The Klein-Nishina Formula in QED And anti Compton effect (2).

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Introduction :

When the photon beam is coming on the material , it's will be attenuation in this material (the number of the photons will be decreased when it's go out the material) this attenuation is related with the energy 's photon and also the kind of the material (density) .
This attenuation is the result of many kinds of reactions between the photon and the material 's electrons (mainly) , one of this kinds is : Compton reaction .
In Compton effect : the photon is loses part of it's energy in each reaction with the electrons , and this photon will disappear when it loses all of it's energy .
This is occurs in the usual Compton effect .wherein the attenuation equation :

$$A = A_0 \cdot e^{-\mu \cdot x}$$

Is including the attenuation coefficient (μ) , and this coefficient is including the cross-section of Compton reaction (σ) that's in this case (usual Compton effect) is take positive values according with the next equation :

$$\mu = \sigma \cdot N$$

So , by using the exponential attenuation equation at the time when the cross-section is take positive values , that's mean the beam of photons will be attenuation .
The klein-Nishina formula is :

$$\sigma = 2\pi r^2 \cdot \left[\frac{1+\varepsilon}{\varepsilon^2} \left(\frac{-1}{\varepsilon} \cdot \ln(1+2\varepsilon) + \frac{2(1+\varepsilon)}{1+2\varepsilon} \right) + \frac{1}{2\varepsilon} \cdot \ln(1+2\varepsilon) - \frac{1+3\varepsilon}{(1+2\varepsilon)^2} \right]$$

$$\varepsilon = \frac{h\upsilon}{m_e C^2}$$

is the ratio of the photon's energy and the electron mass's energy .: ε
r : is the classical radius of electron (r = 2.8e-15 m) .

But in this work the opposite is occurs , wherein the cross-section may takes negative values at some values of ε . consequently , by using the exponential equation we will find the photons in the beam is increases (exponential increases) (the number of photons is increases and maybe also the photon energy do) , so we obtained the same effect as the laser effect , and we can use this effect in many applications .

In this work ,there is many of figures which describe many of parts of curve 's Klein-Nishina formula , that's give a negative values for cross-section at some values of ε
We obtained this figures by the (Nu-Calc) program .

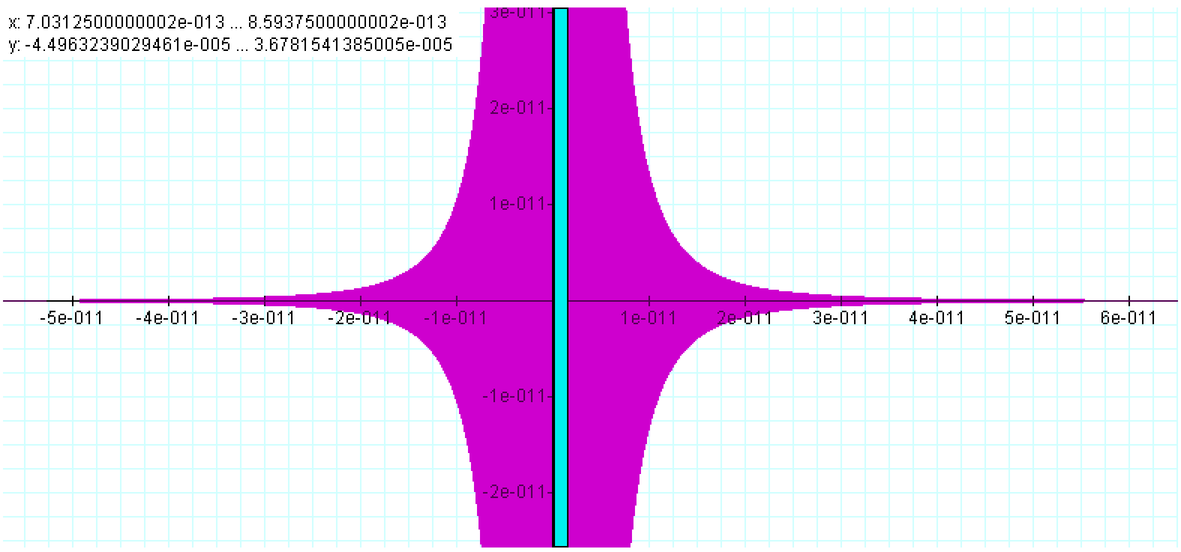

Figure (1) : this figure is describe some zones of representation of the relation Between the cross-section (the symbol Y in the figure and it's unit is square meter) And ε (the symbol X in the figure) according with Klein-Nishina equation .

