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TEST REPORT

CFR 47, Part 15, Subpart D
RSS 213, Issue 2
Isochronous UPCS Device
1920 – 1930 MHz

Report Reference No...... : 10236228_trf2

Compiled by (+ signature) : David Light

Approved by (+ signature) : Tom Tidwell

Date of issue : 7-Mar-13

Report Revision : 4

Total number of pages : 89

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Applicant's name : Uniden America Corporation

Address..... : 4700 Amon Carter Boulevard, Fort Worth, Texas 76155

Model(s) Tested..... : D1680v, D1660v, and DCX160v cordless telephone handset

FCC ID..... : AMWUN368R

Test specification:

Standard : CFR 47, Part 15, Subpart D and RSS 213, Issue 2

Test procedure..... : ANSI C63.17-2006

Non-standard test method : N/A

TRF Revision..... : 7-Feb-13

Revision History

#	Description	Date
0	Original Report Release	28-Feb-13
1	Added engineering judgment (pg. 6)	4-Mar-13
2	Added model DCX160v	7-Mar-13
3	Corrected model numbers	13-Mar-13
4	Corrected frequency ranges throughout test report	21-Mar-13

Notices:

1. This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.
2. The test results presented in this report relate only to the object tested.
3. The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.
4. "(see Enclosure #)" refers to additional information appended to the report.
5. Throughout this report a point is used as the decimal separator.
6. Dimensions in English units for convenience only, metric units prevail.
7. It is the manufacturer's responsibility to provide special instructions, if needed, to the user regarding the use of special cables (length, shielded/unshielded, type, grounding, etc.), clamp-on ferrite beads, etc for use with their product(s).

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Normative References

The following document(s) have been appropriately considered in the performance of the test results detailed in this report.

CFR Title 47, Part 2, Subpart J – Equipment Authorization Procedures

CFR Title 47, Part 15, Subpart D – Unlicensed Personal Communication Services (UPCS) Devices

ANSI C63.17 : 2006 – Methods of Measurement of the Electromagnetic and Operational Compatibility of Unlicensed Personal Communications Services (UPCS) Devices

RSS 213, Issue 2 : Dec 2005 – 2 GHz Licence-exempt Personal Communications Service Devices (LE-PCS)

Equipment Under Test (EUT)

Details:

Test item description:

Model : D1680v, D1660v, and DCX160v
Serial Number : Handset #1(radiated), Handset #2 (antenna conducted)
Production Status : Production Pre-Production Prototype
Other Status Info : [Click here to enter text.](#)
EUT Received Date : 17-Dec-12
Ratings : 2.4VDC (Battery) 1 ϕ 3 ϕ
Product Type..... : Handset
Modulation Type : GFSK
Operating Frequency Range : 1920 - 1930 MHz
Number of Channels..... : 5

User Frequency Adjustment..... : None

General product description:

The EUT is a cordless telephone handset. The cordless phone uses DECT 6.0 protocol with changes to frequency range to make the phone operate within the frequency band 1920 to 1930 MHz as required by CFR 47, Part 15, Subpart D. Power for the handset is provided by rechargeable 2.4 Vdc battery pack.

Modifications to the EUT required for compliance:

There have been no modifications to the EUT as a result of this evaluation.

Deviations from Test Methodology:

None



Engineering Judgements:

Model D1680v and model D1660v handset are electrically identical in the radio circuit. Full testing was performed on model D1680v. Since the two models are electrically identical, the test data in this report is considered to be representative of model D1680v and D1660v.

Model DCX160v is identical and is only a model number assigned to the handset when it is sold separately.

Approved by (+ signature): Tom Tidwell

Table 1 – EUT Internal Operating Frequencies

Frequency (MHz)	Description	Frequency (MHz)	Description
1920.672 MHz - 1927.584 MHz	Local oscillator		
1880 – 1935 MHz	PLL		
2829 – 2903 MHz	VCO		
13.824 MHz	Crystal Oscillator		

Table 2 – EUT Operating Modes

Mode #	Description
1	Transmit continuous data burst mode
2	
3	

EUT Configuration

Figure 1 – EUT Configuration Diagram

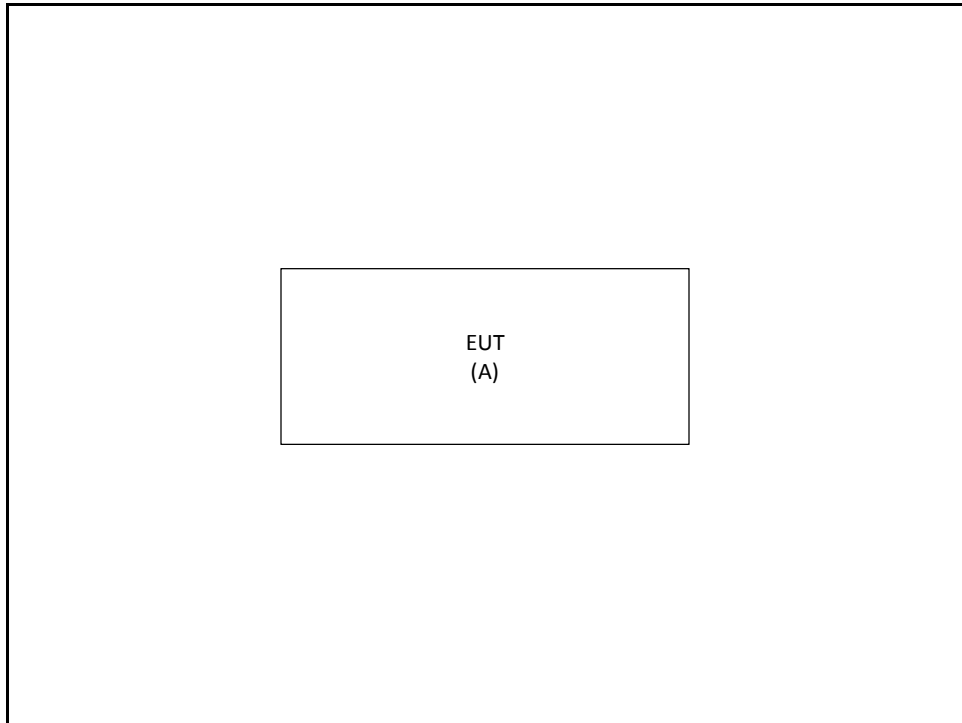


Table 3 – EUT & Auxiliary Equipment List

Item	Use*	Product Type	Manufacturer	Model	Serial No.
A	EUT	Cordless phone handset	Uniden Corp. Japan	D1680v	Handset #1 or Handset #2
B					
C					
D					
E					
F					
Note: * Use = EUT – Equipment Under Test, AE – Auxiliary/Associated Equipment, or SIM – Simulator (Not Subjected to Test)					

Table 4 – Interconnecting Cables List

Item	Use*	Cable Type
1		
2		
3		
4		
5		
6		
7		

EUT Photo(s)


Photo 1	EUT Photo – Front/Top View
	
<p>Supplemental Information: D1680v/D1660v Handset</p>	

Photo 2	EUT Photo – Rear/Side View	
		
Supplemental Information: D1680v/D1660v Handset		

Photo 3	EUT Photo – Front/Top View	
		
Supplemental Information: D1680v/D1660v Handset		

Summary of Testing – CFR Title 47, Part 15, Subpart D

Possible test case verdicts:

- test case does not apply to the test object : N/A
- test object does meet the requirement..... : P (Pass)
- test object does not meet the requirement : F (Fail)
- not tested (not part of this evaluation)..... : NT

Date(s) of performance of tests..... : Jan. 16 – Feb 19, 2013

Clause	Test Description	Verdict	Comment
15.307	Coordination with fixed microwave		
15.319(b)	Digital modulation techniques	P	
15.19(a)(3)	Labelling requirements	P	
15.203, 15.317	Antenna requirement	P	
15.107(a), 15.207(a)	Power line conducted emissions	N/A	Battery powered
15.323(a)	Emission bandwidth	P	
15.323(d)	In-band emissions	P	
15.323(d)	Out-of-band emissions	P	
15.319(c), 15.31(e)	Peak transmit power	P	
15.319(d)	Power spectral density	P	
15.319(f)	Automatic discontinuation of transmission	P	
15.323(f)	Carrier frequency stability	P	
15.323(e)	Frame repetition stability	P	
15.323(e)	Frame period and jitter	P	
15.323(c)(2);(5);(9)	Monitoring threshold, Least Interfered Channel	P	
15.323(c)(1)	Monitoring of intended transmit window and maximum reaction time	P	
15.323(c)(7)	Threshold monitoring bandwidth	P	
15.323(c)(1);(5);(7)	Reaction time and monitoring interval	P	
15.323(c)(4);(6)	Access criteria test interval	N/A	Note 1
15.323(c)(4);(6)	Access criteria functional test	N/A	Note 1
15.323(c)(4)	Acknowledgements	P	
15.323(c)(3)	Transmission duration	P	
15.323(c)(10)	Dual access criteria	P	
15.323(c)(10)(11)	Alternative monitoring interval	N/A	Note 2
15.323(d)	Spurious emissions (antenna conducted)	P	
15.319(g) 15.109(a) 15.209(a)	Spurious emissions (radiated)	P	

Notes:

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

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

³The tested equipment has integrated antennas only.



General remarks:

Summary of compliance with national requirements:

Compliance with this standard provides one means of demonstrating conformity with the specified requirements of CFR Title 47, Part 15, Subpart D.

Summary of Testing – RSS 213, Issue 2

Possible test case verdicts:

- test case does not apply to the test object : N/A
- test object does meet the requirement..... : P (Pass)
- test object does not meet the requirement : F (Fail)
- not tested (not part of this evaluation)..... : NT

Date(s) of performance of tests..... : Jan. 16 – Feb 19, 2013

Clause	Test Description	Verdict	Comment
6.1	Digital modulation techniques	P	
RSS-GEN 5.2	Labelling requirements	P	
4.1(e)	Antenna requirement	P	
6.3 RSS-GEN 7.2.2	Power line conducted emissions	N/A	Battery powered
6.4	Emission bandwidth	P	
6.7.2	In-band emissions	P	
6.7.1	Out-of-band emissions	P	
6.5	Peak transmit power	P	
4.3.2.1	Power spectral density	P	
4.3.4(a)	Automatic discontinuation of transmission	P	
6.2	Carrier frequency stability	P	
4.3.4(c)	Frame repetition stability	P	
4.3.4(c)	Frame period and jitter	P	
4.3.4(b)	Monitoring threshold, Least Interfered Channel	P	
4.3.4	Monitoring of intended transmit window and maximum reaction time	P	
4.3.4	Threshold monitoring bandwidth	P	
4.3.4	Reaction time and monitoring interval	P	
4.3.4	Access criteria test interval	N/A	Note 1
4.3.4	Access criteria functional test	N/A	Note 1
4.3.4	Acknowledgements	P	
4.3.4	Transmission duration	P	
4.3.4	Dual access criteria	P	
4.3.4	Alternative monitoring interval	N/A	Note 2
6.7.1	Spurious emissions (antenna conducted)	P	
4.3.3 RSS-GEN 7.2.3	Spurious emissions (radiated)	P	
6.8	Receiver spurious emissions	P	

Notes:

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

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

³The tested equipment has integrated antennas only.

General remarks:



Summary of compliance with national requirements:
 Compliance with this standard provides one means of demonstrating conformity with the specified requirements of RSS 213, Issue.

Testing Location	
Testing Laboratory:	Nemko USA, Inc. (Dallas)
Testing location/ address	802 N. Kealy Ave. Lewisville, TX 75057 USA
Testing procedure: TMP	
Tested by (name + signature) :	
Approved by (+ signature) :	
Testing location/ address	
Supplemental Information:	
Testing results contained herein were performed at the location(s) listed above.	

Test Methods

Battery operated products: Batteries used for testing are as supplied. Testing is performed with fully charged battery.

Products powered by AC mains connection: Testing is performed at 120 VAC. The voltage is varied to determine if the rf power output varies with voltage variation.

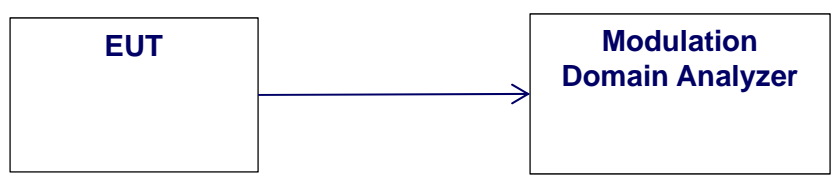
Temperature and humidity:

Normal Conditions

Parameter	Minimum	Nominal	Maximum
Temperature (°C)	21	---	23
Relative Humidity (%)	20	---	40

Testing is performed according to ANSI C63.17:2006

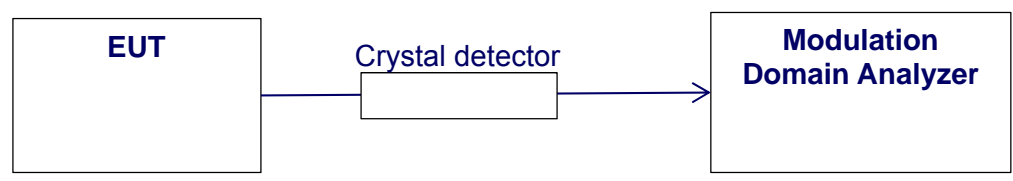
Frequency Measurements



Carrier frequency stability at normal and extreme temperatures

Modulation pattern: 010101...

