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APPARENT DETECTION OF ANTIMATTER GALAXIES VIA A REFRACTIVE TELESCOPE WITH CONCAVE LENSES

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Abstract. In preceding works, the author 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 antimatter via the conjugation of *all* physical quantities and their units, thus resolving the inconsistencies of negative energies; and 3) shown that the 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. In this paper, we show, 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; we build the first known antimatter telescope verifying these conditions; and report 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, antimatter asteroids and antimatter cosmic rays. The main result of this paper is an apparent confirmation of Dirac's [5] original 1928 conception of antiparticles as possessing negative energy because necessary for consistency with the negative energy of light in the electron-positron annihilation $e^+ + e^- \longrightarrow \gamma + \gamma^d$, the consistency of negative energies being apparently assured by their treatment via the isodual mathematics. The paper ends with the suggestion to test the gravity of the photons in the electron-positron annihilation and conduct other truly basic tests on antimatter.

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1 HISTORICAL NOTES

As it is well known, Newtons mechanics [1], Galileos relativity [2] and Einsteins special [3] and general [4] 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.

In fact, the rigorous prediction of antimatter via the negative energy solutions of wave equations was done by P. A. M. Dirac [5] in 1928, and experimentally verified in 1933 by C. D. Anderson [6]. 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.

A number of hypotheses were considered to resolve the causality problem of negative energy solutions, such as the old hypothesis that antimatter evolves according to a negative time (moves backward in time) as apparently necessary to represent the annihilation of matter and antimatter.

However, Dirac is reported stating that this hypothesis does not solve the causality problem of negative energy solutions because the Minkowski line element is quadratic in time, thus admitting both motions forward and backward in time.

As a result of the inability by the Newtonian, Galilean and Einsteinian theories to provide a classical representation of neutral antimatter, and Diracs restriction of the treat- ment of antimatter solely at the level of second quantization, it has been generally believed for about a century that antimatter does not exist in the large scale structure of the universe, and solely exists at the particle level when produced in our laboratories.

However, our planet has been devastated in the past by antimatter asteroids, such as the 1908 Tunguska explosion in Siberia that had the energy equivalent of one thousand Hiroshima atomic bombs, yet it left no crater or residue in the ground (that could be explained via an ice comet), and excited the entire Earth atmosphere for several days (that can only be explained via the annihilation of an antimatter asteroid in our atmosphere [7]).

Similarly, astronauts and cosmonauts have routinely detected flashes of light in the upper dark side of Earths atmosphere that can be best explained via antimatter cosmic rays annihilating at the first contact with our atmosphere [8]. Finally, large flashes of light in our upper atmosphere are routinely detected in various parts of our planet (see the websites of NASA, FERMILAB, CERN and other laboratories).

In summary, there is sufficient evidence indicating the possible risk that our planet is hit again by a large antimatter asteroid, with consequential devastations on the grounds as well as the disruption of all civilian, industrial and military communications for days due to the excitation of our atmosphere.

It is evident that the physics community cannot responsibly address these risks without the conduction of systematic studies on antimatter primarily at the classical level evidently because antimatter asteroids cannot possibly be treated in second quantization. In turn, no such a study can be seriously conducted without surpassing Newtonian, Galilean and Einsteins theories via formulations specifically conceived and constructed for the classical treatment of antimatter as a premise for the subsequent quantization.

2 ISODUAL MATHEMATICS

The author has been interested since his graduate studies at the University of Turin, Italy, in the mid-960s to ascertain whether a far away galaxy is made up of matter or of antimatter. He soon learned that 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.

For this reason, the author initiated a long journey that first required the identification of mathematical means for the consistent classical distinction between neutral matter and antimatter prior to any possible physical application. In this way, after years of search- ing for an existing mathematics, the author discovered that a mathematics for the consistent classical treatment of neutral (or charged) antimatter did not exist and had to be built.

Following the study of a number of alternatives, the author gave priority to the search for new numbers since all mathematics used in physics must be based on a numeric field as a condition for experimental verifications. In any case, all aspects of applied mathematics can be built on a given numeric field via simple compatibility arguments.

In 1993, the author [9] finally identified the desired new numbers under the name of *of isodual real, isodual complex and isodual quaternionic numbers*, which verify the condition of being anti- isomorphic to the conventional real, complex and quaternionic numbers, respectively. The word isodual was suggested to indicate a duality under the preservation of the conventional abstract axioms of numeric fields.

The crucial condition of anti-isomorphism was achieved via the anti-Hermitean conjugation called *isoduality* and indicated with the upper symbols d of all elements of a numeric field and all its operations. Given a conventional field $F(n\times, 1)$ with elements n, m, $\ldots$, conventional associative product $n \times m = nm$ and trivial unit 1, , *Santilli isodual fields*, are denoted $F^d(n^d, \times^d, 1^d)$, and are characterized by a negative basic unit $1^d = -1^\dagger = -1$, isodual numbers $n^d = n1^d$ and isodual product

$$n^d \times^d m^d = n^d(1/1^d)m^d = nm1^d.$$

Following the identification of the desired numbers, the author passed to the systematic construction of the isodual image of all main mathematics used for the study of matter, including functional analysis, differential calculus, metric spaces, Lie algebras, symmetries, Euclidean, Minkowskian and Riemannian geometries, etc. These isodual formulations were first presented in the mathematical memoir [10] and first treated systematically in monographs [11]. The resulting mathematics is today known as Santilli isodual mathematics. Independent mathematical reviews and advances can be found in Refs. [12-14].

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 [10,11], 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.

Contrary to a possible perceptions of mathematical complexities, the isodual mathe- matics needed for applications can be constructed via the application of the simple anti- Hermitean map

$$Q \longrightarrow Q^d = -Q^\dagger$$

provided it is applied to the totality of quantities and to the totality of their operations used for the treatment of matter. Readers should be alerted that, in the absence of even one isodual map, there are inconsistencies that generally remain undetected to non-experts in the field.

Before appraising the results of this paper, readers are suggested to meditate a moment on the differences between conventional and isodual mathematics. As an illustration, a checking account in the isodual world with \$ 1M in the bank is in red because \$ 1M is counted with respect to the basic unit $\$1^d = -\$1$ which is negative. Similar conjugations occur at virtually all levels of study.

3 ISODUAL THEORY OF ANTIMATTER

After achieving mathematical maturity, the author initiated systematic applications of isodual mathematics to the study of antimatter at the classical and operator levels as well for neutral or charged antimatter, resulting in the new theory today called *isodual theory of antimatter* as one of the branches of the broader *hadronic mechanics* (for brevity, see Refs. [22,32]).

A main feature is that all quantities that are positive (negative) for the study of matter become negative (positive) for the study of antimatter, with the clarification that, for matter, all positive and negative quantities are referred to *positive* units of measurements, while for antimatter all negative and positive quantities are referred to *negative* units.

In particular, antimatter is predicted to have *negative* energy $E^d = -E$ (exactly as conceived by Dirac [5]) and evolves along a *negative time* $t^d = -t$ according to an old attempt to understand annihilation of matter and antimatter. Causality and other physical problems are resolved by the isodual mathematics, since negative quantities are measured in terms of negative units. Hence, antimatter evolving backward in time with respect to negative units of time is as causal as matter evolving forward in time with respect to positive units of time. The same holds for negative energy referred to negative units, and of other negative quantities.

The image under isoduality of the entirety of the formulations for matter including the isodual image of all quantities and all their operations, with no exclusion at all, is today known as Santillis isodual theory of antimatter (see monographs [11,22] and independent works [12-14,25-32].

Ref. [10] (written in 1993) presented the first known formulation of Newton equation for classical and neutral antiparticles thanks to the *isodual differential calculus* discovered by Santilli in Ref. [10] and currently developed by the mathematician S. Georgiev in great details [38]. The resulting equations are today known the *Newton-Santilli isodual equations*

$$m^d \times^d \frac{d^d v^d}{d^d t^d} = F^d(t^d, r^d, v^d, \ldots),$$

verify all known experimental data on the classical behavior of antiparticles, and are at the foundation of all subsequent classical and operator formulations.

