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Terminology for space environment of spacecraft

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Terminology for space environment of spacecraft

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FOREWORD

This standard is proposed by China National Space Administration.

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Terminology for space environment of spacecraft

1 Scope

This standard specifies the common terminologies and definitions for space environment and its effects which the spacecraft encounters.

This standard is applicable to satellite, airship, space station, space probe and other spacecrafts as well as launch vehicle.

2 Terms and definitions

2.1 General terms

2.1.1

space

outer space

the physical universe beyond the Earth's dense atmosphere.

2.1.2

near space

the space region with the altitude from about 20 km to 100 km above the Earth's sea level.

2.1.3

terrestrial space (Geospace)

the space within the range of gravitational attraction (its outer boundary is about 9.3×10^5km far from the Earth).

2.1.4

near earth space

the region with the altitude from 100km to about 3.58×10^4 km above the Earth surface.

2.1.5

deep space

the space at a distance from the Earth equal to or greater than the distance between the Earth and the Moon (about 38.4×10^4km).

2.1.6

interplanetary space

the region between the planets of solar system, exclusive of the region where the planetary influence plays a major role (its outer boundary is about 6×10^{10}km far from the Sun).

2.1.7

interstellar space

the region between Stars (exclusive of the region influenced by Stars).

2.1.8

cislunar space

the space between the Earth and the lunar orbit.

2.1.9

space environment

the all of miscellaneous external environment conditions (including natural environment, artificial environment and induced environment) which may impact on the working of spacecraft's equipment or components during its flight in the space.

2.1.10

space environment engineering

the discipline applying engineering practices to various environments which may have some impacts on product effectiveness and the survival of astronauts, mainly including: space environment prediction, test and evaluation, space environment effect analysis, space environmental condition formulating, space environment adaptability design, space environment test, space environment adaptability evaluation, space environment management, etc.

2.1.11

Low Earth Orbit (LEO) environment

the spacecraft encountered environment when it's operating in the low orbit (usually referred to at the altitude below 1000 km), mainly comprised of the Earth's gravitational field, upper neutral atmosphere, ionosphere, plasma, geomagnetic field, radiation zone, and high-energy particle, meteoroid, space debris, solar electromagnetic radiation, involved in the cosmic ray.

2.1.12

geosynchronous orbit (GSO) environment

the spacecraft encountered environment when it's operating in the geosynchronous orbit, comprised of high-energy particle, hot plasma, plasmasphere, ring electric current, magnetic field, solar

electromagnetic radiation, meteoroid, space debris, etc.

2.1.13

space environmental models

a series of relational expression, diagram, data, program, etc., quantitatively describing changes and distribution states of a certain space environment.

2.1.14

launching and ascent phase terrestrial environment

the terrestrial environment encountered during the launch vehicle launching and ascent phase, mainly including meteorological environment on the launching sites, either on land or at sea, such as wind, atmosphere, heat radiation, the earth surface temperature extremum, humidity, precipitation, fog, ice formation, cloud, thunder and lightning, atmospheric composition, tornado and hurricane, geologic hazards, sea conditions, etc.

2.1.15

orbiting space environment

space operational environment

the spacecraft encountered space environment in the orbiting phase. The natural environments mainly involve neutral atmosphere, gravitational field, plasma, high-energy charged particle, magnetic field, ionosphere, space electromagnetic radiation, meteoroid, etc. The artificial environments mainly involve space debris, high-altitude nuclear explosion, pollution, etc.

2.1.16

return environment

the spacecraft encountered environment in the returning phase, involving the space environment and the landing ground environment encountered during its returning process.

2.1.17

cold dark environment

the environment where the electromagnetic radiation the spacecraft received in the space (except the Sun and nearby planets) with the energy is equivalent to the emitted one by the black body with temperature 3K-4K.

2.1.18

vacuum environment

the space vacuum beyond the Earth's atmosphere. In the near earth space 200km-500km above the ground, the space vacuum degree is 1.5×10^{-4}Pa - 1×10^{-6}Pa; in the near earth space 1000km above the ground, the space vacuum degree is about 1.3×10^{-8}Pa; in the near earth space 10000km above the ground, the space vacuum degree is about 10-11 Pa; in the deep space, the space vacuum degree is up to 10^{-13} Pa-10^{-14}Pa.

2.1.19

space external heat flux, external thermal flux

various heat sources of space radiation reaching the outside surface of the spacecraft during its orbital operation.

2.1.20

extreme temperature and great temperature difference

the condition where the spacecraft on the orbit may encounter extremely high and low temperature, and the great temperature differences between its different parts and of the spacecraft itself at different moments.

2.1.21

particle radiation

transfer of energy by means of particles (including photon). Generally, it neither includes electromagnetic radiation of the band lower than X-ray, nor includes ultraviolet radiation, visible radiation, heat radiation and radio-frequency radiation.

2.1.22

heat radiation environment of spacecraft

the heat radiation environment affecting the spacecraft by the heat radiation from the Sun, planets (and natural satellites) and the reflective radiation of the Sun's radiation from planets (and natural satellites).

2.1.23

space environmental effects

the space environment caused effects on in-orbit spacecraft, ground equipment and personel, ground TTC system, communication system, etc.

2.1.24

space weather

the state for an instant or during a short time period of solar surface, solar wind, the Earth's magnetosphere, ionosphere, thermosphere, etc.

2.1.25

space-radiation protection

the measures and methods required to be used to protect the astronauts and electronic equipment on the orbiting from hazards of space radiation as few as possible and keep the space radiation dose they received at the reasonable and as low as possible level.

2.1.26

space environment monitoring

the monitoring activities of the space environment and its effects.

2.1.27

space environment prediction

the prediction of future states of space environment based on the relationship between the rules of space environment parameter change and physical quantities.

2.2 Neutral atmosphere

2.2.1

atmosphere, neutral atmosphere

the gas layer surrounding the Earth or other individual celestial body.

2.2.2

atmospheric structure

the spatial distribution of the atmosphere based on its feature parameters. Based on the vertical distribution of temperature, it can be divided into troposphere, stratosphere, mesosphere, thermosphere and exosphere; Based on the homogenous property of atmospheric composition, it can be divided into homosphere and heterosphere; Based on the ionization feature of atmosphere, it can be divided into ionosphere and non-ionosphere .

2.2.3

middle atmosphere

the Earth’s atmosphere in stratosphere and mesosphere.

2.2.4

upper atmosphere

the Earth’s atmosphere in thermosphere and exosphere.

