

Physics is beautiful

Lubomir Vlcek

Rokytov 132, 086 01, Slovak Republic

Email: lubomir.vlcek@gmail.com

Abstract. *In the paper „Physics is easy“ we showed, that 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 $0.999.. c$.*

Similarly hyperons, mesons and quarks can be replaced by proton and neutron (or alpha particle respectively) moving at different speeds from $0.1c$ up to $0.999.. c$. While, the neutron is composed of proton and electron orbiting around it.

Thus, all particles, which are currently known, can be replaced by the various fast moving electron or proton.

Electron and proton are the only stable fundamental elementary particles. We show, that neutron is source β rays - β electrons (bosons Z_0 , W^{+-} too), γ rays, electron neutrinos, muon neutrinos, tauon neutrinos.

Keywords: mass, kinetic energy, β rays, bosons Z_0 , W^{+-} , γ rays, wave-particle duality.

PACS number: 14.20., 14.40., 14.60., 14.65., 14.70.

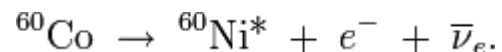
Introduction

Gamma radiation^[1], also known as **gamma rays** (denoted as γ), is electromagnetic radiation of high frequency (very short wavelength). They are produced by sub-atomic particle interactions such as electron-positron annihilation, neutral pion decay, radioactive decay (including isomeric transition which involves an inhibited gamma decay), fusion, fission or inverse Compton scattering in astrophysical processes. 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). Because gamma rays are a form of ionizing radiation, they pose a health hazard.

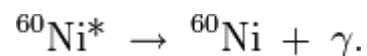
Paul Villard, a French chemist and physicist, discovered gamma radiation in 1900, while studying radiation emitted from radium. Alpha and beta "rays" had already been separated and named by the work of Ernest Rutherford in 1899, and in 1903 Rutherford named Villard's distinct new radiation "gamma rays."

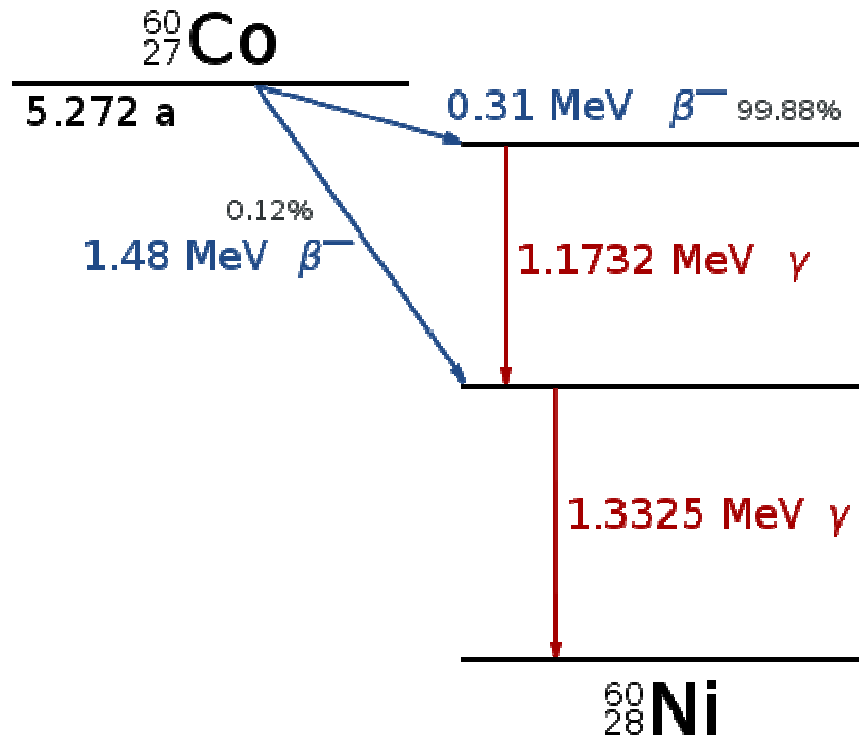
The distinction between X-rays and gamma rays has changed in recent decades. Originally, the electromagnetic radiation emitted by X-ray tubes had a longer wavelength than the radiation emitted by radioactive nuclei (gamma rays).^[2] Older literature distinguished between X- and gamma radiation on the basis of wavelength, with radiation shorter than some arbitrary wavelength, such as 10^{-11} m, defined as gamma rays.^[3] However, as shorter wavelength continuous spectrum "X-ray" sources such as linear accelerators and longer wavelength "gamma ray" emitters were discovered, the wavelength bands largely overlapped. The two types of radiation are now usually distinguished by their origin: X-rays are emitted by electrons outside the nucleus, while gamma rays are emitted by the nucleus.^{[2][4][5][6]}

