On the nature of heat excess in the Rossi reactor. Electron-ions nuclei.

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Key words: structure of the electron nucleus (core), nuclear forces of proton and of electron, atoms with electron-ions nuclei.

Main property Rossi reactor

1) **Energy produced more than it took.**

2) Nature of produced energy can not be a chemical.

3) Mass of <u>atoms</u> in ash changes with respect to fuel.

4) Optical spectrum of atoms in ash changes.

5) Gamma rays with energy ~Mev is absence, but rays with energy ~kev <u>probably</u> exist.

6) Neutrons is absence or negligible.

7) Nuclear diagnostic is not used. → Therefore we not have the right to speak about changes of nuclei of atoms.

G.Levi, E. Foschi, H Essen. 2014. Observation of abundant heat production from a reactor device and of isotopic changes in the fuel. A report on the result of test experiment. The main result: 1) within 32 days produced 3.5 times more energy than took.
2) Energy can not be a chemical. 3) **gamma ray –no**!
4) **Take place very strange isotopic changes**!
Ni=Ni58+Ni60+Ni61+Ni62+Ni64
Ni(fuel)=139398 ~ Ni(ash)=135035 (97%)
The concentration ratio Li6/Ni(ash)=37Li6/Ni(fuel)
Li7/Ni(ash)=0.3Li7/Ni(fuel) Li6=? A6!
Conclusion: **content of isotopes Li6 in ash greatly increased!!!** How to explain it???

In the modern nuclear physics no explanation!!! It is very important!

If $D+D=He^4+\gamma+23.85$ Mev $D+He^4=Li^6+\gamma+1.5$ then where gamma rays of 24 Mev?!

Our purpose: explain nature of particles A6 with a mass 6 like lithium-6 Li6

Second important problem:

Fuel: Ni62/(Ni58+Ni60)=0.04- normal.

Ash: A62/(A58+A60)=75!? → $A^{62} \neq Ni^{62}$?

What is it? Falsification? Apparently not.

←Parkhomov experiment!

Appendix 3

Table 1. Measured and natural occurring abundances for Li and Ni ions in fuel and ash, respectively.

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

Figure 10 and 11 shows the positive mass spectra from different types of fuel and ash powder grains, respectively. Thus, as expected from the EDS analysis the appearance of the ToF-SIMS spectra will differ depending on particle analyzed.

Structure of the electron core and electron-nucleus attraction forces

The structure of a free electron is not described by the Shrodinger equation or the Dirac! Let we have some system of the equations describing free electron **e** structure. Then at the decision of **the same** equations, but with boundary conditions, when at its centre rests a proton **p**, we shall receive a neutral particle – quasi neutron (**ep**), which does not coincide neither with a neutron n, nor with atom of hydrogen **H=[p+e]≠(ep)≠n.**

The quasi neutron size the same as well as electron size: $R_e \sim h/(m_e c) \sim 10^{-10}$ sm, and its mass is less than neutron mass and less than sum of proton mass and electron mass on value of connection energy ~10 kev. The quasi neutron (ep) is the simplest electron-ion core. It is the main agent of LENR→LEENR.

Structure of free electron in approach spherical symmetry

$$\frac{\hbar^2 \Delta\psi}{2m\psi} - \frac{mc^2}{(1+a\psi^2)^2} + mc^2 C_1 + e(\Phi_e + \Phi_i) + 4\pi b^2 \Delta\psi^2 = 0,$$

