The „Mass“ of a Photon
only an expression of its helical configuration ?

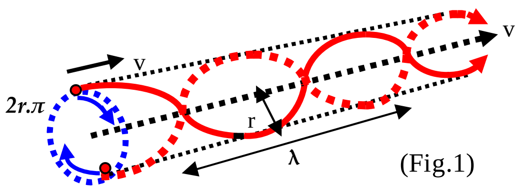
Erich Wanek
Paracelsusstrasse 25 B , A-5020 Salzburg
E-mail : erich.wanek@aon.at

Photons exhibit at the same time both mass und wave properties. If, however, a photon moved in a straight line, no wave properties and no interference were possible. Therefore some wave structure is necessary. The author has presented a model for a "particlewave" consisting of a chain of subparticles revolving around each other in a spiral trajectory like toroidal vortex particles, thus yielding a ***double helical shape*** (Physics Essays, Vol. 21,4, Dec.2008, pp.267-270) with a proportionality between λ and the radius r of the particlewave and $m = h/(\lambda.v)$

If the wavelength shortens, then its mass will increase and its radius will shrink. The inverse relationship of wavelength and mass (with v = const) and the inverse relationship of velocity and mass (with r = const) raises the question if what appears here as "mass" is but a measure for the spatial confinement (the "density") of the helical configuration, i.e. the state of condensation of the cylinder-surface of the double-helix.

The cylinder-surface of the photon helix

Fig.1 shows "The Particlewave" as a double-helix of 2 points of a chain of subparticles



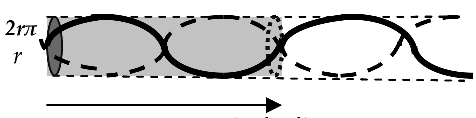
(Fig.1)

r \propto λ $m = h/\lambda.v$

The area of the cylinder-surface of the helical track of motion is given by the product of the circumference (= $2r.\pi$) and the height (i.e. the number of wavelengths) of the cylinder, being proportional to r and to v (= $\lambda.f$)

Therefore, one could argue in the following way: The outer surface of the helically shaped photon may be compressed by either a smaller radius (i.e. a smaller circumference) or a shorter wavelength of the photon helix yielding to a more condensed state of its cylindric surface area. This condensation can be identified with an increase in mass:
The smaller the outer surface of the helix the larger its mass.

Taking m_o and r_o as the parameters of a standard helix (Fig. 2) we may infer for an arbitrary particle with the parameters m_i and r_i :

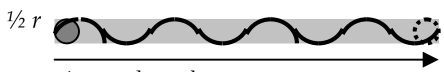


1 wavelength v (= $\lambda . f$)   (Fig.2)

The cylinder-surface of the double-helix is the product of the circumference $2r.\pi$ and $v = \lambda.f$

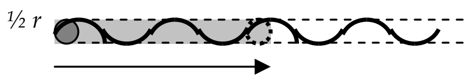
See now some examples to illustrate these relations

a) $m_i = m_o$: if $v_i = 2v_o$ follows $r_i = r_o/2$ and $f_i = f_o^2$.(Fig.3)
Under these conditions the area of the outer surface (i.e. the "mass") remains constant (the shadowed area in Fig.3 is of the same size as the shadowed area in Fig.2)



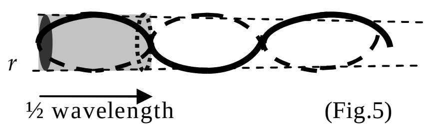
4 wavelengths
2 v (= ½ λ . 4f)   (Fig.3)

b) $v_i = v_o$: if $r_i = r_o/2$ follows $m_i = 2m_o$ and $f_i = 2f_o$ (Fig. 4). Under these conditions the area of the outer surface is condensed (compressed) twice yielding to a doubled mass (the shadowed area in Fig. 4 is half the size of the area in Fig. 2).



2 wavelength
v (= ½ λ . 2f)   (Fig.4)

c) $r_i = r_o$: if $v_i = v_o/2$ follows $m_i = 2m_o$ and $f_i = f_o/2$ (Fig. 5). Under these conditions the area of the outer surface is condensed twice again yielding to a doubled mass (the shadowed area in Fig. 5 is half the size of the area in Fig. 2



½ wavelength   (Fig.5)
½ v (= λ . ½ f)

Thereof the following conclusion may be drawn: What appears as the "mass" of a photon is but an expression of the size of the condensed cylindric surface of the photon helix.