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Surprises in the Return-rates of Photons from a Mirror on the Moon

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Abstract

What happens to a laser beam that points from the bottom of a train (at rest) to a point in the ceiling when the train is moving very fast? Will the beam still hit this point, or will it hit the ceiling behind this point? In the years around 1900 scientists were convinced that photons get a lateral momentum in the direction of movement, because they are particles. But R. Feynman concluded that a mirror emits new photons and is therefore a light source and together with Einstein's second postulate of the STR the laser beam should hit the ceiling behind this point. This can be tested with the return rates of photons from a mirror on the moon. The results show clearly with an error of probability $<10^{-80}$ that photons do not get a lateral momentum but arrive at that location where the earth was 2.55 seconds before.

Besides the detection of an additional velocity of earth in the universe this article proves that Einstein's geometric space-time idea is wrong because the physical basis for that is wrong.

Keywords: Michelson Morley experiment • Theory of relativity • Photons • Velocities of earth • Space-time • Dark matter • Quantum gravity

Introduction

In the former article "are we wrong about the Michelson-Morley experiment?" [1]. It was described that the oblique light-path from the 45° mirror to the upper mirror in Figure 1 must be perpendicular to the direction of movement (along L in the graphic), and that therefore there is no time dilation, and that the length contraction would destroy the null result of the Michelson-Morley experiment [2].

The reason: Richard Feynman stated that a mirror emits new photons and together with Einstein's second postulate to the STR the photons should behave like here in this animation [3,4]. But is that true?

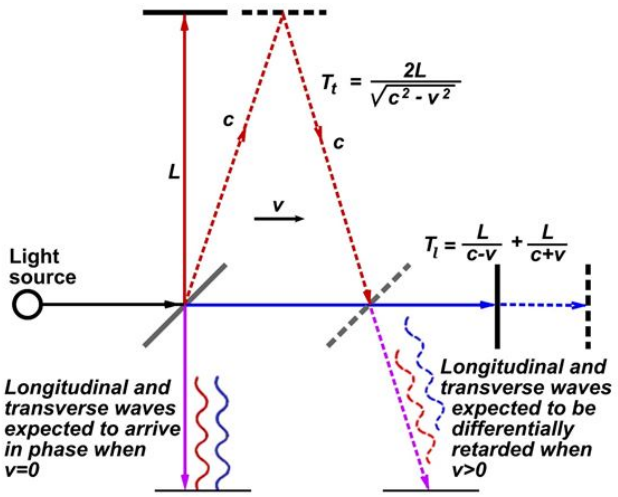

Figure 1. Michelson-Morley experiment.

One can see that the photons can miss the detector if v is very high or if the distance between the upper mirror and the detector is very large. This can be examined with the published data from the Lunar-Laser-ranging project [5]. The idea is that photons which are emitted from a retrograde mirror on the moon arrive at that location where the Earth was 2.55 seconds before and with a decreased

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number in the detector next to the laser, that sends photons to the moon.

Literature Review

Surprises in the return rates

In 2014 Tom Murphy published a comment where he reported that only 10% of the expected photons arrived in the detector [6]. That is the first surprise because it seems to confirm the idea that the photons from the mirror on the moon arrive with a displacement on the Earth, based on the velocities of earth in the universe. This was the encouragement to go deeper.

The selection of the monthly return rates of photons from the APOLLO 15-mirror on the moon for the years 2006, 2007 and 2008 that also have been published by T. Murphy [7], are displayed graphically here (Figure 2):

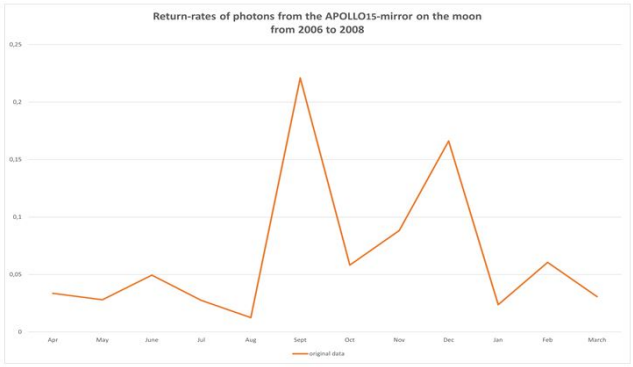

Figure 2. Returns of photons from the APOLLO 15-mirror on the moon from 2006 to 2008.

This is the next surprise: Why do the return rates have such a structure, and why are the return rates on September 9 times as large as in January?

