Lattice Energy LLC

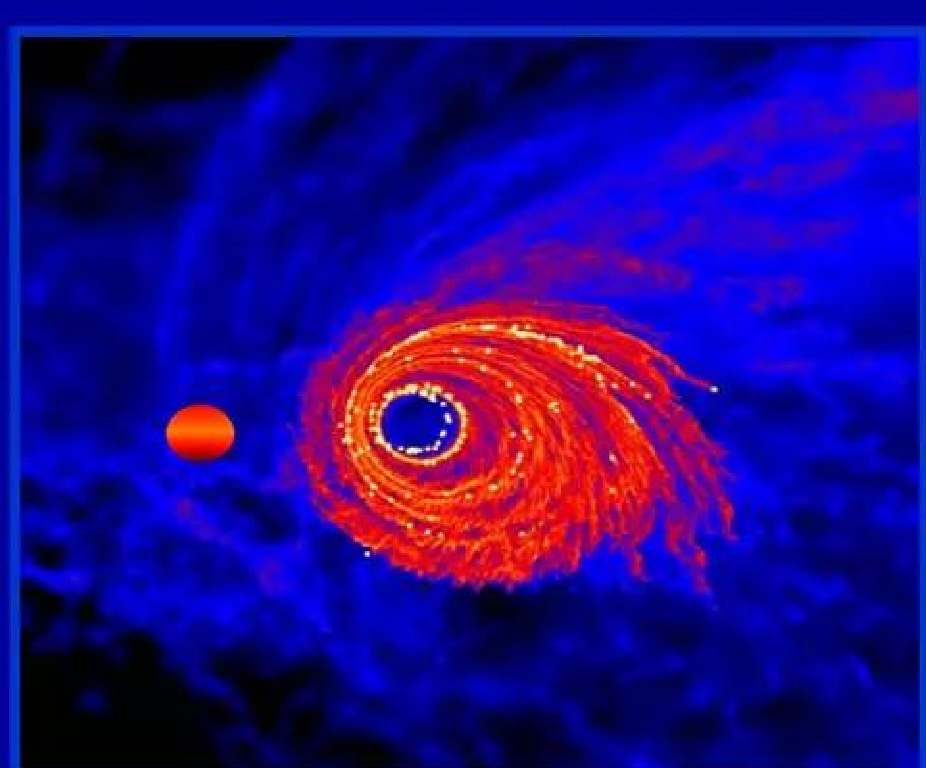
Commercializing a Next-Generation Source of Safe Nuclear Energy

Patent Issuance Announcement

US 7,893,414 will issue on February 22, 2011

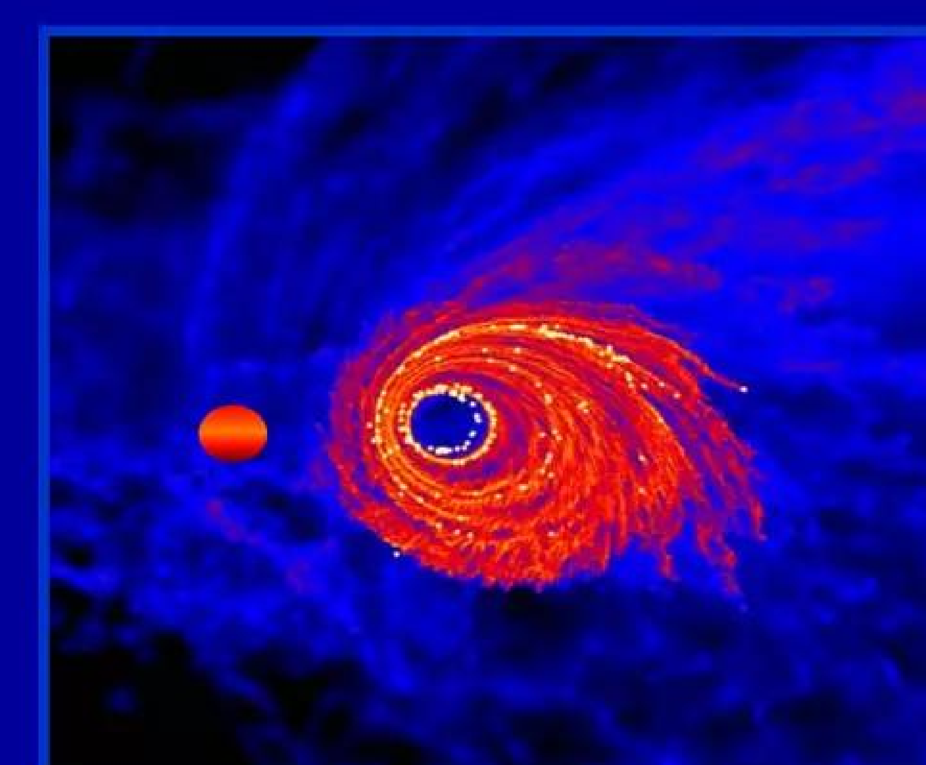
"Apparatus and Method for Absorption of Incident Gamma Radiation and its Conversion to Outgoing Radiation at Less Penetrating, Lower Energies and Frequencies"

