Santilli's detection of antimatter galaxies: An introduction and experimental confirmation

P. M. Bhujbal

Citation: AIP Conference Proceedings **1648**, 510005 (2015); doi: 10.1063/1.4912710
View online: http://dx.doi.org/10.1063/1.4912710
View Table of Contents: http://scitation.aip.org/content/aip/proceeding/aipcp/1648?ver=pdfcov
Published by the AIP Publishing

Santilli's Detection of Antimatter Galaxies: An Introduction and Experimental Confirmation

P. M. Bhujbal

Department of Physics, Nutan Adarsh Arts, Commerce and Smt. Maniben Harilal Wegad Science College, Umrer-441203, India.
Email: prashantmbhujbal@yahoo.com

Abstract. Studies accompanied over the past few decades on the generalization of quantum mechanics known as hadronic mechanics, initiated in 1978 by the Italian-American physicist Ruggero Maria Santilli and its application for detection of light from antimatter galaxy is reported in this paper. The isodual (antimatter) light has negative energy E^d = -E with negative unit, experiences a negative curvature tensor R^d = -R (gravitational repulsion) when in a matter gravitational field, and possesses a negative index of refraction n^d = -n when propagating within a transparent matter medium. Detection of antimatter galaxies is possible by the refractive telescope with concave lenses constructed by Santilli which follow the concept of negative energy and negative index of refraction for antimatter.

Keywords: antimatter, isodual light, antigravity
PACS: 03.65.Ta; 14.60.Cd; 29.30.-h

INTRODUCTION

Newtonian, Galilean and Einsteinian theories had no value for the indicated problem since far away galaxies must be assumed to be neutral, in which case said theories had no distinction whatsoever between matter and antimatter. Santilli discovered that a mathematics for the consistent classical treatment of neutral (or charged) antimatter did not exist and had to be built. The resulting mathematics is today known as Santilli isodual mathematics. It may be of some value to indicate that isoduality is a new transformation not reducible to parity and/or other conventional transformations. We should also recall the new symmetry identified by the isodual mathematics, called isoselfduality [1, 2], namely, the invariance under the isodual transformation, which is verified by the imaginary number $i \equiv i^d$ as well as by Dirac's equation.

Application of the Isodual mathematics helps to study antimatter galaxy light, since Isodual mathematics is anti-isomorphic to the conventional mathematics used for matter, and used it to the construction of the corresponding Isodual theory of antimatter which is applicable from the classical to the quantum level; and predicts that antimatter light propagating in a matter transparent medium possesses an index of refraction opposite that of matter light, which is referred to as a negative index of refraction [3]. Newton's mechanics, Galileo's relativity, Einstein's special and general relativities were conceived before the discovery of antimatter and, consequently, they have no provisions for the classical representation of neutral antimatter since their only conjugation is the sign of the charge. The rigorous prediction of antimatter via the negative energy solutions of wave equations was done by P. A. M. Dirac [4] in 1928, and experimentally verified in 1933 by C. D. Anderson [5]. However, Dirac noted that particles with negative energy violate causality and other physical laws and was consequently forced to represent antiparticles solely at the level of second quantization in his celebrated equation. Since the time of Dirac's prediction of antiparticles and their detection by Anderson [6], the theory of antimatter has been essentially developed at the level of second quantization. This occurrence has created an unbalance between the theories of matter and antimatter at the classical and first quantization levels, as well as a number of shortcomings, such as the inability for the classical theory of antimatter to have a quantized formulation which is the correct charge (or PTC) conjugate of that of matter. In an attempt to initiate the scientific process toward the future resolution of the above problematic aspects, Santilli proposed in 1985 [7] a new anti-isomorphic image of conventional mathematics charactered by the map of the conventional unit; $+1 \rightarrow 1^d = -1$; called for certain technical reasons isodual map, or isoduality.

