# TEST REPORT

| | |
|---|---|
| **Application No.:** | SZEM1906014900CR |
| **Applicant:** | XIAMEN CAME TECHNOLOGY CO., LTD. |
| **Address of Applicant:** | Unit 2204-1, NO.5 Chengyi North Street, Phase three Software Park, 361022, Xiamen City, Fujian Province, China |
| **Manufacturer:** | XIAMEN CAME TECHNOLOGY CO., LTD. |
| **Address of Manufacturer:** | Unit 2204-1, NO.5 Chengyi North Street, Phase three Software Park, 361022, Xiamen City, Fujian Province, China |
| **Factory:** | XIAMEN CAME TECHNOLOGY CO., LTD. |
| **Address of Factory:** | Unit 2204-1, NO.5 Chengyi North Street, Phase three Software Park, 361022, Xiamen City, Fujian Province, China |
| **Equipment Under Test (EUT):** | |
| **EUT Name:** | CAME-TV WIRELESS HEADSET |
| **Model No.:** | WAERO-R |
| **Trade mark:** | CAME-TV |
| **FCC ID:** | 2ATOR-WAERO-R |
| **Standards:** | 47 CFR Part 15, Subpart D |
| **Date of Receipt:** | 2019-06-06 |
| **Date of Test:** | 2019-06-10 to 2019-06-20 |
| **Date of Issue:** | 2019-07-02 |
| **Test Result:** | **Pass*** |

* In the configuration tested, the EUT complied with the standards specified above.

Keny Xu
EMC Laboratory Manager

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| Revision Record | | | | |
|---|---|---|---|---|
| ***Version*** | ***Chapter*** | ***Date*** | ***Modifier*** | ***Remark*** |
| *01* | | *2019-07-02* | | *Original* |
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|---|---|---|---|---|
| **Authorized for issue by:** | | | | |
| | | Vincent Chen<br>**Vincent Chen /Project Engineer** | | |
| | | Eric Fu<br>**Eric Fu /Reviewer** | | |

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# 2 Test Summary

| Test Item | FCC Test Requirement | Result |
|---|---|---|
| Antenna Requirement | 15.317;15.203 | Pass |
| Power Line Conducted Emission | 15.207(a) | NA |
| Digital Modulation Techniques | 15.319(b) | Pass |
| Channel Frequencies | 15.303 | Pass |
| Automatic discontinuation of transmission | 15.319(f) | Pass |
| Emission Bandwidth | 15.323(a) | Pass |
| In-band emissions | 15.323(d) | Pass |
| Out-of-band emissions | 15.323(d) | Pass |
| Peak Transmit Power and Antenna Gain | 15.319(c)(e); 15.31(e) | Pass |
| Power Spectral Density | 15.319(d) | Pass |
| Carrier frequency stability | 15.323(f) | Pass |
| Frame repetition stability | 15.323(e) | Pass |
| Frame period and jitter | 15.323(e) | Pass |
| Monitoring threshold, Least interfered channel | 15.323(c)(2)(5)(9) | Pass |
| Monitoring of intended transmit window and maximum reaction time | 15.323(c)(1) | Pass |
| Threshold monitoring bandwidth | 15.323(c)(7) | Pass |
| Reaction time and monitoring interval | 15.323(c)(1)(5)(7) | Pass |
| Access criteria test interval | 15.323(c)(4)(6) | Pass |
| Access Criteria functional test | 15.323(c)(4)(6) | Pass |
| Acknowledgements | 15.323(c)(4) | Pass |
| Transmission duration | 15.323(c)(3) | Pass |
| Dual access criteria | 15.323(c)(10) | Pass |
| Alterative monitoring interval | 15.323(c)(11)(12) | N/A[1] |
| Spurious Emissions (Radiated) | 15.319(g); 15.209(a) | Pass |

[1] The client declares that the tested equipment does not implement this provision

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# 4 General Information

## 4.1 Details of E.U.T.

| | |
|---|---|
| Power supply: | DC 3.7V 1600mAh from Li-ion battery pack(Model:NB-6L)<br>Charged by DC 5V from USB port |
| Cable: | USB cable 91cm unshielded |
| Frequency Range: | 1921.536 to 1928.448 MHz |
| Number of Channels: | 5 RF Channels, 5 × 12 = 60 TDMA Duplex Channels |
| Type of Modulation: | Digital (Gaussian Frequency Shift Keying) |
| Modulation Technique: | GFSK |
| Antenna Connector: | None (Monopole Antenna) |
| Antenna Gain: | 0dBi |
| Number of Antennas: | 1 |
| Antenna Diversity Supported: | No |
| Hardware Version: | V1.0 |
| Software Version: | V1.0 |

Note:
In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

| Channel | Frequency |
|---|---|
| The Lowest channel(CH4) | 1921.536 MHz |
| The Middle channel(CH2) | 1924.992 MHz |
| The Highest channel(CH0) | 1928.448 MHz |

## 4.2 Test Environment and Mode

| | |
|---|---|
| **Operating Environment:** | |
| Temperature: | 25.6 °C |
| Humidity: | 54 % RH |
| Atmospheric Pressure: | 1005 mbar |
| **Test mode:** | |
| Transmitting mode: | Keep the EUT in transmitting mode with modulation. |

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## 4.3 Description of Support Units

The EUT has been tested with associated equipment below:

| Description | Manufacturer | Model No. |
|---|---|---|
| CAME-TV WIRELESS HEADSET | CAME-TV | WAERO-M |

## 4.4 Measurement Uncertainty

| No. | Item | Measurement Uncertainty |
|---|---|---|
| 1 | Radio Frequency | ± 7.25 x $10^{-8}$ |
| 2 | Duty cycle | ± 0.37% |
| 3 | Occupied Bandwidth | ± 3% |
| 4 | RF conducted power | ± 0.75dB |
| 5 | RF power density | ± 2.84dB |
| 6 | Conducted Spurious emissions | ± 0.75dB |
| 7 | RF Radiated power | ± 4.5dB (Below 1GHz) |
| | | ± 4.8dB (Above 1GHz) |
| 8 | Radiated Spurious emission test | ± 4.5dB (Below 1GHz) |
| | | ± 4.8dB (Above 1GHz) |
| 9 | Temperature test | ± 1℃ |
| 10 | Humidity test | ± 3% |
| 11 | Supply voltages | ± 1.5% |
| 12 | Time | ± 3% |

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## 4.5 Test Location

All tests were performed at:

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Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

## 4.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **CNAS (No. CNAS L2929)**

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

- **VCCI**

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

- **FCC –Designation Number: CN1178**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

- **Innovation, Science and Economic Development Canada**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

## 4.7 Deviation from Standards

None

## 4.8 Abnormalities from Standard Conditions

None

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# 5 Equipment List

| Radiated Emissions (30MHz-1GHz) | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| 3m Semi-Anechoic Chamber | ETS-LINDGREN | N/A | SEM001-01 | 2017-08-05 | 2020-08-04 |
| Measurement Software | AUDIX | e3 V8.2014-6-27 | N/A | N/A | N/A |
| Coaxial Cable | SGS | N/A | SEM025-01 | 2018-07-12 | 2019-07-11 |
| EMI Test Receiver | Agilent Technologies | N9038A | SEM004-05 | 2018-09-25 | 2019-09-24 |
| BiConiLog Antenna (26-3000MHz) | ETS-LINDGREN | 3142C | SEM003-01 | 2017-06-27 | 2020-06-26 |
| Pre-amplifier (0.1-1300MHz) | Agilent Technologies | 8447D | SEM005-01 | 2019-04-01 | 2020-03-31 |
| Digital Radiocommunication Tester | Rohde & Schwarz | CMD60 | / | 2018-12-18 | 2019-12-18 |

| Radiated Spurious Emission | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| 3m Semi-Anechoic Chamber | AUDIX | N/A | SEM001-02 | 2018-03-13 | 2021-03-12 |
| Measurement Software | AUDIX | e3 V8.2014-6-27 | N/A | N/A | N/A |
| Coaxial Cable | SGS | N/A | SEM026-01 | 2018-07-12 | 2019-07-11 |
| EXA Spectrum Analyzer | AgilentTechnologies Inc | N9010A | SEM004-12 | 2019-04-12 | 2020-04-11 |
| Horn Antenna (1-18GHz) | Rohde & Schwarz | HF907 | SEM003-07 | 2018-04-13 | 2021-04-12 |
| Horn Antenna (15GHz-40GHz) | Schwarzbeck | BBHA 9170 | SEM003-15 | 2017-10-17 | 2020-10-16 |
| Pre-Amplifier (0.1-26.5GHz) | Compliance Directions Systems Inc. | PAP-0126 | SEM004-11 | 2018-11-12 | 2019-11-11 |
| Pre-amplifier (18-26GHz) | Rohde & Schwarz | CH14-H052 | SEM005-17 | 2019-04-01 | 2020-03-31 |
| Pre-amplifier (26GHz-40GHz) | Compliance Directions Systems Inc. | PAP-2640-50 | SEM005-08 | 2019-04-01 | 2020-03-31 |
| Digital Radio communication Tester | Rohde & Schwarz | CMD60 | / | 2018-12-18 | 2019-12-18 |
| DC Power Supply | Zhao Xin | RXN-305D | SEM011-02 | 2018-09-25 | 2019-09-24 |
| Active Loop Antenna | ETS-Lindgren | 6502 | SEM003-08 | 2017-08-22 | 2020-08-21 |

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| RF conducted test | | | | | |
|---|---|---|---|---|---|
| **Test Equipment** | **Manufacturer** | **Model No.** | **Inventory No.** | **Cal. date** | **Cal. Due date** |
| DC Power Supply | ZhaoXin | RXN-305D | SEM011-02 | 2018-09-25 | 2019-09-24 |
| EXA Spectrum Analyzer | KEYSIGHT | N9010A | SEM004-12 | 2019-04-12 | 2020-04-11 |
| Signal Generator | Rohde & Schwarz | SML03 | SEM006-02 | 2019-04-25 | 2020-04-25 |
| Power Meter | Rohde & Schwarz | NRVS | SEM014-02 | 2018-09-25 | 2019-09-24 |
| Spectrum Analyzer | Rohde & Schwarz | FSU43 | SEM004-08 | 2019-04-02 | 2020-04-01 |
| Coaxial Cable | SGS | N/A | SEM031-01 | 2018-07-12 | 2019-07-11 |
| Digital Radiocommunication Tester | Rohde & Schwarz | CMD60 | / | 2018-12-18 | 2019-12-18 |
| Splitter | MACOM | 2090-6214-00 | SEL0226 | 2018-03-06 | 2019-03-06 |

| General used equipment | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| Humidity/ Temperature Indicator | Shanghai Meteorological Industry Factory | ZJ1-2B | SEM002-03 | 2018-09-27 | 2019-09-26 |
| Humidity/ Temperature Indicator | Shanghai Meteorological Industry Factory | ZJ1-2B | SEM002-04 | 2018-09-27 | 2019-09-26 |
| Humidity/ Temperature Indicator | Mingle | N/A | SEM002-08 | 2018-09-27 | 2019-09-26 |
| Barometer | Changchun Meteorological Industry Factory | DYM3 | SEM002-01 | 2019-04-04 | 2020-04-03 |

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# 6 Test results and Measurement Data

## 6.1 Antenna Requirement

| **Standard requirement:** | 47 CFR Part 15.317, 15.203 |
|---|---|
| 15.203 requirement:<br>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, 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. | |
| **EUT Antenna:** | |
| The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 0dBi. | |

## 6.2 Digital Modulation Techniques

| **Standard requirement:** | 47 CFR Part 15.319(b) |
|---|---|
| Requirement:<br>All transmissions must use only digital modulation techniques. | |
| The EUT uses Multi Carrier / Time Division Multiple Access / Time Division Duplex and Digital GFSK modulation. For further details see the operational description provided by the applicant. | |

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## 6.3 Automatic discontinuation of transmission

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15.319(f) |
| Test Method: | Declared by manufacture |
| Requirement: | The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude transmission of control and signaling information or use of repetitive codes used by certain digital technologies to complete frame or burst intervals. |
| Test Results: | Pass |

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 | EUT Reaction | Verdict |
|---|---|---|---|
| 1 | Power removed from EUT | C | Pass |
| 2 | Switch Off EUT | N/A | Pass |
| 3 | Hook-On by EUT | N/A | Pass |
| 4 | Power Removed from Companion Device | A | Pass |
| 5 | Switch Off Companion Device | N/A | Pass |
| 6 | Hook-On by Companion Device | N/A | 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/Companion Device does not have On/Off switch and cannot perform Hook-On)

Note: For more information please refer to declaration letter.

