Physics is the experimental science
Richard Feynman

E.N. Tsyganov

Cold Fusion Power, Int.

Cold Nuclear Fusion Development

Charged & Neutral Particles Channeling Phenomena,
September 25-30, 2016, Sirmione del Garda, Italy

Flammarion on the motives of the 16th century

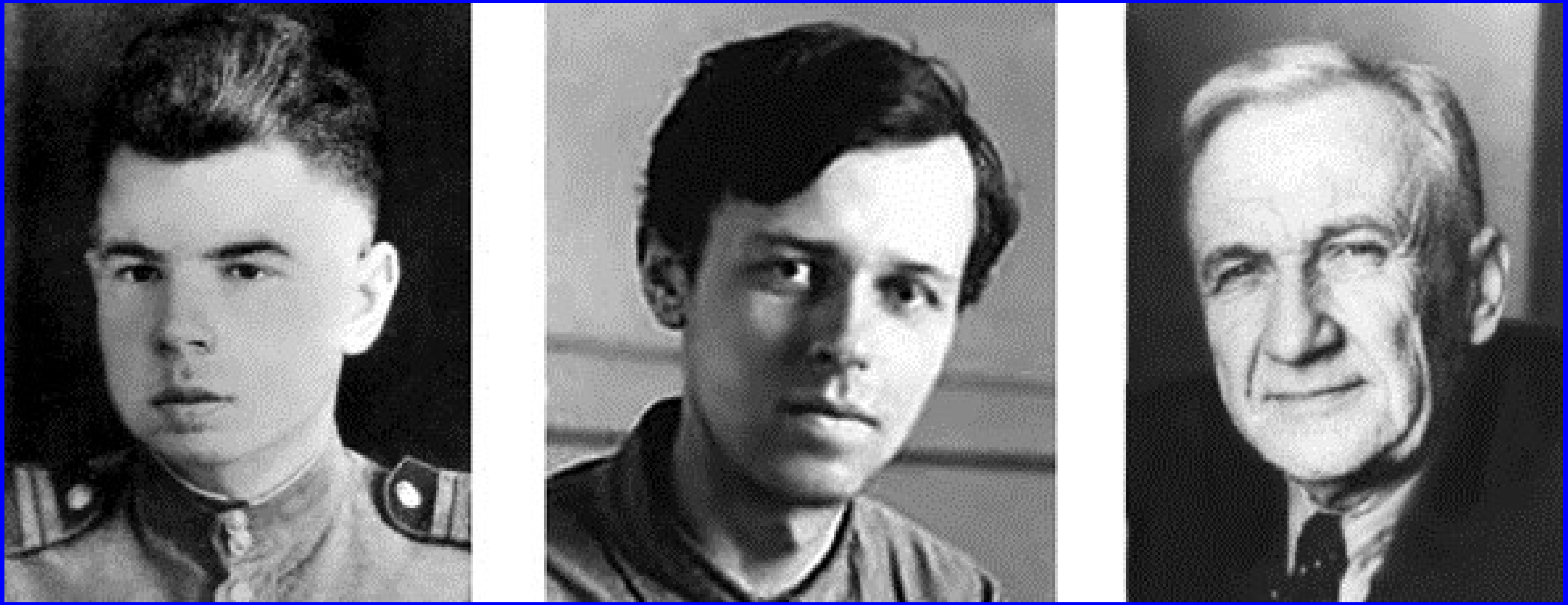
Currently, humanity is facing a severe energy shortage, as well as the effects of pollution. Nuclear power plants based on *fission reactions* are not safe — remember Chernobyl and Fukushima. Reliable preservation of nuclear power plants and disposal of their waste for a period of thousands years is simply *unrealistic*. In addition, the proven reserves of fissionable materials are drying up quickly.

Chernobyl, April 26, 1986

Fukushima, 2011

Fukushima, 2011

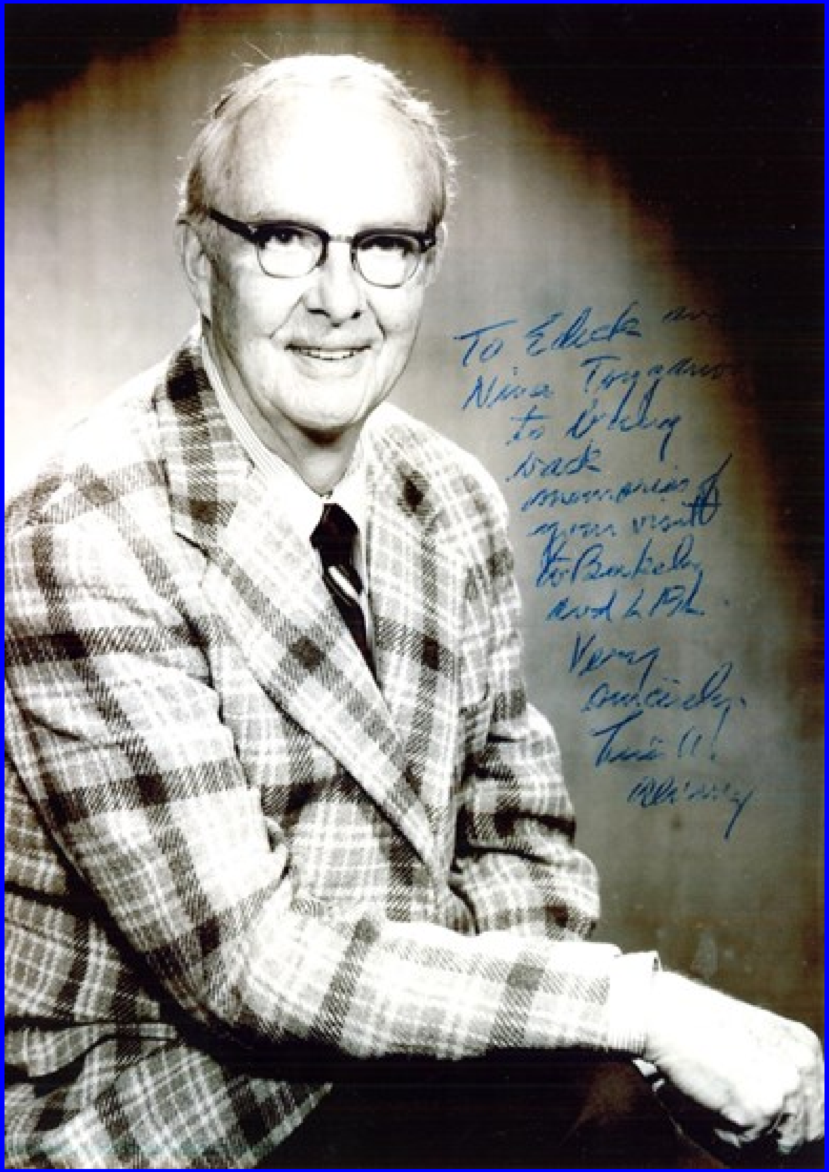
The founders of the tokamak



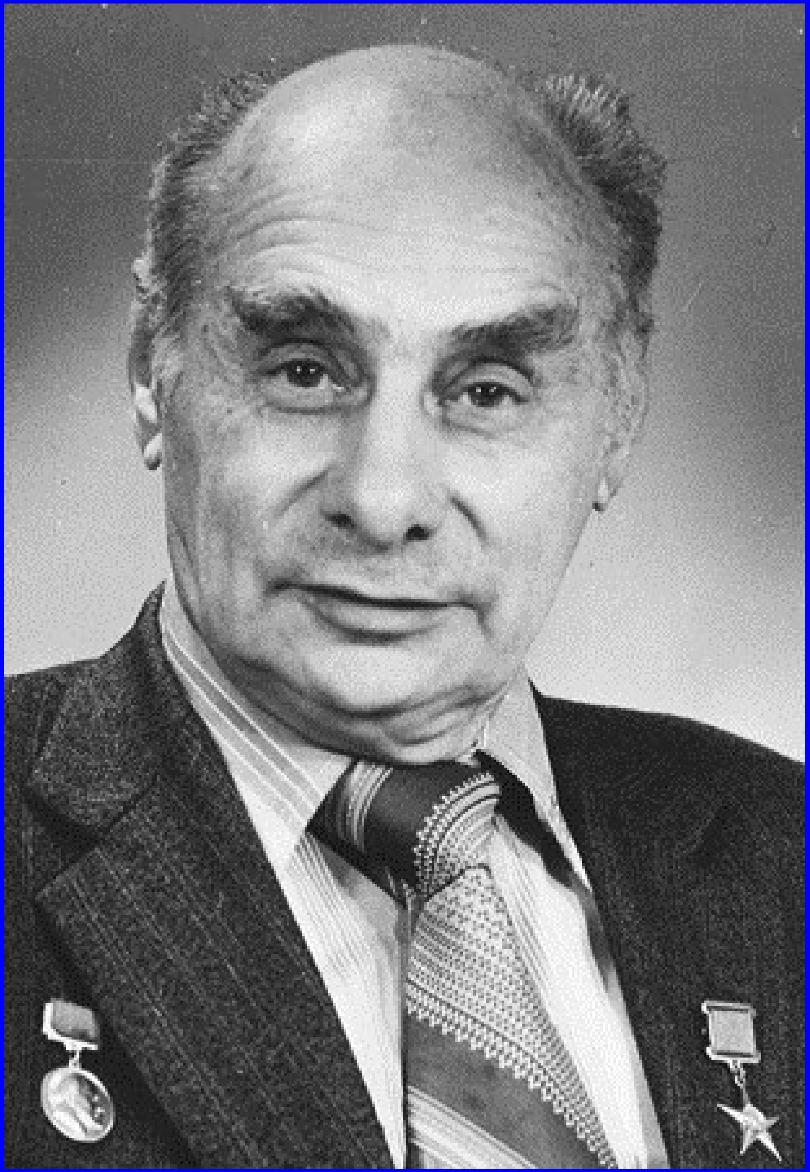
O.A. Lavrentyev A.D. Sakharov I.E. Tamm

Igor Kurchatov and John Cockcroft at the Center for Nuclear Energy in Harwell on 26 April 1956

Luis Alvarez



Georgy Flerov



Washington, 1975

1978, Argonne Laboratory, USA-USSR

Charged & Neutral Particles Channeling Phenomena,
September 25-30, 2016, Sirmione del Garda, Italy

November 19, 1984

μ – catalysis

Ya.B. Zeldovich, Doklady, v. 95, p. 493 (1954)

Luis W. Alvarez et al., Physical Review Series II v. 105, 1957, p. 1127-1128

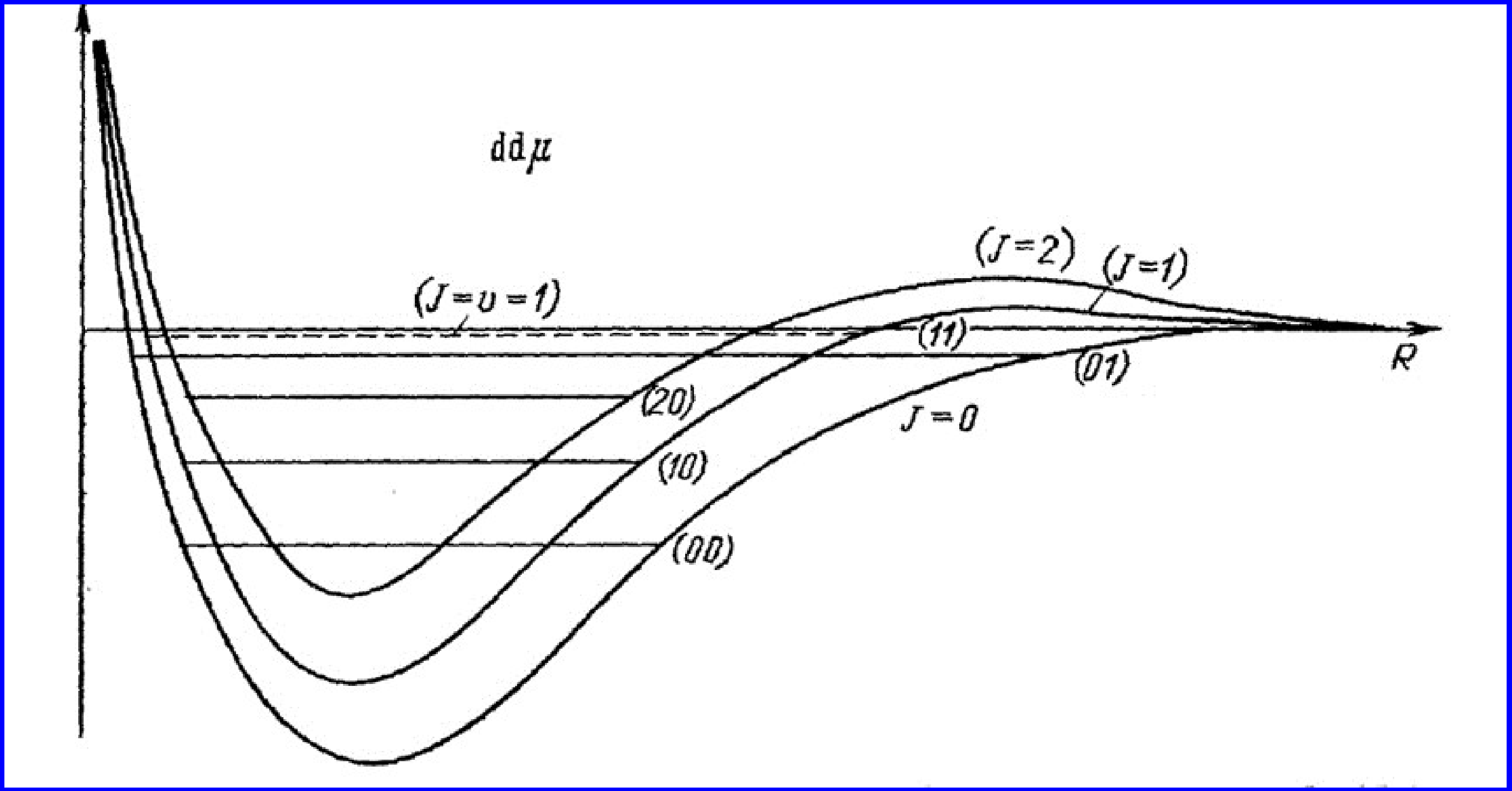
"Rough estimates of the barrier penetration factor (approximately 10^{-6}) and the *vibration frequency* (approximately 10^{17} per second) indicate that the time required for a nuclear reaction between H and D should be small compared with the life of the μ-meson ".

Frequency of *quantum vibrations* $\nu \cong E_{eff} / \hbar$

($\hbar = 6.5\times10^{-34}$ Js, 1 eV = 1.6×10^{-19} J)

A. Vorobiev, S. Gershtein, L. Ponomarev, Russian Academy of Sciences, March 23, 2004

m_π = 139,6 *MeV*
$\pi \longrightarrow \mu + \nu_\mu$
τ_μ = 2,2 × 10^{-6} s
m_μ = 105,7 *MeV*
m_e = 0,511 *MeV*
$m_\mu/m_e \approx 207$

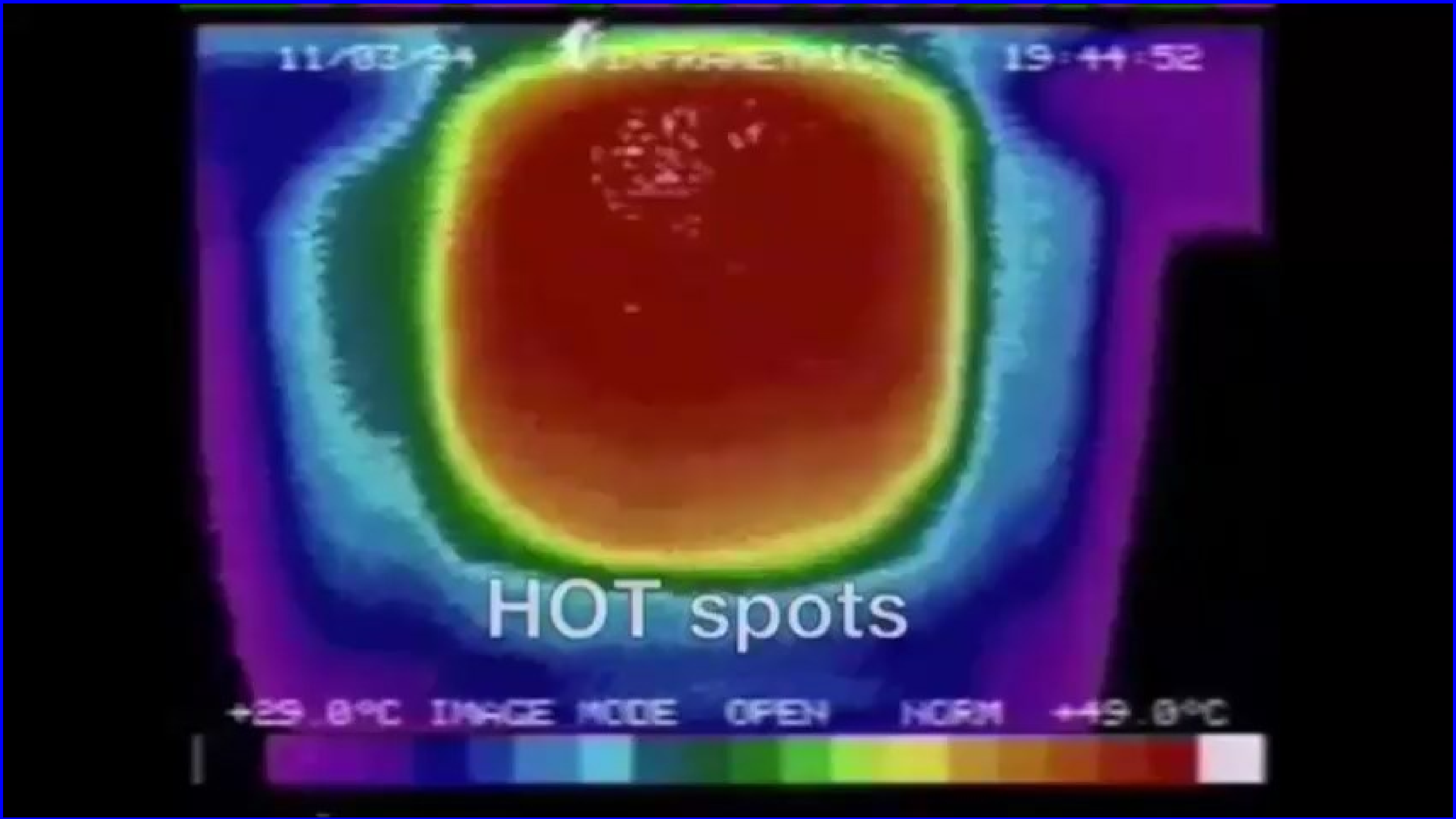


The energy level scheme of rotational-vibrational states *(J,υ)* in meso-molecule *ddμ*

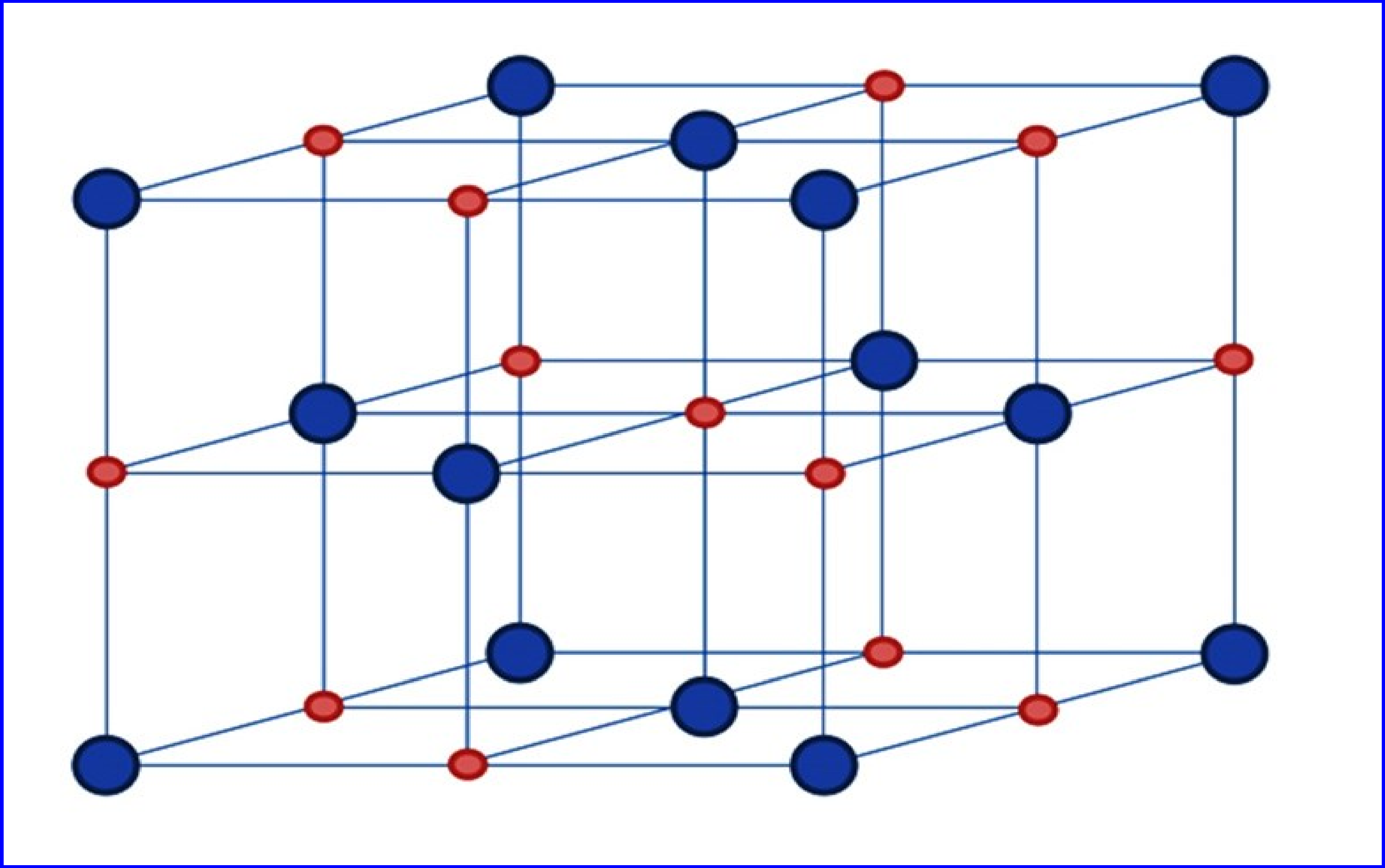
The history of controlled thermonuclear fusion in this year marks 66-th anniversary, at the maximal support of governments of developed countries.

In 1989, Martin Fleischmann and Stanley Pons proposed a different method of implementation of nuclear fusion, the so-called cold fusion.