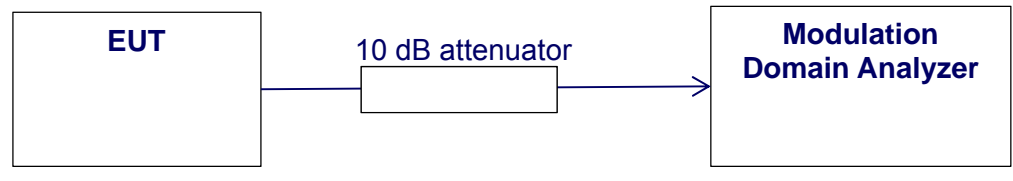
Timing Measurements



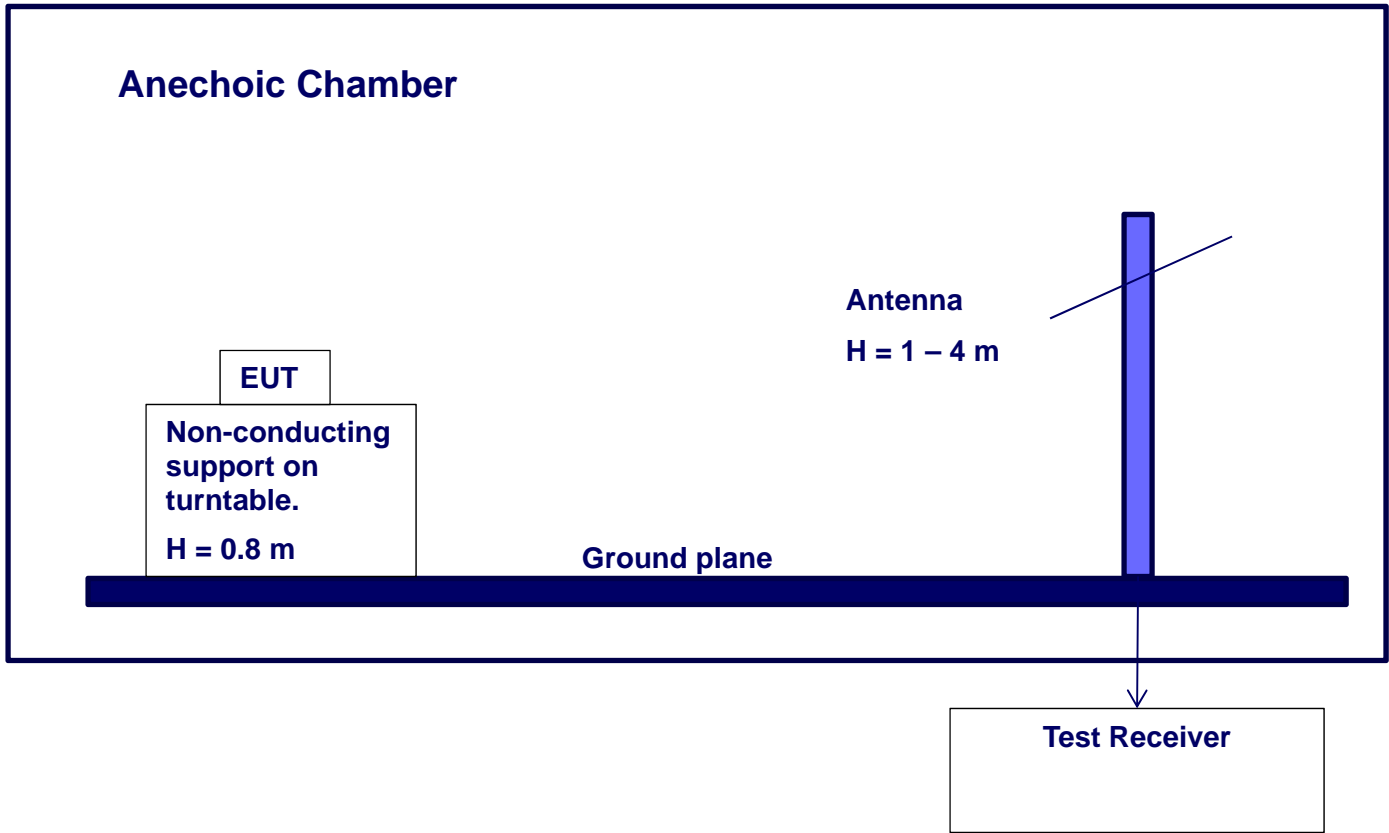
Frame repetition stability, Frame period and Jitter

Modulation pattern: 010101...

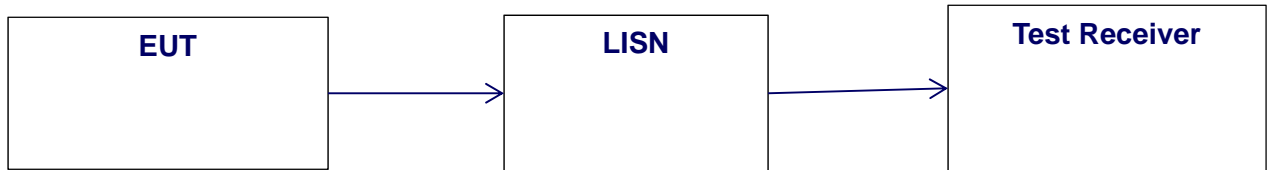
Antenna Conducted Emission Measurement



Radiated Emissions Testing

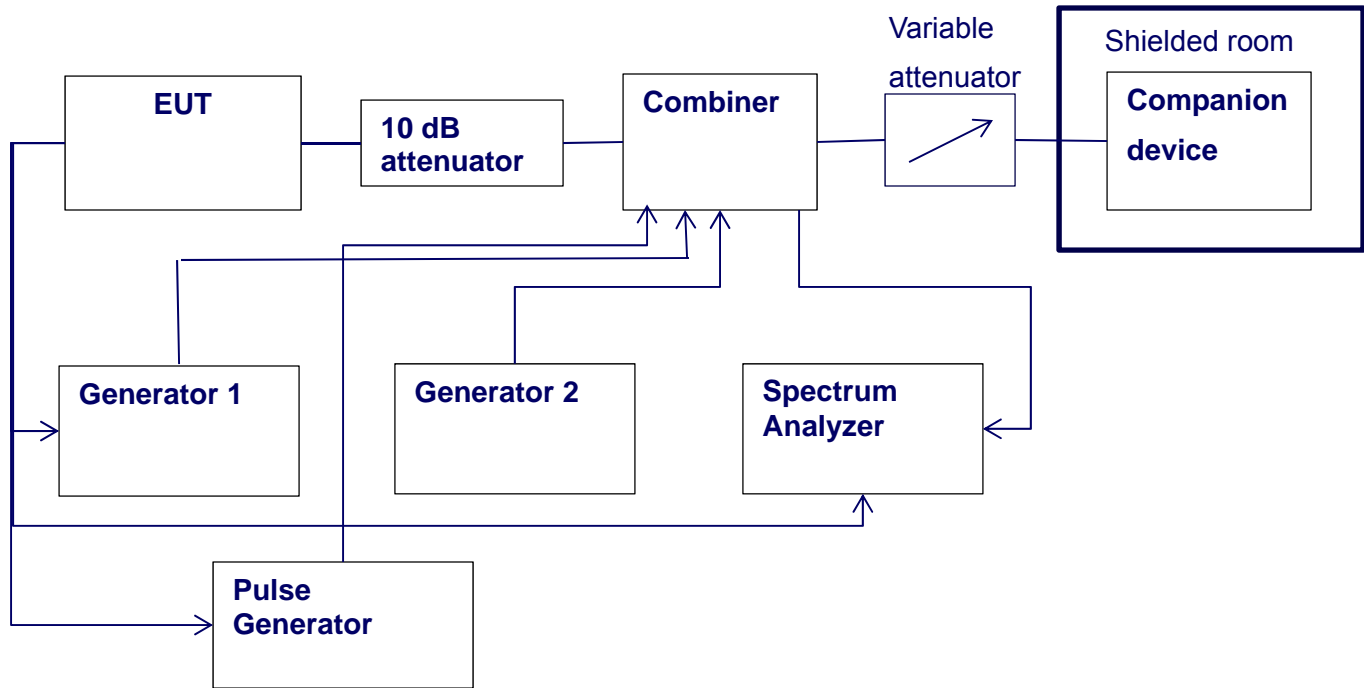


Power Line Conducted Emissions



Measurement range (MHz)	Receiver bandwidth	Detector
0.150 to 30	10 kHz	Peak
0.150 to 30	9 kHz	Average
0.150 to 30	9 kHz	CISPR Quasi-Peak

Monitoring Tests



Path loss between the generators and the EUT is measured using a calibrated spectrum analyzer before the test.

The CLK100 signal is used to synchronize the pulse signal generator, the interfering signal generators and the spectrum analyzer to the start of the DECT frame. CLK100 always comes from the base station, therefore, if the EUT is a handset then the CLK100 comes from the Companion Device in the above drawing.

The EUT was limited by administrative commands to operate on only two RF carriers. Generator 1 is an I/Q generator capable of generating an interference signal on multiple channels. Generator 2 is used to block specific channels as required. The pulse generator was used to generate 50 µsec and 35 µsec. rf pulses.

List of Test Equipment

The following test equipment was used in the performance of the testing herein.

Table 5 – Test Equipment Used

Asset Tag	Description	Manufacturer	Model	Serial Number	Cal. Cycle
1016	Preamplifier	Hewlett Packard	8449A	2749A00159	1 YR
1036	Spectrum Analyzer	Rohde & Schwartz	FSEK30	830844/006	2 YR
1052	Generator, I/Q Modulation	Rohde & Schwartz	AMIQ	830848/0005	N/R
1053	Generator, Vector Signal 300 KHz	Rohde & Schwartz	SMIQ 03	DE22081	N/R
1094	Combiner	Mini Circuits	ZA3PD-2	-	N/R
1095	Combiner	Mini Circuits	ZA3PD-4	-	N/R




1289	Watkins Johnson 1 to 6GHz Pre Amplifier	Nemko USA, Inc.	CRA53	162001	1 YR
1310	Antenna, Horn	Electro Metrics	RGA-60	6174	2 YR
1733	Antenna, Active Loop	EMCO	6507	45939	1 YR
1763	Antenna, Bilog	Schaffner	CBL 6111D	22926	1 YR
1767	Receiver, EMI Test 20Hz - 26.5 GHz - 150 - +30 dBm LCD	Rohde & Schwartz	ESIB26	837491/0002	1 YR
1824	Generator, Vector Signal 300k-3GHz	Rohde & Schwarz	SMIQ-03B	835467/007	N/R
1783	Cable Assy. 3m Chamber	Nemko	Chamber	-	1 YR
1937	PSG Analog Signal Generator	Agilent Technologies	E8257D	MY51500351	1 YR
-	Crystal detector	RLC Electronics	CR-232	-	N/R
1467	Attenuator, 10 dB	MCL, Inc.	BW-S10W 2 10db-2WD C	-	Verify before use
1468	Attenuator, 10 dB	MCL, Inc.	BW-S10W 2 10db-2WD C	-	Verify before use
4030	Modulation Domain Analyzer	HP	53310A	3121A01845	1 YR



Coordination with fixed microwave


Table No. 1	Coordination with fixed microwave	Verdict
		P
The affidavit from UTAM, Inc. is included in the documentation supplied by the applicant:		
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
Requirement:		
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.		
Evaluated by (+ signature)		David Light 

Digital modulation techniques


Table No. 2	Digital Modulation Techniques	Verdict
		P
The EUT uses Multi-carrier/Time Division Multiple Access/Time Division Duplex and Digital GFSK modulation.		
Requirement:		
All transmissions must use only digital modulation techniques.		
Evaluated by (+ signature)		David Light 



Labeling requirements

Table No. 3	Labeling requirements	Verdict
See separate label exhibit document.		P
Requirement:		
<p>The FCC identifier shall be displayed on the label and the device shall bear the following statement in a conspicuous location on the device or in the user manual, if the device is too small:</p> <p><i>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.</i></p> <p>The label shall be of a permanent type, and shall last the life of the equipment.</p>		
<p>Evaluated by (+ signature) : David Light </p>		

Antenna requirement

Table No. 4	Antenna requirement	Verdict
<p>Does the EUT have a detachable antenna? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p>If detachable, is the antenna connector non-standard? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>The EUT has only integral antenna. The conducted tests were performed on a sample with a temporary antenna connector.</p>		P
Requirement:		
The antenna shall be non-detachable or shall be a unique connector.		
<p>Evaluated by (+ signature) : David Light </p>		

Channel frequencies

UPCS Channel	Frequency (MHz)
Upper band edge	1930.000
0	1928.448
1	1926.720
2	1924.992
3	1923.264
4	1921.536
Lower band edge	1920.000

Requirement:

The frequency must remain within 1920 – 1930 MHz band for isochronous devices.

Test Results – Automatic discontinuation of transmission



Table No. 5	Automatic discontinuation of transmission	Verdict
		P

The EUT transmits control and signaling information? Yes No

Type of EUT: Initiating device Responding device

Number	Test	EUT reaction	Verdict
1	Power removed from the EUT	C - Connection breakdown. Companion device transmits control and signaling information.	Pass
2	EUT switch off	C - Connection breakdown. Companion device transmits control and signaling information.	Pass
3	Hook-On by companion device	N/A	Pass
4	Hook-On by EUT	C - Connection breakdown. Companion device transmits control and signaling information.	Pass
5	Power removed from companion device	A - Connection breakdown. Transmissions cease.	Pass
6	Companion device switch off	N/A	Pass

Requirement:

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

Tested by (+ signature)

David Light

Test Results – Peak power output

Table No. 6	Peak power output	Verdict
		P

Test Requirement : 15.319(c)(f)
 Test Method..... : ANSI C63.17, clause 6.1.2
 EUT Configuration : Transmit max. power
 Test Date : 21-Jan-13
 Temperature : 21°C Relative Humidity : 22.3 %
 Test Equipment Asset Tag List : 1036, 1310, 1783 (radiated), 1036, 1467, 1468 (conducted)

Channel	Frequency (MHz)	Maximum Conducted Output Power (dBm)	Maximum Radiated Output Power (dBm)	Maximum Antenna Gain (dBi)
4	1921.536	+19.15	+17.0	-2.2
2	1924.992	+19.01	+16.9	-2.1
0	1928.448	+19.01	+16.9	-2.1

Freq. (MHz)	P _{meas} Meter reading (dBm)	G _R RX antenna gain (dBi)	L _C Cable loss (dB)	G _{amp} Pre-amp Gain (dB)	P _R Adjusted RX Power (dBm)	L _P Free-space propagation loss (dB)	EIRP (dBm)	G _T TX antenna gain (dBi)	P _T Transmit power at antenna port (dBm)	P _T Transmit power at antenna port (mW)
1921.536	-24.8	7.3	1.4	0.0	-30.7	47.7	17.0	-2.2	19.2	82.509
1924.992	-24.9	7.3	1.4	0.0	-30.8	47.7	16.9	-2.1	19.0	80.002
1928.448	-24.7	7.5	1.4	0.0	-30.8	47.7	16.9	-2.1	19.0	79.378

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

The EUT was rotated in 3 planes for the antenna gain test.

Limit:

$$B = 1418837 \text{ Hz}$$

Conducted: $100\mu W \times \sqrt{1496993} = 122 \text{ mW} = 20.9 \text{ dBm}$, where B is the measured emission bandwidth in Hz.

The antenna gain is less than 3 dBi, therefore no reduction of power is required.



