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# TEST REPORT

N° 79502-568197

FCC REGISTRASTION NUMBER 888863  
INDUSTRY CANADA NUMBER 6231

**ISSUED TO** : NORTEL  
Parc d'activités de Magny-Châteaufort  
78928 YVELINES Cedex 09

**SUBJECT** : **ELECTROMAGNETIC COMPATIBILITY TESTS ACCORDING TO THE PUBLICATIONS 47 CFR PART 15 CLASS B of 2007 , ICES003 CLASS B of 2004, 47 CFR PART 22 of 2004 , RSS132 of 2005, 47 CFR PART 24 of 2004 and RSS133 of 2005**

Apparatus under test :

- Product : BASE STATION
- Trade mark : NORTEL
- manufacturer : NORTEL NETWORKS
- type : NG 18000 OUTDOOR BTS
- Serial number : -

Test date : March 2008

Composition of document : 15 pages + 2 related documents

Fontenay-aux-Roses, April 11<sup>th</sup>, 2008

	<b>LABORATOIRE CENTRAL DES INDUSTRIES ELECTRIQUES</b> The technical manager RCS Nanterre B 408 363 174 <b>Sébastien AOUT</b> Général Leclerc 92260 FONTENAY AUX ROSES
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LCIE	33, av du Général Leclerc	Tél : +33 1 40 95 60 60	Société Anonyme
Laboratoire Central	BP 8	Fax : +33 1 40 95 86 56	au capital de 15 745 984 €
des Industries Electriques	92266 Fontenay-aux-Roses cedex	contact@lcie.fr	RCS Nanterre B 408 363 174
Une société de Bureau Veritas	France	www.lcie.fr	



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**1 – GENERAL****1.1 - Manufacturer identification**

Manufacturer : NORTEL  
Address : Parc d'activités de Magny-Châteaufort  
78928 YVELINES Cedex 09

**2 - TESTING PROGRAM**

Test have been carried out according to the following specifications :

- Measurement of continuous conducted disturbances in the frequency range 0.15 MHz to 30 MHz - publication 47CFR Part. 15 subpart B ( § 107) class B of 2000 and standard CISPR 22 (§ 9) class B of 2003
- Measurement of radiated disturbances in the frequency range 30 MHz to 18 GHz - publication 47CFR Part. 15 subpart B (§ 109) ,class B of 2006
- Measurement of radiated disturbances in the frequency range 30 MHz to 6 GHz - standard CISPR 22 (§ 10) class B of 2005 and amendment 1 of 2005
- Measurement of radiated disturbances in the frequency range 30 MHz to 20 GHz – Publication 47CFR Part. 22 subpart H (§ 22.917) and RSS132 (§ 4.5)
- Measurement of radiated disturbances in the frequency range 30 MHz to 20 GHz – Publication 47CFR Part. 24 subpart H (§ 24.238) and RSS133 (§ 6.5)
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The ICES003 standard use CISPR 22 standard method and limit.



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**3 - EQUIPMENT CHARACTERISTICS****3.1 - Label identification**

No number plate statement.

(see hardware and software descriptions of the related document provided by NORTEL , reference : PE/BTS/DJD/023017 issue V06.01 / EN).

**3.2 - Equipment configuration**

The configuration of the equipment under test is described on the related documents reference LCIE 79502-568199-C-TP-18NG-FCC and NORTEL - PE/BTS/DJD/023017 issue V06.01 / EN.

The position of apparatus under test is given in the photograph in annex.

During the measurements, the apparatus was operating in transmitter mode and the output transmitters were connected to 50 Ohms loads.

All transmitters were at maximum power 60W with the following configuration :

	Channel 1	Channel 2	Channel 3
HPRM	128 (896.2 MHz)	189 (881.4 MHz)	251 (893.8 MHz)
HPRM	251(893.8 MHz)	128 (896.2 MHz)	189 (881.4 MHz)
HPRM	189 (881.4 MHz)	251(893.8 MHz)	128 (896.2 MHz)
RM	512 (1930.2 MHz)	669 (1961.6 MHz)	810 (1989.8 MHz)
RM	669 (1961.6 MHz)	810 (1989.8 MHz)	512 (1930.2 MHz)
RM	810 (1989.8 MHz)	512 (1930.2 MHz)	669(1961.6 MHz)

The frame of the BTS was grounded.

**4 - OPERATING CONDITIONS**

The apparatus was placed in an open field site located Chemin des Hautes Peines at ECUELLES (Seine-et-Marne) was powered with a A.C. source delivering 120/240VAC, Split phase US, 60 Hz.