Ref. [11] (first edition in 1993 and second edition in 1995) provided a systematic presentation of the isodualities of Euclidean, Minkowskian and Riemannian geometries, Lie theory, rotational, Galilean, Lorentz and Poincare symmetries, Galilean and special relativities, and other basic formulations. In particular, Refs. [11] presented the first known consistent representation of the gravitational field of an antimatter body via the Riemann-Santilli isodual geometry.

Ref. [15] of 1993 proposed a new isoselfdual cosmology (a cosmology verifying the new symmetry of isoselfduality) for equal amounts of matter and antimatter, in which case all total quantities of the universe, such as total time, total mass, total energy, etc., are identically null to avoid a discontinuity at creation and set up the basis for continuous creation.

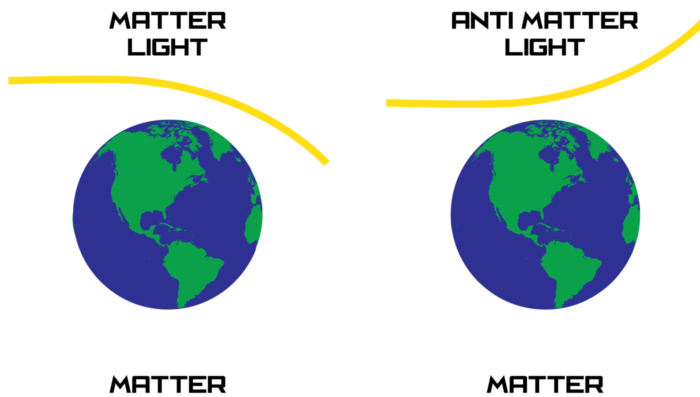

Fig. 1 The prediction of rRepulsion of antimatter light by a matter gravitational field

Ref. [16] of 1994 confirmed the expected verification of the isodual theory with all particle data on antimatter since, at the operator level, isoduality is equivalent to charge conjugation by conception and construction. The main difference is that isoduality applies at all levels of treatment, beginning by conception at the classical level, while charge conjugation solely applies at the operator level. Another important difference is that isoduality maps our spacetime into the new isodual spacetime, while charge conjugation maps our spacetime into itself. It then follows that, according to isoduality, antimatter exists in a new spacetime, which is distinct yet coexisting with our own spacetime while, according to conventional views, antimatter exists jointly with matter in our spacetime.

Ref. [17] of 1994 indicated the prediction of the isodual theory at all levels, including the Newton-Santilli, Minkowski-Santilli and Riemann-Santilli isodual formulations, that matter and antimatter experience gravitational repulsion (antigravity). Ref. [17] then proposed the measure of the gravity of positrons in horizontal flight in a supervacuum and supercooled tube.

Ref. [18] of 1997 presented technical aspects of the isodual special relativity studied in Refs. [11] with particular reference to the hidden verification of special relativity axioms under isoduality (due to the quadratic character of the Minkowskian line element), with the understanding that matter-antimatter interactions are structurally beyond the sole use of special rel- ativity beginning at the classical level and then, expectedly, at the operator level, because requiring the joint use of special relativity and its isodual.

Ref. [19] of 1997 applied all preceding knowledge to initiate the study of antimatter-light, the light emitted by antimatter, also called isodual light, resulting in a prediction of main character for this paper according to which antimatter light is physically different than matter light in an experimentally verifiable way. Since the photon has no charge, the only possible conjugation is that for all other physical quantities.

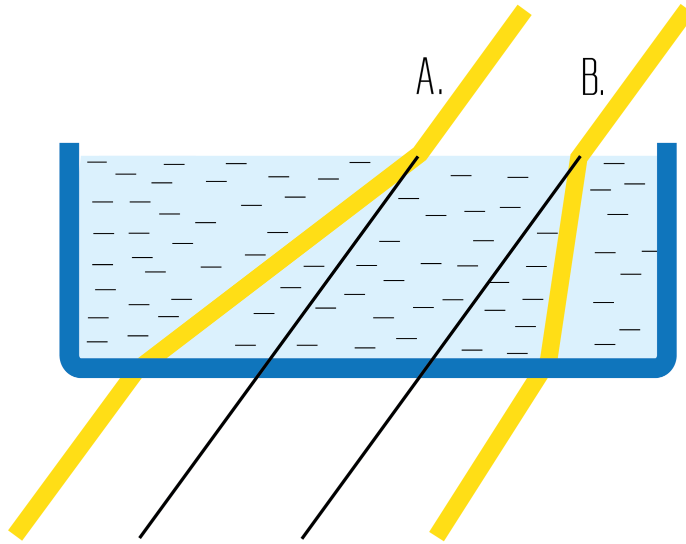

Fig. 2 The prediction of negative index of refraction of antimatter light within matter water.

As a result, antimatter-light is predicted to possess negative energy while all other characteristics are opposite to those of matter light. In particular, antimatter light is predicted to be repelled by matter gravity (see Fig. 1), thus permitting the conception of experiments, e.g. via neutron interferometry, to verify whether one of the two photons emitted in electron-positron annihilation experiences repulsion in our gravitational field.

Ref. [20] of 1998 presented an isotopic unification of Minkowskian and Riemannian geometries for matter (namely, their unification into a single geometry and their differentiation via the generalized unit). Ref. [20] then presented their isodualities for point-like antimatter in vacuum (exterior dynamical conditions) as well as for extended antimatter bodies moving within physical media (interior dynamical conditions).

Ref. [21] of 1999 confirmed that isodual mathematics does indeed permit a consistent classical representation of antimatter at the Newtonian, Minkowskian and Riemannian levels in a way compatible with all available classical experimental data on antimatter.

Ref. [23] of 2006 presented a comprehensive study of antimatter in irreversible conditions achieved via the Lie-admissible covering of Lie formulations.

Monograph [22] of 2006 presented a comprehensive study of isodual mathematics and its application to antimatter, including one of the only known grand unification of electroweak and gravitational interactions with the inclusion of antimatter at the gravitational level in a way parallel to the treatment of antimatter in electroweak interactions. Ref.[22] also indicated the prediction of a causal spacetime machine and the need for isoduality to represent all four directions of time existing in nature, namely, motion forward to future time t and forward from past time $-t$, as well as motion backward in past time t^d and backward from future time $-t^d$.

Ref. [24] of 2012 addressed the open problem of the detection of possible antimatter asteroids and presented the first known hypothesis that antimatter light possesses a negative index of refraction nd = n when propagating within a transparent matter medium. Again, the consistent characterization of neutral antimatter requires the conjugation of all quantities

Fig. 3 The two identical Galileo telescopes and the camera on arrival.

with no exclusion to avoid catastrophic inconsistencies. This implies the necessary conjugation of the index of refraction into a negative value referred to our positive units of measurements since it is observed in our matter world (see Fig. 2).

An important implication of the isodual theory of antimatter is the clarification that *the conventional Dirac equation characterizes the tensorial product of one point-like particle with spin* 1/2 *and its antiparticle without any need for second quantization* (see Sect. 2.3.6 of Ref. [22]). In essence, the author could not accept the conventional 20th century view that Dirac's equations represents only one particle with spin 1/2 because there exists no irreducible or reducible representation of the $SU(2)$-spin symmetry with the structure of Dirac's gamma matrices. Therefore, the author re-inspected Dirac's equation and showed that

$$\gamma^k = \begin{pmatrix} 0 & \sigma^k \\ \sigma^{dk} & 0 \end{pmatrix}, \qquad \hat{\gamma}^4 = \begin{pmatrix} I_{2\times 2} & 0 \\ 0 & I^d_{2\times 2} \end{pmatrix},$$

thus yielding the indicated characterization of a spin 1/2 particle and its antiparticle.

In his genius, Dirac himself provided the true foundation of the isodual theory of antimatter by characterizing antiparticles with the *negative unit* $-I_{2\times 2}$. Dirac merely missed the mathematics for the consistent physical treatment of negative energies. Note that there is no contradiction for a representation of antiparticle at the quantum mechanical level because the isodual theory of antiparticles applies at the classical level, let alone that of first quantization.

