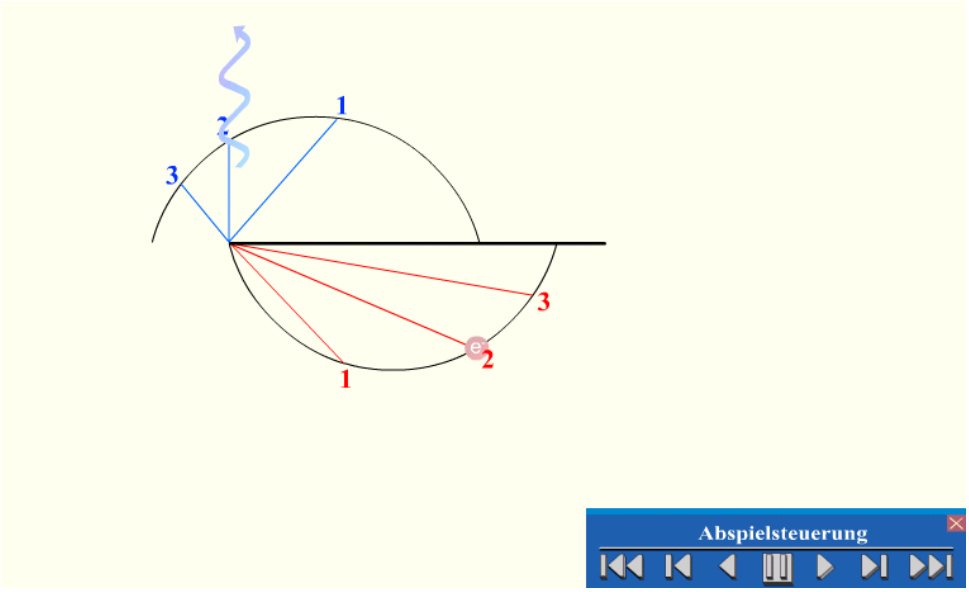


# Compton effect



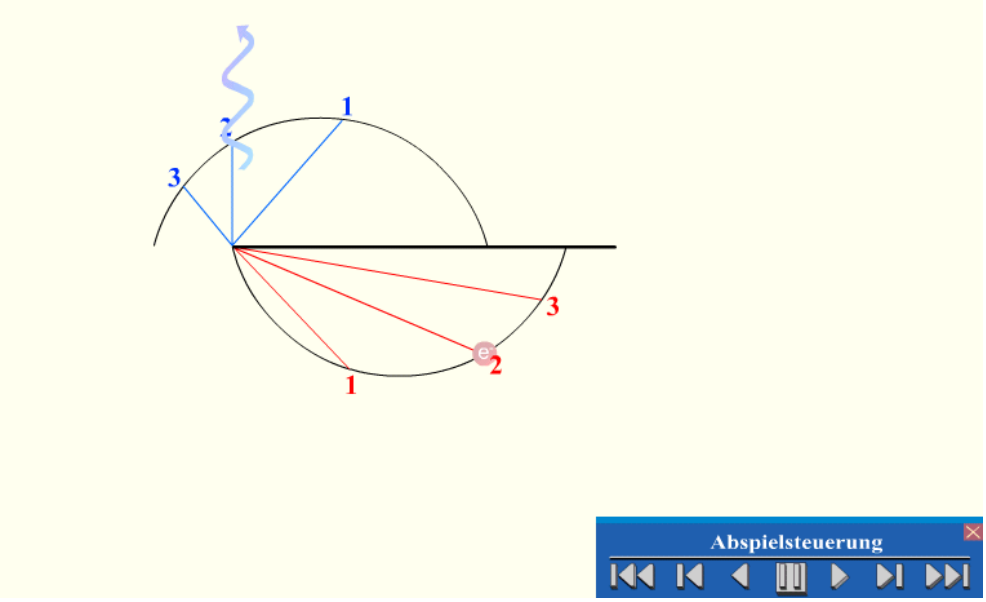

Authors: BIGS 2002 (C. Bluck, J. Gans, S. Stallmann, S. Vogel, Prof. Heimbrodt)

## Explanation

The photons of an x-ray collide with free electrons, transferring part of their impulse, and continue to move under the remaining impulse. These collisions are mainly oblique collisions:

$$p_P = p_e + p_{p'}$$

The electrons can be observed using a Roentgen spectrometer and the photons, with a reduced energy level following collision, using a Roentgen spectrometer




| | | |
|---|---|---|
| $\alpha$ | = | angle at which the electron is repelled by the x-ray |
| $\beta$ | = | angle at which the photon is diverted, with reduced energy, by the collision. |
| h | = | Planck constant |
| $\lambda$ | = | wavelength of x-ray |
| f | = | frequency |
| p | = | impulse |
| W | = | energy |
| c | = | speed of light |
| $m_e$ | = | mass of electron at rest |

In accordance with the energy and impulse equation, the following applies to the situation before and after the collision
(in relative terms)

$W + W_e = W' + W'_e$
$p = p'_e + p'_p$

$p'^2_e = p^2 + p'^2 - 2pp'\cos\beta$

The increase in the photon wavelength following the collision is determined by.

$\lambda' - \lambda = \Delta\lambda = h/(m_e * c) * (1 - \cos\beta)$