

## Particles, waves and trends in physics.

Lubomir Vlcek

Rokytov 132, 086 01, Slovak Republic

Email: [lubomir.vlcek@gmail.com](mailto:lubomir.vlcek@gmail.com)

### Abstract

Speeds of electrons and protons in atoms are small. For example: An electron moving at a speed  $v_e = 0,003c$  creates spectral line  $H\alpha$ . Accurate electron speeds are given in the table in this article. Confirmation of Doppler's principle in hydrogen for Balmer line  $H\alpha$ . Comparison the official and of the author's results.

Theory of particles, waves and heat. Accompanying activity of reaction on movement of stable particles in the transmission medium are waves. Neutron,  $\beta$  electron, gamma rays – calculations. Discussion to Cobalt-60 decay.

Stable **electrons** moving with speeds  $(0,99c - c)$  creates leptons ( $\mu^-, \tau^-$ ), neutrinos ( $\nu_e, \nu_\mu, \nu_\tau$ ) and bosons  $W^+, W^-, Z$  (=  $\beta$  electrons). Weak interactions are caused with stable **electrons**, which creates leptons ( $\mu^-, \tau^-$ ) = (particles = electrons different speeds), neutrinos  $\nu_e, \nu_\mu, \nu_\tau$  (= waves), bosons  $W^+, W^-, Z$  (= particles =  $\beta$  electrons moving at nearly the speed of light) and **gamma rays** (=waves of extremely high frequency  $>10^{19}$  Hz).

Stable particles (**p** +, **n0**, **D**, **He-3**,  **$\alpha$** ) moving with speeds  $(0,3c - 0,99c)$  creates baryons and mesons.

The strong interactions are caused with stable particles (**p** +, **n0**, **D**, **He-3**,  **$\alpha$** ), which creates baryons and mesons. Therefore creation and annihilation operators in physics are irrelevant.

## Introduction

Through the work of Max Planck, Albert Einstein, Louis de Broglie, Arthur Compton, Niels Bohr, and many others, current scientific theory holds that all particles also have a wave nature (and vice versa).<sup>[1]</sup> This phenomenon has been verified not only for elementary particles, but also for compound particles like atoms and even molecules. For macroscopic particles, because of their extremely short wavelengths, wave properties usually cannot be detected.<sup>[2]</sup> Wave-particle duality is an ongoing conundrum in modern physics. Most physicists accept wave-particle duality as the best explanation for a broad range of observed phenomena; however, it is not without controversy.

## Theory

Wave - particle duality elegantly incorporates kinetic energy in direction of movement (as particle or wave in the direction of movement) and kinetic energy against directions of movement (as wave against the spread of directions of movement) in relations the kinetic energy by [3] p. 51-52 :

Calculation of the kinetic energy of a particle moving at the velocity of  $v$  :

$$T_{\text{kin}} = \frac{mc^2}{\cos^2 \vartheta} \left[ \ln \left| 1 - \frac{v}{c} \cos \vartheta \right| + \frac{\frac{v}{c} \cos \vartheta}{1 - \frac{v}{c} \cos \vartheta} \right]$$

while  $\vartheta$  isn't  $\frac{\pi}{2}$ ,  $\frac{3\pi}{2}$

For  $\vartheta = 0^\circ$  we have the kinetic energy in the direction of motion

$$T_{\text{kin,ad}} = mc^2 \left[ \ln \left| 1 - \frac{v}{c} \right| + \frac{\frac{v}{c}}{1 - \frac{v}{c}} \right]$$

For  $\vartheta = 180^\circ$  we have the kinetic energy against the direction of motion

$$T_{\text{kin,ad}} = mc^2 \left[ \ln \left| 1 + \frac{v}{c} \right| - \frac{\frac{v}{c}}{1 + \frac{v}{c}} \right]$$

Kinetic energy of electron

$T_{\text{kin id}} = mc^2 \left[ \ln \left| 1 - \frac{v}{c} \right| + \frac{v/c}{1 - v/c} \right]$  in direction of motion of electron,  
where  $v$  is velocity of electron.

Kinetic energy of electron

$T_{\text{kin ad}} = mc^2 \left[ \ln \left| 1 + \frac{v}{c} \right| - \frac{v/c}{1 + v/c} \right]$  against direction of motion of electron,  
where  $v$  is velocity of electron.

Albert Einstein , who, in his search for a Unified Field Theory , did not accept wave-particle duality, wrote: <sup>[4]</sup>

This double nature of radiation (and of material corpuscles)...has been interpreted by quantum-mechanics in an ingenious and amazingly successful fashion. This interpretation...appears to me as only a temporary way out...

The pilot wave model, originally developed by Louis de Broglie and further developed by David Bohm into the hidden variable theory proposes that there is no duality, but rather a system exhibits both particle properties and wave properties simultaneously, and particles are guided, in a

deterministic fashion, by the pilot wave (or its " quantum potential ") which will direct them to areas of constructive interference in preference to areas of destructive interference . This idea is held by a significant minority within the physics community. <sup>[5]</sup>

When in this idea we will replace the "quantum potential" by "electromagnetic potential" (or by " interference of electromagnetic waves"), the idea will be accepted large majority of physicists.

In 1900 Max Planck hypothesized that the frequency of light emitted by the black body depended on the frequency of the oscillator that emitted it, and the energy of these oscillators increased linearly with frequency (according to his constant h, where E = hv).

Theoretical Planck's oscillator we can replace with circulating electron along ellipse around the nucleus of an atom between two Bohr's energy levels, while electron moving alternately with acceleration and deceleration. This electron really blinks. When an electron moves at the speed of a higher Bohr energy levels (from afnucleus) to lower (towards perinucleus) radiates spectral lines of certain thickness. (real blinks) For example, spectral line Halfa 656.281 + - 1.4 nm. From the thickness of the spectral lines we can easily identify the smallest (in afnucleus) and largest (in perinucleus) the speed of the electron around the nucleus of an atom, taking into account the kinetic energy of the electron in the direction of movement and against the movement if we know that according to the Doppler principle is the lowest wavelength (highest frequency) and against the direction of motion of the electron is a wavelength of the highest (lowest frequency).

$\frac{v}{c}$	Front of electron $\left[ \ln \left  1 - \frac{v}{c} \right  + \frac{\frac{v}{c}}{1 - \frac{v}{c}} \right]$	Behind of electron $\left[ \ln \left  1 + \frac{v}{c} \right  - \frac{\frac{v}{c}}{1 + \frac{v}{c}} \right]$
<b>Electron</b>  <b>0,002717146</b>  <b>It is in the direction of motion (id)</b>	<b>3,704855771252357587813986763267e-6</b>  <b>1,8931773275045679448456130994356 eV</b>  <b>Lambda<sub>id</sub> (v/c=0,002717146) = hc/E<sub>k,id</sub> =</b> <b>=654,900051928391151030938994 nm</b>  <b>4,5776826115258921719509259975895e+14 Hz</b>	

	<b>1,8931773275045679448456130994356 eV</b>	
<b>Electron</b>  <b>It should be in the direction of motion (id)</b>  The core of the spectral line <b>H<math>\alpha</math></b>	<b>3,704856065018122815706535948504e-6</b>  <b>Lambda<sub>id</sub> = c/ f<sub>max</sub>= 654,9 nm</b>  <b>4,5776829744999236524660253473813e+14 Hz</b>  <b>1,8931774776185590593983814322796 eV</b>	
<b>Electron</b>  <b>It should be against the direction of motion (ad)</b>  The core of the spectral line <b>H<math>\alpha</math></b>		<b>3,6890835289347249992492175652666e-6</b>  <b>1,8851177285881014565911509806897 eV</b>  <b>Lambda<sub>ad</sub> = c/ f<sub>min</sub>= 657,7 nm</b>  <b>4,5581945871978105519233693173179e+14 Hz</b>  <b>1,8851177285881014565911509806903 eV</b>
<b>Electron</b>  <b>0,0027212042</b>  <b>It is against the direction of motion (ad)</b>		<b>3,6890835634754294760932629961125e-6</b>  <b>1,8851177462383644166232590190353 eV</b>  <b>Lambda<sub>ad</sub> (v/c= 0,0027212042)=hc/ E<sub>k,ad</sub> =</b> <b>= 657,699993841987869470 nm</b>
<b>Electron average speed</b>  <b>0,0027191751</b>  For the <b>wings<sup>[4]</sup></b> of spectral line <b>H<math>\alpha</math></b>  <b>(id) and (ad)</b>	<b>3,7104012971124629780821510682521e-6</b>  <b>1,8960110852742780772396666918109 eV</b>  <b>Lambda<sub>id</sub> (v/c= 0,0027191751)=hc/ E<sub>k,id</sub> =</b> <b>=653,92124535655764172783570 nm</b>	<b>3,6835939329504166639190831578912e-6</b>  <b>1,8823125509249667924159877724252 eV</b>  <b>Lambda<sub>ad</sub> (v/c= 0,0027191751)=hc/ E<sub>k,ad</sub> =</b> <b>=658,68 nm</b>

## Conclusion:

$\lambda_{ad} (v/c=0,0027212042)=hc/E_{k,ad} = 657,699993841987869470 \text{ nm} = \lambda_{ad} = c/f_{min} = 657,7 \text{ nm}$  against the direction of motion of electron, moving with speed  $v = 0,0027212042c$ . Electron is in perinucleum. Frequency  $4,5776826115258921719509259975895e+14 \text{ Hz}$

$\lambda_{id} (v/c=0,002717146) = hc/E_{k,id} = 654,900051928391151030938994 \text{ nm} = \lambda_{id} = c/f_{max} = 654,9 \text{ nm}$  in the direction of motion of electron moving with speed  $v = 0,002717146c$ . Electron is in afnucleum. Frequency  $4,5581945871978105519233693173179e+14 \text{ Hz}$ .

The wings<sup>[6]</sup> of spectral line  $H\alpha$  are 1 nm. ( $658,68 \text{ nm} - 657,7 \text{ nm} = 0,98 \text{ nm}$ ,  $654,9 \text{ nm} - 653,92 \text{ nm} = 0,98 \text{ nm}$  ).