The reader should be aware that a negative index of refraction implies that antimatter light propagates within a transparent matter medium at superluminal speeds. A con- ceptual interpretation of this prediction is that the ordinary (positive) index of refraction for matter light propagating within a transparent matter medium is due to various, ultimately attractive interactions that slow down the speed of matter light. By contrast, when antimatter light propagates within a transparent matter medium, for consistency, all features of matter have to be conjugated, resulting in new repulsive interactions between antimatter light and the matter medium that, as such, accelerate antimatter light to superluminal speeds.

Numerous independent studies have been conducted on Santilli isodual theory of antimatter, among which we indicate: the theoretician J. Dunning-Davies [25] who con- structed the first known thermodynamics of antimatter bodies; the experimentalists A. P. Mills [26] and V. de Haan [27] who confirmed the feasibility and resolutory character of Santillis proposal to test the gravity of positrons in horizontal flight in a supervacuum and supercooled

Fig. 4 The parallel mount of the Galileo and antimatter telescopes with related finder scopes.

tube (see monograph [22] for details); the mathematician B. Davvaz et al [28] who identified, apparently for the first time, the multi-valued, four dimensional hyperstructural character of the universe suggested by two different yet coexisting spacetimes; the thermodynamicist A. Bhalekar who studied in Ref. [30] Santillis representation of the four directions of time [2] and in Ref. [31] the first known study of antimatter in irreversible conditions via the Lie-admissible formulations of ref. [23]; R. Anderson et al [31] who presented a review of the isodual theory of antimatter which is an excellent introduction to this paper; and the physicists I. Gandzha and J. V. Kadeisvili [32] who wrote a systematic outline of the various studies here referred to for matter and antimatter.

4 THE ANTIMATTER TELESCOPE

In this section, we report the initiation of experimental verifications or denial of the prediction of the isodual theory of antimatter according to which a consistent conjugation from matter to antimatter requires that antimatter light has a negative energy $E^d = -E$ with ensuing repulsion by a matter gravitational field (Fig. 1 and Ref. [19]) and a negative index of refraction (Fig. 2 and Ref. [24]).

To conduct the tests, we here introduce apparently for the first time that, under these premises, antimatter light from distant sources can only be focused via a new refracting telescope with concave lenses, because a conventional telescope with convex lenses will disperse light with a negative index of refraction.

It should be indicated from the outset that the above predictions imply that the human eye cannot distinctly see far antimatter light sources since our iris has been designed by nature to be convex in order to see matter light. As such, our eye will disperse throughout the retina antimatter light with a negative index of refraction.

Consequently, all tests here reported have been conducted under the condition that possible views of distant antimatter light have to be recorded with a suitable camera, and then the pictures, their analyses and their enlargements can be seen by the human eye.

Fig. 5 A close up view of the mounting of the camera directly in the telescope in place of the eyepieces.

We should also indicate from the outset that we expected no antimatter star in our galaxy. Hence, the main hope of our tests has been to see whether there exist detectable far distant antimatter galaxies, since a central open problem of contemporary astrophysics and cosmology is to ascertain whether the universe is solely composed of matter galaxies or antimatter galaxies also exist and, if so, what is their distribution.

Following the above clarifications, we should indicate the expected existence in our galaxy as well as in our planetary environment of possible antimatter asteroids [7] and antimatter cosmic rays [8].

It should be noted that collisions between matter and antimatter bodies appear to be minimized by nature in the event their gravitational repulsion [22] is confirmed. Similar gravitational deflections are expected for weak antimatter gamma and antiparticle radiations. Only antimatter bodies and radiations with a threshold energy and a special trajectory can eventually hit Earth according to the isodual theory of antimatter.

Regrettably, we had to exclude from our search the detection of possible antimatter asteroids due to our lack of any knowledge at this writing on the optics of antimatter light, such as the behavior of matter light from our Sun, when hitting an antimatter asteroid.

Therefore, our search was restricted to the detection of possible far away antimatter galaxies and possible antimatter radiations annihilating in our upper atmosphere without unrealistic expectations of final resolutions in these first tests, and the mere hope of results sufficiently unresolved one way or the other to justify additional investments and more accurate tests.

After verifying the current lack of availability of a refracting telescope with concave lenses, the author had no other alternative than that of securing from specialized opticians and their companies the design and construction of the needed refracting telescope with concave lenses, hereon refereed to as the antimatter telescope.

For these objectives: 1) we secured the design and fabrication of two identical Galileo refracting telescopes (of course, both with convex lenses) and both without the star diagonal viewer to avoid any unnecessary reflection of antimatter light; 2) we had one of the two telescopes converted to a concave version with identical but conjugated foci; 3) we secured one single suitably selected camera to obtain pictures from both the Galileo and the antimat-

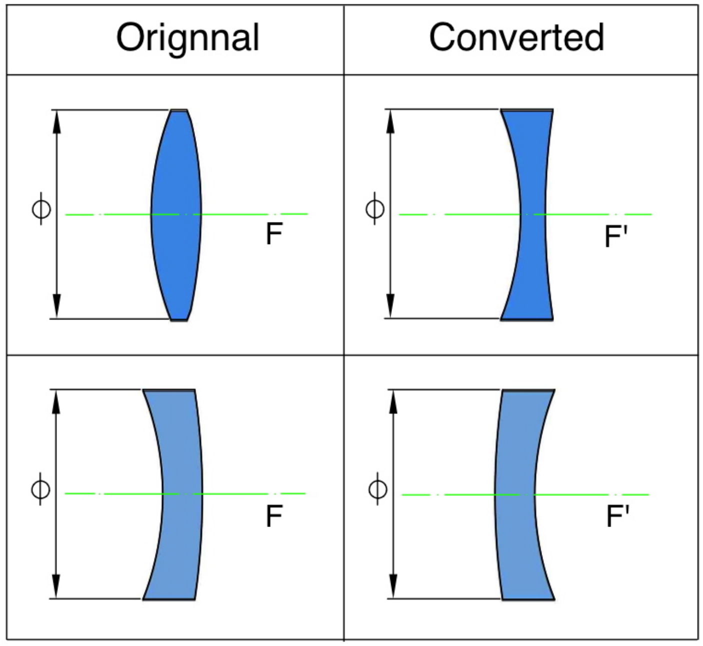

Fig. 6 Main characteristics of the Galileo and antimatter primary lenses (courtesy of Jianmin Guo from China).

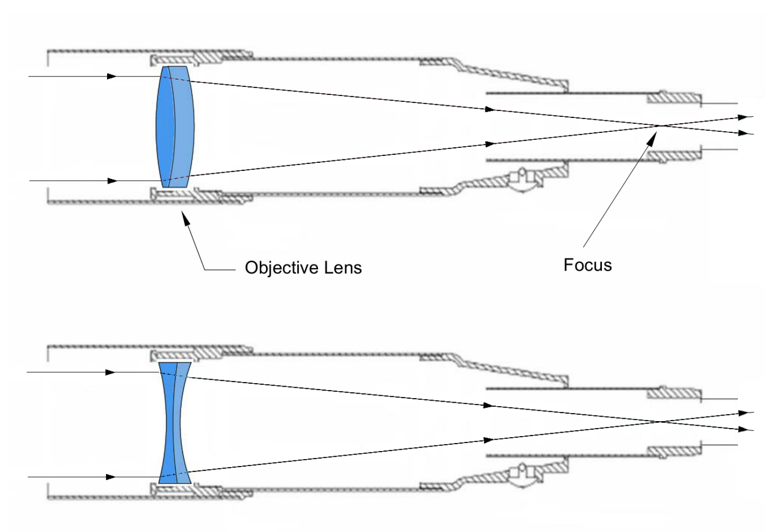

Fig. 7 Schematic view of the telescopes with convex and concave lense (courtesy of Jianmin Guo from China)

ter telescopes; 4) we secured a tripod with mount suitable for the parallel housing of the two telescopes; 5) we optically aligned the two telescopes on the tripod by keeping in mind the evident impossibility of doing visual alignments with the antimatter telescope; 6) we conducted a number of day views with the so mounted and aligned pair of Galileo and antimatter telescopes to verify that astronomical objects visible in the former are not visible in the latter; 7) we conducted a number of night views of the same region of the sky via the so mounted and aligned Galileo and the antimatter telescopes; 8) we obtained a number of pictures from both telescopes via the selected camera; and 9) we 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.