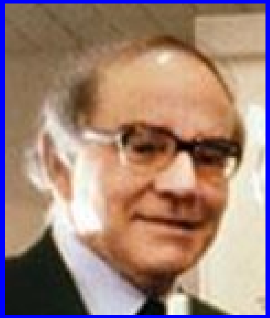
Dr. Stanislaw Szpak experiments, 1994 - 2003



fcc crystal structure – palladium, platinum. Red circles denote the deepest potential niche



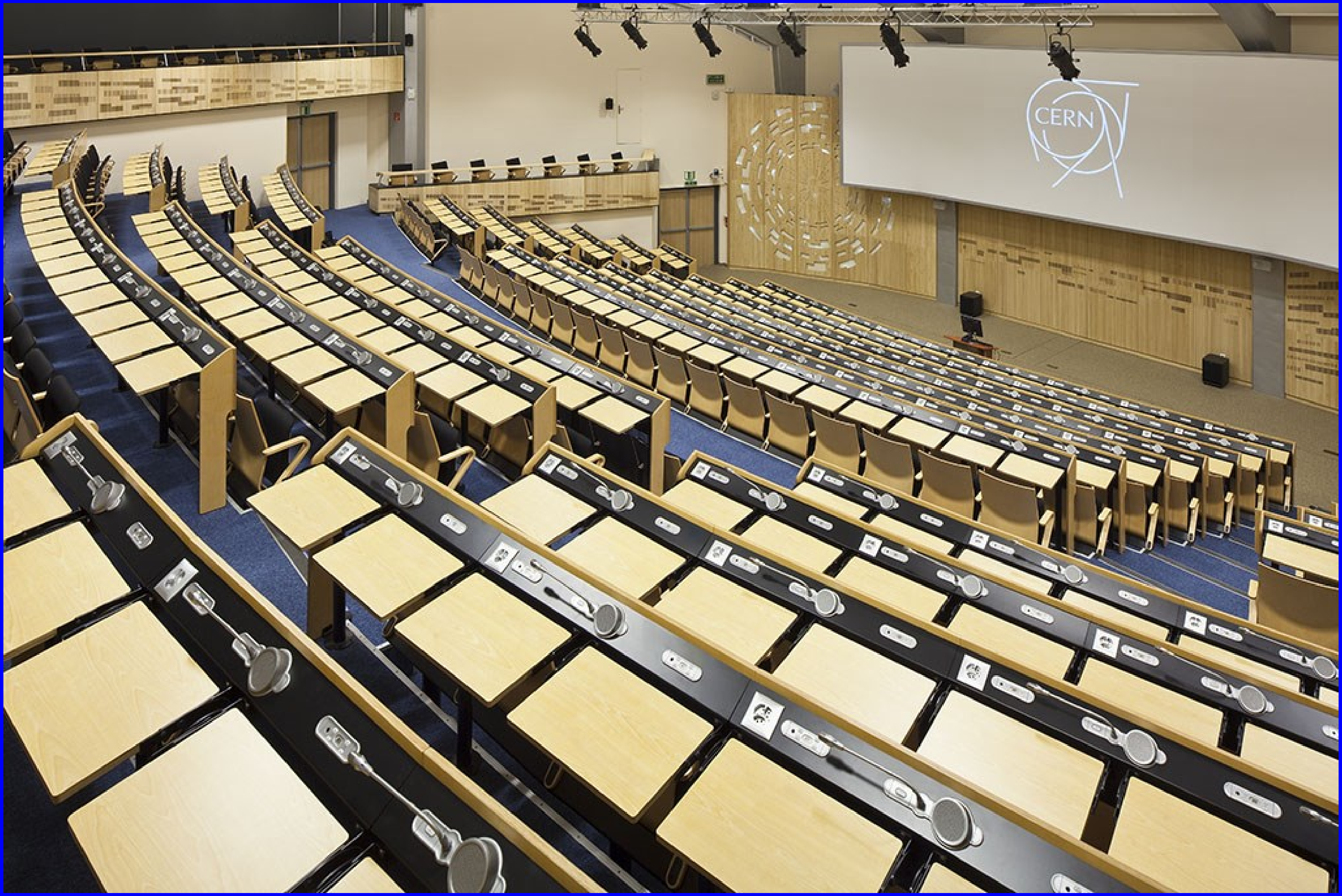
Martyn Fleischmann, CERN, March 31, 1989



M. Fleischmann

C. Rubbia

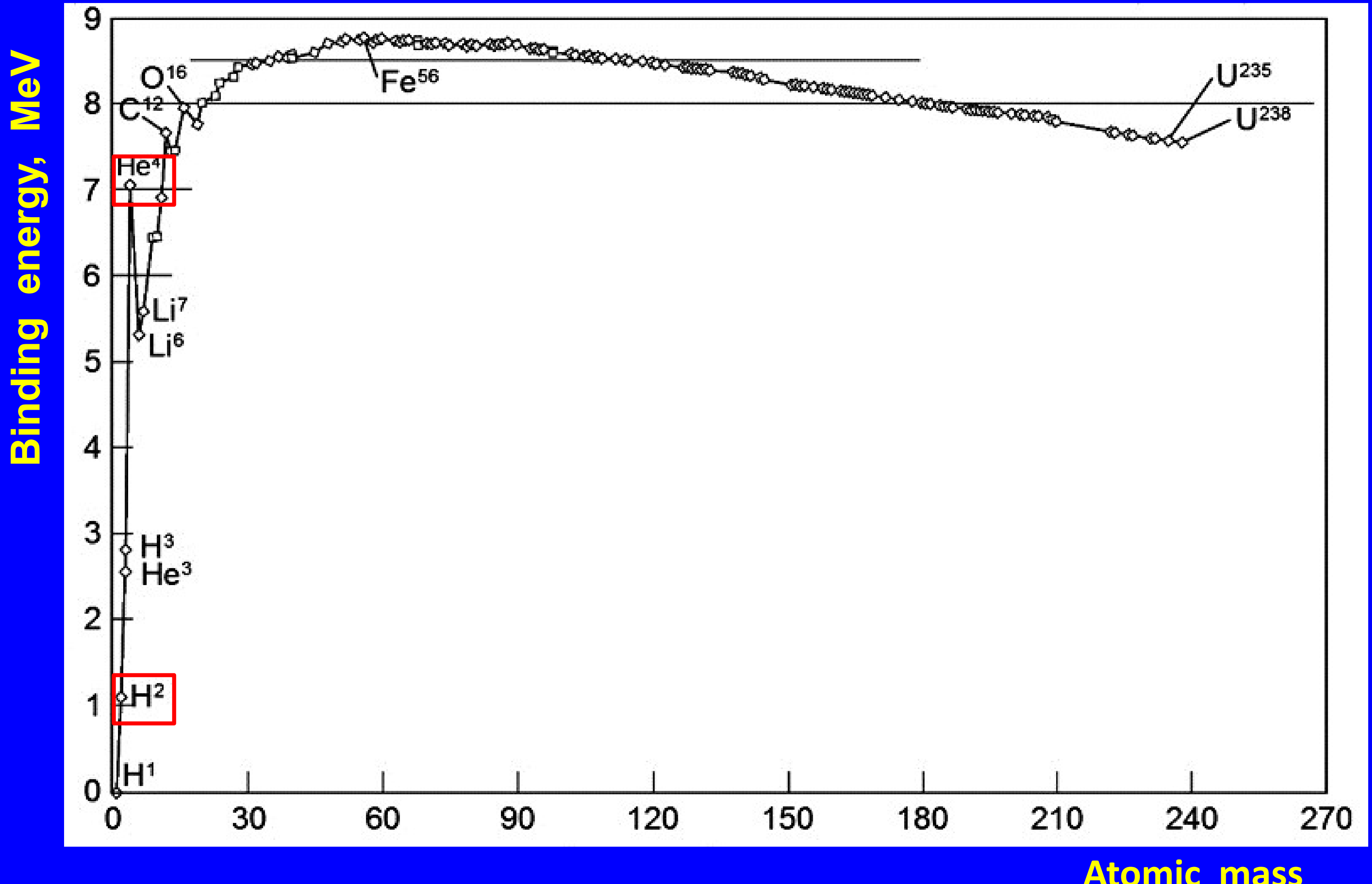
Swiss guards



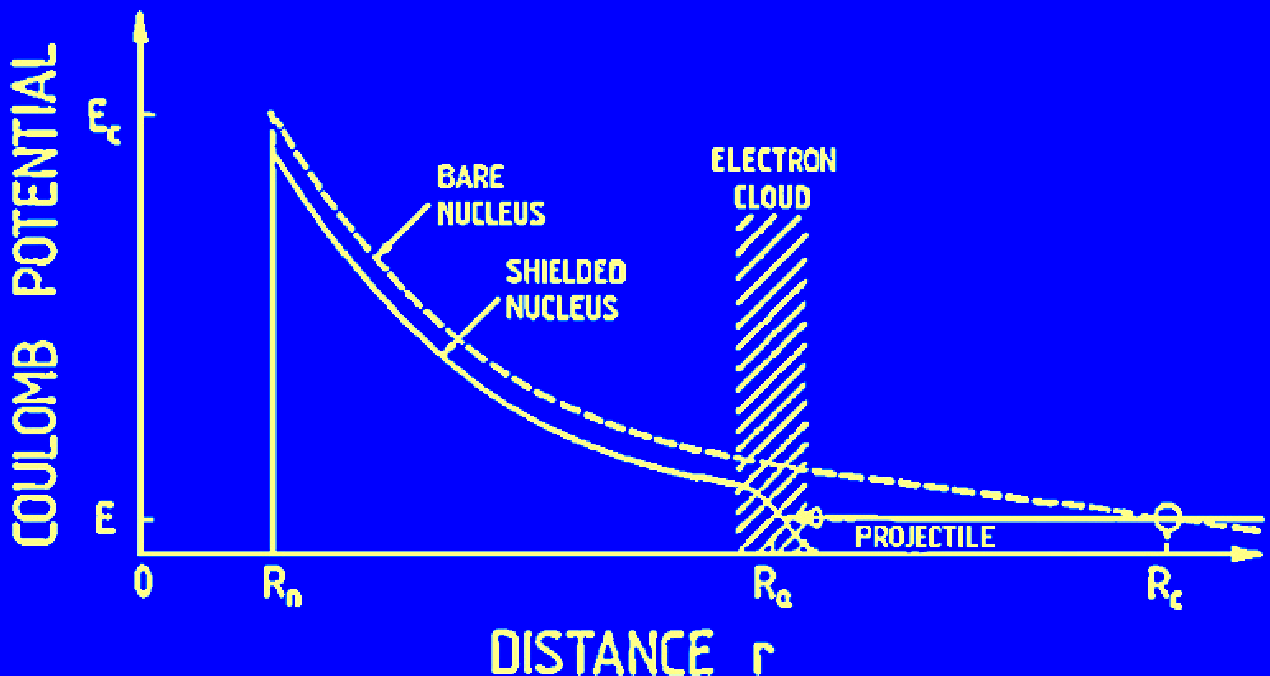
In explaining cold fusion process of deuterium atoms in crystals, one must keep in mind that the Bohr atom (*1s*) cannot be placed in the "deepest" location in the center of the cell of conductive metallic crystal due to the concentration there of ***free conduction electrons.***

The energy threshold for this ban is about 10 eV. In the process of implantation of hydrogen atom in a conducting crystal these atoms are excited from *1s* state to *2p*, *3p* and above states by 10 – 14 eV.

Binding energy per nucleon

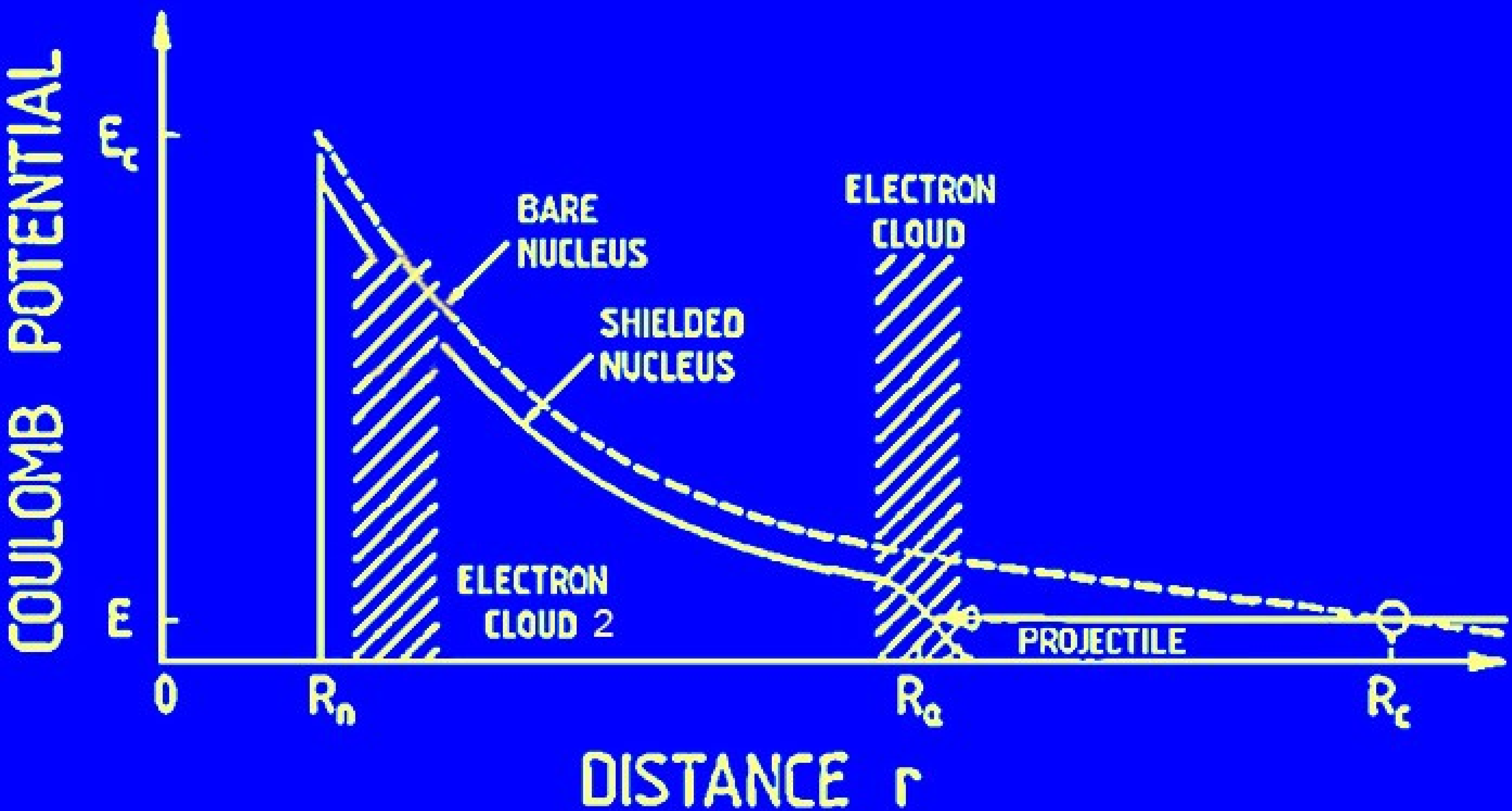


In quantum mechanical consideration the screening potential in the fusion *DD* process is equivalent to additional energy (H.J. Assenbaum, K. Langanke and C. Rolfs)



For fusion of free deuterium atoms this additional energy equal to 27 eV

Screening potential characterizes dimension of the deuterium atom



The incident particle during traveling through the solids captures an electron from the solid body and *moves as an atom*, if its velocity does not exceed the so-called Bohr velocity. For deuterons this threshold energy is ~ 50 keV.

This interesting observation was discussed in the paper:

Y.A. Baranov et al., "Inelastic sputtering of solids by ions", Physics-Uspekhi, November 1988, Volume 156, no. 3, p. 477.

Under normal circumstances, the excited states of atoms quickly return to the ground state. For a free atom of hydrogen, the transition time of *2p* → *1s* is ≈ 1.6 ns. However, the *1s* state in the metal is forbidden due to the presence of conduction electrons in the zone of the lowest electric potential. At the same time, the state *2p* and higher can easily survive this restriction.

Hydrogen atom orbitals
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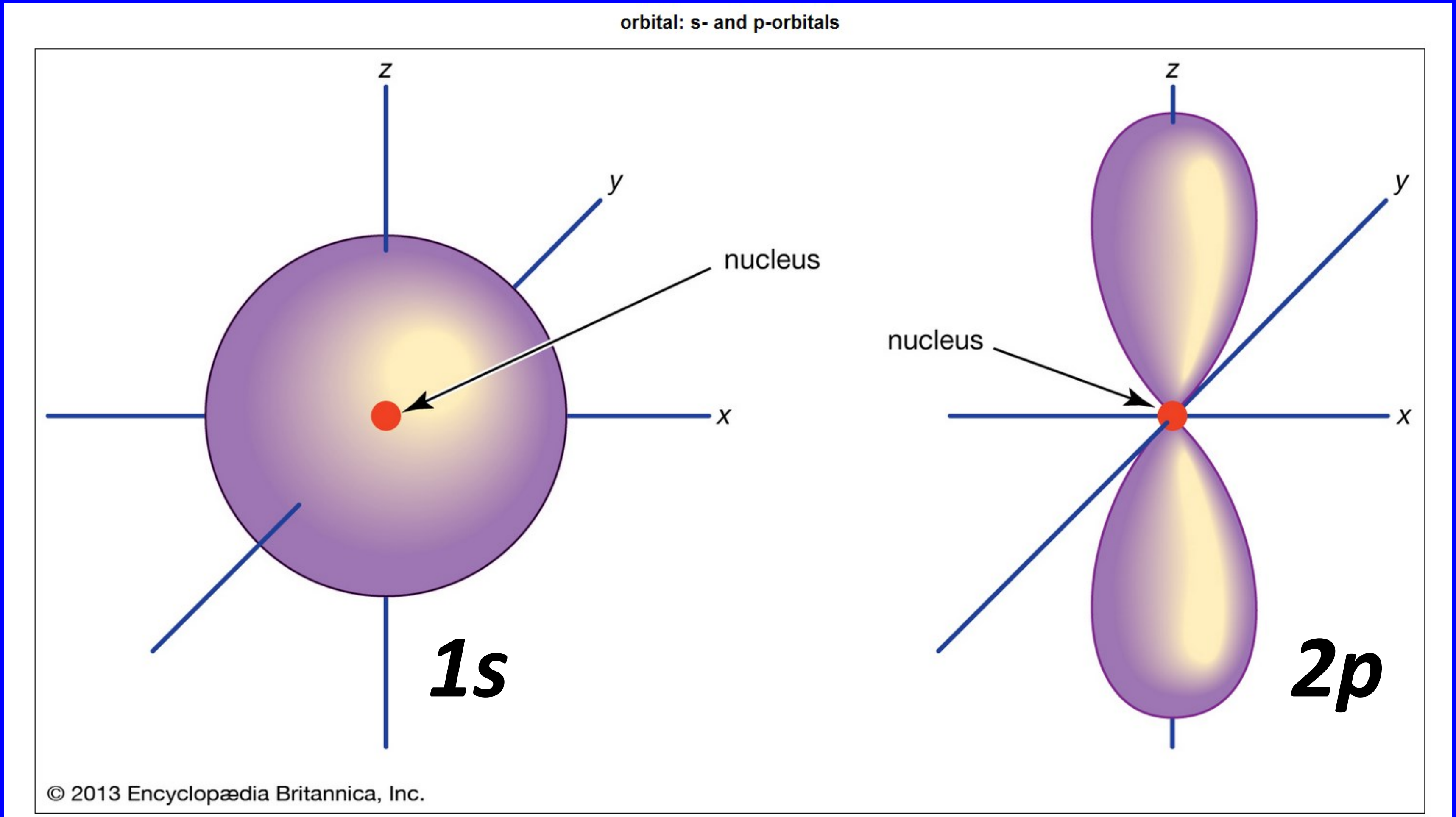


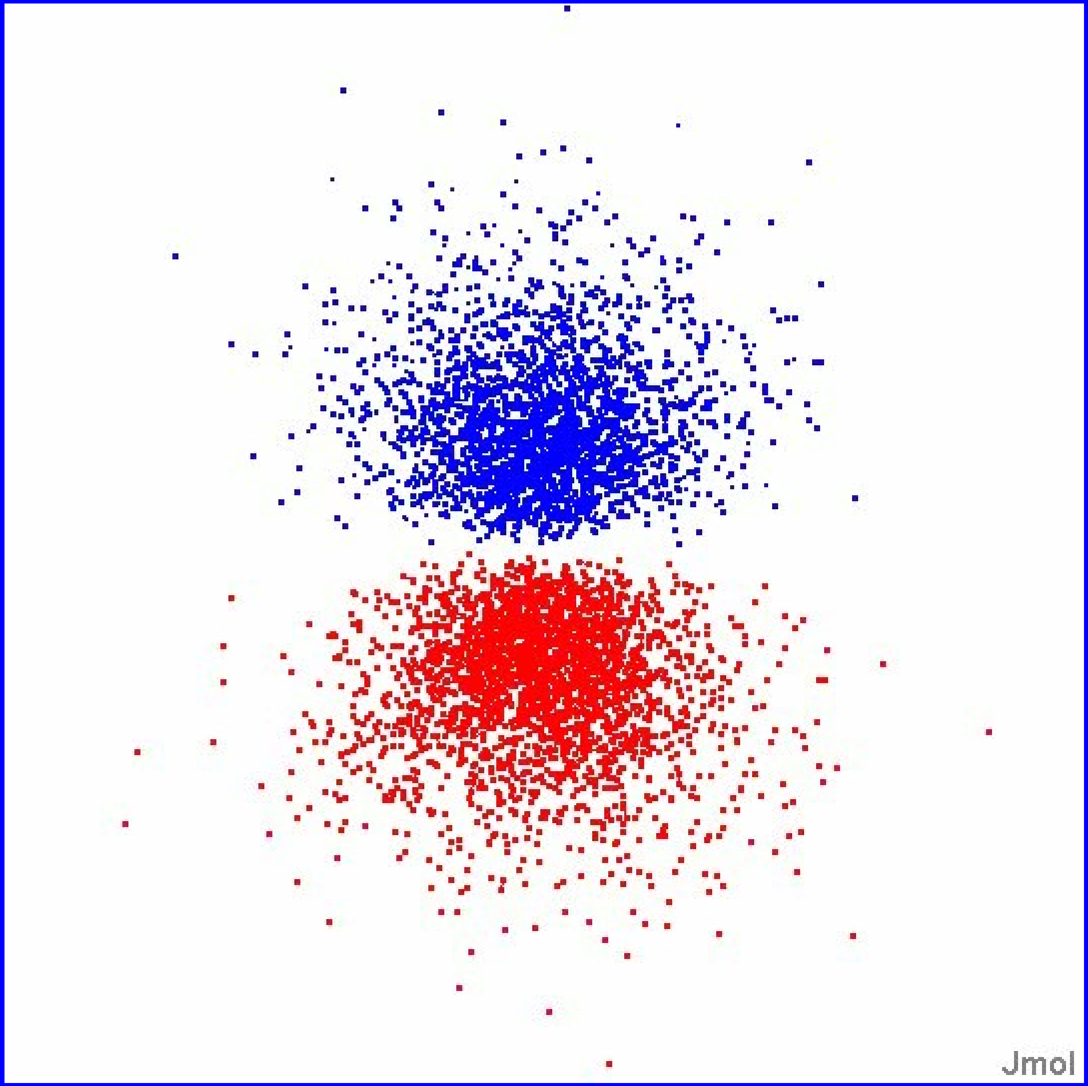
Electron orbitals in atoms **(Left)** ***s*** **orbital; (right)** ***p*** **orbital**

Encyclopædia Britannica, Inc.

