GLOSSARY

ABSORBED DOSE OF IONISING RADIATION, absorbed dose of radiation, absorbed dose, radiation dose, *ionising radiation* energy amount absorbed in exposed matter mass unity. Is the biological detriment risk measure. **A.d.i.r.** (D) is defined as average energy value dE transferred to the matter with radiation in some elementary volume divided by matter mass dm in given volume: $D=dE \cdot dm^{-1}$. **A.d.i.r.** measurement unit is *Grey* (Gy) equal to the 1 Joule of energy absorbed in 1 kg of matter: 1 Gy=1 $J \cdot kg^{-1}$=100 *rads*; 1 cGy=1 rad; 1 mGy=0.1 rad.

ABSORBED DOSE RATE, (P), *ionising radiation absorbed dose* increment dD per low time period dt divided by this period: $P=dD \cdot dt^{-1}$. **A.d.r.** measurement unit is *Grey* per second ($Gy \cdot sec^{-1}$.), equal to 1 $Joule \cdot (kg \cdot sec)^{-1}$.

ABSORPTION (from Latin *absorbeo* — imbibe) imbibing of any substance from environment with whole volume (mass) of absorbing matter (absorbent). A. of any gaseous medium component by liquid absorbent is named dissolving, the same of liquid medium — extraction. Is the *sorption* partial type.

ACTIVITY OF RADIATION SOURCE MINIMALLY SIGNIFICANT, minimally important activity (MIA) on working place, permissible activity of *radioactive material* on working place not requiring sanitary inspections service special authorisation for the right to work with them (ref. also *Activity of Radionuclide*).

ACTIVITY OF RADIONUCLIDE, source activity, number of *radioactive decays* in time unit. **A.r.** is expressed in *radionuclide* nuclei number within time interval *dt:* $A=\lambda N$, where λ — disintegration constant, N — radionuclide atoms number in definite time moment. 1 Becquerel (Bq) is applied as the **A.r.** measurement unit in SI (one decay per one second). Historically the radon activity being in equilibrium state with 1 gram of radium was the first used **A.r.** measurement unit. Later it was accepted being equal to $3.7 \cdot 10^{10}$ dacays per 1 second and named *Curie* (Ci). 1 Ci= $3.7 \cdot 10^{10}$ Bq.

ADSORPTION (from Latin *ad* — on, by and *sorbeo* — imbibe), imbibing of any material from gaseous or liquid medium by surface layer of liquid or solid body. Both as *absorption* is the *sorption* variety. Matter on which surface the **A**. occurs is named adsorbent, one being adsorbing — the adsorbate. **A**. is defines as process leading to the abnormally high material (adsorbate) concentration from gaseous or liquid medium on its divide surface with liquid or solid body.

AEROSOLS (from Greek *αηρ* — air and German *sol* — colloid solution), dispersible systems consisting from liquid or solid particles being in suspended state in gaseous medium (usually in the air). Regarding the particles size **A**. are defined in smoke (particles diameter 0.001–0.1 μm), mist (0.1–10 μm) and dust (over 10 μm). Insoluble radioactive aerosol particles (the so-called «hot particles») are precipitated on the respiratory organs walls and penetrate inside tissues due to their abrasive properties.

ALARA (abbreviated from *As Low As Reasonably Achievable*) — main principle of *radiation safety* providing in *ionising radiation sources* projecting and exploitation in accordance to which the irradiation *dose* is to be reduced to the lowest available value taking into account economic and social factors.

ALPHA-DECAY, α-decay, *alpha-particle* emission by the nuclei, type of atomic nuclei *radioactive decay* with emission of *alpha-particle*, nuclear charge decrease for two unities and maternal nuclei mass figure — for four of them.

ALPHA-PARTICLE, α-particle, helium ^{4}He atom nucleus containing 2 *protons* and 2 *neutrons*.

ALPHA-RADIATION, α-radiation, α-rays, *ionising radiation of* corpuscular nature presented with *alpha-particles* emitted in *atomic nuclei* fission, *nuclear reactions* and *closed-type sources of ionising radiation*. **A.r**. is of slight *penetrating capacity*, higher *ionization capability* and extremely high *energy linear transfer* rate that stipulates highest among ionising radiation types *relative biological effectiveness* (*quality coefficient* = 20).

ANNIHILATION (from late Latin *annihilatio* — extermination, disappearance), one of the *elementary particles* interconversion types. Initially the electromagnetic process of *electron* and its antiparticle — *positron* conversion in their collision into electromagnetic radiation (*photons* or *gamma-quantums*) was named with **A**. However term «**A.**» is lame in its name as in **A.** processes medium is not disappearing but converting from one form into another. Possibility of **A.** was predicted by Paul Dirac in 1930 and experimentally justified in 1933 for pairs electron — positron.

ANTINEUTRINO, antiparticle regarding the *neutrino*, different from it with lepton charge value and spin. Neutrino and **A.** are the different spin states of single really neutral *elemental particle*.

ANTIOXIDANTS (from Greek *αντι* — opposite and *οξυζ* — acidic), antioxidising agents, antioxigens, oxidation inhibitors, natural or synthetic materials preventing or slowing down oxidation of organic compounds. **A.** have also radioprotective properties that enable their application for organism *radioresistance* elevation and *radiation injury* early pathogenetic therapy. They are presented by cysteine, thiourea, citric and ascorbic acids, tocopherol, carotinoids, lecthin etc. (ref. also *Radioprotectors of prolonged effect, Free radicals*).

ARTIFICIAL (MAN-MADE) RADIATION BACKGROUND, global fallout, global contamination, *ionising radiation* stipulated by *nuclear explosions* products *radioactivity*. Ref. also *Natural radiation background, Radiation background, Technologically elevated radiation background.*

ATOM (from Greek *ατομοξ* — indivisible), the least particle of chemical element having its properties. In the center of **A**. there is positively charged *atomic nucleus* surrounded with negatively charged *electrons* forming electron

shells. **A**. dimensions are defined with its electron shell extent. **A**. linear size is of order 10^{-10} meter. Electrons number in **A**. is equal to the *protons* number in nucleus (all electrons charge is equivalent to nucleus charge), protons number is equal to the element sequence number in periodic table by Mendeleyev. **A**. exist in free (in gaze) and combined states forming liquid or solid matters.

ATOMIC BOMB, aircraft bomb with *nuclear explosive charge* having high destructive force. Action is based upon *nuclear fission chain reaction*.

ATOMIC ENERGY, unfaithful name of *nuclear energy*.

ATOMIC EXPLOSION, the same as *Nuclear explosion*.

ATOMIC NUCLEUS, positive charged central part of *atom* concentrating virtually all its mass; consists from *protons* and *neutrons* (nucleons) bound with *nuclear forces*. Size of **A**. are of order 10^{-15}–10^{-14} meter, maximal-binding force per nucleon 8.8 MeV. Nuclear matter density of order 10^{14} g·cm^{-3}.

ATOMIC NUMBER, sequence number of chemical element in periodic table by Mendeleyev equal to the *protons* number in *atomic nucleus*. **A.n.** defines *atom* chemical and most part of physical properties.

ATOMIC REACTOR, the same as *Nuclear reactor*.

ATOMIC WEAPON, the same as *Nuclear weapon*.

ATOMIC-POWERED VESSEL, nuclear-powered ship, common name of ships (surface ships and submarines) with *nuclear power engine*.

AVERAGE EQUIVALENT DOSE, average value of *ionising radiation equivalent dose* in tissue or organism.

BACKGROUND RADIATION, irradiation at the expense of *radiation background*. Is subdivided into internal and external ones depending on *ionising radiation source*. Yearly *effective equivalent dose* of radiation due to the natural external and internal exposure constitutes 2,000 – 2,300 μSv, and due to the man-made one (including also nuclear testing and nuclear energetic) — 1,020 – 1,700 μSv.

BASIC SAFETY STANDARDS, BSS, introduced in force (1995) International norms *for radiation safety* — «International Basic Safety Standards for Protection from Ionising Radiation and Radiation Sources Safety». Were elaborated by the six international organisations (including the World Health Organisation, WHO) under coordination of International Atomic Energy Agency (IAEA). **B.S.S.** are to replace all the previous standards in radiation safety field aiming *deterministic effects of radiation* prevention and *stochastic radiation effects* rise probability limitation. **B.S.S.** regulate the *ionising radiation sources application practice* and *intervention in radiation situation*. **B.S.S.** concern only the human well-being himself and only *ionising radiation* impact. They are not applicable to anyone not-ionising types of radiation and not interfere any kind of non-radiological aspects of health and safety.

BECQUEREL, (Bq) *radionuclide activity* unit in SI equal to one *radioactive decay* per second. 1 Bq=2.7·10^{-11} Ci (ref. *Curie*). Named in honor Antuan Anrie Becquerel

BETA-DECAY, β-decay, *radioactive decay* type with *atomic nuclei* emitting *electrons* and *antineutrino* (β^--decay) or *positrons* and *neutrino* (β^+- decay). Electron capture from *atom* K-shell (K-capture) is also regarded to the **B.d.**, at that atomic nucleus captures electron from inner electron shells followed with *proton* evolution into *neutron* with neutrino emission.

BETA-PARTICLES, β-particles, *electrons* and *positrons*.

BETA-RADIATION, β-radiation, β-rays, *ionising radiation* of corpuscular nature consisting of the *electrons* (β^-) or *positrons* (β^+) stream emitted in radioactive isotopes *beta-decay* or by *radiation sources of closed type*. *Penetrating capacity* not exceeds several millimeters.

BIOGENIC ELEMENTS, chemical elements (with radioactive ones among them — ^{3}H, ^{14}C, ^{40}K, ^{87}Rb, ^{232}Th, ^{238}U, ^{226}Ra) permanently being in content of organisms and executing definite biological functions. ^{40}K is of the most high quota in absorbed dose forming from **B.e.** — 0.19–0.2 mGy·year^{-1}. **B.e.** required for organism in trifling amounts are named microelements.

BIOLOGICAL DOSIMETRY, *ionising radiation doses* assay though biological objects structure and functions alterations registration risen after irradiation. Peripheral blood and bone marrow leukocytes karyotype study is of practical value with chromosome aberrations check in its basis (ref. *Chromosome aberrations*). Methods were also applied estimating the long-living *free radicals* concentration in dental enamel, bone, hair, nail, skin, egg shell, Amphibia testa etc. specimens by means of electron paramagnetic resonance and radio-luminescence.

