POSSIBLE OBSERVATION OF A SECOND KIND OF LIGHT – MAGNETIC PHOTON RAYS

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Several years ago, I suggested a quantum field theory which has many attractive features. (1) It can explain the quantization of electric charge. (2) It describes symmetrized Maxwell equations. (3) It is manifestly covariant. (4) It describes local four-potentials. (5) It avoids the unphysical Dirac string. My model predicts a second kind of light, which I named "magnetic photon rays." Here I will discuss possible observations of this radiation by August Kundt in 1885, Alipasha Vaziri in February 2002, and Roderic Lakes in June 2002.

1. The Theoretical Background

1.1. *The Model*

The existence of the second kind of light was predicted theoretically. It can be understood by the following argumentation.

In 1948/1949 Tomonaga, Schwinger, Feynman, and Dyson introduced quantum electrodynamics [1]. It is the quantum field theory of electric and magnetic phenomena. This theory has one shortcoming. It cannot explain why electric charge is quantized, i.e. why it appears only in discrete units.

In 1931 Dirac [2] introduced the concept of magnetic monopoles. He has shown that any theory which includes magnetic monopoles requires the quantization of electric charge.

A theory of electric and magnetic phenomena which includes Dirac monopoles can be formulated in a manifestly covariant and symmetrical way if two four-potentials are used. Cabibbo and Ferrari in 1962 [3] were the first to formulate such a theory. It was examined in greater detail by later authors [4 – 6]. Within the framework of a quantum field theory one four-potential corresponds to Einstein's electric photon from 1905 [7] and the other four-potential corresponds to Salam's magnetic photon from 1966 [5].

In 1997 I have shown that the Lorentz force between an electric charge and a magnetic charge can be generated as follows [6]. An electric charge couples via the well-known vector coupling with an electric photon and via a new type of tensor coupling, named velocity coupling, with a magnetic photon. This velocity coupling requires the existence of a velocity operator.

For scattering processes this velocity is the relative velocity between the electric charge and the magnetic charge just before the scattering. For emission and absorption processes there is no possibility of a relative velocity. The velocity is the absolute velocity of the electric charge just before the reaction.

The absolute velocity of a terrestrial laboratory was measured by the dipole anisotropy of the cosmic microwave background radiation. This radiation was detected in 1965 by Penzias and Wilson [8], its dipole anisotropy was detected in 1977 by Smoot, Gorenstein, and Muller [9]. The mean value of the laboratory's absolute velocity is 371 km/s. It has an annual sinusoidal period because of the Earth's motion around the Sun with 30 km/s. It has also a diurnal sinusoidal period because of the Earth's rotation with 0.5 km/s.

According to my model from 1997 [6] each process that produces electric photons does create also magnetic photons. The cross-section of magnetic photons in a terrestrial laboratory is roughly one million times smaller than that of electric photons of the same energy. The exact value varies with time and has both the annual and the daily period.

As a consequence, magnetic photons are one million times harder to create, to shield, and to absorb than electric photons of the same energy.

The electric-magnetic duality is:

electric charge	—	magnetic charge
electric current	—	magnetic current
electric conductivity	—	magnetic conductivity
electric field strength	—	magnetic field strength
electric four-potential	—	magnetic four-potential
electric photon	—	magnetic photon
electric field constant	—	magnetic field constant
dielectricity number	—	magnetic permeability

The refractive index of an insulator is the square root of the product of the dielectricity number and the magnetic permeability. Therefore it is invariant under a dual transformation. This means that electric and magnetic photon rays are reflected and refracted by insulators in the same way. Optical lenses cannot distinguish between electric and magnetic photon rays.

By contrast, electric and magnetic photon rays are reflected and refracted in a different way by metals. This is because electric conductivity and magnetic conductivity determine the reflection of light and they are not identical. The electric conductivity of a metal is several orders larger than the magnetic conductivity.