Lewis Larsen, President and CEO



**"Tight-lipped, guided by reasons only,
Cautiously let us step into the era of
the unchained fire."**

**Czeslaw Milosz, poem "Child of Europe,"
New York, 1946**



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Commercializing a Next-Generation Source of CLENR Energy

US Patent No. 7,893,414

Inventors: Lewis Larsen and Allan Widom

Assignee: Lattice Energy LLC, Chicago, Illinois USA

USPTO Issue Date: February 22, 2011

Abstract:

"Gamma radiation (22) is shielded by producing a region of heavy electrons (4) and receiving incident gamma radiation in such region. The heavy electrons absorb energy from the gamma radiation and re-radiate it as photons (38, 40) at a lower energy and frequency. The heavy electrons may be produced in surface plasmon polaritons. Multiple regions (6) of collectively oscillating protons or deuterons with associated heavy electrons may be provided. Nanoparticles of a target material on a metallic surface capable of supporting surface plasmons may be provided. The region of heavy electrons is associated with that metallic surface. The method induces a breakdown in a Born-Oppenheimer approximation. Apparatus and method are described."

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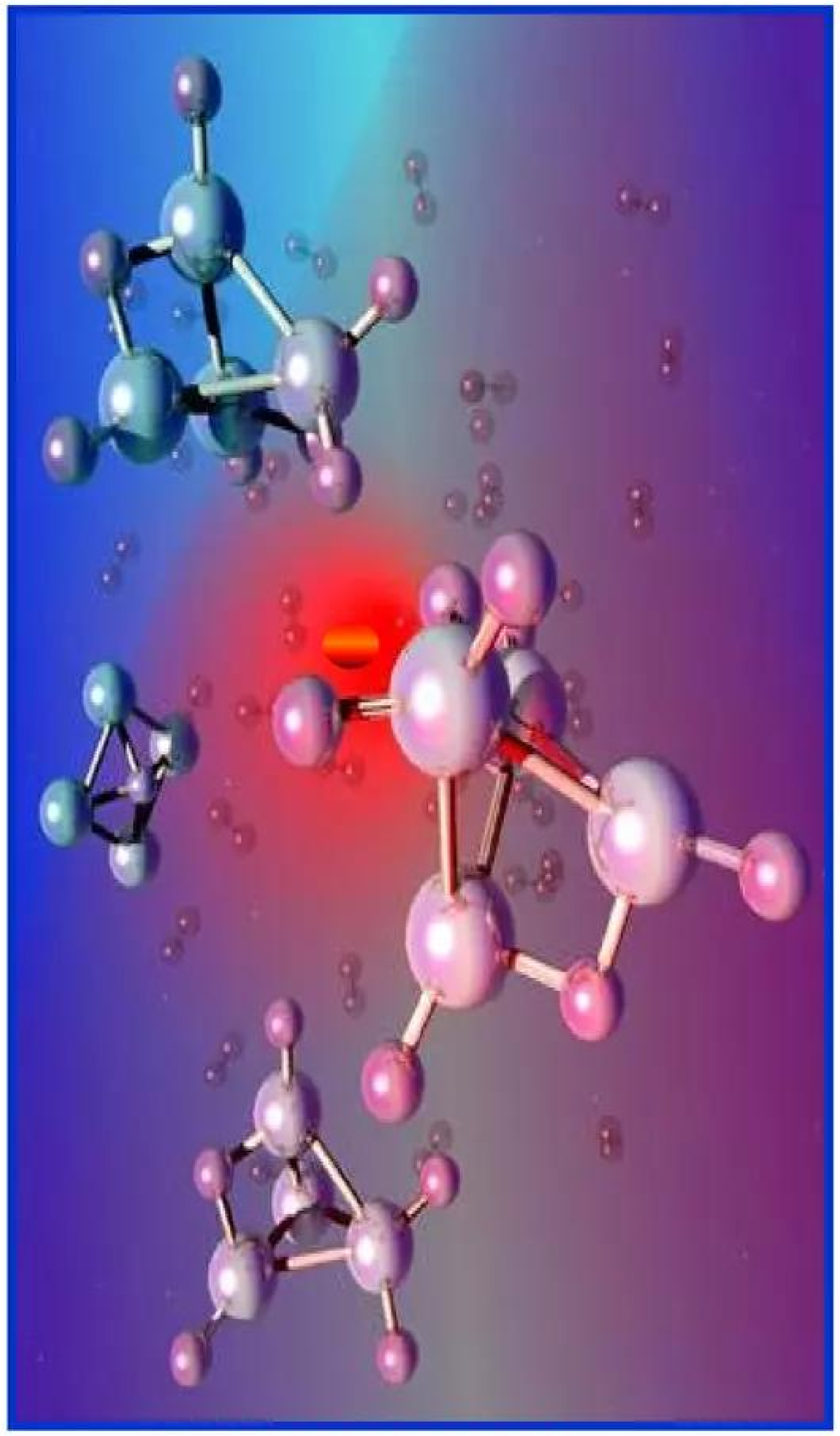
Creation of ULM neutrons on loaded hydride surfaces - I

- ✓ Hydride forming elements, e.g., Palladium (Pd), Nickel (Ni), Titanium (Ti), etc. can be viewed as akin to metallic 'sponges' that can absorb significant amounts of hydrogen isotopes in atom % via 'loading' mechanisms
- ✓ Analogous to loading a bone-dry sponge with H_2O by gradually spilling droplets of water onto it, hydrogen isotopes can actually be 'loaded' into hydride-forming metals using different techniques, e.g., various levels of DC electric currents, pressure gradients, etc.
- ✓ Just prior to entering a metallic lattice, molecules of hydrogen isotopes dissociate, become monatomic, and then ionize by donating their electrons to the metallic electron 'sea,' thus becoming charged interstitial lattice protons (p^+), deuterons (d^+), or tritons (t^+) in the process
- ✓ Once formed, ions of hydrogen isotopes migrate to and occupy specific interstitial structural sites in metallic hydride bulk lattices; this is a material-specific property