Requirement:

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

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

Tested by (+ signature)

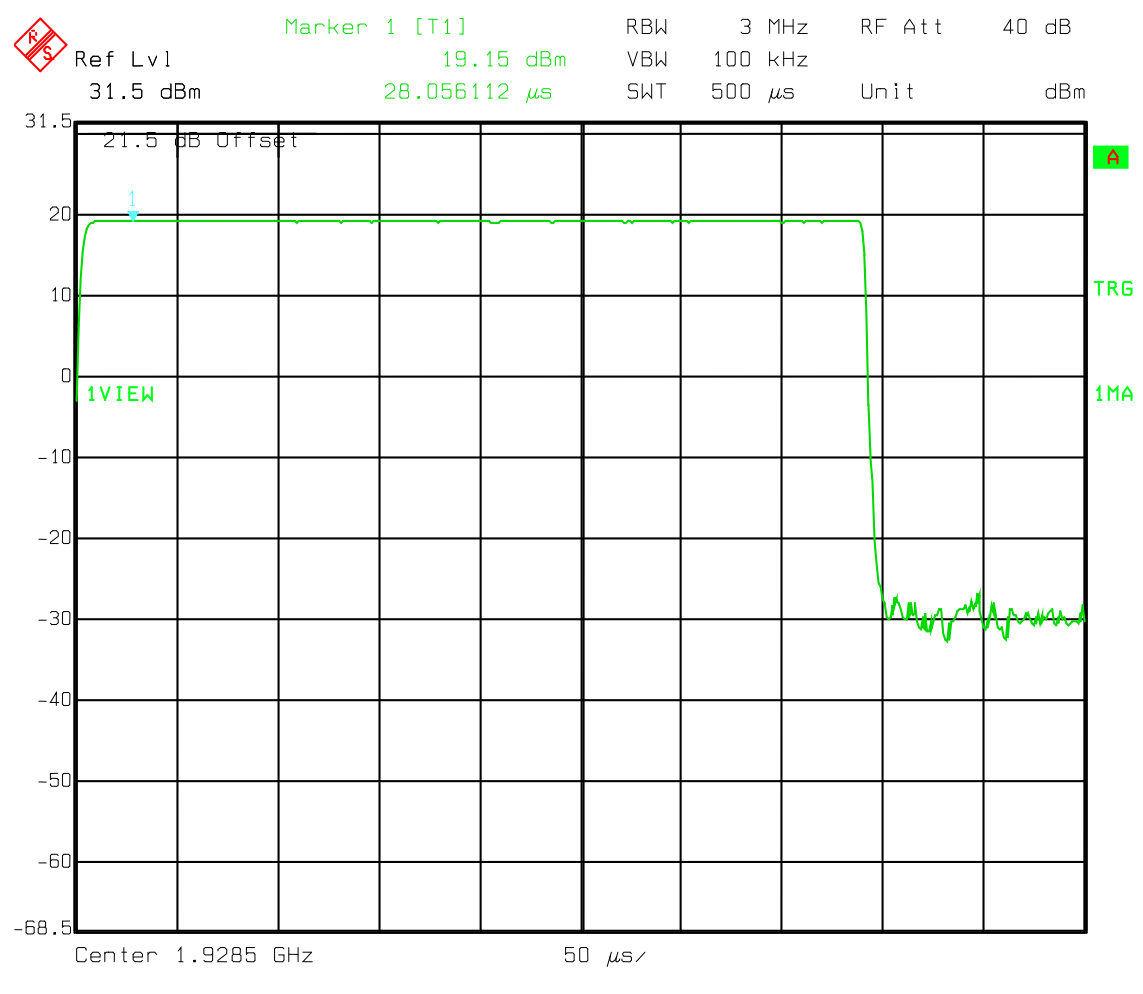
David Light

A handwritten signature in cursive script, appearing to read 'David Light'.



Table No. 7	Peak power output – Upper channel	Verdict
		P

Test Requirement : 15.319(c)(f)
 Test Method..... : ANSI C63.17, clause 6.1.2
 EUT Configuration : Transmit max. power
 Test Date : 21-Jan-13
 Temperature : 21°C
 Relative Humidity : 22.3 %
 Test Equipment Asset Tag List : 1036, 1467, 1468



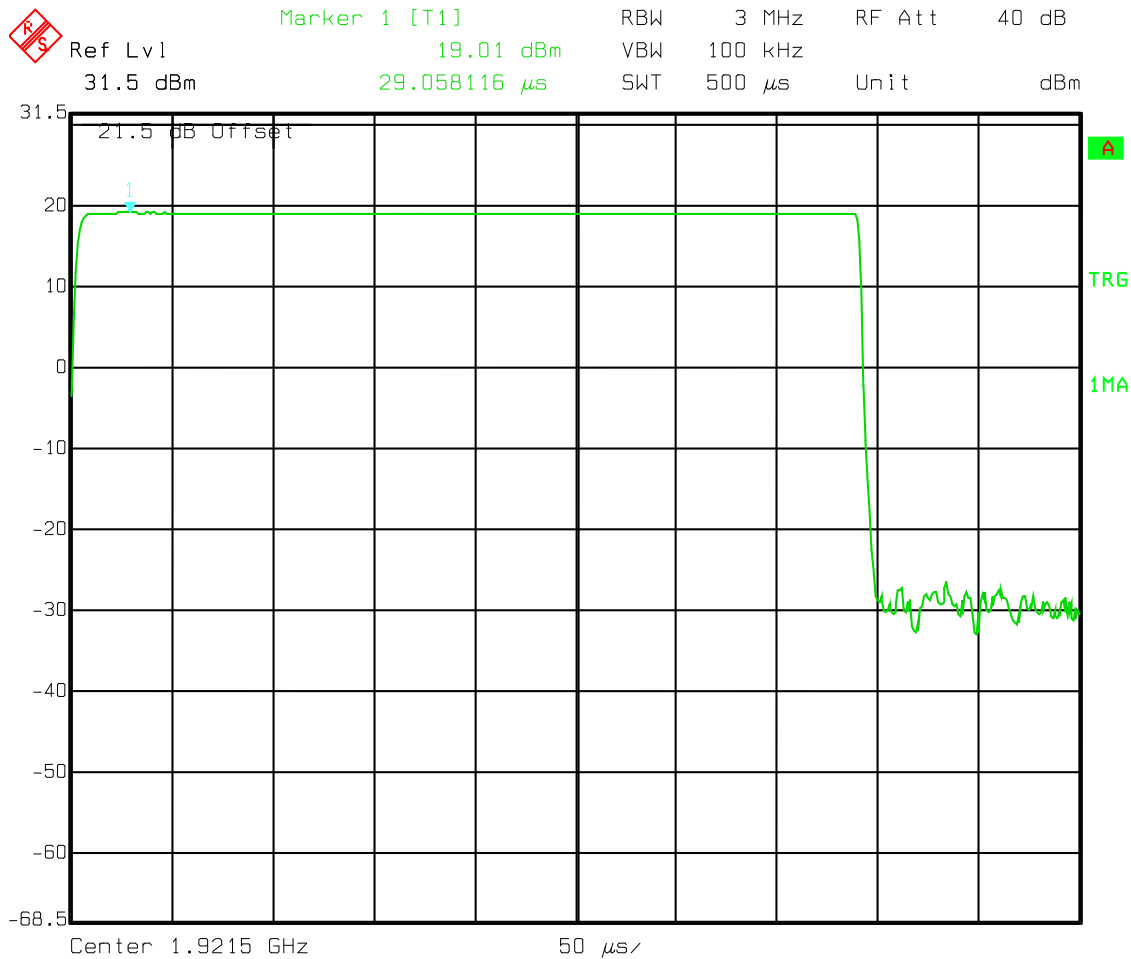
Supplemental Information:

Tested by (+ signature) : *David Light* David Light



Table No. 9	Peak power output – Lower channel	Verdict P
-------------	--	---------------------

Test Requirement : 15.319(c)(f)
 Test Method..... : ANSI C63.17, clause 6.1.2
 EUT Configuration : Transmit max. power
 Test Date : 16-Jan-13
 Temperature : 21°C Relative Humidity : 22.3 %
 Test Equipment Asset Tag List : 1036, 1467, 1468



Supplemental Information:

Tested by (+ signature) : David Light *David Light*

Test Results – Emission bandwidth



Table No. 10	Emission bandwidth	Verdict
		P

Test Requirement: 15.319(c)(f)
 Test Method.....: ANSI C63.17, clause 6.1.3
 EUT Configuration: Transmit max. power, random data
 Test Date: 16-Jan-13
 Temperature: 21°C Relative Humidity: 22.3 %
 Test Equipment Asset Tag List : 1036, 1467, 1468

Channel	Frequency (MHz)	26 dB Bandwidth B (kHz)
4	1921.536	1497.0
2	1924.992	1448.9
0	1928.448	1490.3

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)
2	1924.992	1350.8

Requirement:

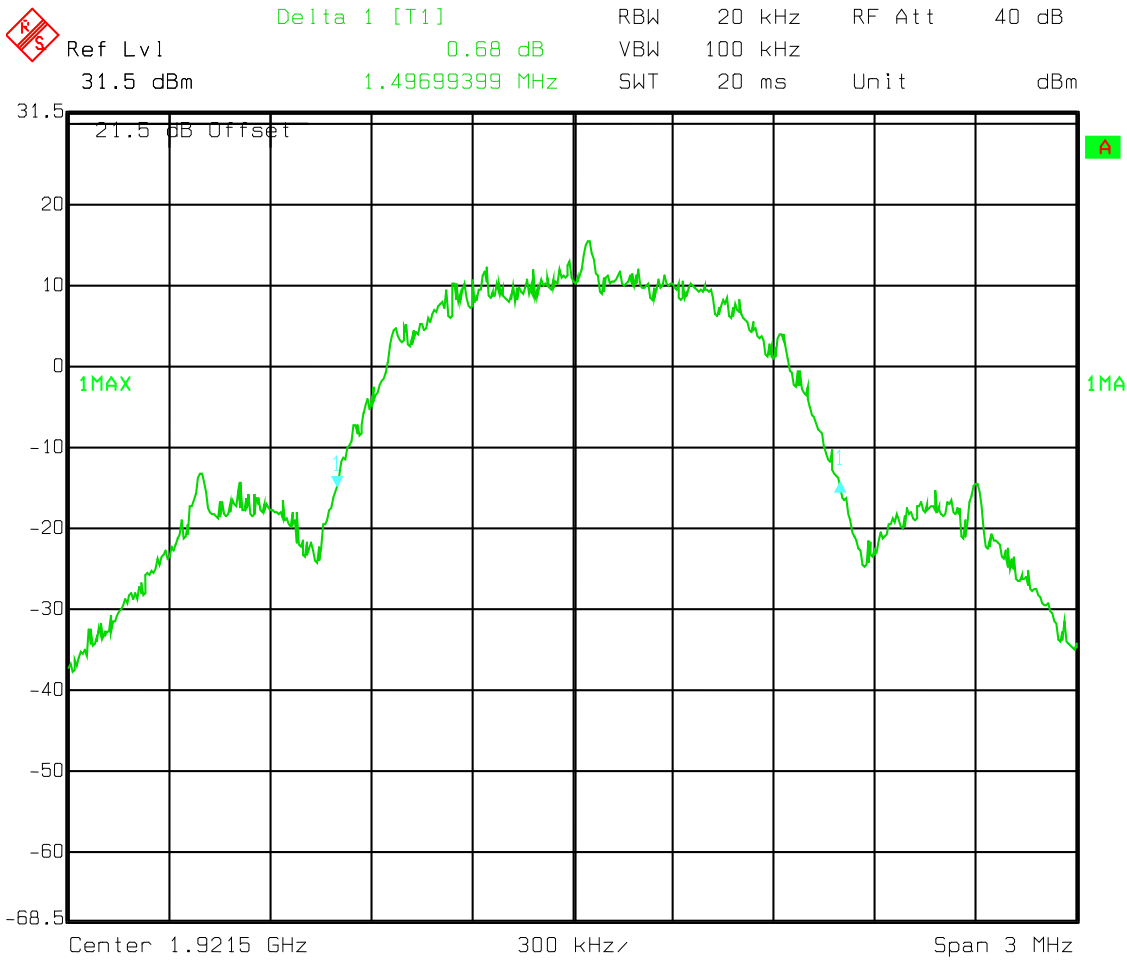
15.323(a): The 26 dB bandwidth *B* shall be larger than 50 kHz and less than 2.5 MHz.
 RSS 213, clause 6.4: The 20 dB bandwidth *B* shall be larger than 50 kHz and less than 2.5 MHz.

Note: There are no requirements for 6 and 12 dB bandwidth. These are only used to test Monitoring Bandwidth when the simple compliance test (ANSI C63.17, clause 7.4) fails.

Tested by (+ signature): David Light

Table No. 11	26 dB Emission bandwidth – Lower channel	Verdict
		P

Test Requirement : 15.319(a)
Test Method..... : ANSI C63.17, clause 6.1.3
EUT Configuration : Transmit max. power, random data
Test Date : 16-Jan-13
Temperature : 21°C Relative Humidity : 22.3 %
Test Equipment Asset Tag List : 1036, 1467, 1468

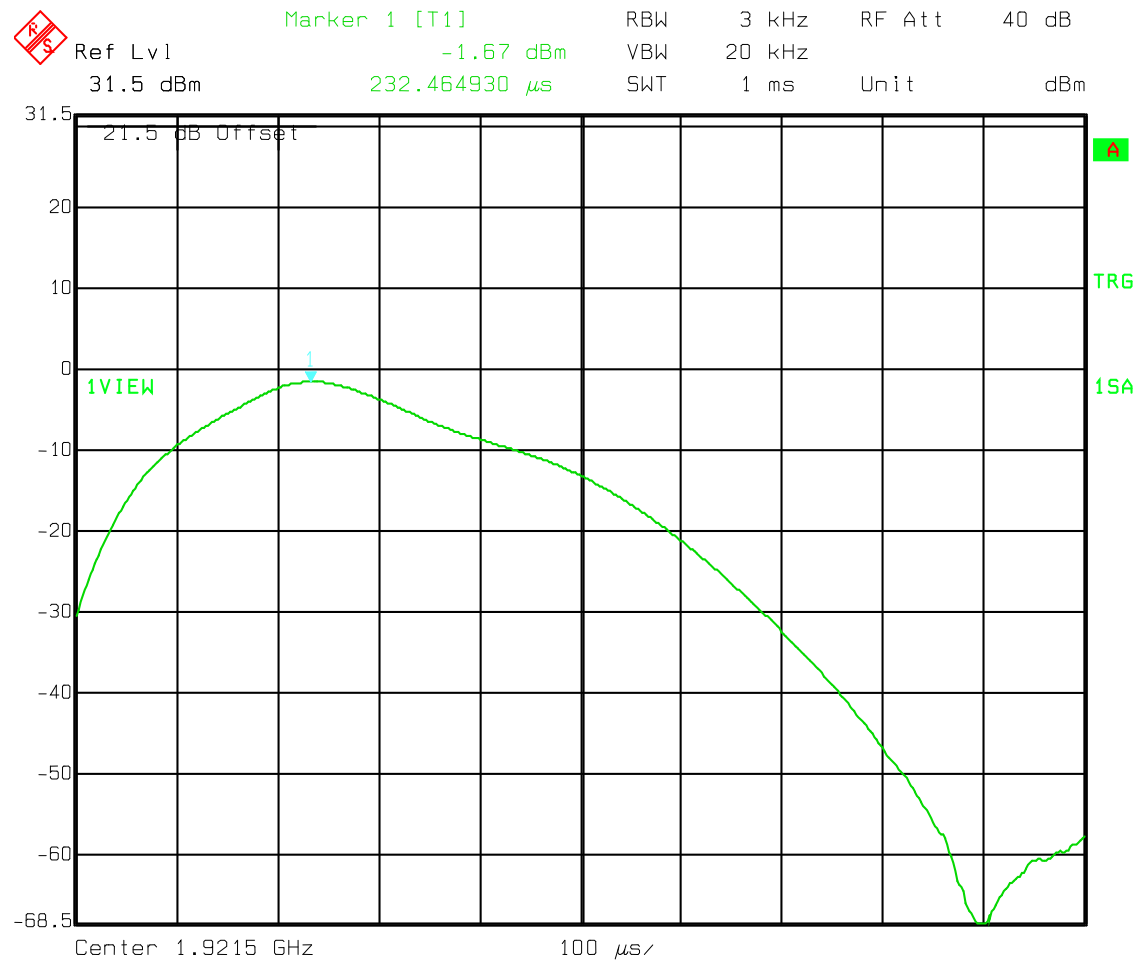


Supplemental Information:

Tested by (+ signature) : David Light 

Test Results – Power spectral density

Table No. 15	Power spectral density – Lower channel	Verdict
		P

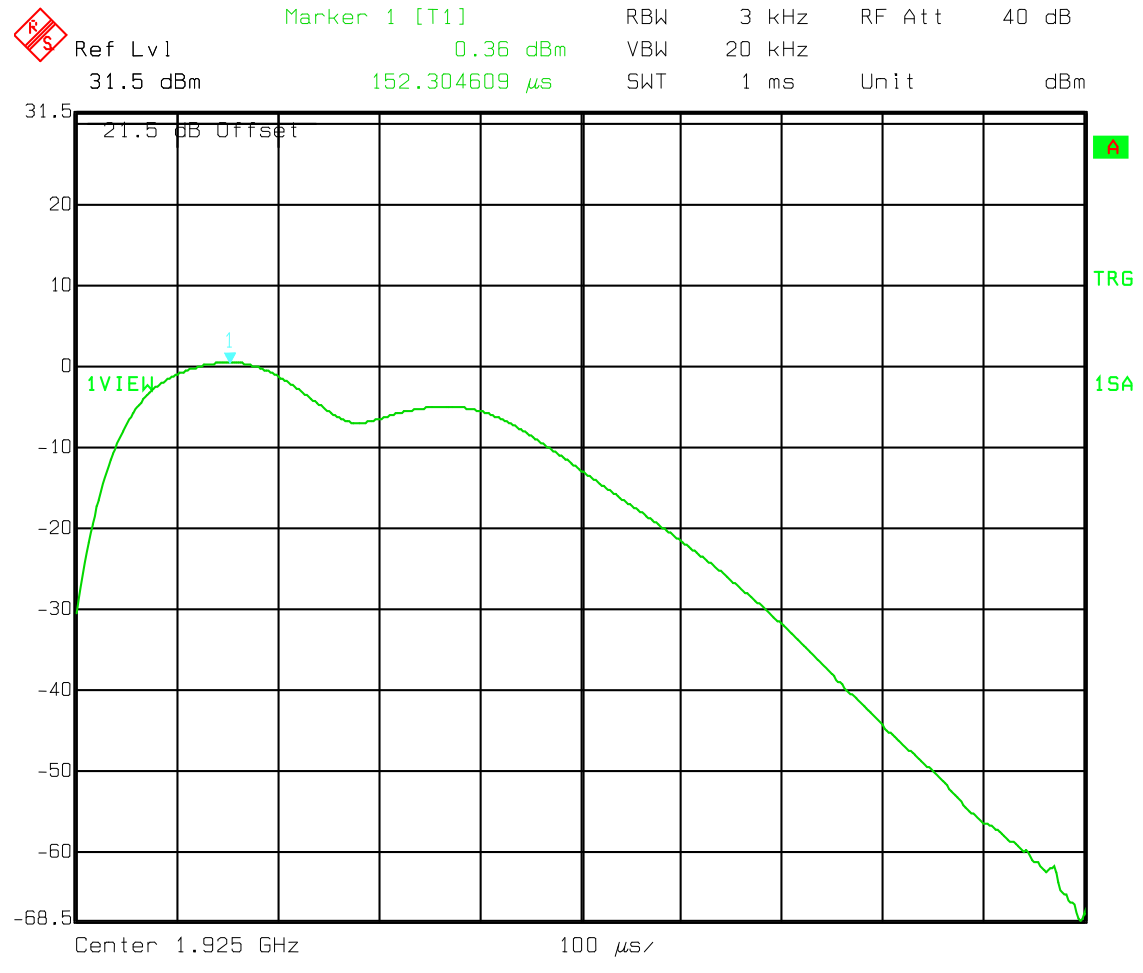


Supplemental Information:

Tested by (+ signature) : David Light 



Table No. 16	Power spectral density – Middle channel	Verdict
		P



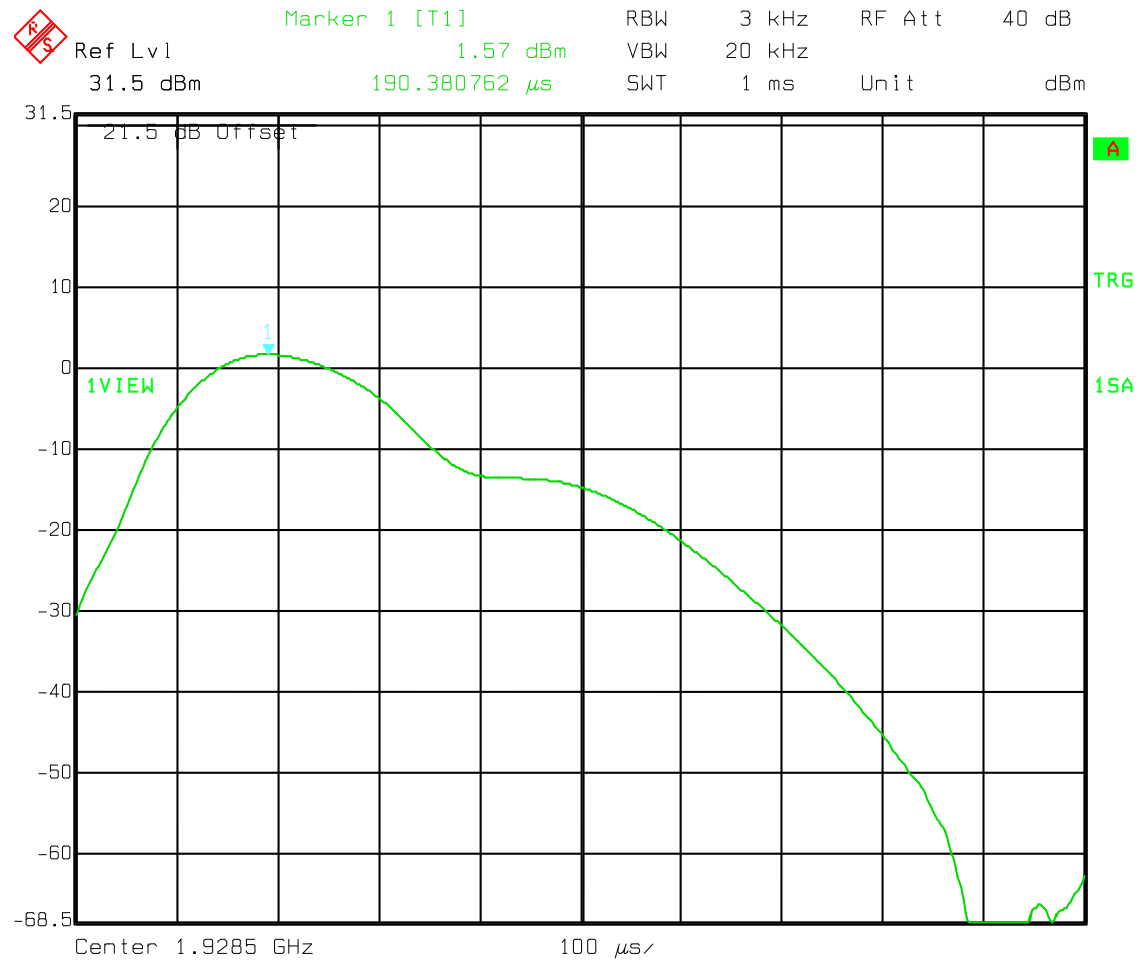
Supplemental Information:

Averaged over 1000 sweeps
 Detector: Sample

Tested by (+ signature) : David Light *David Light*



Table No. 17	Power spectral density – Upper channel	Verdict
		P



Supplemental Information:

Tested by (+ signature) : *David Light* David Light

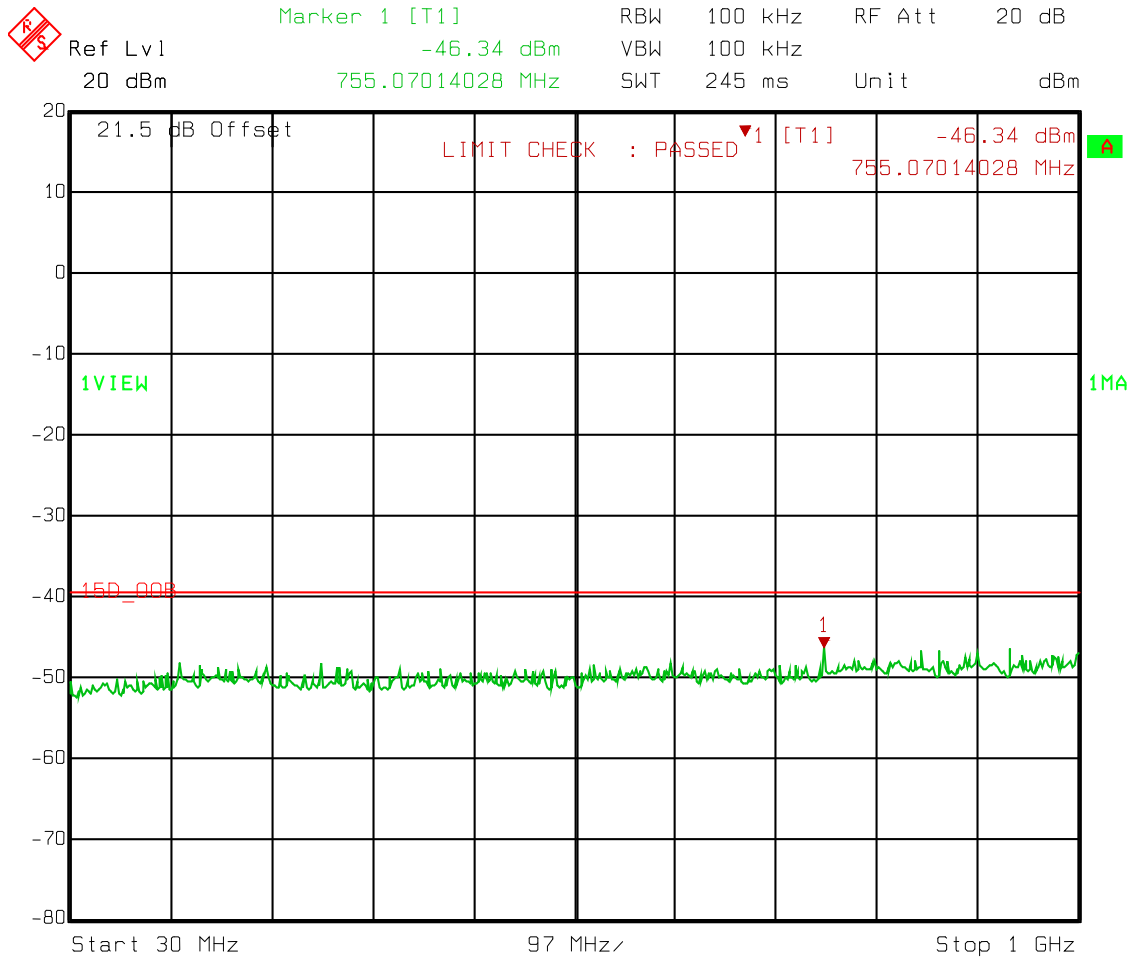


Test Results – In-band unwanted emissions

Test Results – Out-of-band emissions

Table No. 26	Out-of-band emissions – Upper channel	Verdict
		P

Test Requirement : 15.323(d)
 Test Method..... : ANSI C63.17, clause 6.1.6.2
 EUT Configuration : Transmit max. power, random data
 Test Date : 16-Jan-13
 Temperature : 21°C Relative Humidity : 22.3 %
 Test Equipment Asset Tag List : 1036, 1467, 1468



Date: 16.JAN.2013 08:43:12

Supplemental Information:

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

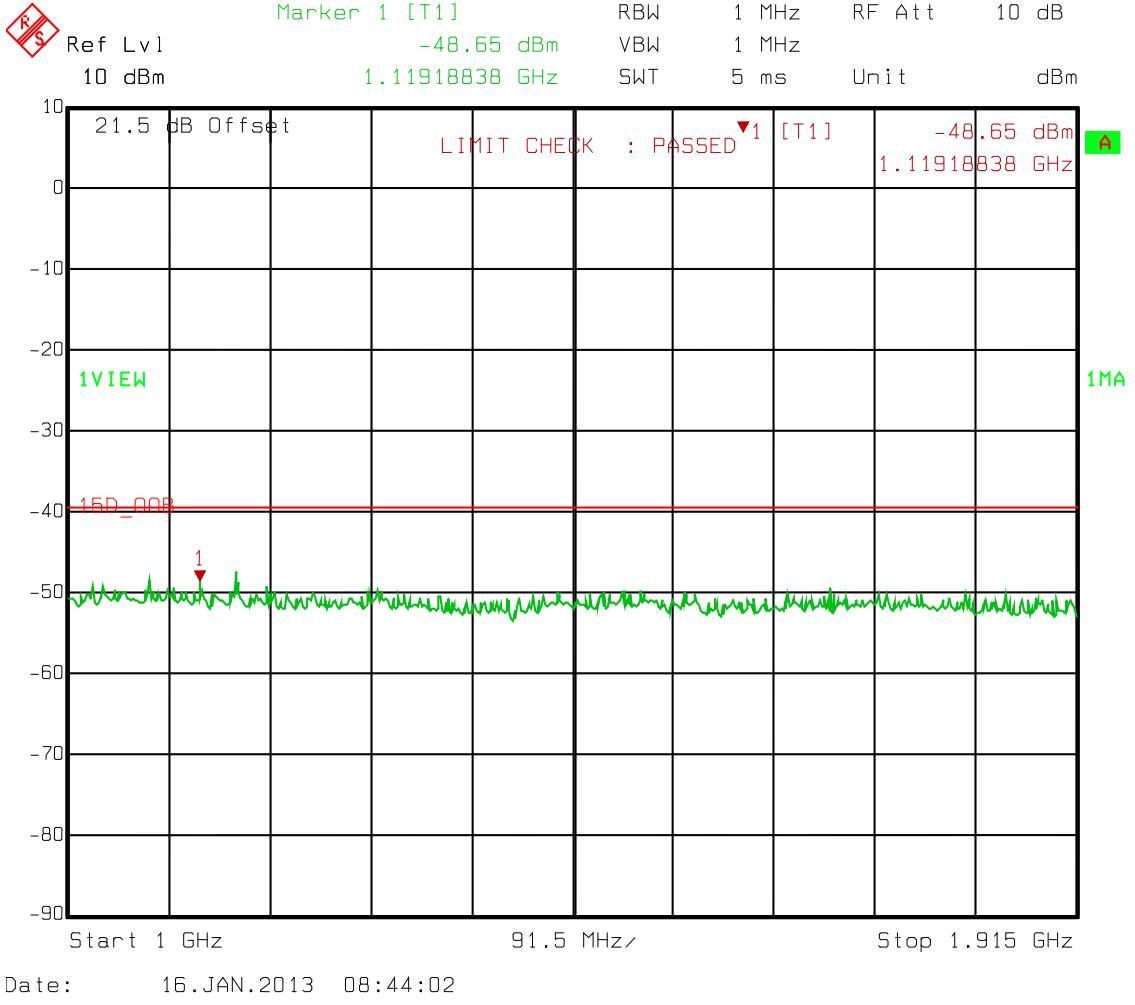
Tested by (+ signature) : David Light





Table No. 27	Out-of-band emissions – Upper channel	Verdict
		P

Test Requirement : 15.323(d)
 Test Method..... : ANSI C63.17, clause 6.1.6.2
 EUT Configuration : Transmit max. power, random data
 Test Date : 16-Jan-13
 Temperature : 21°C
 Relative Humidity : 22.3 %
 Test Equipment Asset Tag List : 1036, 1467, 1468



Supplemental Information:

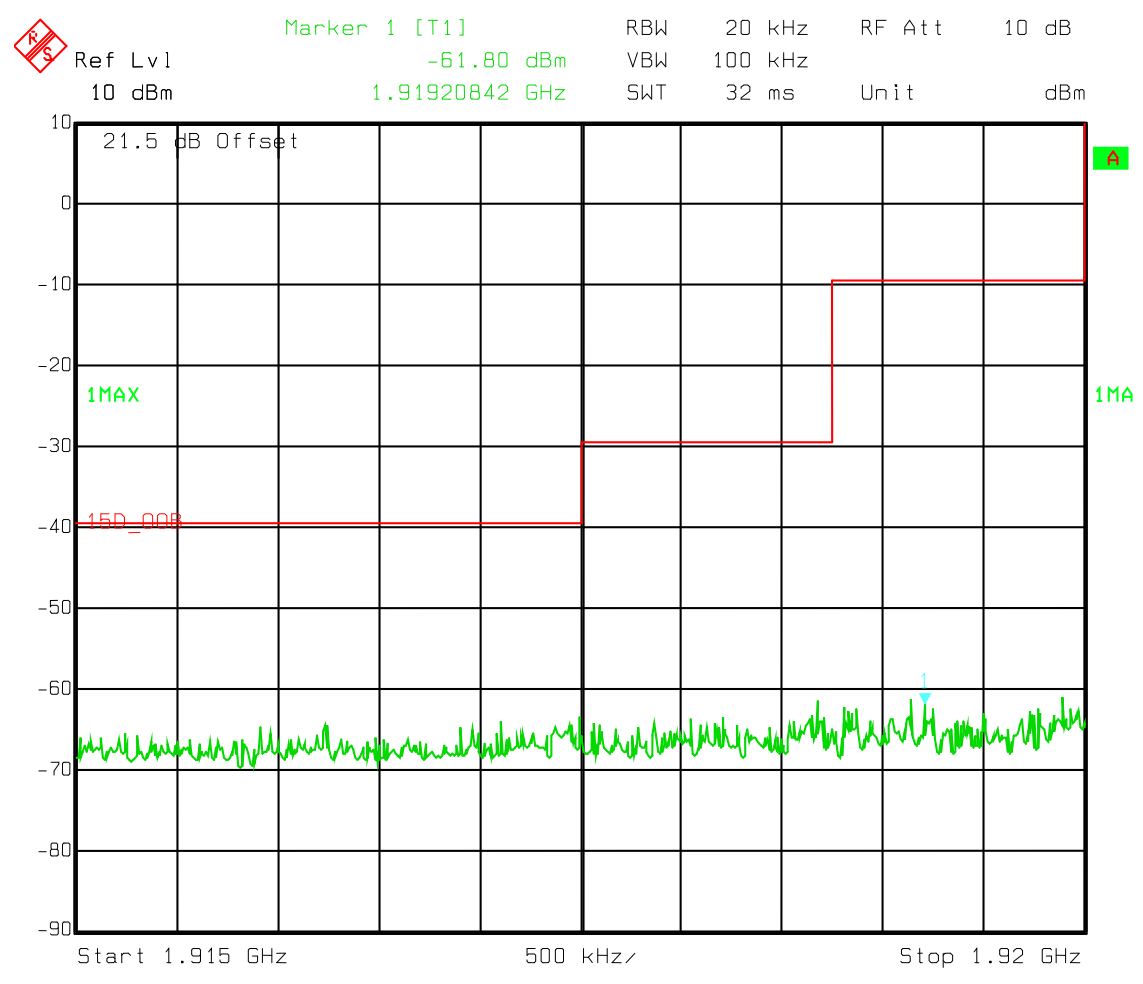
Requirements:
 $f \leq 1.25$ MHz outside UPCS band: ≤ -9.5 dBm
 $1.25 \text{ MHz} \leq f \leq 2.5$ MHz outside UPCS band: ≤ -29.5 dBm
 $f \geq 2.5$ MHz outside UPCS band: ≤ -39.5 dBm

Tested by (+ signature) : David Light



Table No. 28	Out-of-band emissions – Upper channel	Verdict
		P

Test Requirement : 15.323(d)
 Test Method..... : ANSI C63.17, clause 6.1.6.2
 EUT Configuration : Transmit max. power, random data
 Test Date : 16-Jan-13
 Temperature : 21°C Relative Humidity : 22.3 %
 Test Equipment Asset Tag List : 1036, 1467, 1468



Supplemental Information:

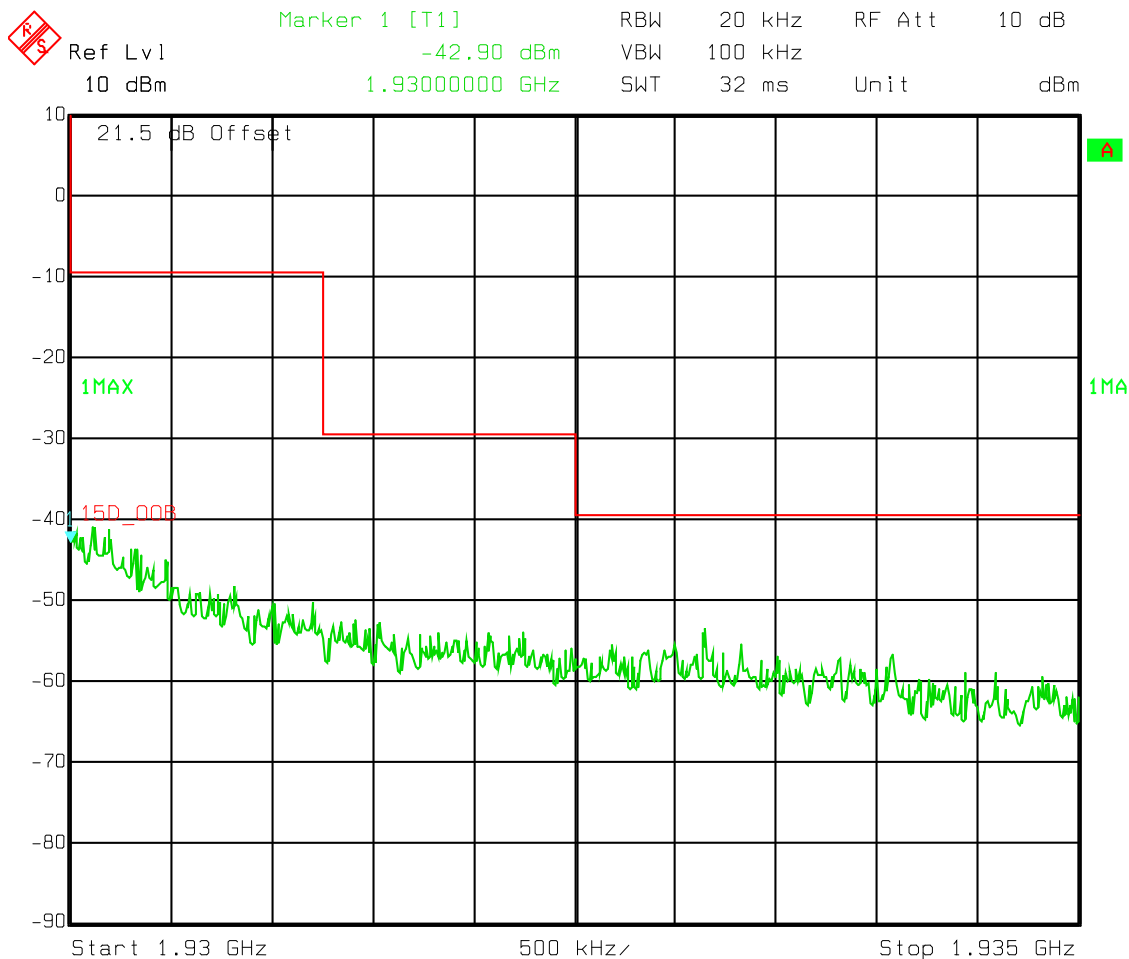
Requirements:
 $f \leq 1.25$ MHz outside UPCS band: ≤ -9.5 dBm
 1.25 MHz $\leq f \leq 2.5$ MHz outside UPCS band: ≤ -29.5 dBm
 $f \geq 2.5$ MHz outside UPCS band: ≤ -39.5 dBm

Tested by (+ signature) : David Light 



Table No. 29	Out-of-band emissions – Upper channel	Verdict
		P

Test Requirement : 15.323(d)
 Test Method..... : ANSI C63.17, clause 6.1.6.2
 EUT Configuration : Transmit max. power, random data
 Test Date : 16-Jan-13
 Temperature : 21°C Relative Humidity : 22.3 %
 Test Equipment Asset Tag List : 1036, 1467, 1468



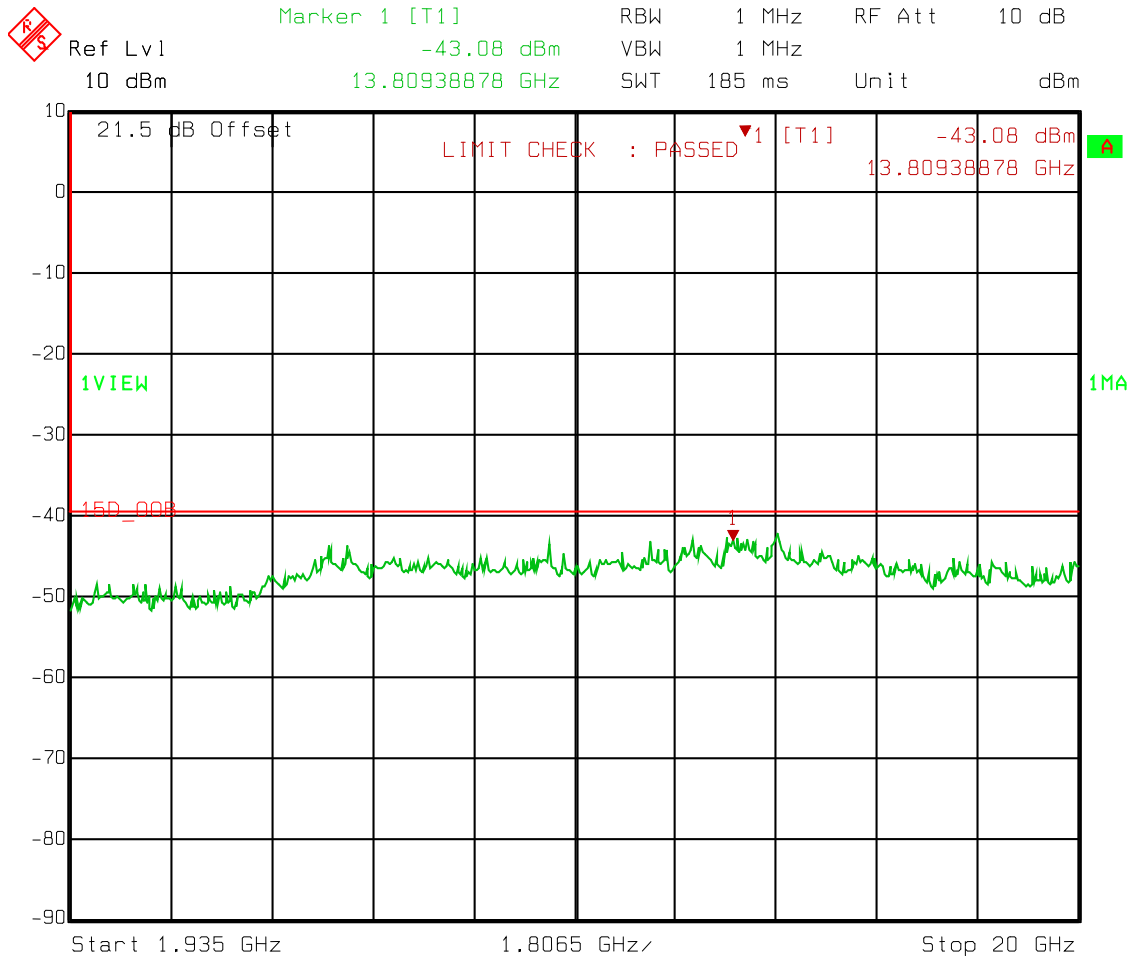
Supplemental Information:

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

Tested by (+ signature) : David Light

Table No. 30	Out-of-band emissions – Upper channel	Verdict
		P

Test Requirement : 15.323(d)
 Test Method..... : ANSI C63.17, clause 6.1.6.2
 EUT Configuration : Transmit max. power, random data
 Test Date : 16-Jan-13
 Temperature : 21°C Relative Humidity : 22.3 %
 Test Equipment Asset Tag List : 1036, 1467, 1468



Date: 16.JAN.2013 08:46:28

Supplemental Information:

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

Tested by (+ signature) : David Light



Test Results – Carrier frequency stability



Table No. 31	Frequency Stability Under Low Voltage Conditions	Verdict
		P

Test Requirement : 15.323(f)
Test Method..... : ANSI C63.17, clause 6.2.1
Test Date : 16-Jan-13
Temperature : 21°C Relative Humidity : 22.3 %
Test Equipment Asset Tag List : 1036, 1467, 1468

Frequency stability over 1 hour of operation at nominal temperature

The FSEK modulation signal analysis function was used to measure the frequency error once per second for a period of one hour.

