

**A RADIO TEST REPORT
FOR
UNIDEN CORPORATION
ON**

700503100 (D160 DECT Handset NA)

DOCUMENT NO. TRA-007213-W-US-1

HULL

Unit E, South Orbital Trading Park, Hedon Road, Hull, HU9 1NJ, UK.

T +44 (0)1482 801801 **F** +44 (0)1482 801806 **E** test@tracglobal.com

www.tracglobal.com

TRaC Wireless Test Report : TRA-007213-W-US-1

Applicant : Uniden Corporation

Apparatus : 700503100 (D160 DECT Handset NA)

Specification(s) : CFR47 Part 15D

Purpose of Test : **Certification**

FCCID : AMWUP683R

Authorised by

: 

: Radio Product Manager

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Section 1:**Introduction****1.1 General**

This report contains an assessment of an apparatus against Electromagnetic Compatibility Standards based upon tests carried out on samples submitted to the Laboratory.

Test performed by: TRaC Global []
Unit E
South Orbital Trading Park
Hedon Road
Hull, HU9 1NJ.
United Kingdom.

Telephone: +44 (0) 1482 801801
Fax: +44 (0) 1482 801806

TRaC Global [X]
Unit 1
Pendle Place
Skelmersdale
West Lancashire, WN8 9PN
United Kingdom

Telephone: +44 (0) 1695 556666
Fax: +44 (0) 1695 577077

Email: test@tracglobal.com
Web site: <http://www.tracglobal.com>

Tests performed by: D. Winstanley

Report author: D. Winstanley

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1.2 Tests Requested By

This testing in this report was requested by :

Uniden Corporation
2-12-7 Hatchobori
Chuo-ku
Tokyo
104-8512
Japan

1.3 Manufacturer

Uniden Vietnam Ltd
LOT 5.1 Tan Truong Industrial Zone
Cam Giang District
Hai Duong Province
Vietnam

1.4 Apparatus Assessed

The following apparatus was assessed between the dates 20th February – 30th May 2012:

700503100 (D160 DECT Handset NA)

1.5 System Description

The system is made up of two parts, a fixed part and a portable part. The portable part is a cordless handset device. The portable part is capable of operating on a maximum of 60 channels (time spectrum windows). The fixed part is a wall mounted base station transmitter.

The system operates in the 1920MHz -1930MHz band. The system use 5 different frequency channels 1.728MHz apart using MC/TDMA/TDD (Multi Carrier / Time Division Multiple Access / Time Division Duplex) using GFSK modulation.

The system employs a 10ms frame, divided into 24 equal timeslots, numbered 0-23. The Base station always transmits in the first half of the frame, and the Portable always transmits on the duplex mate in the second half of the frame.

The portable part is the initiating device. A physical bearer is composed of a transmit single-slot and a receive single-slot for narrowband communications. The two halves of a given bearer are always exactly half a frame (5ms, 12 single slots) apart.

During the testing operation was restricted to certain channels during the tests by the use of out of operating region interference. A portable part and a fixed part with a temporary antenna connector were supplied to allow conducted measurements where applicable.

1.6 Test Result Summary

Full details of test results are contained within Appendix A. The following table summarises the results of the assessment.

The statements relating to compliance with the standards below apply ONLY as qualified in the notes and deviations stated in sections 1.6 to 1.7 of this test report.

Full details of test results are contained within Appendix A. The table overleaf summarises the results of the assessment.

Abbreviations used in the overleaf table:

CFR : Code of Federal Regulations
RSS : Radio Standards Specification

ANSI : American National Standards Institution
PLCE : Power Line Conducted Emissions

TEST/EXAMINATION	Part 15	Result
Coordination with Fixed Microwave Service	15.307 (b)	No Note 1
Cross reference to Subpart B	15.309 (b)	-
Labelling Requirements	15.311 15.19 (a)(3)	-
Measurement Procedures	15.313	-
Antenna Requirement	15.317 15.203	Pass
Modulation Techniques	15.319 (b)	Pass
Conducted AC Powerline	15.315 15.207	Pass
Emission Bandwidth	15.323 (a)	Pass
Peak Transmit Power	15.319 (c)	Pass
Power Spectral Density	15.319 (d)	Pass
Antenna Gain	15.319 (e)	Pass
Automatic Discontinuation of Transmission	15.319 (f)	Pass
Radio Frequency Radiation Exposure	15.319 (i)	Pass
Monitoring Thresholds	15.323 (c)(2) 15.323 (c)(9)	Pass
Monitoring of Intended Transmit Window and Maximum Reaction Time	15.323 (c)(1)	Pass
Monitoring Bandwidth	15.323 (c)(7)	Pass
Access Criteria Functional Test	15.323 (c)(6)	No Note 2
Duration of Transmission	15.323 (c)(3)	Pass
Connection Acknowledgement	15.323 (c)(4)	Pass
Lower threshold Selected Channel, Power Accuracy, Segment Occupancy	15.323 (c)(5)	Pass
Monitoring Antenna	15.323 (c)(8)	Pass
Duplex Connections	15.323 (c)(10)	N/A Note 6
Alternative Monitoring Interval for Co-located Devices	15.323 (c)(11)	N/A Note 5
Fair Access to Spectrum Related to (c)(10) & (c)(11)	15.323 (c)(12)	N/A Note 5
Emission Inside and Outside the Sub-band	15.323 (d)	Pass
Frame Period	15.323 (e)	Pass
Frequency Stability	15.323 (f)	Pass

- Note:
1. Requirement removed April 4th 2005 see public notice DX 05-1005.
 2. The portable part has a removable battery that is charged separately.
 3. The portable part connects indirectly via the fixed part report for results
 4. The EUT does not transmit control and signalling information.
 5. Not utilized by this EUT as devices will not be co-located within 1m of each other.
 6. Manufacturer declares the EUT does not utilise the provisions of 15.323 (c)(10)

1.7 Notes Relating to the Assessment

With regard to this assessment, the following points should be noted:

The results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

The apparatus was set up and exercised using the configurations, modes of operation and arrangements defined in this report only.

Particular operating modes, apparatus monitoring methods and performance criteria required by the standards tested to have been performed except where identified in Section 1.7 of this test report (Deviations from Test Standards).

For emissions testing, throughout this test report, "Pass" indicates that the results for the sample as tested were below the specified limit (refer also to Section 2, Measurement Uncertainty).

Where relevant, the apparatus was only assessed using the monitoring methods and susceptibility criteria defined in this report.

All testing with the exception of testing at the Open Area Test Site was performed under the following environmental conditions:

Temperature	: 17 to 23 °C
Humidity	: 45 to 75 %
Barometric Pressure	: 86 to 106 kPa

All dates used in this report are in the format dd/mm/yy.

This assessment has been performed in accordance with the requirements of ISO/IEC 17025.

1.8 Deviations from Test Standards

There were no deviations from the standards tested to.

Section 2:**Measurement Uncertainty****2.1 Measurement Uncertainty Values**

For the test data recorded in accordance with note (iii) of Section 2.1 the following measurement uncertainty was calculated:

Radio Testing – General Uncertainty Schedule

All statements of uncertainty are expanded standard uncertainty using a coverage factor of 1.96 to give a 95% confidence where no required test level exists.

[1] Adjacent Channel Power

Uncertainty in test result = **1.86dB**

[2] Carrier Power

Uncertainty in test result (Power Meter) = **1.08dB**

Uncertainty in test result (Spectrum Analyser) = **2.48dB**

[3] Effective Radiated Power

Uncertainty in test result = **4.71dB**

[4] Spurious Emissions

Uncertainty in test result = **4.75dB**

[5] Maximum frequency error

Uncertainty in test result (Power Meter) = **0.113ppm**

Uncertainty in test result (Spectrum Analyser) = **0.265ppm**

[6] Radiated Emissions, field strength OATS 14kHz-18GHz Electric Field

Uncertainty in test result (14kHz – 30MHz) = **4.8dB**,

Uncertainty in test result (30MHz – 1GHz) = **4.6dB**,

Uncertainty in test result (1GHz – 18GHz) = **4.7dB**

[7] Frequency deviation

Uncertainty in test result = **3.2%**

[8] Magnetic Field Emissions

Uncertainty in test result = **2.3dB**

[9] Conducted Spurious

Uncertainty in test result – Up to 8.1GHz = **3.31dB**

Uncertainty in test result – 8.1GHz – 15.3GHz = **4.43dB**

Uncertainty in test result – 15.3GHz – 21GHz = **5.34dB**

Uncertainty in test result – Up to 26GHz = **3.14dB**

[10] Channel Bandwidth

Uncertainty in test result = **15.5%**

[11] Amplitude and Time Measurement – Oscilloscope

Uncertainty in overall test level = **2.1dB**,
Uncertainty in time measurement = **0.59%**,
Uncertainty in Amplitude measurement = **0.82%**

[12] Power Line Conduction

Uncertainty in test result = **3.4dB**

[13] Spectrum Mask Measurements

Uncertainty in test result = **2.59% (frequency)**
Uncertainty in test result = **1.32dB (amplitude)**

[14] Adjacent Sub Band Selectivity

Uncertainty in test result = **1.24dB**

[15] Receiver Blocking – Listen Mode, Radiated

Uncertainty in test result = **3.42dB**

[16] Receiver Blocking – Talk Mode, Radiated

Uncertainty in test result = **3.36dB**

[17] Receiver Blocking – Talk Mode, Conducted

Uncertainty in test result = **1.24dB**

[18] Receiver Threshold

Uncertainty in test result = **3.23dB**

[19] Transmission Time Measurement

Uncertainty in test result = **7.98%**

Section 3:

Modifications

3.1 Modifications Performed During Assessment

No modifications were performed during the assessment

Appendix A:**Formal Emission Test Results**

Abbreviations used in the tables in this appendix:

Spec	: Specification	ALSR	: Absorber Lined Screened Room
Mod	: Modification	OATS	: Open Area Test Site
		ATS	: Alternative Test Site
EUT	: Equipment Under Test		
SE	: Support Equipment	Ref	: Reference
		Freq	: Frequency
L	: Live Power Line		
N	: Neutral Power Line	MD	: Measurement Distance
E	: Earth Power Line	SD	: Spec Distance
Pk	: Peak Detector	Pol	: Polarisation
QP	: Quasi-Peak Detector	H	: Horizontal Polarisation
Av	: Average Detector	V	: Vertical Polarisation
CDN	: Coupling & decoupling network		

A1 Cross Reference To Subpart B

CFR 47 Part 15.309(b)

The unit contains digital circuitry, which is not directly related to the radio transmitter. See emissions outside the sub-band for results.

A2 Labelling Information

CFR 47 Part 15.311 & 15.19(a)(3)

This information is contained in a separate document. See attached exhibit.

A3 Antenna Requirements

CFR 47 Part 15.317 & 15.203

The unit employs an integral antenna arrangement.

A4 Modulation Techniques

CFR 47 Part 15.139(b)

The Uniden Corporation 700503100 (D160 DECT Handset NA) is an isochronous device operating in the 1920 MHz – 1930 MHz frequency band.

The Uniden Corporation 700503100 (D160 DECT Handset NA) modulation technique is based on DECT technology as described in European standards EN 300 175-2 and EN 300 175-3.

The Uniden Corporation 700503100 (D160 DECT Handset NA) modulation techniques are MC/TDMA/TDD (Multi Carrier / Time Division Multiple Access / Time Division Duplex) using QPSK modulation.

A5 Radio Frequency Radiation Exposure

CFR 47 Part 15.319(i)

This information is contained in a separate document

A6 Transmitter Emission Bandwidth

Test Details:	
Regulation	CFR 47 Part 15.323(a)
Measurement standard	ANSI C63.17 sub-clause 6.1.3
EUT sample number	S46
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Test Details: $f_i = 1921.536$ MHz				
ΔP (dBc)	f_l (MHz)	f_h (MHz)	Δf (MHz)	Limit
-26	1920.836962	1922.233115	1.396	50kHz > Δf > 2.5MHz
-12	1920.942731	1922.127346	1.185	N/A
-6	1921.423500	1921.858115	0.435	N/A

Test Details: $f_c = 1924.992$ MHz				
ΔP (dBc)	f_l (MHz)	f_h (MHz)	Δf (MHz)	Limit
-26	1924.304500	1925.689115	1.385	50kHz > Δf > 2.5MHz
-12	1924.400654	1925.583346	1.183	N/A
-6	1924.891038	1925.314115	0.423	N/A

Test Details: $f_h = 1928.448$ MHz				
ΔP (dBc)	f_l (MHz)	f_h (MHz)	Δf (MHz)	Limit
-26	1927.757615	1929.145115	1.388	50kHz > Δf > 2.5MHz
-12	1927.858577	1929.039346	1.181	N/A
-6	1928.339346	1928.770115	0.431	N/A

A7 Peak Transmit Power

Test Details:	
Regulation	CFR 47 Part 15.319(c)
Measurement standard	ANSI C63.17 sub-clause 6.1.2
EUT sample number	S46
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Frequency (MHz)	Peak Transmit Power (dBm)	Limit (dBm)
1921.536	20.03	20.72
1924.992	20.00	20.72
1928.448	20.05	20.72

Note: 1. Permanent antenna was replaced with temporary antenna connector to enable conducted measurement.
 2. Antenna gain < 3dBi and so correction of the limit is not required.
 3. See Annex E for Peak Transmit Power Plots.

Limit

The limit for Peak Transmit Power (PTP) is calculated using the following formula:

$$PTP = 5 \log_{10} EBW - 10 \text{ dBm}$$

This limit must be corrected to take into account any gain of the antenna greater than 3dBi.
 Where: EBW is the transmitter emission bandwidth in Hz as determined in the previous test.

$$EBW = 1.396 \text{ MHz}$$

$$PTP = 5 \log_{10} 1.396 - 10 \text{ dBm}$$

$$PTP = 20.72 \text{ dBm}$$

A8 Power Spectral Density

Test Details:	
Regulation	CFR 47 Part 15.319(d)
Measurement standard	ANSI C63.17 sub-clause 6.1.2
EUT sample number	S46
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Frequency (MHz)	Power Spectral Density (mW/3kHz)	Limit (mW/3kHz)
1921.536	1.30	3
1924.992	1.25	3
1928.448	1.43	3

- Note:
1. Permanent antenna was replaced with temporary antenna connector to enable conducted measurement.
 2. Antenna gain < 3dBi and so correction of the limit is not required.
 3. See Annex E for Peak Transmit Power Plots.

