METHOD OF THE “DINEUTRONEUM” EXISTENCE CONFIRMATION

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PROBLEM

One of the main puzzle of the modern low-energy nuclear physics is repeatable effect of the neutronless tritium production ($t/n \sim 10^5 - 10^9$) at the heavy water electrolysis **(Tsarev V.A., Uspekhi Fizicheskikh Nauk, 1992)** [1]. This fact is independently confirmed by enormous tritium quantity in the atmosphere and in the ocean water.

Table 1

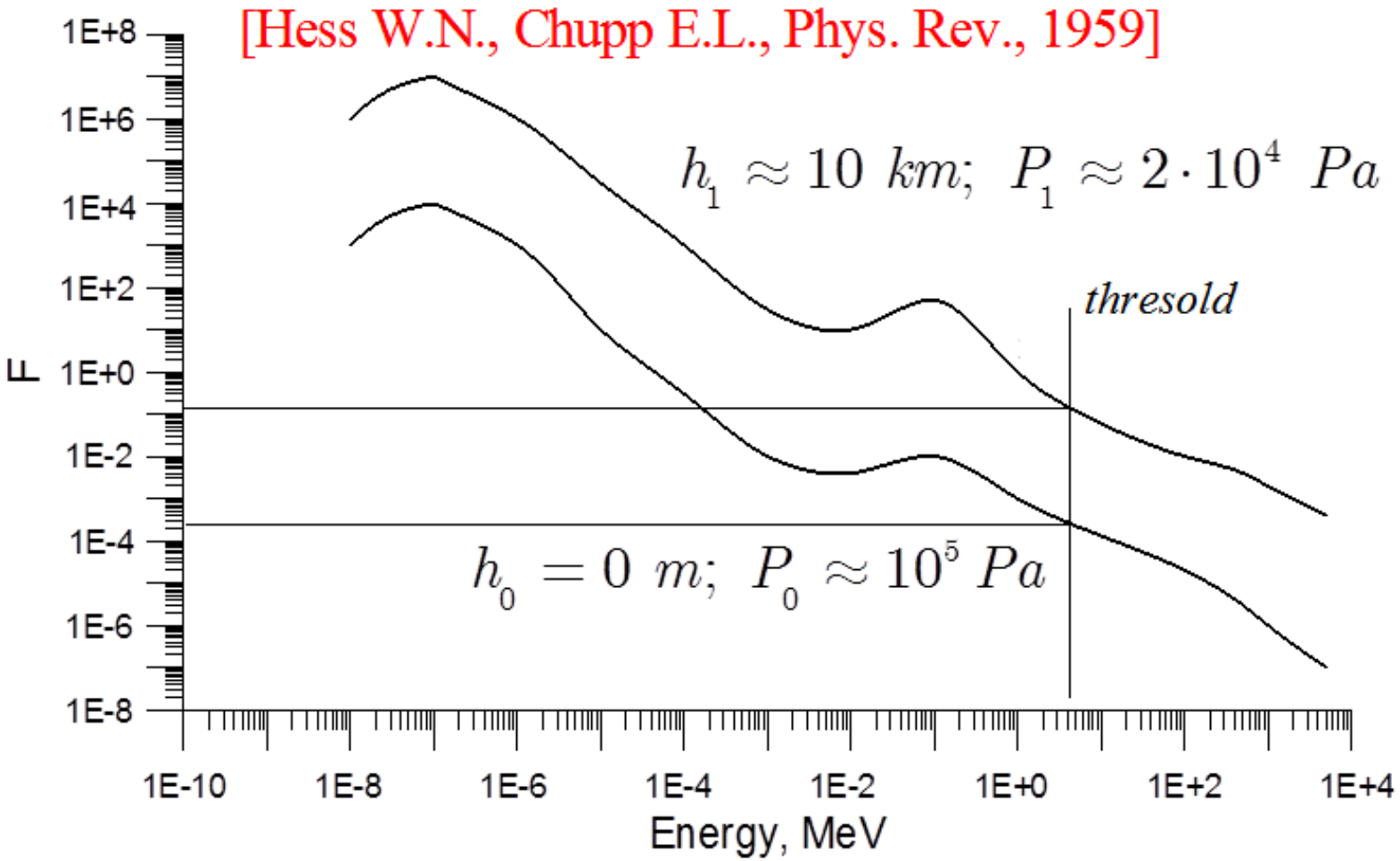
Tritium generation by cosmic ray

Reaction	**Energy (MeV)**	**Cross-section (mbarn)**	**Rate (atom/cm^2·s)**
${}^{14}_{7}N(n,t){}^{12}_{6}C$	>4.4	>4.4	$0.1-0.2$
${}^{16}_{8}O(p,t){}^{14}_{8}O$	>100	25	0.08
${}^{14}_{7}N(p,t){}^{12}_{7}N$	>100	25	0.08
${}^{16}_{8}O(p,t){}^{14}_{8}O$	$10-100$	25	0.01
${}^{14}_{7}N(p,t){}^{12}_{7}N$	$10-100$		0.01
${}^{14}_{7}N(p,t){}^{12}_{7}N$	<10		0.05
		$\Sigma = 0.43$	

Neutron flux density $F\ \left[cm^{-2}\cdot s^{-1}\right]$ [2]

Measurement position: 44° north latitude

Neutron energy: $0.023\ eV \le E_n \le 500\ MeV$



Tritium equilibrium quantity

$$\frac{dM_{{}^{3}_{1}H}}{dt} = -\lambda_{{}^{3}_{1}H} M_{{}^{3}_{1}H} + f_{{}^{3}_{1}H} \tag{1}$$

$$f_{{}^{3}_{1}H} \equiv \frac{dM^{cosmic}_{{}^{3}_{1}H}}{dt} \approx 0.35 \ \ [kg \,/\, year]; \qquad \lambda_{{}^{3}_{1}H} = \frac{\ln 2}{T_{1/2}({}^{3}_{1}H)} \approx 5.68 \cdot 10^{-2} \ \ year^{-1} \tag{2}$$

