

# Evidence of reproducible Tritium production in a pulsed electrolytic cell

## Authors:

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# SUMMARY

1. An innovative electrolytic cell that **produces Tritium** is presented.
2. The production of Tritium occurs contextually to the **generation of low energy photons**.
3. Electrolysis is activated with a Nickel wire immersed in an electrolytic solution with **light-water**, opportunely **solicited by** intense, short **electrical pulses**.
4. The **experiment is now 100% reproducible**.
5. The gas produced by the cell emits low energy electrons whose **energy spectrum is compatible** with that of **Tritium Beta decay**.
6. The presence of Tritium in the electrolytic solution has been **confirmed by different laboratories**.
7. The experimental results are here presented along with a **preliminary theoretical hypothesis**.

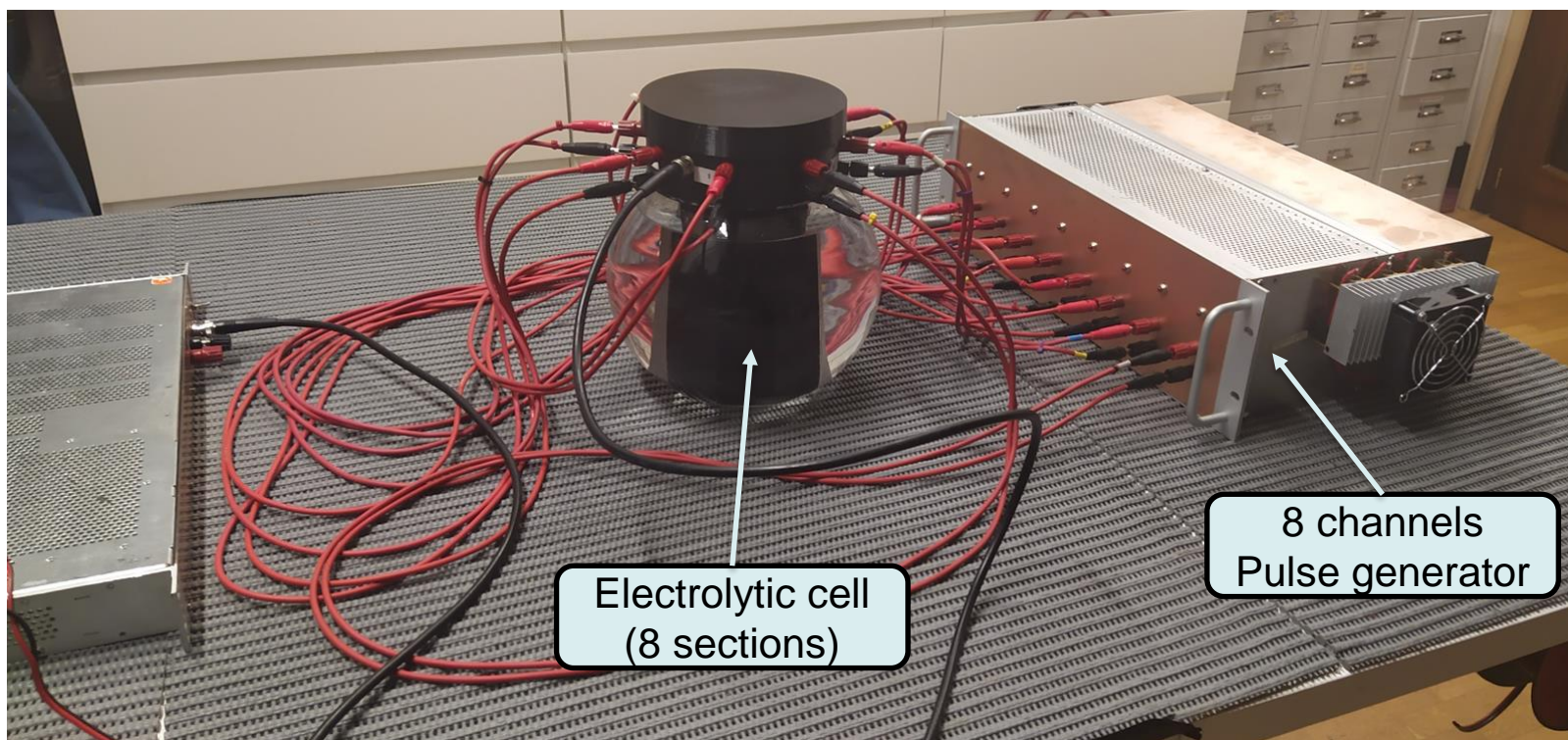
# LENR AND TRITIUM

According to E. Storms “Tritium appears to be the least ambiguous and most easily measured product of the Cold Fusion effect”.

- Evidence of Tritium production in electrolytic cells with **heavy water** ( $D_2O$ ):
  - ✓ E. Storms & C. Talcott “Electrolytic Tritium Production”,
  - ✓ N. J. C. Packham et al. “Production of Tritium from  $D_2O$  Electrolysis at a Palladium Cathode”,
  - ✓ S. Szpak et al. “On the behaviour of the Pd/D system: Evidence for tritium production” ..... and several others.
- Evidence of Tritium production in electrolytic cells with **light water**:
  - ✓ Sankaranarayanan, T.K., Srinivasan et al. 1995 “Evidence for Tritium Generation in Self-Heated Nickel Wires Subjected to Hydrogen Gas Absorption/Desorption Cycles”.
- An innovative pulsed electrolytic cell working with a **light water electrolytic solution** is presented here. The cell is the result of several years of experiments carried out by Dr. Fabrizio Righes.
- The production of Tritium is 100% **reproducible**.

# THE ELECTROLYTIC CELL

In the picture below, an 8 independent sections device and its pulse generator are reported. In each cell Ni electrodes are present, previously subjected to both mechanical and chemical treatments.

