Simultaneous Characterization of Particle and Wave Nature of Quantum Phenomena

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In our initial paper [1] we proposed that the Pioneer anomaly [2] was the result of a force that is gravitational in nature. Treating the sun as a black body, we postulate that the force on the probes is due to an acceleration that is proportional to the highest energy photons emitted by the sun. We arrived at an empirical equation,

$$a = [h]\nu c$$

where c is the speed of light, ν is the highest frequency, and $[h]$ is Planck's constant, held as a dimensionless constant. Thus the acceleration is quantized, showing the particle nature of light.

Light also has a wave nature, as has been verified in classical mechanics. One example we may note is the momentum on an object due to the amount of energy falling on its surface. For an object that absorbs all of the incident radiation, we have the equation,

$$p = U / c$$

where p is momentum, U is energy and c the speed of light. For an object that totally reflects all of the incident radiation, we have

$$p = 2U / c .$$

If the acceleration affecting the Pioneer probes is indeed quantized, then it, in conjunction with the momentum transferred to the probes through radiation pressure, may be the first example of the simultaneous verification of both the wave and particle nature of light.

Taking this one step further and equating to the common factor c we obtain

$$U = ap /[h]\nu .$$

References

[1] Original Abstracts of hypothesis:
http://meetings.aps.org/Meeting/MAR05/Event/28518
http://adsabs.harvard.edu/abs/2005APS..MAR.R1197M

[2] Pioneer probe data:
(a) http://xxx.lanl.gov/PS_cache/gr-qc/pdf/9903/9903024.pdf
(b) http://arxiv.org/pdf/gr-qc/0104064.pdf