First ^{60}Co decays to excited ^{60}Ni by beta decay:



Then the ^{60}Ni drops down to the ground state by emitting two gamma rays in succession (1.1732 MeV then 1.3325 MeV):





Cobalt-60 Decay

Theory

Calculation of the kinetic energy of a body moving at the velocity of v , [7] p. 51-52:

$$T_{\text{kin}} = \frac{mc^2}{\cos^2 \vartheta} \left[\ln \left| 1 - \frac{v}{c} \cos \vartheta \right| + \frac{\frac{v}{c} \cos \vartheta}{1 - \frac{v}{c} \cos \vartheta} \right] \quad (3.11)$$

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

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

$$T_{\text{kin}_d} = mc^2 \left[\ln \left| 1 - \frac{v}{c} \right| + \frac{\frac{v}{c}}{1 - \frac{v}{c}} \right] \quad (3.12)$$

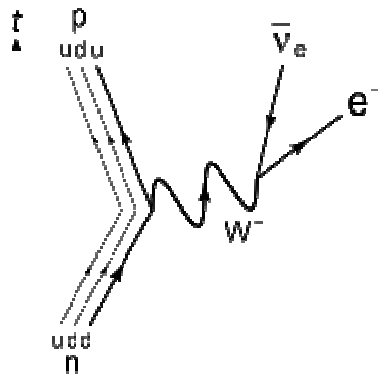
For $\vartheta = 180^\circ$ we have the kinetic energy against the direction of motion

$$T_{\text{kin}_a} = mc^2 \left[\ln \left| 1 + \frac{v}{c} \right| - \frac{\frac{v}{c}}{1 + \frac{v}{c}} \right] \quad (3.13)$$

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).**

β electron is emitted from the neutron

Stability and beta Decay



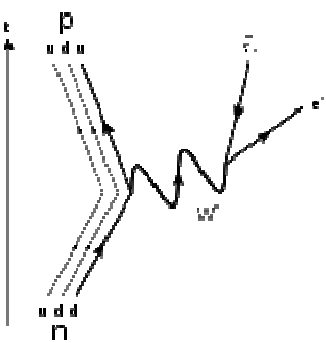
The Feynman diagram for beta decay of a neutron into a proton , electron , and electron antineutrino via an intermediate heavy W boson.

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, β electron has kinetical energy in direction of motion $80\ 398\ \text{MeV}$ (it is W- boson), proton is moving at a speed $0,023337082847141190198366394399065c$, and radiates γ ray.

1.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
$v/c = 0,99999364465781184$ W+- BOSON = β electron w+- = 80 398±0.25 MeV = kinetic energy of elektron in direction of motion of electron Planck : $80\ 398\ \text{MeV} = h \cdot f$ $h = 6,6260689633e-34\ \text{Js} = 4,1356673310e-15\ \text{eVs}$ $f = 80\ 398\ \text{MeV} / h = 8,0\ 398e+10\ \text{eV} / 4,1356673310e-15\ \text{eVs} = 19440151628578850990759246,829759\ \text{Hz}$ $= 1,944015162857885099075924682976e+25\ \text{Hz}$	$0,19314559172439827476506281953288$ Muon neutrino < 170 keV = 0,17 MeV $98,697186837160259358230511606622\ \text{keV} = \text{kinetic energy of elektron against direction of motion of electron} < 170\ \text{keV} = 0,17\ \text{MeV}$ 	$5,4446174569388848365045232464552e-4$ $0,51085321825892503086182184224528\ \text{MeV}$ $v/c = 0,02333688281754913995220424151085$ $1-v/c = 0,97666311718245086004779575849$ $[\ln 1-v/c + (v/c) / (1-v/c)] = 2,8100617662290541726076100292775e-4$ kinetic energy of proton = $0,26366023107003842838512741809889\ \text{MeV}$	$1+v/c = 1,0233368828175491399522$ $[\ln 1+v/c - (v/c) / (1+v/c)] = 2,64049092631168143129656776e-4$ $0,247749873734600891500904\ \text{MeV}$ against the direction of movement = only energy of waves radiated by movement of proton $5,990565824226854176364e+19\ \text{Hz}$ $0,2636602310700384283851274\ \text{MeV} + 0,247749873734600891500904\ \text{MeV} = 0,5114101048046393198860312\ \text{MeV}$ β electron is radiated from a

