



COMPLIANCE WORLDWIDE INC. TEST REPORT 521-15

In Accordance with the Requirements of
Industry Canada RSS 213, Issue 3, March 2015
2 GHz License-exempt Personal Communications Service Devices (LE-PCS)
Federal Communications Commission Title 47 CFR Part 15, Subpart D
Technical Requirements for
Unlicensed Personal Communication Service (UPCS) Devices

Issued to

David Clark Company
360 Franklin Street
Worcester, MA 01604

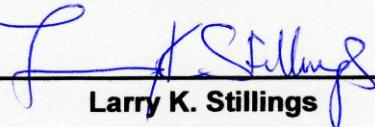
For the

Digital Intercom Wireless Gateway
Model: U9120-W4

FCC ID: Y3J-U9120W4
IC: 9409A-U9120W4

Report Issued on January 10, 2016

Tested by



Larry K. Stillings

Reviewed By



Brian F. Breault

This test report shall not be reproduced, except in full, without written permission from Compliance Worldwide, Inc.

Table of Contents

| | |
|---|----|
| 1. Scope..... | 3 |
| 2. Product Details..... | 3 |
| 2.1. Manufacturer..... | 3 |
| 2.2. Model Number | 3 |
| 2.3. Serial Number..... | 3 |
| 2.4. Description..... | 3 |
| 2.5. Power Source | 3 |
| 2.6. Hardware Revision..... | 3 |
| 2.7. Software Revision | 3 |
| 2.8. Modulation Type | 3 |
| 2.9. Operating Frequency | 3 |
| 2.10. Emission Designator..... | 3 |
| 2.11. EMC Modifications..... | 3 |
| 3. Product Configuration | 3 |
| 3.1. Cables..... | 3 |
| 3.2. EUT Hardware | 4 |
| 3.3. Support Equipment | 4 |
| 3.4. EUT Diagram | 4 |
| 3.5. EUT Channels & Frequencies | 5 |
| 4. Measurements Parameters..... | 6 |
| 4.1. Measurement Equipment Used to Perform Test..... | 6 |
| 4.2. Measurement & Equipment Setup | 7 |
| 4.3. Measurement Procedure | 7 |
| 4.4. Measurement Uncertainty..... | 7 |
| 5. Measurement Summary..... | 8 |
| 6. Measurement Data | 9 |
| 6.1. Antenna Gain..... | 9 |
| 6.2. Type of Modulation and Access Protocol..... | 9 |
| 6.3. Peak Transmit Power..... | 10 |
| 6.4. Emission Bandwidth..... | 15 |
| 6.5. Spurious Emissions at the antenna terminals | 23 |
| 6.6. Radiated Spurious Emissions (Harmonics) | 34 |
| 6.7. Power Spectral Density..... | 37 |
| 6.8. Conducted Emissions | 42 |
| 6.9. Frequency Stability | 45 |
| 6.10. Transmitter Spurious Emissions | 47 |
| 6.11. Specific Requirements to UPSCS Devices | 52 |
| 6.12. Public Exposure to Radio Frequency Energy Levels..... | 74 |
| 7. Test Images | 76 |
| 8. Test Site Description..... | 84 |

Test Number: 521-15

Issue Date: 1/10/2016

1. Scope

This test report certifies that the Digital Intercom Wireless Gateway U9120-W4, as tested, meets the FCC Part 15, Subpart D and Industry Canada RSS 213, Issue 3 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: | David Clark Company |
| 2.2. Model Numbers: | U9120-W4 |
| 2.3. Serial Number: | 8208-20 |
| 2.4. Description: | Digital Intercom Wireless Gateway. Relay for all audio interface between Wireless Belt Station users and the U9100 Master Station and connected ancillaries. |
| 2.5. Power Source: | 48 VDC (Ethernet POE) |
| 2.6. Hardware Revision: | V43000G-32AY Rev 4 Assy # V43000G-32AY Rev 3 |
| 2.7. Software Revision: | N/A |
| 2.8. Modulation Type: | GFSK |
| 2.9. Operating Frequencies: | 1921.536 -1928.448 MHz |
| 2.10. Emission Designator: | 1M45F7E (FCC), 1M23F7E (IC) |
| 2.11. EMC Modifications: | None |

3. Product Configuration

3.1. Cables

| Cable Type | Length | Shield | From | To |
|------------|--------|--------|------|--------------------------|
| Ethernet | 2 M | No | EUT | Power Dsine POE Injector |

3.2. EUT Hardware

| Manufacturer | Model/Part # / Options | Serial Number | Input Voltage | Frq (Hz) | Description/Function |
|--------------|------------------------|---------------|---------------|----------|-----------------------------------|
| David Clark | U9120-W4 | None | 48.0 V | DC | Digital Intercom Wireless Gateway |

Test Number: 521-15

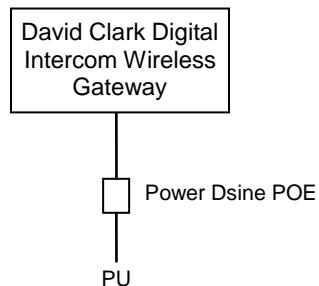
Issue Date: 1/10/2016

3. Product Configuration (continued)

3.3. Support Equipment

| Device | Manufacturer | Model | Serial No. | Comment |
|--------------|--------------|-------|--------------------|--|
| POE Injector | Power Dsine | 3001G | R01756080008543100 | Used to supply the DUT with +48 volts DC operating voltage |

3.4 EUT Diagram



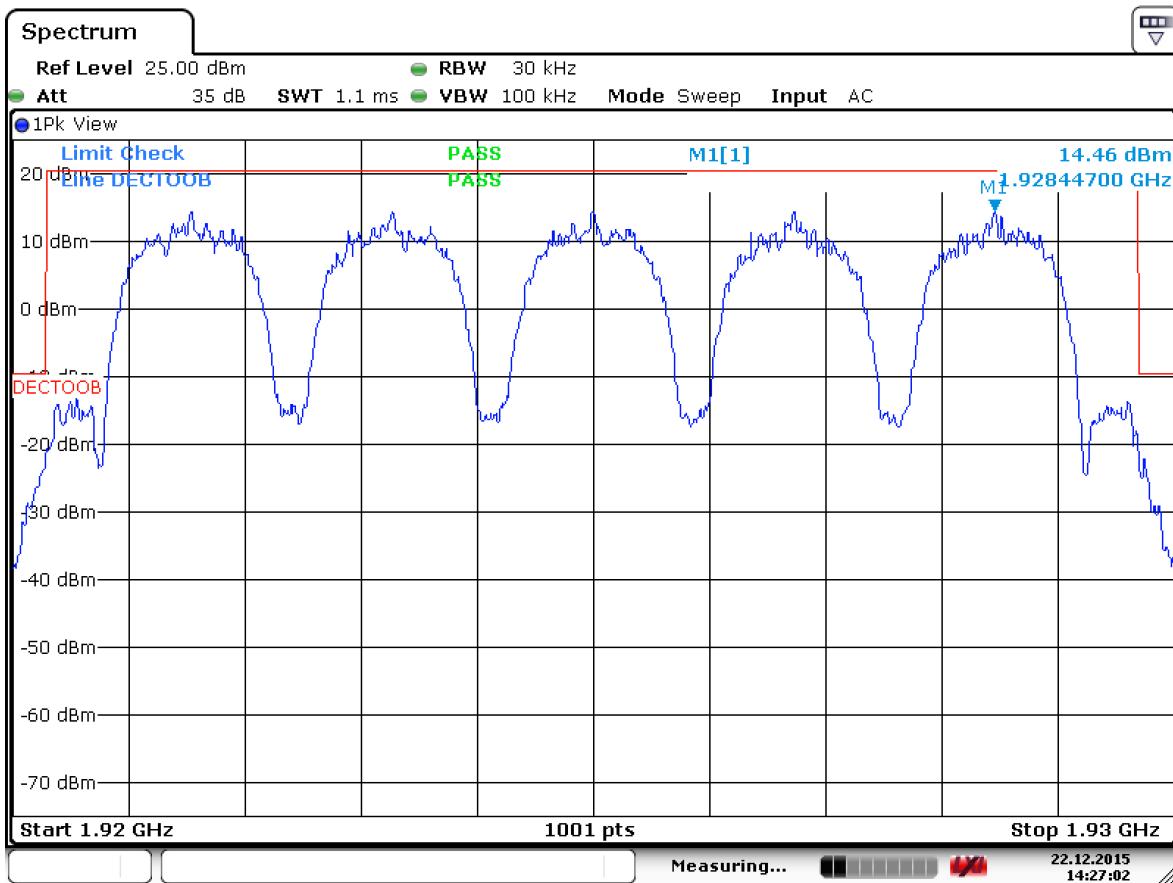
Test Number: 521-15

Issue Date: 1/10/2016

3. Product Configuration (continued)

3.5 EUT Channels & Frequencies

| Channel Plan | Channel | Frequency (MHz) | |
|------------------|---------|-----------------|--|
| Band Edge | | 1930.000 | |
| 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 | |
| Band Edge | | 1920.000 | |



Date: 22.DEC.2015 14:27:02

Test Number: 521-15
Issue Date: 1/10/2016

4. Measurements Parameters

4.1. Measurement Equipment Used to Perform Test

| Device | Manufacturer | Model No | Serial No | Cal Due | Interval |
|---|-------------------------|-----------------|------------------|----------------|-----------------|
| EMI Test Receiver, 9kHz - 7GHz ¹ | Rohde & Schwarz | ESR7 | 101156 | 7/23/2017 | 2 Years |
| Spectrum Analyzer 20 Hz – 40 GHz ² | Rohde & Schwarz | FSV40 | 100899 | 7/23/2017 | 2 Years |
| Spectrum Analyzer, 9 kHz to 40 GHz ³ | Rohde & Schwarz | FSVR40 | 100909 | 7/23/2017 | 2 Years |
| EMI Receiver, 9 kHz to 6.5 GHz | Hewlett Packard | 8546A | 3650A00360 | 6/4/2016 | 2 Years |
| Loop Antenna, 9 kHz to 30 MHz | EMCO | 6512 | 9309-1139 | 9/23/2016 | 2 Years |
| Biconilog Antenna, 30 MHz to 2 GHz | Sunol Sciences | JB1 | 25509 | 5/15/2016 | 3 Years |
| Horn Antenna, 960 MHz – 18 GHz | Electro-Metrics | RGA-50/60 | 2813 | 7/15/2016 | 2 Years |
| Horn Antenna, 18 GHz – 40 GHz | Com-Power | AH-840 | 3075 | 9/24/2016 | 2 Years |
| Preamplifier, 1 GHz to 26.5 GHz | Hewlett Packard | 8449B | 3008A01323 | 7/21/2017 | 2 Years |
| Horn Antenna 1 to 18 GHz | ETS-Lindgren | 3117 | 00143292 | 1/14/2016 | 3 Years |
| High Pass Filter 2.5 to 20 GHz | Micro-Tronics | HPM50110 | 070 | 2/5/2016 | 1 Year |
| DMM / Temperature | Fluke | 187 | 79690058 | 10/6/2016 | 1 Year |
| Digital Barometer | Control Company | 4195 | ID236 | 10/8/2017 | 2 Years |
| Thermal Chamber | Associated Testing Labs | SLHU-1-CRLC | N/A | CNR | |
| Directional Coupler 1.7 – 26.5 GHz | Narda Microwave | 4227-16 | 03034 | 11/1/2016 | 1 Year |
| Digital Radio Communication Tester | Rohde & Schwarz | CTS65 | 829877/006 | 11/2/2016 | 2 Years |
| RF Signal Generator 100 kHz - 40 GHz | Rohde & Schwarz | SMB 100A | 175352 | 6/3/2016 | 2 Years |
| RF Signal Generator 5 kHz to 6.4 GHz | Rohde & Schwarz | SMIQ06B | 100090 | 7/22/2017 | 2 Years |
| RF Signal Generator 9 kHz to 6 GHz | Rohde & Schwarz | SMBV100A | 257046 | 6/4/2016 | 2 Years |
| Modulation Generator | Rohde & Schwarz | AMIQ04 | 100540 | CBU | |
| DC Source 0-60 Volts, 0-3 Amps | Hewlett Packard | 6296A | 1929A03770 | UWCE | |
| Power Splitter Resistive DC – 4.2 GHz | RF Bay | PSC-2R-42 | 14110124 | 1/14/2016 | 1 Year |
| Power Splitter Resistive DC – 4.2 GHz | RF Bay | PSC-2R-42 | 14110125 | 1/14/2016 | 1 Year |
| Power Splitter Resistive DC – 4.2 GHz | RF Bay | PSC-2R-42 | 14110126 | 1/14/2016 | 1 Year |
| LISN 50 Ω 50 µH, 9 kHz to 30 MHz | EMCO | 3825/2 | 9109-1860 | 7/23/2016 | 1 Year |

¹ ESR7 Firmware revision: V2.26,

Date installed: 8/15/2014

Previous V2.17, installed 6/11/2014.

² FSV40 Firmware revision: V2.30 SP1

Date installed: 10/22/2014

Previous V2.30, installed 7/23/2014.

³ FSVR40 Firmware revision: V2.23,

Date installed: 10/20/2014

Previous V1.63 SP1, installed 8/28/2013.

Test Number: 521-15

Issue Date: 1/10/2016

4. Measurements Parameters (continued)

4.2. Measurement & Equipment Setup

| | |
|---------------------------------------|---|
| Test Date: | 11/5/2015, 11/7/2015, 12/16/2015, 12/22/2015, 12/28/2015, 1/7/2016 |
| Test Engineer: | Larry Stillings |
| Normal Site Temperature (15 – 35 °C): | 21.6 °C |
| Relative Humidity (20 – 75 %RH): | 35 % |
| Frequency Range: | 10 kHz to 19.3 GHz |
| Measurement Distance: | 3 Meters or 1 Meter as necessary 9 kHz – 150 kHz to 30 MHz 120 kHz - 30 MHz to 1000 MHz 1 MHz - Above 1000 MHz |
| EMI Receiver IF Bandwidth: | 30 kHz – 150 kHz to 30 MHz 300 kHz - 30 MHz to 1000 MHz 3 MHz - Above 1000 MHz |
| EMI Receiver Avg Bandwidth: | Peak, Quasi-Peak, EMI Average and RMS Average |
| Detector Function: | |

4.3. Measurement Procedure

Test measurements were made in accordance FCC Parts 15.315, 15.317, 15.319, 15.323 of Subpart D, IC RSS-213 Issue 3, and ANSI C63.17:2013.

The test methods used to generate the data in this test report is in accordance with ANSI C63.17:2013, American National Standard Methods of Measurement of the Electromagnetic and Operational Compatibility of Unlicensed Personal Communications Services (UPCS) Devices.

4.4. Measurement Uncertainty

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

| | |
|--|----------------------|
| RF Frequency (out of band) | ± 1x10 ⁻⁸ |
| Radiated Emission of Transmitter to 20 GHz | ± 4.55 dB |
| Radiated Emission of Receiver | ± 4.55 dB |
| Temperature | ± 0.91° C |
| Humidity | ± 5% |

Test Number: 521-15
Issue Date: 1/10/2016

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 and an external Monopole Antenna with RP SMA |
| Antenna Gain | 15.319 (e) | RSS 213 5.6 | 6.1 | Compliant | -5.84 dBi for ANT0 2.13 dBi for ANT1 |
| Type of Modulation and Access Protocol | 15.319 (b) 15.307 | RSS-213 5.1 | 6.2 | Compliant | Device uses GFSK Digital Modulation |
| Peak Transmit Power | 15.319 (c) | RSS-213 5.6 | 6.3 | Compliant | |
| Emission Bandwidth Occupied Bandwidth | 15.323 (a) | RSS-213 5.5 | 6.4 | Compliant | |
| Spurious Conducted Emissions – Antenna Port | 15.323 (d) 15.319 (g) | RSS-213 5.8 | 6.5 | Compliant | |
| Spurious Radiated Emissions for integral antennas | 15.323 (d) 15.319 (g) 15.209 | RSS-213 5.8 | 6.6 | Compliant | |
| Power Spectral Density | 15.319 (d) | RSS-213 5.7 | 6.7 | Compliant | |
| Conducted Emissions | 15.315 15.207 | RSS-213 5.4 RSS-GEN | 6.8 | Compliant | |
| Frequency Stability | 15.323 (f) | RSS-213 5.3 | 6.9 | Compliant | |
| Transmitter Spurious Emissions | 15.323 (d) 15.209 | RSS-213 6.7 | 6.10 | Compliant | |
| Specific Requirements for UPCS | 15.323 (c) 15.323 (e) | RSS-213 5.2 | 6.11 | Compliant | |
| Radio Frequency Exposure | 15.319 (i) 1.1307 (b) FCC OET Bulletin 65 | RSS-GEN 3.2 RSS-102 | 6.12 | Compliant | |

Test Number: 521-15

Issue Date: 1/10/2016

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 a PCB antenna and an external monopole antenna for antenna diversity.

6.1.1 Antenna Gain (15.319 (e), RSS-213 Section 5.6)

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: Compliant, the EUT uses a PCB Mount antenna for ANT0 and an external monopole antenna for ANT1 for antenna diversity with a gain of -5.84 dBi for ANT0 and 2.13 dBi for ANT1 as measured and calculated in section 6.3.

6.2 Type of Modulation and Access Protocol (15.319 (b), 15.307, RSS-213 Sect 5.1)

Requirement: Equipment certified under this standard shall use digital modulation. Both asynchronous and isochronous operations are permitted within the 1920 to 1930 MHz Band.

Result: The product uses GFSK digital modulation.

Test Number: 521-15

Issue Date: 1/10/2016

6. Measurement Data

6.3. Peak Transmit Power (15.319 (c), RSS-213 Sec 5.6, 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 = 1447600 Hz, OBW = 1234800 Hz

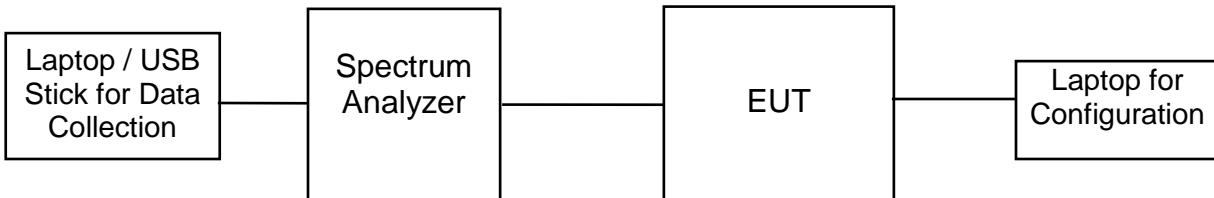
$$P_{max} = 100 \mu W * (EBW)^{\frac{1}{2}} = 100 \mu W * (1447600)^{\frac{1}{2}} = 120.32 \text{ mW} = 20.80 \text{ dBm}$$

$$P_{max} = 100 \mu W * (OBW)^{\frac{1}{2}} = 100 \mu W * (1234800)^{\frac{1}{2}} = 111.12 \text{ mW} = 20.46 \text{ dBm}$$

| ANT0 Channel | Channel Frequency | Peak Power | Requirement | Peak Power |
|-----------------|----------------------|---------------|---------------------------------|---------------|
| | MHz | dBm | FCC = 20.80 dBm, IC = 20.46 dBm | Watts |
| TX4 | 1921.536 | 18.80 | Compliant | 0.076 |
| TX2 | 1924.992 | 18.83 | Compliant | 0.076 |
| TX0 | 1928.448 | 18.82 | Compliant | 0.076 |

| ANT1 Channel | Channel Frequency | Peak Power | Requirement | Peak Power |
|-----------------|----------------------|---------------|---------------------------------|---------------|
| | MHz | dBm | FCC = 20.80 dBm, IC = 20.46 dBm | Watts |
| TX4 | 1921.536 | 18.30 | Compliant | 0.068 |
| TX2 | 1924.992 | 18.35 | Compliant | 0.068 |
| TX0 | 1928.448 | 18.37 | Compliant | 0.069 |

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 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.



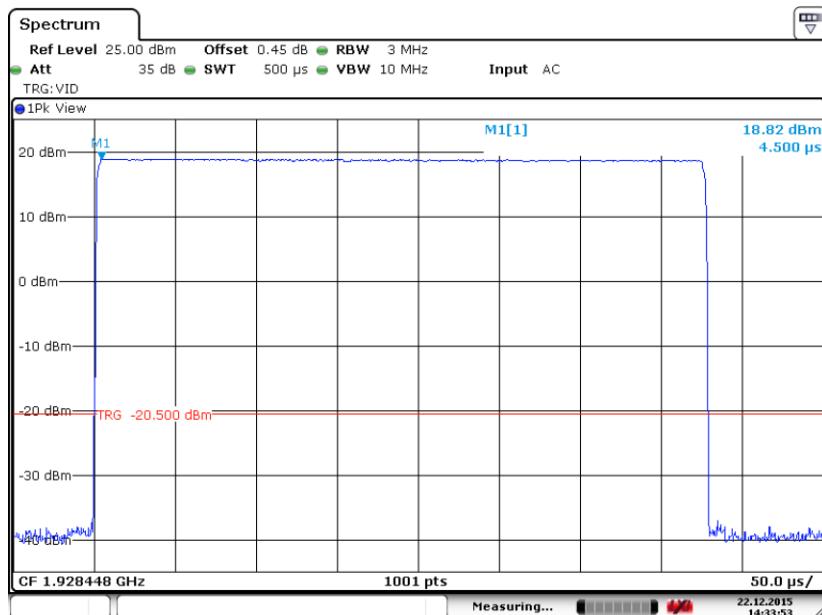
Test Number: 521-15

Issue Date: 1/10/2016

6. Measurement Data

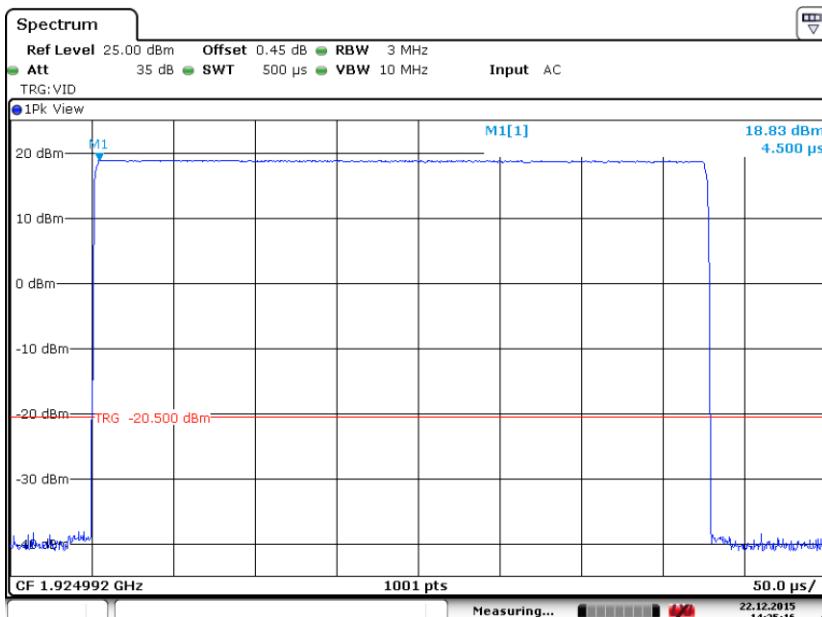
6.3. Peak Transmit Power (15.319 (c), RSS-213 Sec 5.6, ANSI C63.17 Sec 6.1.2)

