International Institute for Bau-biologie® & Ecology

IBE SBM-2008C

Standard of Building Biology Testing Methods

BRINGING TOGETHER TECHNOLOGY AND DESIGN METHODS TO PROVIDE THE INFORMATION NEEDED TO CREATE HEALTHY HOMES AND WORKPLACES

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Standard of Building Biology Testing Methods, SBM-2008C

(Combines and updates SBM 2003 and SBM 2008)

The Standard gives an overview of the physical, chemical and biological risks encountered in sleeping areas, living spaces, workplaces and properties. It offers guidelines on how to perform specific measurements and assess possible health risks. All testing results, testing instruments and procedures are documented in a final written report. In case potential problems are identified, an effective remediation strategy is developed.

The individual subcategories of the Standard describe critical indoor environmental influences. With its professional approach, it helps identify, minimize and avoid such factors within an individual's framework of achievability. It is the Standard's goal to create indoor living environments that are as exposure-free and natural as practicable, this holistic approach is accomplished by taking all subcategories into account and implementing all available diagnostic possibilities. Testing, assessment and remediation strategies focus mainly on the building biology experience, precaution and achievability. Any risk reduction is worth striving for.

Between 1987 and 1992, *BAUBIOLOGIE MAES* developed the *Standard of Building Biology Testing Methods*, the accompanying *Building Biology Evaluation Guidelines for Sleeping Areas* and additional testing details on behalf and with the support of the *Institut für Baubiologie und Ökologie Neubeuern IBN*. Scientists, medical doctors and colleagues also offered their support. The *Standard* was issued for the first time in May 1992. The most current *Standard* SBM-2008 is the seventh edition and was published at the beginning of 2008. Since 1999 a 10-member expert commission assists in maintaining and updating the *Standard,* including the *Guidelines* and specific testing protocols. The current members of the commission are as follows: Dr. Dipl. Chem. Thomas Haumann, Dipl.Ing. Norbert Honisch, Wolfgang Maes, Dipl.Ing. Helmut Merkel, Dr. Dipl. Biol. Manfred Mierau, Uwe Münzenberg, Rupert Schneider, Peter Sierck, Dipl. Chem. Jörg Thumulla, Dr. Ing. Martin H. Virnich.

A Fields, Waves, Radiation

1 AC ELECTRIC FIELDS (Low Frequency, ELF/VLF)
Sources: AC voltage in electrical installations, cables, appliances, outlets, walls, floors, beds, high-tension and other power lines...
Measurement of low frequency electric **field strength** (V/m) and human **body voltage** (mV) as well as identification of dominant **frequency** (Hz) and prominent **harmonics**

2 AC MAGNETIC FIELDS (Low Frequency, ELF/VLF)
Sources: AC current in electrical installations, cables, appliances, transformers, motors, overhead and ground cables, power lines, railways...
Measurement and data logging of low frequency magnetic **flux density** (nT) from power grid or railway system as well as identification of dominant **frequency** (Hz) and prominent **harmonics**

3 RADIOFREQUENCY RADIATION (High Frequency, Electromagnetic Waves)
Sources: cell phone technology, RF transmitters, broadcast, trunked radio systems, line-of-sight systems, radar, military, cordless phones...
Measurement of high frequency electromagnetic **power density** ($\mu W/m^2$) as well as identification of do-minant RF **sources** and low frequency **signals** (pulse, periodicity, modulation...)

4 DC ELECTRIC FIELDS (Electrostatics)
Sources: synthetic carpeting, drapes and textiles, vinyl wallpaper, varnishes, laminates,

stuffed toy animals, TV or computer screens...
Measurement of electrostatic **surface potential** (V) as well as **discharge time** (s)

5 **DC MAGNETIC FIELDS** (Magnetostatics)
Sources: steel components in beds, mattresses, furniture, appliances, building materials; DC current in street cars, photovoltaic systems...
Measurement of **geomagnetic field distortion** as **spatial deviation** of magnetic flux density (μT, metal/ steel) or **temporal fluctuation** of magnetic flux density (μT, current) as well as **compass deviation** (°)

