**Photons are Weightless in the Local System of Reference** ARI
BRYNJOLFSSON, Applied Radiation Industries — It is generally surmised that
photon's gravitational mass $m_g$ is equivalent to its inertial mass $m_i = h\nu/c^2$. This
is derived from incorrectly designed and incorrectly interpreted experiments. For
measuring the energy change $\Delta E$ (the gravitational redshift) of a photon during its
time of flight $\Delta t$, we must have that $\Delta E \cdot \Delta t > h/(2\pi)$ (confer uncertainty principle).
But in all the many experiments, the product $\Delta E \cdot \Delta t$ is much smaller than $h/(2\pi)$;
see e.g. those by Pound and Repka in Phys. Rev. Lett. 4 (1960) 337. In all the
experiments, it was therefore impossible to detect any change in $\Delta E$. No conclusion
about photons weight or weightlessness can be derived from any of these experi-
ments. However, plasma redshift and solar redshift experiments, see: Brynjolfsson,
arXiv:astro-ph/0401420, make it clear that $m_g = 0$ for the optical photons in a local
system of reference, while in a distant reference system the gravitational redshift is
reversed; that is, the photons are seen as gravitationally repelled; see: Brynjolfsson,
arXiv:astro-ph/0408312. The plasma redshift and weightlessness of photons revo-
lutionize the basic physics and cosmology. I will briefly discuss the theory and the
cosmological perspective.

Ari Brynjolfsson
Applied Radiation Industries

Date submitted: 15 Oct 2009                    Electronic form version 1.4