Abstract Submitted
for the TSF09 Meeting of
The American Physical Society

The photon RUSSELL L. COLLINS, U T Austin, retired — There are no TEM waves, only photons. Lets build a photon, using a radio antenna. A short antenna ($2L << \lambda$) simplifies the calculation, letting **B** fall off everywhere as $1/r^2$. The Biot-Savart law finds $B = (\mu_0/4\pi)(LI_0/r^2)\sin\theta\sin\omega t$. The magnetic flux thru a semi-circle of radius $\lambda/2$ is set equal to the flux quantum h/e, determining the needed source strength, LI_0. From this, one can integrate the magnetic energy density over a sphere of radius $\lambda/2$ and finds it to be $1.0121hc/\lambda$. Pretty close. A **B** field collapses when the current ceases, but the photon evades this by creating a $\epsilon_0\partial\mathbf{E}/\partial\mathbf{t}$ displacement current at center that fully supports the toroidal **B** assembly as it moves at c. This $\mathbf{E} = \mathbf{vxB}$ arises because the photon moves at c. Stopped, a photon decays. At every point along the photon's path, an observer will note a transient oscillation of an **E** field. This sources the EM "guiding wave", carrying little or no energy and expanding at c. At the head of the photon, all these spherical guiding waves gather "in-phase" as a planar wavefront. This model speaks to all the many things we know about light. The photon is tiny, but its guiding wave is huge.

Russell L. Collins
U T Austin, retired

Date submitted: 25 Sep 2009 Electronic form version 1.4