Can the calculation with the displacement of the photons from the moon-mirror show the same pattern as the data? In a first trial 6 tangential velocity-components of earth in the east-west and west-east directions in equatorial coordinates were added, such that every displacement is zero in the direction of each velocity. This displacement was entered in a Gauss distribution with SD=4.3 km (Figure 3). The starting point is the vernal equinox and here is the result:

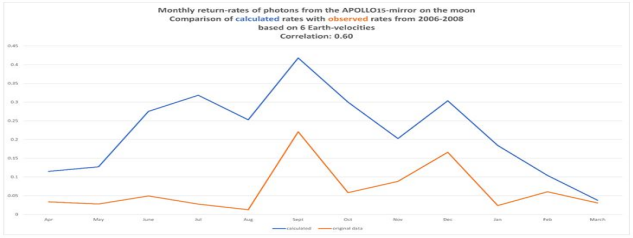

Figure 3. Monthly return-rates of photons the APOLLO 15-mirror on the moon comparison of calculated rates with observed rates from 2006-2008 based on 6 Earth-velocities correlation: 0.60.

And this is the next surprise: the 'rhythmical' pattern of the calculated rates is similar to the pattern of the measured rates. This cannot be a random coincidence.

The 6 velocities are the rotation of Earth, the Earth around the Sun, the Sun to the Apex, the rotation of our Galaxy, our Galaxy to the Andromeda galaxy and the local group to the great attractor. For more details on the calculation methods see appendix.

This correlation can be improved by adding a new velocity in the direction of 2 h 44 m because there is a gap of 41° between the sum of the angles of these velocities and the direction of the dipole-velocity of the earth to the CMB. This 'residual' velocity could for instance describe the velocity of a system containing the local group and the great attractor. In addition, there is a velocity in the north-south and south-north directions and a yearly constant that also provide a displacement of the photons. The variation of these two velocities led to a new surprise (Figure 4):

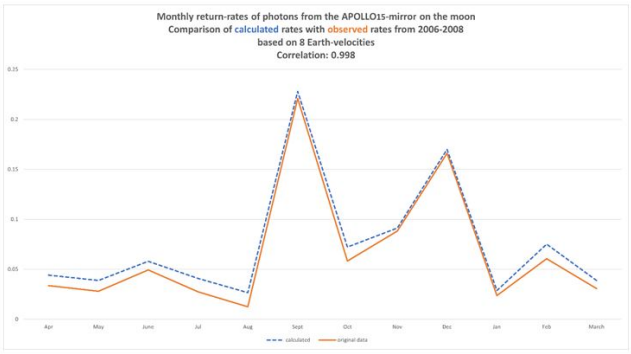

Figure 4. Monthly return-rates of photons from the APOLLO 15-mirror on the moon comparison of calculated rates with observed rates from 2006-2008 based on 8 Earth-velocities correlation: 0.998.

This is amazing and sheer unbelievable but certainly exaggerated because many data points are singular per year, and it is not for sure that in some cases the center of the laser-beam did hit the mirror on the moon. On the other hand, one can see that it is possible to determine the residual velocity exactly, which is not known until now, if one had enough reliable data. In this case v_r ~300 km/s.

The daily return rates per month

To further validate these considerations the daily return rates per month were calculated, assuming that the displacement must change when the Earth-Moon-axis turns by 360° in 29,53 days. As there are too few data, the years 2007, 2012 and 2015 were merged because in these years the Earth-Moon axes point in about the same direction at full moon [7-9]. Because of that, the calculation method is different (see appendix). The residual velocity was added here as well to get higher correlation coefficients and in addition the monthly displacement in the north-south-direction (Figure 5). The results are overwhelming:

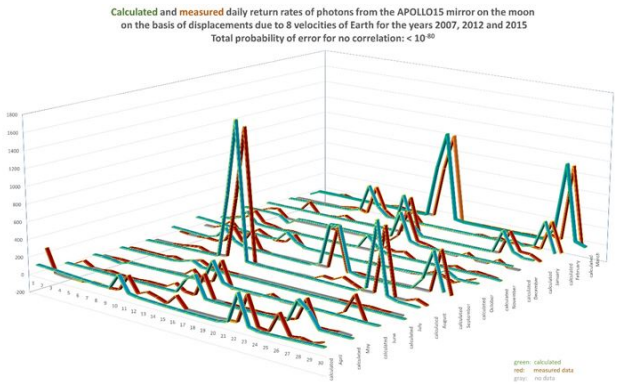

Figure 5. Calculated and measured daily return rates of photons from the APOLLO 15-mirror on the basis of displacements due to 8 velocities of Earth for the year 2007, 2012 and 2015 total probability of errors for no correlation: $<10^{-80}$.

The interesting thing is that the monthly structures look quite different and random, but the calculated values follow from the same formula for the displacements. The residual velocity was determined here to 227 ± 86 km/s. In 8 cases the correlation is ≥ 0.90. More pictures in detail see appendix. The t-tests of these correlations resulted in a total error of probability of $p<10^{-90}$. This is an excellent proof that Einstein's second postulate of the STR is correct.