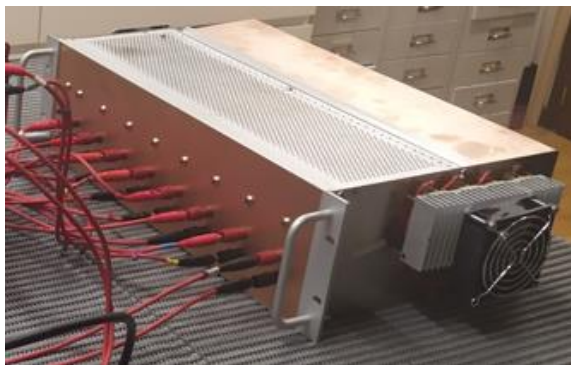


# THE ELECTROLYTIC CELL



## Technical data:

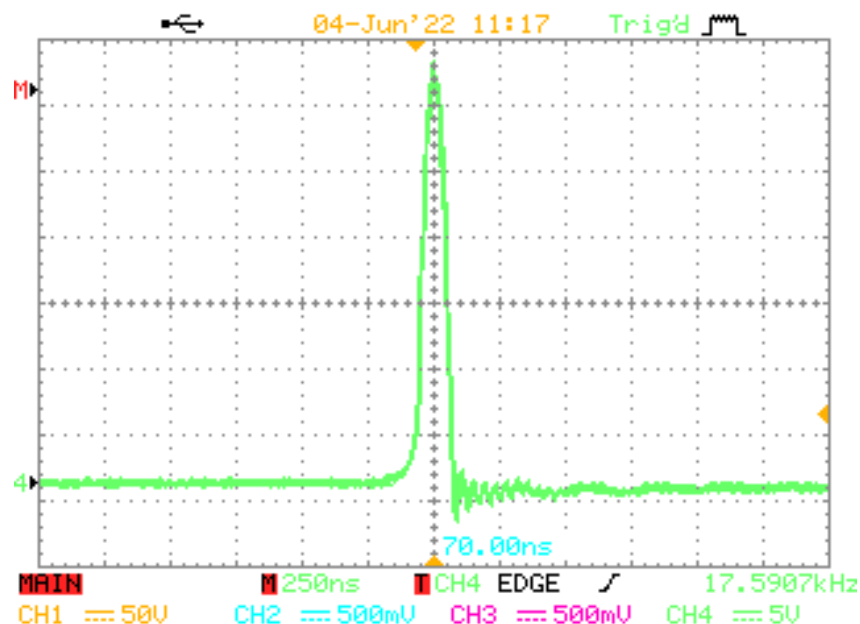
- Cell volume: 5 litres
  - Number independent sections: 8
  - Single section volume: 135 cm<sup>3</sup>
  - Nickel wire section: 0,3 mm<sup>2</sup>
  - Electrolytes: NaHCO<sub>3</sub> or KOH (However, the cell works also with light water only, even if at a lower reaction rate).
- 
- Pulse generator peak power: 400W
  - Pulses frequency: up to 100kHz
  - Pulses amplitude: up to 400V
  - Number independent channels: 8
  - Average power for each channel: 50W



# THE PULSE GENERATOR

- A specific class of EM pulses is the key factor for the activation of the reported nuclear transmutations inside the electrolytic cell as they are able to affect the physical properties of clusters of electrons (Righes, Vassallo, Parchi 2022 Journal Phys. Communications <https://doi.org/10.1088/2399-6528/ac809c>).
- Pulses only are not sufficient to trigger the reaction. Several other variables affect the production of Tritium in the cell.

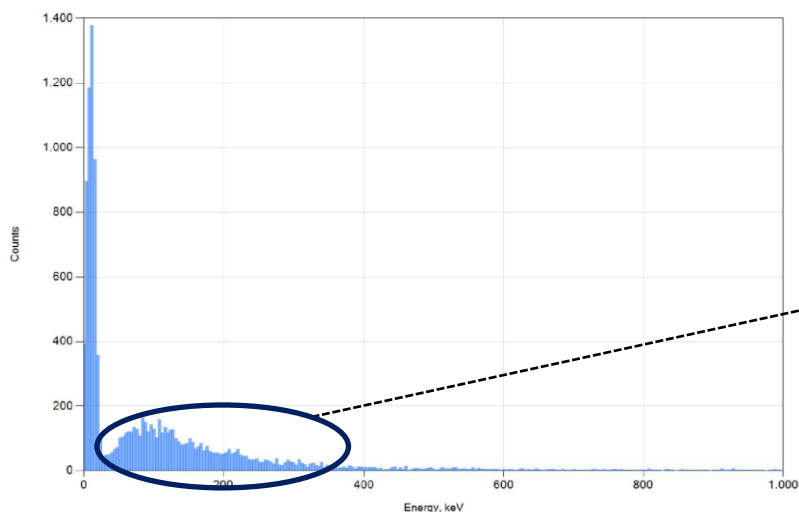
Amplitude: 450V  
Pulse width: 70ns



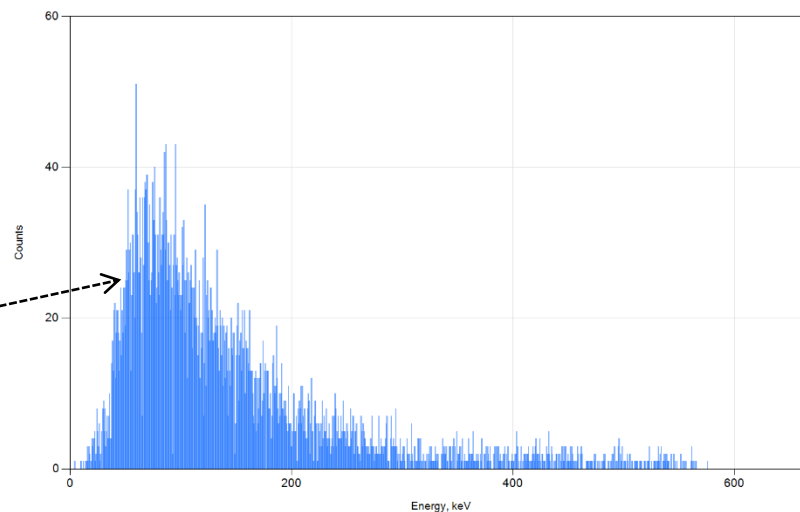
# EARLY EVIDENCES OF LOW ENERGY RADIATION

The first evidence of consistent Tritium production occurred in September 2020. A low energy spectrometer (Scionix 38B57 detector probe) placed on the same desktop of the electrolytic cell showed an energy spectrum compatible with Tritium Beta decay.

Low energy photons were detected also at the ceiling of the laboratory.



Photons energy spectrum detected during the experiment with unexpected T release in the lab (Sept 18).