It should be noted that the change of the basic unit implies a simple, yet unique and nontrivial change of the totality of conventional mathematics, including: numbers and angles; functions and transforms; vector and metric spaces; algebras and geometries; etc. In 1991 Santilli [8] showed that the above isodual mathematics, since it is an

Proceedings of the International Conference on Numerical Analysis and Applied Mathematics 2014 (ICNAAM-2014)
AIP Conf. Proc. 1648, 510005-1–510005-5; doi: 10.1063/1.4912710

anti-isomorphic image of the mathematics of matter, provides a novel classical representation of antimatter. The proof that isoduality on a Hilbert space is equivalent to charge conjugation has first appeared in paper [9] of 1994. A comprehensive operator treatment subsequently appeared in monographs [10]. The prediction that isoduality implies antigravity for massive antiparticles in the field of matter was submitted in paper [11], which also included the proposal for its experimental verification via the use of a low energy positron beam in horizontal flight in a suitable vacuum tube. The latter experimental proposal was subsequently studied by Mills [12]. This note is devoted to a study of the spectroscopy of antimatter via the isodual characterization of the light emitted by the antihydrogen atom. In particular, Santilli has shown that isoduality predicts that antimatter emits a new light here called isodual light which can be solely differentiated from the conventional light via gravitational interactions. In the events additional theoretical and experimental studies confirm the above hypothesis; isoduality would therefore permit the future experimental measures whether far away galaxies and quasars are made up of matter or of antimatter [13].

In particular, it should be kept in mind that, as repeatedly stated by Professor Santilli, the isoduality is the only known consistent procedure for the differentiation between neutral as well as charged matter and antimatter at all levels of treatment. A main difference in the treatment of antimatter between 20th century Einsteinian theories and the novel isodual theories is the following. Special relativity and relativistic quantum mechanics characterize antimatter with the same positive energy used for matter. By contrast, the isodual theory characterizes antimatter via a negative energy referred to as a negative unit, thus being as causal as a positive energy referred to as a positive unit. Similarly, according to the isodual theory, antiparticle evolve in a negative time referred to a negative unit of time, thus yielding an evolution as causal as that of particles evolving in a positive time referred to positive units. It should be stressed that the joint isodual conjugation of a physical quantity and its related unit is mandatory for consistency of the theory, as well as for the very achievement of scientific democracy for the treatment of matter and antimatter. Similarly, Einsteinian theories predict that matter and antimatter emit the same light, evidently due to the indicated lack of any differentiation between neutral matter and antimatter, light having no charge as is well known. By contrast, isodual theories predict that the light emitted by antimatter is different than that emitted by matter in an experimentally verifiable way. In fact, matter light has a positive energy h x ν referred to positive unit MeV, while antimatter light has a negative energy $E^d = h^d\ x^d\ \nu^d = -E$ referred to a negative unit $MeV^d = -MeV$ [14].

The isodual theory has a number of rather fundamental, experimentally verifiable predictions not tested until now. A first new prediction is that antimatter (matter) in the gravitational field of matter (antimatter) experiences a gravitational repulsion (antigravity). Again, this prediction can be solely formulated under isodual rules, that is, the systematic, step-by-step construction of the isodual Riemannian geometry and related gravitational formulation of antimatter bodies. A negative curvature tensor (representing gravitational repulsion) then occurs in the interplay between a Riemannian gravitation and its isodual [3].

Similarly, Einsteinian theories predict that both, matter and antimatter light experience gravitational bending (attraction). By contrast, the isodual theory predicts that antimatter (matter) light experiences gravitational repulsion from a matter (antimatter) gravitational field. Note that the differentiation between matter and antimatter light is mandatory under isoduality which, in turn, is the only known differentiation between neutral matter and antimatter, thus including matter and antimatter light [14].

In short in the preceding works, Santilli has: 1) developed an anti-Hermitean image of the mathematics used for matter characterized by a map called isoduality and denoted with the upper symbol d; 2) achieved the isodual classical representation of neutral (as well as charged) antimatter particles and light via the conjugation of all physical quantities and their units, thus resolving the inconsistencies of negative energies; and 3) shown that the isodual (antimatter) light has negative energy $E^d = -E$, experiences a negative curvature tensor $R^d = -R$ (gravitational repulsion) when in a matter gravitational field, and possesses a negative index of refraction $n^d = -n$ when propagating within a transparent matter medium.

An attempt is made to present a short review of the apparent detections of antimatter galaxies and its experimental confirmation by Santilli and co-workers [15, 17] in this paper.

