Comments to the Widom-Larsen Theory

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The basic idea of the Widom-Larsen theory is quite imaginative. However, for it to work several assertions have to be made:

1) An extremely strong electromagnetic field is being generated.
2) Due to that electromagnetic field the electrons present will experience a huge mass renormalization, picking up relativistic energies.
3) The electrons are not being ejected from the region of the strong field, even though the mass renormalization within that region could be interpreted as a strongly repulsive effective potential.
4) The highly energetic electrons will be able to interact with protons via the weak interaction to form neutrons, that will be able to induce nuclear reactions without the need to overcome the Coulomb barrier.

When first starting to read about the Widom-Larsen theory I was thinking of the Landau levels in a constant magnetic field, which can indeed be interpreted as a resulting in a higher effective mass of the charged particles in that field. However, reading the Hagelstein-Chaudhary Critique, http://www.newenergytimes.com/v2/library/2008/2008Hagelstein-ElectronMassShift-PUB.pdf, and the rebuttal, http://www.newenergytimes.com/v2/sr/WL/2008Widom-ErrorsInTheQuantum.pdf, it became clear to me that Widom and Larsen clearly claim that this is not a magnetic, but rather an electric effect. The claim is that the increase in the effective electron mass is caused oscillating protons seems counter-intuitive as one might naïvely expect that the Coulomb field of the positively charged protons would provide attraction and thus lower the energy of the electrons rather than raising it. I was then taking a closer look at section 3 of the original paper, http://www.newenergytimes.com/v2/library/2006/2006Widom-UltraLowMomentumNeutronCatalyzed.pdf in order to understand the reasoning behind the claim that a strong electric field is being generated, hoping to better understand its nature. Let me rephrase the description of their model scenario and add a few thoughts. They are describing a proton moving in a sphere of constant electron density $1/(\pi a^3)$ with a being the Bohr radius. As correctly stated by them it is well known that the electric field within such a sphere grows linearly with the distance from its origin. I will put aside the question if it is a realistic assumption that the electrons do not react to the motion of the proton. What they are claiming is that the mean displacement $u_{mean} = \sqrt{<u^2>}$ of the protons during their oscillations is about 4.2 a. In order for their conclusions about the strength of the electric field to be valid the charged sphere should have at least that radius, and a simple calculation shows that it would contain at least $4\pi/3 * u_{mean}^3 * 1/(\pi a^3) = 4/3*4.2^3 \approx 100$ electrons, all within a radius of about 2 Angströms, without any protons or palladium nuclei counteracting the field. In the scenario they are describing it is the magnitude of the total charge of the electrons accumulated in the sphere that is creating the large electric field. This highly charged sphere is introduced by them as an assumption. It is not clear what would create such an accumulation of charge, what would maintain it despite the strong repulsion between the electrons, and what it has to do with proton oscillations. Also, many such charge accumulations would need to exist for a weak interaction to occur somewhere. Unless they can clarify the physical picture behind their model assumptions it appears that their explanation for claim number 1, that an extremely strong electric field is generated, does not hold up under closer scrutiny.