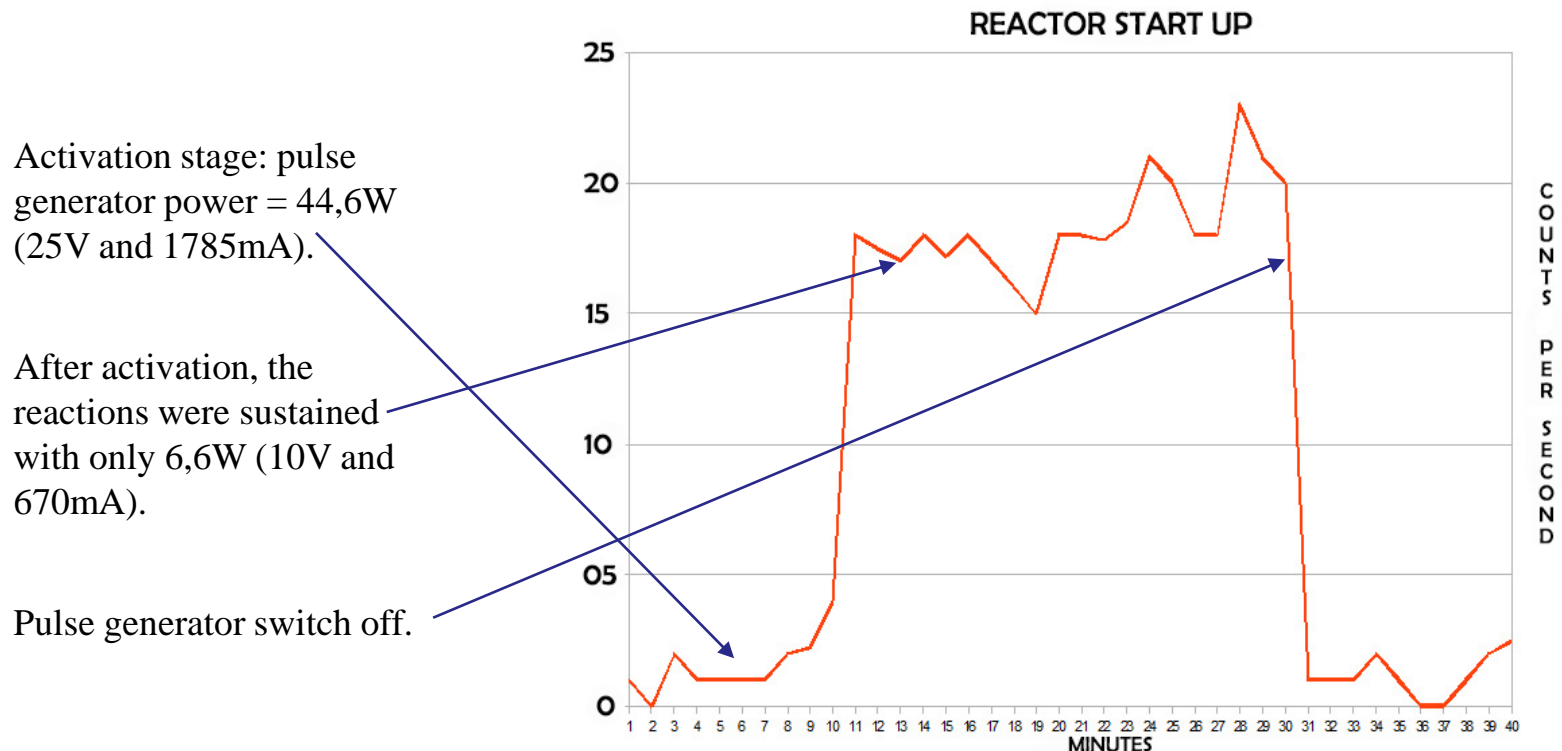


Background photons energy spectrum (Sept 17).



# EXPERIMENTS REPRODUCIBILITY

- The emission of low energy photons is monitored by a Geiger counter with two SBM-20 Geiger Muller counter tubes placed inside the cell. In the graph below Counts/s Vs Time (minutes) are represented.
- Some minutes after activating the pulse generator, the photon counts/s rise well over the background values. We have also checked that the Geiger counts are not an artifact due to the pulses.





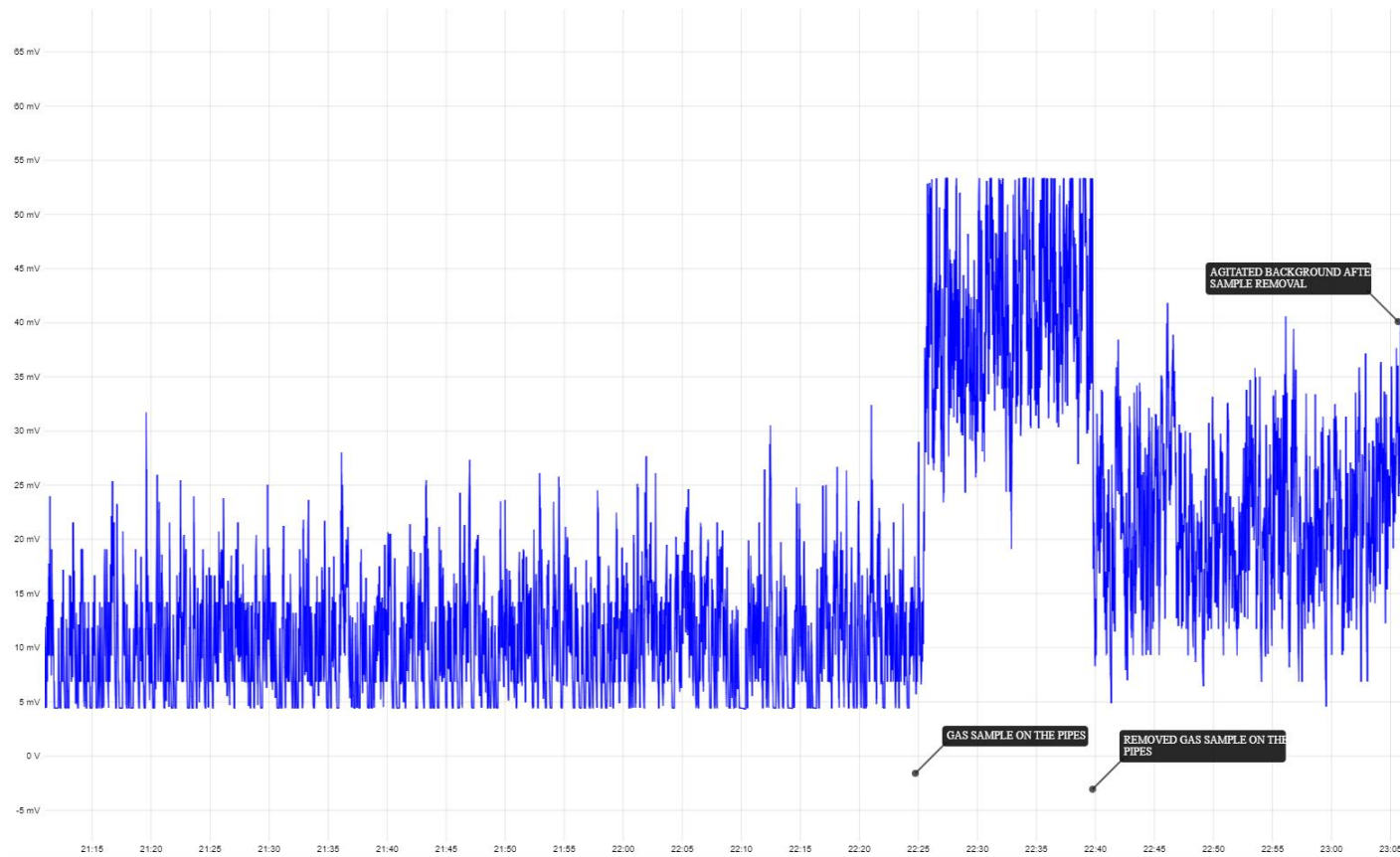
# TRITIUM IN GASEOUS FORM

A gas (Tritium) producing low energy photos is released by the electrolytic solution after any successful experiment. In the video below the gas extraction procedure is showed.