$$M_{{}^{3}_{1}H}(t) = \left[\ f_{{}^{3}_{1}H} \,/\, \lambda_{{}^{3}_{1}H} \ \cdot \ \exp(\lambda_{{}^{3}_{1}H} t) - 1 \ + M_{{}^{3}_{1}H}(t=0) \right] \cdot \exp(-\lambda_{{}^{3}_{1}H} t) \tag{3}$$

$$M_{{}^{3}_{1}H}(\infty) = f_{{}^{3}_{1}H} \,/\, \lambda_{{}^{3}_{1}H} \approx 6 \ \ kg \tag{4}$$

Tritium in the ocean and atmosphere

$$N_{{}^{3}_{1}H} \,/\, N_{{}^{1}_{1}H} \approx 10^{-18} \ \ [tritium \ \ unity]; \quad 2 \cdot 10^{20} \ \ kg \leq M^{Earth}_{{}^{1}_{1}H} < 10^{21} \ \ kg \tag{5}$$

$$M^{Ocean}_{{}^{3}_{1}H} \geq 200 \ \ kg \tag{6}$$

$$M^{Ocean}_{{}^{3}_{1}H} \gg M_{{}^{3}_{1}H}(\infty) \tag{7}$$

POSSIBLE EXPLANATION

This effect one can explain in the framework of the “orthodox” nuclear physics on the base of hypothesis of the neutroneum and dineutroneum (bound state of the neutron and neutroneum) existence.

HAMILTONIAN

$$H' = \frac{G}{\sqrt{2}} \int J^{\lambda +}(\vec{r}) \cdot J_{\lambda}(\vec{r}) \mathrm{d}\vec{r} \tag{8}$$

$$h'(\vec{r},t) = \frac{G}{\sqrt{2}} \; i\beta[\tilde{f}_1 \gamma_\lambda + \tilde{f}_2 \sigma_{\lambda\rho} k_\rho + (\tilde{g}_1 \gamma_\lambda + i\tilde{g}_2 k_\lambda)\gamma_5] \; ^{+} j^{\lambda}(\vec{r},t) + h.c. \tag{9}$$

$$j_\lambda(\vec{r},t) = \; i\bar{\psi}_e(\vec{r})\gamma_\lambda(1+\gamma_5)\psi_\nu(\vec{r}) \; \cdot \exp\left(-\frac{i}{\hbar}(E_\nu - E_e)t\right) \tag{10}$$