SANTILLI TELESCOPE AND EXPERIMENTAL DETAILS

Santilli has been constructed a new refracting telescope with "concave" lenses; known as Santilli telescope; for detection of antimatter light from distant sources, because a conventional telescope with convex lenses will disperse light with a negative index of refraction. For that Santilli secured the design and fabrication of two identical Galileo refracting telescopes; without the star diagonal viewer to avoid any unnecessary reflection of antimatter light. One of the two telescopes converted to a concave version with identical but conjugated foci. He secured one single suitably selected camera to obtain pictures from both the Galileo and the Santilli telescopes. He also secured a tripod with mount suitable for the parallel housing of the two telescopes. He optically aligned the two telescopes on the tripod by keeping in mind the evident impossibility of doing visual alignments with the antimatter telescope and conducted a number of day views with the so mounted and aligned pair of Galileo and Santilli telescopes to verify that astronomical objects visible in the former are not visible in the latter. A number of night views of the same region of the sky via the so mounted and aligned Galileo and Santilli telescopes was conducted and obtained a number of pictures from both telescopes via the selected camera; and finally conducted a comparative inspection of the pictures from both telescopes under a variety of enlargements and contrasts to see whether the pictures from the antimatter telescope contained focused images absent in the pictures from the Galileo telescope under the same enlargement and contrast.

Following the availability of the so mounted and aligned pair of telescopes, Santilli initiated night views by first confirming that, as expected, any celestial object visibly focused by the Galileo telescope was not focused at all with the antimatter telescope. In particular, the view of details of our Moon, which were very nicely focused by the Galileo telescope, resulted in a diffuse light when seen from the antimatter telescope without any possible identification. The same occurred for planets and nearby matter stars. Then Santilli finally initiated preliminary views of the sky at night with said pair of telescopes. He reported the tests conducted at the Gulf Anclote Park, Holiday, Florida, GPS Coordinates: Latitude = 28.193, Longitude = - 82.786. The camera was set at the exposure of 15 seconds for the specific intent of having streaks of light from far away matter stars caused by Earth rotation, since streaks can be better identified with the limited capabilities of the available telescopes compared to individual dots of light in the pictures. Additionally, streaks from matter stars have a clear orientation as well as length that are important for the identification of possible streaks from antimatter light. Following various tests, he selected the 10 setting of the camera at ISO 1600 because various tests with smaller and bigger ISO resulted inconclusive and ambiguous for various reasons. All pictures were analyzed with particular reference to the identification of the background as well as impurities in the camera sensors that are evidently present in both pictures from the Galileo and the Santilli telescope [15].

RESULTS AND DISCUSSION

Some of the pictures taken by Galileo and Santilli telescopes of matter and antimatter galaxies respectively are shown in Figures 1 and 2 [15].

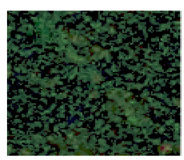

FIGURE 1. View of one of the streaks of matter light representing a far away matter star or galaxy identified in the Epsilon Alpha and Beta region of the night sky near Vega via the Galileo telescope [15]

(a) (b) (C)

FIGURE 2. Views of (a) First Streak, (b) Second streak and (c) Third streak of light detected in the Epsilon Alpha and Beta region with the Santilli telescope of antimatter galaxies [15]

When antimatter is considered in the matter world represented with a conventional Hilbert state |>, a first line of current thinking is that the energy of antimatter is positive. This view can be represented via the isodual eigen value equation $H^d \ x^d \ |> = E \ x \ |>, E > 0$, where x^d is the product in the antimatter world. In this case, antimatter light hitting the pixels of the camera should produce the same voltage and, therefore, the same image as those of matter light. Hence, we first looked for ordinary streaks of light that are present in the pictures from the antimatter telescope but absent in the Galileo telescope. In particular, we used a camera exposure causing a streak of light sufficiently long to be clearly distinguishable from the background. However, the knowledge of antimatter is extremely limited. Therefore, we have to consider for completeness the possibility that antimatter light is received by the camera pixels as having a negative energy from the alternative eigen value equation $H^d x \ |> = -E \ x \ |>, E > O$, where "x" is now the product in our matter world as requested by isodual mathematics. In this second case, antimatter light hitting the pixels of the camera are expected to produce a voltage opposite that of matter light, thus causing a streak of darkness, rather than light. This suggested the additional search for streaks of darkness that are present in the pictures from the antimatter telescope but absent in those from the Galileo telescope. In regard to the alternative of streaks due to positive or negative energies, we should recall that the invariance under isoselfduality requires that matter-antimatter annihilation jointly produces matter and antimatter light. This can be seen from the conventional particle reaction $e^+ + e^- \rightarrow \gamma + \gamma$ in which isoselfduality is verified in the left but not in the right side. The verification of isoselfduality for both sides then requires the revised formulation $e^+ + e^- \rightarrow \gamma + \gamma^d$ resulting in the indicated production of two lights [16].