From this figure and by using more details we can find the three following figures :

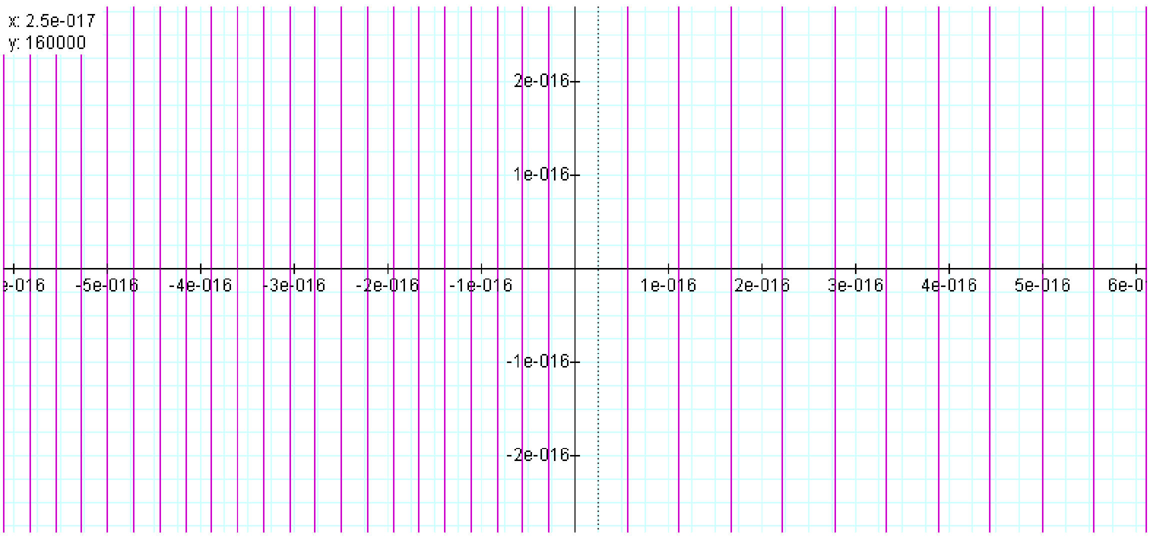

Figure (2) .

In the figure (2) for the next photon's energy (hυ = 1.2775e-11 eV) we can find a very Large value of the cross-section (σ = 160000 m²) .
Were σ is in (m²) .

