



**Test report no. : 93339-11**

**Item tested : SP3550**

**Type of equipment : Handheld UHF Transceiver**

**FCC ID : TCOSP3550**

**Client : Thrane & Thrane A/S**

**FCC Parts 80 and 90**

Non-Broadcast Transmitter held to face

**RSS-119, Issue 9**

Land Mobile and Fixed Radio Transmitters and Receivers  
Operating in the Frequency Range 27.41-960 MHz

**12 November 2007**

**Authorized by :**  .....

G.Suhanthakumar  
Technical Verificator



**CONTENTS**

- 1 GENERAL INFORMATION ..... 3**
- 1.1 Testhouse Info ..... 3
- 1.2 Client Information ..... 3
- 1.3 Manufacturer (if other than client) ..... 3
- 2 Test Information ..... 4**
- 2.1 Test Item ..... 4
- 2.2 Test Environment ..... 5
- 2.3 Test Period ..... 5
- 3 TEST REPORT SUMMARY ..... 6**
- 3.1 General ..... 6
- 3.2 Test Summary ..... 7
- 3.3 Description of modification for Modification Filing ..... 7
- 3.4 Comments ..... 7
- 3.5 Family List Rational ..... 7
- 4 TEST RESULTS ..... 8**
- 4.1 RF Output Power, Conducted ..... 8
- 4.2 Modulation Characteristics ..... 9
- 4.3 Occupied Bandwidth ..... 18
- 4.4 Spurious Emissions at the Antenna Terminal, Swept Frequency ..... 22
- 4.5 Spurious Emissions at the Antenna Terminal, Emission Masks ..... 26
- 4.6 Field Strength of Spurious Radiations ..... 30
- 4.7 Frequency Stability ..... 31
- 4.8 Transient Frequency Behaviour ..... 32
- 4.9 Suppression of Interference Aboard Ships/ Receiver Spurious Emissions ..... 35
- 5 LIST OF TEST EQUIPMENT ..... 38**
- 6 TEST SETUP ..... 39**
- 6.1 Test Site Radiated Emissions ..... 39

## 1 GENERAL INFORMATION

### 1.1 Testhouse Info

Name : Nemko Comlab  
Address : Gåsevikeveien 8, Box 96  
N-2027 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 # : 4443  
Total Number of Pages: 39

### 1.2 Client Information

Name : Thrane & Thrane A/S  
Address : Porsvej 2, DK-9200 Aalborg SV, Denmark

**Contact:**

Name : Helge Hoff  
Telephone : +45 9634 6311  
E-mail : hof@thrane.com

### 1.3 Manufacturer (if other than client)

Name : /  
Address : /

## 2 Test Information

### 2.1 Test Item

Name :	Sailor
FCC ID :	TCOSP3550
Industry Canada ID :	6200B-SP3550
Model/version :	SP3550
Serial number :	0012
Hardware identity and/or version:	/
Software identity and/or version :	/
Frequency Range :	440.000 – 470.000 MHz
Tunable Bands :	1
Number of Channels :	3
Type of Modulation :	Phase Modulation
Emissions Designator :	8K50G3E (12.5 kHz channels) 16K0G3E (25 kHz channels)
User Frequency Adjustment :	None
Rated Output Power :	0.3 Watts 1.8 Watts (Part 80) 4.8 Watts (Part 90)
Type of Power Supply :	Secondary Battery: B3502, Lithium-Ion, 7.2V, 1800mAH
Antenna Connector :	50 Ohm SMA connector
Desktop Charger :	Type: CH3508, serial no.: 0254160070

### Theory of Operation

The EUT is a hand portable UHF transceiver for two way communication. The EUT is a Push-To-Talk device. The EUT also contains a Receiver.

### Exposure Evaluation

The EUT is a portable device and is designed to be worn in a belt clip and handheld (held to face) when used.

## **2.2 Test Environment**

### **2.2.1 Normal test condition**

Temperature:	22 - 23 °C
Relative humidity:	30 - 50 %
Normal test voltage:	7.2 V DC

The values are the limit registered in the laboratory during the test period. All tests except the Frequency Stability Test, were performed with a fully charged battery.

The Frequency stability test was performed with a regulated DC Power Supply.

## **2.3 Test Period**

Item received date:	2007-09-21
Test period :	from 2007-10-24 to 2007-10-11

### 3 TEST REPORT SUMMARY

#### 3.1 General

Manufacturer: Thrane & Thrane A/S  
Model No.: See paragraph 2.1

All measurements are traceable to national standards.

The tests were conducted for the purpose of demonstrating compliance with FCC CFR 47 Parts 80 and 90 and Industry Canada RSS-119 Issue 9.


Radiated tests were conducted in accordance with ANSI C63.4-2003 and ANSI/TIA/EIA-603-B-2002. The radiated tests were made in a semi-anechoic chamber at measuring distances of 3 and 10metres.

- |   |   |
|---|---|
| <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>TNF</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 #: 93339-11

TESTED BY:   
Frode Sveinsen, Chief Engineer

DATE: 26 October 2007

Nemko Group authorizes the above named company to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only. Any reproduction of parts of this report requires approval in writing from Nemko Group.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Nemko Group accepts no responsibility for damages suffered by any third party as a result of decisions made or actions based on this report.

### 3.2 Test Summary

Name of test	FCC Parts 2 and 90 reference	RSS-119 Issue 9 reference	Result
RF Power Output	2.1046, 80.215, 90.205	5.4	Pass
Modulation Characteristics, - Audio Frequency Response - Audio Low Pass Filter - Modulation Limiting	2.1047	N/A	Pass
Occupied Bandwidth	2.1049, 80.205, 90.209	5.5	Pass
Spurious Emissions at antenna terminals	2.1051, 2.1057, 80.211, 90.210	5.8	Pass
Field Strength of Transmitter Spurious Radiations	2.1053, 2.1057, 80.211, 90.210	5.8	Pass
Frequency Stability	2.1055, 80.209 90.213	5.3	Pass
Transient Frequency Behavior	90.214	5.9	Pass
Suppression of Interference Aboard Ships	80.217	N/A	Pass
Exemption from technical standards	90.217(b)	5.10	Not Applicable
Receiver Spurious Emissions	N/A	5.11	Pass

<sup>1</sup> The tested equipment transmits analog voice.

<sup>2</sup> The tested equipment has a 50 ohm antenna connector only.

### 3.3 Description of modification for Modification Filing

Not applicable.

### 3.4 Comments

The can select the preprogrammed frequencies and can select full output power or the LOW setting for reduced output power. The pre-programmed frequencies and power levels can not be changed by the user.

### 3.5 Family List Rationale

Not Applicable.

## 4 TEST RESULTS

### 4.1 RF Output Power, Conducted

Para. No.: 2.1046, 80.215, 90.205

Test Performed By: Frode Sveinsen	Date of Test: 4-Oct-2007
-----------------------------------	--------------------------

**Test Results: Complies**

**Measurement Data:**

Frequency (MHz)	Measured RF Output Power (W)		
	Low Setting	Programmed 2 W FCC 80.215(e)(3)	Programmed 5 W FCC 90.205(h) and RSS-219
440.000	0.32	1.55	4.07
457.575	0.33	1.67	4.37
470.000	0.37	1.96	4.79
<b>Rated Power Level</b>	<b>0.3</b>	<b>1.8</b>	<b>4.8</b>
<b>Largest deviation from Rated Power</b>	<b>+0.9 dB</b>	<b>-0.7 / +0.4 dB</b>	<b>-0.7 dB</b>

In addition to Full Power the EUT also has a Low Power setting. The Low Power setting is the same, but the Full Power can be programmed to either 2W or 5W.

This measurement was performed with a RBW of 100 kHz and Peak Detector using a spectrum analyzer.

The test was performed conducted on the permanent 50 Ohm antenna connector.

**Requirements:**

FCC 80.215(e)(3):

The maximum conducted RF output power must not exceed 4 Watts.

FCC 90.205(h):

The maximum RF output power (ERP) must be between 2 and 500 Watts ERP.

RSS 119 section 5.4:

The maximum conducted RF output power must not exceed 30 Watts, and must be within  $\pm 1$  dB of the manufacturers rated output power.



## **4.2 Modulation Characteristics**

### **4.2.1 Audio Frequency Response**

**Para. No.: 2.1047**

<b>Test Performed By: Frode Sveinsen</b>
--

<b>Date of Test: 27-Sept-2007</b>
-----------------------------------

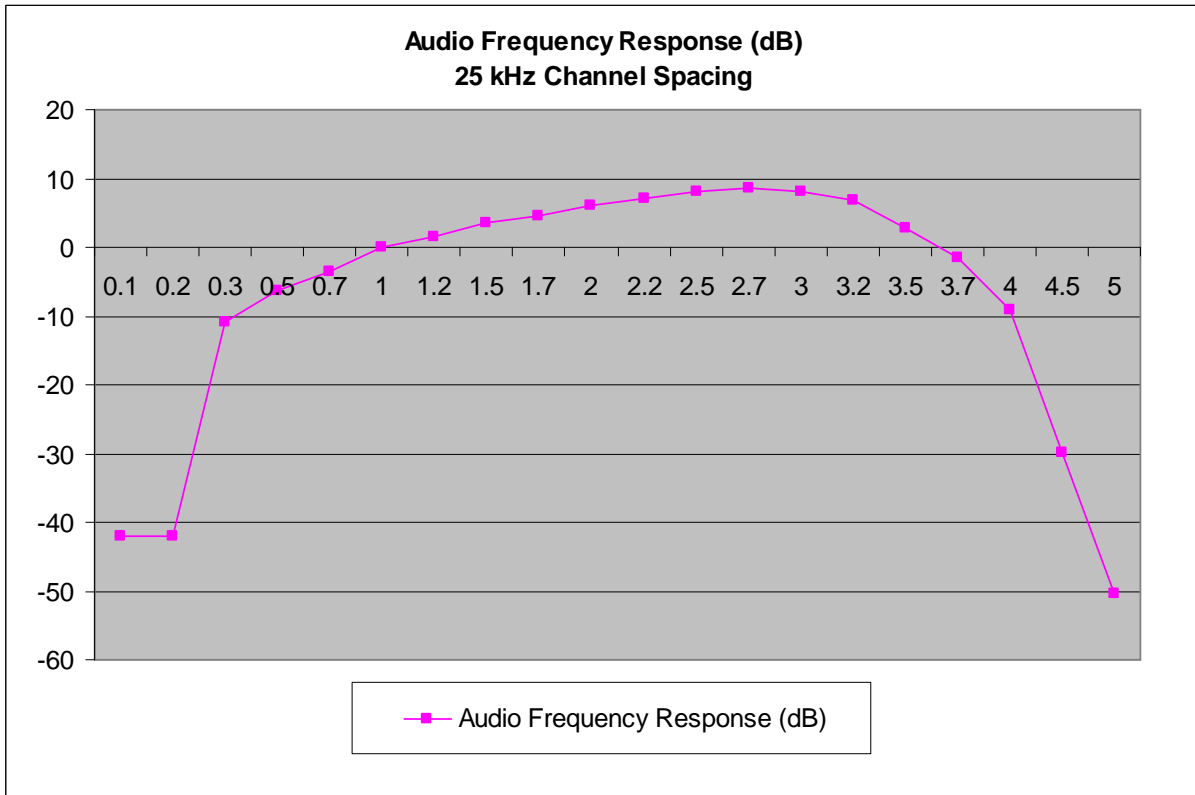
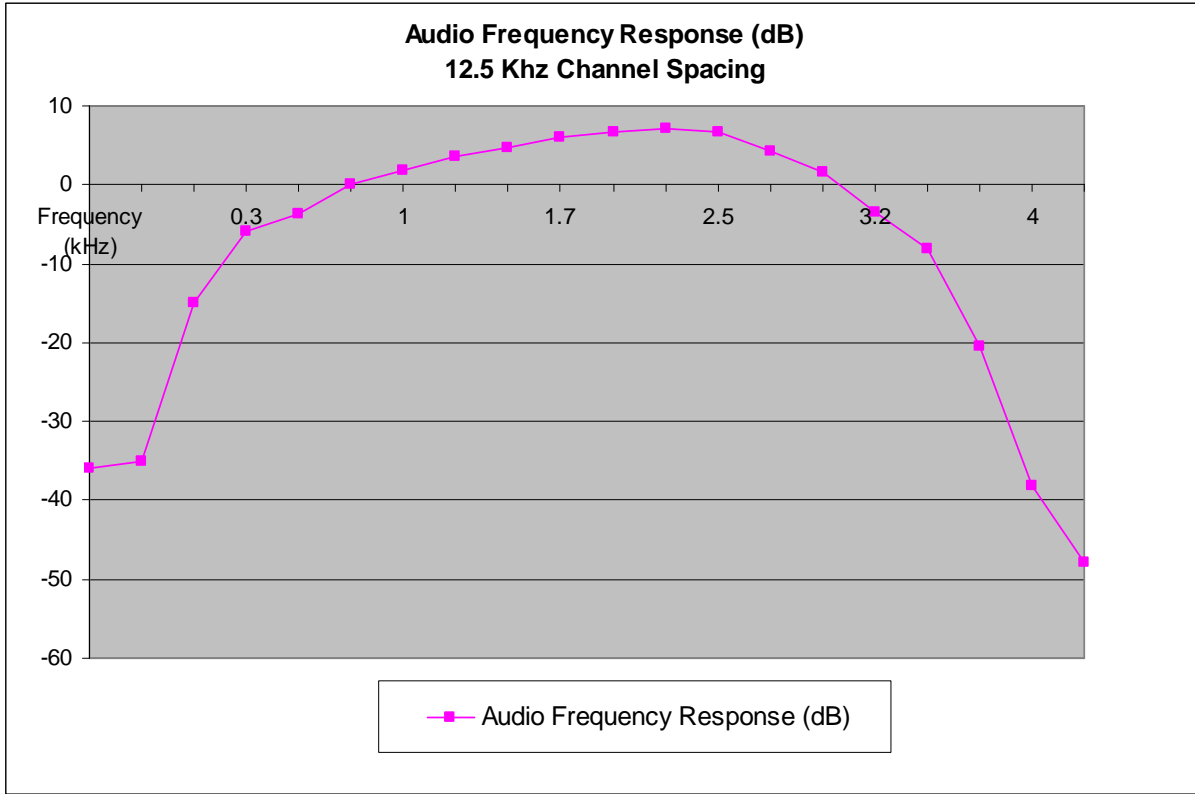
**Test Results: Complies**

**Measurement Data:**

**See attached graphs.**

**Requirements:**

None.



