GLOSSARY OF BASIC RADIATION PROTECTION TERMINOLOGY

ABSORBED DOSE: The amount of energy absorbed, as a result of radiation passing through a material, per unit mass of material. Measured in rads (1 rad = 100 ergs/gm) or grays, the SI unit, where 1 gray = 100 rads.

ABSORPTION: Process by which energy from radiation is transferred to matter by interactions with the constituents of the matter. A result is a reduction in the intensity of the radiation.

ACTIVITY: The strength of a radioactive source, i.e. the number of radioactive atoms decaying per unit of time. (See Radioactivity) Measured in Curies or Bequerels, where 1 Curie = 3.7×10^{10} Bequerels.

ALPHA PARTICLE: A particle which is similar to the helium nucleus, consisting of two protons and two neutrons, but is stripped of its orbital electrons. It has a charge of +2 and is the least penetrating of the three common types of radiation. Usually a hazard only occurs when an alpha-emitting substance has entered the body by inhalation, ingestion or absorption through the skin.

ANNIHILATION RADIATION: Photons produced when a particle and its anti-particle interact and annihilate each other. The photons have an energy of 0.511 MeV each and are emitted in opposite (180°) directions.

ATOMIC NUMBER: The number of protons in the nucleus of an atom.

ATOMIC WEIGHT: Number approximately equal to the total number of protons and neutrons in the nucleus of an atom, i.e. the mass of an atom.

ATTENUATION: A reduction in the intensity of radiation as it passes through matter.

AVALANCHE: The buildup of ionization by electrons produced in a G-M tube by the primary ionization as the electrons drift toward the collector. The electrons gain energy when travelling toward the collector and in the last few mean free paths of the collector, undergo collisions and secondary ionization.

BACKGROUND: In measurements, the count obtained in the absence of a sample due to instrument noise, as well as other sources of natural background radiation.

BACKSCATTER: Reflection of radiation back in the direction of the detector as a result of interactions occurring in the sample holder, the sample itself, or the sample backing material.

BETA PARTICLE: A negatively charged particle emitted by the nucleus during radioactive decay, having the same charge and mass as an electron.

BIOLOGICAL HALF-LIFE: The time required for a biological system to eliminate one-half of the amount of substance that has entered it.

BREMSSTRAHLUNG: Electromagnetic radiation emitted when a charged particle undergoes acceleration. X-Rays are produced in this manner.

CERENKOV RADIATION: Visible light emitted by charge particles traveling through a transparent media faster than light can travel through that media.

COINCIDENCE CIRCUIT: An electromagnetic circuit that produces an output pulse only when input pulses arrive at the gates simultaneously or within a given interval of time.

COMMITTED EFFECTIVE DOSE EQUIVALENT: The sum of the products of the weighting factors applicable to each of the body organs or tissues that rae irradiated and the dose equivalent to organs or tissues of reference that will be received from an intake of radioactive material by an individual during the 50-year period following the intake.

COMPTON EFFECT: A collision between a photon and an electron in which the photon is scattered at a reduced energy and the electron, which gains kinetic energy in the collision, is ejected from the atom.

CONTAMINATION: See radioactive contamination.

CURIE: A unit of radioactivity corresponding to a disintegration rate of 3.7×10^{10} disintegrations per second. (SI unit is the Becquerel which equals 1 disintegration per second).

CUTIE PIE: A radiation survey meter of the ionization type used to determine exposure rate.

DEAD TIME: The time interval after which a pulse has occurred during which the detector system is insensitive to further ionizing events.

DECAY CONSTANT: The fraction of the number of atoms of a radioactive nuclide which will decay in a unit time interval.

DECAY, RADIOACTIVE: Spontaneous change in the state of a nuclide to another energy state of the same nuclide or into a different nuclide. Usually involves the emission of particles or photons.

DECONTAMINATION: Removal of radioactive contamination from where it is deposited.

DEEP DOSE EQUIVALENT: Applies to external whole body exposure and is the dose equivalent at a tissue depth of 1 cm.

DETECTOR: Material or device that is sensitive to radiation and can produce a signal suitable for measurement or analysis.

DISCRIMINATOR: Electronic circuitry which passes or blocks a pulse according to its pulse height or amplitude.

DISINTEGRATION, RADIOACTIVE: See DECAY, RADIOACTIVE.

DOSE EQUIVALENT: The sum of the products of the dose equivalent to each organ or tissue and the weighting factors applicator to each of the body organs or tissue that are irradiated. Dose Equivalent uses a newer set of weighting factors that are applicable to more organs and tissues then the Effective Dose Equivalent.

DOSE-RATE: Radiation dose per unit time.