$$\Delta\Phi_e = 4\pi e\psi^2, \quad n_e = -\psi^2 \le 0, \quad \Phi_i = Ze/R,$$

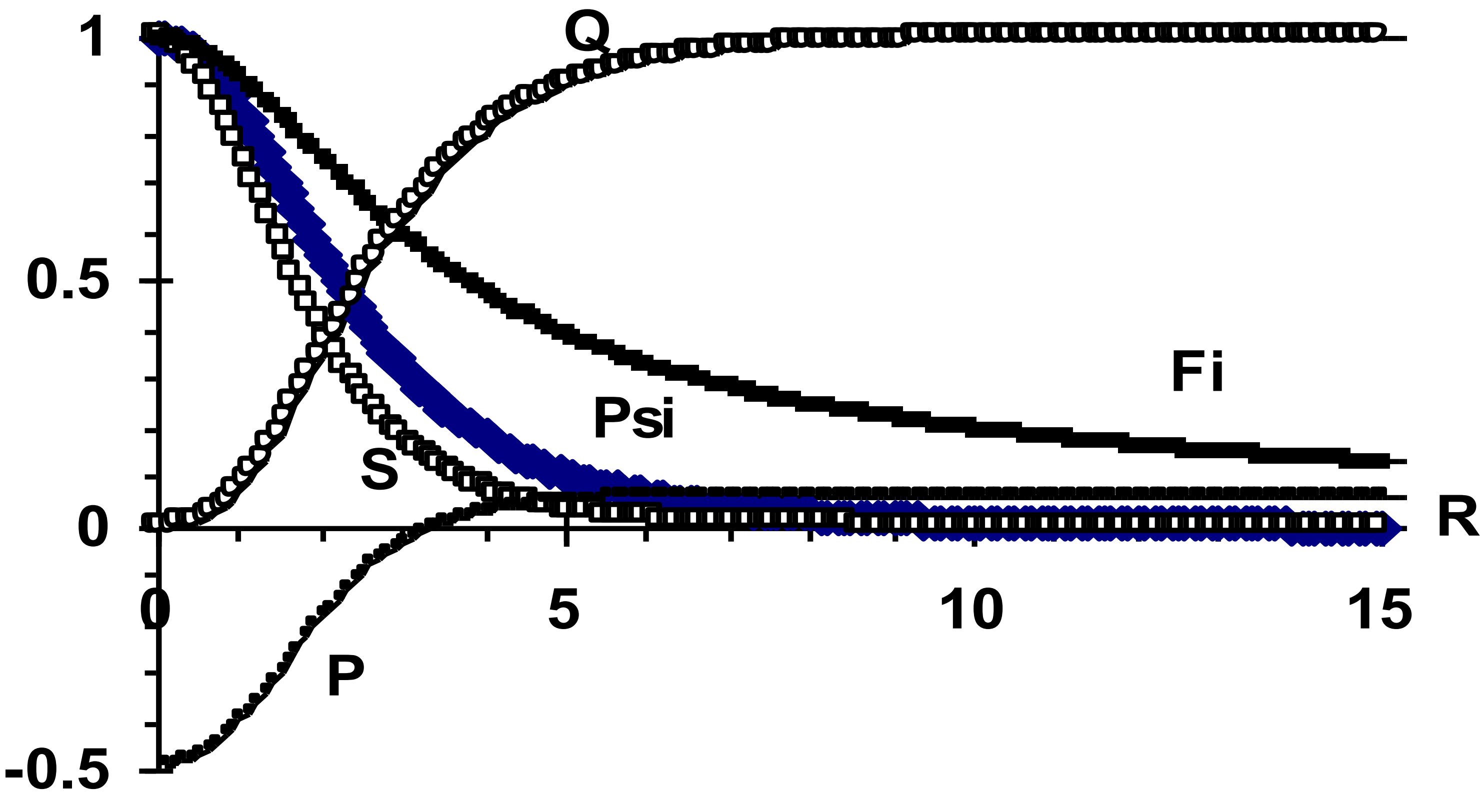
Electron: Z=0, Φ_i =0. **Boundary conditions:**

$$R \to 0: \quad \psi \to \psi_0, \Phi_e \to \Phi_{e0}, d\psi/dR \to 0, d\Phi_e/dR \to 0,$$

