Physics of Missing Mass in the Universe - A new definition of dark matter and dark energy

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Abstract— **This paper combines three empirical facts- existence of highs boson, dark matter and matter antimatter asymmetry. Decline in concentration of dark matter and rapid increasing rate of formation of dark energy has been discussed here. Most importantly, the observations of AMS (Alpha Magnetic Spectrometer) regarding the incoming of gamma rays from galactic centre and observations of FGST (Fermi Gamma Ray Space Telescope) and reasons of out coming of such observations have been explained.**

Additionally, the root cause of declining rate of star formation has been discussed. The analysis is done on the basis of comparison between properties of missing mass with various annihilation products and the observations of NASA's FGST and that of AMS. Dark matter is the additional annihilation product apart from gamma particles produced by the annihilation of matter and antimatter at the time of big bang. The formation of different categories of dark matter depends upon the mass of particle annihilated with its antiparticle. Annihilation took after big bang was affected by higgs field. Annihilation of dark matter with its antiparticle generates high energy gamma particles which are responsible for the creation of concave curvature of space time generating repulsive effect which is basic property of dark energy.

Keywords— **Baryon Asymmetry, Annihilation, Higgs Field, Dark Matter, Dark Energy, Repulsive Effect.**

I. Introduction

Since 1937, we have known that there is not enough detectable matter present in and around galaxies to account for their motion (Zwicky 1937). So dark matter was postulated to account for the missing mass. Others results suggested that either Newtonian gravity does not apply universally or that, conservatively, upwards of 50% of the mass of galaxies was constrained in the relatively dark galactic halo (Rubin et al. 1980). Previous works have provided enough proof of the existence of dark matter (Clowe et al. 2006). By CMB (Cosmic Microwave background) spectra, it is clear that universe is made up of 68.3% of dark energy, 26.8% of dark matter and 4.9% of ordinary matter. Till now, early theories of dark matter concentrate on hidden heavy normal objects, such as black holes, neutron stars, faint old white dwarfs, brown dwarfs as the possible candidate for dark matter, collectively known as MACHOs(Massive Compact Halo Objects) Astronomical surveys failed enough of these hidden MACHOs.

Some hard-to-detect baryonic matter such as MACHOs and some forms of gas, additionally were believed to make a contribution to the overall dark matter content but evidence indicated that such would constitute only a small fraction of dark matter. Consequently, the most commonly held vire was that dark matter is primarily non-baryonic.

The most commonly proposed particles then became axions, sterile neutrinos, and WIMPs. Even for dark energy, many possible explanations were given. One was that it is a property of space and it would not be diluted as space expands. But the explanation was not clear. Another explanation for how space acquiring energy was that empty space is full of temporary particles, continually forming and disappearing. But the energy calculated, which this would give empty space, was wrong by a lot. Another explanation for dark energy was given that it is new kind of dynamical energy fluid called quintessences that fill all of space but something whose effect on expansion of the universe is the opposite of that of matter and normal energy. But that term was unknown to us. AMS captured 25 billion particles events streaming in from all over the universe (Aguilar et al. 2013). Those observations are used here for explaining dark matter. In 2008, PAMELA satellite noticed an excess of energy i.e. ray of gamma particles coming from dark matter. These were later on confirmed by the data from NASA's FGST showed an extra bright gamma ray glow coming from the galactic centre of our galaxy Milky Way, a region thought to be rich in dark matter (Hopper et al.2011). These observations are used for describing formation of dark energy. These observations are used for describing for formation of dark energy. These results provides excellent information for this paper analysis. Apart from these, the study of various annihilation products and their behavior have had crucial role in the paper analysis. When higgs boson decays to other particles in Large Hadron Collider (LHC) at CERN, Europe's particle-physics laboratory near Geneva, Switzerland, it forms dark matter particles. This paper combines dark matter asymmetry and existence of higgs field.

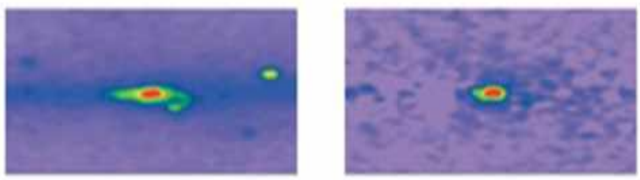

Fig 1-Gamma ray signals recorded by NASA'S Fermi Gamma-Ray Space Telescope, coming from the galactic

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centre of galaxy Milky Way, the region was considered as highly rich in dark matter

II. MATERIALS AND METHODS

To define dark matter, the first observations of AMS are used (Aguilar et al. 2013). Observations are analyzed by comparing the properties of dark matter with the properties of energy particles generated after annihilation. Behaviors of various annihilation products were studied. When as particle and antiparticle collide, their energy is converted into a force carrier particle. If annihilation takes place at low temperature it will result in the formation of lighter particle. Also, the amount of energy releasing after annihilation depending upon the mass of the particles which are going to be annihilated.