Channel 0 – ANT0



Date: 22.DEC.2015 14:33:53

Channel 2 – ANT0



Date: 22.DEC.2015 14:35:17

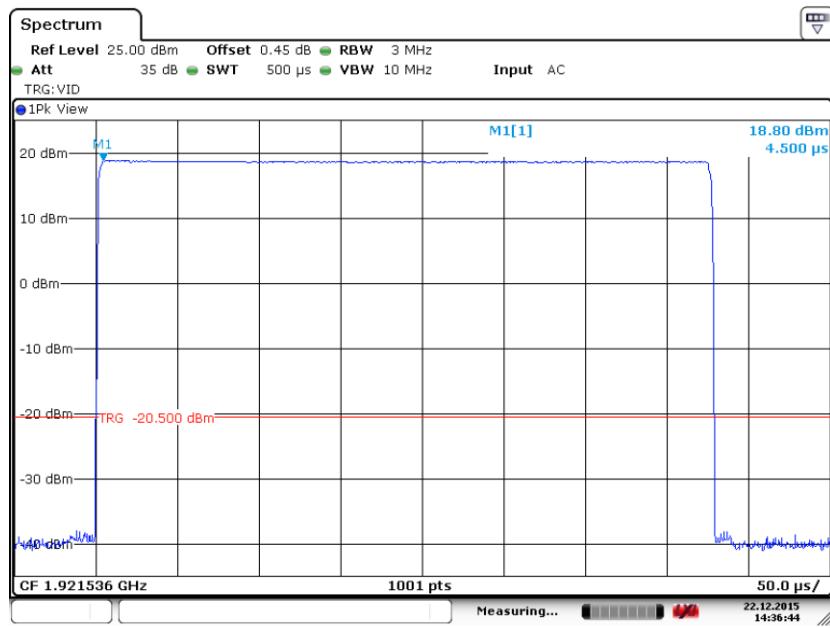
Test Number: 521-15

Issue Date: 1/10/2016

6. Measurement Data

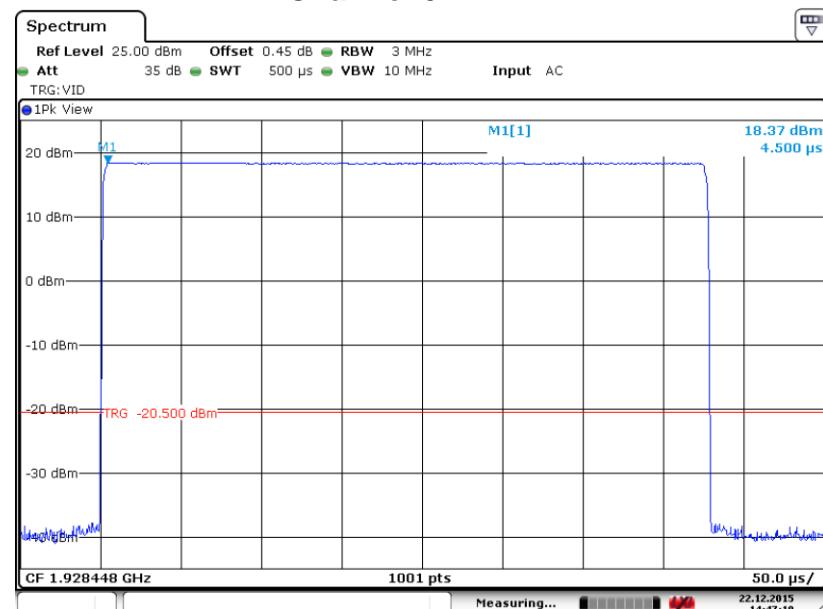
6.3. Peak Transmit Power (15.319 (c), RSS-213 Sec 5.6, ANSI C63.17 Sec 6.1.2)

Channel 4 – ANT0



Date: 22.DEC.2015 14:36:45

Channel 0 – ANT1



Date: 22.DEC.2015 14:47:10

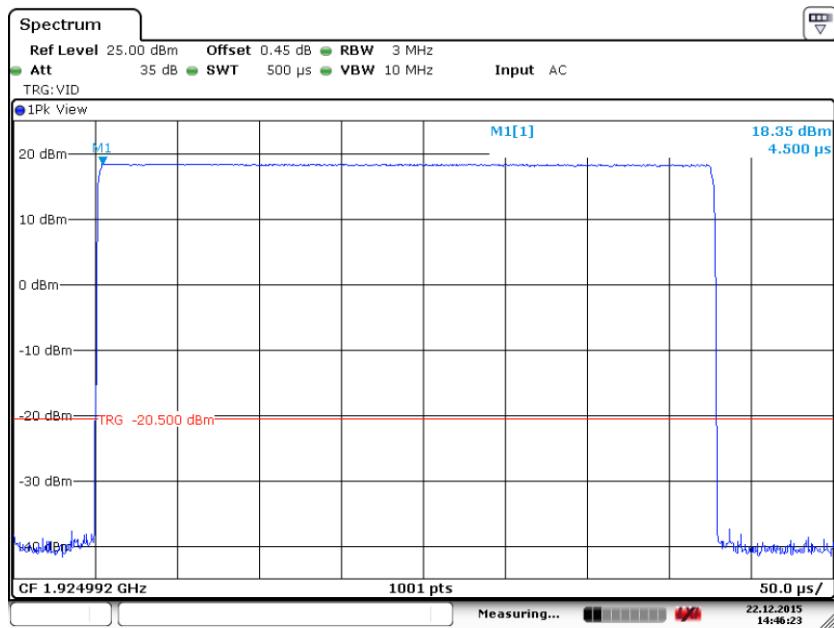
Test Number: 521-15

Issue Date: 1/10/2016

6. Measurement Data

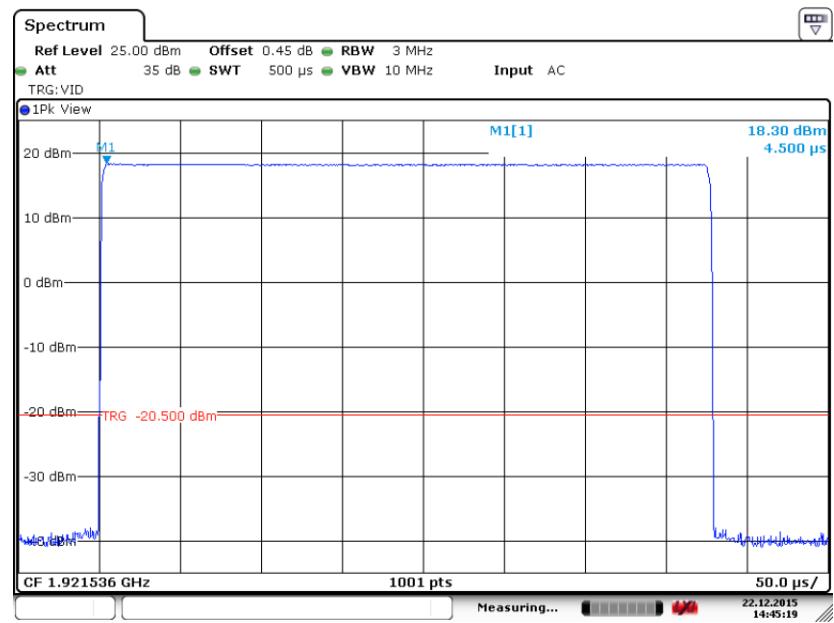
6.3. Peak Transmit Power (15.319 (c), RSS-213 Sec 5.6, ANSI C63.17 Sec 6.1.2)

Channel 2 – ANT1



Date: 22.DEC.2015 14:46:23

Channel 4 – ANT1



Date: 22.DEC.2015 14:45:19

Test Number: 521-15
Issue Date: 1/10/2016

6. Measurement Data

6.3. Peak Transmit Power (15.319 (c)), RSS-213 Sec 5.6 (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 dB μ V/m conversion was used to determine Radiated Peak Power in dBm.

Result: Peak Field Strength is $20.50 + 95.2 = 115.70$ dB μ V/m at 3 Meters

| Radiated Test for Integral Antennas | | | | | |
|-------------------------------------|----------------------|----------------------------|------------------------|-----------------|-----------|
| ANT0 Channel | Channel Frequency | Conducted Peak Power | Radiated Peak Power | Antenna Gain | Result |
| | MHz | dBm | dBm | dBi | |
| TX4 | 1921.536 | 18.80 | 11.76 | -7.04 | Compliant |
| TX2 | 1924.992 | 18.83 | 12.32 | -6.51 | Compliant |
| TX0 | 1928.448 | 18.82 | 12.98 | -5.84 | Compliant |

| Radiated Test for Integral Antennas | | | | | |
|-------------------------------------|----------------------|----------------------------|------------------------|-----------------|-----------|
| ANT1 Channel | Channel Frequency | Conducted Peak Power | Radiated Peak Power | Antenna Gain | Result |
| | MHz | dBm | dBm | dBi | |
| TX4 | 1921.536 | 18.30 | 19.51 | 1.21 | Compliant |
| TX2 | 1924.992 | 18.35 | 20.37 | 2.02 | Compliant |
| TX0 | 1928.448 | 18.37 | 20.50 | 2.13 | Compliant |

Test Number: 521-15

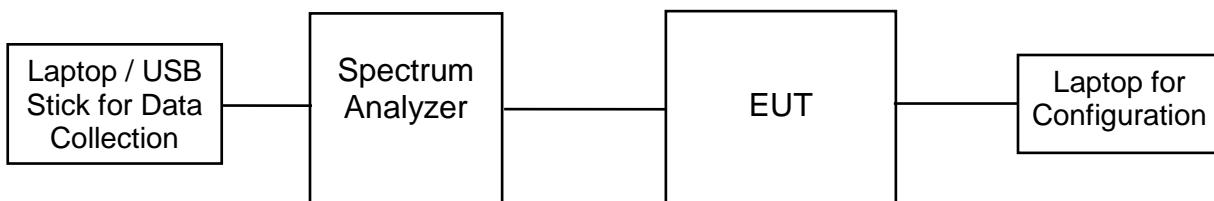
Issue Date: 1/10/2016

6. Measurement Data

6.4. Emission Bandwidth (15.323 (a), RSS-213 Section 5.5, ANSI C63.17 Sec 6.1.3)

Requirement: Operation shall be contained within the 1920–1930 MHz band. The emission bandwidth shall be less than 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)

| ANT0 Channel | Channel Frequency | Emission Bandwidth | Requirement |
|--------------|-------------------|--------------------|------------------------|
| | MHz | MHz | 50 kHz < EBW < 2.5 MHz |
| TX4 | 1921.536 | 1.4416 | Compliant |
| TX2 | 1924.992 | 1.4236 | Compliant |
| TX0 | 1928.448 | 1.4416 | Compliant |

| ANT1 Channel | Channel Frequency | Emission Bandwidth | Requirement |
|--------------|-------------------|--------------------|------------------------|
| | MHz | MHz | 50 kHz < EBW < 2.5 MHz |
| TX4 | 1921.536 | 1.4476 | Compliant |
| TX2 | 1924.992 | 1.4386 | Compliant |
| TX0 | 1928.448 | 1.4356 | Compliant |

Test Number: 521-15

Issue Date: 1/10/2016

6. Measurement Data

6.4. Emission Bandwidth (15.323 (a), RSS-213 Sec 5.5, ANSI C63.17 Sec 6.1.3) cont

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

| ANT0 Channel | Channel Frequency | Occupied Bandwidth | Requirement |
|-----------------|----------------------|-----------------------|------------------------|
| | MHz | MHz | 50 kHz < OBW < 2.5 MHz |
| TX4 | 1921.536 | 1.2288 | Compliant |
| TX2 | 1924.992 | 1.2228 | Compliant |
| TX0 | 1928.448 | 1.2288 | Compliant |

| ANT1 Channel | Channel Frequency | Occupied Bandwidth | Requirement |
|-----------------|----------------------|-----------------------|------------------------|
| | MHz | MHz | 50 kHz < OBW < 2.5 MHz |
| TX4 | 1921.536 | 1.2198 | Compliant |
| TX2 | 1924.992 | 1.2348 | Compliant |
| TX0 | 1928.448 | 1.2258 | Compliant |

Note: Please see the next pages for plots of measurements

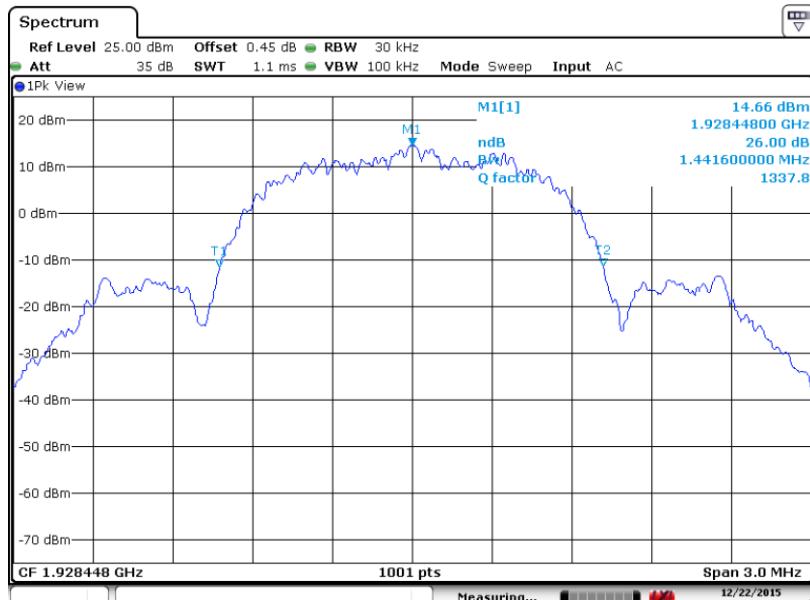
Test Number: 521-15

Issue Date: 1/10/2016

6. Measurement Data (continued)

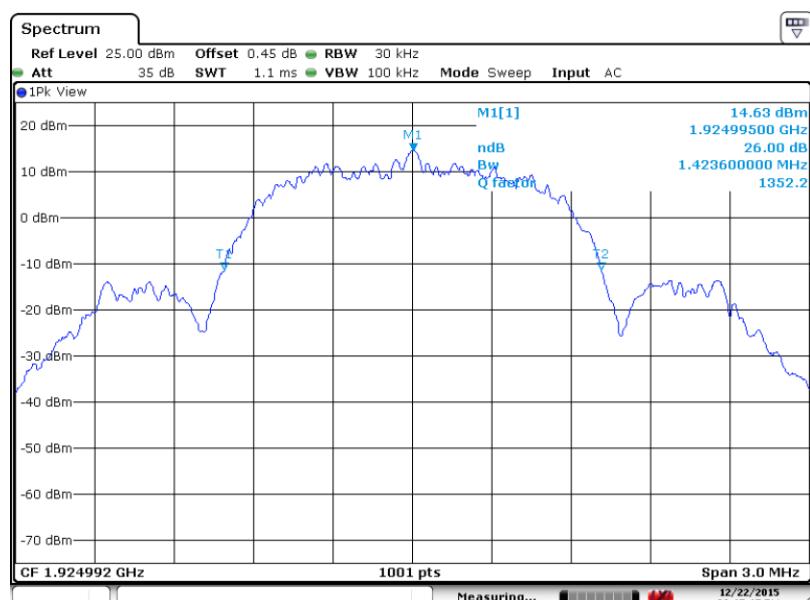
6.4. Emission Bandwidth (15.323 (a), RSS-213 Sec 5.5, ANSI C63.17 Sec 6.1.3) (cont)

6.4.3. Measurement Plot – TX0 – ANT0 – 26 dB BW



Date: 22.DEC.2015 15:15:53

6.4.4. Measurement Plot – TX2 – ANT0 – 26 dB BW



Date: 22.DEC.2015 15:17:18

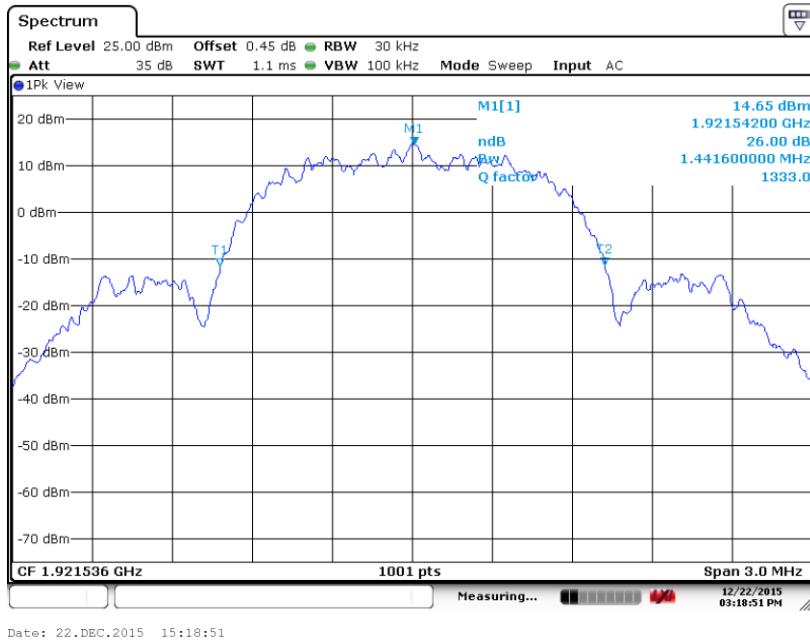
Test Number: 521-15

Issue Date: 1/10/2016

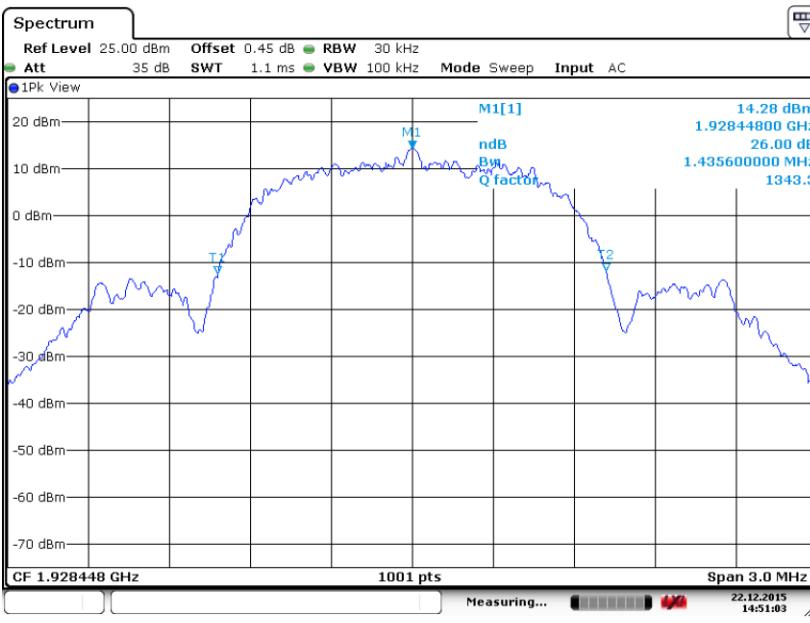
6. Measurement Data (continued)

6.4. Emission Bandwidth (15.323 (a), RSS-213 Sec 5.5, ANSI C63.17 Sec 6.1.3) (cont)

6.4.5. Measurement Plot – TX4- ANT0 – 26 dB BW



6.4.6. Measurement Plot – TX0- ANT1 – 26 dB BW



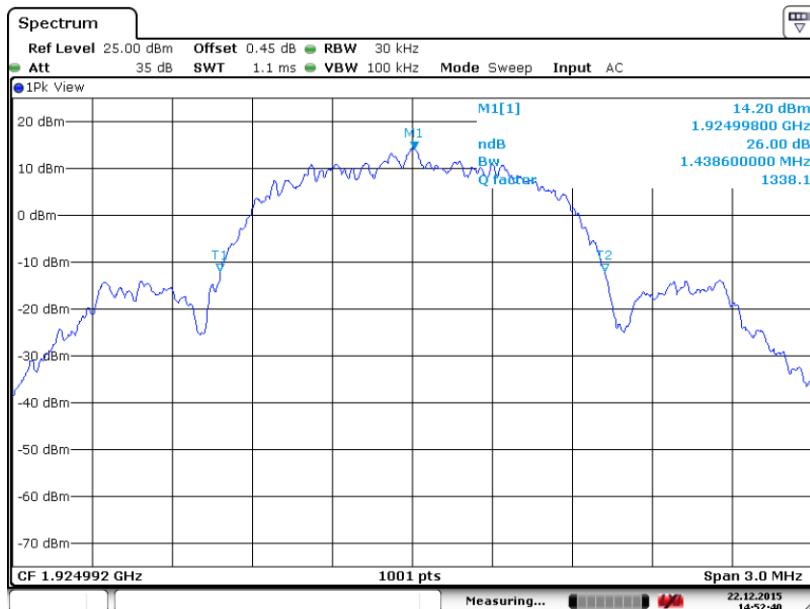
Test Number: 521-15

Issue Date: 1/10/2016

6. Measurement Data (continued)

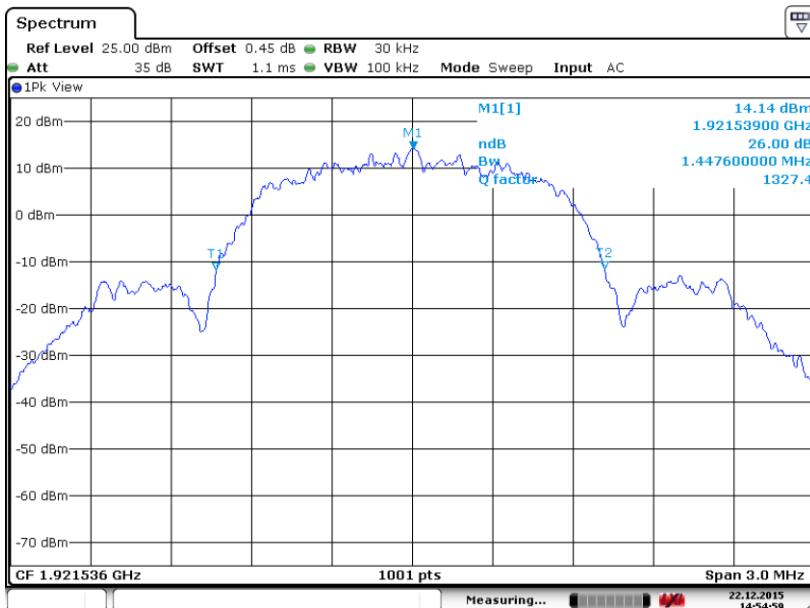
6.4. Emission Bandwidth (15.323 (a), RSS-213 Sec 5.5, ANSI C63.17 Sec 6.1.3) (cont)

6.4.7. Measurement Plot – TX2 - ANT1 – 26 dB BW



Date: 22.DEC.2015 14:52:40

6.4.8. Measurement Plot – TX4 - ANT1 – 26 dB BW



Date: 22.DEC.2015 14:55:00

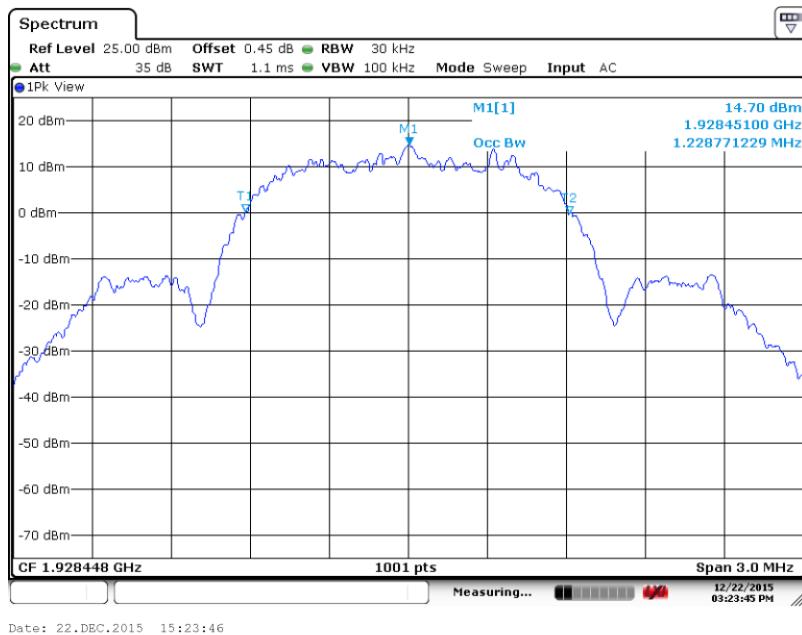
Test Number: 521-15

Issue Date: 1/10/2016

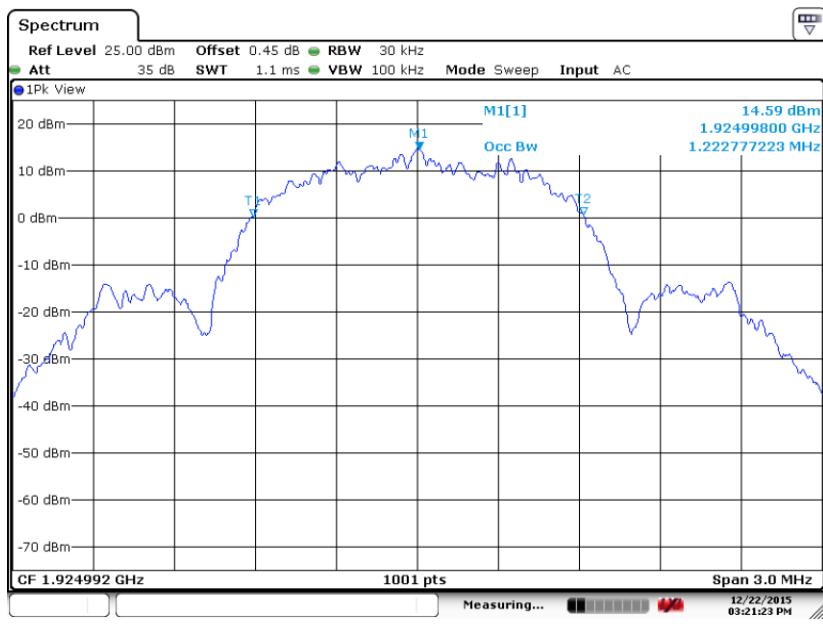
6. Measurement Data (continued)

