Neutrinos Mass

Contributed
by the
Einstein γ-Factor

Lorentz γ-Factor

- If v<<c the Lorentz gamma-factor is about 1

$$\gamma(v) = \frac{1}{\sqrt{1 - \left(\frac{v}{c}\right)^2}}$$

eV-Neutrinos (v<<c)

Experimental Data

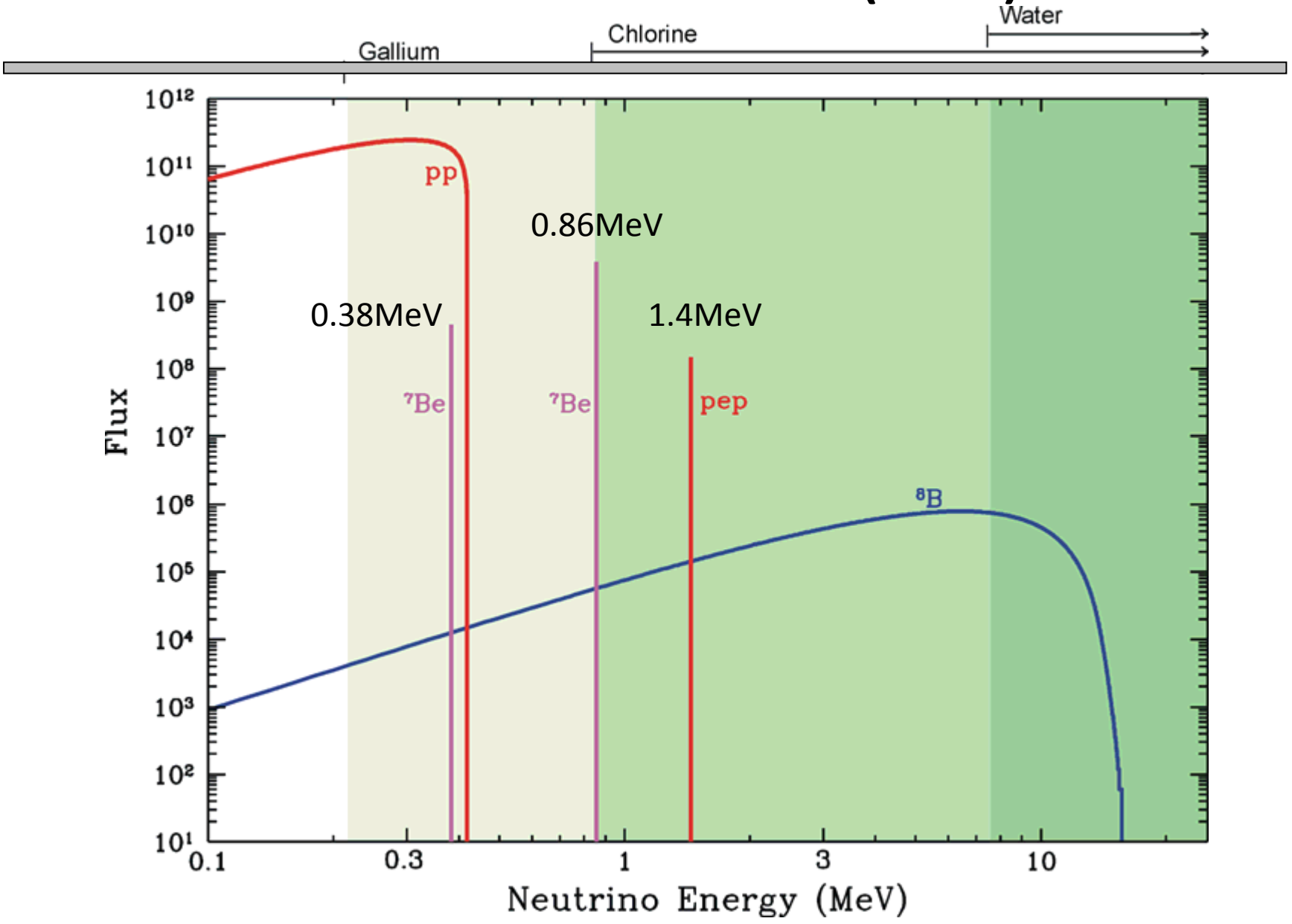
Cosmology				
Observation	Data sets	No. of Parameters	M_ν (95%C.L)	Ref.
LSS	2dFGRS	5	<1.8 eV	[6]
LSS,CMB	2dFGRS, WMAP(1y),ACBAR,VSA,CBI	7	<1.2 eV	[7]
LSS,CMB	SDSS, WMAP(3y)	9	<0.9 eV	[8]
LSS,CMB,SN1a, BAO	2dFGRS,SDSS,WMAP(3y),SNLS,BOOM	11	<0.62 eV	[9]
LSS,CMB,SN1a	2dFGRS,SDSS,SNLS	7	<0.66 eV	[10]
LSS,CMB,SN1a, BAO,Lya,	2dF,SDSS, SDSS(gal),SNLS, WMAP(3y), CBI,VSA,ACBAR	7	<0.17 eV	[11]
LSS,CMB,x-ray cluster data	2dFGRS,WMAP(1y),ACBAR,CBI,Chandra	10	$= 0.56^{+.30}_{-.26}$ eV	[12]