DOSIMETER: A device used to measure the radiation exposure which a person has received. A film badge, TLD or pocket ionization chamber.

EFFECTIVE DOSE EQUIVALENT: The sum of the products of the dose equivalent to each organ or tissue and the weighting factor applicable to each of the body organs or tissues that are irradiated.

EFFECTIVE HALF-LIFE: See HALF-LIFE EFFECTIVE.

ELECTRON: Elementary particle with a unit negative electric charge and mass 1/1837 that of a proton. Positive electrons are called positrons.

ELECTRON CAPTURE: Radioactive decay of a nuclide in which an orbital electron is captured by the nucleus, forming a new nuclide with the same atomic weight but the atomic number is reduced by one.

ELECTRON VOLT: Amount of kinetic energy gained from an electron that has passed through a potential difference of one volt. Symbol eV.

EXCITED STATE: The state of an atom, molecule, nucleus, or electron when it possesses more than the normal energy.

EYE DOSE EQUIVALENT: External dose equivalent to the lens of the eye at a tissue depth of 0.3 cm.

FILM BADGE: A device consisting of photographic film and a holder which is used to determine the radiation exposure of the person wearing the device. The holder contains filters which allow the determination of the energy of the radiation exposing the film.

FLUORESCENCE: Absorption of radiation and the re-emission of radiation at the same or a different wavelength.

GAMMA RAY: Electromagnetic radiation emitted from the nucleus of an atom as a result of transformations occurring in the nucleus. Very penetrating radiation which must be shielded with a very dense material (usually lead bricks, glass etc.).

GEIGER-MULLER COUNTER: An ionizing chamber, operating in the geiger region, used to measure and detect radioactivity. Also called a G-M Counter.

HALF-LIFE: The period of time required for any given radioisotope to decrease to one-half of its original quantity.

HALF-LIFE, EFFECTIVE: Time required for a radionuclide contained in a biological system to reduce its activity to half as a result of physical decay and biological elimination.

HALF-VALUE LAYER: Thickness of any absorber required to reduce the intensity of a beam of radiation (X or Gamma) to one-half its original intensity. Synonym for half-value thickness.

IONIZATION: Process of adding or removing electrons from atoms or molecules, creating ions.

IONIZATION CHAMBER: Instrument used to detect or measure ionizing radiation by measuring the electrical current that flows when radiation ionizes gas or air in a chamber, making the gas or air a conductor of the electricity.

IONIZING RADIATION: Any radiation that ionizes atoms or molecules (i.e. alpha, beta, gamma rays, x-rays).

ION PAIR: A positive ion and an electron or negative ion produced by an ionizing event.

ISOTOPE: One of two or more atoms of the same element but with different atomic weights, i.e. nuclei of isotopes have the same number of protons but different numbers of neutrons.

keV: Symbol for kilo-electron volt or 1000 eV.

LINEAR AMPLIFIER: An electronic amplifier which produces an output pulse linearly proportional to the input pulse. Used in gamma scintillation counters and some liquid scintillation counters.

LINEAR ENERGY TRANSFER: A measure of the ability of biological material to absorb ionizing radiation; specifically for charged particles traversing a medium, the energy lost per unit length of path as a result of those collisions with electrons in which the energy loss is less than a specific maximum value. A similar quantity may be defined for photons.

LUMINESCENCE: Emission of light produced by interactions of radiation with certain chemicals or materials.

MEAN FREE PATH: The average distance traveled by a particle, atom or molecule between collisions or interactions.

MEAN LIFE: The average life of a radioactive atom. It is equal to the reciprocal of the decay constant or 1.44 times its half-life.

MeV: Symbol for one million electron volts, or 1000 keV.

NEUTRINO: An electrically neutral elementary particle with a negligible mass. Accounts for that part of beta decay energy not associated with the emitted beta particle.

NEUTRON: An uncharged elementary particle with a mass slightly greater than that of a proton, found in the nucleus of an atom.

NUCLIDE: A species of an atom characterized by the makeup of its nucleus. The atom must exist for a measurable amount of time.

PAIR PRODUCTION: An absorption process for x- and gamma radiation in which the incident photon is annihilated in the vicinity of the nucleus of the absorbing atom. As a result of the interaction, an electron-positron pair is produced. The incident energy of the photon must be greater than 1.022 MeV.

PERSONNEL MONITORING: Determination by either physical or biological measurement of the amount of ionizing radiation to which a person has been exposed. (i.e. film badges, or measurements of urine or thyroid)

PHOTOCATHODE: Component of a PHOTOMULTIPLIER TUBE which absorbs photons emitted by a scintillator or other light source and emits a photo-electron in the process.

