Colloque national du WG Dark Energy 2025 - 9ème édition

Rapport sur les contributions

https://indico.in2p3.fr/e/36618

ID de Contribution: **1** Type: **Non spécifié**

The Open Effective Field Theory of Dark Energy

jeudi 6 novembre 2025 12:10 (20 minutes)

Open effective field theories seek to incorporate dissipation and noise into our effective descriptions of gravity. These effects arise from the incomplete modelling of unknown components, which can significantly alter the dynamics of observable degrees of freedom. In this talk, I will introduce a framework that extends the standard effective field theory of dark energy, recovering it as a limit while incorporating local dissipation and noise. I will explore the resulting phenomenology in the scalar and tensor sectors, with a focus on the potential observational signatures of these effects. This construction provides a natural embedding for interacting dark energy models and establishes a versatile framework to investigate dissipative and stochastic effects in cosmology.

Auteur: Dr COLAS, Thomas (DAMTP - University of Cambridge)

Orateur: Dr COLAS, Thomas (DAMTP - University of Cambridge)

ID de Contribution: **3** Type: **Non spécifié**

Cosmic Shear Cosmology with the Completed Kilo-Degree Survey

jeudi 6 novembre 2025 14:20 (40 minutes)

The fifth (and final) data release of the Kilo-Degree Survey (KiDS) provides significantly more than just an increase in survey area. Instead, additional observations couple with improvements in data quality, data reduction, and value-added data-products, to make KiDS-DR5 the most robust and reliable release produced by KiDS to date. We leverage the lensing sample from this state-of-the-art dataset (called KiDS-Legacy) to perform the most robust and precise analysis of cosmic shear to date, finding KiDS-Legacy to be wholly consistent with the results from the Planck Cosmic Microwave Background (CMB) analyses. This talk will provide an introduction KiDS-DR5, discuss how this dataset differs with respect to previous KiDS releases, and focus in particular on how these differences have influenced the analysis of cosmic shear with KiDS-Legacy. I will discuss the causes of systematic variation in the parameter constraints that we observe between KiDS data releases, and discuss the implications that these systematic effects have for future analyses of cosmic shear.

Auteur: WRIGHT, Angus (Ruhr University Bochum)

Orateur: WRIGHT, Angus (Ruhr University Bochum)

ID de Contribution: **4** Type: **Non spécifié**

Cosmic tensions and interactions in the dark sector

jeudi 6 novembre 2025 10:10 (20 minutes)

The persistent discrepancy between theoretical predictions of the standard cosmological model and precision measurements from various observational probes remains a significant challenge in modern cosmology. Over the past decade, mounting evidence for persistent discrepancies in the inferred values of cosmological parameters derived from both model-dependent and -independent methodologies has motivated the proposal of alternatives to the standard paradigm. In this talk, I will focus on the exploration of potential missing physics within the standard model, particularly the enigmatic dark sector comprising dark matter and dark energy, and any potential interactions between them. Leveraging on phenomenology considerations and fluid approximations for the physical nature of the dark sector and its underlying dynamics, we assess the viability of various models in reconciling the observed cosmological tensions.

Auteur: TEIXEIRA, Elsa (LUPM Montpellier)

Orateur: TEIXEIRA, Elsa (LUPM Montpellier)

ID de Contribution: **5** Type: **Non spécifié**

Euclid : Weak lensing (TBC)

ID de Contribution: **6** Type: **Non spécifié**

Simons Observatory: News and Prospects

mercredi 5 novembre 2025 16:40 (40 minutes)

The Simons Observatory (SO) is already taking data and moving toward full science operations with its suite of small- and large-aperture telescopes. In this talk I will present recent updates on the project and outline its scientific potential, based on new forecasts.