BIOLOGICAL EFFECTIVENESS OF NATURAL RADIATION BACKGROUND, living creatures alterations totality occurring due to *ionising radiation* impact from the *natural radiation background*. **B.e.n.r.b.** constitutes in stipulating of organisms heredity changes and new forms appearing — *mutants* within all the Earth life history. Ref. also *Genetic effects of radiation, Genetic effects of ionising radiation, Mutations*. Data regarding the *natural radiation background* stimulating effect are present too. However no direct evidence of natural radiation background minimal impact harmlessness are available due to organisms study in completely non-radiation conditions unavailability.

BIOLOGICAL EFFECTS OF IONISING RADIATION, alterations induced in living organisme vital activity and structure under *ionising radiation* impact. Any kind of ionising radiation energy absorbed by organism tissues evoke reciprocal biological reaction with expression extent depending upon the absorbed dose value, organism sensitivity etc. **B.e.i.r.** are characterised with the following peculiarities: 1) discrepancy between low amount of absorbed by tissues ionising radiation energy and their impact on organism result: dose of 500 R capable for resulting in organism death transfers to the tissues the negligibly small amount of energy that can be presented with one tea-spoon of hot tea; 2) presentation both in generation exposed to radiation impact and in further ones that is explained with *ionising radiation genetic effects*; 3) radiation injuries genesis silent (latent) period presence. Ionising

radiation various types have unequal **B.e.i.r.** where physical and physical-chemical stages, chemical and biomolecular alterations, early and remote biological effects are sequentially divided. Ref. also *Radiation relative biological effectiveness, Radiation remote consequences, Radiation effects, Oxygen effect, Water radiolysis, Radiation injuries*.

BIOLOGICAL PROTECTION in nuclear energetic, construction structures surrounding *nuclear reactor* aiming *ionising radiation* reduction down to the biologically save level (ref. *Dose limits*). Is calculated for *gamma-* and *neutron* radiation absorption. Water, graphite etc. are applied to reduce the neutron radiation, steel & led for γ-radiation. Components of **B.p.n.e.** are placed in a way to reduce the secondary γ-radiation too, rising after *neutrons* capture: close to *ionising radiation sources* are placed the constructions from light elements, farther — from heavy ones.

BOUNDARY OF DOSE, maximum *equivalent dose of ionising radiation* per one year for limited part of population — category «B». **B.d.** is set lower than *maximum permissible dose* for given people contingent unreasonable irradiation prevention. **B.d.** is controlled with the averaged for *critical group* dose of *external irradiation* and values of radioactive releases & environment objects *radioactive contamination*. **B.d.** is the main *dose limit* for persons of category «B». According to the Radiation Safety Norms Criteria 76/87 the **B.d.** for Ist group of *critical organs* in category «B» constitutes 5 mSv·year^{-1}, for IInd group — 15 mSv·year^{-1} and for IIIrd group — 30 mSv·year^{-1} respectively. Ref. *Permissible levels, Categories of irradiated persons*. According to the International norms for radiation safety — *Basic Safety Standards* (1995) the **B.d.** for total population are a bit different: 1 mSv of *ionising radiation effective dose* per year, at that in especial conditions the effective dose of 5 mSv is accepted under the condition that average dose for the next five years will not exceed 1 nSv per year; equivalent dose on eye lens — 15 mSv per year and equivalent dose on skin — 50 mSv per year.

BREMSSTRAHLUNG, *photon ionising radiation* with continuous spectrum emitted in the charged particles kinetic energy change. **B.** Appears in medium surrounding the *beta-radiation* source, in roentgen tubes, electrons accelerators etc.

CHARACTERISTIC IONISING RADIATION, *photon ionising radiation* with discrete spectrum emitted in energetic state change in *atom electrons*. Trace of *roentgen radiation*.

CHROMOSOME ABERRATIONS (from Latin *aberratio* — deviation), chromosome reorganisations, chromosome mutations, type of *mutations* altering the *chromosome* structure and followed by genetic material redistribution, loss or partial doubling. Cell number calculation with **C.a.** is one of the main issues in *biologic* dosimetry.

CHROMOSOMES (from Greek χροωμα - color and Greek σωμα - body) cellular nuclei organoids that are gene carriers and defining hereditary properties of cells and organisms.

CLOSED-TYPE SOURCES OF IONISING RADIATION, *ionising radiation sources* with design excluding the *radioactive materials* entry to environment under exploitation conditions and tear. Regarding function character the **C.s.i.r.** are conditionally divided in two types: ones of continuous action (γ-facilities of various purpose, neutron, β- and γ-producers) and sources of radiation periodical generation (roentgen devices and charged-particle accelerators).

COEFFICIENT OF RELATIVE BIOLOGICAL EFFECTIVENESS OF RADIATION, (η) *exemplary (standard)* absorbed dose D_0 inducing definite biological effect ratio to the absorbed dose of concerned radiation D resulting in the same biological effect: $\eta = D_0 \cdot D^{-1}$. Is applied in radiobiology (Ref. also *Quality coefficient of radiation*).

COLLECTIVE EFFECTIVE DOSE OF IONISING RADIATION, collective effective equivalent dose, CEDIR, sum of individual *effective doses of ionising radiation* in definite population group. Measurement unit is man-*Sivert* (man-Sv) or man-*rem* (man-rem).

COLLECTIVE RADIATION DOSES, sum of *individual radiation doses*. Is applied in epidemiological studies of *radiation injuries*, in populational approach in *radiation risks* estimation. Ref. *Collective effective dose of ionising radiation, Expected collective effective dose of ionising radiation*.

CONTAMINATION OF TERRITORY WITH RADIONUCLIDES, *radioactive contamination* accounted for territory square unity. Is measured in Bq·m^{-2} [SI] or Ci·km^{-2}.

CONTROL LEVELS, *permissible levels* values set for population and personnel irradiation limitation (Ref. *Irradiated persons categories*). **C.l.** are set lower than permissible levels in permanent function facilities (processes) exploitation. In extremal cases the **C.l.** can be set over the permissible ones however taking into account the radiation factor average-year value not exceeding respective permissible value.

CONTROLLED THERMONUCLEAR SYNTHESIS, light nuclei controlled synthesis process aimed on *nuclear energy* production. Up to the present time remains unsolved scientific problem.

CORPUSCULAR IONISING RADIATION, *ionising radiation* presented with rest-mass different from zero (*alpha-* and *beta-particles, protons and neutrons*).

CRITICAL GROUP, persons being exposed to the higher radiation impact due to the life conditions, age and other factors among the given population contingent.

CRITICAL MASS, minimum amount of *nuclear fuel* containing decaying *radionuclides* that is enough for self-maintaining of *nuclear chain reaction* of fission. **C.m.** depends upon material density and geometric configuration. 1) **C.m.** of *nuclear cartridge* — amount of nuclear fuel (^{235}U, ^{239}Pu) that in concentrated placement in critical volume can result in *nuclear explosion* — uncontrolled avalanche chain reaction. **C.m.** of pure ^{235}U constitutes 9 kg. 2) **C.m.** of *nuclear reactor* is it's characteristic presenting nuclear fuel minimal quantity enough for the self-maintaining process run. **C.m.** values depends substantially upon dimensions and form of the system, nuclear fuel and *neutrons* moderator type.

CRITICAL ORGANS FOR RADIATION, organs, tissues, body parts or body in a whole which exposure to non-uniform irradiation can result in highest detriment to the exposed person health or posterity. In *radioactive materials incorporation* organ of *radionuclide* primary deposition is the critical one. Critical organs through *radiosensitivity* decrease (in the present opinions light) are graded in three groups. The 1st group — all the body, gonads and red bone marrow. The 2nd group — muscles, thyroid gland, adipose tissue, gastro-intestinal tract, lungs, eye lens and other organs excluding those classified to the groups 1st and 3rd. The 3rd group — bone tissue, skin, hands, forearms, shanks and feet.

CURIE, (Ci) off-system unit for *radionuclide activity*. **C.** Is the isotope activity where the $3.7 \cdot 10^{10}$ nuclear transformations occur per 1 second. 1 Ci= $3.7 \cdot 10^{10}$ *Becquerel* (Bq). Named in honor of French physicist P. Curie [1859–1906] and M. Sklodowska–-Curie [1867–1934] that together discovered polonium and radium in 1898, introduced the *«radioactivity»* concept and were awarded the Nobel Prize (1903).

DENSENESS OF IONISING PARTICLES FLOW, (φ) ratio of *ionising particles flow* dF entering the elementary sphere volume to the named sphere cross-section square dS: $\varphi = dF \cdot dS^{-1}$. **D.i.p.f**. is also defined as *fluence* of particles dF per small time period dt divided by that period: $\varphi = dF \cdot dt^{-1}$.

DETERMINISTIC EFFECTS OF RADIATION (from Latin *determino* – to define), non-stochastic effects of irradiation, *radiation effects* which severity and genesis are depending upon *ionising radiation absorbed dose* and for which the *threshold dose* can be present. Early **D.e.r.** are defined as capable for presentation within several weeks and remote ones that can become manifesting several months or years after irradiation. It is also pointed out to the especial heritable non-stochastic radiation injury on cellular level of organisation [Bychkovskaya I.B., Komarov E.I., 1990]. *Radiation sickness*, hypoplastic and dystrophic states, endocrine glands dysfunction; nervous, cardiovascular, immune and haemopoietic systems functional and organic alterations are attributed to **D.e.r.** both with *irradiation remote consequences* non-tumour forms (hypoplastic states, sclerotic processes and dyshormonal disorders). All that leads to the life span shortening due to the mortality rate elevation from various diseases being directly or indirectly stipulated by *ionising radiation* unfavourable impact.

DOSE ABSOLUTELY LETHAL MINIMAL, LD_{100} (from Greek *δοσιζ* — portion, part) *ionising radiation absorbed dose* resulting in death of 100% cells or organisms.

