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Radio Tests Report in Extreme Environment for 1900 MHz UMTS Mono iBTS equipped with i-modules

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Product Name: UMTS Mono iBTS

Frequency: UMTS 1900

Discipline: RF in extreme environment

Author: J. PALARD

Verified by: P. GALOPIN

Approved by: C. CHANSARD

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1. INTRODUCTION

This document presents the measurements results of Radio tests performed on the 1900 MHz UMTS Mono iBTS equipped with UMTS 1900 MHz i-modules, in extreme environment according to 3GPP TS 25.141 and 47CFR Part 24 and Nortel requests.

The measurements reported in this document have been performed in Sanmina-SCI climatic chamber. The tests definitions, methods and requirements follow the applicable version of the 3GPP TS 25.141 and 47CFR Part 24 as defined in the PLN-T-030466-6G1 Test Plan.

The tests results in this report relate to the equipment under test only described below and in the Nortel Networks AVL ref: UMT/BTS/DJD/7225 Ver 01.01/EN:

Product:	UMTS Mono iBTS
Manufacturer:	Nortel Networks
Type:	UMTS 1900
Configuration:	OTOR1
Power supply:	DC: -48Vdc and AC: 208-240Vac for Heater (See Note below)
Power supply range:	DC Range: -40.5Vdc to -57Vdc
Extreme temperature range:	-20°C to +45°C

Note: The UMTS Mono iBTS has two Operation Mode:

Mode 1: AC Supply Only (208-240Vac)

Mode 2: AC +DC Supply (AC for Heater: 208-240VAC and DC: -48Vdc)

As the Mode 1 has been used during the RF tests performed on the UMTS Mono iBTS with Alpha modules, the Mode 2 has been chosen to performed the RF tests on the UMTS Mono iBTS with i-modules.

This document is addressed to Nortel Networks and Sanmina-SCI R&D department involved in the development of the UMTS Mono iBTS and UMTS 1900 MHz i-modules.

2. RELATED DOCUMENTS

2.1. APPLICABLES DOCUMENTS

[A1]	3GPP TS 25.141	3 rd generation partnership project: Technical Specification Group Radio Access Networks; Base Station (BS) conformance testing (FDD) Release 1999; Version 3.12.0
[A2]	47 CFR Part 24	Personal Communications Services

2.2. REFERENCE DOCUMENTS

[R1]	UMT/BTS/DPL/07135	1900 MHz UMTS Project Qualification Plan
[R2]	PLN-V-030355-6G1	1900 Mhz UMTS PI Qualification Plan
[R3]	UMT/BTS/DD/453	Mechanical, Environmental and Electrical Requirement Specification for a Mono iBTS Cabled Cabinet
[R4]	Nortel-sinf-00358	Mono iBTS Cooling Unit Description
[R5]	UMT/BTS/DJD/7225	Hardware Delivery form for 1900 MHz UMTS Mono iBTS
[R6]	PLN-T-030465-6G1	Radio Tests Plan in Extreme Environment for UMTS Mono iBTS equipped with 1900 MHz i-modules

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3. IDENTIFICATION OF TESTED TECHNICAL VARIANT AND OF THE MODULES CONSTITUTING THE TESTED EQUIPMENT

Tests were performed on all the following variants:

TECHNICAL VARIANTS		
Identification	Comments	Configuration code
UMTS Mono iBTS	OTOR1 30W	A

Software compatibility :

Modules software version : V03E3.0E01.4

PI bench : v03d0402

Visual TRM : v03d0402 with a modification : the file for channelizers configuration "TX_umts.chz" delivered with Visual TRM was modified by the file "TX_umts.chz" delivered with PI Bench v03d0402.

Visual BBS for iCEM : V03D3.2_E04

ARTICLE	PEC code	Release	Serial number	Comment
iTRM 1900	NTUM17BA	D1	CDN200326005	136.147. 33.145
iCCM shelf	NTUM27AA	D1	CDN200247007	
iCCM board	NTUM25BA	D2	SLR200247007	136.147. 32.149
iCEM 128	NTUM00DA	D2	CDN200316023	136.147. 33.98
cGPSAM	NTA520AA	02	NNTM7503OECE	
MCPA 1900	NTUM30PA	D2	PWWT03DC11NY	Firmware 1.16
cDDM 1900	NTU719AA	D1	FORM01437242	
Cooling Unit	NTU752AA	D1	SNMN7500AV7Q	
MCA	NTU750AA	D1	SNMN7500AW3T	
INTERCO PANEL	NTU727AA	D1	SNMN7500AVY9	
DIGITAL SHELF	NTU753DA	D1	SNMN7500AW3U	
Control board	NTU751AA	D1	SNMN7500AV7L	
Rectifier	NTU753HA	D1	PITS01W00606	
DC Box	NTU754AA	D2	SNMN7500C9YY	
LPPCM	NTU733AA	D1	SNMN7500BTTR	
External alarm module	NTU735BA	D1	SNMN7500B4UP	

