Annual Meeting Iniziativa Specifica QGSKY INFN Gruppo 4



Report of Contributions

Annual Meeting I $\ldots \,$ / Report of Contributions

Initial addresses

Contribution ID: 2

Type: not specified

Initial addresses

Thursday, October 17, 2019 9:30 AM (10 minutes)

A new technique for the scalar wa...

Contribution ID: 3

Type: not specified

A new technique for the scalar wave equation in curved space-time

Thursday, October 17, 2019 9:40 AM (30 minutes)

We prove that the equation for the amplitude function for the parametrix of the scalar wave equation can be obtained by covariant differentiation of a first-order non-linear equation.

The construction of such a first-order non-linear equation relies upon a pair of auxiliary 1-forms "psi,rho".

The 1-form "psi" satisfies the divergenceless condition div(psi)=0, whereas the 1-form "rho" fulfills the non-linear equation div(rho)+<rho,rho>=0.

The auxiliary 1-forms "psi,rho" are evaluated explicitly in Kasner space-time, hence, amplitude and phase function in the parametrix are eventually obtained.

Thus, our novel method can be used with profit in physical applications.

Presenter: ESPOSITO, Giampiero

Connecting cosmography with ear ...

Contribution ID: 4

Type: not specified

Connecting cosmography with early times

Thursday, October 17, 2019 10:10 AM (30 minutes)

Recently, the cosmographic approach has gain considerable interest as model-independent technique able to describe the recent expansion of the universe.

Indeed, given only the observational assumptions of the cosmological principle, it permits the study of the dark energy (or modified gravity) evolution without the need of assuming a specific cosmological model.

Up to now, the cosmographic approach has been used to reconstruct the Hubble parameter as a function of redshift, assuming an arbitrary fiducial value for the current matter density, analysing low redshift cosmological data.

In this talk I propose a different strategy, linking the cosmographic behaviour of large scale universe evolution with the standard cosmological model, that we can assume at small scales (starting from matter domination era) without loss of generality.

In this way, we can use cosmography for the evolution description of the late time universe without assuming "a priori" values for the cosmological parameters, that we constrain at early times using both the current Cosmic Microwave Background data and Barionic Acoustic Oscillation data.

I will show the results of this first test of such a new strategy, using the Padè polinomials P(2,2) series, and also the interesting dependence of the current matter density value with cosmographic parameters as well as the data constraints on these latter.

Presenter: BENETTI, Micol

Contribution ID: 5

Type: not specified

Lectio Magistralis: Gravitational waves and multi-messenger astronomy: a new window on the Universe

Thursday, October 17, 2019 11:10 AM (1 hour)

The first two observing runs of Advanced LIGO and Advanced Virgo have been characterized by several groud-breaking discoveries.

On September 14, 2015, there was the first observation of gravitational waves (GWs) from the merger of a binary black hole (BBH);

two years later, on August 17, 2017, there was the first joint detection of GWs and photons from a binary neutron star merger: this dicovery marked the birth of multi-messenger astronomy with GWs, opening a new chapter in the study of the universe.

Besides this two events, the LIGO and Virgo collaborations also reported the detection of other 9 BBH mergers during the first two science runs;

furthermore, other GW candidates have been observed during the current observing run, started on April 2019.

Both Advanced LIGO and Advanced Virgo are operating with improved sensitivity, and more GW and joint GW and electromagnetic detections are expected in the near future I will give an overview of the past and most recent GW and multi-messenger observations, their astrophysical implications and the prospects for the upcoming years.

Presenter: PADRICIELLI, Barbara

Low Surface Brightness galaxies: n...

Contribution ID: 6

Type: not specified

Low Surface Brightness galaxies: new hints for dark matter?

Thursday, October 17, 2019 12:10 PM (30 minutes)

I will talk about the relevance of the universal rotation curve (URC) method applied to rotating disc galaxies and, particularly, I will focus on the results obtained by analysing a special sample of galaxies called Low Surface Brightness (LSB) galaxies.

