ISSN: 3033-3652

Journal of Physical Mathematics & its Applications

SCIENTIFIC Research and Community

Review Article

Open Access

The Data from the Lunar Laser Ranging Project Contradict Einstein's Genius Spacetime Idea

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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 STR-postulate 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 spacetime idea is wrong because the physical basis for that is wrong.

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Received: June 22, 2023; **Accepted:** June 30, 2023; **Published:** July 05, 2023

Keywords: Michelson Morley, Theory of Relativity, Photons, Velocities of Earth, Spacetime, 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 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] (Figure 1). The reason: Richard Feynman stated that a mirror emits new photons [3] and together with Einstein's second postulate to the STR [4] the photons should behave like here in this animation. But is that true?

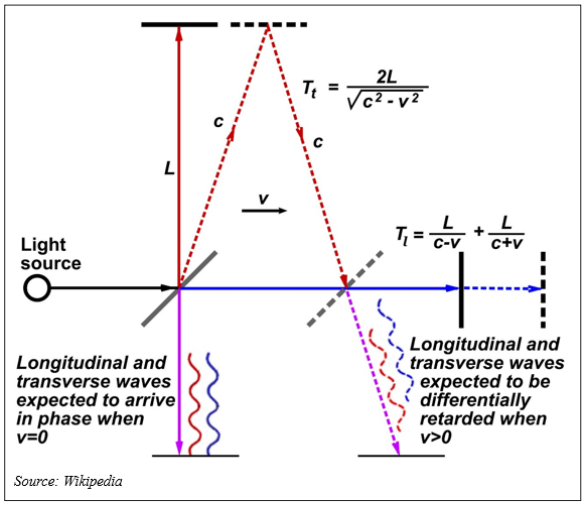


Figure 1

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

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 APOLLO15-mirror on the moon for the years 2006, 2007 and 2008, that also have been published by T. Murphy [7], are displayed graphically here:

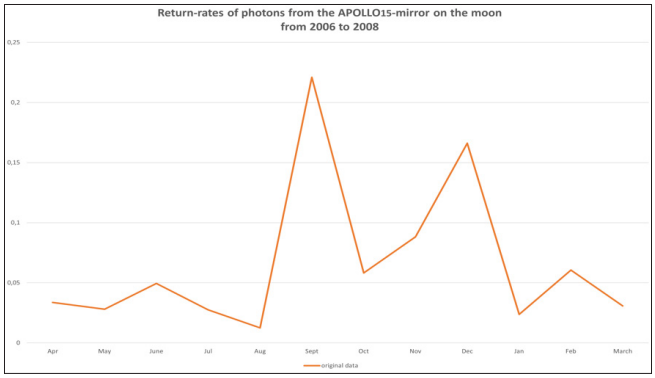


Figure 2

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. The starting point is the vernal equinox and here is the result:

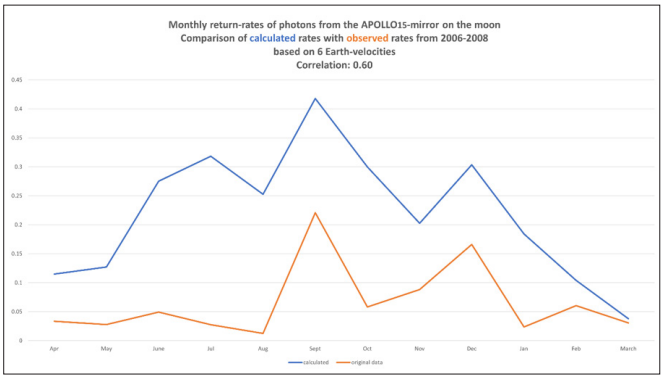


Figure 3

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 2h 44m 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:

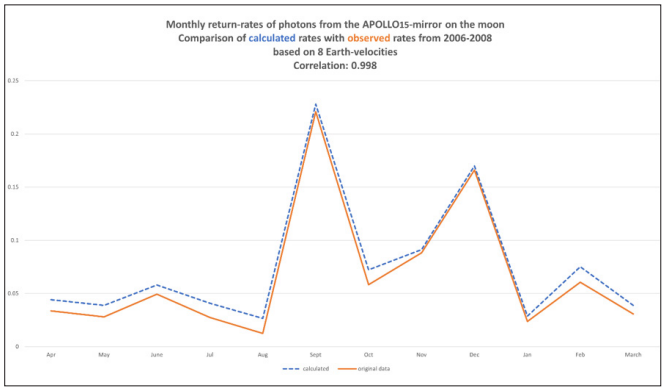


Figure 4

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 $v_R \sim 300$ 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 [8]. 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. The results are overwhelming:

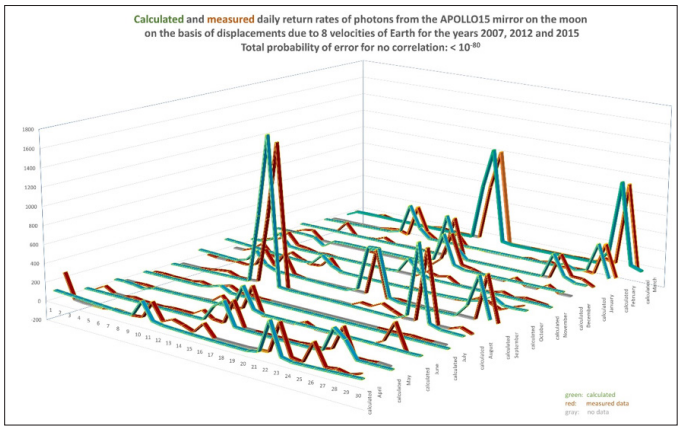


Figure 5

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 tangential 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 an total error of probability of $p < 10^{-90}$. This an excellent proof that Einstein's second postulate of the STR is correct.

The monthly return rates of photons from the Apollo15-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. As the monthly patterns show high correlations this is also valid for the monthly maximum rates:

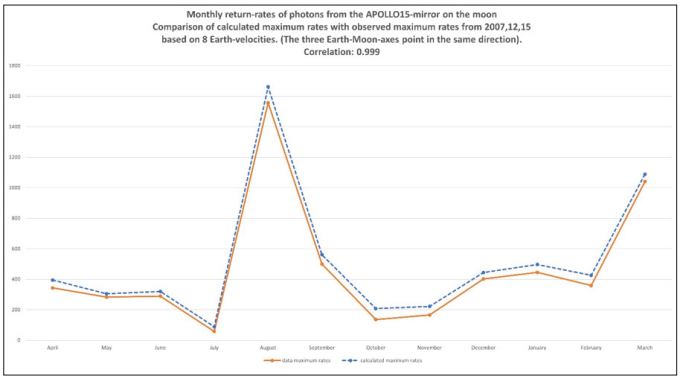


Figure 6

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

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 spacetime, 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

1. 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-digit field in a former format. The real value is not known. The same is valid for data that have the value 500. Therefore, the tangential Residual velocity of 227 km/s for the daily rates is a raw estimation only.
2. 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 results in an interesting consequence: An observer outside of a galaxy would then measure a 50% higher blueshift 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.
3. 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 one or e.g. 6 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.
4. 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 spacetime 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?

Appendix

Calculation method for the monthly return rates

All Earth velocity components in the east-west direction in equatorial coordinates were set such that the displacement is zero in the direction α of the velocity. For the velocity of the Earth around the sun the maximum displacement is set at full moon.

In the first step only the trigonometric functions for one month were set $(\sin(1.031*(\alpha_i+30 \ldots)) - \sin(1.031*(\alpha_i \ldots)))$ with i = [0;11], to get the sum of return rates for the month i. The factor 1.031 is a transformation of the calendrical days to the number

of Moon-days per year (365 /354 = 1.031).
For the Earth around the Sun there is in March a shift of 21 days from the beginning of the month to the vernal equinox plus 2 or 1 missing days in February.

Beginning in April, Tangential velocity:
V_{1i} = cos(1.031*(i*30-23+30)) - cos(1.031*(i*30-23))
with i = [0;11] month
Radial velocity:
V_{1i} = sin(1.031*(i*30-23+30)) - sin(1.031*(i*30-23)
For the rotation of the Galaxy, **318.2** is the angle from the vernal equinox to the direction of this velocity at the position of the sun, where the hours and minutes (rectascention) are transformed into degrees for the trigonometric functions.
Tangential velocity:
V_{2i} = sin(1.031*(i*30-23+30)-**318.2**) - sin(1.031*(i*30-23)-**318.2**)
Radial velocity:
V_{2i} = cos(1.031*(i*30-23+30)-**318.2**) - cos(1.031*(i*30-23)-**318.2**)

The same procedure is valid for the other Earth-velocities in the Universe, where instead of 318.2 the angels to the directions of these velocities are entered.