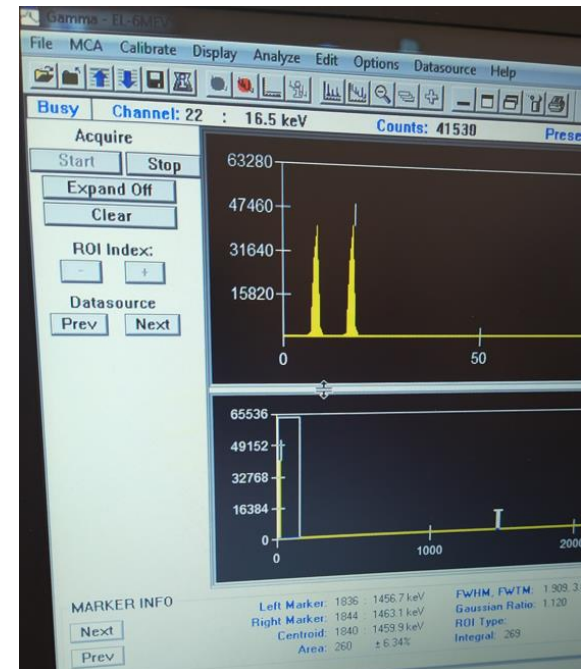
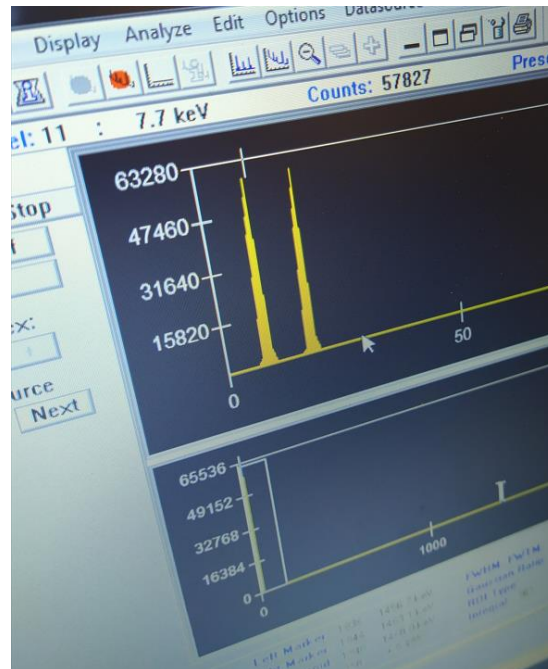
# TRITIUM IN GASEOUS FORM

After placing the sample on the SBM-20 counter tubes, the background photon emissions immediately change.



# ENERGY SPECTRUM OF THE GAS

CANBERRA liquid nitrogen  
cooled germanium detector



The two peaks at 7.7 keV and 16.5 keV were revealed.

# INDEPENDENT THIRD-PARTY ANALYSES

## IDENTIFICAZIONE CAMPIONI

Codice Campione	Sigillo	Luogo di prelievo	Data prelievo	Data Accettazione
C2022_0085	Deumidificatore Test		12/04/2022	13/04/2022

## C2022\_0085 - DEUMIDIFICATORE TEST -

Campione	Metodo Prova	Radionuclide	Unità di Misura	Valore Risultati	Incertezza di Misura**	MCR	Valore di Parametro*	Data di Esecuzione
C2022_0085_H	UNI EN ISO 9698:2019	Trizio	Bq/l	<b>42,720</b>	15,120	9,430	<b>100</b>	15/04/2022

\* Valore di parametro come da D.Lgs n° 28 - 2016

\*\* Fattore di copertura K=2 con intervallo di confidenza pari al 95%

#1 Standard di riferimento Alfa Totale: Am-241

#2 Standard di riferimento Beta Totale: Sr-90

#3 L'attività del Rn-222 è riferita alla data e all'ora di prelievo del campione

**FINE RAPPORTO DI PROVA N. CAR-2022-793 rev.0**

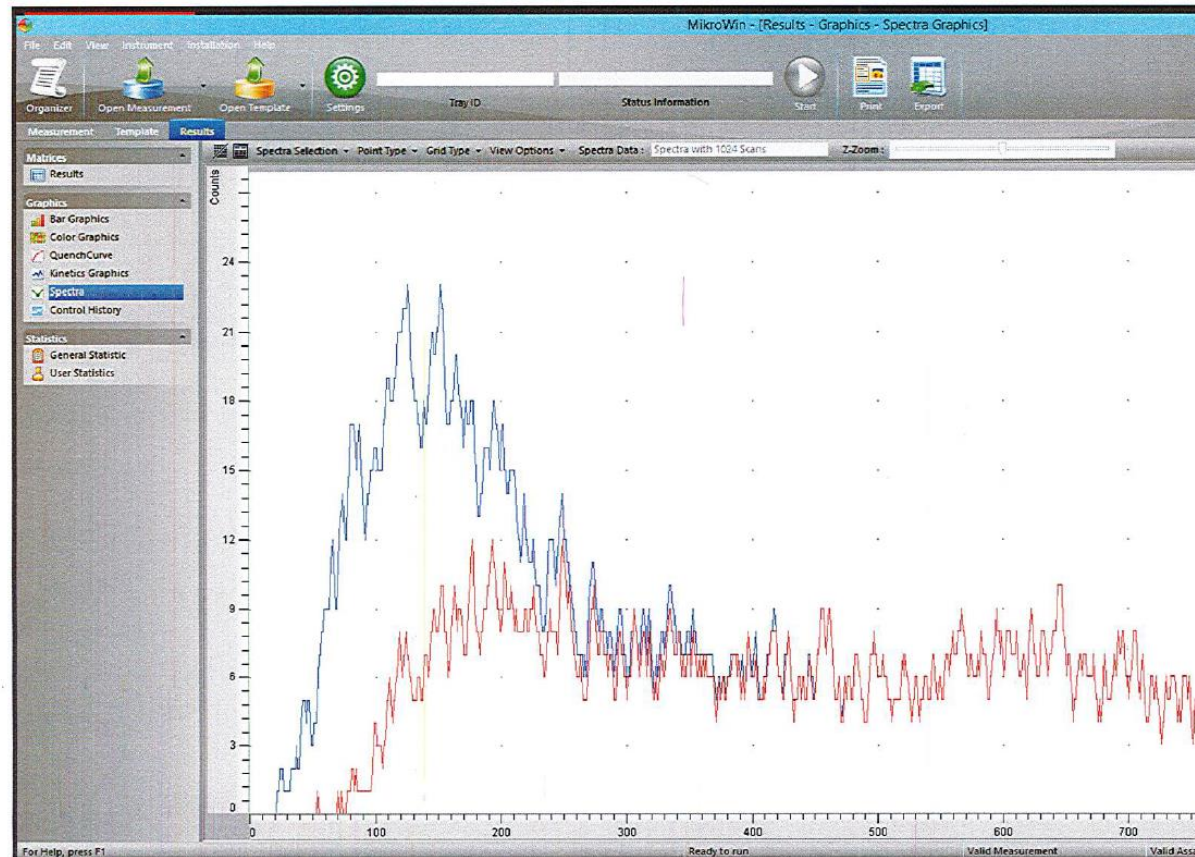
**Sampling date: April 12<sup>th</sup>, 2022 - Dehumidifier - 42,72 Bq/l.**



# INDEPENDENT THIRD-PARTY ANALYSES

22/04/22, 19:05

C2022\_0085\_Spectro.png



Energy spectrum. Sampling date: April 12<sup>th</sup>, 2022 - Dehumidifier.

