TGD based interpretation for the strange findings of Eric Reiter

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Abstract

Eric Reiter has studied the behavior of gammas emitted by heavy nuclei going through two detectors in tandem. Quantum theory predicts that only one detector fires. It is however found that both detectors fire with the same pulse height and firings are causally related. The pulse height depends on wavelength and distance between the source and detector and also on the chemistry of the source, which does not conform with the assumption that nuclear physics and chemistry decouple from each other. Reiter has made analogous experiments also with alpha particles with the same conclusion. These findings pose a challenge for TGD, and in this article a TGD based model for the findings is developed.

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1 Introduction

I learned of rather interesting findings claimed by Eric Reiter hosting a public group "*A serious challenge to quantum mechanics*" (https://cutt.ly/VlBgFk4). There is a published article [H2, H1] https://cutt.ly/rlBgOl1) about the behavior of gammas emitted by heavy nuclei.

Eric Reiter has studied the behavior of gammas emitted by heavy nuclei going through two detectors in tandem. Quantum theory predicts that only one detector fires. It is however found that both detectors fire with the same pulse height and firings are causally related. The pulse height depends on wavelength and distance between the source and detector and also on the chemistry of the source, which does not conform with the assumption that nuclear physics and chemistry decouple from each other. Reiter has made analogous experiments also with alpha particles with the same conclusion. These findings pose a challenge for TGD, and in this article a TGD based model for the findings is developed.

On the basis of these findings, Reiter makes the rather provocative proposal that quantum theory is an illusion, and suggests a semiclassical theory known as loading theory represented originally by Max Planck. The theory states that the detectors fire only after they have loaded a sufficient amount of energy. The theory assumes that quantization of energy holds true only at the moment of emission but after that the energy disperses to the em fields describing the radiation.

In order that loading theory can explain the almost simultaneous and causally related firings, the loaded electromagnetic energy should achieve a critical value at the same time for both detectors. It seems that both detectors must start always as unloaded. It is not obvious how the loading theory can explain the success of quantum theory for visible photons. Reiter claims that this is possible.

Before continuing, let us make clear that I am not a proponent of unquantum theory but trust these observations are real and regard them as an extremely interesting challenge also for TGD.

The basic observations claimed by Reiter [H2, H1] `https://cutt.ly/rlBgOl1`) are the following.

1. Half-pulses and full pulses are detected in both detectors in contrast with the prediction that only one detector should fire if pulses are caused by the absorbtion of the gamma. The pulses are causally related. The probability for half pulse pairs is by factor of 100 higher than by change. The probability for full pulse pairs is 4 times higher than by change. Both observations should correspond to 2 gammas in standard quantum theory. Only full pulses are considered.

   Remark: One can ask whether the secondary gammas associated with the absorption of gamma can propagate to the second detector and cause a pulse in it.

2. In 2-1 cases with full pulse two gammas are observed. This challenges energy conservation and the proposal based on loading theory is that a threshold effect is in question. For half pulses, the energy of pulses would be one half of total gamma energy and thus conserved.

   Remark: One can consider the possibility that the half pulses correspond to Compton scattering and full pulses to absorption of gamma.

1.1 A rough view about the TGD based explanation of the Reiter's effect

I am not an experimentalist and I am not at all sure whether I have understood correctly the description of the experiments and results. With these cautions in mind, consider first a thought experiment forgetting the belief that the incoming particles are ordinary gammas and quantum theory holds true.

1. In 2-1 cases the pulses correspond to separate incoming photons. At least two photons arrive at the first detector.

2. One can understand simultaneous pulses with equal pulse heights, if a considerable number of photons instead of a single gamma arrive the detector simultaneously. The particle from gamma source would not be gamma but a particle decaying to N nearly parallel gammas with the energy of ordinary gamma. These photons for a subset of them would be distributed between the detectors and average pulse heights could be identical.

The challenge is to see whether this picture can be realized in TGD framework. The key questions are the following.

1. What are the particles which would decay to N gammas before the detector or inside it.

2. Why pairs of full pulses and pairs of half pulses are observed?

1.2 Hierarchy of effective Planck constants and the notion of N-photon

The TGD inspired model involves two new physics effects predicted by TGD.

1. In the TGD framework classical physics is an exact part of quantum physics and essential for the interpretation of quantum theory. M^8-H duality which is central element of TGD realizes kind of quantum-classical duality: both M^8 and $H=M^4\times CP_2$ are needed. At the level of M^8 having interpretation as analog of momentum space, everything is quantal: there are no classical fields and space-time is analog of Fermi ball. At the level of $H=M^4\times CP_2$ one has space-time as dynamical entity and classical fields.

