# LET

**Linear energy transfer (LET, radiation energy transfer over distance)** is a quantity typical for individual types of ionizing radiation. It gives the **energy** that a particle or photon imparts, relative to the distance it penetrates the surrounding medium. The overall trajectory of the particle or photon does not matter. The basic unit of LET is **J/m**. But the LET values are very small, so **keV/µm** is more often used.

## LET value

It is determined by the energy of the radiation entering the environment and its ability to interact with the environment.

- LET **increases with the charge** ***of the particle, the trajectory is affected by the attractive forces of the surrounding charges. Also, as the*** *particle size* increases, the LET increases, larger particles more often "bumping" into the surroundings.
- **Lower** LET shows **indirectly ionizing radiation'** (neutrons, γ-rays, X-rays). The relationship with size is similar, smaller passes better.

The unequal ability of individual types of radiation to transfer energy to the environment affects the so-called *effective H dose*. This is calculated as the original **dose D [Gy]** times the **radiation quality factor Q**. The resulting unit is **Sievert [Sv]**.

- For γ, β and X-ray radiation, Q=1;
- for α radiation with Q=20.

## Example

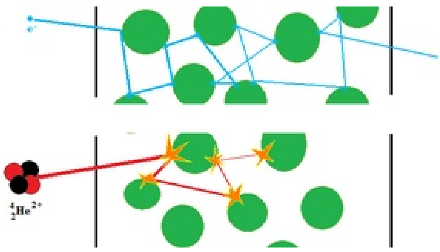
Diagram of energy transfer by radiation

Scheme of LET α particle and $\beta^-$ particle. Although α radiation has more energy, it quickly transfers it to the environment → high LET. $\beta^-$ particle reflects more easily, transmits less energy at the same distance → small LET.

## Links

### Related Articles

- Ionizing radiation
- Interaction of γ radiation with the electron shell
  - Photoelectric phenomenon
  - Compton scattering
  - Electron-positron pairs

### References


- BENEŠ, Jiří, Pravoslav STRÁNSKÝ a František VÍTEK. *Základy lékařské biofyziky : Basisübungen für alle Sportarten.* 2. vydání. Praha : Karolinum, 2007. 201 s. ISBN 978-80-246-1386-4.