Swiss Cosmolgy Days 2016 - Program
11. - 12. February 2016 - EPF Lausanne - Auditorium ELA1

11. February 2016

09.30 - 10.15	**Welcome Coffee**		
Name	*Organisation*	*Title*	*Abstract*
10.15 - 12.00	**Observations/Modelling**		
Bonvin, Vivien	EPF Lausanne	COSMOGRAIL: constrain cosmology with quasar time delays	Abstract: COSMOGRAIL, the COSmological MOnitoring of GRAvItational Lenses, aims at measuring time delays for most known lensed quasars in order to determine the Hubble constant H0 in a complementary way to other cosmological probes. In my talk, I will review the current progresses and most recent results of the COSMOGRAIL collaboration, presenting namely the results of a pilot VLT monitoring campain of the quadruple images quasar HE0435-1223. I will also present the future of time-delay measurements in the scope of the next generation of surveys and telescopes such the LSST.
Nicola, Andrina	ETH Zurich	New cosmic shear results from DES	Abstract: A few months ago, the Dark Energy Survey (DES) collaboration published results from the analysis of a 140 square degree subset of Science Verification (SV) data. In this talk I will give an overview of the latest DES results in weak lensing with a special focus on the measurement of the cosmic shear 2-point function and cosmological results obtained from it.
Neronov, Andrii	Université de Geneve	X-ray and gamma-ray view of gravitational lensed quasars	Abstract: I will review some recent results on X-ray and gamma-rayobservations of strongly lensed quasars, including the measurements of the gravitational time delays and detection of the microlensing in the X-ray and gamma-ray signal.
Sokolowa, Aleksandra	University of Zurich	Shedding light on the missing baryons problem with cosmological simulations of galaxy formation	Abstract: Observed mass fraction of baryons in individual galaxies falls short of the cosmic baryon fraction. Proposed solutions to this problem embrace observational challenges and physical phenomena that would cause local baryon deficiencies. High-resolution hydrodynamical simulations can make predictions for where the missing baryons reside. I will present our results from a representative sample of cosmological simulations: Eris suite of zoom-ins and the large-scale EAGLE simulations, all with different sub-grid schemes for the star formation and feedback processes. Understanding how the baryons are distributed is particularly relevant for the large-scale simulations designed to perform high precision cosmological parameter estimation.
12.00 - 14.00	**Lunch**		
14.00 - 15.45	**Theory**		
Ballesteros, Guillermo	Cern	A novel point of view on massive gravity	Abstract: I will discuss how general massive gravity and dark energy models can be interpreted using an effective field theory akin to that of very simple condensed matter systems.
Pirtskhalava, David	EPF Lausanne	Constraints on Single-Field Inflation	Abstract: Within an EFT approach to inflationary perturbations, I will discuss surprisingly robust constraints---both theoretical and experimental---that allow to significantly limit/rule out an overwhelming majority of single-field models of inflation.
Moradinezhad Dizgah, Azadeh	Université de Geneve	The galaxy bispectrum in the presence of primordial non-Gaussianity	Abstract: In this talk I will discuss our recent work on calculating the galaxy bispectrum in Lagrangian space, using the prediction of the peak model for the bias. I will describe our theoretical prediction and the comparison with N-body simulation.
15.45 - 16.15	**Coffee Break**		
16.15 - 17.45	**Observations/Modelling**		
Tihhonova, Olga	EPF Lausanne	Mapping the mass along the line of sight of multiply lensed quasars	Abstract: Time-delays in gravitationally lensed quasars allow to measure the Hubble parameter. But lens galaxies often lie close to the line of sight of groups or clusters of galaxies. Such intervening objects modify the expected image positions and time delays hence modify the inferred value for the Hubble parameter. One possibility to account for this is to measure the overall mass distribution along the line of sight to gravitational lenses using weak gravitational lensing technique. In this talk we present such weak lensing measurements using the HSC on the Subaru telescope.
Schneider, Aurel	University of Zurich	Quantifying the influence of baryons on the large scale structure of the universe	Abstract: Future large-scale galaxy surveys have the potential to become leading probes for cosmology provided the influence of baryons is understood well enough. I will discuss how baryonic feedback alters the matter distribution up to surprisingly large scales and I will present a method to quantify these effects.
Seehars, Sebastian	ETH Zurich	Simulating HI intensity maps	Abstract: Intensity mapping of neutral hydrogen (HI) in the post-reionization universe is a promising observational probe of cosmology. In this talk, I will present wide field simulations of HI intensity maps based on N-body simulations, the halo model, and a phenomenological prescription for assigning HI mass to halos. The simulations span a redshift range of $0.35 < z < 0.9$ and cover a quarter of the sky at an angular resolution of about 7′. I will describe how the non-linear clustering of HI affects the estimation of angular power spectra from the simulated maps and discuss how our results can be useful for planning and interpreting future HI intensity mapping surveys.
19.00 - 23.00	**Dinner**		

