

## Advanced Relativity and formula $E = mc^2$

**Amrit Sorli & Davide Fisaletti**

In Advanced Relativity (AR) energy of space (quantum vacuum) is the fundamental energy of the universe. Matter is structured energy of quantum vacuum. A given particle or massive body diminishes is structured energy of space (quantum vacuum). As universal space is infinite, energy of space (quantum vacuum)  $E_{qv}$  is infinite too:

$$E_{qv} = \infty \quad (1).$$

Each particle or massive body is structured energy of quantum vacuum, we can write following formula:

$$\Delta E_{qv} = E = mc^2 \quad (2).$$

Energy density in the centre of given particle or massive body is diminished exactly for the amount of energy that is contained in the particle or massive body:

$$\Delta E_{qv} = (\rho_{PE} - \rho_{qvE}) \cdot V = E = mc^2 \quad (3),$$

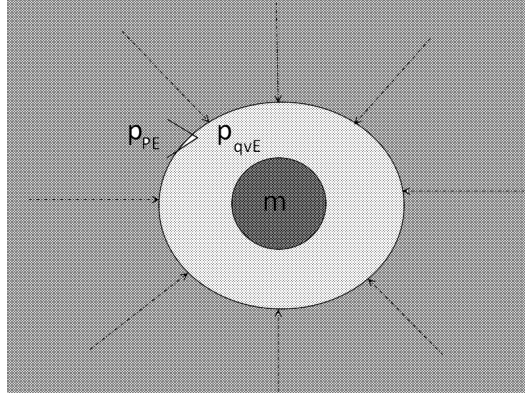
where  $\rho_{PE}$  is Planck energy density and  $\rho_{qvE}$  is the energy density of quantum vacuum in the centre of the elementary particle or massive body,  $V$  is the volume of particle or massive body.

Out of formula (3) we can get:

$$\frac{(\rho_{PE} - \rho_{qvE}) \cdot V}{c^2} = m \quad (4),$$

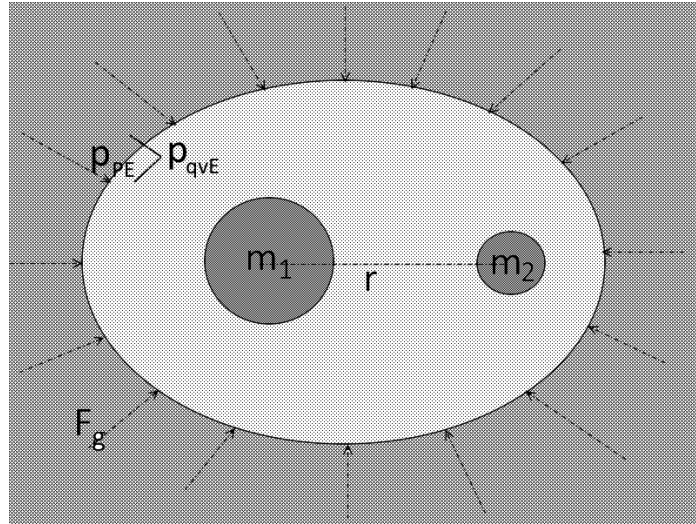
where  $m$  is the mass and represents the amount of energy of quantum vacuum which is structured in a given particle or massive body. Higher energy density of quantum vacuum is pushing towards the centre of a given particle or massive body where energy density is lower. This difference between outer and inner energy density generates inertial mass and gravitational mass of a given particle or massive body. Mass  $m$  of a given particle or massive body is the amount of energy we measure with inertial mass  $m_i$  or gravitational mass  $m_g$ . It is valid:

$$m = m_i = m_g \quad (5).$$



**Figure 1:** Origin of inertial mass and of gravitational mass

In the formula  $F_g = \frac{m_1 \cdot m_2 \cdot G}{r^2}$  we can see that mass  $m_1$  and mass  $m_2$  have origin in diminished energy density of quantum vacuum inside of a given material objects.



**Figure 2:** Origin of gravity

Gravity force is pushing together material objects  $m_1$  and  $m_2$ . There is no hypothetical graviton that would carry attraction force between material objects.