1.2. *The Formulae for Classical Electromagnetodynamics*

Let $J^\mu = (P, \mathbf{J})$ denote the electric four-current and $j^\mu = (\rho, \mathbf{j})$ the magnetic four-current. The well-known four-potential of the electric photon is $A^\mu = (\Phi, \mathbf{A})$. The four-potential of the magnetic photon is $a^\mu = (\varphi, \mathbf{a})$. Expressed in three-vectors the symmetrized Maxwell equations read,

$$\begin{aligned} \nabla \cdot \mathbf{E} &= P && (1) \\ \nabla \cdot \mathbf{B} &= \rho && (2) \\ \nabla \times \mathbf{E} &= -\mathbf{j} - \partial_t \mathbf{B} && (3) \\ \nabla \times \mathbf{B} &= +\mathbf{J} + \partial_t \mathbf{E} && (4) \end{aligned}$$

and the relations between field strengths and potentials are

$$\begin{aligned} \mathbf{E} &= -\nabla \Phi - \partial_t \mathbf{A} - \nabla \times \mathbf{a} && (5) \\ \mathbf{B} &= -\nabla \varphi - \partial_t \mathbf{a} + \nabla \times \mathbf{A}. && (6) \end{aligned}$$

By using the tensors

$$\begin{aligned} F^{\mu\nu} &\equiv \partial^\mu A^\nu - \partial^\nu A^\mu && (7) \\ f^{\mu\nu} &\equiv \partial^\mu a^\nu - \partial^\nu a^\mu && (8) \end{aligned}$$

we obtain the two Maxwell equations

$$\begin{aligned} J^\mu &= \partial_\nu F^{\nu\mu} = \partial^2 A^\mu - \partial^\mu \partial^\nu A_\nu && (9) \\ j^\mu &= \partial_\nu f^{\nu\mu} = \partial^2 a^\mu - \partial^\mu \partial^\nu a_\nu. && (10) \end{aligned}$$

Evidently, the two Maxwell equations are invariant under the $U(1) \times U'(1)$ gauge transformations

$$\begin{aligned} A^\mu &\rightarrow A^\mu - \partial^\mu \Lambda && (11) \\ a^\mu &\rightarrow a^\mu - \partial^\mu \lambda. && (12) \end{aligned}$$

Furthermore, the four-currents satisfy the continuity equations

$$0 = \partial_\mu J^\mu = \partial_\mu j^\mu. \qquad (13)$$

The electric and magnetic field are related to the tensors above by

$$\begin{aligned} E^i &= F^{i0} - \frac{1}{2} \varepsilon^{ijk} f_{jk} && (14) \\ B^i &= f^{i0} + \frac{1}{2} \varepsilon^{ijk} F_{jk}. && (15) \end{aligned}$$

Finally, the Lorentz force is

$$K^\mu = Q(F^{\mu\nu} + \frac{1}{2}\varepsilon^{\mu\nu\varrho\sigma} f_{\varrho\sigma})u_\nu + q(f^{\mu\nu} - \frac{1}{2}\varepsilon^{\mu\nu\varrho\sigma} F_{\varrho\sigma})u_\nu, \tag{16}$$

where $\varepsilon^{\mu\nu\varrho\sigma}$ denotes the totally antisymmetric tensor.

2. Arguments for an Absolute Rest Frame

Soon after I presented my model of magnetic monopoles [6], I learned that the main obstacle for most physicists to accept my model was that it requires an absolute rest frame. For this reason, I will present the arguments for an absolute frame in this section. The first subsection deals with the classical arguments, the second subsection deals with the arguments based on General Relativity and relativistic cosmology.

2.1. *Space and Time Before General Relativity*

According to Aristotle, the Earth was resting in the centre of the universe. He considered the terrestrial frame as a preferred frame and all motion relative to the Earth as absolute motion. Space and time were absolute [10].

In the days of Galileo the heliocentric model of Copernicus [11] was valid. The Sun was thought to be resting within the centre of the universe and defining a preferred frame. Galileo argued that only relative motion was observed but not absolute motion. However, to fix motion he considered it as necessary to have not only relative motion, but also absolute motion [12].