6.4. Emission Bandwidth (15.323 (a), RSS-213 Sec 5.5, ANSI C63.17 Sec 6.1.3) (cont)

6.4.9. Measurement Plot – TX0 – ANT0 – OCC BW



6.4.10. Measurement Plot – TX2 – ANT0 – OCC BW



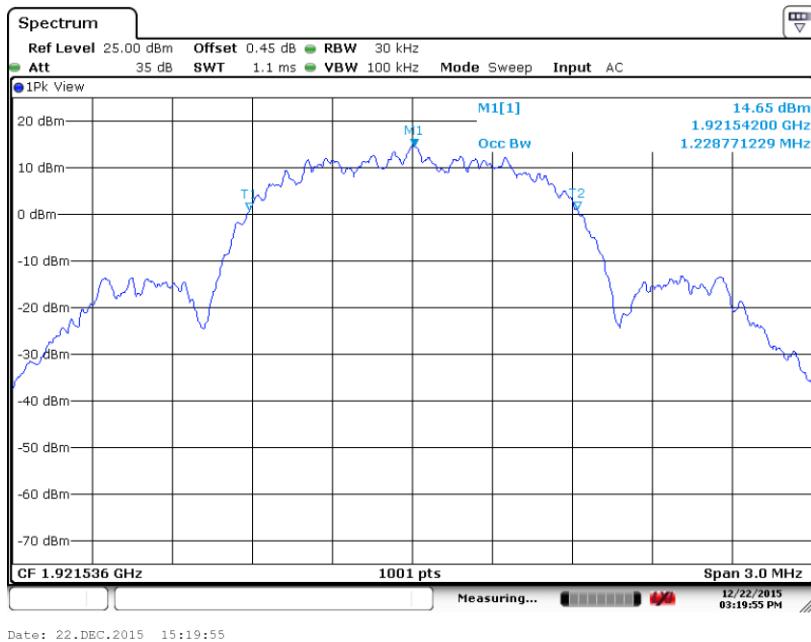
Test Number: 521-15

Issue Date: 1/10/2016

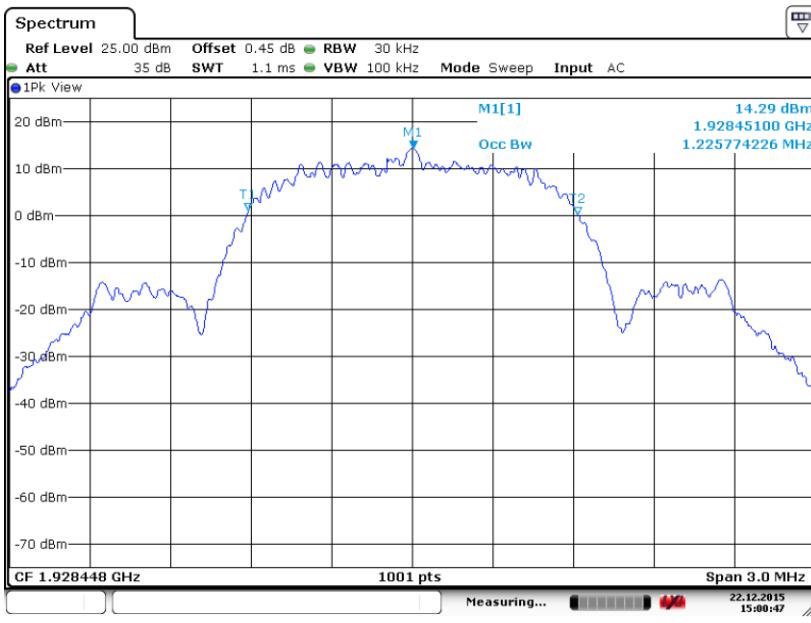
6. Measurement Data (continued)

6.4. Emission Bandwidth (15.323 (a), RSS-213 Sec 5.5, ANSI C63.17 Sec 6.1.3) (cont)

6.4.11. Measurement Plot – TX4- ANT0 – OCC BW



6.4.12. Measurement Plot – TX0- ANT1 – OCC BW



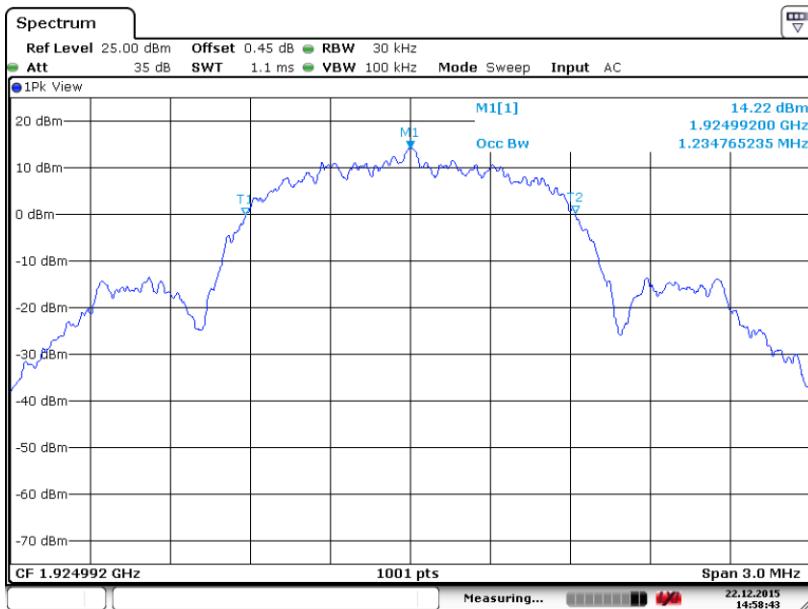
Test Number: 521-15

Issue Date: 1/10/2016

6. Measurement Data (continued)

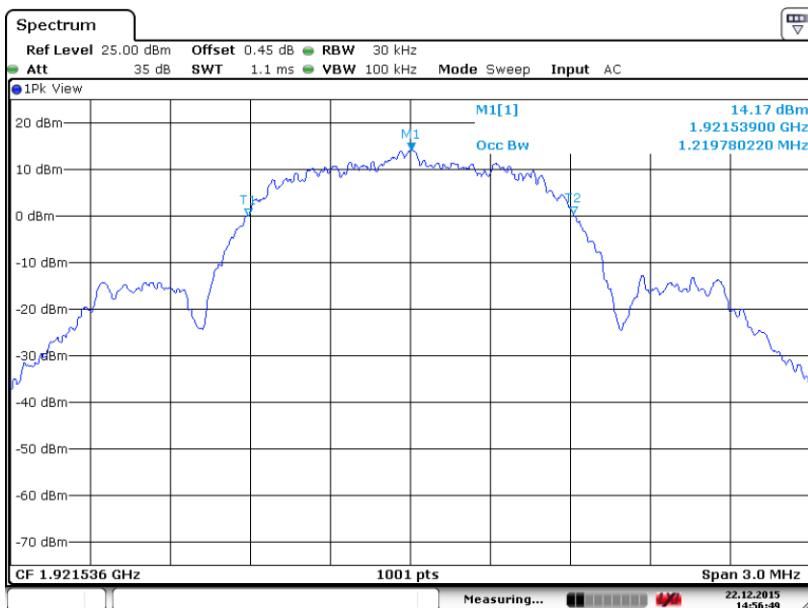
6.4. Emission Bandwidth (15.323 (a), RSS-213 Sec 5.5, ANSI C63.17 Sec 6.1.3) (cont)

6.4.13. Measurement Plot – TX2 - ANT1 – OCC BW



Date: 22.DEC.2015 14:58:43

6.4.14. Measurement Plot – TX4 - ANT1 – OCC BW



Date: 22.DEC.2015 14:56:50

Test Number: 521-15

Issue Date: 1/10/2016

6. Measurement Data (continued)

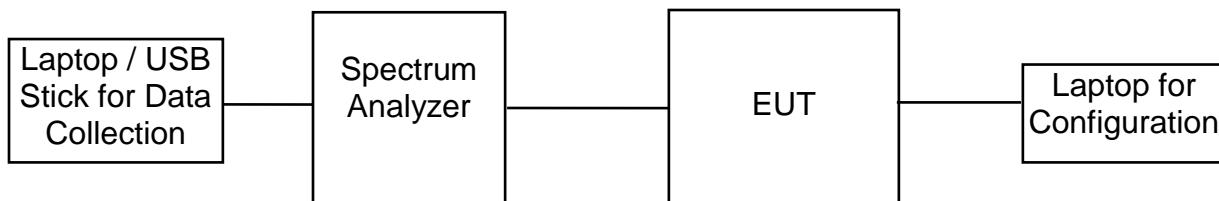
6.5 Spurious Emissions at the antenna terminals (15.323 (d), RSS-213 5.8.2,

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 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.



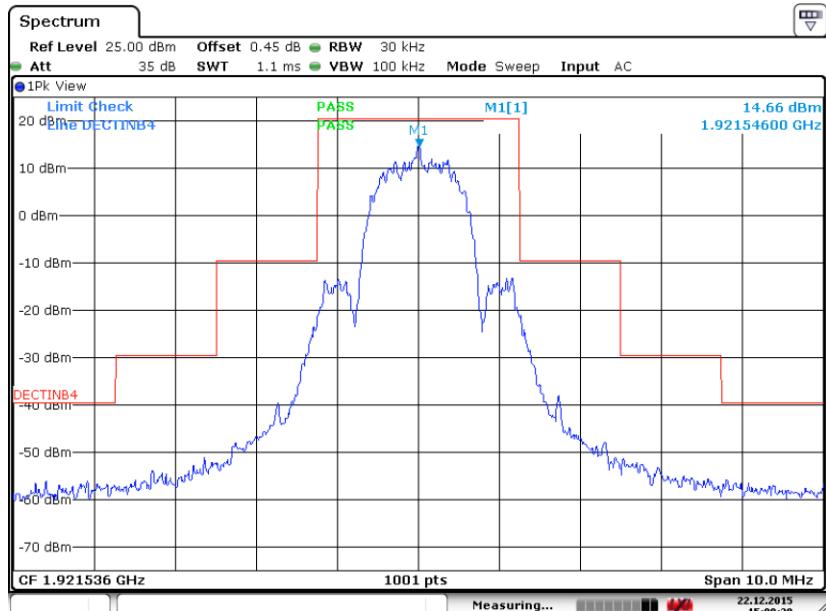
Test Number: 521-15

Issue Date: 1/10/2016

6. Measurement Data (continued)

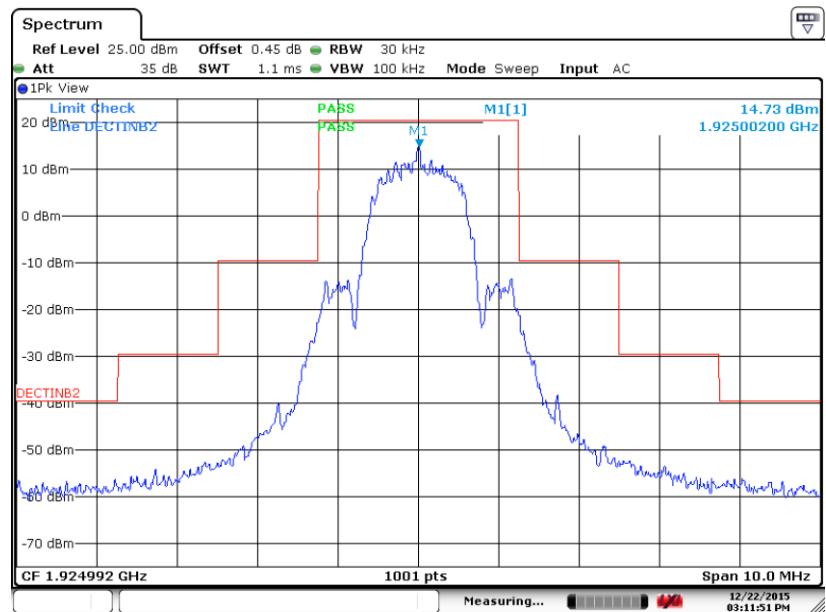
6.5 Spurious Emissions at the antenna terminals (15.323 (d), RSS-213 5.8.2) (cont)

6.5.1 Low Channel – In Band – ANT0



Date: 22.DEC.2015 15:09:40

6.5.2 Mid Channel – In Band – ANT0



Date: 22.DEC.2015 15:11:52

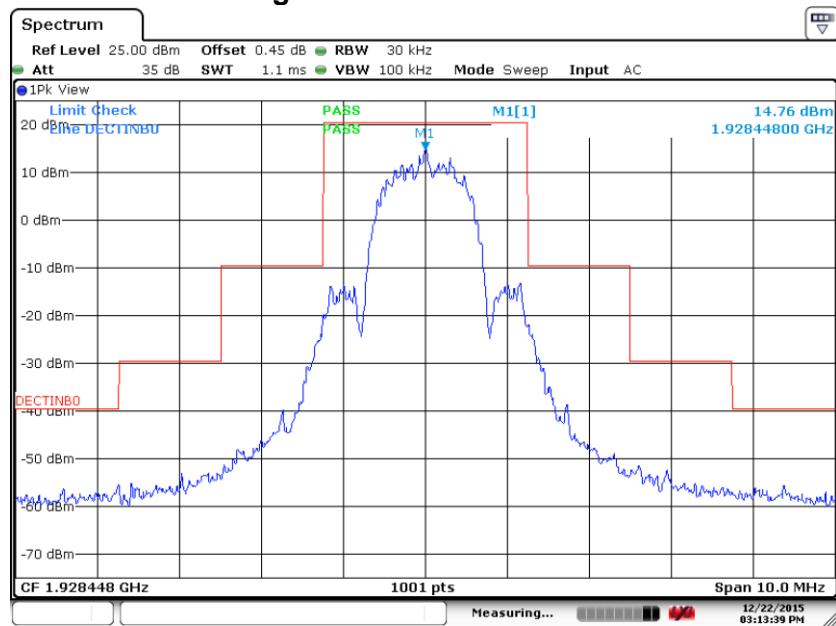
Test Number: 521-15

Issue Date: 1/10/2016

6. Measurement Data (continued)

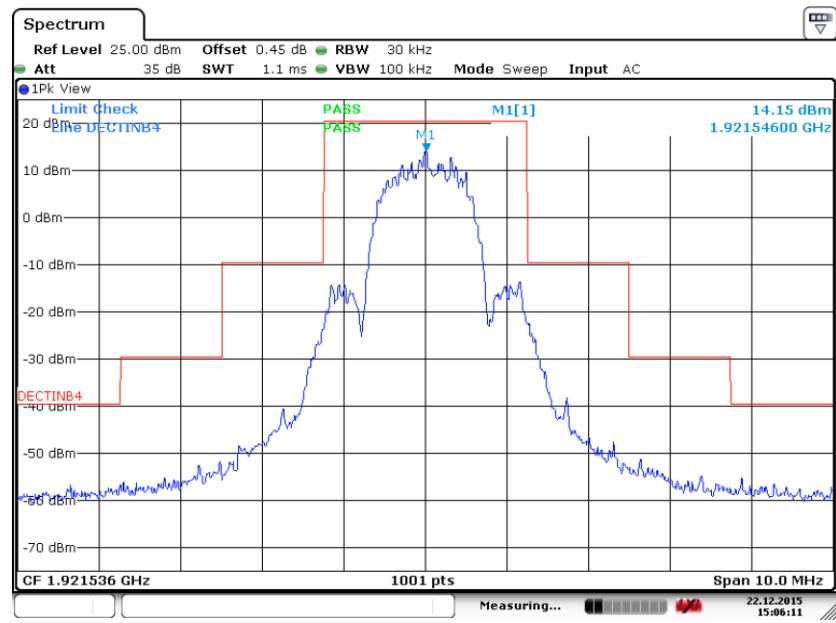
6.5 Spurious Emissions at the antenna terminals (15.323 (d), RSS-213 5.8.2) (cont)

6.5.3 High Channel – In Band – ANT0



Date: 22.DEC.2015 15:13:40

6.5.4 Low Channel – In Band – ANT1



Date: 22.DEC.2015 15:06:12

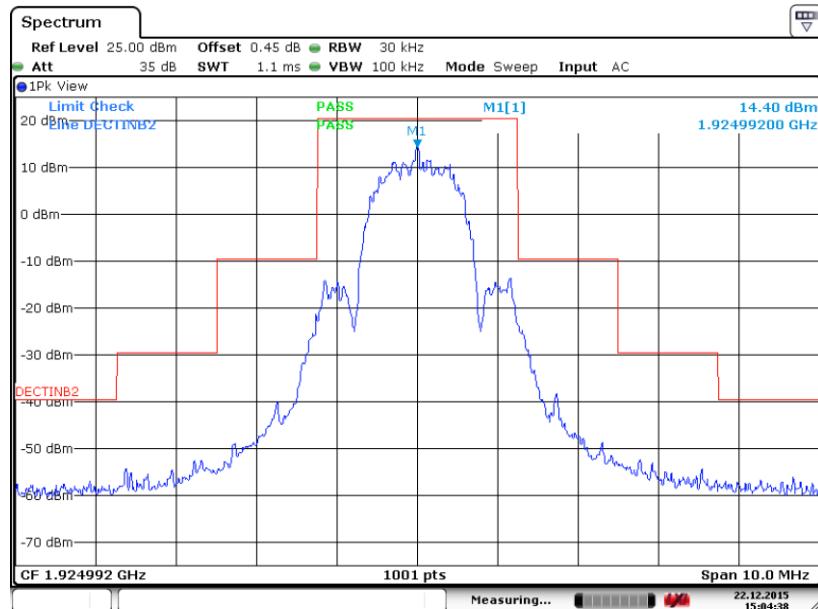
Test Number: 521-15

Issue Date: 1/10/2016

6. Measurement Data (continued)

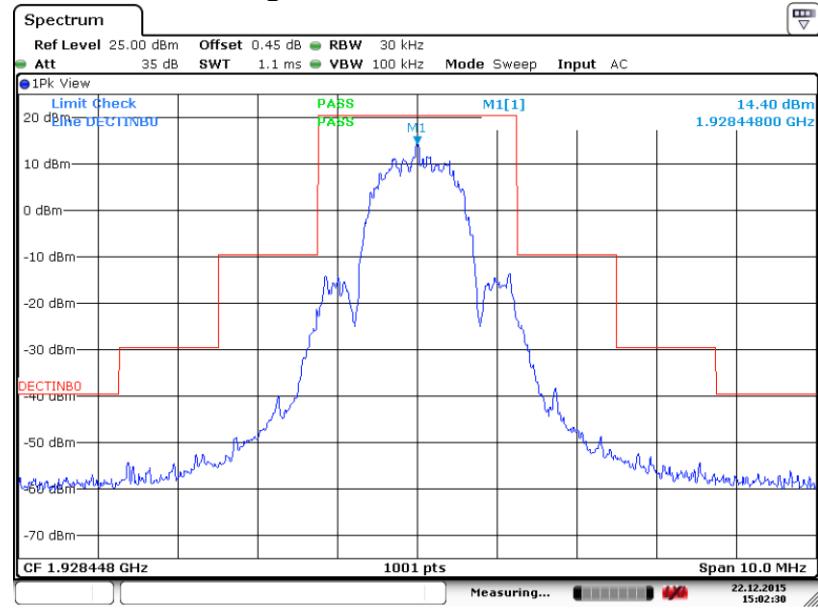
6.5 Spurious Emissions at the antenna terminals (15.323 (d), RSS-213 5.8.2) (cont)

6.5.5 Mid Channel – In Band – ANT1



Date: 22.DEC.2015 15:04:38

6.5.6 High Channel – In Band – ANT1



Date: 22.DEC.2015 15:02:31

Test Number: 521-15

Issue Date: 1/10/2016

6. Measurement Data (continued)

6.5 Spurious Emissions at the antenna terminals (15.323 (d), RSS-213 5.8.1) (cont)

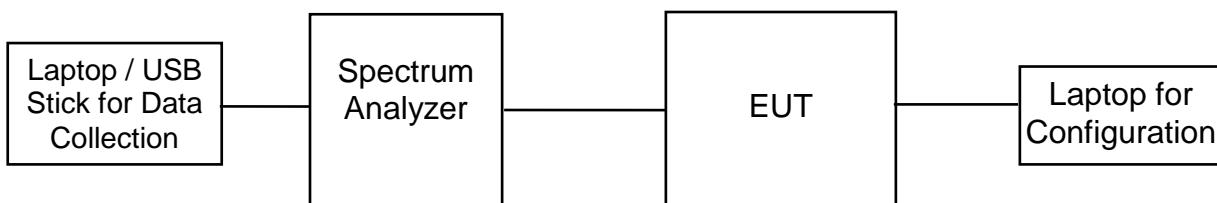
Requirement: Emissions outside the sub-band shall be attenuated below a reference power of 112 milliwatts as follows: 30 dB between the sub-band and 1.25 MHz above or below the sub-band; 50 dB between 1.25 and 2.5 MHz above or below the sub-band; and 60 dB at 2.5 MHz or greater above or below the sub-band.

Per ANSI C63.17-2013 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.

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 the range of 30 MHz to 19.3 GHz, zooming in on the bandedges. 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 data associated with the device.



