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EMC Test report for the qualification of GSM 1900Mhz BTS 6000 Cabinets (FCC)

Reference: 60049617-550144-C-TR-FCC

Version: A

Status: Approved

Date: 08/Nov/2006

Customer: NORTEL NETWORKS
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Product: GSM 6000 BTS 1900 MHz

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16/11/2006

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PUBLICATION HISTORY

VERSION	DATE	AUTHOR	MODIFICATION
A	8-Nov-06	M.CANCOUËT	Creation of document



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1. INTRODUCTION

This document presents the EMC tests report for the FCC EMC qualification of GSM 6000 BTS in the 1900MHz frequency band.

For the qualification of GSM 6000 BTS in the 1900MHz GSM band, a full EMC qualification has been done on GSM 6000 BTS Outdoor cabinet in AC and DC versions, and on GSM 6000 BTS Indoor cabinet in DC version only.

The GSM 6000 BTS Indoor cabinet in AC version has been introduced by similarity with GSM 6000 BTS Outdoor cabinet in AC version.

Those both versions are identical except door, enclosure and gaskets. Gaskets of Outdoor version are less efficient than Indoor version gaskets concerning EMC aspect, so we'll be able to deduce EMC conformity of GSM 6000 BTS Indoor cabinet in AC version from results of GSM 6000 BTS Outdoor cabinet in AC version.

For North America, applicable standard for EMC Base stations are the FCC part 15 [Part 15.107 and 15.109 (subpart B)]/ICES 003 Class B and the FCC Part 24 [Part 24.238 (subpart E)]/RS133.

We covered also the FCC Part 15 [Part 15.207 and 15.209 in frequency range 30MHz to 18 GHz (subpart C)] class B.

The tests were performed at LCIE Ecuelles (FCC registration number: 93402 – Industry Canada number: IC6231)

The following table gives some information of the EUT :

Product Name	GSM 6000 BTS
Manufacturer	NORTEL
Serial Number	-
Alimentation of the EUT	AC or DC



2. RELATED DOCUMENTS

2.1. APPLICABLE STANDARDS

[A1]	CFR 47 Part 2	Code of Federal Regulations - Part 2 - Frequency Allocations and Radio Treaty Matters. General Rules and Regulations. Date : June 1996.
[A2]	47 CFR Part 15 08/20/02	FCC Rules for Radio Frequency Devices, Title 47 of the Code of Federal Regulations – Radio frequency devices – dated 08/20/02
[A3]	CFR 47 Part 24	Code of Federal Regulations - Part 24 - Personal Communications Services.
[A4]	IC ES 003 (NMB 003)	Industry Canada - Digital apparatus
[A5]	RSS 133	Industry Canada – 2 GHz Personal Communications Services.

2.2. REFERENCE DOCUMENTS

[R1]	PE/BTS/DPL/019851	GSM BTS 6000 Project Qualification Plan For 1900MHz Cabinet and Additional Introduction on 900/1800MHz Cabinet
[R2]	60049617-550144-C-TP-FCC	EMC Test plan for the qualification of GSM 1900Mhz BTS 6000 Cabinets (FCC)
[R3]	PE/BTS/DJD/020820 01.01/EN	GSM 6000 outdoor BTS 1900MHz hardware delivery notice
[R4]	PE/BTS/DJD/020820 02.01/EN	GSM 6000 outdoor BTS 1900MHz hardware delivery Notice
[R5]	60049617- 550144_A_T_NORTEL	ELECTROMAGNETIC COMPATIBILITY TESTS ACCORDING TO THE PUBLICATIONS 47 CFR PART 15 CLASS B of 2005 AND ICES003 CLASS B of 2004 on GSM 1900 BTS 6000 OUTDOOR (A.C.)
[R6]	60049617- 550144_B_T_NORTEL	ELECTROMAGNETIC COMPATIBILITY TESTS ACCORDING TO THE PUBLICATIONS 47 CFR PART 24 of 2004 and RSS133 of 2005 on GSM 1900 BTS 6000 OUTDOOR (A.C.)
[R7]	60049617- 550144_C_T_NORTEL	ELECTROMAGNETIC COMPATIBILITY TESTS ACCORDING TO THE PUBLICATIONS 47 CFR PART 15 CLASS B of 2005 AND ICES003 CLASS B of 2004 on GSM 1900 BTS 6000 OUTDOOR (D.C.)
[R8]	60049617- 550144_D_T_NORTEL	ELECTROMAGNETIC COMPATIBILITY TESTS ACCORDING TO THE PUBLICATIONS 47 CFR PART 24 of 2004 and RSS133 of 2005 on GSM 1900 BTS 6000 OUTDOOR (D.C.)
[R9]	60049617- 550144_F_T_NORTEL	ELECTROMAGNETIC COMPATIBILITY TESTS ACCORDING TO THE PUBLICATIONS 47 CFR PART 15 CLASS B of 2005 AND ICES003 CLASS B of 2004 on GSM 1900 BTS 6000 INDOOR (D.C.)
[R10]	60049617- 550144_G_T_NORTEL	ELECTROMAGNETIC COMPATIBILITY TESTS ACCORDING TO THE PUBLICATIONS 47 CFR PART 24 of 2004 and RSS133 of 2005 on GSM 1900 BTS 6000 INDOOR (D.C.)

