On interaction free testing and photon divisibility

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3rd Mar 2022

Abstract Informed by the results of double slit experiments and experiments involving half silvered mirrors, photon divisibility is proposed. The nature of the divided parts is given as well as terminology for describing and identifying the different parts. The photon parts are used to explain the outcomes of the Elitzur-Vaidman bomb tester experiment. It is concluded that: The photon splitting proposition can be used for prediction and explanation. As a viable alternative to use of superposition. Explaining experimentally observed outcomes of similar scenarios using detectors other than bombs. Interaction free detection is a misnomer. As this result relies upon the sub photon member being taken out of 'circulation' at the bomb. (An interaction). So it can not reunite and interfere. That enabling the chance of detection by detector D.

On interaction free testing and photon divisibility.

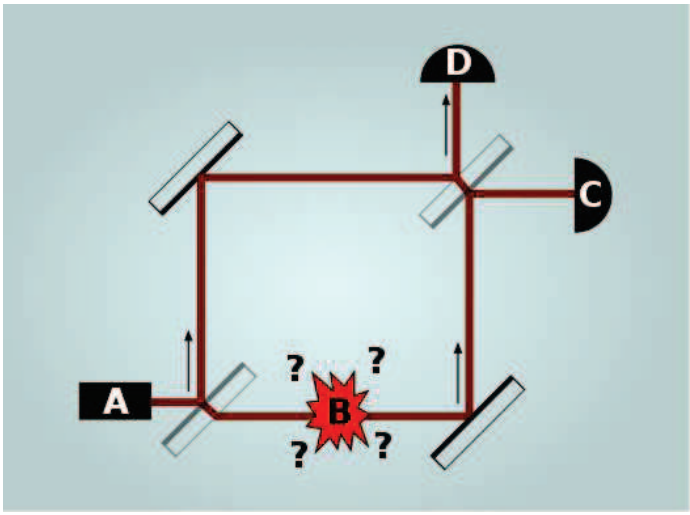
Proposal. Informed by the results of double slit experiments and experiments involving half silvered mirrors, photon divisibility is proposed. Half silvered mirrors are able to divide photons into a detectable portion, detected as a particle. That particle is still called a photon despite having undergone 'amputation'. For clarity it shall be called a cut photon body Also a sub detectable portion is formed having wave like character. Which will be called a sub-photon member. Identified by causing wave interference when recombined with the portion it was split from (the cut photon body). The sub-photon member is an existing element of noumenal Object reality. Source of the phenomenon of detection indicating wave interference has happened. This can explain observed outcomes, rather than needing to use superposition for explanation. Both an entire photon and a cut photon body are detected as if the same; a photon. Yet, informed by the results of double slit experiments and experiments involving half silvered mirrors, we have reason to doubt that photons that have encountered such apparatus are just the same as untreated entire photons.

Elitzur–Vaidman bomb tester This (Wikipedia) link gives background and conventional explanation.

This contraption uses a photon sensitive bomb. If live, detection of a photon causes detonation. If dud the photons pass through unhindered and undetected. Only an entire (un-split) photon or detectable portion from silver mirror photon splitting is able to detonate a bomb. An undetectable but existing 'amputated' part (photon member) can pass through a dud bomb and be stopped by a live bomb, but not detonate it.

The apparatus

https://en.wikipedia.org/wiki/ElitzurE2%80%93Vaidman_bomb_tester#/media/File:E-V_bomb-testing_2.svg 17th Sept 2019



Another half-silvered mirror and the two detectors C and D are positioned so that the photon arrives at Detector C *if the bomb is a dud;* [following photon reunion and interference.] Or for an un-*exploded live bomb*, **half the time** if just the pre cut photon body arrives at the mirror, via the upper path; **Half the time** the pre cut photon body goes via the upper path to detector D. [Without Interference with the formerly severed sub-photon member in either case.] If the live bomb explodes the cut photon body took the lower path, no detection is made at C or D.

Results summary and explanation:

For a dud bomb;
There is always photon body and sub photon member coming together and interference which always gives a C detection no matter which part took which path.

For a live bomb;
No photon was detected (50% of tests). Lower path taken by cut photon body Explosion result!
Or cut photon body takes upper path. [No coming together and interference of parts as the sub photon member has been taken up by the bomb and removed from 'circulation'.] There is the usual 50:50 chance of being deflected at the 2nd half silvered mirror or not, passing through. So, for the remaining 50% of tests ; The photon detected at C (25% of tests). The photon detected at D (25% of tests).

Conclusion:

The photon splitting proposition can be used for prediction and explanation. As a viable alternative to use of superposition. Explaining experimentally observed outcomes of similar scenarios using detectors other than bombs.

Interaction free detection is a misnomer. As this result relies upon the sub photon member being taken out of 'circulation' at the bomb. So it can not come together with the cut photon body and interfere. That enabling the chance of D detector detection.

Acknowledgments

Wikipedia Elitzur–Vaidman bomb tester, via https://en.wikipedia.org/wiki/Elitzur-Vaidman_bomb_tester, last retrieved 3rd March 2022

YouTube video "Why is quantum mechanics weird? The bomb experiment" Sabine Hossenfelder, uploaded 29th Aug. 2021

YouTube video "Elitzur-Vaidman bombs", MIT OpenCourseWare, Instructor; Barton Zwiebach, uploaded 6th July 2017