2. TGD predicts a hierarchy of Planck constants $h_{eff}=nh_0$, $h=6h_0$ is the value of h_0 suggested by the findings of Randel Mills [D1] [L3]. For a given frequency $E=h_{eff}f$ means that the frequency for a given energy is scaled down by $h/h_{eff}=1/n$ in $h\rightarrow h_{eff}$. $n=2$ would give period doubling.

3. Large values of h_{eff} allow quantum coherence in arbitrarily long scales since quantum coherence lengths increase with h_{eff} [L9]. This makes possible Bose-Einstein (B-E) condensate like N-particle states behaving like single particle: N-protons, N-ions, N-photons... A number theoretical phenomenon that I have christened as Galois confinement would be in question.

   N-photon as analog of BE-condensate-like state of N photons behaving like a single particle. Quantum coherent state can be regarded as superposition of N-photon B-E condensates of this kind.

   N-photons play a central role in TGD inspired quantum biology. For instance, biophotons would be ordinary photons resulting from decay of dark 3N-photons to ordinary photons [L6, L7]. Baryons as 3-quark states provide the analogy: color confinement forces the 3 quarks to behave like a single particle.

   Also condensed matter could realize these N-particle states states. Ordinary DNA would be accompanied by dark DNA which would consist of sequence of dark 3-protons realizing genetic code and providing also counterparts for RNA, tRNA, and amino-acids [L4].

   The dark 3-protons combine to form similar 3N-proton states representing genes and emitting 3N-photons in collective cyclotron transitions and providing representations of genetic codons and coupling resonantly to corresponding genes. Dark N-particle states might be possible even for nuclei.

These considerations motivate the question whether the gammas could originate from N-gammas, which decay to ordinary gammas possibly having $h_{eff}>h$? Could this guarantee that both detectors receive a signal and average pulse heights are same.

1.3 TGD based model for the findings of Reiter

Reiter has also carried another experiment [H1]. In this experiment detectors are in series. The detectors are scintillators in which the incoming gamma can suffer Compton scattering, become absorbed, or transform to an electron-positron pair. Electron can also absorb gamma. It is assumed that full pulses are due to the gamma absorption and that Compton scattering gives rise to what is called half-pulses.

The scintillators are crystals. Compton scattering and gamma absorption by electron lead to secondary processes, which can generate gammas. For instance, after the absorption of gamma the electron dissipates its energy and this effect is amplified in photo-multipliers. Scattered gamma can suffer further scatterings.

The surprising observation is that the responses of the two detectors identical in the measurement resolution used [H1].

1. If there is only a single incoming gamma, it should be absorbed in either detector. If the secondary gammas created in the first detector do not enter the second detector, the presence of pulses of same pulse height in both detectors does not conform with the standard physics picture. Even if they enter to the second detector, the pulse heights are not expected to be the same.

2. If the N-gamma decays to N ordinary or dark gammas, it might be easier to understand why the pulse heights are the same.

It is also good to start with an objection. That pulse heights are the same for both detectors, could be simply due to the fact that detectors are ideal yes-no detectors, which are (quantum) critical systems in the sense that incoming gamma rays serve as a control acting producing the same response irrespective of their number and energies. In this case, the secondary gamma rays from the first detector could induce the same response in the second detector.

There are however other observations of Reiter, which strongly suggest that new nuclear physics is involved.

1.3.1 The dependence of the unquantum effect on the chemistry of the gamma source

Unquantum effect depends on the chemistry of the source [H1]. This is observed when ^{109}Cd is used as a source. ^{109}Cd appears as salt or metal and salt produces 5 times larger unquantum effect. The proposed interpretation is that gamma waves from salt are more coherent. This behavior suggests that gamma emission is not a single-nucleus effect as standard nuclear physics would predict but involves many nuclei. Hence new nuclear physics would be involved.

Why would the nuclei of ^{109}Cd salt form larger quantum coherent structures? What these structures could be?

1. That several nuclei would be involved with the emission of gammas conforms with the N-gamma model in which N parallel gammas are emitted simultaneously as N-gamma in quantum coherent N-nucleus transition. N-gamma beam is analogous to B-E condensate of N gammas that is an N-photon state with identical photons. Intensity of N-gamma beam from different nuclei higher.