. Climatic conditions: ambient temperature : 20 to 23 °C  
relative humidity : 38 to 51 %  
atmospheric pressure : - hPa

**5 - TESTING RESULTS**

**5.1 DISTURBANCES MEASUREMENT- CISPR22 , 47CFR Part. 15**

Apparatus class : B

TEST	TEST SPECIFICATION	RESULTS			
		P	F	NA	Rem
<u>Limits for conducted disturbances at mains ports</u>	Frequency range : 0.15MHz to 30 MHz Diagram No 1	[X]	[ ]	[ ]	[ ]
<u>Limits for radiated disturbances</u>	Frequency range : 30 MHz to 18000 MHz Antennas : - bilog (30 MHz to 1000 MHz) - Horn (1 GHz to 18 GHz) Diagrams No 2 and 3	[X] [X]	[ ] [ ]	[ ] [ ]	[ ] [1]

P : pass - F : Fail - NA : not applicable - Rem : remark

Remark

N° 1 : between 1 GHz to 18 GHz , The measured levels are below the limit level (15 dB margin)



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**5.2 DISTURBANCES MEASUREMENT -47CFR Part. 22 subpart H (§ 22.917) ,RSS132 (§ 4.5), 47CFR Part. 24 subpart H (§ 22.238) ,RSS133 (§ 6.5)****5.2.1-Test procedure**

Radiated emission measurement procedures shall be performed as outlined in ANSI/TIA-603-C-2004 measurement standard.

The measurements have been carried out in two steps : the identification of the frequencies and the measurement of the radiated field.

**5.2.2- The identification of the frequencies ( pre scan )**

The apparatus was placed inside a shielded room.

The measurement antenna is placed near the apparatus and connected to a spectrum analyzer.

The observation of the radioelectric spectrum is allowed to identify the spurious frequencies to the equipment under test.

**5.2.3 -Measurement of the radiated field.**

Measurements have been carried out in an open field site with the following antennas :

- Bilog antenna : 30 MHz to 1000 MHz
- Horn type : EMCO 3115 : 1 GHz to 18 GHz
- Horn type : AH SYSTEMS SAS-572 : 18 GHz to 20 GHz

Antennas were placed at 10 m from the equipment under test and connected successively to a spectrum analyzer equipped with a radiofrequency preselector, a preamplifier and a quasi peak-adaptor.

Antennas height was adjusted between 1m and 4 m in order to obtain the maximal electric field value

Antennas under test was placed on a turntable in order to present the side giving the highest level disturbance.

**5.2.4 Limits for radiated emissions from FCC Part 22, FCC Part.24, RS133 and RSS132.**

Frequency range	Minimum requirement (e.r.p.)/Reference Bandwidth
30 MHz ≤ f < 20 GHz	The spurious emissions must be attenuated by at least 43 + 10 Log(P) P = Transmitter rated Power in Watts

Measurements were made according to the procedures outline in ANSI C63.4  
 The emissions were investigated up to the tenth harmonic of the fundamental emission (20 GHz).  
 The measured level of the emissions was recorded and compared to the limit.  
 The reference level for spurious radiation was taken with reference to an ideal dipole antenna excited by the rated output power according to the following relationship :

$$E(V/m) = \frac{1}{R(m)} * \sqrt{30 * P_t * G}$$

Where,

- E = Field Strength in Volts/meter,
- R = Measurement distance in meters,
- P<sub>t</sub> = Transmitter Rated Power in Watts (30 Watts),
- G = Gain of ideal Dipole (linear)

Therefore :

$$E(V/m) = \frac{1}{10} * \sqrt{30 * 60 * 1.64}$$

E = 5.43 V/m = 134.7 dB<sub>μ</sub>V/m

The spurious emissions must be attenuated by at least 43 + 10\*Log(60) = 60.7 dB.

Therefore the field strength limit at 10 meters is :

E = 134.7 dB<sub>μ</sub>V/m – 60.7 dB = 74 dB<sub>μ</sub>V/m

Limit Level = 74 dB<sub>μ</sub>V/m

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**5.2.5 Spectrum Analyzer setting:**

Receiver Setting	Pre-Scan (to identify spurious emissions from EUT)	Final Measurements
Detector Type	Peak	Quasi-Peak (CISPR) for 30 MHz – 1 GHz Peak for 1GHz – 20 GHz
Mode	Max Hold	Not Applicable
Bandwidth	100 kHz or 1 MHz (for > 1GHz)	120 kHz Quasi-Peak 100 kHz or 1 MHz (for > 1GHz)
Amplitude Range	60 dB	20 dB
Measurement Time	Not Applicable	> 1 s
Observation Time	Not Applicable	> 15 s
Step size	Continuous sweep	Not Applicable
Sweep Time	Coupled	Not Applicable
Measuring Distance	3 m for 30 MHz - 1GHz 1 m for 1 GHz – 20 GHz	10m for 30 MHz – 1 GHz 10m for 1 GHz – 20 GHz

**5.2.6- Testing results**

TEST	TEST SPECIFICATION	RESULTS			
		P	F	NA	Rem
<u>Limits for radiated disturbances</u>	Frequency range : 30 MHz to 20000 MHz				
	Antenna :				
	- bilog (30 MHz to 1000 MHz)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[1]
	- Horn (1 GHz to 18 GHz)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[1]
	- Horn (18 GHz to 20 GHz)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[1]
	Diagram No 4				