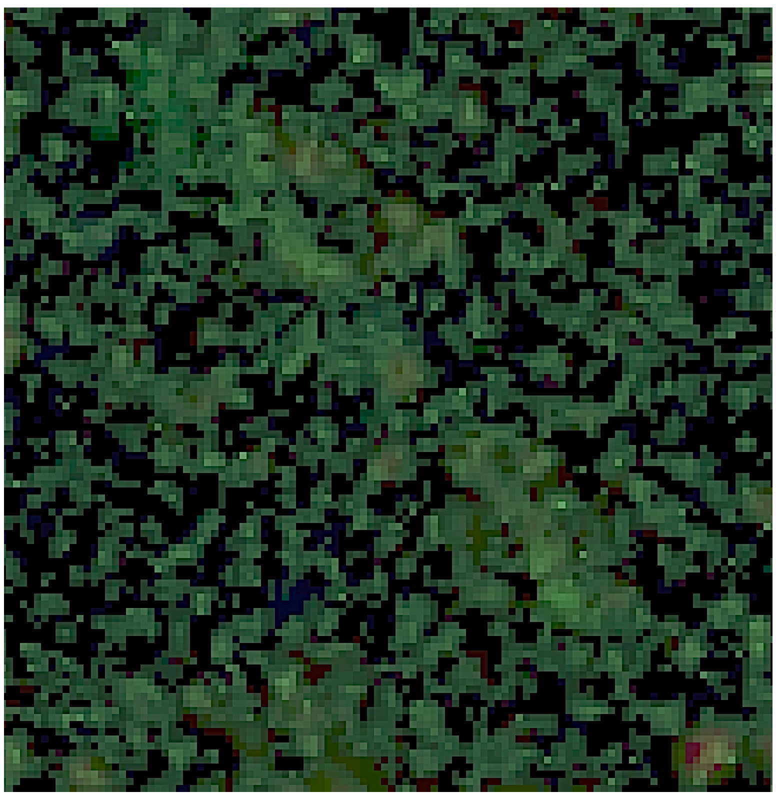

Fig. 8 Enlarged view of one of the streaks of matter light representing a far away matter star or galaxy identified in the main picture of the Epsilon Alpha and Beta region of the night sky near Vega obtained on November 7, 2013, via the Galileo telescope [34].

Along the above nine steps, we requested the astronomer Nilesh Vayada from India to design for us two identical straight refracting Galileo telescopes with 100 mm effective primary lenses, 900 mm focal length and with ratio 8.82, each having the finder scope, where straight means without the star diameter viewer to avoid unnecessary deflections of antimatter light. Following acceptance of the drawings, the two telescopes were fabricated for us by Galileo Telescope Makers, 503A, Prem Kunj, Navroji Lane, Ghatkopar (W) Mumbai 400 086, India (website www.galileotelescope.com). Fig. 3 shows the two identical Galileo refracting telescopes on arrival to our laboratory at the Institute for Basic Research, 150 Rainville Rd, Tarpon Springs, FL 34689, U.S.A. It should be indicated that the telescopes were ordered under the assurance by the manufacturer that they could see galaxies.

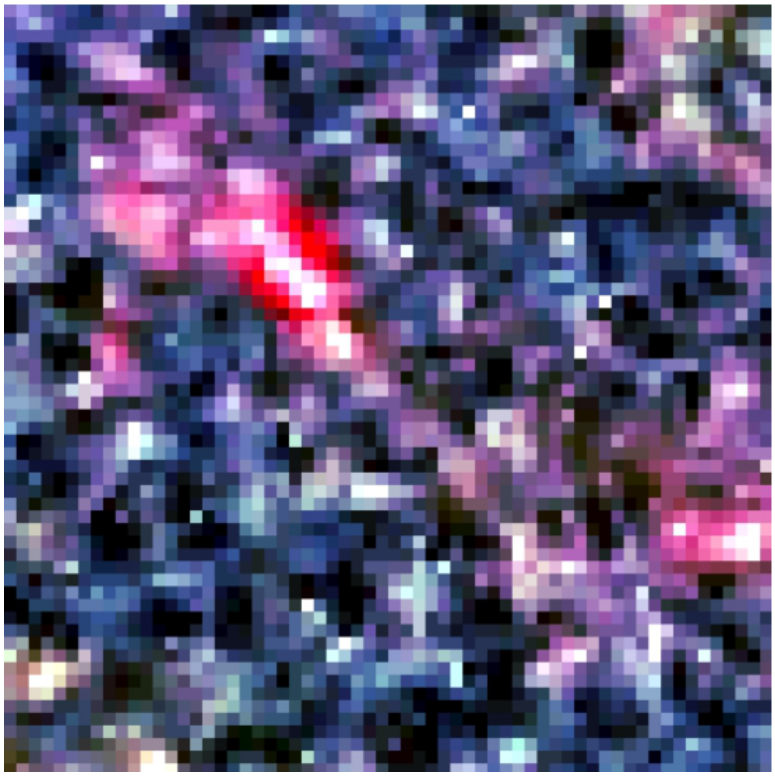

Fig. 9 The first focused streak of light detected in the antimatter telescope in the Epsilon Alpha and Beta region of the night sky on November 7, 2013, expectedly originated by a far away antimatter galaxy [35].

Galileo Telescope Makers also supplied the selected camera by Cannon, model EOS 600D with image sensor of type CMOS, and Bayer Filter. Light from the telescope primary lenses passes through a Low-Pass filter, then through an IR and a UV Filter, then through a Pixel Micro-Lens, and finally through a Pixel Color Filter after which light hits the pixel silicon photo diode where there is the conversion of light into electric signals. The conversion from analogue to digital allows the storage of raw data or their con- version into visible images in the LCD screen, as well as for storage in said visible format. A reflex mirror in front of the camera sensor used for the viewfinder is automatically retracted at the time an image is captured. In all tests the camera was directly attached to the two telescopes via a T ring adaptor and housed in lieu of the eyepieces. A picture of the camera is available in Figs. 4 and 5).

We then purchased an Orion Sky View Pro Equatorial Telescope Tripod model number 09829 equipped with an Orion Narrow Side-by-Side Plate model number 07956 for the housing of the two telescopes in a parallel fashion (see also Figs. 4 and 5). The tripod is equipped with three manually operated means for positioning the direction of the telescopes, one for the altitude, one for for right ascention, and one for declination.

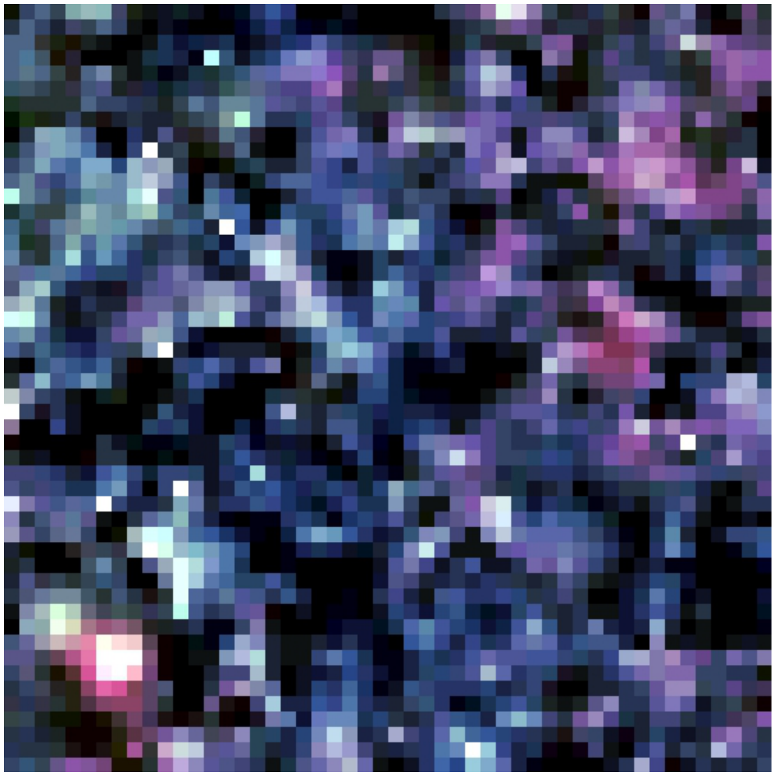

Fig. 10 The second streak of light detected in the picture of the Epsilon Alpha and Beta region with the antimatter telescope also expectedly due to another antimatter galaxy [35].