Lorentz γ-Factor

- v<c can shift the gamma factor from 1 to about 10^6 and more!

$$\gamma(v) = \frac{1}{\sqrt{1 - \left(\frac{v}{c}\right)^2}}$$

MeV-Neutrinos (v<c)



Content

- **Equation of Motion**
- ev-Neutrinos
- MeV-Neutrinos

Einstein Equation of Motion

$$0 = \frac{d^2 x^\mu}{d\lambda^2} + \Gamma^\sigma_{\mu\nu} \cdot \frac{dx^\mu}{d\lambda} \cdot \frac{dx_\nu}{d\lambda}$$

Can not explain the natur of restmass

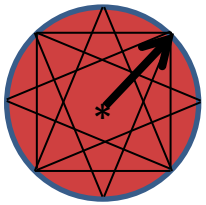
A Priori **Point Particle's** ($\mathbf{r}_0 = 0$) restmass moves as a test particle in an a priori G-Field

Einstein Equation of Motion

SR+GR

$$0 = \frac{d}{dt}\left(\cancel{c} \cdot \boldsymbol{m_N}(t) \cdot \frac{d}{dt}[r(t) \cdot \vec{u}(t)] \right) - \gamma_i{}^2 \cdot g_{44} \cdot \cancel{c} \cdot \vec{f}(t)$$

explains the nature of a free restmass **m**(t) center at rest



Non Point Particle ($\mathbf{r}_0 \neq 0$)
obeys **internal dynamics** [J/s] or [J/m]

Quantization of Restmass

$$\mathrm{E} = \mathrm{m}(\mathrm{N}) \cdot c^2$$

A Quantum-Theory based on (GR+TD) is able to reveal the nature of the Quantum-Number N.

$$\mathrm{m}(\mathrm{N}) \sim 1/N$$

GR+TD

Restmass Electron

$$m_e = \sqrt{\frac{1}{4\pi} \cdot \frac{h \cdot c}{G} \cdot 2\alpha \cdot \frac{24}{\mathbf{N}^2}} = 9.109389 * 10^{-31} \text{kg}$$

Fine Structure Constant alpha
G: Gravitational Constant
h: Planck-Constant
c: velocity of light in vacuum
me: **effective value from theory** compared with me-experiment: gives $Ne=10^{22}$

Completed Mass Contributions

GR **ST** **TD**

$$m = m_{e\boldsymbol{G}}(N) + m_{e\boldsymbol{H}}(\lambda) + Q + ..$$

GR-Pure Restmass, the main contribution

Correlation Test

Gravitational Constant from Codata: G=6.674<u>08</u>(31)*10^{-11}m^3/kgs^2

$$G = \frac{6}{N^2} \cdot \left(\frac{\alpha}{Ry}\right)^2 \cdot \left(\frac{\alpha c}{2} \cdot \frac{\alpha c}{\pi} \cdot \frac{\alpha c}{h}\right) = 6{,}67430 * 10^{-11} \frac{m^3}{kg \cdot s^2}$$

is in accordance with **N$_e$**= 0.**99987**29*10^{22} :

Alpha=1/137.035999
h=6,6260696*10-34Js
Ry=10973731,568539/m (into the mass-formula me)
c=299792458m/s

Electron's Quantum-Number

Hypothesis:

Ne=2^2*5^2*3^2***11*19**^2*23***61**^3*467*10^7
=**999872**9586153000000000 about 10^22

Notice:

The prime number speculation defining Ne is without Relativistic background.

