(1)

Deduction [illegible]
between the Neutron and the Proton

$$H_U = -4\pi c^2 \tilde{U}^\dagger U^\dagger - \frac{1}{4\pi}(\text{grad}\,\tilde{U}\,\text{grad}\,U + \lambda^2 \tilde{U} U)$$
$$+ 4\pi c^2 \sum_i \tilde{B}_i^\dagger B_i^\dagger + \frac{1}{4\pi}\sum_i (\text{grad}\,\tilde{B}_i\,\text{grad}\,B_i + \lambda^2 \tilde{B}_i B_i)$$

$$H_M = \tilde{\Psi}\left\{\frac{1}{2M}\left[\vec{p} - \frac{g}{2c}\{(\tau_1 - i\tau_2)\vec{\tilde{B}} + (\tau_1 + i\tau_2)\vec{B}\}\right]^2 + \Delta D\right.$$
$$\left. + \frac{g}{2}\{(\tau_1 - i\tau_2)\tilde{U} + (\tau_1 + i\tau_2)U\}\right\}\Psi$$

$$\bar{H} = \iiint H_U\,dv + \iiint H_M\,dv = \bar{H}_U + \bar{H}_M$$

$$i\hbar\frac{\partial U}{\partial t} = U\bar{H} - \bar{H}U = -i\hbar\cdot 4\pi c^2\cdot \tilde{U}^\dagger$$

$$\frac{\partial U}{\partial t} = -4\pi c^2 \tilde{U}^\dagger \qquad \frac{\partial \tilde{U}}{\partial t} = -4\pi c^2 U^\dagger$$

$$i\hbar\frac{\partial \tilde{U}^\dagger}{\partial t} = (-i\hbar)\left\{\frac{1}{4\pi}(\Delta U - \lambda^2 U) - \frac{g}{2}\tilde{\Psi}(\tau_1 - i\tau_2)\Psi\right\}$$

or $$\Delta U - \frac{1}{c^2}\frac{\partial^2 U}{\partial t^2} - \lambda^2 U = -\frac{4\pi g}{2}\tilde{\Psi}(\tau_1 - i\tau_2)\Psi.$$

$$\Delta\tilde{U} - \frac{1}{c^2}\frac{\partial^2 \tilde{U}}{\partial t^2} - \lambda^2\tilde{U} = -\frac{4\pi g}{2}\tilde{\Psi}(\tau_1 + i\tau_2)\Psi.$$

$$\frac{\partial \vec{B}}{\partial t} = 4\pi c^2 \vec{\tilde{B}}^\dagger \qquad \frac{\partial \vec{\tilde{B}}}{\partial t} = -4\pi c^2 \vec{B}^\dagger$$

$$\Delta\vec{B} - \frac{1}{c^2}\frac{\partial^2 \vec{B}}{\partial t^2} - \lambda^2\vec{B} = -\frac{4\pi g}{2c}\tilde{\Psi}(\tau_1 - i\tau_2)\vec{I}\,\Psi$$

$$\vec{I} = \frac{1}{i\hbar}\{\vec{B}^\dagger \bar{H}_M - \bar{H}_M \vec{B}^\dagger\}$$

$$\text{div}\,\vec{B} + \frac{1}{c}\frac{\partial U}{\partial t} = 0 \qquad \text{div}\,\vec{\tilde{B}} + \frac{1}{c}\frac{\partial \tilde{U}}{\partial t} = 0$$

$$\frac{\partial^2\tilde{\varphi}}{\partial x^2}\ \frac{\partial^2\varphi}{\partial x^2}$$

$$U = \sum a_\sigma \varphi_\sigma \qquad \tilde{U} = \sum \tilde{a}_\sigma \tilde{\varphi}_\sigma$$
$$U^\dagger = \sum a_\sigma^\dagger \tilde{\varphi}_\sigma \qquad \tilde{U}^\dagger = \sum \tilde{a}_\sigma^\dagger \varphi_\sigma$$

$$\left(\Delta - \lambda^2 + \frac{\nu_\sigma^2}{c^2}\right)\begin{Bmatrix}\varphi_\sigma\\ \tilde{\varphi}_\sigma\end{Bmatrix} = 0 \qquad \varphi = \sum b_\sigma\,\text{grad}\,\varphi_\sigma$$

$$\vec{B} = \vec{B}_1 + \vec{B}_2 + \vec{B}_3 \qquad \text{div}\,\vec{B}_{1,2} = 0 \qquad \vec{B}_3 = \text{grad}\,\varphi\sum$$