P : pass - F : Fail - NA : not applicable - Rem : remark

**Remark N° 1 :** During the Pre-Scan at 1 meter, no spurious frequencies has been detected in the frequency range 1 GHz to 20 GHz. The measured levels are below the limit level (30 dB margin)  
Same result for 47CFR Part. 22 subpart H (§ 22.917) of 2004, RSS132 (§ 4.5) of 2005, 47CFR Part. 24 subpart H (§ 24.238) of 2004 and RSS133 (§ 6.5) of 2005



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**6 - CONCLUSION**

The apparatus of manufacturer NORTEL and model NG 18000 OUTDOOR BTS is in compliance with the requirements of the publications 47 CFR PART 15 Subpart B (§107 and § 109 in the frequency range 30 MHz to 18 GHz) class B of 2006, ICES003 class B , 47CFR Part. 22 subpart H § 22.917( in the frequency range 30 MHz to 20 GHz) of 2004 , RSS132 (§ 4.5) of 2005, 47CFR Part. 24 subpart H § 24.238( in the frequency range 30 MHz to 20 GHz) of 2004 and RSS133 (§ 6.5) of 2005.

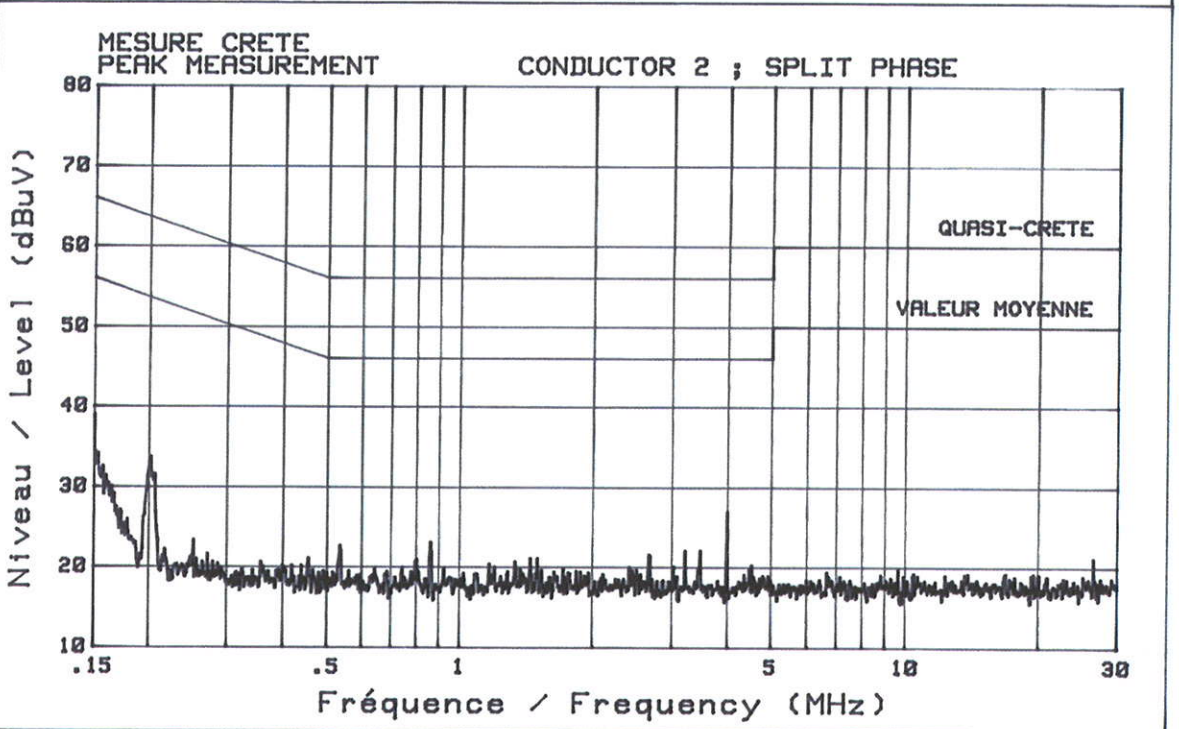
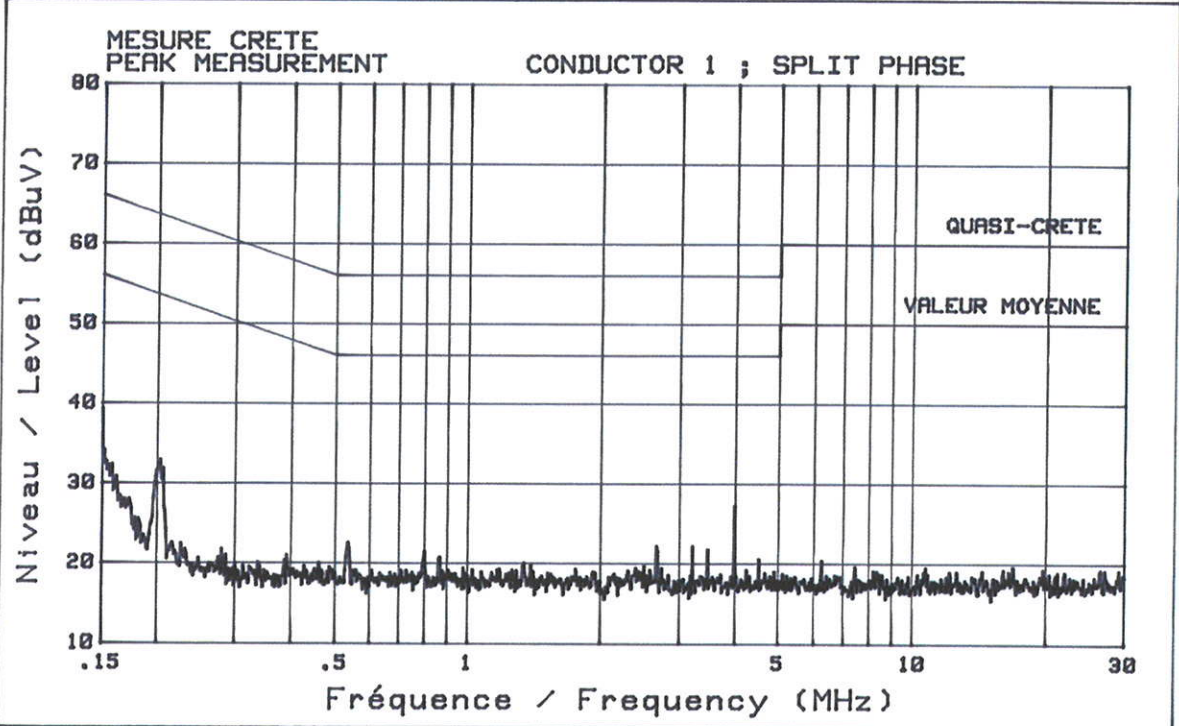




