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Research Article

Equation of Constructing the Universe

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Abstract

We present an equation for all particles, objects and systems in the universe. The four main physical parameters (Mass, Distance, Force, Velocity) are connected in one equation with two faces, one of them is expressed by velocity of light for small particles and small systems (Protons, Neutrons, Electrons, Nuclei, Atoms, Molecules) and the other is expressed by rotational and orbital velocities of large bodies and large systems (Planets, Stars, Galaxies). With new form of main equation, it is found that the values of physical parameters (Mass, Distance, Rotational Velocity, Orbital Velocity) of all objects of the solar system are identical with known determined values. The following physical principle can be applied to all systems in the universe "Existing certain masses at certain distances is main condition of existing certain significant fundamental forces capable to form and bound certain systems with certain spin and orbital motions leading to the formation and construction of the universe".

Keywords: Force, Mass, Distance, Velocity

1. Introduction

According to the cosmological principle and all models that use the Friedman-Lamaitre-Robertson-Walker metric including the current version of the Lambda Cold Dark Matter (ΛCDM) model, the distribution of matter in the universe is homogeneous and isotropic this means that the universe is the same in all locations and in all directions respectively [1,2]. The universe consists of matter and energy in the form of systems (Nuclei – Atoms – Molecules – Planets – Stars - Galaxies) and all its contents and systems are hold and maintained by fundamental forces at certain distances with certain velocities. The diameter of the observable universe is nearly 93 billion light years (8.8×10^{26} m) with 10^{12} galaxies, 10^{22} stars, 10^{78} atoms, 1.5×10^{79} electrons, 1.5×10^{79} protons and 10^{88} photons. The mass of the observable universe is 2.6×10^{52} kg [3,4]. Every system composed of smaller particles or bodies and is a part of larger system.

Quarks and electrons are two types of elementary particles and a fundamental constituent of matter. Quarks combine together by strong nuclear force to form composite particles called hadrons, the most stable of them are protons and neutrons. Atoms and molecules are combined together by electromagnetic force. All commonly observable matter in the universe is composed of up quarks, down quarks and electrons. According to Newton's law of universal gravitation, the attractive force between two masses is directly proportional to the product of their masses and inversely proportional to the square of the distance along their center of masses [5-10].

$$F = G\frac{m_1 m_2}{r^2} \qquad (1)$$

The gravitational constant G is proposed by Newton and its value is determined by Henry Cavendish in 1798 and subsequent works to be $6.674\times10^{-11}\ m^3\ kg^{-1}\ s^{-2}$ [11-13].

2. Physical Foundations and Astronomical Evidence

All particles, objects and systems in the universe (Protons, Neutrons, Electrons, Nuclei, Atoms, Molecules, Planets, Stars, Galaxies) are certain masses at certain distances with certain velocities bound by certain fundamental forces (Strong Nuclear Force & Electromagnetic Force & Gravitational Force). The universe in its essence as the biggest construction consists of four main physical parameters: (Mass & Distance & Fundamental Forces & Velocity). So, there must be a general law or equation connecting them which can be considered as the common equation of all systems in the universe. The fundamental forces (Strong Nuclear Force & Electromagnetic Force & Gravitational Force) are important and essential factors to form and bound the universe, without these forces there were no any formed system either (Nuclei, Atoms, Molecules, Planets, Stars, Galaxies) and consequently the universe as a whole.

The main fundamental forces in the universe are effective at certain distances between certain masses. The significant strong nuclear force is working at certain distances between protons and neutrons. The significant electromagnetic force is working at certain distances between electrons and nucleus or between atoms to form molecules or between molecules to form elements and masses. The significant gravitational force is working at certain distances between celestial objects. The calculations of nuclear physics confirmed that the strong nuclear force is effective at the average distance of $\sim 2 \times 10^{-15}$ m between protons and neutrons and out of this range the force is insignificant. This means and indicate that the strong nuclear force is significant and capable of holding certain masses (protons & neutrons) and maintain nuclei only at certain distances and for the same particles (protons & neutrons) the strong nuclear force will be very weak out of this range of distances and can't maintain the nuclei.

