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Comment

Comment on "Electron mass renormalization and absorption of hard photons" by E. Pourjafarabadi and A. Mojavezi

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1 Introduction

In 2022, authors E. Pourjafarabadi and A. Mojavezi published a paper that claimed to present a novel mechanism for gamma-ray absorption by heavy electrons [1]. However, this paper contains two serious deficiencies. First, it does not describe such a mechanism. Second, it fails to inform readers about the publications of Widom and Larsen, which do describe such a mechanism.

The claim in Ref. 1, as stated in the abstract, is the presentation of "a novel mechanism to show how the heavy electron results in hard photon absorption." Further clarification comes from the authors' statement that "this work presents a new field in gamma-ray absorption systems to scientists."

Although the paper includes extensive discussion about mass renormalization, no novel mechanism for gamma-ray absorption or shielding is provided.

2 Widom–Larsen gamma absorption method

The authors of Ref. 1, in their Fig. 4 (shown here as Fig. 1) have provided a diagram with the caption "Schematic of the basic design of a shield system by heavy electrons." This diagram is nearly identical to Fig. 20 (shown here as Fig. 2) in U.S. patent #7,893,414 B2, issued a decade earlier, to low-energy nuclear reaction (LENR) theorists Allan Widom and Lewis Larsen [2]. The title of the Widom-Larsen patent is "Apparatus and Method for Absorption of Incident Gamma Radiation and its Conversion to Outgoing Radiation at Less Penetrating, Lower Energies and Frequencies." The authors of Ref. 1 did not cite this patent.

Additionally, Widom and Larsen described, as part of their novel mechanism, how heavy-mass surface plasmon polariton (SPP) electrons absorb hard gamma photons in their 2005 paper [3]. The authors of Ref. 1 did not cite this paper.

In this 2005 paper, and in their 2011 patent, Widom and Larsen describe, in great detail, a system of gamma-ray absorption, using patches of heavy-mass SPP electrons on the surfaces of heavily-loaded metallic hydrides or deuterides. This gamma conversion process, or shielding mechanism, is a final step in a multi-step process that Widom and Larsen provided to explain a broad array of previously inexplicable experimentally observed results in LENR research. Widom and Larsen published their first journal paper describing this theory in 2006 [4]. The authors of Ref. 1 did, in fact, cite this prior work.

In Ref. 4 and in many other formal and informal publications in the following decade, Widom and Larsen explained the fundamental first step in their proposed process for LENRs: creation of high electric fields on the surfaces of metallic hydrides or deuterides, leading to effective mass renormalization and the creation of heavy-mass SPP electrons.

A result of the creation of these heavy-mass SPP electrons is that, after subsequent neutron formation, and then, after those neutrons are captured by nearby nuclei, and emit gamma photons, the heavy-mass SPP electrons act as a shield, absorbing the hard gamma photons and converting them to soft infrared photons. Widom and Larsen explained this in their publications, but in our 2016 book *Hacking the Atom* [5], Larsen summarized the concept:

When an ultra-low-momentum neutron captures onto an atom located inside the entangled three-dimensional quantum-mechanical structure of a LENR-active patch, there is normally a prompt gamma photon emission by that atom. The key point to remember is that the DeBroglie wave functions of the entangled, mass-renormalized heavy electrons are also three-dimensional, not two-dimensional. Because the neutron-capture gamma-photon emission occurs within

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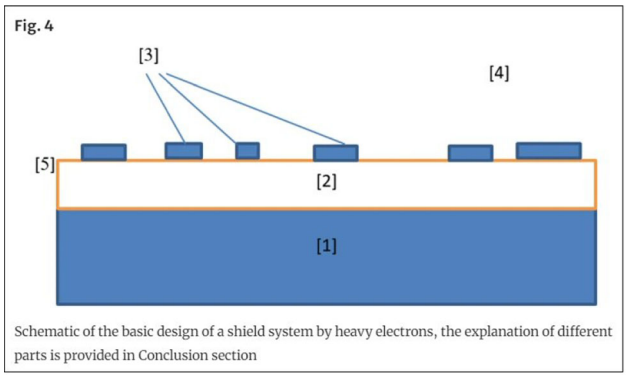

Fig. 1 (Displayed as Fig. 4 in Pourjafarabadi and Mojavezi) [1]

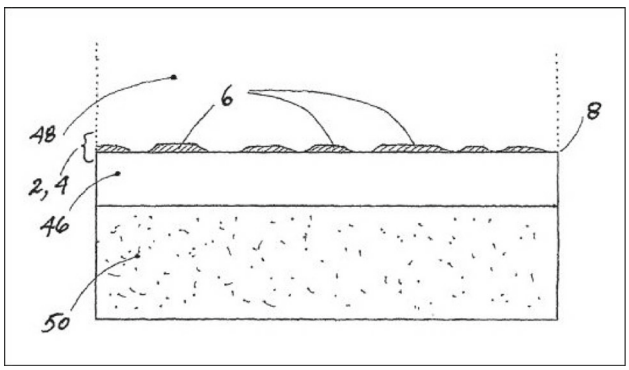

Fig. 2 (Displayed as Fig. 20 in Widom and Larsen) [2]

the structure of a LENR-active patch, there are always heavy electrons available nearby to absorb such gamma emissions and convert them directly into infrared photons. Therefore, it doesn't matter where a gamma emission occurs inside a given patch; it will always get converted to infrared, which is exactly what has been observed experimentally. Large fluxes of hard gammas will not be emitted from such a patch, no matter which direction, on any axis, they are measured from.

3 Pourjafarabadi and Mojavezi support for gamma absorption

The authors of Ref. 1 claim a "novel mechanism to show how the heavy electron results in hard photon absorption." We find their purported explanation for this process in the last paragraph of their paper. In the first five sentences of this paragraph, the authors provide only a general overview of a well-established parameter of LENRs: the degree of loading of hydrogen or deuterium into the host metal. This loading parameter is not specific to gamma-ray absorption. It does not explain how heavy-mass SPP electrons are formed, why prompt gammas are emitted, or how they interact with each other.

4 Creation of heavy-mass SPP electrons

In the remaining nine sentences, the authors' text does not describe the process of gamma-ray absorption. Instead, the text, somewhat imprecisely, restates a fundamental sequence of events leading to electron mass renormalization, as described by the Widom-Larsen theory: (a) saturation of the metallic lattice with deuterons or protons, (b) formation of islands, or patches, of deuterons or protons on the metallic surface, and (c) an increase in the local electric field which then results in effective mass renormalization and the formation of heavy-mass SPP electrons. This is the same concept as expressed by Widom and Larsen. But the authors stop there.

As Widom and Larsen explained further, gamma photons are not produced, let alone absorbed, until (a) those heavy-mass SPP electrons react with by nearby protons or deuterons to form ultra-low-momentum (ULM) neutrons and (b), those ULM neutrons are subsequently captured by nearby nuclei, resulting in the emission of a gamma photon. It is at this point where the heavy-mass SPP electrons absorb and convert the gamma radiation to infrared, as our quote from Larsen, above, explains.

5 Conclusion

The authors of Ref. 1 have not, in fact, described any "novel mechanism to show how the heavy electron results in hard photon absorption." Instead, they have, rather imprecisely, discussed the mechanism of mass renormalization used to create heavy-mass SPP electrons, as previously described by Widom and Larsen.

Data Availability Statement This manuscript has no associated data or the data will not be deposited. [Authors' comment: There is no data because this analysis is limited to theoretical discussion.]

Declarations

Conflict of interest The authors have no financial or non-financial interests that are directly or indirectly related to the work submitted for publication. No funds, grants, or other support was received.

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