6 **RADIOACTIVITY** (Gamma Radiation, Radon)
Sources: building materials, stones, tiles, slags, waste products, devices, antiques, ventilation, terrestrial radiation, location, environment...
Measurement of **equivalent dose rate** (nSv/h, %) as well as **radon concentration** (Bq/mP3P)

7 **GEOLOGICAL DISTURBANCES** (Geomagnetic Field, Terrestrial Radiation)
Sources: currents and radioactivity in the earth; local disturbances caused by faults, fractures, underground water courses...
Measurement of earth's **magnetism** (nT) and earth's **radiation** (ips) and its prominent **disturbances** (%)

8 **SOUND** and **VIBRATION** (Airborne and Solid Sound)
Sources: traffic noise, air traffic, train traffic, industry, buildings, devices, machines, motors, transformers, sound bridges...
Measurement of **noise level**, **sound**, **infrasound**, **ultrasound**, **oscillations** and **vibrations** (dB, m/s^2)

B Toxins and Indoor Climate

1 **Formaldehyde** and Other Toxic Gases
Measuring **formaldehyde**, ozone and chlorine; industrial pollutants, natural gas, carbon monoxide, nitrogen dioxide and other combustion gases (ppm, $\mu g/m^3$)
Sources: varnishes, glues, particle board, wood products, furnishings, devices, type of heating, gas leaks, exhaust fumes

2 **Solvents** and Other Volatile Organic Compounds **(VOC's)**
Measuring **volatile organic compounds** (ppm, $\mu g/cm^3$) such as aldehydes, aliphates, cycloalkanes, alcohols, amines, aromatic compounds, chlorine hydrocarbons, esters, ethers, glycoles, isocyanates, ketones, terpenes
Sources: paints, varnishes, adhesives, synthetics, particle board, building parts, furniture, cleaners, furnishings

3 **Biocides** and Other Semi-volatile Organic Compounds **(SVOC's)**
Measured are **semi-volatile organic compounds** (mg/kg, ng/cm^3) such as pesticides, insecticides, fungicides, wood preservatives, fire retardants, plasticizer, pyrethroids, PCBs, PAHs, dioxines
Sources: wood, leather and carpet protections, adhesives, plastics, sealers, moth-proofing agents, pest-control agents

4 **Heavy Metals** and Other Inorganic Toxins
Measuring **inorganic substances** (mg/kg) such as heavy metals, metal compounds, salts
Sources: wood preservatives, building materials, building moisture, PVC, paints, glazes, plumbing pipes, industry, environment

5 **Particles and Fibers** (Dust, Suspended Particles, Asbestos, other Mineral Fibers...)
Measuring **dust, number and size of particles**, **asbestos**, and other **fibers** (/cm³, /l)
Sources: aerosols, smoke, soot, dust, building and insulating materials, heating and air-conditioning and heating systems, insulation, appliances, ventilation, environment

6 **Indoor Climate** (Temperature, Humidity, CO_2, Air Ions, Smells)
Measuring air **temperature** (°C), air **humidity** (% r.h., a_w), **oxygen** (vol. **%), carbon dioxide** (ppm), **air pressure** (mbar), **air movement** (m/s) as well as **small ions** (/cm³) and **air electricity** (V/m), identification of **odors** and **air exchange rate**
Source: building moisture, ventilation, heating, furnishings, breathing activity, static electricity, electromagnetic radiation, dust, environment.

C Fungi, Bacteria, Allergens

1 **Molds** (Spores and Metabolites)
Measuring and identifying of **fungi** that can or cannot be cultivated, their spores (/m³, /dm³, /g) and their metabolites (volatile organic compounds such as MVOC and mycotoxins)
Sources: moisture damage, heat bridges, building material, ventilation, air-conditioning, furnishings, environment.....

