



LCIE

GSM 6000 Outdoor BTS (FCC extreme condition) Radio Test Report for RM2 1900 introduction

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Product: GSM 6000 Outdoor BTS

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09/07/2008

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CONTENTS

CONTENTS	3
1. INTRODUCTION	5
2. RELATED DOCUMENTS	5
3. RELATED DOCUMENTS	5
3.1. APPLICABLE STANDARDS	5
3.2. REFERENCE DOCUMENTS	5
4. IDENTIFICATION OF EQUIPMENT UNDER TEST	6
5. TESTS PRESENTATION	9
5.1. TEST PROCEDURE	9
5.2. SOFTWARE CONFIGURATION	10
5.3. SPECIFICATION RELATED FOR TX TESTS	11
5.3.1 Mean RF output power	11
5.3.2 Phase and mean frequency error	11
5.4. BTS CONFIGURATION FOR TESTS	12
5.5. MOLDULE USED DURING RF TESTS	12
6. RF TEST RESULTS	13
6.1. TESTS AT -33°C ON RM2 SLOT 0 (PCS 1900MHZ) IN GMSK MODULATION	13
6.1.1.1 Mean RF power.....	13
6.1.1.2 Phase and mean frequency error.....	13
6.2. TESTS AT -20°C ON RM2 SLOT 0 (PCS 1900MHZ) IN GMSK MODULATION	14
6.2.1.1 Mean RF power.....	14
6.2.1.2 Phase and mean frequency error.....	14
6.3. TESTS AT -10°C ON RM2 SLOT 0 (PCS 1900MHZ) IN GMSK MODULATION	15
6.3.1.1 Mean RF power.....	15
6.3.1.2 Phase and mean frequency error.....	15
6.4. TESTS AT 00°C ON RM2 SLOT 0 (PCS 1900MHZ) IN GMSK M ODULATION	16
6.4.1.1 Mean RF power.....	16
6.4.1.2 Phase and mean frequency error.....	16
6.5. TESTS AT +10°C ON RM2 SLOT 0 (PCS 1900MHZ) IN GMSK MODULATION	17
6.5.1.1 Mean RF power.....	17
6.5.1.2 Phase and mean frequency error.....	17
6.6. TESTS AT +20°C ON RM2 SLOT 0 (PCS 1900MHZ) IN GMSK MODULATION	18
6.6.1.1 Mean RF power.....	18
6.6.1.2 Phase and mean frequency error.....	18
6.7. TESTS AT +30°C ON RM2 SLOT 0 (PCS 1900MHZ) IN GMSK MODULATION	19
6.7.1.1 Mean RF power.....	19
6.7.1.2 Phase and mean frequency error.....	19
6.8. TESTS AT +40°C ON RM2 SLOT 0 (PCS 1900MHZ) IN GMSK MODULATION	20



L C I E

6.8.1.1	Mean RF power	20
6.8.1.2	Phase and mean frequency error	20
6.9.	TESTS AT +50°C ON RM2 SLOT 0 (PCS 1900MHZ) IN GMSK MODULATION.....	21
6.9.1.1	Mean RF power	21
6.9.1.2	Phase and mean frequency error	21
6.10.	EXAMPLE OF PHASE / FREQUENCY ERROR CURVE	22
6.10.1	TESTS AT -33°C.....	22
6.10.2	TESTS AT -20°C.....	22
6.10.3	TESTS AT -10°C.....	23
6.10.4	TESTS AT 00°C.....	23
6.10.5	TESTS AT +10°C.....	24
6.10.6	TESTS AT +20°C.....	24
6.10.7	TESTS AT +30°C.....	25
6.10.8	TESTS AT +40°C.....	25
6.10.9	TESTS AT +50°C.....	26
7.	CONCLUSION	27
8.	MEASUREMENT EQUIPMENT LIST	27
9.	ABBREVIATIONS AND DEFINITIONS.....	28
9.1.	GENERAL ABBREVIATIONS	28
9.2.	GSM ABBREVIATIONS.....	29
9.3.	DEFINITIONS.....	30



1. INTRODUCTION

The objective of this document is to present the Radio tests which have been performed in extreme temperature for the introduction of RM2 PCS1900 on the GSM 6000 Outdoor BTS for FCC Mark.

For North America, applicable standard for Radio of PCS 1900 MHz Base stations are the FCC Part 24 / RS133 .

This document is addressed to Nortel Product Integrity team.

2. RELATED DOCUMENTS

3. RELATED DOCUMENTS

3.1. 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 22 - Public Mobiles Services.
[A3]	RSS 132	Industry Canada - 800 MHz Cellular Telephones Employing New Technologies.
[A4]	CFR 47 Part 24	Code of Federal Regulations - Part 24 - Personal Communications Services.
[A5]	RSS 133	Industry Canada – 2 GHz Personal Communications Services.

3.2. REFERENCE DOCUMENTS

[R1]	PE/BTS/DPL/023431	GSM 18000 & 9000 & 6000 BTS Project Qualification Plan for the RM2 GSM 1900MHz introduction (Ver 01.03/EN)
[R2]	PCS/BTS/DPL/023530	Radio Test Plan for the introduction of RM2 1900MHz (FCC & 3GPP)
[R3]	PE/BTS/DJD/020820	GSM 6000 Outdoor BTS RM2 1900MHz hardware delivery notice (Ver 03.01/EN)



4. IDENTIFICATION OF EQUIPMENT UNDER TEST

Product: GSM 6000 Outdoor BTS (AC version)

Manufacturer: NORTEL

Frequencies: PCS 1900 MHz

AVLM Recipient: LCIE	Date of delivery: 13/JUNE/2008
Product: GSM 6000 Outdoor BTS	
Article delivered: AC version of GSM 6000 Outdoor BTS	Article code: NTQ610FA 01
Section transmitting: 8Z60	Designer name: Chenet Stéphane
Cabinet Serial Number: NNTMGVC10024	
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 : /	
- ICM/ABM : CDI120795	
- RM : CDI121233	
PI software tools :	
- WINTMI:	v03d306
- TIL COAM:	v16a304
- TIL Alarm:	v16a301
- WINTOOL:	v05a2_e16.0



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The delivery includes :

ARTICLE	PEC code	Release	Serial number	Comment
CAB: PRECA	NTQ610FA	01	NNTMGVC10024	
UCPS CCU UMTS/GSM	NTUM44AF	01	ATSNZH117028	
DDU	NTN066AA	D1	ATSNZH122771	
ADU	NTQ666CA	D1	ATSNZH121759	
CRICO	NTQ620CA	01	NNTMGVC30024	
CECU	NTQ675JG	01	NNTMGVC20024	
CECU Control Board	NTQ629AA	01	NNTMLA07G23D	
RICAM	NTN024AA	0D2	FANTASTIX	MIR 2.5 IP ICM0 : 47.164.182.180
RM2 1900 50/30	NTN050PP	D1	NNTM7880Y9QV	
RM2 1900 50/30	NTN050PP	D1	NNTM7880Y9QY	
DDM 1900 W/VSWR W/ HYBRIDS	NTN063AA	04	FICT03000PEX	
DDM 1900 W/VSWR W/HYBRIDS	NTN063AA	03	FICT03000N94	
DDM 1900 W/VSWR W/ HYBRIDS	NTN063AA	D1	FICT020000JH	
CALPRO2	NTQ675CA	D1	NNTMGT004MHZ	
CUSERICO	NTQ650AA	D1	NNTMGT004L67	
Battery SAFT	NTQ675AA	01	07445L000015	
CPRIPRO2	NTQ675SA	02	NNTM7880WTAV	
RECTIFIER, 1400 W	NTN070BF	01	ATSNZH085318	
RECTIFIER, 1400 W	NTN070BF	01	ATSNZH085344	