Orateur: LOUIS, Thibaut (LAL)

ID de Contribution: **7** Type: **Non spécifié**

Euclid

Orateur: TUTUSAUS, Isaac

ID de Contribution: **8** Type: **Non spécifié**

KIDS

Orateur: WRIGHT, Angus (Ruhr University Bochum)

ID de Contribution: **9** Type: **Non spécifié**

What the 21cm signal can tell us about cosmology, astrophysics, and the Epoch of Reionisation

jeudi 6 novembre 2025 15:00 (30 minutes)

The brightness temperature of the 21cm spectral line of neutral hydrogen is directly proportional to the cosmic baryon density and the neutral fraction of the IGM. By measuring this signal at different frequencies, one can map the IGM at any given redshift, and follow the formation and evolution of cosmic structures. As such, the 21cm signal is an exceptional tracer of both cosmology and the astrophysics of galaxies during the Epoch of Reionisation, which saw the first light sources in the Universe slowly ionise the primordial atoms of the surrounding IGM. In this talk, I will present the cosmological prospects of the 21cm signal, with a focus on reionisation, and show what we can learn from radio observations with current and future experiments, in particular the upcoming Square Kilometre Array (SKA).

Orateur: GORCE, Adélie

ID de Contribution: **10** Type: **Non spécifié**

SPT-3G D1: CMB temperature and polarization power spectra and cosmology from 2019 and 2020 observations of the SPT-3G Main field

vendredi 7 novembre 2025 11:30 (40 minutes)

I will present the most precise measurements of CMB temperature and polarization power spectra from SPT-3G observations of 4% of the sky during 2019-2020. Using the deepest CMB maps to date for a TT/TE/EE analysis, we achieve the most precise measurements of the lensed EE and TE spectra at small angular scales. These results provide strong confirmation of the ΛCDM model and yield cosmological constraints comparable to Planck. From SPT-3G alone, we measure H_0=66.66±0.60 km/s/Mpc, confirming the Hubble tension at 6.2σ significance relative to SH0ES.
For the first time, combined ground-based CMB experiments (SPT+ACT) reach Planck's constraining power on key parameters. The combination of all three CMB experiments yields the tightest constraints to date: H_0=67.24±0.35 km/s/Mpc and σ_8=0.8137±0.0038. While CMB data alone show no evidence for physics beyond ΛCDM, we observe a growing 2.8σ discrepancy with DESI BAO results, which drives 2-3σ deviations from the standard model when combined.

Orateur: CAMPHUIS, Etienne

ID de Contribution: **11** Type: **Non spécifié**

Dark Energy Beyond Λ: Clues from the Late Universe

vendredi 7 novembre 2025 10:10 (30 minutes)

The ΛCDM model has been remarkably successful in describing the expansion history and structure of our Universe. Yet, recent high-precision observations are beginning to challenge this simple picture, suggesting possible departures from the cosmological constant, Λ. In this talk, I will discuss what current measurements reveal about the nature of dark energy, focusing on implications for the Horndeski class of scalar-tensor theories and the dynamics of the field driving cosmic acceleration. I will conclude by outlining promising directions for future work, including possible connections to observational systematics and other cosmological tensions.

Orateur: CALDERON, Rodrigo

ID de Contribution: **12** Type: **Non spécifié**

LSST current status

The Vera C. Rubin Observatory is set to significantly advance our understanding of the Universe in the coming decade. It is now entering its final commissioning phase prior to the start of the 10-year Legacy Survey of Space and Time (LSST). In this talk, I will discuss the observatory's progress and share some of the first results emerging from the analyses of early commissioning data.

Orateur: RICCI, Marina (LAPP)

ID de Contribution: **13** Type: **Non spécifié**

SKA

Orateur: SPINELLI, Marta

ID de Contribution: **14** Type: **Non spécifié**

Generative models and component separation with Scattering Transforms

jeudi 6 novembre 2025 09:40 (30 minutes)

Scattering Transforms are a type of summary statistics developed for the study of highly non-Gaussian processes. These statistics can be used to build generative models of data, and even to develop new component separation techniques. In this seminar, I will first give a general introduction to these tools. Then, I will show how they can be used for generative models of physical fields, with examples on various data formats (2D planar or spherical maps, 3D data). Finally, I will show an example of component separation between galactic dust emission and the cosmic infrared background using Scattering Transforms.

