Introduction to my two articles Physics is easy and Physics is beautiful

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Abstract. *In the present paper we show, that accurate measurement kinetical energy in high-energy physics will use to determine the exact value of the speed of particles. The exact value of the speed of particles allows us to establish the precise momentum of particles.*

Keywords: mass, kinetic energy, potential energy. neutron, proton, electron, leptons, quarks
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Introduction

At present, high-energy physics to measure:
the mass of used units eV/c^2 , keV/c^2, MeV/c^2 , GeV/c^2, TeV/c^2,....
the momentum of used units eV/c , keV/c, MeV/c , GeV/c, TeV/c,....
and energy measurement units *eV, keV, MeV, GeV, TeV,....*

1eV/c^2 = 1,78267590318850207295025946150 79e-36 kg

1keV/c^2=1,78267590318850207295025946150 79e-33 kg

1MeV/c^2= 1,78267590318850207295025946150 79e-30 kg

1GeV/c^2 = 1,78267590318850207295025946150 79e-27 kg

1 kg = 5,60954460769563070329022315217 48e+35 eV/c^2

1 g = 5,60954460769563070329022315217 48e+32 eV/c^2

1 mg = 5,60954460769563070329022315217 48e+29 eV/c^2

1 µg = 5,6095446076956307032902231521748e+26 eV/c^2

1 ng = 5,6095446076956307032902231521748e+23 eV/c^2

1 pg = 5,6095446076956307032902231521748e+20 eV/c^2

1 fg = 5,6095446076956307032902231521748e+17 eV/c^2

1 ag = 5,6095446076956307032902231521748e+14 eV/c^2

1 zg = 5,6095446076956307032902231521748e+11 eV/c^2

1 yg = 5,6095446076956307032902231521748e+8 eV/c^2

1eV/c = 5,3443279083425107378785359570 32e-28 kgm/s

1keV/c = 5,3443279083425107378785359570 32e-25 kgm/s

1MeV/c= 5,3443279083425107378785359570 32e-22 kgm/s

1GeV/c = 5,3443279083425107378785359570 32e-19 kgm/s

1kgm/s = 1,8711426715396658521977304 55,3045e+27 eV/c

1kgm/s =1,8711426715396658521977304 55,3045e+27 eV/c

1kgm/s =1,8711426715396658521977304 55,3045e+24 keV/c

1kgm/s =1,8711426715396658521977304 55,3045e+21 MeV/c

1kgm/s =1,8711426715396658521977304 55,3045e+18 GeV/c

1eV = 1,6021764874e-19 J

1keV = 1,6021764874e-16 J

1MeV = 1,6021764874e-13 J

1GeV = 1,6021764874e-10 J

1TeV = 1,6021764874e-7 J

1 J = 6,241509645562159683457604085171 5e+18 eV

1 aJ = 6,24150964556215968345760408517 15 eV

1keV/c^2=1,782675903188502072950259461 5079e-33 kg

1MeV/c^2= 1,782675903188502072950259461 5079e-30 kg

1GeV/c^2 = 1,782675903188502072950259461 5079e-27 kg

Subject and Methods

Calculation of the kinetic energy of a body moving at the velocity of v , [4] p. 51-52:

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

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

$$T_{kin_{\vartheta}} = mc^2 \left[\ln\left|1 - \frac{v}{c}\right| + \frac{\frac{v}{c}}{1 - \frac{v}{c}} \right] \tag{3.12}$$

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

$$T_{kin_{\vartheta}} = mc^2 \left[\ln\left|1 + \frac{v}{c}\right| - \frac{\frac{v}{c}}{1 + \frac{v}{c}} \right] \tag{3.13}$$

Modern physics knows very precise values of the kinetic energy of elementary particles

Although not able to accurately determine the speed of the particles, nor their momentum and even mean life time.

It is caused by:

1. incorrect interpretation of Heisenberg uncertainty principle,
2. symmetrical shape of the intensity of moving charge, instead of its nonsymmetrical form
3. using the relativistic formulas

Nonsymmetrical intensity form of moving charge leads to a precise relationship to calculate the kinetic energy of particles and hence to calculate the radius of force reach particles moving at speed v

$\frac{v}{c}$	ϑ	$\left(1-\frac{v}{c}\cos\vartheta\right)^2$	$\left[ln\lvert 1-\frac{v}{c}\cos\vartheta\rvert+\frac{\frac{v}{c}cos\vartheta}{1-\frac{v}{c}\cos\vartheta}\right]$	$\frac{\left(1-\frac{v}{c}\cos\vartheta\right)^2\cos^2\vartheta}{c^2\left[ln\lvert 1-\frac{v}{c}\cos\vartheta\rvert+\frac{\frac{v}{c}cos\vartheta}{1-\frac{v}{c}\cos\vartheta}\right]}$
1e-11	0^o	0,9999999999800000000001	5,000000000066666666667416681543e-23	222530,01120330601939454831181967
	180^o	1,000000000200000000001	4,999999999933333333334083307909e-23	222530,01121814135347526322604228
1e-5	0^o	0,9999800001	5,000066667416674666750000857151 6e-11	2,22522593631458641882359212473 26e-7
	180^o	1,0000200001	4,999933334083325333416665809532 6e-11	2,22537428965540184276755812939 38e-7
0,0233369 (proton in neutron W,Z)	0^o	0,95387081090161	2,810065969995205943097089283371 4e-4	3,77686653107079007712334030290 56e-14
	180^o	1,04721841090161	2,640494755360067288948655393568 3e-4	4,41276249924294374649828181718 77e-14
0.1	0^o	0,81	0,00575059545328480988361013027179 83	1,56722299929588677685575805825 92e-15
	180^o	1,21	0,00440108889523395095304303237090 91	3,05903061690670983392925730930 29e-15
0.2	0^o	0,64	0,02685644868579024423370490969016 5	2,65148994271564297188402292956 76e-16
	180^o	1,44	0,01565489012728795954505135848784 8	

