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Expansion of the Universe and Cosmic Microwave Background Correlation and Detecting Deficient Energy Photons

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ABSTRACT

The Conservation of Energy and Conservation of Momentum was balanced in 2016 for the first time, from the perspective of the reflector, to the authors knowledge, when motion of a reflector results after a reflection. The method used for balancing the conservation laws was applied to the model of the Expansion of the Universe and a direct correlation to the peak wavelengths of the Cosmic Microwave Background was determined and associated with the maximum velocities of the Expansion of the Universe model. The method also indicates there may be more celestial bodies moving toward an observer than what is currently observed through modern telescopes. An experimental setup is presented, but not tested, that may be able to view an increase of celestial bodies compared to what is currently observed through modern telescopes.

***Keywords*:** Conservation of Energy, Conservation of Momentum, Deficient Energy Photons, Microwave, Expansion

1. INTRODUCTION

The current science that describes the motion of a reflector, after a reflection, involves applying the conservation of momentum from the perspective of the reflector. That is, when

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considering parallel vectors, the momentum of the photon before and after the reflection is identical but in opposite directions, resulting in the reflector moving in the direction of the original photon at twice the value of the momentum of the photon, when the conservation of momentum is used [1,2]. However, a 2013 publication indicated the Conservation of Energy was not balanced from the same reflectors perspective [3]. Though in this paper the Conservation of Energy was balanced by considering Quantum Theory and the Doppler Shift, the Conservation of Momentum was not balanced. In 2016, the Conservation of Energy and Momentum were finally balanced, which was done by maintaining the energy associated with the space-time of the photon, when first emitted at the source, but using the value of the observed wavelength, via Doppler Effect, for the discrete energy state excitation of the atoms and/or molecules associated with the reflection [4]. This resulted in observed photon values having more energy and momentum than what is observed for sources moving away from a reflector, and photon values having less energy and momentum than what is observed for sources moving towards a reflector. Considering parallel vectors, the difference in energy of what is observed to the energy at the source was:

$$\frac{\sqrt{1+\beta}}{\sqrt{1-\beta}}hf_r - hf_r \tag{1}$$

In this equation hf_r is the discrete energy observed by the reflector and the energy value need to excite the discreet energy level, $\frac{\sqrt{1+\beta}}{\sqrt{1-\beta}}hf_r$ is the emitted photon energy at the source, and β is the velocity of the source divided by the speed of light or v/c. The scalar equation for momentum is similar [4], but hf_r becomes $\frac{h}{\lambda_r}$.

When balancing momentum vectors the following was used, and to the authors knowledge, has not been used before:

a) The space-time geometry associated with the photon at the source is maintained with the photon despite observers or reflectors relative motion.

b) The energy and momentum of an absorbed photon becomes the energy and momentum within the atom or molecule, leaving no excess of energy and momentum.

c) The direction of the photon's momentum, when absorbed in an atom or molecule, does not impact the excited state of the atom or molecule.

d) The energy and momentum of an emitted photon originates from the energy and momentum within the atom or molecule, leaving no excess of energy and momentum.

e) The direction of the photon's momentum, when emitted from an atom or molecule, does not impact the state of the atom or molecule after emission

f) Despite absorbed energy and momentum of a photon, the space-time geometry of the photon determines the excess or deficiency of the actual energy and momentum of a photon.

For simplicity, only energy will be considered in this paper. For sources moving away from a reflector, the value of the velocity was positive. For sources moving toward a reflector, the value of the velocity was negative.

As there is more energy than is needed to excite the discreet energy state of the atom or molecule, for a source moving away from the atom or molecule, the excess energy may be applied to motion, particle emission, vibration and other forms of discreet energies, and/or in combination of energies [5]. The uppercase word SINK was used to describe energy that was dispeled from an atom or molecule, which absorbed a photon with more energy than what is observed that originated from a photon source moving away from the atom or molecule. As there is insufficient energy to excite the discreet energy state of the atom or molecule despite the observed wavelength, for a source moving toward the atom or molecule, energy may be acquired from the atom or molecules surroundings to satisfy the excitation of the discreet energy state, where energy could be acquired from within and/or external to the atom or molecule.