When a low energy electron annihilates with a low energy positron, they can only produce three or four gamma particles, since electron and positron do not carry enough mass-energy to produce heavier particles and conservation of energy and linear momentum allow the creation of only one photon. However, if one or both particles carry a large amount of kinetic energy various other particle pair can be produced. Most importantly, the annihilation of an electron-positron pair into a single photon, cannot occur in free space because momentum would not be conserved in this process. But a proton encountering an antiproton will turn into a number of mesons, mostly pions and kions which will fly away from the annihilation point. The newly created mesons are unstable and will decay in a serious of reactions that ultimately produce nothing but gamma particles, electrons, positrons and neutrinos. This conversion of unstable mesons further into stable particles provided base for defining dark matter and its formation. It explains the finding of AMS experiment (Aguilar et al. 2013).

As dark matter annihilation with its antiparticle forms dark energy and generates the gamma energy particles, it explains the results of FGST (Hooper et al. 2011). Further on, due to continuous formation of dark matter the rate of star formation is reducing. The results are based on the Fermi Gamma Ray Telescope, having NSSDC ID 2008-029A, a joint venture of NASA, the United States department of energy and government agencies in France, Germany, Italy, Japan, Sweden, and on the results from Alpha Magnetic Spectrometer (AMS-02) mounted on International Space Station.

III. ANALYSIS

The first findings of AMS experiment recorded more than 25 billion particles events streaming in from all over the universe, including 400,000 positrons. Positrons excess, whatever its source seems to come uniformly from all parts of the sky (Aguiler et al. 2013). Dark matter is the additional annihilation product apart from the gamma particle produced after matter-antimatter annihilation. As the matter-antimatter annihilation is still going on, dark matter formation is continuous. As we have studied that proton-antiproton annihilation ultimately produce stable particles like positrons, electrons and neutrinos and gamma particles. And due to continuous process of dark matter formation by matter-antimatter annihilation, so are we getting particle events continuously (Aguilar et al. 2013).

When dark matter annihilation with its antiparticle, it generates high energy gamma particles which forms dark energy. This explains the observations of PAMELA satellite of 2008. PAMELA noticed an excess of energy and later on these observations were confirmed by NASA's FGST. Data of FGST showed an extra-bright gamma ray glow coming from the galactic centre of Milky Way, a region thought to be rich in dark matter. It can be analyzed from it that dark energy is the resultant of annihilation of dark matter with its antiparticle. The percentage composition of dark matter is reducing. Around 13.7 billion years ago, it was 63% and now it is 26.8%. As dark matter is annihilating with its antiparticle, it reduces the concentration of it in universe and it results in the increase in the concentration of dark energy. Now from the ongoing dark matter formation, rate of star formation has been reduced.

IV. DISCUSSION

It is a natural assumption that the universe be neutral with all conserved charges. For it, the Big Bang should have produced equal amounts of matter and antimatter. Since this is apparently not the case, some physical laws must have acted differently for matter and antimatter. By the new CERN experiment, clues to the dominance of matter over antimatter in the universe have been found in the cluster IE 0657-558. The LHC experiment has observed a preference for matter over antimatter known as CP-violation in the decays of neutral B0s particles. Thus Big Bang had produced matter more than antimatter. After the production of particles, matter and antimatter both get annihilated. But in the annihilation product, the particles apart from gamma energy particles formed dark matter. At the time of production of particles, higgs field was generated which was responsible for the mass of particles.

The particles generated after annihilation interacted with higgs field. More the particles get interacted more massive it would be. And massive particles form cold dark matter. Also proportion of cold dark matter is highest among other two types of dark matter. As due to dominance of matter, a particular proportion of matter got escaped from annihilation and formed visible universe. Around 13.7 billion years ago, 12% mass of the universe was ordinary matter, 15% mass was that of photons and 10% that of neutrinos and 63% that of dark matter. But now 68.3% mass of the whole universe is that of dark energy, 26.8% of dark matter and 4.9% of ordinary matter.