Limit

The power spectral density shall not exceed 3mW in any 3 kHz bandwidth as measured with a spectrum analyser having a resolution bandwidth of 3 kHz.

A9 Antenna Gain**CFR 47 Part 15.319(e)**

Any directional gain of the antenna exceeding 3dBi has an effect on the limit applied to the measurements taken for the peak transmit power test. If the directional gain of the antenna is less than 3dBi it is not required to be taken into account.

Maximum Type & Antenna Gain	Exceeds 3dBi by
1/4λ-L Antenna -1.0dBi	N/A

A10 Automatic Discontinuation of Transmissions

Test Details:	
Regulation	CFR 47 Part 15.319(f)
Measurement standard	ANSI C63.17 sub-clause 6.1.2
EUT sample number	S46
Modification state	0
SE in test environment	None
SE isolated from EUT	S19, S33, S36, S42
EUT set up	Refer to Appendix C

Automatic discontinuation of transmission means break off of transmissions that are not control and signalling information.

The 700503100 (D160 DECT Handset NA) is a Portable part and as such does not transmit control and signalling information the counter part device is a fixed part device and does transmit control and signalling information.

Part	Transmits Control and Signalling Information	Equipment Under Test
Fixed Part	X	
Portable Part		X

Results

The following tests were performed after a connection had been established with the counter part device

Number	Test	Reaction of EUT	Pass / Fail
1	Battery Removed	C	Pass
2	Seated In Charger	C	Pass
3	Removal of RJ45 Cable from Counterpart	A	Pass

A – Connection breakdown, Cease of all transmissions.

B – Connection breakdown, EUT transmits control and signalling information.

C – Connection breakdown, Counterpart transmits control and signalling information.

A11 Monitoring Thresholds

Test Details:	
Regulation	CFR 47 Part 15.323(c)(2) & (c)(9)
Measurement standard - Calculation	ANSI C63.17 sub-clause 7.2.1
Calculations	As laid out in ANSI C63.17 sub-clauses 4.3.3 and 4.3.4
Measurement standard	ANSI C63.17 sub-clause 7.3
EUT sample number	S46
Modification state	0
SE in test environment	None
SE isolated from EUT	S19, S33, S36, S42
EUT set up	Refer to Appendix C

Calculation of monitoring threshold limits for isochronous devices:

$$\text{Lower threshold: } T_L = -174 + 10\log_{10}B + M_U + P_{MAX} - P_{EUT} \text{ (dBm)}$$

$$\text{Upper threshold: } T_U = -174 + 10\log_{10}B + M_U + P_{MAX} - P_{EUT} \text{ (dBm)}$$

Where:

- B = Emission bandwidth (Hz)
- M_U = dBs the threshold may exceed thermal noise (30 for T_L & 50 for T_U)
- P_{MAX} = Output Power Limit (dBm)
- P_{EUT} = Transmitted power (dBm)

Monitor Threshold	B (MHz)	M_U (dB)	P_{MAX} (dBm)	P_{EUT} (dBm)	Threshold (dBm)
T_L	1.396	30	20.72	20.05	-81.9
T_U	1.396	50	20.72	20.05	-61.9

Note: 1. Threshold levels rounded up/down to nearest whole number

The threshold level was determined following the procedure as laid out in ANSI C63.17 sub-clause 7.3.2 (a) Frequency administration was used to allow operation on the carrier closest to the centre of the band.

Limits

The EUT must not transmit until the interference level is less than or equal to:

$$\text{Measured Threshold Level} \leq T_U + U_M$$

Where:

- T_U = Calculated Upper threshold level
- T_L = Calculated Lower threshold level
- U_M = Margin of uncertainty in threshold measurements (6dB)

Results

Monitor threshold	Measured Threshold Level	Limit	Pass/Fail
Lower Threshold (dBm)	-	-	Pass
Upper threshold (dBm)	-65.9	-55.9	Pass

A12 Monitoring of Intended Transmit Window & Maximum Reaction Time

Test Details:	
Regulation	CFR 47 Part 15.323(c)(1)
Measurement standard	ANSI C63.17 sub-clause 7.5
EUT sample number	S46
Modification state	0
SE in test environment	None
SE isolated from EUT	S19, S33, S36, S42
EUT set up	Refer to Appendix C

The EUT was restricted to only one operating frequency channel. The interference generator was fed pulses from the function generator to produce a pulsed carrier of the specified time length and the output of the interference generator was set to the required level. The pulse generator and companion device were synchronized so the position of the pulses corresponded to the time-slot pattern in the frame of the EUT.

For each of the required tests the pulse width and interference level are as below:

Test c)

With the interference generator output set at the relevant calculated threshold level plus measurement uncertainty (U_M) and the width of the pulse interference exceeds the largest of $50\mu\text{s}$ and $50\sqrt{1.25/B} \mu\text{s}$ verify that the EUT does not establish a connection.

Test d)

With the interference generator output set at 6dB above the relevant calculated threshold level plus measurement uncertainty (U_M) and the width of the pulse interference exceeds the largest of $35\mu\text{s}$ and $35\sqrt{1.25/B} \mu\text{s}$ verify that the EUT does not establish a connection.

Where B = Emission bandwidth of the EUT in MHz

Results

Test Equation (μs)	Pulse Width (μs)	Interferer Level (dBm)	Connection Made	Pass/Fail
$50\sqrt{1.25/B}$	50	$T_U + U_m$	No	Pass
$35\sqrt{1.25/B}$	35	$T_U + U_m + 6$	No	Pass

Notes:

1. T_U is the calculated upper threshold.
2. U_M is Margin of uncertainty in threshold measurements (6dB).

A13 Monitoring Bandwidth & Antenna

Monitoring Bandwidth – CFR 47 Part 15.323(c)(7)

The monitoring bandwidth test was carried out in accordance with ANSI C63.17 sub-clause 7.4.

ANSI C63.17 sub-clause 7.4 states that if the monitoring is made through the radio receiver used by the EUT for communication the intended bandwidth requirements for the monitoring system are met.

As declared by the manufacturer the EUT uses the radio receiver used for communication for monitoring therefore the intended bandwidth requirements for the monitoring system are met of ANSI C63.17 sub-clause 7.4 are met.

Monitoring Antenna – CFR 47 Part 15.323(c)(8)

The antenna of the EUT used for transmitting is the same antenna that is used for monitoring.

A14 Power Accuracy

CFR 47 Part 15.323(c)(5)

The power measurement resolution for the previous comparison must be accurate to within 6dB.

The monitoring threshold test covered in Part 15.323 (c)(2) automatically proves that this requirement is met.

A15 Segment Occupancy

CFR 47 Part 15.323(c)(5)

The manufacturer declares that no device or group of co-operating devices located within 1meter of each other shall, during any frame period, occupy more than 6 MHz of aggregate bandwidth, or alternatively, more than one third of the time and spectrum windows defined by the system.

A16 Duration Of Transmission

Test Details:	
Regulation	CFR 47 Part 15.323(c)(3)
Measurement standard	ANSI C63.17 sub-clause 8.2.2
EUT sample number	S46
Modification state	0
SE in test environment	None
SE isolated from EUT	S19, S33, S36, S42
EUT set up	Refer to Appendix C

The test was carried out in two parts. The first was to verify that with the companion device off the EUT does not transmit on the same time/spectrum window for more than the limit.

Result

Repetition of Access Criteria	Maximum Transmission Time	Maximum Transmission Time Limit	Pass/Fail
Period	5 hours 13.56 minutes	<8 Hours	Pass

Note: 1. The portable part is the initiating device that repeats the access criteria

A17 Connection Acknowledgement

Test Details:	
Regulation	CFR 47 Part 15.323(c)(4)
Measurement standard	ANSI C63.17 sub-clause 8.2.1
EUT sample number	S46
Modification state	0
SE in test environment	None
SE isolated from EUT	S19, S33, S36, S42
EUT set up	Refer to Appendix C

The test was carried out in two parts. The first was to verify that with the companion device off the EUT does not transmit on the same time/spectrum window for more than the limit. The second was to verify that after a connection is broken the EUT terminates its transmission on the current communication channel within 30 seconds or less.

Result

Test	Time Taken (seconds)	Limit (seconds)	Pass/Fail
Transmission on communications channel no acknowledgement received (note 1)	0	1	Pass
Established communication channel termination, acknowledgements blocked during communication (note 1)	5.15	30	Pass

- Note:
1. The companion device transmits a beacon signal when acknowledgements are blocked.
 2. The EUT does not transmit a control channel.
 3. See Appendix B for Acknowledgement plots.

A18 Least Interfered Channel (LIC) Procedure

Test Details:	
Regulation	CFR 47 Part 15.323(c)(5)
Measurement standard	ANSI C63.17 sub-clause 7.3.3
EUT sample number	S46
Modification state	0
SE in test environment	None
SE isolated from EUT	S19, S33, S36, S42
EUT set up	Refer to Appendix C

The EUT utilizes more than 40 channels; therefore the least interfered channel testing is applicable.

The EUT was restricted to operating on two frequencies only, f1 and f2.

f1 = 1924.992 MHz

f2 = 1926.720 MHz

Test b)

Interference on f1 was set at $T_L + U_M + 7\text{dB}$ and at $T_L + U_M$ on f2. Initiate communication. The EUT should transmit on f2. Repeat 5 times. If the EUT transmits on f1 the test is failed.

Test c)

Interference on f1 was set at $T_L + U_M$ and at $T_L + U_M + 7\text{dB}$ on f2. Initiate communication. The EUT should transmit on f1. Repeat 5 times. If the EUT transmits on f2 the test is failed.

Test d)

Interference on f1 was set at $T_L + U_M + 1\text{dB}$ and at $T_L + U_M - 6\text{dB}$ on f2. Initiate communication. The EUT should transmit on f2. Repeat 5 times. If the EUT transmits on f1 the test is failed.

Test e)

Interference on f1 was set at $T_L + U_M - 6\text{dB}$ and at $T_L + U_M + 7\text{dB}$ on f2. Initiate communication. The EUT should transmit on f1. Repeat 5 times. If the EUT transmits on f2 the test is failed.

Result

Test	Transmit on f1	Transmit on f2	Wanted Transmit Channel	Pass/Fail
b	No	Yes	f2	Pass
c	Yes	No	f1	Pass
d	No	Yes	f2	Pass
e	Yes	No	f1	Pass

Note: 1. All tests were repeated 5 times.

A19 Selected Channel Confirmation

Test Details:	
Regulation	CFR 47 Part 15.323(c)(1) & (c)(5)
Measurement standard	ANSI C63.17 sub-clause 7.3.4
EUT sample number	S46
Modification state	0
SE in test environment	None
SE isolated from EUT	S19, S33, S36, S42
EUT set up	Refer to Appendix C

The test is to ensure the EUT monitors the time/spectrum window immediately prior to transmission.

The EUT was frequency administered to operating on two frequencies only, f1 and f2.

f1 = 1923.264 MHz

f2 = 1924.992 MHz

Test a)

Interference is applied on f1 at a level of $T_U + U_M$. Verify a connection is established on f2.

Any connection is terminated.

Test b)

Interference is applied on f2 at a level of $T_U + U_M$ and immediately removed from f1 and the EUT is immediately caused to attempt transmission. In this case the EUT should transmit on f1

Result

Test	Transmit on f1	Transmit on f2	Wanted Transmit Channel	Pass/Fail
a	No	Yes	f2	Pass
b	Yes	No	f1	Pass

A20 Fair Access To Spectrum

CFR 47 Part 15.323(c)(12)

The provisions of (10) & (11) shall not be used to extend the range of spectrum occupied over space or time for the purposes of denying fair access to the spectrum to other devices.

The manufacturer declares that this device does not work in a mode, which denies fair access to the spectrum to others.

(10) Relates to part 15.323(c)(10)

(11) Relates to part 15.323(c)(11)

A21 Emissions Inside and Outside the Sub-Band - Conducted

Test Details: Lowest Carrier Defined by the EUT	
Regulation	CFR 47 Part 15.323(d)
Measurement standard	ANSI C63.17 sub-clause 6.1.6
EUT sample number	S46
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Out-of-Band Emissions from UPCS bandedge	FREQ. (MHz)	MEAS. Rx. (dBm)	CABLE & ATTEN. LOSS (dB)	EMISSION LEVEL (dBm)	LIMIT (dBm)
> - 2.5MHz	1911.153	-76.6	19.9	-56.7	-39.5
- 1.25 MHz – 2.5 MHz	No Significant Emissions Within 20 dB of the Limit				
- 1.25 MHz					
+ 1.25 MHz					
+ 1.25 MHz – 2.5 MHz					
> + 2.5MHz	1931.891	-73.75	19.9	-53.9	-39.5
Limits	Out-of-Band Emissions From UPCS bandedge		Attenuation (dB) required below Reference power of 112mW		
	± 1.25MHz		30		
	±1.25 MHz – 2.5 MHz		50		
	> ±2.5MHz		60		
	In band Emissions from centre of emission bandwidth		Attenuation (dB) required below permitted peak power for the EUT		
	1B – 2B		30		
	2B – 3B		50		
	3B – UPCS band edge		60		

Notes:

- 1 EUT fitted with temporary antenna connector.
- 2 New / Fully Charged batteries used for battery powered products.
- 3 See Appendix B for out of band emissions compliance plots, offsets <2.5 MHz
- 4 See Appendix B for in band emissions compliance plots.
- 5 Resolution bandwidth approximately 1% of emissions bandwidth.
- 6 Video bandwidth 3 x Resolution bandwidth.
- 7 Receiver detector = Peak detector, Max Hold Enabled.
- 8 Only emissions within 20 dB of the limit are recorded.

Test Method:

- 1 The EUT was connected to a spectrum analyser via suitable attenuation or filter.
- 2 The Spectrum analyser was tuned to upper and lower offsets in turn.
- 3 Any emissions found were measured with the required analyser settings.