$\iiint \tilde{\varphi}_\rho \varphi_\sigma d\ldots$

$$\vec{B} = \sum_{(1,2)\sigma} b_\sigma^{(1,2)} \vec{B}_\sigma^{(1,2)} + \sum_\sigma b_\sigma \,\mathrm{grad}\, \varphi_\sigma$$

$$\mathrm{div}\, \vec{B} + \frac{1}{c}\frac{\partial U}{\partial t} = 0 \rightarrow \quad b_\sigma \Delta \varphi_\sigma + \frac{1}{c}\dot{a}_\sigma \varphi_\sigma = 0.$$

$$\left(\frac{\nu_\sigma^2}{c^2} - \lambda^2\right) b_\sigma = \frac{\dot{a}_\sigma}{c} = -4\pi c\, \tilde{a}_\sigma^{+}$$

$$\left.\begin{array}{l} \left(\frac{\nu_\sigma^2}{c^2} - \lambda^2\right)\dot{b}_\sigma = \frac{\ddot{a}_\sigma}{c} \\ \ddot{a}_\sigma + \nu_\sigma^2 a_\sigma = T_\sigma \\ \dot{b}_\sigma = 4\pi c^2 \tilde{b}_\sigma^{+} \end{array}\right\} \quad a_\sigma = \frac{T_\sigma - \ddot{a}_\sigma}{\nu_\sigma^2} = \frac{T_\sigma - c\left(\frac{\nu_\sigma^2}{c^2} - \lambda^2\right) 4\pi c^2 \tilde{b}_\sigma^{+}}{\nu_\sigma^2}$$

$$\bar{H}_U = -(4\pi c^2)^2 \sum_\sigma \tilde{a}_\sigma^{+} a_\sigma^{+} - \sum_\sigma \nu_\sigma^2 \tilde{a}_\sigma a_\sigma$$

$$+\sum_\sigma \left(\frac{\nu_\sigma^2}{c^2} - \lambda^2\right)\left\{(4\pi c^2)^2 \sum_{\sigma,i} \tilde{b}_\sigma^{+(i)} b_\sigma^{+(i)} + \sum_{\sigma,i} \nu_\sigma^2 \tilde{b}_\sigma^{(i)} b_\sigma^{(i)}\right\}$$

$$\iiint \tilde{\Psi} \frac{g}{2}\left[(\tau_1 - i\tau_2)\tilde{U} + (\tau_1 + i\tau_2) U\right] \Psi dv = \sum_\sigma (\tilde{a}_\sigma T_\sigma + a_\sigma \tilde{T}_\sigma)$$

$$\bar{H}_U = -c^2 \sum_\sigma \left(\frac{\nu_\sigma^2}{c^2} - \lambda^2\right) \sum \tilde{b}_\sigma b_\sigma - \sum_\sigma \frac{\left(\tilde{T}_\sigma - 4\pi c^3\left(\frac{\nu_\sigma^2}{c^2}-\lambda^2\right)\tilde{b}_\sigma^{+}\right)\left(T_\sigma - 4\pi c^3\left(\frac{\nu_\sigma^2}{c^2}-\lambda^2\right)\tilde{b}_\sigma^{+}\right)}{\nu_\sigma^2}$$

$$+\sum_\sigma \nu_\sigma^2 \left(\frac{\nu_\sigma^2}{c^2} - \lambda^2\right) \sum \tilde{b}_\sigma b_\sigma + \sum_\sigma \left(\frac{\nu_\sigma^2}{c^2} - \lambda^2\right)(4\pi c^2)^2 \tilde{b}_\sigma^{+} b_\sigma^{+}$$

$$(4\pi c^2)^2\left(\frac{\nu_\sigma^2}{c^2} - \lambda^2\right)\left\{1 - \frac{c^2\left(\frac{\nu_\sigma^2}{c^2}-\lambda^2\right)}{\nu_\sigma^2}\right\}$$

$c^2\left(\frac{\nu_\sigma^2}{c^2} - \lambda^2\right) + \nu_\sigma^2$

$$\sum_\sigma (\tilde{a}_\sigma T_\sigma + a_\sigma \tilde{T}_\sigma) = \frac{\tilde{T}_\sigma - 4\pi c^3\left(\frac{\nu_\sigma^2}{c^2} - \lambda^2\right)\tilde{b}_\sigma^{+}}{\nu_\sigma^2} T_\sigma + \frac{T_\sigma - 4\pi c^3\left(\frac{\nu_\sigma^2}{c^2}-\lambda^2\right)\tilde{b}_\sigma^{+}}{\nu_\sigma^2}\tilde{T}_\sigma$$

$$\bar{H}_U + \sum_\sigma (\tilde{a}_\sigma T_\sigma + a_\sigma \tilde{T}_\sigma) = \sum_\sigma c^2 \lambda^2 \left(\frac{\nu_\sigma^2}{c^2} - \lambda^2\right)\tilde{b}_\sigma b_\sigma + \sum_\sigma (4\pi c^2)^2 \left(\frac{\nu_\sigma^2}{c^2} - \lambda^2\right)\frac{c^2\lambda^2}{\nu_\sigma^2}\tilde{b}_\sigma^{+} b_\sigma^{+}$$

$$+\sum_\sigma \frac{\tilde{T}_\sigma T_\sigma}{\nu_\sigma^2}$$

$$\iiint \operatorname{grad} \tilde{\varphi}_\rho \operatorname{grad} \varphi_\sigma \, dv = \cdots \iiint \varphi_\rho \left(\frac{\nu_\sigma^2}{c^2} - \lambda^2\right) \varphi_\sigma \, dv = 4\pi c^2 \left(\frac{\nu_\sigma^2}{c^2} - \lambda^2\right)$$

$$b_\rho^\dagger b_\sigma - b_\sigma b_\rho^\dagger = \frac{-i\hbar}{4\pi c^2 \left(\frac{\nu_\sigma^2}{c^2} - \lambda^2\right)}$$

