# RF TEST REPORT

| | |
|---|---|
| **Applicant** | Shanghai Smawave Technology Co. ,Ltd |
| **FCC ID** | 2AU8HMGM5608A |
| **Product** | LTE Module |
| **Brand** | Smawave |
| **Model** | MGM5608A |
| **Report No.** | R2001A0018-R1 |
| **Issue Date** | April 8, 2020 |

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 15E (2019)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

*Performed by: Peng Tao* *Approved by: Kai Xu*


## TA Technology (Shanghai) Co., Ltd.

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# Summary of measurement results

| Number | Test Case | Clause in FCC rules | Verdict |
|---|---|---|---|
| 1 | Average conducted output power | 15.407(a) | PASS |
| 2 | Occupied bandwidth | 15.407(e) | PASS |
| 3 | Frequency stability | 15.407(g) | PASS |
| 4 | Power spectral density | 15.407(a) | PASS |
| 5 | Unwanted Emissions | 15.407(b) | PASS |
| 6 | Conducted Emissions | 15.207 | PASS |
| Test Date: February 22, 2020~ March 30, 2020 | | | |
| Note: All indications of Pass/Fail in this report are opinions expressed by TA Technology (Shanghai) Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. | | | |


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# 1. Test Laboratory

## 1.1. Notes of the test report

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## 1.2. Test facility

**FCC (Designation number: CN1179, Test Firm Registration Number: 446626)**

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

**A2LA (Certificate Number: 3857.01)**

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

## 1.3. Testing Location

| | |
|---|---|
| Company: | TA Technology (Shanghai) Co., Ltd. |
| Address: | No.145, Jintang Rd, Tangzhen Industry Park, Pudong |
| City: | Shanghai |
| Post code: | 201201 |
| Country: | P. R. China |
| Contact: | Xu Kai |
| Telephone: | +86-021-50791141/2/3 |
| Fax: | +86-021-50791141/2/3-8000 |
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| E-mail: | xukai@ta-shanghai.com |


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# 2. General Description of Equipment under Test

## 2.1. Applicant and Manufacturer Information

| | |
|---|---|
| **Applicant** | Shanghai Smawave Technology Co. ,Ltd |
| **Applicant address** | 3/F, Building 8, 1001 North Qinzhou Road，Xuhui District, Shanghai, China |
| **Manufacturer** | Shanghai Smawave Technology Co. ,Ltd |
| **Manufacturer address** | 3/F, Building 8, 1001 North Qinzhou Road，Xuhui District, Shanghai, China |

## 2.2. General information

| **EUT Description** | |
|---|---|
| Model | MGM5608A |
| SN | 1# |
| Hardware Version | V1.1 |
| Software Version | MG56_BYPASS_V1.0.3 |
| Power Supply | External Power Supply |
| Antenna Type | The EUT don't have standard Antenna, The Antenna used for testing in this report is the after-market accessory (Dipole Antenna) |
| Antenna Gain | 3.18 dBi |
| Modulation Type | (LTE)QPSK 16QAM; |
| Max. Conducted Power | 21.17dBm |
| Operating Frequency Range(s) | 5725-5850MHz |
| Operating temperature range: | -40 ° C to 70° C |
| Operating voltage range: | 3.3 V to 4.2V |
| State DC voltage: | 4.0V |
| Note:1. The EUT is sent from the applicant to TA and the information of the EUT is declared by the applicant. | |


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# 3. Applied Standards

According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**Test standards:**

**FCC CFR47 Part 15E (2019)** Unlicensed National Information Infrastructure Devices

**ANSI C63.10 (2013)**

**Reference standard:**

**KDB 789033 D02 General UNII Test Procedures New Rules v02r01**


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# 4. Test Configuration

## Test Mode

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (X axis) and the worst case was recorded.


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# 5. Test Case Results

## 5.1. Occupied Bandwidth

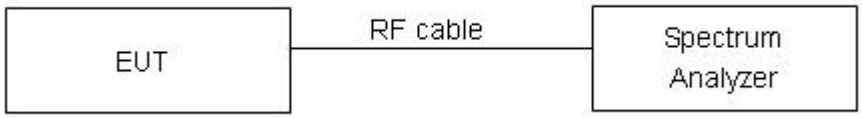
**Ambient condition**

| Temperature | Relative humidity | Pressure |
|---|---|---|
| 23°C ~25°C | 45%~50% | 101.5kPa |

**Method of Measurement**

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable.
Set RBW = 100 kHz, VBW ≥ 3 × RBW, 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 relative to the maximum level measured in the fundamental emission.
Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver may be employed if it implements the functionality described above.
Use the 99 % power bandwidth function of the instrument

**Test Setup**




**Limits**

Rule FCC Part §15.407(e)
Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

**Measurement Uncertainty**

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k$ = 2, $U$= 936 Hz.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**Test Results:**

| Modulation | Channel | 99% bandwidth (MHz) | Minimum 6 dB bandwidth (MHz) | Limit (kHz) | Conclusion |
|---|---|---|---|---|---|
| QPSK | 52740 | 17.827 | 17.96 | 500 | PASS |
| | 53140 | 17.806 | 18.00 | 500 | PASS |
| | 53540 | 17.786 | 18.01 | 500 | PASS |
| 16QAM | 52740 | 17.799 | 17.76 | 500 | PASS |
| | 53140 | 17.791 | 17.95 | 500 | PASS |
| | 53540 | 17.786 | 17.92 | 500 | PASS |


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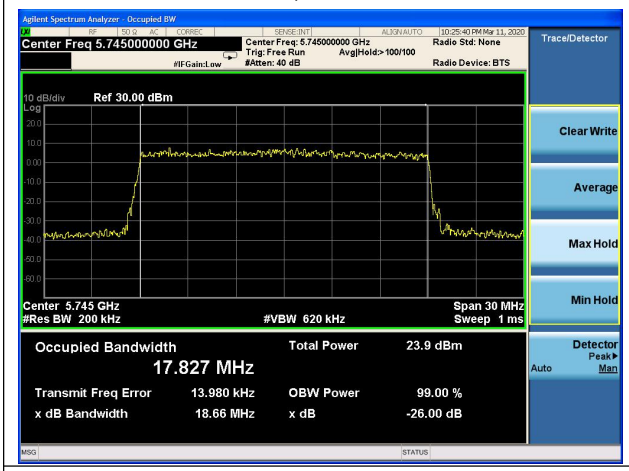
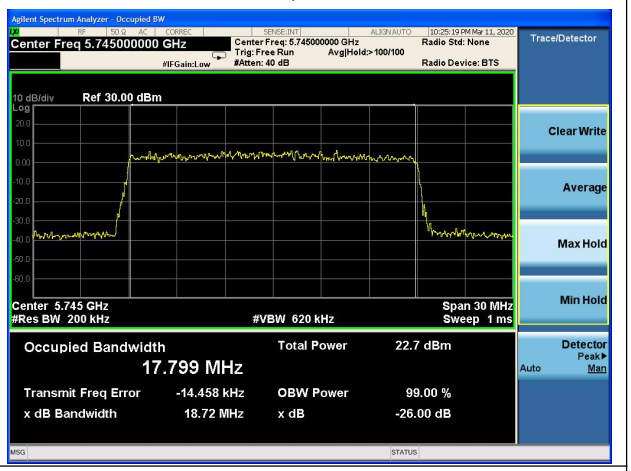
## 99% bandwidth