2. Also coherent states of gammas as superpositions of N-gammas for various values of N can be considered. This state would behave as classically as possible. Intuitively the unquantum effect indeed corresponds to effective classicality.

   Putting it more precisely, coherent state is an eigenstate of the annihilation operator of the photon and has the form $exp(\alpha a^\dagger)|0\rangle$, where α is a complex parameter. The expectation value and variance of photon number N are given by $|N| = |\alpha|^2$ and $|\Delta N^2| = |\alpha|^2$. $|\alpha|^2$ is analogous to field intensity. The larger its value, the more classical the state is.

   The value of $|\alpha|^2$ should be larger for ^{109}Cd salt than for ^{109}Cd metal. The coherence of gammas would directly reflect the quantum coherence of ^{109}Cd as a many-nucleon system: this coherence is impossible in standard physics picture.

The larger the size of quantum coherence length in the gamma source, the larger the value of N if every nucleus emits identical gamma simultaneously. The scale of quantum coherence scales like h_{eff} and N like $(h_{eff}/h)^3(L_n/L_a)^3$ if the coherence region is spherical. Here $L_n \sim 10^{-14}$ m is nuclear scale and $L_a \simeq 10^{-10}$ m is atomic scale. One must $h_{eff}/h >> h_{eff,min}/h = (L_n/L_a)^3 = 10^{12}$ for the spherical option and $h_{eff}/h >> h_{eff,min}/h = (L_n/L_a) = 10^4$ for the linear option.

A couple of remarks are in order.

1. In TGD inspired quantum biology [L9] flux tubes carrying dark protons define linear coherence regions giving $N \propto (h_{eff}/h) \times (L_n/L_a)$.

2. In cold fusion the distance of dark protons at flux tube is about electron Compton length $L_e \simeq 10^{-12}$ m, one has $h_{eff}/h \simeq m_p/m_e \simeq 2000$ [L5, L1].

1.3.2 The dependence of the unquantum effect on the detector-source distance and gamma wave length

The intensity of the unquantum effect depends on the wavelength λ of gamma and distance d between source and detectors [H1].

1. ^{241}Am has longer wavelength λ. The UQ effect is enhanced as the distance d between source and detector decreases.
2. ^{1}37Cs produces gammas with a shorter wavelength λ. UQ effect is enhanced when d increases.

How to understand this behavior? d is certainly a relevant variable. But is this true for λ? N correlates with the size of the nuclear quantum coherent state. Could N be the relevant variable instead of λ. It is best to build a concrete view for what happens in the decay of N-gamma to N gammas.

1. N-gamma is analogous to B-E condensate of N gammas which have $h_{eff} > h$. B-E condensate is formed from ordinary photons which in general do not have parallel momenta and identical energies. The phase transition however creates this kind of state. The phase transition occurs by addition of photons to the B-E condensate and takes some time.

   The decay of N-gamma is the reversal of this phase transition. Therefore the N-gamma must decay during some time interval to N gammas which do not have exactly parallel momenta. These gammas move inside a cone with some opening angle. The intensity of the gamma beam decreases with distance like $1/r^2$, where r is the distance from the point of phase transition.

   The number of (possibly dark) gammas, which arrive the detector decreases with the distance of the detector from the phase transition region. If more than one gamma contributes to the pulse, one can understand why the height of the peak is reduced with the distance. If only one, the reduction does not occur.

2. On the other hand, the detector must be far enough from the source so that the phase transition to ordinary gammas has already occurred. If the decay of N-gamma to gammas takes place gradually and only the gammas interact with the detector the peak height increases with the distance from the phase transition. This is true if the interaction of the still existing M-gamma state ($1 < M < N$) with the detector is so weak that it goes through the detector without interaction with a high probability.

These two constraints imply that there is some distance at which the pulse height is maximal.For Am having larger gamma wavelength d would be larger than the optimal distance and for Cs with smaller gamma wave d would be smaller than optimal distance. Note that the optimal distance depends on N and therefore the size scale of coherent regions of nuclei. Intuitively it seems clear that the optimal distance increases with N since the decay time of a larger B-E condensate is expected to be longer.

1.3.3 Why the pulse heights in the two detectors are the same?

Pulse heights in the two detectors are the same. This explanation might involve both new physicsand understanding of the functioning of the detector.

It would seem that the conical beam consisting of N gammas is not considerably attenuated in the first detector which is a thin crystal. If the gammas are dark, the interaction with the detector would involve transformation of dark gamma to ordinary gamma and the probability for this process is expected to be low. This alone could explain why the beam is not considerably attenuated in the first detector.

