Are LENRs causing some of the 'UFO' dust particles observed in the Large Hadron Collider? Maybe somebody should look?

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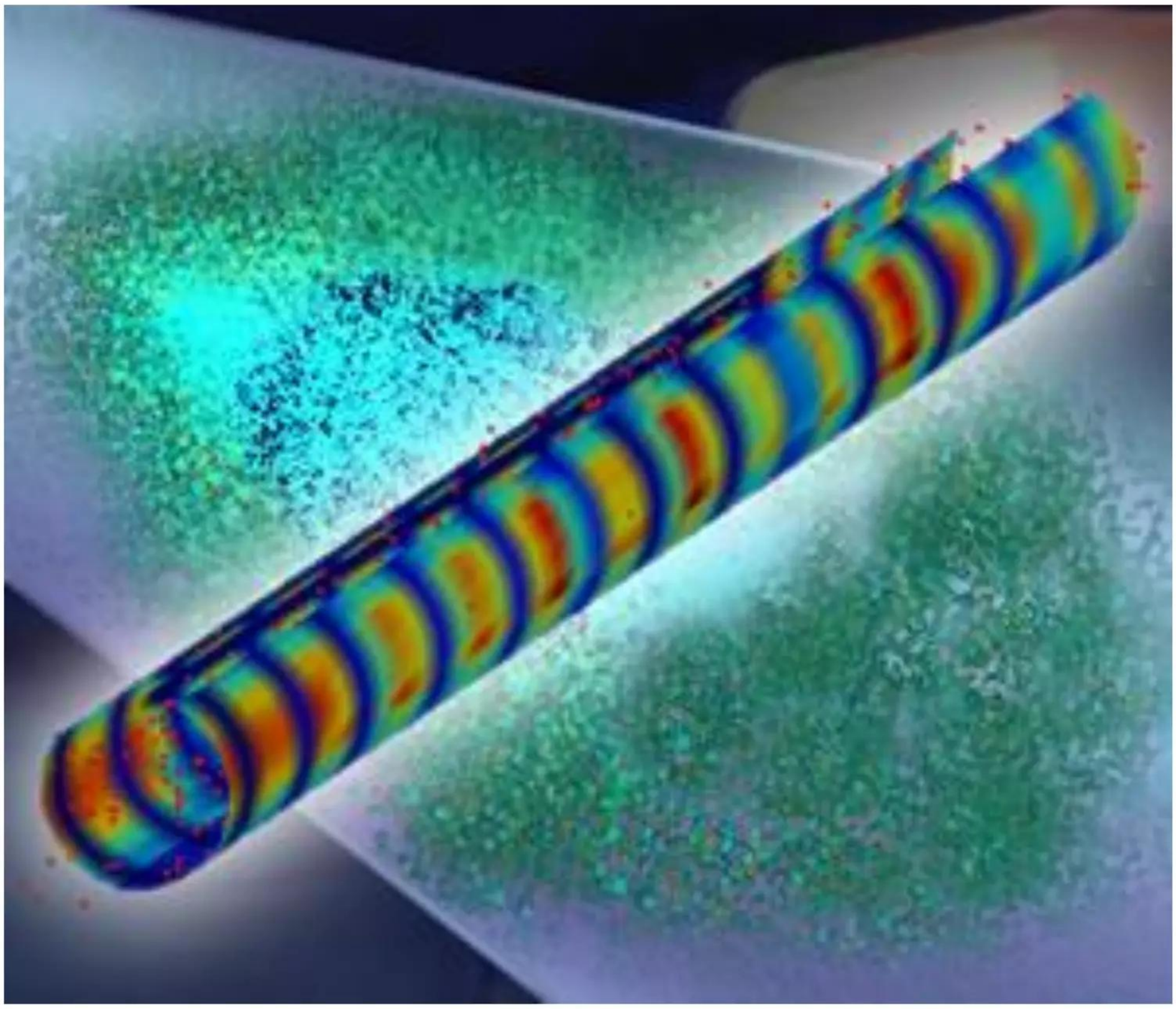

