

Test Report

Verified code: 720968

Report No.: E20220126665001-2-G1

Customer: Lumi United Technology Co., Ltd

Address: B1, Chongwen Park, Nanshan iPark, Liuxian Avenue, Taoyuan Residential District,
Nanshan District, Shenzhen, China

Sample Name: Hub M1S Gen 2

Sample Model: HM1S-G02

Receive Sample Date: Feb.09,2022

Test Date: Feb.15,2022 ~ Feb.21,2022

Reference Document: CFR 47, FCC Part 15 Subpart C
RADIO FREQUENCY DEVICES:Subpart C—Intentional Radiators
ANSI C63.10-2013
KDB 558074 D01 15.247 Meas Guidance v05r02

Test Result: Pass

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GUANGZHOU GRG METROLOGY & TEST CO., LTD

Issued Date: 2022-03-24

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REPORT ISSUED HISTORY

| Report Version | Report No. | Description | Compile Date |
|----------------|----------------------|----------------|--------------|
| 1.0 | E20220126665001-2 | Original Issue | 2022/03/09 |
| 2.0 | E20220126665001-2-G1 | Update | 2022/03/23 |

Version 2.0:

1. On the basis of the original report, added the description of radiated spurious emissions test from 18GHz to 26.5GHz.
2. This report instead the report E20220126665001-2, and from the date of issuance of this report, the report which being replaced become invalid.

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1. TEST RESULT SUMMARY

| Standard | Item | Limit / Severity | Result |
|---|--|------------------------------------|--------|
| CFR 47, FCC Part 15 Subpart C (§15.247) | Antenna Requirement | §15.203 | PASS |
| | Conducted Emissions | §15.207 (a) | PASS |
| | Radiated Spurious Emission | §15.247(d) § 15.205 § 15.209 | PASS |
| | 6 dB Bandwidth | §15.247 (a)(2) | PASS |
| | Maximum Peak Output Power | §15.247(b)(3) | PASS |
| | Power Spectral Density | §15.247(e) | PASS |
| | Conducted band edges and Spurious Emission | §15.247(d) | PASS |
| | Restricted bands of operation | §15.205 § 15.209 §15.247(d) | PASS |

The EUT have two antennas. The antenna is Internal antenna.

The max gain of antenna is 1dBi, which accordance 15.203 is considered sufficient to comply with the provisions of this section.

----- The following blanks -----

2. GENERAL DESCRIPTION OF EUT

2.1 APPLICANT

Name: Lumi United Technology Co., Ltd
Address: B1, Chongwen Park, Nanshan iPark, Liuxian Avenue, Taoyuan Residential District,
Nanshan District, Shenzhen, China

2.2 MANUFACTURER

Name: Lumi United Technology Co., Ltd
Address: B1, Chongwen Park, Nanshan iPark, Liuxian Avenue, Taoyuan Residential District,
Nanshan District, Shenzhen, China

2.3 BASIC DESCRIPTION OF EQUIPMENT UNDER TEST

Product Name: Hub M1S Gen 2
Product Model: HM1S-G02
Adding Model: /
Trade Name: Aqara
FCC ID: 2AKIT-HM1S-G02
Power Supply: AC120V/60Hz
Adapter Specification: /
Frequency Band: 2405MHz-2475MHz
Transmit Power: 8.86 dBm
Modulation Type: OQPSK
Antenna Specification: Internal antenna with 1dBi gain (Max)
Temperature Range: -10℃ ~ +40℃
Hardware Version: T0
Software Version: V1.0.1_0001
Sample submitting way: ☒ Provided by customer ☐ Sampling
Sample No: E20220126665001-0002, E20220126665001-0003
Note: /

2.4 CHANNEL LIST

| CH11 - CH25 for Zigbee | | | | | | | |
|------------------------|-----------------|---------|-----------------|---------|-----------------|---------|-----------------|
| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 11 | 2405 | 15 | 2425 | 19 | 2445 | 23 | 2465 |
| 12 | 2410 | 16 | 2430 | 20 | 2450 | 24 | 2470 |
| 13 | 2415 | 17 | 2435 | 21 | 2455 | 25 | 2475 |
| 14 | 2420 | 18 | 2440 | 22 | 2460 | | |

2.5 TEST OPERATION MODE

| Mode No. | Description of the modes |
|----------|--------------------------|
| 1 | Zigbee TX mode |