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Diagram n° 1

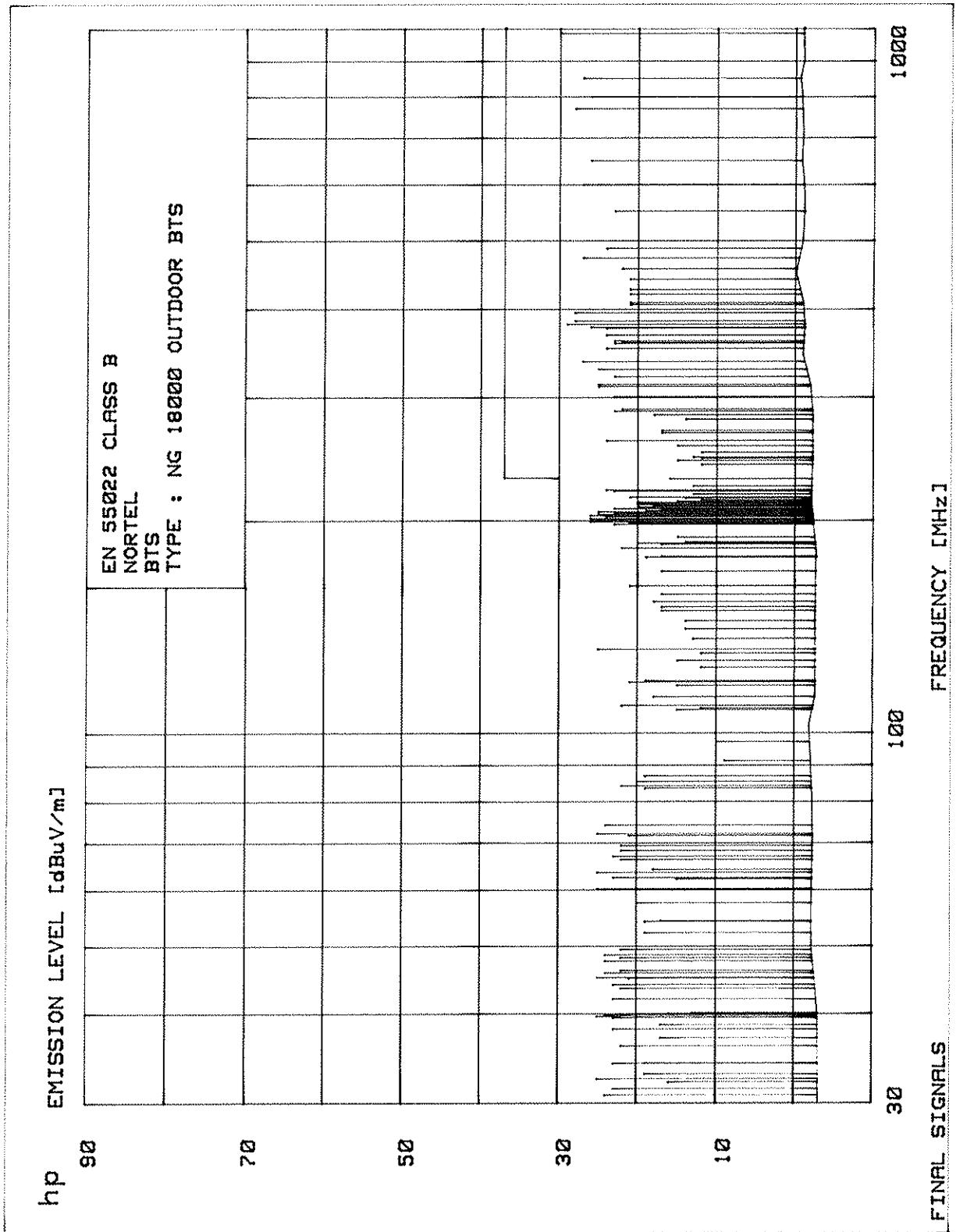
FCC PART.15 CLASS B	NORTEL BTS TYPE : NG 18000 OUTDOOR BTS
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Diagram n° 2