Furthermore, I will briefly talk about the relevance of the LSB results when compared to the Radial Acceleration Relation (RAR) given by McGaugh et al. three years ago.

Presenter: DI PAOLO, Chiara

The scattering angle of a two-body...

Contribution ID: 7

Type: not specified

The scattering angle of a two-body system: checks at 3PM - 5PN level

Thursday, October 17, 2019 2:30 PM (30 minutes)

Some recent progress in the analytic treatment of the scattering angle in a two-body system will be shortly discussed.

Presenter: BINI, Donato

Probing the nature of neutrinos th ...

Contribution ID: 8

Type: not specified

Probing the nature of neutrinos through decoherence and geometric phases

Thursday, October 17, 2019 3:00 PM (30 minutes)

We analyze the non-cyclic geometric phase and the phenomenon of decoherence for neutrinos propagating in long baseline experiments.

We find that the geometric phase and the total phase associated to the mixing phenomenon provide a theoretical tool to distinguish between Dirac and Majorana neutrinos.

Moreover, we show that, in presence of an off-diagonal term in the dissipative matrix, the Majorana neutrino can violate the CPT symmetry, which, on the contrary, is preserved for Dirac neutrinos. We show that the oscillation formulae for Majorana neutrinos depend on the choice of the mixing matrix.

Indeed, different choices of this matrix lead to different oscillation formulae.

Presenter: QUARANTA, Aniello

Cosmography in extended theorie ...

Contribution ID: 9

Type: not specified

Cosmography in extended theories of gravity

Thursday, October 17, 2019 3:30 PM (30 minutes)

In this talk, we provide an overview of the cosmographic technique in the context of extended and modified theories of gravity, invoked to tackle the dark energy problem.

We show how cosmography can be used to reconstruct the late-time expansion history of the universe with no a priori assumptions on its equation of state.

In particular, we present a new method involving the use of rational polynomials to approximate the luminosity distance, which allows to overcome the drawbacks of the standard Taylor approach by extending the convergence radius and by reducing the uncertainties on the cosmographic series at high-redshift regimes.

We thus apply the new technique to reconstruct f (R) and f (T) gravity actions in lieu of the latest cosmic data.

Presenter: D'AGOSTINO, Rocco

Contribution ID: 10

Type: not specified

Casimir effect in a weak gravitational field: "Schwinger's approach"

Thursday, October 17, 2019 4:30 PM (30 minutes)

In this paper we discuss the Casimir effect in a small cavity at rest in the weak gravitational field of a massive, non-rotating source.

We propose a new approach, based upon Schwinger's effective action method, showing that the gravitational interaction induces a small correction in the vacuum energy density, in full agreement with the result we obtained in a previous work (Sorge F 2005 Class. Quantum Grav. 22 5109), following a standard field mode decomposition technique.

The present result reinforces the belief that gravity can indeed be effective in modifying the vacuum energy of a quantum field confined to the cavity, against the recent claim (Lima A P C M, Alencar G, Muniz C R and Landim R R 2019 JCAP 7 11) that a weak gravitational field has no influence on the Casimir energy.

Presenter: SORGE, Francesco

Round Table of the Day's Speaker

Contribution ID: 11

Type: not specified

Round Table of the Day's Speaker

Thursday, October 17, 2019 5:20 PM (40 minutes)

Annual Meeting I ... / Report of Contributions

Communications on GQSKY

Contribution ID: 12

Type: not specified

Communications on GQSKY

Friday, October 18, 2019 9:30 AM (30 minutes)

Presenter: LAMBIASE

M87 the galaxy with imaged Super ...

Contribution ID: 13

Type: not specified

M87 the galaxy with imaged Supermassive BH

Friday, October 18, 2019 10:00 AM (30 minutes)

M87 is the biggest nearby galaxy located at the center of the Virgo cluster.

