



3. REQUIREMENTS BEFORE EMC ASSESSMENT

3.1. HARDWARE TECHNICAL STATUS

Details on the technical status of the system will be available in the document, supplied by Nortel during the commissioning & acceptance phase .

Configuration GSM 18000 Outdoor dualband 850/1900 MHz

																			User ICO
			RM2-0 1900	RM2-1 1900	RM2-2 1900					RM-3 850	RM-4 850	RM-5 850							
			DDM0 1900	DDM1 1900	DDM2 1900					DDM3 850	DDM4 850	DDM5 850							
			2 Rectifiers 1,6kW	1 filler	2 Rectifiers 1,6kW	DDU	CCU			NARADA Batteries									



Configuration GSM 18000 Indoor 850/1900 MHz

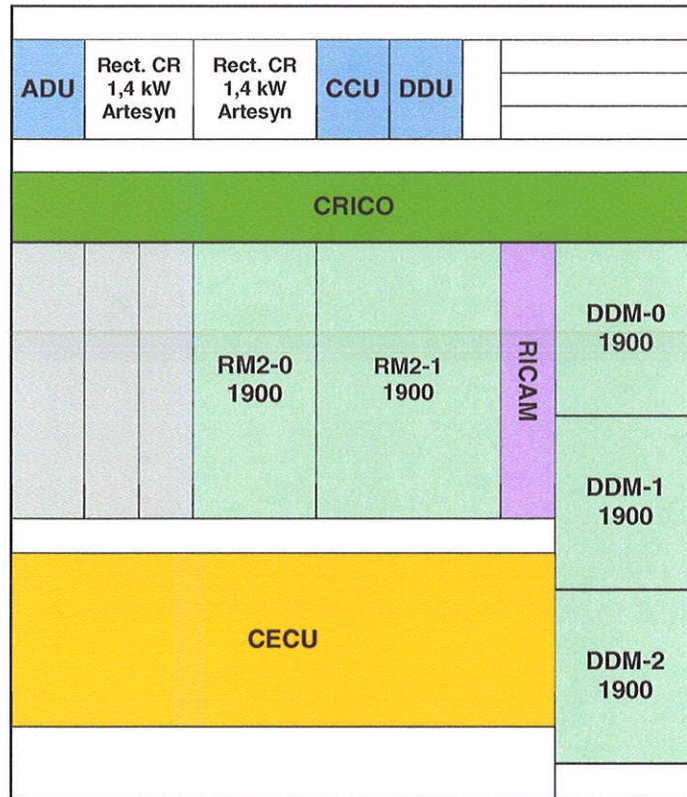
DDM-0 1900			DDM-1 1900			DDM-2 1900		
DDM-3 850			DDM-4 850			DDM-5 850		
			RM2-0 1900	RM2-1 1900	RM2-2 1900	RICAM		
			RM-3 850	RM-4 850	RM-5 850	ABM		

Configuration GSM 9000 Indoor 1900 MHz

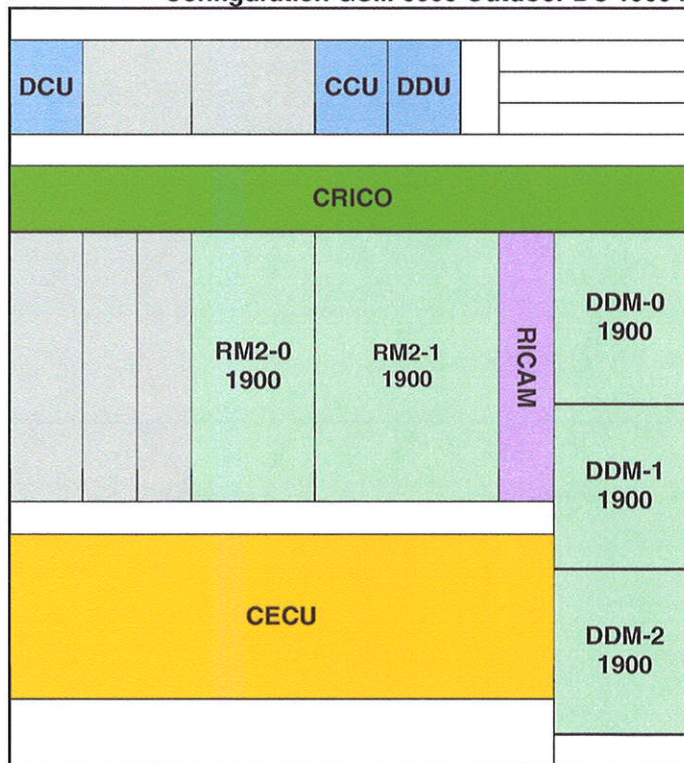
			DDM-0 1900	DDM-1 1900	DDM-2 1900	
			RM2-0 1900	RM2-1 1900	RM2-2 1900	RICAM



