COMPLIANCE WORLDWIDE INC.
TEST REPORT 362-14

In Accordance with the Requirements of

Industry Canada RSS 213, Issue 2, December 2005
2 GHz License-exempt Personal Communications Service Devices (LE-PCS)

Federal Communications Commission 47 CFR Part 15, Subpart D
Technical Requirements for
Unlicensed Personal Communication Systems (UPCS)

Issued to

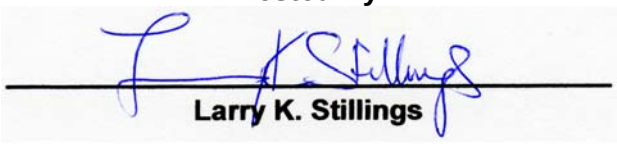
Revolabs, Inc.
144 North Road, Suite 3250
Sudbury, MA 01776

For the
HD Elite Wearable Microphone
Model Numbers:
01-ELITEMIC-WR, 01-ELITEMIC-TA4, and 01-ELITEMIC-XLR

FCC ID: T5V01EXECMICWR
IC: 6455A-01EXECMICWR

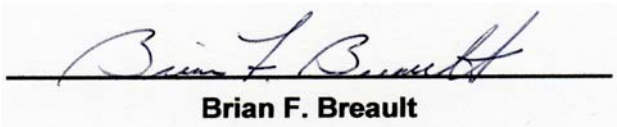
Report Issued on October 7, 2014

Tested By



Larry K. Stillings

Reviewed By



Brian F. Breault

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1. Scope

This test report certifies that the Revolabs HD Elite Wearable Microphone, as tested, meets the FCC Part 15, Subpart D and Industry Canada RSS 213 requirements. The scope of this test report is limited to the test sample provided by the client, only in as much as that sample represents other production units. If any significant changes are made to the unit, the changes shall be evaluated and a retest may be required.

2. Product Details

2.1. Manufacturer: Revolabs, Inc.
2.2. Model Numbers: 01-ELITEMIC-WR (represents 01-ELITEMIC-TA4, 01-ELITEMIC-XLR)
2.3. Serial Number: VT4300000911 (radiated), VT4300000702 (conducted)
2.4. Description: DECT wireless wearable microphone.
ELITEMIC-WR is a wireless wearable microphone.
ELITEMIC-XLR is a wireless XLR mic adapter.
ELITEMIC-TA4 is TA4 mini XLR microphone adapter (belt pack).
01-ELITEMIC-XX are the models for US / Canada
All 3 wearable mic types use the same PCBs and DECT RF circuitry. Each of the microphones are identical and only the microphone element is changed to determine the model/type. For this reason, the ELITEMIC-WR was tested as a representation of all 3 mic types.
2.5. Power Source: 3.7 Volts via Battery, Ni-MH Rechargeable
2.6. Hardware Revision: 12 / 255
2.7. Software Revision: 1.0.25
2.8. Modulation Type: GFSK
2.9. Operating Frequencies: 1921.536 -1928.448 MHz
2.10. Emission Designator: 1M41F7E (FCC), 1M21F7E (IC)
2.11. EMC Modifications: None

3. Product Configuration

3.1 Operational Characteristics & Software

The microphones are configured using amber software via USB port on the laptop.

1. Using the amber software, the unit is configured to transmit on its lowest, middle and highest frequencies with typical modulation.

3.2. EUT Hardware

Manufacturer	Model	Serial Number	Description/Function
Revolabs	01-ELITEMIC-WR	VT4300000911	For Radiated Measurements
Revolabs	01-ELITEMIC-WR	VT4300000702	For Antenna Port Conducted

3.3. EUT Cables/Transducers

Temporary antenna connector was used for conducted measurements.

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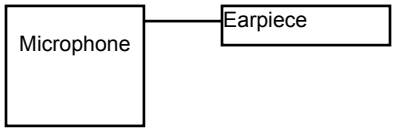
3. Product Configuration (continued)

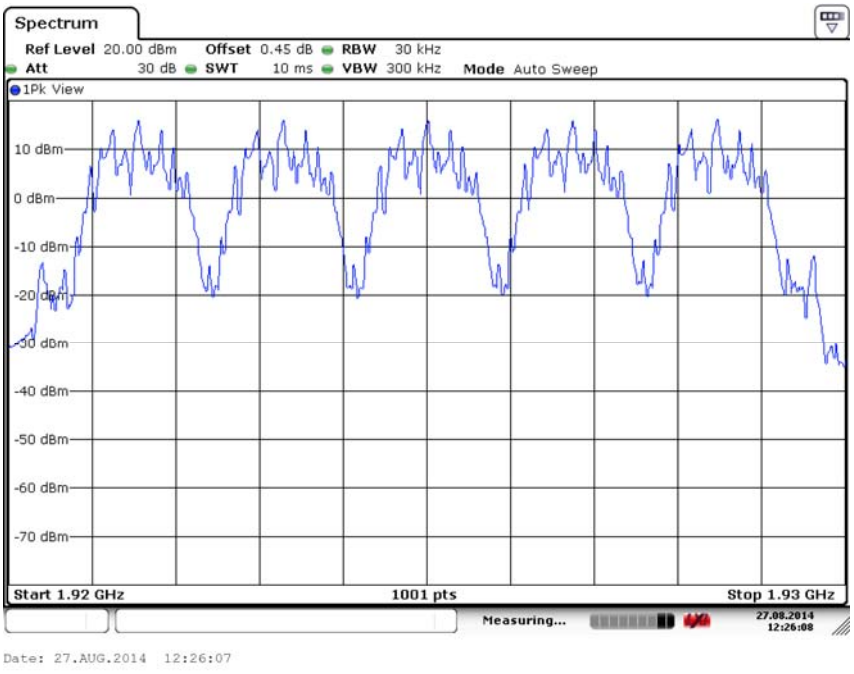
3.4. Support Equipment

Manufacturer	Model/Part #	Input Voltage	Input Freq	Description/Function
Dell	Latitude D620	120V	60	Software Control via USB

3.5 EUT Diagram



Channel Plan	Channel	Frequency (MHz)	
Measure	0	1928.448	Note: The channel numbers count down vs frequency
	1	1926.720	
Measure	2	1924.992	
	3	1923.264	
Measure	4	1921.536	



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4. Measurements Parameters

4.1. Measurement Equipment Used to Perform Test

Device	Manufacturer	Model No.	Serial No.	Cal Due	Cal Interval
Spectrum Analyzer 10 Hz to 40 GHz	Rohde & Schwarz	FSVR40	100909	5/15/2015	2 yr
Spectrum Analyzer 9 kHz to 40 GHz	Rohde & Schwarz	FSV40	100899	6/6/2015	2 yr
Spectrum Analyzer 100 Hz to 26.5 GHz	Agilent Tech	E4407B	MY45104493	2/26/2015	2 yr
EMI Receiver 9 kHz to 7 GHz	Rohde & Schwarz	ESR7	101156	4/4/2015	2 yr
Bilog Antenna 30 to 2000 MHz	Sunol Sciences	JB1	A050913	5/15/2015	2 yr
Horn Antenna 1 to 18 GHz	ETS-Lindgren	3117	00143292	1/14/2015	2 yr
Horn Antenna 1 to 18 GHz	Electro-Metrics	EM-6961	6337	10/11/2015	2 yr
High Pass Filter 2.5 to 20 GHz	Micro-Tronics	HPM50110	070	2/5/2015	1 yr
DECT 1.88 to 1.93 GHz Notch Filter	Micro-Tronics	BRM18083	001	4/14/2015	1 yr
DMM / Temperature	Fluke	187	79690058	2/22/2015	1 yr
Barometer	Control Company	4195	Cal ID# 236	2/25/2015	2 yr
Thermal Chamber	Associated Testing Labs	SLHU-1-CRLC	N/A	CNR	
Digital Radio Communication Tester	Rohde & Schwarz	CTS65	829877/006	11/2/2014	2 yr
RF Signal Generator 100 kHz - 40 GHz	Rohde & Schwarz	SMB 100A	175352	6/3/2016	2 yr
RF Signal Generator 5 kHz to 6.4 GHz	Rohde & Schwarz	SMIQ06B	100090	2/22/2015	2 yr
Modulation Generator	Rohde & Schwarz	AMIQ04	100540	CBU	
DC Source 0-60 Volts, 0-3 Amps	Hewlett Packard	6296A	1929A03770	9/18/2014	1 yr
Power Splitter Resistive DC – 4.2 GHz	RF Bay	PSC-2R-42	14110124	4/3/2015	1 yr
Power Splitter Resistive DC – 4.2 GHz	RF Bay	PSC-2R-42	14110125	4/3/2015	1 yr
Power Splitter Resistive DC – 4.2 GHz	RF Bay	PSC-2R-42	14110126	4/3/2015	1 yr
Spectrum Analyzer w/DECT Personality	Hewlett Packard	8593E	3829A03887	6/4/2016	2 yr
Dipole Antenna Set 30 to 300 MHz	Schwarzbeck	VHAP-10dB	562	CNR	
Dipole Antenna Set 30 to 300 MHz	Schwarzbeck	VHAP-10dB	563	CNR	
Dipole Antenna Set 300 to 1000 MHz	Schwarzbeck	UHAP-10dB	527	CNR	
Dipole Antenna Set 300 to 1000 MHz	Schwarzbeck	UHAP-10dB	528	CNR	

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4. Measurements Parameters (continued)

4.2. Measurement & Equipment Setup

Test Dates:	8/22/2014, 8/25/2014, 8/27/2014
Test Engineers:	Larry Stillings, Cody Merry
Normal Site Temperature (15 – 35 °C):	21.6 °C
Relative Humidity (20 – 75 %RH):	35 %
Frequency Range:	10 MHz to 19.3 GHz
Measurement Distance:	3 Meters or 1 Meter as necessary
EMI Receiver IF Bandwidth:	9 kHz – 10 to 30 MHz 120 kHz - 30 MHz to 1000 MHz 1 MHz - Above 1000 MHz
EMI Receiver Avg Bandwidth:	30 kHz – 10 to 30 MHz 300 kHz - 30 MHz to 1000 MHz 3 MHz - Above 1000 MHz
Detector Function:	Peak, Quasi-Peak, EMI Average and RMS Average

4.3. Measurement Procedure

Test measurements were made in accordance FCC Part 15.315, 15.317, 15.319, 15.323, IC RSS-213 Issue 2, and ANSI C63.17:2006.

The test methods used to generate the data is this test report is in accordance with ANSI C63.17:2006, American National Standard Methods of Measurement of the Electromagnetic and Operational Compatibility of Unlicensed Personal Communications Services (UPCS) Devices.

For radiated measurements, in accordance with ANSI C63.4-2003 section 13.1.4.1 c), the device under test was rotated through three orthogonal axes to determine which attitude produced the highest emission relative to the limit. The attitude that produced the highest emission relative to the limit was used for all radiated emission measurements and is detailed in this test report.

4.4. Measurement Uncertainty

The following uncertainties are expressed for an expansion/coverage factor of K=2.

RF Frequency (out of band)	$\pm 1x10^{-8}$
Radiated Emission of Transmitter to 20 GHz	$\pm$ 4.55 dB
Radiated Emission of Receiver	$\pm$ 4.55 dB
Temperature	$\pm 0.91^{o}$ C
Humidity	$\pm$ 5%

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5. Measurements Summary

Test Requirement	FCC Rule Requirement	IC Rule Requirement	Test Report Section	Result	Comment
Antenna Requirement	15.317 15.203	RSS-GEN 7.1.4	6.1	Compliant	Equipment uses an PCB Mounted Ant
Antenna Gain	15.319 (e)	RSS 213 4.1 (e)	6.1	Compliant	0.64 dBi Maximum
Type of Modulation and Access Protocol	15.319 (b) 15.307	RSS-213 6.1	6.2	Compliant	Device uses GFSK Digital Modulation
Peak Transmit Power	15.319 (c)	RSS-213 6.5	6.3	Compliant	
Emission Bandwidth Occupied Bandwidth	15.323 (a)	RSS-213 6.4	6.4	Compliant	
Spurious Conducted Emissions – Antenna Port	15.323 (d) 15.319 (g)	RSS-213 6.7	6.5	Compliant	
Spurious Radiated Emissions for integral antennas	15.323 (d) 15.319 (g) 15.209	RSS-213 6.7	6.6	Compliant	
Power Spectral Density	15.319 (d)	RSS-213 6.6	6.7	Compliant	
Conducted Emissions	15.315 15.207	RSS-213 6.3 RSS-GEN	6.8	Compliant	
Frequency Stability	15.323 (f)	RSS-213 6.2	6.9	Compliant	
Transmitter Spurious Emissions	15.323 (c) 15.323 (e)	RSS-213 6.7	6.10	Compliant	
Specific Requirements for UPCS	15.323 (c) 15.323 (e)	RSS-213 4.3.4 RSS-213 6.1	6.11	Compliant	
Radio Frequency Exposure	15.319 (i) 2.1091 FCC OET Bulletin 65	RSS-GEN 5.5 RSS-102	6.12	Compliant	

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6. Measurement Data

6.1. Antenna Requirement (15.317, 15.203, RSS-GEN Section 7.1.4)

Requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

Result: The EUT incorporates the use of a PCB Mounted antenna.

6.1.1 Antenna Gain (15.319 (e), RSS-213 Section 4.1(e))

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

Result: Internal PCB Board Antenna – 0.64 dBi Gain

6.2 Type of Modulation and Access Protocol (15.319 (b), 15.307, RSS-213 Sect 4.1(e))

Requirement: UTAM, Inc. is designated to coordinate and manage the transition of the 1910–1930 MHz band from the Private Operational-Fixed Microwave Service (OFS) operating under part 101 of this chapter to unlicensed PCS operations.

Result: A letter from UTAM to Revolabs Inc. will be provided as part of the submittal.

Requirement: Equipment certified under this standard shall use digital modulation.

Result: The product uses GFSK digital modulation.

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6. Measurement Data

6.3. Peak Transmit Power (15.319 (c), RSS-213 Sec 6.5, ANSI C63.17 Sec 6.1.2)

Requirement: Peak transmit power shall not exceed 100 microwatts multiplied by the square root of the emission bandwidth in Hertz. Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an RMS equivalent voltage.

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

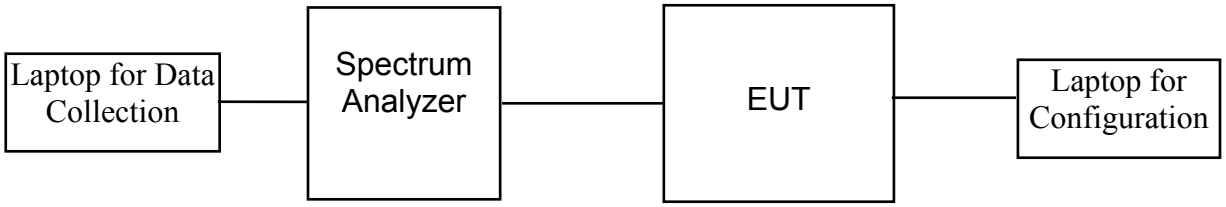
EBW = 1408600 Hz, OBW = 1210789 Hz

Pmax = 100 µW * $(EBW)^{½}$ = 100 µW * $(1408600)^{½}$ = **118.68 mW = 20.74 dBm**

Pmax = 100 µW * $(OBW)^{½}$ = 100 µW * $(1210789)^{½}$ = **110.04 mW = 20.42 dBm**

Channel	Channel Frequency	Peak Power	Requirement	Peak Power
	MHz	dBm	FCC = 20.74 dBm, IC = 20.42 dBm	Watts
TX4	1921.536	13.25	Compliant	0.0211
TX2	1924.992	13.22	Compliant	0.0210
TX0	1928.448	13.24	Compliant	0.0211

Test Equipment Setup: EUT is configured to transmit a modulated signal in burst mode on the lowest, middle and highest channels. EUT is connected to the spectrum analyzer via on board u.fl connector and adapter cable. The spectrum analyzer is configured / triggered to capture a single peak pulse using a 3 MHz RBW. Cable loss is accounted for within the analyzer. Marker is moved to the highest peak of the pulse.



