
British Standard Glossary of

Electrotechnical, power, telecommunication, electronics, lighting and colour terms

Part 5. Terms particular to electromedical equipment
Group 01. Radiology and radiological physics terminology

Glossaire des termes relatifs à l'électrotechnique, aux télécommunications, à l'électronique,
à l'éclairage et à la couleur

Partie 5. Termes particuliers aux appareils d'électricité médicale

Groupe 01. Terminologie relative à la radiologie et à la physique de la radiologie

Begriffe der Elektrotechnik, Fernmeldetechnik, Elektronik, Lichttechnik und Farbphysik

Teil 5. Elektromedizinische Geräte; Begriffe

Gruppe 01. Terminologie der Radiologie und Strahlenphysik

Guide to the glossary

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Titles to any further groups will be added in due course.

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Titles to any further groups will be added in due course.

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Titles to any further groups will be added in due course.

Part 5 Terms particular to electromedical equipment

- Group 01 Radiology and radiological physics terminology**

Titles to any further groups will be added in due course.

*Not yet published, as at October 1985

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Foreword

This Group of Part 5 of BS 4727, prepared under the direction of the Health Care Standards Committee, contains terms and definitions relating to radiology and radiological physics. It supersedes BS 2597 : 1955 which is withdrawn. The terms and definitions given in this British Standard Glossary are technically identical with the corresponding terms appearing in IEC Publication 50(881) : 1984 which is an advance edition of Chapter 881 of the International Electrotechnical Vocabulary.

The glossary is divided into five main Parts, each of which is further subdivided into Groups. Each Group will comprise the terms and definitions used in a particular branch of electrical engineering and will be issued individually as soon as it is completed. This arrangement makes it possible to add new Groups or revise existing Groups at any time without affecting the remainder of the glossary.

The five main Parts of the glossary are as follows;

- Part 1 Terms common to power, telecommunications and electronics
- Part 2 Terms particular to power engineering
- Part 3 Terms particular to telecommunications and electronics
- Part 4 Terms particular to lighting and colour
- Part 5 Terms particular to electromedical equipment

Fundamental and general terms common to power, telecommunications and electronics respectively form the first two Groups of Part 1. General terms particular to Part 2 and Part 3 similarly form the first Groups of their respective Parts. The specialist Groups contain only the terms and definitions relating to their subject.

As far as has been practicable all terms and definitions established in current usage and falling within the scope of this glossary have been included. Experience has shown that it is rarely possible to replace, or even to modify, a well established term no matter what the logical or aesthetic shortcomings of that term may be. Current usage has therefore been accepted as the authority for terms and their meanings except where there has been a very good reason for doing otherwise, e.g. where terms have been considered to be fundamentally wrong, ambiguous, superfluous or in need of standardization. Where two or more synonymous terms are in use, those which are deprecated are omitted from the body of the text but are entered in the alphabetical index with a cross-reference to the standard term. In cases where it was felt that the time was not yet right to deprecate a synonym, preferred terms are given first and other terms are printed in less prominent type to indicate the intention to deprecate them in the course of time. Where synonyms are considered of equal value they are shown in the same type.

Where terms are used with somewhat different meanings in different branches of electrical engineering, appropriate definitions are given in the Groups of the glossary corresponding to these branches. Such a definition, when taken out of the context of its Group, should always be quoted with a preamble indicating its proper context.

It is to be noted that the given definition of a term represents the generally accepted meaning of that term. Under no circumstances should it be regarded as taking the place of a specification.

An effort has been made to arrange the terms in a logical order proceeding from the general to the specific and from the whole to the part and placing allied terms in proximity. Each term has assigned to it a Part number (one digit) and a Group number of two digits followed by a space and four digits, the first digit of which represents the section, the second digit the subsection and the last two digits the place within the subsection. The International Electrotechnical Vocabulary employs a different numbering system and for convenience the IEV number is given in parentheses after the BS number for each term.

A general view of the arrangement of the Group in the glossary can be obtained from the guide to the glossary. An alphabetical index of the terms of the Group is provided at the end to facilitate reference to particular terms.

For simplicity, only the last four digits of a term's number are quoted in the index. It is recommended that the user of any Group of the glossary should consider the Group in association with the Groups covering general or fundamental terms within the Part, for Parts 2 and 3, and also together with Groups 01 and 02 of Part 1.

In this glossary parentheses () enclose words or phrases that are not part of the term or definition and can be omitted without affecting the meaning.

Square brackets [] enclose words which may replace a preceding part of an expression.

Attention is drawn to BS 6641 which includes some of the terms appearing in this Group of Part 5 of BS 4727. BS 6641 has a specialized purpose, namely to provide definitions of radiological terms which are used in British Standards which form Sections of BS 5724. Whereas BS 4727 reflects current usage of the terms listed, BS 6641 contains some terms which are at present relatively unfamiliar. Differences between definitions in the two British Standards are mainly editorial but some are technical. In case of difference, the definitions given in BS 6641 are to be preferred for use in connection with BS 5724.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Glossary

