The energy levels in the Hydrogen atom are:

$E_n = -me^4 / (\varepsilon_0^2 8n^2h^2)$

A Helium atom has a nuclear charge of Ze, where Z=2. One of the electrons is removed leaving an atom that resembles a Hydrogen atom but with twice the nuclear charge. What are the energy levels in this atom?

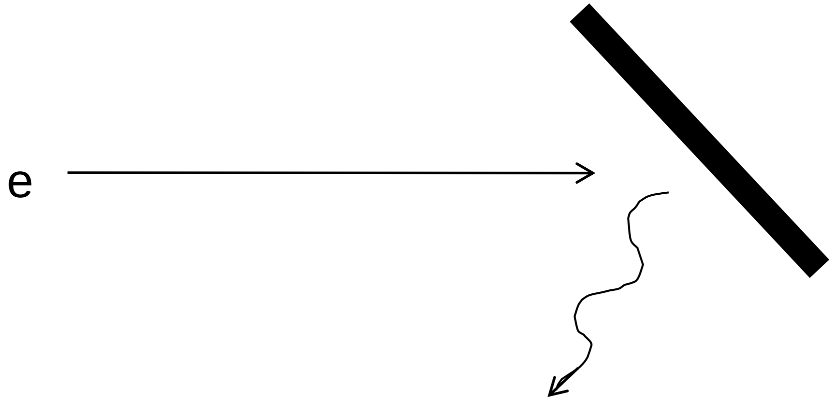
a) $E_n = -mZe^4 / (\varepsilon_0^2 8n^2h^2)$

b) $E_n = -mZ^2e^4 / (\varepsilon_0^2 8n^2h^2)$

c) $E_n = -mZ^4e^4 / (\varepsilon_0^2 8n^2h^2)$

d) $E_n = -me^4 / (\varepsilon_0^2 8(Zn)^2h^2)$

An electron that has been accelerated through a voltage V undergoes a large acceleration when it hits the target.

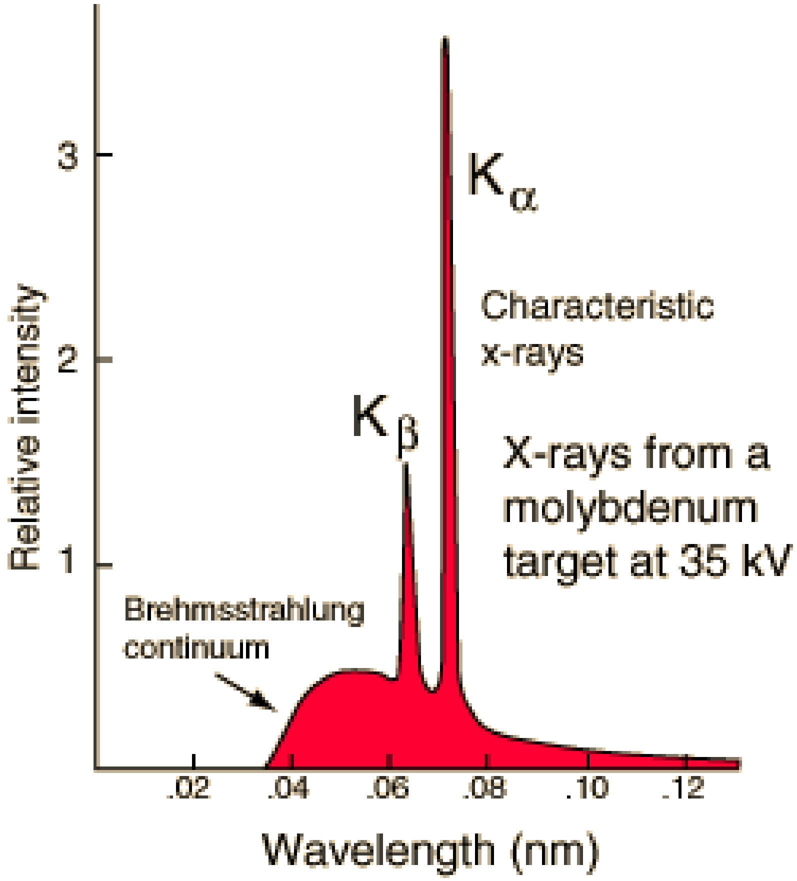


Is there a limit to the wavelength of electromagnetic radiation produced?

a) No

b) There is an upper limit on wavelength

c) There is a lower limit on wavelength



http://hyperphysics.phy-astr.gsu.edu/Hbase/quantum/xrayc.html

An electron is in the field of an EM plane wave. The electron is accelerated by the electric field, and therefore emits EM radiation. What would classical theory* predict is the wavelength of the emitted radiation?

a) A shorter wavelength than the plane wave.

b) A longer wavelength than the plane wave.

c) The same wavelength as the plane wave.