The uppercase word SOURCE was used to describe the energy that was supplied to an atom or molecule, which absorbed an energy deficient photon that originated from a photon source moving toward the atom or molecule, which would put the atom or molecule its fully excited state. Further, the AFFECTED ATOM or AFFECTED MOLECULE was referred to an atom or molecule that absorbed an energy deficient photon or a photon with excess energy.

The total possible SOURCE's and SINK's for a reflector within a molecular gas [5] is as follows:

$$E_{v_l} + E_{r_m} + E_{e_n} + E_{z_y} + E_{v_{l_i}} + E_{r_{m_i}} + E_{e_{n_i}} + E_{z_{y_i}} + E_t + E_{v_{l2_a}} + E_{r_{m2_a}} + E_{e_{n2_a}} + E_{z_{y2_a}} + E_{t2_a} + E_p \tag{2}$$

In the equation above E_{v_l} is the summation of the total possible occupied or unoccupied vibrational energy states for SOURCE's and SINKs, respectively, and where there are a total number of l vibrational energy states. E_{r_m}, and E_{e_n} and E_{z_y}, are the summations associated with the rotational energy states, electronic energy states and nuclear energy states, respectively. In the equation above, i is the total number of molecules and/or atoms that provide SOURCE's and SINKs that are internal to the AFFECTED MOLECULE and/or AFFECTED ATOM. In the equation above, a is the total number of molecules and/or atoms that provide SOURCE's and SINKs that are external to the AFFECTED MOLECULE and/or AFFECTED ATOM. $l2$, $m2$, $n2$, $y2$, and $t2$ indicate the transcriptions for the external vibrational, rotational, electronic, nuclear and translational energies. Equation (2) is similar in mathematical structure to the summation of the vibrational energy states. E_t is associated with translational energy. E_p is associated with particle energy. There are many combinations of these energies, where the total possible combinations [5] for equation (2) are as follows:

$$\left((2^{l+n+y})^{i+1} + 3\right)\left((2^{l2+m2+n2+y2+a})^{a+1} + 3\right) \tag{3}$$

Both numerator and denominator contain a square root in equation (1), which is a correction to the 2017 publication [5], where several equations did not contain a square root in the denominator.

In this paper, this method of balancing the conservation of energy and conservation of momentum, for sources moving away and toward a reflector, will be applied to the model of the expansion of the universe.

A direct correlation between the model of the expanding universe and the Cosmic Microwave Background will be made with the application of this method. Using the application and correlation, this paper will, through thought experiments, show that celestial bodies moving toward an observer have a lower probability of being observed than sources moving away from an observer or reflector.

Further, an experimental setup will be presented to detect celestial bodies that are moving towards an observer or reflector, where successful results can prove the existence of energy deficient photons caused by sources moving away from an observer or reflector. As this paper is only an introduction, and possibly the first time, to the author's knowledge, of the direct application of this new method to astronomical observations, performing the suggested experiment is beyond the scope of this paper.

2. EXCESS ENERGY CAUSED BY THE EXPANSION OF THE UNIVERSE

As sources moving away from a reflector results in energy that is greater than what is observed by a reflector [4], then celestial bodies associated with an expanding universe would also produce energy that is greater than the observed wavelengths. Equation (1) will be used to determine this excess energy.

A paper published in 2012 determined the Hubble constant to be 74.3 +/- 2.1 kmS^{-1} Mpc^{-1} [6]. For this current paper, the celestial bodies of the universe will be moving away from a reflector at a velocity of 74.3 +/- 2.1 km/s.

