New Possibilities of Motion with Velocity v > c

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ABSTRACT: The possibilities of motion with the velocity v > c have been analyzed, both in the case described by Itzykson and Zuber and in the consequences of the Hubble law.

The wave function penetrates the light cone in the case of v > c (at a distance x) [1,2].
We have:

$$\psi = \psi_0 e^{-\alpha x} , \quad \alpha > 0 \tag{1}$$

But we have another solution too:

$$\psi = \psi_0 e^{\beta x} , \quad \beta > 0 \tag{2}$$

which shouldn't be rejected.

Both situations describe the motion with the velocity v > c, but the second case means the arising of the wave function.

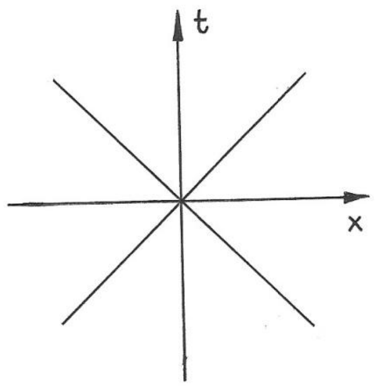


Fig. 1

However we have the Hubble law:

$$v = Hx \tag{3}$$

and:

$$\frac{dv}{dt} = H\frac{dx}{dt} = v$$

$$v = v_0 e^{H_1 t}\,, \qquad H_1 > 0$$

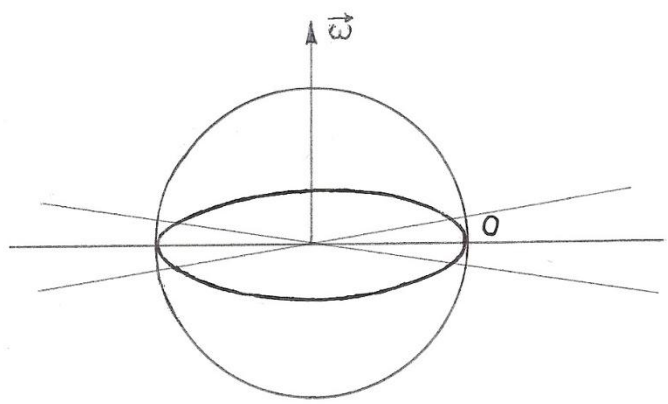
This velocity must pass the limit velocity at certain time.

At the beginning the Universe enlarged with v > c , what the Hawking complex time testifies to [3].

After the achievement the dimension:

$$x \geq \frac{H}{c} \tag{4}$$

The Universe will enlarge again with the velocity v > c.
One has suggested that the pulsar emits the radiation in two opposite directions (on the same line) and rotating it sheds the radiation into the space.



This conception has been rejected, because it has been implicated that the points which are existing on the perimeter 0 of the rotating pulsar would move with the velocity v > c. [4]
Now it is seen that this argumentation isn't valid and the boundary points of the pulsar may move with the velocity v > c.

Fig. 2

References:

[1] C. Itzykson, J. B. Zuber, “Quantum Field Theory”
[2] W. Bardyszewski, private communication
[3] S. W. Hawking, R. Laflamme, Physics Letters B, vol. 209, no. 1; 28. July 1988
[4] Cz. Sołtys, private communication