# INDEPENDENT THIRD-PARTY ANALYSES

## IDENTIFICAZIONE CAMPIONI

Codice Campione	Sigillo	Luogo di prelievo	Data prelievo	Data Accettazione
C2022_0105	Bianco		19/04/2022	20/04/2022

## C2022\_0105 - BIANCO -

Campione	Metodo Prova	Radionuclide	Unità di Misura	Valore Risultati	Incertezza di Misura**	MCR	Valore di Parametro*	Data di Esecuzione
C2022_0105_H	UNI EN ISO 9698:2019	Trizio	Bq/l	< MCR	-	8,600	100	22/04/2022

\* Valore di parametro come da D.Lgs n°28 - 2016

\*\* Fattore di copertura K=2 con intervallo di confidenza pari al 95%

#1 Standard di riferimento Alfa Totale: Am-241

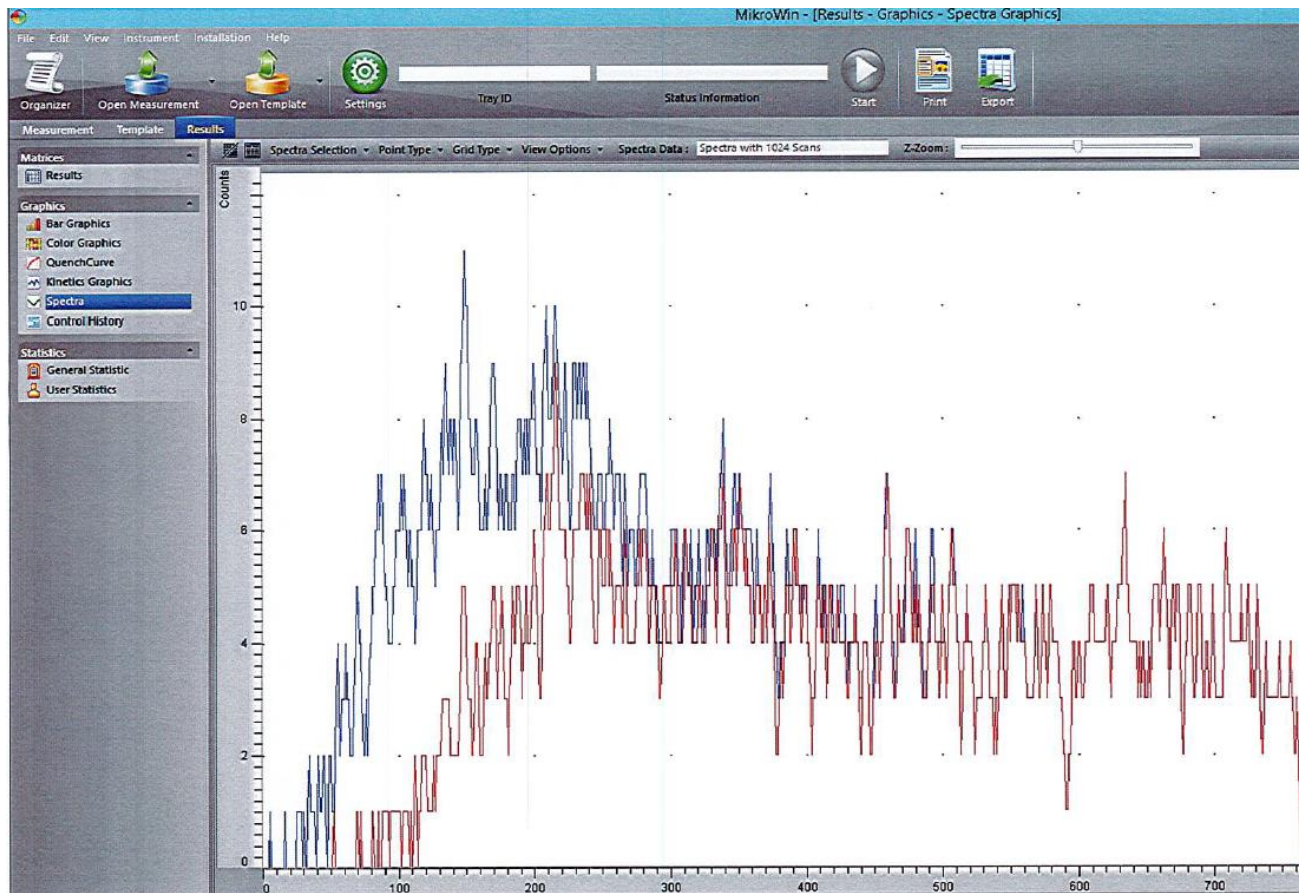
#2 Standard di riferimento Beta Totale: Sr-90

#3 L'attività del Rn-222 è riferita alla data e all'ora di prelievo del campione

**FINE RAPPORTO DI PROVA N. CAR-2022-809 rev.0**

Sampling date: April 19<sup>th</sup>, 2022 – Blank sample - < MCR (8,6) Bq/l.

# INDEPENDENT THIRD-PARTY ANALYSES



Energy spectrum. Sampling date: April 19<sup>th</sup>, 2022 - Blank.



# INDEPENDENT THIRD-PARTY ANALYSES

## IDENTIFICAZIONE CAMPIONI

Codice Campione	Sigillo	Luogo di prelievo	Data prelievo	Data Accettazione
C2022_0104	Campione 02		19/04/2022	20/04/2022

## C2022\_0104 - CAMPIONE 02 -

Campione	Metodo Prova	Radionuclide	Unità di Misura	Valore Risultati	Incertezza di Misura**	MCR	Valore di Parametro*	Data di Esecuzione
C2022_0104_H	UNI EN ISO 9698:2019	Trizio	Bq/l	<b>45,330</b>	16,600	10,200	<b>100</b>	22/04/2022