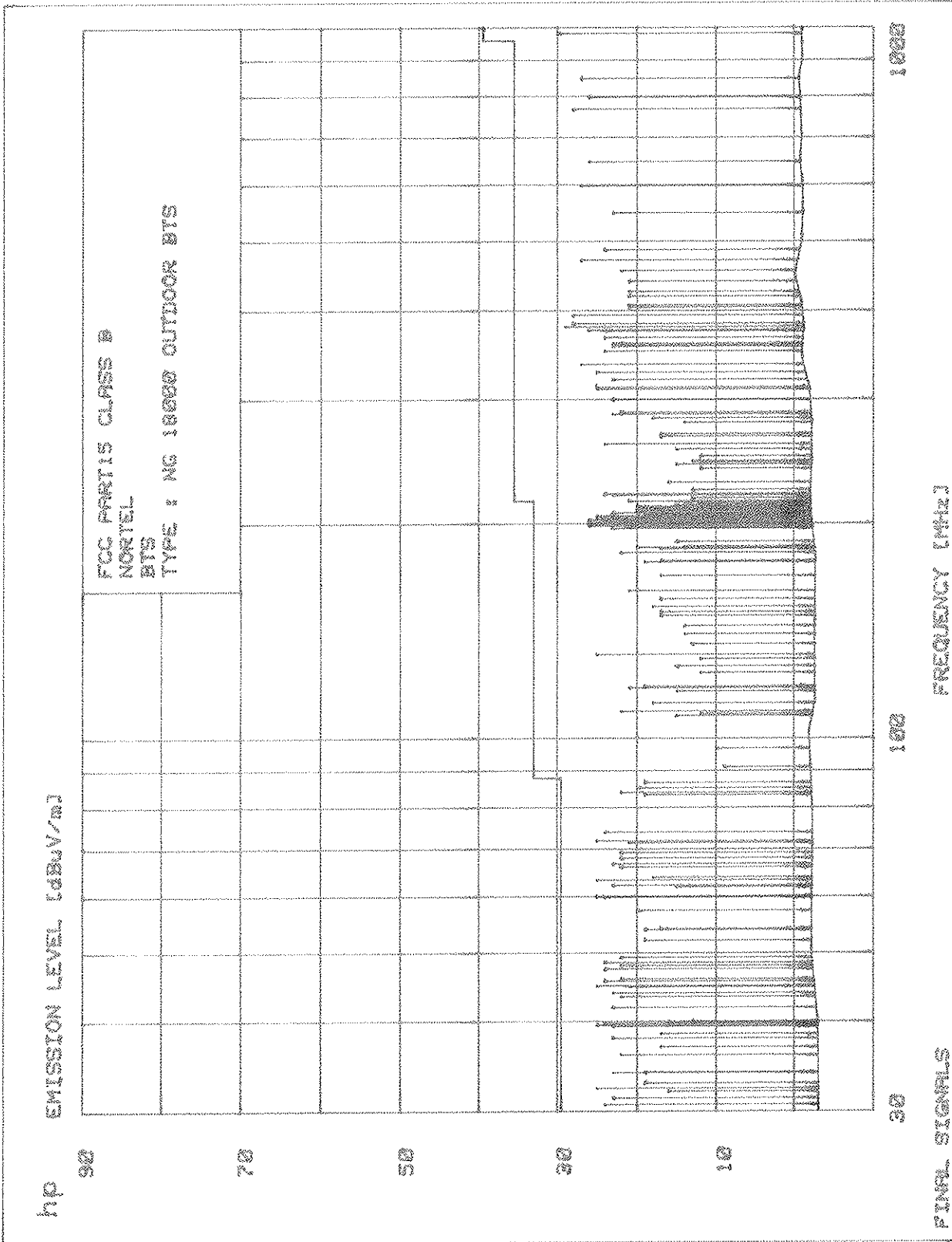




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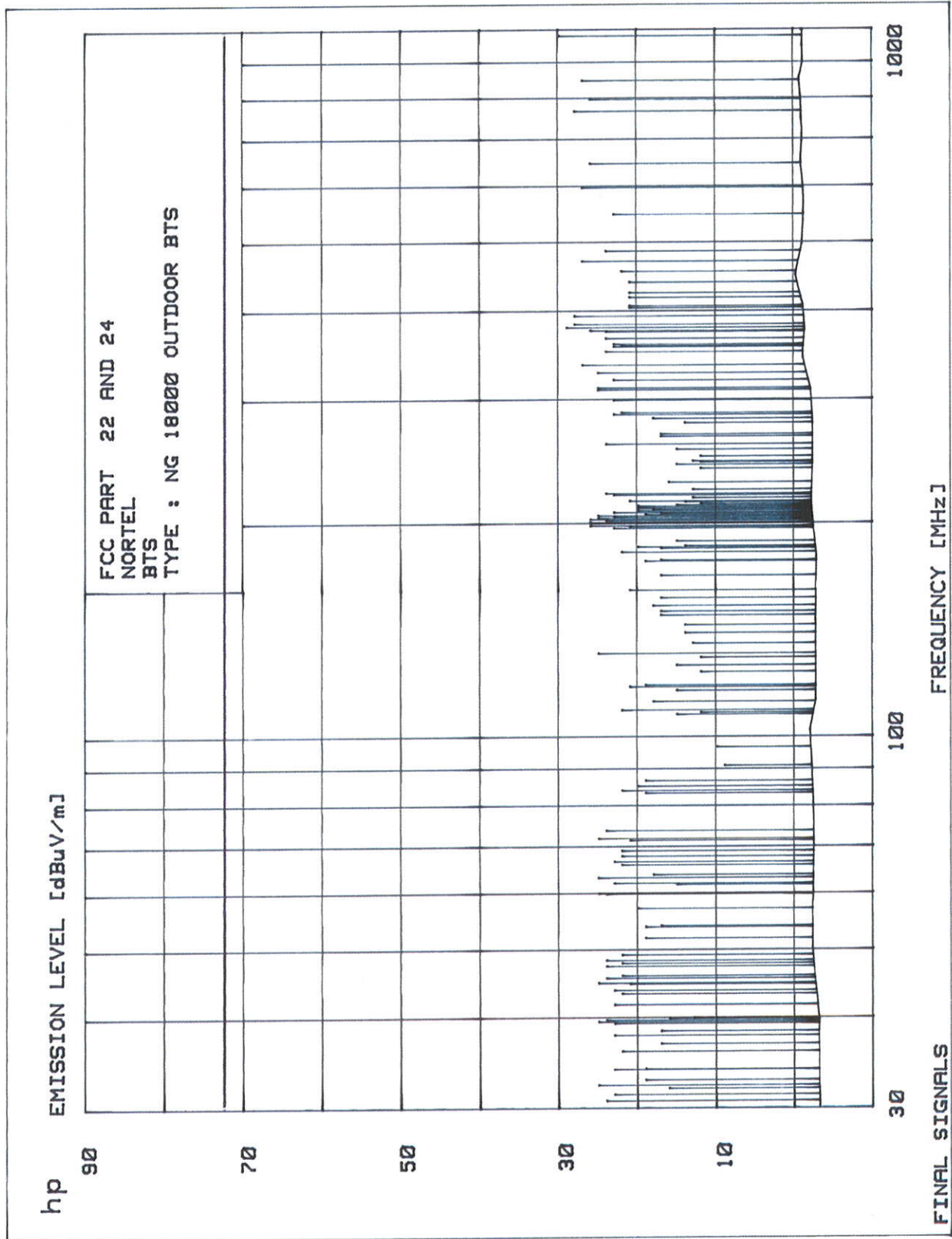
Diagram n° 3





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Diagram n° 4







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Photo N° 1





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**EQUIPMENT LIST**

Test	Apparatus	Trade Mark	Type	Registration number
<i>Open area test site</i>				
X	Spectrum analyseur	HEWLETT PACKARD	8566B	A4060004
X	Preselector	HEWLETT PACKARD	85685A	A4069001
X	Quas-Peak adaptator	HEWLETT PACKARD	85650A	B2163019
X	Preamplifier	HEWLETT PACKARD	8449B	A4069002
	Signal Generator	HEWLETT PACKARD	8657A	A5442003
	Signal Generator	HEWLETT PACKARD	E4433B	A5488014
	Signal Generator	ROHDE & SCHWARZ	SMP02	B2163019
	Mire	PHILIPS	PM 5518-TX	A5240009
	RLTE	SECRET	ENS 1039	C2324001
	Coupler	NARDA	3020A	C5364002
	Coupler	SALIES	3060-20	C5364001
X	V ISLN	ROHDE & SCHWARZ	ESH2-Z5	C2322001
	V ISLN	ROHDE & SCHWARZ	ESH3-Z6	C2322020
X	Bilog antenna	CHASE	CBL 6112A	C2040040
	Bilog antenna	AH SYSTEM	SAS-2001251	C2040025
	Dipole large bande	ROHDE & SCHWARZ	HUF-Z1	C2040011
	Logperiodic antenna	ROHDE & SCHWARZ	HL 023 A2	C2040001
	Logperiodic antenna	EID	AN112	C2040029
x	Horn antenna	AH SYSTEMS	SAS-572	C20042026
X	Horn antenna	EMCO	.3115	C2042016