DOSE ACCUMULATED, integral dose, *effective dose of ionising radiation* absorbed for the definite time interval as a rule — for a year or for the life span (LD_{70}). Is applied for *ionising radiation biological effects* prognostics in human. So the human LD_{70} due to the *natural radiation background* not exceeds 0.1 Sv (10 *rem*) as a rule, and that from all main radiation sources — 0.5 Sv (50 *rem*). **D.a.** for the NPP personnel occupational irradiation for 25 years of work without accidents not exceeds as a rule 0.12–0.25 Sv (12–25 *rem*). Ref. also *Natural radiation background, Artificial (man-made) radiation background, Irradiated persons categories, Technologically elevated radiation background.*

DOSE BOUNDS, dose limits, permissible radiation impact criterions: *maximum permissible dose* (for persons of category «A») and *dose limit* (for persons of category «B»). **D.b.** not include dose received by patient in medical diagnostic and radiation therapy both with dose stipulated by the *natural radiation background*. Ref. *Permissible levels, Categories of irradiated persons.*

DOSE OF HALF LETHALITY, half mortality dose, (LD_{50} or $LD_{50/30}$), *ionising radiation absorbed dose* inducing death of 50% cells or organisms within 30th day after irradiation. Single-celled creatures are the least sensitive to irradiation, and most sensitive are mammalians including human. So for bacteria the LD_{50} constitutes 400–1000 Gy, for yeast — 400 Gy, for crucian and turtle — 13–15 Gy, for frog and rabbit — 7–8 Gy, for rat — 5–6 Gy, for monkey — 4.5–5.5 Gy, for human — 4 Gy, for guinea pigs — 3–3.5 Gy.

DOSE OF IONISING RADIATION, denominator of *ionising radiation* energy amount spent for air *ionisation* or absorbed by matter. Term «radiation dose» use is available as the synonym of *ionising radiation absorbed dose*, term «dose» — in its turn instead of *ionising radiation equivalent dose* if that leads to no misunderstandings. Ref. also *Exposition dose of ionising radiation, Effective dose of ionising radiation.*

DOSE RATE, abridged name of *equivalent dose rate.*

DOSE REDUCTION FACTOR, *radioprotectors* efficiency estimation criterion. Is defined with ratio of radiation doses producing equal biological effect in radioprotector presence and without it.

DOSIMETRY OF IONISING RADIATION IN MEDICINE, *ionising radiation* energy value absorbed by human organism registration and quantitative assay methods.

DOSIMETRY, field of applied nuclear physics making measurements, explorations and theoretical calculations of those characteristics of *ionising radiation* and their interaction with environment that define radiation effects in exposed living and inanimate nature objects (Ref. *Dose of ionising radiation*).

EFFECTIVE DOSE OF IONISING RADIATION, effective dose of radiation, effective equivalent dose, effective dose, EED, (H_E), *average equivalent doses* (H_T) sum in various organs and tissues weighted with W_T coefficients characterising the *stochastic radiation effect* risk ratio for given organ (tissue) to the stochastic effect integral risk in total body uniform exposure, that enables radiation risk evening beyond dependence of whether the total body is exposed uniformly or not: $H_E = \Sigma W_T H_T$. **E.d.i.r.** is introduced for human health detriment estimation in whole body non-uniform irradiation with separate organs and tissues *radiosensitivity* taking into account. Both as the *equivalent dose of ionising radiation* the **E.d.i.r.** is measured in *Siverts* (Sv). The off-system unit is *rem*. 1 Sv=100 *rem*.

EFFECTS OF RADIATION (from Latin *effectus* – execution, action, *efficio* – acting, executing), *ionising radiation biological impact* result, consequence. Radiation detriment is becoming apparent through *somatic, hereditary and*

embryotoxic effects of radiation. Ref. also *Deterministic effects of radiation, Stochastic effects of radiation, Genetic effects of radiation, Teratogenic effects of radiation*.

ELECTRON, (e, e^-), stable negatively charged *elementary particle* of leptons class with charge value equal to elementary electrical charge. **E.** was the first discovered elementary particle. **E.** is the material carrier of lowest mass and lowest electrical charge in nature, component of atom. Number of **E.** in neutral atom is equal to the *atomic number*. **E.** is one of main structure elements of matter; *atom* electron shells define optical, electrical, magnetic and chemical properties of atoms and molecules both with majority solid bodies properties.

ELEMENTARY PARTICLES, the finest structural elements of matter subject to condition that they are not *atoms* or *atomic nuclei*. Idea of **E.p.** reflects the stage of mater cognition that is reached by modern science. No clear criterion of **E.p.** is present. Now there are accounted more than 350 **E.p.** mainly unstable ones. The *photons,* leptons, mesons etc. belong to the **E.p.** Every **E.p.** (except the «genuine neutral» photon and some mesons) corresponds to its antiparticle. Particle-antiparticle pairs interaction leads to *annihilation*.

ELIMINATION BIOLOGICAL HALF-TIME, (T_b), — time within which the *radionuclide activity* accumulated in organism or organ id reduced in twice only due to the biological elimination processes. Ref. *Elimination effective half-time*.

ELIMINATION EFFECTIVE HALF-TIME, (T_{ef}) — time within which the *radionuclide activity* accumulated in organism or organ id reduced in twice due to the biological elimination processes and nuclide *radioactive decay*: $T_{ef}=T_bT_{1/2}\cdot(T_b+T_{1/2})^{-1}$, where $T_{1/2}$ — radionuclide *half-life* and T_b —*elimination biological half-time*.

EMBRYO (from Greek *εμβρυον* —germ), germ, organism on early stages of progress. Human embryo development period is from zygote (fertilized ovicell) up to the foetal organs laying completion on prenatal period 8th week. After that up to the birth **E.** is named *foetus*.

EMBRYOTOXIC EFFECTS OF RADIATION, anomalies and malformations forming as the result of embryonic progress alteration due to *intrauterine irradiation*. **E.e.r.** are the part of *teratogenic effects of radiation*. **E.e.r.** possess the intermediate place between *somatic* and *hereditary effects of radiation*.

EMERGENCY (accident) IRRADIATION, unexpected increased *external irradiation* and/or *radioactive materials* incorporation by personnel and population as the result of *nuclear power plants accidents*. Ref. also *Exposed person categories*.

EMISSIONS OF RADIOACTIVE SUBSTANCES, releases, *radioactive substances* entry into atmosphere as the result of industrial facility function. Is characterised with emission rate (emission speed) — value of **E.r.s.** per time unity.

ENERGY SPECTRUM OF IONISING RADIATION, *corpuscular ionising radiation* or *photons* scale through their energy.

EQUIVALENT DOSE OF IONISING RADIATION, equivalent dose of radiation, equivalent dose, (H), value introduced for radiation danger estimation from chronic exposure of random content and defined as product of *ionising radiation absorbed dose* (D) and average *radiation quality coefficient* (Q) in tissue given point: H=DQ. **E.d.i.r.** is applied for *ionising radiation biological effects* accounting in organs and tissues, for low doses irradiation consequences estimation regarding human in a whole the *effective dose of ionising radiation* is applied. In SI the **E.d.i.r.** is measured in *Siverts* (Sv). The off-system unit is *rem*: 1 Sv=100 rem. In case of only *external irradiation* when the *alpha-particles* can't provide effect on organism, the absorbed dose and **E.d.i.r.** are equal to each other: 1 Gy=1 Sv, 1 *rad*=1 rem. Under *internal* (or combined) *irradiation* the **E.d.i.r.** are all the more different from absorbed dose along the more amounts of *radionuclides* emitting α-particles entered organism.

EQUIVALENT DOSE RATE, (P), *ionising radiation equivalent dose* increment dH per low time period dt divided by this period: $P=dH\cdot dt^{-1}$. **E.d.r.** measurement unit is *Sivert* per second ($Sv\cdot sec^{-1}$).

ERYTHEMATOUS DOSE (dated), *threshold dose of ionising radiation* inducing *radiation erythema* (biodose analog for ultraviolet radiation). **E.d.** depends on exposed mammalian individual *radiosensitivity*. In human the **E.d.** ≈300–400 R (3–4 Gy).

EXEMPLARY RADIATION, *roentgen radiation* with generating voltage 180–250 kV and *linear energy transfer* average value 3 $keV\cdot\mu m^{-1}$ of water.

EXPECTED COLLECTIVE EFFECTIVE DOSE OF IONISING RADIATION, expected collective equivalent dose, ECED, *collective effective dose of ionising radiation* that people (people generation) receive from some *ionising radiation sources* for all the rest existence period. Measurement unit is men-*Sivert* (man-Sv) or man-*rem*.

EXPECTED EFFECTIVE DOSE, *effective dose* or *average equivalent dose* in some organ or organism that can be received as the result of planned irradiation decision or after practical work with *ionising radiation sources* for all term of those sources exploitation in this group of people. This is calculated per one person as average value for given group.

EXPOSITION DOSE OF IONISING RADIATION, exposition dose of radiation, exposition dose, (X), amount of *ionising radiation* energy spent for *ionisation* of air volume unity. Is defined as integral charge dQ of one-sign ions appearing in air under all secondary *electrons* complete slowdown that were originated by *photons* in air low volume rated to the air mass dm in that volume: $X=dQ\cdot dm^{-1}$. Term **E.d.i.r.** is applied for *photon ionising radiation* with *photon* energy 1–3,000 keV. Characterises the *roentgen* or *gamma-radiation* source (Ref. *Ionising radiation sources*). *Roentgen* (R) is off-system but traditionally applied measurement unit for **E.d.i.r.** In SI the **E.d.i.r.** unit is $Coulomb\cdot kg^{-1}$: $1\ R = 2.58\cdot10^{-4}\ Cl\cdot kg^{-1}$; $1\ Cl\cdot kg^{-1} = 3.876$ R. In human organism soft tissue exposure to *roentgen* or *gamma-radiation* the **E.d.i.r.** of 1 R corresponds to the *absorbed dose of ionising radiation* of 8.8 mGy.

EXPOSITION DOSE RATE, (P), *ionising radiation exposition dose* increment dX per low time period dt divided by this period: $P=dX \cdot dt^{-1}$. **E.d.r.** measurement unit is Coulomb·(kg·sec) $^{-1}$=3,876 *roentgen* per second (R·sec). Ref. also *radiation background.*

EXTERNAL IRRADIATION, body exposure to radiation from outside sources of *ionising radiation.*

FOETUS, mammalian *embryo* in period after main organs and systems genesis initiation. In human the germ since 2nd month of gestation till birth is named foetus.