Source Paul Preuss – May 2, 2008: Quoting his caption, "A positron-beam pulse (background, dark blue) encounters a diffuse cloud of electrons. Tuned microwave signals (foreground, colored stripes) sent through the beam pipe can be used to measure the density of electron clouds. (Background visualization, Berkeley Lab Visualization Group; foreground visualization, Kiran Sonnad, with VORPAL)"

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Speculative conjecture:

Could LENRs potentially be responsible for creating some of the unidentified falling objects (UFOs --- micron-scale dust particles) observed in the Large Hadron Collider (LHC) that have occasionally caused troublesome beam dumps which reduce operating time?

Dear Readers:

Please let me begin by admitting that I am not a particle beam system specialist. That said, I believe that LENR processes are potentially capable of producing types of UFO 'dust' particles observed in the LHC.

Summary re LENRs as a potential causative source of UFOs in the Large Hadron Collider:

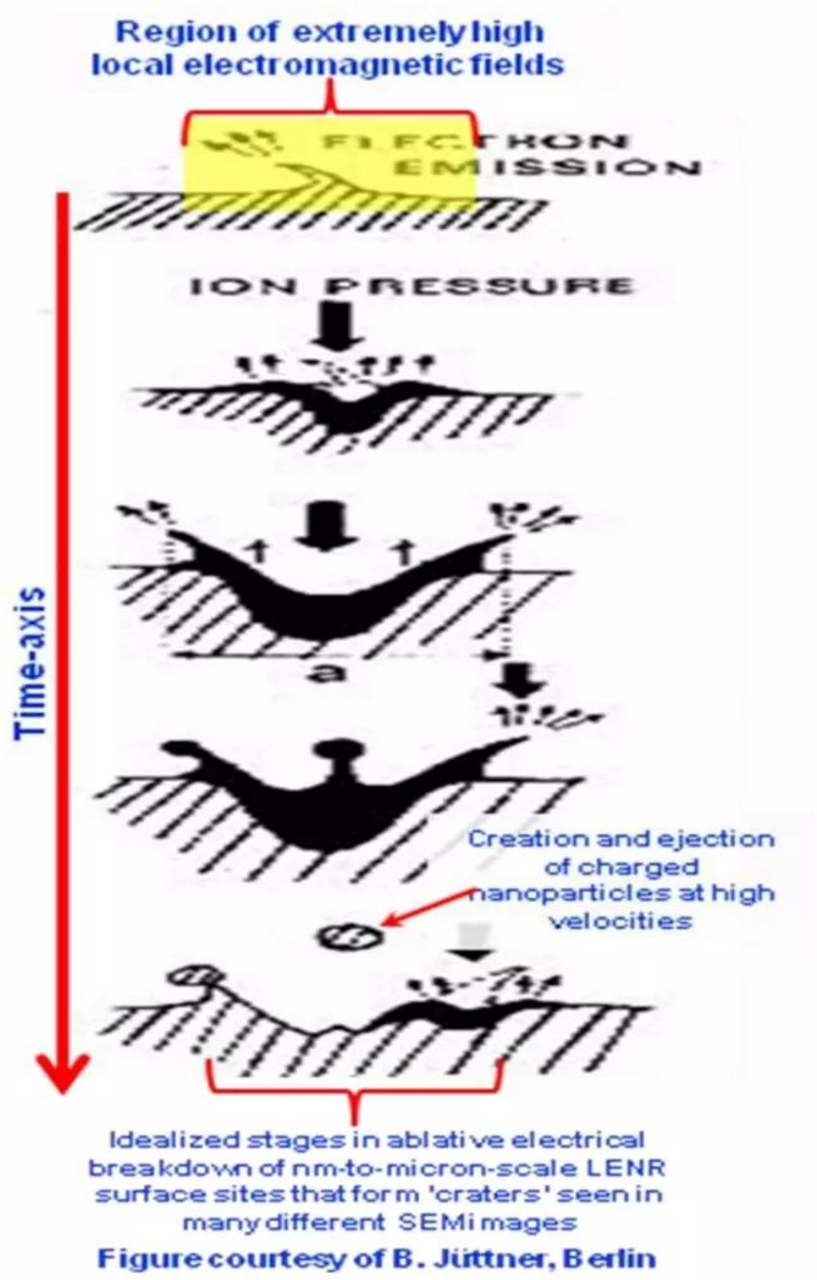
There is a possibility that small amounts of neutron production via the weak *e* + *p* reaction could potentially occur in small numbers of *nm* to *μ*-sized surface 'patches' found at scattered locations on LHC interior walls, specially on the inner exposed surface of the beam screens and on or near the magnetic kicker injectors (MKIs) where E-M fields and currents are both very high and rapidly changing.