Test Details: Highest Carrier Defined by the EUT	
Regulation	CFR 47 Part 15.323(d)
Measurement standard	ANSI C63.17 sub-clause 6.1.6
EUT sample number	S46
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Out-of-Band Emissions from UPCS bandedge	FREQ. (MHz)	MEAS. Rx. (dBm)	CABLE & ATTEN. LOSS (dB)	EMISSION LEVEL (dBm)	LIMIT (dBm)
> - 2.5MHz	1918.092	-72.89	19.9	-53.0	-39.5
- 1.25 MHz – 2.5 MHz	No Significant Emissions Within 20 dB of the Limit				
- 1.25 MHz					
+ 1.25 MHz					
+ 1.25 MHz – 2.5 MHz					
> + 2.5MHz	1938.814	-69.83	19.9	-49.9	-39.5
Limits	Out-of-Band Emissions From UPCS bandedge		Attenuation (dB) required below Reference power of 112mW		
	± 1.25MHz		30		
	±1.25 MHz – 2.5 MHz		50		
	> ±2.5MHz		60		
	In band Emissions from centre of emission bandwidth		Attenuation (dB) required below permitted peak power for the EUT		
	1B – 2B		30		
	2B – 3B		50		
	3B – UPCS band edge		60		

Notes:

- 1 EUT fitted with temporary antenna connector.
- 2 New / Fully Charged batteries used for battery powered products.
- 3 See Appendix B for out of band emissions compliance plots, offsets <2.5 MHz
- 4 See Appendix B for in band emissions compliance plots.
- 5 Resolution bandwidth approximately 1% of emissions bandwidth.
- 6 Video bandwidth 3 x Resolution bandwidth.
- 7 Receiver detector = Peak detector, Max Hold Enabled.
- 8 Only emissions within 20 dB of the limit are recorded.

Test Method:

- 1 The EUT was connected to a spectrum analyser via suitable attenuation or filter.
- 2 The Spectrum analyser was tuned to upper and lower offsets in turn.
- 3 Any emissions found were measured with the required analyser settings.

A22 Frame Repetition Stability

Test Details:	
Regulation	CFR 47 Part 15.323(e)
Measurement standard	ANSI C63.17 sub-clause 6.2.2 & 6.2.3
EUT sample number	S46
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Frame Repetition Stability

This is the mean value of the frame repetition rate recorded over 1000 samples. For devices that divide access in time the repetition rate shall not exceed 10ppm.

Result

Frame Repetition Stability (ppm)	Limit (ppm)	Pass/Fail
-0.06	±10ppm	PASS

Frame Period and Jitter

Jitter is the difference in time between the rising edges of consecutive pulses.

Result

Maximum Jitter (μs)	3xSD Jitter (μs)	Frame period (ms)	Limit (μs)		Pass/Fail
			Frame Period (ms)	Jitter (μs)	
0.87	2.61	10.00261	2 or 10/X	12.5	Pass

A23 Frequency Stability

Test Details:	
Regulation	CFR 47 Part 15.323(f)
Measurement standard	ANSI C63.17 sub-clause 6.2.1
EUT sample number	S46
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

This testing is carried out with the following conditions over 5000 samples.

Results

Temperature (°C)	Voltage (Vdc)	Fc (MHz)	offset (kHz)	offset (ppm)	Limit (ppm)
+20	Vnom	1924.992	-3	1.56	±10ppm
-20	Vnom	1924.992	-8	4.16	±10ppm
+55	Vnom	1924.992	-3	1.56	±10ppm

- Note:
1. The EUT is battery powered therefore voltage variations are not required.
 2. Frequency variation at Tnom relative to EUT operating Frequency.
 3. Frequency variation at Temperature extremes relative to frequency at Tnom.

A24 Power Line Conducted Emissions

Preview power line conducted emission measurements were performed with a peak detector in a screened room. The effect of the EUT set-up on the measurements is summarised in note (b). Where applicable formal measurements of the emissions were performed with a peak, average and/or quasi peak detector.

Test Details:	
Regulation	CFR 47 Part 15.315 & 15.207
Measurement standard	ANSI C63.10:2003
Frequency range	150kHz to 30MHz
EUT sample number	S46
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Photographs (Appendix F)	3

The worst-case power line conducted emission measurements are listed below:

Results measured using the average detector compared to the average limit

Ref No.	Freq (MHz)	Conductor	Result (dBuV)	Spec Limit (dBuV)	Margin (dB)	Result Summary
1	0.395	RX Live	37.69	47.96	-10.27	Pass
2	0.520	RX Live	30.59	46.00	-15.41	Pass
3	0.720	RX Live	32.08	46.00	-13.92	Pass
4	0.770	TX Live	27.88	46.00	-18.12	Pass
5	0.820	RX Live	29.23	46.00	-16.77	Pass
6	1.015	RX Live	28.61	46.00	-17.39	Pass
7	1.350	RX Live	28.35	46.00	-17.65	Pass
8	1.660	RX Live	30.57	46.00	-15.43	Pass
9	1.910	RX Live	28.24	46.00	-17.76	Pass
10	2.575	RX Live	27.71	46.00	-18.29	Pass
11	3.490	RX Live	26.15	46.00	-19.85	Pass

Results measured using the quasi-peak detector compared to the quasi-peak limit

Ref No.	Freq (MHz)	Conductor	Result (dBuV)	Spec Limit (dBuV)	Margin (dB)	Result Summary
1	0.395	RX Neu	43.10	57.96	-14.86	Pass
2	0.520	RX Neu	36.89	56.00	-19.11	Pass
3	0.765	RX Neu	36.63	56.00	-19.37	Pass
4	0.820	RX Neu	37.08	56.00	-18.92	Pass
5	1.710	RX Neu	37.20	56.00	-18.80	Pass
5	1.710	RX Neu	37.20	56.00	-18.80	Pass

Specification limits :

Conducted emission limits (47 CFR 15: Clause 15.207):

Conducted disturbance at the mains ports.

Frequency range MHz	Limits dB μ V	
	Quasi-peak	Average
0.15 to 0.5	66 to 56 ²	56 to 46 ²
0.5 to 5	56	46
5 to 30	60	50

Notes:

1. The lower limit shall apply at the transition frequency.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

Notes:

- (a) The levels may have been rounded for display purposes.
- (b) The following table summarises the effect of the EUT operating mode and internal configuration on the measured emission levels :

	See (i)	See (ii)	See (iii)	See (iv)
Effect of EUT operating mode on emission levels		✓		
Effect of EUT internal configuration on emission levels		✓		

(i) Parameter defined by standard and / or single possible, refer to Appendix C
(ii) Parameter defined by client and / or single possible, refer to Appendix C
(iii) Parameter had a negligible effect on emission levels, refer to Appendix C
(iv) Worst case determined by initial measurement, refer to Appendix C

A25 Unintentional Radiated Emissions

Preliminary scans were performed using a peak detector with the RBW = 100kHz. The radiated electric field emission test applies to all spurious emissions on directly related to the transmitter. The maximum permitted field strength is listed in Section 15.109. The EUT was set to operate in a transmit standby / receive mode.

The following test site was used for final measurements as specified by the standard tested to:

3m open area test site : ☐

3m alternative test site : ☒

The effect of the EUT set-up on the measurements is summarised in note (c) below.

Test Details:	
Regulation	CFR 47 Part 15.323(d)
Measurement standard	ANSI C63.17 sub-clause 6.1.6.
Frequency range	30MHz – 20GHz
EUT sample number	S01
Modification state	0
SE in test environment	S11, S12
SE isolated from EUT	None
EUT set up	Refer to Appendix C
Photographs (Appendix F)	1 & 2

The worst case radiated emission measurements for spurious emissions are listed below:

Ref No.	FREQ. (MHz)	MEAS Rx (dBµV)	CABLE LOSS (dB)	ANT FACT. (dB/m)	PRE AMP (dB)	FIELD ST'GH (dBµV/m)	EXTRAP FACT (dB)	FIELD ST'GH (µV/m)	LIMIT (µV/m)
1	No Significant Emissions Within 20 dB of the limit								

Notes:

- 1 Any testing performed below 30 MHz was performed using a magnetic loop antenna in accordance with ANSI C63.10: section 4.5, Table 1 For emissions below 30MHz the cable losses are assumed to be negligible.
- 2 In accordance with 15.35(b), above 1 GHz, emissions measured using a peak detector shall not exceed a level 20 dB above the average limit.
- 3 Testing was performed with the EUT orientated in three orthogonal planes and the maximum emissions level recorded. In addition, the EUT antenna was varied within its range of motion in order to maximise emissions.
- 4 For Frequencies below 1 GHz, RBW = 120 kHz, testing was performed with CISPR16 compliant test receiver with QP detector. Above 1 GHz tests were performed using a spectrum analyser using the following settings:

Peak RBW=VBW= 1MHz
Average RBW=VBW= 1MHz

The upper and lower frequency of the measurement range was decided according to 47 CFR Part 15 Clause 15.33(a) and 15.33(a)(1).

Radiated emission limits 47 CFR Part 15: Clause 15.209 for all emissions:

Frequency of emission (MHz)	Field strength $\mu\text{V/m}$	Measurement Distance m	Field strength $\text{dB}\mu\text{V/m}$
0.009-0.490	2400/F(kHz)	300	67.6/F (kHz)
0.490-1.705	24000/F(kHz)	30	87.6/F (kHz)
1.705-30	30	30	29.5
30-88	100	3	40.0
88-216	150	3	43.5
216-960	200	3	46.0
Above 960	500	3	54.0

- (a) Where results have been measured at one distance, and a signal level displayed at another, the results have been extrapolated using the following formula:

$$\text{Extrapolation (dB)} = 20 \log_{10} \left(\frac{\text{measurement distance}}{\text{specification distance}} \right)$$

- (b) The levels may have been rounded for display purposes.
- (c) The following table summarises the effect of the EUT operating mode, internal configuration and arrangement of cables / samples on the measured emission levels :

	See (i)	See (ii)	See (iii)	See (iv)
Effect of EUT operating mode on emission levels	✓	✓	✓	✓
Effect of EUT internal configuration on emission levels	✓	✓	✓	✓
Effect of Position of EUT cables & samples on emission levels	✓	✓	✓	✓
(i) Parameter defined by standard and / or single possible, refer to Appendix D (ii) Parameter defined by client and / or single possible, refer to Appendix D (iii) Parameter had a negligible effect on emission levels, refer to Appendix D (iv) Worst case determined by initial measurement, refer to Appendix D				

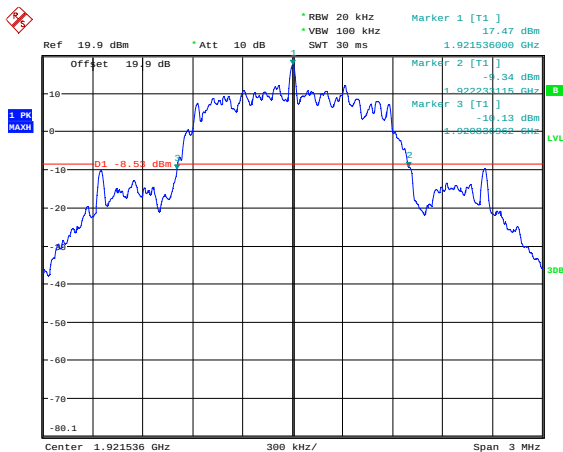
Appendix B:**Supporting Graphical Data**

This appendix contains graphical data obtained during testing.

Notes:

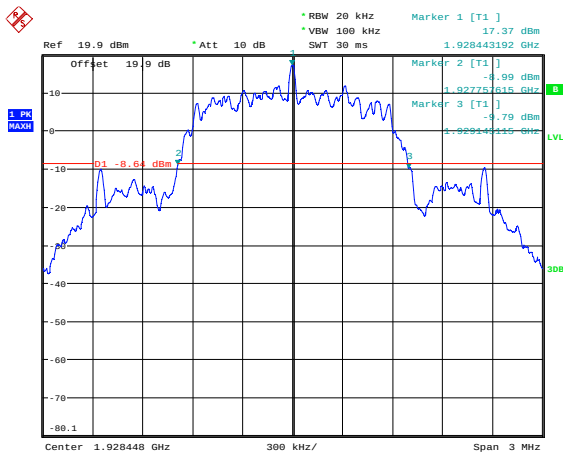
- (a) The radiated electric field emissions and conducted emissions graphical data in this appendix is preview data. For details of formal results, refer to Appendix A and Appendix B.
- (b) The time and date on the plots do not necessarily equate to the time of the test.
- (c) Where relevant, on power line conducted emission plots, the limit displayed is the average limit, which is stricter than the quasi peak limit.
- (d) Appendix C details the numbering system used to identify the sample and its modification state.
- (e) The plots presented in this appendix may not be a complete record of the measurements performed, but are a representative sample, relative to the final assessment.