Configuration GSM 6000 Outdoor AC 1900 MHz



Configuration GSM 6000 Outdoor DC 1900 MHz





3.2. LIST OF KITS & CABLES LIST OF KITS

In fact, protections modules are optional but can be used to protect the PCM links & the Alarms links. These modules are made only with passive components and then are not critical modules for the system.

Kits are the following:

- Kits: PCM lightning protection (PRIPRO 2 Box)
- EAM lightning protection (ALPRO2 box)

3.3. LIST OF CABLES

The following ports of the GSM BTS are available and will be connected:

- Abis port (telecom port) : cable 5.5 meters. This cable will be looped in order to transmit TX signals on RX ones.
- GSM external Alarms ports: 1 cable will be looped and the other cable will be in open circuit.
- Radio port (signal port): 6 RF cables RADIALL SHF9TD – DC-2GHz – Insertion loss < 5.5 dB at 2 GHz (15 meters). Attenuators and loads will also be used on RF links.
- AC or DC ports: Lab cables (about 10 meters).



4. TEST PLAN SUMMARY

4.1. TEST PLAN SUMMARY FOR EMISSIONS TESTING AT LCIE LABORATORY

The following table presents the test plan summary for the FCC & IC qualification for introduction of RM2 GSM 1900MHz on the GSM 18000 Outdoor & 6000 Outdoor BTS products:

Test case	Application	Test requirement	Performance criteria	Comment	
Emission tests					
1	Conducted Emissions FCC Part 15 § 15.107 & ICES 003 *	AC port	150 kHz to 30 MHz	Class B	Realized on GSM 18000 Outdoor & 6000 Outdoor AC Realized on configuration 120/240VAC, Split phase US, Three wires plus protective earth, 208-240V – 60 Hz
2	Conducted Emissions ICES 003*	DC port	150 kHz to 30 MHz	Class B	Realized on GSM 6000 Outdoor DC
3	Radiated emissions FCC part 15 § 15.109 & ICES 003 *	E- field enclosure	30 MHz to 20 GHz	Class B	Realized on GSM 18000 Outdoor & GSM 6000 Outdoor AC
4	Radiated emissions spurious FCC part 24 § 24.238 & RS133	E- field enclosure	30 MHz to 20 GHz	The spurious emissions must be attenuated by at least $43 + 10 \text{ Log}(P)$ $P = \text{Transmitter rated Power in Watts}$	Realized on GSM 18000 Outdoor & GSM 6000 Outdoor AC

* : ICES003 standard use EN 55022 standard methods & Limits.



4.2. TEST PLAN SUMMARY FOR EMISSIONS TESTING AT GDNT

The following table presents the test plan summary for the FCC & IC qualification for introduction of RM2 GSM 1900MHz on the GSM 18000 Indoor & 9000 Indoor BTS products:

	Test case	Application	Test requirement	Performance criteria	Comment
Emission tests					
5	Conducted Emissions ICES 003*	DC port	150 kHz to 30 MHz	Class B	Realized on GSM 18000 Indoor & 9000 Indoor
6	Radiated emissions FCC part 15 § 15.109 & ICES 003 *	E- field enclosure	30 MHz to 20 GHz	Class B	Realized on GSM 18000 Indoor & GSM 9000 Indoor
7	Radiated emissions spurious FCC part 24 § 24.238 & RS133	E- field enclosure	30 MHz to 20 GHz	The spurious emissions must be attenuated by at least $43 + 10 \text{ Log}(P)$ $P = \text{Transmitter rated Power in Watts}$	Realized on GSM 18000 Indoor & GSM 9000 Indoor

* : ICES003 standard use EN 55022 standard methods & Limits.

