On the relationship between normal matter and dark matter

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Using a pre-fermion hypothesis, the ratio of normal matter 3-fold, asymmetric and symmetric, 3-pair fermion loops to the universe's total matter, including dark matter loops of other pair-number, is estimated. The result of 17% is in the approximate region of the observed value of 15% but would benefit from a more detailed treatment or improved methodology. Also explained is why dark matter loops cannot form the dark matter equivalent of atoms.

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I. INTRODUCTION

The ratios of dark matter and normal matter to total matter are of great interest in cosmology [1]. Based on previously published work [2, 3], the ratios of normal matter and dark matter can be estimated approximately, given some reasonable assumptions.

The previously published hypothesis suggests that normal matter fermions are loops composed of three meon/anti-meon pairs and that other pair-number loops are dark matter. Meons and anti-meons are the only real objects in the universe, having Planck-size properties and exist only as merged pairs or as pairs within loops.

Loops of three pairs are our fermions, being 3-fold asymmetric (quarks) and symmetric (leptons). Loops of other pair number have different asymmetries and symmetries so cannot successfully bind stably, through frequency matching of inter-loop charge and mass forces, with 3-fold symmetry loops.

The analysis of the different numbers of pairs in a loop that can be formed from the very large number of pairs available in an unmerging event can be approximated. The method employed here is reasonable, but there may be other methods, or adaptations to this method, that provide a better fit to observations.

An unmerging event is where the background of the universe, composed of a myriad of moving, vibrating and rotating merged meon and anti-meons (called zero mass black holes or ZMBHs), has a concentration of the right amount of energies to unmerge one ZMBH and then many more.

ZMBHs are the only force carriers and have zero spin. Bosons are only loop combinations. ZMBHs move, spin, rotate and vibrate, as partially merged meon/anti-meons, to transfer forces between meons in loops and other partially merged meons within the background of ZMBHs. They form chains attached to meons in loops and affect other ZMBHs that form the background to the universe, producing the effect of gravity due to the rotational rate of the loops, and are slowed by the background in a form of viscosity. The effect of chains of ZMBHs is visible in iron filings aligned by magnets, evidencing the presence of magnetic field lines due to the motions of charges within the magnets.

No account is taken in this analysis of what the mass of any loop is. The estimation here is concerned only with loop numbers. Since the mass effect of any loop is due to its rotational frequency, the pair-number of any loop is of no gravitational consequence. On the assumption that inflation along three dimensions affected the increase in radius of all sets of pair-number loops identically and that the distribution of loop frequencies is the same for all sets of pair-number loops, then the loop numbers for each different pair-number set will be a valid substitute for the ratio of masses, and thus mass-energy, between pair number sets.

II. SIGNIFICANCE and OBJECTIVES

The significance is in explaining, in terms of a physical pre-fermion-based framework of loops, what underlies the similarities and differences between normal and dark matter. The objective is to estimate what proportion of normal 3-pair loop matter is made from the available pairs at the outset of a big bang versus the total of all the loop pair-numbers that formed and to compare that with the latest observed value.

III. OUTLINE

The paper considers the number of loops of each pair-number that could be formed from the whole number of pairs available and then how likely it is that these pair numbers are to be formed. This is not a normal permutation or combination calculation.

IV. NUMBER OF LOOPS FORMED

The estimation is based on how many loops of each pair-number can be formed from the number of unmerged ZMBHs available. Each ZMBH unmerges into a pair of meon and anti-meon, and each loop always has an equal number of meons and anti-meons, so it is pairs that need to be accounted for.

The 1-pair set is for one single pair. Although it is not possible to form a loop from a single pair, the calculation starts at that base level and the result will be adjusted later to account for there being no 1-pair loops.

The number of 1-pair loops possible from *n* unmerged ZMBHs will be *n*

The number of 2-pair loops possible from *n* unmerged ZMBHs will be *n*/2

The number of 3-pair loops possible from *n* unmerged ZMBHs will be *n*/3

The number of *n*-pair loops possible from *n* unmerged ZMBHs will be *n*/*n*

Without weighting the sets of pair numbers, the total number of loops across all pair-number sets, each considered to use all available pairs, would be

$$N_{loop-unweighted} = \frac{n}{1} + \frac{n}{2} + \frac{n}{3} + \cdots + \frac{n}{n}$$

$$= n\left(1 + \frac{1}{2} + \frac{1}{3} + \cdots + \frac{1}{n}\right)$$

However, this infinite series diverges and the value of *n* would be required to produce an answer. This sum also assumes that each pair-number loop is equally likely to form, which is not the case, so weighting of the sets will be required.

The individual set numbers will also not necessarily have integer values of loops formed and there will be remainders where the set pair-number does not divide *n* into integer numbers of loops. The remainders will be considered later.

V. WEIGHTING OF PAIR-NUMBER SETS

The weighting of each set depends on the probability of forming that loop number from the starting point of the available pairs.

The probability of forming 1-pair loops will be 100% (1) because that is how they start.

The probability of forming 2-pair loops will be 50% (½) because they could either form that size or smaller.

