A Different Look at Gravity

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Abstract

This paper presents a new formula for the gravitational force – formula (1). It is based on the following reaction of an Electron Antineutrino with a Proton: $\tilde{\mathbf{v}}_\mathbf{e} + \mathbf{p}^+ \rightarrow \mathbf{n} + \mathbf{e}^+$
and is only the principal component of the possible gravitational forces that may exist in the Universe. I assume that all interactions that are weak and do not belong to these four types of known interactions and decrease with the square of the distance, can also be considered as gravitational interactions. Gravity is a product of the so-called weak interactions, if one interprets this reaction and the formula for the gravitational force associated with it correctly. The new formula uses the numerical values measured by Cowan and Reines in an experiment conducted by these two physicists with electron antineutrinos to determine the probability of this above reaction occurring. In the new formula, there is a constant value for the energy density of relic electron antineutrinos which, however, only to a limited extent guarantees the stability of the gravitational forces, since there are neutrino sources in the Universe and even in our immediate surroundings, such as the Sun or even nuclear reactors. The gravitational field is not a fictitious property of space, but is directly related to the transfer of momentum and energy of neutrinos to particles of matter. I assume that the mathematical formulas used in this work are understandable to anyone with some interest in mathematics and physics. This document can be found in the German[6] version and the Polish[7] version on my website (meinuniversum.de).

1 Introduction

In this work, a new formula for the gravitational force is presented. Calculations using the new formula give the same results as calculations using Newton's formula, as proved below. Thus it is shown that the Gravitational Constant G can depend on the energy density of the cosmic neutrino background. This paper is the last of the three papers of my physics trilogy [2]. In my works, I only refer to generally available sources of knowledge, because I do not belong to a privileged group. In my life, until now I have not been able to read the content of a large number of documents, because it involves large fees that only rich companies can afford, not, for example, schools, often with a small budget. "

2 New formula for gravitational force

The gravitational force depends in the following formula on the number of nucleons in both objects (N_1, N_2) for which we calculate it, then on the energy density of electron antineutrinos I_n and on the active cross section (σ) for this mentioned reaction (2) of electron antineutrinos with protons.

$$\mathbf{F} = \frac{\mathbf{A}}{\mathbf{r^2}} \sigma \, \mathbf{I_n} \, \mathbf{N_1} \, \mathbf{N_2} \tag{1}$$

The reaction in the experiment mentioned above [1] can be presented as follows:

$$\widetilde{\mathbf{v}_\mathbf{e}} + \mathbf{p}^+ \rightarrow \mathbf{n} + \mathbf{e}^+ \tag{2}$$

The variables occurring in formula (1) have the following meaning:
$A = 1m^2$ – a constant whose purpose is to match the units to the International System of Units (SI)[5].
σ - cross section in m^2 for scattering of neutrinos on protons (reaction (2)), whose value determined by the Cowan-Reines experiment is: $\sigma = \mathbf{6.3 \cdot 10^{-48} \, m^2}$ [1][1]
I_n - energy density of relic electron antineutrinos, whose energy per one Neutrino is at least 1.8 MeV
N_1 - number of nucleons in the first object M_1
N_2 - number of nucleons in the second object M_2
The principle of conservation of momentum and angular momentum must always be fulfilled, which means that neutrinos exert pressure on protons and the created neutrons and positrons receive momentum and angular momentum. At the same time additional mass is generated (the neutron has a greater mass than the proton), which significantly reduces the kinetic energy of the created particles and therefore limits the increase in temperature of the environment with which the newly created particles interact through collisions. This is only one of the possible reactions of the neutrino momentum transfer into material particles. Only the reaction for which the scattering cross section was determined experimentally is presented here. The cross section for this reaction is very small, but for formula (1) to give the same force values as Newton's formula it is sufficient that the energy density of electron antineutrinos has the following value:
$\mathbf{I_n = 2.921213972 \cdot 10^{-17} \, \frac{J}{m^3}}$

This is a very small energy density, because at this density there is only one such Neutrino in $10,000\,m^3$ (neutrino energy ~ 1.8 MeV). Calculations using both formulas for 1 kg of matter have been made below and their results are compared with each other.