FISSION OF ATOMIC NUCLEI, atomic nuclei splitting, *atomic nucleus* decay into 2 (rare 3 of 4) fragments. Spontaneous **F.a.n.** is observed only in heavy elements (uranium for instance) and restricts the new trans-uranium elements existence availability. Is accompanied with emission of secondary *neutrons*, *gamma-quantums* and energy discharge. *Chain nuclear reaction* realisation is base upon the **F.a.n.** phenomenon. Was discovered by O.Gann & F. Shtrassmann (1939). Spontaneous F.a.n. was discovered by G. Flerov & K. Petrjak (1940).

FLUENCE, ratio of total number of particles passed for some time period through area perpendicular to the particles flow direction to that area square. In *radiation safety* **F.** is the number of particles (*photons*) dN entering the sphere of low cross-section dS rated to that section $F = dN \cdot dS^{-1}$.

FREE RADICALS, *atoms* or groups of atoms having unpaired *electrons* for example H, OH, HO_2, CH_3 etc. **F.r.** are extremely capable for reacting and unstable in normal conditions. Main biological effect of radiation is stipulated by H, OH & HO_2 **F.r.** Hydroperoxide (HO_2) concentration depends upon solution saturation with oxygen (Ref. *Oxygen effect*). **F.r.** risen after the water *radiolysis* interact with various dissolved molecules initiating the secondary-radical products.

GALACTIC SPACE RADIATION, type of *space radiation* — the most high-energy component of corpuscular flow in cosmic space. **G.s.r.** is presented with accelerated to the high energy values chemical elements nuclei with hydrogen and helium nuclei prevalence. **G.s.r.** with its *penetrating capacity* surpasses all other types of *ionising radiation.* **G.s.r.** particles energy is about 10 GeV. Radiation dose from galactic **S.r.** reaches in interplanetary space 50–100 *rem* per year making radiation danger for cosmonauts especially in long-term flights.

GAMMA-QUANTUM, γ-quantum, *photon* (electromagnetic field quantum) of high energy (commonly over 10^5 eV). **G.q.** are produced under *quantum transitions* in *atomic nuclei* and *elementary particles* transformations.

GAMMA-RADIATION, γ-radiation, γ-rays, short-wave electromagnetic *ionising radiation* with wave length less than 10^{-10} m, appearing in quick charged particles interaction with matter, electron-positron pairs *annihilation* and *closed type sources of ionising radiation.*

GENBAKU-BURA-BURA DISEASE (from Japanese *genbaku* – atomic bomb and *bura-bura* – lingering, chronic), «atomic bomb chronic disease», syndrome risen in many *hibakusha* after Hiroshima & Nagasaki atomic bombings. **G.b.b.d.** combines complaints on fatigability, dizziness, palpitation, lumbago, back & neck pain etc. Underlying conditions of the syndrome are debatable. One authors explain the **G.b.b.d.** through psychological problems («atomic bomb neurosis»), others consider the disease as the *ionising radiation* impact result.

GENE (from Greek *γενοξ* — clan, origin) discrete heredity unit with which *genetic information* recording, storage and transmission is held in generations sequence.

GENEFUND, (from *gene* and French *fond* — basis, fund) totality of all the genes in organisms one population or species.

GENETIC ACTION OF IONISING RADIATION, radiation mutagenesis, hereditary alterations (*mutation*) rise under organism exposure to all kinds of *ionising radiation.*

GENETIC EFFECTS OF RADIATION, irradiation consequences having no dose threshold and realised through the *genetic action of ionising radiation*. **G.e.r.** are regarded to irradiation stochastic effects, however recently data were published concerning especial heritable non-stochastic radiation injury on cellular level of organisation [Bychkovskaya I.B., Komarov E.I., 1990]. **G.e.r.** are defined with integral *absorbed dose of ionising radiation* inrespective of exposure duration (ref. *Dose accumulated*) and have prolonged latent period counting with decades. **G.e.r.** presentation in first generation are consistent in birth rate decrease and malignancy incidence elevation. In further generations — in population *genefund* damage. However according to IAEA data (1995) the **G.e.r.** were still not registered in studies of both Japanese and other population cohorts. Therefore the radiation genetic risk existence for human is recognised only though theoretical considerations with its value estimation with animal studies results extrapolation (Ref. Also *Radiation risks*).

GENETIC INFORMATION, hereditary information, total amount of information about organism content, structure and metabolism character with related to that functions. In human is located in desoxyribonucleic acid (DNA) that is localised in chromosomes and some cell organella (mitochondria).

GENETICALLY SIGNIFICANT EQUIVALENT DOSE OF IONISING RADIATION, genetically significant equivalent dose (GSED), radiation dose value after which absorption the *genetic radiation effects* rise is possible. Is characterised with *ionising radiation equivalent dose* on gonads and probability value for exposed person to have children later on (defined by age). Ref. Also *Radiation risks.*

GLOBAL FALLOUT, the same as *Artificial (man-made) radiation background.*

GREY, (Gy) measurement unit for *ionising radiation absorbed dose* in SI. One Gy is equal to 1 Joule of any ionising radiation energy transferred to 1 kilogram of irradiated matter. 1 Gy=100 *rad.* Named in honour of British scientist S. Grey (1670–1736).

HALF-LIFE, time interval through which the nuclei number of given substance radioactive *atoms* reduces in twice due to spontaneous nuclear transformations.

HAEMOSORPTION (from Greek *αιμα* — blood and *sorbeo* — imbibe), detoxifying haemosorption, way of toxic substances elimination from blood flow through *sorption* of toxic substances with sorbent through which the purifying blood is filtrated. **H.** Can be applied in *radionuclides* incorporation however this method is actual regarding *radioactive materials* elimination only in terms of their intake by the organism and circulation in blood. Ref. Also *Absorption, Adsorption, Sorption*.

HEREDITARY RADIATION EFFECTS, *ionising radiation* impact becoming apparent in exposed organisms posterity (Ref. also *Somatic effects of radiation, Embryotoxic effects of radiation*).

HIBAKUSHA (from Japanese – survived after atomic bomb) Hiroshima & Nagasaki atomic bombings victims and their offspring.

HYDROGEN BOMB, thermonuclear bomb, bomb of high destructive force with *thermonuclear explosive charge*. Action of **H.b.** is based upon energy discharge in more heavy nuclei synthesis from light ones under extremely high temperatures.

HYPOTHETICAL ACCIDENT, accident for which no *radiation security* was provided in technical project and requiring arrangements elaboration and application for population and personnel protection. Ref. *Nuclear power plant accidents*.

INCORPORATION OF RADIOACTIVE MATERIALS, radionuclides deposition, (from late Latin *incorporatio* – including in its content), *radioactive isotopes* accumulation process in organism through their inclusion in organs and tissues structure both with participation in metabolism.

INDIVIDUAL RADIATION DOSES, *absorbed, equivalent and effective doses of ionising radiation* determined for one person with individual peculiarities and irradiation character taking into account both with irradiation irregularity, *ionising radiation* type and biological effectiveness, exposed organs and tissues individual *radiosensitivity* etc.

INTERNAL IRRADIATION, body exposure to radiation from *ionising radiation* sources located inside it. Injuring effects of incorporated radionuclides is considered being stipulated mainly by the formed by them *ionising radiation absorbed dose* (radiotoxicity) but not the chemical toxicity. That is related to the radioactive materials extremely low amounts under high *radioactivity* value. **I.i.** is peculiar with selective accumulation in *critical organs* and with effects of highly-ionising *alpha-* and *beta-radiation* impact of which on viscera from *external exposure* is insufficient due to their low penetrating capacity. **I.i.** can induce *radiation injuries* similar to that in external irradiation with equal absorbed dose values.

INTERNATIONAL NUCLEAR EVENTS SCALE (INES), tool of information transmission applied by IAEA for radiation events classification. Scale covers levels from zero one (inessential event for security) up to the seventh one — large-scale accident with wide consequences for people's health and environment. Accident on the Tree-Mile-Island NPP corresponded to the level «five»; damages on the industrial site were serious but radioactivity releases out of site occurred not substantial. Chernobyl accident that led to wide-scale impact outside the NPP industrial site was attributed to the level «seven» i.e. highest scale rank. Ref. also *Nuclear power plant accidents*.

INTERVENTION IN RADIATION SITUATION, intervention, activity altering the normal life style aiming mainly the respective protective arrangements application for people exposure reduction from accident *ionising radiation source*. According to the *basic safety standards* levels of intervention in radiation situation include emergent protective arrangements (sheltering, iodine prophylaxis, evacuation), long-term actions (temporary relocation and constant resettlement), foodstuffs requisition and replacement. So evacuation is considered expedient if the dose of 50 mSv (5 rem) is avoided for no more than 1 week, constant resettlement — 1 Sv (100 rem) for the whole life.

INTRAUTERINE BRAIN IRRADIATION, pre-natal brain irradiation, brain irradiation in utero, *ionising radiation impact* on developing brain of *embryo* and *fetus*. Considered fixed consequences of **I.b.i.** are: olygophrenia, microcephalia, fits, some types of neurological deficit; additional schizophrenia cases rise is suggested. *Threshold dose* for mental retardation genesis after pre-natal irradiation in 8–15 gestation weeks (the most critical period for cerebrogenesis) is considered within 0.12–0.23 Gy interval and 0.23–0.7 Gy — for 16–26 weeks gestation period. Ref. Also *Radiation risks, Teratogenic effects of radiation*.

INTRAUTERINE IRRADIATION, pre-natal irradiation, irradiation in utero, *ionising radiation* impact on *embryo* and *fetus*. As the result of **I.i.** the *radiation embryotoxic effects* can be observed. Ref. also *Teratogenic effects of radiation*.

ION, electrically charged particle produced after *atom* or molecule capture or lost of *electrons*. Positively charged **I.** are named cautions and negatively charged — anions.