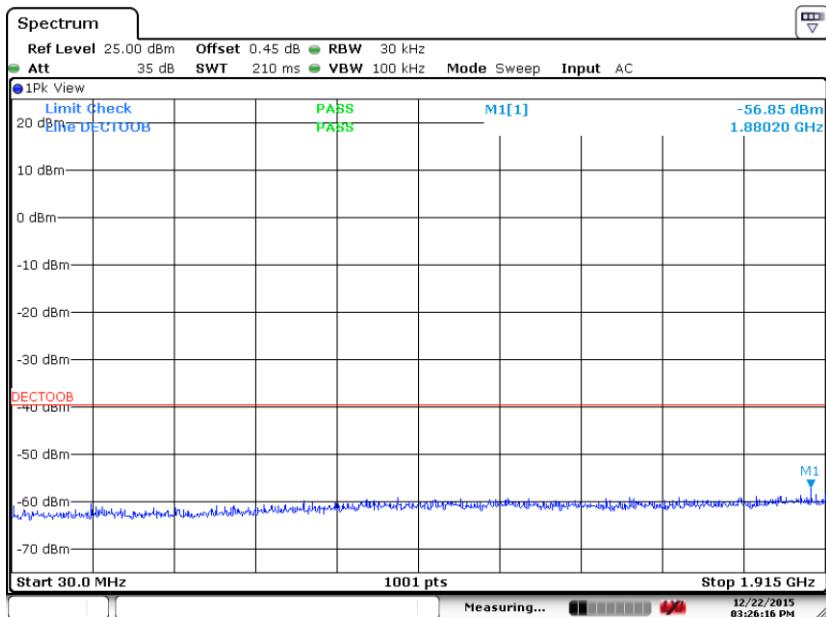
Test Number: 521-15

Issue Date: 1/10/2016

6. Measurement Data (continued)

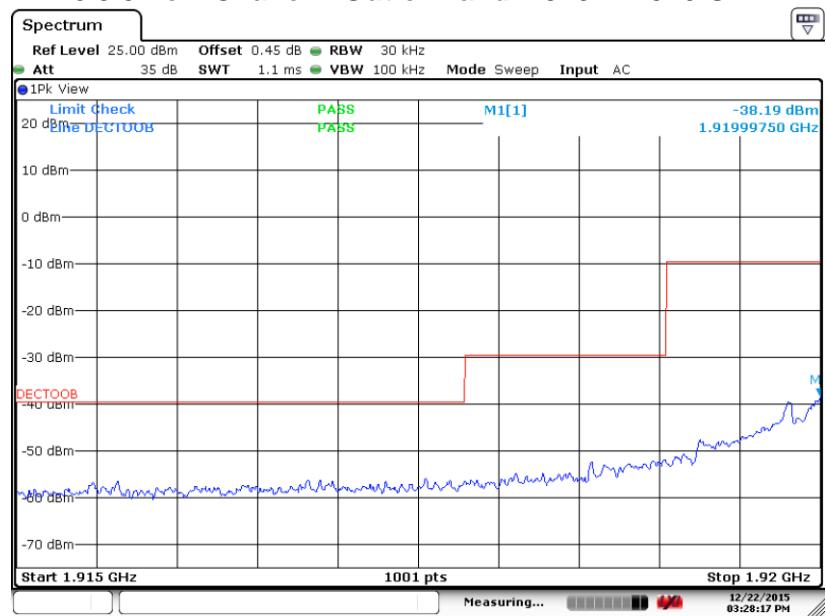
6.5 Spurious Emissions at the antenna terminals (15.323 (d), RSS-213 5.8.1) (cont)

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



Date: 22.DEC.2015 15:26:17

6.5.5 Low Chanel – Out of Band 1.915 – 1.920 GHz



Date: 22.DEC.2015 15:28:18

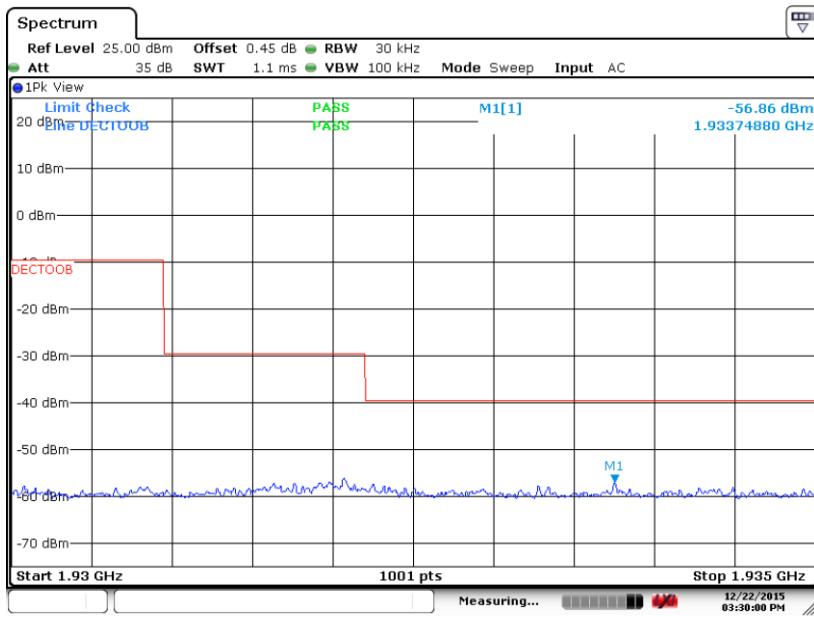
Test Number: 521-15

Issue Date: 1/10/2016

6. Measurement Data (continued)

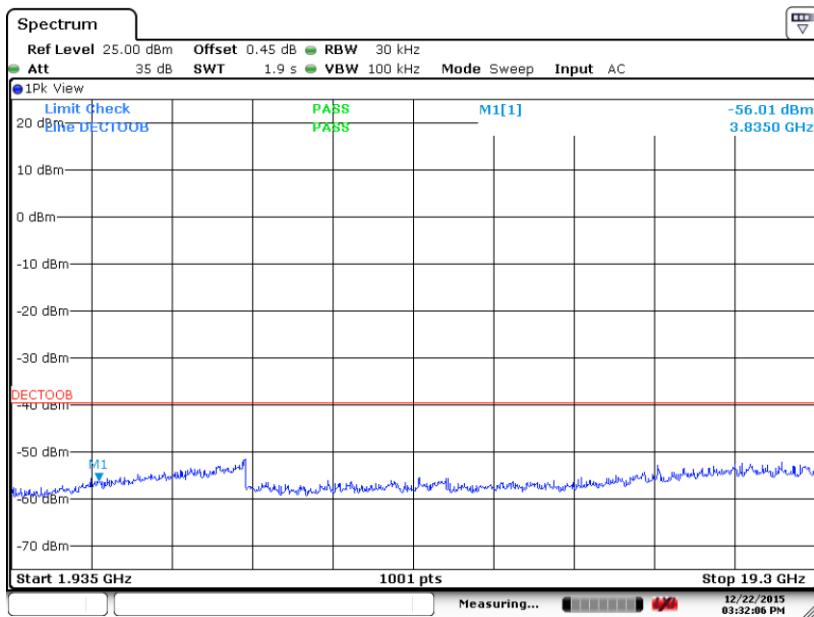
6.5 Spurious Emissions at the antenna terminals (15.323 (d), RSS-213 5.8.1) (cont)

6.5.6 Low Channel Out of Band 1.930 – 1.935 GHz



Date: 22.DEC.2015 15:30:00

6.5.7 Low Channel Out of Band 1.935 – 19.3 GHz



Date: 22.DEC.2015 15:32:06

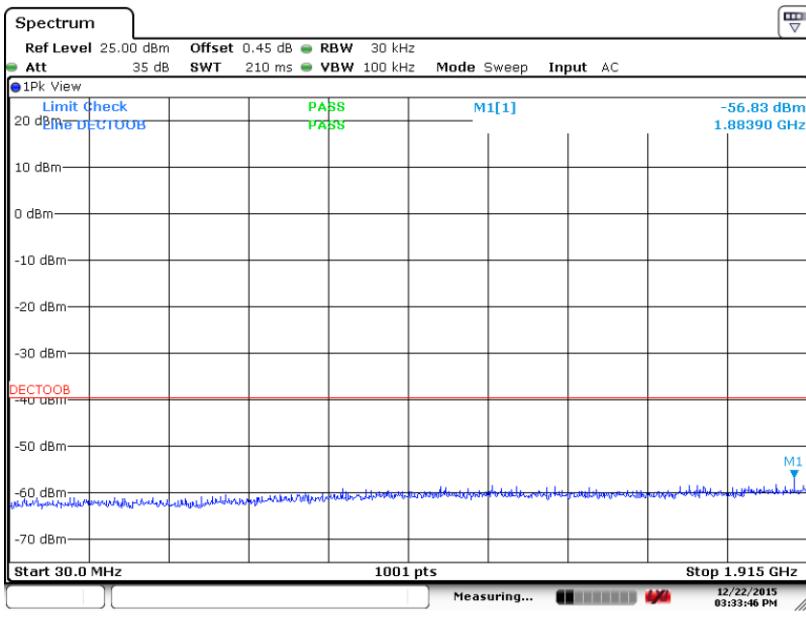
Test Number: 521-15

Issue Date: 1/10/2016

6. Measurement Data (continued)

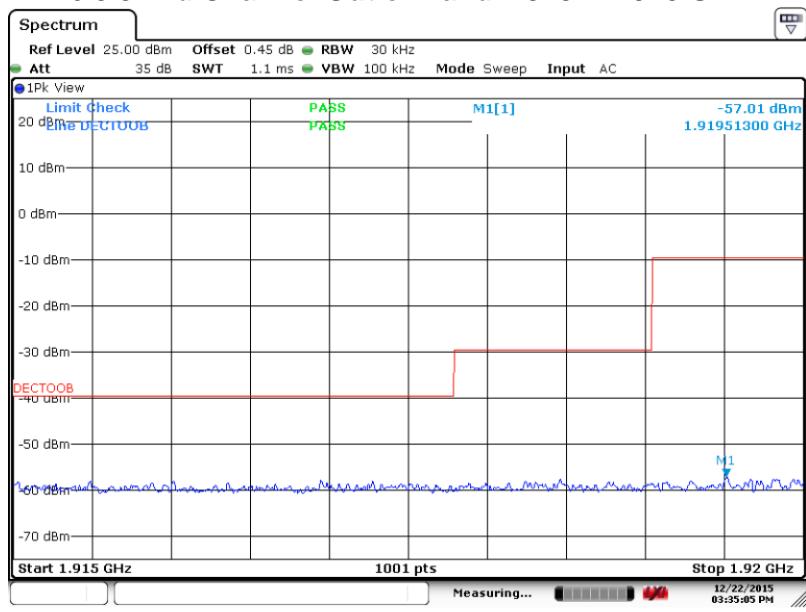
6.5 Spurious Emissions at the antenna terminals (15.323 (d), RSS-213 5.8.1) (cont)

6.5.8 Mid Channel Out of Band 30 MHz – 1.915 GHz



Date: 22.DEC.2015 15:33:47

6.5.9 Mid Channel Out of Band 1.915 – 1.920 GHz



Date: 22.DEC.2015 15:35:05

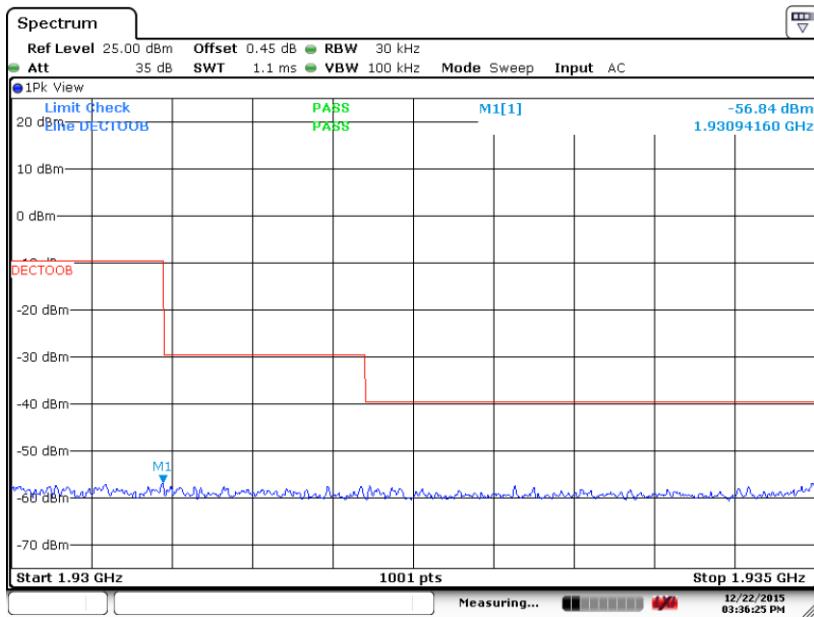
Test Number: 521-15

Issue Date: 1/10/2016

6. Measurement Data (continued)

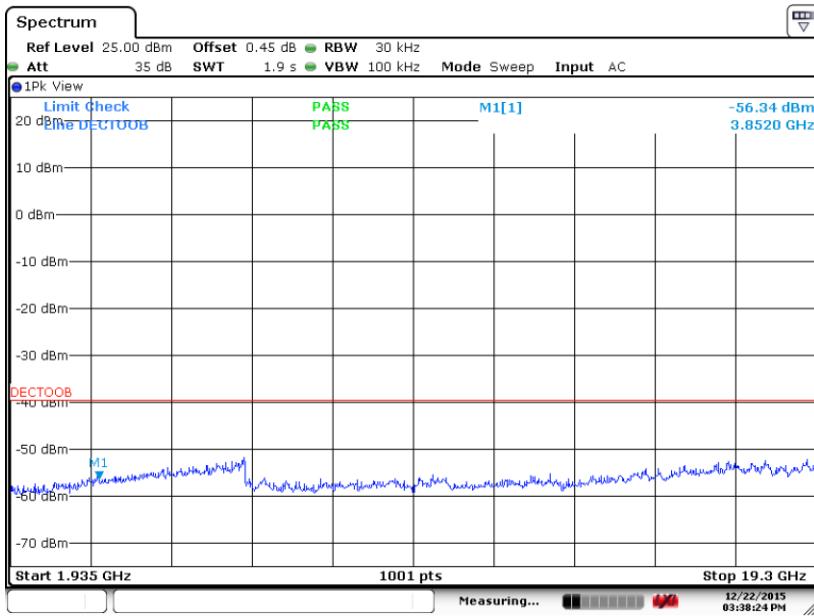
6.5 Spurious Emissions at the antenna terminals (15.323 (d), RSS-213 5.8.1) (cont)

6.5.10 Mid Channel Out of Band 1.930 – 1.935 GHz



Date: 22.DEC.2015 15:36:25

6.5.11 Mid Channel Out of Band 1.935 – 19.3 GHz



Date: 22.DEC.2015 15:38:23

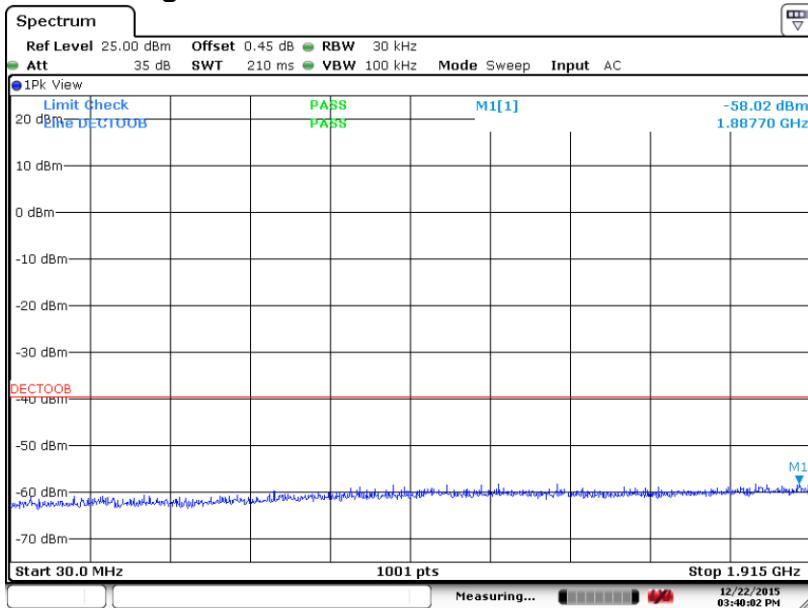
Test Number: 521-15

Issue Date: 1/10/2016

6. Measurement Data (continued)

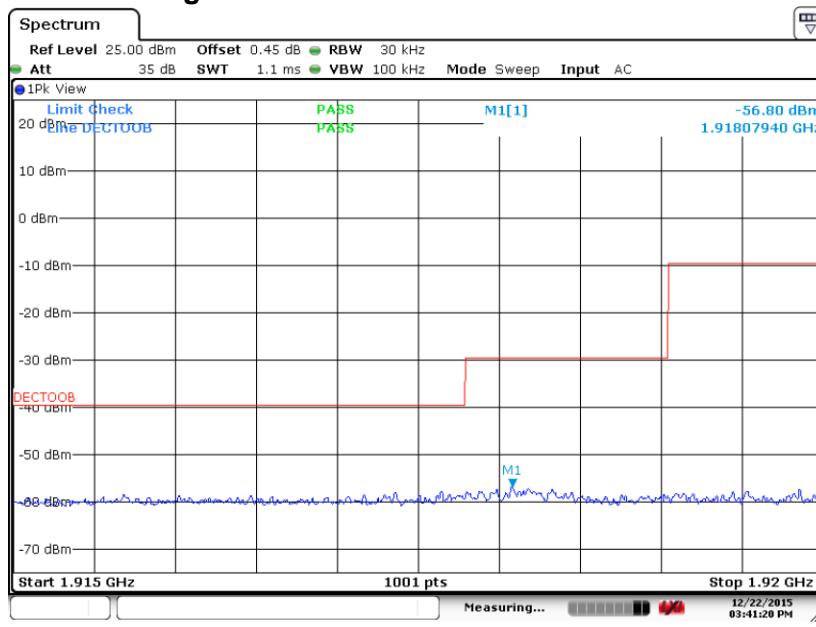
6.5 Spurious Emissions at the antenna terminals (15.323 (d), RSS-213 5.8.1) (cont)

6.5.12 High Channel Out of Band 30 MHz – 1.915 GHz



Date: 22.DEC.2015 15:40:03

6.5.13 High Channel Out of Band 1.915 – 1.920 GHz



Date: 22.DEC.2015 15:41:20

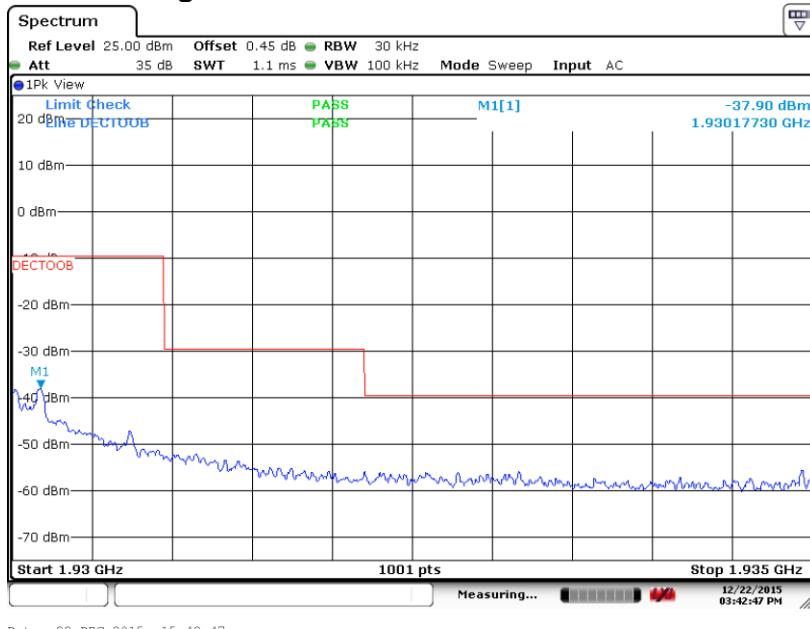
Test Number: 521-15

Issue Date: 1/10/2016

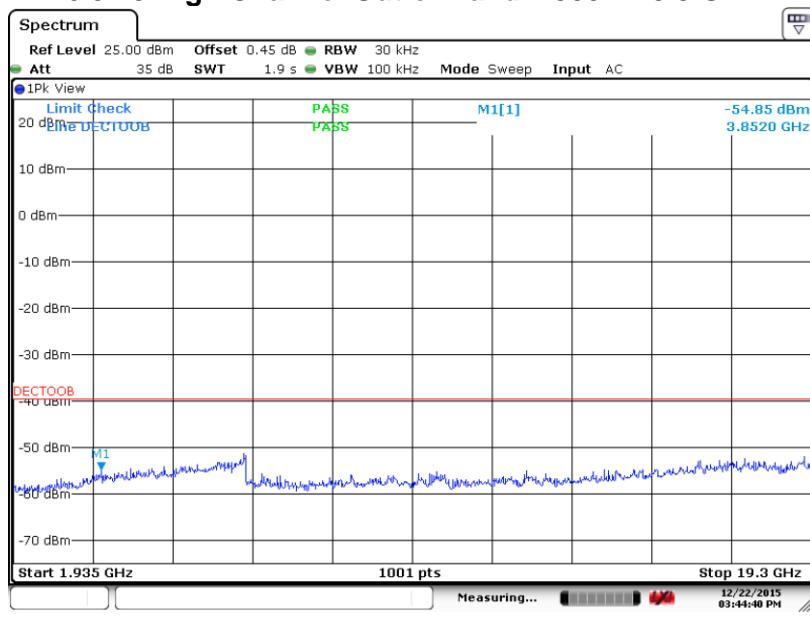
6. Measurement Data (continued)

6.5 Spurious Emissions at the antenna terminals (15.323 (d), RSS-213 5.8.1) (cont)

6.5.14 High Channel Out of Band 1.930 – 1.935 GHz



6.5.15 High Channel Out of Band 1.935 – 19.3 GHz



Test Number: 521-15
Issue Date: 1/10/2016

6. Measurement Data

6.6. Radiated Spurious Emissions (Harmonics)

Regulatory Limit: FCC Part 15.323(d), 15.209, IC RSS-213 5.8, RSS-GEN

| Frequency Range (GHz) | Limits (dB μ V/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 GHz | EMCO | 3117 | 00143292 | 1/14/2016 | 3 Years |
| Horn Antenna 18-40 GHz | Com Power | AH-840 | 03075 | 9/24/2016 | 2 Years |
| Spectrum Analyzer | Rohde & Schwarz | FSV40 | 100899 | 7/23/2017 | 2 Years |
| Preamplifier, 1 to 26.5 GHz | Hewlett Packard | 8449B | 3008A01323 | 7/21/2017 | 2 Years |
| 2.5 GHz HP Filter | Micro-Tronics | HPM50110 | 070 | 2/5/2016 | 1 Year |
| 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: | November 5, 2015 |
| Test Engineer: | Larry Stillings |
| Site Temperature (°C): | 21.6 |
| Relative Humidity (%RH): | 35 |
| Frequency Range: | 1.0 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 C63.4-2014, Standard Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronics Equipment in the Range of 9 kHz to 40 GHz.

