Glossary

Absorbed dose
The fundamental dosimetric quantity D, defined as:

$$D = \frac{d\epsilon}{dm}$$

where $d\epsilon$ is the mean energy imparted by ionizing radiation to matter in a volume element and dm is the mass of matter in the volume element. The energy can be averaged over any defined volume, the average dose being equal to the total energy imparted in the volume divided by the mass in the volume. The SI unit of absorbed dose is the joule per kilogram ($J \cdot kg^{-1}$), termed the gray (Gy).

Accelerator
A device that accelerates charged particles (e.g., protons or electrons) to high speed, often used for the production of certain radionuclides or for treatment of radiation therapy patients.

Accident
Any unintended event, including operating errors, equipment failures or other mishaps, the consequences or potential consequences of which are not negligible from the point of view of protection or safety.

Activity
The quantity A for an amount of radionuclide in a given energy state at a given time, defined as:

$$A = \frac{dN}{dt}$$

where dN is the expectation value of the number of spontaneous nuclear transformations from the given energy state in the time interval dt. The SI unit of activity is the reciprocal second (s^{-1}), termed the becquerel (Bq).

Alpha particle
A nucleus of Helium ($^{4}_{2}$ He).

Annual Limit on Intake (ALI)
The intake by inhalation, ingestion or through the skin of a given radionuclide in a year by the reference man which would result in a committed dose equal to the relevant dose limit. The ALI is expressed in units of activity.

Authorization
A permission granted in a document by the regulatory authority to a legal person who has submitted an application to carry out a practice or any other action described in the general obligations for practices of the BSS. The authorization can take the form of a registration or a license.

Average mammary glandular dose
The theoretical average absorbed dose, D_g, in the mammary gland which, for purposes of mammography, can be calculated from:

$$D_g = D_{gN} X_a$$

where D_{gN} is the average absorbed dose in the mammary gland resulting from an incident exposure in air of 2.58×10^{-4} C·kg^{-1} and X_a is the incident exposure in air, and where for X ray tubes with molybdenum targets and molybdenum filters operating at 0.3 mm Al half-value layer and for a tissue composition of 50% adipose tissue and 50% gland, D_{gN} can be inferred from the following:

Breast thickness (cm)	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0
D_{gN}	2.2	1.95	1.75	1.55	1.4	1.25	1.15	1.05	0.95

D_{gN} is expressed in mGy per 2.58×10^{-4} C·kg^{-1}.

Beta particle
Negatively or positively charged electron, emitted during a radioactive decay process.

Collective dose
An expression for the total radiation dose incurred by a population, defined as the product of the number of individuals exposed to a source and their average radiation dose. The collective dose is expressed in man-sieverts (man·Sv).

Committed (effective) dose
An expression for the total radiation dose resulting from an incorporated radioactive substance in the body over an integration time taken as 50 years for adults and 70 years for children.

Computerized tomography (CT) scanner
Equipment for image acquisition using X rays with a computer system for tomographic reconstructions.

Contamination
The presence of radioactive substances in or on a material or the human body or other place where they are undesirable or could be harmful.

Controlled area
A controlled area is any area in which specific protection measures and safety provisions are or could be required for:
a) controlling normal exposures or preventing the spread of contamination during normal working conditions; and
b) preventing or limiting the extent of potential exposures.

Cosmic rays
Stream of atomic nuclei of heterogeneous extremely penetrating character that enters the earth's atmosphere from outer space at speeds approaching that of light.

Decentralization
Transfer of the decision-making process from the central to the local level.

Decontamination
The removal or reduction of contamination in or on materials, persons or the environment by a physical or chemical process.

Deterministic effect
A radiation effect for which generally a threshold level of dose exists above which the severity of the effect is greater for a higher dose.

Detriment
The total harm that would eventually be experienced by an exposed group and its descendants as a result of the group's exposure to radiation from a source.