Newton introduced the mathematical description of Galileo's kinematics. His equations described only relative motion. Absolute motion did not appear in his equations [13].

This inspired Leibniz to suggest that absolute motion is not required by the classical mechanics introduced by Galileo and Newton [14].

Huyghens introduced the wave theory of light. According to his theory, light waves propagate via oscillations of a new medium which consists of very tiny particles, which he named aether particles. He considered the rest frame of the luminiferous aether as a preferred frame [15].

The aether concept reappeared in Maxwell's theory of classical electrodynamics [16]. Faraday [17] unified Coulomb's theory of electricity [18] with Ampère's theory of magnetism [19]. Maxwell unified Faraday's theory with Huyghens' wave theory of light, where in Maxwell's theory light is considered as an oscillating electromagnetic wave which propagates through the luminiferous aether of Huyghens.

We all know that the classical kinematics was replaced by Einstein's Special Relativity [20]. Less known is that Special Relativity is not able to answer several problems that were explained by classical mechanics.

According to the relativity principle of Special Relativity, all inertial frames are equivalent, there is no preferred frame. Absolute motion is not required, only the relative motion between the inertial frames is needed. The postulated absence of an absolute frame prohibits the existence of an aether [20].

According to Special Relativity, each inertial frame has its own relative time. One can infer via the Lorentz transformations [21] on the time of the other inertial frames. Absolute space and time do not exist. Furthermore, space is homogeneous and isotropic, there does not exist any rotational axis of the universe.

It is often believed that the Michelson-Morley experiment [22] confirmed the relativity principle and refuted the existence of a preferred frame. This believe is not correct. In fact, the result of the Michelson-Morley experiment disproved the existence of a preferred frame only if Galilei invariance is assumed. The experiment can be completely explained by using Lorentz invariance alone, the relativity principle is not required.

By the way, the relativity principle is not a phenomenon that belongs solely to Special Relativity. According to Leibniz it can be applied also to classical mechanics.

Einstein's theory of Special Relativity has three problems.

(i) The space of Special Relativity is empty. There are no entities apart from the observers and the observed objects in the inertial frames. By contrast, the space of classical mechanics can be filled with, say, radiation or turbulent fluids.

(ii) Without the concept of an aether Special Relativity can only describe but not explain why electric and magnetic fields oscillate in propagating light waves.

(iii) Special Relativity does not satisfy the equivalence principle [23] of General Relativity, according to which inertial mass and gravitational mass are identical. Special Relativity considers only inertial mass.

Special Relativity is a valid approximation of reality which is appropriate for the description of most of the physical phenomena examined until the beginning of the twenty-first century. However, the macroscopic properties of space and time are better described by General Relativity.

2.2. *General Relativity: Absolute Space and Time*

In 1915 Einstein presented the field equations of General Relativity [24] and in 1916 he presented the first comprehensive article on his theory [25]. In a later work he showed an analogy between Maxwell's theory and General Relativity. The solutions of the free Maxwell equations are electromagnetic waves while the solutions of the free Einstein field equations are gravitational waves which propagate on an oscillating metric [26]. As a consequence, Einstein called space the aether of General Relativity [27]. However, even within the framework of General Relativity do electromagnetic waves not propagate through a luminiferous aether.

Einstein applied the field equations of General Relativity on the entire universe [28]. He presented a solution of a homogeneous, isotropic, and static universe, where the space has a positive curvature. This model became known as the Einstein universe. However, de Sitter has shown that the Einstein universe is not stable against density fluctuations [29].

This problem was solved by Friedmann and Lemaître who suggested a homogeneous and isotropic expanding universe where the space is curved [30].

Robertson and Walker presented a metric for a homogeneous and isotropic universe [31]. According to Gödel this metric requires an absolute time [32]. In any homogeneous and isotropic cosmology the Hubble constant [33] and its inverse, the Hubble age of the universe, are absolute and not relative quantities. In the Friedmann-Lemaître universe there exists a relation between the actual age of the universe and the Hubble age.

