



L C I E

---

## Radio Test Report in extreme conditions for the introduction of RICAM and GSM 850MHz band in GSM 6000 BTS Outdoor DC version (FCC)

---

Reference: 60056545-557309-R-TR-6odc-FCC

Version: A

Status: Approved

Date: 13/Jun/2007

---

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

Product: GSM 6000 BTS

---

Author: Marc CANCOUËT

Technical Manager: Didier PRADON

---

This document shall not be reproduced, except in full, without the written approval of the LCIE.  
This document contains results related only to the items tested. It does not imply the conformity of the whole production to the items tested.

# PUBLICATION HISTORY

---

VERSION	DATE	AUTHOR	MODIFICATION
A	13-Jun-07	M.CANCOUËT	Creation of document

---

# CONTENTS

CONTENTS .....	3
1. INTRODUCTION .....	4
2. RELATED DOCUMENTS .....	5
2.1. APPLICABLE STANDARDS .....	5
2.2. REFERENCE DOCUMENTS .....	5
3. IDENTIFICATION OF EQUIPMENT UNDER TEST .....	6
3.1. GSM 6000 OUTDOOR BTS .....	6
4. TESTS RESULTS .....	8
4.1. TEST PROCEDURE .....	8
4.2. SOFTWARE CONFIGURATION.....	8
4.3. TEST RESULTS GSM 6000 OUTDOOR BTS.....	9
5. CONCLUSION .....	13
6. MEASUREMENT EQUIPMENT LIST .....	13
7. ABBREVIATIONS AND DEFINITIONS .....	14
7.1. ABBREVIATIONS.....	14
7.2. DEFINITIONS.....	15

# 1. INTRODUCTION

The objective of this document is to present the tests report of the FCC Radio qualification in extreme temperature on the GSM 6000 Outdoor BTS DC version for the qualification of GSM 850 MHz and RICAM introduction on BTS 6000 Cabinets.

For North America, applicable standard for Radio of GSM 850 MHz Base stations are the FCC Part 22 /RS132.

This document is addressed to Nortel Product Integrity team.

## 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]	CFR 47 Part 22	Code of Federal Regulations - Part 24 - PERSONAL COMMUNICATIONS SERVICES.
[A3]	RSS 132	Industry Canada - Personal Communication Services in the 2GHz band.

### 2.2. REFERENCE DOCUMENTS

[R1]	PE/BTS/DPL/021882	GSM 6000 BTS Project Qualification Plan For GSM850&PCS1900 Cabinet and RICAM Introduction for CE & FCC Marking
[R2]	PE/BTS/DPL/022107	Test Plan for Dual Band GSM 850 & PCS1900 BTS 6000 Cabinets Radio Qualification (FCC & 3GPP)
[R3]	PE/BTS/DJD/022074 02.01/EN	GSM 6000 outdoor BTS 850MHz hardware delivery notice

### 3. IDENTIFICATION OF EQUIPMENT UNDER TEST

#### 3.1. GSM 6000 OUTDOOR BTS

This document applies to:

Product: GSM 6000 OUTDOOR BTS (DC Version)  
Manufacturer: NORTEL NETWORKS  
Frequencies: GSM 850 MHz  
Configuration: -  
Option: -

AYLM Recipient: LCIE	Date of delivery: 11/MAY/2007
Product: GSM 6000 Outdoor BTS	
Article delivered: DC version of GSM 6000 Outdoor BTS	Article code: NTQ610AA D1
Section transmitting: SU00	Designer name: Chenet Stéphane
Cabinet Serial Number: NNTMGTD004R9N / 445082	
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: - Antennas cables from output of DDM to bulkhead are missing ; Use antennas cables from the BTS 6000 AC previously delivered.	
Software compatibility: Modules software version : - Load BTS : v15f1e04 / CDI118000 > IC M/WABM : v15f104 / CDI117970 > RM : v15e403 / CDI117006 PI software tools : - WINTMI: v03d306 - TIL COAM: v15e403 - TIL Alarm: v15e402 - WINTOOL: v04b4e10	

