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Test report no. : 65008-7

Item tested : CT7141H-US

Type of equipment : Isochronous UPCS Device

FCC ID : T7HCT7141H-US

Client : D.R.S. Electronics 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)

10 July 2006

Authorized by : .....
Egil Hauger
Technical Verificator

CONTENTS

1 GENERAL INFORMATION 3
1.1 Tested by 3
1.2 Client Information 3
1.3 Manufacturer (if other than client) 3

2 TEST INFORMATION 4
2.1 Tested Item 4
2.2 Test Environment 5
2.3 Test Period 5
2.4 Test Engineers 5
2.5 Test Equipment 5
2.6 Other Comments 5

3 TEST REPORT SUMMARY 6
3.1 General 6
3.2 Test Summary 7

4 TEST RESULTS 8
4.1 Powerline Conducted Emissions 8
4.2 Coordination with fixed microwave 10
4.3 Digital Modulation Techniques 10
4.4 Labelling Requirements 10
4.5 Antenna Requirement 11
4.6 Channel Frequencies 11
4.7 Automatic Discontinuation of Transmission 12
4.8 Peak Power Output 13
4.9 Emission Bandwidth B 15
4.10 Power Spectral Density 17
4.11 In-Band Unwanted Emissions, Conducted 19
4.12 Out-of-band Emissions, Conducted 21
4.13 Carrier Frequency Stability 24
4.14 Frame Repetition Stability 25
4.15 Frame Period and Jitter 25
4.16 Monitoring Threshold, Least Interfered Channel 28
4.17 Threshold Monitoring Bandwidth 29
4.18 Reaction Time and Monitoring Interval 30
4.19 Time and Spectrum Window Access Procedure 33
4.20 Acknowledgements and Transmission Duration 34
4.21 Dual Access Criteria Check 36
4.22 Alternative Monitoring Interval 36
4.23 Alternative Monitoring Interval 38
4.24 Duty Cycle Correction Factor Calculation 39
4.25 Spurious Emissions (Radiated) 40
4.26 Receiver Spurious Emissions 54

5 TEST SETUPS 61
5.1 Frequency Measurements 61
5.2 Timing Measurements 61
5.3 Conducted Emission Tests 61
5.4 Radiated Emission Tests 62
5.5 Powerline Conducted Tests 62
5.6 Monitoring Tests 63

6 TEST EQUIPMENT USED 64

1 GENERAL INFORMATION

1.1 Tested by

Name :	Nemko Comlab
Address :	Gåsevikveien 8, Box 96 N-2027 Kjeller, NORWAY
Telephone :	+47 64 84 57 00
Fax :	+47 64 84 57 05
E-mail:	post@comlab.no
FCC test firm registration # :	994405
IC OATS registration # :	4443
Total Number of Pages:	64

1.2 Client Information

Name :	D.R.S. Electronics Ltd.
Address :	11/F, CAC Tower, 165 Hioi Bun Road, Kwun Tong, Kowloon, Hong Kong

Contact:

Name :	Søren Bove
Telephone :	+852 23487 3718
Fax :	+852 2480 6121
E-mail :	soren.bove@drs-electronics.com

1.3 Manufacturer (if other than client)

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

2 Test Information

2.1 Tested Item

Name :	D.R.S. Electronics Ltd.
FCC ID :	T7HCT7141H-US
Industry Canada ID :	6499A-CT7141H
Model/version :	CT7141H-US
Serial number :	022
Hardware identity and/or version:	V3, RF Module V2
Software identity and/or version :	V1.10
Frequency Range :	1921.536 – 1928.448 MHz
Tunable Bands :	1
Number of Channels :	5 RF Channels, 5x12 = 60 TDMA Duplex Channels
Operating Modes :	/
Type of Modulation :	GFSK
User Frequency Adjustment :	None
Rated Output Power :	90 mW Peak Power, 3.75 mW Average Power
Type of Power Supply :	Rechargeable NiMH batteries
Antenna Connector :	None
Antenna Diversity Supported :	No, the EUT has only one antenna
Desktop Charger :	Charger cradle: CT7141C-US AC adaptor: Salom Model: SSW-1254US (switched mode adaptor)

Description of Tested Device(s)

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

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

Exposure Evaluation

The EUT is a portable device and is designed to be held to ear or worn in a belt clip when used. A test reports with the measured SAR values for both configurations are submitted with the application. The SAR values are also included in the user manual.

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 2.5.1 for General Public Use.

2.2 Test Environment

Temperature:	20 – 25 °C
Relative humidity:	30 – 50 %
Normal test voltage:	3.6 V DC

The values are the limit registered during the test period.

2.3 Test Period

Item received date: 2006-04-24

Test period : from 2006-04-24 to 2006-05-23

2.4 Test Engineers

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. The lower check was performed at 3.35 V DC since the EUT has implemented cut-off at 3.3 V DC.

3 TEST REPORT SUMMARY

3.1 General

Manufacturer: D.R.S. Electronics Ltd.

Model No.: CT7141H-US

Serial No.: 022

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 15, Paragraph 15.323 for Isochronous UPCS Devices and Industry Canada RSS-213 Issue 2.

The conducted test methods have been in accordance with ANSI C63.17-2006 Draft 3.5 where applicable.

Radiated tests were conducted is 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.

☒ New Submission ☒ Production Unit

☐ Class II Permissive Change ☐ Pre-production Unit

PUE Equipment Code ☐ Family Listing

THIS TEST REPORT RELATES ONLY TO THE ITEM (S) TESTED.

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

TEST REPORT NO.: 65008/7

TESTED BY : _____ **DATE: 24 MAY 2006**

Frode Sveinsen, Chief Engineer

3.2 Test Summary

Name of test	FCC CFR 47 Paragraph #	IC RSS-213 Paragraph #	Verdict
Coordination with fixed microwave	15.307(b)	-	Complies
Digital Modulation Techniques	15.319(b)	6.1	Complies
Labelling requirements	15.19(a)(3)	RSS-GEN 5.2	Complies
Antenna Requirement	15.317, 15.203	4.1(e)	Complies
Powerline Conducted Emission	15.207(a)	6.3	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), 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	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);(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);(7)	4.3.4	Complies
Access criteria test interval	15.323(c)(4);(6)	4.3.4	N/A[1]
Access Criteria functional test	15.323(c)(4);(6)	4.3.4	N/A[1]
Acknowledgements	15.323(c)(4)	4.3.4	Complies
Transmission duration	15.323(c)(3)	4.3.4	Complies
Dual access criteria	15.323(c)(10)	4.3.4	Complies
Alternative monitoring interval	15.323(c)(10);(11)	4.3.4	N/A[2]
Spurious Emissions (Antenna Conducted)	15.323(d)	6.7.1	Complies[3]
Spurious Emissions (Radiated)	15.209	4.3.3	Complies
Receiver Spurious Emissions	/	6.8	Complies

[1] Only applies for equipment that transmits unacknowledged control and signalling information.

[2] The client declares that the tested equipment does not implement this provision.

[3] The tested equipment has integral antennas only.

4 TEST RESULTS

4.1 Powerline Conducted Emissions

Para. No.: 15.207 (a)

Test Performed By: Tore Løvlien	**Date of Test: 3 May 2006**

Measurement procedure: ANSI C63.4-2003 using 50 µH/50 ohms LISN.

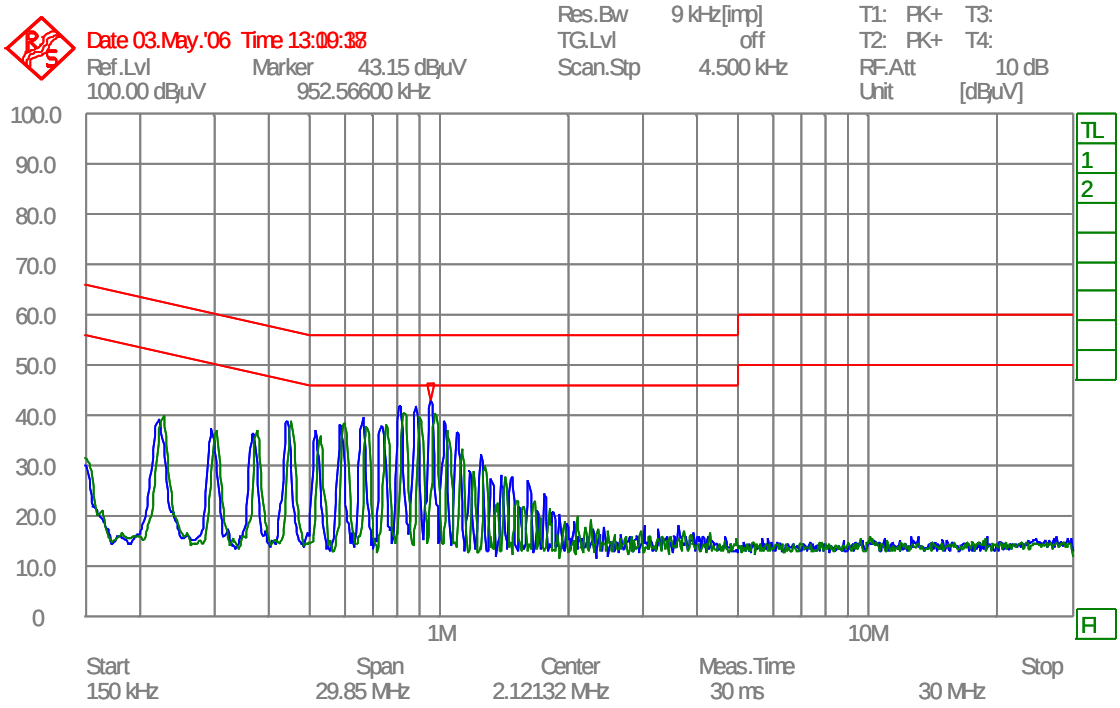
Test Results: **Complies**

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

Highest measured value (L1 and N):

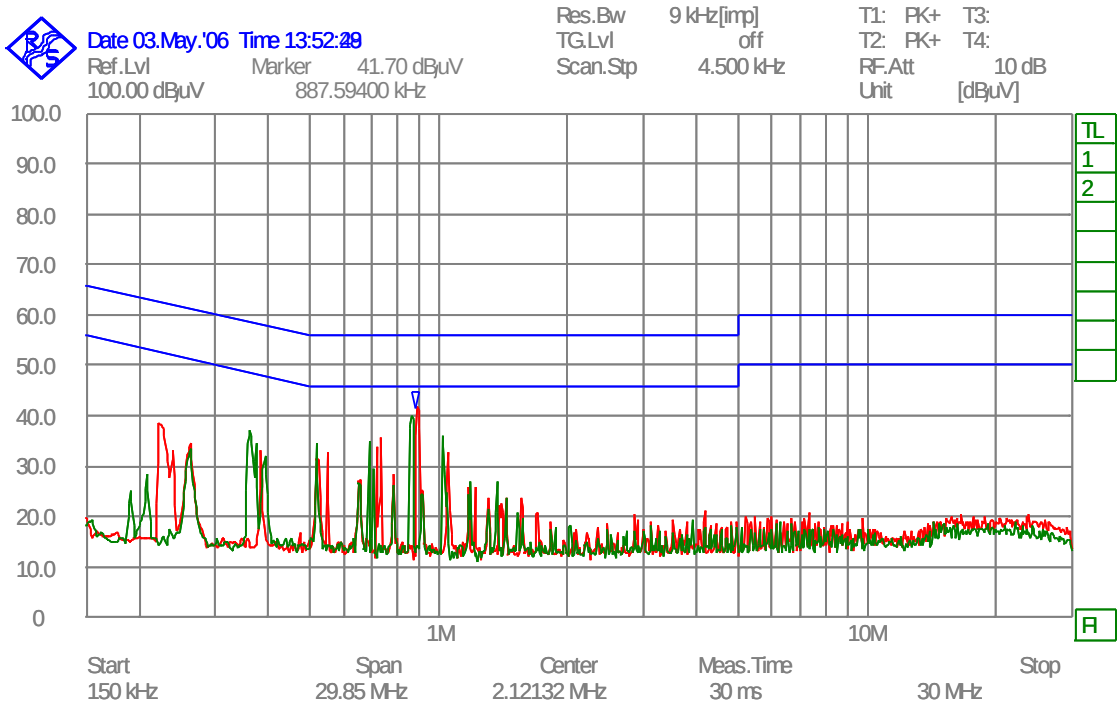
All emissions are below the Average limit when measured with Peak detector.

Frequency	**Detector**	**Measured value**	**Limit**	**Margin**
KHz	**Peak/QP/AV**	**dBµV**	**dBµV**	**dB**
/	QP	/	/	/
/	AV	/	/	/



RTX Sally DECT Handset FCC
AC Mains 115V AC 60Hz

Transmitter Active, EUT in Speakerphone Mode



RTX Sally DECT Handset Stand bye mode
AC Mains 115V AC 60Hz FCC

Standby Mode

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 fulfil 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 and the output power is reduced.

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 Labelling 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? ☐ Yes ☒ No

If detachable, is the antenna connector 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

The EUT transmits Control and Signalling Information?		☐ **YES** ☒ **NO**
TYPE OF EUT :	☒ **INITIATING DEVICE**	☐ **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	C	Pass
2	EUT Switch Off	C	Pass
3	Hook-On by companion device	NA	Pass
4	Hook-On by EUT	C	Pass
5	Power Removed from Companion Device	A	Pass
6	Companion Device Switch Off	NA	Pass

A - Connection breakdown, Cease of all transmissions
B - Connection breakdown, EUT transmits control and signalling information
C - Connection breakdown, Companion Device transmits control and signalling information
NA - Not Applicable

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	19.2	20.4	+1.2
0	1928.448	19.1	20.3	+1.2

The EIRP is calculated from measured field strength by the formula in DA00-705.

Limit:

Conducted: 100 µW x SQRT(B) = 115 mW = > 20.6 dBm, where B is measured emission bandwidth in Hz

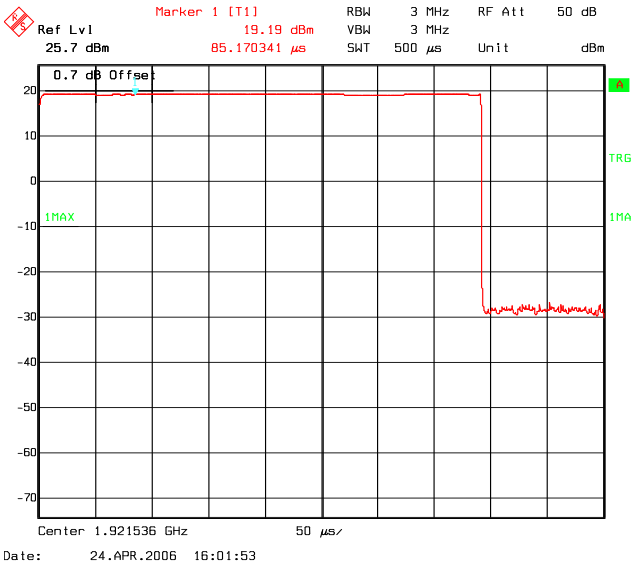
The antenna gain is below 3 dBi, no reduction in transmit power is necessary.

Requirements, FCC 15.319(c)(f)

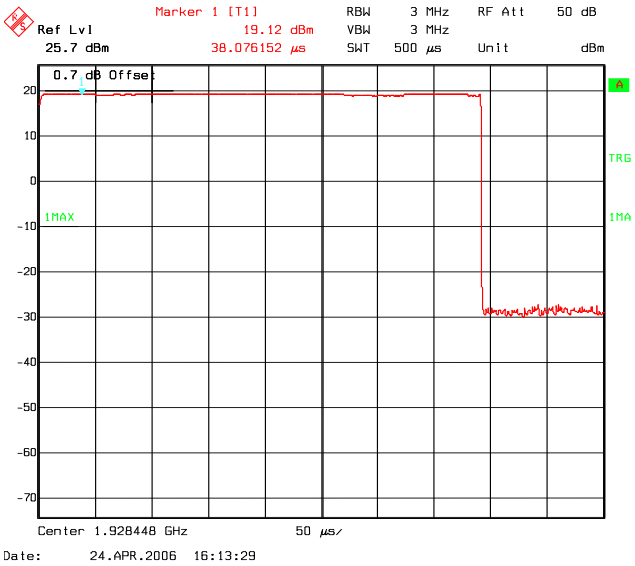
Peak transmit power shall not exceed 100 microwatts multiplied by the square root of the emission bandwidth in hertz.

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

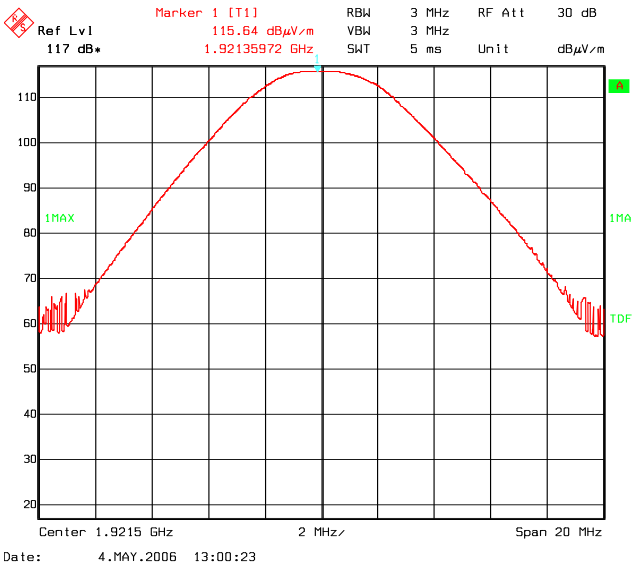


Lower Channel

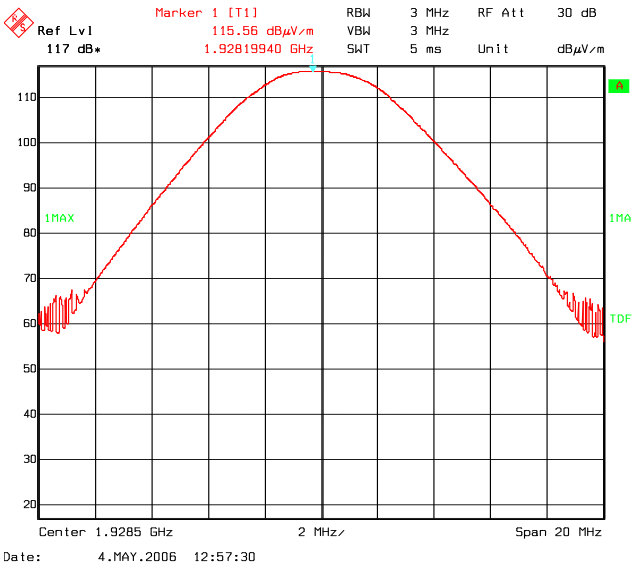


Upper Channel

Radiated Peak Output Power



Lower Channel (Max: VP)



Upper Channel (Max: VP)

4.9 Emission Bandwidth B

Test Method:

ANSI C63.17 D3.5, clause 6.1.3.