2 **Yeast** and their Metabolites
Measuring and identifying **yeast-like fungi** (/m³, /dm³, /g) and their metabolites
Sources: moist areas, hygiene problems, food storage, garbage, appliances, furnishings, environment

3 **Bacteria** and their Metabolites
Measuring and identifying **bacteria** (/m³, /dm³, /g) and their metabolites
Sources: moisture damage, waste water damage, hygiene problems, food storage, garbage, environment

4 **Dust Mites** and other Allergens
Measuring **number** and **feces of dust mites, pollen, grasses, animal hair** (/m³, /g, %)
Sources: dust mites and their metabolites, hygiene problems, house dust, humidity, ventilation, environment

Additional measurements that can also be part of a *Building Biology Survey* include: light quality, lighting intensity and UV exposure, potable water quality, testing of building materials, furniture and other furnishings, as well as for home and wood pests.

*We now direct your attention to the **Building Biology Evaluation Guidelines for Sleeping Areas,** which were developed for assessing the level of concern for a long term health risk during our sleeping period a delicate time of body regeneration. The Guidelines are on the next page.*

Building Biology Testing Method SBM-2008C

BUILDING BIOLOGY EVALUATION GUIDELINES FOR SLEEPING AREAS

The Building Biology Evaluation Guidelines are based on the precautionary principle, with specific regard for the potential long-term exposure and risks associated with sleeping areas, and the fragile window of opportunity that sleep presents for biological and metabolic regeneration. These guidelines are based on fifty years of accumulated building biology experience and knowledge, as well as on outside scientific research and studies, and they focus on solutions that are practicable and achievable. Approaching the built environment in an holistic manner, considering all possible sources of risk to health and wellness, these guidelines set forth the best possible diagnostic and analytic methodology for creating indoor living environments that are as exposure-free, risk-free, and natural as is reasonably possible.

No Concern This category provides the highest degree of precaution. It reflects the unexposed natural conditions or the common and nearly inevitable background level of our modern living environment.

Slight Concern As a precaution and especially with regard to sensitive and ill people, remediation should be carried out whenever it is possible.

Severe Concern Values in this category are not acceptable from a building biology point of view, they call for action. Remediation should be carried out soon. In addition to numerous case histories, scientific studies indicate biological effects and health problems within this reference range.

Extreme Concern These values call for immediate and rigorous action. In this category international guidelines and recommendations for public and occupational exposures may be reached or even exceeded.

If several sources of risk are identified within a single subcategory or for different subcategories, one should be more critical in the final assessment.

The small print at the end of each subcategory of the Building Biology Standard is meant as a comparative guide - e.g. legally binding exposure limits or other guidelines, recommendations and research results or natural background levels.

Building Biology Evaluation Guidelines for Sleeping Areas	**No** Concern	**Slight** Concern	**Severe** Concern	**Extreme** Concern

A FIELDS, WAVES, RADIATION, SBM-2008

1 AC ELECTRIC FIELDS (Low Frequency, ELF/VLF)

Field strength with ground potential in volt per meter	**V/m**	< 1	1-5	5 - 50	> 50
Body voltage with ground potential in millivolt	**mV**	< 10	10 - 100	100 - 1000	> 1000
Field strength potential-free in volt per meter	**V/m**	< 0.3	0.3-1.5	1.5 - 10	> 10

Values apply up to and around 50 (60) Hz, higher frequencies and predominant harmonics should be assessed more critically.

ACGIH occupational TLV: 25000 V/m; DIN/VDE: occupational 20000 V/m, general 7000 V/m; ICNIRP: 5000 V/m; TCO: 10 V/m; US-Congress/ EPA: 10 V/m; BUND: 0.5 V/m; studies on oxidative stress, free radicals, melatonin, childhood leukaemia: 10-20 V/m; nature: < 0.0001 V/m

Building Biology Evaluation Guidelines for Sleeping Areas	**No** Concern	**Slight** Concern	**Severe** Concern	**Extreme** Concern

2 AC MAGNETIC FIELDS (Low Frequency, ELF/VLF)

Flux density in nanotesla	**nT**	< 20	20-100	100 - 500	> 500
in milligauss	**mG**	< 0.2	0.2-1	1 - 5	> 5

Values apply to frequencies up to and around 50 (60) Hz, higher frequencies and predominant harmonics should be assessed more critically. Line current (50-60 Hz) and traction current (16.7 Hz) are recorded separately.