## Comparison

### Official physics:

$$H_{\alpha} : E_3 - E_2 = -1,51\text{eV} - (-3,40\text{eV}) = 1,89\text{eV}$$

### LV:

$1,8931774776185590593983814322796 \text{ eV}$ ,  $654,90\text{nm}$  The core of the spectral line  $H\alpha$

$1,8931773275045679448456130994356 \text{ eV}$

$1,8851177285881014565911509806897 \text{ eV}$   $\lambda_{ad} = c/f_{min} = 657,7 \text{ nm}$  The core of the spectral line  $H\alpha$

$1,8823125509249667924159877724252 \text{ eV}$   $\lambda_{ad} (v/c=0,0027191751)=hc/E_{k,ad} = 658,68 \text{ nm}$  For the wings<sup>[6]</sup> of spectral line  $H\alpha$

$1,8960110852742780772396666918109 \text{ eV}$   $\lambda_{id} (v/c=0,0027191751)=hc/E_{k,id} = 653,92124535655764172783570 \text{ nm}$  For the wings<sup>[6]</sup>

Physics in the past formulated at least part of the truth about the physical phenomena.

Some ideas, even if they were doubtful and rejectable, are still valid today:

1. Electron radiates electromagnetic waves if and only if it moves with acceleration from the higher Bohr's energy levels to a lower. In atom, as a source of electromagnetic waves, then it then, when it moves from afnucleum to perinucleum along the ellipse. If the electron moves with decelerated motion, when it absorbs energy, while moving from a lower to a higher energy level, in the direction from perinucleum to afnucleum along the ellipse with of very small eccentricity. Eccentricity of the ellipse is maximal, when electron radiates head of series. Minimal, almost zero, eccentricity corresponds to edge series.

Faulty arguments leveled against classical physics - the electron is moving with acceleration along of a spiral towards the nucleus - we will find in Beiser<sup>[19]</sup> 5.7 The failure of classical physics, p.120, Fig.5.12: "Electron in an atom should be according to classical physics, rapidly converge to the nucleus, because as a result of its acceleration radiates energy."

Because the electron flashes **4,56793859936185,1361937147657453 e+14** times per second, i.e. emits energy **4,567938599361851361937147657453 e+14** times per second and absorbs energy **4,567938599361851361937147657453 e+14** times per second (for spectral line **H $\alpha$** ). Electron creates in the transmission medium, electromagnetic wave **4,567938599361851361937147657453 e+14** times per second and absorbs energy **4,567938599361851361937147657453 e+14** times per second (for spectral line **H $\alpha$** ) - Beiser's argument is unfounded.

Electron is no oscillator. Atom resembles to the solar system with the same "planets" (electrons) and different distances from the nucleus.

Electron in an atom not to skip, but moves continuously with great speed, which increases from the value **0,002717146 c** (in afnucleum) to **0,0027212042 c** (in perinucleum). Then decreases from the value **0,0027212042 c** (in perinucleum) to **0,002717146 c** (in afnucleum) etc.

Changing the speed of the electron is repeated **9,135877198723702723874295314906e+14** times per sec. (spectral lines **H $\alpha$** ).

2. The quantum harmonic oscillator as the quantum-mechanical analog of the classical Planck's harmonic oscillator we can replace with circulating electron along ellipse around the nucleus of an atom between two Bohr's energy levels, while electron moving alternately with acceleration and deceleration. Linear harmonic oscillator is only the projection of the real motion of the electrons along the ellipse in the plane perpendicular to the plane of the ellipse.

Linear harmonic oscillator is only the projection of the real motion of the electrons along the ellipse in the plane perpendicular to the plane of the ellipse.

Or more accurately, is only the projection - of rotating ellipses (Sommerfeld's ellipses around perinucleus) - in a plane perpendicular to the plane of the ellipses.

In quantum mechanics are used so imprecise and imperfect expressions of motion of electrons around the nucleus.

## Definition of heat

The main characteristic of **heat** is the energy transfer through a transmission medium.

And no transfer of the substance (= of real particles) from the source to the transmission medium.

**Heat** exists if and only if there is not a source.

In physics, **heat** refers to a process of transfer of energy between a source and its **transmission medium** other than by work or transfer real particles.

Heat must therefore consist of living force

$$F = QE_{\text{mov}} = QE_{\text{still}} \left( 1 - \frac{v}{c} \cos \theta \right)^2 = QE_{\text{still}} \left( 1 + \frac{v}{c} \sin \phi \right)^2 =$$

$$= QE_{\text{still}} + QE_{\text{still}} \left( 2 + \frac{v}{c} \sin \phi \right) \frac{v}{c} \sin \phi$$

We can conceive, real moving particles - **e**, leptons (**μ<sup>-</sup>**, **τ<sup>-</sup>**), **W<sup>+</sup>**, **W<sup>-</sup>**, **Z** (= **β** electrons) or (**p<sup>+</sup>**, **n<sup>0</sup>**, **D**, **He-3**, **α**) - as moving charges and as the constituent of source in atoms. And creates (emits, radiates) and absorbs (annihilates) by your motion (if moves with acceleration and with deceleration), electromagnetic waves.

Heat as electromagnetic energy or (even outside physics too) thermal electromagnetic energy is the internal energy intake by the body (absorbed when charge (electron, proton) = real particle as a source, annihilates from the transmission medium, electromagnetic energy, i.e. source moving charge (electron, proton) absorbs (annihilates) from the transmission medium the electromagnetic energy, wherein transmission medium between the electrodes of hydrogen lamp is powered, in Interference comparator. Or transmit the electromagnetic energy to the transmission medium when charge (electron, proton) i.e. real particle as a source, creates in the transmission medium, electromagnetic wave. When the real particle as a source (charge-electron, proton) annihilates from the transmission medium, electromagnetic energy, source as a charge (electron, proton) absorbs (annihilates) from the transmission medium, electromagnetic energy by heat exchange to another body.

## Definition of particle

The main characteristic of the particle :

Particle as a source exists if and only if repeatedly speeds up and slows down its movement in source along ellipse (when blinks).

Particle as a source, creates in the transmission medium, electromagnetic wave, that spreads in all directions with the velocity  $c/n$ , regardless of the source movement, where  $n$  is the refractive index of the transmission medium.

In other words, particle, which is the source, can not become the transmission medium and remain in it.

Particle that is the source, remain in the source.

## Definition of waves

The main characteristic of the waves is the energy transfer through a transmission medium.

And no transfer of the substance (= of real particles) from the source to the transmission medium.

Wave exists if and only if there is not a source.

In the case of electromagnetic waves, see **2.1.3 The electromagnetic field. Maswell's equations, p. 28**<sup>[3]</sup>

electric field intensity  $E$  and the magnetic induction  $B$

are both associated with the intensity of a moving charge

$$E_{\text{mov}} = E_{\text{still}} \left( 1 - \frac{v}{c} \cos \theta \right)^2 = E_{\text{still}} + B \quad \text{where} \quad B = \frac{E_{\text{still}}}{c} \left( 2 + \frac{v}{c} \sin \phi \right)$$

The force acting on the moving electric charge is

$$F = QE_{\text{mov}} = QE_{\text{still}} \left( 1 - \frac{v}{c} \cos \theta \right)^2 = QE_{\text{still}} \left( 1 + \frac{v}{c} \sin \phi \right)^2 =$$

$$= QE_{\text{still}} + QE_{\text{still}} \left( 2 + \frac{v}{c} \sin \phi \right) \frac{v}{c} \sin \phi$$

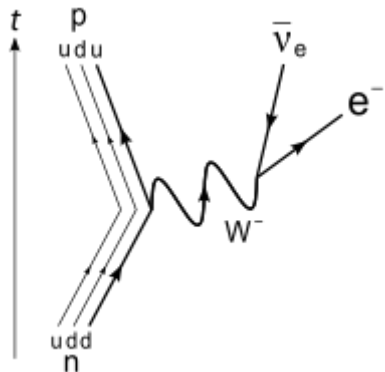
whereby  $-\cos \theta = \sin \phi$

$$F = F_{\text{el}} + F_{\text{m}} = QE + Q(v \times B)$$

### Neutron, $\beta$ electron , gamma rays

Gamma rays have frequencies above 10 exahertz ( $10^{19}$  Hz), and therefore have energies above 100 keV and wavelength less than 10 picometers, often smaller than an atom. Gamma rays from radioactive decay commonly have energies of a few hundred keV, and almost always less than 10 MeV. The upper limit for such energies is about 20 MeV, and there is effectively no lower limit (they are sometimes classed as x-rays if their frequencies are lower than  $10^{19}$  Hz).

$\beta$  electron is emitted from the neutron



The Feynman diagram for beta decay of a neutron into a proton, electron, and electron antineutrino via an intermediate heavy W boson.

In the "stable" neutron, electron orbits around the center-of-mass with speed greater than  $0,999994c$ .

If will start beta decay of a neutron,  $\beta$  electron has kinetic energy in direction of motion  $80\,398\text{ MeV}$  (it is W- boson), proton is moving at a speed  $0,023337082847141190198366394399065c$ , and radiates  $\gamma$  ray.

Planck:  $80\,398\text{ MeV} = h \cdot f$ ,  $f$  is frequency circulation electron around center of mass in neutron in center-of-mass coordinate system

Neutron (= Proton and an electron orbiting a common center of mass) Beta decay is mediated by the weak force.