Subsequent local captures of neutrons (ULM and otherwise) produced in such 'patches' on nearby materials could superheat tiny, micron-scale surface 'patches' up to 4,000 – 6,000^{o} K, causing localized nano- to micron-scale 'cratering' events that evolve over the course of 200 – 300 nanoseconds before the local heating is quenched. While in the process of 'boiling', these crater-like microstructures are capable of ejecting charged nanoparticles of various sizes outward (away from the surface) at significant velocities, which might then possibly become some of the UFOs being observed episodically in the LHC during beam operation. This conjectured process of UFO production is illustrated in the following diagram:

For a much larger copy of the graphic on the right, please see Slide #33 in the Lattice SlideShare presentation on the LENR Nickel-seed nucleosynthetic network dated April 20, 2011, that can be found online at URL: **http://www.slideshare.net/lewisglarsen/lattice-energy-llcnickelseed-lenr-networksapril-20-2011**

A SEM image of a typical type of LENR crater-like structure seen on a post-experiment Palladium (Pd) surface is shown immediately below:

Credit: P. Boss et al.



Also relevant to this topic; please see Slides #28 – 36 for a discussion of wall interactions and related concepts in the non-peer-reviewed Lattice PowerPoint presentation as follows:

"Experimental examples: gas-phase Nickel-seed Hydrogen systems and their measured transmutation products; 'hard'radiation is absent-What products might be found if Fe, Cr, Pd seeds were also present?"
Lewis Larsen
Lattice Energy LLC, April 20, 2011 [61 slides]
http://www.slideshare.net/lewisglarsen/lattice-energy-llcnickelseed-lenr-networksapril-20-2011

Summary: presents selected segments of W-L model LENR nucleosynthetic networks starting with ULM neutron captures on stable Chromium (Cr), Iron (Fe), and Nickel (Ni) 'seed' isotopes; discuss likely pathways and isotopic products that might be produced. Relate described W-L model networks and related concepts to specific experiments involving measurements of LENR transmutation products and photon radiation and how W-L theory can potentially help readers to better understand such observations. Discuss implications of W-L Palladium (Pd) and Cr 'seed' networks in context of selected examples of anomalous isotopic abundances observed in a variety of interesting and different physical environments, including catalytic converters.

For background, suggested reading on LHC UFOs is as follows:

"*UFOs in the LHC*"
T. Baer *et al.*
Proceedings of IPAC2011 San Sebastian, Spain, TUPC137
http://cdsweb.cern.ch/record/1379150/files/CERN-ATS-2011-051.pdf

"*UFOs in the LHC*" [65-slide MS-PowerPoint presentation]
Tobias Baer
CERN *MAC #4* August 12, 2011
http://indico.cern.ch/getFile.py/access?contribId=16&resId=1&materialId=slides&confId=149070

"MKI UFOs at injection"
T. Baer *et al.*
CERN-ATS-Note-2011-065 MD (2011-08-08)
https://espace.cern.ch/lhc-md/Shared%20Documents/2011%20MD%20Results/CERN-ATS-Note-2011-065%20MD%20-%20MKI%20UFOs%20at%20Injection.pdf