				1,023460444429690261431424782922e-15
0.3	0^o 180^o	0,49 1,69	0,071896484632696192515932717330244 0,031595033698260282804726756111724	7,583104101008220925037834091858 1e-17 5,951500519634370348182498201 1149e-16
0.4	0^o 180^o	0,36 1,96	0,155841042900675983461152570363 0,050757950906927216218879124502706	2,570272969968459916949941120 2269e-17 4,296458132961130198889454578 3634e-16
0.5	0^o 180^o	0,25 2,25	0,306852819440054690582767878541 82 0,072131774774831048644679782131016	9,065014117223880214546269485867e-18 3,470679369716790989946438808 4794e-16
0.6	0^o 180^o	0,16 2,56	0,583709268125844934816472788231 99 0,095003629245735553650937031148342	3,049874632626148771612946806 7033e-18 2,998184560012605158842705461 2182e-16
0.7	0^o 180^o	0,09 2,89	1,129360529007397340710587115571 5 0,118863545179817455055072574953 47	8,866832377508188007026334121 8428e-19 2,705252192445077776964187653 7934e-16
0.8	0^o	0,04	2,390562087565899625399240666773 8	1,861737976755973251180660244798e-19

	180^o	3,24	0,14334222045767456374528669617442	2,5149507033611130483587166590632e-16
0.9	0^o 180^o	0,01 3,61	6,69741490700595431598200854531 56 0,16816967564607898651735176667717	1,661312717672172783736265270596 1e-20 2,388460753653843660919847643869 3e-16
0.99	0^o 180^o	0,0001 3,9601	94,39482981401190863196401709063 2 0,19064720155047137913293235234825	1,178719277576850256657463013711 7e-23 2,311182881859112145684482633641 8e-16
0.999	0^o 180^o	0,000001 3,996001	992,09224472101786294794602563595 0,19289718058079427713077657976 81	1,121518751884309034507901817560 2e-26 2,304932982044318355080641688899 5e-16
0.9999	0^o 180^o	0,00000001 3,99960001	9989,78965962802381726392803418 13 0,19312218055996614431315920999989	1,113787270767269253905485759948 6e-29 2,304321110301848688694499977935 4e-16
0.99999	0^o 180^o	0,0000000001 3,9999600001	99987,48707453502977157991004272 7 0,19314468055994533025072170572902	1,112789298549128049598388371459 3e-32 2,304260052837541280902901255611 4e-16

0.999999	0^o 180^o	0,000000000001 3,999996000001	999985,184489442035725895892051 27 0,193146930559945309438065470416 02	1,1126665407765008000082017834 58e-35 2,3042539483867541993784900262 739e-16
0.9999999	0^o 180^o	0,00000000000001 3,99999960000001	9999982,881904349041680211874059 8 0,193147155559945309417252954792 13	1,1126519607018873842966670804 881e-38 2,3042533379546304737349677770 133e-16
0.99999999	0^o 180^o	0,0000000000000001 3,9999999600000001	99999980,579319256047634527856068 0,193147178059945309417232142291 51	1,1126502721378755807880843098 156e-41 2,3042532769115476495417861976 33e-16
0.999999999	0^o 180^o	0,000000000000000001 3,999999996000000001	999999978,27673416305358884383808 0,193147180309945309417232121478 5	1,1126500802240119083800515298 461e-44 2,3042532708072406626047258441 206e-16
0.9999999999	0^o 180^o	0,0000000000000000001 3,99999999960000000001	9999999975,974149070059543159820 1 0,193147180534945309417232121458 06	1,1126500587268548769901809810 519e-47 2,3042532701968099768658409329 029e-16
0.99999999999	0^o 180^o	0,00000000000000000001 3,999999999960000000001	99999999973,671563977065497475802 0,193147180557445309417232121458	

				1,112650056346561790418439179 2971e-50 2,304253270135766908421500651 5694e-16
0.999999999999	0^o 180^o	0,000000000000000000000001 3,999999999996000000000001	999999999971,36897888407145179178 0,193147180559695309417232121458 18	1,112650056085474739424512275 5733e-53 2,304253270129662601578362105 5325e-16
0,999999999999 99999999999999 9999	0^o 180^o	1,e-60 3,999999999999999999999999 999996	999999999999999999999999999929,92 0,193147180559945309417232121457 93	1,112650056053618432174089964926e-107 2,304253270128984345262472362 2911e-16