IONISATING CAPACITY, ionisation denseness, *ionising radiation* capacity to split the *atoms* into positively and negatively charged *ions*. Is measured with number of ion pairs produced per unity of radiation particle run in air (ref. *Linear denseness of ionisation*). **I.c.** of *alpha-radiation* constitutes 10,000–20,000 pairs·mm^{-1}, of *beta-radiation* — 5–10 pairs·mm^{-1}, of *gamma-radiation* — 1 pair·cm^{-1}, of *neutrons* — hundred–dozens thousand pairs·mm^{-1}, of *protons* — 46,000 pairs within run path.

IONISATION, *ions* and free *electrons* formation from electrically neutral *atoms* and molecules.

IONISING PARTICLES FLOW, (F), number of *ionising particles* dN passing the given surface for time interval dt: $F=dN\cdot dt^{-1}$. Ref also *Fluence*.

IONISING PARTICLES, particles constituting the *ionising radiation*.

IONISING RADIATION SOURCES, objects containing radioactive materials or technical facilities emitting or capable to emit under definite conditions the *ionising radiation*. *Closed-type and opened-type* ***I.r.s***. are defined both with that of natural and man-made, standard, control etc.

IONISING RADIATION, radioactive radiation, penetrating rays, radiation, any kind of radiation interacting with environment with opposite — charged ions forming i.e. atoms and molecules *ionization*. Following types of **I.r.** are recognised: *gamma-radiation, roentgen (characteristic and bremsstrahlung)* and *corpuscular* ***I.r.*** **I.r.** are classified in *quantum* or *photon* ones (γ- and roentgen radiation) and *corpuscular* ***I.r.***

IRRADIATED PERSONS CATEGORIES, groups of irradiated persons conditionally selected through contact circumstances with *ionising radiation sources* and possible consequences of *ionising radiation* impact on organism. **Category A** — personnel (professional workers) — persons directly working with ionising radiation sources. **Category B** — limited part of population — persons not working with radiation sources but regarding the residence conditions, professional activity or working places location exposed to ionising radiation impact. **Category C** — population.

ISOTOPES (from Greek *ισος* — equal, similar and *τοπος* — place), varieties of the same chemical element different with atoms mass. Atomic nuclei of **I.** differ with number of *neutrons* but contain equal number of *protons* and possess the same place in periodical system by Mendeleyev. Natural and artificial **I.** are recognised both with stable and radioactive ones (ref. *Radioactive isotopes*). Term was suggested by F. Soddy in 1910.

KERMA (English abbreviation *Kinetic Energy Released in Material*), initial kinetic energies sum of the charged particles (*ions*) produced in the exposed environment under impact of indirectly *ionising radiation (neutron, roentgen* and *gamma-radiation)*. **K** is not coincides with *absorbed dose of ionising radiation* as some its part is transformed in secondary indirect ionising radiation at the expense of secondary *electrons* bremsstrahlung and not evolves in the absorbed dose. **K.** As the absorbed dose is measured in *Greys* or *rads*.

LAYER OF RADIATION HALF-REDUCTION, substance layer thickness reducing the mono-directed radiation beam in two times.

LINEAR ENERGY TRANSFER, linear energy loss, LET, (L), *ionisation* events number per particle run length unit or tissue volume. **L.e.t.** is calculated as ratio of the energy amount dE transferred to the medium by moving charged particle through collisions in its move for distance dl and this distance $L=dE \cdot dl^{-1}$. Measurement unit for **L.e.t.** is the kilo-electron-volt per micrometer of water ($keV \cdot \mu m^{-1}$). Characterises volume distribution of *ionising radiation* absorbed energy. Through **L.e.t.** the *Quality coefficient of radiation* is defined.

LINEAR IONISATION DENSENESS, (LID), ions number pairs produced per run length unit (1 μm) of *ionising particle*. Ref. *Ionising capacity*.

LONG-ACTING RADIOPROTECTORS, biological radioprotection, mainly the substances of biological nature aimed on organism elevated *radioresistance* prolonged state maintenance. Are applied in works with *ionising radiation sources* or in elevated *radioactivity* zones, long-term space flights, and prolonged radiotherapy. The *antioxidants* (tocopherol, ascorbic acid etc.), vaccines and polysacharides isolated from some bacteria and yeast cells; sex hormones (estradiol); blood extract; serum globulins; polyphlavan; buckwheat extract; aspartic acid potassium and magnesium salts; dry preparations from thyroid gland etc. are placed among the **L.a.r. L.a.r.** application directly before irradiation is ineffective. To provide the radioprotective effect their use is required one or several days before exposure. **L.a.r.** protective action and side-effects compared to the *short-term ones* are presented rather to the less extent.

MAXIMUM EQUIVALENT DOSE, (H_M), highest value of integral *equivalent dose of ionising radiation* in *critical organ* (body) from all *ionising radiation sources*.

MAXIMUM PERMISSIBLE DOSE, individual *equivalent dose of ionising radiation* maximum value per year that under uniform impact for 50 years will induce in personnel (category «A») no health unfavorable changes registered by modern methods. Is the maim *dose limit* for category «A» persons. **M.p.d.** is the permissible value of sum of equivalent dose from external occupational irradiation per year and semi-centennial equivalent dose from *radionuclides* occupational intake for the same year. According to the Radiation Safety Norms Criteria – 76/87 the **M.p.d.** for the 1st group of *critical organs* in category «A» constitutes 50 $mSv \cdot year^{-1}$, for the 2nd group — 150 $mSv \cdot year^{-1}$ and for the 3rd group — 300 $mSv \cdot year^{-1}$ respectively. Ref. *Permissible levels, Categories of irradiated persons*. According to the International norms for radiation safety — *Basic Safety Standards* (1995) the limits of occupational irradiation dose (or **M.p.d.**) are a bit different: *effective dose of ionising radiation* averaged for 5 consequent years: 20 mSv per year; effective dose 50 mSv per year for any separate year; equivalent dose on eye lens — 150 mSv per year; effective dose on extremities — 500 mSv per year; under especial conditions workers executing *intervention in radiation situation* can be exposed to the level of 100 mSv per year.

MAXIMUM PERMISSIBLE YEARLY INTAKE, such kind of *radioactive materials* organism intake per respiratory and digestive organs in limited population part (category «A») for 1 year that will form in the *critical organ* (organism) *the ionising radiation equivalent dose* equal to 1 *maximum permissible dose* for 50 years.

MUTAGENESIS (from Latin *mutatio* — change and Greek *γενεσιζ* — origin), artificial production of *mutations* by means of physical, chemical or biological *mutagens*.

MUTAGENS, physical, chemical and biological factors which impact on biological organism leads to *mutations* rise with incidence exceeding the spontaneous mutations level. All *ionising radiation* types are the **M**.

MUTANT, hereditarily changed form of organism as the result *mutation*.

MUTATIONS, sudden natural or artificially induced heritable changes in genetic material leading to ones or another organism feature changes.

NATURAL RADIATION BACKGROUND, native radiation background, *ionising radiation* from natural *sources of ionising radiation* of space and earth origin. For population of the Ukraine the average-year weighted *effective*

doses of ionising radiation due to the **N.r.b.** constitutes 4.88 mSv (0.488 *rem*). Percentage contribution of main dose-forming sources constitutes: radon (^{222}Rn) in the air — 3.8 mSv (77.9%), building materials radioactivity — 0.26 mSv (5.3%), ^{234,238}U, ^{226}Ra, ^{222}Rn in water — 0.17 mSv (3.5%), natural γ-background — 0.15 mSv (3.1%), space radiation 0.3 mSv (5.9%), internal β-irradiation — 0.2 mSv (4.1%). Ref. also *Artificial radiation background, Cosmic space radiation, Radiation background, Technologically elevated radiation background.*

NEUTRINO (from Italian neutrino, diminutive from neutron) (ν), stable electrically neutral *elementary particle* attributed to the leptons with rest-mass in many times lower than rest-mass of *electron* and participating only in weak and gravitation interactions.

NEUTRON (from Latin neuter — neither one nor another), (n), electrically neutral *elementary particle* with rest-mass exceeding that of *proton* for 2.5 electron masses; is attributed to baryons. **N.** together with proton are in content of *atomic nuclei*. In free state is unstable (life time is about 16 minutes) and decays in *proton, electron and antineutrino*. In nuclei **N.** is stable.

NEUTRON RADIATION, flow of *neutrons*. Is attributed to *corpuscular ionising radiation*.

NON-STOCHASTIC RADIATION EFFECTS, the same as *deterministic effects of radiation*.

NON-UNIFORM (IRREGULAR) RADIATION IMPACT, radiation impact on object with volume distribution irregularity coefficient of *equivalent dose* exceeds value of 1.1.

NUCLEAR ACCIDENT, uncontrolled run of *nuclear chain reaction* in *nuclear reactor* that can be related to the thermoproducing elements, erroneous drawing out of regulating rod, and also the *critical mass* forming. Ref. *Accidents on NPP*.

NUCLEAR AMMUNITION, battle-operational parts of missiles and torpedoes both with aircraft bombs, fougasses, shells etc. with *nuclear* or *thermonuclear loads*. In **N.a.** explosion the shock wave, light radiation, penetrating radiation, radioactive contamination and electromagnetic impulse make the striking action. **N.a.** explosion power (trotyl equivalent) constitutes from several hundred up to dozens Mt of trotyl.

NUCLEAR CARBURANT, ref. *Nuclear fuel*.

NUCLEAR CHAIN REACTION, self-maintaining reaction of *atomic nuclei fission* under neutrons impact in condition that every decay event is followed by emission of not less than 1 *neutron* that provides reaction maintenance. In rather high values of *neutrons* multiplication coefficient the **N.c.r.** can become uncontrolled and lead to the *nuclear explosion*. **N.c.r.** is the way of *nuclear energy* obtaining.

NUCLEAR ENERGY, atomic energy, *atomic nuclei* inner energy released in *nuclear reactions*. The **N.e.** utilisation is based upon *atomic nuclei fission* chain reaction realisation. Ref. also *Controlled thermonuclear synthesis, Nuclear chain reaction*.

NUCLEAR EXPLOSION, atomic explosion, high-power explosion resulting from the *nuclear energy* release in extremely rapidly progressing *nuclear chain reaction* of heavy nuclei fission (^{235}U or ^{239}Pu) or in *thermonuclear reaction* of helium nuclei synthesis from the more light ones. For the **N.e.** realisation resulting from nuclear chain fission reaction the decaying material mass is to exceed the *critical mass*. **N.e.** based upon the light nuclei synthesis reaction is called thermonuclear explosion.