In the case of intense and frequent temporal fluctuations of the magnetic field, data logging needs to be carried out - especially during nighttime - and for the assessment, the 95th percentile is used.

DIN/VDE: occupational 5000000 nT, general 400000 nT; ACGIH occupational TLV: 200000 nT; ICNIRP: 100000 nT; Switzerland 1000 nT; WHO: 300-400 nT “possibly carcinogenic”; TCO: 200 nT; US-Congress/EPA: 200 nT; BioInitiative: 100 nT; BUND: 10 nT; nature: < 0.0002 nT

3 RADIOFREQUENCY RADIATION (High Frequency, Electromagnetic Waves)

Power density in microwatt per square meter	**µW/m²**	< 0.1	0.1-10	10 - 1000	> 1000

Values apply to single RF sources, e.g. GSM, UMTS, WiMAX, TETRA, Radio, Television, DECT cordless phone technology, WLAN..., and refer to peak measurements. They do not apply to radar signals. More critical RF sources like pulsed or periodic signals (mobile phone technology, DECT, WLAN, digital broadcasting...) should be assessed more seriously, especially in the higher ranges, and less critical RF sources like non-pulsed and non-periodic signals (FM, short, medium, long wave, analog broadcasting...) should be assessed more generously especially in the lower ranges.

Former Building Biology Evaluation Guidelines for RF radiation / HF electromagnetic waves (SBM-2003): pulsed < 0.1 no, 0.1-5 slight, 5-100 strong, > 100 µW/m² extreme anomaly; non-pulsed < 1 no, 1-50 slight, 50-1000 strong, > 1000 µW/m² extreme anomaly

DIN/VDE: occupational up to 100000000 µW/m², general up to 10000000 µW/m²; ICNIRP: up to 10000000 µW/m²; Salzburg Resolution / Vi-enna Medical Association: 1000 µW/m²; BioInitiative: 1000 µW/m² outdoor; EU-Parliament STOA: 100 µW/m²; Salzburg: 10 µW/m² outdoor, 1 µW/m² indoor; EEG / immune effects: 1000 µW/m²; sensitivity threshold of mobile phones: < 0.001 µW/m²; nature < 0.000001 µW/m²

4 DC ELECTRIC FIELDS (Electrostatics)

Surface potential in volt	**V**	< 100	100 - 500	500 - 2000	> 2000
Discharge time in seconds	**s**	< 10	10 - 30	30 - 60	> 60

Values apply to prominent materials and appliances close to the body and/or to dominating surfaces at ca. 50 % r.h.

TCO: 500 V; damage of electronic parts: from 100 V; painful shocks and actual sparks: from 2000-3000 V; synthetic materials, plastic finishes: up to 10000 V; synthetic flooring, laminate: up to 20000 V; TV screens: up to 30000 V; nature: < 100 V

5 DC MAGNETIC FIELDS (Magnetostatics)

Deviation of flux density (steel) in microTesla	**µT**	< 1	1-6	6-20	> 20
Fluctuation of flux density (current) in microtesla	**µT**	< 1	1-2	2-10	> 10
Deviation of compass needle in degree	**°**	< 2	2-10	10-100	> 100

Values refer to the flux density deviation through metal/steel or flux density fluctuation through direct current.

Germany: DIN/VDE 0848 occupational 67,000 µT and general public 21,200 µT; USA/Austria 5,000-200,000 µT; MRI ca. 2T; earth’s magnetic field across temperate latitudes 40-50 µT ± 1 µT; magnetic field of eye 0.0001 nT; brain 0.001 nT; heart 0.05 nT

	No Concern	**Slight** Concern	**Severe** Concern	**Extreme** Concern

6 RADIOACTIVITY (Gamma Radiation and Radon)

Increase of equivalent dose rate in percent **%**	< 50	50-70	70-100	> 100

Values refer to the local radiation in the surroundings when the levels in the vicinity are average. In the case of a distinct higher radiation in the vicinity, a percentage wise smaller equivalent-dose rate is applied.