According to Bondi and Gold, a preferred motion is given at each point of space by cosmological observations, namely the redshift-distance relation generated by the Hubble effect. It appears isotropic only for a unique rest frame [34].

I argued that the Friedmann-Lemaître universe has a finite age and therefore a finite light cone. The centre-of-mass frame of this Hubble sphere can be regarded as a preferred frame [6].

After the discovery of the cosmic microwave background radiation by Penzias and Wilson [8], it was predicted that it should have a dipole anisotropy generated by the Doppler effect by the Earth's motion. This dipole anisotropy was predicted in accordance with Lorentz invariance [35] and later discovered experimentally [9]. Peebles called these experiments "aether drift experiments" [36].

The preferred frames defined by the Robertson-Walker metric, the Hubble effect, and the cosmic microwave background radiation are probably identical. In this case the absolute motion of the Sun was determined by the dipole anisotropy experiments of the cosmic microwave background radiation to be (371 ± 1) km/s.

3. Three Experiments to Verify the Magnetic Photon Rays

3.1. *How to Verify the Magnetic Photon Rays*

The easiest test to verify/falsify the magnetic photon is to illuminate a metal foil of thickness $1, \ldots, 100 \mu$m by a laser beam (or any other bright light source) and to place a detector (avalanche diode or photomultiplier tube) behind the foil. If a single foil is used, then the expected reflection losses are less than 1%. If a laser beam of the visible light is used, then the absorption losses are less than 15%. My model [6] predicts the detected intensity of the radiation to be

$$f = r(v/c)^4 \tag{17}$$

times the intensity that would be detected if the metal foil were removed and the laser beam would directly illuminate the detector. Here

$$v = v_{sun} + v_{earth} \cos(2\pi t/T_e) \cos(\varphi_{ec}) + v_{rotation} \cos(2\pi t/T_{rot}) \cos(\varphi_{eq}) \tag{18}$$

is the absolute velocity of the laboratory. The absolute velocity of the Sun as measured by the dipole anisotropy of the cosmic microwave background radiation is

$$v_{sun} = (371 \pm 0.5)\mathrm{km/s}. \tag{19}$$

The mean velocity of the Earth around the Sun is

$$v_{earth} = 30\mathrm{km/s}. \tag{20}$$

The rotation velocity of the Earth is

$$v_{rotation} = 0.5\mathrm{km/s} \cos(\varphi). \tag{21}$$

The latitude of the dipole with respect to the ecliptic is

$$\varphi_{ec} = 15°. \tag{22}$$

The latitude of the dipole with respect to the equator (declination) is

$$\varphi_{eq} = 7°. \tag{23}$$

The latitude of the laboratory is

$$\varphi = 48° \tag{24}$$

for Strassbourg and Vienna and $\varphi = 43°$ for Madison. The sidereal year is

$$T_e = 365.24\mathrm{days}. \tag{25}$$

A sidereal day is

$$T_{rot} = 23\mathrm{h}\ 56\mathrm{min}. \tag{26}$$

The zero point of the time, $t = 0$, is reached on December 9 at 0:00 local time. The speed of light is denoted by c. The factor for losses by reflection and absorption of magnetic photon rays of the visible light for a metal foil of thickness $1, \ldots, 100\mu$m is

$$r = 0.8, \ldots, 1.0. \tag{27}$$

To conclude, my model [6] predicts the value $f \sim 10^{-12}$.

More precisely, this value is correct only for interactions of free electric charges with photons. In these situations the cross-section of magnetic photons is reduced by the factor $(v/c)^2$ for emission and absorption processes with respect to the cross-section of magnetic photons of the same energy. Since in metals we do not have free electric charges nor free photons, this value has to be modified.

3.2. *The Experiment by August Kundt*

In Strassbourg in 1885, August Kundt [37] passed sunlight through red glass, a polarizing Nicol, and platinized glass which was covered by an iron layer. The entire experimental setup was placed within a magnetic field. With the naked eye, Kundt measured the Faraday rotation of the polarization plane generated by the transmission of the sunlight through the iron layer. His result was a constant maximum rotation of the polarization plane per length of $418,000°/\mathrm{cm}$ or $1°$ per 23.9nm. He verified this result until thicknesses of up to 210nm and rotations of up to $9°$.