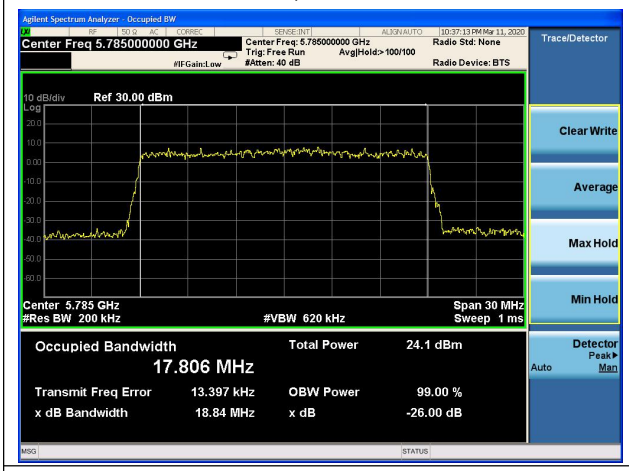
QPSK, CH52740



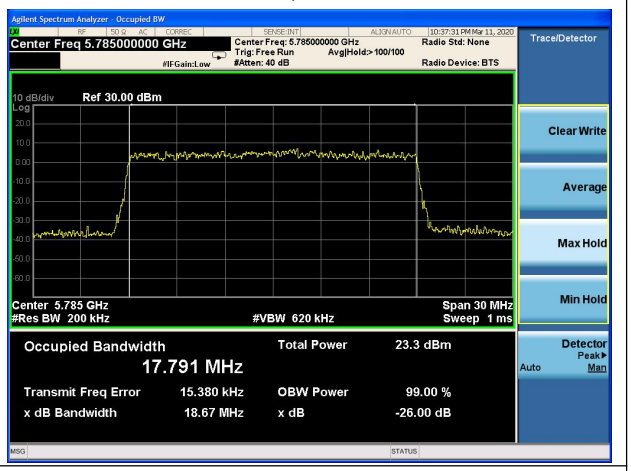

16QAM, CH52740



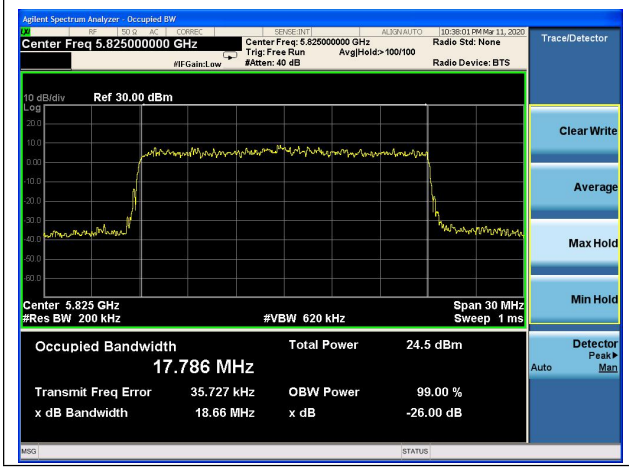

QPSK, CH53140



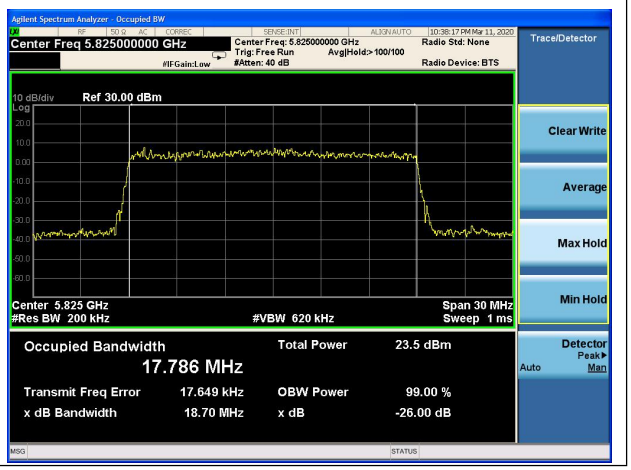

16QAM, CH53140




QPSK, CH53540




16QAM, CH53540





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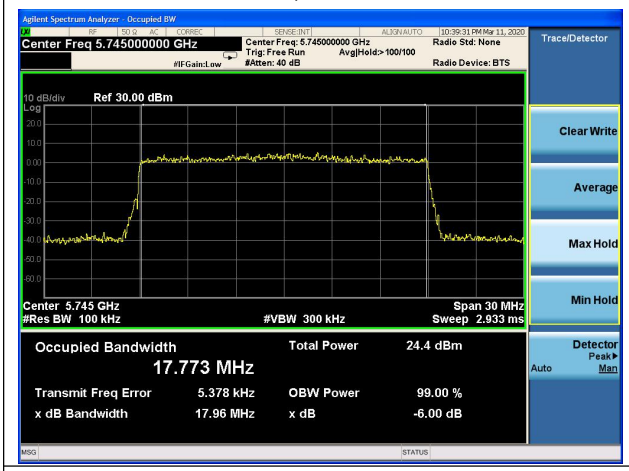
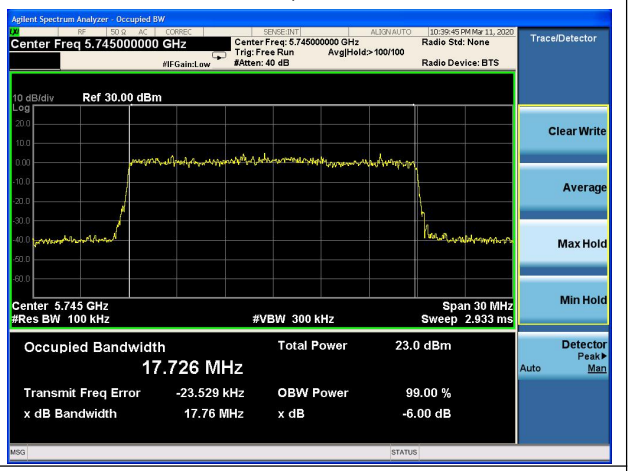
## Minimum 6 dB bandwidth

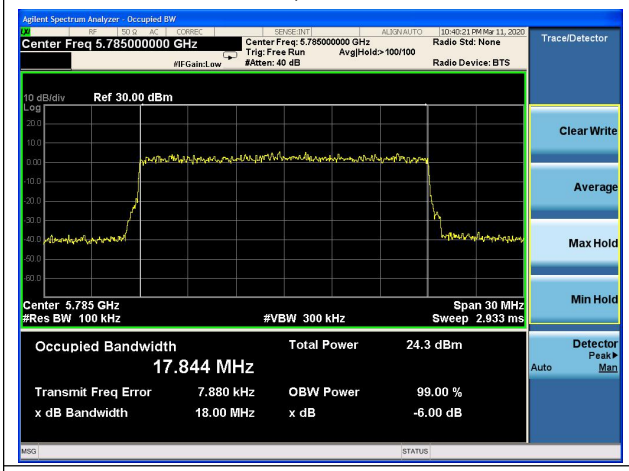
QPSK, CH52740



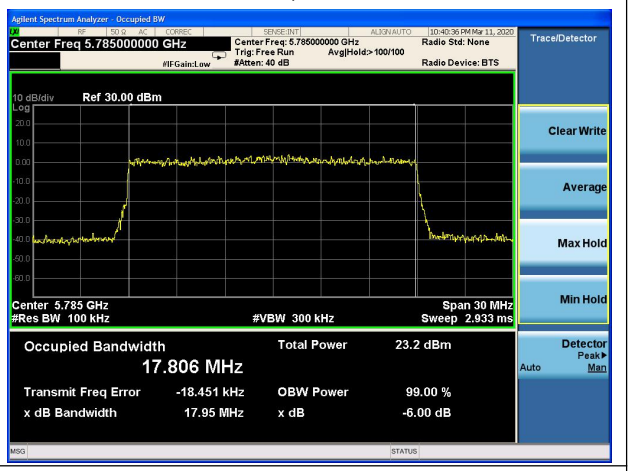

16QAM, CH52740



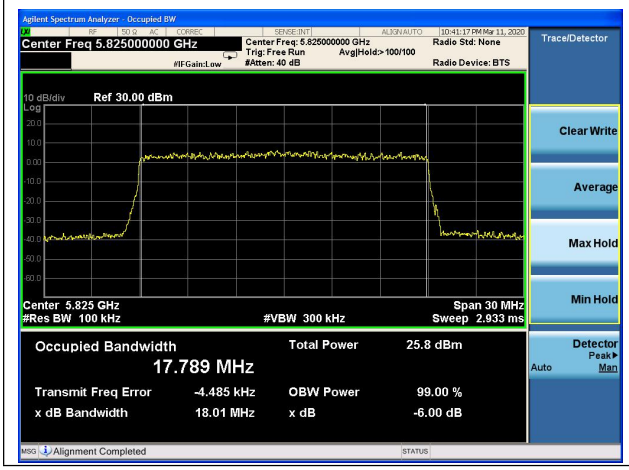

QPSK, CH53140



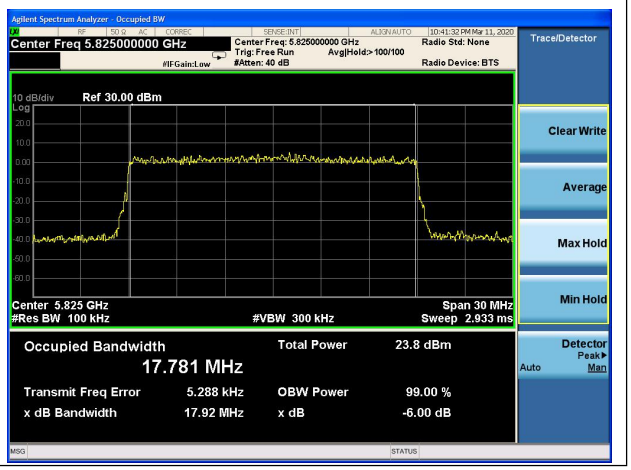

16QAM, CH53140




QPSK, CH53540




16QAM, CH53540





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## 5.2. Average Power Output –Conducted

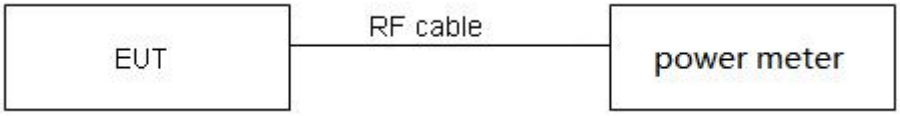
**Ambient condition**

| Temperature | Relative humidity | Pressure |
|---|---|---|
| 23°C ~25°C | 45%~50% | 101.5kPa |

**Methods of Measurement**

During the process of the testing, The EUT was connected to the average power meter through an external attenuator and a known loss cable. The EUT is max power transmission with proper modulation. We use Maximum average Conducted Output Power Level Method in KDB789033 for this test

**Test Setup**




**Limits**

Rule FCC Part 15.407(a)(1)(2)(3)

(1)For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. 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 6 dBi.