Emission Bandwidth



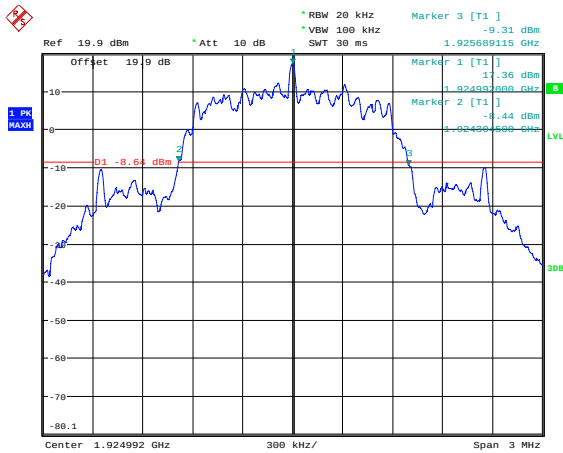
Date: 20.FEB.2012 11:19:38

f_l



Date: 20.FEB.2012 11:22:35

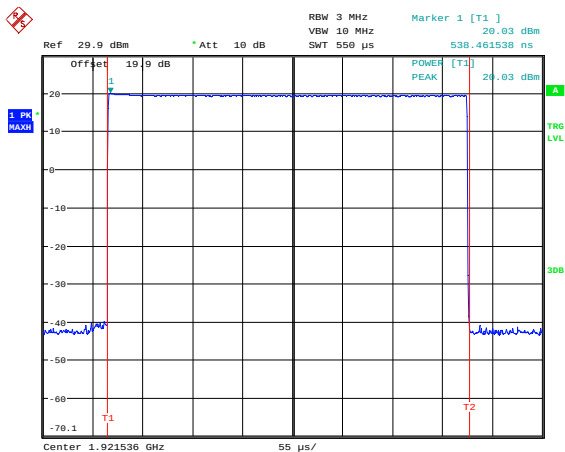
f_c



Date: 20.FEB.2012 11:25:58

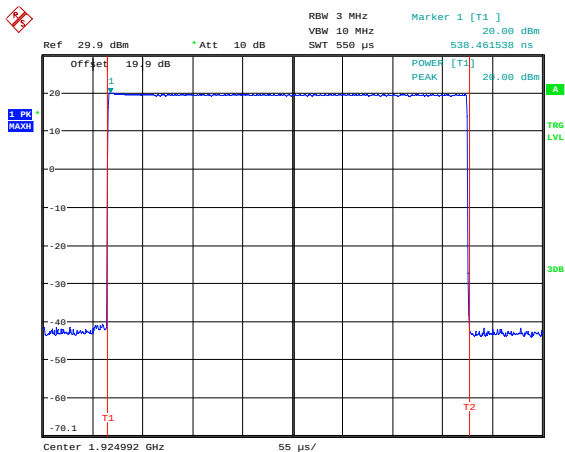
f_h

Peak Transmit Power



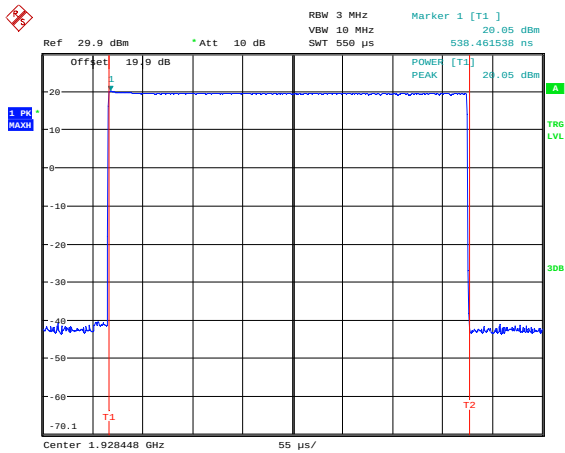
Date: 22.FEB.2012 10:14:20

f_l



Date: 22.FEB.2012 10:15:05

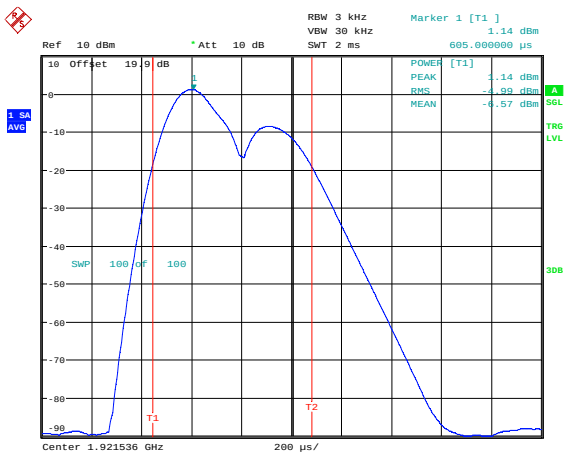
f_c



Date: 22.FEB.2012 10:12:00

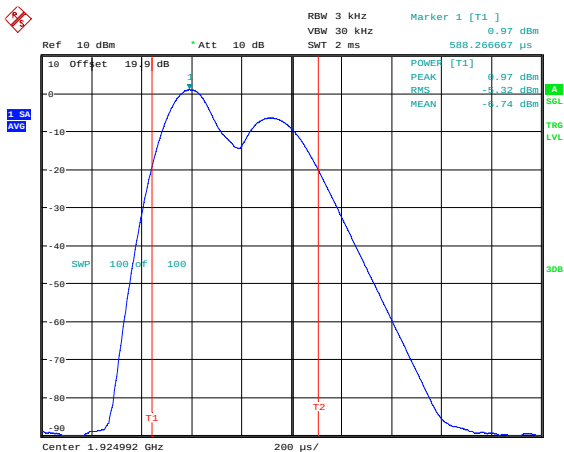
f_h

Power Spectral Density



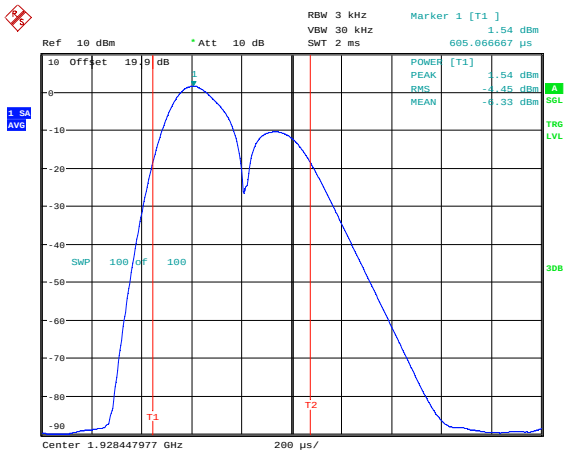
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f_l



Date: 22.FEB.2012 10:23:10

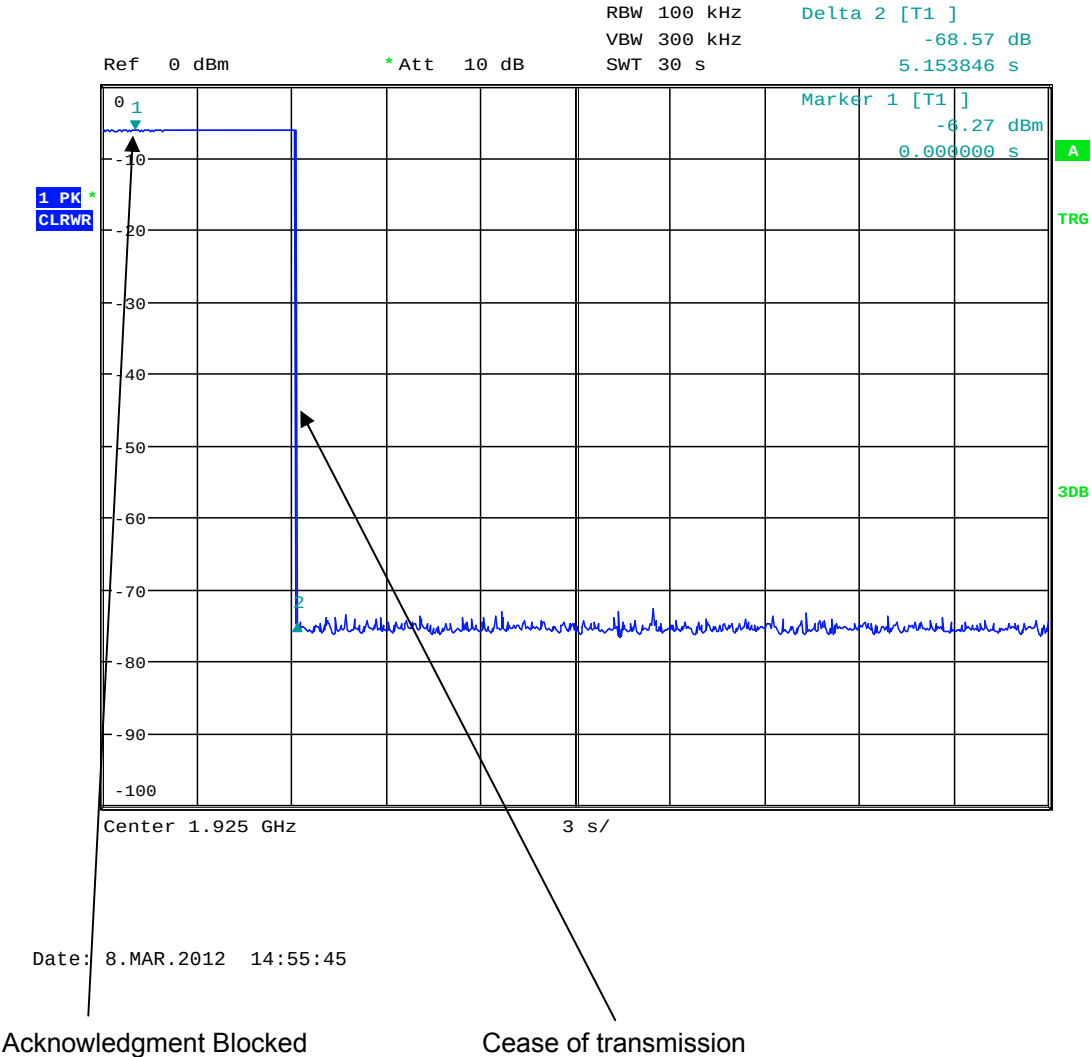
f_c



Date: 22.FEB.2012 10:28:07

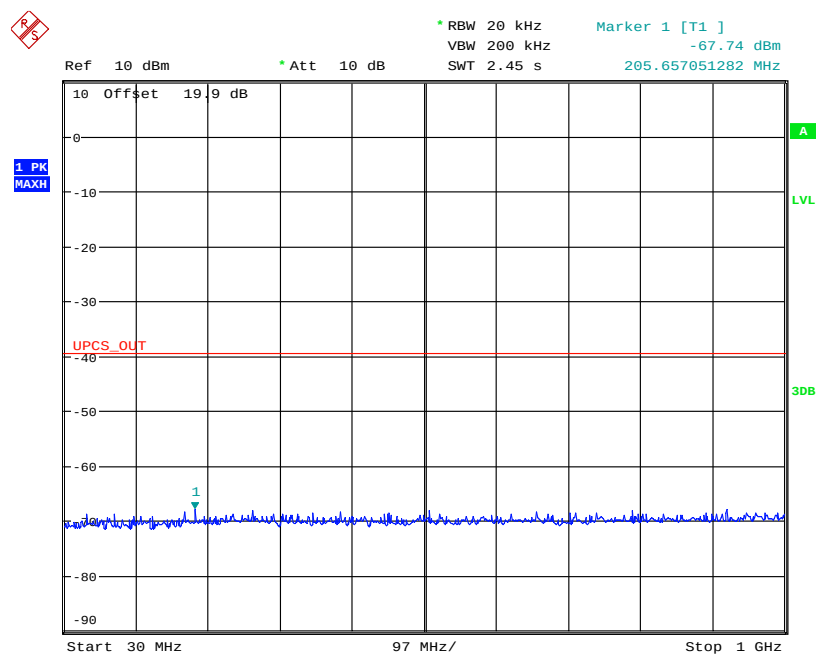
f_h

Acknowledgements



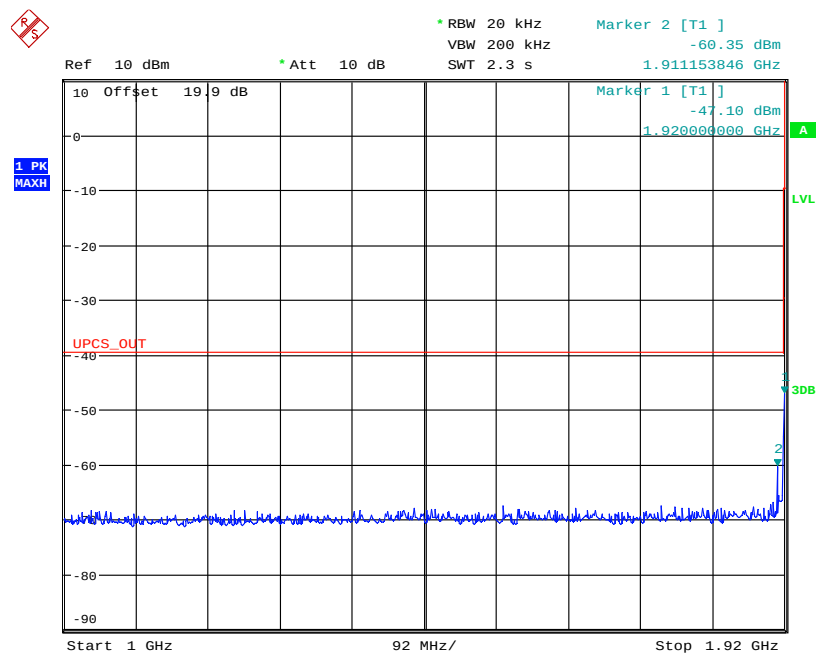
Cease Of Transmissions on Communications Channel - Acknowledgements Blocked

Conducted Emissions outside the Sub-Band RF carrier set to the lowest carrier defined by the EUT



Date: 22.FEB.2012 11:18:05

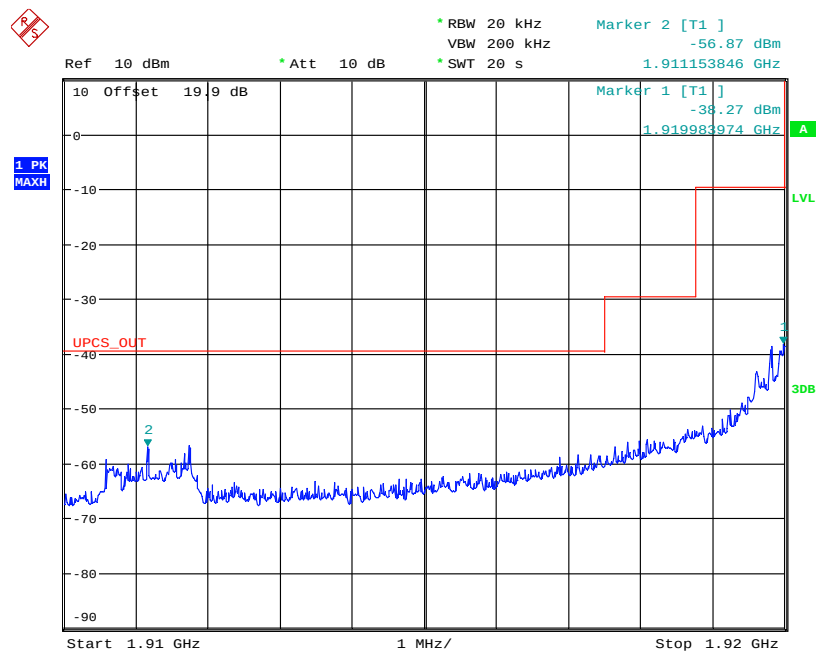
30MHz – 1GHz



Date: 22.FEB.2012 11:18:48

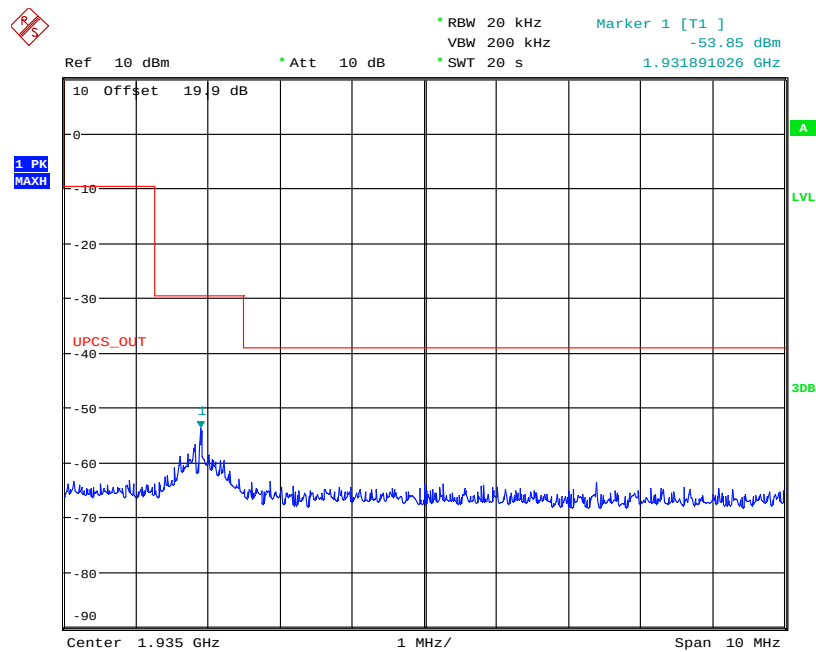
1GHz – Lower Bandedge

Conducted Emissions outside the Sub-Band RF carrier set to the lowest carrier defined by the EUT