Orateur: MUSSET, Louise

ID de Contribution: **15** Type: **Non spécifié**

TDCosmo

ID de Contribution: **16** Type: **Non spécifié**

ZTF

ID de Contribution: **17** Type: **Non spécifié**

Constraining the dark sector and the initial conditions of the Univers with the EFTofLSS

jeudi 6 novembre 2025 15:30 (30 minutes)

In this talk, I will first present the paradigm of the effective field theory of large-scale structure (EFTofLSS), a semi-analytical method which provides an accurate description of the power spectrum and bispectrum of bias tracers, and aims at improving cosmological constraints from large-scale structure surveys, a major challenge in the context of DESI and the forthcoming Euclid mission. Second, I will present some possible applications of this theory and show its potential to enhance our understanding of non-standard hypotheses concerning the dark sector and the initial conditions of the Universe.

Orateur: SIMON, Théo

ID de Contribution: **18** Type: **Non spécifié**

The Dark Energy Survey Y6 3x2pt analysis

jeudi 6 novembre 2025 16:30 (40 minutes)

I will present an overview of the 3×2pt analysis of the full 4000 deg² of imaging data from the final Dark Energy Survey data release (DES Y6). I will begin with a general introduction to the 3×2pt framework, outlining how cosmological parameters are inferred from the joint analysis of the three two-point correlations that can be measured from galaxy positions and shapes: galaxy clustering, galaxy–galaxy lensing, and cosmic shear.

Focusing on the DES analysis, I will describe the construction of the data samples and the shear calibration, followed by the treatment of masking and imaging systematics. I will then focus on the redshift calibration. In particular, I will detail how photometric and clustering information are derived and combined within a Bayesian framework, and present the DES Y6 redshift marginalization method based on "modes"designed to better capture cosmology-relevant redshift uncertainties. I will also cover the intrinsic alignment modeling and the robustness tests against baryonic effects through optimized scale cuts. I will conclude by presenting the expected cosmological parameter uncertainties from DES Y6, without disclosing best-fit values, as the final results are not yet public.

Orateur: D'ASSIGNIES D., William

ID de Contribution: **19** Type: **Non spécifié**

Measurement of the anisotropy of cosmic expansion on ZTF type Ia supernovae simulations

vendredi 7 novembre 2025 10:40 (20 minutes)

The cosmological principle assumes the isotropy of the Universe. The high coverage of the Zwicky Transient Facility survey (ZTF) makes it possible to carry out an unprecedented study of the veracity of this principle by using observation of type Ia supernovae (SNe Ia).

This unique low redshift (z<0.15) survey with more than 3000 SNe Ia in the second data release (ZTF-DR2-SNe Ia) increases by a factor 10 the current low-redshift statistics. Its sky coverage, which represents more than the Northern sky, allows to develop new cosmological analysis such as the study a possible anisotropy of H_0. In this talk, I will present a preliminary analysis attending to quantify the sensitivity of detecting anisotropies, like a dipole effect, with realistic simulation reproducing the ZTF-DR2-SNe Ia.

Auteur: BARJOU-DELAYRE, Chloé

Orateur: BARJOU-DELAYRE, Chloé

ID de Contribution: **20** Type: **Non spécifié**

$f\sigma_8$ measurement with the type Ia Supernovae from the Zwicky Transient Facility DR2.5

mercredi 5 novembre 2025 14:50 (20 minutes)

$f\sigma_8$ is a powerful probe at low redshift to discriminate between different theories of gravity. In linear theory, this parameter is directly related to the velocity field. In this talk, I will show how the peculiar velocities of ZTF Type Ia supernovae can be used to measure $f\sigma_8$. I apply a maximum likelihood approach together with realistic simulations based on N-body mocks. I also investigate systematic effects in preparation for the analysis of the ZTF Data Release 2.5.

Auteur: KEBADIAN, Rafael (CPPM)

Orateur: KEBADIAN, Rafael (CPPM)

ID de Contribution: **21** Type: **Non spécifié**

The ZTF SN Ia DR2 and beyond

vendredi 7 novembre 2025 09:30 (40 minutes)

With around 3,000 published Type Ia supernovae (SNe Ia), ZTF is now the state-of-the-art low-redshift SN Ia sample. In the coming years, it will become the ideal sample to anchor Stage IV supernovae surveys, e.g. LSST.
In this talk, I will review published results from the ZTF SN Ia DR2, for which the data are now publicly available. I will focus on discoveries concerning the astrophysical biases affecting the SNe Ia, which will impact cosmological parameters. I will then present the future data releases, namely the DR2.5, DR3 and DR4.