501 1 (881-01) General terms: domains, subdivisions and personnel

No.	Term	Definition
501 1001 (881-01-01)	radiology	The fields of application of ionizing radiation, e.g. medical radiology and industrial radiology.
501 1003 (881-01-03)	nuclear medicine	The field of medicine in which radionuclides are used for diagnosis or therapy.
501 1004 (881-01-04)	radiation physics	That part of physics which deals with the properties and physical effects of radiation. NOTE. This term usually refers to ionizing radiation but other radiation may be included.
501 1005 (881-01-05)	radiological physics	That branch of physics which deals with the medical and industrial application of ionizing radiation.
501 1006 (881-01-06)	radiation biology	The branch of biology which deals with the effects of radiation on living organisms.
501 1007 (881-01-07)	biophysics	The science of physical phenomena and processes in living organisms.
501 1008 (881-01-08)	medical radiology	The applications of ionizing radiation in medicine.
501 1009 (881-01-09)	diagnostic radiology	Medical radiology applied to diagnosis.
501 1010 (881-01-10)	radiotherapy	Medical radiology applied to therapy.
501 1011 (881-01-11)	health physics	That part of physics relating to all scientific and professional aspects concerning the protection of man against the detrimental effects on health of environmental conditions.
501 1012 (881-01-12)	radiation hygiene	The special practices intended to maintain health in the presence of radiation hazards.
501 1013 (881-01-13)	radiation protection	That branch of science and technology which deals with the protection of persons and their environment against deleterious effects arising from ionizing and non-ionizing radiation.
501 1014 (881-01-14)	radiological protection	Radiation protection in radiology.
501 1015 (881-01-15)	radiologist	In medical radiology, a medical specialist employing ionizing radiation for the diagnosis or treatment of disease.
501 1016 (881-01-16)	radiotherapist	A radiologist employing ionizing radiation for radiotherapy.
501 1017 (881-01-17)	radiation physicist	A physicist dealing with the theoretical, experimental, or applied aspects of radiation, usually ionizing radiation.
501 1018 (881-01-18)	X-radiation technician	A technical assistant in the practical application of X-radiation, diagnostic or therapeutic; or industrial or scientific.
501 1019 (881-01-19)	radiographer	A person specializing in the practical application of radiation in diagnostic radiology, radiotherapy or industrial radiography.

No.	Term	Definition
501 1021 (881-01-21)	isotope technician	A technical assistant in the practical application of radionuclides.
501 1022 (881-01-22)	radiation protection technician	A person carrying out work for radiation protection.
501 1023 (881-01-23)	radiation safety officer	A person charged with the organization of radiation protection.

501 2 (881-02, 881-03, 881-04) Ionizing radiations

501 21 (881-02) Ionizing radiations: types and properties

501 2101 (881-02-01)	radiation	Emission or propagation of energy in the form of waves or particles.
501 2102 (881-02-02)	particle	Minute portion of matter or energy.
501 2103 (881-02-03)	corpuscle	A particle with a rest mass.
501 2104 (881-02-04)	photon	The elementary quantity of energy of electromagnetic radiation. For electromagnetic energy of frequency ν , the quantum energy is $h\nu$, where h is Planck's constant. NOTE. A photon is an elementary particle without a rest mass.
501 2105 (881-02-05)	ionizing radiation	Radiation consisting of directly or indirectly ionizing particles (including photons) or a mixture of both. NOTE. By convention, visible and ultra-violet radiation are excluded.
501 2106 (881-02-06)	directly ionizing radiation; directly ionizing particles	Radiation comprising charged particles (electrons, protons, alpha-particles, etc.) having sufficient kinetic energy to produce ionization by collision.
501 2107 (881-02-07)	indirectly ionizing radiation; indirectly ionizing particles	Radiation comprising uncharged particles (neutrons, photons) which can liberate directly ionizing particles or can initiate nuclear transformations.
501 2108 (881-02-08)	heterogeneous radiation	Ionizing radiation consisting of photons of various energies, or corpuscles of one kind having different kinetic energies.
501 2109 (881-02-09)	mixed radiation	Ionizing radiation consisting of different kinds of particles (for example, corpuscles and photons).
501 2110 (881-02-10)	monoenergetic radiation	Ionizing radiation consisting of photons with nearly the same energy, or corpuscles of one kind having nearly the same kinetic energy.
501 2111 (881-02-11)	natural radiation	Ionizing radiation at a point attributable to natural sources, including those in the terrestrial environment, such as those in living organisms and extra-terrestrial sources.
501 2112 (881-02-12)	man-made radiation	Ionizing radiation emitted by artificial or concentrated natural, radioactive material or resulting from the operation of high voltage apparatus, such as X-ray apparatus or particle accelerators, or nuclear reactors, or from nuclear explosions.