2.2.5

troposphere

the Earth’s atmosphere from the surface of the Earth to the altitude of 10 km-20 km where the atmosphere has significant convection, with the temperature generally falling rapidly along with the increase of altitude.

2.2.6

stratosphere

the Earth's atmosphere from the tropopause top above to the altitude of 50 km-55 km where the altitude of top layer varies along with different latitudes and seasons, and the temperature within the layer increases along with the increase of altitude.

2.2.7

mesosphere

the Earth's atmosphere from the stratopause top above to the altitude of about 80 km-85 km where the temperature within the layer falls along with the increase of altitude.

2.2.8

thermosphere

the Earth's atmosphere from the mesopause top above to the altitude of about 85 km-500 km where the temperature within the layer increases sharply and steadily along with the increase of altitude.

2.2.9

exosphere

escape layer

the outermost layer of the Earth's atmosphere above thermosphere and extendable to the altitude of 1×10^3km above, where the temperature within the layer does not vary with the altitude, while the gas molecules have the velocity enough to overcome the gravitational attraction.

2.2.10

upper atmospheric wind shear

the spatial variation of upper atmospheric wind vector in a specific direction, generally categorized as horizontal shear and vertical shear.

2.2.11

wind field

the horizontal motion of air relative to the ground, a vector expressed by wind direction and wind speed.

2.2.12

homosphere

the Earth's atmosphere at the altitude below 105 km where various compositions of atmosphere are fully mixed together, and their proportions do not vary with altitude on the whole.

2.2.13

heterosphere

the Earth's atmosphere at the altitude above 105 km where the proportions of various neutral compositions change due to diffuse equilibrium effect. With the increase of altitude, the proportion of heavy molecule (or atom) composition decreases gradually, and the proportion of light molecule (or atom)

composition increases.

2.2.14

atmospheric electric field

a physical field, being in the atmosphere and causing the electrical interaction with charged materials.

2.2.15

atmospheric model

the model describing the atmospheric structure and changing process, established based on the statistics and theoretical analysis of a large number of parametric and test data in the form of diagram, formula or calculator program. Common models are CIRA, Jacchia, GRAM, MET, etc.

2.2.16

standard atmosphere

the assumptive vertical distribution of atmospheric temperature, pressure and density on the presumption to follow the ideal gas law and hydrostatic equation, roughly reflecting the average conditions of atmosphere over the middle latitudes in a year.

2.2.17

reference atmosphere

the model made with various parameters in the theoretical equations determined by measured data on the basis of theories, indicating the vertical distribution of atmospheric temperature, pressure and density in the conditions of different solar activities and geomagnetic activities.

2.2.18

flight atmospheric environment

the neutral atmospheric environment encountered during the spacecraft operation.

2.2.19

atomic oxygen

the atomic state oxygen (O) with strong oxidizability, generated from oxygen molecule (O2) in the neutral atmosphere due to photoionization produced by solar ultraviolet radiation.

2.2.20

atmospheric temperature

the macro measurement for the kinetic energy of thermal motion of gas molecule in the Earth’s atmosphere.

2.2.21

exospheric temperature

the atmospheric temperature in the outer sphere of the Earth’s atmosphere.

2.2.22

atmospheric density

the ratio of gas mass to the volume it occupies in atmosphere.

2.2.23

diurnal effect

the diurnal variation of atmospheric parameters due to the Earth's rotation.

2.2.24

semi-annual effect

the periodic variation in half a year of upper atmospheric parameters caused by the interaction between the solar wind and the Earth's magnetic field due to the Earth's revolution around the Sun.

2.2.25

atmospheric scattering

the process of changes in direction of propagation, frequency and polarization of electromagnetic waves caused by the interaction between various substance compositions (atom, molecule, dust, cloud, mist, etc.) in the atmosphere and electromagnetic waves.

2.2.26

rayleigh scattering

molecule scatter

the scatter formed when the wavelength of the incident electromagnetic wave is far less than the size of atoms or molecules in the Earth's atmosphere, and its refractive index in the atmosphere is not quite large.

2.2.27

mic scattering

big particulate scatter

the scatter formed when the wavelength of the incident electromagnetic wave is approximate to or greater than the size of various corpuscules (dust, smog, liquid state cloud, solid state cloud, etc.) in the atmosphere.

2.2.28

atmospheric absorption band

the wavebands where the radiation intensity is weakened due to the absorption of atmospheric compositions when electromagnetic radiation is passing through the Earth's atmosphere.

2.2.29

atmospheric window

some electromagnetic wavebands where the wave can penetrate through the atmosphere.

2.2.30

air mass

a dimensionless number characterizing the thickness of the atmosphere that the solar electromagnetic radiation passes through, and taking the thickness of vertical atmosphere of standard atmosphere above

the sea level as a unit measurement.

2.2.31

atmospheric optical thickness

a physical quantity representing the optical properties of the Earth's atmosphere, and expressed as formula (1).

$$Z_\lambda(Z_1, Z_2) = \int_{Z_2}^{Z_1} F(\lambda, Z)\mathrm{d}Z \quad \cdots\cdots (1)$$

wherein:

Z_λ ——Optical thickness of the atmosphere;

Z_1, Z_2——Altitude range in kilometer (km);

F——Volume extinction coefficient of the Earth's atmosphere in per kilometer (km^{-1});

λ ——Wavelength in meter (m);

Z——Altitude in kilometer (km).

2.2.32

atmospheric extinction

the decrease of radiation intensity and the change of spectrum distribution of the electromagnetic radiation due to the absorption and scatter by the Earth's atmosphere.

2.2.33

atmospheric extinction coefficient

the characterizing for the degree of change in the radiation intensity caused by the absorption and scatter of the incident electromagnetic radiation by the atmosphere.

2.2.34

atmospheric agitation

the agitation of aerodynamic structure or aerodynamic surface caused by the unsteady flow or gust in the atmosphere.

2.2.35

atmospheric dispersion

the chromatic dispersion effect produced due to the difference of refractive indices the lights with different wavelengths have in the Earth's atmosphere.

2.2.36

atmospheric transmittance

the ratio between the radiant energy of the electromagnetic wave having passed through the atmosphere and reached the observation point and that radiant energy before its passing through this section of the atmosphere.

2.3 Ionosphere

2.3.1

ionosphere

the quasi-neutral plasma region with low energy, composed of free electron, ion and neutral particle generated by the ionization of the Earth's atmosphere due to solar high-energy electromagnetic radiation, cosmic ray and fallout particle acting on it, located at the altitude from 50 km to thousands of kilometers, dividable into D layer, E layer, F1 layer and F2 layer based on the change of electron density along with the altitude.