Additional delivery:				
ARTICLE	PEC code	Release	Serial number	Comment
Isolator box for CECU debug	N/A	N/A	N/A	
External alarm cable				
ABIS external cable				

Tests performed:

- MIC BER in T1
- Inventory test.
- DDM Alarms & Inventory interface.
- Dale & Dali.
- TX sequence with factory test bench on each RM2 1900 MHz
- RX sequence with factory test bench on each RM2 1900 MHz

Functional limits:

- **Hardware Limitations :**
None
- **Software Limitations :**
None

Documents related to the Hardware Test Specifications

Reference of the test specifications documents:

- PE/BTS/DJD/018118 V01.01/EN Hardware integration test specification for BTS 6000

Documents related to the Hardware Test Report

Reference of the test reports documents:

- PE/BTS/DJD/023736 V01.01/EN Hardware integration tests report for GSM1900 RM2 introduction

Remark: The exact configuration used during tests is described in § 5.5

5. TESTS PRESENTATION

5.1. TEST PROCEDURE

BTS are able to operate under the following external extreme temperatures and voltages:

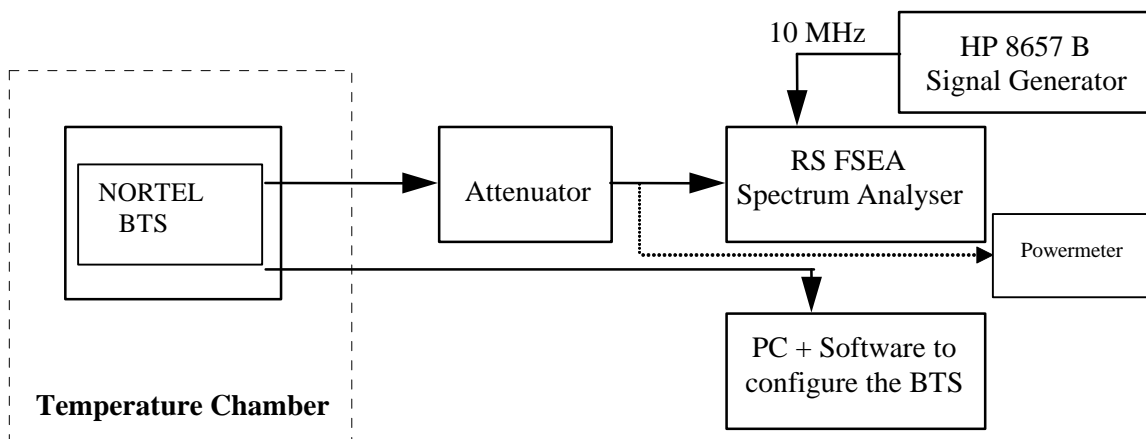
- GSM 6000 Outdoor BTS (AC version) : -33°C until + 50 °C by steps of 10°C; 187 Vac and 264 Vac for each temperature steps

Modules RM PCS 1900MHz are configured with nominal power regulation at maximum power (50W) 47dBm in GMSK modulation and at maximum power (30W) 44,7dBm in 8PSK modulation.

All RM were configured to transmit at maximum power (Static level 0).

A period of at least two hour was performed prior to start radio measurement to ensure that all the components of the oscillator circuit was stabilized for each steps of temperature.

The equipment was configured as shown in Schematic below.



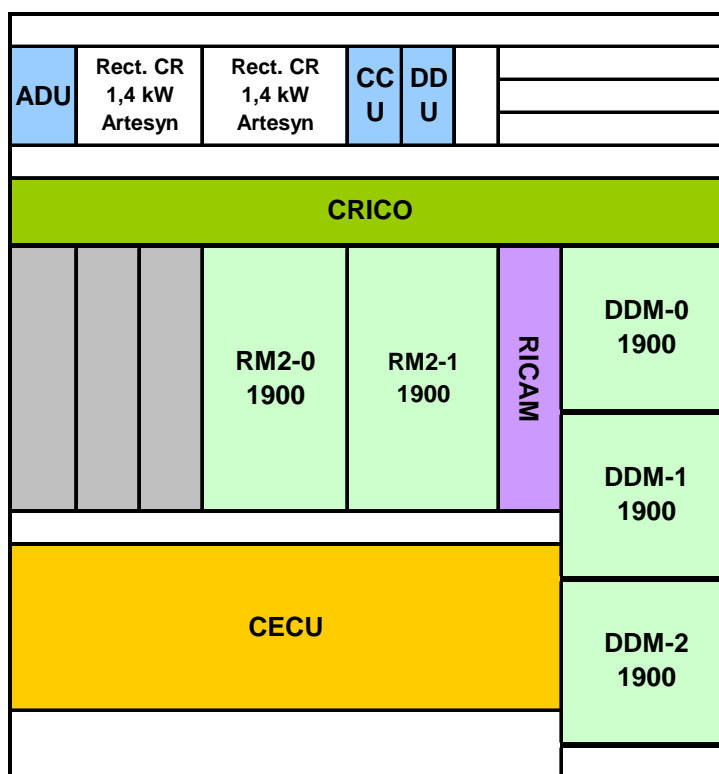


5.2. SOFTWARE CONFIGURATION

Software compatibility:	
Modules software version :	
- Load BTS : /	
- ICM/ABM : CDI120795	
- RM : CDI121233	
PI software tools :	
- WINTM:	v03d306
- TIL COAM:	v16a304
- TIL Alarm:	v16a301
- WINTOOL:	v05a2_e16.0



5.4. BTS CONFIGURATION FOR TESTS



Maximum radio configuration:
3 x 50W on each RM2 GSM1900 module

5.5. MOLDULE USED DURING RF TESTS

Tested modules

Location	Article	PEC code	Release	Serial number
RM2 in slot 0	RM2 1900 50/30	NTN050PP	D1	NNTM7880Y9QV
DDM in slot 0	DDM 1900 W/VSWR W/ HYBRIDS	NTN063AA	04	FICT03000PEX

Note:

- For RM2 PCS1900 50/30
 - TDMA 0 connected on DDM slot 0 (Main channel)
 - TDMA 1 connected on DDM slot 0 (Main channel)
 - TDMA 2 connected on DDM slot 0 (Diversity channel)

6. RF TEST RESULTS

6.1. TESTS AT -33°C ON RM2 SLOT 0 (PCS 1900MHZ) IN GMSK MODULATION

Measurements are realized at antenna output with DDM H2 configuration.