Auteur: GINOLIN, Madeleine (IP2I/IN2P3/CNRS)

Orateur: GINOLIN, Madeleine (IP2I/IN2P3/CNRS)

ID de Contribution: **22** Type: **Non spécifié**

Cosmology from Three Years of DESI (DR2)

jeudi 6 novembre 2025 11:30 (40 minutes)

The Dark Energy Spectroscopic Instrument (DESI) is building the largest 3D map of our universe to measure its expansion history over the past 11 billion years, and thereby, study dark energy. Over a five-year period, DESI will spectroscopically classify nearly 40 million galaxies and quasars over 1/3 of the sky and to redshifts z < 3.5.

The DESI collaboration has completed measurements of the baryon acoustic oscillation (BAO) feature and more generally, of large-scale structure, using data from the first three years of observation (DR2). In this seminar, I will present those measurements and their implications for our understanding of the cosmological model, I will discuss the tensions with LambdaCDM and the question of the nature of dark energy.

Orateur: YECHE, Christophe

ID de Contribution: **23** Type: **Non spécifié**

TBA

Orateur: FABBIAN, Giulio

ID de Contribution: **24** Type: **Non spécifié**

Cosmology from CMB and space-based galaxy surveys

jeudi 6 novembre 2025 10:30 (30 minutes)

Cosmology is entering a new high precision era with the beginning of the operations of next generation ground-based CMB experiments (Simons Observatory, SPT) and galaxy surveys (Euclid, Rubin, DESI). These experiments will deliver high-sensitivity data sets on large sky fractions and will enable us to constrain cosmology and astrophysics on all scales.
In this talk I will focus on how galaxy surveys from space can play an important role in this endeavor. I will first discuss the Quaia catalog, the largest quasar catalog produced to date, derived from data of the Gaia mission. I will show how this catalog can be used to constrain primordial and late-time universe physics in combination with Planck and ACT data, and will give prospects on the improvement expected for this catalog by future Gaia data releases. I will then discuss the status of Euclid and on the cross-correlation analyses with CMB probes carried out for the first Euclid Q1 data release. I will then conclude giving prospects for future Euclid data releases, outlining synergies with

Auteur: FABBIAN, Giulio (Institut d'Astrophysique Spatiale (IAS))

Orateur: FABBIAN, Giulio (Institut d'Astrophysique Spatiale (IAS))

ID de Contribution: **25** Type: **Non spécifié**

Angular Bispectrum of Galaxy Number Counts for Photometric Surveys

mercredi 5 novembre 2025 17:20 (20 minutes)

Upcoming surveys of cosmic structures will probe scales ranging from the nonlinear regime to scales close to the cosmological horizon. This opens the door to testing the ΛCDM model, as well as early universe scenarios with primordial non-Gaussianity. Modeling the galaxy angular bispectrum is particularly challenging, as it requires accounting for nonlinear dynamics and light-cone projection effects, which lead to computationally demanding numerical integrations. In this talk, I will present the theoretical framework and numerical setup we have developed to evaluate, for the first time, the angular bispectrum on the light cone, including redshift binning and without relying on the Limber approximation. This provides a new way to extract information from the photometric surveys of Euclid.

Auteur: MONTANDON, Thomas (Laboratoire Univers et Particule de Montpellier (LUPM))

Orateur: MONTANDON, Thomas (Laboratoire Univers et Particule de Montpellier (LUPM))

ID de Contribution: **26** Type: **Non spécifié**

Spectrophotometric standardisation of ZTF-SEDm type Ia supernova sample

vendredi 7 novembre 2025 12:30 (20 minutes)

Type Ia Supernovae (SNe Ia) are standardisable candles used to measure cosmic distances from their nearly constant maximum luminosity. Standardisation methods have been developed to reduce intrinsic scatter and improve distance estimates. Traditional photometric method reaches a ~0.15 mag precision, but the SNFactory (SNf) survey has suggested that a spectroscopic approach can reach ~0.07 mag.
We test for the first time the spectroscopic method called the Twins Embedding (TE) using an other survey. The Zwicky Transient Facility (ZTF) spectra sample has around 700 spectroscopic SNe from the spectrograph SEDm, four times larger than SNf for the same selection cuts. During the talk, I will present results of the TE applied to ZTF sample. We show that a first standardisation of ZTF SNe reach a 0.155 mag dispersion and ~0.1 mag for the bluest. We will discuss the robustness of the method and its limits.

