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

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Customer: NORTEL NETWORKS
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Product: GSM 6000 BTS

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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

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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 Indoor 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/022268 01.01/EN	GSM 6000 Indoor BTS 850MHz hardware delivery notice

3. IDENTIFICATION OF EQUIPMENT UNDER TEST

3.1. GSM 6000 INDOOR BTS

This document applies to:

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

AVLM Recipient: LCIE	Date of delivery: 30/MAY/2007
Product: GSM 6000 Outdoor BTS	
Article delivered: DC version of GSM 6000 Indoor BTS DC IN S222 Mode S111 850 H2D E1	Article code: NTQ610AM D1
Section transmitting: 8U00	Designer name: Jeuland Patrick
Cabinet Serial Number: NNTMGT004KGL / 4 34149	
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 : – BTS Load: v15f1e04 / CDI118000 > ICM/ABM : 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	NTQ610AM	D1	NNTMGT004KGL	
DC box	NTQ675AM	D1	NNTMGT004MZI	
CRICO	NTQ620CA	D1	NNTMGT004KVH	
Fan Tray Indoor	NTQ675JG	D1	NNTMGT004KGR	
CECU Control Board	NTQ629AA	D1	NNTMGT004KV9	
RICAM	NTN024AA	D2	ERRATIX	
HPRM 3T 850	NTN050JA	D1	CDN200702004	
HPRM 3T 850	NTN050JA	D1	CDN200651009	
DDM H2 850 W/FSWR	NTN063HA	D2	FICT030020XT	
DDM H2 850 W/FSWR	NTN063HA	D2	FICT0300213J	
DDM H2 850 W/FSWR	NTN063HA	D2	FICT03002067	
CALPRO2	NTQ691AA	01	NNTM78901H2T	
CUSERICO	NTQ691HA	01	NNTM78901H2M	

Additional delivery:

ARTICLE	PEC code	Release	Serial number	Comment
External Alarm Cable	NTQG60CA	N/A	N/A	16M
External ABIS cable	NTQG60DA	N/A	N/A	16M 120Ohm

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 Indoor : - 5°C / + 50 °C

Frequency stability are performed under following extreme conditions:

for Indoor 6000 BTS

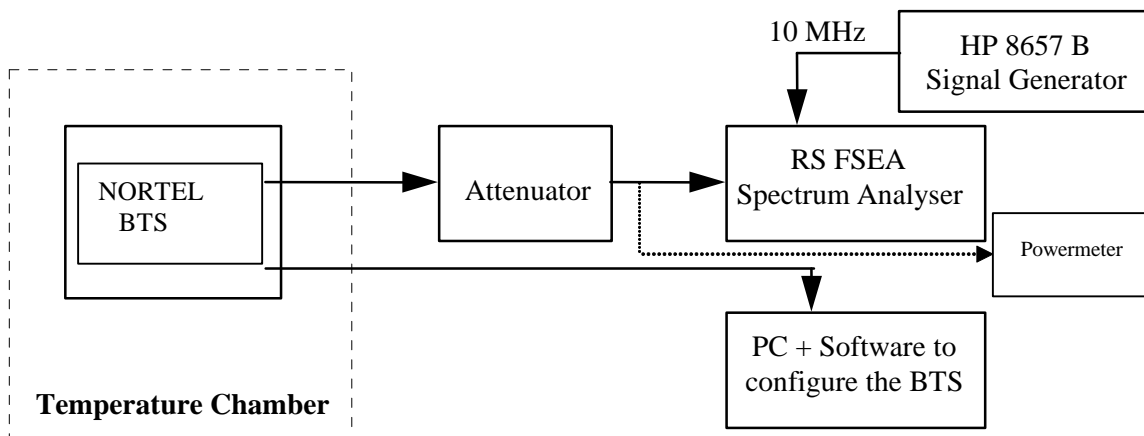
Temperature from -5°C to +50°C at intervals of 10 degrees.

With DC power supply variations: -40.5 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



