The informational physical model: detection of dark matter particles

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Abstract In the paper dark matter particles detection problem is considered in framework of the Planck scale informational physical model. It is shown that the detection practically for sure is impossible.

1. Introduction

Attempts to detect dark matter [DM] particles were, and are, rather numerous , however till now only some limits for the corresponding cross-sections are obtained. At that in the attempts it is assumed that DM particles interact by fundamental Nature Weak force, despite that till now only gravitational interaction of DM and ordinary matter is observed.

From this fact it follows, including, that the basic initial assumption in the Planck scale cosmological model ([1[, section 5 "\Cosmology") that DM particles have only Gravity Force charges is really correct, and the attempts fail since Gravity is extremely weak Force,

Besides from the extreme Gravity weakness above the gravitational interactions between particles cannot be analyzed in framework of Newton theory, that is possible only in framework of the Planck scale informational physical model ([1], section 6. Mediation of the fundamental forces in complex systems), Corresponding first approximation estimation of probability DM and ordinary particles interactions is given below.

2. Gravitational interactions of DM and ordinary particles.

In the model in complete accordance with all reliable experimental data it is shown that Matter's ultimate base is at least a [4+4+1]4D dense lattice of primary elementary logical structures – binary reversible fundamental logical elements (FLE),that is placed in a corresponding fundamentally absolute, flat, continuous, and "Cartesian", [4+4+1]4D spacetime with metrics ($c\tau$, X, Y, Z, g, w, e, s, ct). "FLE size" and "FLE binary flip time" are Planck length and Planck time, respectively,

- while everything in Matter, really [particles and fundamental Nature forces mediators] are some specific disturbances in the lattice.

Including in the model it is substantively shown that with rather large probability at least fundamental Nature Gravity. Electric and Nuclear Forces interactions happen as exchange by universal mediators, in Gravity Force case - “circular gravitons”.

The mediators are radiated by particles’ Forces charges, and, if a mediator specifically hits into “irradiated” particle, it transmits to the particle specific momentum $p = \frac{\hbar}{r}$ that releases in this particle corresponding portion of the particle’s own energy, transforming the portion into the particle’s kinetic energy.

So to estimate at least in a first approximation what happens at particles gravitational interaction let consider interactions of two protons.

At statics the momentum above releases energy E $E = \frac{p^2}{2m} = \frac{\hbar^2}{mr^2}$, so for given E

$$r = (\frac{\hbar^2}{2mE})^{1/2}$$

Let E is a detector threshold, say, 1eV, then from the above and for m=1.67x10^{-27} kg; E=1.6x10^{-19}J; p=2.3x10^{-23}kgm/s, we obtain r^2=2.07x10^{-23}m, r=4.6x10^{-12}m.

Correspondingly first approximation cross-section, s, estimation is

s=6.5x10^{-23}m^2=6.5x10^{-19}cm^2 .

That is rather large cross-section value in particle physics, however here is a nuance. As that is shown in the model the gravitational force, F,

$F = \frac{G\mu m}{r^2} = Np$, where μ is mass of radiating DM particle N is number of impacting on the irradiated particle momentums. If large masses interact N is extremely large, and so, despite that the interactions are random, it practically exactly is equal to the average $N = F / p$ value.

However in this case, i.e. when $\mu = m$, and so Newtonian force, F, is equal F=9x10^{-42}newtons, the average number of the momentums in a second is N= 3.9x10^{-19}, i.e. two having ~1GeV/c^2 masses particles in average interact 1 time in time intervals 2.5x10^{18} seconds or in ~10^{10}years.

If a detector has the volume 1m^3, and detecting material density, say, is a bit more 1 g-mole, i.e. 10^{24} particles/cm^3, the distances between the particles, d, is ~10^{-10}m. So effective volume where detections can happen is ~$(r/d)^3$ ~10$^{-4\cdot}$ F the detector volume.

Ordinary matter density in Milky Way is ~ 6 protons/m^3, and, if DM particles have ~1GeV/c^2 masses, in the 1m^3 detector there would be constantly ~20 ones, what decreases the time interval ~10^{10}years above quite inessentially.

Increasing of both, μ and m, masses increases the probability, but really that is inessential in the ordinary matter case, say, if instead protons here would be some heavy nuclei. Increasing of μ can be more effective, however that is possible only provided that in Space the DM particles density correspondingly decreases.

Say, in the model it is suggested that the DM particles are Planck mass ones, which have mass ~10^{19} GeV/c^2 , and so in they interact with protons with ~5 times/s rate, however in this case the density is ~20x100^{-19}.

3. Conclusion

From the above it follows that experimental observation of DM particles interactions with ordinary matter is unreal.

References

[1] Shevchenko, S.V, Tokarevsky, V. DOI: http://dx.doi.org/10.20944/preprints202110.0453.v5