# TEST REPORT

## CFR 47 Part 15
## and CFR 47 Part 24

# UMTS 1900 Mono iBTS

## N°149027DK




| | | |
|---|---|---|
| Technical control: O.ROY | **GYL technologies**<br>Parc d'activités de Lanserre<br>21, rue de la Fuye 49610 Juigné sur Loire<br>Tel. : 02.41.57.57.40 - Fax : 02.41.45.25.77 | Quality Control: L.MONTIEL |

# Summary

# 1 GENERAL INFORMATION

## 1.1 APPLICANT:

**SANMINA SCI**
**46 Rue Pierre Curie**
**78376 PLAISIR - FRANCE**

## 1.2 MANUFACTURER:

**NORTEL NETWORKS**
**38, rue Paul Cézanne**
**78928 Guyancourt Yvelines – France**

## 1.3 APPLICANT REPRESENTATIVE:

Marc CANCOUËT

## 1.4 TEST DATE:

September 9 and 10, 2003

## 1.5 TEST SITE:

GYL Technologies
Parc d'activités de Lanserre
49610 Juigné sur Loire – France
FCC registration Number: 90469

# 2 INTRODUCTION

The following test report for a Base Station Transmitter is written in accordance with Part 15 and 24 of the Federal Communications Commissions. The Equipment Under Test (EUT) was the UMTS 1900 Mono iBTS. The test results reported in this document relate only to the item that was tested.

All measurements contained in this Application were conducted in accordance with ANSI C63.4 Methods of Measurement of Radio Noise Emissions of 2001. The instrumentation utilized for the measurements conforms to the ANSI C63.4 standard for EMI and Field Strength Instrumentation. Some accessories are used to increase sensitivity and prevent overloading of the measuring instrument. These are explained in this report. Calibration checks are performed regularly on the instruments, and all accessories including the high pass filter, preamplifier and cables.

All radiated and conducted emissions measurements were performed manually at GYL TECHNOLOGIES. The radiated emissions measurements required by the rules were performed on the three to ten meters, open field, test site maintained by GYL Technologies Parc d'activités de Lanserre, 49610 Juigné sur Loire , France. Complete description and site attenuation measurement data have been placed on file with the Federal Communications Commission.

The power line conducted emission measurements were performed in a shielded enclosure also located at the Parc d'activités de Lanserre, 49610 Juigné sur Loire, France facility

# 3 MEASUREMENT EQUIPMENT LIST

| PART TYPE | MANUFACTURER | MODEL | SERIAL NUMBER | CALIBRATION DATE |
|---|---|---|---|---|
| **RECEIVERS** | | | | |
| Receiver | Rohde & Schwarz | ESI 7 | M02020 | Mar-03 |
| Spectrum analyzer | Rohde & Schwarz | FSEM 30 | M02021 | Dec-02 |
| **ARTIFICIAL MAINS NETWORKS** | | | | |
| LISN (50µH / 5/50Ω) | Rohde & Schwarz | ESH2-Z5 | M02034 | Oct-02 |
| **ANTENNAS** | | | | |
| Bilog (30-2000MHz) | CHASE | CBL-6112 | M02031 | Nov-02 |
| Horn (1 to 18GHz) | EMCO | 3161-01 | M01138 | |

# 4 TESTED SYSTEM DETAILS

The equipment tested is a **B**ase **T**ransceiver **S**tation single channel for **U**niversal **M**obile **T**elecommunications **S**ystem also considered as an Information Technology Equipment. The equipment provides Personal Communications Services in the 1930 – 1990 MHz frequency band.

# 5 EQUIPMENT DESCRIPTION

## 5.1 PRODUCT TYPE:

UMTS 1900 Mono iBTS :

### 5.1.1 Equipment Release Status:

| | |
|---|---|
| iTRM 1900 : | D1 |
| iCCM : | D2 |
| iCEM : | D2 |
| cGPSAM : | 02 |
| MCPA 1900 : | D2 |
| cDDM 1900 : | D1 |
| Cooling Unit : | D1 |
| Control board : | D1 |
| MCA : | D1 |
| INTERCO : | D1 |
| Digital backplane : | D1 |
| Rectifier : | D1 |
| DC box : | D2 |
| LPPCM : | D1 |
| External alarm module : | D1 |

## 5.2 AUXILIARY EQUIPMENT:

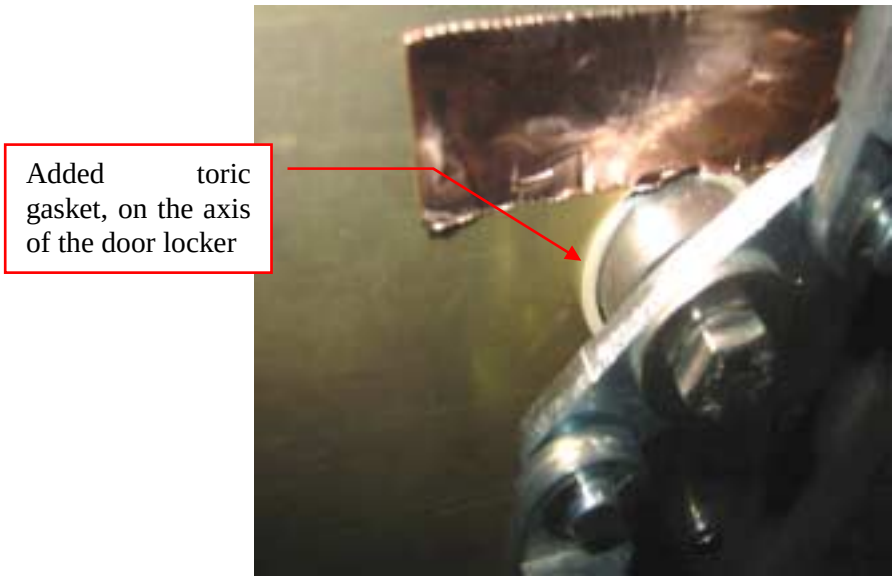
Attenuators and 50 ohms load

**5.3 PRODUCT PICTURES:**

**Front view**

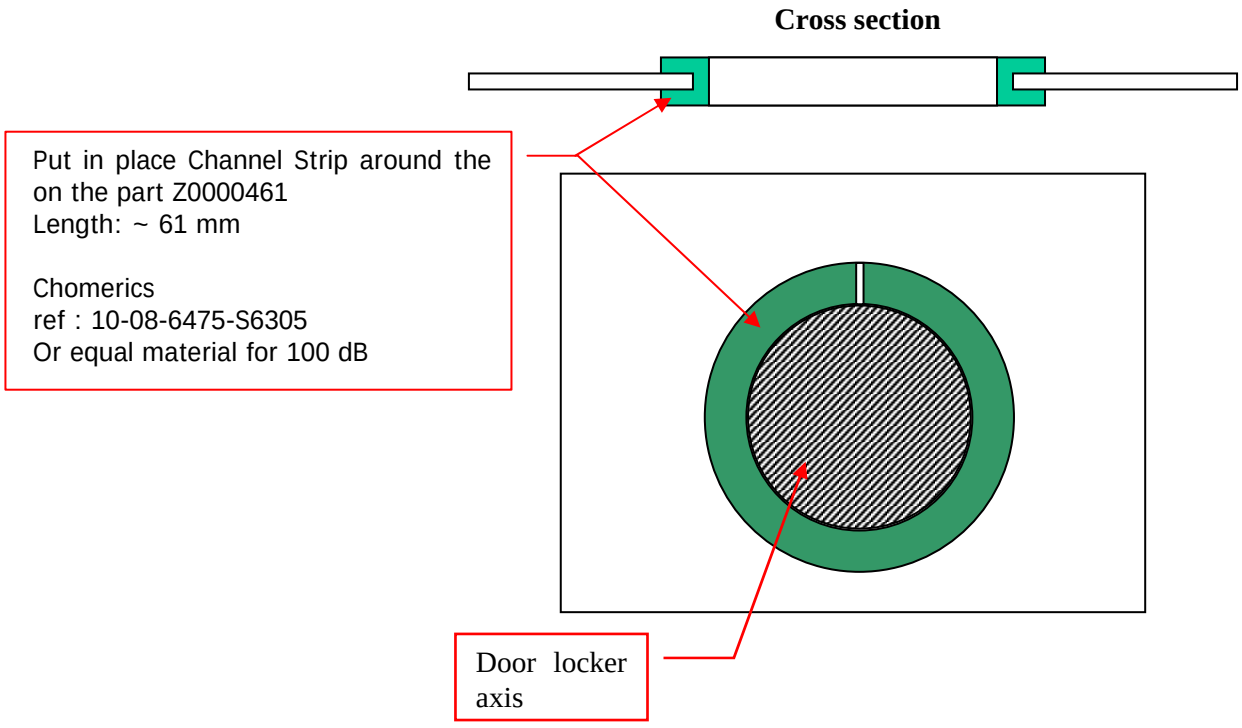
**Rear view**

**Applied modifications during testing**




**Final solution for manufacturing**

**This solution being in compliance with the modification done during testing solves the door leakage problem by implementing a signal attenuation greater than 60 dB. So it is not necessary to redo testing**



### 5.4 PRODUCT COMPOSITION

The table given here under gives the features details of the equipment under test

| ARTICLE | PEC code | Release | Serial number | Comments |
|---|---|---|---|---|
| iTRM 1900 | NTUM17BA | D1<br>DER AC 03 06 046 | CDN200326004 | 136.147. 33.147 |
| ICCM Board | NTUM25BA | D2 | SLR200247010 | 136.147. 32.162 |
| ICCM shelf | NTUM26AA | D1 | CDN200247010 | |
| iCEM 128 | NTUM00DA | D2 | CDN200316012 | 136.147. 33.109 |
| 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 | |
| DC Box | NTU754AA | D2 | SNMN7500C9YY | |
| LPPCM | NTU733AA | D1 | SNMN7500BTTR | |
| MCA | NTUM7200 | D1 | SNMN7500B0CS | |
| Control board | NTU751AA | D1 | SNMN7500AV7L | |
| Rectifier | NTU753HA | D1 | PITS01W00606 | |
| External alarm module | NTU735BA | D1 | SNMN7500B4UP | |

# 6 EXERCISING TEST CONDITIONS

Measurements are done in transmitter mode (the transmitter is set at maximum power 30 watts).
Installation diagram and cables list on appendix A6 and A9

### 6.1 CHANNELS TEST CONFIGURATION:

| TRM | CHANNEL # | Definition |
|---|---|---|
| 3 | M | TRM 1 output on PA 1 transmitting at 1960 MHz and 44.8 dBm |

### 6.2 EUT EXERCISING SOFTWARE

The EUT was provided with the software to continuously transmit during testing. The carrier was also checked to verify that the information was being transmitted.