We then contacted the optician Jianmin Guo from China who designed the conversion of the two lenses per our specifications (Figs. 6 and 7). Following their approval by us, we shipped one of the two telescopes to Guos company, Zhengzhou Union Optics Co. LTD, No.10 ChenXu Road, Jinshui District, Zhengzhou City, China 450011 (web site http://www.unionoptics.com) to perform the transformation of the telescope from the Galileo form with 100 mm effective convex primary lenses, to our antimatter telescope with features identical to those the Galileo one but conjugated as described above. Since the camera is directly attached to the telescope without the eyepiece, this conversion essentially consisted in the fabrication and assembly of concave lenses as per the data of Fig. 6. Fig. 7 provides a comparative view of the Galileo and the antimatter telescope.

Following reception in late October 2013 from China of the telescope modified for antimatter, we assembled the two telescopes in the above described tripod with parallel dual mount and conducted their alignment during the daytime as follows: we first aligned the finder scope to the Galileo telescope via the view of a far object (a transformer in a far electric pole); then we aligned the finder scope of the antimatter telescope to the same view of the Galileo telescope; and finally aligned optically the antimatter telescope to the Galileo one. It should be indicated that extreme accuracy in alignment of the two telescopes was of no relevance for our initial tests. Our primary objective was to see whether or not antimatter galaxies can be detected with our concave lens telescope, since the identification of their precise location was quite unrealistic for these initial tests due to our current complete lack of knowledge of the optics of antimatter light.

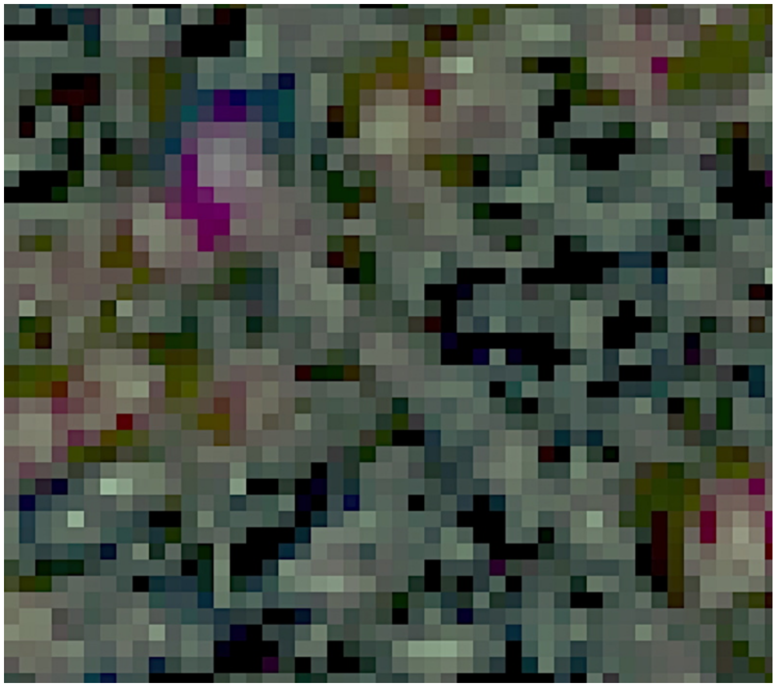

Fig. 11 The third streak of light detected in the picture of the Epsilon Alpha and Beta region with the antimatter telescope also expectedly due to a third antimatter galaxy [35].

Following the availability of the so mounted and aligned pair of telescopes, we 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.

Following the above preparatory steps, we finally initiated preliminary views of the sky at night with said pair of telescopes. Among a variety of tests not indicated here for brevity, we report the tests conducted between 10 and 11 pm of November 7, 2013, 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, we selected the setting of the camera at ISO 1600 because various tests with smaller and bigger ISO resulted inconclusive and ambiguous for various reasons. Detailed values of the various additional settings of the camera are available from Ref. [33].

All pictures were analyzed by the expert photographer Scott Randall of Night Fox Productions, P. O. Box 252, Dunedin, Florida 34697,U.S.A.(websitewww.NightFoxProductions.com) who conducted extensive analyses 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 antimatter telescope.

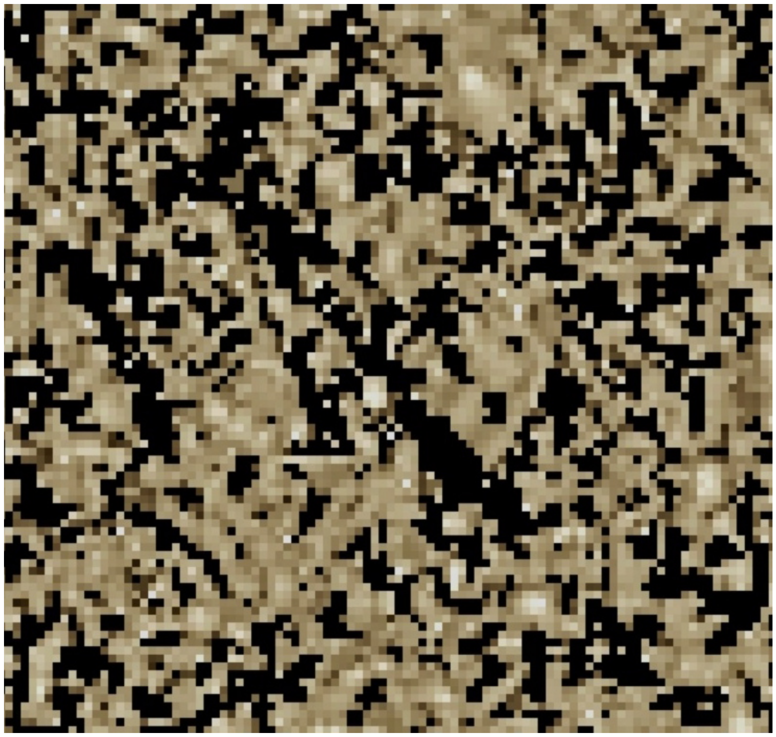

Fig. 12 The first streak of darkness identified in the picture of the Epsilon Alpha ane Beta region of the night sky taken on November 7, 2013, with the antimatter telescope [35] providing possible evidence of a far away antimatter star or galaxy as an alternative for the streaks of light.

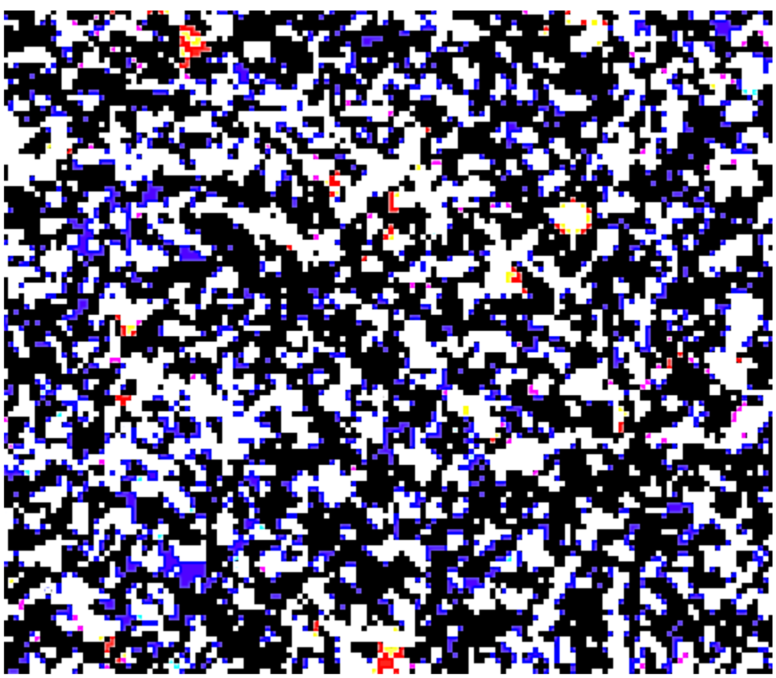

Fig. 13 Another representative streak of darkness present in the antimatter telescope [35] but absent in the Galileo telescope that may constitute an alternative to the streak of light.

