Bosonization causes free neutrons halflife capricious when measuring by different methods

Yanming Wei

Kiwaho laboratory of energy and ecology Inc. K0E1S0, Ontario, Canada.

Email: yan@kiwaho.com

Abstract

Many country's standards management departments have struggled for long time to accurately calibrate the halflife of free neutrons with different methods, unfortunately they are all obsessed by the mysterious unexplainable discrepancy: in-beam method longer than bottle method by 1%, so as to question whether there is undiscovered new physics therein. In this paper, I assert that nothing is new and the puzzle can be explained by the so-defined spontaneous Bosonization effect acting on dense colonized neutrons. At last, some inspired researches and possible applications are presented.

DOI: 10.13140/RG.2.2.26828.62084

Introduction

In 2005, two separate teams applying two very different methods have published their measurements on free neutrons life time.

A collaboration headed by Jeffrey Nico of NIST Physical Measurement Laboratory (PML) employed the "in-beam" method that conducts cold neutrons to converge along a very slim line. It counts the number of neutron decays in a section of a neutron beam, while simultaneously measuring the density of neutrons in that region of the beam.

Applying this method at the NIST Center for Neutron Research (NCNR), the team reported a lifetime of 886.3 ±1.2 [statistical] ±3.2 [systematic] seconds, which in 2005 was in pretty good agreement with the adopted world average of 885.7 ± 0.8 seconds.

The other team, managed by Anatoli Serebrov of the St. Petersburg Nuclear Physics Institute in Russia, chose the "bottle" method which means a colony of neutrons is loosely confined in a storage vessel and the number of neutrons remaining in the bottle is measured at several different times. Their official value of free neutrons lifetime was 878.5 ± 0.7 [statistical] ± 0.3 [systematic] seconds.

Strikingly, there is circa 8 seconds or nearly 1% discrepancy between the Serebrov's value and the world average! This cast serious doubt on the world average, and led to further investigation into all neutron lifetime experiments in the world average and proposals for new and more sensitive experiments.

Although 10 more years passed since the mystery appeared, and measurement uncertainties of both methods have been substantially reduced, however the embarrassing situation is still there[1] [2] [3] [4] [5].

My explanation

In fact, even without new physics, the standard model physics alone can explain the subject puzzle.

In standard model physics, fermions stand for particles with half integer, i.e. ½ spin, e.g. neutrons, neutrinos, protons, electrons etc. and Bosons stand for particles with integer 1 spin, e.g. photons, dineutrons, dineutrinos, etc.

In statistical mechanics and according to **Pauli Exclusion Principle**, all fermions are "unsociable", which means that they either resist being crowded too close with same quantum state or can be packed together but every individual fermion should occupy different quantum state: spin-parity **Jπ**, i.e. only one pair fermion can keep ½+ and ½- spin, and others must be respectively in 3/2, 5/2, 7/2, and so on.

In orthodox jargon, fermions aggregation follows Fermi-Dirac statistics distribution.

For spin higher than ½, the subject particle should be excited to higher energy level for aggregation, but individual neutron can only stay at **Jπ** = **½+** state and can never be excited to other half integer spin state that is larger than ½ quantum or other parity.

Now that fermions can be successfully forced or compressed to high dense colony, so what in the hell has happened therein? Before answering this question, let's then characterize Bosons property of statistical mechanics.

In statistical mechanics, except fermions, Pauli Exclusion Principle is no longer imposed on bosons, which means bosons are very "sociable", and can be crowded together without prerequisite of different quantum states.

In orthodox jargon, bosons aggregation follows Bose-Einstein statistics distribution.

In fact, this quantum law can be visually proved by watching the focal point of a lens receiving incident parallel light rays, as all photons have same quantum **Jπ = 1-** state and they are "happily" focused together into a spotlight.

Therefore, the established fact that fermions neutrons can converge to a dense beam, should firmly link to another hidden fact: the condensate must incorporate prior fermions with quid pro quo of Bosonization to form even-number bundled quasiparticles!

Now, with this theory analysis, the lifetime puzzle of neutrons is ready to be cleared.

As neutrons are fermions, when focusing or compressing or densely colonized, **Pauli exclusive 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 or beam by yielding to converging pinch, in straight words, **2** or more even number neutrons tend to combine as a quasi-particle with integer spin quanta, e.g. **1** (**2** neutrons, i.e. dineutron), **2** (**4** neutrons), **3** (**6** neutrons), etc.

