

Test report no. : 59525-6

Item tested : RAID2

Type of equipment : Isochronous UPCS Device

FCC ID : BXZRAID2

Client : Ascom Tateco AB

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)

28 March 2006

Authorized by : 
Egil Hauger
Technical Verificator

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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: 49

1.2 Client Information

Name : Ascom Tateco AB
Address : P.O.Box 8783, Grimbodalen 2, SE-402 76 Gothenburg, Sweden
Telephone : +46 31 559 300
Fax : +46 31 552 031

Contact:

Name : Tania Ottebrink
E-mail : tania.ottebrink@ascomtateco.se

1.3 Manufacturer (if other than client)

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

2 Test Information

2.1 Tested Item

Name :	ASCOM
FCC ID :	BXZRAID2
Industry Canada ID :	3724B-RAID2
Model/version :	RAID2-CDAAD
Serial number :	No serial number
Hardware identity and/or version:	RI1
Software identity and/or version :	FF.51
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
Emissions Designator :	/
User Frequency Adjustment :	None
Rated Output Power :	90 mW
Type of Power Supply :	Li-Ion Battery
Antenna Connector :	None
Antenna Diversity Supported :	Yes
Desktop Charger :	Art no : 660117/1A

Description of Tested Device(s)

The tested equipment is a DECT handset which complies with ETSI EN 300175. The frequencies have been reprogrammed 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 base station, which is then the responding device.

2.2 Test Environment

2.2.1 Normal test condition

Temperature:	20 - 22 °C
Relative humidity:	30 - 50 %
Normal test voltage:	3.6 V DC

The values are the limit registered during the test period.

All tests were performed with a fully charged battery.

2.3 Test Period

Item received date: 2006-01-22

Test period : from 2006-01-26 to 2006-03-28

2.4 Test Engineer

Frode Sveinsen / Egil Hauger

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 in order to synchronize the Arbitrary 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 Arbitrary Generator was used to apply time synchronized interference to time windows where this was required.

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

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

The Power line conducted emissions test was performed with the EUT in the supplied charger and charging. This test was also repeated with the EUT transmitting in speakerphone mode.

3 TEST REPORT SUMMARY

3.1 General

Manufacturer: ASCOM
Model No.: RAID2
Serial No.: No serial numbers.

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 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 |
| PUE Equipment Code | <input type="checkbox"/> 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: 59525-6

TESTED BY : 
Frode Sveinsen, Chief Engineer

DATE: 28 March 2006

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This test report applies only to the items and configurations tested.

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)	15.247(c)	6.7.1	N/A ³
Spurious Emissions (Radiated)	15.247(c)	4.3.3	Complies

¹ The EUT does not transmit control or signalling information.

² This provision is not used by the EUT.

³ The tested equipment has integrated antennas only.

4 TEST RESULTS

4.1 Powerline Conducted Emissions

Para. No.: 15.207 (a)

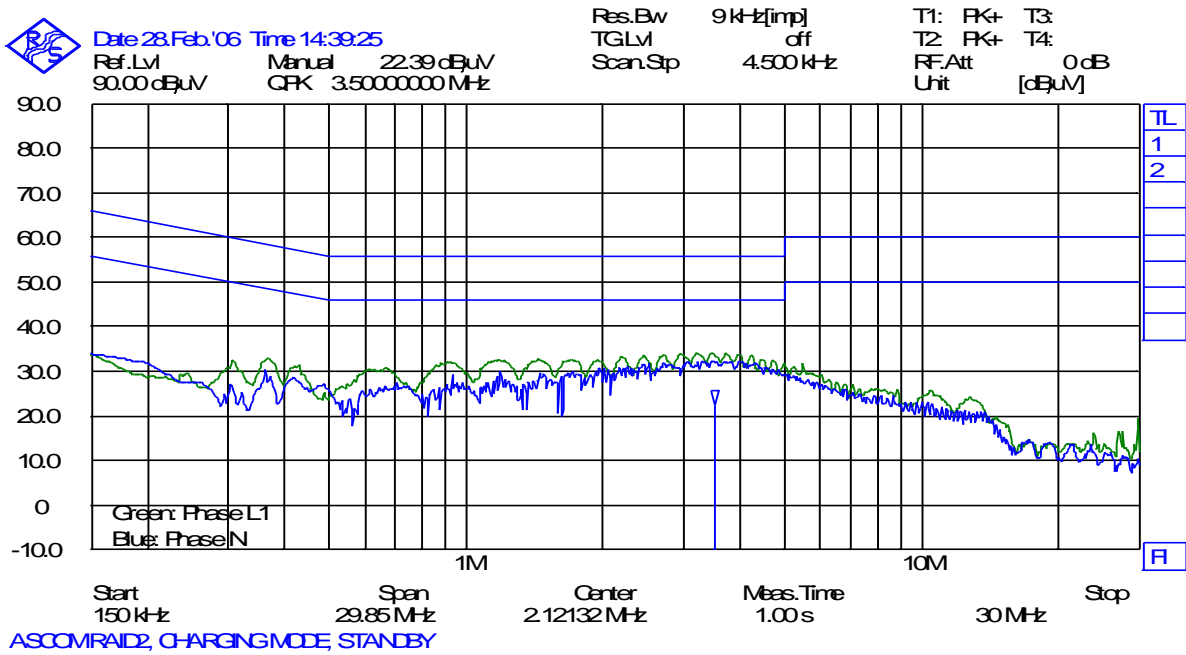
Test Performed By: Egil Hauger	Date of Test: 28-Feb-06
--------------------------------	-------------------------

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

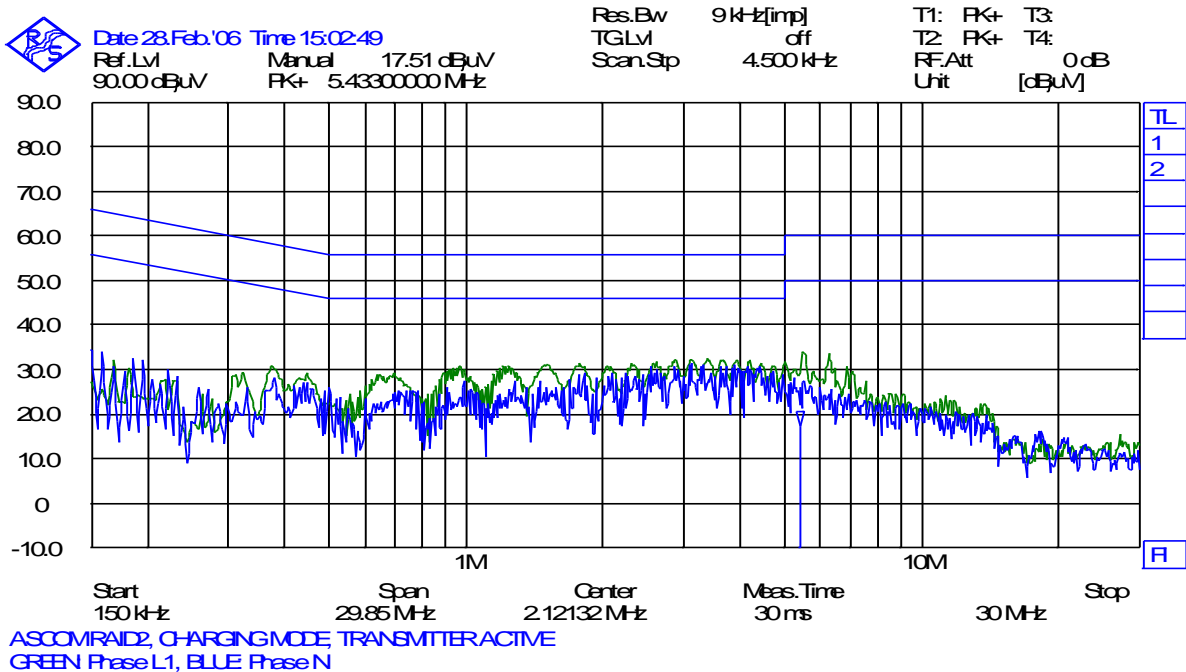
Test Results: Complies
Measurement Data: See attached graph, (Peak detector).

Highest measured value (L1 and N):
 All emissions were below the QP and Average limits when measured with Peak detector.
 The test was performed with the EUT in standby charging and repeated with the EUT transmitting in speakerphone mode and charging.

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



EUT Charging, Standby



EUT Charging, Transmitter Active

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 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, 15.317.

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 Peak Power Output

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
4	1921.536	19.4	21.2	+1.8
0	1928.448	19.4	21.1	+1.7

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

Measurement method according to ANSI C63.17 D3.5 paragraph 6.1.3

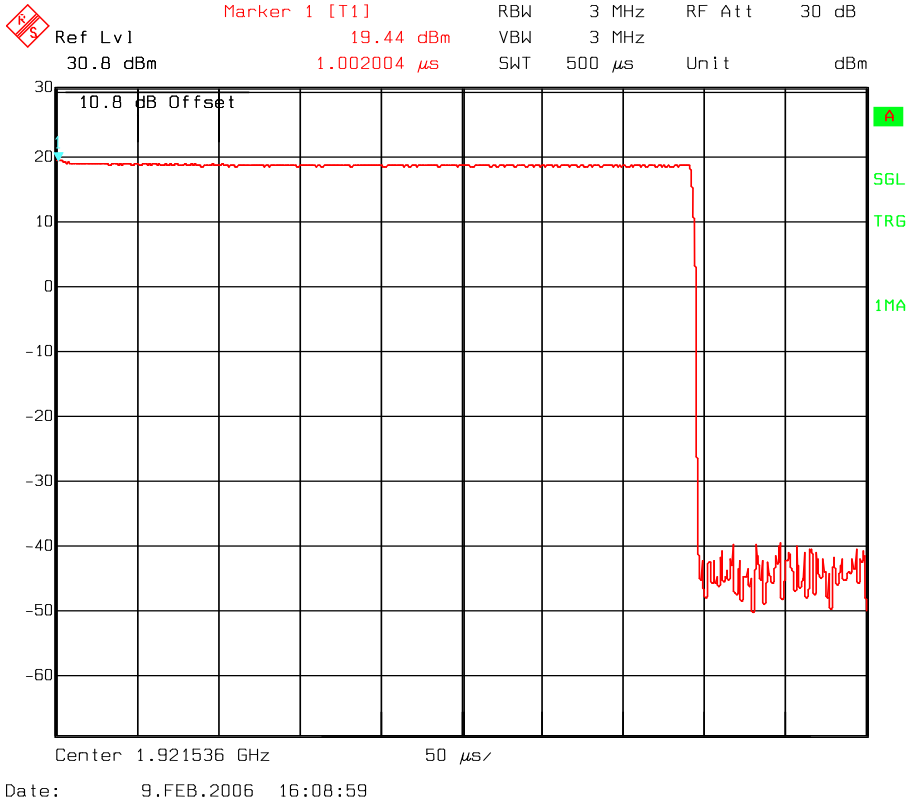
Limit:

Conducted: $100 \mu\text{W} \times \text{SQRT}(B) = 121 \text{ mW} = 20.8 \text{ dBm}$, where B is the measured emission bandwidth in Hz

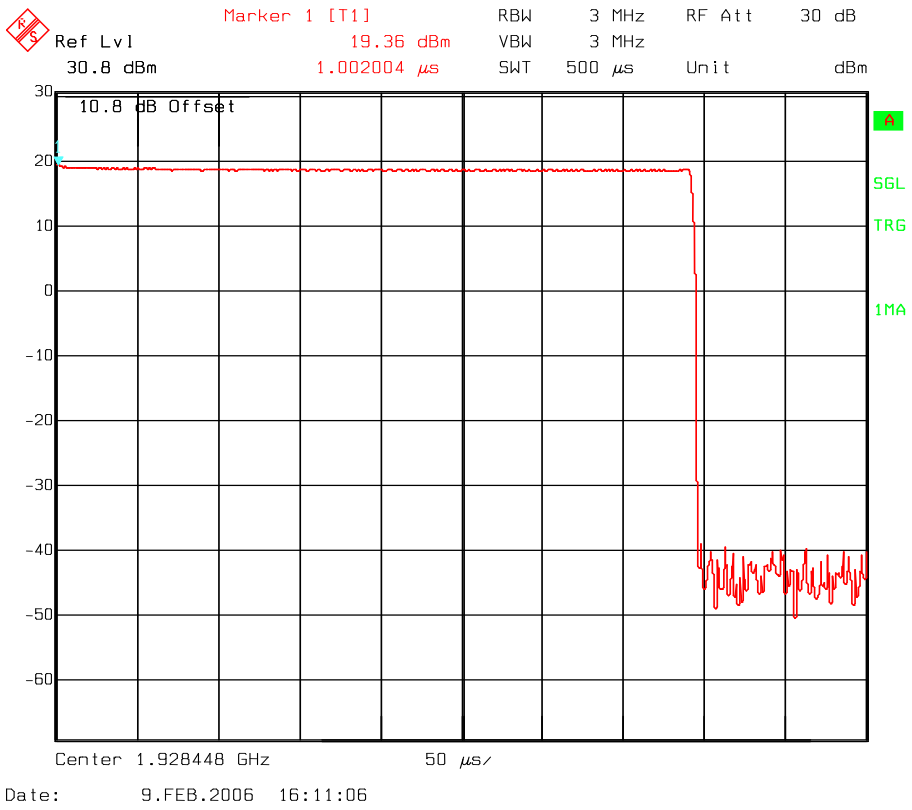
Requirements, FCC 15.319(c)(f)

