Focused neutrinos and alt-superconductor catalyzed betavoltaic nuclear reactor

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Abstract

My recent deep researches have fruited many great discoveries and inventions: **1**. thermal solar neutrinos can be focused by special heavy metal lens, and the focused neutrinos can catalyze nuclear beta decay in exponential effect. **2**. it is possible to mimic superconductor by dyno-capacitor module to cheaply realize same effects but working in room temperature even higher hundreds Celsius degree. By combining above 2 catalysis technologies, we expect to build a powerful high voltage DC betavoltaic nuclear reactor by using Lutetium fuel 176Lu. Although energy density is far less than conventional fission fuel 235U, however it is very clean nuclear energy, because of non-toxic material and no harmful waste.

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Introduction

It is well known that thermal neutrons can be used to catalyze **235**-uranium fission reaction, but do you believe that thermal neutrinos can be used to catalyze nuclear **beta decay** in exponential effect?

It is well known that photons light ray can be refracted or reflected upon reaching media interface, but do you believe that neutrinos beam ray can also be refracted or reflected upon reaching media interface?

It is well known that solar light can be focused by lens and a piece of paper at the focus will be burnt in fire, but do you believe that solar neutrinos can be focused by lens and radioactive matter at the focus will be nuclearly "burnt" in faster rate?

It is well known that superconductor must work in cryogenic extreme low temperature, but do you believe we can mimic it by alternative system to cheaply realize alt-superconductor working in room temperature even higher hundreds Celsius degree?

My long time prior researches have made "yes" answers to these mysterious questions. For details, see reference [1], [2], [3].

In a sense, all beta decay radioactive nuclei are constantly burning themselves by emitting fast electrons and transmuting to next nuclei, but only decay fast enough matter can be regarded as nuclear fuel.

For rectifying chaotic **β** particles, superconductor is applied in our blueprint. But conventional superconductor needs cumbersome and expensive cryogenic equipment and consumes too much energy in keeping low temperature.

Luckily we invent alternative system to mimic superconductor without all the said demerits.

Potential beta nuclear fuel candidates

We care about power density, the higher, the better. See reference [4] for a convenient formula.

Artificial isotope radioactive elements have high energy density, e.g. cobalt **60Co 11.3kw/kg**, but it is prohibitedly expensive, because it need nuclear reactor brooding. So, forget it.

Natural abundant elements all have super long halflife, even the so-called "fastest" decay isotope potassium **40K** billion years, i.e. **38µw/kg**, obviously no commercial value, if in its pristine state.

Luckily we find some isomer state of natural existed isotopes have very high energy density with very low excitation energy and significant even **100%** branch ratio of **β** decay.

Example 1: the dirt cheap element cadmium, of isotope **113Cd**, its sibling abundance **12.22%** is decent, and still stable, though it undergoes extreme slow beta decay at half life **$7.6*10^{15}$ years**, however it's yrast isomer of **263keV** undergoes only **14.1** years beta decay with **99.86%** branch ratio versus **0.14%** gamma decay to its ground state, such a fact suggests energy density of pure **113Cd** isomer is **466W/kg**.

Example 2: lutetium **176Lu** with abundance **2.59%** (not bad but not decent), halflife **$3.83*10^{10}$ years**, its isomer state: **122keV**, **β** branch ration **100%,** half life merely **3.664 hours**! hence its energy density is calculated out: **23MW/kg**.

Fig. 1 displays its isomer decay channel, where extreme slow decay from ground state is ignored.

As long as we can excite the fuel to isomer state, then great energy can be harvested.

Considering the energy consumption of excitation and efficiency, all above calculated isomers energy density should be discounted in large scale, embarrassingly, even the situation of no commercial value could occur if too low efficiency of excitation by non-free energy, such as coulomb or photons excitation.

Thanks to the new discovered neutrinos optical phenomenon and its catalysis to beta decay, now we can use the focused neutrino to excite radioactive nuclei.