**Measurement Uncertainty**

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k$ = 2, $U$= 0.44 dB.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## Test Results

| Bandwidth | Modulation | Channel | RB Configuration | Conducted Power(dBm) |
|---|---|---|---|---|
| 20M | QPSK | 52740 | 1RB#0 | 19.09 |
| 20M | QPSK | 52740 | 1RB#50 | 19.77 |
| 20M | QPSK | 52740 | 1RB#99 | 18.62 |
| 20M | QPSK | 52740 | 50RB#0 | 18.47 |
| 20M | QPSK | 52740 | 50RB#25 | 18.65 |
| 20M | QPSK | 52740 | 50RB#50 | 18.79 |
| 20M | QPSK | 52740 | 100RB#0 | 18.80 |
| 20M | QPSK | 53140 | 1RB#0 | 20.21 |
| 20M | QPSK | 53140 | 1RB#50 | 21.17 |
| 20M | QPSK | 53140 | 1RB#99 | 20.41 |
| 20M | QPSK | 53140 | 50RB#0 | 19.54 |
| 20M | QPSK | 53140 | 50RB#25 | 19.79 |
| 20M | QPSK | 53140 | 50RB#50 | 19.93 |
| 20M | QPSK | 53140 | 100RB#0 | 19.85 |
| 20M | QPSK | 53540 | 1RB#0 | 20.80 |
| 20M | QPSK | 53540 | 1RB#50 | 21.03 |
| 20M | QPSK | 53540 | 1RB#99 | 20.03 |
| 20M | QPSK | 53540 | 50RB#0 | 19.82 |
| 20M | QPSK | 53540 | 50RB#25 | 19.77 |
| 20M | QPSK | 53540 | 50RB#50 | 19.65 |
| 20M | QPSK | 53540 | 100RB#0 | 19.70 |
| 20M | 16QAM | 52740 | 1RB#0 | 18.25 |
| 20M | 16QAM | 52740 | 1RB#50 | 19.38 |
| 20M | 16QAM | 52740 | 1RB#99 | 18.14 |
| 20M | 16QAM | 52740 | 50RB#0 | 17.67 |
| 20M | 16QAM | 52740 | 50RB#25 | 17.78 |
| 20M | 16QAM | 52740 | 50RB#50 | 17.79 |
| 20M | 16QAM | 52740 | 100RB#0 | 17.78 |
| 20M | 16QAM | 53140 | 1RB#0 | 19.45 |
| 20M | 16QAM | 53140 | 1RB#50 | 20.28 |
| 20M | 16QAM | 53140 | 1RB#99 | 19.71 |
| 20M | 16QAM | 53140 | 50RB#0 | 18.47 |
| 20M | 16QAM | 53140 | 50RB#25 | 19.22 |
| 20M | 16QAM | 53140 | 50RB#50 | 18.73 |
| 20M | 16QAM | 53140 | 100RB#0 | 18.67 |
| 20M | 16QAM | 53540 | 1RB#0 | 19.93 |
| 20M | 16QAM | 53540 | 1RB#50 | 20.17 |


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| | | | | |
|---|---|---|---|---|
| 20M | 16QAM | 53540 | 1RB#99 | 19.18 |
| 20M | 16QAM | 53540 | 50RB#0 | 18.65 |
| 20M | 16QAM | 53540 | 50RB#25 | 18.67 |
| 20M | 16QAM | 53540 | 50RB#50 | 18.84 |
| 20M | 16QAM | 53540 | 100RB#0 | 18.60 |


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## 5.3. Frequency Stability

**Ambient condition**

| Temperature | Relative humidity | Pressure |
|---|---|---|
| 23°C ~25°C | 45%~50% | 101.5kPa |

**Method of Measurement**

1. Frequency stability with respect to ambient temperature

a) Supply the EUT with a nominal ac voltage or install a new or fully charged battery in the EUT. If possible, a dummy load shall be connected to the EUT because an antenna near the metallic walls of an environmental test chamber could affect the output frequency of the EUT. If the EUT is equipped with a permanently attached, adjustable-length antenna, then the EUT shall be placed in the center of the chamber with the antenna adjusted to the shortest length possible. Turn ON the EUT and tune it to one of the number of frequencies shown in 5.6.

b) Couple the unlicensed wireless device output to the measuring instrument by connecting an antenna to the measuring instrument with a suitable length of coaxial cable and placing the measuring antenna near the EUT (e.g., 15 cm away), or by connecting a dummy load to the measuring instrument, through an attenuator if necessary.

c) Adjust the location of the measurement antenna and the controls on the measurement instrument to obtain a suitable signal level (i.e., a level that will not overload the measurement instrument but is strong enough to allow measurement of the operating or fundamental frequency of the EUT).

d) Turn the EUT OFF and place it inside the environmental temperature chamber. For devices that have oscillator heaters, energize only the heater circuit.

e) Set the temperature control on the chamber to the highest specified in the regulatory requirements for the type of device and allow the oscillator heater and the chamber temperature to stabilize.

f) While maintaining a constant temperature inside the environmental chamber, turn the EUT ON and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized. Four measurements in total are made.

g) Measure the frequency at each of frequencies specified in 5.6.

h) Switch OFF the EUT but do not switch OFF the oscillator heater.

i) Lower the chamber temperature by not more that 10°C, and allow the temperature inside the chamber to stabilize.

j) Repeat step f) through step i) down to the lowest specified temperature.

2. Frequency stability when varying supply voltage

Unless otherwise specified, these tests shall be made at ambient room temperature (+15°C to +25 °C). An antenna shall be connected to the antenna output terminals of the EUT if possible. If the EUT is equipped with or uses an adjustable-length antenna, then it shall be fully extended.

a) Supply the EUT with nominal voltage or install a new or fully charged battery in the EUT. Turn ON the EUT and couple its output to a frequency counter or other frequency-measuring instrument.


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b) Tune the EUT to one of the number of frequencies required in 5.6. Adjust the location of the measurement antenna and the controls on the measurement instrument to obtain a suitable signal level (i.e., a level that will not overload the measurement instrument but is strong enough to allow measurement of the operating or fundamental frequency of the EUT).
c) Measure the frequency at each of the frequencies specified in 5.6.
d) Repeat the above procedure at 85% and 115% of the nominal supply voltage.

**Limit**

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.

**Measurement Uncertainty**

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k$ = 2, $U$= 936Hz


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## Test Results

| Voltage (V) | Temperature (°C) | Test Results | | | |
|---|---|---|---|---|---|
| | | 5785MHz | | | |
| | | 1min | 2min | 5min | 10min |
| 4 | -40 | 5784.997641 | 5784.988046 | 5784.985861 | 5784.976567 |
| 4 | -30 | 5784.989680 | 5784.985760 | 5784.978224 | 5784.969402 |
| 4 | -20 | 5784.986959 | 5784.976335 | 5784.974243 | 5784.964327 |
| 4 | -10 | 5784.980585 | 5784.972424 | 5784.966837 | 5784.961236 |
| 4 | 0 | 5784.972032 | 5784.964191 | 5784.956904 | 5784.956239 |
| 4 | 10 | 5784.966194 | 5784.961552 | 5784.955025 | 5784.953849 |
| 4 | 20 | 5784.958120 | 5784.957622 | 5784.952455 | 5784.943863 |
| 4 | 30 | 5784.951004 | 5784.955644 | 5784.944851 | 5784.938199 |
| 4 | 40 | 5784.975999 | 5784.969750 | 5784.966571 | 5784.952673 |
| 4 | 50 | 5784.971545 | 5784.960268 | 5784.957662 | 5784.945268 |
| 4 | 60 | 5784.969889 | 5784.954197 | 5784.949538 | 5784.935732 |
| 4 | 70 | 5784.964764 | 5784.951083 | 5784.946806 | 5784.930112 |
| 3.3 | 20 | 5784.955043 | 5784.950538 | 5784.938132 | 5784.927653 |
| 4.2 | 20 | 5784.951467 | 5784.941500 | 5784.929183 | 5784.922661 |
| MHz | | -0.048996 | -0.058500 | -0.070817 | -0.077339 |
| PPM | | -8.469427 | -10.112379 | -12.241531 | -13.368812 |


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## 5.4. Power Spectral Density

**Ambient condition**

| Temperature | Relative humidity | Pressure |
|---|---|---|
| 23°C ~25°C | 45%~50% | 101.5kPa |

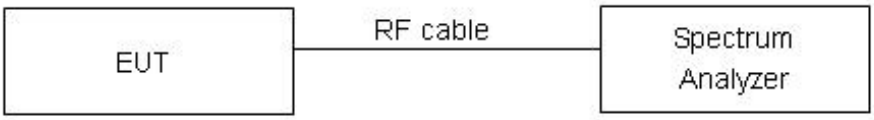
**Method of Measurement**

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable.

Set RBW = 500 kHz, VBW =1.5MHz for the band 5.725-5.85 GHz

The conducted PSD is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically.

**Test setup**




**Limits**

Rule FCC Part 15.407(a)(1)/ Part 15.407(a)(2) / Part 15.407(a)(3)

For an indoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. 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 6 dBi.

For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmittingantennas 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 6 dBi.

| Frequency Bands/MHz | Limits |
|---|---|
| 5725-5850 | 30dBm/500kHz |

**Measurement Uncertainty**

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k$ = 2, $U$= 0.75dB.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**Test Results:**

Note: Power Spectral Density =Read Value+Duty cycle correction factor

**U-NII-3**

| Modulation | Channel | Power Spectral Density (dBm/500kHz) | Limit (dBm/500kHz) | Conclusion |
|---|---|---|---|---|
| QPSK | 52740 | -1.540 | 30 | PASS |
| | 53140 | -0.432 | 30 | PASS |
| | 53540 | 0.687 | 500 | PASS |
| 16QAM | 52740 | -2.514 | 500 | PASS |
| | 53140 | -2.102 | 500 | PASS |
| | 53540 | -0.814 | 500 | PASS |