Super high spin boson quasi-particle is always hard to form, but spin under **10** quanta, especially **1** spin boson – dineutron or quasi-dineutron is relatively easy.

Thus, the cold neutrons beam used by NIST team should primarily comprise dineutrons or quasi-dineutrons in bounded bosonic state, and should never be regarded as true free neutrons.

Of course, not to mention the dineutron that is elusive and still controversial in science community, even the bounded quasi-dineutron can also be regarded as difference particle with single free neutron, therefore, its lifetime must be longer than free neutron!

The neutrons used in bottle method can be regarded as free neutrons, therefore, nothing is worthy to wonder and needless to make a fuss on the respective measurement result of neutrons lifetime that is **8 seconds shorter** than the result from beam method.

Hereby I believe above explanation is perfectly done!

By the way, supposedly, Bosonization should accompany energy release, but loosely bounded quasi-particle can merely release very tiny energy so as not to be sensible or detectable.

Bonus or trophy from Bosonization theory

A. Optical lens for neutrons

Bosonization theory can not only be used to explain the puzzle of free neutrons lifetime discrepancy , but also inspire scientists and engineers to discover more nature laws or promote hi-tech innovation in renewable energy research and development.

For fermions to form bosons, there must be a compressing environment so as to induce “anti-force” to resist and overcome Pauli exclusion. Optics focusing can do it, where boson quasi-particle comprising neutrons in even number can be formed at focus of neutron lens.

Science community has never given up the effort of searching for dineutron or tetraneutron or hexaneutron, but so far, only dineutron and tetraneutron have been theoretically claimed to exist and be vaguely characterized.

As thermal or cold neutron beam can be refracted by proper medium, so why not to design a dedicated neutron lens for boson multi-neutron system research?

According to prior researches[6], the refractive index of neutrons is less than and very close to 1.0, for example, the refractive index will be 0.999996 for thermal neutrons refracted by MgF_2 crystal glass.

Thus bi-concave lens should be used to converge thermal neutrons beam, as illustrated in **fig. 1**, and as per the Bosonization theory, dineutrons or tetraneutrons can be formed at the focal point.

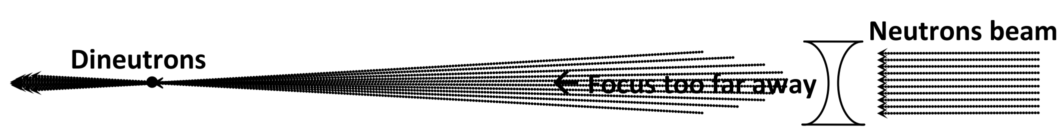

Fig. 1: thermal neutron lens can bosonize neutrons to dineutrons even 4-neutron quasiparticles

B. Optical lens for neutrinos

Both neutrino and neutron are neutral **Jπ = ½+** fermion, thus they must possess similar properties.

If neutrons can be focused by lens, then neutrinos should be capable too.

According to current researches[7] [8] [9], thermal neutrinos can either be reflected by mirrors or refracted by matter, and its refractive index is larger than 1.0, which means a convex lens with proper matter or engineered material can be used in neutrino optical system.

As per Bosonization theory, dineutrinos, tetraneutrinos, hexaneutrinos or other high spin boson quasi-particles can be generated at focal point of neutrinos lens, with broad spectra of both multiplied high energy and diversified high spin. For example, 100 neutrinos of 10keV may forge one quasi-particle of 1MeV and spin quanta selectable from 0 to 50.

It is well-recognized that energetic high spin bosons can turn forbidden transitions under rules of spin-parity selection to dominant electric or magnetic multipolarity transitions or trigger **β** decay during nuclear excitation or deexcitation.

That can be very good news to industry of energy production, because the focused high spin quasi-particles bundled with multiple neutrinos may unlash the high-K spin-locked clean nuclear energy from abundant special nuclides with potential high energy beta decay, such as isotope 50V of vanadium 2200keV per nucleus locked by 6 spin quanta, Lutetium 176Lu, etc.

Following figure illustrates the neutrinos optical system.