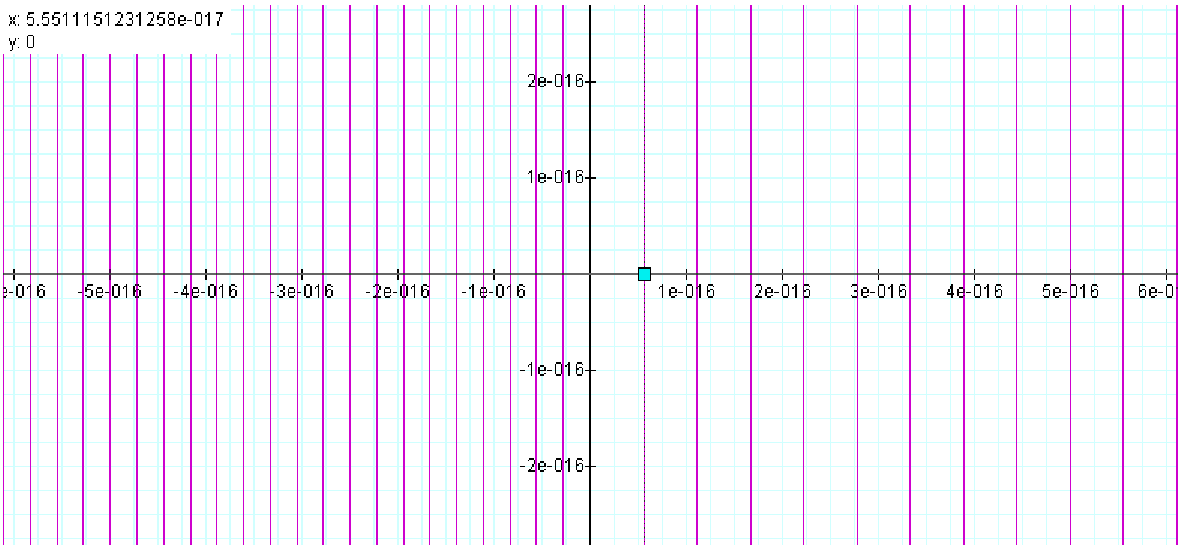

Figure (3) : for the example, the photon's energy (hυ = 2.836e-11 eV) gives The zero value for the cross – section .

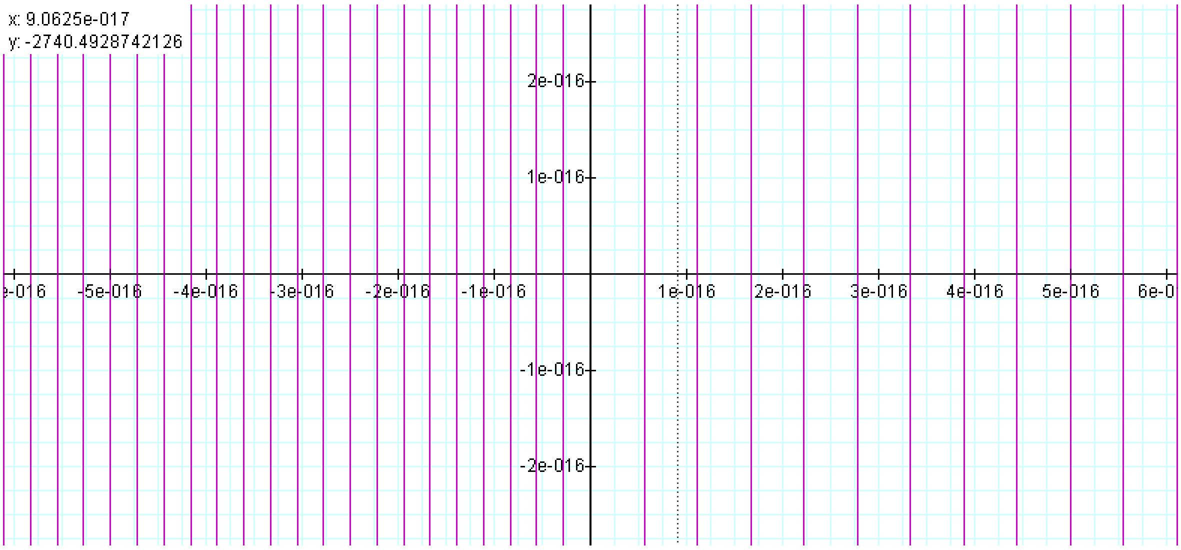

Figure (4) : for the photon's energy (hυ = 4.631e-11 eV) we find negative value for σ about (σ = -2740 m²)

From the latest three figures we find the values for σ is alternating between the positive and the negative values , but in the same region of ε values approximately .