2.3.2

electron density distribution

the change of electron density in the ionosphere at the given time varied with the spatial location.

2.3.3

total electron content, Integrated electron content, Column electron content

the total number of electrons catained in the altitude column of a unit cross-sectional area.

2.3.4

ionospheric disturbance

the change of ionosphere due to the solar activity or wave, spacecraft motion in the atmosphere and other artificial factors.

2.3.5

ionospheric storm

the ionospheric disturbance caused by the enhanced solar wind during the solar flare eruption.

2.3.6

ionospheric substorm

the phenomenon that the electron with energy greater than 20 keV increase the ionization degree in the region of the altitude below 100 km and impact on the radio wave propagation.

2.3.7

ionospheric scintillation

the rapid change of signal amplitude and phase when the radio wave passes through the ionospheric plasma.

2.3.8

sudden ionospheric disturbance

the phenomenon that the ionization degree in the low ionosphere suddenly increase because of a large number of ultraviolet rays emitted and X-rays during the solar flare eruption.

2.3.9

ionospheric model

the model quantitatively providing the parameters, variation features and distributions of ionosphere.

At present, the international reference model in this regard is the international reference ionosphere (IRI).

2.3.10

D layer

a part of the Earth's ionosphere, with the altitude about 50 km-90 km, the electron density with in layer about 1×10^3 e/cm^3-1×10^4 e/cm^3, and the neutral particle concentration much larger than in other layers. And this layer exists only in the daytime.

2.3.11

E layer

a part of the Earth's ionosphere, above D layer, with the altitude about 90km-140km, the electron density about 1×10^5 e/cm^3~2×10^5 e/cm^3, and large in the daytime and turning to small in the nighttime.

2.3.12

F layer

a part of the Earth's ionosphere, above E layer, with the altitude from 140 km extending to thousands of kilometers.

2.3.13

F1 layer

a part of F layer, appearing in the lower part of F layer in the daytime of summer, with the altitude 140 km-200 km and electron density about 3×10^5 e/cm^3.

2.3.14

F2 layer

the main part of F layer, with obvious electron density peak value, large in the daytime and winter, but small in the nighttime and summer. The peak value is at the altitude about 300 km, the peak of electron density is about 1×10^6 e/cm^3 order of magnitude in the daytime and 5×10^5 e/cm^3 order of magnitude in the nighttime, and F2 range is at the altitude from 200 km extending to thousands of kilometers.

2.3.15

sporadic E(E_s) layer

the inhomogenous structure frequently occurring in E layer, thickness about 3 km-5 km, and horizontal scale from about dozens of kilometers to hundreds of kilometers.

2.3.16

spread F

the phenomenon that the inhomogenous structure of a small scale in F region makes the echo trace in F layer on the ionogram present extension.

2.3.17

protonsphere

apart of the ionosphere, with proton as the dominant composition among its ionic compositions.

2.3.18

topside ionosphere

the ionosphere above the altitude where the maximum electron density in the F2 layer exists.

2.3.19

bottom ionosphere

the ionosphere below the altitude where the maximum electron density for the F2 layer exists.

2.3.20

chapman layer

an ideal mode of the vertical distribution of electron density in the ionosphere with the supposition that the solar monochromatic radiation would uniquely control the ionization of the atmosphere with single composition.

2.3.21

critical frequency

the maximum frequency, measured by Hz, of the wave reflectable by the ionosphere when the radio wave is emitted up vertically.

2.3.22

maximum usable frequency

the maximum frequency, measured by Hz, usable by the short-wave communication of the ground surface in the given communication distance.

2.3.23

absorption coefficient

the ohmic loss value of radio wave energy per unit length when the radio wave passes through the ionization medium.

2.3.24

absorption fading

the ionosphere’s attenuation effect on radio waves due to the electron’s collision with gas molecules or atoms in the atmosphere.

2.3.25

ionosphere wave guide

the region between two layers of the ionosphere where the radio wave propagates undulately.

2.3.26

earth-ionospheric wave guide

the region between the ground surface and the ionosphere where the radio wave propagates undulately.

2.3.27

ionospheric wind

the mass motion of neutral atmosphere at the altitude of ionosphere mainly related to the tidal phenomenon and the uneven atmosphere heating.

2.3.28

ionospheric drift

the motion of ionizing compositions in the upper atmosphere crossing over the magnetic lines of flux of the geomagnetic field due to the action of various factors.

2.3.29

equational electrojet

the stronger zonal electric current in the E layer of the geomagnetic equatorial region, caused by the conductivity anisotropy of ionospheric plasma at the altitude of 90 km-130 km in the daylight.

2.3.30

auroral absorption

the observable radio wave absorption with abnormal features in the auroral regions, caused by the high-energy particle flux immersing into the low ionosphere.

2.3.31

polar cap absorption

the phenomenon that, during outburst of the solar flare eruption, the eruptive high-energy proton flux makes ionization of D layer in the polar gap region increase sharply, and the absorption of radio waves is drastically increased.

2.3.32

travelling ionospheric disturbance

the undulating inhomogeneity of electron density in the ionosphere caused by the acoustic-gravity wave propagation.

2.3.33

ionospheric resonance

the phenomenon that the refractive index of waves drastically increased when the wave frequency approaches to the natural frequency of ionospheric plasma.

2.4 Electromagnetic radiation

2.4.1

electromagnetic radiation

the energy transfer in the form of electromagnetic radiation.

2.4.2

earth infrared, outgoing long wave radiation

thermal radiation emitted by the Earth.

2.4.3

cosmic electromagnetic radiation

the electromagnetic wave radiation coming from the cosmic space of the extra solar system.

2.4.4

cosmic X-ray

the electromagnetic wave radiation with wavelength 1.0×10^{-6}μm~1.0×10^{-2}μm coming from the extra solar system.

2.4.5

cosmic γ-ray

the electromagnetic wave radiation with wavelength less than 1.0×10^{-6} μm coming from the extra solar system.

2.4.6

cosmic background radiation

the isotropic electromagnetic radiation with wavelength between about 0.001m and 1 m from the cosmic space background.

2.4.7

solar electromagnetic radiation

the electromagnetic radiation from the Sun.

2.4.8

astronomic unit (AU)

a length unit equal to the average distance between the Earth and the Sun, namely $1.4959787066\times10^{11}$.