**4.2.2 Audio Low Pass Filter**

**Para. No.: 2.1047**

<b>Test Performed By: Frode Sveinsen</b>
--

<b>Date of Test: 27-Sept-2007</b>
-----------------------------------

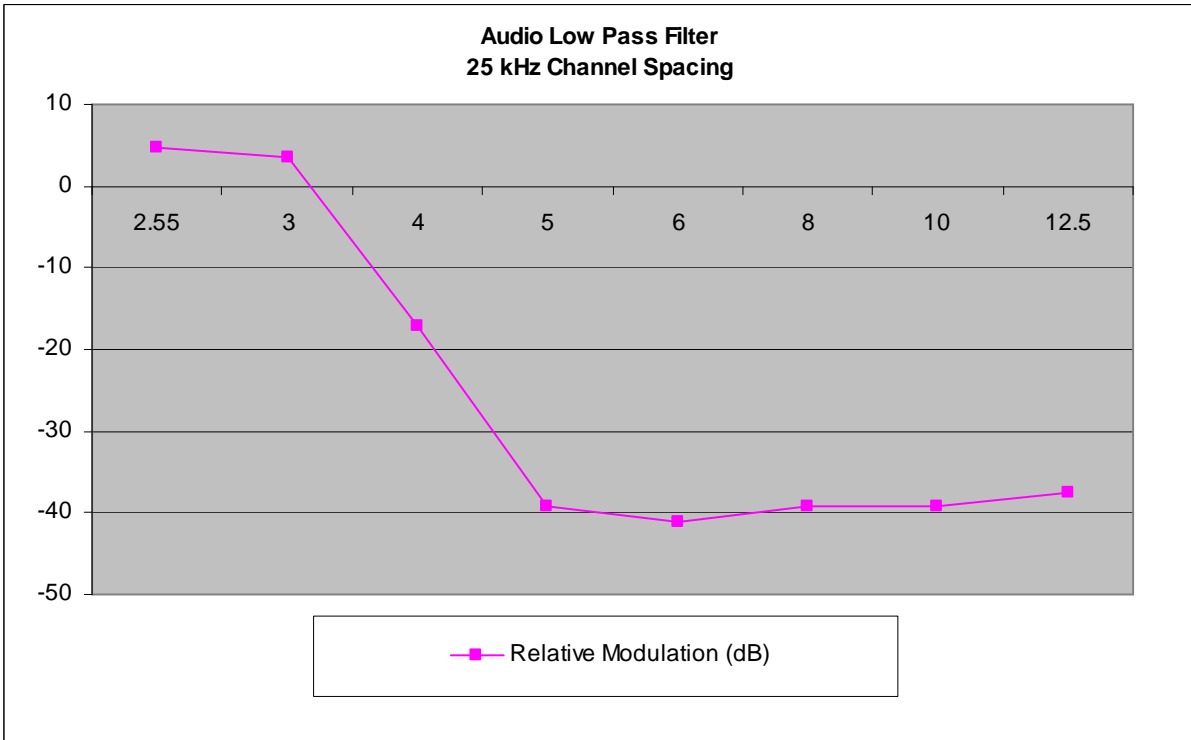
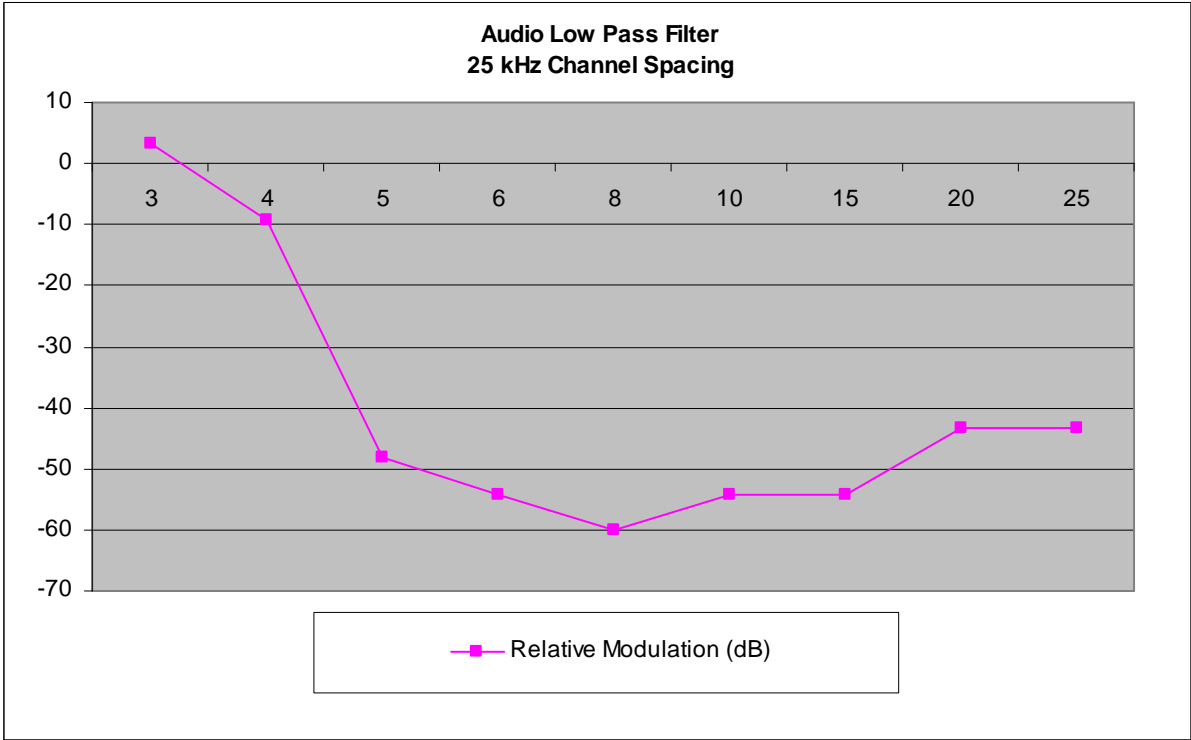
**Test Results: Complies**

**Measurement Data:**

**See attached graphs.**

**Requirements:**

None.



---

***Modulation Limiting***

**Para. No.: 2.1047**

<b>Test Performed By: Frode Sveinsen</b>
--

<b>Date of Test: 27 Sept-2007</b>
-----------------------------------

**Test Results: Complies**

**Measurement Data:**

**See attached graphs.**

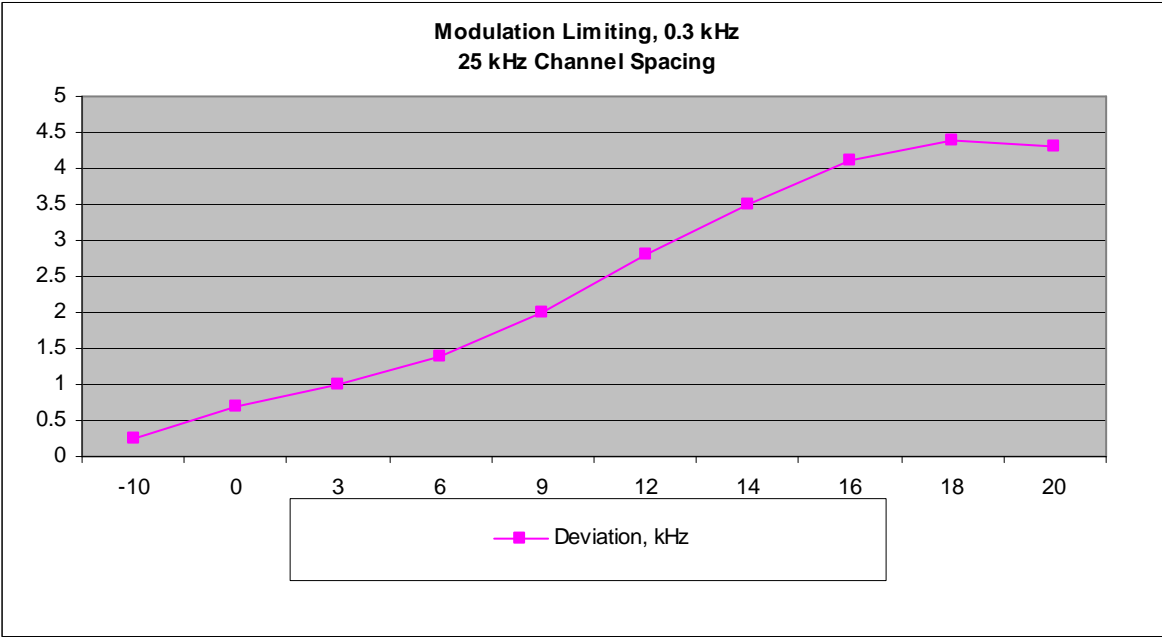
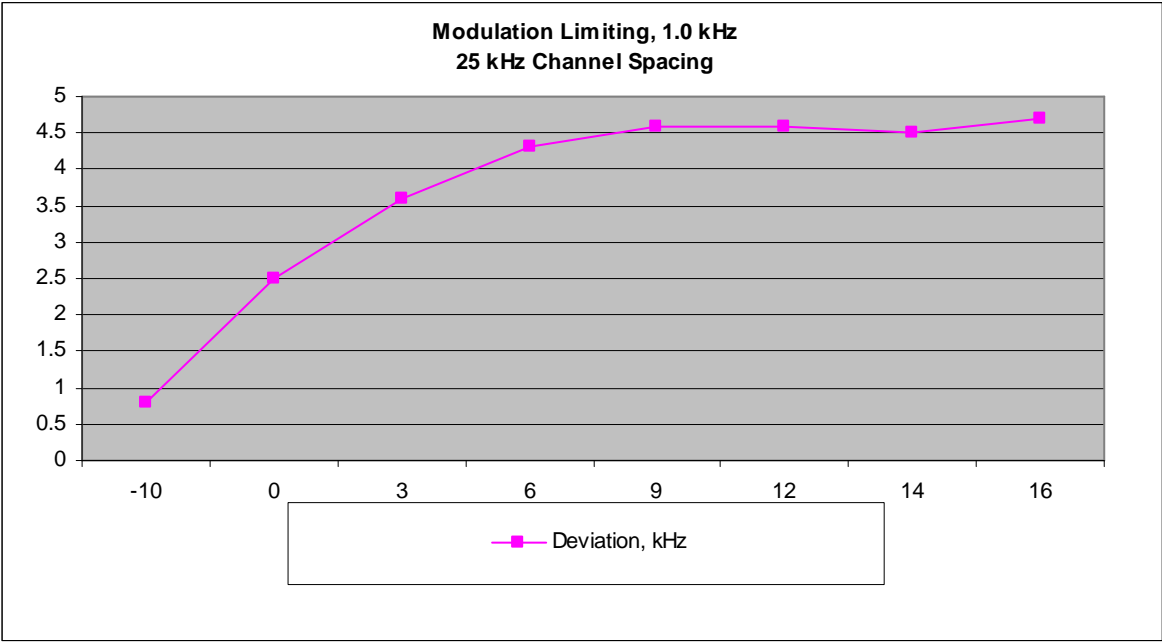
**Requirements:**

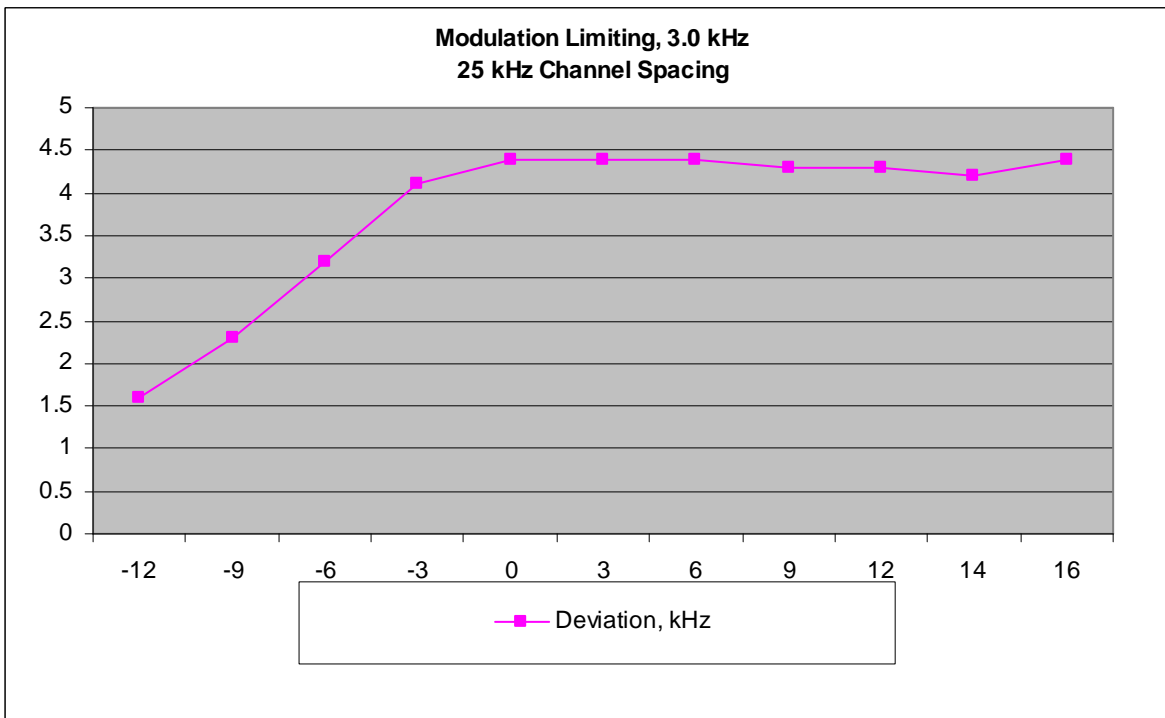
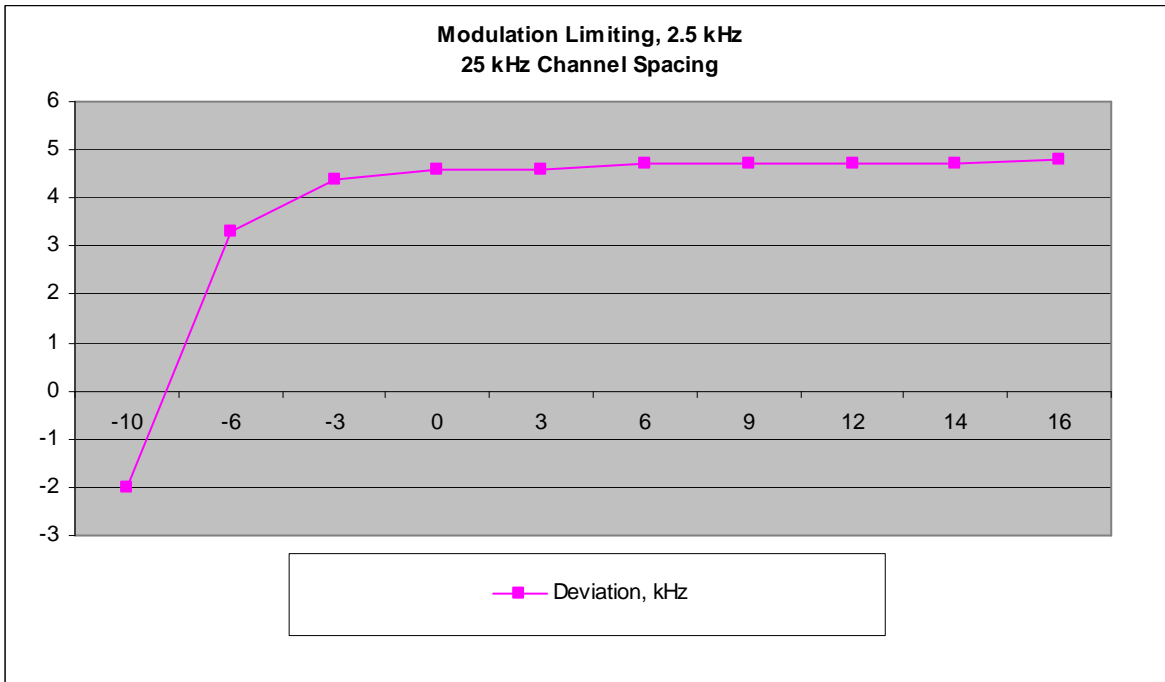
*FCC 80.205(a) footnote 8:*