In the next step these tangential velocities, multiplied with their cosine-velocity components in the equatorial coordinates, were added (v_t) and the radial components (v_r) as well (in units of 30 km/s:
v_t = 2.9 (South-North) + 0.0133 (Earth rotation) + 1*around the Sun -0.4285*7*galactic rotation - 0.4*Sun to Apex + 0.755*4*Galaxy to Andromeda - 0.485*20.3*to the Great Attractor + 7.6*Residual velocity.

The monthly representations can be built by adding v_t + v_r or using the Pythagoras $v\_t^2 + v\_r^2$ or by the geometric mean $\sqrt{v\_t*v\_r}$ but the experience showed that the product $v\_t_i*v\_r_i$ resulted in the best accordance to the pattern-structure of the measured data.

This product, multiplied by 2.55 seconds, was entered in a Gauss-distribution with the standard deviation of 4.3 km, the default value for these data, and then scaled up to the values of the data. To achieve the observed asymmetry a modulation-factor with the half angle was included that represents the fact that the temperatures are different in winter in summer or in the monthly calculations that the moon is above the ecliptic plane for half a month and below it for the other half of a month, starting at the vernal equinox. By the variation of the starting point of this term the correlation can be increased by 10%.

The displacement in the North-South is combined with a constant displacement per year. Now the variation of this one and the Residual displacement led to increasing correlation-coefficients until the maximum correlation of 0.998 was found. The result is demonstrated in Figure 4. The velocity in the North-South direction was found to be about 60 km/s and the Residual velocity at about 300 km/s.

Calculation Method for The Daily Return Rates for One Month, 2007,2012,2015
The strategy for these calculations was to achieve a maximum correlation with the measured data. And this was possible by the change of the Residual displacement and the North-South-displacement + a monthly constant every day. The beginning of the pattern within this range of full moons in these years after the vernal equinox is very sensitive. One must observe the pattern in a graphical representation to find the best shift for a match. Otherwise, the correlation could be around zero. The change of the North-South-component changes the distance between the peaks, and the change of the Residual velocity changes the height and the position of the peaks.

If the Earth-Moon axis points in the direction of velocity, there is no displacement. As these axes point in about the same direction the cosine component is not necessary.

The angles in the sine-function are:
sin(12.2*(α_i+11+[1;30]-[1;7])-d_i+0.9864*(α_i +11+[1;30])
The factor 0.9864 is 360/365, the transformation of 365 days to 360°. The factor 12.19 is the transformation of 29.53 Moon-days to 360°. There are 11 days from the vernal equinox to the 1st of April, and d_i is the number of days on the 1st of every month i. The range [1;7] includes the days where one of the three full moons occurred after the vernal equinox (April 2.,4.,6.). α_i is increasing every month by 30.5°.

And this leads to the next surprise: The North-South displacements have a complex pattern structure as well.