PHOTOELECTRIC EFFECT: An inelastic collision between a photon and an orbital electron in which the electron is ejected from the atom.

PHOTOELECTRON: The electron ejected from an atom as a direct result of an interaction with a photon.

PHOTOMULTIPLIER TUBE (PM Tube): A photo-tube containing a PHOTOCATHODE as a source of PHOTOELECTRONS. The PHOTOELECTRONS are then amplified by a dynode series and collected at the anode, producing an output pulse proportional to the number of photoelectrons released.

PHOTON: A quantum of electromagnetic radiation. The energy of the photon of frequency v is equal to hv where h is Planck's constant.

POSITRON: An elementary particle with the mass of an electron but unit positive charge.

PROPORTIONAL COUNTER: A radiation detector which produces an output pulse proportional in amplitude to the energy of the incident radiation.

PROTON: An elementary particle with a single positive electrical charge, i.e. the nucleus of an ordinary or light hydrogen atom. All nuclei of all atoms contain protons.

PULSE HEIGHT ANALYZER: An electronic circuit which sorts pulses according to height or voltage.

QUALITY FACTOR: The factor by which absorbed dose (rads or grays) is to be multiplied to obtain a quantity (rems or Sieverts) that expresses on a common scale the radiation dose. The quality factor for x- and gamma rays is equal to one.

QUENCHING: A reduction in the total photon output of a sample which results from a reduction in energy transfer efficiency.

RAD (Radiation Absorbed Dose): Unit of absorbed dose. One RAD is equal to the absorption of 100 ergs of energy per gram of absorbing material or the SI unit of grays, where 1 gray = 100 rads.

RADIATION: The emission and propagation of energy by means of photons or high speed particles.

RADIATION AREA: Any area in which a person's body could receive a dose of 5 mRem in one hour or in 5 consecutive days, a dose of 100 mRem.

RADIOACTIVE CONTAMINATION: Radioactivity deposited on any material or structure where it will become a health hazard or source of radiation.

RADIOACTIVITY: The spontaneous decay of an excited atomic nucleus usually accompanied by the emission of ionizing radiation and/or particulate radiations.

RADIOACTIVE DECAY: See DECAY, RADIOACTIVE.

RADIOACTIVE STANDARD: An amount of radioactive material, the activity of which is known to a high degree of precision. Used to calibrate radiation measuring equipment and for comparing measurements.

RADIOISOTOPE: An unstable isotope of an element that decays or disintegrates spontaneously, emitting radiation.

RECOVERY TIME: Time required for complete recovery of the pulse size after the end of the deadtime interval.

REM (Roentgen Equivalent Man): A unit dose of dose equivalent that expresses on a common scale, the biological damage incurred by an exposed person. The dose in REMs is equal to the product of the dose in RADs times a quality factor and a modifying factor.

RESOLVING TIME: The minimum time interval by which two impulses must be separated to be detected as separate pulses.

ROENTGEN: That amount of x- or gamma radiation which produces, in 1 cubic centimeter of air under standard conditions, ions carrying 1 electrostatic unit of electrical charge of either sign.

SCALER: An instrument for rapid counting and registering of radiation-induced pulses from radiation detectors.

SCINTILLATION COUNTER: An instrument that detects and measures ionizing radiation by counting and analyzing the photons produced by absorption of radiation in certain materials.

SELF-ABSORPTION: The absorption of radioactive material by the radioactive substance itself.

SHALLOW DOSE EQUIVALENT: Applies to external exposure of the skin or an extremity and is the dose equivalent at a tissue depth of 0.007 cm averaged over an area of 1 cm^2.

SHIELD: Material used to absorb radiation and protect personnel from radiation exposure.

SPECIFIC ACTIVITY: The activity of a radioisotope per unit mass of the sample.

SPECTRUM: A visual display or plot of the distribution of the intensity of a given type of radiation as a function of its energy or some other quantity.

SPILL: An accidental release of radioactive material.

SURVEY METER: A hand-held portable radiation detection instrument designed for surveying or monitoring an area for the presence of radioactive material.

THERMOLUMINESCENT DOSIMETER (TLD): A device used to measure the radiation dose to an individual wearing the device. The device contains a small amount of LiF which absorbs energy from the radiation and when heated will remit the energy in the form of light. The emitted light is measured by a PMT.

TOTAL EFFECTIVE DOSE EQUIVALENT: The sum of the deep dose equivalent for external exposures and the committed effective dose equivalent for internal exposures.

X-RAY: Electromagnetic radiation emitted when orbital electrons of an excited atom return to their ground or normal state (characteristic x-rays). X-Rays are also emitted when high speed electrons strike a metal target (bremmstrahlung).