NUCLEAR FORCES, forces keeping nucleons (*protons* and *neutrons*) in *atomic nucleus*. **N.f.** are the short-range ones and act within 10^{-14} – 10^{15} m.

NUCLEAR FUEL, substance used in *nuclear reactors* for *nuclear chain fission reaction* realisation and serves for energy obtaining. Usually is presented with substances (materials) mixture containing fission nuclei (for instance ^{235}U) both with nuclei ^{238}U or/and ^{232}Th capable after the neutron bombardment in reactor active zone to form the fissile nuclei ^{233}U and ^{239}Pu not existing naturally. Sometimes the **N.f.** is called nuclear carburant, however the « nuclear carburant » term is applied also for the decaying nuclei denomination.

NUCLEAR LOAD, substance containing *nuclear energy* reserve, initiating charge and other devices providing rapid energy release for *nuclear explosion* realisation.

NUCLEAR MAGNETIC RESONANCE, radio-wave range frequency alternating electromagnetic field energy resonant absorption by the substance present in direct magnetic field stipulated by the *atomic nuclei* magnetism. **N.m.r.** is applied for nuclei magnetic moment assay, substance structure study and content analysis (in nervous system studies in particular).

NUCLEAR POWER ENGINE, includes *nuclear reactor*, is used as the mechanical energy source in hauling unit (*atomic-powered vessels*).

NUCLEAR POWER PLANT ACCIDENTS (from Italian *avar*, Arabian *avar* - damage, detriment) sudden damage of *nuckear power plant* facilities and/or lodgments with *radiation safety* alteration that can lead to the people *emergency (accident) irradiation* both with environment *radioactive contamination*. Ref. *Hypothetical accident, International Nuclear Accidents Scale (INES), Planned Accident, Radiation Accident, Nuclear Accident.*

NUCLEAR POWER PLANT, NPP, power plant where *nuclear* (atomic) *energy* is transformed into electricity. The turbogenerator rotation is provided through water steam production under impact of heat liberated in NPP *nuclear rector* active zone.

NUCLEAR RADIATION, flows of particles and *gamma-quantum* born in nuclei transformations (*nuclear reactions, radioactive decay*).

NUCLEAR REACTION, *atomic nuclei* transformations in interaction with *elementary particles, gamma-quantums* or with each other. For **N.r.** realisation the particles (two nuclei, nucleus and nucleon etc.) close approach is required (to the distance ≈ 10^{-15} m) and the single-charged particles energy is to be ≈ 10 MeV. First were started studied by E. Reserford in 1919. Ref. also *Nuclear chain reaction*.

NUCLEAR REACTOR, atomic reactor, device for the controlled *nuclear chain fission reaction* realisation. First **N.r.** was launched in the USA in 1942 (in USSR — in 1946). Nuclei decay takes place in reactor active zone where the *nuclear fuel* is lumped and is followed by the energy substantial amounts release. The **N.r.** are differ through the producing nuclei fission *neutrons* energy values (**N.r.** on thermal, quick and intermediate-type neutrons); according to the nuclear fuel distribution (homogenous and heterogeneous ones); regarding the used moderator (graphite, water/water type etc.); regarding the purpose (power-producing, research); etc. The Chernobyl NPP was equipped with the RBMK-1000 reactors with electric power 1000 MW — heterogeneous, channel-type devices using thermal neutrons with graphite moderator and water heat-transfer. It was revealed that the **N.r.** of RBMK-1000 – type had the constructive imperfections that became one among reasons of the 4th power unit explosion on the Chernobyl NPP.

NUCLEAR WEAPON, atomic weapon, totality of *nuclear ammunition*, their conveyance to the target and control facilities; are the weapons of extermination and have enormous destructive force.

OPEN-TYPE IONISING RADIATION SOURCES, *ionising radiation sources* in which exploitation the contained *radioactive materials* entry to environment is possible.

OPTIMAL DOSE, *ionising radiation absorbed dose* value under which the majority of cancer cells destruction is provided and at the same time adjacent healthy tissues are considered as if not injured. For majority of malignant neoplasm cells the absorbed dose when their destruction occurs constitutes 45–80 Gy. (Ref. *Tolerant dose*).

OXYGEN EFFECT, effect of radiation impact decrease in irradiated tissues under oxygen content lowering in exposure to *ionising radiation* period. Ref. also *Radiolysis, Free radicals.*

PENETRATING CAPABILITY, *ionising radiation* capability to pass through the opaque for visible light substances. *Alpha-radiation* can be entirely stopped by paper sheet or skin epidermis; *beta-radiation* can pass the water layer of 1–2 cm but will be blocked by aluminium plate of several millimeter thickness; *gamma-radiation* is capable for passing through the human body bat can be stopped by thick concrete walls or lead; *neutrons* have the significant penetrating capability and can be braked only by means of thick layers of concrete, water of paraffin.

PENETRATING RADIATION, one of the damaging factors in *nuclear ammunition* explosion. Term is applied mainly in Civil Defence System.

PERMISSIBLE CONCENTRATIONS, permissible volumetric activity, ratio of *maximum permissible year intake* (for persons of category «A») or *year intake limit* (for persons of category «B») of *radioactive materials* to air or water volume with which first ones are incorporated. For persons of category «A» the air volume is set to $V=2.5\cdot10^6$ $L\cdot year^{-1}$, for persons of category «B» the air volume is set to $V=7.3\cdot10^6$ $L\cdot year^{-1}$, water volume — $V=800$ $L\cdot year^{-1}$. Ref. *Permissible levels, Categories of irradiated persons.*

PERMISSIBLE CONTENT, *radioactive materials* average-year content in organism (critical organs) resulting in *ionising radiation equivalent dose* being equal to one *maximum permissible dose* for persons of category «A» or one *dose limit* for persons of category «B». Ref. *Permissible levels, Categories of irradiated persons, Critical organs in exposure.*

PERMISSIBLE DENSENESS OF PARTICLES FLOW, *ionising particles flow denseness* resulting in *permissible dose rate* formation.

PERMISSIBLE DOSE RATE, *maximum permissible dose* (for persons of category «A») or *dose limit* (for persons of category «B») ratio to the time of irradiation during the year. For persons of category «A» the exposure time is set equal to 1,700 $h=1\cdot10^5$ minutes$=6.1\cdot10^6$ sec (taking into account the 36-hour working week and vocation for 4–6 weeks). For persons of category «B» the irradiation time T is set to 8,800 $h=5.3\cdot10^5$ minutes$=3.2\cdot10^7$ sec. Ref. *Permissible levels, Categories of irradiated persons.*

PERMISSIBLE LEVELS, normative values of *radioactive materials* intake, radioactive materials content in organism, their concentration in air and water, dose rate, flow denseness etc. calculated from main *dose limits* values. Ref. *Permissible concentration, Permissible dose rate, Permissible denseness of particles flow, Permissible content.*

PHOSPHENE (from Greek *φως* — light and *φαινω* — show), visible sensation of light spots appearing in human without light impact on eye under mechanical, chemical, electrical etc. irritation of retina or brain cortex visible zones. In *ionising radiation* impact the radiophosphene was described, in electric current — the electrophosphene.

PHOTON IONISING RADIATION, quantum ionising radiation, electromagnetic *ionising radiation*. *Gamma-* and *roentgen radiation* belong to the **F.i.r.**

PHOTON, quantum of light, (from Greek *φως (φωτος)* — light), electromagnetic radiation field quantum. Accordingly the quantum conception the electromagnetic waves are the *elementary particles* — photons flow having zero rest-mass and speed of light.

POSITRON (from Latin *positivus* — positive), (e^+), positively charged *elementary particle*, antiparticle of *electron*. **P.** is stable but in matter exists for extremely short time due to the *annihilation* with electron (e^-). **P.** are produced in processes of e^+e^- pairs birth by *gamma-quantums*, in muon decay etc. Is attributed to the lepton class and take part in electromagnetic, weak and gravitation interactions.

PRACTICE OF IONISING RADIATION SOURCES APPLICATION, practice, people protection providing against excessive irradiation under useful but planned in advance as probably elevating people's exposure application of all *ionising radiation sources* types ranging from medicine, industry and science to the nuclear energetic. Is regulated by the *Basic Safety Standards* through the dose limits (Ref. *Dose limits, Boundary of dose, Maximum permissible dose*). Main limit of in advance planned population irradiation values under nuclear facility normal function constitutes 1 mSv per year or 70 mSv (7 rem) per 70 years of life.

PROJECTED ACCIDENT, *accident on NPP* the initial event of which is set by being in-force normative-technical documentation.

PROTON (from Greek *πρωτος* —first), (p), stable *elementary particle* with positive elementary electrical charge attributed to the baryons; nucleus of hydrogen atom light *isotope* (protium). Together with *neutrons* **P.** Form all the *atomic nuclei.*

QUALITY COEFFICIENT OF RADIATION, obsolete (Q), non-dimensional coefficient defining quality of one or another *ionising radiation* type through complete *energy linear transfer* value for given radiation in water. **Q.c.r.** rise elevates the radiation unfavourable biological consequences degree. Is applied in *radiation safety* field. For *roentgen, gamma- and beta-radiation* Q=1; for *protons* and *neutrons* Q=10; for *alpha-radiation* and heavy rebound nuclei Q=20. Now the *radiation weighted coefficient* is applied instead of **Q.c.r**. (Ref. also *Coefficient of relative biological effectiveness of radiation*).

QUANTUM IONISING RADIATION, the same as *Photon ionising radiation.*

QUANTUM TRANSITION, spasmodic atom or molecule transition from one energy level to another.

RAD, radiation absorbed dose, off-system unit for *ionising radiation absorbed dose* measurement. One rad is equal to 100 ergs of any ionising radiation transferred to the 1 gram of exposed substance mass. 1 rad=100 $erg \cdot g^{-1}$=0.01 Gy, (Ref. *Grey*).