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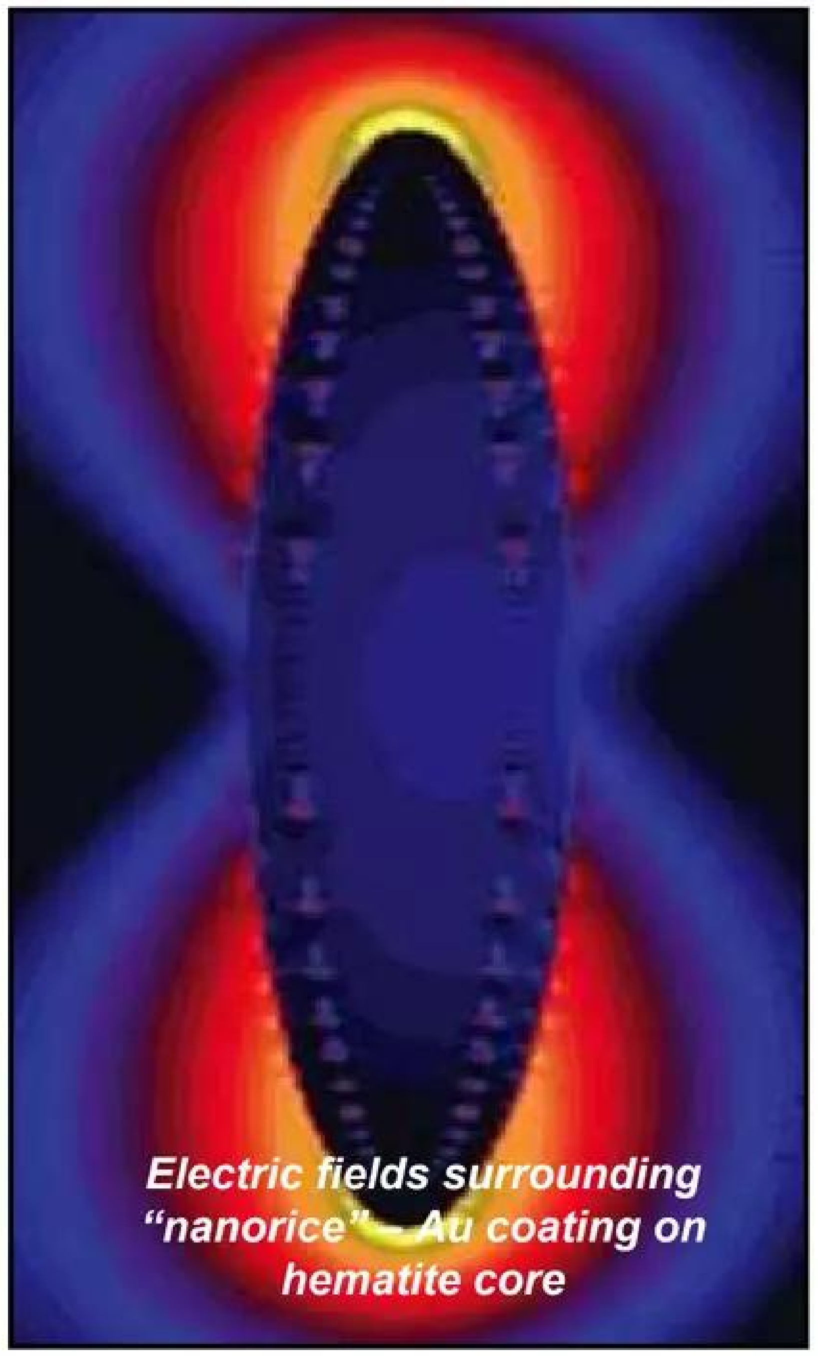
Creation of ULM neutrons on loaded hydride surfaces - II

- ✓ **When all available interstitial sites in the interior of a bulk lattice are occupied by hydrogenous ions, a metallic hydride is 'fully loaded,' i.e., saturated. At that point, a dynamic balance between loading and deloading begins (so-called "breathing" mode) during which some of those ions start 'leaking back out' of the bulk onto the surface. This localized deloading is a dynamic process, occurring in discrete, island-like, micron-scale surface 'patches' or 'droplets' (scattered randomly across the surface) comprised of many contiguous p+, d+, and/or t+ ions (or admixtures thereof)**

- ✓ **Homogeneous (limited % admixtures; too large % will destroy coherence) collections of p^+, d^+, or t^+ found in many-body patches on loaded metallic hydride surfaces oscillate in unison, collectively and coherently; their QM wave functions are effectively 'entangled.' Such coherence has been demonstrated in many experiments involving deep inelastic neutron- and electron-scattering measurements on loaded hydrides**

