New discoveries in Parkhomov's 60Co astro-catalyzed beta decay

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Abstract

In 2011, Russian experimental physicist Parkhomov delivered a paper: "Deviations from Beta Radioactivity Exponential Drop". It seems that his explanation on the observed phenomenon is little bit shallow. Hereby I present my new discoveries based on his experiment settings and data, and try to generalize it as profound lemma.

1. Introduction

In 2011, the Russian experimental physicist Parkhomov delivered a paper: "Deviations from Beta Radioactivity Exponential Drop" (**ref. 1**).

He claimed that cobalt **60Co** radioactive source will demonstrate unusual beta decay drastically quickened by almost **700** folds if it is placed at the focus of a celestial sphere scanning mirror-type astronomical telescope and a star is just being scanned.

He explained that this phenomenon may be caused by focusing energy-attenuated cosmic neutrinos flux or even big bang relic neutrinos flux.

Luckily the replicability of his experiment is very good, until now, nobody challenges his claims.

2. Summary of five new important discoveries

In fact, Parkhomov's experiment is just the substantial proof of neutrinos flux reflection,

because the parabolic mirror-type astronomical telescope does focus neutrinos in his experiment. Now let me present further and deeper scientific explanations.

To superficially accept his explanation is not enough, as it is a little bit conservative and he also did not present any explicit useful lemma.

For convincibilty and exploring implicit lemmas, **60Co** and its decay product **60Ni** should be analyzed in detail about nuclear energy levels and possible channels of decay transmutation.

To my best understanding, his experiment is the best convincible one that proves **five** lemma:

- **i.** Good use of neutrinos can greatly accelerate beta decay;
- **ii.** Low energy neutrinos can reflect on mirror.
- **iii.** Boson quasi-particle comprising neutrinos in even number can be formed under focusing condition.
- **iv.** Such a quasi-particle in high spin can excite nucleus to overcome high spin lock.
- **v.** Only **β-** decay can be catalyzed by neutrinos, as well as only **β+** or electric capture decay can be catalyzed by antineutrinos; converse decay will be slowed down.

3. My analysis

According to **NNDC**(National Nuclear Data Center) experiment-based open official data, **60Co** decay energy **Q(β-) = 2822keV**, $\mathbf{T_{1/2}}$ **= 1925** days.

Further let me analyze respective energy levels and possible decay routes. As lots of energy levels, here only list the lowest a few important levels.

Nucleus **60Co**: **GS** ~ **Jπ= 5+**; **1st** level ~ isomer state! $\mathbf{E_1}$ **= 58keV**, **Jπ = 2+**, $\mathbf{T_{1/2}}$ **= 10.4** minutes with **2** possibilities: internal conversion (**IT**) in **99.75%** chance & **β-** in **0.25%** chance; **2nd** level ~ $\mathbf{E_2}$ **= 277keV**, **Jπ = 4+**, $\mathbf{T_{1/2}} \approx$ **0**, very fast gamma decay to **GS**.