We have also the next figures in another regions of the curve's Klein-Nishina equation :

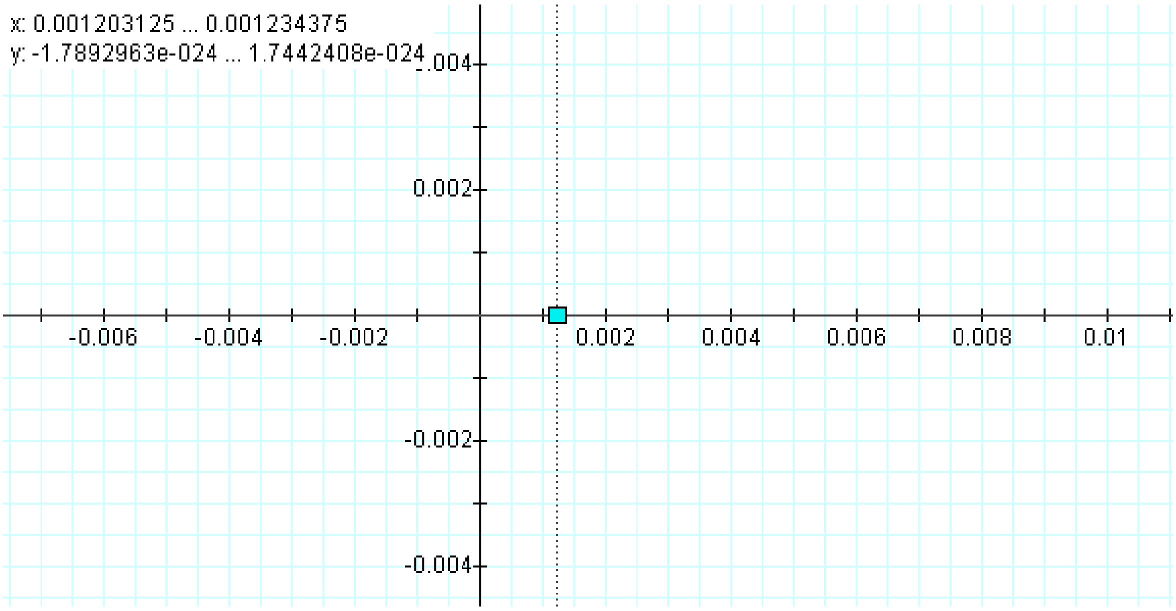

Figure (5) : here we find a region of photon's energy between (614 eV) and (630 eV) Which accord with values of σ , some of them has positive and the another has negative values .