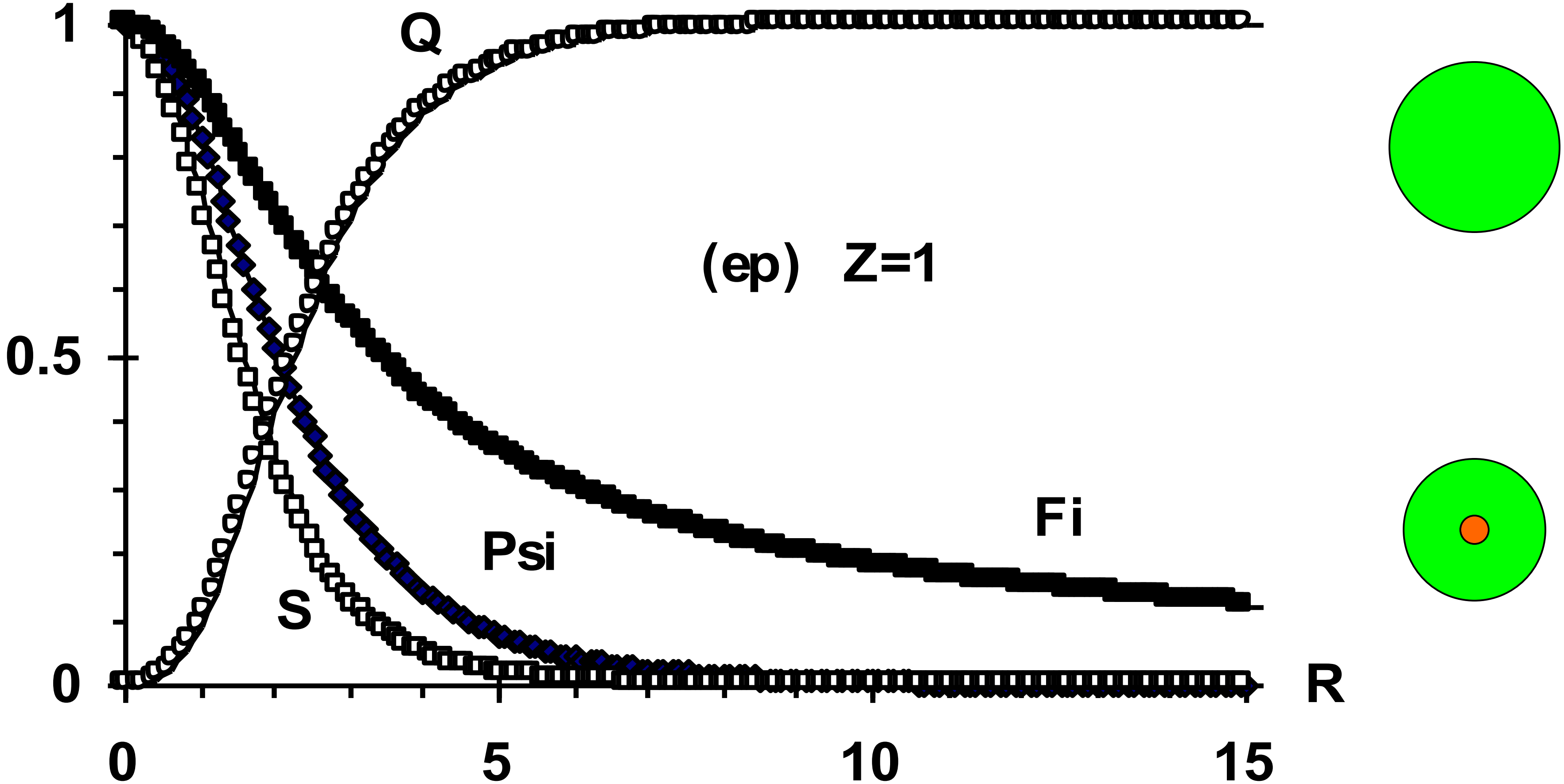
$$R \to \infty: \quad \psi \to 0, \Phi_e \to 0, \quad Q \equiv \int_0^R 4\pi R^2 \psi^2 dR \to 1.$$

$$\partial Q(a,b,\psi_0)/\partial\psi_0 = 0, \quad Q(a,b,\psi_0) = 1.$$

$mc^2C_1 = mc^2(1 - \alpha Э)$ $\quad Э(a_m(b), b, \psi_{0m}(b)) = \max \equiv Э_{\max}.$