* This is called Thomson scattering

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THE

PHYSICAL REVIEW

A QUANTUM THEORY OF THE SCATTERING OF X-RAYS BY LIGHT ELEMENTS

By Arthur H. Compton

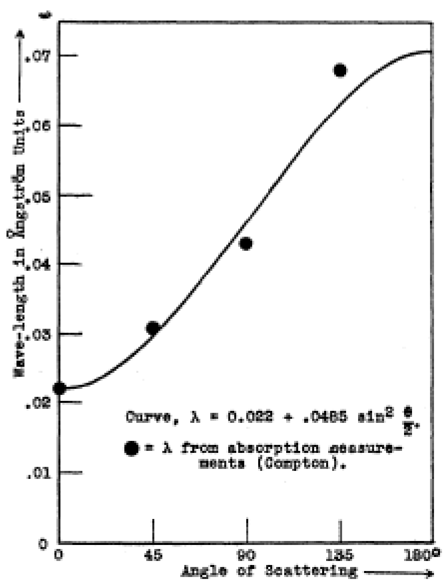


Fig. 5. The wave-length of scattered γ-rays at different angles with the primary beam, showing an increase at large angles similar to a Doppler effect.

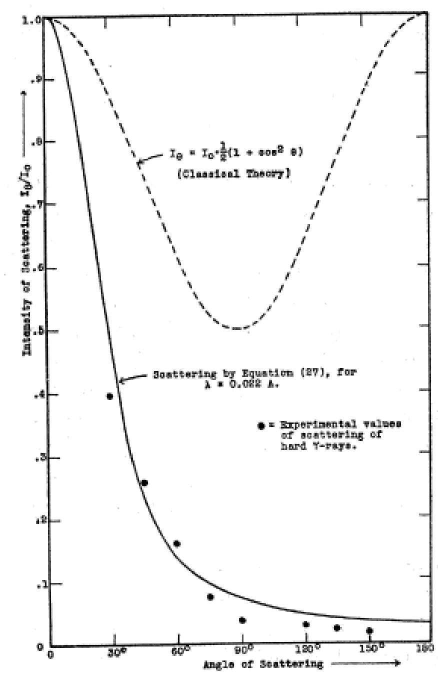
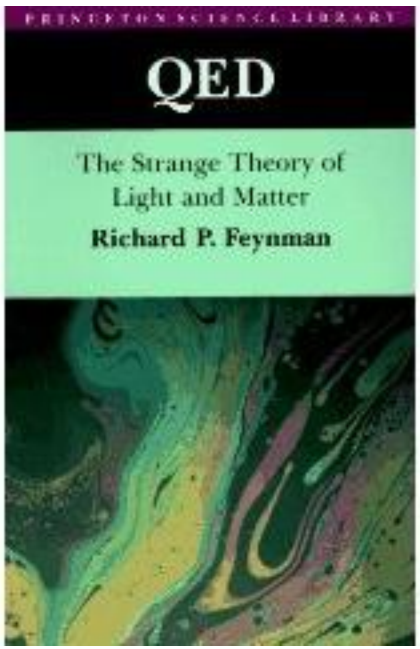


Fig. 7. Comparison of experimental and theoretical intensities of scattered γ-rays.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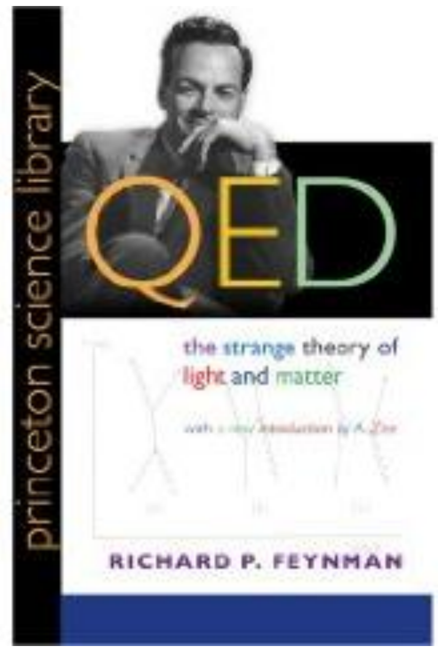
The Strange Theory of
Light and Matter
Richard P. Feynman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