5. TEST CONFIGURATION

5.1. TEST CONFIGURATION FOR EMISSIONS TESTING

The GSM BTS will be configured as close to normal intended use. The BTS will be configured to transmit on all RF channels at Pmax on all the frequency band.

The Abis cable of the BTS is looped back at the end and a PCM signal is transmitted on this cable.

The following ports of the GSM BTS are available and will be connected:

- Abis port (telecom port) : cable 5.5 meters. This cable will be looped in order to transmit TX signals on RX ones.
- GSM external Alarms ports: 1 cable will be looped and the other cable will be in open circuit.
- Radio port (signal port): 6 RF cables RADIALL SHF9TD – DC-2GHz – Insertion loss < 5.5 dB at 2 GHz (15 meters). Attenuators and loads will also be used on RF links.
- AC or DC ports: Lab cables (about 10 meters).

Figure N°1: Emissions testing configuration

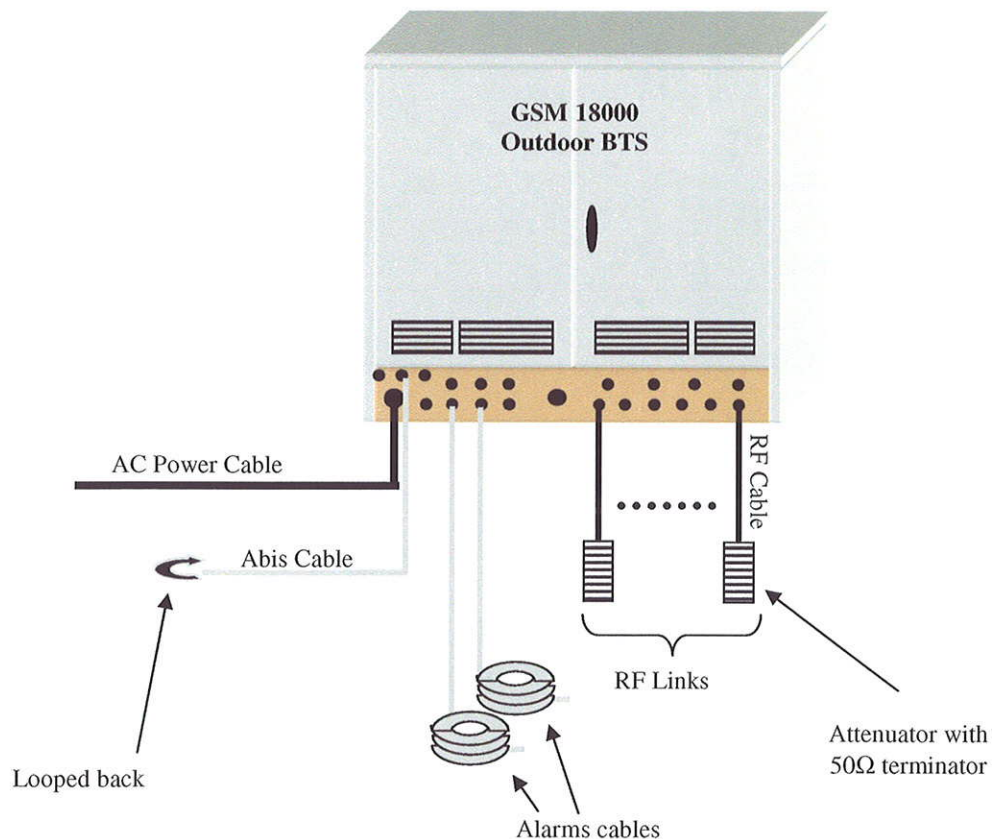
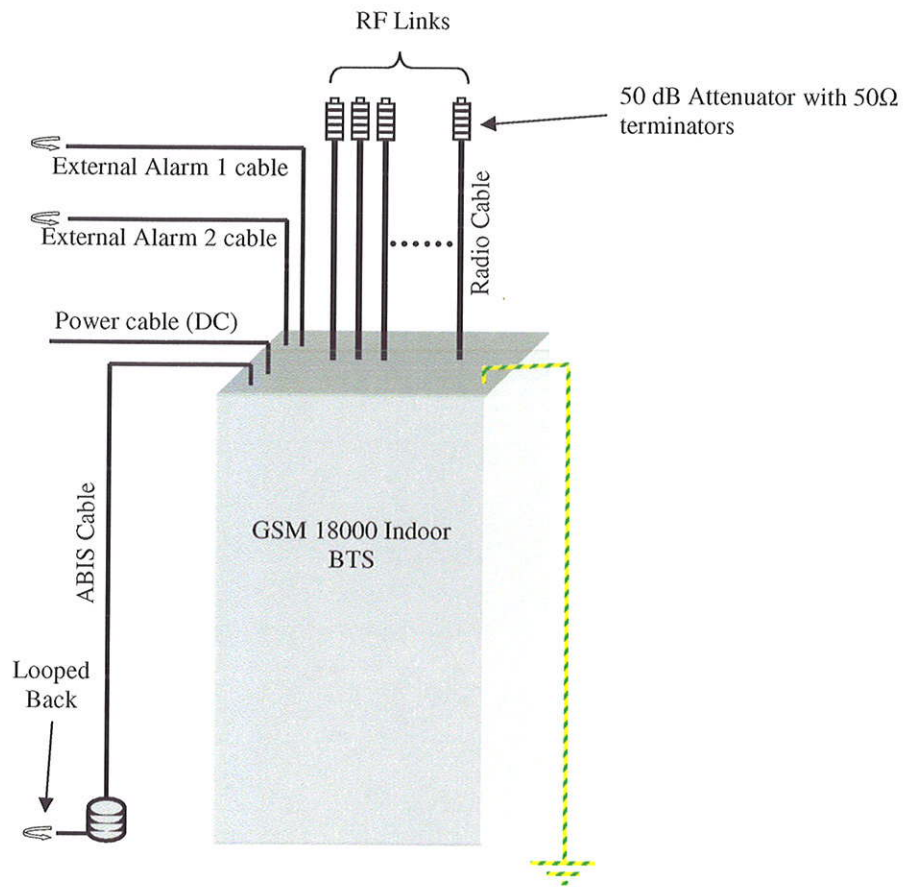