Electron		Proton	
$mc^2 \ln(1-v^2/c^2) + (2v^2/c^2)/(1-v^2/c^2)$ in the direction of movement = kinetic energy of electron + energy of waves radiated by movement of electron	$mc^2 [\ln 1+v/c  - (v/c) / (1+v/c)]$ against the direction of movement = only energy of waves radiated by movement of electron	$mc^2 \ln(1-v^2/c^2) + (2v^2/c^2)/(1-v^2/c^2)$ in the direction of movement = kinetic energy of proton + energy of waves radiated by movement of proton	$mc^2 [\ln 1+v/c  - (v/c) / (1+v/c)]$ against the direction of movement = only energy of waves radiated by movement of proton
$v/c = 0,99999364465781184$ <b>W+- BOSON = <math>\beta</math> electron W+-</b> <b>= <math>80\,398 \pm 0.25\text{ MeV}</math> = kinetic energy of elektron in direction of motion of</b>	$0,19314559172439827476506281953288$ Muon neutrino $< 170\text{ keV} = 0,17\text{ MeV}$	$5,4446174569388848365045232464552e-4$ $0,510853218258925030861821842245\text{ MeV}$	$1+v/c = 1,0233368828175491399522$ $[\ln 1+v/c  - (v/c) / (1+v/c)] = 2,640490926311681431296567e$

**electron**

**Planck : 80 398 MeV = h\*f**

$h = 6,6260689633e-34 \text{ Js} = 4,1356673310e-15 \text{ eVs}$

$f = 80 398 \text{ MeV} / h = 8,0 398e+10 \text{ eV} / 4,1356673310e-15 \text{ eVs}$

$= 19440151628578850990759246,829759 \text{ Hz}$

$= 1,94401516285788509907592468297e+25 \text{ Hz}$

angular velocity of the  $\beta$  electron =  $= 2 * \pi * f = 122146075082029946177950744,23446 \text{ rad/s}$

Re orbit =  $0,99999364465781184c / 122146075082029946177950744,23446 =$

$= 299790552,71634398041510272 / 122146075082029946177950744,23446 =$

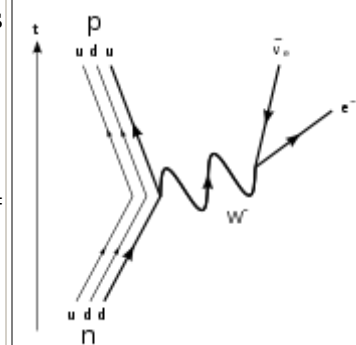
Re orbit =  $2,45436091593620905607969474e-18 \text{ m/rad}$

$42,850352057551791567501064480165 * 0,023336882817549139952204241510852c =$

$0,99999364465781183999999999996341c$

$0,99999364465781184c$

$98,697186837160259358230511606622 \text{ keV} =$  kinetic energy of elektron against direction of motion of electron  $< 170 \text{ keV} = 0,17 \text{ MeV}$



Feynman's diagram beta decay of neutron

$v/c = 0,0233368828175491399522042$

$v/c = 0,9766631171824508600477957$

$[\ln |1-v/c| + (v/c) / (1-v/c)] =$

$= 2,810061766229054172607610e-4$

kinetic energy of proton =  $0,263660231070038428385127 \text{ MeV}$

$mp / me =$

$= 938,27201323 / 0,51099891013 = 1836,152670054228007830683$

$(mp / me)^{0,5} =$

$42,85035204119364067457096660409$

$(mp / me)^{0,5} =$

$= 42,85035205755179156750106448 = 1,67262163783e-27 / 9,1093825e-31 \text{ Rp orbit} = \text{Re orbit} /$

$42,850352057551791567501$

$42,850352057551791567501$

$-40,247749873734600891500904M \text{ eV}$

against the direction of movement = only energy of waves radiated by movement of proton

$5,990565824226854176364e+19 \text{ Hz}$

$0,2636602310700384283851274 \text{ MeV} +$

$+0,24774987373460089150090M \text{ eV}$

$= 0,5114101048046393198860312 \text{ MeV}$

$\beta$  electron is radiated from a neutron .Logically follows that , gamma rays are actually caused by the movement of a proton

		<p>Rp orbit=  =5,72774971052696715576355e-20 m/rad</p> <p>angular velocity of the proton =  =2*<math>\pi</math>*f=122146075082029946177950744,23446 rad/s = angular velocity of the <math>\beta</math> electron in center-of-mass coordinates system</p> <p>Orbital speed of the proton =12214607508202994617795 rad/s* *5,727749710526967155e-20 m/rad = 6996221,46193102220205731201m/s=  =0,0233368828175491399522042415cOrbital speed of the electron=  =42,8503520575517915675010644 * *Orbital speed of the proton, see[3] p.63</p>	
<p>v/c = <b>0,999994396591</b>  <b>BOSON Z 91 187,6 MeV/c<sup>2</sup> = 91,187,6 GeV = kinetic energy of elektron in direction of motion of electron</b>  <b>BOSON Z Planck 91 187,6 MeV = h*f</b>  <b>h = 6,6260689633e-34 Js=4,1356673310e-15 eVs</b>  <b>f = 91 187,6 MeV / h = 9,11876e+10 eV/ /4,1356673310e-15 eVs =</b></p>	<p>0,1931457797076835630826  <b>Muon neutrino=</b>  98,6972828964141347372324 keV =  <b>kinetic energy of elektron against direction of motion of electron &lt; 170 keV = 0,17 MeV</b></p>	<p>5,45056089619770317642249978648e-4  <b>0,51141087453081320114439047437297 MeV</b>  <b>How energy of electron !!!!!!! I tis energy <math>\beta</math> electron in neutron too !!!!!!!</b>  v/c = <b>0,023336900365437361502580178294</b>  1-v/c=0,97666309963456263849741982  [ln  1-v/c + (v/c) / (1-v/c) ] =  <b>0,00028100660594011835046899960813</b>  <b>kinetical energy of proton =</b></p>	<p>1+v/c=<b>1,023336900365437361502580178294878</b>  [ln  1+v/c - (v/c) / (1+v/c) ]=  =2,64049483679651967173250371e-4  <b>0,247750240644449079625375 MeV</b>  <b>5,99057469606829649581e+19 Hz</b>  <b>against the direction of movement of</b></p>

$=22049065532055484372807257,596126$   
**Hz**  
 $=2,2049065532055484372807257596126e$   
 $+25$  Hz  
**angular velocity of  $\beta$  elektron  $=2*\pi*f=$**   
 $138538364588050870918387289,29769$   
 rad/s  
  
**Re orbit =  $0,999994396591c$  /**  
  
 $/ 138538364588050870918387289,29769=$   
  
 $=299790778,140242710678 /$   
  
 $/ 138538364588050870918387289,29769=$   
  
 $= 2,1639549379096690127802754e-18$   
 m/rad  
  
**Radius of force reach of electron**  
**(  $v/c=0,99999$  (electron in neutron W,Z**  
**):**  
 $r_e = 2,8182929384359290310322993e-30$  m  
 ...in the direction of movement  
 $r_e = 5,8358575551536354084674977e-14$   
**m**  
 ...against direction of movement

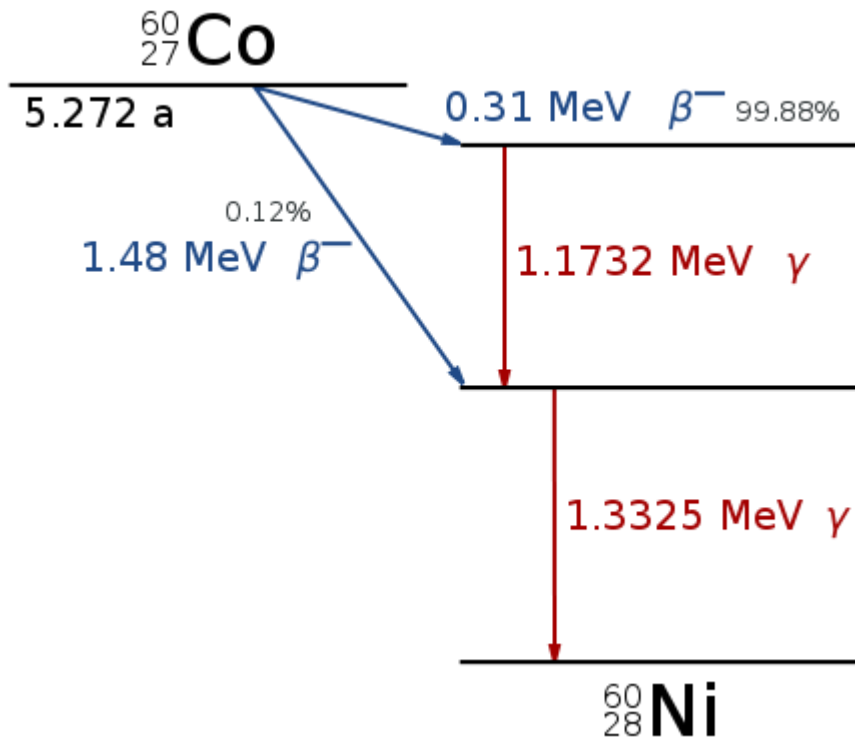
$=0,26366063388636412151901497$  MeV  
**Rp orbit = Re orbit /**  
 $/42,85035205755179156750106448016 =$   
 $=5,05002837550386332418e-20$   
 m/rad  
**angle speed of proton  $=2*\pi*f=$**   
 $138538364588050870918387289,2976$   
**9 rad/s = angle speed of  $\beta$**   
**electron in the center- of- mass**  
**coordinates system speed**  
**of proton =**  
 $=138538364588050870918387289,297$   
**69 rad/s\***  
 $*5,050028375503863324181e-20$  m/rad =  
 $6996226,7226555648498930849931m/s$   
 $=0,023336900365437361502580178294878c$   
**Radius of force reach of proton (**  
 **$v/c=0,0233369$  proton in neutron**  
**... W,Z):**  
 $r_p = 5,209499982315842954057e-$   
 15 m in the direction of movement  
 $r_p = 6,086602736065618022025e-$   
 15 m against direction of movement

proton = only energy of waves  
 radiated by movement of proton  
 $0,263660633886364121519015$  MeV+  
 $+0,247750240644449079625375$  MeV =  
 $= 0,5114108745308132011443905$  MeV  
  
 **$\beta$  electron is radiated from a**  
**neutron . Logically follows that**  
**, gamma rays are actually**  
**caused by the movement of a**  
**proton**

**Planck and orbital radius of proton and electron in a Co and Ni neutrons: Cobalt-60 Decay**

**0,31 MeV  $\beta$  electrons is radiated from a neutron 99,88% from CO-60, 1,48 MeV  $\beta$  electrons is radiated from a neutron 0,12% from**

