Energy Conservation Violation by Modulation of Coherent States

We present a generalized account of how one might achieve energy conservation violation with quantum coherence effects. The general setup involves a violation of energy conservation by means of a change to the preparation of a coherent quantum mechanical effect which causes a change to the probability distribution of the measurable statistics of an observable. We also present a simple theoretical account of why there is a violation of conservation occurring in this setup.

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The Wave Property In Interference

The problem of wave particle duality in quantum mechanics is explained with simple reference to the correspondence between system and description in quantum mechanics; the system is irreducibly particle like but the description leads to calculations which only correspond to statistically relevant sets of particle measurements. This wave particle dichotomy is best understood in the context of interference measurements because these effects always have a fringe pattern of constructive and destructive interference which is conceptually relatable to a wave like phenomenon. However, these interference effects are always observations of a statistical probability distribution which may be calculated from the appropriate bra-ket which is evaluated with the state description of the system. In optics, this bra-ket is the well known correlation function which evaluates the electric field components using the state vector of the system as bra and ket. In spatial interference, this function then defines the detection probability which is an indication of the intensity of the system as a function of the phases of the inputs and the position on the detector screen.

This is where the crux of the wave particle duality argument lies, the system may be irreducibly particle like but it is detected with a spatial probability distribution that is dependent upon the frequency/phase of the inputs. The wave like property of quantum mechanical systems arises in these interference effects, and the key word here is probability. For it is the calculated probability of detection which is verified by observation of a statistically relevant set in these quantum experiments, and it is the probability of detection where we show dependence upon frequency.

Energy Conservation Violation In Spatial Interference Effects

In earlier writings[1,2] by the current author there is the establishment of a method by which we may use the modulation of interference effects between states of interference and non-interference to attempt the creation of energy. We generalize this effect of *energy creation* to all possible cases of modulation of an interference effect which have an associated change of the statistics of measurement. The most efficient possibility would be to modulate between the states of interference which would display the central fringe maxima and the central fringe minima. If we take for example the case of optical interference with a travelling Michelson interferometer which displays interference as a function of optical path difference of the two sources, then we would consider modulating between the central minima and maxima that occur at and near zero optical path difference respectively. The first state, the central maxima of detection, occurs at zero optical path difference where there is constructive interference and the second state, the central minima, occurs at an optical path difference of ½λ where there is destructive interference. If we setup the preparation of the interferometer so that the optical path lengths are identical then we will have prepared the state of constructive interference at the central maxima. To change this preparation to that of the second state, destructive interference, requires a simple modification to the preparation where we insert a delay mechanism (a plate with the appropriate phase shift) in one path of the photons which causes a phase delay equal to half the wavelength of the source. When one path is delayed by a half wavelength, then the relative phases of the two paths differ by a half wavelength and this leads to a calculation of destructive interference in the detection probability. This of course would be the detection rate at the output port of the beam splitter of the travelling Michelson interferometer. The other "output port" of the beam splitter is actually the reverse of the input port where the source comes from and this output of a travelling Michelson is not measured, but it is noted that the two outputs always combine to a total detection rate which is identical to the rate of emission. So when we vary the path difference so that there is a change between constructive and destructive interference we are only changing the relative amplitudes of the two outputs where one output goes to the detector and the other goes towards the source.

This should be quite amusing to us as classically thinking physicists, that the simple insertion of a plate in one arm of the interferometer is capable of changing the relative statistics of the two outputs so that the detection changes between that of constructive and destructive interference. This is a fairly demanding change in terms of the amount of energy that should be required to change these relative statistics. How could it be that such a change is possible with the simple insertion of a wave plate? There is only one way to understand this change in relative statistics of the two outputs; there is a violation of conservation occurring when we change between the two states. Each state itself is one which conserves energy because for each state there is an identical rate of total emission and the intensities of the beams at the two output ports of the beam splitter always add to this emission, however the two states of constructive and destructive interference differ in the relative intensities of the two output ports. For constructive interference there is a greater intensity that reaches the detector and lesser intensity that returns towards the source but for destructive interference less intensity reaches the detector and more intensity returns towards the source.

