Science with LSS and CMB cross-correlations

(INAF-OAB, Wednesday Sept. 23rd, Merate)

- 10:00--10:15 Welcome

- 10:15--10:45 Giulio Fabbian (SISSA/ISAS)

Precision CMB-LSS cross-correlation with the POLARBEAR experiment

I will present the POLARBEAR experiment, an ongoing ground-based CMB polarization experiment located in northern Chile. I will review the results obtained from analysis of the data collected during the first season of observations. These included the first evidence of lensing induced B-mode polarization on sub-degree scale using CMB data alone. I will also present the capabilities of the upgrade of the POLARBEAR experiment, the Simons Array, which will observe 65% of the sky and provide one of the best CMB data set for cross-correlation studies with galaxy surveys.

- 10:45--11:15 Mariachiara Rossetti (Physics Dept, Milan Univ)

Cosmology with the Second Planck Catalogue of SZ sources

I will present the Second Planck Catalogue of Sunyaev-Zeldovich sources, released by the Planck Collaboration in March 2015. From this sample, we could measure the abundance of clusters in the Universe, as a function of redshift and S/N, and we used it to constrain cosmological parameters. I will show the impact of the uncertainty on the mass measurement on the estimates of cosmological parameters and make use of external datasets to calibrate the mass bias and to reduce the tension with measurements from primary CMB.

- 11:15--11:45 Carmelita Carbone (INAF-OAB)

XC in N-body Simulations with neutrinos: WL, ISW-RS and SZ effects

I will present the first set of cosmological simulations produced within the “Dark Energy and Massive Neutrino Universe” (DEMNUni) project. These simulations are characterized by L=2Gpc/h, Npart=2x2048^3, a baseline LCDM-Planck cosmology, and four different total neutrino masses, Mnu=0,0.17,0.3,0.53 eV, with a degenerate mass spectrum. They are the largest N-body simulations to date with a massive neutrino component treated as an additional particle type. I will present fully non-linear effects in the presence of massive neutrinos, extracted from the DEMNUni simulations, and show how neutrino free-streaming alters the SZ, CMB- and weak-lensing signals, introducing also an excess of power in the ISW/RS signals, and related cross-correlations, at intermediate scales.

- 11:45--12:15 Ben Granett (INAF-OAB)

The Integrated Sachs-Wolfe Effect from BOSS Super-Structures

Cosmic structures leave an imprint on the microwave background radiation through the integrated Sachs-Wolfe effect. We construct a template map of the signal using the SDSS-III Baryon Acoustic Oscillation Survey at redshift $0.43 < z < 0.65$. We verify at the 97% confidence level the imprint of this map on the CMB using Planck data and show consistency with the density-temperature cross-correlation measurement. Using this ISW reconstruction we investigate the presence of ISW sources and examine the properties of the Granett et al (2008) supervoid and supercluster catalogue. We characterise the three-dimensional density profiles of these structures for the first time, shedding new light on the original measurement.

- 12:15--14:15 Lunch

- 14:15--14:45 Federico Bianchini (SISSA/ISAS)

Toward a tomographic analysis of Planck CMB lensing-Herschel cross correlation

High-resolution Cosmic Microwave Background (CMB) measurements carried out both by space- and ground-based experiments enables us to reconstruct the CMB Lensing map which probes the matter distribution in the Universe out to high redshifts, hence encoding a wealth of cosmological information. On the other side, dusty star-forming galaxies (DSFG) at $z > 1.5$ are the biased signposts of the haloes that act as lenses for CMB photons. I will present the first cross-correlation analysis between CMB Lensing measured by Planck and the spatial distribution of the sub-mm selected high-z H-ATLAS galaxies, describing both datasets and technique exploited. The signal is detected with high significance even when analysis is performed on redshift bins. I will show constraints on galaxy bias inferred from jointly clustering and cross-correlation data, discussing possible systematics and future work needed in order to fully exploit upcoming CMB and galaxy surveys.

- 14:45--15:15 Matteo Calabrese (SISSA/ISAS)

Lensing of the Cosmic Microwave Background (CMB): modelling and cross-correlation with real and simulated galaxy surveys

We describe the effect of gravitational lensing on the Cosmic Microwave Background (CMB) anisotropies due to the matter distribution in the Universe. In the first part of the talk, we describe the multiple planes ray-tracing approximation to follow the primordial CMB photons travelling through large-scale structures (LSS) distribution, as predicted by N-Body numerical simulations. We discuss the impact of LSS non-linear evolution on the CMB temperature and polarization 2-points statistics of power spectra, analysing full-sky maps. In the second part, we describe a new algorithm to study the cross-correlation between CMB lensing potential and other matter tracers using mock catalogues. We discuss the procedure we have used to populate halos from a numerical simulation with galaxies, as we plan to mimic observations of future missions as Euclid.

- 15:15--15:45 Gigi Guzzo (INAF-OAB)

The VIPERS redshift survey: an overview

The VIMOS Public Extragalactic Redshift Survey (VIPERS - Large Programme # 182.A-0886) has built a unique statistical sample of 90,000 redshifts to i_{AB} = 22.5 mag, to map in detail the large-scale distribution of galaxies at 0.5 < z <1.2. With a combination of volume and sampling density that is unique for these redshifts, it focuses on measuring galaxy clustering and related cosmological quantities as part of the grand challenge of understanding the origin of cosmic acceleration. At the same time, VIPERS has been designed to guarantee a broader legacy, allowing detailed investigations of the properties and evolutionary trends of z ~ 1 galaxies. The survey strategy exploited the specific advantages of VIMOS, building what represents the largest redshift survey ever performed with ESO telescopes. Results based on the PDR-1 release (containing the first 2/3 of the survey and public since October 2013), include among others the best available estimates at z~1 of the power spectrum of galaxy clustering, the growth rate of structure, and the galaxy stellar mass function. The observations have been completed in January this year, with all redshifts reduced and validated by the end of April. A series of new and refined investigations are ongoing using the full survey, as to obtain the definitive measurements. Many more are expected from the community when the full VIPERS will be released, in mid-2016.

- 15:45--16:15 Adam Hawken (INAF-OAB)

Measuring the growth rate of structure around cosmic voids in VIPERS

Using an algorithm based on searching for empty spheres we identified void regions in the final data release of the Vimos Public Extragalactic Redshift survey. The cross-correlation between these objects and the full galaxy sample exhibits an enhancement along the line of sight. This anisotropy is indicative of redshift space distortions caused by galaxies flowing away from the void centres, falling onto surrounding massive structure. By fitting a model for the cross-correlation which includes the linear motions of galaxies, we are able to estimate the redshift space distortion parameter β. Our constraints are competitive with standard methods but may be subject to systematic effects which are not fully understood.

- 16:15--16:45 Jianhua He (INAF-OAB)

Testing f(R) gravity with the large scale structure

Using the large scale structure as a ground for testing the nature of gravity is a topic of active current interest. In this talk, I will introduce a novel idea of testing f(R) gravity with cosmological surveys.

- 16:45--17:15 Discussion/Concluding remarks