Dose
A measure of the radiation received or "absorbed" by a target. The quantities termed absorbed dose, organ dose, equivalent dose, effective dose, committed equivalent dose or committed effective dose are used, depending on the context. The modifying terms are often omitted when they are not necessary for defining the quantity of interest.

Dose limit
The value of the effective dose or the equivalent dose to individuals from controlled practices that shall not be exceeded.

Effective dose
The quantity E, defined as a summation of the tissue equivalent doses, each multiplied by the appropriate tissue weighting factor:

$$E = \sum_T W_T \cdot H_T$$

where H_T is the equivalent dose in tissue T and W_T is the tissue weighting factor for tissue T. From the definition of equivalent dose, it follows that:

$$E = \sum_T W_T \cdot \sum_R W_R \cdot D_{T,R}$$

where W_R is the radiation weighting factor for radiation R, and $D_{T,R}$ is the average absorbed dose in the organ or tissue T. The unit of effective dose is $J \cdot kg^{-1}$, termed the sievert (Sv).

Electrometer
Device sensitive to small flows of electrical charge used with an ionization chamber for dosimetry purposes.

Electron
Atomic particle negatively charged.

Emergency plan
A set of procedures to be implemented in the event of an accident.

Employer
A legal person with recognized responsibility, commitment and duties towards a worker in his or her employment by virtue of a mutually agreed relationship. (A self-employed person is regarded as being both an employer and a worker.)

Entrance surface dose
Absorbed dose in the center of the field at the surface of entry of radiation for a patient undergoing a diagnostic radiology examination, expressed in air and with backscatter.

Equivalent dose
The quantity $H_{T,R}$, defined as:

$$H_{T,R} = D_{T,R} \cdot W_R$$

where $D_{T,R}$ is the absorbed dose delivered by radiation type R averaged over a tissue or organ T and W_R is the radiation weighting factor for radiation type R. When the radiation field is composed of different radiation types with different values of W_R, the equivalent dose is:

$$H_T = \sum_R W_R \cdot D_{T,R}$$

The unit of equivalent dose is $J \cdot kg^{-1}$, termed the sievert (Sv).

Exposure
The act or condition of being subject to irradiation. Exposure can be either external exposure (irradiation by sources outside the body) or internal exposure (irradiation by sources inside the body). Exposure can be classified as either normal exposure or potential exposure; either occupational, medical or public exposure; and, in intervention situations, either emergency exposure or chronic exposure. The term exposure is also used in dosimetry to express the amount of ionization produced in air by ionizing radiation (see average mammary glandular dose).

Gamma camera
Medical device utilized in nuclear medicine to determine and display the distribution of a radioisotope(s) incorporated in the patient. It is made up of a detector(s), collimators appropriate to the energy of the isotopes utilized, a system for archiving analogical or digital images for static and dynamic studies and a data processing system.

Gamma rays (gamma radiation)
Electromagnetic radiation emitted by atomic nuclei.

Gantry
Part of the support of a radiation emitting or radiation detector unit that normally encloses the source of radiation or the detectors.

Guidance level for medical exposure
A value of dose, dose rate or activity selected by professional bodies in consultation with the regulatory authority to indicate a level above which there should be a review by medical practitioners in order to determine whether or not the value is excessive, taking into account the particular circumstances and applying sound clinical judgement.

Half-life
Time in which the activity of a radionuclide decreases to half its initial value.

Half-value layer
Term used to express the quality of a photon beam of low and medium energy. It corresponds to the thickness of a material which reduces the radiation beam intensity to its half.

Intervention
Any action intended to reduce or avert exposure or the likelihood of exposure to sources which are not part of a controlled practice or which are out of control as a consequence of an accident.

Intervention level
The level of avertable dose at which a specific protective action or remedial action is taken in an emergency exposure situation or a chronic exposure situation.

Ionization
Any process that produces ion pairs.

Ionization (ion) chamber
A device for the detection of ionizing radiation or for measurements of dose and/or dose rate.

