The speed of the matter, acceleration, force and other derived units.

Imagine next example: We have an atomic clock with Cs^{133} . We know how many periods the second is. Exactly 9 192 631 770 periods. Now we have a piece of the matter e.g. plenty atoms of iron in one small (2mm) ball. Such ball is moving by the velocity along the distance of 32,6 mm. Why such distance? For the reason the radiation of 9,2GHz atomic clock of caesium has the wavelenght cca 32,6 mm for one period. What is the velocity of the ball? That depends on how many periods pass before the ball moves a given distance.

If we measure 91 926 317 700 periods for the time of the atomic clock, which means the ball is moving at one period (32,6 mm) over 91 926 317 700 periods. If the ball stands in one place, that means it will travel a distance of zero for any (even unlimited) number of atomic clock periods.

If we take a closer look at the „still" ball, we can see the rapid oscillating motions of the iron atoms (the thermal Brown motion). If we go any deeper, we cool the ball almost to absolute zero, so the thermal Brown motion almost disappears, but what doesn't disappear will be the vibrations of individual atoms due to their bonds - due to the movement of valence electrons. And these oscillations may correspond in some proportion to the oscillations of the atomic clock. Once there, once on the other side, always different and different - pure randomness. We find that if it weren't for the internal bonds between the iron ball atoms, the ball wouldn't exist as we know it. Even though we consider him perfectly calm, standing still, all parts of him move oscillatingly.

There is a motion inside the „still" ball and we could measure it by the atomic clock. Eventually, we get to the quantum fluctuations of the vacuum, the main characteristic of which is that the electromagnetic waves move at a constant rate. Or rather, "constant" (after averaging deviations) - we will no longer be here to discuss the true and false vacuum. In short, if we were to look at the ball from the position of quantum fluctuations (a kind of quantum foam) in which its particle expressions (protons, neutrons, electrons) are held by binding forces, we would find that even here at the micro level, is valid the velocity of the elektromagnetic waves $c = 1$. There is no difference between the distance and the time. From our „outer" experience we know speeds of material objects as our ball are less then **c**. But such speed (or velocity if we take a direction) is imaginary. From our experience (and from our sensec) we see a still ball without no fluctuations. A possible reason is that we humans also composed of the same particles in the ocean of quantum foam are unable to detect these changes. Just like we see motion on a movie screen and not 24 (or 48) still images in one second.

Go back. How to measure the acceleration of „imaginary" speeds?

the acceleration $\mathbf{a} = \frac{\mathbf{dv}}{\mathbf{dt}}$

dv – the differential of the speed (imagine as a difference between two different speeds)

dt – the differential of the time (imagine as the time needed to change speed)

Example: the car has 0 m/s and after 60 seconds its speed will be 50 m/s. dv = 50 – 0 = 50 , dt = 60

$\mathbf{a} = \frac{50}{60}$ = **0,833.. m/s^2**

O.K. But we need speed, time and acceleration in base units derived from **c = 1.** We must solve the ratio between the speed v = 50 m/s and the speed c = 299 792 458 m/s.

$\mathbf{the\,ratio} = \frac{50}{299\,792\,458}$ = 0,000 000 166 .. c = **1,66 x 10 $^{-7}$ c**

There is no m/s, only c, which means the speed **v** is the ratio to **c**. We could use perctentages, but the ratio is better for next purposes.

to be continued