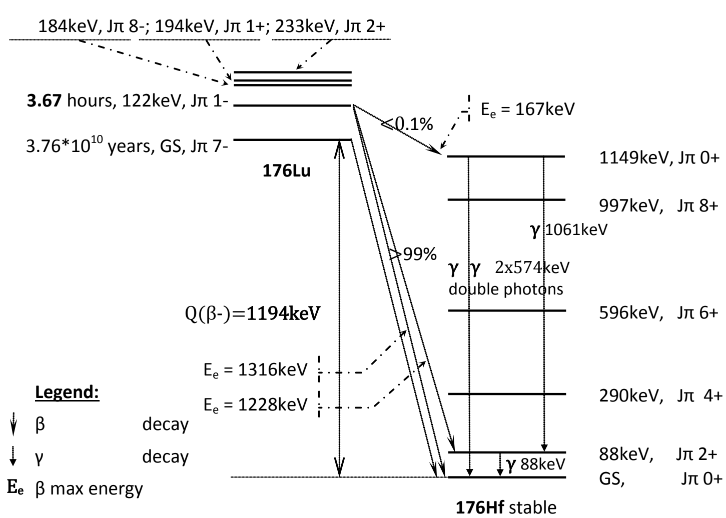


Fig. 1 Lutetium 176Lu isomer decay channel

How to dynamically excite fuel to isomer state?

As a common sense, a proper size magnifier can focus solar light, and enable temperature at focal point high enough to ignite cigarette.

Similarly, provided solar neutrinos can be focused, it will be possible to trigger nuclear reaction at focal point, especially exponentially accelerate **β** decay, as per the recent discovered fermions Bosonization theory [5].

Figure 2 illustrates 3 different lens applications, including unmentioned neutron lens.

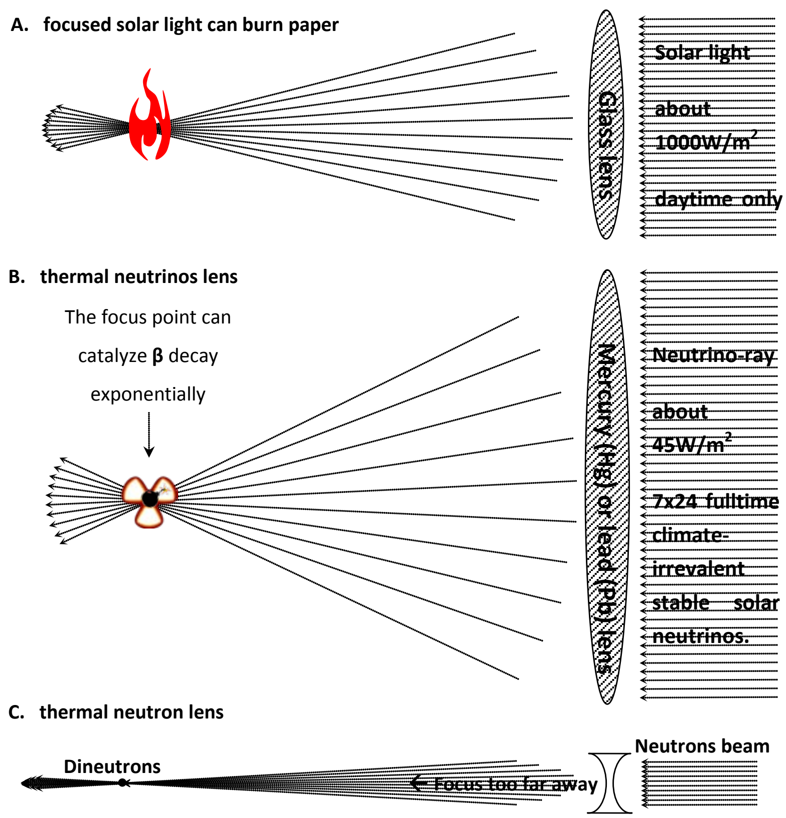


Fig. 2 comparison amid different lens

The observed neutrinos optical phenomena do not work for high energy neutrinos because of extreme low cross section. Only very low energy, **<100keV**, i.e. thermal neutrinos work.

Note: my definition of **thermal neutrinos** is different with the official **thermal neutrons** that energy is very tiny, only **0.025eV**, i.e. the **20°C** temperature.