Date: 22.FEB.2012 11:21:06

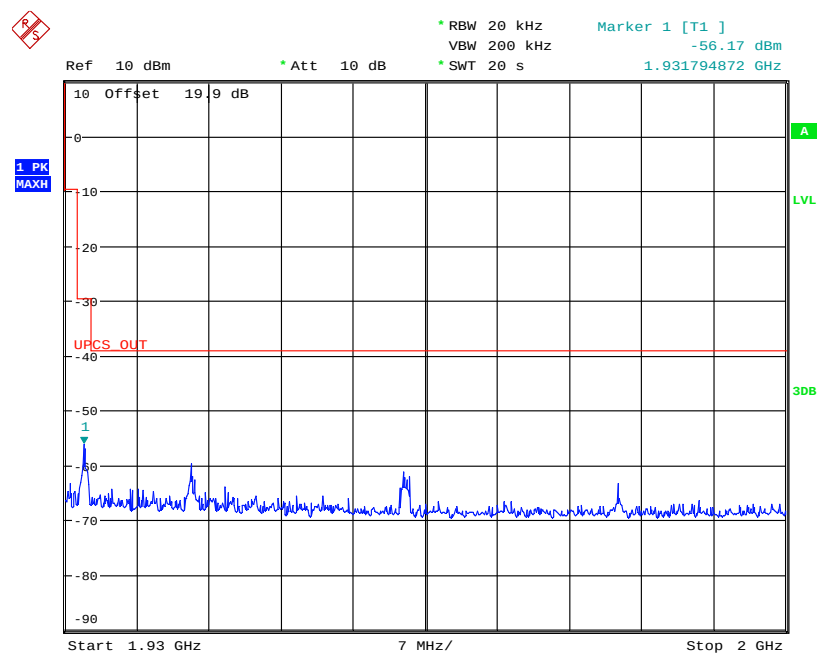
Lower Bandedge - > 2.5MHz



Date: 22.FEB.2012 11:22:38

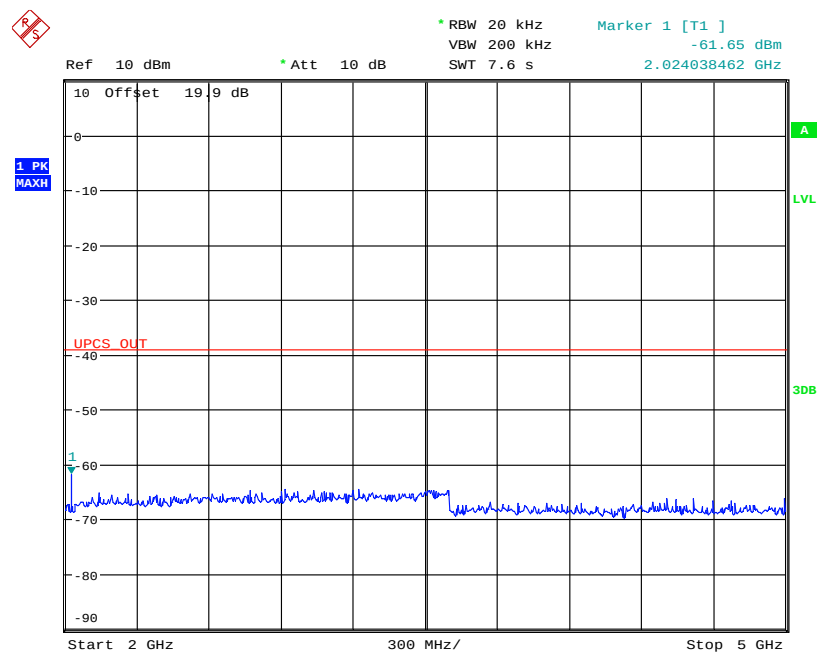
Upper Bandedge - > 2.5MHz

Conducted Emissions outside the Sub-Band RF carrier set to the lowest carrier defined by the EUT



Date: 22.FEB.2012 11:23:28

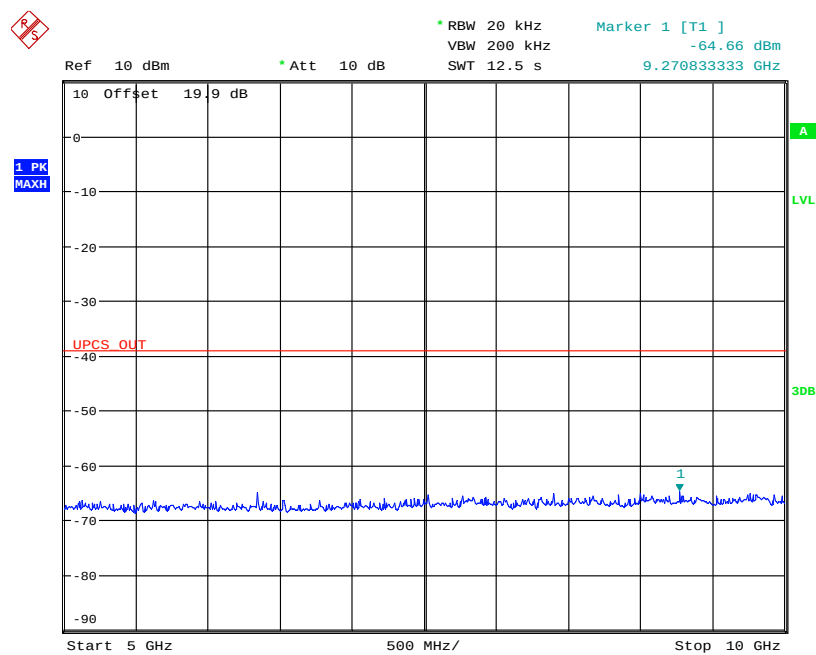
Upper Bandedge – 2GHz



Date: 22.FEB.2012 11:26:50

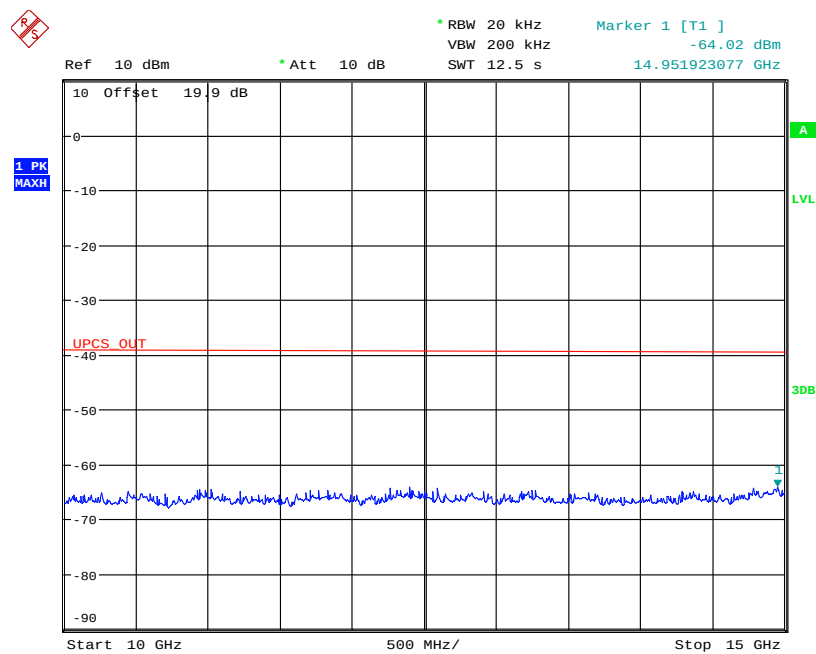
2 GHz – 5GHz

Conducted Emissions outside the Sub-Band RF carrier set to the lowest carrier defined by the EUT



Date: 22.FEB.2012 11:34:58

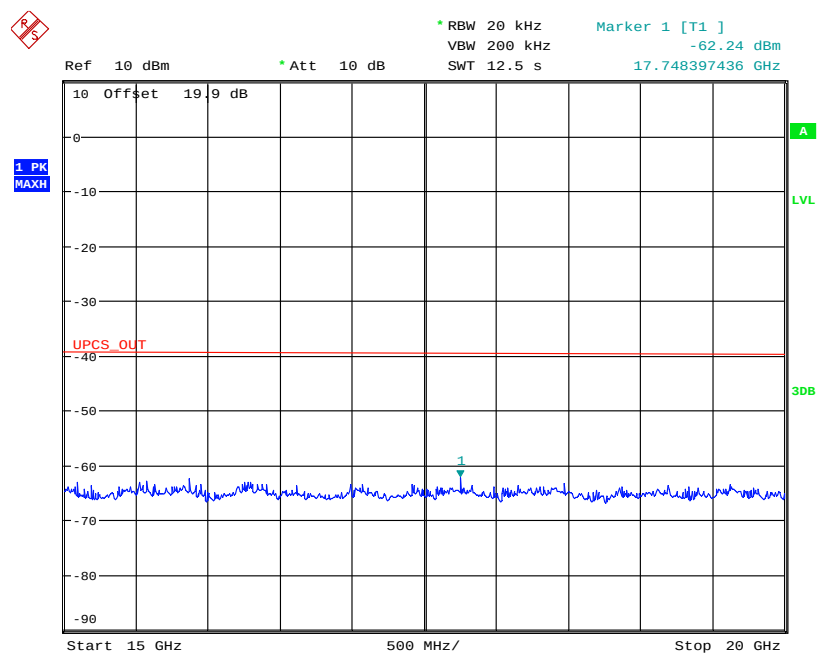
5 GHz – 10 GHz



Date: 22.FEB.2012 11:38:20

10 GHz – 15 GHz

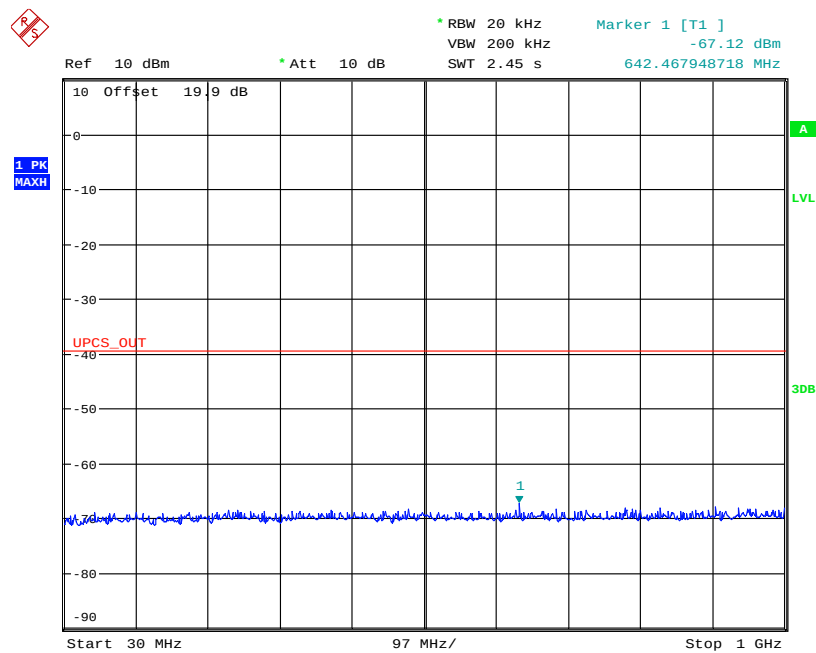
Conducted Emissions outside the Sub-Band RF carrier set to the lowest carrier defined by the EUT



Date: 22.FEB.2012 11:40:40

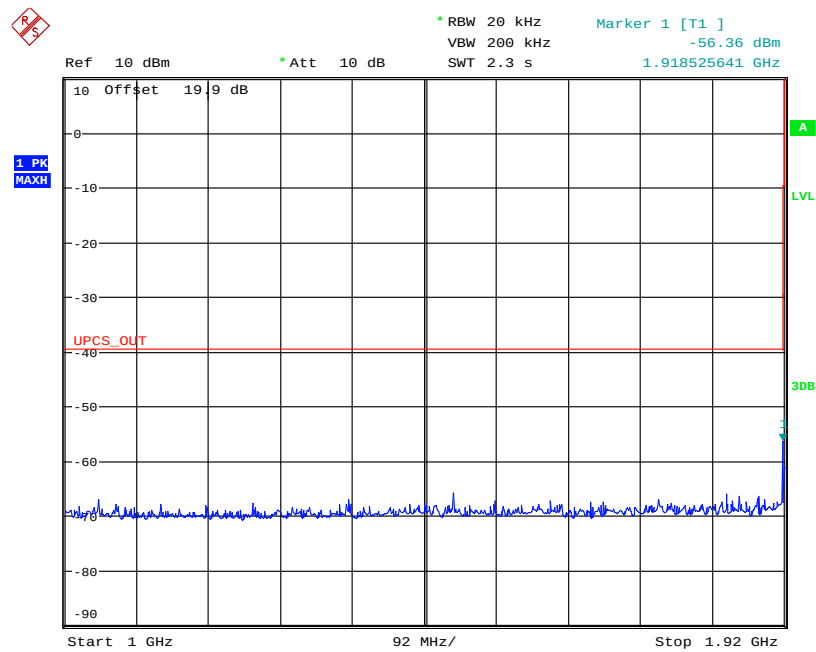
15 GHz – 20 GHz

Conducted Emissions outside the Sub-Band RF carrier set to the highest carrier defined by the EUT



