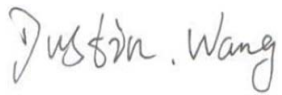




RF TEST REPORT



Report No.: 15070077-FCC-R1-PP

Supersede Report No.: N/A

| | | |
|--|---|---|
| Applicant | DASAN ELECTRON | |
| Product Name | Wireless Headset | |
| Model No. | DW-779H | |
| Serial No. | N/A | |
| Test Standard | FCC Part 15 Subpart D: 2014; ANSI C63.4: 2014; ANSI C63.17: 2013 | |
| Test Date | March 05 to April 03, 2015 | |
| Issue Date | April 03, 2015 | |
| Test Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail | |
| Equipment complied with the specification | <input checked="" type="checkbox"/> | |
| Equipment did not comply with the specification | <input type="checkbox"/> | |
|  |  |  |
| Dustin Wang Test Engineer | Alex Liu Checked By | |
| <p>This test report may be reproduced in full only Test result presented in this test report is applicable to the tested sample only</p> | | |

Issued by:

SIEMIC (SHENZHEN-CHINA) LABORATORIES

Zone A, Floor 1, Building 2 Wan Ye Long Technology Park

South Side of Zhoushi Road, Bao' an District, Shenzhen, Guangdong China 518108

Phone: +86 0755 2601 4629801 Email: China@siemic.com.cn

Laboratories Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.



In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

Accreditations for Conformity Assessment

| Country/Region | Scope |
|----------------|------------------------------------|
| USA | EMC, RF/Wireless, SAR, Telecom |
| Canada | EMC, RF/Wireless, SAR, Telecom |
| Taiwan | EMC, RF, Telecom, SAR, Safety |
| Hong Kong | RF/Wireless, SAR, Telecom |
| Australia | EMC, RF, Telecom, SAR, Safety |
| Korea | EMI, EMS, RF, SAR, Telecom, Safety |
| Japan | EMI, RF/Wireless, SAR, Telecom |
| Singapore | EMC, RF, SAR, Telecom |
| Europe | EMC, RF, SAR, Telecom, Safety |

| | |
|-------------|--------------------|
| Test Report | 15070077-FCC-R1-PP |
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1. Report Revision History

| Report No. | Report Version | Description | Issue Date |
|--------------------|----------------|-------------|----------------|
| 15070077-FCC-R1-PP | NONE | Original | April 03, 2015 |
| | | | |
| | | | |
| | | | |
| | | | |

2. Customer information

| | |
|----------------------|--|
| Applicant Name | DASAN ELECTRON |
| Applicant Address | 606, GODOWHADONG, KYUNGGI TECHONO PARK 1271-11, SA-DONG, ANSAN-SI, KYUNGGI-DO, ANSAN-SI, South Korea |
| Manufacturer Name | DASAN ELECTRON CO.,LTD |
| Manufacturer Address | #307, P1-dong, Gyunggi Techno Park, 1271-11, Sa-dong, Sangnok-Gu, Ansan-si, Gyunggi-Do, 426-901, KOREA |

3. Test site information

| | |
|----------------------|--|
| Lab performing tests | SIEMIC (Shenzhen-China) LABORATORIES |
| Lab Address | Zone A, Floor 1, Building 2 Wan Ye Long Technology Park South Side of Zhoushi Road, Bao' an District, Shenzhen, Guangdong China 518108 |
| FCC Test Site No. | 718246 |
| IC Test Site No. | 4842E-1 |

4. Equipment under Test (EUT) Information

| | |
|-------------------------------|---|
| Description of EUT: | Wireless Headset |
| Main Model: | DW-779H |
| Serial Model: | N/A |
| Date EUT received: | Mar 02, 2015 |
| Test Date(s): | March 05 to April 03, 2015 |
| Antenna Type/Gain: | 0.16 dBi |
| Type of Modulation: | GFSK |
| RF Operating Frequency (ies): | 1921.536 MHz~1928.448 MHz (Tx/Rx) |
| Channel numbers: | 5 |
| ERP/EIRP: | 16.554 dBm |
| Port: | Charging port |
| Hardware Version: | 15.0106.1.4.0 |
| Software Version: | 15.0106.1.0.0 |
| Input Power: | Battery: Model: TDB062035 1501 Standard: 3.7V, 400mAh Charging Limited Voltage: 4.2V |
| Trade Name : | N/A |

5. Test Summary

The product was tested in accordance with the following specifications.

All testing has been performed according to below product classification:

GFSK Modulation Product

Test Results Summary for *PP

| Test Standard | Description | Result |
|---|--|------------|
| FCC part 15.203 | Antenna Requirement | Compliance |
| FCC part 15.315, 15.207(a) | AC Power Line Conducted Emission | N/A |
| FCC part 15.323(a) | Emission Bandwidth | Compliance |
| FCC part 15.319(c) (e) | Peak transmit power | Compliance |
| FCC part 15.319(d) | Power spectral density | Compliance |
| FCC part 15.323(d) | In-band and Out-of-band emissions | Compliance |
| FCC part 15.323(f) | Carrier Frequency Stability | Compliance |
| FCC part 15.323(e) | Frame repetition Stability, period and jitter | Compliance |
| FCC part 15.319(f) | Automatically discontinue transmission | Compliance |
| Specific requirements for devices operating in the 1920-1930MHz sub-band | | |
| FCC part 15.323(c)(1) | Monitoring time | Compliance |
| FCC part 15.323(c)(2)(5) | Monitoring Threshold, Lease Interfered Channel | Compliance |
| FCC part 15.323(c)(7) | Monitoring Threshold Bandwidth | Compliance |
| FCC part 15.323(c)(1)(5)(7) | Reaction Time and Monitoring Interval | Compliance |
| FCC part 15.323(c)(4)(6) | Time and Spectrum Window Access Procedure | Compliance |
| FCC part 15.323(c)(3)(4) | Acknowledgements and Transmission Duration | Compliance |
| FCC part 15.323(c)(10) | Dual Access Criteria Check | N/A** |
| FCC part 15.323(c)(11) | Alternative Monitoring Interval | N/A** |
| FCC part 15.323(c)(12) | Fair Access | N/A** |

All measurement uncertainty is taken into consideration for all presented test result.

Note: *FP: This measurement is necessary only for Fixed Part.

| | |
|-------------|--------------------|
| Test Report | 15070077-FCC-R1-PP |
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*PP: This measurement is necessary only for Portable Part.

N/A**: The manufacturer declares that this device does not use any mechanisms as provided by Part15.323 (c) (10) or (c) (11) to extend the range of spectrum occupied over space or time for the purpose of denying fail access to spectrum to other device.

6. MEASUREMENTS, EXAMINATION AND DERIVED RESULTS

6.1 Antenna Requirement

Applicable Standard

According to FCC § 15.203, 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 with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Antenna Connector Construction

The antenna of EUT is a fixed internal antenna which permanently attached, and the best case gain of the antenna is 0.21dBi.

The antenna meets up with the ANTENNA REQUIREMENT.

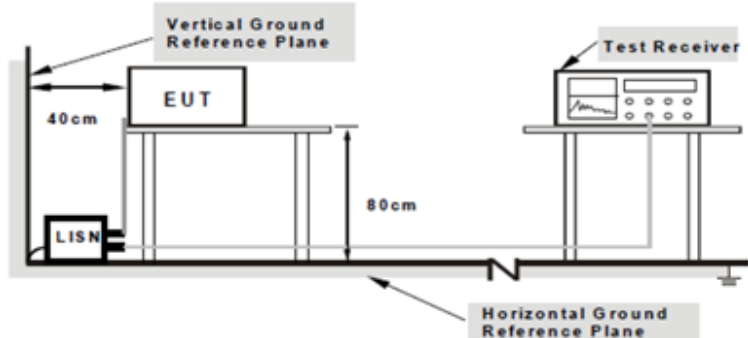
Result: Compliance.

6.2 AC Power Line Conducted Emission

| | |
|----------------------|------------------|
| Temperature | 21°C |
| Relative Humidity | 60% |
| Atmospheric Pressure | 1019mbar |
| Test date : | March 20th, 2015 |
| Tested By : | Dustin Wang |

Requirement(s):

| Spec | Requirement | Applicable | | | | | | | | | | | | | | |
|----------------------------|--|------------------------|--------------|--|----|---------|------------|---------|---------|---------|----|----|--------|----|----|-------------------------------------|
| FCC part 15.315, 15.207(a) | <p>For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 [μ]H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequencies ranges.</p> <table border="1"> <thead> <tr> <th rowspan="2">Frequency ranges (MHz)</th> <th colspan="2">Limit (dBμV)</th> </tr> <tr> <th>QP</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15 ~ 0.5</td> <td>66 – 56</td> <td>56 – 46</td> </tr> <tr> <td>0.5 ~ 5</td> <td>56</td> <td>46</td> </tr> <tr> <td>5 ~ 30</td> <td>60</td> <td>50</td> </tr> </tbody> </table> | Frequency ranges (MHz) | Limit (dBμV) | | QP | Average | 0.15 ~ 0.5 | 66 – 56 | 56 – 46 | 0.5 ~ 5 | 56 | 46 | 5 ~ 30 | 60 | 50 | <input checked="" type="checkbox"/> |
| Frequency ranges (MHz) | Limit (dBμV) | | | | | | | | | | | | | | | |
| | QP | Average | | | | | | | | | | | | | | |
| 0.15 ~ 0.5 | 66 – 56 | 56 – 46 | | | | | | | | | | | | | | |
| 0.5 ~ 5 | 56 | 46 | | | | | | | | | | | | | | |
| 5 ~ 30 | 60 | 50 | | | | | | | | | | | | | | |

| | |
|------------|---|
| Test Setup |  <p>Note: 1.Support units were connected to second LISN. 2.Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.</p> |
|------------|---|

| | |
|----------------|---|
| Test Procedure | <ol style="list-style-type: none"> The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table. The power supply for the EUT was fed through a 50W/50mH EUT LISN, connected to filtered mains. |
|----------------|---|

| | |
|-------------|--------------------|
| Test Report | 15070077-FCC-R1-PP |
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| | |
|--------|--|
| | <ol style="list-style-type: none"> 3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable. 4. All other supporting equipment were powered separately from another main supply. 5. The EUT was switched on and allowed to warm up to its normal operating condition. 6. A scan was made on the NEUTRAL line (for AC mains) or Earth line (for DC power) over the required frequency range using an EMI test receiver. 7. High peaks, relative to the limit line, The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10 kHz. 8. Step 7 was then repeated for the LIVE line (for AC mains) or DC line (for DC power). |
| Remark | BATTERY ONLY |
| Result | <input type="checkbox"/> Pass <input type="checkbox"/> Fail |

Test Data Yes N/A
 Test Plot Yes (See below) N/A

6.3 Emission Bandwidth

| | |
|----------------------|------------------|
| Temperature | 21°C |
| Relative Humidity | 60% |
| Atmospheric Pressure | 1019mbar |
| Test date : | March 20th, 2015 |
| Tested By : | Dustin Wang |

Requirement(s):

| Spec | Requirement | Applicable |
|--------------------|--|-------------------------------------|
| FCC part 15.323(a) | The 26 dB and 99% Bandwidth B shall be larger than 50 kHz and less than 2.5 MHz | <input checked="" type="checkbox"/> |
| Test Setup | <pre> graph LR SA[Spectrum analyzer] --- CS[Combiner/Splitter] CS --- EUT[EUT] CS --- PS[Power source] CS --- CMD60[CMD 60] </pre> | |
| Test method | According to ANSI 63.17: 2013 clause 6.1.3 | |
| Remark | N/A | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail | |

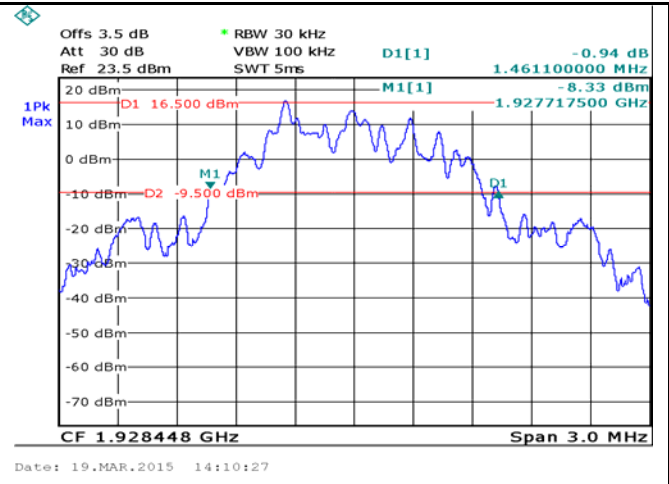
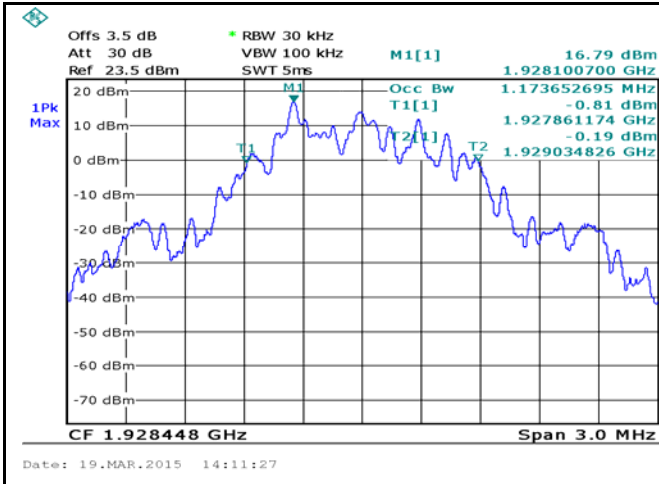
Test Data Yes N/A

Test Plot Yes (See below) N/A

Test data

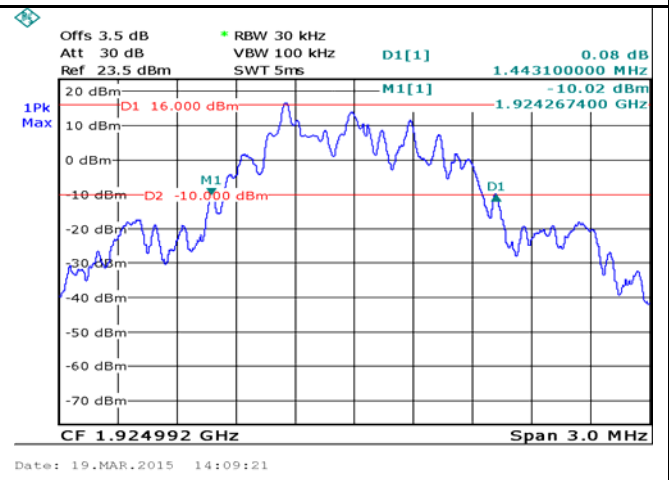
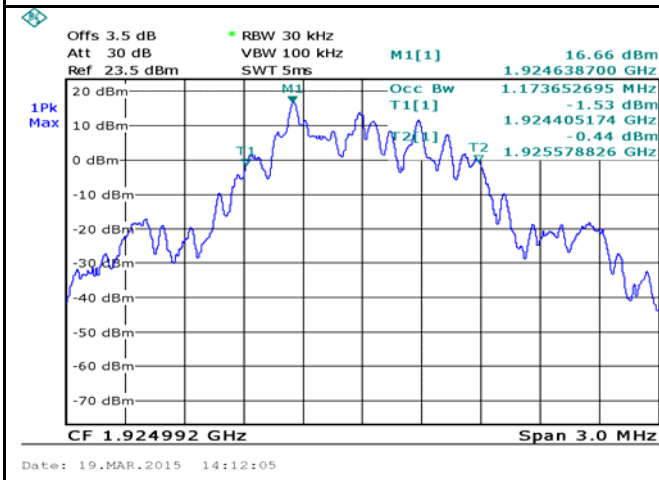
| Channel | Frequency (MHz) | 99% Occupied Bandwidth (MHz) | 26 dB Bandwidth (MHz) |
|---------|-----------------|------------------------------|-----------------------|
| 4 | 1921.536 | 1.1617 | 1.4371 |
| 2 | 1924.992 | 1.1737 | 1.4431 |
| 0 | 1928.448 | 1.1737 | 1.4611 |

Test Plots



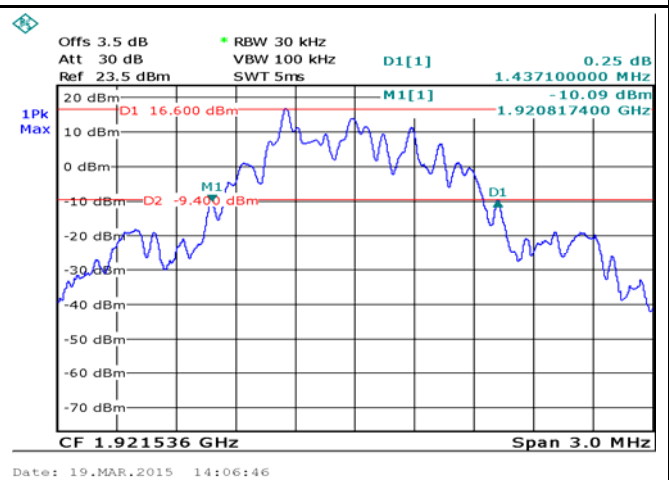
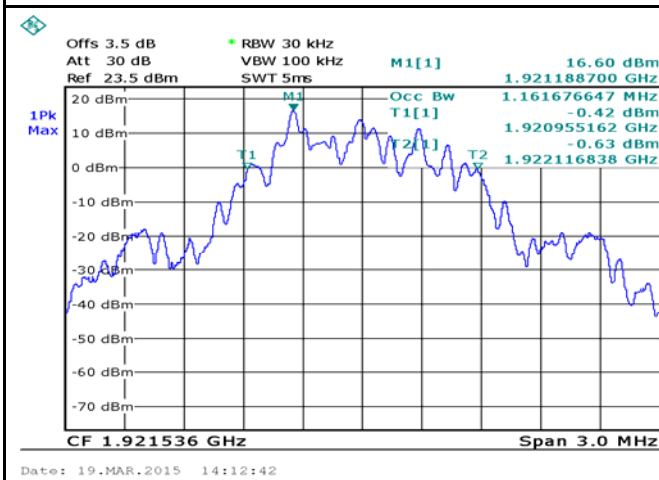
GFSK - Low Channel 99%

GFSK - Low Channel 26dB



GFSK - Middle Channel 99%

GFSK - Middle Channel 26dB



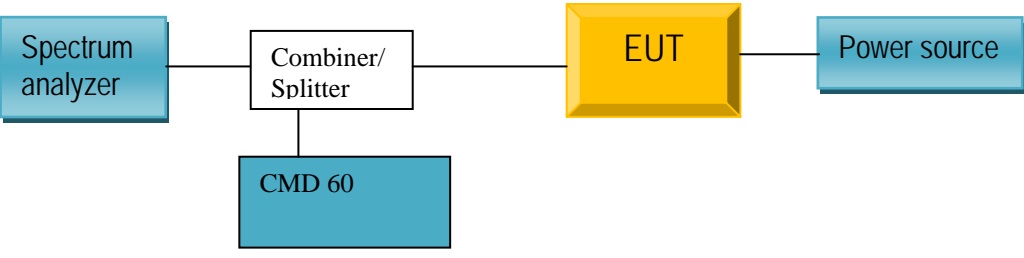
GFSK - High Channel 99%

GFSK - High Channel 26dB

6.4 Peak transmit power

| | |
|----------------------|------------------|
| Temperature | 21°C |
| Relative Humidity | 58% |
| Atmospheric Pressure | 1017mbar |
| Test date : | March 20th, 2015 |
| Tested By : | Dustin Wang |

Requirement(s):

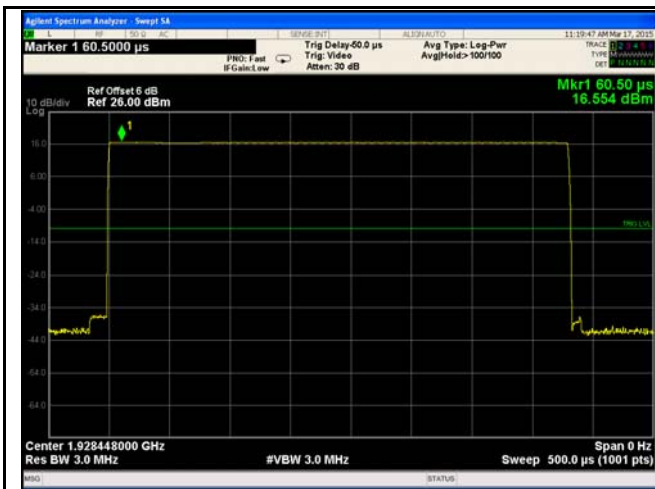
| Spec | Requirement | Applicable |
|---------------------------|--|-------------------------------------|
| FCC part 15.319(c) (e) | Conducted: $100 \mu W \times \text{SQRT}(B)$ where B is the measured Emission Bandwidth in Hz FCC 15.319(c)(e): <u>20.87 dBm (122.23 mW)</u> The antenna gain is below 3 dBi, no reduction in transmit power is necessary | <input checked="" type="checkbox"/> |
| Test Setup |  <pre> graph LR SA[Spectrum analyzer] --- CS[Combiner/Splitter] CS --- CMD60[CMD 60] CS --- EUT[EUT] EUT --- PS[Power source] </pre> | |
| Test Procedure | According to ANSI 63.17: 2013 clause 6.1.2 | |
| Remark | N/A | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail | |

Test Data Yes N/A
 Test Plot Yes (See below) N/A

Test data

| Type | CH | Freq (MHz) | Power (dBm) | Limit (dBm) | Result |
|-------|------|------------|-------------|-------------|--------|
| Power | High | 1921.536 | 16.475 | 20.87 | Pass |
| | Mid | 1924.992 | 16.485 | 20.87 | Pass |
| | Low | 1928.448 | 16.554 | 20.87 | Pass |

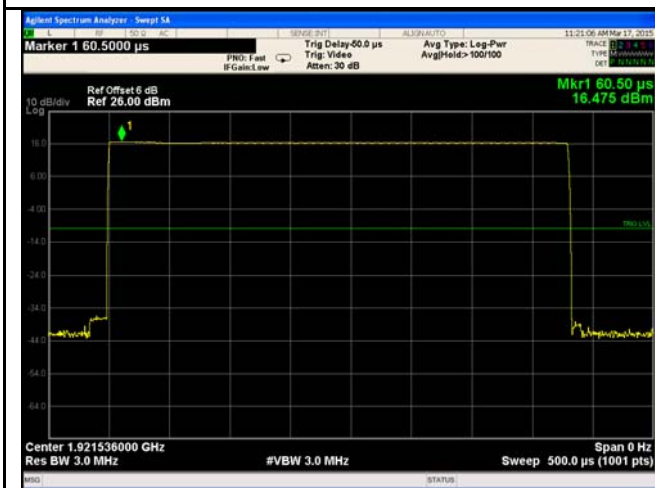
Test Plots



GFSK - Low Channel



GFSK - Middle Channel



GFSK - High Channel

6.5 Power spectral density

| | |
|----------------------|------------------|
| Temperature | 21°C |
| Relative Humidity | 58% |
| Atmospheric Pressure | 1017mbar |
| Test date : | March 20th, 2015 |
| Tested By : | Dustin Wang |