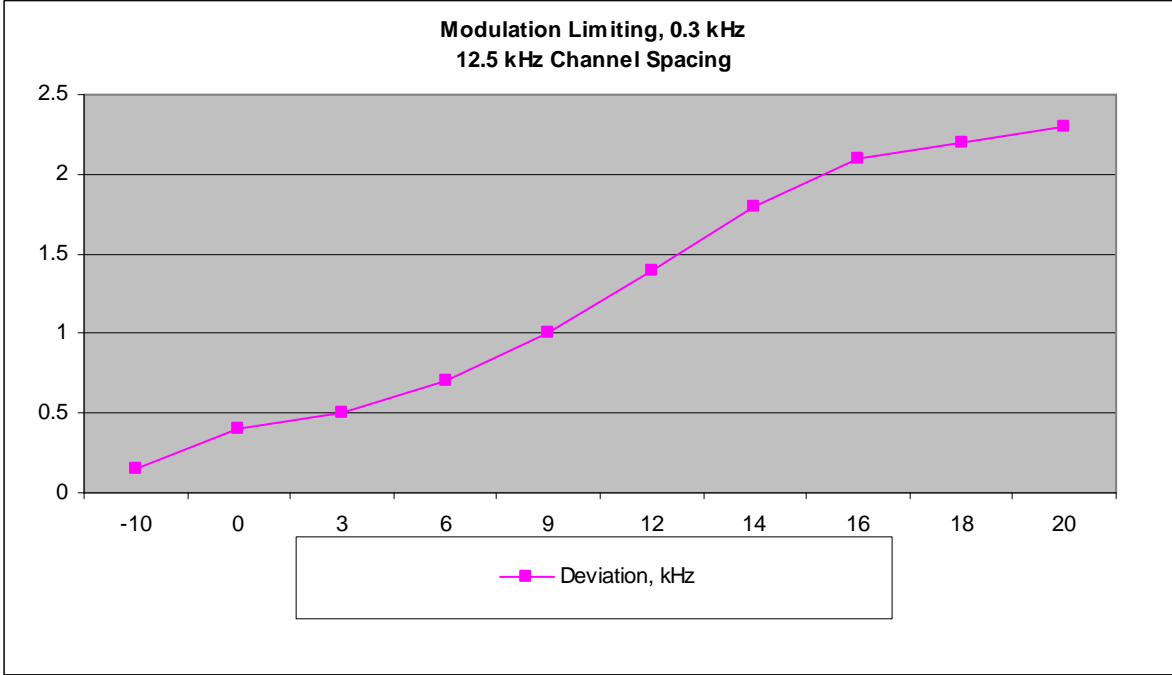
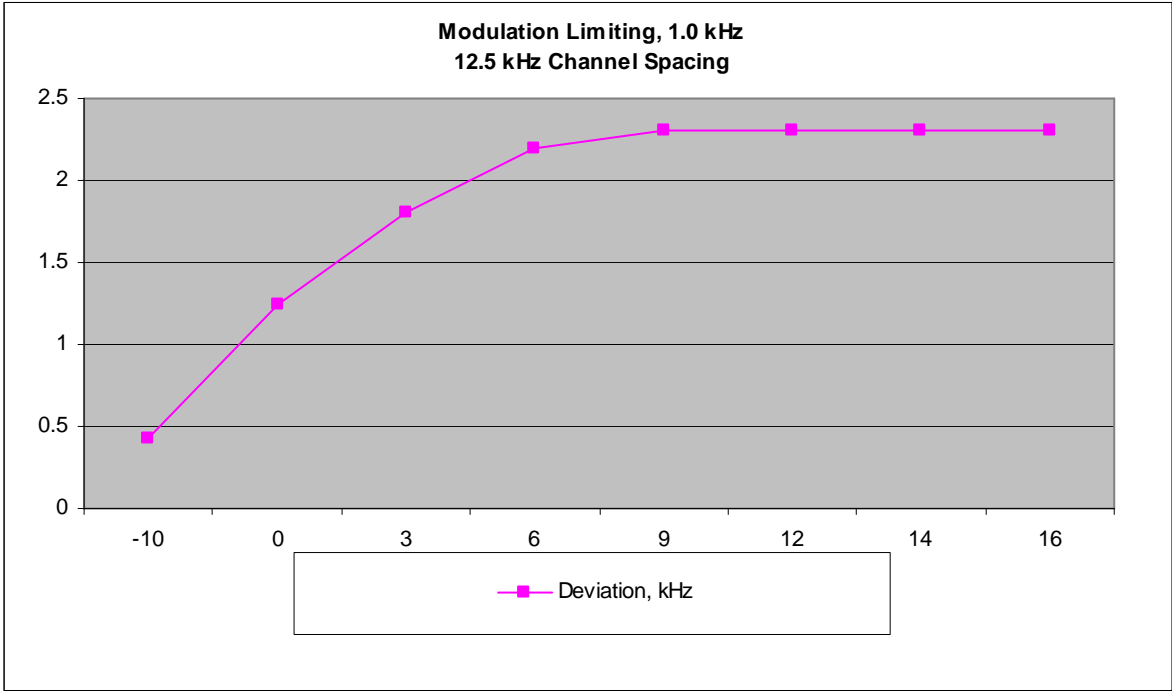
5 kHz Maximum Frequency Deviation

*FCC 90:*

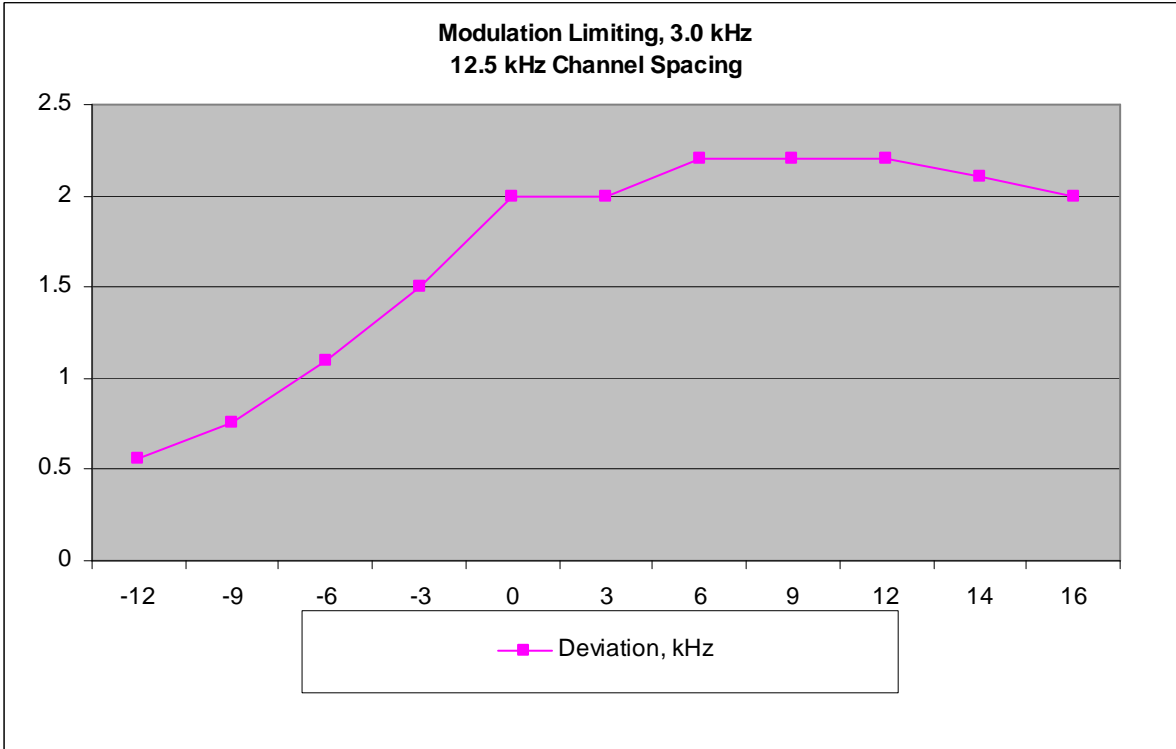
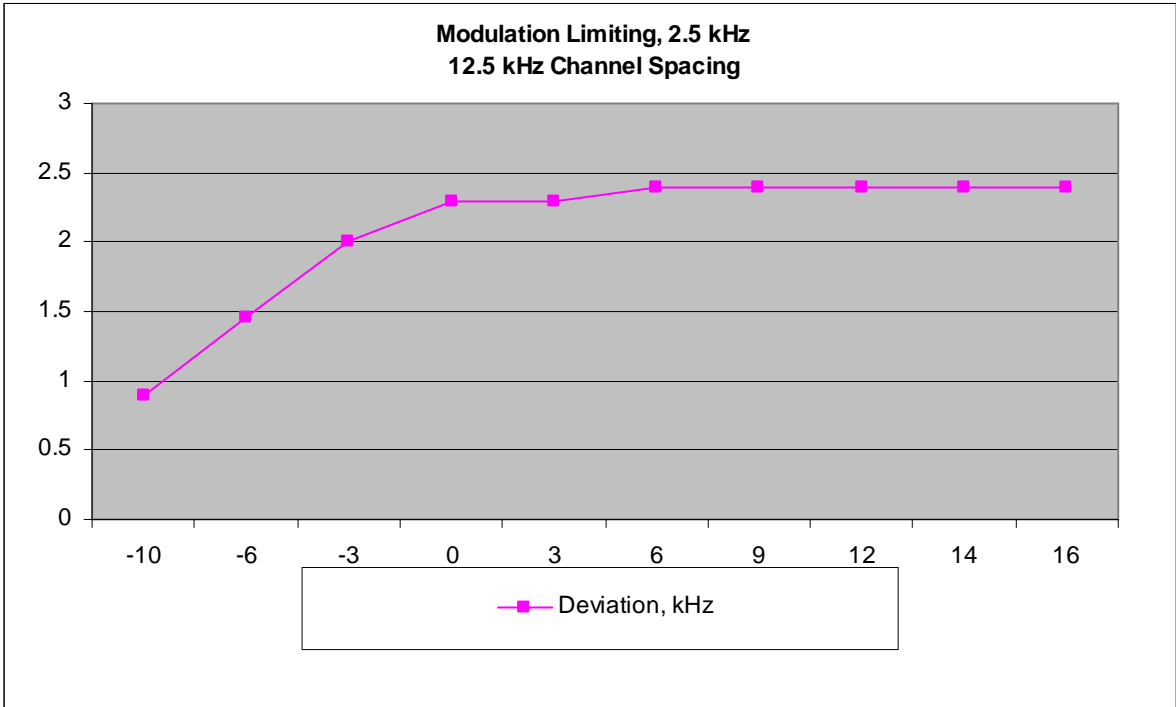
None.











### 4.3 Occupied Bandwidth

Para. No.: 2.1049, 80.205, 90.209, 90.217

Test Performed By: Frode Sveinsen	Date of Test: 26-Sept-2007
-----------------------------------	----------------------------

Test Results: Complies

#### Measurement Data:

Carrier Frequency	99% Occupied Bandwidth	
	12.5 kHz Channels	25 kHz Channels
440.000 MHz	6.09	11.94
457.575 MHz	6.13	11.06
470.000 MHz	6.13	11.94

See attached graph.

For this test the EUT was made to transmit continuously with modulation activated.

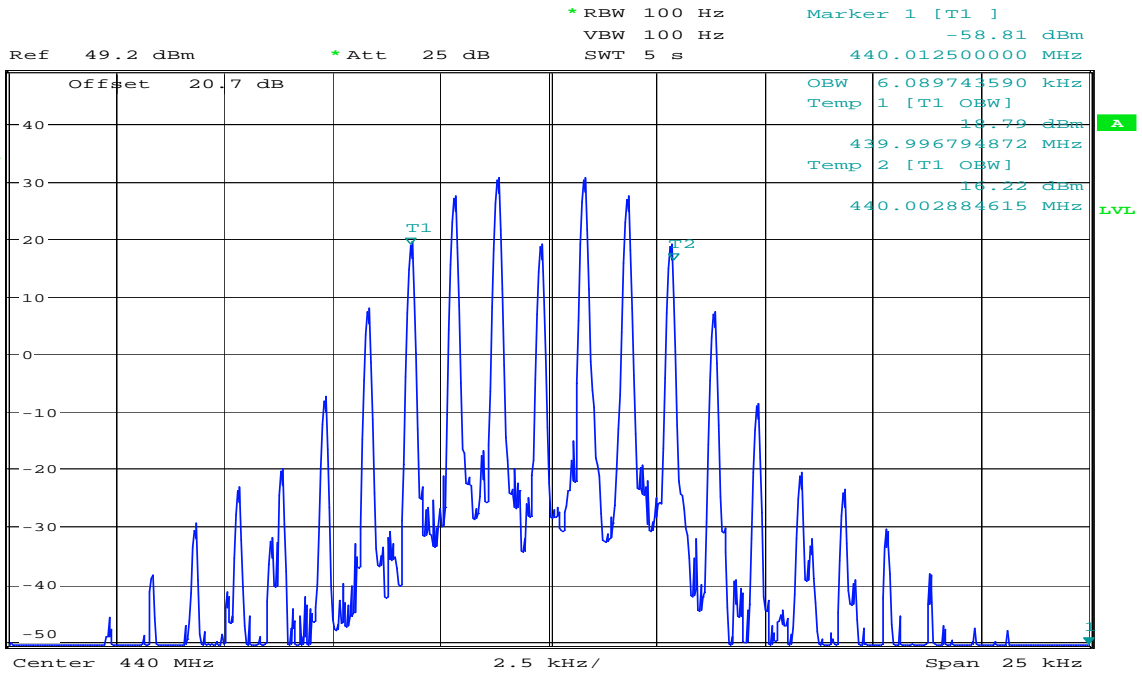
#### Requirements:

80.205(a):

Authorized Bandwidth for G3E emission, maximum authorized bandwidth = 20 kHz

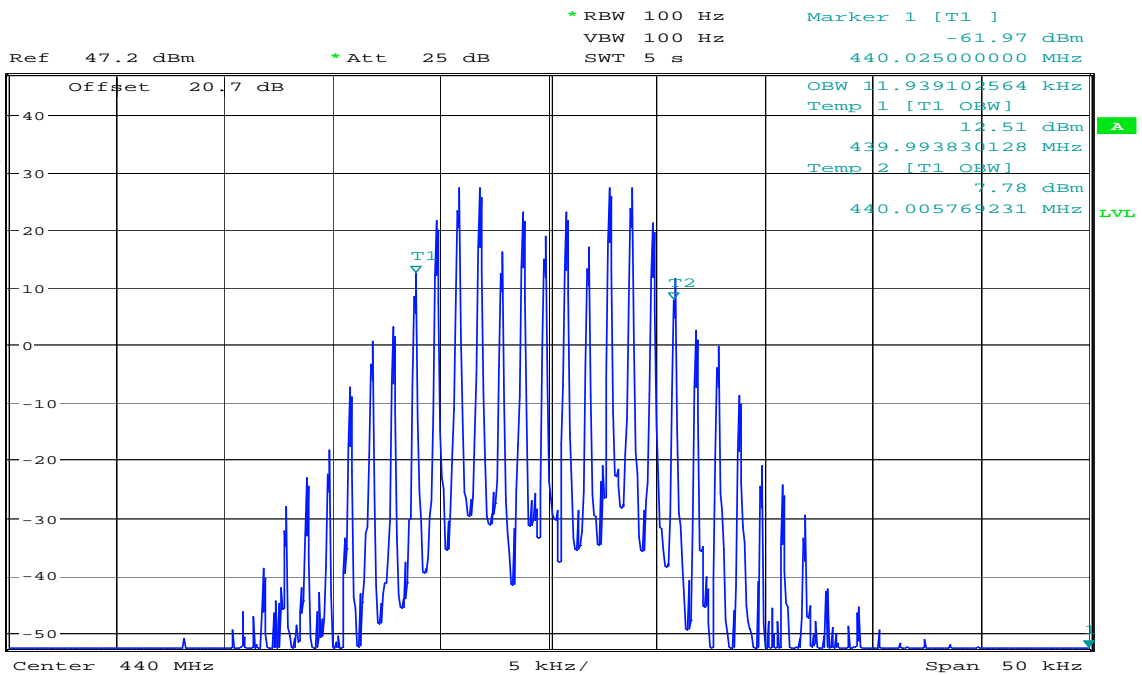
90.209(b)(5) and RSS 119, section 5.5:

Bandwidth Limitations: maximum authorized bandwidth = 20 kHz for 25 kHz channels and 11.25 kHz for 12.5 kHz channels.



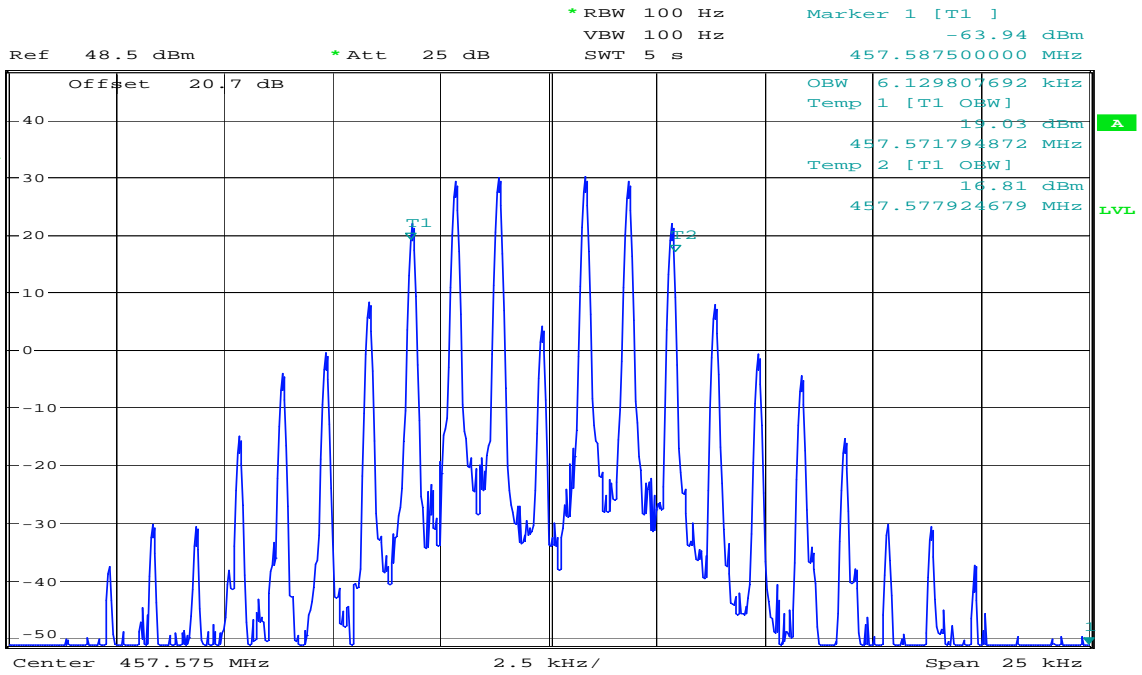
Date: 26.SEP.2007 13:31:11

**99% Occupied Bandwidth, 12.5 kHz Channels**



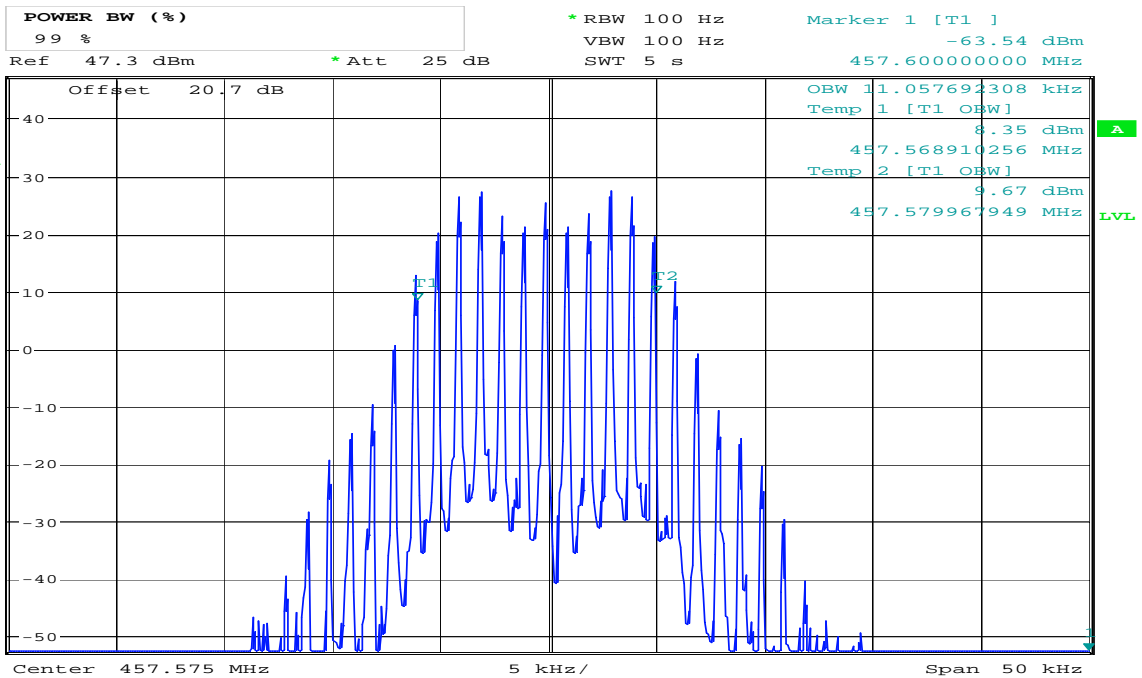
Date: 26.SEP.2007 13:21:24

**99% Occupied Bandwidth, 25 kHz Channels**



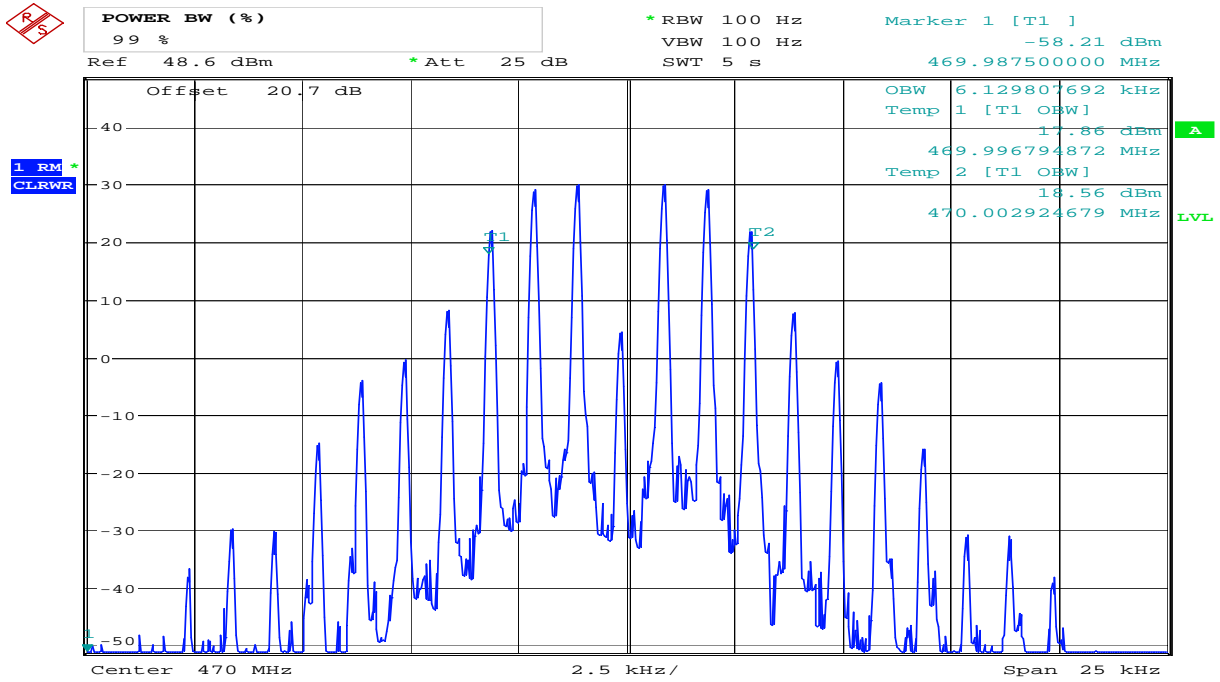
Date: 26.SEP.2007 13:30:07

**99% Occupied Bandwidth, 12.5 kHz Channels**



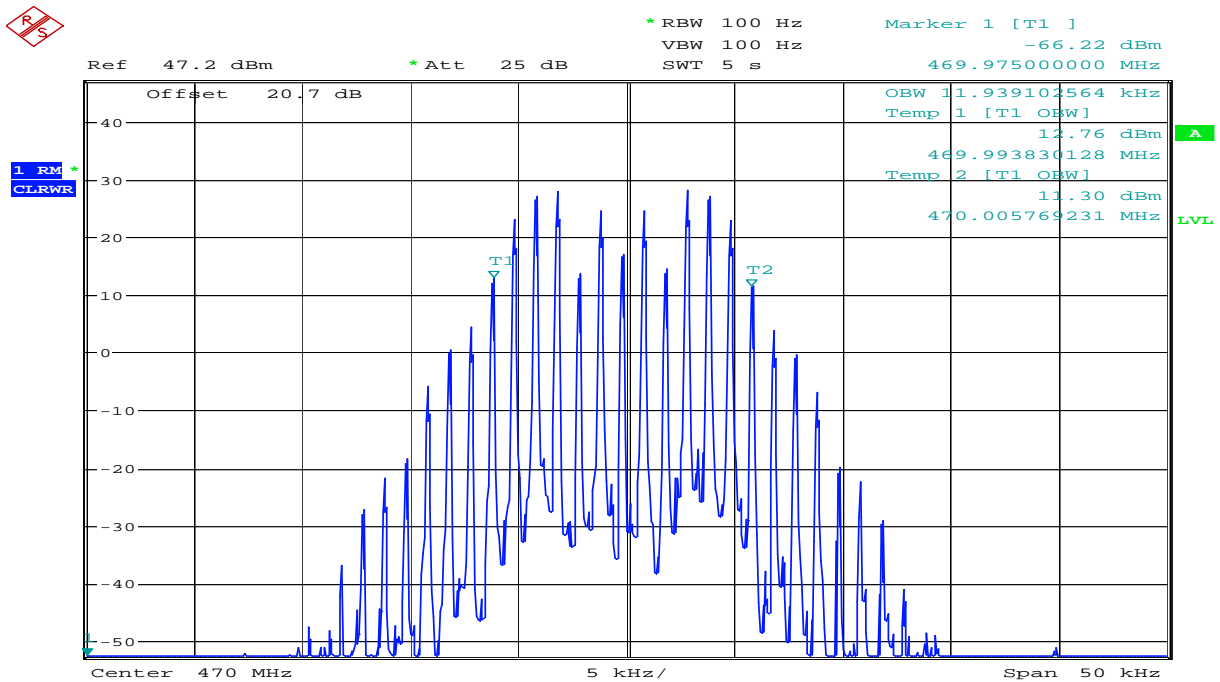
Date: 26.SEP.2007 13:20:07

**99% Occupied Bandwidth, 25 kHz Channels**



Date: 26.SEP.2007 13:28:48

**99% Occupied Bandwidth, 12.5 kHz Channels**



Date: 26.SEP.2007 13:22:38

**99% Occupied Bandwidth, 25 kHz Channels**

#### 4.4 Spurious Emissions at the Antenna Terminal, Swept Frequency

Para. No.: 2.1053, 2.1057, 80.211, 90.210, 90.217

Test Performed By: Frode Sveinsen

Date of Test: 26-Sept-2007

**Test Results: Complies**

##### Measurement Data:

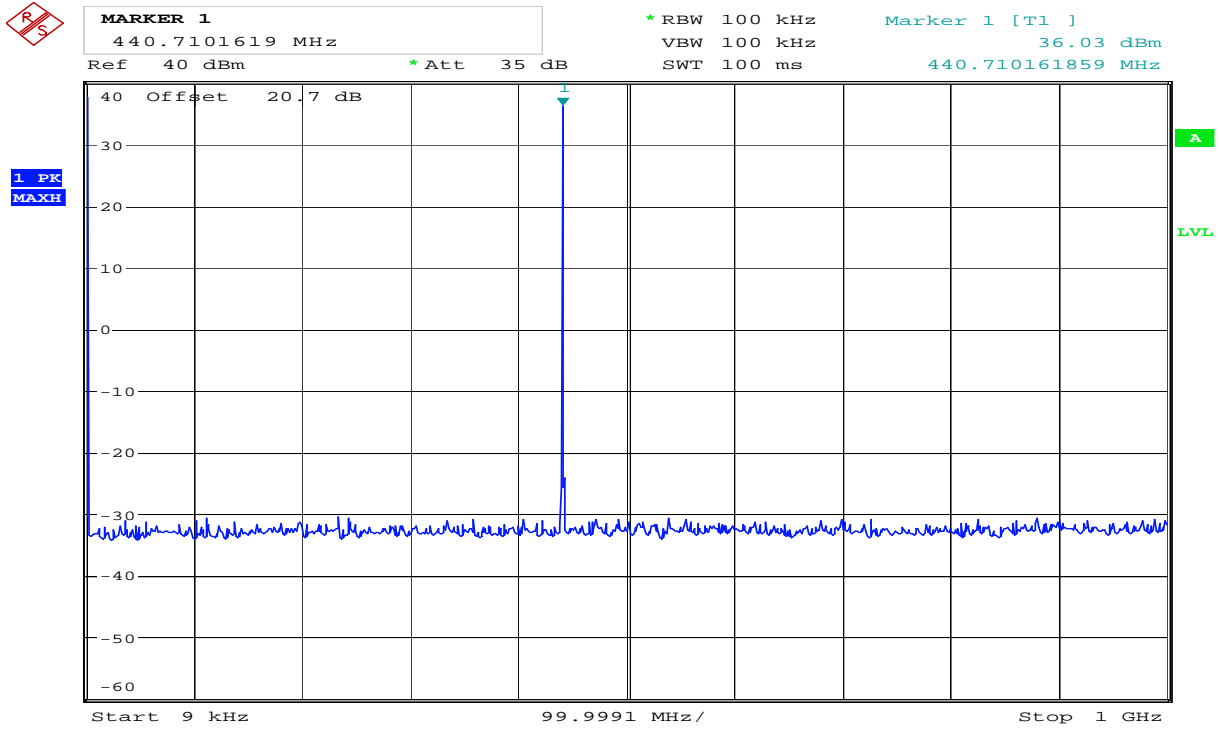
See attached plots. The plots are identical for 12.5 kHz and 25 kHz channels.

##### Requirements:

FCC 80.211(f)(3): Below -13 dBm

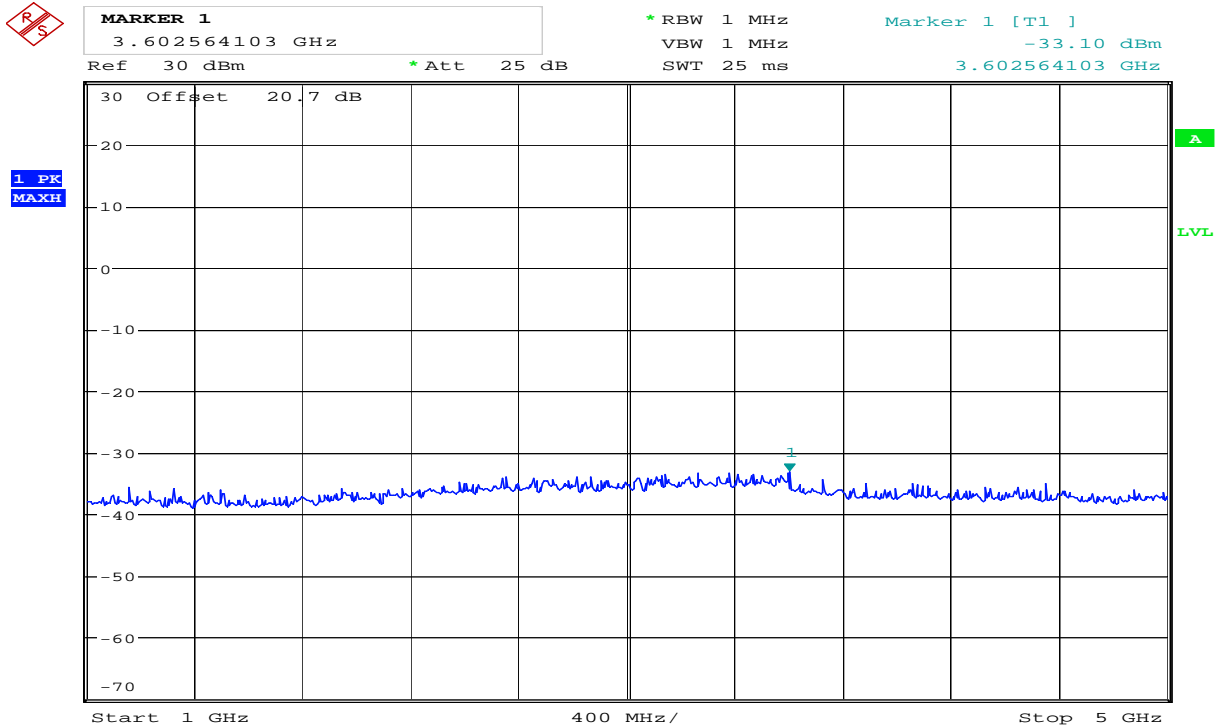
FCC 90.210(b)(3): 25 kHz channels with ALPF: Below -13 dBm

FCC 90.210(d)(3): 12.5 kHz channels: Below -20 dBm



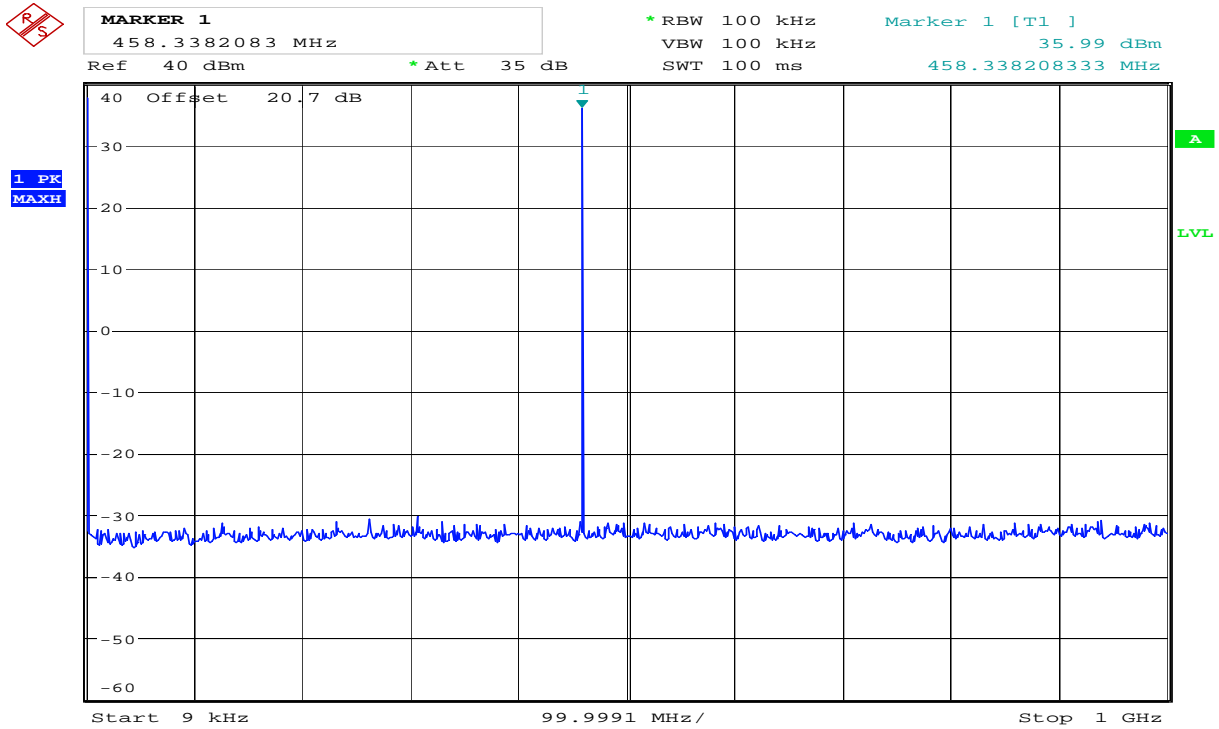
Date: 26.SEP.2007 14:07:07

**Antenna Conducted Emissions, 9 kHz – 1 GHz, Lower Channel**



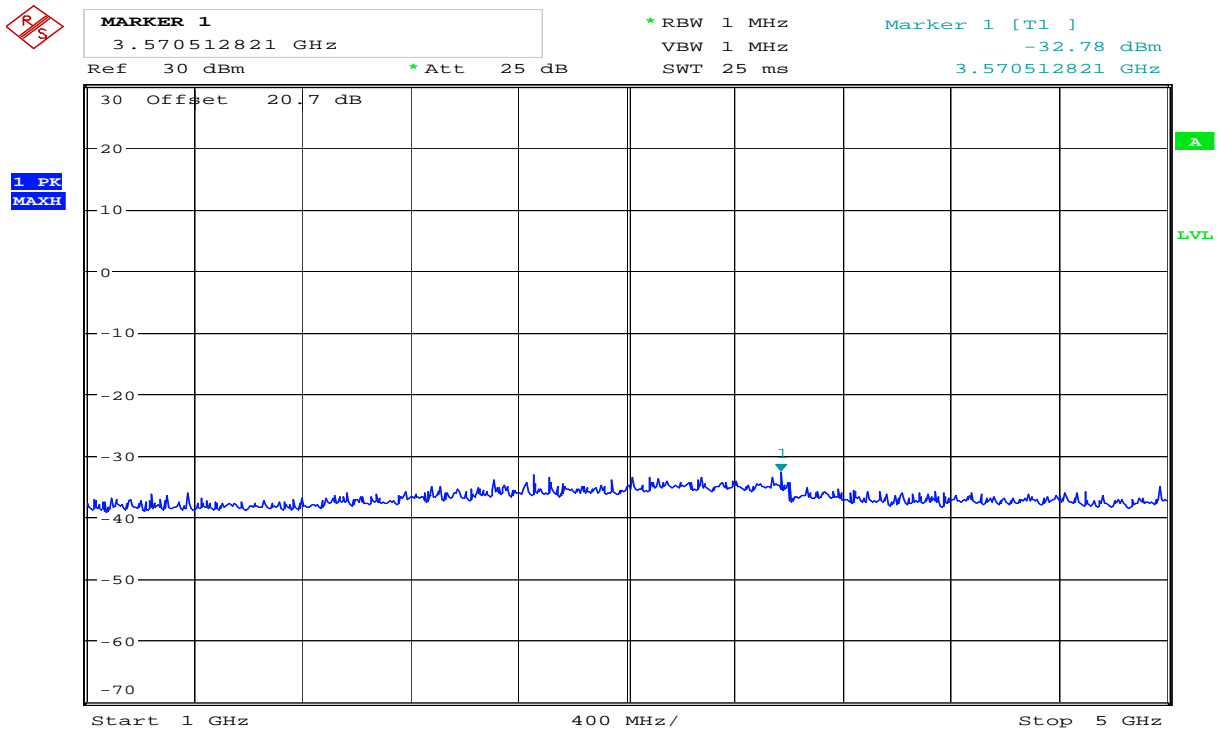
Date: 26.SEP.2007 13:59:23

**Antenna Conducted Emissions, 1 - 5 GHz, Lower Channel**



Date: 26.SEP.2007 14:07:54

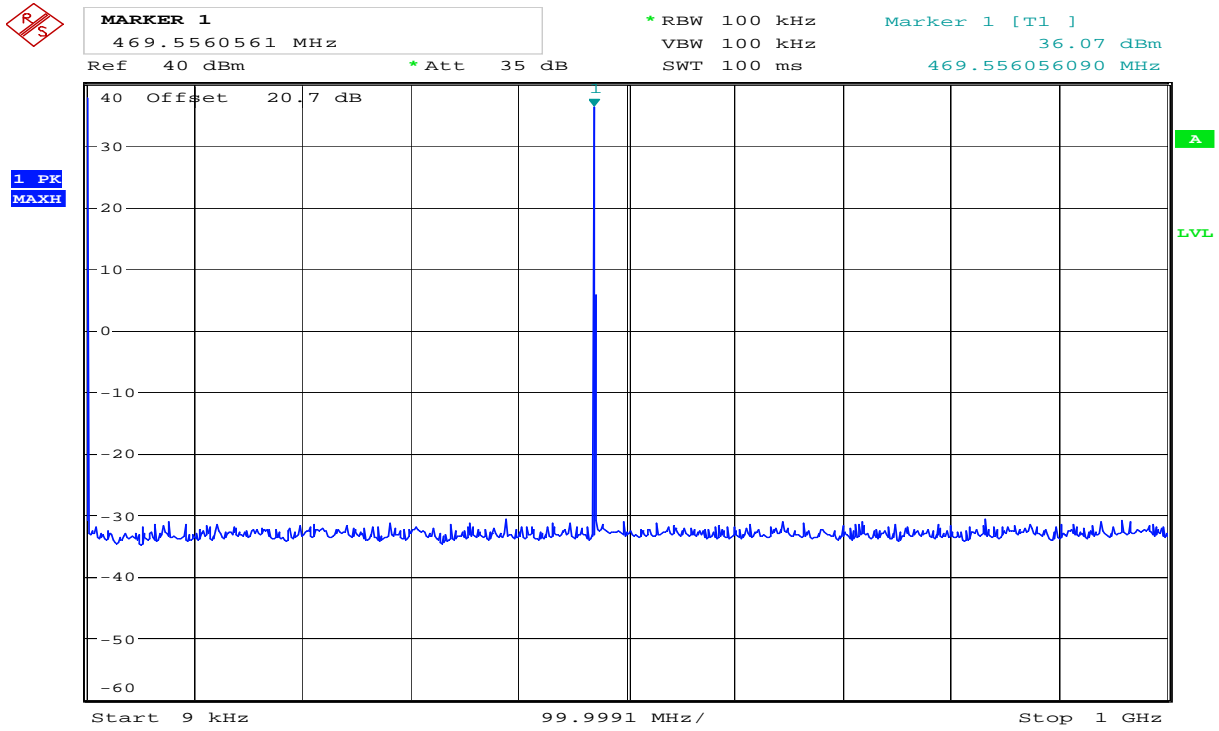
**Antenna Conducted Emissions, 9 kHz – 1 GHz, Middle Channel**



Date: 26.SEP.2007 14:10:31

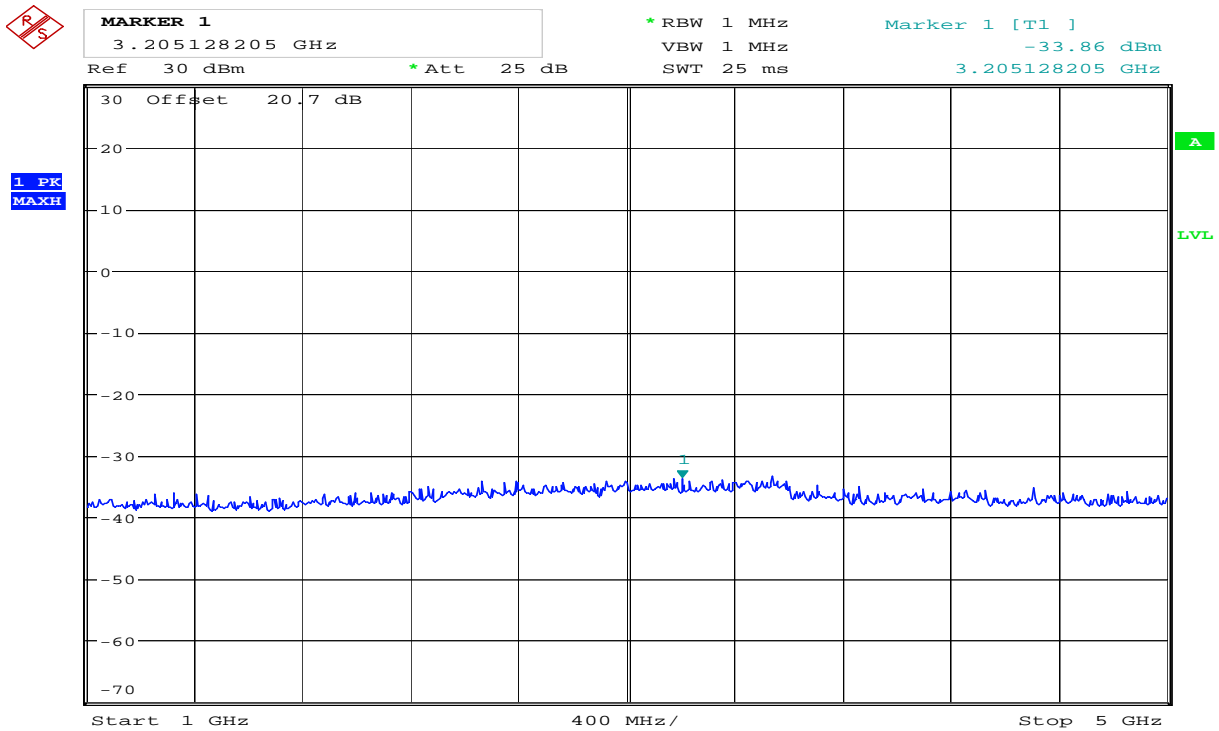
**Antenna Conducted Emissions, 1 - 5 GHz, Middle Channel**





Date: 26.SEP.2007 14:08:26

**Antenna Conducted Emissions, 9 kHz – 1 GHz, Upper Channel**



Date: 26.SEP.2007 14:11:06

**Antenna Conducted Emissions, 1 - 5 GHz, Upper Channel**

## 4.5 Spurious Emissions at the Antenna Terminal, Emission Masks

Para. No.: 2.1053, 2.1057, 80.211, 90.210, 90.217

Test Performed By: Frode Sveinsen
-----------------------------------

Date of Test: 26-Sept-2007
----------------------------

**Test Results: Complies**

### Measurement Data:

See attached plots.

### Requirements:

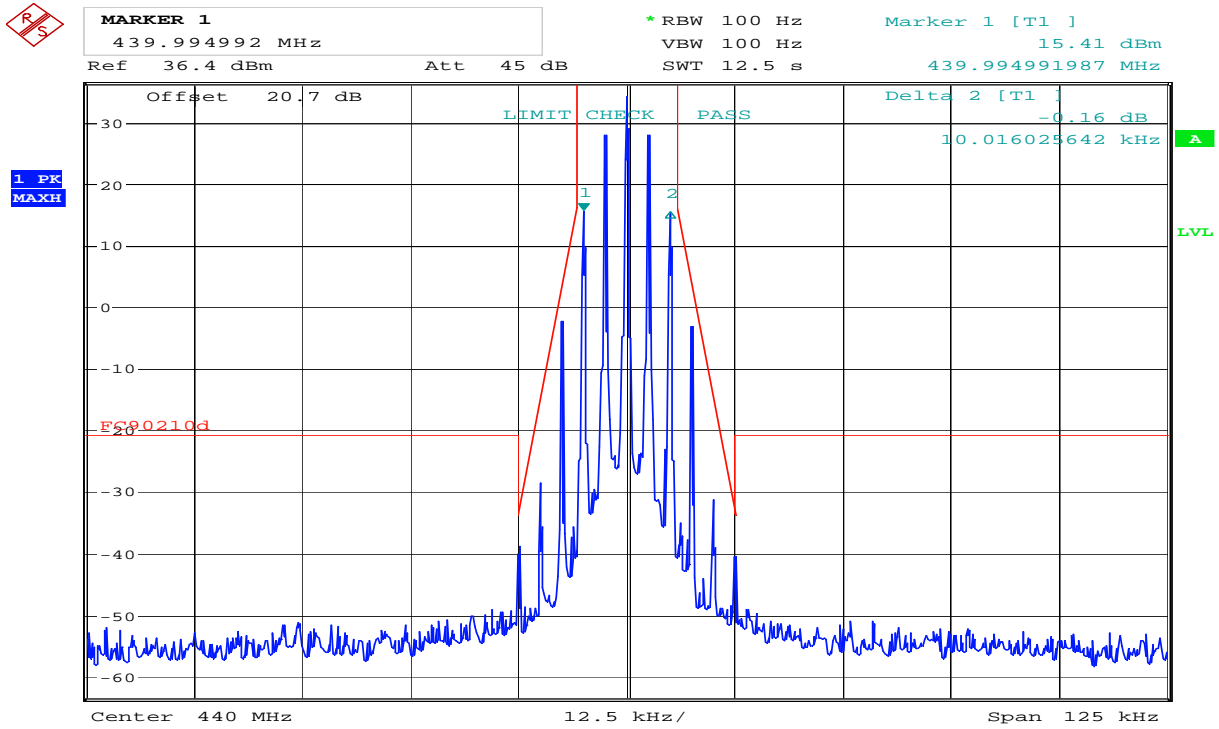
FCC 80.211(f) for 25 kHz channels, 20 kHz authorized bandwidth

FCC 90.210(b) for 25 kHz channels with ALPF, 20 kHz authorized bandwidth

FCC 90.210(d) for 12.5 kHz channels, 11.25 kHz authorized bandwidth

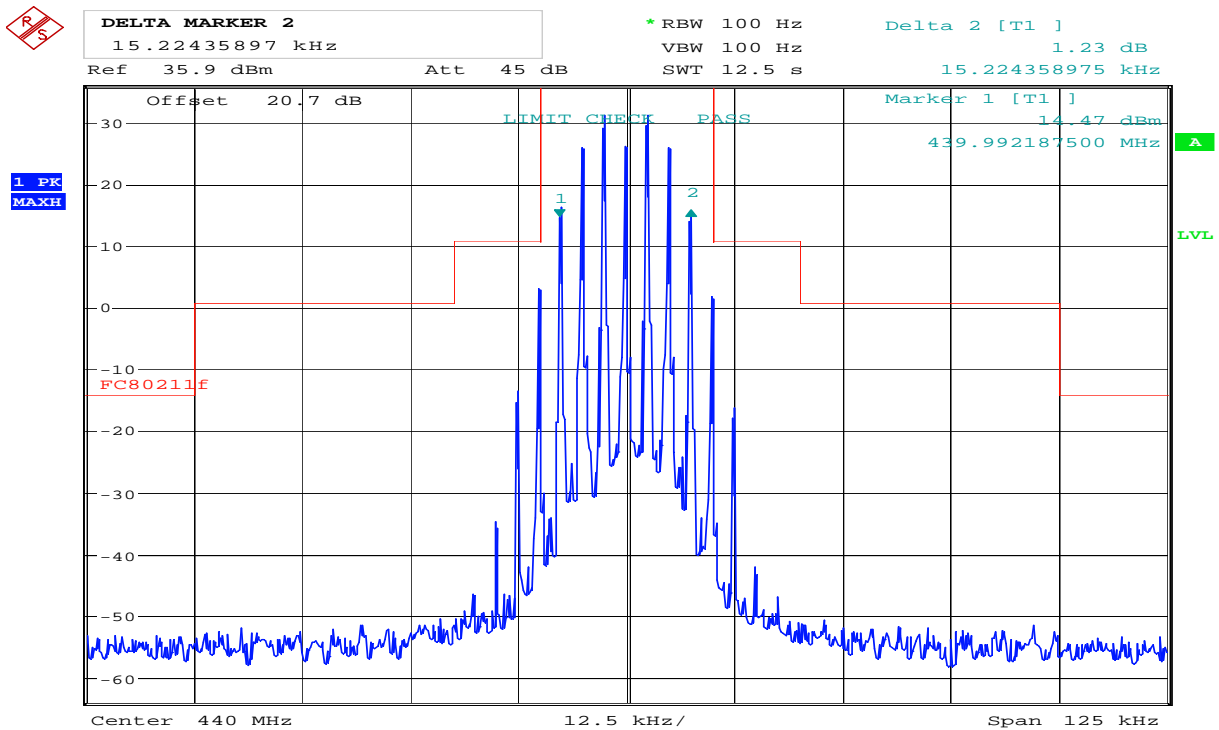
RSS-119 section 5.8.1 for 25 kHz channels with ALPF, 20 kHz authorized bandwidth