WAVEFUCTIONS IN THE LEPTON V-A CURRENT

Investigated cases:

1. Neutron decay, muon decay and so on

$$\begin{cases} \psi_e(\vec{r}) = (2\pi)^{-3/2} \cdot \exp(i\vec{k}_e\vec{r})u_e(\vec{k}_e) \\ \psi_\nu(\vec{r}) = (2\pi)^{-3/2} \cdot \exp(i\vec{k}_\nu\vec{r})u_\nu(\vec{k}_\nu) \end{cases} \tag{11}$$

2. Electron capture

$$\begin{cases} \psi_e(\vec{r}) = \begin{pmatrix} g_k(r)\ \chi^k_{jm_j} \\ if_{-k}(r)\chi^{-k}_{jm_j} \end{pmatrix} \\ \psi_\nu(\vec{r}) = (2\pi)^{-3/2} \cdot \exp(i\vec{k}_\nu\vec{r})u_\nu(\vec{k}_\nu) \end{cases} \tag{12}$$

NON-INVESTIGATED CASE

3. Exotic induced electron capture (the lost possibility)

$$\begin{cases} \psi_e(\vec{r}) = (2\pi)^{-3/2} \cdot \exp(i\vec{k}_e\vec{r})u_e(\vec{k}_e) \\ \psi_\nu(\vec{r}) = \begin{pmatrix} g_k(r)\ \chi^k_{jm_j} \\ if_{-k}(r)\chi^{-k}_{jm_j} \end{pmatrix} \end{cases} \tag{13}$$

NATURE OF THE "BLINKERS EFFECT"

1. Heisenberg uncertainty principle

$$\Delta p \cdot \Delta x \geq \hbar \tag{14}$$

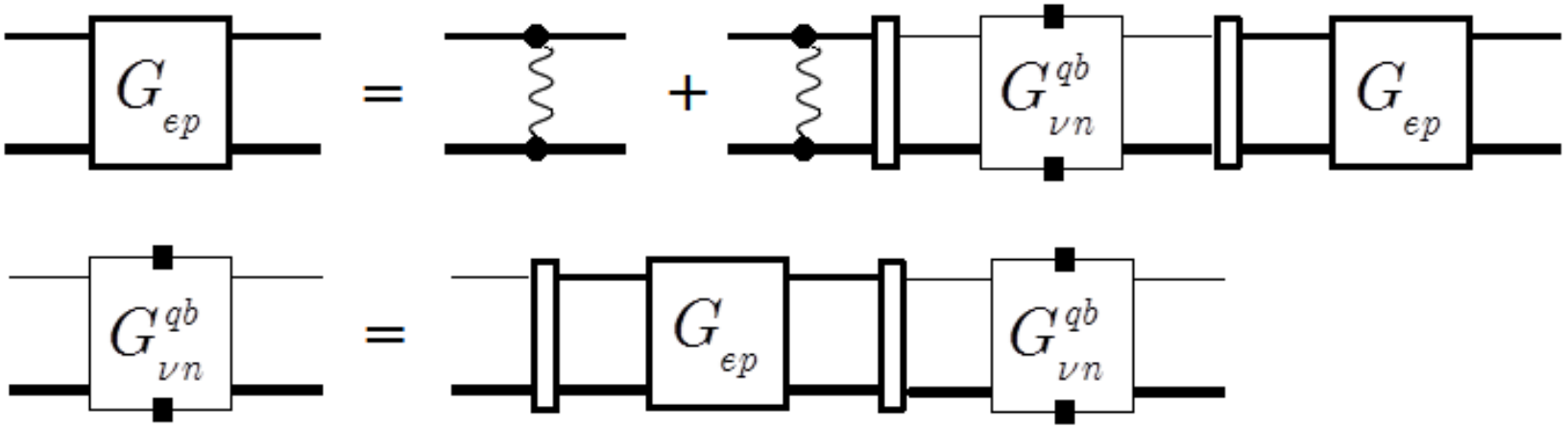
2. Neutrinos Compton wavelength

$$\lambda_C^{(\nu)} \gg r_N \approx 0.86\ fm \tag{15}$$

EVERY KNOW: (13)-(15) ARE IN UNRESOLVED LOGICAL CONTRADICTION

THE END OF THE OWFUL MISTAKE

Formula (13) – (15) contradicts each other only for the authentic bound states, not for resonances. For the exotic electroweak resonances in the coupled channels quantum systems the boundary conditions (13) is not forbidden!!!



