Abstracts

1. Tarun Souradeep (IUCAA)

   Title : Comely or Foxy universe from Planck?

   Abstract : The talk will review the first cosmology results announced by the Planck space mission very recently. The Planck satellite measured fluctuations in the temperature and linear polarization of Cosmic Microwave background over the full sky at unprecedented angular resolution and sensitivity. On one hand, this milestone in cosmology confirms the emerging 'standard model' of cosmology with high confidence, including multiple remarkable cross-checks on simple model of structure formation within the LCDM model and also points to the simplest version of inflation. On the other hand, it has also solidified the evidence for possible violation of the the cosmological principle – a fundamental assumption of cosmology!!!

2. Sanjit Mitra (IUCAA)

   Title : Extracting science from the Planck Mission

   Abstract : Planck mission has recently published the full sky measurements of temperature anisotropy of the Cosmic Microwave Background (CMB) and other astrophysical sources in the frequency range 30-1000 GHz with exquisite accuracy. Though precision of measurements makes it easy to improve our understanding of the universe, it poses a great challenge for data analysis, as many more systematic effects tend to become significant. This presentation will contain an overview of the Planck mission and its data analysis, with some emphasis on the systematic effects arising from the asymmetric instrumental beams.

3. L Sriramkumar (IIT Chennai)

   Title : The early universe: Through the "eyes" of Planck

   Abstract : The inflationary scenario is the most promising paradigm to describe the origin of perturbations in the early universe. It is also a remarkably efficient paradigm. Even the simplest of models lead to a sufficiently long duration of inflation as is required to overcome the horizon problem. In fact, many of these models admit inflation of the slow roll type, which lead to nearly scale invariant primordial power spectra that are rather consistent with the observations of the anisotropies in the CMB.

   The efficiency of the inflationary scenario has led to the concern that it may be difficult to converge on a single model or even a class of models of inflation. However, the recent observations of the CMB anisotropies by the Planck mission has provided hope. The stronger constraints from Planck on quantities such as the tensor-to-scalar ratio and the amplitude and the shape of the bispectrum suggests that a systematic effort involving the two point and the three point correlation functions can aid in ruling out a wide variety of inflationary models.

In this talk, I discuss the constraints from Planck on the primordial power spectra and bispectra as well as the implications for different inflationary models.

4. Aditya Rotti (IUCAA)

   Title : Beyond the Isotropic Universe

   Abstract : The currently accepted ΛCDM model of Cosmology is built on the assumption that the universe is isotropic. This assumption needs to be rigorously tested and the CMB temperature anisotropy measurement is an ideal data set for this task. The PLANCK satellite has measured these anisotropies with unprecedented accuracy, resolution and sky coverage.

   In the absence of the assumption about the isotropic nature of the universe, the CMB two point correlation function can be most generally decomposed into a direction independent part and a direction dependent part. The direction independent part of the two point correlation function (better known as the CMB angular power spectrum) has been extensively studied.

   A measurement of the direction dependent part of the correlation function can be used to reconstruct the large scale structure surrounding us. Further it can also be used to test the isotropic nature of the universe. Both these tasks have been carried out on PLANCK data and have yielded interesting results.

   In the talk, I will provide an overview of the wealth of information that can be extracted by studying the direction dependent part of the CMB two point correlation function and discuss some of the interesting results from PLANCK.

5. Pravabati Chingangbam (IIA)

   Title : Traces of residual foreground signals in the CMB data

   Abstract : The clean isolation of the true CMB signal from the total observed signal in the microwave sky is a formidable task. It is very important to crosscheck the cleanliness of the signal by a variety of independent ways since any residual foreground contamination will bias the cosmological information that we extract from the data. We infer the presence of small but statistically significant residual foreground contamination in the cleaned WMAP data from calculations of correlations between the foreground map and the cleaned map after applying the Galaxy and point sources masks. To quantify the effect of the residual contamination on the search for primordial non-Gaussianity in the CMB we add estimated contaminant fraction to simulated Gaussian CMB maps and calculate the characteristic non-Gaussian deviation shapes of Minkowski Functionals that arise due to the contamination. We find remarkable agreement of these deviation shapes with those measured from WMAP data, which imply that a major fraction of the observed non-Gaussian deviation comes from residual foreground contamination. These techniques will be applied to the recently released CMB data from the Planck satellite.