USA federal law: general population <5mSv and workers < 50mSv/a; USA average background 1.3mS/a; depending on the local surroundings. Germany: average 0.85 mSv/a (100 nSv/h); BGA: general population 1.67 mSv/a; SSK (Radiation Protection Branch in Germany) general population 1.5mSv/a additional impact and workers 15mSv/a; if unusual deviation from average background radiation is substantial the frame of equivalent dose rate increase must be reduced.

Radon in Becquerel per cubic meter	**Bq/m^3**	< 30	30-60	60-200	> 200
Radon in curies per liter	**pCi/L**	< 0.75	0.75-1.5	1.5-5	> 5

EPA recommendation 160 Bq/m^3 or 4 pCi/L; Swedish recommendation 200 Bq/m^3 or 5 pCi/L; Radiation Protection Branch Germany (SSK) 250 Bq/m^3 or 6.25 pCi/L

7 TERRESTRIAL RADIATION (Geomagnetic Field, Earth Radiation)

Disturbance of geomagnetic field					
In nanotesla	nT	< 100	100-200	200-1000	> 1000
In milliGauss	mG	< 1	1-2	2-10	> 10
Disturbance of terrestrial radiation in percent	%	< 10	100-20	20-50	> 50

Values refer to the natural geomagnetic field and to the natural radioactive gamma radiation or neutron radiation of the earth.

Natural fluctuations of the earth's magnetic field temporal 10-100nT; local (magnetic storms caused by solar eruptions) 100-1,000nT

B Environmental Toxins & Indoor Climate, SBM-2003

1 **Formaldehyde** and Other Toxic Gases

formaldehyde in parts per million ppm	< 0.02	0.02 – 0.05	0.05 – 0.1	> 0.1

MAK–threshold value: 0.5 ppm; WHO 0.05 ppm; ACGHI ceiling limit 0.3 ppm; BGA Recommendations: 0.1ppm; Katalyse Institute 0.04 ppm; VDI 1992: 0.02 ppm; natural background 0.002 ppm; irritation of mucuous membranes and eyes 0.05 ppm; smell threshold 0.05 ppm; life threat from 30 ppm

2 **Solvents** and Other Volatile Organic Compounds **(VOC)**

values of **VOC's** in microgram/m^3 $\mu g/m^3$	< 100	100 – 300	300 – 1,000	> 1,000

Molhave (1986) 200 $\mu g/m^3$; Seifert (BGA 1990) 300 $\mu g/m^3$; Association of Enviornmental Chemistry GfU (1998) 200 $\mu g/m^3$

3 **Biocides** and other Semi-volatile Compounds **(SVOC's)**

Values for air in nanogram per cubic meter and in milligram per kilogram for material

pesticides	**air** ng/m^3	< 5	5 - 50	50 – 100	> 100
PCP, Lindane, Permethrin	**wood** mg/kg	<0.2	0.2-5	5-100	> 100
Dichlofluanid, Chlorpyriphos	**dust** mg/kg	<0.2	0.2-1	1-5	>5
PCB, fire retardants	**dust** mg/kg	<0.1	0.1-1	1-10	>10
PAH (PAK)	**dust** mg/kg	< 0.5	0.5-5	5-50	>50

Plasticizer	**dust** mg/kg	< 100	100-250	250-500	>500

Values only for chlorinated fire retardants; values only for plasticizers absorbed by dust (total content x 3); PCB according to LAGA; PAH (PAK) according to EPA; PCP ban in Germany: 5 mg/kg (wood); BGA 1000 ng/m³; ARGE-Bau 100 ng/m³, 1 mg/kg (dust