CO-60



## Cobalt-60 Decay

Electron

Proton

$mc^2 \ln(1-v^2/c^2) + (2v^2/c^2)/(1-v^2/c^2)$ <p>in the direction of movement = kinetic energy of electron + energy of waves radiated by movement of electron</p>	$mc^2 [\ln  1+v/c  - (v/c) / (1+v/c)]$ <p>against the direction of movement = only energy of waves radiated by movement of electron</p>	$mc^2 \ln(1-v^2/c^2) + (2v^2/c^2)/(1-v^2/c^2)$ <p>in the direction of movement = kinetic energy of proton + energy of waves radiated by movement of proton</p>	$mc^2 [\ln  1+v/c  - (v/c) / (1+v/c)]$ <p>against the direction of movement = only energy of waves radiated by movement of proton</p>
<p><math>f = 2,8367852298127699672079838280397e+20</math> Hz  <b>Re orbit =</b>  <math>42,850352057551791567501064480165</math> *Rp  <b>orbit =</b> <math>42,850352057551791567501064480165</math> *  <math>8,6990713657946508626073196142044e-15</math> m =  <b>Re orbit =</b> <math>3,7275827059806869125485783868524e-13</math> m</p>		<p>0,00268572349418252610237987554703  <b>2,5199391898657489591669909237MeV</b>  v/c = <b>0,05172</b> , 1-v/c= 0,94828  <math>[\ln  1-v/c  + (v/c) / (1-v/c)] =</math>  <math>= 0,00143539122553642070990525571</math>  <b>kinetic energy of proton =</b>  <b>1,3467874149567344461710700766414</b>  MeV  Planck : <b>1,1732 MeV = h*f</b>  <b>f = 1,1732 MeV / h = 1,1732e+6 eV/</b>  <b>/4,1356673310e-15 eVs =</b>  <b>f =</b>  <b>283678522981276996720,79838280Hz</b>  <b>f = 2,836785229812769967207983828e+20 Hz</b>  Vlcek : v/c = <b>0,05172</b>, v =  <b>0,05172c</b>  <b>v = 2*pi*f*r</b>      <b>r = v/(2*pi*f)</b>  <b>r = 0,05172c/(2*pi*f)</b>  <math>= 8,69907136579465086260731961e-15</math> m  which is 10 times more than CODATA 2006 for the proton radius, the orbit is so real!  Lower speed of proton, a larger radius orbit the proton in a neutron (in a center-of-mass system)  <b>0,05172c = 15505265,92776 m/s</b>  <math>2*pi*f</math>  <math>= 1782404727558366288414,7841132354</math>  <b>r = 0,05172c * h / (2*pi* 1,1732 MeV )</b>  <b>0,05172 / 1,1732 =</b>  <b>0,044084555063075349471530855779</b></p>	<p>0,0012503836664180792918138993482  <b>1,1732 MeV</b> <math>\gamma</math> ray  <hr/> <b>1,3467874149567344461710700766414</b>  <b>+1,1732 =</b>  <b>=2,519987414956734446171070076641</b>    <b><math>\beta</math> electron is radiated from a neutron .</b>  Logically follows that , gamma rays are actually caused by the movement of a proton</p>

<p> <math>f = 3,2219709501581281804505953382738e+20 \text{ Hz}</math>  <b>Re orbit</b>  <math>42,850352057551791567501064480165^*</math>  <math>*8,18066498314118032563081834804e-15 \text{ m} =</math>  <math>=3,5054437459248556864205100794378e-13 \text{ m}</math>  <b>Re orbit</b> <math>=3,5054437459248556864205100794378e-13 \text{ m}</math>  <math>f</math> is electron frequency circulation in neutron  around center of mass </p>	<p style="text-align: center;">=</p>	<p> <math>0,0030656951951629005752891913607</math>  <b><math>2,8764560027150324805829147674735</math></b>  <math>v/c = \mathbf{0,055242}</math>, <math>1-v/c = 0,944758</math>  <math>[\ln  1-v/c  + (v/c) / (1-v/c)] =</math>  <math>0,00164564772927706190965458676942</math>  <b>kinetical energy of proton</b>  <math>=1,5440652080161668904309575 \text{ MeV}</math>  <b>Planck</b> : <math>1,3325 \text{ MeV} = h \cdot f</math>  <b><math>f = 1,3325 \text{ MeV} / h =</math></b>  <math>= 1,3325 e+6 \text{ eV} / 4,1356673310e-15 \text{ eVs}</math>  <b><math>f = 322197095015812818045,0595338 \text{ Hz}</math></b>  <b><math>f = 3,22197095015812818045059e+20 \text{ Hz}</math></b>  <math>2 \cdot \pi \cdot f =</math>  <math>=2024424053419300272172,43422339 \text{ Hz}</math>  <b>Vlcek</b> : <math>v/c = \mathbf{0,055242}</math>  <b><math>v = 0,055242c =</math></b>  <b><math>=16561134,964836 \text{ m/s}</math></b>  <math>v = 2 \cdot \pi \cdot f \cdot r</math>      <math>r = v / (2 \cdot \pi \cdot f)</math>  <b><math>r = 0,055242c / (2 \cdot \pi \cdot f)</math></b>  <b><math>=16561134,964836 /</math></b>  <b><math>r = 8,18066498314118e-15 \text{ m}</math></b>  which is 10 times more than CODATA  2006 for the proton radius, the orbit is  so real!  <b><math>0,055242 / 1,3325 =</math></b>  <math>=0,041457410881801125703564727955</math>  Greater speed of proton, smaller  radius of the orbit of the proton (in a  center-of-mass system)  <b><math>1,3467874149567344461710700766414</math></b>  <b><math>+1,1732 =</math></b>  <math>=2,519987414956734446171070077 \text{ MeV}</math> </p>	<p> <math>0,001420163855695610856070594001</math>  <b><math>1,3325 \text{ MeV } \gamma \text{ ray}</math></b>    <b><math>\beta</math> electron is radiated from a neutron .</b>  <b>Logically follows that , gamma rays</b>  <b>are actually caused by the movement</b>  <b>of a proton</b>  <hr/> <b><math>1,5440652080161668904309575020503</math></b>  <b><math>\text{MeV} + 1,3325 \text{ MeV} =</math></b>  <b><math>=2,87656520801616689043095750205</math></b> </p>
		<p> <math>0,06206184027937119578766962708235</math>  <b><math>58,23088782368431751016927661 \text{ MeV}</math></b>  <math>v/c = \mathbf{0,2385}</math>      <math>1-v/c = \mathbf{0,7615}</math>  <math>[\ln  1-v/c  + (v/c) / (1-v/c)] =</math> </p>	<p> <math>0,02131578019805794905922092308681</math>  <math>= [\ln  1+v/c  - (v/c) / (1+v/c)]</math>  <math>[\ln  1+v/c  - (v/c) / (1+v/c)]^*</math>  <b><math>*938,27201323 \text{ MeV} =</math></b> </p>

		0,04073252959733420964215285359831 kinetic energy of proton = =38,21819254924133012209363582 MeV 38,21819254924133012209363582MeV + +20 MeV = = 58,2181925492413301220936358 MeV	=19,999999999999999999999999999999 MeV Gamma rays The upper limit for such energies is about 20 MeV 20e+6 eV/4,1356673310e-15 eVs = =4,8359789120572280382e+21H Z γ rays
--	--	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

$h = 6,6260689633e-34 \text{ Js} = 4,1356673310e-15 \text{ eVs}$

$W_{+-} \text{ BOSON} = \beta \text{ electron } W_{+-} = 80 \text{ 398} \pm 0.25 \text{ MeV} = \text{kinetic energy of elektron in direction of motion of electron}$

Planck :  $80 \text{ 398 MeV} = h \cdot f$

$f = 80 \text{ 398 MeV/h} = 8,0 \text{ 398e+10 eV} / 4,1356673310e-15 \text{ eVs} = 19440151628578850990759246,829759 \text{ Hz}$

$= 1,9440151628578850990759246829759e+25 \text{ Hz}$

angular velocity of  $\beta$  elektron  $= 2 \cdot \pi \cdot f = 122146075082029946177950744,23446 \text{ rad/s}$

Re orbit =  $0,999994c / 122146075082029946177950744,23446 \text{ m/rad} =$

$= 299790659,245252 / 122146075082029946177950744,23446 =$

$= 2,4543617880797302297482811359261e-18 \text{ m/rad}$

Rp orbit = Re orbit /  $42,850352057551791567501064480165 = 5,7277517458510177080276963063067e-20 \text{ m/rad}$

angular velocity of proton  $= 2 \cdot \pi \cdot f = 122146075082029946177950744,23446 \text{ rad/s} =$  angular velocity of  $\beta$  elektron in center-of-mass coordinates system

velocity of proton  $= 122146075082029946177950744,23446 \text{ rad/s} \cdot 5,7277988053202572456202593603874e-20 \text{ m/rad} = 6996281,4292940956826137689614932 \text{ m/s} = 0,023337082847141190198366394399065c$

$\beta$  electron is radiated from a neutron . Logically follows that , gamma rays( eg  $1,1732 \text{ MeV } \gamma \text{ ray}$   $1,3325 \text{ MeV } \gamma \text{ ray}$  ) are actually caused by the movement of a proton.

$\gamma$  rays ( $\gamma$  photons) emitted by the excited protons

One neutron from the nucleus Co first converted on excited proton in nucleus Ni \*, ( and being radiated beta electron ) while the excited proton from nucleus Ni \* gets into state non excited Ni , which emits a gamma photon. I.e.  $\gamma$  ray ( $\gamma$  photons) are emitted by excited protons.