It hosts multiple kinematic tracers that have recently allowed a very good determination of its mass distribution from the very center up to the virial radius.

In this work, we approach the question by adopting the Burkert halo profile for the dark matter which well represents the dark matter halos around spirals and some ellipticals.

We found that the mass model including a such halo plus a standard Nuker stellar spheroid, well fits the gravitating mass.

The galaxy extends out to a virial radius of 1.3 +/- 0.2 Mpc, with a virial mass of (1.3 +/- 0.3) x $10^{14} M_sun$.

It shows a very huge core with a radius of 91.2 +/- 9.0 kpc and a central density (6.9 +/- 1.4) x 10^6 M_sun/kpc^3.

Presenter: SALUCCI, Paolo

Contribution ID: 14

Type: not specified

A multifiltering study of turbulence in a large sample of simulated galaxy clusters

Friday, October 18, 2019 11:00 AM (30 minutes)

In this paper, we present results from a large set of N-body/SPH hydrodynamical cluster simulations aimed at studying the statistical properties of turbulence in the ICM.

The numerical hydrodynamical scheme employs a SPH formulation in which spatial gradients are estimated using an integral approach.

This formulation strongly reduces gradient errors which are found to critically affect SPH numerical simulations of subsonic turbulence.

The simulations were performed using cluster initial conditions extracted from dark matter cosmological simulations of different box sizes according to a zoom-in technique, with final cluster samples comprising about ~ 200 simulated clusters.

We consider both adiabatic and radiative simulations.

In the latter the physical modeling of the gas includes cooling, star formation and thermal feedback from supernovae.

We construct clusters subsamples according to the cluster dynamical status or gas physical modeling, from which we extract small-scale turbulent velocities obtained by applying to cluster velocities different multiscale filtering methods.

These act as low-pass filters in which the individual particle filtering lengths H_i depend on the root finding procedure and adopted smoothing function.

We use the turbulent velocities to perform subsample averages of velocity power spectra, velocity structure functions and radial profiles of turbulent related quantities.

We determine the optimal filtering strategy by applying different filtering methods to the same sets of subsample velocities.

Overall, the best performances are obtained by adopting a mass-weighted top-hat velocity filtering, with very small root search steps in units of the cluster virial radius r_200.

Presenter: VALDARNINI, Riccardo

On the physical origin of the cosm ...

Contribution ID: 15

Type: not specified

On the physical origin of the cosmological constant: planckian fluctuations, decoherence scale and comparison with the Casimir effect.

Friday, October 18, 2019 11:30 AM (30 minutes)

In this talk I present a new proposal concerning the nature of the cosmological constant depicted in terms of Planckian fluctuations.

A semi-classical model is presented with a Planckian generalization of the quasi local Misner-Sharp energy.

The observed (dressed) value of \Lambda is fixed at the scale such that an absolute positive minimum for the generalized Misner-Sharp energy is reached: the new physical scale represents the decoherence one at which the crossover to classicality is obtaned.

Finally, a comparison with the Casimir effect is discussed.

Presenter: VIAGGIU, Stefano

Study of the dark matter distributi ...

Contribution ID: 16

Type: not specified

Study of the dark matter distribution in High redshift galaxies using Rotation Curves.

Friday, October 18, 2019 12:00 PM (30 minutes)

We have analysed the Rotation Curves (RCs) of 310 H α detected star-forming galaxies from KMOS redshift one spectroscopic survey (KROSS).

The targets were selected from four deep extragalactic fields those are covered by wide range of multiwavelength photometric and spectroscopic surveys:

1) Extended Chandra Deep Field Survey (E-CDFS);

2) Cosmic Evolution Survey (COSMOS);

3) Ultra-Deep Survey (UKIDSS);

4) High-redshift(Z) Emission Line Survey (HiZELS).

The median redshift of the samples is z = 0.85, H alpha luminosity is log(L H α [ergs]) = 41.5 The length scale of an individual galaxy is measured from High-quality broadband images taken from the above surveys.Furthermore, by adapting the concept and techniques of "Universal RCs of spiral galaxies at z = 0", we have built the templates of normalised and co-added RCs over six-velocity bins out to 1.2 optical radii.