Since the second detector is thicker, also an additional condition must be satisfied. Only the gammas arriving absorbed by electrons (or possibly Compton scattered for half pulses) during some time interval ΔT can contribute to the pulse. The detector would therefore have a time resolution ΔT in the sense that the gammas arriving after this time would not affect the height of the pulse. Detector would be analogous to a neuron which has some dead time after the arrival of the nerve pulse.

Effectively the detector would serve as a yes-no detector telling whether dark N-gamma arrived or not and would be analogous to a quantum critical system whose response does not depend on the strength of control action but only on its existence.

Suppose that a conical beam of N (possibly dark) gammas arrives the first detector.

If only the gammas arriving during ΔT and interacting with electrons of the detector contribute to the pulse, the same pulse height is obtained in both detectors if the number M of interacting gammas is high enough. This suggests that N must be large enough so that the product $M = pN$ is large enough. Here p is the probability of dark-to-ordinary transition. The detector would not react to later gammas. The value of M decreases with the distance of the detector from the phase transition regions by the conical character of the beam. It is however essential that the detectors are not too far from each other. This could be tested.

One cannot exclude the possibility that the secondary gammas, which are ordinary gammas, from the first detector cause a pulse in the second detector. In this case, one cannot expect identical pulse heights.

If $h_{eff} > h$ is true for gammas, one can imagine that one prevents the arrival of the secondary gammas from the first detector to the second one. Dark gammas could however get through and cause detection. This could be used to see whether the primary gammas are dark.

1.3.4 Application to alpha particle decays

The model should also explain similar findings for alpha particles behaving like bosons. The direct generalization of the N-gamma model would require that atoms in the alpha source ^{241}Am (Americium is used as alpha source in smoke detectors) form a quantum coherent state in a scale longer than atomic size scale. This state could be an atomic B-E condensate of N atoms and emit N entangled possibly dark alphas simultaneously. This B-E condensate would decay to dark or ordinary alphas.

Remark: In TGD framework Galois confinement [L9, L8] - also proposed to make possible dark genes as sequences of 3N dark protons - would force the N source nuclei to behave like a single quantum coherent unit.

1.4 Quantum criticality and objection against unquantum effect

The proposed model assumes that the response of the detector is yes-no response. In critical systems the response is almost independent of the stimulus, kind of yes/no response. The incoming stimulus is like a small perturbation generating a phase transition. Therefore thel 3 intuitive idea is that quantum criticality is crucial.

A good metaphor is control knob: the response does not depend on how hard you push the knob. The role of the magnetic body in TGD inspired biology is to control the biological body. The control action pushes a knob generating a phase transition.

How to realize the control action?

1. Quantum criticality is accompanied by long range correlations and fluctuations implied by the quantum coherence in long scales. $h_{eff} = nh_0 > h$ indeed increases the scale of quantum coherence. The natural first guess is that $h_{eff} > h$ is true for the N gamma rays from N-gamma. $h_{eff} > h$ photons behave like dark photons in the sense that they do not interact directly with the ordinary matter.

2. The interaction with ordinary matter requires the transformation of the dark photon to ordinary photon with $h_{eff} = h$ after which the interaction can occur in the usual manner. The Feynman diagrams describing the interaction containing in the incoming photon line a vertex describing this transition.

   A very rough description of the transformation of the dark photon to ordinary photon is in terms of a transition probability p, which does not depend on the detector. A more refined description would be in terms of mixing of ordinary and dark photons. This requires that the mass squared of dark photon is non-vanishing but very small. Nothing happens in the detector unless this transition takes place.

3. Consider now what happens in the detector if the probability p is very small: $p << 1$. The dark photon detection rate $R_{d,1}$ in the first detector is given in the first approximation by $R_{d,1} = pR_1$, where R_1 characterizes the rate for the detection of ordinary gamma.

   In the second detector the "dark" detection rate is $R_{d,2} = p(1-p)R_2 \simeq pR_2$. $1-p$ characterizes the attenuation of the "single photon beam". If the detectors are ideal yes/no detectors then $R_1 = R_2$ and the ratio of the dark rates is $(1-p_1) \simeq 1$. This requires that the detector response is determined only by the first dark photons of the conical dark gamma beam serving in the role of control knob.

To sum up, the prediction is that for ideal detectors the detection rates are the same in both detectors and independent of the values d_i of the detector thickness. This prediction allows the testing of the dark photon hypothesis.

