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## Radio Tests Report in Extreme Environment for 1900 MHz UMTS Indoor 2 iBTS 24Vdc with i-modules

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Product Name: UMTS Indoor 2 iBTS (24Vdc)

Frequency: UMTS 1900

Discipline: RF in extreme environment

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Author: J. PALARD 

Verified by: P. GALOPIN 

Approved by: C. CHANSARD   
11/09/03

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## PUBLICATION HISTORY

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## 1. INTRODUCTION

This document presents the measurements results of Radio tests performed on the 1900 MHz UMTS Indoor 2 iBTS powered by 24Vdc and 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-030465-6G1 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/0122 Ver 04.01/EN:

Product:	UMTS Indoor 2 iBTS
Manufacturer:	Nortel Networks
Type:	UMTS 1900
Configuration:	STSR3D
Power supply:	24Vdc
Power supply range:	20Vdc to 31Vdc
Extreme temperature range:	-5°C to +45°C

This document is addressed to Nortel Networks and Sanmina-SCI R&D department involved in the development of the UMTS Indoor 2 iBTS and UMTS 1900 MHz i-modules.

## 2. RELATED DOCUMENTS

### 2.1. APPLICABLES DOCUMENTS

[A1]	3GPP TS 25.141	3 <sup>rd</sup> 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]	UMT/BTS/DD/458	Technical Requirements for a +24/+48V DC power converter solution to supply our Indoor UMTS BTS
[R3]	UMT/BTS/DD/0390	Requirements specification for a phase II 600 mm UMTS Indoor cabinet
[R4]	PLN-V-030355-6G1	1900 Mhz UMTS PI Qualification Plan
[R5]	UMT/BTS/DJD/0122	Hardware Delivery form for iBTS UMTS 1900 Cabinet
[R6]	PLN-T-030465-6G1	Radio Tests Plan in Extreme Environment for UMTS Outdoor iBTS & UMTS Indoor 2 iBTS 24V equipped with 1900 MHz i-modules

### 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 Indoor 2 iBTS	STSR3D 30W	A
UMTS Indoor 2 iBTS	STSR3D 45W	B
UMTS Indoor 2 iBTS	STSR3D 45W with TMA	C

**Software compatibility :**

Modules software version : V03E3.0E01.4

PI bench : v03d0402

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

Visual BBS for iCEM : V03D3.2\_E04

ARTICLE	PEC code	Release	Serial number	Comment
iTRM 1900	NTUM17BA	D1 DER AC 03 06 046	CDN200324005	136.147.33.128
iTRM 1900	NTUM17BA	D1 DER AC 03 06 046	CDN200324003	136.147.33.129
iTRM 1900	NTUM17BA	D1 DER AC 03 06 046	CDN200326006	136.147.33.138
iCCM shelf	NTUM26AA	D1	CDN200247007	
iCCM board	NTUM25BA	D2	SLR200247007	136.147.32.149
iCCM shelf	NTUM26AA	D1	CDN200242001	
iCCM board	NTUM25BA	D2	SLR200241004	136.147.32.132
iCEM 128	NTUM00DA	D1	CDN200308012	136.147.33.74
iCEM 128	NTUM00DA	D2	CDN200316008	136.147.33.87
iCEM 128	NTUM00DA	D2	CDN200316019	136.147.33.92
iCEM 128	NTUM00DA	D2	CDN200316016	136.147.33.95
GPSAM	NTUM24AA	D7	NNTM7503PHK7	
MCPA 1900	NTUM30PA	D2	PWWT03D97J86	Firmware 1.16
MCPA 1900	NTUM30PA	D2	PWWT03D9DJTN	Firmware 1.16
MCPA 1900	NTUM30PA	D2	PWWT03D9DJV6	Firmware 1.16
MCPA 1900	NTUM30PA	D2	PWWT03D97J8D	Firmware 1.16
MCPA 1900	NTUM30PA	D2	PWWT03D97J81	Firmware 1.16
MCPA 1900	NTUM30PA	D2	PWWT03D9L74Y	Firmware 1.16
DDM 1900	NTUM42AA	D1	FORM01426047	
DDM 1900	NTUM42AA	D1	FORM01428020	
DDM 1900	NTUM42AA	D1	FORM01426048	
ICU	NTBY58AA	D5	SNMNGG0002G8	
INTERCO	NTBY76AA	D1	SNMN7500AUF8	
DIGITAL SHELF	NTBY72CA	D2	SNMN7500AS4G	
MCA	NTBY90AA	D1	SNMN7500A006	
LPPCM	NTBY14BA	P1	SNMN7500979P	
External alarm kit	NTBY98AA	D2	SNMN75007DFG	
Rack Delta 24VDC/48VDC converter	NTBY51AA	02	K5032900049	Wrong release on label
Converter 24/48	NTBY5101	00	MG032500005	
Converter 24/48	NTBY5101	00	MG031700280	No Nortel label
Converter 24/48	NTBY5101	00	MG031700284	No Nortel label
Converter 24/48	NTBY5101	00	MG031700242	No Nortel label
2 fillers converter	NTBY5102	S0		