EXOTIC REACTION OF THE TRITIUM PRODUCTION

$$D_\nu + d \rightarrow t + n_\nu \qquad (16)$$

The sources of dineutroneum – exotic induced electron capture $D(e,e')D_\nu$, $D(\gamma,\gamma')D_\nu$

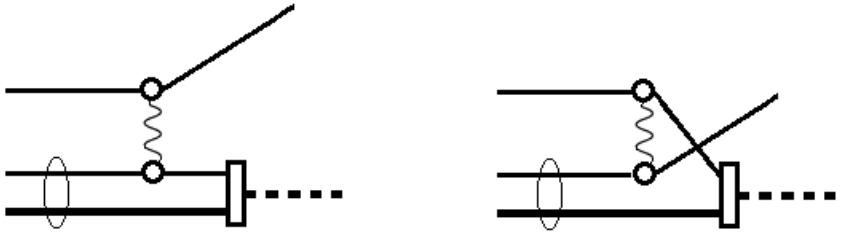


Fig. 1. Neutroneum electroproduction at the inelastic photon-hydrogen scattering

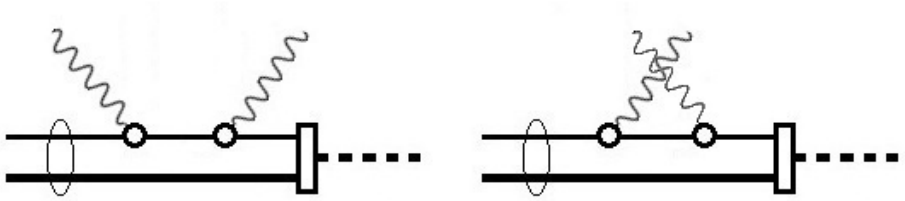


Fig. 2. Neutroneum photoproduction at the inelastic photon-hydrogen scattering

PREDICTIONS [3], [4]

(Yu. R. The Old and New Conc. of Phys., 2009, Yu. R. ISINN-21, 2013)

$$\sigma^{tot}_{D(\gamma,\gamma')D_\nu} \sim \frac{v_e}{c}\cdot\sigma^{max}_{D(e,e')D_\nu} \sim 10^{-4}\ mbarn \qquad (17)$$

"EXPERIMENTUM CRUCIS".

If we expose the X- ray transparent vessel contains gaseous deuterium ($V_{D_2} \sim 1\,litre$) at the room temperature and high pressure $P \sim 10^7\ Pa$ at the γ- quanta beam with the energy $\varepsilon_\gamma \sim 50 keV$ (total X- tube power $W_X \sim 0.5\,kW$), than the estimating rate of the tritium generation events will be approximately

$$\dot{N}_t \sim 10^6 \div 10^9\ event/s \qquad (18)$$

In all reasonable schemes of such kind experiments we can detect enormous quantity of tritium.

That will be the clear signal of the dineutroneum existence!

References

1. Tsarev V.A., Uspekhi Fizicheskikh Nauk (Sov.Phys.- Uspekhi), **162**, №10, 63 (1992)
2. Hess W.N., Chupp E.L. “Cosmic Ray Neutron Energy Spectrum” Phys. Rev., v.116, p.445-457, 1959.
3. Ratis Yu.L. The Old and New Concepts of Physics, Volume VI (2009), N 4, p.525-543 http://www.conceptsofphysics.net/VI_4/525.pdf
4. Ratis Yu.L., Proceedings of the XXI International Seminar on Interaction of Neutrons with Nuclei, Dubna: JINR, 2014.

THANK YOU!