According to Equation (1) a discrete value of hf_r is needed to excite the atoms or molecules associated with reflection. For simplification, only visible light will be used. The visible light spectrum that will be used, and applied to Equation (1), is 380 nm to 700 nm [8], or λ_r values. Using f_r = c/λ_r results in the following frequencies 7.89×10^{14} Hz to 3.79×10^{14} Hz. The velocities that will be applied to Equation (1) are 76.4 km/s, 74.3 km/s and 72.2 km/s, where these three velocities include the medium celestial speed, and the uncertainty that is included in the Hubble constant.

Applying the stated visible spectrum and the stated velocities into Equation (1) results in the following excess energies:

Table 1. Excess Energies for Expansion.

	72.2 km/s	**74.3 km/s**	**76.4 km/s**
380 nm	1.2591E-22	1.29573E-22	1.33236E-22
790 nm	6.05645E-23	6.23263E-23	6.40881E-23

The column to the left indicates the wavelengths used in Equation (1), and the top most column are the velocities used in Equation (1). The calculated values, within in the center of Table 1, contain units in kg·m^2/s^2. Solving in terms of frequency (1/s) results in the following:

Table 2. Frequencies for Expansion.

Wavelength (nm)	72.2 km/s	74.3 km/s	76.4 km/s
380	190.023 GHz	195.551 GHz	201.078 GHz
790	91.403 GHz	94.062 GHz	96.721 GHz

Solving in terms of wavelength (m) results in the following:

Table 3. Wavelength for Expansion.

Wavelength (nm)	72.2 km/s	74.3 km/s	76.4 km/s
380	1.577665019 mm	1.533068846 mm	1.490924296 mm
790	3.27988254 mm	3.187169444 mm	3.099553141 mm

3. DEFICIENT ENERGY OF CELESTIAL BODIES

As sources moving towards a reflector results in energy that is less than what is observed by a reflector [4], then celestial bodies moving towards a reflector would also produce photons with energy that will not be large enough to excite an atom or molecule for a reflection to occur. Equation (1) will also be used to determine the deficient energy; however, the velocity values will be negative. Further, as this paper will be showing that sources moving towards a reflector have a lower probability of being reflected, as compared to sources moving away from a reflector, then the same velocity values that were acquired from the Hubble constant, though negative, will be used, or -74.3 +/- 2.1 km/s. So, the three velocity values that will be used are -76.4 km/s, -74.3 km/s and -72.2 km/s.

Applying the wavelength values of the visible spectrum and the negative velocities into Equation (1) results in the following deficient energies:

Table 4. Deficient Energies for Celestial.

	72.2 km/s	74.3 km/s	76.4 km/s
380 nm	-1.2588E-22	-1.29541E-22	-1.33202E-22
790 nm	-6.055E-23	-6.23109E-23	-6.40718E-23

The negative energy values, in kg·m^2/s^2, indicate the additional energy that will be required to excite the atom or molecule, associated with a reflection, so a reflection can occur. Solving in terms of frequency (1/s) results in the following:

Table 5. Frequencies for Celestial.

Wavelength (nm)	72.2 km/s	74.3 km/s	76.4 km/s
380	-189.977 GHz	-195.502 GHz	-201.027 GHz
790	-91.381 GHz	-94.039 GHz	-96.697 GHz

Solving in terms of wavelength (m) results in the following:

Table 6. Wavelength for Celestial.

Wavelength (nm)	72.2 km/s	74.3 km/s	76.4 km/s
380	-1.578045019 mm	-1.533448846 mm	-1.491304296 mm
790	-3.280672540 mm	-3.187959444 mm	-3.100343141 mm

4. POSSIBLE SOURCES AND SINK'S FOR THE EXPANSION OF THE UNIVERSE AND CONTRACTING CELESTIAL BODIES

The possible SOURCE's and SINKs depends on the phase of matter; where, for simplicity, a SOURCE will be used to describe the energy that will be supplied to an atom or molecule, which absorbed an energy deficient photon that originated from a photon source moving toward the atom or molecule, which will put the atom or molecule in a fully excited state; and where a SINK will be used to describe energy that will dispel from an atom or molecule, which absorbed a photon with more energy than what is observed that originated from a photon source moving away from the atom or molecule [5]. An AFFECTED ATOM or AFFECTED MOLECULE will be referred to an atom or molecule that absorbed an energy deficient photon or a photon with excess energy [5].