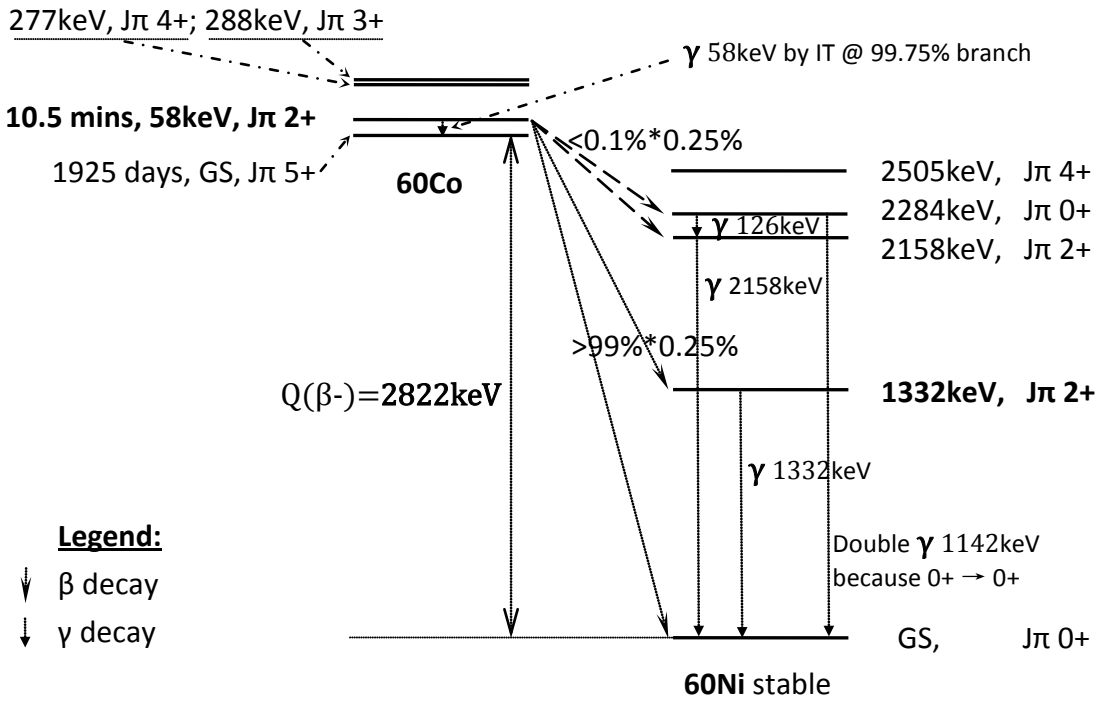
Detail tabulated official data of 60Co see the government web reference link 1.

Nucleus **60Ni**: **GS ~ Jπ= 0+**; **1st** level ~ **E_1 = 1332keV**, **Jπ = 2+**, **$T_{1/2}$ = 0.7ps**, gamma decay to ground **GS**; **2nd** level ~ **E_2 = 2158keV**, **Jπ = 2+**, **$T_{1/2}$ = 0.6ps**, gamma decay with **2** routes to **GS**; **3rd** level ~ **E_3 = 2284keV**, **Jπ = 0+**, **$T_{1/2}$ > 1.5ps**, gamma decay with **2** routes to **GS**; **4th** level ~ **E_4 = 2505keV**, **Jπ = 4+**, **$T_{1/2}$ = 3.3ps**, gamma decay with **3** routes to **GS**.

Detail tabulated official data of 60Ni see the government web link 2.

Obviously the decay transmutation from **60Co GS** to **60Ni GS** is spin-locked, because **ΔJ = 5** is too high! Normally, the most possible transmutation routes should be **60Co GS** to **60Ni 4th** (**ΔJ = 1**), **3rd** (**ΔJ = 3**) and **2nd** (**ΔJ = 3**) energy level.

The adopted most important energy levels and decay channels are drawn in following figure:



Remarks:

The β from 60Co GS intentionally undrawn, because circa 700 times quicker even from isomer state.

As Dr. Parkhomov claims almost **700** times faster than normal decay speed, hence the start point is probably not from **60Co** ground state, but from excited state: the **1st** energy level **E_1 =**

58keV, Jπ = 2+, $\mathbf{T_{1/2}}$ **= 10.4** minutes, i.e. an isomer state!

Theoretically, via the isomer decay route, the **β-** decay will be accelerated to **(1925*24*60/10.4)*0.25% = 666** times. What a magic signature, the experiment data greatly coincides with the calculation!

Hence it seems that low energy (**< 100keV**) neutrinos can be either refracted or reflected, just like as the properties of normal visible light interacting with lens or mirror.

More excitant finding: the focused low energy neutrino flux not only can transfer energy to **60Co**, but also even can easily modify spin **3** quanta, because excitation from ground state to **1st** energy level need spin change **ΔJ = 5 - 2 = 3**.

As single neutrino is Fermion, it can only modify **½** spin quantum, so, modifying **3** quanta needs a Boson quasi-particle comprising at least **6** neutrinos in even number.

For Fermions to form Bosons, there must be a compressing environment so as to induce Pauli exclusive force. Optics focusing can do it.