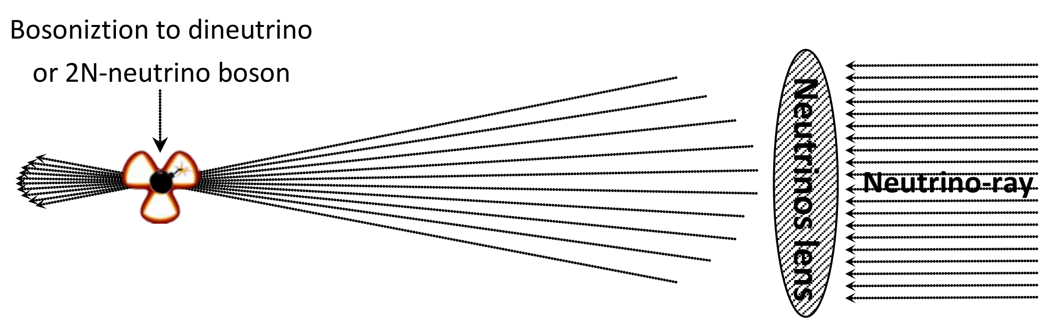

Fig. 2: Fermion neutrinos should behave same with neutrons

Some recent patents even disclosed the focused-neutrino-catalyzed betavoltaic nuclear reactor [11].

C. Spot focusing bombardment by fast electrons

Electrons are also **Jπ = ½+** fermions, but negative charged. Although theoretically Bosonization can still apply to electrons, however the large repulsive **Coulomb force** can frustrate condensation, thus weak thermal electrons may suffer from difficult Bosonization, despite a strong magnetic lens can converge, but reaching extreme dense is impossible.

Anyway, all charged particles can be easily accelerated by electric field, hence, we can still focus large amount of electrons into a point by high energy targeted bombardments.

In 1999, a famous experimental physicist **Kenneth Shoulders** developed his EV (Electron Validum) theory based on substantial experiment observations and data[9]. He believed that a large cluster of electrons can be "compressed" densely into so-called EVO (Exotic Vacuum Objects) quasi-particle with super strong electric field collimating acceleration and bombardments.

With the debut of my Bosonization theory, his claim seems unable to stand firmly, I prefer to regard his presented phenomena as Bosonization effect of electrons, i.e. lots of bosonized even-number-electrons-loosely-bounded quasi-particles in dense colony of electrons are formed with very short lifetime.

Conclusion

1. It is the Bosonization effect that causes the neutrons life time significant discrepancy amongst different measurement methods.

2. In great influence, Bosonization theory can benefit other scientific researches, as well as new technology developments and applications.

Reference

1. **Neutron death mystery has physicists stymied -- conflicting measurements of particle's lifetime could point to exotic new physics**, by Clara Moskowitz, DOI: 10.1038/nature.2014.15219.
2. **Improved Determination of the Neutron Lifetime**, by A. T. Yue, et la. Phys. Rev. Lett. 111, 222501–27 November 2013. DOI: 10.1103/PhysRevLett.111.222501.

3. NIST news: **Toward New Precision in Measuring the Neutron Lifetime**, February 03, 2014. TECHNICAL CONTACT: Maynard S. Dewey.
4. NIST news: **Physicists measured something new in the radioactive decay of neutrons -- the experiment inspired theorists; future ones could reveal new physics,** June 14, 2016
5. **Precision measurement of the radiative beta decay of the free neutron,** M.J. Bales, et la. (RDK II Collaboration), Phys. Rev. Lett. 2016, DOI: 10.1103/PhysRevLett.116.242501.
6. **Focusing cold neutrons with multiple biconcave lenses for small-angle neutron scattering**, by S. Choi, et la, J. Appl. Cryst. (2000). 33, 793±796.
7. **Deviations from Beta Radioactivity Exponential Drop**, Alexander G. Parkhomov, 2011, Sci. Research Publication, DOI:10.4236/jmp.2011.211162.
8. **Converged Solar Neutrinos Heat Outer Core of Earth to Liquid**, by Yanming Wei, 2017-04-27, viXra:1704.0375 or DOI: 10.13140/RG.2.2.22716.23689.
9. **New Discoveries in Parkhomov's 60co Astro-Catalyzed Beta Decay**, by Yanming Wei, 2017-04-27, viXra:1704.0374 or DOI: 10.13140/RG.2.2.30632.98564.
10. **Charge clusters in action**, Ken Shoulders et la, www.rexresearch.com/shoulders.
11. USPTO patent application US15/486,412, 2017-04-13, **Room temperature alternative superconductor, beta nuclear reactor and more**.