Ionizing radiation
For the purposes of radiation protection, radiation capable of producing ion pairs in biological material(s).

Isotopes
Nuclides that have the same atomic number but different mass number.

Kerma
Quotient K defined by as:

$$K = \frac{dE_{tr}}{dm}$$

being dE_{tr} is the sum of the initial kinetic energies of all charged ionizing particles liberated by uncharged ionizing particles in a material of mass dm. The SI unit of kerma is the joule per kilogram ($J \cdot kg^{-1}$), termed gray (Gy).

Kernel
Mathematical algorithm generally used in image reconstruction software programs.

Klystron
In a medical linear accelerator, component of the power supply circuit.

Levels of care
A stratified form of health service organization and delivery, the purpose of which is to achieve a balance in the quantity, variety, and quality of the health care services available to the population. This stratification is achieved through a deliberate process of re-organization aimed at combining health care programs, personnel, and technologies in a way that they are distributed and shared equitably by all users of health services. Functionally, levels of care correspond to sets of services. The least-complex service—the "primary care level"—comprehends the most basic activities of the health services system.

The other levels, or sets of services—generally termed "secondary", "tertiary," etc.—comprise services of increasing complexity and varying degrees of specialization.

License
An authorization granted by the regulatory authority on the basis of a safety assessment and accompanied by specific requirements and conditions to be complied with by the licensee.

Limit
The value of a quantity used in certain specified activities or circumstances that must not be exceeded.

Local health systems
Interrelated group of health resources, from within and outside the health sector, responsible for the health of a population in a defined geographic environment

Magnetron
In a medical linear accelerator, component of the power supply circuit.

Medical exposure
Exposure incurred by patients as part of their own medical or dental diagnosis or treatment; by persons, other than those occupationally exposed, knowingly while voluntarily helping in the support and comfort of patients; and by volunteers in a programme of biomedical research involving their exposure.

Member of the public
In a general sense, any individual in the population except, for the purposes of the BSS, when subject to occupational or medical exposure. For the purpose of verifying compliance with the annual dose limit for public exposure, the representative individual in the relevant critical group.

Natural sources
Naturally occurring sources of radiation, including cosmic radiation and terrestrial sources of radiation.

Neutron
Atomic particle without electric charge, with a mass approximately equal to that of the proton.

Normal exposure
An exposure which is expected to be received under normal operating conditions of an installation or a source, including possible minor mishaps that can be kept under control.

Nuclide
Atomic species characterized by its mass number, atomic number and nuclear energy level.

Occupational exposure
All exposures of workers incurred in the course of their work, with the exception of exposures excluded from the BSS and exposures from practices or sources exempted by the BSS.

Organ dose
The mean absorbed dose D_T in a specified tissue or organ T of the human body.

Penetration ratio
Term used to express the quality of high energy photon beams. It corresponds to the ratio of absorbed dose at two different depths using either a constant source-surface distance or a constant source-detector distance, depending on the irradiation conditions.

Phantom
An object used to simulate the absorption and scatter characteristics of the patient's body for radiation measurement or image quality assessment purposes.

Photon
A *quantum* of electromagnetic radiation that has the energy $h \cdot \nu$ where the h is Planck constant and ν the frequency.

Pixel
In a digital image it corresponds to the smallest area which contains information.

Planning target volume
A geometrical concept used in radiotherapy for planning treatment with consideration of the net effect of movements of the patient and of the tissues to be irradiated, variations in size and shape of the tissue, and variations in beam geometry such as beam size and beam direction.

Potential exposure
Exposure that is not expected to be delivered with certainty but that may result from an accident at a source or owing to an event or sequence of events of a probabilistic nature, including equipment failures and operating errors.

Practice
Any human activity that introduces additional sources of exposure or exposure pathways or extends exposure to additional people or modifies the network of exposure pathways from existing sources, so as to increase the exposure or the likelihood of exposure of people or the number of people exposed.

Proton
Atomic particle positively charged; the nucleus of the hydrogen atom.