As neutrinos are fermions, when focusing or compressing, **Pauli exclusion principle** will regulate the "thick" incompressible fermions flux to form "thin" compressible Bosons stream so as to compact particles as small volume as possible until down to a point by yielding to converging pinch, in straight words, **2** or more even number neutrinos tend to combine as a quasi-particle with integer spin quanta, e.g. **1** (**2** neutrinos), **2** (**4** neutrinos), **3** (**6** neutrinos), etc.

Above is just the brief of the aforementioned Bosonization theory.

If single neutrino **100keV**, then **6**-neutrino boson quasiparticle is **600keV**, that means energy stackable. Thus even **263keV** of **113Cd** is excitable by **100keV** neutrinos current. But lower excitation energy is always easier to afford, hence we will choose lutetium **176Lu** as our prototype fuel, though its price about **30%** of gold.

As to the neutrino source, the broad spectral free solar neutrinos are good enough, and its average energy flux on Earth about **45W/m^2,** plus fulltime **7x24** available and climate irrelevant, even **3.2%** stronger at night than day. What we need is simply to track the Sun.

Revelation of the Great Nature' logics

Philosophically thinking, photons can be regarded as the basic "**tax**" levied by the **Great Nature** for cosmic welfare, it comes from energy gain of every atom's electron shell activity, so as to distantly cast light rays from numerous photons, because in His mercy, everywhere is created equal and should deserve of opportunity of illumination. Without such generous and abundant basic "tax", our human beings have to live in dark forever, even can not survive.

In additional sense, neutrinos can be regarded as the luxury "tax" or nuclear "tax".

A reasonable proportion must be deducted from the released energy of every beta decay in form of any distance reachable neutrino, so as to expand cosmic, and provide accessible Promethean nuclear igniter anywhere anytime for energy production at convenient disposal.

Perhaps, that is why we have abundant neutrinos supply from the nuclear fusion powered Sun and all stars, plus comic background relic.

Neutrino optical design

As to the material of neutrinos lens, we find heavy metal, e.g. Lead(Pb), mercury(Hg), especially **210Hg** is good enough.

If using mercury, then the lens is easy to be engineered for vari-focus or adaptive application, because of its liquid property. In general, the refractive index **n** of heavy metal for thermal neutrinos is about 1.1~3.0, the lower the energy, the higher the **n**, e.g. **50keV**, **n > 2**.

There is a formula: refractive index $\mathbf{n = 1 +} \frac{2\pi}{k^2} N f(0)$, obviously **n > 1**, even **~2** possible!
As to reflective material used for neutrinos mirrors, conventional silver is good enough, but it should be thicker many folds than regular mirrors. Gold has better performance than silver, but it is not economic.

Usually neutrino lens is not transparent, thus, solar light cannot pass it.

For the bi-convex lens, the focal length calculation formula is:

$$\frac{1}{f} = (n-1)\left(\frac{1}{R_1} + \frac{1}{R_2} - \frac{(n-1)d}{nR_1R_2}\right)$$