The camera was first focused in the Galileo telescope via the rack and pinion of the telescope terminal and via the sharpness of the view in the camera optical view finder. The position of the rack and pinion was marked. When the camera was used in the antimatter telescope, the only possible focus was to assure that the position of the rack and pinion was the same as that of the Galileo telescope due to the identity of the foci (Figs. 6 and 7).

Following these preliminaries, we oriented the telescopes at the indicated location and time toward the star Vega, and then specialized the orientation for the pair of matter stars Epsilon Alpha and Epsilon Beta near Vega. In order to properly interpret expected anomalies

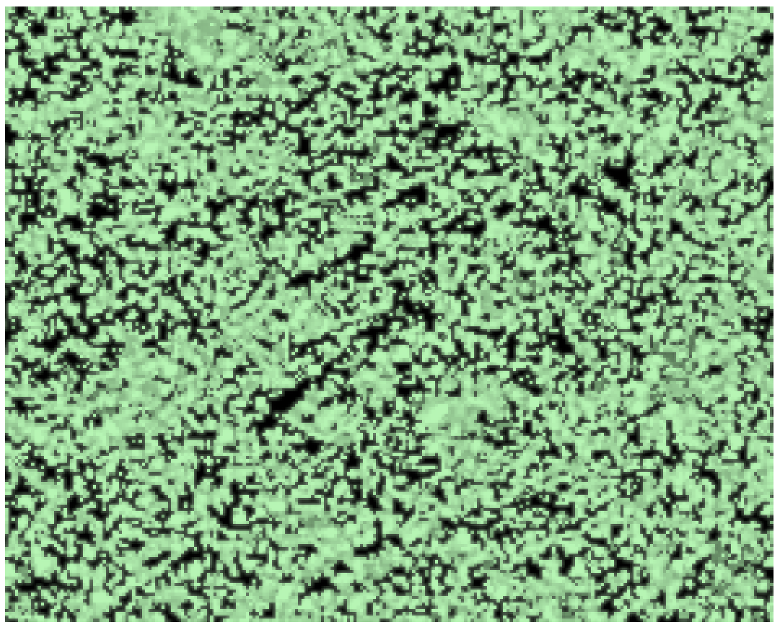

Fig. 14 Seemingly connected streaks of darkness identified in a picture of the Vega region of the night sky on November 7, 2013, with the antimatter telescope that could be due to the annihilation of a shower of small antimatter asteroids in our atmosphere, in a way much similar but the conjugate of the frequent view in the night sky of the streaks of light caused by the annihilation of a shower of small matter asteroids in our atmosphere.

in the pictures, we should recall the following properties of the isodual theory of antimatter [22].

As indicated in Sect. 3, isodual mathematics predicts that antimatter possesses *negative energy* according to Dirac's original conception [5], although referred to a *negative units* of energy when considered in the antimatter world.

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 eigenvalue equation

$$H^d \times^d | >= E \times | >, \quad E > 0,$$

where $\times^d$ 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 (due to Earth's rotation) sufficiently long to be clearly distinguishable from the background.

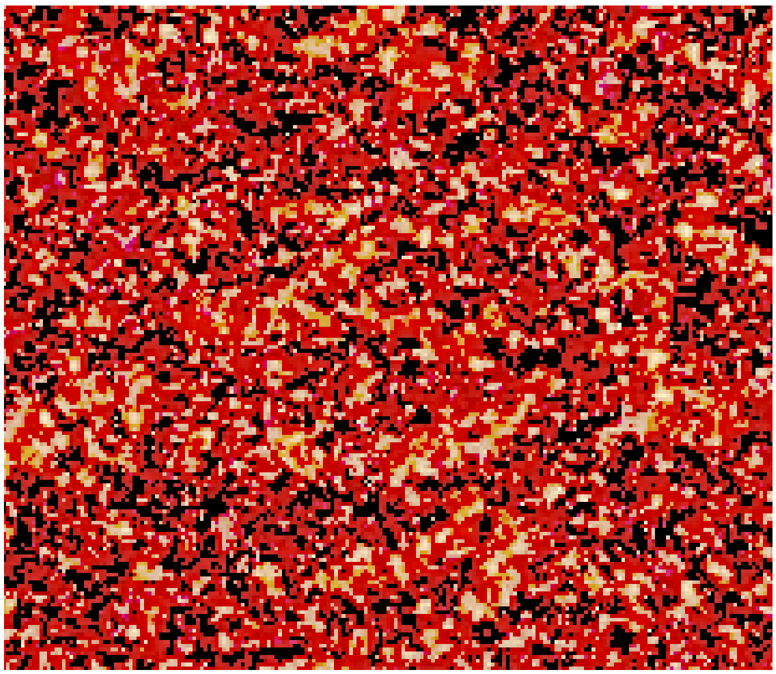

Fig. 15 The first of numerous circular traces identified in a picture of Vega regions of the night sky on Nov ember 7, 2013, with the antimatter telescope that could be due to the annihilation of an antimatter cosmic ray.

However, our current 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 eigenvalue equation

$$H^d \times | >= -E \times | >, \quad E > 0,$$

where "$\times$" 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 (verified by Diracs equation [22]) requires that matter-antimatter annihilation jointly produces matter and antimatter liht.* This can be seen from the conventional particle reaction

$$e^+ + e^- \longrightarrow \gamma + \gamma$$

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

$$e^+ + e^- \longrightarrow \gamma + \gamma^d$$

resulting in the indicated production of two lights (see Ref. [24] for apparent insufficiencies of Feynman's diagrams for particle-antiparticle annihilation due to violation of the isoselfdual invariance, impossibility of representing annihilation via the notion of particle exchange, and other shortcomings).

Consequently, any confirmation that antimatter light has a negative energy, either via the pictures of this paper or via the possible experimental detection of gravitational repulsion for antimatter light in a matter field, would confirm Dirac's original conception of antiparticles as having negative energy [5[while isomathematics would resolve known inconsistencies.

Following the above clarifications for a tentative interpretation of expected anomalies, we provide in Ref. [34] the main picture of the indicated Epsilon Alpha and Beta region of the sky from the Galileo telescope in both compiled and raw forms, where one can easily identify the Epsilon Alpha and Epsilon Beta pair of matter stars near Vega.

Fig. 8 provides the typical view of a far away matter star or galaxy in the indicated region of the sky which view can be easily identified in the main picture of Ref. [34] under suitable magnification. One should note the length and orientation of the streak of light of Fig. 8 due to Earths rotation during the 15 second exposure, as well as its weakness due to the fact that the sky was inspected in an essentially urban area with consequential unavoidable diffuse luminescence. An additional reason for the weakness of the streak is that the tests were conducted at the Gulf Anclote Park which is at the edge of the Gulf of Mexico, thus implying significant humidity of the air, with ensuing additional weakness of the streaks of light due to water absorption of light. The reader should keep in mind these limitations so as to avoid the expectation of the detection of brilliant streaks of light in the antimatter telescope.

Ref. [35] provides the compiled and raw forms of the corresponding pictures of the same region of the sky from the antimatter telescope.

As indicated above, in our analysis of the latter picture we first identified streaks of light reported in Figs. 9 to 11 that are present in the antimatter telescope but can arguably be conceived as being absent in the Galileo telescope. The magnification has been obtained via the Gimp 2.8 software. The position of the anomalous streaks of light of Figs. 9 to 11 is indicated with squares in the main picture visible under no magnifications. The anomalous streaks of light will then appear under suitable magnification.