Figure N°2: Emissions testing configuration

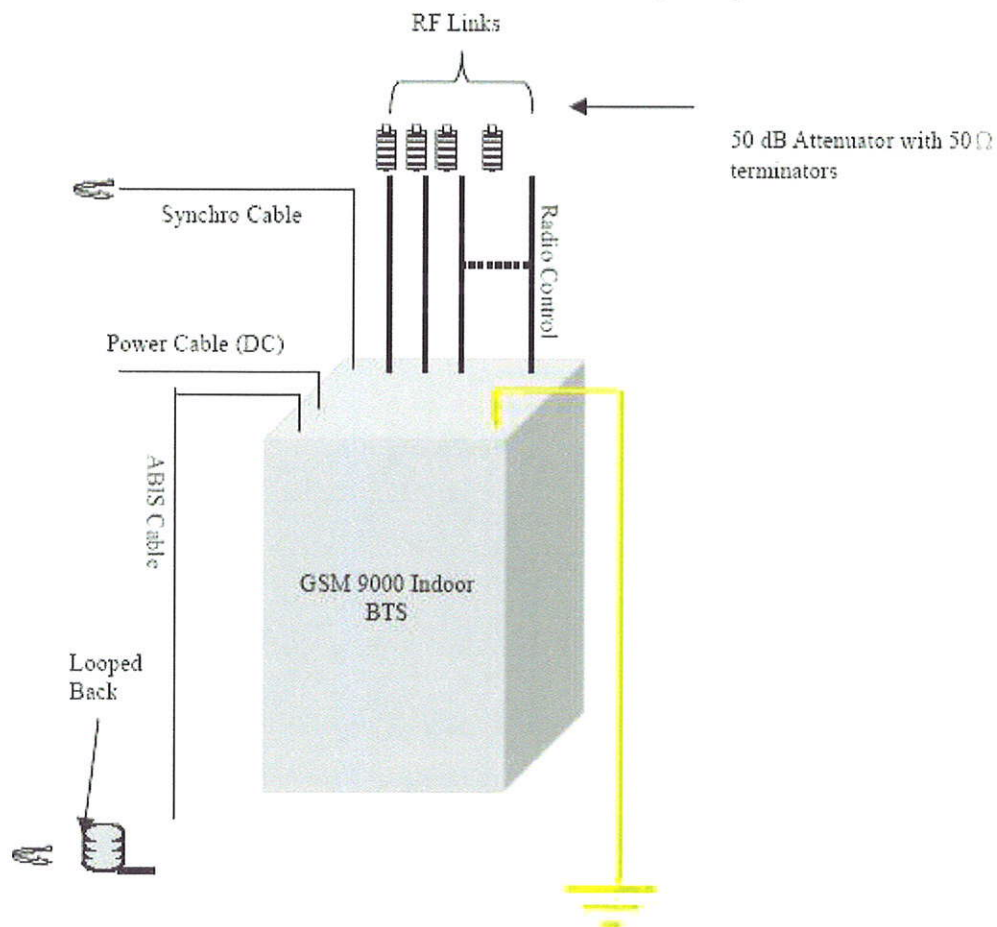


The BTS will be configured as close to normal intended use. The BTS will be configured to transmit on all RF channels at Pmax on all the frequency band.

The hardware configuration will then be equivalent to a S333. The Abis cable of the BTS is looped back at the end and a PCM signal is transmitted on this cable. The following ports of the BTS will be available and connected:

- Abis port (telecom port) : cable 120ohm. This cable will be looped in order to transmit TX signals on RX ones.
- Synchro cable: This cable has been looped in order to transmit TX signals on RX ones.
- Radio port (signal port): all RF cables RADIALL SHF9TD – DC-2GHz (or other with similar characteristic) – Insertion loss < 5.5 dB at 2 GHz (15 meters). Attenuators and loads will also be used on RF links.
- DC Power port: Lab cables (about 10 meters).

Figure N3: Emissions testing configuration





6. ABBREVIATIONS AND DEFINITIONS

6.1. ABBREVIATIONS

6.1.1 GENERAL ABBREVIATIONS

°C	Degree Centigrade
3GPP	3 rd Generation Partnership Project
A	Ampere
AC	Alternative Current (Power Source)
ADU	AC Distribution Unit
ALPRO	Alarm Protection
ANSI	American National Standards Institute
BTS	Base Station Transceiver Subsystem or Base Transceiver Station
CFR	Code of Federal Regulations
CSA	Canadian Standards Association
dB	Decibel
dB(A)	Decibel Audio
DC	Direct Current (Power Source)