Voltage	Average mean carrier frequency (MHz)	Pk-Pk difference (Hz)	Deviation (ppm)	Limit
V _{nom}	1928.450624	2398	0.62	±10 ppm

Deviation (ppm) = ((Pk-Pk difference) / 2) / Mean) x 10⁶
Calculated from 3000 readings

Frequency stability over power supply variations at nominal temperature

Voltage	Measured carrier frequency (MHz)	Difference (kHz)	Deviation (ppm)	Limit
V _{nom}	-	-	-	±10 ppm
85% of V _{nom}	-	-	-	
115% of V _{nom}	-	-	-	

Deviation (ppm) = ((Mean – Measured Frequency) / Mean) x 10⁶
This test does not apply for EUT that is powered by battery.

Frequency stability over temperature

V _{nom}	Measured carrier frequency (MHz)	Difference (kHz)	Deviation (ppm)	Limit
T = +20 °C	1928.4497	0	0	±10 ppm
T = -20 °C	1928.4503	+0.6	0.311	
T = +50 °C	1928.4501	+0.4	0.207	

Deviation (ppm) = ((Mean – Measured Frequency) / Mean) x 10⁶

Supplemental Information:

Tested by (+ signature) : David Light

Test Results – Frame repetition stability

Table No. 32	Frame repetition stability	Verdict
		P

Test Requirement : 15.323(e)
Test Method..... : ANSI C63.17, clause 6.2.2
Test Date : 16-Jan-13
Temperature : 21°C Relative Humidity : 22.3 %
Test Equipment Asset Tag List : 4030

Carrier frequency	Mean (Hz)	Standard deviation (Hz)	Frame repetition stability (ppm)
1924.992	100.8	0.00119	0.00357

The envelope of the RF signal from the EUT is detected with a crystal detector and the mean and standard deviation of the frame repetition frequency is then gated over 100 frames and measured using a frequency domain analyzer. The frame repetition stability is 3 x the standard deviation

Supplemental Information:

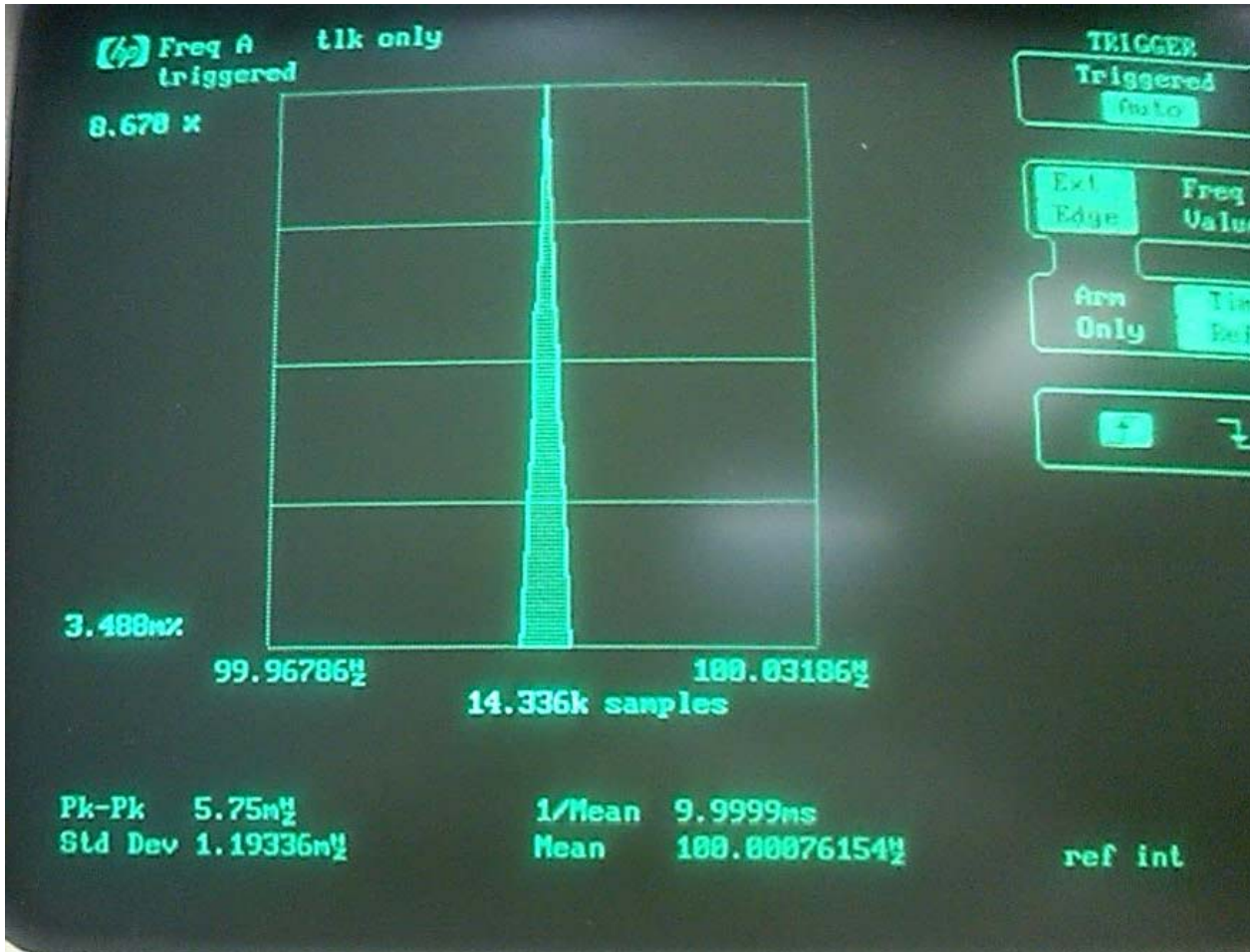
Tested by (+ signature) :

David Light

A handwritten signature in dark ink, appearing to read 'David Light', is positioned to the right of the printed name.

Table No. 33	Frame repetition stability	Verdict
		P

Test Requirement : 15.323(e)
 Test Method..... : ANSI C63.17, clause 6.2.3
 EUT Configuration : Transmit loop
 Test Date : 16-Jan-13
 Temperature : 21°C Relative Humidity : 22.3 %
 Test Equipment Asset Tag List :



Supplemental Information:

Gated over 100 frames

Tested by (+ signature) : David Light 

Test Results – Frame period and jitter

Table No. 34	Frame period and jitter	Verdict
		P

Test Requirement : 15.323(e)
 Test Method..... : ANSI C63.17, clause 6.2.3
 Test Date : 16-Jan-13
 Temperature : 21°C Relative Humidity : 22.3 %
 Test Equipment Asset Tag List : 4030

Carrier frequency	Frame period (ms)	Max jitter (µs)	3 x standard deviation of jitter (µs)
1924.992	10.000	0.0667	0.2001

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

Supplemental Information:

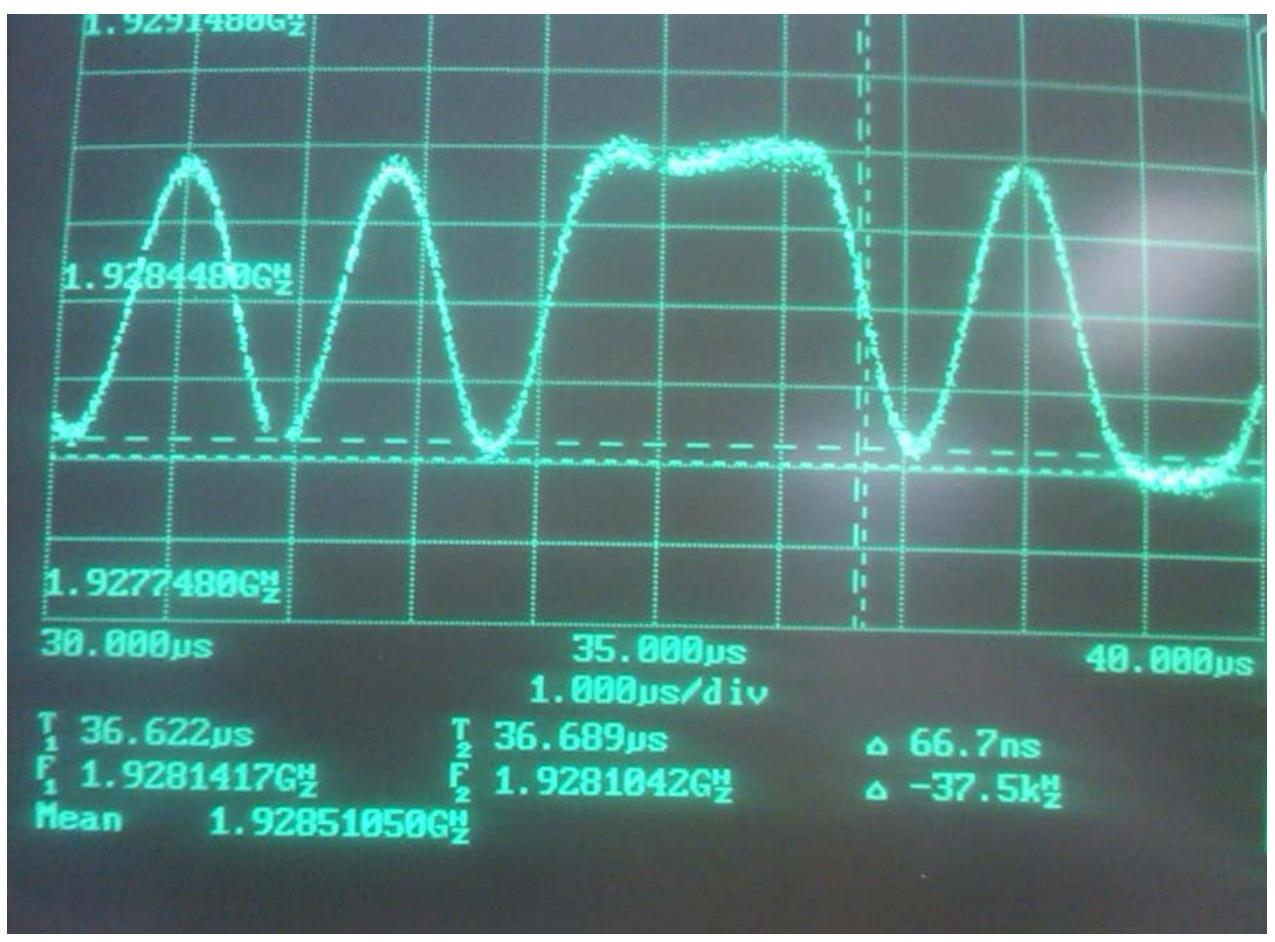
Limit:

Frame period	20 or 10 ms
Max jitter	25 µs
3 x Standard dev. of jitter	12.5 µs

Tested by (+ signature) : David Light 

Table No. 35	Frame period and jitter	Verdict
		P

Test Requirement : 15.323(e)
 Test Method..... : ANSI C63.17, clause 6.2.3
 EUT Configuration :
 Test Date : 16-Jan-13
 Temperature : 21°C Relative Humidity : 22.3 %
 Test Equipment Asset Tag List :



Supplemental Information:

Tested by (+ signature) : David Light *David Light*

Test Results – Monitoring threshold, LIC



Table No. 36	Monitoring threshold limits, LIC	Verdict
		P

Test Requirement : 15.323(e)
 Test Method : ANSI C63.17, clause 7.3.1 and 7.3.2
 Test Date : 1-Feb-13
 Temperature : 22°C Relative Humidity : 26.2 %
 Test Equipment Asset Tag List : 1036, 1052, 1053, 1094, 1095, 1824, 1937, 1467, 1468

Calculated values:

	FCC 15.323	RSS 213
Lower threshold	-78.9	-80.0
Upper threshold	-58.9	-60.0

The lower threshold is applicable for systems which have defined less than 40 duplex system access channels. The upper threshold is applicable for systems with more than 40 duplex system access channels and that implements the Least Interfered Channel (LIC) procedure.