3 Calculations

3.1 Newton's gravitational force

The calculation is very simple if the distance of the two objects of mass 1 kg each is 1 m. The gravitational force in this case takes exactly the value of the gravitational constant G in Newtons. According to the 2018 CODATA table [3], this constant takes on the following value: $\mathbf{G = 6.6743 \cdot 10^{-11} \frac{Nm^2}{kg^2}}$
The equation for the gravitational force according to Newton for objects of volume $0\,m^3$ (point)
looks for $M_1 = M_2 = 1\,kg\ and\ r = 1\,m$ as follows:

$$F = \frac{GM_1M_2}{r^2} = 6.6743 \cdot 10^{-11}\,N \tag{3}$$

Where:
G - Gravitational Constant
M_1 – mass of the first object
M_2 – mass of the second object
r – distance of the two objects from each other

3.2 Gravitational force according to the new formula (1)

The number of nucleons N_1 and N_2 in both objects with masses $M_1 = M_2 = 1kg$ kg can be calculated using the following simple formulas:
$N_1 = \frac{M_1}{u}\ ; N_2 = \frac{M_2}{u}$
Where:
u - atomic unit of mass; $u = 1.6605390666 \cdot 10^{-27}\,kg$ (according to the 2018 CODATA table [3])
The number of nucleons found on average in 1 kg of matter ($N = N_1 = N_2$) is calculated below.

$$N = \frac{1}{1.6605390666 \cdot 10^{-27}} = \mathbf{6.022140762 \cdot 10^{26}} \tag{4}$$

It is not possible to estimate the number of nucleons in a specific object without knowing its mass. Formula (1) with exact values of variables appearing ($r = 1m\ and\ \frac{A}{m^2} = 1$) in it looks as follows:

$$F = \sigma \cdot I_n \cdot N_1 \cdot N_2 = \mathbf{6.6743 \cdot 10^{-11}}\,N \tag{5}$$

The value of the gravitational force calculated here is the same as that calculated by Newton's formula (3).

4 New formula for the Gravitational Constant

A comparison of both formulas (1) and (3) makes it possible to derive the following formula for the Gravitational Constant:

$$\mathbf{G = \frac{A \cdot \sigma \cdot I_n}{u^2}} \tag{6}$$

5 Summary

Both formulas give the same G Newton result. The new formula for the gravitational force allows for a different interpretation of this force and its origin and could belong to a new model of the gravitational force, perhaps more similar to the laws governing our universe, if the energy density of electron antineutrinos, which have an energy of at least 1.8 MeV, would be exactly $I_n = 2.921213972 \cdot 10^{-17}\,\frac{J}{m^3}$ This possibility is supported by the fact that the cosmic neutrino background now has an energy density of almost $3 \cdot 10^{-14}\,\frac{J}{m^3}$ [3] [4], which is a density three orders of magnitude higher than that found in the new equation (almost exactly a thousand times higher). But it is also the case that, compared to single relic photons, single neutrinos have not lost so much of their energy on their way to us, or, as is also possible, on their way with us, because neutrinos have very rarely interacted by scattering with matter with a loss of their momentum over these almost 14 billion years. It is therefore likely that these neutrinos with energies of at least 1.8 MeV are still present in the cosmic neutrino background and their energy density is exactly $I_n = 2.921213972 \cdot 10^{-17}\,\frac{J}{m^3}$. The model of gravitational forces presented in this work is not complete and awaits other still active physics enthusiasts who are able to develop it further, taking into account the two previous works of my trilogy [2]. It should be taken into account that the number of reactions, scattering with momentum transfer both by neutrinos and by photons is very large, so there is a very large number of possibilities for those who will follow this path to describe different kinds of forces in the Universe. At the turn of the fifteenth and up to the

mid-sixteenth century, a theory explaining the forces of gravity in a mechanical way was developed in the work of Le-Sage. It should continue to be developed. It follows from equation (6) that the Gravitational Constant need not have a constant value and its measurements can vary depending on the distance from the nuclear power station they were taken and the energy density of electron antineutrinos in the areas of the galaxy through which the Sun is moving at that time.

References

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[1] Experiment with electron antineutrinos with very high flux density (on the order of $10^{21}\, s^{-1}\, m^{-2}$ near an atomic reactor) and hydrogen atoms found in water molecules, conducted in 1956 by Clyde L. Cowan and Frederick Reines et al.

[2] The three papers have the following titles: „A Different Look at the Power of the Sun “, „A Different Look at the Hydrogen Atom “and „A Different Look at Gravity “

[3] Calculated for z=1089 and $N_v = 3,14$