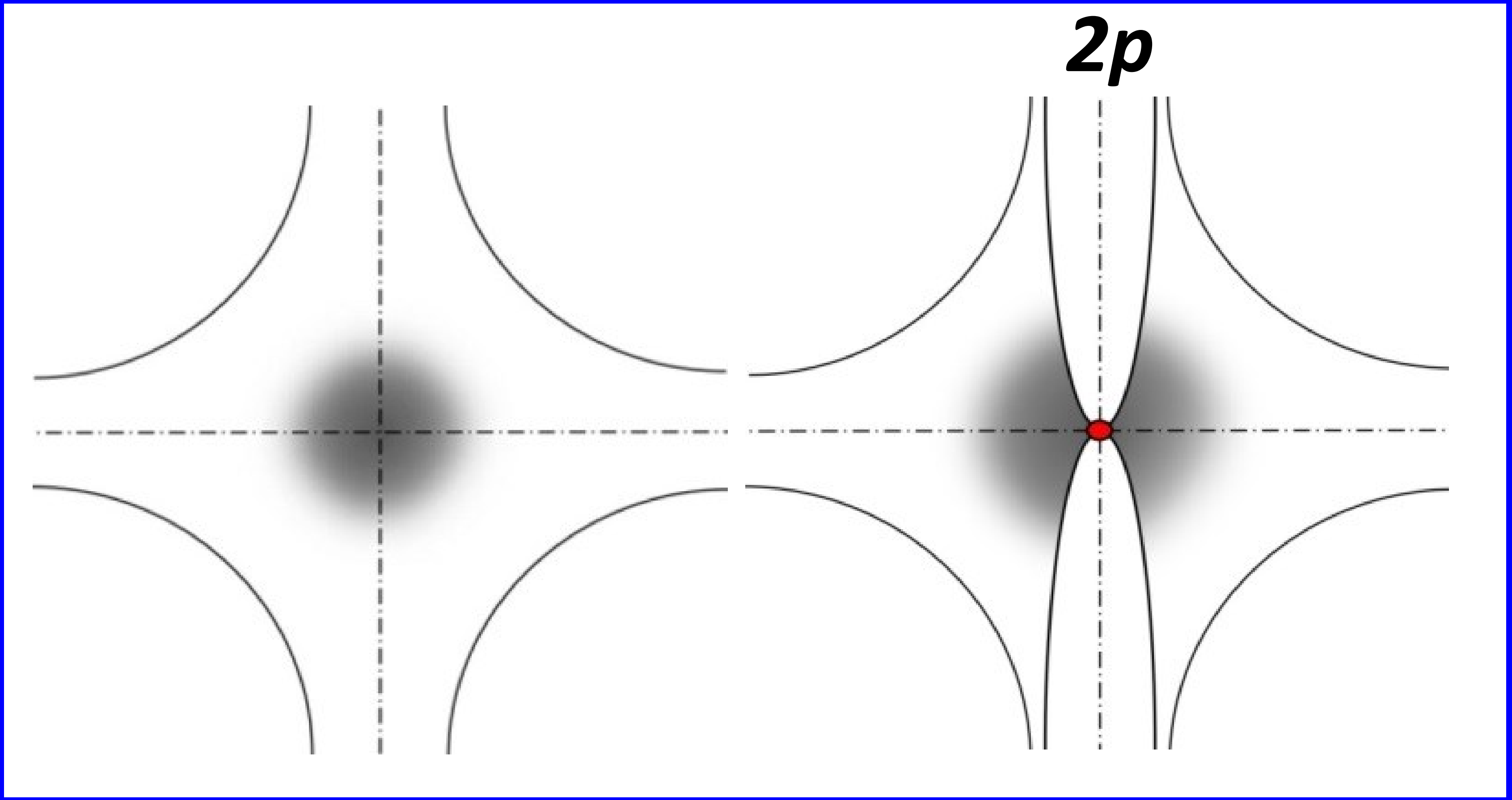
Numerical solutions of the Schrödinger equation **for *2p* state of the hydrogen by calculations of M. Winter (University of Sheffield, England) is shown in the following figure. The nucleus of the deuterium atom is located in the center of an atom between two electronic clusters**

2p orbital of hydrogen atom

Dot-density plot of the *2p* electron density function ψ_{2p}^2. Blue represents negative values for the wave functions and red represents positive values. http://winter.group.shef.ac.uk/orbitron/AOs/2p/wave-fn.html

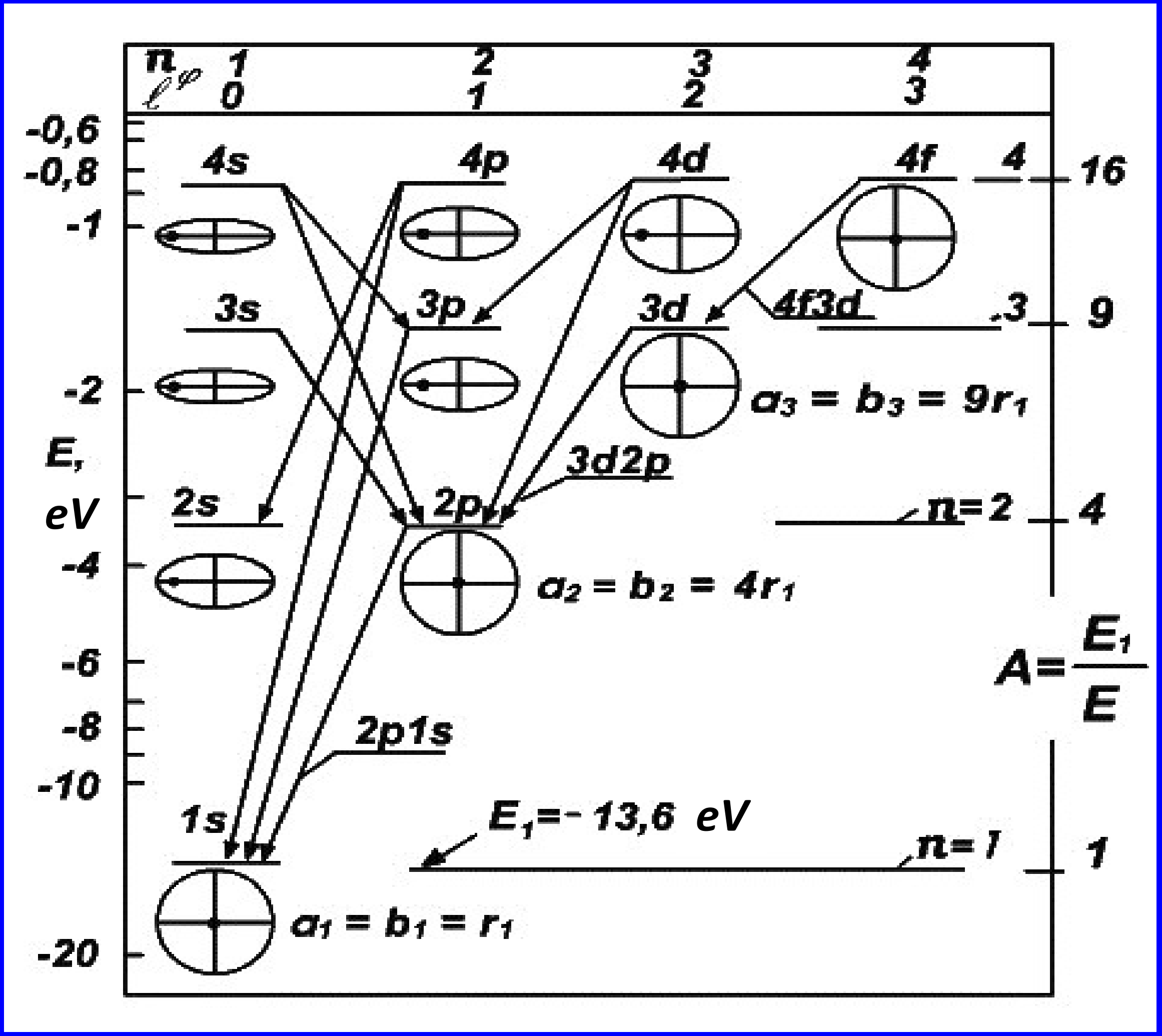


Schematic illustration of influence of the conductive crystal free-electron cloud on the implantation of a foreign atom.



Energy levels of hydrogen atom.
Rydberg states, 1885.

Johannes Robert Rydberg
Sweden
1854 – 1919

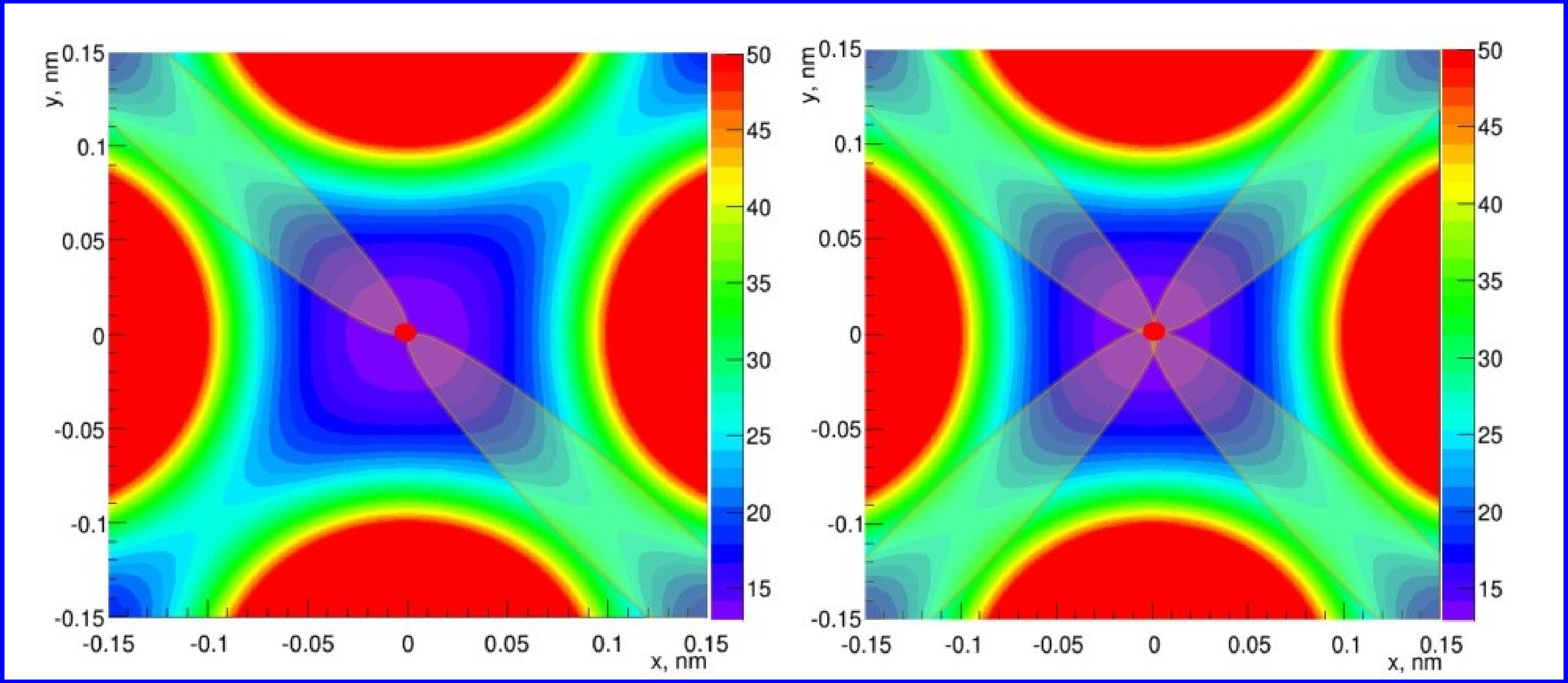


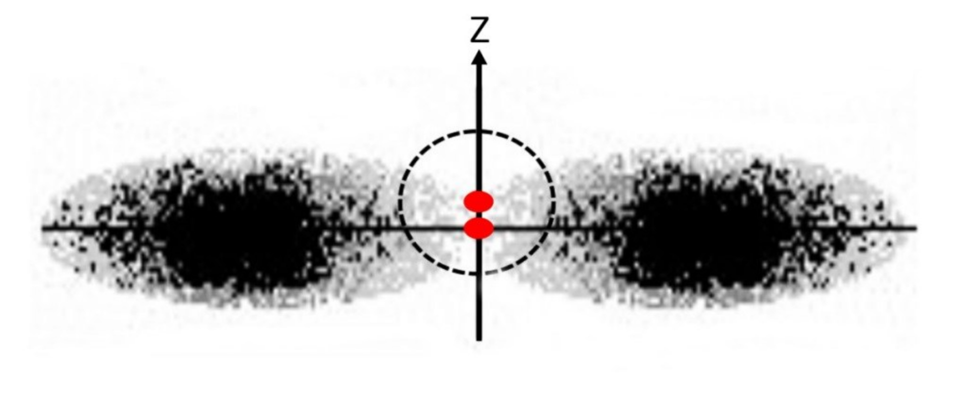
Quantum numbers:
n – energy
ℓ – angular moment

When all the deepest potential niches in the crystal are already filled by deuterium atoms in position *2p* or higher, filling them further create *doubles of such clusters*. *2p* deuterium atoms or their higher *p*-excitations do not take an arbitrary positions due to the non-sphericity, but stay in a well-defined spatial orientation in a crystal niche in order to minimize their potential energy.

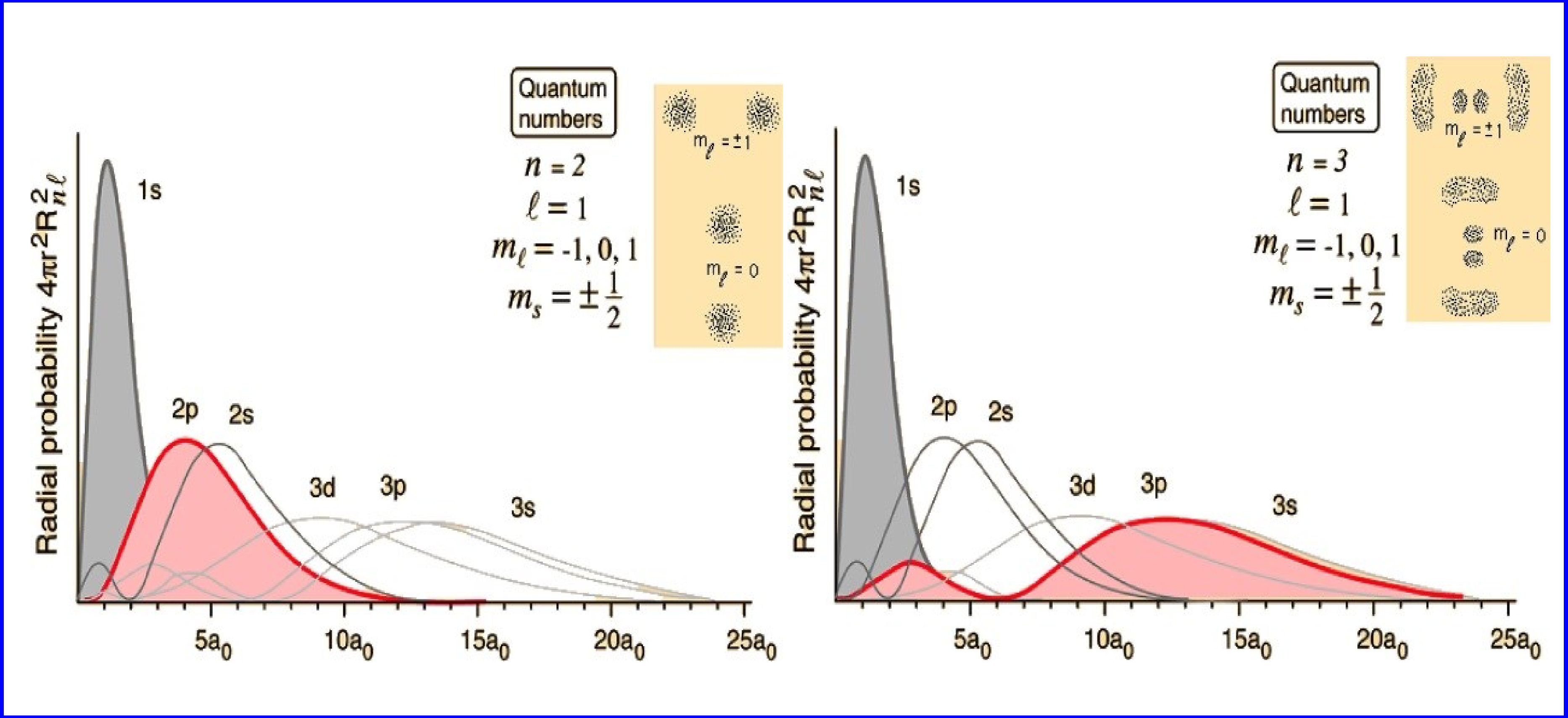
The following figures shows two hydrogen (deuterium) atoms in a *2p* state on the octahedral niche of platinum crystal, in a horizontal *XY* plane that is in a *crisscross* orientation at $Z = 0$, and also on the vertical axis *Z*. Color scale – the electric potential in Volts.

Hydrogen (deuterium) atoms in *2p* states in octahedral niche of platinum





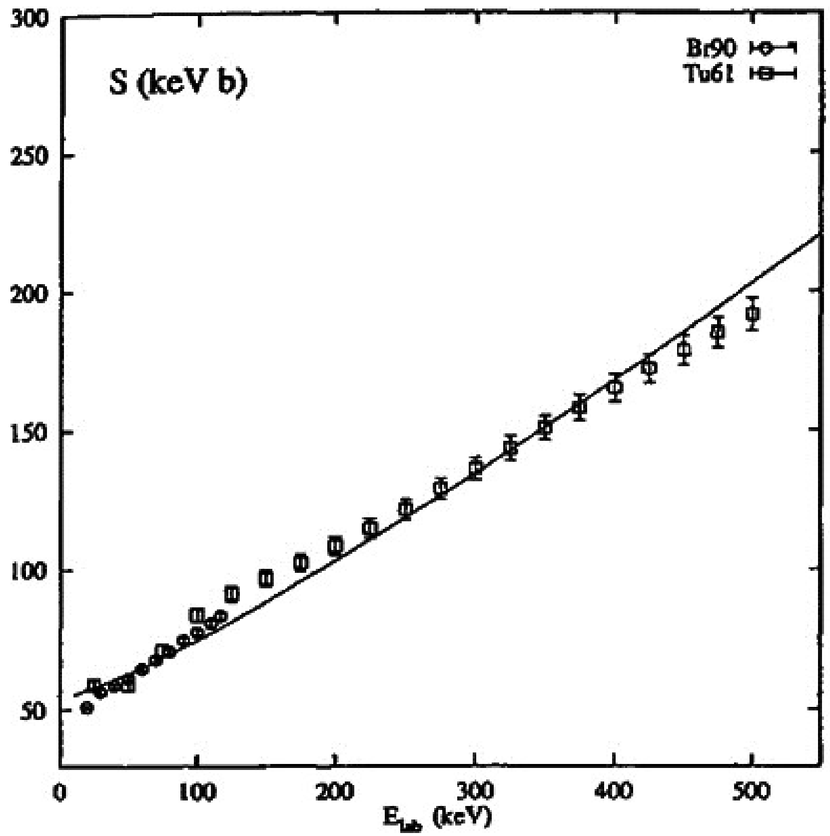
Dependence of probability of electron position in hydrogen atom *vs* distance. a_0 – *Bohr radius* = 52.9 *pm*.



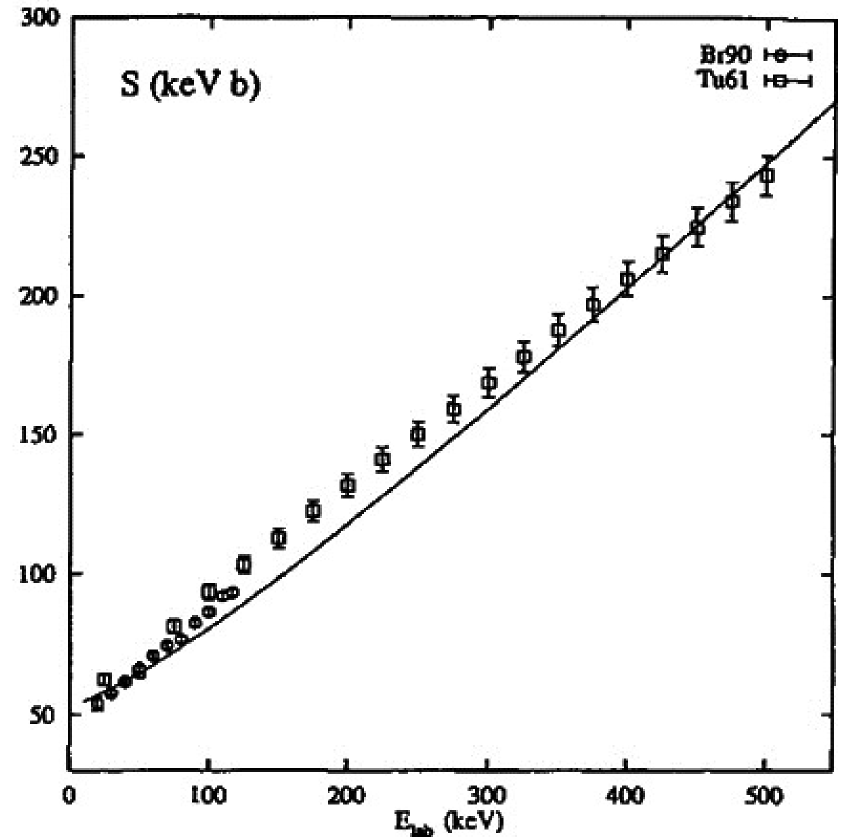
S(E) – astrophysical factor for reactions *D(d,p)*^{3}*H* and *D(d,n)*^{3}*He*, Lemaitre, S. at al., *Ann. Physik 2* (1993), 503.

$$S(E) = E\sigma \bullet \exp\left(\pi \frac{e^2}{\hbar c}\sqrt{\frac{M_{\mathrm{d}}c^2}{E}}\right) = E\sigma \bullet \exp(31.41/\sqrt{E})$$