Test Results: Complies

Measurement Data:

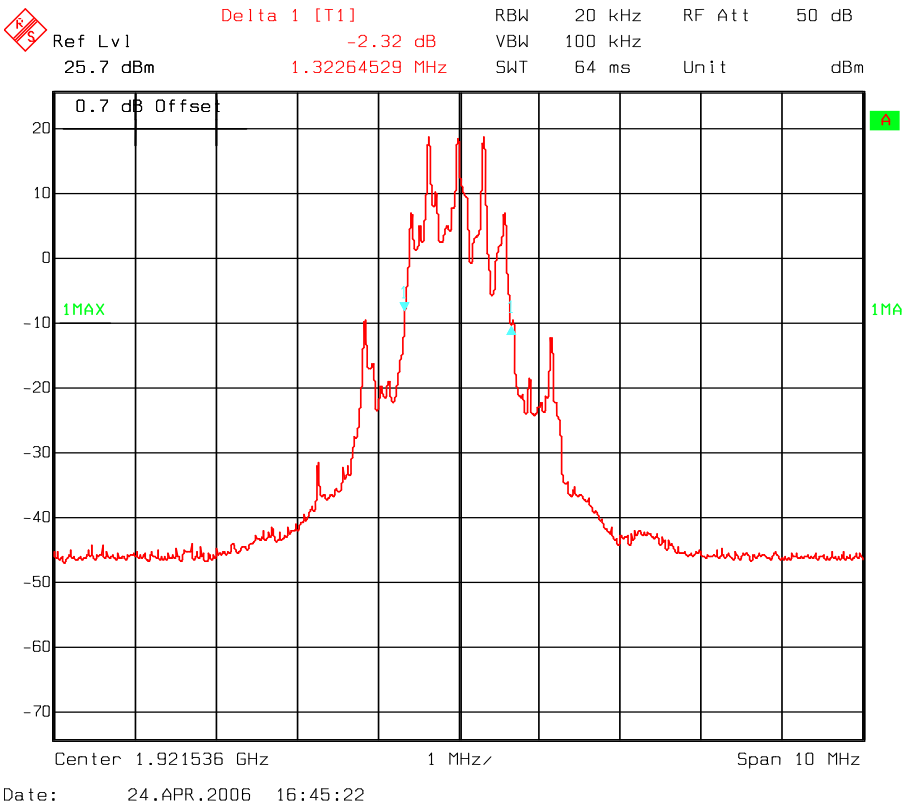
Channel No.	Frequency (MHz)	26 dB Bandwidth B (kHz)
4	1921.536	1322.6
0	1928.448	1322.6

Channel No.	Frequency (MHz)	6 dB Bandwidth (kHz)
4	1921.536	761.5
0	1928.448	761.5
Channel No.	**Frequency (MHz)**	**12 dB Bandwidth (kHz)**
4	1921.536	1202.4
0	1928.448	1202.4

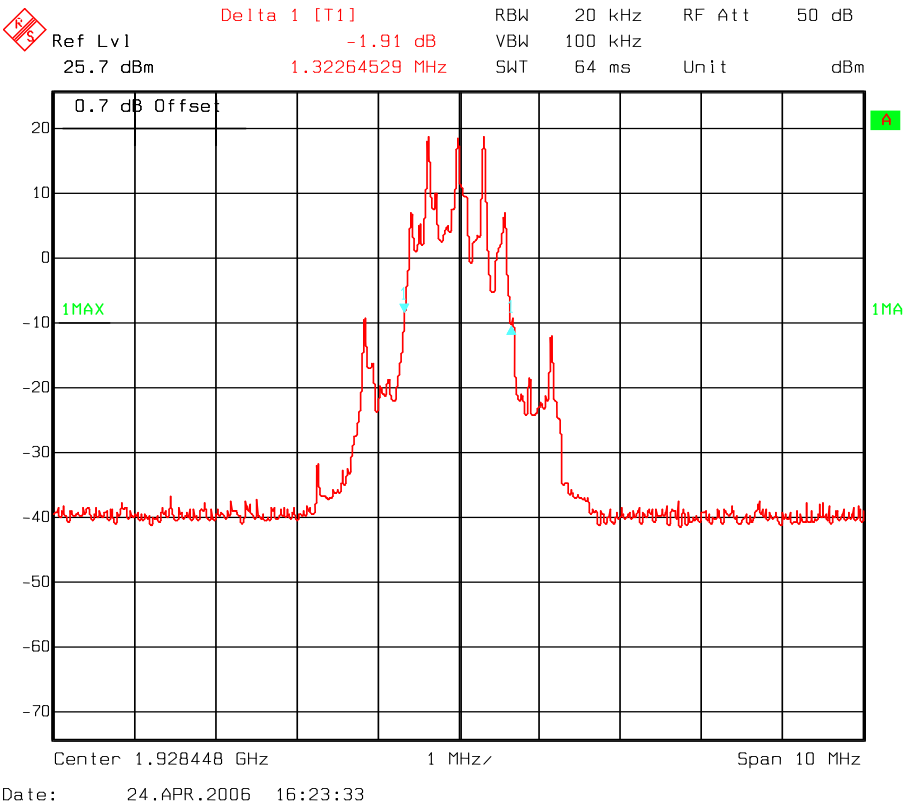
Requirements, FCC 15.323(a)

The 26 dB Bandwidth B 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 D3.5 clause 7.4).



Emission Bandwidth *B*, Lower Channel



Emission Bandwidth *B*, Upper 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	4.2
0	1928.448	3.3

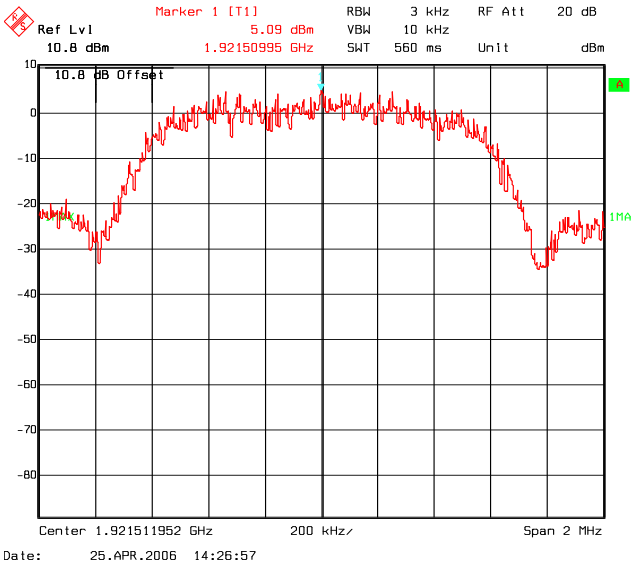
Averaged over 100 sweeps.

Requirements, FCC 15.319(d)

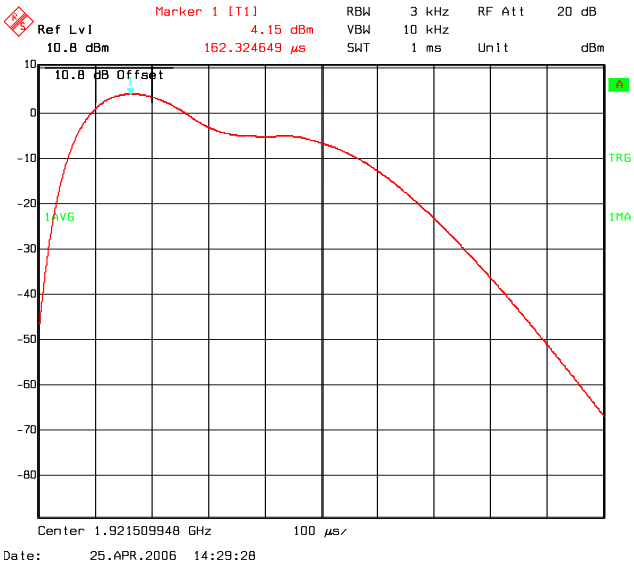
The Power Spectral Density shall be less than 3 mW (4.77 dBm) when averaged over 100 sweeps.

Power Spectral Density

Lower Channel:

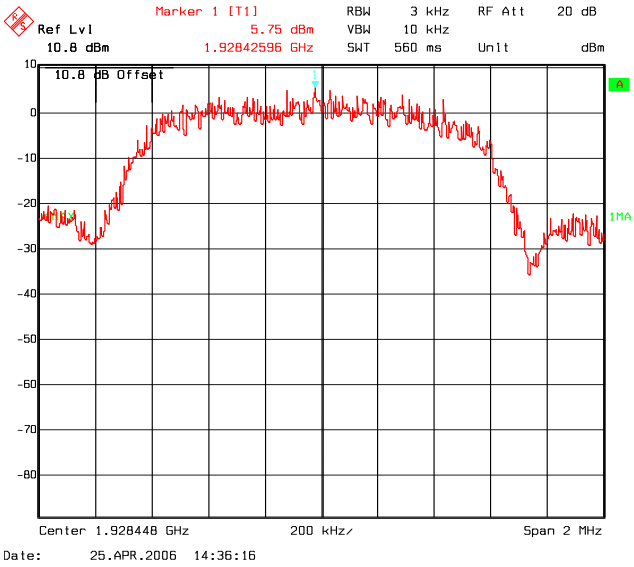


Overview

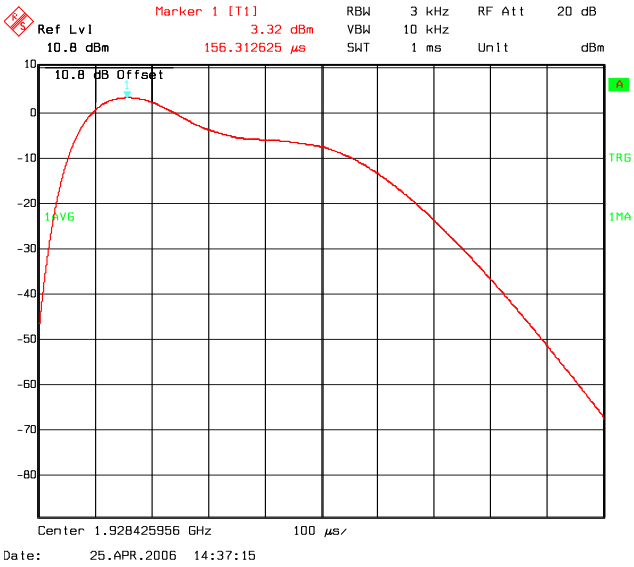


Averaged, 100 Sweeps

Upper Channel:



Overview



Averaged, 100 Sweeps

4.11 In-Band Unwanted Emissions, Conducted

Test Method:

ANSI C63.17, clause 6.1.6.1.

Test Results: Complies

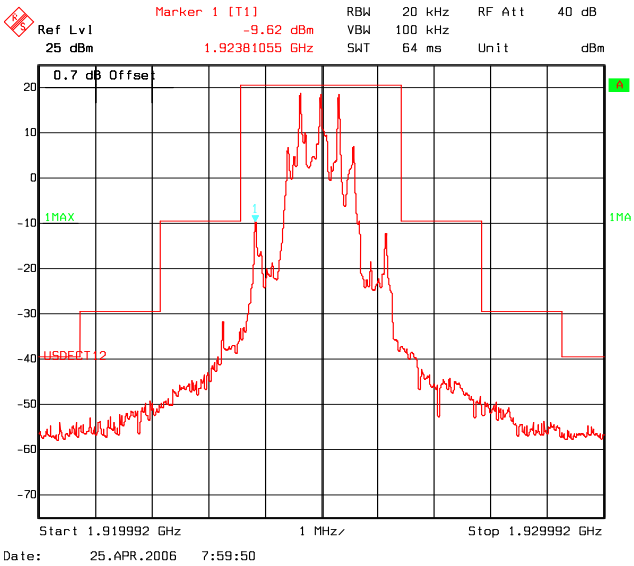
Measurement Data:

See plots.

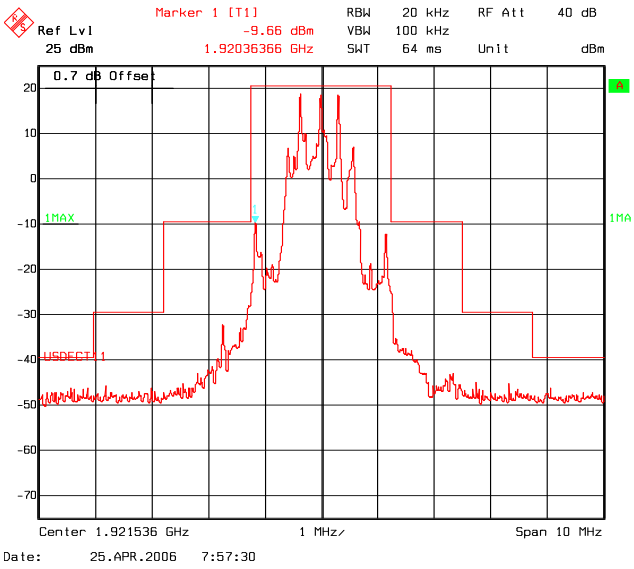
Requirements, FCC 15.323(d):

$B < f \leq 2B$: less than or equal to 30 dB below maximum permitted peak power level
$2B < f \leq 3B$: less than or equal to 50 dB below maximum permitted peak power level
$3B < f \leq$ UPCS Band Edge : less than or equal to 60 dB below maximum permitted peak power level

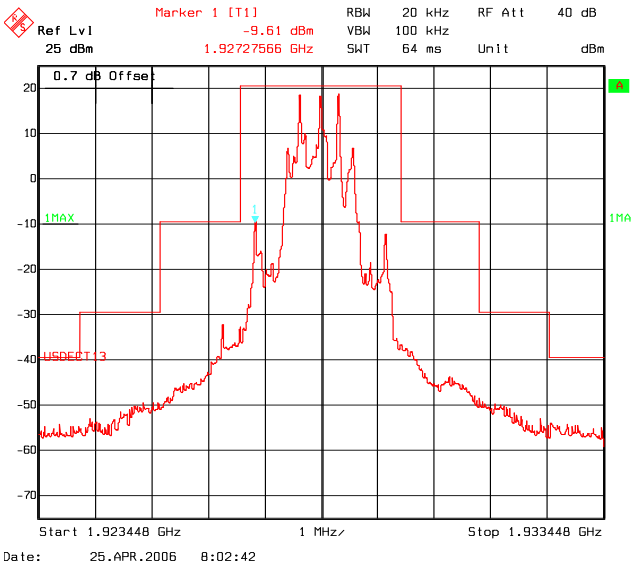
In-Band Unwanted Emissions, Conducted



Middle Channel



Lower Channel



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):

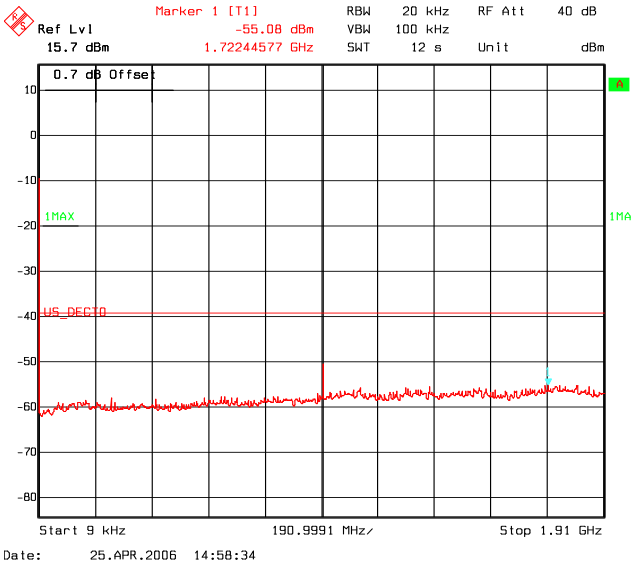
$f \leq$ 1.25MHz outside UPCS band :	≤ -9.5dBm
1.25MHz ≤ $f \leq$ 2.5MHz outside UPCS band :	≤ -29.5 dBm
$f \geq$ 2.5MHz outside UPCS band :	≤ -39.5 dBm

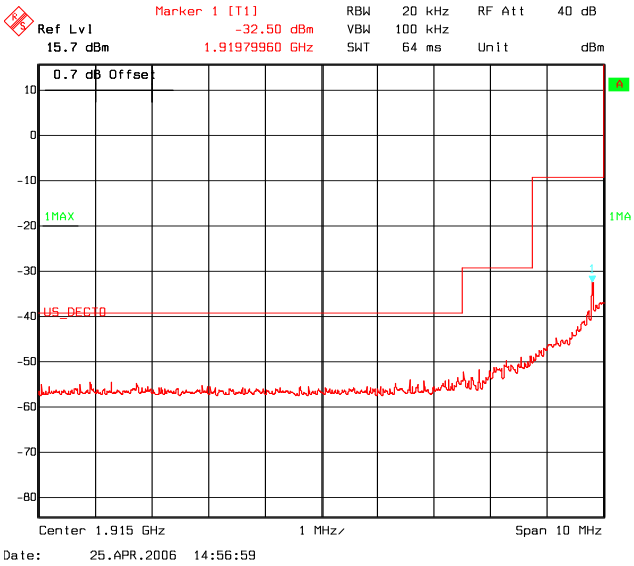
FCC 15.319 (g):

Notwithstanding other technical requirements specified in this subpart, attenuation of emissions below the general emission limits in §15.209 is not required.

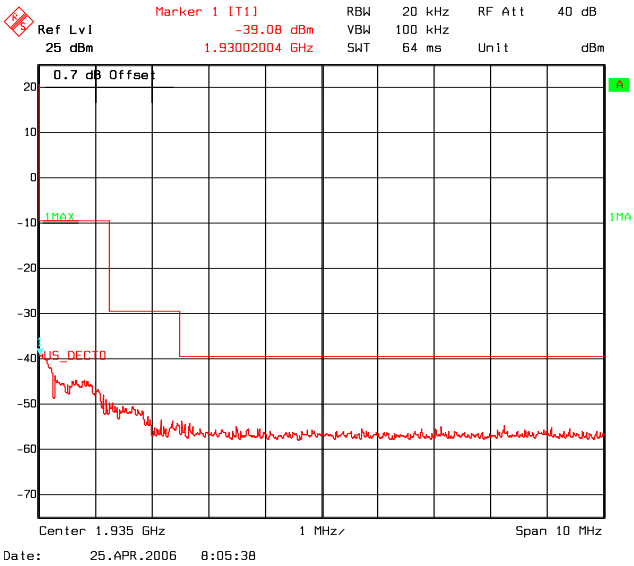
Out-of-Band Emissions, Conducted

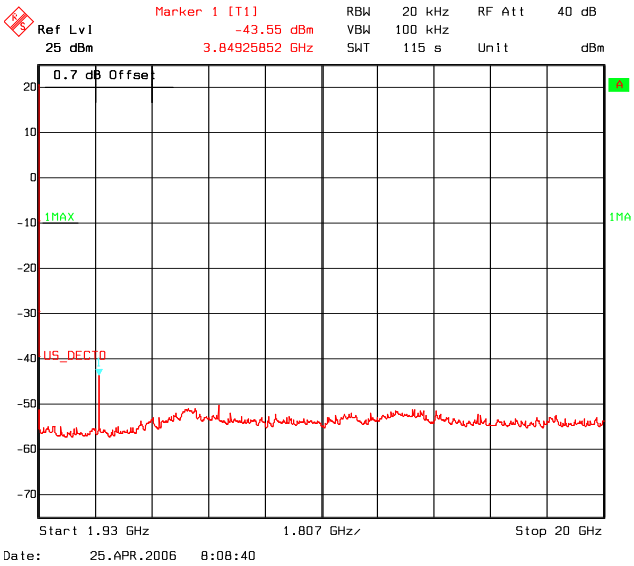
Lower Channel:





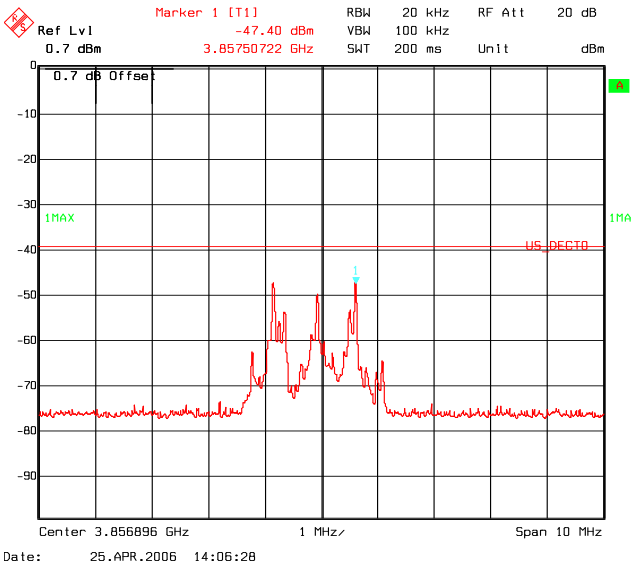
Upper Channel:



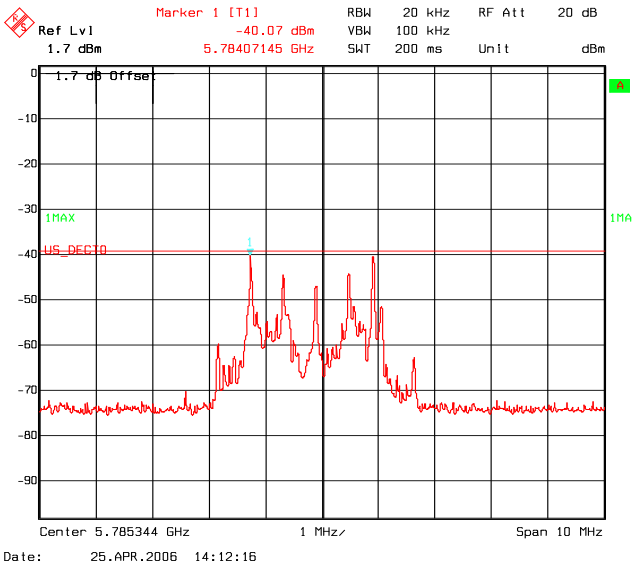


Out-of-Band Emissions, Conducted, Harmonics

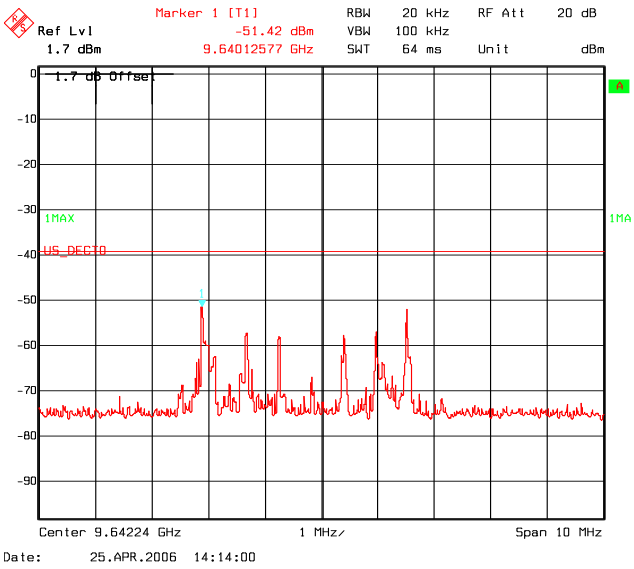
2nd harmonic



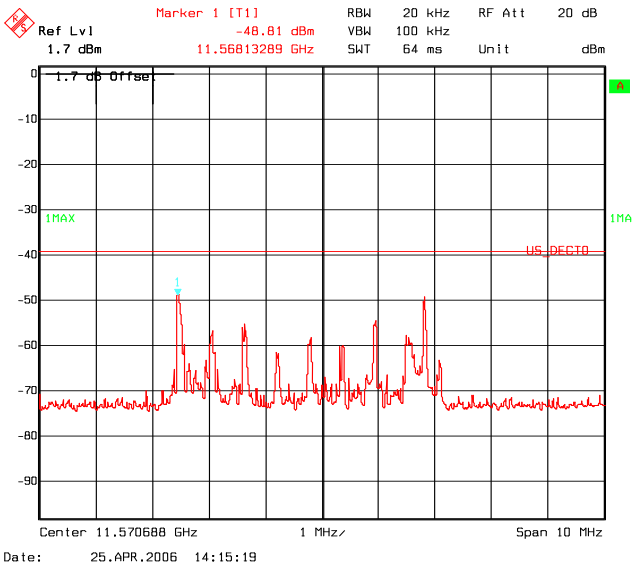
3rd harmonic



5th harmonic



6th harmonic



4.13 Carrier Frequency Stability

Test Method:

ANSI C63.17, clause 6.2.1.