- 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 as modified by the file "TX_umts.chz" delivered with PI Bench v03d0402.
- Visual BBS for iCEM : V03D3.2_E04

# 7 CONFORMANCE STATEMENT

## 7.1 STANDARDS REFERENCED FOR THIS REPORT

| | |
|---|---|
| **PART 2: 1999** | Frequency allocations and Radio Treaty Matters General Rules and Regulations |
| **PART 15: 2002** | Radio frequency devices |
| **ANSI C63.4-2001** | Standard format measurements/technical report personal computer and peripherals |
| **PART 24 Subpart E"-2000** | Broadband Personal communications services |

## 7.2 JUSTIFICATION

As mentioned in paragraph 5 of this report, the equipment is an information technology equipment providing public mobiles services and Personal Communication Services and as it may be installed in residential commercial or light industry areas the following sub clause of the standard mentioned above are

- Part 15.107 and 15.109 (subpart B) for respectively conducted and radiated emission.
- Part 24.238 (subpart E) for broadband PCS emission limits

# 8 Interpretation and remarks:

**This equipment complies with the rules of the FCC**.

## 8.1 IMPORTANT REMARK:

**Even if spurious emissions were observed during part 15 testing, substitution method was not performed on UMTS 1900 Mono iBTS due to the measured margin greater than 20dB**

**The EUT Plot on page 26 shows measured noise floor levels detected while testing the UMTS 1900 Mono iBTS**

# 9 TEST ACCORDING TO CFR 47 Part 15 Class B

Tests performed by Daniel RAUD at GYL Technologies laboratories, on September 9 and 10, 2003

## 9.1 REFERENCE DOCUMENTATION:

FCC part 15 (Sub part B) §15.107 and 15.109 of 2002

## 9.2 CONDUCTED EMISSIONS MEASUREMENTS

The power line conducted emission measurements were performed in a semi anechoic chamber manufactured by SIDT. The EUT was assembled on a non conductive 10 centimeters high wooden pallet. Power was fed to the EUT through a 50 ohm / 50 micro-Henry Line Impedance Stabilization Network (EUT LISN). The EUT LISN was fed power through an A.C. filter box on the outside of the shielded enclosure. The filter box and EUT LISN housing are bonded to the ground plane of the shielded enclosure. The spectrum analyzer was connected to the A.C. line through an isolation transformer. The 50-ohm output of the EUT LISN was connected to the spectrum analyzer input through a Rohde and Schwartz 150 kHz high-pass filter. The filter is used to prevent overload of the spectrum analyzer from noise below 150 kHz. Conducted emission levels were measured on each current-carrying line with the receiver operating in the CISPR quasi-peak mode (or average mode if applicable


### 9.3 RESULTS: (§ 15.107 class B)

The following table lists worst-case conducted emission date. Specifically: Emission Frequency, Test Detector, Analyzer Reading, Site Correction Factor, corrected Emission Level, Quasi Peak Limit and Margin, and the Average Limit and Margin.

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. If the conducted emissions exceed the limit with the instrument set to the quasi-peak mode, then measurements are made in the average mode.

The conducted test was performed with the EUT exercise program loaded, and the emissions were scanned between 150 kHz to 30 MHz on the NEUTRAL SIDE and LIVE SIDE, herein referred to as Neutral, Live1 and Live2 respectively.

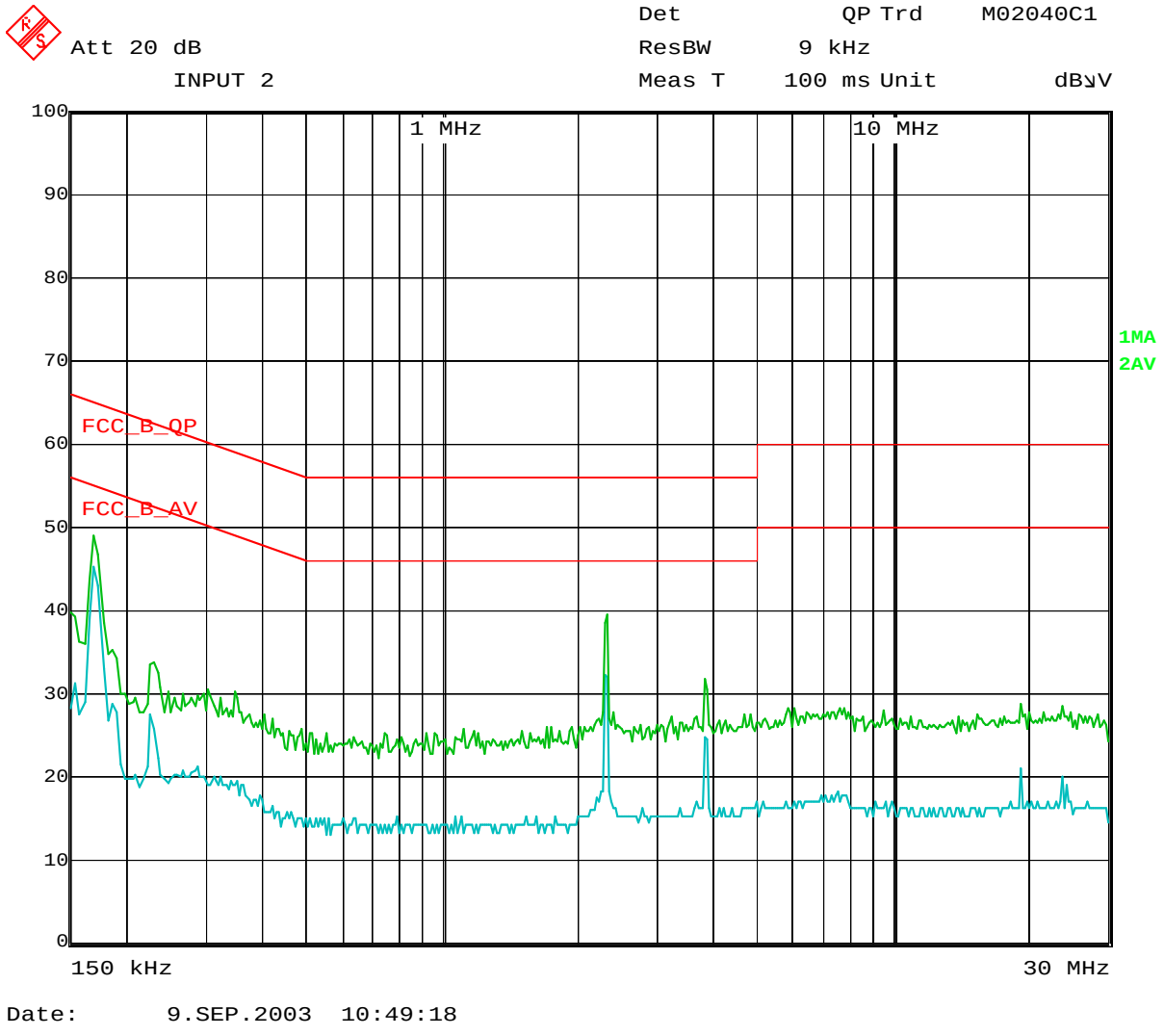
| ESI 7 EMI TEST RECEIVER IN RECEIVER MODE | |
|---|---|
| Peak measurement time | 5 ms |
| step size | 4KHz |
| Preamplifier | OFF |
| Preselector | ON |
| Resolution, Band With | 9 kHz |
| Final Quasi Peak measurement time | 1 s minimum |
| Final average measurement time | 1 sec minimum |

All readings are quasi-peak unless stated otherwise.

### 9.3.1 LIVE 1 (EUT is AC powered)

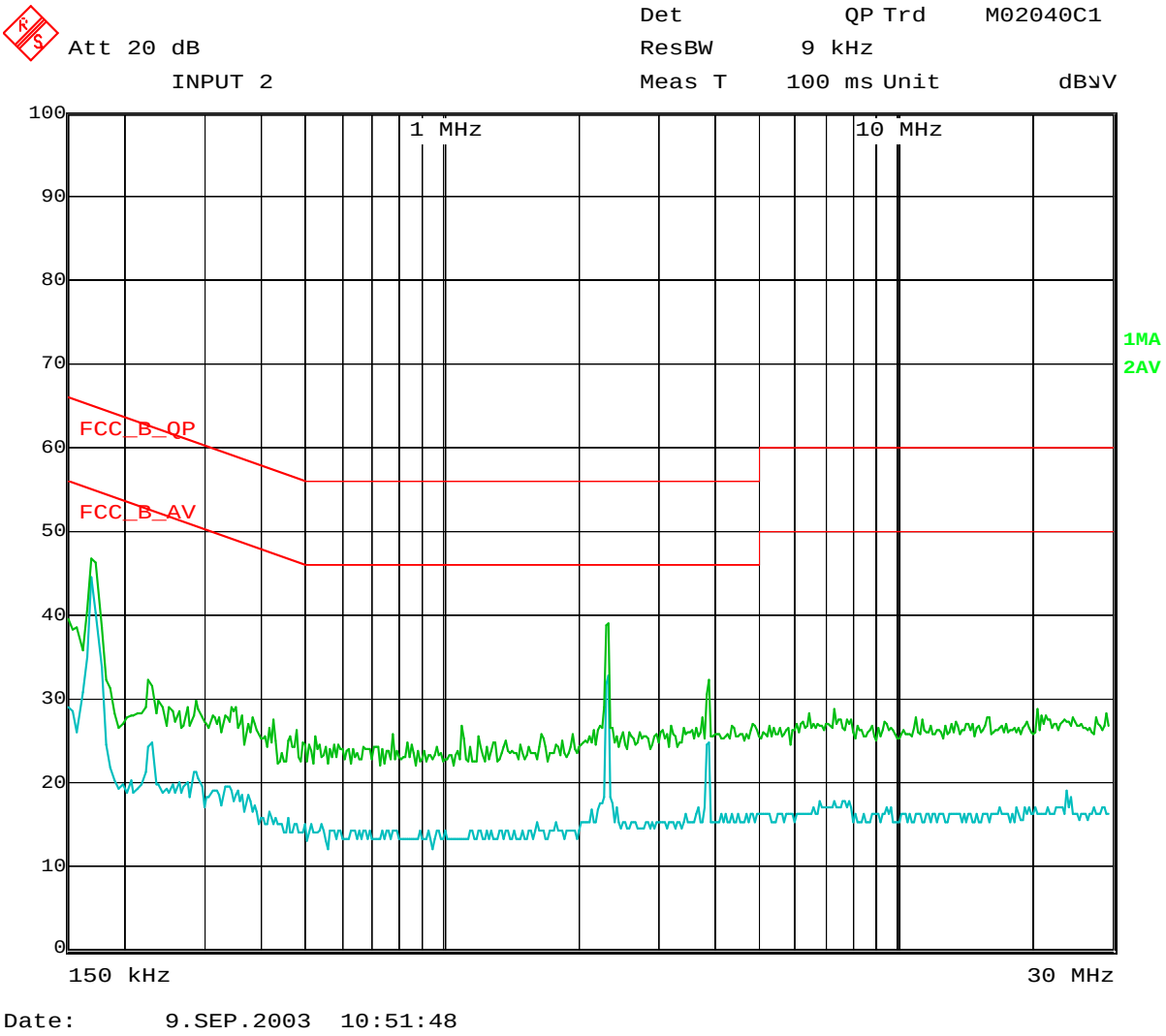
| Frequency (MHz) | Quasi-peak (dBµV/m) | QP margin (dBµV/m) | Frequency (MHz) | Average (dBµV/m) | Average margin (dBµV/m) |
|---|---|---|---|---|---|
| 0.170 | 47.978 | -16.982 | 0.170 | 44.574 | -10.386 |
| 2.318 | 37.178 | -18.822 | 0.226 | 26.280 | -26.316 |
| 3.858 | 27.247 | -28.753 | 2.314 | 31.862 | -14.138 |
| | | | 3.858 | 24.006 | -21.994 |

Legend: Blue curve represents average values
Green curve represents the peak values



### 9.3.2 LIVE 2 (EUT is AC powered)

| Frequency (MHz) | Quasi-peak (dBµV/m) | QP margin (dBµV/m) | Frequency (MHz) | Average (dBµV/m) | Average margin (dBµV/m) |
|---|---|---|---|---|---|
| 0.170 | 47.19 | -17.77 | 0.170 | 43.61 | -11.35 |
| 2.318 | 37.25 | -18.75 | 2.318 | 32.26 | -13.74 |
| 3.862 | 27.88 | -28.12 | 3.862 | 24.58 | -21.42 |

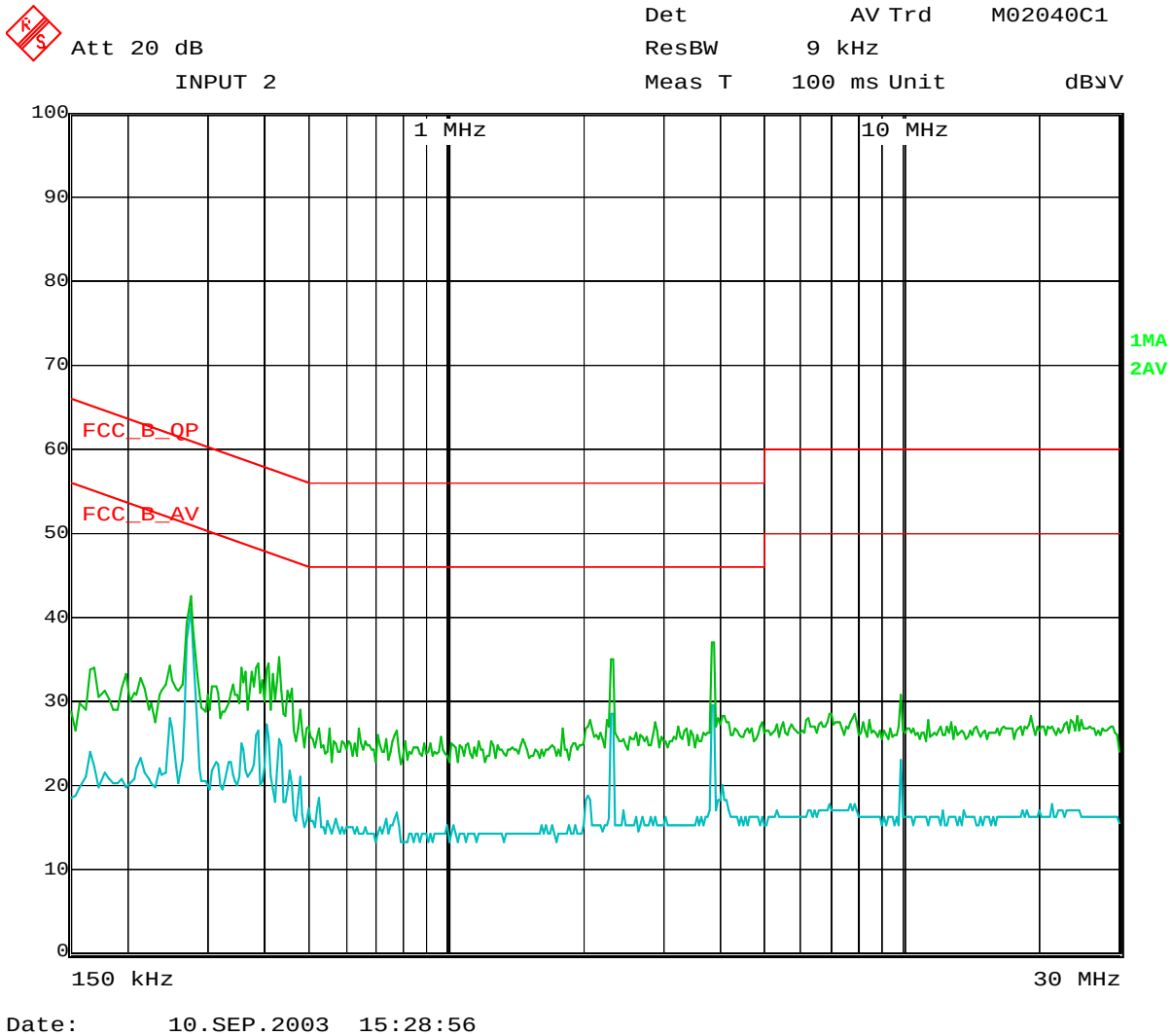


### 9.3.3 LIVE 1 (HEATING is AC powered while EUT is DC powered)

Measurement are done on the heating power

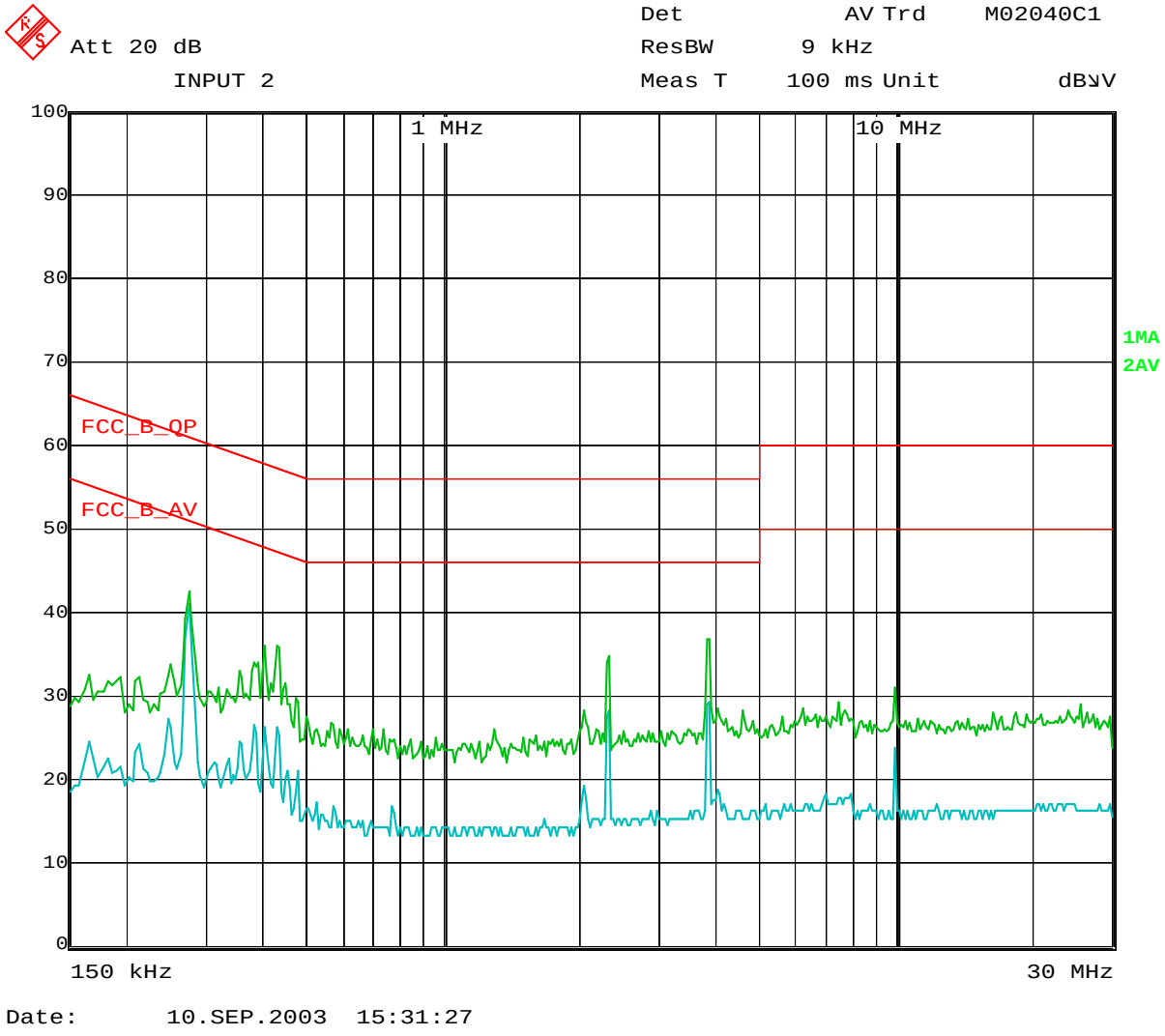
| Frequency (MHz) | Quasi-peak (dBµV/m) | QP margin (dBµV/m) | Frequency (MHz) | Average (dBµV/m) | Average margin (dBµV/m) |
|---|---|---|---|---|---|
| 0.274 | 41.72 | -19.27 | 0.274 | 41.06 | -9.94 |
| 0.426 | 30.55 | -26.78 | 2.314 | 28.06 | -17.94 |
| 2.318 | 32.90 | -23.10 | 2.318 | 28.41 | -17.59 |
| 3.858 | 36.03 | -19.97 | 3.858 | 29.43 | -16.57 |
| 3.862 | 35.63 | -20.37 | 3.862 | 29.25 | -16.75 |

Legend: Blue curve represents average values
Green curve represents the peak values



### 9.3.4 LIVE 2 (HEATING is AC powered while EUT is DC powered)

| Frequency (MHz) | Quasi-peak (dBµV/m) | QP margin (dBµV/m) | Frequency (MHz) | Average (dBµV/m) | Average margin (dBµV/m) |
|---|---|---|---|---|---|
| 0.274 | 41.64 | -19.35 | 0.274 | 40.99 | -10.01 |
| 2.318 | 33.12 | -22.88 | 0.426 | 25.26 | -22.07 |
| 3.858 | 35.79 | -20.21 | 2.318 | 28.30 | -17.70 |
| 3.862 | 35.55 | -20.45 | 3.862 | 29.13 | -16.87 |




### 9.4 INTERPRETATION AND REMARKS:

| The equipment complies with the §15.107 requirements |
|---|

## 9.5 RADIATED EMISSIONS MEASUREMENTS

Before final measurements of radiated emissions were made on the open-field three/ten meter range; the EUT was pre-scanned in the semi anechoic at one meter distance. This was done in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, in order to insure that maximum emission amplitudes were attained. As Part 24 radiated requirements was tested in conjunction with the Part 15 testing. The spectrum was searched to identify emissions. A complete scan of the applicable spectrum was completed (up to $10^{th}$ harmonic of fundamental). The transmitters were then turned off, with the rest of the equipment powered on. A complete scan of the spectrum was done and referred to as "ambient" without the transmitter keyed on. Emissions emanating from the transmitter were identified from comparing these two scans. The identified emissions (from the transmitter) were measured and the levels recorded with the transmitter keyed on at full rated power output.