2.6 LOCAL SUPPORTIVE INSTRUMENTS

| Name of Equipment | Manufacturer | Model | Serial Number | Note |
|--------------------------|--------------|------------------|---------------|------------------|
| Notebook | LENOVO | TianYi 310-14ISK | MP18DLC6 | / |
| Cable | | | | |
| Serial port to USB cable | / | / | / | UnShielded, 1.5m |

2.7 CONFIGURATION OF SYSTEM UNDER TEST

EUT

Test software:

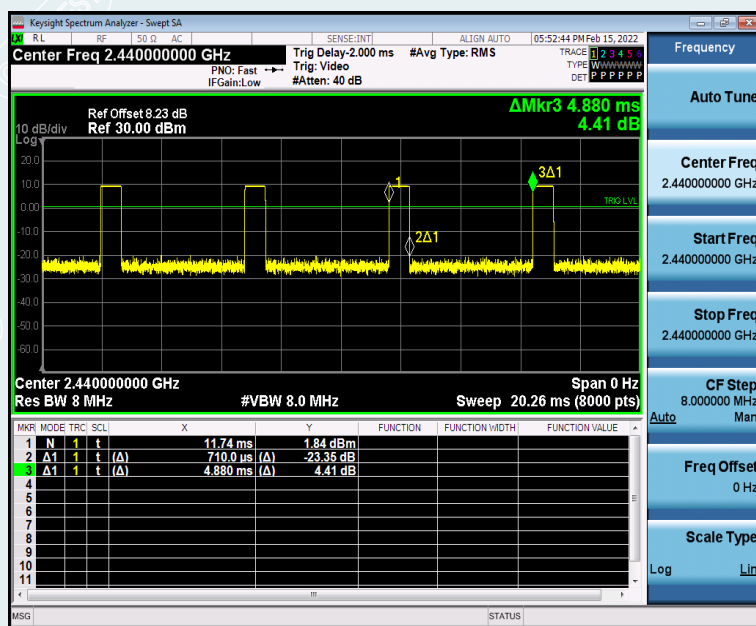
| Software version | Power Setting |
|------------------|---------------|
| QCOM_V1.0 | 90 |

2.8 DUTY CYCLE

| | | | |
|--------------------------|---------------|--------------|-------------|
| EUT Name | Hub M1S Gen 2 | Model | HM1S-G02 |
| Environmental Conditions | 22.4°C/51%RH | Test Voltage | AC120V/60Hz |
| Tested By | Deng Weihao | Tested Date | 2022/02/15 |

| Test Mode | Frequency (MHz) | Transmission Duration [ms] | Transmission Period [ms] | Duty Cycle [%] | T [s] |
|-----------|-----------------|----------------------------|--------------------------|----------------|---------|
| Zigbee | 2440 | 0.71 | 4.88 | 14.55 | 0.00071 |

Zigbee_2440MHz



3. LABORATORY AND ACCREDITATIONS

3.1 LABORATORY

The tests & measurements refer to this report were performed by Shenzhen EMC Laboratory of Guangzhou GRG Metrology & Test Co., Ltd.

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Shenzhen, 518110, People's Republic of China

P.C. : 518000

Tel : 0755-61180008

Fax : 0755-61180008

3.2 ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

USA A2LA(Certificate#:2861.01)

China CNAS(L0446)

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

Canada ISED (Company Number: 24897, CAB identifier:CN0069)

USA FCC (Registration Number: 759402, Designation Number:CN1198)

Copies of granted accreditation certificates are available for downloading from our web site,
<http://www.grgtest.com>

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3.3 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

| Measurement | | Frequency | Uncertainty |
|---------------------|------------|---------------|-------------|
| Radiated Emission | Horizontal | 9kHz~30MHz | 4.46dB |
| | | 30MHz~1000MHz | 4.30dB |
| | | 1GHz~18GHz | 5.60dB |
| | | 18GHz~26.5GHz | 3.65dB |
| | Vertical | 9kHz~30MHz | 4.46dB |
| | | 30MHz~1000MHz | 4.30dB |
| | | 1GHz~18GHz | 5.60dB |
| | | 18GHz~26.5GHz | 3.65dB |
| Conduction Emission | | 9 kHz~150kHz | 2.80dB |
| | | 150kHz~10MHz | 2.80dB |
| | | 10MHz~30MHz | 2.20dB |

| Measurement | Uncertainty |
|------------------------------|----------------------|
| RF frequency | 6.0×10^{-6} |
| RF power conducted | 0.78 dB |
| Occupied channel bandwidth | 0.4 dB |
| Unwanted emission, conducted | 0.68 dB |
| Humidity | 6 % |
| Temperature | 2°C |

This uncertainty represents an expanded uncertainty factor of k=2.