E1	European Standard For PCM Link Interface (2.048mbit/S)
ECU	Environmental Control Unit
EDGE	Enhanced Data rates for GSM Evolution
EGPRS	Enhanced General Packet Radio Service (cf. EDGE)
EMC	Electro-Magnetic Compatibility
ETS	European Telecommunication Standard
ETSI	European Telecommunication Standard Institute
EVM	Error Vector Magnitude
FCC	Federal Communications Commission
GHz	Giga Hertz
GND	This Ground Represents Earth-Grounding Connection From Equipment
HW	Hardware
Hz	Hertz
IEC	International Electro-Technical Commission
IC	Industry Canada
ISO	International Standards Organization
IUT	International Telecommunication Union
kbits/s	Kilo Bits Per Second
LVD	Low Voltage Directive
MCPA	Multi-Carrier Power Amplifier
MHz	Mega-Hertz
N.A.	Not Applicable
NEMA	National Electrical Manufacturers Association (USA)
PA	Power Amplifier
PCM	Pulse Code Modulation



PCS	Personal Communication Service
PI	Product Integrity
R&D	Research and Development
RF	Radio Frequency
RSS	Radio Standard Specification
RTTE	Radio And Telecommunication Terminal Equipment
RX	Receiver
SELV	Safety Extra Low Voltage
T°	Temperature
T1	US Standard For PCM Interface (1.544mbps)
T1 PCM	Pulse Code Modulation at 1.544 MHz
TBC	To Be Confirmed
TBD	To Be Defined
TIA/EIA/IS	Telecommunication Industry Association / Electronic Industries Alliance /
TNV	Telecommunication Network Voltage Circuit
TX	Transmitter
UL	Underwriters Laboratories Inc.
V	Volt (Vdc with DC) or (Vac with AC)
VSWR	Voltage Standing Wave Ratio
W	Watt