12. February 2016

09.00 - 10.30	**Theory**		
Mancarella, Michele	Cern	Effective theory of dark energy on redshift survey scales	Abstract: There are currently so many dark energy scenarios, each leading to a different phenomenology, that it will be hard to compare their predictions with the observations of future surveys. I will review a unifying approach to describe dark energy and modified gravity models based on a single scalar field and allowing different matter species to couple differently to the gravitational sector. Restricting to the quasi-static approximation, I will discuss the constraining power of a future redshift survey with Euclid-like characteristics on the parameters of such description, in the case when cold dark matter is non-trivially coupled to the gravitational sector.
Monin, Alexandre	EPF Lausanne	Ricci gauging and the coset construction	Abstract: In the talk I will show how using the coset construction a theory can be systematically made Weyl invariant by gauging the scale symmetry. I demonstrate that an analog of the inverse Higgs constraint allows the elimination of the Weyl vector (gauge) field in favor of curvatures. I discuss the subtleties of the procedure -- previously coined Ricci gauging -- for the case of theories with higher derivatives of conformally variant fields.
Cefala, Francesco	University of Basel	Parametric resonance after hilltop inflation caused by an inhomogeneous inflation field	Abstract: I will first give a short overview of preheating after hilltop inflation. In the main part of the talk I will discuss how the dynamics can change when the inflaton couples to another scalar field, e.g. a right-handed sneutrino, which provides a mechanism for generating the correct initial conditions for inflation and also a decay channel for the inflaton that allows for non-thermal leptogenesis. I will particularly discuss how the known phases of preheating during which the inflaton field becomes fully inhomogeneous, can be followed by a subsequent preheating phase where the fluctuations of the secondary field gets resonantly enhanced, from initially tiny amplitudes up to amplitudes of the same order (and even larger) as the ones of the inflaton field. This resonant enhancement differs from the usual parametric resonance as the inflaton field is highly inhomogenous at the time the enhancement takes place.
Karananas, Georgios	EPF Lausanne	Weyl vs. Conformal	Abstract: It is usually assumed that a conformally invariant theory in flat space-time can be coupled to gravity in a Weyl invariant manner. I will argue that this is not always possible and I will present a class of conformal theories that do not allow for Weyl invariant generalizations.
10.30 - 11.00	**Coffee Break**		
11.00 - 12.15	**Observations/Modelling**		
Harvey, David	EPF Lausanne	Understanding the self-coupling of dark matter	Abstract: Recent studies into the dynamics of galaxy clusters and galaxy cluster members has revealed potential signatures of self-interacting dark matter. In this talk I will discuss the current evidence that support this hypothesis, the observational signals that self-interacting dark matter may manifest it self as and the current work that is continuing to probe this potentially revealing property of the Universe's most mysterious matter.
Bruderer, Claudio	ETH Zurich	A new approach to weak lensing measurements and application to DES	Abstract: The Dark Energy Survey (DES) is in its third year of operation. Thus, large datasets well-suited to study our Universe using Weak Lensing and other cosmological probes are now available and currently being analyzed. In order for Weak Lensing not to be limited by systematic uncertainties, among other challenges, galaxy shapes need to be accurately measured. In this talk I will present a new approach to Weak Lensing measurements. Preparing for the analysis of the currently largest wide-field imaging dataset, I show the results of the first implementation of this method applied on data from the Science Verification release of DES.
Kuntzer, Thibault	EPF Lausanne	Binary stars and their effect on weak gravitational lensing measurements	Abstract: Euclid is the next ESA mission dedicated to cosmology. It will survey ~15 000 degrees squared and image 1.5 billion galaxies. A powerful probe in the Euclid toolbox is the weak gravitational lensing (WL) effect. In order to reach good precision in the scientific output of the mission, the shear caused by WL must be measured to unprecedented accuracy. One of the main source of systematics for WL is an imperfect correction for the convolution of the images with the response of the telescope, -- the Point Spread Function (PSF). Binary stars are very common in the Milky Way, such multiple systems make up about 35% of the stellar population. If a PSF is reconstructed from an image of a binary system, it can deviate at the percent level from the true shape of the PSF, several orders of magnitudes more than the requirements. A popular technique to reconstruct PSF is to co-add the image to increase the signal-to-noise ratio which mitigates the effect, but binary stars still dominate the error budget. We present analytical tools and simulations that have been developed to predict the PSF alteration. The stellar spectral type is strongly correlated to the probability of binary systems. We devised a novel technique to predict the spectral type of stars imaged in a single band using machine learning. We test our method on simulations of Euclid-like and Hubble Space Telescope images. The results show a success rate of 78% and up to 65% respectively with an incertitude on the prediction of half a spectral class.
12.15 - 14.00	**Lunch**		