We mass model these co-added RCs using two different density profiles: 1) Burkert (1995) and 2) Navarro, Frenk & White (1996) including the gaseous disk contribution.

Thus allow us to determine the structural properties of individual spirals at z = 1.

In particular, we have determined the stellar mass M^{*}, halo mass MH, gas mass MHI, halo radii RHI, dark matter density and core radius, as well as we have determined the angular momentum of stellar and dark matter component respectively.

By using these fundamental properties, we have examined the existence of global scaling relations (e.g. Baryonic Tully Fisher Relation) and the RC universality for redshift z=1 spirals.

All the analysis has been done using robust statistical approaches which allow us to reach an unprecedented level of precision.

Moreover, exploring the various disk, gas and halo models patronages to constrain the parameters without being biased to a particular model.

In this talk, I will present the preliminary result of this work, addressing the unique interplay between baryonic and dark matter from z = 0 to z = 1, the traditional core-cusp problem and the evolution of scaling relations toward z = 1.

Presenter: SHARMA, Gauri

A white paper for GQSKY

Contribution ID: 17

Type: not specified

A white paper for GQSKY

Friday, October 18, 2019 12:30 PM (30 minutes)

Annual Meeting I... / Report of Contributions

Classical and quantum states of th ...

Contribution ID: 18

Type: not specified

Classical and quantum states of the universe

Friday, October 18, 2019 2:30 PM (30 minutes)

I show that one can unify the description of quantum and classical cosmological states by introducing the tomographic description.

I'll present some examples of possible classical tomograms obtained phenomenologically and the problems that one has to address in order to relate these tomograms to the original quantum state of the universe.

Presenter: STORNAIOLO, Cosimo

Merging rates of compact binaries ...

Contribution ID: 19

Type: not specified

Merging rates of compact binaries in galaxies

Friday, October 18, 2019 3:00 PM (30 minutes)

In this talk I will investigate the merging rates of compact binaries and the related detection rates of gravitational waves with current (AdvLIGO/Virgo) and future detectors (Einstein Telescope). I will rely on three main ingredients:

1) a redshift dependent galaxy statistics observationally determined;

2) a star formation and chemical enrichment history for individual galaxies inferred from observations;

3) a compact remnant mass distribution taken from stellar evolution simulations.

The detailed treatment of the individual history of each single galaxy allows to relate the properties of the gravitational wave signal to the properties of the host galaxy.

Finally I will analyze the rate of lensed gravitational wave events and the gravitational wave back-ground.

Presenter: BOCO, Lumen

Neutrino oscillations in Unruh rad...

Contribution ID: 20

Type: not specified

Neutrino oscillations in Unruh radiation: the proton' s testimony

Friday, October 18, 2019 3:30 PM (30 minutes)

The study of the inverse beta-decay of accelerated protons (p \rightarrow n + e + ve) recently provided a theoretical proof of the necessity of the Unruh effect in QFT.

Indeed, on the basis of the sole requirement of General Covariance of the formalism, it was found that the decay rates in the inertial and comoving frames are in agreement only when taking into account the thermal nature of the accelerated vacuum.

Such an analysis was then extended to the case of flavor mixing for the emitted neutrinos, leaving open the question of whether to consider mass or flavor neutrinos as fundamental (i.e asymptotic) states.

In the present analysis, we prove that the only scenario which is compatible with the General Covariance of QFT and naturally incorporates neutrino oscillations is the one build upon flavor eigenstates.

We further point out that the Unruh thermal bath must be made up of oscillating neutrinos.

Presenter: LUCIANO, Gaetano

Round Table of the Day's Speaker

Contribution ID: 21

Type: not specified

Round Table of the Day's Speaker

Friday, October 18, 2019 4:00 PM (30 minutes)