Test Number: 521-15
Issue Date: 1/10/2016

6. Measurement Data (continued)

6.6 Spurious Emissions for integral antennas (15.323 (d), 15.209, RSS-213 5.8) (cont)

Low Channel

| Frequency (MHz) | Amplitude (dB μ V/m) | | Peak Limit | Peak Margin (dB) | Average Limit | Average Margin (dB) | Ant Pol | Ant Ht | TT Pos | Result |
|-----------------|--------------------------|-------|------------|------------------|---------------|---------------------|---------|--------|--------|-----------|
| | Peak | Avg | | | | | | | | |
| 3843 | 60.05 | 38.63 | 74 | -13.95 | 54 | -15.37 | V | 219 | 282 | Compliant |
| 5765 | 57.28 | 40.38 | 74 | -16.72 | 54 | -13.62 | V | 120 | 99 | Compliant |
| 7686 | 53.85 | 38.67 | 74 | -20.15 | 54 | -15.33 | V | 100 | 46 | Compliant |
| 9608 | 63.01 | 42.48 | 74 | -10.99 | 54 | -11.52 | V | 100 | 266 | Compliant |
| 11529 | 56.75 | 42.77 | 74 | -17.25 | 54 | -11.23 | V | 100 | 0 | Compliant |
| 13451 | 61.49 | 45.28 | 74 | -12.51 | 54 | -8.72 | V | 139 | 0 | Compliant |
| 15372 | 60.27 | 46.72 | 74 | -13.73 | 54 | -7.28 | V | 100 | 0 | Compliant |
| 17294 | 62.81 | 49.10 | 74 | -11.19 | 54 | -4.90 | V | 100 | 0 | Compliant |
| 19215 | 57.58 | 43.75 | 74 | -16.42 | 54 | -10.25 | V | 100 | 0 | Compliant |

Mid Channel

| Frequency (MHz) | Amplitude (dB μ V/m) | | Peak Limit | Peak Margin (dB) | Average Limit | Average Margin (dB) | Ant Pol | Ant Ht | TT Pos | Result |
|-----------------|--------------------------|-------|------------|------------------|---------------|---------------------|---------|--------|--------|-----------|
| | Peak | Avg | | | | | | | | |
| 3850 | 56.47 | 35.56 | 74 | -17.53 | 54 | -18.44 | V | 100 | 249 | Compliant |
| 5775 | 54.23 | 37.18 | 74 | -19.77 | 54 | -16.82 | V | 100 | 102 | Compliant |
| 7700 | 55.38 | 39.05 | 74 | -18.62 | 54 | -14.95 | V | 142 | 5 | Compliant |
| 9625 | 60.44 | 42.01 | 74 | -13.56 | 54 | -11.99 | V | 115 | 24 | Compliant |
| 11550 | 56.73 | 42.67 | 74 | -17.27 | 54 | -11.33 | V | 100 | 0 | Compliant |
| 13475 | 61.85 | 46.19 | 74 | -12.15 | 54 | -7.81 | V | 121 | 5 | Compliant |
| 15400 | 61.64 | 47.58 | 74 | -12.36 | 54 | -6.42 | V | 100 | 0 | Compliant |
| 17325 | 64.16 | 50.44 | 74 | -9.84 | 54 | -3.56 | V | 100 | 0 | Compliant |
| 19250 | 56.80 | 44.00 | 74 | -17.20 | 54 | -10.00 | V | 100 | 0 | Compliant |

High Channel

| Frequency (MHz) | Amplitude (dB μ V/m) | | Peak Limit | Peak Margin (dB) | Average Limit | Average Margin (dB) | Ant Pol | Ant Ht | TT Pos | Result |
|-----------------|--------------------------|-------|------------|------------------|---------------|---------------------|---------|--------|--------|-----------|
| | Peak | Avg | | | | | | | | |
| 3857 | 55.88 | 35.45 | 74 | -18.12 | 54 | -18.55 | V | 100 | 318 | Compliant |
| 5785 | 53.69 | 36.98 | 74 | -20.31 | 54 | -17.02 | V | 100 | 102 | Compliant |
| 7714 | 55.18 | 39.04 | 74 | -18.82 | 54 | -14.96 | V | 111 | 265 | Compliant |
| 9642 | 60.91 | 42.07 | 74 | -13.09 | 54 | -11.93 | V | 108 | 39 | Compliant |
| 11571 | 55.80 | 42.51 | 74 | -18.20 | 54 | -11.49 | V | 100 | 0 | Compliant |
| 13499 | 62.38 | 46.29 | 74 | -11.62 | 54 | -7.71 | V | 167 | 2 | Compliant |
| 15428 | 61.33 | 47.79 | 74 | -12.67 | 54 | -6.21 | V | 100 | 0 | Compliant |
| 17356 | 64.00 | 50.40 | 74 | -10.00 | 54 | -3.60 | V | 100 | 0 | Compliant |
| 19284 | 56.27 | 43.95 | 74 | -17.73 | 54 | -10.05 | V | 100 | 0 | Compliant |

¹ Correction factors are included in measurement values

Test Number: 521-15
Issue Date: 1/10/2016

6. Measurement Data (continued)

6.6 Spurious Emissions for integral antennas (15.323 (d), 15.209, RSS-213 5.8) (cont)

Low Channel

| Frequency (MHz) | Amplitude (dB μ V/m) | | Peak Limit | Peak Margin (dB) | Average Limit | Average Margin (dB) | Ant Pol | Ant Ht | TT Pos | Result |
|-----------------|--------------------------|-------|------------|------------------|---------------|---------------------|---------|--------|--------|-----------|
| | Peak | Avg | | | | | | | | |
| 3843 | 56.66 | 35.31 | 74 | -17.34 | 54 | -18.69 | H | 253 | 336 | Compliant |
| 5765 | 49.34 | 36.40 | 74 | -24.66 | 54 | -17.60 | H | 100 | 47 | Compliant |
| 7686 | 52.23 | 38.46 | 74 | -21.77 | 54 | -15.54 | H | 100 | 0 | Compliant |
| 9608 | 57.97 | 41.59 | 74 | -16.03 | 54 | -12.41 | H | 100 | 258 | Compliant |
| 11529 | 56.06 | 42.46 | 74 | -17.94 | 54 | -11.54 | H | 100 | 0 | Compliant |
| 13451 | 58.03 | 44.87 | 74 | -15.97 | 54 | -9.13 | H | 100 | 0 | Compliant |
| 15372 | 59.58 | 46.02 | 74 | -14.42 | 54 | -7.98 | H | 100 | 0 | Compliant |
| 17294 | 61.81 | 48.32 | 74 | -12.19 | 54 | -5.68 | H | 100 | 0 | Compliant |
| 19215 | 57.60 | 43.80 | 74 | -16.40 | 54 | -10.20 | H | 100 | 0 | Compliant |

Mid Channel

| Frequency (MHz) | Amplitude (dB μ V/m) | | Peak Limit | Peak Margin (dB) | Average Limit | Average Margin (dB) | Ant Pol | Ant Ht | TT Pos | Result |
|-----------------|--------------------------|-------|------------|------------------|---------------|---------------------|---------|--------|--------|-----------|
| | Peak | Avg | | | | | | | | |
| 3850 | 52.09 | 34.34 | 74 | -21.91 | 54 | -19.66 | H | 100 | 303 | Compliant |
| 5775 | 51.37 | 36.31 | 74 | -22.63 | 54 | -17.69 | H | 100 | 20 | Compliant |
| 7700 | 52.48 | 38.32 | 74 | -21.52 | 54 | -15.68 | H | 100 | 0 | Compliant |
| 9625 | 58.81 | 41.33 | 74 | -15.19 | 54 | -12.67 | H | 116 | 278 | Compliant |
| 11550 | 56.06 | 42.40 | 74 | -17.94 | 54 | -11.60 | H | 100 | 0 | Compliant |
| 13475 | 58.34 | 44.55 | 74 | -15.66 | 54 | -9.45 | H | 100 | 0 | Compliant |
| 15400 | 58.55 | 45.66 | 74 | -15.45 | 54 | -8.34 | H | 100 | 0 | Compliant |
| 17325 | 61.13 | 48.45 | 74 | -12.87 | 54 | -5.55 | H | 100 | 0 | Compliant |
| 19250 | 56.63 | 44.00 | 74 | -17.37 | 54 | -10.00 | H | 100 | 0 | Compliant |

High Channel

| Frequency (MHz) | Amplitude (dB μ V/m) | | Peak Limit | Peak Margin (dB) | Average Limit | Average Margin (dB) | Ant Pol | Ant Ht | TT Pos | Result |
|-----------------|--------------------------|-------|------------|------------------|---------------|---------------------|---------|--------|--------|-----------|
| | Peak | Avg | | | | | | | | |
| 3857 | 52.98 | 34.98 | 74 | -21.02 | 54 | -19.02 | H | 100 | 26 | Compliant |
| 5785 | 49.80 | 36.64 | 74 | -24.20 | 54 | -17.36 | H | 100 | 0 | Compliant |
| 7714 | 52.25 | 38.70 | 74 | -21.75 | 54 | -15.30 | H | 100 | 0 | Compliant |
| 9642 | 57.69 | 41.60 | 74 | -16.31 | 54 | -12.40 | H | 141 | 285 | Compliant |
| 11571 | 56.85 | 42.44 | 74 | -17.15 | 54 | -11.56 | H | 100 | 0 | Compliant |
| 13499 | 59.45 | 46.03 | 74 | -14.55 | 54 | -7.97 | H | 100 | 0 | Compliant |
| 15428 | 61.30 | 47.48 | 74 | -12.70 | 54 | -6.52 | H | 100 | 0 | Compliant |
| 17356 | 64.35 | 50.37 | 74 | -9.65 | 54 | -3.63 | H | 100 | 0 | Compliant |
| 19284 | 56.55 | 44.00 | 74 | -17.45 | 54 | -10.00 | H | 100 | 0 | Compliant |

¹ Correction factors are included in measurement values

Test Number: 521-15

Issue Date: 1/10/2016

6. Measurement Data

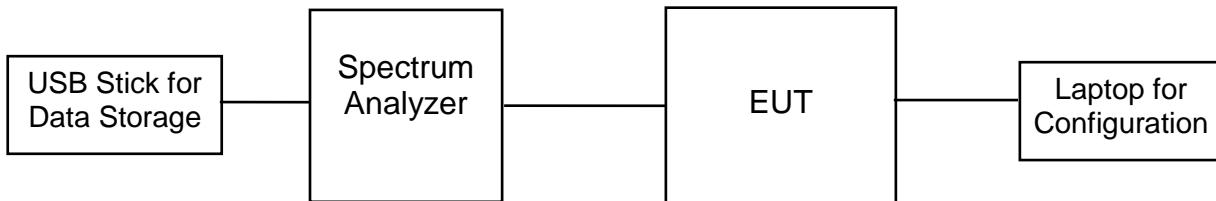
6.7. Power Spectral Density (15.319 (d), RSS-213 Sec 5.7, ANSI C63.17 Sec 6.1.5)

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 analyzer is then placed in zero span at that frequency and a 100 averages using the sample detector is recorded. Cable loss is accounted for within the analyzer.



Test Number: 521-15
Issue Date: 1/10/2016

6. Measurement Data

6.7. Power Spectral Density (15.319 (d), RSS-213 Sec 5.7, ANSI C63.17 Sec 6.1.5)

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

| ANT0 Channel | Channel Frequency | Actual Measured Frequency | Power Spectral Density | FCC Limit | FCC Limit | Result |
|-----------------|----------------------|---------------------------------|------------------------------|------------|-----------|-----------|
| | MHz | MHz | dBm / 3kHz | dBm / 3kHz | mW / 3kHz | |
| TX4 | 1921.536 | 1921.5375 | -3.05 | 4.77 | 3.00 | Compliant |
| TX2 | 1924.992 | 1924.9950 | 0.72 | 4.77 | 3.00 | Compliant |
| TX0 | 1928.448 | 1928.4503 | 0.68 | 4.77 | 3.00 | Compliant |

| ANT1 Channel | Channel Frequency | Actual Measured Frequency | Power Spectral Density | FCC Limit | FCC Limit | Result |
|-----------------|----------------------|---------------------------------|------------------------------|------------|-----------|-----------|
| | MHz | MHz | dBm / 3kHz | dBm / 3kHz | mW / 3kHz | |
| TX4 | 1921.536 | 1921.5390 | -0.56 | 4.77 | 3.00 | Compliant |
| TX2 | 1924.992 | 1924.9958 | 0.54 | 4.77 | 3.00 | Compliant |
| TX0 | 1928.448 | 1928.4495 | -0.63 | 4.77 | 3.00 | Compliant |

Note: The IC limit is 12 mW, please see the next pages for plots of measurements

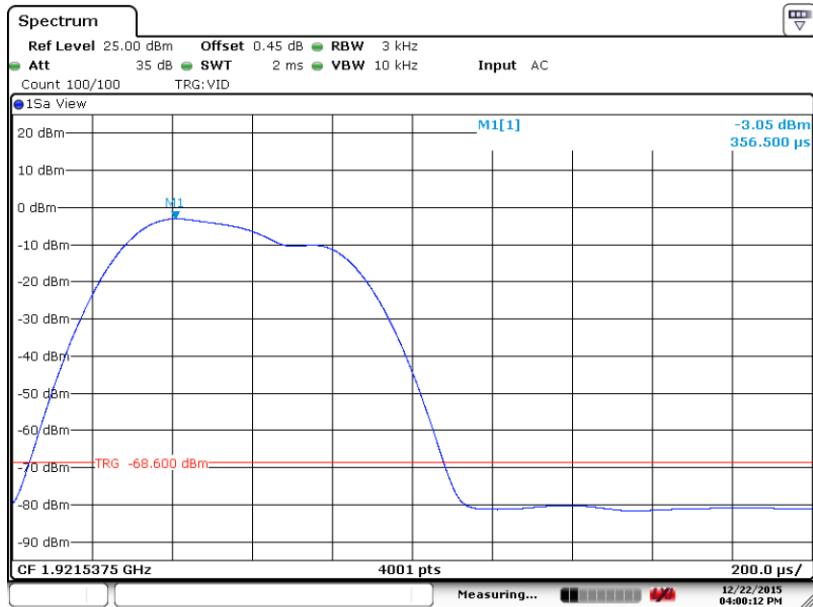
Test Number: 521-15

Issue Date: 1/10/2016

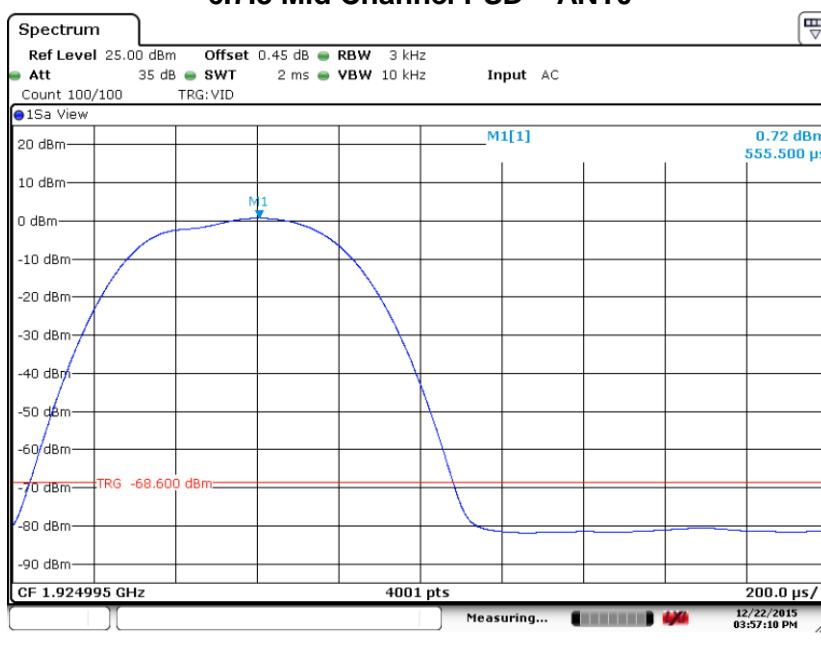
6. Measurement Data

6.7. Power Spectral Density (15.319 (d)), RSS-213 Sec 5.7 (cont)

6.7.2 Low Channel PSD – ANTO



6.7.3 Mid Channel PSD – ANTO



Test Number: 521-15

Issue Date: 1/10/2016

6. Measurement Data

6.7. Power Spectral Density (15.319 (d)), RSS-213 Sec 5.7 (cont)

6.7.4 High Channel PSD – ANTO



Date: 22.DEC.2015 15:53:59

6.7.5 Low Channel PSD – ANT1



Date: 22.DEC.2015 16:21:45

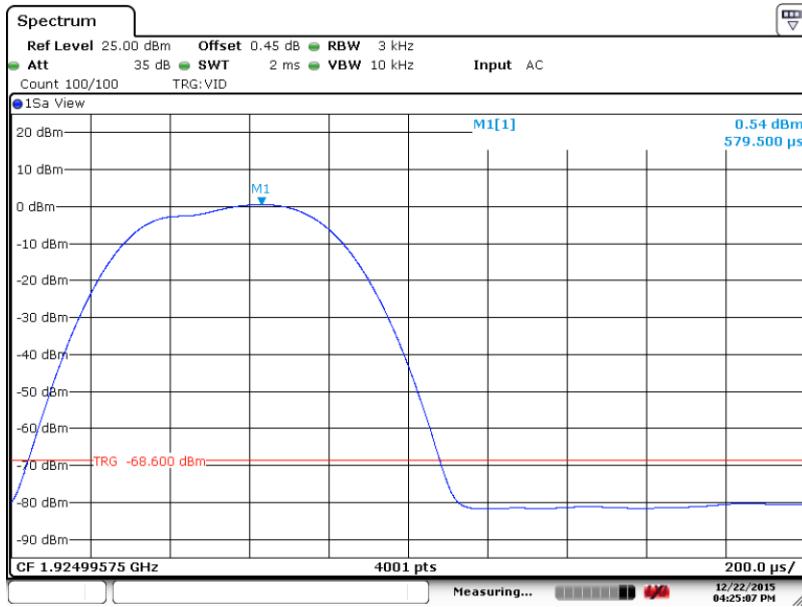
Test Number: 521-15

Issue Date: 1/10/2016

6. Measurement Data

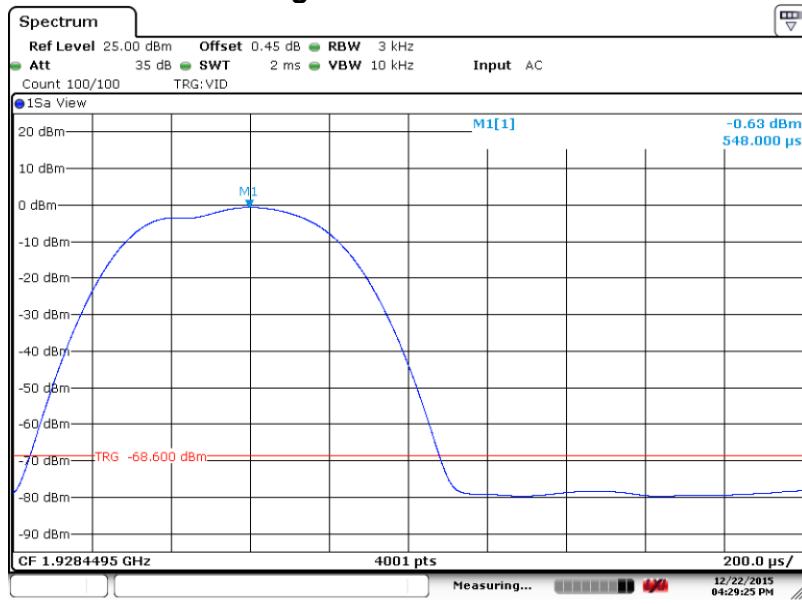
6.7. Power Spectral Density (15.319 (d)), RSS-213 Sec 5.7 (cont)

6.7.6 Mid Channel PSD – ANT1



Date: 22.DEC.2015 16:25:07

6.7.7 High Channel PSD – ANT1



Date: 22.DEC.2015 16:29:25

Test Number: 521-15
Issue Date: 1/10/2016

6. Measurement Data

6.8. Conducted Emissions

Regulatory Limit: FCC Part 15.315, 15.207, IC RSS-213 5.4, RSS-GEN

| Frequency Range (MHz) | Limits (dB μ V) | |
|--------------------------|------------------------|-----------|
| | 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 | 7/23/2015 | 1 Year |
| EMI Receiver | Hewlett Packard | 8546A | 3330A00115 | 6/4/2016 | 2 Years |
| | | | | | |
| 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: | 12/16/2015 |
| Test Engineer: | Brian Breault |
| Site Temperature (°C): | 21 |
| Relative Humidity (%RH): | 37 |
| 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 C63.4-2014, Standard Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronics Equipment in the Range of 9 kHz to 40 GHz.

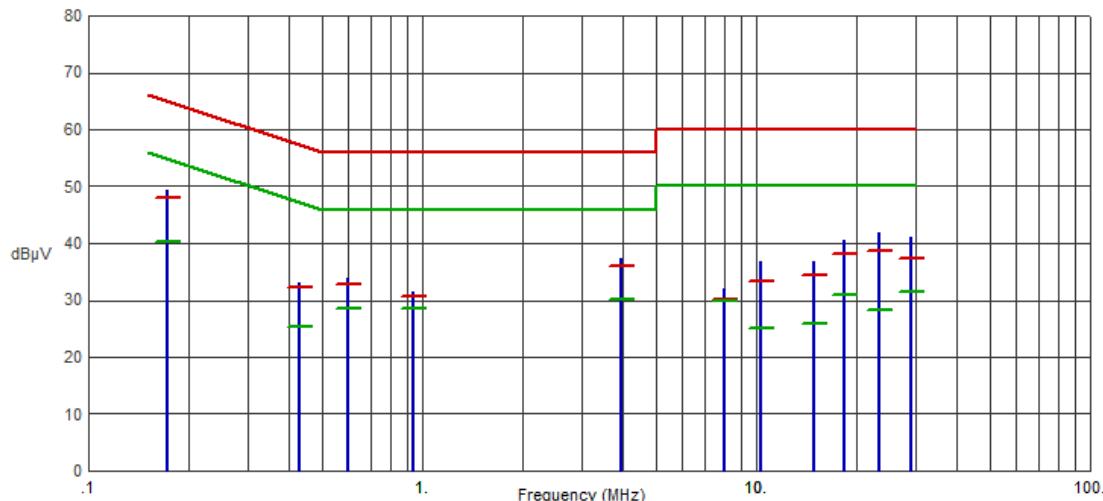
Test Number: 521-15
Issue Date: 1/10/2016

6. Measurement Data

6.8.4. 120 Volts, 60 Hz Phase

Test No.: 578-15, 120 Volts, 60 Hz Phase

FCC, Class B



| Frequency (MHz) | Pk Amp (dB μ V) | QP Amp (dB μ V) | QP Limit (dB μ V) | QP Margin (dB) | Avg Amp (dB μ V) | Avg Limit (dB μ V) | Avg Margin (dB) | Comments |
|-----------------|---------------------|---------------------|-----------------------|----------------|----------------------|------------------------|-----------------|----------|
| .1715 | 49.36 | 47.90 | 64.89 | -16.99 | 40.17 | 54.89 | -14.72 | |
| .4283 | 33.11 | 32.36 | 57.29 | -24.93 | 25.31 | 47.29 | -21.98 | |
| .5995 | 33.96 | 32.86 | 56.00 | -23.14 | 28.42 | 46.00 | -17.58 | |
| .9424 | 31.51 | 30.61 | 56.00 | -25.39 | 28.52 | 46.00 | -17.48 | |
| 3.9388 | 37.35 | 36.02 | 56.00 | -19.98 | 30.12 | 46.00 | -15.88 | |
| 8.0412 | 32.03 | 30.18 | 60.00 | -29.82 | 30.00 | 50.00 | -20.00 | |
| 10.2826 | 36.79 | 33.33 | 60.00 | -26.67 | 25.03 | 50.00 | -24.97 | |
| 14.9027 | 36.91 | 34.46 | 60.00 | -25.54 | 25.78 | 50.00 | -24.22 | |
| 18.4318 | 40.66 | 38.06 | 60.00 | -21.94 | 30.95 | 50.00 | -19.05 | |
| 23.2346 | 41.75 | 38.69 | 60.00 | -21.31 | 28.14 | 50.00 | -21.86 | |
| 28.9660 | 41.17 | 37.37 | 60.00 | -22.63 | 31.38 | 50.00 | -18.62 | |



Test Number: 521-15

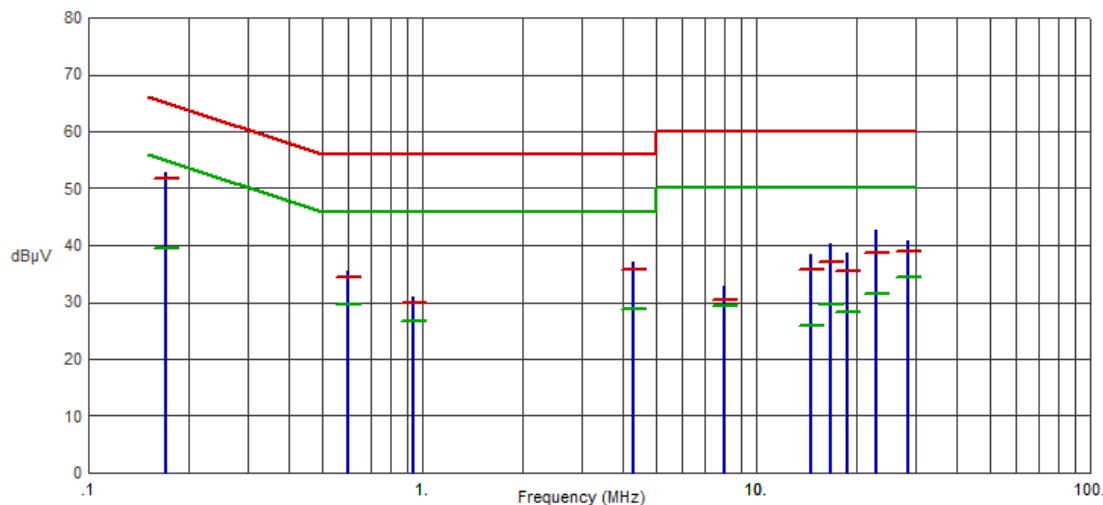
Issue Date: 1/10/2016

6. Measurement Data

6.8.5. 120 Volts, 60 Hz Neutral

Test No.: 578-15, 120 Volts, 60 Hz Neutral

FCC, Class B



| Frequency (MHz) | Pk Amp (dB μ V) | QP Amp (dB μ V) | QP Limit (dB μ V) | QP Margin (dB) | Avg Amp (dB μ V) | Avg Limit (dB μ V) | Avg Margin (dB) | Comments |
|-----------------|---------------------|---------------------|-----------------------|----------------|----------------------|------------------------|-----------------|----------|
| .1711 | 52.86 | 51.68 | 64.91 | -13.23 | 39.44 | 54.91 | -15.47 | |
| .5987 | 35.47 | 34.32 | 56.00 | -21.68 | 29.57 | 46.00 | -16.43 | |
| .9421 | 30.98 | 29.97 | 56.00 | -26.03 | 26.64 | 46.00 | -19.36 | |
| 4.2812 | 37.07 | 35.77 | 56.00 | -20.23 | 28.90 | 46.00 | -17.10 | |
| 8.0424 | 32.81 | 30.39 | 60.00 | -29.61 | 29.34 | 50.00 | -20.66 | |
| 14.5616 | 38.45 | 35.79 | 60.00 | -24.21 | 25.97 | 50.00 | -24.03 | |
| 16.7720 | 40.35 | 37.03 | 60.00 | -22.97 | 29.73 | 50.00 | -20.27 | |
| 18.8244 | 38.56 | 35.39 | 60.00 | -24.61 | 28.37 | 50.00 | -21.63 | |
| 22.9400 | 42.58 | 38.69 | 60.00 | -21.31 | 31.38 | 50.00 | -18.62 | |
| 28.5141 | 40.86 | 38.88 | 60.00 | -21.12 | 34.53 | 50.00 | -15.47 | |

Test Number: 521-15

Issue Date: 1/10/2016

6. Measurement Data (continued)

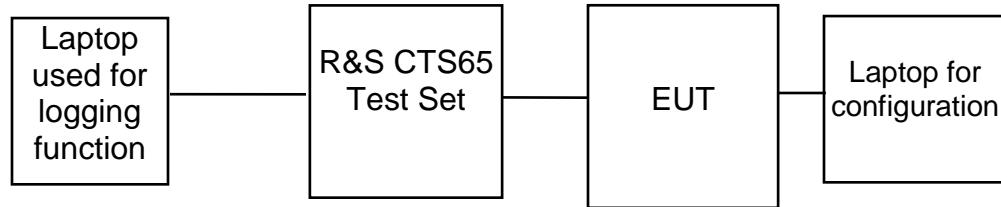
6.9 Carrier Frequency Stability (15.323 (f), IC RSS-213 5.3, ANSI C63.17 Sec 6.2.1)

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.