Requirement(s):

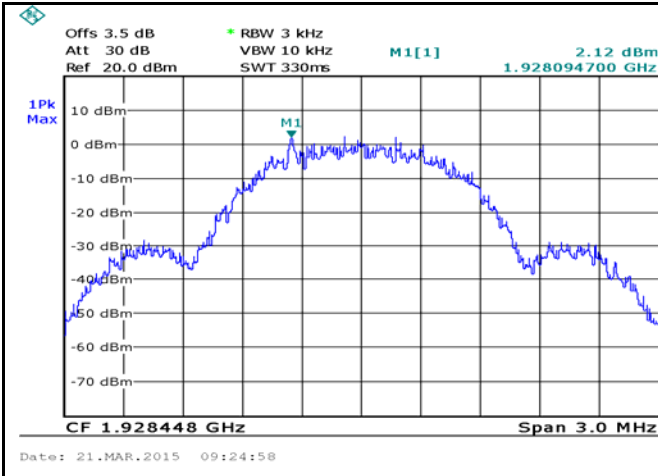
| Spec | Requirement | Applicable |
|-----------------------|--|-------------------------------------|
| FCC part 15.319(d) | The Power Spectral Density shall be less than 3 mW (4.77 dBm) when averaged over at least 100 sweeps. | <input checked="" type="checkbox"/> |
| Test Setup | <pre> graph LR SA[Spectrum analyzer] --- CS[Combiner/Splitter] CS --- EUT[EUT] CS --- PS[Power source] CS --- CMD60[CMD 60] </pre> | |
| Test Procedure | According to ANSI 63.17: 2013 clause 6.1.5 | |
| Remark | N/A | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail | |

Test Data Yes N/A
 Test Plot Yes (See below) N/A

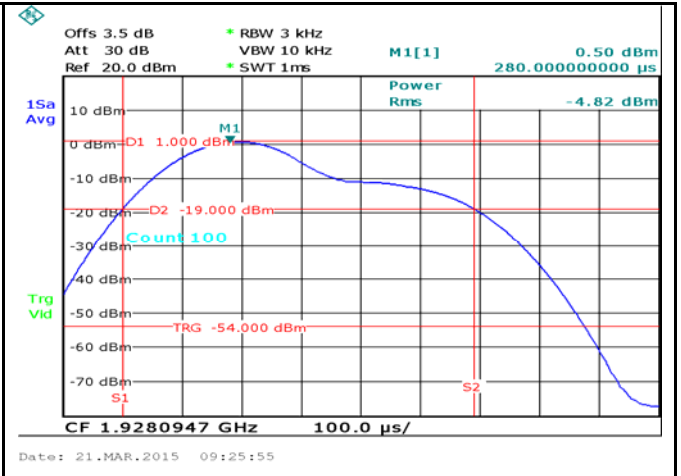
Test data

| Type | CH | Freq (MHz) | PSD (dBm) | Limit (dBm) | Result |
|------|------|------------|-----------|-------------|--------|
| PSD | Low | 1921.536 | -4.82 | 4.77 | Pass |
| | Mid | 1924.992 | -5.52 | 4.77 | Pass |
| | High | 1928.448 | -5.49 | 4.77 | Pass |

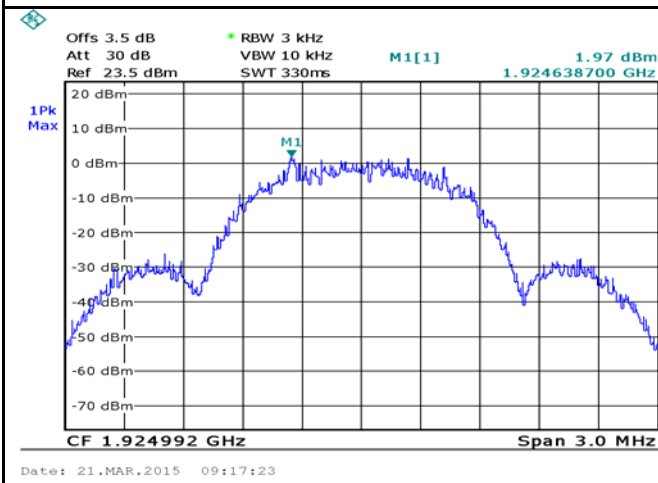
Test Plots



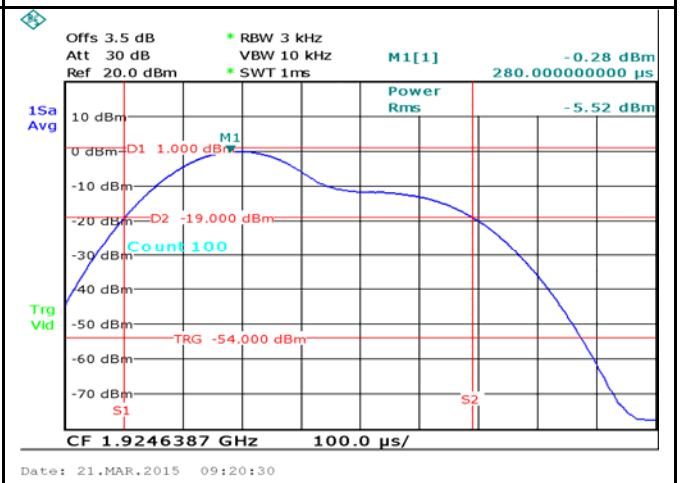
GFSK - Low Channel 1



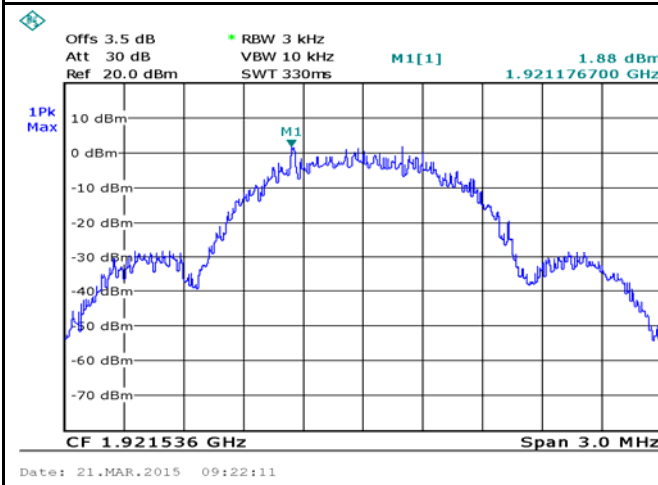
GFSK - Low Channel 2



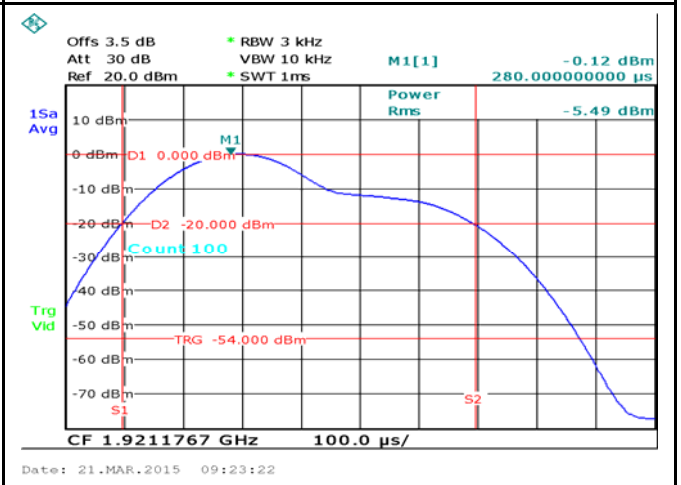
GFSK - Middle Channel 1



GFSK - Middle Channel 2



GFSK - High Channel 1

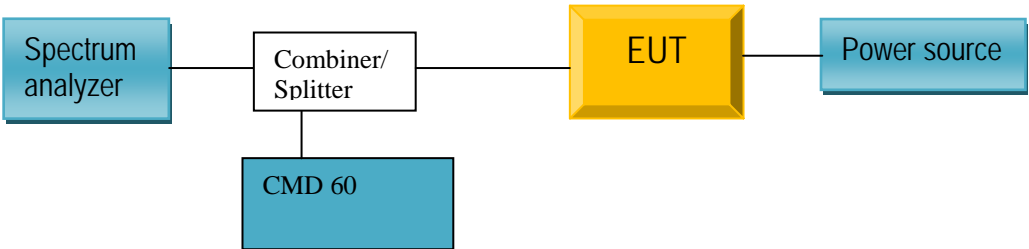


GFSK - High Channel 2

6.6 In-band and Out-of-band emissions

| | |
|----------------------|------------------|
| Temperature | 21°C |
| Relative Humidity | 58% |
| Atmospheric Pressure | 1017mbar |
| Test date : | March 20th, 2015 |
| Tested By : | Dustin Wang |

Requirement(s):

| Spec | Requirement | Applicable |
|--------------------|--|-------------------------------------|
| FCC part 15.323(d) | <p>In-Band Emissions:</p> <p>$B < f \leq 2B$: at least 30 dB below max. permitted peak power</p> <p>$2B < f \leq 3B$: at least 50 dB below max. permitted peak power</p> <p>$3B < f \leq$ UPCS Band Edge: at least 60 dB below max. permitted peak power</p> <p>Out-of-Band Emissions:</p> <p>$f \leq 1.25\text{MHz}$ outside UPCS band: $\leq -9.5\text{dBm}$</p> <p>$1.25\text{MHz} \leq f \leq 2.5\text{MHz}$ outside UPCS band: $\leq -29.5\text{ dBm}$</p> <p>$f \geq 2.5\text{MHz}$ outside UPCS band: $\leq -39.5\text{ dBm}$</p> | <input checked="" type="checkbox"/> |
| Test Setup |  | |
| Test Procedure | According to ANSI 63.17: 2013 clause 6.1.6 | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail | |

Test Data Yes N/A

Test Plot Yes (See below) N/A

Test Plots

In-band emissions



In-band emissions - Low Channel



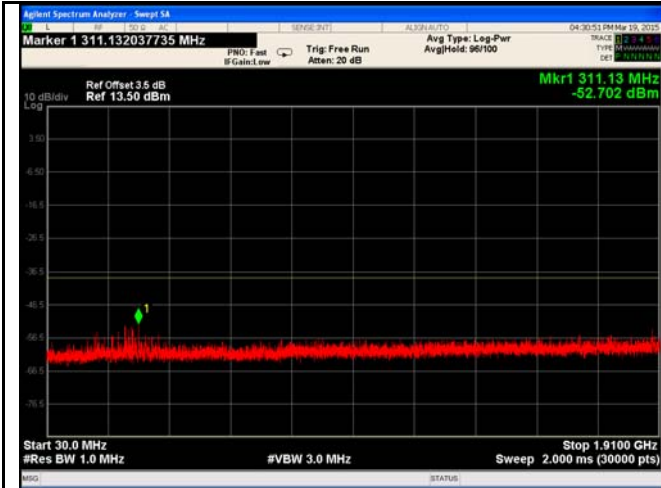
In-band emissions - Middle Channel



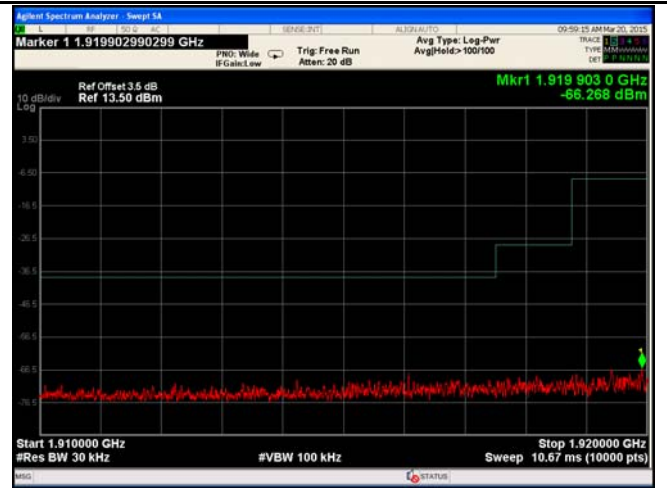
In-band emissions - High Channel

Test Plots

Out of band emissions



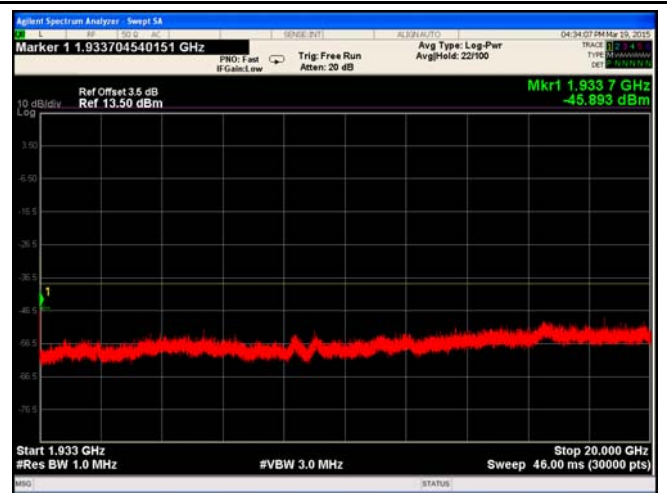
Out of band emission - 30-1915 MHz
 Low Channel



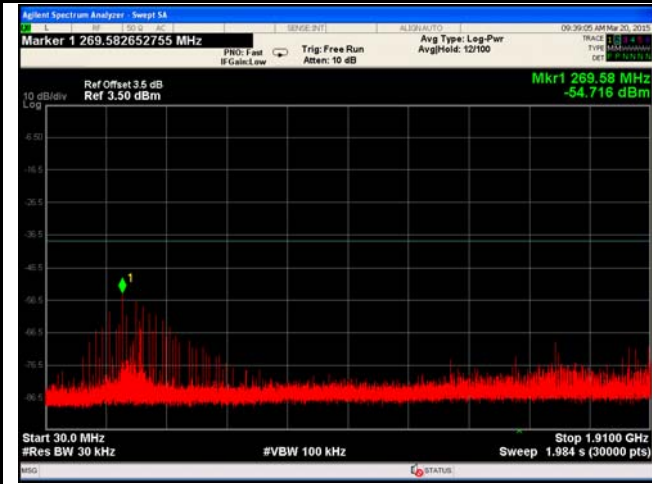
Out of band emission - 1915-1920 MHz
 Low Channel



Out of band emission - 1930-1935 MHz
 Low Channel

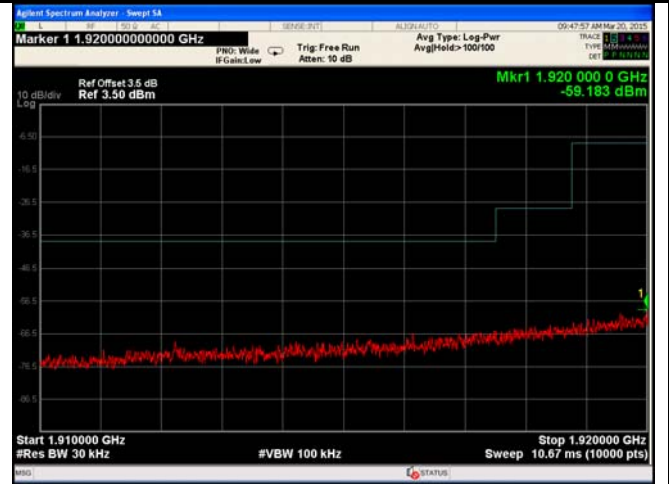


Out of band emission - 1935-20000 MHz
 Low Channel



Out of band emission - 30-1915 MHz

Middle Channel



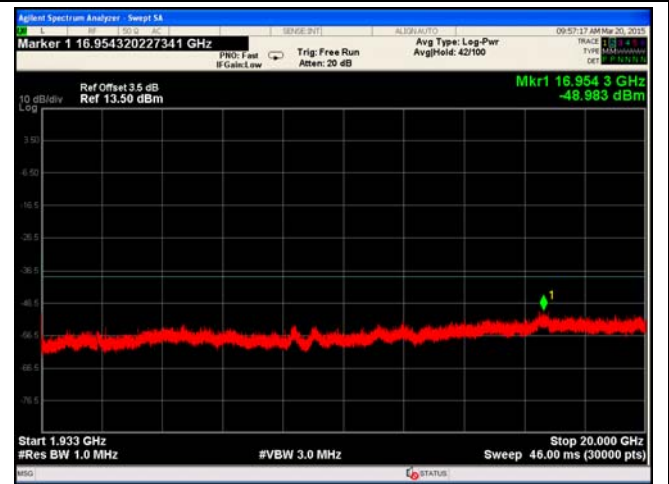
Out of band emission - 1915-1920 MHz

Middle Channel



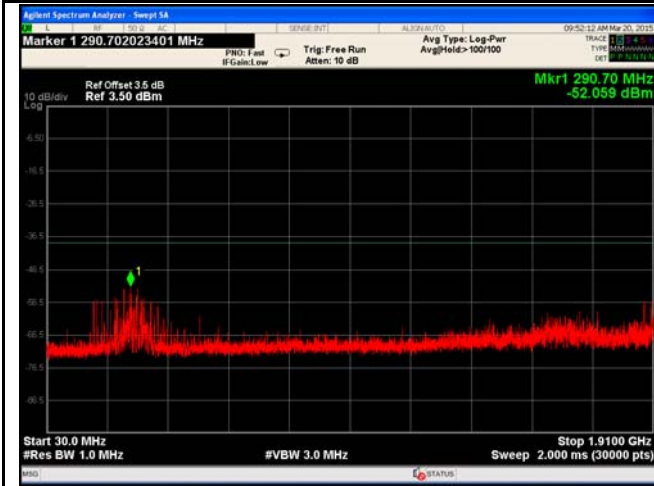
Out of band emission - 1930-1935 MHz

Middle Channel



Out of band emission - 1935-20000 MHz

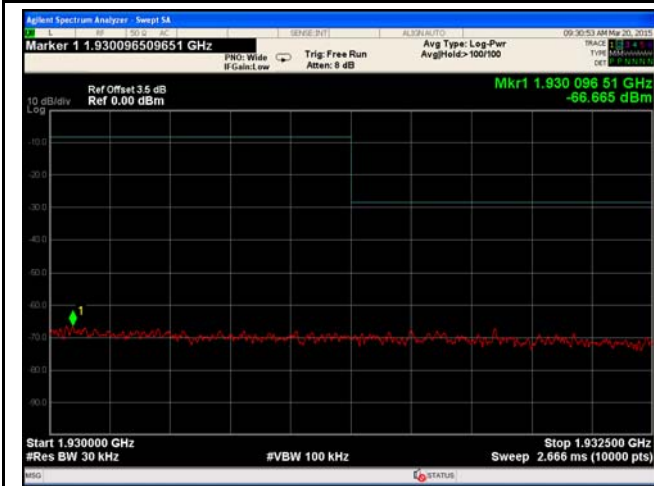
Middle Channel



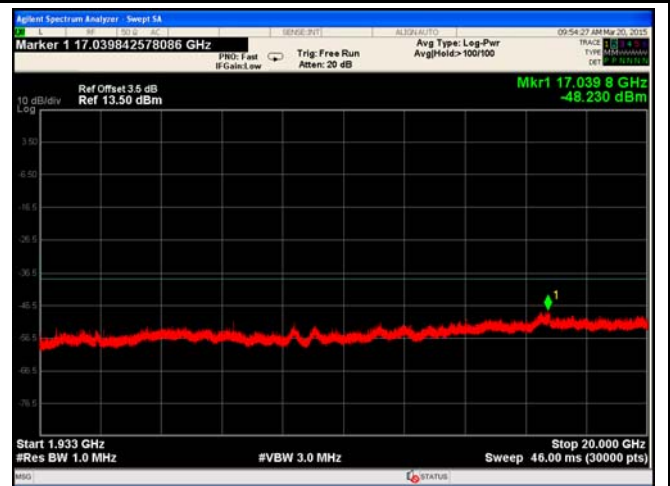
Out of band emission - 30-1915 MHz
 High Channel



Out of band emission - 1915-1920 MHz
 High Channel



Out of band emission - 1930-1935 MHz
 High Channel



Out of band emission - 1935-20000 MHz
 High Channel

Test data:

| | |
|-------------------|--------------------------|
| Test Mode: | Transmitting Mode |
|-------------------|--------------------------|

(Above 1GHz)

Note: Other modes were verified, only the result of worst case basic rate mode was presented.

Low Channel (1928.448 MHz)

| Frequency (MHz) | S.A. Reading (dB μ V) | Detector (PK/AV) | Polarity (H/V) | Ant. Factor (dB/m) | Cable Loss (dB) | Pre-Amp. Gain (dB) | Cord. Amp. (dB μ V/m) | Limit (dB μ V/m) | Margin (dB) |
|-----------------|---------------------------|------------------|----------------|--------------------|-----------------|--------------------|---------------------------|----------------------|-------------|
| 3856.9 | 36.82 | AV | V | 31.66 | 3.86 | 28.72 | 43.62 | 54 | -10.38 |
| 3856.9 | 37.16 | AV | H | 31.66 | 3.86 | 28.72 | 43.96 | 54 | -10.04 |
| 3856.9 | 48.77 | PK | V | 31.66 | 3.86 | 28.72 | 55.57 | 74 | -18.43 |
| 3856.9 | 47.24 | PK | H | 31.66 | 3.86 | 28.72 | 54.04 | 74 | -19.96 |

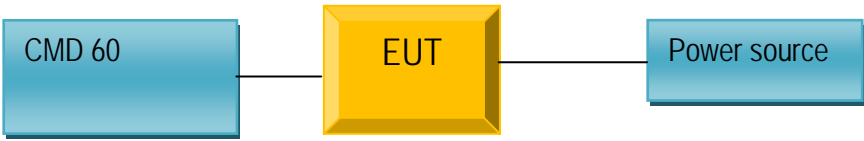
High Channel (1921.536 MHz)

| Frequency (MHz) | S.A. Reading (dB μ V) | Detector (PK/AV) | Polarity (H/V) | Ant. Factor (dB/m) | Cable Loss (dB) | Pre-Amp. Gain (dB) | Cord. Amp. (dB μ V/m) | Limit (dB μ V/m) | Margin (dB) |
|-----------------|---------------------------|------------------|----------------|--------------------|-----------------|--------------------|---------------------------|----------------------|-------------|
| 3843.07 | 37.99 | AV | V | 31.66 | 3.86 | 28.72 | 44.79 | 54 | -9.21 |
| 3843.07 | 36.45 | AV | H | 31.66 | 3.86 | 28.72 | 43.25 | 54 | -10.75 |
| 3843.07 | 47.92 | PK | V | 31.66 | 3.86 | 28.72 | 54.72 | 74 | -19.28 |
| 3843.07 | 46.34 | PK | H | 31.66 | 3.86 | 28.72 | 53.14 | 74 | -20.86 |