Comparing the kinetic energies of the 1,1732 MeV  $\gamma$  ray and proton we calculate the speed of proton :

$$1,1732 \text{ MeV} = \frac{mc^2}{\cos^2 \vartheta} \left[ \ln \left| 1 - \frac{v}{c} \cos \vartheta \right| + \frac{\frac{v}{c} \cos \vartheta}{1 - \frac{v}{c} \cos \vartheta} \right] = eU_{\text{mov}} = eU_{\text{still}} \left( 1 - \frac{v}{c} \cos \vartheta \right)^2 =$$

$$= 938,27201323 * \left[ \ln \left| 1 + \frac{v}{c} \right| - \frac{(v/c)}{(1+v/c)} \right],$$

$$\left[ \ln \left| 1 + \frac{v}{c} \right| - \frac{(v/c)}{(1+v/c)} \right] = 0,0012503836664180792918138993482723$$

$$v/c = \mathbf{0,05172} \quad 1+v/c = 1,05172 \quad \left[ \ln \left| 1 + \frac{v}{c} \right| - \frac{(v/c)}{(1+v/c)} \right] = 0,001250332268646105392474619837639$$

$$v/c = \mathbf{0,05172} \quad 1-v/c = 0,94828 \quad \left[ \ln \left| 1 - \frac{v}{c} \right| + \frac{(v/c)}{(1-v/c)} \right] = 0,0014353912255364207099052557093913$$

the kinetic energy of proton = **1,3467874149567344461710700766414 MeV**

$$1 - v^2/c^2 = 0,9973250416 \quad v^2/c^2 = 0,0026749584$$

Comparing the kinetic energies of the 1,3325 MeV  $\gamma$  ray and proton we calculate the speed of proton :

$$1,3325 \text{ MeV} = \frac{mc^2}{\cos^2 \vartheta} \left[ \ln \left| 1 - \frac{v}{c} \cos \vartheta \right| + \frac{\frac{v}{c} \cos \vartheta}{1 - \frac{v}{c} \cos \vartheta} \right] = eU_{\text{mov}} = eU_{\text{still}} \left( 1 - \frac{v}{c} \cos \vartheta \right)^2 =$$

$$= 938,27201323 * \left[ \ln \left| 1 + \frac{v}{c} \right| - \frac{(v/c)}{(1+v/c)} \right], \quad \left[ \ln \left| 1 + \frac{v}{c} \right| - \frac{(v/c)}{(1+v/c)} \right] = 0,0014201638556956108560705940006587$$

$$v/c = \mathbf{0,055242} \quad 1+v/c = 1,055242 \quad \left[ \ln \left| 1 + \frac{v}{c} \right| - \frac{(v/c)}{(1+v/c)} \right] = 0,0014200474658858386656346045912884$$

$$1 - v^2/c^2 = 0,996948321436 \quad v^2/c^2 = 0,003051678564$$

$$v/c = \mathbf{0,0233371} \quad 1+v/c = \mathbf{1,0233371}$$

$$\left[ \ln \left| 1 + \frac{v}{c} \right| - \frac{(v/c)}{(1+v/c)} \right] = \mathbf{2,6405393248504354747513935636936e-4}$$

$$1 - v^2/c^2 = 0,99945537976359 \quad v^2/c^2 = 0,00054462023641$$

$$\ln(1 - v^2/c^2) = -5,4476859587977874891229245264689e-4$$

$$v/c = \mathbf{0,0233371} \quad , 1 - v/c = 0,9766629$$

$$[\ln|1 - v/c| + (v/c) / (1 - v/c)] = 2,8101149011597037322533689209691e-4$$

**Proton 938,27201323 MeV/c<sup>2</sup> :**

v/c	$mc^2 \ln(1 - v^2/c^2) + (2v^2/c^2) / (1 - v^2/c^2)$ <b>in the direction of movement = kinetic energy of proton + energy of waves radiated by movement of proton</b>	$mc^2 [\ln 1 + v/c  - (v/c) / (1 + v/c)]$ <b>against the direction of movement = only energy of waves radiated by movement of proton</b>
0,0233371	$5,4506542260101392070047624846627e-4$ <b>0,51141963140591407441489142146824 MeV</b> because : for emission of electron $\beta$ from neutron is valid equation: <i>kinetic energy of proton + energy of waves radiated by movement of proton = kinetic energy of elektron in direction of motion of electron</i> $= 0,26366521657187376826117133419276 \text{ MeV} +$ $+ 0,24775441483404030615372008727548 \text{ MeV } \gamma \text{ ray ( for emission of electron } \beta \text{ from neutron) =}$ $= 0,51141963140591407441489142146776 \text{ MeV =free electron}$  (for electron speed $v = 0,6821555671006273161671553c$ ) = $= 0,51099890997249598396127388955714 \text{ MeV}$ for a free electron, which left neutron, from $\beta$ electron (W + -, or Z) becomes a free electron ( $v = 0,6821555671 c$ )  <hr/> $v/c = \mathbf{0,0233371} \quad , 1 - v/c = 0,9766629$ $[\ln 1 - v/c  + (v/c) / (1 - v/c)] =$	$2,6405393248504354747513935636936e-4$ <b>0,24775441483404030615372008727548 MeV <math>\gamma</math> rays for emission of electron <math>\beta</math> from neutron</b> <b>energy of waves radiated by movement of proton:</b> <hr/> $mc^2 [\ln 1 + v/c  - (v/c) / (1 + v/c)] = \mathbf{938,27201323 \text{ MeV} *}$ $* 2,6405393248504354747513935636936e-4 =$ $= 0,24775441483404030615372008727548 \text{ MeV } \gamma \text{ rays}$ ( for emission of electron $\beta$ from neutron)  <b>Comment:</b> $0,26366521657187376826117133419276 +$ $+ 0,24775441483404030615372008727548 =$ $= 0,51141963140591407441489142146776$ for emission of electron $\beta$ from neutron is valid equation: <i>kinetic energy of proton + energy of waves radiated by movement of proton = kinetic energy of elektron in direction of motion of electron (for v/c = 0,6821555671006273161671553)</i> $= 0,51099890997249598396127388955714 \text{ MeV =free electron (for electron speed$

	<p>= 2,8101149011597037322533689209691e-4  <b>kinetic energy of proton =</b>  <b>=0,26366521657187376826117133419276 MeV</b></p>	<p><b>v =0,6821555671006273161671553c) =</b>  <b>=0,51099890997249598396127388955714 MeV</b>  <b>for a free electron, which left neutron,</b>  <b>from β electron (W + -, or Z) becomes a free electron (v =</b>  <b>0,6821555671 c )</b></p>
<p><b>W+- BOSON = β electron W+- = 80 398±0.25 MeV = kinetic energy of elektron in direction of motion of electron</b>  <b>Planck : 80 398 MeV = h*f</b>  <b>f = 80 398 MeV/h = 8,0 398e+10 eV /4,1356673310e-15 eVs =19440151628578850990759246,829759 Hz</b>  <b>=1,9440151628578850990759246829759e+25 Hz</b>  <b>angular velocity of β elektron =2*π*f=122146075082029946177950744,23446 rad/s</b></p> <p><b>Re orbit = 0,999994c /122146075082029946177950744,23446 m/rad=</b>  <b>= 299790659,245252 / 122146075082029946177950744,23446=</b>  <b>=2,4543617880797302297482811359261e-18 m/rad</b></p> <p><b>Rp orbit = Re orbit / 42,850352057551791567501064480165 = 5,7277517458510177080276963063067e-20 m/rad see you [3] p.68.</b></p> <p><b>angular velocity of proton =2*π*f=122146075082029946177950744,23446 rad/s= angular velocity of β elektron in center-of-mass coordinates system</b></p> <p><b>velocityofproton=122146075082029946177950744,23446rad/s*5,7277988053202572456202593603874e-20m/rad</b>  <b>=6996281,4292940956826137689614932m/s= =0,023337082847141190198366394399065c =0,0233371c</b></p> <p><b>for emission of electron β from neutron is valid equation:</b>  <b>kinetic energy of proton + energy of waves radiated by movement of proton = kinetic energy of elektron in direction of motion of electron (for electron speed v =0,6821555671006273161671553c ) =0,51099890997249598396127388955714 MeV</b></p>		
<p><b>0,05172</b></p>	<p>0,0026857234941825261023798755470303  <b>2,5199391898657489591669909237489</b></p>	<p>0,0012503836664180792918138993482723  <b>1,1732 MeV γ rays</b></p>

	<p>v/c = 0,05172 , 1-v/c= 0,94828  <math>[\ln  1-v/c  + (v/c) / (1-v/c) ] =</math>  =0,0014353912255364207099052557093913  <b>kinetic energy of proton =</b>  <b>1,3467874149567344461710700766414 MeV</b></p> <hr/> <p><b>1,3467874149567344461710700766414 +1,1732 =</b>  = <b>2,519987414956734446171070076641 MeV=</b>  = <math>mc^2 \ln (1-v^2/c^2) + (2v^2/c^2) / (1-v^2/c^2) =</math>  = <b>in the direction of movement = kinetic energy of proton +</b>  + <b>energy of waves radiated by movement of proton</b></p>	<p>Comparing the kinetic energies of the 1,1732 MeV <math>\gamma</math> rays and proton we calculate the speed of proton :</p> <p><b>1,1732 MeV =</b></p> $\frac{mc^2}{\cos^2 \vartheta} \left[ \ln \left  1 - \frac{v}{c} \cos \vartheta \right  + \frac{\frac{v}{c} \cos \vartheta}{1 - \frac{v}{c} \cos \vartheta} \right] = eU_{\text{mov}} =$ <p>= <b>938,27201323 MeV * [ln  1+v/c - (v/c) / (1+v/c) ] ,</b>  <b>v = 0,05172c</b> see you above</p> <hr/> <p><math>mc^2 [\ln  1+v/c - (v/c) / (1+v/c) ] =</math> <b>1,1732 MeV</b>  <b>against the direction of movement = only energy of waves radiated by movement of proton = energy of <math>\gamma</math> rays 1,1732 MeV</b></p>
0,055242	<p>0,0030656951951629005752891913607114  <b>2,8764560027150324805829147674735</b>  v/c = 0,055242, 1-v/c= 0,944758  <math>[\ln  1-v/c  + (v/c) / (1-v/c) ] =</math>  = 0,0016456477292770619096545867694231  <b>kinetic energy of proton =</b>  <b>=1,5440652080161668904309575020503 MeV</b></p> <hr/> <p><b>1,544065208016166890430957502050 MeV+1,3325 MeV=</b>  = <b>2,87656520801616689043095750205 MeV=</b>  = <math>mc^2 \ln (1-v^2/c^2) + (2v^2/c^2) / (1-v^2/c^2) =</math>  = <b>in the direction of movement = kinetic energy of proton +</b>  + <b>energy of waves radiated by movement of proton</b></p>	<p>0,0014201638556956108560705940006587  <b>1,3325 MeV <math>\gamma</math> rays</b>  Comparing the kinetic energies of the 1,3325 MeV <math>\gamma</math> ray and proton we calculate the speed of proton :</p> <p><b>1,3325MeV=</b></p> $\frac{mc^2}{\cos^2 \vartheta} \left[ \ln \left  1 - \frac{v}{c} \cos \vartheta \right  + \frac{\frac{v}{c} \cos \vartheta}{1 - \frac{v}{c} \cos \vartheta} \right] = eU_{\text{mov}} =$ <p>= <b>938,27201323 * [ln  1+v/c - (v/c) / (1+v/c) ] ,</b>  <math>[\ln  1+v/c - (v/c) / (1+v/c) ] =</math>  = <b>0,0014201638556956108560705940006587</b>  <b>v =0,055242c</b></p> <hr/> <p><math>mc^2 [\ln  1+v/c - (v/c) / (1+v/c) ] =</math> <b>1,3325 MeV</b>  <b>against the direction of movement=onlyenergy of waves radiated by movement of proton = energy of <math>\gamma</math> rays 1,3325 MeV</b></p>