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

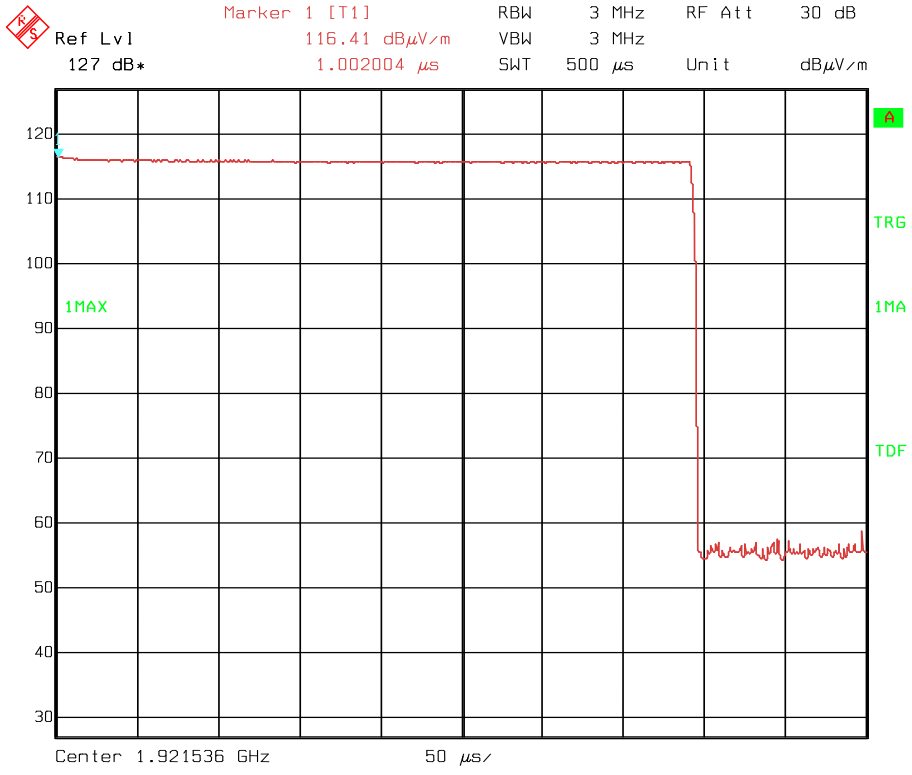
The peak transmit power shall be reduced by the amount in decibels that the maximum directional gain of the antenna exceeds 3 dBi.



Conducted Peak Output Power, Lower Channel

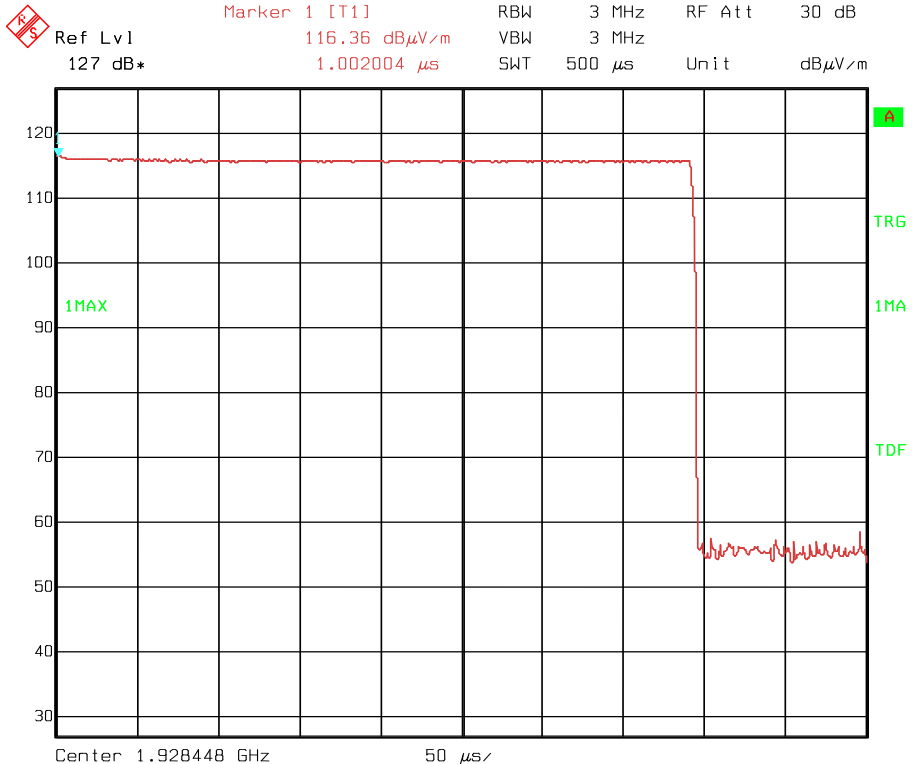


Conducted Peak Output Power, Upper Channel



Date: 26.JAN.2006 12:04:55

Maximum Radiated Peak Output Power, Lower Channel (Ant 0)



Date: 26.JAN.2006 10:05:42

Radiated Peak Output Power, Upper Channel (Ant 0)

Emission Bandwidth B

Test Results: Complies

Measurement Data:

Channel No.	Frequency (MHz)	26 dB Bandwidth B (kHz)
4	1921.536	1473
0	1928.448	1473

Channel No.	Frequency (MHz)	6 dB Bandwidth (kHz)
4	1921.536	942
0	1928.448	952

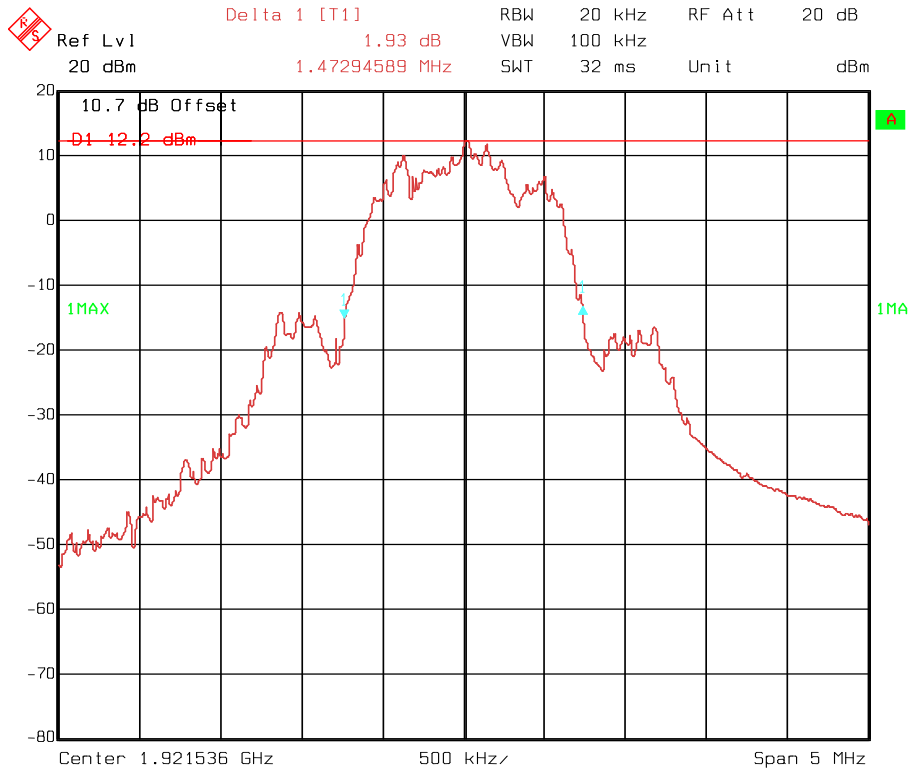
Channel No.	Frequency (MHz)	12 dB Bandwidth (kHz)
4	1921.536	1222
0	1928.448	1222

Measurement method according to ANSI C63.17 D3.5 paragraph 6.1.3

Requirements, FCC 15.323(a)

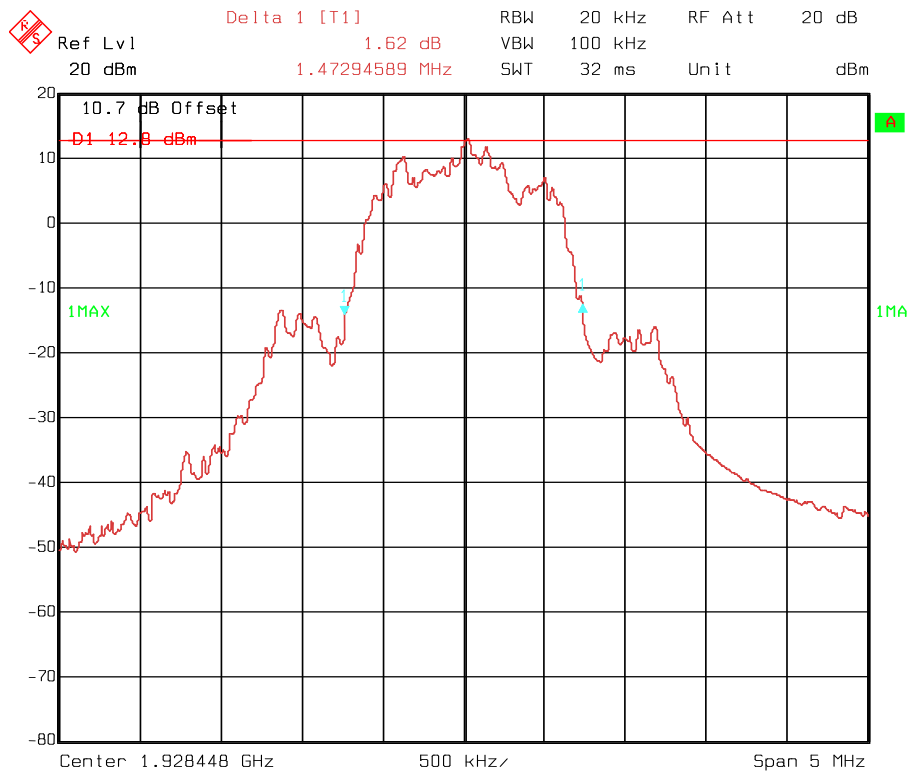
The 26 dB Bandwidth B shall be larger than 50 kHz and less than 2.5 MHz.

No requirements for 6 and 12 dB Bandwidth, these values are only used for the monitoring bandwidth test (ANSI C63.17 D3.5 clause 7.4).



Date: 25.JAN.2006 12:31:31

Emission Bandwidth B, Lower Channel



Date: 25.JAN.2006 12:27:27

Emission Bandwidth B, Upper Channel

4.8 Power Spectral Density

Test Results: Complies

Measurement Data:

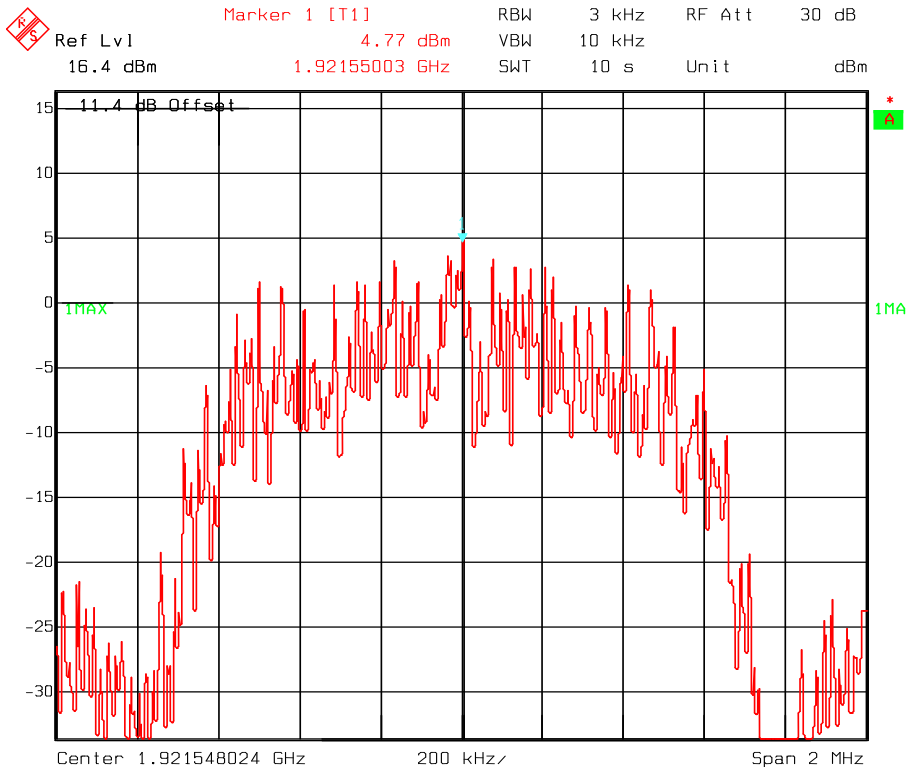
Channel No.	Frequency (MHz)	Power Spectral Density (dBm)
4	1921.536	4.64
0	1928.448	3.84

Averaged over 100 sweeps.