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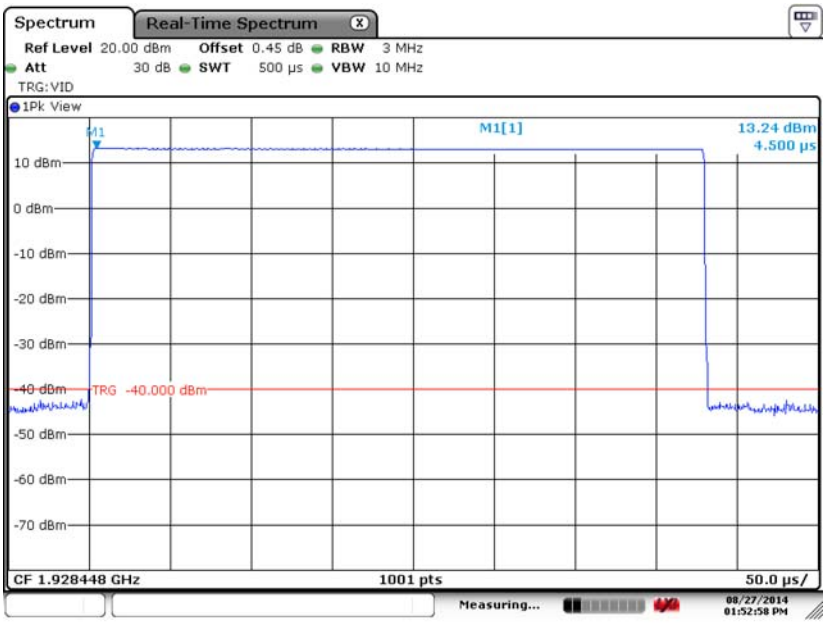
6. Measurement Data

6.3. Peak Transmit Power (15.319 (c), RSS-213 Sec 6.5, ANSI C63.17 Sec 6.1.2) cont.

Channel 0



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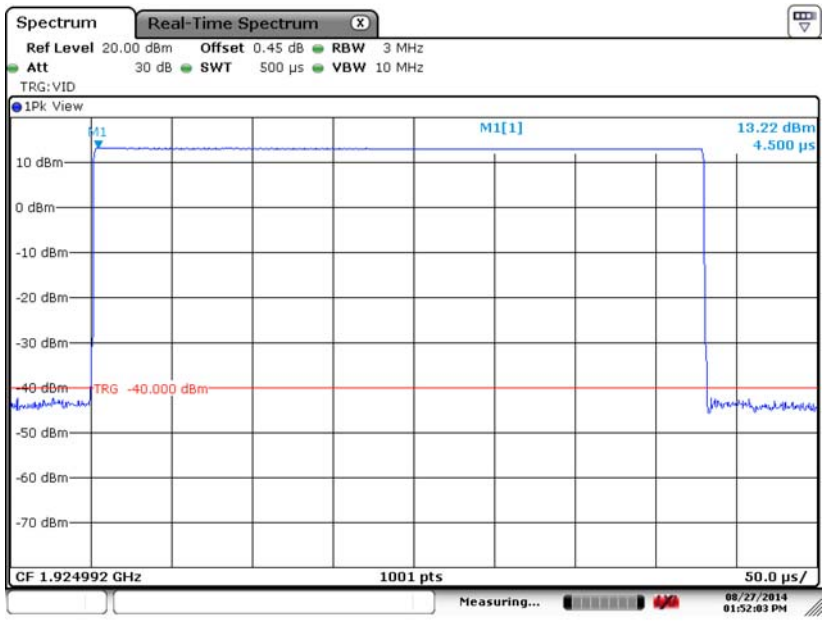
Channel 2



Date: 27.AUG.2014 13:52:03

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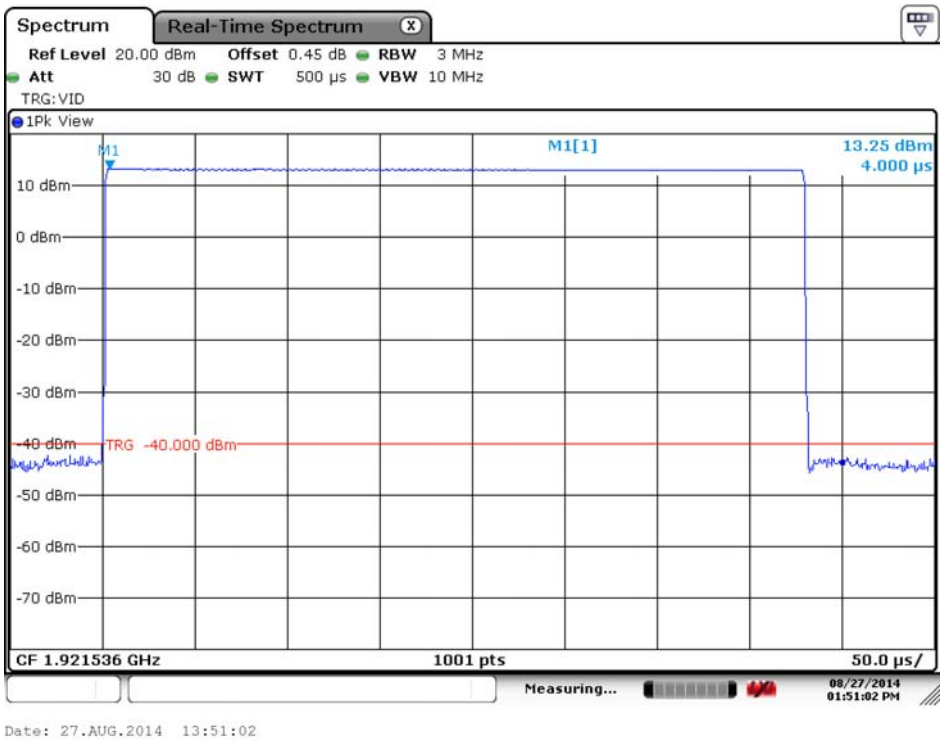
6. Measurement Data

6.3. Peak Transmit Power (15.319 (c), RSS-213 Sec 6.5, ANSI C63.17 Sec 6.1.2) cont.

Channel 4



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6. Measurement Data

6.3. Peak Transmit Power (15.319 (c), RSS-213 Sec 6.5, ANSI C63.17 Sec 6.1.2) cont.

Requirement: Radiated Emissions test is performed on device that only contains integral antenna(s) to determine their gain. Gain shall be less than 3 dBi or output power shall be adjusted.
Field strength was measured at 3 Meters and 95.2 dBuV/m conversion was used to determine Radiated Peak Power in dBm.

Result: Peak Field Strength is 13.89 + 95.2 = 109.1 dBuV/m at 3 Meters

Radiated Test for Integral Antennas					
Channel	Channel Frequency	Conducted Peak Power	Radiated Peak Power	Antenna Gain	Result
	MHz	dBm	dBm	dBi	
TX4	1921.536	13.25	13.89	0.64	Compliant
TX2	1924.992	13.22	13.78	0.56	Compliant
TX0	1928.448	13.24	13.67	0.43	Compliant

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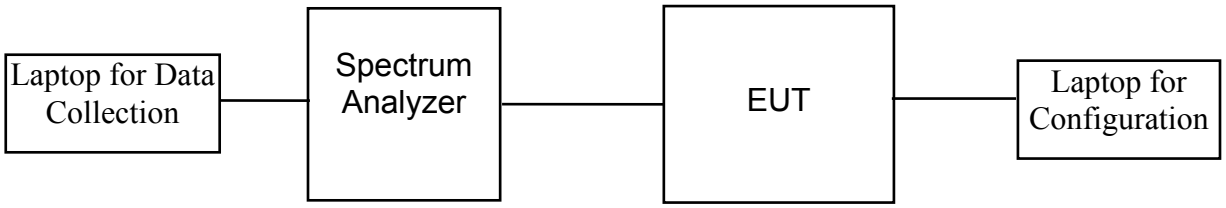
6. Measurement Data

6.4. Emission Bandwidth (15.323 (a), RSS-213 Section 6.4, ANSI C63.17 Sec 6.1.3)

Requirement: Operation shall be contained within the 1920–1930 MHz band. The emission bandwidth shall be less then 2.5 MHz. The power level shall be as specified in § 15.319(c), but in no event shall the emission bandwidth be less than 50 kHz.

Test Equipment Setup: EUT is configured to transmit a modulated signal in burst mode on the lowest, middle and highest channels. The EUT is connected to the spectrum analyzer via on board u.fl connector and adapter cable. The spectrum analyzer is configured with a 30 kHz RBW over a 3 MHz Span. Cable loss is accounted for within the analyzer. Using the occupied BW function of the spectrum analyzer, the 26 dB and 99% Power bandwidths are recorded, allowing sufficient time for the analyzer's max hold function to capture any transient effects associated with the burst edges.



6.4.1. Measurement Data – 26 dB Emission Bandwidth (EBW)

Channel	Channel Frequency	Emission Bandwidth	Requirement
	MHz	MHz	50 kHz < EBW < 2.5 MHz
TX4	1921.536	1.3427	Compliant
TX2	1924.992	1.3427	Compliant
TX0	1928.448	1.4086	Compliant

6.4.2. Measurement Data – 99% Occupied Bandwidth (OBW)

Channel	Channel Frequency	Occupied Bandwidth	Requirement
	MHz	MHz	50 kHz < OBW < 2.5 MHz
TX4	1921.536	1.2108	Compliant
TX2	1924.992	1.2108	Compliant
TX0	1928.448	1.2108	Compliant

Note: Please see the next pages for plots of measurements

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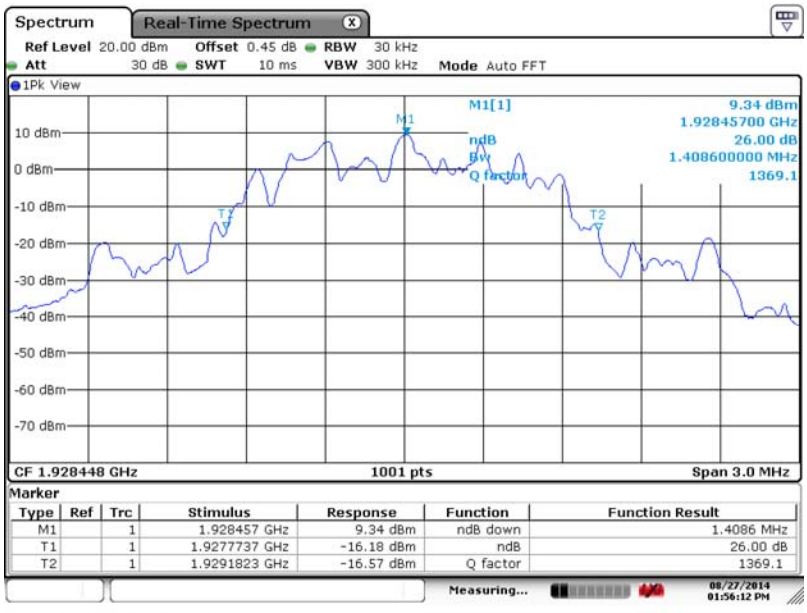
6. Measurement Data (continued)

6.4. Emission Bandwidth (15.323 (a), RSS-213 Sec 6.4, ANSI C63.17 Sec 6.1.3) cont

6.4.3. Measurement Plot – TX0



6.4.4. Measurement Plot – TX2

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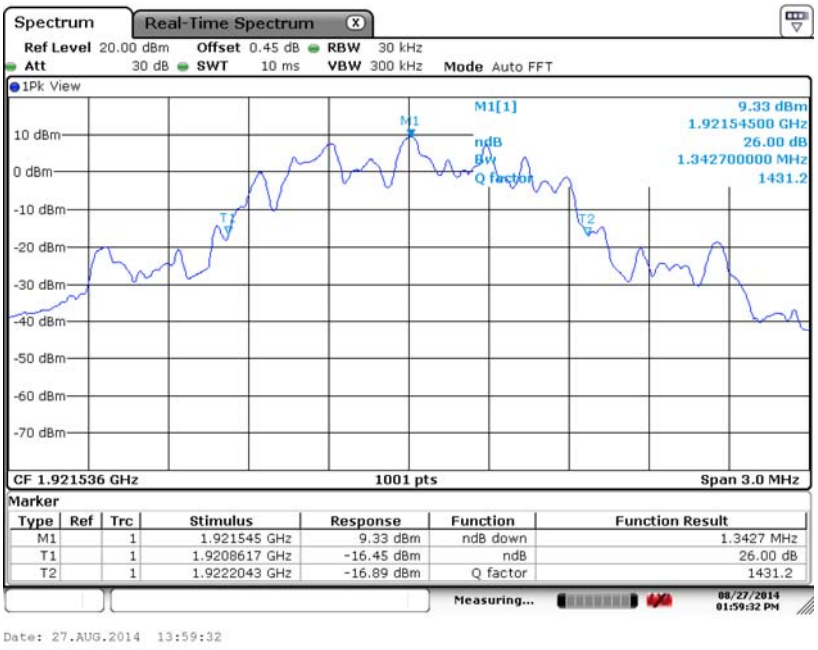
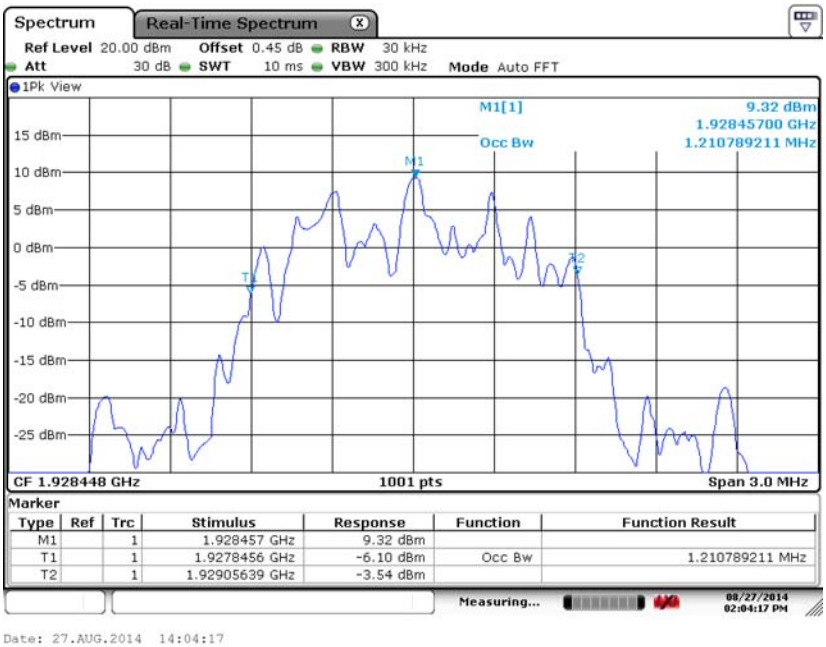
6. Measurement Data (continued)

6.4. Emission Bandwidth (15.323 (a), RSS-213 Sec 6.4, ANSI C63.17 Sec 6.1.3) cont

6.4.5. Measurement Plot – TX4



6.4.6. Measurement Plot – TX0



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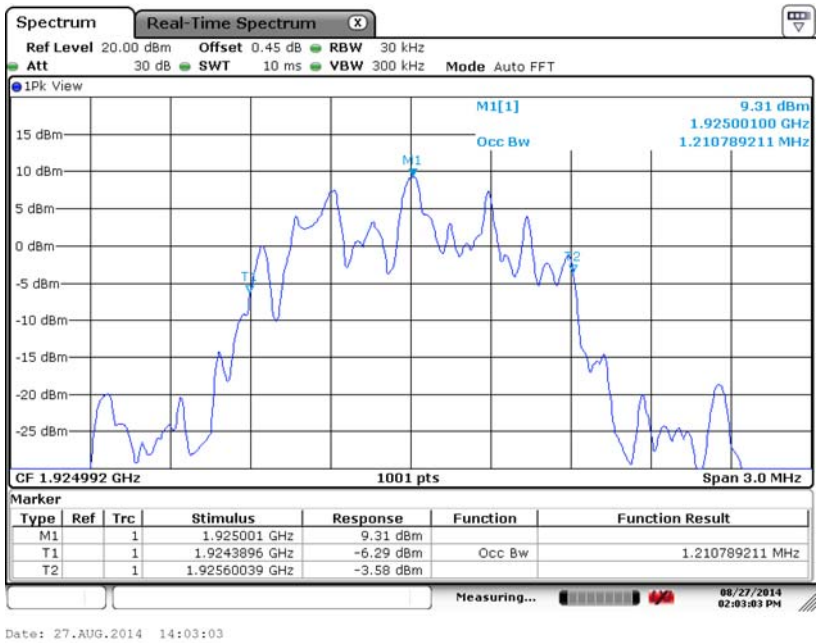
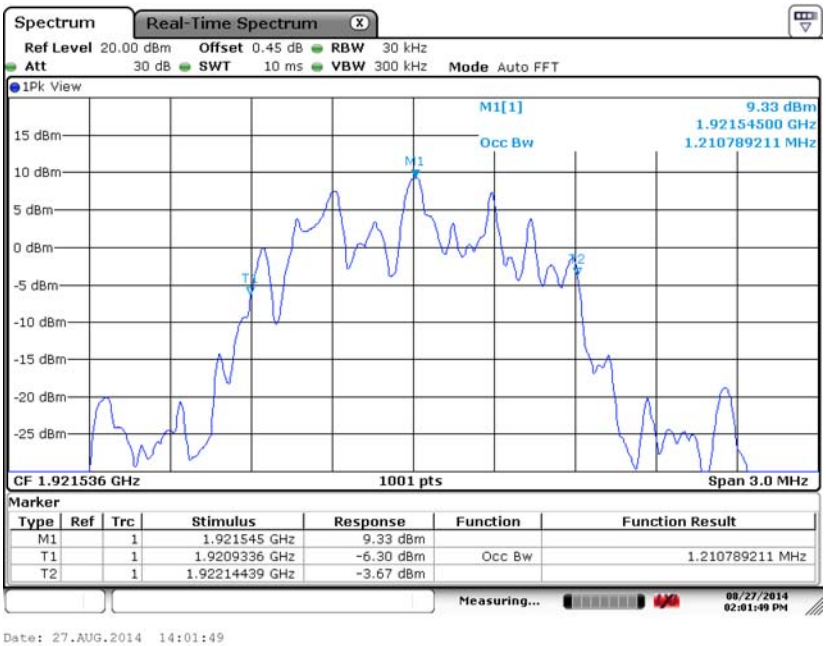
6. Measurement Data (continued)

6.4. Emission Bandwidth (15.323 (a), RSS-213 Sec 6.4, ANSI C63.17 Sec 6.1.3) cont

6.4.7. Measurement Plot – TX2



6.4.8. Measurement Plot – TX4



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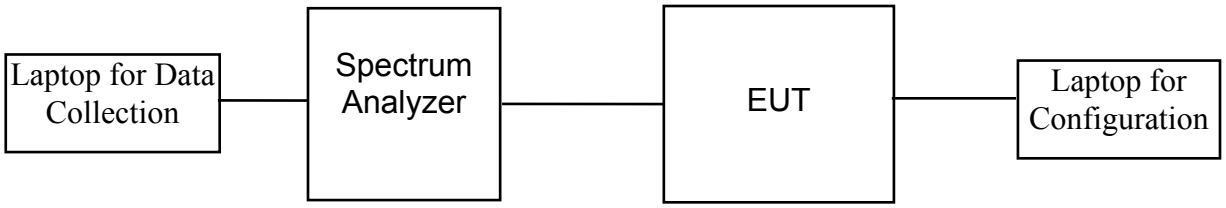
6. Measurement Data (continued)

6.5 Spurious Emissions at the antenna terminals (15.323 (d), RSS-213 6.7.2, ANSI C63.17 Sec 6.1.6)

Requirement: Emissions inside the sub-band must comply with the following emission mask: In the bands between 1B and 2B measured from the center of the emission bandwidth the total power emitted by the device shall be at least; 30 dB below the transmit power permitted for that device; in the bands between 2B and 3B measured from the center of the emission bandwidth the total power emitted by an intentional radiator shall be at least 50 dB below the transmit power permitted for that radiator; in the bands between 3B and the subband edge the total power emitted by an intentional radiator in the measurement bandwidth shall be at least 60 dB below the transmit power permitted for that radiator.

• 30 dB between the frequencies 1B and 2B measured from the centre of the occupied bandwidth;
• 50 dB between the frequencies 2B and 3B measured from the centre of the occupied bandwidth; and
• 60 dB between the frequencies 3B and band edge, where B is the occupied bandwidth in hertz.

