Emission of cold neutrons in TNTL installation

Fedor S. Zaitsev[1], Sergei M. Godin[2]

[1]Specialist in the ether theory and its application,
DSC, Professor, Academician of RANS, fszaitsev@gmail.com

[2]Specialist in experimental physics and LENR,
engineer-physicist, equipment designer, sergeigodin@gmail.com

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The main aim: describe briefly cold neutrons generation in TNLT using the ether resonances and show prospects of practical use. Intended for LENR and the ether researchers, and practical physicists.

Contents

1. Introduction

A detailed talk: F.S. Zaitsev, S.M. Godin. Resonances in the ether and their application. Presentation at the international webinar № 18 of the winter-spring 2022 session of the Klimov-Zatelepin scientific seminar 15.06.2022. http://eth21.ru/LENR_en.html.

Another detailed talk: F.S. Zaitsev, S.M. Godin. Resonant excitation of LENR. Scientific seminar of Research Center «Kurchatov Institute», 12.07.2022.

Since then a more advanced version of TNLT was created by S.M. Godin. TNLT – Transformation of Nuclides at Low Temperature. Here we give new information about TNLT processes exploited in TNLT and present some recent results.

The basis put in TNTL functioning was first predicted theoretically by the ether analysis of Nikola Tesla's experiments with ball lightning, replicated by Corum brothers in1988. See sec. 24.4 in V.L. Bychkov and F.S. Zaitsev: http://eth21.ru/index.html. Impossible to predict without knowing the right value of the ether density. The ether density value is confirmed by quantitative analyses in the book of ~30 different experiments. Suggested a theory – suggest an experiment to test it!

The main idea is resonant pumping of kinetic energy into the ether longitudinal waves with the help of cyclotron ether resonance (CER). CER is rediscovered after N. Tesla and studied quantitatively by F.S. Zaitsev, sec. 11.2 of the book in English or addendum 2 of the book in Russian. CER for typical constant magnetic fields arises in electromagnetic waves of sound frequencies ~10 kHz. Easier to create than high frequency waves. Pumping into the volume of large ether kinetic energy amounts by small portions.

The CER effect was used for developing LENR-R (Low Energy Nuclear Reactions on Resonances) technology and device TNLT demonstrating it.

Several people keep the LENR-R technology know-how. We decided to slightly open details on physics in TNLT, since the technology of pumping energy into the ether should become a public domain.

A glowing gas discharge with standing stratas in a tube. Usually existence of stratas is very sensitive to parameters of the discharge. We invented a technique for getting standing stratas in a wide range of conditions.

Stratas have been studied for more than 150 years. Raised all refs. found in the Internet. Physics tries to explain running stratas are by ionization waves, but fails giving even convincing qualitative explanations of standing strata, see, e.g., p. 629–632 in «L.S. Landa, I.A. Miskinova, Yu.V. Ponomarev. Ionization waves in low-temperature plasma. Successes of physical sciences. 1980, vol. 132, issue 4, p. 601-637 (in Russian)».

Ionization energy is of the order of dozens eV. Nuclear reactions in plasma require $T \gtrsim 10\ [\mathrm{keV}]$. No hope with the XX century physics, which rejected the ether!

In the ether interpretation a discharge with standing stratas is a discharge with the ether longitudinal standing wave. As known from mathematical physics, an oscillating process can be represented as a sum of standing waves. One standing wave can be selected by adjusting input parameters or applying resonance action. Velocity of a substance oscillates between nodes of a standing wave. At the antinodes the kinetic energy is highest.

Thus, kinetic energy concentration is already high at the antinode (at stratas). CER allows additional energy pumping, giving $\gtrsim 10\ \mathrm{MeV/mm^3}$, $E \gtrsim 10^7\ [\mathrm{V/cm}]$.

CER technology can be mastered using the ideas presented here, knowing that it works. This needs guessing up some solutions that were not in Tesla's devices. A faster way is to apply to authors of the talk for the LENR-R technology and/or TNLT.

2. Generation of cold neutrons in TNLT

We emphasize that the initiation of nuclear processes under «normal» conditions does not contradict generally accepted physical concepts, since physics admits the possibility, e.g, of resonant pumping into matter of the energy necessary to activate nuclear processes.