5 Particles and Fibers (Dust, Suspended Particles, Asbestos, other Mineral Fibers…)

Under evaluation				

WHO 200 /m³; European Community 400 /m³; Germany BGA 500 – 1,000/m³

6 Indoor Climate (Temperature, Humidity, CO_2, Air Ions, Odors)

relative humidity in percent % r.h.	40 – 60	< 40 / > 60	< 30 / > 70	< 20 / > 80

carbon dioxide in parts per million ppm	< 500	500 – 700	700 – 1,000	> 1,000

USA occupational exposure 1,000 ppm; Germany MAK limits 5,000 ppm; nature: rural areas < 360 ppm and urban areas 400 – 500 ppm

small air ions per cubic centimeter air/cm³	> 500	200 – 500	100 – 200	< 100

nature: oceanside > 3,000/cm³; clean outdoor air 2,000/cm³; urban areas < 1,000/cm³; indoor living space with synthetics < 100/cm³; smog < 50/cm³

air electricity in volt per meter, V/m	< 100	100 – 500	500 – 2,000	> 2,000

DIN/VDE 0848: workplace 40,000V/m; general public 10,000 V/m; nature ca. 50 – 200 V/m; foehn/thunderstorm ca. 1,000 – 10,000 V/m

C Fungi, Bacteria, Allergens, SBM-2003

1 Molds (their Spores and Metabolites)

The **mold count** of air in living spaces should be substantially less compared to the one in the surrounding outdoor environment or in not contaminated rooms. **Mold types** of indoor air should be very similar to those outside. Particularly **toxic species** of mold-like fungi such as aspergillus or stachybotrys and yeast-like fungi such as candida, cryptococcus and coliform bacteria should **not be found at all** in living spaces or in very low quantities. In the event of a suspected microbial infestation indicated by building damages, history of the building, moisture, smells, symptoms of illness, presence of fungi and bacteria an inspection is recommended.

Given exposure limits refer to colony forming units (CFU) on building biology agar (YM anilin blue) and culture temperature at 20 – 24 °C as well as to relative low concentrations in the outside air. Climatic, geographic and the hygiene of rooms needs to be taken in consideration as well.

Spores CFU per cubic meter air /m³	< 200	200 – 500	500 – 1000	> 1000

WHO: pathogenic and toxigenic biologicals should not at all be tolerated in indoor air; if more than 50/m³ of a single fungal species is found, the source should be identified; a mixture of fungi typical for a given location can be tolerated up to 500/m³.

Any attainable reduction in readings is worthwhile to achieve.
Nature is *the* ultimate guide.

Please See our Glossary of Terms on the Following Pages

Glossary Term	German	Definition	
µg	µg	micro gram	
ACGIH	ACGIH	American Conference of Industrial Hygienists	
agar	Agar	A gel culture medium based on a seaweed extract, widely used for growing microorganisms in laboratories	
ARGE-BAU Conference of minister of building	ARGE BAU Bauministerkonferenz	The conference of minister of building is a working group for town construction, building and housings responsible Minister and senators of the 16 countries of the Federal Republic of Germany.	
a_w	a_w		
Becquerel	**Becquerel**	(symbol Bq) the SI unit of the activity of a radioactive substance. The unit is named after Henry Becquerel, a French physicist, who discovered natural radioactivity in 1896 and together with Pierre and Marie Curie was awarded the Nobel Prize of physics in 1903.	
BGA			
BImSchV			
Bq/m^3	**Bq/m^3**	SI unit of the activity of a radioactive substance per cubic meter of air – see also *pCi/L*	
Building Biology™	Baubiologie™	a branch of science concerned with the holistic interrelationship of humans and their living environment that is rooted in ancient wisdom and based on current scientific knowledge covering all aspects of home, health & habitat; originating in Germany where it is called *Baubiologie* and first introduced to North America by the International Institute of Bau-biology & Ecology as *Bau-biology*	
DIN	**DIN** (Deutsche Industrienorm)	a non-governmental association in Germany concerned with industry standards regarding quality assurance, standardization and environmental protection; founded in 1917	
EEG	**EEG** (Electrocardiogram)	recording of the changing electrical potentials of brain waves	
EPA	EPA	Environmental Protection Agency	
EU	EU European Union	European Union	
EU-Parliament STOA			
Gauss	**Gauss**	(symbol G) the former unit of magnetic flux density, which is still in common usage in North America	