Auteur: GANOT, Constance

Orateur: GANOT, Constance

ID de Contribution: **27** Type: **Non spécifié**

TDCOSMO 2025: Cosmological constraints from strong lensing time delays

mercredi 5 novembre 2025 14:10 (40 minutes)

Time-delay cosmography with lensed quasars is a one-step method for estimating the Hubble constant in the local Universe independently of the cosmic distance ladder. It does not require any intermediate calibration and relies on measuring the time delays between multiple images of strongly lensed quasars, which are inversely proportional to the Hubble constant.
In this talk, I will present the cosmological constraints from the latest blinded analysis conducted by the TDCOSMO collaboration from eight strongly lensed quasars (hereafter, the TDCOSMO-2025 sample). Building on recent advances, we have improved our modelling of (1) line-of-sight effects, the surface brightness profiles of lens galaxies, (3) the stellar orbital anisotropy, and we also corrected for projection effects in the lens dynamics. Our uncertainties in the deflectors' mass density profiles remain maximally conservative as they incorporate explicitly the effect of the mass-sheet degeneracy, now constrained by new measurements of stellar velocity dispersions from spectra obtained with the James Webb Space Telescope (JWST), the Keck Telescopes, and the Very Large Telescope (VLT), all benefitting from crucial methodology improvements.
Our primary result, $H_0 = 71.6^{+3.9}_{-3.3}$ km/s/Mpc, is derived from the TDCOSMO-2025 sample combined with Ω_m constraints from the Pantheon+ Type Ia supernova (SN) dataset. Importantly, our Hubble constant measurement is robust against the addition of external lens samples (SL2S, SLACS), the prior on Ω_m (Pantheon+, DES Year-5 SN sample or DESI DR2 BAO), and the choice of different cosmological models.

Auteur: TDCOSMO COLLABORATION

Co-auteurs: BIRRER, Simon; SHAJIB, Anowar; MILLON, Martin; GALAN, Aymeric (MPA, TUM)

Orateur: GALAN, Aymeric (MPA, TUM)

ID de Contribution: **28** Type: **Non spécifié**

Probe combination in Euclid to go beyond the standard model

mercredi 5 novembre 2025 15:10 (40 minutes)

After a successful launch in 2023, and the beginning of the scientific survey last year, Euclid has become the first stage IV photometric survey in operations. In addition to all the cosmological probes that can be considered from Euclid's photometric observations, a spectroscopic survey is also being performed, allowing us to add even more probes to a combined analysis from Euclid data alone. In this talk I will present the current predictions for a combined analysis with the main Euclid probes, namely spectroscopic galaxy clustering and 3x2pt (photometric galaxy clustering, weak lensing, and galaxy-galaxy lensing), paying special attention to how the combination of different probes enables us to test different models beyond the LCDM framework.

Auteur: TUTUSAUS, Isaac (ICE/IRAP)

Orateur: TUTUSAUS, Isaac (ICE/IRAP)

ID de Contribution: **29** Type: **Non spécifié**

4MOST-CRS BG and LRG Target Selection

vendredi 7 novembre 2025 12:10 (20 minutes)

The Cosmology Redshift Survey of the 4-metre Multi-Object Spectroscopic Telescope (4MOST-CRS) will provide the most extensive spectroscopic redshift catalogue of galaxies and quasars over 5700 deg² in the southern hemisphere.
As targets for the 4MOST-CRS, we present a selection of a sample of Bright Galaxies (BG) and Luminous Red Galaxies (LRG) in the redshift ranges $0.1 < z < 0.5$ and $0.4 < z < 1$, respectively. We will also show the synergistic power with DESI and the possibility to provide redshifts to big cosmological surveys as Euclid, LSST, CMB experiments and radio interferometers