4. SYNTHESIS OF TESTS RESULTS FOR ALL VARIANTS

For 3GPP TS 25.141:

Identification	Description	Configuration Code
		A
	UMTS Mono iBTS, OTOR1 30W	X
Clause number	Description	Test Status (note)
6.2.1	Base station maximum output power	P
6.3	Frequency error	P
7.2	Reference sensitivity level	P

For 47 CFR Part 24:

Identification	Description	Configuration Code
		A
	UMTS Mono iBTS, OTOR1 30W	X
Clause number	Description	Test Status (note)
24.235	Frequency error	P

Note : P = Pass, F = Fail, NT = Not Tested, N/A = Not Applicable

5. TESTS DATES AND OPERATORS FOR EACH VARIANT

Configuration: A

Start of Test: 24 September 2003

Finish of Test: 29 September 2003

Location of Tests: SANMINA-SCI laboratory at Plaisir (78-France)

Tests Engineer: J. PALARD

6. TESTS APPARATUS USED FOR TESTS

ID	Instrument/Ancillary	Type	Manufacturer	Serial number
ESG	ESG-D	E4433B	Agilent	524529
VSA	VSA	E4406A	Agilent	524069
CO	Counter	RACAL 1992	RACAL - DANA	57220007
SG1	High stability signal generator	8657B	HP	57220052
PCM	PCM analyser	ANT 20	W&G	57220004
PM	Power meter	8542C	Gigatronics	57220022

7. TESTS RESULTS OF 3GPP TS 25.141 STANDARD

7.1. BASE STATION MAXIMUM OUTPUT POWER AT 30W (CL. 6.2.1)

Ambient Temperature (°C)	Relative humidity (%)	Operator
-20°C	20	J. PALARD
+45°C	45	J. PALARD

Configuration code: A
Site configuration type : OTOR1 30W at -20°C OTOR1 30W at +45°C
Activation mode : Single carrier
Output power : 44.7dBm at power amplifier output
Test model: 1

Tests results:

Emission frequency	Ambient temperature (°C)	Input voltage (Vdc)	BS max output power(dB)
B	45	-40,5	43,4
B	45	-48	43,4
B	45	-57	43,4

M	45	-40,5	43,8
M	45	-48	43,8
M	45	-57	43,8

T	45	-40,5	43,8
T	45	-48	43,8
T	45	-57	43,8

Emission frequency	Ambient temperature (°C)	Input voltage (Vdc)	BS max output power(dB)
B	-20	-40,5	43,6
B	-20	-48	43,6
B	-20	-57	43,6

M	-20	-40,5	44,1
M	-20	-48	44,1
M	-20	-57	44,1

T	-20	-40,5	44
T	-20	-48	44
T	-20	-57	44

Radio Tests Report in Extreme Environment for 1900 MHz UMTS Mono iBTS equipped with i-modules

Requirements of the clause 6.2.1:

Maximum Output Power	
Normal Conditions	43.3 dBm ± 2.7
Extreme conditions	43.3 dBm ± 3.2

Result

The equipment passed the requirement of this clause.

7.2. FREQUENCY ERROR AT P_{MAX}-3DB (CL. 6.3)

Ambient Temperature (°C)	Relative humidity (%)	Operator
-20°C	20	J. PALARD
+45°C	45	J. PALARD

Configuration code: A
Site configuration type : OTOR1 30W at -20°C OTOR1 30W at +45°C
Activation mode : Single carrier
Output power : 41.7 dBm at power amplifier output
Test model: 4

Tests results:

Emission frequency	Ambient temperature (°C)	Input voltage (Vdc)	Frequency error (Hz)
B	45	-40,5	-16,4
B	45	-48	-8,3
B	45	-57	-3,6

M	45	-40,5	2,7
M	45	-48	-3,5
M	45	-57	-11,1

T	45	-40,5	7,9
T	45	-48	-9,8
T	45	-57	13,9

Emission frequency	Ambient temperature (°C)	Input voltage (Vdc)	Frequency error (Hz)
B	-20	-40,5	2,4
B	-20	-48	11,9
B	-20	-57	-9,1

M	-20	-40,5	1,6
M	-20	-48	-3,1
M	-20	-57	8,5

T	-20	-40,5	5,8
T	-20	-48	-2,6
T	-20	-57	-10,1

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Radio Tests Report in Extreme Environment for 1900 MHz UMTS Mono iBTS equipped with i-modules

Requirements of the Clause 6.3:

Frequency error	
Normal Conditions	± (0.05ppm + 12Hz)
Extreme conditions	± (0.05ppm + 12Hz)

Result

The equipment passed the requirement of this clause.

