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Regular Article

Violation of local Lorentz invariance for deformed space-time neutron emission

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Abstract. Deformed Space-Time (DST) transformations are the consequence of the DST reactions induced in matter by the variation in energy density, in conditions of broken Local Lorentz Invariance (LLI). Through the DST transformations, it is possible to change the atomic weight of matter without using ionizing radiations and avoiding radionuclide production. In this sense, we can call this change of atomic weight "nuclear metabarysis". These phenomena of nuclear metabarysis are associated with neutron emission. We discuss an experiment of sonication of a steel bar (carried out in Rome in 2012), and analyze the energy distribution of the emitted neutrons. The main signatures of the neutron emission are its asymmetry and anisotropy. We compare these features of neutron emission with those of the Lorentz invariance breakdown, obtained by means of electromagnetic experiments some years ago.

1 Introduction

Anomalous transformations of matter have been observed by different research teams and exploiting different experimental techniques [1–5]. We also obtained compatible results by means of the cavitation phenomenon, as reported in previous papers [6–8]. We named these phenomena Deformed Space-Time (DST), or piezonuclear, reactions, because, according to the formalism of Deformed Special Relativity (DSR) [9–12], they take place in conditions of broken local Lorentz invariance[1], that can be achieved by means of (acoustical or mechanical) pressure [13]. Let us recall that DSR is a generalization of Special Relativity based on a Minkowski space-time endowed with a metric whose coefficients are not constant, but depend on the energy of the process considered.

The DST reactions causing matter transformations were produced in preceding experiments by means of the cavitation phenomenon [6–8], that allows one to obtain energy density variations in conditions of violated Lorentz invariance [9–12].

All the principles at the very basis of this kind of phenomena were set out in the pioneering work [14] and then developed in subsequent experiments. Such an analysis made possible to arrive to the precursor work [15], where, for the first time, the possibility of transformations that "run through" the nuclear curve (Aston-Bohr-Wheeler plot) in every direction is put forward [15]. In any material, it is necessary to achieve conditions on energy, such as to allow

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[1] In the following, for shortness, we will use the phrase "Lorentz invariance" instead of "local Lorentz invariance".