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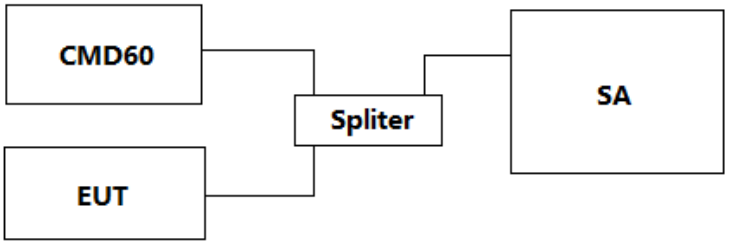
## 6.4 Peak Power Output

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15.319(c)(e), 15.31(e) |
| Test Method: | ANSI C63.17: 2013 |
| Limit: | Peak transmit power shall not exceed 100 microwatts multiplied by the square root of the emission bandwidth in Hertz.<br>The peak transmit power shall be reduced by the amount in decibels that the maximum directional gain of the antenna exceeds 3dBi. |
| Test Procedure: | RBW: ≥ Emission bandwidth<br>Video bandwidth: ≥ RBW<br>Span: Zero<br>Center frequency: Nominal center frequency of transmit carrier<br>Amplitude scale: Log (linear may be used if analyzer has sufficient linear dynamic range and accuracy)<br>Detection: Peak detection<br>Trigger: Video<br>Sweep rate: Sufficiently rapid to permit the transmit pulse to be resolved accurately |
| Test Setup: |  |
| Test Mode: | Transmitting mode |
| Instruments Used: | Refer to section 5.0 for details |

| Channel | Frequency (MHz) | Measured Peak Transmit Power (dBm) | Limit (dBm) | Results |
|---|---|---|---|---|
| Lowest | 1921.536 | 18.82 | 20.78 | Pass |
| Middle | 1924.992 | 19.88 | 20.84 | Pass |
| Highest | 1928.448 | 19.33 | 20.84 | Pass |

The plots of peak transmit power are saved as below.

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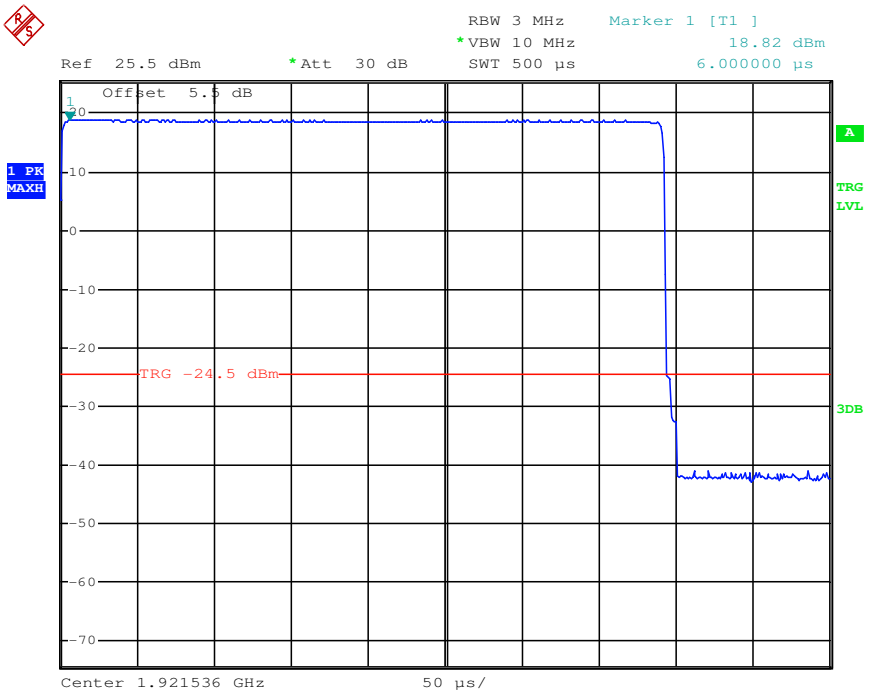
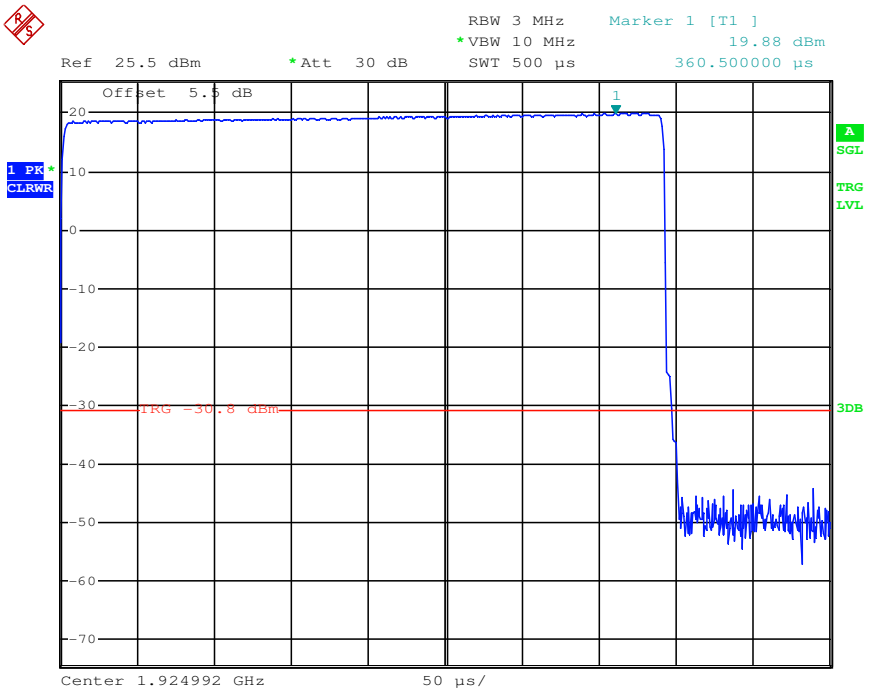
Plots of peak transmit power:

Lowest channel, Traffic carrier




Middle channel, Traffic carrier

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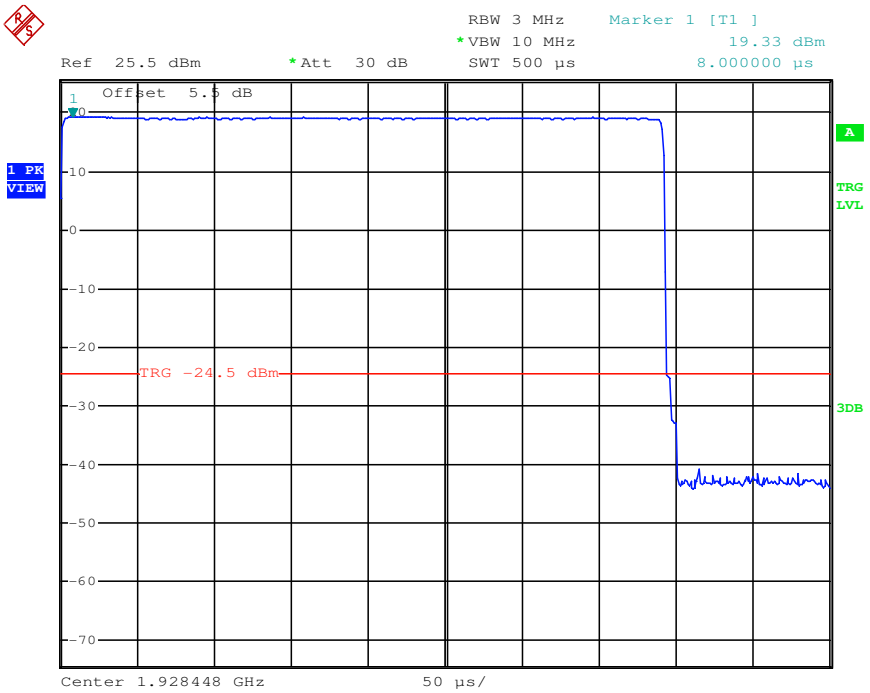
Highest channel, Traffic carrier

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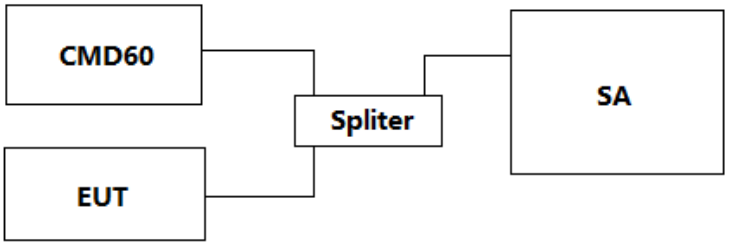
## 6.5 Emission Bandwidth B

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15.323(a) |
| Test Method: | ANSI C63.17: 2013 |
| Limit: | The Emission Bandwidth B shall be larger than 50 kHz and less than 2.5 MHz.<br>No requirements for 6 and 12 dB Bandwidth, these values are only used for testing Monitoring Bandwidth if the Simple Compliance test fails (ANSI C63.17, clause 7.4). |
| Test Procedure: | RBW: Approximately 1% of the emission bandwidth (a rough estimate may be obtained from peak power level measurement, or use manufacturer's declared value)<br>Video bandwidth: ≥ 3 × the RBW<br>Center frequency: Nominal center frequency of channel<br>Span: ≥ 2 × the expected emission bandwidth<br>Sweep time: Coupled to frequency span and RBW<br>Amplitude scale: Log<br>Detection: Peak detection with maximum hold enabled |
| Test Setup: |  |
| Test Mode: | Transmitting mode |
| Instruments Used: | Refer to section 5.0 for details |

| Channel | Frequency (MHz) | Emission Bandwidth B (MHz) |
|---|---|---|
| Lowest | 1921.536 | 1.43 |
| Middle | 1924.992 | 1.47 |
| Highest | 1928.448 | 1.47 |