The threshold energy to excite nuclei will be decreased by many folds if considering multiple neutrinos bounded quasi-particle Boson, e.g. for **6**-neutrino bounded Boson, every neutrino only need $\mathbf{E_1/6}$ **= 9.7keV** to excite **60Co** to **58keV**; for **6000**-neutrino bounded Boson, every neutrino only need **9.7eV**.

In parabolic mirror, as per geometry optics, theoretically all energy scale neutrinos can focus in same point without chromatic aberration.

Hence, it is hard to estimate the neutrinos energy spectrum at the focus point, because not to mention **58keV** even **300keV** or so neutrinos are still regarded as “Dark Matter” until today.

But one rule is probably true: the lower energy the neutrinos, the higher probability to be reflected on mirror.

By the way, I am aware that some researchers believe the existence of magnetic monopole and

suggest it is the high spin excited state of neutrino. Yes, unleashing the spin-locked isomer or yrast nuclear energy DOES need high spin projectiles, perhaps my modeled multiple even number neutrinos bounded quasi-particle Boson is just the imagined magnetic monopole.

4. Why is the replicability of all prior LENRs so low and unstable?

Now, I have a rude awakening: perhaps my new discoveries can also explain why the replicability of all prior LENRs (Low Energy Nuclear Reactor) is so low and unstable.

Since Pons and Fleischmann reported their findings that **Pd-D** electrolysis experiments generate nuclear- reaction-level anomalous energy in **1989**, many researchers and organizations all over the world have input their efforts in phenomena explanation, replicability experiments and more deeper research.

However, the results are not always optimistic: either low replicability or instability.

In 2006, a Chinese team delivered a paper: “Changes of decay rates of radioactive **111In** and **32P** induced by mechanic motion” (ref. **2**), they claimed fast rotation can affect beta decay rate.

Dramatically, only **2** year later, another team delivered a challenging paper: “Can the decay rate of **32P** be changed by mechanic motion?”(ref. **3**), they refuted the claims in reference **2**.

In 2014, a New Zealand team delivered a summary paper: “Hidden Variable Theory Supports Variability in Decay Rates of Nuclides” (ref. **4**).

On my experience, I believe that: the main causation of low replicability is that all repeaters ignored the importance of solar neutrino flux realtime direction, and they probably copycatted in wrong time so as unconsciously to result in mismatch between neutrinos flux incoming direction and orientation of experiment devices.

Usually, the original experimenters used to introduce detail configuration and procedure in published paper, but never to state what time they conducted.

For example, if original experimenters got the positive effect at noon **12:00**, and the followers in same district retry at morning **8:00**, then probably a negative effect will be recorded, because neutrinos flux pour down vertically at noon, but horizontal at morning, circa **90°** difference.

The location is also important factor, simply thinking, solar neutrinos flux direction is not same in north hemisphere with south hemisphere even at same local time.

Frankly speaking, the originators do not intend to hide the time when they got the plausible effect, probably themselves just luckily hit the right time without aware of relation to neutrinos.

The beta decay acceleration by high speed mechanic spin is very typical example. According to my repetition, if the rotating disk faces up to sky, the best effect will occur at noon, but if retry at sunset time, you absolutely cannot get the same result with the originators, then probably jeer the originators crackpot.

5. More profound influence

These new discoveries could 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!

References

1. Deviations from Beta Radioactivity Exponential Drop, Alexander G. Parkhomov, DOI:**10.4236/jmp.2011.211162**.

2. Changes of decay rates of radioactive **111In** and **32P** induced by mechanic motion, He YuJian et la, DOI: **10.1007/s11426-007-0030-z**.
3. Can the decay rate of **32P** be changed by mechanic motion? Ding YouQian et la, DOI: **10.1007/s11426-009-0012-4**.
4. Hidden Variable Theory Supports Variability in Decay Rates of Nuclides, Dirk J. Pons et la, DOI:**10.5539/apr.v7n3p18**.

Web links

1. Cobalt 60Co adopted levels
   https://www.nndc.bnl.gov/chart/getdataset.jsp?nucleus=60co&unc=nds
2. Nickel 60Ni adopted levels
   https://www.nndc.bnl.gov/chart/getdataset.jsp?nucleus=60Ni&unc=nds