Figure 1 provides the typical view of a far away matter star or galaxy in the indicated region of the sky by Galileo telescope. One should note the length and orientation of the streak of light of Figure 1 due to Earth's rotation during the 15 second exposure. In his analysis of the latter pictures he first identified streaks of light reported in Figure 2 that are present in the Santilli telescope but can arguably be conceived as being absent in the Galileo telescope. The position of the anomalous streaks of light of Figure 2 is indicated with squares. Santilli additionally conducted a search for streaks of darkness in the pictures of the indicated Epsilon Alpha and Beta region of the night sky from the Santilli telescope under the conditions that: 1) said streaks are present in the Santilli telescope but not in the Galileo telescope; 2) the streaks have approximately the same orientation and length of the streak of matter light of Figure 1; and 3) the streaks are clearly distinguished from the background. Note that, since the background is predominantly that of light, streaks of darkness are more distinguishable than those of light, thus being less controversial. Also, a photographic analysis of the streaks of light in Figure 2 reveals that each streak is in reality supported by a background of darkness, the organization of some of the pixels to produce a streak of light being possibly due to a yet unknown effect of the yet unknown antimatter optics. Consequently, it appears that, under a deeper analysis, even the streaks of apparent light may support a negative energy for antimatter light when detected in our world [15].

Santilli showed, apparently for the first time, that the only possible detection of antimatter light with a negative index of refraction is that via a telescope with concave lenses and reported the first known detection of images apparently focused by a telescope with concave lenses, which images appears as being of darkness, rather than light, thus supporting the negative energy of their origination. In the event confirmed, these unusual images may result in being the first detection of antimatter galaxies. The main result of this detection of antimatter [15] is an apparent confirmation of Dirac's [4] original 1928 conception of antiparticles as possessing negative energy because necessary for consistency with the negative energy of light in the electron-positron annihilation $e^+ + e^- \rightarrow \gamma + \gamma^d$, the consistency of negative energies being apparently assured by their treatment via the isodual mathematics.

Santilli presented seemingly correlated streaks of darkness of unknown origin (not shown here due to limitation of pages), but which could be arguably due to a shower of small antimatter asteroids annihilating in or passing through our upper atmosphere. It should be noted that Santilli could locate no additional, clearly identified streaks of light or darkness in pictures of various regions of the sky obtained with the Santilli telescope, although the search was at random and definitely not systematic. Arguably, the absence of additional streaks besides those of the Epsilon Alpha and Beta region could be due to the fact that possible antimatter galaxies are too much far away. Besides said linear streaks, Santilli has identified numerous, completely unexpected circular traces in pictures of the Epsilon Alpha and Beta region as well as in other regions of the night sky, which traces are present in the Santilli's telescope but not in the Galileo telescope [15].

After due analysis Professor Santilli asserts that, it is possible that these circular traces might be due to the annihilation of antimatter cosmic rays in the upper region of our atmosphere, thus yielding approximately the same diameter of the trace at sea level due to the same travel in air. This interpretation is also suggested by the fact that the circles show no motion during the fifteen seconds of exposure, thus implying extremely fast events. An additional aspect supporting the indicated interpretation is the variety of the circular traces identified by the Santilli in numerous regions of the sky. It can be argued that, during the annihilation, of possible antimatter cosmic rays in our atmosphere matter light may quickly dissipate in the atmosphere, while antimatter light may continue its path along the original direction. The detected circles might then characterize, in reality, a cone of antimatter light. In the event confirmed, these circular traces would be the first detection at sea level of the flashes of light seen by astronauts and cosmonauts in the upper dark side of our atmosphere. Note that, again in case of verifications, the flashes seen by astronauts and cosmonauts would only be originated by matter light due to the convex character of our iris, while our view at sea level would be due to antimatter light seen via Santilli telescope with concave lenses [15].

Santilli has presented preliminary pictures with his telescope of the Epsilon Alpha and Beta region of the night sky that appear to support the capability of a telescope with concave lenses to focus apparent antimatter light. In order to initiate the expectantly laborious process of experimental verification or dismissal of Santilli's findings, by using the same telescopes, the same camera, the same settings and the same conditions as those of Ref. [15], Bhujbal et al [17] presented preliminary pictures (not shown here) of the same region of the night sky from the area Sebring, Florida that provide preliminary confirmation of the capability of a telescope with concave lenses to focus light whose sole conceivable origin is that from antimatter.