6.1.2 GSM ABBREVIATIONS

ABM	Alarm And Bridge Module
AC	Alternative Current (Power Source)
ADU	AC Distribution Unit
ALPRO	Alarm Protection
CSU	Channel Service Unit
DBP	Digital Back Panel
DCS	Digital Cellular System
DDM	Dual Duplexer Module
ECU	Environmental Control Unit
EDGE	Enhanced Data rates for GSM Evolution
GSM	Global System For Mobile Communication
H2D	Hybrid Duplexer Two Paths
H3	Coupling Module Handling Up To 3 TX TDMA
H3D	Hybrid Duplexer Three Paths
H4M	PCM Clock At 4.096 MHz
HPRM	High Power Radio Module
IBP	Interface Back Panel
ICM	Interface Control Module
IFM	Interface Module Dedicated To PCM Link within a BTS 18000
LAPD	Link Access Protocol On The D Channel
PCS	Personal Communication Service
PRIPRO	Primary Protection
RICO	Radio Inter-Connection For Cabinet And Coupling Modules



RM	Radio Module
RMPSU	Radio Module Power Supply Unit
RXLEV	Reception Level
RXQUAL	Reception quality
S8000/S12000	This Represents The Previous GSM BTS Family (S8000 And S12000)
SICS	Snew Integrated Cooling System
SPM	Spare Module
SPU	Signal Processing Unit
TXF	Transmitter filter
UCPS	Univity Compact Power System
User ICO	User Interconnection



6.2. DEFINITIONS

Air discharge method : a method of testing, in which the charged electrode of the test generator is brought close to the EUT, and the discharge actuated by a spark to the EUT.

Amplitude modulation : process by which the amplitude of a carrier wave is varied following a specified law.

Anechoic chamber : shielded enclosure which is lined with radio-frequency absorbers to reduce reflections from the internal surfaces.

Antenna : transducer which either emits radio-frequency power into space from a signal source or intercepts an arriving electromagnetic field, converting it into an electrical signal.

Antistatic material : material exhibiting properties which minimize charge generation when rubbed against or separated from the same or other similar materials.

Artificial hand : an electrical network simulating the impedance of the human body under average operational conditions between a hand-held electrical appliance and earth

Auxiliary equipment : equipment necessary to provide the EUT with the signals required for normal operation and equipment to verify the performance of the equipment under test.

Balanced lines : a pair of symmetrically driven conductors with a conversion loss from differential to common mode of less than 20 dB.

Balun : device for transforming an unbalanced voltage to a balanced voltage or vice versa.

Burst : a sequence of a limited number of distinct pulses or an oscillation of limited duration.

Contact discharge method : a method of testing, in which the electrode of the test generator is held in contact with the EUT, and the discharge actuated by the discharge switch within the generator.

Clamp injection : clamp injection is obtained by means of a clamp-on "current" injecting device on the cable.

Continuous waves : electromagnetic waves, the successive oscillations of which are identical under steady-state conditions, which can be interrupted or modulated to convey information.

Coupling clamp : device of defined dimensions and characteristics for common mode coupling of the disturbance signal to the circuit under test without any galvanic connection to it.

Coupling network : electrical circuit for the purpose of preventing EFT voltage applied to the EUT from affecting other devices, equipment or systems which are not under test.

Coupling plane : a metal sheet or plate, to which discharges are applied to simulate electrostatic discharge to objects adjacent to the EUT.

Current clamp : a transformer, the secondary winding of which consists of the cable into which the injection is made.

Current surge : the front time T_f of a surge voltage is a virtual parameter defined as 1.25 times the interval T between the instants when the impulse is 10% and 90% of the peak value.

Decoupling network : electrical circuit for the purpose of preventing surges applied to the EUT from affecting other devices, equipment or systems which are not under test.



Degradation of performance : an undesired departure in the operational performance of any device, equipment or system from its intended performance.

Direct application : application of the discharge directly to the EUT.

Duration : the absolute value of the interval during which a specified waveform or feature exists or continues.

Electrical installation : an assembly of associated electrical equipment to fulfil a specific purpose or purposes and having coordinated characteristics.

Electromagnetic clamp : (EM-clamp) injection devices with combined capacitive and inductive coupling.

Electromagnetic compatibility : the ability of an equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment.

Electromagnetic wave : radiant energy produced by the oscillation of an electric charge characterized by oscillation of the electric and magnetic field.

Electrostatic discharge : a transfer of electric charge between bodies of different electrostatic potential in proximity or through direct contact.