No.	Term	Definition
501 2113 (881-02-13)	background radiation; ambient radiation	Ionizing radiation from any origin, natural or artificial, other than the radiation it is desired to detect or measure.
501 2114 (881-02-14)	annihilation radiation	Radiation that is produced when a particle and its antiparticle interact and cease to exist. NOTE. When, for example, a decelerated positron and an extra-nuclear electron interact, usually two quanta of energy equal to 0.511 MeV are emitted in opposite directions.
501 2115 (881-02-15)	nuclear radiation	Radiation emitted from atomic nuclei: alpha and beta particles, neutrons, gamma radiation, etc.
501 2116 (881-02-16)	X-radiation; X-rays	Radiation consisting of photons, other than gamma radiation, comprising bremsstrahlung or characteristic radiation and having energies much higher than those of visible light.
501 2117 (881-02-17)	gamma radiation; gamma rays	Radiation consisting of photons emitted in the process of nuclear transformation or of particle annihilation.
501 2118 (881-02-18)	bremsstrahlung	Radiation consisting of photons produced by the deceleration or acceleration of charged particles, usually upon passing through the electric field of nuclei.
501 2119 (881-02-19)	spectrum	The distribution of the values of a specific radiation quantity with respect to particle energy (or wavelength or frequency for photons); for corpuscular radiation, the distribution of the number of particles emitted with respect to kinetic energy.
501 2120 (881-02-20)	continuous X-ray spectrum	Spectrum of X-radiation, excluding characteristic radiation, having a maximum photon energy that is equal to the product of the electron charge and the maximum acceleration voltage.
501 2121 (881-02-21)	characteristic radiation	X-radiation with a discontinuous energy spectrum emitted in the transition of atoms from an excited state of the electron shell to a lower state.
501 2122 (881-02-22)	radiation quality	The characteristic of ionizing radiation determined by the spectral distribution of radiation with respect to energy or wavelength. It is usually expressed in terms of effective wavelength, effective energy, half-value layer, or X-ray tube voltage, waveform and filtration.
501 2123 (881-02-23)	Grenz rays	X-radiation generated with X-ray tube voltages below about 20 kV.
501 2124 (881-02-24)	Cerenkov radiation	Electromagnetic radiation produced by the passage of electrons or other charged particles through a substance at speeds greater than the speed of light in that substance.
501 2125 (881-02-25)	inverse square law	The statement that in the absence of attenuation by matter, energy fluence rate, particle fluence rate, exposure rate, or kerma rate (of radiation) from a point source is inversely proportional to the square of the distance from the source.
501 2126 (881-02-26)	radioactivity	The property of certain nuclides of spontaneously emitting corpuscles or gamma radiation, or of emitting X-radiation following orbital electron capture, or of undergoing spontaneous nuclear fission.

No.	Term	Definition
501 2127 (881-02-27)	nuclear disintegration	The transformation of a nucleus involving nuclear fission or the emission of particles.
501 2128 (881-02-28)	radioactive decay	a) A spontaneous nuclear transformation in which corpuscles or gamma radiation are emitted, or X-radiation is emitted following orbital electron capture, or the nucleus undergoes spontaneous nuclear fission. b) The decrease with time, by spontaneous nuclear transformation, of the activity of a radioactive substance or a mixture of such substances.
501 2129 (881-02-29)	natural radioactivity	Radioactivity of naturally occurring radioactive material.
501 2130 (881-02-30)	induced radioactivity	Radioactivity induced by irradiation.
501 2131 (881-02-31)	artificial radioactivity	Radioactivity which is not natural radioactivity.
501 2132 (881-02-32)	radioactive equilibrium	In a radioactive series for which the radioactive half-life of the precursor is longer than that of any other member of the series, the state which prevails when the ratios between the activities of successive members of the series remain constant.
501 2133 (881-02-33)	secular equilibrium	In a radioactive series for which the radioactive half-life of the precursor is very much longer than that of any other member of the series, the state that prevails when the activities of all members of the series are equal.
501 2134 (881-02-34)	transmutation	The transformation of a nuclide of one element to a nuclide of another element, by means of a nuclear reaction.
501 2135 (881-02-35)	nuclide	A species of atom characterized by its mass number and atomic number.
501 2136 (881-02-36)	radionuclide	A radioactive nuclide.
501 2137 (881-02-37)	isotopes	Nuclides having the same atomic number but different mass numbers.
501 2138 (881-02-38)	radioisotope	A radioactive isotope of a specified element.
501 2139 (881-02-39)	radioelement	A chemical element having one or more naturally occurring radioisotopes.
501 2140 (881-02-40)	isotones	Nuclides having the same number of neutrons, but different atomic numbers.
501 2141 (881-02-41)	isobars	Nuclides having the same mass number, but different atomic numbers.
501 2142 (881-02-42)	nucleus	The central part of an atom, composed of protons and neutrons, possessing a positive charge and containing nearly all the mass of the atom.
501 2143 (881-02-43)	metastable state	An excited state of an atomic nucleus, with a relatively long radioactive half-life (see nuclear isomeric transition, 501 2245).