The delivery includes :

ARTICLE	PEC code	Release	Serial number	Comment
CAB: PRECA	NTQ610AA	D1	NNTMG T004R9N	
FILLER RECTIFIER	NTW70351	01	ATSNZH056168	
FILLER RECTIFIER	NTW70351	01	ATSNZH056166	
UCPS CCU UMTS/GSM	NTUM44AF	01	ATSNZH085723	
DDU	NTN066AA	D1	ATSNZH096624	
DCU	NTQ666BA	01	ATSNZH125868	Input filter updated to be compliant to CLASSE B in CEM test
CRICO	NTQ620CA	D1	NNTMG T004KVD	
CECU	NTQ675JA	D1	NNTMG T004R9J	
CECU Control Board	NTQ629AA	01	NNTM75012345	
RICAM	NTN024AA	D1 MIR 2.5	FANTASTIX	ICMO : IP → 47.164.182.180 ICMO : IP → 47.164.182.181 ABMO : IP → 47.164.182.182
HPRM 3T 850	NTN050JA	D1	CDN200651001	IP 47.164.182.183 with new PSU CR NTN058AM 04 / ATSNZH155429 For Radio test
HPRM 3T 850	NTN050JA	D1	CDN200651004	IP 47.164.182.184 with new PSU CR NTN058AM 04 / ATSNZH155427
DDM 850 W/VSWR W/HYBRIDS ROHS	NTN063HA	D2	FIC T0300213H	
DDM 850 W/VSWR W/HYBRIDS ROHS	NTN063HA	D2	FIC T0300212F	
DDM 850 W/VSWR W/HYBRIDS ROHS	NTN063HA	D2	FIC T0300212G	
CALPRO2	NTQ675CA	D1	NNTMG T004MHZ	
CUSER-ICO	NTQ650AA	D1	NNTMG T004L73	

Remark: The exact configuration used during tests is described in § 5.3

## 4. TESTS RESULTS

### 4.1. TEST PROCEDURE

The BTS must operate under the following external extreme temperatures:

- BTS 6000 Outdoor : - 33°C / + 50 °C

Frequency stability are performed under following extreme conditions:

for Outdoor 6000 BTS

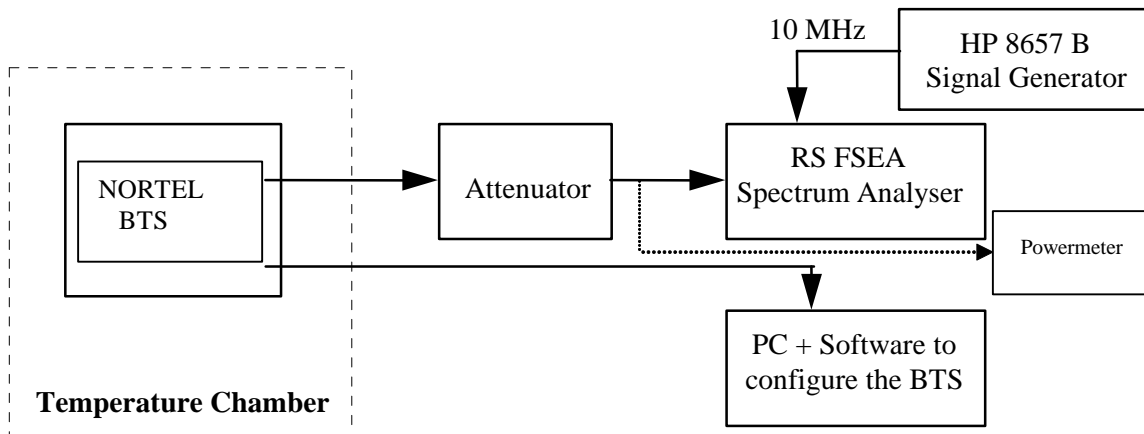
Temperature from -33°C to +50°C at intervals of 10 degrees.