CONCLUSION

In the event confirmed, the anomalous traces reported by Santilli may emerge as being the first experimental detection of antimatter galaxy, antimatter asteroids and antimatter cosmic rays. The isodual light has negative energy and possesses a negative index of refraction when propagating within a transparent matter medium as predicted by Santilli isodual mathematics. Detection of antimatter galaxies is possible by the refractive telescope with concave lenses as constructed by Santilli known as Santilli telescope; which follow the concept of negative energy and negative index of refraction. Based on the discussion, the first detection of antimatter galaxies by Santilli is thus then confirmed.

ACKNOWLEDGEMENTS

The author expresses his deepest gratitude to Prof. R. M. Santilli for continuous encouragement, support and a critical reading of the papers. Additional thanks to Prof. A. A. Bhalekar for his guidance and for reading this manuscript and providing suggestions. The financial support from the R. M. Santilli Foundation is gratefully acknowledged.

REFERENCES

1. R. M. Santilli, "Nonlocal-Integral Isotopies of Differential Calculus, Mechanics and Geometries, in Isotopies of Contemporary Mathematical Structures" Rendiconti Circolo Matematico Palermo, Suppl. 42 (**1996)** pp. 7-82. http://www.santillifoundation. org/docs/Santilli-37.pdf
2. R. M. Santilli, Elements of Hadronic Mechanics, Volumes I and II Ukraine Academy of Sciences, Kiev **(1995)**. http://www.santillifoundation. org/docs/Santilli-300.pdf; http://www.santillifoundation.org/docs/Santi lli-301.pdf
3. Santilli, R. M., Isodual Theory of Antimatter with Applications to Antigravity, Grand Unification and Cosmology, Springer **(2006)**.
4. P. A. M. Dirac, Proceedings of the Royal Society, 117 **(1928)** pp. 610-624.
5. C. D. Anderson, Phys.Rev. 43 **(1933)** pp. 491.
6. P. A. M. Dirac, The Principles of Quantum Mechanics, Clarendon Press, Oxford (**1958**); R. L. Forward in Antiproton Science and Technology, ed. B. W. Augenstein, B. E. Bonner, F. E. Mill and M. M. Nieto, Word Scientific, Singapore, (**1988**).
7. R. M. Santilli, Hadronic J. 8 **(1985)** pp. 25 and 36.
8. R. M. Santilli, Isotopic Generalization of Galileis and Einstein's Relativities, Hadronic Press, Palm Harbor, FL, I and II (**1991**).
9. R. M. Santilli, Comm. Theor. Phys. 3 **(1994)** pp. 153.
10. R. M. Santilli, Elements of Hadronic Mechanics, Hadronic Press, Palm Harbor, FL, I (**1994**); II (**1995**).
11. R. M. Santilli, Hadronic J. 17 **(1994)** pp. 257.
12. A. P. Mills, Hadronic J. 19 **(1996)** pp. 77-96.
13. R. M. Santilli, Does Antimatter Emit a New Light? Invited paper for the International Workshop on Antimatter Gravity and Antihydrogen Atom Spectroscopy, Sepino (IS), Italy, May **1996**.
14. R. M. Santilli "Can Antimatter Asteroids, Stars and Galaxies be detected with current Means?" Proceedings of the Third International Conference on Lie-Admissible Treatment of Irreversible Processes (ICLATIP-3) Kathmandu University, Nepal, April (2011) pages 25-36.
15. R. M. Santilli, Apparent detection of Antimatter Galaxies via a Refractive telescope with concave Lenses, CACAA, 3 **(2014)** pp. 1-26.
16. R. M. Santilli. "The Mystery of Detecting Antimatter Asteroids, Stars and Galaxies," American Institute of Physics, Proceed. 2012, 1479, 1028-1032 **(2012)**. http://www.santillifoundation. org/docs/antimatter-asteroids.pdf
17. P. M. Bhujbal, J. V. Kadeisvili, A. Nas, S. Randall, T. R. Shelke, Preliminary confirmations of antimatter detection via Santilli's telescope with concave Lenses, CACAA, 3 (**2014**) pp. 27-39.