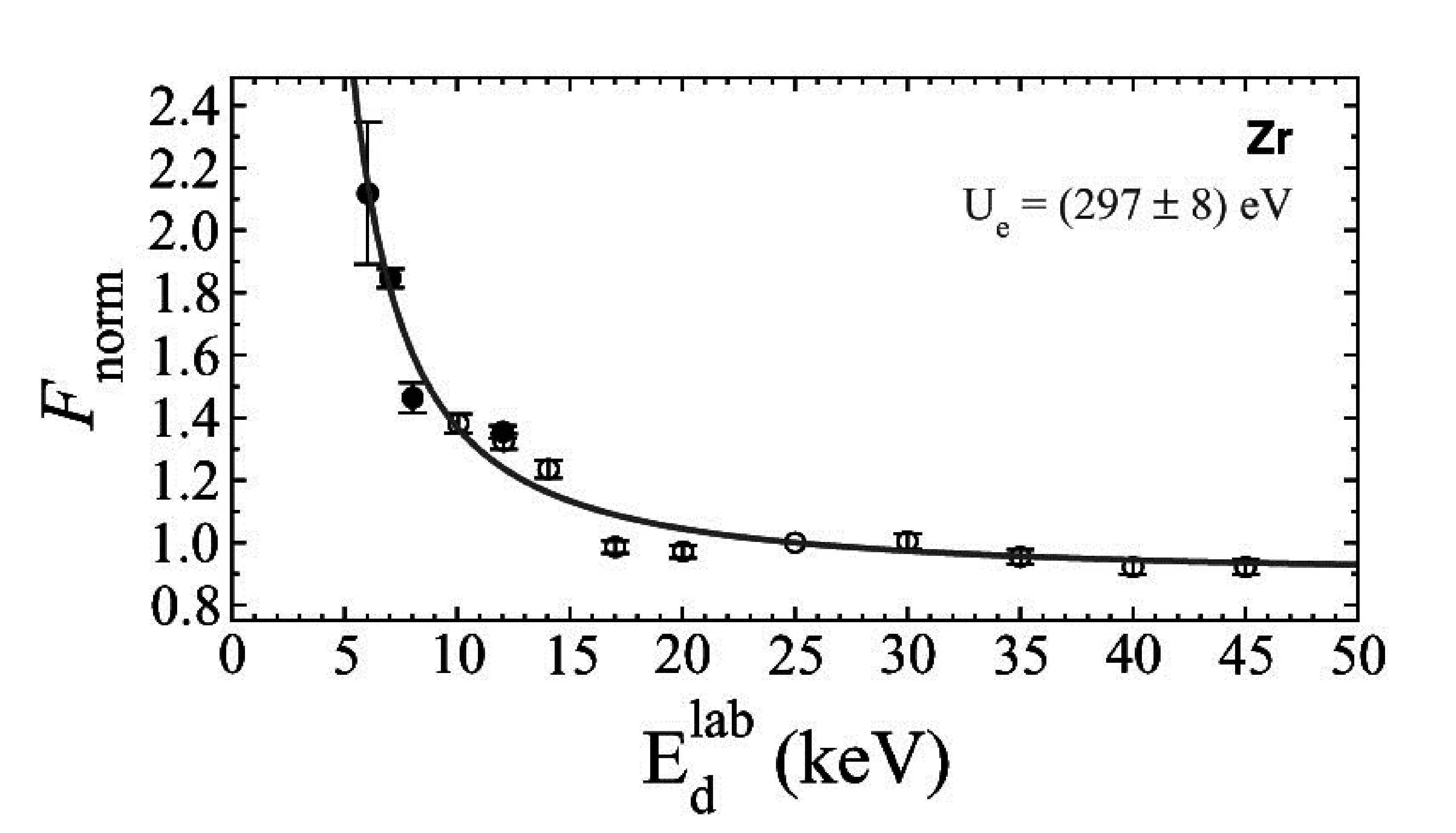
$D(d,p)^3H$



$D(d,n)^3He$

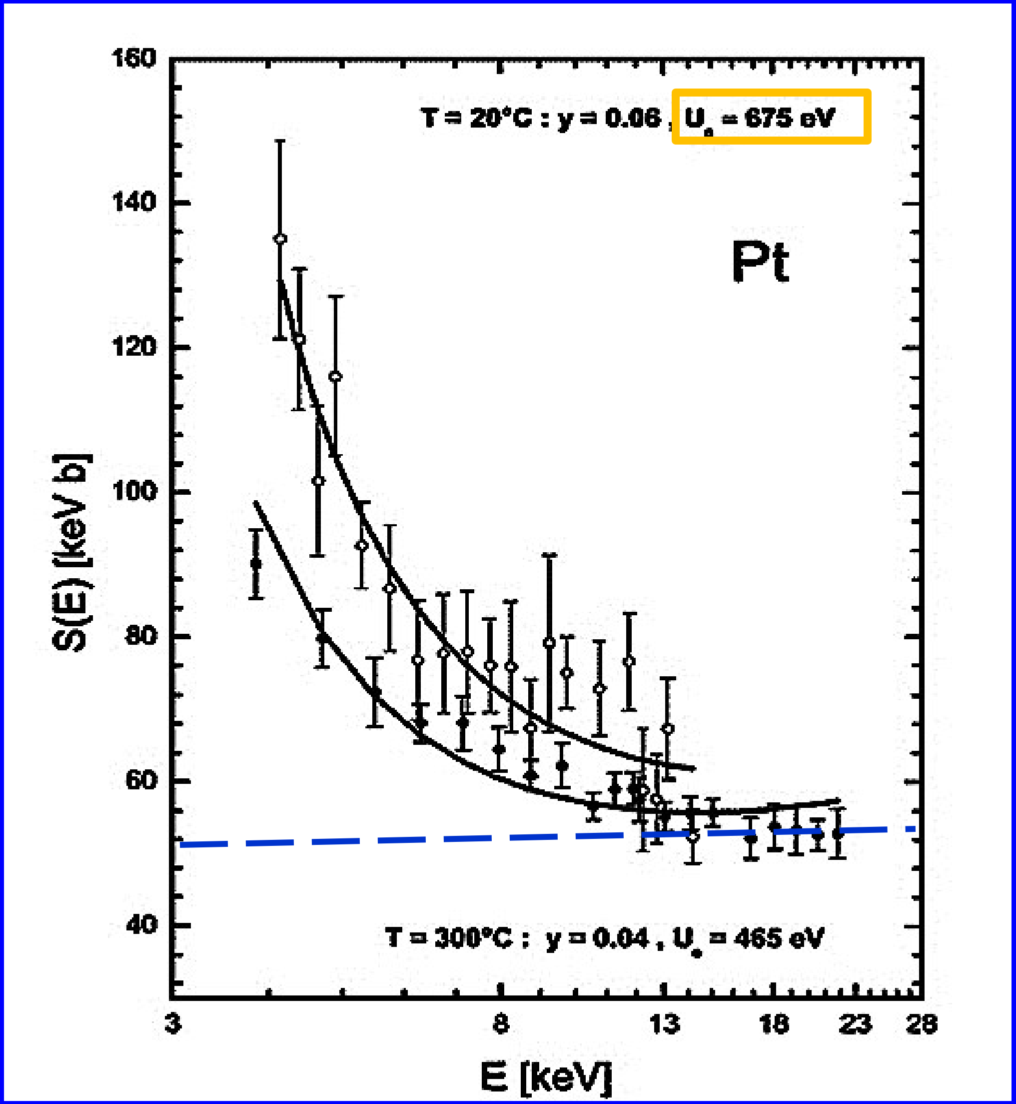


Normalized astrophysical factor *S(E)* for DD fusion, when target Is imbedded in Zr. Unusually high electron screening potential, about 10 times larger than that for free atoms (A. Huke, K. Czerski et al., Physical Review C 78, 015803, 2008)



Astrophysical factor *S(E)* for *DD* reaction in Platinum

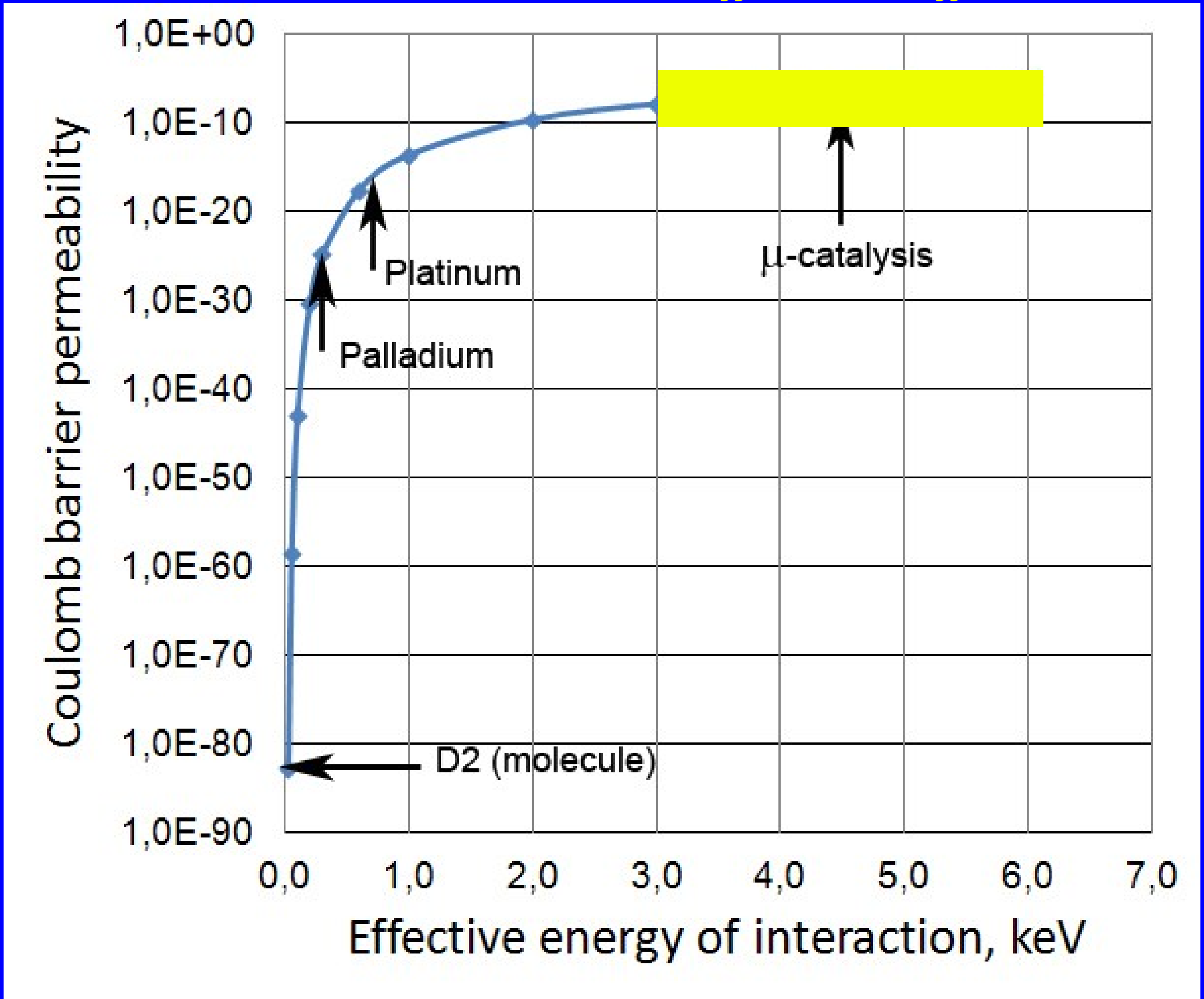
F. Raiola, B. Burchard et al., *Eur. Phys. J. A27 (2006) 79.*



Transparency of Coulomb barrier is *increased by about 65 orders of magnitude* with an increase in the so-called screening potential for deuterium molecules (27 eV) to 300 – 700 eV for a cluster of two deuterium atoms in *2p* state or higher for the platinum crystal *in a crisscross position.*

Transparency of Coulomb barrier for *DD* fusion

$P = e^{-2\pi\eta}$ $(2\pi\eta = 31{,}41/E_{eff}^{1/2},\ E_{eff}$ in кeV$)$



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Rate of *DD*-fusion in a crystalline cell

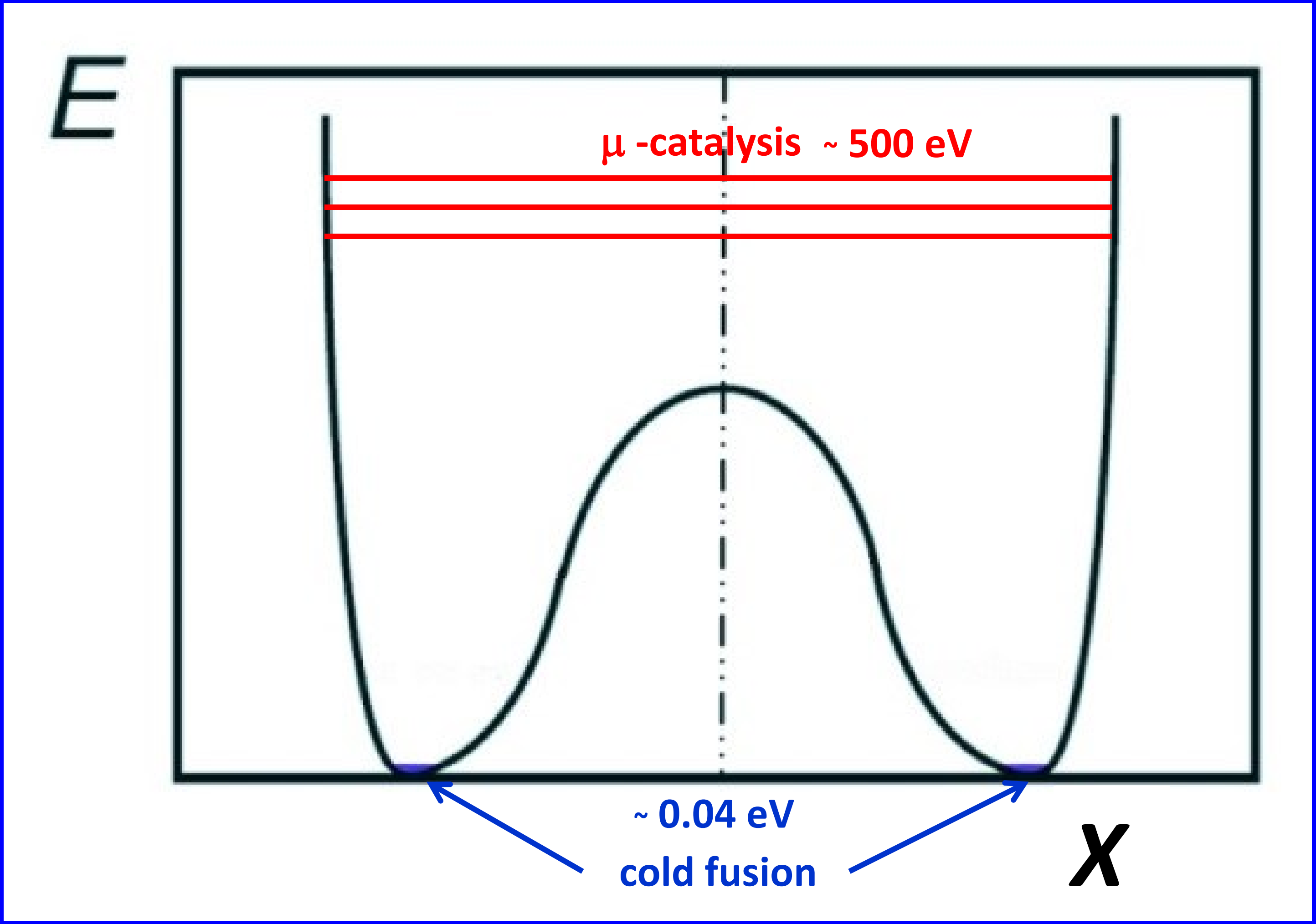
Crystal type	Screening potential, eV	Quantum vibration frequency ν, s^{-1}	Barrier permeability $e^{-2\pi\eta}$	Rate of *DD* fusion λ, s^{-1}
Palladium	300	$0{,}74\times10^{17}$	$1{,}29\times10^{-25}$	$0{,}95\times10^{-8}$
Platinum	675	$1{,}67\times10^{17}$	$2{,}52\times10^{-17}$	4,2

E.N. Tsyganov, "Cold Nuclear Fusion", *Physics of Atomic Nuclei*, 2012, Vol. 75, No. 2, pp. 153–159

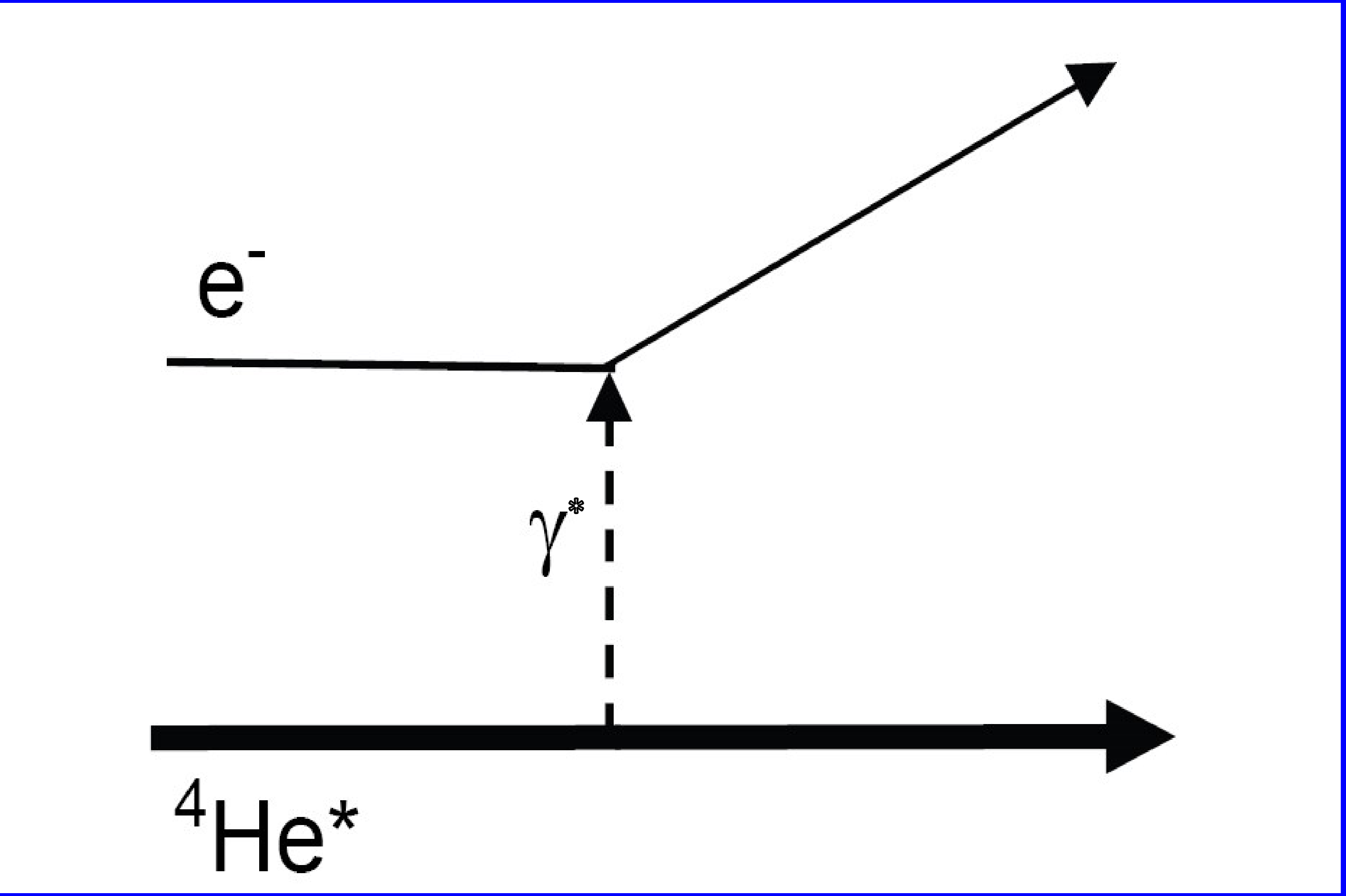
The observed *slowing down* of the decay of the intermediate nucleus through the direct channels of nuclear decays of $^{4}He^{*}$ system in cold fusion experiments can be explained by the existence of residual *Coulomb repulsion* (peaked at 100 – 200 eV) already in the potential well of the strong interaction after the reaction $DD \rightarrow 4He^{*}$ at the thermal excitation energies.

Thermal deuterons that penetrated the potential well of strong interactions at the low excitation energies are separated by a relic of the *Coulomb repulsion* and are at the opposite ends of the well. In this case, the energy discharge of the ^{4}He* system having a projection of the orbital angular momentum $\ell = 0$ could occur only through the emission of *virtual photons* with the *spin directed on the time axis*.

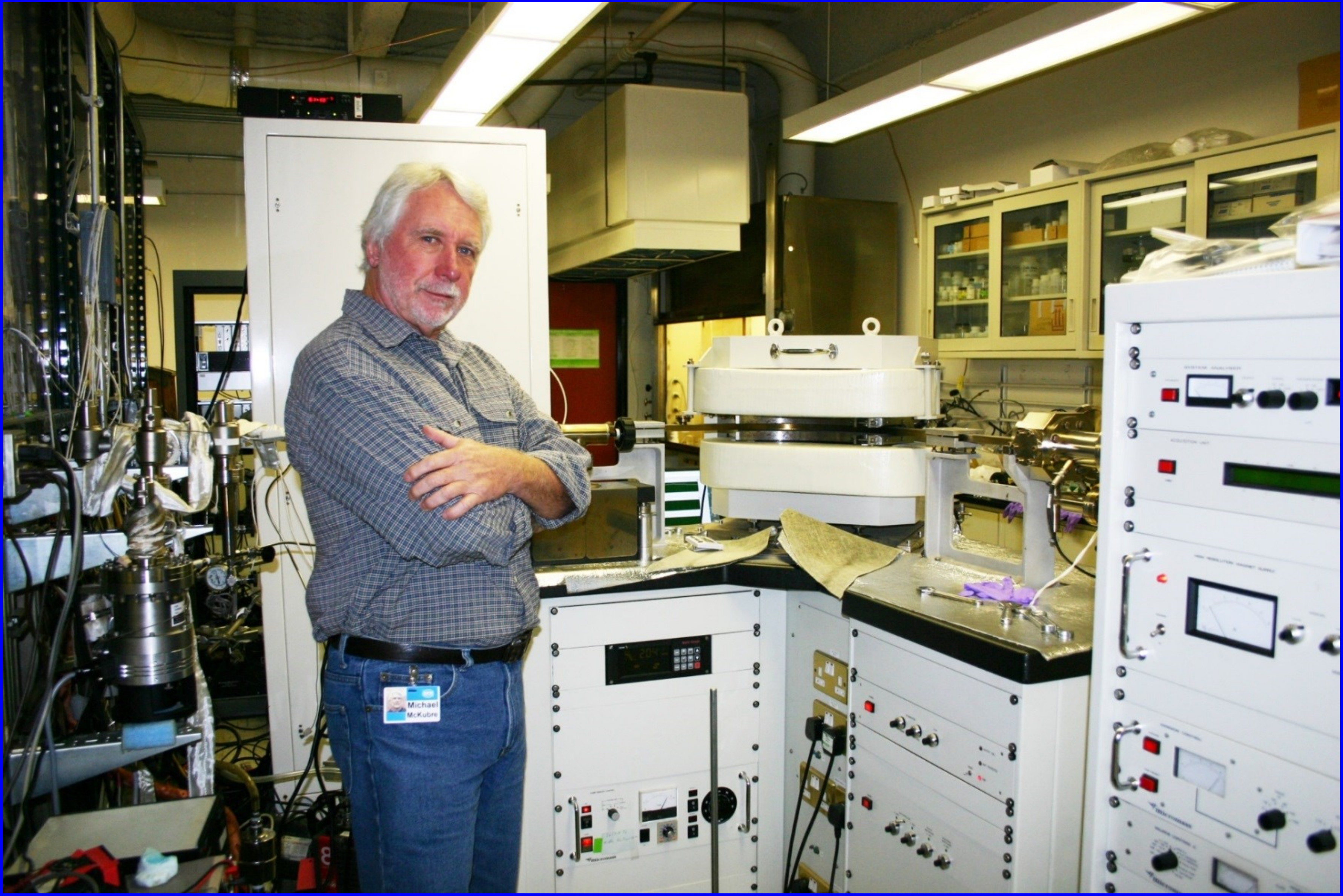
Schematics of a potential well after cold fusion reaction $DD \to {}^4He^*$. $\mu -$ catalysis also shown.