Test Results: Complies

Measurement Data:

The Carrier frequency stability is measured directly with a Frequency Domain Analyzer in histogram mode.

Frequency Deviation in ppm is calculated.

Frequency Stability over 1 hour of operation at Nominal Temperature

	Measured Carrier Frequency (MHz)	Pk-Pk Difference (kHz)	Deviation ppm	Limit
V_{nom}	1924.921815	35.2	9.1	±10 ppm

Deviation ppm = ((Pk-Pk difference / 2) / Mean) x 10^6

Frequency Stability over Power Supply Voltage at Nominal Temperature

	Measured Carrier Frequency (MHz)	Difference (kHz)	Deviation ppm	Limit
V_{nom}	N/A	0	0	±10 ppm
85% of V_{nom}	N/A	N/A	N/A	
115% of V_{nom}	N/A	N/A	N/A	

Deviation ppm = ((Mean – Measured Frequency) / Mean) x 10^6

Comment: This test is not required for battery operated equipment.

Frequency Stability over Temperature

	Measured Carrier Frequency (MHz)	Difference (kHz)	Deviation ppm	Limit
T_{nom} (+20 ℃)	1924.93908	0	0	±10 ppm
T = -20 ℃	1924.92654	-12.5	-6.5	
T = +50 ℃	1924.94728	+8.2	4.3	

Deviation ppm = ((Mean – Measured Frequency) / Mean) x 10^6

Comment: Frequency Stability over Temperature was measured in speech mode with test set-up 6 with the Spectrum Analyzer replaced by the Modulation Domain Analyzer.

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 measured with a frequency domain analyzer. The frame repetition stability is 3 times the standard deviation.

Carrier Frequency (MHz)	Mean (Hz)	Standard Deviation (mHz)	Frame Repetition Stability (ppm)
1924.992	99.999238	0.0468	1.40

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:

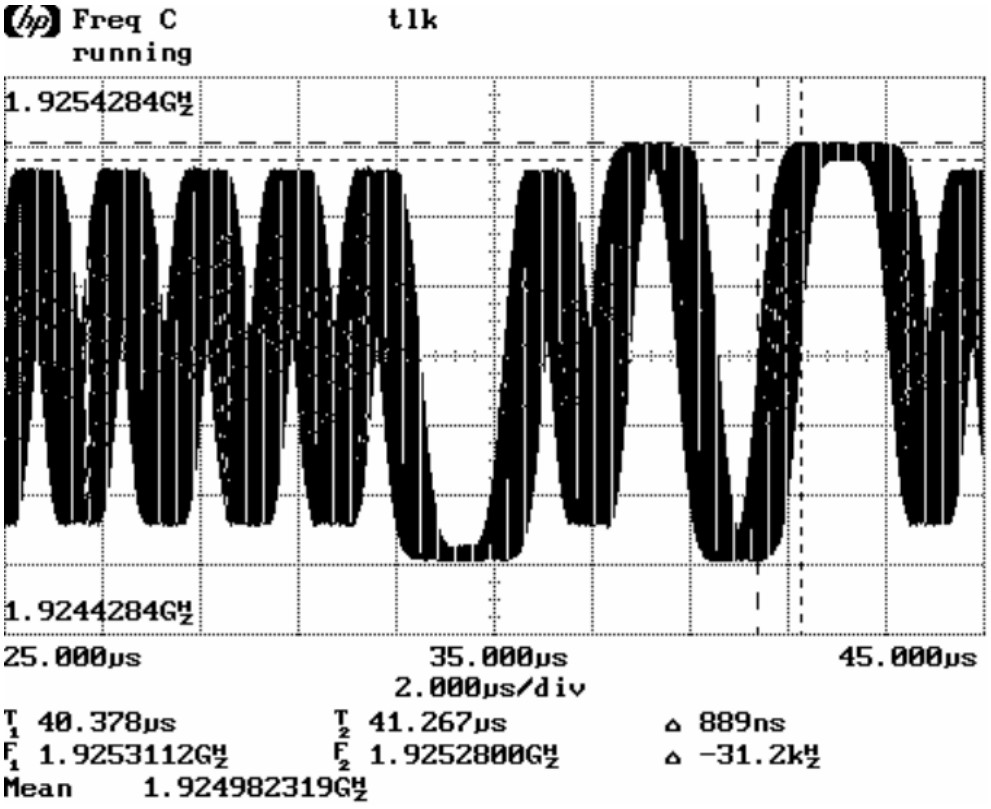
Carrier Frequency (MHz)	Frame Period (ms)	Max Jitter (µs)	3xStandard Deviation of Jitter (µs)
1924.992	10.000	0.889	0.65

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

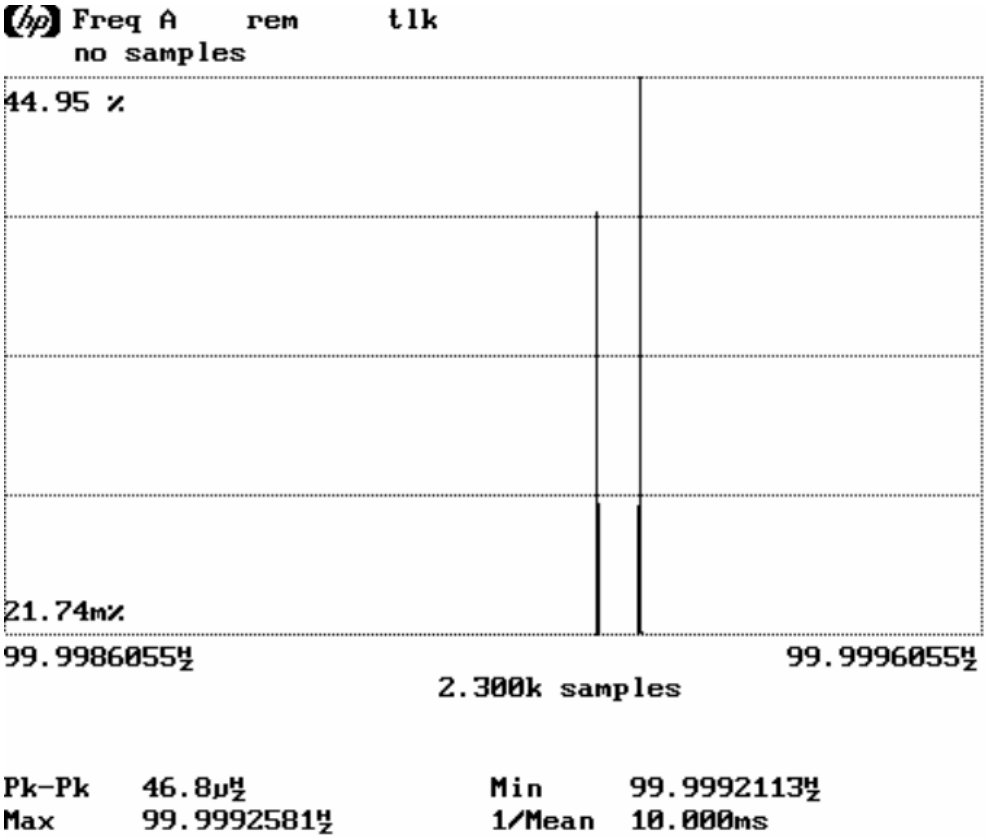
Limit:

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

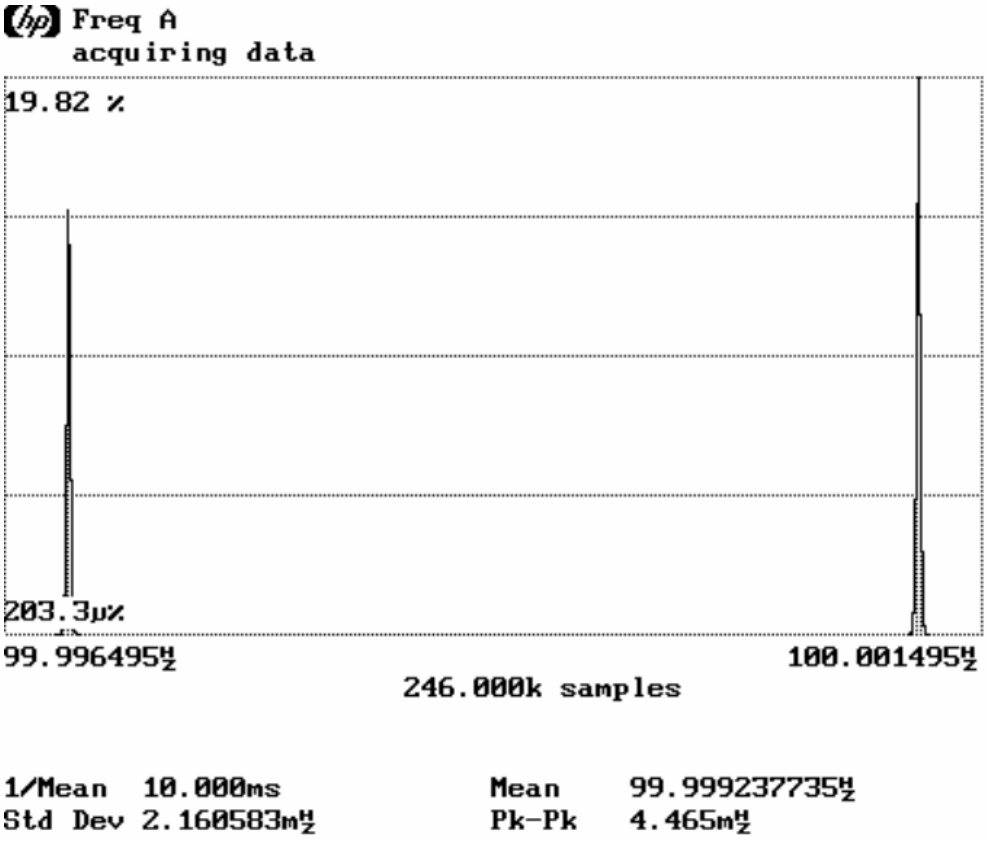
Ref. FCC 15.323(e), ANSI C63.17 clause 6.2.3



Carrier Frequency Stability, Long Term



Frame Repetition Stability



Frame Period and Jitter

4.16 Monitoring Threshold, Least Interfered Channel

Monitoring Threshold Limits:

Lower Threshold:

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

Upper Threshold:

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

B is measured Emission Bandwidth in Hz
P is measured Transmitter Power in dBm

Calculated values:

Lower Threshold	-81.4 dBm
Upper Threshold	-61.4 dBm

The upper Threshold is applicable for systems which have defined a minimum of 40 duplex system access channels.

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.

Least Interfered Channel	
Lower Threshold	N.A.
Upper Threshold	-60.4 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 **not** transmit on f_1	EUT transmits on f_2	Pass
d) Shall **not** transmit on f_2	EUT transmits on f_1	Pass

Limits:

Lower Threshold + 6 dB margin	-75.4 dBm
Upper Threshold + 6 dB margin	-55.4 dBm

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.

Test Results:

Test performed	Observation	Verdict
Simple Compliance test, at ±30% of *B*	No connection	Pass
More Detailed Test, at -6 dB points	N/A	
More Detailed Test, at -12 dB points	N/A	

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

Comment: The tested EUT uses the same receiver for monitoring and communication and the test is therefore not required, however the test has been performed nonetheless and is pass.

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 is than applied on the the carrier at pulsed level T_U+6dB or T_L+6dB , as appropriate.

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 µs and 50*SQRT(1.25/*B*)	No Connection	Pass
d) > largest of 35 µs and 35*SQRT(1.25/*B*), and with interference level raised 6 dB	No Connection	Pass

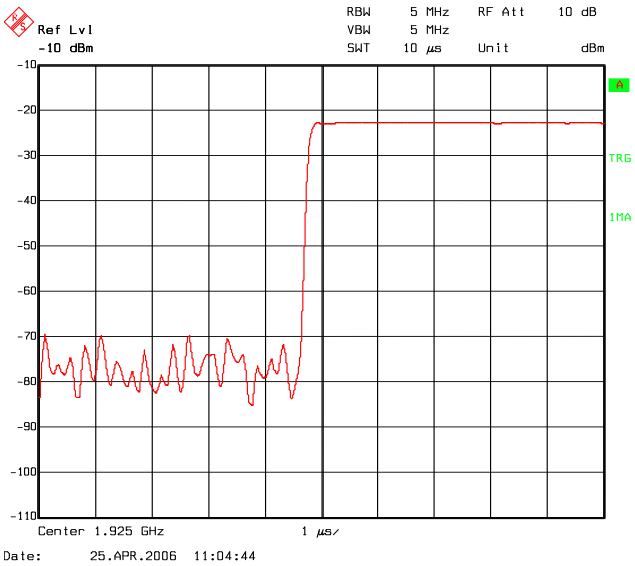
Comment: The test was performed with pulse lengths of 50 µs and 35 µs. It was not possible to establish a connection during this test.

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

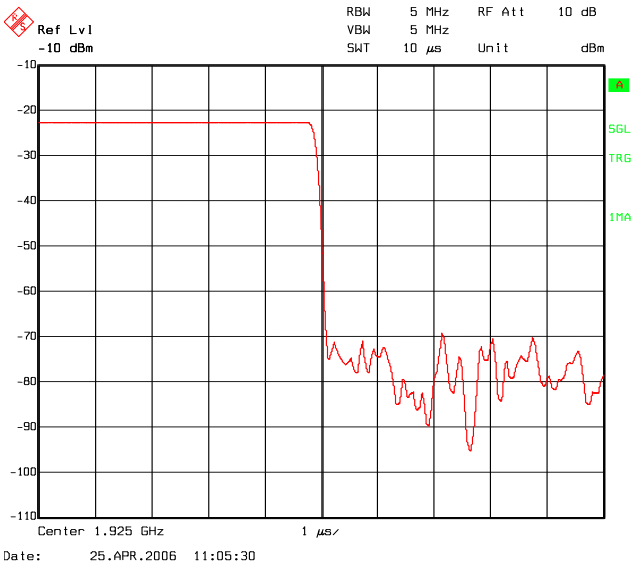
The maximum reaction time must be less than 50xSQRT (1.25/emission bandwidth in MHz) microseconds for signals at the applicable threshold level but shall not be required to be less than 50 microseconds.

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

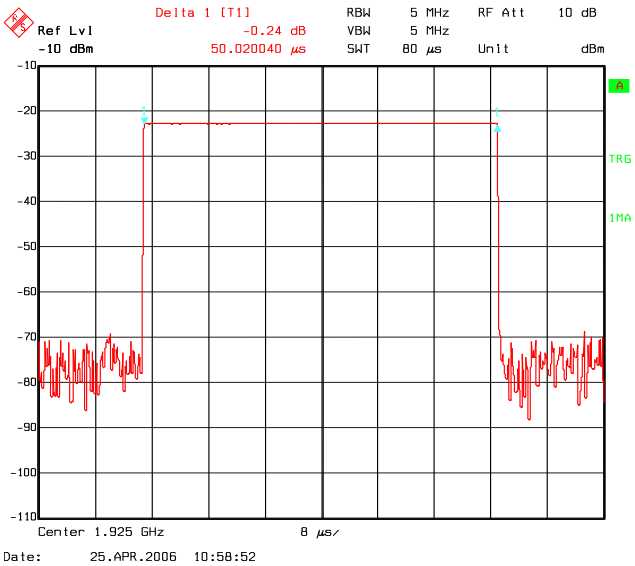
50 µs Pulses



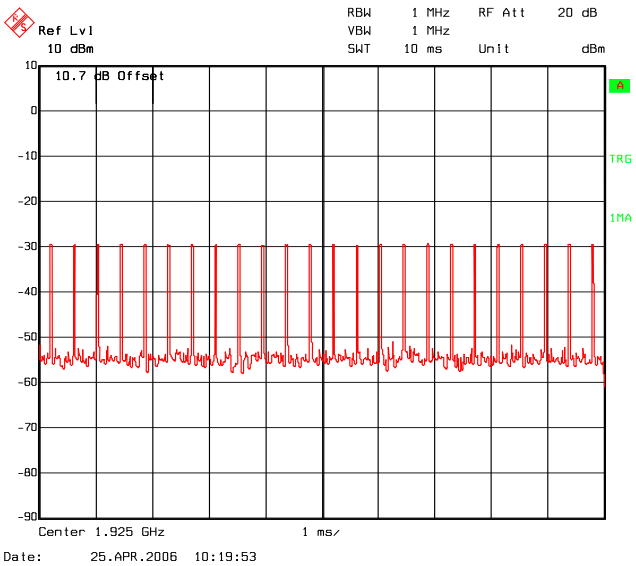
Rise time



Fall time

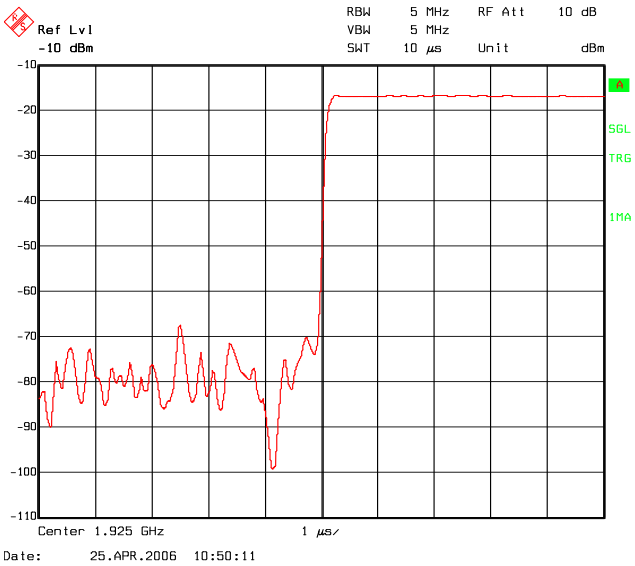


Pulse length

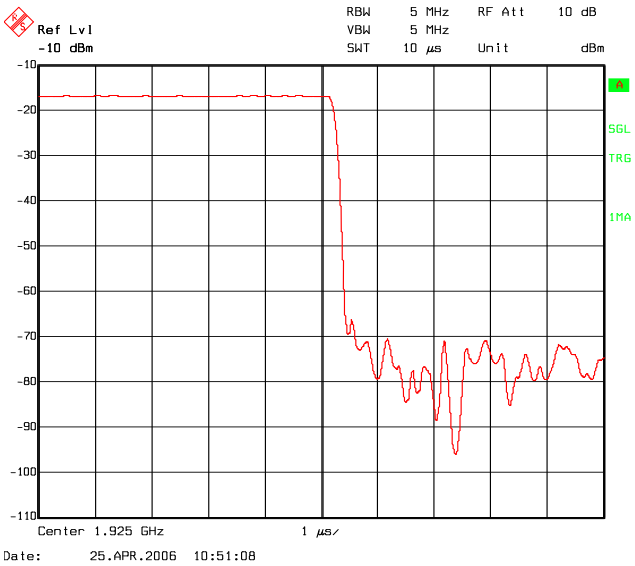


Pulses synced with DECT-Frame

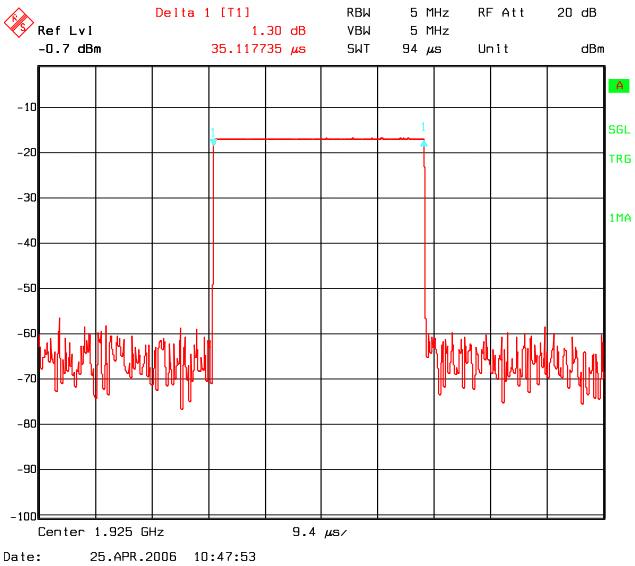
35 µs Pulses



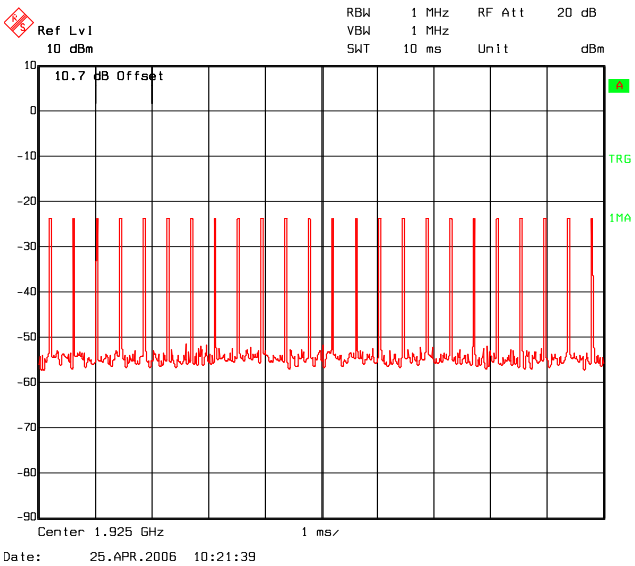
Rise time



Fall time



Pulse length



Pulses synced with DECT-Frame

4.19 Time and Spectrum Window Access Procedure

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

Measurement Procedure:

Timing for EUTs using control and signalling 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	N/A	N/A

If FCC 15.323(c)(6) option, **If Random Waiting Interval 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	N/A	N/A

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: This test is not applicable since the tested EUT is a DECT handset that does not transmit unacknowledged control or signalling information.