3. IDENTIFICATION OF EQUIPMENT UNDER TEST

This document applies to:

Product: GSM 6000 BTS
 INDOOR & OUTDOOR (AC & DC version)
Manufacturer: NORTEL
Frequencies: 1900 MHz

Configuration: AC or DC OUT S222 Mode S111 900 H2D T1

Option: CALPRO2 & CPRIPRO2

AVLM Recipient: LCIE	Date of delivery: 11/OCT/2006
Product: GSM 6000 Outdoor BTS	
Article delivered: AC version of GSM 6000 Outdoor BTS AC OUT S222 Mode S111 900 H2D T1	Article code: NTQ610FA D1
Section transmitting: 8K34	Designer name: Chenet Stéphane
Cabinet Serial Number: NNTMGTD004KG1 / 434143	
Documents related to the Hardware Design Specifications - PE/BTS/DD.016672 V01.05/EN BTS 6000 Product Specification	
Documents dealing with specifications:	
Issues fixed on the cabinet:	
Missing Equipment:	
Software compatibility:	
Modules software version : - Load BTS : v15e3e03 / CD1114389 > IC WABM : v15e303 / CD1113946 > RM : v15e302 / CD1114293	
PI software tools : - WINTMI: v03d306 - TIL COAM: v15e204 - TIL Alarm: v01205 - WINTOOL: v04b4e09	

The delivery includes :

ARTICLE	PEC code	Release	Serial number	Comment
CAB: PRECA	NTQ610FA	D 1	NNTMG T004KG1	
UCPS Rectifier 1.4KW	NTN070BF	01	ATSNZH085318	ARTESYN
UCPS Rectifier 1.4KW	NTN070BF	01	ATSNZH085320	ARTESYN
UCPS CCU UMTS/GSM	NTUM44AF	01	ATSNZH093053	
DDU	NTN066AA	D 1	ATSNZH096635	
ADU	NTQ666CA	D 1	ATSNZH096697	
SAF T Battery	NTQ675AA	0D	07445L000010	
CRICO	NTQ620CA	D 1	NNTMG T004KVL	
CECU	NTQ675JG	D 1	NNTMG T004KGD	
CECU Control Board	NTQ629AA	01	NNTMG TROMAIN	
IFM1	NTN025BF	01	NNTMG R00MFR7	
ICM	NTN023AF	01	NNTMG R00MFX2	ip 136.147.44.93
ICM	NTN023AF	01	NNTMG R00MFY6	ip 136.147.44.210
ABM	NTN029AF	01	NNTMG R00MFKW	
RM 1900	NTN050PM	03	NNTM7504MVSQ	ip 136.147.44.190
RM 1900	NTN050PM	D 1	C DN200428013	ip 136.147.44.132
DDM 1900 W/V/SWR W/HYBRIDS ROHS	NTN063AA	03	FIC T03000N7C	
DDM 1900 W/V/SWR W/HYBRIDS ROHS	NTN063AA	01	FIC T03000TU	MIR02
DDM 1900 W/V/SWR W/HYBRIDS ROHS	NTN063AA	D 3	FIC T03000MS	MIR03-1
CALPRO2	NTQ675CA	D 1	NNTMG T004MHX	
CUSERICO	NTQ650AA	D 1	NNTMG T004L79	

Additional delivery:

ARTICLE	PEC code	Release	Serial number	Comment
CPRIPRO2	NTQ675SA	D 1	NNTMG T004MZ7	
UCPS - Rectifier 1kW ROHS	NTW703BF	01	ATSNZH055897	
UCPS - Rectifier 1kW ROHS	NTW703BF	01	ATSNZH055899	
AC Power cable				
Diplexeur 1900 Mhz				F or Base/Base loopback