<b>0,1</b>	0,01015168434851876083665316264402 <b>9,5250413113601786986314420892325</b>	0,0044010888952339509530430323716742 <b>4,1294185381353557125587631775622</b>
<b>0,2</b>	0,042511338813078203778756268178333 <b>39,887199453249524912925837248854</b>	0,015654890127287959545051358487848 <b>14,688545276624924762274133011344</b>
<b>0,2385</b> upper limit for speed of proton in neutron= 0,2385c	0,062061840279371195787669627082353 <b>58,230887823684317510169276612683 MeV</b> v/c = 0,2385      1-v/c= 0,7615      [ln  1-v/c + (v/c) / (1-v/c) ] = 0,040732529597334209642152853598307 <b>kinetic energy of proton =</b> <b>=38,218192549241330122093635817073 MeV</b> <b>Comment: <math>mc^2 \ln(1-v^2/c^2) + (2v^2/c^2) / (1-v^2/c^2) =</math></b> <b>= in the direction of movement = kinetic energy of proton +</b> <b>+ energy of waves radiated by movement of proton =</b> <b>38,218192549241330122093635817073 MeV + 20 MeV =</b> <b>= 58,218192549241330122093635817073 MeV</b>	0,02131578019805794905922092308681 <b>Gamma rays The upper limit for such energies is about 20 MeV</b> <b>20 MeV =</b> $\frac{mc^2}{\cos^2 \vartheta} \left[ \ln \left  1 - \frac{v}{c} \cos \vartheta \right  + \frac{\frac{v}{c} \cos \vartheta}{1 - \frac{v}{c} \cos \vartheta} \right] = eU_{\text{mov}} =$ = <b>= 938,27201323 [ln  1+v/c - (v/c) / (1+v/c) ] ,</b> <b>[ln  1+v/c - (v/c) / (1+v/c) ]=</b> <b>=0,02131578019805794905922092308681</b> v/c = <b>0,2385</b> 1+v/c= 1,2385      [ln  1+v/c - (v/c) / (1+v/c) ] = 0,021329310682036986145516773484046 v/c = <b>0,2385</b> 1-v/c= <b>0,7615</b> [ln  1-v/c + (v/c) / (1-v/c) ] = 0,040732529597334209642152853598307 <b>kinetic energy of proton =</b> <b>38,218192549241330122093635817073 MeV</b>  1 - v <sup>2</sup> /c <sup>2</sup> = 0,94311775      , v <sup>2</sup> /c <sup>2</sup> =0,05688225      ln (1-v <sup>2</sup> /c <sup>2</sup> ) = <b>-0,058564136699643354622393167303608</b>

<b>0,3</b>	0,1034915183309564753206594734422 <b>97,103195256615981530619973957697</b>	0,031595033698260282804726756111724 <b>29,644735876136367895740124416315</b>
<b>0,4</b>	0,20659899380760319968003169486638 <b>193,84605385115215744477303017213</b>	0,050757950906927216218879124502706 <b>47,624764784872103514767224480511</b>
<b>0,5</b>	0,37898459421488573922744766067367 <b>355,59063819715545377935410145411</b>	0,072131774774831048644679782131016 <b>67,679225535833657944955762108731</b>
<b>0,6</b>	0,678712897371580488467409819381 <b>636,81731662199920030130340847408</b>	0,095003629245735553650937031148342 <b>89,139246476552804316253364891193</b>
<b>0,7</b>	1,248224074187214795765659690525 <b>1171,173715049790902349488797128</b>	0,11886354517981745505507257495347 <b>111,52633783552238591841798542491</b>
<b>0,8</b>	2,5339043080235741891445273629486 <b>377,49149642144899674890050027</b>	0,14334222045767456374528669617442 <b>134,49399376968080492945211734271 / meson pí +- /</b>
<b>0,9</b>	6,8655845826520333024993603119937 <b>6441,7858683657726192890803907208</b>	0,16816967564607898651735176667717 <b>157,78890013268263163523366844813</b>
<b>0,99</b>	94,585477015562380011096949442981 <b>88746,905941711606333662244494576</b>	0,19064720155047137913293235234906 <b>178,8789336154263583545510500319</b>
<b>0,999</b>	992,28514190159865722507680221572 <b>931033,3777902292026700374964563</b>	0,19289718058079427713077657976902 <b>180,99002596993270707595628949319</b>
<b>0,9999</b>	9989,9827818085837834082411933913 <b>9373321,2568205757269535807354964</b>	0,19312218055996614431315921000012 <b>181,20113715336700296534860754822</b>
<b>0,99994</b>	166653,83606125849039287728844767 <b>156366630,27369937738835558708407</b>	0,19314568055994531391725237153108 <b>181,22318654565836338784472026638</b>

$$\begin{aligned}
20 \text{ MeV} &= \frac{mc^2}{\cos^2 \vartheta} \left[ \ln \left| 1 - \frac{v}{c} \cos \vartheta \right| + \frac{\frac{v}{c} \cos \vartheta}{1 - \frac{v}{c} \cos \vartheta} \right] = eU_{\text{mov}} = eU_{\text{still}} \left( 1 - \frac{v}{c} \cos \vartheta \right)^2 = \\
&= 938,27201323 * [\ln |1+v/c|- (v/c) / (1+v/c) ], \\
&[\ln |1+v/c|- (v/c) / (1+v/c) ] = 0,02131578019805794905922092308681
\end{aligned}$$

$v/c = \mathbf{0,2385}$     $1+v/c = 1,2385$     $[\ln|1+v/c| - (v/c) / (1+v/c)] = 0,021329310682036986145516773484046$   
 $v/c = \mathbf{0,2385}$     $1-v/c = \mathbf{0,7615}$     $[\ln|1-v/c| + (v/c) / (1-v/c)] = 0,040732529597334209642152853598307$   
**kinetic energy of proton = 38,218192549241330122093635817073 MeV**

$1 - v^2/c^2 = 0,94311775$  ,  $v^2/c^2 = 0,05688225$     $\ln(1-v^2/c^2) = \mathbf{-0,058564136699643354622393167303608}$

### Electron **0,51099891013 MeV/c<sup>2</sup>**

v/c	$mc^2 \ln(1-v^2/c^2) + (2v^2/c^2) / (1-v^2/c^2)$ in the direction of movement = kinetic energy of of realy electron + energy of waves radiated by movement of electron	$mc^2 [\ln 1+v/c  - (v/c) / (1+v/c)]$ against the direction of movement = only energy of waves radiated by movement of electron
<b>0,1</b>	0,01015168434851876083665316264402 <b>0,0051874996380768658673878930679016 MeV</b>	0,0044010888952339509530430323716742
<b>0,2</b>	0,042511338813078203778756268178333	0,015654890127287959545051358487848
<b>0,3</b>	0,1034915183309564753206594734422	0,031595033698260282804726756111724
<b>0,4</b>	0,20659899380760319968003169486638	0,050757950906927216218879124502706
<b>0,5</b>	0,37898459421488573922744766067367 <b>0,19366071459986691576770514278552 MeV</b>	0,072131774774831048644679782131016
	<b>0,31 MeV ...99,88%</b> <b>0,31 MeV <math>\beta</math> electrons is radiated from a neutron 99,88%</b> <b>from CO-60, see you scheme-fig. Cobalt-60 Decay above.</b>	
<b>0,6</b>	0,678712897371580488467409819381 <b>0,34682155084805217124241945172775 MeV</b>	0,095003629245735553650937031148342
<b>0,7</b>	1,248224074187214795765659690525	0,11886354517981745505507257495347
<b>0,8</b>	2,5339043080235741891445273629486 <b>1,2948223397737582250000519595204 MeV</b>	0,14334222045767456374528669617442 <b>0,073247718429485891868064712669302</b>

	1,48 MeV ...0,12 % 1,48 MeV $\beta$ electrons is radiated from a neutron 0,12% from CO-60 see you scheme-fig. Cobalt-60 Decay above.	
0,9	6,8655845826520333024993603119937 3,5083062391405199226056377244506	0,16816967564607898651735176667717 0,085934520972061965718261717105777
0,99	94,585477015562380011096949442981	0,19064720155047137913293235234906
0,999	992,28514190159865722507680221572	0,19289718058079427713077657976902
0,9999	9989,9827818085837834082411933913 5104,870313721651903600403226683 MeV	0,19312218055996614431315921000012
0,999994 W+-	166653,83606125849039287728844767 85159,928596286780506969369911588 MeV	

## Discussion to Cobalt-60 Decay

Neutron is source  $\beta$  rays -  $\beta$  electrons ( bosons Zo W+- too) ,  $\gamma$  rays, electron neutrinos, muon neutrinos, tauon neutrinos:

1a.)  $\beta$  electron is radiated from a neutron ,for  $v/c = 0,999994396591$

**BOSON Z =  $\beta$  electron**

for  $v/c = 0,99999364465781184$  W+- BOSON =  $\beta$  electron w+-

1b.) electron neutrinos, muon neutrinos, tauon neutrinos are waves against the direction of movement (= only energy of waves radiated by movement of electron ) and in direction of movement (= only energy of waves radiated by movement of electron)

2. Logically follows that , gamma rays are actually caused by the movement of a proton in neutron.

Quarks

Why are discovered by quarks in pairs?

u,d

c,s

t,b

We show that each particle is accompanied by his twin.

A pair of quarks of one generation = one speed of proton.