Final radiated emissions measurements were made, as outlined in Section 8 of the ANSI C63.4 measurement standard, on the three/ten-meter, open-field test site. The EUT was placed on a nonconductive turntable 0.1 meter above the ground plane. The iBTS was tested to the applicable limits of the FCC rules. The measurement distance between the center of the measurement antenna and the equipment under test is 10 meters (or less for frequencies above 1 GHz .At each frequency, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters in order to determine the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarizations. The spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. No video filter less than 10 times the resolution bandwidth was used. The range of the frequency spectrum to be investigated is specified in FCC Part 15. The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

**Since the EUT has a DC and AC versions, pre-scan measurements were performed in both modes to determine which on was the worst case conditions. For this reasons measurements were performed only on 208V ac version ( see pages 20 and 22 for pre-scan data)**

**Summary of settings**

| ESI 7 EMI TEST RECEIVER IN RECEIVER MODE | |
|---|---|
| Peak measurement time | 5 ms |
| step size | 40 KHz |
| Preamplifier | ON |
| Preselector | ON |
| Resolution, Band With | 120 kHz |
| Final Quasi Peak measurement time | 1 s minimum |
| Final average measurement time | 1 second |

All readings are quasi-peak unless stated otherwise.

### 9.5.1 Test Set up

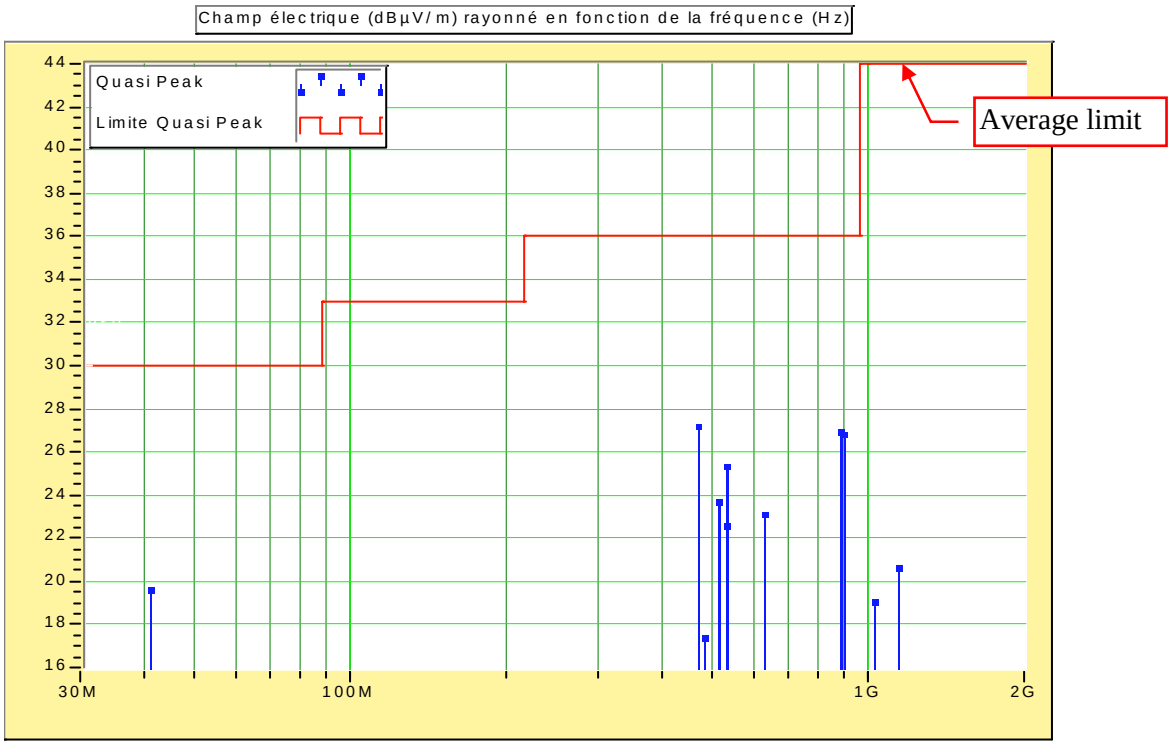
## 9.6 RESULTS (§ 15.109 class B):

The following data table lists the most significant emission frequencies, measured level, correction factor (includes cable and antenna corrections), corrected reading and the limit. The highest peaks are measured in quasi-peak detection mode at 10 meters distance, except for emissions radiated above 1 GHz where an average detector with 1 MHz resolution bandwidth was used.

**Results**

| F (MHz) | PK (dBµV/m) | QP (dBµV/m) | Margin (dB) | Pol | H (cm) | Angle (degrees) | Corr. Fact(dB) | RBW (kHz) | Comments |
|---|---|---|---|---|---|---|---|---|---|
| 40,918 | 28,22 | 19,65 | -10,35 | V | 104 | 64 | 13,56 | 120 | |
| 468,018 | 30,62 | 27,22 | -9,78 | V | 239 | 323 | 20,49 | | |
| 483,379 | 22,32 | 17,38 | -19,62 | V | 104 | 352 | 20,78 | | |
| 511,183 | 27,05 | 23,70 | -13,30 | V | 250 | 329 | 21,27 | | |
| 530,833 | 28,13 | 25,33 | -11,67 | V | 103 | 353 | 21,57 | | |
| 533,332 | 26,28 | 22,55 | -14,45 | V | 249 | 345 | 21,61 | | |
| 629,148 | 26,45 | 23,11 | -13,89 | V | 104 | 6 | 22,78 | | |
| 884,744 | 30,61 | 26,92 | -10,08 | V | 232 | 7 | 24,69 | | |
| 894,585 | 29,66 | 26,83 | -9,17 | V | 241 | 356 | 24,69 | | |

| F (MHz) | PK (dBµV/m) | Average (dBµV/m) | Margin (dB) | Pol | H (cm) | Angle (degrees) | Corr. Fact (dB) | RBW (kHz) | Comments |
|---|---|---|---|---|---|---|---|---|---|
| 1022,371 | 30,74 | 19,06 | -25,74 | V | 224 | 328 | 26,79 | 1 MHz | Average |
| 1142,407 | 32,70 | 20,61 | -27,22 | V | 208 | 353 | 27,67 | | |



For indicative level

| F (MHz) | PK (dBµV/m) | QP (dBµV/m) | Pol | H (cm) | A (degrees) | Corr. fact (dB) | RBW (kHz) | Comments |
|---|---|---|---|---|---|---|---|---|
| **1960.000** | **61** | **59** | **V** | **103** | **221** | **32.66** | **1000** | **transmitter** |

**Only two spurious signals were found at 1022,371 and 1142,407 MHz with an attenuation greater than – 25dB. No other spurious signal found between 1.2 GHZ and 20 GHZ**

## 9.7 INTERPRETATION AND REMARKS:

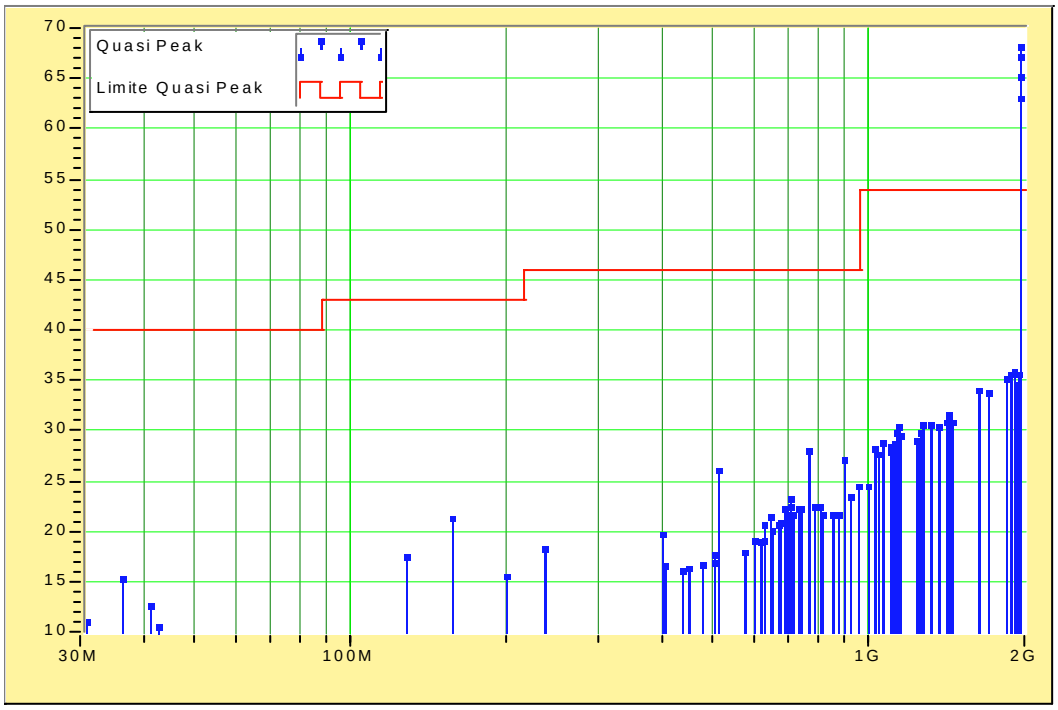
| The equipment complies with the §15.109 requirements |
|---|

## 9.8 PRE-SCAN MEASUREMENT TO IDENTIFY SPURIOUS EMISSIONS FROM EUT at D = 1m WHEN EUT IS – 48V dc powered:

| F (MHz) | PK (dBµV/m) | Margin (dB) | Pol | H (cm) | Angle (degrees) | Corr. Fact. (dB) | Comments |
|---|---|---|---|---|---|---|---|
| 30,05 | 10,11 | -29,89 | H | 100 | 90 | 16,77 | |
| 30,75 | 10,99 | -29,01 | H | 100 | 0 | 16,5 | |
| 36,297 | 15,38 | -24,62 | V | 100 | 90 | 14,34 | |
| 40,894 | 12,51 | -27,49 | V | 100 | 90 | 12,56 | |
| 42,493 | 10,65 | -29,35 | V | 100 | 90 | 11,94 | |
| 127,848 | 17,59 | -25,41 | H | 100 | 0 | 13,46 | |
| 157,282 | 21,29 | -21,71 | V | 100 | 0 | 12,58 | |
| 200,059 | 15,48 | -27,52 | V | 100 | 0 | 11,09 | |
| 235,94 | 18,29 | -27,71 | V | 100 | 0 | 13,44 | |
| 400,003 | 19,72 | -26,28 | H | 100 | 90 | 19,2 | |
| 404,301 | 16,52 | -29,48 | H | 100 | 90 | 19,26 | |
| 438,232 | 16,15 | -29,85 | H | 100 | 90 | 19,71 | |
| 450,526 | 16,31 | -29,69 | V | 100 | 0 | 19,88 | |
| 476,562 | 16,66 | -29,34 | H | 100 | 90 | 20,23 | |
| 502,298 | 17,01 | -28,99 | V | 100 | 90 | 20,57 | |
| 502,548 | 17,84 | -28,16 | H | 100 | 90 | 20,57 | |
| 502,898 | 17,84 | -28,16 | V | 100 | 0 | 20,58 | |
| 511,194 | 26,07 | -19,93 | H | 100 | 0 | 20,69 | |
| 577,758 | 18,04 | -27,96 | H | 100 | 90 | 21,61 | |
| 600,896 | 19,19 | -26,81 | H | 100 | 0 | 21,94 | |
| 618,436 | 18,85 | -27,15 | V | 100 | 0 | 22,51 | |
| 626,682 | 19,12 | -26,88 | H | 100 | 90 | 22,78 | |
| 628,231 | 19,17 | -26,83 | V | 100 | 90 | 22,83 | |
| 629,081 | 20,78 | -25,22 | V | 100 | 0 | 22,86 | |
| 647,621 | 21,47 | -24,53 | V | 100 | 0 | 23,47 | |
| 652,968 | 20,1 | -25,90 | V | 100 | 90 | 23,64 | |
| 670,708 | 20,79 | -25,21 | H | 100 | 90 | 24,22 | |
| 675,356 | 20,96 | -25,04 | V | 100 | 0 | 24,37 | |
| 690,098 | 22,25 | -23,75 | V | 100 | 90 | 24,86 | |
| 692,097 | 21,47 | -24,53 | H | 100 | 90 | 24,92 | |
| 701,492 | 21,63 | -24,37 | V | 100 | 90 | 25,17 | |
| 702,991 | 21,64 | -24,36 | V | 100 | 0 | 25,16 | |
| 705,09 | 22,48 | -23,52 | V | 100 | 90 | 25,15 | |
| 707,839 | 23,24 | -22,76 | H | 100 | 0 | 25,13 | |
| 712,486 | 21,65 | -24,35 | V | 100 | 0 | 25,1 | |
| 732,276 | 22,31 | -23,69 | V | 100 | 0 | 24,97 | |
| 736,374 | 22,27 | -23,73 | V | 100 | 90 | 24,95 | |
| 766,807 | 27,99 | -18,01 | V | 100 | 90 | 24,75 | |
| 786,847 | 22,6 | -23,40 | H | 100 | 90 | 24,62 | |
| 808,235 | 22,54 | -23,46 | H | 100 | 90 | 24,56 | |
| 854,61 | 21,75 | -24,25 | H | 100 | 90 | 24,69 | |
| 876,299 | 21,82 | -24,18 | H | 100 | 90 | 24,75 | |
| 894,589 | 27,18 | -18,82 | V | 100 | 0 | 24,8 | |
| 923,724 | 23,47 | -22,53 | V | 100 | 90 | 25,59 | |
| 952,958 | 24,6 | -21,40 | V | 100 | 0 | 26,56 | |
| 1002,382 | 24,58 | -29,42 | V | 100 | 90 | 28,12 | |
| 1027,868 | 28,24 | -25,76 | H | 100 | 90 | 28,2 | |
| 1047,358 | 27,62 | -26,38 | H | 100 | 90 | 28,26 | |
| 1063,749 | 28,78 | -25,22 | H | 100 | 90 | 28,31 | |

| F (MHz) | PK (dBµV/m) | Margin (dB) | Pol | H (cm) | Angle (degrees) | Corr. Fact. (dB) | Comments |
|---|---|---|---|---|---|---|---|
| 1101,079 | 28,39 | -25,61 | V | 100 | 0 | 28,44 | |
| 1101,679 | 27,8 | -26,20 | H | 100 | 0 | 28,45 | |
| 1111,574 | 28,53 | -25,47 | H | 100 | 90 | 28,58 | |
| 1117,42 | 28,61 | -25,39 | V | 100 | 0 | 28,65 | |
| 1131,813 | 29,88 | -24,12 | H | 100 | 90 | 28,84 | |
| 1139,459 | 30,48 | -23,52 | V | 100 | 90 | 28,94 | |
| 1147,354 | 29,56 | -24,44 | H | 100 | 90 | 29,05 | |
| 1242,254 | 29,02 | -24,98 | H | 100 | 90 | 30,29 | |
| 1249,95 | 29,12 | -24,88 | H | 100 | 90 | 30,39 | |
| 1254,697 | 29,82 | -24,18 | H | 100 | 90 | 30,46 | |
| 1266,341 | 30,58 | -23,42 | H | 100 | 90 | 30,61 | |
| 1321,362 | 30,66 | -23,34 | V | 100 | 0 | 31,29 | |
| 1360,541 | 30,46 | -23,54 | H | 100 | 90 | 31,73 | |
| 1411,963 | 30,95 | -23,05 | V | 100 | 90 | 32,2 | |
| 1421,708 | 31,61 | -22,39 | V | 100 | 90 | 32,21 | |
| 1431,153 | 30,97 | -23,03 | V | 100 | 0 | 32,22 | |
| 1444,346 | 30,96 | -23,04 | V | 100 | 90 | 32,24 | |
| 1447,295 | 30,95 | -23,05 | V | 100 | 0 | 32,24 | |
| 1622,701 | 34,13 | -19,87 | V | 100 | 90 | 33,57 | |
| 1708,955 | 33,81 | -20,19 | H | 100 | 90 | 33,83 | |
| 1839,686 | 35,27 | -18,73 | V | 100 | 90 | 35,29 | |
| 1873,967 | 35,64 | -18,36 | H | 100 | 90 | 35,65 | |
| 1905,55 | 35,91 | -18,09 | H | 100 | 0 | 35,88 | |
| 1926,839 | 34,61 | -19,39 | V | 100 | 90 | 35,68 | |
| 1947,078 | 35,72 | -18,28 | V | 100 | 90 | 35,49 | |
| 1958,422 | 68,26 | 14,26 | V | 100 | 90 | 35,39 | |
| 1958,672 | 62,98 | 8,98 | H | 100 | 0 | 35,39 | |
| 1959,522 | 65,3 | 11,30 | H | 100 | 90 | 35,38 | |
| 1961,57 | 67,22 | 13,22 | V | 100 | 0 | 35,36 | Transmitter |
| 854,61 | 21,75 | -24,25 | H | 100 | 90 | 24,69 | |
| 876,299 | 21,82 | -24,18 | H | 100 | 90 | 24,75 | |

Champ électrique (dBµV/m) rayonné en fonction de la fréquence (Hz)

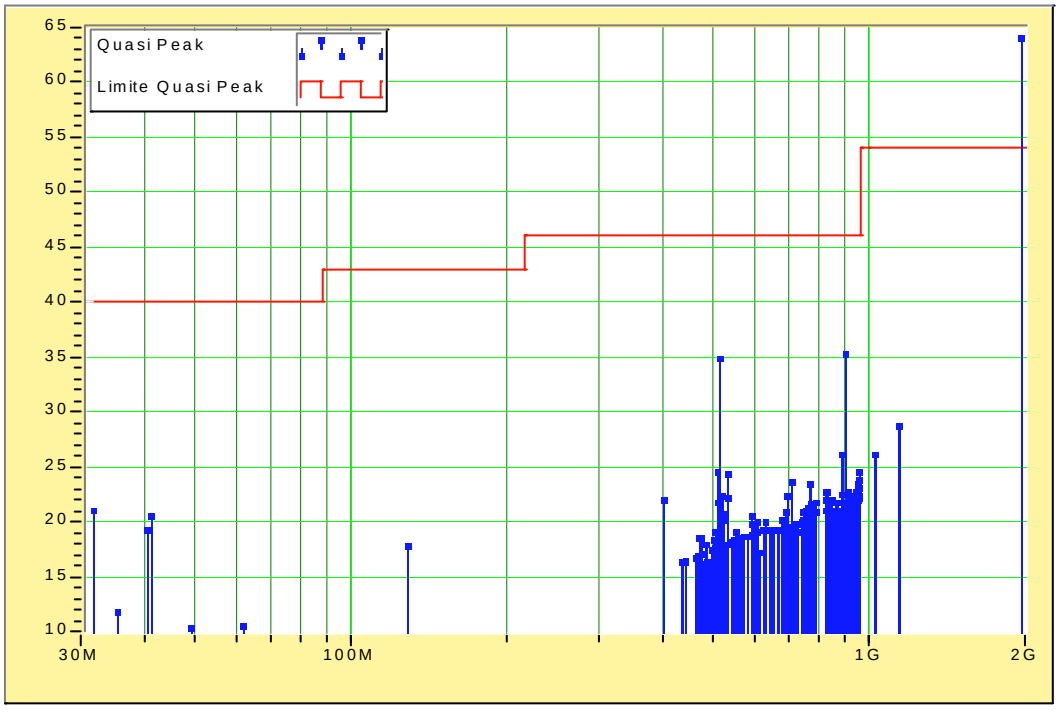


## 9.9 PRE-SCAN MEASUREMENT TO IDENTIFY SPURIOUS EMISSIONS FROM EUT at D = 1m WHEN EUT IS 208Vac powered:

| F (MHz) | PK (dBµV/m) | Margin (dB) | Pol | H (cm) | Angle (degrees) | Corr. Fact. (dB) | Comments |
|---|---|---|---|---|---|---|---|
| 31,644 | 21,18 | V | 100 | 90 | 17,88 | 31,644 | |
| 35,249 | 11,77 | V | 100 | 90 | 16,25 | 35,249 | |
| 40,132 | 19,29 | V | 100 | 90 | 13,91 | 40,132 | |
| 48,901 | 10,28 | V | 100 | 90 | 10,34 | 48,901 | |
| 61,756 | 10,49 | V | 100 | 90 | 6,97 | 61,756 | |
| 127,848 | 17,89 | V | 100 | 90 | 13,49 | 127,848 | |
| 432,585 | 16,30 | V | 100 | 90 | 19,83 | 432,585 | |
| 440,081 | 16,45 | V | 100 | 90 | 19,97 | 440,081 | |
| 442,080 | 16,48 | H | 100 | 90 | 20,01 | 442,080 | |
| 459,021 | 16,80 | H | 100 | 90 | 20,32 | 459,021 | |
| 465,518 | 16,92 | H | 100 | 90 | 20,45 | 465,518 | |
| 468,067 | 18,55 | H | 100 | 90 | 20,49 | 468,067 | |
| 470,965 | 17,01 | H | 100 | 90 | 20,55 | 470,965 | |
| 471,765 | 17,03 | V | 100 | 90 | 20,56 | 471,765 | |
| 471,914 | 18,61 | H | 100 | 90 | 20,56 | 471,914 | |
| 473,264 | 17,06 | H | 100 | 90 | 20,59 | 473,264 | |
| 473,614 | 17,06 | H | 100 | 90 | 20,60 | 473,614 | |
| 475,762 | 16,18 | V | 100 | 90 | 20,64 | 475,762 | |
| 476,312 | 16,19 | V | 100 | 90 | 20,65 | 476,312 | |
| 478,861 | 16,24 | H | 100 | 90 | 20,69 | 478,861 | |
| 479,560 | 16,25 | V | 100 | 90 | 20,71 | 479,560 | |
| 480,810 | 16,27 | V | 100 | 90 | 20,73 | 480,810 | |
| 483,408 | 18,06 | H | 100 | 90 | 20,78 | 483,408 | |
| 484,258 | 16,33 | V | 100 | 90 | 20,80 | 484,258 | |
| 491,454 | 16,46 | H | 100 | 90 | 20,93 | 491,454 | |
| 495,302 | 17,44 | V | 100 | 90 | 21,00 | 495,302 | |
| 497,151 | 18,30 | H | 100 | 90 | 21,04 | 497,151 | |
| 500,249 | 17,53 | V | 100 | 90 | 21,09 | 500,249 | |
| 501,399 | 19,13 | H | 100 | 90 | 21,11 | 501,399 | |
| 511,194 | 34,86 | H | 100 | 90 | 21,27 | 511,194 | |
| 571,361 | 18,66 | V | 100 | 90 | 22,21 | 571,361 | |
| 578,957 | 18,78 | V | 100 | 90 | 22,33 | 578,957 | |
| 581,306 | 18,82 | V | 100 | 90 | 22,37 | 581,306 | |
| 600,046 | 19,92 | V | 100 | 90 | 22,66 | 600,046 | |
| 621,735 | 19,24 | H | 100 | 90 | 22,75 | 621,735 | |
| 624,133 | 19,25 | V | 100 | 90 | 22,76 | 624,133 | |
| 650,769 | 19,30 | V | 100 | 90 | 22,87 | 650,769 | |
| 651,019 | 19,30 | H | 100 | 90 | 22,87 | 651,019 | |
| 653,668 | 19,31 | V | 100 | 90 | 22,89 | 653,668 | |
| 662,563 | 19,32 | V | 100 | 90 | 22,92 | 662,563 | |
| 673,657 | 20,18 | H | 100 | 90 | 22,97 | 673,657 | |
| 677,105 | 19,36 | V | 100 | 90 | 22,98 | 677,105 | |
| 691,797 | 19,44 | H | 100 | 90 | 23,05 | 691,797 | |
| 694,496 | 22,39 | V | 100 | 90 | 23,06 | 694,496 | |
| 697,044 | 19,49 | V | 100 | 90 | 23,07 | 697,044 | |
| 698,094 | 19,50 | V | 100 | 90 | 23,07 | 698,094 | |
| 699,293 | 19,51 | V | 100 | 90 | 23,08 | 699,293 | |
| 702,342 | 19,54 | H | 100 | 90 | 23,12 | 702,342 | |
| 702,891 | 18,63 | V | 100 | 90 | 23,13 | 702,891 | |