With DC power supply variations: -52 VDC, -57 VDC

Modules GSM HPRM 850MHz run with nominal power regulation at maximum power (60W) in GMSK modulation. The HPRM were configured to transmit at maximum power (Static level 0). A period of at least one hour was allowed prior to measurement to ensure that all the components of the oscillator circuit was stabilized at each temperature.

The equipment was configured as shown in Schematic below.

Test configuration for Frequency Stability & Power



### 4.2. SOFTWARE CONFIGURATION

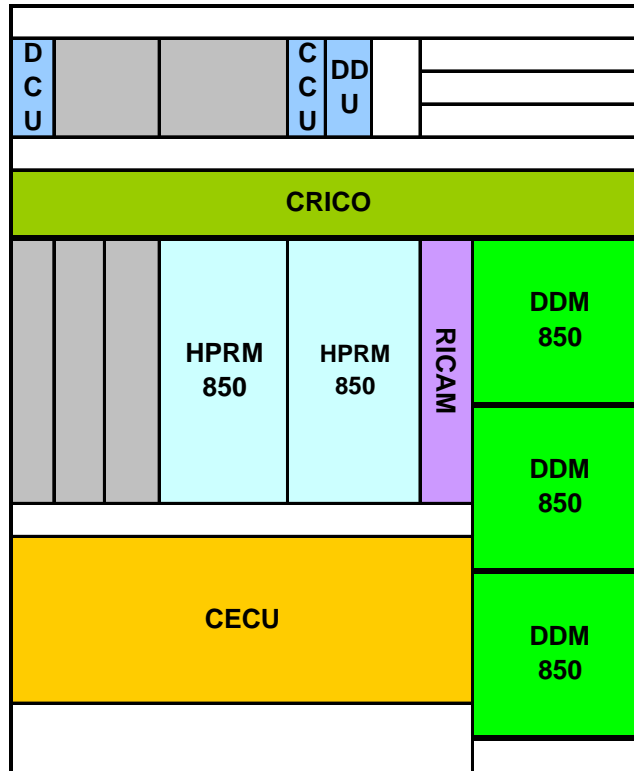
BTS type	GSM 6000 Outdoor BTS
BTS	v15f1e04 / CDI118000
ICM/ABM/RICAM	v15f104 / CDI117970
RM	v15e403 / CDI117006
WinTMI	v03d306
Til COAM	v15e403
Til Alarm	v15e402
Win TOOL	v04b4e10



### 4.3. TEST RESULTS GSM 6000 OUTDOOR BTS

#### 4.3.1 BTS CONFIGURATION

GSM 6000 OUTDOOR BTS (DC version)



Tested modules

	ARTICLE	PEC code	Release	Serial number
HPRM 1	HPRM 3T 850	NTN050JA	D1	CDN200651001
DDM 1 850	DDM 850 W/VSWR W/HYBRIDS ROHS	NTN063HA	D2	FICT0300213H

#### 4.3.1.1 FREQUENCY STABILITY IN BTS 6000 OUTDOOR CONFIGURATION – CHANNEL 128

Table below shows the Frequency Stability power for channel 128 (F= 869,2 MHz) in BTS 6000 OUTDOOR (TX0) configuration under extreme conditions.

Temperature (°C)	Maximum Carrier Frequency Deviation (Hz)	
	Supply voltage -52 V DC	Supply voltage -57 V DC
-33	7.13	7.29
-20	8.78	8.38
-10	9.61	8.27
0	7.84	10.54
10	10.68	7.77
20	9.36	7.66
30	9.01	9.7
40	9.74	6.41
50	8.44	8.89

The maximum frequency deviation allowed is 0.05 ppm (+/- 43 Hz).. The maximum deviation measured (10.68Hz) is more than sufficient to ensure that the fundamental emission stays within the authorized frequency block.