Date: 22.FEB.2012 11:57:04

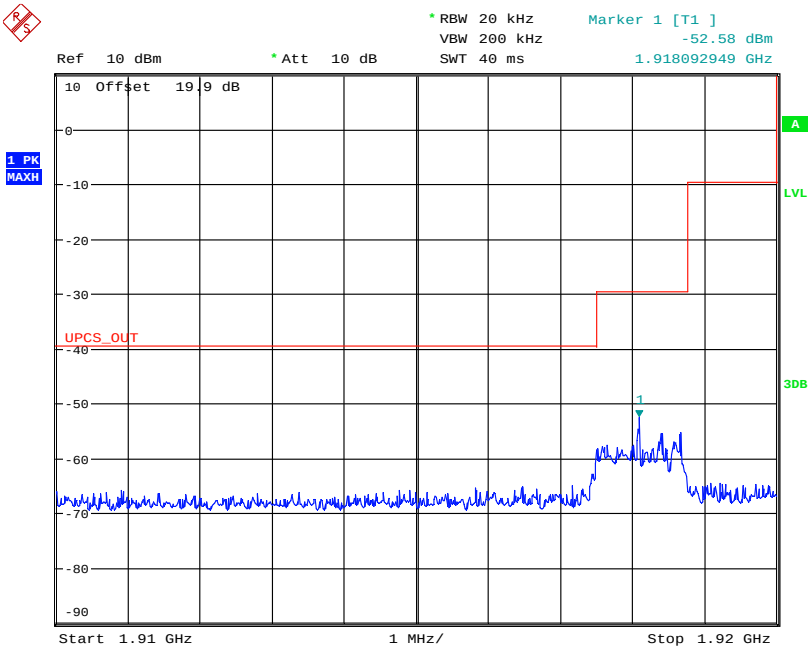
30MHz – 1GHz



Date: 22.FEB.2012 11:58:19

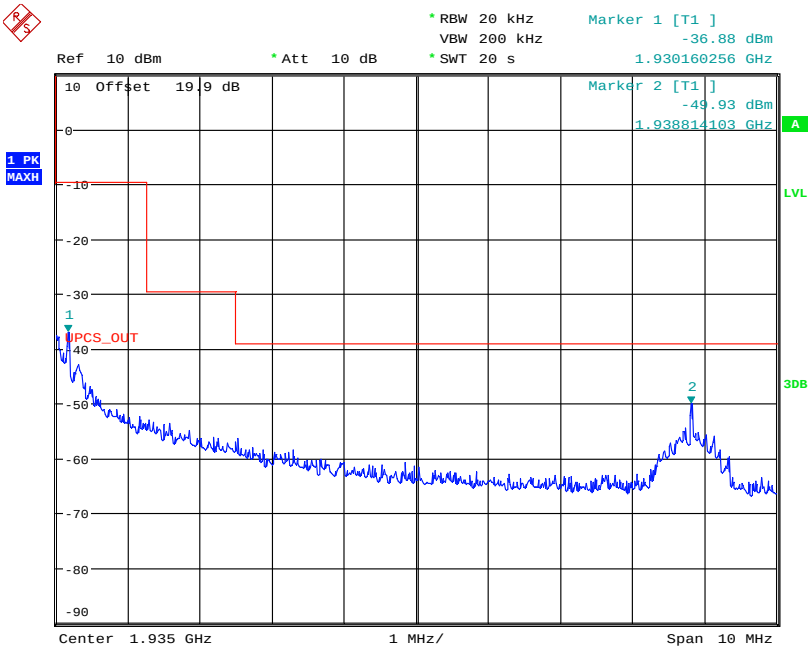
1GHz – Lower Bandedge

Conducted Emissions outside the Sub-Band RF carrier set to the highest carrier defined by the EUT



Date: 22.FEB.2012 11:59:29

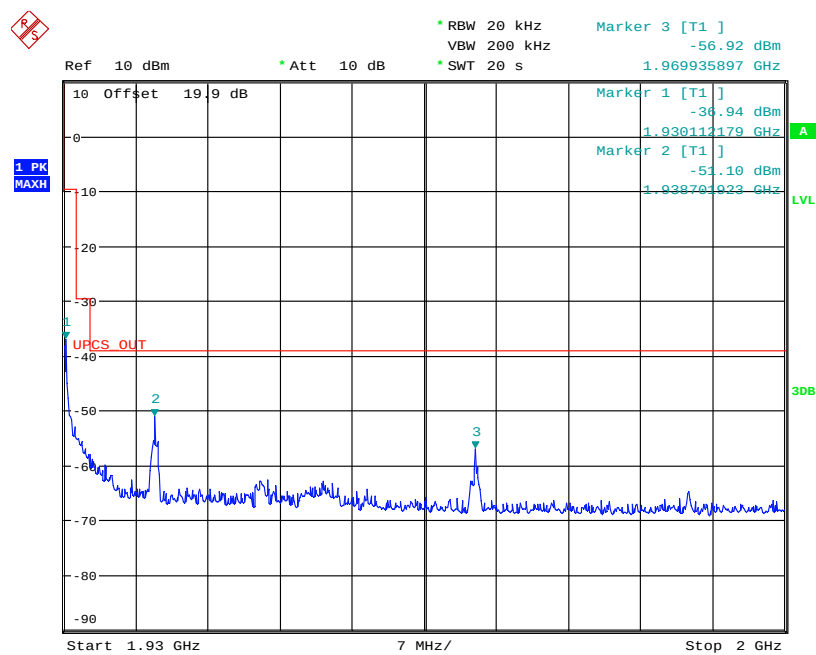
Lower Bandedge - > 2.5MHz



Date: 22.FEB.2012 12:02:06

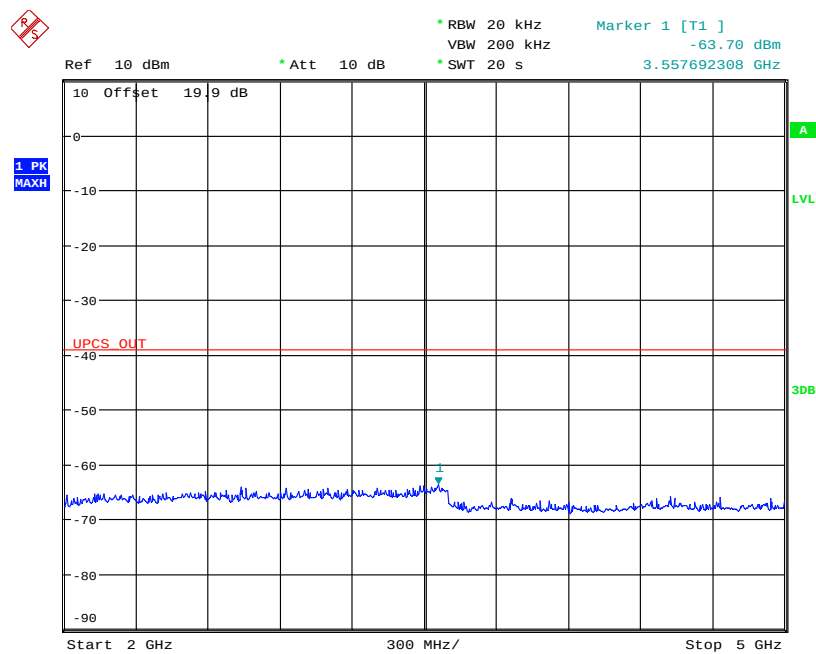
Upper Bandedge - > 2.5MHz

Conducted Emissions outside the Sub-Band RF carrier set to the highest carrier defined by the EUT



Date: 22.FEB.2012 12:04:37

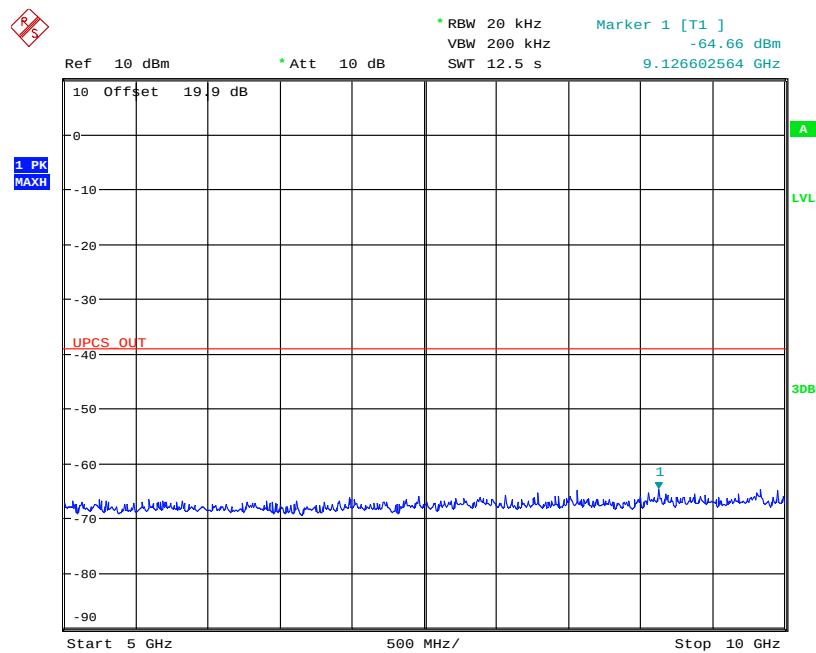
Upper Bandedge – 2GHz



Date: 22.FEB.2012 12:11:20

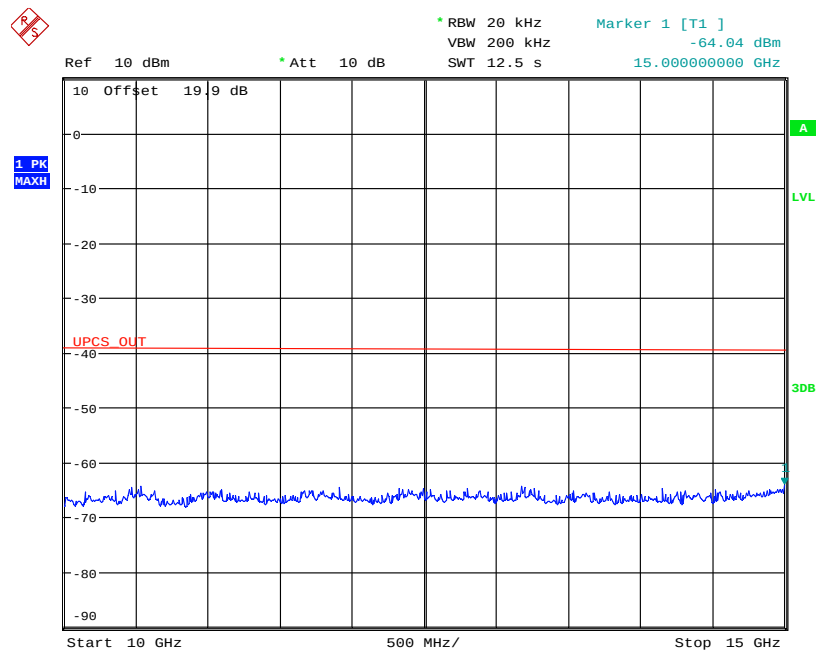
2 GHz – 5GHz

Conducted Emissions outside the Sub-Band RF carrier set to the highest carrier defined by the EUT



Date: 22.FEB.2012 12:14:07

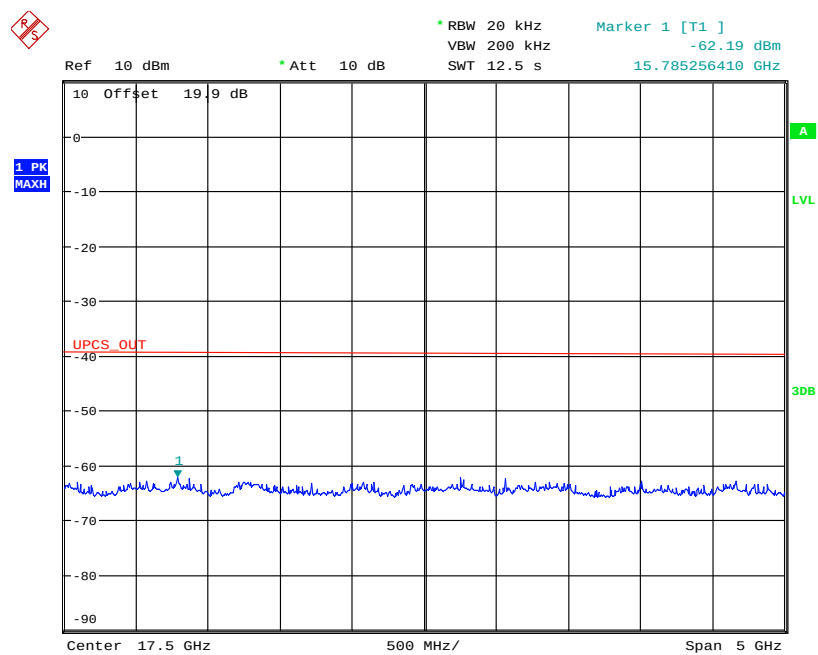
5 GHz – 10 GHz



Date: 22.FEB.2012 12:16:37

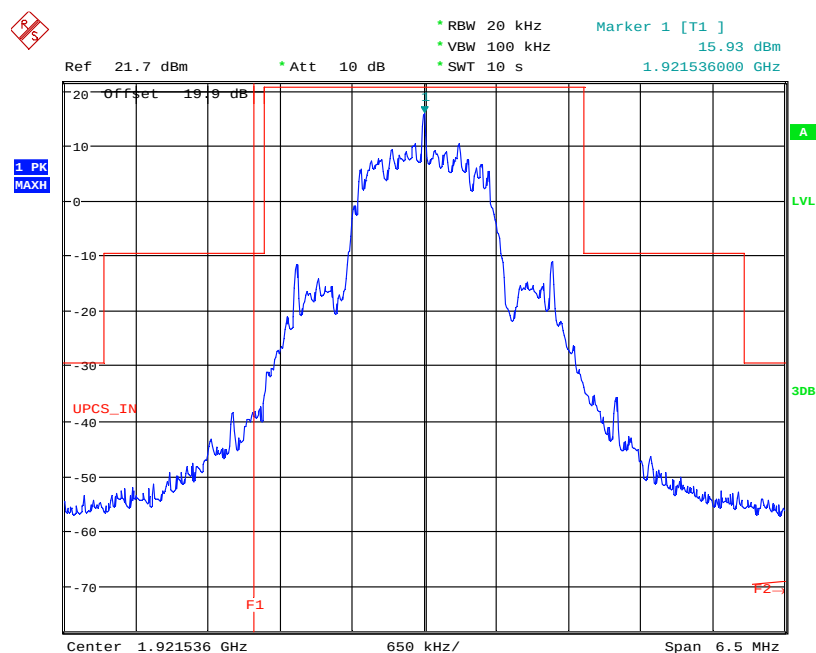
10 GHz – 15 GHz

Conducted Emissions outside the Sub-Band RF carrier set to the highest carrier defined by the EUT