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## 4. SYNTHESIS OF TESTS RESULTS FOR ALL VARIANTS

For 3GPP TS 25.141:

Identification	Description	Configuration Code		
		A	B	C
	UMTS Indoor 2 iBTS, STSR3D 30W	X		
	UMTS Indoor 2 iBTS, STSR3D 45W		X	
	UMTS Indoor 2 iBTS, STSR3D 45W with TMA			X
Clause number	Description	Test Status (note)		
6.2.1	Base station maximum output power	P	P	P
6.3	Frequency error	NT	P	N/A
7.2	Reference sensitivity level	NT	P	P

For 47 CFR Part 24:

Identification	Description	Configuration Code
		A
	UMTS Indoor 2 iBTS, STSR3D 45W	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, B and C

Start of Test: 01 September 2003  
Finish of Test: 05 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	57220090
PCM	PCM analyser	ANT 20	W&G	57220004
PM	Power meter	8542C	Gigatronics	57220022

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## 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
-5°C	25	J. PALARD
+45°C	45	J. PALARD

Configuration code: A
Site configuration type : STSR3D 30W at -5 °C STSR3D 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 (V)	BS max output power(dBm)
B	-5	20	43,5
B	-5	24	43,5
B	-5	31	43,5

M	-5	20	44,1
M	-5	24	44,1
M	-5	31	44,1

T	-5	20	44,0
T	-5	24	44,1
T	-5	31	44,0

Emission frequency	Ambient temperature (°C)	Input voltage (V)	BS max output power(dBm)
B	45	20	43,2
B	45	24	43,2
B	45	31	43,2

M	45	20	43,8
M	45	24	43,8
M	45	31	43,8

T	45	20	43,7
T	45	24	43,7
T	45	31	43,7

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## Requirements of the clause 6.2.1:

Maximum Output Power	
Normal Conditions	43.3 dBm $\pm$ 2.7
Extreme conditions	43.3 dBm $\pm$ 3.2

### Result

The equipment passed the requirement of this clause.

## 7.2. BASE STATION MAXIMUM OUTPUT POWER AT 45W (CL. 6.2.1)

Ambient Temperature (°C)	Relative humidity (%)	Operator
-5°C	25	J. PALARD
+45°C	45	J. PALARD

Configuration code: B
Site configuration type : STSR3D 30W at -5 °C STSR3D 30W at +45 °C
Activation mode : Single carrier
Output power : 46.5 dBm at power amplifier output
Test model: 1

### Tests results:

Emission frequency	Ambient temperature (°C)	Input voltage (V)	BS max output power(dBm)
B	-5	20	44,6
B	-5	24	44,6
B	-5	31	44,6

M	-5	20	45,6
M	-5	24	45,7
M	-5	31	45,6

T	-5	20	45,5
T	-5	24	45,5
T	-5	31	45,5

Emission frequency	Ambient temperature (°C)	Input voltage (V)	BS max output power(dBm)
B	45	20	44,7
B	45	24	44,7
B	45	31	44,7

M	45	20	45,4
M	45	24	45,4
M	45	31	45,4

T	45	20	45,3
T	45	24	45,3
T	45	31	45,3

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## Requirements of the clause 6.2.1:

Maximum Output Power	
Normal Conditions	45.1 dBm $\pm$ 2.7
Extreme conditions	45.1 dBm $\pm$ 3.2

## **Result**

The equipment passed the requirement of this clause.