No.	Term	Definition
501 2144 (881-02-44)	nuclear isomer	A nucleus in a metastable energy state. NOTE. Nuclear isomers have identical mass numbers and atomic numbers.
501 2145 (881-02-45)	elementary particle	A particle presently considered to be a non-dissociable entity, as distinguished from those which are considered to be assemblies, such as nuclei and ions. Examples are: photons, electrons, protons, neutrons, mesons, baryons.
501 2146 (881-02-46)	antiparticle	The antiparticle of an elementary particle has the same mass and spin as the particle, with an electric charge (if any) that is opposite in sign. Examples are: electron and positron, proton and antiproton.
501 2147 (881-02-47)	particle beam	A unidirectional or approximately unidirectional stream of free particles of limited cross-sectional area.
501 2148 (881-02-48)	nucleon	Proton or neutron forming part of the atomic nucleus.
501 2149 (881-02-49)	mass number (<i>A</i>)	The number of nucleons in an atomic nucleus.
501 2150 (881-02-50)	atomic number (<i>Z</i>)	The number of protons in an atomic nucleus.
501 2151 (881-02-51)	proton	A stable elementary particle having a positive charge of $1.602\ 19 \times 10^{-19}$ C and a rest mass of $1.672\ 65 \times 10^{-27}$ kg.
501 2152 (881-02-52)	neutron	An elementary particle having no electric charge, a rest mass of $1.674\ 95 \times 10^{-27}$ kg, and a mean life in the free state for β -decay of approximately 1 000 s.
501 2153 (881-02-53)	slow neutron	Neutron of kinetic energy less than some specified value. This value may vary over a wide range, and depends upon the application. For example, in reactor physics the value is frequently chosen to be 1 eV.
501 2154 (881-02-54)	thermal neutron	One of a group of neutrons in thermal equilibrium with the surrounding material.
501 2155 (881-02-55)	intermediate neutron; epithermal neutron	Neutron of kinetic energy between the energies for slow and fast neutrons. For example, in reactor physics the range is frequently chosen to be from 1 eV to 0.1 MeV.
501 2156 (881-02-56)	fast neutron	Neutrons of kinetic energy greater than some specified value. This value may vary over a wide range and depends upon the application. For example, in reactor physics the value is frequently chosen to be 0.1 MeV.
501 2157 (881-02-57)	electron	A stable elementary particle having an electric charge of $\pm 1.602\ 19 \times 10^{-19}$ C and a rest mass of 9.1095×10^{-31} kg. When used without specification the term means a negatively charged electron.
501 2158 (881-02-58)	positron	An electron with positive charge.
501 2159 (881-02-59)	beta particle	An electron, of positive or negative charge, emitted by an atomic nucleus in a nuclear transformation.

No.	Term	Definition
501 2160 (881-02-60)	beta radiation; beta rays	Radiation composed of beta particles.
501 2161 (881-02-61)	delta radiation; delta rays	Electrons, having sufficient energy to produce excitation or ionization, that are impelled by charged particles moving through matter.
501 2162 (881-02-62)	cathode rays <i>deprecated</i>	Stream of electrons emitted from the surface of a cathode.
501 2163 (881-02-63)	deuteron	The nucleus of deuterium, which is the hydrogen isotope of mass number 2.
501 2164 (881-02-64)	triton	The nucleus of tritium, which is the hydrogen isotope of mass number 3.
501 2165 (881-02-65)	alpha particle	A stable particle having the same bound configuration of 2 protons and 2 neutrons as a helium-4 nucleus, emitted during nuclear disintegration.
501 2166 (881-02-66)	alpha radiation; alpha rays	Radiation composed of alpha particles.
501 2167 (881-02-67)	muon	An elementary short-lived charged particle whose mass is between the mass of the electron and that of the proton.
501 2168 (881-02-68)	pion; π-meson	Elementary short-lived particle with mass approximately 270 times the mass of the electron. NOTE. There are three pions: π^+ , π^- and π^0 .
501 2169 (881-02-69)	neutrino	A stable elementary particle with zero charge and a rest mass less than one-thousandth that of the electron.
501 2170 (881-02-70)	ion	An atom or molecule or fragment of a molecule possessing a net electric charge.
501 2171 (881-02-71)	excitation	The process by which a system — such as an atom or a nucleus — is transferred from one energy level to another, higher level.
501 2172 (881-02-72)	ionization	The formation of ions by the division of molecules or by the addition to, or removal of electrons from, atoms or molecules.
501 2173 (881-02-73)	columnar ionization	Very dense ionization along the path of a charged ionizing particle in a gas.
501 2174 (881-02-74)	ion cluster	A group of ions close together, along or near the path of an ionizing particle.
501 2175 (881-02-75)	ionization path	The trail of ion clusters produced by an ionizing particle in its passage through matter.
501 2176 (881-02-76)	recombination	Interaction between a negative and a positive charge carrier with resulting neutralization of their charges and conservation of their masses.
501 2177 (881-02-77)	mobility	<i>Of a particle.</i> The ratio of the average drift velocity to the electric field strength for a charged particle in a specified medium.

No.	Term	Definition
501 2178 (881-02-78)	energy dependence	The change in the response of a physical or biological system with a change in the energy of radiation.
501 2179 (881-02-79)	luminescence	A phenomenon in which certain substances, when irradiated, emit light of wavelength characteristic of the substance.
501 2180 (881-02-80)	phosphorescence	Luminescence that continues for an appreciable time after excitation.
501 2181 (881-02-81)	fluorescence	Luminescence that occurs essentially only during irradiation.
501 2182 (881-02-82)	thermoluminescence	Luminescence released by heating a substance previously irradiated.
501 2183 (881-02-83)	scintillation	Luminescence of short duration (of the order of a few micro-seconds or less) caused by an ionizing particle.
501 2184 (881-02-84)	photoelectric effect	The complete absorption of a photon by an atom with the emission of an orbital electron.
501 2185 (881-02-85)	photoelectron	The electron ejected from an atom in the photoelectric effect.
501 2186 (881-02-86)	Compton effect	The interaction of an X-ray or gamma-ray photon and an electron, relatively loosely bound to an atom, resulting in the ejection of the electron from its atom with a certain kinetic energy and of a scattered photon carrying the remaining energy.
501 2187 (881-02-87)	Compton electron; recoil electron	An electron ejected from an atom as a result of the Compton effect.
501 2188 (881-02-88)	Compton shift	The increase in wavelength corresponding to the decrease in energy between incident and emergent photon in the Compton effect.
501 2189 (881-02-89)	Compton scattering	Incoherent scattering of photons by the Compton effect.
501 2190 (881-02-90)	pair production	The simultaneous formation of a positron and an electron as a result of the interaction of a photon of sufficient energy with the field of a nucleus.
501 2191 (881-02-91)	annihilation	Interaction between a particle and its antiparticle with resulting disappearance of them and emission of particles different in their nature.
501 2192 (881-02-92)	filtration	<i>Of radiation.</i> Modification of the characteristics of ionizing radiation by its passage through matter of stated form and composition, e.g.: — the preferential absorption of the less penetrating components of a heterogeneous beam, accompanying its attenuation; — the modification of the distribution of the exposure rate over a cross-section of the beam.
501 2193 (881-02-93)	space charge	The charge of electricity in a region, due to the presence of charged particles.