14.00-15.45	**Theory**		
Meyer, Manuel	University of Bern	Standard Model thermodynamics accross the electroweak crossover	Abstract: Within the Standard Model there is no electroweak phase transition (EWPT) but merely a crossover. Nevertheless, the thermodynamical evolution experiences a "soft point" with a deviation from an ideal gas at a temperature around 160 GeV. This deviation might have an effect on (weakly interacting) dark matter relic abundances or in leptogenesis scenarios taking place in this temperature regime. We use results from lattice simulations in a dimensionally reduced effective theory to estimate different thermodynamical quantities across the crossover.
Valkenburg, Wessel	Cern	Initial conditions for simulations of arbitrary modified gravity, beyond quasi-static approximations	Abstract: I will present a novel description for setting initial particle displacements and field values under arbitrary metric theories of gravity, for perfect and imperfect fluids with arbitrary characteristics. We extend the Zel'dovich Approximation to nontrivial theories of gravity, and show how scale dependence implies curved particle paths, even in the entirely linear regime of perturbations. Initial conditions set at high redshifts are affected at the level of up to 5% at Mpc scales, which exemplifies the importance of going beyond ΛCDM initial conditions for modifications of gravity outside of the quasi-static approximation. Our description paves the way for simulations and mock galaxy catalogs under theories of gravity beyond the standard model, crucial for progress towards precision tests of gravity and cosmology.
Nardini, Germano	University of Bern	Detecting Electroweak Phase Transitions at eLISA	Abstract: In many extensions of the Standard Model of particle physics (SM) the LHC data impose a stringent bound on the strength of the electroweak phase transition and, in turn, on the stochastic gravitational wave background that this transition produces. In this talk we highlight some exceptions, we explain how they overcome the LHC constraints, and we carefully analyse their detection prospective at eLISA.
Dupuy, Hélène	Université de Geneve	Neutrinos beyond the linear regime: a multi-flow approach	Abstract: I will present a new method allowing to deal with massive neutrinos beyond the linear regime. The key idea is to describe neutrinos as a collection of flows instead of considering them as a single multi-flow fluid. In this framework, no velocity dispersion has to be taken into account. Hopefully, this approach is a further step towards a computation of the nonlinear matter power spectrum in the presence of massive neutrinos.
15.45 - 16.15	**Coffee Break**		
16.15 - 17.00	**Observations/Modelling**		
Tucci, Marco	Université de Geneve	Modelling the radio luminosity function of AGN through the supermassive black holes evolution	Abstract: In this talk a new model for the evolution of the luminosity function of radio sources powered by AGN is presented. Firstly, the growth of supermassive black holes through the time is studied by the continuity equation. This approach, jointly with the knowledge of the bolometric lumiosity function of AGN, is able to put strong constraints on the AGN mass function and its evolution. Physical properties of active supermassive black holes, such as the mass and the accration rate, are then related to the radio luminosity of AGN. This is done by exploiting theoretical and phenomenological relations (e.g., the well-known "Fundamental Plane" relation between black hole mass and bolometric and radio luminosity) that connect the jets radio emission to the central engine of AGN. These relations are calibrated by fitting the observed local luminosity function and number counts of radio AGN. The model is able to provide the radio luminosity function between redshift 0-4 for 'radiative'-mode and 'jet'-mode AGN, and for flat- and steep-spectrum radio sources. The results are found in good agreement with observational data.
Reed, Darren	University of Zurich	High Redshift Galaxies and the Cosmic Infrared Background as a Test of Galaxy Formation and Warm versus Cold Dark Matter	Abstract: A warm dark matter universe should have a lower diffuse cosmic infrared background due to the suppression of low mass halo formation. However, our limited understanding of galaxy formation makes its prediction uncertain. I discuss the potential of the infrared background to constrain the dark matter particle and dwarf galaxy formation.