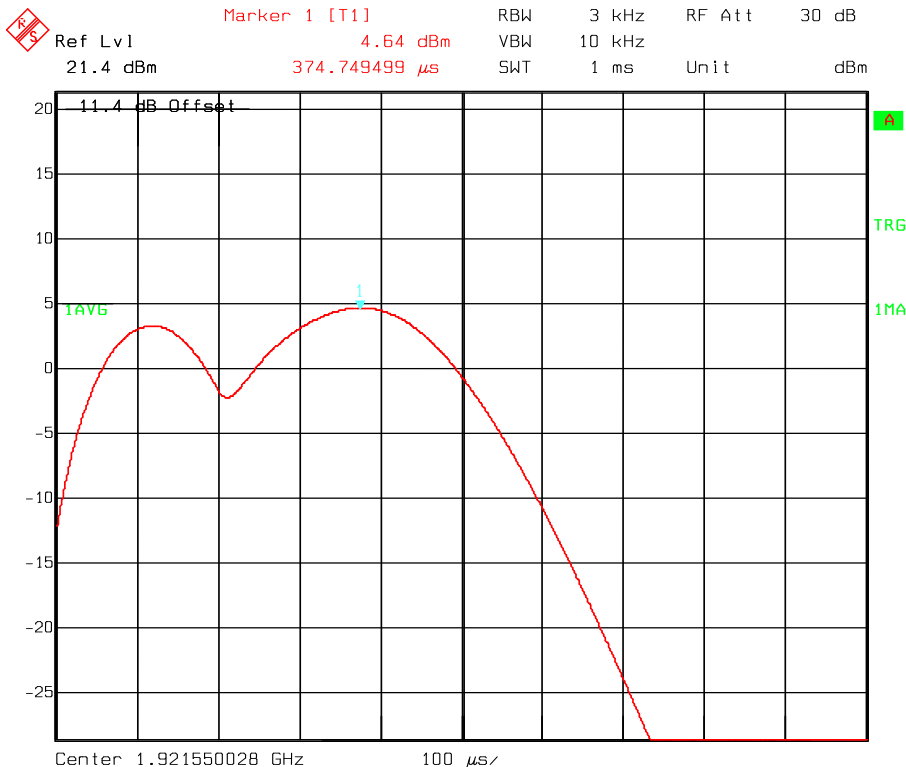
Measurement method according to ANSI C63.17 D3.5 paragraph 6.1.5.

Requirements, FCC 15.319(d)

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

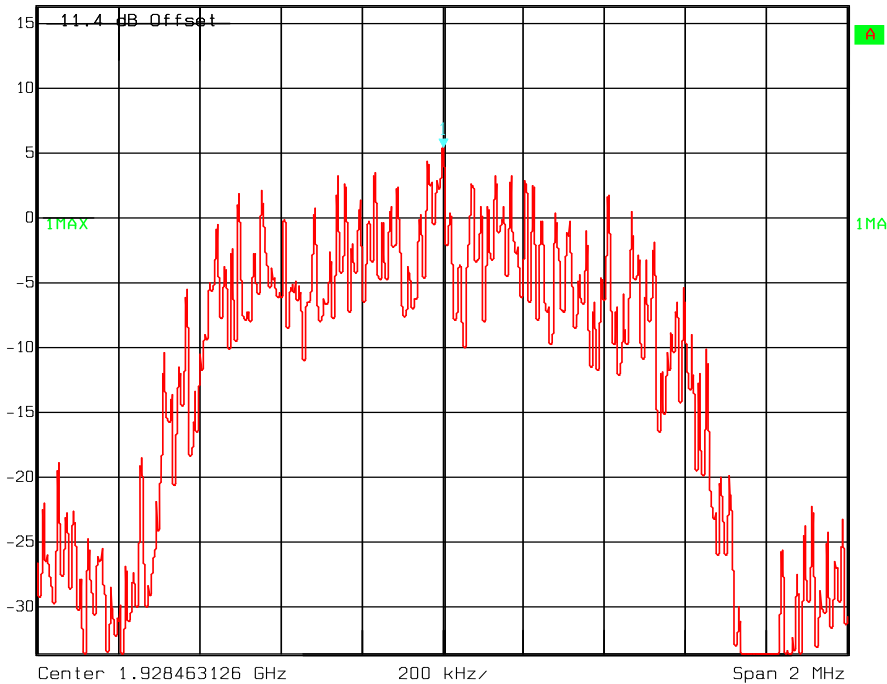


Power Spectral Density, Overview, Lower Channel



Power Spectral Density, Averaged on Max. Value, Lower Channel

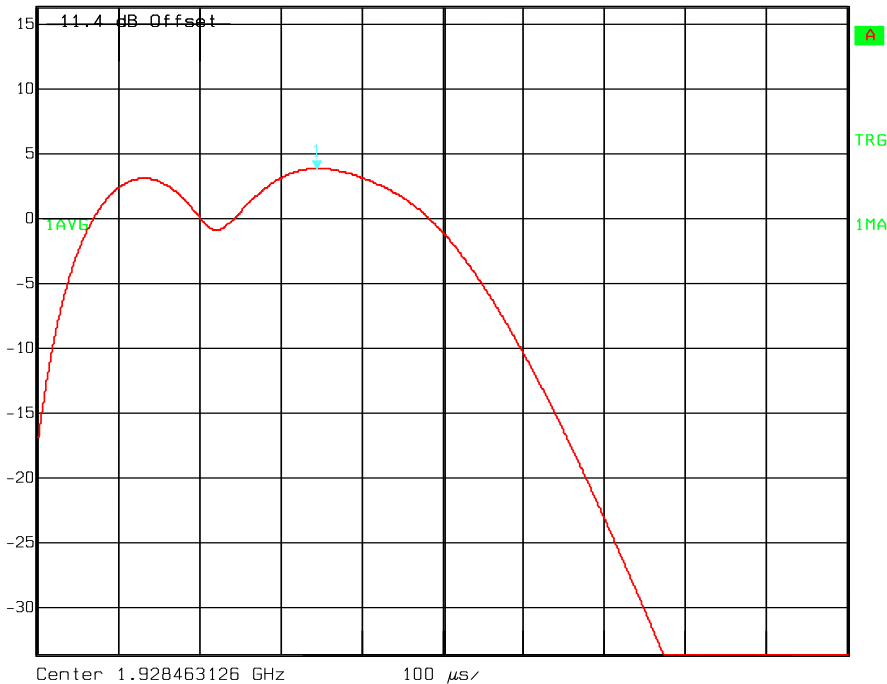
K S Marker 1 [T1] RBW 3 kHz RF Att 30 dB
 Ref Lvl 16.4 dBm 5.48 dBm VBW 10 kHz
 1.92846513 GHz 1.92846513 GHz SWT 10 s Unit dBm



Date: 9.FEB.2006 11:08:07

Power Spectral Density, Overview, Upper Channel

K S Marker 1 [T1] RBW 3 kHz RF Att 30 dB
 Ref Lvl 16.4 dBm 3.84 dBm VBW 10 kHz
 344.689379 μ s 344.689379 μ s SWT 1 ms Unit dBm



Date: 9.FEB.2006 11:05:09

Power Spectral Density, Averaged on Max. Value, Upper Channel

4.9 In-band Unwanted Emissions, Conducted

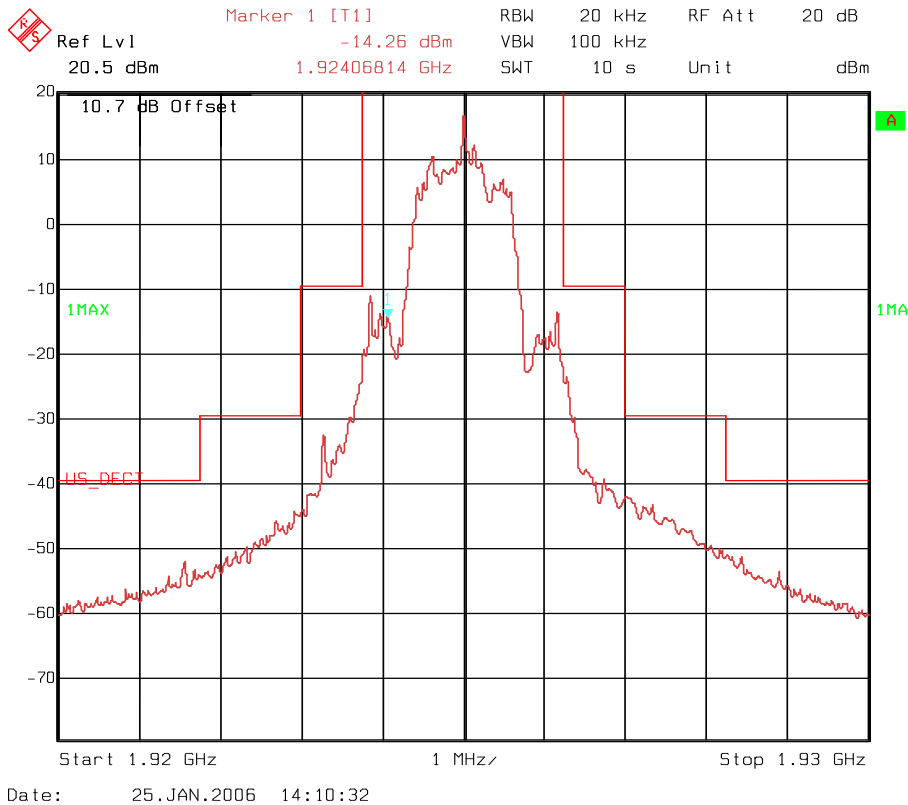
Test Results: Complies

Measurement Data:

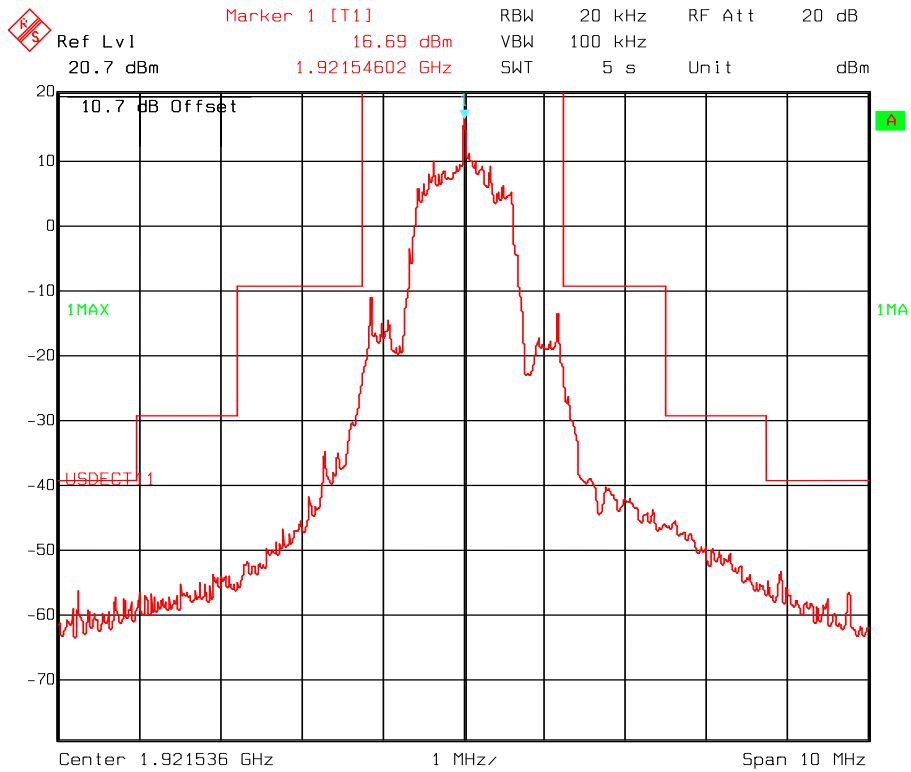
See plots.