"*Industrial Surfaces Behaviour Related to the Adsorption and Desorption of Hydrogen at Cryogenic Temperature*" [note copper data; inner working surface of SS beam pipe coated w. thin layer of Cu]
G. Moulard, B. Jenninger, and Y. Saito
6th European Vacuum Conference (EVC-6)
7-12 December 1999, Villeurbanne, France
Published as LHC Project Report 375 April 11, 2000
http://cdsweb.cern.ch/record/434210/files/lhc-project-report-375.pdf

Also see documents re "*electron clouds*" (ECs) that also form inside the LHC:

"*Electron cloud observations in LHC*"
G. Rumolo *et al.*
Proceedings of IPAC2011 San Sebastian, Spain, THOBA01
http://infoscience.epfl.ch/record/170234/files/thoba01.pdf

"Can low energy electrons affect high energy physics accelerators?"
R. Cimino *et al.*
SLAC-PUB-10350 (February 2004)
http://slac.stanford.edu/cgi-wrap/getdoc/slac-pub-10350.pdf

Widom-Larsen theory of LENRs in condensed matter systems and the LHC in particular:

I believe that LENR phenomena can potentially occur in tiny *nm* to *μ*-sized surface regions in widely scattered locations found on interior wall and material surfaces inside the LHC. It might be interesting for scientists charged with investigating and solving the LHC's UFO problems to determine whether LENR processes are actually occurring somewhere inside the extremely large system.

Nuclear processes enabled by the Widom-Larsen mechanism (which we refer to as low energy nuclear reactions or LENRs) do not presume any 'new physics.' Under a very specific set of conditions, LENRs can occur at random locations on metallic surfaces and/or at metal/oxide interfaces in tiny local regions wherein the Born-Oppenheimer approximation breaks down and both ubiquitous surface plasmon (SP) electrons and contiguous 'patches' collectively oscillating protons happen to be juxtaposed together.

What readers may find rather startling about the novel QED mechanism proposed in our theoretical work is that it enables significant rates of nuclear reactions to occur in condensed matter systems under surprisingly 'mild' conditions. Importantly, it explains exactly why a significant population of MeV-energy electrons is NOT required to trigger substantial local rates of *e* + *p* neutron production on certain types of surfaces and at interfaces under certain well-specified conditions.

In Nature, local micron-scale conditions conducive to the initiation of LENR processes are relatively rare and typically occur spontaneously at random, very widely-spaced locations. For example, if LENRs are in fact occurring at a number of scattered locations somewhere inside the LHC during beam operation (which I again confess is pure speculation at this point), *I suspect that affected areas would not comprise more than a very minute fraction of one percent of the LHC's relevant interior exposed surface area.*

The condensed matter QED neutron production process via the weak interaction that we explain in our papers involves many-body, collective quantum effects (including effective entanglement) between mutually interacting surface plasmon electrons and 'patches' of collectively oscillating protons. While duration of quantum coherence in the 'patches' is short (and has been measured experimentally by others for different reasons), local nuclear processes are even faster, thus reactions can and do proceed.

In essence, breakdown of Born-Oppenheimer and many-body collective quantum and E-M effects enable nuclear-strength (> 10^{11} V/m) local electric fields to form in and around nm- to micron-scale surface 'patches' of collectively oscillating protons. A fraction of the local SP electrons 'bathed' in these locally high E-fields have their effective masses renormalized upward (this is taken directly out of Landau & Lifshitz, so it is not controversial); once key thresholds for effective mass are surpassed (and this varies somewhat for protons versus deuterons or tritons), production of neutrons via an *e* + *p* reaction can begin.