Least interfered channel procedure NOT implemented:	
Lower threshold	N/A
Least interfered channel procedure implemented:	
Upper threshold	-67.2 dBm

Least interfered Channel (LIC) procedure test, 15.323(b) , (c)(2), and (c)(5)

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

Supplemental Information:

Limit:
 Lower threshold:
 $T_L = 15 \log B - 184 + 30 - P_{EUT}$
 Upper threshold
 $T_L = 15 \log B - 184 + 50 - P_{EUT}$

Tested by (+ signature) : David Light



Table No. 37	Monitoring threshold limits, LIC	Verdict
		P

Test Requirement: 15.323(e)
Test Method.....: ANSI C63.17, clause 7.3.4
Test Date: 1-Feb-13
Temperature: 22°C Relative Humidity: 26.2 %
Test Equipment Asset Tag List : 1036, 1052, 1053, 1094, 1095, 1824, 1937, 1467, 1468

Selected channel confirmation, 15.323(c)(1) and (5):

ANSI C63.17, clause 7.3.4	Observation	Verdict
b) shall not transmit on f_1	EUT transmits on f_2	Pass
d) shall not transmit on f_2	EUT transmits on f_1	Pass

Limits:

	FCC 15.323	RSS 213
Lower threshold + 6 dB margin	-72.9 dBm	-74.0 dBm
Upper threshold + 6 dB margin	-52.9 dBm	-54.0 dBm

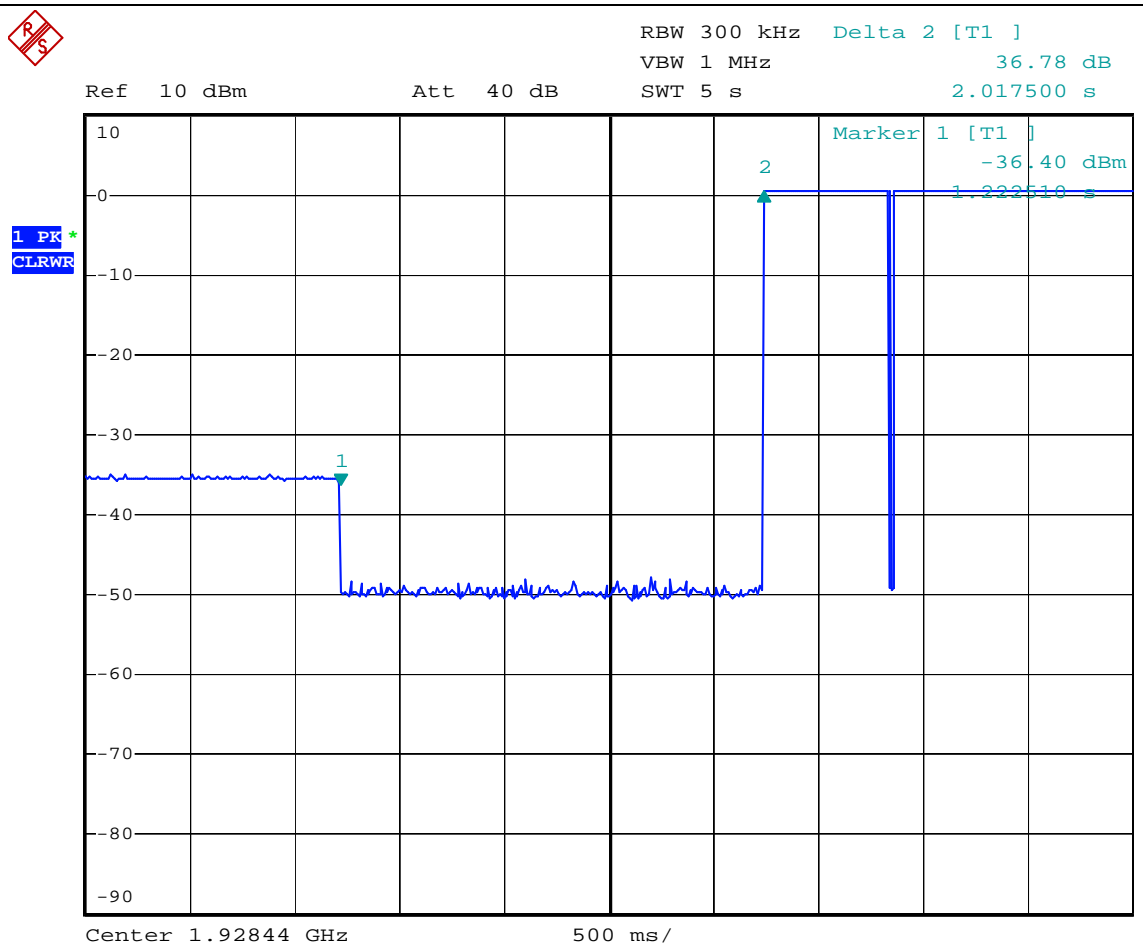
Supplemental Information:

Tested by (+ signature) : David Light



Table No. 38	Selected channel confirmation	Verdict
		P

Test Requirement : 15.323(c)(1) and (5)
Test Method..... : ANSI C63.17, clause 7.3.4
Test Date : 1-Feb-13
Temperature : 22°C Relative Humidity : 26.2 %
Test Equipment Asset Tag List : 1036, 1052, 1053, 1094, 1095, 1824, 1937, 1467, 1468



Date: 1.FEB.2013 16:22:33

Supplemental Information:

Connection 2 sec. after interferer is removed.

Tested by (+ signature)

David Light



Test Results – Threshold monitoring bandwidth



Table No. 39	Threshold monitoring bandwidth	Verdict
		P

Test Requirement : 15.323(e)
Test Method..... : ANSI C63.17, clause 7.4.1 or 7.4.2
Test Date : 1-Feb-13
Temperature : 22°C Relative Humidity : 26.2 %
Test Equipment Asset Tag List : 1036, 1052, 1053, 1094, 1095, 1824, 1937, 1467, 1468

Test results:

Test performed	Observation	Verdict
Simple compliance test, at ±30% of B	No transmissions	Pass
More detailed test at -6 dB points	N/A	N/A
More detailed test at -12 dB points	N/A	N/A

The more detailed test must pass at both the -6 dB and -12 dB points if the simple compliance test fails.
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 that is used for communication.

Procedures:
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 Compliance Test is passed.
During this test the spectrum analyzer is observed to determine if the EUT transmits or not.

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

Supplemental Information:

The Simple Compliance Test was performed with the level at $T_U + U_M + 10$ dB to verify that the EUT did not transmit at all. The tested EUT uses the same receiver for monitoring and communication, this test is therefore not required. However, the test has been performed and is passed.

Tested by (+ signature) : David Light 

Test Results – Reaction time and monitoring interval

Table No. 40	Reaction time and monitoring interval	Verdict
		P

Test Requirement : 15.323(c)(1), (5), and (7)
 Test Method..... : ANSI C63.17, clause 7.5
 Test Date : 1-Feb-13
 Temperature : 22°C Relative Humidity : 26.2 %
 Test Equipment Asset Tag List : 1036, 1052, 1053, 1094, 1095, 1824, 1937, 1467, 1468

Test results:

Pulse width, ref. to ANSI C63.17, clause 7.5	Observation	Verdict
c) >Largest of 50 μs and $50 * \sqrt{1.25 / B}$	No transmissions	Pass
d) >Largest of 35 μs and $35 * \sqrt{1.25 / B}$, with the interference level raised 6 dB	No transmissions	Pass

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

Time synchronized pulsed interference was applied on the carrier at pulsed levels $T_U + U_M$ to verify that the EUT does not transmit. The level was raised 6 dB for part d).

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

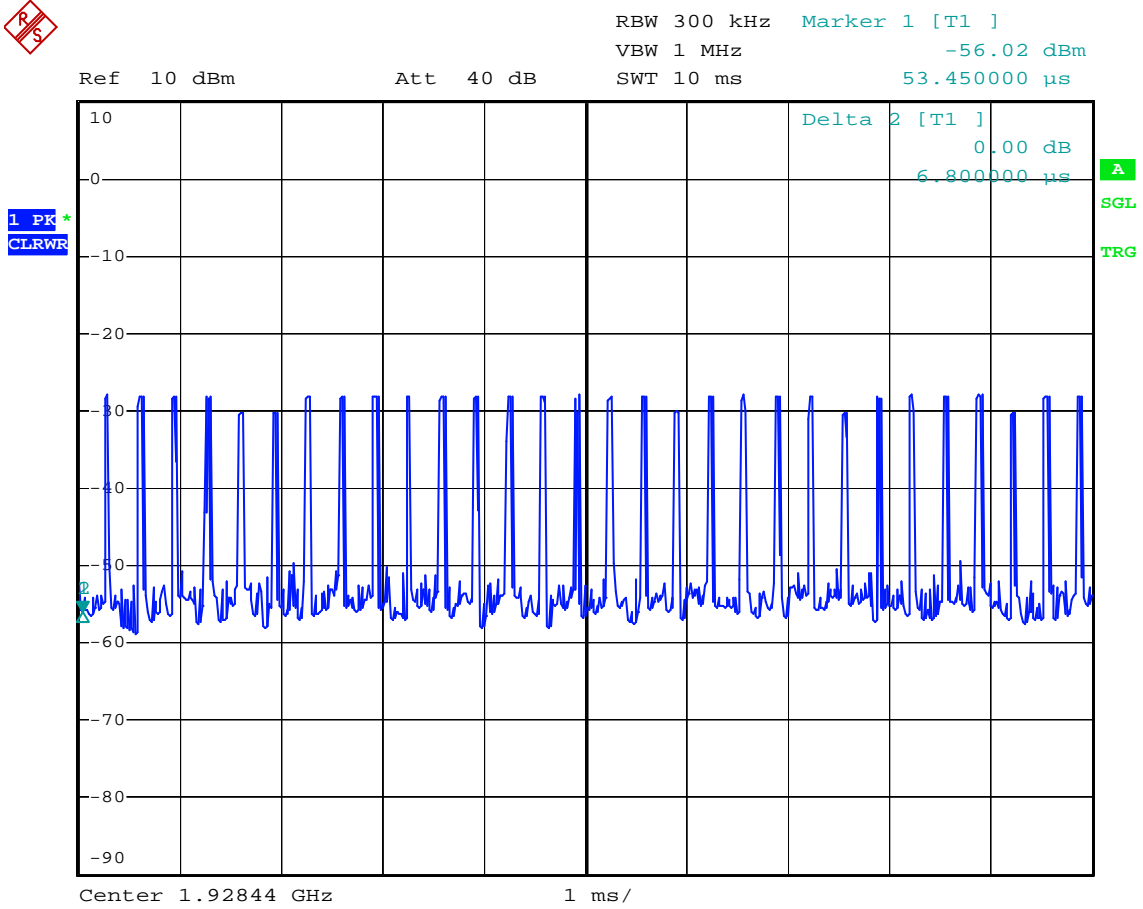
Since B is larger than 1.25 MHz, the test was performed with pulse lengths of 50 μs and 35 μs.

Supplemental Information:

Tested by (+ signature) : David Light 

Table No. 41	50 μs pulses	Verdict
		P

Test Requirement : 15.323(c)(1), (5), and (7)
 Test Method..... : ANSI C63.17, clause 7.5
 Test Date : 1-Feb-13
 Temperature : 22°C Relative Humidity : 23.6 %
 Test Equipment Asset Tag List : 1036, 1052, 1053, 1094, 1095, 1824, 1937, 1467, 1468



Date: 1.FEB.2013 17:34:28

Supplemental Information:

Tested by (+ signature) : David Light



Table No. 42	35 μs pulses	Verdict
		P

Test Requirement : 15.323(c)(1), (5), and (7)
 Test Method..... : ANSI C63.17, clause 7.5
 Test Date : 1-Feb-13
 Temperature : 22°C Relative Humidity : 26.2 %
 Test Equipment Asset Tag List : 1036, 1052, 1053, 1094, 1095, 1824, 1937, 1467, 1468

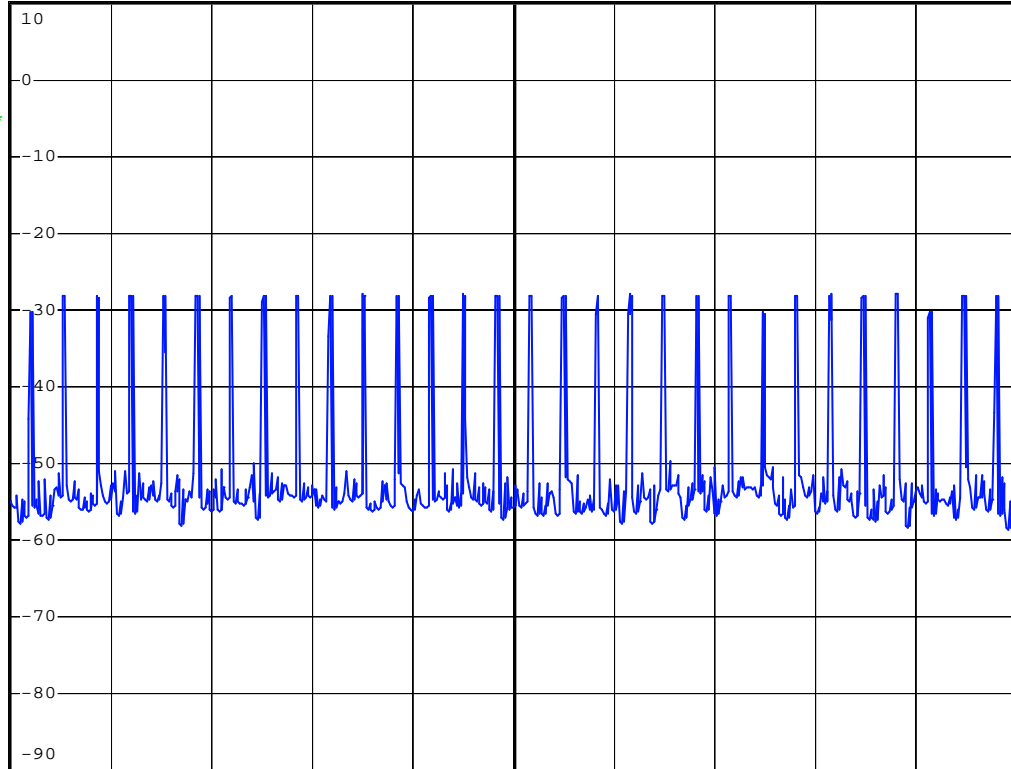


RBW 300 kHz
 VBW 1 MHz
 SWT 10 ms

Ref 10 dBm

Att 40 dB

1 PK *
 CLRWR



Center 1.92844 GHz

1 ms/

Date: 1.FEB.2013 17:35:41

Supplemental Information:

Tested by (+ signature) : David Light *David Light*

Test Results – Time and Spectrum Window Access Procedure

Table No. 43	Reaction time and monitoring interval	Verdict
		NT

Test Requirement : 15.323(c)(6)
 Test Method..... : ANSI C63.17, clause 8.1
 Test Date : Click here to enter a date.
 Temperature : Click here to enter text. °C Relative Humidity : Click here to enter text. %
 Test Equipment Asset Tag List : 1036, 1052, 1053, 1094, 1095, 1824, 1937, 1467, 1468

Test results:

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

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

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

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

This device does not transmit unacknowledged control and signaling information.

Limits:

FCC 15.323(c)(4): Once access to specific combined time and spectrum windows is obtained, an acknowledgement for a system participant must be received by the initiating transmitter within one second or transmission must cease. Periodic acknowledgements must be received at least every 30 seconds or transmission must cease. Channels used exclusively for control and signaling information may transmit continuously for 30 seconds without receiving an acknowledgement, at which time the access criteria must be repeated.

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.

Tested by (+ signature)

David Light





Test Results – Acknowledgements and Transmission Duration



Table No. 44	Acknowledgements and Transmission Duration	Verdict
		P

Test Requirement : 15.323(c)(3) and (4)
 Test Method : ANSI C63.17, clause 8.2.1 and 8.2.2
 Test Date : 1-Feb-13
 Temperature : 22°C Relative Humidity : 26.2 %
 Test Equipment Asset Tag List : 1036, 1052, 1053, 1094, 1095, 1824, 1937, 1467, 1468

Test results:

Acknowledgements

Test ref. to ANSI C63.17, clause 8.2.1	Observation	Verdict
a) Initial transmission without acknowledgements	0.2 sec	Pass
c) Transmission time after loss of acknowledgements	5.0 sec	Pass

Transmission duration

Test ref. to ANSI C63.17, clause 8.2.2	Observation	Verdict
b) Transmission duration on same time and frequency window	5:30 hours*	Pass

Connection lost after 5:30 hours due to depleted battery.