RSS-119 section 5.8.3 for 12.5 kHz channels, 11.25 kHz authorized bandwidth



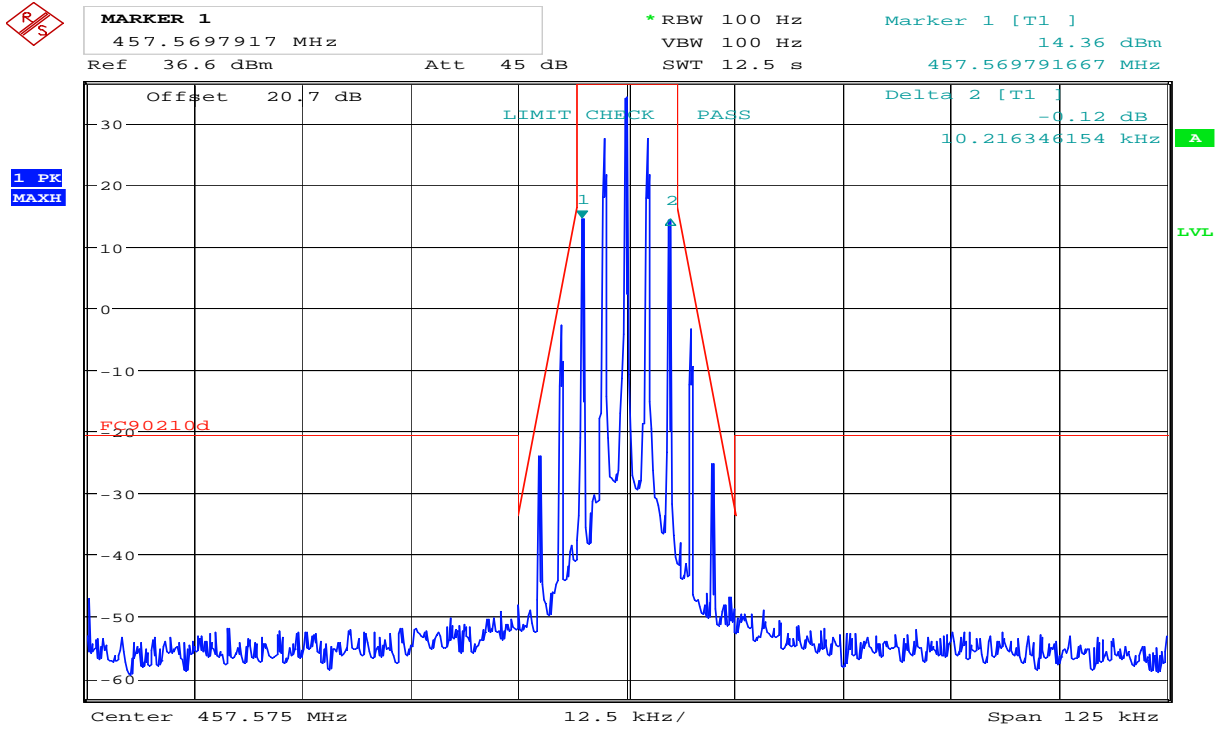
Date: 26.SEP.2007 16:34:28

**Emission Mask, FCC 90.210(d), RSS 119 mask D, Lower Channel**



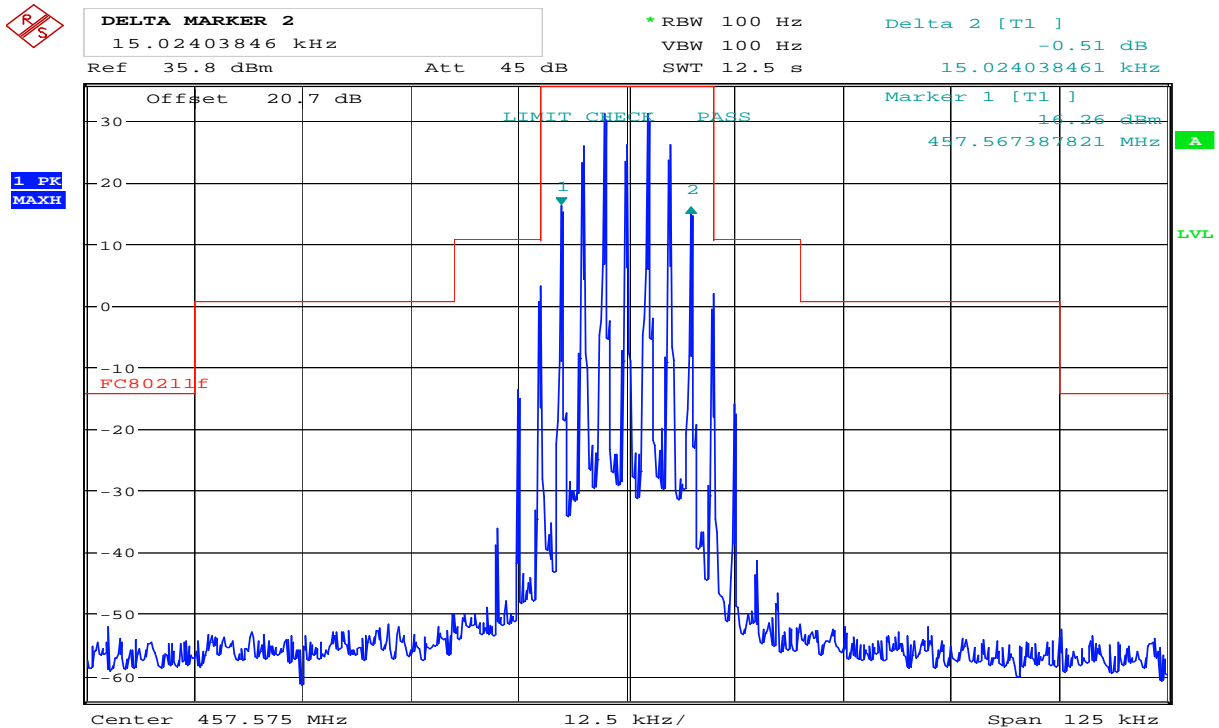
Date: 26.SEP.2007 15:25:36

**Emission Mask, FCC 80.211(f), 90.210(b), RSS 119 mask B, Lower Channel**



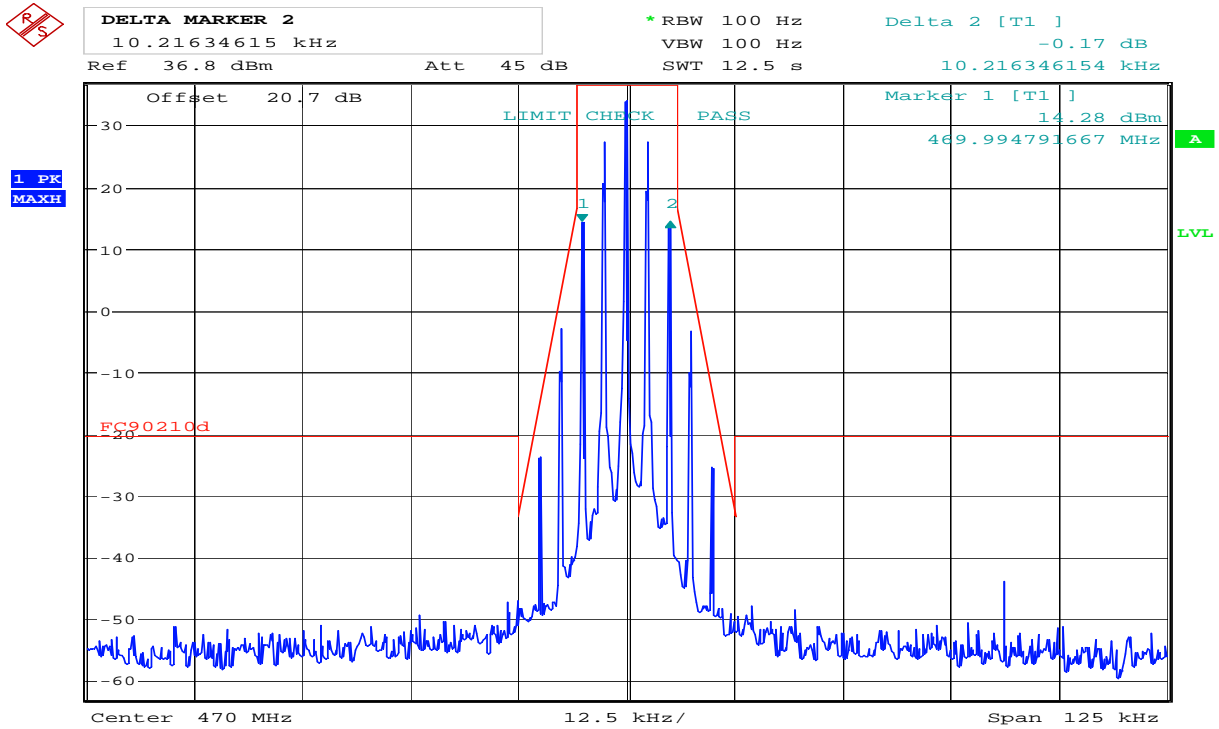
Date: 26.SEP.2007 16:42:20

**Emission Mask, FCC 90.210(d), RSS 119 mask D, Middle Channel**



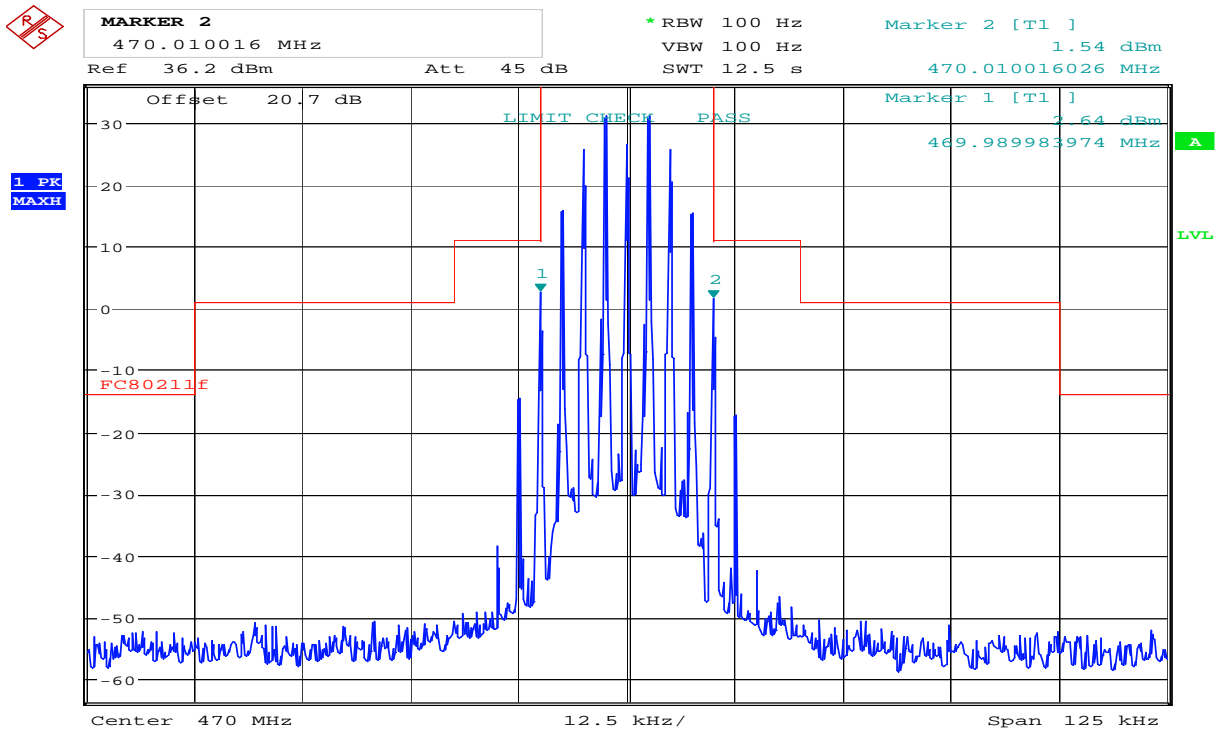
Date: 26.SEP.2007 15:21:28

**Emission Mask, FCC 80.211(f), 90.210(b), RSS 119 mask B, Middle Channel**



Date: 26.SEP.2007 16:44:37

**Emission Mask, FCC 90.210(d), RSS 119 mask D, Upper Channel**



Date: 26.SEP.2007 15:18:28

**Emission Mask, FCC 80.211(f), 90.210(b), RSS 119 mask B, Upper Channel**

**4.6 Field Strength of Spurious Radiations**

Para. No.: 2.1053, 2.1057, 80.211, 90.210, 90.217

Test Performed By: Frode Sveinsen	Date of Test: 25-Sept-2007
-----------------------------------	----------------------------

Test Results: Complies

**Measurement Data:**

Carrier Frequency MHz	Spurious Frequency MHz	Measured Value dBm	Limit dBm	Margin dB
457.575	All Frequencies	< -40	-20	>20

The frequency band below 1 GHz is measured with 100 kHz and Peak Detector; the frequencies from 1 to 5 GHz were measured with 1 MHz RBW and Peak Detector.

The measurement was performed at 10m below 1 GHz and at 3m above 1 GHz, both measurements with transducer factor programmed in the spectrum analyzer.

The emissions on highest and lowest frequency did not differ significantly from the values at the middle frequency.

EUT was transmitting continuously without modulation. The EUT was rotated in 3 planes for this test.

The measured values are ERP below 1 GHz and EIRP above 1 GHz.

**Requirements:**

FCC 80.211(f)(3): Less than -13 dBm

FCC 90.210(b)(3): 25 kHz channels: Less than -13 dBm

FCC 90.210(d)(3): 12.5 kHz channels: Less than -20 dBm

## 4.7 Frequency Stability

Para. No.: 2.1055, 80.209, 90.213, 90.217(b)

Test Performed By: Frode Sveinsen	Date of Test: 10-Oct-2007
-----------------------------------	---------------------------

Test Results: Complies

### Measurement Data:

Temperature	Measured Frequency (MHz)	Deviation (kHz)	Deviation (ppm)
+50 degrees C	457.574903	-0.097	-0.212
+40 degrees C	457.574931	-0.069	-0.151
+30 degrees C	457.574967	-0.033	-0.072
+20 degrees C	457.575028	0.028	0.061
+10 degrees C	457.575023	0.023	0.050
0 degrees C	457.574957	-0.043	-0.094
-10 degrees C	457.574795	-0.205	-0.448
-20 degrees C	457.574704	-0.296	-0.647
-30 degrees C	457.574712	-0.288	-0.629

Voltage	Measured Frequency (MHz)	Deviation (kHz)	Deviation (ppm)
11.2 Volts	457.575029	0.029	0.063
7.2 Volts (Nominal)	457.575037	0.037	0.081
6.1 Volts (lowest operating voltage)	457.575058	0.058	0.127

Comment: /

### Requirements:

FCC 80.209(a): Band 400- 466 MHz (ii) On-board stations: 5 ppm

FCC 90.213(a) note 8: Mobile stations using 12.5 kHz channels: 2.5 ppm

RSS 119 section 5.3: Mobile station on 12.5 channels: 2.5 ppm

## 4.8 Transient Frequency Behaviour

Para. No.: 2.1055, 80.209, 90.213, 90.217(b)

Test Performed By: Frode Sveinsen
-----------------------------------

Date of Test: 26-Sept-2007
----------------------------

**Test Results: Complies**

**Measurement Data:**

See attached plots.

Measurement method according to ANSI/TIA/EIA-603-B-2002 with Frequency Domain Analyzer.

Comment: /

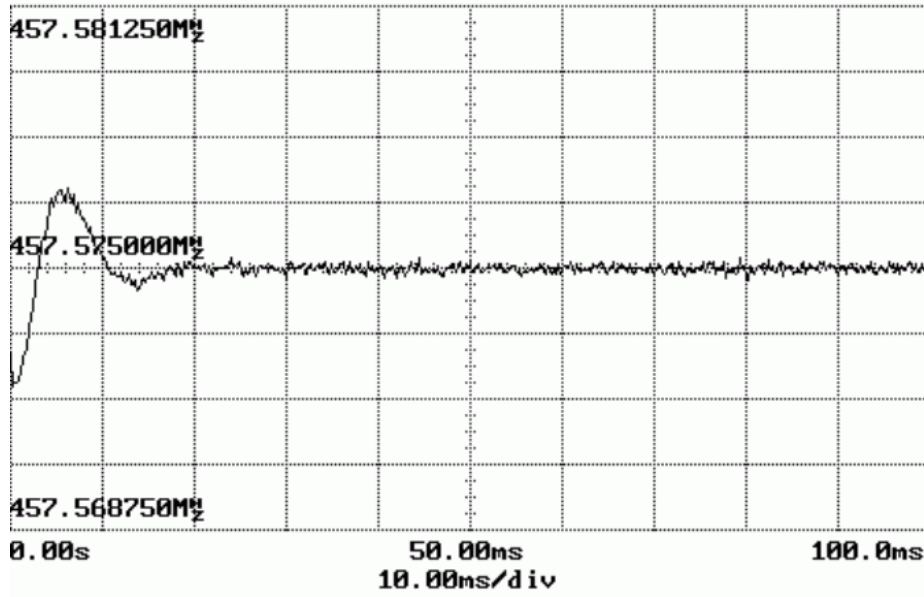
**Requirements:**

FCC 90.214

RSS 119 Section 5.9



(hp) Freq C rem t1k  
 waiting for trigger



**VERTICAL**

Center/Top/Bottom  
 Span

Center  
 457.575000MHz

Span  
 12.500kHz

1.562kHz/div

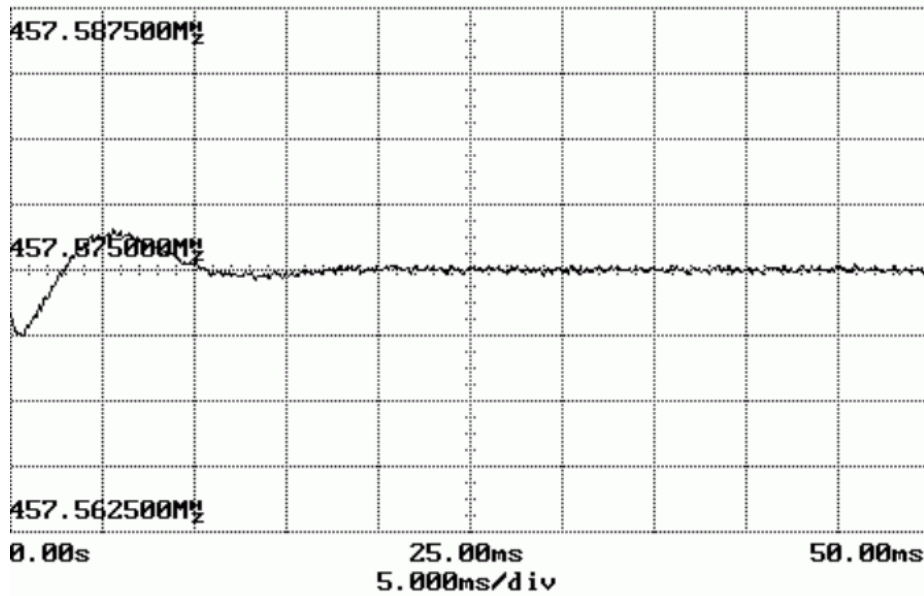
Find Center

Find Center And Span

ref int

Transient Frequency, 12.5 kHz Channels, Tx ON

(hp) Freq C Post-trigger data available only  
 waiting for trigger



**TRIGGER**

Triggered  
 Auto

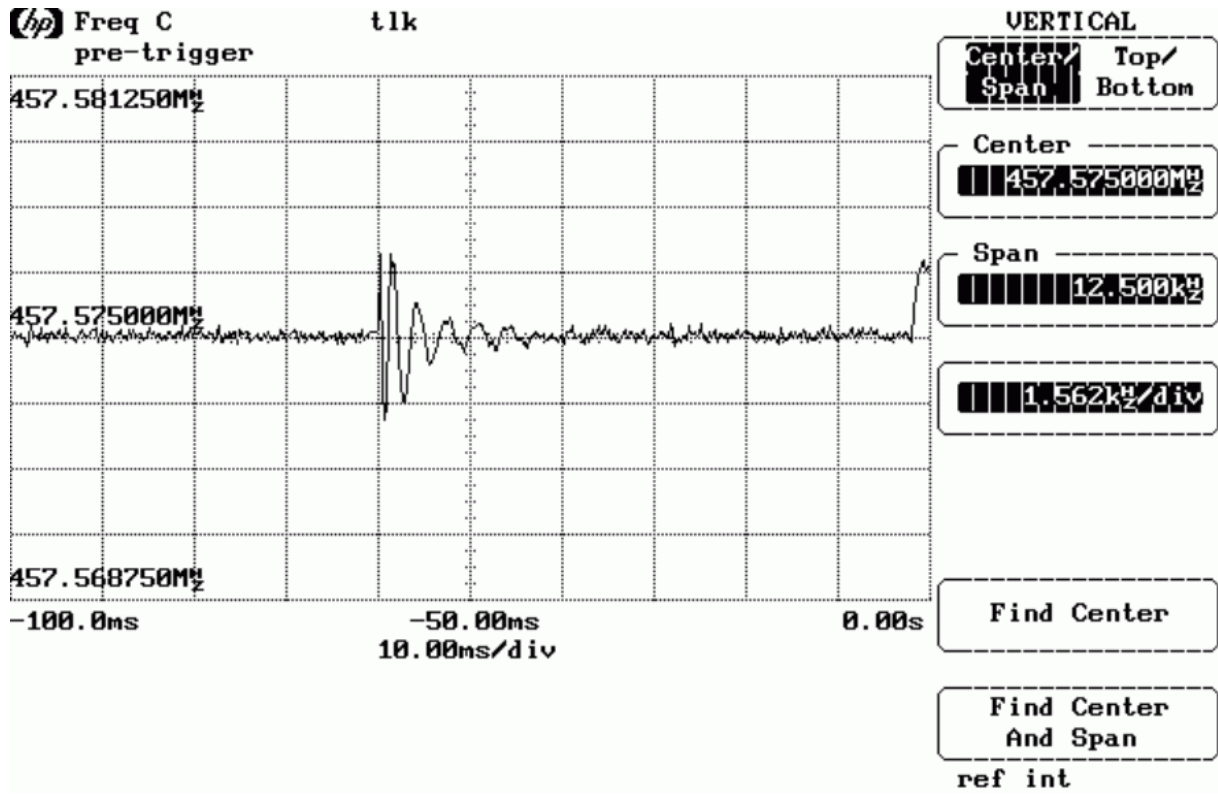
Ext Freq RF  
 Edge Value Env

Time Ref Only

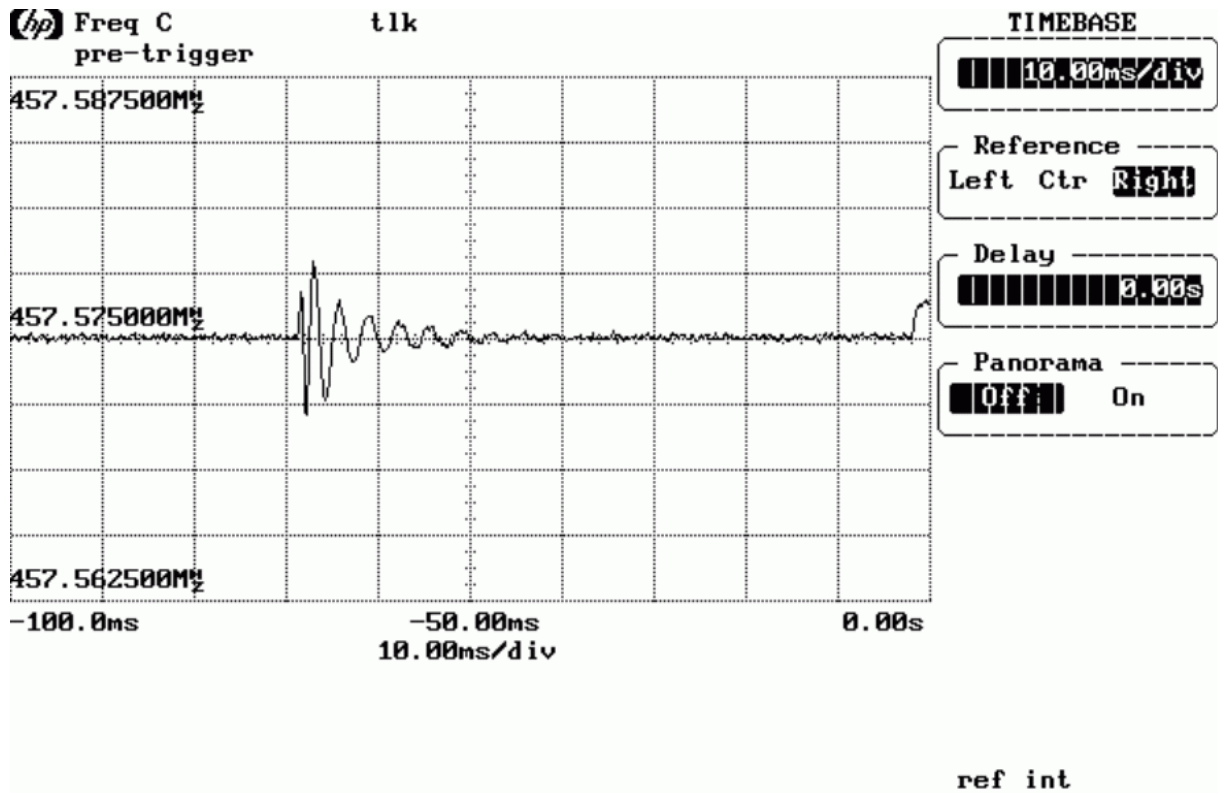
↑ ↓

ref int

Transient Frequency, 25 kHz Channels, Tx ON



Transient Frequency, 12.5 kHz Channels, Tx OFF



Transient Frequency, 25 kHz Channels, Tx OFF

#### 4.9 Suppression of Interference Aboard Ships/ Receiver Spurious Emissions

**Measurement Procedure:**

FCC 80.217

IC RSS-119 clause 5.11, RSS-GEN clauses 4.8 and 6.