The monthly return rates of photons from the APOLLO 15-mirror on the moon for the years 2007, 2012 and 2015 cannot be calculated exactly because the CRD-format only provides the return rates but not the raw data for that: The number of photons coming from the moon and the number of shots. Therefore, the maximum rates were compared with the maximum of calculated rates (Figure 6). As the monthly patterns show high correlations this is also valid for the monthly maximum rates:

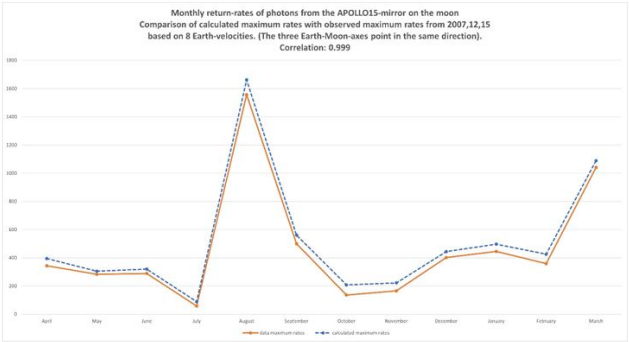

Figure 6. Monthly return-rates of photons from the APOLLO 15-mirror on the moon comparison of calculated maximum rates with observed maximum rates from 2007,12,15 based on 8 Earth-velocities. (The three Earth-Moon-axes point in the same direction). Correlation: 0.999.

Here one can see that the structure of this pattern is different from the other monthly return rates above.

Discussion

But now it is also very clear that photons do not get a momentum in the direction of motion of the moon but arrive the Earth with a complex displacement that can change even from minute to minute. Therefore, there is no time-dilation by the theorem of Pythagoras, and the length-contraction in the Lorentz-transformation, that deforms the space, would destroy the null result at the Michelson-Morley experiment. Thus, Einstein's genius idea about space-time that is based on the Lorentz-transformation is wrong. The relativistic effects, which we know now thanks to the theories of relativity, and the gravitation must be derived and explained by another model, for instance by interactions of matter-structures and energy-densities with the non-empty space.

Some issues

- The calculation-strategy was to achieve a maximum correlation between calculated and measured data. By varying the residual velocity and the North-South velocity plus a monthly constant velocity it is possible to get these good matches that are shown here. But if the data were different, these calculated speeds would be different too. Unfortunately the return rates are not documented in their raw form: The number of returning photons and the number of shots. How should one calculate a mean value with these published return rates? A geometric mean could be appropriate but not for sure. In addition, some return rates have the value 999 due to a restricted 3-digits field in a former format. The real value is not known. The same is valid for data that have the value 500. Therefore, the residual velocity of 227 km/s for the daily rates is a raw estimation only.
- The high displacement values that are entered in the gauss-distribution result in very small 'return rates'. They must be amplified to come into the scale of the measured data. It would be better if the displacement-values would be smaller. But how, as the Earth-velocities and the 2.55 seconds for the photons from earth to moon and back are given? The only possibility is to assume that photons are carried along within the gravitational field of the galaxy, like the sound in a train. Some trials with smaller displacements showed that a reduction of the displacements by 50% still results in correlation coefficients of about 0.6-0.8 and thus in a total error probability of p<10-60.
- **This result in an interesting consequence:** An observer outside of a galaxy would then measure a 50% higher blue shirt and a 50% lower redshift with the Doppler-effect for a galaxy whose plane is parallel to the direction of observation. And this was the reason why the dark matter has been introduced. According to the considerations above this is not necessary.
- It is easy to refute the above considerations if one shifts the starting point of the calculations by some days. The pattern-structure reacts very sensitively on the smallest changes of data. In this case the correlation coefficient could become about zero, but in the graphical display one can see that the typical structure of rates for the corresponding month is already there but shifted by some days. This should be accepted to be valid, because the three full moons happen on different days at different years, and the match depends on which data are significant for the actual calculation.
- Looking again at this animation, one can see that sometimes the width of a laser beam can be increased by 10 mrad even if the displacements are reduced by 60%. Usually, the dispersion of a laser is about 0.3 mrad. Therefore, there must be a transversal force between the photons, especially if they have the same spin-direction and are near together. This could for instance

be explained if gravitation can be shielded by the structures of the photons, and this would lead to new ideas to understand the quantum world.

Conclusion

Besides the detection of an additional velocity of Earth in the universe this article proves that Einstein's space-time idea is wrong because the physical basis for that is wrong. Now it becomes clear that photons do not get a lateral momentum into the direction of motion and that therefore no time dilation by the theorem of Pythagoras and no length contraction in the direction of motion by $1/\gamma$ can happen. Therefore, the idea about the light clock is wrong and the relativistic interpretation of the MME is wrong too. The return rates of the lunar laser ranging project reveal that scientists should think about some other models for the relativistic phenomena.

The question is: Can scientists accept an experimental fact that contradicts the theories of relativity, even though these have been confirmed by numerous and varied experiments and in some cases by a great technical expense?

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