~~$b_\sigma = \frac{1}{\sqrt{2}\sqrt{4\pi c^2 \left(\frac{\nu_\sigma^2}{c^2} - \lambda^2\right)}} c_\sigma + i d_\sigma, \quad b_\sigma^\dagger = \frac{1}{\sqrt{2}}(c_\sigma^\dagger - i d_\sigma^\dagger)$~~

~~$\tilde{b}_\sigma = c_\sigma - i d_\sigma \quad \tilde{b}_\sigma^\dagger = c_\sigma^\dagger \; i d_\sigma^\dagger$~~

$$b_\sigma = \frac{1}{\sqrt{2}\sqrt{4\pi c^2 \left(\frac{\nu_\sigma^2}{c^2} - \lambda^2\right)}} (c_\sigma + i d_\sigma) \qquad b_\sigma^\dagger = \frac{1}{\sqrt{2}} \frac{1}{\sqrt{4\pi c^2 \left(\frac{\nu_\sigma^2}{c^2} - \lambda^2\right)}} (c_\sigma^\dagger - i d_\sigma^\dagger)$$

$$\tilde{b}_\sigma = \quad \text{〃} \quad (c_\sigma - i d_\sigma) \qquad \tilde{b}_\sigma^\dagger = \quad \text{〃} \quad (c_\sigma^\dagger + i d_\sigma^\dagger)$$

$$c_\sigma^\dagger c_\sigma - c_\sigma c_\sigma^\dagger = -i\hbar \qquad \text{etc.}$$

$$c^2 \lambda^2 \left\{ \sum_\sigma \left(\frac{\nu_\sigma^2}{c^2} - \lambda^2\right) b_\sigma b_\sigma + \frac{(4\pi c^2)}{\nu_\sigma^2} \left(\frac{\nu_\sigma^2}{c^2} - \lambda^2\right) b_\sigma^\dagger b_\sigma^\dagger \right\}$$

$$= \frac{c^2 \lambda^2}{2} \left\{ \frac{1}{4\pi c^2} (c_\sigma^2 + d_\sigma^2) + \frac{(4\pi c^2)}{\nu_\sigma^2} (c_\sigma^{\dagger 2} + d_\sigma^{\dagger 2}) \right\}$$

$$\left(\frac{\sqrt{\nu_\sigma}\, c_\sigma}{\sqrt{4\pi c^2}} \;(q),\; \sqrt{\frac{4\pi c^2}{\nu_\sigma}}\, c_\sigma^\dagger \;(p) \right) \qquad \frac{1}{2}(p^2 + q^2) =$$

$$= \frac{c^2 \lambda^2}{2} \cdot \sum \frac{\hbar n_\sigma}{\nu_\sigma}$$

$$i\hbar \frac{\partial \Psi}{\partial t} = \frac{1}{2M}\left[\vec{p} - \frac{g}{2c}\left\{(\tau_1 - i\tau_2)\vec{B}^* + (\tau_1 + i\tau_2)\vec{B}\right\}\right]^2 \Psi + \frac{\tau_3}{2} D\Psi$$

$$+ \frac{g}{2}\left\{(\tau_1 - i\tau_2)U^* + (\tau_1 + i\tau_2)U\right\}\Psi.$$

$$-i\hbar \frac{\partial \tilde{\Psi}}{\partial t} = \frac{1}{2M}\left[-\vec{p} - \frac{g}{2c}\left\{(\tau_1 + i\tau_2)\vec{B}^* + (\tau_1 - i\tau_2)\vec{B}\right\}\right]^2 \tilde{\Psi} + \frac{\tau_3}{2} D\tilde{\Psi}$$

$$+ \frac{g}{2}\left\{(\tau_1 + i\tau_2)U^* + (\tau_1 \pm i\tau_2)U\right\}\tilde{\Psi}$$

$$i\hbar \frac{\partial (\tilde{\Psi}(\tau_1 - i\tau_2)\Psi)}{\partial t} = \frac{1}{2M}\left(\tilde{\Psi}\,\vec{p}^2 \Psi - \Psi\,\vec{p}^2\tilde{\Psi}\right)$$

$$\leftarrow \frac{1}{2M}\left(\tilde{\Psi}(\tau_1 - i\tau_2)\vec{p}^2\Psi - (\vec{p}^2\tilde{\Psi})(\tau_1 - i\tau_2)\Psi\right)$$

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