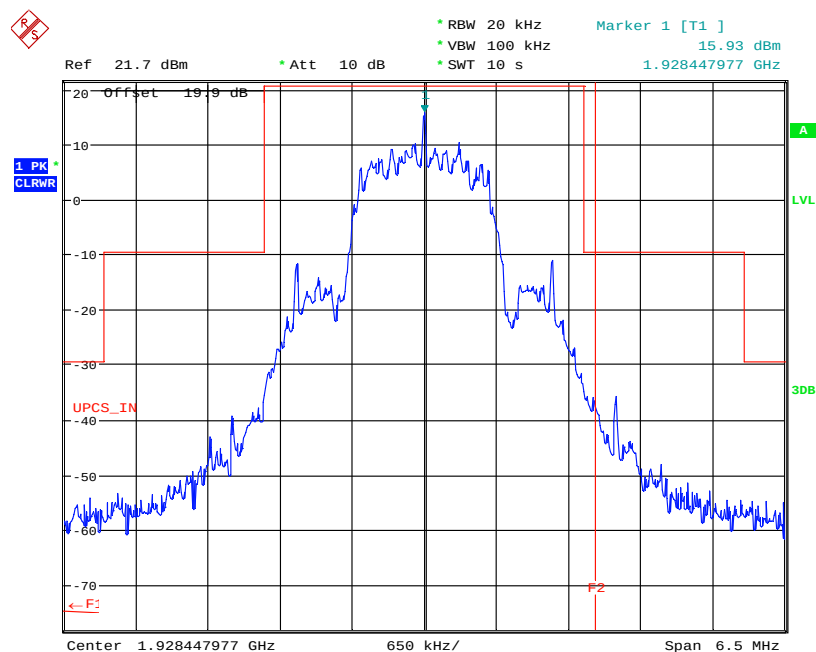
Date: 22.FEB.2012 11:48:12

15 GHz – 20 GHz



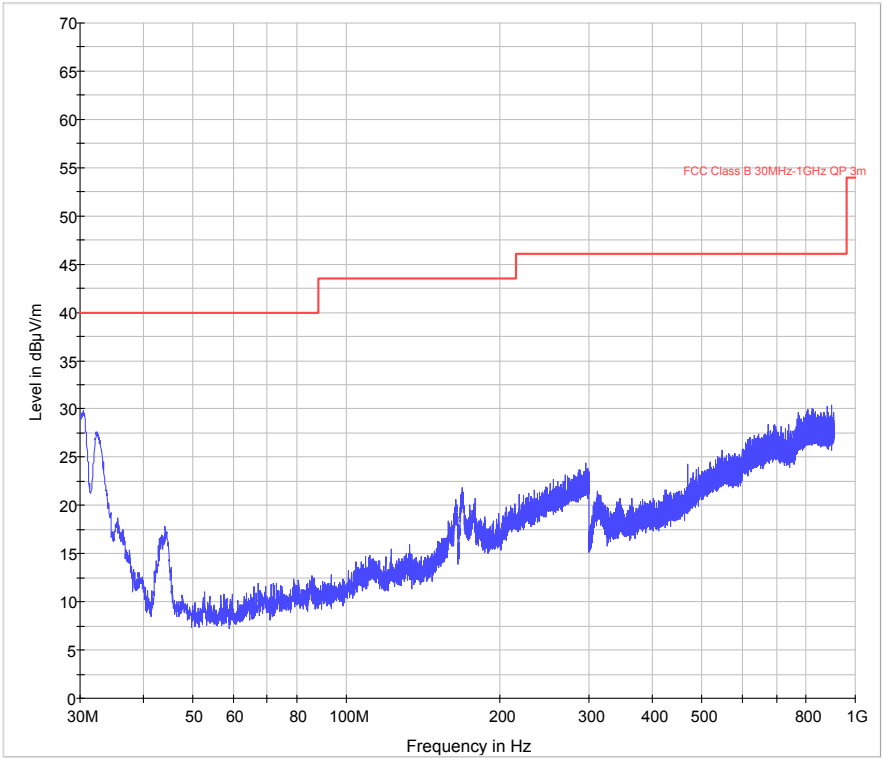
Date: 22.FEB.2012 11:00:28

Emissions inside the Sub-Band RF carrier set to the lowest carrier defined by the EUT

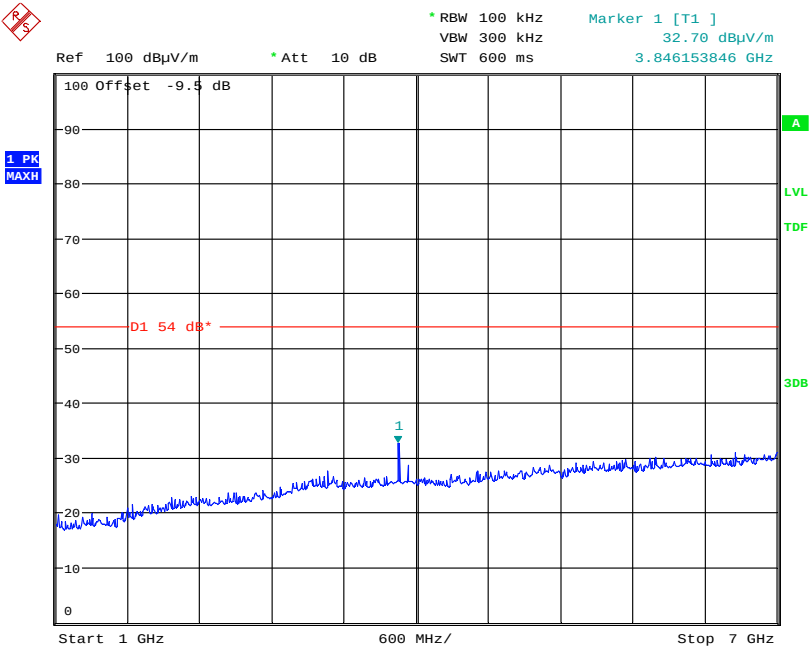


Date: 22.FEB.2012 10:41:16

Emissions inside the Sub-Band RF carrier set to the highest carrier defined by the EUT

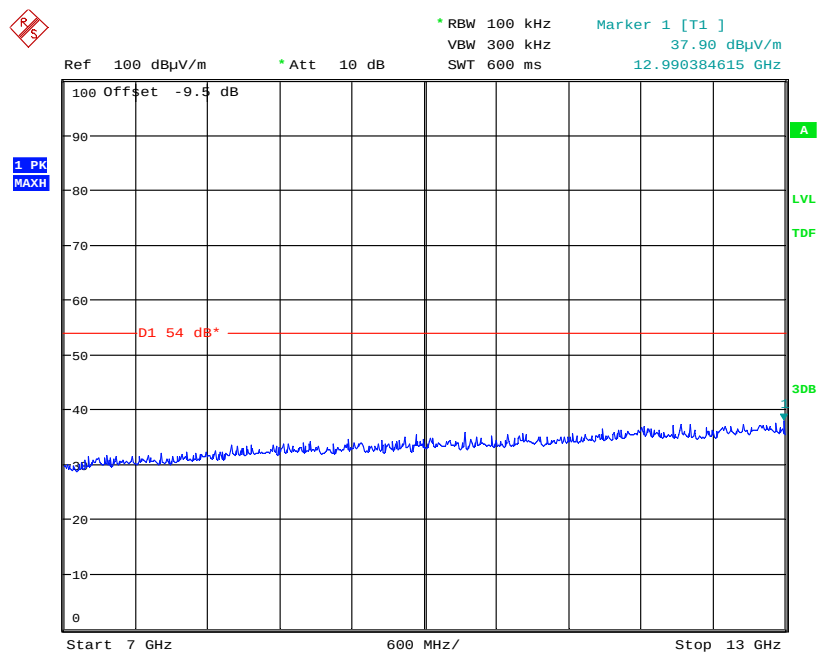


Unintentional Radiated spurious emissions 30 MHz to 1 GHz



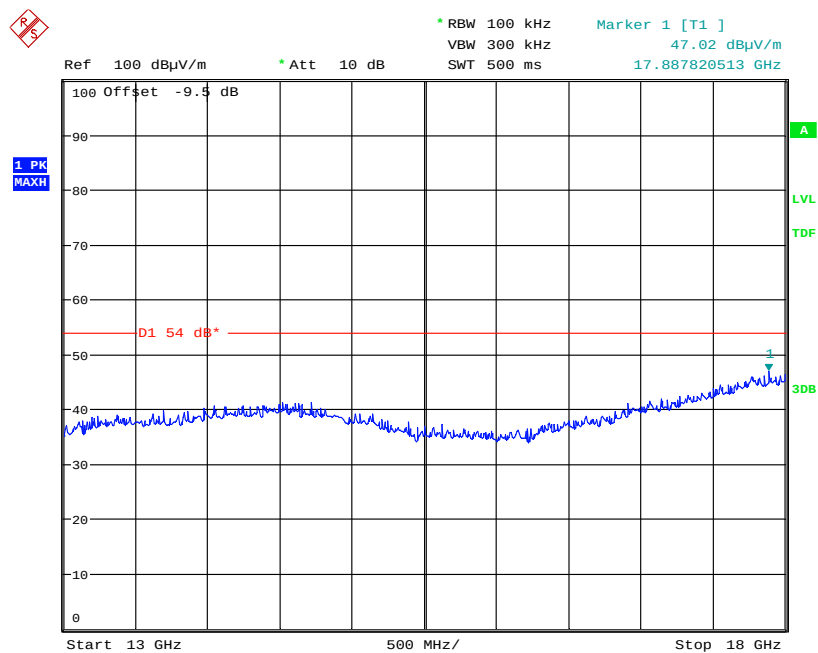
Date: 28.FEB.2012 12:23:08

Unintentional Radiated spurious emissions 1 GHz to 7 GHz



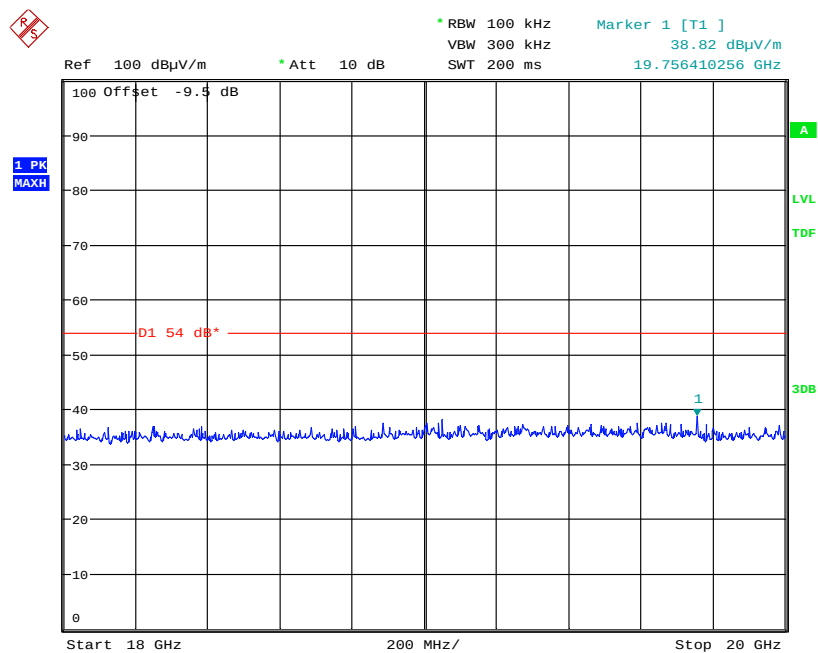
Date: 28.FEB.2012 12:21:05

Unintentional Radiated spurious emissions 7 GHz to 13 GHz



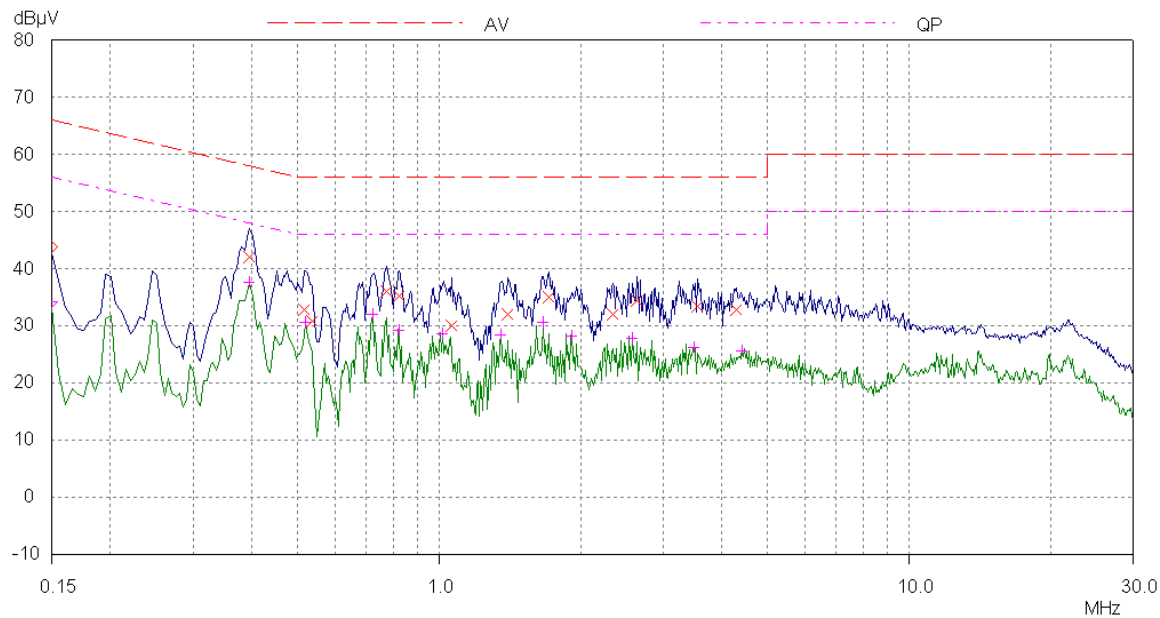
Date: 28.FEB.2012 12:21:29

Unintentional Radiated spurious emissions 13 GHz to 18 GHz



Date: 28.FEB.2012 12:28:26

Unintentional Radiated spurious emissions 18 GHz to 20 GHz



AC Powerline Conducted Emissions

Appendix C:**Additional Test and Sample Details**

This appendix contains details of:

1. The samples submitted for testing.
2. Details of EUT operating mode(s)
3. Details of EUT configuration(s) (see below).
4. EUT arrangement (see below).