A reflector, where the phase of matter that will be used in this paper is a solid such as a reflector in a telescope, would need to serve as a SOURCE and SINK to view celestial bodies moving away and toward the reflector. The possible SINK's for the reflector are vibrational energy states, rotational energy states, and nuclear energy states internal to the AFFECTED ATOM or AFFECTED MOLECULE and atoms or molecules external to the AFFECTED ATOM or AFFECTED MOLECULE. Particle creation, such as a generated photon, is another SINK. However, translational motion will not be considered as the mass of a reflector, such as a reflector in a telescope attached to a planet, would be too large for translational motion to occur. Similarly, the possible SOURCE's are vibrational energy states, rotational energy states, nuclear energy states, internal and external of the AFFECTED ATOM or AFFECTED MOLECULE, and particle absorption. As there are no current restrictions to prevent any combination of SOURCE's and SINKs, SOURCE's and SINKs that are internal and external to the AFFECTED ATOM or AFFECTED MOLECULE can be combined [6].

5. DISCUSSION

As telescopes used for visible light operate in ambient temperature, energy states internal to the AFFECTED ATOMs and AFFECTED MOLECULEs, in combination with the SOURCE's and SINKS external to the AFFECTED ATOMs and AFFECTED MOLECULEs, may provide overall adequate SOURCE's and SINKs to observe the current visible universe, with the exception of particle creation and particle absorption. The material used for reflections of visible light in telescopes do not normally radiate microwave radiation, to the author's knowledge, and may be an indication that particle creation may not be an adequate SINK for the radiation indicated in Tables 1 to 3. As the science presented is new, it is unknown if the material used for reflections may prevent particle creation, and/or the gas prior to the material uses the excess energy during transmission of the visible light. However, as the visible universe is large there may be matter that may allow particle creation as a SINK.

The Cosmic Microwave Background (CMB) is thought to be a remnant of the big bang in the big bang theory. However, according to the figure below, the peak of the CMB is within the calculated frequency and wavelength in Tables 2 and 3, respectively.

That is, there is a possibility the CMB is a result of particles being created as a SINK. According to the Big Bang Theory the CMB would eventually dim over time, where in the presented method the CMB would remain as long as there are celestial bodies continuously moving away from each other, at an average speed of 74.3 +/- 2.1 km/s, and emitting visible light. However, as particle creation is only one possible SINK the CMB may be a fraction of the total energy that may be caused by the expanding universe. Further, if there were equal amounts of celestial bodies contracting, as compared to an expanding universe, the visible light from the contracting celestial bodies would be dimmer compared to the expanding celestial bodies. To show this, thought experiments will be used below.

If a reflector was restricted to particle creation and particle absorption, as SINKs and SOURCE's, respectively, and one side of the reflector was exposed to celestial bodies moving away from an observer and the other side of the reflector was exposed to celestial bodies moving towards an observer, the result would be reflections only occurring on the side of the reflector exposed to celestial bodies moving away, as there would be no particles serving as a SOURCE for the opposite side of the reflector.

If the reflector was curved to allow the particles created as a SINK to serve as a SOURCE for the opposite side of the reflector, the opposite side would then have enough energy for a reflection to occur. However, the particles take a little time to reach the other side of the reflector, and a particle must be present at a time and location where an AFFECTED ATOM or AFFECTED MOLECULE, on the other side of the reflector, would use the particle. The result of this experiment would be the side exposed to celestial bodies moving toward the reflector being dimmer than the opposite side.