angular velocity of the β electron=
= $2*\pi*f=122146075082029946177950744,$
23446 rad/s

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

= 299790552,71634398041510272 /
122146075082029946177950744,23446=

Re orbit =

= 2,454360915936209056079694743154e-
18 m/rad

42,850352057551791567501064480165*0,
023336882817549139952204241510852c
=
0,99999364465781183999999999996341c

0,99999364465781184c

neutron

$m_p / m_e = 938,27201323 /$
 $0,51099891013$

= 1836,152670054228007830683

$(m_p / m_e)^{0,5} =$
42,850352041193640674570966604098

$(m_p / m_e)^{0,5} =$
42,8503520575517915675010644802= =
1,67262163783e-27 /9,1093821545e-31

Rp orbit = Re orbit /
42,850352057551791567501 Rp orbit=
=5,72774971052696715576355e-20 m/rad

angular velocity of the proton =
= $2*\pi*f=1221460750820299461779507$
44,23446 rad/s = angular velocity of
the β electron in center-of-mass
coordinates system

Orbital speed of the proton
=122146075082029946177950744,2344
6 rad/s* $5,72774971052696715576355e-$
20 m/rad =
6996221,46193102220205731201m/s=

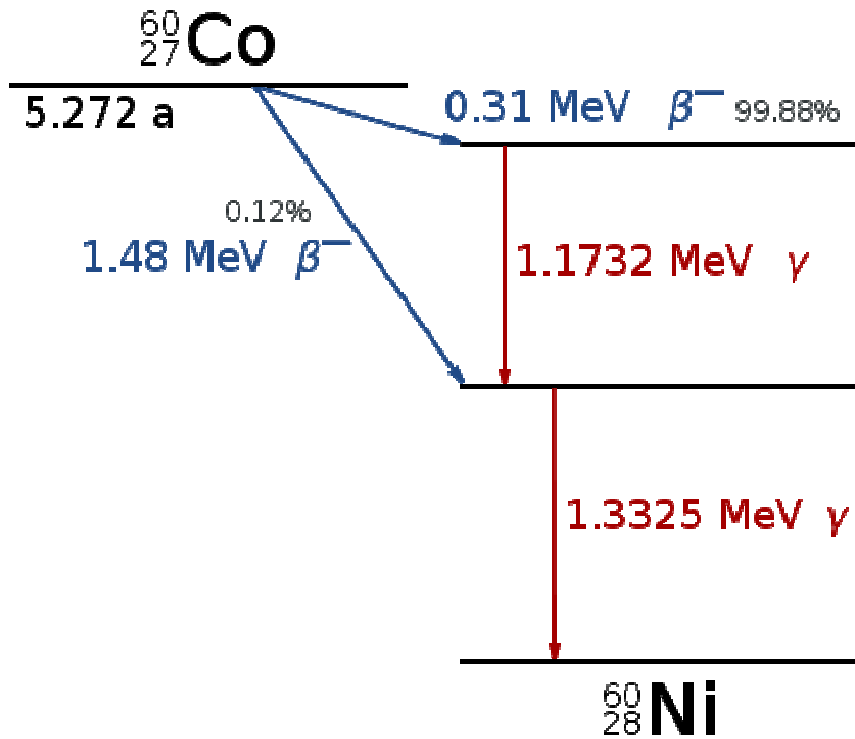
=
0,02333688281754913995220424151c

Orbital speed of the electron=

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

		<p>=42,85035205755179156750106448</p> <p>* Orbital speed of the proton, see[7] p.63</p>	
<p>v/c = 0,999994396591</p> <p>BOSON Z 91 187,6 MeV/c² = 91, 187,6 GeV = kinetic energy of elektron in direction of motion of electron</p> <p>BOSON Z Planck 91 187,6 MeV = h*f</p> <p>h = 6,6260689633e-34 Js = 4,1356673310e-15 eVs</p> <p>f = 91 187,6 MeV / h = 9,11876e+10 eV / 4,1356673310e-15 eVs = = 22049065532055484372807257,596126 Hz = = 2,2049065532055484372807257596126e+25 Hz</p> <p>angular velocity of β elektron = 2*π*f = 138538364588050870918387289,29769 rad/s</p> <p>Re orbit = 0,999994396591c / 138538364588050870918387289,29769 =</p> <p>= 299790778,140242710678 / 138538364588050870918387289,29769 =</p> <p>= 2,1639549379096690127802754046778e-18 m/rad</p>	<p>0,1931457797076835630826</p> <p>Muon