This shows that concentration of dark matter is going to be decreasing with the period of time. This is due to annihilation of dark matter with its antiparticle. This dark matter particle-antiparticle annihilation decreases the concentration of dark matter and thus results in the formation of gamma energy particles. These gamma energy particles results in the formation of dark energy. As the annihilation of dark matter particle with its antimatter is continuous, thus the formation of dark energy is continuous, thus the formation of dark energy is continuous and its concentration is increasing. As after this annihilation, there is gamma ray burst which forms concave curvature of space time on closed volumes. As by modern concept, gravitation is not an attractive force but an external pressure force exerted by the convex curvature of space time on closed volumes that tends to bring them closer to each other. Now gamma ray burst is producing concave of space

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time i.e. negative curvature and therefore produces repulsive effect. So does dark energy has this repulsive effect and which is responsible for expansion of universe. As the dark energy is increasing, the expansion rate of the universe is increasing. If the concentration of dark energy would be constant, then the expansion rate of the universe would be constant. But the expansion rate of the universe is increasing with time (Hubble 1929). So as by the increasing rate of formation of dark energy, the expansion rate of the universe is increasing.

Before 13.7 billion years ago, it has been mentioned that 15% mass of the universe was that of protons. This must be dark energy because if dark energy would not be present at that moment, there would be no repulsive effect and thus no expansion. And in the absence of expansion all the particles would clump again into that point of singularity from which the universe had started and thus universe would not be in the present state. Thus the presence of dark energy at the very beginning of the universe after generation of particles was much important.

AMS recorded particle event including 400,000 positrons. These particle events are the resultant of dark matter formation. As the dark matter formation is continuous thus upcoming particle events are continuous. As a proton encountering an antiproton will turn into as number of mesons, mostly pions and kaons but the newly created mesons are unstable and decay in a serious of reactions that ultimately produce nothing but gamma rays, electrons, positrons and neutrinos. Also, when a low energy annihilates a low energy positron, they can only produce three or four gamma particles. But the annihilation of an electron-positron pair into a single photon cannot occur in free space because in that case momentum would not be conserved. Thus proton-antiproton and electron-positron annihilations lead to particle events.

By these particle events, it is clear that dark matter formation is still going on as matter-antimatter annihilation is continuous. This annihilation can be in two possible ways. The first one is that high energy cosmic rays impacting on the earth produces antimatter which on annihilation with matter forms dark matter. There is one another possible way. Modern theories say that after Big Bang, universe started expanding at very high rate and due to increasing distance between particles as few as one in the millions of the matter and antimatter particles escaped from annihilation. Those escaped antimatter particles are going to annihilate with matter particles now and thus forming dark matter.

But in spite of continuous dark matter formation its concentration is decreasing with time. This is so because of annihilation of dark matter particle with its antiparticle which is resulting in dark energy formation. Thus, concentration of dark energy is increasing. The continuous formation of dark matter is responsible for the decline in the formation of stars. In 2012, it was revealed that the rate of formation of new stars in the universe is now only

1/30th of its peak value which way 11 billion years ago and this decline is said to continue. This is due to using up of matter in dark matter formation. Although we are getting star dust after the star death then also rate of formation of stars is declining as due to consumption of matter in dark matter formation.

High energy gamma parte were captured by NASA's FGRT, coming from the galactic centre of Milky Way, the region which was earlier thought to be highly rich in dark matter (Hopper et al. 2011). The gamma rays coming from, were produced due to dark matter particle annihilation with its antiparticle forming dark energy

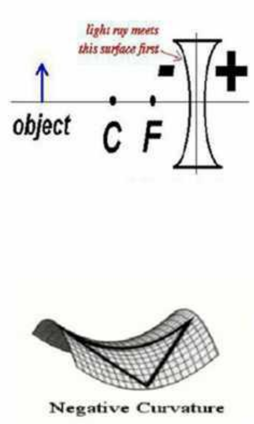

Fig-2(a)

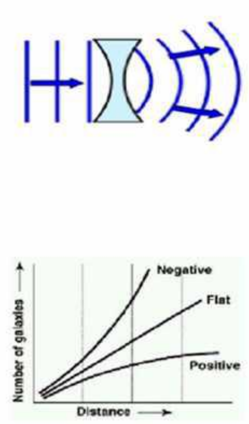

Fig-2(b)

V. CONCLUSION

Fig-2(a) shows that light emitting from the Gamma Ray Burst which leads to formation of concave curvature strikes on the negative curvature first. Fig-2(b) shows the gamma rays striking the concave surface leads to the divergence of light. Fig-2(c) depicts the formation of negative curvature. Fig-2(d) shows that concave curvature i.e. negative curvature produces repulsive effect which leads to the expansion of universe and thus the energy coming from gamma ray burst which is none other than dark energy is responsible for the expansion of the universe.

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