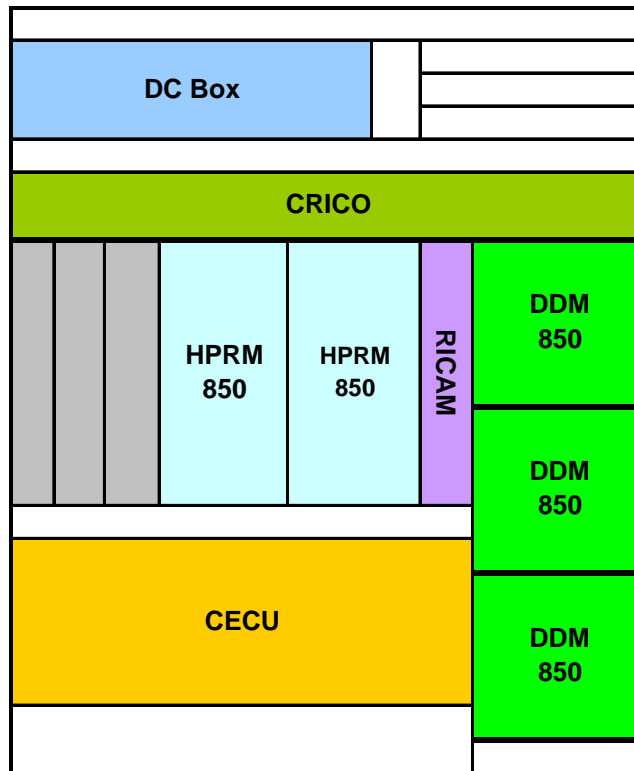
4.2. SOFTWARE CONFIGURATION

BTS type	GSM 6000 Indoor 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 INDOOR BTS

4.3.1 BTS CONFIGURATION

GSM 6000 INDOOR BTS (DC version)



Tested modules

	ARTICLE	PEC code	Release	Serial number
HPRM 1	HPRM 3T 850	NTN050JA	D1	CDN200651009
DDM 1 850	DDM 850 W/VSWR W/HYBRIDS ROHS	NTN063HA	D2	FICT030020XT

4.3.1.1 FREQUENCY STABILITY IN BTS 6000 INDOOR CONFIGURATION – CHANNEL 128

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

Temperature (°C)	Maximum Carrier Frequency Deviation (Hz)	
	Supply voltage -40.5 V DC	Supply voltage -57 V DC
-5	8.4	7.47
0	9.35	8.28
10	8.16	5.12
20	7.5	7.09
30	-7.75	5.74
40	-6.94	6.02
50	10.96	7.87

The maximum frequency deviation allowed is 0.05 ppm (+/- 43 Hz).. The maximum deviation measured (10.96Hz) 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 INDOOR CONFIGURATION – CHANNEL 190

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

Temperature (°C)	Maximum Carrier Frequency Deviation (Hz)	
	Supply voltage -40.5 V DC	Supply voltage -57 V DC
-5	6.81	9.35
0	8.37	11.77
10	7.46	8.53
20	6.95	7.73
30	-8.06	-7.73
40	7.91	-7.3
50	12.12	10.48

The maximum frequency deviation allowed is 0.05 ppm (+/- 43 Hz).. The maximum deviation measured (12.12 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 INDOOR CONFIGURATION – CHANNEL 251

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

Temperature (°C)	Maximum Carrier Frequency Deviation (Hz)	
	Supply voltage -40.5 V DC	Supply voltage -57 V DC
-5	7.44	5.25
0	7.8	8.61
10	-7.05	8.29
20	6.61	6.38
30	9.46	11.8
40	8.29	-7.3
50	10.5	10.48

The maximum frequency deviation allowed is 0.05 ppm (+/- 43 Hz).. The maximum deviation measured (11.8 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 INDOOR CONFIGURATION – CHANNEL 128

Table below shows the Mean RF power for channel 128 (F= 869,2 MHz) in BTS 6000 INDOOR (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 ≥ 41 dBm and ≥ 45 dBm.

Temperature (°C)	Mean RF Power (dBm)		
	Supply voltage -40.5 V DC	Supply voltage -57 V DC	Sanction
-5	43.15	43.15	PASS
0	43.1	43.09	PASS
10	43.01	43	PASS
20	42.89	42.89	PASS
30	42.7	42.71	PASS
40	42.66	42.66	PASS
50	42.6	42.62	PASS

4.3.1.5 MEAN RF POWER IN BTS 6000 INDOOR CONFIGURATION – CHANNEL 190

Table below shows the Mean RF power for channel 190 (F= 881,6 MHz) in BTS 6000 INDOOR (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 ≥ 41 dBm and ≥ 45 dBm.

Temperature (°C)	Mean RF Power (dBm)		
	Supply voltage -40.5 V DC	Supply voltage -57 V DC	Sanction
-5	43.23	43.23	PASS
0	43.21	43.21	PASS
10	43.12	43.12	PASS
20	43.05	43.06	PASS
30	42.94	42.93	PASS
40	42.88	42.9	PASS
50	42.83	42.82	PASS

4.3.1.6 MEAN RF POWER IN BTS 6000 INDOOR CONFIGURATION – CHANNEL 251

Table below shows the Mean RF power for channel 251 (F= 893,8 MHz) in BTS 6000 INDOOR (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 ≥ 41 dBm and ≥ 45 dBm.

Temperature (°C)	Mean RF Power (dBm)		
	Supply voltage -40.5 V DC	Supply voltage -57 V DC	Sanction
-5	43.05	43.08	PASS
0	42.96	42.95	PASS
10	42.89	42.87	PASS
20	42.7	42.73	PASS
30	42.73	42.71	PASS
40	42.61	42.62	PASS
50	42.52	42.52	PASS

5. CONCLUSION

The GSM 6000 Indoor 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