Test Equipment Setup: EUT is configured to transmit a modulated signal in burst mode on the lowest, middle and highest channels. The EUT is connected to the spectrum analyzer via on board u.fl connector and adapter cable. The spectrum analyzer is configured with a 30 kHz RBW over a 10 MHz Span. Cable loss is accounted for within the analyzer. Using the mask defined above and allowing sufficient time for the analyzer's max hold function to capture any transient effects associated with the burst edges.



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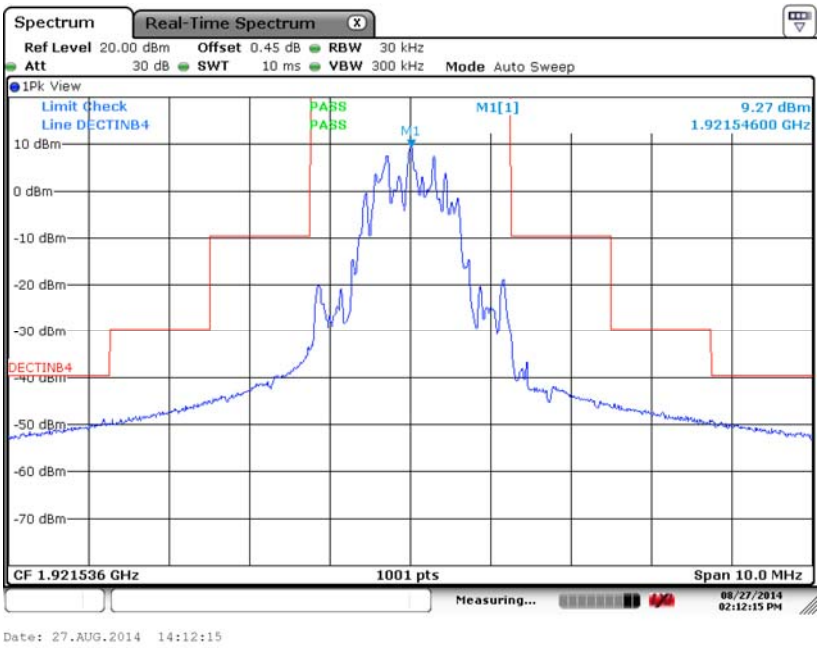
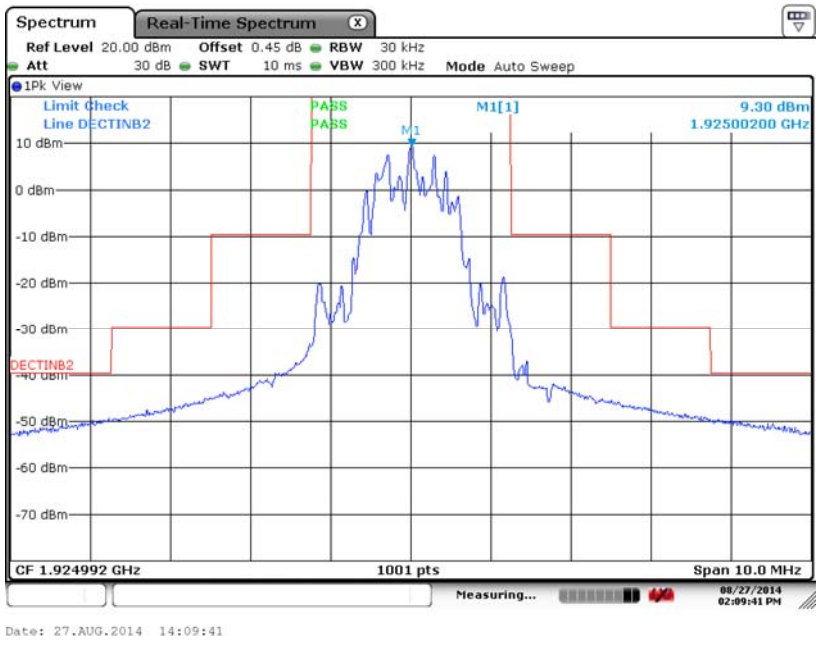
6. Measurement Data (continued)

6.5 Spurious Emissions at the antenna terminals (15.323 (d), RSS-213 6.7.2)) (cont)

6.5.1 Low Channel – In Band



6.5.2 Mid Channel – In Band



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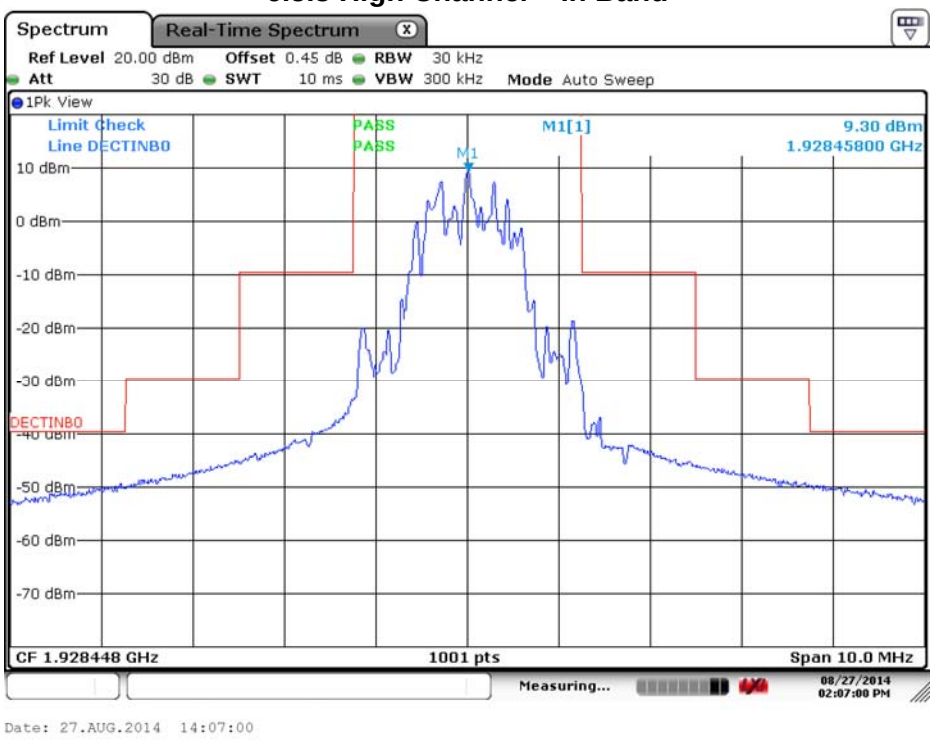
6. Measurement Data (continued)

6.5 Spurious Emissions at the antenna terminals (15.323 (d), RSS-213 6.7.2)) (cont)

6.5.3 High Channel – In Band



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6. Measurement Data (continued)

6.5 Spurious Emissions at the antenna terminals (15.323 (d), RSS-213 6.7.1) (cont)

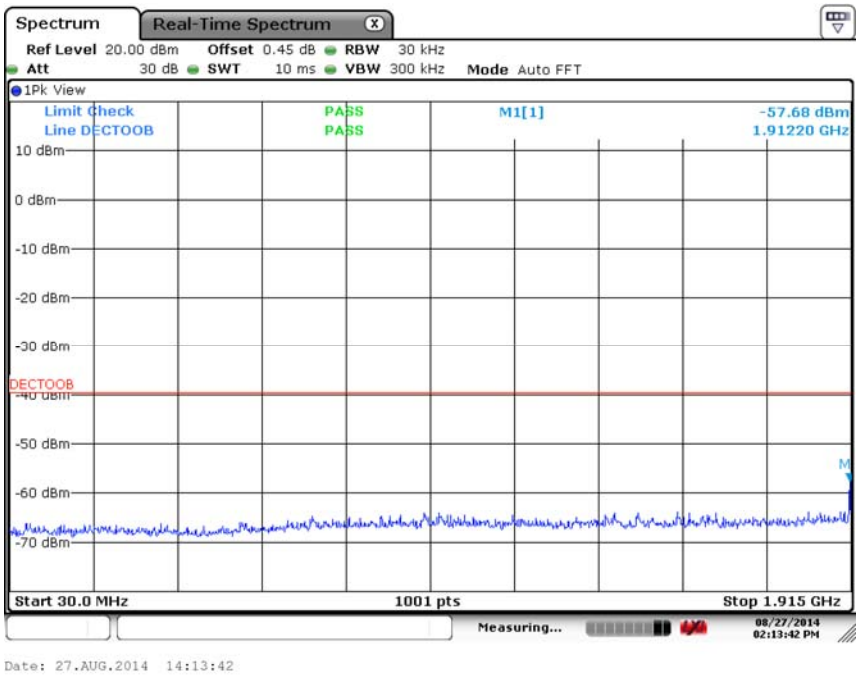
Requirement: Emissions outside the sub-band shall be attenuated below a reference power of 112 milliwatts as follows: 30 dB between the sub-band and 1.25 MHz above or below the sub-band; 50 dB between 1.25 and 2.5 MHz above or below the sub-band; and 60 dB at 2.5 MHz or greater above or below the sub-band.

Per ANSI C63.17-2006 Clause 6.1.6.2 the emissions in the region 2.5 MHz or greater above and below the limit can either meet the requirements outlined below **or** be made as a radiated emissions test and not exceed the limits of section 15.209.

Emissions outside the 1920-1930 MHz band shall be attenuated below a reference power of 112 milliwatts (-9.5 dBW) by at least:

• 30 dB between the band edges and 1.25 MHz above and below the band edges;
• 50 dB between 1.25 MHz and 2.5 MHz above or below the band edges; and
• 60 dB at 2.5 MHz or greater above or below the band edges.

6.5.4 Low Channel – Out of Band 30 MHz – 1.915 GHz



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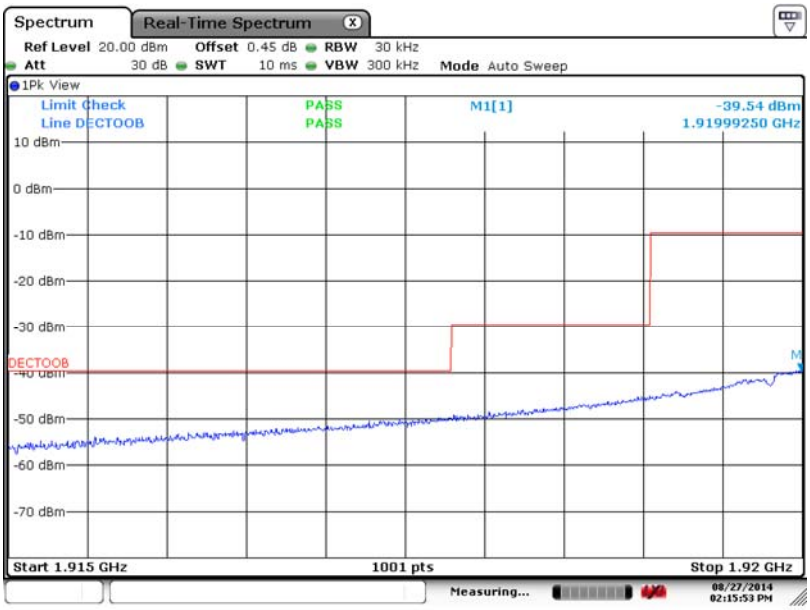
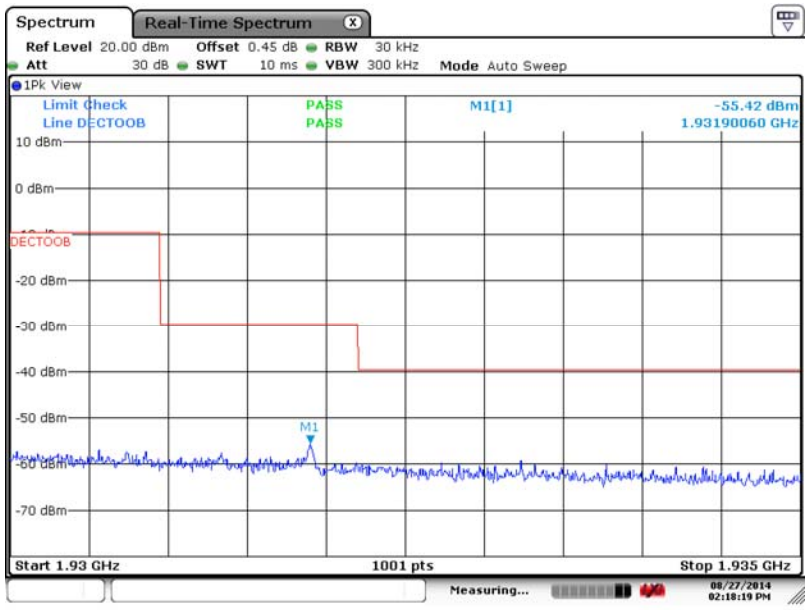
6. Measurement Data (continued)

6.5 Spurious Emissions at the antenna terminals (15.323 (d), RSS-213 6.7.1) (cont)

6.5.5 Low Chanel – Out of Band 1.915 – 1.920 GHz



6.5.6 Low Channel Out of Band 1.930 – 1.935 GHz



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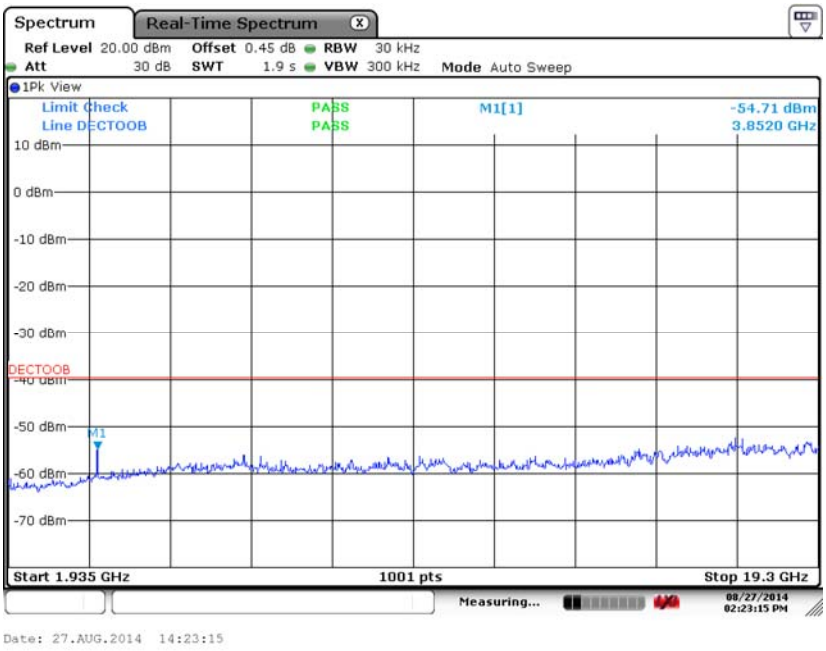
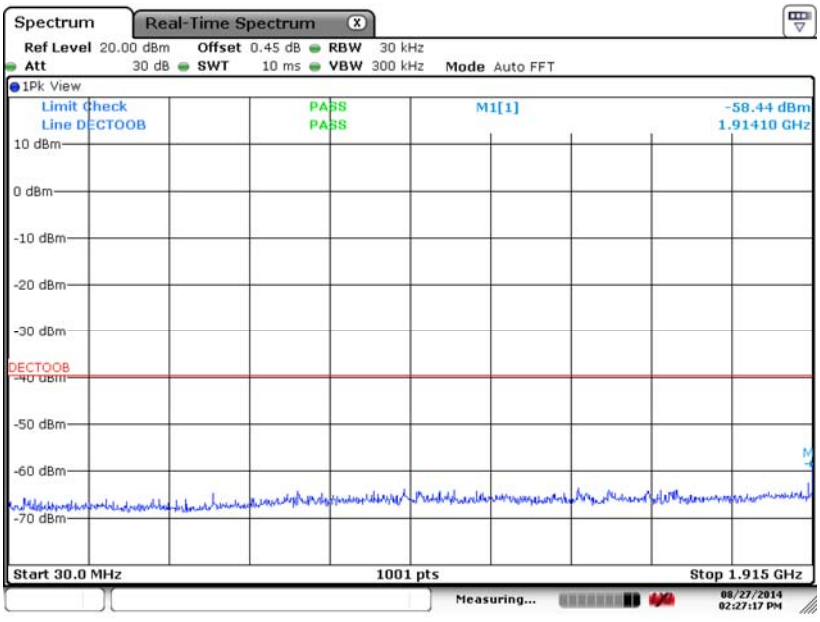
6. Measurement Data (continued)