Public exposure
Exposure incurred by members of the public from radiation sources, excluding any occupational or medical exposure and the normal local natural background radiation but including exposure from authorized sources and practices and from intervention situations.

Quality assurance (QA)
All those planned and systematic actions necessary to provide adequate confidence that a structure, system, component or procedure will perform satisfactorily complying with agreed standards.

Quality control (QC)
It is a part of quality assurance. The set of operations (programming, coordinating, implementing) intended to maintain or to improve quality. It covers monitoring, evaluation and maintenance at required levels of all characteristics of performance of equipment that can be defined, measured and controlled.

Qualified expert
An individual who, by virtue of certification by appropriate boards or societies, professional licenses or academic qualifications and experience, is duly recognized as having expertise in a relevant field of specialization, e.g. medical physics, radiation protection, occupational health, fire safety, quality assurance or any relevant engineering or safety specialty

Radiation generator
Device capable of generating radiation, such as x rays, neutrons, electrons or other charged particles, which may be used for scientific, industrial or medical purposes.

Radioactive decay
Exponential decrease of the activity of a radioactive substance; its transformation in its daughter products.

Radioactive waste
Material, whatever its physical form, remaining from practices or interventions and for which no further use is foreseen I) that contains or is contaminated with radioactive substances and has an activity or activity concentration higher than the level for clearance from regulatory requirements, and ii) exposure to which is not excluded from the BSS.

Radioactivity
Activity synonym.

Radioisotope
An isotope which is radioactive.

Radionuclide
A nuclide which is radioactive.

Radionuclide calibrator
Equipment made up of a detector system and an activity counter, utilized in nuclear medicine to calibrate different isotopes of common use.

Radionuclide generator
Device containing a relatively long-lived parent radionuclide solution from which a short-lived daughter can be separated by elution in the nuclear medicine laboratory. Examples: ^{99}Mo - ^{99m}Tc for diagnosis and ^{188}W - ^{188}Re for therapy.

Radon
The isotope ^{222}Rn of the element of atomic number 86.

Reference level
Action level, intervention level, investigation level or recording level. Such levels may be established for any of the quantities determined in the practice of radiation protection.

Regulatory authority
An authority or authorities designated or otherwise recognized by a government for regulatory purposes in connection with protection and safety.

Risk
A multiattribute quantity expressing hazard, danger or chance of harmful or injurious consequences associated with actual or potential exposures. It relates to quantities such as the probability that specific deleterious consequences may arise and the magnitude and character of such consequences.

Sealed source
Radioactive material that is permanently sealed in a capsule or closely bounded and in a solid form. The capsule or material of a sealed source shall be strong enough to maintain leaktightness under the conditions of use and wear for which the source was designed, also under foreseeable mishaps. Examples: ^{60}Co in radiation therapy and ^{192}Ir in brachytherapy.

Shielding
Material or structure the purpose of which is to reduce or attenuate a beam of ionizing radiation.

Source
Anything that may cause radiation exposure, such as by emitting ionizing radiation or releasing radioactive substances or materials.

SPECT and PET
Equipment for image acquisition in nuclear medicine, with a computer system for tomographic reconstructions. The SPECT (single photon emission computed tomography) uses photons, the PET (positron emission tomography) uses positrons.

Stochastic effects
Radiation effects, generally occurring without a threshold level of dose, the probability of which is proportional to the dose and the severity of which is independent of the dose.

Supervised area
Any area not designated as a controlled area but for which occupational exposure conditions are kept under review even though specific protective measures and safety provisions are not normally needed.

Unsealed source
A source that does not meet the definition of a sealed source.

Worker
Any person who works, whether full time, part time or temporarily, for an employer and who has recognized rights and duties in relation to occupational radiation protection. (A self-employed person is regarded as having the duties of both an employer and a worker.)

X rays
Electromagnetic radiation produced bombarding a substance with electrons accelerated to high velocity.