Auteur: VERDIER, Aurélien (Ecole Polytechnique Fédérale de Lausanne (EPFL))

Co-auteur: Dr ROCHER, Antoine (EPFL)

Orateur: VERDIER, Aurélien (Ecole Polytechnique Fédérale de Lausanne (EPFL))

ID de Contribution: **30** Type: **Non spécifié**

Bayesian field-level inference with DESI galaxies and ZTF SN Ia

mercredi 5 novembre 2025 15:50 (20 minutes)

To unlock the full potential of upcoming datasets and probe the dark sector, we must move beyond information-compression techniques towards field-level analysis. The Aquila Consortium has been at the forefront of developing Bayesian field-level inference (FLI) with the BORG algorithm.
In this talk, I will briefly remind the basics of FLI with BORG, then I will present its application to ZTF SN Ia mock data which constitutes the work of my PhD student, Mahmoud Osman, with preliminary results on the density and velocity fields reconstruction, together with cosmological parameter inference. Eventually, I will present my work on developing and testing BORG's data product, Manticore, to the DESI BGS with preliminary results on the reconstruction at fixed cosmology.

Auteur: ZARROUK, Pauline (LPNHE)

Orateur: ZARROUK, Pauline (LPNHE)

ID de Contribution: **31** Type: **Non spécifié**

The DESI Peculiar Velocity survey: growth rate measurements with Data Release 1

jeudi 6 novembre 2025 17:10 (20 minutes)

In this talk I will overview the preliminary cosmological results from the DESI Peculiar Velocity survey, using the first year of data. We measured about 100k peculiar velocities using the Tully-Fisher relation and the Fundamental Plane. We use auto and cross-correlations between our peculiar velocities and galaxy positions from the Bright Galaxy Survey at redshifts z < 0.1 to measure the growth rate of structures at 12.5\% precision (preliminary). This measurement was performed with three different methods and consistently tested with the largest and most realistic set of mock catalogs. Thanks to this low-redshift growth rate measurement, we are able to reduce uncertainties on the gravitational index parameter gamma by a factor of nearly 2.

Auteur: BAUTISTA, Julian (CPPM, Aix-Marseille Université, CNRS/IN2P3)

Orateur: BAUTISTA, Julian (CPPM, Aix-Marseille Université, CNRS/IN2P3)

ID de Contribution: **32** Type: **Non spécifié**

Cosmological implications of the Gaia Milky Way declining rotation curve.

mercredi 5 novembre 2025 17:40 (20 minutes)

Although the existence of dark matter is widely accepted, its true nature remains unknown, motivating alternative explanations such as \textbf{Modified Newtonian Dynamics (MOND)}. MOND modifies Newton's laws for low accelerations (around $a_0 \sim 1.2 \times 10^{-10}\,\mathrm{m/s^2}$) and generally reproduces the flat rotation curves of galaxies.

However, recent \textit{Gaia} data reveal a \textbf{declining} rotation curve in the Milky Way, which differs from the usual flat behavior. This study tests whether MOND can accomodate this decline.

A standard baryonic model of the Milky Way is first built, and an \textbf{NFW dark matter} model successfully fits the decline with a scale radius of about $4\,\mathrm{kpc}$. In contrast, the standard MOND framework fails to do so.

By relaxing the baryonic parameters and using an \textbf{MCMC} analysis, we find that MOND could only match the data if the stellar disk is very massive ($\sim 10^{11} M_\odot$), while a_0 is consistent with zero and limited to $0.53 \times 10^{-10}\,\mathrm{m/s^2}$, much smaller than the standard MOND value.

Auteur: BLANCHARD, ALAIN (IRAP , OMP)

Orateur: BLANCHARD, ALAIN (IRAP , OMP)

ID de Contribution: **33** Type: **Non spécifié**

Discussion : relevés spectroscopiques de 5e generation

mercredi 5 novembre 2025 18:00 (30 minutes)

Orateur: ZARROUK, Pauline

ID de Contribution: **34** Type: **Non spécifié**

Welcome

mercredi 5 novembre 2025 14:00 (10 minutes)

Orateur: BLANCHARD, Alain