It should be noted that streaks of light are of difficult identification, particularly for their corresponding absence in the Galileo telescope, thus being unsettled at this writing, since the background is also made up of light. We have indicated them in representation of the current first line of thinking that antimatter light, and therefore antiparticles, have positive energy.

It should also be noted that the focal position of the camera was accurately marked in the transition from the Galileo to the antimatter telescope, but not its angular orientation due to the primitive character of the available equipment, thus implying possible small differences in orientation of the streaks in the Galileo and antimatter telescopes. Hence, expectations of extreme accuracy in the orientation of the matter and antimatter streaks would be unrealistic for these first tests.

As indicated above, we additionally conducted a search for streaks of darkness in the main pictures of the indicated Epsilon Alpha and Beta region of the night sky from the antimatter telescope under the conditions that: 1) said streaks are present in the antimatter telescope

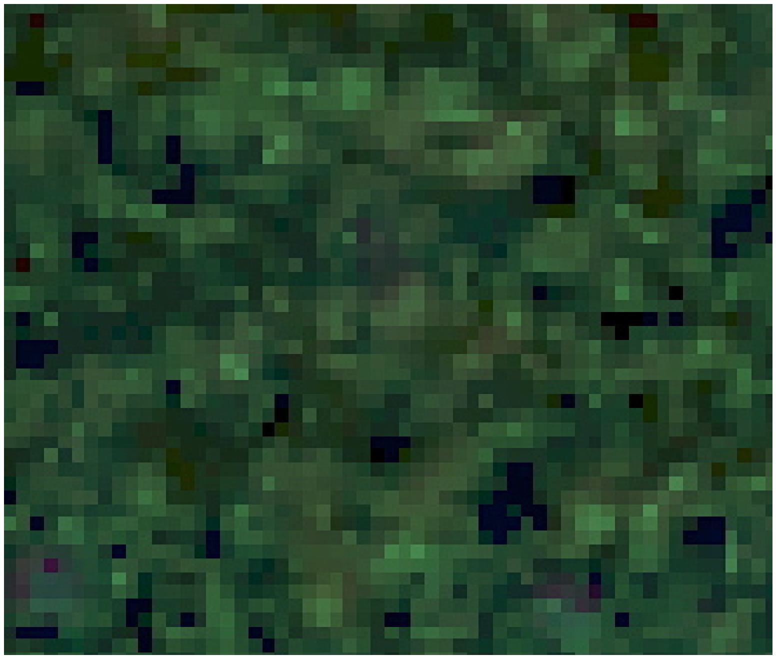

Fig. 16 View of a circular trace identified in a picture of Deneb regions of the night sky with the antimatter telescope.

but not in the Galileo telescope; 2) the streaks have approximately the same orientation and length of the streak of matter light of Fig. 8; 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.

Two representative streaks of darkness verifying these requirements are reported in Figs. 12 and 13. Note the apparent clear organization of dark pixels over illuminated ones with a low statistical probability if occurring at random. The streaks of Figs. 12 and 13 are here tentatively presented as providing possible evidence, following due verifications, that antimatter light may cause fpcused images of darkness when hitting the pixels of the selected camera (that was evidently produced to detect matter light).

In Fig. 14 we present seemingly correlated streaks of darkness of unknown origin, but which could be arguably due to a shower of small *antimatter asteroids* annihilating in or passing through our upper atmosphere. This is due to the fact that their orientation is not compatible with that caused by the fifteen second exposure of the camera as set by the streak of Fig. 8, thus solely allowing for interpretation an essentially instantaneous event.

It should be noted that the author could locate no additional, clearly identified streaks of light or darkness in pictures of various regions of the sky obtained with the antimatter telescope besides the streaks reported in Figs. 9 to 14, 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 for the very limited possibilities of the used 10 cm telescopes, thus suggesting the construction of a bigger pair of Galileo and antimatter telescope for their possible dection.

Besides said linear streaks, the author 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 antimatter but not in the Galileo telescope. Representative examples of these *circular traces* are reproduced in Figs. 15 to 19. As one can see, these circular traces all have approximately the same diameter for a given magnification; and are clearly distinct from the background.

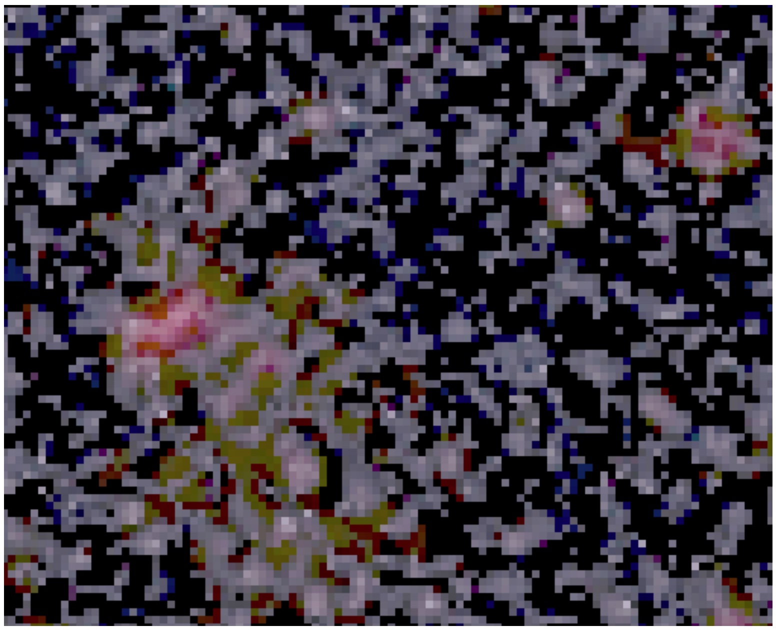

Fig. 17 View of a circular trace identified in a picture of Altair regions of the night sky with the antimatter telescope.

After due analysis, 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 author 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 concave lenses.

Note that the circular traces could also be due to antimatter gamma rays, their arrival at sea level in the forms of cones being possibly due to effects inherent in the yet unknown optics of antimatter light.

As one can see, the circular traces appear to be predominantly, but not definitely due to *circles of darkness*, rather than light. *Consequently, the circular traces of darkness of Figs. 15 to 19 support the hypothesis that antimatter light causes images of darkness, rather than light, in a camera built for matter light.*

A resolution of the alternative between images of light or darkness suggests the of a special camera with inverted sign of the pixel voltage, or other means under which matter light is detected as darkness in order to see whether antimatter light produces visible images. Needless to say, the construction of such a special camera should be complemented with the construction of bigger and more accurate pair of Galileo and antimatter telescopes.

There is no doubt that, besides the above proposed special camera and bigger telescopes, a considerable amount of additional mathematical, theoretical and experimental research is needed for the resolution of the background central issues: whether matter-antimatter annihilation verifies the symmetry of isoselfduality; whether annihilation jointly produces distinct matter and antimatter light; and whether antimatter and/or light experiences gravitational repulsion in a matter field.

Among the needed research, we indicate: the great need to develop the *antimatter optics*, also called by the author *isodual optics* [24]; the measurement of the gravity of the positron in horizontal flight in a supervacuum and supercooled tube [22,26,27]; and the experimental resolution whether the two photons emitted in the electron positron annihilation

$$e^+ + e^- \longrightarrow \gamma + \gamma^d$$

both experience gravitational attraction, or one experience attraction and the other repulsion.

Until all this basic knowledge is achieved, any resolution of the origin of the anomalous streaks and circles reported in this paper, whether in favor or against, will be purely illusory.

It should be noted that the cap[ability by a telescope with concave lenses to focus images appears to be an experimental verification of the novel isodual differential calculus [10,38[.

Additional information in the above measurements can be found in Ref. [39[.

5 CONCLUDING REMARKS

Following a rather long scientific journey for the construction of the isodual theory of neutral or charged antimatter applicable at all levels of treatment, from classical mechanics to second quantization, the author has presented in this paper apparently for the first time pictures of the Epsilon Alpha and Beta region of the night sky via a telescope with concave primary lenses as suggested by isodual mathematics.

