

### CFR 47 FCC PART 15 SUBPART C

### **TEST REPORT**

For

### Capsule

### MODEL NUMBER: AKES-11SI

### FCC ID: 2A6BYAKES-11SI

### **REPORT NUMBER: 4790307922-3**

### ISSUE DATE: Apr. 19, 2022

Prepared for

### ANKON Technologies Co., Ltd.

Prepared by

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### **Revision History**

| Rev. | Issue Date | Revisions     | Revised By |
|------|------------|---------------|------------|
| V0   | 04/19/2022 | Initial Issue |            |



| Summary of Test Results |   |   |                     |  |  |
|-------------------------|---|---|---------------------|--|--|
| Clause                  | Test Items  | FCC Rules   | Test Results        |  |  |
| 1                       | 6dB Bandwidth   | FCC Part 15.247 (a) (2)                                   | Pass                |  |  |
| 2                       | Conducted Output Power  | FCC Part 15.247 (b) (3)                                   | Pass                |  |  |
| 3                       | Power Spectral Density  | FCC Part 15.247 (e)                                       | Pass                |  |  |
| 4                       | Conducted Bandedge and<br>Spurious Emission                         | FCC Part 15.247 (d)                                       | Pass                |  |  |
| 5                       | Radiated Bandedge and<br>Spurious Emission                          | FCC Part 15.247 (d)<br>FCC Part 15.209<br>FCC Part 15.205 | Pass                |  |  |
| 6                       | Conducted Emission Test for<br>AC Power Port                        | FCC Part 15.207   | N/A<br>(See Note 1) |  |  |
| 7                       | Antenna Requirement   | FCC Part 15.203   | Pass                |  |  |
| ,                       | Γ is powered by battery.<br>asurement result for the sample receive | ed is <pass> according to &lt; ANSI C</pass>              | 63.10-2013,         |  |  |

2) The measurement result for the sample received is <Pass> according to < ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15C> when <Accuracy Method> decision rule is applied.



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| <b>7.</b><br><b>8.</b><br>8.<br>8.<br>8.<br>8.<br>8.<br><b>9.</b><br>9.<br>9. | ME<br>AN<br>1.<br>2.<br>3.<br>4.<br>5.<br>RA<br>1.       | ASUREMENT METHODS   |                                  |
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# **1. ATTESTATION OF TEST RESULTS**

### **Applicant Information**

| Company Name:            | ANKON Technologies Co., Ltd.  |
|--------------------------|---|
| Address:                 | B3-2, B3-3, D3-4 Biolake, No.666, Hi-Tech Road, East Lake New Technology Development Zone, Wuhan, 430075 Hubei, China |
| Manufacturer Information |   |
| Company Name:            | ANKON Technologies Co., Ltd.  |
| Address:                 | B3-2, B3-3, D3-4 Biolake, No.666, Hi-Tech Road, East Lake New Technology Development Zone, Wuhan, 430075 Hubei, China |
| Factory Information      |   |
| Company Name:            | ANKON Technologies Co., Ltd.  |
| Address:                 | B3-2, B3-3, D3-4 Biolake, No.666, Hi-Tech Road, East Lake New Technology Development Zone, Wuhan, 430075 Hubei, China |
| EUT Description          |   |
| EUT Name:                | Capsule   |
| Model:                   | AKES-11SI   |
| Sample Number:           | 4755808-S001, 4755808-S006  |
| Sample Received Date:    | Mar. 12, 2022   |
| Date of Tested:          | Mar. 16, 2022 ~ Apr. 19, 2022   |
|                          |   |

| APPLICABLE STANDARDS         |      |  |  |  |
|------------------------------|------|--|--|--|
| STANDARD TEST RESULTS        |      |  |  |  |
| CFR 47 FCC PART 15 SUBPART C | PASS |  |  |  |

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# 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC KDB 558074 D01 15.247 Meas Guidance v05r02, KDB 414788 D01 Radiated Test Site v01r01, CFR 47 FCC Part 2, CFR 47 FCC Part 15, ANSI C63.10-2013.

# 3. FACILITIES AND ACCREDITATION

| Accreditation<br>Certificate | A2LA (Certificate No.: 4829.01)<br>UL-CCIC COMPANY LIMITED has been assessed and proved to be in<br>compliance with A2LA.<br>FCC (FCC Designation No.: CN1247)<br>UL-CCIC COMPANY LIMITED has been recognized to perform<br>compliance testing on equipment subject to the Commission's<br>Declaration of Conformity (DoC) and Certification rules.<br>IC (IC Designation No.: 25056; CAB No.: CN0073)<br>UL-CCIC COMPANY LIMITED has been recognized to perform<br>compliance testing on equipment subject to the Commission's<br>Declaration of Conformity (DoC) and Certification rules. |
|------------------------------|---|
|------------------------------|---|

Note 1: All tests measurement facilities use to collect the measurement data are located at No. 2, Chengwan Road, Suzhou Industrial Park, Suzhou 215122, People's Republic of China

Note 2: For below 30MHz, lab had performed measurements at test anechoic chamber and comparing to measurements obtained on an open field site. These measurements below 30MHz had been correlated to measurements performed on an OFS.

Note 3: The test anechoic chamber in UL-CCIC COMPANY LIMITED had been calibrated and compared to the open field sites and the test anechoic chamber is shown to be equivalent to or worst case from the open field site.



# 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations and is traceable to recognize national standards.

# 4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

| Test Item   | Uncertainty        |  |  |
|---|--------------------|--|--|
| Conduction emission   | 3.1dB              |  |  |
| Radiation Emission test (include Fundamental<br>emission)<br>(9kHz-30MHz)   | 3.4dB              |  |  |
| Radiation Emission test (include Fundamental<br>emission)<br>(30MHz-1GHz)   | 3.4dB              |  |  |
| Radiation Emission test<br>(1GHz to 26GHz) (include Fundamental emission)   | 3.9dB (1GHz-18Gz)  |  |  |
|   | 4.2dB (18GHz-26Gz) |  |  |
| Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2. |                    |  |  |

# 5. EQUIPMENT UNDER TEST

# 5.1. DESCRIPTION OF EUT

| EUT Name            | Capsule         |
|---------------------|-----------------|
| Model               | AKES-11SI       |
| Radio Technology    | 915MHz RF       |
| Operation frequency | 905MHz ~ 925MHz |
| Modulation          | 8-FSK           |
| Data Rate           | 4Mbps           |
| Power Supply        | DC 3V           |

# 5.2. MAXIMUM OUTPUT POWER

| Number of Transmit Chains | Frequency | Channel Number | Max Conducted Power |
|---------------------------|-----------|----------------|---------------------|
| (NTX)                     | (MHz)     |                | (dBm)               |
| 1                         | 905-925   | 1-21[11]       | 10.84               |

# 5.3. CHANNEL LIST

| Channel | Frequency<br>(MHz) | Channel | Frequency<br>(MHz) | Channel | Frequency<br>(MHz) | Channel | Frequency<br>(MHz) |
|---------|--------------------|---------|--------------------|---------|--------------------|---------|--------------------|
| 1       | 905                | 7       | 911                | 13      | 917                | 19      | 923                |
| 2       | 906                | 8       | 912                | 14      | 918                | 20      | 924                |
| 3       | 907                | 9       | 913                | 15      | 919                | 21      | 925                |
| 4       | 908                | 10      | 914                | 16      | 920                |         |                    |
| 5       | 909                | 11      | 915                | 17      | 921                |         |                    |
| 6       | 910                | 12      | 916                | 18      | 922                |         |                    |

# 5.4. TEST CHANNEL CONFIGURATION

| Test Mode | Test Channel       | Frequency              |  |
|-----------|--------------------|------------------------|--|
| TX        | CH 1, CH 11, CH 21 | 905MHz, 915MHz, 925MHz |  |

# 5.5. THE WORSE CASE CONFIGURATIONS

| The Worse Case Power Setting Parameter under 902 ~ 928MHz Band |              |           |       |  |  |
|--|--------------|-----------|-------|--|--|
| Test Software  | DAQ-Mobile   |           |       |  |  |
|  | Test Channel |           |       |  |  |
| Transmit Antenna<br>Number                                     |              | NCB: 4MHz |       |  |  |
| Number   | CH 1         | CH 11     | CH 21 |  |  |
| 1  | 905 915 925  |           |       |  |  |

# 5.6. DESCRIPTION OF AVAILABLE ANTENNAS

| Antenna | Frequency (MHz) | Antenna Type         | MAX Antenna Gain (dBi) |
|---------|-----------------|----------------------|------------------------|
| 1       | 905-925         | Embedded FPC Antenna | -32.0                  |

| Transmit and Receive Mode | Description  |
|---------------------------|--|
| ⊠1TX, 1RX                 | ANT 1 can be used as transmitting/receiving antenna. |

# 5.7. THE WORSE CASE CONFIGURATIONS

The EUT only support 8-FSK modulation whose data rate is 4 Mbps, so the data rate of 4 Mbps was test and recorded in this report.



# 5.8. DESCRIPTION OF TEST SETUP

#### SUPPORT EQUIPMENT

| Item | Equipment | Brand Name | Model Name             | P/N |
|------|-----------|------------|------------------------|-----|
| 1    | Laptop    | ThinkPad   | ThinkPad X1 Carbon 5th | /   |

#### I/O CABLES

| Cable No | Port | Connector Type | Cable Type | Cable Length(m) | Remarks |
|----------|------|----------------|------------|-----------------|---------|
| 1        | USB  | USB            | USB Cable  | 1               | /       |

#### ACCESSORIES

| Item | Accessory | Brand Name | Model Name | Description |
|------|-----------|------------|------------|-------------|
| 1    | /         | /          | /          | /           |

#### TEST SETUP

The EUT can work in engineering mode with a software through a laptop.

#### SETUP DIAGRAM FOR TESTS

|--|



# 6. MEASURING INSTRUMENT AND SOFTWARE USED

|              | Conducted Emissions (Instrument)         |  |                                     |                                      |        |         |                    |            |            |
|--------------|--|--|-------------------------------------|--------------------------------------|--------|---------|--------------------|------------|------------|
| Used         | Equipment                                | Manufacturer                           | Mod                                 | lel No.                              | Seri   | al No.  | Upper Last<br>Cal. | Last Cal.  | Next Cal.  |
| $\checkmark$ | EMI Test Receiver                        | R&S                                    | E                                   | SR3                                  | 12     | 6700    | 2020-12-05         | 2021-12-04 | 2022-12-03 |
| $\checkmark$ | Two-Line V-Network                       | R&S                                    | EN                                  | V216                                 | 12     | 6701    | 2020-12-05         | 2021-12-04 | 2022-12-03 |
| V            | Artificial Mains<br>Networks             | R&S                                    | EN                                  | NY81                                 | 12     | 6711    | 2020-10-13         | 2021-10-12 | 2022-10-11 |
| Software     |  |  |                                     |                                      |        |         |                    |            |            |
| Used         | Des                                      | scription                              |                                     | Ma                                   | inufac | turer   | Name               | Version    |            |
|              | Test Software for (                      | Conducted distur                       | bance                               |                                      | R&S    | ;       | EMC32              | Ver. 9.25  |            |
|              |  | Ra                                     | diated                              | d Emissi                             | ions ( | Instrum | nent)              |            |            |
| Used         | Equipment                                | Manufacturer                           | Mod                                 | lel No.                              | Seri   | al No.  | Upper Last<br>Cal. | Last Cal.  | Next Cal.  |
| $\checkmark$ | Spectrum Analyzer                        | Keysight                               | N9                                  | 010B                                 | 15     | 5727    | 2020-05-10         | 2021-05-09 | 2022-05-08 |
| $\checkmark$ | EMI test receiver                        | R&S                                    | ES                                  | SR26                                 | 12     | 6703    | 2020-12-05         | 2021-12-04 | 2022-12-03 |
| $\checkmark$ | Receiver Antenna<br>(9kHz-30MHz)         | Schwarzbeck                            | FMZ                                 | B 1513                               | 15     | 5456    | 2018-06-15         | 2021-06-03 | 2024-06-02 |
| $\checkmark$ | Receiver Antenna<br>(30MHz-1GHz)         | SunAR RF<br>Motion                     | JB1                                 |                                      | 17     | 7821    | 2019-01-19         | 2022-01-18 | 2025-01-17 |
| V            | Receiver Antenna<br>(1GHz-18GHz)         | R&S                                    | HF907                               |                                      | 12     | 6705    | 2019-01-27         | 2022-02-28 | 2025-02-27 |
| V            | Receiver Antenna<br>(18GHz-26.5GHz)      | ETS                                    | 3160-10                             |                                      | 15     | 5565    | 2019-01-05         | 2021-07-15 | 2024-07-14 |
| V            | Pre-amplification<br>(To 18GHz)          | Compliance<br>Direction<br>System Inc. | PAP-1G18-50                         |                                      | 17     | 8825    | 2021-03-26         | 2022-03-01 | 2023-02-28 |
| V            | Pre-amplification<br>(To 26.5GHz)        | R&S                                    | SCI                                 | U-26D                                | 13     | 5391    | 2020-12-05         | 2021-12-04 | 2022-12-03 |
| V            | Band Reject Filter                       | Wainwright                             | 2350<br>2483.5                      | CJV8-<br>)-2400-<br>5-2533.5-<br>0SS |        | 1       | 2020-05-10         | 2021-05-09 | 2022-05-08 |
| V            | Highpass Filter                          | Wainwright                             | WHKX10-<br>2700-3000-<br>18000-40SS |                                      |        | 2       | 2020-05-10         | 2021-05-09 | 2022-05-08 |
|              | Software                                 |  |                                     |                                      |        |         |                    |            |            |
| Used         | Used Description I                       |  | Manufac                             | cturer Nar                           |        | Name    | Version            |            |            |
| $\checkmark$ | ☑ Test Software for Radiated disturbance |  |                                     | Tonsce                               |        |         | TS+                | Ver. 2.5   |            |
|              |  |  | 0                                   | ther ins                             | trum   | ents    |                    |            |            |
| Used         | Equipment                                | Manufacturer                           | Mod                                 | lel No.                              | Seri   | al No.  | Upper Last<br>Cal. | Last Cal.  | Next Cal.  |
|              | Spectrum Analyzer                        | Keysight                               | N9                                  | 010B                                 | 15     | 5368    | 2020-05-10         | 2021-05-09 | 2022-05-08 |
| $\checkmark$ | Power Meter                              | Keysight                               | U20                                 | )21XA                                | 15     | 5370    | 2020-05-10         | 2021-05-09 | 2022-05-08 |



# 7. MEASUREMENT METHODS

| No. | Test Item   | KDB Name                                      | Section         |
|-----|---|---|-----------------|
| 1   | 6dB Bandwidth and<br>99% Occupied Bandwidth       | KDB 558074 D01 15.247<br>Meas Guidance v05r02 | 8.2             |
| 2   | Peak Output Power                                 | KDB 558074 D01 15.247<br>Meas Guidance v05r02 | 8.3.1.3/8.3.2.3 |
| 3   | Power Spectral Density                            | KDB 558074 D01 15.247<br>Meas Guidance v05r02 | 8.4             |
| 4   | Out-of-band emissions in non-<br>restricted bands | KDB 558074 D01 15.247<br>Meas Guidance v05r02 | 8.5             |
| 5   | Out-of-band emissions in restricted bands         | KDB 558074 D01 15.247<br>Meas Guidance v05r02 | 8.6             |
| 6   | Band-edge   | KDB 558074 D01 15.247<br>Meas Guidance v05r02 | 8.7             |
| 7   | Conducted Emission Test for<br>AC Power Port      | ANSI C63.10-2013                              | 6.2             |



# 8. ANTENNA PORT TEST RESULTS

# 8.1. ON TIME AND DUTY CYCLE

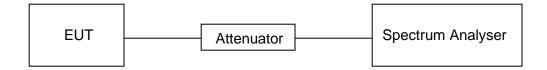
### <u>LIMITS</u>

None; for reporting purposes only

### PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method

### TEST SETUP



#### TEST ENVIRONMENT

| Temperature         | 20°C   | Relative Humidity | 56%   |
|---------------------|--------|-------------------|-------|
| Atmosphere Pressure | 101kPa | Test Voltage      | DC 3V |

#### **RESULTS**

| On Time<br>(msec) | Period<br>(msec) | Duty Cycle<br>x<br>(Linear) | Duty Cycle<br>(%) | Duty Cycle<br>Correction<br>Factor<br>(db) | 1/T<br>Minimum<br>VBW<br>(kHz) | Final<br>setting<br>For VBW<br>(kHz) |
|-------------------|------------------|-----------------------------|-------------------|--|--------------------------------|--------------------------------------|
| 2.200             | 4.890            | 0.4499                      | 44.99%            | 3.47                                       | 0.45                           | 0.5                                  |

Note:

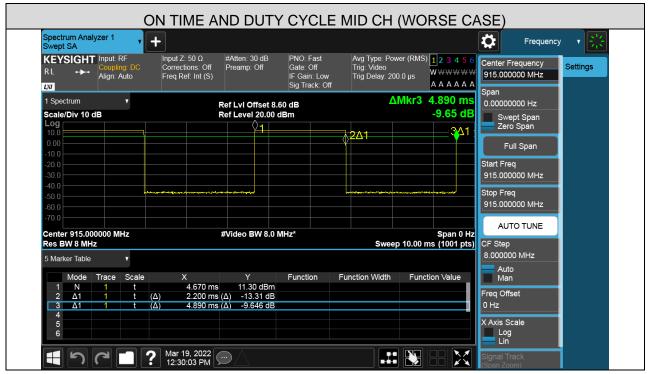
Duty Cycle Correction Factor=10log (1/x).

Where: x is Duty Cycle (Linear)

Where: T is On Time

If that calculated VBW is not available on the analyzer then the next higher value should be used.

#### TEST GRAPHS





### 8.2. 6 dB BANDWIDTH

### <u>LIMITS</u>

| CFR 47 FCC Part15 (15.247) Subpart C          |                |          |         |  |  |  |
|---|----------------|----------|---------|--|--|--|
| Section Test Item Limit Frequency Range (MHz) |                |          |         |  |  |  |
| CFR 47 FCC 15.247(a)(2)                       | 6 dB Bandwidth | ≥ 500kHz | 902-928 |  |  |  |

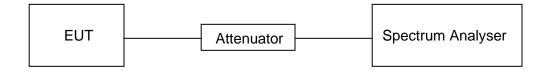
#### TEST PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

| Center Frequency | The centre frequency of the channel under test |
|------------------|--|
| Detector         | Peak   |
| RBW              | 100 kHz  |
| VBW              | ≥3 × RBW                                       |
| Trace            | Max hold                                       |
| Sweep            | Auto couple                                    |

Allow the trace to stabilize and measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB to the maximum level measured in the fundamental emission.