neutrino = 98,6972828964141347372324 keV = kinetic energy of elektron against direction of motion of electron < 170 keV = 0,17 MeV</p>	<p>5,4505608961977031764224997864799e-4</p> <p>0,51141087453081320114439047437297 MeV</p> <p>How energy of electron !!!!!!! I tis energy β electron in neutron too !?!!??</p> <hr/> <p>v/c = 0,023336900365437361502580178294</p> <p>1-v/c = 0,97666309963456263849741982</p> <p>[ln 1-v/c + (v/c) / (1-v/c)] = 0,00028100660594011835046899960813</p> <p>kinetical energy of proton = = 0,26366063388636412151901497702731 MeV</p> <p>Rp orbit = Re orbit / /42,850352057551791567501064480165 = = 5,05002837550386332418140229019 28e-20 m/rad</p> <p>angle speed of proton = 2*π*f =</p>	<p>1+v/c = 1,023336900365437361502580 178294878</p> <p>[ln 1+v/c - (v/c) / (1+v/c)] = = 2,640494836796519671732503708885 2e-4</p> <p>0,2477502406444490796253754976 9641 MeV</p> <p>5,9905746960682964958086348966 16e+19 Hz</p> <p>against the direction of movement of proton = only energy of waves radiated by movement of proton</p> <p>0,263660633886364121519015 MeV + + 0,247750240644449079625375 MeV =</p>

<p>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</p>		<p>138538364588050870918387289,29769 rad/s = angle speed of β electron in the center- of- mass coordinates system speed of proton = =138538364588050870918387289,2976 9 rad/s* *5,05002837550386332418140229019 28e-20 m/rad = 6996226,7226555648498930849930997 m/s= =0,023336900365437361502580178294878c</p> <p>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</p>	<p>= 0,5114108745308132011443905 MeV β electron is radiated from a neutron . Logically follows that , gamma rays are actually caused by the movement of a proton</p>
--	--	--	---



Cobalt-60 Decay

Planck , Vlcek and orbital radius of proton and electron in a Co and Ni neutrons:

0,05172c

$$v = 2\pi f r \quad r = v / (2\pi f)$$

$$r = 0,05172c / (2\pi f)$$

$$= 8,6990713657946508626073196142044e-15 \text{ m}$$

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)

