Appendix A

Principal magnitudes of dosimetry

- **Absorbed dose, D:** is the quotient of $d\bar{\epsilon}$ by dm, where $d\bar{\epsilon}$ is the energy imparted by ionizing radiation to the matter in a volume element and dm is the mass of the matter in that volume element [8].

$$D = \frac{d\bar{\epsilon}}{dm} \qquad [Gy] = [JKg^{-1}] \tag{A.1}$$

- **Relative biological effectiveness, RBE:** is the quotient of the dose of a reference radiation to a given test radiation for the same biological effect[9].

$$RBE = \frac{Dose\ reference\ radiation}{Dose\ test\ radiation} \tag{A.2}$$

- **Linear Energy Transfer, LET:** or restricted linear electronic stopping power,L_Δ, of a material, for charged particles of a given type and energy, is the quotient of dE_Δ by dl,where dE_Δ is the mean energy lost by the charged particles due to electronic interactions in traversing a distance dl, minus the mean sum of the kinetic energies in excess of Δ of all the electrons released by the charged particles[10].

$$L_\Delta = \frac{dE_\Delta}{dl} \qquad [J\,m^{-1}], [ev\,m{-}1], [keV\,\mu m^{-1}] \tag{A.3}$$

  When $\Delta \to \infty$, LET coincides with the stopping power. LET is considered a primary factor in the effect of radiation in tissue. It allows to distinguish the different ionizing radiations by the biological damage.
  The ionizing radiation can be classified based on the LET:

  - Low LET radiation, such as electromagnetic radiations. This type of ionizing radiation deposits less amount of energy along the track or have infrequent or widely spaced ionizing events.
  - High LET radiation, such as charged particles and massive neutral particles. This type deposits a large amount of energy in a small distance.