6.5 Spurious Emissions at the antenna terminals (15.323 (d), RSS-213 6.7.1) (cont)

6.5.7 Low Channel Out of Band 1.935 – 19.3 GHz



6.5.8 Mid Channel Out of Band 30 MHz – 1.915 GHz



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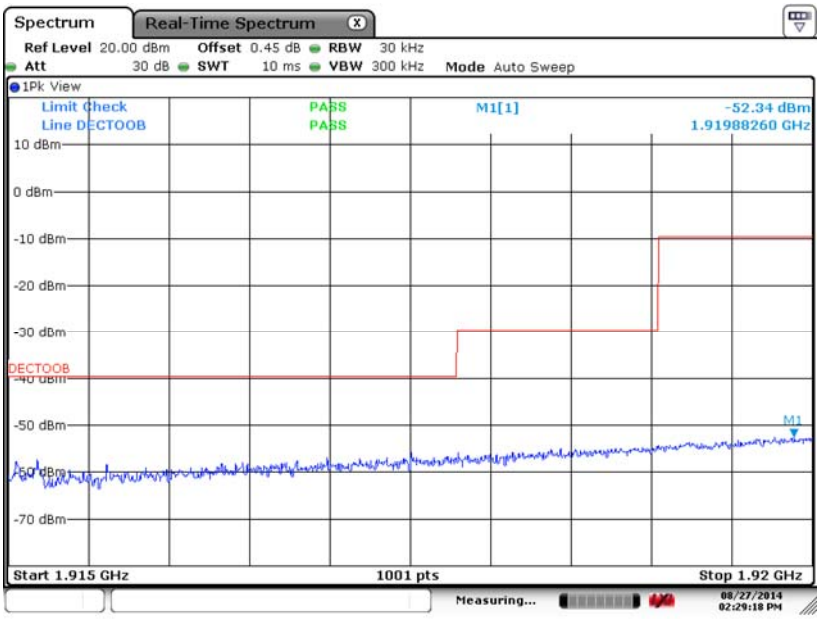
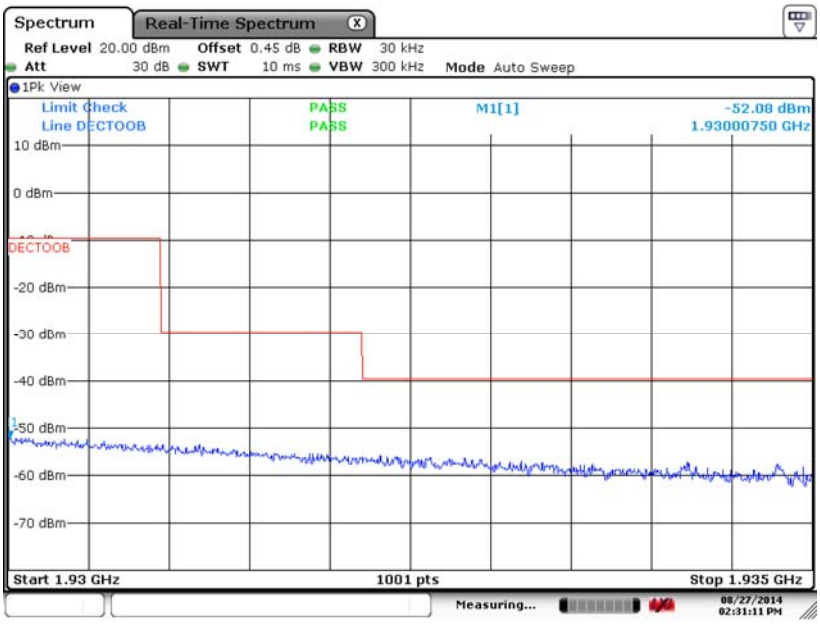
6. Measurement Data (continued)

6.5 Spurious Emissions at the antenna terminals (15.323 (d), RSS-213 6.7.1) (cont)

6.5.9 Mid Channel Out of Band 1.915 – 1.920 GHz



6.5.10 Mid Channel Out of Band 1.930 – 1.935 GHz



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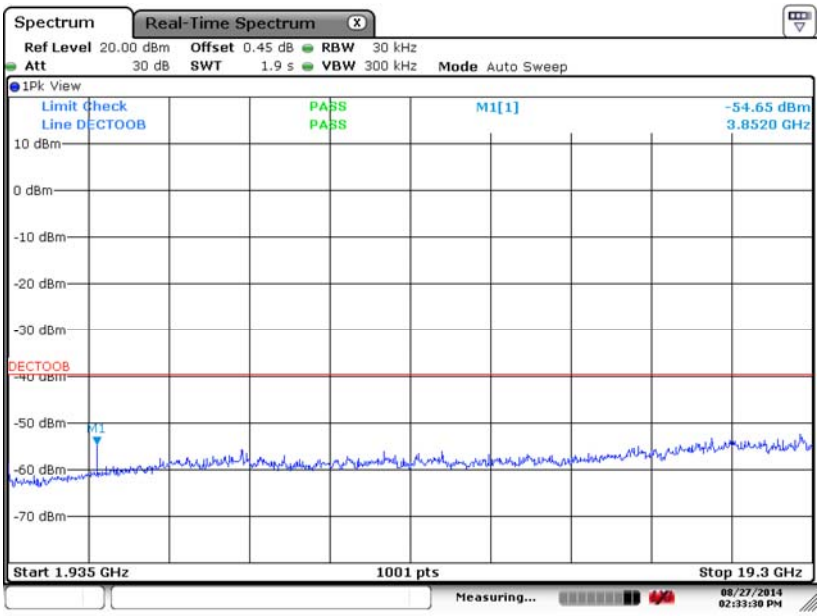
6. Measurement Data (continued)

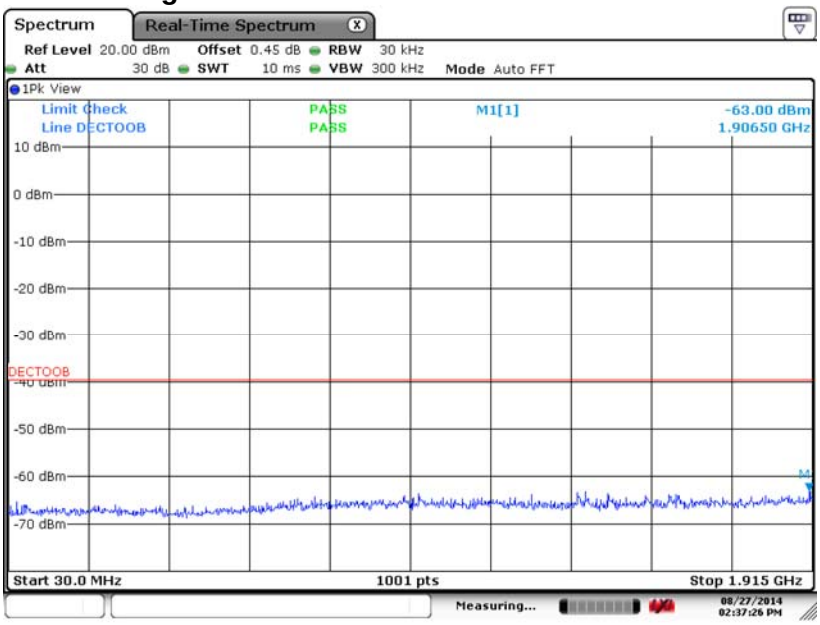
6.5 Spurious Emissions at the antenna terminals (15.323 (d), RSS-213 6.7.1) (cont)

6.5.11 Mid Channel Out of Band 1.935 – 19.3 GHz



Date: 27.AUG.2014 14:33:30

6.5.12 High Channel Out of Band 30 MHz – 1.915 GHz



Date: 27.AUG.2014 14:37:26

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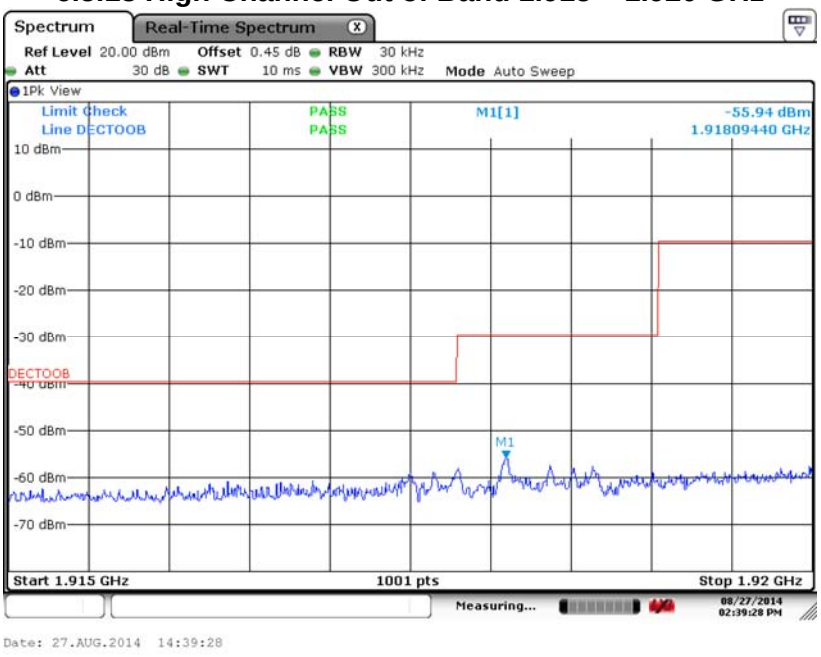
6. Measurement Data (continued)

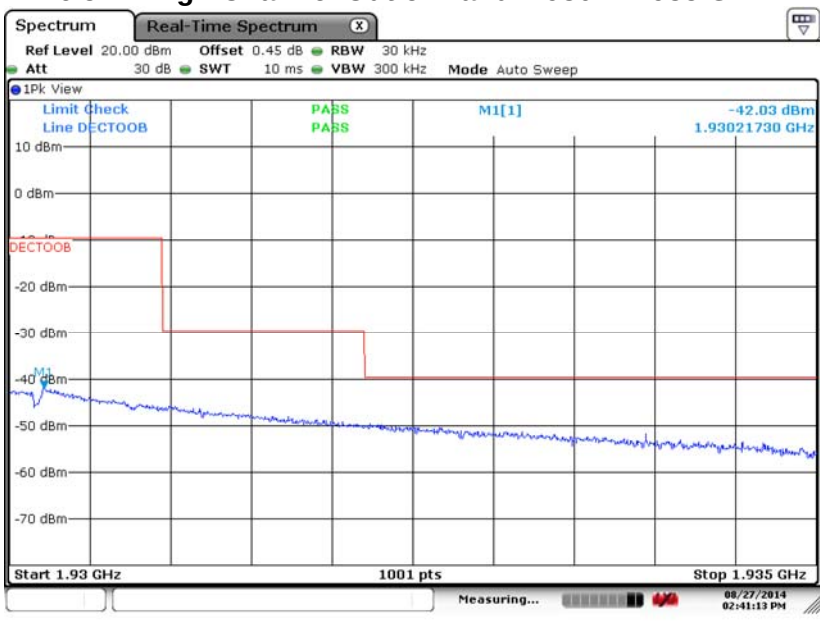
6.5 Spurious Emissions at the antenna terminals (15.323 (d), RSS-213 6.7.1) (cont)

6.5.13 High Channel Out of Band 1.915 – 1.920 GHz



Date: 27.AUG.2014 14:39:28

6.5.14 High Channel Out of Band 1.930 – 1.935 GHz



Date: 27.AUG.2014 14:41:13

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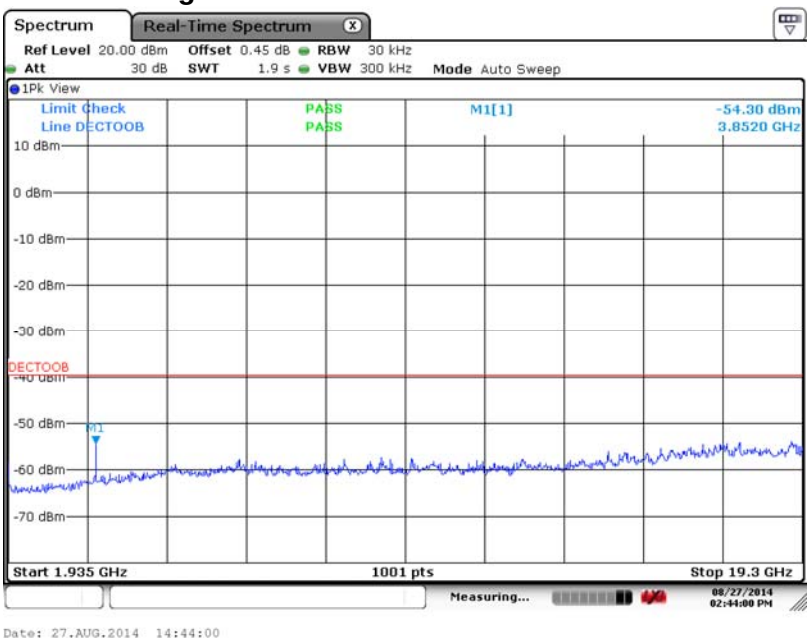
6. Measurement Data (continued)

6.5 Spurious Emissions at the antenna terminals (15.323 (d), RSS-213 6.7.1) (cont)

6.5.15 High Channel Out of Band 1.935 – 19.3 GHz



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6. Measurement Data

6.6. Radiated Spurious Emissions for Integral Antennas (Harmonics)

Regulatory Limit: FCC Part 15.323 (d), 15.209, IC RSS-213 6.7, RSS-GEN

Frequency Range (GHz)	Limits (dBµV/m)	
	Peak	Average
1.0 to 19.3	74	54

6.6.1. Measurement Equipment Used to Perform Test

Device	Manufacturer	Model No.	Serial No.	Cal Due	Cal Interval
Horn Antenna 1-18	EMCO	3117	00143292	1/14/2015	2 yr
Horn Antenna 18-40	Com Power	AH-840	03075	8/27/2014	2 yr
Spectrum Analyzer 9 kHz to 40 GHz	Rohde & Schwarz	FSV40	100899	6/6/2015	2 yr
Preamplifier 1 – 26.5	Hewlett Packard	8449B	3008A01323	6/5/2015	2 yr
DECT 1.88 to 1.93 GHz Notch Filter	Micro-Tronics	BRM18083	001	4/14/2015	1 yr

Manufacturer	Software Description	Title/Model #	Rev.
Compliance Worldwide	Test Report Generation Software	Test Report Generator	1.0

6.6.2. Measurement & Equipment Setup

Test Date:	August 25, 2014
Test Engineer:	Cody Merry
Site Temperature (°C):	21.6
Relative Humidity (%RH):	35
Frequency Range:	1.0 GHz to 19.3 GHz
EMI Receiver IF Bandwidth:	1 MHz
EMI Receiver Avg Bandwidth:	3 MHz
Detector Functions:	Peak, Average

6.6.3. Test Procedure

Test measurements were made in accordance with ANSI C63.4-2003, Standard Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronics Equipment in the Range of 9 kHz to 40 GHz. The product was tested through 3 Axis and worse case data is presented.

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6. Measurement Data (continued)

6.6 Spurious Emissions for integral antennas (15.323 (d), 15.209, RSS-213 6.7.1) (cont)

Low Channel - Horizontal

Frequency (MHz)	Amplitude (dBµV/m)		Peak Limit	Peak Margin (dB)	Average Limit	Average Margin (dB)	Ant Pol	Ant Ht	TT Pos	Result
	Peak	Avg					H/V	cm	Deg	
3843	68.41	39.37	74	-5.59	54	-14.63	H	220	346	Compliant
5765	61.94	39.32	74	-12.06	54	-14.68	H	125	0	Compliant
7686	63.72	41.48	74	-10.28	54	-12.52	H	106	6	Compliant
9608	56.95	43.21	74	-17.05	54	-10.79	Noise Floor			Compliant
11529	58.17	44.74	74	-15.83	54	-9.26	Noise Floor			Compliant
13451	61.23	47.27	74	-12.77	54	-6.73	Noise Floor			Compliant
15372	53.03	39.65	74	-20.97	54	-14.35	Noise Floor – 1 Meter			Compliant
17294	56.04	42.43	74	-17.96	54	-11.57	Noise Floor – 1 Meter			Compliant
19215	53.90	33.90	74	-20.10	54	-20.10	Noise Floor			Compliant

Mid Channel - Horizontal

Frequency (MHz)	Amplitude (dBµV/m)		Peak Limit	Peak Margin (dB)	Average Limit	Average Margin (dB)	Ant Pol	Ant Ht	TT Pos	Result
	Peak	Avg					H/V	cm	Deg	
3850	66.10	38.78	74	-7.90	54	-15.22	H	237	6	Compliant
5775	62.25	39.48	74	-11.75	54	-14.52	H	130	91	Compliant
7700	63.56	41.32	74	-10.44	54	-12.68	H	107	7	Compliant
9625	56.36	42.90	74	-17.64	54	-11.10	Noise Floor			Compliant
11550	58.00	44.34	74	-16.00	54	-9.66	Noise Floor			Compliant
13475	61.60	47.45	74	-12.40	54	-6.55	Noise Floor			Compliant
15400	53.07	39.52	74	-20.93	54	-14.48	Noise Floor – 1 Meter			Compliant
17325	55.77	41.95	74	-18.23	54	-12.05	Noise Floor – 1 Meter			Compliant
19250	54.53	34.53	74	-19.47	54	-19.47	Noise Floor			Compliant

High Channel - Horizontal

Frequency (MHz)	Amplitude (dBµV/m)		Peak Limit	Peak Margin (dB)	Average Limit	Average Margin (dB)	Ant Pol	Ant Ht	TT Pos	Result
	Peak	Avg					H/V	cm	Deg	
3857	64.84	38.17	74	-9.16	54	-15.83	H	100	185	Compliant
5785	61.15	38.89	74	-12.85	54	-15.11	H	116	234	Compliant
7714	61.93	40.93	74	-12.07	54	-13.07	H	122	185	Compliant
9642	56.38	42.64	74	-17.62	54	-11.36	Noise Floor			Compliant
11571	57.70	44.04	74	-16.30	54	-9.96	Noise Floor			Compliant
13499	60.66	47.20	74	-13.34	54	-6.80	Noise Floor			Compliant
15428	53.89	39.67	74	-20.11	54	-14.33	Noise Floor – 1 Meter			Compliant
17356	55.34	42.11	74	-18.66	54	-11.89	Noise Floor – 1 Meter			Compliant
19284	56.28	36.28	74	-17.72	54	-17.72	Noise Floor			Compliant

[1] Correction factors are included in measurement values. Worse case of X, Y & Z Axis

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6. Measurement Data (continued)

6.6 Spurious Emissions for integral antennas (15.323 (d), 15.209, RSS-213 6.7.1) (cont)

Low Channel - Vertical

Frequency (MHz)	Amplitude (dBµV/m)		Peak Limit	Peak Margin (dB)	Average Limit	Average Margin (dB)	Ant Pol	Ant Ht	TT Pos	Result
	Peak	Avg					H/V	cm	Deg	
3843	69.28	40.30	74	-4.72	54	-13.70	V	190	318	Compliant
5765	62.64	40.00	74	-11.36	54	-14.00	V	100	54	Compliant
7686	61.96	41.02	74	-12.04	54	-12.98	V	145	0	Compliant
9608	56.35	42.83	74	-17.65	54	-11.17	Noise Floor			Compliant
11529	57.85	44.17	74	-16.15	54	-9.83	Noise Floor			Compliant
13451	60.30	46.73	74	-13.70	54	-7.27	Noise Floor			Compliant
15372	50.59	37.49	74	-23.41	54	-16.51	Noise Floor – 1 Meter			Compliant
17294	53.03	39.69	74	-20.97	54	-14.31	Noise Floor – 1 Meter			Compliant
19215	53.90	33.90	74	-20.10	54	-20.10	Noise Floor			Compliant

Mid Channel - Vertical

Frequency (MHz)	Amplitude (dBµV/m)		Peak Limit	Peak Margin (dB)	Average Limit	Average Margin (dB)	Ant Pol	Ant Ht	TT Pos	Result
	Peak	Avg					H/V	cm	Deg	
3850	66.06	38.97	74	-7.94	54	-15.03	V	243	181	Compliant
5775	57.61	38.87	74	-16.39	54	-15.13	V	170	245	Compliant
7700	56.55	40.60	74	-17.45	54	-13.40	V	100	6	Compliant
9625	57.21	43.33	74	-16.79	54	-10.67	Noise Floor			Compliant
11550	58.57	44.95	74	-15.43	54	-9.05	Noise Floor			Compliant
13475	61.62	47.76	74	-12.38	54	-6.24	Noise Floor			Compliant
15400	54.03	39.91	74	-19.97	54	-14.09	Noise Floor – 1 Meter			Compliant
17325	56.24	43.36	74	-17.76	54	-10.64	Noise Floor – 1 Meter			Compliant
19250	54.53	34.53	74	-19.47	54	-19.47	Noise Floor			Compliant

High Channel - Vertical

Frequency (MHz)	Amplitude (dBµV/m)		Peak Limit	Peak Margin (dB)	Average Limit	Average Margin (dB)	Ant Pol	Ant Ht	TT Pos	Result
	Peak	Avg					H/V	cm	Deg	
3857	69.98	40.81	74	-4.02	54	-13.19	V	185	328	Compliant
5785	62.97	39.55	74	-11.03	54	-14.45	V	192	53	Compliant
7714	61.85	41.06	74	-12.15	54	-12.94	V	168	0	Compliant
9642	56.66	42.86	74	-17.34	54	-11.14	Noise Floor			Compliant
11571	58.32	44.39	74	-15.68	54	-9.61	Noise Floor			Compliant
13499	62.01	47.59	74	-11.99	54	-6.41	Noise Floor			Compliant
15428	53.14	39.79	74	-20.86	54	-14.21	Noise Floor – 1 Meter			Compliant
17356	55.65	42.12	74	-18.35	54	-11.88	Noise Floor – 1 Meter			Compliant
19284	56.00	36.00	74	-18.00	54	-18.00	Noise Floor			Compliant

[1] Correction factors are included in measurement values. Worse case of X, Y & Z Axis.

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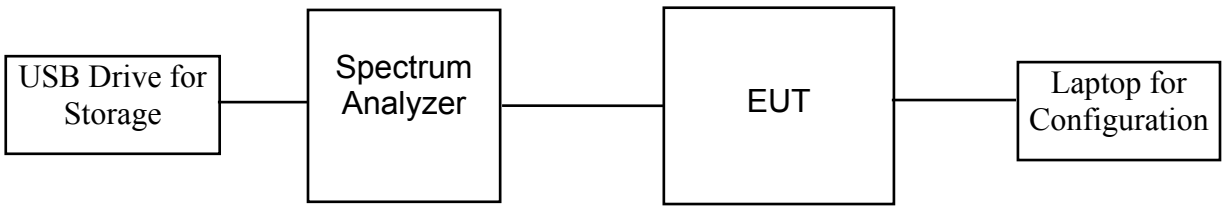
6. Measurement Data

6.7. Power Spectral Density (15.319 (d), RSS-213 Sec 6.6, ANSI C63.17 Sec 6.1.5)

Requirement: FCC: Power spectral density shall not exceed 3 milliwatts in any 3 kHz bandwidth as measured with a spectrum analyzer having a resolution bandwidth of 3 kHz.

IC: The peak-hold power spectral density shall not exceed 12 milliwatts per any 3 kHz bandwidth.
As an alternative to the peak-hold power spectral density, the time-averaged power spectral density may be measured and it shall not exceed 3 milliwatts per any 3 kHz bandwidth.

Test Equipment Setup: EUT is configured to transmit a modulated signal in burst mode on the lowest, middle and highest channels. The EUT is connected to the spectrum analyzer via on board u.fl connector and adapter cable. The spectrum analyzer is configured with a 3 kHz RBW and the maximum frequency over the bandwidth of the signal is determined. The marker is then placed at that frequency and 100 averages using the sample detector is recorded. Cable loss is accounted for within the analyzer.



6.7.1. Measurement Data – Average Power Spectral Density (PSD)

Channel	Channel Frequency	Actual Measured Frequency	Power Spectral Density	Limit	Limit	Result
	MHz	MHz	dBm / 3kHz	dBm / 3kHz	mW / 3kHz	
TX4	1921.536	1921.545	-5.86	4.77	3.00	Compliant
TX2	1924.992	1925.001	-5.67	4.77	3.00	Compliant
TX0	1928.448	1928.457	-5.81	4.77	3.00	Compliant

Note: Please see the next pages for plots of measurements

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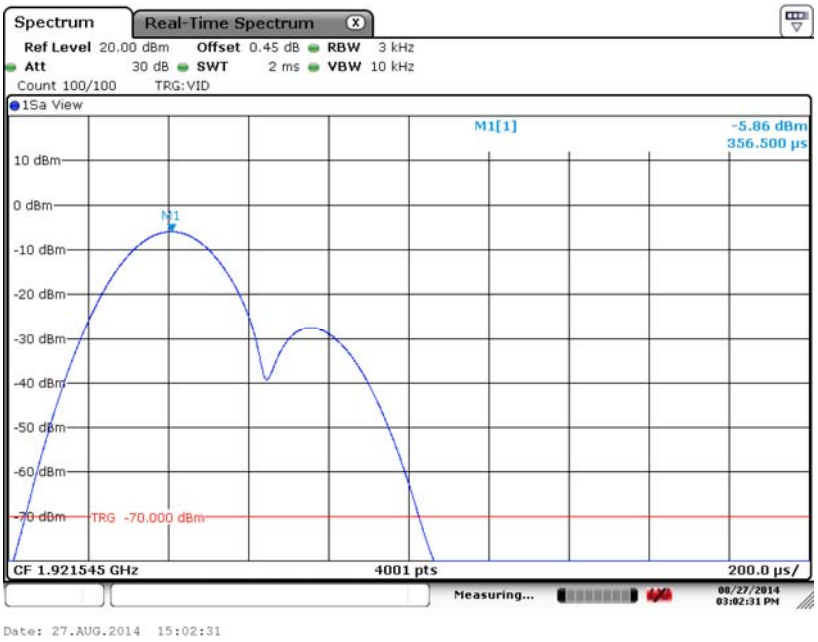
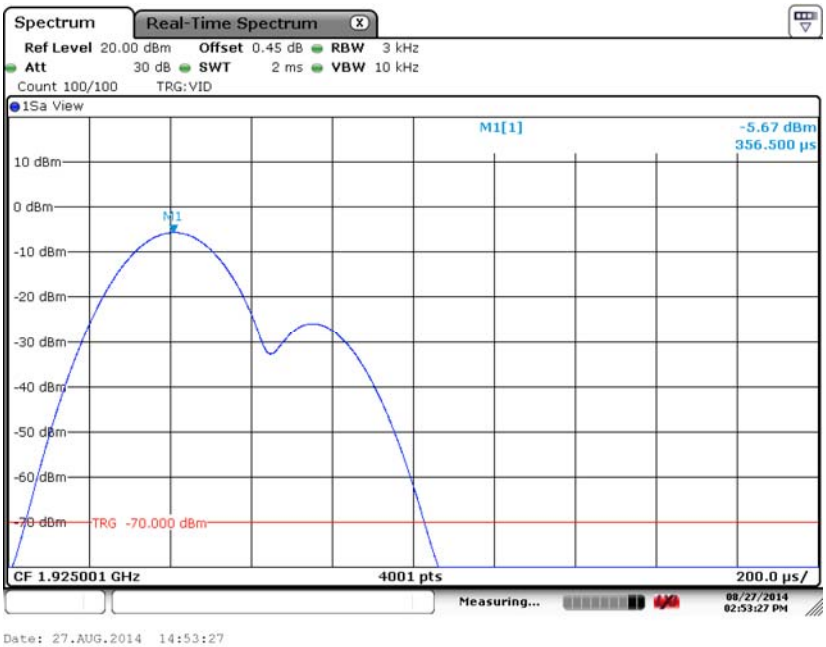
6. Measurement Data

6.7. Power Spectral Density (15.319 (d)), RSS-213 Sec 6.6 (cont)

6.7.2 Low Channel PSD



6.7.3 Mid Channel PSD



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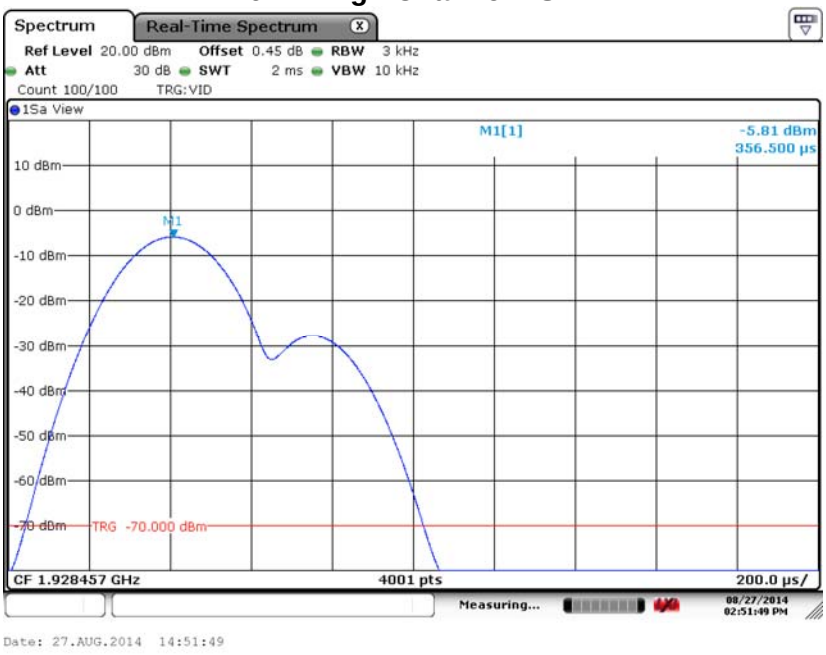
6. Measurement Data

6.7. Power Spectral Density (15.319 (d)), RSS-213 Sec 6.6 (cont)

6.7.4 High Channel PSD



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6. Measurement Data

6.8. Conducted Emissions

Regulatory Limit: FCC Part 15.315, 15.207, IC RSS-213 6.3, RSS-GEN

Frequency Range (MHz)	Limits (dBµV)	
	Quasi-Peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5.0	56	46
5.0 to 30.0	60	50
* Decreases with the logarithm of the frequency.		

6.8.1. Measurement Equipment Used to Perform Test

Device	Manufacturer	Model No.	Serial No.	Cal Due	Cal Interval
LISN	EMCO	3825/2	9109-1860	6/2/2015	1 yr
EMI Receiver	Hewlett Packard	8546A	3330A00115	6/4/2016	2 yr

Manufacturer	Software Description	Title/Model #	Rev.
Compliance Worldwide	Test Report Generation Software	Test Report Generator	1.0

6.8.2. Measurement & Equipment Setup

Test Date:	09/10/2014
Test Engineer:	Tom Charron
Site Temperature (°C):	26.5
Relative Humidity (%RH):	44
Frequency Range:	0.15 MHz to 30 MHz
EMI Receiver IF Bandwidth:	9 kHz
EMI Receiver Avg Bandwidth:	30 kHz
Detector Functions:	Peak, Quasi-Peak & Average

6.8.3. Test Procedure

Test measurements were made in accordance with ANSI C63.4-2003, Standard Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronics Equipment in the Range of 9 kHz to 40 GHz.

Note: The microphone was tested in its recharging tray. The microphone is typically not operated and/or used in this manner.

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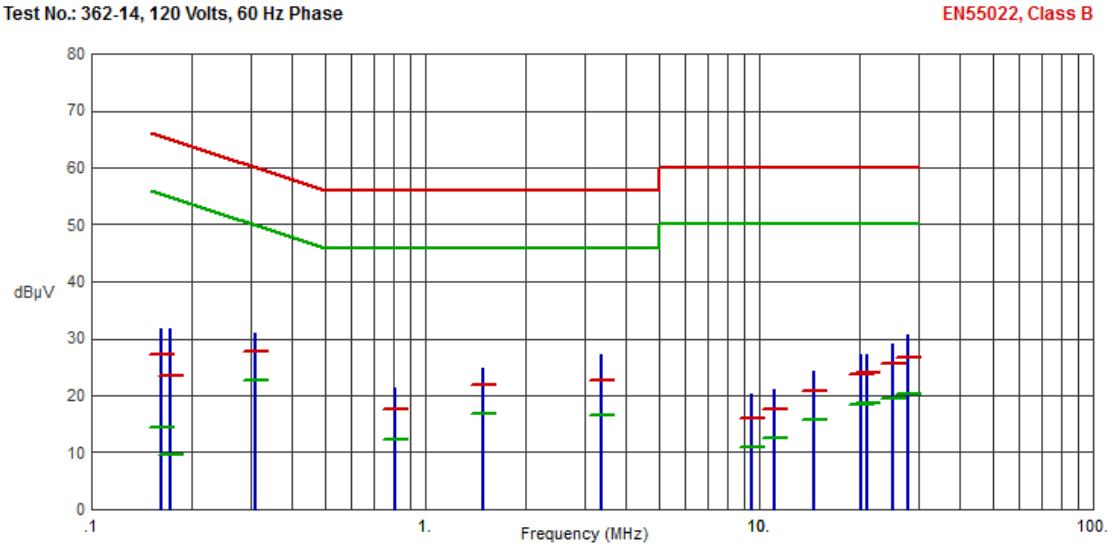
6. Measurement Data

6.8.4. 120 Volts, 60 Hz Phase



Frequency (MHz)	Pk Amp (dBµV)	QP Amp (dBµV)	QP Limit (dBµV)	QP Margin (dB)	Avg Amp (dBµV)	Avg Limit (dBµV)	Avg Margin (dB)	Comments
.1614	31.82	27.30	65.39	-38.09	14.32	55.39	-41.07	
.1721	31.69	23.57	64.86	-41.29	9.52	54.86	-45.34	
.3113	30.85	27.60	59.94	-32.34	22.73	49.94	-27.21	
.8135	21.22	17.60	56.00	-38.40	12.33	46.00	-33.67	
1.4904	24.88	21.81	56.00	-34.19	16.74	46.00	-29.26	
3.3725	27.10	22.58	56.00	-33.42	16.53	46.00	-29.47	
9.5370	20.21	16.00	60.00	-44.00	10.85	50.00	-39.15	
11.1577	21.19	17.69	60.00	-42.31	12.59	50.00	-37.41	
14.5727	24.14	20.79	60.00	-39.21	15.62	50.00	-34.38	
20.0643	27.15	23.66	60.00	-36.34	18.35	50.00	-31.65	
21.0913	27.25	23.92	60.00	-36.08	18.68	50.00	-31.32	
25.0773	29.00	25.47	60.00	-34.53	19.49	50.00	-30.51	
27.9502	30.75	26.59	60.00	-33.41	20.19	50.00	-29.81	

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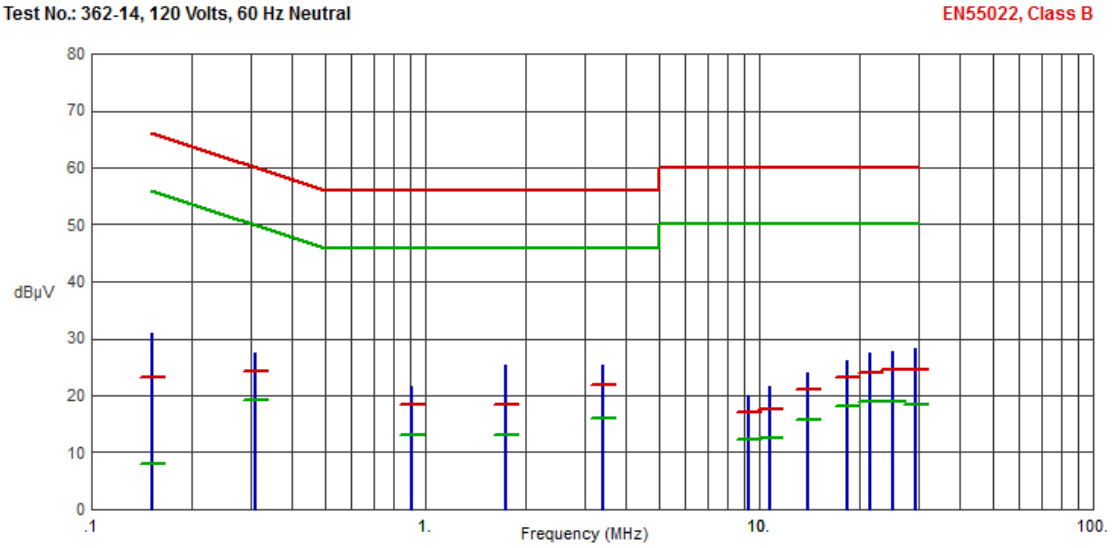
6. Measurement Data

6.8.5. 120 Volts, 60 Hz Neutral



Frequency (MHz)	Pk Amp (dBµV)	QP Amp (dBµV)	QP Limit (dBµV)	QP Margin (dB)	Avg Amp (dBµV)	Avg Limit (dBµV)	Avg Margin (dB)	Comments
.1521	30.91	23.07	65.88	-42.81	7.98	55.88	-47.90	
.3082	27.53	24.25	60.02	-35.77	19.23	50.02	-30.79	
.9059	21.57	18.28	56.00	-37.72	13.07	46.00	-32.93	
1.7435	25.41	18.36	56.00	-37.64	13.14	46.00	-32.86	
3.3908	25.33	21.79	56.00	-34.21	16.05	46.00	-29.95	
9.2986	20.10	17.19	60.00	-42.81	12.19	50.00	-37.81	
10.8013	21.64	17.55	60.00	-42.45	12.43	50.00	-37.57	
14.0121	24.12	20.95	60.00	-39.05	15.76	50.00	-34.24	
18.4056	26.13	23.17	60.00	-36.83	18.08	50.00	-31.92	
21.4545	27.51	24.09	60.00	-35.91	18.99	50.00	-31.01	
25.2502	27.79	24.42	60.00	-35.58	18.94	50.00	-31.06	
29.4389	28.20	24.51	60.00	-35.49	18.41	50.00	-31.59	

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6. Measurement Data (continued)

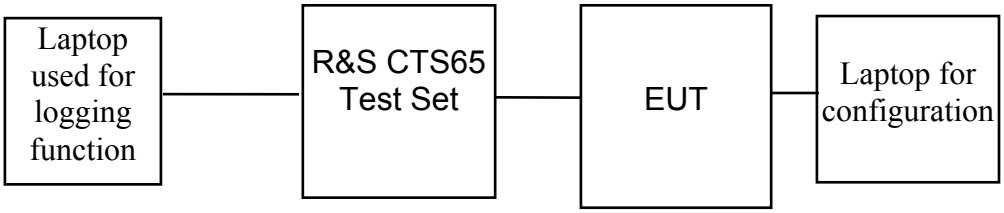
6.9 Carrier Frequency Stability (15.323 (f), IC RSS-213 6.2, ANSI C63.17 Sec 6.2.1)

Requirement: The frequency stability of the carrier frequency of the intentional radiator shall be maintained within 10 ppm over 1 hour or the interval between channel access monitoring, whichever is shorter. This translates to a frequency drift of 19.2 kHz for a 1920 MHz carrier.