Two other novelties also happen in LENR-active surface 'patches' on which I will now comment:

First, for reasons that we explain in detail in our peer-reviewed theoretical papers, in condensed matter systems the vast majority of neutrons produced via this weak interaction mechanism have ultra low momentum; that is, their DeBroglie wave functions must 'span' the spatial dimensions of an LENR-active patch (the size of which can range from a few nanometers up to ~100 microns). Consequently, their capture cross-sections are enormous (in most isotopes it is proportional to 1/*v*) and almost all of them are captured locally before they have enough time to thermalize (which requires several tenths of a millisecond). *Thus, substantial fluxes of energetic neutrons will not necessarily be observed.*

Second, the large population of un-reacted 'heavy' mass-renormalized SP electrons present on and around the LENR-active patch converts (in a range of ~0.5 – 1.0 MeV up to ~10MeV) any gammas arising from neutron-captures or subsequent decay processes directly into infrared photons (with a highly variable 'tail' in soft X-rays) at high efficiencies. In effect, it is like having built-in gamma shielding; our company was recently awarded a fundamental US patent on a method and apparatus for ultra high performance gamma shielding based on this principle. Again, this fascinating process is explained in our publications. *Importantly, large fluxes of energetic MeV-energy gammas will generally not be observed; IR photons arising from gamma conversion will simply heat-up the local environment*.

How might one determine whether LENRs are in fact occurring somewhere inside the LHC?

Since readily measured energetic neutron and/or gamma signatures specifically resulting from LENRs would be absent or heavily obscured by everything else occurring inside the LHC during beam operation, other types of diagnostic indicators would have to be utilized to unambiguously detect and verify the presence of LENR nucleosynthetic processes operating therein.

Use of mass spectroscopy to detect the presence of LENR transmutation products in the LHC:

Several possibilities immediately come to mind; using appropriate mass spectroscopy techniques:

1. **Detecting the presence of small amounts of 'anomalous', unexpected elements (that might otherwise be dismissed as merely prosaic 'contaminants'** (as opposed to being products of a neutron-capture-driven LENR nucleosynthetic process) located either on or in condensed matter particles that are clearly identified as UFOs, or in localized, micron-scale, crater-like structures found on exposed surfaces inside the LHC; and/or,

2. **Detecting otherwise expected elements in which stable neutron-rich isotopes have been enriched relative to their normal terrestrial abundances**, either in particles that are clearly identified as UFOs or in localized, micron-scale, crater-like structures found on exposed surfaces found inside the LHC; however,

   Please note that LENR nucleosynthetic processes sometimes create stable products that mimic normal terrestrial isotopic abundances, so one cannot necessarily expect or assume that their product suites will always present neutron-rich isotopic signatures.

SEM-SIMS is an excellent analytical tool for making spatially dependent isotopic measurements. Even better, if one is able to get access to one of them, is a Cameca NanoSIMS-50, which can measure many different isotopes in isolated surface regions down to dimensions of 50 nanometers.

Since an unusual number of UFOs appear to originate in and round the LHC MKIs, I would suggest looking for micron-scale cratering features on interior surfaces close to those areas. Again, E-M fields near the MKIs are high and rapidly changing, which according to our theoretical work should be conducive to the occurrence of weak interaction LENR neutron production and subsequent capture/decay processes somewhere nearby. In that regard, two additional points are worth noting:

Inner working surface of LHC stainless steel beam screen pipe is thin layer of high-purity copper:

When struck by high-intensity electron currents and other charged-particle beams, local many-body, collectively oscillating 'patches' of protons (effectively micron-scale, spatially isolated, local monolayers of hydrogen) on a copper surface can engage in $e + p$ weak reactions and produce neutrons and neutrinos.

Anyone who doubts this possibility should examine the voluminous experimental data collected and published by an R&D organization called Proton-21 located in Kiev, Ukraine (see their company website at http://www.proton21.com.ua/) Also please examine their summary of experiments published in 2004 at http://www.proton21.com.ua/publ/Booklet_en.pdf).

