

**CHARGE, PARITY, TIME (CPT) SYMMETRY BREAKING: EXPERIMENTAL DETECTION DURING A QUANTUM OPTIC PROCEDURE AND ITS APPLICATION TO THE SPACE AND PLANETARY SCIENCES.** F. Homor<sup>1</sup> and A. Gucsik<sup>2</sup>, <sup>1</sup>Sopron, Pf. 210, Hungary (E-mail: ferenchomor@gmail.com) <sup>2</sup> Department of Mineralogy and Geology, University of Debrecen, Egyetem tér 1., 4000, Debrecen, Hungary (E-mail: sopronianglicus@gmail.com).

**Introduction:** The development of own systems in physics research, the related experimental proof, the quantum communication invention as well as the quantum entanglement study results carried out by previous researchers (refer to the widely-known experiments: in the quantum optics, we wanted to create new quantum communication methods based on the results of Walborn et al. [1] and Kim et al. [2]). During our experiments we discovered the nearly complete charge-parity-time (CPT) symmetry breaking ( $\approx 100\%$ ), which was then incorporated into our quantum communication system, as follows.

In 2016-2017, we conducted a series of experiments on the subject above. The CPT symmetry-breaking effect and the underlying conditions of the invention are: the symmetry-breaking effect is based on the electromagnetic interactions, especially in the field of the quantum optics. It is important to note that our method is related to neither Faraday nor Kerr effects as well as laser beam wavenumbers. It is important to note that the laser beam does not enter a waveguide (there is not a procedure called PT violation in the communications).

New CPT Symmetry Effect (Symmetry breaking at  $\approx 100\%$  level): It was repeated in the form of the experiments, which was used for our invention and is always repeatable. The theoretical elaboration and proof of the CPT symmetry breaking is carried out in the relevant essay, the theoretical processing and proof of CPT symmetry violation, and the deduction of the consequences attached to physics is also based on QT, QED, and new parts related to the discovery: CPT symmetry breaking, gauge symmetry violation, Lorentz invariance – violation. Under experimental conditions, in the case of CPT symmetry violation, the functioning of physical laws has changed:

Based on the CPT symmetry violation, some physical processes considered impracticable can be made and usable: a new physical chapter - new technics and technology.

The current use of new degrees of freedom and its further application possibilities:

We have developed a Telecommunication invention based on quantum-based, already explored effect.

In the invention, further applications have been designated (deep and planetary research, implementation

or contribution to new energy production processes (e.g., nuclear fusion).

**Methods:** Our basic method is based on the basics of physics, the system physics analysis and the prognosis of a new physical model, which was confirmed in the designated area (quantum optics and quantum entanglement based quantum communication), experiments and inventions. First, experimentally, the CPT symmetry approach was created: this approach was associated with a physical model and a mathematical derivation (i.e., proof, operation description). Then the CPT symmetry-breaking effect was used for the experimental process for inventions and developed the theoretical basis for further applications (e.g., space exploration). It relies on the CPT symmetry violation theory: the theory of quantum mechanics, quantum optics, and QCD. Showing the symmetry breaking in these areas, as follows: using the symmetry operators, the linear vector space linear superpositions and related theory of measurements (the elaboration was carried out on the basic and relativistic level of particle theory as well as field theory). In the new physical model, the introduced reference system and the mathematical structure are the derivation operators, which give an adequate background for this symmetry violation (which is transposed into non-substitutable model elements). The descriptions are normalized for Planck units.

In the case of the symmetry breaking, conventional symmetry operators in this field will sign a sign, compared to the general symmetric case. Without the drawings, the final result, relativistic quantum mechanics [3]:

*Symmetric case CPT symmetry operator:*

$$(1) \Psi_{CPT}(t, r) = \Psi(t, r)$$

*In symmetric fracture, the CPT symmetry operator:*

$$(2) \Psi_{CPT}(t, r) = \Psi(-t, -r)$$

The basic self-function of the given operators, through an example:

(3)

$$\Psi(t, r) = \sum_p \frac{1}{\sqrt{2\epsilon}} (a_p e^{-i\omega t + i p r} + b_p^+ e^{i\omega t - i p r})$$

Functions satisfying the operator  $H\Psi = E\Psi$ , can be given in the usual way using differential equations or matrix solutions. Thus, the condition of symmetry is also the following:

$[H, CPT] = 0$  for symmetry (EM, Weak, Strong, Gravity Interaction). While in the special new procedure, for effect symmetry breaks  $[H, CPT] \neq 0$ .