#### TEST SETUP





### TEST ENVIRONMENT

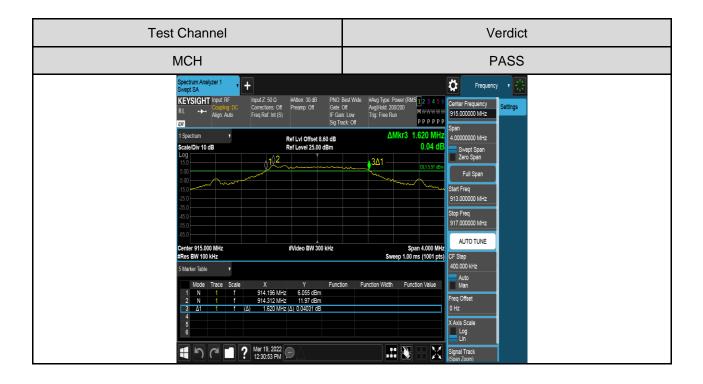
| Temperature         | 20°C   | Relative Humidity | 56%   |
|---------------------|--------|-------------------|-------|
| Atmosphere Pressure | 101kPa | Test Voltage      | DC 3V |

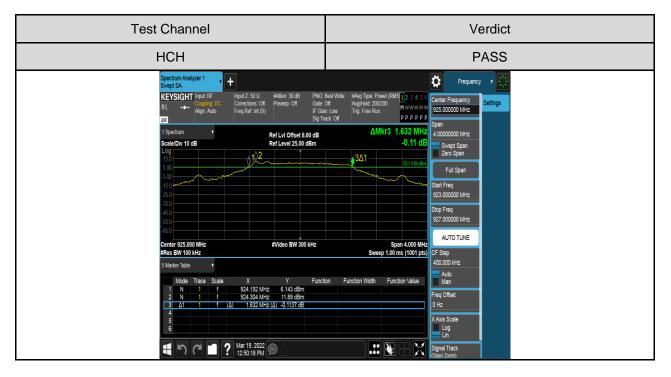
### **RESULTS**

| Channel | Frequency | 6dB bandwidth<br>(MHz) |
|---------|-----------|------------------------|
| Low     | 905       | 1.612                  |
| Middle  | 915       | 1.620                  |
| High    | 925       | 1.632                  |

#### **TEST GRAPHS**

| Test Channel  | Verdict   |
|---|---|
| LCH   | PASS  |
| Spectrum Analyzer 1<br>Swept SA   Imput 75 0.0<br>(Control Align Auto   Im  | Low Trig: Free Run MWWWW 905.000000 MHz   |
| 66 0   Center 905.000 MHz   #Video BW 300 kHz     #Res BW 100 kHz   #Video BW 300 kHz     #Res BW 100 kHz   Formation and the second seco | Span 4.000 Mt/s<br>Sweep 1.00 ms (1001 pts)<br>n Function Width Function Value<br>Auto<br>Man<br>Freq Offset<br>Og<br>Lin<br>Signal Track<br>Signal Track |







# 8.3. CONDUCTED OUTPUT POWER

#### <u>LIMITS</u>

| CFR 47 FCC Part15 (15.247) Subpart C  |  |  |  |  |
|---|--|--|--|--|
| Section Test Item Limit Frequency Range (MHz)                               |  |  |  |  |
| CFR 47 FCC 15.247(b)(3) Output Power 1 watt or 30dBm<br>(See note1) 902-928 |  |  |  |  |

Note:

1. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

#### TEST PROCEDURE

Place the EUT on the table and set it in the transmitting mode.

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Power sensor.

Measure the power of each channel.

Average Detector used for Average result.

#### TEST SETUP



#### TEST ENVIRONMENT

| Temperature         | 20°C   | Relative Humidity | 56%   |
|---------------------|--------|-------------------|-------|
| Atmosphere Pressure | 101kPa | Test Voltage      | DC 3V |

#### <u>RESULT</u>

| Test Channel | Measurement<br>Output Power (AV) | 10log(1/x)<br>Factor | Maximum Conducted<br>Output Power (AV) | LIMIT<br>(dBm) |
|--------------|----------------------------------|----------------------|--|----------------|
|              | dBm                              | dB                   | dBm                                    |                |
| Low          | 7.35                             | 3.47                 | 10.82                                  | 30             |
| Middle       | 7.37                             | 3.47                 | 10.84                                  | 30             |
| High         | 7.26                             | 3.47                 | 10.73                                  | 30             |



### 8.4. POWER SPECTRAL DENSITY

#### **LIMITS**

| CFR 47 FCC Part15 (15.247) Subpart C   |  |  |  |
|--|--|--|--|
| Section Test Item Limit Frequency Range (MHz)  |  |  |  |
| CFR 47 FCC §15.247 (e)Power Spectral Density8 dBm/3 kHz<br>(See note1)902-928                          |  |  |  |
| Note:<br>1. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum |  |  |  |

1. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

#### TEST PROCEDURE

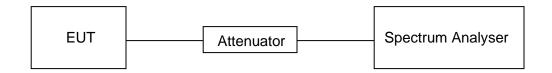
| Center Frequency | The centre frequency of the channel under test |  |
|------------------|--|--|
| Detector         | Peak   |  |
| RBW              | 3 kHz ≤ RBW ≤100 kHz                           |  |
| VBW              | ≥3 × RBW                                       |  |
| Span             | 1.5 x DTS bandwidth                            |  |
| Trace            | Max hold                                       |  |
| Sweep time       | Auto couple.                                   |  |

Connect the UUT to the spectrum analyser and use the following settings:

Allow trace to fully stabilize and use the peak marker function to determine the maximum amplitude level within the RBW.

If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

#### TEST SETUP



#### TEST ENVIRONMENT

| Temperature         | 20°C   | Relative Humidity | 56%   |
|---------------------|--------|-------------------|-------|
| Atmosphere Pressure | 101kPa | Test Voltage      | DC 3V |

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#### **RESULTS**

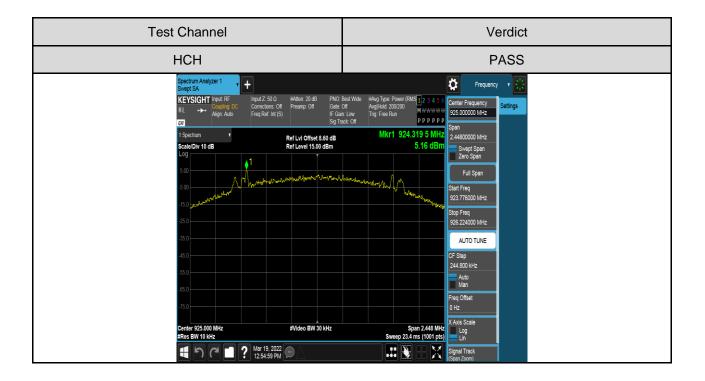
| Test Channel | Power Spectral Density<br>(dBm/10kHz) | Limit<br>(dBm/3kHz) | Result |
|--------------|---------------------------------------|---------------------|--------|
| Low          | 5.20                                  | 8                   | PASS   |
| Middle       | 5.47                                  | 8                   | PASS   |
| High         | 5.16                                  | 8                   | PASS   |

#### **TEST GRAPHS**





| Test Channel  |   |   | Verdict  |  |
|---|---|---|--|--|
| МСН   |   |   | PASS   |  |
| RL   →→   Correct     RL   →→   Align Audo   Freq F     1   Spectrum   ■   Scale/Div 10 dB   ■     Log   0   0   0   0   0     5:00   0   0   0   0   0   0     5:00   0   0   0   0   0   0   0     5:00   0 | Etions Off<br>Ref. Int (S)<br>Preamp Off<br>Fig Gram<br>Sig Tra<br>Ref Level 15.00 dBm<br>Press<br>Ref Level 15.00 dB | Low     Migree Run     Microwy     Microwy     P P P P P       Mkr1     914.322     03 MHz     5.47 dBm       Microwy     0     0     0       Microwy     0     0 | Span<br>2.4300000 MHz<br>3.vept Span<br>Zero Span<br>Full Span<br>Start Freq<br>913.785000 MHz<br>Stop Freq<br>915.215000 MHz<br>CF Step<br>2.43.0000 KHz<br>Auto TUNE<br>CF Step<br>2.43.0000 KHz<br>Auto Start<br>Man<br>Freq Offset<br>0 Hz<br>X.Aris Scale<br>Log<br>Lin |  |
|   | 19, 2022<br>38:35 PM  | 🛄 🔛 🔜 🔛   | Signal Track<br>(Span Zoom)  |  |





# 8.5. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS

#### LIMITS

| CFR 47 FCC Part15 (15.247) Subpart C |   |  |  |
|--------------------------------------|---|--|--|
| Section Test Item Limit              |   |  |  |
| CFR 47 FCC §15.247 (d)               | at least 30 dB below that in the 100 kHz<br>bandwidth within the band that contains<br>the highest level of the desired power |  |  |

#### TEST PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

| Center Frequency | The centre frequency of the channel under test |
|------------------|--|
| Detector         | Peak   |
| RBW              | 100 kHz  |
| VBW              | ≥3 × RBW                                       |
| Span             | 1.5 x DTS bandwidth                            |
| Trace            | Max hold                                       |
| Sweep time       | Auto couple.                                   |

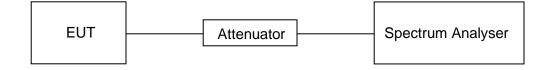
Use the peak marker function to determine the maximum PSD level.

| Span  | Set the center frequency and span to encompass frequency range to be measured |  |
|---|---|--|
| Detector  | Peak  |  |
| RBW   | 100 kHz   |  |
| VBW   | ≥3 × RBW  |  |
| measurement points  | ≥span/RBW   |  |
| Trace   | Max hold  |  |
| Sweep time  | Auto couple.  |  |
| the state we also an end on the state to the terms in a the second income second builds have be |   |  |

Use the peak marker function to determine the maximum amplitude level.