## **7.3. BASE STATION MAXIMUM OUTPUT POWER AT 45W WITH TMA (CL. 6.2.1)**

Ambient Temperature (°C)	Relative humidity (%)	Operator
-5°C	25	J. PALARD
+45°C	45	J. PALARD

Configuration code: C
Site configuration type : STSR3D 30W at -5 °C STSR3D 30W at +45 °C
Activation mode : Single carrier
Output power : 46.5 dBm at power amplifier output
Test model: 1

## **Tests results:**

Emission frequency	Ambient temperature (°C)	Input voltage (V)	BS max output power(dBm)
B	-5	20	40,7
B	-5	24	40,7
B	-5	31	40,7

M	-5	20	41,5
M	-5	24	41,5
M	-5	31	41,5

T	-5	20	41,3
T	-5	24	41,3
T	-5	31	41,3

Emission frequency	Ambient temperature (°C)	Input voltage (V)	BS max output power(dBm)
B	45	20	40,9
B	45	24	41,0
B	45	31	41,0

M	45	20	41,3
M	45	24	41,3
M	45	31	41,3

T	45	20	41,1
T	45	24	40,0
T	45	31	41,1

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## Requirements of the clause 6.2.1:

Maximum Output Power (with cable attenuation between antenna and TMA = -4dB)	
Normal Conditions	40.6 dBm ± 2.7
Extreme conditions	40.6 dBm ± 3.2

### Result

The equipment passed the requirement of this clause.

## 7.4. FREQUENCY ERROR AT P<sub>MAX</sub>-3DB (CL. 6.3)

Ambient Temperature (°C)	Relative humidity (%)	Operator
-5°C	30	J. PALARD
+45°C	50	J. PALARD

Configuration code: B
Site configuration type : STSR3D 45W at -5 °C STSR3D 45W at +45 °C
Activation mode : Single carrier
Output power : 43.5 dBm at power amplifier output
Test model: 4

### Tests results:

Emission frequency	Ambient temperature (°C)	Input voltage (Vdc)	Frequency error (Hz)
B	-5	20	8,4
B	-5	24	-7,1
B	-5	31	-4,8
M	-5	20	-4,9
M	-5	24	-14,9
M	-5	31	-10,6
T	-5	20	-15,3
T	-5	24	7,4
T	-5	31	2,6

Emission frequency	Ambient temperature (°C)	Input voltage (Vdc)	Frequency error (Hz)
B	45	20	1,9
B	45	24	-6,1
B	45	31	10,8
M	45	20	5,8
M	45	24	-3,4
M	45	31	-8,9
T	45	20	17,6
T	45	24	15,2
T	45	31	-3,4

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# Radio Tests Report in Extreme Environment for 1900 MHz UMTS Indoor 2 iBTS 24Vdc with i-modules

## Requirements of the Clause 6.3:

Frequency error	
Normal Conditions	$\pm (0.05\text{ppm} + 12\text{Hz})$
Extreme conditions	$\pm (0.05\text{ppm} + 12\text{Hz})$

## Result

The equipment passed the requirement of this clause.

## 7.5. FREQUENCY ERROR AT P<sub>MAX</sub>-18DB (CL. 6.3)

Ambient Temperature (°C)	Relative humidity (%)	Operator
-5°C	30	J. PALARD
+45°C	50	J. PALARD

Configuration code: B
Site configuration type : STSR3D 45W at -5 °C STSR3D 45W at +45 °C
Activation mode : Single carrier
Output power : 28.5 dBm at power amplifier output
Test model: 4

## Tests results:

Emission frequency	Ambient temperature (°C)	Input voltage (V)	Frequency error (Hz)
B	-5	20	1,7
B	-5	24	4,4
B	-5	31	-1,1

M	-5	20	3,5
M	-5	24	11,1
M	-5	31	5,1

T	-5	20	-1,7
T	-5	24	-7,1
T	-5	31	-9,8

Emission frequency	Ambient temperature (°C)	Input voltage (V)	Frequency error (Hz)
B	45	20	8,5
B	45	24	-0,9
B	45	31	-3,8

M	45	20	10,2
M	45	24	3,2
M	45	31	-4,8

T	45	20	6,7
T	45	24	11,9
T	45	31	-9,4

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# Radio Tests Report in Extreme Environment for 1900 MHz UMTS Indoor 2 iBTS 24Vdc 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.

## 7.6. REFERENCE SENSITIVITY LEVEL (CL. 7.2)

Ambient Temperature (°C)	Relative humidity (%)	Operator
-5°C	30	J. PALARD
+45°C	50	J. PALARD

Configuration code: B
Site configuration type : STSR3D 45W at -5 °C STSR3D 45W 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 (-5°C)	Vmin (20 Vdc)	0	0	0
	Vnom (24 Vdc)	0	0	0
	Vmax (31 vdc)	0	0	0
Tmax (45°C)	Vmin (20 Vdc)	0	0	0
	Vnom (24 Vdc)	0.01	0	0
	Vmax (31 Vdc)	0	0	0

**Requirements clause 7.2:**

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

**Result**

The equipment passed the requirement of this clause.