6.1.1.1 MEAN RF POWER

Specification for DDM H2 configuration in GMSK :
 $40,6 \text{ dBm} \leq \text{RF power} \leq 43,7 \text{ dBm}$

For an input voltage of 187VAC:

	Canal	Modulation Type	Mean RF Power	Sanction
TDMA 0	512	GMSK	41,90	PASS
TDMA 1	661	GMSK	41,60	PASS
TDMA 2	810	GMSK	42,02	PASS

For an input voltage of 264VAC:

	Canal	Modulation Type	Mean RF Power	Sanction
TDMA 0	512	GMSK	41,82	PASS
TDMA 1	661	GMSK	41,58	PASS
TDMA 2	810	GMSK	42,01	PASS

6.1.1.2 PHASE AND MEAN FREQUENCY ERROR

	Canal	Mesure	Max hold	Average	Sanction
TDMA 0	512	Phase Pk	5,80 °	4,10 °	PASS
		Phase RMS	1,65 °	1,38 °	PASS
		Freq	6,91 Hz	0,61 Hz	PASS
TDMA 1	661	Phase Pk	6,56 °	4,25 °	PASS
		Phase RMS	1,46 °	1,28 °	PASS
		Freq	-9,10 Hz	-0,38 Hz	PASS
TDMA 2	810	Phase Pk	6,59 °	5,35 °	PASS
		Phase RMS	1,78 °	1,65 °	PASS
		Freq	-10,20 Hz	-3,66 Hz	PASS

For an input voltage of 187VAC:

	Canal	Mesure	Max hold	Average	Sanction
TDMA 0	512	Phase Pk	5,23 °	4,06 °	PASS
		Phase RMS	1,72 °	1,36 °	PASS
		Freq	6,78 Hz	0,69 Hz	PASS
TDMA 1	661	Phase Pk	5,26 °	4,06 °	PASS
		Phase RMS	1,24 °	1,14 °	PASS
		Freq	-7,36 Hz	-0,90 Hz	PASS
TDMA 2	810	Phase Pk	6,29 °	5,31 °	PASS
		Phase RMS	1,78 °	1,65 °	PASS
		Freq	-11,04 Hz	-2,83 Hz	PASS

For an input voltage of 264VAC

Conclusion: Test PASS, maximum error frequency measured = -11.04Hz

6.2. TESTS AT -20°C ON RM2 SLOT 0 (PCS 1900MHZ) IN GMSK MODULATION

Measurements are realized at antenna output with DDM H2 configuration.

6.2.1.1 MEAN RF POWER

Specification for DDM H2 configuration in GMSK :
 $40,6 \text{ dBm} \leq \text{RF power} \leq 43,7 \text{ dBm}$

For an input voltage of 187VAC:

	Canal	Modulation Type	Mean RF Power	Sanction
TDMA 0	512	GMSK	41,82	PASS
TDMA 1	661	GMSK	41,57	PASS
TDMA 2	810	GMSK	41,97	PASS

For an input voltage of 264VAC:

	Canal	Modulation Type	Mean RF Power	Sanction
TDMA 0	512	GMSK	41,84	PASS
TDMA 1	661	GMSK	41,52	PASS
TDMA 2	810	GMSK	41,95	PASS

6.2.1.2 PHASE AND MEAN FREQUENCY ERROR

	Canal	Mesure	Max hold	Average	Sanction
TDMA 0	512	Phase Pk	4,96 °	3,96 °	PASS
		Phase RMS	1,54 °	1,32 °	PASS
		Freq	-5,17 Hz	0,14 Hz	PASS
TDMA 1	661	Phase Pk	6,51 °	4,40 °	PASS
		Phase RMS	1,58 °	1,38 °	PASS
		Freq	-7,23 Hz	-0,43 Hz	PASS
TDMA 2	810	Phase Pk	6,38 °	5,29 °	PASS
		Phase RMS	1,77 °	1,65 °	PASS
		Freq	-7,43 Hz	-2,35 Hz	PASS

For an input voltage of 187VAC:

	Canal	Mesure	Max hold	Average	Sanction
TDMA 0	512	Phase Pk	5,05 °	3,57 °	PASS
		Phase RMS	1,29 °	1,18 °	PASS
		Freq	-11,49 Hz	-0,82 Hz	PASS
TDMA 1	661	Phase Pk	5,72 °	3,97 °	PASS
		Phase RMS	1,25 °	1,14 °	PASS
		Freq	7,68 Hz	0,99 Hz	PASS
TDMA 2	810	Phase Pk	6,49 °	5,28 °	PASS
		Phase RMS	1,79 °	1,65 °	PASS
		Freq	-14,40 Hz	-3,17 Hz	PASS

For an input voltage of 264VAC

Conclusion: Test PASS, maximum error frequency measured = -14.40Hz

6.3. TESTS AT -10°C ON RM2 SLOT 0 (PCS 1900MHZ) IN GMSK MODULATION

Measurements are realized at antenna output with DDM H2 configuration.

6.3.1.1 MEAN RF POWER

Specification for DDM H2 configuration in GMSK :
 $40,6 \text{ dBm} \leq \text{RF power} \leq 43,7 \text{ dBm}$

For an input voltage of 187VAC:

	Canal	Modulation Type	Mean RF Power	Sanction
TDMA 0	512	GMSK	41,92	PASS
TDMA 1	661	GMSK	41,64	PASS
TDMA 2	810	GMSK	42,05	PASS

For an input voltage of 264VAC:

	Canal	Modulation Type	Mean RF Power	Sanction
TDMA 0	512	GMSK	41,87	PASS
TDMA 1	661	GMSK	41,63	PASS
TDMA 2	810	GMSK	42,06	PASS

6.3.1.2 PHASE AND MEAN FREQUENCY ERROR

	Canal	Mesure	Max hold	Average	Sanction
TDMA 0	512	Phase Pk	5,17 °	4,03 °	PASS
		Phase RMS	1,60 °	1,36 °	PASS
		Freq	-7,36 Hz	-0,28 Hz	PASS
TDMA 1	661	Phase Pk	6,03 °	4,24 °	PASS
		Phase RMS	1,45 °	1,27 °	PASS
		Freq	-7,36 Hz	-2,30 Hz	PASS
TDMA 2	810	Phase Pk	6,10 °	5,29 °	PASS
		Phase RMS	1,76 °	1,65 °	PASS
		Freq	-12,40 Hz	-3,76 Hz	PASS

For an input voltage of 187VAC:

	Canal	Mesure	Max hold	Average	Sanction
TDMA 0	512	Phase Pk	4,61 °	3,61 °	PASS
		Phase RMS	1,29 °	1,18 °	PASS
		Freq	7,10 Hz	-0,10 Hz	PASS
TDMA 1	661	Phase Pk	6,21 °	4,27 °	PASS
		Phase RMS	1,58 °	1,30 °	PASS
		Freq	6,20 Hz	0,63 Hz	PASS
TDMA 2	810	Phase Pk	7,20 °	5,49 °	PASS
		Phase RMS	2,18 °	1,72 °	PASS
		Freq	-12,91 Hz	-5,56 Hz	PASS

For an input voltage of 264VAC

Conclusion: Test PASS, maximum error frequency measured = -12.91Hz



6.4. TESTS AT 00°C ON RM2 SLOT 0 (PCS 1900MHZ) IN G MSK MODULATION

Measurements are realized at antenna output with DDM H2 configuration.