In one case, on a very clear day, he observed the penetrating sunlight for rotations of up to $12°$. Unfortunately, he has not given the thickness of this particular iron layer he used. But if his result of a constant maximum rotation per length can be applied, then the corresponding layer thickness was ~ 290nm.

Let us recapitulate some classical electrodynamics to determine the behavior of light within iron. The penetration depth of light in a conductor is

$$\delta = \frac{\lambda}{2\pi\gamma},$$

where the wavelength in vacuum can be expressed by its frequency according to $\lambda = 1/\sqrt{\nu^2\varepsilon_0\mu_0}$. The extinction coefficient is

$$\gamma = \frac{n}{\sqrt{2}}\left[-1+\left(1+\left(\frac{\sigma}{2\pi\nu\varepsilon_0\varepsilon_r}\right)^2\right)^{1/2}\right]^{1/2},$$

where the refractive index is $n = \sqrt{\varepsilon_r\mu_r}$. For metals we get the very good approximation

$$\delta \approx \left(\frac{1}{\pi\mu_0\mu_r\sigma\nu}\right)^{1/2}.$$

The specific resistance of iron is

$$1/\sigma = 8.7\times 10^{-8}\Omega\mathrm{m},$$

its permeability is $\mu_r \geq 1$. For red light of $\lambda = 630$nm and $\nu = 4.8\times 10^{14}$Hz we get the penetration depth

$$\delta = 6.9\mathrm{nm}.$$

Only a small fraction of the sunlight can enter the iron layer. Three effects have to be considered. (i) The red glass allows the penetration of about $\varepsilon_1 \sim 50\%$ of the sunlight only. (ii) Only $\varepsilon_2 = 2/\pi \simeq 64\%$ of the sunlight can penetrate the polarization filter. (iii) Reflection losses at the surface of the iron layer have to be considered. The refractive index for electric photon light is given by

$$\bar{n}^2 = \frac{n^2}{2}\left(1+\sqrt{1+\left(\frac{\sigma}{2\pi\varepsilon_0\varepsilon_r\nu}\right)^2}\right). \tag{28}$$

For metals we get the very good approximation

$$\bar{n} \simeq \sqrt{\frac{\mu_r\sigma}{4\pi\varepsilon_0\nu}}. \tag{29}$$

The fraction of the sunlight which is not reflected is

$$\varepsilon_3 = \frac{2}{1+\bar{n}} = \frac{2}{1+\sqrt{\mu_r\sigma/(4\pi\varepsilon_0\nu)}} \tag{30}$$

and therefore $\varepsilon_3 \simeq 0.13$ for the system considered. Taken together, the three effects allow only $\varepsilon_1\varepsilon_2\varepsilon_3 \sim 4\%$ of the sunlight to enter the iron layer.

The detection limit of the naked eye is 10^{-13} times the brightness of sunlight provided the light source is pointlike. For an extended source the detection limit depends on the integral and the surface brightness. The detection limit for a source as extended as the Sun (0.5° diameter) is $l_d \sim 10^{-12}$ times the brightness of sunlight. If sunlight is passed through an iron layer (or foil, respectively), then it is detectable with the naked eye only if it has passed not more than

$$(\ln(1/l_d) + \ln(\varepsilon_1\varepsilon_2\varepsilon_3))\delta \sim 170\text{nm}.$$

Reflection losses by haze in the atmosphere further reduce this value.

Kundt's observation of sunlight which penetrated through iron layers of up to 290nm thickness can hardly be explained by classical electrodynamics. Air bubbles within the metal layers cannot explain Kundt's observation, because air does not generate such a large rotation. Impurities, such as glass, which do generate an additional rotation, cannot completely be ruled out as the explanation. However, impurities are not a likely explanation, because Kundt was able to reproduce his observation by using several layers which he examined at various places.