Implementation solution

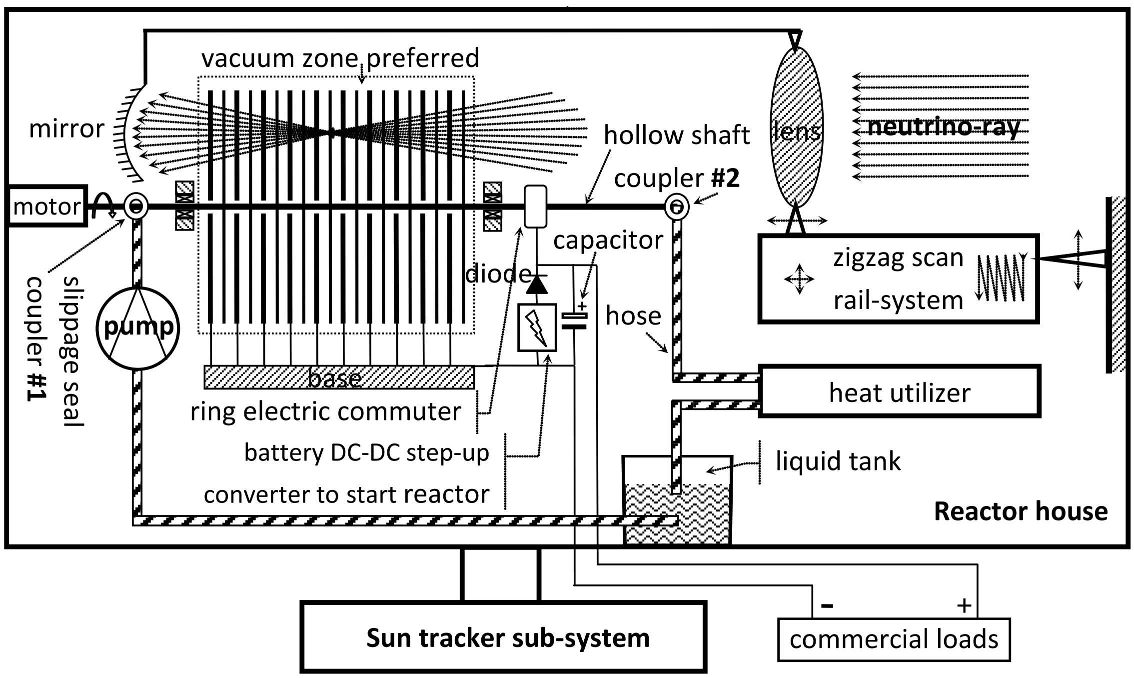
Our patent pending betavoltaic system is illustrated in fig. **3**, application number: **US15/486,412**.

The whole system is housed in reactor container made of wood or aluminum, and sits on platform of Sun track mechanism for fulltime power generation.

The vacuumed comb-like disks module is just the superconductor alternative system. Its anode disks are interlaced with cathode disks to form a capacitor. Cathode is stator, but anode is rotor.

The anode is made of or coated with nuclear fuel Lutetium **176Lu**, and initially charged with high voltage, then driven by a high speed motor, so as to activate superconductor alternative module, and the positive charges on spinning disks produce huge circular virtual electric current on their surfaces that can induct strong magnetic field for guiding the **β** particles aligning shaft direction, even further catalyzing beta decay.

Fig. 3. Focused neutrinos + alt superconductor catalyzed betavoltaic system



The starter comprises battery and step-up high voltage DC-DC converter, and is switched off after stable state is established, then is recharged by output in float mode.

Driven by solar tracking module, the neutrino lens is always facing the Sun no matter day or night, and its focus should be inside fuel zone. The zigzag scan module drives lens to evenly disperse focus in the said zone that may spin in millions rpm, then the concentrated neutrinos at focus excite local **176Lu** nuclei to isomer state for exponentially quickened **β** decay.

As the **β** particles are decelerated by the electric field, thus the dyno-capacitor is recharged as electric cell so as to sustainably output high voltage DC for external commercial loads.

Compared with the great output, the driving energy of dyno-capacitor and other auxiliary consumption is very small overhead percentage.

Thermal energy as by-product is inevitable, so proper heat utilizer is a must. In large scale power station, a steam turbine can be hooked for electricity generation and co-feeding the hydro grid.

There are many other varieties solutions with improvements on special performances. For details, see the full patent description [6].

Perspective outlook

Our laboratory is still searching for other beta duels, even double beta fuels, e.g. molybdenum 100Mo most likely[7].

Conceptual verification is done, next step, we need set up a project to prototype a workable small capacity reactor for deep research and demonstration.

As this project is very big and involves multiple disciplines, we are seeking cooperation and financial support from any interested organization or individual.

Our new discoveries and basic inventions can bring out profound influence in future nuclear clean energy research and development, because focused neutrino-catalyzed beta decay energy is very efficient, relatively clean and harmless to humankind and ecology.

Year by year, the conventional 235U fission commercial nuclear reactors are generating lots of toxic radioactive wastes all over the world, and impose potential tremendous threat on environment. If we can utilize focused neutrino-catalysis technology to process the nuclear waste, it will be a great achievement!

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