No.	Term	Definition
501 2194 (881-02-94)	thermionic emission	The emission of electrons from a substance resulting from its elevated temperature.
501 2195 (881-02-95)	cold emission	The emission, produced by sufficiently high electric field strengths, of electrons from unheated surfaces.

501 22 (881-03) Ionizing radiations: sources and interactions

501 2201 (881-03-01)	radiation source	An apparatus or a material emitting or capable of emitting radiation.
501 2202 (881-03-02)	source strength	Number of particles emitted by a radiation source per unit time.
501 2203 (881-03-03)	spectral source strength	Number of particles with an energy between E and $(E + dE)$ emitted by a radiation source per unit time.
501 2204 (881-03-04)	radiation field	Region through which radiation is being propagated.
501 2205 (881-03-05)	exposure	<i>To radiation.</i> The incidence of radiation on living or inanimate material by accident or intent.
501 2206 (881-03-06)	irradiation	Exposure to ionizing radiation.
501 2207 (881-03-07)	exposure	<i>Of a radiographic film.</i> The process of irradiating the radiographic film, by X-radiation or gamma-radiation.
501 2208 (881-03-08)	primary radiation	The radiation coming directly from the target of the X-ray tube or accelerator or from the source of gamma-rays.
501 2209 (881-03-09)	secondary radiation	The ionizing radiation emitted by matter as a result of an interaction of the primary radiation with the medium under consideration (see 501 2237).
501 2210 (881-03-10)	useful beam	Radiation leaving the housing of a radiation source through the aperture defined by the collimating diaphragm.
501 2211 (881-03-11)	beam axis	The straight line passing through the centre of the source and the centre of the final beam-limiting device.
501 2212 (881-03-12)	heel effect	The decrease in intensity at the anode side of an X-ray beam owing to absorption in the anode.
501 2213 (881-03-13)	residual radiation	Unwanted remainder of the useful beam after it has fulfilled its purpose.
501 2214 (881-03-14)	scattering	A process in which a change in direction or energy of an incident particle is caused by a collision with a particle or system of particles.
501 2215 (881-03-15)	coherent scattering	Scattering in which a definite phase relation exists between the incident and scattered waves.
501 2216 (881-03-16)	incoherent scattering	Scattering in which no definite phase relation exists between the incident and scattered waves.

No.	Term	Definition
501 2217 (881-03-17)	elastic scattering	Scattering in which the total kinetic energy is unchanged.
501 2218 (881-03-18)	inelastic scattering	Scattering in which the total kinetic energy changes.
501 2219 (881-03-19)	scattered radiation	Radiation which, during passage through a material, has been deviated from its original direction or changed in energy by scattering.
501 2220 (881-03-20)	backscatter	Scattering of radiation by material through angles greater than 90° with respect to its initial direction. NOTE. In radiotherapy, it is particularly applied to radiation scattered back to the skin from underlying tissues. In measurements of radioactivity, it applies to the scattering of particles into the measuring device by the material on which the sample is mounted.
501 2221 (881-03-21)	stray radiation	Radiation not serving any useful purpose. NOTE. It includes leakage radiation, residual radiation, and scattered radiation from irradiated objects.
501 2222 (881-03-22)	leakage radiation	The radiation passing through a source housing except for that in the useful beam.
501 2223 (881-03-23)	extra-focal radiation	X-radiation emitted from parts of the X-ray tube other than the focal spot.
501 2224 (881-03-24)	penetrability <i>deprecated</i>	The ability of a material to be traversed. NOTE. This term should not be used as a synonym for radiation quality.
501 2225 (881-03-25)	interaction	1. A generic term referring to forces between particles (including photons) in atoms or between particles that collide. 2. This term also refers to events involving two or more particles.
501 2226 (881-03-26)	electromagnetic interaction	Interaction attributable to an electromagnetic field, such as: — interaction between photons and charged particles in atoms; — forces on electrons in atoms; — forces between atoms or molecules.
501 2227 (881-03-27)	attenuation	The reduction of a radiation quantity upon passage of radiation through matter, resulting from all types of interaction with that matter. NOTE. Attenuation does not include geometric attenuation.
501 2228 (881-03-28)	geometric attenuation	The reduction of a radiation quantity due to the effect of the distance between the point of interest and the source (e.g. the inverse-square law for a point source), excluding the effect of any matter present.
501 2229 (881-03-29)	narrow-beam attenuation	The attenuation of radiation by matter measured in such a way that scattered radiation is negligible.
501 2230 (881-03-30)	broad-beam attenuation	The attenuation of radiation by matter when a maximum amount of the scattered radiation is included in the measurement.