### 7.7. REFERENCE SENSITIVITY LEVEL WITH TMA (CL. 7.2)

Ambient Temperature (°C)	Relative humidity (%)	Operator
-5°C	30	J. PALARD
+45°C	50	J. PALARD

Configuration code: B
Site configuration type : STSR3D 45W at -5 °C STSR3D 45W 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 (-5°C)	Vmin (20 Vdc)	0	0	0
	Vnom (24 Vdc)	0	0	0
	Vmax (31 vdc)	0	0	0
Tmax (45°C)	Vmin (20 Vdc)	0	0	0
	Vnom (24 Vdc)	0	0	0
	Vmax (31 Vdc)	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

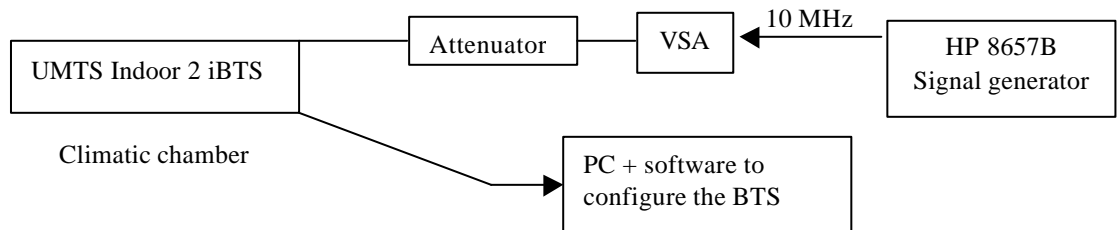
**Test performed:** clause 24.235 of the 47CFR Part 24 standard

Configuration code: B
Site configuration type : STSR3D 45W at -5°C, +5°C, +15°C, +25°C, +35°C and +45°C
Activation mode : Single carrier
Output Power: 46.5 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 (46.5dBm, 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	20	-17,8
B	45	24	7,5
B	45	31	-11,6

M	45	20	-14,7
M	45	24	9,3
M	45	31	-7,4

T	45	20	-13,7
T	45	24	-4,5
T	45	31	-17,2

Emission frequency	Ambient temperature (°C)	Input voltage (Vdc)	Frequency error (Hz)
B	35	20	6,6
B	35	24	6,4
B	35	31	5,8

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M	35	20	-9,5
M	35	24	1,3
M	35	31	-0,3

T	35	20	13,2
T	35	24	-4,1
T	35	31	-7,3

Emission frequency	Ambient temperature (°C)	Input voltage (Vdc)	Frequency error (Hz)
B	25	20	8,9
B	25	24	-14,7
B	25	31	-7,8

M	25	20	12,5
M	25	24	-0,2
M	25	31	-2,1

T	25	20	8,7
T	25	24	-8
T	25	31	-5,6

Emission frequency	Ambient temperature (°C)	Input voltage (Vdc)	Frequency error (Hz)
B	15	20	-4,3
B	15	24	-4,4
B	15	31	-9,3

M	15	20	12,1
M	15	24	-1,4
M	15	31	9,8

T	15	20	-6,5
T	15	24	7,1
T	15	31	-9,5

Emission frequency	Ambient temperature (°C)	Input voltage (Vdc)	Frequency error (Hz)
B	5	20	11,6
B	5	24	-12,8
B	5	31	11,1

M	5	20	15,4
M	5	24	4,4
M	5	31	4,1

T	5	20	19,3
T	5	24	-9,5
T	5	31	2,5

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## Radio Tests Report in Extreme Environment for 1900 MHz UMTS Indoor 2 iBTS 24Vdc with i-modules

Emission frequency	Ambient temperature (°C)	Input voltage (Vdc)	Frequency error (Hz)
B	-5	20	5,5
B	-5	24	-7,7
B	-5	31	16,2
M	-5	20	6,0
M	-5	24	4,6
M	-5	31	14,9
T	-5	20	-4,7
T	-5	24	4,6
T	-5	31	7,1

## 9. CONCLUSION

The 1900 MHz UMTS Indoor 2 iBTS 24Vdc 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.

## 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

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# Radio Tests Report in Extreme Environment for 1900 MHz UMTS Indoor 2 iBTS 24Vdc with i-modules

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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 ❧