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

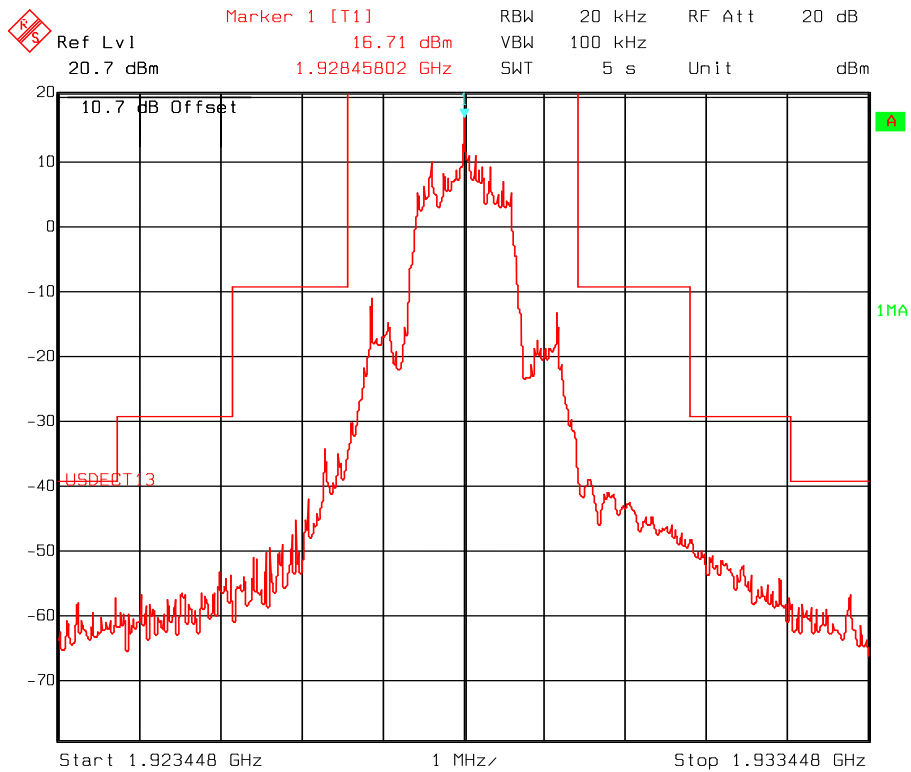


In-Band Unwanted Emissions, Middle channel



Date: 23.FEB.2006 15:43:14

In-Band Unwanted Emissions, Lower channel



Date: 23.FEB.2006 15:48:15

In-Band Unwanted Emissions, Upper channel

4.10 Out-of-band Emissions, Conducted

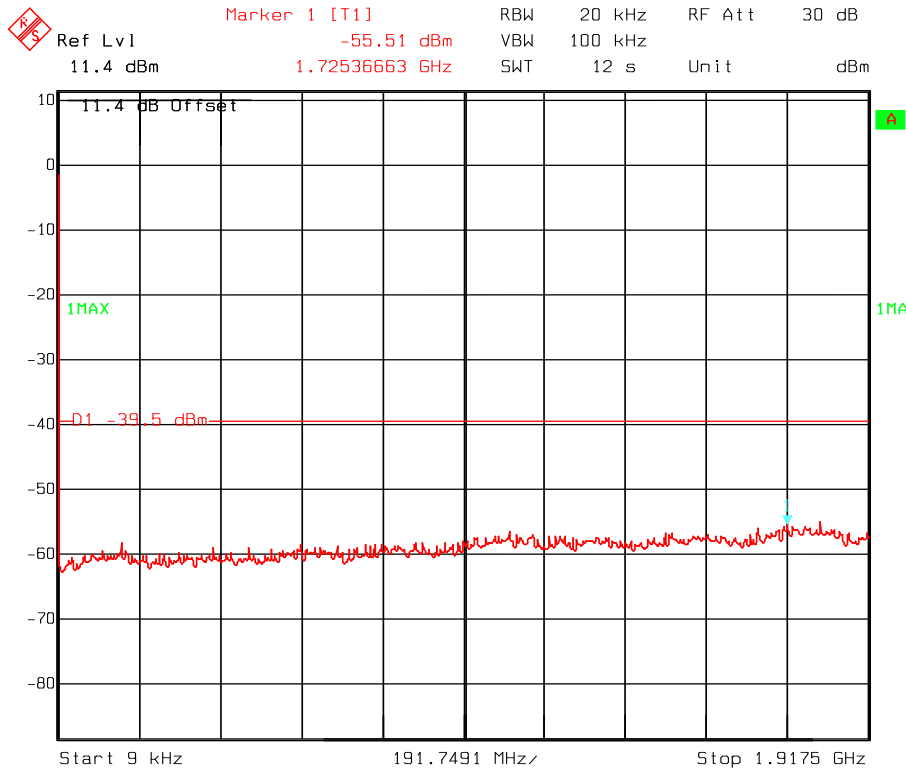
Test Results: Complies

Measurement Data:

See plots.

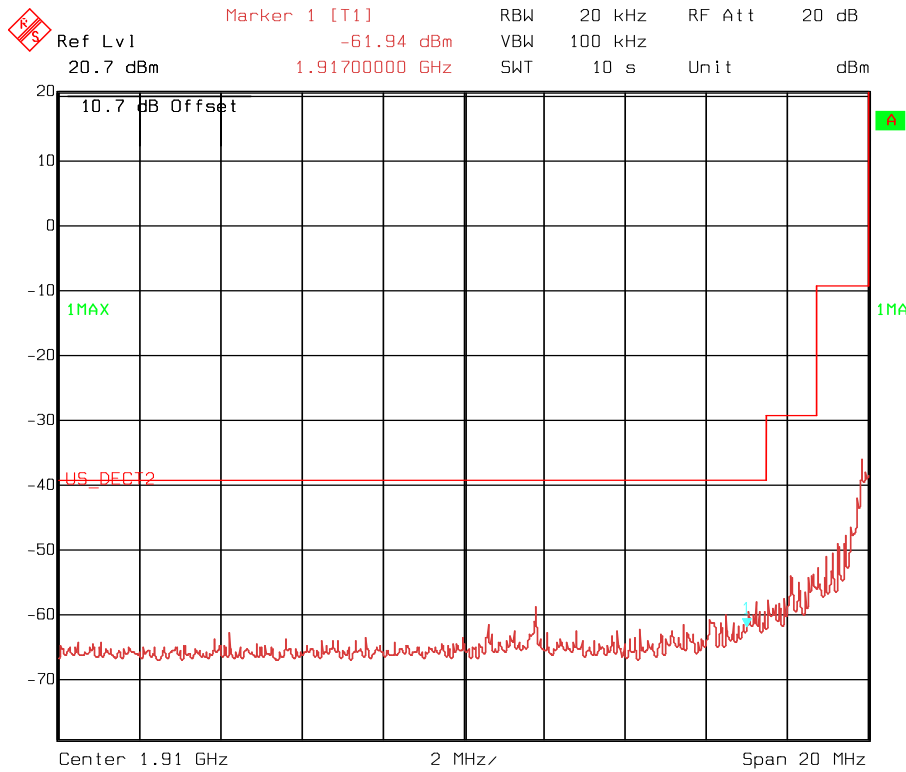
Requirements, FCC 15.323(d):

$f \leq 1.25\text{MHz}$ 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 :	$\leq -39.5 \text{ dBm}$



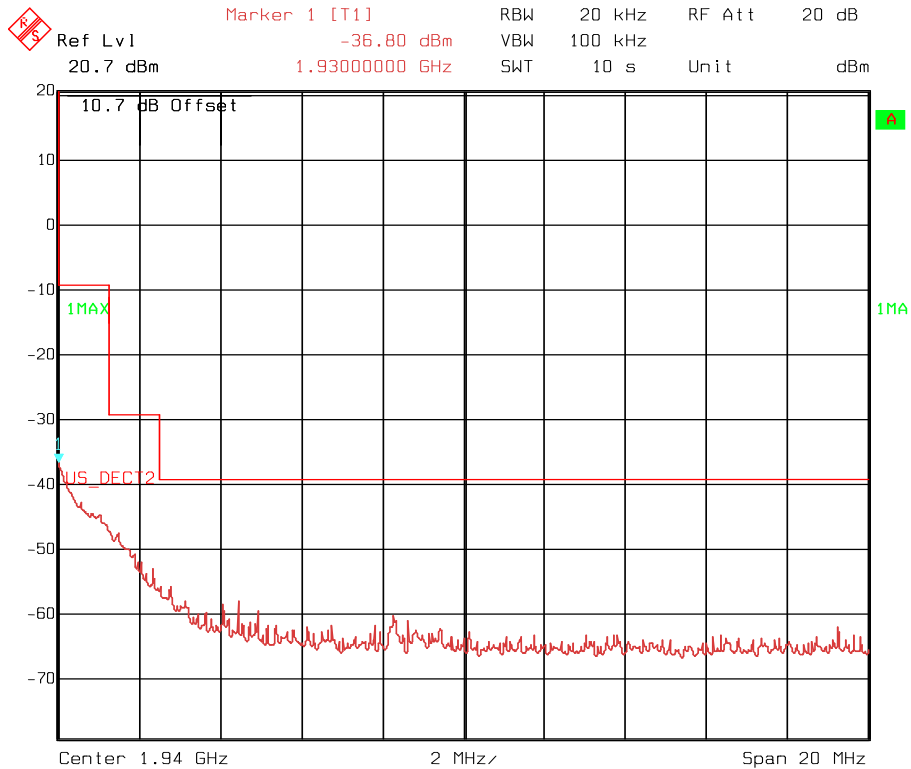
Date: 9.FEB.2006 11:22:09

Out-of-Band Unwanted Emissions, Lower Channel



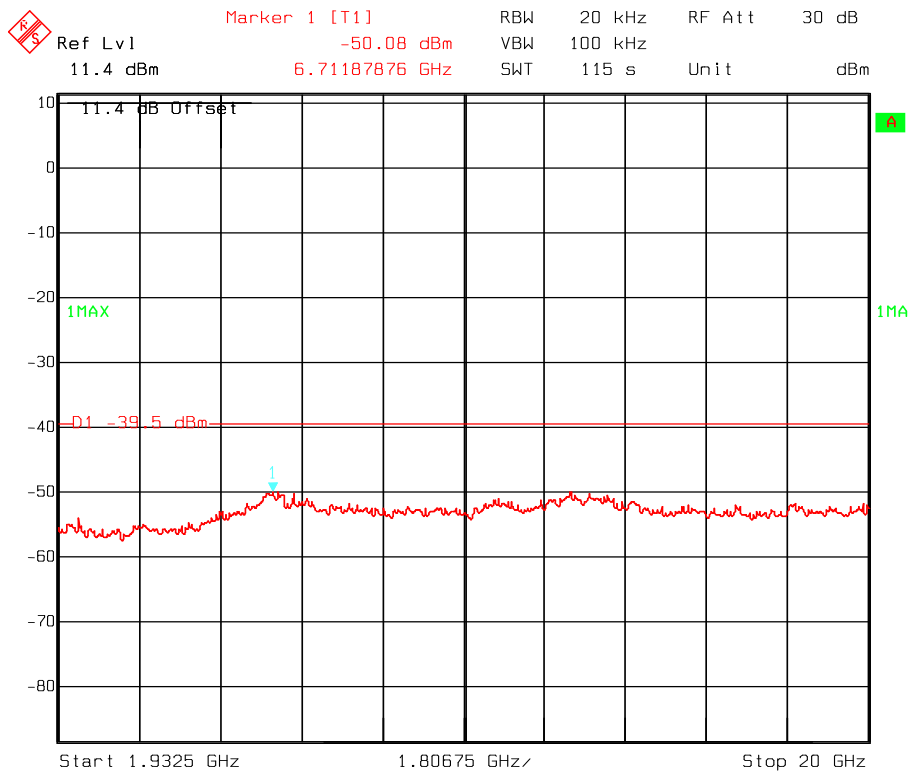
Date: 25.JAN.2006 14:55:38

Out-of-Band Unwanted Emissions, Lower Channel



Date: 25.JAN.2006 14:57:07

Out-of-Band Unwanted Emissions, Upper Channel



Date: 9.FEB.2006 11:52:34

Out-of-Band Unwanted Emissions, Upper Channel

4.11 Carrier Frequency Stability

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}	1924.993264	31.2	8.1	±10 ppm

$$\text{Deviation ppm} = ((\text{Pk-Pk difference} / 2) / \text{Mean}) \times 10^6$$

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	

$$\text{Deviation ppm} = ((\text{Mean} - \text{Measured Frequency}) / \text{Mean}) \times 10^6$$

Frequency Stability over Temperature

	Measured Carrier Frequency (MHz)	Difference (kHz)	Deviation ppm	Limit
T _{nom} (+21 °C)	1925.004798	0	0	±10 ppm
T = -20 °C	1924.991478	13.3	6.9	
T = -10 °C	1925.000074	4.7	2.5	
T = 0 °C	1925.004137	0.7	0.3	
T = +10 °C	1925.004475	0.3	0.2	
T = +20 °C	1925.004510	0.3	0.1	
T = +30 °C	1925.001847	3.0	1.5	
T = +40 °C	1925.002219	2.6	1.3	
T = +50 °C	1925.002768	2.0	1.1	

$$\text{Deviation ppm} = ((\text{Mean} - \text{Measured Frequency}) / \text{Mean}) \times 10^6$$

Comment: Test of power variations is not required since the EUT is powered from batteries.

4.12 Frame Repetition Stability

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	Mean (Hz)	Standard Deviation (Hz)	Frame Repetition Stability (ppm)
1924.992	99.9999344458	0.0000847992	2.5

Limit:

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

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

4.13 Frame Period and Jitter

Test Results: Complies

Measurement Data:

Carrier Frequency	Frame Period (ms)	Max Jitter (µs)	3xStandard Deviation of Jitter (µs)
1924.992	10.00000656	0.0454	0.025

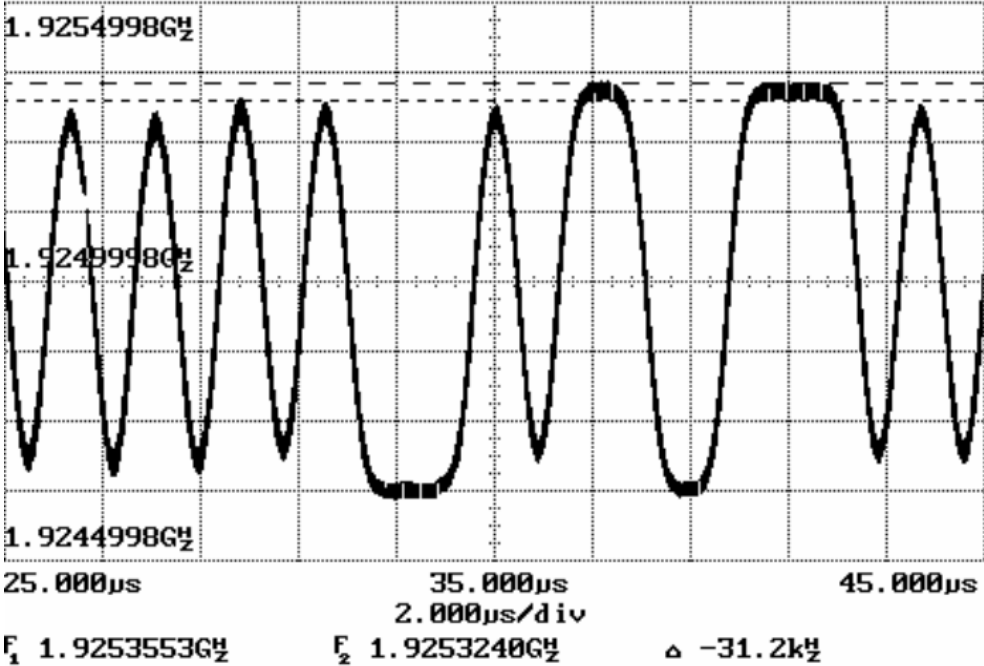
Max Jitter = (1/ (Frame period + Pk-Pk/2)) - (1/Frame Period), when Pk-Pk and Frame Period are in Hz

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.

