International Journal of Modern Physics B
Vol. 31, No. 23 (2017) 1750168 (20 pages)

DOI: 10.1142/S0217979217501685

Deformed space–time transformations in Mercury

F. Cardone[*,†], G. Albertini[*,‡], D. Bassani[§], G. Cherubini[¶,‖], E. Guerriero[**],
R. Mignani[††,†], M. Monti[‡‡], A. Petrucci[§§,***], F. Ridolfi[¶¶], A. Rosada[§§],
F. Rosetto[¶], V. Sala[‡‡], E. Santoro[§§] and G. Spera[‖‖]

[*]*Istituto per lo Studio dei Materiali Nanostrutturati (ISMN–CNR),*
Via dei Taurini, 00185 Roma, Italy

[†]*GNFM, Istituto Nazionale di Alta Matematica "F.Severi", Città Universitaria,*
P.le A. ldo Moro 2, 00185 Roma, Italy

[‡]*Università' Politecnica delle Marche (UNIVPM),*
Via Brecce Bianche, 60131 Ancona, Italy

CNISM (Consorzio Nazionale Interuniversitario
per le Scienze fisiche della Materia) - Ancona Unit, Ancona, Italy

[§]*SIDOM S.A.S., Via Volta 34, 12010 Cervasca (CN), Italy*

[¶]*ARPA Radiation and Chemical Laboratories Via Montezebio - 01100 Viterbo, Italy*

[‖]*Facoltà di Medicina, Università degli Studi La Sapienza,*
P.le A. Moro 2, 00185 Roma, Italy

[**]*CNR – Isituto d'Inquinamento atmosferico (IIA-CNR)*
Area Ricerca Roma 1 – CNR – Montelibretti (Roma), Italy

[††]*Dipartimento di Matematica e Fisica - Sezione di Fisica,*
Università degli Studi "Roma Tre",
Via della Vasca Navale, 84 - 00146 Roma, Italy

[‡‡]*STARTEC Srl, Via Libero Grassi, 1, 23875 OSNAGO (LC), Italy*

[§§]*Italian National Agency for New Technologies,*
Energy and Sustainable Economic Development (ENEA),
Via Anguillarese, 301 – 00123 Roma, Italy

[¶¶]*Dipartimento di Scienze della Terra, della Vita e dell'Ambiente (DISTEVA),*
Università degli Studi di Urbino "Carlo Bo" (UNIURB),
Campus Scientifico "Enrico Mattei" Via Cà Le Suore 2, 61029 Urbino, Italy

[‖‖]*CRA - IS.Pa.Ve., Chemical Section, Via C.G. Bertero, 22, 00156 Roma, Italy*
[***]*petrucciandr@gmail.com*

Received 7 September 2016
Revised 23 January 2017
Accepted 14 March 2017
Published 22 March 2017

[***]Corresponding author.

A mole of Mercury was suitably treated by ultrasound in order to generate in it the same conditions of local Lorentz invariance violation that were generated in a sonicated cylindrical bar of AISI 304 steel and that are the cause of neutron emission during the sonication. After 3 min, part of the mercury turned into a solid material which turned out to contain isotopes having a different mass (higher and lower) with respect to the isotopes already present in the initial material (mercury). These transformations in the atomic weight without gamma production above the background are brought about during Deformed Space–Time reactions. We present the results of the analyses performed on samples taken from the transformation product. The analyses have been done in two groups, the first one using five different analytical techniques: ICP-OES, XRF, ESEM-EDS, ICP-MS, INAA. In the second group of analyses, we used only two techniques: INAA and ICP-MS. The second group of analyses confirmed the occurring of the transformations in mercury.

Keywords: Deformed space-time reactions; local Lorentz invariance; nuclear transformations; neutrons; ultrasound; mercury.

PACS numbers: 21.30.Fe, 24.80.+y

1. Introduction

It has been suggested in previous papers the existence of a new type of nuclear reactions, called piezonuclear reactions that occur during cavitation phenomena induced by ultrasounds. This new kind of nuclear reactions occur when the ultrasounds and the cavitation produce suitable variations of energy density which correspond to a violation of Local Lorentz invariance (hereafter indicated as LLI or as "Lorentz Invariance").[1,2]

The violation of LLI produces deformed space–time conditions which are the stage of Deformed Space–Time (DST) reactions of which piezonuclear reactions are a particular case.

The pioneering work of Petrucci *et al.*[3] set the theoretical basic principles of these phenomena, while the following experimental data have been the starting point of the innovative work of Mignani *et al.*,[4] that predicts that the Aston–Bohr–Wheeler "nuclear curve" (see e.g., Refs. 4 and 5) can be completely followed in both directions.

These investigations, aimed at reaching LLI violation, are characterized by three main ingredients: reaching the energy threshold to have space–time deformation[2] for fundamental interactions governing the phenomena; obtaining the corresponding energy density inside the volume of the Ridolfi cavities in metallic materials,[6,7] for the weak (leptonic) and strong (hadronic) interactions; producing the right rate of energy or the right "time density" of energy, as shown in Ref. 2 where we showed how to transform the intervals of time for the hadronic interactions. Being the hadronic metric anisotropic,[8] the interactions driven by it (hadronic interactions) are consequently anisotropic.

With the purpose to study this anisotropic behavior, it was designed an experiment to register the spatial distribution of neutrons emitted by a steel bar suitably treated by ultrasounds in order to trigger in it the DST reactions. This experiment