Term «cold neutrons» is more appropriate than «neutron-like objects», since at present we see no evidence of their substantially different behavior (free path, capture, half-life time of produced isotopes) known from cold neutrons known to experimental physics, energies $10^{-7} - 10^{-2}$ [eV] (thermal neutrons have $T \approx 0.03$ [eV]). Besides, this term does not push away nuclear experimentalist from the LENR topic.

Extended description of experiments on TNLT of previous version and their analyses are in the booklet, intended for LENR researchers and practical physicists:

F.S. Zaitsev. Low-energy nuclear reactions LENR and related processes in the TNLT device». 2022, 99 p., 26 figs., 69 refs.

Russian and English versions for personal viewing can be downloaded free from
http://eth21.ru/LENR.html
http://eth21.ru/LENR_en.html

Video and slides of presentation 15.06.2022 is also there.

The experiments on recent version of TNLT have just begun. Preliminary it is several times more effective in LENR production than the previous versions.

All the main processes accompanying LENR have been detected in TNLT. These are described and analyzed in the booklet:

1. X-ray and γ-radiation.
2. The appearance of cold and thermal neutrons.
3. Changes in the composition of isotopes.
4. The formation of new chemical elements.
5. The appearance of fast electrons.
6. Excess heat generation.
7. Strong voltage spikes on the thermocouple.
8. Strange radiation.
9. The aftereffect.

The use of CER resonances determines the fundamental advantages of LENR-R technology over LENR generation in traditional nickel-hydrogen reactors:

1. Generation of LENR at room temperature $\sim 20\ [\mathrm{C^o}]$, which is ~ 50 times less than usually used.
2. The power input into the reactor zone is $\lesssim 10\ [\mathrm{W}]$, which is ~ 2 orders of magnitude less than in traditional installations.
3. Generation of LENR in a few minutes after the TNLT device is turned on.
4. The emission of cold and thermal neutrons (or neutron-like objects) of energies less than $\lesssim 0.03\ [\mathrm{eV}]$ with intensity of $\gtrsim 10^6\ [\mathrm{neutron}/s]$ into the solid angle $4\pi\ [\mathrm{sr}]$ is observed, which is comparable to the intensity of industrial fast neutron sources. Booklet, sec. 1.6, 2.2–2.4.
5. The regularity of LENR reproduction in experiments (over 200 experiments).
6. Excess heat generation in ~ 2 times (measuring technique: booklet, sec. 4) is comparable or higher than in typical LENR units.

Detection of cold neutron effects in experiments is complicated. Use of non-appropriate detecting techniques holds back recognition of LENR existence. The list of problems and ways to overcome them:

1. Only some of cold neutrons escape from the reactor zone of their birth due to small free path before capture.
2. Typical neutron meters are focused on detecting thermal neutrons. As a result, a significant part of cold neutrons are captured by the walls of such meters and their real number is difficult to count. Special meters are required: thin window 0.07 [mm]. The material of the detector walls is activated. Initial measurements after a brake are more reliable.
3. Amplitude of signal produced by cold neutrons in proportional neutron meters is much less than the one from thermal neutrons. Such signals can be considered by the «black box» automatic counters as noise and dropped away. Required: manual counting or usful signal recognition among noise (e.g. neural networks).
4. Rather low intensity $\sim 0.07\ [\text{quanta}/(\text{mm}^2 s)]$ of X/γ-radiation produced by fast deceleration of beta-particles formed by decay of isotopes (booklet, sec 1.5). Not many cold neutrons get out and there is low efficiency of braking radiation generation (1% of electrons energy give X-rays in Roentgen lamp, 99% - heating). Standard detectors can be insensitive to such flow or automatic counting can considered it as noise and reject. Required: special detectors, application of high sensitivity X-ray films, manual counting or useful signal recognition among noise.
5. X/γ-radiation from item 4 appears after the beginning of beta decay, which, unlike neutron generation, is stretched over time according to the isotopes half-life. Required: counting for at least several half-lives. For the closes to natural copper isotopes counting should be done for > 20 min.
6. Low intensity of new chemical elements production $\sim 10^8\ [\text{atom}/s]$ (booklet, sec. 2.4) compared to the atom density $\sim 10^{23} [\text{atom}/\text{cm}^3]$. Required: neutron activation analysis, it can detect $\sim 10^{-9} - 10^{-3}$ chemical element content.