6.7 Carrier Frequency Stability

| | |
|----------------------|------------------|
| Temperature | 21°C |
| Relative Humidity | 58% |
| Atmospheric Pressure | 1017mbar |
| Test date : | March 20th, 2015 |
| Tested By : | Dustin Wang |

Requirement(s):

| Spec | Requirement | Applicable |
|-----------------------|---|-------------------------------------|
| FCC part 15.323(f) | ±10 ppm | <input checked="" type="checkbox"/> |
| Test Setup |  | |
| Test Procedure | According to ANSI 63.17: 2013 clause 6.2.1 | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail | |

Test Data Yes N/A
 Test Plot Yes (See below) N/A

Test Data:

Frequency Stability over Power Supply Voltage at Nominal Temperature

| Voltage | Channel Frequency | Difference | Deviation | Limits |
|--------------|-------------------|------------|-----------|---------|
| Vnom | 1924.992 MHz | 3 kHz | 0.99 ppm | ±10 ppm |
| 85% of Vnom | 1924.992 MHz | -2 kHz | 0.97 ppm | |
| 115% of Vnom | 1924.992 MHz | 4 kHz | 1.02 ppm | |

Note: Deviation ppm = ((Mean - Measured Frequency) / Mean) x 10⁶


Frequency Stability over Temperature

| Temp. | Channel Frequency | Difference | Deviation | Limits |
|-------|-------------------|------------|-----------|---------|
| +20°C | 1924.992 MHz | 3 kHz | 0.99 ppm | ±10 ppm |
| -20°C | 1924.992 MHz | -3 kHz | 1.10 ppm | |
| +50°C | 1924.992 MHz | 5 kHz | 1.12 ppm | |

6.8 Frame repetition Stability, period and jitter

| | |
|----------------------|------------------|
| Temperature | 21°C |
| Relative Humidity | 58% |
| Atmospheric Pressure | 1017mbar |
| Test date : | March 20th, 2015 |
| Tested By : | Dustin Wang |

Requirement(s):

| Spec | Requirement | Applicable |
|-----------------------|--|-------------------------------------|
| FCC part 15.323(e) | ±10 ppm for Frame Repetition Stability, 20 or 10 ms for frame period, 25 μ s for max jitter. | <input checked="" type="checkbox"/> |
| Test Setup |  <pre> graph LR A[CMD 60] --- B[EUT] B --- C[Power source] </pre> | |
| Test Procedure | According to ANSI 63.17: 2013 clause 6.2.2 | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail | |

Test Data Yes N/A
 Test Plot Yes (See below) N/A

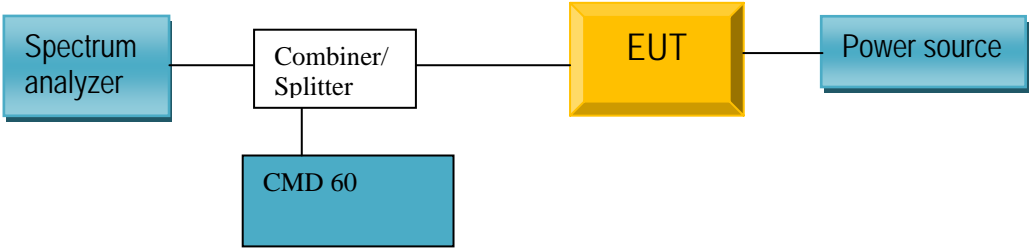
Test Data:

| Carrier Frequency (MHz) | Frame repetition (ppm) | Frame period (ms) | Max. pos. jitter (μ s) | Max. neg.jiter (μ s) |
|-------------------------|------------------------|-------------------|------------------------|----------------------|
| 1924.992 | 2.01 | 10 | 0.13 | -0.01 |

6.9 Automatically discontinue transmission

| | |
|----------------------|------------------|
| Temperature | 21°C |
| Relative Humidity | 58% |
| Atmospheric Pressure | 1017mbar |
| Test date : | March 20th, 2015 |
| Tested By : | Dustin Wang |

Requirement(s):

| Spec | Requirement | Applicable |
|--------------------|---|-------------------------------------|
| FCC part 15.319(f) | The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. The provisions in this section are not intended to preclude transmission of control and signaling information or use of repetitive codes used by certain digital technologies to complete frame or burst intervals. | <input checked="" type="checkbox"/> |
| Test Setup |  <pre> graph LR SA[Spectrum analyzer] --- CS[Combiner/Splitter] CS --- EUT[EUT] CS --- PS[Power source] CS --- CMD60[CMD 60] </pre> | |
| Test Procedure | | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail | |

Test Data Yes N/A
Test Plot Yes (See below) N/A

Measurement Data:

The EUT is a responding device, and can transmit control and signaling information. The following tests simulate the reaction of the EUT in case of either absence of information to transmit or operational failure after a connection with the companion device is established.

| Number | Test Items | EUT Reaction | Verdict |
|--------|-------------------------------------|--------------|---------|
| 1 | Power removed from EUT | A | Pass |
| 2 | Switch off EUT | N/A | Pass |
| 3 | Hook-on by EUT | N/A | Pass |
| 4 | Power removed from companion device | B | Pass |
| 5 | Switch off companion device | B | Pass |
| 6 | Hook-on by companion device | B | Pass |

A - Connection breakdown, cease of all transmissions

B - Connection breakdown, EUT transmits control and signaling information

C - Connection breakdown, companion device transmits control and signaling information

N/A - Not Applicable (EUT does not have On/ Off switch and cannot perform Hook-on)

6.10 Specific requirements for devices operating in the 1920-1930MHz sub-band

6.10.1 Monitoring time

| | |
|----------------------|------------------|
| Temperature | 21°C |
| Relative Humidity | 58% |
| Atmospheric Pressure | 1017mbar |
| Test date : | March 21th, 2015 |
| Tested By : | Dustin Wang |

Requirement(s):

| Spec | Requirement | Applicable |
|------------------------|---|-------------------------------------|
| FCC part 15.323(c) (1) | Immediately prior to initiating transmission, devices must monitor the combined time and spectrum windows in which they intend to transmit for a period of at least 10 milliseconds for systems designed to use a 10 milliseconds or shorter frame period or at least 20 milliseconds for systems designed to use a 20 milliseconds frame period. | <input checked="" type="checkbox"/> |
| Test Setup | <pre> graph LR SA[Spectrum analyzer] --- CS[Combiner/Splitter] CS --- EUT[EUT] CS --- PS[Power source] CS --- CMD60[CMD 60] </pre> | |
| Test Procedure | According to ANSI 63.17: 2013 clause 7.3.4 | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail | |

Test Data Yes N/A
 Test Plot Yes (See below) N/A

Measurement Data:

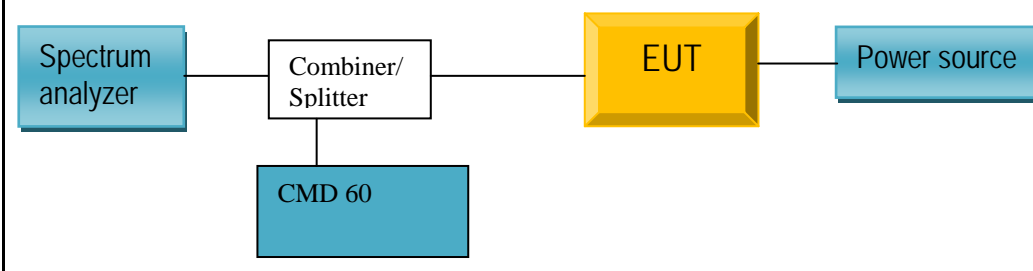
EUT monitors the combined time and spectrum window prior to initiation of transmission. The observation results as below

| Channel Selection | Observation result | Verdict |
|--|------------------------|---------|
| 1. Apply the interference on f1 at level TU +UM, and no interference on f2. Initiate transmission and verify the transmission on f2. | EUT transmission on f2 | Pass |
| 2. Apply interference on f2 at a level of TU + UM, in-band, and immediately remove all interference from f1 and immediately (but not sooner than 20 ms after the interference on f2 is applied) cause the EUT to attempt transmission. | EUT transmission on f1 | Pass |

6.10.2 Monitoring Threshold, Lease Interfered Channel

| | |
|----------------------|------------------|
| Temperature | 21°C |
| Relative Humidity | 58% |
| Atmospheric Pressure | 1017mbar |
| Test date : | March 21th, 2015 |
| Tested By : | Dustin Wang |

Requirement(s):

| Spec | Requirement | Applicable |
|----------------------------|--|-------------------------------------|
| FCC part 15.323(c) (2) (5) | The monitoring threshold must not be more than 30 dB above the thermal noise power for a bandwidth equivalent to the emission bandwidth used by the device. If access to spectrum is not available as determined by the above, and a minimum of 40 duplex system access channels are defined for the system, the time and spectrum windows with the lowest power level below a monitoring threshold of 50 dB above the thermal noise power determined for the emission bandwidth may be accessed. | <input checked="" type="checkbox"/> |
| Test Setup |  <pre> graph LR SA[Spectrum analyzer] --- CS[Combiner/Splitter] CS --- EUT[EUT] CS --- PS[Power source] CS --- CMD60[CMD 60] </pre> | |
| Test Procedure | According to ANSI 63.17: 2013 clause 7.3.1, 7.3.2, 7.3.3 and 7.3.4 | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail | |

Test Data Yes N/A
 Test Plot Yes (See below) N/A

Measurement Data:

Lower threshold: $TL = -174 + 10\log_{10}B + MU + P_{MAX-PEUT}$ (dBm)

Upper threshold: $TU = -174 + 10\log_{10}B + Mu + P_{MAX-PEUT}$ (dBm)

Where: B=Emission bandwidth (Hz)

MU=dB the threshold may exceed thermal noise (30 for TL & 50 for TU)

Calculated values

| Threshold | FCC part 15D | RSS-213 |
|-----------------|--------------|---------|
| Lower threshold | -81.5 | -83.3 |
| Upper threshold | N/A | -63.7 |

The Lower Threshold is applicable for systems which have defined less than 40 duplex system access channels. The Upper Threshold is applicable for systems with more than 40 duplex system access channels and that implements the Least Interfered Channel Procedure (LIC).

Upper Threshold has been removed from FCC 15D but still exists in the current Industry Canada RSS-213.