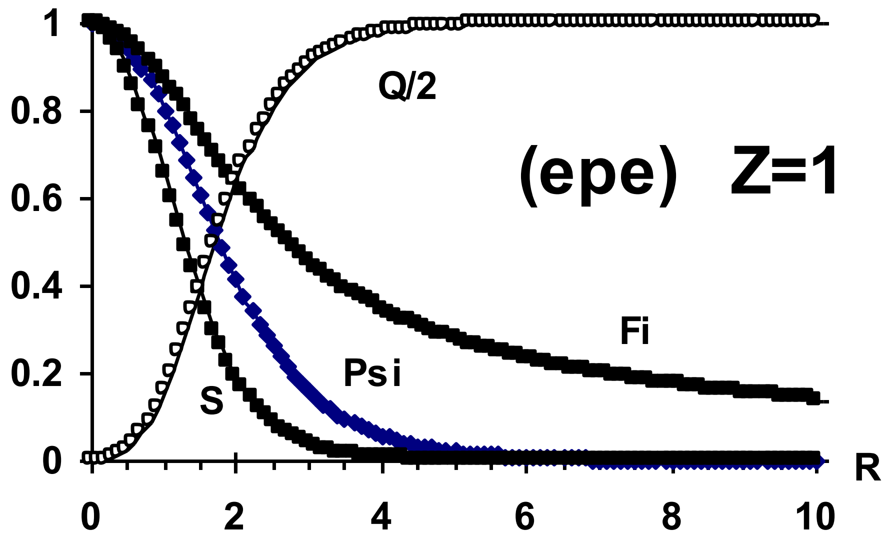


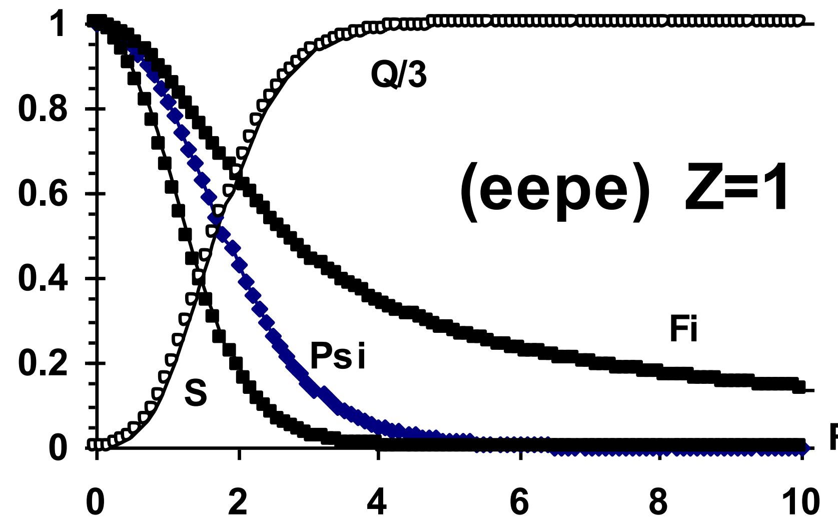
Structure of free electron in approach spherical symmetry. Parameters: $Э_e$=8.23546 (30.71 kev), $Q(R=10)=0.996922$, $Q(R=15)=0.999905$, $P \equiv \Delta\psi/(2\psi)$, $Q(R=20)=0.999997$, $Q(R=25.2 \div 30.5)=1.000000$.



Structure of quasi neutron in approach spherical symmetry. Parameters: Э(connection)=11.94 kev, *Psi*≡ψ/ψ_0, *Fi*≡Φ_e/Φ_{e0}, *Q*(*R*=18.7÷25.5)=1.000000

e+p+e=(ep)+e+11.94 kev





e+ (ep)+e→(epe)+e+68.7kev Analog. D=H_1^2 stab.

e+ (epe)+e→($eepe$)+e+11.6 kev Analog He_2^3 stab.

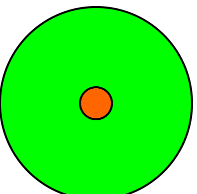
($eepee$)→($eepe$)+e+ 4.0 kev (ср. с Li_3^4→He_2^3+p+2.9 Mev)

In free state dielectron and diproton is not exist. But exist D and (epe) and (eepe). Experiment m/z=1/2 → (eepe) Хвостенко, Дукельский ЖЭТФ (JETF) 1958.

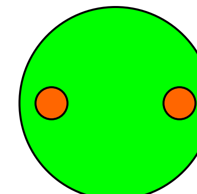
The simplest model of the electron

$$\mathbf{E} = -\nabla\Phi = \frac{Ze\mathbf{R}}{a^3+R^3}, \quad Z=-1, \quad \rho = \frac{div\mathbf{E}}{4\pi} = \frac{3Zea^3}{4\pi(a^3+R^3)^2},$$

$$\Phi = \frac{Ze}{6a}\ln\left(\frac{(a+R)^2}{a^2-aR+R^2}\right) + \frac{Ze}{a\sqrt{3}}\left(arctg\left(\frac{a-2R}{a\sqrt{3}}\right)+\frac{\pi}{2}\right)$$