| F (MHz) | PK (dBµV/m) | Margin (dB) | Pol | H (cm) | Angle (degrees) | Corr. Fact. (dB) | Comments |
|---|---|---|---|---|---|---|---|
| 705,040 | 19,57 | V | | 9 | 23,16 | 705,040 | |
| 705,790 | 19,58 | V | | 9 | 23,17 | 705,790 | |
| 707,789 | 23,68 | V | | 9 | 23,20 | 707,789 | |
| 735,974 | 19,13 | H | | 9 | 23,65 | 735,974 | |
| 766,807 | 23,54 | V | | 9 | 24,14 | 766,807 | |
| 785,397 | 21,76 | V | | 9 | 24,43 | 785,397 | |
| 820,579 | 22,01 | H | | 9 | 24,67 | 820,579 | |
| 852,412 | 21,10 | V | | 9 | 24,68 | 852,412 | |
| 877,498 | 21,03 | V | | 9 | 24,68 | 877,498 | |
| 894,589 | 35,40 | V | | 9 | 24,69 | 894,589 | |
| 921,425 | 22,29 | H | | 9 | 25,12 | 921,425 | |
| 924,223 | 22,35 | V | | 9 | 25,17 | 924,223 | |
| 924,473 | 22,35 | H | | 9 | 25,18 | 924,473 | |
| 925,173 | 21,54 | V | | 9 | 25,19 | 925,173 | |
| 928,971 | 21,62 | H | | 9 | 25,27 | 928,971 | |
| 931,519 | 21,68 | H | | 9 | 25,32 | 931,519 | |
| 935,517 | 21,77 | V | | 9 | 25,40 | 935,517 | |
| 936,917 | 22,63 | H | | 9 | 25,42 | 936,917 | |
| 942,414 | 22,76 | V | | 9 | 25,53 | 942,414 | |
| 943,763 | 23,55 | H | | 9 | 25,56 | 943,763 | |
| 944,662 | 22,82 | V | | 9 | 25,58 | 944,662 | |
| 947,711 | 22,89 | H | | 9 | 25,64 | 947,711 | |
| 948,510 | 22,08 | H | | 9 | 25,66 | 948,510 | |
| 951,959 | 22,17 | V | | 9 | 25,72 | 951,959 | |
| 955,906 | 23,84 | V | | 9 | 25,80 | 955,906 | |
| 958,005 | 22,31 | V | | 9 | 25,84 | 958,005 | |
| 958,855 | 24,61 | H | | 9 | 25,86 | 958,855 | |
| 1022,371 | 26,21 | H | | 9 | 26,79 | 1022,371 | |
| 1142,407 | 28,73 | H | | 9 | 27,67 | 1142,407 | |
| 1959,522 | 64,08 | H | | 9 | 34,15 | 1959,522 | Transmitter |

Champ électrique (dBµV/m) rayonné en fonction de la fréquence (Hz)



# 10 TEST ACCORDING TO CFR 47 Part 24 subpart E

Tests performed by Daniel RAUD at GYL Technologies laboratories on September 9 and 10, 2003.

## 10.1 REFERENCE DOCUMENTATION:

CFR 47 part 24 subpart E (§ 24.238) of 2000

## 10.2 RADIATED DISTURBANCE:

### 10.2.1 General measurement conditions.

Conforms to Section 8 of the ANSI C63.4 measurement standard.
Diagram in 0° position, angles are positives in the reverse clock wise.

**Equipment under test set up**:

.

### 10.2.2 Method of measurement.

Measurements are done at 10m in an open area test site and maximum at all frequencies is analyzed by moving the product orientation and antenna polarization. The height of the antenna can vary from 1 m to 4 m Since no emission were detected above 1 GHZ a less than 30 cm scan was performed
Measurements are done in transmitter mode (the transmitter is at 30Watts maximum power)

### 10.2.3 RESULTS (§24.238):

Measurement at transmitters' frequencies **for indicative level**
Transmitters output connected to resistive 50 ohms loads

| FREQUENCY (MHz ) | Measure ( dBµV ) | AF A | Loss cable B | Correc. Factor A+B | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| **1 960.0** | **37.1** | **27.9** | **2** | **29.9** | **67** | **93.9** | **-26.9** |

### 10.2.4 Spurious emissions measurement (peak values) at D=1m

The measurement instrumentation has a resolution bandwidth of 10 kHz up to 10 MHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of 100 kHz was used. Outside this bandwidth, all emissions shall be attenuated at least 26 dB below the transmitter power.

Only two spurious emissions in horizontal polarization found which level upper to noise level in 1 MHz bandwidth (harmonics transmitters' frequencies under noise level)

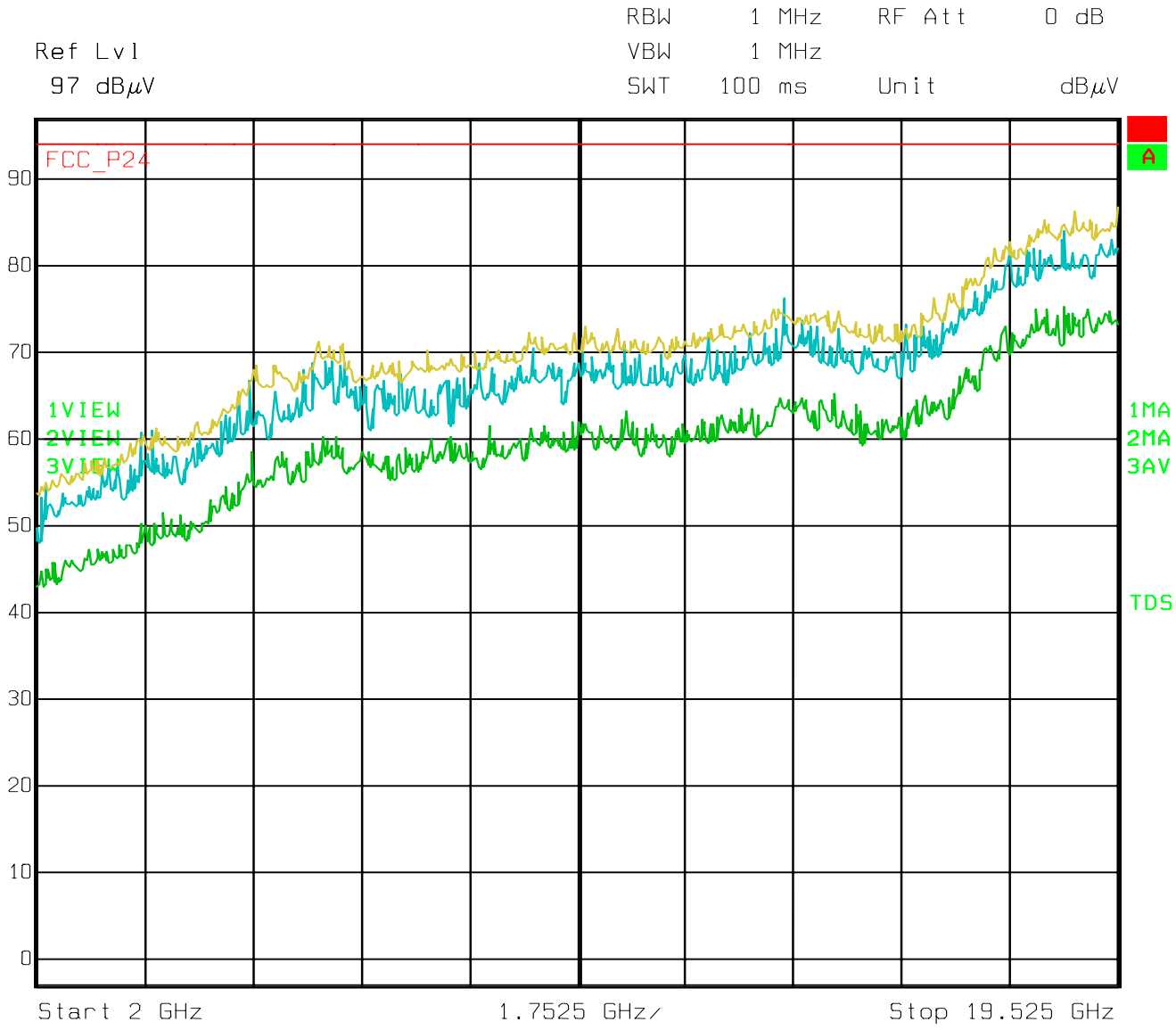
| FREQUENCY (MHz ) | Measure (dBµV ) | AF A | Loss cable B | Correc. Factor A+B | Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| **1022,371** | **noisefloor** | **27.9** | **2** | **29.9** | **noisefloor** | **93.9** | **>-60dB** |
| **1142,407** | **noisefloor** | **27.9** | **2** | **29.9** | **noisefloor** | **93.9** | |

## 10.3 INTERPRETATION AND REMARKS:

The equipment complies with the §24.238 requirements

Spectrum of noise level from 1GHz to 20GHz including cables loss and antenna factors

**Legend**:
Yellow curve represents the peak measurement in max hold mode
Blue curve represents the peak measurement in sweeping mode
Green curve represents the average measurements



SANMINA-SCI

# UMTS 1900 Mono iBTS: EMC test plan

| | |
|---|---|
| **Reference:** | **PLN-T-030459-6G1** |
| **Version:** | **A** |
| **Status:** | **Approved** |
| **Date:** | **09/07/2003** |

| | |
|---|---|
| **Product Name:** | **UMTS 1900 Mono iBTS** |
| **Frequency:** | **UMTS-1900** |
| **Discipline:** | **EMC** |


| | |
|---|---|
| **Author:** | **Marc CANCOUËT** |
| **Verified by:** | **Patrick GALOPIN** |
| **Approved by:** | **Christian CHANSARD** |

# PUBLICATION HISTORY

| VERSION | DATE | AUTHOR | MODIFICATION |
|---|---|---|---|
| A | 06/08/2003 | M. CANCOUËT | Creation of the document |

# CONTENTS

# 1. INTRODUCTION

The purpose of this document is to present the plan for the EMC qualification of the UMTS 1900 Mono iBTS used for the US Market. The conformity with the test program presented below will be used to demonstrate the compliance of the UMTS 1900 Mono iBTS with the Electromagnetic Compatibility applicable standard.

