Answer on Question #58994, Physics / Atomic and Nuclear Physics

is it any relation between energy of x rays and potential between anode and cathode during x ray production?

Solution:

Consider the braking X-rays. It is formed in the X-ray tube. To the anode and cathode applied the high voltage.

The kinetic energy of the electron is equal of the electric field work:

$$\frac{mv^2}{2} = |e|V \text{ (1)},$$

where e – electron charge (e=-1,6×10^{-19} C),

V – potential between anode and cathode

Electrons braked in contact with the surface of the tungsten anode.

The braking of electron generates the formation of X-ray photon.

The energy of the photon: $E = h\vartheta$ (2),

where υ – frequency of radiation,

h – Planck's constant (h=6,626×10^{-34} J× s)

We believe that all the kinetic energy of the electron is converted into energy photon.

Of (1) and (2) $\Rightarrow h\vartheta_{max} = |e|V$ (3)

If we assume that the part of electron energy is converted into heat energy, then we can write:

$h\vartheta + Q = |e|V$ (4),

where Q – heat energy

Answer:

$h\vartheta_{max} = |e|V$

$h\vartheta + Q = |e|V$