The main proofs of LENR in TNLT, in particular cold neutrons generation:

- Long term radioactivity of non-radioactive Cu, Ag, Al, Mb plates after activation them in TNLT and moving far away from the reactor (booklet, sec. 1.2, 1.4). Observed duration of radioactivity is appropriate to half-lives of isotopes, closest to natural contents.
- The registration of cold and thermal neutron emission (booklet, sec. 1.6).
- X-ray ($1.24 - 124$ [keV]) and γ-radiation (> 124 [keV]) (booklet, sec. 1.1, 1.3, 1.4, 1.6.1, 2.1). X-ray and γ-radiation do not appear in significant amounts in chemical reactions. Giving electrons the speed necessary for the appearance of X-rays during abrupt braking requires a voltage of at least ~ 30 [kV], such or even comparable voltage is not used in TNLT.

Measurements with different reaction (working) mixtures were done, see examples in the booklet, p. 8.

Explanation: accumulation of large kinetic energy in the cyclotron ether resonance (like pushing a swing) with subsequent impact on the working mixture.

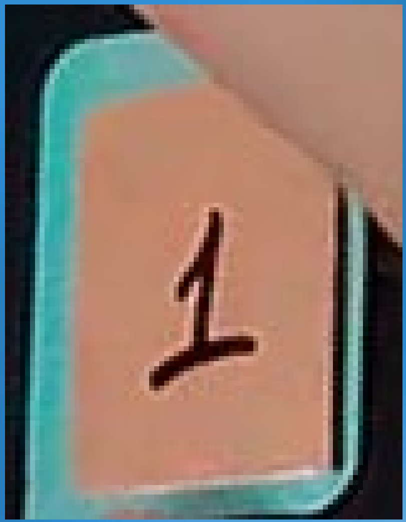
Examples of measurements with the X-ray film

Activating Cu plate in TNLT, for ~ 20 $[\mathrm{min}]$ in the recent one. Taking Cu far away from TNLT and exposure of ERGONOM-X X-ray films on it (booklet, sec. 1.2, 2.2, 2.3).

Previous TNTL version

Recent TNTL version is several times more efficient

Exposure 40 $[\mathrm{min}]$ away from TNLT.



Exposure 20 $[\mathrm{min}]$ away from TNLT.
In some cases plastic backing was spoiled!

For reference. Natural copper $^{63}\mathrm{Cu}$ 69.1%, $^{65}\mathrm{Cu}$ 30.9% activated by cold and thermal neutrons gives radionuclides $^{62}\mathrm{Cu}$, $^{64}\mathrm{Cu}$ and $^{66}\mathrm{Cu}$ with half-lives of 9.9 $[\mathrm{min}]$, 12.8 $[\mathrm{h}]$, 5.1 $[\mathrm{min}]$ (For $^{62}\mathrm{Cu}$ production see «V.N. Podchainova, L.N. Simonova. Copper. Series of the USSR AS: Analytical Chemistry of Elements. – M: Nauka, 1990»). $^{62}\mathrm{Cu}$ – β^+-decay, $^{66}\mathrm{Cu}$ β^--decay. Produce stable Ni, Zn. Refs. – in booklet, sec. 2.3. Fast deceleration of β-decay electrons and positrons gives X-quanta of 10s keV.