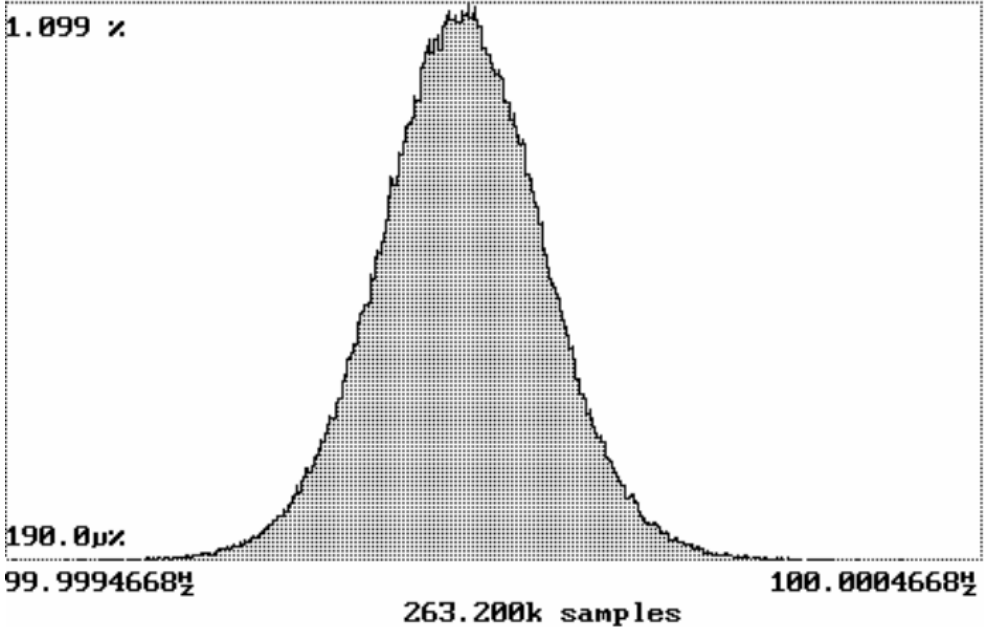
(hp) Freq C
 running



Mean 1.924993264 GHz

Carrier Frequency Stability, Long term value

(hp) Freq A
 running t1k



Pk-Pk 908.7 μHz Std Dev 84.7992 μHz
 Mean 99.9999344458 MHz 1/Mean 10.000 ms

Frame repetition Stability, Middle channel

4.14 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 is measured Transmitter Power in dBm

Calculated values:

Lower Threshold	-81.3 dBm
Upper Threshold	-61.3 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	-61.2 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	Transmits on f_2	Pass
c) $f_1 T_L + 6$ dB, f_2 at $T_L + 13$ dB	Transmits on f_1	Pass
d) $f_1 T_L + 7$ dB, f_2 at T_L	Transmits on f_2	Pass
e) $f_1 T_L$, f_2 at $T_L + 7$ dB	Transmits on f_1	Pass

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

ANSI C63.17 clause 7.3.4	Observation	Verdict
If the EUT transmits it shall do so on f_2	No transmission	Pass

Limits:

Lower Threshold + 6 dB margin	-75.3 dBm
Upper Threshold + 6 dB margin	-55.3 dBm

4.15 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 $\pm 30\%$ of B	No connection	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 passed at both the -6 and -12 dB points if the Simple Compliance test fails.

Comment: This test is not required since the tested EUT uses the same receiver for monitoring and for communication, but the test has been performed anyway and the EUT complies with the requirements.

Limits, FCC 15.323(c)(7):

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

4.16 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 then applied on the carrier at pulsed level $T_U+6\text{dB}$ or $T_L+6\text{dB}$, as appropriate.

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

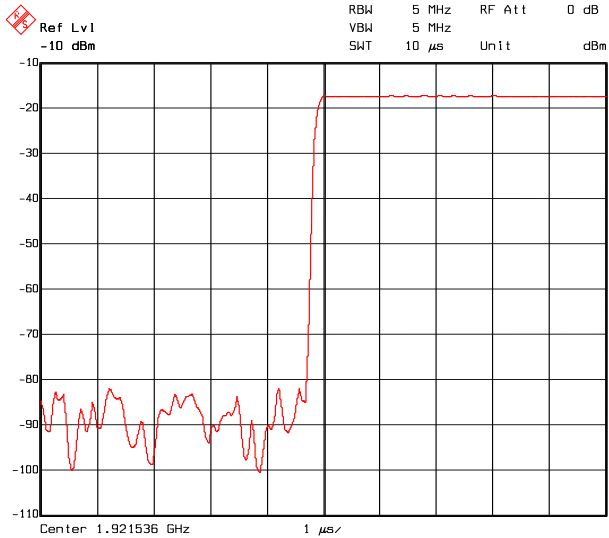
Pulse Width, ref. to ANSI C63.17 clause 7.5	Observation	Verdict
c) > largest of 50 μs and $50 \cdot \text{SQRT}(1.25/B)$	No Connection	Pass
d) > largest of 35 μs and $35 \cdot \text{SQRT}(1.25/B)$, and with interference level raised 6 dB	No Connection	Pass

Comment: The test was performed with pulse lengths of 50 μs and 35 μs .
 The EUT display indicates "System Busy" on both tests above and it was observed that the EUT did not try to establish a connection.

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

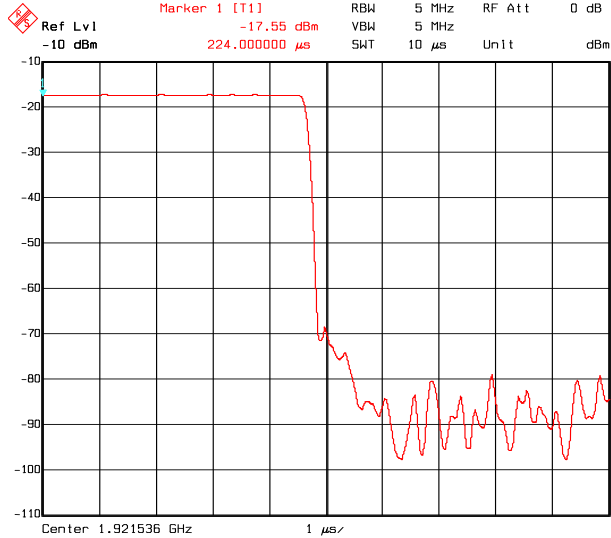
The maximum reaction time must be less than $50 \cdot \text{SQRT}(1.25/\text{emission bandwidth in MHz})$ microseconds for signals at the applicable threshold level but shall not be required to be less than 50 microseconds.

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.



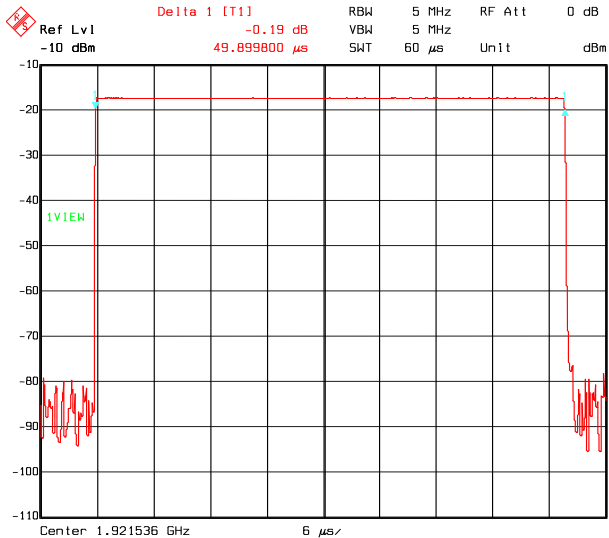
Date: 14.MAR.2006 10:07:50

50 µs pulse, Rise Time



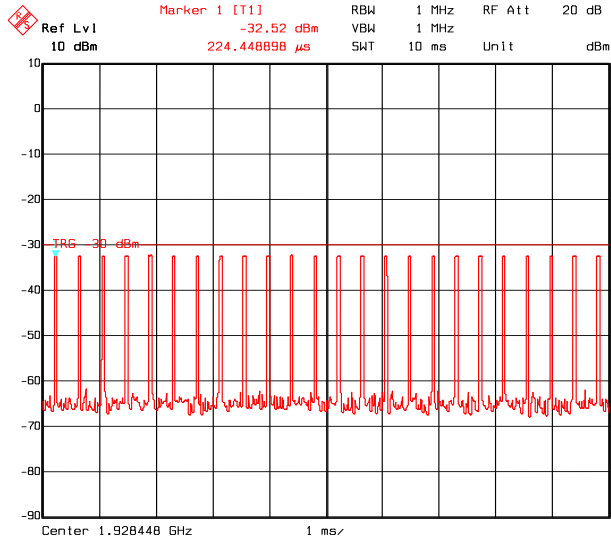
Date: 14.MAR.2006 10:09:06

50 µs pulse, Fall Time



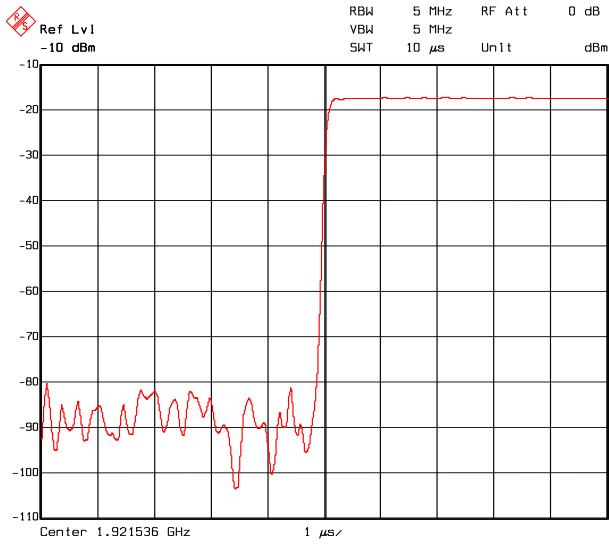
Date: 14.MAR.2006 10:14:25

50 µs pulse



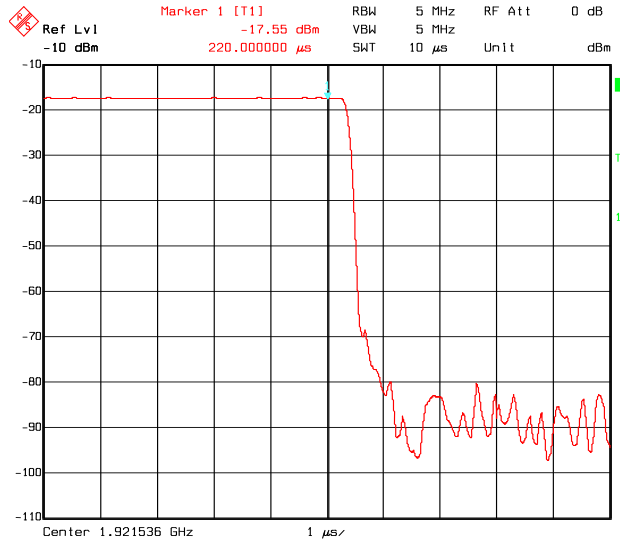
Date: 24.FEB.2006 14:11:18

50 µs pulses synced to DECT frame



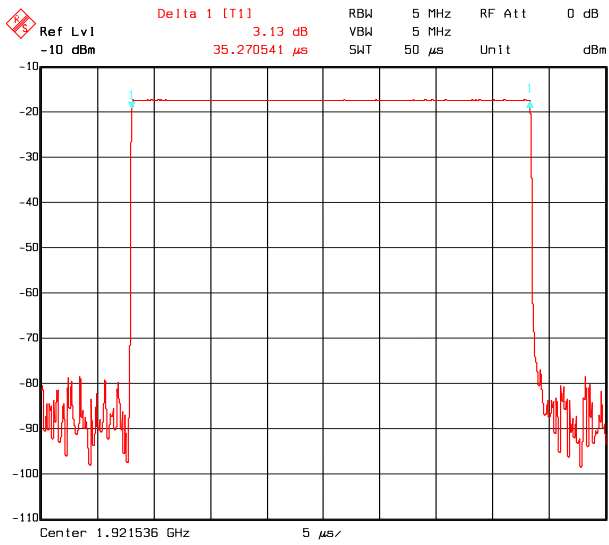
Date: 14.MAR.2006 10:02:05

35 µs pulse, Rise Time



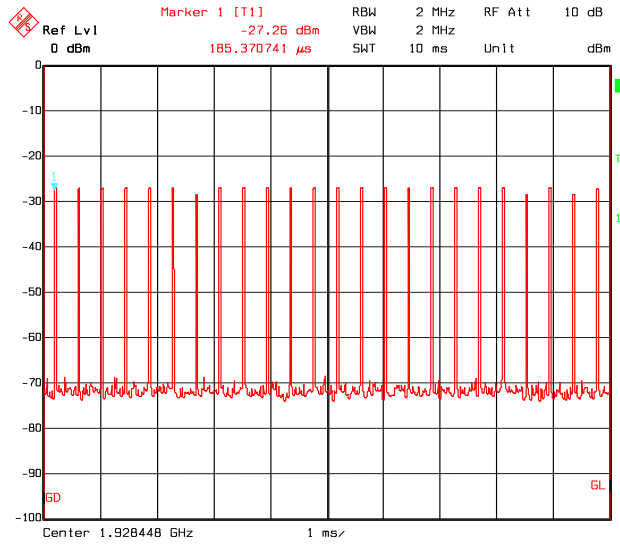
Date: 14.MAR.2006 10:03:43

35 µs pulse, Fall Time



Date: 14.MAR.2006 10:12:38

35 µs pulse



Date: 15.FEB.2006 14:06:53

35 µs pulses synced to DECT frame

4.17 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) EUT must transmit on the interference free time-slot	N/A	N/A

If FCC 15.323(c)(6) option, **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, **Random Waiting Interval 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 is a DECT handset and 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