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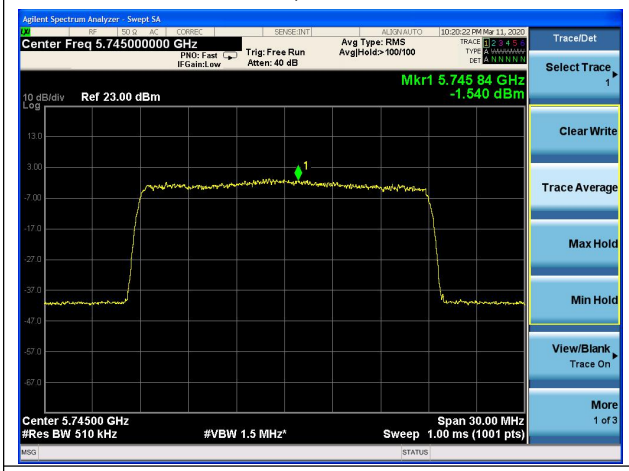
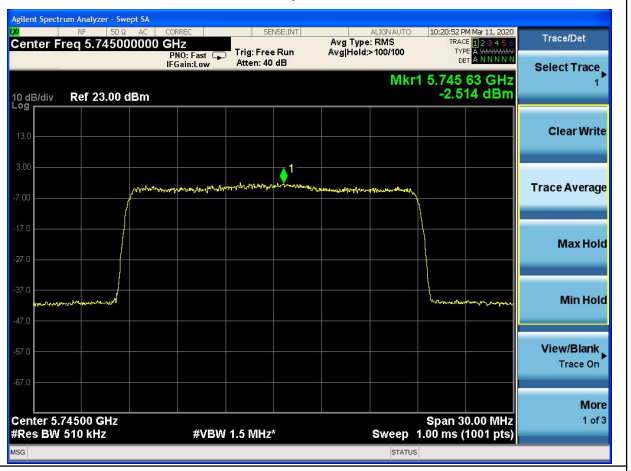
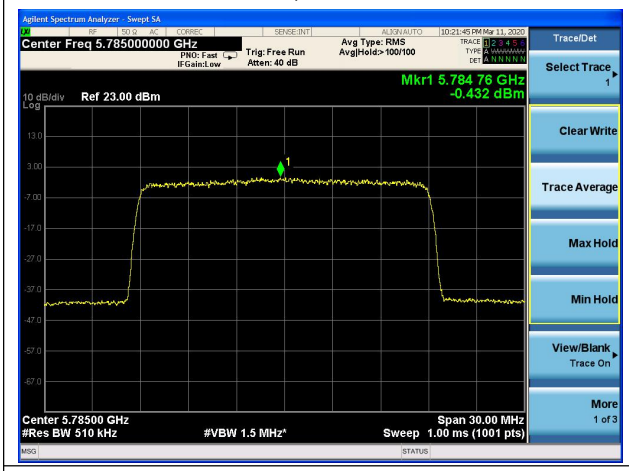
QPSK, CH52740



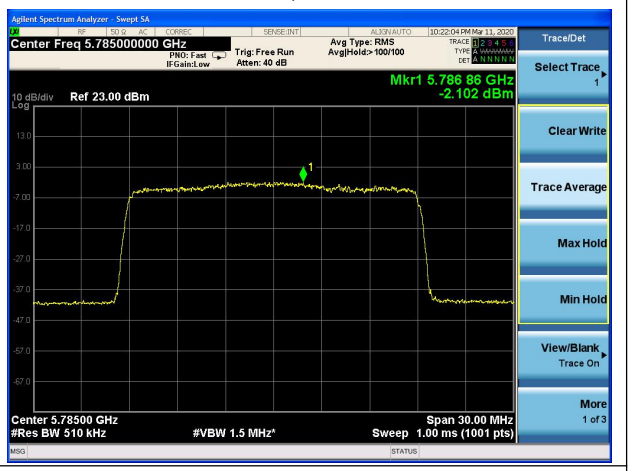

16QAM, CH52740



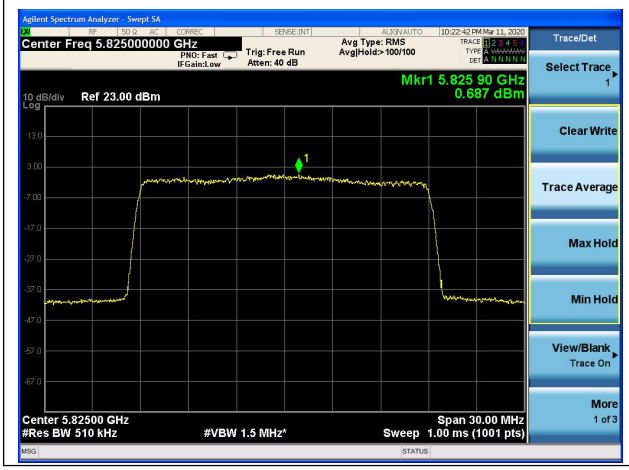

QPSK, CH53140



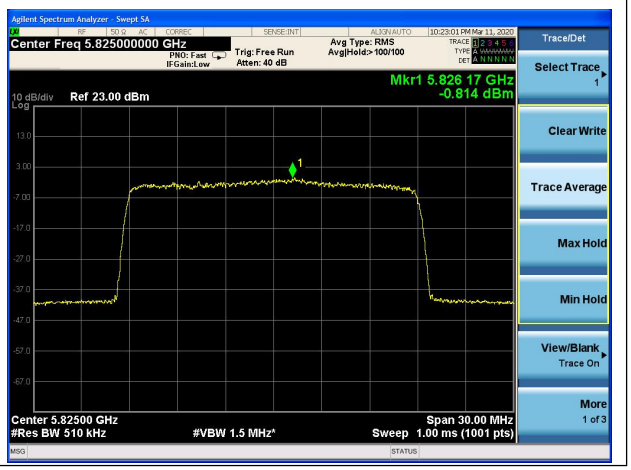

16QAM, CH53140




QPSK, CH53540




16QAM, CH53540





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## 5.5. Unwanted Emission

**Ambient condition**

| Temperature | Relative humidity | Pressure |
|---|---|---|
| 23°C ~25°C | 45%~50% | 101.5kPa |

**Method of Measurement**

The test set-up was made in accordance to the general provisions of ANSI C63.10-2013. The Equipment Under Test (EUT) was set up on a non-conductive table in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna. The radiated emissions measurements were made in a typical installation configuration.
Sweep the whole frequency band range from 9kHz to the 10th harmonic of the carrier, and the emissions less than 20 dB below the permissible value are reported.

During the test, the height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. The turntable shall be rotated from 0 to 360 degrees for detecting the maximum of radiated spurious signal level. The measurements shall be repeated with orthogonal polarization of the test antenna. The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing.
Set the spectrum analyzer in the following:
Below 1GHz (detector: Peak and Quasi-Peak)
RBW=100kHz / VBW=300kHz / Sweep=AUTO
Above 1GHz (detector: Peak):
I) Peak emission levels are measured by setting the instrument as follows:
1) RBW = 1 MHz.
2) VBW ≥ [3 × RBW]
3) Detector = peak.
4) Sweep time = auto.
5) Trace mode = max hold.
6) Allow sweeps to continue until the trace stabilizes. Note that if the transmission is not continuous, then the time required for the trace to stabilize will increase by a factor of approximately 1 / D, where D is the duty cycle.

II) Average emission levels are measured by setting the instrument as follows:
a) RBW = 1 MHz.
b) VBW ≥ [3 × RBW].
c) Detector = RMS (power averaging), if [span / (# of points in sweep)] ≤ RBW / 2. Satisfying this condition can require increasing the number of points in the sweep or reducing the span. If the condition is not satisfied, then the detector mode shall be set to peak.
d) Averaging type = power (i.e., rms) (As an alternative, the detector and averaging type may be set for linear voltage averaging. Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.)


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e) Sweep time = auto.

f) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, then the number of traces shall be increased by a factor of 1 / D, where D is the duty cycle. For example, with 50% duty cycle, at least 200 traces shall be averaged. (If a specific emission is demonstrated to be continuous—i.e., 100% duty cycle—then rather than turning ON and OFF with the transmit cycle, at least 100 traces shall be averaged.)

g) If tests are performed with the EUT transmitting at a duty cycle less than 98%, then a correction factor shall be added to the measurement results prior to comparing with the emission limit, to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:

1) If power averaging (rms) mode was used in the preceding step e), then the correction factor is [10 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 3 dB shall be added to the measured emission levels.

2) If linear voltage averaging mode was used in the preceding step e), then the correction factor is [20 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 6 dB shall be added to the measured emission levels.

3) If a specific emission is demonstrated to be continuous (100% duty cycle) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

Reduce the video bandwidth until no significant variations in the displayed signal are observed in subsequent traces, provided the video bandwidth is no less than 1 Hz. For regulatory requirements that specify averaging only over the transmit duration (e.g., digital transmission system [DTS] and Unlicensed National Information Infrastructure [U-NII]), the video bandwidth shall be greater than [1 / (minimum transmitter on time)] and no less than 1 Hz.

The field strength of spurious emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the loop antenna is vertical, others antenna are vertical and horizontal.

The test is in transmitting mode.