2.4.9

solar constant

the whole electromagnetic radiant energy in the outer Earth's atmosphere projected by the Sun per a unit time to a unit area with the distance of one AU from the Sun and perpendicular to the direction of solar ray in the outer Earth's atmosphere.

2.4.10

F10.7 radio flux

the radio flux at a wavelength of 10.7 cm in units of 104 Jansky (1 Jansky=10^{-26}W•m^{-2}•Hz^{-1}).

2.4.11

electromagnic radiation of earth atmosphere

the electromagnetic waves from the Earth's atmosphere, including heat radiation, aurora, airglow, atmospheric lightning, etc.

2.4.12

aurora

the colored lights emitted due to the interaction between charged particles and gases when the charged particles entering the dense atmosphere above the polar region.

2.4.13

airglow

the weak light radiation from the Earth's middle and upper atmosphere irradiated after absorption of the solar electromagnetic radiant energy.

2.4.14

artificial airglow

the luminescent phenomenon due to the chemical reactions between atmospheric compositions and the chemical substances carried and released to the high altitude by the launching rocket, or there scattering sunlight.

2.4.15

solar infrared radiation

the solar electromagnetic radiation with wavelength greater than visible wavelength but shorter than 0.1 mm.

2.4.16

solar visible radiation

the solar electromagnetic radiation at the visible light waveband with the lower limit of wavelength 0.38μm～0.4μm, and the upper limit of wavelength 0.76μm～0.78μm.

2.4.17

solar ultraviolet radiation

the solar electromagnetic radiation with the wavelength between 0.01μm and 0.4μm.

2.4.18

solar X-ray

the solar electromagnetic radiation with the wavelength between 1×10^{-4}μm and 1×10^{-2}μm.

2.4.19

solar γ-ray

the solar electromagnetic radiation with the wave length less than 1.0×10^{-6}μm.

2.4.20

solar radiation pressure

the radiation pressure produced by the solar radiation to in-orbit spacecrafts due to the momentum transfer of photon from the Sun.

2.4.21

microwave radiation

the electromagnetic radiation with the wavelength between about 1×10^{-3}m~3×10^{-1}m .

2.4.22

direct solar radiation

the electromagnetic radiation directly coming from the Sun.

2.4.23

diffuse solar radiation

the radiation from the direct solar radiation after diffusion by atmospheric molecules or suspended solids in the Earth's atmosphere.

2.4.24

albedo

the ratio of the electromagnetic radiation energy the body reflects to the incident one.

2.4.25

Earth's reflectivity

the reflection power of the Earth and its atmosphere for incidence solar electromagnetic radiation.

2.4.26

bremsstrahlung

the process where the electrons of incident material come into inelastic collision with the nucleus of material, and the electrons deflect and change the speed due to Coulombic force while emiting the electromagnetic radiation and losing the energy as well.

2.4.27

diffuse radiation

the randomly distributed radiation of the radiant flux in all directions, formed due to scattering the incidence radiation by the surface or medium and forms.

2.4.28

diffuse sky radiation

the part of diffuse radiation having reached the Earth's surface after the direct solar radiation is diffused by the atmospheric molecules or suspended solids in the Earth's atmosphere.

2.4.29

Earth-atmosphere long-wave radiation

the electromagnetic radiation emitted by the Earth and its atmosphere with the wavelength greater than 4 μm.

2.4.30

spectrum intensity

the radiant energy on the unit wavelength coming through a unit area perpendicular to the ray direction in a unit time with a unit solid angle.

2.4.31

spectrum irradiance

the radiant energy on the unit wavelength (or frequency) interval coming through a unit area and in a unit time.

2.4.32

radiation temperature

the absolute temperature of radiant black-body determined by Wien's displacement law.

2.4.33

sky radiation temperature

the average radiation temperature when the sky is assumed as a black body.

2.4.34

cosmic noise

the electromagnetic noise from outside of the solar system, mainly from the Galaxy.

2.4.35

solar radio noise

the electromagnetic radiation on the radio-frequency band form the Sun.

2.5 Charged particle radiation

2.5.1 General terms

2.5.1.1

space radiation

the natural ionizing radiation from the space outside the earth atmosphere. As per its source, it can be divided into geomegnatic trapped radiation belt, galactic cosmic ray and solar cosmic ray.

2.5.1.2

energetic particle

the charged particle in the cosmic space with energy greater than millions electron volts.

2.5.1.3

cosmic rays

the high-energy charged particle from the cosmic space, including solar cosmic rays, galactic cosmic rays and extragalactic cosmic rays.

2.5.2 Earth's radiation belt

2.5.2.1

Earth's radiation belt, Earth trapped radiation belt , Van Allen belt

the charged particle area stably trapped by the geomagnetic field around the Earth and as with electrons and protons its major ingredients, dividable into inner radiation belt and outer radiation belt according to the altitude positioned.

2.5.2.2

inner radiation belt

the radiation belt near to the earth, with the magnetic latitude boundary on meridian plane located from -40° to +40°, and the altitude above sea level on equatorial plane from 600 km to10000 km; as with electrons and protons its major ingredients and little influence of the solar activity on its strength.

2.5.2.3

outer radiation belt

the radiation belt far from the earth, with the magnetic latitude boundary on meridian plane located from -55° to +55°, and the altitude above sea level on equatorial plane from 10000 km to 60000 km; as with electrons its major ingredients, and protons coming with low energy and flux, and large influence of the solar activity on its strength.

2.5.2.4

artificial radiation belt

the charged particle belt stably trapped by geomagnetic field, formed due to human factors such as nuclear explosion in high altitude, etc.

2.5.2.5

precipitation particle

the charged particle, which drops to low altitude along the magnetic line in high-magnetic latitude area and cannot vibrate between the two mirror points of the geomagnetic field any more.

2.5.2.6

radiation belt model

the mathematical description for the average distribution state of radiation belt, established on the analysis, handling and processing of the space detected radiation belt data. So far, the model widely used at home and abroad for calculating the particle flux of the standard radiation belt is the electron environment mode AE8 and the proton environment mode AP8.

2.5.2.7

flux

the amount particles of vertically incident to a unit area in a unit time.

2.5.2.8

fluence

time-integration of particles incident on a unit area.

2.5.2.9

orbital integrated flux

the amount of particles received on a unit spherical area during a specific time period when the spacecraft operating along the predefined orbit.

2.5.2.10

equivalent fluence

the fluence value of different particles and different energy when causing the same damage to components, parts or materials of spacecrafts.