Finally, Tables 1 to 3 and Tables 4 to 6 have slight differences in their values due to a change in the velocity being negative for contracting celestial bodies. If the peak of the CMB is caused by particle creation of celestial bodies moving away from other celestial bodies, then the contracting celestial bodies may be slightly off peak. This would result in contracting bodies having naturally less SOURCE's, if all created particles that resulted from SINK's served as SOURCE's for AFFECTED ATOMs or AFFECTED MOLECULEs that are exposed to photons from contracting celestial bodies.

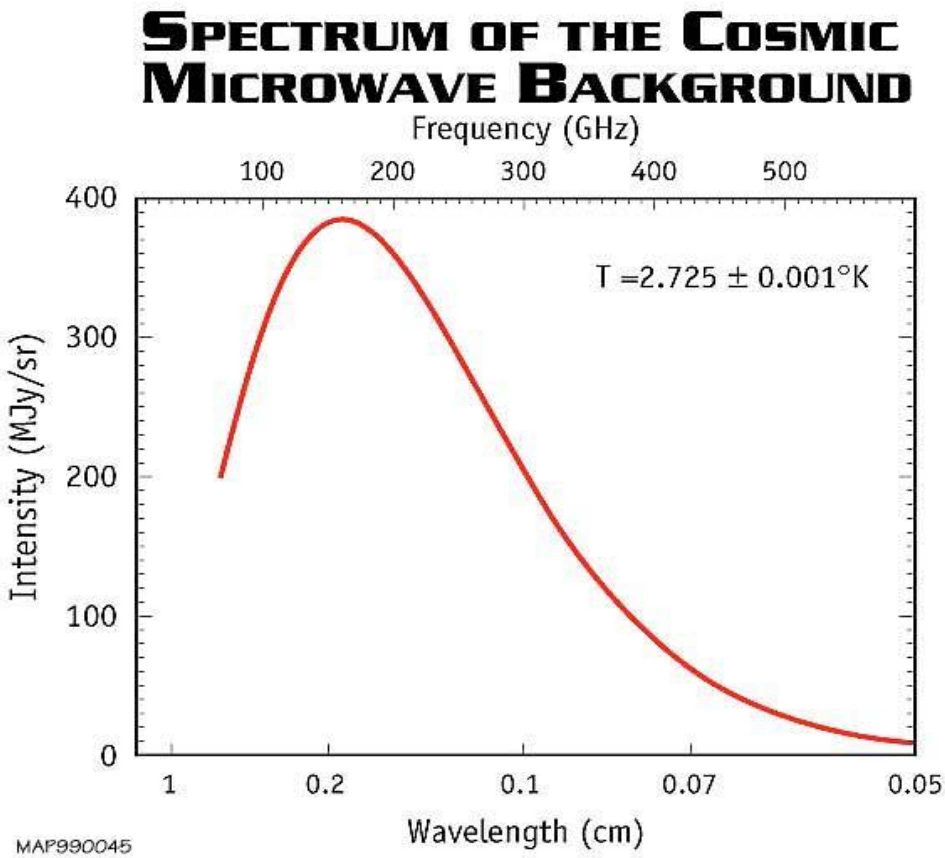


Figure 1. Spectrum of the Cosmic Microwave Background [12].

3. CONCLUSIONS

Observations have been made that detected celestial bodies moving towards an observer [7]. If the SOURCE's within the reflector in the telescope and gas surrounding the reflector was equally available for all possibly AFFECTED ATOMS or AFFECTED MOLECULES, then it may be the combination of the SOURCE's within and around the reflector in the telescope and the particles created by celestial expansion that caused the celestial bodies, moving towards an observer, to be seen. It is currently unknown how much of each type of SOURCE contributed to the celestial observation, and how much microwaves from the CMB was transmitted through the earth's atmosphere during the time of the Hubble observations.