The frequency stability shall be maintained over a temperature variation of -20° to +50 °C at normal supply voltage, and over a variation in the primary supply voltage of 85 percent to 115 percent of the rated supply voltage at a temperature of 20 °C. For equipment that is capable only of operating from a battery, the frequency stability tests shall be performed using a new battery without any further requirement to vary supply voltage.

Test Equipment Setup: EUT is connected to the CTS65 test set using a special operational mode of the EUT (TBR6 mode) on one of the channels (frequencies). The RF Modulation function of the test set is used for this measurement. The test set is configured to perform the measurement over 100 bursts (approximate frame period x 100). The frequency offset measured in kHz is compared against the equivalent of 10 ppm or 19.2 kHz.

The measurement is performed over 1 hour and a laptop is used to capture the data approximately once per second from the test set via its serial port. The peak to peak difference was recorded and the mean value and deviation in kHz (ppm) calculated.



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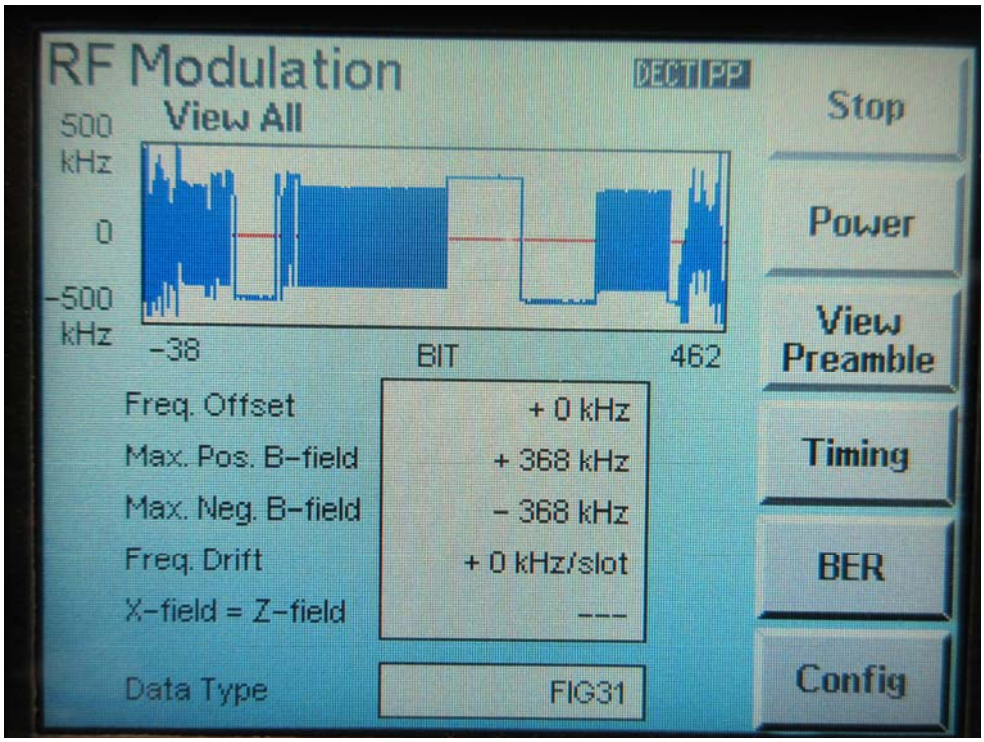
6. Measurement Data (continued)

6.9 Carrier Frequency Stability (15.323 (f), IC RSS-213 6.2, ANSI C63.17 Sec 6.2.1) cont.

Channel	Channel Frequency	Voltage	Temperature	Measured Frequency Offset	Limit (+/-)	Limit (+/-)	Result
	MHz	VDC	Degrees C	kHz	kHz	ppm	
TX4	1921.676	3.70	20	-	19.2	10.0	Compliant
TX4	1921.680	3.70	-20	4.0	19.2	10.0	Compliant
TX4	1921.676	3.70	+50	0.0	19.2	10.0	Compliant
TX2	1925.129	3.70	20	-	19.2	10.0	Compliant
TX2	1925.136	3.70	-20	7.0	19.2	10.0	Compliant
TX2	1925.143	3.70	+50	14.0	19.2	10.0	Compliant
TX0	1928.588	3.70	20	-	19.2	10.0	Compliant
TX0	1928.588	3.70	-20	0.0	19.2	10.0	Compliant
TX0	1928.599	3.70	+50	11.0	19.2	10.0	Compliant

6.9.1 Timing 3.7 VDC, 20 degrees C



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6. Measurement Data (continued)

6.10 Transmitter Spurious Emissions (FCC Part 15.209, RSS 213 6.7)

6.10.1. Regulatory Limit: FCC Part 15.209, IC RSS-GEN, Class B, Quasi-Peak

Frequency Range (MHz)	Distance (Meters)	Limit (dBµV/m)
10 to 30	3	69.5
30 to 88	3	40.0
88 to 216	3	43.5
216 to 960	3	46.0
960 to 19,300	3	54.0

6.10.2. Measurement Equipment Used to Perform Test

Device	Manufacturer	Model No.	Serial No.	Cal Due	Cal Interval
Loop Antenna	EMCO	6512	9309-1139	8/28/2014	2 yr
Biconilog Antenna	Sunol Sciences	JB1	A050913	5/15/2015	2 yr
EMI Receiver	Hewlett Packard	8546A	3330A00115	6/4/2016	2 yr
Spectrum Analyzer 9 kHz to 40 GHz	Rohde & Schwarz	FSV40	100899	6/6/2015	2 yr
Preamplifier 1 – 26.5	Hewlett Packard	8449B	3008A01323	6/5/2015	2 yr
DECT 1.88 to 1.93 GHz Notch Filter	Micro-Tronics	BRM18083	001	4/14/2015	1 yr
Horn Antenna	EMCO	3117	00143292	1/14/2015	2 yr
Horn Antenna	Com-Power	AH-840	03075	8/27/2014	2 yr

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6. Measurement Data (continued)

6.10 Transmitter Spurious Emissions (FCC Part 15.209, RSS 213 6.7)

6.10.3. Measurement & Equipment Setup

Test Date:	8/22/2014
Test Engineer:	Larry Stillings, Brian Breault
Site Temperature (°C):	25
Relative Humidity (%RH):	33
Frequency Range:	10 MHz to 19.3 GHz
Measurement Distance:	3 Meters
EMI Receiver IF Bandwidth:	9, kHz, 120 kHz, 1 MHz
EMI Receiver Avg Bandwidth:	30 kHz, 300 kHz, 3 MHz
Detector Functions:	Peak, Quasi-Peak, Average
Antenna Height:	1 to 4 meters

6.10.4. Test Procedure

Test measurements were made in accordance with ANSI C63.4-2003, Standard Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronics Equipment in the Range of 9 kHz to 40 GHz.

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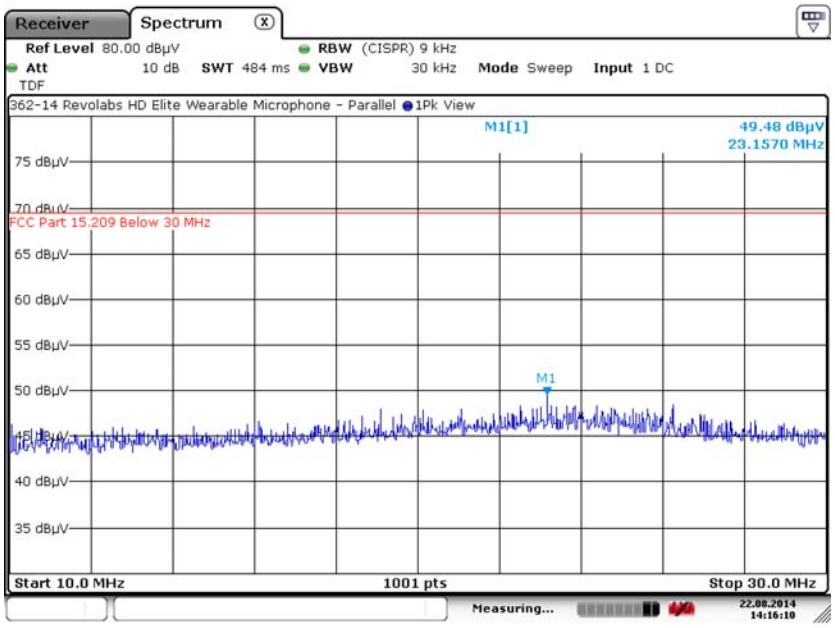
6. Measurement Data (continued)

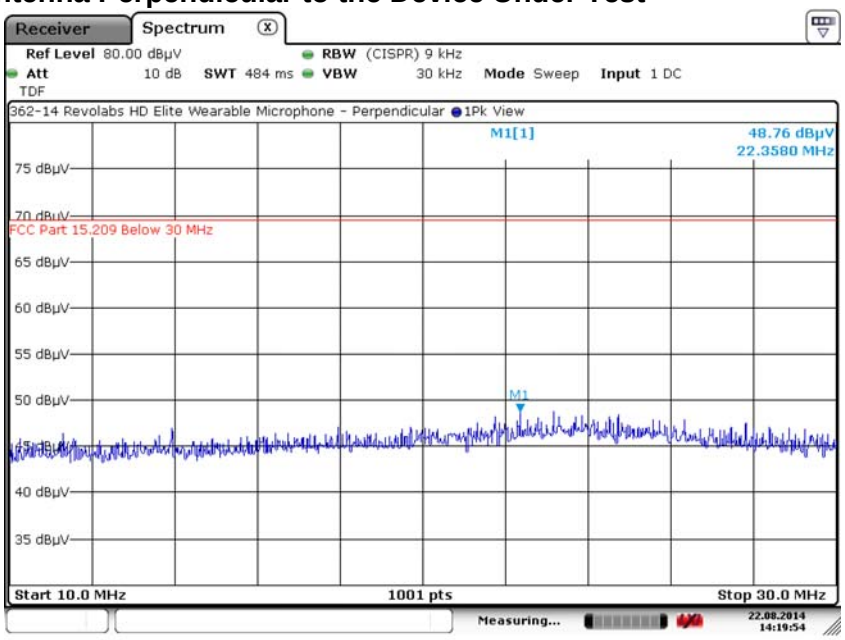
6.10. Radiated Emissions (10 MHz to 30 MHz) Test Results

6.10.5. Antenna Parallel to the Device Under Test



Date: 22.AUG.2014 14:16:11

6.10.6. Antenna Perpendicular to the Device Under Test



Date: 22.AUG.2014 14:19:54

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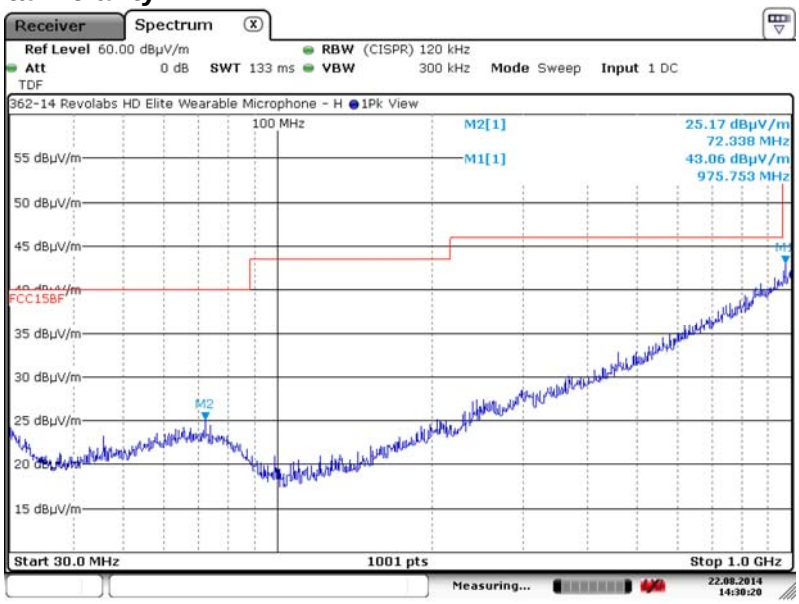
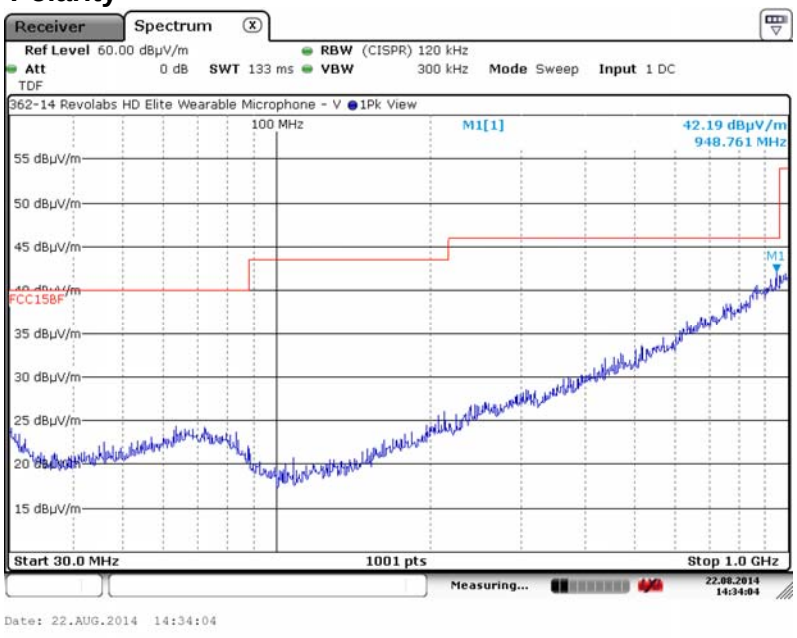
6. Measurement Data (continued)

6.10. Radiated Emissions (30 MHz to 1 GHz) Test Results

6.10.7. Horizontal Polarity



6.10.8. Vertical Polarity



Prescan from Compact 3 Meter Chamber, no Measurable signals on 3 Meter OATS.

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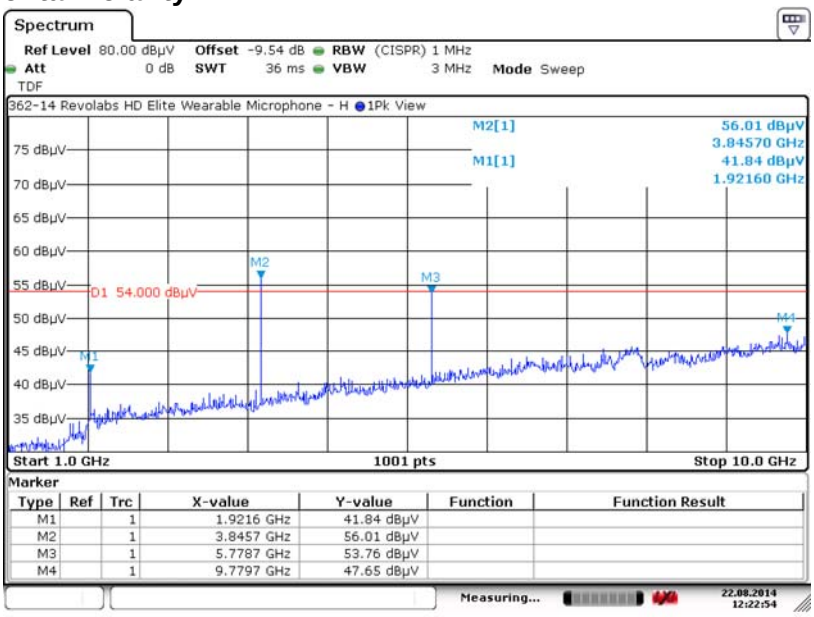
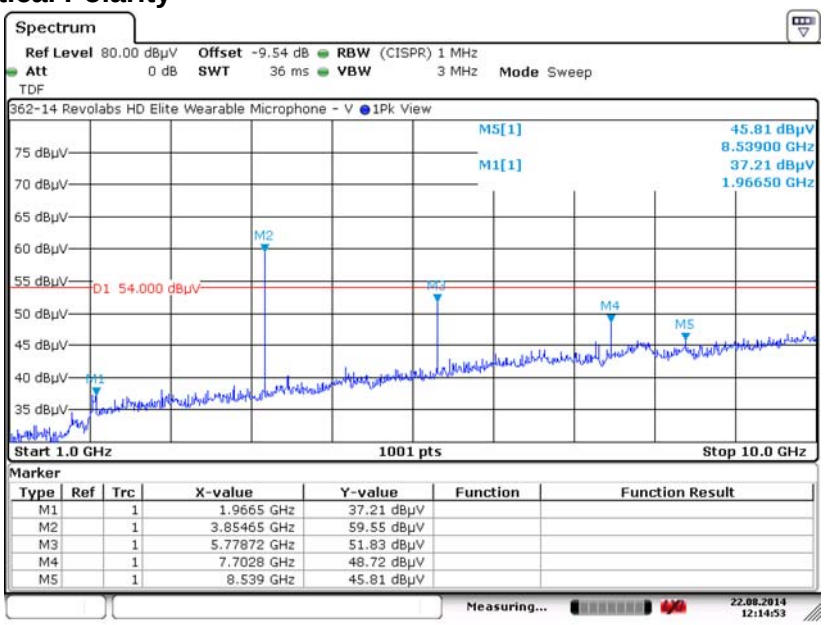
6. Measurement Data (continued)

6.10. Radiated Emissions (1 to 10 GHz) Test Results

6.10.9. Horizontal Polarity



6.10.10. Vertical Polarity



Harmonics shown are tabled in section 6.6 of this report.