The equilibrium condition in system (pep)



$$\mathbf{F}_e + \mathbf{F}_i = \frac{-e^2\mathbf{R}}{a^3+R^3} + \frac{e^2\mathbf{R}}{4R^3} = 0 \rightarrow R = a/3^{1/3} \cong 0.69336a$$

The simplest model of the electron-ion nuclei (ep) и (pep)

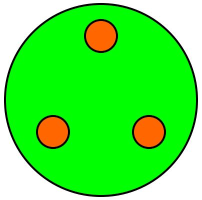
$$P_{(ep)} = e\Phi = -\frac{2\pi e^2}{3a\sqrt{3}} \cong -1.209\frac{e^2}{a}, \quad P_{(pep)} = 2e\Phi(R=b) + \frac{e^2}{2b} \cong -1.471\frac{e^2}{a}$$

$$(pep) \rightarrow (ep) + p - 0.262e^2/a, \quad (pep) + e \rightarrow (ep) + (ep) + 0.947e^2/a,$$

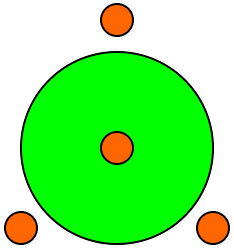
$$a = \hbar/(m_e c) = 3.86\cdot 10^{-11}\,см \rightarrow e^2/a = 3729\,эв$$

Electron-ion nucleus with A=3 and Z=2

$$\mathbf{F}_{\mathrm{e}} + \mathbf{F}_i = \frac{-e^2\mathbf{R}}{a^3 + R^3} + \frac{e^2\mathbf{R}}{\sqrt{3}R^3} = 0 \rightarrow R = \frac{a}{\sqrt[3]{(\sqrt{3}-1)}} \cong 1.1095a$$

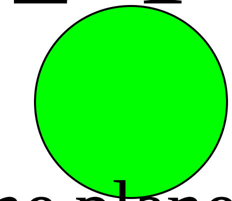


Electron-ion nucleus with A=4 and Z=3



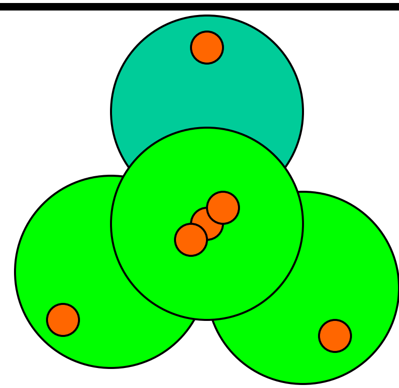
$$\mathbf{F}_{\mathrm{e}} + \mathbf{F}_i = \frac{-e^2\mathbf{R}}{a^3 + R^3} + \frac{3\sqrt{6}\,e^2\mathbf{R}}{8R^3} = 0 \rightarrow R \cong 2.24a$$

Electron-ion nucleus (E-nucleus) with A=6 and Z=1

proton 3+1+1+1=6  - electron 5 .

Fifth electron is in the center below the plane of the figure.

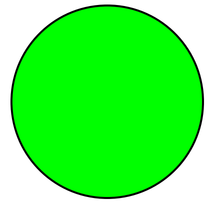
<u>Density of electrons as in white dwarf stars.</u> **H6**



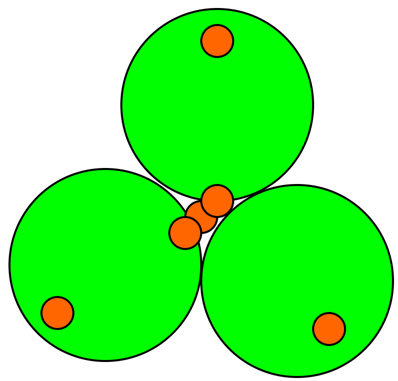
$$\mathbf{F}_e + \mathbf{F}_i = \frac{-5e^2\mathbf{R}}{a_5^3 + R^3} + \frac{Z_i e^2 \mathbf{R}}{R^3} = 0,\ a_5^3 = 5a^3\ \ Z \cong 2.3 \rightarrow R \cong 0.948 a_5 \cong 1.62 a,$$

$$Z_1 = 1 + \frac{1}{\sqrt{3}} + \frac{1}{\sqrt{2}} \cong 2.28, \quad Z_2 = 1 + \frac{1}{4} + \frac{3}{2\sqrt{2}} \cong 2.31$$

Electron-ion nucleus (E-nucleus) with A=6 and Z=3

Proton  3+1+1+1=6  - electron of core - 3.

