A discussion related to the Energy Relativity and its Implications

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Abstract:

A corner stone of Physics is the Energy Conservation principle which states that the Energy is always conserved and that the Energy, embedded in the Universe, cannot disappear or be created from nothing.

This should imply that the Total amount of the Energy, which is embedded in the whole Universe, must be a constant value.

This, might also imply, as will be elaborated in the paper, that the measured amount of an Energy should not be relative to a specific spectator, which performs the measurement of this amount of this Energy, and all spectators, measuring the Total Energy Content of several specific Energy components, in the Universe, must conclude, that these specific Energy components, contain the same Total amount of Energy, as each of the spectators measured.

However, this paper provides significant arguments that the Energy might be also relative to the spectator, and two separate spectators, measuring the Total Energy Content of several specific Energy components, in the Universe, might arrive at ***different results***, relating to this Total Energy Content, of these several specific Energy components, which they measured.

The paper also elaborates on the Implications of the conclusion that the Energy might be also relative.

1. Arguments that the Energy might be also relative

A corner stone of Physics is the Energy Conservation principle which states that any amount of the Energy which is embedded in the whole Universe, cannot disappear or be created from nothing.

This should imply that the Total amount of the Energy, embedded in the whole Universe, must be a constant value, because no amount of Energy, in the Universe, can disappear or be created from nothing.

Because, as already stated above, the Total amount of the Energy, which is embedded in the whole Universe, must be constant, all Human spectators should arrive at the same value of the Total amount of the Energy which is embedded in the whole Universe.

However, Humans cannot devise means or experiments which end up in providing an exact value of the Total amount of the Energy which is embedded in the whole Universe.

Thus, it seems that Humans did not provide yet a complete validity, or a complete proof, to the Energy Conservation Principle, despite the fact that this principle is considered to be a very significant corner stone of the nowadays Science of Physics.

Thus, this paper tries to elaborate on this very issue.

This paper states, that although Humans cannot arrive at an exact value of the Total amount of the Energy which is embedded in the whole Universe, Humans can still check if all Humans spectators are indeed able, ***or are not able***, to arrive at the same constant value of the Total amount of the Energy which is embedded in the whole Universe, ***without actually*** devising means or experiments which actually measure the Total amount of the Energy which is embedded in the whole Universe.

This can be done by only checking what two specific Human spectators measure, relating to two specific Energy components, in the Universe.

Because, although it is impossible to calculate exactly the Total amount of the Energy which is embedded in the whole Universe, the conclusion that the Total amount of the Energy, which is embedded in the whole Universe, must be a constant value, also implies, that if two separate spectators, measure the Total amount of the Energy which is embedded ***only*** in two specific Energy components (for example, two massive bodies), these measurements, of these two specific spectators, must arrive to the same measured amount of the Total Energy, in these two specific Energy components, if all Humans are indeed able to completely conclude, that the Total amount of the Energy embedded in the whole Universe, must be a constant value.

Because, if these two separate specific spectators arrive at ***different values*** as related to the Total amount of Energy ***only*** in these two specific Energy components (for example, these two massive bodies), then, this will necessarily also result in these two spectators ending up with two ***different values*** of the Total amount of the Energy embedded in the whole Universe, even if these two spectators would be able to devise means which provide an exact value of the Total amount of Energy in the whole Universe, based on the experiment that each of these two spectators execute.

Einstein's Special Relativity Theory brought about the recognition that the Mass is equated with Energy via his famous equation *(1)*:

$E= mc^2$.

Where E is Energy, m is the amount of Mass and c is the velocity of Light in vacuum.

Einstein's Special Relativity Theory also brought about the recognition that a spectator measuring the amount of Mass in a specific Massive body which is moving at a constant velocity, v, relative to this spectator, sees an increase of the amount of Mass in this Massive body, relative to the amount of Mass measured in this Massive body, by this spectator, when this Massive body is at rest, relative to this spectator, according to the following equation (*2*):

$m = m_0 / \sqrt{(1-v^2/c^2)}$.

Where m is the measured amount of Mass, by the spectator, in the moving massive body, m_0 is the measured amount of Mass, by the spectator, when the massive body is at rest relative to the spectator, v is the velocity of the massive body relative to the spectator, and c is the velocity of Light in vacuum.

Thus, let's examine how two spectators measure the Total amount of Energy in two specific massive bodies, when each spectator resides in a ***separate*** Inertial Frame of Reference, and the ***relative velocity*** between these two Inertial Frames of Reference is v.

In these measurements each spectator measures the amount of Mass, m_1, in a specific massive body residing in his Inertial Frame of Reference, and also the amount of Mass, m_2, in a specific massive body residing in the Inertial Frame of Reference related to the other spectator.

Also, the rest Mass values of the above-mentioned massive bodies are not the same, or, m_{10} is different from m_{20}.

The amount of Mass (Energy) that the first spectator measures, related to the massive body residing in his Inertial Frame of Reference is m_{10}, because this massive body is at rest, relative to that spectator.

The amount of Mass (Energy) that the first spectator measures, related to the massive body residing in the other Inertial Frame of Reference is $m_2 = m_{20} / \sqrt{(1-v^2/c^2)}$, because this massive body is moving at a velocity v relative to that spectator.

Thus, the Total amount of Mass (Energy) that the first spectator measures related to the two massive bodies is:

$m_{10} + m_{20} / \sqrt{(1-v^2/c^2)}$

The amount of Mass (Energy) that the second spectator measures, related to the massive body residing in his Inertial Frame of Reference is m_{20}, because this massive body is at rest, relative to that spectator.