\* Valore di parametro come da D.Lgs n° 28 - 2016

\*\* Fattore di copertura K=2 con intervallo di confidenza pari al 95%

#1 Standard di riferimento Alfa Totale: Am-241

#2 Standard di riferimento Beta Totale: Sr-90

#3 L'attività del Rn-222 è riferita alla data e all'ora di prelievo del campione

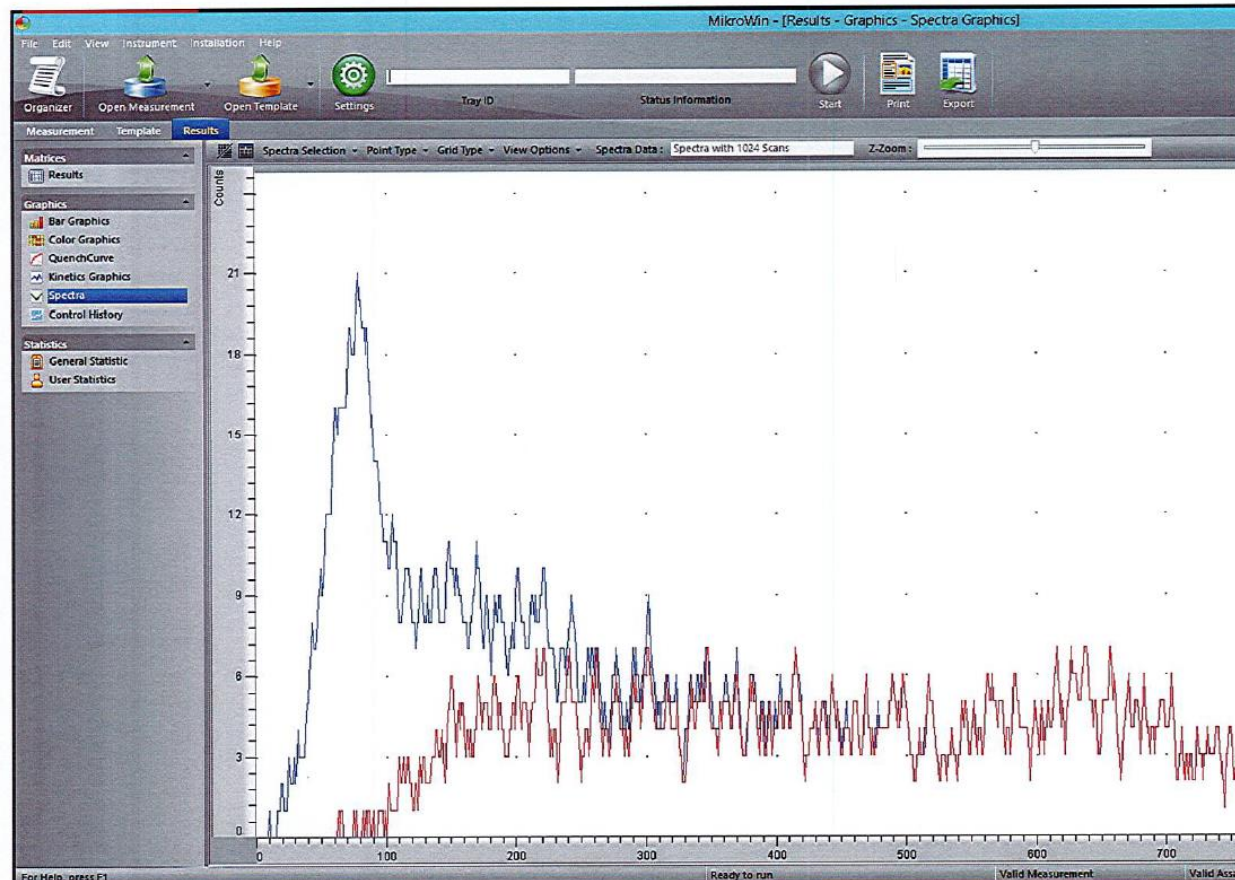
**FINE RAPPORTO DI PROVA N. CAR-2022-808 rev.0**

Sampling date: April 19<sup>th</sup>, 2022 – Electrolyte from the cell – 45,33 Bq/l.

# INDEPENDENT THIRD-PARTY ANALYSES

26/04/22, 11:34

C2022\_0104\_Campione2\_Spettro.png



Energy spectrum. Sampling date: April 19<sup>th</sup>, 2022 – Electrolytic solution.

# INDEPENDENT THIRD-PARTY ANALYSES (ENEA)



AGENZIA NAZIONALE PER LE NUOVE TECNOLOGIE,  
L'ENERGIA E LO SVILUPPO ECONOMICO SOSTENIBILE



Dipartimento Fusione e Tecnologie per la Sicurezza Nucleare  
Divisione Sicurezza e Sostenibilità del Nucleare  
Laboratorio Metodi e Tecniche Nucleari per la Sicurezza,  
il Monitoraggio e la Tracciabilità  
U.O. Radioecologia

## RAPPORTO di ANALISI

n° BELLUNO.01

Campioni di: *Acqua per analisi Trizio*

che ci sono stati recapitati il: *16/06/2022*

per conto dell'Istituto: *PROMETEON S.R.L.*

*sede legale in Bologna (BO), Via Delle Rose, 48 – CAP 40136*

Sigla Campione	Attività $^3\text{H}$ (Bq/l)	Errore (%)
Campione 1 (16/06/2022)	18	20
Campione 2 (27/06/2022)	MDL (0,35)	20

Data di riferimento = 29/06/2022

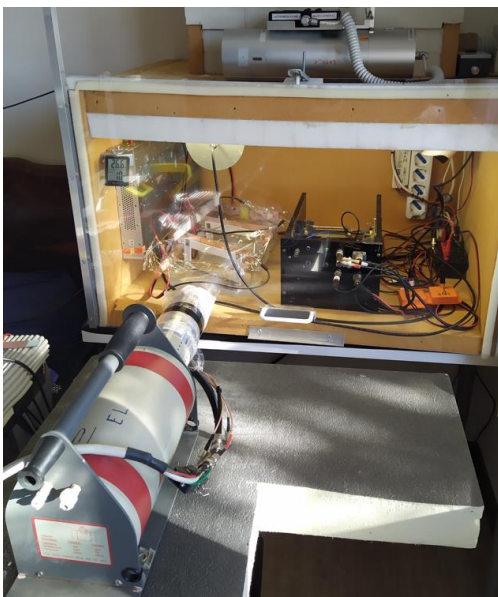
Limite di rivelazione (Minimum Detection Limit) DL = 0.354 Bq/l

Strumento di misura utilizzato: Scintillatore Liquido Quantulus 1220

Procedura Tecnica di rif.: PRO TNMT 04 - Istruzione Operativa di rif.: ISL TNMT 09 (senza arricchimento elettrolitico)