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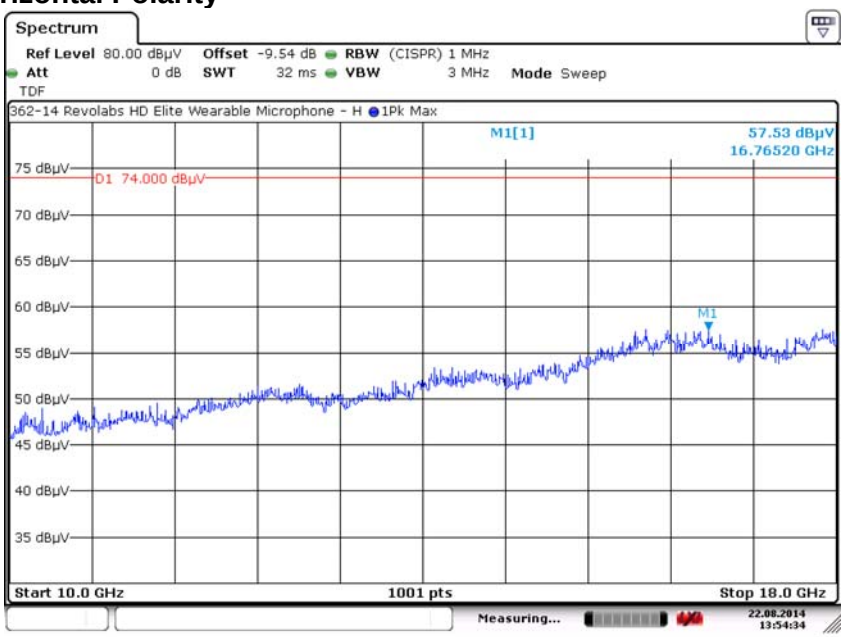
6. Measurement Data (continued)

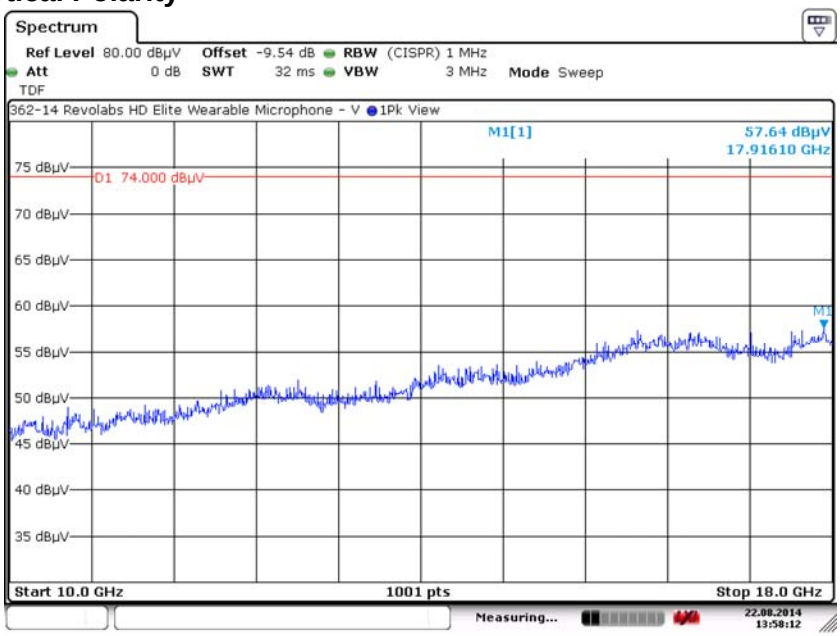
6.10. Radiated Emissions (10 to 18 GHz) Test Results

6.10.11. Horizontal Polarity



Date: 22.AUG.2014 13:54:34

6.10.12. Vertical Polarity



Date: 22.AUG.2014 13:58:12

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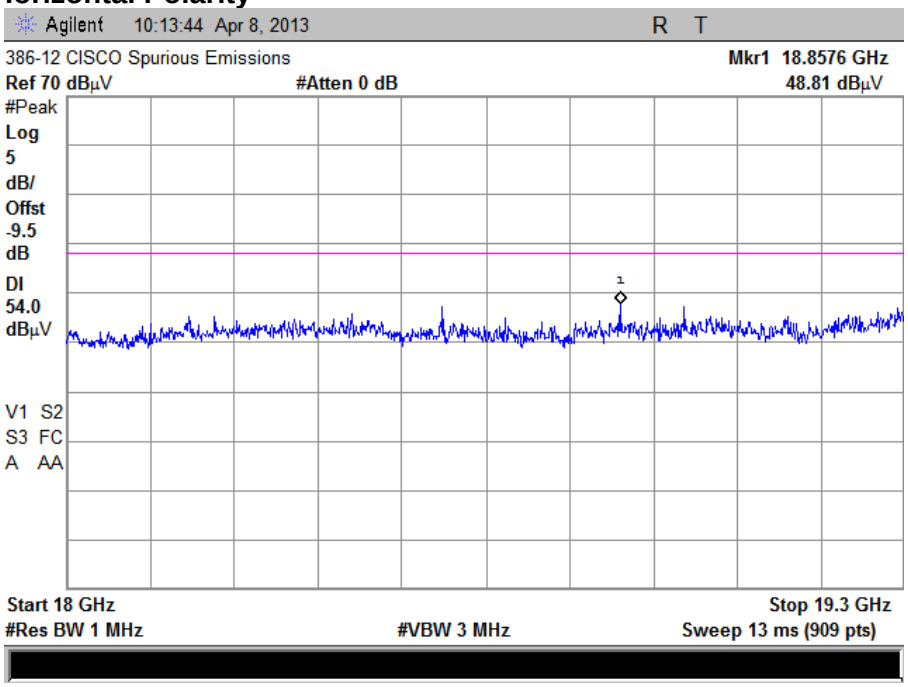
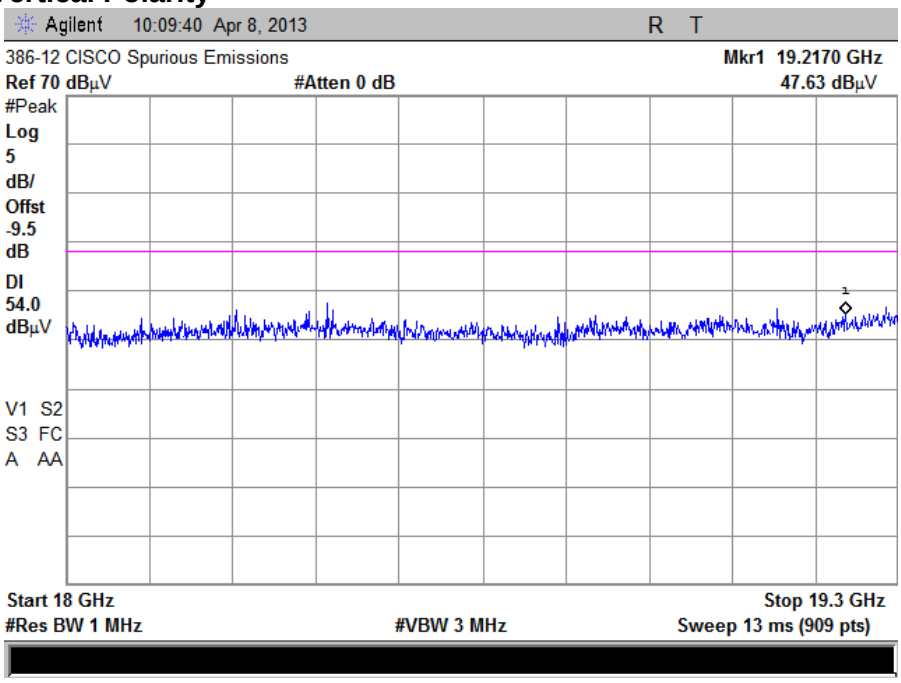
6. Measurement Data (continued)

6.10. Radiated Emissions (18 to 19.3 GHz) Test Results

6.10.13. Horizontal Polarity



6.10.14. Vertical Polarity



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6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (15.323 (e), RSS-213 4.3.4 (c), ANSI C63.17 Section 6.2.2 Frame Repetition-Stability and ANSI C63.17 Section 6.2.3 Frame Period and Jitter)

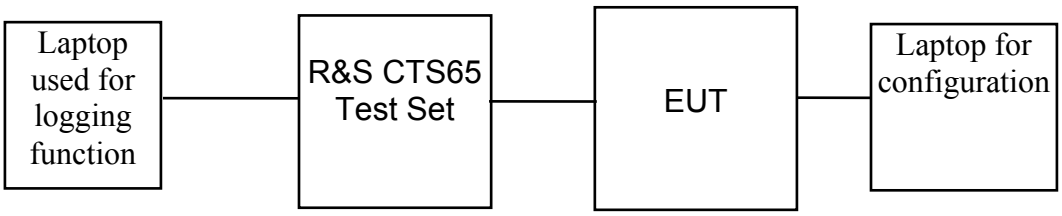
Requirement: The frame period (a set of consecutive time slots in which the position of each time slot can be identified by reference to a synchronizing source) of an intentional radiator operating in this sub-band shall be 20 milliseconds/X where X is a positive whole number.

Each device that implements time division for the purpose of maintaining a duplex connection on a given frequency carrier shall maintain a frame repetition rate with a frequency stability of at least 50 parts per millions (ppm). Each device which further divides access in time in order to support multiple communication links on a given frequency carrier shall maintain a frame repetition rate with a frequency stability of at least 10 ppm.

The jitter (time-related, abrupt, spurious variations in the duration of the frame interval) introduced at the two ends of such a communication link shall not exceed 25 microseconds for any two consecutive transmissions.

The Frame Repetition Stability which is measured is 3 times the standard deviation.

Test Equipment Setup: EUT is connected to the CTS65 test set using a special operational mode of the EUT (TBR6 mode) on one of the channels (frequencies). The CTS65 test set serves as the companion device for the EUT. The Timing function of the test set is used for this measurement. The test set is configured to perform the measurement over 1000 bursts. The data is captured approximately once every 10 seconds via the laptop for 1000 seconds.



Note: Frame repetition stability measurement is only applicable for Fixed Parts.

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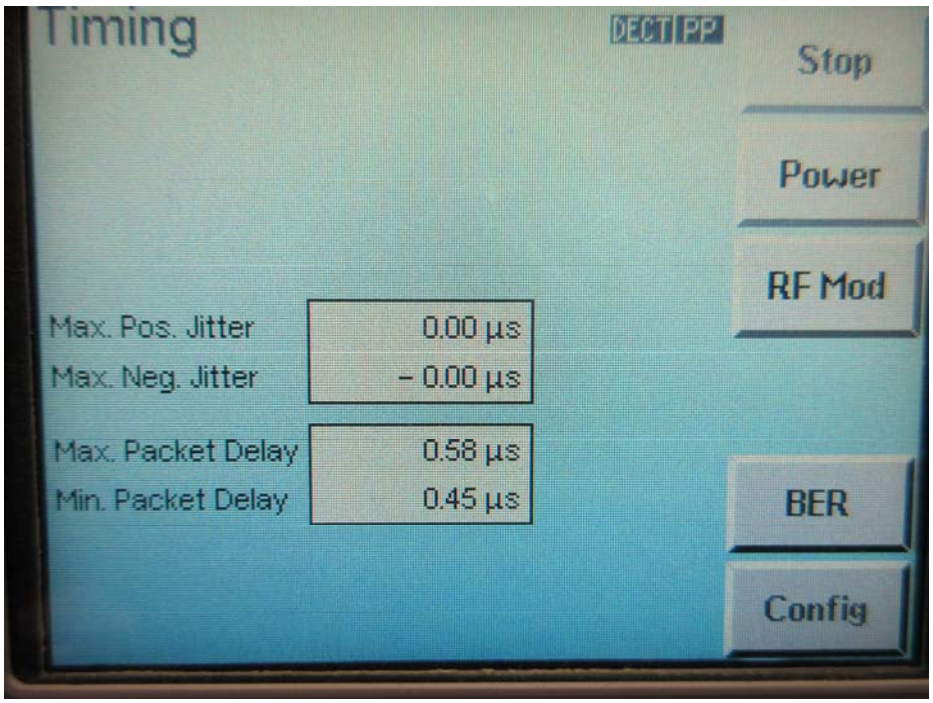
6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (15.323 (e), RSS-213 4.3.4 (c), ANSI C63.17 Section 6.2.2 Frame Repetition-Stability and ANSI C63.17 Section 6.2.3 Frame Period and Jitter) (cont)

Maximum Positive Jitter (µS)	Maximum Negative Jitter (µS)	Frame Period (mS)	Limit	Result
0.00	-0.00	10.000	25 µS	Compliant

Packet Delay Positive Jitter (µS)	Packet Delay Negative Jitter (µS)	Frame Period (mS)	Limit	Result
0.58	0.45	10.000	25 µS	Compliant

6.11.1 Time Accuracy & Maximum Jitter (cont)



Note: The tester is configured for 1000 bursts of analysis (its maximum) and then monitored for a minimum of 1000 seconds recording the maximum and minimum values of jitter to satisfy the measurement requirement over 100,000 frames.

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6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (15.323 (e), RSS-213 4.3.4) (cont)

6.11.2 Automatic Discontinuation of Transmission (15.319(f), RSS-213 4.3.4 (a))

Requirement: Devices shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. This is 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.

Result: Compliant

Evaluation	Result
Test according to a)	Compliant
Assessment of manufacturer declaration	-- --

a) The tests are done after establishment of a connection to counter part.

	Test case	Reaction of EUT	Result
1	Switch – off counterpart	A	Compliant
2	Hook-on by counterpart	--	--
3	Switch- off by EUT	A	Compliant
4	Hook -on on EUT side	--	--
5	Remove power from EUT	A	Compliant
6	Remove power from counterpart	A	Compliant

A – Connection break down, cease of transmit
B – Connection break down, EUT transmits signaling information
C – Connection break down, counter part transmits signaling information

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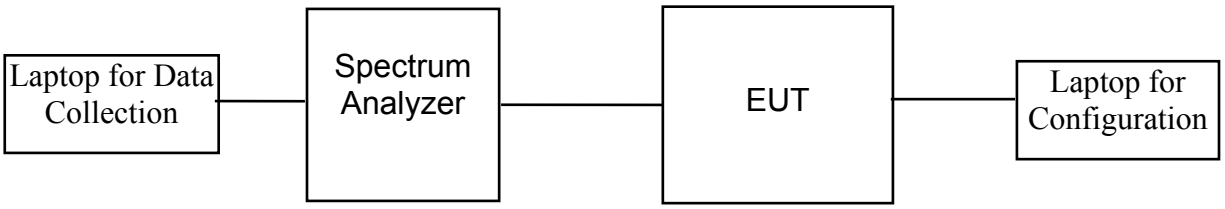
6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (cont)

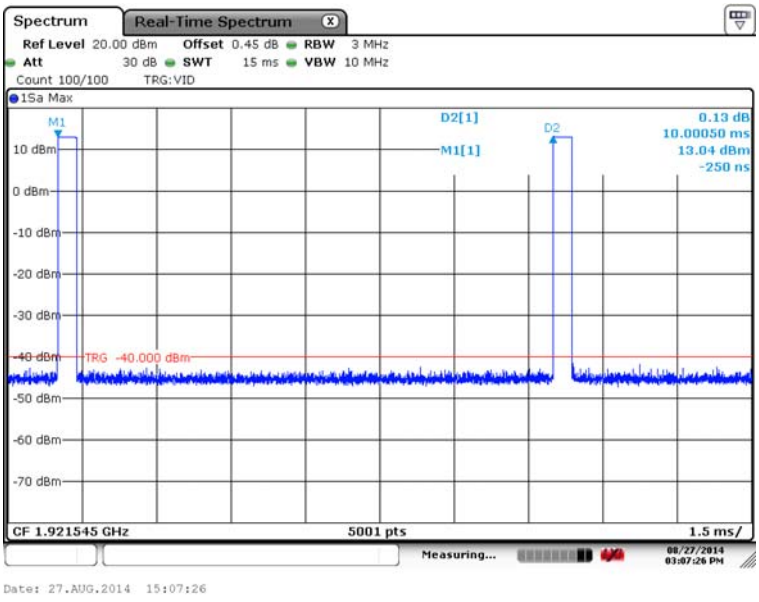
6.11.3 Monitoring Time (15.323(c) (1), RSS-213 4.3.4 (b) (1), ANSI C63.17 Sec 7.3.4

Requirement: Devices must incorporate a mechanism for monitoring the time and spectrum windows that their transmission is intended to occupy. The following criteria must be met:

Immediately prior to initiating a transmission, devices must monitor the combined time and spectrum window, which they intend to use, to verify if the channel is free, for at least 10 milliseconds for systems designed to use a 10 ms or shorter frame period, or at least 20 ms for systems designed to use a 20 ms frame period.



6.11.3.1 Measurement of Frame Period



Result: Compliant, plot is used to demonstrate this is a 10 mS or shorter system. This requirement is covered by the results of the LIC test performed in Section 6.11.7 of this report.