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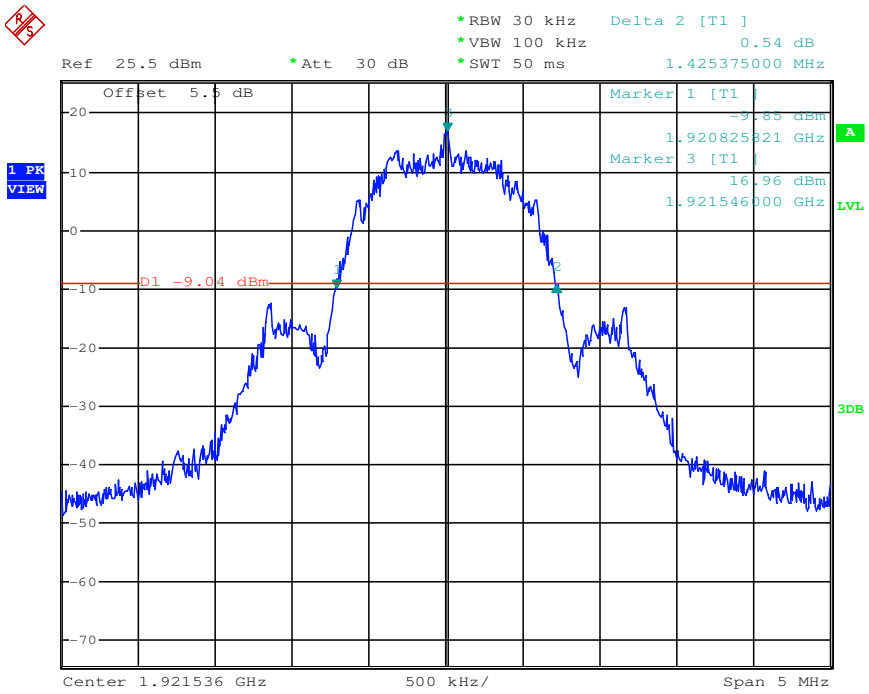
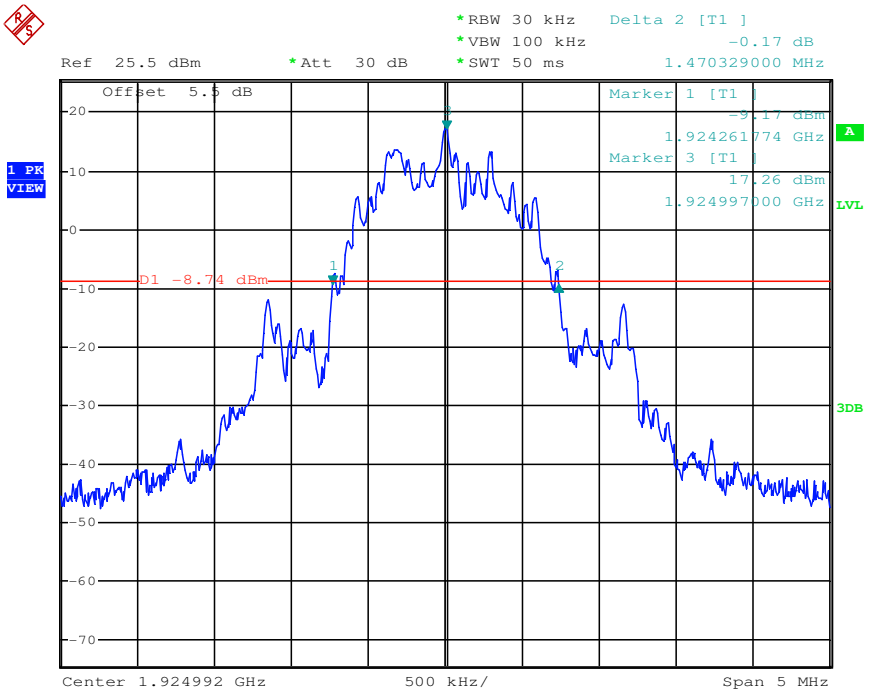
Emission Bandwidth

Lowest channel:




Middle channel:

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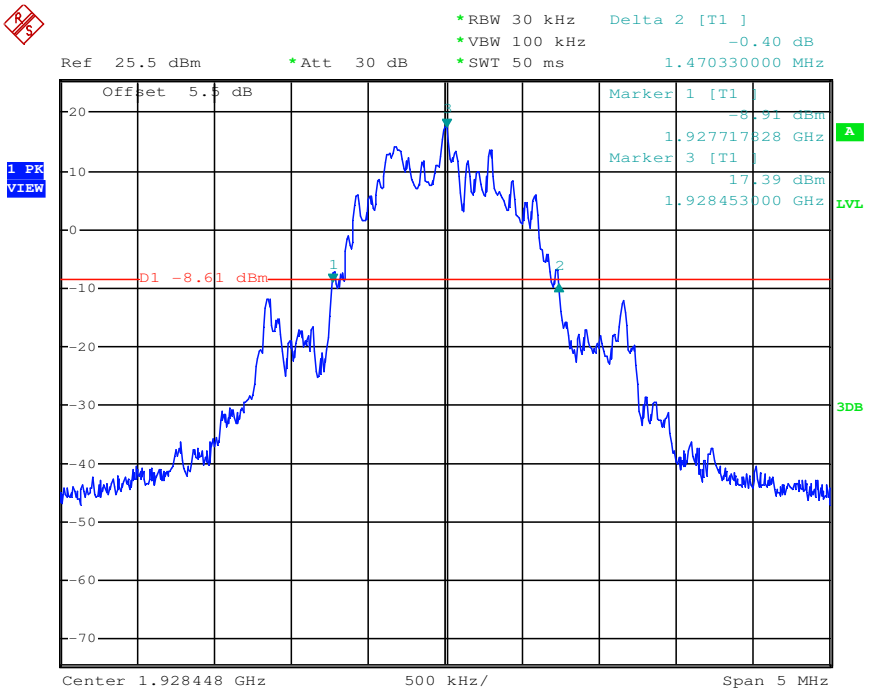
Highest channel:

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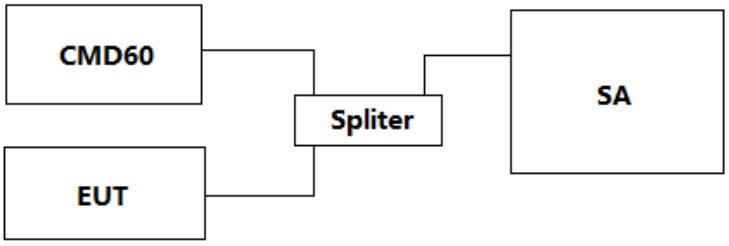
## 6.6 Power Spectral Density

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15.319(d), RSS-213 5.7 |
| Test Method: | ANSI C63.17: 2013 |
| Limit: | FCC:<br>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 |
| Test Procedure: | RBW: 3 kHz<br>Video bandwidth: ≥ 3 × RBW<br>Span: Zero span at frequency with the maximum level (frequency determined in 6.1.3 if the same type of signal (continuous versus burst) was used in 6.1.3)<br>Center frequency: Spectral peak as determined in 6.1.3<br>Sweep time: For burst signals, sufficient to include essentially all of the maximum length burst at the output of a 3 kHz filter (e.g., maximum input burst duration plus 600 μs). For continuous signals, 20 ms.<br>Amplitude scale: Log power<br>Detection: Sample detection and averaged for a minimum of 100 sweeps<br>Trigger: External or internal |
| Test Setup: |  |
| Test Mode: | Transmitting mode |
| Instruments Used: | Refer to section 5.0 for details |

Test Results:

| Channel | Frequency (MHz) | Power Spectral Density (dBm/3 kHz) | Limit (dBm/3 kHz) | Results |
|---|---|---|---|---|
| Lowest | 1921.536 | -3.45 | 4.8 | Pass |
| Highest | 1928.448 | -3.39 | 4.8 | Pass |

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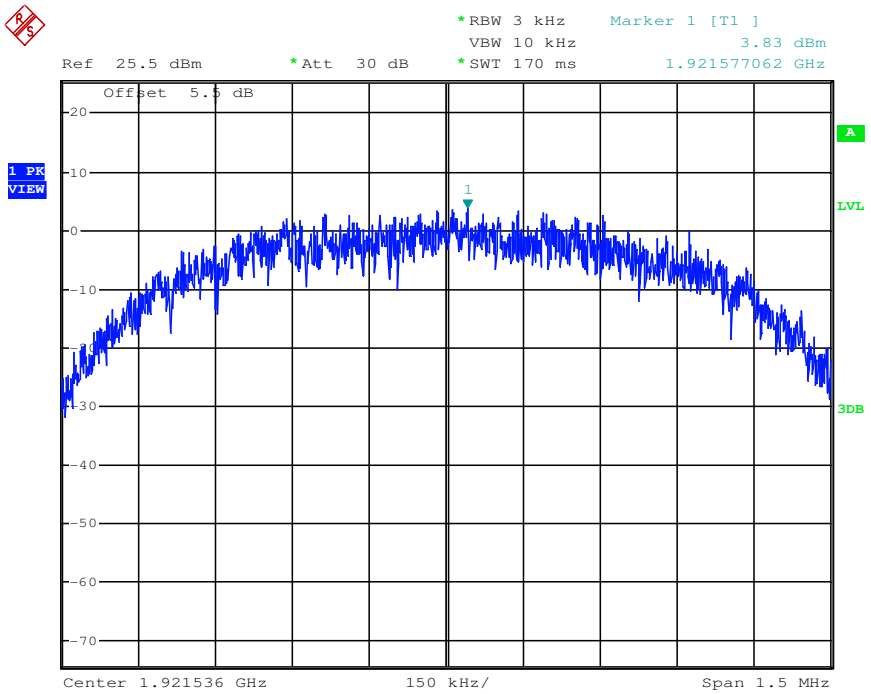
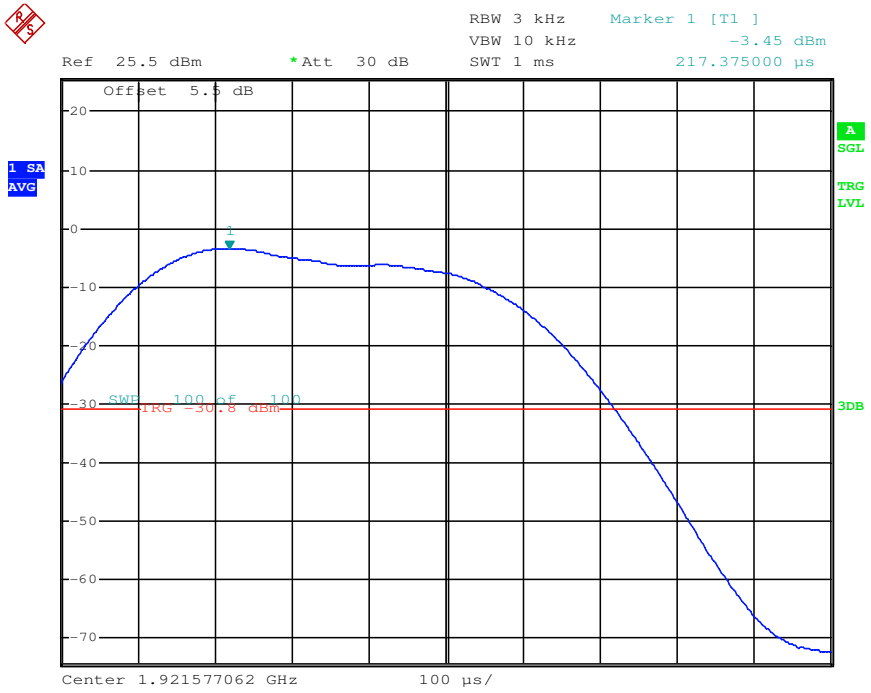
Power Spectral Density:

Lowest channel:

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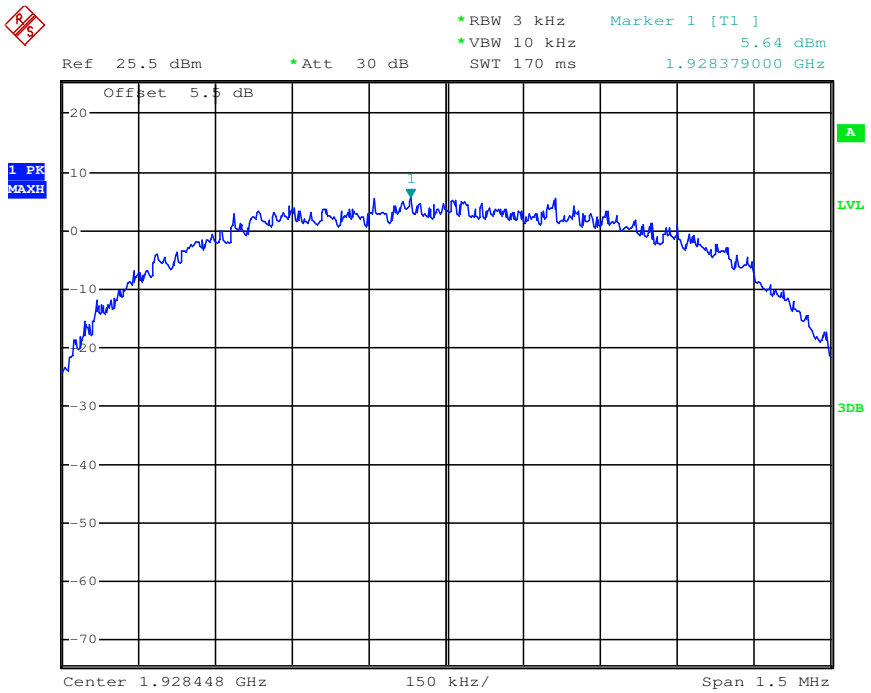
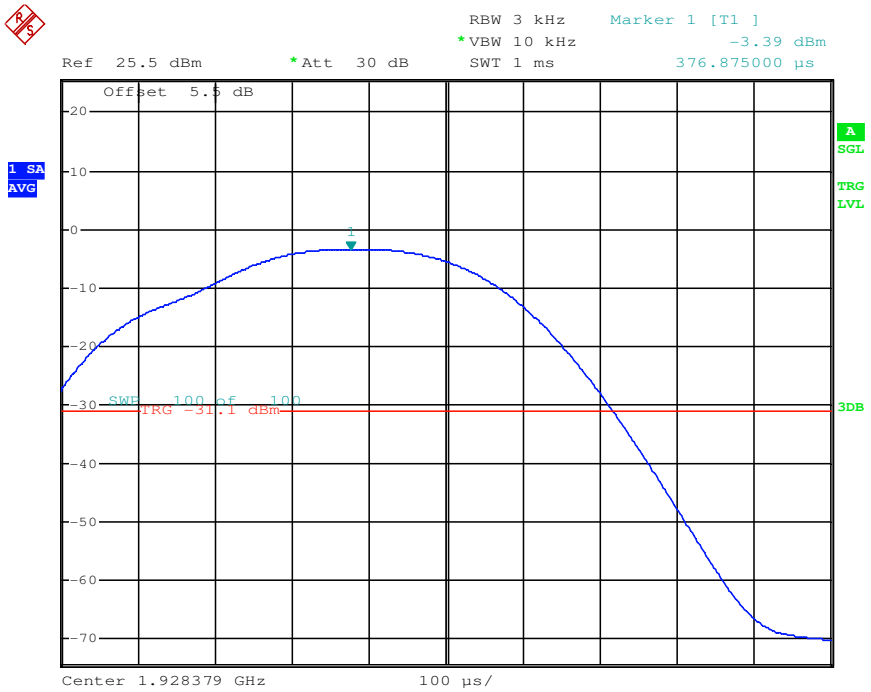
Highest channel:

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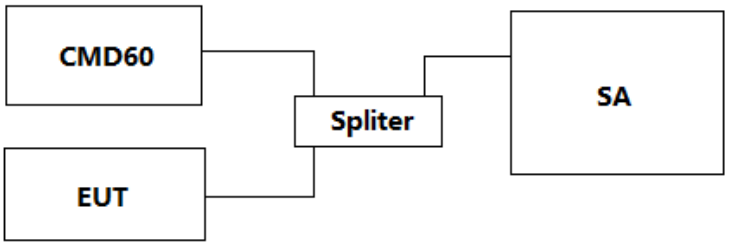
## 6.7 In-Band Unwanted Emissions, Conducted

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15.323(d) |
| Test Method: | ANSI C63.17: 2013 |
| Limit: | B < f ≤ 2B : at least 30 dB below max. permitted peak power<br>2B < f ≤ 3B : at least 50 dB below max. permitted peak power<br>3B < f ≤ UPCS Band Edge : at least 60 dB below max. permitted peak power |
| Test Procedure: | RBW: Approximately 1% of the emission bandwidth (B)<br>Video bandwidth: 3 × RBW<br>Sweep time: The sweep time shall be sufficiently slow that the swept frequency rate shall not exceed one RBW per three transmit bursts.<br>Number of sweeps: Sufficient to stabilize the trace<br>Amplitude scale: Log<br>Detection: Peak detection and max hold enabled<br>Span: Approximately equal to 3.5 B |
| Test Setup: |  |
| Test Mode: | Transmitting mode |
| Instruments Used: | Refer to section 5.0 for details |

Test Results:

| Channel | Frequency (MHz) | Results |
|---|---|---|
| Lowest | 1921.536 | Pass |
| Middle | 1924.992 | Pass |
| Highest | 1928.448 | Pass |

The plots of the unwanted emission inside the sub-band are as below.

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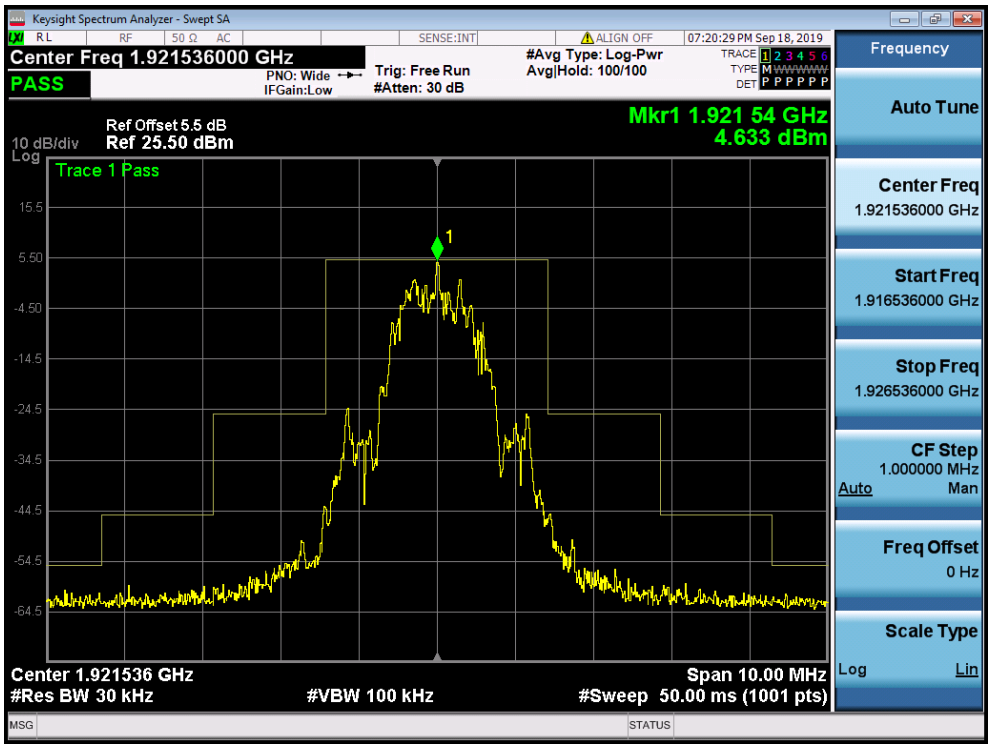
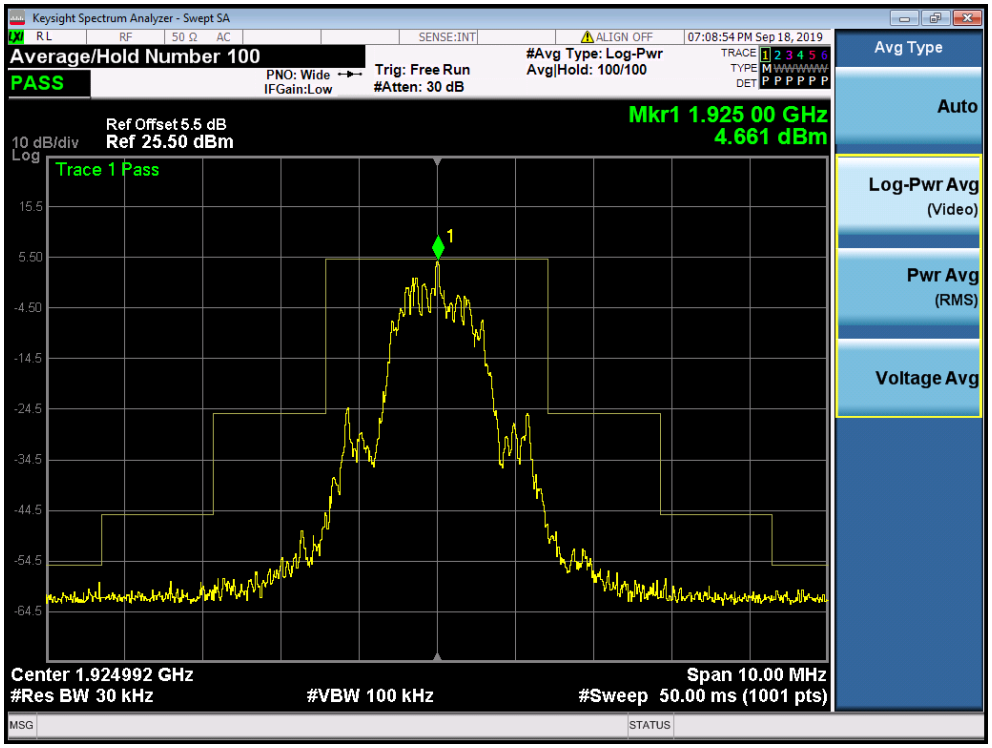
Test Plot of In-Band Unwanted Emissions:

Lowest channel:




Middle channel:

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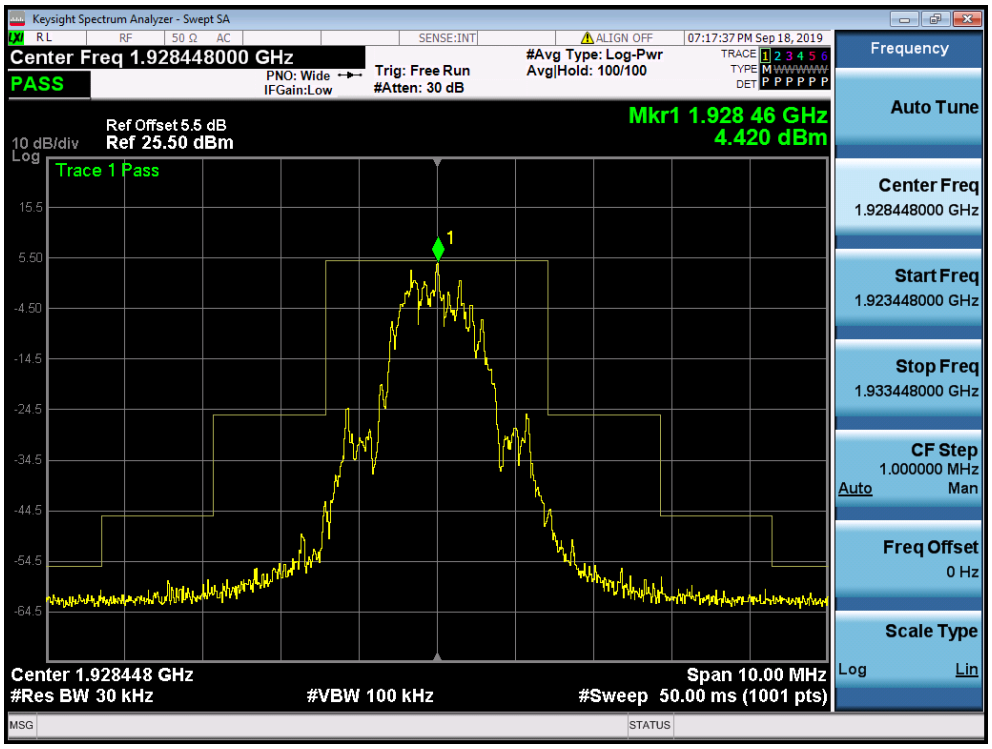
Highest channel:

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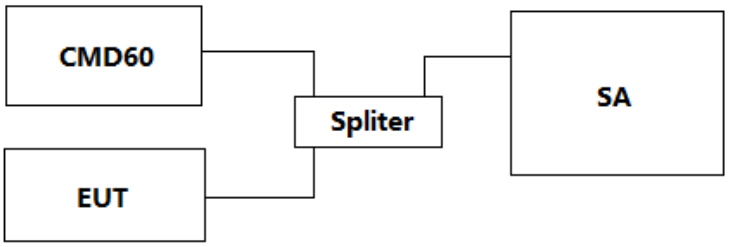
## 6.8 Out-of-band Emissions, Conducted

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15.323(d) |
| Test Method: | ANSI C63.17: 2013 |
| Limit: | f ≤ 1.25MHz outside UPCS band : ≤ -9.5dBm<br>1.25MHz ≤ f ≤ 2.5MHz outside UPCS band : ≤ -29.5 dBm<br>f ≥ 2.5MHz outside UPCS band : ≤ -39.5 dBm |
| Test Procedure: | RBW: Approximately 1% of the emission bandwidth (B)<br>Video bandwidth: 3 × RBW<br>Sweep time: The sweep time shall be sufficiently slow that the swept frequency rate shall not exceed one RBW per three transmit bursts.<br>Number of sweeps: Sufficient to stabilize the trace<br>Amplitude scale: Log<br>Detection: Peak detection and max hold enabled<br>Span: Approximately equal to 3.5 B |
| Test Setup: |  |
| Test Mode: | Transmitting mode |
| Instruments Used: | Refer to section 5.0 for details |

Test Results:

| Channel | Frequency (MHz) | Results |
|---|---|---|
| Lowest | 1921.536 | Pass |
| Middle | 1924.992 | Pass |
| Highest | 1928.448 | Pass |

The plots of the unwanted emission inside the sub-band are as below.

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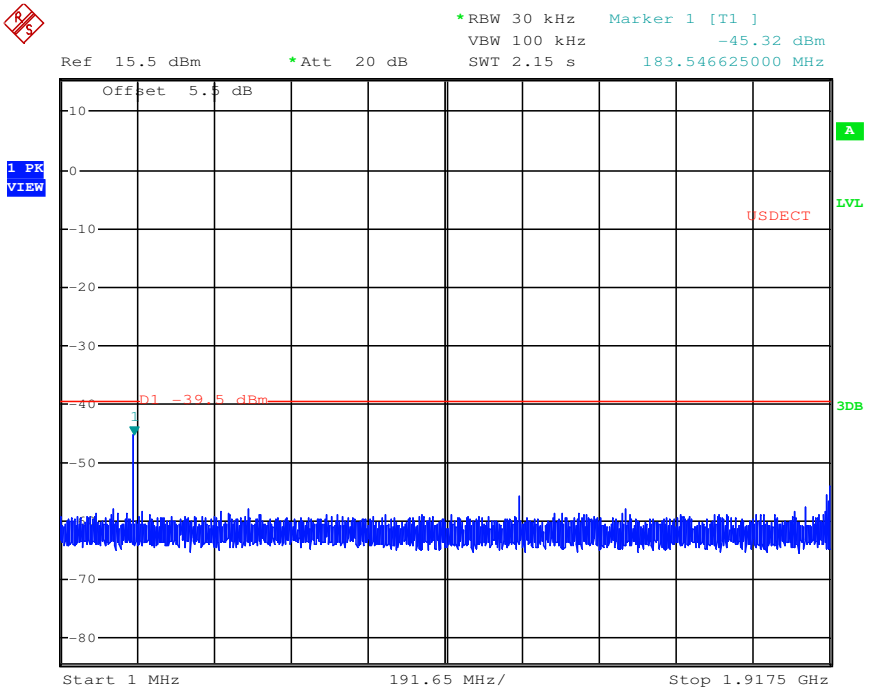
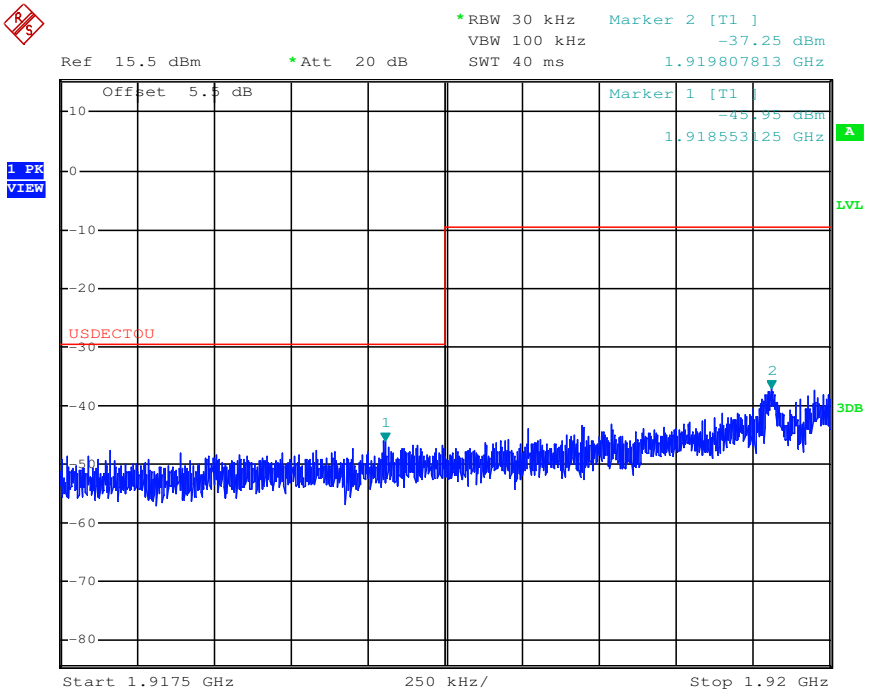
Test Plot of Out-of-Band Unwanted Emissions Lowest Channel:

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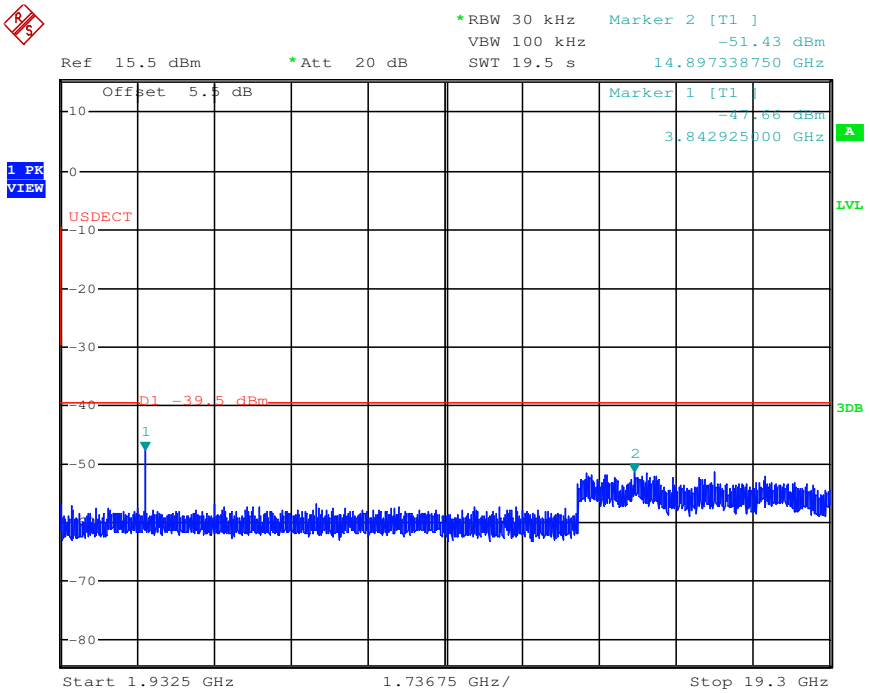
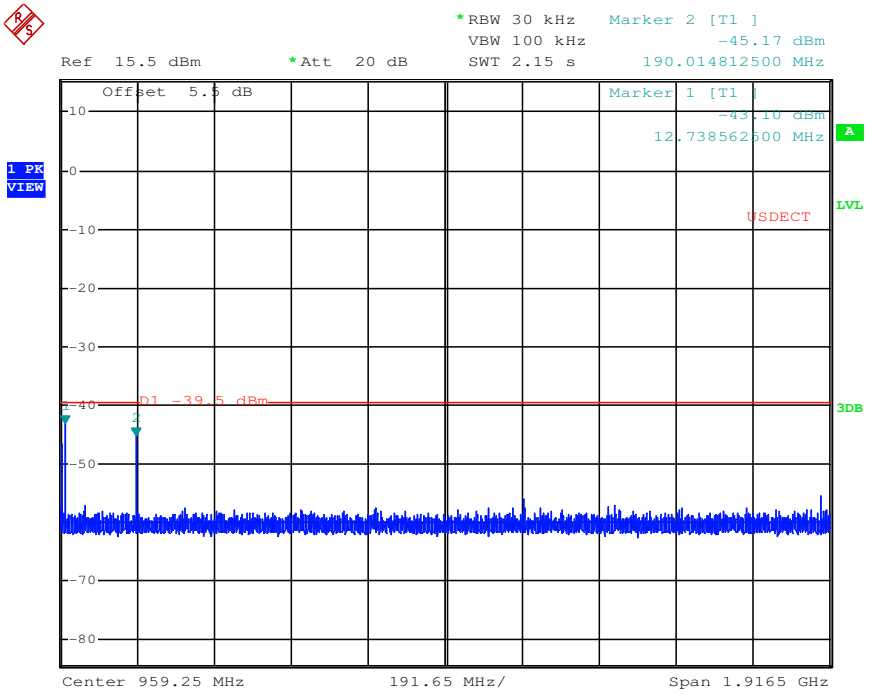