Calculation of the radius of force reach of particles moving at the velocity of v , [4] p. 55-57:

Coulomb force constant :

$$k_e = \frac{1}{4\pi\varepsilon_0} = \frac{c^2\,\mu_0}{4\pi} = c^2 \cdot 10^{-7}\ \mathrm{H \cdot m^{-1}}$$
$$= 8.987\ 551\ 787\ 368\ 176\ 4 \times 10^9\ \mathrm{N \cdot m^2/C^2}$$

Coulomb force constant: k_e **= 8,987 551 787 368 176 4e+9** m_e **= 9.10938215(45)×10−31 kg** −1.602176487(40)×10−19 C

m_e **= 9,1093821545e-31 kg** **e =1,6021764874e-19 C** e^2 **= 2,566969496777402358 76e-38**

$k_e e^2/m_e$ = 253,26384267987327744648929039417 **ELECTRON**

v/c	ϑ	$\frac{\left(1-\frac{v}{c}\cos\vartheta\right)^2\cos^2\vartheta}{c^2\left[ln\lvert1-\frac{v}{c}\cos\vartheta\rvert+\frac{\frac{v}{c}cos\vartheta}{1-\frac{v}{c}\cos\vartheta}\right]}$	**Radius of force reach of electron r_e =($k_e e^2/m_e$) x** $\frac{\left(1-\frac{v}{c}\cos\vartheta\right)^2\cos^2\vartheta}{c^2\left[ln\lvert1-\frac{v}{c}\cos\vartheta\rvert+\frac{\frac{v}{c}cos\vartheta}{1-\frac{v}{c}\cos\vartheta}\right]}$ **x [m]**
1e-11	0^o	222530,01120330601939454831181967	56358805,748944533620585462739198
	180^o	222530,01121814135347526322604228	56358805,752701787337307007225384
1e-5	0^o	2,22522593631458641882359212 47326e-7	5,635692714619511274534147824 8751e-5

	180^o	2,22537428965540184276755812939 38e-7	5,6360684399912043860636272385214e-5
0.1	0^o 180^o	1,56722299929588677685575805825 92e-15 3,05903061690670983392925730930 29e-15	3,96920919137952616924297486104 06e-13 7,74741848913176659445626489878 72e-13
0.2	0^o 180^o	2,65148994271564297188402292956 76e-16 1,02346044442969026143142478292 2e-15	6,71526531719200810030133955025 42e-14 2,59205524987114261171361101771 12e-13
0.3	0^o 180^o	7,58310410100822092503783409185 81e-17 5,95150051963437034818249820111 49e-16	1,92052608406284794343024879075 22e-14 1,50729989131386323363988066581 47e-13
0.4	0^o 180^o	2,57027296996845991694994112022 69e-17 4,29645813296113019888945457836 34e-16	6,50957209110422685414321794642 65e-15 1,08813749666692974310087524473 74e-13
0.5	0^o 180^o	9,06501411722388021454626948586 7e-18 3,47067936971679098994643880847 94e-16	2,29584030927541913525946580148 95e-15 8,78997593884235096080088888082 77e-14
0.6	0^o	3,04987463262614877161294680670 33e-18	7,72422969150765249846722686965 67e-16

	180^o	2,998184560012605158842705461218 2e-16	7,593317427322575141627541861027 2e-14
0.7	0^o 180^o	8,866832377508188007026334121842 8e-19 2,705252192445077776964187653793 4e-16	2,245648040326040470182950945820 1e-16 6,851425656767924461797050640951 6e-14
0.8	0^o 180^o	1,861737976755973251180660244798e-19 2,514950703361113048358716659063 2e-16	4,715109140562703820469244814403 8e-17 2,514950703361113048358716659063 2e-16
0.9	0^o 180^o	1,661312717672172783736265270596 1e-20 2,388460753653843660919847643869 3e-16	4,207504427705978979241959157875 5e-18 6,049107485604386242708564287693 8e-14
0.99	0^o 180^o	1,178719277576850256657463013711 7e-23 2,311182881859112145684482633641 8e-16	2,985269736799572846952864979765 6e-21 5,853390577955823253926926232676 3e-14
0.999	0^o 180^o	1,121518751884309034507901817560 2e-26 2,304932982044318355080641688899 5e-16	2,840401487397554751560630135382e-24 5,837561841521234216758243048149 3e-14

0.9999	0^o 180^o	1,113787270767269253905485759948 6e-29 2,304321110301848688694499977935 4e-16	2,820820441224471012473005686097 2e-27 5,836012191633983241514820532005 8e-14
0.99999 (electron in neutron …W,Z)	0^o 180^o	1,112789298549128049598388371459 3e-32 2,304260052837541280902901255611 4e-16	2,818292938435929031032299328043 3e-30 5,835857555153635408467497760879 5e-14
0.999999	0^o 180^o	1,112666540776500800008201783458e-35 2,304253948386754199378490026273 9e-16	2,817982037383785037089182329211 5e-33 5,835842094786997544029465474407e-14
0.9999999	0^o 180^o	1,112651960701887384296667080488 1e-38 2,304253337954630473734967777013 3e-16	2,817945111326553507779589530355 1e-36 5,835840548783144044106255642065 2e-14
0.99999999	0^o 180^o	1,112650272137875580788084309815 6e-41 2,304253276911547649541786197633e-16	2,817940834804451104784773175160 5e-39 2,304253276911547649541786197633e-16
0.999999999	0^o 180^o	1,112650080224011908380051529846 1e-44	2,817940348756025332630820616203 8e-42