#### TEST SETUP



#### **TEST ENVIRONMENT**

| Temperature         | 20°C   | Relative Humidity | 56%   |
|---------------------|--------|-------------------|-------|
| Atmosphere Pressure | 101kPa | Test Voltage      | DC 3V |

#### PART 1: REFERENCE LEVEL MEASUREMENT

#### TEST RESULTS TABLE

| Test Channel | Result[dBm] |
|--------------|-------------|
| LCH          | 11.85       |
| MCH          | 11.99       |
| НСН          | 11.90       |

#### **TEST GRAPHS**





| Test Channe  | I  | MCH  |
|--|--|--|
| Spectrum Analyzer 1<br>Swept SA<br>KEYSIGHT<br>RL ↔ Auto<br>Algor Auto | C Corrections: Off Preamp: Off Gate: Off<br>Freq Ref: Int (S) IF Gain: Low |  |
| tor<br>1 Spectrum ▼<br>Scale/Dv 10 dB<br>Log                           | Sig Track C<br>Ref LvI Offset 8.60 dB<br>Ref Level 28.60 dBm               | лят рррррр<br>Мкг1 914.309 88 МН2<br>11.99 dBm Span<br>змер Span<br>змер Span<br>Zero Span<br>Zero Span      |
| 18.6<br>8.60   | 1  | Full Span<br>Start Freq<br>913.785000 MHz  |
| -1.40  |  | Stop Freq<br>916.215000 MHz  |
| -31.4  |  | CF Step<br>243.000 MHz<br>Auto   |
| -51.4<br>  |  | Freq Offset<br>0 Hz<br>X Avis Scale  |
| Certer 915.000 MHz<br>#Res BW 100 kHz<br>북 이 전 대                       | #Video BW 300 kHz<br>Mar 19, 2022<br>12:39:55 PM                           | Span 2.430 MHz<br>Sweep 1.00 ms (1001 pts)<br>Signal Track<br>Span 1 Track<br>Span 2.430 MHz<br>Signal Track |



### PART 2: CONDUCTED BANDEDGE

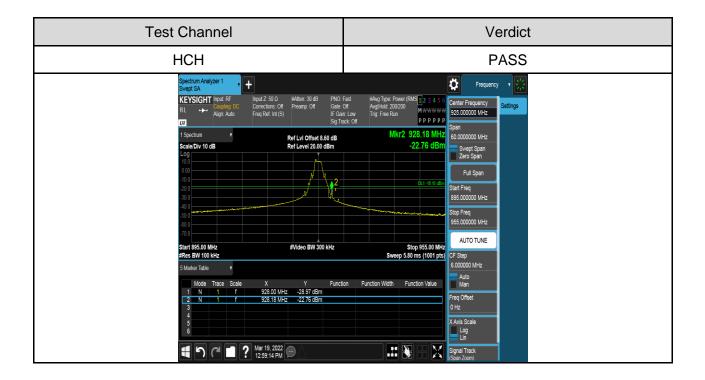
#### TEST RESULTS TABLE

| Test Channel | Result                  | Verdict |
|--------------|-------------------------|---------|
| LCH          | Refer to the Test Graph | PASS    |
| НСН          | Refer to the Test Graph | PASS    |

### TEST GRAPHS

| Test Channel  | Verdict  |
|---|--|
| LCH   | PASS   |
| Spectrum Analyzer 1 +   Swept SA Input RF   RL →   Aggn Auto Corrections Off   TS Spectrum   1 Spectrum   1 Spectrum   1 Spectrum   1 Spectrum   10 Ref Level   10 00   00 00   00 00   00 00   00 00   00 00   | Diff Gate Off Merry Hergener Preparety Sattings   iF Gan Low Tig/ Free Run Merry Hergener Preparety Sattings   sg Track. Off Mir/2 90.20000 MHz   Span -23.36 dBm   2 01.1115 dB   2 01.1115 dB |
| Start 877.00 MHz     #Video B       #Res BW 100 kHz     5 Marker Table       Mode     Trace     Scale     X     Y       1     N     1     f     902 00 MHz     -27.88       2     N     1     7     901 80 MHz     -23.36       3     4     -     -     -       6     -     -     -     - |  |
| <b>4 5 7 1 2222</b>   |  |





#### PART 3: CONDUCTED SPURIOUS EMISSION

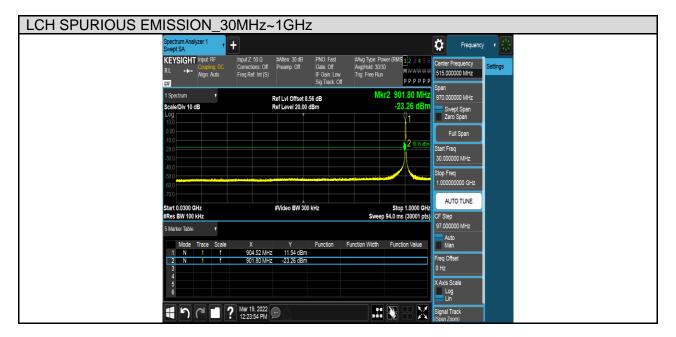
#### TEST RESULTS TABLE

| Test Channel | Result                  | Verdict |
|--------------|-------------------------|---------|
| LCH          | Refer to the Test Graph | PASS    |
| МСН          | Refer to the Test Graph | PASS    |
| НСН          | Refer to the Test Graph | PASS    |



#### **TEST GRAPHS**

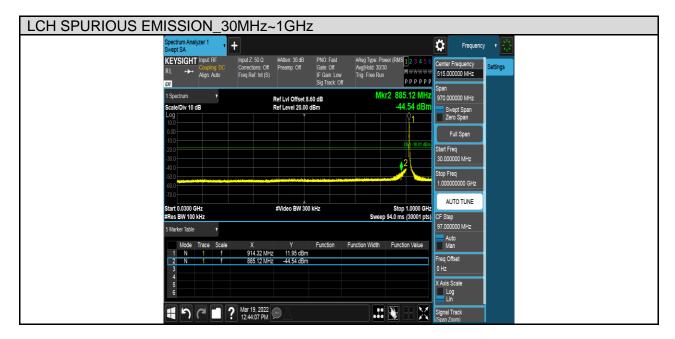
| Channel | Verdict |
|---------|---------|
| LCH     | PASS    |



#### LCH SPURIOUS EMISSION\_1GHz~26.5GHz Ö ectrum / ent SA + Frequency v Input Z: 50 Ω Corrections: Off Freq Ref: Int (S) PNO: Fas Gate: Off IF Gain: L #Avg Type: P Avg|Hold: 30/ Trig: Free Ru KEYSIGHT Input RI Center Frequency Settings Align: Aut 13.750000000 GHz рррррр LUI Mkr1 2.712 75 GH Ref LvI Offset 8.56 dB Ref Level 15.00 dBm 25.5000000 GHz -36.42 dB Div 10 dB Swept Span Zero Span Start Freq 1.000000000 GHz Stop Freq 26.5000 00 GHz AUTO TUNE Start 1.00 GHz #Res BW 100 kHz #Video BW 300 kHz Stop 26.50 GHz Sweep 2.44 s (30001 pts) CF Step . 2.550000000 GHz Marker Tabl Auto Man Function Val Mode Trace Scale Functio ion Width 2.712 75 GHz -36.42 dBm req Offset X Axis Scale Log Lin (Mar 19, 2022) 12:26:52 PM X Signal Track



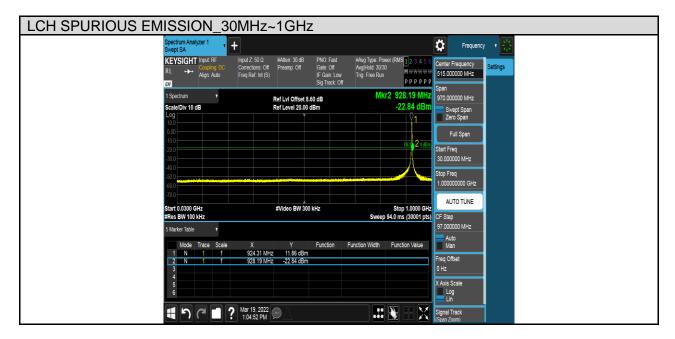
| Channel | Verdict |
|---------|---------|
| MCH     | PASS    |







| Channel | Verdict |
|---------|---------|
| НСН     | PASS    |







# 9. RADIATED TEST RESULTS

### <u>LIMITS</u>

Please refer to CFR 47 FCC §15.205 and §15.209

Radiation Disturbance Test Limit for FCC (Class B) (9kHz-1GHz)

| Frequency<br>(MHz) | Field Strength<br>(microvolts/meter) | Measurement Distance<br>(meters) |
|--------------------|--------------------------------------|----------------------------------|
| 0.009~0.490        | 2400/F(kHz)                          | 300                              |
| 0.490~1.705        | 24000/F(kHz)                         | 30                               |
| 1.705~30.0         | 30                                   | 30                               |
| 30~88              | 100                                  | 3                                |
| 88~216             | 150                                  | 3                                |
| 216~960            | 200                                  | 3                                |
| 960~1000           | 500                                  | 3                                |

Note: 1) At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

(2) At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). This paragraph (f) shall not apply to Access BPL devices operating below 30 MHz.



### Radiation Disturbance Test Limit for FCC (Above 1G)

| Frequency (MHz) | dB(uV/m) (at 3 meters) |         |  |
|-----------------|------------------------|---------|--|
|                 | Peak                   | Average |  |
| Above 1000      | 74                     | 54      |  |

FCC Restricted bands of operation:

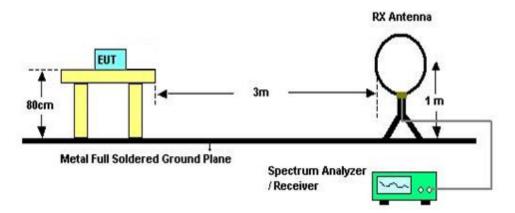
| MHz                      | MHz                 | MHz           | GHz         |  |
|--------------------------|---------------------|---------------|-------------|--|
| 0.090-0.110              | 16.42-16.423        | 399.9-410     | 4.5-5.15    |  |
| <sup>1</sup> 0.495-0.505 | 16.69475-16.69525   | 608-614       | 5.35-5.46   |  |
| 2.1735-2.1905            | 16.80425-16.80475   | 960-1240      | 7.25-7.75   |  |
| 4.125-4.128              | 25.5-25.67          | 1300-1427     | 8.025-8.5   |  |
| 4.17725-4.17775          | 37.5-38.25          | 1435-1626.5   | 9.0-9.2     |  |
| 4.20725-4.20775          | 73-74.6             | 1645.5-1646.5 | 9.3-9.5     |  |
| 6.215-6.218              | 74.8-75.2           | 1660-1710     | 10.6-12.7   |  |
| 6.26775-6.26825          | 108-121.94          | 1718.8-1722.2 | 13.25-13.4  |  |
| 6.31175-6.31225          | 123-138             | 2200-2300     | 14.47-14.5  |  |
| 8.291-8.294              | 149.9-150.05        | 2310-2390     | 15.35-16.2  |  |
| 8.362-8.366              | 156.52475-156.52525 | 2483.5-2500   | 17.7-21.4   |  |
| 8.37625-8.38675          | 156.7-156.9         | 2690-2900     | 22.01-23.12 |  |
| 8.41425-8.41475          | 162.0125-167.17     | 3260-3267     | 23.6-24.0   |  |
| 12.29-12.293             | 167.72-173.2        | 3332-3339     | 31.2-31.8   |  |
| 12.51975-12.52025        | 240-285             | 3345.8-3358   | 36.43-36.5  |  |
| 12.57675-12.57725        | 322-335.4           | 3600-4400     | (2)         |  |
| 13.36-13.41              |                     |               |             |  |

Note: <sup>1</sup>Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz. <sup>2</sup>Above 38.6



### TEST SETUP AND PROCEDURE

#### Below 30MHz



The setting of the spectrum analyser

| RBW      | 200 Hz (From 9kHz to 0.15MHz)/ 9 kHz (From 0.15MHz to 30MHz) |
|----------|--|
| VBW      | 200 Hz (From 9kHz to 0.15MHz)/ 9 kHz (From 0.15MHz to 30MHz) |
| Sweep    | Auto   |
| Detector | Peak/QP  |
| Trace    | Max hold   |

1. The testing follows the guidelines in ANSI C63.10-2013

2. The EUT was arranged to its worst case and then turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both Horizontal, Face-on and Face-off polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 0.8 meter above ground.