RADIATION (from Latin *radiatio* —shining, emitting) slang name of *ionising radiation.*

RADIATION ACCIDENT, *ionising radiation sources* safe exploitation limit alteration with radioactive products or *ionising radiation* release exceeding the values fixed for normal exploitation as the result of control loss. Industrial, communal and global **R.a.** All **R.a.** are usually classified according to the accident process scale. Ref. *Accidents on NPP.*

RADIATION BACKGROUND, *ionising radiation equivalent dose* from *ionising radiation* natural *sources* of Earth and space origin both with man-made *radionuclides* dispersed in biosphere as the human activity aftermath. **R.b.** is stipulated by the environment factors and not includes irradiation of persons working with ionising radiation sources. **R.b.** is measured with *exposition dose rate* value that is registered in place in the air on height 1.1 m from ground surface. Ref. also *Natural radiation background, Artificial radiation background, technologically elevated radiation background.*

RADIATION DAMAGE, radiation injury, organs and tissues structure and function pathological alterations after irradiation. **R.d.** are distinguished in reversible (*radiation reaction*) presenting part of **R.d.** capable for restoration in irradiated organism and irreversible **R.d.** — part not restoring and capable for *remote radiation consequences* stipulation. Ref also *Biological effects of ionising radiation.*

RADIATION ERYTHEMA, stable skin reddening owing to the *ionising radiation* impact. Is characterised with hyperemia risen due to the capillary dilatation, sensation of skin itching and burning pain. Latent period lasts from several hours up to six days. After irradiation termination the skin reddening decrease and its fine peeling start. Several weeks later the pigmentation appears capable to remain for long time.

RADIATION FROM VAN ALLEN RADIATION BELT, *cosmic radiation* type — flows of *protons and neutrons* captured by the Earth geomagnetic field and forming zones of elevated *ionising radiation* in near-earth space. In central zone of Van Allen radiation belt inner layer within 2,000–3,000 km from Earth surface the *ionising radiation equivalent dose* rate from *protons* reaches several hundred *rem* daily and from *electrons* — several hundred thousand rem daily. That makes extremely actual radiation danger for cosmonauts. On height about 22,000 km from Earth surface the dose rate constitutes about 10^4 $rem \cdot day^{-1}$. In circle-orbit height decrease from Earth surface down to 400–500 km the radiation danger is reduced dramatically.

RADIATION INCIDENT, event with people irradiation with doses exceeding established *dose limits* for respective persons. Ref. *Accidents on NPP.*

RADIATION REACTION, reversible *radiation injury*. Nervous system functional state alterations are the most early **R.r.** Whole organism reactions mediated through neuro-endocrine regulation are of determinative role in **R.r.** forming.

RADIATION RISKS, *irradiation effects* realisation probability. *Radiation genetic effects* risk according to the international norms of *radiation safety — Basic Safety Standards* (1995) — is estimated as 1.2% per 1 Sv and 0.3% per 1 Sv for first two generations. Life-span probability of cancer lethal case induction is estimated in 5% per 1 Sv for all-age people and 4% per 1 Sv for people of workable age. *Radiation teratogenic effects* risk in terms of 8 – 15 weeks after conception is accepted as following: 1 Sv induces the intellectual level (IQ) decrease for 30 ranks; dose required for IQ decrease from normal to the severe mental retardation level — 1 Sv an over; dose required for IQ decrease from low to the severe mental retardation level — several hundred milliSivert. Integral estimations of **R.r.** from *radiation stochastic effects* are accepted as 0.0073% per 1 mSv (0.1 rem) for all people and 0.0056% per 1 mSv for adult working persons.

RADIATION SAFETY, 1) **R.s.** of the NPP — state of NPP at which the fixed limits of personnel and population external and *internal irradiation* equivalent doses, established maximum-permissible limits of *radioactive materials releases and effluents* to environment under NPP normal exploitation and under *projected accidents* are provided by means of technical, organisational and hygienic arrangements complex. 2) arrangements complex bounding people's irradiation and environment *radioactive contamination* down to the lowest values. The ALARA principle is applied in **R.s.** 3) **R.s.** is the scientific-applicable branch of science elaborating ways of radiation situation estimation and prognostics both with providing recommendations of putting it in concordance with established standards. Ref. also *Basic Safety Standards.*

RADIATION SICKNESS, common name of disease rising after the *radiation injury*. **R.s.** is the general and generalised disease rising as the result of *ionising radiation* impact on organism with wide amount of organs and

systems involvement in pathological process. Classification in **acute and chronic R.s.** is generally accepted depending on the irradiation mode i.e. single massive in acute **R.s.** and prolonged repeated in relatively low doses — in chronic one. The **subacute R.s.** is also divided in case of *radionucludes* incorporation with long *elimination half-time period*, when not frequency and repeated mode of radionuclides entry but resulting irradiation dose becomes defining factor in **R.s.** genesis. Irrespective of **R.s.** clinical course form in its progress are divided: 1) disease forming — exposure period and close terms after its termination (up to 1 year); 2) recovery — nearest 1 – 2 years after irradiation termination (or substantial decrease); 3) remote consequences of irradiation.

RADIATION WEIGHTING COEFFICIENT, (RWC), coefficient reflecting *radiation stochastic effects* probability dependence upon the given *ionising radiation* type and energy. Is estimated depending on relative biological effectiveness value (RBE) of given radiation type. To the higher extent is conformed to *quality coefficient of radiation* values. However the quality coefficient application depending on *energy linear transfer* value provides only illusion of measurement high precision, therefore the International Commission for Radiation Protection (ICRP) expects that use of **R.w.c.** based upon RBE will avoid that.

RADIOACTIVE CONTAMINATION, *radioactive substances* natural content exceeding on surfaces, in volume, in human body, home and industrial surroundings, environment.

RADIOACTIVE DECAY, radioactive transformations, radioactivity, spontaneous transformations of one *atomic nuclei* into another followed by *elementary particles*, atomic nuclei (for instance — *alpha-particles*) and hard electromagnetic radiation emission. Following types of **R.d.** are defined: *alpha-decay, beta-decay* (electronic β-decay, positron β-decay and electron capturing), spontaneous fission of *atomic nuclei* and *thermonuclear reactions* (nuclear synthesis).

RADIOACTIVE ISOTOPES, radioisotopes, varieties of chemical element with equal *protons* number but various number of *neutrons* in *atomic nuclei* subject to *radioactive decay*. Ref. also *Isotopes*.

RADIOACTIVE SUBSTANCE (from Latin *radius* — ray, *radio* — beam and *activus* — efficient) type of matter having rest-mass in which the *radioactive decay* is taking place. **R.s.** in opened mode as *internal irradiation* potential sources are divided in four groups of radiation danger. Affiliation with group is defined depending on the **R.s.** minimal meaning activity on working place (MMA): group «A» — the **R.s.** of extremely high gadiation danger degree — includes *radionuclides* with MMA=0.1 μCi; group «B» (high degree) — 1 μCi; group «C» (average degree) — 10 μCi; group «D» (low degree) — 100 μCi (Ref. *Activity of radiation source minimally significant*).

RADIOACTIVE SUBSTANCES EFFLUENT with sewage, effluent, *radioactive substances* entry to the water reservoirs with liquid industrial waste products. Characterised with effluent rate (effluent speed) i.e. **R.s.e.** per time unity.

RADIOACTIVE WASTE, (RW), biologically and/or technically detrimental side-products (substances) containing *radionuclides* produced as the result of human technical activity.

RADIOACTIVITY, radioactive decay, phenomenon of chemical element unstable isotopes spontaneous transformation into another ones following by *ionising radiation* emission. Natural **R.** (**R.** of isotopes existing in nature) and man-made **R.** (of isotopes received through *nuclear reaction*) are distinguished.

RADIOLYSIS (from *radio*… and Greek *λνσιζ* — decay), decay of water and other substances molecules under *ionising radiation* impact. As the result of radiation impact the *ionisation* products appear in water — *free radicals* that interacting to each other realise ionising radiation indirect effect in living cells. Initial processes of *ionising radiation biological effects* are connected to the **R.**

RADIOMODIFICATION (from *radio*… and Latin *modificatio* — degree establishment, dimension definition), biological objects *radiosensitivity* change by means of agents of various nature. Ref. also *Radiosensitization*.

RADIONUCLIDE, *atom* with definite *protons* and *neutrons* number in nuclei content subject to *radioactive decay*.

RADIOPHOBIA (from *radio*… and Greek *phobos* — obsessive fear, dread), obsessive fear of *ionising radiation*. Variant of mysophobia — fear of dirtying. Most often is met in obsessive state neurosis structure (obsessive-phobic neurosis). Is characterised with overwhelming apprehension of *radiation damage* rise in clearly inadequate for that radiation situation. At that critic attitude towards fear groundlessness is preserved and person is actively struggling against, frequently by means of protective rituals. Term **R.** in some cases is allotted with the unwarrantably wide interpretation. The **R.** assignment to the natural personality reaction on irradiation real possibility (especially in case of insufficient or contradictory information about radiation situation both with population illiteracy in the field of radiation hygiene and medicine) and also ultra-valued & delirious ideas of radiation impact is incompetent.

RADIOPROTECTORS (from *radio*… and Latin *protector* – defender), pharmacological preparations increasing organism *radioresistance*. Effect of **R.** is estimated with *dose decrease factor*. *Long-acting radioprotectors* and ones of short-term effect are distinguished.

RADIORESISTANCE, organism stability degree against *ionising radiation* impact. Ref. also *Biological effects of ionising radiation, Radiosensitivity*.

RADIOSENSITIVITY, biological objects sensitivity to the *ionising radiation* impact, opposite to the *radioresistance*. Measured with *half-lethality dose* — LD_{50}. Traditionally is considered that low-differentiated, young and growing cells are the most radiosensitive. Several authors separate concepts «radiosensitivivty» and «radiodamagebility» where in first case the *radiation reactions* are meant and in second — the irreversible *radiation damage*.

RADIOSENSITISATION (from *radio*… and Latin *sensibilis* — sensitive), biological objects *radiosensitivity* elevation by means of various nature agents. Ref. also *Radiomodification*.

RELATIVE BIOLOGICAL EFFECTIVENESS OF RADIATION, RBE, relative (compared to *roentgen* and *gamma-radiation*) capability to induce the *radiation injury* of definite severity degree under given absorbed dose value. Is estimated through the **R.b.e.** *coefficient* which value depends not only on *linear energy transfer* by also upon physical and biological factors. Therefore term **R.b.e.** is applied only in comparative estimation of various radiation types in radiobiology whereas in *radiation safety* field the *quality coefficients* (Q) are applied.

