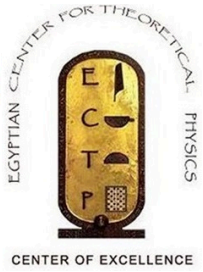
Online Conference on
Gravitational Physics and Astronomy
4-9 December 2022
Internet https://indico.cern.ch/e/GPA2022
JOURNAL https://www.mdpi.com/journal/physics/special_issues/SPGPCC



Contribution ID: **22** Contribution code: **GPA22-16** Type: **not specified**

Study on CMB dipole using COBE/FIRAS data set

Thursday 8 December 2022 10:30 (30 minutes)

Cosmology, as the name suggests, concerns the study of the origin, structure, laws, and ultimate fate of the universe on a very large scale. The origin of the universe and its evolution have always been the most sought-after information for us. To know how the universe came into existence, CMB is the most practical tool, or the only one, at least for now, available to us. CMB, the earliest light in the universe, is one of the most effective techniques for examining the physics of the cosmos. In recent years there has been a substantial shift towards the model formation, simulation and computational technique with a desire to contribute precise results by twining with the experimental satellite data.

The latest studies and observations on CMB impart that detected radiation is not from a solitary blackbody with a specific temperature but are radiations due to combination or mixture of blackbodies. This creates the distortion in the CMB spectrum namely μ and y distortion. Temperature and distortions of CMB are the crucial parameters for the investigation of the origin of the existing universe. As the CMB spectrum resembles a Planck spectrum we can analyse the probability distribution of temperature for CMB. One of the such techniques is blackbody radiation inversion.

In this research the technique of blackbody radiation inversion is applied to calculate the CMB temperature and its uncertainty from COBE/FIRAS dipole dataset. It is also found that the process is somehow similar to mixing of weighted blackbodies. The temperature and its spreading obtained from the distribution is 2.514 ± 0.555K. This spreading is larger than the estimated spreading (3.3 × 10-3 K) by considering relative motion. Deviation from gaussian behaviour is established by measuring skewness and kurtosis. The comparison between the probability distribution of temperature of monopole, dipole and their resultant are also done. The distribution is found to be asymmetrically oriented. Interpreting the spreading as the distortion we calculated the μ and y-distortions, and found to be in the order of 10-1 and 10-2 respectively. This research presents the very first mention of CMB dipole temperature and its spreading assuming the mixing of black bodies.

Primary author: DHAL, SOMITA (BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI)

Presenter: DHAL, SOMITA (BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI)