EMC Test report for the introduction of the GSM 18000 Outdoor NG BTS (FCC)

Reference:	**79502-568199-C-TR-18NG-FCC**
Version:	**A**
Status:	**Approved**
Date:	**05/May/2008**
Customer:	**NORTEL NETWORKS** **Parc d'Activités de Magny-Châteaufort** **78928 Yvelines Cedex 09**
Product:	**GSM 18000 Outdoor NG BTS 850/1900 MHz**
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PUBLICATION HISTORY

VERSION	DATE	AUTHOR	MODIFICATION
A	05-May-08	V.GODET	Creation of document

CONTENTS

1. INTRODUCTION

This document presents the FCC EMC tests report for the introduction of GSM 18000 Outdoor NG BTS Dual GSM 850 MHz / PCS 1900 MHz as described in the document referenced [R1].

For North America, applicable standard for EMC Base stations are the FCC part 15/ICES 003 Class B, the FCC Part 22 /RS132 and the FCC Part 24/RS133.

The tests were performed at LCIE Ecuelles (FCC registration number: 888863 – Industry Canada number: IC6231)

The following table gives some information of the EUT:

Product Name	GSM 18000 Outdoor NG BTS
Manufacturer	NORTEL
Serial Number	-
Alimentation of the EUT	AC

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 22	Code of Federal Regulations - Part 22 - Public Mobiles Services.
[A4]	CFR 47 Part 24	Code of Federal Regulations - Part 24 - Personal Communications Services.
[A5]	IC ES 003 (NMB 003)	Industry Canada - Digital apparatus
[A6]	RSS 132	Industry Canada - 800 MHz Cellular Telephones Employing New Technologies.
[A7]	RSS 133	Industry Canada – 2 GHz Personal Communications Services.

2.2. REFERENCE DOCUMENTS

[R1]	PE/BTS/DPL/022827	GSM BTS 18000 Project Qualification Plan for Outdoor NG BTS introduction - FCC
[R2]	79502-568199-C-TP-18NG-FCC	EMC Test plan for the qualification of NG 18000 Outdoor BTS (FCC)
[R3]	PE/BTS/DJD/023017 06.01 / EN	Outdoor NG BTS18000 hardware delivery notice
[R4]	PE/BTS/DJD/023017 03.03 / EN	Outdoor NG BTS18000 hardware delivery notice
[R5]	79502-568197	EMC Laboratory Test Report

3. IDENTIFICATION OF EQUIPMENT UNDER TEST

This document applies to:

Product: GSM 18000 Outdoor NG BTS

Manufacturer: NORTEL
Frequencies: 850 / 1900 MHz

Configuration: S666

Option: *ALPRO2*

AVLM Recipient: LCIE	Date of delivery: 31/JAN/2008
Product: GSM NG BTS 18000 Outdoor	
Article delivered: GSM NG BTS 18000 Outdoor	Article code: NTT915BS P1
Section transmitting: 8Z60	Designer name: P.JEULAND
Cabinet Serial Number: Serial Number : N°5	
Documents related to the Hardware Design Specifications	
Documents dealing with specifications: – PE/BTS/DD/ 5282 V04.01/EN BTS 18000 system design specification	
Issues fixed on the cabinet: – None Label on the Cabinet, no pec code, no serial number – Acoustic Kit added : Foam + Deflector + New rear Solar shield – New ECS board with new firmware 1.07	
Missing Equipment: – Missing one heater, **Warning do not connect heater AC cable on ADU**	
Software compatibility: Modules software version : Load BTS S18000 v16b1e11 CDI121234 – ICM/ABM : CDI120795 – RM : CDI121233 PI software tools : – WINTMI: v03d306 – TIL COAM: V16a402 – TIL Alarm: V16a401 – WINTOOL: V05a2e19	

The delivery includes :

ARTICLE	PEC code	Release	Serial number	Comment
BARE CABINET S333 & ECS/ETR	NTT915BS	P1	5	
S666 EXPANSION KIT ETR	NTT998ED	P1	5	
ECS MAIN Rohs VERSION	NTT965AA	01	NNTMJR000LCK	With Firmware 1.07
ECS ETR RoHS VERSION	NTT965AM	P1	5	
KIT BATTERY NARADA	NTT988AA	P1	N/A	
RICAM	NTN024AA	D2	ERRATIX	ICM 0 : 47.164.182.175 ICM 1 : 47.164.182.176 ABM : 47.164.182.177
ABM	NTN029AF	D1	NNTMGR00MCVF	47.164.182.189
CIBP	NTN027AM	01	NNTMDV03EP8L	
CIBP	NTN027AM	01	NNTMDV03EP8V	
DBP2	NTN020EF	01	NNTMJR000023	
DBP2	NTN020EF	01	NNTMJR000026	
ADU	NTT966CA	P1	ATSNZH230293	
RICO	NTN020CF	01	NNTMJR000022	No label on the front
DDM 850 W/VSWR W/HYBRIDS	NTN063HA	D2	FICT03002119	
DDM 850 W/VSWR W/HYBRIDS	NTN063HA	D2	FICT0300213H	
DDM 850 W/VSWR W/HYBRIDS	NTN063HA	D1	FICT0200204F	
DDM 1900 W/VSWR W/HYBRIDS	NTN063AA	04	FICT030016F3	
DDM 1900 W/VSWR W/HYBRIDS	NTN063AA	04	FICT03000MPC	
DDM 1900 W/VSWR W/HYBRIDS	NTN063AA	03	FICT03000N7C	
HPRM 3T 850	NTN050JA	D1	CDN200651008	47.164.182.185
HPRM 3T 850	NTN050JA	D1	CDN200651004	47.164.182.184
HPRM 3T 850	NTN050JA	D1	CDN200651003	47.164.182.178
RM 1900	NTN050PM	D5	CDN200640003	47.164.182.211
RM 1900	NTN050PM	D4	DN200640006	47.164.182.229
RM 1900	NTN050PM	D3	CDN200639007	47.164.182.230
ngUCPS 1600W RECTIFIER	NTT966EA	P1	ATSNZH224298	
ngUCPS 1600W RECTIFIER	NTT966EA	P1	ATSNZH224291	
ngUCPS 1600W RECTIFIER	NTT966EA	P1	ATSNZH224300	
ngUCPS 1600W RECTIFIER	NTT966EA	P1	ATSNZH224286	
ngUCPS GSM CCU	NTT966DA	P1	ATSNZH229048	
ngUCPS BTS18K SHELF&DDU	NTT966AA	P1	ATSNZH236039	
ngUSER-ICO	NTT988DA	P1	N°2	
ALPRO 2	NTT971AF	D1	NNTMGT003U5C	
ALPRO 2	NTT971AF	D1	NNTMGT003U5A	

Additional delivery:

ARTICLE	PEC code	Release	Serial number	Comment
Cable DDM/Bulkhead with Lighting Protection	NTT996ZH	N/A	N/A	*6 For DCS1800 test
Standard Fan tray	NTT967AA	P1	N/A	*2 With fan support modified
ETR Fan tray	NTT967AD	P1	N/A	*2
AC cable				Only for Acoustic test

Tests performed:

The following features have been tested:

- IFM/ ICM / ABM / RM Inventory test
- DDM Alarms & Inventory interface
- Dale & Dali

Functional limits :

- **Hardware Limitations :**
  - Missing one heater, **Warning do not connect heater AC cable on ADU**
- **Software Limitations :**
  -

Documents related to the Hardware Test Specifications

Reference of the test specifications documents:

- PE/BTS/DJD/010557 V01/EN Hardware integration test specification for BTS 18000 Outdoor

Documents related to the Hardware Test Report

Reference of the test reports documents:

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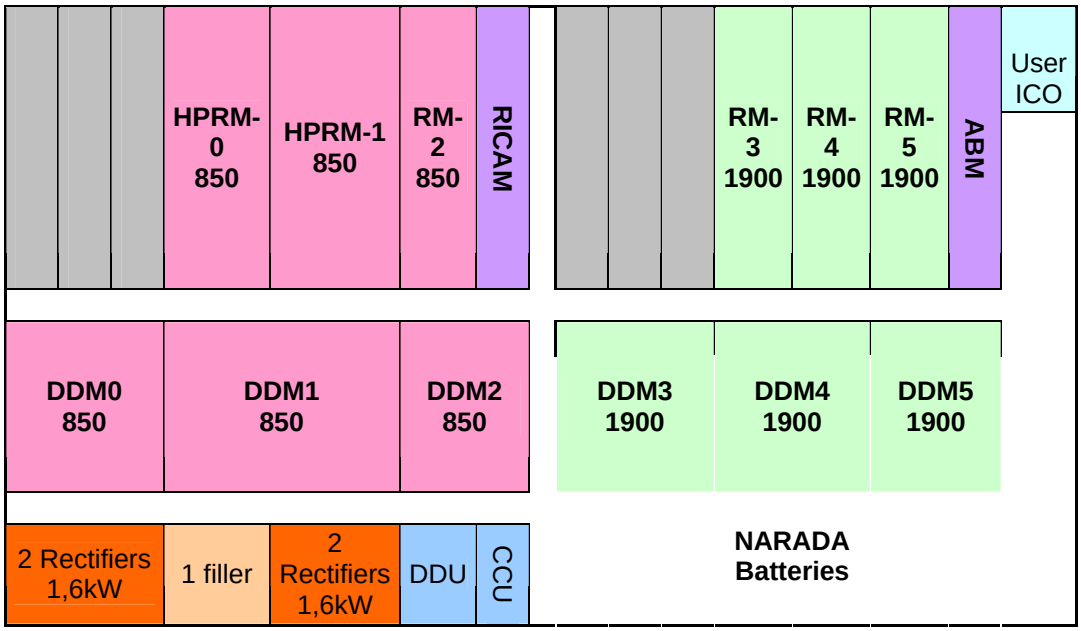
4. TESTS RESULTS

4.1. EMISSIONS TESTS

4.1.1 TEST CONFIGURATION

The BTS is configured as close to normal intended use. The GSM 18000 Outdoor NG BTS 850/1900 MHz is configured to transmit on all RF channels at Pmax on all the frequency band.

Configuration GSM 18000 Outdoor NG dualband 850/1900 MHz



Frequencies configurations:
On GSM 18000 Outdoor NG Dual band GSM 850 MHz/PCS 1900 MHz channel (128 190, 251) & (512, 661, 810).

ALPRO2 is present during this EMC campaign.

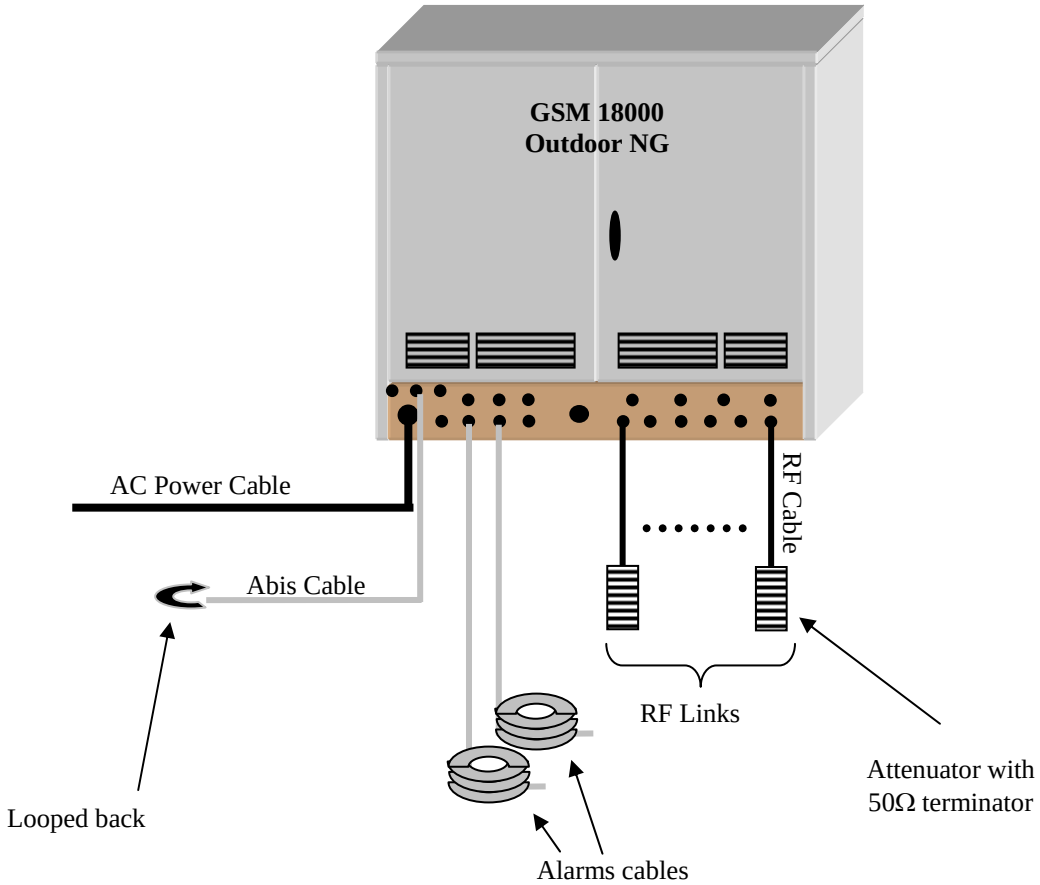
The Abis cable of the BTS is looped back at the end and a PCM signal is transmitted on these cables.

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): 12 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.
- GSM external Alarms ports: 1 cable will be looped and the other cable will be in open circuit.
- AC 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:

Test	Compliance	Comments
Conducted Emissions on AC Port FCC Part15 §15.107 ICES003 (0.15 MHz to 30 MHz)	**PASS**	Configuration: 120/240VAC, Split phase US – 60 Hz Pass the FCC Part §15.107 Class B & ICES 003 with 15 dB margin QP / AVG.
Radiated Emissions FCC Part 15 § 15.109 ICES003 (30 MHz to 18 GHz)	**PASS**	Pass the FCC Part §15.109 (30MHz to 18 GHz) Class B with 4 dB margin & ICES 003 with 4 dB margin in worst case.
Radiated Emissions Spurious FCC Part 22 § 22.917 RSS132 § 4.5 (30 MHz to 20 GHz)	**PASS**	No spurious (>40dB margin)
Radiated Emissions Spurious FCC Part 24 § 24.238 RSS133 § 6.5 (30 MHz to 20 GHz)	**PASS**	No spurious (>40dB margin)

5. CONCLUSION

The GSM 18000 BTS Outdoor NG Dual GSM 850 MHz / PCS 1900 MHz as described in this document complies with the FCC part 15 [Part 15.107 (subpart B)]/ICES 003 Class B, the FCC Part 22 [Part 22.917 (subpart H)]/RS132 and the FCC Part 24 [Part 24.238 (subpart E)]/RS133 .

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 tem “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