		2,304253270807240662604725844 1206e-16	5,835840378723084349204101470 2241e-14
0.9999999999	0^o 180^o	1,112650058726854876990180981 0519e-47 2,304253270196809976865840932 9029e-16	2,817940294311499368006262398 3703e-45 5,835840377177084137604700346 4431e-14
0.99999999999	0^o 180^o	1,112650056346561790418439179 2971e-50 2,304253270135766908421500651 5694e-16	2,817940288283077629911306404 4206e-48 5,835840377022484116772859008 2991e-14
0.999999999999	0^o 180^o	1,112650056085474739424512275 5733e-53 2,304253270129662601578362105 5325e-16	2,817940287621838531824526850 7968e-51 5,835840377007024114692955862 223e-14
0,99999999999999999999999999999	0^o 180^o	1,112650056053618432174089964 926e-107 2,304253270128984345262472362 2911e-16	2,817940287541158023946200225 4501e-105 5,835840377005306336684114558 5626e-14

Coulomb force constant: k_e = 8,987 551 787 368 176 4e+9 **m_p = 1.672621637(83)×10−27 kg** 1.602176487(40)×10−19 C

m_p = 1,67262163783e-27 kg e =1,6021764874e-19 C e^2 = 2,566969496777402358 76e-38

$k_e e^2/m_p$ = 0,13793179979910179480477042123259 **PROTON**

v/c	ϑ	$\frac{\left(1-\frac{v}{c}\cos\vartheta\right)^2\cos^2\vartheta}{c^2\left[ln\lvert 1-\frac{v}{c}\cos\vartheta\rvert+\frac{\frac{v}{c}cos\vartheta}{1-\frac{v}{c}\cos\vartheta}\right]}$	**Radius of force reach of proton r_p =($k_e e^2/m_p$) x** $\frac{\left(1-\frac{v}{c}\cos\vartheta\right)^2\cos^2\vartheta}{c^2\left[ln\lvert 1-\frac{v}{c}\cos\vartheta\rvert+\frac{\frac{v}{c}cos\vartheta}{1-\frac{v}{c}\cos\vartheta}\right]}$ **x [m]**
1e-11	0^o	222530,011203306019394548311819 67	30693,964954586285353106449123719
	180^o	222530,011218141353475263226042 28	30693,964956632549683480410539001
1e-5	0^o	2,22522593631458641882359212473 26e-7	3,06929418355512374244417295160 75e-8
	180^o	2,22537428965540184276755812939 38e-7	3,06949880998817255216867090455 55e-8
0,0233369 (proton in neutron …W,Z)	0^o	3,77686653107079007712334030290 56e-14	5,20949998231584295405706633642 43e-15
	180^o	4,41276249924294374649828181718 77e-14	6,08660273606561802202528686433 97e-15
0.1	0^o	1,56722299929588677685575805825 92e-15	2,16169888979428108028684845998 55e-16
	180^o		

		3,059030616906709833929257309302 9e-15	4,219375986304991588977496164658 3e-16
0.2	0^o 180^o	2,651489942715642971884022929567 6e-16 1,023460444429690261431424782922e-15	3,657247799479859526845379108201 2e-17 1,411677411233757848274702231937 7e-16
0.3	0^o 180^o	7,583104101008220925037834091858 1e-17 5,951500519634370348182498201114 9e-16	1,045951196716013723286997030914 1e-17 8,209011781784582713784175066355 8e-17
0.4	0^o 180^o	2,570272969968459916949941120226 9e-17 4,296458132961130198889454578363 4e-16	3,545223767227323930442800754313 8e-18 5,926182030408172907588423677913 2e-17
0.5	0^o 180^o	9,065014117223880214546269485867e-18 3,470679369716790989946438808479 4e-16	1,250353712392955734757057127601 8e-18 4,787170519906492152828802688143 5e-17
0.6	0^o 180^o	3,049874632626148771612946806703 3e-18 2,998184560012605158842705461218 2e-16	4,206746972397490873713091922499 9e-19 4,135449924924167552978788186304 1e-17

0.7	0^o 180^o	8,866832377508188007026334121842 8e-19 2,705252192445077776964187653793 4e-16	1,223018148346653176139209619345 6e-19 3,731403038144156685399300615569e-17
0.8	0^o 180^o	1,861737976755973251180660244798e-19 2,514950703361113048358716659063 2e-16	2,567928698882897332131275225847 6e-20 3,468916769206152903038769898177 3e-17
0.9	0^o 180^o	1,661312717672172783736265270596 1e-20 2,388460753653843660919847643869 3e-16	2,291478531776598587234051212752 6e-21 3,294446905009937544809616715754 4e-17
0.99	0^o 180^o	1,178719277576850256657463013711 7e-23 2,311182881859112145684482633641 8e-16	1,625828714140720069370190227512 6e-24 3,187856145597021918126889682839 7e-17
0.999	0^o 180^o	1,121518751884309034507901817560 2e-26 2,304932982044318355080641688899 5e-16	1,546930999558450325395853257106 2e-27 3,179235546296836113013201737132 2e-17
0.9999	0^o 180^o	1,113787270767269253905485759948 6e-29	1,536266828502589656094030968965 9e-30