- ✓ **Collective oscillations of hydrogenous ions in many-body surface patches set the stage for local breakdown of the Born-Oppenheimer approximation; this enables loose electromagnetic coupling between p^+, d^+, or t^+ ions located in patches and nearby 'covering' surface plasmon polariton (SPP) electrons. B-O breakdown creates nuclear-strength local electric fields (above 10^{11} V/m) in and around such patches. Effective masses of SPP electrons (e-) exposed to very large local electric fields are thereby increased (e-*), enabling neutron production via e-* + p^+, e-* + d^+, e-* + t^+ reactions above isotope-specific threshold values for E-M field strength**



→ ***See: A. Bushmaker et al., "Direct observation of Born-Oppenheimer approximation breakdown in carbon nanotubes" in Nano Lett. 9 (2) pp. 607-611 Feb. 11, 2009***

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Local capture of ULM neutrons on loaded hydride surfaces

- ✓ **Unlike energetic neutrons produced in most nuclear reactions, collectively produced LENR neutrons are effectively 'standing still' at the moment of their creation in condensed matter. Since they are vastly below thermal energies (ultra low momentum), ULMNs have huge QM DeBroglie wavelengths (up to microns) and extraordinarily large capture cross-sections on nearby nuclei; virtually all will be locally absorbed; not detectable as 'free' neutrons**

- ✓ **For the vast majority of stable and unstable isotopes, ULM neutron capture cross-sections are directly related to ~1/v, where v is the neutron velocity in m/sec. Since v is extremely small for ULM neutrons, their capture cross-sections on atomic nuclei will therefore be correspondingly large relative to cross-sections measured at thermal energies where v = 2,200 m/sec and the neutron DeBroglie wavelength is ~2 Angstroms. After being collectively created, virtually all ULMNs will be locally absorbed before any scattering on lattice atoms can elevate them to thermal kinetic energies; per S. Lamoreaux (Yale) thermalization would require ~0.1 to 0.2 msec, i.e. 10^{-4} sec., a long time on typical 10^{-19} - 10^{-22} sec. time-scale of nuclear reactions**

→ *Ultra low momentum neutrons have enormous absorption cross-sections on 1/v isotopes. For example, Lattice has estimated ULMN fission capture cross-section on U-235 @ ~1 million barns and on Pu-239 @ 49,000 barns (b), vs. ~586 b and ~752 b, respectively, for neutrons @ thermal energies. A neutron capture expert recently estimated ULMN capture on He-4 @ ~20,000 b vs. value of <1 b for thermal neutrons*