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 signalling 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

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

Test Results:

Acknowledgements

Test ref. to ANSI C63.17 clause 8.2.1	Observation	Verdict
a) Initial transmission without acknowledgements	541 ms	Pass
c) transmission time without acknowledgements	5.0 s	Pass

Transmission Duration

Test ref. to ANSI C63.17 clause 8.2.2	Observation	Verdict
b) Transmission duration on same time and frequency window	10 min	Pass

Comment: All tests were performed with the Spectrum Analyzer time synchronized to the EUT frame and by monitoring the activity on the frame. All other frequencies were blocked by administrative commands and by applying an interferer.

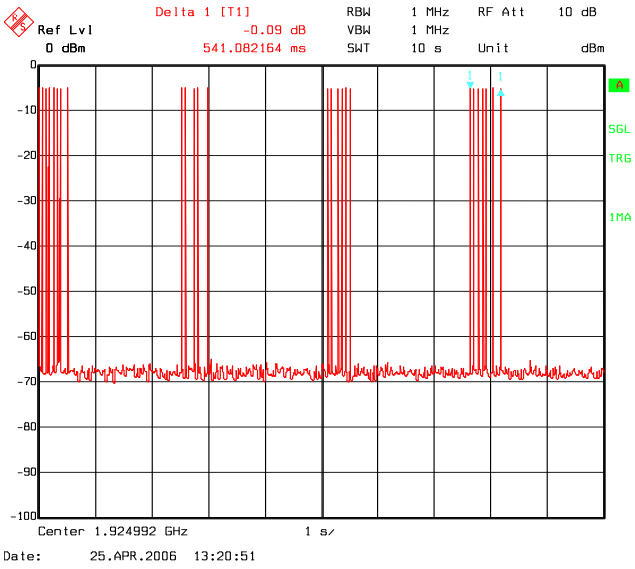
The EUT changes the transmit time window every 10 minutes, this was observed by monitoring the spectrum analyzer with a computer.

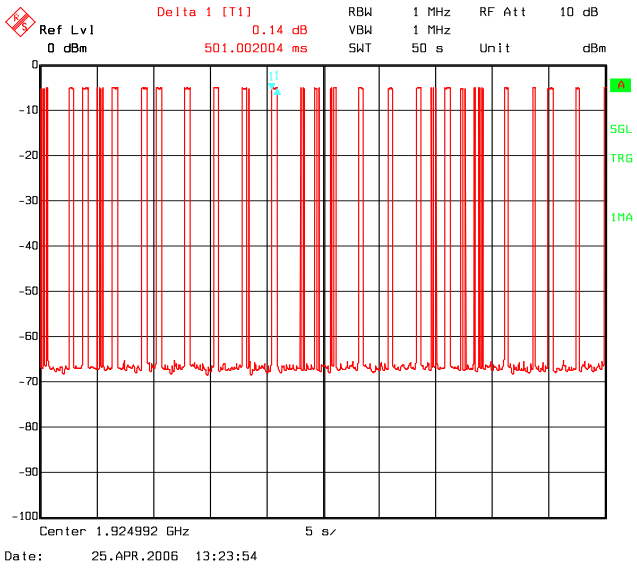
Limits, FCC 15.323(c)(3) and (4)

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.

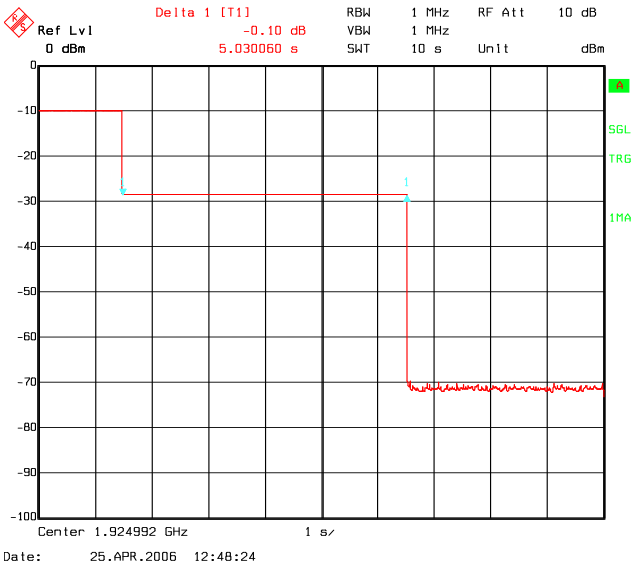
Once access to specific combined time and spectrum windows is obtained an acknowledgement from a system participant must be received by the initiating transmitter within one second or transmission must cease.

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





8.2.1 Transmission Time without Initial Acknowledgement



8.2.2 Transmission Time after losing Acknowledgements

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 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_1 for TDMA systems. The Test is Pass if EUT can transmit	EUT can transmit	Pass
c) d) Transmission on interference-free **receive** time/spectrum window	EUT transmits on interference free receive slot.	Pass
e) f) Transmission on interference-free **transmit** time/spectrum window	EUT transmits on interference free transmit slot.	Pass
g) Transmission not possible on any time/spectrum window	No connection possible	Pass

Comment: See plots.

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.

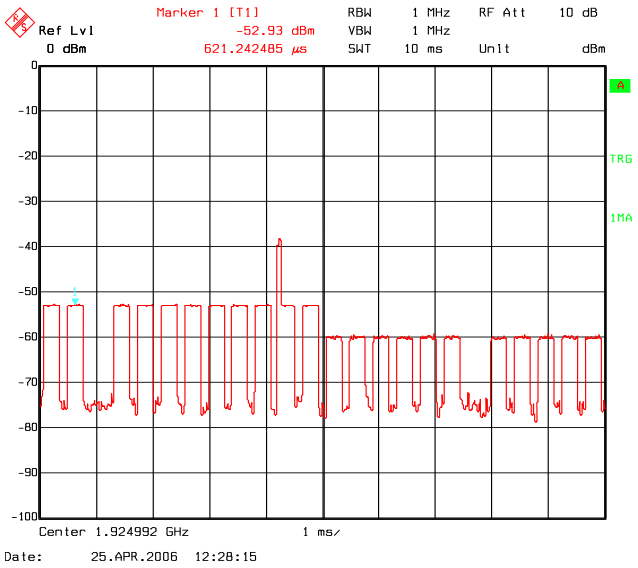
4.22 Alternative Monitoring Interval

Test procedure described in ANSI C63.17 clause 8.4.

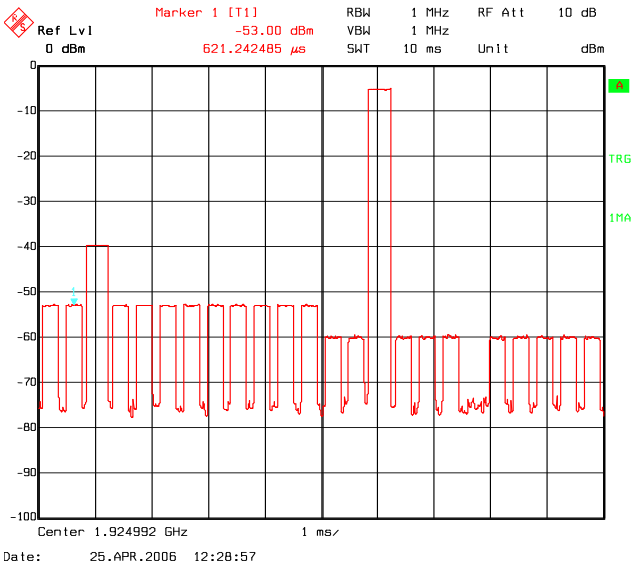
This test is required if the EUT implements the provisions of FCC 15.323(c)(11).

Test result:

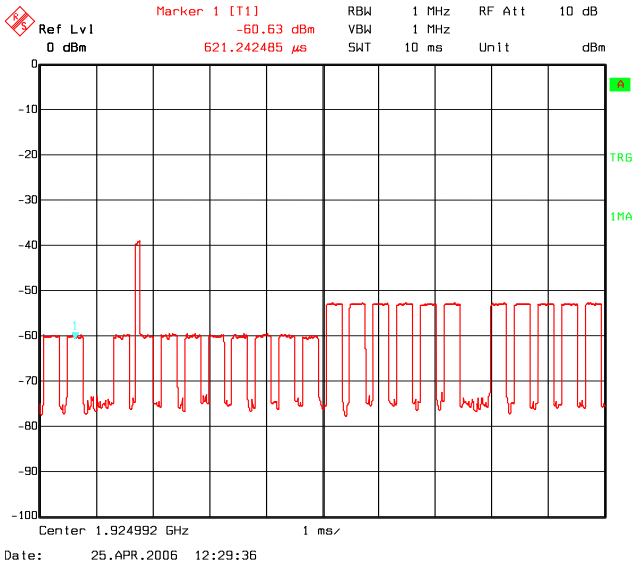
Not Tested. The tested EUT does not implement this provision. See manufacturers' declaration.



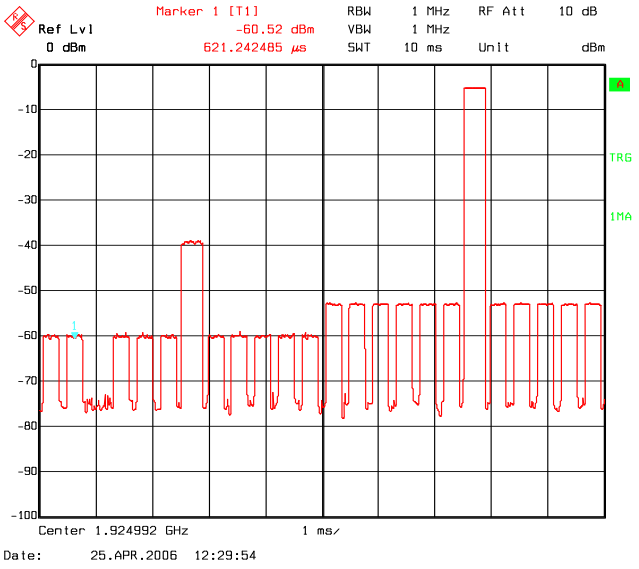
8.3.2 c) Status before Connection is made



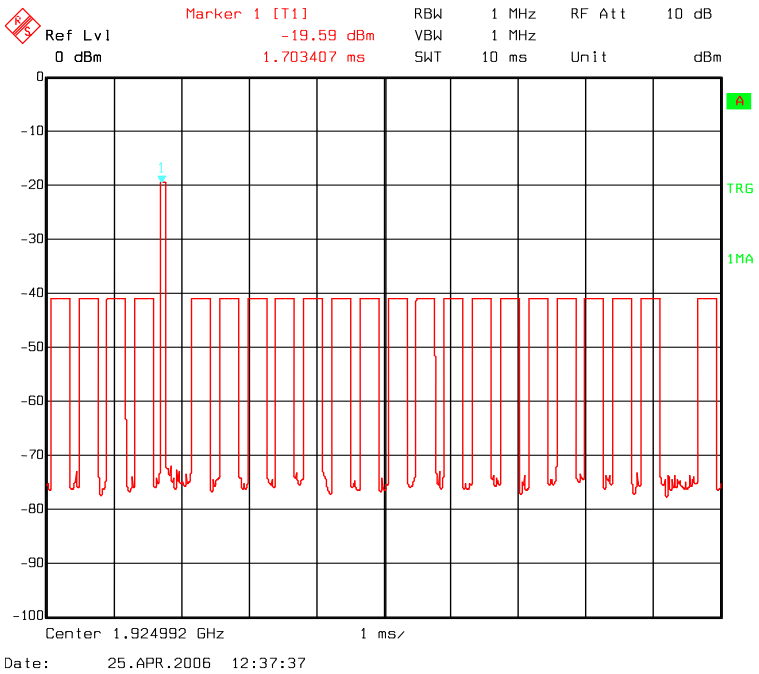
8.3.2 d) Connection on uninterfered RECEIVE slot



8.3.2 e) Status before Connection is made



8.3.2 f) Connection on uninterfered TRANSMIT slot



8.3.2 g) No connection possible

4.23 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 client declares that the tested EUT does not implement this provision.

4.24 Duty Cycle Correction Factor Calculation

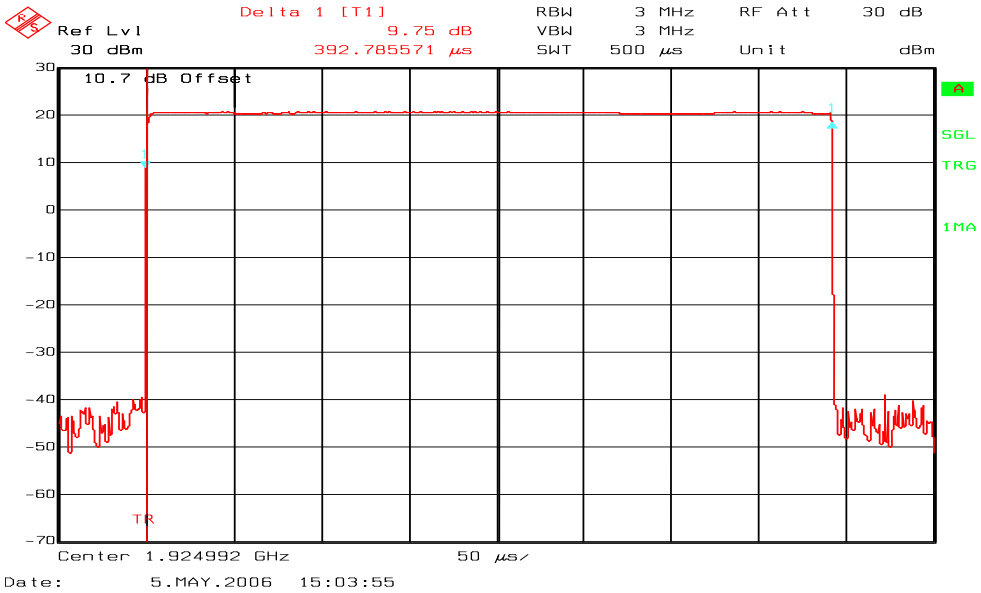
The tested EUT is a DECT handset that transmits one single burst per 10ms DECT system frame.

Frame length: 10.03ms
Slot length: 0.3928ms

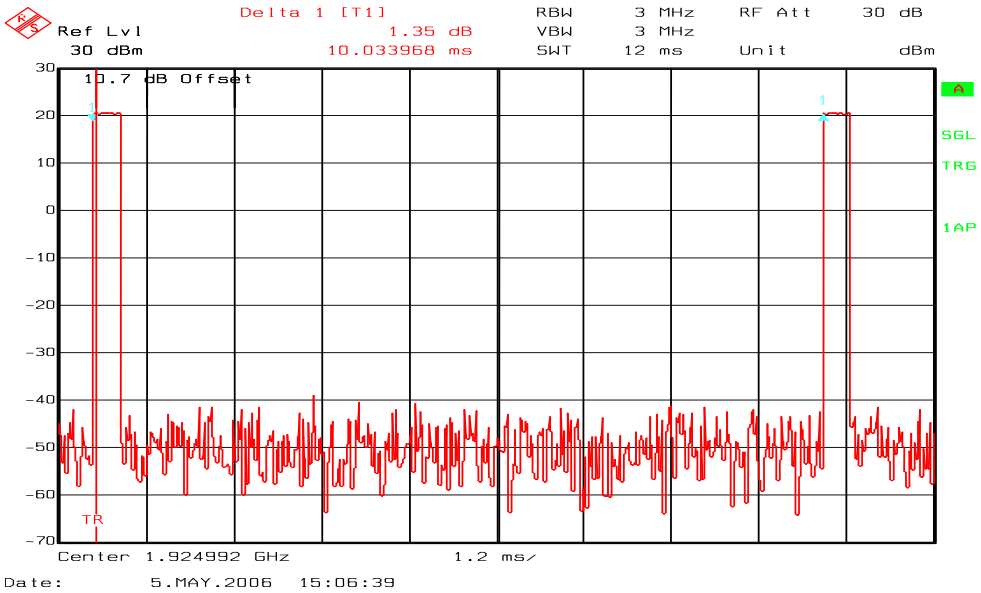
Calculation of DC Correction Factor:
-20 log (slot length / Frame length) = -20 log (0.3928/10.03) = 28.1 dB

Duty Cycle Correction Factor : 20.0 dB

Maximum allowed Duty Cycle Correction Factor is 20 dB.



Burst Length



Frame Length

4.25 Spurious Emissions (Radiated)

Measurement Procedure:

FCC 15.209

Spurious emissions were tested on 3 axis.

Test Results:

Radiated emission 10 kHz-30 MHz.

Measuring distance 10m, measured with Peak detector.

No component detected, see attached graph.

Limit is converted to 10m using 40 dB/decade according to 15.31 (f) (2).

Radiated Emissions 30 - 1000 MHz.

Detector: Quasi-Peak

Measuring distance 3m.

Transmitter active, with charger

Frequency	RF channel	Dist. corr. factor	Field strength Quasi Peak 3m	Limit	Margin
MHz		dB	dBµV/m	dBµV/m	dB
60.7	02	0	18.3	40	21.7
165.8	02	0	13.0	43.5	30.5
186.6	02	0	13.0	43.5	30.5

Radiated Emissions 1 - 20 GHz

Detector: Peak

1 - 8.5 GHz: measuring distance 3m.

8.5-20 GHz: measuring distance m.

Checked in 3 planes and on highest and lowest channel.

Transmitter active.

Frequency	RF channel	Dist. corr. factor	Field strength, Peak, 3 meters	Duty cycle corr. factor	Limit	Margin
MHz	00 / 04	dB	dBµV/m	dB	dBµV/m	dB
3857.6	00	0	64.1	20	74	9.9
5784.1	00	0	62.0	20	74	12.0
7715.2	00	0	70.4	20	74	3.6
9640.4	00	10.5	67.9	20	74	6.1
11568	00	10.5	59.0	20	74	15.0
13496	00	10.5	59.7	20	74	14.3
15430	00	10.5	61.7	20	74	12.3
17353	00	10.5	59.7	20	74	14.3
19212	04	10.5	61.7	20	74	12.3

The values with average detector is 20 dB lower than in the above table, the margin of compliance is the same since the limit is also 20 dB lower.