7.3. FREQUENCY ERROR AT P_{MAX}-18DB (CL. 6.3)

Ambient Temperature (°C)	Relative humidity (%)	Operator
-20°C	20	J. PALARD
+45°C	45	J. PALARD

Configuration code: A
Site configuration type : OTOR1 30W at -20°C OTOR1 30W at +45°C
Activation mode : Single carrier
Output power : 26,7 dBm at power amplifier output
Test model: 4

Tests results:

Emission frequency	Ambient temperature (°C)	Input voltage (Vdc)	Frequency error (Hz)
B	45	-40,5	10,8
B	45	-48	-12,3
B	45	-57	13,4

M	45	-40,5	4,3
M	45	-48	5,5
M	45	-57	10,7

T	45	-40,5	8,7
T	45	-48	-13,2
T	45	-57	-11,9

Emission frequency	Ambient temperature (°C)	Input voltage (Vdc)	Frequency error (Hz)
B	-20	-40,5	-11,2
B	-20	-48	-7,7
B	-20	-57	-2,3

M	-20	-40,5	18,4
M	-20	-48	-8,1
M	-20	-57	-7,5

T	-20	-40,5	11,6
T	-20	-48	-0,4
T	-20	-57	-4,6

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Radio Tests Report in Extreme Environment for 1900 MHz UMTS Mono iBTS equipped with i-modules

Requirements of the Clause 6.3:

Frequency error	
Normal Conditions	± (0.05ppm + 12Hz)
Extreme conditions	± (0.05ppm + 12Hz)

Result

The equipment passed the requirement of this clause.

7.4. REFERENCE SENSITIVITY LEVEL (CL. 7.2)

Ambient Temperature (°C)	Relative humidity (%)	Operator
-20°C	20	J. PALARD
+45°C	45	J. PALARD

Configuration code: B
Site configuration type : OTOR1 30W at -20°C OTOR1 30W at +45°C
Activation mode : Single carrier
Wanted Signal Level: -121dBm

Tests results:

Tests Conditions		BIT ERROR RATIO (BER en %)		
		Channel B 1932.4 MHz	Channel M 1960 MHz	Channel T 1987.6MHz
Tmin (-20°C)	Vmin (-40.5Vdc)	0	0	0
	Vnom (-48Vdc)	0	0	0
	Vmax (-57Vdc)	0	0	0
Tmax (45°C)	Vmin (-40.5Vdc)	0	0	0
	Vnom (-48Vdc)	0	0	0
	Vmax (-57Vdc)	0	0	0

Requirements clause 7.2:

BER	< 0.1%
-----	--------

Result

The equipment passed the requirement of this clause.

8. TESTS RESULTS OF 47 CFR PART 24

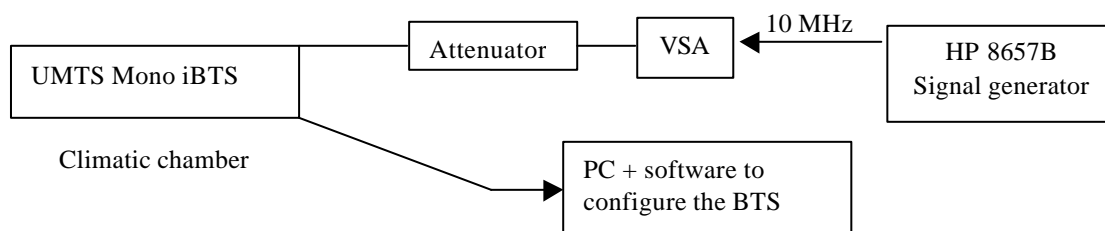
Test performed: clause 24.235 of the 47CFR Part 24 standard

Configuration code: A
Site configuration type : OTOR1 30W at -20°C, -10°C, 0°C, +5°C, +15°C, +25°C, +35°C and +45°C
Activation mode : Single carrier
Output Power: 44,7 dBm at power amplifier output
Test model: 1
Operator: J. PALARD

Test Procedure:

To realize these tests, the equipment was placed in the climatic chamber during sufficient time to obtain good temperature stabilization at several temperatures. The PA were configured at maximum RF output power (44,7dBm, test model: 1) and this value was controlled during all tests.

The measurements were performed with a VSA, as described on the figure below:



A period of at least one hour was allowed prior to measurement to ensure that all the components of the oscillator circuit were stabilized at each temperature.