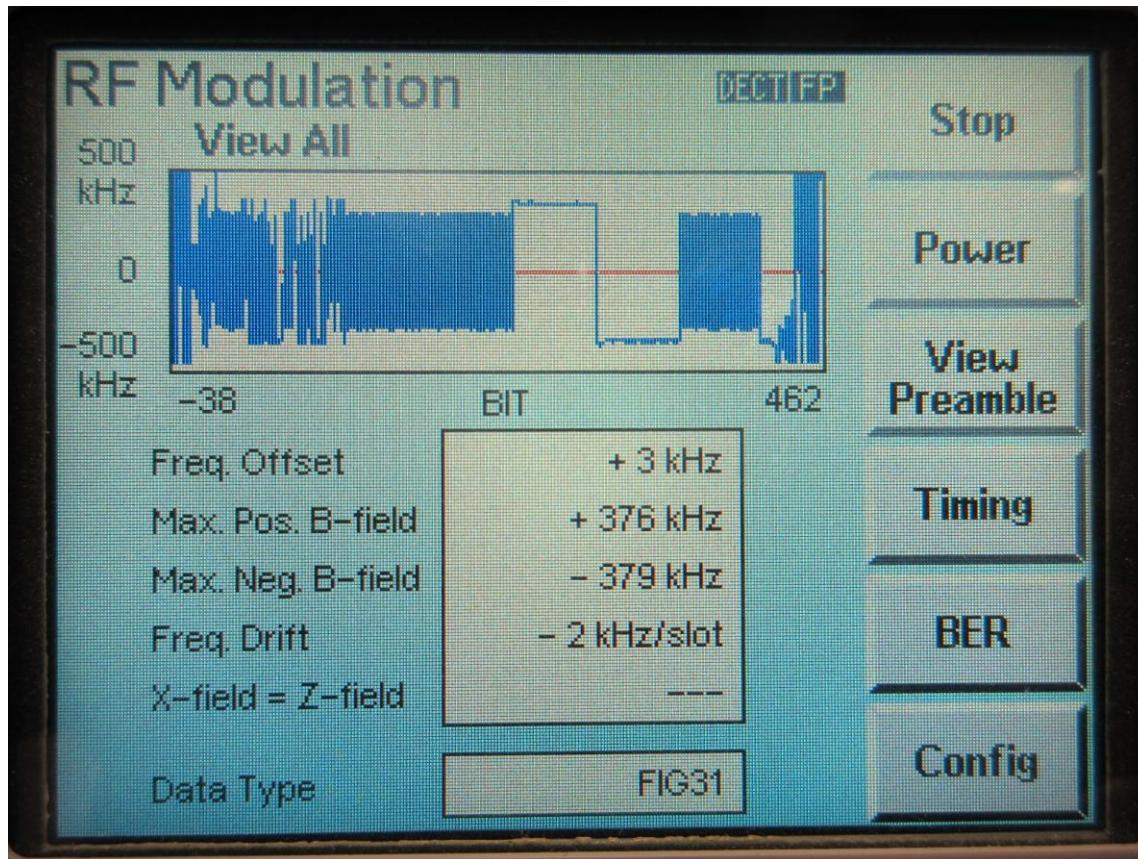
Test Number: 521-15
Issue Date: 1/10/2016

6. Measurement Data (continued)

6.9 Carrier Frequency Stability (15.323 (f), IC RSS-213 5.3, 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 | |
| TX0 | 1928.448 | 48.0 | 20 | +3.00 | 19.2 | 10.0 | Compliant |
| TX0 | 1928.448 | 40.8 | 20 | +6.00 | 19.2 | 10.0 | Compliant |
| TX0 | 1928.448 | 55.2 | 20 | +6.00 | 19.2 | 10.0 | Compliant |
| TX0 | 1928.448 | 40.8 | -20 | +1.00 | 19.2 | 10.0 | Compliant |
| TX0 | 1928.448 | 55.2 | +50 | +3.00 | 19.2 | 10.0 | Compliant |

6.9.1 Timing 48 VDC, 20 degrees C



Test Number: 521-15
Issue Date: 1/10/2016

6. Measurement Data (continued)

6.10 Transmitter Spurious Radiated Emissions (FCC Part 15.209, RSS 213 5.8.1)

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

| Frequency Range (MHz) | Distance (Meters) | Limit (dB μ V/m) |
|-----------------------|-------------------|----------------------|
| 0.009 to 0.490 | 3 | 128.5 to 93.8 |
| 0.490 to 1.705 | 3 | 73.8 to 63.0 |
| 1.705 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 1000 | 3 | 54.0 |

6.10.2. Measurement Equipment Used to Perform Test

| Device | Manufacturer | Model No. | Serial No. | Cal Due | Interval |
|-------------------|-----------------|-----------|------------|-----------|----------|
| Loop Antenna | EMCO | 6512 | 9309-1139 | 9/23/2016 | 2 Years |
| Biconilog Antenna | Sunol Sciences | JB1 | A050913 | 5/15/2016 | 3 Years |
| EMI Receiver | Hewlett Packard | 8546A | 3330A00115 | 6/4/2016 | 2 Years |
| EMI Receiver | Rohde & Schwarz | ESR7 | 101156 | 7/23/2017 | 2 Years |

6.10.3. Measurement & Equipment Setup

| | |
|-----------------------------|-------------------------|
| Test Date: | 12/28/2015, 1/7/2016 |
| Test Engineer: | Brian Breault |
| Site Temperature (°C): | 21 |
| Relative Humidity (%RH): | 37 |
| Frequency Range: | 10 kHz to 1 GHz |
| Measurement Distance: | 3 Meters |
| EMI Receiver IF Bandwidth: | 200 Hz, 9 kHz, 120 kHz |
| EMI Receiver Avg Bandwidth: | 300 Hz, 30 kHz, 300 kHz |
| Detector Functions: | Peak and Quasi-Peak. |
| Antenna Height: | 1 to 4 meters |

6.10.4. Test Procedure

Test measurements were made in accordance with ANSI C63.4-2014, Standard Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronics Equipment in the Range of 9 kHz to 40 GHz.

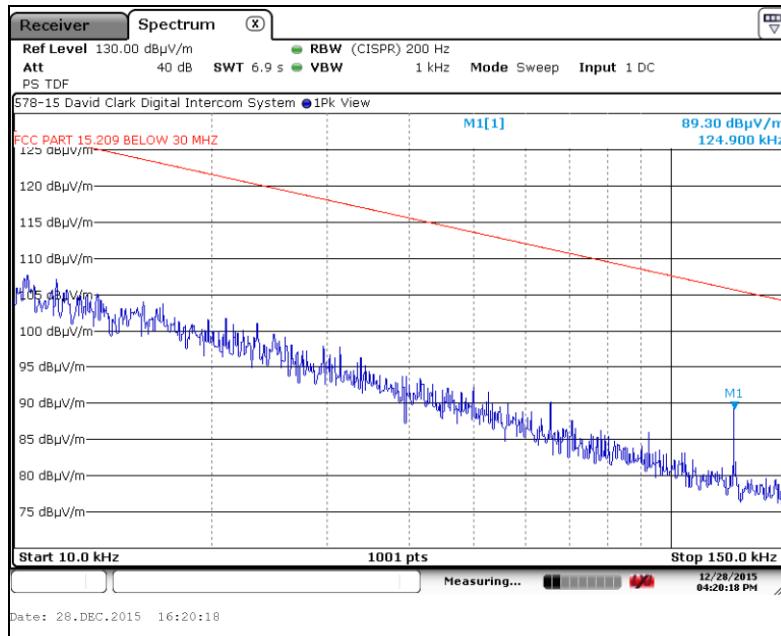
Test Number: 521-15

Issue Date: 1/10/2016

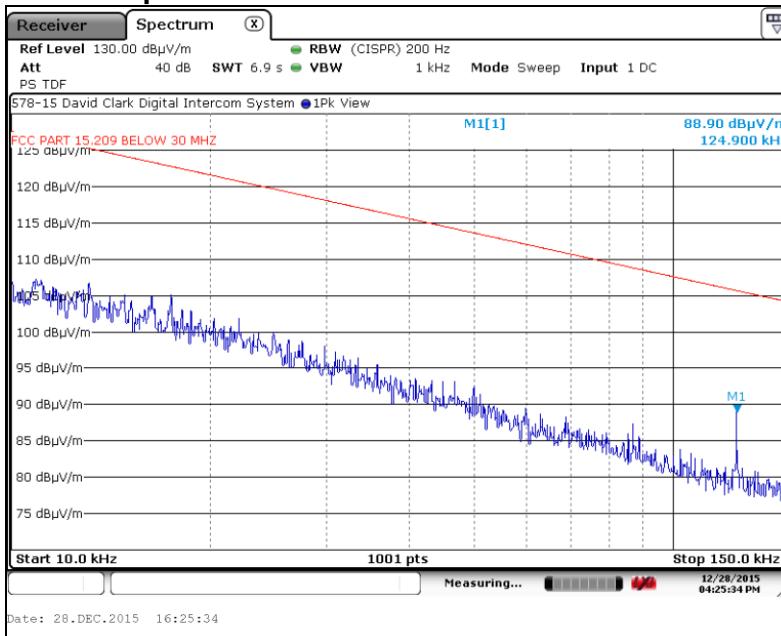
6. Measurement Data (continued)

6.10. Radiated Emissions (10 kHz to 150 kHz) Test Results

6.10.5. Antenna Parallel to the Device Under Test



6.10.6. Antenna Perpendicular to the Device Under Test



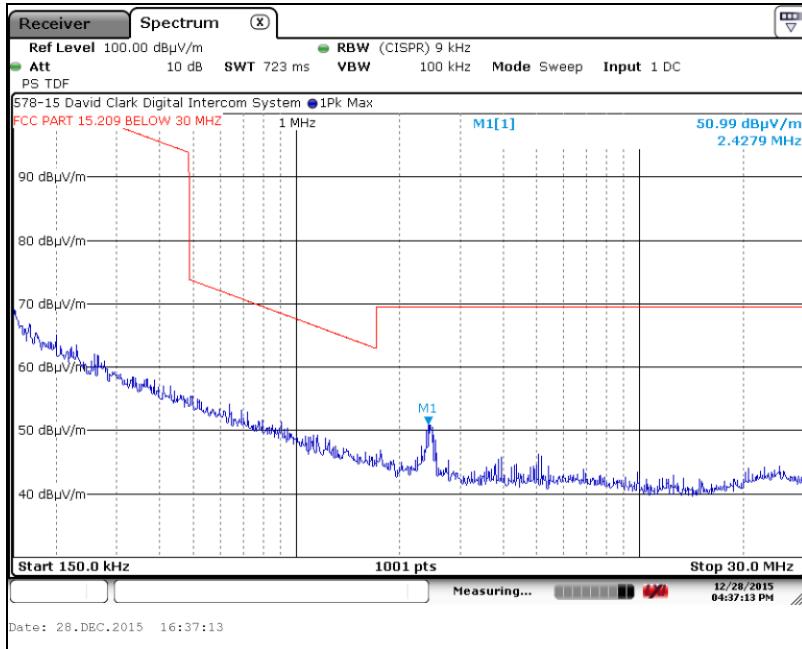
Test Number: 521-15

Issue Date: 1/10/2016

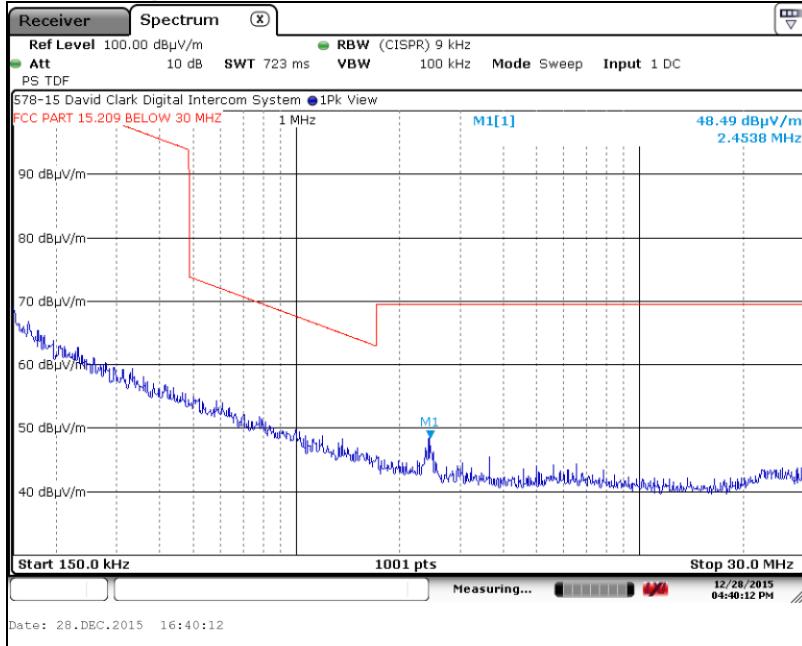
6. Measurement Data (continued)

6.10. Radiated Emissions (150 kHz to 30 MHz) Test Results

6.10.7. Antenna Parallel to the Device Under Test



6.10.8. Antenna Perpendicular to the Device Under Test



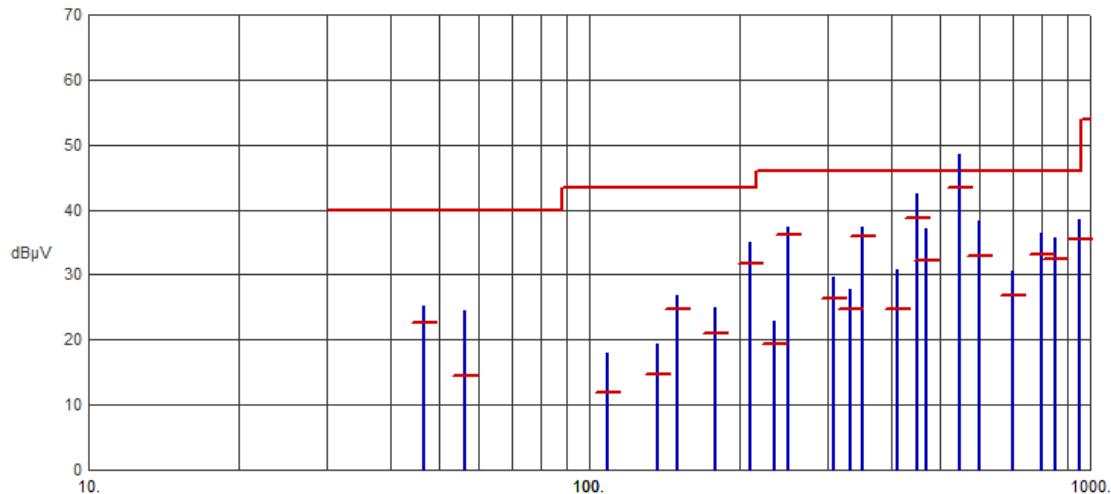
Test Number: 521-15
Issue Date: 1/10/2016

6. Measurement Data (continued)

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

6.10.9. Horizontal Polarity

Test No.: 578-15, Radiated Emissions - Horizontal Polarity FCC, Class B



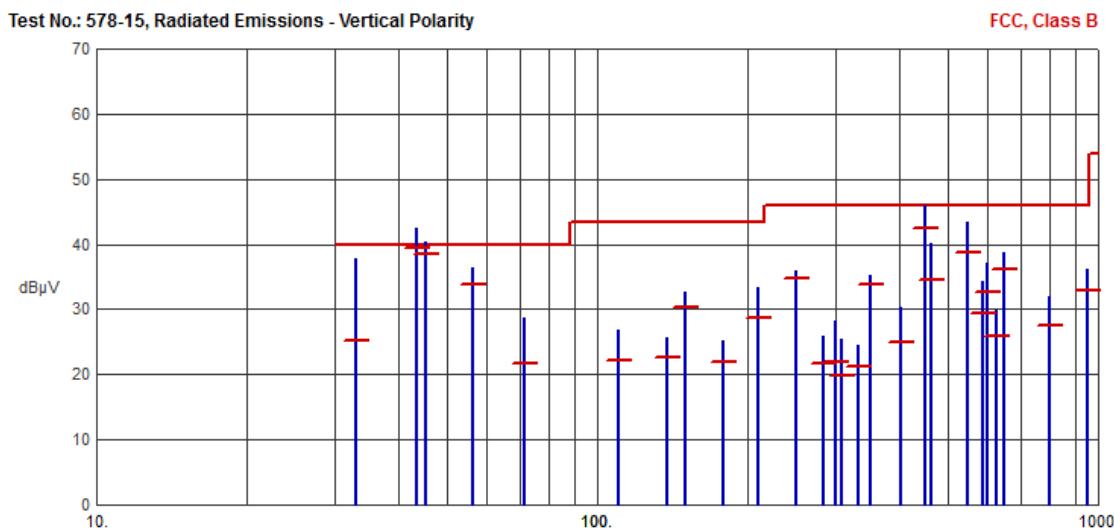
| Frequency (MHz) | Pk Amp (dB μ V/m) | QP Amp (dB μ V/m) | QP Limit (dB μ V/m) | Margin (dB) | Ant Ht (cm) | Table (Deg) | Comments |
|-----------------|-----------------------|-----------------------|-------------------------|-------------|-------------|-------------|----------|
| 46.8608 | 25.14 | 22.59 | 40.00 | -17.41 | N/A | N/A | |
| 56.3339 | 24.51 | 14.48 | 40.00 | -25.52 | N/A | N/A | |
| 108.8018 | 17.93 | 11.98 | 43.50 | -31.52 | N/A | N/A | |
| 137.2461 | 19.27 | 14.59 | 43.50 | -28.91 | N/A | N/A | |
| 149.9953 | 26.87 | 24.67 | 43.50 | -18.83 | N/A | N/A | |
| 177.9575 | 24.89 | 21.10 | 43.50 | -22.40 | N/A | N/A | |
| 208.8937 | 34.94 | 31.76 | 43.50 | -11.74 | N/A | N/A | |
| 233.4716 | 22.95 | 19.30 | 46.00 | -26.70 | N/A | N/A | |
| 250.0004 | 37.40 | 36.23 | 46.00 | -9.77 | N/A | N/A | |
| 307.1837 | 29.64 | 26.42 | 46.00 | -19.58 | N/A | N/A | |
| 331.7774 | 27.69 | 24.80 | 46.00 | -21.20 | N/A | N/A | |
| 349.9871 | 37.22 | 35.85 | 46.00 | -10.15 | N/A | N/A | |
| 411.7149 | 30.79 | 24.62 | 46.00 | -21.38 | N/A | N/A | |
| 450.0024 | 42.37 | 38.78 | 46.00 | -7.22 | N/A | N/A | |
| 470.1751 | 37.10 | 32.24 | 46.00 | -13.76 | N/A | N/A | |
| 549.9936 | 48.57 | 43.42 | 46.00 | -2.58 | N/A | N/A | |
| 599.9831 | 38.20 | 32.87 | 46.00 | -13.13 | N/A | N/A | |
| 700.4181 | 30.68 | 26.88 | 46.00 | -19.12 | N/A | N/A | |
| 799.9703 | 36.36 | 33.16 | 46.00 | -12.84 | N/A | N/A | |
| 849.9811 | 35.78 | 32.43 | 46.00 | -13.57 | N/A | N/A | |
| 949.9967 | 38.47 | 35.44 | 46.00 | -10.56 | N/A | N/A | |

Test Number: 521-15
Issue Date: 1/10/2016

6. Measurement Data (continued)

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

6.10.10. Vertical Polarity



| Frequency (MHz) | Pk Amp (dB μ V/m) | QP Amp (dB μ V/m) | QP Limit (dB μ V/m) | Margin (dB) | Ant Ht (cm) | Table (Deg) | Comments |
|-----------------|-----------------------|-----------------------|-------------------------|-------------|-------------|-------------|----------|
| 32.9016 | 37.86 | 25.20 | 40.00 | -14.80 | N/A | N/A | |
| 43.7181 | 42.49 | 39.53 | 40.00 | -0.47 | N/A | N/A | |
| 45.5903 | 40.27 | 38.45 | 40.00 | -1.55 | N/A | N/A | |
| 56.3324 | 36.39 | 33.75 | 40.00 | -6.25 | N/A | N/A | |
| 71.3148 | 28.64 | 21.68 | 40.00 | -18.32 | N/A | N/A | |
| 110.0128 | 26.77 | 22.23 | 43.50 | -21.27 | N/A | N/A | |
| 137.5206 | 25.75 | 22.63 | 43.50 | -20.87 | N/A | N/A | |
| 149.9988 | 32.77 | 30.35 | 43.50 | -13.15 | N/A | N/A | |
| 178.4433 | 25.21 | 21.91 | 43.50 | -21.59 | N/A | N/A | |
| 208.8985 | 33.28 | 28.67 | 43.50 | -14.83 | N/A | N/A | |
| 249.9900 | 35.94 | 34.78 | 46.00 | -11.22 | N/A | N/A | |
| 282.6083 | 25.95 | 21.80 | 46.00 | -24.20 | N/A | N/A | |
| 300.0002 | 28.16 | 22.02 | 46.00 | -23.98 | N/A | N/A | |
| 307.3748 | 25.44 | 19.73 | 46.00 | -26.27 | N/A | N/A | |
| 331.7814 | 24.44 | 21.31 | 46.00 | -24.69 | N/A | N/A | |
| 349.9943 | 35.22 | 33.72 | 46.00 | -12.28 | N/A | N/A | |
| 402.5666 | 30.28 | 25.03 | 46.00 | -20.97 | N/A | N/A | |
| 449.9832 | 45.89 | 42.54 | 46.00 | -3.46 | N/A | N/A | |
| 465.4587 | 40.06 | 34.55 | 46.00 | -11.45 | N/A | N/A | |
| 550.0032 | 43.48 | 38.71 | 46.00 | -7.29 | N/A | N/A | |
| 589.8071 | 34.41 | 29.50 | 46.00 | -16.50 | N/A | N/A | |
| 599.9851 | 37.03 | 32.59 | 46.00 | -13.41 | N/A | N/A | |
| 626.6759 | 29.80 | 25.88 | 46.00 | -20.12 | N/A | N/A | |
| 649.9878 | 38.63 | 36.12 | 46.00 | -9.88 | N/A | N/A | |
| 799.9985 | 31.96 | 27.49 | 46.00 | -18.51 | N/A | N/A | |
| 949.9874 | 36.20 | 32.96 | 46.00 | -13.04 | N/A | N/A | |

6.10.11. Above 1 GHz

Note: There were no measurable emissions above 1 GHz other then the harmonics documented in Section 6.6.