2.5.2.11

pitch angle

the angle between the direction of charged particle movement and the direction of geomagnetic field.

2.5.2.12

mirror point

the charged particle moving from the weak magnetic field to the strong magnetic field will be reflected back under the condition that the magnetic field is strong enough, this reflection point is called mirror point, and the pitch angle at the mirror point is π/2rad.

2.5.2.13

magnetic rigidity of charged particle

the amount used to describe the motion features of charged particle in the steady magnetic field, and determined by Formula (2):

$$R = \frac{pc}{Ze} \quad \cdots\cdots (2)$$

Wherein:

R——magnetic rigidity of charged particle, and the unit is Temi (T•m);

P——momentum of charged particle, and the unit is Newton second (N•s);

c——the speed of light in vacuum, and the unit is meter per second (m/s);

Ze——the charges of particles, and the unit is coulomb (C).

2.5.2.14

geomagnetic cut-off rigidity

the minimum magnetic rigidity required, for any single point in geomagnetic field and the given incidence direction, for the cosmic particles from infinity to reach the point along this direction.

2.5.2.15

trapped particles

the charged particle able to drift more than a circuit around the Earth under the effect of the geomagnetic field.

2.5.2.16

quasitrapped particles

the charged particle only able to drift less than a circuit around the Earth under the effect of the geomagnetic field.

2.5.2.17

drift shell

the curved surface traced by the drifting trajectory when the charged particles drifting in geomagnetic field.

2.5.3 Solar cosmic rays

2.5.3.1

solar cosmic rays

the high-energy charged particle emitted from the Sun when the solar flare erupting.

2.5.3.2

primary cosmic rays

the cosmic ray not influenced by the earth atmosphere.

2.5.3.3

secondary cosmic rays

the charged particles generated from the interaction between the primary cosmic rays and the earth atmosphere.

2.5.3.4

solar flare

the phenomenon refered to the solar activity that the brightness of the solar local area is enhanced suddenly, rapidly and strongly, which plenty of energy is releasing at the same time.

2.5.3.5

sunspot

A spot or patch appearing from time to time on the sun’s photosphere, appearing dark by contrast with its surroundings.

2.5.3.6

solar particle radiation

the charged particle emitted from the Sun, such as electron, proton, alpha particle, etc.

2.5.3.7

solar particle event , Solar proton event

the event that plenty of high-energy protons and a few other ions are ejected from the solar active region when the solar flare erupts.

2.5.4 Galactic cosmic rays

2.5.4.1

galactic cosmic rays ,galactic cosmic radiation

the high-energy charged particle of the galaxy originated from the extrasolar galaxy.

2.6 Plasma

2.6.1

space plasma , plasma

the partly or wholly ionized gas. Usually, the plasma with energy greater than 10 eV is referred to as hot plasma, and the plasma whose energy less than or equal to 10 eV is referred to as cold plasma. The plasmas in near-earth space include solar wind plasma, magnetospheric plasma, ionization layer plasma and so on.

2.6.2

space plasma instability

one of the characters of the space plasma that the space plasma in mechanical equilibrium state deviates from Maxwell particle distribution or makes the system be away from equilibrium state for some reason, and if the disturbances increase with time, the system will deviate from the equilibrium state more and more, and eventually will result in the loss of balance.

2.6.3

space plasma wave

the longitudinal wave (electrostatic waves of electric field fluctuations) naturally occurred in space and the transverse wave of electromagnetic fluctuations, as well as the electromagnetic wave artificially transmitted into space.

2.6.4

plasmasphere

the region with higher-density plasma surrounding the Earth in the middle and low latitude, its bottom interfaces with ionosphere and its outer boundary generally coincides with the closed magnetic field line.

2.6.5

plasmapause

the outer boundary of plasmasphere structured by the magnetic field line of geomagnetic field.

2.6.6

magnetospheric plasma

the plasma inside the magnetosphere composed of the electrons and ions from the ionosphere and the interplanetary source.

2.6.7

plasma sheath

the ionization shock layer with a large number of positive ions and negative free electrons.

2.6.8

solar wind

the stable plasma flow continuously emitted from the Sun, and with lower-energy electrons and

protons as its main ingredients.

2.6.9

dynamical solar wind pressure

momentum flux of the solar wind is equal to the product of the solar wind density and the square of the speed the given point.

2.6.10

cold plasma flow

the plasma flow with average energy of electrons less than or equal to 10 eV in the geomagnetic field.

2.6.11

thermal plasma clouds

the plasma flow with average energy of electrons accelerated by magnetic fields greater than 10 eV during the course of substorms.

2.7 Space magnetic field

2.7.1 General terms

2.7.1.1

space magnetic field

the magnetic fields including the magnetic field in the space produced by the currents inside the star in the universe and the magnetic field produced by the current system of the space.

2.7.2 Geomagnetic field

2.7.2.1

geomagnetic field

the magnetic fields within the space scope from the geocenter to the magnetsphere boundary.

2.7.2.2

Earth's magnetosphere, Magnetosphere

the plasma region around the Earth surrounded by the solar wind and controlled by the geomagnetic field. It is composed of the magnetopause, plasma mantle, magnetic tail, neutral sheet, plasma layer, plasma sheet, and so on.

2.7.2.3

geocentric solar magnetospheric coordinates

the right-handed Cartesian coordinate system (X, Y, Z) with the original point located at the earth's core. X-axis points to the Sun, and Z-axis is perpendicular to the X axis; and with X-axis and the magnetic dipole sub-axis located in the same plane; Y axis is perpendicular to X axis and Z axis and approximately points to the direction of the dusk geomagnetism at the local time.

2.7.2.4

geomagnetic model

the quantitative description of the distribution of parameters of the geomagnetic field in the space. The commonly used models include the IGRF series and so on.

2.7.2.5

geomagnetic anomaly

the phenomenon that the geomagnetic field deviating from the central dipole magnetic field makes the magnetic fields in some areas on the Earth at the same latitude greater differences.

2.7.2.6

south Atlantic anomaly area

the anomaly area of the inner radiation belt located over the South Atlantic, where the low boundary of inner radiation belt over this area, due to the negative anomaly of geomagnetic field, down to about 200 km above the sea level.

2.7.2.7

magnetopause

the outer boundary of the magnetosphere.

2.7.2.8

bow shock

the shock wave formed in front of the Earth's magnetosphere when the plasma flow of solar wind at speed exceeds over the Alfven speed interacts with Earth's magnetosphere each other.