6.4.1.1 MEAN RF POWER

Specification for DDM H2 configuration in GMSK :
 $40,6 \text{ dBm} \leq \text{RF power} \leq 43,7 \text{ dBm}$

For an input voltage of 187VAC:

	Canal	Modulation Type	Mean RF Power	Sanction
TDMA 0	512	GMSK	41,74	PASS
TDMA 1	661	GMSK	41,48	PASS
TDMA 2	810	GMSK	41,94	PASS

For an input voltage of 264VAC:

	Canal	Modulation Type	Mean RF Power	Sanction
TDMA 0	512	GMSK	41,76	PASS
TDMA 1	661	GMSK	41,50	PASS
TDMA 2	810	GMSK	41,89	PASS

6.4.1.2 PHASE AND MEAN FREQUENCY ERROR

For an input voltage of 187VAC:					For an input voltage of 264VAC						
	Canal	Mesure	Max hold	Average	Sanction		Canal	Mesure	Max hold	Average	Sanction
TDMA 0	512	Phase Pk	4,58 °	3,59 °	PASS	TDMA 0	512	Phase Pk	4,97 °	3,89 °	PASS
		Phase RMS	1,29 °	1,18 °	PASS			Phase RMS	1,57 °	1,32 °	PASS
		Freq	-9,69 Hz	-1,51 Hz	PASS			Freq	-7,88 Hz	-2,04 Hz	PASS
TDMA 1	661	Phase Pk	6,22 °	4,02 °	PASS	TDMA 1	661	Phase Pk	5,59 °	4,05 °	PASS
		Phase RMS	1,44 °	1,14 °	PASS			Phase RMS	1,24 °	1,14 °	PASS
		Freq	7,88 Hz	0,20 Hz	PASS			Freq	-8,20 Hz	-1,93 Hz	PASS
TDMA 2	810	Phase Pk	6,32 °	5,35 °	PASS	TDMA 2	810	Phase Pk	6,32 °	5,29 °	PASS
		Phase RMS	1,78 °	1,65 °	PASS			Phase RMS	1,76 °	1,65 °	PASS
		Freq	-9,17 Hz	-2,07 Hz	PASS			Freq	-11,62 Hz	-4,27 Hz	PASS

Conclusion: Test PASS, maximum error frequency measured = -11.62Hz

6.5. TESTS AT +10°C ON RM2 SLOT 0 (PCS 1900MHZ) IN GMSK MODULATION

Measurements are realized at antenna output with DDM H2 configuration.

6.5.1.1 MEAN RF POWER

Specification for DDM H2 configuration in GMSK :
 $40,6 \text{ dBm} \leq \text{RF power} \leq 43,7 \text{ dBm}$

For an input voltage of 187VAC:

	Canal	Modulation Type	Mean RF Power	Sanction
TDMA 0	512	GMSK	41,86	PASS
TDMA 1	661	GMSK	41,61	PASS
TDMA 2	810	GMSK	42,06	PASS

For an input voltage of 264VAC:

	Canal	Modulation Type	Mean RF Power	Sanction
TDMA 0	512	GMSK	41,84	PASS
TDMA 1	661	GMSK	41,65	PASS
TDMA 2	810	GMSK	42,06	PASS

6.5.1.2 PHASE AND MEAN FREQUENCY ERROR

	Canal	Mesure	Max hold	Average	Sanction
TDMA 0	512	Phase Pk	5,11 °	3,55 °	PASS
		Phase RMS	1,27 °	1,17 °	PASS
		Freq	-6,91 Hz	-0,67 Hz	PASS
TDMA 1	661	Phase Pk	6,51 °	4,39 °	PASS
		Phase RMS	1,70 °	1,36 °	PASS
		Freq	7,55 Hz	-0,70 Hz	PASS
TDMA 2	810	Phase Pk	7,15 °	5,31 °	PASS
		Phase RMS	2,13 °	1,65 °	PASS
		Freq	-9,88 Hz	-2,79 Hz	PASS

For an input voltage of 187VAC:

	Canal	Mesure	Max hold	Average	Sanction
TDMA 0	512	Phase Pk	5,24 °	3,98 °	PASS
		Phase RMS	1,60 °	1,35 °	PASS
		Freq	-8,33 Hz	-0,77 Hz	PASS
TDMA 1	661	Phase Pk	5,96 °	4,27 °	PASS
		Phase RMS	1,52 °	1,31 °	PASS
		Freq	-7,62 Hz	-1,06 Hz	PASS
TDMA 2	810	Phase Pk	7,43 °	5,67 °	PASS
		Phase RMS	2,08 °	1,76 °	PASS
		Freq	-10,20 Hz	-3,70 Hz	PASS

For an input voltage of 264VAC

Conclusion: Test PASS, maximum error frequency measured = -10.20Hz

6.6. TESTS AT +20°C ON RM2 SLOT 0 (PCS 1900MHZ) IN GMSK MODULATION

Measurements are realized at antenna output with DDM H2 configuration.

6.6.1.1 MEAN RF POWER

Specification for DDM H2 configuration in GMSK :
 $40,6 \text{ dBm} \leq \text{RF power} \leq 43,7 \text{ dBm}$

For an input voltage of 187VAC:

	Canal	Modulation Type	Mean RF Power	Sanction
TDMA 0	512	GMSK	41,80	PASS
TDMA 1	661	GMSK	41,56	PASS
TDMA 2	810	GMSK	41,23	PASS

For an input voltage of 264VAC:

	Canal	Modulation Type	Mean RF Power	Sanction
TDMA 0	512	GMSK	41,86	PASS
TDMA 1	661	GMSK	41,61	PASS
TDMA 2	810	GMSK	41,22	PASS

6.6.1.2 PHASE AND MEAN FREQUENCY ERROR

	Canal	Mesure	Max hold	Average	Sanction
TDMA 0	512	Phase Pk	4,88 °	3,93 °	PASS
		Phase RMS	1,52 °	1,33 °	PASS
		Freq	8,39 Hz	1,66 Hz	PASS
TDMA 1	661	Phase Pk	5,99 °	4,29 °	PASS
		Phase RMS	1,53 °	1,28 °	PASS
		Freq	-6,97 Hz	-1,66 Hz	PASS
TDMA 2	810	Phase Pk	7,47 °	5,56 °	PASS
		Phase RMS	2,06 °	1,75 °	PASS
		Freq	-10,72 Hz	-4,17 Hz	PASS

For an input voltage of 187VAC:

	Canal	Mesure	Max hold	Average	Sanction
TDMA 0	512	Phase Pk	4,62 °	3,53 °	PASS
		Phase RMS	1,27 °	1,16 °	PASS
		Freq	7,36 Hz	0,99 Hz	PASS
TDMA 1	661	Phase Pk	6,15 °	4,26 °	PASS
		Phase RMS	1,57 °	1,30 °	PASS
		Freq	-7,75 Hz	-1,26 Hz	PASS
TDMA 2	810	Phase Pk	7,06 °	5,60 °	PASS
		Phase RMS	2,07 °	1,75 °	PASS
		Freq	-10,01 Hz	-3,90 Hz	PASS

For an input voltage of 264VAC

Conclusion: Test PASS, maximum error frequency measured = -10.72Hz

6.7. TESTS AT +30°C ON RM2 SLOT 0 (PCS 1900MHZ) IN GMSK MODULATION

Measurements are realized at antenna output with DDM H2 configuration.