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

Limits:

FCC 15.323(c)(3) and (4): Occupation of the same time and spectrum windows by a device or group of cooperating devices continuously over a period of time longer than 8 hours is not permitted without repeating the access criteria.

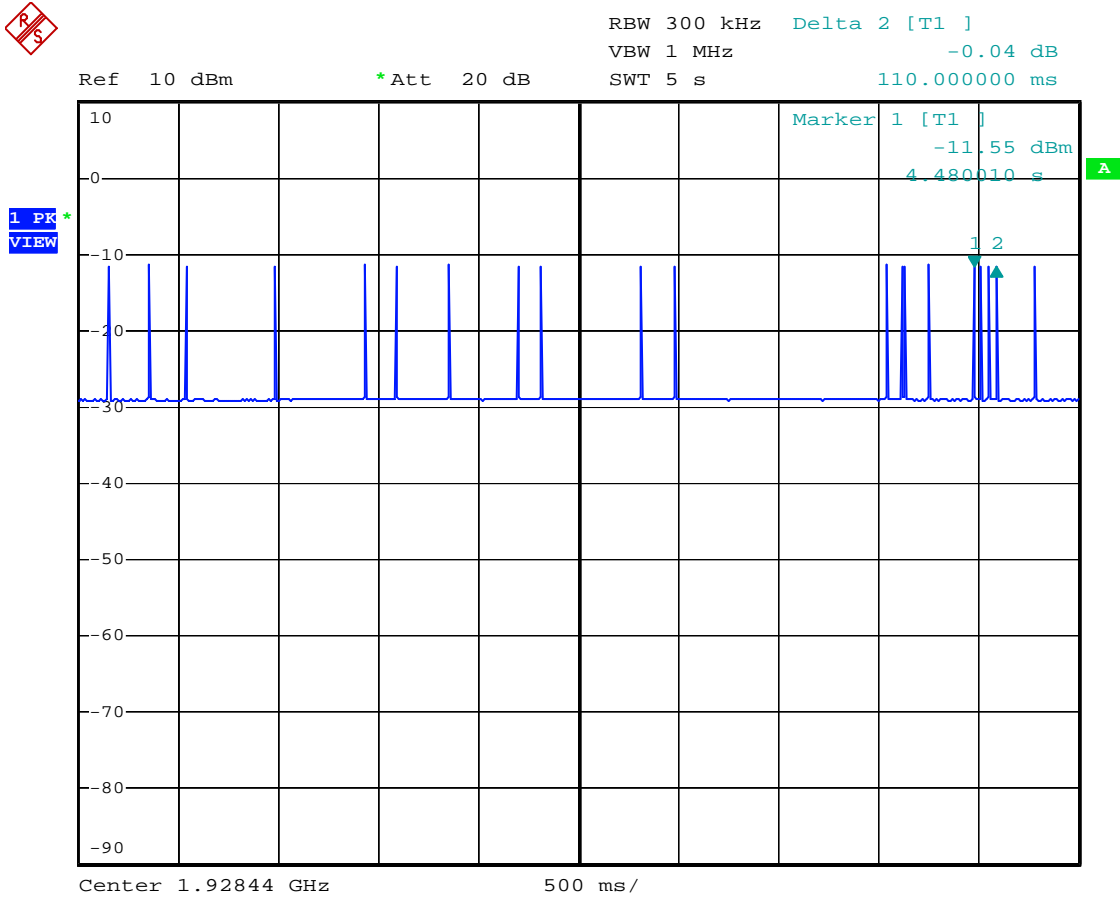
Once access to specific combined time and spectrum windows is obtained, an acknowledgement from a system participant must be received by the initiating transmitter within one second or transmission must cease.

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

Tested by (+ signature) : David Light

Table No. 45	Initial transmission without acknowledgements	Verdict
		P

Test Requirement : 15.323(c)(3)
 Test Method..... : ANSI C63.17, clause 8.2.1(a)
 Test Date : 1-Feb-13
 Temperature : 22°C Relative Humidity : 26.2 %
 Test Equipment Asset Tag List : 1036, 1052, 1053, 1094, 1095, 1824, 1937, 1467, 1468



Date: 1.FEB.2013 18:14:18

Supplemental Information:

Tested by (+ signature)

David Light




Test Results – Dual access criteria check



Test Results – Alternative monitoring interval



Table No. 47	Dual access criteria check	Verdict
		NT
Test Requirement : 15.323(c)(11) Test Method..... : ANSI C63.17, clause 8.4 Test Date : Click here to enter a date. Temperature : Click here to enter text.°C Relative Humidity: Click here to enter text. % Test Equipment Asset Tag List : 1036, 1052, 1053, 1094, 1095, 1824, 1937, 1467, 1468		
<p>Test results:</p> <p>This test is required for equipment that implements the provisions of 15.323(c)(11).</p> <p>This device does not implement this provision. See manufacturer's declaration</p>		
Tested by (+ signature) : David Light 		

Test Results – Power line conducted emissions

Test Results – Radiated Spurious Emissions



Table No. 49	Low channel	Verdict
		P

Frequency Range : 10 kHz to 20 GHz
 Test Requirement : CFR 47, Part 15.209, RSS-GEN
 Test Method..... : ANSI C63.4:2009 and RSS-GEN
 EUT Configuration : Transmit max. power
 Test Date : 19-Feb-13
 Temperature : 21.8°C Relative Humidity : 30.4 %
 Test Equipment Asset Tag List : 1016, 1289, 1310, 1733, 1763, 1767, 1783

Meas. Freq. (MHz)	Ant. Pol. (H/V)	Det. Atten. (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail Unc.	Comment
											Handset
3843	V	0	42	31.6	3.9	32.5	45.0	54.0	-9.0	Pass	Low Channel
7686	V	0	50.6	35.9	5.3	32.3	59.5	74.0	-14.5	Pass	
7686	V	0	43	35.9	5.3	32.3	51.9	54.0	-2.1	Pass	
11529	V	0	42	38.7	7.3	34.3	53.7	74.0	-20.3	Pass	
11529	V	0	34	38.7	7.3	34.3	45.7	54.0	-8.3	Pass	
15372	V	0	41	39.5	7.7	32.3	55.9	74.0	-18.1	Pass	
15372	V	0	33	39.5	7.7	32.3	47.9	54.0	-6.1	Pass	
3843	H	0	43	31.6	3.9	32.5	46.0	54.0	-8.0	Pass	
7686	H	0	52.8	35.9	5.3	32.3	61.7	74.0	-12.3	Pass	
7686	H	0	44.6	35.9	5.3	32.3	53.5	54.0	-0.5	Unc.	
11529	H	0	42	38.7	7.3	34.3	53.7	74.0	-20.3	Pass	
11529	H	0	35	38.7	7.3	34.3	46.7	54.0	-7.3	Pass	
15372	H	0	40	39.5	7.7	32.3	54.9	74.0	-19.1	Pass	
15372	H	0	33.2	39.5	7.7	32.3	48.1	54.0	-5.9	Pass	

Supplemental Information:

Detector: Peak
 RBW: 10 kHz below 30 MHz, 120 kHz in the range 30 MHz to 1 GHz, 1 MHz at frequencies above 1 GHz.
 VBW: 3 x RBW
 Detector: Average
 RBW: 10 kHz below 30 MHz, 120 kHz in the range 30 MHz to 1 GHz, 1 MHz at frequencies above 1 GHz.
 VBW: 10 Hz

All emissions detected within 20 dB of the specification limit are reported.

Tested by (+ signature) : David Light



Setup Photos

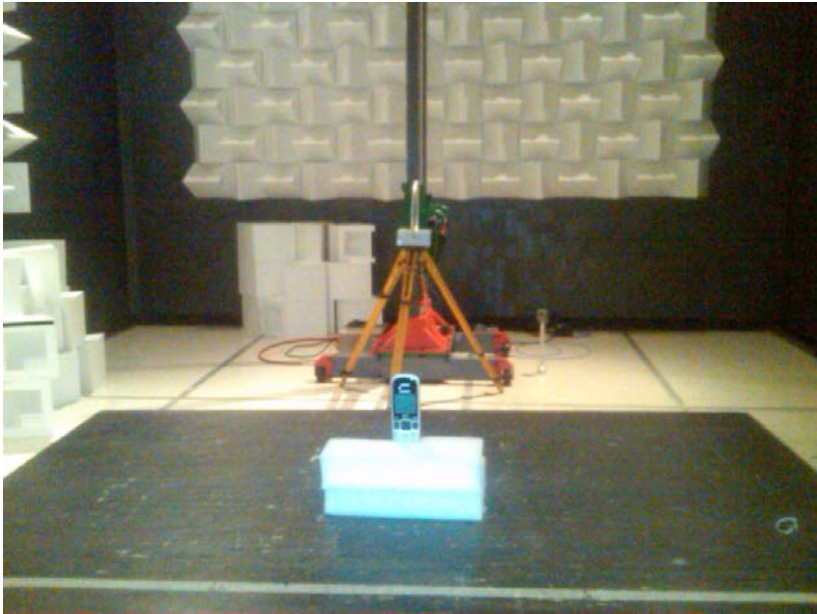
Photo 4	Test Setup – Radiated Emissions	
		
Supplemental Information:		

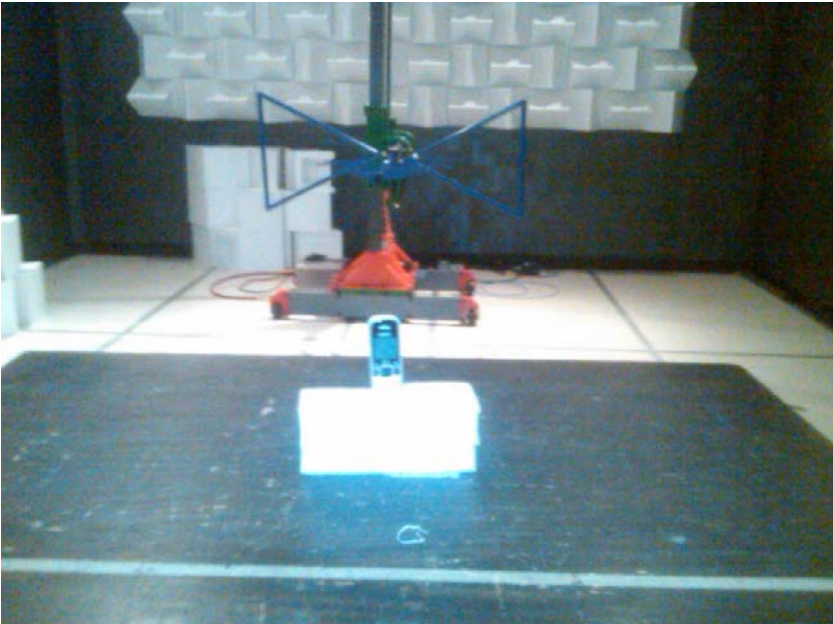
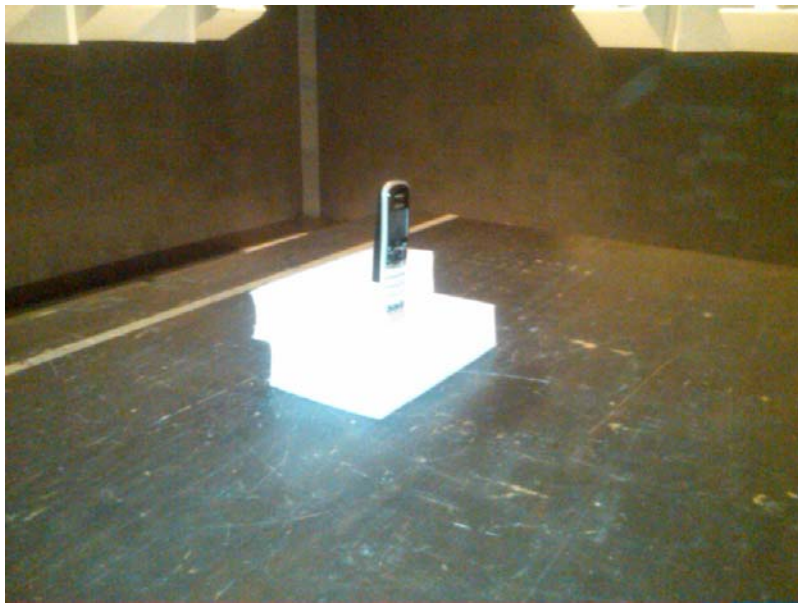
Photo 5	Test Setup – Radiated Emissions	
		
Supplemental Information:		

Photo 6	Test Setup – Radiated Emissions	
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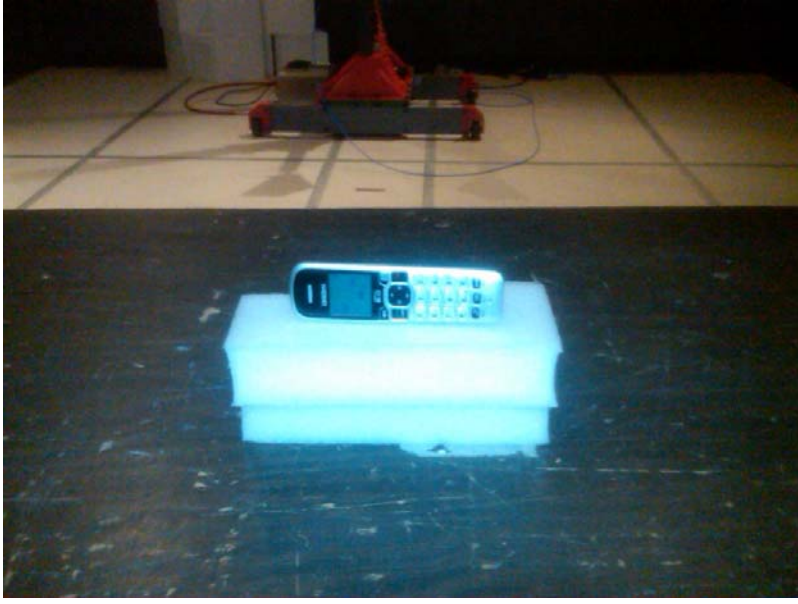
Supplemental Information:

Photo 7	Test Setup – X axis	
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Supplemental Information:

Photo 8	Test Setup – Y axis	
		
Supplemental Information:		

Photo 9	Test Setup – Z axis	
		
Supplemental Information:		