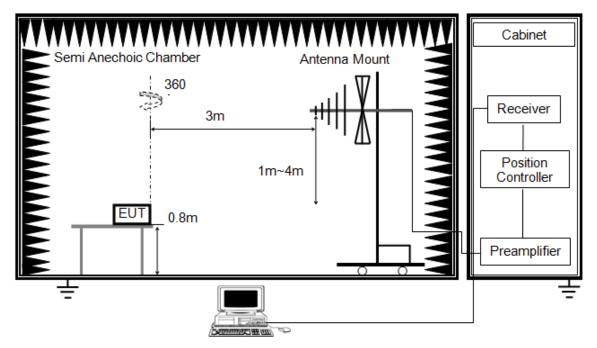
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a 1m height antenna tower.

5. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

6. Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field site based on KDB 414788.



### Below 1G



The setting of the spectrum analyser

| RBW      | 120 kHz  |
|----------|----------|
| VBW      | 300 kHz  |
| Sweep    | Auto     |
| Detector | Peak/QP  |
| Trace    | Max hold |

1. The testing follows the guidelines in ANSI C63.10-2013.

2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 0.8 meter above ground.

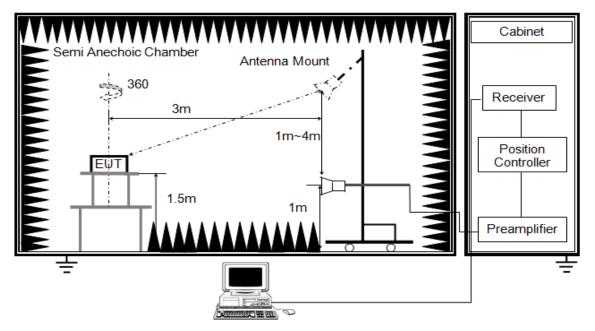
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

5. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

6. For the actual test configuration, please refer to the related item in this test report (Photographs of the Test Configuration)



### Above 1G



The setting of the spectrum analyser

| RBW      | 1 MHz                         |
|----------|-------------------------------|
| IVBW/    | PEAK: 3 MHz<br>AVG: See note6 |
| Sweep    | Auto                          |
| Detector | Peak                          |
| Trace    | Max hold                      |

1. The testing follows the guidelines in ANSI C63.10-2013.

2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 1.5m above ground.

4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

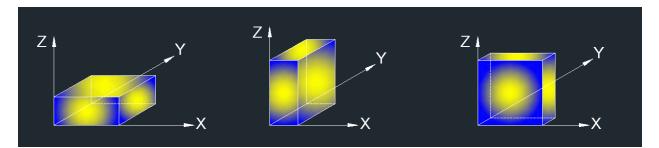
5. For measurement above 1GHz, the emission measurement will be measured by the peak detector. This peak level, once corrected, must comply with the limit specified in Section 15.209.

6. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with set VBW ≤RBW/100, but not less than list in section 7.1 with average detector, max hold to run for at least 50 traces for average measurements.

7. For the actual test configuration, please refer to the related item in this test report (Photographs of the Test Configuration)



### X axis, Y axis, Z axis positions:



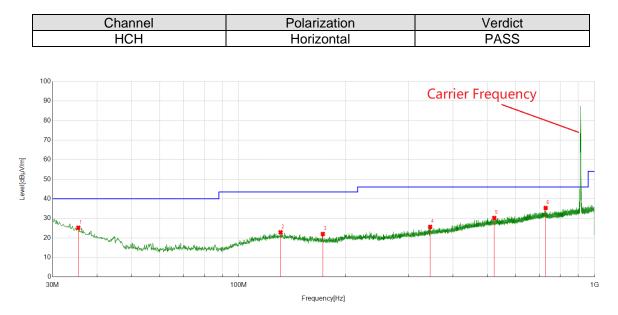
Note: For all radiated test, EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.

#### **TEST ENVIRONMENT**

| Temperature         | 20°C   | Relative Humidity | 56%   |
|---------------------|--------|-------------------|-------|
| Atmosphere Pressure | 101kPa | Test Voltage      | DC 3V |



# 9.1. SPURIOUS EMISSIONS BELOW 1 GHz



#### SPURIOUS EMISSIONS 30MHz TO 1GHz (WORST-CASE CONFIGURATION)

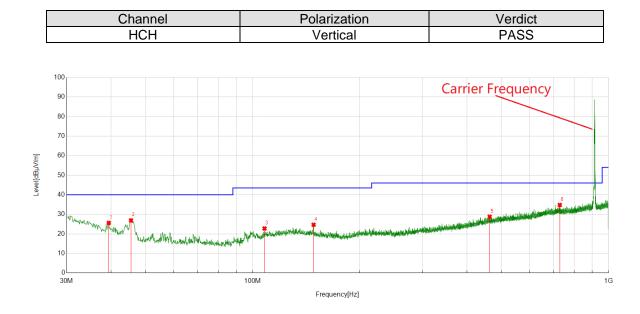
| No. | Frequency | Reading<br>Level | Correct<br>Factor | Result   | Limit    | Margin | Remark |
|-----|-----------|------------------|-------------------|----------|----------|--------|--------|
|     | (MHz)     | (dBuV/m)         | (dB)              | (dBuV/m) | (dBuV/m) | (dB)   |        |
| 1   | 35.4325   | 1.22             | 23.98             | 25.20    | 40.00    | -14.80 | Peak   |
| 2   | 131.1811  | 1.79             | 21.07             | 22.86    | 43.50    | -20.64 | Peak   |
| 3   | 172.4102  | 3.28             | 18.73             | 22.01    | 43.50    | -21.49 | Peak   |
| 4   | 345.2815  | 3.38             | 22.26             | 25.64    | 46.00    | -20.36 | Peak   |
| 5   | 522.7123  | 3.51             | 26.69             | 30.20    | 46.00    | -15.80 | Peak   |
| 6   | 728.8579  | 5.49             | 29.81             | 35.30    | 46.00    | -10.70 | Peak   |

Note: 1. Result Level = Read Level + Correct Factor.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.





| No. | Frequency | Reading<br>Level | Correct<br>Factor | Result   | Limit    | Margin | Remark |
|-----|-----------|------------------|-------------------|----------|----------|--------|--------|
|     | (MHz)     | (dBuV/m)         | (dB)              | (dBuV/m) | (dBuV/m) | (dB)   |        |
| 1   | 39.4099   | 4.36             | 21.27             | 25.63    | 40.00    | -14.37 | Peak   |
| 2   | 45.5216   | 9.53             | 17.39             | 26.92    | 40.00    | -13.08 | Peak   |
| 3   | 107.9958  | 3.90             | 18.88             | 22.78    | 43.50    | -20.72 | Peak   |
| 4   | 148.3518  | 4.91             | 19.77             | 24.68    | 43.50    | -18.82 | Peak   |
| 5   | 463.4393  | 3.13             | 25.64             | 28.77    | 46.00    | -17.23 | Peak   |
| 6   | 729.634   | 4.96             | 29.83             | 34.79    | 46.00    | -11.21 | Peak   |

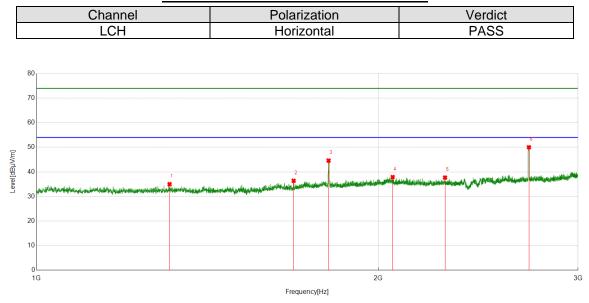
Note: 1. Result Level = Read Level + Correct Factor.

If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

Note: All constructions and test modes have been tested, only the worst data record in the report.