SR Invariant Restmass m_{eo}

$$m_{eo} \cdot c^2 = {E_e}^2 - (c \cdot P)^2$$

$$E_e = \frac{1}{\sqrt{1 - \left(\frac{v}{c}\right)^2}} \cdot m_{eo} \cdot c^2$$

$$E_e = \gamma_v \cdot m_{eo} \cdot c^2$$

GR+TD extended Equation

$$m_{No} \cdot c^2 = {E_e}^2 - (c \cdot P)^2 - \left(\frac{n}{ni} E_e\right)^2 + \left(\frac{n \cdot v}{ni \cdot c} E_e\right)^2$$

$$E_e = \frac{1}{\sqrt{1 - \left(\frac{v}{c}\right)^2}} \frac{1}{\sqrt{1 - \left(\frac{n}{ni}\right)^2}} \cdot m_{No} \cdot c^2$$

$$E_e = \gamma_v \cdot (\gamma_i \cdot m_{No}) \cdot c^2$$

„New Einstein γ_i-Factor “

- $E_{eo} = \gamma_i \cdot mN_o \cdot c^2$
- $m_e \sim (\gamma_i / N_o) = 1/N_e$
- Internal γ_i-Factor contribute to m_{No}.

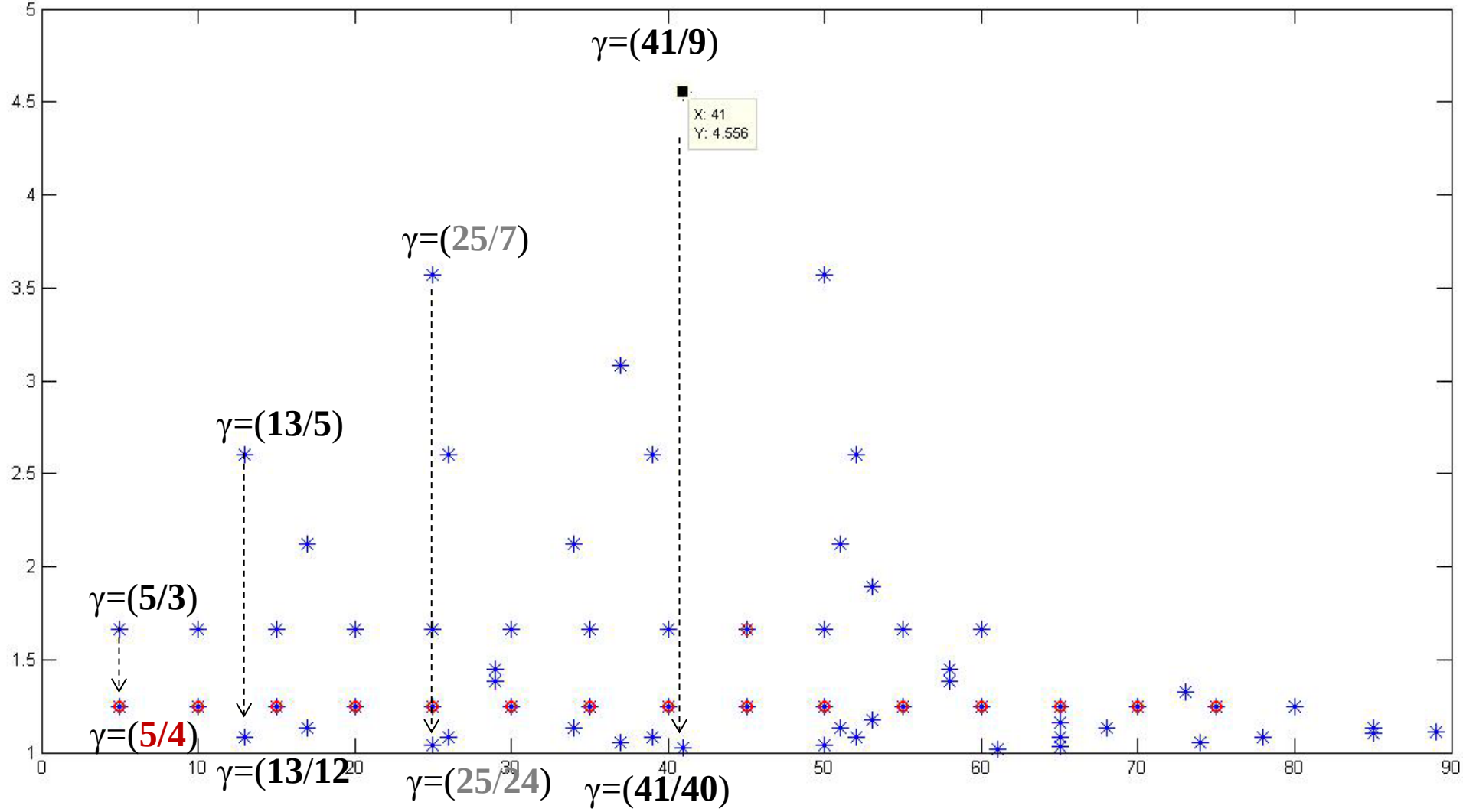
$$\gamma_i = \frac{1}{\sqrt{1 - \left(\frac{n}{n_i}\right)^2}}$$