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UNCERTAINTIES CHART

<i>Kind of measurement</i>	<i>Wide uncertainty laboratory (k=2) ±x(dB)</i>	<i>CISPR uncertainty limit ±y(dB)</i>
<i>Measurement of conducted disturbances in voltage on the AC power port on the Fontenay-aux-Roses site.</i>	3.56	3.6
<i>Measurement of conducted disturbances in voltage on the AC power port on the Ecuelles site.</i>	3.50	3.6
<i>Measurement of conducted disturbances in voltage on the DC power port on the Fontenay-aux-Roses site.</i>	3.56	3.6
<i>Measurement of conducted disturbances in voltage on the DC power port on the Ecuelles site.</i>	3.56	3.6
<i>Measurement of conducted disturbances in voltage on the telecommunication port.</i>	3.28	<i>Under consideration</i>
<i>Measurement of conducted disturbances in current</i>	2.90	<i>Under consideration</i>
<i>Measurement of radiated electric field from 30 to 200 MHz in horizontal position on the Fontenay-aux-Roses site</i>	4.58	5.2
<i>Measurement of radiated electric field from 30 to 200 MHz in vertical position on the Fontenay-aux-Roses site</i>	4.82	5.2
<i>Measurement of radiated electric field from 200 to 1000MHz on the Fontenay-aux-Roses site</i>	4.92	5.2
<i>Measurement of radiated electric field from 1 to 18GHz on the Fontenay-aux-Roses site</i>	6.54	<i>Under consideration</i>
<i>Measurement of radiated electric field from 30 to 1000MHz on the Ecuelles site</i>	4.72	5.2
<i>Measurement of radiated electric field from 1 to 6GHz on the Ecuelles site</i>	5.60	<i>Under consideration</i>
<i>Measurement of radiated electric field from 6 to 18GHz on the Ecuelles site</i>	5.83	<i>Under consideration</i>
<i>Measurement of disturbance power</i>	3.37	4.5
<i>Immunity to conducted disturbances, induced by radio electric field</i>	2.36	/
<i>Immunity to conducted disturbances, induced by radio electric field, method oh the injection clamp</i>	2.76	/
<i>Immunity to radiated radio electric field from 80 MHz to 2.6 GHz</i>	2.64	/

The uncertainty values calculated by the laboratory are lower than limit uncertainty values defined by the CISPR. The conformity of the sample is directly established by the applicable limits values.



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## EMC Test plan for the qualification of NG 18000 Outdoor BTS (FCC)

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**Reference:** 79502-568199-C-TP-18NG-FCC

**Revision:** A

**Status:** Approved

**Date:** 12/Mar/2008

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**Customer:** NORTEL NETWORKS  
Parc d'Activités de Magny-Châteaufort  
78928 Yvelines Cedex 09

**Product:** NG 18000 Outdoor BTS

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**Author:** J. PALARD

**Verified by:** D. PRADON

  
12/03/2008

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LABORATOIRE CENTRAL  
DES INDUSTRIES ELECTRIQUES  
RELATED DOCUMENT  
to test report N° 79502-568199  
15 pages





## PUBLICATION HISTORY

VERSION	DATE	AUTHOR	MODIFICATION
A	12/Mar/2008	J. PALARD	Creation of document



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# 1. INTRODUCTION

This document presents the FCC EMC tests to be performed for qualification of RoHS NG 18000 Outdoor BTS 850MHz & 1900MHz as described in the document referenced [R1] on GSM 18000 BTS product.

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.

Tests will be performed on the following EUT:

Product Name	NG 18000 Outdoor BTS
Manufacturer	NORTEL
Serial Number	-
Frequencies	GSM 850MHz & GSM 1900MHz
Alimentation of the EUT	AC

This document is addressed to Nortel and LCIE people in charge with NG 18000 Outdoor BTS product qualification.



## 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.
[A8]	EN 55022	Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement (1998).
[A9]	EN 301 489-1	Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1 : Common technical requirements.
[A10]	EN 301 489-8	ElectroMagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 8 : Specific conditions for GSM base stations.
[A11]	EN 301 908-1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Base Stations (BS) and User Equipment (UE) for IMT-2000 Third – Generation cellular networks; Part 1 : Harmonized EN for IMT-2000, introduction and common requirements covering essential requirements of article 3.2 of the R&TTE Directive.
[A12]	3GPP TS 101 087	Digital cellular telecommunications system (Phase 2 and Phase 2+); Base Station System (BSS) equipment specification; Radio aspects (3GPP TS 11.21)
[A13]	CISPR 22	Limits and methods of measurement of radio disturbance characteristics of information technology equipment (1997)
[A14]	EN 61000-4-2	Electromagnetic Compatibility (EMC) Part 4-2: Testing and measurement techniques – Electrostatic Discharge immunity test (1995)
[A15]	EN 61000-4-3	Electromagnetic Compatibility (EMC) Part 4-3: Testing and measurement techniques – Radiated, radio-frequency electromagnetic field immunity test (1995)
[A16]	EN 61000-4-4	Electromagnetic Compatibility (EMC) Part 4-4: Testing and measurement techniques – Electrical fast transient / burst immunity test (1995)