		2,304321110301848686944999779354e-16	3,178391580589985577061519861703 9e-17
0.99999	0^o 180^o	1,112789298549128049598388371459 3e-32 2,304260052837541280902901255611 4e-16	1,534890307460612474726166714030 7e-33 3,178307362930554675311158795390 2e-17
0.999999	0^o 180^o	1,112666540776500800008201783458e-35 2,304253948386754199378490026273 9e-16	1,534720985455434420237875515090 3e-36 3,178298942951716203329139220210 1e-17
0.9999999	0^o 180^o	1,112651960701887384296667080488 1e-38 2,304253337954630473734967777013 3e-16	1,534700874896108084013687369130 9e-39 3,178298100971701396669147898346 3e-17
0.99999999	0^o 180^o	1,112650272137875580788084309815 6e-41 2,304253276911547649541786197633e-16	1,534698545829375843516629284865e-42 3,178298016773878604403114858280 6e-17
0.999999999	0^o 180^o	1,112650080224011908380051529846 1e-44 2,304253270807240662604725844120 6e-16	1,534698281119129616169633965551 1e-45 3,178298008354098112058505821957 3e-17
0.9999999999	0^o	1,112650058726854876990180981051 9e-47	1,534698251467714017134423143990 7e-48

	180^o	2,30425327019680997685840932902 9e-16	3,17829800751212008069286285559 62e-17
0.99999999999	0^o 180^o	1,11265005634656179041843917929 71e-50 2,30425327013576690842150065156 94e-16	1,53469824818453292233242747478 77e-51 3,17829800742792227773498673632 93e-17
0.999999999999	0^o 180^o	1,11265005608547473942451227557 33e-53 2,30425327012966260157836210553 25e-16	1,53469824782441085385410540524 09e-54 3,17829800741950249744098600617 42e-17

$k_e e^2/m_p$ = 0,13793179979910179480477042123259 **PROTON**

v/c	ϑ	$\frac{\left(1-\frac{v}{c}\cos\vartheta\right)^2\cos^2\vartheta}{c^2\left[ln\lvert 1-\frac{v}{c}\cos\vartheta\rvert+\frac{\frac{v}{c}cos\vartheta}{1-\frac{v}{c}\cos\vartheta}\right]}$	**Radius of force reach of proton r_p =($k_e e^2/m_p$) x** $\frac{\left(1-\frac{v}{c}\cos\vartheta\right)^2\cos^2\vartheta}{c^2\left[ln\lvert 1-\frac{v}{c}\cos\vartheta\rvert+\frac{\frac{v}{c}cos\vartheta}{1-\frac{v}{c}\cos\vartheta}\right]}$ **x [m]**

0,0233369 (proton in neutron …W,Z)	0^o 180^o	3,776866531070790077123340302905 6e-14 4,412762499242943746498281817187 7e-14	5,209499982315842954057066336424 3e-15 6,086602736065618022025286864339 7e-15

$k_e e^2/m_e$ = 253,263842679873277446489290394 17 **ELECTRON**

v/c	ϑ	$\frac{\left(1-\frac{v}{c}\cos\vartheta\right)^2\cos^2\vartheta}{c^2\left[ln\left\lvert1-\frac{v}{c}\cos\vartheta\right\rvert+\frac{\frac{v}{c}cos\vartheta}{1-\frac{v}{c}\cos\vartheta}\right]}$	**Radius of force reach of electron r_e =($k_e e^2/m_e$) x** $\frac{\left(1-\frac{v}{c}\cos\vartheta\right)^2\cos^2\vartheta}{c^2\left[ln\left\lvert1-\frac{v}{c}\cos\vartheta\right\rvert+\frac{\frac{v}{c}cos\vartheta}{1-\frac{v}{c}\cos\vartheta}\right]}$ **x [m]**
0.99999 (electron in neutron …W,Z)	0^o 180^o	1,112789298549128049598388371459 3e-32 2,304260052837541280902901255611 4e-16	2,818292938435929031032299328043 3e-30 5,835857555153635408467497760879 5e-14

In neutron:

Re orbit = 0,999994396591c / 1385383645880508709183872 89,29769 = 2,163954937909669012780275404677 8e-18 m/rad

Rp orbit = Re orbit / /42,850352057551791567501064480165 = =5,050028375503863324181402290192 8e-20 m/rad

Calculation of radius of force reach of Earth in the gravitational field of Sun

Orbital speed of Earth around of Sun v=29,77km/s **v/c = 9,930203114048986515864918789918 3e-5**

(1-v/c) =0,999900697968859510134841350812 1 (1-v/c)^2 = 0,999801405798612408896501611701 61