6.7.1.1 MEAN RF POWER

Specification for DDM H2 configuration in GMSK :
 $40,6 \text{ dBm} \leq \text{RF power} \leq 43,7 \text{ dBm}$

For an input voltage of 187VAC:

	Canal	Modulation Type	Mean RF Power	Sanction
TDMA 0	512	GMSK	41,77	PASS
TDMA 1	661	GMSK	41,55	PASS
TDMA 2	810	GMSK	42,00	PASS

For an input voltage of 264VAC:

	Canal	Modulation Type	Mean RF Power	Sanction
TDMA 0	512	GMSK	41,77	PASS
TDMA 1	661	GMSK	41,57	PASS
TDMA 2	810	GMSK	42,00	PASS

6.7.1.2 PHASE AND MEAN FREQUENCY ERROR

	Canal	Mesure	Max hold	Average	Sanction
TDMA 0	512	Phase Pk	5,08 °	3,89 °	PASS
		Phase RMS	1,63 °	1,32 °	PASS
		Freq	-9,62 Hz	-2,28 Hz	PASS
TDMA 1	661	Phase Pk	6,22 °	4,17 °	PASS
		Phase RMS	1,45 °	1,26 °	PASS
		Freq	-8,52 Hz	-0,56 Hz	PASS
TDMA 2	810	Phase Pk	7,23 °	5,46 °	PASS
		Phase RMS	2,08 °	1,73 °	PASS
		Freq	-8,46 Hz	-2,77 Hz	PASS

For an input voltage of 187VAC:

	Canal	Mesure	Max hold	Average	Sanction
TDMA 0	512	Phase Pk	4,73 °	3,55 °	PASS
		Phase RMS	1,26 °	1,15 °	PASS
		Freq	-13,37 Hz	-2,12 Hz	PASS
TDMA 1	661	Phase Pk	5,38 °	4,01 °	PASS
		Phase RMS	1,23 °	1,12 °	PASS
		Freq	-7,04 Hz	-1,57 Hz	PASS
TDMA 2	810	Phase Pk	7,35 °	5,55 °	PASS
		Phase RMS	2,08 °	1,74 °	PASS
		Freq	-7,88 Hz	-2,26 Hz	PASS

For an input voltage of 264VAC

Conclusion: Test PASS, maximum error frequency measured = -13.37Hz

6.8. TESTS AT +40°C ON RM2 SLOT 0 (PCS 1900MHZ) IN GMSK MODULATION

Measurements are realized at antenna output with DDM H2 configuration.

6.8.1.1 MEAN RF POWER

Specification for DDM H2 configuration in GMSK :
 $40,6 \text{ dBm} \leq \text{RF power} \leq 43,7 \text{ dBm}$

For an input voltage of 187VAC:

	Canal	Modulation Type	Mean RF Power	Sanction
TDMA 0	512	GMSK	41,75	PASS
TDMA 1	661	GMSK	41,60	PASS
TDMA 2	810	GMSK	41,90	PASS

For an input voltage of 264VAC:

	Canal	Modulation Type	Mean RF Power	Sanction
TDMA 0	512	GMSK	41,66	PASS
TDMA 1	661	GMSK	41,45	PASS
TDMA 2	810	GMSK	41,84	PASS

6.8.1.2 PHASE AND MEAN FREQUENCY ERROR

	Canal	Mesure	Max hold	Average	Sanction
TDMA 0	512	Phase Pk	5,12 °	3,53 °	PASS
		Phase RMS	1,51 °	1,17 °	PASS
		Freq	7,49 Hz	1,19 Hz	PASS
TDMA 1	661	Phase Pk	6,60 °	4,09 °	PASS
		Phase RMS	1,50 °	1,26 °	PASS
		Freq	-7,36 Hz	0,66 Hz	PASS
TDMA 2	810	Phase Pk	7,14 °	5,52 °	PASS
		Phase RMS	2,36 °	1,75 °	PASS
		Freq	-13,62 Hz	-4,23 Hz	PASS

For an input voltage of 187VAC:

	Canal	Mesure	Max hold	Average	Sanction
TDMA 0	512	Phase Pk	4,55 °	3,49 °	PASS
		Phase RMS	1,26 °	1,14 °	PASS
		Freq	-9,94 Hz	-0,46 Hz	PASS
TDMA 1	661	Phase Pk	5,31 °	3,89 °	PASS
		Phase RMS	1,19 °	1,12 °	PASS
		Freq	6,26 Hz	0,32 Hz	PASS
TDMA 2	810	Phase Pk	6,18 °	5,13 °	PASS
		Phase RMS	1,71 °	1,60 °	PASS
		Freq	-9,30 Hz	-3,45 Hz	PASS

For an input voltage of 264VAC

Conclusion: Test PASS, maximum error frequency measured = -13.62Hz

6.9. TESTS AT +50°C ON RM2 SLOT 0 (PCS 1900MHZ) IN GMSK MODULATION

Measurements are realized at antenna output with DDM H2 configuration.

6.9.1.1 MEAN RF POWER

Specification for DDM H2 configuration in GMSK :
 $40,6 \text{ dBm} \leq \text{RF power} \leq 43,7 \text{ dBm}$

For an input voltage of 187VAC:

	Canal	Modulation Type	Mean RF Power	Sanction
TDMA 0	512	GMSK	41,63	PASS
TDMA 1	661	GMSK	41,58	PASS
TDMA 2	810	GMSK	41,93	PASS

For an input voltage of 264VAC:

	Canal	Modulation Type	Mean RF Power	Sanction
TDMA 0	512	GMSK	41,74	PASS
TDMA 1	661	GMSK	41,60	PASS
TDMA 2	810	GMSK	41,91	PASS

6.9.1.2 PHASE AND MEAN FREQUENCY ERROR

	Canal	Mesure	Max hold	Average	Sanction
TDMA 0	512	Phase Pk	5,23 °	3,96 °	PASS
		Phase RMS	1,61 °	1,35 °	PASS
		Freq	-8,52 Hz	-2,01 Hz	PASS
TDMA 1	661	Phase Pk	5,18 °	3,88 °	PASS
		Phase RMS	1,21 °	1,11 °	PASS
		Freq	-5,75 Hz	-0,43 Hz	PASS
TDMA 2	810	Phase Pk	7,31 °	5,79 °	PASS
		Phase RMS	2,10 °	1,74 °	PASS
		Freq	-6,13 Hz	-1,57 Hz	PASS