Energy storage capacitor : the capacitor of the ESD generator representing the capacity of a human body charged to the test voltage value. This may be provided as a discrete component, or a distributed capacitance.

Far field : region where the power flux density from an antenna approximately obeys an inverse square law of the distance.

Field strength : the term "field strength" is applied only to measurements made in the far field. The measurement may be of either the electric or the magnetic component of the field and may be expressed as V/m, A/m or W/m²; any one of these may be converted into the others.

Frequency band : continuous of frequencies extending between two limits.

Fully anechoic chamber : shielded enclosure whose internal surfaces are totally lined with anechoic material.

Ground reference plane : a flat conductive surface whose potential is used as a common reference

Holding time : interval of time within the decrease of the test voltage due to leakage, prior to the discharge, is not greater than 10%.

Human body-mounted equipment : equipment which is intended for use when attached to the human body. This definition included hand-held devices which are carried by people while in operation (e.g. pocket devices) as well as electronics aid devices and implants.

Immunity to a disturbance : the ability of a device, equipment or system to perform without degradation in the presence of an electromagnetic disturbance.

Indirect application : application of the discharge to a coupling plane in the vicinity of the EUT, and simulation of personnel discharge to objects which are adjacent to the EUT.

Induction field : predominant electric and/or magnetic field existing at a distance $d < \lambda/2\pi$, where λ is the wavelength and the physical dimensions of the source are much smaller than distance d .



Isotropic : having properties of equal values in all directions

Malfunction : the termination of the ability of an equipment to carry out intended functions or the execution of unintended functions by the equipment.

Maximum RMS value : the highest short-term RMS value of a modulated RF signal during an observation time of one modulation period. The short-term RMS is evaluated over a single carrier cycle.

Modified semi-anechoic chamber : semi-anechoic chamber which has additional absorbers installed on the ground plane.

Non-constant envelope modulation : RF modulation schemes where the amplitude of the carrier wave varies slowly in time compared with the period of the carrier itself. Examples include conventional modulation and TDMA.

Polarization : orientation of the electric field vector of a radiated field.

Port : particular interface of the EUT with the external electromagnetic environment

Primary protection : the means by which the majority of stressful energy is prevented from propagating beyond the designated interface.

Rise time : the interval of time between the instants at which the instantaneous value of a pulse first reaches 10% value and then the 90% values.

Secondary protection : the means by which the let-through energy from primary protection is suppressed. It may be a special device or an inherent characteristic of the EUT.

Semi-anechoic chamber : shielded enclosure where all internal surfaces are covered with anechoic material with the exception of the floor, which shall be reflective (ground plane).

Shielded enclosure : screened or solid metal housing designed expressly for the purpose of isolating the internal from the external electromagnetic environment. The purpose is to prevent outside ambient electromagnetic fields from causing performance degradation and to prevent emission from causing interference to outside activities.

Short interruption : the disappearance of the supply voltage for a period of time typically not exceeding 1 min. Short interruptions can be considered as voltage dips with 100% amplitude.

Spurious radiation : any undesired electromagnetic emission from an electrical device.

Stripline : terminated transmission line consisting of two parallel plates between which a wave is propagated in the transverse electromagnetic mode to produce a specified field for testing purposes.

Surge : a transient wave of electrical current, voltage, or power propagating along a line or a circuit and characterized by a rapid increase followed by a slower decrease.

Surge voltage : the front time T_f of a surge voltage is a virtual parameter defined as 1.67 times the interval T between the instants when the impulse is 30% and 90% of the peak value.

Sweep : continuous or incremental traverse over a range of frequencies

System : set of interdependent elements constituted to achieve a given objective by performing a specified function.



Time to half-value T_2 : the time to half value T_2 of a surge is a virtual parameter defined as the time interval between the virtual origin O_1 and the instant when the voltage current has decreased to half the peak value.

Transceiver : Combination of radio transmitting and receiving equipment in a common housing.

Transient : pertaining to or designating a phenomenon or a quantity which varies between two consecutive steady states during a time interval which is short compared with the time-scale of interest.

Voltage dips : a sudden reduction of the voltage at a point in the electrical system, followed recovery after a short period of time, from half a cycle to a few second.

Voltage variation : a gradual change of the supply voltage to a higher or lower value than the rated voltage. The duration of the change can be short or long with regard to the period.

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