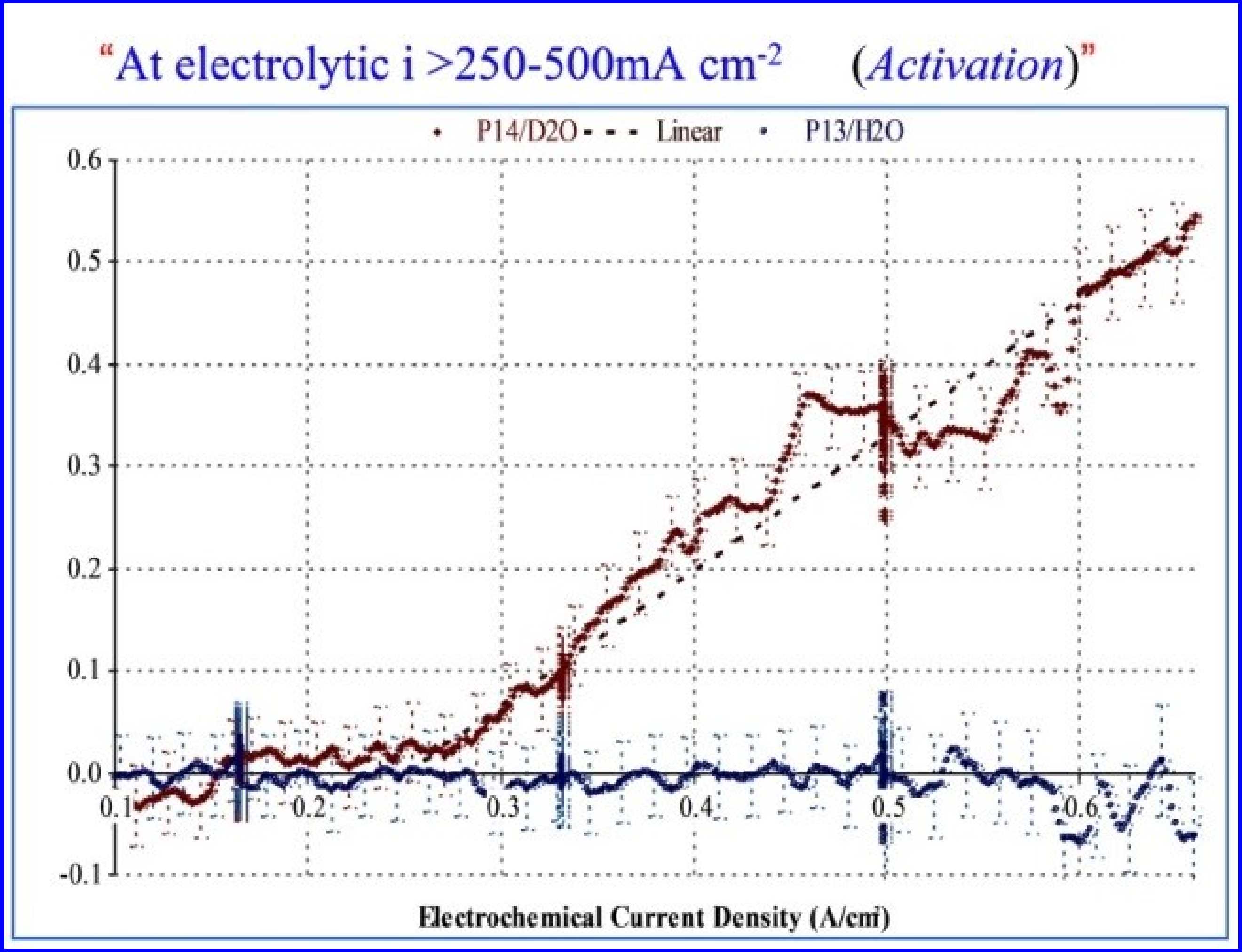
Escape of *virtual photon* from the excited nucleus and its subsequent absorption with the nearest electron



Dr. McKubre, 2011



P13/14 Simultaneous Series Operation of Light & Heavy Water Cells; *Excess Power vs. Current Density*



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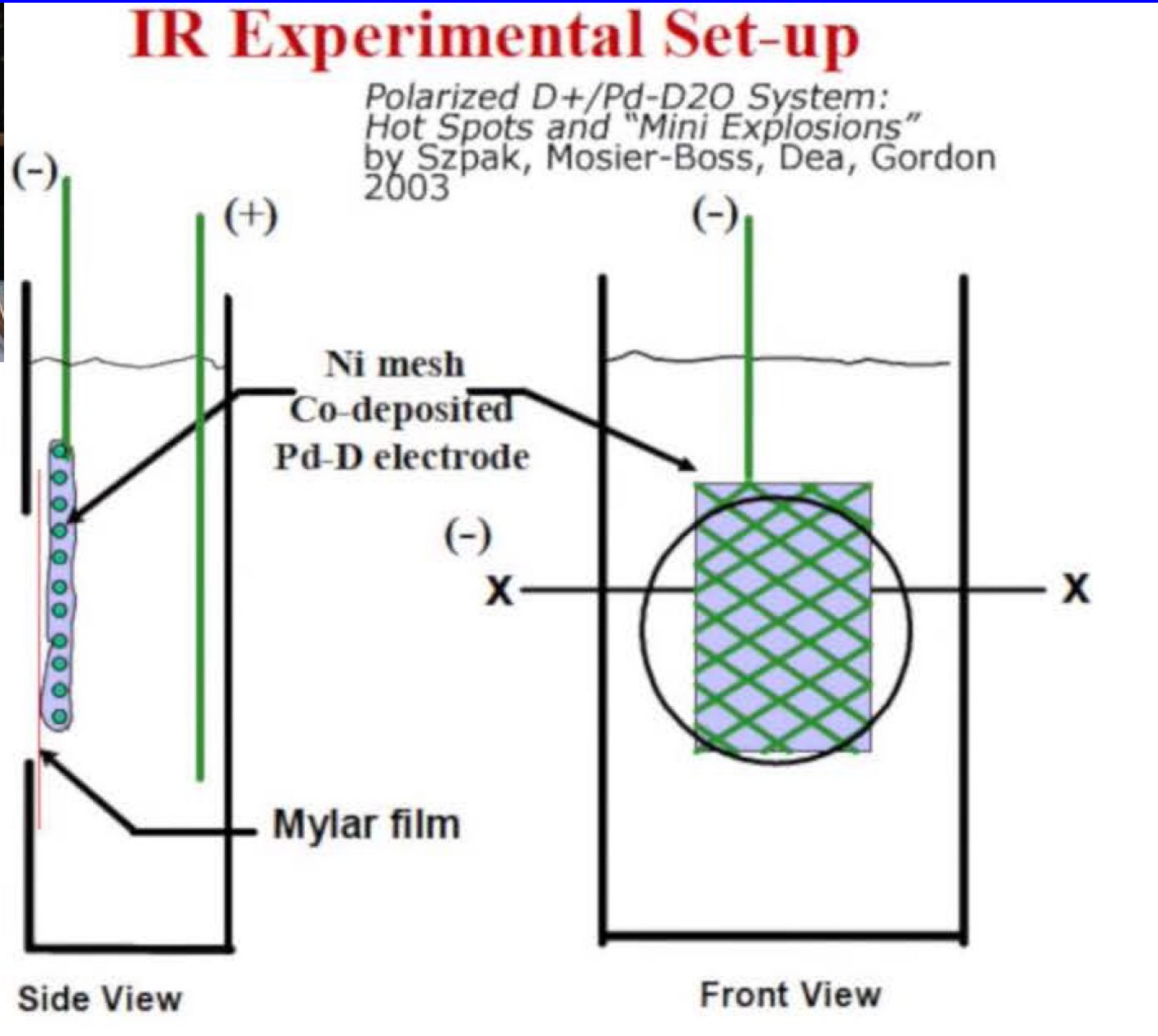
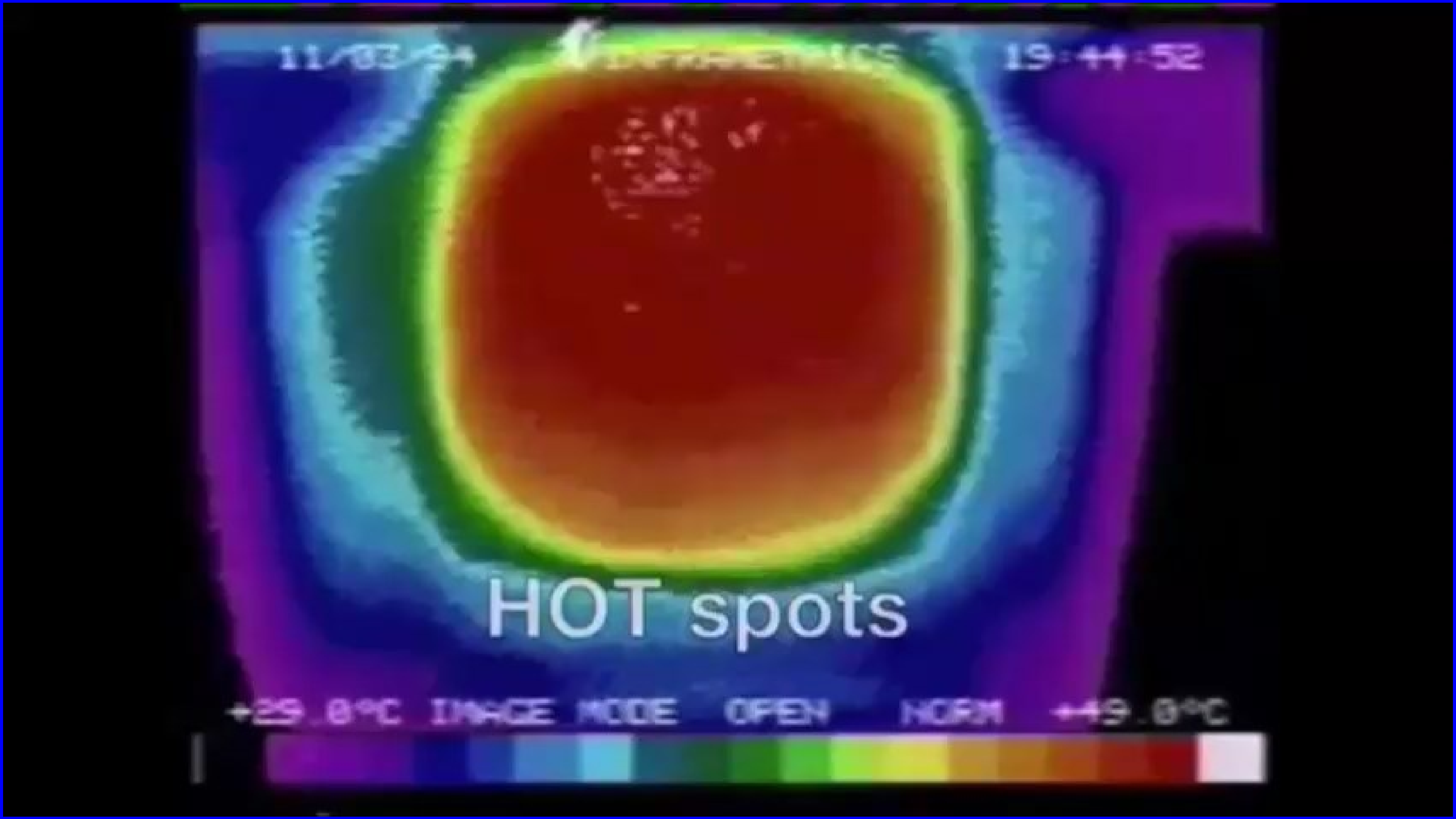
Dr. Stanislaw Szpak experiments, 1994 - 2003

Stanislaw Szpak



Hot spots


11/03/94
INFRAMETRICS
19:44:52
HOT spots
+29.0°C IMAGE MODE OPEN NORM +49.0°C

Cold fusion topic in CERN plans

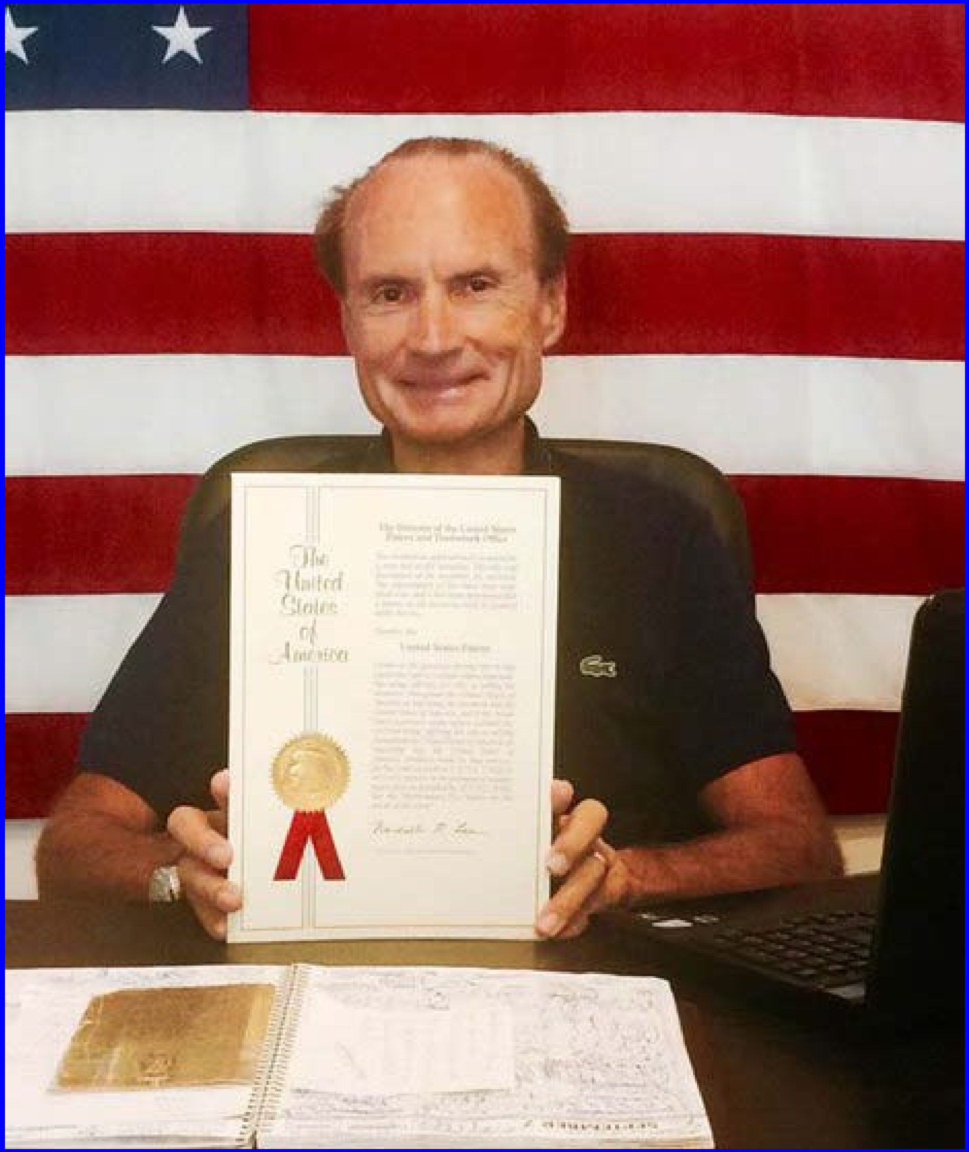
Consideration of cold fusion took place at the seminar of *ISOLDE* Department on October 14, 2015 in the reports of G. Hubler, V. Violante and J. Shell.

ISOLDE administration and the guests of the seminar

Some new results

1. Andrea Rossi and Giuseppe Levi
2. A.G. Parkhomov
3. China Institute of Atomic Energy
4. I.N. Stepanov et al.
5. LENZ
6. Brillouin Energy Corporation

Andrea Rossi – Patent



Tom Darden
Industrial Heat

X-cat Андреа Росси

Charged & Neutral Particles Channeling Phenomena,
September 25-30, 2016, Sirmione del Garda, Italy

$Li_7 + H_1 \rightarrow Be_8 \rightarrow 2\ He_4 + 17.3\ MeV$

(12) **United States Patent**
Rossi

(10) **Patent No.: US 9,115,913 B1**
(45) **Date of Patent: Aug. 25, 2015**

(54) **FLUID HEATER**

(75) Inventor: **Andrea Rossi**, Miami Beach, FL (US)

(73) Assignee: **Leonardo Corporation**, Miami Beach, FL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under U.S.C. 154(b) by 609 days.

(21) Appl. No.: **13/420,109**

(22) Filed: **Mar. 14, 2012**

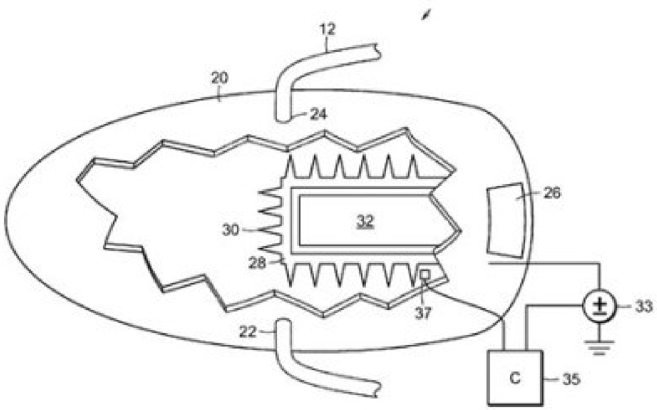
(51) **Int. Cl.**
F24J 1/00 (2006.01)

(52) **U.S. Cl.**
CPC ***F24J 1/00*** (2013

(58) **Field of Classification Search**
USPC 122/16.1
See application file for complete search history.

2004/0013585	A1*	1/2004	Whyatt et al.	422/189
2004/0065314	A1*	4/2004	Layer et al.	126/263.03
2010/0251694	A1*	10/2010	Hugus et al.	60/253
2010/0252023	A1*	10/2010	Coffey et al.	126/263.01
2011/0005506	A1	1/2011	Rossi	

FOREIGN PATENT DOCUMENTS



Norman Cook and Andrea Rossi

"On the Nuclear Mechanisms Underlying the Heat Production by the E-Cat"

http://arxiv.org/ftp/arxiv/papers/1504/1504.01261.pdf

CookRossi9April2015.docx

$^{58}_{28}Ni_{30}\ (0^+)+p \rightarrow {}^{59}_{29}Cu_{30}\ (3/2^-)(EC + \beta^+) \rightarrow {}^{59}_{28}Ni_{31}\ (3/2^-)(EC+\beta^+) \rightarrow {}^{59}_{27}Co_{32}\ (7/2^-)(\text{stable})$

$^{60}_{28}Ni_{32}\ (0^+) + p \rightarrow {}^{61}_{29}Cu_{32}\ (3/2^-)\ (EC + \beta^+) \rightarrow {}^{61}_{28}Ni_{33}\ (3/2^-)(\text{stable})$

$^{61}_{28}Ni_{33}\ (3/2^-) + p \rightarrow {}^{62}_{29}Cu_{33}\ (1^+)\ (EC + \beta^+) \rightarrow {}^{62}_{28}Ni_{34}\ (0^+)(\text{stable})$

$^{62}_{28}Ni_{34}\ (0^+) + p \rightarrow {}^{63}_{29}Cu_{34}\ (3/2^-)(\text{stable})$

$^{64}_{28}Ni_{36}\ (0^+) + p \rightarrow {}^{65}_{29}Cu_{36}\ (3/2^-)(\text{stable})$

Norman Cook and Andrea Rossi in their descriptions of Ni + H reaction are repeating our conclusions from 2012. Authors do not pay attention to the fact that the annihilation of positrons produces hard gamma rays with energy of 511 keV.

E.N. Tsyganov, S.B. Dabagov, M.D. Bavizhev

"XI International Scientific Conference: Solid State Chemistry"

Nanomaterials, Stavropol, Russia on 22-27 April 2012, p. 51-57.

68,27%	$^{58}Ni+^{1}H$	$\rightarrow$ $^{59}Cu^*$	$\rightarrow$	$^{59}Ni+\beta^{+}+\gamma^*+\nu_e$	1,3	min.
	$^{59}Ni+^{1}H$	$\rightarrow$ $^{60}Cu^*$	$\rightarrow$	$^{60}Ni+\beta^{+}+\gamma^*+\nu_e$	23,7	min.
26,10%	$^{60}Ni+^{1}H$	$\rightarrow$ $^{61}Cu^*$	$\rightarrow$	$^{61}Ni+\beta^{+}+\gamma^*+\nu_e$	3,3	min.
1,13%	$^{61}Ni+^{1}H$	$\rightarrow$ $^{62}Cu^*$	$\rightarrow$	$^{62}Ni+\beta^{+}+\gamma^*+\nu_e$	9,7	min.
3,59%	$^{62}Ni+^{1}H$	$\rightarrow$ $^{63}Cu^*$	$\rightarrow$	$^{63}Cu+\gamma^*$	^{63}Cu	stab.
0,91%	$^{64}Ni+^{1}H$	$\rightarrow$ $^{65}Cu^*$	$\rightarrow$	$^{65}Cu+\gamma^*$	^{65}Cu	stab.