due to **internal** relativistic **dynamics**

SR Quantization Condition

$$\gamma_i = \frac{1}{\sqrt{1 - \left(\frac{n}{ni}\right)^2}} = \frac{1}{\sqrt{\frac{ni^2 - n^2}{ni^2}}} = \frac{ni}{nj}$$

γ=(ni/nj)


γ=(41/9)
X: 41
Y: 4.556
γ=(25/7)
γ=(13/5)
γ=(5/3)
γ=(5/4)
γ=(13/12
γ=(25/24)
γ=(41/40)
5
4.5
4
3.5
3
2.5
2
1.5
1
0
10
20
30
40
50
60
70
80
90

New Electron‘s Quantum Number

Ne:=$(N_o)*(1/\gamma_i)$

Ne=(2^5*3^2*5^9*7*13^3*19^2*29*37*41*61^2)*(**3/5*4/5*5/13*12/13*11/61*20/29*35/37***40/41**) =**99987**1432560000000000

Notice:

The Ne prime numbers are theoretically based on (SR).

Electron‘s Quantum Number

You might replace (**40/41**) by 1/gamma=(**9/41**). So then we must have 13^2 instead of 13^3 and 2^10 (instead 2^5) as new factors when simultaneously removing the multiplication of inverse gamma factors (3/5 and 12/13). At least to keep Ne constant.

Ne=(2^10*3^2*5^9*7*13^2*19^2*29*37*41*61^2)*(**4/5***
5/13*11/61*20/29*35/37*9/41**)=**9998714**256000000000

Notice:
The change of the prime numbers indicate a change of the internal structure while the total Ne keeps constant.

Correlation Test

Gravitational Constant from Codata: G=6.674<u>08</u>(31)*10^{-11}m^3/kgs^2

$$G = \frac{6}{N^2} \cdot \left(\frac{\alpha}{Ry}\right)^2 \cdot \left(\frac{\alpha c}{2} \cdot \frac{\alpha c}{\pi} \cdot \frac{\alpha c}{h}\right) = 6{,}67431 * 10^{-11} \frac{m^3}{kg \cdot s^2}$$

is in accordance with **N$_e$**= 0.**99987**14*10^{22} :

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Correlation Test

m~1/**N**	N	Calculation [MeV/c^2]	Experiment [MeV/c^2]
e-	**(**2^5*3^2***5**^{9}***7***13^3***19**^{2}***29***37***41***61**^{2}**)*** (3/5*4/5***5/13*12/13***11/61***20/29*** **35/37*40/41**)=0.99987143*10^{22}		**0.510 998 94**61(31)
μ	(2^7***3*5^9***13^2***19^2*29*41*61^2**)*** (**5/13*12/13*20/29*40/41**)	**105.65**615	< 105,658 3745(24) 0.002 22
t	(2^5***3*5^9***7***13^3***19*29***37***41***61)*** (3/5*4/5***5/13*12/13***11/61***20/29*** **35/37*40/41**)	**1776.**743 3	< 1776,82(16) 0.077