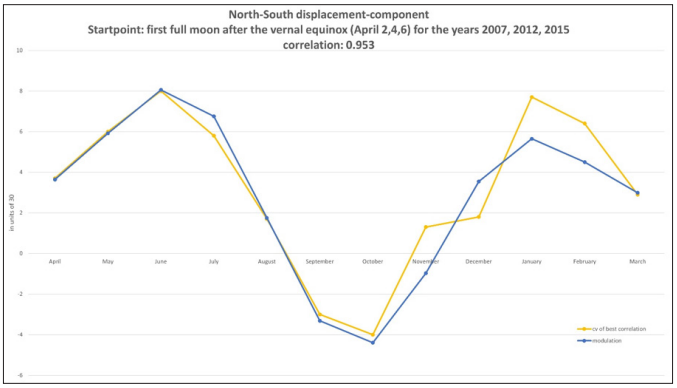


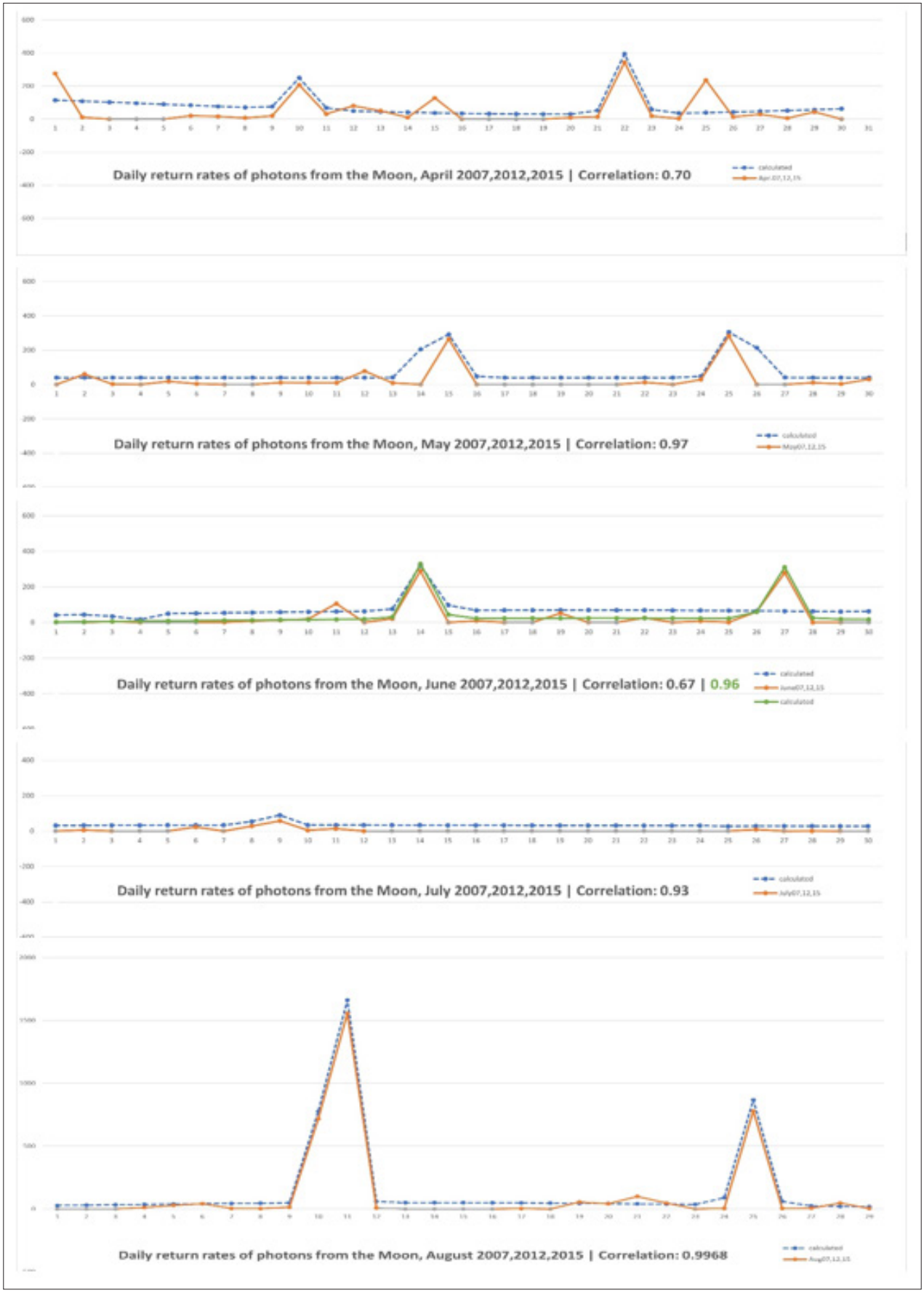
Figure 7

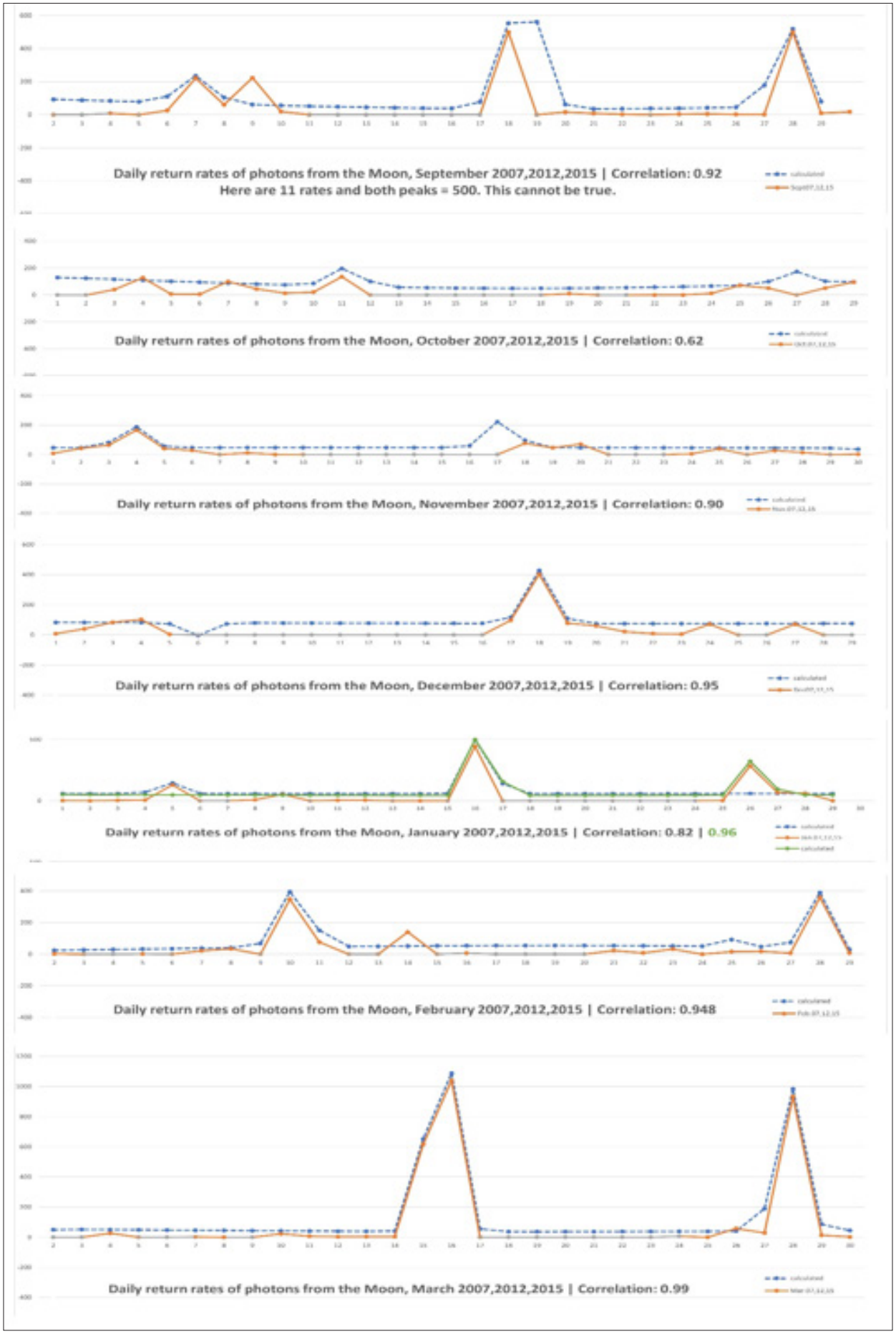
But the empirical found values, by searching the highest correlation, seem to fit very well the calculated North-South-displacements. Therefore, the non-fitting points of the daily return rates were corrected to the calculated points for the North-South displacements. By this the correlation coefficients were decreased a little, but the total error of probability is still < 10^{-80}.

For the calculation of the North-South component the declinations of the various velocities were used for the trigonometric functions, and these were multiplied with the sum of the former calculated displacement to get a similar course as in the calculated pattern. This is also necessary because the surface of Earth is always changing direction, and flying in a non-East-West direction or vice versa both displacement components must be regarded. There is another surprise: the starting point for this pattern on the 4th of April (full moon) led to a correlation of 95% with the calculated North-South displacements (see Figure 7).

This combined displacement was again entered into the above-mentioned Gauss distribution and continued with the same procedure as described above. The pictures below show the matches and the correlation coefficients between the calculated rates and the measured rates.

Comparison of the daily return rates of photons from the Apollo15-mirror on the moon in the years 2007, 2012 and 2015, and the calculated return rates based on 8 velocities of Earth. Total error of probability for no correlation: $< 10^{-80}$




Daily return rates of photons from the Moon, September 2007,2012,2015 | Correlation: 0.92
Here are 11 rates and both peaks = 500. This cannot be true.
Daily return rates of photons from the Moon, October 2007,2012,2015 | Correlation: 0.62
Daily return rates of photons from the Moon, November 2007,2012,2015 | Correlation: 0.90
Daily return rates of photons from the Moon, December 2007,2012,2015 | Correlation: 0.95
Daily return rates of photons from the Moon, January 2007,2012,2015 | Correlation: 0.82 | 0.96
Daily return rates of photons from the Moon, February 2007,2012,2015 | Correlation: 0.948
Daily return rates of photons from the Moon, March 2007,2012,2015 | Correlation: 0.99

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