How the violation of conservation of energy occurs is in changing between the two states of constructive and destructive interference because this will cause a change in the relative intensities or amplitudes of the two outputs. The only explanation is that the change in preparation (the insertion or removal of the plate) causes a change to the state description which leads to a change of the calculated probability of detection (and a change in the amplitude which returns to the source). We as classically thinking physicists would like to know how this change in the intensities or amplitudes of the two outputs is occurring, what is the *driving force* behind this change? To which we can only reply that the photons are simply observed in accordance with the calculated probability. In the one state the photons are detected at a predictable rate of detection and in the other state the photons arrive at a different rate of detection with similar predictability. But this is insufficient! The relative amplitudes of the two outputs do not change as a result of the insertion of a delay, at least not by the standards of the laws of conservation of energy. Perhaps we should explain this with an example which is more intuitively obvious to us.

The analog to this effect in spatial interference with a detector screen would be the common optical double slit experiment. If we observe the double slit experiment we find a fringe pattern on the screen in the far field approximation which is describable with the common equation $n\lambda = d\theta_n$ where n is the integer of the fringe, θ_n is the angle from the normal and d is the distance between slits. If the distance between the slit aperture and the screen is x then the spacing between fringes n and m is

$$x\theta_m - x\theta_n = x(m\lambda/d - n\lambda/d) = (m-n)x\lambda/d$$

With this equation we find that for adjacent fringes (m-n=1) they are spaced by a distance of $x\lambda/d$. If we insert our ½λ delay mechanism (a plate) in front of one slit then the fringes will shift. The fringes of constructive interference will now appear where the fringes of destructive interference were, and vica versa. This results in a spatial displacement of the average position of the photons of $\frac{1}{2}x\lambda/d$. So how do the photons change their positions on average by a displacement of ½xλ/d? To which we may only respond that the delay (plate) caused a change to the state description which results in the change to the detection probability which is a function of frequency and screen position, thus the displacement. This may be a sufficient explanation when we consider the context of a statistically relevant set of photons, but as classically thinking physicists it is insufficient. We would like to know how each individual photon is physically displaced on the detector screen by an average position of ½xλ/d. Where is the energy input or *driving force* which causes this change in position? To which we may only answer that the insertion of the plate in front of one slit is the cause of this displacement. This is insufficient by the standards of the law of conservation of energy. When we have a change in preparation (the simple insertion of a plate in front of one slit) which causes a displacement to the average position of measurement of the system we must ask *how is it that this change in preparation is a driving force behind the change in the position of a statistically relevant set of measurements?*

Generalized Conservation Violation in Coherence Effects

We generalize this effect of *energy creation* to all cases of quantum coherence effects which have distinct quantum mechanical measurements. This could be a recombination effect like spin recombination, an interference effect or any choice of coherent quantum mechanical effect. The effect should fulfill a specific criterion; that there be a set of measurements which define the effect that are calculable with the standard bra-ket expectation value of an observable in quantum mechanics. The distinct measurable statistical observations of the effect must be predictable with a calculation of a probabilistic average of an observable, an expectation value. Another criterion of this protocol for energy creation is that the quantum mechanical effect being used must have at least two possible preparations which have differing statistical observations, and that the distinct observations of these two preparations (both being predictable with a calculation of the observable) cannot be explained in the context of an energy input into the system which would sufficiently explain the difference in observations by the standards of energy conservation. In other words, the change to the preparation which is "the difference between the two preparations" cannot be an energy input that is classically equivalent to the change in the measured observations.

With such a quantum mechanical effect as the root setup to our energy creation protocol, we now only need prepare our total setup to modulate between the two distinct preparations. With a modulation between the two preparations we also have a resulting change of the measurable statistics which are defined by the calculation of the observable. These changes of the measurable statistics are occurring in the absence of a *driving force* or an *input of energy* into the system. This being the case, we may exploit the end change in statistics as a means to *energy creation*.

References

1) Thomas Alexander Meyer, *www.violationprotocol.webs.com*, (2013).

2) Thomas Alexander Meyer, *Interference in Quantum Mechanics, A Violation of the Law of Conservation of Energy*, (2013). Available as viXra:1305.0168