$$0,05172c = 15505265,92776 \text{ m/s}$$

$$2\pi f$$

$$= 1782404727558366288414,7841132354$$

$$r = 0,05172c \cdot h / (2\pi \cdot 1,1732 \text{ MeV})$$

$$0,05172 / 1,1732 =$$

$$0,044084555063075349471530855779066$$

$$f = 3,2219709501581281804505953382738e+20 \text{ Hz}$$

$$\text{Re orbit} = 42,850352057551791567501064480165^*$$

$$*8,18066498314118032563081834804e-15 \text{ m} =$$

$$= 3,5054437459248556864205100794378e-13 \text{ m}$$

$$\text{Re orbit} = 3,5054437459248556864205100794378e-13 \text{ m}$$

$$0,003065695195162900575289191360711$$

$$2,8764560027150324805829147674735$$

$$v/c = \mathbf{0,055242}, 1-v/c = 0,944758$$

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

$$0,001645647729277061909654586769423$$

kinetical energy of proton

$$= 1,5440652080161668904309575020503$$

MeV

$$\text{Planck} : 1,3325 \text{ MeV} = h \cdot f$$

$$f = 1,3325 \text{ MeV} / h =$$

$$= 1,3325 \text{ e}+6 \text{ eV} / 4,1356673310e-15 \text{ eVs}$$

$$f = 322197095015812818045,0595338 \text{ Hz}$$

$$f = 3,22197095015812818045059e+20 \text{ Hz}$$

$$2 \cdot \pi \cdot f =$$

$$2024424053419300272172,4342233942 \text{ Hz}$$

$$v_{\text{cek}} : v/c = \mathbf{0,055242}$$

$$\mathbf{v = 0,055242c =}$$

$$\mathbf{16561134,964836 \text{ m/s}}$$

$$v = 2 \cdot \pi \cdot f \cdot r \quad r = v / (2 \cdot \pi \cdot f)$$

$$r = \mathbf{0,055242c} / (2 \cdot \pi \cdot f)$$

$$0,001420163855695610856070594001$$

$$1,3325 \text{ MeV } \gamma \text{ ray}$$

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

$$1,5440652080161668904309575020503$$

$$\text{MeV} + 1,3325 \text{ MeV} =$$

$$= 2,87656520801616689043095750205$$

=**16561134,964836 /**

r =

**8,180664983141180325630818
34804e-15 m**

which is 10 times more than CODATA
2006 for the proton radius, the orbit is so
real!

0,055242 / 1,3325=

=**0,04145741088180112570356472795497**

Greater speed of proton, smaller
radius of the orbit of the proton (in a
center-of-mass system)

**1,3467874149567344461710700766414 +
+1,1732 =
=2,519987414956734446171070076641M
eV**

0,062061840279371195787669627082353

**58,230887823684317510169276612683
MeV**

v/c = 0,2385 1-v/c= 0,7615

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

0,0213157801980579490592209230868

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

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

***938,27201323MeV =**

=19,99999999999999999999999999999999 MeV

Gamma rays The upper limit for such

		0,040732529597334209642152853598307	energies is about 20 MeV
		kinetic energy of proton = 38,218192549241330122093635817073 MeV	20e+6 eV/4,1356673310e-15 eVs =4,835978912057228038199767862 3247e+21 Hz γ rays
		38,218192549241330122093635817073 MeV ++ 20 MeV = 58,218192549241330122093635817073 MeV	

f is electron frequency circulation in neutron around center of mass

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

$$f = 80 \text{ 398 MeV}/h = 8,0 \text{ 398e+10 eV} / 4,1356673310e-15 \text{ eVs} = 19440151628578850990759246,829759 \text{ Hz} = 1,9440151628578850990759246829759e+25 \text{ Hz}$$

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

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

$$= 299790659,245252 / 122146075082029946177950744,23446 =$$

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

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

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

velocity of proton = **122146075082029946177950744,23446 rad/s * 5,7277988053202572456202593603874e-20 m/rad**
=6996281,4292940956826137689614932m/s= =0,023337082847141190198366394399065c

β electron is radiated from a neutron . Logically follows that , gamma rays(eg 1,1732 MeV γ ray 1,3325 MeV γ ray) are actually caused by the movement of a proton.

γ rays (γ 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. γ ray (γ photons) are emitted by excited protons.

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

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

$$= 938,27201323 * [\ln |1+v/c| - (v/c) / (1+v/c)] ,$$

$$[\ln |1+v/c| - (v/c) / (1+v/c)] = 0,0012503836664180792918138993482723$$

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

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

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 γ ray and proton we calculate the speed of proton :