If there were the same amount of contracting celestial bodies, as compared to expanding celestial bodies, then the amount of artificial SOURCEs that are needed to view more celestial bodies moving toward an observer can be determined for the same experimental setup used in the Hubble observations [7].

As celestial bodies moving away from an observer will typically have enough energy to excite an atom or molecule, the probability of viewing a celestial body moving away from an observer will be a value of one. Of the twenty-four measurements Edwin Hubble made in a 1929 paper [7], there were five measurements that indicated a negative velocity, or celestial bodies moving towards an observer. Therefore, the SOURCE's within and around the reflector in the telescope and from celestial expansion provides enough energy to see only 5 out of 24, instead of 12 out of 24, celestial bodies moving towards and observer. So the amount of SOURCE's needs to be increased, at a minimum, by 1-5/12, or approximately 58%, to see the total 12 celestial bodies moving toward the reflector in the telescope.

For every telescope, the gas surrounding the telescope and the transmission of CMB, to be used as SOURCE's, through the atmosphere, may provide a different concentration of SOURCE's, so the increase of approximately 58% may not be consistent for every telescope. Further, as the amount of contribution from each type of SOURCE is unknown, it may be beneficial to artificially provide a large amount of photons to the reflector in the telescope at positive values equal to and within the minimum and maximum values in Tables 4 to 6. The following is a suggested experiment to detect more celestial bodies moving toward an observer, if the amount of contracting celestial bodies is greater than what is currently observed.

For any type of telescope used for observing visible light, whether simple design, Newtonian Design or Cassegrain design, for example, all reflective surfaces should have applied large amounts of microwaves equal to and within the minimum and maximum values, but positive, indicated in Tables 4 to 6. Then the following steps are recommended.

Step (1): Place a tarp above the telescope to block any visible light and record the results

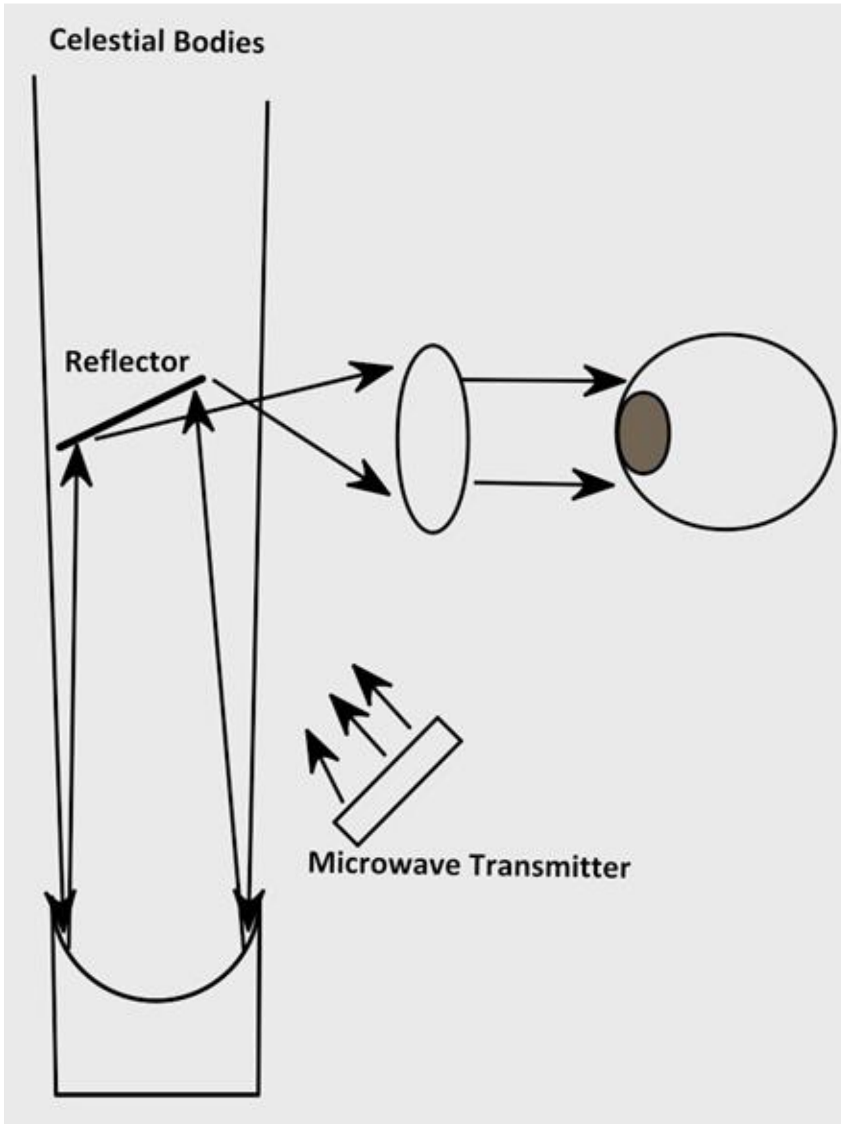
Step (2): With the tarp on the telescope, turn on the microwave transmitters that are pointed towards the reflectors and record results