For an input voltage of 187VAC:

	Canal	Mesure	Max hold	Average	Sanction
TDMA 0	512	Phase Pk	5,15 °	3,80 °	PASS
		Phase RMS	1,55 °	1,27 °	PASS
		Freq	-6,97 Hz	-1,67 Hz	PASS
TDMA 1	661	Phase Pk	5,68 °	4,00 °	PASS
		Phase RMS	1,48 °	1,21 °	PASS
		Freq	-9,88 Hz	-2,53 Hz	PASS
TDMA 2	810	Phase Pk	6,96 °	5,77 °	PASS
		Phase RMS	2,09 °	1,74 °	PASS
		Freq	-11,75 Hz	-3,66 Hz	PASS

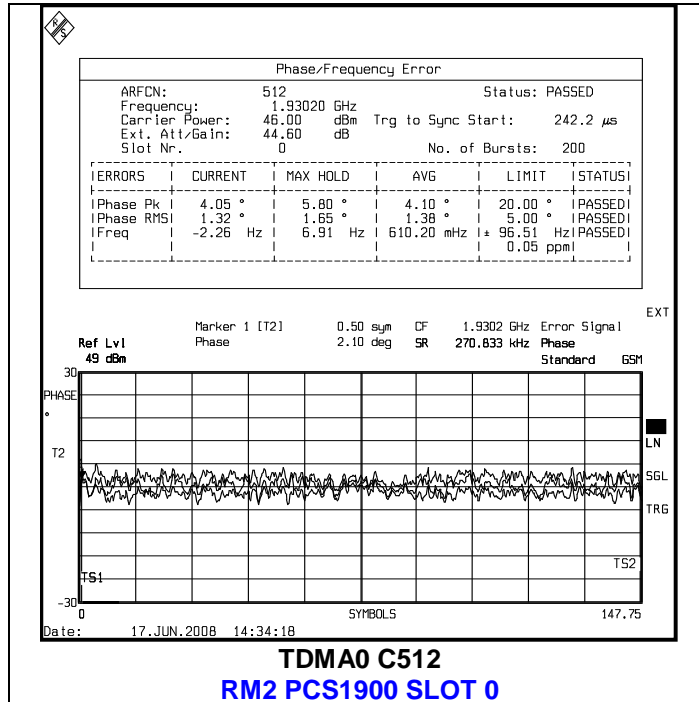
For an input voltage of 264VAC

Conclusion: Test PASS, maximum error frequency measured = -11.75Hz

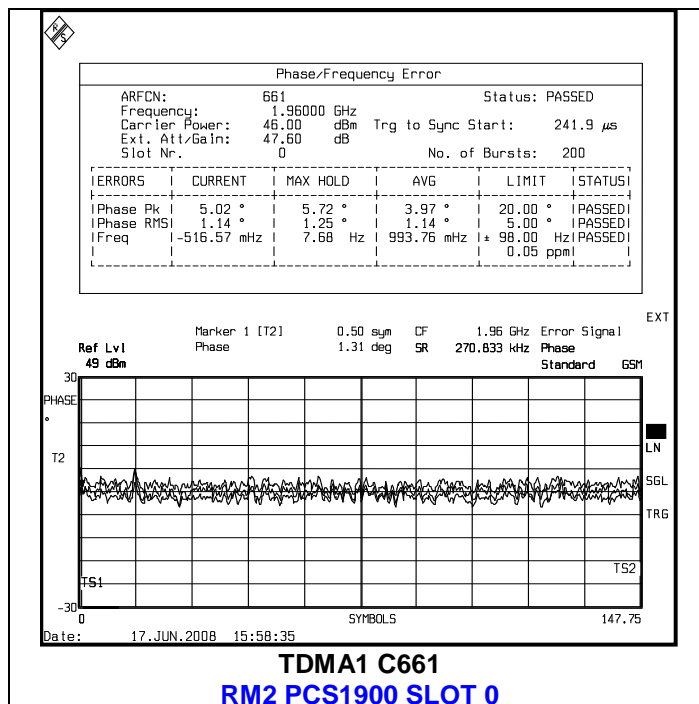


6.10. EXAMPLE OF PHASE / FREQUENCY ERROR CURVE

6.10.1 TESTS AT -33°C



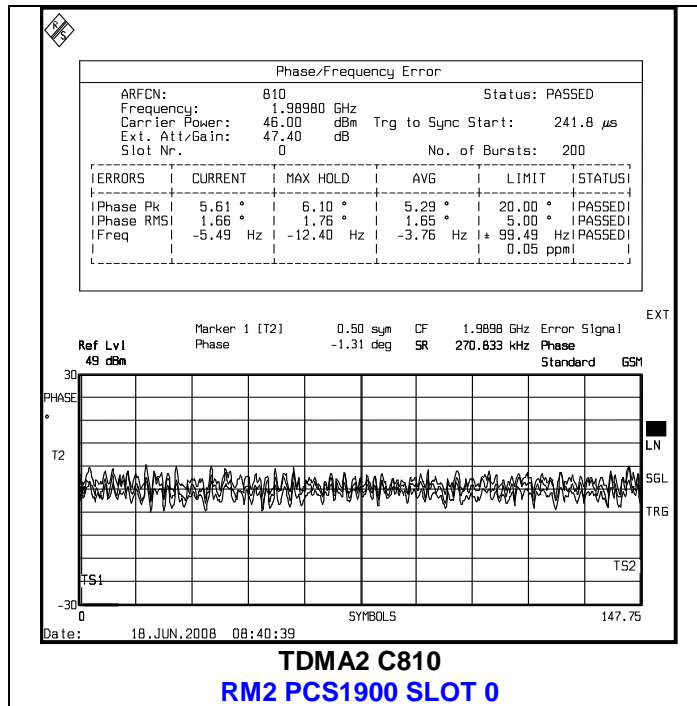
6.10.2 TESTS AT -20°C



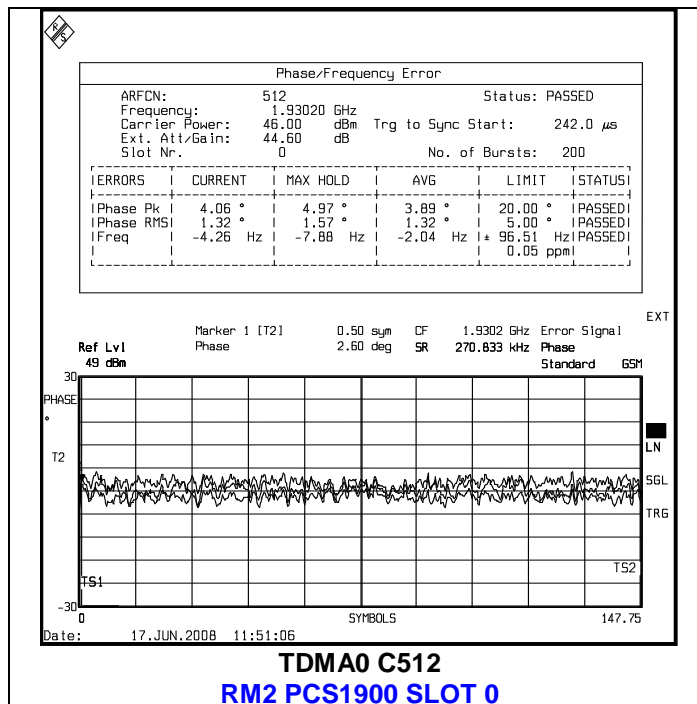


L C I E

6.10.3 TESTS AT -10°C



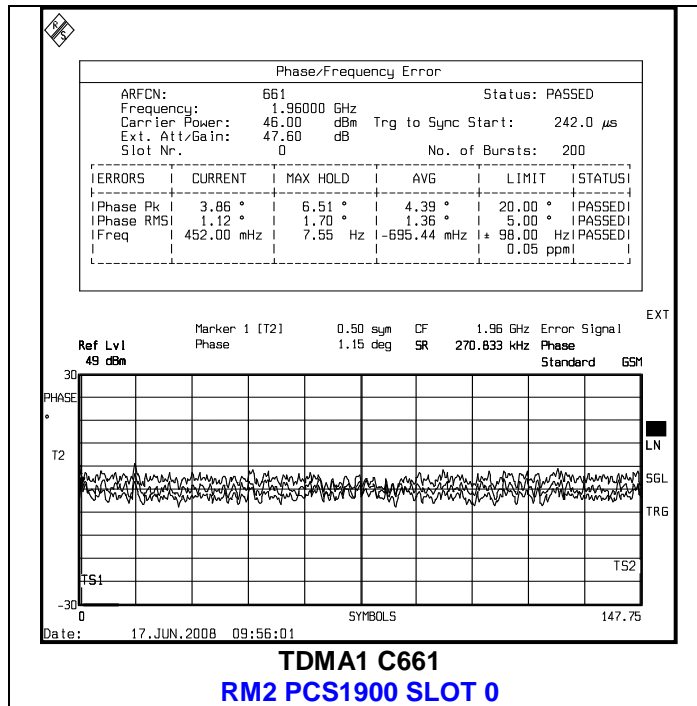
6.10.4 TESTS AT 00°C



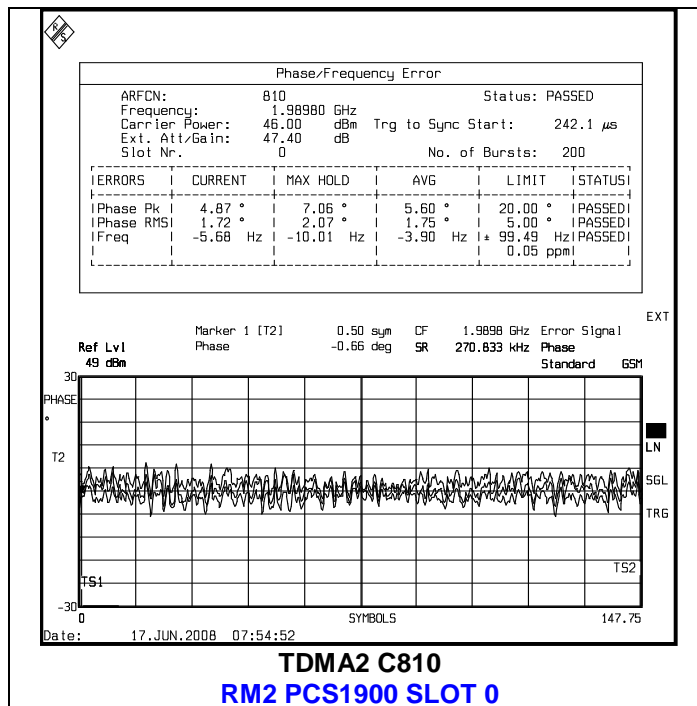


L C I E

6.10.5 TESTS AT +10°C



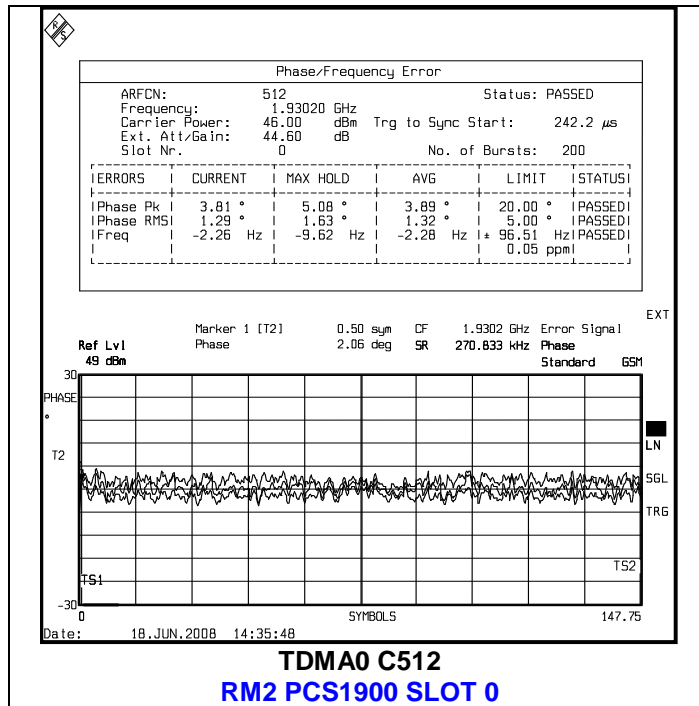
6.10.6 TESTS AT +20°C



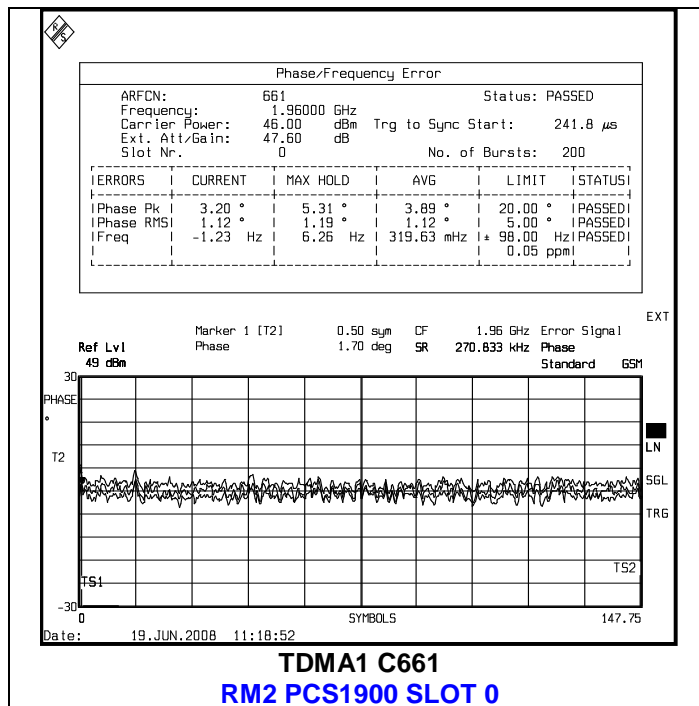


L C I E

6.10.7 TESTS AT +30°C

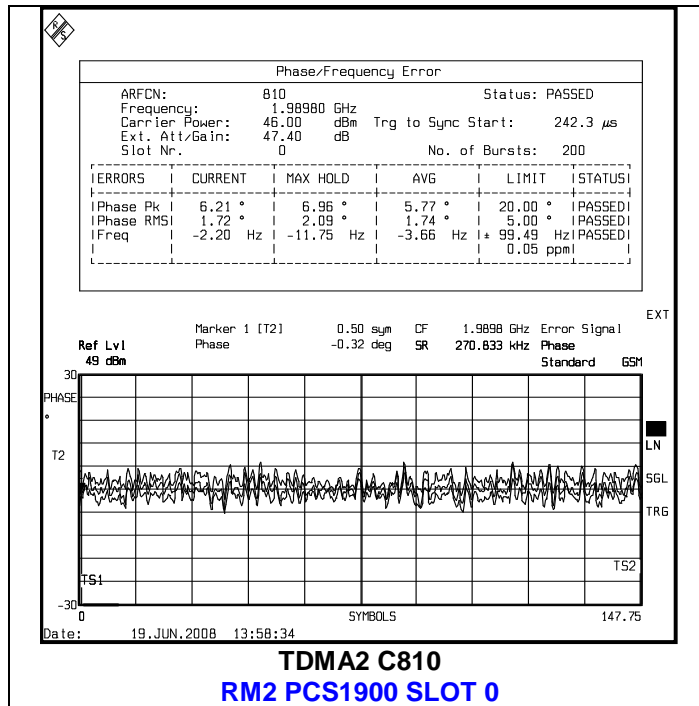


6.10.8 TESTS AT +40°C





6.10.9 TESTS AT +50°C





7. CONCLUSION

The GSM 60000 Outdoor BTS (AC version) equipped with modules RM2 PCS 1900MHz and as described in this document complies with the FCC & IC radio requirements in extreme temperature.

8. MEASUREMENT EQUIPMENT LIST

Equipment description	Manufacturer	Model	Nortel No.	LCIE No.
Spectrum analyser	R&S	FSEA	-	A4060024
Spectrum analyser	Agilent	VSA	524526	-
MIC analyseur	W&G	PA20	-	A4040011
Signal generator	HP	8657B	-	A5442023
Signal generator	HP	8648A	-	A5442029
Power Meter	Giga-tronics	8542C	-	A1503009
RF Probe	Giga-tronics	80401A	-	A1509027
Temperature chambre	CLIMAT SAPRATIN	Climats 12M3	-	D1025025



