

$E = pc$  , where  $p$  is the magnitude of the momentum vector  $\mathbf{p}$  . This derives from the following relativistic relation , with  $m = 0$  :

<formula>

The energy and momentum of a photon depend only on its frequency (  $\nu$  ) or inversely , its wavelength (  $\lambda$  ) :

<formula>

<formula>

where  $\mathbf{k}$  is the wave vector ( where the wave number  $k$

$= |\mathbf{k}| =$