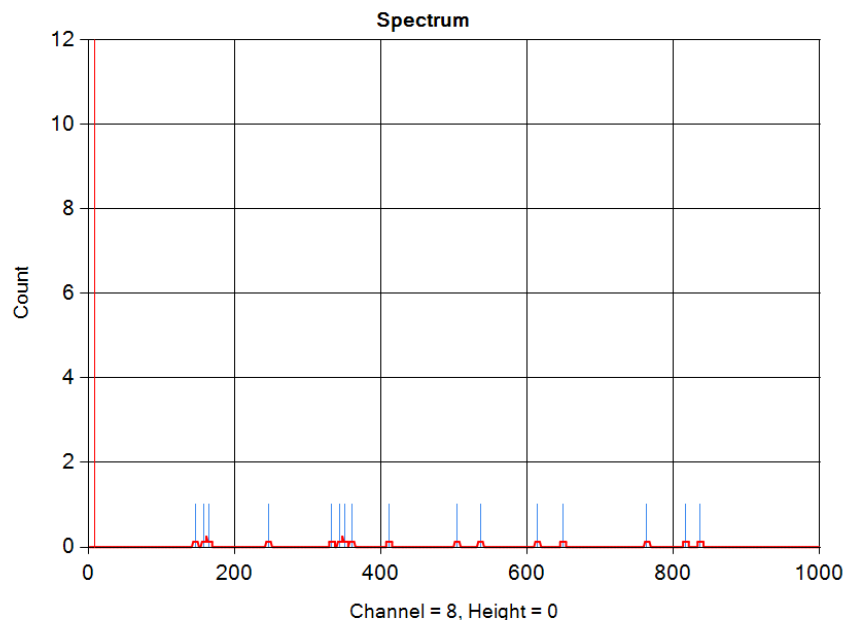
Sampling dates: June 16<sup>th</sup> and 27<sup>th</sup> 2022 - Electrolytic solution (18Bq/l and < MDL).

# GAMMA & NEUTRONS EMISSIONS

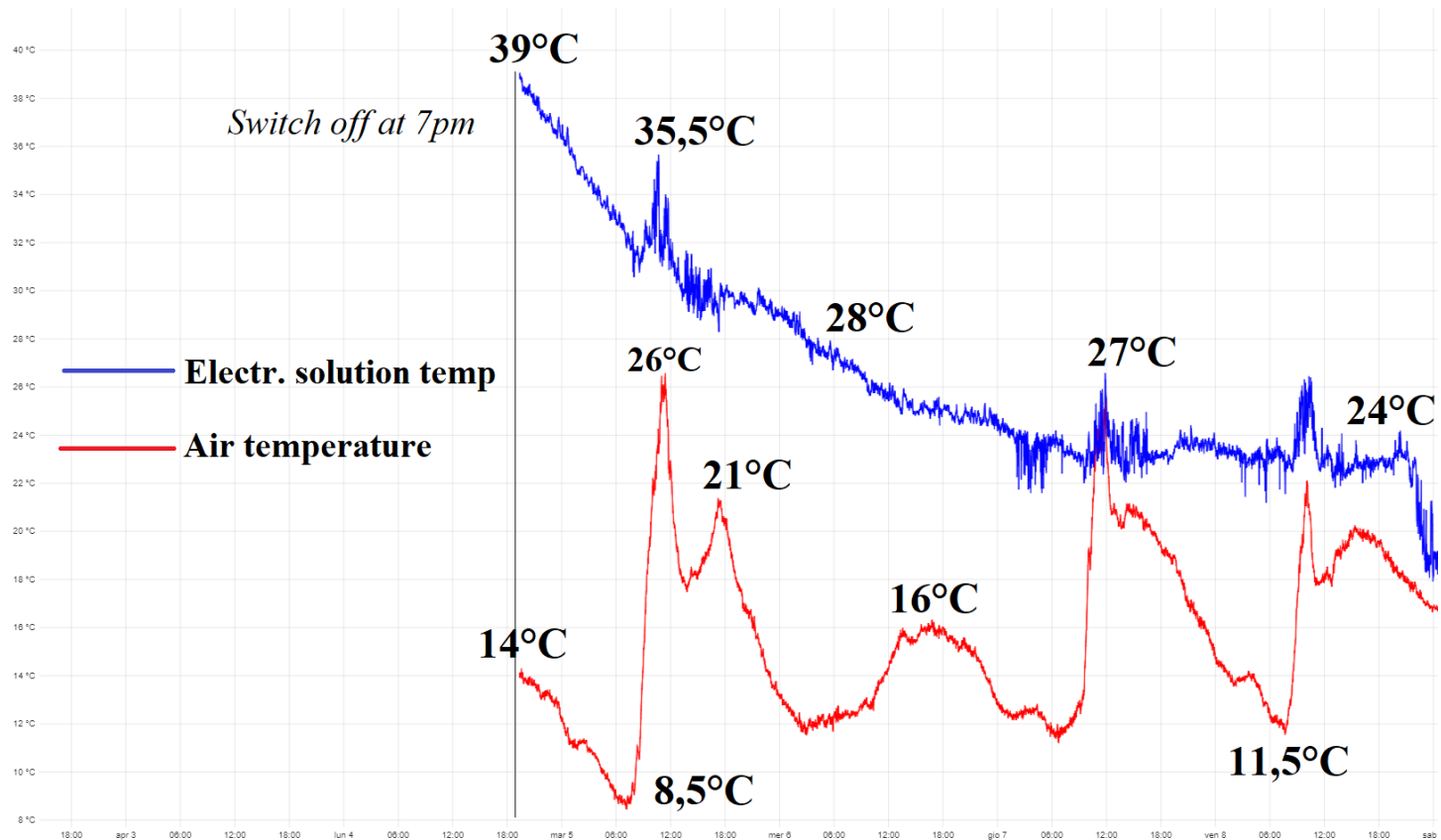


No high energy ( $>20\text{keV}$ ) gamma radiation emissions have been detected by a CANBERRA spectrometer when placed close to a working electrolytic cell.

Neutrons emissions over 10% background counts were never detected (CHM-10 proportional counter tube).

