Riddle of Expanding Universe

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ABSTRACT: The consequences of the Hubble law have been analyzed. The influence of the superconducting effects on the expansion of the Universe has been investigated.

The Universe can expand faster than one has expected because:

- Other interactions, especially repulsing and these not discovered yet can play an important role
- The negative masses exist too and the masses with different signs repulse each other on the contrary to the charges.
- The Universe is pumped with the energy through the black holes (from the parallel Universes or MEGAVERSE) and each elementary particle can be practically a black hole.

All these possibilities can appear simultaneously.

An antiparticle is something more than an empty place where there was earlier a particle.

The particle is a particle and simultaneously a hole in the sea of antiparticles; and the antiparticle is an antiparticle and a hole in the sea of particles [1].

So there are plenty of seas generally not excited.

And so the statement is valid that so called “dark matter” is simply unempty Dirac’s sea.

The increase in the enlargement of the Universe is implicated by the Hubble law and shouldn’t be a surprise.

We have:

$$v = HS$$

$$\frac{ds}{dt} = HS\,, \quad H > 0$$

$$S = S_0\, e^{Ht}$$

The diminution is possible only in the case of the motion rearwards the time $(t < 0)$. Generally there is an exponential increase.
We have Londons' equation:

$$\frac{mc^2}{4\pi ne^2}\,\nabla^2 H \;=\; H$$

$$\alpha \;=\; \nabla^2 H \;=\; H$$

and

$$\vec{B} = \vec{\nabla} \times \vec{A}$$

$$\vec{\nabla} \times \vec{A} \;=\; \vec{e_1}\left(\frac{\partial A_3}{\partial x_2} - \frac{\partial A_2}{\partial x_3}\right) + \vec{e_2}\left(\frac{\partial A_1}{\partial x_3} - \frac{\partial A_3}{\partial x_1}\right) + \vec{e_3}\left(\frac{\partial A_2}{\partial x_1} - \frac{\partial A_1}{\partial x_2}\right)$$

We analyze the case:

$$A_1 = A_x(y)$$
$$A_2 = A_y(z)$$
$$A_3 = A_z(x)$$

and then:

$$B_z \;=\; -\frac{\partial A_x}{\partial y} \;\Rightarrow\; A_x = -\int B_z\,dy$$

$$B_y \;=\; -\frac{\partial A_z}{\partial x} \;\Rightarrow\; A_z = -\int B_y\,dx$$

$$B_x \;=\; -\frac{\partial A_y}{\partial z} \;\Rightarrow\; A_y = -\int B_x\,dz$$

Next:

$$\vec{B} \;=\; \mu\vec{H}$$

and

$$H_x = H_{ox}\,e^{ky} \qquad H_y = H_{oy}\,e^{kz} \qquad H_z = H_{oz}\,e^{kx}$$

We have:

$$A_x = -\int \mu H_z dy = -\mu e^{kx} + C(y,z)$$

For $x = 0$ we have:

$$A_x(0) = -\mu + C(0)$$

Analogically

$$A_y = -\mu e^{ky} + C(x,z)$$

$$A_z = -\mu e^{kz} + C(x,y)$$

Because of the symmetry:

$$C\,(x,z) = C(y,z) = C(x,y)$$

We have the series of implications:
If $x = const$, then $C(z) = C(y)(= (C(x)$ analogically putting $y = 0)$
and $C(y,z) = C(z,y)$

For $z = x$ we have:

$$C(x,x) = C(y,x) = C(x,y)$$

and, from the symmetry:

$$C(x,x) = C(x)$$

because the function C of two coordinates x is the function of only one coordinate x.

We put $x = 0$.
So we have:

$$C(0{,}0) = C(y,0)$$

and next:

$$C(y) = C(0)$$

So the function C is a constant.

And so we have:

$$A_x \;=\; -\mu A_0 e^{kx} + \; C$$

Let’s analyze only this case.
According to the Hubble law we have:

$$v = hx$$

and

$$A \;=\; -\mu A_0 e^{kx} + \; C \;\;=\; -\mu A_0 e^{\frac{k}{h}v} \; + C$$

So the superconducting effects increase with the velocity, what testifies to the statement that “dark matter” may be the superconducting Dirac Sea which intermediates in the enlargement of the Universe.
The velocity increases because we have:

$$\frac{dv}{dt} \;=\; h\frac{dx}{dt} \;=\; hv$$

so:

$$v \;=\; v_0 e^{ht}$$

In the cosmic scale the superconducting effects exist not only for constant values what explains the success of General Relativity.

If > 0 , it means $m > 0$
we have the slope of potential along which the Universe slops up enlarging.

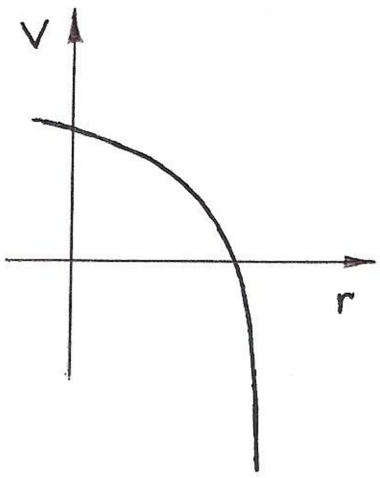

Fig. 1

If we have $\alpha < 0$ and $m < 0$ then the function tends to $-\infty$ because of $-x$, so we have again the slope of potential along which the Universe slops up.

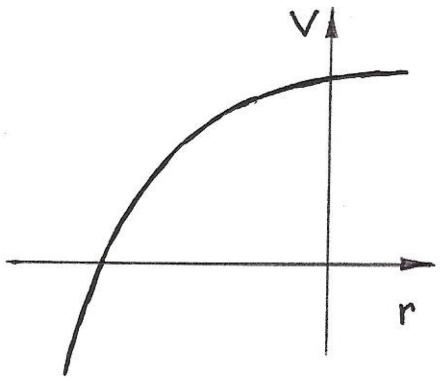

Fig. 2

Both situations are symmetrical because they describe the same phenomenon: the choice of the axis x is free and may be changed (because of the symmetry of problem).

The shorter solution of the problem is:

$$\Delta\varphi - \mu^2\varphi = 0$$

$$\Delta\varphi = \frac{1}{r}\frac{\partial^2}{\partial r^2}(r\varphi)$$

$$\frac{1}{r}\frac{\partial^2}{\partial r^2}(r\varphi) - \mu^2\varphi = 0$$

$$\frac{\partial^2}{\partial r^2}(r\varphi) = \mu^2(r\varphi)$$

$$r\varphi = ke^{\pm\mu r}$$

And next:

$$\varphi = k\frac{e^{-\mu r}}{r} + k\frac{e^{\mu r}}{r}$$

The second term can't naturally be rejected. This force can be correlated with the enlargement of the Universe, because all interactions are equivalent. K may be negative and then this force has repulsing character.

References:

[1] Z. Morawski, "Implications of Complex Mass", this website
[2] Z. Morawski, "Attempt at Unification of Interactions and Quantization of Gravitation", this website