2.7.2.9

magnetoshoath

the area composed of the heated plasmas of the solar wind between the bow shock and the magnetopause, located on the sun-earth connection line with the average distance to the Earth's core from 10 Earth radii to 14 Earth radii; during the period of morning and night, the average distance from 14 Earth radii to 22 Earth radii.

2.7.2.10

geomagnetic tail

the extension of Earth's magnetosphere in the shady direction and in the external form of conicalness.

2.7.2.11

geomagnetic micro pulsation

a short-periodic variation of the geomagnetic field the range of cycle generally from tenths of seconds to one or two minutes, the duration time from several minutes to several hours, and the variation range of geomagnetic field from several gammas to hundreds of gammas.

2.7.2.12

magnetospheric storm, magnetic storm

the global intense geomagnetic disturbance. The duration of disturbance is more than ten hours to dozens of hours, the variation extent of magnetic induction intensity on the ground surface is from dozens of gammas to hundreds of gammas and up to more than1000γ occasionally.

2.7.2.13

agnetospheric substorm, substorm

the strong disturbance in the night side of high-latitude area and magnetotail of the magnetosphere. The disturbance area includes the entire magnetotail, the plasma sheet and the ionosphere near the auroral zone; its duration is about 1h-2 h.

2.7.2.14

magnetic storm of sudden commencement

a type of magnetic storms, characterized by the sudden commencement, rapid development and slow recovery.

2.7.2.15

magnetic storm of gradual commencement

a type of magnetic storms. It has no specific sign of beginning, and the fluctuations of magnetograms and declination of the principle phase are the main bases for identification. It is the feature of its development that the intension of horizontal component of the geomagnetic field rises slowly at the beginning and then rapidly declines down to the minimum in about ten hours, and then rises again slowly until it returns to normal status in about 1-3 days.

2.7.2.16

magnetically quiet day and disturbed day

the five days in each month when the geomagnetic field is relatively quiet, i.e. magnetic the disturbance is minimum, is called magnetically quiet day of this month. And the five days in each month when the disturbance is maximum is called magnetically disturbed day.

2.7.2.17

geomagnetic activity index, geomagnetic index

the physical quantity characterizing the geomagnetic disturbance degree. It is the classification index to describe the geomagnetic disturbance intension in each time period or the physical quantity to describe certain types of magnetic disturbance intensity.

2.7.2.18

Kp index

the geomagnetic activity index describing the geomagnetic field fluctuations and characterizing the global geomagnetic activity in 3h interval.

2.7.2.19

Ap index

the geomagnetic activity index describing the geomagnetic field fluctuations, derived from the Kp index. And it is the average value of Ap which changes the Kp index of half-logarithm of iron relation and geomagnetic disturbance range relation as linear relation approximately.

2.7.2.20

geomagnetic disturbance

the disturbance occurred in the geomagnetic field, including magnetic storm, magnetospheric substorm, solar disturbed daily variation, geomagnetic pulsation and so on.

2.7.2.21

magnetogram

the kymogram of variation process of the geomagnetic field. Usually it records three elements, including the horizontal components, magnetic declination and vertical components.

2.7.3 Interplanetary magnetic field

2.7.3.1

interplanetary magnetic field

the magnetic field carried by the solar plasma entering into the interplanetary space.

2.7.3.2

large-scale interplanetary magnetic field

the interplanetary magnetic field when the sun is quiet. It is a type of helical field with uniform property and sector structure.

2.7.3.3

sector structure

a kind of sector presented by the large-scale structure of interplanetary magnetic field, its helical line can be divided into several sectors whose interplanetary magnetic fields are in the opposite direction (point to the sun, or deviate from the sun), and the solar wind plasma density and speed in every sector area are distributed in accordance with certain rules.

2.7.3.4

interplanetary disturbance

the variation of the interplanetary space environment caused by the solar activity. It includes the variation of the interplanetary magnetic field, the interplanetary plasma and the cosmic rays.

2.7.4 Spacecraft magnetic field

2.7.4.1

spacecraft magnetic moment

the central magnetic dipole moment of spacecraft.

2.7.4.2

spacecraft remanent magnetic moment

the magnetic moment of the spacecraft off duty in zero magnetic field.

2.7.4.3

spacecraft magnetic compensation

the action, when the residual magnetic moment of the spacecraft in operation goes beyond the requirements of index, to reduce the magnetic moment by means of sticking small magnets on certain positions inside the spacecraft.

2.7.4.4

spacecraft magnetic cleanliness

the method to reduce the magnetism of the spacecraft by changing the installation position or cable-run and methods of spacecraft components.

2.7.4.5

spacecraft magnetizing

the phenomenon that the magnetism of the spacecraft changes because of the influence of the environmental magnetic field when the spacecraft is in the process of ground transportation, storage, testing and launching.

2.7.4.6

spacecraft demagnetizing

the way using the applied-alternating magnetic field to reduce the magnetic moment of spacecraft.

2.7.4.7

magnetic induction

the basic physical quantity describing the intension and direction of magnetic field, its symbol is B, and its unit is T.

2.7.4.8

magnetic intensity

a auxiliary physical quantity describing the magnetic field in the magnetic medium, its symbol is H, and its unit is A/m.

2.8 Space electric field

2.8.1

space electric field

the electric field generated by the non-zero charge-density area due to the charged particles in space, or the induced electric field generated due to the variation of magnetic field, or the magnetosphere space electric field caused by the parametric variation of the solar wind, existing in the cosmic space.

2.8.2

space induced electric field

the space electric field generated by the time-varying magnetic field or space current system.

2.9 Space debris and micrometeoroid

2.9.1 Space debris

2.9.1.1

space debris

all the failed man-made objects in Earth's orbit or re-entried into the atmosphere.

2.9.1.2

large debris

the space debris of size larger than 10 cm.

2.9.1.3

small debris

the space debris of size between 1cm and 10 cm.

2.9.1.4

micro debris

the space debris of size smaller than 1 cm.

2.9.1.5

trackable debris

the debris which can be monitored and traced by the ground equipment.

2.9.1.6

space debris flux

the number of space debris passing through a unit area in unit time; usually referred to the number of space debris passing through one-square meter section in one year.

2.9.1.7

engineering model

the model of the variation of the space debris flux obtained on the basis of the orbit altitude data, along with the debris parameters such as size, speed, direction, etc., and usable for short-term forecasts.