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

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

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

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

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

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

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

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

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

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

Proton 938,27201323 MeV/c²

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 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
0,0233371	<p>5,4506542260101392070047624846627e-4</p> <p>0,51141963140591407441489142146824 MeV</p> <hr/> <p>v/c = 0,0233371 , 1-v/c= 0,9766629</p> <p>[ln 1-v/c + (v/c) / (1-v/c)] = 2,8101149011597037322533689209691e-4</p> <p>kinetic energy of proton =0,26366521657187376826117133419276 MeV</p>	<p>2,6405393248504354747513935636936e-4</p> <p>0,24775441483404030615372008727548 MeV γ ray for emission of electron β from neutron</p> <hr/> <p>0,26366521657187376826117133419276+ +0,24775441483404030615372008727548= =0,51141963140591407441489142146776</p> <p>for emission of electron β from neutron is valid equation:</p> <p>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) = =0,51099890997249598396127388955714 MeV</p>
0,05172	<p>0,0026857234941825261023798755470303</p>	<p>0,0012503836664180792918138993482723</p>

	<p>2,5199391898657489591669909237489</p> <hr/> <p>v/c = 0,05172 , 1-v/c= 0,94828</p> <p>[ln 1-v/c + (v/c) / (1-v/c)] =0,0014353912255364207099052557093913</p> <p>kinetic energy of proton = 1,3467874149567344461710700766414 MeV</p>	<p>1,1732 MeV γ ray</p> <hr/> <p>1,3467874149567344461710700766414 + +1,1732 = = 2,519987414956734446171070076641</p>
0,055242	<p>0,0030656951951629005752891913607114</p> <p>2,8764560027150324805829147674735</p> <p>v/c = 0,055242, 1-v/c= 0,944758</p> <p>[ln 1-v/c + (v/c) / (1-v/c)] = 0,0016456477292770619096545867694231</p> <p>kinetic energy of proton =1,5440652080161668904309575020503 MeV</p>	<p>0,0014201638556956108560705940006587</p> <p>1,3325 MeV γ ray</p> <hr/> <p>1,5440652080161668904309575020503 MeV +1,3325 MeV = =2,87656520801616689043095750205</p>
0,1	<p>0,01015168434851876083665316264402</p> <p>9,5250413113601786986314420892325</p>	<p>0,0044010888952339509530430323716742</p> <p>4,1294185381353557125587631775622</p>
0,2	<p>0,042511338813078203778756268178333</p> <p>39,887199453249524912925837248854</p>	<p>0,015654890127287959545051358487848</p> <p>14,688545276624924762274133011344</p>
0,2385	<p>0,062061840279371195787669627082353</p>	<p>0,02131578019805794905922092308681</p>

	<p>58,230887823684317510169276612683 MeV</p> <p>$v/c = 0,2385 \quad 1-v/c = 0,7615 \quad [\ln 1-v/c + (v/c) / (1-v/c)] = 0,040732529597334209642152853598307$</p> <p>kinetic energy of proton = 38,218192549241330122093635817073 MeV</p>	<p>Gamma rays The upper limit for such energies is about 20 MeV</p> <hr/> <p>38,218192549241330122093635817073 MeV + + 20 MeV = 58,218192549241330122093635817073 MeV</p>
0,3	<p>0,1034915183309564753206594734422</p> <p>97,103195256615981530619973957697</p>	<p>0,031595033698260282804726756111724</p> <p>29,644735876136367895740124416315</p>
0,4	<p>0,20659899380760319968003169486638</p> <p>193,84605385115215744477303017213</p>	<p>0,050757950906927216218879124502706</p> <p>47,624764784872103514767224480511</p>
0,5	<p>0,37898459421488573922744766067367</p> <p>355,59063819715545377935410145411</p>	<p>0,072131774774831048644679782131016</p> <p>67,679225535833657944955762108731</p>
0,6	<p>0,678712897371580488467409819381</p> <p>636,81731662199920030130340847408</p>	<p>0,095003629245735553650937031148342</p> <p>89,139246476552804316253364891193</p>
0,7	<p>1,248224074187214795765659690525</p> <p>1171,173715049790902349488797128</p>	<p>0,11886354517981745505507257495347</p> <p>111,52633783552238591841798542491</p>
0,8	<p>2,5339043080235741891445273629486</p> <p>2377,49149642144899674890050027</p>	<p>0,14334222045767456374528669617442</p> <p>134,49399376968080492945211734271 / pí +- /</p>