4.18 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	No transmissions	Pass
c) transmission time without acknowledgements	5.4 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	7.0 hours	Pass

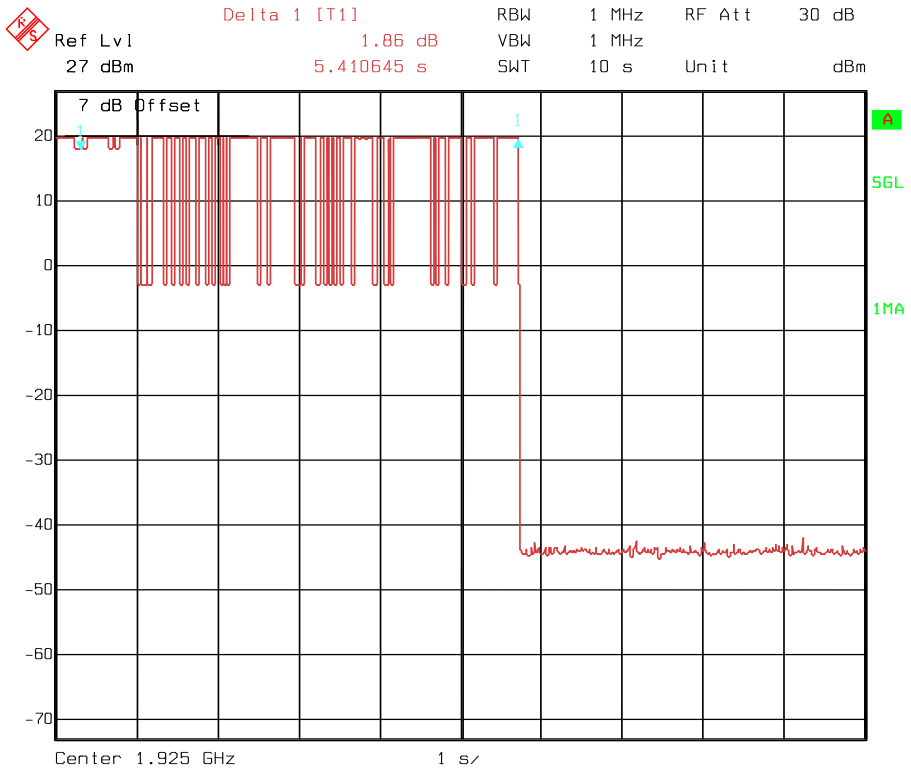
Comment: The Transmission Duration test was performed with the EUT in speakerphone mode and with the EUT in the charger. The EUT changes time slot after 7.0 hours.
 All tests were performed with the Spectrum Analyzer time synchronized to the EUT frame and by monitoring the activity on the frame. All other frequencies were blocked by administrative commands and by applying an interferer.

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 2,880,000 frames (8 hours with 10ms frame length) 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.



Duration of unacknowledged transmissions

4.19 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:

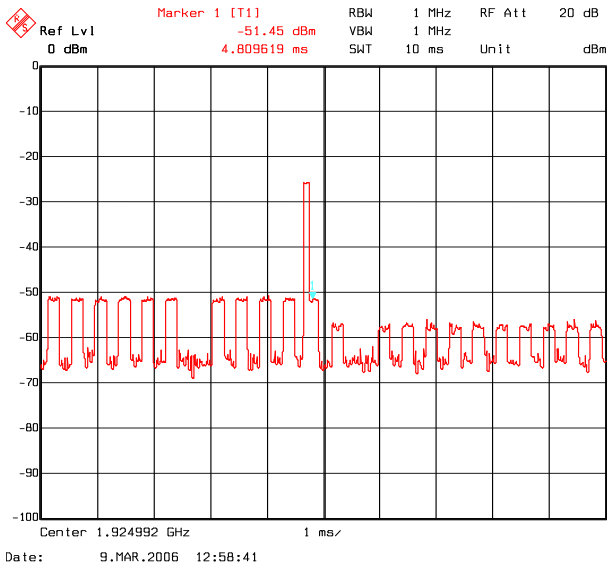
Test ref. to ANSI C63.17 clause 8.3.2	Observation	Verdict
b) EUT is restricted to a single carrier f_i for TDMA systems. The Test is Pass if EUT can transmit	EUT can transmit	Pass
c) d) Transmission on interference-free receive time/spectrum window	EUT transmits on interference free receive slot.	Pass
e) f) Transmission on interference-free transmit time/spectrum window	EUT transmits on interfered transmit slot.	Pass
g) Transmission not possible on any time/spectrum window	No connection possible. EUT shows System Busy in the display.	Pass

Comment: See plots.

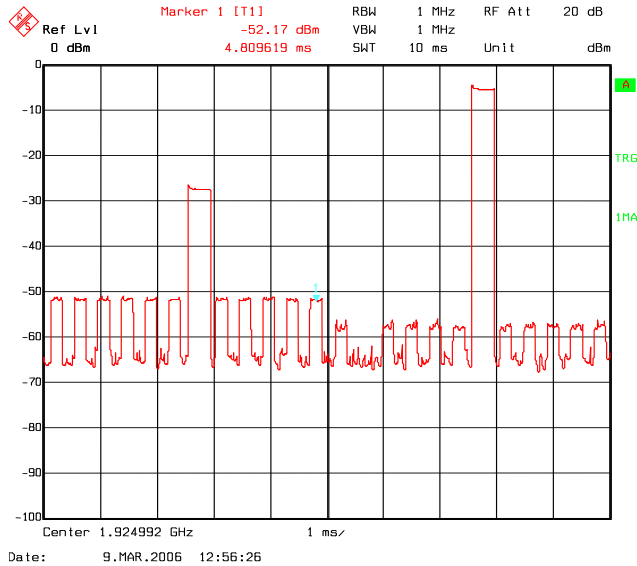
Verdict: Pass

Limits, FCC 15.323(c)(10)

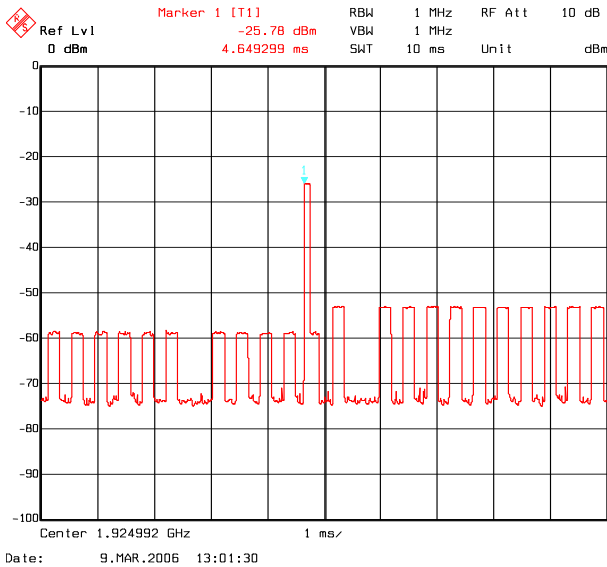
An initiating device may attempt to establish a duplex connection by monitoring both its intended transmit and receive time and spectrum windows. If both the intended transmit and receive time and spectrum windows meet the access criteria, then the initiating device can initiate a transmission in the 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.



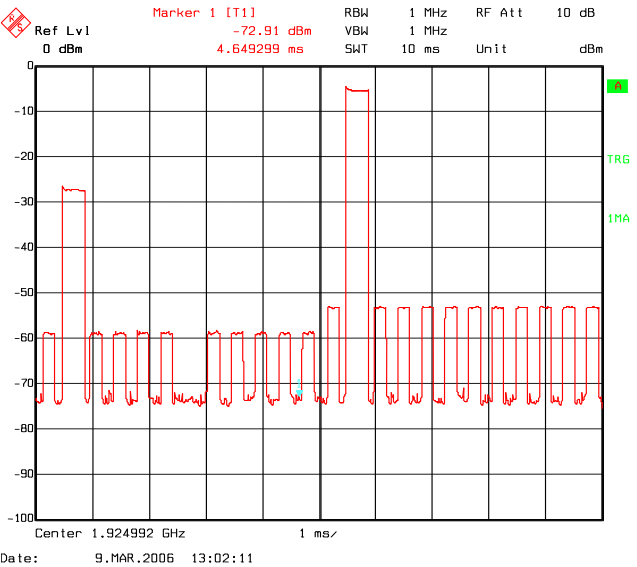
8.3.2 c) Status before Connection is made



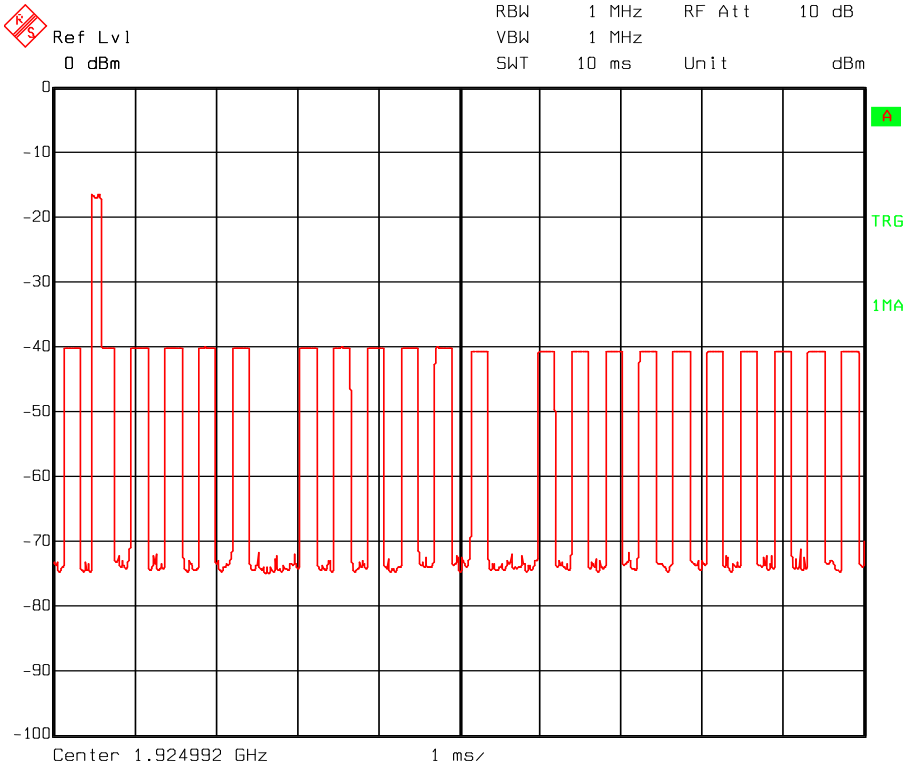
8.3.2 d) Connection on uninterfered RECEIVE slot



8.3.2 e) Status before Connection is made



8.3.2 f) Connection on uninterfered TRANSMIT slot



Date: 9.MAR.2006 13:07:20

8.3.2 g) No connection possible

4.20 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.

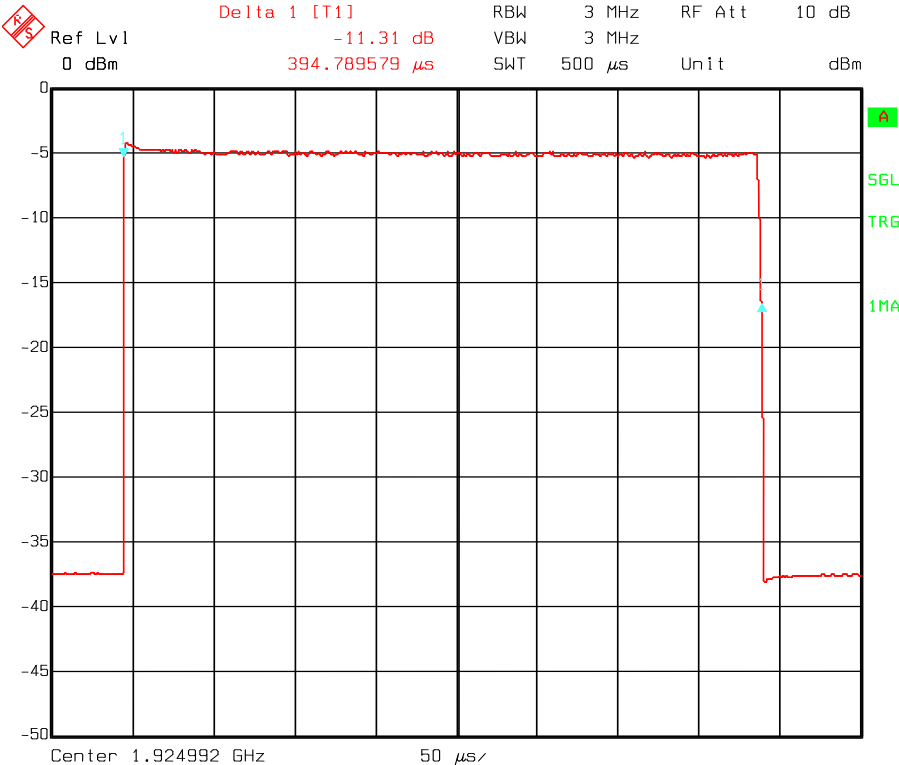
4.21 Duty Cycle Correction Factor Calculation

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

Frame length: 10ms
 Slot length: 0.395ms

Calculation of DC Correction Factor:
 $-10 \log(\text{slot length} / \text{Frame length}) = -10 \log(0.395/10) = 14.0 \text{ dB}$

Duty Cycle Correction Factor : 14.0 dB
 Max Duty Cycle Correction Factor is 20 dB



Date: 3.MAR.2006 13:18:46

Slotlength of one Full Slot
 The frame period is measured in clause 4.13

4.22 Spurious Emissions, Radiated

Measurement Procedure:

FCC 15.209

Test Results:

Radiated emission 10 kHz-30 MHz.