9. ABBREVIATIONS AND DEFINITIONS

9.1. GENERAL ABBREVIATIONS

°C	Degree Centigrade
3GPP	3 rd Generation Partnership Project
A	Ampere
AC	Alternative Current (Power Source)
ADU	AC Distribution Unit
ALPRO	Alarm Protection
ANSI	American National Standards Institute
BTS	Base Station Transceiver Subsystem or Base Transceiver Station
CFR	Code of Federal Regulations
CSA	Canadian Standards Association
dB	Decibel
dB(A)	Decibel Audio
DC	Direct Current (Power Source)
E1	European Standard For PCM Link Interface (2.048mbit/S)
ECU	Environmental Control Unit
EDGE	Enhanced Data rates for GSM Evolution
EGPRS	Enhanced General Packet Radio Service (cf. EDGE)
EMC	Electro-Magnetic Compatibility
ETS	European Telecommunication Standard
ETSI	European Telecommunication Standard Institute
EVM	Error Vector Magnitude
FCC	Federal Communications Commission
GHZ	Giga Hertz
GND	This Ground Represents Earth-Grounding Connection From Equipment
HW	Hardware
Hz	Hertz
IEC	International Electro-Technical Commission
ISO	International Standards Organization
IUT	International Telecommunication Union
kbits/s	Kilo Bits Per Second
LVD	Low Voltage Directive
MCPA	Multi-Carrier Power Amplifier
MHz	Mega-Hertz
N.A.	Not Applicable
NEMA	National Electrical Manufacturers Association (USA)
PA	Power Amplifier
PCM	Pulse Code Modulation
PCS	Personal Communication Service
PI	Product Integrity
R&D	Research and Development
RF	Radio Frequency
RSS	Radio Standard Specification
RTTE	Radio And Telecommunication Terminal Equipment



RX	Receiver
SELV	Safety Extra Low Voltage
T°	Temperature
T1	US Standard For PCM Interface (1.544mbps)
T1 PCM	Pulse Code Modulation at 1.544 MHz
TBC	To Be Confirmed
TBD	To Be Defined
TIA/EIA/IS	Telecommunication Industry Association / Electronic Industries Alliance /
TNV	Telecommunication Network Voltage Circuit