No.	Term	Definition
501 2231 (881-03-31)	attenuation curve; transmission curve	A curve relating the value of a radiation quantity and the thickness of material traversed by the radiation. NOTE. If these terms are used it should be stated: 1. which radiation quantity is the dependent variable; 2. whether the dependent variable is the logarithm of the radiation quantity; 3. whether the incident beam is narrow and collimated and the measuring device beyond the attenuator is relatively small and far from it (narrow-beam measurements), or the incident beam is broad and not collimated and the measuring device beyond the attenuator is relatively near to it (broad-beam measurements).
501 2232 (881-03-32)	standard attenuation curve	A curve showing the energy flux density or, more often, the exposure rate of a beam of photon radiation, either mono-energetic radiation or heterogeneous radiation, under narrow-beam conditions as a function of thickness of material such as aluminium, copper or lead, usually with specified and constant X-ray tube voltages and with as little initial filtration as possible.
501 2233 (881-03-33)	absorption (energy)	The removal of energy from radiation by the matter which it traverses.
501 2234 (881-03-34)	absorber	A substance that removes energy from any type of radiation.
501 2235 (881-03-35)	self absorption	The absorption of radiation from a radionuclide, contained in a radioactive source, in the material of that source.
501 2236 (881-03-36)	build-up	The phenomenon of the increase with depth of the absorbed dose rate due to the release of electrons and to scattered radiation in matter beyond the entrance surface.
501 2237 (881-03-37)	secondary electron	An electron ejected from an atom due to the interaction of incident radiation with matter.
501 2238 (881-03-38)	capture	Any process by which an atomic or nuclear system acquires an additional particle.
501 2239 (881-03-39)	orbital electron capture	A radioactive transformation whereby a nucleus captures an orbital electron.
501 2240 (881-03-40)	radiative capture	The capture of a particle by a nucleus followed by immediate emission of gamma radiation.
501 2241 (881-03-41)	binding energy	1. For a system, such as an atomic nucleus, the net energy required to decompose it into its constituent particles. 2. For a particle in a system, the net energy required to remove it from the system.
501 2242 (881-03-42)	internal conversion	The emission of an electron from an atom due to the liberation of energy from its excited nucleus.
501 2243 (881-03-43)	Auger effect	The return to the ground state of an atom, ionized in an inner shell, by the ejection of one or more electrons from surrounding shells.

No.	Term	Definition
501 2244 (881-03-44)	Auger electron	Electron ejected as a result of the Auger effect.
501 2245 (881-03-45)	nuclear isomeric transition	The spontaneous (radioactive) transition of one nuclear isomeric state into another, with the emission of a gamma ray photon or a conversion electron.
501 2246 (881-03-46)	conversion electron	An electron ejected from an atom by internal conversion.
501 2247 (881-03-47)	activation	The process of inducing radioactivity by irradiation.
501 2248 (881-03-48)	activation analysis	A method of chemical analysis based on the identification and measurement of radiation specific to the radionuclides formed by irradiation with neutrons.
501 2249 (881-03-49)	photonuclear reaction	A nuclear reaction produced by the interaction of a photon and an atomic nucleus usually with the emission of nuclear radiation.
501 2250 (881-03-50)	photoneutron	A neutron ejected from an atomic nucleus resulting from the interaction of a photon with an atomic nucleus.
501 2251 (881-03-51)	collision	An interaction between two particles (including photons), which changes the existing momentum and/or energy conditions.
501 2252 (881-03-52)	elastic collision	A collision in which the physical content of each colliding system and the total kinetic energy are left unchanged, although the directions of their relative motion will probably be altered.
501 2253 (881-03-53)	inelastic collision	A collision in which at least one system gains internal excitation energy at the expense of the total kinetic energy.
501 2254 (881-03-54)	nuclear fission	The division of a heavy nucleus into two (or rarely, more) parts, usually accompanied by the emission of neutrons and energy. Fission may occur spontaneously or as a result of the absorption of a neutron or photon.
501 2255 (881-03-55)	nuclear fusion	A process in which two light nuclei interact to produce at least one nucleus heavier than either initial nucleus, together with excess energy attributable to the conversion of mass.
501 2256 (881-03-56)	effective atomic number	The atomic number of a hypothetical element with which radiation of a specified kind would interact in the same way as it interacts with a compound or mixture of interest.

501 23 (881-04) Ionizing radiations: quantities and units (see also appendix A)

501 2301 (881-04-01)	ångström <i>deprecated</i>	A unit of length, often used to measure wavelengths of X-radiation and gamma radiation, equal to 0.1 nm (exactly). NOTE. The ångström will be used with the SI system for a limited time.
501 2302 (881-04-02)	X-unit <i>deprecated</i>	A unit of measurement of wavelength of radiation, approximately equal to 0.1002 pm.