Limit

| Threshold | FCC part 15D | RSS-213 |
|------------------------|--------------|---------|
| Lower threshold + 6 dB | -75.8 | -77.1 |
| Upper threshold + 6 dB | N/A | -57.1 |

The Upper or Lower Threshold is found by the procedure defined in ANSI C63.17: 2013 clause 7.3.1 or 7.3.2.

| Monitor Threshold | Measured level | FCC part 15D | RSS-213 |
|-------------------|----------------|--------------|---------|
| Lower threshold | N/A | -75.8 | -77.1 |
| Upper threshold | -61.3 | N/A | -57.1 |

For the EUT which support LIC there is no need to measure lower threshold because it is automatically met by LIC procedure

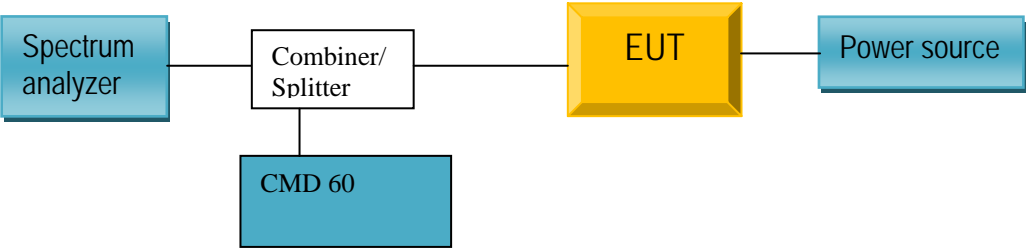
Least Interfered Channel (LIC) Procedure Test, FCC 15.323(c)(2) and (c)(5)

| ANSI C63.17: 2013 clause 7.3.3 ref. Observation Verdict | ANSI C63.17: 2013 clause 7.3.3 ref. Observation Verdict | ANSI C63.17: 2013 clause 7.3.3 ref. Observation Verdict |
|---|---|---|
| b) f1 TL + 13 dB, f2 at TL + 6 dB | Transmission always on f2 | Pass |
| c) f1TL + 6 dB, f2 at TL + 13 dB | Transmission always on f1 | Pass |
| d) f1 TL + 7 dB, f2 at TL | Transmission always on f1 | Pass |
| e) f1 TL, f2 at TL + 7 dB | Transmission always on f1 | Pass |

6.10.3 Monitoring Threshold Bandwidth

| | |
|----------------------|------------------|
| Temperature | 21°C |
| Relative Humidity | 58% |
| Atmospheric Pressure | 1017mbar |
| Test date : | March 21th, 2015 |
| Tested By : | Dustin Wang |

Requirement(s):

| Spec | Requirement | Applicable |
|---------------------------|---|-------------------------------------|
| FCC part 15.323(c) (7) | The monitoring system bandwidth must be equal to or greater than the emission bandwidth of the intended transmission. | <input checked="" type="checkbox"/> |
| Test Setup |  | |
| Test Procedure | According to ANSI 63.17: 2013 clause 7. 4 | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail | |

Test Data Yes N/A
 Test Plot Yes (See below) N/A

Measurement Data:

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

| Test performed | Observation result | Verdict |
|--|--------------------|---------|
| Simple Compliance test, at $\pm 30\%$ of B | No transmissions | Pass |
| More Detailed Test, at -6 dB points | N/A | N/A |
| More Detailed Test, at -12 dB points | N/A | N/A |

Notes:

- The more detailed test must be pass at both the -6 and -12 dB points if the Simple Compliance test fails.
- The Simple Compliance Test was performed with the level at $T_U + U_M + 10$ dB to check that the EUT did not transmit at all.

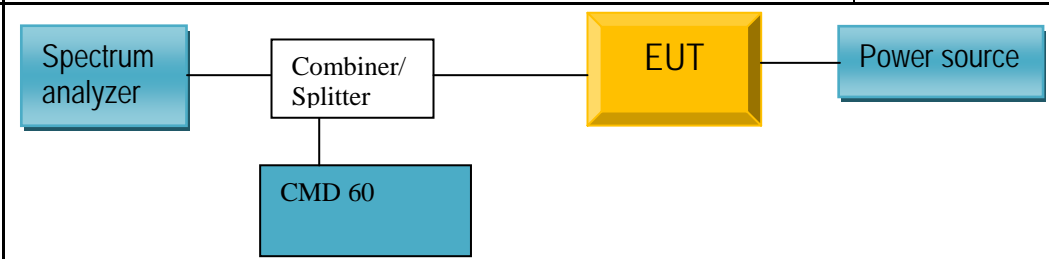
| | |
|-------------|--------------------|
| Test Report | 15070077-FCC-R1-PP |
| Page | 34 of 54 |

3. The tested EUT uses the same receiver for monitoring and communication, this test is therefore not required. However the test has been performed nonetheless and the test is passed.

6.10.4 Reaction Time and Monitoring Interval

| | |
|----------------------|------------------|
| Temperature | 21°C |
| Relative Humidity | 58% |
| Atmospheric Pressure | 1017mbar |
| Test date : | March 21th, 2015 |
| Tested By : | Dustin Wang |

Requirement(s):

| Spec | Requirement | Applicable |
|--------------------------------------|---|-------------------------------------|
| FCC part 15.323(c) (1) (5) (7) | <p>The monitoring system bandwidth must be equal to or greater than the emission bandwidth of the intended transmission and have a maximum reaction time less than $50 \times \text{SQRT}(1.25/\text{emission bandwidth in MHz})$ microseconds for signals at the applicable threshold level but shall not be required to be less than 50 microseconds.</p> <p>If a signal is detected that is 6 dB or more above the applicable threshold level, the maximum reaction time shall be $35 \times \text{SQRT}(1.25/\text{emission bandwidth in MHz})$ microseconds but shall not be required to be less than 35 microseconds.</p> | <input checked="" type="checkbox"/> |
| Test Setup |  | |
| Test Procedure | According to ANSI 63.17: 2013 clause 7.5 | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail | |

Test Data Yes N/A
 Test Plot Yes (See below) N/A

Measurement Data:

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

Time-synchronized pulsed interference was then applied on the carrier at pulsed levels $T_U + U_M$ to check that the EUT does not transmit at all. The level was raised 6 dB for part d) with 35 μ s pulses.

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

| Pulse Width, ref. to ANSI C63.17: 2013 clause 7.5 | Observation result | Verdict |
|---|--------------------|---------|
| c) > largest of 50 μ s and $50 \cdot \text{SQRT}(1.25/B)$ | No transmissions | Pass |
| d) > largest of 35 μ s and $35 \cdot \text{SQRT}(1.25/B)$, and with interference level raised 6 dB | No transmissions | Pass |

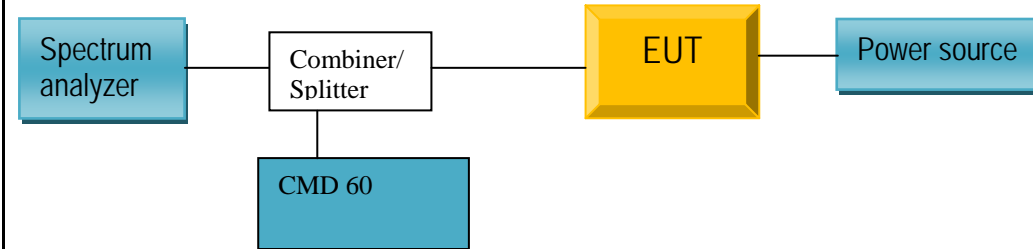
Notes:

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

6.10.5 Time and Spectrum Window Access Procedure

| | |
|----------------------|------------------|
| Temperature | 21°C |
| Relative Humidity | 58% |
| Atmospheric Pressure | 1017mbar |
| Test date : | March 21th, 2015 |
| Tested By : | Dustin Wang |

Requirement(s):

| Spec | Requirement | Applicable |
|----------------------------------|--|-------------------------------------|
| FCC part 15.323(c) (4) (6) | <p>FCC 15.323(c)(4): Once access to specific combined time and spectrum windows is obtained an acknowledgement from a system participant must be received by the initiating transmitter within one second or transmission must cease. Periodic acknowledgements must be received at least every 30 seconds or transmission must cease. Channels used exclusively for control and signaling information may transmit continuously for 30 seconds without receiving an acknowledgement, at which time the access criteria must be repeated.</p> <p>FCC 15.323(c)(6): If the selected combined time and spectrum windows are unavailable, the device may either monitor and select different windows or seek to use the same windows after waiting an amount of time, randomly chosen from a uniform random distribution between 10 and 150 milliseconds, commencing when the channel becomes available</p> | <input checked="" type="checkbox"/> |
| Test Setup |  <pre> graph LR SA[Spectrum analyzer] --- CS[Combiner/Splitter] CS --- EUT[EUT] EUT --- PS[Power source] CS --- CMD60[CMD 60] </pre> | |
| Test Procedure | According to ANSI 63.17: 2013 clause 8.1 | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail | |

Test Data Yes N/A
 Test Plot Yes (See below) N/A

Measurement Data:

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

| Access Criteria, ref. to ANSI C63.17: 2013 clause 8.1.1 | Observation result | Verdict |
|--|--------------------|---------|
| b) Check that the EUT transmits on the interference free time-slot | N/A | N/A |
| b) The EUT must terminate or pause in its repetitive transmission of the control and signaling channel on the open channel to repeat the access criteria not less frequently than every 30 s | N/A | N/A |

If FCC 15.323(c)(6) option, **If Random Waiting Interval is NOT implemented**

| Access Criteria, ref. to ANSI C63.17: 2013 clause 8.1.1 | Observation result | Verdict |
|--|--------------------|---------|
| b) Check that the EUT transmits on the interference free time-slot | N/A | N/A |
| b) The EUT must terminate or pause in its repetitive transmission of the control and signaling channel on the open channel to repeat the access criteria not less frequently than every 30 s | N/A | N/A |

If FCC 15.323(c)(6) option, **Only if Random Waiting Interval is implemented**

| Access Criteria, ref. to ANSI C63.17: 2013 clause 8.1.1 | Observation result | Verdict |
|--|--------------------|---------|
| b) Check that the EUT transmits on the interference free time-slot | N/A | N/A |
| b) The EUT must terminate or pause in its repetitive transmission of the control and signaling channel on the open channel to repeat the access criteria not less frequently than every 30 s | N/A | N/A |

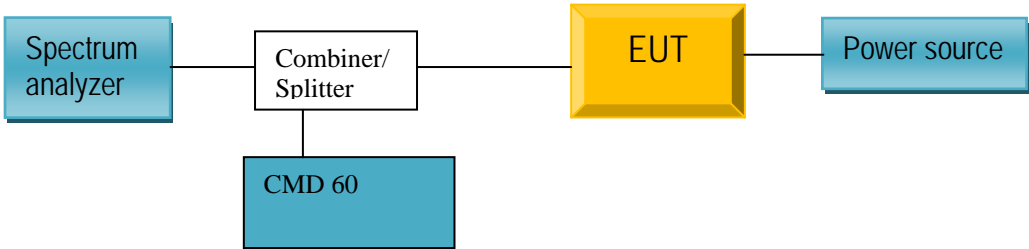
Notes:

The tested EUT does not transmit unacknowledged control and signaling information.

6.10.6 Acknowledgements and Transmission Duration

| | |
|----------------------|------------------|
| Temperature | 21°C |
| Relative Humidity | 58% |
| Atmospheric Pressure | 1017mbar |
| Test date : | March 21th, 2015 |
| Tested By : | Dustin Wang |

Requirement(s):

| Spec | Requirement | Applicable |
|----------------------------------|---|-------------------------------------|
| FCC part 15.323(c) (3) (4) | Occupation of the same combined time and spectrum windows by a device or group of cooperating devices continuously over a period of time longer than 8 hours is not permitted without repeating the access criteria. Once access to specific combined time and spectrum windows is obtained an acknowledgement from a system participant must be received by the initiating transmitter within one second or transmission must cease. Periodic acknowledgements must be received at least every 30 seconds or transmission must cease. Channels used exclusively for control and signaling information may transmit continuously for 30 seconds without receiving an acknowledgement, at which time the access criteria must be repeated. | <input checked="" type="checkbox"/> |
| Test Setup |  <pre> graph LR SA[Spectrum analyzer] --- CS[Combiner/Splitter] CS --- EUT[EUT] EUT --- PS[Power source] CS --- CMD60[CMD 60] </pre> | |
| Test Procedure | According to ANSI 63.17: 2013 clause 8.2 | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail | |

Test Data Yes

N/A

Test Plot Yes (See below) N/A

Measurement Data:

During the test **Initial transmission without acknowledgements** the signal from the EUT to the companion device is blocked by circulators in addition to the tunable attenuator.