## 9.2. SPURIOUS EMISSIONS (1GHz~3GHz)



HARMONICS AND SPURIOUS EMISSIONS

| PK Res | PK Result: |                  |                   |          |          |        |        |  |  |  |  |
|--------|------------|------------------|-------------------|----------|----------|--------|--------|--|--|--|--|
| No.    | Frequency  | Reading<br>Level | Correct<br>Factor | Result   | Limit    | Margin | Remark |  |  |  |  |
|        | [MHz]      | [dBuV/m]         | [dB]              | [dBuV/m] | [dBuV/m] | [dB]   |        |  |  |  |  |
| 1      | 1309.7887  | 41.10            | -6.09             | 35.01    | 74.00    | -38.99 | Peak   |  |  |  |  |
| 2      | 1684.8356  | 41.44            | -5.07             | 36.37    | 74.00    | -37.63 | Peak   |  |  |  |  |
| 3      | 1808.6011  | 49.06            | -4.45             | 44.61    | 74.00    | -29.39 | Peak   |  |  |  |  |
| 4      | 2059.6325  | 40.73            | -2.84             | 37.89    | 74.00    | -36.11 | Peak   |  |  |  |  |
| 5      | 2290.4113  | 40.91            | -3.22             | 37.69    | 74.00    | -36.31 | Peak   |  |  |  |  |
| 6      | 2715.4644  | 51.41            | -1.40             | 50.01    | 74.00    | -23.99 | Peak   |  |  |  |  |

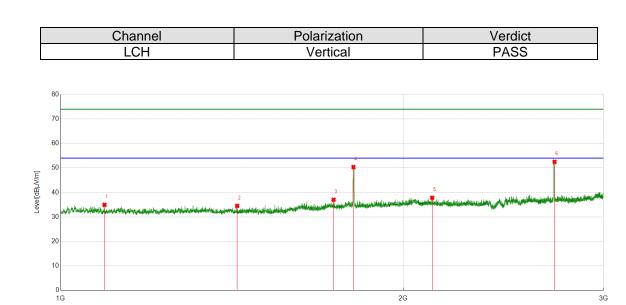
Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

4. Peak: Peak detector.

5. Only the worst case emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

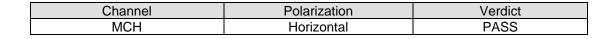


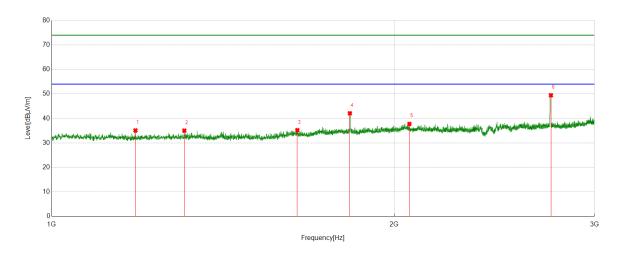
| No. | Frequency | Reading<br>Level | Correct<br>Factor | Result   | Limit    | Margin | Remark |
|-----|-----------|------------------|-------------------|----------|----------|--------|--------|
|     | [MHz]     | [dBuV/m]         | [dB]              | [dBuV/m] | [dBuV/m] | [dB]   |        |
| 1   | 1092.7616 | 41.19            | -6.24             | 34.95    | 74.00    | -39.05 | Peak   |
| 2   | 1429.3037 | 41.07            | -6.54             | 34.53    | 74.00    | -39.47 | Peak   |
| 3   | 1737.3422 | 41.97            | -4.94             | 37.03    | 74.00    | -36.97 | Peak   |
| 4   | 1808.6011 | 54.82            | -4.45             | 50.37    | 74.00    | -23.63 | Peak   |
| 5   | 2121.1401 | 40.77            | -2.95             | 37.82    | 74.00    | -36.18 | Peak   |
| 6   | 2717.2147 | 53.92            | -1.42             | 52.50    | 74.00    | -21.50 | Peak   |

Frequency[Hz]

- 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
- 3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
- 4. Peak: Peak detector.
- 5. Only the worst case emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

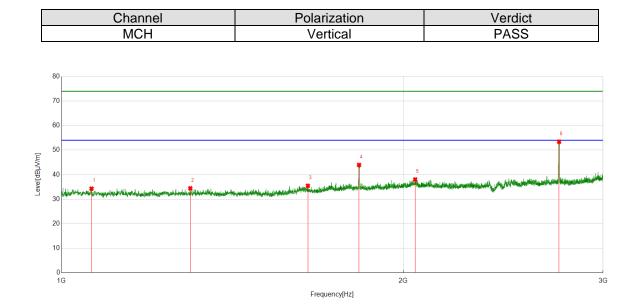






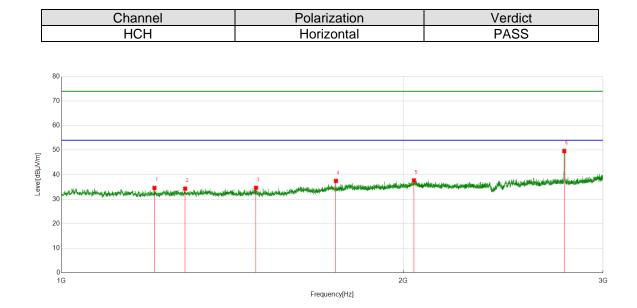
| No. | Frequency | Reading<br>Level | Correct<br>Factor | Result   | Limit    | Margin | Remark |
|-----|-----------|------------------|-------------------|----------|----------|--------|--------|
|     | [MHz]     | [dBuV/m]         | [dB]              | [dBuV/m] | [dBuV/m] | [dB]   |        |
| 1   | 1184.7731 | 41.64            | -6.55             | 35.09    | 74.00    | -38.91 | Peak   |
| 2   | 1308.0385 | 41.20            | -6.17             | 35.03    | 74.00    | -38.97 | Peak   |
| 3   | 1644.0805 | 40.41            | -5.20             | 35.21    | 74.00    | -38.79 | Peak   |
| 4   | 1828.6036 | 46.24            | -4.14             | 42.10    | 74.00    | -31.90 | Peak   |
| 5   | 2062.6328 | 40.68            | -2.92             | 37.76    | 74.00    | -36.24 | Peak   |
| 6   | 2746.9684 | 51.02            | -1.54             | 49.48    | 74.00    | -24.52 | Peak   |

- 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
- 3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
- 4. Peak: Peak detector.
- 5. Only the worst case emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.



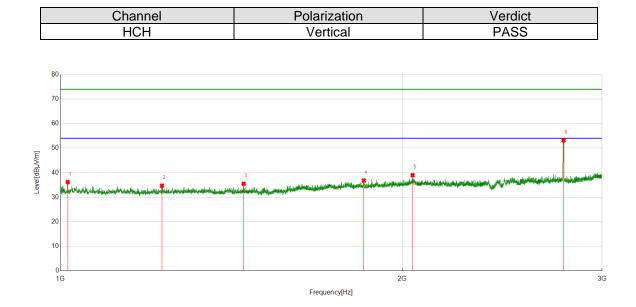
| No. | Frequency | Reading<br>Level | Correct<br>Factor | Result   | Limit    | Margin | Remark |
|-----|-----------|------------------|-------------------|----------|----------|--------|--------|
|     | [MHz]     | [dBuV/m]         | [dB]              | [dBuV/m] | [dBuV/m] | [dB]   |        |
| 1   | 1062.7578 | 40.20            | -5.90             | 34.30    | 74.00    | -39.70 | Peak   |
| 2   | 1298.5373 | 40.97            | -6.52             | 34.45    | 74.00    | -39.55 | Peak   |
| 3   | 1648.331  | 40.62            | -5.14             | 35.48    | 74.00    | -38.52 | Peak   |
| 4   | 1828.6036 | 48.10            | -4.14             | 43.96    | 74.00    | -30.04 | Peak   |
| 5   | 2049.3812 | 40.60            | -2.55             | 38.05    | 74.00    | -35.95 | Peak   |
| 6   | 2743.968  | 54.99            | -1.55             | 53.44    | 74.00    | -20.56 | Peak   |

- 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
- 3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
- 4. Peak: Peak detector.
- 5. Only the worst case emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.



| No. | Frequency | Reading<br>Level | Correct<br>Factor | Result   | Limit    | Margin | Remark |
|-----|-----------|------------------|-------------------|----------|----------|--------|--------|
|     | [MHz]     | [dBuV/m]         | [dB]              | [dBuV/m] | [dBuV/m] | [dB]   |        |
| 1   | 1207.5259 | 40.99            | -6.39             | 34.60    | 74.00    | -39.40 | Peak   |
| 2   | 1285.0356 | 40.66            | -6.35             | 34.31    | 74.00    | -39.69 | Peak   |
| 3   | 1483.5604 | 41.16            | -6.53             | 34.63    | 74.00    | -39.37 | Peak   |
| 4   | 1744.8431 | 42.42            | -4.97             | 37.45    | 74.00    | -36.55 | Peak   |
| 5   | 2044.1305 | 40.20            | -2.55             | 37.65    | 74.00    | -36.35 | Peak   |
| 6   | 2772.9716 | 51.14            | -1.48             | 49.66    | 74.00    | -24.34 | Peak   |

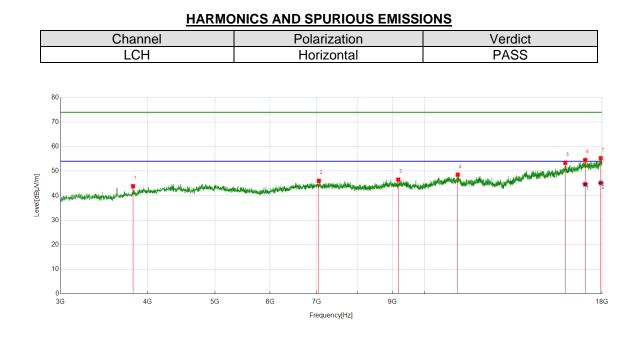
- 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
- 3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
- 4. Peak: Peak detector.
- 5. Only the worst case emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.



| No. | Frequency | Reading<br>Level | Correct<br>Factor | Result   | Limit    | Margin | Remark |
|-----|-----------|------------------|-------------------|----------|----------|--------|--------|
|     | [MHz]     | [dBuV/m]         | [dB]              | [dBuV/m] | [dBuV/m] | [dB]   |        |
| 1   | 1014.7518 | 41.84            | -5.62             | 36.22    | 74.00    | -37.78 | Peak   |
| 2   | 1228.5286 | 41.20            | -6.48             | 34.72    | 74.00    | -39.28 | Peak   |
| 3   | 1449.8062 | 41.81            | -6.33             | 35.48    | 74.00    | -38.52 | Peak   |
| 4   | 1850.3563 | 40.96            | -4.16             | 36.80    | 74.00    | -37.20 | Peak   |
| 5   | 2042.6303 | 41.53            | -2.55             | 38.98    | 74.00    | -35.02 | Peak   |
| 6   | 2774.7218 | 54.68            | -1.50             | 53.18    | 74.00    | -20.82 | Peak   |