1+v/c =1,000099302031140489865158649187 899183 1-v/c= 0,999900697968859510134841350812 1

in direction of motion [ln |1-v/c|+ (v/c) / (1-v/c)] = 4,931099571743949067190802725819e-9

against direction of motion [ln |1+v/c|- (v/c) / (1+v/c)] = 4,92979396273869907375818744450 81e-9

$$G = (6{,}6742 \pm 0{,}0010) \cdot 10^{-11}\ \frac{\mathrm{m}^3}{\mathrm{kg\ s}^2}$$

G = 6,67428e-11

The gravitational constant **G = 6,67428e-11** In SI units, the CODATA recommended 2006 **M_s = 1,9891e+30 kg**

r_{id}={ **6,67428e-11***M_s (1-v/c)^2}/ {c^2*[ ]} ={ **6,67428e-11*** 1,9891e+30 * 0,999801405798612408896501611701 61}/

/ { 89875517873681764*4,931099571743949067190802725819e-9 }= 1327317384904616582 20,69383357619 /443185127,6971777863363391099774 1 =

=299495019564,725563233533090519 m= **2,99495019564,72556233533090519e+11 m**

r_{ad}={ **6,67428e-11***M_s (1-v/c)^2}/ {c^2*[ ]} **={ 6,67428e-11*1,9891e+30 * 0,999801405798612408896501611701 61}/**

/{ 89875517873681764 * 4,92979396273869907375818744450 81e-9 }=

= 1327317384904616582 20,69383357619 /443067785,411690400683535107384 28 = 299574337969,820529803117268973 79 m=
=**2,99574337969820529803117268973 79e+11 m**

147+152 = 299 milion km **R_{Z-S} = 0,5*299 milion km** **R_{Z-S} =1,5e+11m**

Galaktická perioda (oběžná doba) 2,26×10^8 a =2,26e+8 a 1 a = The Julian year is, therefore, on average 365.25 days long

1 a = 31 556 925,4 s It is 20 minutes shorter than the sidereal year 20*60=1200 s 31 556 925,4 s + 1200 s = 31 558 125,4 s

2,26e+8 *31 558 125,4 s = 7132136340400000 s 2,26e+8 * 31 556 925,4 s = 7131865140400000 s

Orbital speed of Sun in GALAXY v = 217 km/s Orbital radius of Sun in GALAXY R_{S-G} =2,5e+17 km =2,5e+20 m

2*pí*2,5e+17 km=157079632679489661923 13216916398 km = 1,57079632679489661923 13216916398e+18 km

1,57079632679489661923 13216916398e+18 km / 7131865140400000s = 220,25042480076908034621278039205 km/s

Calculation of radius of force reach of Sun in the gravitational field GALAXIE Sun – GALAXY :

Speed of Sun around center of Galaxy v = 217km/s **v/c = 7,2383408657998994757900147041057e-4**

(1-v/c) = 0,99927616591342001005242099852959 (1-v/c)^2 = 0,99855285576262491519322552351 64

in direction of motion [ln |1-v/c|+ (v/c) / (1-v/c)] = 2,62220926875010566836100989322 37e-7

v/c=7,2383408657998994757900147041057e-4 1+v/c= 1,00072383408657998994757900147 04

against direction of motion [ln |1+v/c|- (v/c) / (1+v/c)] = 2,617152697833775654952171660934 2e-7

GALAXY Mass 7.0×10^{11} $M_\odot$ (1.4×10^{42} kg) **7e+11*** 1,9891e+30 kg = 1,39237e+42 kg

The gravitational constant **G = 6,67428e-11** In SI units, the CODATA recommended 2006 **M_s = 1,9891e+30 kg**

r_{id}={ **6,67428e-11***M_s (1-v/c)^2}/ {c^2*[ ]} ={ **6,67428e-11*** 1,39237e+42 * 0,99855285576262491519322552351 64 }/

/ { 89875517873681764* 2,62220926875010566836100989322 37e-7}= 92796188348908850965353920772140/23567241600,208411024731870231558 =

= 3937507406385999412502,2966641138 m= **3,9375074063859994125022966641138e+21 m**

Sun's distance to galactic center 26,400±1,600 light years 1 light-year = 9.461×10^{12} km = 9.461×10^{15} m **1 light-year = 9,461e+15 m**

26 400*9,461e+15 m = 249770400000000000000 = 2,4977040000000000000e+20 m **R_{S-G} =2,5e+17 km =2,5e+20 m**

Diameter GALAXY = 100 000 light years =9,461e+20 m Radius GALAXY = 4,7305e+20 m

Radius of force reach of Sun r_{id}= 3,937507406385999412502296664113 8e+21 m r_{ad}=3,945115019594982313836,7757809177e+21 m

r_{ad}={ **6,67428e-11***M_s (1-v/c)^2}/ {c^2*[ ]} ={ **6,67428e-11*** 1,39237e+42 * 0,998552855762624915193225523 5164 }/

/ { 8987551787368176 4*2,617152697833775654952171660934 2e-7}=

= 92796188348908850965353920772140/ 23521795407,231395275161213129806 =

= 3945115019594982313836,7757809177 m = **3,945115019594982313836,7757809177e+21 m**