No.	Term	Definition
501 2303 (881-04-03)	cross-section	A measure of the probability of a specified interaction between an incident radiation and a target particle or system of particles. It is the reaction rate per target particle for a specified process divided by the flux density of the incident radiation.
501 2304 (881-04-04)	barn <i>deprecated</i>	A unit of cross-section equal to 10^{-28} m^2 . NOTE. The barn will be used for a limited time with the SI system.
501 2305 (881-04-05)	mole	The amount of substance of a system which contains as many elementary entities as there are atoms in 0.012 kilograms of carbon 12. When the mole is used, the elementary entities must be specified and may be atoms, molecules, ions, electrons, other particles, or specified groups of such particles.
501 2306 (881-04-06)	atomic mass unit (u)	The mass of an atom of carbon 12 divided by 12.
501 2307 (881-04-07)	Avogadro's number	The number of molecules or atoms per mole of a substance.
501 2308 (881-04-08)	coulomb (C)	The special name for the SI unit of electric charge. $1 \text{ C} = 1 \text{ A}\cdot\text{s}$
501 2309 (881-04-09)	electrostatic unit of charge <i>deprecated</i>	A unit of electric charge equal approximately to 0.33356 nC.
501 2310 (881-04-10)	milliampere second (mA·s)	A unit of electric charge equal to one millicoulomb. NOTE. The mAs is commonly used as a unit to measure the product of average X-ray tube current and exposure time, particularly in radiography.
501 2311 (881-04-11)	elementary charge (e)	The value of the electric charge associated with the electron, proton or positron.
501 2312 (881-04-12)	electronvolt (eV)	A unit of energy equal to the kinetic energy acquired by an electron in passing through a potential difference of 1 volt in vacuum. $1 \text{ eV} = 1.60219 \times 10^{-19} \text{ J}$ approximately.
501 2313 (881-04-13)	velocity of light (c_0)	The speed of propagation of light in a vacuum.
501 2314 (881-04-14)	Planck's constant (h)	The constant used in the formula $E = h\nu$ where E is the energy of a photon and ν is the frequency of its associated wave. NOTE. It should be distinguished from $\hbar$ which is $h/2\pi$.
501 2315 (881-04-15)	minimum wavelength	The shortest wavelength in a continuous X-ray spectrum. NOTE. The minimum wavelength in nm for an applied peak accelerating potential U in kV is $1.2398/U$ approximately.
501 2316 (881-04-16)	rest mass (m_0)	The mass of a particle excluding additional mass acquired by the particle in motion according to the theory of relativity.
501 2317 (881-04-17)	rest energy (E_0)	The energy corresponding to the rest mass of a particle given by the equation: $E_0 = m_0 c_0^2$ where m_0 is the rest mass and c_0 is the velocity of light.

No.	Term	Definition
501 2318 (881-04-18)	(particle) fluence (Φ)	The quotient of dN by da , where dN is the number of particles incident on a sphere of cross-sectional area da : $\Phi = \frac{dN}{da}$
501 2319 (881-04-19)	(particle) fluence rate (φ); (particle) flux density	The quotient of $d\varphi$ by dt where $d\varphi$ is the increment of particle fluence in the time interval dt : $\varphi = \frac{d\varphi}{dt}$
501 2320 (881-04-20)	stochastic quantity	A quantity whose value is subject to random fluctuations. NOTE. The mean of a stochastic quantity is a non-stochastic quantity.
501 2321 (881-04-21)	radiant energy (R)	The energy of particles (excluding rest energy) emitted, transferred or received.
501 2322 (881-04-22)	(particle) energy fluence (Ψ)	The quotient of dR by da , where dR is the radiant energy incident on a sphere of cross-sectional area da : $\psi = \frac{dR}{da}$
501 2323 (881-04-23)	energy fluence rate (ψ); energy flux density	The quotient of $d\Psi$ by dt , where $d\Psi$ is the increment of energy fluence in the time interval dt : $\psi = \frac{d\Psi}{dt}$
501 2324 (881-04-24)	first collision dose <i>deprecated</i>	A quantity which has sometimes been used with the same meaning as kerma and sometimes with a somewhat different meaning.
501 2325 (881-04-25)	attenuation coefficient	<i>Of a substance.</i> For a parallel beam of specified radiation, the quantity μ in the expression μdx for the fraction of a radiation quantity removed by attenuation in passing through a thin layer dx of that substance. It is a function of the energy of the radiation. According as to whether dx is expressed in terms of length, mass per unit area, moles per unit area, or atoms per unit area, μ is called the linear, mass, molar, or atomic attenuation coefficient.
501 2326 (881-04-26)	absorption coefficient	<i>Of a substance.</i> For a parallel beam of radiation, the quantity μ_{abs} in the expression $\mu_{\text{abs}} dx$ for the fraction of energy absorbed in passing through a thin layer of thickness dx of that substance. It is a function of the energy of the radiation. According as to whether dx is expressed in terms of length, mass per unit area, moles per unit area, or atoms per unit area, μ_{abs} is called the linear, mass, molar, or atomic absorption coefficient.