Throughout testing, the following numbering system is used to identify the sample and it's modification state:

Sample No: Sxx Mod w

where:

xx	= sample number	eg. S01
w	= modification number	eg. Mod 2

The following terminology is used throughout the test report:

Support Equipment (SE) is any additional equipment required to exercise the EUT in the applicable operating mode. Where relevant SE is divided into two categories:

SE in test environment: The SE is positioned in the test environment and is not isolated from the EUT (e.g. on the table top during REFE testing).

SE isolated from the EUT: The SE is isolated via filtering from the EUT. (e.g. equipment placed externally to the ALSR during REFE testing).

EUT configuration refers to the internal set-up of the EUT. It may include for example:

- Positioning of cards in a chassis.
- Setting of any internal switches.
- Circuit board jumper settings.
- Alternative internal power supplies.

Where no change in EUT configuration is **possible**, the configuration is described as "single possible configuration".

EUT arrangement refers to the termination of EUT ports / connection of support equipment, and where relevant, the relative positioning of samples (EUT and SE) in the test environment.

For further details of the test procedures and general test set ups used during testing please refer to the related document "EMC Test Methods - An Overview", which can be supplied by TRaC Global upon request.

C1) Test samples

The following samples of the apparatus were submitted by the client for testing :

Sample No.	Description	Identification
S01	Conducted Handset Sample	None
S11	Power Supply	None
S12	Headset	None
S20	Handset Cradle / Charging Base	None
S46	Radiated Handset Sample	None

The following samples of apparatus were submitted by the client as host, support or drive equipment (auxiliary equipment):

Sample No.	Description	Identification
S19	Base Unit	None
S33	Avaya IP Office 500 V2	None
S36	Avaya IP Desk Phone	None
S42	Netgear Prosafe Gs108P	None

The following samples of apparatus were supplied by TRaC Global as support or drive equipment (auxiliary equipment):

Identification	Description
	None

C2) EUT Operating Mode During Testing.

During testing, the EUT was exercised as described in the following tables :

Test	Description of Operating Mode:
RF Emissions Testing / PLCE	EUT transmitting at highest power using normal modulation and time frame restricted to frequency of interest by out of operating region interference

Test	Description of Operating Mode:
RF Etiquette Testing	EUT in normal communications with companion device restricted to frequency of interest by out of operating region interference

Test	Description of Operating Mode:
Receiver radiated spurious emissions / PLCE	EUT active but non-transmitting seated in charging base with headset connected.

C3) EUT Configuration Information.

The EUT was submitted for testing in one single possible configuration.

C4) List of EUT Ports

The tables below describe the termination of EUT ports:

Sample : S46
Tests : Conducted

Port	Description of Cable Attached	Cable length	Equipment Connected
Antenna Port	Coaxial	<30cm	Measurement system
Battery Terminals	2 wire	1m	Power Supply
Charging Ports	None	-	-
Headset	None	-	-

Sample : S01
Tests : Radiated Emissions

Port	Description of Cable Attached	Cable length	Equipment Connected
Antenna Port	Integral Antenna	-	-
Battery Terminals	Battery	-	-
Charging Ports	Charging Base	-	-
Headset	2 wire	30cm	Headset

* Only connected during setup.

C5 Details of Equipment Used

TRAC Ref	Type	Description	Manufacturer	Date Calibrated.
TRLUH281	FSU46	Spectrum Analyser	Rhode & Schwarz	09/02/2012
TRL138	3115	1-18GHz Horn Antenna	EMCO	08/11/2011
TRL139	3115	1-18GHz Horn Antenna	EMCO	14/09/2011
TRL572	8499B	1 – 26.5 GHz Pre Amplifier	Agilent	24/11/2010
TRLUH04	ESHS10	Receiver	Rhode & Schwarz	12/01/2012
TRLUH191	CBL611/A	BiLog Periodic Antenna	York	08/11/2010
TRLUH93	CBL6112B	BiLog Periodic Antenna	Chase	20/06/2011
TRL11	TCC 125-815P	Temperature Chamber	Shartree	Use TRL426
TRL426	52 Series II	Temperature indicator	Fluke	22/03/2012
TRL176	2042	Signal Generator	Marconi	07/10/2011
TRLUH303	11667A	Splitter/Combiner	HP	Cal in Use
TRLUH305	11667A	Splitter/Combiner	HP	Cal in Use
RFG433	CMD60	Modulation Analyser	Rhode & Schwarz	
REF916	SMBV100	Signal Generator	Rhode & Schwarz	Cal in Use
REF844	D3008	Signal Generator	Agilent	Cal in Use
N/A	E4433B	Signal Generator	Agilent	Cal in Use
TRLUH003	ESHS10	Receiver	R&S	16/02/2012
TRLUH396	ENV216	Lisn	R&S	12/04/2012

Appendix D:

Additional Information

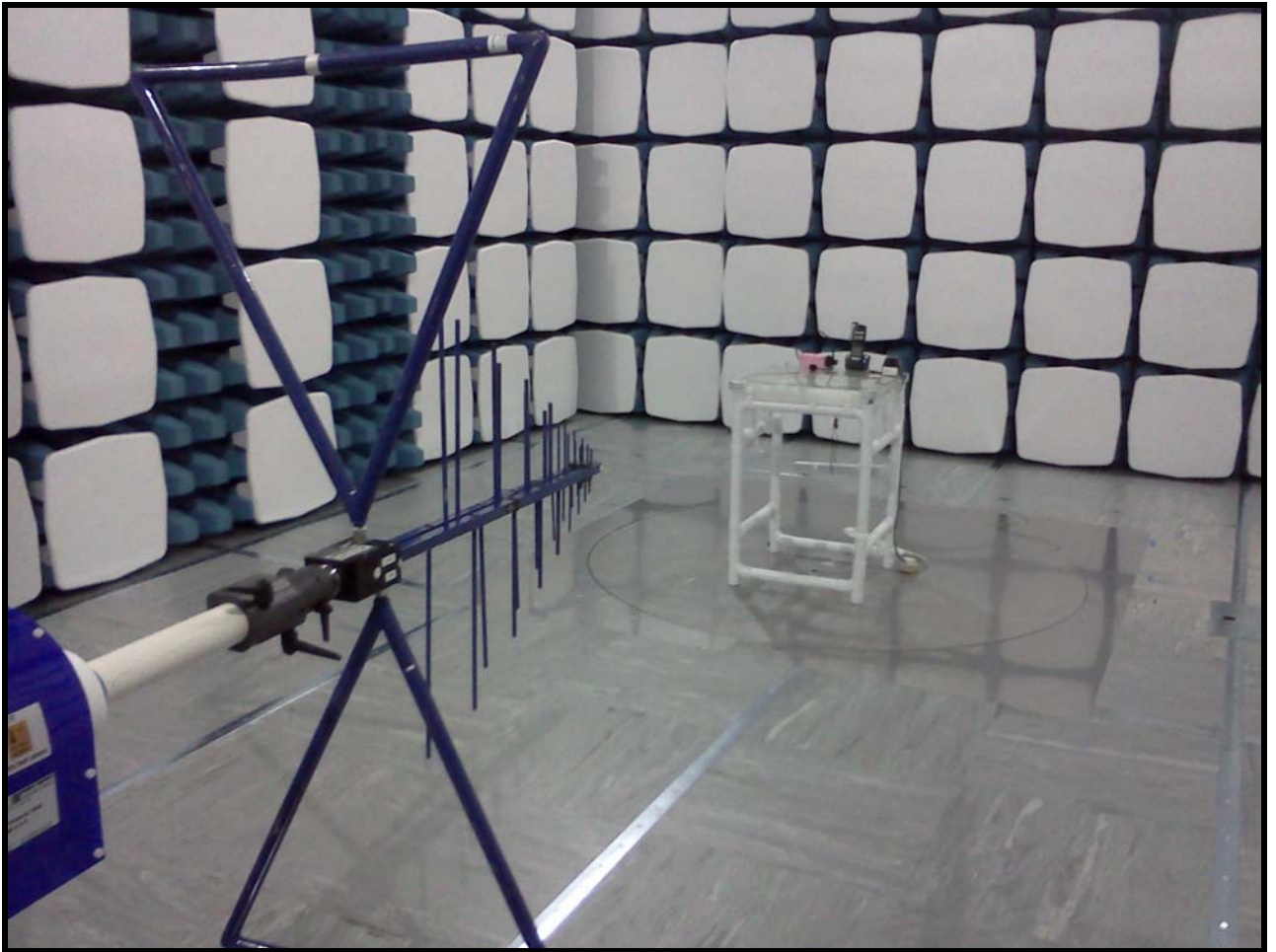
No additional information is included within this test report.

Appendix E:

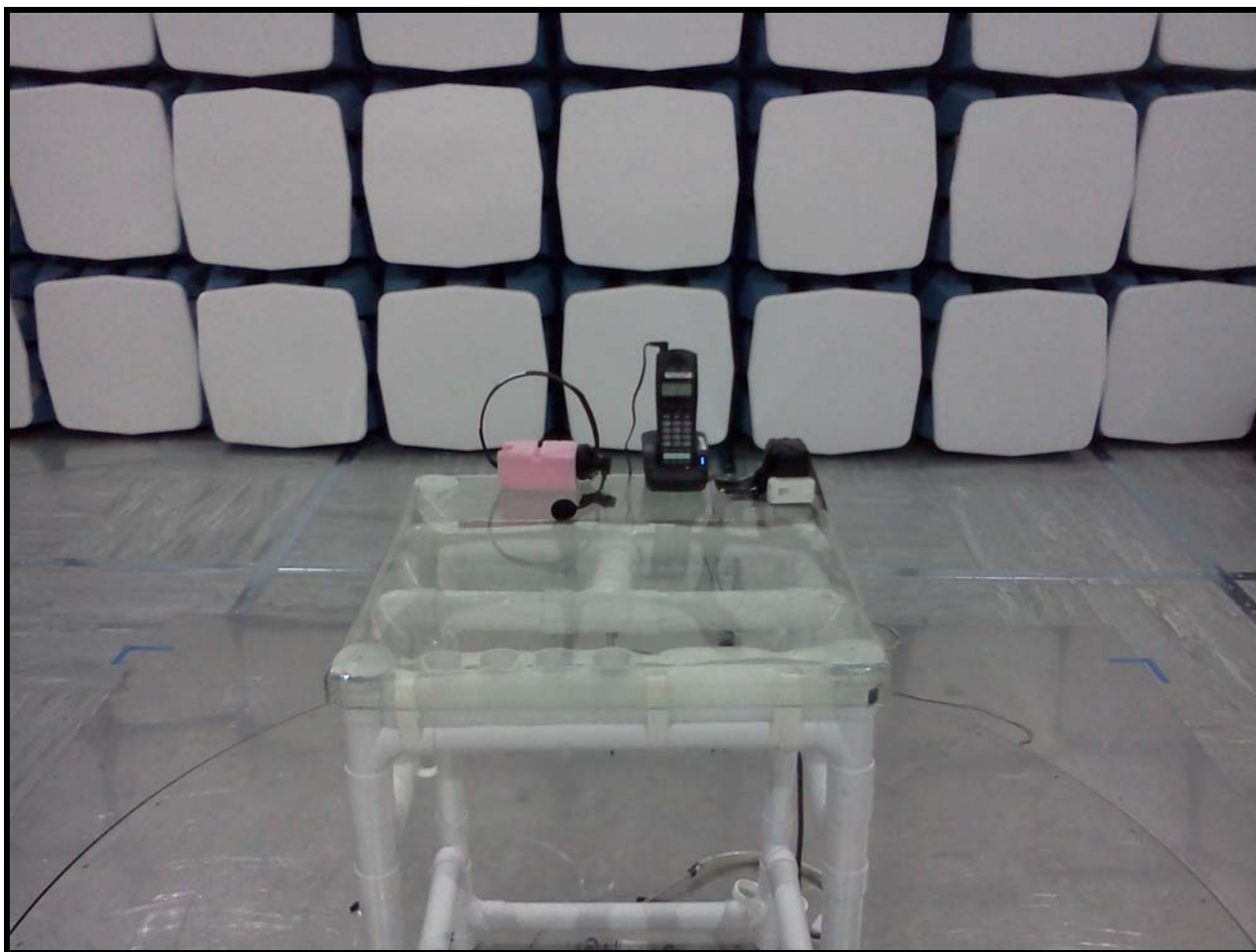
Photographs and Figures

The following photographs were taken of the test samples:

1. Radiated electric field emissions arrangement: Overview
2. Radiated electric field emissions arrangement: Close up.
3. AC Powerline Conducted emissions arrangement: Overview



Photograph 1



Photograph 2



Photograph 3