AVLM Recipient: LCIE	Date of delivery: 13/OCT/2006
Product: GSM 6000 Outdoor BTS	
Article delivered: DC version of GSM 6000 Outdoor BTS DC OUT S222 Mode S111 1900 HD T1	Article code: NTQ610AA D1
Section transmitting: SK34	Designer name: Chenet Stéphane
Cabinet Serial Number: NNTMG T004R9N / 446082	
Documents related to the Hardware Design Specifications - PE/BTS/DD/016672 V01.05/EN BTS 6000 Product Specification	
Documents dealing with specifications:	
Issues fixed on the cabinet:	
Missing Equipment:	
Software compatibility: Modules software version : - Load BTS : v15e3e03 / CD1114389 > ICM/ABM : v15e303 / CD1113946 > RM : v15e302 / CD1114293 PI software tools : - WINTMI: v03d306 - TIL COAM: v15e204 - TIL Alarm: v01f05 - WINTOOL: v04b4e09	

The delivery includes :

ARTICLE	PEC code	Release	Serial number	Comment
CAB: PRECA	NTQ610AA	D 1	NNTMG T004R9N	
FILLER RECTIFIER	NTW70351	01	ATSNZH056168	
FILLER RECTIFIER	NTW70351	01	ATSNZH056166	
UCPS CCU UMTS/GSM	NTUM44AF	01	ATSNZH085723	
DDU	NTN066AA	D 1	ATSNZH096624	
DCU	NTQ666BA	D 1	ATSNZH 101660	
CRICO	NTQ620CA	D 1	NNTMG T004KVO	
CECU	NTQ675JA	D 1	NNTMG T004R9J	
CECU Control Board	NTQ629AA	01	NNTMG T00400G	
IFM1	NTN025BF	01	NN TMGR00MF PT	
ICM	NTN023AF	01	NNTMGWC300KK	IP 136.147.42.74
ICM	NTN023AF	02	NNTMGWC3021R	IP 136.147.42.75
ABM	NTN029AF	01	NNTMG R00MFMR	IP 136.147.42.76
RM 1900	NTN050PM	07	NNTM75051UHR	IP 136.147.42.77
RM 1900	NTN050PM	07	NN TM75051UI8	IP 136.147.42.78
DDM 1900 W/V/SWR W/O HYBRIDS	NTN063BA	04	FICT03001E81	
DDM 1900 W/V/SWR W/O HYBRIDS	NTN063BA	04	FICT03001F5X	
DDM 1900 W/V/SWR W/O HYBRIDS	NTN063BA	04	FICT03001F61	
CALPRO2	NTQ675CA	D 1	NNTMG T004MHT	
CUSERICO	NTQ650AA	D 1	NN TMGT004L78	

Additional delivery:

ARTICLE	PEC code	Release	Serial number	Comment
MOD: ALTERNATIVE RM 1900	NTN050PM	D4	CDN200640006	IP : 136.147.45.187
MOD: ALTERNATIVE RM 1900	NTN050PM	D3	CDN200639007	IP : 136.147.45.66
DC Power cable				
DCU	NTQ666BA	P1	ATSNZH077028	Module 1W for CEM test

AVLM Recipient: LCIE	Date of delivery: 18/AUG/2006
Product GSM 6000 Indoor BTS	
Article delivered: DC version of GSM 6000 Indoor BTS IND DC H2D VSWR EXT ALARM USER	Article code: NTQ6 10AM D1
Section transmitting: 8K34	Designer name: Hervé Peyrot
Cabinet Serial Number: NNTMGT004KGL / 434149	
Documents related to the Hardware Design Specifications - PE/BTS/DD/016672 V01.05/EN BTS 6000 Product Specification	
Documents dealing with specifications:	
Issues fixed on the cabinet: - Fillers were initially missing: reuse of 1W ones and tailored one for battery gap. - 1W DC box replaced with 0D one - Bulkhead 25 pins subD holes enlarged to allow correct connectors placement	
Missing Equipment: - Missing external cable for external alarms	
Software compatibility: Modules software version : - BTS Load: v15e3e03 / CDI114389 > ICWABM : v15e303 / CDI113946 > RM : v15e302 / CDI114293 PI software tools : - WINTMI: v03d306 - TIL COAM: v15e203 - TIL Alarm: v01f204 - WINTOOL: v04b4e09	

The delivery includes :