**u,d quarks are in the proton at speed of proton :**

**from  $v= 0,05875c$  to  $v= 0,105065c$  .... down – up,**

<b>PROTON</b>	<b>Front of proton</b>	<b>Behind proton</b>
$\frac{v}{c}$	$\left[ \ln \left  1 - \frac{v}{c} \right  + \frac{\frac{v}{c}}{1 - \frac{v}{c}} \right]$ kinetic energy of proton in direction of motion of proton	$\left[ \ln \left  1 + \frac{v}{c} \right  - \frac{\frac{v}{c}}{1 + \frac{v}{c}} \right]$ kinetic energy of proton against direction of motion of proton
<b>0,05875</b>	<b>0,0018704988039450329861777626124876</b> <i>Down quark: 1,7550 MeV</i>	<b>0,0015986835148543461794415692315107</b> <i>Up quark: 1,5 MeV</i>
<b>0,075</b>	<b>0,0031195396113692225967210545118109</b> <i>Down quark: 2,92697671 MeV</i>	<b>0,0025532197191610043413170483032692</b> <i>Up quark: 2,4MeV</i>
<b>0,081622</b>	<b>0,0037302615346601410853636615401917</b> <i>Down quark: 3,5 MeV</i>	<b>0,0029991740444424494322328316937018</b> <i>Up quark: 2,81404106871 MeV</i>
<b>0,08878</b>	<b>0,0044589013511482922312132108807756</b> <i>Down quark: 4,18366235 MeV</i>	<b>0,0035171037326795615947714523093236</b> <i>Up quark: 3,3 MeV</i>
<b>0,094686</b>	<b>0,0051156918494022662432562213837619</b> <i>Down quark: 4,8MeV</i>	<b>0,0039715278483606256196473452168454</b> <i>Up quark: 3,72637 MeV</i>
<b>0,105065</b>	<b>0,0063947340594173847177662769260429</b> <i>Down quark: 6 MeV</i>	<b>0,0048283015026596502291040657295924</b> <i>Up quark: 4,530260 MeV</i>

**c,s quarks are in the proton at speed of proton**

**from  $v=0,5111c$  to  $v=0,7805c$  :**

<b>PROTON</b>	<b>Front of proton</b>	<b>Behind proton</b>

$\frac{v}{c}$	$\left[ \ln \left  1 - \frac{v}{c} \right  + \frac{\frac{v}{c}}{1 - \frac{v}{c}} \right]$ kinetic energy of proton in direction of motion of proton	$\left[ \ln \left  1 + \frac{v}{c} \right  - \frac{\frac{v}{c}}{1 + \frac{v}{c}} \right]$ kinetic energy of proton against direction of motion of proton
0,5111	0,32981074951021491557976368704646 c quark: 309,452195927844585291MeV 1.16–1.34 GeV	0,074607434272664489316082658299818 s quark: 70,002067556937811146930701620MeV
0,6668	0,90218811150262740395503144610525 c quark: 846,49785569 MeV 1.16–1.34 GeV	0,11085762440585416420687015655648 s quark: 104,0146 MeV
0,6821555671006273161671553	1,00000000000000000000000002540294 proton 938,27201323 MeV	0,11455138503597051915497991380189 107,48035865598495497447128210228 MeV muon ??
0,68235958021424280152472	1,0013786565641523712273883571732 neutron = 939,5655681 MeV	0,1146005687662303001068450497695 107,52650637359396091907658895042 MeV muon ??
0,713	1,236047494268773255524413529431 c quark: 1160 MeV 1.16–1.34 GeV	0,12201738104659464824870350196726 s quark=114,485493763640 MeV
0,72585	1,3535582771630143437838209404184 c quark: 1270 MeV 1.16–1.34 GeV	0,12514431408438967945446850497659 s quark: 117,41941 MeV
0,73333	1,4281572732698825869678018468163 c quark: 1340 MeV 1.16–1.34 GeV	0,12696860023316592749751861919307 s quark= 119,1311MeV

0,7805	2,0394056095695354577702972159855 c quark:1913,517207083363387638 MeV/c <sup>2</sup> 1.16–1.34 GeV	0,13853421250289559168530489708379 s quark: 129,982774 MeV
<b>0,9928305</b>	<b>Higgs Boson /p:</b> 133,54335827671029218747501724036 <b>Higgs Boson 125300 MeV/c<sup>2</sup></b>	<b>0,191354813279005033975005068774</b> <b>179,5428721672400220720275MeV/c<sup>2</sup></b>

**t quark is in the proton (neutron) at speed of proton (neutron):**

**v=0,994637c for Top quark: 169 100MeV**

**v=0,994766c for Top quark: 173 400MeV/c<sup>2</sup>**

PROTON	Front of proton	Behind proton
$\frac{v}{c}$	$\left[ \ln \left  1 - \frac{v}{c} \right  + \frac{\frac{v}{c}}{1 - \frac{v}{c}} \right]$ kinetic energy of proton in direction of motion of proton	$\left[ \ln \left  1 + \frac{v}{c} \right  - \frac{\frac{v}{c}}{1 + \frac{v}{c}} \right]$ kinetic energy of proton against direction of motion of proton
<b>0,9928305</b>	<b>Higgs Boson /p:</b> 133,54335827671029218747501724036 <b>Higgs Boson 125300 MeV/c<sup>2</sup></b>	<b>0,191354813279005033975005068774</b> <b>179,5428721672400220720275MeV/c<sup>2</sup></b>
<b>0,994637</b>	180,2249215745799592957129046 9898 <b>Top quark: 169 100MeV</b>	0,19180643378644112290601029593 852 <b>179,966608779270804265884148 MeV</b>
<b>0,994766</b>	184,8078143171624183434454031 6264 <b>Top quark: 173 400MeV</b>	0,19183868355887822897300444041 866 <b>179,99686783818157713891779163 MeV</b>

**b quark is in the proton (neutron) at speed of proton (neutron):**

**v=0,8665c pre 4,2 GeV Bottom quark**

<b>PROTON</b>	<b>Front of proton</b>	<b>Behind proton</b>
$\frac{v}{c}$	$\left[ \ln \left  1 - \frac{v}{c} \right  + \frac{\frac{v}{c}}{1 - \frac{v}{c}} \right]$	$\left[ \ln \left  1 + \frac{v}{c} \right  - \frac{\frac{v}{c}}{1 + \frac{v}{c}} \right]$
	<b>kinetic energy of proton in direction of motion of proton</b>	<b>kinetic energy of proton against direction of motion of proton</b>
<b>0,8665</b>	4,476313841592169302436394	0,159827140990503087217669575
	4,2 GeV <i>Bottom quark</i>	<b>149,96133334595438795425311140944 MeV</b>

**Leptons ( electron, muon, tau ), W + - Z bosons and neutrinos**

Leptons ( electron, muon, tau ), W + - Z bosons and neutrinos ( electron neutrino , muon neutrino, tau neutrino) can be replaced with electron moving at different speeds from 0.1c up to 0.999.. c :

<b>ELECTRON</b>	<b>Front of elektron</b>	<b>Behind elektron</b>
$\frac{v}{c}$	$\left[ \ln \left  1 - \frac{v}{c} \right  + \frac{\frac{v}{c}}{1 - \frac{v}{c}} \right]$	$\left[ \ln \left  1 + \frac{v}{c} \right  - \frac{\frac{v}{c}}{1 + \frac{v}{c}} \right]$
	<b>kinetic energy of elektron in direction of motion of electron</b>	<b>kinetic energy of elektron against direction of motion of electron</b>



where  $v$  is velocity of electron , proton , neutron, alpha particle.

$\frac{v}{c}$	Front of electron, proton, neutron, deuteron, He-3, $\alpha$ -particle	Behind of electron, proton, neutron, deuteron, He-3, $\alpha$ -particle	Decay modes
	$\left[ \ln \left  1 - \frac{v}{c} \right  + \frac{\frac{v}{c}}{1 - \frac{v}{c}} \right]$	$\left[ \ln \left  1 + \frac{v}{c} \right  - \frac{\frac{v}{c}}{1 + \frac{v}{c}} \right]$	
<b>Neutron</b> <b>0,5836009497521116689581</b>	<b>K<sup>+</sup>/<u>n0</u> :</b> 0,5254312381545198230873 <b>Kaon K<sup>+</sup></b> 493.677 MeV/c <sup>2</sup>	<b>/<u>n0</u> :</b> 0,09117355136082414012969482667 85,6635122670815933982547583 <b>MeV/c<sup>2</sup></b> f =2,07133460116943425312851e+22 <b>Hz</b> ...gamma rays $\gamma + \gamma$	<b><math>\mu^+ + \nu_\mu</math> or</b> <b><math>\pi^+</math> + <math>\pi^0</math> or</b> <b><math>\pi^0 + e^+ + \nu_e</math></b>
<b>Neutron</b> <b>0,58484084562020497175</b>	<b>K<sup>0</sup>/<u>n0</u> :</b> 0,52962147343915804715590191755369 <b>K<sup>0</sup></b> 497,614 MeV/c <sup>2</sup>	<b>?/<u>n0</u> :</b> 0,091462174250863105453354510569334 85,934692341921117094216144 <b>MeV/c<sup>2</sup></b> f = 2,0778917064911439211823414e+22 <b>Hz</b> ...gamma rays $\gamma + \gamma$	<b><math>\pi^\pm + e^\mp + \nu_e</math> or</b> <b><math>\pi^\pm + \mu^\mp + \nu_\mu</math> or</b> <b><math>\pi^0 + \pi^0 + \pi^0</math> or</b> <b><math>\pi^+ + \pi^0 + \pi^-</math></b>
<b>Neutron</b> <b>0,599835288</b>	<b><math>\eta</math>/<u>n0</u> :</b> : 0,58309194091818769891623293001713 <b>Eta</b> meson $\eta$ 547,853 MeV/c <sup>2</sup>	<b><math>\gamma</math> ? /<u>n0</u> :</b> 0,094965026195762925653475196132505 89,22585075434455074110 <b>MeV/c<sup>2</sup></b> f=2,15747156630740041065976e+22Hz...gamma rays $\gamma + \gamma$	<b><math>\gamma</math> + <math>\gamma</math> or</b> <b><math>\pi^0 + \pi^0 + \pi^0</math> or</b> <b><math>\pi^+ + \pi^0 + \pi^-</math></b>
<b>Neutron</b> <b>0,68499502942048864</b>	<b><math>\eta'</math>(958)/<u>n0</u> :</b> : 1,0193862207063241677384071561382 <b>Eta prime meson <math>\eta'</math>(958)</b> 957,78 MeV/c <sup>2</sup>	<b><math>\gamma</math> ? /<u>n0</u> :</b> 0,115236174677131574767638556 108,27192004399275268448921 <b>MeV/c<sup>2</sup></b> f = 2,618003492816778961296378e+22Hz ...gamma rays $\gamma + \gamma$	<b><math>\pi^+ + \pi^- + \eta</math> or</b> <b><math>(\rho^0 + \gamma) / (\pi^+ + \pi^- + \gamma)</math> or</b> <b><math>\pi^0 + \pi^0 + \eta</math></b>
<b>Alpha particle</b> <b>0,740795108978806110189</b>	<b><math>\Lambda 0b</math>5620,2/<math>\alpha</math>:</b> 1,5078154480367796791747546093745 <b>bottom</b> Lambda <b><math>\Lambda 0b</math></b> 5620,2MeV/c <sup>2</sup>	<b>/<math>\alpha</math>:</b> 0,12879211144543390135241844828114 480,057042583086248078468247 <b>MeV/c<sup>2</sup></b>	See <a href="#"><math>\Lambda 0b</math> decay modes</a>
<b>Alpha particle</b> <b>0,753304289775682</b>	<b><math>\Omega^- b</math> /<math>\alpha</math>:</b> 1,6539771248615256969702790233076 <b>bottom Omega <math>\Omega^- b</math></b> 6165 MeV/c <sup>2</sup>	<b>K<sup>+</sup> /<math>\alpha</math>:</b> 0,13185382624286629129216216386684 491,4692147603471497734838317031 <b>MeV/c<sup>2</sup></b> 2,20778523965285 <b>MeV/c<sup>2</sup></b> less than <b>K<sup>+</sup> mezón</b> 493,677 <b>MeV/c<sup>2</sup></b>	<b><math>(\Omega^- + J/\psi)</math> seen)</b>
		<b>K<sup>+</sup> 493,677/<math>\alpha</math>:</b> 0,13244614197078588654692405272934	<b><math>\mu^+ + \nu_\mu</math> or</b> <b><math>\pi^+ + \pi^0</math> or</b>