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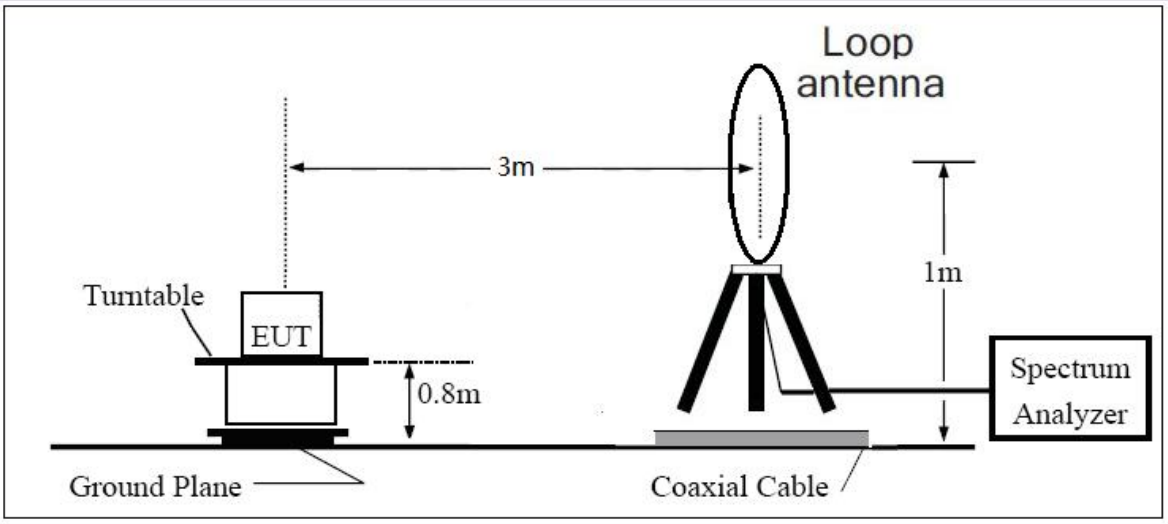
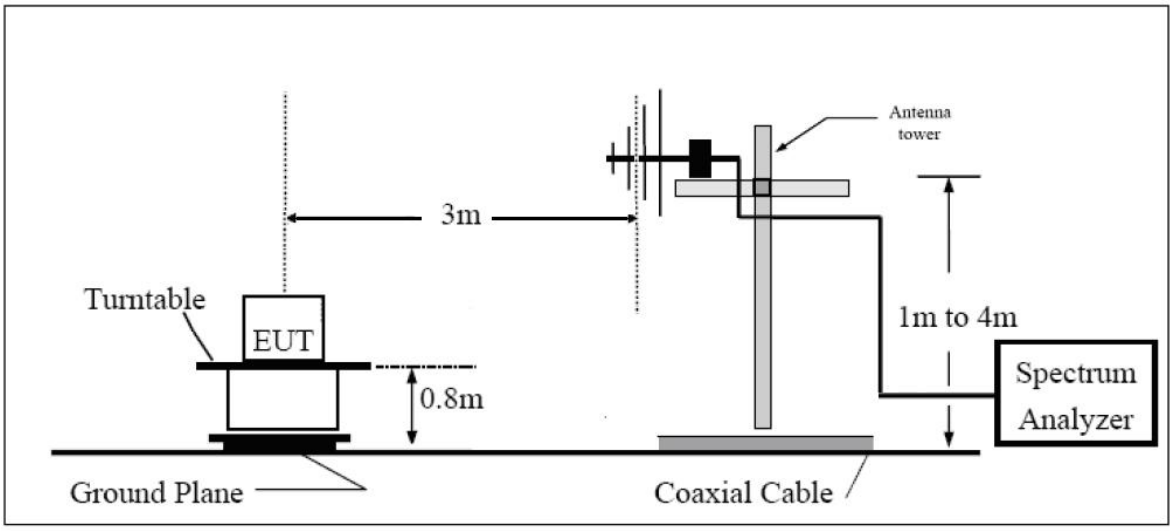
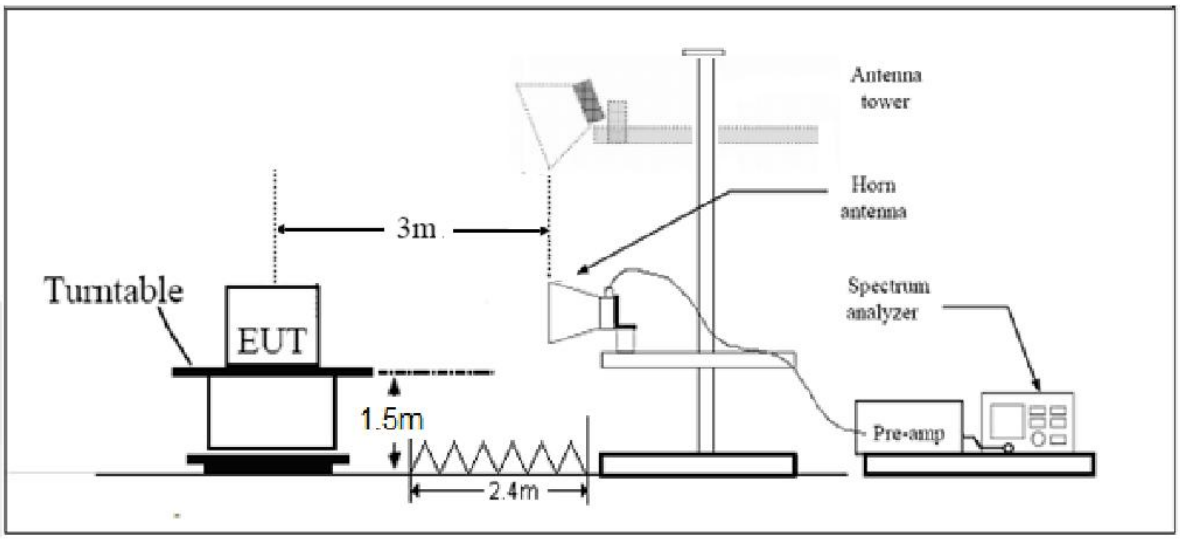
**9KHz~~~30MHz**




**30MHz~~~ 1GHz**




**Above 1GHz**




Note: Area side:2.4mX3.6m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**Limits**

(1) For transmitters operating in the 5725-5850 MHz band: All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

**Measurement Uncertainty**

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor *k* = 1.96.

| Frequency | Uncertainty |
|---|---|
| 9KHz-30MHz | 3.55 dB |
| 30MHz-200MHz | 4.02 dB |
| 200MHz-1GHz | 3.28 dB |
| 1GHz-18G | 3.70 dB |
| 18GHz-26.5GHz | 5.78 dB |
| 26.5G-40GHz | 5.82 dB |


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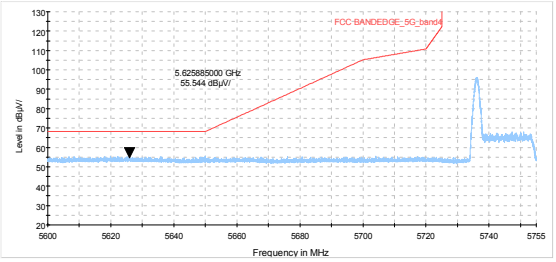
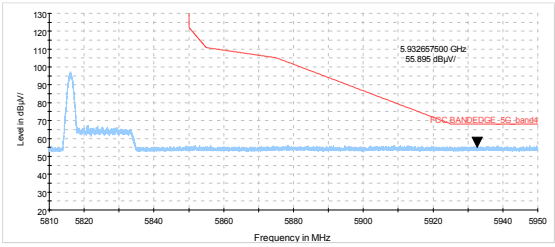
## Test Results:

## The signal beyond the limit is carrier.

| 5745M: Peak | 5825M: Peak |
|---|---|
|  |  |



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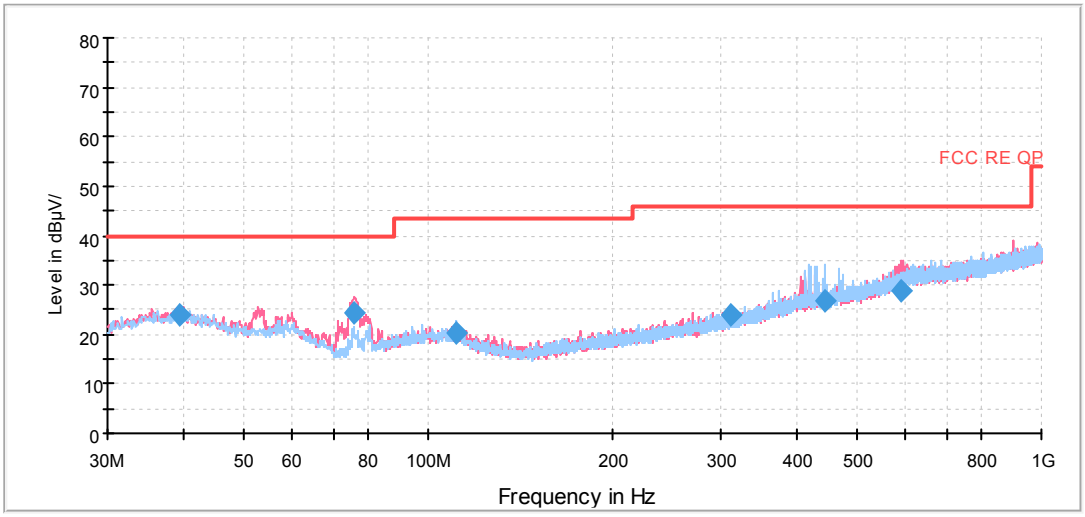
**Result of RE**

**Test result**

Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier, the Emissions in the frequency band 9kHz-30MHz and 26.5GHz-40GHz are more than 20dB below the limit are not reported.

During the test, the Radiates Emission from 30MHz to 1GHz was performed in all modes with all channels, **5745M** are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

**Continuous TX mode:**




Radiates Emission from 30MHz to 1GHz

| Frequency (MHz) | Quasi-Peak (dBuV/m) | Height (cm) | Polarization | Azimuth (deg) | Correct Factor (dB) | Margin (dB) | Limit (dBuV/m) |
|---|---|---|---|---|---|---|---|
| 39.261250 | 23.9 | 100.0 | V | 0.0 | 16.9 | 16.1 | 40.0 |
| 75.713750 | 24.4 | 100.0 | V | 0.0 | 10.2 | 15.6 | 40.0 |
| 110.958750 | 20.1 | 125.0 | H | 0.0 | 13.3 | 23.4 | 43.5 |
| 310.487500 | 24.0 | 100.0 | H | 82.0 | 15.8 | 22.0 | 46.0 |
| 443.988750 | 26.7 | 225.0 | H | 74.0 | 20.3 | 19.3 | 46.0 |
| 590.181250 | 29.0 | 100.0 | V | 17.0 | 22.9 | 17.0 | 46.0 |