Quantum effects cannot explain the observation, because they decrease the penetration depth, whereas an increment would be required.

The observation may become understandable if Kundt has observed a second kind of electromagnetic radiation, the magnetic photon rays. I predict their penetration depth to be

$$\delta_m = \delta(c/v)^2 \sim 5\text{mm}.$$

To learn whether Kundt has indeed observed magnetic photon rays, his experiment has to be repeated.

3.3. *The Experiment by Alipasha Vaziri*

On February 22, 2002 between 15:30 and 16:30 local time of Vienna/Austria, Alipasha Vaziri tried an experiment to verify my predicted magnetic photon rays. As a light source he used a He-Ne laser of 1 milli Watt power and wavelength 632 nano meters. He coupled the light in a multi mode optical fibre with coupling efficiency of 70%. The light came out at the other end. After 3 centi meters he coupled the light in a second multi mode glass fibre, also with coupling efficiency of 70%. In front of the second optical fibre he placed an aluminium foil to shield the electric photon light. Behind the second optical fibre he placed an avalanche diode with 30% efficiency for electric photon light of 632 nano meters wavelength as a detector.

He did four sets of runs. Each run lasted for 10 seconds.

In the first set the laser illuminated the foil. The effective power of the laser was 56 micro Watts, because the sensitive area of the optical fibres was smaller than the cross-section of the laser beam. The counts of the 15 runs were:

350, 341, 339, 338, 337, 338, 331, 333, 336, 333, 325, 327, 341, 335, 343.

For the second set the laser was off. The counts of the 14 runs were:

344, 332, 329, 337, 332, 336, 338, 336, 343, 336, 330, 344, 333, 338.

For the third set of experiments, he placed optical lenses between the two optical fibres to focus the laser beam. The effective power of the laser was 1 milli Watt. The counts of these 17 foreground runs were:

367, 343, 345, 356, 339, 348, 345, 355, 353, 358, 346, 352, 345, 347, 342, 342, 345.

For the fourth set, the optical lenses were placed between the optical fibres and the laser was off. The counts of the 15 runs were:

336, 337, 330, 345, 341, 345, 340, 337, 339, 343, 345, 337, 332, 340, 330.

In total, he made 44 background runs and 17 foreground runs. The mean background count rates were:

$$\begin{aligned} \text{set 1:}&\ 33.65 \text{ counts/s} \\ \text{set 2:}&\ 33.63 \text{ counts/s} \\ \text{set 4:}&\ 33.85 \text{ counts/s} \\ \text{mean :}&\ 33.71 \text{ counts/s} \end{aligned}$$

The mean foreground count rate was:

$$\text{set 3: } 34.87 \text{ counts/s}$$

Therefore the excessive count rate was 1.16 counts/s.

The error bar can be estimated as follows. Two thirds of all data points should be within the one-sigma error bar, 95% of all data points should be within the two-sigma error bar. The individual error bar is therefore 6 counts for the 44 background runs and 7 counts for the 17 foreground runs. The total error bar can be calculated by dividing the individual error bar through the square-root of the number of runs. Hence, the total error bar for the background is 0.9 counts, that of the foreground is 1.7 counts.

The count rates are therefore:

$$\begin{aligned} \text{foreground} &: (34.87 \pm 0.17) \text{ counts/s} \\ \text{background} &: (33.71 \pm 0.09) \text{ counts/s} \\ \text{excess rate} &: (\ 1.16 \pm 0.19) \text{ counts/s} \end{aligned}$$

The statistical significance of the result is therefore 6 sigma.

There is another interesting point. All of the 17 foreground counts are larger than the mean of the 44 background counts. The probability for this by pure chance is $1 : 2^{17} = 1 : 131072$.

It is difficult to explain the small excess rate by conventional effects.

(1) The statistical significance is 6 standard deviations.

(2) The foreground runs were made between the second and third background measurements. The mean count rate of set 4, which directly followed the foreground set, is close to those of sets 1 and 2. Therefore a variability of the detector system (dark count rate) is not a likely explanation.