Interaction	**Relative Strength**	**Radius of force reach calculation [m]**	ϑ	**Radius of force reach formula [m]**	**v/c**
Strong QCD	10^{38}	2,161698889794281080286848459985 5e-16 4,219375986304991588977496164658 3e-16	0^o 180^o	**Radius of force reach of proton r_p =($k_e e^2/m_p$) x** $\frac{\left(1-\frac{v}{c}\cos\vartheta\right)^2\cos^2\vartheta}{c^2\left[ln\lvert 1-\frac{v}{c}\cos\vartheta\rvert+\frac{\frac{v}{c}cos\vartheta}{1-\frac{v}{c}\cos\vartheta}\right]}$ **x**	**(0,06 –) 0,1 u,d quarks**
		1,223018148346653176139209619345 6e-19 3,731403038144156688539930061556 9e-17	0^o 180^o		**(0,5 – 0,78) 0,7 c,s quarks**
		2,291478531776598587234051212752 6e-21 3,294446905009937544809616715754 4e-17	0^o 180^o		**(0,8665) 0,9 b quark**
		1,625828714140720069370190227512 6e-24 3,187856145597021918126889682839 7e-17	0^o 180^o		**(0,994637- -0,994766) 0,99 t quark**
Electromagnetic QED	10^{36}	56358805,748944533620585462739198 56358805,752701787337307007225384	0^o 180^o	**Radius of force reach of electron r_e =($k_e e^2/m_e$) x**	**1e-11 (- 0,682) electron**

		7,7242296915076524984672268696567e-16 7,5933174273225751416275418610272e-14	0^o 180^o	$\frac{\left(1-\frac{v}{c}\cos\vartheta\right)^2\cos^2\vartheta}{c^2\left[ln\left\|1-\frac{v}{c}\cos\vartheta\right\|+\frac{\frac{v}{c}cos\vartheta}{1-\frac{v}{c}\cos\vartheta}\right]}$ x	**0,6 electron**
		2,9852697367995728469528649797656e-21 5,8533905779558232539269262326763e-14	0^o 180^o		**0,9953 muon**
		2,8404014873975547515606301353 82e-24 5,8375618415212342167582430481493e-14	0^o 180^o		**0,99971 tauon**
Weak	10^{25}	5,2094999823158429540570663364243e-15 6,0866027360656180220252868643397e-15	0^o 180^o	**Radius of force reach of proton r_p =($k_e e^2/m_p$) x** $\frac{\left(1-\frac{v}{c}\cos\vartheta\right)^2\cos^2\vartheta}{c^2\left[ln\left\|1-\frac{v}{c}\cos\vartheta\right\|+\frac{\frac{v}{c}cos\vartheta}{1-\frac{v}{c}\cos\vartheta}\right]}$ x	**0,0233369** (proton in neutron …W,Z)
		2,8182929384359290310322993280433e-30 5,8358575551536354084674977608795e-14	0^o 180^o	**Radius of force reach of electron r_e =($k_e e^2/m_e$) x** $\frac{\left(1-\frac{v}{c}\cos\vartheta\right)^2\cos^2\vartheta}{c^2\left[ln\left\|1-\frac{v}{c}\cos\vartheta\right\|+\frac{\frac{v}{c}cos\vartheta}{1-\frac{v}{c}\cos\vartheta}\right]}$ x	**0.99999** (electron in neutron …W,Z)
Gravitation	1	**Calculation of radius of force reach of Earth in the gravitational field of Sun** **r_{id}=2,99495019564,72556323353309051 9e+11** **r_{ad}=2,995743379698205298031172689 74e+11**	0^o 180^o	**Radius of force reach of Earth in the gravitational field of Sun** **r_{id}={ 6,67428e-11***M_s (1-v/c)^2}/ {c^2*[ ]} **r_{ad}={ 6,67428e-11***M_s (1-v/c)^2}/ {c^2*[ ]}	**9,9302031140489 86515864918789 9183e-5** (Earth around of Sun: v=29,77km/s)
		Calculation of radius of force reach of Sun in the gravitational field of GALAXY **r_{id}=3,937507406385999412502296664 1138e+21** **r_{ad}=3,945115019594982313836,775780917e+21**		**Radius of force reach of Sun in the gravitational field of GALAXY** **r_{id}={ 6,67428e-11*M_G** (1-v/c)^2}/ {c^2*[ ]} **r_{ad}={ 6,67428e-11*M_G** (1-v/c)^2}/ {c^2*[ ]}	**7,2383408657998 99475790014704 1057e-4** (Sun in GALAXY v = 217 km/s)