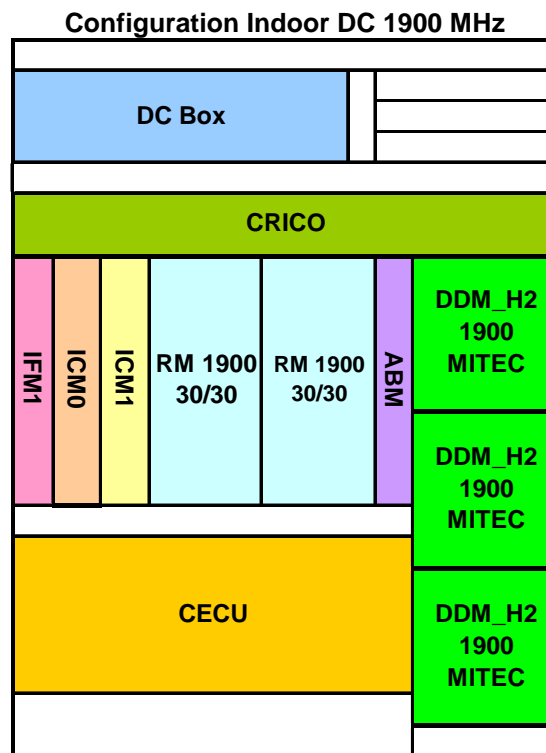
ARTICLE	PEC code	Release	Serial number	Comment
CAB: PRECA	NTQ610AM	D1	NNTMGT004KGL	
DC box	NBTQ675AM	D1	NNTMGT004MZI	
CUSERIOO	NTQ650AA	D1	NNTMGT004L77	
RICO	NTQ620CA	D1	NNTMGT004KVH	
CECU	NTQ675JG	D1	NNTMGT004KQ8	
CECU Control Board	NTQ629AA	D1	NNTMGT004KV9	
IFM1	NTN025BF	01	NNTMGR00MFPC	
ICM	NTN023AF	01	NNTMGR00MFX3	@p 136.147.42.28
ICM	NTN023AF	01	NNTMGR00MFW0	@p 136.147.42.27
ABM	NTN029AF	01	NNTMGR00MFNL	@p 136.147.42.29

4. TESTS RESULTS

4.1. EMISSIONS TESTS

4.1.1 TEST CONFIGURATION

The BTS is configured as close to normal intended use. The GSM 6000 BTS 1900 MHz is configured to transmit on all RF channels at Pmax on all the frequency band.



Configuration Outdoor DC 1900 MHz

D C U			C C U	D D U		
CRICO						
IFM1	ICM0	ICM1	RM 1900 30/30	RM 1900 30/30	ABM	DDM_H2 1900 MITEC
						DDM_H2 1900 MITEC
CECU						DDM_H2 1900 MITEC

Configuration Outdoor AC 1900 MHz

A D U	Rect. 1,4 kW Artesyn	Rect. 1KW	C C U	D D U		
CRICO						
IFM1	ICM0	ICM1	RM 1900 30/30	RM 1900 30/30	ABM	DDM_H2 1900 MITEC
						DDM_H2 1900 MITEC
CECU						DDM_H2 1900 MITEC

Frequencies configurations:
 On 1900 MHz HPRM0 (Channel 512, 661, 810).
 On 1900 MHz MPRM1 (Channel 512, 661, 810).

CPRIPRO2 is present during this EMC campaign.
 CALPRO2 is present during this EMC campaign.