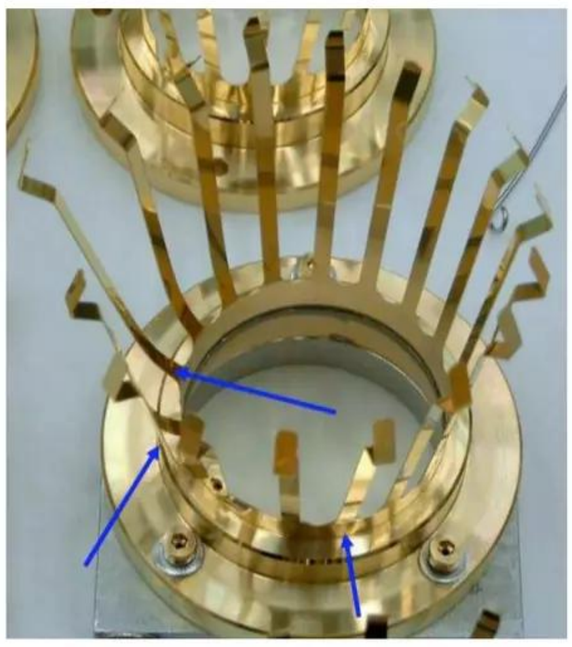
In a very large number of successful experiments, they essentially hit a copper target having a particular geometry with a huge, short rise-time electron current arc in a vacuum. What they find post-experiment is an amazing array of different nuclear transmutation products in and around the original copper target. I believe their results are explained by the Widom-Larsen theory (it's more akin to the exploding wire case that we have analyzed and published) and yes, I do think they are truly observing copious transmutations.

That said, Adamenko & Vysotskii have their own alternative theory for what's happening in their unique experimental system, which they have published. I don't happen to agree with their theoretical ideas but readers are nonetheless strongly urged to examine their work carefully and then judge for themselves.

LHC MKI's so-called 'finger contacts' consist of AISI 304L stainless steel coated with pure Gold:

"*New design for the MKI RF finger contacts in the LHC*"
Jason Rabinovitch
CERN Non-member Nation Summer Student 2007
http://www.ipp.ca/pdfs/Rabinovitch_cern_summer.pdf

Quoting excerpts from the paper: "*The* [short rise-time] *Injection Kicker Magnets (MKI) are responsible for transferring the beam from the Super Proton Synchrotron (SPS) to the LHC. Within these magnets, there must be a flexible electrical contact between the end of the ceramic beam pipe and the next section of the beam pipe. This connection must have low electrical resistance in order to obtain a low beam impedance ... The fingers themselves are made from Stainless Steel 316L, and are covered with gold (please see section 4 for a more detailed discussion of material properties). The fingers are designed to conduct the beam image current, which is expected to be high frequency but small in magnitude. Because of this, the majority of the current will travel along the surface of the fingers, not the interior ...*"



Above: Figure 4 copied from Rabinovitch's 2007 paper

Lattice remark: gold and silver are examples of metals on which it is particularly easy to excite surface plasmon electrons. Given appropriate and adequate inbound input energy (e.g., from electron 'beams' impinging a surface), a many-body patch of collectively oscillating protons located on such a gold surface would be in a nanoenvironment that is very conducive to the triggering of LENRs via the W-L mechanism.

Final Lattice comments:

A finding that the observed UFO rate in the LHC is proportional to beam intensity (reported by Baer et al. August 2011) is consistent with operation of the Widom-Larsen mechanism for local neutron production via weak interaction in micron-scale regions randomly scattered across exposed interior surfaces.

We hope this information may provide some additional useful insights that can potentially help CERN personnel eventually solve the LHC's present UFO problems. Maybe LENRs are occurring inside the LHC and maybe they're not; only appropriate measurements can answer that question and confirm or falsify our speculative conjecture about the origin of some UFOs. One thing is certain: we will never know the answer if we don't try to look.

Happy holidays and *bon chance* to all.

Lew

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