- 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
- 3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
- 4. Peak: Peak detector.
- 5. Only the worst case emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

## 9.3. SPURIOUS EMISSIONS (3GHz~18GHz)



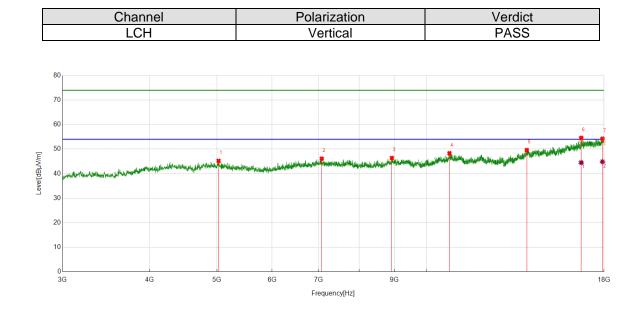
#### PK Result:

| No. | Frequency  | Reading<br>Level | Correct<br>Factor | Result   | Limit    | Margin | Remark |
|-----|------------|------------------|-------------------|----------|----------|--------|--------|
|     | [MHz]      | [dBuV/m]         | [dB]              | [dBuV/m] | [dBuV/m] | [dB]   |        |
| 1   | 3813.8517  | 40.72            | 3.17              | 43.89    | 74.00    | -30.11 | Peak   |
| 2   | 7052.3815  | 37.42            | 8.65              | 46.07    | 74.00    | -27.93 | Peak   |
| 3   | 9171.3964  | 37.84            | 8.70              | 46.54    | 74.00    | -27.46 | Peak   |
| 4   | 11166.6458 | 37.10            | 11.45             | 48.55    | 74.00    | -25.45 | Peak   |
| 5   | 15937.2422 | 36.99            | 16.41             | 53.40    | 74.00    | -20.60 | Peak   |
| 6   | 17024.8781 | 36.22            | 18.17             | 54.39    | 74.00    | -19.61 | Peak   |
| 7   | 17928.7411 | 36.53            | 18.92             | 55.45    | 74.00    | -18.55 | Peak   |

#### AV Result:

| No. | Frequency  | Reading<br>Level | Correct<br>Factor | Result   | Limit    | Margin | Remark |
|-----|------------|------------------|-------------------|----------|----------|--------|--------|
|     | [MHz]      | [dBuV/m]         | [dB]              | [dBuV/m] | [dBuV/m] | [dB]   |        |
| 1   | 17024.8781 | 26.48            | 18.17             | 44.65    | 54.00    | -9.35  | AV     |
| 2   | 17928.7411 | 26.24            | 18.92             | 45.16    | 54.00    | -8.84  | AV     |

- 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
- 3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
- 4. Peak: Peak detector.
- 5. Only the worst case emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

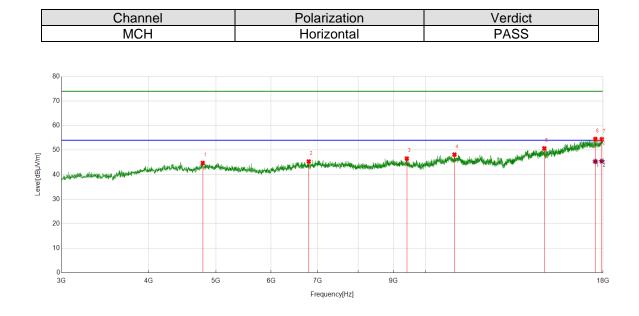


| No. | Frequency  | Reading<br>Level | Correct<br>Factor | Result   | Limit    | Margin | Remark |
|-----|------------|------------------|-------------------|----------|----------|--------|--------|
|     | [MHz]      | [dBuV/m]         | [dB]              | [dBuV/m] | [dBuV/m] | [dB]   |        |
| 1   | 5027.1284  | 39.44            | 5.78              | 45.22    | 74.00    | -28.78 | Peak   |
| 2   | 7073.0091  | 37.33            | 8.77              | 46.10    | 74.00    | -27.90 | Peak   |
| 3   | 8920.115   | 37.67            | 8.72              | 46.39    | 74.00    | -27.61 | Peak   |
| 4   | 10791.599  | 36.92            | 11.40             | 48.32    | 74.00    | -25.68 | Peak   |
| 5   | 13940.1175 | 35.50            | 14.12             | 49.62    | 74.00    | -24.38 | Peak   |
| 6   | 16691.0864 | 36.11            | 18.27             | 54.38    | 74.00    | -19.62 | Peak   |
| 7   | 17909.9887 | 34.98            | 19.05             | 54.03    | 74.00    | -19.97 | Peak   |

#### AV Result:

| No. | Frequency  | Reading<br>Level | Correct<br>Factor | Result   | Limit    | Margin | Remark |
|-----|------------|------------------|-------------------|----------|----------|--------|--------|
|     | [MHz]      | [dBuV/m]         | [dB]              | [dBuV/m] | [dBuV/m] | [dB]   |        |
| 1   | 16691.0864 | 26.24            | 18.27             | 44.51    | 54.00    | -9.49  | AV     |
| 2   | 17909.9887 | 25.80            | 19.05             | 44.85    | 54.00    | -9.15  | AV     |

- 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
- 3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
- 4. Peak: Peak detector.
- 5. Only the worst case emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

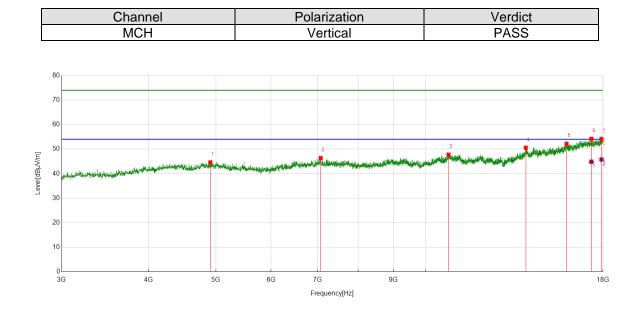


| No. | Frequency  | Reading<br>Level | Correct<br>Factor | Result   | Limit    | Margin | Remark |
|-----|------------|------------------|-------------------|----------|----------|--------|--------|
|     | [MHz]      | [dBuV/m]         | [dB]              | [dBuV/m] | [dBuV/m] | [dB]   |        |
| 1   | 4787.0984  | 38.87            | 5.90              | 44.77    | 74.00    | -29.23 | Peak   |
| 2   | 6797.3497  | 37.32            | 8.07              | 45.39    | 74.00    | -28.61 | Peak   |
| 3   | 9403.9255  | 37.58            | 8.99              | 46.57    | 74.00    | -27.43 | Peak   |
| 4   | 11011.0014 | 36.40            | 11.79             | 48.19    | 74.00    | -25.81 | Peak   |
| 5   | 14823.3529 | 35.87            | 14.86             | 50.73    | 74.00    | -23.27 | Peak   |
| 6   | 17548.0685 | 36.47            | 18.07             | 54.54    | 74.00    | -19.46 | Peak   |
| 7   | 17928.7411 | 35.53            | 18.92             | 54.45    | 74.00    | -19.55 | Peak   |

#### AV Result:

| No. | Frequency  | Reading<br>Level | Correct<br>Factor | Result   | Limit    | Margin | Remark |
|-----|------------|------------------|-------------------|----------|----------|--------|--------|
|     | [MHz]      | [dBuV/m]         | [dB]              | [dBuV/m] | [dBuV/m] | [dB]   |        |
| 1   | 17548.0685 | 27.29            | 18.07             | 45.36    | 54.00    | -8.64  | AV     |
| 2   | 17928.7411 | 26.57            | 18.92             | 45.49    | 54.00    | -8.51  | AV     |

- 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
- 3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
- 4. Peak: Peak detector.
- 5. Only the worst case emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

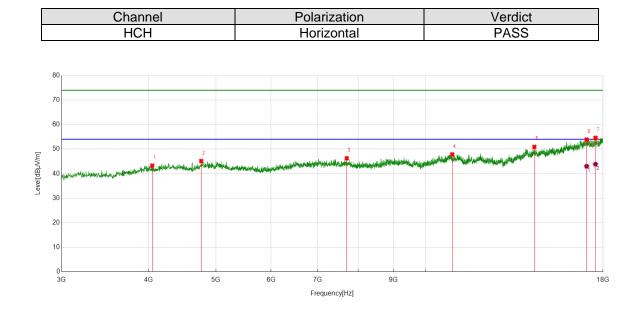


| No. | Frequency  | Reading<br>Level | Correct<br>Factor | Result   | Limit    | Margin | Remark |
|-----|------------|------------------|-------------------|----------|----------|--------|--------|
|     | [MHz]      | [dBuV/m]         | [dB]              | [dBuV/m] | [dBuV/m] | [dB]   |        |
| 1   | 4908.9886  | 39.07            | 5.51              | 44.58    | 74.00    | -29.42 | Peak   |
| 2   | 7071.1339  | 37.62            | 8.77              | 46.39    | 74.00    | -27.61 | Peak   |
| 3   | 10793.4742 | 36.36            | 11.39             | 47.75    | 74.00    | -26.25 | Peak   |
| 4   | 13941.9927 | 36.50            | 14.09             | 50.59    | 74.00    | -23.41 | Peak   |
| 5   | 15954.1193 | 35.64            | 16.53             | 52.17    | 74.00    | -21.83 | Peak   |
| 6   | 17319.2899 | 36.34            | 17.65             | 53.99    | 74.00    | -20.01 | Peak   |
| 7   | 17915.6145 | 35.28            | 18.78             | 54.06    | 74.00    | -19.94 | Peak   |

#### AV Result:

| No. | Frequency  | Reading<br>Level | Correct<br>Factor | Result   | Limit    | Margin | Remark |
|-----|------------|------------------|-------------------|----------|----------|--------|--------|
|     | [MHz]      | [dBuV/m]         | [dB]              | [dBuV/m] | [dBuV/m] | [dB]   |        |
| 1   | 17319.2899 | 27.21            | 17.65             | 44.86    | 54.00    | -9.14  | AV     |
| 2   | 17915.6145 | 26.98            | 18.78             | 45.76    | 54.00    | -8.24  | AV     |