No.	Term	Definition
501 2327 (881-04-27)	mass attenuation coefficient (μ/ρ)	<i>Of a material for indirectly ionizing particles.</i> The quotient dN/N by ρdl, where dN/N is the fraction of particles that experience interactions in traversing a distance $d/$ in a medium of density ρ $\frac{\mu}{\rho} = \frac{1}{\rho N} \cdot \frac{dN}{d/}$ NOTE. The mass attenuation coefficient μ/ρ for X-radiation and gamma-radiation may be expressed as the sum of several parts, each attributed to a particular phenomenon; τ/ρ for the photoelectric effect; σ_c/ρ for the Compton effect; σ_{coh}/ρ for coherent scattering; and κ/ρ for pair production.
501 2328 (881-04-28)	mass attenuation coefficient (photoelectric) (τ/ρ)	That part of the mass attenuation coefficient that is attributable to the photoelectric effect.
501 2329 (881-04-29)	mass attenuation coefficient (scattering) (σ_c/ρ) + (σ_{coh}/ρ)	Those parts of the mass attenuation coefficient attributable to Compton scattering (σ_c/ρ) and to coherent scattering (σ_{coh}/ρ).
501 2330 (881-04-30)	mass attenuation coefficient (pair production) (κ/ρ)	That part of the mass attenuation coefficient that is attributable to pair production.
501 2331 (881-04-31)	linear attenuation coefficient (μ)	The product of the mass attenuation coefficient by the density of the attenuating material (ρ) NOTE. The linear attenuation coefficient can be expressed as the sum of several parts ($\tau, \sigma_c, \sigma_{coh}, \kappa$).
501 2332 (881-04-32)	mass energy transfer coefficient (μ_{tr}/ρ)	<i>Of a material for indirectly ionizing particles.</i> The quotient of dE_{tr}/E_N by ρdl, where E_N is the energy of each particle (excluding rest energy), N is the number of particles and dE_{tr}/E_N is the fraction of incident particle energy that is transferred to kinetic energy of charged particles by interactions in traversing a distance $d/$ in the material of density ρ $\frac{\mu_{tr}}{\rho} = \frac{1}{E_N \rho} \cdot \frac{dE_{tr}}{d/}$ NOTE. For a given monoenergetic radiation, the relationship between kerma (K) and energy fluence (Ψ) may be written $K = \Psi (\mu_{tr}/\rho)$.
501 2333 (881-04-33)	mass energy absorption coefficient (μ_{en}/ρ)	<i>Of a material for indirectly ionizing particles.</i> The product of the mass energy transfer coefficient (μ_{tr}/ρ) for that energy and $(1-g)$ where g is the fraction of the energy of secondary charged particles that is lost to bremsstrahlung in the material. NOTE. When material is air, (μ_{en}/ρ) is proportional to the quotient of exposure by energy fluence in the usual case of constant W.
501 2334 (881-04-34)	half-value layer (abbrev. HVL); half-value thickness (abbrev. HVT)	The thickness of a specified material that reduces the exposure rate to 50 per cent; the second HVL is the additional thickness necessary to reduce the exposure rate to 25 per cent of the initial value. NOTE. Measurements of HVL are performed under narrow beam conditions (see 501 2229).

No.	Term	Definition
501 2335 (881-04-35)	tenth-value layer (abbrev. TVL); tenth-value thickness (abbrev. TVT)	The thickness of a specified material that reduces the exposure rate to 10 per cent. NOTE. The TVL will depend on whether the measurement has been made under broad or narrow beam conditions (see 501 2230 and 501 2229).
501 2336 (881-04-36)	homogeneity factor	The ratio of the first to the second half-value layer. NOTE. The homogeneity factor for monoenergetic radiation is unity.
501 2337 (881-04-37)	attenuation equivalent	A quantity indicating the attenuation effected by a layer of reference material which if substituted in a beam of specified radiation quality and under specified geometrical conditions, would effect the same attenuation as the layer under consideration. NOTE. Attenuation equivalent is expressed in terms of the thickness of the reference material, usually in millimetres.
501 2338 (881-04-38)	equivalent wavelength; effective wavelength	The wavelength of monoenergetic X-rays which, in some specified respect, have the same property as the heterogeneous beam under consideration. NOTE. It may be defined with respect to half-value layer or other wavelength-dependent quantities.
501 2339 (881-04-39)	equivalent energy; effective energy	The photon energy of monoenergetic X-rays which, in some specified respect, have the same property as the heterogeneous beam under consideration. NOTE. It may be defined with respect to half-value layer or other energy-dependent quantities.
501 2340 (881-04-40)	mean free path	The average distance that particles of a specified type travel between interactions of a specified type in a specified medium.
501 2341 (881-04-41)	decay constant (λ); disintegration constant	For a radionuclide, the probability per unit time for the spontaneous decay of one of its nuclei. It is given by $\lambda = -\frac{1}{N} \cdot \frac{dN}{dt}$ in which N is the number of nuclei of concern existing at time t .
501 2342 (881-04-42)	activity (A)	Of an amount of a radionuclide in a particular energy state at a given time, the quotient of dN by dt , where dN is the expectation value of the number of spontaneous nuclear transitions from that energy state in the time interval dt : $A = \frac{dN}{dt}$ NOTE. The SI unit of activity is the reciprocal second (s^{-1}) and is given the special name becquerel (Bq). The earlier special unit of activity, still in temporary use, was the curie (Ci). $1 \text{ Bq} = 1 \text{ s}^{-1} = 2.703 \cdot 10^{-11} \text{ Ci}$ approximately.
501 2343 (881-04-43)	specific activity	Activity per unit mass of the element whose radionuclide is considered.
501 2344 (881-04-44)	radioactive concentration; activity concentration	Activity of a radionuclide per unit volume of the radioactive material in which it is contained.