The average distance between protons and neutrons is nearly 1 femtometer (10^{-15} m), the average distance between electrons and protons is nearly 1 Å, the average distance between atoms is nearly 1 Å and the average distance between molecules is about 3 Å. The average distance between stars is nearly 5 light years [14-15]. It is noticed that all particles on small scale (nuclei & atoms & molecules) and objects on large scale (celestial objects) have common physical properties and the same physical units either in their mass, distance, fundamental force and two motions (spin & orbital) with certain velocities as indicated in table (1).

Physical Parameter	Nuclei	Atoms	Molecules	Stars
Mass	$\sim 10^{-27}$ kg	$\sim 10^{-26}$ kg	$\sim 10^{-24}$ kg	$\sim 10^{30}$ kg
Distance	$\sim 10^{-15}$ m	$\sim 1 \times 10^{-10}$ m	$\sim 3 \times 10^{-10}$ m	~ 5 ly $\sim 10^{16}$ m
Fundamental Force	Strong Nuclear Force	Electromagnetic Force		Gravitational Force
Motion	Spin & Orbital Motion	Spin & Orbital Motion		Rotational & Orbital Motion
Velocity	Velocity of Light	Velocity of Light		Rotational & Orbital Velocity

Table 1: Lists the Common Physical Parameters of Small Particles and Large Objects

So, the following physical principle can be applied to all particles, objects and systems of the universe "Existing certain masses (protons, neutrons, electrons, nuclei, atoms, molecules, planets, stars, galaxies) at certain distances is main condition of existing certain significant fundamental forces (strong nuclear force & electromagnetic force & gravitational force) capable to form and bound certain systems with spin and orbital motions with certain velocities leading to the formation and construction of the universe".

3. Mathematical Foundations

For small systems (nuclei, atoms and molecules) with velocities comparable to the velocity of light both strong nuclear force and electromagnetic force can be expressed as follows [16].

$$F = \frac{4c^2 \times m}{d} \quad (2)$$

$$F = \frac{4c^2 \times (m_1 + m_2)}{d} \quad (3)$$

from equation (3)

$$\frac{F \times d}{4(m_1 + m_2)} = c^2 \quad (4)$$

This means that the three main physical parameters (fundamental force, distance, mass) for any particles equals square of velocity of light. For large systems (planets & stars) with velocities smaller than the velocity of light the gravitational force of celestial objects can be expressed as follows [17].

$$F = \frac{m \times v_{rot} \times v_{orb}}{d} \quad (5)$$

$$F = \frac{(m_1 + m_2) \times (v_{r1} + v_{r2}) \times (v_{o1} + v_{o2})}{d} \quad (6)$$

where

m is the sum of two masses of small particles, celestial objects or galaxies m^1+m^2

v_{rot} is the sum of two rotational velocities $v_{r1} + v_{r2}$

v_{orb} is the sum of two orbital velocities $v_{o1} + v_{o2}$

m_1 is the mass of the first particle, celestial object or galaxy

m_2 is the mass of the second particle, celestial object or galaxy

v_{r1} is the rotational velocity of the first celestial object or galaxy

v_{r2} is the rotational velocity of the second celestial object or galaxy

v_{o1} is the orbital velocity of the first celestial object or galaxy

v_{o2} is the orbital velocity of the second celestial object or galaxy

d is the distance between two particles, two celestial objects or two galaxies

c is the velocity of light

4. Results and Discussions

4.1. Strong Nuclear Force

By using equation (3) for two nucleons (proton & neutron) with distance of 10^{-15} m it is found that the value of strong nuclear force to be $=1.2\times10^6$ N and equation (4)

$$\frac{F \times d}{4(m_1 + m_2)} = 9 \times 10^{16} \text{ square of velocity of light}$$

4.2. Electromagnetic Force for

4.2.1. Hydrogen Atom

By using equation (3) for proton and electron (Hydrogen atom) with an average distance of 10^{-10} m, it is found that the value of electromagnetic force to be = 6 N and $\frac{F \times d}{4(m_1 + m_2)} = 9 \times 10^{16}$ square of velocity of light.

4.2.2. Hydrogen Molecule

By using equation (3) for hydrogen molecule (two hydrogen atoms) with an average distance of 3×10^{-10} m, it is found that the value of electromagnetic force to be =4 N and $\frac{F \times d}{(m_1 + m_2)}$ =9×10^{16} square of velocity of light.

