Laboratoire LEPRINCE-RINGUET
Ecole polytechnique IN2P3/CNRS

Séminaire

Clusters of galaxies physics and cosmology with KID cameras

Clusters of galaxies have been proved to be a competitive cosmological probe and complementary to primary CMB anisotropies. In the last two decades technical developments have permitted to observe and detect clusters of galaxies in a large wavelength range including the X-ray, visible, IR, millimeter, microwave and radio domains. Within this context, the thermal Sunyaev-Zeldovich (tSZ) effect, produced by the inverse Compton interaction of hot electrons in the clusters with CMB photons, is an observable of choice as it constitutes a spectral distortion to the CMB spectrum and thus, it is not affected by cosmological dimming. Various CMB experiments like Planck, ACT and SPT have produced large catalogues of clusters of galaxies that have been used for cosmological analyses. These analyses have demonstrated the power of clusters cosmology in terms of precision. They have also shown that to achieve high accuracy cosmology a deep knowledge of clusters physics is needed. At this respect, the tSZ effect is also a major tool providing insights in the thermodynamic properties of the clusters allowing us to measure their pressure and mass, but also their temperature via relativistic corrections. Furthermore, the kinetic SZ effect can be also used to derive clusters velocity along the line-of-sight providing extra cosmological information.

Such measurements require a large variety of high sensitivity instruments enabling: 1) high and low resolution measurements to study high redshift and low redshift clusters, 2) multi-band photometric measurements for deep cluster mapping, and 3) spectroscopic measurements to separate the different SZ components. In this seminar we will describe the 4 main instruments that we have developed for cluster observations: the NIKA and NIKA2 bi-band cameras for high redshift cluster mapping, and the KISS and CONCERTO spectrometers for spectral studies of low and high redshift clusters, respectively. These 4 instruments have been made possible thanks to the development in Grenoble of a new millimeter detectors technology based on Kinetic Inductance Detectors, which allows us to construct high sensitivity large detector arrays (up to thousands of pixels) with a large multiplexing factor.

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Responsables séminaires

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