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- **ev-Neutrinos**
- MeV-Neutrinos

eV-Neutrinos (v<c)

Theoretical Calculation

$N_{ve} > N_e$ $N_e=10^{22}$

$$m_{1ve} = 0.511MeV/c^2\left(\frac{10^{22}}{30\cdot 10^{27}}\right) = 0.17eV/c^2$$

$N_{1ev}=3*N_e*10^6$

eV	n-Quantum Number *10^{27}
4,088	**1*(5/4)**
2,725	3/2*(5/4)
2,044	**2*(5/4)**
1,817	3/2*3/2*(5/4)
1,363	**3*(5/4)**
1,211	3/2*3/2*3/2*(5/4)
0,908	½*3/2*3/2*(5/4)
0,681	**2*3*(5/4)**
0,606	½*3/2*3/2*3/2*(5/4)
0,340	4***3*(5/4)**
0,170	**2*3*4*(5/4)**
0,085	2***3*4***5/2

Cosmology — M. Steidl Karlsruhe

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Two γ-Factors

- $E_N = m_N(v) * c^2$
- $m_N(v) = (m_{No} * \gamma_i) * \gamma_v$ (both γ Factors contribute to mass)
- $m_N(v) \sim (\gamma_i / N_o) * \gamma_v = (1/N) * \gamma_v$

$$\gamma_i \cdot \gamma(v) = \frac{1}{\sqrt{1 - \left(\frac{n}{ni}\right)^2}} \cdot \frac{1}{\sqrt{1 - \left(\frac{v}{c}\right)^2}}$$

external dynamics

due to internal relativistic dynamics

MeV-Neutrinos (v<c)

- $m_{1ev}*\gamma_v = 0.17\ eV*10^6 = m_{11ev}$

  $m_{11ve} \sim 1/N_{11ev}$

  $m_{11ve} = (m_e*N_e/N_{11ev})*\gamma_v$

  $N_{11ve} = (n_o*\gamma_{ve})*10^{21}$

  $= (2*3*4*(5/4))*10^{21}$

  $= (2*3*3*(5/3))*10^{21}$

  $= 3*10^{22} = (3*N_e) = (3*N_{eo}/\gamma_i)$

$$m_{11ev} = 0.510999 eV/c^2 \left(\frac{10^{22}}{3 \cdot 10^{22}}\right) \cdot 10^6 = \mathbf{0.17}03 MeV/c^2$$

MeV-Neutrinos (v<c)

- ***„Invarinace“***: $n_1 * \gamma_{12} * m_1 = \gamma_{21} * m_x$

$$0.6386 MeV/c^2 = 3 \cdot \left(\frac{\mathbf{5}}{\mathbf{4}}\right) \cdot \boldsymbol{m}_{11ev} = \left(\frac{\mathbf{5}}{\mathbf{3}}\right) \cdot m_{B1e}$$