The probability of forming 3-pair loops will be 33.3% (1/3)

The probability of forming an n-pair loop will be 1/*n*

Taking these two factors together, for each set of pair-numbers the relationship will be

$$Number\ of\ pairs\ available\ /(pair\ number\ x\ pair\ probability)$$

The number of pairs available depends on whether remainders are being considered, as discussed later. So each set is based on the number that it is possible to make of that specific pair size, from the total available number of unmerged ZMBHs, together with the probability of forming such a loop. This will give the following summation across all *n* sets of pair-numbers

$$nN_{loop-weighted} = \frac{n}{1^2} + \frac{n}{2^2} + \frac{n}{3^2} + \cdots + \frac{n}{n^2}$$

$$= n\left(1 + \frac{1}{2^2} + \frac{1}{3^2} + \cdots + \frac{1}{n^2}\right)$$

where each set is based on the whole number of available pairs being used for each, which produces a total that is *n* times too large, although when calculating a ratio this effect will cancel.

The infinite summation within brackets is convergent and is called the Basel Problem which was solved by Euler in 1734 for $n = \infty$ with the result being $\pi^2/6$. Since the unmerger results in a big bang, whether successful or failed, the number of available pairs will approach infinity but will not be infinite. So the Euler result will be a good approximation.

Looking at the ratio of 3-pair loops to all pair-loop numbers, which is the ratio of normal matter to the total of normal and dark matter, the equation will be

$$R_{m/all-m} = \left(\frac{1}{3^2}\right)/\left[\frac{\pi^2}{6} - 1\right] = 0.1723$$

The deduction of *n* from the total loop number nN_{loop} is to eliminate the 1-pair loops, which are not loops, but which enabled the infinite series to be calculated. This result, without adjustment for the remainders, is

$$R_{m/-m} = 17.23\%$$

This result, as a first approximation, is not far from the CMB observations [1] of 15.73% as the ratio of baryonic matter to total matter, based on $\Omega_c h^2 = 0.12 \pm 0.001$ and $\Omega_b h^2 = 0.0224 \pm 0.0001$. The analysis here suggests that dark matter represents 82.77% of total matter versus 84.27% from the CMB data.

VI. REMAINDER ADJUSTMENTS

Above *n*/2, there will only be one loop in each set, with the remainder available to form smaller loops. Redistribution of the remainders in each set to form other loop-numbers may seem to be a reasonable method of calculating the ratios better. Although the remainders will be smaller at small pair-number and larger at larger pair-number, the effect overall might be expected to weight the distribution of number of loops towards smaller pair-loop sizes.

There will be an increase the total overall number of loops, but the similarity of the structure of the remainders across the sets between any two number fractions, for example *n*/2 up to *n*, called a number gap, means that, apart from at low *n*, the ratios of loop numbers between any two fractions is approximately the same as the total for all *n* sets.

For the largest number gap between *n*/2 and *n*, all pair-number sets higher than *n*/2 up to *n* will have only one complete loop, plus a remainder. This gap is similar in structure to the overall set from *n*=1 up to *n*, although truncated with only *n/*2 sets. If the pairs remaining in each set are redistributed in the same way as was done for the overall *n* sets, the same Euler summation can be used, but multiplied in each case by the number of sets in each gap.

This effectively treats each gap length of *n*/2, *n*/6, *n*/12 and so on, as substitutes for *n* in the Euler formula and so will overstate the total loop number because, for increasingly smaller *n*, the Euler summation becomes less valid. The summation of the gap lengths will be

$$G_{gap\ total} = \frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + \cdots + \frac{1}{n(n+1)}$$

$$\cong 1\ as\ n \to \infty$$

However, even with this increase in loop numbers, both the normal and dark matter components are increased by the same factor. The result is an equation for the ratio normal matter to total matter, including remainders, of

$$R_{m/all-m(rem\ inc)} = \{\left(\frac{1}{3^2}\right)(1+1)\}/\{\left[\frac{\pi^2}{6} - 1\right](1+1)\}$$

$$= 0.1723$$

This repeated result of 17.23% normal matter to total matter, and 82.77% dark matter to total matter, may again overstate the loop numbers and a more precise calculation should improve accuracy.

VII. DARK ENERGY

The CMB analysis [1] concluded that dark energy made up the ‘missing’ mass-energy for a flat universe that the matter/dark matter mass-energy does not appear to account for. In the hypothesis promoted in the previous work to which this paper relates [2, 3], dark energy is not necessarily required.

Firstly, all meons, loops, atoms, planets, stars and the universe itself always have total energy of zero when considering both mass and charge related energies. So the requirement for the universe to have some specific mass-related overall energy is not relevant.

Secondly, the existence of failed big bangs, past which our successful big bang is expanding and existing beyond its current extent, suggest that the upward curve of the Hubble constant at longer distances may be related to the high red shift of those objects which will have coalesced into black holes and rotating galaxies, many before our own big bang.

Thirdly, those failed big bangs will provide further normal and dark matter which is not directly observable.

In this hypothesis, our big bang occupies only a fraction of the single total universe and all observable structures within it are composed only of loops that are themselves composed of unmerged meon/anti-meon pairs. Those same pairs, when merged as ZMBHs, form the background of the universe and transmit all forces.

Not explained extensively here is the reason why even-pair number dark matter loops cannot form the dark matter equivalent of atoms. The references explain in detail how odd-pair number loops, which have odd-asymmetries in their quark-equivalent charged loops, need to form maximum-charge stacks of those loops that balance those asymmetries. These stacks need to be of odd number and so will have a net spin that needs to be balanced by an orbiting symmetric maximum opposite-sign charged loop – an atom.

VIII. CONCLUSION

Based on a reasonable set of assumptions, the results lie not too far from the observed value for the ratios of normal and dark matter to total matter, although the analysis ignores any dark energy contribution.

The hypothesis suggests that the only difference between normal and dark matter is how many pairs of unmerged meon/anti-meons are in a loop.

IX. REFERENCES

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