- 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
- 3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
- 4. Peak: Peak detector.
- 5. Only the worst case emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

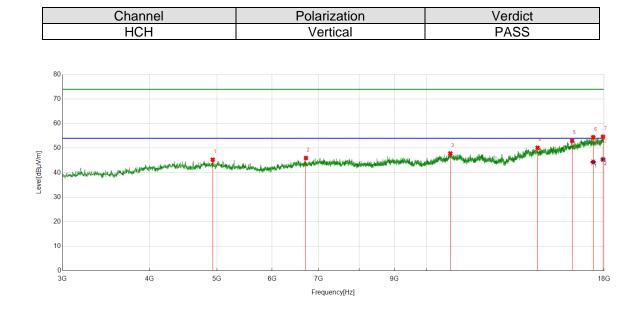


| No. | Frequency  | Reading<br>Level | Correct<br>Factor | Result   | Limit    | Margin | Remark |
|-----|------------|------------------|-------------------|----------|----------|--------|--------|
|     | [MHz]      | [dBuV/m]         | [dB]              | [dBuV/m] | [dBuV/m] | [dB]   |        |
| 1   | 4050.1313  | 39.70            | 3.60              | 43.30    | 74.00    | -30.70 | Peak   |
| 2   | 4762.7203  | 39.89            | 5.27              | 45.16    | 74.00    | -28.84 | Peak   |
| 3   | 7708.7136  | 38.26            | 8.01              | 46.27    | 74.00    | -27.73 | Peak   |
| 4   | 10928.4911 | 36.11            | 11.75             | 47.86    | 74.00    | -26.14 | Peak   |
| 5   | 14339.5424 | 36.45            | 14.48             | 50.93    | 74.00    | -23.07 | Peak   |
| 6   | 17051.1314 | 35.48            | 18.04             | 53.52    | 74.00    | -20.48 | Peak   |
| 7   | 17555.5694 | 36.03            | 18.12             | 54.15    | 74.00    | -19.85 | Peak   |

#### AV Result:

| No. | Frequency  | Reading<br>Level | Correct<br>Factor | Result   | Limit    | Margin | Remark |
|-----|------------|------------------|-------------------|----------|----------|--------|--------|
|     | [MHz]      | [dBuV/m]         | [dB]              | [dBuV/m] | [dBuV/m] | [dB]   |        |
| 1   | 17051.1314 | 24.97            | 18.04             | 43.01    | 54.00    | -10.99 | AV     |
| 2   | 17555.5694 | 25.72            | 18.12             | 43.84    | 54.00    | -10.16 | AV     |

- 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
- 3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
- 4. Peak: Peak detector.
- 5. Only the worst case emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

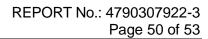


| No. | Frequency  | Reading<br>Level | Correct<br>Factor | Result   | Limit    | Margin | Remark |
|-----|------------|------------------|-------------------|----------|----------|--------|--------|
|     | [MHz]      | [dBuV/m]         | [dB]              | [dBuV/m] | [dBuV/m] | [dB]   |        |
| 1   | 4931.4914  | 39.94            | 5.34              | 45.28    | 74.00    | -28.72 | Peak   |
| 2   | 6712.9641  | 37.66            | 8.30              | 45.96    | 74.00    | -28.04 | Peak   |
| 3   | 10823.4779 | 36.34            | 11.49             | 47.83    | 74.00    | -26.17 | Peak   |
| 4   | 14448.306  | 36.14            | 14.01             | 50.15    | 74.00    | -23.85 | Peak   |
| 5   | 16196.0245 | 36.07            | 16.89             | 52.96    | 74.00    | -21.04 | Peak   |
| 6   | 17366.1708 | 36.24            | 18.22             | 54.46    | 74.00    | -19.54 | Peak   |
| 7   | 17939.9925 | 35.41            | 19.11             | 54.52    | 74.00    | -19.48 | Peak   |

#### AV Result:

| No. | Frequency  | Reading<br>Level | Correct<br>Factor | Result   | Limit    | Margin | Remark |
|-----|------------|------------------|-------------------|----------|----------|--------|--------|
|     | [MHz]      | [dBuV/m]         | [dB]              | [dBuV/m] | [dBuV/m] | [dB]   |        |
| 1   | 17366.1708 | 26.11            | 18.22             | 44.33    | 54.00    | -9.67  | AV     |
| 2   | 17939.9925 | 26.29            | 19.11             | 45.40    | 54.00    | -8.60  | AV     |

- 2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
- 3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
- 4. Peak: Peak detector.
- 5. Only the worst case emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.





## 9.4. SPURIOUS EMISSIONS BELOW 30MHz

#### Channel Frequency Range Verdict HCH 9kHz~150kHz PASS 60 50 40 30 20 10 Level[dBµV/m] 0 -10 -20 -30 -40 -50 -60 L 9k 30k 20k 40k 60k 80k 150k Frequency[Hz]

#### SPURIOUS EMISSIONS Below 30MHz (WORST CASE CONFIGURATION-FACE ON)

| No. | Frequency | Reading<br>Level | Correct<br>Factor | Result   | Limit    | Margin | Remark |
|-----|-----------|------------------|-------------------|----------|----------|--------|--------|
|     | (MHz)     | (dBuV/m)         | (dB)              | (dBuV/m) | (dBuV/m) | (dB)   |        |
| 1   | 0.0155    | 34.18            | -61.89            | -27.71   | 43.77    | -71.48 | Peak   |
| 2   | 0.0273    | 39.30            | -61.77            | -22.47   | 38.88    | -61.35 | Peak   |
| 3   | 0.0312    | 29.21            | -61.74            | -32.53   | 37.72    | -70.25 | Peak   |
| 4   | 0.0469    | 24.37            | -61.74            | -37.37   | 34.18    | -71.55 | Peak   |
| 5   | 0.0546    | 36.31            | -61.75            | -25.44   | 32.86    | -58.30 | Peak   |
| 6   | 0.0819    | 26.50            | -61.83            | -35.33   | 29.33    | -64.66 | Peak   |

Note: 1. Measurement = Reading Level + Correct Factor.

2. Result 300m= Result 3m-80 dBuV/m

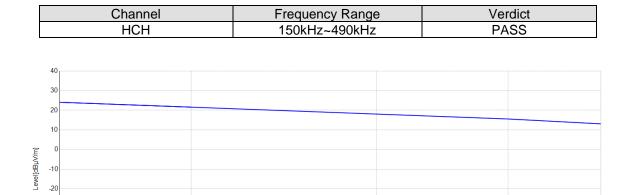
3. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

400k

490k



-30 -40 mm -50 -60 150k



| No. | Frequency | Reading<br>Level | Correct<br>Factor | Result   | Limit    | Margin | Remark |
|-----|-----------|------------------|-------------------|----------|----------|--------|--------|
|     | (MHz)     | (dBuV/m)         | (dB)              | (dBuV/m) | (dBuV/m) | (dB)   |        |
| 1   | 0.1625    | 28.22            | -61.85            | -33.63   | 23.39    | -57.02 | Peak   |
| 2   | 0.1921    | 23.98            | -61.86            | -37.88   | 21.93    | -59.81 | Peak   |
| 3   | 0.2323    | 26.89            | -61.87            | -34.98   | 20.28    | -55.26 | Peak   |
| 4   | 0.2722    | 22.21            | -61.89            | -39.68   | 18.91    | -58.59 | Peak   |
| 5   | 0.2882    | 21.69            | -61.90            | -40.21   | 18.41    | -58.62 | Peak   |
| 6   | 0.3819    | 18.03            | -61.90            | -43.87   | 15.96    | -59.83 | Peak   |

Frequency[Hz]

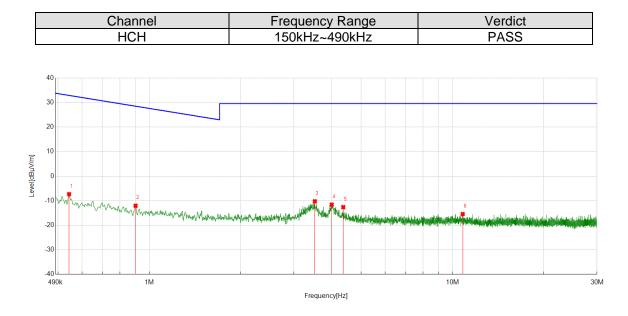
300k

Note: 1. Measurement = Reading Level + Correct Factor.

200k

- 2. Result 300m= Result 3m-80 dBuV/m
- 3. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.





| No. | Frequency | Reading<br>Level | Correct<br>Factor | Result   | Limit    | Margin | Remark |
|-----|-----------|------------------|-------------------|----------|----------|--------|--------|
|     | (MHz)     | (dBuV/m)         | (dB)              | (dBuV/m) | (dBuV/m) | (dB)   |        |
| 1   | 0.5431    | 14.56            | -21.89            | -7.33    | 32.91    | -40.24 | Peak   |
| 2   | 0.9002    | 9.83             | -21.87            | -12.04   | 28.52    | -40.56 | Peak   |
| 3   | 3.5151    | 11.51            | -21.75            | -10.24   | 29.54    | -39.78 | Peak   |
| 4   | 3.9961    | 10.13            | -21.74            | -11.61   | 29.54    | -41.15 | Peak   |
| 5   | 4.3621    | 9.13             | -21.74            | -12.61   | 29.54    | -42.15 | Peak   |
| 6   | 10.8136   | 6.16             | -21.61            | -15.45   | 29.54    | -44.99 | Peak   |

Note: 1. Measurement = Reading Level + Correct Factor.

- 2. Result 30m= Result 3m-40 dBuV/m
- 3. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

Note: All constructions and test modes have been tested, only the worst data record in the report.

## **10. ANTENNA REQUIREMENTS**

## APPLICABLE REQUIREMENTS

#### Please refer 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.

## Please refer to FCC §15.247(b)(4)

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

## **RESULTS**

Complies

# END OF REPORT