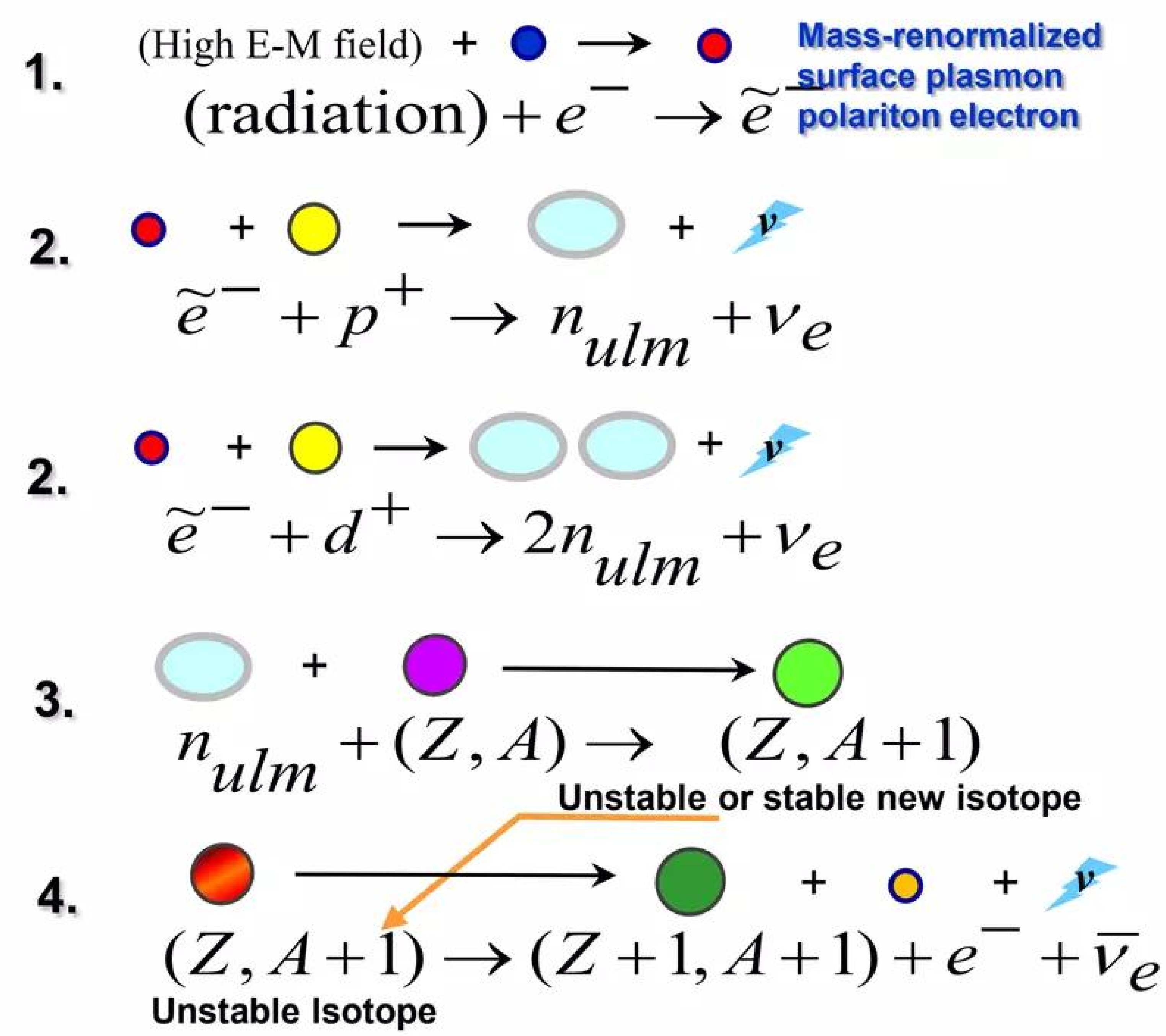
By comparison, the highest known thermal capture cross section for any stable isotope is Gadolinium-157 @ ~49,000 b. The highest measured cross-section for any unstable isotope is Xenon-135 @ ~2.7 million b

Weak interaction processes are very important in LENRs

1. **E-M radiation on metallic hydride surface increases mass of surface plasmon electrons**
2. **Heavy-mass surface plasmon polariton electrons react directly with surface protons (p^+) or deuterons (d^+) to produce ultra low momentum (ULM) neutrons (n_{ulm} or $2n_{ulm}$, respectively) and an electron neutrino (ν_e)**
3. **Ultra low momentum neutrons (n_{ulm}) are captured by nearby atomic nuclei (Z, A) representing some element with charge (Z) and atomic mass (A). ULM neutron absorption produces a heavier-mass isotope ($Z, A+1$) via transmutation. This new isotope ($Z, A+1$) may itself be a stable or unstable, which will perforce eventually decay**
4. **Many unstable isotopes β^- decay, producing: transmuted element with increased charge ($Z+1$), ~ same mass ($A+1$) as 'parent' nucleus; β^- particle (e^-); and an antineutrino**