For North America, applicable standard for EMC Base stations are the FCC part 15 Class B and the FCC Part 24.

This document applies to:

| | |
|---|---|
| *Product:* | UMTS 1900 Mono iBTS |
| *Manufacturer:* | NORTEL NETWORKS |
| *Frequencies:* | 1930 – 1990 MHz |
| *Configuration:* | OTOR1 |
| *Option:* | PCM lightening protection kit |
| | External alarm module |
| | DC box |

# 2. RELATED DOCUMENTS

## 2.1. APPLICABLES DOCUMENTS

| | | |
|---|---|---|
| [A1] | 47CFR Part 2 | FCC Rules for Radio Frequency Devices, Title 47 of the Code of Federal Regulations - Frequency allocations and radio treaty matters; general rules and regulations - dated 10/1/01 |
| [A2] | 47 CFR Part 15 | FCC Rules for Radio Frequency Devices, Title 47 of the Code of Federal Regulations - Radio frequency devices - dated 10/1/01 |
| [A3] | 47 CFR Part 24 | FCC Rules for Radio Frequency Devices, Title 47 of the Code of Federal Regulations - Personal communications services - dated 10/1/01 |
| [A4] | 47 CFR Part 15 08/20/02 | FCC Rules for Radio Frequency Devices, Title 47 of the Code of Federal Regulations – Radio frequency devices – dated 08/20/02 |

## 2.2. REFERENCE DOCUMENTS

| | | |
|---|---|---|
| [R1] | UMT/BTS/DD/0017 | E-Mobility iBTS Platform / UMTS Product Specification |
| [R2] | UMT/COM/DD/001 | UMTS Product Overview |
| [R3] | UMT/DCL/DD/002 | IBTS Reference Manual |
| [R4] | UMT/BTS/DD/453 | Requirements specification for a Mono cabled cabinet |
| [R5] | UMT/BTS/DD/552 | Mono iBTS Modular Structure |
| [R6] | UMT/BTS/DD/453 | Requirements specification for a Mono cabled cabinet |

# 3. REQUIREMENTS BEFORE EMC ASSESSMENT

## 3.1. HARDWARE TECHNICAL STATUS

Details on the technical status of the system will be available in the document, supplied by Nortel Networks during the commissioning & acceptance phase form for UMTS 1900 Mono iBTS.

## 3.2. LIST OF KITS & CABLES

### 3.2.1 LIST OF KITS

In fact, protections modules are optional but can be used to protect the PCM links & the Alarms links. These modules are made only with passive components and then are not critical modules for the system.
Kits are the following :

Kits: PCM lightning protection (NTUM98BA)
EAM lightning protection (NTUM98AA)

The TMA Kit (NTUM35AA) as ancillary equipments already comply with FCC standard, and is under the responsibility of the OEM supplier.

### 3.2.2 LIST OF CABLES

The following ports of the UMTS 1900 Mono iBTS were available and connected:

- Iub port (telecom port): cable referenced NTQG41HA 25 meters 100Ω. This cable has been looped in order to transmit TX signals on RX ones.
- Alarms externs ports: cable referenced NTUM41JA 25 meters. 1 cable has been looped and the other cable has been in open circuit.
- Radio port (signal port) : 6 RF cables RADIALL SHF9TD – DC-2GHz – Insertion loss < 5.5 dB at 2 GHz (15 meters). Attenuators and loads have also been used on RF links.
- DC port : Lab cable (about 10 meters).

## 3.3. SOFTWARE NEEDS FOR IBTS UMTS 1900 MONO IBTS

As the objective is to perform the FCC marking on the UMTS 1900 Mono iBTS OTOR1, we need to use performance criteria as defined in the EMC applicable standard for UMTS project.
Consequently, for emissions, we have to configure the equipment with the power amplifiers set at their maximum rated level, and looped back the Iub link in order to generate activity inside this cable.

If one of the above functionality is not available for the testing phase, we will not be able to perform the FCC marking based on the tests realized.

# 4. TEST PLAN SUMMARY

## 4.1. TESTS MATRIX FOR QUALIFICATION

The following table lists the tests to be done, the severity level to apply, the configuration to test and comment when necessary.

| | Test case | Application | Standard | Test requirement | Performance criteria | Comment |
|---|---|---|---|---|---|---|
| | Emission tests | | | | | |
| 1 | Radiated emissions | Enclosure of iBTS Indoor | FCC Part 15 § 15.109 | 30MHz – 18 GHz | Class B | **This EMC test is realized with the DC box configuration.** |
| 2 | Radiated emissions | Enclosure of iBTS Indoor | FCC Part 24 § 24.238 | 30 MHz – 20GHz | The spurious emissions must be attenuated by at least 43 + 10 Log(P)<br>P = Transmitter rated Power in Watts | **This EMC test is realized with the DC box configuration.** |
| 3 | Conducted emissions | AC Power | FCC Part 15 | 150 kHz – 30 MHz | Class B | **This EMC test is realized in AC Power, in two configuration: with & without DC box option** |

# 4.2. TEST DESCRIPTION OF THE RADIATED EMISSION

**Standard Coverage** : FCC Part 15.109, FCC Part 24.238

**Intend** :

(a) Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonics and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of 2.989, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required, with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open filed measurements (e.g., a broadcast transmitter installed in a building) measurements will be acceptable of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from half-wave dipole antennas.

(b) The measurements specified in paragraph (a) of this section shall be made for the following equipment :

  (1) Those in which the spurious emission are required to be 60 dB or more below the mean power of the transmitter.
  (2) All equipment operating on frequencies higher than 25 MHz.
  (3) All equipment where the antenna is an integral part of, and attached directly to the transmitter.
  (4) Other types of equipment as required, when deemed necessary by the Commission.

**Test Procedure** :

Radiated emission measurement procedures shall be performed as outlined in Section 8 of the ANSI C63.4 measurement standard. The iBTS will be tested to the applicable limits of the FCC rules. For radiated emission measurements the measurement distance between the center of the measurement antenna and the equipment under test shall be 3 meters (or less for frequencies above 1 GHz). In order to maximize all emission levels from the equipment, the emissions will be searched with the receive antenna at varied height levels. The equipment shall also be rotated a full 360 degrees on the turntable with the receive antenna at varying height levels (1 to 4 meters). Tests shall be made with the antenna positioned in both the horizontal and vertical planes of polarization. The iBTS shall be placed on the turntable as per ANSI C63.4 measurement procedures. Please see the Part 15 test plan as Part 24 radiated requirements will be tested in conjunction with the Part 15 testing. The spectrum shall be searched to identify emissions. A complete scan of the applicable spectrum shall be completed (up to $10^{th}$ harmonic of fundamental). The transmitter shall then be turned off, with the rest of the equipment powered on. A complete scan of the spectrum shall be done and referred to as “ambient” without the transmitter keyed on. Emissions emanating from the transmitter shall be identified from comparing these two scans. The identified emissions (from the transmitter) shall be measured and the levels recorded with the transmitter keyed on at full rated power output.

**Important remark :**

Substitution measurements must be made on all detected emissions given that the limits for the FCC are given in power measurements. If no emissions are detected, measurements should be made et the noise floor levels for each of the transmitter harmonic frequencies and a statement should be placed in the test report indicating that no emissions were detected.

The equipment was configured as shown in the next figure.

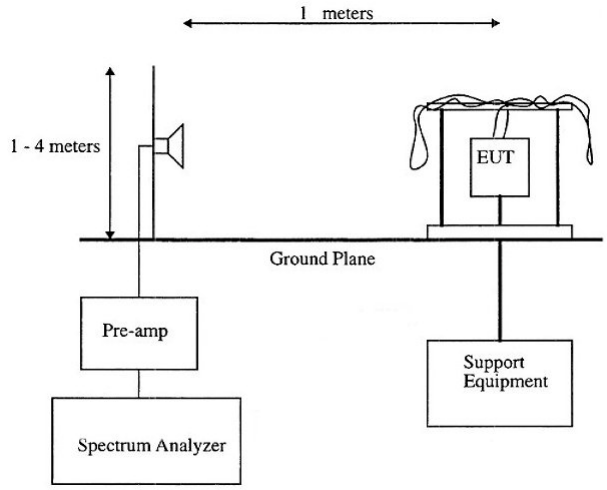



*Figure 7 : Test configuration for Radiated Spurious emissions*

**Limits for radiated emissions from FCC Part 24.**

| **Frequency range** | **Minimum requirement (e.r.p.)/Reference Bandwidth** |
|---|---|
| 30 MHz≤ f <20 GHz | The spurious emissions must be attenuated by at least 43 + 10 Log(P) P = Transmitter rated Power in Watts |

Limits for radiated emissions (FCC Part 15 class B)

| Frequency range MHz | Distance m | Electrics fields | |
|---|---|---|---|
| | | µV/m | dBµV/m |
| 30-88 | 3 | 100 | 40 |
| 88-216 | 3 | 150 | 43.5 |
| 216-960 | 3 | 200 | 46 |
| >960 | 3 | 500 | 54 |

Measurements were made according to the procedures outline in ANSI C63.4
The emissions were investigated up to the tenth harmonic of the fundamental emission (20 GHz).
The measured level of the emissions was recorded and compared to the limit.
The reference level for spurious radiation was taken with reference to an ideal dipole antenna excited by the rated output power according to the following relationship :

$$E(V/m) = \frac{1}{R(m)} * \sqrt{30 * Pt * G}$$

Where,

E = Field Strength in Volts/meter,
R = Measurement distance in meters,
$P_t$ = Transmitter Rated Power in Watts (30 Watts),
G = Gain of ideal Dipole (linear)

Therefore :

$$\mathbf{E(V/m) = \sqrt{30 * 30 * 1.64}}$$

E = 38.42 V/m = 151.69 dBµV/m
The spurious emissions must be attenuated by at least 43 + 10*Log(30) = 57.7 dB.
Therefore the field strength limit at 1 meters is :
E = 151.69 dBµV/m – 57.7 dB = 93.9 dBµV/m