Here γ^* - multiple *virtual photons*

Lifetime of ^{59}Ni - 76,000 years

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BROWSING TOOLS

Observation of abundant heat production from a reactor device and of isotopic changes in the fuel

Levi, Giuseppe ; **Evelyn, Foschi** ; **Bo, Hoistad** ; **Roland, Pettesson** ; **Lars, Tegnér** ; **Hanno, Essén** (2014) *Observation of abundant heat production from a reactor device and of isotopic changes in the fuel.* [Preprint]

Giuseppe Levi et al.

$$H + {}^{7}Li \rightarrow {}^{8}B^{*} \rightarrow {}^{4}He + {}^{4}He$$

Ion	Fuel		Ash		
	Counts in peak	Measured abundance [%]	Counts in peak	Measured abundance [%]	Natural abundance [%]
$^{6}Li^{+}$	15804	8.6	569302	92.1	7.5
$^{7}Li^{+}$	168919	91.4	48687	7.9	92.5
$^{58}Ni^{+}$	93392	67	1128	0.8	68.1
$^{60}Ni^{+}$	36690	26.3	635	0.5	26.2
$^{61}Ni^{+}$	2606	1.9	~0	0	1.8
$^{62}Ni^{+}$	5379	3.9	133272	98.7	3.6
$^{64}Ni^{+}$	1331	1	~0	0	0.9

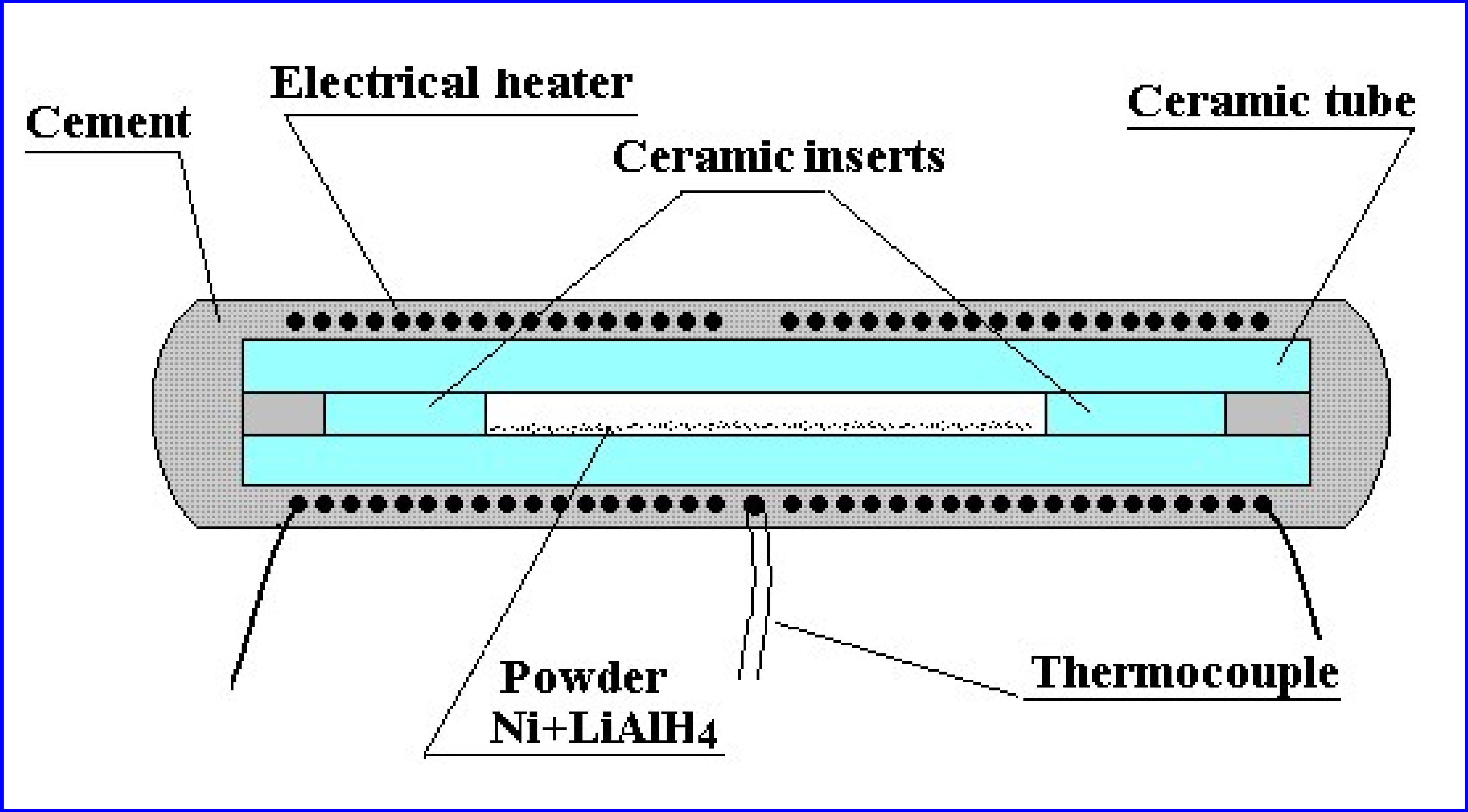
ICCF-19

Researches of the Heat Generators Similar to High-Temperature Rossi Reactor

A.G. Parkhomov, E.O. Belousova
Lomonosov Moscow State University, Moscow, Russia

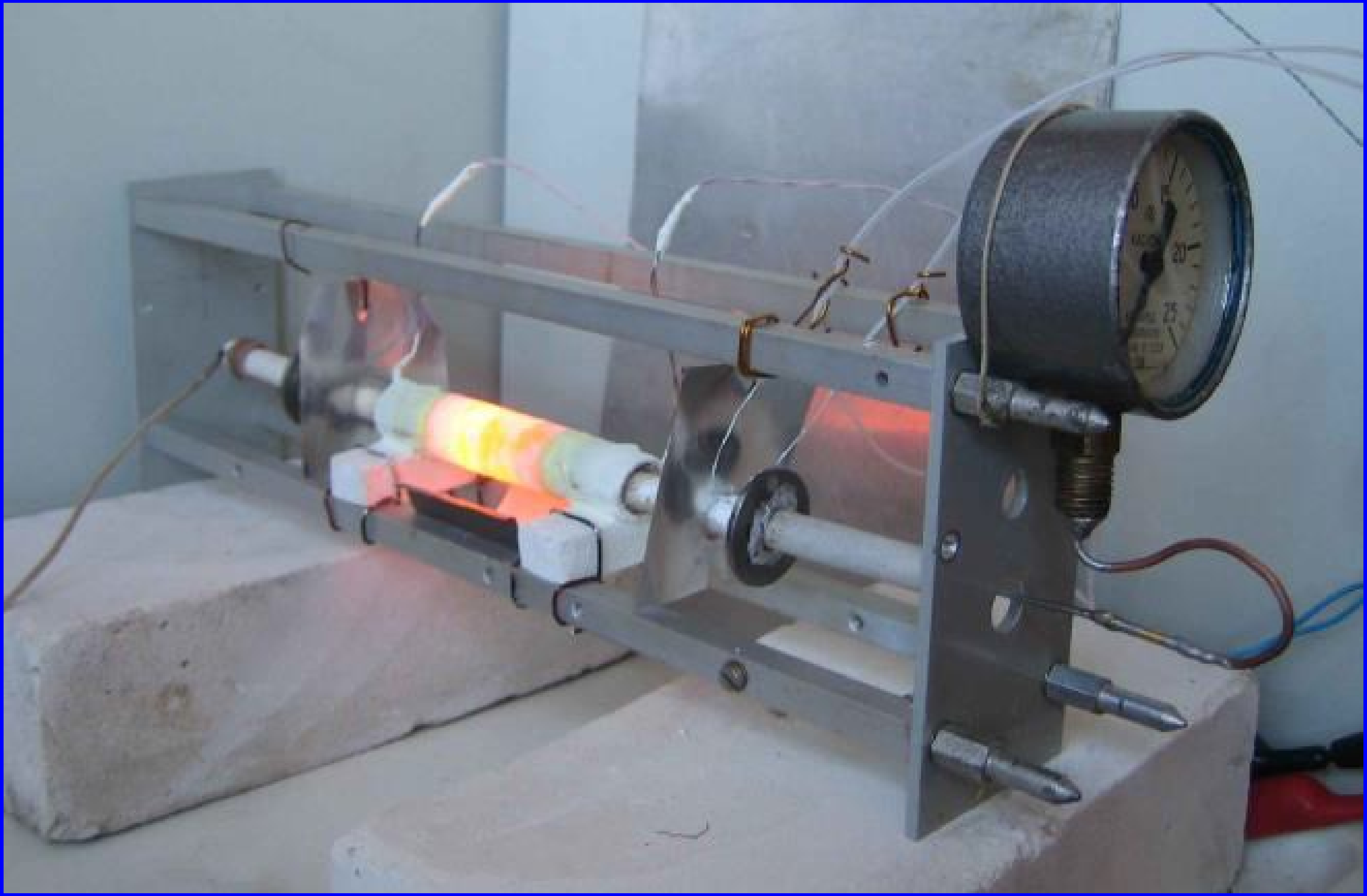
The devices similar to high-temperature Rossi reactor were made. Excess heat by the temperature about 1100 °C and more was demonstrated. ***There was no ionized radiation observed during the reactor's work above the background level.***

Reactor scheme

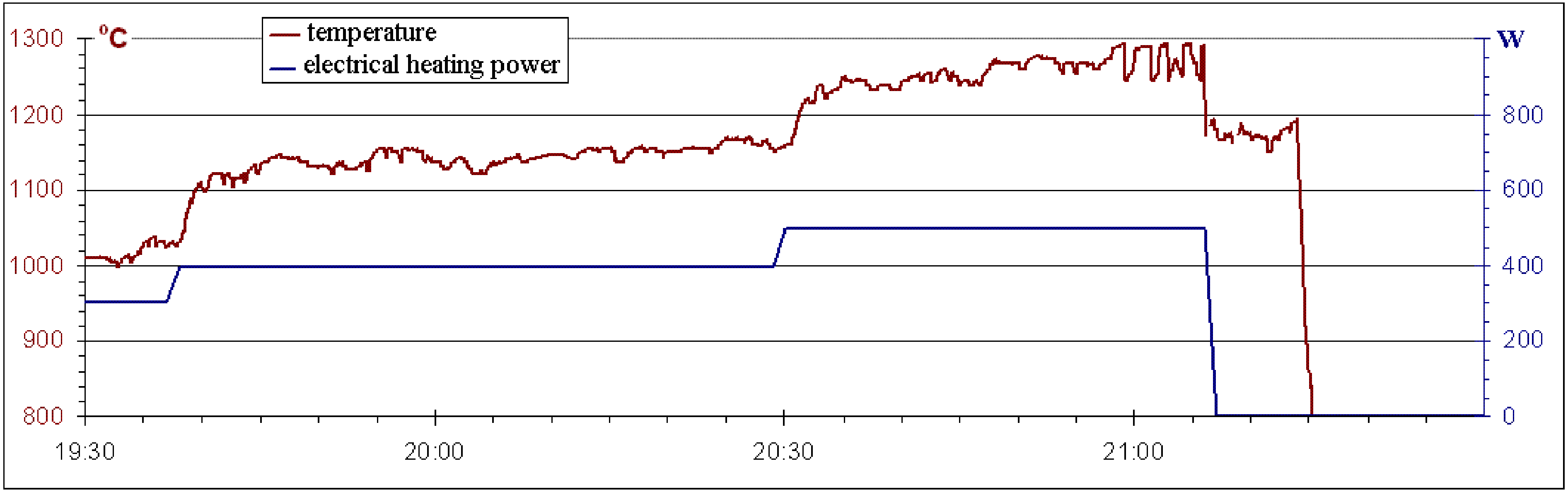


First reactor during the tests

Modified reactor during the tests



Temperature dynamics and electrical heating power at high temperature.



Reactor loaded with fuel

Date	Temper.	Durat.	Cons.	Prod.	COP
	°C	min	W	W	
20.12.2014	970	38	301	297	0,99
20.12.2014	1150	50	395	758	**1,92**
20.12.2014	1290	40	499	1365	**2,74**
04.01.2015	940	131	304	305	1,00
04.01.2015	1020	75	377	407	1,08
10.01.2015	1080	73	161	284	**1,77**
18.01.2015	800	90	308	293	0,95
18.01.2015	1080	38	78	135	**1,73**

Anomalous heat production in hydrogen-loaded metals: possible nuclear reactions occurring at normal temperature

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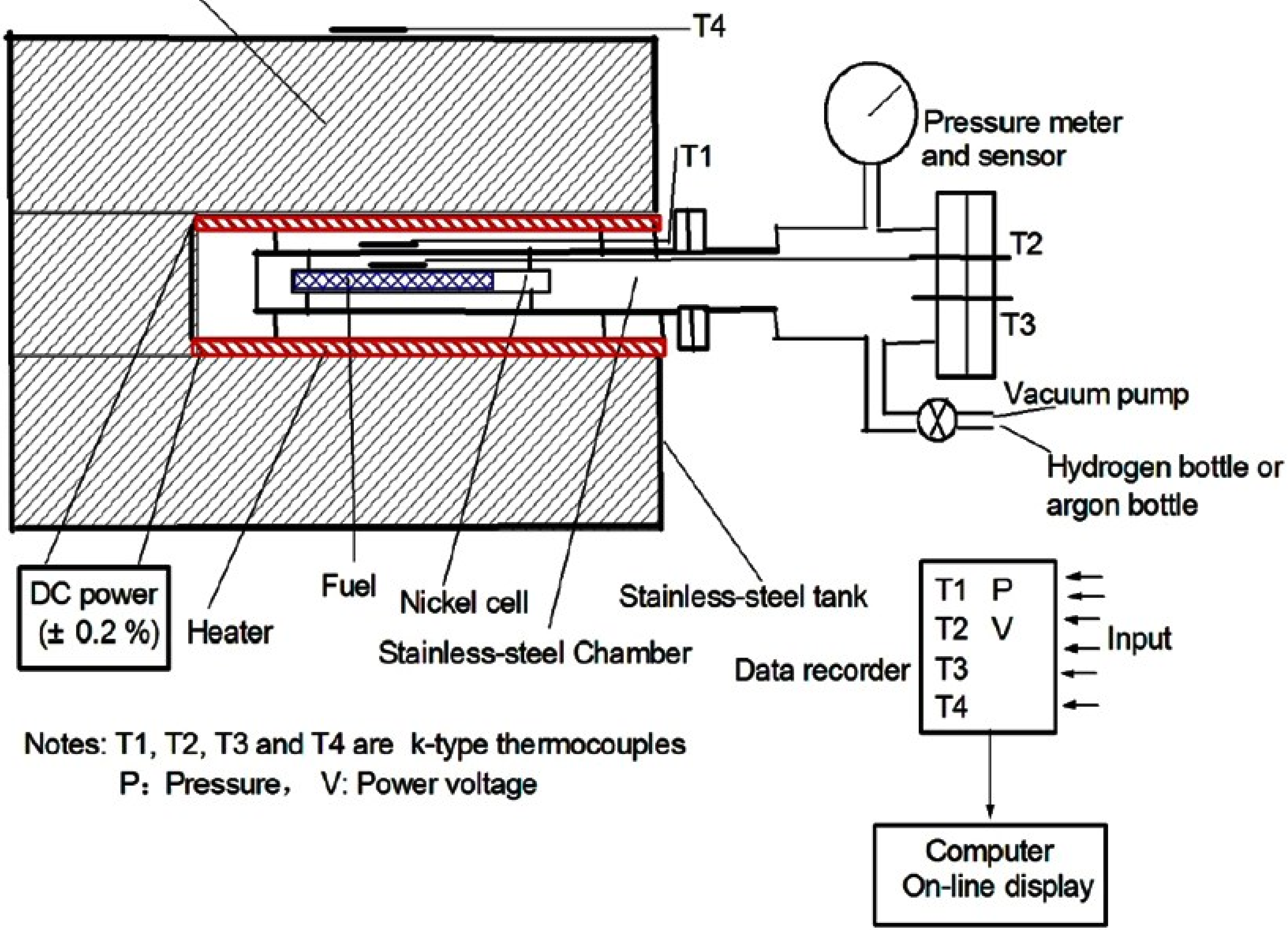
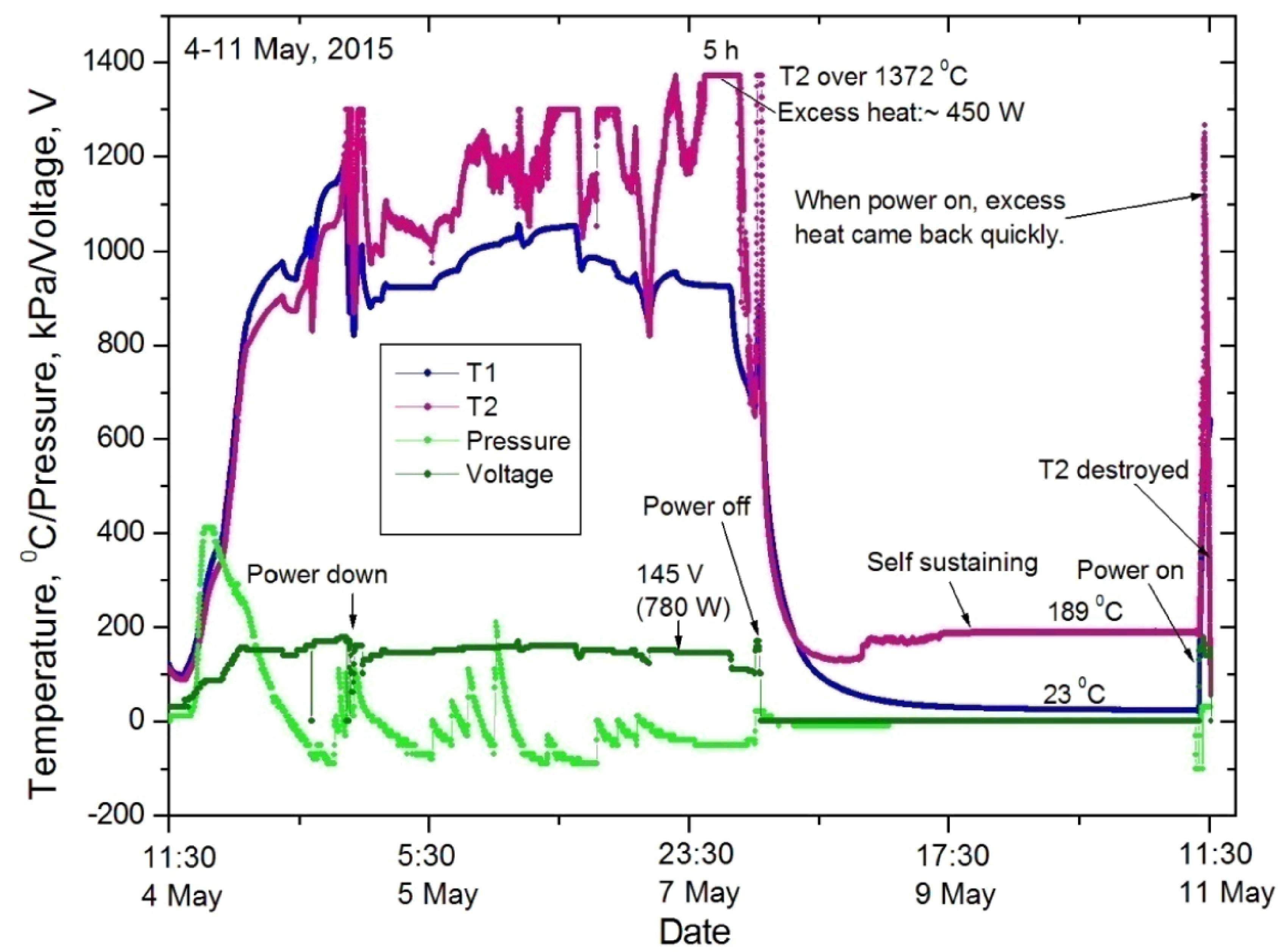
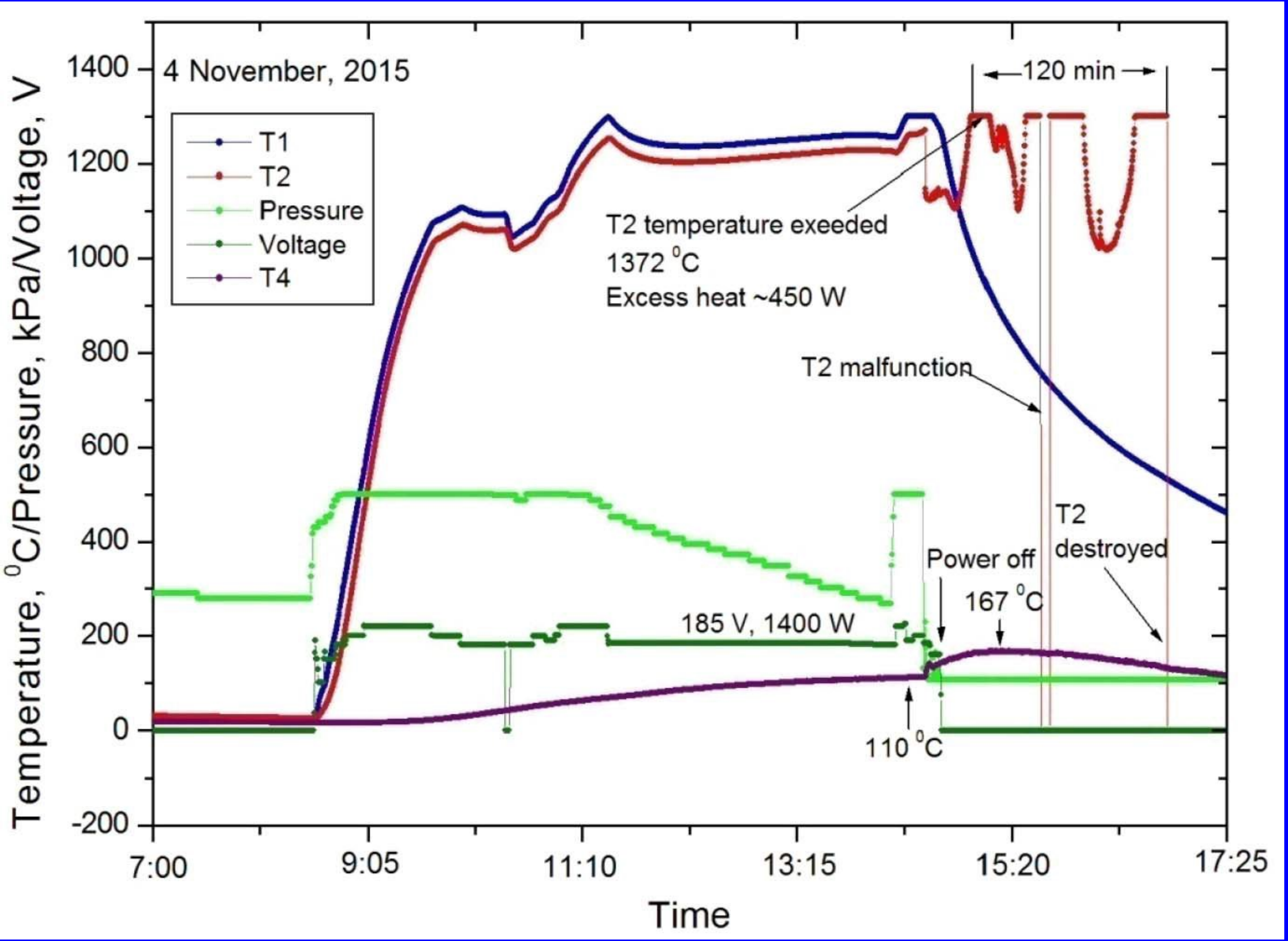
This paper reports results of anomalous heat generation in hydrogen-loaded metals at a temperature below 1300 °C. The heat was produced in the fuel sample (mixture of nickel powder and $LiAlH_4$), which was added to a nickel cell, and then the cell was placed in a sealed stainless-steel chamber. Results of two runs are demonstrated. Excess heat lasted for seven days in the first run.



Notes: T1, T2, T3 and T4 are k-type thermocouples
P: Pressure, V: Power voltage


4-11 May, 2015
Temperature, ^{0}C/Pressure, kPa/Voltage, V
1400
1200
1000
800
600
400
200
0
-200
5 h
T2 over 1372 ^{0}C
Excess heat:~ 450 W
When power on, excess heat came back quickly.
T1
T2
Pressure
Voltage
Power off
T2 destroyed
Power down
145 V (780 W)
Self sustaining
Power on
189 ^{0}C
23 ^{0}C
11:30 4 May
5:30 5 May
23:30 7 May
17:30 9 May
11:30 11 May
Date



4 November, 2015
T1
T2
Pressure
Voltage
T4
120 min
T2 temperature exeeded
1372 °C
Excess heat ~450 W
T2 malfunction
T2
destroyed
Power off
167 °C
185 V, 1400 W
110 °C
Temperature, °C/Pressure, kPa/Voltage, V
Time
1400
1200
1000
800
600
400
200
0
-200
7:00
9:05
11:10
13:15
15:20
17:25

In the second round of experiments, when the external power was disconnected, T1 temperature decreased while the temperature at *T2 remained in the range of 1300° C for about 120 minutes*, demonstrating tolerance of the fuel samples for self-sustaining heat generation of about 450 W. In the second round experiment, when the external power supply was disconnected, temperature T4 on the outer shell of the assembly abnormally rose from 110° C to 167° C. This result indicates that, in addition to the heater power, there is another inner heat source to promote the T4 temperature.