Tests results:

Emission frequency	Ambient temperature (°C)	Input voltage (Vdc)	Frequency error (Hz)
B	45	-40,5	7,7
B	45	-48	12,8
B	45	-57	-9,5

M	45	-40,5	2,7
M	45	-48	13,4
M	45	-57	-3,5

T	45	-40,5	4,1
T	45	-48	-0,9
T	45	-57	11,2

Emission frequency	Ambient temperature (°C)	Input voltage (Vdc)	Frequency error (Hz)
B	35	-40,5	14,7
B	35	-48	-10,8
B	35	-57	-5,3

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M	35	-40,5	0,3
M	35	-48	8,8
M	35	-57	-16,7

T	35	-40,5	-0,9
T	35	-48	-14,4
T	35	-57	-8,6

Emission frequency	Ambient temperature (°C)	Input voltage (Vdc)	Frequency error (Hz)
B	25	-40,5	11,4
B	25	-48	-1,2
B	25	-57	-5,8

M	25	-40,5	-10,2
M	25	-48	-9,4
M	25	-57	-7,1

T	25	-40,5	13,8
T	25	-48	-14,1
T	25	-57	-0,4

Emission frequency	Ambient temperature (°C)	Input voltage (Vdc)	Frequency error (Hz)
B	15	-40,5	14,2
B	15	-48	-9,3
B	15	-57	-3,2

M	15	-40,5	15,1
M	15	-48	10,1
M	15	-57	-3,8

T	15	-40,5	0,4
T	15	-48	4,9
T	15	-57	5,2

Emission frequency	Ambient temperature (°C)	Input voltage (Vdc)	Frequency error (Hz)
B	5	-40,5	7,4
B	5	-48	-12,7
B	5	-57	14,1

M	5	-40,5	3,8
M	5	-48	3,5
M	5	-57	-13,1

T	5	-40,5	1,3
T	5	-48	12,7
T	5	-57	-0,9

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Emission frequency	Ambient temperature (°C)	Input voltage (Vdc)	Frequency error (Hz)
B	0	-40,5	12,7
B	0	-48	14,3
B	0	-57	0,2

M	0	-40,5	6,9
M	0	-48	-15,1
M	0	-57	-4,8

T	0	-40,5	9,4
T	0	-48	-8,9
T	0	-57	7,2

Emission frequency	Ambient temperature (°C)	Input voltage (Vdc)	Frequency error (Hz)
B	-10	-40,5	0,2
B	-10	-48	12,4
B	-10	-57	-17,9

M	-10	-40,5	3,2
M	-10	-48	8,4
M	-10	-57	12,2

T	-10	-40,5	8,9
T	-10	-48	-1,8
T	-10	-57	13,1

Emission frequency	Ambient temperature (°C)	Input voltage (Vdc)	Frequency error (Hz)
B	-20	-40,5	1,5
B	-20	-48	4,9
B	-20	-57	-9,6

M	-20	-40,5	5,2
M	-20	-48	-6,5
M	-20	-57	4,4

T	-20	-40,5	9,6
T	-20	-48	-7,4
T	-20	-57	-11,3

9. CONCLUSION

The 1900 MHz UMTS Mono iBTS equipped with i-modules, respects the RF requirements of the TS 25.141 V3.12.0 standard for measurements in extreme environment and the clause 24.235 of the 47 CFR Part 24 standard.

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10. ABBREVIATIONS & DEFINITIONS

10.1. ABBREVIATIONS

ETS : European Telecommunication Standard

BTS : Base Transceiver Station

UMTS : Universal Mobile Telecommunication System

PA : Power Amplifier

CEM : Channel element module

CCM : Core Control Module

TRM : Transmitter receiver module

TMA: Tower Mounted Amplifier

GPSAM : Global position system alarm module

MCA : Manufacturing Commissioning Alarm Module

DC : Direct Current

TBC : To Be Confirmed

EUT : Equipment Under Test

BS : Base Station

UARFCN : Ultra ARFCN

ARFCN : Absolute Radio Frequency Channel Number

ESG : E Signal Generator

VSA : Vector Signal Analyzer

3GPP : Generation Partnership Project

Tx : Transmit

Rx : Receive

B : Bottom UARFCN Downlink (BTS Tx) and Uplink (BTS Rx) frequencies are given as follows :
 $F_{B \text{ Downlink}} = 1932.4 \text{ MHz}$; $F_{B \text{ uplink}} = 1852.4 \text{ MHz}$.

M : Middle UARFCN Downlink (BTS Tx) and Uplink (BTS Rx) frequencies are given as follows :
 $F_{M \text{ Downlink}} = 1960 \text{ MHz}$; $F_{M \text{ uplink}} = 1880 \text{ MHz}$.

T : Top UARFCN Downlink (BTS Tx) and Uplink (BTS Rx) frequencies are given as follows : $F_{T \text{ Downlink}} = 1987.6 \text{ MHz}$; $F_{T \text{ uplink}} = 1907.6 \text{ MHz}$.

10.2. DEFINITIONS

N/A

❧ END OF DOCUMENT ❧