			$\pi^0 + e^+ + \nu_e$
<b>0,76</b>	1,739550311026520918277625358595	0,13349562723187859551307097261093	
		<a href="#">K0</a> , <a href="#">K0S</a> , <a href="#">K0L</a> 497,614/a: 0,13350238007979032474302239232303	$\pi^\pm + e^\mp + \nu_e$ or $\pi^\pm + \mu^\mp + \nu_\mu$ or $\pi^0 + \pi^0 + \pi^0$ or $\pi^+ + \pi^0 + \pi^-$
<b>Neutron</b> <b>0,8103668245118</b>	$\Sigma^+c//n^0$ : 2,6106751662913639364421254497813 2452,9 MeV/c <sup>2</sup>	( $\pi^0/n^0$ : 0,1436585501770159947294269 ) ( $\pi^+ /n^0$ : 0,1485475979299 ) 0,14590373087681143063739535698886 137,08609408352138674567554995853 <a href="#">MeV/c<sup>2</sup></a> ..... pion pi $\pi^0$	$\Delta^+c + \pi^0$
	$\Sigma c$ (2455) / $n^0$ : 2,6129102428463471969270455599951		
<b>Proton</b> <b>0,8105263656822</b>	$\Sigma^+c/ p^+$ : 2,6142737704998220827257144593942 2452,9 MeV/c <sup>2</sup>	0,145943178944838051921943801563 136,93440513896538769387243389314 <a href="#">MeV/c<sup>2</sup></a> ..... pion zero $\pi^0$	$\Delta^+c + \pi^0$
<b>Neutron</b> <b>0,821091179644426</b>	$\Omega c$ // $n^0$ : 2,8685603604665840766027218852177 Charmed <a href="#">Omega <math>\Omega c</math></a> 2695,2 MeV/c <sup>2</sup>	$\pi^\pm /n^0$ : 0,14855719485567454693134509431545 139,57919697038852205221964844453 <a href="#">MeV/c<sup>2</sup></a> ..... pion pi $\pi^+$ , $\pi^+$ , $\pi^-$ $\pi^- = 139,57018 \pm 0,00035$ MeV/c <sup>2</sup>	See <a href="#"><math>\Omega c</math> decay modes</a>
	$\Omega c^0 = 2695,2$ $\Omega c^0 /p^+$ : 2,8725144391651203471961904745908		
<b>Proton</b> <b>0,8212451756</b>	$\Omega c$ / $p^+$ : 2,8725144391651203471961904745908 2,872514499307888530047789439106 2,695.2 $\pm$ 1.7 <a href="#">MeV/c<sup>2</sup></a> 6,9 $\pm$ 1.2 $\times$ 10 <sup>-14</sup> s	<b>Proton</b> v/c= 0,82188 $\pi^+ / p^+$ : 0,14875235875885830238195117240016 139,57017509117216095767602139546.... MeV/c <sup>2</sup> 139,57 = $\pi^- +$	See <a href="#"><math>\Omega c</math> decay modes</a>
<b>Electron</b> <b>0,996425584251459554502</b>	$\pi^-/e^-$ : 273,13204749023558573115849192 139,5701835 MeV/c <sup>2</sup> pi minus $\pi^-$ 139,57 MeV/c <sup>2</sup>	$\nu\mu/e^-$ : 0,19225357757678994895712344707072 98,241372067052395131711693801718 keV/c <sup>2</sup> = kinetic energy of elektron against direction of motion of electron <	$\mu^+ + \nu\mu$

## Conclusion

All movements in physics are based on principle of **action - reaction** and on velocity of stable particles ( **e-, p+,n0, D, He-3,  $\alpha$**  ).

**Action**, as a motion of stable charged particles ( **e-, p+,n0, D, He-3,  $\alpha$**  ), is characterized speeds up in source along ellipse.

**Action** creates unstable particles ( leptons  $\mu^-$ ,  $\tau^-$ , baryons, mesons ), bosons **W +, W-, Z** (= particles =  $\beta$  electrons moving at nearly the speed of light )in direction of motion of stable particles ( e-, p+,n0, D, He-3, alfa ).

**Reaction** creates in the transmission medium, electromagnetic waves, as unstable “particles” - neutrinos  **$\nu e, \nu\mu, \nu\tau$**  , mesons  $\pi^0, \pi^+, \pi^-$  ,  $\eta$  , **K** and **gamma rays** (=waves of extremely high frequency  $>10^{19}$  Hz ) - against direction of motion of stable particles ( e-, p+,n0, D, He-3, alfa ).

Accompanying activity of **reaction** on movement of stable particles in the transmission medium are waves, or unstable “ particles“ , i.e. neutrinos and mesons. See you please Shortened great table of elementary particles.<sup>[20]</sup>

## References

- [ 1] Walter Greiner (2001). [\*Quantum Mechanics: An Introduction\*](#). Springer. [ISBN 3-540-67458-6](#).
- [2] R. Eisberg and R. Resnick (1985). *Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles* (2nd ed.). John Wiley & Sons. pp. 59–60. [ISBN 047187373X](#).
- [3] VLCEK, L.: New Trends in Physics, Slovak Academic Press, Bratislava 1996, ISBN 80-85665-64-6. Presentation on European Phys. Soc. 10th Gen. Conf. – Trends in Physics ( EPS 10) Sevilla , E 9 -13 September 1996 , <http://www.trendsinfo.info/>
- [ 4] Paul Arthur Schilpp, ed, *Albert Einstein: Philosopher-Scientist* , Open Court (1949), ISBN 0-87548-131-7 , p 51.

[ 5] [^](#) (Buchanan pp. 29–31)

[ 6 ] E. A. Ershov-Pavlov, L. V. Chvyaleva, N. I. Chubrik: Taking the wings of spectral lines into account when measuring their intensities, *Journal of Applied Spectroscopy*, September 1985, Volume 43, Issue 3, pp 960-965

[7] Wikipedia, the free encyclopedia last modified on 23 December 2010 at 03:16.

[8] Dendy, P. P.; B. Heaton (1999). *Physics for Diagnostic Radiology*. USA: CRC Press. p. 12. ISBN 0750305916.

<http://books.google.com/?id=1BTQvsQIs4wC&pg=PA12>

[9] Charles Hodgman, Ed. (1961). *CRC Handbook of Chemistry and Physics, 44th Ed.*. USA: Chemical Rubber Co.. p. 2850.

[10] Feynman, Richard; Robert Leighton, Matthew Sands (1963). *The Feynman Lectures on Physics, Vol.1*. USA: Addison-Wesley. pp. 2–5. ISBN 0201021161.

[11] L'Annunziata, Michael; Mohammad Baradei (2003). *Handbook of Radioactivity Analysis*. Academic Press. p. 58. ISBN 0124366031.

<http://books.google.com/?id=b519e10OPT0C&pg=PA58&dq=gamma+x-ray>

[12] Grupen, Claus; G. Cowan, S. D. Eidelman, T. Stroth (2005). *Astroparticle Physics*. Springer. p. 109. ISBN 3540253122.

[13] KAUFMANN, W.: *Annalen der Physik*, Vierte Folge, Band 19, Leipzig, 1906 Verlag von Johann Ambrosius Barth p. 487-552

[14] EINSTEIN, A.: *Sobranie naucnych trudov v cetyrech tomach pod redakciej I. E.TAMMA, Ja. A. SMORODINSKOGO, B. G. KUZNECOVA*, Izdatelstvo "Nauka", Moskva 1966

[15] FIZEAU, M. H.: Sur les hypothéses relatives a l'éther lumineux. *Ann. de Chim. et de Phys.*, 3e série, T. LVII. (Décembre 1859) Présenté á l'Académie des Sciences dans sa séance du 29 septembre 1851.

[16] KNOPF, O.: *Annalen der Physik*, Vierte folge, Band 62, 1920 : "Die Versuche von F. Harress uber die Geschwindigkeit des Lichtes in bewegten Korpern, von O. Knopf. p. 391 – 447

[17] PURCELL, E. M.: *Electricity and magnetism*. In: *Berkley physics courses* (Russian translation). Moskva, Nauka 1971.

[18] FEYNMAN, R. P. - LEIGHTON, R. B. - SANDS, M.: *The Feynman lectures on physics* (Russian translation) Moskva, Mir 1965-1966.

[19] BEISER, A.: *Perspectives of Modern Physics* (Czech translation) Academia, Praha 1975.

[20] Shortened great table of elementary particles. <http://www.trendsinfo/>

[ 21] K Nakamura *et al* (Particle Data Group) 2010 *J. Phys. G: Nucl. Part. Phys.* **37** 075021