4.3. Gravitational Force Between Celestial Objects

Existing celestial objects as certain masses at certain distances leading to the formation of gravitational force which in turn leads to their rotational and orbital velocity. By using equation (6) we found that the gravitational force between the (Sun & Earth), (Earth & Moon) and (Earth & Venus) are to be F = 8.7×10^{27} $kg.m.s^{-2}$, F = 2.85×10^{23} $kg.m.s^{-2}$ and F = 8.03×10^{21} $kg.m.s^{-2}$ respectively. According to the above values the gravitational force between celestial objects depends on the sum of the mass of the two objects, sum of two rotational velocities, sum of two orbital velocities and the distance between them. It is noticed that the gravitational force between Earth and Moon is greater than the gravitational force between Earth and Venus because the distance between Earth and Moon is much smaller than the distance between Earth and Venus.

4.4. Confirming Validity of Gravitational Force of Celestial Objects

4.4.1 Mass, Distance, Rotational and Orbital Velocity of Celestial Objects

According to the above equation (6) with new form of gravitational force between celestial objects the mass, distance, rotational and orbital velocities of any two celestial objects can be determined by the following equations.

$$m_1 = \frac{F \times d}{(v_{r1} + v_{r2}) \times (v_{o1} + v_{o2})} - m_2 \quad (7)$$

$$m_2 = \frac{F \times d}{(v_{r1} + v_{r2}) \times (v_{o1} + v_{o2})} - m_1 \quad (8)$$

$$d = \frac{(m_1 + m_2) \times (v_{r1} + v_{r2}) \times (v_{o1} + v_{o2})}{F} \quad (9)$$

$$v_{r1} = \frac{F \times d}{(m_1 + m_2) \times (v_{o1} + v_{o2})} - v_{r2} \quad (10)$$

$$v_{r2} = \frac{F \times d}{(m_1 + m_2) \times (v_{o1} + v_{o2})} - v_{r1} \quad (11)$$

$$v_{o1} = \frac{F \times d}{(m_1 + m_2) \times (v_{r1} + v_{r2})} - v_{o2} \quad (12)$$

$$v_{o2} = \frac{F \times d}{(m_1 + m_2) \times (v_{r1} + v_{r2})} - v_{o1} \quad (13)$$

It is found that the calculated value of mass, distance rotational velocity and orbital velocity of any object of the solar system by using equations (7 - 13) is identical with known determined values as indicated in table (2).

Object	Mass (kg)	Distance from Sun (m)	rotational velocity (m/s)	orbital velocity (m/s)
Sun	1.9×10^{30}		2000	225000
Mercury	3.2×10^{23}	58×10^{9}	3	48000
Venus	4.8×10^{24}	109×10^{9}	1.8	35000
Earth	5.9×10^{24}	150×10^{9}	263	30000
Moon	7.3×10^{22}	150×10^{9}	4.5	1000
Mars	6.4×10^{23}	228×10^{9}	241	24000
Jupiter	1.8×10^{27}	779×10^{9}	12600	13000
Saturn	5.6×10^{26}	1434×10^{9}	9860	9000
Uranus	8.6×10^{25}	2873×10^{9}	2580	6900
Neptune	1.02×10^{26}	4495×10^{9}	2670	5000
Pluto	1.3×10^{22}	5995×10^{9}	13	4000

Table 2: lists the Values of Mass, Distance, Rotational and Orbital Velocity of the Objects of Solar System

5. Conclusions

The four main physical parameters (force, mass, distance and velocity) for all particles, objects and systems in the universe are connected in one equation with two faces one of them for small particles and small systems ((Protons, Neutrons, Electrons, Nuclei, Atoms, Molecules) with velocities comparable to velocity of light and the other form for large objects and large systems of the universe (Planets, Stars, Galaxies) with rotational and orbital velocities.

The construction of universe depends on the following physical principle "Existing certain masses (protons, neutrons, electrons, nuclei, atoms, molecules, planets, stars, galaxies) at certain distances is main condition of existing certain significant fundamental forces capable to form and bound certain systems with spin and orbital motions with certain velocities leading to the formation and construction of the universe".

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