This however also leads to an objection. If both detectors are ideal yes-no detectors, the pulse heights are the same even in the case that the secondary gamma rays leaking from the first detector generate the pulse in the second detector.

There is an interesting connection of quantum criticality with an effect discovered by Podkletnov and Modanese [H3] discussed from TGD point of view in [L2]. In Modanese-Podkletnov effect the electric discharges of a capacitor for which the second plate is super-conductor are reported to generate a pulse of unidentified radiation inducing the oscillation of test penduli. What is strange is that the beam of radiation does not seem to be attenuated. This suggests that the effect is caused by a dark photon beam which serves in the role of control knob in a quantum critical system and does not provide energy causing the oscillation of the penduli. Therefore the effect would have obvious resemblance to what is reported to happen in the tandem experiment of Reiter.

2 Conclusions

One can divide the findings of Reiter to two categories.

1. The observations that the pulse height depends on the chemistry of the gamma source and on the distance between detector and source strongly suggest the presence of new nuclear physics and nuclear quantum coherence above atomic scale. In the TGD framework, the notion of N-gamma as an analog of B-E condensate and the model for its decay to N gamms explain these findings.

   What is important that these findings can be made without the presence of the second detector.

2. The observation that the pulse heights for detectors in series are the same, could have an explanation in terms of secondary gammas from the first detector generating a pulse in the second detector. If the detectors are ideal yes no detectors the presence of input creates the same responses irrespective of the strength of the input.

One can imagine two experimental arrangements for testing the TGD based explanation.

1. Could one use as a scintillator a network of conducting wires allowing to observe the positions of gammas inducing response and to see whether the input contains several gammas. This could directly provide support for the N-gamma hypothesis.

2. If it is possible to prevent the leakage of the secondary gamma rays from the first detector to the second detector, the observation of causally related pulses in both detectors could be seen as a support for the hypothesis that N-gamma decays to N dark gammas.

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REFERENCES

Fringe Physics

[H1] Reiter E. New Experiments Call for a Continuous Absorption Alternative to Quantum Mechanics — The Unquantum Effect. *Progress in Physics*, 10(2):82–88, 2013. Available at: http://www.ptep-online.com/2014/PP-37-06.PDF.

[H2] Reiter ES. Experiment and Theory Removing all that Quantum Photon Wave-particle-Duality Entanglement Nonsense. *Proceedings of the CNPS*, 10, 2017. Available at: https://cutt.ly/rlBgOl1. .

[H3] Modanese G Podkletnov E. Investigation of high voltage discharges in low pressure gases through large ceramic super-conducting electrodes, 2002. Available at: http://xxx.lanl.gov/abs/physics/0209051.

Condensed Matter Physics

[D1] Mills R et al. Spectroscopic and NMR identification of novel hybrid ions in fractional quantum energy states formed by an exothermic reaction of atomic hydrogen with certain catalysts, 2003. Available at: http://www.blacklightpower.com/techpapers.html.

Articles about TGD

[L1] Pitkänen M. Cold Fusion Again . Available at: http://tgdtheory.fi/public_html/articles/cfagain.pdf., 2015.

[L2] Pitkänen M. Could Podkletnov effect be understood using $h_{gr} = h_{eff}$ hypothesis? Available at: http://tgdtheory.fi/public_html/articles/Podkletnovagain.pdf., 2015.

[L3] Pitkänen M. Hydrinos again. Available at: http://tgdtheory.fi/public_html/articles/Millsagain.pdf., 2016.

[L4] Pitkänen M. An overall view about models of genetic code and bio-harmony. Available at: http://tgdtheory.fi/public_html/articles/gcharm.pdf., 2019.

[L5] Pitkänen M. Could TGD provide new solutions to the energy problem? Available at: http://tgdtheory.fi/public_html/articles/proposal.pdf., 2020.

[L6] Pitkänen M. How to compose beautiful music of light in bio-harmony? https://tgdtheory.fi/public_html/articles/bioharmony2020.pdf., 2020.

[L7] Pitkänen M. Is genetic code part of fundamental physics in TGD framework? Available at: https://tgdtheory.fi/public_html/articles/TIH.pdf., 2021.

[L8] Pitkänen M and Rastmanesh R. New Physics View about Language: part I. Available at: http://tgdtheory.fi/public_html/articles/languageTGD1.pdf., 2020.

[L9] Pitkänen M and Rastmanesh R. The based view about dark matter at the level of molecular biology. Available at: http://tgdtheory.fi/public_html/articles/darkchemi.pdf., 2020.