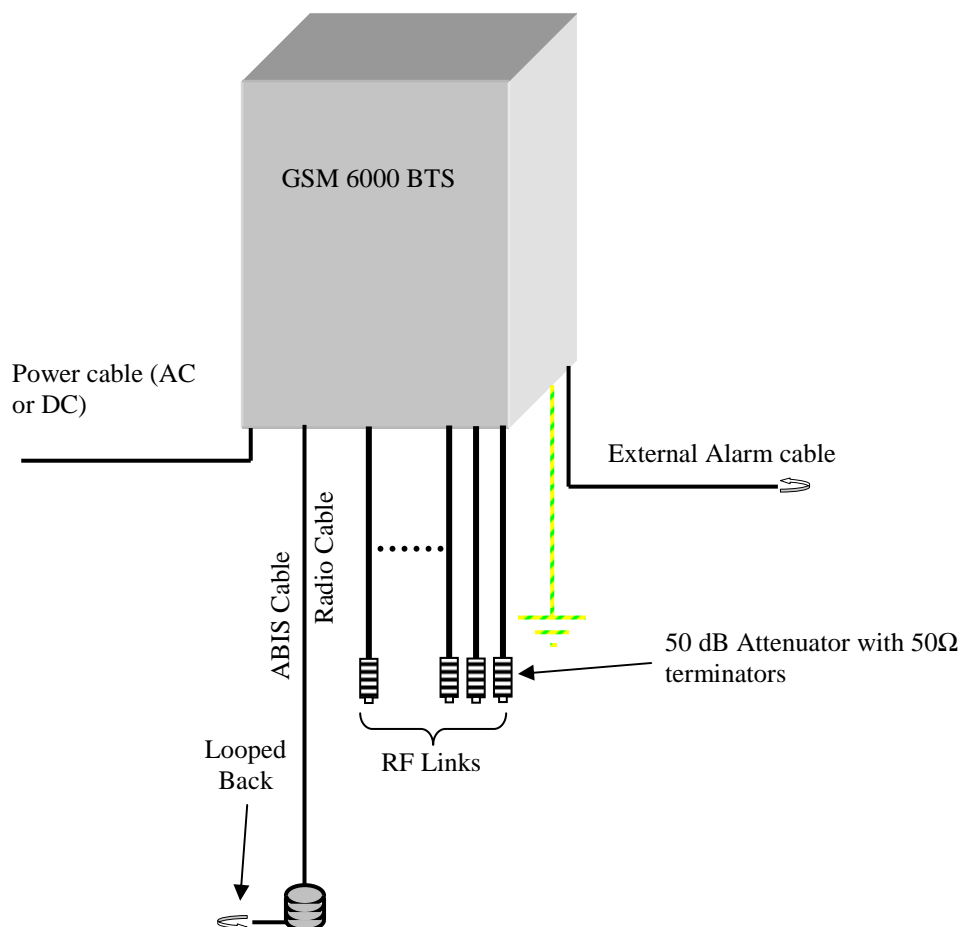
The Abis cable of the BTS is looped back at the end and a PCM signal is transmitted on these cables.

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

- Abis port (telecom port) : cable 16 meters 120Ω. This cable is looped in order to transmit TX signals on RX ones.
- Radio port (signal port) : 4 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 port : Lab cable (about 10 meters).

The hardware, software status and the functional limits are described in the document referenced [R3].

Figure N°1: Emissions testing configuration





4.1.2 MATRIX RESULTS

This table presents the tests realized and the severity applied :

Configuration Indoor DC 1900 MHz

Test	Compliance	Comments
Conducted Emissions on DC Port FCC Part15 §15.107 & §15.207 ICES003 (0.15 MHz to 30 MHz)	PASS	For information only: DC -48 V: Pass the FCC Part §15.107 & 15.207 Class B & ICES 003 with 8 dB margin / AVG and 18 dB margin / QP.
Radiated Emissions FCC Part 15 § 15.109 & 15.209 ICES003 (30 MHz to 18 GHz)	PASS	Pass the FCC Part §15.109 & 15.209 (30MHz to 18 GHz) Class B with 7.5 dB margin & ICES 003 with 7.5 dB margin in worst case.
Radiated Emissions Spurious FCC Part 24 § 24.238 RSS133 § 6.5 (30 MHz to 20 GHz)	PASS	For 30 W, limit is 93.9 dBµV/m @ 1 m or 73.9 dBµV/m @ 10 m. No spurious (44dB margin)

Configuration Outdoor DC 1900 MHz

Test	Compliance	Comments
Conducted Emissions on AC Port FCC Part15 §15.107 & §15.207 ICES003 (0.15 MHz to 30 MHz)	PASS	For information only: DC -48 V: Pass the FCC Part §15.107 & 15.207 Class A & ICES 003 with 7 dB margin / AVG and 17 dB margin / QP..
Radiated Emissions FCC Part 15 § 15.109 & 15.209 ICES003 (30 MHz to 18 GHz)	PASS	Pass the FCC Part §15.109 & 15.209 (30MHz to 18 GHz) Class B with 5 dB margin & ICES 003 with 8 dB margin in worst case.
Radiated Emissions Spurious FCC Part 24 § 24.238 RSS133 § 6.5 (30 MHz to 20 GHz)	PASS	For 30 W, limit is 93.9 dBµV/m @ 1 m or 73.9 dBµV/m @ 10 m. No spurious (38dB margin)