**Test results:**

See plot. No other Spurious Emissions from the Receiver were detected.

**Requirements, FCC 80.217(b)**

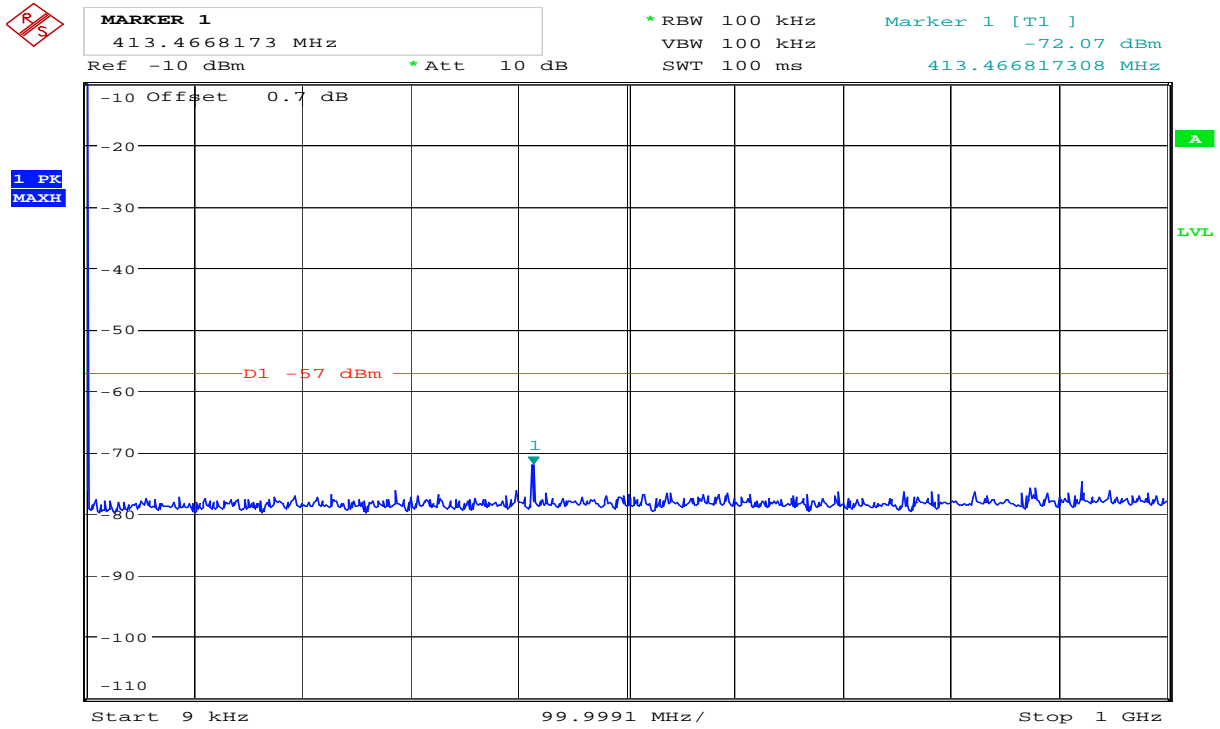
Frequency of Interfering Emissions	Power to Artificial Antenna in microwatts
Below 30 MHz	400 (-4.0 dBm)
30 to 100 MHz	4,000 (6.0 dBm)
100 to 300 MHz	40,000 (16.0 dBm)
Over 300 MHz	400,000 (26.0 dBm)

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

The measurement can be performed either radiated or conducted.

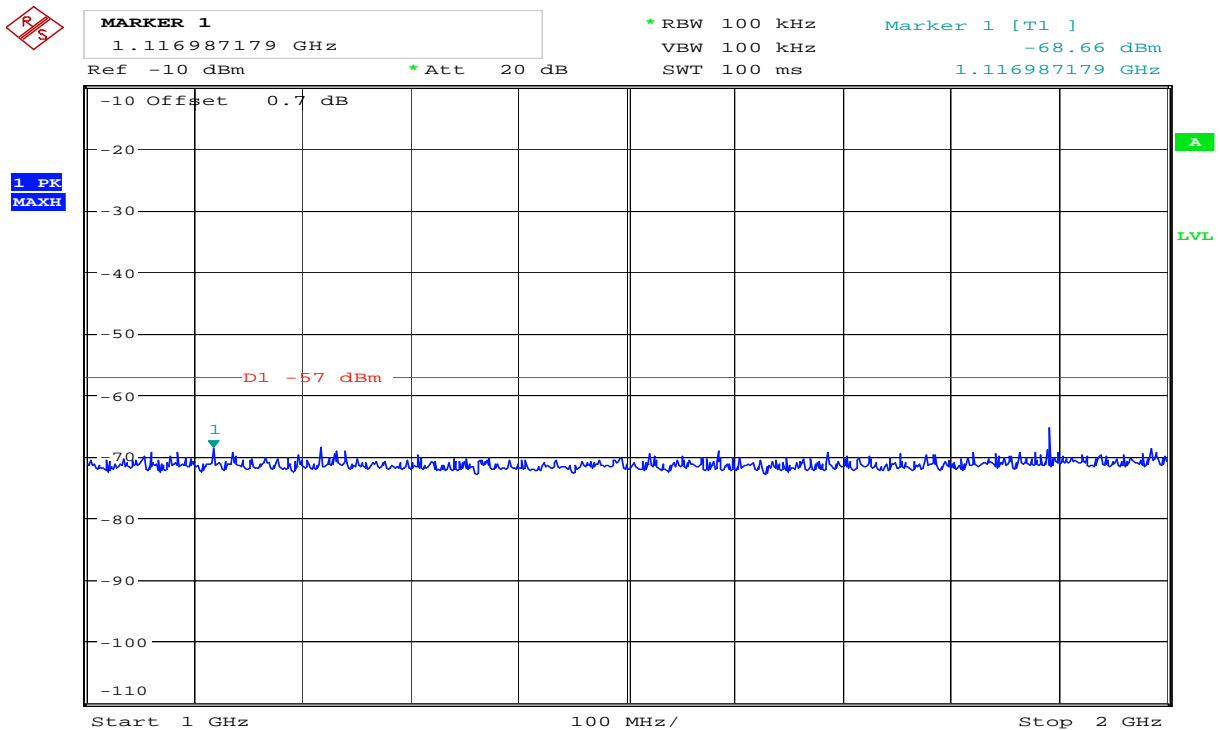
**When measured Conducted:** no spurious signals appearing at the antenna terminals shall exceed 2 nW per any 4 kHz spurious frequency in the band 30-1000 MHz, or 5 nW above 1 GHz.

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



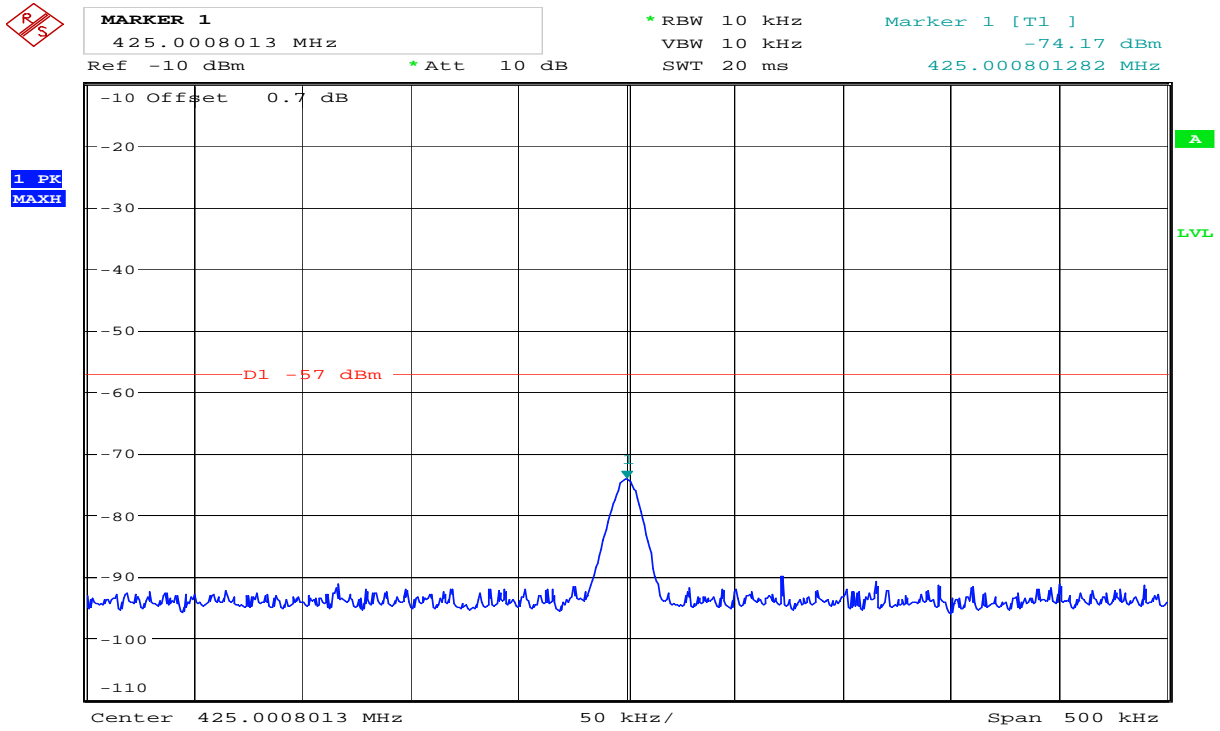
Date: 27.SEP.2007 10:27:44

**Receiver Spurious Emissions, 9 kHz – 1 GHz, Middle Channel**



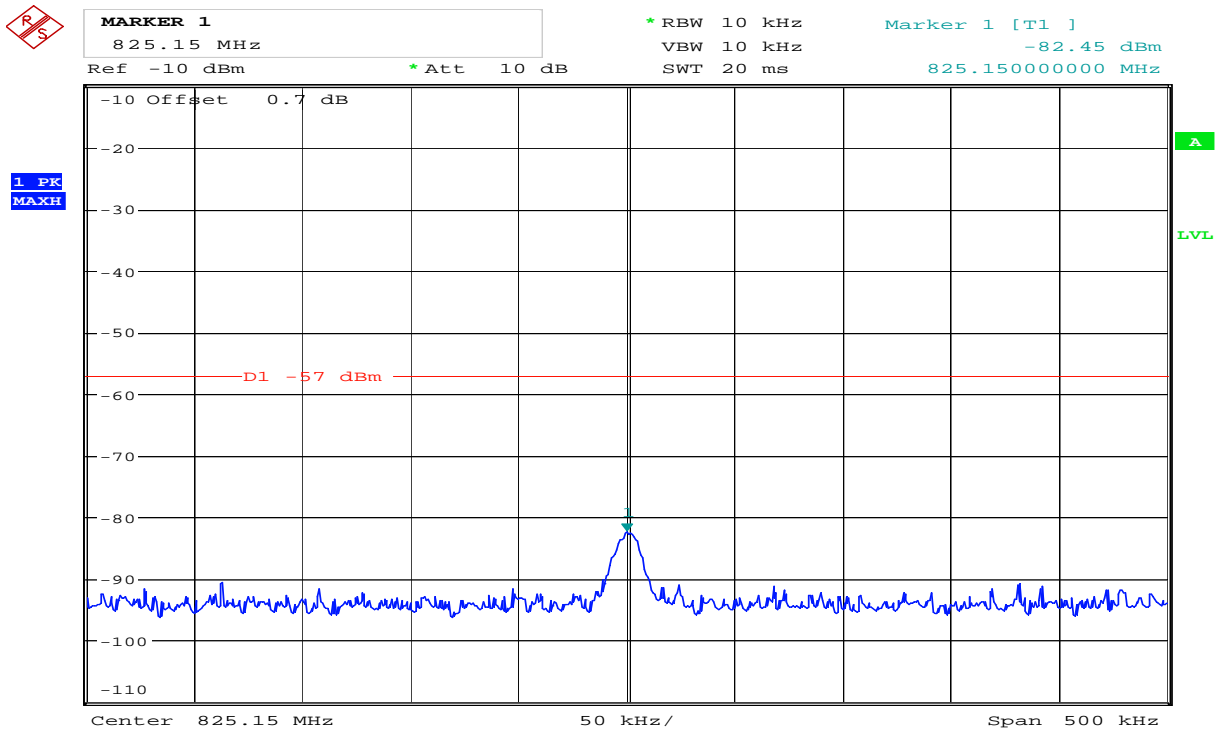
Date: 27.SEP.2007 10:31:10

**Receiver Spurious Emissions, 1 - 2 GHz, Middle Channel**



Date: 27.SEP.2007 10:57:08

**Receiver Spurious Emissions, Oscillator, Upper Channel**



Date: 27.SEP.2007 11:00:32

**Receiver Spurious Emissions, 2<sup>nd</sup> Harmonic Oscillator, Middle Channel**

## 5 LIST OF TEST EQUIPMENT

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 Test Laboratory.

No.	Instrument/ancillary	Type of instrument/ancillary	Manufacturer	Ref. no.
1	CMTA	Radiocom. Analyzer	Rohde & Schwarz	LR 1087
2	SMHU	Signal generator	Rohde & Schwarz	LR 1079
3	SMPD	Signal generator	Rohde & Schwarz	LR 002
4	6232B	Power Supply	Hewlett Packard	LR 1088
5	77	Multimeter	Fluke	LR 302
6	FSU26	Spectrum Analyzer	Rohde & Schwarz	LR 1504
7	FSEK30	Spectrum Analyzer	Rohde & Schwarz	LR 1337
8	765-10	Attenuator	Narda	LR 1005
9	6810.17B	Attenuator	Suhner	LR 1184
10	6810.17B	Attenuator	Narda	LR 1212
11	H-9	Hybrid	Anzac	LR 1091
12	H-9	Hybrid	Anzac	LR 1095
13	8470B	Crystal Detector	Hewlett Packard	LR 1207
14	PM 3392	Oscilloscope	Philips	LR 1125
15	8561B	Spectrum Analyzer	Hewlett Packard	LR 1085
16	53310	Modulation Domain Analyzer	Hewlett Packard	LR 1483
17	ESVS30	Measuring Receiver	Rohde & Schwarz	LR 1101
18	ESN	Measuring Receiver	Rohde & Schwarz	LR 1237
19	8449B	Preamplifier	Hewlett Packard	LR 1322
20	3115	Horn Antenna	EMCO	LR 1226
21	HL223	Biconical Antenna	Rohde & Schwarz	LR 1261
22	HK116	Logperiod Antenna	Rohde & Schwarz	LR 1260
23	HFH2-Z2	Loop Antenna	Rohde & Schwarz	LR 285
24	HZ-12	Substitution Dipoles	Rohde & Schwarz	LR 1332
25	HZ-13	Substitution Dipoles	Rohde & Schwarz	LR 1334

## 6 TEST SETUP

### 6.1 Test Site Radiated Emissions

