our numerical procedure helps us to easily extend the formalism to ultra slow-roll inflation and study the possibility of primordial black hole formation.

ID de Contribution: 3

Type: **Non spécifié**

Amin Nassiri-Rad: Stochastic non-attractor inflation

lundi 9 novembre 2020 16:00 (45 minutes)

We extend the formalism of stochastic inflation to the setup of non-attractor inflation with a sound speed c_s . We obtain the Langevin equations for the superhorizon perturbations and calculate the stochastic corrections to curvature perturbation power spectrum. It is shown that the fractional stochastic corrections in mean number of e-folds and power spectrum are at the order of power spectrum. We also calculate the boundary crossing and the first hitting probabilities in a hypothetical dS space with two boundaries in field space. Furthermore, the stochastic corrections in power spectrum in a setup akin to eternal inflation with large diffusion term are calculated.

ID de Contribution: 4

Type: **Non spécifié**

Emmanuel Frion: Stochastic Collapse

lundi 9 novembre 2020 16:45 (45 minutes)

In this talk, I will present the consequences of applying the stochastic formalism to cosmological models described by a scalar field with an exponential potential. In particular we show that quantum field fluctuations perturb the equation of state on large scales which can lead to a quantum instability of the classical collapse solution below the Planck scale in the case of a pressureless collapse.

ID de Contribution: 5

Type: **Non spécifié**

Yuichiro Tada: StocDeltaN: numerical approach to inflation in combination of the stochastic and delta N formalism

mardi 10 novembre 2020 10:00 (45 minutes)

The stochastic approach to inflation enables us to treat the superhorizon perturbations in a non-perturbative way.

Though it deals only with the inflatons' perturbations in itself, fluctuations in the duration of inflation

can be connected with the observable curvature perturbations from the viewpoint of the delta N formalism.

In 2015, Vennin and Starobinsky revealed the adjoint Fokker-Planck equation for the probability density function of such time fluctuations.

We with Renaux-Petel are now developing a C++ package to automatically solve this adjoint FP eq. and

enable a full stochastic analysis for arbitrary models of inflation.

I'll introduce this ongoing project with several examples.

ID de Contribution: 6

Type: **Non spécifié**

Sebastien Renaux-Petel: Multifield stochastic inflation in phase space: a manifestly covariant theory and its first principle derivation.

mardi 10 novembre 2020 10:45 (45 minutes)

In this talk based on arXiv:2008.07497 (from Lucas Pinol, Yuichiro Tada and myself), after an introduction to stochastic inflation, I explain the difficulties and the solution to formulate this theory in a manner that respects covariance under field redefinitions. I do so in the general framework of multifield inflation with a curved field space, taking into account the coupling to gravity as well as the full phase space in the Hamiltonian language. Moreover, I show how to rigorously derive the corresponding Langevin equations using tools of nonequilibrium quantum field theory.

ID de Contribution: 7

Type: **Non spécifié**

Laura Iacconi: Small-Scale Tests of Inflation

mardi 10 novembre 2020 12:00 (45 minutes)

The detection and characterisation of primordial gravitational waves produced during inflation can be an excellent test for the particle content of the very early universe. We consider an inflationary realisation whose tensor spectrum is sourced already at linear order, with a sufficient production of primordial gravitational waves to make the signal detectable at interferometer scales. We then focus on the tensor non-Gaussianities that ensue from the same configuration. On small-scales, anisotropies induced in the tensor power spectrum by long-short modes coupling become the key handle on (squeezed) primordial non-Gaussianities. We identify the parameter space generating percent level anisotropies at scales soon to be probed by SKA and LISA.