NEMKO COMLAB

04. May 06 10:09

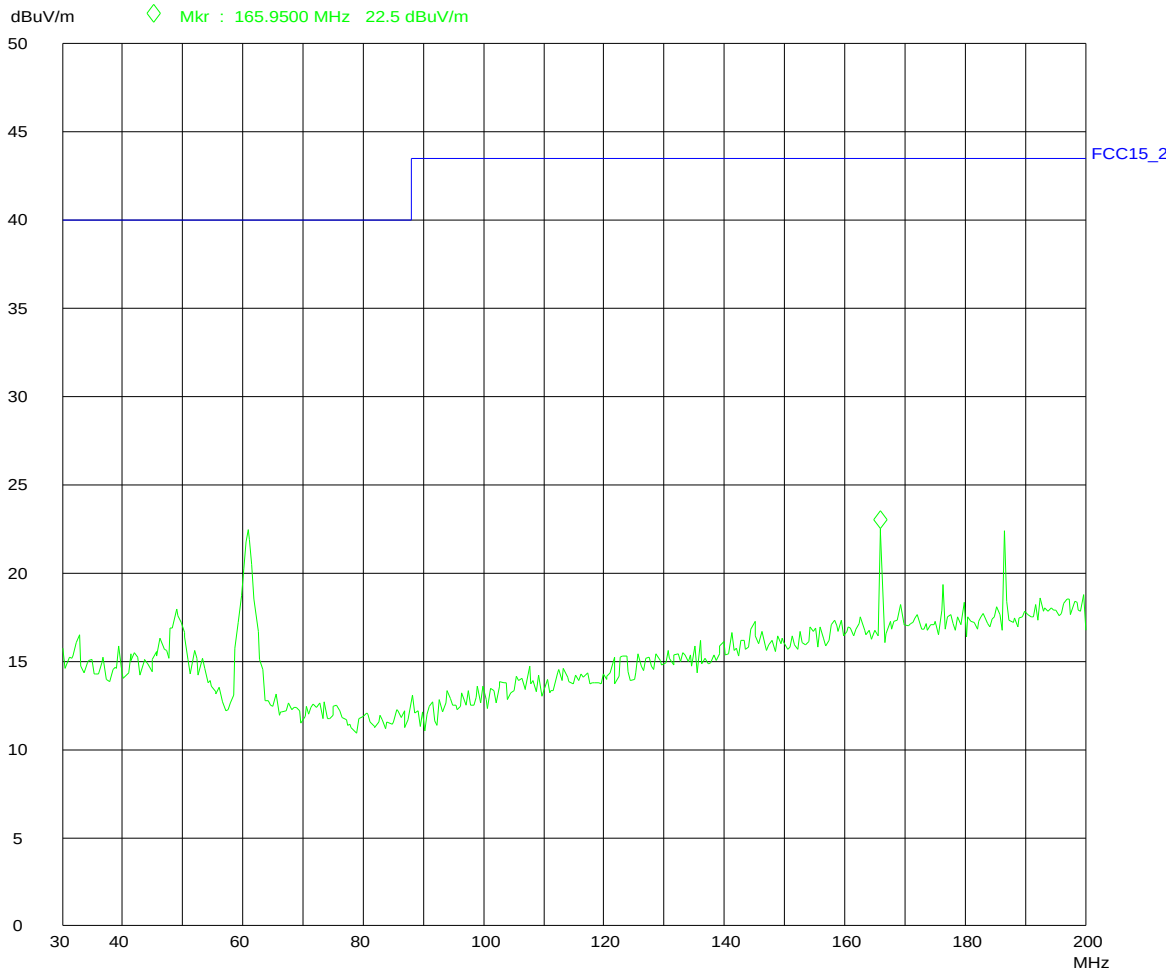
Peak

Operator: FS
Comment: RTX Telecom, Sally Project
FCC 15.209, 3m. h=1m VP
FCC 15D, UPCS Handset
Transmitter Active, In charger

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
30M	200M	50k	120k	PK	50ms	AUTO	LN ON	60dB

Transducer No.	Start	Stop	Name
20	30M	200M	HK116



Radiated Emissions 30 MHz – 200 MHz, Vertical Polarization

NEMKO COMLAB

04. May 06 10:25

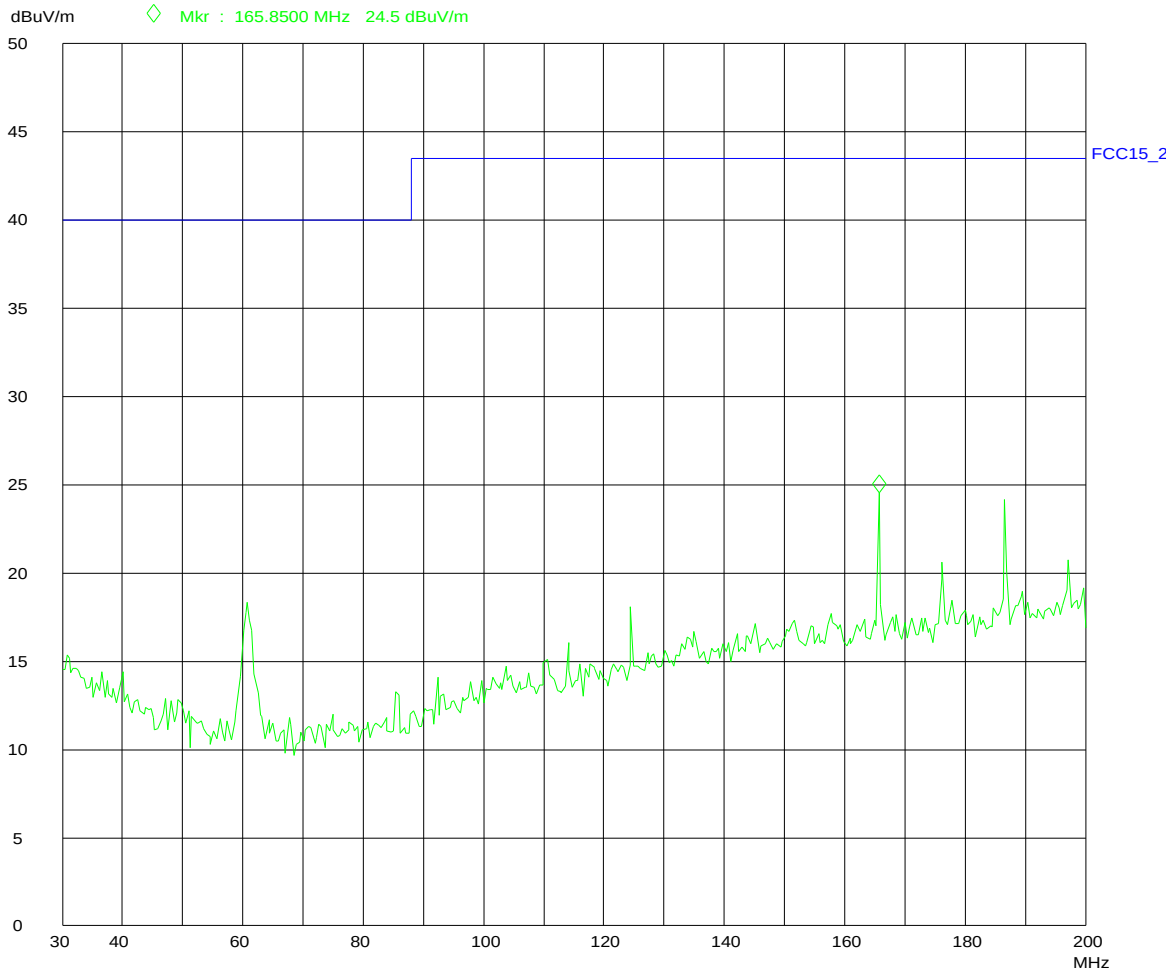
Peak

Operator: FS
Comment: RTX Telecom, Sally Project
FCC 15.209, 3m. h=2m HP
FCC 15D, UPCS Handset
Transmitter Active, In charger

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
30M	200M	50k	120k	PK	50ms	AUTO	LN ON	60dB

Transducer No.	Start	Stop	Name
20	30M	200M	HK116



Radiated Emissions 30 MHz – 200 MHz, Horizontal Polarization

NEMKO COMLAB

04. May 06 10:43

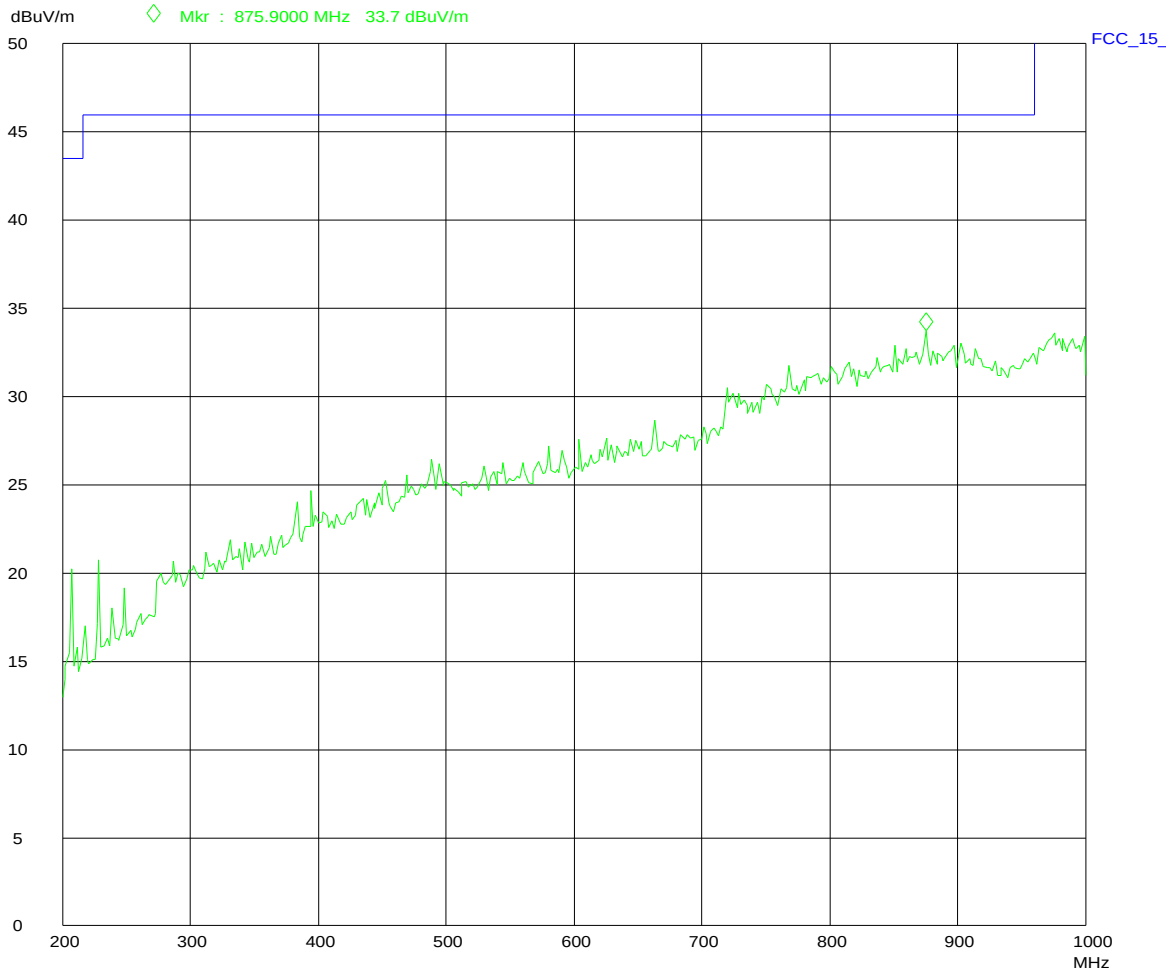
Peak

Operator: FS
Comment: RTX Telecom, Sally Project
FCC 15.209, 3m. h=1m VP
FCC 15D, UPCS Handset
Transmitter Active, In charger

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
200M	1000M	50k	120k	PK	20ms	AUTO	LN ON	60dB

Transducer No.	Start	Stop	Name
21	200M	1000M	HL223



Radiated Emissions 200 MHz – 1000 MHz, Vertical Polarization

NEMKO COMLAB

04. May 06 10:56

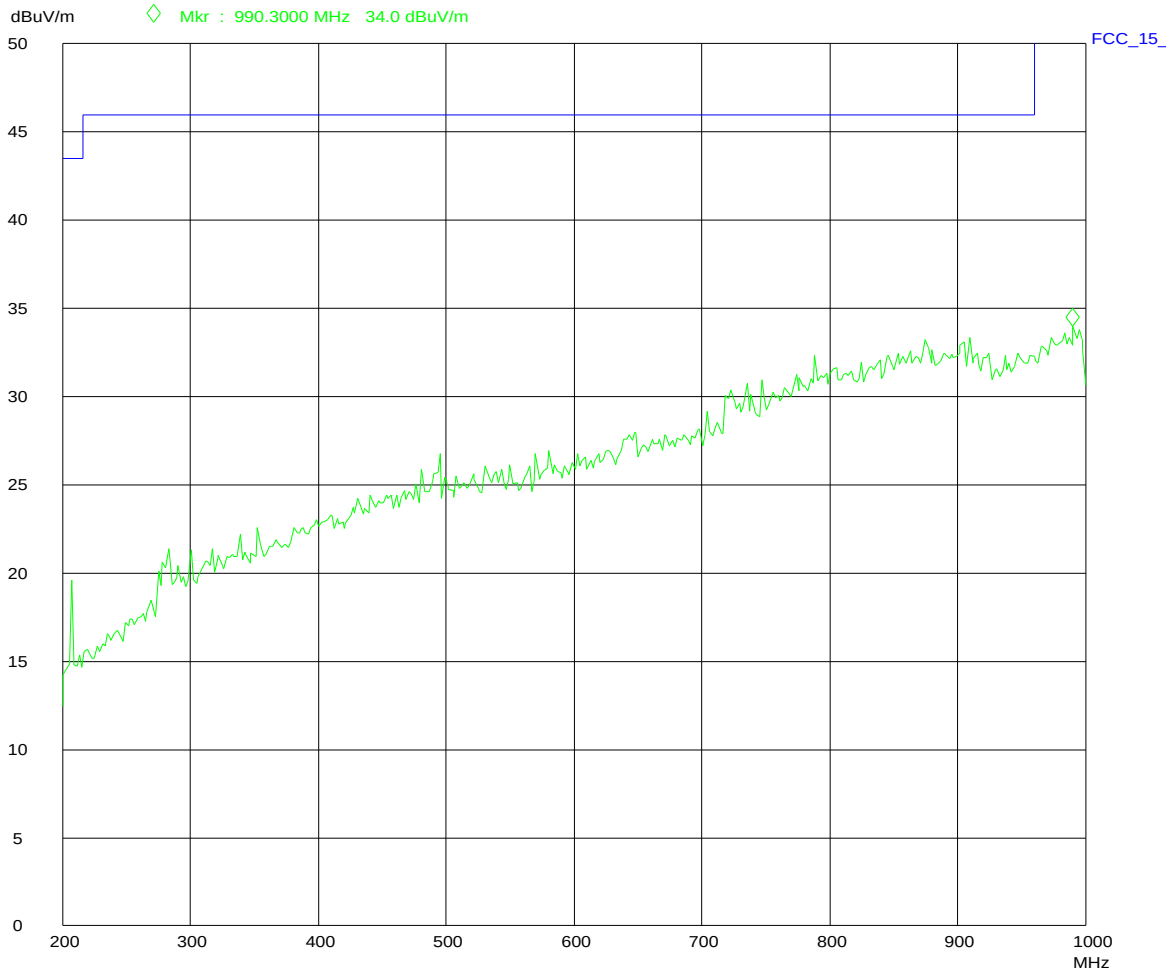
Peak

Operator: FS
Comment: RTX Telecom, Sally Project
FCC 15.209, 3m. h=2m HP
FCC 15D, UPCS Handset
Transmitter Active, In charger

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
200M	1000M	50k	120k	PK	20ms	AUTO	LN ON	60dB

Transducer No.	Start	Stop	Name
21	200M	1000M	HL223



Radiated Emissions 200 MHz – 1000 MHz, Horizontal Polarization

NEMKO COMLAB

04. May 06 12:24

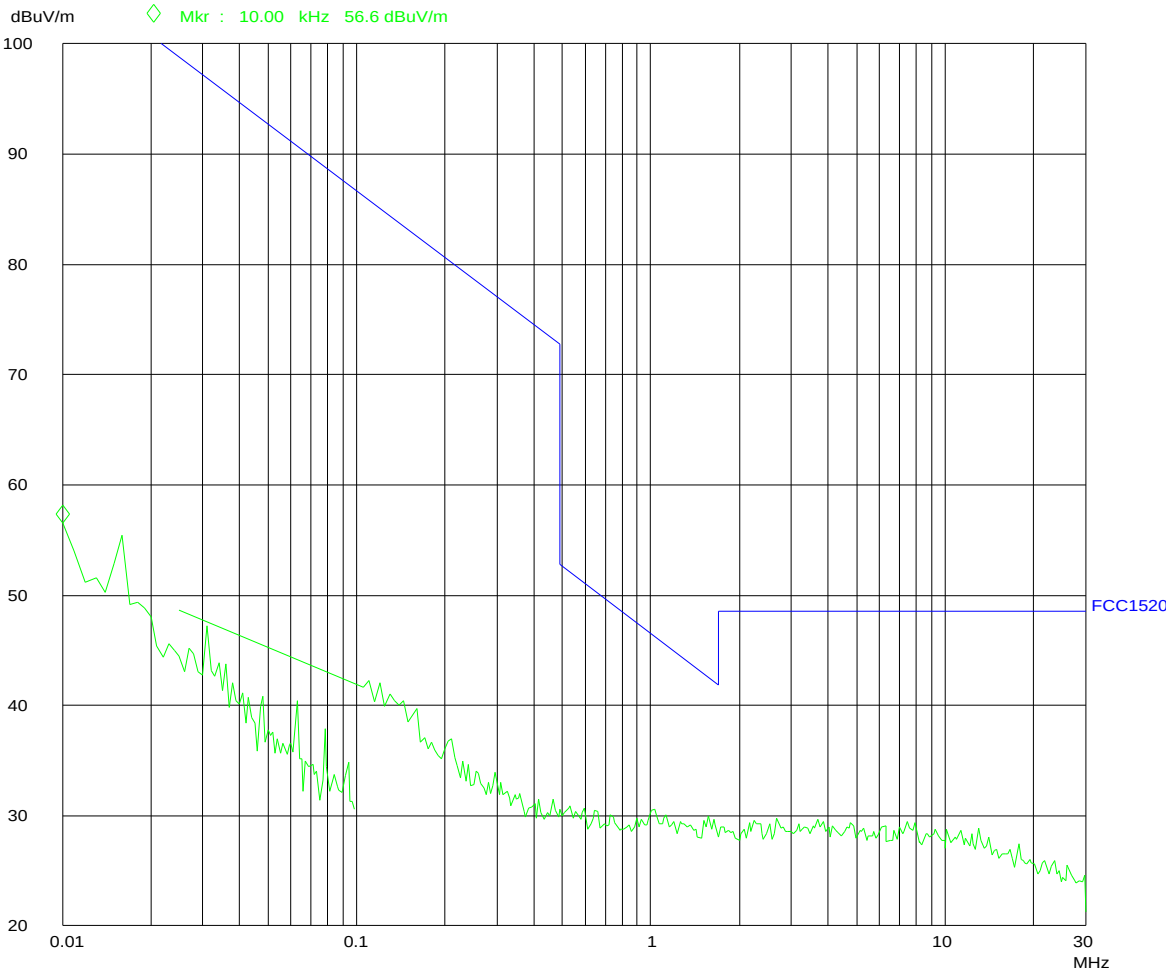
Peak

Operator: FS
Comment: RTX Telecom, Sally Project
FCC 15.209, 10m
FCC 15D, UPCS Handset
TX On, In charger

Scan Settings (4 Ranges)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
10k	100k	1k	1k	PK	20ms	0dB	LN OFF	60dB
20k	20k	5k	9k	PK	20ms	AUTO	LN ON	60dB
20k	10M	5k	9k	PK	20ms	AUTO	LN OFF	60dB
10M	30M	5k	9k	PK	20ms	AUTO	LN OFF	60dB

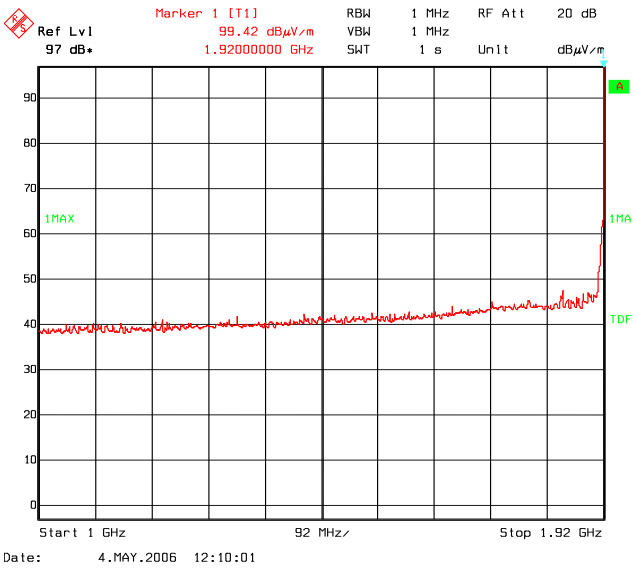
Transducer No.	Start	Stop	Name
13	10k	30M	HFH2Z2



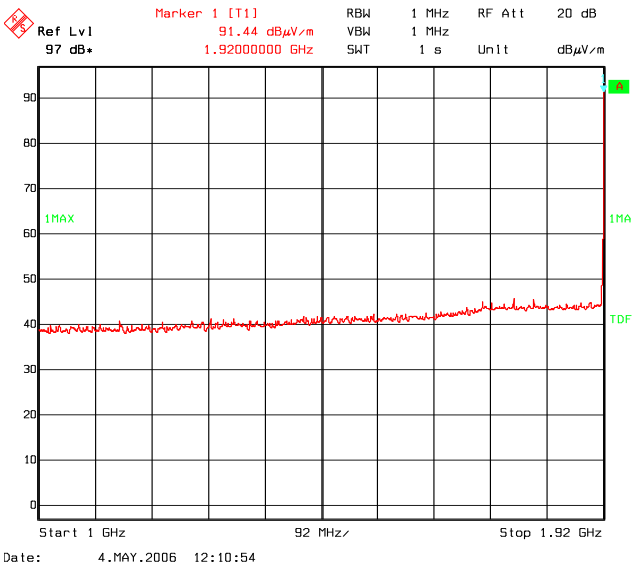
Radiated Emissions 10 kHz – 30 MHz

Radiated Emissions

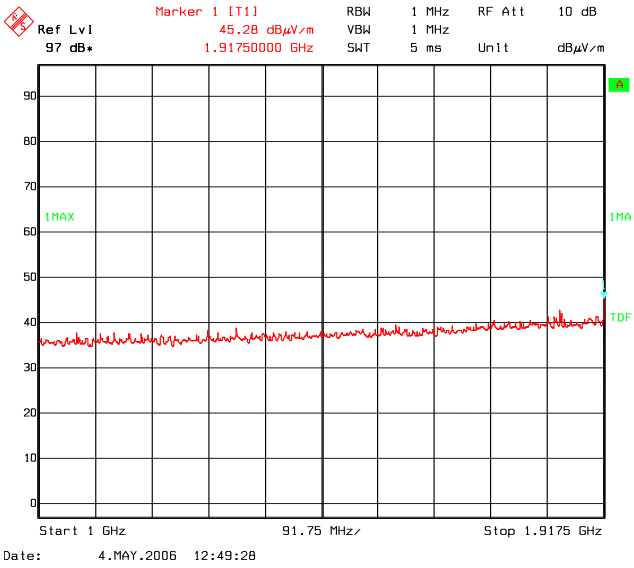
1.0 - 1.9 GHz:



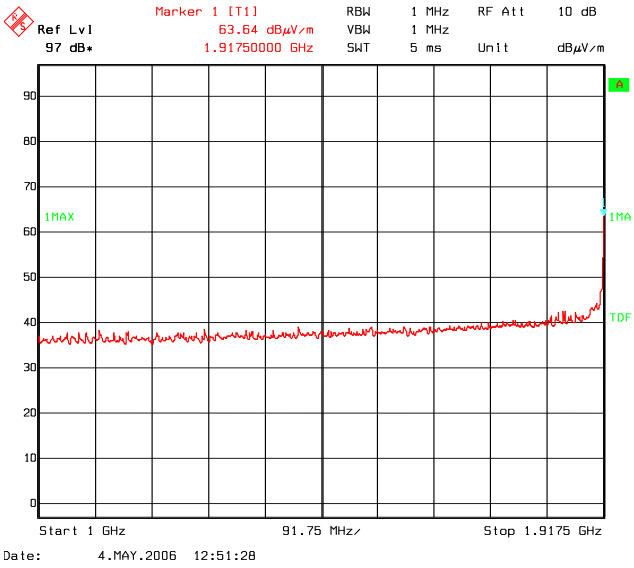
VP, EUT Vertical



HP, EUT Vertical



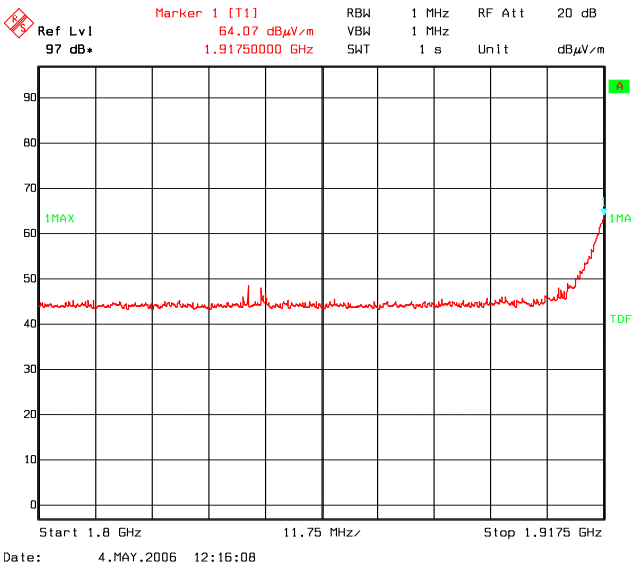
VP, EUT Horizontal



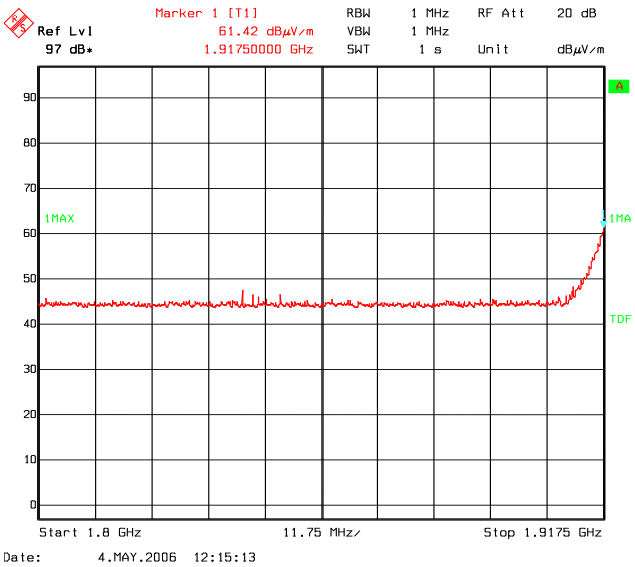
HP, EUT Horizontal

Radiated Emissions

1.8 - 1.9175 GHz

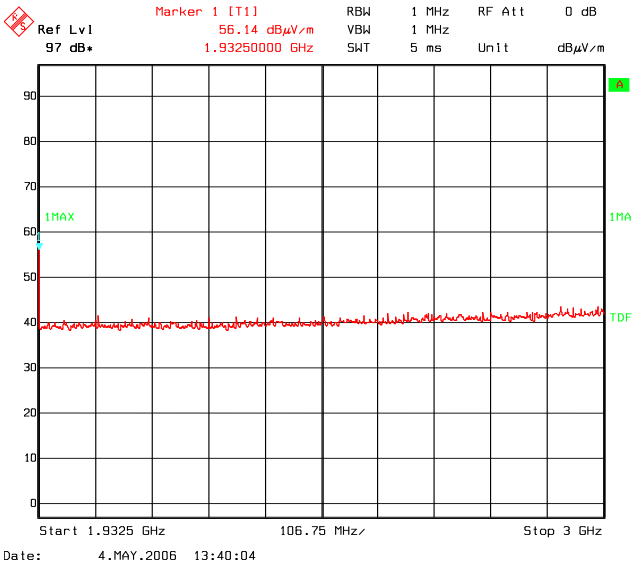


VP, EUT Vertical

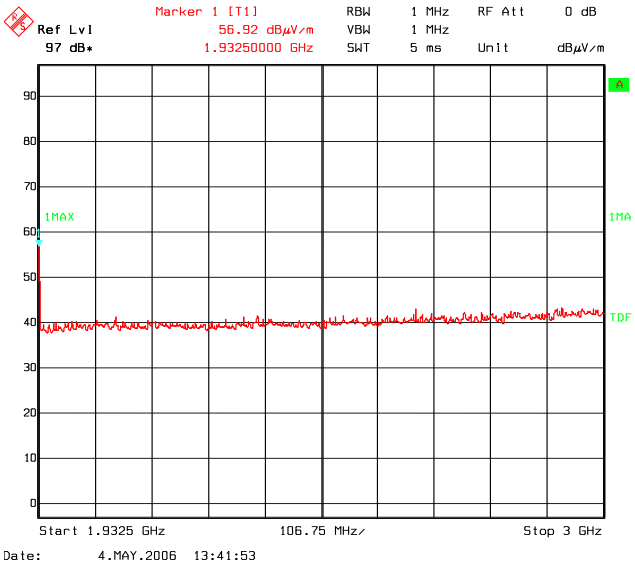


HP, EUT Vertical

1.9325 - 3 GHz:



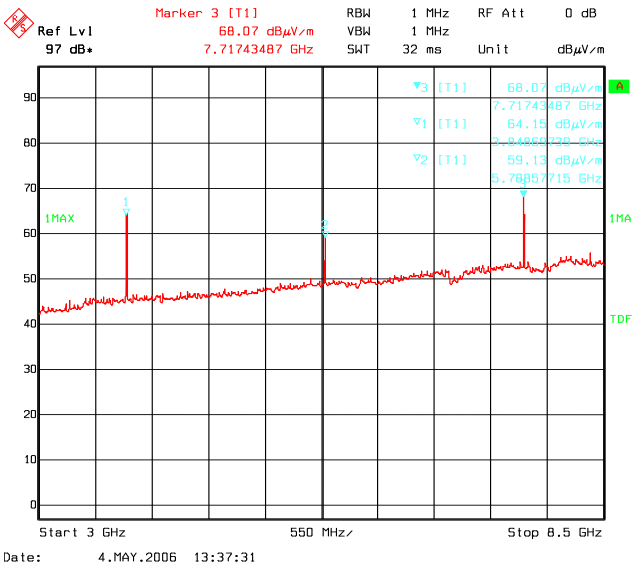
VP, EUT Vertical



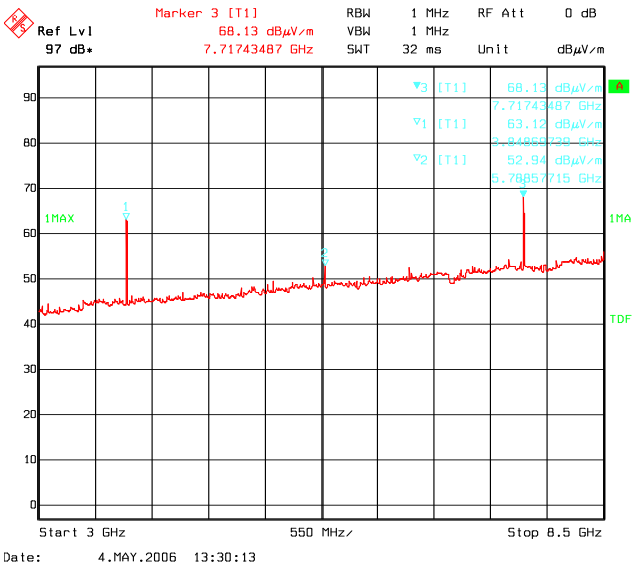
HP, EUT Vertical

Radiated Emissions

3.0 - 8.5 GHz:



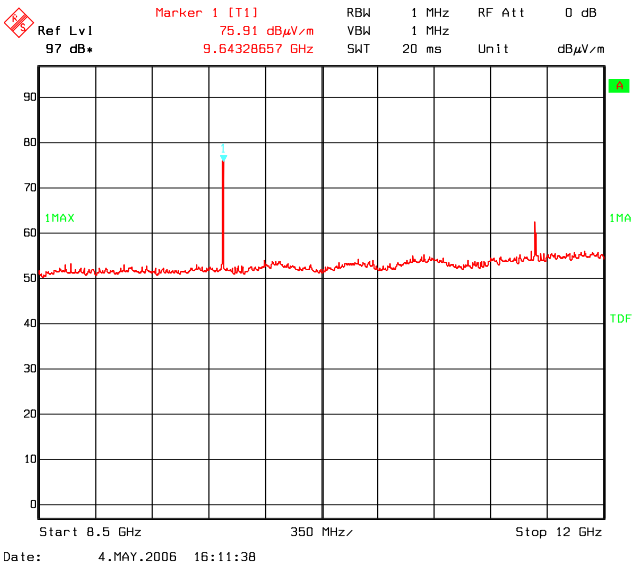
VP, EUT Vertical



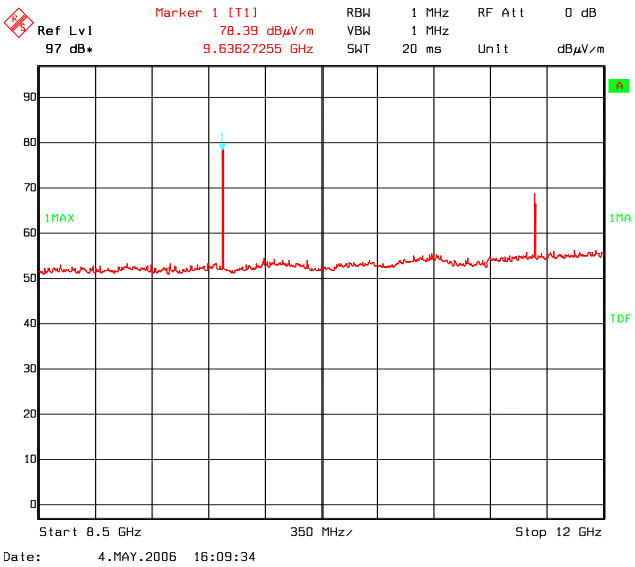
HP, EUT Vertical

8.5 - 12 GHz, @1m

(distance correction not included in transducer factor)



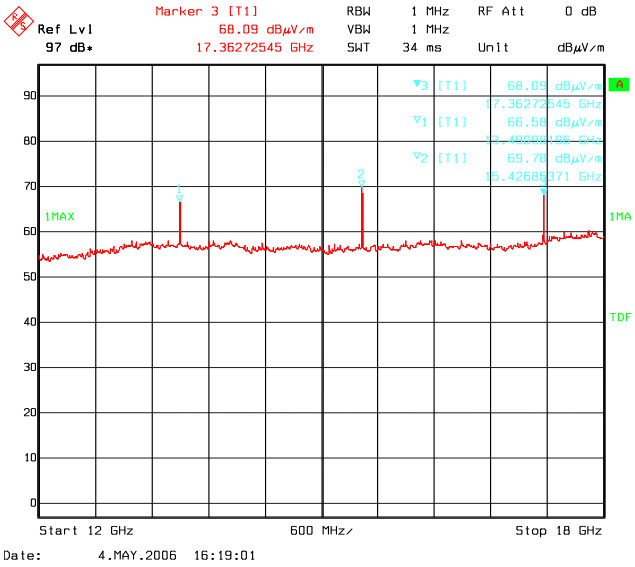
VP, EUT Vertical



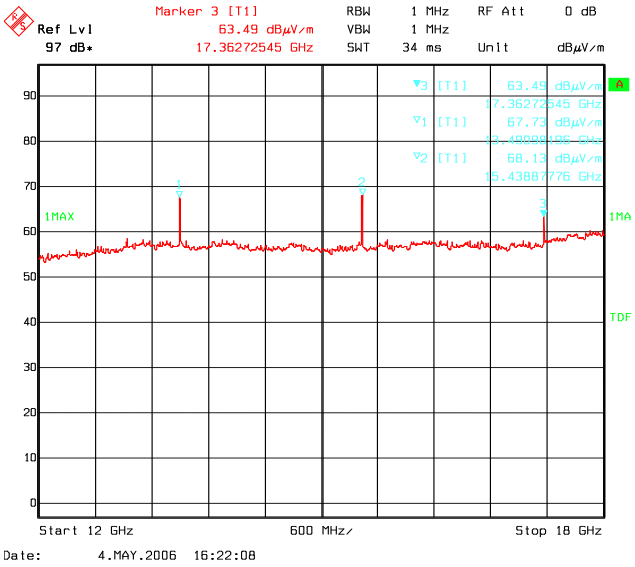
HP, EUT Vertical

Radiated Emissions

12 - 18 GHz, @1m
(distance correction not included in transducer factor)

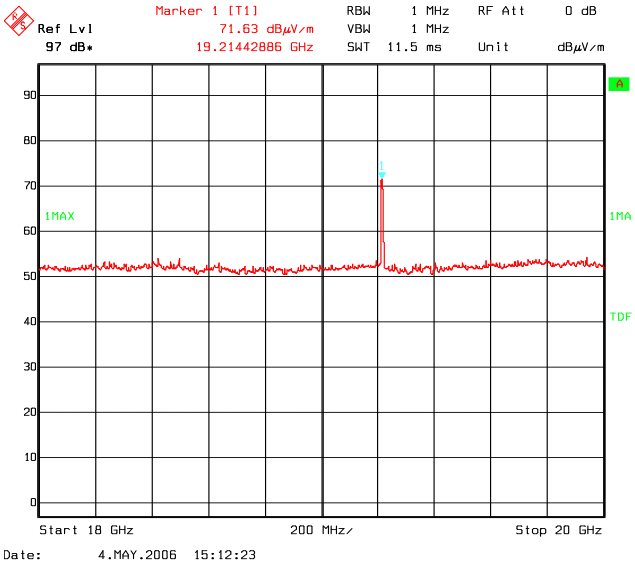


VP, EUT Vertical

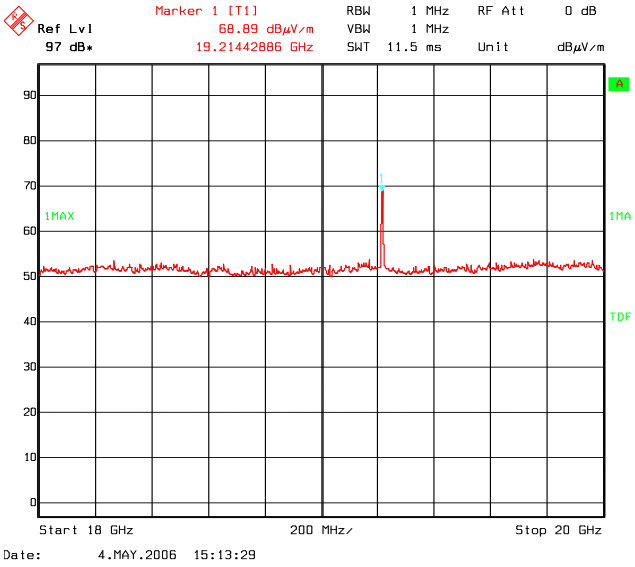


HP, EUT Vertical

18 - 20 GHz, @1m
(distance correction not included in transducer factor)



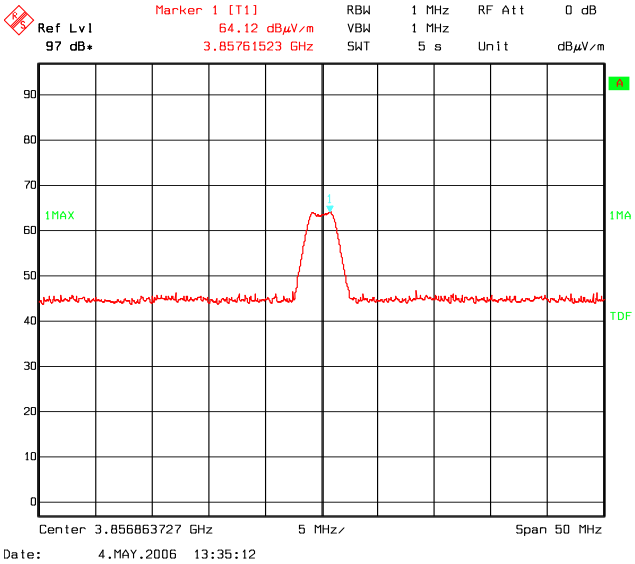
VP, EUT Vertical



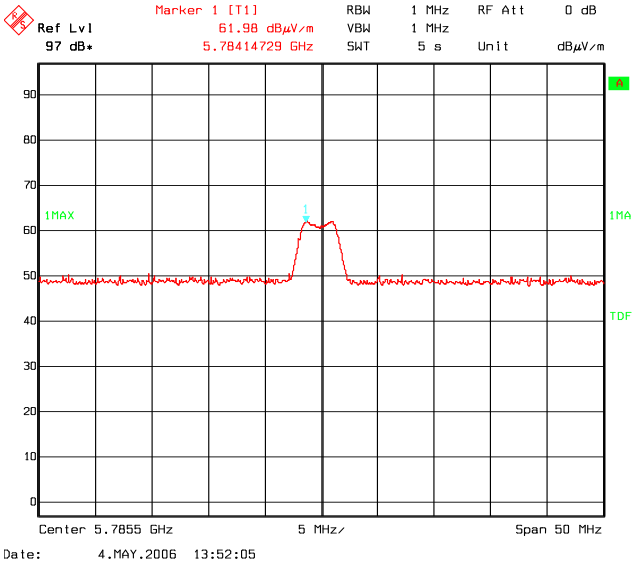
VP, EUT Horizontal

Radiated Emissions

2nd Harmonic

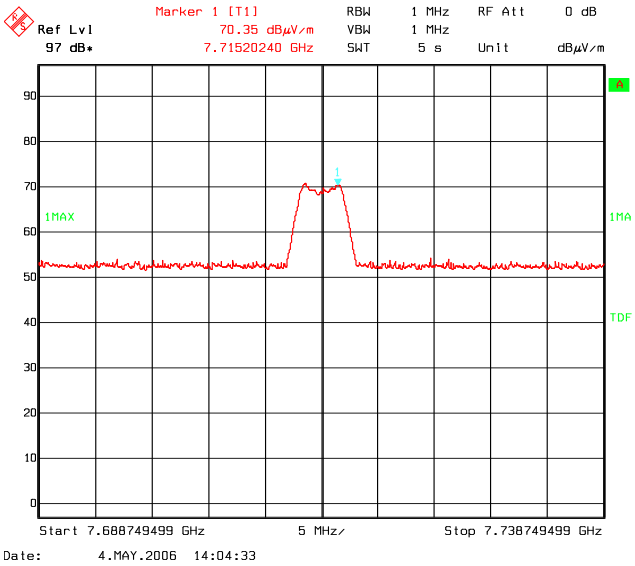


3rd Harmonic



Maximum

4th Harmonic

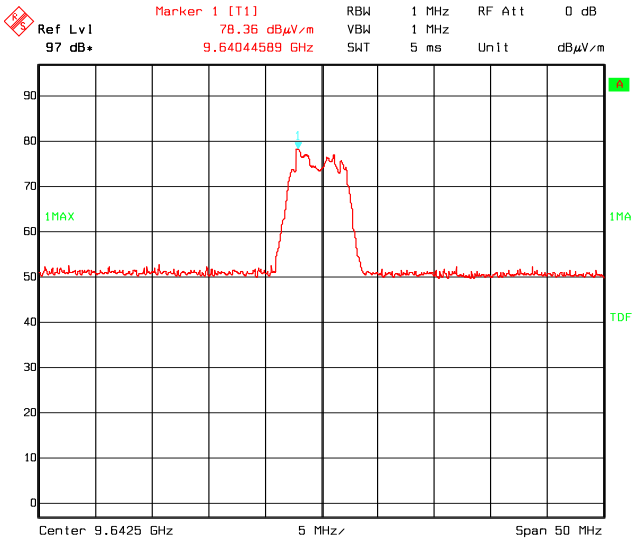


Maximum

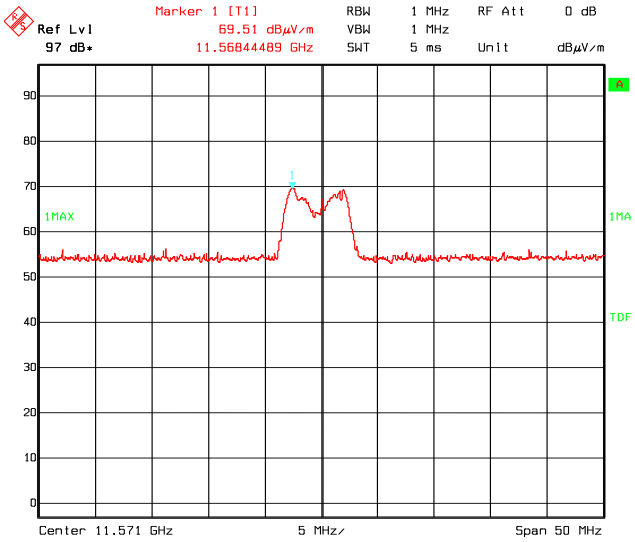
Radiated Emissions, @1m

(distance correction not included in transducer factor)

5th Harmonic

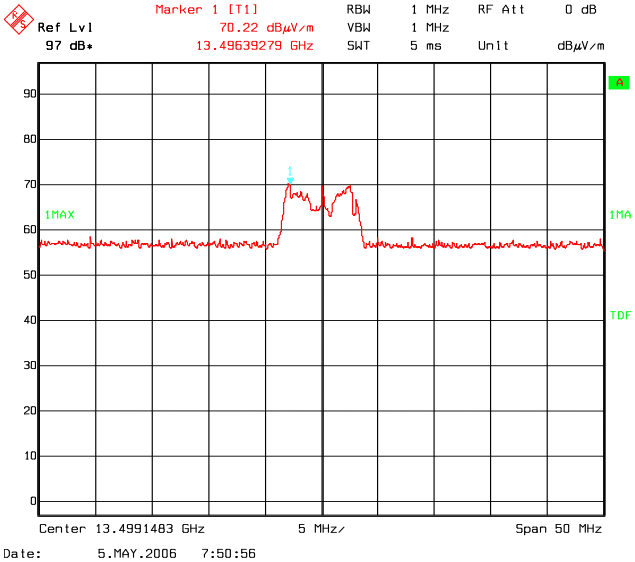


6th Harmonic

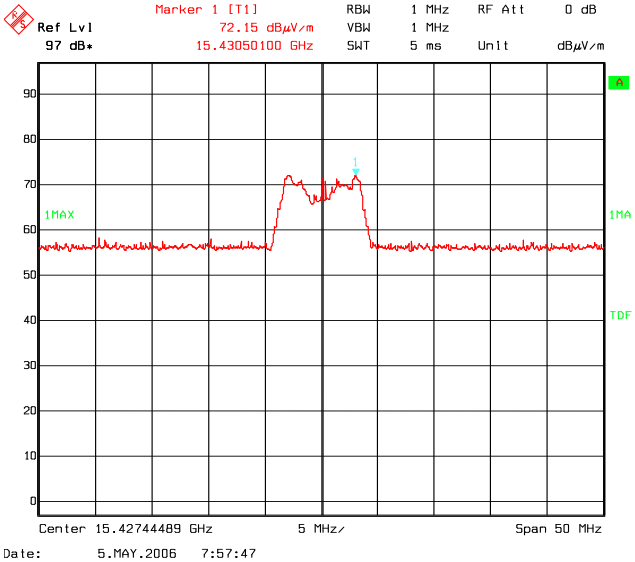


Maximum

7th Harmonic



8th Harmonic

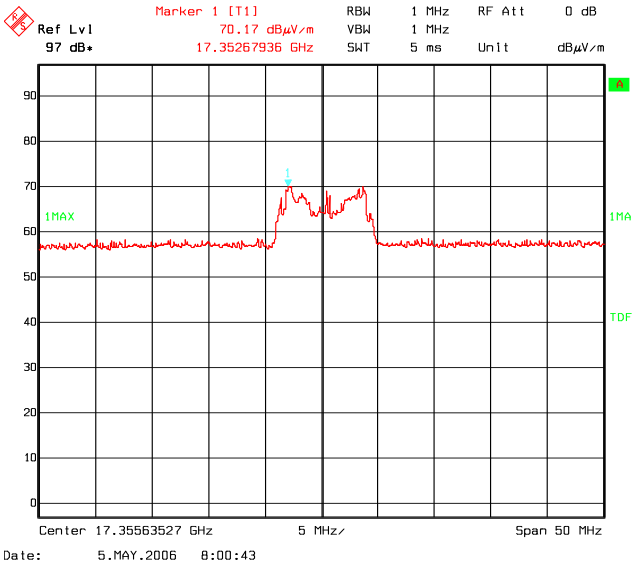


Maximum

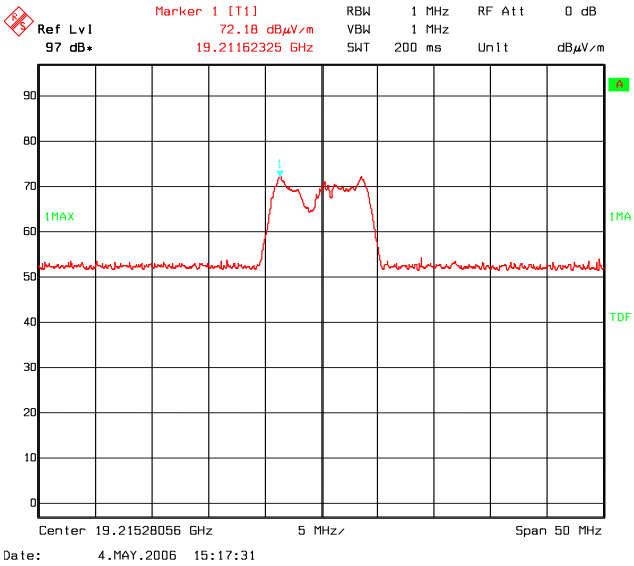
Radiated Emissions, @1m

(distance correction not included in transducer factor)

9th Harmonic



10th Harmonic



Maximum

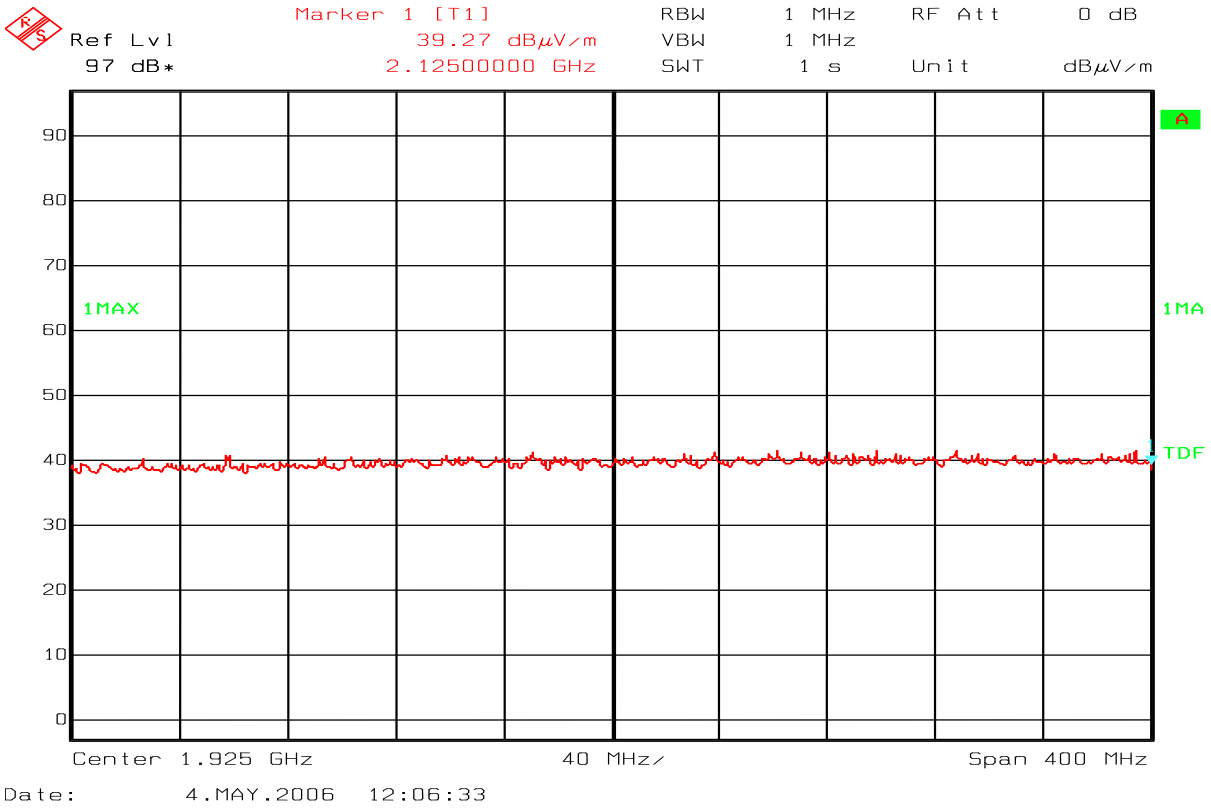
4.26 Receiver Spurious Emissions

Measurement Procedure:

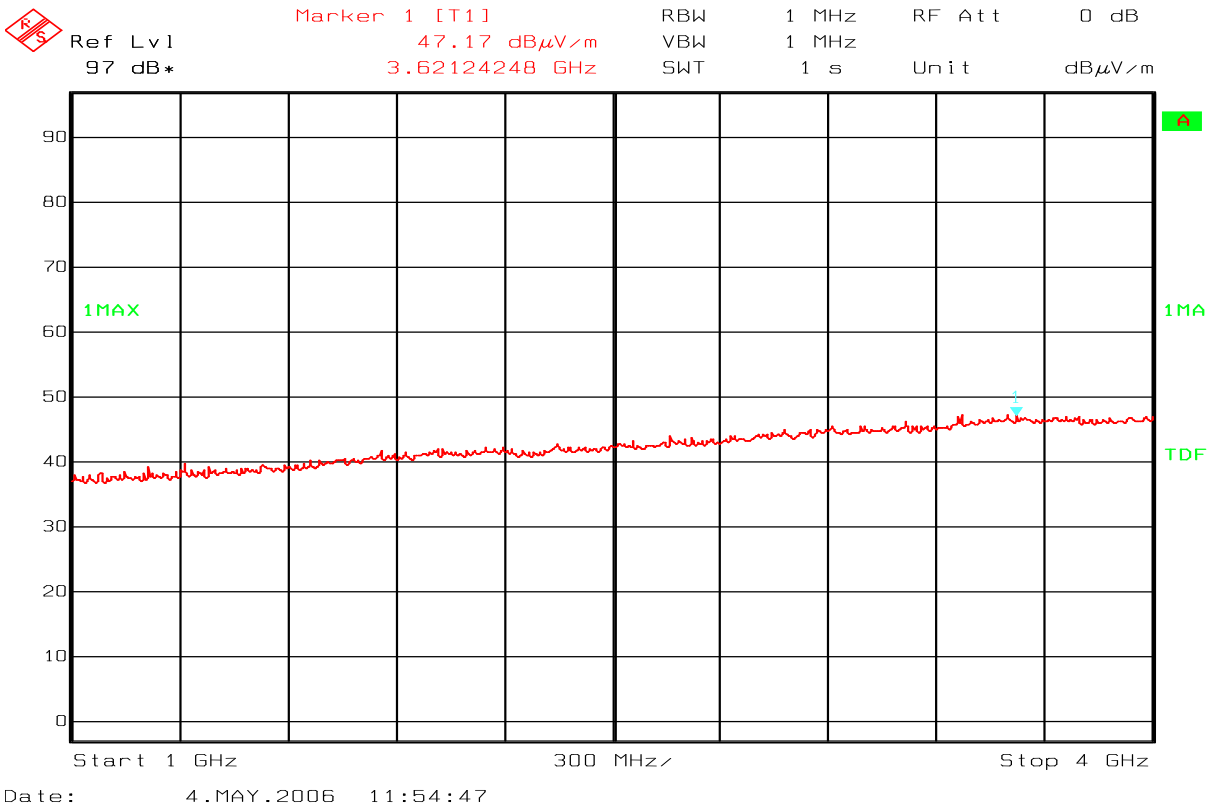
Industry Canada RSS-213 paragraph 6.8 and RSS-GEN paragraphs 4.8 and 6.

Test results:

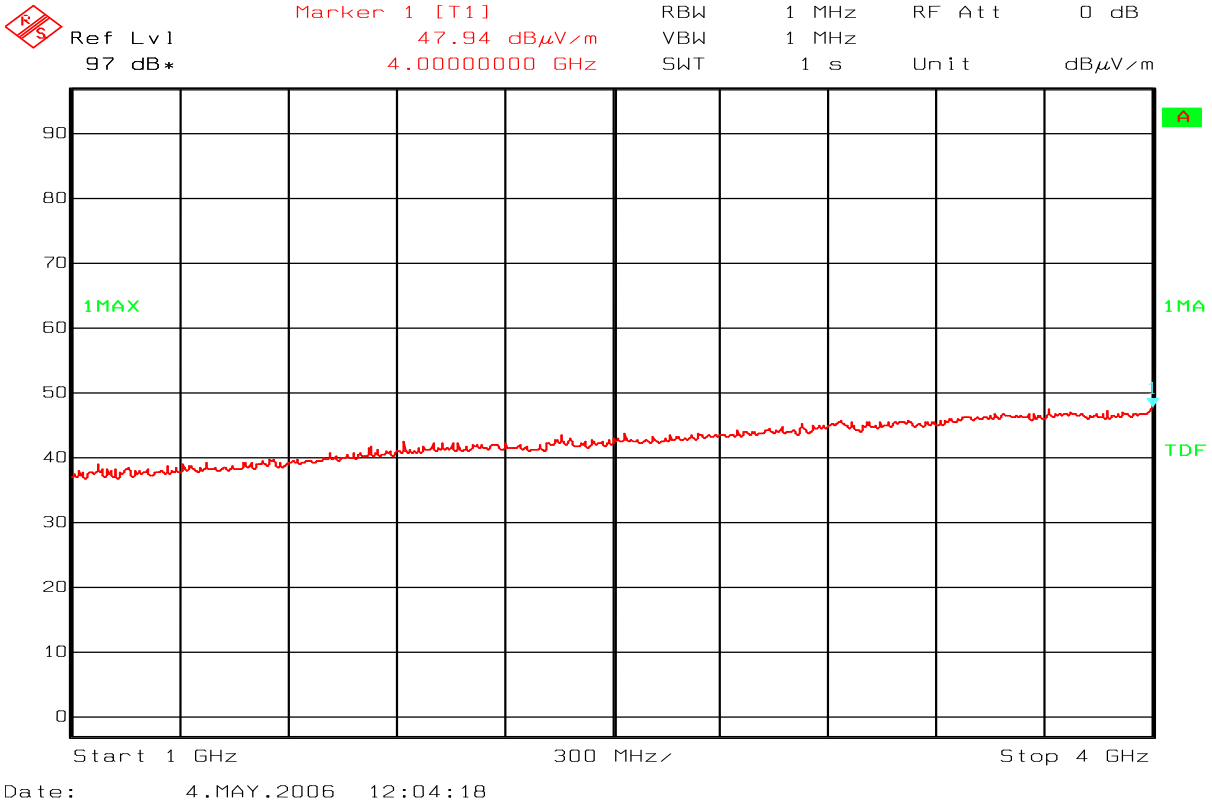
The Receiver Spurious Emissions are covered by paragraph 4.23 Spurious Emissions Radiated. No separate Spurious Emissions which could be related to the receiver were detected during the radiated test.



Receiver Emissions, 1725-2125 MHz, Vertical Polarization



Receiver Emissions, 1-4 GHz, Vertical Polarization



Receiver Emissions, 1-4 GHz, Horizontal Polarization

NEMKO COMLAB

04. May 06 11:55

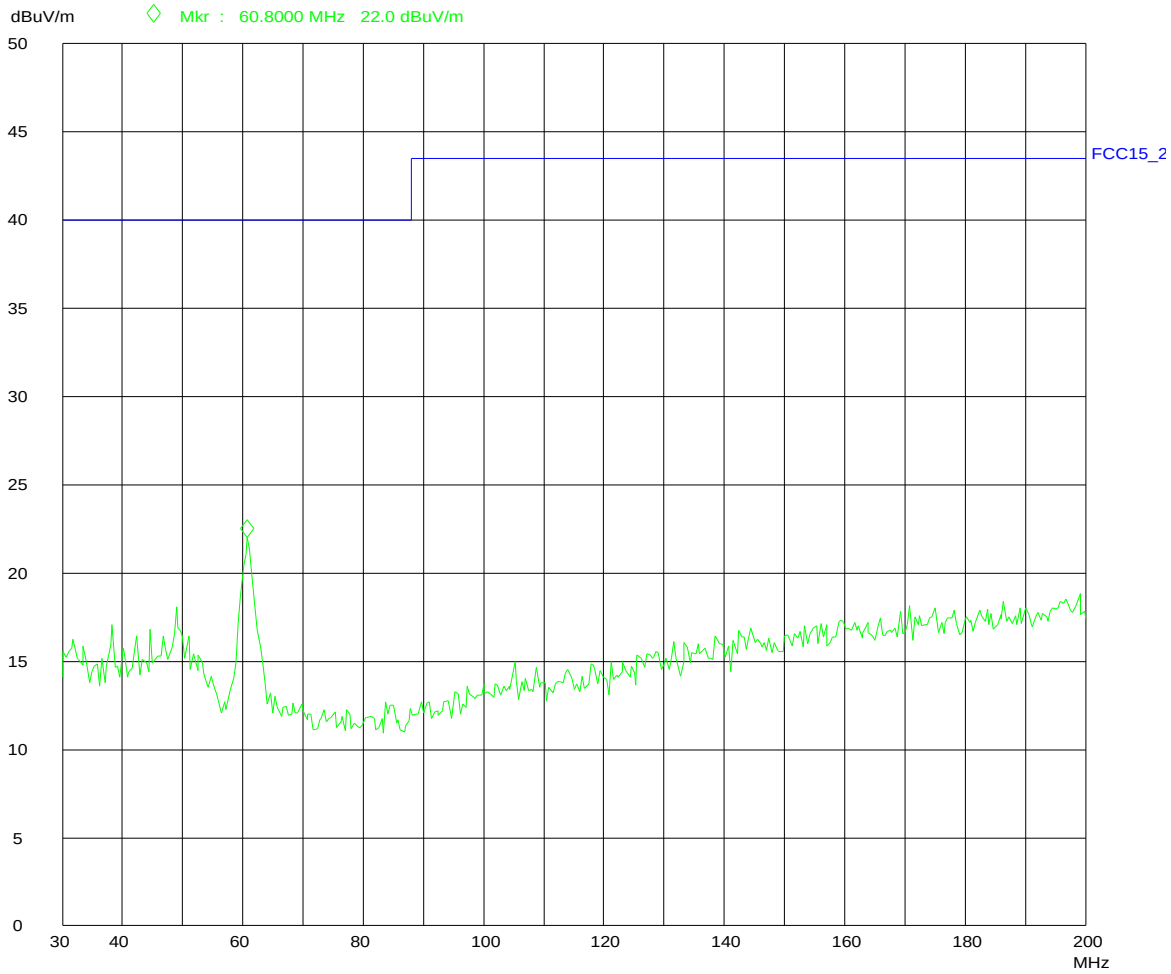
Peak

Operator: FS
Comment: RTX Telecom, Sally Project
FCC 15.209, 3m. h=1m VP
FCC 15D, UPCS Handset
Continous RX Mode, In charger

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
30M	200M	50k	120k	PK	50ms	AUTO	LN ON	60dB