Step (3): With transmitters off, and tarp off, observe and record celestial bodies

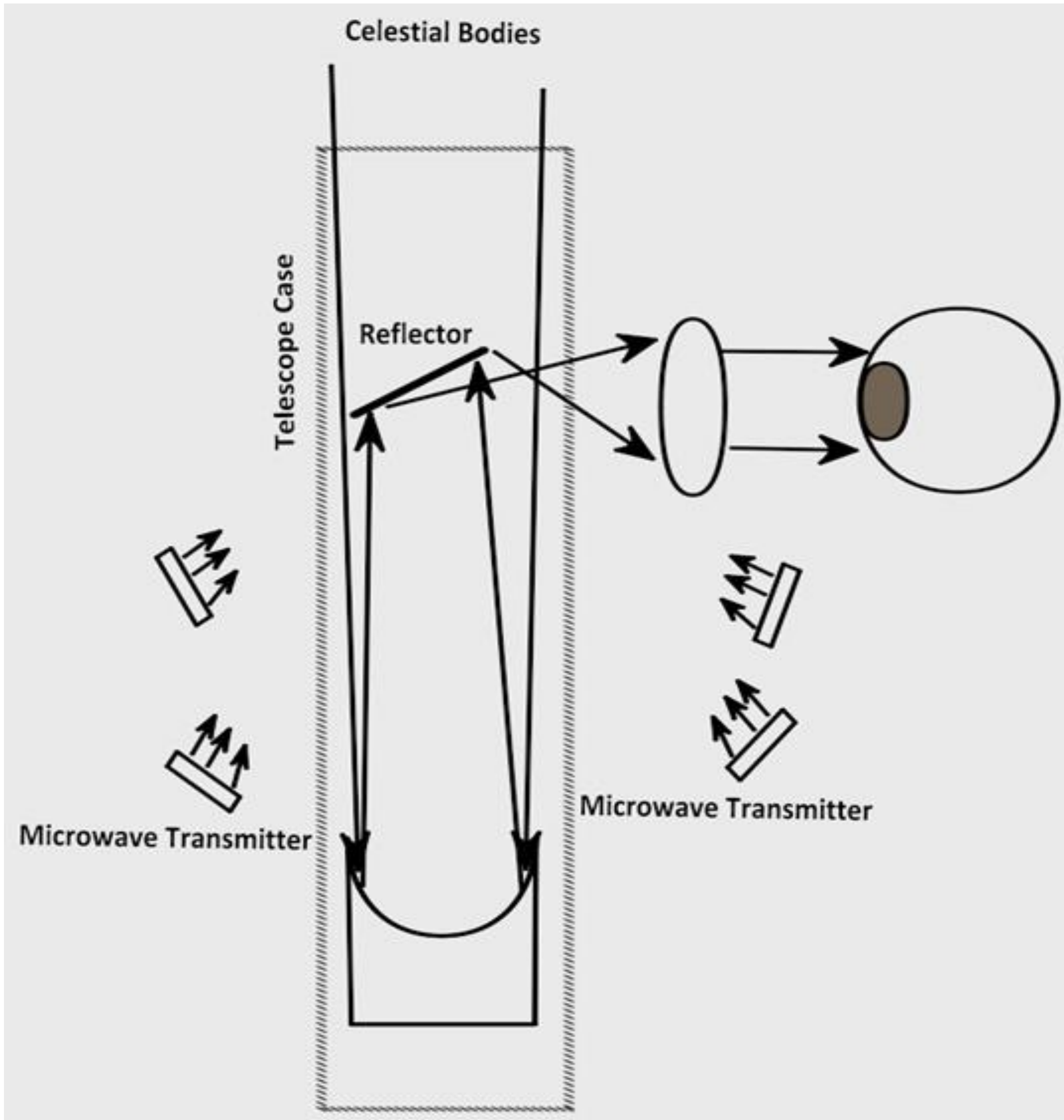
Step (4): Turn on the microwave transmitter(s) and determine if there are more celestial bodies, then record results