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- [A17] EN 61000-4-5 Electromagnetic Compatibility (EMC) Part 4-5: Testing and measurement techniques – Surge immunity test (1995)
- [A18] EN 61000-4-6 Electromagnetic Compatibility (EMC) Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances induced by radio frequency fields (1996)
- [A19] EN 61000-4-11 Electromagnetic Compatibility (EMC) Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity test (1994)
- [A20] EN 61000-3-2 Electromagnetic Compatibility (EMC) Part 3-2: Limit of harmonic current emissions (equipment input current up to and including 16A per phase) (1995)
- [A21] EN 61000-3-3 Electromagnetic Compatibility (EMC) Part 3-3: Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current up to 16A. (1995)

## 2.2. REFERENCE DOCUMENTS

- [R1] PE/BTS/DPL/022827 GSM BTS 18000 Project Qualification Plan for Outdoor NG BTS introduction - FCC



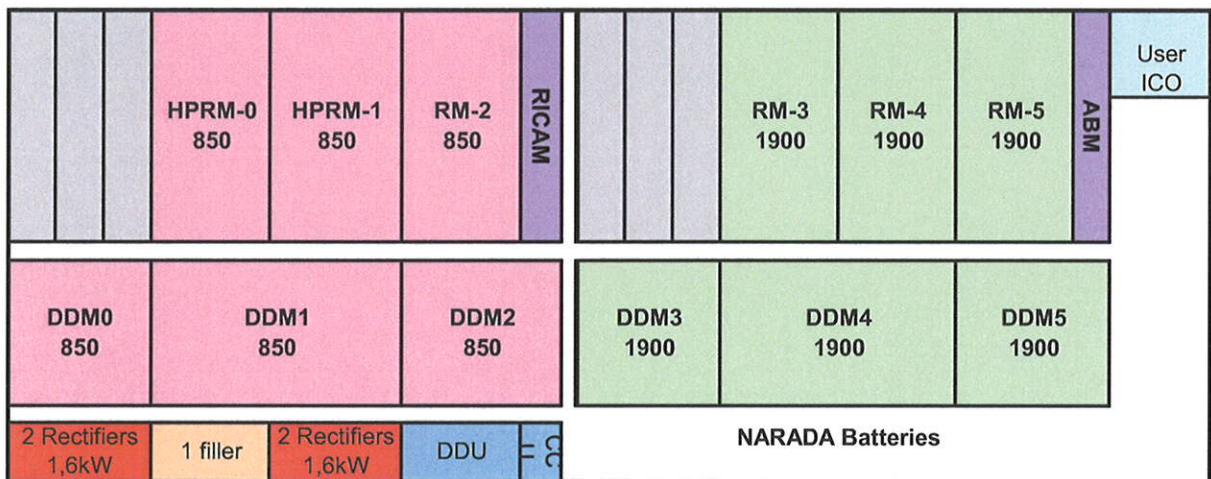


### 3. REQUIREMENTS BEFORE EMC ASSESSMENT

#### 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 form for NG 18000 Outdoor BTS.

**Configuration of NG 18000 Outdoor BTS 850/1900 MHz**



#### 3.2. LIST OF KITS & CABLES

##### 3.2.1 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 NG 18000 Outdoor 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).



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## 4. TEST PLAN SUMMARY

### 4.1. TEST PLAN SUMMARY FOR EMISSIONS TESTING

The following table presents the FCC & IC test plan summary for the qualification of NG 18000 Outdoor BTS:

Test case	Application	Test requirement	Performance criteria	Comment	
<b>Emission tests</b>					
1	Conducted Emissions FCC Part 15 § 15.107 & ICES 003 *	AC port	150 kHz to 30 MHz	Class B	Realized on NG 18000 Outdoor Realized on configuration Dual Band GSM 850 & 1900 MHz 208/240VAC, Split phase US
2	Radiated emissions  FCC part 15 § 15.109 & ICES 003 *	E- field enclosure	30 MHz to 18 GHz	Class B	Realized on NG 18000 Outdoor Realized on configuration Dual Band GSM 850 & 1900 MHz 208/240VAC, Split phase US
3	Radiated emissions spurious  FCC part 22 § 22.917 & RS132	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 NG 18000 Outdoor Realized on configuration Dual Band GSM 850 & 1900 MHz 208/240VAC, Split phase US
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 NG 18000 Outdoor Realized on configuration Dual Band GSM 850 & 1900 MHz 208/240VAC, Split phase US

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