➔ Note: colored shapes associated with diagram on next Slide

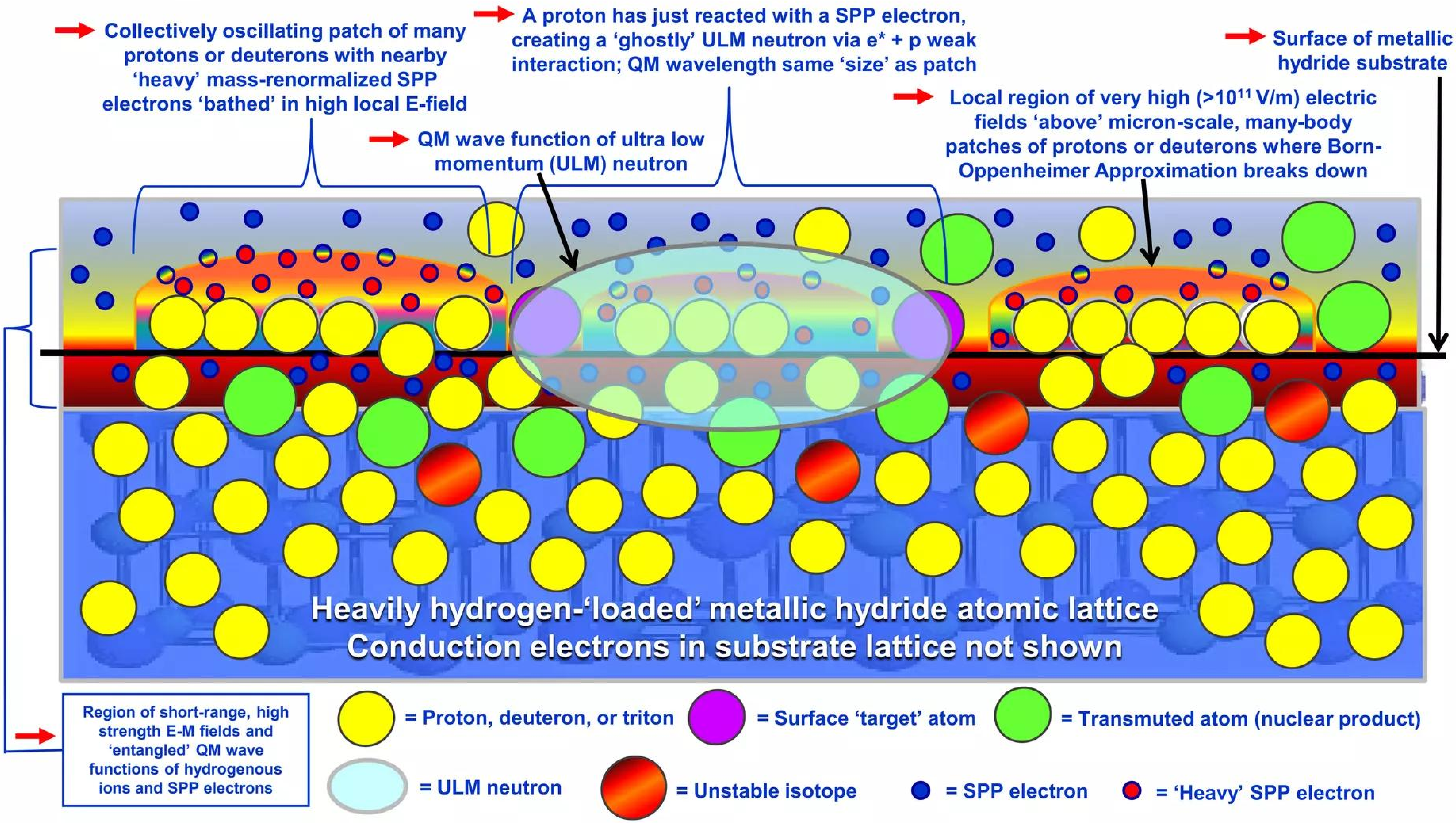
➔ ***No strong interaction fusion or heavy element fission occurring below, only weak interactions***



➔ ***Weak interaction β^- decays (shown above), direct gamma conversion to infrared (not shown), and α decays (not shown) produce most of the excess heat calorimetrically observed in LENR systems***

Conceptual details: W-L mechanism in metallic hydrides

Side view – not to scale – charge balances in diagram only approximate



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High level overview: W-L mechanism in condensed matter

US Patent No. 7,893,414 covers gamma to IR conversion below