The possible energy generated by chemical reaction was calculated to be 26 kJ. The abnormal heat output from the experiments was *higher than that of chemical energy by a factor of 3*. Therefore, such a huge excess heat may be caused by low-energy nuclear reactions (LENR).

Theoretical research of low-energy nuclear reactions has made significant progress in recent years, and there are many proposed mechanisms. However, there is no single accepted theory.

Our results clearly show thermal abnormalities in heating of metal containing hydrogen, capable of generating heat at constant temperature. This opens scientific research into a new and important source of energy.

I.N. Stepanov, Yu.N. Malakhov, Shi Nguen-Kuok

stepanovigorn@gmail.com, Moscow State Lomonosov University yumalakhov@yandex.ru, nguyenquocshi@yahoo.com, National Research University MEI, **“Journal of Forming Scientific Directions”, No 9(3), pp. 90-93, 2015**

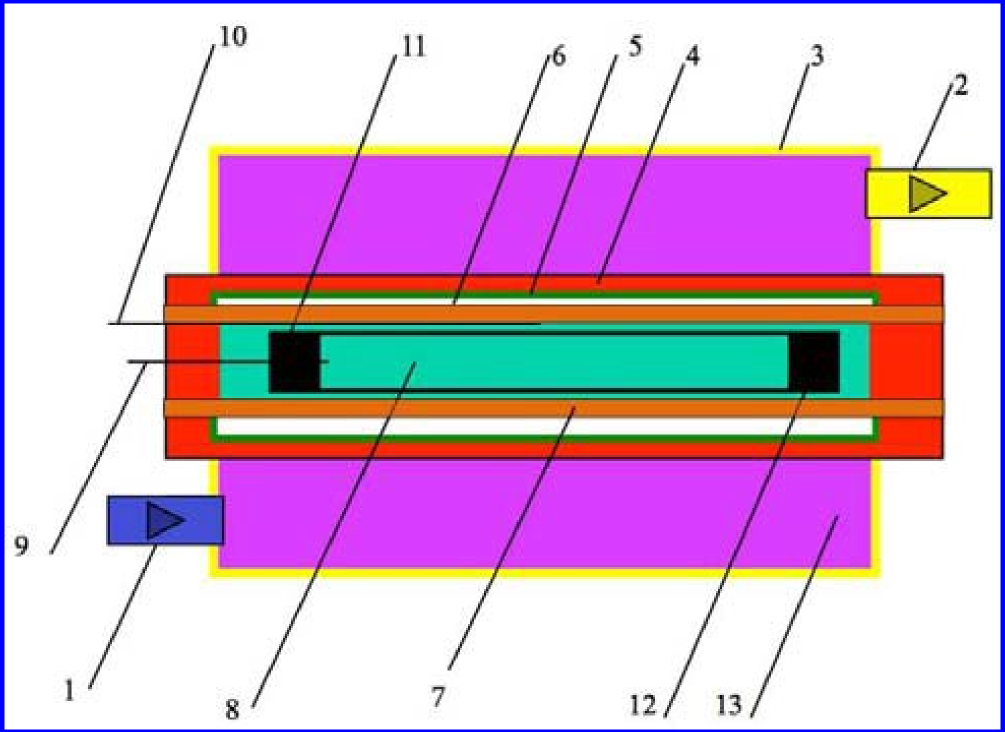
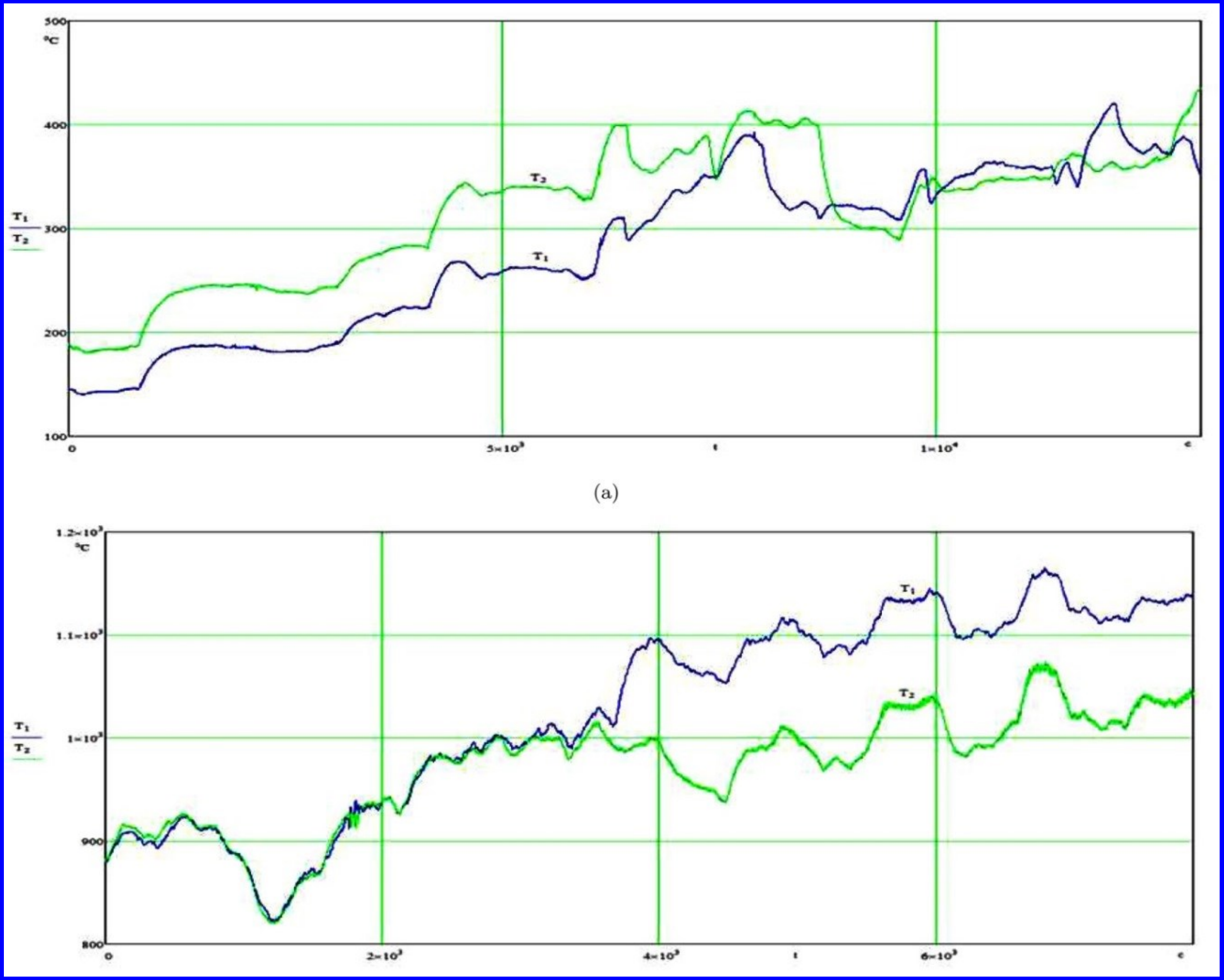


Figure 1. Schematics of a heat generator. 1 - The inlet connection being inserted into the calorimeter thermocouple for connection to a cooling water pipe. 2 - Connecting the output from a thermocouple for o pen water discharge. 3 - The outer casing of the calorimeter. 4 - The inner shell of the calorimeter of the copper pipe. 5 - An electrically insulating layer. 6 - Heater. 7 - Ceramic body heater. 8 - Heating with fuel cell. 9, 10 - Thermocouple. 11, 12 – Container plugs. 13 - Running water.

The time dependence of the temperature inside the heat cell T1 and on its surface: a) the initial stage, b) energy generation stage.



1. Setup of a heat generator for experiments to study the process of turning excess energy into heat is established with sealed boxes filled with a mixture of nickel powder and lithium aluminum hydride.

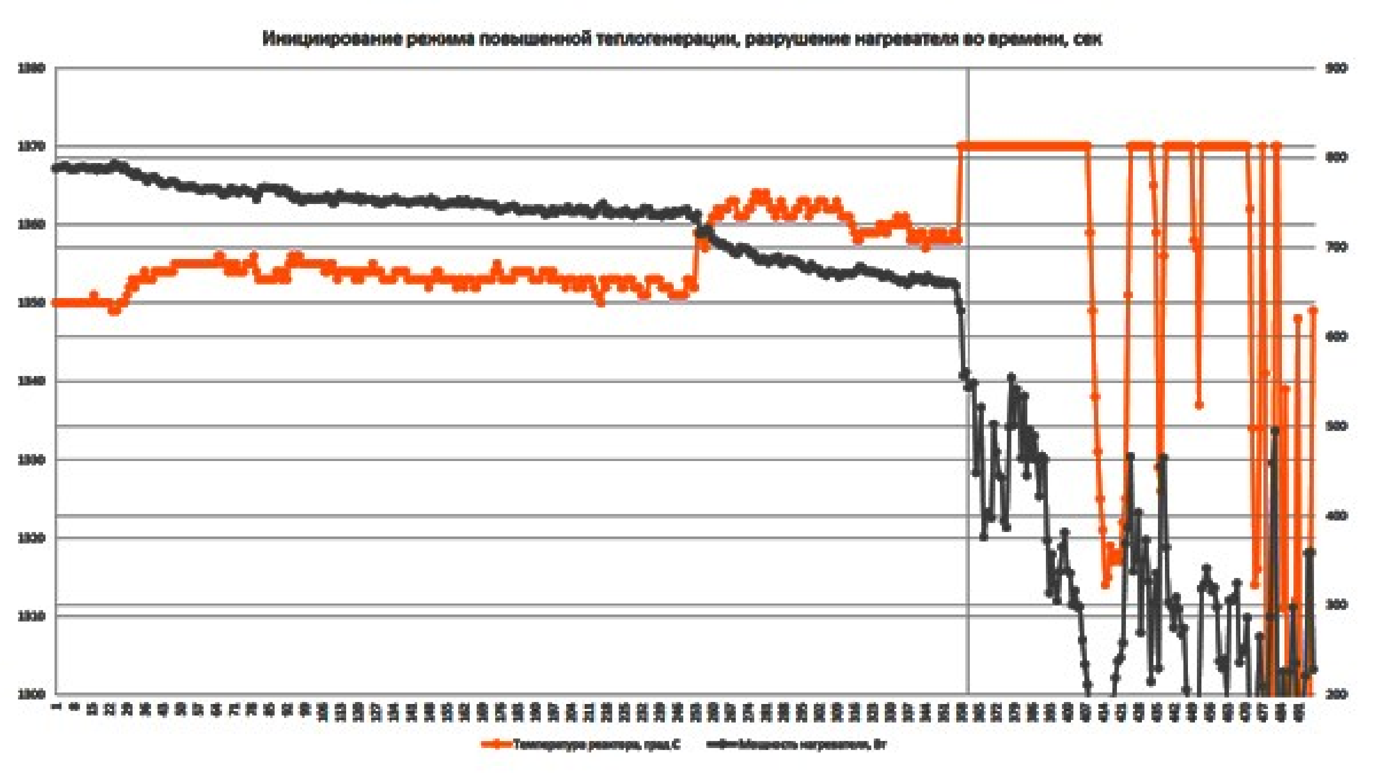
2. The results indicate excessive heat after heating a mixture of nickel powder and lithium aluminum hydride in a temperature range of 1030 - 1140^o C, which is consistent with the results of the work of Levi (Lugano experiment) and Parkhomov.

3. During the work of the generator, no radiation by exposure of X-ray photographic emulsion (RF film 3) was recorded.

4. The results obtained by measuring the excess heat of reaction and the chemical analysis indicate the *large additional source of power inside the generator; these values are not achieved in known chemical reactions*. Determining the nature of this reaction, including confirmation that it is a kind of nuclear transmutation reaction in vapors of lithium aluminum hydride catalyst, would be necessary to analyze the source and the spent fuel isotopes after prolonged operation of the generator.

Study of modes of operation of heat Ni-H generator

LenzandColab@gmail.com



Conclusions

Initiation of energy generation mode for thin (0.2 mm) reactor can occur even with 800-900 ^{o} C.

The rising rate of temperature of the heater (air) for initiation of heat generation can be greater or equal to 0.5^{o} C/s.

Thermo-generation mode for thick-wall reactor can be initiated at a temperature of 1350 degrees.

Evaluation of COP (1347 ^{O} C) > 3.

Low Energy Nuclear Reactions (LENR) Phenomena and Potential Applications

Louis F. DeChiaro, Ph.D.
Physicist

September 23, 2015

NSWCDD-PN-15-00408; Distribution A: Approved for Public Release: Distribution is Unlimited.

ELECTROMAGNETIC & SENSOR SYSTEMS DEPARTMENT

Summary

- Low Energy Nuclear Reactions appear to be real; are probably attributable to something like nuclear fusion. BUT …
- Presence of lattice profoundly affects results; little prompt radiation…
- Multiple labs observed excess heat, elemental transmutations, soft X-ray emission, ^4He generation commensurate with heat, tritium production, occasional MeV neutron emission, and RF emission in the HF and mm wave bands.
- SPAWAR, & JWK Internat. and others all observed 100% repeatability.
- Rossi Hotcat tested by 3rd party academic group; 1.5×10^6 Watt-hours excess thermal energy over 32 day continuous run + isotope shifts.
- Hotcat has been duplicated by Profs. A. Parkhomov (Moscow) & Jiang* (PRC).
- Commercial products (1 MW plant) now being tested, customer location.
- E-cats in 1 MW plant were still running on initial fuel charge at 4 months, COP varies between 20 and 80 in self-sustain mode.
- Multiple entrepreneurs now developing products for market.
- Ten LENR patents actually granted worldwide during past 5 years, 5 by USPTO.
- Plans exist to build LENR propulsion systems into vehicles for sale to public.
- NASA plans to use LENR thrusters in deep-space probes.

*Professor Jiang is also affiliated with China Institute of Atomic Energy, Beijing.

Press Release Brillouin Energy

CONGRESS VIEWS BRILLOUIN ENERGY'S LENR WET™ AND HHT™ BOILER REACTOR SYSTEMS FOR GENERATING THERMAL ENERGY

BERKELEY, CA, 18 November 2015 **- Brillouin Energy Corporation, developer of renewable energy technologies capable of producing commercially useful *amounts of thermal energy (heat) based on controlled low energy nuclear reactions (LENR),* announced today that its WET™ and HHT™ Boiler System reactor core modules were presented to Congress on Capitol Hill.**

Dr. Michael McKubre said, "it is very clear that something on the order of *four times (4x) and potentially more gain power* (and therefore ultimately energy) was achieved at an impressive and industrially significant operating temperature of around 640 °C. This had not been achieved before in the LENR field. That the Brillouin Energy Q-Puls^{TM} control system is capable of triggering the excess power on and off 's also highly significant."

Step 1) Q Pulse and electrons combine with hydrogen to form neutrons.

*

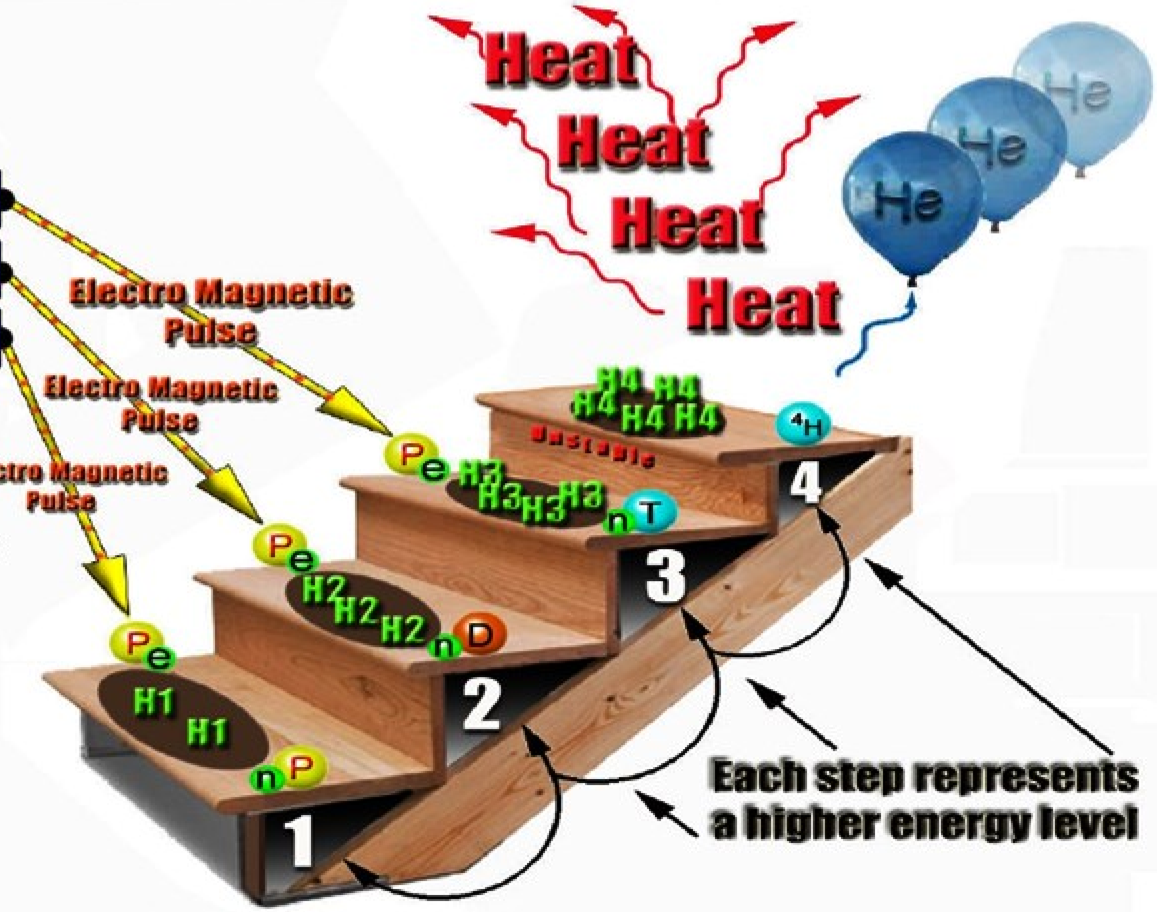
Step 2) Neutrons readily combine with the hydrogen ions in the lattice forming heaver hydrogen 2, 3 & 4.

*

Step 3) Hydrogen ions (P / 1, D / 2, & T / 3) move in the matrix to combine with the newly formed neutrons.

*

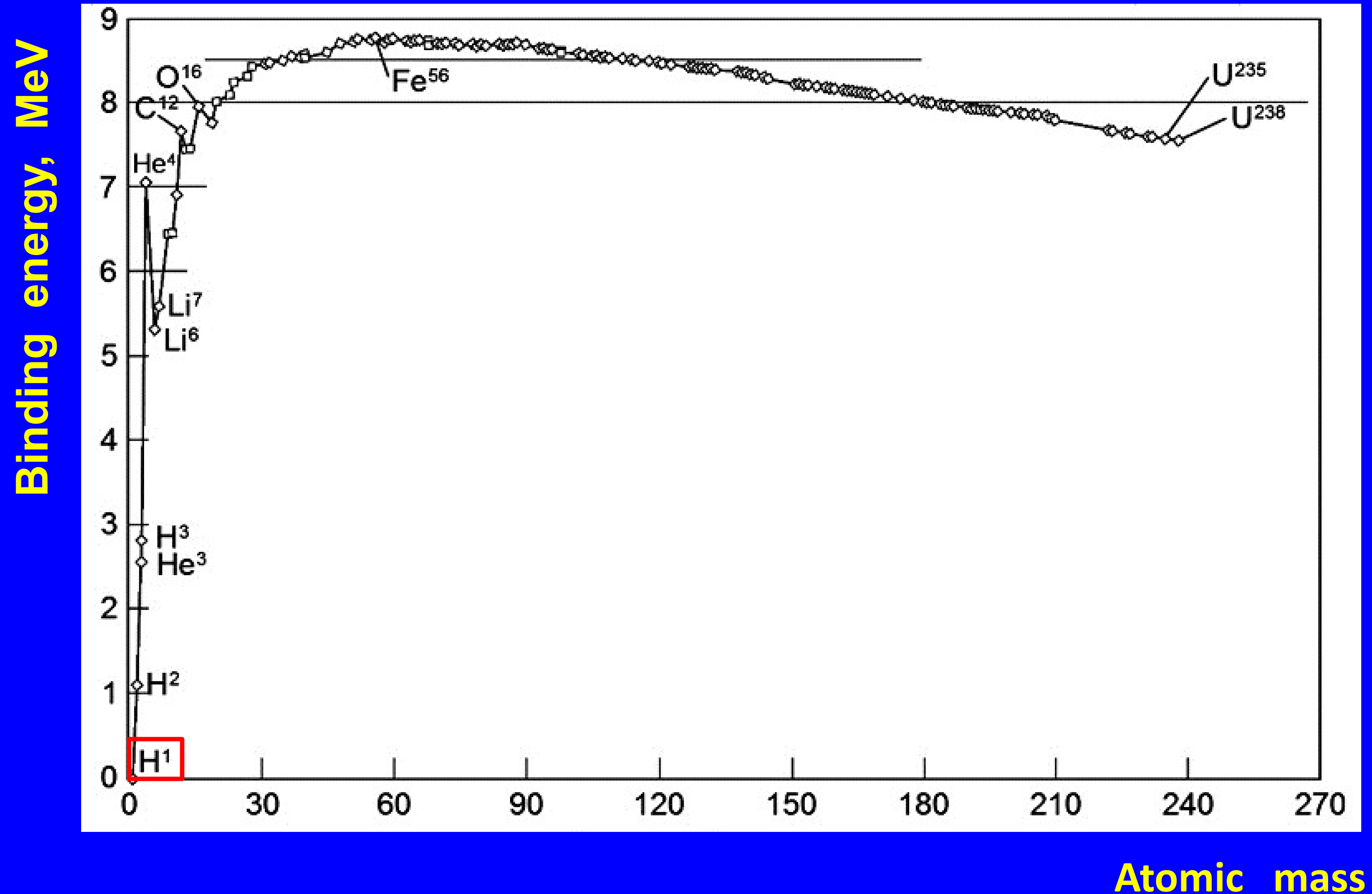
Step 4) Finally ^{4}H decays into Helium releasing lots of energy.



Brillouin Controlled Electron Capture Reaction

10

Binding energy per nucleon



A possible interpretation of Brillouin results

Earlier, it was observed that the electron capture *(i.e. weak interaction)* for light element $^{4}Be_{7} + e^{-} \rightarrow {}^{3}Li_{7} + \nu_{e}$ runs with a lifetime of about 53 days. Experiments have shown that the electron capture rate depends on the electron proximity to the core. The reaction rate of the weak interaction $^{4}Be_{7} + e^{-} \rightarrow {}^{3}Li_{7} + \nu_{e}$, in the case when this process occurs in a metal, is expected to be higher than in the case where this process takes place in the insulator.