**Remark: 1. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)**

**2. Margin = Limit – Quasi-Peak**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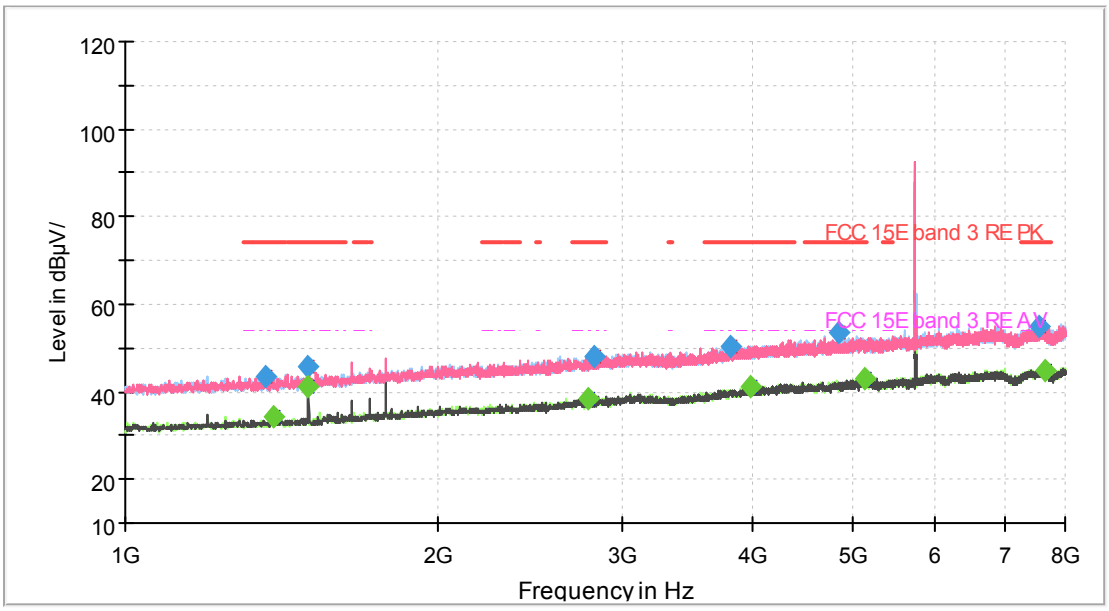
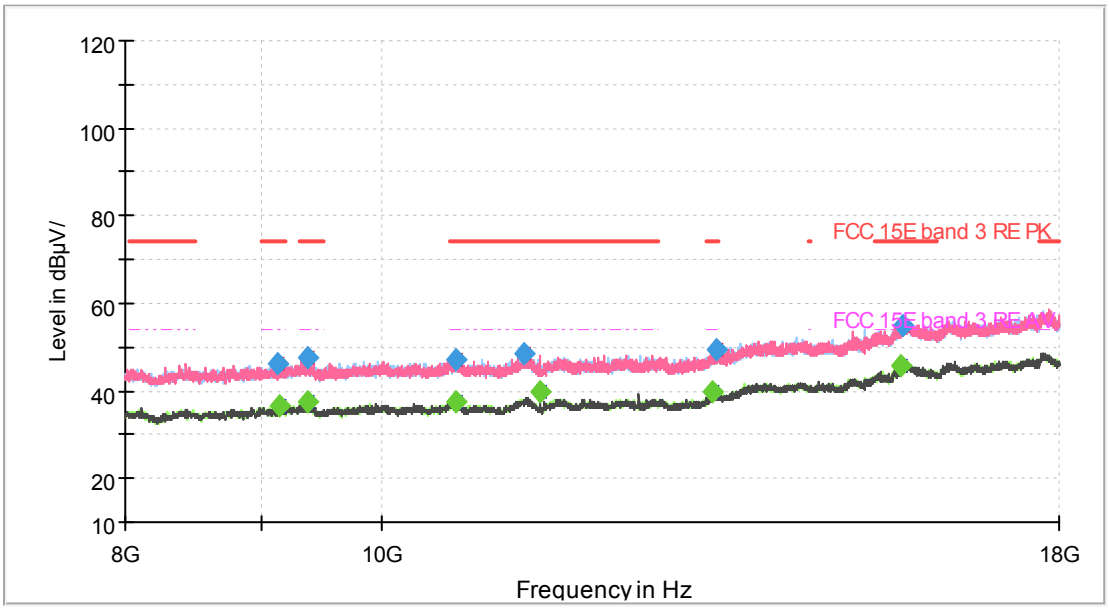
**5745M**




Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 8GHz




Radiates Emission from 8GHz to 18GHz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| Frequency (MHz) | MaxPeak (dBμV/m) | Average (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Height (cm) | Polarization | Azimuth (deg) | Correct Factor (dB) |
|---|---|---|---|---|---|---|---|---|
| 1366.625000 | 43.38 | --- | 74.00 | 30.62 | 100.0 | H | 103.0 | 0.8 |
| 1385.875000 | --- | 34.50 | 54.00 | 19.50 | 100.0 | V | 0.0 | 0.8 |
| 1499.625000 | 45.86 | --- | 74.00 | 28.14 | 100.0 | V | 356.0 | 1.3 |
| 1499.625000 | --- | 41.20 | 54.00 | 12.80 | 100.0 | V | 356.0 | 1.3 |
| 2782.375000 | --- | 38.54 | 54.00 | 15.46 | 100.0 | V | 300.0 | 6.8 |
| 2827.875000 | 47.87 | --- | 74.00 | 26.13 | 100.0 | H | 204.0 | 7.0 |
| 3807.875000 | 50.54 | --- | 74.00 | 23.46 | 100.0 | H | 34.0 | 10.2 |
| 3981.125000 | --- | 41.27 | 54.00 | 12.73 | 100.0 | H | 37.0 | 10.7 |
| 4850.875000 | 53.51 | --- | 74.00 | 20.49 | 100.0 | H | 262.0 | 12.6 |
| 5132.625000 | --- | 43.01 | 54.00 | 10.99 | 100.0 | V | 28.0 | 13.3 |
| 7555.500000 | 54.72 | --- | 74.00 | 19.28 | 100.0 | V | 210.0 | 17.4 |
| 7636.875000 | --- | 45.05 | 54.00 | 8.95 | 100.0 | V | 286.0 | 17.7 |

**Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)**


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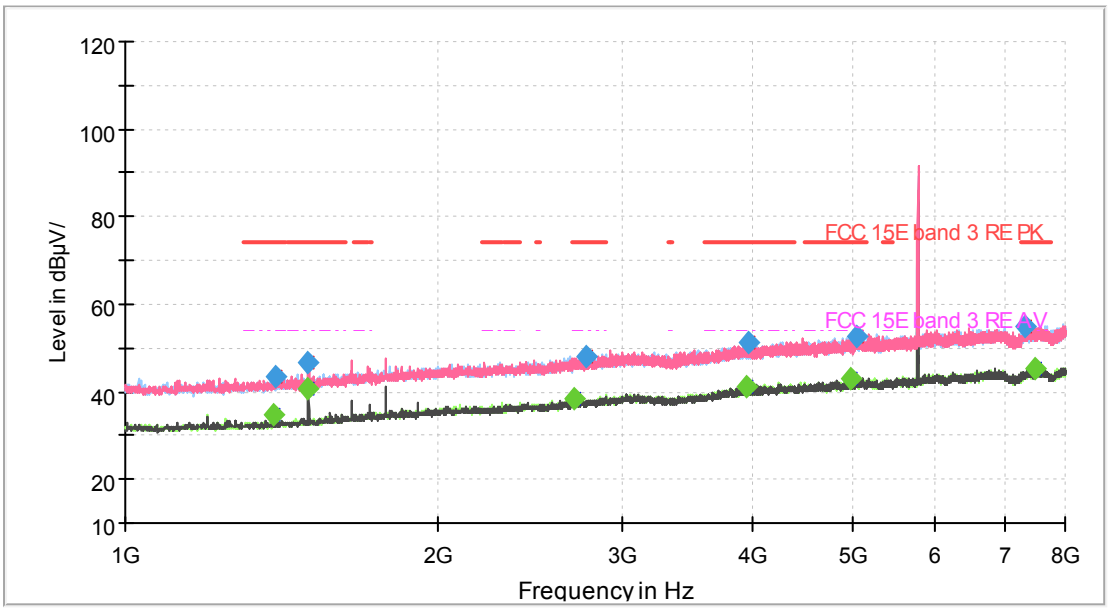
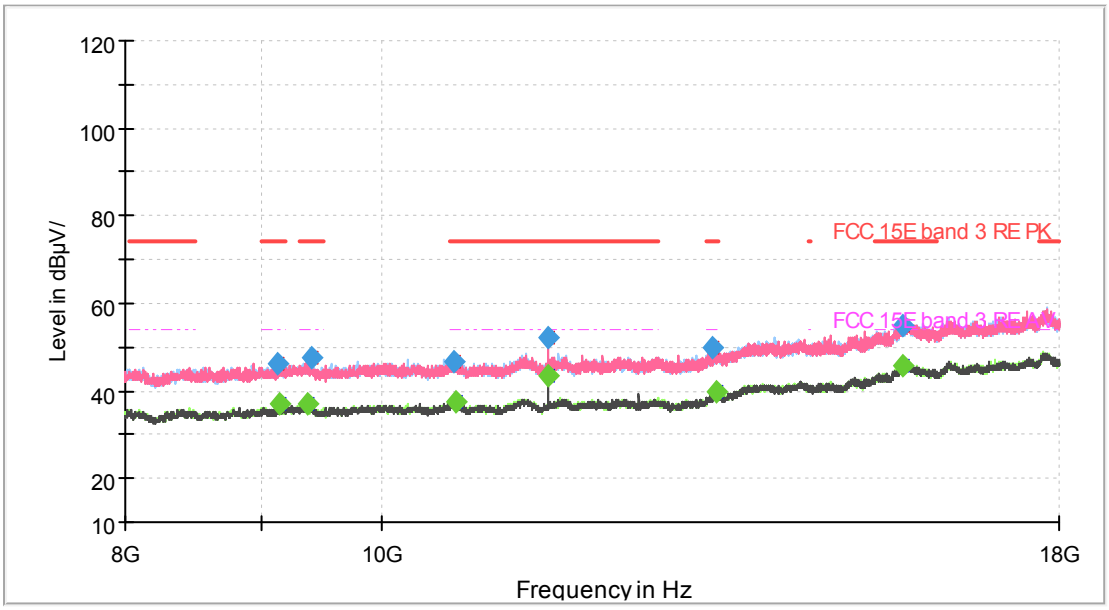
**5785M**




Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 8GHz




Radiates Emission from 8GHz to 18GHz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| Frequency (MHz) | MaxPeak (dBμV/m) | Average (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Height (cm) | Polarization | Azimuth (deg) | Correct Factor (dB) |
|---|---|---|---|---|---|---|---|---|
| 1385.875000 | --- | 34.65 | 54.00 | 19.35 | 100.0 | V | 9.0 | 0.8 |
| 1394.625000 | 43.29 | --- | 74.00 | 30.71 | 100.0 | V | 23.0 | 0.9 |
| 1499.625000 | --- | 40.90 | 54.00 | 13.10 | 100.0 | V | 0.0 | 1.3 |
| 1499.625000 | 46.58 | --- | 74.00 | 27.42 | 100.0 | V | 0.0 | 1.3 |
| 2704.500000 | --- | 38.35 | 54.00 | 15.65 | 100.0 | V | 241.0 | 6.5 |
| 2774.500000 | 48.10 | --- | 74.00 | 25.90 | 100.0 | H | 0.0 | 6.7 |
| 3958.375000 | --- | 41.26 | 54.00 | 12.74 | 100.0 | V | 168.0 | 10.6 |
| 3965.375000 | 51.14 | --- | 74.00 | 22.86 | 100.0 | V | 291.0 | 10.7 |
| 4988.250000 | --- | 42.96 | 54.00 | 11.04 | 100.0 | H | 341.0 | 12.8 |
| 5052.125000 | 52.56 | --- | 74.00 | 21.44 | 100.0 | V | 275.0 | 13.3 |
| 7321.875000 | 55.13 | --- | 74.00 | 18.87 | 100.0 | H | 48.0 | 17.1 |
| 7499.500000 | --- | 45.30 | 54.00 | 8.70 | 100.0 | V | 176.0 | 17.3 |

**Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)**


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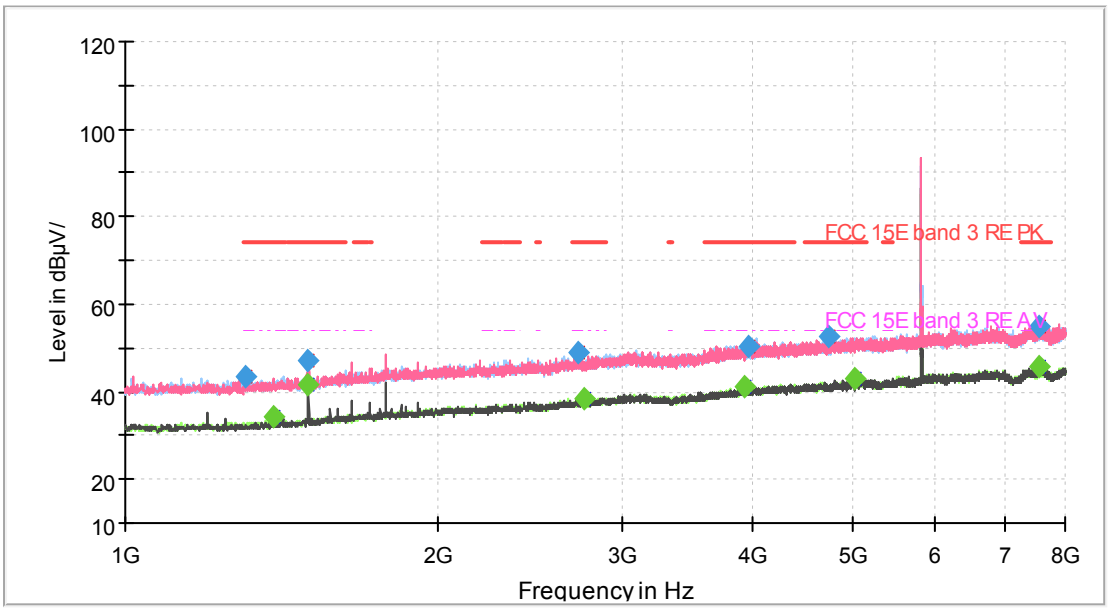
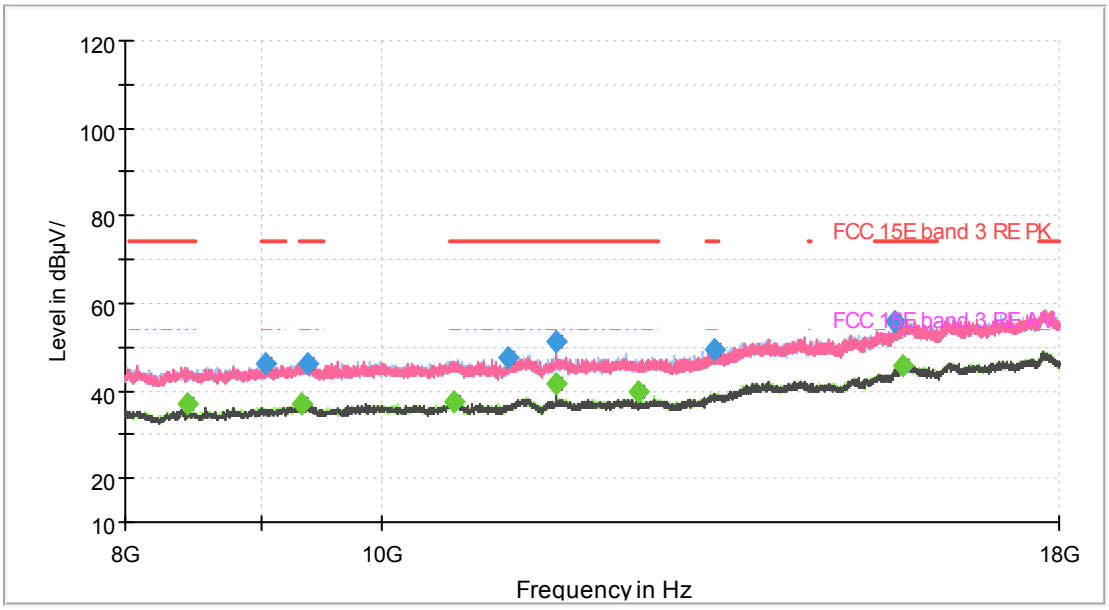
**5825M**




Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 8GHz




Radiates Emission from 8GHz to 18GHz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| Frequency (MHz) | MaxPeak (dBμV/m) | Average (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Height (cm) | Polarization | Azimuth (deg) | Correct Factor (dB) |
|---|---|---|---|---|---|---|---|---|
| 1305.375000 | 43.49 | --- | 74.00 | 30.51 | 100.0 | V | 45.0 | 0.5 |
| 1385.875000 | --- | 34.10 | 54.00 | 19.90 | 100.0 | V | 15.0 | 0.8 |
| 1499.625000 | --- | 41.56 | 54.00 | 12.44 | 100.0 | V | 357.0 | 1.3 |
| 1499.625000 | 46.99 | --- | 74.00 | 27.01 | 100.0 | V | 357.0 | 1.3 |
| 2720.250000 | 48.86 | --- | 74.00 | 25.14 | 100.0 | H | 8.0 | 6.8 |
| 2757.875000 | --- | 38.32 | 54.00 | 15.68 | 100.0 | V | 322.0 | 6.7 |
| 3943.500000 | --- | 41.30 | 54.00 | 12.70 | 100.0 | V | 357.0 | 10.6 |
| 3978.500000 | 50.54 | --- | 74.00 | 23.46 | 100.0 | H | 259.0 | 10.7 |
| 4734.500000 | 52.59 | --- | 74.00 | 21.41 | 100.0 | V | 129.0 | 12.2 |
| 5023.250000 | --- | 42.78 | 54.00 | 11.22 | 100.0 | V | 13.0 | 13.1 |
| 7539.750000 | 54.79 | --- | 74.00 | 19.21 | 100.0 | H | 23.0 | 17.4 |
| 7539.750000 | --- | 45.89 | 54.00 | 8.11 | 100.0 | H | 23.0 | 17.4 |

**Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)**


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## 5.6. Conducted Emission

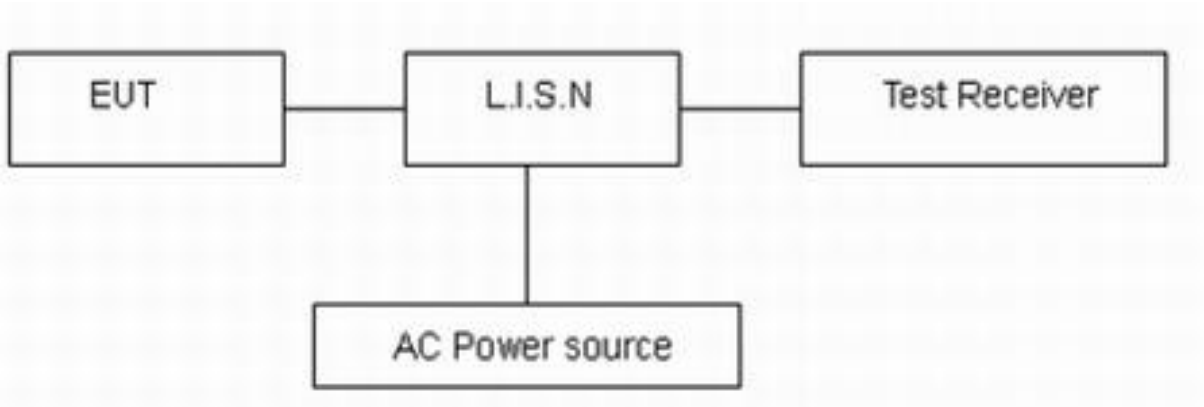
**Ambient condition**

| Temperature | Relative humidity | Pressure |
|---|---|---|
| 23°C ~25°C | 45%~50% | 101.5kPa |

**Methods of Measurement**

The EUT IS placed on a non-metallic table of 80cm height above the horizontal metal reference ground plane. During the test, the EUT was operating in its typical mode. The test method is according to ANSI C63.10-2013.Connect the AC power line of the EUT to the LISN Use EMI receiver to detect the average and Quasi-peak value. RBW is set to 9kHz, VBW is set to 30kHz The measurement result should include both L line and N line.
The test is in transmitting mode.

