The possible signature of symmetry violation in Nature Laws

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Abstract

In order to test the coincidence of CMBR anisotropies with the asymmetries of Lorentz Invariance violations in electromagnetic and nuclear experiments, it is shown in this work the comparison between the anisotropy of the Cosmics Microwave Background Radiation (CMBR) and the asymmetry of the violation of Local Lorentz Invariance (LLI) emerging from both electromagnetic and nuclear laboratory experiments.

Several studies of the spatial anisotropy of CMBR have been carried out and several maps have been released with increased spatial resolutions. From the data collected by the Planck Surveyor [1], which is so far the survey mission of the CMBR with the highest spatial resolution, seven types of spatial anisotropy of the CMBR could be extracted corresponding to seven different types of features of this radiation. Each of these seven types of anisotropy possesses a preferred spatial direction, which was compared with the spatial preferred directions of asymmetry found out in the electromagnetic and nuclear experiments performed to study the violation of LLI.

In the past some authors put forward the phenomenological theory of Deformed Space-Time [2] in order to describe the effects of the violation of LLI for the four fundamental interactions on the local geometry of space time. Several experiments have been carried out since then both to build up the theory and to verify its predictions. The two laboratory experiments, whose results were compared with those of CMBR, belong exactly to these two categories.

In the electromagnetic experiment it has been studied the tension induced on a capacitor by a static magnetic field produced by a constant current flowing in a Helmotz coil [3]. Although the coil and the capacitor belonged to the same reference frame, i.e. they were still with respect to each other, a not null voltage could be measured across the capacitor for precise orientations both of the coil in space and of the capacitor with respect to the coil. In other words, the results of this experiment indicated a clear violation of LLI along specific directions in space and hence the anisotropy of the violation of this symmetry.

Several experiments of a completely different type have been also carried out in order to investigate the effect of the LLI breakdown on the hadronic interaction. By following the prediction of the DST theory about the existence of a new type of nuclear reactions if precise energy density in space and time were reached, ultrasounds were applied to iron bars and measured the emission of nuclear radiation (neutrons in particular) from them during the ultrasonic treatment [4]. It was integrated the neutron emission from the bars surrounded over 2π radians by neutron detectors for several minutes and was found out that this emission hadn't been isotropic but, on the contrary, it presented a remarkable anisotropy and asymmetry.

The central idea of this work is the comparison of the direction of the CMBR anisotropy with these last two [5,6]. First of all we projected the preferred directions of the CMBR, given in galactic coordinates on the same altazimuth system of reference of the two laboratory experiments. Secondly, we compared by scalar product the projected directions of the 7 anisotropies of the CMBR with each direction along which it had been found the violation of LLI and with each direction of neutron emission. Thirdly we applied a statistical correlation test between the values of the scalar product and the quantitative results of the two experiments, that is the level of LLI violation for the several directions along which this symmetry was found to be broken and the intensity of neutron emission along the several radial direction around the ultrasonic treated bars.

Both for the electromagnetic experiment and for the nuclear one, it turned out that the strongest correlation of their data with the directions of anisotropy of the CMBR is with the anisotropy called

Cold Spot which so far, among the 7, has no good explanation by computer simulations. We put forward the idea that this correlation between preferred directions in these three so different experiments may indicate the existence of a possible physical symmetry violation in Nature, resulting in an asymmetry underlying the Nature laws. In particular these phenomenological evidences teach us that Lorentz symmetry violation possesses its own directionality. Therefore when we analyse the phenomenal rules by Lorentz violation, we have also to take into account the directionality of this violation indeed as a global matter of fact.

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