

**Test report no. : 106355-6****Item tested : KX-TG9391****Type of equipment : UPCS Base****FCC ID : ACJ96NKX-TG9391****Client : Panasonic Communications Co., Ltd.****FCC Part 15, subpart D**Isochronous UPCS Device  
1920 - 1930 MHz**Industry Canada RSS-213, Issue 2**2 GHz Licence-exempt Personal  
Communications Service Devices  
(LE-PCS)**17 June 2008****Authorized by : .....**Egil Hauger  
Technical Verificator

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## 1 GENERAL INFORMATION

### 1.1 Testhouse Info

Name : Nemko AS  
Address : Nemko Comlab  
Gåsevikveien 8, Box 96  
N-2007 Kjeller, NORWAY  
Telephone : +47 64 84 57 00  
Fax : +47 64 84 57 05  
E-mail: comlab@nemko.com  
FCC test firm  
registration # : 994405  
IC OATS  
registration # : 2040D-1  
Total Number  
of Pages: 59

### 1.2 Client Information

Name : Panasonic Communications Co. Ltd.  
Address : 1-62, 4-chome, Minoshima, Hakata-ku, Fukuoka 812-8531, Japan  
Telephone : +81 92 477 1405

**Contact:**

Name : Mr. Junji Sumi  
Telephone : +81 92 477 1405  
E-mail : sumi.junji@jp.panasonic.com

### 1.3 Manufacturer (if other than client)

Name : /  
Address : /  
Telephone : /  
E-mail : /

## 2 Test Information

### 2.1 Tested Item

|                                    |                                               |
|------------------------------------|-----------------------------------------------|
| Name :                             | Panasonic                                     |
| FCC ID :                           | ACJ96NKX-TG9391                               |
| Model/version :                    | KX-TGA9391                                    |
| Serial number :                    | /                                             |
| Hardware identity and/or version:  | /                                             |
| Software identity and/or version : | /                                             |
| Frequency Range :                  | 1921.536 – 1928.448 MHz                       |
| Number of Channels :               | 5 RF Channels, 5x12 = 60 TDMA Duplex Channels |
| Type of Modulation :               | GFSK                                          |
| User Frequency Adjustment :        | None                                          |
| Rated Output Power :               | 90 mW Peak Power, 4 mW Time Averaged Power    |
| Type of Power Supply :             | AC Adaptor Model: PQLV219 and PQLV207         |
| Antenna Connector :                | None                                          |
| Number of Antennas :               | 2                                             |
| Antenna Diversity Supported :      | Yes                                           |
| Desktop Charger :                  | None                                          |

#### Description of Tested Device(s)

The tested equipment is a DECT base which complies with ETSI EN 300 175. The frequencies have been reprogrammed, the output power reduced and the software updated to comply with the FCC requirements to an Isochronous UPCS device after FCC Part 15D.

The EUT is a responding device as described in ANSI C63.17 and is designed to operate together with a DECT portable part (i.e. a handset), which is then the initiating device.

#### Exposure Evaluation

The EUT is designed to be fixed to a wall etc. and the user manual contains text that it shall be mounted with a separation distance of at least 20cm from any persons. For the purposes of exposure evaluation this EUT is a mobile or fixed device. MPE calculation at 20cm satisfying FCC requirements is submitted as a separate document.

The EUT is exempted from RF Exposure Evaluation to Industry Canada SAR requirements since the output power is below the limit in RSS-102 Issue 2, clause 2.5.2 for General Public Use.

## 2.2 Test Environment

|                      |            |
|----------------------|------------|
| Temperature:         | 21 – 23 °C |
| Relative humidity:   | 30 – 40 %  |
| Normal test voltage: | 115 V AC   |

The values are the limit registered during the test period.

## 2.3 Test Period

|                     |                               |
|---------------------|-------------------------------|
| Item received date: | 2008-04-30                    |
| Test period :       | from 2008-05-05 to 2008-06-17 |

## 2.4 Test Engineer(s)

Frode Sveinsen / Tore Løvlien

## 2.5 Test Equipment

See list of test equipment in clause 6.

## 2.6 Other Comments

The Monitoring and Time and Spectrum Window Access tests were performed with Test Set-Up 6 (Ref. clause 5). A clock signal from the companion device was used to synchronize the Pulse Pattern Generator and the Spectrum Analyzer to the start of the DECT time window. The EUT was limited by administrative commands to operate on only two frequency carriers. For the tests where the EUT was required to operate on only one frequency carrier, one carrier was blocked by applying a CW interfering signal from RF Generator 3. The Pulse Pattern Generator was used to apply time synchronized interference to time windows where this was required.

Since the EUT was programmed to operate on only two RF carriers, it was only necessary with two RF generators for the monitoring tests, however a third generator was applied for the tests that required specific time slots to be blocked.

All tests except the Radiated Spurious Emissions, Radiated Power and the Power line conducted emissions tests were performed in conducted mode with a temporary antenna connector.

It was checked that 85% of the lowest and 115% of the operating voltage did not have any influence on the measurement results.

### 3 TEST REPORT SUMMARY

#### 3.1 General

Manufacturer: Panasonic  
Model No.: KX-TG9391  
Serial No.: /

All measurements are traceable to national standards.

The tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC CFR47 Part 15D for Isochronous UPCS Devices and Industry Canada RSS-213 Issue 2.

The conducted test methods have been in accordance with ANSI C63.17-2006 where applicable.

Radiated tests were conducted in accordance with ANSI C63.4-2003. Radiated emissions are made in a 10m semi-anechoic chamber. A description of the test facility is on file with the FCC and Industry Canada.

|                                                     |                                                     |
|-----------------------------------------------------|-----------------------------------------------------|
| <input checked="" type="checkbox"/> New Submission  | <input checked="" type="checkbox"/> Production Unit |
| <input type="checkbox"/> Class II Permissive Change | <input type="checkbox"/> Pre-production Unit        |
| <b>PUB</b> Equipment Code                           | <input type="checkbox"/> Family Listing             |

**THIS TEST REPORT APPLIES ONLY TO THE ITEM(S) AND CONFIGURATIONS TESTED.**

**Deviations from, additions to, or exclusions from the test specifications  
are described in "Summary of Test Data".**



**TEST REPORT NO: 106355-6**

TESTED BY :



Frode Sveinsen, Chief Engineer

DATE: 17 June 2008

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## 3.2 Test Summary

| Name of test                                                     | FCC CFR 47 Paragraph #              | IC RSS-213 Paragraph # | Verdict               |
|------------------------------------------------------------------|-------------------------------------|------------------------|-----------------------|
| Coordination with fixed microwave                                | 15.307(b)                           | N/A                    | Complies              |
| Digital Modulation Techniques                                    | 15.319(b)                           | 6.1                    | Complies              |
| Labeling requirements                                            | 15.19(a)(3)                         | RSS-GEN 5.2            | Complies              |
| Antenna Requirement                                              | 15.317, 15.203                      | 4.1(e)                 | Complies              |
| Power Line Conducted Emission                                    | 15.107(a)<br>15.207(a)              | 6.3<br>RSS-GEN 7.2.2   | Complies              |
| Emission Bandwidth                                               | 15.323(a)                           | 6.4                    | Complies              |
| In-band emissions                                                | 15.323(d)                           | 6.7.2                  | Complies              |
| Out-of-band emissions                                            | 15.323(d)                           | 6.7.1                  | Complies              |
| Peak transmit Power                                              | 15.319(c)(e),<br>15.31(e)           | 6.5                    | Complies              |
| Power Spectral Density                                           | 15.319(d)                           | 4.3.2.1                | Complies              |
| Automatic discontinuation of transmission                        | 15.319(f)                           | 4.3.4(a)               | Complies              |
| Carrier frequency stability                                      | 15.323(f)                           | 6.2                    | Complies              |
| Frame repetition stability                                       | 15.323(e)                           | 4.3.4(c)               | Complies              |
| Frame period and jitter                                          | 15.323(e)                           | 4.3.4(c)               | Complies              |
| Monitoring threshold, Least interfered channel                   | 15.323(c)(2);(5);<br>(9)            | 4.3.4(b)               | Complies              |
| Monitoring of intended transmit window and maximum reaction time | 15.323(c)(1)                        | 4.3.4                  | Complies              |
| Threshold monitoring bandwidth                                   | 15.323(c)(7)                        | 4.3.4                  | Complies              |
| Reaction time and monitoring interval                            | 15.323(c)(1);(5);<br>(7)            | 4.3.4                  | Complies              |
| Access criteria test interval                                    | 15.323(c)(4);(6)                    | 4.3.4                  | Complies              |
| Access Criteria functional test                                  | 15.323(c)(4);(6)                    | 4.3.4                  | Complies              |
| Acknowledgements                                                 | 15.323(c)(4)                        | 4.3.4                  | Complies              |
| Transmission duration                                            | 15.323(c)(3)                        | 4.3.4                  | N/A <sup>1</sup>      |
| Dual access criteria                                             | 15.323(c)(10)                       | 4.3.4                  | N/A <sup>1</sup>      |
| Alternative monitoring interval                                  | 15.323(c)(10);(11)                  | 4.3.4                  | N/A <sup>2</sup>      |
| Spurious Emissions (Antenna Conducted)                           | 15.323(d)                           | 6.7.1                  | Complies <sup>3</sup> |
| Spurious Emissions (Radiated)                                    | 15.319(g)<br>15.109(a)<br>15.209(a) | 4.3.3<br>RSS-GEN 7.2.3 | N/A <sup>4</sup>      |
| Receiver Spurious Emissions                                      | N/A                                 | 6.8                    | Complies              |

<sup>1</sup> Only applies for EUT that can be initiating device

<sup>2</sup> The client declares that the tested equipment does not implement this provision

<sup>3</sup> The tested equipment has integrated antennas only

<sup>4</sup> Not required if the Conducted Out-of-Band Emissions test is Passed

## 4 TEST RESULTS

### 4.1 Power Line Conducted Emissions

Para. No.: 15.207 (a)

Test Performed By: Tore Løvlien

Date of Test: 7 May 2008

Measurement procedure: ANSI C63.4-2003 using 50  $\mu$ H/50 ohms LISN.

Test Results: Complies

Measurement Data: See attached graph, (Peak detector).

All measured values are below the Average Limit even when measured with Peak detector.

| Frequency | Detector | Measured value | Limit      | Margin |
|-----------|----------|----------------|------------|--------|
| KHz       | QP/AV    | dB $\mu$ V     | dB $\mu$ V | dB     |
| /         | QP       | /              | /          | /      |
| /         | AV       | /              | /          | /      |
| /         | QP       | /              | /          | /      |
| /         | AV       | /              | /          | /      |

NEMKO Com 3b

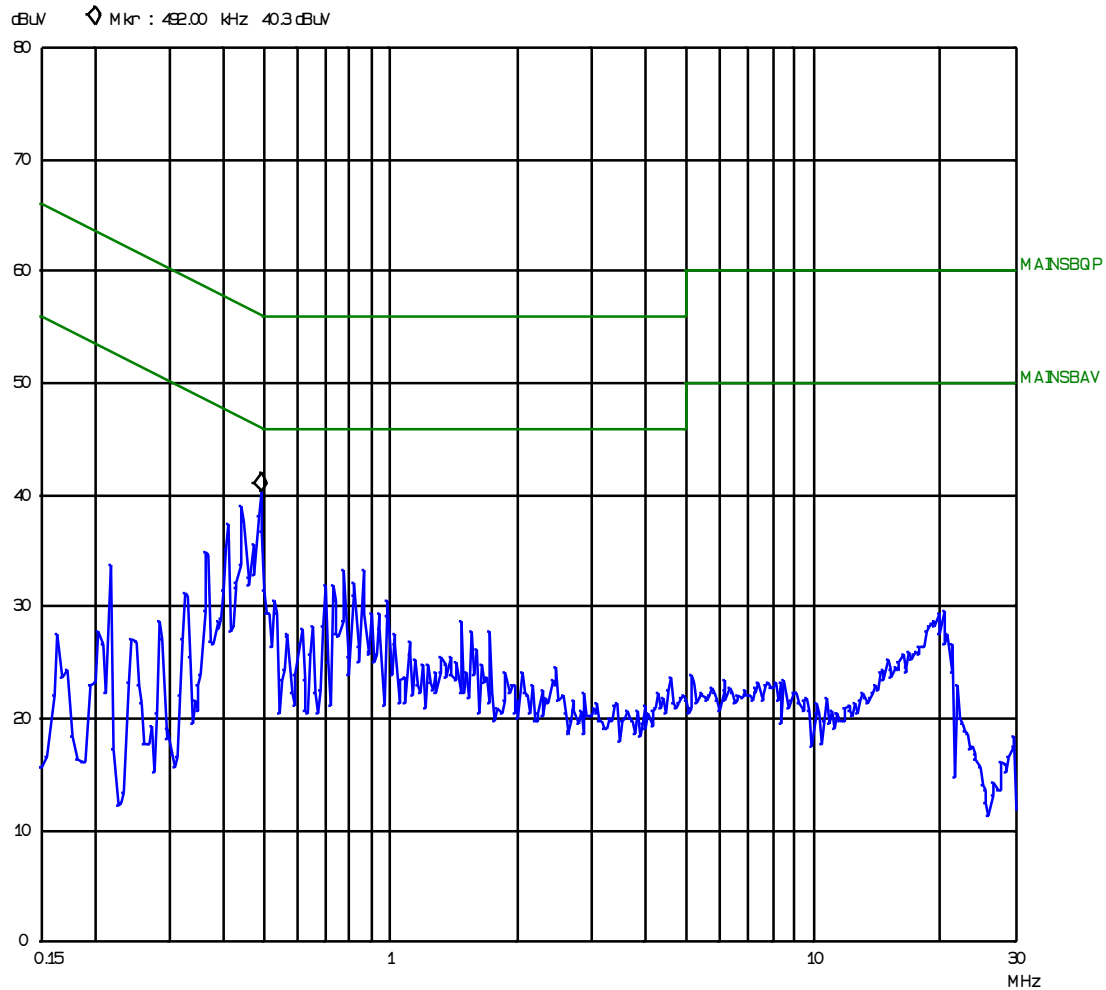
07. May 08 15:00

PK

Operator: TLO  
Comment: Panasonic KX-9991T "RADIATION"  
AC 115V 60Hz N to gnd  
Stand by  
EN55022B  
PQLV219 AC adapter

### Scan Settings (1 Range)

| Frequencies |      |      | Receiver Settings |          |        |        |        |       |
|-------------|------|------|-------------------|----------|--------|--------|--------|-------|
| Start       | Stop | Step | IF BW             | Detector | M-Tune | Attien | Preamp | OPRge |
| 150k        | 30M  | 4.5k | 9k                | PK       | 50ms   | AUTO   | LN OFF | 60dB  |



### PQLV219, Standby, Phase N

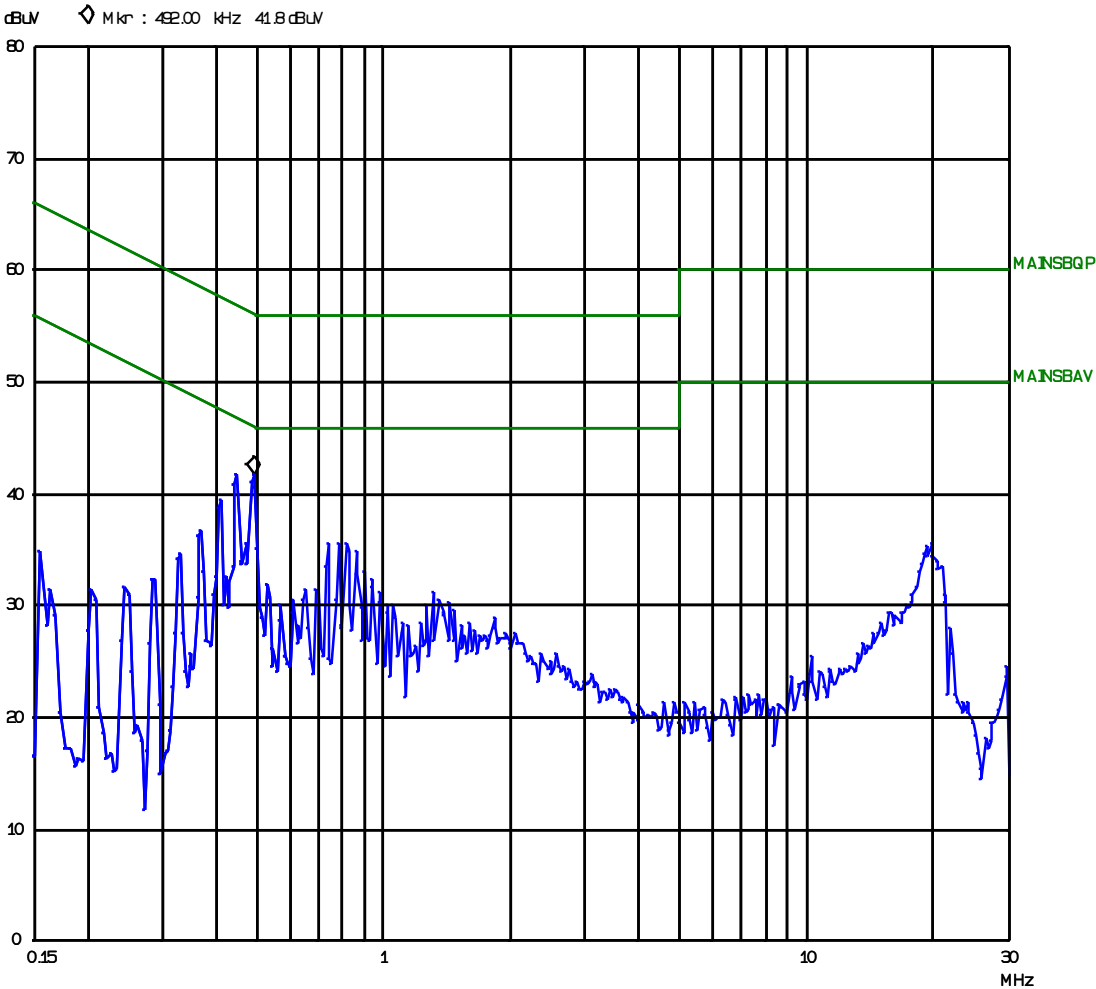
**NEMKO Com Lab**  
**PK**

07. May 08 15:08

Operator: TLD  
 Comment: Panasonic KX-9991T "RADIATION"  
 AC 115V 60Hz L1 to gnd  
 Stand by  
 EN55022B  
 PQLV219 AC adapter

Scan Settings (1 Range)

| Frequencies |      |      | Receiver Settings |          |      |                  |
|-------------|------|------|-------------------|----------|------|------------------|
| Start       | Stop | Step | IF BW             | Detector | M-T  | Time Att         |
| 150k        | 30M  | 4.5k | 9k                | PK       | 50ms | AUTO LN OFF 60dB |



**PQLV219, Standby, Phase L1**

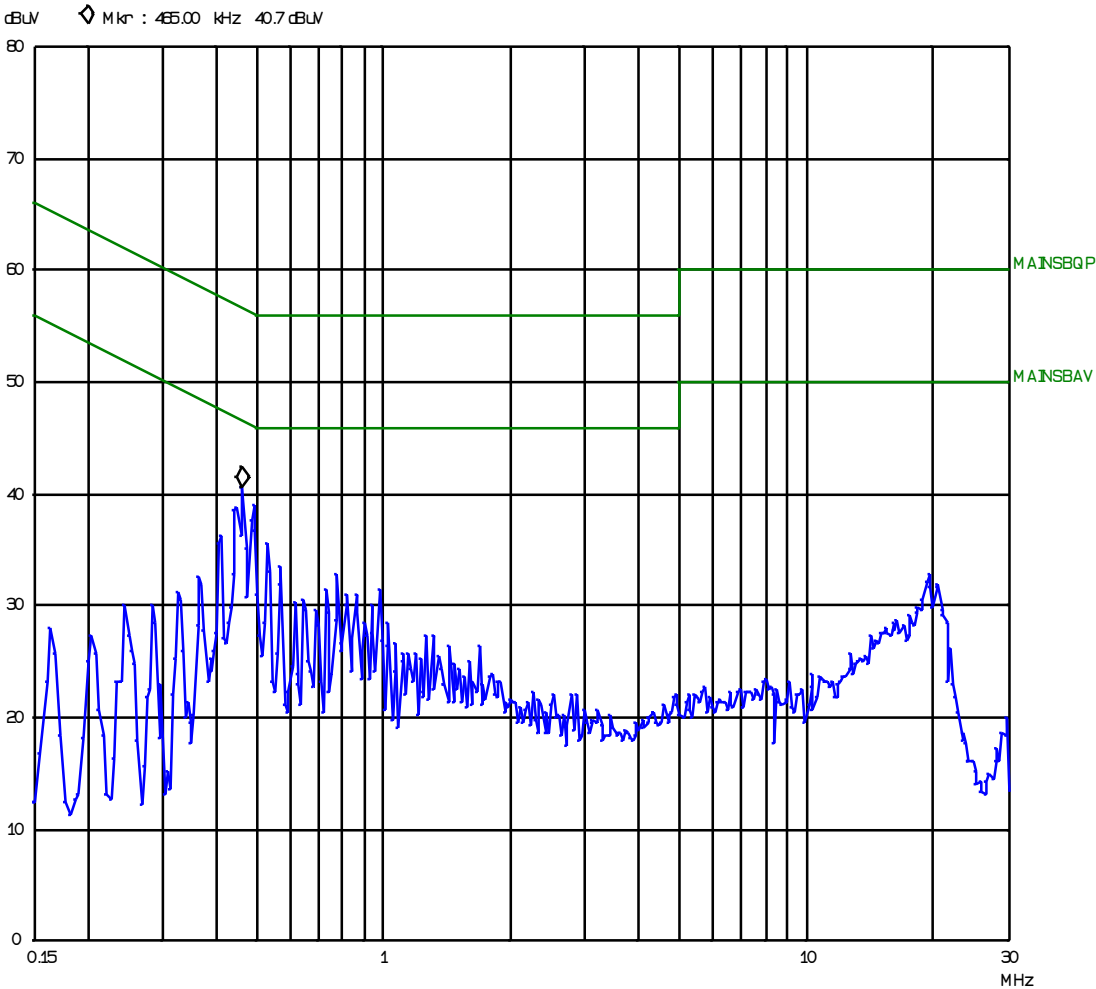
**NEMKO Com Lab**  
**PK**

07. May 08 15:50

Operator: TLD  
Comment: Panasonic KX-9991T "RADIATION"  
AC 115V 60Hz N to grd  
Speech mode  
EN55022B  
PQLV219 AC adapter

Scan Settings (1 Range)

| Frequencies |      |      | Receiver Settings |          |                             |
|-------------|------|------|-------------------|----------|-----------------------------|
| Start       | Stop | Step | IF BW             | Detector | M-Tune Atten Preamp P P Rge |
| 150k        | 30M  | 4.5k | 9k                | PK       | 50ms AUTO LN OFF 60dB       |



**PQLV219, Speech Mode, Phase N**

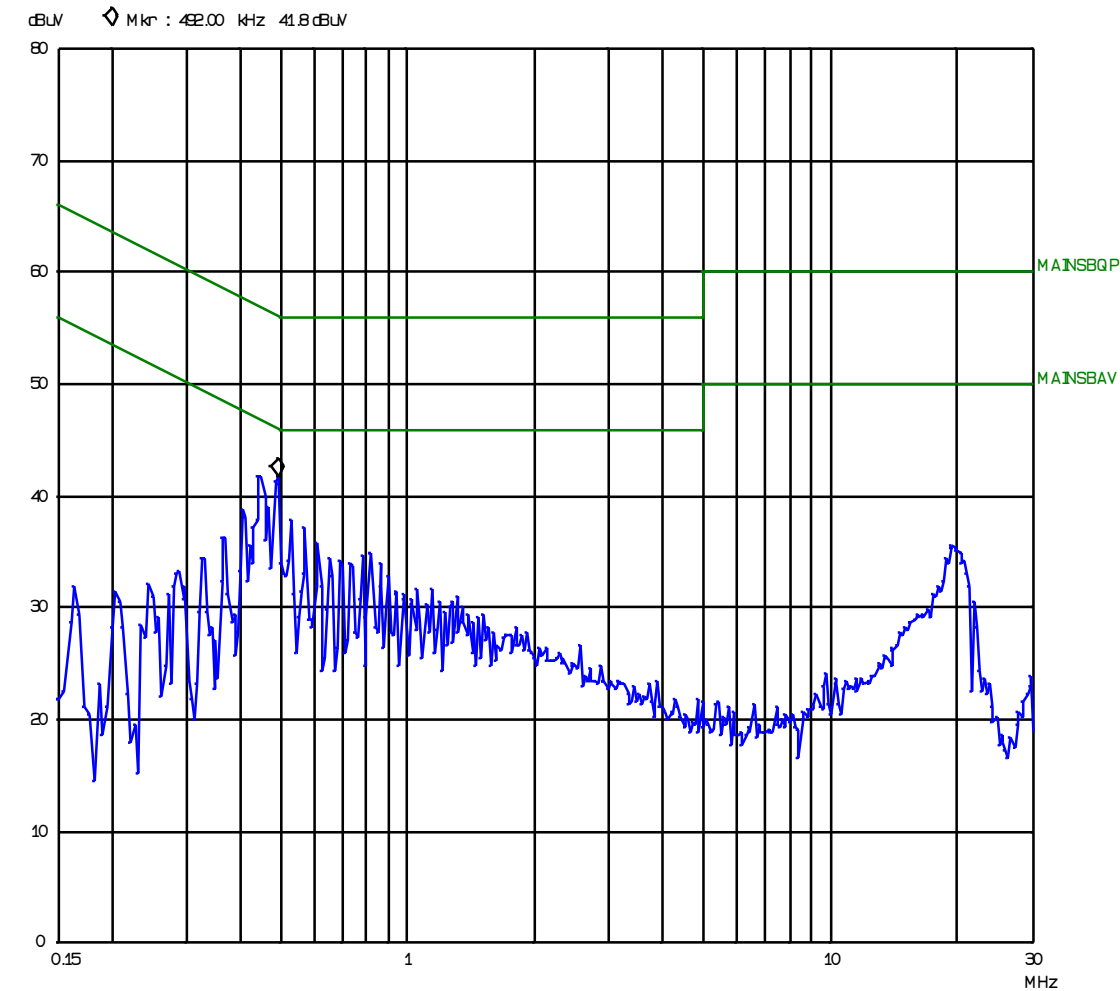
**NEMKO Com Lab**  
**PK**

07. May 08 15:30

Operator: TLD  
 Comment: Panasonic KX-9991T "RADIATION"  
 AC 115V 60Hz L1 to gnd  
 Speech mode  
 EN55022B  
 PQLV219 AC adapter

Scan Settings (1 Range)

| Frequencies |      |      |       | Receiver Settings |      |          |              |
|-------------|------|------|-------|-------------------|------|----------|--------------|
| Start       | Stop | Step | IF BW | Detector          | M-T  | Time Att | Preamplifier |
| 150k        | 30M  | 4.5k | 9k    | PK                | 50ms | AUTO     | LN OFF 60dB  |



**PQLV219, Speech Mode, Phase L1**

NEMKO Com 3b

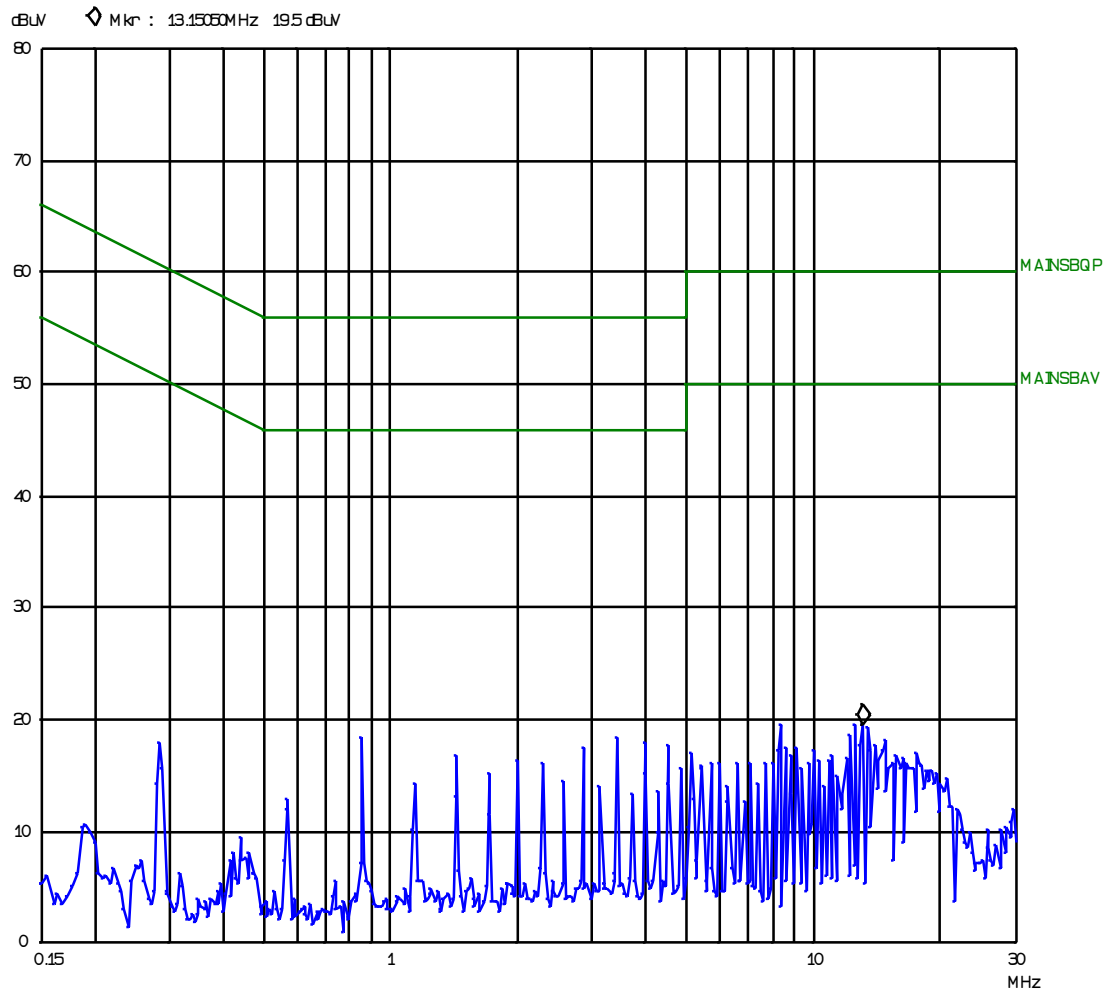
07.May 08 13:57

PK

Operator: TLO  
Comment: Panasonic KX-9991T "RADIATION"  
AC 115V 60Hz N to gnd  
Stand by  
EN55022B

### Scan Settings (1 Range)

| Frequencies |      |      | Receiver Settings |          |          |        |         |         |
|-------------|------|------|-------------------|----------|----------|--------|---------|---------|
| Start       | Stop | Step | F BW              | Detector | M-T in e | Attien | Pream p | O p Rge |
| 150k        | 30M  | 4.5k | 9k                | PK       | 50ms     | AUTO   | LN OFF  | 60dB    |



**PQLV207, Standby, Phase N**

NEMKO Com 3b

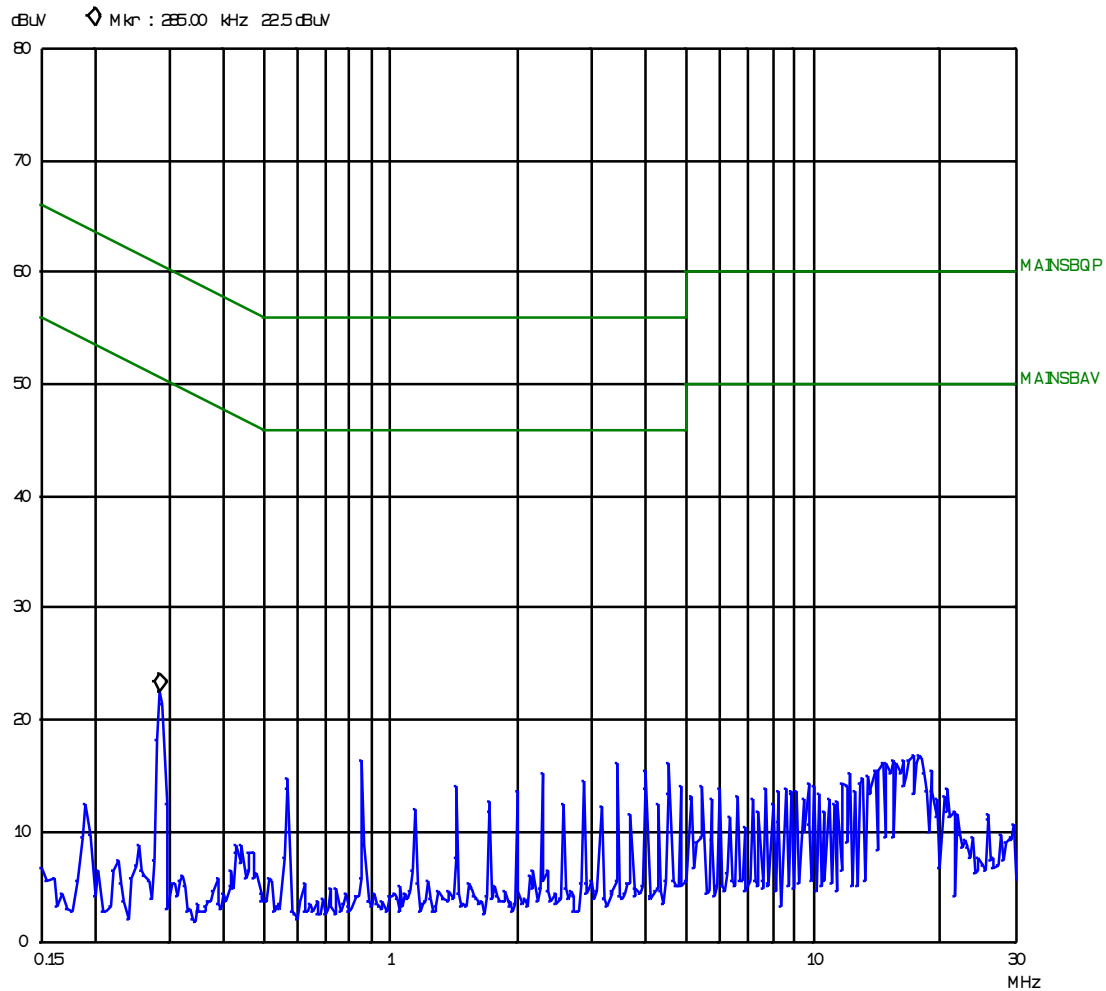
07. May 08 14:18

PK

Operator: TLO  
Comment: Panasonic KX-9991T "RADIATION"  
AC 115V 60Hz L1 to gnd  
Stand by  
EN56022B

### Scan Settings (1 Range)

| Frequencies |      |      | Receiver Settings |          |          |                        |
|-------------|------|------|-------------------|----------|----------|------------------------|
| Start       | Stop | Step | F BW              | Detector | M-T in e | Attien Pream p O p Rge |
| 150k        | 30M  | 4.5k | 9k                | PK       | 50ms     | AUTO LN OFF 60dB       |



### PQLV207, Standby, Phase L1

NEMKO Com Lab

PK

07. May 08 14:42

Operator: TLD

Comment: Panasonic KX-9991T "RADIATION"

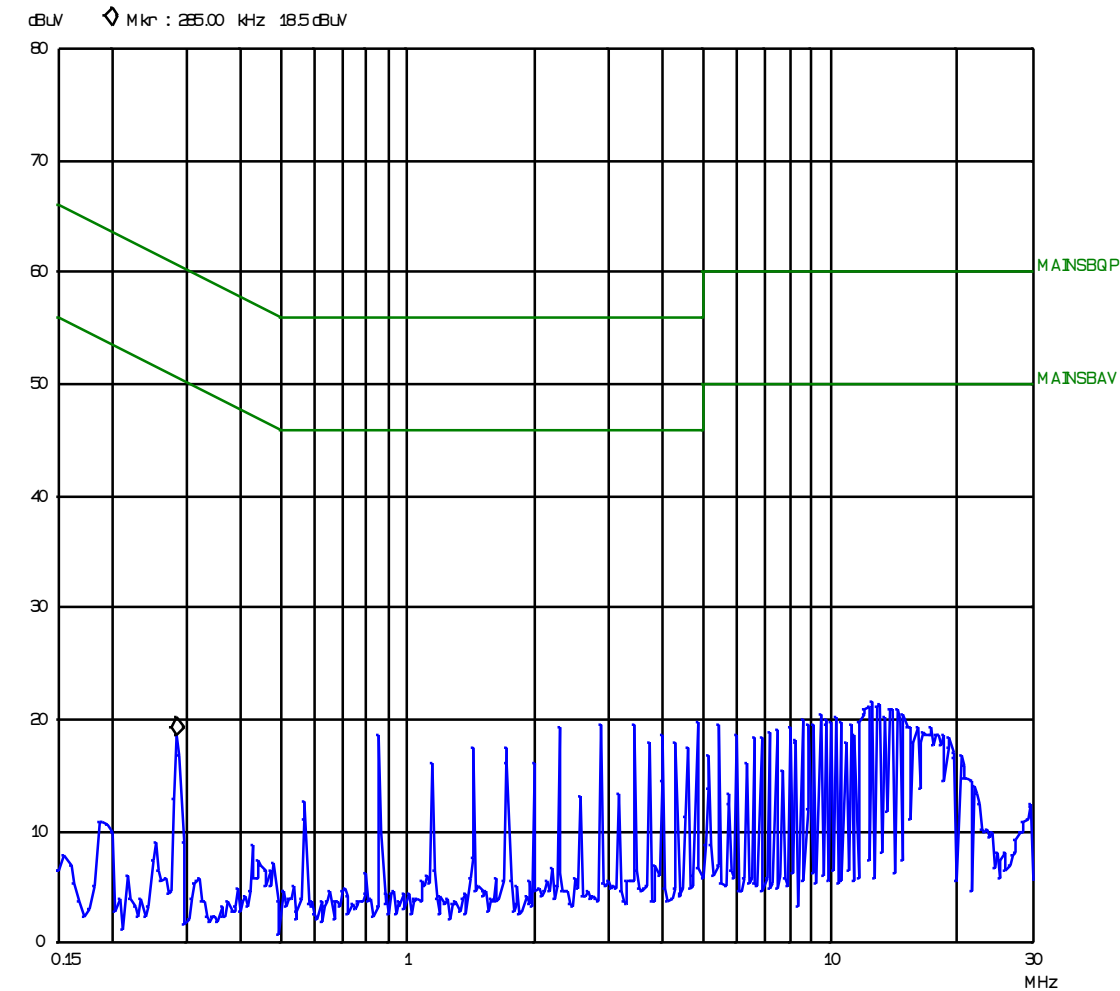
AC 115V 60Hz N to grd

Speech

EN55022B

Scan Settings (1 Range)

| Frequencies |      |      | Receiver Settings |          |      |                  |
|-------------|------|------|-------------------|----------|------|------------------|
| Start       | Stop | Step | IF BW             | Detector | M-T  | Time Att         |
| 150k        | 30M  | 4.5k | 9k                | PK       | 50ms | AUTO LN OFF 60dB |



PQLV207, Speech Mode, Phase N

NEMKO Com Lab

PK

07. May 08 14:30

Operator: TLD

Comment: Panasonic KX-9991T "RADIATION"

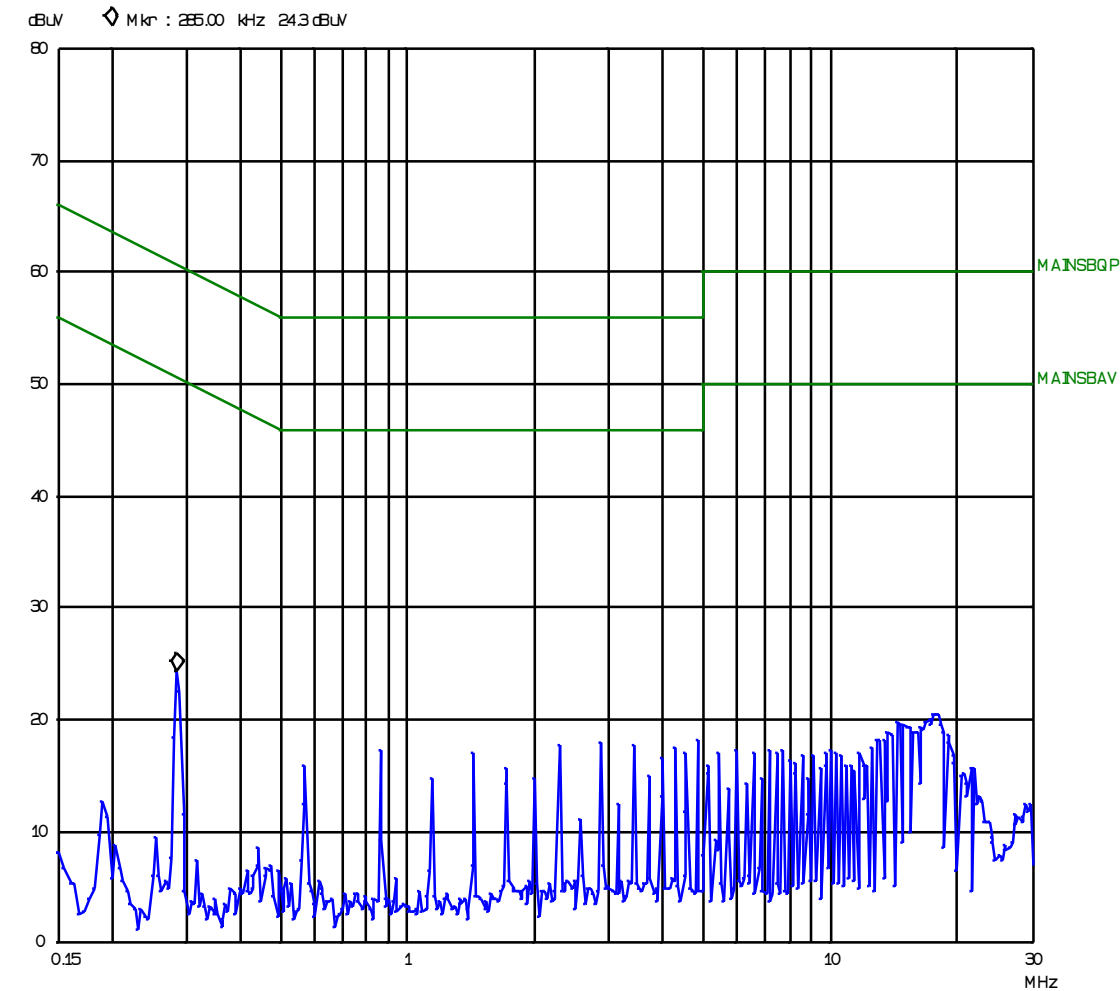
AC 115V 60Hz L1 to gnd

Speech

EN55022B

Scan Settings (1 Range)

| Frequencies |      |      | Receiver Settings |          |      |                  |
|-------------|------|------|-------------------|----------|------|------------------|
| Start       | Stop | Step | IF BW             | Detector | M-T  | Time Att         |
| 150k        | 30M  | 4.5k | 9k                | PK       | 50ms | AUTO LN OFF 60dB |



PQLV207, Speech Mode, Phase L1

## 4.2 Coordination with fixed microwave

The affidavit from UTAM, Inc. is included in the documentation supplied by the applicant:

☒ Yes

☐ No

### Requirement, FCC 15.307 (b):

Each application for certification of equipment operating under the provisions of this Subpart must be accompanied by an affidavit from UTAM, Inc. certifying that the applicant is a participating member of UTAM, Inc. In the event a grantee fails to fulfill the obligations attendant to participation in UTAM, Inc., the Commission may invoke administrative sanctions as necessary to preclude continued marketing and installation of devices covered by the grant of certification, including but not limited to revoking certification.

## 4.3 Digital Modulation Techniques

The tested equipment is based on DECT technology described in the ETSI standard EN 300175, the only difference is that the channel allocation is modified to operate in the 1920-1930 MHz band.

The EUT used Multi Carrier / Time Division Multiple Access / Time Division Duplex and Digital GFSK modulation.

For further details see the operational description provided by the applicant.

### Requirement, FCC 15.319(b):

All transmissions must use only digital modulation techniques.

## 4.4 Labeling Requirements

See separate documents showing the label design and the placement of the label on the EUT.

### Requirements FCC 15.19

The FCC Identifier shall be displayed on the label, and the device(s) shall bear the following statement in a conspicuous location on the device or in the user manual if the device is too small:

*This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.*

The label itself shall be of a permanent type, not a paper label, and shall last the lifetime of the equipment.

#### 4.5 Antenna Requirement

Does the EUT have detachable antenna(s)?

☐ Yes ☒ No

If detachable, is the antenna connector(s) non-standard?

☐ Yes ☐ No

The tested equipment has only integral antennas. The conducted tests were performed on a sample with a temporary antenna connector.

**Requirement: FCC 15.203, 15.204, 15.317.**

#### 4.6 Channel Frequencies

| UPCS CHANNEL    | FREQUENCY (MHz) |
|-----------------|-----------------|
| Upper Band Edge | 1930.000        |
| 0 (Highest)     | 1928.448        |
| 1               | 1926.720        |
| 2               | 1924.992        |
| 3               | 1923.264        |
| 4 (Lowest)      | 1921.536        |
| Lower Band Edge | 1920.000        |

**Requirement: FCC 15.303 (d), (g)**

Within 1920 -1930 MHz band for isochronous devices.

## 4.7 Automatic Discontinuation of Transmission

|                                                          |                                                                                                  |
|----------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| Does the EUT transmit Control and Signaling Information? | <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO                              |
| TYPE OF EUT :                                            | <input type="checkbox"/> INITIATING DEVICE <input checked="" type="checkbox"/> RESPONDING DEVICE |

The following tests simulate the reaction of the EUT in case of either absence of information to transmit or operational failure after a connection with the companion device is established.

| Number | Test                                | EUT Reaction | Verdict |
|--------|-------------------------------------|--------------|---------|
| 1      | Power removed from the EUT          | A            | Pass    |
| 2      | EUT Switch Off                      | NA           | Pass    |
| 3      | Hook-On by companion device         | B            | Pass    |
| 4      | Hook-On by EUT                      | NA           | Pass    |
| 5      | Power Removed from Companion Device | B            | Pass    |
| 6      | Companion Device Switch Off         | B            | Pass    |

- A - Connection breakdown, Cease of all transmissions
- B - Connection breakdown, EUT transmits control and signaling information
- C - Connection breakdown, Companion Device transmits control and signaling information
- NA - Not Applicable (the EUT does not have an On/Off switch and can not perform Hook-On)

### Requirements, FCC 15.319(f)

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude transmission of control and signaling information or use of repetitive codes used by certain digital technologies to complete frame or burst intervals.

## 4.8 Peak Power Output

### Test Method:

ANSI C63.17, clause 6.1.2.

### Test Results: Complies

### Measurement Data:

#### Maximum Conducted Output Power

| Channel No. | Frequency (MHz) | Maximum Conducted Output Power (dBm) | Maximum Radiated Output Power (dBm) | Maximum Antenna Gain (dBi) |
|-------------|-----------------|--------------------------------------|-------------------------------------|----------------------------|
| 4           | 1921.536        | 19.5                                 | 20.9                                | +1.4                       |
| 2           | 1924.992        | 19.4                                 | 20.5                                | +1.1                       |
| 0           | 1928.448        | 19.4                                 | 20.4                                | +1.0                       |

The Radiated Output Power is measured as Output Power with correction factors stored in the Spectrum Analyzer.

For this test it was also checked that input voltage variation of 85 and 115% of nominal value did not have any effect on the measured output power, neither radiated nor conducted.

### Limit:

Conducted:  $100 \mu\text{W} \times \text{SQRT}(B)$  where  $B$  is the measured Emission Bandwidth in Hz

FCC 15.319(c)(e): 21.4 dBm (137 mW)

RSS-213, Issue 2: 20.5 dBm (112 mW)

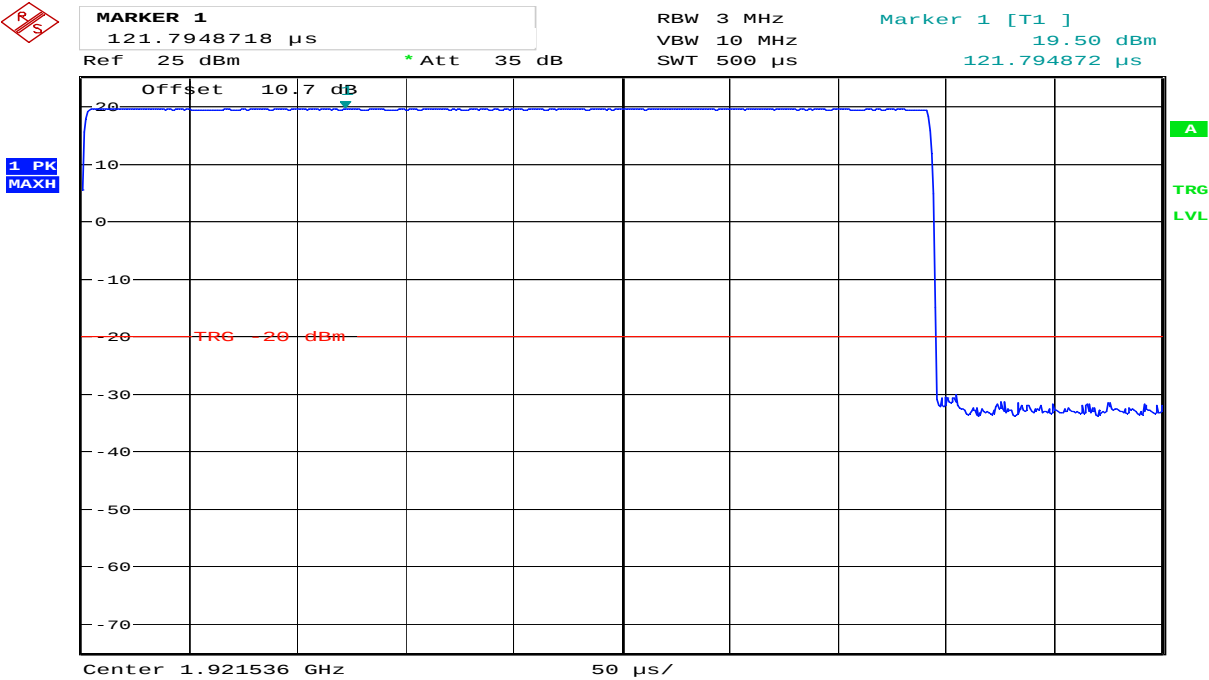
The antenna gain is below 3 dBi, no reduction in transmit power is necessary.

### Requirements, FCC 15.319(c)(e), RSS-213, Issue 2

Peak transmit power shall not exceed 100 microwatts multiplied by the square root of the emission bandwidth in Hertz.

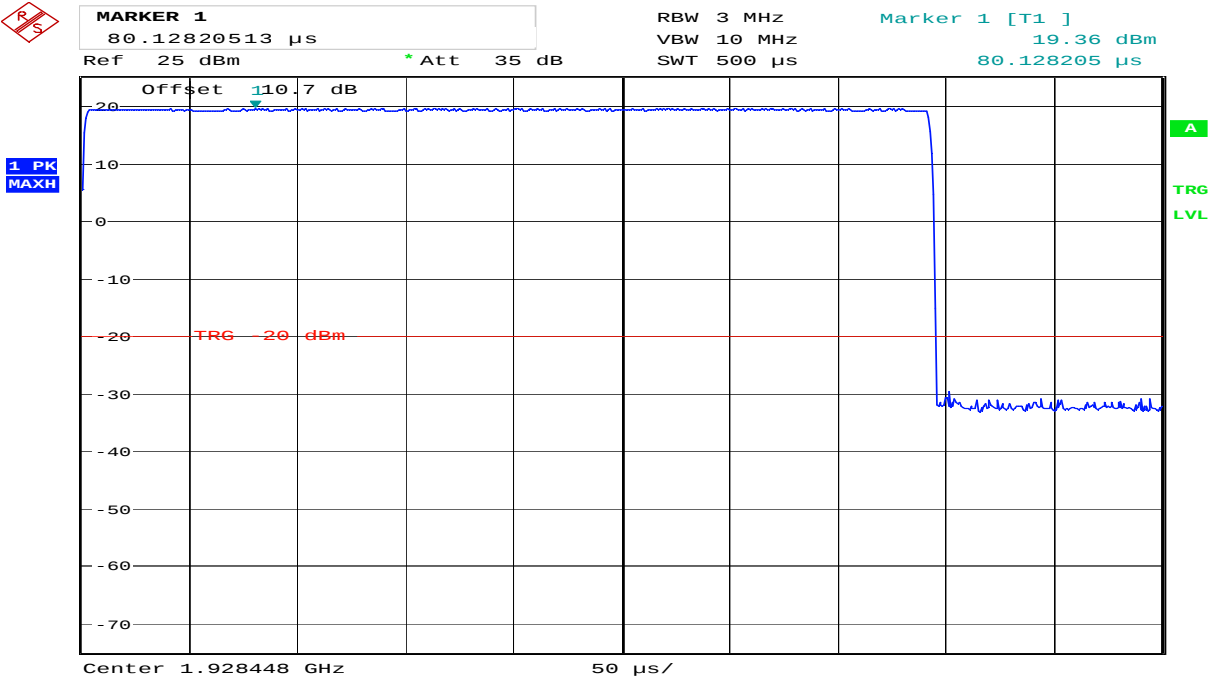
The peak transmit power shall be reduced by the amount in decibels that the maximum directional gain of the antenna exceeds 3 dBi.

Conducted Peak Output Power



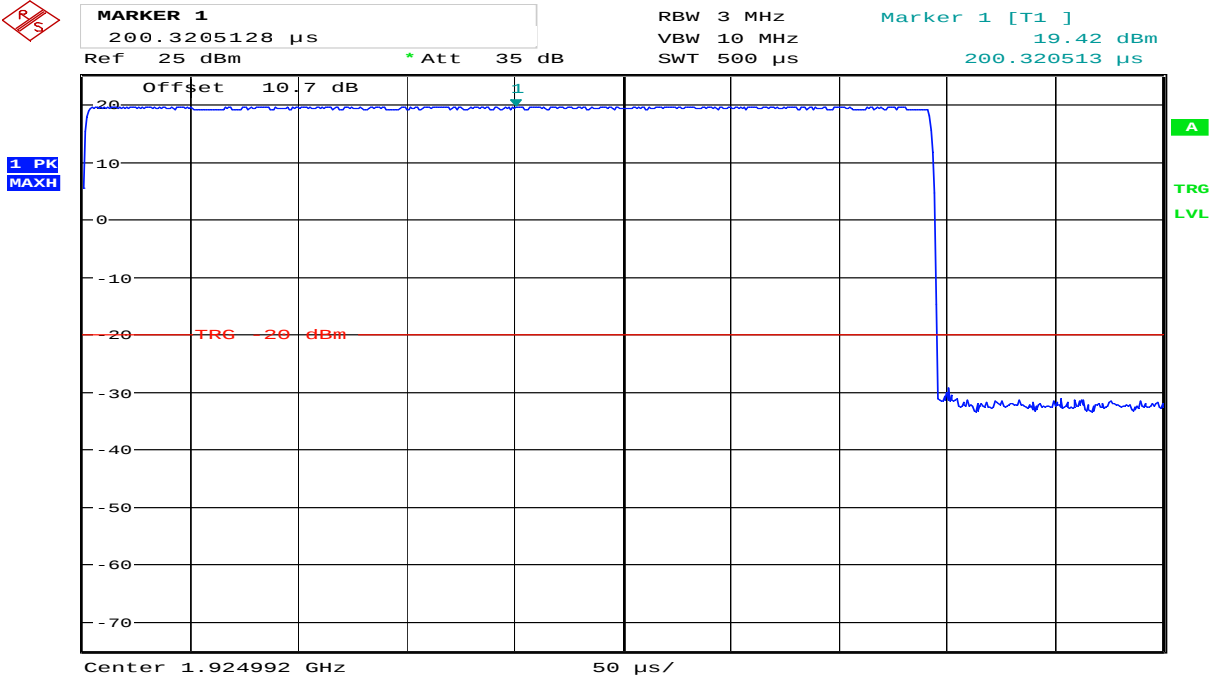
Date: 5.MAY.2008 15:11:59

Lower Channel



Date: 5.MAY.2008 15:11:04

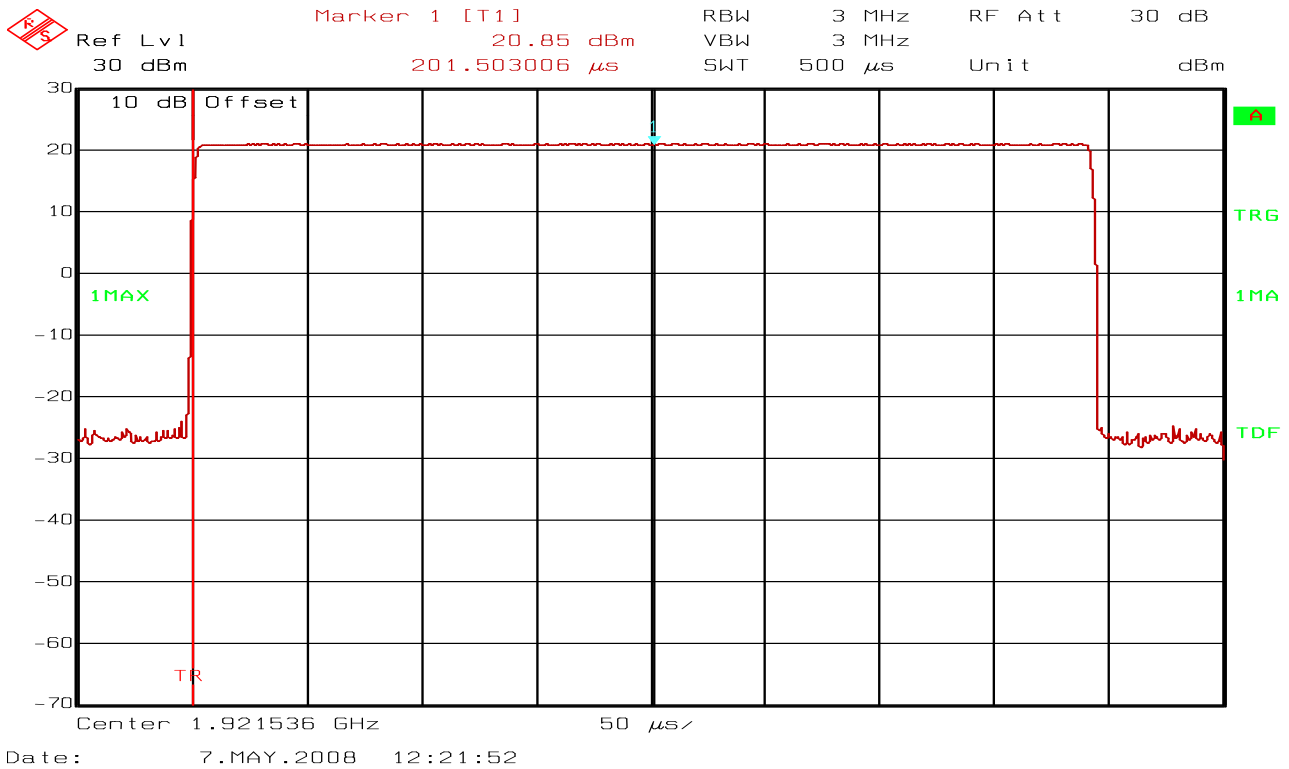
Upper Channel



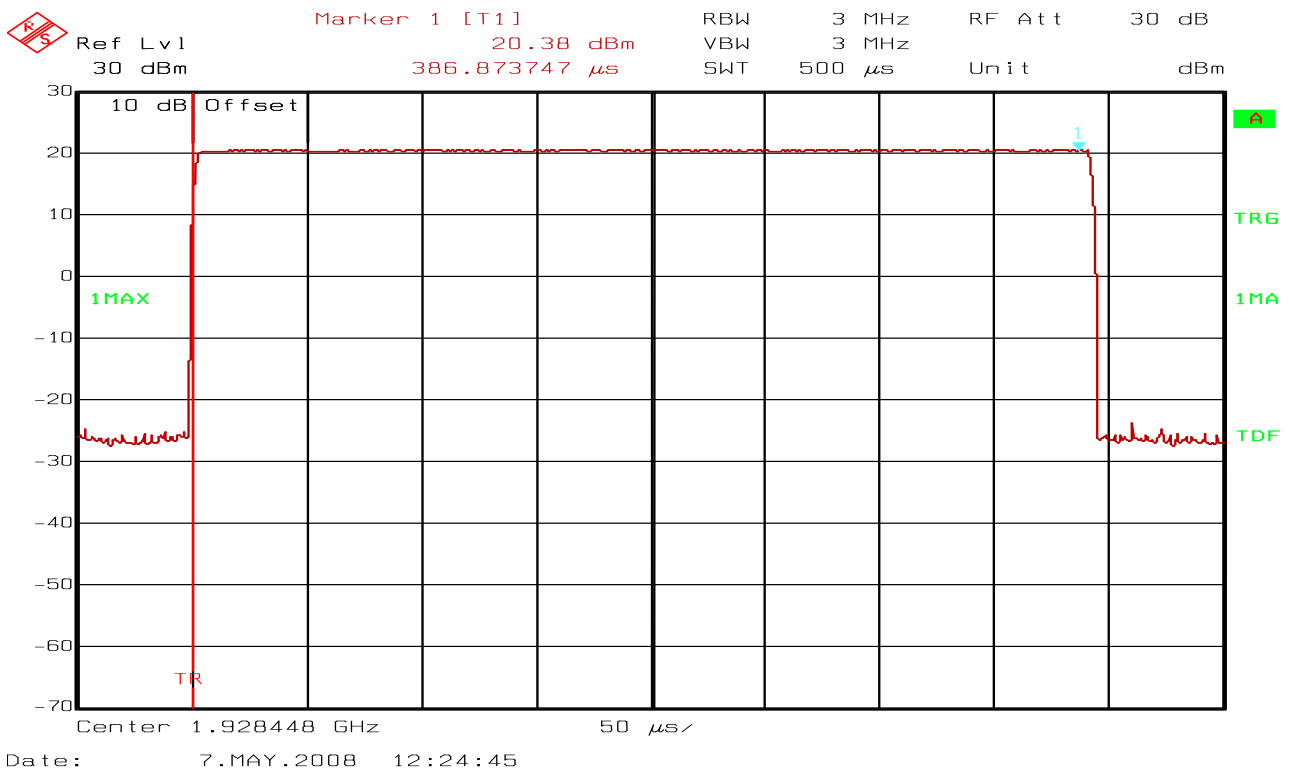
Date: 5.MAY.2008 15:09:29

Middle Channel

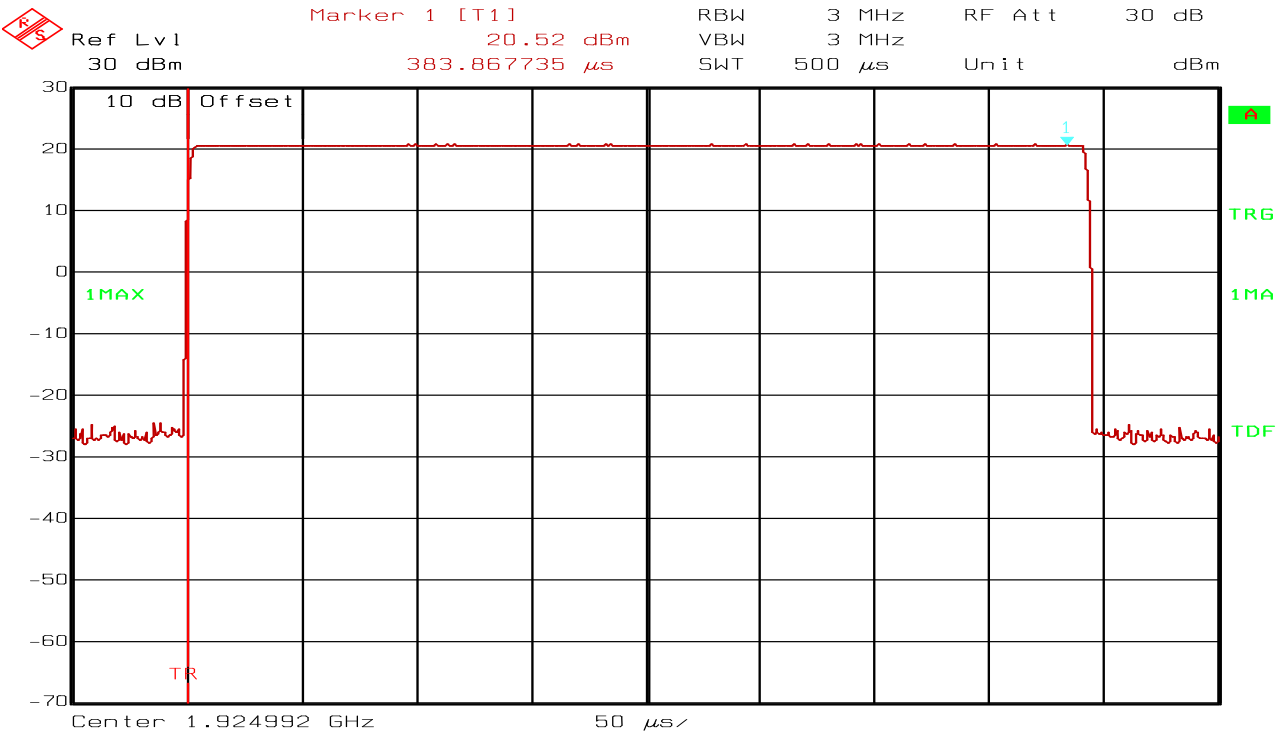
## Radiated Peak Output Power



## Lower Channel (Max: Ant 2, VP)



## Upper Channel (Max: Ant 2, VP)



Date: 7.MAY.2008 12:11:10

**Middle Channel (Max: Ant 2, VP)**

## 4.9 Emission Bandwidth *B*

### Test Method:

ANSI C63.17, clause 6.1.3.

### Test Results: Complies

### Measurement Data:

| Channel No. | Frequency (MHz) | 26 dB Bandwidth <i>B</i> (kHz) |
|-------------|-----------------|--------------------------------|
| 4           | 1921.536        | 1891.0                         |
| 0           | 1928.448        | 1875.0                         |

| Channel No. | Frequency (MHz) | 20 dB Bandwidth (kHz) |
|-------------|-----------------|-----------------------|
| 2           | 1924.992        | 1266.0                |

| Channel No. | Frequency (MHz) | 6 dB Bandwidth (kHz)  |
|-------------|-----------------|-----------------------|
| 4           | 1921.536        | NA                    |
| 0           | 1928.448        | NA                    |
| Channel No. | Frequency (MHz) | 12 dB Bandwidth (kHz) |
| 4           | 1921.536        | NA                    |
| 0           | 1928.448        | NA                    |

### Requirements, FCC 15.323(a)

The 26 dB Bandwidth *B* shall be larger than 50 kHz and less than 2.5 MHz.

### Requirements, RSS-213 Issue 2, clause 6.4

The 99% Bandwidth shall be larger than 50 kHz and less than 2.5 MHz.

No requirements for 6 and 12 dB Bandwidth, these values are only used for testing Monitoring Bandwidth if the Simple Compliance test fails (ANSI C63.17, clause 7.4).



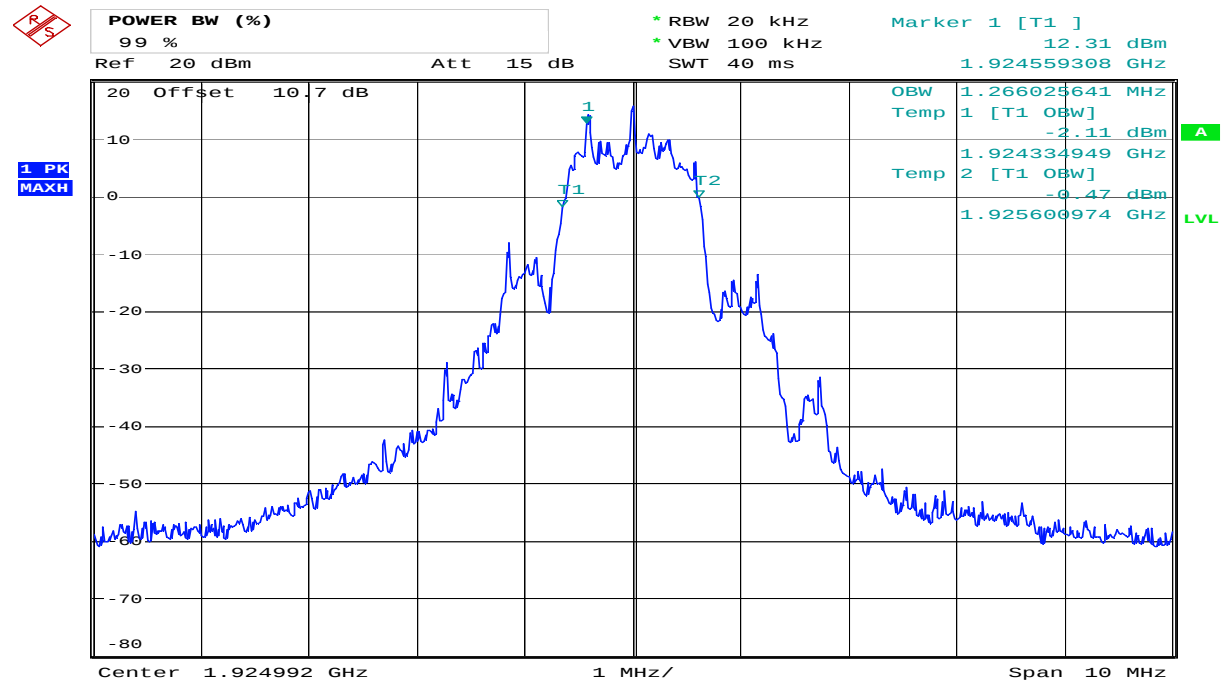
Date: 5.MAY.2008 15:24:31

### Emission Bandwidth B, Lower Channel



Date: 5.MAY.2008 15:34:58

### Emission Bandwidth B, Upper Channel



Date: 17. JUN. 2008 09:31:39

**99% Bandwidth, Middle Channel**

#### 4.10 Power Spectral Density

**Test Method:**

ANSI C63.17, clause 6.1.5.

**Test Results: Complies**

**Measurement Data:**

| Channel No. | Frequency (MHz) | Power Spectral Density (dBm) |
|-------------|-----------------|------------------------------|
| 4           | 1921.536        | 3.6                          |
| 0           | 1928.448        | 3.2                          |

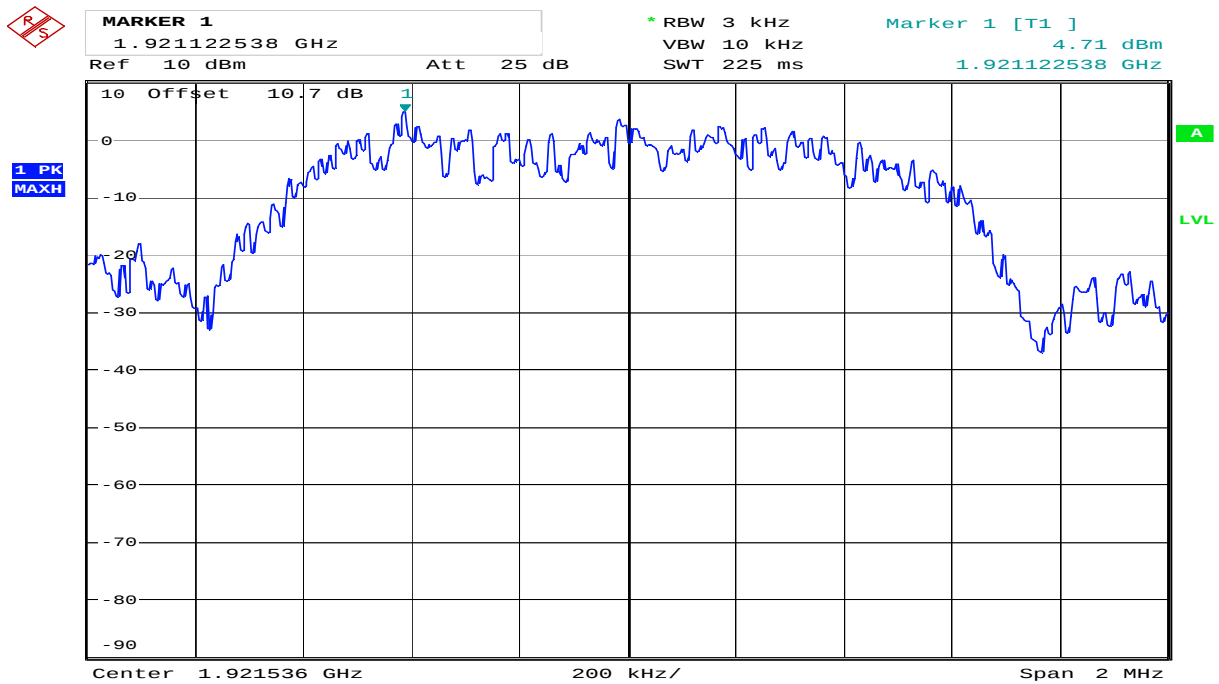
Averaged over 1000 sweeps.

**Requirements, FCC 15.319(d)**

The Power Spectral Density shall be less than 3 mW (4.77 dBm) when averaged over at least 100 sweeps.

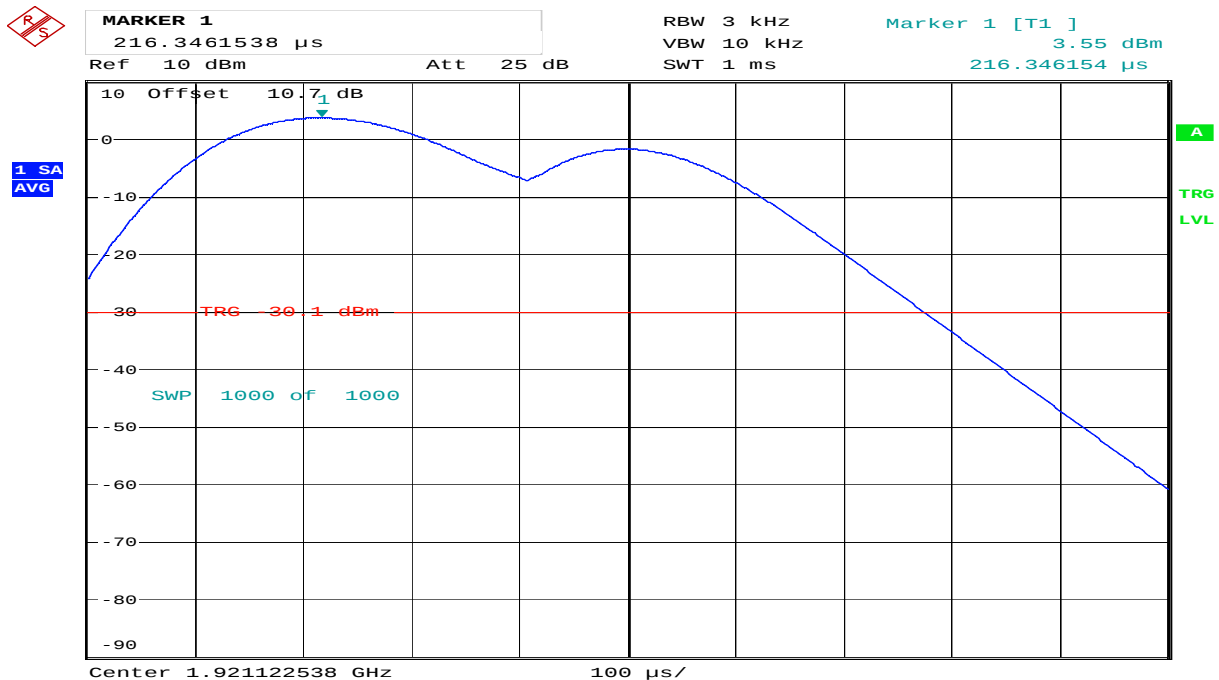
## Power Spectral Density

### Lower Channel:



Date: 5.MAY.2008 16:30:21

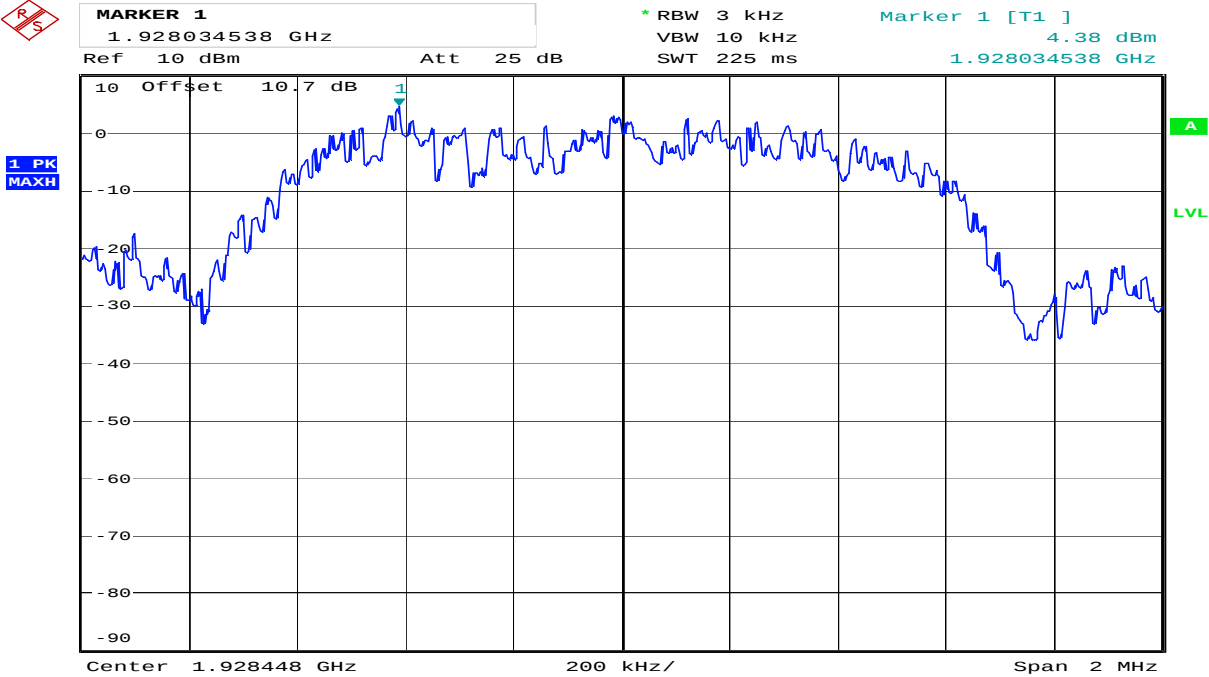
### Overview



Date: 5.MAY.2008 16:32:03

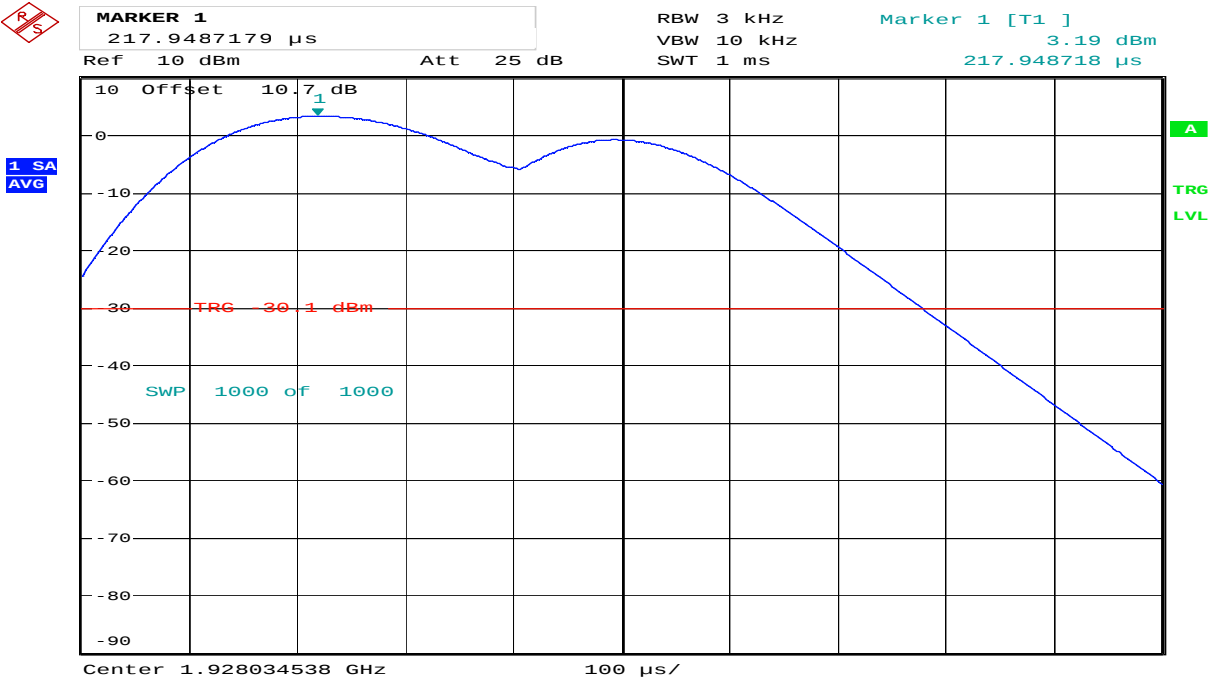
### Averaged, 1000 Sweeps

Upper Channel:



Date: 5.MAY.2008 16:16:27

Overview



Date: 5.MAY.2008 16:19:17

Averaged, 1000 Sweeps

## 4.11 In-Band Unwanted Emissions, Conducted

### Test Method:

ANSI C63.17, clause 6.1.6.1.

### Test Results: Complies

### Measurement Data:

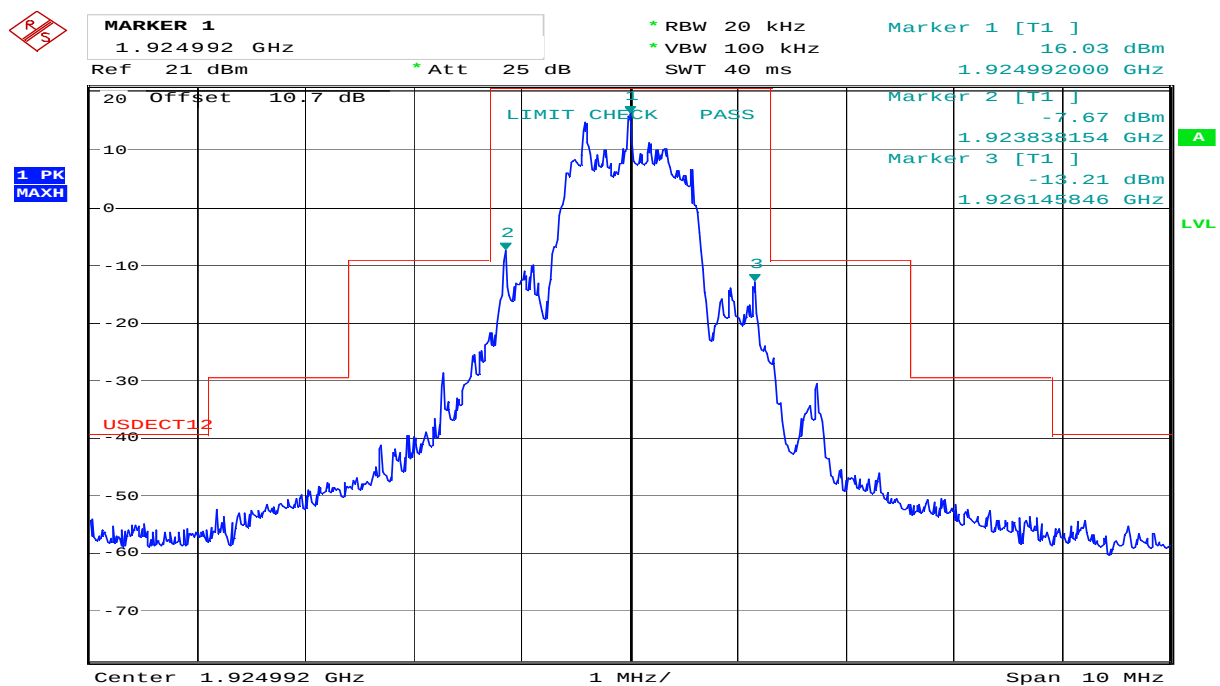
See plots.

### Requirements, FCC 15.323(d):

$B < f \leq 2B$  : less than or equal to 30 dB below max. permitted peak power level

$2B < f \leq 3B$  : less than or equal to 50 dB below max. permitted peak power level

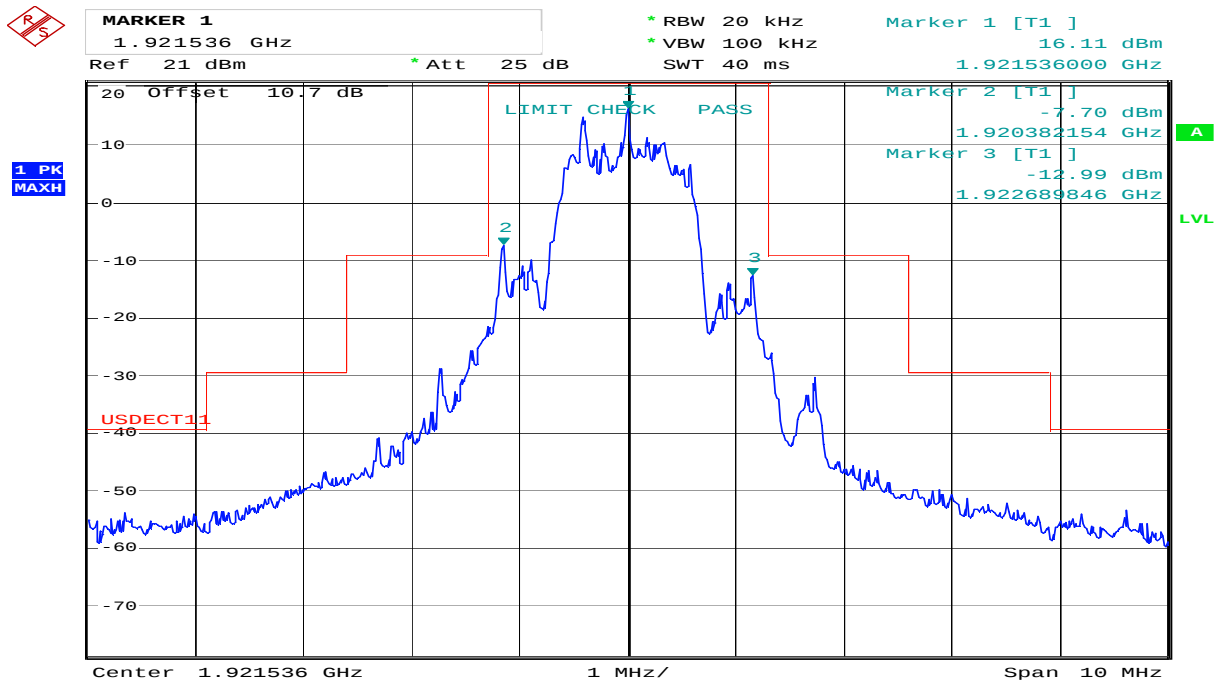
$3B < f \leq$  UPCS Band Edge : less than or equal to 60 dB below max. permitted peak power level



Date: 5.MAY.2008 15:41:52

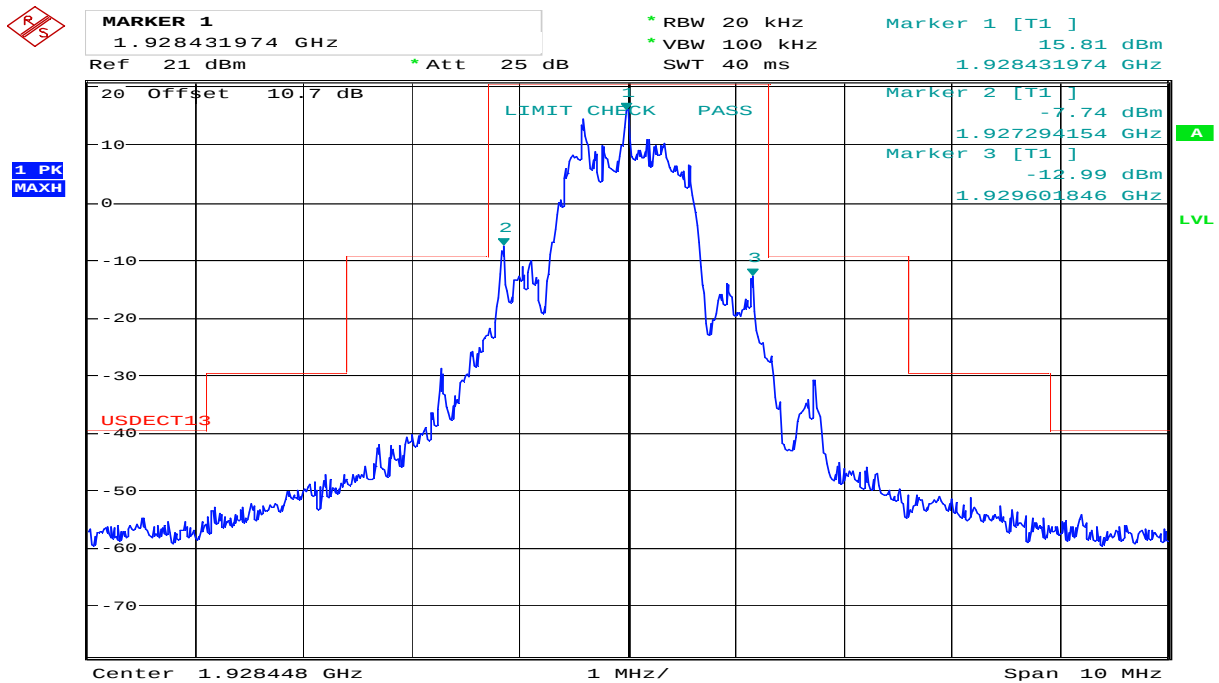
### Middle Channel

## In-Band Unwanted Emissions, Conducted



Date: 5.MAY.2008 15:46:49

## Lower Channel



Date: 5.MAY.2008 15:37:56

## Upper Channel

## 4.12 Out-of-band Emissions, Conducted

### Test Method:

ANSI C63.17, clause 6.1.6.2.

### Test Results: Complies

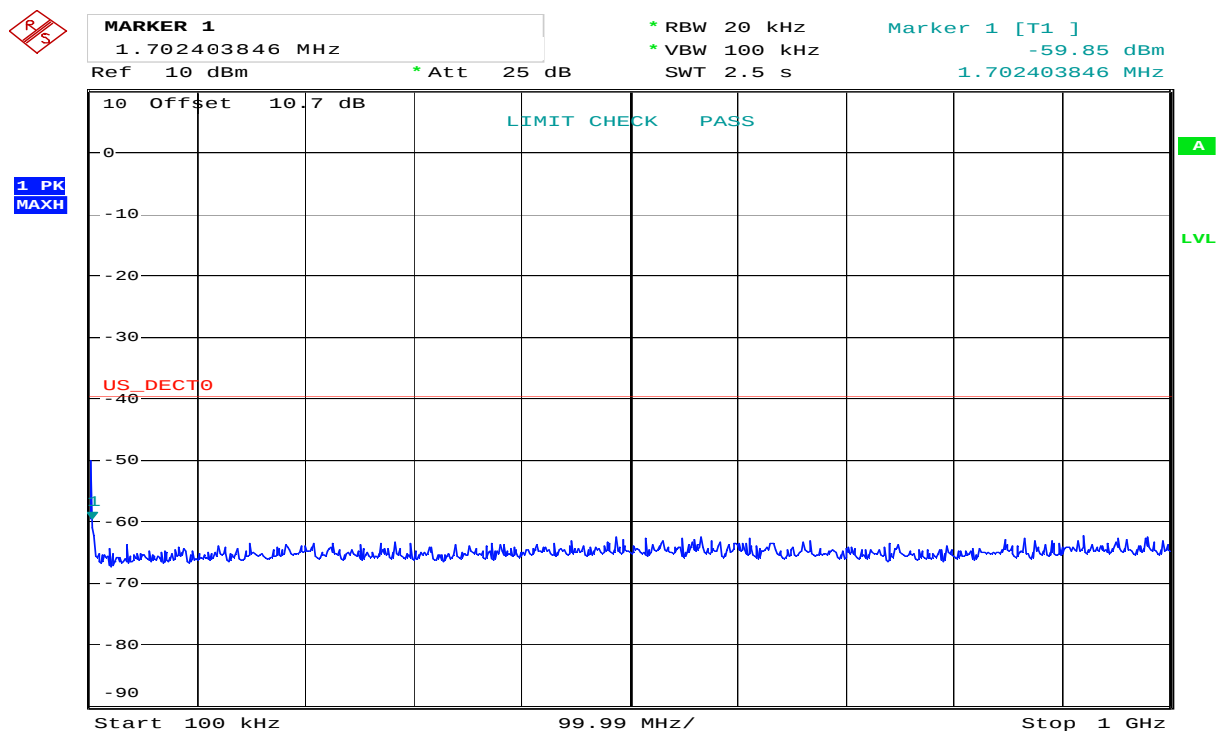
### Measurement Data:

See plots.

### Requirements, FCC 15.323(d):

$f \leq 1.25\text{MHz}$  outside UPCS band :  $\leq -9.5\text{dBm}$   
 $1.25\text{MHz} \leq f \leq 2.5\text{MHz}$  outside UPCS band :  $\leq -29.5\text{ dBm}$   
 $f \geq 2.5\text{MHz}$  outside UPCS band :  $\leq -39.5\text{ dBm}$

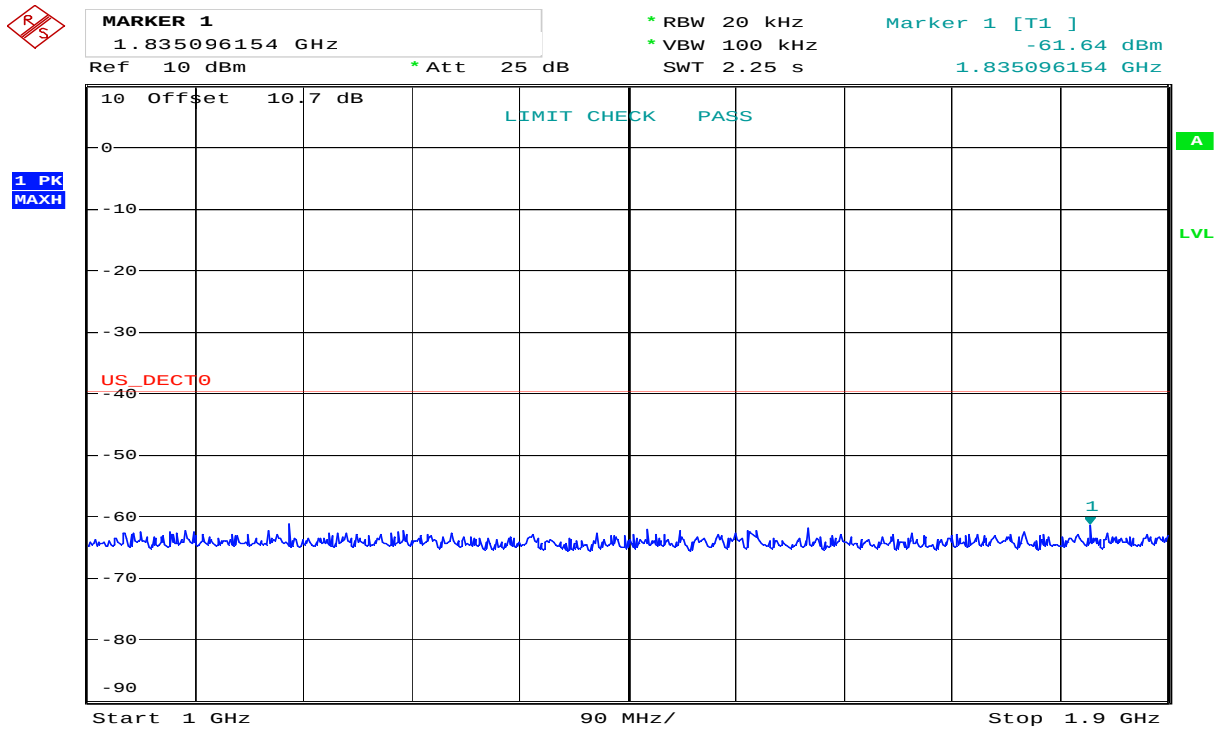
### Lower Channel:



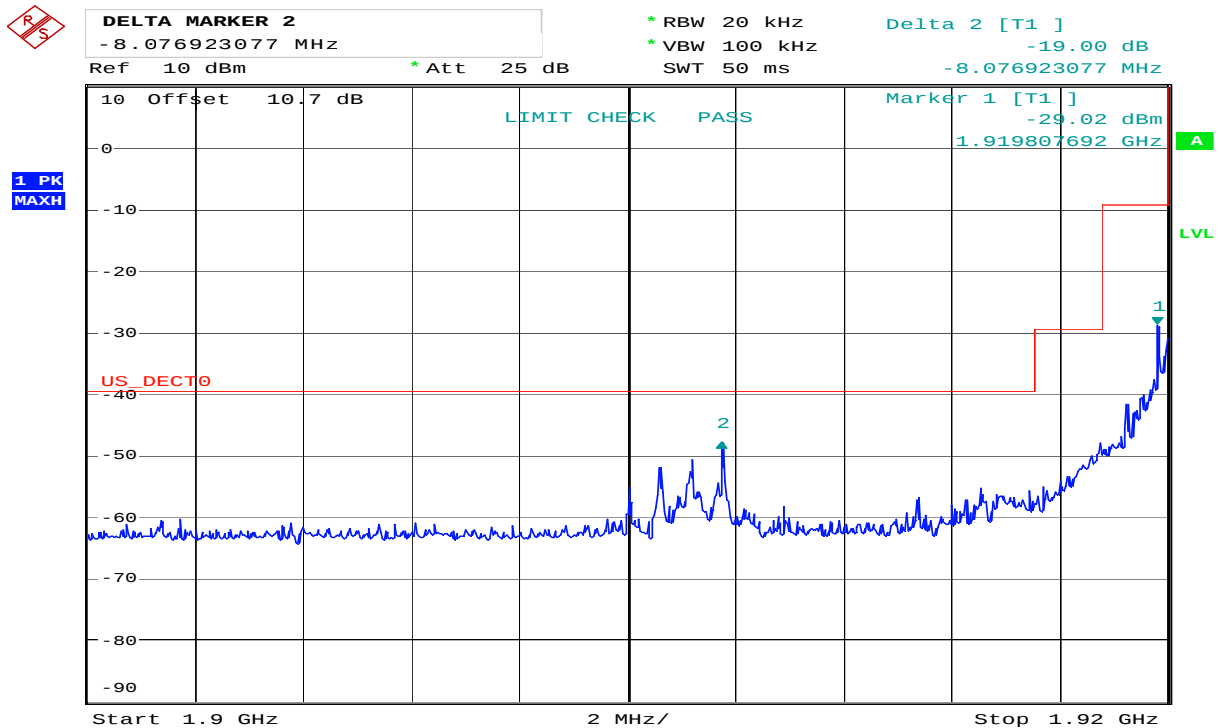
Date: 5.MAY.2008 15:52:54

## Out-of-Band Emissions, Conducted

### Lower Channel:



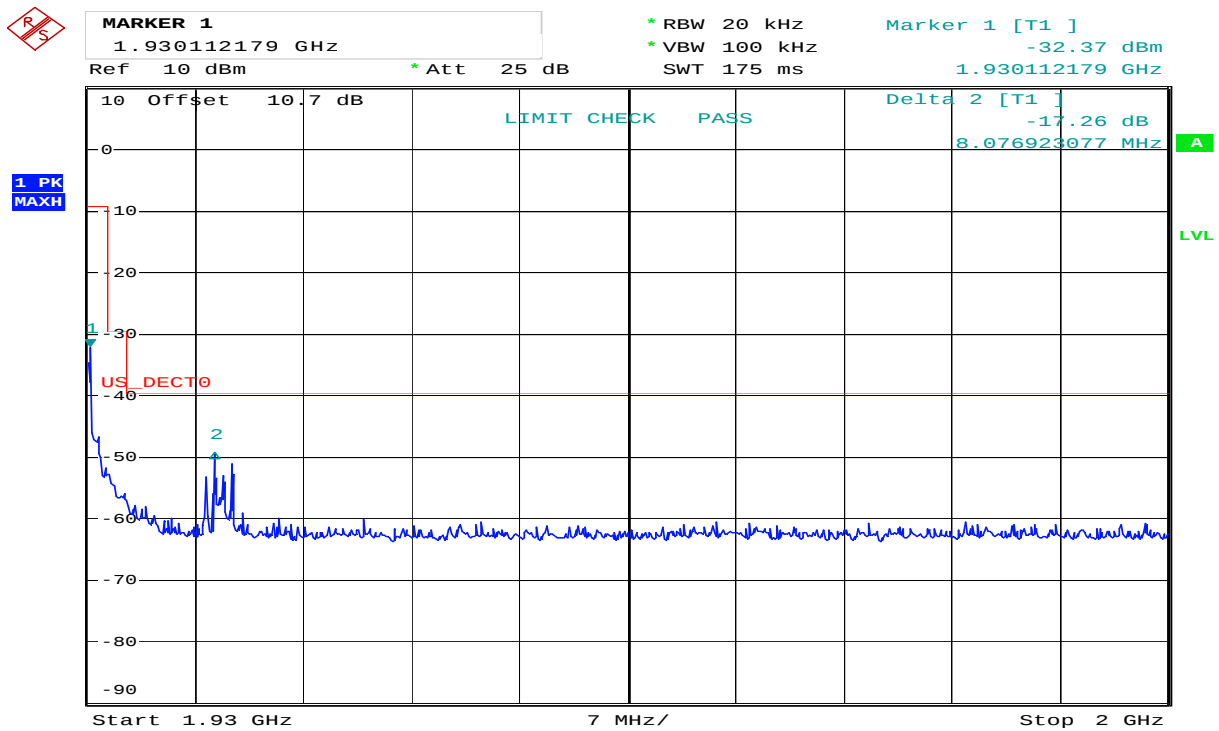
Date: 5.MAY.2008 15:51:49



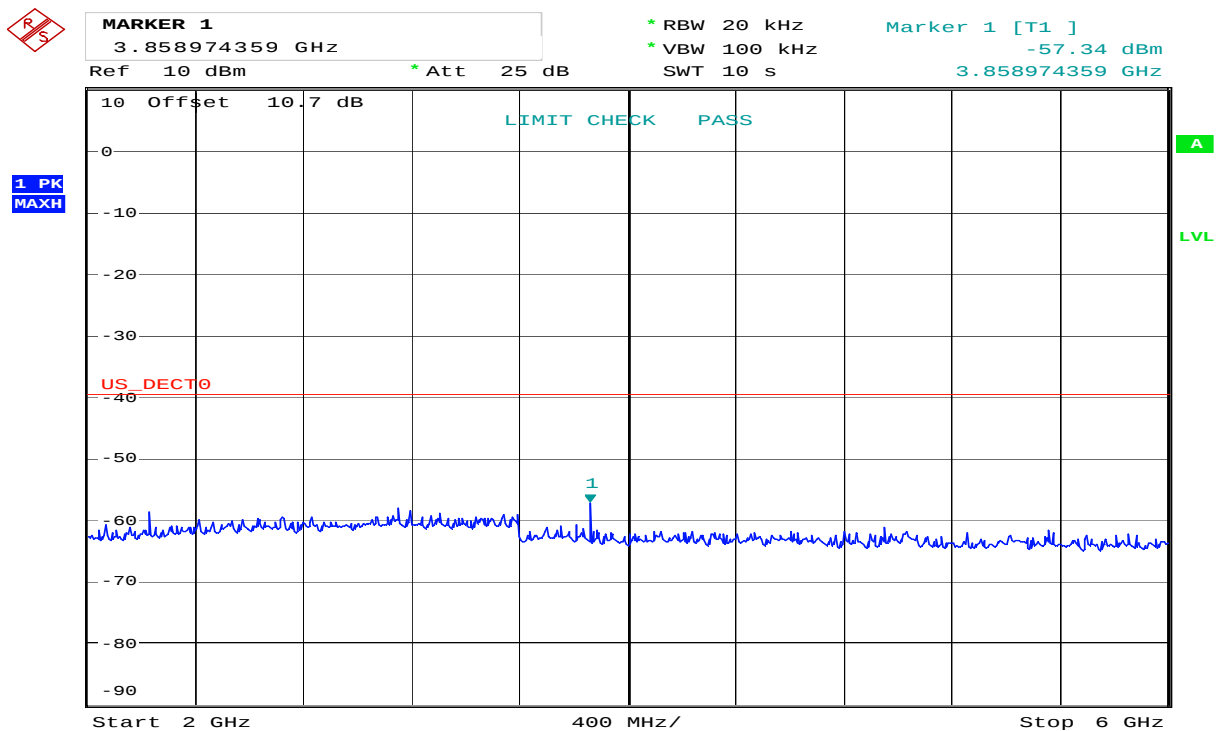
Date: 5.MAY.2008 15:50:47

## Out-of-Band Emissions, Conducted

### Upper Channel:



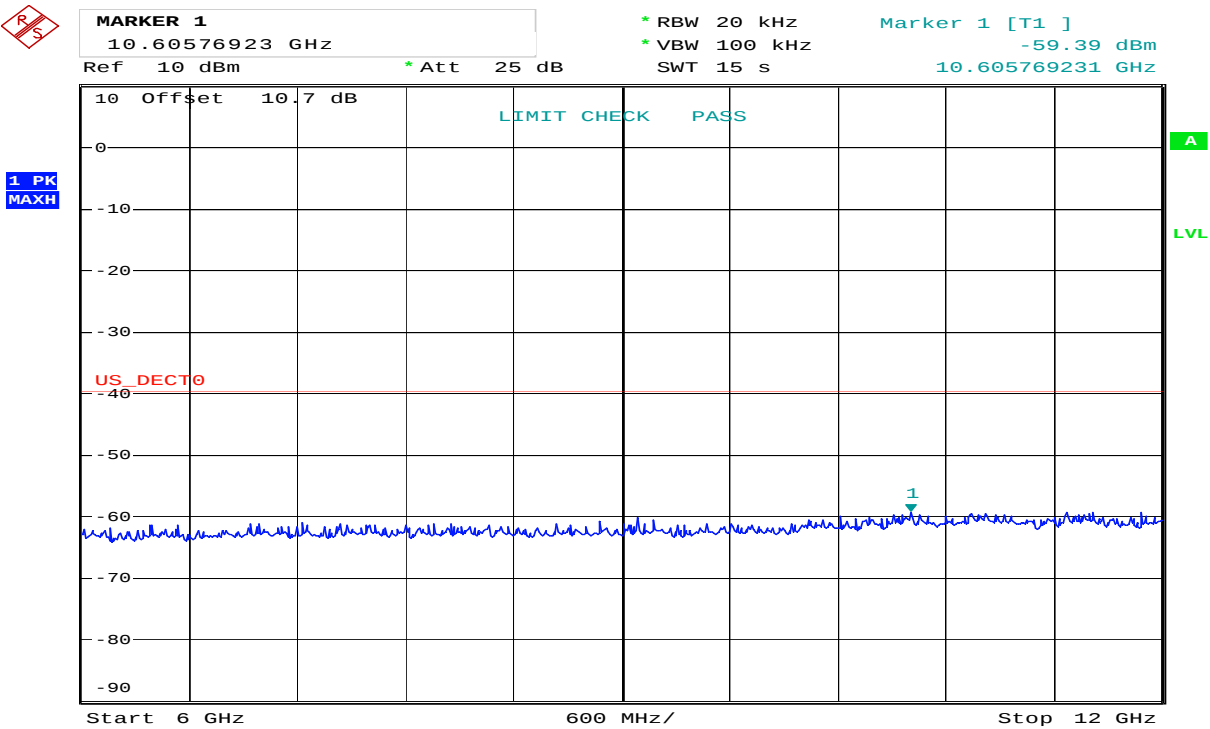
Date: 5.MAY.2008 15:55:31



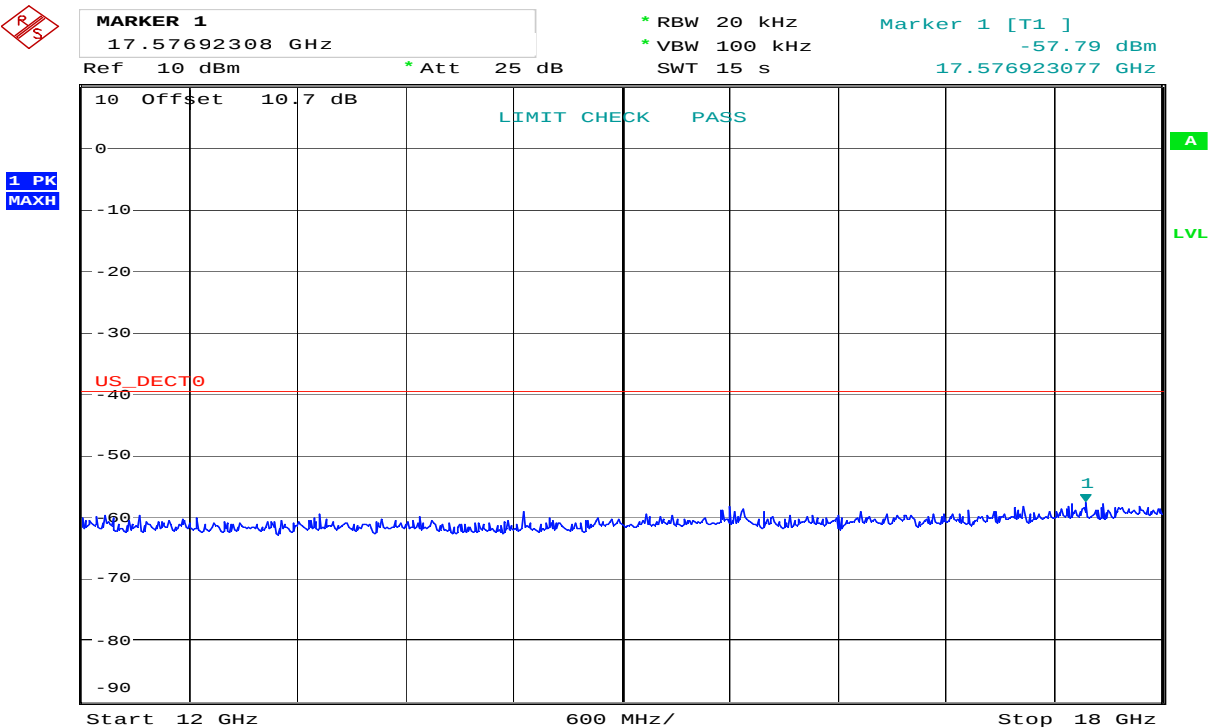
Date: 5.MAY.2008 15:56:56

Out-of-Band Emissions, Conducted

Upper Channel:



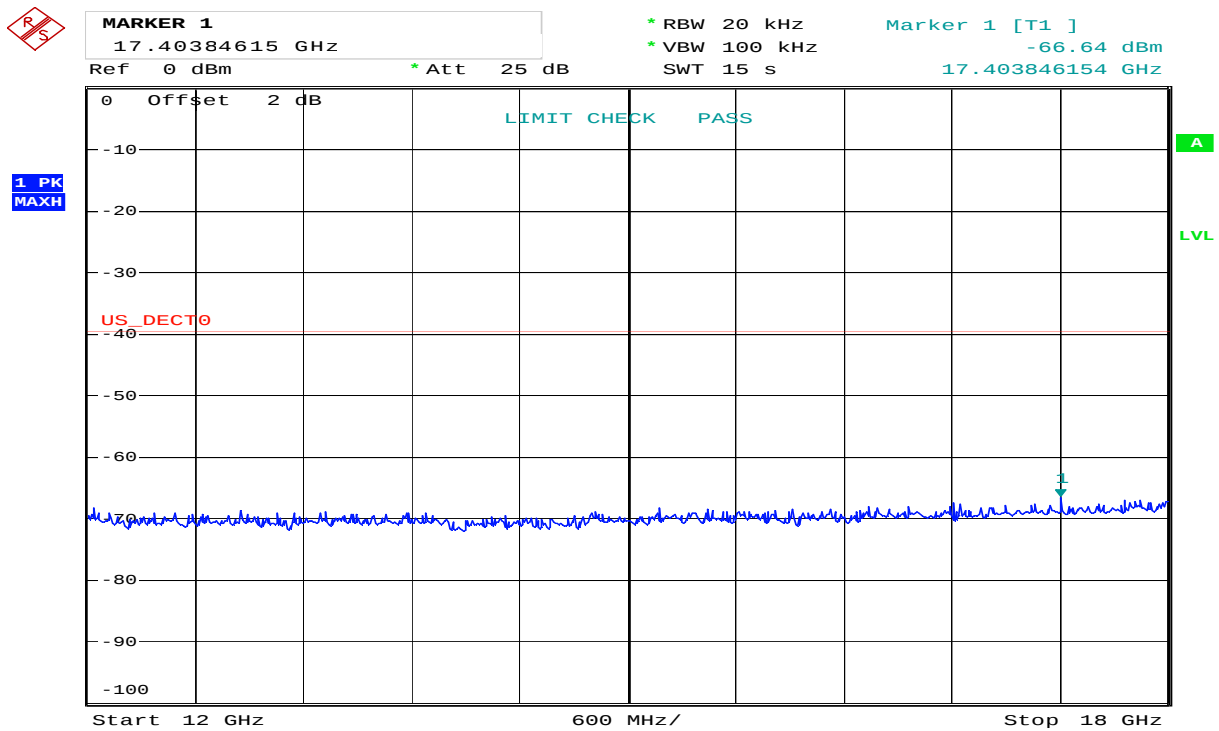
Date: 5.MAY.2008 16:06:13



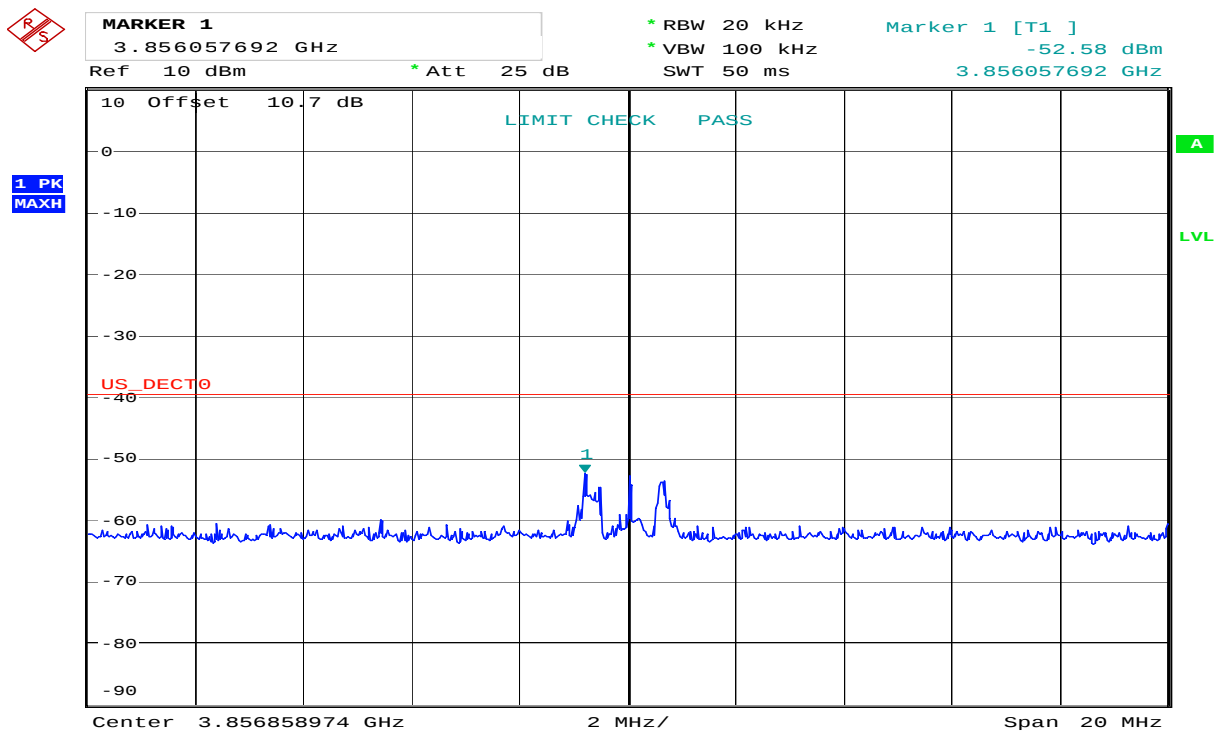
Date: 5.MAY.2008 16:07:56

## Out-of-Band Emissions, Conducted

### Upper Channel:



Date: 5.MAY.2008 16:10:06



Date: 5.MAY.2008 16:02:18

### 2<sup>nd</sup> Harmonic of Carrier

## 4.13 Carrier Frequency Stability

### Test Method:

ANSI C63.17, clause 6.2.1.

### Test Results: Complies

### Measurement Data:

The Frequency Stability is measured directly with a Frequency Domain Analyzer. Frequency Deviation in ppm is calculated from the measured peak to peak value.

The Carrier Frequency Stability over Power Supply Voltage and over Temperature is measured with a Frequency Domain Analyzer in histogram mode.

### Carrier Frequency Stability over Time at Nominal Temperature

| Nominal Carrier Frequency (MHz) | Peak-Peak Diff. (kHz) | Max. Dev. (ppm) | Limit   |
|---------------------------------|-----------------------|-----------------|---------|
| 1924.992                        | 27.3                  | 7.1             | ±10 ppm |

Deviation ppm = ((Peak-Peak Diff. / 2) / Mean Carrier Freq.) x 10<sup>6</sup>

Deviation (ppm) is calculated from readings over 3000 frames.

### Frequency Stability over Power Supply Voltage at Nominal Temperature

| Voltage                  | Measured Carrier Frequency (MHz) | Difference (kHz) | Deviation (ppm) | Limit   |
|--------------------------|----------------------------------|------------------|-----------------|---------|
| V <sub>nom</sub>         | 1924.971072                      | 0                | 0               | ±10 ppm |
| 85% of V <sub>nom</sub>  | 1924.971101                      | 0.0              | 0.0             |         |
| 115% of V <sub>nom</sub> | 1924.971073                      | 0.0              | 0.0             |         |

Deviation ppm = ((Mean – Measured Frequency) / Mean) x 10<sup>6</sup>

### Frequency Stability over Temperature

| Temperature | Measured Carrier Frequency (MHz) | Difference (kHz) | Deviation (ppm) | Limit   |
|-------------|----------------------------------|------------------|-----------------|---------|
| T = +20 °C  | 1924.970218                      | 0                | 0               | ±10 ppm |
| T = -20 °C  | 1924.987301                      | 17.1             | 8.9             |         |
| T = +50 °C  | 1924.960125                      | -10.1            | -5.2            |         |

Deviation ppm = ((Mean – Measured Frequency) / Mean) x 10<sup>6</sup>

#### 4.14 Frame Repetition Stability

**Test Method:**

ANSI C63.17, clause 6.2.2.

**Test Results: Complies**

**Measurement Data:**

The envelope of the RF signal from the EUT is detected with a Crystal Detector and the mean and standard deviation of the frame repetition frequency is then gated over 100 frames and measured with a Frequency Domain Analyzer. The frame repetition stability is 3 times the standard deviation.

| Carrier Frequency (MHz) | Mean (Hz) | Standard Deviation (Hz) | Frame Repetition Stability (ppm) |
|-------------------------|-----------|-------------------------|----------------------------------|
| 1924.992                | 99.99998  | 0.00000216              | 0.065                            |

**Limit:**

|                            |                |
|----------------------------|----------------|
| Frame Repetition Stability | ±10 ppm (TDMA) |
|----------------------------|----------------|

Ref. FCC 15.323(e), ANSI C63.17, clause 6.2.2

#### 4.15 Frame Period and Jitter

**Test Method:**

ANSI C63.17, clause 6.2.3.

**Test Results: Complies**

**Measurement Data:**

| Carrier Frequency (MHz) | Frame Period (ms) | Max Jitter (µs) | 3xStandard Deviation of Jitter (µs) |
|-------------------------|-------------------|-----------------|-------------------------------------|
| 1924.992                | 10.000            | -0.055          | -0.036                              |

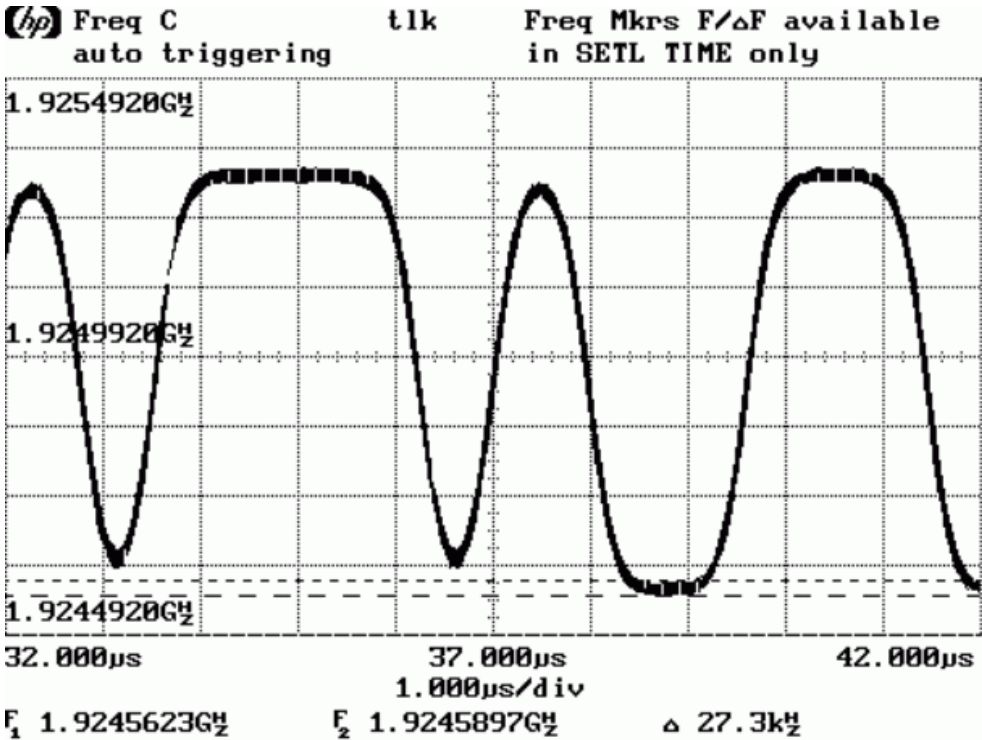
Max Jitter = (1/ (Frame period + Pk-Pk/2)) - (1/Frame Period), when Pk-Pk and Frame Period are in Hz

3xSt.Dev.Jitter = 3x (1/(Frame Period + St.Dev) – 1/St.Dev) x 10<sup>6</sup>

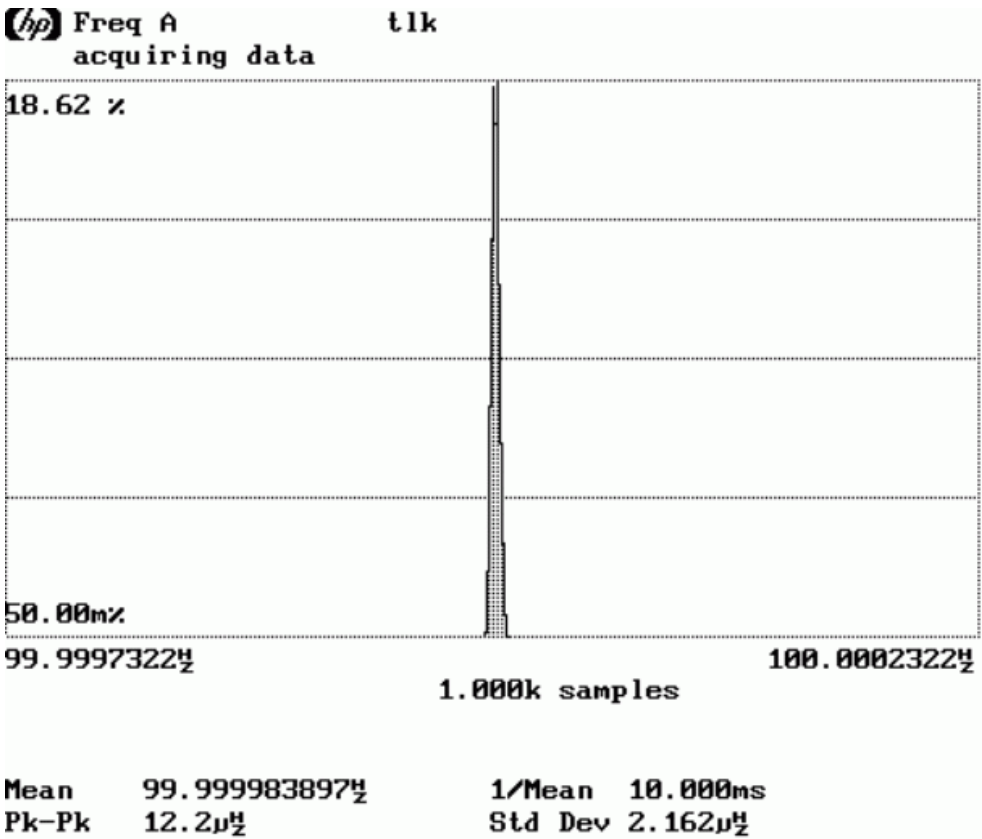
**Limit:**

|                          |             |
|--------------------------|-------------|
| Frame Period             | 20 or 10 ms |
| Max Jitter               | 25 µs       |
| 3 times St.Dev of Jitter | 12.5 µs     |

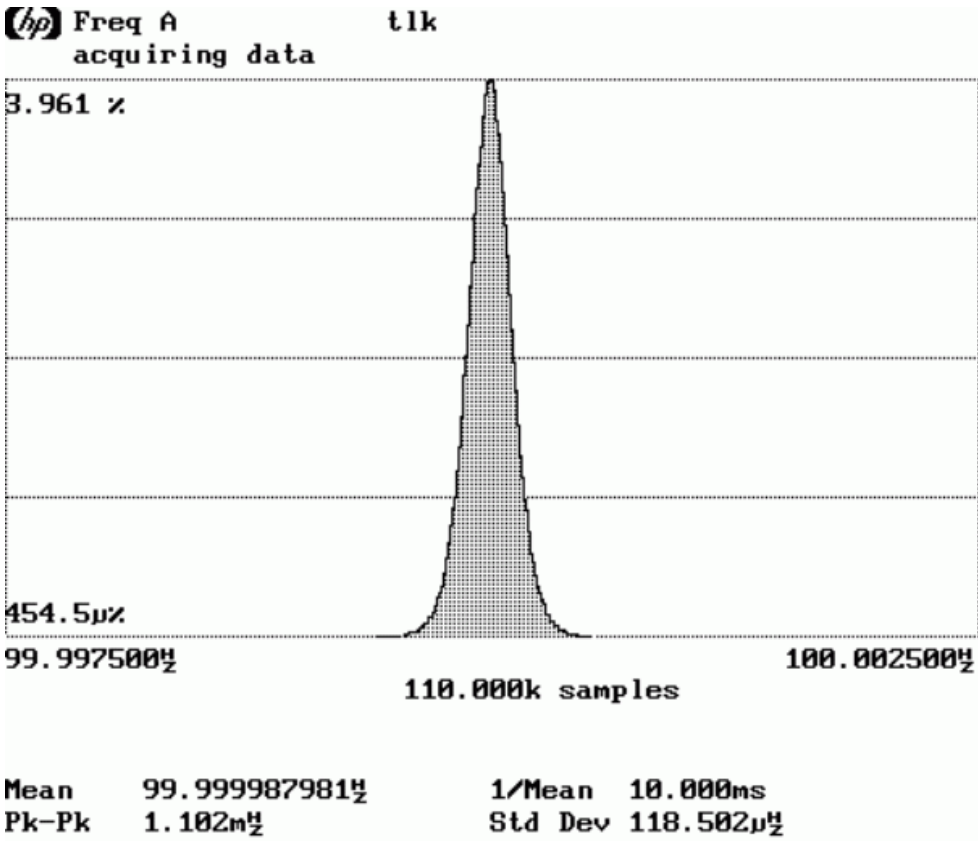
Ref. FCC 15.323(e), ANSI C63.17, clause 6.2.3



Carrier Frequency Stability, Long Term



Frame Repetition Stability, Gated over 100 Frames



Frame Period and Jitter

#### 4.16 Monitoring Threshold, Least Interfered Channel

##### Monitoring Threshold Limits:

Lower Threshold:

$$T_L = 15 \log B - 184 + 30 - P_{EUT} \quad (\text{dBm})$$

Upper Threshold:

$$T_U = 15 \log B - 184 + 50 - P_{EUT} \quad (\text{dBm})$$

$B$  is measured Emission Bandwidth in Hz

$P_{EUT}$  is measured Transmitter Power in dBm

Calculated values:

|                 |           |
|-----------------|-----------|
| Lower Threshold | -79.3 dBm |
| Upper Threshold | -59.3 dBm |

The Lower Threshold is applicable for systems which have defined less than 40 duplex system access channels. The Upper Threshold is applicable for systems with more than 40 duplex system access channels and that implements the Least Interfered Channel Procedure (LIC).

##### Measurement Procedure:

The Upper or Lower Threshold is found by the procedure defined in ANSI C63.17 clause 7.3.1 or 7.3.2.

|                                                     |           |
|-----------------------------------------------------|-----------|
| <b>Least Interfered Channel Procedure NOT used:</b> |           |
| Lower Threshold                                     | NA dBm    |
| <b>Least Interfered Channel Procedure:</b>          |           |
| Upper Threshold                                     | -63.3 dBm |

##### Least Interfered Channel (LIC) Procedure Test, FCC 15.323(b), (c)(2) and (c)(5)

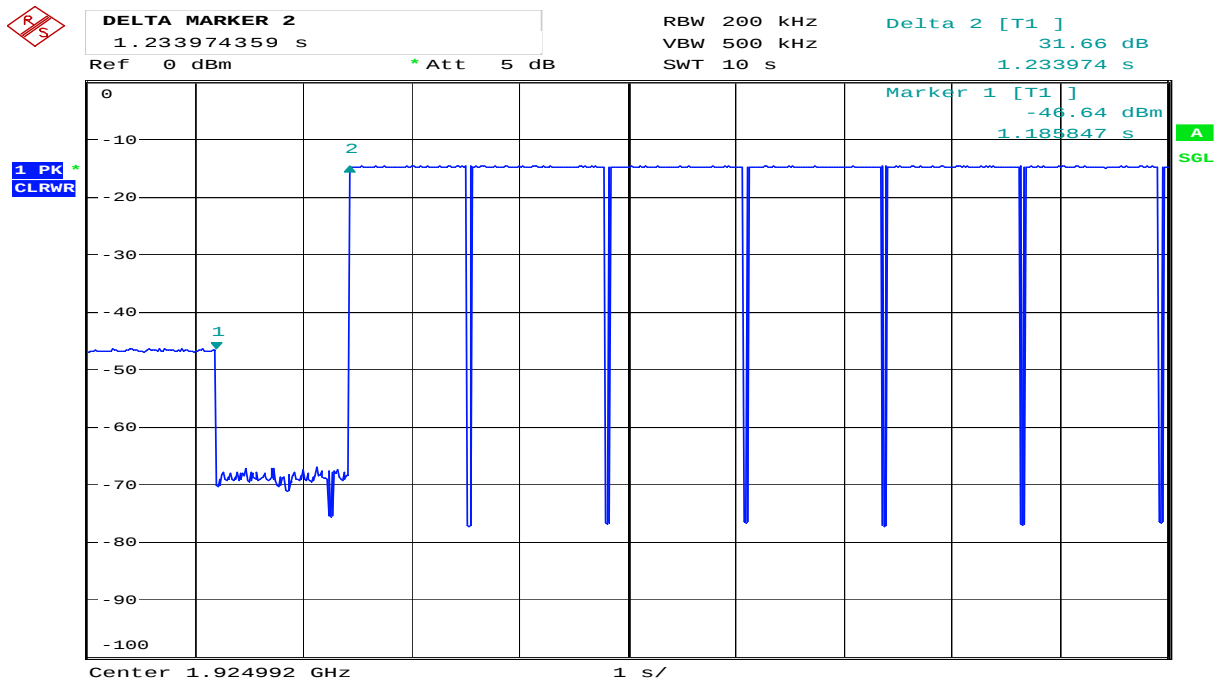
| ANSI C63.17 clause 7.3.3 ref.                 | Observation                  | Verdict |
|-----------------------------------------------|------------------------------|---------|
| b) $f_1$ $T_L + 13$ dB, $f_2$ at $T_L + 6$ dB | Transmission always on $f_2$ | Pass    |
| c) $f_1$ $T_L + 6$ dB, $f_2$ at $T_L + 13$ dB | Transmission always on $f_1$ | Pass    |
| d) $f_1$ $T_L + 7$ dB, $f_2$ at $T_L$         | Transmission always on $f_2$ | Pass    |
| e) $f_1$ $T_L$ , $f_2$ at $T_L + 7$ dB        | Transmission always on $f_1$ | Pass    |

### Selected Channel Confirmation, FCC 15.323(c)(1) and (5)

| ANSI C63.17 clause 7.3.4              | Observation            | Verdict |
|---------------------------------------|------------------------|---------|
| b) Shall <b>not</b> transmit on $f_1$ | EUT transmits on $f_2$ | Pass    |
| d) Shall <b>not</b> transmit on $f_2$ | EUT transmits on $f_1$ | Pass    |

### Limits:

|                               |           |
|-------------------------------|-----------|
| Lower Threshold + 6 dB margin | -73.3 dBm |
| Upper Threshold + 6 dB margin | -53.3 dBm |



Date: 6.MAY.2008 13:49:01

### 7.3.4 Selected Channel Confirmation, Connection 1.2s After Interferer Removed

#### 4.17 Threshold Monitoring Bandwidth

This test is only required if a dedicated monitoring receiver is used. However, if the test is not carried out the manufacturer shall declare and provide proper evidence that the monitoring is made through the radio receiver used for communication.

##### Measurement Procedure:

Simple Compliance Test, ANSI C63.17, clause 7.4.1

More Detailed Test, ANSI C63.17, clause 7.4.2

The test is passed if **either** the Simple Compliance Test or the More Detailed test is passed.

During this test the spectrum analyzer is observed visually to see if the EUT transmits or not.

##### Test Results:

| Test performed                               | Observation      | Verdict |
|----------------------------------------------|------------------|---------|
| Simple Compliance test, at $\pm 30\%$ of $B$ | No transmissions | Pass    |
| More Detailed Test, at -6 dB points          | N/A              | N/A     |
| More Detailed Test, at -12 dB points         | N/A              | N/A     |

The more detailed test must be pass at both the -6 and -12 dB points if the Simple Compliance test fails.

**Comment:** The Simple Compliance Test was performed with the level at  $T_U + U_M + 10$  dB to check that the EUT did not transmit at all.

The tested EUT uses the same receiver for monitoring and communication, this test is therefore not required. However the test has been performed nonetheless and the test is passed.

##### Limits, FCC 15.323(c)(7):

The monitoring system bandwidth must be equal to or greater than the emission bandwidth of the intended transmission.

## 4.18 Reaction Time and Monitoring Interval

### Measurement Procedure

ANSI C63.17, clause 7.5

### Test results:

By administrative commands and out-of-operating region interference, the EUT is restricted to operate on a single carrier frequency.

Time-synchronized pulsed interference was then applied on the carrier at pulsed levels  $T_U + U_M$  to check that the EUT does not transmit at all. The level was raised 6 dB for part d) with 35  $\mu$ s pulses.

The pulses are synchronized with the EUT timeslots and applied centered within all timeslots.

| Pulse Width, ref. to ANSI C63.17 clause 7.5                                                                | Observation      | Verdict |
|------------------------------------------------------------------------------------------------------------|------------------|---------|
| c) > largest of 50 $\mu$ s and $50 \cdot \text{SQRT}(1.25/B)$                                              | No transmissions | Pass    |
| d) > largest of 35 $\mu$ s and $35 \cdot \text{SQRT}(1.25/B)$ ,<br>and with interference level raised 6 dB | No transmissions | Pass    |

**Comment:** Since  $B$  is larger than 1.25 MHz the test was performed with pulse lengths of 50  $\mu$ s and 35  $\mu$ s.

### Limits, FCC 15.323(c)(1), (5) and (7)

The maximum reaction time must be less than  $50 \cdot \text{SQRT}(1.25/\text{emission bandwidth in MHz})$  microseconds for signals at the applicable threshold level but shall not be required to be less than 50 microseconds.

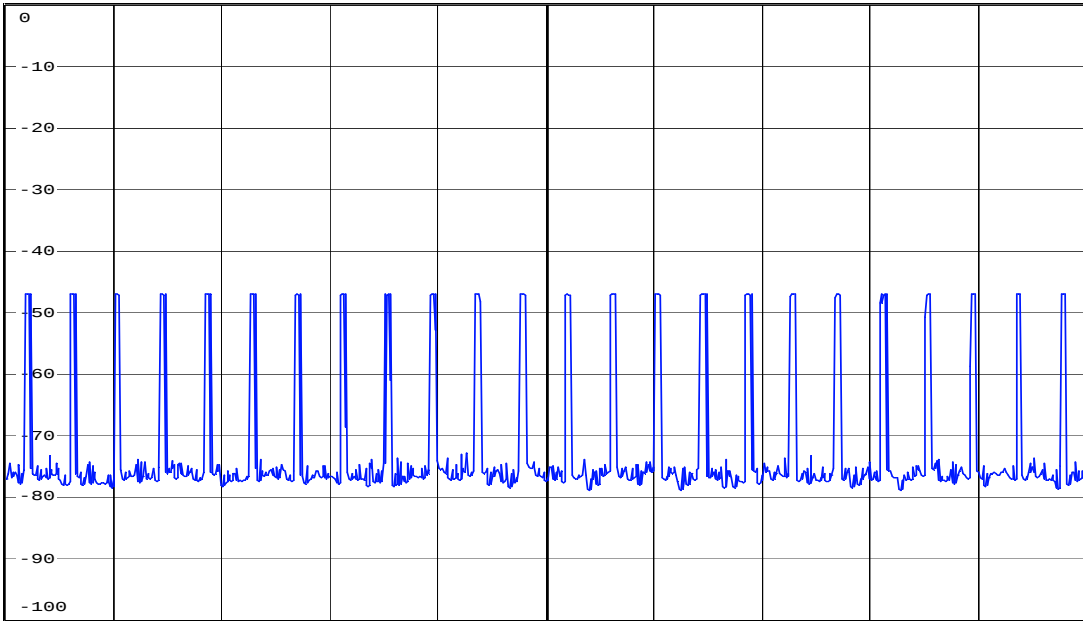
If a signal is detected that is 6 dB or more above the applicable threshold level, the maximum reaction time shall be  $35 \cdot \text{SQRT}(1.25/\text{emission bandwidth in MHz})$  microseconds but shall not be required to be less than 35 microseconds.



**CENTER FREQUENCY**  
 1.924992 GHz  
 Ref 0 dBm \* Att 5 dB

RBW 1 MHz  
 VBW 3 MHz  
 SWT 10 ms

1 PK \*  
 CLRWR



Center 1.924992 GHz 1 ms/

Date: 6.MAY.2008 17:05:33

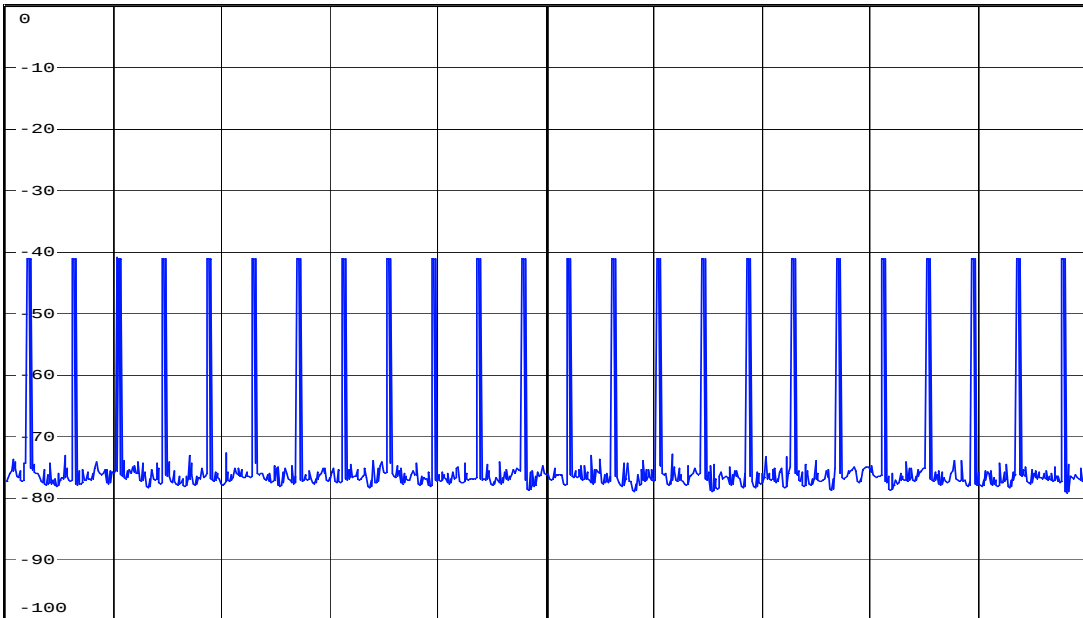
### 50 µs Pulses



**SWEEP TIME**  
 10 ms  
 Ref 0 dBm \* Att 5 dB

RBW 1 MHz  
 VBW 3 MHz  
 SWT 10 ms

1 PK \*  
 CLRWR



Center 1.924992 GHz 1 ms/

Date: 6.MAY.2008 17:06:50

### 35 µs Pulses

## 4.19 Time and Spectrum Window Access Procedure

This requirement is only for EUTs which transmit unacknowledged control and signaling information.

### Measurement Procedure:

Timing for EUTs using control and signaling channel type transmissions: ANSI C63.17, clause 8.1

### Test results:

| Access Criteria, ref. to ANSI C63.17 clause 8.1.1                                                                                                                                             | Observation                                      | Verdict |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|---------|
| b) Check that the EUT transmits on the interference free time-slot                                                                                                                            | EUT transmits on the interference free time-slot | Pass    |
| b) The EUT must terminate or pause in its repetitive transmission of the control and signalling channel on the open channel to repeat the access criteria not less frequently than every 30 s | Transmission paused every 1.28 s                 | Pass    |

If FCC 15.323(c)(6) option, **If Random Waiting Interval is NOT implemented**

| Access Criteria, ref. to ANSI C63.17 clause 8.1.2                                                                  | Observation                                                     | Verdict |
|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|---------|
| b) Check that the EUT changes to an interference-free slot when interference is introduced on the time slot in use | EUT changes to the interference-free time-slot, and stays there | Pass    |

If FCC 15.323(c)(6) option, **Only if Random Waiting Interval is implemented**

| Access Criteria, ref. to ANSI C63.17 clause 8.1.3                                                              | Observation | Verdict |
|----------------------------------------------------------------------------------------------------------------|-------------|---------|
| b-d) Check that the EUT uses random waiting interval before continuing transmission on an interfered time slot | N/A         | N/A     |

Comment: The tested EUT does not support the Random Waiting Interval option.

### Limits:

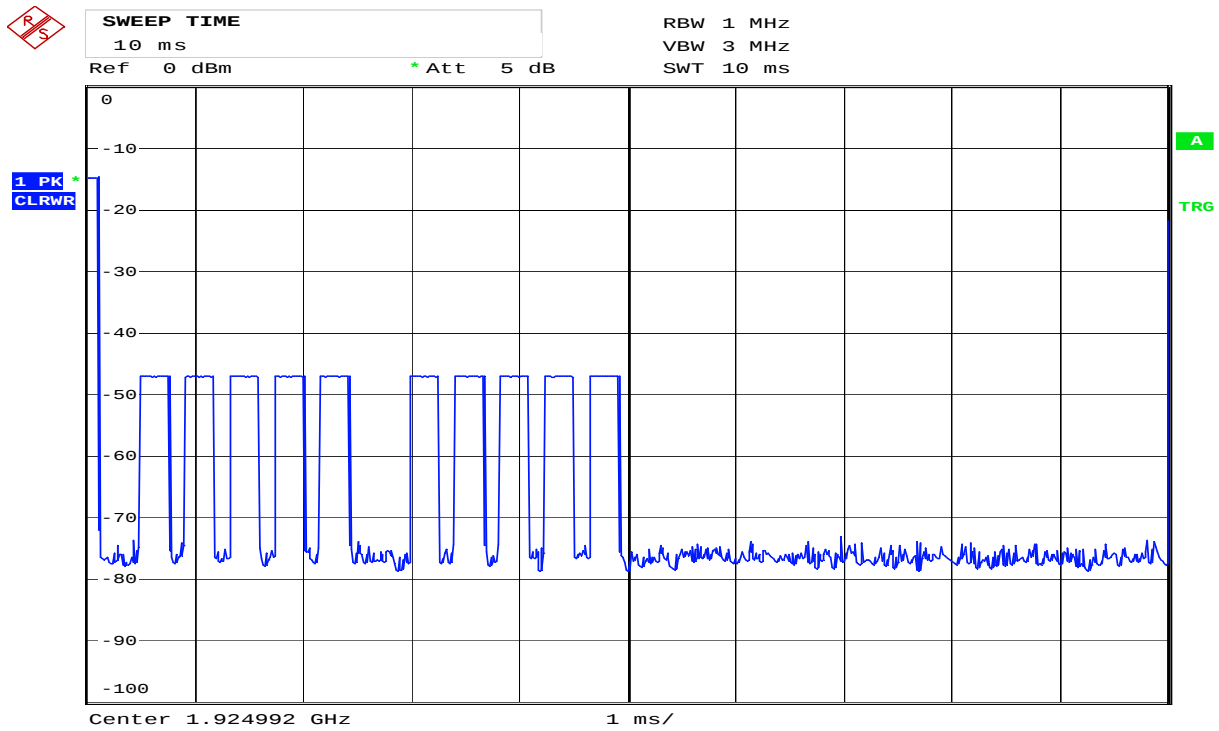
#### FCC 15.323(c)(4):

Once access to specific combined time and spectrum windows is obtained an acknowledgement from a system participant must be received by the initiating transmitter within one second or transmission must cease. Periodic acknowledgements must be received at least every 30 seconds or transmission must cease. Channels used exclusively for control and signaling information may transmit continuously for 30 seconds without receiving an acknowledgement, at which time the access criteria must be repeated.

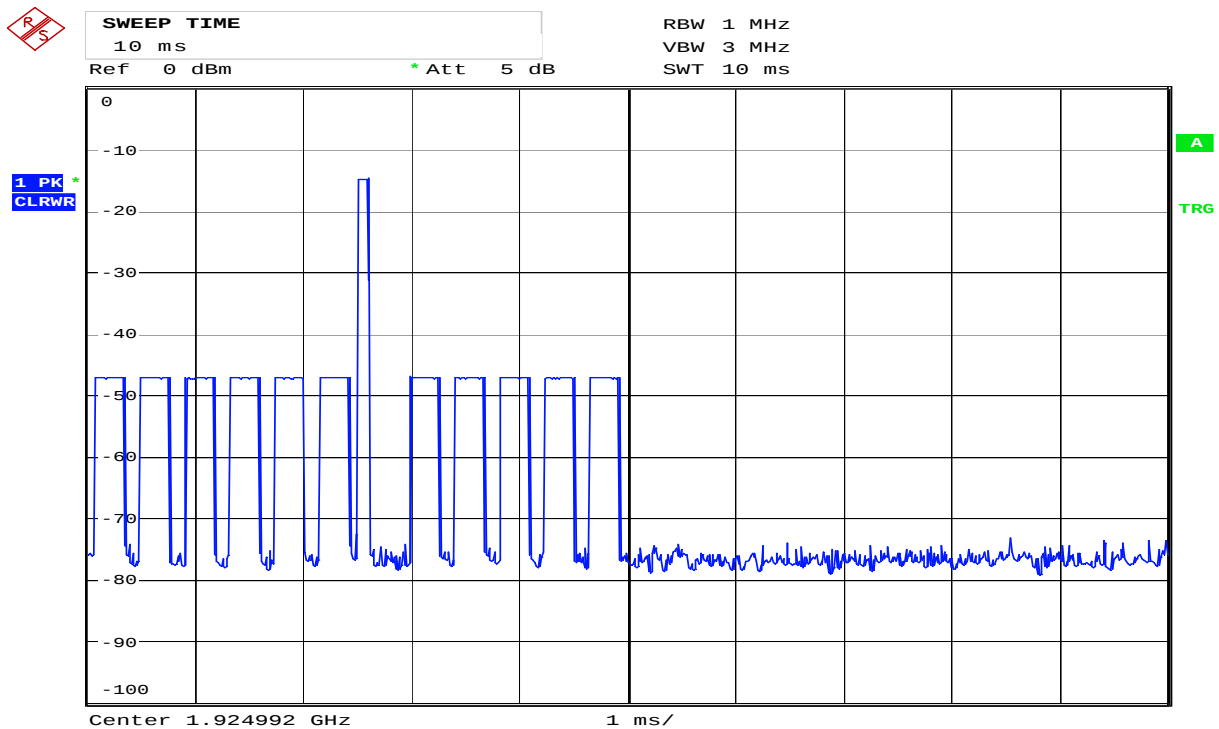
#### FCC 15.323(c)(6):

If the selected combined time and spectrum windows are unavailable, the device may either monitor and select different windows or seek to use the same windows after waiting an amount of time, randomly chosen from a uniform random distribution between 10 and 150 milliseconds, commencing when the channel becomes available

## Access Criteria Check



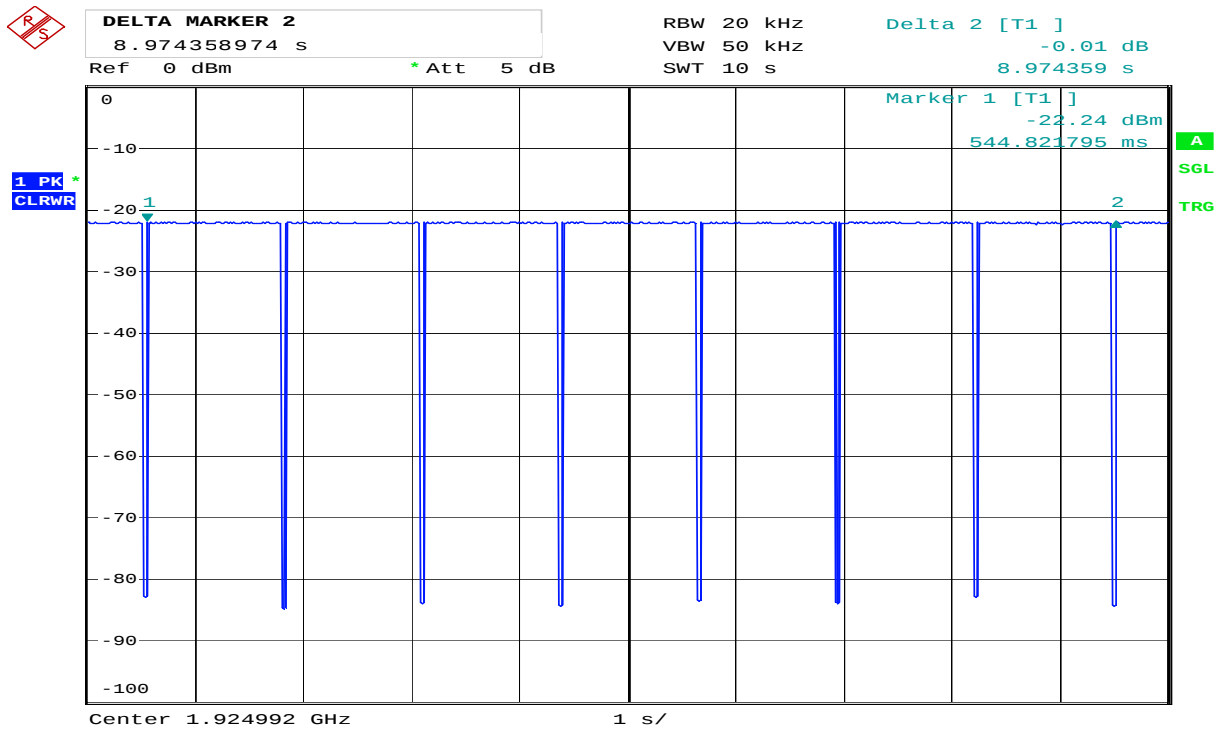
Date: 6.MAY.2008 17:10:00



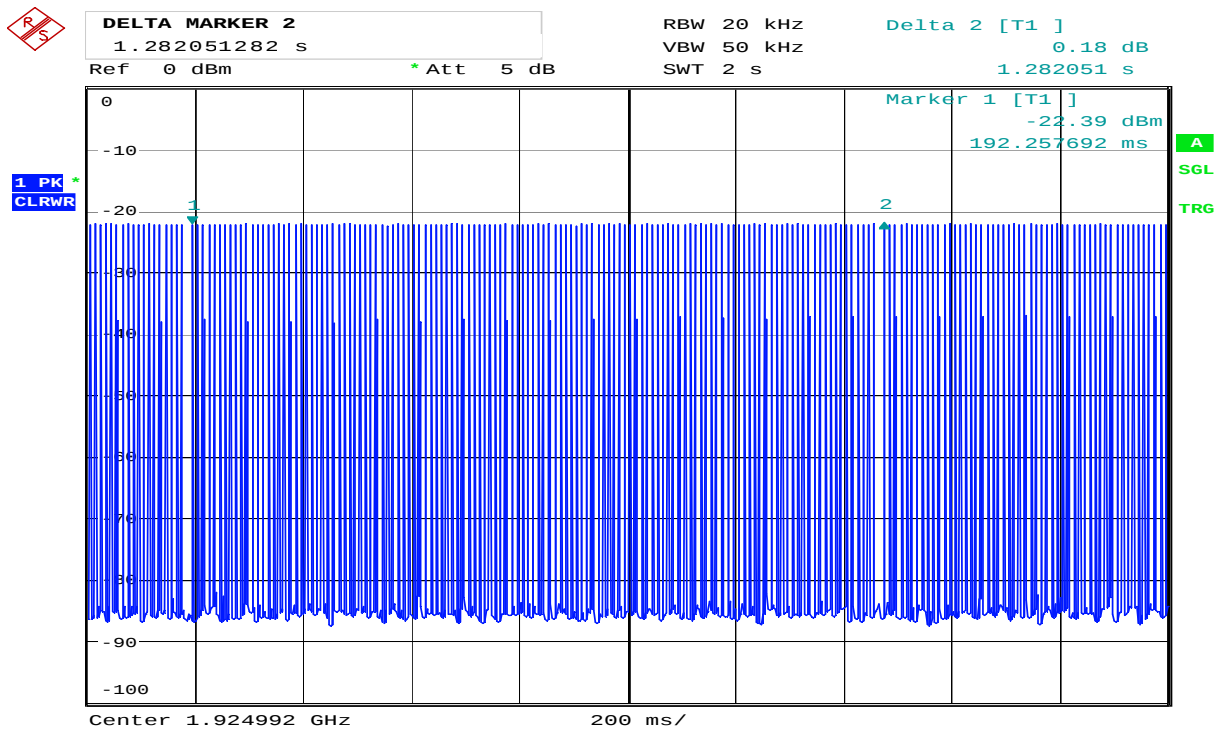
Date: 6.MAY.2008 17:10:37

### 8.1.1a) EUT Transmits on Unblocked Slot

## Access Criteria Check



Date: 6.MAY.2008 14:32:29



Date: 6.MAY.2008 14:34:05

### 8.1.1b) Access Criteria check Interval

## 4.20 Acknowledgements and Transmission Duration

### Measurement Procedure:

Acknowledgements: ANSI C63.17, clause 8.2.1

Transmission Duration: ANSI C63.17, clause 8.2.2

During the test **Initial transmission without acknowledgements** the signal from the EUT to the companion device is blocked by circulators in addition to the tunable attenuator.

The test **Transmission time after loss of acknowledgements** is performed by cutting-off the signal from the companion device by a RF switch and measuring the time until the EUT stops transmitting.

The **Transmission Duration** test is performed by monitoring the slot in use and measuring the time until the EUT changes to a different slot.

### Test Results:

#### Acknowledgements

| Test ref. to ANSI C63.17 clause 8.2.1               | Observation                | Verdict |
|-----------------------------------------------------|----------------------------|---------|
| a) Initial transmission without acknowledgements    | Only for initiating device | N/A     |
| c) Transmission time after loss of acknowledgements | 5.0 sec                    | Pass    |

#### Transmission Duration

| Test ref. to ANSI C63.17 clause 8.2.2                      | Observation                                                      | Verdict |
|------------------------------------------------------------|------------------------------------------------------------------|---------|
| b) Transmission duration on same time and frequency window | Only for initiating device that controls which time slot is used | N/A     |

Comment: /

### Limits, FCC 15.323(c)(3) and (4)

Occupation of the same combined time and spectrum windows by a device or group of cooperating devices continuously over a period of time longer than 8 hours is not permitted without repeating the access criteria.

Once access to specific combined time and spectrum windows is obtained an acknowledgement from a system participant must be received by the initiating transmitter within one second or transmission must cease.

Periodic acknowledgements must be received at least every 30 seconds or transmission must cease. Channels used exclusively for control and signaling information may transmit continuously for 30 seconds without receiving an acknowledgement, at which time the access criteria must be repeated.

## 4.21 Dual Access Criteria Check

### Measurement Procedure:

EUTs that does not implement the Upper Threshold: ANSI C63.17, clause 8.3.1

EUTs that implement the Upper Threshold: ANSI C63.17, clause 8.3.2

This test is required for equipment that uses the access criteria in FCC 15.323(c)(10).

### Test Results:

#### EUTs that do NOT Implement the Upper Threshold:

| Test ref. to ANSI C63.17 clause 8.3.1                                                                        | Observation | Verdict |
|--------------------------------------------------------------------------------------------------------------|-------------|---------|
| b) EUT is restricted to a single carrier $f_i$ for TDMA systems. The Test is Pass if EUT can transmit        | N/A         | N/A     |
| c) d) No transmissions on interference-free <b>receive</b> time/spectrum window. All transmit slots blocked. | N/A         | N/A     |
| e) f) No transmission on interference-free <b>transmit</b> time/spectrum window. All receive slots blocked.  | N/A         | N/A     |

#### EUTs that Implements the Upper Threshold:

| Test ref. to ANSI C63.17 clause 8.3.2                                                                 | Observation | Verdict |
|-------------------------------------------------------------------------------------------------------|-------------|---------|
| b) EUT is restricted to a single carrier $f_i$ for TDMA systems. The Test is Pass if EUT can transmit | N/A         | N/A     |
| c) d) Transmission on interference-free <b>receive</b> time/spectrum window                           | N/A         | N/A     |
| e) f) Transmission on interference-free <b>transmit</b> time/spectrum window                          | N/A         | N/A     |
| g) Transmission not possible on any time/spectrum window                                              | N/A         | N/A     |

Comment: This test is only applicable for EUT that can be initiating device.

### Limits, FCC 15.323(c)(10)

An initiating device may attempt to establish a duplex connection by monitoring both its intended transmit and receive time and spectrum windows. If both the intended transmit and receive time and spectrum windows meet the access criteria, then the initiating device can initiate a transmission in the intended transmit time and spectrum window. If the power detected by the responding device can be decoded as a duplex connection signal from the initiating device, then the responding device may immediately begin transmitting on the receive time and spectrum window monitored by the initiating device.

#### **4.22      Alternative Monitoring Interval**

Test procedure described in ANSI C63.17 clause 8.4.

This test is required if the EUT implements the provisions of FCC 15.323(c)(11).

**Test result:**

Not Tested. The tested EUT does not implement this provision. See manufacturers' declaration.

## 4.23 Receiver Spurious Emissions

### Measurement Procedure:

Industry Canada RSS-213 paragraph 6.8 and RSS-GEN paragraphs 4.8 and 6.

### Test results:

| Frequency MHz  | Carrier No. | Measured Value Conducted dBm | Conducted Limit dBm | Margin dB |
|----------------|-------------|------------------------------|---------------------|-----------|
| 30 - 1000      | all         | < -80                        | -57                 | >23       |
| 1.000 – 20.000 | all         | < -80                        | -53                 | >27       |

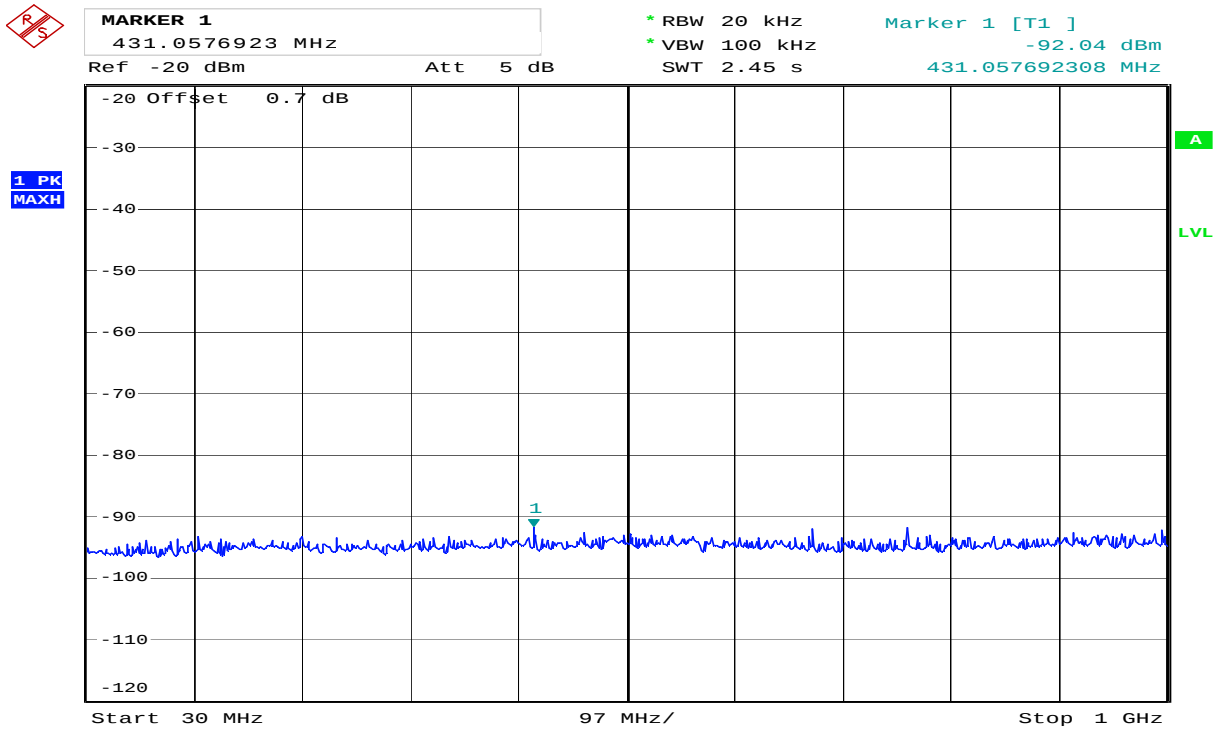
The Receiver Spurious Emissions are covered by paragraph 4.23 Spurious Emissions Radiated. No separate Spurious Emissions which could be related to the receiver were detected during the radiated test.

### Requirements, RSS-GEN Issue 2, clause 6

The measurement can be performed either radiated or conducted.

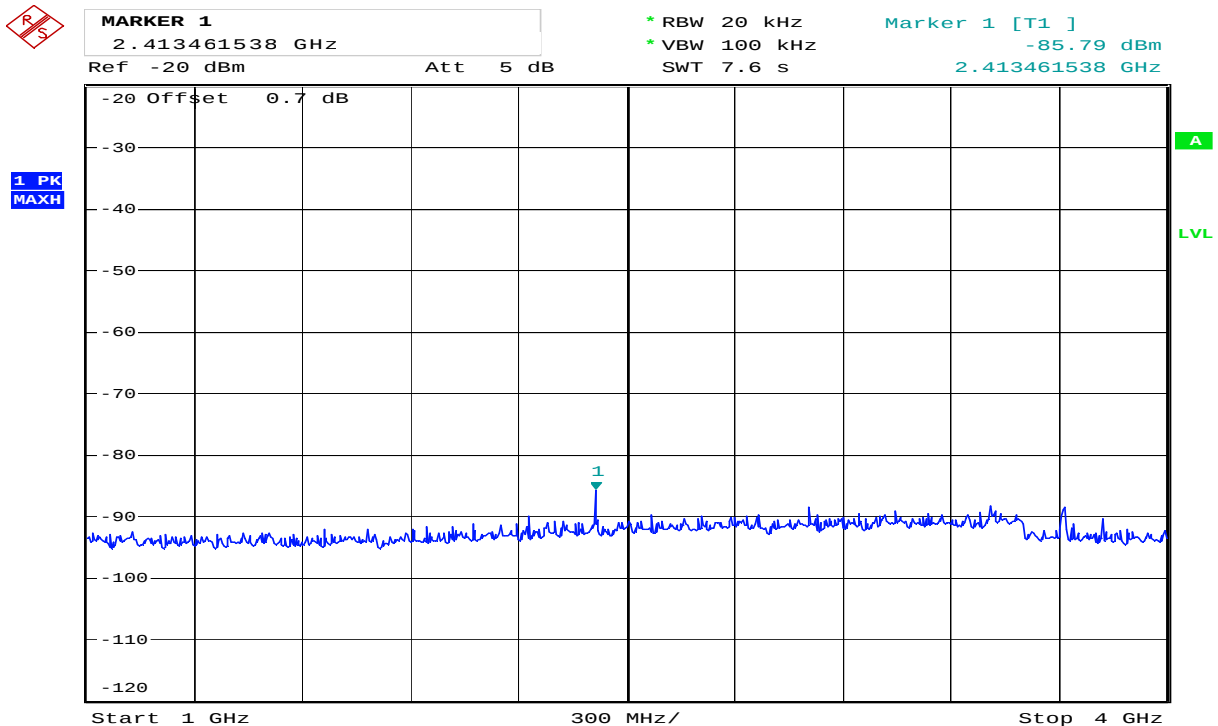
**When measured Conducted:** no spurious signals appearing at the antenna terminals shall exceed 2 nW per any 4 kHz spurious frequency in the band 30-1000 MHz, or 5 nW above 1 GHz.

**When measured Radiated:** See Table 1 in RSS-GEN Issue 2, clause 6.



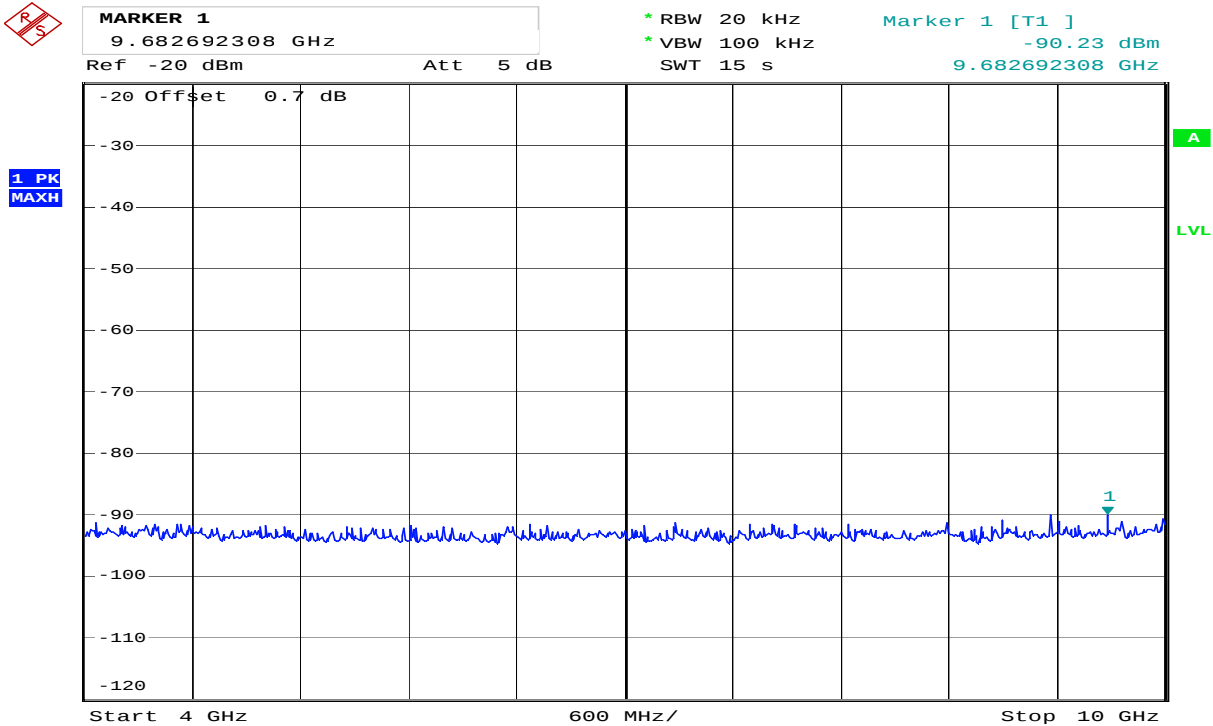
Date: 6.MAY.2008 09:23:32

### Receiver Emissions, Conducted, 30 - 1000 MHz



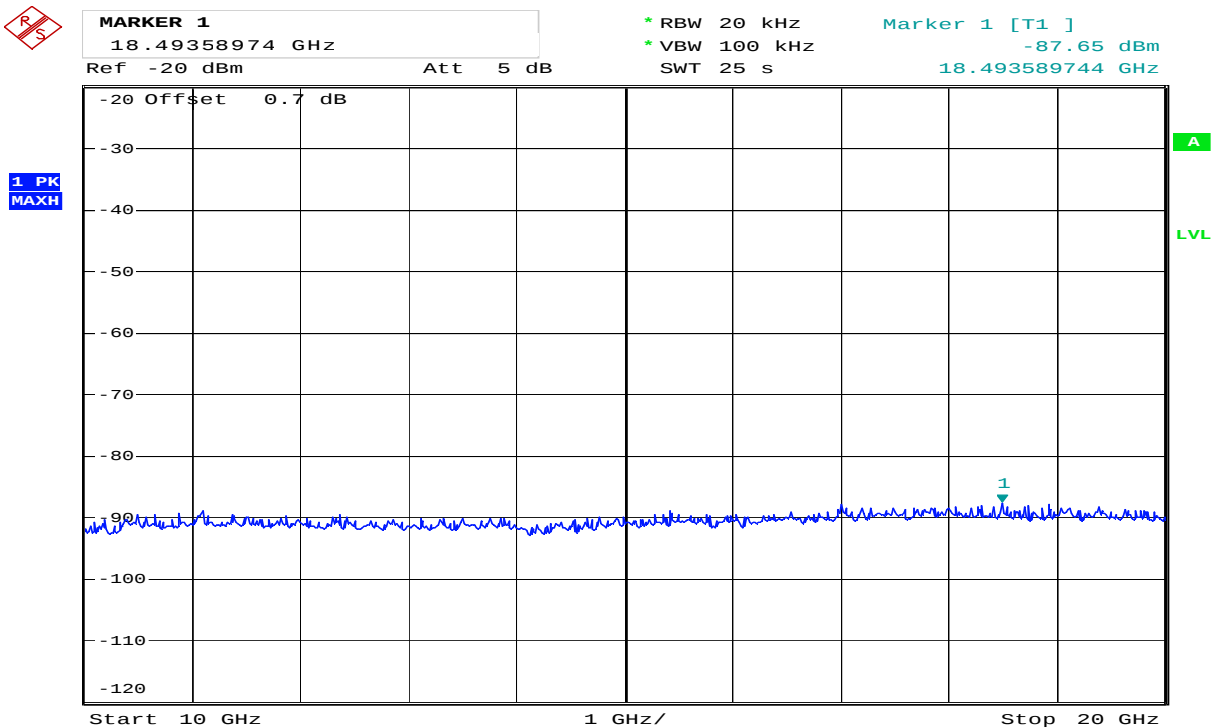
Date: 6.MAY.2008 09:24:32

### Receiver Emissions, Conducted, 1 - 4 GHz



Date: 6.MAY.2008 09:25:47

**Receiver Emissions, Conducted, 4 - 10 GHz**



Date: 6.MAY.2008 09:28:10

**Receiver Emissions, Conducted, 10 - 20 GHz**

## 5 Test Setups

### 5.1 Frequency Measurements

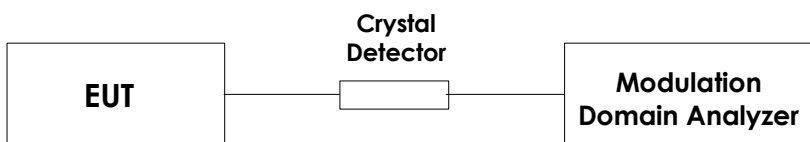


Test equipment included: 5

#### Test Set-up 1

This setup is used for measuring Carrier frequency stability at normal and extreme temperatures.

### 5.2 Timing Measurements

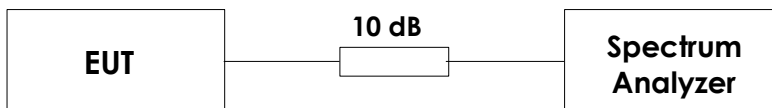


Test equipment included: 5, 7

#### Test Set-up 2

This setup is used for measuring Frame repetition stability, Frame period and Jitter.

### 5.3 Conducted Emission Test

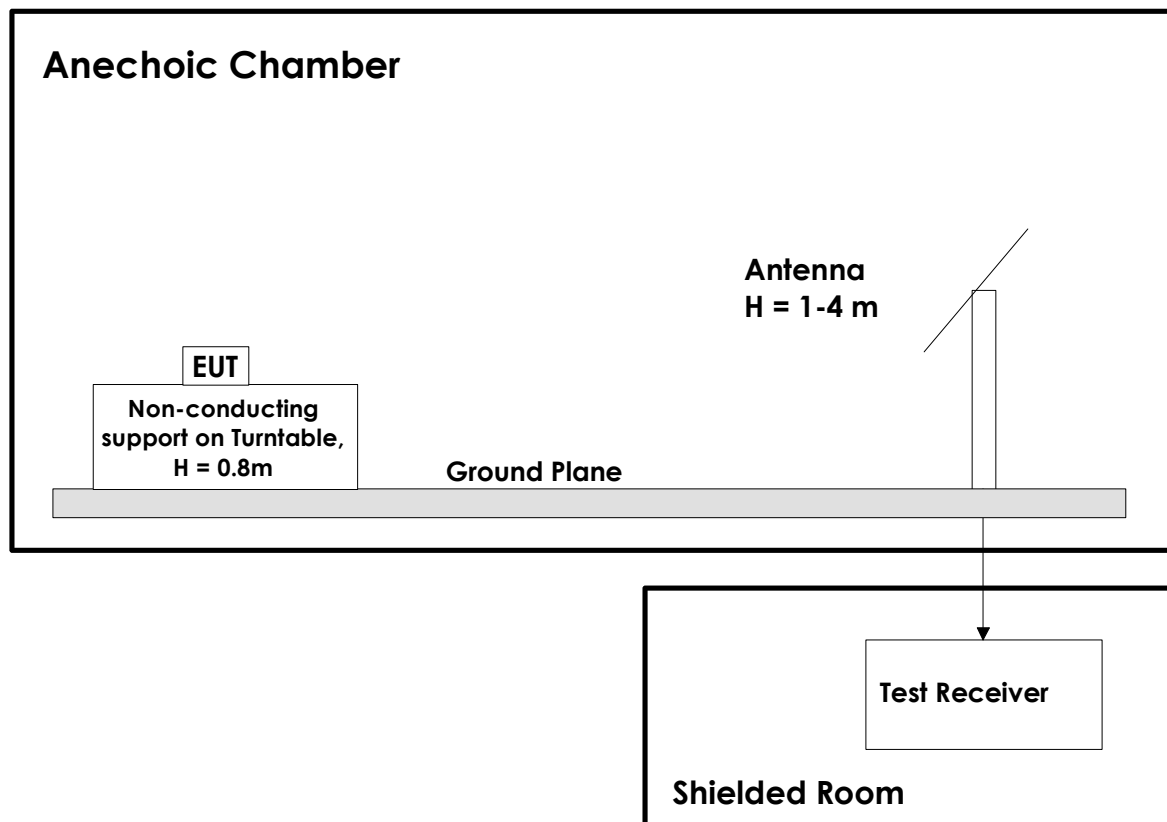


Test equipment included: 1, 13, 29

#### Test Set-up 3

This setup is used for all conducted emission tests.

## 5.4 Radiated Emissions Test

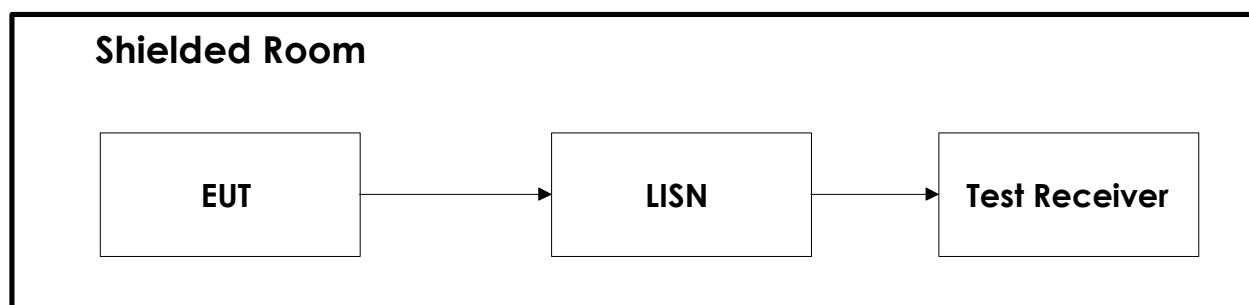


Test equipment: 1, 8, 9, 10, 11, 20, 21, 22, 23, 24, 25, 26, 31

### Test Set-Up 4

This test setup is used for all radiated emissions tests. For frequencies below 30 MHz the measuring distance is 10 m, for all other frequencies it is 3m or 1m. Emissions above 1 GHz were measured with a Spectrum Analyzer and Horn Antenna and with the preamplifier after the antenna. For measurements above 18 GHz the test receiver is moved inside the anechoic chamber and located next to the antenna to minimize the cable loss.

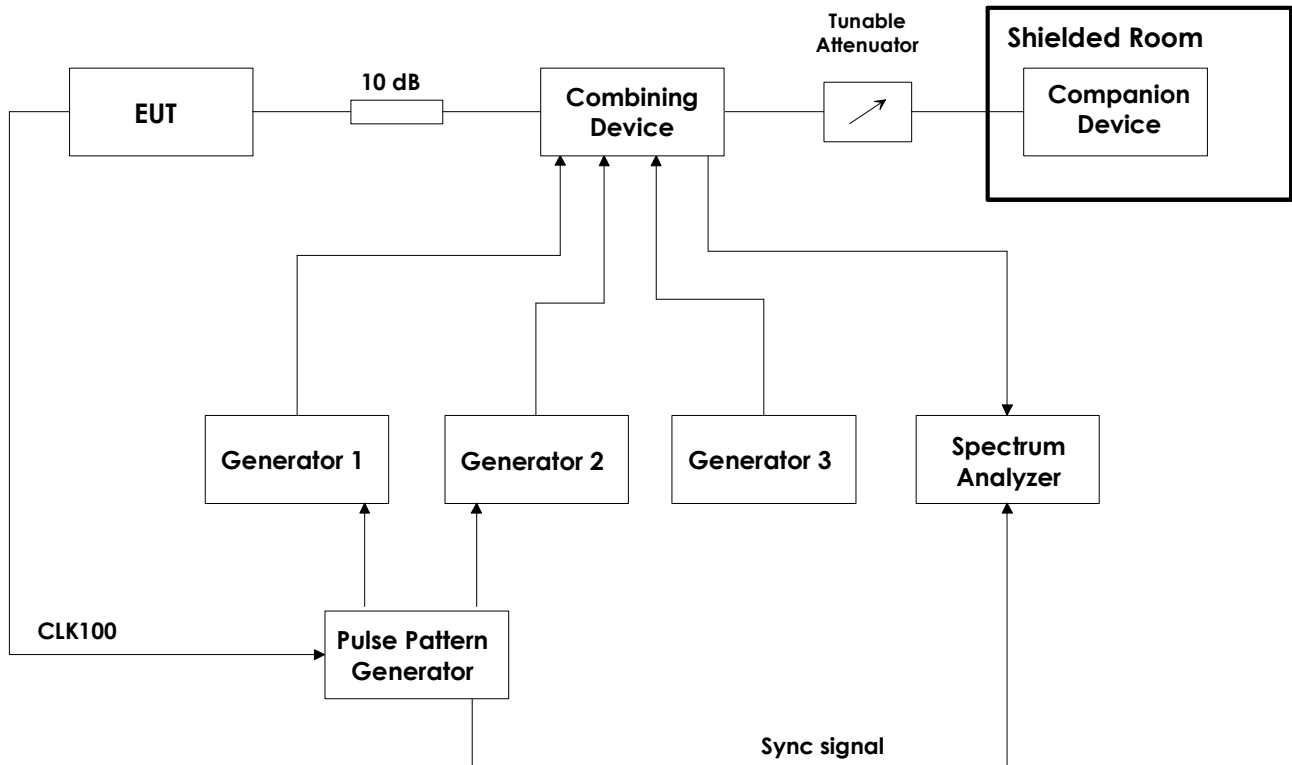
## 5.5 Power Line Conducted Emissions Test



Test equipment: 12, 27, 28

### Test Set-Up 5

## 5.6 Monitoring Tests



Test equipment: 1, 2, 4, 6, 13, 14, 15, 16, 17, 18, 19, 29

### Test Set-Up 6

This test setup is used for all Monitoring and Time and Spectrum Access Procedure tests. The path loss from the signal generators to the EUT is measured with a power meter before the testing is started.

The CLK100 is used to synchronize the Pulse-/ Pattern generator to the start of the DECT frame, this signal always comes from the base station. If the EUT is a DECT Portable Part (i.e. a handset) the CLK100 signal will come from the Companion Device.

The sync signal to the Spectrum Analyzer is the CLK100 signal that is regenerated in the Pulse-/ Pattern Generator, this is used to synchronize the Spectrum Analyzer to the DECT frame when in zero span. The Pulse-/ Pattern Generator is used for tests that require time synchronized pulses or blocking of specific time slots.

## 6 Test Equipment Used

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment and ancillaries are identified (numbered) by the Testhouse.

| No. | Instrument/ancillary | Type of instrument/ancillary | Manufacturer    | Ref. no.       |
|-----|----------------------|------------------------------|-----------------|----------------|
| 1   | FSEK30               | Spectrum Analyzer            | Rohde & Schwarz | LR 1337        |
| 2   | SME03                | Signal generator             | Rohde & Schwarz | LR 1238        |
| 3   | SMIQ03               | Signal generator             | Rohde & Schwarz | LR 1516        |
| 4   | SMP22                | Signal generator             | Rohde & Schwarz | LR 1287        |
| 5   | 53310A               | Modulation Domain Analyzer   | Hewlett Packard | LR 1483        |
| 6   | 81104A               | Pulse-/ Pattern Generator    | Agilent         | LR 1502        |
| 7   | 8470B                | Crystal Detector             | Hewlett Packard | LR 1207        |
| 8   | 8449B                | Preamplifier                 | Hewlett Packard | LR 1322        |
| 9   | 4HC3000/18000        | High-pass filter             | Trilithic       | S.No.: 9849045 |
| 10  | ESVS30               | Measuring Receiver           | Rohde & Schwarz | LR 1101        |
| 11  | ESN                  | Measuring Receiver           | Rohde & Schwarz | LR 1237        |
| 12  | ESAI                 | Measuring Receiver           | Rohde & Schwarz | LR 1090        |
| 13  | 6810.17B             | Attenuator                   | Narda           | LR1212         |
| 14  | 745-69               | Step Attenuator              | Narda           | LR 1442        |
| 15  | WE 1506A             | Power Splitter               | Weinchel        | LR 244         |
| 16  | WE 1506A             | Power Splitter               | Weinchel        | LR 245         |
| 17  | H-9                  | Hybrid                       | Anzac           | LR 86          |
| 18  | H-9                  | Hybrid                       | Anzac           | LR 257         |
| 19  | S212DS               | RF Switch                    | Narda           | LR 1244        |
| 20  | 3115                 | Horn Antenna                 | EMCO            | LR 1226        |
| 21  | PM7320-X             | Horn Antenna                 | Sivers Lab      | LR 102         |
| 22  | DBF-520-20           | Horn Antenna                 | Systron Donner  | LR 100         |
| 23  | 638                  | Horn Antenna                 | Narda           | LR 1480        |
| 24  | HL223                | Log-period Antenna           | Rohde & Schwarz | LR 1261        |
| 25  | HK116                | Biconical Antenna            | Rohde & Schwarz | LR 1260        |
| 26  | HFH2-Z2              | Loop Antenna                 | Rohde & Schwarz | LR 285         |
| 27  | ESH3-Z5              | Two Line V-Network           | Rohde & Schwarz | LR 1076        |
| 28  | 80S                  | Signal Generator             | Powertron       | LT 502         |
| 29  | FSU26                | Spectrum Analyzer            | Rohde & Schwarz | LR 1504        |
| 30  | CMD60                | DECT Tester                  | Rohde & Schwarz | LR 1335        |
| 31  | 6812B                | AC Power Source              | Agilent         | LR 1515        |