

Chapter “Kerma Factor” for LEXFOR

(M. Mikhailiukova, N. Otsuka, M. Fleming, 2019-01-15, Memo 4C-4/219)

At the October 2014 EXFOR Workshop, S.Simakov presented a review of the situation regarding kerma factor data and highlighted the fact that there is no information about kerma factors in the LEXFOR manual.

At a Technical Meeting on Nuclear Reaction Data and Uncertainties for Radiation Damage, the participants encouraged the International Network of Nuclear Data Centres (NRDC) to compile the data of kerma factors (recommendation 21 in INDC(NDS)-0719).

In memo CP/N-132 (June 2016), the centres were requested to compile the published data of kerma factors.

To improve the LEXFOR manual we propose to add the following chapter:

Kerma Factors

Definition: Kerma (Kinetic energy released per unit mass) is the sum of the kinetic energies of the secondary (outgoing and residual) charged particles, per sample mass, from a reaction induced by an uncharged particle projectile. It is related to the energy differential cross section by

$$K = N \Phi \sum_i \int dE_i E_i (d\sigma/dE_i)$$

where N is the number of atom per unit mass, Φ is the incident particle flux, and E_i is the energy of the i -th secondary charged particle. The quantity $k = K / \Phi$ is known as the **kerma factor** (also known as kerma coefficient).

The kerma factor can be determined

- (1) directly by measurement of the absorbed dose and flux or
- (2) indirectly by measurement of the energy differential cross section.

Kerma Factor Units in articles: $\text{fGy} \cdot \text{m}^2 = 10^{+15} \text{ J/kg m}^2$ (**SI base units**)

$\text{rad cm}^2 = \text{erg/g cm}^2$ (**CGS base units**)

Conversion: $1 \text{ fGy} \cdot \text{m}^2 = 10^{+9} \text{ rad cm}^2$

REACTION Coding: KER in SF6.

Units: a code from Dictionary 25 with the dimension KER (*e.g.*, FGY*M2).

Examples:

(...(N,TOT),,KER) kerma factor summed over all secondary charged particles

(...(N,X)1-H-1,,KER) kerma factor for secondary protons

Reference U.J.Schrewe et al., Phys. Med. Biol. **45** (2000) 651.