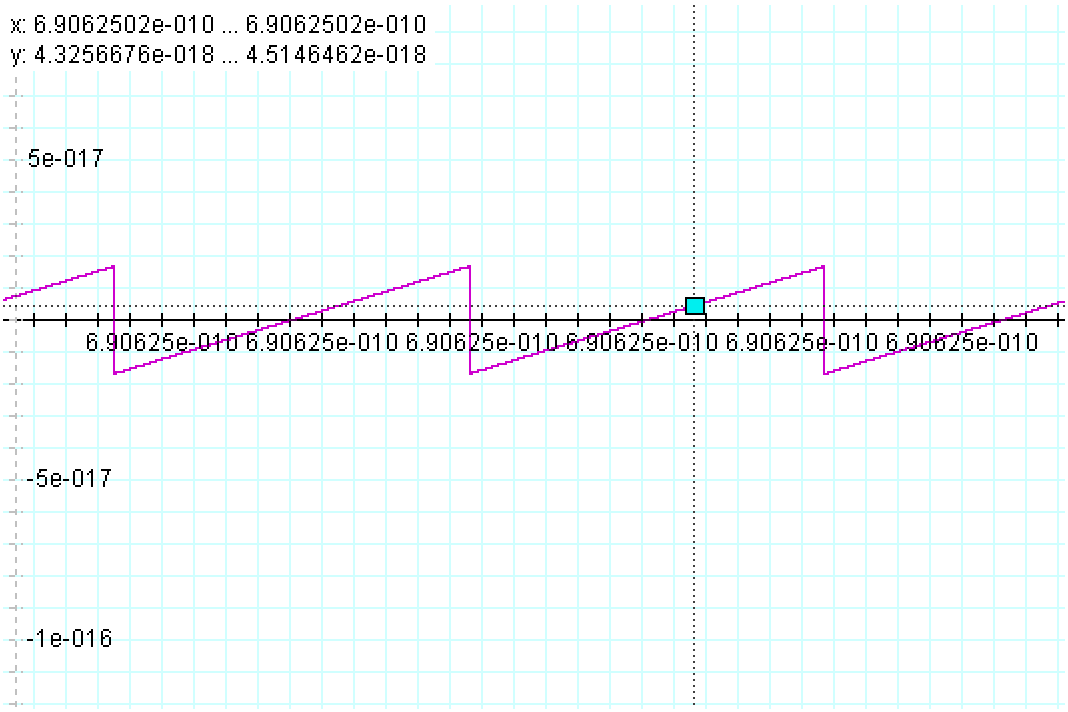

Figure (6) .

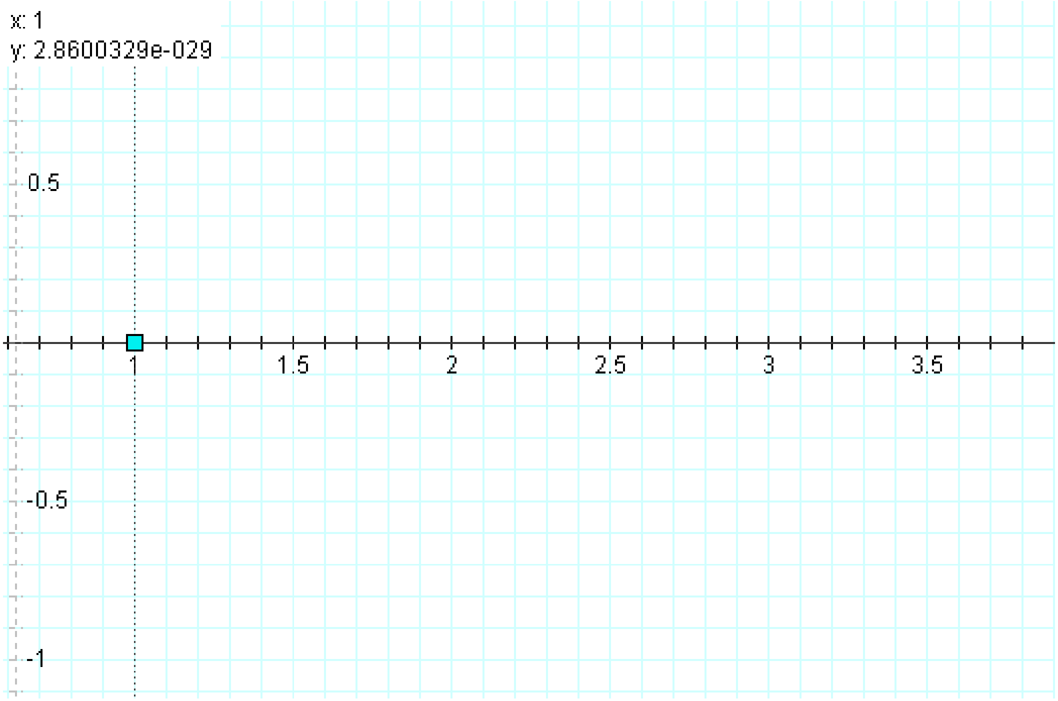

Figure (7) : here , for the photon's energy (511000 eV) (mass's energy of the electron)
We find the σ is (σ = 2.68e-29 m^2 = 0.268 barns) .

The summary :

from all of this figures , we can find negative values for the cross-section at some values of photon's energy , so we find by using the exponential attenuation equation ; the number of the photons will be increases in the beam that crossing the material instead of decrease of them .
So we obtained the same effect of the laser approximately and also with high energies .

References:

QUANTUM ELECTRODYNAMICS , Third Edition . : W. Greiner • J. Reinhart