(3) Background set 4 was started directly after the foreground set was terminated. The count rate dropped simultaneously. Therefore it is unlikely that the excessive count rate resulted from electronic noise by equipment either inside or outside the laboratory.

(4) The two optical lenses were used to focus the laser beam, so they should have decreased effects of stray light. It is therefore unlikely that the excess is due to stray light.

(5) The penetration depth of electric photon light of 632 nano meters in aluminium is only 3.68 nano meters. Hence, the excess rate is not due to transmitted electric photon light.

(6) The excessive count rate is at least 7 orders of magnitude too small to be explicable by electric photon light which transmitted the aluminium foil through a pinhole or hairline crack, respectively.

(7) Because of the second optical fibre, the electric photon light of the laser cannot have heated the avalanche detector.

3.4. *The Experiment by Roderic Lakes*

The third experiment was performed by Roderic Lakes in Madison/Wisconsin in June 2002. As a light source he used a diode pumped YAG laser at 532 nano meters with 80 milli Watts of power. The detector was a photomultiplier with a quantum efficiency of 10% for green electric photon light and a variable dark count rate between 5 and 30 counts/s. The diameter of the detector was 6.5 milli meters. An aluminium foil was placed directly in front of the detector.

Roderic Lakes made 4 foreground sets and 3 background sets. Each set consisted of 6 runs. Each run lasted for 10 seconds. The foreground and background sets alternated.

The measured effect of the laser was 5 counts per second above background.

It is difficult to explain this excess by conventional effects.

(1) The foreground consisted of 5400 counts within 240 seconds. The mean foreground count rate was significantly greater than the mean background count rate. The background consisted of only 3200 counts within 180 seconds.

(2) Foreground and background measurements alternated. Therefore a variability of the detector is unlikely. For the same reason, it is unlikely that the excess results from noise of equipment either inside or outside the laboratory.

(3) The penetration depth of electric photon light of 532 nano meters in aluminium is only 3.38 nano meters. Hence, the excess rate is not due to transmitted electric photon light.

(4) The excessive count rate is at least 8 orders of magnitude too small to be explicable by electric photon light which transmitted the aluminium foil through a pinhole or hairline crack, respectively.

I have to point out that neither Alipasha Vaziri nor Roderic Lakes claim to have detected a new effect. They wrote me that they disagree with my interpretation of their experiments (personal communications from Alipasha Vaziri and Roderic Lakes, June 12, 2003). Further experiments have to be done to ensure that the excessive count rates have indeed been generated by magnetic photon rays.

4. Consequences

The observation of magnetic photon rays would be a multi-dimensional revolution in physics. Its implications would be far-reaching.

(1) The experiment would provide evidence of a second kind of electromagnetic radiation. The penetration depth of these magnetic photon rays is roughly one million times greater than that of electric photon light of the same wavelength. Hence, these new rays may find applications in medicine where X-ray and ultrasonic diagnostics are not useful. X-ray examinations include a high risk of radiation damages, because the examination of teeth requires high intensities of X-rays and genitals are too sensible to radiation damages. Examinations of bones and the brain may also become possible.

(2) A positive result would provide evidence of an extension of (quantum) electrodynamics which includes a symmetrization of Maxwell's equations from 1873 [16].

(3) My model describes both an electric current and a magnetic current, even in experimental situations which do not include magnetic charges. This new magnetic current has a larger specific resistance in conductors than the electric current. It

may find applications in electronics.

(4) The intensity of the magnetic photon rays should depend on the absolute velocity of the laboratory. The existence of the absolute velocity would violate Einstein's relativity principle of special relativity from 1905 [20]. It would be interesting to learn whether there exist further effects of absolute motion.

(5) The supposed non-existence of an absolute rest frame was the only argument against the existence of a luminiferous aether [20]. If the absolute velocity does exist, we have to ask whether aether exists and what its nature is.

(6) Magnetic photon rays may contribute to our understanding of several astrophysical and high energy particle physics phenomena where relativistic absolute velocities appear and where electric and magnetic photon rays are expected to be created in comparable intensities.

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