The interaction of charged particles and the electromagnetic field is described by the product of  $A$  and  $j$  four-vector operators. In our case, the operators change sign, in the symmetry breaking case, compared to the general symmetric case. The outcome of the relativistic quantum mechanics [3] (the whole essay is necessary for interpretation) is as follows:

*Symmetric case, CPT symmetry general case:*

$$(4)C: (A_0, A) \rightarrow (A_0, A)_{t,r,m} \quad P: (A_0, A) \rightarrow (A_0, A)_{t,r,m}$$

$$CPT: (A_0, A) \rightarrow (A_0, A)_{t,r,m}$$

$$CPT=1, C=1, P=1, T(p)=1, A_0=A$$

*Failure symmetry, CPT symmetry breaking process:*

$$(5)C: (A_0, A) \rightarrow (-A_0, -A)_{t,r} \quad P: (A_0, A) \rightarrow (A_0, -A)_{t,r}$$

$$A)_{t,r} \rightarrow (A_0, -A)_{-\lambda, -r}$$

$$CPT: (A_0, A) \rightarrow (-A_0, -A)_{-t, -r} \rightarrow (-A_0, -A)_{-\lambda, -r}$$

$$\rightarrow CPT=-1 \rightarrow C=-1, P=-1, T(p)=-1, A_0 \neq A$$

### Results and Discussion:

*The significance of our discovery:* due to the discovery and theoretical conclusion of the CPT symmetry breaking process, the granularity of the physical basic model is significantly increased. As a result of our CPT symmetry breaking detection, the degree of physical freedom increases in the following way (also in technical use): it was thought that this was the foundation of physics that space, at all levels, it a gauge space (gauge symmetric space), and no CPT symmetry violation. However, the CPT symmetry violation makes this position impossible. Therefore, the CPT symmetry violation has very profound consequences, in terms of the foundations of physics and, therefore, in terms of technical development as well. There was a strategic change in the field of physical knowledge and their use: in physics science and technology the new degrees of freedom are embodied, in the tools that so far they were not feasible (e.g., our invention).

*The first use of CPT symmetry breaking phenomena:* We built a new quantum-entanglement-based telecommunication method and Invention. This is not QKD (Quantum Key Distribution) but a real quantum communication. The connection is not space and time-dependent, and there is no measurable change in space in the stream, only the transmitter and the receiver can detect the signal. This transmission does not require the development of new types of telecommunication channels. The transmitter-receiver equipment with the current available tools can be achieved. Our solution is an invention already: the system is working, but further development is required.

*Space Science and Technology Applications:* Based on the modelling above: theoretical interpretation of the CPT symmetry breaking, and the knowledge of the present invention and the quantum entanglement accordingly, it seems possible, in the case of research and development with significant forces, to further develop the results and to extend them to newer areas: cosmology, astronomy, planetary, cosmic telecommunications, new type drive and new type of energy production of space tools also. To do this, an appropriate research and development partner is required.

(A) Real-time communication with space objects: Compared to the current light speed mode, we can see the quasi-future, distance-independent instantaneous connection. There is a theoretical possibility of contact with the spacecraft in the cover: planet, behind the sun, etc.

B) Cosmic KVANTUM fluctuation tests, through the development of our telecommunication tool: In the invention, the time dilation branch is utilized, but if the reference beam is extended to a space object from which a quasi "reflection", space contractions is obtained (see Delayed Choice Quantum Eraser experiments: instant "reflection"), then there is a difference in space between the signal changes.

**Conclusions:** In this study, the first use of the CPT symmetry breaking effect can open a new field of the telecommunication, power generation and analytical systems, especially in the relatively rapid communication with satellites as well as probes to the planetary missions, for instance.

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