If the deficient energy photons penetrate the tarp in Step (2), complete all steps then repeat Steps (1) to (4) with the telescope pointed at a different location, then repeat Steps (1) to (4) at the original location. The two locations would have a unique set of detected deficient energy photons, and have the same set of detected photons when the telescope returns to the original location.

The following is an example of a Newtonian telescope with the microwave transmitter within the telescope casing.



The reflector within the telescope must be within the line-of-sight of the microwave transmitter. A line-of-sight is a straight line along which a reflector has an unobstructed view of the source. Further, the reflector, despite the line-of-sight, must have enough energy from the microwave transmitter to see a difference in the amount of celestial bodies moving toward the reflector. As a result, the intensity of the emissions from the microwave transmitter that is in the line-of-sight of the reflector would probably need to be increased if there is no initial change in the amount of celestial bodies. Another possibility is to move the microwave transmitter toward the reflector, but maintaining the line-of-sight with the reflector. This change of position would increase the intensity. A combination of increasing the intensity of the microwave transmitter and changing the position of the microwave transmitter is another possibility. However, the microwave transmitter would need to be positioned in a way to not obstruct the light from the celestial bodies. A way to not obstruct the reflector and provide enough intensity is in the following modified design of the Newtonian Telescope.



In this design there are multiple transmitters directed toward the reflector within the telescope. The transmitter bodies are positioned outside of the Newtonian tube to not interfere with the light from celestial bodies. The transmitters, for maximum intensity, should be similar to microwave lasers, where the spread of the beam, as the beam strikes the reflector, is at or slightly larger than the size of the reflector.

The casing of the telescope, the lenses and reflector must be unaffected by the microwaves. That is, if the microwaves cause physical damage or deformation then materials that are unaffected by the microwaves should be sought. Despite using materials that would be unaffected by the microwaves, the energy states of a reflector during a reflection would still be affected by the microwaves, as this is the energy required for a reflection.

As stated in a previous publication, as the rules for energy deficient photons have not been established, the energy deficient photons should be unperturbed [5]. That is, ideally, there would be no protective covering at the top of the telescope, and the telescope would be in the vacuum of space, to eliminate the variation of SOURCE's in gases. This would reduce the number of SOURCE'S indicated in equation (2), and reduce the possible combinations associated with equation (3). However, as most telescopes, to the author's knowledge, contain both a protective covering and are not in the same vacuum as the celestial bodies that are being observed, then both, if not one, of these perturbations will serve as a base for the first rules of this method of observation if the deficient energy photons are detected.

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