#### 4.3.1.2 FREQUENCY STABILITY IN BTS 6000 OUTDOOR CONFIGURATION – CHANNEL 190

Table below shows the Frequency Stability power for channel 190 (F= 881,6 MHz) in BTS 6000 OUTDOOR (TX1) configuration under extreme conditions.

Temperature (°C)	Maximum Carrier Frequency Deviation (Hz)	
	Supply voltage -52 V DC	Supply voltage -57 V DC
-33	10.59	9.68
-20	9.92	10.87
-10	10.04	9.57
0	7.61	8.86
10	10.01	9.36
20	-7.47	8.99
30	7.21	7.89
40	9.69	-10
50	10.46	9.11

The maximum frequency deviation allowed is 0.05 ppm (+/- 43 Hz).. The maximum deviation measured (10.87 Hz) is more than sufficient to ensure that the fundamental emission stays within the authorized frequency block.

#### 4.3.1.3 FREQUENCY STABILITY IN BTS 6000 OUTDOOR CONFIGURATION – CHANNEL 251

Table below shows the Frequency Stability power for channel 251 (F= 893,8 MHz) in BTS 6000 OUTDOOR (TX2) configuration under extreme conditions.

Temperature (°C)	Maximum Carrier Frequency Deviation (Hz)	
	Supply voltage -52 V DC	Supply voltage -57 V DC
-33	-6.32	8.14
-20	6.58	-8.66
-10	9.44	8.92
0	6.6	9.41
10	7.65	7.67
20	7.41	6.98
30	6.46	-6.56
40	9.07	8.85
50	8.83	7.04

The maximum frequency deviation allowed is 0.05 ppm (+/- 43 Hz).. The maximum deviation measured (9.44 Hz) is more than sufficient to ensure that the fundamental emission stays within the authorized frequency block.

#### 4.3.1.4 MEAN RF POWER IN BTS 6000 OUTDOOR CONFIGURATION – CHANNEL 128

Table below shows the Mean RF power for channel 128 (F= 869,2 MHz) in BTS 6000 OUTDOOR (TX0) configuration under extreme conditions.

Measurements are realized at antenna output for H2 Duplexer configuration.

Specification for H2 Duplexer configuration in GMSK :

The power must be  $\geq 41$  dBm and  $\geq 45$  dBm.

Temperature (°C)	Mean RF Power (dBm)		
	Supply voltage -52 V DC	Supply voltage -57 V DC	Sanction
-33	42.82	42.83	PASS
-20	42.75	42.77	PASS
-10	42.81	42.83	PASS
0	42.72	42.74	PASS
10	42.66	42.66	PASS
20	42.6	42.58	PASS
30	42.59	42.55	PASS
40	42.48	42.49	PASS
50	42.44	42.4	PASS

#### 4.3.1.5 MEAN RF POWER IN BTS 6000 OUTDOOR CONFIGURATION – CHANNEL 190

Table below shows the Mean RF power for channel 190 (F= 881,6 MHz) in BTS 6000 OUTDOOR (TX1) configuration under extreme conditions.

Measurements are realized at antenna output for H2 Duplexer configuration.

Specification for H2 Duplexer configuration in GMSK :

The power must be  $\geq 41$  dBm and  $\geq 45$  dBm.

Temperature (°C)	Mean RF Power (dBm)		
	Supply voltage -52 V DC	Supply voltage -57 V DC	Sanction
-33	42.21	43.21	PASS
-20	43.14	43.16	PASS
-10	43.24	43.2	PASS
0	43.08	43.09	PASS
10	43.03	43.03	PASS
20	43	42.99	PASS
30	42.99	42.96	PASS
40	42.93	42.92	PASS
50	42.89	42.89	PASS

#### 4.3.1.6 MEAN RF POWER IN BTS 6000 OUTDOOR CONFIGURATION – CHANNEL 251

Table below shows the Mean RF power for channel 251 (F= 893,8 MHz) in BTS 6000 OUTDOOR (TX2) configuration under extreme conditions.

Measurements are realized at antenna output for H2 Duplexer configuration.