Test Plot of Out-of-Band Unwanted Emissions Highest Channel:

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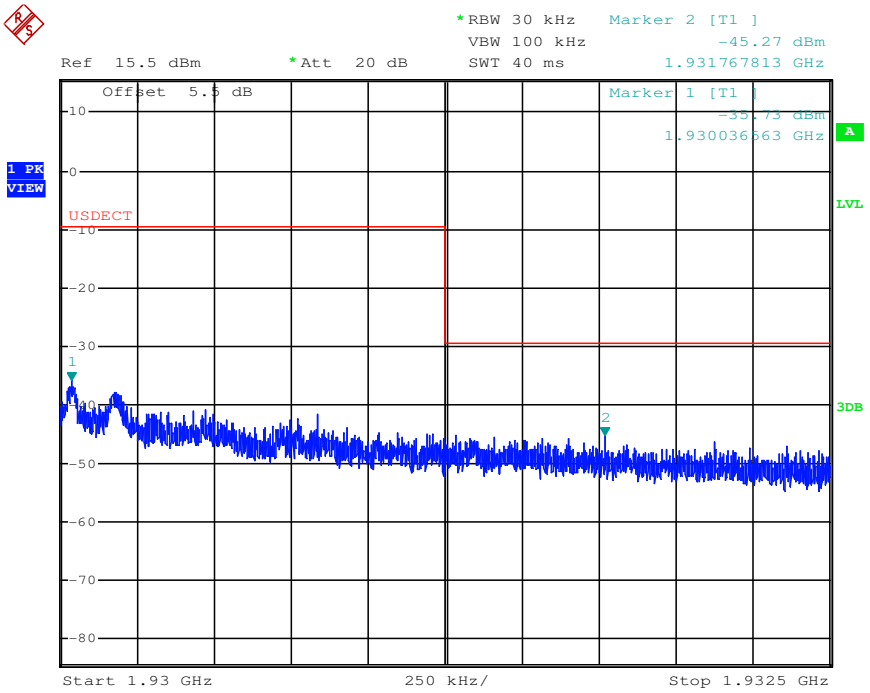


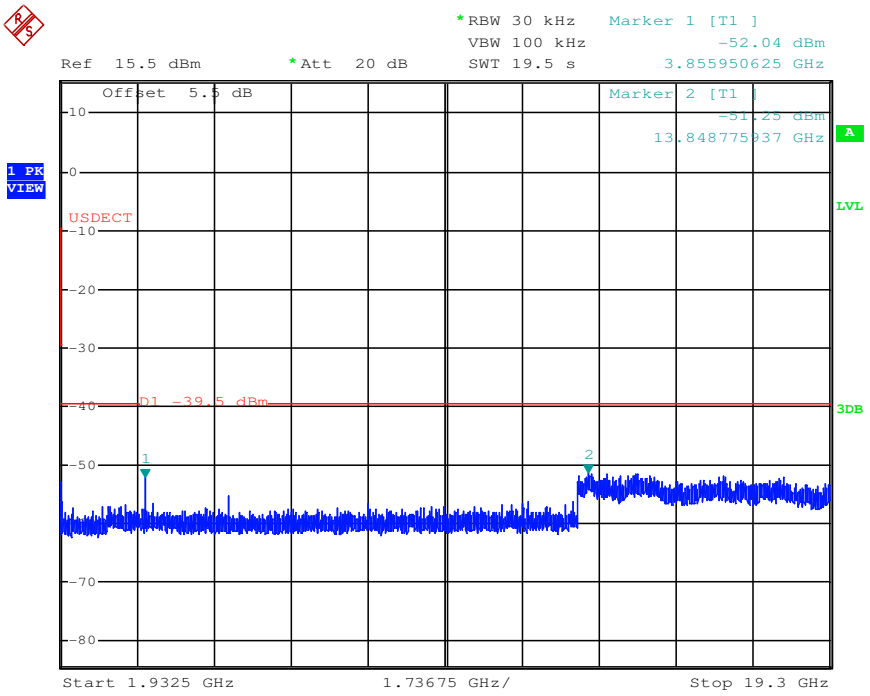


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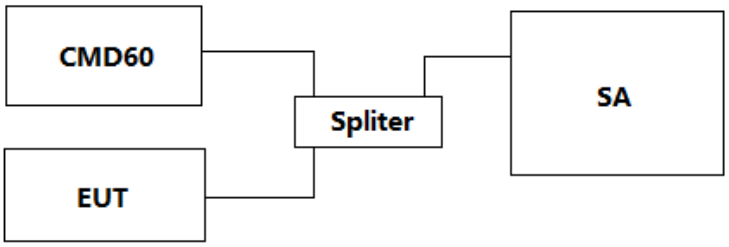
## 6.9 Carrier Frequency Stability

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15.323(f) |
| Test Method: | ANSI C63.17: 2013 |
| Limit: | maintained within +/-10 ppm at the following conditions:<br>1. Over 1 hour at nominal supply voltage and a temperature of +20 ℃;<br>2. Over a variation in the primary supply voltage of 85 % to 115 % of nominal supply voltage at a temperature of +20 ℃. This test does not apply to an EUT that is only powered by battery for operation;<br>3. Over a temperature variation of -20 ℃ to +50 ℃ or at extreme temperatures as declared by manufacturer, and at nominal supply voltage. |
| Test Procedure: | Measurements are made in accordance with ANSI C63.17 sub-clause 6.2.1 The EUT and CMD60 is connected with shielded coaxial cable. The EUT is controlled by DECT Radio Communication Tester, CMD60, to use a fixed frequency channel during test as well as record the frequency offset. The transmission of EUT is in burst mode with pseudo-random data. |
| Test Setup: |  |
| Test Mode: | Transmitting mode |
| Instruments Used: | Refer to section 5.0 for details |

Test Results:

**Carrier Frequency Stability over time at nominal temperature:**

| Average Mean Carrier Frequency (MHz) | Max. Diff. (kHz) | Min. Diff. (kHz) | Max. Dev. (ppm) | Limit(ppm) | Results |
|---|---|---|---|---|---|
| 1924.991891 | 0.12 | -0.34 | 0.2 | ±10 | Pass |

**Carrier Frequency Stability over Power Supply Voltage at Nominal Temperature**

| Voltage | Measured Carrier Frequency (MHz) | Difference (kHz) | Deviation (ppm) | Limit(ppm) | Results |
|---|---|---|---|---|---|
| Vnom | 1924.991325 | 0 | 0 | ±10 | Pass |
| 85% of Vnom | 1924.991562 | 0.0 | 0.0 | ±10 | Pass |
| 115% of Vnom | 1924.991893 | 0.0 | 0.0 | ±10 | Pass |

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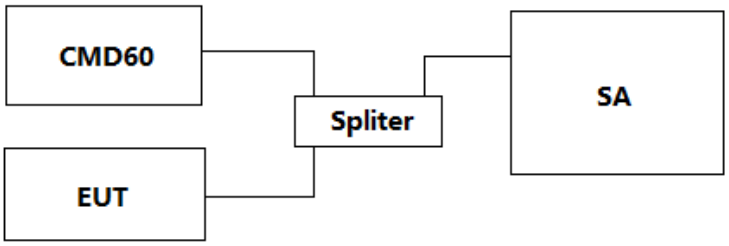
**Carrier Frequency Stability over Temperature:**

| Temperature (℃) | Measured Carrier Frequency (MHz) | Difference (kHz) | Deviation (ppm) | Limit(ppm) | Results |
|---|---|---|---|---|---|
| -20℃ | 1924.991643 | 0.35 | 0.81 | ±10 | Pass |
| +50℃ | 1924.991486 | -0.68 | -0.93 | ±10 | Pass |

## 6.10 Frame Repetition Stability

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15.323(e) |
| Test Method: | ANSI C63.17: 2013 |
| Limit: | TDD:<br>EUT that implement time division for the purpose of maintaining a duplex connection shall maintain a frame-repetition rate whereby three times the standard deviation of the frequency stability shall not exceed 50 ppm, not including a shift of the mean;<br>TDMA:<br>EUT that further divides access in time shall maintain a frame-repetition rate whereby three times the standard deviation of the frequency stability shallnot exceed 10 ppm, not including a shift of the mean. |
| Test Procedure: | X axis: Time<br>Time setting: Approximate frame period × 100<br>Y axis: Frequency<br>Center frequency: Nominal frame-repetition rate<br>Frequency span: Span large enough so that the full waveform is greater than 50% but less than 100% of the display scale<br>Measurement time interval (gating time) :X (in units of frame period) where X ≤ 1000<br>Number of measurements: 1000/X (where X is the measurement interval in units of frame period) |
| Test Setup: |  |
| Test Mode: | Transmitting mode |
| Instruments Used: | Refer to section 5.0 for details |

Test Results:

| Carrier Frequency (MHz) | Mean (Hz) | Standard Deviation (μHz) | Frame Repetition Stability (ppm) | Limit (ppm) | Results |
|---|---|---|---|---|---|
| 1924.992 | 100.000 | 1.258 | 0.037 | ±10 | Pass |

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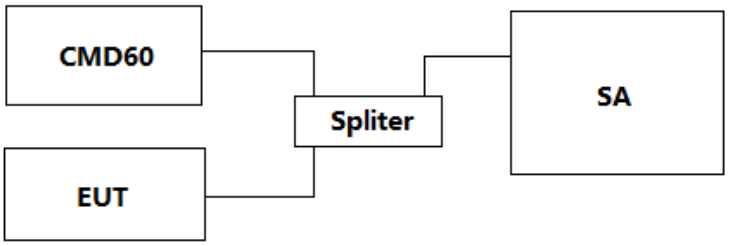
## 6.11 Frame Period and Jitter

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15.323(e) |
| Test Method: | ANSI C63.17: 2013 |
| Limit: | Frame Period: 20 or 10 ms<br>Max Jitter: 25 μs<br>3 times St.Dev of Jitter: 12.5 μs |
| Test Procedure: | Measurements are made in accordance with ANSI C63.17 sub-clause 6.2.3. Test setup is shown in section 3.2 Figure 3.2.1. A spectrum analyzer measures the time duration between the rising edges of two consecutive frames. The measurements are taken over 100,000 frames. These measurement values are used to compute mean value and the difference between any two consecutive frame periods. The mean value is the frame period. |
| Test Setup: |  |
| Test Mode: | Transmitting mode |
| Instruments Used: | Refer to section 5.0 for details |