3D numerical modelling of the ether flow and CER in TNTL

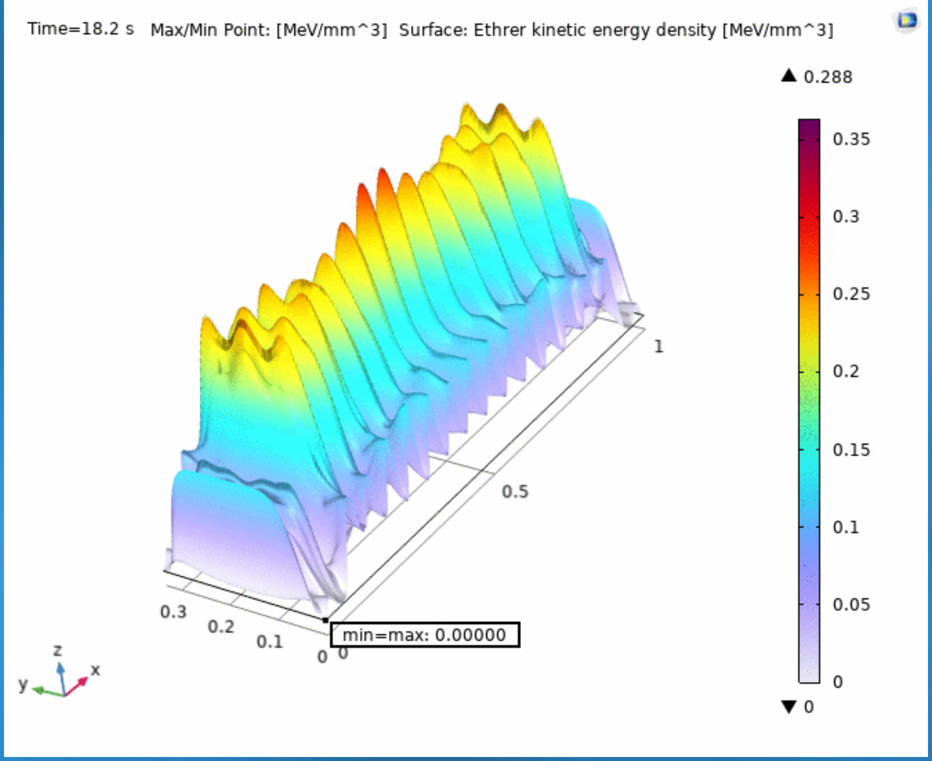
3D ether equations are solved numerically for the first time in the world. Solving 3D fluid dynamics problems is a real challenge, since requires supercomputing.

TNLT construction and the 3D ether flow are implemented in COMSOL Multiphysics.

Correspondence between model and experiment confirms both the model and right understanding of the experiment.

Enhances research by elements impossible in real experiment:

- reducing costs of real experiments in optimizing construction and regimes,
- finding values of quantities that are not measured,
- visualizing physical process for interpretation and development of intuition,
- studying large number of parameters combinations,
- prediction of behavior.



Example of the ether standing wave calculation in TNLT. The ether kinetic energy density in a section of the tube. Peaks are appropriate to standing stratas centers. Computation time: several hours.

Mini-supercomputer used:

- CPU - two Intel Xeon E5-2680v; each 14 cores, 28 threads.
- GPU – two NVIDIA GTX 1080, one NVIDIA RTX 2070 Super.
- RAM - 256 Gb.
- CPU+GPU dbl precision: ~1.5 Tflops.
- Price ~20 k$

COMSOL Multiphysics price > 10 k$.

3. Conclusion

Prospects for the practical use of LENR.
Adaptation to specific needs together with specialists from the industry.
Safer technologies for health and the environment.

1. A source of cold and thermal neutrons. Applications in science, Neutron activation analysis, Nuclear medicine, industry.
2. A source of thermal and electrical energy up to 100 [kW], not competing with powerful power plants.
3. Room high-temperature superconductivity at LENR (DTRA - Defense Threat Reduction Agency for Pentagon, USA, 2016, 133 p.).
4. Laboratory studies on the regeneration of mineral deposits.

Prospects for the practical use of CER. Some require study.

1. Efficient generation of LENR.
2. Efficient chemical production of substances and fertilizers.
3. Energy storage by means of resonant pumping and confinement.
4. Efficient transmission of information over long distances using the ether longitudinal waves which should have a much higher penetrating ability.
5. Softening solid materials for forming and cutting by resonant pumping of the ether energy into them.
6. Weakening of gravity.
7. Compact and efficient creation of ball lightnings by the improvement and replacement of equipment used by Tesla. To remind – an interpretation of Tungus explosion as Tesla's experiment on resonant pumping energy.