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Physics news on the Internet (based on electronic preprints)

1. Experimental test of the general relativity theory

Experimental verification of the general relativity theory is still a topical subject, because not so long ago the accuracy of measurements was still low. New and more accurate measurements of the deflection of electromagnetic radiation in the gravitational field of the Sun have been performed in the USA. In the experiments use was made of long baseline radio interferometry with two antennas, one mounted in Massachusetts and another in California, to measure the deflection of radio waves coming from the extragalactic source 3C279. The wide spacing of the antennas made it possible to obtain much more accurate data than is possible with a single antenna. The ratio of measured to predicted deflection was 0.9998 ± 0.0008.

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2. Anisotropy of microwave background radiation

One of the primary means for studying the early history of the Universe is the observation of background radiation. In particular, anisotropy of the background radiation over the sky is associated with inhomogeneities of the density of matter that existed at the time of recombination of hydrogen. Later these inhomogeneities gave rise to the present large-scale structure of the Universe: galaxies and clusters and superclusters of galaxies. Of much interest and importance is the question of the origin of the initial inhomogeneities. The theory that is most widespread is that inhomogeneities stem from quantum fluctuations at the inflationary stage, but there exist also alternative theories, such as, for example, the cosmic string theory. Each theory leads to a specific spectrum of inhomogeneities, and observations of the background radiation provide estimates of the reliability of any given theory.

Measurements of the anistropy of the background radiation are being carried out, in particular, at the Amundsen – Scott scientific station in the Antarctic. The Rython-2 telescope was used for repeated measurements which confirmed the results obtained with the Rython-1 telescope in 1993. Rython is a parabolic telescope with a diameter of 0.75 m fitted with bolometric detectors. The measurements were performed at 90 GHz over subtended angles of around 1°. The value obtained for the mean square relative temperature of the background radiation was $\Delta T/T = 2.8^{+1.1}_{-0.7} \times 10^{-5}$.

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