Test Results:

| Measured Maximum Jitter (μs) | Limit (μs) | Results |
|---|---|---|
| -0.181 | ±25 | Pass |

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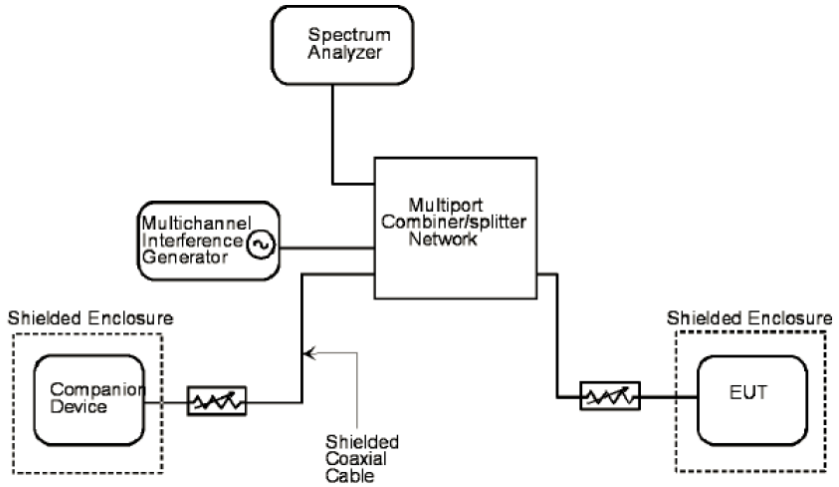
## 6.12 Monitoring Threshold, Least Interfered Channel

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15.323(c)(2)(5)(9) |
| Test Method: | ANSI C63.17: 2013 |
| Limit: | Least Interfered Channel Procedure (LIC) may only be used by systems with more than 20 duplex system access channels. Systems with less than 20 duplex system access channels are not allowed to transmit when interferer level is above Lower Threshold. |
| Test Procedure: | Please refer to accordance with ANSI C63.17 Clause 7.3.1, 7.3.3, 7.3.4 |
| Test Setup: |  |
| Test Mode: | Transmitting mode |
| Instruments Used: | Refer to section 5.0 for details |

Calculation of Monitoring Threshold Limit:

Monitoring Threshold (T) $\leq -174 + 10 \log_{10} B + M + P_{max} - P_{EUT}$ dBm

$\leq 15 \log_{10} B - 184 + M - P_{EUT}$ dBm

Where B =Measured Emission Bandwidth: $1.47 \times 10^6$Hz

M = 30 dB for Lower Monitoring Threshold ($T_L$), or

= 50 dB for Upper Monitoring Threshold ($T_U$)

$P_{max}$ = $5 \log_{10} B - 10$ dBm

$P_{EUT}$ = Measured Peak Transmit Power: 19.88dBm

Monitoring Threshold Limits:

| | FCC |
|---|---|
| Lower Monitoring Threshold ($T_L + U_M$) in dBm | -81.4 |
| Upper Monitoring Threshold ($T_U + U_M$) in dBm | -61.4 |

NA - Not applicable

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Test Descriptions and Results:

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

| ANSI C63.17 clause 7.3.2 ref. | Observation | Results |
|---|---|---|
| b) f1 at TL + UM + 7 dB, f2 at TL + UM | Transmission always on f2 | Pass |
| c) f1 at TL + UM, f2 at TL + UM +7 dB | Transmission always on f1 | Pass |
| d) f1 at TL + UM + 1 dB, f2 at TL + UM - 6 dB | Transmission always on f2 | Pass |
| e) f1 at TL + UM - 6 dB, f2 at TL + UM + 1 dB | Transmission always on f1 | Pass |

NA - Not applicable

Selected Channel Confirmation, FCC 15.323(c)(1) and (5)

| ANSI C63.17 clause 7.3.3 | Observation | Results |
|---|---|---|
| b) Shall not transmit on f1 | EUT transmits on f2 | Pass |
| d) Shall not transmit on f2 | EUT transmits on f1 | Pass |

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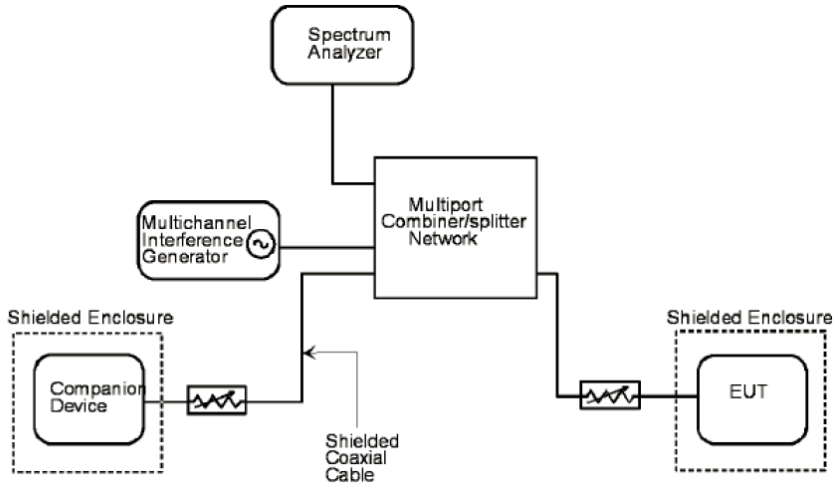
## 6.13 Threshold Monitoring Bandwidth

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15.323(c)(7), RSS-213 5.2 (7) |
| Test Method: | ANSI C63.17: 2013 |
| Limit: | The monitoring system bandwidth must be equal to or greater than the emission bandwidth of the intended transmission. |
| Test Procedure: | Please refer to accordance with ANSI C63.17 Clause 7.4.1 |
| Test Setup: |  |
| Test Mode: | Transmitting mode |
| Instruments Used: | Refer to section 5.0 for details |

Test Results:

| Test performed | Observation | Results |
|---|---|---|
| Simple Compliance test, at ±30% of B | N/A | N/A |
| More Detailed Test, at ±6 dB points | N/A | N/A |
| More Detailed Test, at ±12 dB points | N/A | N/A |

NA – Not applicable

*Remarks: Detailed Compliance Test was used to show the compliance of the EUT.

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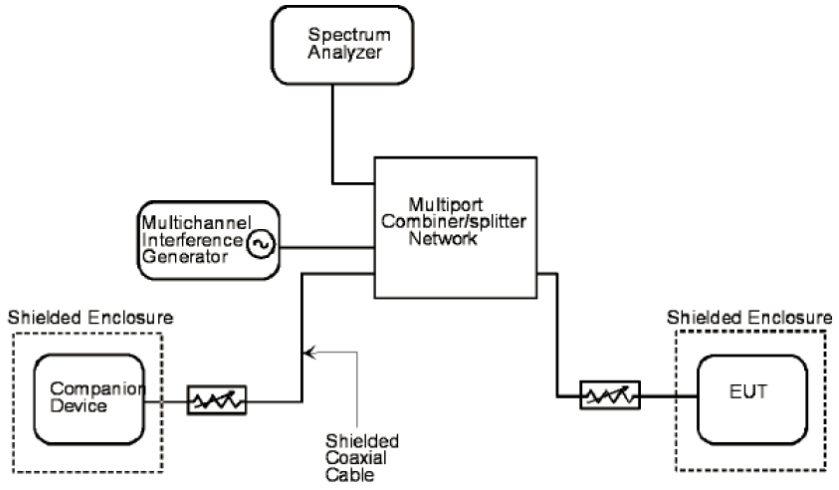
## 6.14 Reaction Time and Monitoring Interval

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15.323(c) (1) (5) (7) |
| Test Method: | ANSI C63.17: 2013 |
| Limit: | The maximum reaction time must be required to be less than 50 µs.<br>If a signal is detected that is 6 dB or more above the applicable threshold level, the maximum reaction time shall not be required to be less than 35 µs. |
| Test Procedure: | Please refer to accordance with ANSI C63.17 Clause 7.5 |
| Test Setup: |  |
| Test Mode: | Transmitting mode |
| Instruments Used: | Refer to section 5.0 for details |

Test Results:

| Pulse Width, ref. to ANSI C63.17 clause 7.5 | Observation | Results |
|---|---|---|
| c) > largest of 50 µs | EUT transmits on f1 | Pass |
| d) > largest of 35 µs | EUT transmits on f1 | Pass |

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

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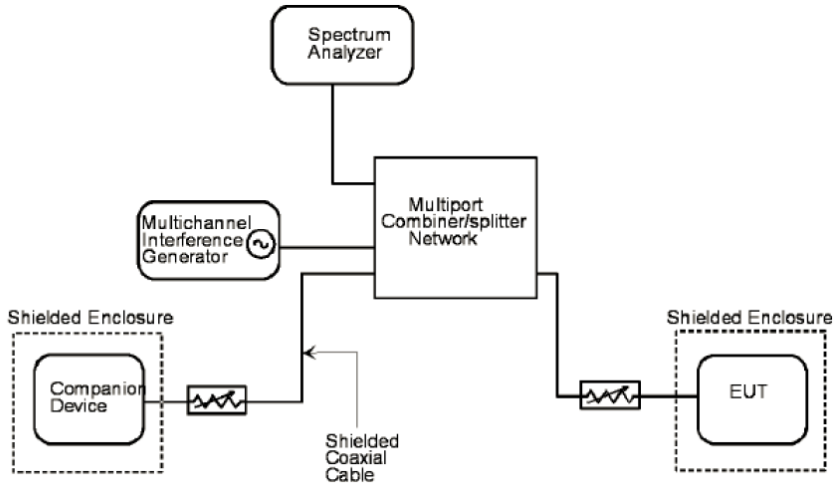
## 6.15 Time and Spectrum Window Access Procedure

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15.323(c) (4) (6) |
| Test Method: | ANSI C63.17: 2013 |
| Limit: | Once access to specific combined time and spectrum windows is obtained an acknowledgment from a system participant must be received by the initiating transmitter within one second or transmission must cease. Periodic acknowledgments 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 acknowledgment, at which time the access criteria must be repeated.<br>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. |
| Test Procedure: | Please refer to accordance with ANSI C63.17 Clause 8.1.1, 8.2.1; 8.1.2 or 8.1.3. |
| Test Setup: |  |
| Test Mode: | Transmitting mode |
| Instruments Used: | Refer to section 5.0 for details |

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Test results:

| Access Criteria, ref. to ANSI C63.17 clause 8.1.1, 8.2.1 | Observation | Results |
|---|---|---|
| b) Check that the EUT transmits on the interference free time-slot | EUT transmits on the interference free time-slot | Pass |
| b) The EUT must terminate or pause in its repetitive transmission of the control and signalling channel on the open channel to repeat the access criteria not less frequently than every 30 s | Transmission paused every 1.08 s | Pass |

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

| Access Criteria, ref. to ANSI C63.17 clause 8.1.2 | Observation | Results |
|---|---|---|
| b) Check that the EUT changes to an interference-free slot when interference is introduced on the time slot in use | EUT changes to the interference-free time-slot, and stays there | Pass |

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

| Access Criteria, ref. to ANSI C63.17 clause 8.1.3 | Observation | Results |
|---|---|---|
| b-d) Check that the EUT uses random waiting interval before continuing transmission on an interfered time slot | N/A | N/A |

Comment: The tested EUT does not support the Random Waiting Interval option.