TX	Transmitter
UL	Underwriters Laboratories Inc.
V	Volt (Vdc with DC) or (Vac with AC)
VSWR	Voltage Standing Wave Ratio
W	Watt

9.2. GSM ABBREVIATIONS

ABM	Alarm And Bridge Module
AC	Alternative Current (Power Source)
ADU	AC Distribution Unit
ALPRO	Alarm Protection
CSU	Channel Service Unit
DBP	Digital Back Panel
DCS	Digital Cellular System
DDM	Dual Duplexer Module
ECU	Environmental Control Unit
EDGE	Enhanced Data rates for GSM Evolution
GSM	Global System For Mobile Communication
H2D	Hybrid Duplexer Two Paths
H3	Coupling Module Handling Up To 3 TX TDMA
H3D	Hybrid Duplexer Three Paths
H4M	PCM Clock At 4.096 MHz
IBP	Interface Back Panel
ICM	Interface Control Module
IFM	Interface Module Dedicated To PCM Link within a BTS 18000
LAPD	Link Access Protocol On The D Channel
PCS	Personal Communication Service
PRIPRO	Primary Protection
RICO	Radio Inter-Connection For Cabinet And Coupling Modules
RM	Radio Module
RMPSU	Radio Module Power Supply Unit
RXLEV	Reception Level
RXQUAL	Reception quality
S8000/S12000	This Represents The Previous GSM BTS Family (S8000 And S12000)
SICS	Snew Integrated Cooling System
SPM	Spare Module
SPU	Signal Processing Unit



TXF	Transmitter filter
UCPS	Univity Compact Power System
User ICO	User Interconnection

9.3. DEFINITIONS

Interconnect

Discipline which ensures telecom interface

Interface T1 PCM

Pulse Code Modulation interface at 1.544 MHz

Interface E1 PCM

European Standard for Pulse Code Modulation interface at 2.048Mbit/s

PCM Interface:

PCM port at the bulkhead of the BTS

Sxxx:

BTS radio configuration where "S" means sectorized cell and each "x" represents the number of TDMA per sector.

Ox

BTS radio configuration where "O" means Omni directional cell and the "x" represents the number of TDMA.

END OF DOCUMENT