Glossary Term	German	Definition	
GfU	GfU Gesellschaft für Umweltchemie	Society for Environmental Chemistry	
ICNIRP	ICNIRP (Internation ale Kommission für den Schutz von nicht-ionisieendr Strahlung)	(International Commission on Non-ionizing Radiation Protection) an international organization concerned with radiation protection of the non-ionizing portion of the electromagnetic spectrum; founded in 1992	
ips	ips Impressions per second	Measuring the number of impression per second. When measuring radioactivity a Geiger counter is used.	
IRPA	**IRPA** (Internationale Gesellschaft für Strahlenschutz)	(International Radiation Protection Association) an international health physics society setting international exposure limits for electromagnetic radiation; founded in 1964	
ISM	ISM	an abbreviation for Industrial, Services, Medical; covering various frequency ranges for multiple uses allocated internationally by standards bodies	
Katalyse Institute Köln, Germany	Katalyse Institut	Catalysis Institute for Applied Research	
LAGA	LAGA Länderarbeitzgemeinschaft Abfall	The State (Land) Working Group Waste in Germany	
large ions	**Grossionen**	are found in high concentrations in polluted air with a diameter up to 0.1 micron (or at least ten times the size of small ions) having a low mobility and disintegrating rather slowly – also referred to as *aerosol ions*	
mbar millibar	mbar Millibar	A unit of atmospheric pressure equal to 1/1000 of a bar	
mG		milliGauss, a a unit of magnetic field flux density (US System)	
micotoxin			
MPR	**MPR**	an abbreviation for Swedish Board for Technical Accreditation, which set the first low-emission exposure limits for computers	
MRI	Kernspin	magnetic resonance imaging	
mSv	**mSv** (Millisievert)	(**m**illi**s**ie**v**ert) a millionth of Sievert, the SI unit of equivalent dose rate	
mSv/a	**mSv/a** (Millisievert pro Jahr)	(**m**illi**s**ie**v**ert per **a**nnum) a millionth of Sievert per year, the equivalent dose rate per year	
µT	µT microTesla	Millionth of a Tesla, a unit of magnetic field flux density	
MVOC		Microbial Volatile Organic Compound	
ng	ng Nanogramm	nano gram	
nT	nT NanoTesla	Billionth of a Tesla, a unit of magnetic field flux density	

Glossary Term	German	Definition	
PAH	PAK	Polycyclic Aromatic Hydrocarbons	
PPM/ PPB	ppm parts per million/ billion	Parts per million/ billion	
pulsed	**gepulste (Strahlung)**	to produce or modulate electromagnetic waves as pulses- rapid increase and decrease	
RH	r.F relative Feuchte	Relative humidity	
radio frequency radiation (RF)	**hochfrequente Strahlung**	(RF radiation) electromagnetic radiation that ranges approximately from 30 thousand Hz (kHz) to 300 billion Hz (GHz) including radio and microwaves	
rem	**rem**	(**r**oentgen **e**quivalent **m**an) a former unit of dose equivalent of absorbed ionizing radiation	
RF also HF	**HF** (Hochfrequenz)	an abbreviation for radio frequency or high frequency - see also *radio frequency radiation*	
SI units	**SI-Einheiten**	(Système International d'Unités) the internationally agreed system of units now in use for all scientific purposes	
Sievert	**Sievert**	(symbol Sv) the SI unit of dose equivalent of absorbed ionizing radiation. The unit is named after the Swedish physicist Rolf Sievert.	
small ions	**Kleinionen**	are found in high concentrations in fresh air with a diameter between 0.001 – 0.003 micron, which consist of only a few molecules and therefore are highly mobile and instable - also referred to as *cluster ions*	
SSK	SSK Strahlenschutzkommission	a German commission for radiation protection	
TCO	TCO (Schwedische Zentralorganisation der Angestellten und Beamten)	an abbreviation of the Swedish Association of Professional Employees, which sets a standard for low-radiation computer systems including ergonomic, ecological and indoor air considerations	
TLV		Threshold Limit Value	
VDE	VDE Verein Deutscher Ingenieure	Association of German Engineers	
WHO	WHO	World Health Organization	