Transducer No.	Start	Stop	Name
20	30M	200M	HK116



Receiver Spurious Emissions 30 MHz – 200 MHz, Vertical Polarization

NEMKO COMLAB

04. May 06 12:07

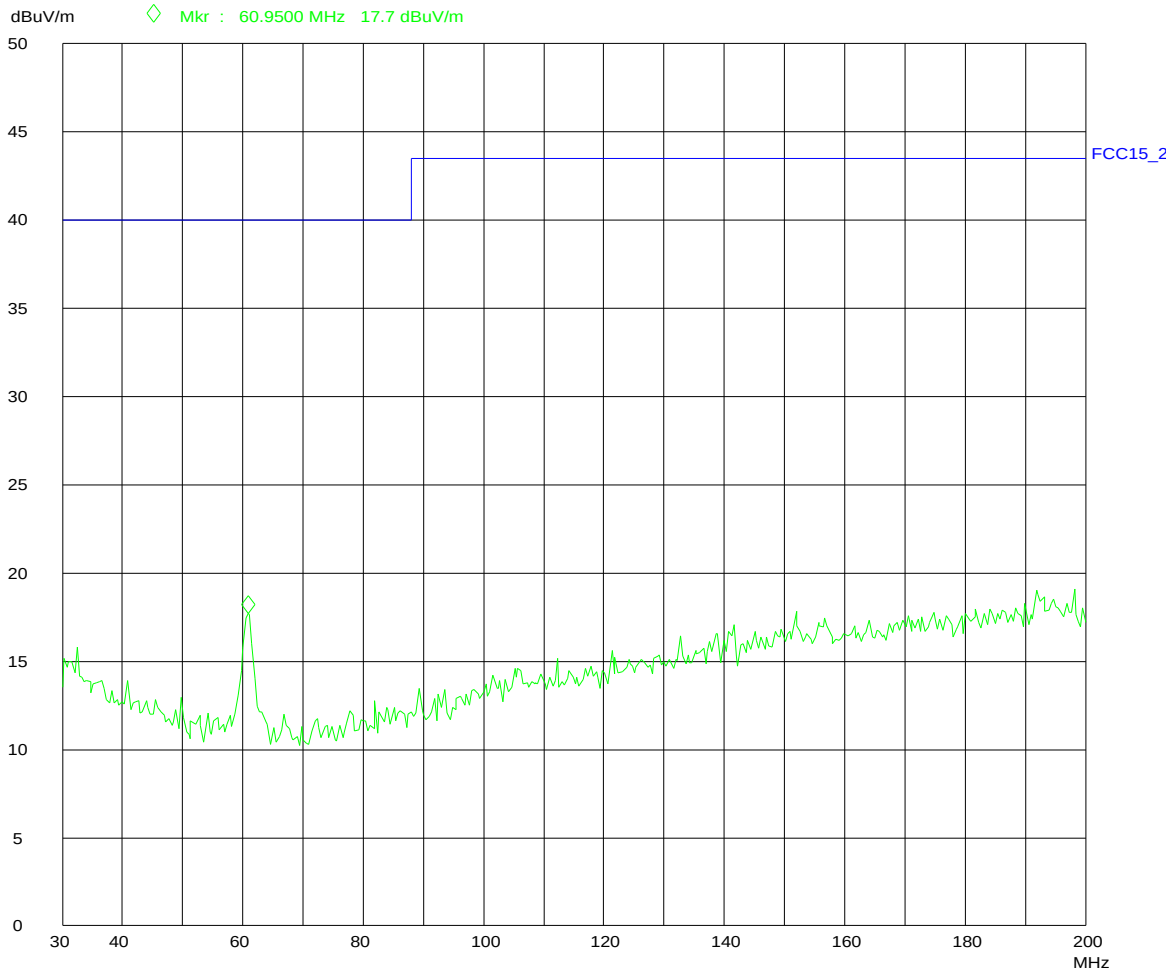
Peak

Operator: FS
Comment: RTX Telecom, Sally Project
FCC 15.209, 3m. h=2m HP
FCC 15D, UPCS Handset
Continous RX Mode, In charger

Scan Settings (1 Range)
|-------- Frequencies ----------||---------- Receiver Settings ----------|

Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
30M	200M	50k	120k	PK	50ms	AUTO	LN ON	60dB

Transducer No.	Start	Stop	Name
20	30M	200M	HK116



Receiver Spurious Emissions 30 MHz – 200 MHz, Horizontal Polarization

NEMKO COMLAB

04. May 06 11:22

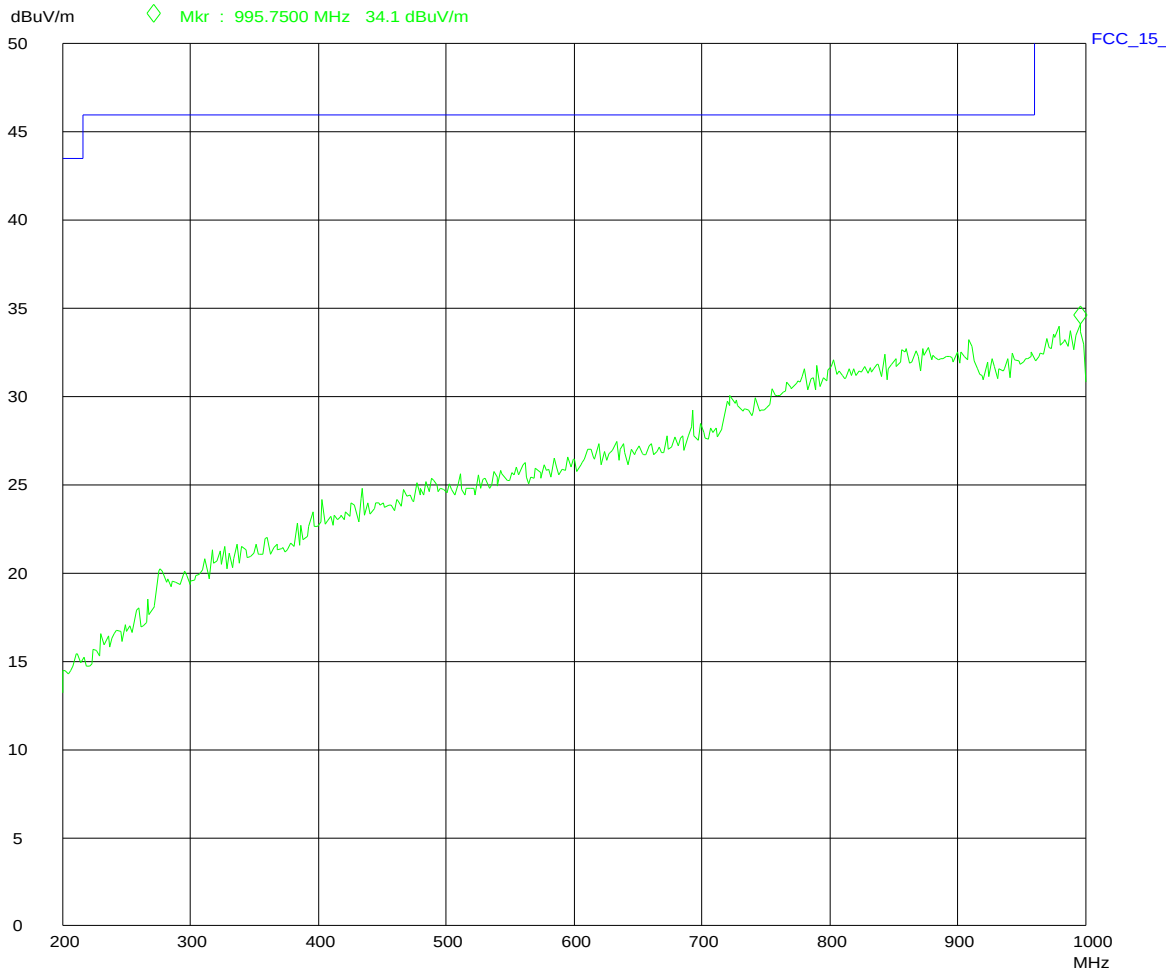
Peak

Operator: FS
Comment: RTX Telecom, Sally Project
FCC 15.209, 3m. h=1m VP
FCC 15D, UPCS Handset
Continous RX Mode, In charger

Scan Settings (1 Range)
|-------- Frequencies ----------||---------- Receiver Settings ----------|

Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
200M	1000M	50k	120k	PK	20ms	AUTO	LN ON	60dB

Transducer No.	Start	Stop	Name
21	200M	1000M	HL223



Receiver Spurious Emissions 200 MHz – 1000 MHz, Vertical Polarization

NEMKO COMLAB

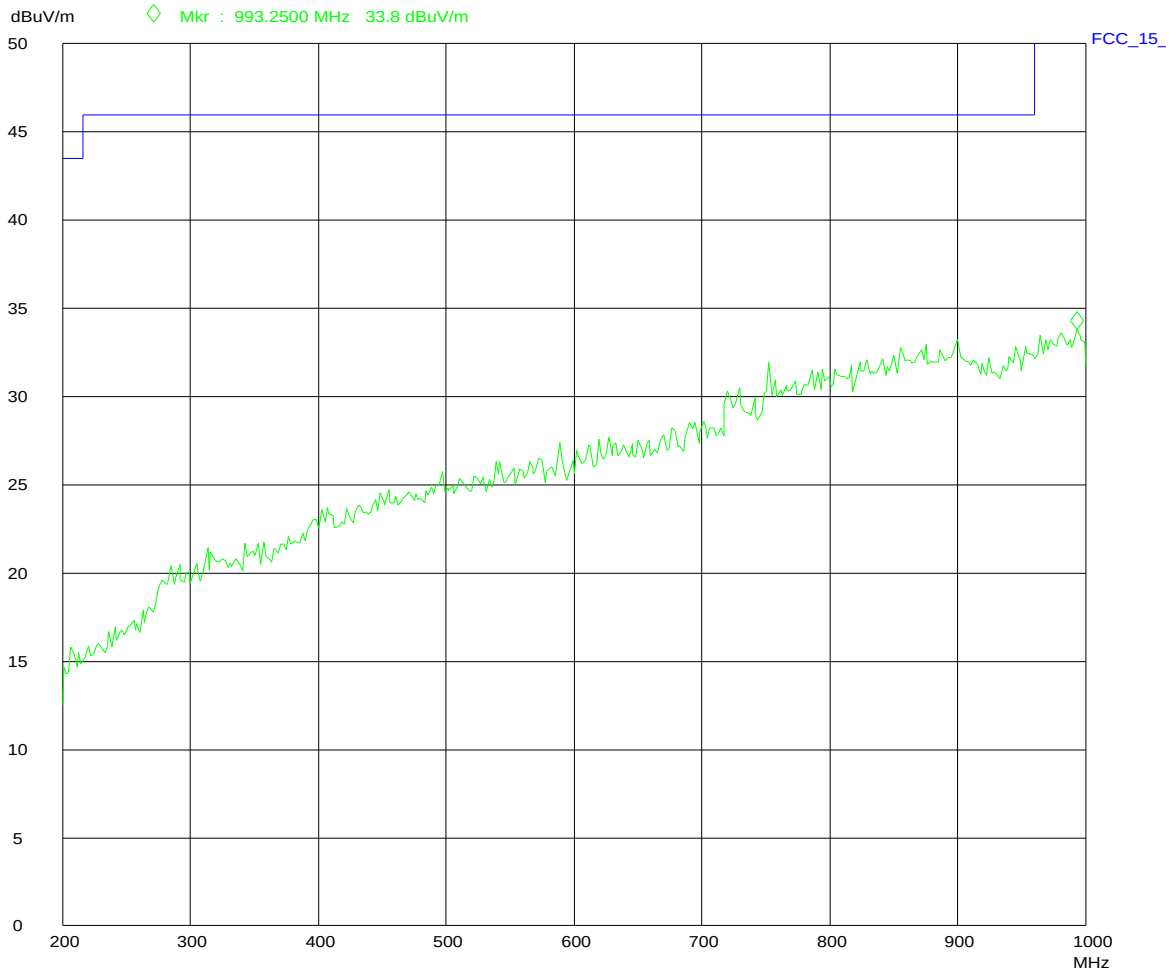
04. May 06 11:09

Peak

Operator: FS
Comment: RTX Telecom, Sally Project
FCC 15.209, 3m. h=2m HP
FCC 15D, UPCS Handset
Continous RX Mode, In charger

Scan Settings (1 Range)
|-------- Frequencies ----------||---------- Receiver Settings ----------|
Start Stop Step IF BW Detector M-Time Atten Preamp OpRge
200M 1000M 50k 120k PK 20ms AUTO LN ON 60dB

Transducer No. Start Stop Name
21 200M 1000M HL223



Receiver Spurious Emissions 200 MHz – 1000 MHz, Horizontal Polarization

5 Test Setups

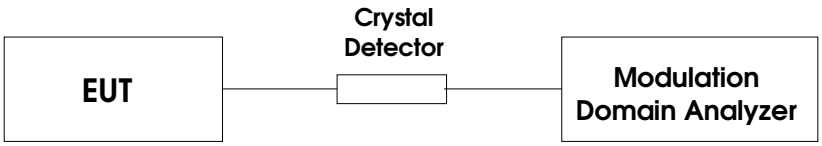
5.1 Frequency Measurements

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

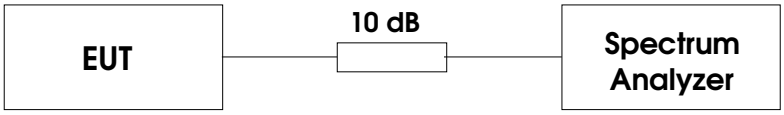


Test equipment included: 5, 7

Test Set-up 2

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

5.3 Conducted Emission Tests

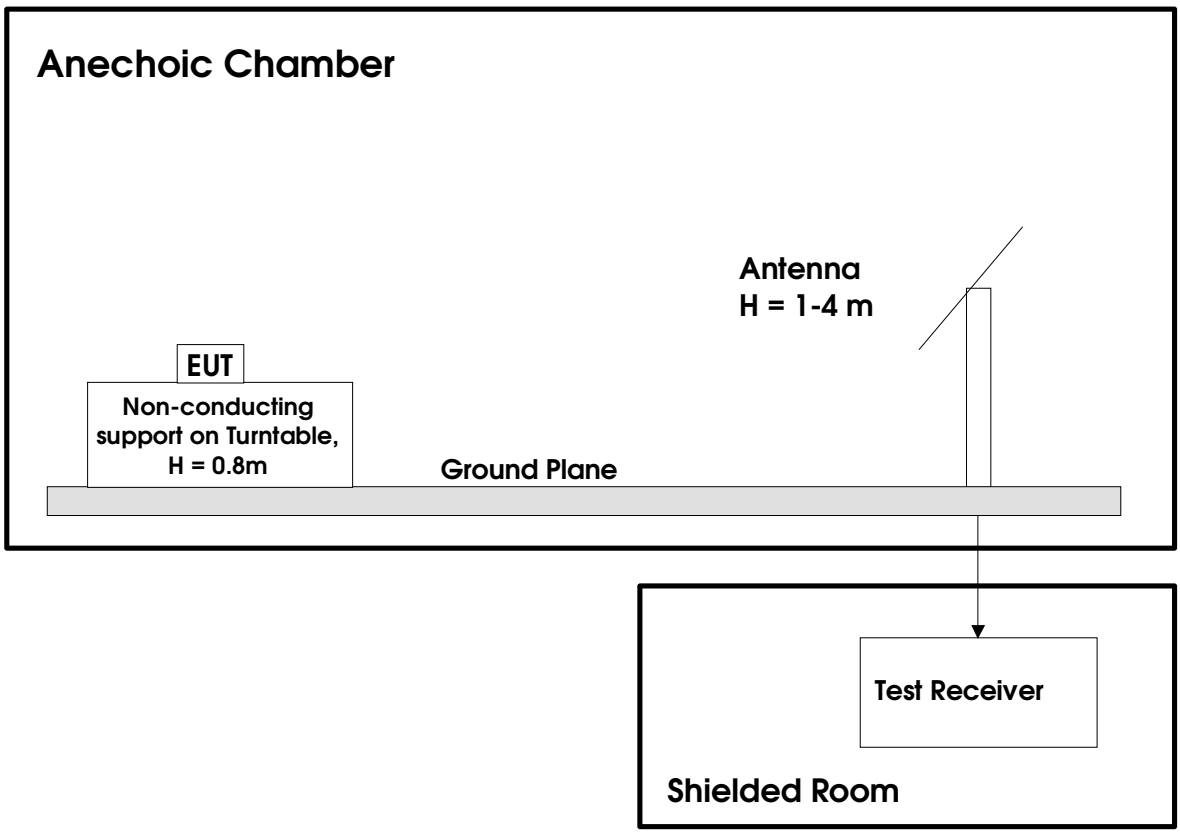


Test equipment included: 1, 13

Test Set-up 3

This setup is used for all conducted emission tests.

5.4 Radiated Emission Tests

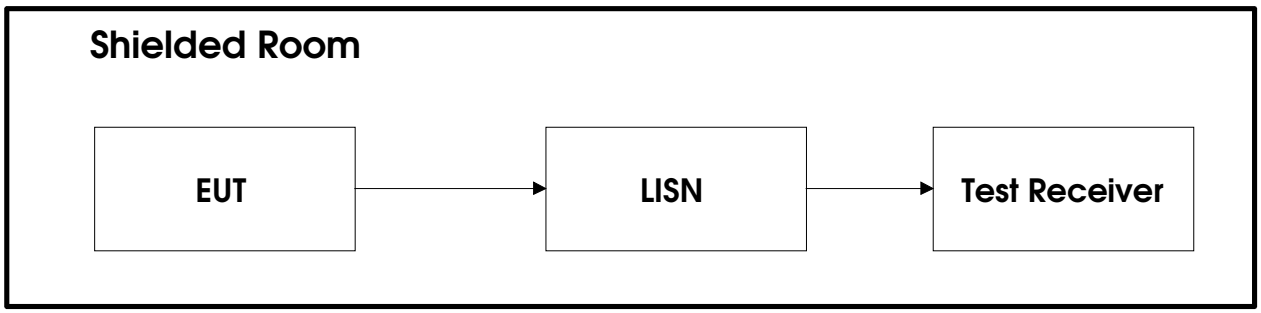


Test equipment: 1, 8, 9, 10, 11, 20, 21, 22, 23, 24, 25, 26

Test Set-Up 4

This test setup is used for all radiated emissions tests. For frequencys 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.

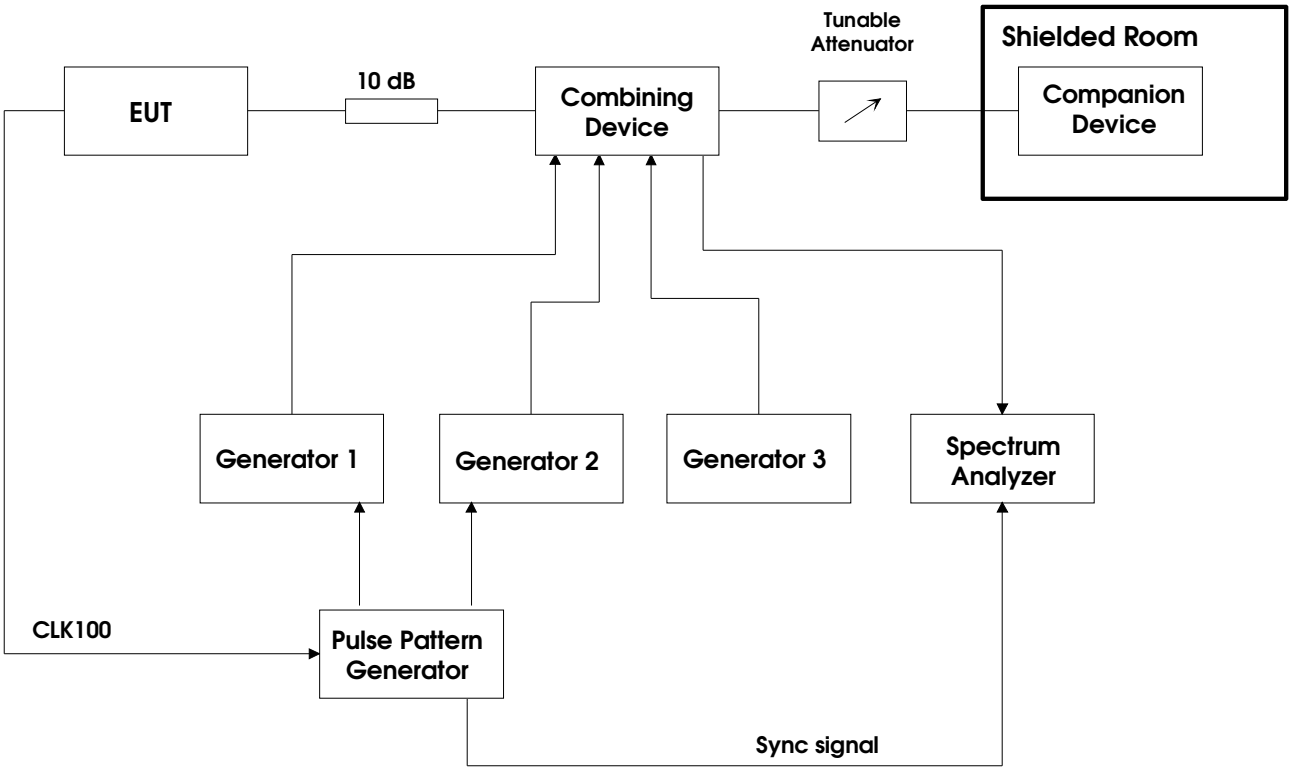
5.5 Powerline Conducted Tests



Test equipment: 12, 27, 28

Test Set-Up 5

5.6 Monitoring Tests



Test equipment: 1, 2, 3, 4, 6, 13, 14, 15, 16, 17, 18, 19

Test Set-Up 6

This test setup is used for all Monitoring and Time and Spectrum Access Procedure tests.

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 Test Laboratory.

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	SMP04	Signal generator	Rohde & Schwarz	LR 1336
4	SMHU52	Signal generator	Rohde & Schwarz	LR 1240
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	Highpass 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	Biconical Antenna	Rohde & Schwarz	LR 1261
25	HK116	Logperiod 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