The test **Transmission time after loss of acknowledgements** is performed by cutting-off the signal from the companion device by a RF switch and measuring the time until the EUT stops transmitting.

The **Transmission Duration** test is performed by monitoring the slot in use and measuring the time until the EUT changes to a different slot.

Acknowledgements

| Test ref. to ANSI C63.17: 2013 clause 8.2.1 | Observation result | Verdict |
|---|--------------------|---------|
| a) Initial transmission without acknowledgements | 0.65s | Pass |
| c) Transmission time after loss of acknowledgements | 9.5s | Pass |

Transmission Duration

| Test ref. to ANSI C63.17: 2013 clause 8.2.2 | Observation | Verdict |
|--|-------------|---------|
| b) Transmission duration on same time and frequency window | 1 hour | Pass |

6.10.7 Dual Access Criteria Check

| | |
|----------------------|------------------|
| Temperature | 21°C |
| Relative Humidity | 58% |
| Atmospheric Pressure | 1017mbar |
| Test date : | March 21th, 2015 |
| Tested By : | Dustin Wang |

Requirement(s):

| Spec | Requirement | Applicable |
|----------------------------|--|-------------------------------------|
| FCC part 15.323(c) (10) | An initiating device may attempt to establish a duplex connection by monitoring both its intended transmits 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. | <input checked="" type="checkbox"/> |
| Test Setup | | |
| Test Procedure | According to ANSI 63.17: 2013 clause 8.3 | |
| Result | <input type="checkbox"/> Pass <input type="checkbox"/> Fail | |

Test Data Yes N/A
 Test Plot Yes (See below) N/A

Not tested.

The manufacturer declares that this provision is not utilized by the EUT.

6.10.8 Alternative Monitoring Interval

| | |
|----------------------|------------------|
| Temperature | 21°C |
| Relative Humidity | 58% |
| Atmospheric Pressure | 1017mbar |
| Test date : | March 21th, 2015 |
| Tested By : | Dustin Wang |

Requirement(s):

| Spec | Requirement | Applicable |
|----------------------------|--|-------------------------------------|
| FCC part 15.323(c) (11) | 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 center 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. | <input checked="" type="checkbox"/> |
| Test Setup | | |
| Test Procedure | According to ANSI 63.17: 2013 clause 8.4 | |
| Result | <input type="checkbox"/> Pass <input type="checkbox"/> Fail | |

Test Data Yes N/A
Test Plot Yes (See below) N/A

Not tested.

The manufacturer declares that this provision is not utilized by the EUT.

6.10.9 Fair Access

| | |
|----------------------|------------------|
| Temperature | 21°C |
| Relative Humidity | 58% |
| Atmospheric Pressure | 1017mbar |
| Test date : | March 21th, 2015 |
| Tested By : | Dustin Wang |

Requirement(s):

| Spec | Requirement | Applicable |
|----------------------------|---|-------------------------------------|
| FCC part 15.323(c) (12) | The provisions of (c)(10) or (c)(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. | <input checked="" type="checkbox"/> |
| Test Setup | | |
| Test Procedure | | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail | |

Test Data Yes N/A
Test Plot Yes (See below) N/A

Test Result:

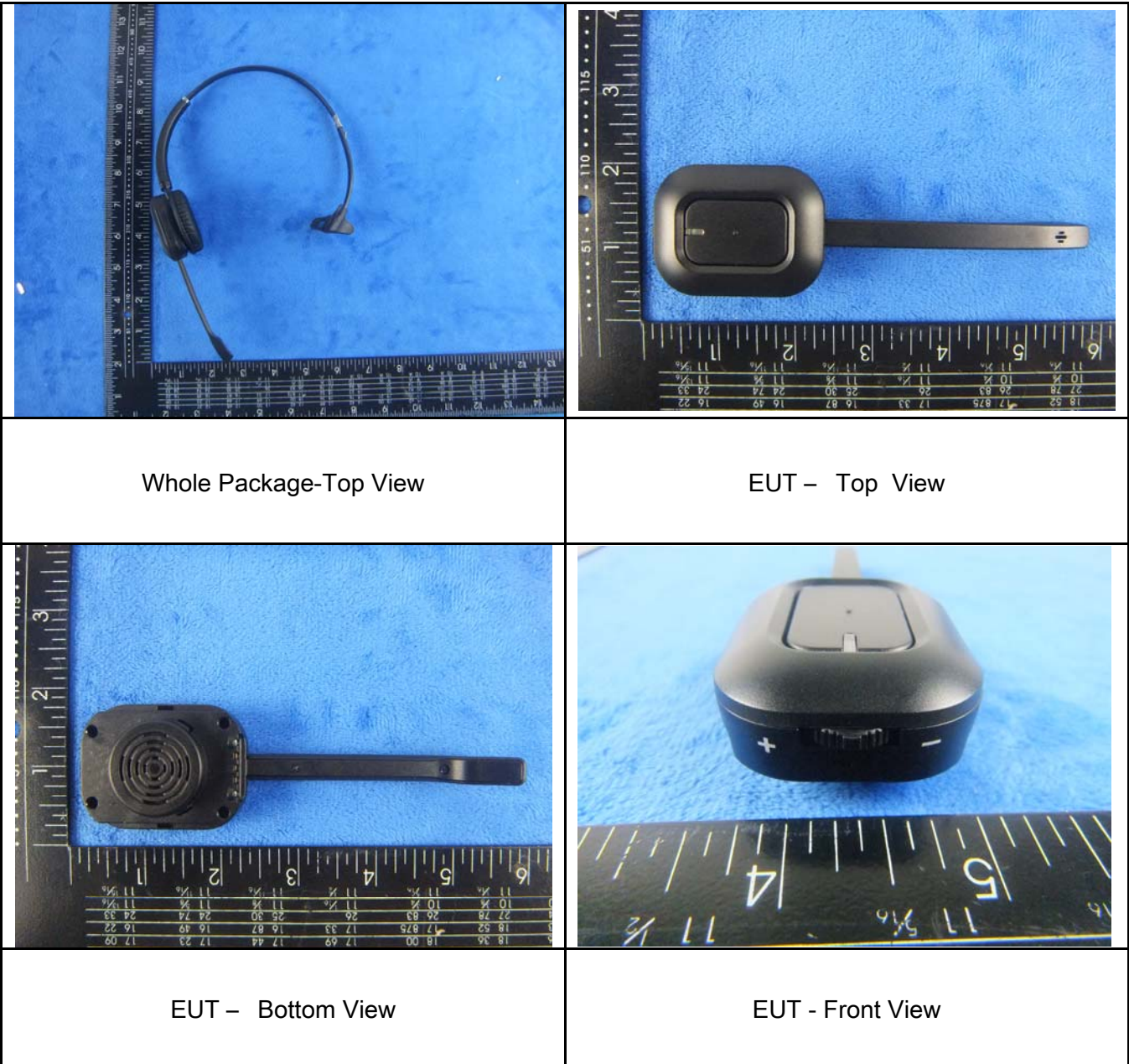
The manufacturer declares that this device does not use any mechanisms as provided by Part 15.323 (c) (10) or (c) (11) to extend the range of spectrum occupied over space or time for the purpose of denying fair access to spectrum to other device.

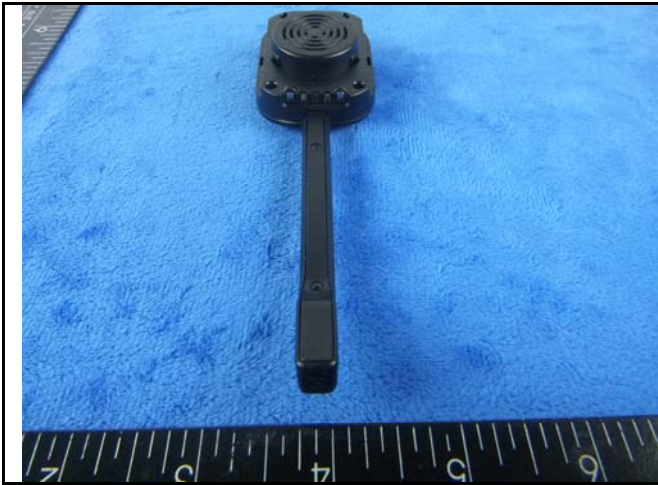
Annex A. TEST INSTRUMENT

| Instrument | Model | Serial # | Cal Date | Cal Due | In use |
|--|---------|------------|------------|------------|-------------------------------------|
| Agilent ESA-E SERIES SPECTRUM ANALYZER | E4407B | MY45108319 | 09/18/2014 | 09/17/2015 | <input checked="" type="checkbox"/> |
| EMI test receiver | ESL6 | 100262 | 09/18/2014 | 09/17/2015 | <input checked="" type="checkbox"/> |
| Power Splitter | 1# | 1# | 09/02/2014 | 09/01/2015 | <input checked="" type="checkbox"/> |
| SYNTHESIZED SIGNAL GENERATOR | 8665B | 3744A01293 | 09/18/2014 | 09/17/2015 | <input checked="" type="checkbox"/> |
| DC Power Supply | E3640A | MY40004013 | 09/18/2014 | 09/17/2015 | <input checked="" type="checkbox"/> |
| Bilog Antenna (30MHz~6GHz) | JB6 | A110712 | 09/22/2014 | 09/21/2015 | <input checked="" type="checkbox"/> |
| Bilog Antenna (30MHz~2GHz) | JB1 | A112017 | 09/22/2014 | 09/21/2015 | <input checked="" type="checkbox"/> |
| A-INFOMW Horn Antenna (1~18GHz) | AH-118 | 71259 | 09/25/2014 | 09/24/2015 | <input checked="" type="checkbox"/> |
| EMCO Horn Antenna (1~18GHz) | AH-118 | 71283 | 09/25/2014 | 09/24/2015 | <input checked="" type="checkbox"/> |
| OPT 010 AMPLIFIER(0.1~1300MHz) | 8447E | 2727A02430 | 09/02/2014 | 09/01/2015 | <input checked="" type="checkbox"/> |
| Microwave Preamplifier(0.5 ~ 18GHz) | PAM-118 | 443008 | 09/02/2014 | 09/01/2015 | <input checked="" type="checkbox"/> |
| Temperature/Humidity Chamber | UHL-270 | 001 | 10/10/2014 | 10/09/2015 | <input checked="" type="checkbox"/> |
| R&S Digital Radio communication Tester | CMD60 | CCIS0149 | 09/17/2014 | 09/16/2015 | <input type="checkbox"/> |
| | | | | | |

Annex B. EUT and Test Setup Photographs

Annex B.i. Photograph: EUT External Photo





EUT - Rear View

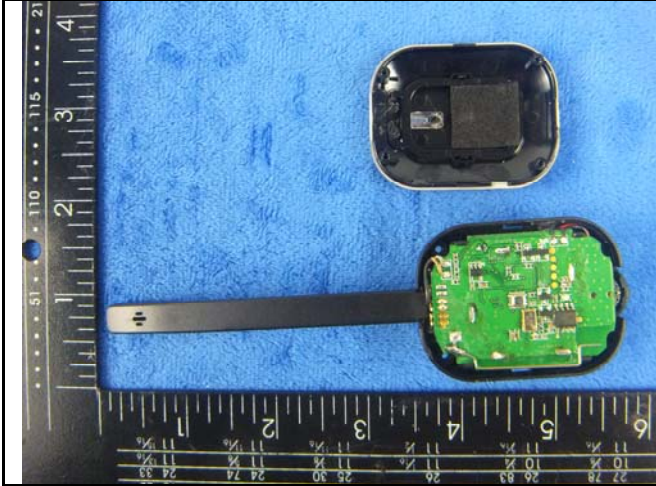


EUT – Left View

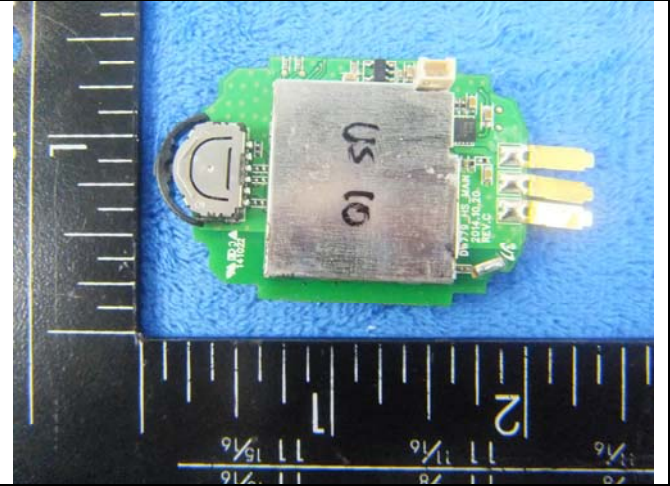


EUT – Right View

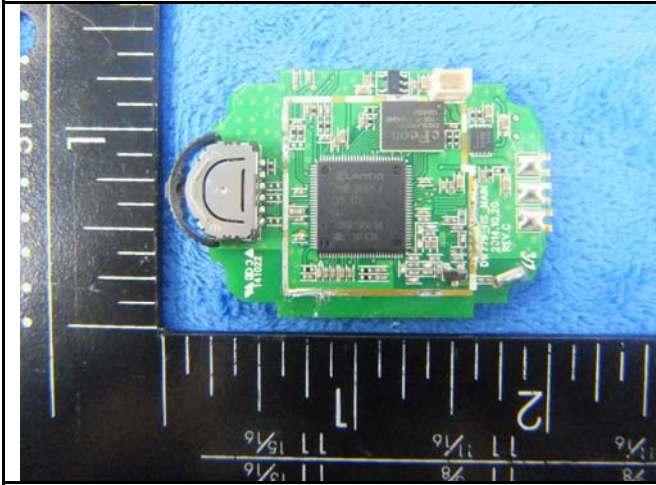
Annex B.ii. Photograph: EUT Internal Photo



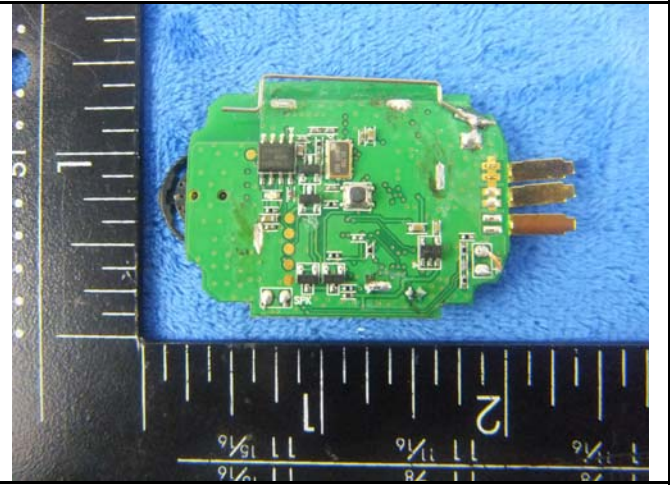
EUT – Uncover Front View 1



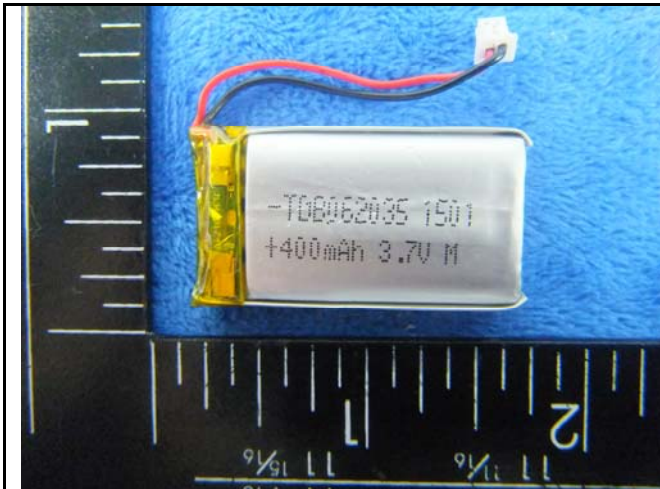
EUT – Mainboard Rear View



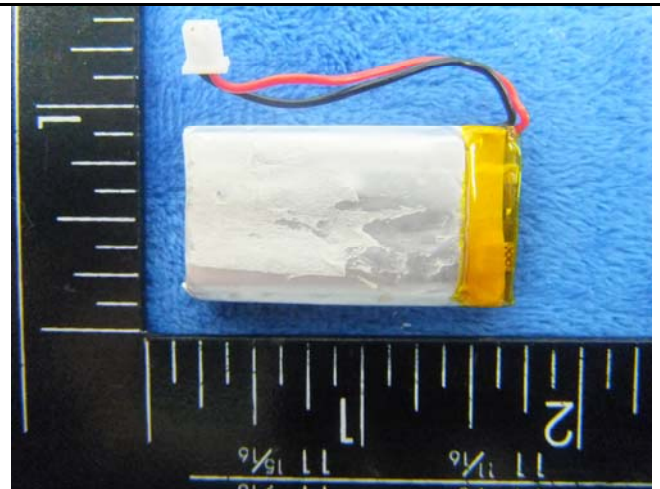
EUT – Mainboard Without Shielding Rear View



EUT – Mainboard Front View



Adapter – Front View



Adapter – Rear View

Annex B.iii. Photograph: Test Setup Photo



Radiated Spurious Emissions Test Setup Below 1GHz

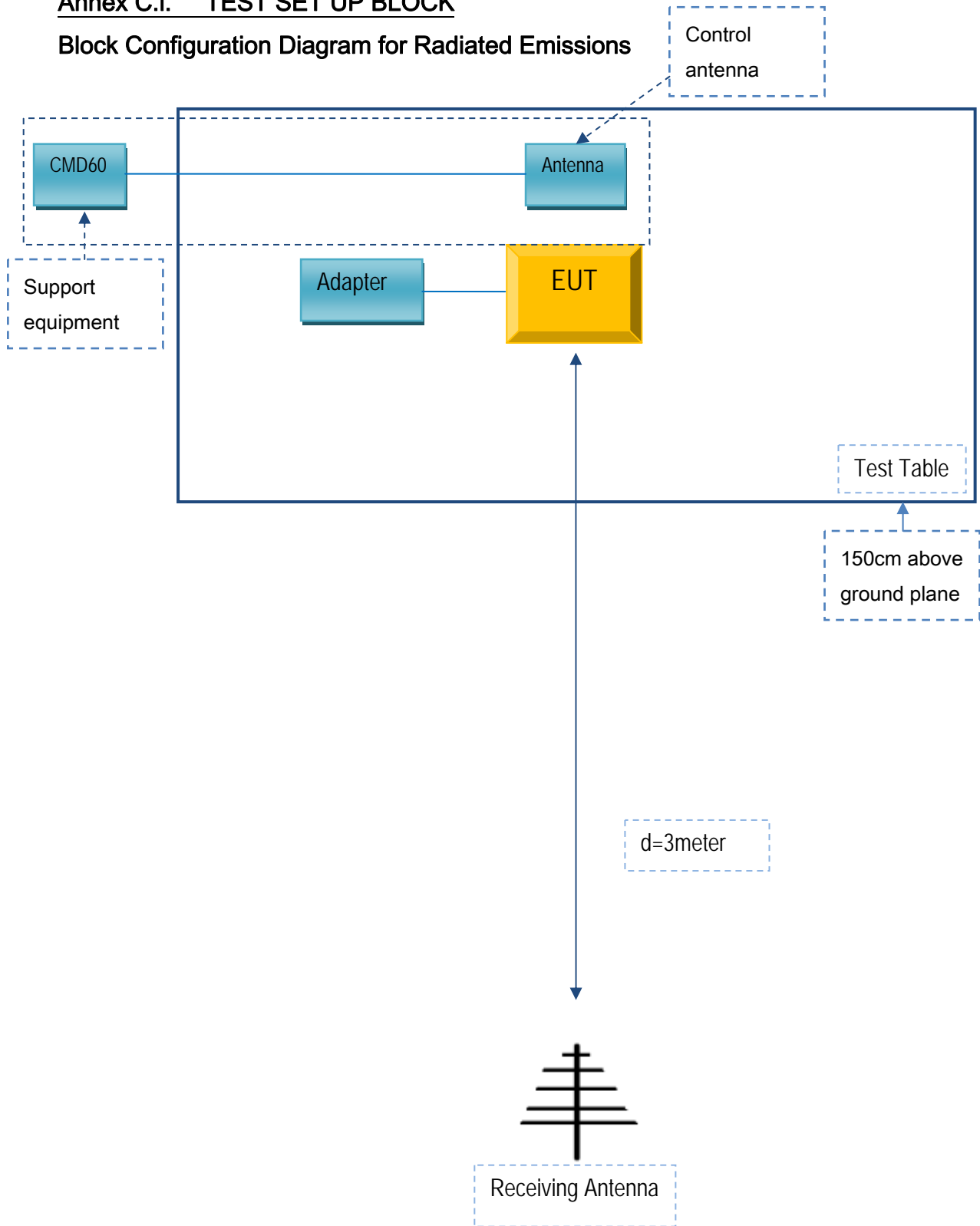


Radiated Spurious Emissions Test Setup Above
1GHz

Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.i. TEST SET UP BLOCK

Block Configuration Diagram for Radiated Emissions



Annex C. ii. SUPPORTING EQUIPMENT DESCRIPTION

The following is a description of supporting equipment and details of cables used with the EUT.

| Manufacturer | Equipment Description | Model | Calibration Date | Calibration Due Date |
|--------------|-----------------------|-------|------------------|----------------------|
| N/A | N/A | N/A | N/A | N/A |

| | |
|-------------|--------------------|
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Annex D. User Manual / Block Diagram / Schematics / Partlist

Please see attachment

Annex E. DECLARATION OF SIMILARITY

Declaration Letter

To whom it may concern,

For our business issue and marketing requirement, we would like to list 2 model numbers on the FCC certificates and reports, as following:

Model No.: DW-779U; DW-779

We declare that there is no electrical change has been made to the equipment that alters the compliance characteristics. The differences of these models are different logo and different model name. Please handle on the project.

Signature:



Printed name/title: Kyung Ryong Hong /Director

Tel: 82-31-500-3422

Fax:

Applicant: DASAN ELECTRON

Address: 606, GODOWHADONG, KYUNGGI TECHONO PARK 1271-11, SA-DONG,
ANSAN-SI, KYUNGGI-DO, ANSAN-SI, South Korea

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