$$m_{B1e} = \mathbf{0.38}32 MeV/c^2$$

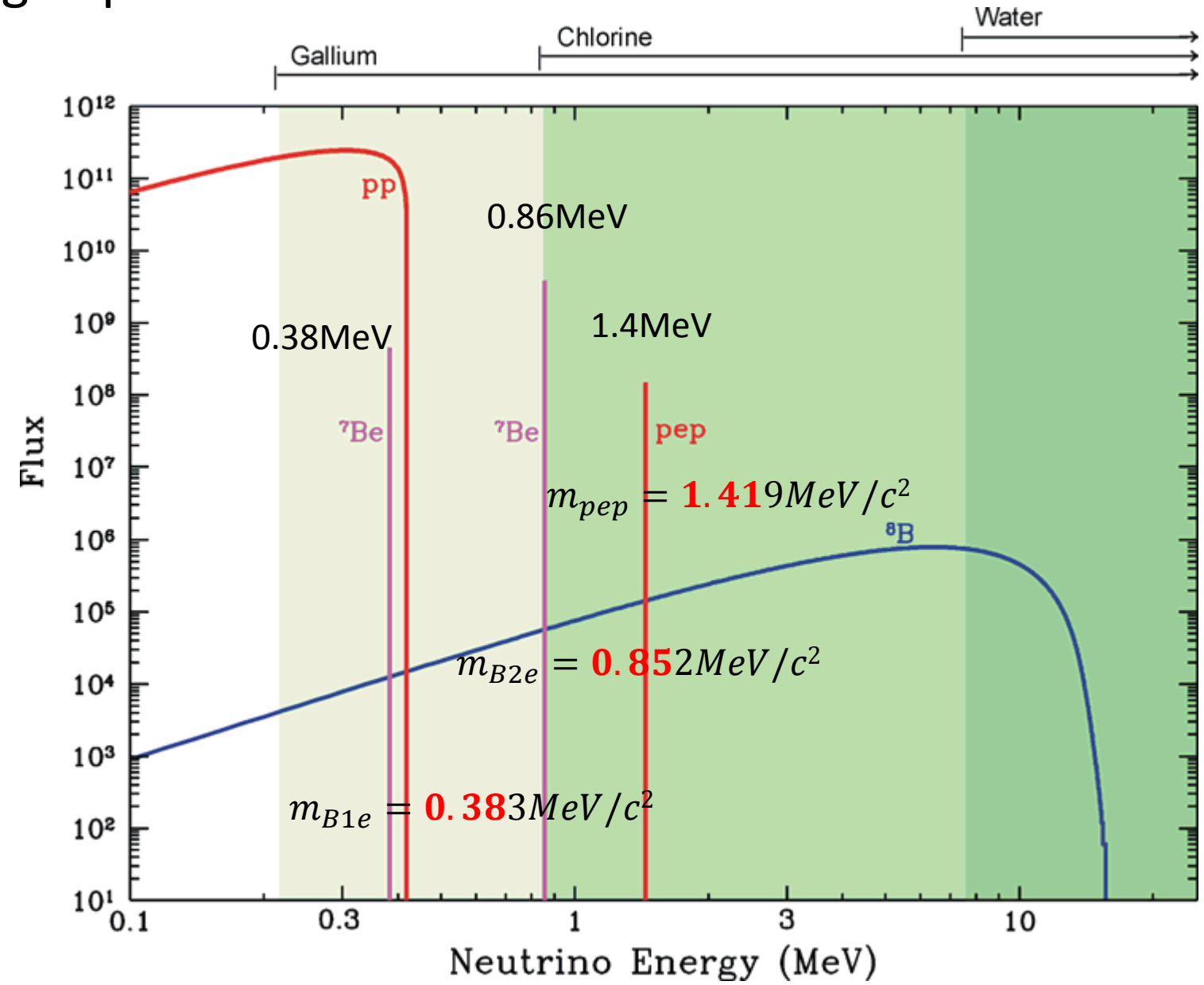
$$2 \cdot \left(\frac{\mathbf{41}}{\mathbf{40}}\right) \cdot m_{B2e} = \left(\frac{\mathbf{41}}{\mathbf{9}}\right) \cdot m_{B1e} = 1.7456 MeV/c^2$$

$$m_{B2e} = \mathbf{0.85}15 MeV/c^2$$

$$2 \cdot \left(\frac{\mathbf{13}}{\mathbf{12}}\right) \cdot m_{11ev} * 10 = \left(\frac{\mathbf{13}}{\mathbf{5}}\right) \cdot m_{pep} = 3.690 MeV/c^2$$

$$m_{pep} = \mathbf{1.41}9 MeV/c^2$$

High Speed Electron Neutrinos calculated restmass



Conclusion from GR+TD

- Ne is SR Lorentz invariant
- Restmass is completed by GR, Higgs, and TD contributions.
- $E_e = E(Ne) + E_{Higgs} + Q = m_{exp} \cdot c^2$
- E_H Higgs-Part.
- Q is based on gravitational an electromagnetic (external) interactions, zero for a free particle.
- Neutrino-Oscillation: “switching from one possible γ_i factor to the other possible one”.