Spectrum Analyzer setting during measurements shall be as following :

| **Receiver Setting** | **Pre-Scan (to identify spurious emissions from EUT)** | **Final Measurements** |
|---|---|---|
| Detector Type | Peak | Quasi-Peak (CISPR) |
| Mode | Max Hold | Not Applicable |
| Bandwidth | 100 kHz or 1 MHz (for > 1GHz) | 120 kHz* |
| Amplitude Range | 60 dB | 20 dB |
| Measurement Time | Not Applicable | > 1s |
| Observation Time | Not Applicable | > 15s |
| Step size | Continuous sweep | Not Applicable |
| Sweep Time | Coupled | Not Applicable |
| Measuring Distance | 3m for 30 MHz - 1GHz<br>1m for 1GHz - 20GHz | 10m for 30 MHz - 1GHz<br>1m for 1GHz - 20GHz |

**Pass / Fail criteria :**

- For 30 MHz to 1 GHz :
  Measurement distance : **10 m**
  Limit : [30 MHz-88 MHz] **30 dBµV/m**
  [88 MHz-216 MHz] **33.5 dBµV/m**
  [216 MHz-960 MHz] **36 dBµV/m**
  Above 960 MHz **43.5 dBµV/m**

- For 1 GHz to 20 GHz :
  Measurement distance : 1 m
  Limit : **93.9 dBµV/m**

**Limits for radiated emissions from FCC Part 24.**

| **Frequency range** | **Minimum requirement (e.r.p.)/Reference Bandwidth** |
|---|---|
| 30 MHz≤ f <20 GHz | The spurious emissions must be attenuated by at least 43 + 10 Log(P) P = Transmitter rated Power in Watts |

Limits for radiated emissions (FCC Part 15 class B)

| Frequency range MHz | Distance m | Electrics fields | |
|---|---|---|---|
| | | µV/m | dBµV/m |
| 30-88 | 3 | 100 | 40 |
| 88-216 | 3 | 150 | 43.5 |
| 216-960 | 3 | 200 | 46 |
| >960 | 3 | 500 | 54 |

### 4.2.1.1 CONTUCTED EMISSIONS

Limits for conducted emissions (FCC Part 15 class B)

| **Frequency range** | **Quasi-peak** | **Average** |
|---|---|---|
| > 0,15-0,5 MHz | 66 - 56 dBµV | 56 - 46 dBµV |
| > 0.5- 5 MHz | 56 dBµV | 46 dBµV |
| > 5-30 MHz | 60 dBµV | 50 dBµV |
| NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz. | | |

## 4.3. IBTS EMISSION TESTS CONFIGURATIONS

In agreement with the Nortel requirements specification [R1 ], EMC tests will be carried out for North America according to the standard FCC part 15 Class B.
The iBTS UMTS will be configured with the maximum hardware activation in order to simulate the worst case. The hardware configuration will then be equivalent to a O1.
We will have the following number of modules:
- 1 CEM
- 1 TRM
- 1 CCM
- 1 GPSAM
- 1 MCPA
- 1 cDDM

For a functional point of view, the test configuration shall be as close to the normal intended use and the base station shall transmit with the maximum power declared by Nortel with all the transmitters active. So the MCPA have to transmit a UMTS radio signal at the maximum power (30W). The iBTS UMTS Mono will be configured to transmit a radio signal corresponding to test model 1 (according to the 3 GPP standard) on the MCPA.
Following the software, we can activate the RF link as follow:

- TRM output on PA transmitting at 1960 MHz and 44.7dBm

In the same time, some data are looped back on the Iub link (external cable with TX and RX looped back together).
The ancillary equipment, as TMA, will be tested separately and have to comply with the TS 25.113 requirements. The iBTS UMTS Mono will not be tested with these ancillary.
All the input/output ports will be connected to representative cables and load. The nominal external cables shall be supplied to Sanmina EMC team before the tests.

Internal protection module is optional but can be used to protect the Alarm links. This module is made only with passive components and then is not critical modules for the system.
This optional module will be used in the system for the tests.

Another internal protection module is optional but can be used to protect the PCM links. This module is made only with passive components and then is not critical modules for the system.
This optional module will not be used in the system for the emission tests.

The power of the Mono iBTS is carried out in 2 ways, either one in 230 V ac only, or the other in 230 V ac and -48 V dc.

# 5. CONCLUSION

The tests presented in this document, if compliant with the EMC standard, will allow determining the compliance of the UMTS 1900 Mono iBTS with the FCC standards.

# 6. ABBREVIATIONS AND DEFINITIONS

## 6.1. ABBREVIATIONS

The following abbreviations are relevant to this document.

| Abbreviation | Explanation |
|---|---|
| 3GPP | Third Generation Partnership Project |
| 3-ϕ | Three Phase |
| A | Ampere |
| AC | Alternating Current |
| AMN | Artificial Mains Network |
| ATM | Asynchronous Transfer Mode |
| BIP | Breaker Interface Panel |
| BLER | Block Error Ratio |
| BS | Base Station |
| BTS | Base station Transceiver System |
| CB | Circuit Breaker |
| CCM | Core Control Module |
| CE | Compliance Europe |
| CEM | Channel Element Module |
| CPICH | Common Pilot Channel |
| CPC | Common Product Code |
| CPU | Central Processing Unit |
| CRC | Cyclic Redundancy Check |
| dB | Decibel |
| dBm | Power unit (in Decibels) referenced to 1 mW |
| dBµV | Voltage unit (in Decibels) referenced to 1 µV |
| dBµV/m | Field Strength unit (in Decibels) referenced to 1 µV/m. |
| DC | Direct Current |
| DDM | Dual Duplexer Module |
| DPCH | Dedicated Physical Channel |
| EFT | Electrical Fast Transients |
| EMC | Electromagnetic Compatibility |
| EMI | Electromagnetic Interference |
| EN | European Norms |
| ESD | Electrostatic Discharge |
| EUT | Equipment Under Test |
| f | Frequency |
| fc | Chip frequency in IS-95 standard. fc = 1.2288MHz |
| FCC | Federal Communications Commission |
| FDD | Frequency Division Duplexing |
| GHz | Gigahertz |
| GPS | Global Positioning System |
| GPSAM | Global Positioning System Alarm Module |
| HSSL | High Speed Serial Links |
| HW | Hardware (also H/W) |
| Hz | Hertz |
| iaw | In Accordance With |
| iBTS | Internet Base station Transceiver System |
| IEC | International Electrotechnical Commission |

| | |
|---|---|
| I/O | Input/Output |
| ITU | International Telecommunications Union |
| kHz | Kilohertz |
| kV | Kilovolt |
| LISN | Line Impedance Stabilization Network |
| m | Meter |
| MCPA | Multichannel Power Amplifier (also PA). |
| MHz | Megahertz |
| mm | Millimeter |
| mW | Milliwatt |
| N/A | Not Applicable |
| OEM | Original Equipment Manufacturer |
| PA | Power Amplifier |
| PCB | Printed Circuit Board |
| PCCPCH | Primary Common Control Physical Channel |
| PEC | Procurement Engineering Code |
| PFM | Power Filter Module |
| PI | Product Integrity |
| PICH | Page Indication Channel |
| PP and G | Power Protection and Ground |
| RF | Radio Frequency |
| R&TTE | Radio and Telecommunications Equipment |
| SF | Spreading Factor |
| STSR3D | Sector Transmit Sector Receive |
| TBT | Test Bench Tools |
| TDD | Time Division Duplexing |
| TMA | Tower Masthead Antenna |
| TRM | Transmit Receive Module |
| ULC | Unlimited Liability Corporation |
| UMTS | Universal Mobile Telecommunications System |
| µV | Microvolts |
| V | Volts |
| VAC | Volts AC |
| VDC | Volts DC |
| W | Watt |

## 6.2. DEFINITIONS

The following are definitions of terms used throughout this test plan.

*Ancillary Equipment* - Equipment (apparatus), used in connection with a receiver, transmitter or transceiver is considered as an ancillary equipment (apparatus) if:

- the equipment is intended for use in conjunction with a receiver, transmitter or transceiver to provide additional operational and/or control features to the radio equipment, (e.g. to extend control to another position or location); and
- the equipment cannot be used on a stand alone basis to provide user functions independently of a receiver, transmitter or transceiver; and
- the receiver, transmitter or transceiver to which it is connected, is capable of providing some intended operation such as transmitting and/or receiving without the ancillary equipment (i.e. it is not a sub-unit of the main equipment essential to the main equipment basic functions).

*Base Station Equipment* - Radio and/or ancillary equipment intended for operation at a fixed location and powered directly or indirectly (e.g. via an AC/DC converter or power supply) by AC mains network, or an extended local DC mains network.

*BLER* - BLER is block error ratio. The BLER calculation shall be based on evaluating the CRC on each transport block.

*Continuous phenomena (continuous disturbance)* **-** Electromagnetic disturbance, the effects of which on a particular device or equipment cannot be resolved into a succession of distinct effects (IEC 60050-161).

*Radio communications equipment* **-** Telecommunications equipment , which includes one or more transmitters and/or receivers and/or parts thereof for use in a fixed, mobile or portable application. It can be operated with ancillary equipment but if so, is not dependent on it for basic functionality.

*Port* **-** A particular interface, of the specified equipment (apparatus), with the electromagnetic environment. For example, any connection point on equipment intended for connection of cables to or from that equipment is considered as a port (see Figure 2-1).

*Signal and control* **-** Port which carries information or control signals, excluding antenna ports.

*Spurious Emission* – Emissions on a frequency, or frequencies, which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products but exclude out-of band emissions.

*Effective Radiated Power (ERP)* – The product of the power supplied to the antenna and its gain relative to a half-wave dipole in a given direction.

*Equivalent Isotropically Radiated Power (e.i.r.p.)* – The product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna.

*Mean power (of a radio transmitter)* – The average power supplied to the antenna transmission line by a transmitter during an interval of tile sufficiently long compared with the lowest frequency encountered in the modulation taken under normal operating conditions.

*Telecommunication port* **-** Ports, which are intended to be connected to telecommunication networks (e.g. public switched telecommunication networks, integrated services digital networks), local area networks (e.g. Ethernet, Token Ring) and similar networks.

*Transient phenomena* **-** Pertaining to or designating a phenomena or a quantity, which varies between two consecutive steady states during a time interval short, compared with the time-scale of interest (IEC 60050-161).

fc -Chip frequency in IS-95 standard. fc = 1.2288MHz

NodeB - A logical node responsible for radio transmission/reception in one or more cells to/from the User Equipment.

Iub - Interface between a Node B and an RNC.

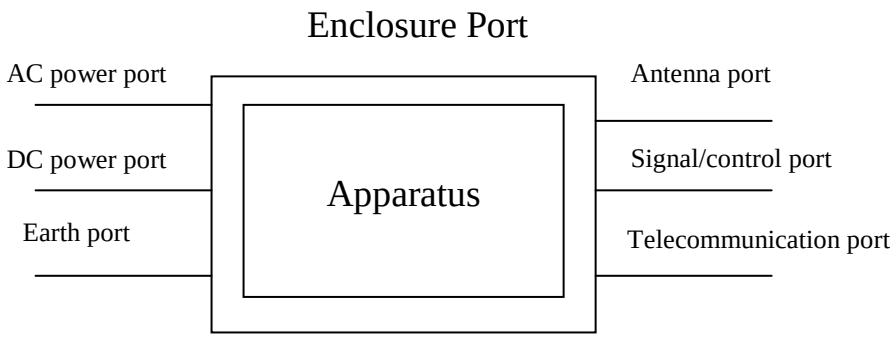



Figure 1: Examples of Ports.

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