Measuring distance 10 m, measured with Peak detector.

No component detected, see attached graph.

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

Radiated Emissions 30 - 1000 MHz.

Detector: Quasi-Peak

Measuring distance 3 m.

Transmitter active, with charger

Frequency	Polarization	Dist. corr. factor	Field strength QP Detector 3m	Limit QP	Margin
MHz	V / H	dB	dB μ V/m	dB μ V/m	dB
41.6	V	0	24.6	40	15.6
45.8	V	0	25.5	40	14.5
974.6	V	0	36.8	54	17.2
127.0	H	0	19.0	44	25.0
135.9	H	0	19.0	44	25.0
971.1	H	0	36.7	54	

Radiated Emissions 1 - 20 GHz

Detector: Peak

Measuring distance 3 m, 1 m above 12 GHz. The turntable was rotated 360 degrees for all measurements. A check was also performed with the EUT rotated in 3 axis.

Transmitter active

Frequency	RF channel	Dist. corr. factor	Field strength, Peak, 3 meters	Duty cycle corr. factor	Limit	Margin
MHz	00 / 04	dB	dB μ V/m	dB	dB μ V/m	dB
All	00 / 04	0	No Spuriouses detected	14	54	> 10
/	/	0	/	14	54	/

Nemko COMLAB AS

26 Jan 06 16:31

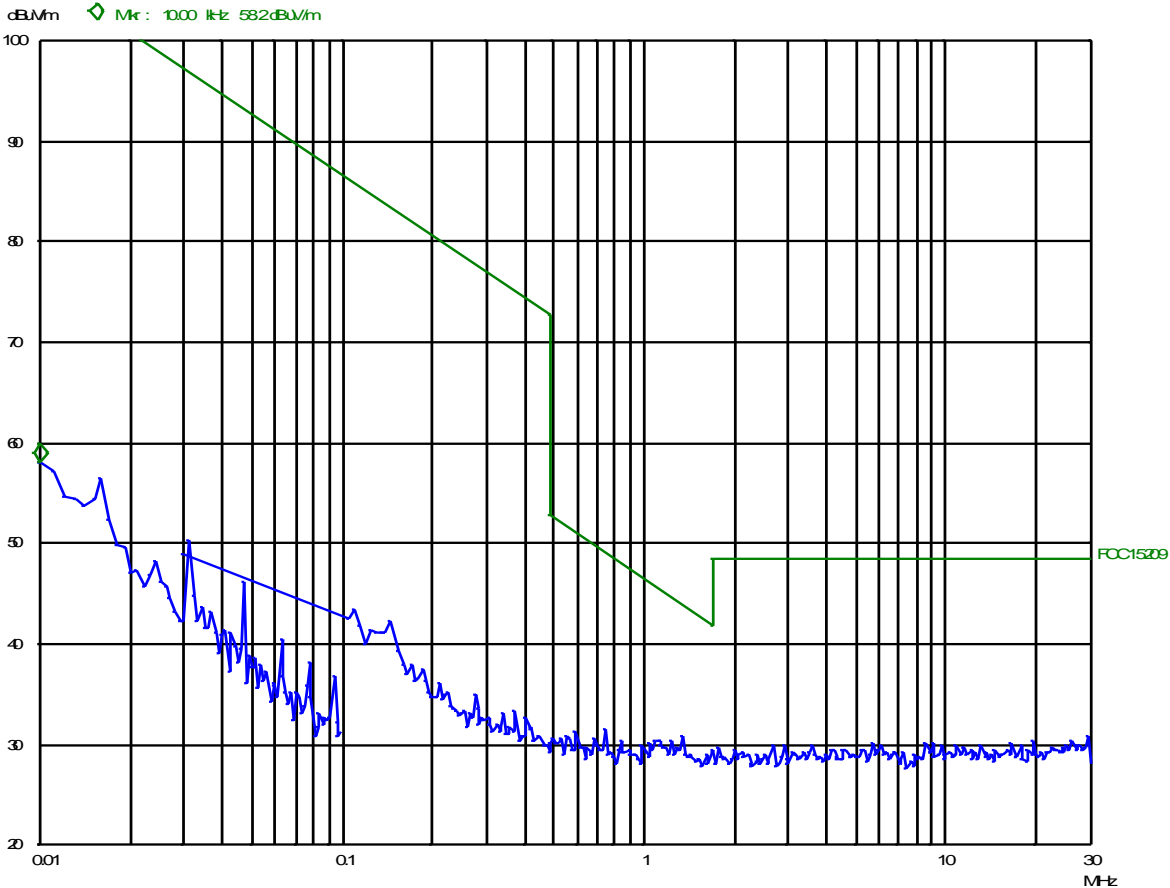
Peak

Operator: FS
 Comment: ASCOMRAID2
 FCC 15209
 TX ON With Charger

Scan Settings (4 Ranges)

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

Transducer No.	Start	Stop	Name
13	10k	30M	HFH22



Radiated Emissions, 9kHz-30MHz

Nemko Comlab AS

26. Jan 06 13:29

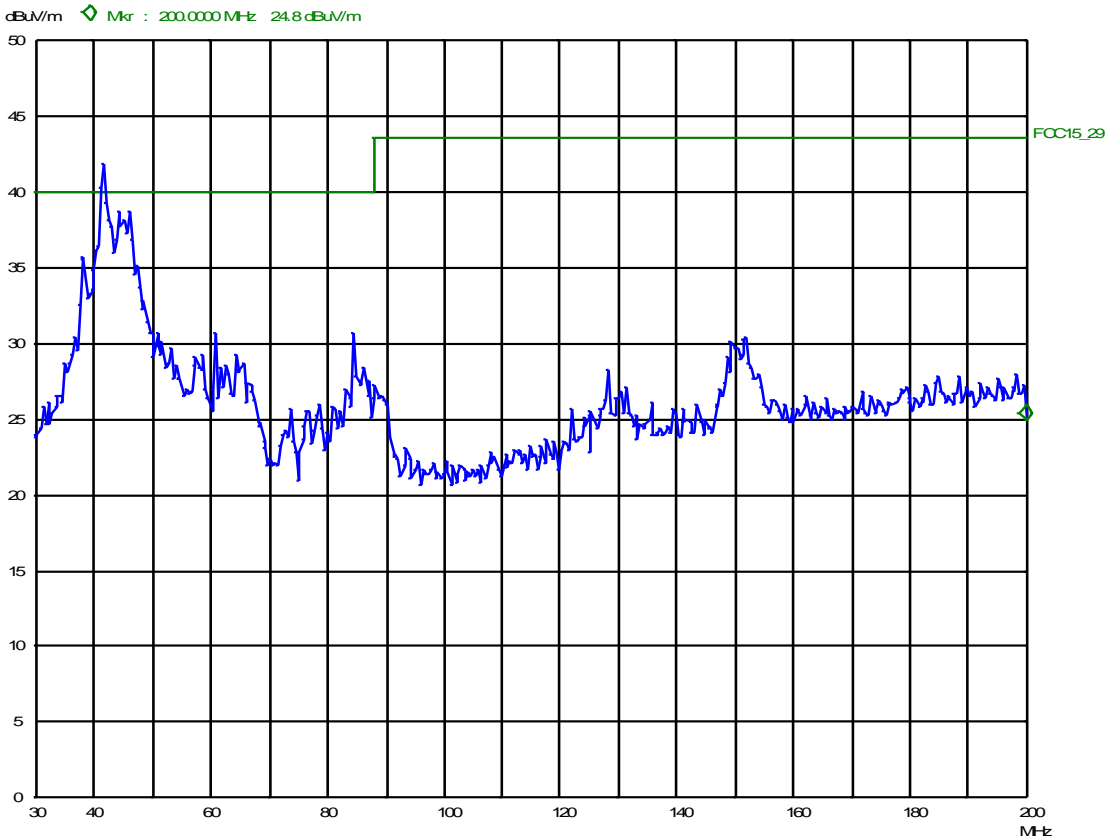
Peak

EUT: RAID2
 Manuf: ASCOM
 Op Cond: 1m vp
 Operator: fs
 Test Spec: FCC 15.209
 Comment: 3m
 TX ON In charger

Scan Settings (1 Range)

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

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



Radiated Emissions, 30-200MHz, Vertical Polarization

Nemko Comlab AS

26. Jan 06 13:43

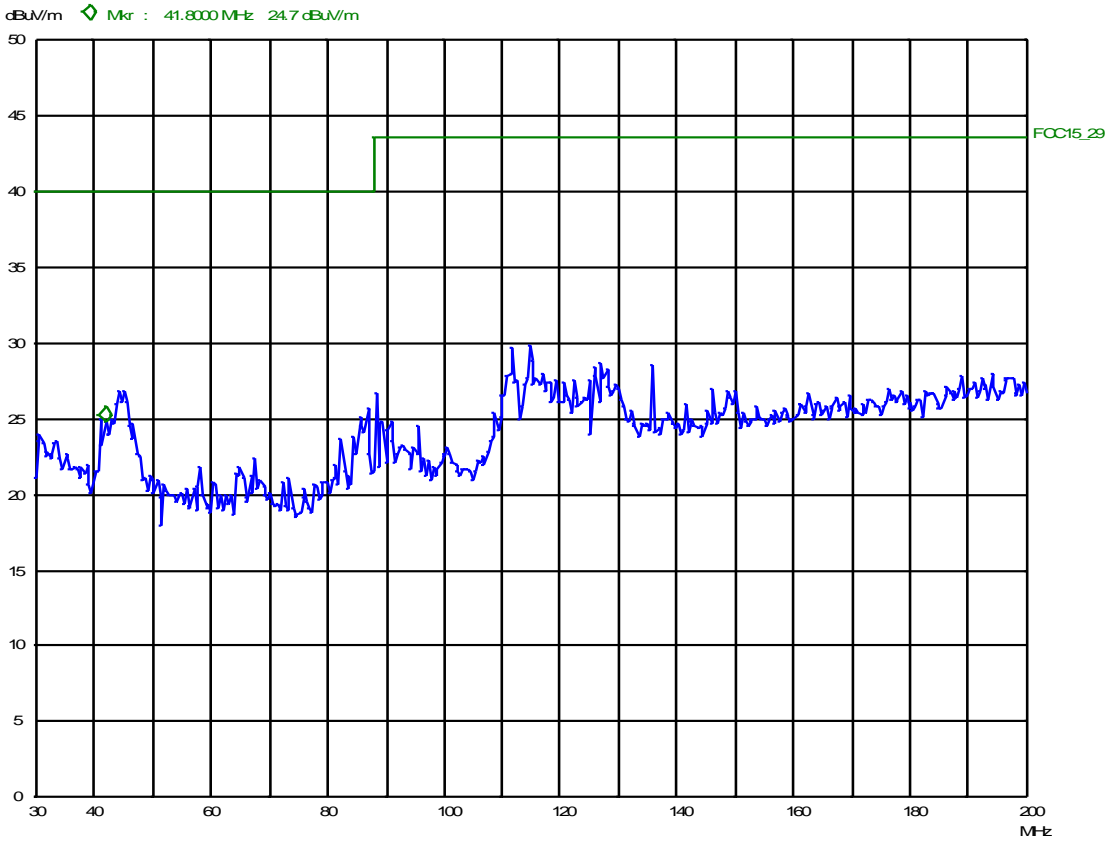
Peak

EUT: RAID2
 Manuf: ASCOM
 Op Cond: 2m hp
 Operator: fs
 Test Spec: FCC 15.209
 Comment: 3m
 TX ON 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, 30-200MHz, Horizontal Polarization

Nemko Comlab AS

26. Jan 06 14:22

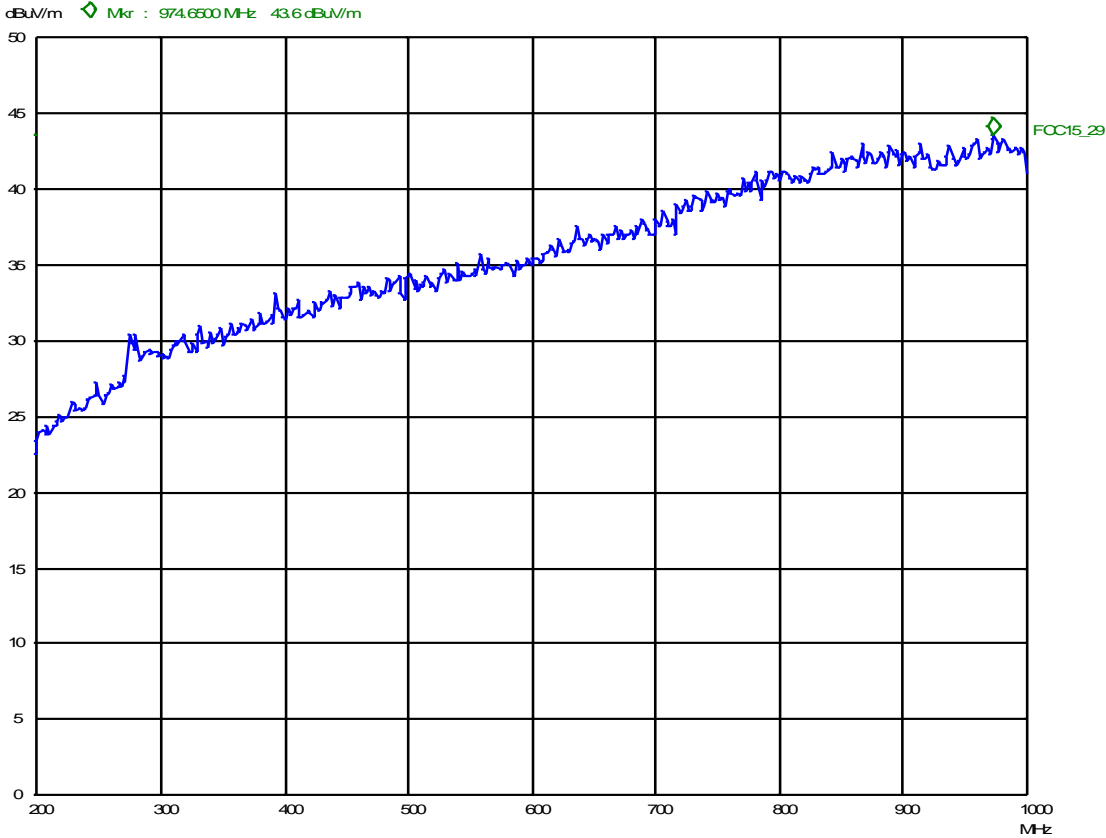
Peak

EUT: RAID2
 Manuf: ASCOM
 Op Cond: 1m vp
 Operator: fs
 Test Spec: FCC 15.209
 Comment: 3m
 TX ON, 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	50ms	AUTO	LN ON	60dB