$k_e e^2/m_p$ = 0,13793179979910179480477042123259 for PROTON, **$k_e e^2/m_e$ = 253,26384267987327744648929039417 for ELECTRON**

v/c	ϑ	$\frac{\left(1-\frac{v}{c}\cos\vartheta\right)^2\cos^2\vartheta}{c^2\left[ln\left\|1-\frac{v}{c}\cos\vartheta\right\|+\frac{\frac{v}{c}cos\vartheta}{1-\frac{v}{c}\cos\vartheta}\right]}$	**Radius of force reach of proton r_p =($k_e e^2/m_p$) x** $\frac{\left(1-\frac{v}{c}\cos\vartheta\right)^2\cos^2\vartheta}{c^2\left[ln\left\|1-\frac{v}{c}\cos\vartheta\right\|+\frac{\frac{v}{c}cos\vartheta}{1-\frac{v}{c}\cos\vartheta}\right]}$ **x [m]**
0,0233369 (proton in neutron …W,Z)	0^o	3,77686653107079007712334030290 56e-14	5,20949998231584295405706633642 43e-15
	180^o	4,41276249924294374649828181718 77e-14	6,08660273606561802202528686433 97e-15

$k_e e^2/m_e$ = 253,26384267987327744648929039417 **ELECTRON**

v/c	ϑ	$\frac{\left(1-\frac{v}{c}\cos\vartheta\right)^2\cos^2\vartheta}{c^2\left[ln\left\|1-\frac{v}{c}\cos\vartheta\right\|+\frac{\frac{v}{c}cos\vartheta}{1-\frac{v}{c}\cos\vartheta}\right]}$	**Radius of force reach of electron r_e =($k_e e^2/m_e$) x** $\frac{\left(1-\frac{v}{c}\cos\vartheta\right)^2\cos^2\vartheta}{c^2\left[ln\left\|1-\frac{v}{c}\cos\vartheta\right\|+\frac{\frac{v}{c}cos\vartheta}{1-\frac{v}{c}\cos\vartheta}\right]}$ **x [m]**
0.99999 (electron in neutron …W,Z)	0^o	1,11278929854912804959838837145 93e-32	2,81829293843592903103229932804 33e-30
	180^o	2,30426005283754128090290125561 14e-16	5,83585755515363540846749776087 95e-14
	0^o		
	180^o		

Subject and Methods

Calculation of the kinetic energy of a body moving at the velocity of v, [4] p. 51-52:

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

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

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

$$T_{kin_{\parallel}} = mc^2\left[\ln\left|1 - \frac{v}{c}\right| + \frac{\frac{v}{c}}{1 - \frac{v}{c}}\right] \tag{3.12}$$

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

$$T_{kin_{rel}} = mc^2 \left[\ln\left|1 + \frac{v}{c}\right| - \frac{\frac{v}{c}}{1 + \frac{v}{c}} \right] \tag{3.13}$$

Comparing the kinetic energies of the baryon and proton we calculate the speed of proton.

Results

1. 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 .
2. 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 .

Discussion

In my two articles Physics is easy and Physics is beautiful we show:

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

Electron and proton are the only stable fundamental elementary particles.

t -> b -> c -> s -> u <-> d

This decay of quarks actually means a reduction of the speed of proton or alfa particle.

QUARKS = different speeds proton (or alfa particle) **= proton** (or alfa particle) **of different speeds**

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,

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

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

t quark is in the proton (neutron or alfa particle) **at speed of proton (neutron** or alfa particle**):**
v=0,994637c for *Top quark:* 169 100MeV

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

b quark is in the proton (neutron or alfa particle) **at speed of proton (neutron** or alfa particle**):**
v=0,8665c pre 4,2 GeV *Bottom quark*

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 0.001c up to 0.999.. c :

Electron, electron neutrino are in the electron at speed of electron :

from v= 0.001c to v= 0.9 c odhad

Muon, muon neutrino are in the electron at speed of electron :

v= 0,995308032046c

Tauon, tauon neutrino are in the electron at speed of electron : v= 0,99971316674c

W + - boson and neutrino are in the electron at speed of electron :

v= 0,99999364465781184c

Z boson and neutrino are in the electron at speed of electron : v= 0,999994396590953c

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 . :

Lambda hyperón 2286,46 MeV and pion π^0: 134.9766(6) MeV are in the proton at speed of proton v= 0,8022863362c

hyperon Chí c (2645)+ 2646,6MeV and pion $\pi^{\pm}$: 139.57018(35) MeV are in the proton at speed of proton v= 0,819183027c

hyperon 6,165 GeV and meson K^- 493.7 MeV are in the alpha particle at speed of alpha particle v= 0,7533c

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

Electron , proton and alfa particle are the only stable fundamental elementary particles.

References

[1] F. Kirchner : Über die Bestimmung der spezifischen Ladung des Elektrons aus Geschwindigkeitsmessungen, Ann. d. Physik [5] **8**, 975 (1931)

[2] F. Kirchner : Zur Bestimmung der spezifischen Ladung des Elektrons aus Geschwindigkeitsmessungen , Ann. d. Physik [5] **12**, 503 (1932)

[3] Ch. T. Perry, E.L. Chaffee : A DETERMINATION OF e/m FOR AN ELECTRON BY DIRECT MEASUREMENT OF THE VELOCITY OF CATHODE RAYS , Phys.Rev.**36**,904 (1930)

[4] L. Vlcek : New Trends in Physics, Slovak Academic Press, Bratislava 1996

ISBN 80-85665-64-6.

[5] L. Vlcek : 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.