3 electrons as in atom of lithium Li6 is not show in figure.



$$\mathbf{F}_{\mathrm{e}} + \mathbf{F}_i = \frac{-3e^2\mathbf{R}}{a_3^3 + R^3} + \frac{Z_i e^2 \mathbf{R}}{R^3} = 0,\; a_3^3 = 3a^3 \rightarrow R \cong 1.486 a_3 = 2.1a,$$

$$Z_1 = 1 + \frac{1}{\sqrt{3}} + \frac{1}{\sqrt{2}} \cong 2.28, \quad Z_2 = 1 + \frac{1}{4} + \frac{3}{2\sqrt{2}} \cong 2.31$$

Conclusion

1. **As there is no reasonable opportunity to explain strong growth of the concentration ratio of particles with weights A^6 and A^7 from N (A^6) /N (A^7) =0.09 in fuel up to N (A^6) /N (A^7) =12 in ashes (in 130! times) and since A^6/Ni (ash) =37Li^6/Ni (fuel), and since not present radiation with energy ~24 Mev, then the hypothesis about existence in a nature of atoms with electron-ion nucleuses of a kind (5e6p) +e=H^{*6} either (4e6p) +2e=He^{*6} or (3e6p) +3e=Li^{*6} has the right to be. The result of test experiment by G.Levi, E. Foschi, H Essen is very importent key for decision of LENR-problem.**

2. Within the framework of this hypothesis it would be possible to explain superfluous growth of concentration of atoms with weight A=62 as at an isotope Ni62 by connection quasi-neutron (ep) or quasi-dineutron (peep) to nucleuses Ni: (peNi60ep) +28e and (pepeNi58epep) +28e and formation of atoms with weight A62 as at isotope Ni62. Other opportunities are probable much less!

3. All the observed properties of the Rossi reactor and "LENR" can be explained in terms of the electron-nuclear forces, electron-ion cores of new atoms type.

4. Typical energy of electron-nuclear forces is ~Kev, while for usual nuclear force it is ~Mev .

More detailed about theory of non-point particles you can see in next work:

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2. Laptukhov A.I. **Electron-ions nuclei with a size of 10^{-10} cm and low-energy transformations of atoms//** *Ingenernya Fizika*. N4. 2012. P. 20-30.

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6. Laptukhov A.I. **Display of new atomic formations, new force and energy, electronic power in experiments Adamenko S.V., Vachaev A.V., Solin M.I. and in the fireballs** // *Proceredings of the 17-th Russian conference on cold nuclear transmutation of chemical elements and ball lightning*. M. 2011. P. 87-105.

7. Laptukhov A.I. **Derivation of the equations of polarizable liquid dynamics on the basis of electrodynamics of moving media and conservations laws of energy, pulse and moment of a pulse**// *Ingenernya Fizika*. 2013. N8. P. 16-22.

Thank you for attention

В рамках развиваемой автором теории неточечных частиц у электрона, как и любой частицы, есть характерный размер, который порядка комптоновской волны для электрона, есть ядро электрона и, значит, есть электронные ядерные силы притяжения, препятствующие обычным кулоновским силам отталкивания. Именно эти силы ответственны за сохранения электрического заряда электрона в его компактном объёме. Аналогичные силы есть и у протона – это обычные ядерные силы. Корректная теория неточечных частиц изложена в работах:

1. Лаптухов А.И. Электродинамика и динамика неточечных частиц – новая физика микромира. - М.: Тровант. 2007. 63 с.
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5. Лаптухов А.И. Электрон-ионные ядра с размером ~10-10 см и низкоэнергетическая трансформация атомов// Инженерная физика. №4. 2012. С. 20-30.
6. Лаптухов А.И. Структура электрона и электрон-ядерные силы. Квазинейтрон как один из основных агентов низкоэнергетических преобразований атомов// Инженерная физика. №9. 2014. С. 09-16.
7. Лаптухов А.И. Рухадзе А.А. Замечание о характерном размере электрона. Инженерная физика. 2015.