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



Radiated Emissions, 200-1000MHz, Vertical Polarization

Nemko Comlab AS

26. Jan 06 14:46

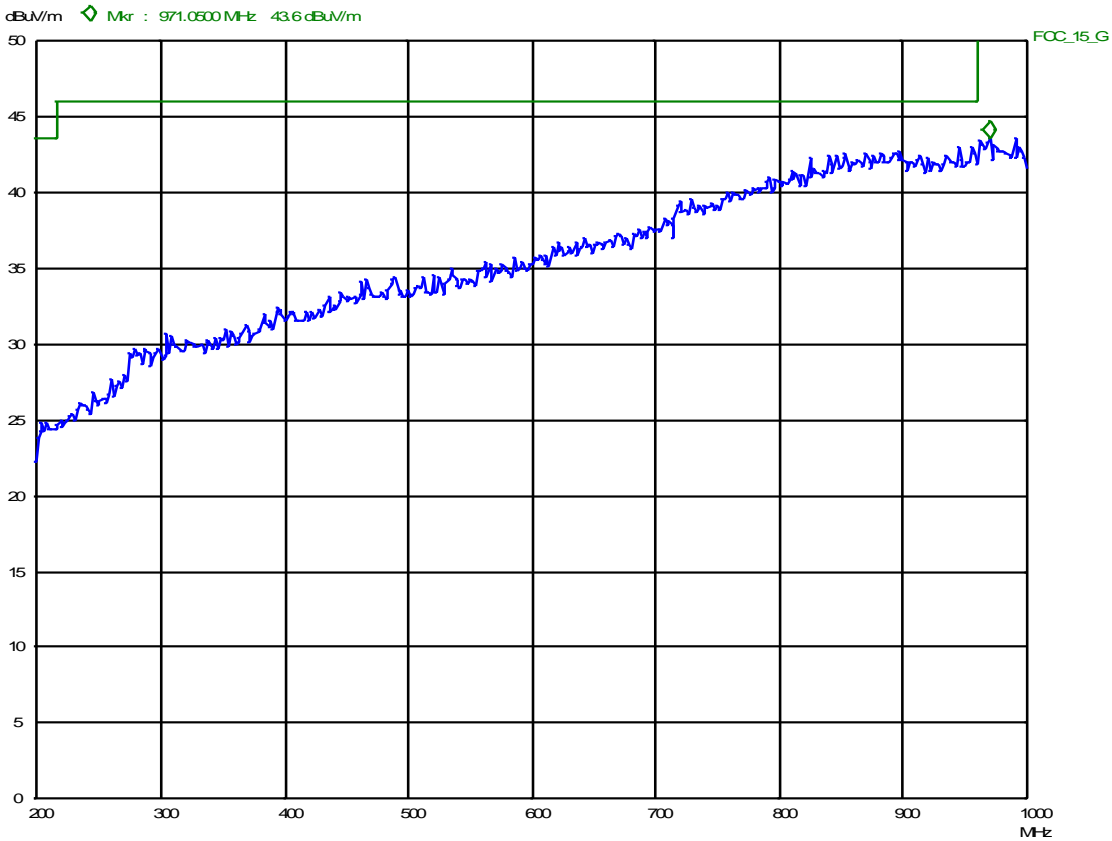
Peak

EUT: RAID2
 Manuf: ASCOM
 Op Cond: 2m hp
 Operator: fs
 Test Spec: FCC 15.209
 Comment: 3m
 TX ON, In charger

Scan Settings (1 Range)

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

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



Radiated Emissions, 200-1000MHz, Horizontal Polarization

5 Test Setups

5.1 Frequency Measurements

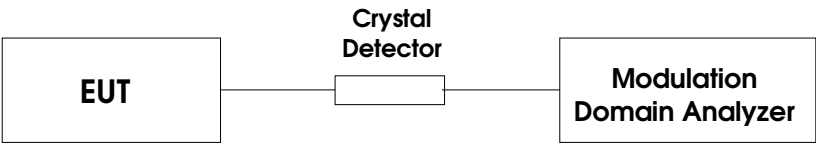


Test equipment included: 5

Test Set-up 1

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

5.2 Timing Measurements

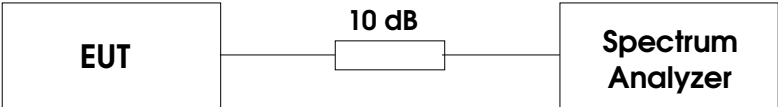


Test equipment included: 5, 7

Test Set-up 2

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

5.3 Conducted Emission Tests

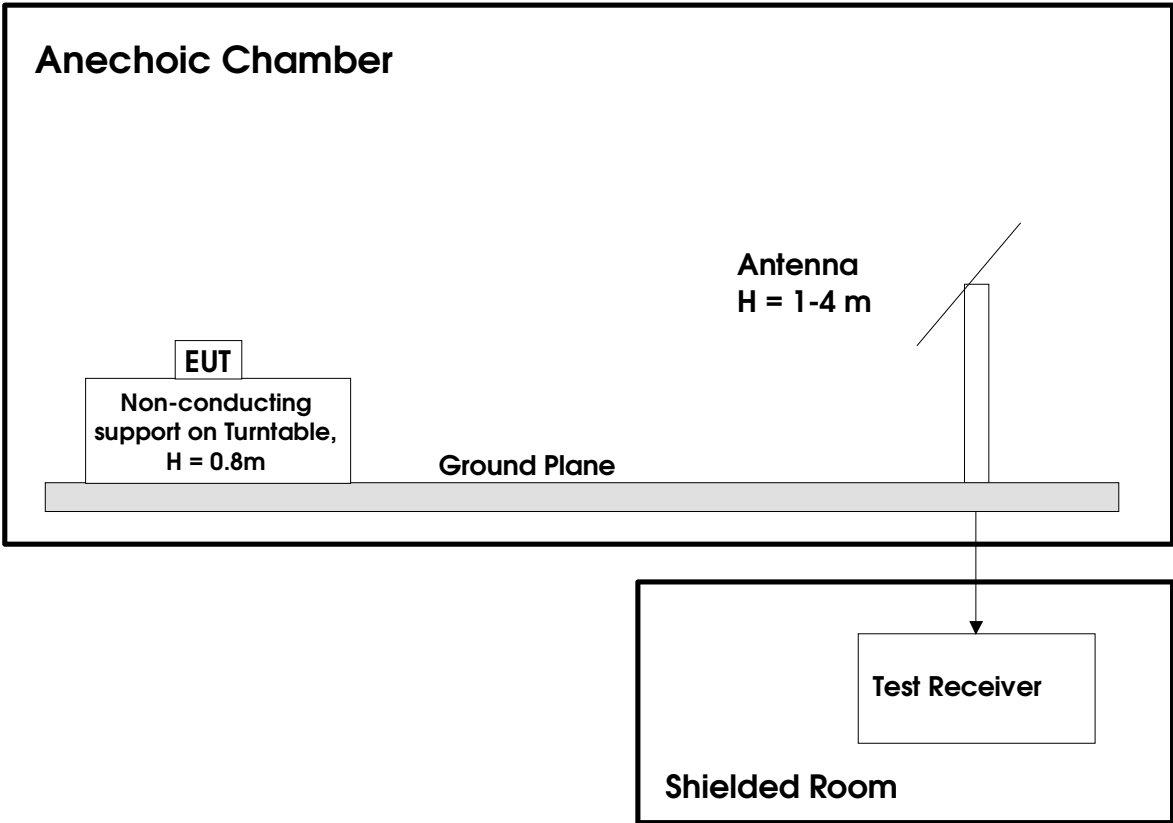


Test equipment included: 1, 13

Test Set-up 3

This setup is used for all conducted emission tests.

5.4 Radiated Emission Tests

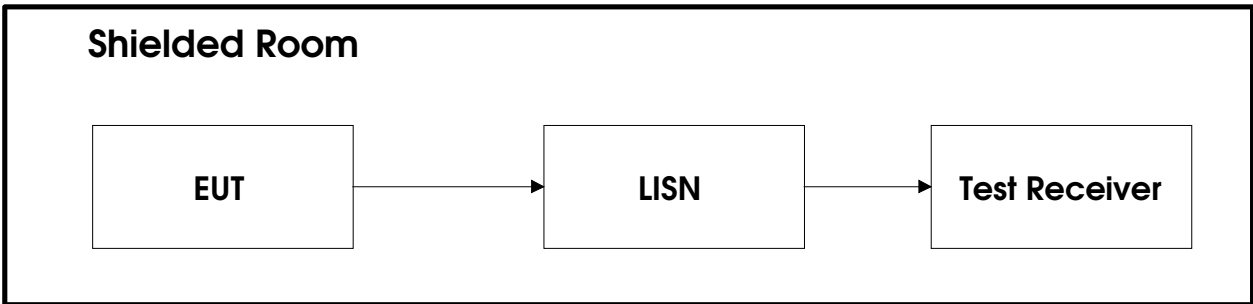


Test equipment: 1, 8, 9, 10, 11, 20, 21, 22, 23, 24, 25, 26

Test Set-Up 4

This test setup is used for all radiated emissions tests. For frequencies below 30 MHz the measuring distance is 10 m, for all other frequencies it is 3 m. Emissions above 1 GHz were measured with the Spectrum Analyzer and with Horn Antenna and with the preamplifier after the antenna.

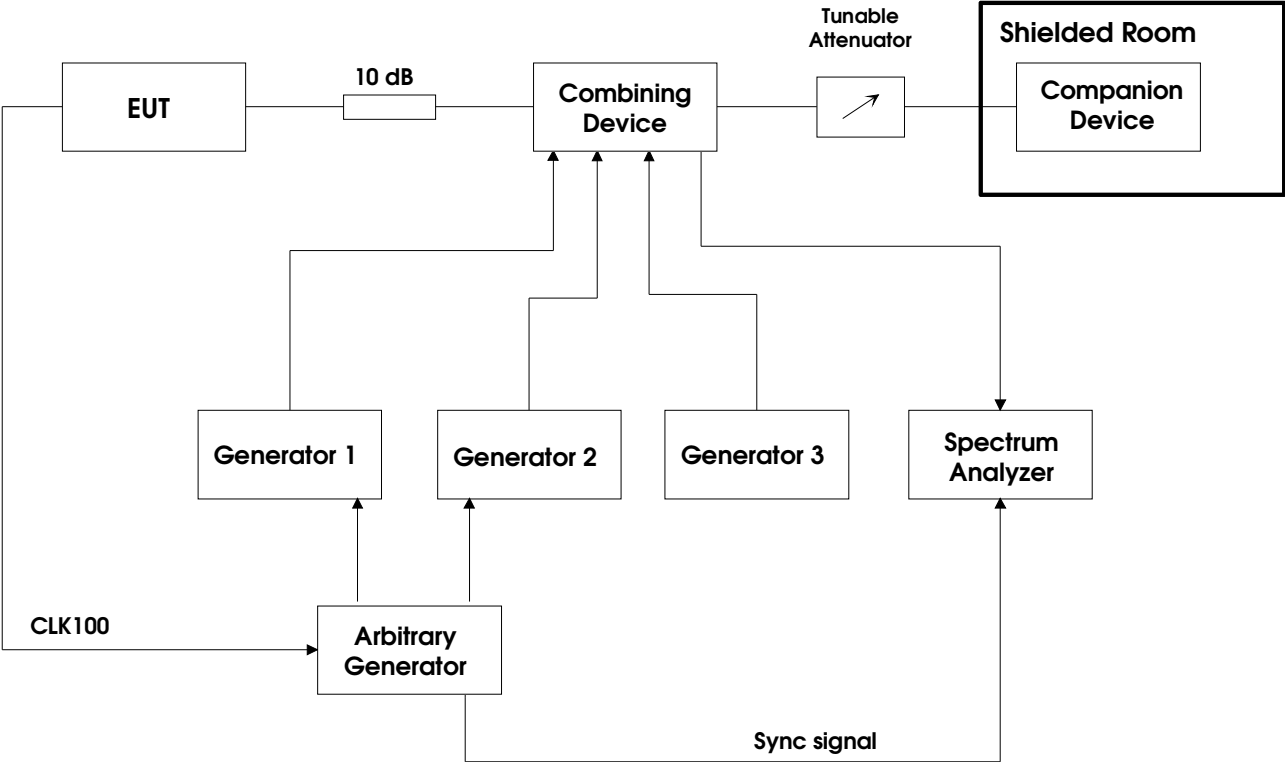
5.5 Powerline Conducted Tests



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	AFG320	Arbitrary Generator	Sony Tektronix	S.No.: J311690
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