Test Number: 521-15

Issue Date: 1/10/2016

6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (15.323 (e), RSS-213 5.2.13, ANSI C63.17 Section 6.2.2 Frame Repetition-Stability and ANSI C63.17 Section 6.2.3 Frame Period and Jitter)

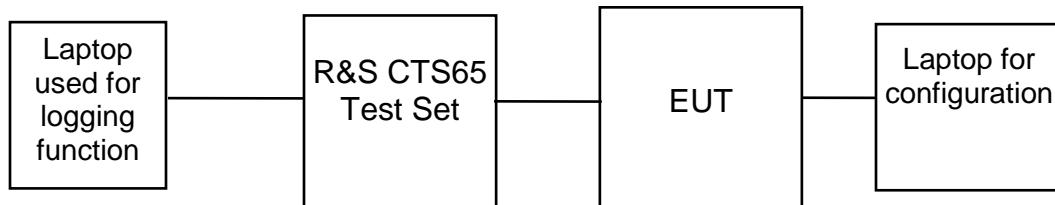
Requirement: The frame period (a set of consecutive time slots in which the position of each time slot can be identified by reference to a synchronizing source) of an intentional radiator operating in this sub-band shall be 20 milliseconds/X where X is a positive whole number.

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.



Test Number: 521-15
Issue Date: 1/10/2016

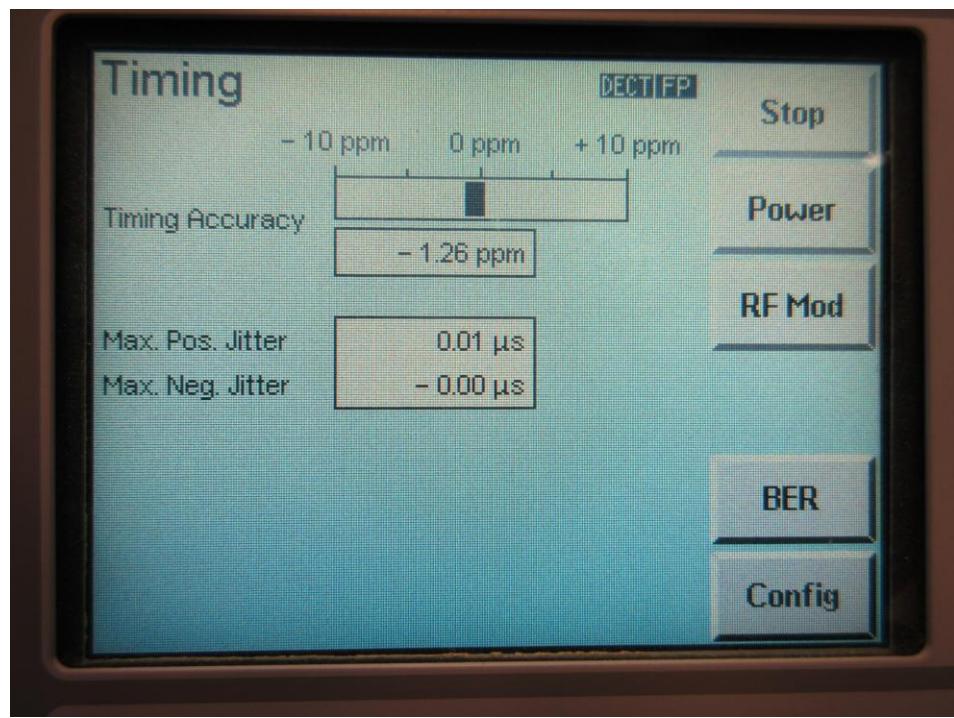
6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (15.323 (e), RSS-213 5.2.13, ANSI C63.17 Section 6.2.2 Frame Repetition-Stability and ANSI C63.17 Section 6.2.3 Frame Period and Jitter) (cont)

| Frame Repetition Stability (ppm) | Limit (ppm) | Standard Deviation (ppm) | Result |
|----------------------------------|-------------|--------------------------|-----------|
| -1.26 | 10.00 | -0.42 | Compliant |

| Maximum Positive Jitter (μ S) | Maximum Negative Jitter (μ S) | Frame Period (mS) | 3xStandard Deviation of Jitter (μ S) | Limit | Result |
|------------------------------------|------------------------------------|-------------------|---|------------|-----------|
| 0.01 | -0.00 | 10.000 | 0.0033 | 25 μ S | 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.

Test Number: 521-15

Issue Date: 1/10/2016

6. Measurement Data (continued)**6.11 Specific Requirements to UPCS Devices (15.323 (e), RSS-213 5.2) (cont)****6.11.2 Automatic Discontinuation of Transmission (15.319 (f), RSS-213 5.2)**

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 | B | 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 | B | 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

Test Number: 521-15

Issue Date: 1/10/2016

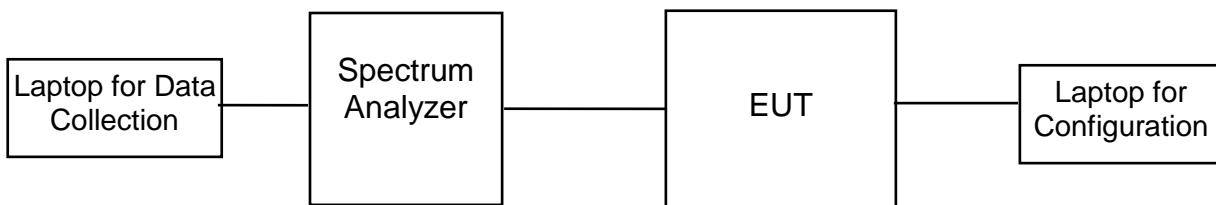
6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (cont)

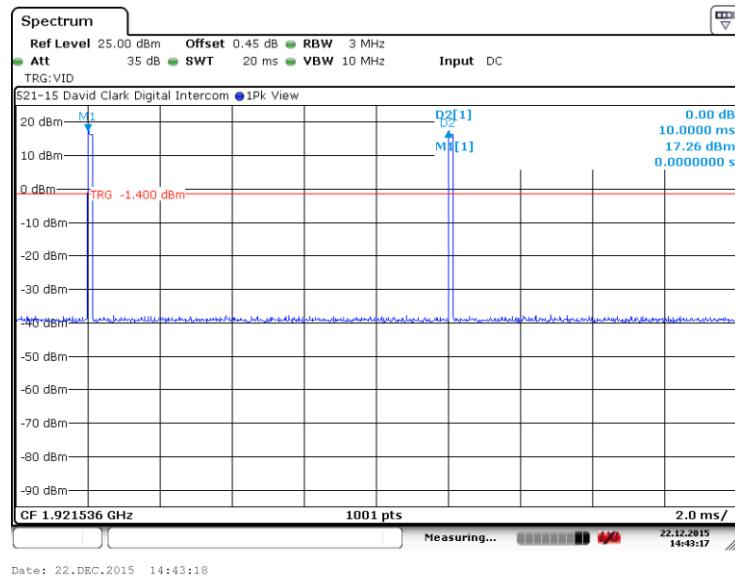
6.11.3 Monitoring Time (15.323(c) (1), RSS-213 5.2.1, ANSI C63.17 Sec 7.3.4

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.

Test Number: 521-15

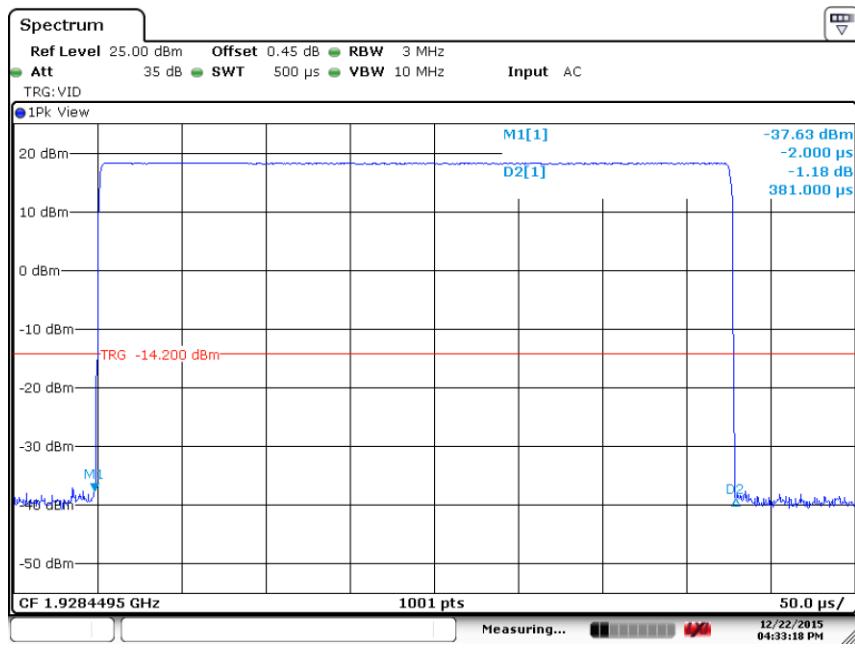
Issue Date: 1/10/2016

6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (cont)

6.11.3 Monitoring Time (15.323(c) (1), RSS-213 5.2.1, C63.17 Sec 7.3.4 (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.

Test Number: 521-15

Issue Date: 1/10/2016

6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (cont)

6.11.4 Lower Monitoring Threshold (15.323 (c) (2), RSS-213 5.2.2, 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 5.2.2.

These are automatically met by the LIC procedure in clauses 15.323 (c) (5) and 5.2.2.

Result: The Lower Threshold is only applicable for systems which have defined 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 (EUT) and 12 timeslots for the portable parts 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.

Test Number: 521-15

Issue Date: 1/10/2016

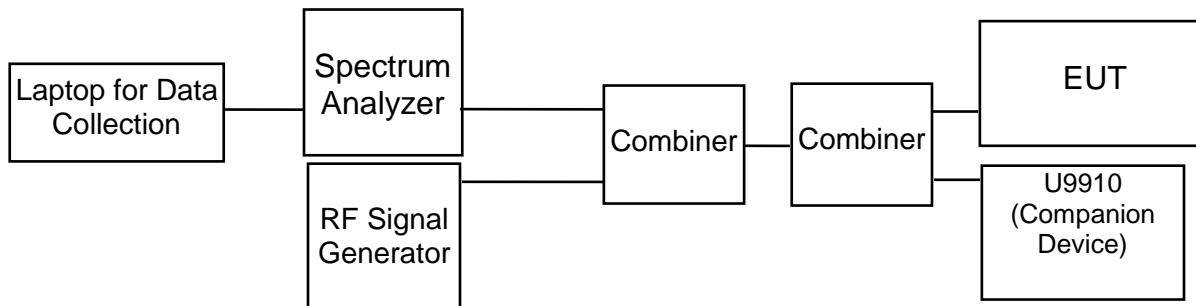
6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (cont)

6.11.5 Maximum Transmit Period (15.323 (c) (3), RSS-213 5.2.3, 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: The EUT is connected to the test set via a combiner and placed in TBR6 mode. The spectrum analyzer is configured to monitor and record in a single sweep the established connection, and the repeating of the access criteria.



| Requirement | Time | Limit | Result |
|---------------------------------|---------|---------|-----------|
| Maximum Transmission Time 8.2.2 | 8 hours | 8 Hours | Compliant |

Result: Compliant

Test Number: 521-15

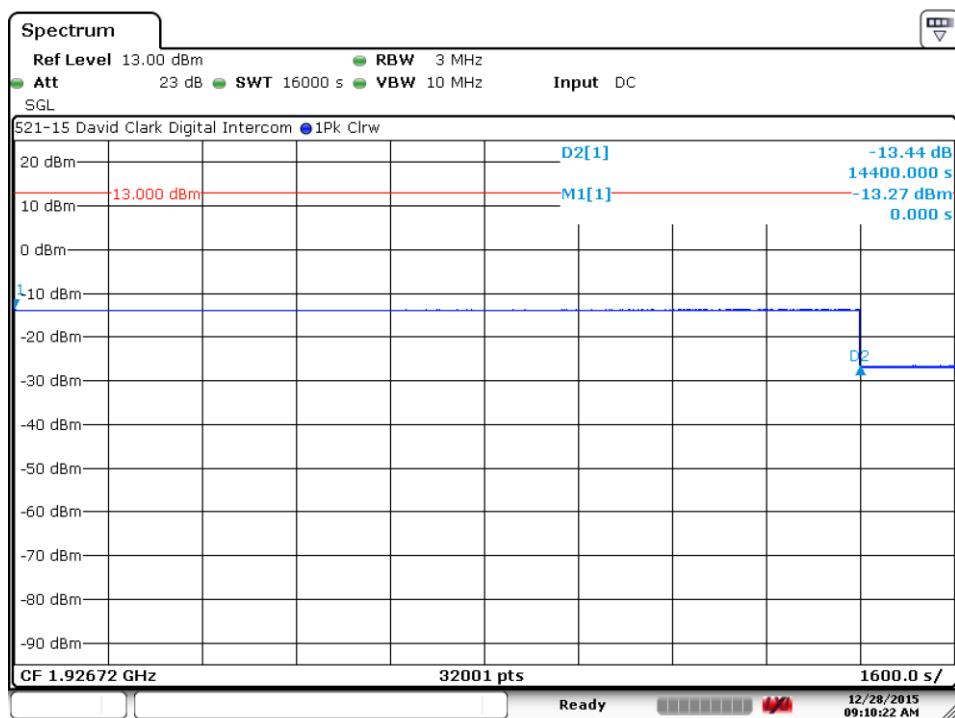
Issue Date: 1/10/2016

6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (cont)

6.11.5 Maximum Transmit Period (15.323 (c) (3), RSS-213 5.2.3, ANSI C63.17 Section 8.2.2)

6.11.5.1 Plot of Maximum Transmit Period – 28,800 Seconds



Date: 28.DEC.2015 09:10:22

Note: The Analyzer's single sweep was reset at 14,400 seconds providing a total of 28,800 seconds.

Test Number: 521-15
Issue Date: 1/10/2016

6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (cont)

6.11.6 System Acknowledgement (15.323(c) (4), RSS-213 5.2.4

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.

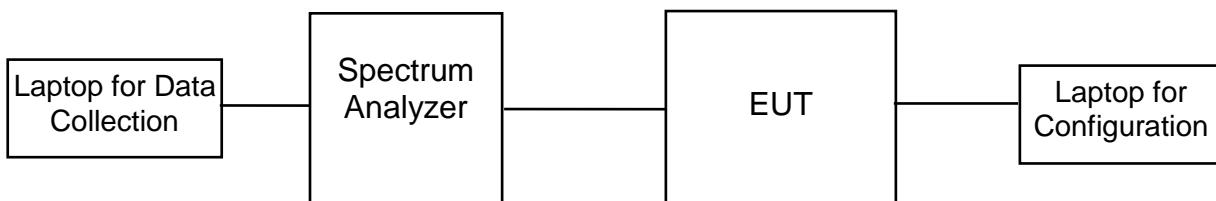
Connection acknowledgements are tested according to ANSI 63.17-2013 subclause 8.2.1.

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 5.2.6 is not implemented.

Test Equipment Setup: The EUT is powered up without a companion device present. The transmission time without an acknowledgement is recorded and plotted via the spectrum analyzer.



| Requirement | Time | Limit | Result |
|-------------------------------------|-------------|-----------|-----------|
| Access Criteria test interval 8.1.1 | ~ 1.28 secs | <=30 secs | Compliant |

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

Test Number: 521-15

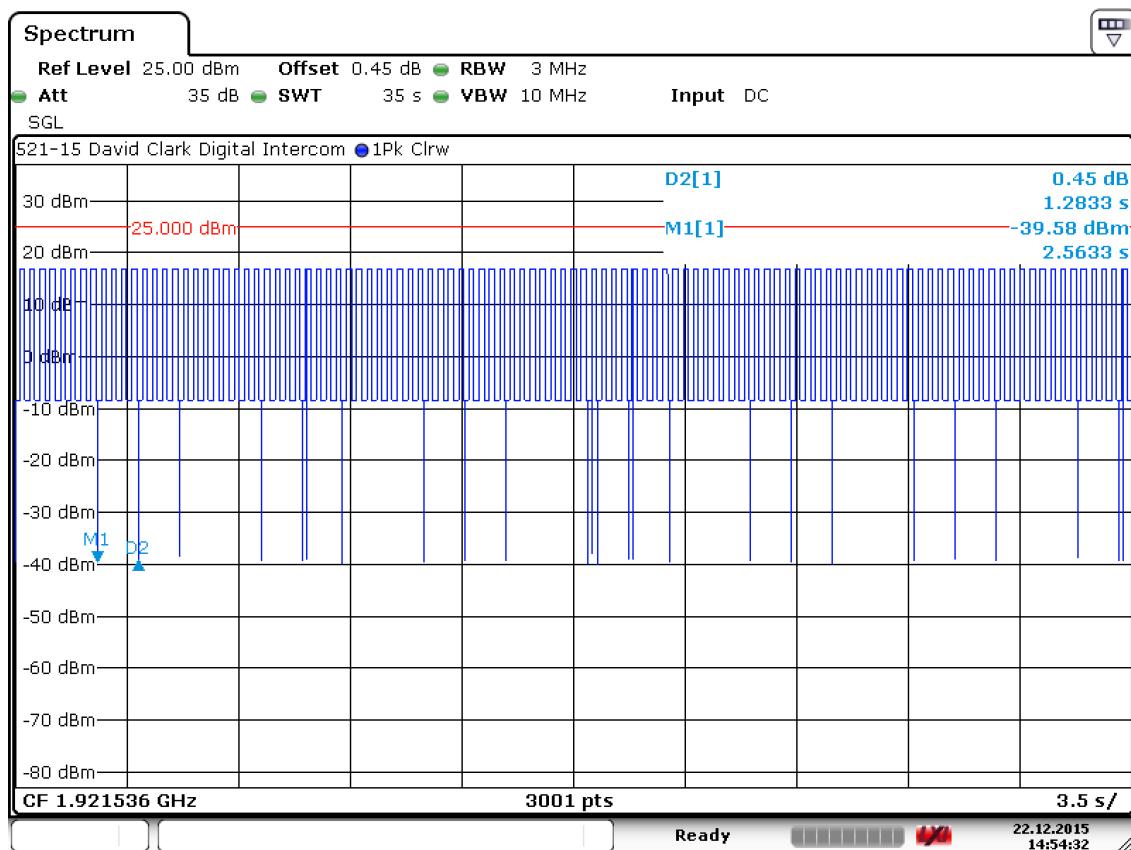
Issue Date: 1/10/2016

6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (cont)

6.11.6 System Acknowledgement (15.323(c) (4), RSS-213 5.2.4

6.11.6.1 Plot of Unacknowledged Transmission



Date: 22.DEC.2015 14:54:32

Test Number: 521-15
Issue Date: 1/10/2016

6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (cont)

6.11.7 Least Interfered Channel (LIC) Selection (15.323(c) (5), RSS-213 5.2.5)

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, each device occupies would occupy 1.448 MHz of spectrum and the maximum number of devices that may be used is 4 totaling 5.95 MHz of aggregate bandwidth.

Upper Threshold: $TU \leq -174 + 10 \log_{10} B + Mu + Pmax - Peut$ (dBm)

B = Emission Bandwidth in Hz

P = Peak Transmit Power (dBm)

Pmax = $5 \log_{10} B - 10$ dBm

Calculated Thresholds:

| | dBm |
|----------------------------|--------|
| TL: Lower Threshold | N/A |
| TU: Upper Threshold | -60.42 |

Limits:

| | |
|--------|--|
| Limits | $TLR < TL+ UM = N/A + 6.0 = N/A$ dBm |
| | $TUR < TU+ UM = -60.42 + 6.0 = -54.42$ dBm |

Test Number: 521-15
Issue Date: 1/10/2016

6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (cont)

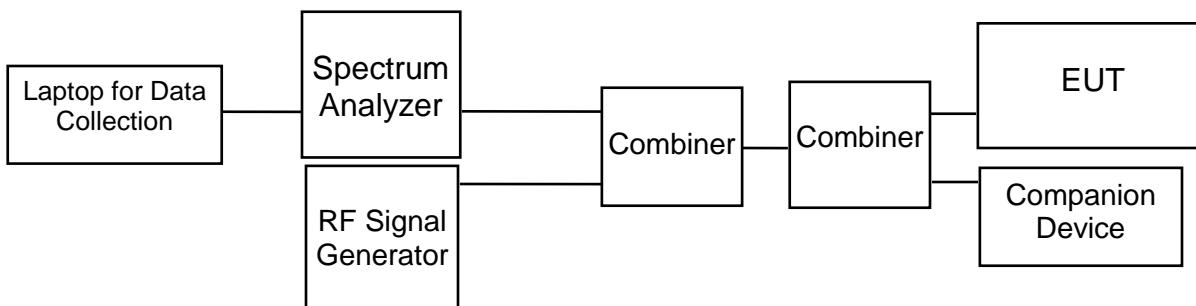
6.11.7 (LIC) Selection (15.323 (c) (5), RSS-213 5.2.5, ANSI C63.17 Sec 7.3.3) (cont)

Test Equipment Setup: The EUT is configured to establish a connection with a companion device. Using a multi carrier RF signal generator interference is created on each of the channels at the Upper Threshold (-54.42 dBm) with one of the channels 6 dB lower than the other four channels. The EUT shall demonstrate the channel move function to the available channel as shown in Plots 6.11.7.1 to 6.11.7.5. Black trace shows the level of the multi-interference signal generator.

The EUT shall be able to distinguish between two low channels, and pick the lower of the two channels (least interfered), this is shown in plot 6.11.7.6.

The other tests were performed per ANSI C63.17:2013 Clause 7.3.2 and documented in the table below.

Each of the tests requires terminating the connection, re-establishing the connection and repeating the test 5 times.