2.9.1.8

evolutionary model

the model of the space debris amount and distribution obtained on the basis of the models with respect to the space launch frequency, space debris collisions and disintegration, and usable for long-term forecasts.

2.9.2 micrometeoroid

2.9.2.1

meteor

the light track generated by the interplanetary small solid objects friction with atmosphere and burning when their breaking into earth atmosphere at a high speed.

2.9.2.2

meteoroid

the small solid objects in interstellar space, orbiting around the Sun along various possible elliptical orbits.

2.9.2.3

micrometeoroid

the tiny and dust-sized meteoroid, usually referred to the meteoroid with the mass less than l gram.

2.9.2.4

meteoroid model

the distribution pattern of the meteoroid flux with mass obtained on the basis of the meteoroid data observed on ground and directly detected in orbit.

2.9.2.5

bolide

a meteoroid with larger mass. When it breaks into the Earth's atmosphere at high speed and rubs against the atmosphere and burns, and a particularly bright light appears, accordingly, dragging a long tail light band.

2.9.2.6

meteorite

the wreckage of meteoroid fallen down to the earth surface.

2.9.2.7

cosmic dust

the solid object with the diameter less than 1mm and existing in the cosmic space. Its main components include silicon, iron, magnesium and their oxides, and ice crystals of hydrogen and ammonia as well.

2.9.2.8

micrometeorite

the cosmic dust fallen down to the earth surface.

2.9.2.9

meteor shower

a phenomenon that many meteors spread out from a certain point in the starry sky, like as radiating

from a point. Meteor shower generates while many meteoroids with the approximate revolution orbits around the Sun break into the Earth's atmosphere at the same time, and they can last for several hours generally.

2.9.2.10

meteor storm

a phenomenon that the number of meteors generated from the zenith per hour increases in a short time suddenly and abnormally.

2.9.2.11

meteor stream

a stream or flow formed by many meteors with the approximate revolution orbits around the Sun.

2.9.2.12

sporadic meteor

the meteors scattered in the sky sporadically.

2.9.2.13

meteor trail

the cloudiness long belt left in the upper atmosphere after the high-speed meteoroids break into the Earth's atmosphere and burn to form as meteors. It consists of burning dust particles of the meteoroids, ionized atmospheric atoms and molecules.

2.9.2.14

orbit of meteor

the movement route of meteors in the heliocentric coordinates.

2.9.2.15

trajectory of meteor

the movement route of meteors in the geocentric coordinates.

2.9.2.16

geocentric speed of meteor

the speed of meteors in the geocentric coordinates after the earth rotation and gravity correction.

2.9.2.17

heliocentric speed of meteor

the speed of meteor relative to the movement speed of the Sun, and equal to the vector sum of the meteor-geocentric velocity and the earth-orbital velocity.

2.10 Gravitational field

2.10.1

gravitational field of the celestial body

the force field where the celestial body attracts other objects. The celestial body refers to a variety of stars in the universe, and the gravitational fields of each star show up as the attraction to the objects (mass) in their own fields.

2.10.2

weightlessness environment

the environment where the objects in space operation are acted only by the gravitations of the Earth, the Sun and other celestial bodies, and there is no interaction between object and object, different parts inside object, and different material particle.

2.10.3

micro-gravity environment

the gravity environment where the micro-acceleration speed generated due to the gravity gradient and other disturbances is less than 1×10^{-3}g (ground-gravity acceleration speed) when the spacecraft does free movement in the gravitational field.

2.10.4

low gravity environment

the gravity environment where the micro-acceleration speed generated due to the gravity gradient and other disturbances is more than 1×10^{-3}g but less than 1g when the spacecraft does free movement in the gravitational field.

2.11 Contamination

2.11.1

contaminant environment

the environment where molecules and particles exist nearby and are generated from the development phase to the orbit-flight phase.

2.11.2

contaminant

when the unwanted molecules or particles from outside attach oneself to the surfaces of the components and parts or materials, the performances of components and parts or materials will be affected, or degenerated.

2.11.3

molecular contamination

the contamination caused by the deposition of a variety of escaping materials in the vacuum environment on other parts surfaces of the spacecraft by means of the molecular flowing.

2.11.4

mass flow rate

the mass of molecular substances passing a unit area of a given plane per a unit time, with the unit:

$g \cdot cm^{-2} \cdot s^{-1}$.

2.11.5

free molecular flow regime

the flow area where the average free path of the molecular is much longer than 10 times the characteristic length of the object.

2.11.6

sticking coefficient

the parameter to definite the probability of molecules impacting and sticking to the surface for a long time.

Note: The sticking coefficient is the function of the parameters such as contamination / surface material matching, temperature, light polymerization, interaction with atomic oxygen, etc.

2.11.7

surface accommodation

the condition that the molecules touch with the surface for enough time and lead to the thermal balance between them.

2.11.8

VCM (Volatile condensable material) test

the test which testes the outgassing characteristics of materials heated to different temperatures in vacuum environment.

2.11.9

molecular column density

the number density integral (the number of a certain molecule in a unit volume) along the specified line of sight from the surface of goals, key, measurement or reference.

2.11.10

outgassing rate

the mass of the molecular released from the materials in a unit surface area during a unit time, with the unit $g \cdot cm^{-2} \cdot s^{-1}$.

2.11.11

particulate contaminant

the contamination caused by dust, fragments, exhausting plume ejected from engine, etc. entering the optical path of spacecrafts or depositing on the surface materials.

2.11.12

exhausting plume

the plume smog formed by the thermal gas ejected while the engines of rocket or spacecraft working in the outer space.

2.11.13

permanent molecular deposition

the molecular substance reacted on the surface of material and adhered on the surface permanently (non-volatile in the given environment).

2.12 Moon and planetary environment

2.12.1

planetary space environment

the environment around the planets and within the spatial region controlled by planetary magnetic field, gravitational field and electromagnetic radiation.

2.12.2

interplanetary matter

all the cosmic matters existing in the interplanetary space.

2.12.3

lunar rocks

the material grains in the surface of the Moon with the diameter larger than or equal to 1 cm.

2.12.4

lunar soil

the material grains in the surface of the Moon with the diameter from 1 mm to 1 cm.

2.12.5

lunar dust

the material grains in the surface of the Moon with the diameters are less than 1 mm.

2.12.6

moonquakes

the quakes occurred in the near-surface or interior of the Moon itself.

2.12.7

mars atmosphere

the gaseous layer restrained by the gravitational field and the magnetic field of the Mars and surrounding the land circle of the Mars.