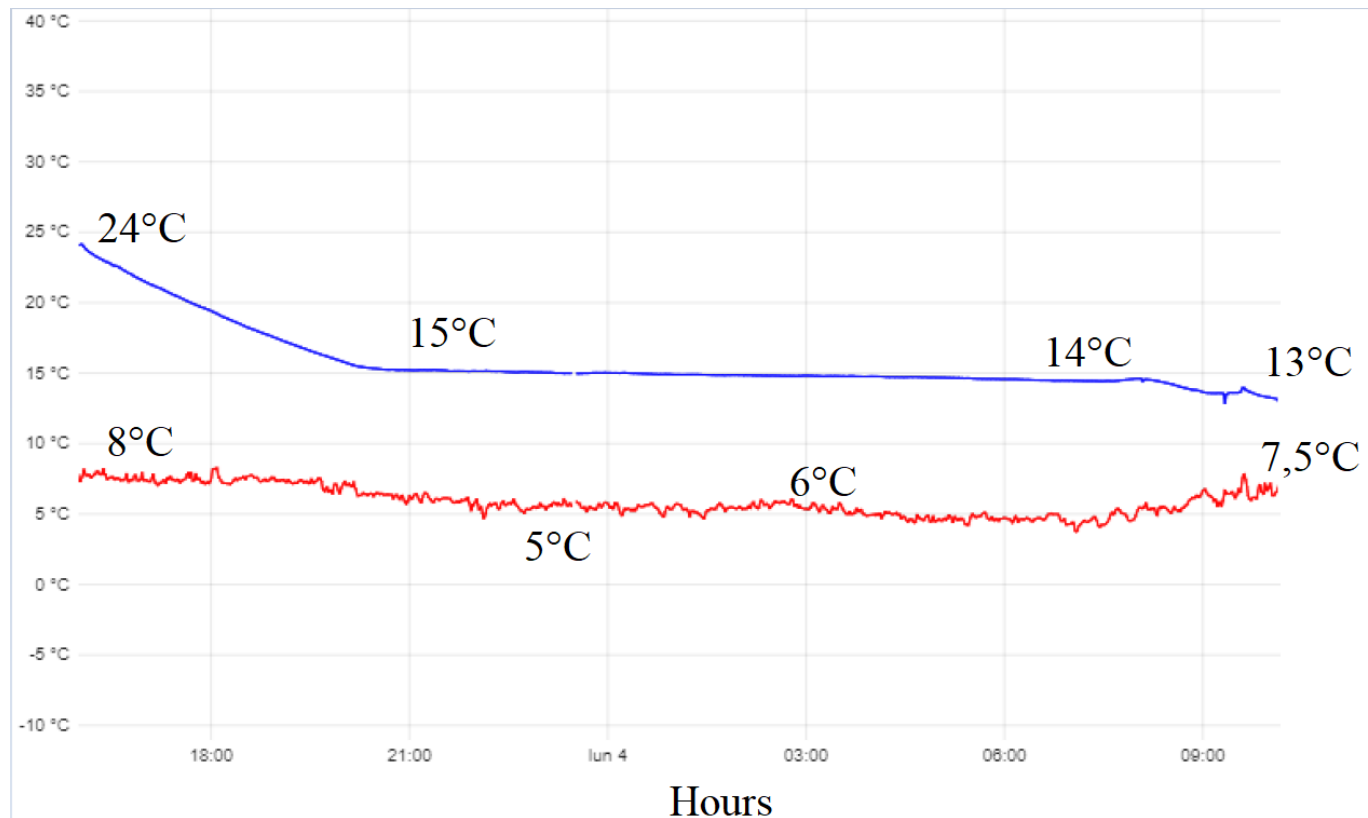


# HEAT AFTER DEATH?



*Temperature graph (100 hours) after turning off the pulse generator (Cell placed outside lab).*

# HEAT AFTER DEATH?



*Temperature graph (17 hours) after turning off the pulse generator (Cell inside lab).*

# A POSSIBLE THEORETICAL HYPOTHESIS

Any tentative to explain Tritium formation, as well as other Low Energy Nuclear Reactions, must deal with three fundamental issues:

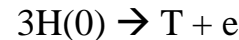
1. how to overcome the Coulomb barrier,
2. the absence of significant neutron emission,
3. the absence of high energy ionizing radiation.



# A POSSIBLE THEORETICAL HYPOTHESIS

A possible theoretical hypothesis is proposed.

Electrical pulses → pico-metric coherent structure [1, 4] of three “atoms” of ultra dense hydrogen → aneutronic many-body nuclear fusion:



Where H(0) indicates a neutral “atom” of ultra-dense hydrogen (L. Holmlid) [2, 4, 1].

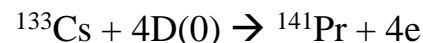
No neutron emission and no Coulomb barrier to overcome.

Reaction energy is carried away by:

1. the kinetic energy of the reaction products,
2. an energy-mass transfer mechanism that involves the presence of the scalar field described in some Extended Electro Dynamics (EED) theories [8, 4, 9, 5, 6, 7].

Another case of possible **aneutronic many-body nuclear reactions**: Iwamura [3].

- Hypothesis: pico-metric structures of ultra-dense deuterium D(0) [1, 4].
- Example: Cesium to Praseodymium transmutation:



It's probable that the formation of ultra-dense Hydrogen is triggered by the attractive magnetic dipole force generated by excited hydrogen atoms (see appendix A).

# BIBLIOGRAPHIC REFERENCES

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# CONCLUSIONS

1. The stimulation of a **light water electrolytic solution** with a particular kind of EM pulses induces the emission of **low energy photons** owing to yet to be identified nuclear events.
2. A gas is produced during these nuclear events emitting low energy electrons whose **energy spectrum is compatible** with that of **Tritium Beta decay**.
3. **No gamma emissions** have been detected so far.
4. Neutron emissions over 10% background counts were never detected.
5. Analyses of the electrolytic solution in different laboratories reported **concentrations of Tritium** ranging from 18Bq/l to 45Bq/l. No Tritium was found in the blank tests of the same electrolytic solution.
6. A preliminary hypothesis about the process of Tritium formation is proposed, where aneutronic many body fusion reactions of ultra dense Hydrogen “atoms” occur:  
$$3\text{H}(0) \rightarrow \text{T} + \text{e}.$$
7. The production of Deuterium, Helium and/or of other elements both inside the electrolytic solution and on the Ni electrodes has not been checked yet.

# Thank you!

## Authors:

- Fabrizio Righes (TERALAB - Italy)
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# APPENDIX A

## Appendix A: Magnetic force between excited hydrogen atoms:

Equating the centripetal force to the Coulomb attraction in a simple Bohr hydrogen atom we can write, using natural units where  $\hbar = c = 1$

$$\frac{m_e v_n^2}{r_n} = \frac{e^2}{r_n^2} \implies m_e v_n r_n v_n = e^2 = \alpha$$

In this equation  $m_e$  is the electron mass,  $e$  the electron charge,  $r_n$  the electron orbit radius,  $v_n$  the electron speed, the subscript  $n$  indicates the principal quantum number and  $\alpha$  is the fine structure constant. Applying the angular momentum quantization we find that electron speed is equal to the fine structure constant divided the quantum number  $n$ .

$$m_e v_n r_n = n\hbar = n$$

$$v_n = \frac{\alpha}{n} \quad r_n = \frac{n^2}{\alpha m_e}$$

The magnetic moment of the excited atom is equal to the product of the current  $I_n$  and the enclosed area  $A_n$ :

$$I_n = \frac{e}{T_n} = \frac{e v_n}{2\pi r_n}$$

This implies that the magnetic moment of the excited atom is proportional to the principal quantum number  $n$

$$\mu_n = I_n A_n = \frac{e v_n}{2\pi r_n} \pi r_n^2 = \frac{e v_n r_n}{2} = \frac{e \alpha}{2 n} \frac{n^2}{\alpha m_e} = n \frac{e}{2 m_e} = n \mu_B$$

Consequently the dipole attraction force  $F$  at distance  $d$  between two excited atoms is proportional to the product of their principal quantum number:

$$F(d, \mu_{nA}, \mu_{mB}) = \frac{3\mu_0}{4\pi} \frac{\mu_{nA} \mu_{mB}}{d^4} = nmF(d, \mu_A, \mu_B)$$