=======

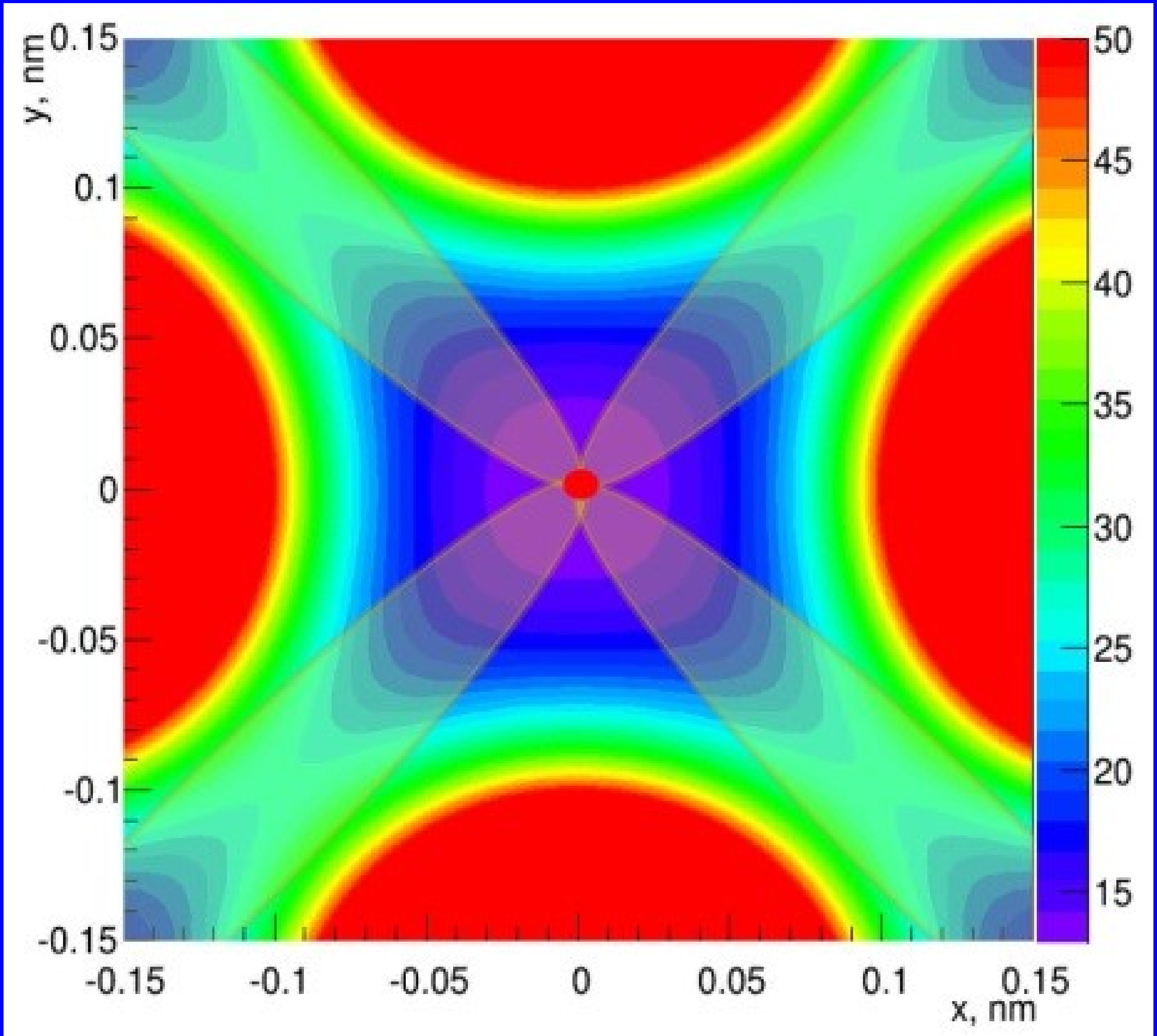
*B. Wang, et al. (2006). "Change of the ^{7}Be electron capture half-life in metallic environments". The European Physical Journal A 28: 375-377.

It can be *assumed* that a similar reaction

$$^{1}H_{1} + {}^{1}H_{1} \rightarrow {}^{2}He_{2}^{*} \rightarrow {}^{2}He_{2}^{*} + e^{-} \rightarrow {}^{1}H_{2} + \nu_{e}$$

of *2p* hydrogen implantation in metals is very rapid. Please note that in *crisscross* configuration this reaction without any visible energy release can take place extremely fast.

$^1H_1 + ^1H_1 \rightarrow ^2He_2^* \rightarrow ^2He_2^* + e^- \rightarrow ^1H_2 + \nu_e$



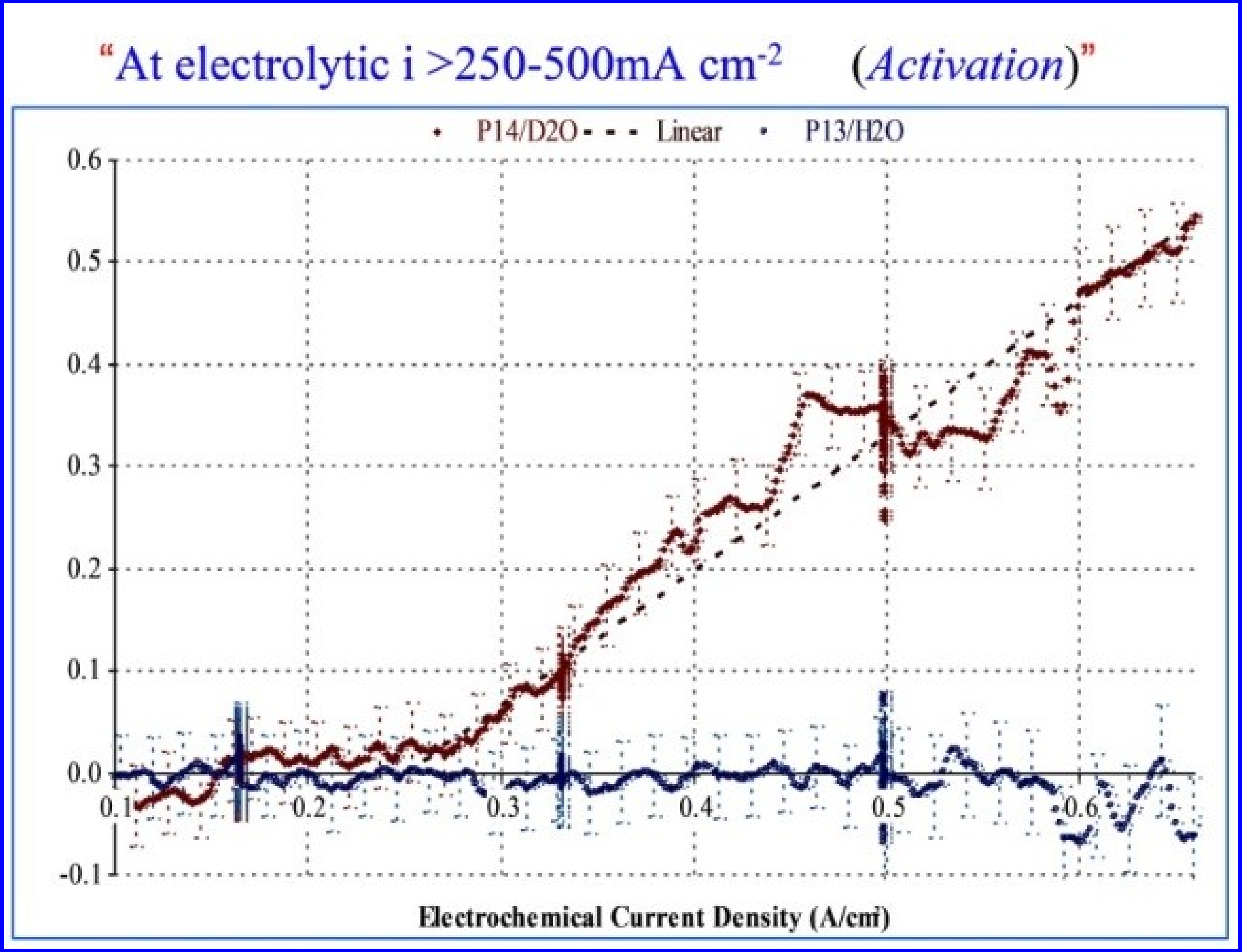
The energy released in this reaction equals 0.93 MeV. Since the deuteron is quite a heavy particle, almost all of this energy is taken by the neutrino. Upon further saturation of the conductive crystal cell with $^{1}H_{1}$ hydrogen, $^{2}He_{3}$ is formed as a result of cold fusion, then $^{2}He_{4}$, etc.

As we can see, the first step in the fusion reaction of two ordinary hydrogen atoms $^1H_1$ in the conductive crystals with the electron-capture reaction causes no recorded energy release.

Apparently, this fact was the basis for the initial statement of the McKubre and others than the fusion reaction $^1H_1+^1H_1$ in their first experiments was not applicable.

Further cold fusion reactions *HD* and *DD* occur without the neutrino emission.

P13/14 Simultaneous Series Operation of Light & Heavy Water Cells; *Excess Power vs. Current Density*



Charged & Neutral Particles Channeling Phenomena, September 25-30, 2016, Sirmione del Garda, Italy

114TH CONGRESS
2d Session } HOUSE OF REPRESENTATIVES { REPORT
114–537

NATIONAL DEFENSE AUTHORIZATION ACT FOR FISCAL YEAR 2017

R E P O R T

OF THE

COMMITTEE ON ARMED SERVICES
HOUSE OF REPRESENTATIVES

ON

H.R. 4909

together with

ADDITIONAL VIEWS

[Including cost estimate of the Congressional Budget Office]

MAY 4, 2016.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Low Energy Nuclear Reactions (LENR) Briefing

The committee is aware of recent positive developments in developing low-energy nuclear reactions (LENR), which produce ultra clean, low-cost renewable energy that have strong national security implications. ***For example, according to the Defense Intelligence Agency (DIA), if LENR works it will be a "disruptive technology that could revolutionize energy production and storage."*** **The committee is also aware of the Defense Advanced Research Project Agency's (DARPA) findings that other countries including China and India are moving forward with LENR programs of their own and that Japan has actually created its own investment fund to promote such technology.**

DIA has also assessed that Japan and Italy are leaders in the field and that Russia, China, Israel, and India are now devoting significant resources to LENR development. To better understand the national security implications of these developments, the ***committee directs the Secretary of Defense to provide a briefing on the military utility of recent U.S. industrial base LENR advancements to the House Committee on Armed Services by September 22,*** **2016. This briefing should examine the current state of research in the United States, how that compares to work being done internationally, and an assessment of the type of military applications where this technology could potentially be useful.**

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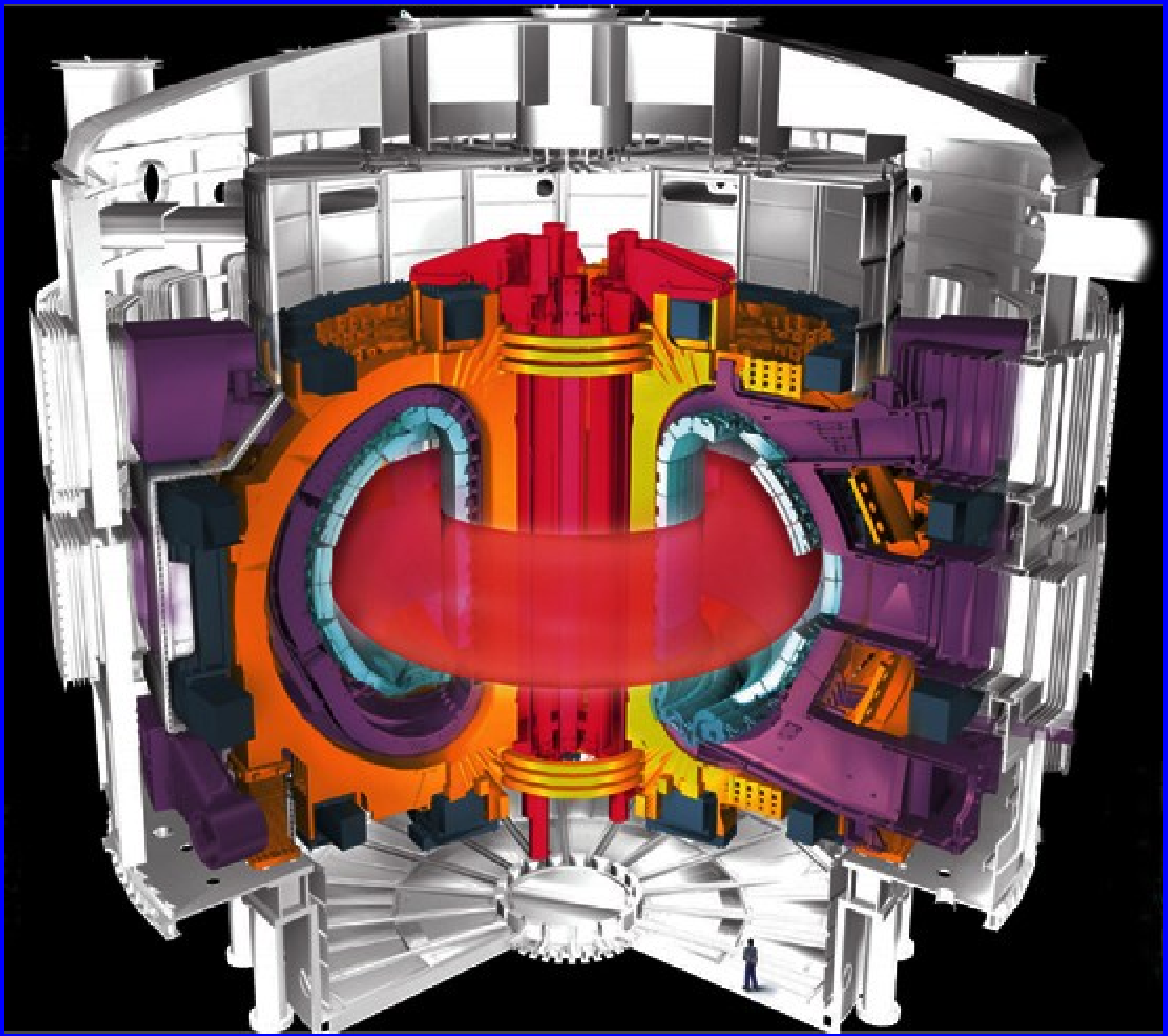
ITER Project – development of 1950-th approach

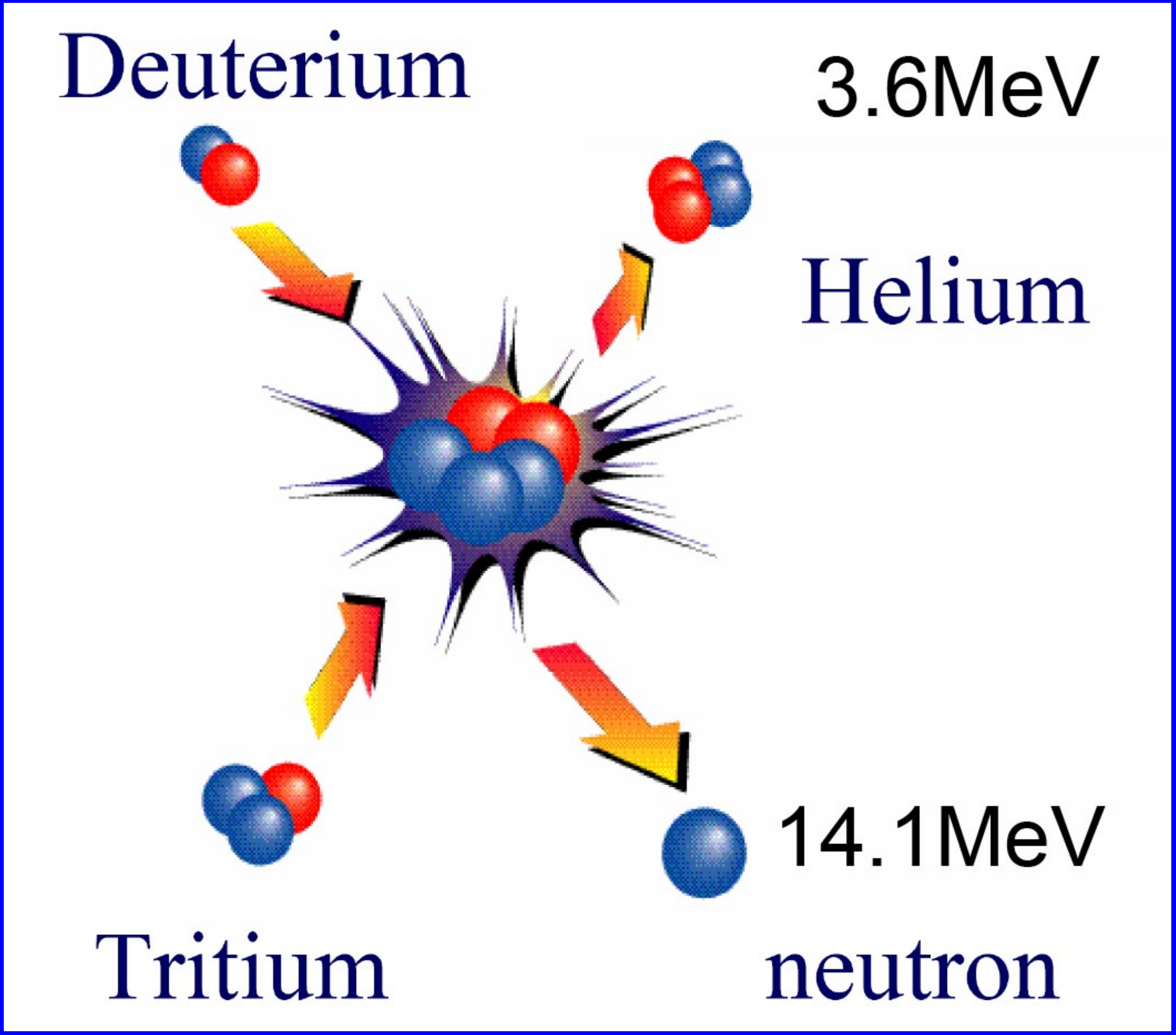
60 m



ITER

ITER - an abbreviation for the International Thermonuclear Experimental Reactor. ITER began in 1985 as a Reagan-Gorbachev initiative (E.P. Velikhov). It is assumed that ITER will produce about 500 MW power and can operate continuously for up to 8 minutes. ITER, as it is expected, will provide energy (as heat) 10 times more than consumed for heating the plasma to fusion temperatures. ITER is a pure research Project; the heat produced is not intended to be used to generate electricity. The Project cost estimation is about $15-20 billion.

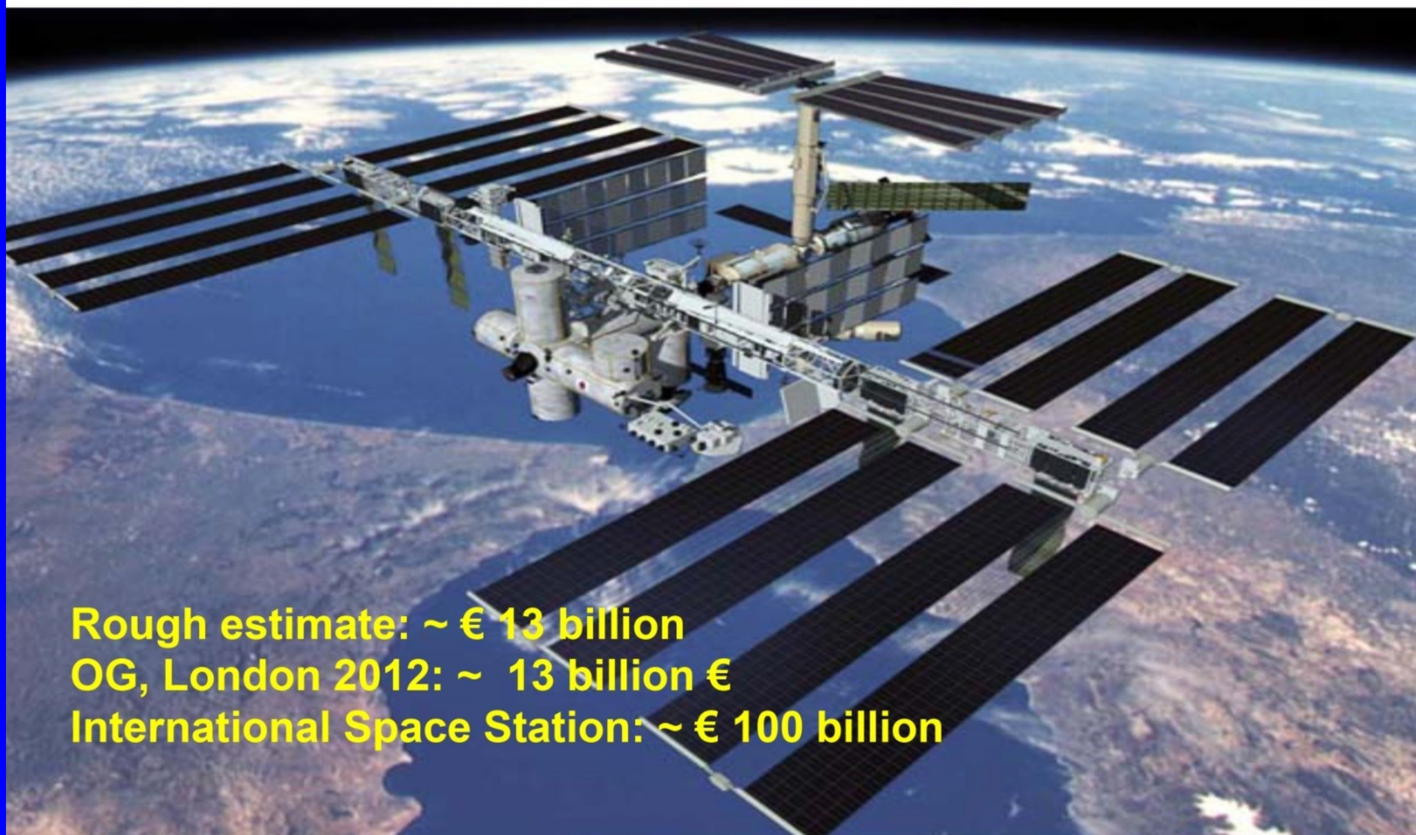
ITER physics



cea

How much does ITER cost?

More than 80% contributions are in kind



From the criticism of ITER project:

The total cost of ITER experiment could greatly exceed € 15 billion.

There are technical concerns that the 14 MeV neutrons which carry about 80% of the energy released, will *quickly destroy the reactor materials, as well as will cause a large secondary radioactivity*. Particular concern is the possible destruction of superconducting coils by the radiation.

ITER Project

Another confirmation of the high level of French industry

Stop ITER. Sortir du nucléaire!

“En 1950, nous espérions réaliser le réacteur thermonucléaire en 10 ans, 15 ansau grand maximum”. (A. Sakharov, "père" de la bombe H russe et des premiers tokamaks).

"Today, in 1950, we hope to create a fusion reactor in 10, maximum 15 years." (Sakharov, the "father" of the Russian hydrogen bomb on the first tokamak).

Cold nuclear fusion

Power plants based on the principles of cold fusion, potentially have *quite unique advantage* over the still hypothetical thermonuclear fusion.

Compact cold fusion power setups will permit to use this technology on ships, planes, near and outer space, that in principle is *inaccessible for the giant thermonuclear installations*.

Thank you for attention!