The amount of Mass (Energy) that the second spectator measures, related to the massive body residing in the other Inertial Frame of Reference is $m_1 = m_{10} / \sqrt{(1-v^2/c^2)}$, because this massive body is moving at a velocity v relative to that spectator.

Thus, the Total amount of Mass (Energy) that the second spectator measures related to the two massive bodies is:

$m_{20} + m_{10} / \sqrt{(1-v^2/c^2)}$

And since $m_{10} + m_{20} / \sqrt{(1-v^2/c^2)}$ ***is not equal*** to $m_{20} + m_{10} / \sqrt{(1-v^2/c^2)}$ then, the two spectators arrive at ***different values*** for the Total Mass (Energy) embedded in these two massive bodies, which implies that ***Energy measurements might be indeed relative*** to the spectator measuring these Energy amounts.

2. Implications to the conclusion that the Energy is also relative.

A possible conclusion that can be derived from what was just presented above, that the Energy measurements might be also relative, might be that the Energy Conservation Principle might not be ***completely*** correct, because the above just demonstrated that two separate spectators, arrive at different measurements for the Total Mass (Energy) embedded in two specific Energy components in the Universe (the two specific massive bodies presented above), which implies, that Humans cannot prove that the Total amount of the Energy, in the whole Universe, is a constant value, which might imply that the Energy might not be ***completely*** conserved, as the Energy Conservation Principle states.

This conclusion might be also supported by the fact, that the nowadays Science of Physics does agree that in addition to the Detectable Energy, the Universe embeds a very large amount of undetectable, or Dark Energy, (about 70% of the estimated Total Energy which is estimated to be embedded in the whole Universe), which might further imply, that Humans cannot measure the actual amount of the Total Energy embedded in the Universe, which might further support the assumption, that Humans cannot prove, that all the Energy embedded in the Universe, is indeed conserved.

However, since the Energy Conservation Principle is a very significant corner stone of the Science of Physics, an additional possible conclusion can might be also derived from what was just presented above, that the Energy measurements might be also relative.

That additional conclusion can state that although separate spectators might arrive at different measurements as related to the Total amount of the Energy embedded in specific Energy components in the Universe, each such spectator can still detect Energy Conservation in his specific measurements, especially if the measurements related to each spectator are limited to what this spectator can measure, and not to the Energy embedded in the whole Universe.

The Science of Physics states that the laws of Physics are the same in all Inertial Frames of Reference.

Thus, although the additional conclusion presented above, that each spectator can still detect Energy Conservation in his measurements, does comply with the statement that the laws of Physics are the same in all Inertial Frames of Reference, still, what was presented in this paper, that the Energy measurements might be also relative, should point out a significant limitation that Humans might have.

Because, Humans cannot provide a complete proof to the Energy Conservation principle, which is a very significant corner stone of the Science of Physics, because Humans cannot devise means or experiments which arrive at an exact value of the Total amount of the Energy in the whole Universe, and also, because all Humans might not be able to arrive at a unique constant value of the Total amount of the Energy in the whole Universe, as presented in this paper, because the Energy measurements seems to be relative to the sectator , and thus, all this should indicate that Humans do have significant limitations in Humans endeavors to achieve a deep and comprehensive understanding of the Universe or the Existence.

The author of this paper published a paper: " Energy Might be the Only Unique, Distinct and Independent Entity in Nature." (3).

This paper presents the possibility that the Universe is composed of only one distinct and independent entity, Energy. This implies that also Humans are composed of only this distinct and independent entity, Energy.

And thus, since it is impossible to figure out completely an issue just by using this same issue, Human minds, being just an aggregate of forms of Energy, might not be able to figure out completely what is Energy, and what are all the details for understanding all the elements involved in all the interactions between Energy forms, and this might provide some explanation to the Humans limitation presented above.

3. Summary and Conclusions

The paper states that the Energy Conservation principle, which is considered a corner stone of the Science of Physics, actually implies that the Total amount of the Energy, which is embedded in the whole Universe, must be a constant vale, because otherwise, this would imply that Energy can either disappear or be created from nothing, contrary to what is implied by the Energy Conservation principle.

The paper also points out that Humans cannot provide a complete proof to the Energy Conservation principle, because Humans cannot devise means or experiments which would provide an exact value of the Total amount of the Energy, embedded in the whole Universe.

On the other hand, the paper provides arguments, that two specific Human spectators, each measuring the Total amount of Energy, in two specific Energy components in the Universe, (two specific massive bodies), might not arrive at the same results, which would imply that the measurements of Energy amounts might be also relative to the spectator, measuring these Energy amounts.

The paper then elaborates on the Implication of the Energy relativity demonstrated in the paper, on whether this might render the Energy Conservation Principle to be completely not correct, or weather each Human spectator still can decide that the Energy Conservation principle is valid as related to his own measurements, because the Science of Physics states that the laws of Physics are the same in all Inertial Frames of Reference.

But still, what is presented in this paper, that the Energy measurements might be also relative to the spectator executing these measurements, might also point out a significant limitation that Humans might have in Humans endeavors to achieve a deep and comprehensive understanding of the Universe or the existence, if Humans cannot provide a complete proof to a very significant building block, or corner stone, of the Science of Physics, the Energy Conservation principle.

References

(*1*). Special Relativity. Wikipedia.
https://en.wikipedia.org/wiki/Special_relativity

(*2*). Mass in special relativity. Wikipedia.
https://en.wikipedia.org/wiki/Mass_in_special_relativity

(3). Energy Might be the Only Unique, Distinct and Independent Entity in Nature. Moshe Segal. SSRN preprints site. https://ssrn.com/abstract=4816130 or https://doi.org/10.32388/2HITLM.2.