Configuration Outdoor AC 1900 MHz

Test	Compliance	Comments
Conducted Emissions on AC Port FCC Part15 §15.107 & §15.207 ICES003 (0.15 MHz to 30 MHz)	PASS	Split phase 240V – 60 Hz: Pass the FCC Part §15.107 & 15.207 Class B with 9 dB margin / AVG and 19 dB margin / QP.
Radiated Emissions FCC Part 15 § 15.109 & 15.209 ICES003 (30 MHz to 18 GHz)	PASS	Pass the FCC Part §15.109 & 15.209 (30MHz to 18 GHz) Class B with 10 dB margin & ICES 003 with 3 dB margin in worst case.
Radiated Emissions Spurious FCC Part 24 § 24.238 RSS133 § 6.5 (30 MHz to 20 GHz)	PASS	For 30 W, limit is 93.9 dBµV/m @ 1 m or 73.9 dBµV/m @ 10 m. No spurious (40dB margin)



4.2. CONCLUSIONS OF EMISSIONS TESTS

During this assessment, we have validated the qualification of the GSM 6000 BTS Outdoor cabinet in AC and DC versions, and on GSM 6000 BTS Indoor cabinet in DC version as described in the document referenced [R2].

The GSM 6000 BTS Indoor cabinet in AC version has been introduced by similarity with GSM 6000 BTS Outdoor cabinet in AC version.

Those both versions are identical except door, enclosure and gaskets. Gaskets of Outdoor version are less efficient than Indoor version gaskets concerning EMC aspect, according to the EMC results of the GSM 6000 BTS Outdoor cabinet in AC version, we deduce the EMC conformity of GSM 6000 BTS Indoor cabinet in AC version.



5. CONCLUSION

The GSM 6000 BTS Outdoor cabinet in AC version, and GSM 6000 BTS Indoor cabinet in DC version as described in this document complies with the FCC part 15 [Part 15.107 and 15.207 (subpart B)]/ICES 003 Class B and the FCC Part 24 [Part 24.238 (subpart E)]/RS133. They comply also with the FCC Part 15 [Part 15.109 and 15.209 in frequency range 30MHz to 18 GHz (subpart C)] class B.

The GSM 6000 BTS Outdoor cabinet in DC version as described in this document comply with the FCC part 15 [Part 15.107 and 15.207 (subpart B)] Class A and the FCC Part 24 [Part 24.238 (subpart E)]/RS133. It complies also with the FCC Part 15 [Part 15.109 and 15.209 in frequency range 30MHz to 18 GHz (subpart C)] class B.

The GSM 6000 BTS Indoor cabinet in AC version is introduced by similarity with GSM 6000 BTS Outdoor cabinet in AC version and by analysis of the EMC results obtained during this qualification of GSM 6000 BTS products.

The GSM 6000 BTS Indoor cabinet in AC version as described in this document comply with the FCC part 15 [Part 15.107 and 15.207 (subpart B)]/ICES 003 Class B and the FCC Part 24 [Part 24.238 (subpart E)]/RS133. It complies also with the FCC Part 15 [Part 15.109 and 15.209 in frequency range 30MHz to 18 GHz (subpart C)] class B.

6. ABBREVIATIONS AND DEFINITIONS

6.1. ABBREVIATIONS

AC	Alternative Current (Power source)
AC/DC	Alternative Current to Direct Current converter
AE	Auxiliary Equipment
AM	Amplitude Modulation
AV	Average
BER	Bit Error Rate
CW	Continuous Waves
dBm	Decibel milliwatt
DC	Direct Current
EFT/B	Electrical Fast Transient / Burst
EM	ElectroMagnetic
EMC	ElectroMagnetic Compatibility
EMI	Electro-Magnetic Interference
EN	European Norm
ERM	Electromagnetic compatibility and Radio spectrum Matters
ESD	ElectroStatic Discharge
ETS	ETSI Standard
EUT	Equipment Under Test
GRP	Ground Reference Plane
HCP	Horizontal Coupling Plane
IT	Information Technology
PE	Protective Earth
N/A	Not Applicable
NTP	Network Termination Point
RF	Radio Frequency
RFI	Radio Frequency Interference
TDMA	Time Division Multiple Access
VCP	Vertical Coupling Plane

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_1 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_1 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.

TDMA : a time multiplexing modulation scheme which places several communication channels on the same carrier wave at an allocated frequency. Each channel is assigned a time slot during which, if the channel is active, the information is transmitted as a pulse of RF power. If the



channel is not active no pulse is transmitted, thus the carrier envelope is not constant. During the pulse, the amplitude is constant and the RF carrier is frequency or phase modulated.

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.

❧END OF DOCUMENT❧