**Test Setup**




Note: AC Power source is used to change the voltage 110V/60Hz.

**Limits**

| Frequency (MHz) | Conducted Limits(dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15 - 0.5 | 66 to 56 * | 56 to 46* |
| 0.5 - 5 | 56 | 46 |
| 5 - 30 | 60 | 50 |
| *: Decreases with the logarithm of the frequency. | | |

**Measurement Uncertainty**

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k$ = 1.96, $U$= 2.69 dB.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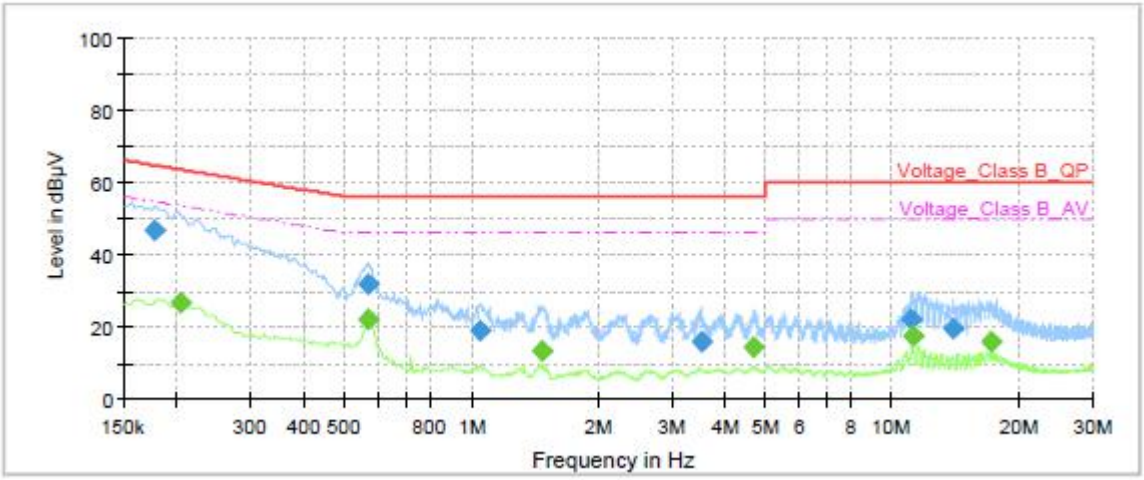
**Test Results:**

Following plots, Blue trace uses the peak detection and Green trace uses the average detection. During the test, the Conducted Emission was performed in all modes with all channels, **5745M** was selected as the worst condition. The test data of the worst-case condition was recorded in this report.




| Frequency (MHz) | QuasiPeak (dBµV) | Average (dBµV) | Limit (dBµV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Filter | Corr. (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 0.18 | 46.65 | --- | 64.63 | 17.98 | 1000.0 | 9.000 | L1 | ON | 19 |
| 0.20 | --- | 26.70 | 53.45 | 26.75 | 1000.0 | 9.000 | L1 | ON | 19 |
| 0.57 | --- | 22.17 | 46.00 | 23.83 | 1000.0 | 9.000 | L1 | ON | 19 |
| 0.57 | 31.84 | --- | 56.00 | 24.16 | 1000.0 | 9.000 | L1 | ON | 19 |
| 1.04 | 19.05 | --- | 56.00 | 36.95 | 1000.0 | 9.000 | L1 | ON | 19 |
| 1.47 | --- | 13.33 | 46.00 | 32.67 | 1000.0 | 9.000 | L1 | ON | 19 |
| 3.52 | 16.10 | --- | 56.00 | 39.90 | 1000.0 | 9.000 | L1 | ON | 19 |
| 4.70 | --- | 14.18 | 46.00 | 31.82 | 1000.0 | 9.000 | L1 | ON | 19 |
| 11.14 | 21.83 | --- | 60.00 | 38.17 | 1000.0 | 9.000 | L1 | ON | 19 |
| 11.21 | --- | 17.48 | 50.00 | 32.52 | 1000.0 | 9.000 | L1 | ON | 19 |
| 13.98 | 19.33 | --- | 60.00 | 40.67 | 1000.0 | 9.000 | L1 | ON | 19 |
| 17.25 | --- | 15.86 | 50.00 | 34.14 | 1000.0 | 9.000 | L1 | ON | 20 |

**Remark: Correct factor=cable loss + LISN factor**

L line Conducted Emission from 150 KHz to 30 MHz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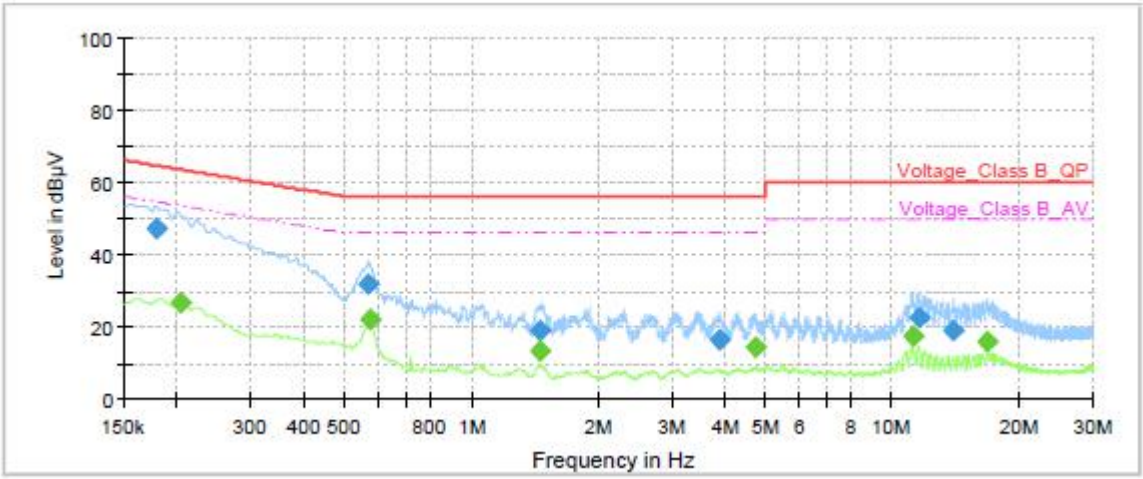


| Frequency (MHz) | QuasiPeak (dBµV) | Average (dBµV) | Limit (dBµV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Filter | Corr. (dB) |
|---|---|---|---|---|---|---|---|---|---|
| 0.18 | 46.96 | --- | 64.52 | 17.56 | 1000.0 | 9.000 | N | ON | 19 |
| 0.20 | --- | 26.69 | 53.45 | 26.76 | 1000.0 | 9.000 | N | ON | 19 |
| 0.57 | 31.76 | --- | 56.00 | 24.24 | 1000.0 | 9.000 | N | ON | 19 |
| 0.57 | --- | 22.22 | 46.00 | 23.78 | 1000.0 | 9.000 | N | ON | 19 |
| 1.45 | --- | 13.19 | 46.00 | 32.81 | 1000.0 | 9.000 | N | ON | 19 |
| 1.46 | 19.06 | --- | 56.00 | 36.94 | 1000.0 | 9.000 | N | ON | 19 |
| 3.90 | 16.36 | --- | 56.00 | 39.64 | 1000.0 | 9.000 | N | ON | 19 |
| 4.72 | --- | 14.20 | 46.00 | 31.80 | 1000.0 | 9.000 | N | ON | 19 |
| 11.22 | --- | 17.47 | 50.00 | 32.53 | 1000.0 | 9.000 | N | ON | 19 |
| 11.55 | 22.39 | --- | 60.00 | 37.61 | 1000.0 | 9.000 | N | ON | 19 |
| 14.00 | 19.12 | --- | 60.00 | 40.88 | 1000.0 | 9.000 | N | ON | 19 |
| 16.84 | --- | 15.68 | 50.00 | 34.32 | 1000.0 | 9.000 | N | ON | 19 |

**Remark: Correct factor=cable loss + LISN factor**

N line Conducted Emission from 150 KHz to 30 MHz


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# 6. Main Test Instruments

| Name | Manufacturer | Type | Serial Number | Calibration Date | Expiration Time |
|---|---|---|---|---|---|
| Spectrum Analyzer | R&S | FSV40 | 15195-01-00 | 2019-05-19 | 2020-05-18 |
| Spectrum Analyzer | Key sight | N9010A | MY50210259 | 2019-12-15 | 2020-12-14 |
| Trilog Antenna | Schwarzbeck | VULB 9163 | 9163-201 | 2017-11-18 | 2020-11-17 |
| Horn Antenna | R&S | HF907 | 100126 | 2018-07-07 | 2020-07-06 |
| Wideband radio communication tester | R&S | CMW500 | 150415 | 2019-05-19 | 2020-05-18 |
| Signal analyzer | R&S | FSQ 26 | 101132 | 2019-05-19 | 2020-05-18 |
| Baseband signal generator and fading simulator | R&S | AMU 200A | 100577 | 2019-05-19 | 2020-05-18 |
| Vector signal generator | R&S | SMU 200A | 104652 | 2019-05-19 | 2020-05-18 |
| Signal generator | R&S | SMF 100A | 102235 | 2019-05-19 | 2020-05-18 |
| MOB COMMS DC SUPPLY | Keysight | 66319D | MY43004105 | 2019-05-19 | 2020-05-18 |
| Climate Chamber | ESPEC | SU-242 | 93000506 | 2017-12-17 | 2020-12-16 |
| Software | R&S | EMC32 | 9.26.0 | / | / |

********END OF REPORT ********


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