Specification for H2 Duplexer configuration in GMSK :

The power must be  $\geq 41$  dBm and  $\geq 45$  dBm.

Temperature (°C)	Mean RF Power (dBm)		
	Supply voltage -52 V DC	Supply voltage -57 V DC	Sanction
-33	43.39	43.38	PASS
-20	43.34	43.35	PASS
-10	43.34	43.37	PASS
0	43.28	43.3	PASS
10	43.23	43.24	PASS
20	43.18	43.18	PASS
30	43.04	43.04	PASS
40	43.03	43.05	PASS
50	42.99	43.01	PASS

## 5. CONCLUSION

The GSM 6000 Outdoor BTS (DC version) equipped with GSM 850MHz HPRM 850 as described in this document complies with the FCC & IC radio requirements in extreme temperature.

## 6. MEASUREMENT EQUIPMENT LIST

Equipment description	Manufacturer	Model	Serial No.	LCIE No.
Spectrum analyser	R&S	FSEA	842655/02	A4060015
Spectrum analyser	Agilent	VSA	Nortel N° 571313	-
MIC analyseur	W&G	PA20	Y0075	A4040009
Signal generator	HP	8657B	3520U06355	A5442020
Signal generator	HP	8648A	3430V00370	-
Power Meter	Giga-tronics	8542C	1832488	A1503009
RF Probe	Giga-tronics	80401A	18330224	A1509027
40 dB 60 W attenuator	Diconex		02077	-
Temperature chambre	CLIMAT SAPRATIN	PV140C80F60H R	SV025496S	D1025025

## 7. ABBREVIATIONS AND DEFINITIONS

### 7.1. ABBREVIATIONS

ARFCN	Absolute Radio Frequency Channel Number
BCCH	Broadcast Control Channel
BER	Bit Error Rate
BTS	Base Transceiver Station
C	Celsius
CPC	Common Product Code
DB	Decibel
dBc	Decibel referenced to the carrier level
dBm	Decibel ref 1milliwatt
DOA	Dead On Arrival
DRX	Driver Receiver Board
DTX	Discontinuous Transmitter
EDGE	Enhanced Data for GSM Evolution
EFT	Electrical Fast Transient
EMC	Electro-Magnetic-Compatibility
EMI	Electro-Magnetic-Interference
ESD	Electrical Static Discharge
ESS	Environmental Screaming Test
FH Bus	Transmission bus between FP and TX
FMECA	Failures Mode Effect Critically Analysis
FP	Frame Processor
GMSK	Gaussian Minimum Shift Keying
GSM	Global System for Mobile Communications
HALT	Highly Accelerated Life Test
IF	Intermediate Frequency
LISN	Line Impedance Stabilization Networks
LNA	Low Noise Amplifier
MTBF	Mean Time Between Failure
N.A.	Not Applicable
NER	Nominal Error Rate
NFF	No Fault Found
NFH	No Frequency Hopping
NN	Nortel Networks
OEM	Original Equipment Manufacturer
PA	Power Amplifier

PAR	Peak to Average Ratio
PEC	Product Engineering Code
PMR	Peak to Minimum Ratio
PSU	Power Supply Unit
RBER	Residual Bit Error Rate
RF	Radio Frequency
RICAM	Redundant Interface Control Alarm Module
RMS	Root Mean Square
RX	Receiver
SFH	Slow Frequency Hopping
SPQL	Shipped Product Quality Level
SPR	Serial PEC Release
TBC	To Be Confirmed
TBD	To Be Defined
TCH	Traffic Channel
TDMA	Time Domain Multiple Access
TRX	Transmitter – Receiver
TS	Time slot
TX	Transmitter
UNL	Unit nominal Level
URG	Unit Reference Gain
UUT	Unit Under Test
VAD	Voice Activity Detection
VSWR	Voltage Standing Wave Ratio
VVA	Variable Voltage Attenuator

## 7.2. DEFINITIONS

None

**END OF DOCUMENT**