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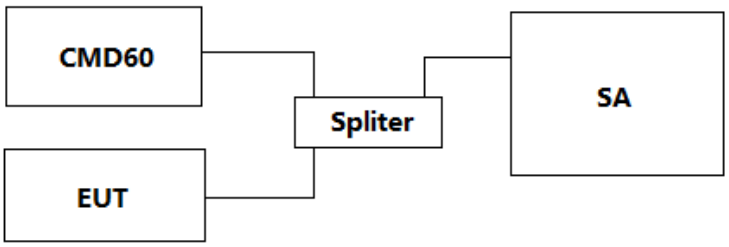
## 6.16 Acknowledgements and Transmission Duration

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15.323(c) (3) (4) |
| Test Method: | ANSI C63.17: 2013 |
| Limit: | 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.<br>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.<br>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. |
| Test Procedure: | Please refer to accordance with ANSI C63.17 Clause 8.2 |
| Test Setup: |  |
| Test Mode: | Transmitting mode |
| Instruments Used: | Refer to section 5.0 for details |

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Test results:

Acknowledgements

Timing for EUTs using control and signaling channel type transmissions:

| Conditions | Transmission Duration (seconds) | Limit (seconds) | Results |
|---|---|---|---|
| Time needed to repeat access criteria | 2 | 30 | Pass |

Timing for EUTs using communications channel type transmissions:

| Conditions | Transmission Duration (seconds) | Limit (seconds) | Results |
|---|---|---|---|
| Activate EUT w/ companion device off | NA | 1 | NA |
| Time needed to cease Traffic Channel | 4.5 | 30 | Pass |

NA - Not applicable

Transmission Duration

| Measured Maximum Transmission Duration (minutes) | Limit (minutes) | Results |
|---|---|---|
| 220 | 480 | Pass |

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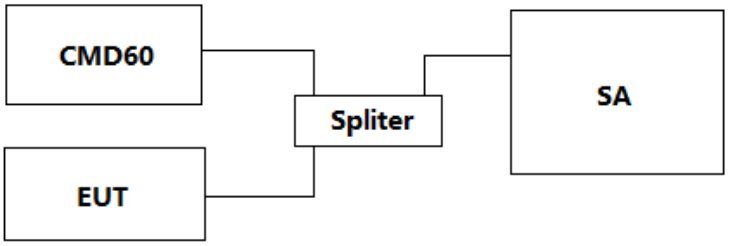
## 6.17 Dual Access Criteria Check

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15.323(c) (10) , RSS-213 5.2 (10) |
| Test Method: | ANSI C63.17: 2013 |
| Limit: | 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. |
| Test Procedure: | Please refer to accordance with ANSI C63.17 Clause 8.3 |
| Test Setup: |  |
| Test Mode: | Transmitting mode |
| Instruments Used: | Refer to section 5.0 for details |

Test results:

EUTs that implements the LIC procedure:

| Test ref. to ANSI C63.17 clause 8.3.2 | Observation | Results |
|---|---|---|
| b) EUT is restricted to a single carrier f1 for TDMA systems. The Test is Pass if EUT can transmit | EUT can transmit | Pass |
| c) d) Transmission on interference-free receive time/spectrum window | EUT transmits on interference free receive slot | Pass |
| e) f) Transmission on interference-free transmit time/spectrum window | EUT transmits on interference free transmit slot | Pass |

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## 6.18 Radiated Spurious Emissions

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15.319(g), 15.209(a) |
| Test Method: | ANSI C63.4: 2014 |
| Test Site: | Measurement Distance: 3m (Semi-Anechoic Chamber) |
| Receiver Setup: | |

| Frequency | Detector | RBW | VBW | Remark |
|---|---|---|---|---|
| 0.009MHz-0.090MHz | Peak | 10kHz | 30kHz | Peak |
| 0.009MHz-0.090MHz | Average | 10kHz | 30kHz | Average |
| 0.090MHz-0.110MHz | Quasi-peak | 10kHz | 30kHz | Quasi-peak |
| 0.110MHz-0.490MHz | Peak | 10kHz | 30kHz | Peak |
| 0.110MHz-0.490MHz | Average | 10kHz | 30kHz | Average |
| 0.490MHz -30MHz | Quasi-peak | 10kHz | 30kHz | Quasi-peak |
| 30MHz-960MHz | Quasi-peak | 100 kHz | 300kHz | Quasi-peak |
| Above 960MHz | RMS | 1MHz | 3MHz | RMS |

| | |
|---|---|
| Limit:<br>(Spurious Emissions) | f ≤ 1.25MHz outside UPCS band : ≤ -9.5dBm<br>1.25MHz ≤ f ≤ 2.5MHz outside UPCS band : ≤ -29.5dBm<br>f ≥ 2.5MHz outside UPCS band : ≤ -39.5dBm or shall meet the requirement of FCC Rule 15.319(g) which shall not exceed the limits of FCC Rule 15.209 |

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| Test Setup: | |
|---|---|

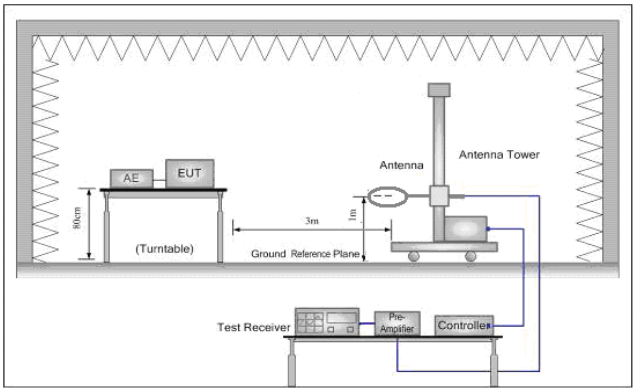


Figure 1. Below 30MHz

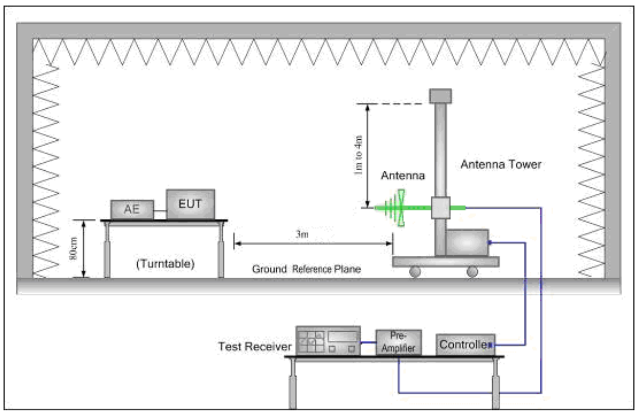


Figure 2. 30MHz to 1GHz

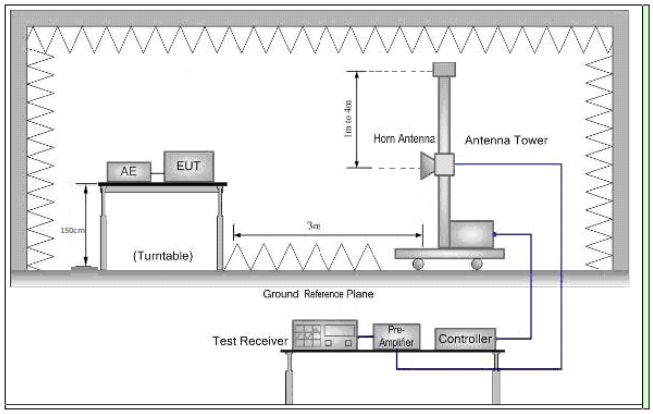


Figure 3. Above 1 GHz

| Test Procedure: | |
|---|---|
| | 1) For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.<br>2) For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.<br>3) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.<br>4) The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.<br>5) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to |

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| | |
|---|---|
| | 360 degrees to find the maximum reading.<br>6) The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.<br>7) If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.<br>8) Test the EUT in the lowest channel,the middle channel,the Highest channel<br>9) The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode,And found the X axis positioning which it is worse case.<br>10) Repeat above procedures until all frequencies measured was complete. |
| Exploratory Test Mode: | Transmitting mode |
| Final Test Mode: | Pretest the EUT at Transmitting mode and Charge +Transmitting mode, found the Charge +Transmitting mode which it is worse case<br>Only the worst case is recorded in the report. |
| Instruments Used: | Refer to section 5.0 for details |

**Test Data:**

**Below 1GHz:**

| Polarization | Frequency (MHz) | Measured Power (dBm) | Power Limit (dBm) | Margin (dBm) |
|---|---|---|---|---|
| H | 30.11 | -65.61 | -39.5 | -26.11 |
| H | 590.97 | -65.52 | -39.5 | -26.02 |
| H | 790.62 | -66.45 | -39.5 | -26.95 |
| V | 30.11 | -65.21 | -39.5 | -25.71 |
| V | 564.64 | -65.7 | -39.5 | -26.2 |
| V | 774.16 | -66.43 | -39.5 | -26.93 |

**Above 1GHz:**

**Lowest Channel:**

| Polarization | Frequency (MHz) | Measured Power (dBm) | Power Limit (dBm) | Margin (dBm) |
|---|---|---|---|---|
| H | 3843.072 | -57.56 | -39.5 | -18.06 |
| H | 5764.608 | -53.58 | -39.5 | -14.08 |
| H | 7686.144 | -51.33 | -39.5 | -11.83 |
| V | 3843.072 | -56.07 | -39.5 | -16.57 |
| V | 5764.608 | -52.55 | -39.5 | -13.05 |
| V | 7686.144 | -51.72 | -39.5 | -12.22 |

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**Middle Channel:**

| Polarization | Frequency (MHz) | Measured Power (dBm) | Power Limit (dBm) | Margin (dBm) |
|---|---|---|---|---|
| H | 3849.984 | -57.01 | -39.5 | -17.51 |
| H | 5774.976 | -53.19 | -39.5 | -13.69 |
| H | 7699.968 | -50.43 | -39.5 | -10.93 |
| V | 3849.984 | -57.15 | -39.5 | -17.65 |
| V | 5774.976 | -53.74 | -39.5 | -14.24 |
| V | 7699.968 | -51.27 | -39.5 | -11.77 |

**Highest Channel:**

| Polarization | Frequency (MHz) | Measured Power (dBm) | Power Limit (dBm) | Margin (dBm) |
|---|---|---|---|---|
| H | 3856.896 | -56.88 | -39.5 | -17.38 |
| H | 5785.344 | -53.1 | -39.5 | -13.6 |
| H | 7713.792 | -51.98 | -39.5 | -12.48 |
| V | 3856.896 | -57.27 | -39.5 | -17.77 |
| V | 5785.344 | -53.44 | -39.5 | -13.94 |
| V | 7713.792 | -51.45 | -39.5 | -11.95 |

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# 7 Photographs

Please refer to setup photos.

## 7.1 EUT Constructional Details (EUT Photos)

Please refer to external and internal photos for details.

- End of the Report -

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