2.13 Space environmental effect

2.13.1

atmospheric drag effect

the effect making the size and shape of the spacecraft orbit change constantly due to the action of the atmosphere drag on it.

2.13.2

single event effects

single event phenomena

the radiation effect caused from the incidence of the single high energy proton, neutron or heavy ion

on the electronic device or component.

2.13.3

single event upset

the effect that the single particle (proton, neutron or heavy ion) is incident on the electron device and changes the logic state of the device by means of the ionization effect.

2.13.4

single event latch-up

the effect that the single particle (proton, neutron or heavy ion) is incident on bulk-Si CMOS devices and leads to the breakover of the parasitic silicon controlled of CMOS devices by means of the ionization effect.

2.13.5

single event burnout

the effect that single particle (proton, neutron or heavy ion) is incident on devices such as power MOSFET, etc. and leads to the avalanche breakdown of PN of the device and burning down of devices by means of the ionization effect.

2.13.6

single event gate rupture

the effect that single particle (proton, neutron or heavy ion) is incident on devices such as power MOSFET, etc. and leads to the breakdown of the insulating layer of the device and the permanent failure of devices by the ionization effect.

2.13.7

single event transient

the effect that single particle (proton, neutron or heavy ion) is incident on simulation or digital devices and leads to the transient fluctuation of the device output voltage.

2.13.8

surface charging

a physical phenomenon that the space charged particles deposit on the surface dielectric materials of the spacecraft, and have the electric potential occur on the surface of spacecraft.

2.13.9

absolute charging

a phenomenon that the potential differences occur in the ground potential of the spacecraft comparing with the space plasma due to the spacecraft surface charging when the spacecraft operates in the space plasma environment.

2.13.10

differential charging

a phenomenon that the different potentials occur in the surfaces of every part of the spacecraft in the

process of charging because different parts of the spacecraft surface are in different conditions when the spacecraft operates in the space plasma environment.

2.13.11

internal charging

a phenomenon that space high-energy electrons penetrate the spacecraft or the equipment housing, deposit in the spacecraft or the dielectric materials inside the device, which causes the dielectric charging eventually.

2.13.12

surface discharging

the phenomenon of discharging generated due to the potential differences between every parts of spacecraft surface and between different plasmas.

2.13.13

arcing discharge

the phenomenon of arc discharging incurred between different parts of the spacecrafts with different potential differences in the space orbit.

2.13.14

spacecraft wake

the area of the ion density decrease formed behind the spacecraft when its moving in the ionosphere plasma environment at the supersonic speed.

2.13.15

current leakage

the current loss caused due to the plasma when the metal connecting components of the spacecraft solar batteries with different potentials touch with the plasma.

2.13.16

atomic oxygen denudation effect

the effect that the atomic oxygen interaction with outer surface materials of spacecrafts (such as oxidation, sputtering, etching, hollowed out, etc.) leads to the mass loss of the materials, surface denudation and the change with respect to physical / chemical characterstics.

2.13.17

adhesion

a phenomenon that if two solid surfaces contact closely and are loaded with a certain pressure at a temperature far below their melting points, it needs to apply a certain opposite force to separate them.

2.13.18

adsorption

a phenomenon that the gas, dissolved substance or liquid is pulled or absorbed by the surface of solid or liquid it contacts with due to physical or chemical forces between the molecules.

2.13.19

desorption

a phenomenon that the gas or vapor absorbed by materials releases under the rnatural conditions or by means of the physical method boosting, namely the inverse process of absorption.

2.13.20

vacuum dry friction

a phenomenon that the surface friction coefficients of the materials contacted with each other increase in the vacuum due to the desorption and some other reasons.

2.13.21

ublimation

a physical phenomenon that the solid state materials directly become of the into gaseous state leaping over the liquid state stage.

2.13.22

material outgassing

the gas natural desorption from the material.

2.13.23

material degassing

the gas artificial desorbption from the material.

2.13.24

material mass loss

a phenomenon that the materials' mass gradually loses due to analysis and sublimation in a vacuum environment.

2.13.25

vacuum coldwelding

a phenomenon that the materials contacted with each other bond together due to the interdiffusion of material molecules in the contact surface in the environment with the vacuum degree higher than 1×10^{-9} Pa-1×10^{-7} Pa.

2.13.26

effect of solar light pressure

the effect that the direct effects on the spacecraft caused by the solar radiation cause the photon momentum transfer leaving from the Sun and make the radiation pressures on the in-orbit spacecraft.

2.13.27

magnetic moment effect of space magnetic field

the effect that spacecraft's attitude changes due to the magnetic moment when the spacecraft flies in the space magnetic field environment.

2.13.28

linear energy transfer

it is also called the density of linear energy transfer and refers to the energy the incident ions lost along a unit length of path when their transferring in the material, and with the unit MeV/(mg×cm^{-2}).

2.13.29

radiation effect

the property variation of solid, liquid and gas caused by the electromagnetic radiation and the particle radiation.

2.13.30

total dose effects

the accumulated ionization radiation damage of the device caused after it is radiated.

2.13.31

absorbed dose

the ionization and excitation energy absorbed by a unit mass exposed to the radiation.

2.13.32

dose equivalent

it refers to that the different severe degrees which are generated by different kinds of radiation are convert into

the conversion coefficient, generally used in the biological effect, converting the different degrees of severity generated by different kinds of radiation into an identical effect.

2.13.33

ionization dose

the energy of the incident particle the matter absorbed by means of the ionization effect.

2.13.34

maximum acceptable dose

the maximum dose absorbed by a given equipment, components and parts or materials when its parameters degeneration the radiation caused approaches to the lower limit of the damage criterion.

2.13.35

surface erosion

a long-term collision effect on the surface materials of spacecraft given by the meteoroid and space debris with the size mm order.

2.13.36

space radiation biological effects

the effect performed when the space radiation environment interacts with the organism.

2.13.37

ionization effect

the effect that the incidence radiation transmits enough energy to the bound electrons of target

material atoms so as to make the bound electrons excite or escape from bound state to be as free electrons.

2.13.38

displacement effect

the effect that the incidence radiation transmits enough energy to target material atoms so as to make the atoms move away from the original positions and produce steady lattice imperfection.

2.13.39

electronic noise, radiation induced background

the noise increment generated because the electronic equipment is radiated, and leading to the performance reduction of the equipment.

2.13.40

damage-equivalent fluence

the accumulated fluence of some kind of selected energy particle, expressing the damage degree of materials.