Result: Compliant

| ANSI C63.17 clause 7.3.3 reference | Observation | Result |
|--|---|-----------|
| a) Uniform Interference except f1 & f2 | Transmission always moves to lowest interfered channel f1 | Compliant |
| b) f1 TL + 13 dB, f2 TL + 6 dB | Transmission always on f2 | Compliant |
| c) f1 TL + 6 dB, f2 TL + 13 dB | Transmission always on f1 | Compliant |
| d) f1 TL + 7 dB, f2 TL | Transmission always on f2 | Compliant |
| e) f1 TL, f2 at TL + 7 dB | Transmission always on f1 | Compliant |

Test Number: 521-15

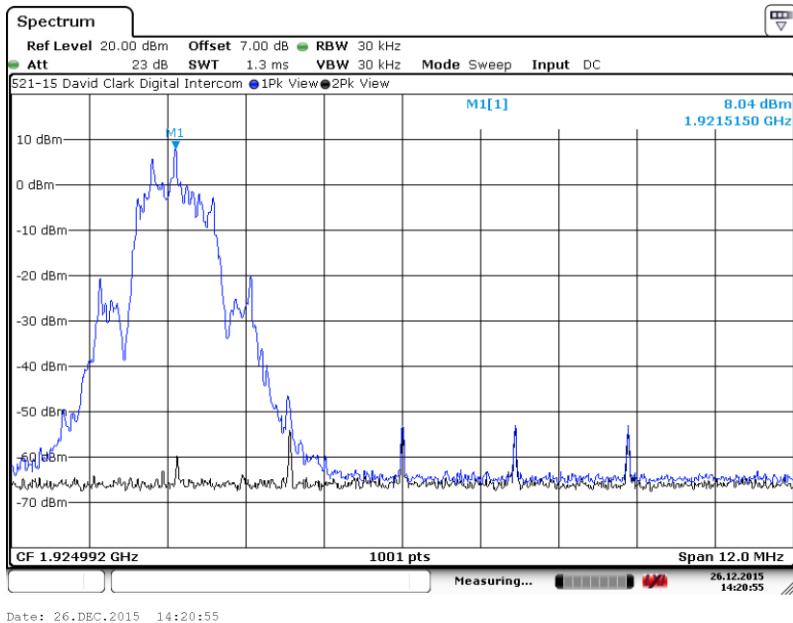
Issue Date: 1/10/2016

6. Measurement Data (continued)

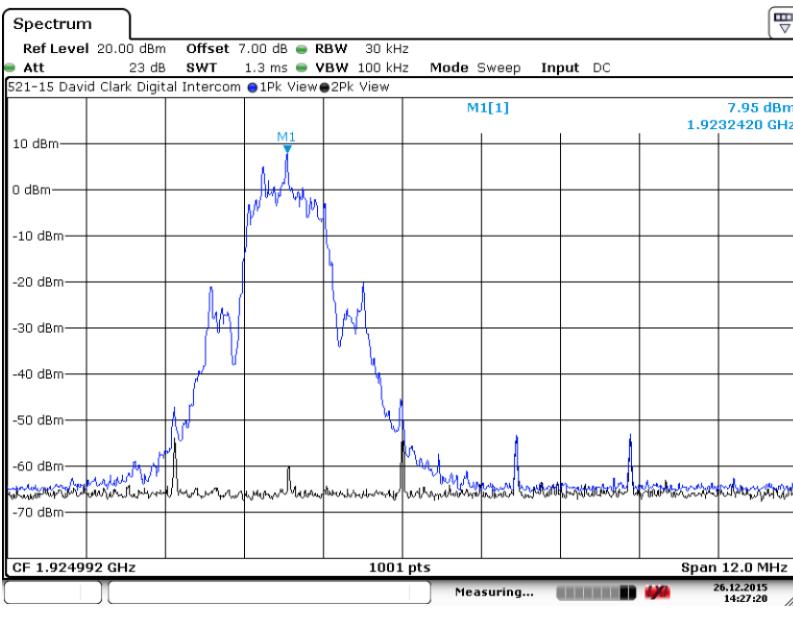
6.11 Specific Requirements to UPCS Devices (cont)

6.11.7 (LIC) Selection (15.323(c) (5), RSS-213 5.2.5 (cont)

6.11.7.1 Plot Showing Least Interfered Channel Transmission on Channel 4



6.11.7.2 Plot Showing Least Interfered Channel Transmission on Channel 3



Test Number: 521-15

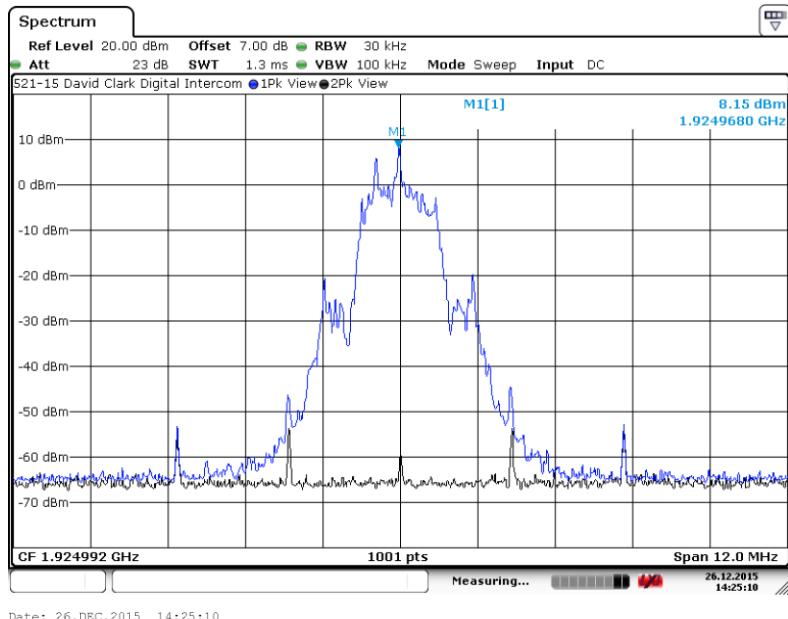
Issue Date: 1/10/2016

6. Measurement Data (continued)

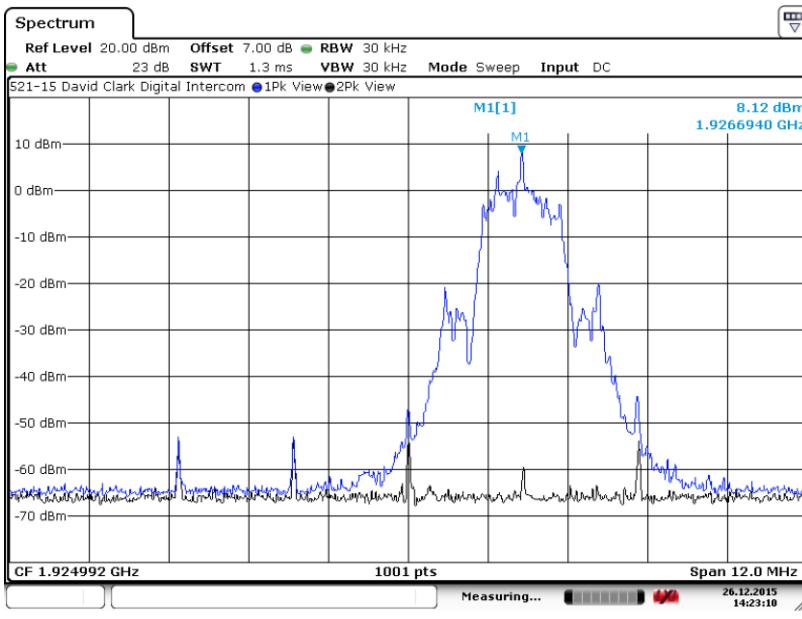
6.11 Specific Requirements to UPCS Devices (cont)

6.11.7 (LIC) Selection (15.323(c) (5), RSS-213 5.2.5 (cont)

6.11.7.3 Plot Showing Least Interfered Channel Transmission on Channel 2



6.11.7.4 Plot Showing Least Interfered Channel Transmission on Channel 1



Test Number: 521-15

Issue Date: 1/10/2016

6. Measurement Data (continued)

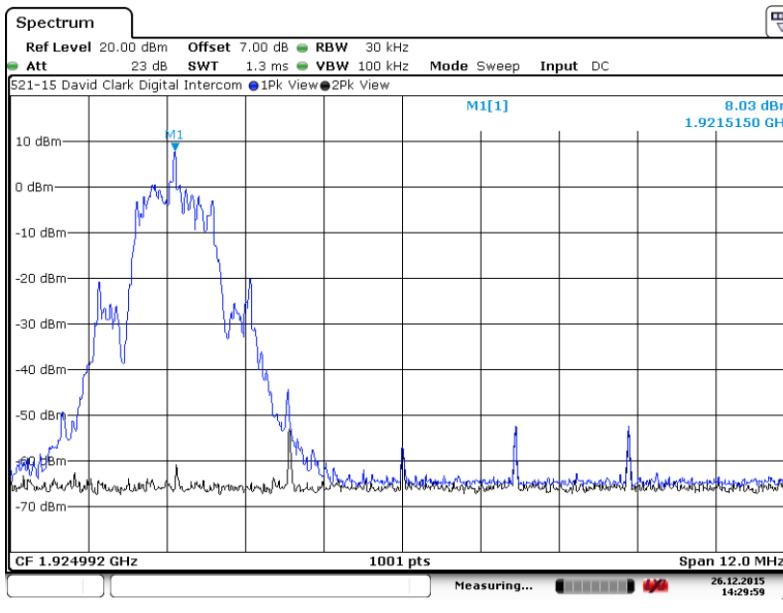
6.11 Specific Requirements to UPCS Devices (cont)

6.11.7 (LIC) Selection (15.323(c) (5), RSS-213 5.2.5 (cont)

6.11.7.5 Plot Showing Least Interfered Channel Transmission on Channel 0



6.11.7.6 Plot demonstrating when Ch 4 is lower than Ch 2, EUT Transmits on Ch 4



Test Number: 521-15

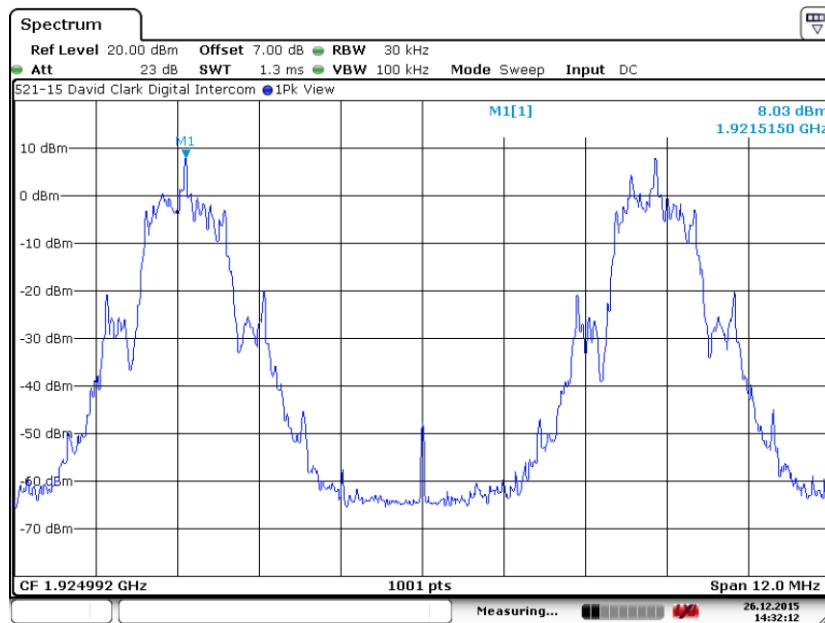
Issue Date: 1/10/2016

6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (cont)

6.11.7 (LIC) Selection (15.323(c) (5), RSS-213 5.2.5 (cont)

6.11.7.5 Plot Showing Channel Move Function from Channel 4 to Channel 0



Date: 26.DEC.2015 14:32:12

Test Number: 521-15

Issue Date: 1/10/2016

6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (cont)

6.11.7 (LIC) Selection (15.323(c) (5), RSS-213 5.2.5, ANSI 63.17 Sec 7.3.2 (b)

Requirement: By a multi-carrier interference generator, apply to the EUT uniform CW interference on all system carriers each at level $TU + UM + 10$ dB. Lower the interference uniformly on all carriers until the EUT can transmit. If the EUT first transmits at a per-carrier interference level greater than $TU + UM$, the EUT fails the test.

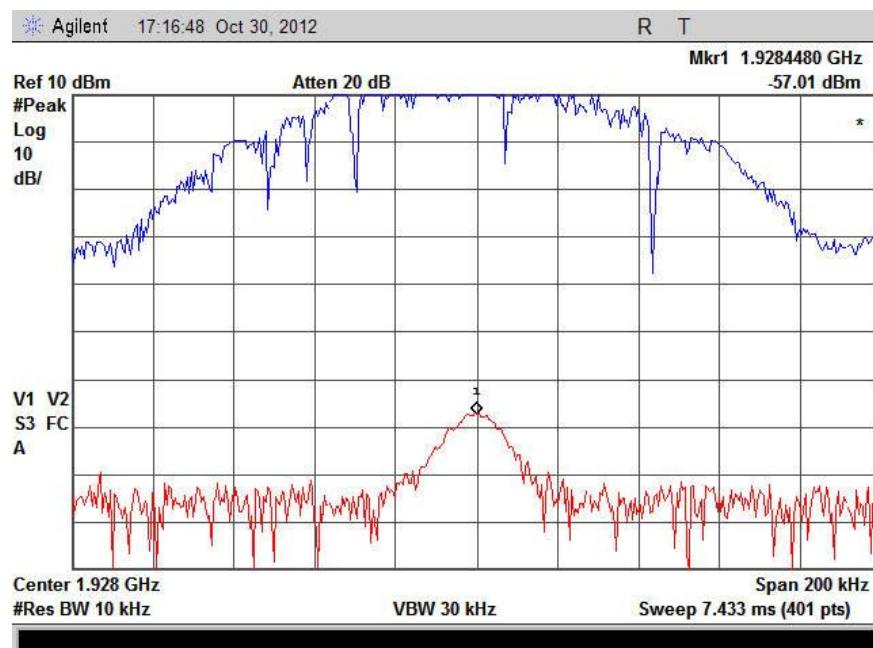
$TU = -61.25$ dBm

$UM = 6$ dBm

$TUR = -55.25$ dBm

Result: Compliant the EUT starts transmitting at -57.01 dBm

6.11.7.8 Upper Threshold Measurement for EUTs that implement LIC procedure



Test Number: 521-15
Issue Date: 1/10/2016

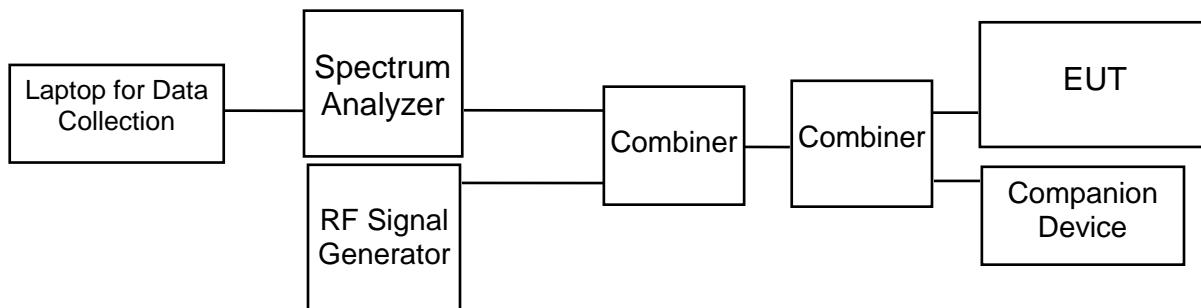
6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (cont)

6.11.7 (LIC) Selection (15.323(c) (5), RSS-213 5.2.5, ANSI 63.17 Sec 7.3.3

Requirement: The EUT shall make its channel selection decision based upon a recent power level reading using the procedure documented in ANSI C63.17:2013 Section 7.3.3.

Test Equipment Setup:



Result: Compliant

| ANSI C63.17 clause 7.3.4 reference | Observation | Result |
|------------------------------------|---------------------|-----------|
| b) EUT Shall Not Transmit on f1 | EUT transmits on f2 | Compliant |
| d) EUT Shall Not Transmit on f2 | EUT transmits on f1 | Compliant |

Test Number: 521-15

Issue Date: 1/10/2016

6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (cont)

6.11.8 Random waiting (15.323(c) (6), RSS-213 5.2.6

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.

Test Number: 521-15
Issue Date: 1/10/2016

6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (cont)

6.11.9 Monitoring Bandwidth (15.323(c) (7), RSS-213 5.2.7

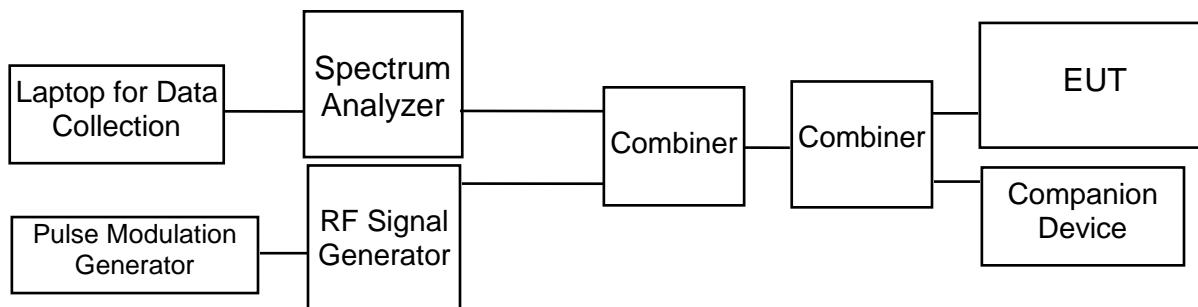
Requirement: The monitoring system bandwidth must be equal to or greater than the occupied bandwidth of the intended transmission.

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 $50\sqrt{1.25 / \text{occupied bandwidth in MHz}}$ 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 $35\sqrt{1.25 / \text{occupied bandwidth in MHz}}$ microseconds but shall not be required to be less than 35 microseconds.

Test Equipment Setup: Using a multi carrier RF signal generator in conjunction with a pulse modulation generator, interference is generated on all 5 modulated carrier frequencies using 35 μ s and 50 μ s pulsed signals. The EUT shall not connect in the presence of these signals.



| Pulse Width | Connection |
|--|------------|
| 50 μ s or $50 * \sqrt{1.25/B}$ μ s | no |
| 35 μ s or $35 * \sqrt{1.25/B}$ μ s | no |

Result: Compliant, the EUT does not connect in the presence of 35 μ s and/or 50 μ s pulsed modulated carriers.

Test Number: 521-15

Issue Date: 1/10/2016

6. Measurement Data (continued)

6.11 Specific Requirements to UPCS Devices (cont)

6.11.10 Monitoring Antenna (15.323(c) (8), RSS-213 5.2.8

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 antennas.

6.11.11 Monitoring Threshold Relaxation (15.323(c) (9), RSS-213 5.2.9

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) / 5.2.5.

6.11.12 Duplex Connections (15.323(c) (10), RSS-213 5.2.10

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.

Test Number: 521-15

Issue Date: 1/10/2016

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 5.2.11

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.

6.11.14 Fair Access (15.323(c) (12), RSS-213 5.2.12

Requirement: The provisions of Part 15.323 (c) (10) or (c) (11) and/or RSS-213 5.2.10 or 5.2.11 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.

Test Number: 521-15
Issue Date: 1/10/2016

6. Measurement Data (continued)

6.12. Public Exposure to Radio Frequency Energy Levels (15.319 (i), 1.1307 (b)(1))

RSS-GEN 3.2, RSS 102

6.12.1. MPE Power Density Table

| Channel | MPE Distance (cm) | DUT Output Power (dBm) | DUT Antenna Gain (dBi) | Power Density | | Limit (mW/cm2) | Result |
|-------------|-------------------|------------------------|------------------------|---------------|--------|----------------|-----------|
| | | | | (mW/cm2) | (W/m2) | | |
| ANT0 | (1) | (2) | (3) | (4) | | (5) | |
| TX4 | 20 | 18.80 | 2.13 | 0.025 | 0.246 | 1 | Compliant |
| TX2 | 20 | 18.83 | 2.13 | 0.025 | 0.248 | 1 | Compliant |
| TX0 | 20 | 18.82 | 2.13 | 0.025 | 0.248 | 1 | Compliant |
| ANT1 | | | | | | | |
| TX4 | 20 | 18.30 | 2.13 | 0.022 | 0.220 | 1 | Compliant |
| TX2 | 20 | 18.35 | 2.13 | 0.022 | 0.222 | 1 | Compliant |
| TX0 | 20 | 18.37 | 2.13 | 0.022 | 0.223 | 1 | Compliant |

$$PD = \frac{OP + AG}{(4 \times \pi \times d^2)}$$

PD = Power Density

OP = DUT Output Power (dBm)

AG = Antenna Gain (dBi)

D = MPE Distance

1. Reference CFR 2.1093(b): For purposes of this section, a portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user.
2. Section 6.3 of this test report.
3. Data supplied by the client.
4. Power density is calculated from conducted power output measurement and antenna gain.
5. Reference CFR 1.1310, Table 1: Limits for Maximum Permissible Exposure (MPE), Section (B): Limits for General Population/Uncontrolled Exposure.

Test Number: 521-15
Issue Date: 1/10/2016

6. Measurement Data (continued)

6.12. Public Exposure to Radio Frequency Energy Levels (15.319 (i), 1.1307 (b)(1))

RSS-GEN 3.2, 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) | | |
| TX4 | 1921.536 | 18.80 | 2.13 | 123.88 | 4.72 | 2297.82 | Compliant |
| TX2 | 1924.992 | 18.83 | 2.13 | 124.74 | 4.75 | 2300.65 | Compliant |
| TX0 | 1928.448 | 18.82 | 2.13 | 124.45 | 4.74 | 2303.47 | Compliant |

| | | | | | | | |
|-----|----------|-------|------|--------|------|---------|-----------|
| TX4 | 1921.536 | 18.30 | 2.13 | 110.41 | 4.21 | 2297.82 | Compliant |
| TX2 | 1924.992 | 18.35 | 2.13 | 111.69 | 4.26 | 2300.65 | Compliant |
| TX0 | 1928.448 | 18.37 | 2.13 | 112.20 | 4.27 | 2303.47 | Compliant |

NOTE: Although the peak power is over the general exposure limit, the time averaged power is very small for DECT technology. In this case a nominal frame width of 381.0 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 $10 * \log (0.381 / 10)$ or -14.19 dB

RSS-102 Section 2.5, 2.5.1 & 2.5.2 Requirements:

2.5 - 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).

2.5.1 - 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 at or below the limits in Table 1:

| Frequency (MHz) = 1900 | | Exemption Limits (mW) | | |
|---------------------------------|---------------------------------|---------------------------------|---------------------------------|----------------------------------|
| At separation distance of ≤5 mm | At separation distance of 10 mm | At separation distance of 15 mm | At separation distance of 20 mm | At separation distance of 25 mm |
| 7 mW | 10 mW | 18 mW | 34 mW | 60 mW |
| At separation distance of 30 mm | At separation distance of 35 mm | At separation distance of 40 mm | At separation distance of 45 mm | At separation distance of ≥50 mm |
| 99 mW | 153 mW | 225 mW | 316 mW | 431 mW |

2.5.2 - RF exposure evaluation is required if the separation distance between the user and the device's radiating element is greater than 20 cm, except when the device operates as follows:

at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz

Test Number: 521-15

Issue Date: 1/10/2016

7. Test Images

7.1. Radiated Emissions – Front 150 kHz to 1 GHz



Test Number: 521-15

Issue Date: 1/10/2016

7. Test Images

7.2. Radiated Emissions – Rear Below 30 MHz



Test Number: 521-15

Issue Date: 1/10/2016

7. Test Images

7.3. Radiated Emissions – Rear 30 MHz to 1 GHz



Test Number: 521-15

Issue Date: 1/10/2016

7. Test Images

7.4. Radiated Emissions – Front Above 1 GHz



Test Number: 521-15

Issue Date: 1/10/2016

7. Test Images

7.5. Radiated Emissions – Rear 1 to 18 GHz



Test Number: 521-15

Issue Date: 1/10/2016

7. Test Images

7.6. Radiated Emissions – Rear 18 to 20 GHz



Test Number: 521-15

Issue Date: 1/10/2016

7. Test Images

7.7. Conducted Emissions (Front)



Test Number: 521-15

Issue Date: 1/10/2016

7. Test Images

7.8. Conducted Emissions (Rear)





Test Number: 521-15



Issue Date: 1/10/2016

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.