REM, *rad* (before 1963 — *roentgen*) equivalent man, off-system unit of *ionising radiation equivalent dose and ionising radiation effective dose*. 1 rem=0.01 Joule·kg^{-1}=0.01 *sivert* (Sv). **R.** — *ionising radiation* any type absorbed dose resulting in the same biological effect as 1 *rad of roentgen radiation* with spectrum maximal power 200 kEV.

REMOTE RADIATION CONSEQUENCES, biological effects of radiation in terms of more than two years after *ionising radiation* single-time impact termination and also in *radionuclides* chronic impact both with exposure to low doses. **R.r.c.** are stipulated by injuries combination in blood vessels, parenchymal organs and connective tissue. On cellular level the radiation in remote period leads to the potentially tumour cells appearing. **R.r.c.** are presented through genetic and somatic effects and also life-span shortening and premature ageing. All types of **R.r.c.** are devided in tumor and non-tumor forms. Ref. also *Biological effects of ionising radiation*.

REP, roentgen equivalent physical, off-system unit for *corpuscular ionising radiation* (α- & β-particles, neutrons) exposition dose at which the same number of ion pairs is produced in air as under *roentgen* or *gamma-radiation* 1 *roentgen* exposition dose. **R.** is amount of *ionising radiation* dispersing in 1 g of water the energy equal to 93 ergs (or 98 erg in 1 gram of biological tissue). Ref. also *Exposition dose of ionising radiation*.

ROENTGEN (R), the off-system unit for *roentgen* and *gamma-radiation* exposition doses measurement defined through their ionising effect on air. *Ionising radiation exposition dose of* 1 R is corresponding to the 2.083·10^{9} *ion* pairs in 1 cm^3 or 1.61·10^{12} pairs in 1 gram of air. 1 R=2.58·10^{-4} Cl·kg^{-1}.

ROENTGEN RADIATION, roentgen rays, X-rays, invisible short-wave electromagnetic radiation appearing in charged particles or *photons* interaction with *atoms* of substance. **R.r. w**ave length is from 10^{-7} to 10^{-12} m. Characteristic **R.r.** and bremsstrahlung are defined with *photons* energy range constituting 1–1,000 keV (Ref. *Characteristic ionising radiation, Bremsstrahlung*). Was discovered in 1895 by German physicist Vilhelm Konrad Roentgen [1845–1923], awarded for that the Nobel Prize (1901).

SEMI-CENTENNIAL EXPECTED EFFECTIVE DOSE, *expected effective dose* or expected average *equivalent dose* in some organ or organism, that will be accumulated for 50 years from moment of *radionuclides* incorporation in human.

SHORT-TERM-ACTING RADIOPROTECTORS, chemical radioprotection, *radioprotectors* designed for the single-time prophylaxis of acute *external irradiation*. Effect duration lasts from several minutes to several hours. Are used before supposed entry of zone elevated *radioactive contamination* after *nuclear explosion*, *NPP accident*, radiotherapeutic exposure, space extravehicular activity etc. Among them are belonging: mercamine, cystamine, WR-2721, gammaphos, cytaphos, batilol etc. As a rule, the **S.t.a.r.** have side-effects.

SIVERT, (Sv) measurement unit for *ionising radiation equivalent dose and ionising radiation effective dose* in SI. 1 Sv=100 *rem*. 1 Sv is equal to equivalent dose when *ionising radiation absorbed dose* is 1 Gy and *radiation quality coefficient* is equal to 1.

SOLAR COSMIC RADIATION, one of the *cosmic (space) radiation* types — high-energy part of Solar corpuscular radiation originating in chromosphere flashes on the Sun. In intensive solar flashes followed by the charged particles flows (mainly *protons*) the radiation dose can reach dozens and hundreds or *rems* per flash outside the Earth magnetosphere.

SOMATIC EFFECTS OF RADIATION, alterations induced by *ionising radiation* in the exposed organism itself without impact on further generations (Ref. also *Hereditary effects of radiation, Embryotoxic effects of radiation*).

SORPTION (from Latin *sorbeo* – imbibe), imbibing of some substance from environment by solid or liquid body. *Absorption, adsorption,* chemosorption are the main varieties of **S.** Imbibing body is named sorbent and imbibed one — sorptive (sorbate).

SPACE RADIATION, cosmic rays, cosmic radiation, flow of high-energy particles (1–10^{12} GeV) coming to Earth from Space (primary radiation) and born from those particles interaction with atmosphere *atomic nuclei* (secondary radiation) presented with all known *elementary particles*. Primary **S.r.** is isotropic in space and invariable in time; it's content is presented with *protons* (90%), *alpha-particles* (about 7%) and other atomic nuclei up to the most heavy ones both with low amount of *electrons, positrons* and *gamma-quantum*. *Galactiv* ***S.r.****, Sun* ***S.r. and Earth Van Allen radiation belt*** are distinguished.

SPECIFIC ABSORBED DOSE, (δ) *ionising radiation absorbed dose* in *fluence* equal to 1 particle·cm^{-2}, expressed with ratio: δ=D·F^{-1}. **S.a.d.** unit is *Grey*-centimeter squared per particle (Gy·cm^2/particle).

SPECIFIC EQUIVALENT DOSE, (h), *equivalent dose of ionising radiation* in *fluence* equal to 1 particle·cm^{-2}, expressed with ratio: h=D·F^{-1}. **S.e.d.** unit is *Sivert*-centimeter squared per particle (Sv·cm^2/particle).

STOCHASTIC EFFECTS OF RADIATION (from Greek *stochastikos* — be able to divine), probabilistic, casual *effects of radiation*, probability of which is present in arbitrarily low *ionising radiation doses* and elevating along with radiation dose rise. At that unlike the *deterministic effects of radiation* the consequence severity not depends upon the dose value. **S.e.r.** usually become apparent long time after the irradiation. *Genetic effects of radiation*, tumours, leukaemia genesis risks elevation and life span shortening are traditionally attributed to. Stochastic effects of radiation link to the radiation dose is considered through linear, quadratic and linear- quadratic models. At that International Commission for Radiological Protection — ICRP (1977) issues from opinion about threshold absence and «dose-effect» dependence linear character presence.

TANTAMOUNT EQUIVALENT DOSE, average-tissue *equivalent dose of ionising radiation* under uniform radiation impact inducing the same radiobiological effect as the average-tissue equivalent dose in *non-uniform radiation impact*.

TECHNOLOGICALLY ELEVATED RADIATION BACKGROUND, *ionising radiation* from *natural radiation sources* amplified through human industrial (productive) activity. **T.e.r.b.** is formed at the expense of organic fuel burn products containing natural *radionuclides*; in mineral natural resources mining; mineral fertilisers production; aircraft flights; radioisotopes application in science, technics, defence industry, agriculture, national economy; TV-set radiation; charged particles accelerators exploitation. In *NPP (nuclear reactors) accidents* the **T.e.r.b.** substantial elevation takes place. At the same time in NPP normal exploitation the **T.e.r.b.** from its activity is for 5–40 times lower than in heat electropower station of equivalent power capacity. Ref. also *Natural radiation background, Artificial radiation background, Radiation background*.

TERATOGENIC EFFECTS OF RADIATION (from Greek *τεραζ (τερατοζ)* — monster, freak), congenital malformations, anomalies and malformations forming as the result of embryonic development process alteration due to *ionising radiation genetic effect* and *embrytoxic effects of radiation*. **T.e.r.** appear after irradiation in any embryo term and include posterity death, malformations, mental retardation, microcephaly, cancerogenesis etc. Ref. also *Intrauterine irradiation, Intrauterine brain irradiation, Radiation risks, Effects of radiation*.

THERMONUCLEAR CARTRIDGE, mixture of chemical compounds containing hydrogen isotopes (tritium & deuterium). Placed in missile or bomb battle-operational part and capable for *thermonuclear reaction* production followed by energy enormous amount discharge within extremely short time period (ref. *Hydrogen bomb*).

THERMONUCLEAR REACTION, light *atomic nuclei* synthesis reaction into more heavy ones (nuclei synthesis reaction) taking place in ultra-high temperatures 10^7 K of order and higher. **T.r.** are followed by enormous amounts of energy. So in complete transformation of 1 kg hydrogen the $8 \cdot 10^{14}$ Joules are released i.e. approximately 10-fold more that in 1 kg U^{235} fission and $2 \cdot 10^7$ times more than 1 kg petrol burn utilisation. In natural conditions the **T.r.** are take place in the Sun and stars being the main source of radiated energy. Artificial **T.r.** was received yet only in form of uncontrolled reaction in *hydrogen bombs* explosion. Ref. also *controlled thermonuclear reaction*.

THRESHOLD DOSE of radiation damage, minimal dose of *ionising radiation* which absorption can lead to one or another biological effect rise among 1–5% of exposed persons. Ref. *Biological effects of ionising radiation, Absorbed dose of ionising radiation, Erythematous dose*.

TISSUE DOSE, *ionising radiation* energy absorbed by 1 cm^3 of tissue. Ref. also *Absorbed dose of ionising radiation*.

TOLERANT DOSE, endurable dose, 1) (dated) dose, limiting occupational irradiation. Now corresponds to the *maximum permissible dose*; 2) maximum *irradiation dose* not yet stipulating the *deterministic radiation effect* rise presented clinically; 3) *absorbed dose of ionising radiation* prohibited to being exceeded in radiation therapy conduction as the treatment effect will be surpassed with pathological alterations due to surrounding organs and tissues *radiation damage*. Based on nervous system *radioresistance* traditional opinions the **T.d.** for brain in medical radiology field are accepted as 50 Gy, for medulla — 30 Gy, for spinal cord — 30–35 Gy, for eye lens — 5 Gy in case of daily exposure 5 times a week to the dose not more than 2 Gy.

TRACK, charged particle trace in substance.

YEARLY INTAKE LIMIT, such extent of *radioactive materials* entry in organism via respiratory and digestive organs among limited part of population (category «B») for 1 year, that will for the next 70 years produce in *critical organ* (organism) *maximum equivalent dose* equal to 1 *dose limit*. Ref. *Permissible levels, Categories of exposed persons*.