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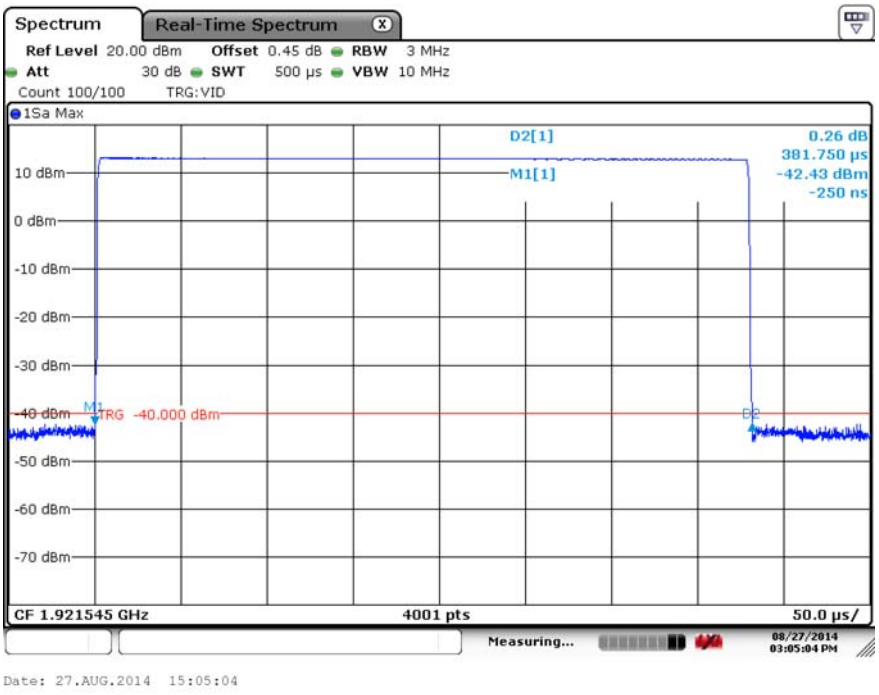
6. Measurement Data (continued)

6.10 Specific Requirements to UPCS Devices (cont)

6.11.3 Monitoring Time (15.323(c) (1), RSS-213 4.3.4 (b) (1) (cont)

6.11.3.2 Measurement of Nominal Burst Length (Frame Width)



Result: Compliant, plot is for reference only, requirement covered via the LIC tests performed in Section 6.11.7 of this report.

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6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (cont)

6.11.4 Lower Monitoring Threshold (15.323 (c) (2), RSS-213 4.3.4 (b) (2), ANSI C63.17 Sec 7.3.2)

Requirement: The monitoring threshold must not be more than 30 dB above the thermal noise power (KTB) of a bandwidth equivalent to the occupied bandwidth of the device.

For EUTs which support least interfered channel procedure (LIC), it is not necessary to measure the lower threshold under rule parts 15.323 (c) (2) and 4.3.4 (b) (2).

These are automatically met by the LIC procedure in clauses 15.323 (c) (5) and 4.3.4 (b) (5).

Result: The Lower Threshold is only applicable for systems which have dfined less than 40 duplex system access channels. The EUT implements 5 channels as shown on page 5 of the test report. Each channel is made up of 12 timeslots for the Fixed Part and 12 timeslots for the Portable Parts (EUT – Microphone(s)) as documented in the manufacturers declaration.

Therefore the EUT uses 60 TDMA Duplex Channels and meets this requirement via the LIC tests performed in Section 6.11.7 of this report.

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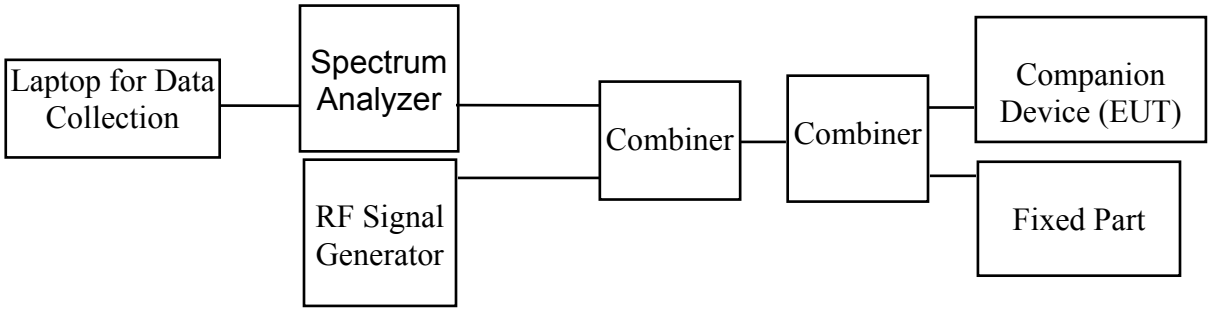
6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (cont)

6.11.5 Maximum Transmit Period (15.323 (c) (3), RSS-213 4.3.4 (b) (3), ANSI C63.17 Section 8.2.2)

Requirement: If no signal above the threshold level is detected, transmission may commence and continue with the same bandwidth in the monitored time and spectrum windows without further monitoring. Occupation of the same combined time and spectrum windows by a device or group of cooperating devices, continuously over a period of time longer than 8 hours is not permitted without repeating the access criteria.

Test Equipment Setup:



Requirement	Time	Limit	Result
Maximum Transmission Time 8.2.2	30 Minutes	8 Hours	Compliant

Result: Compliant

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6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (cont)

6.11.6 System Acknowledgement (15.323(c) (4), RSS-213 4.3.4 (b) (4)

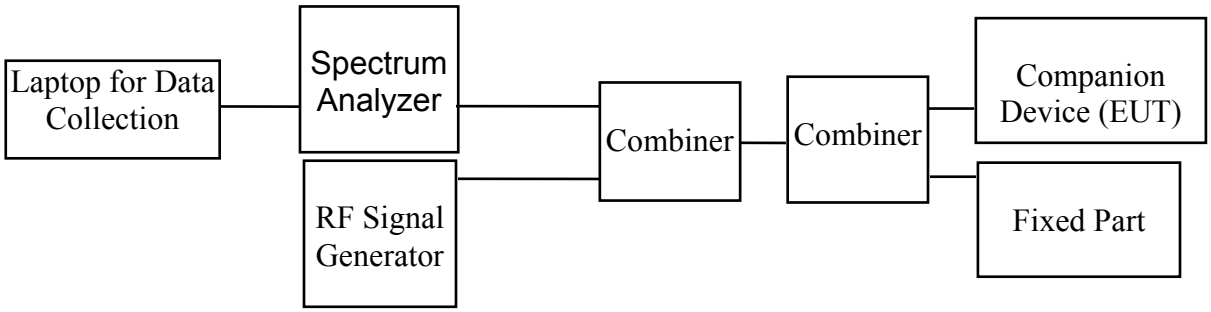
Requirement: Once access to specific combined time and spectrum windows is obtained, an acknowledgement from a system participant must be received by the initiating transmitter within one second or transmission must cease. Periodic acknowledgements must be received at least every 30 seconds or transmission 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.

Connection acknowledgements are tested according to ANSI 63.17-2006 subclause 8.2.1.

Unacknowledged transmission following ANSI C63.17 Section 8.1.1 is performed.

Result: Access criteria test interval per ANSCI 63.17 Section 8.1.2 Access criteria functional test is performed via the LIC test documented in Section 6.11.7 of this report.

ANSI C63.17 Section 8.1.3 Access criteria functional test is not applicable because option FCC 15.323 (c) (6) / RSS-213 4.3.4 (b) (6) is not implemented.



Requirement	Time	Limit	Result
Access Criteria test interval 8.1.1	28 s	<=30 secs	Compliant

Result: Compliant, the test was repeated 5 times and the worst case time is documented.

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6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (cont)

6.11.7 Least Interfered Channel (LIC) Selection (15.323(c) (5))

Requirement: If access to spectrum is not available as determined by the above, and a minimum of 20 duplex system access channels are defined for the system, the time and spectrum windows with the lowest power level may be accessed.

A device utilizing the provisions of this paragraph (5) must have monitored all access channels defined for its system within the last 10 seconds and must verify, within the 20 milliseconds (40 milliseconds for devices designed to use a 20 millisecond frame period) immediately preceding actual channel access, that the detected power of the selected time and spectrum windows is no higher than the previously detected value.
The power measurement resolution bandwidth for this comparison must be accurate to within 6 dB.

No device or group of cooperating devices located within 1 meter 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.

Result: Compliant, the maximum number of wireless microphones that is used with a base is one. Up to two bases could be daisy chained together and therefore they could be up to two devices co-located with 1 meter, although this is not realistic for proper operation. However, since each device occupies 1.45 MHz of spectrum the maximum that would ever occur is 2.9 MHz of aggregate bandwidth.

Upper Threshold: TU <= -174 + 10 log10 B + Mu + Pmax - Peut (dBm)

B = Emission Bandwidth in Hz

P = Peak Transmit Power (dBm)

Pmax = 5 log10 B – 10 dBm

Calculated Thresholds:

	dBm
TL: Lower Threshold	N/A
TU: Upper Threshold	-61.90

Limits:

Limits	**TLR < TL+ UM = N/A + 6.0 = N/A**
	TUR < TU+ UM = -61.90 + 6.0 = -55.90 dBm

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6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (cont)

6.11.7 Least Interfered Channel (LIC) Selection (RSS-213 4.3.4 (b) (5)

Requirement: If access to spectrum is not available as determined by the above, and a minimum of 40 duplex system access channels are defined for the system, the time and spectrum windows with a power level below a monitoring threshold of 50 dB above the thermal noise power determined for the occupied bandwidth may be accessed.

A device utilizing the provisions of this paragraph (5) must have monitored all access channels defined for its system within the last 10 seconds and must verify, within the 20 milliseconds (40 milliseconds for devices designed to use a 20 millisecond frame period) immediately preceding actual channel access, that the detected power of the selected time and spectrum windows is no higher than the previously detected value.
The power measurement resolution bandwidth for this comparison must be accurate to within 6 dB.

No device or group of cooperating devices located within 1 meter 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.

Result: Compliant, the maximum number of wireless microphones that is used with a base is one. Up to two bases could be daisy chained together and therefore they could be up to two devices co-located within 1 meter, although this is not realistic for proper operation. However, since each device occupies 1.45 MHz of spectrum the maximum that would ever occur is 2.9 MHz of aggregate bandwidth.

Upper Threshold: TU <= -174 + 10 log10 B + Mu + Pmax - Peut (dBm)

B = Emission Bandwidth in Hz

P = Peak Transmit Power (dBm)

Pmax = 5 log10 B – 10 dBm

Calculated Thresholds:

	dBm
TL: Lower Threshold	N/A
TU: Upper Threshold	-61.90

Limits:

Limits	**TLR < TL+ UM = N/A + 6.0 = N/A**
	TUR < TU+ UM = -61.90 + 6.0 = -55.90 dBm

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6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (cont)

6.11.7 (LIC) Selection (15.323(c) (5), RSS-213 4.3.4 (b) (5) (cont)

Note: The EUT is not an initiating device and therefore relies on the Fixed part device to perform the channel monitoring and least interfered channel (LIC) function to determine which channel is free. The EUT does not transmit any beacons and is strictly a listen before talk device.

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6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (cont)

6.11.8 Random waiting (15.323(c) (6), RSS-213 4.3.4 (b) (6)

Requirement: 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 from the time when the channel becomes available.

Result: Compliant, this feature is not implemented in the EUT.

6.11.9 Monitoring Bandwidth (15.323(c) (7), RSS-213 4.3.4 (b) (7)

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

Note: Testing of the monitoring system bandwidth is not required if the designed bandwidth from the manufacturer is available and given in the test report.

The monitor shall have a maximum reaction time less than 50√ (1.25 / occupied bandwidth in MHz) microseconds for signals at the applicable threshold level but shall not be required to be less than 50 microseconds.

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

Result: Compliant, the device is a listen before talk device.

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6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (cont)

6.11.10 Monitoring Antenna (15.323(c) (8), RSS-213 4.3.4 (b) (8)

Requirement: The monitoring system shall use the same antenna used for transmission, or an antenna that yields equivalent reception at that location.

Note: A monitoring antenna of the same model (and manufacturer) as the transmitting antenna is considered equivalent. An antenna not of the same model but of the same type (e.g. both are horn antennas of different manufacturers) is considered equivalent if the main beam antenna gains are within 3 dB of each other. Both antennas are to be installed to point at the same general coverage area.

Result: Compliant, the device uses the same antenna.

6.11.11 Monitoring Threshold Relaxation (15.323(c) (9), RSS-213 4.3.4 (b) (9)

Requirement: Devices that have a power output lower than the maximum permitted under this standard may increase their detection threshold by 1 dB for each 1 dB that the transmitter power is below the maximum permitted.

Result: Compliant, requirement is covered by LIC test in 15.323 (b)(5) / 4.3.4 (b)(5).

6.11.12 Duplex Connections (15.323(c) (10), RSS-213 4.3.4 (b) (10)

Requirement: A device initiating a communication (hereafter called an initiating device) may attempt to establish a duplex connection by monitoring both its intended transmit and receive time and spectrum windows.
If both the intended transmit and receive time and spectrum windows meet the access criteria, then the initiating device can initiate a transmission in the intended transmit time and spectrum window.
If the power detected by the responding device can be decoded as a duplex connection signal from the initiating device, then the responding device may immediately begin transmitting on the receive time and spectrum window monitored by the initiating device.

Result: Compliant, EUT does not support Duplex Connections.

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6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (cont)

6.11.13 Alternative monitoring interval for co-located devices (15.323(c) (11), RSS-213 4.3.4 (b) (11)

Requirement: An initiating device that is prevented from monitoring during its intended transmit window due to monitoring system blocking from the transmissions of a co-located (within one meter) transmitter of the same system, may monitor the portions of the time and spectrum windows in which they intend to receive over a period of at least 10 milliseconds.
The monitored time and spectrum window must total at least 50 percent of the 10 millisecond frame interval and the monitored spectrum must be within 1.25 MHz of the centre frequency of channel(s) already occupied by that device or co-located co-operating devices.
If the access criteria is met for the intended receive time and spectrum window under the above conditions, then transmission in the intended transmit window by the initiating device may commence.

Result: Compliant, devices are not co-located within 1 meter. A Wired microphone is provided on the Base (speaker phone) unit, and wireless microphones would never be used within 1 meter of the base.

6.11.14 Fair Access (15.323(c) (12), RSS-213 4.3.4 (b) (12)

Requirement: The provisions of Part 15.323 (c) (10) or (c) (11) and/or RSS-213 4.3.4 (b) (10) or (11) shall not be used to extend the range of spectrum occupied over space or time for the purpose of denying fair access to spectrum to other devices.

Result: Compliant, EUT does not operate in a mode that denies fair access.

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6. Measurement Data (continued)

6.12. Public Exposure to Radio Frequency Energy Levels (1.1307 (b)(1))

RSS-GEN 5.5, RSS 102

6.12.1. SAR Test Exclusion Calculation

Requirement: Portable devices as defined in § 2.1093 of this chapter operating under 15.247 are subject to radio frequency radiation exposure requirements as specified in §§ 1.1307(b) and 2.1093 of this chapter.

For a 1-g SAR, the test exclusion result must be ≤ 3.0.

Test Notes: The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by the following formula:

$$\text{SAR Test Exclusion} = \frac{P_{MAX}}{d_{MIN}} \times \sqrt{f_{(GHz)}} \quad (1)$$

P_{MAX}	mW	Maximum power of channel, including tune-up tolerance
d_{MIN}	mm	Minimum test separation distance, mm (≤ 50 mm)
$f_{(GHz)}$	GHz	$f_{(GHz)}$ is the RF channel transmit frequency in GHz (>100 MHz and <6 GHz)

(1) FCC OET 447498 - Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

Result: The device under test meets the exclusion requirement detailed in FCC OET 447498.

Test Channel:		**TX4**	**TX2**	**TX0**
Input: P_{MAX}[1]	(mW)	21.13	20.99	21.09
d_{MIN}	(mm)	5.00	5.00	5.00
$f_{(GHz)}$		1.922	1.925	1.928
Test Exclusion:		**5.86**	**5.82**	**5.86**
Limit Exemption:		**3.00**	**3.00**	**3.00**

[1] Taken from the table in Section 6.3 of this test report (converted to mW).

The device exceeds the test limit exemption and therefore a routine SAR Evaluation must be performed

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6. Measurement Data (continued)

6.11. Public Exposure to Radio Frequency Energy Levels (1.1307 (b)(1)) RSS-GEN 5.5, RSS 102 cont.

6.12.2. MPE Time Averaged Power Table

Channel	Frequency	DUT Output Power	DUT Antenna Gain	Calculated Output Power	Time Averaged Power	Limit	Result
	(MHz)	(dBm)	(dBi)	(mW)	(mW)	(mW)	
TX4	1921.536	13.25	0.64	24.49	0.93	100.00	Compliant
TX2	1924.992	13.22	0.56	23.88	0.91	100.00	Compliant
TX0	1928.448	13.24	0.43	23.28	0.89	100.00	Compliant

NOTE: Although the peak power is over the general exposure limit for RSS-102, the time averaged power is very small for DECT technology. In this case a nominal frame width of 381.75 µS repeating every 10 mS, and therefore is compliant with the general exposure requirements defined in RSS-102 Section 2.5.1. The reduction in power is calculated by 10 * LOG (0.38175 / 10) or -14.18 dB.

RSS-102 Section 2.5 and 2.5.1 Requirements:

All transmitters are exempt from routine SAR and RF exposure evaluations provided that output power complies with the power levels of sections 2.5.1 or 2.5.2. If the equipment under test (EUT) meets the requirements of sections 2.5.1 or 2.5.2, applicants are only required to submit a properly signed declaration of compliance (see Annex C).

SAR evaluation is required if the separation distance between the user and the radiating element of the device is less than or equal to 20 cm, except when the device operates as follows:

- above 1 GHz and up to 2.2 GHz inclusively, and with output power (i.e. the higher of the conducted or radiated (e.i.r.p.) source-based, time-averaged output power) that is less than or equal to 100 mW for general public use and 500 mW for controlled use

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7. Test Images

7.1. Radiated Emissions (Front)

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7. Test Images

7.2. Radiated Emissions - 30 MHz – 1 GHz (Rear)

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7. Test Images

7.3. Radiated Emissions - Above 1 GHz (Front)

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7. Test Images

7.4. Radiated Emissions – 1 to 18 GHz (Rear)

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7. Test Images

7.5. Radiated Emissions – 18 to 19.3 GHz (Rear)

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7. Test Images

7.6. Radiated Emissions – Below 30 MHz (Rear)

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7. Test Images

7.7. Conducted Emissions - Front

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8. Test Site Description

Compliance Worldwide is located at 357 Main Street in Sandown, New Hampshire. The test sites at Compliance Worldwide are used for conducted and radiated emissions testing in accordance with Federal Communications Commission (FCC) and Industry Canada standards. A description of the test sites is on file with the FCC (registration number **96392**) and Industry Canada (file number **IC 3023A-1)**.

The radiated emissions test site is a 3 and 10 meter enclosed open area test site (OATS). Personnel, support equipment and test equipment are located in the basement beneath the OATS ground plane.

The conducted emissions site consists of a 10' x 9' ground plane with an 8' x 9' Vertical Plane that is bonded at the seams.

Both sites are designed to test products or systems 1.5 meter W x 1.5 meter L x 2.0 meter H, floor standing or table top.

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