These pictures show anomalous streaks and circles that are absent in pictures of the same region of the sky from a Galileo telescope, thus suggesting antimatter as their origination, and their main common feature is that of being *streaks and circles of darkness*, rather than light, as it should be after all expected under matter-antimatter conjugation, by therefore supporting the negative energy of light predicted by the isodual theory of antimatter.

In the event confirmed, the anomalous traces presented in this paper may emerge as being the first experimental detection of antimatter galaxy, antimatter asteroids and antimatter cosmic rays.

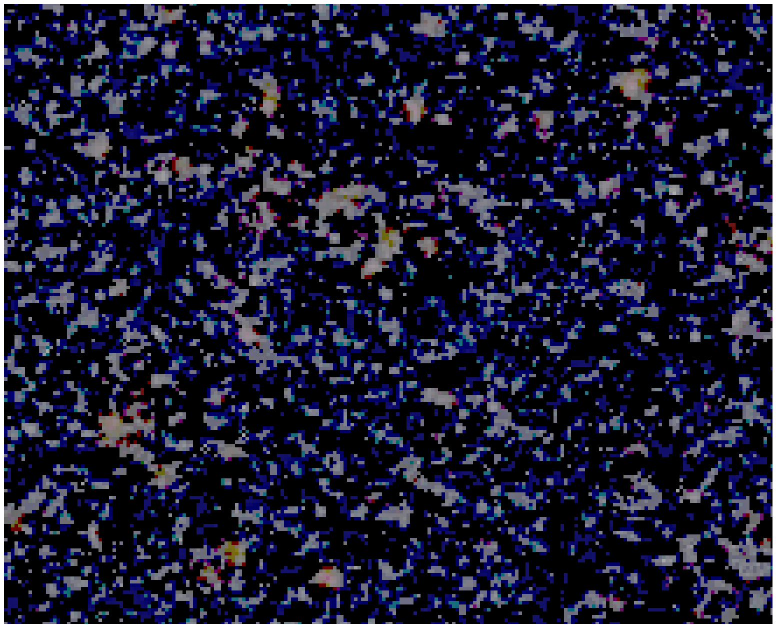

Fig. 18 View of a circular trace identified in a picture of Sadr regions of the night sky with the antimatter telescope.

The main result of this paper is an apparent confirmation of Dirac's [5] original 1928 conception of antiparticles as possessing negative energy because necessary for consistency with negative energy of light in the electron-positron annihilation, the inconsistencies of negative energies being apparently assured by their treatment via the isodual mathematics.

The author would like to close this paper with a call of the physics community to balance experiments at *very high energies* with complementary experiments at very low energies, because the former do not appear to have new objectives worth the use of large public funds, while only the latter can yield fundamental new advances in virtually all scientific fields.

In particular, we recommend the measurement of the gravity of the positron in horizontal flight [22,26,27] (with caution in the use of antiprotons expressed in Appendix A due their possible confusion with the pseudoproton and other reasons), as well as the complementary measurement of the gravity of the photons produced in electron-positron annihilation [24].

Only these tests can yield the necessary scientific knowledge to prevent that Earth is devasted again by a large antimatter asteroid without the physics community being able to provide any advance detection.

6 APPENDIX A: Antiprotons or pseudoprotons?

A few words of caution should be voiced in regard to other proposed measurements of the gravity of antimatter in a matter field via current production of antiprotons [36]. This is due to the fact that, in the event the isodual theory of antimatter is confirmed, true matter-antimatter annihilations solely produce light without any residual particles or antiparticles, as it was the case for the 1908 Tunguska explosion in Siberia (since the production of particles would have destroyed all trees in the ground).

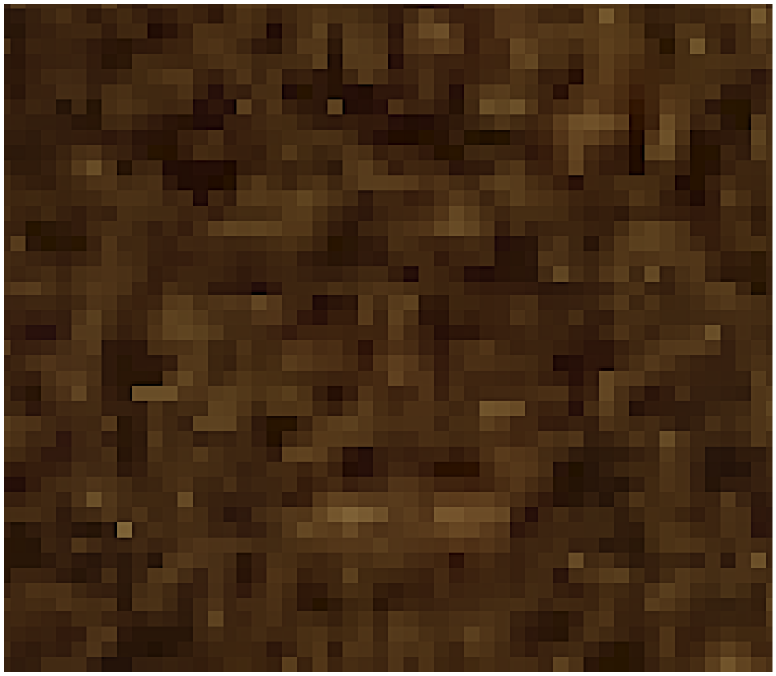

Fig. 19 View of a circular trace identified in a picture of Gienah Cyngi regions of the night sky with the antimatter telescope.

But the currently claimed proton-antiprotons annihilations, such as that of the Bose-Einstein correlation, produce a large number of particles, as well known (see Ref. [32] for a review and quotations), thus casting shadows as to whether the particles currently called "antiprotons" are truly characterized by antimatter or they are at least in part the "pseudo-protons" predicted by hadronic mechanics[37].

In essence, at the time a proton beam hits a matter target as it is the case for the currently production of apparent antiprotons, we have all the necessary energy for the synthesis of the neutron from a proton and an electron

$$p^+ + e^- \longrightarrow n + \nu,$$

as occurring in the core of a star. This synthesis is quantitatively represented solely by hadronic mechanics due to 0.782 excess rest energy of the neutron over the sum of the rest energies of the proton and the electron that would require, for the use of quantum mechanics, a "positive binding energy" under which the Schrodinger's equation becomes inconsistent in favor of its non-unitary covering equation of hadronic mechanics (for brevity the review and quotations, see also Chapter 6 of Ref. [32]).

Following the quantitative representation of the neutron synthesis, hadronic mechanics quite easily predicts the "pseudoproton" which is characterized by the synthesis of the proton and an electron pair in singlet coupling (as normally existing in atomic orbitals of the target),

$$p^+ + (e^-_\uparrow, e^-_\downarrow)_{J=0} \longrightarrow \tilde{p}$$

(without any need to emit the hypothetical neutrino), yielding a fully "matter" particle without any antiparticle content, with a negative elementary charge, a meanlife similar to that of the isolated neutron (about fifteen minutes) and a mass close to that of the proton due to the apparent balance between the negative energy of the strongly attractive Coulomb interactions at very short distances with the positive energy due to the isorenormalization of rest energies under deep wave overlapping as necessary for the synthesis of the neutron (see Ref. [37] for here inessential calculations mostly similar to those for the neutron synthesis).

It is evident that the pseudoproton can quickly capture a positron to form a kind of "hybrid Hydrogen atom" composed by a matter nucleus and an orbiting antimatter particle, thus being predominantly constituted by matter. Consequently, *experiments via the use of the currently produced "antiprotons" and related "anti-Hydrogen atoms" are predicted by hadronic mechanics to yield a full gravitational attraction*, thus being potentially insidious for basic advances in antimatter, unless the claimed antiprotons are truly proved to be as such via consistent annihilation processes and not via the sole measurement of the charge and mass.

In view of these and other ambiguities, the author has stressed in Ref. [22] the need that *the first test of the gravity of antimatter be done with positrons in our matter field, since positrons are the only certain antiparticle known at this writing.*

7 ACKNOWLEDGMENTS

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