0,9	6,8655845826520333024993603119937 6441,7858683657726192890803907208	0,16816967564607898651735176667717 157,78890013268263163523366844813
0,99	94,585477015562380011096949442981 88746,905941711606333662244494576	0,19064720155047137913293235234906 178,8789336154263583545510500319
0,999	992,28514190159865722507680221572 931033,3777902292026700374964563	0,19289718058079427713077657976902 180,99002596993270707595628949319
0,9999	9989,9827818085837834082411933913 9373321,2568205757269535807354964	0,19312218055996614431315921000012 181,20113715336700296534860754822
0,999994	166653,83606125849039287728844767 156366630,27369937738835558708407	0,19314568055994531391725237153108 181,22318654565836338784472026638

$$20 \text{ MeV} = \frac{mc^2}{\cos^2 \vartheta} \left[\ln \left| 1 - \frac{v}{c} \cos \vartheta \right| + \frac{\frac{v}{c} \cos \vartheta}{1 - \frac{v}{c} \cos \vartheta} \right] = eU_{\text{mov}} = eU_{\text{still}} \left(1 - \frac{v}{c} \cos \vartheta \right)^2 =$$

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

$$\left[\ln \left| 1 + \frac{v}{c} \right| - \frac{v/c}{1 + v/c} \right] = \mathbf{0,02131578019805794905922092308681}$$

0,2385 $1+v/c= 1,2385$ $[\ln |1+v/c| - (v/c) / (1+v/c)] = 0,021329310682036986145516773484046$

$v/c = 0,2385$ $1-v/c= 0,7615$ $[\ln |1-v/c| + (v/c) / (1-v/c)] = 0,040732529597334209642152853598307$

kinetic energy of proton = 38,218192549241330122093635817073 MeV

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

Electron 0,51099891013 MeV/c²

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
0,1	0,01015168434851876083665316264402 0,0051874996380768658673878930679016 MeV	0,0044010888952339509530430323716742
0,2	0,042511338813078203778756268178333	0,015654890127287959545051358487848
0,3	0,1034915183309564753206594734422	0,031595033698260282804726756111724
0,4	0,20659899380760319968003169486638	0,050757950906927216218879124502706
0,5	0,37898459421488573922744766067367	0,072131774774831048644679782131016

	0,19366071459986691576770514278552 MeV	
	0,31 MeV ...99,88%	
0,6	0,678712897371580488467409819381 0,34682155084805217124241945172775 MeV	0,095003629245735553650937031148342
0,7	1,248224074187214795765659690525	0,11886354517981745505507257495347
0,8	2,5339043080235741891445273629486 1,2948223397737582250000519595204 MeV	0,14334222045767456374528669617442 0,073247718429485891868064712669302
	1,48 MeV0,12 %	
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

Neutron is source β rays - β electrons (bosons Z_0 W_{+-} too) , γ rays, electron neutrinos, muon neutrinos, tauon neutrinos:

1a.) β electron is radiated from a neutron ,for $v/c = 0,999994396591$ **BOSON $Z_0 = \beta$ electron**

for $v/c = 0,99999364465781184$ W_{+-} **BOSON = β 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.

References

- [1] Wikipedia, the free encyclopedia last modified on 23 December 2010 at 03:16.
- [2] 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>.
- [3] Charles Hodgman, Ed. (1961). *CRC Handbook of Chemistry and Physics, 44th Ed.*. USA: Chemical Rubber Co.. p. 2850.
- [4] Feynman, Richard; Robert Leighton, Matthew Sands (1963). *The Feynman Lectures on Physics, Vol.1*. USA: Addison-Wesley. pp. 2–5. ISBN 0201021161.
- [5] 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>.
- [6] Grupen, Claus; G. Cowan, S. D. Eidelman, T. Stroth (2005). *Astroparticle Physics*. Springer. p. 109. ISBN 3540253122.
- [7] 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
- [8] Vlcek L.: *New Trends in Physics /book, elementes pictures, spheres in nuclei, forecasted nuclei, ZOO-3D editorfor interactive inspecting of nuclei spheres/*, Academic Electronic Press, Bratislava, 2000, CD- ROM,
ISBN 80-88880-38-6. Only book: Presentation on European Phys. Soc. 10th Gen. Conf. – Trends in Physics (EPS 10) Sevilla, E 9 -13 September 1996