----- The following blanks -----

4. LIST OF USED TEST EQUIPMENT AT GRGT

| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Due |
|---|--------------|-----------------|---------------|-----------------|
| Conducted Emissions | | | | |
| EZ-EMC | EZ | CCS-3A1-CE | / | / |
| EMI Receiver | R&S | ESCI | 100783 | 2022-09-13 |
| LISN(EUT) | R&S | ENV216 | 101543 | 2022-03-21 |
| Radiated Spurious Emission&Restricted bands of operation | | | | |
| Test S/W | EZ | CCS-2ANT | | |
| Loop Antenna | TESEQ | HLA6121 | 52599 | 2022-04-21 |
| Test Receiver | R&S | ESCI | 100088 | 2022-10-31 |
| Preamplifier | EMEC | EM330 | / | 2022-03-21 |
| Bi-log Antenna | TESEQ | CBL6143A | 32399 | 2022-11-25 |
| Spectrum Analyzer | Agilent | N9010A | MY52221469 | 2022-04-16 |
| Horn Antenna | Schwarzbeck | BBHA9120D(1201) | 02143 | 2022-10-22 |
| Board-Band Horn Antenna | Schwarzbeck | BBHA 9170 | BBHA 9170-497 | 2022-10-16 |
| Amplifier | Tonscend | TAP01018048 | AP20E8060075 | 2022-06-07 |
| Amplifier | Tonscend | TAP184050 | AP20E806071 | 2022-05-17 |
| Test S/W | Tonscend | JS32-RE/2.5.1.5 | | |
| 6 dB Bandwidth | | | | |
| Spectrum Analyzer | R&S | FSV30 | 104381 | 2022-12-10 |
| Output Power | | | | |
| Pulse power sensor | Agilent | MA2411B | 1126150 | 2022-03-21 |
| Power meter | Anritsu | ML2495A | 1204003 | 2022-03-21 |
| Conducted band edges and Spurious Emission | | | | |
| Spectrum Analyzer | R&S | FSV30 | 104381 | 2022-12-10 |
| Power Spectral Density | | | | |
| Spectrum Analyzer | R&S | FSV30 | 104381 | 2022-12-10 |

Note: The calibration interval of the above test instruments is 12 months.

5. CONDUCTED EMISSION MEASUREMENT

5.1 LIMITS

| Frequency range | Limits (dB μ V) | |
|-----------------|---------------------|---------|
| | Quasi-peak | Average |
| 150kHz ~ 0.5MHz | 66~56 | 56~46 |
| 0.5 MHz ~ 5 MHz | 56 | 46 |
| 5 MHz ~ 30 MHz | 60 | 50 |

NOTE: (1) The lower limit shall apply at the transition frequencies.

(2) The limit decreases in line with the logarithm of the frequency in the range of 150 kHz to 0.5MHz.

5.2 TEST PROCEDURES

Procedure of Preliminary Test

Test procedures follow ANSI C63.10:2013.

For measurement of the disturbance voltage the equipment under test (EUT) is connected to the power supply mains and any other extended network via one or more artificial network(s). An EUT, whether intended to be grounded or not, and which is to be used on a table is configured as follows:

– Either the bottom or the rear of the EUT shall be at a controlled distance of 40 cm from a reference ground plane. This ground plane is normally the wall or floor of a shielded room. It may also be a grounded metal plane of at least 2 m by 2 m. This is physically accomplished as follows:

1) place the EUT on a table of non-conducting material which is at least 80 cm high. Place the EUT so that it is 40 cm from the wall of the shielded room, or

2) place the EUT on a table of non-conducting material which is 40 cm high so that the bottom of the EUT is 40 cm above the ground plane;

– All other conductive surfaces of the EUT shall be at least 80 cm from the reference ground plane;

– The EUT are placed on the floor that one side of the housings is 40 cm from the vertical reference ground plane and other metallic parts;

– Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth forming a bundle 30 cm to 40 cm long, hanging approximately in the middle between the ground plane and the table.

– I/O cables that are connected to a peripheral shall be bundled in the centre. The end of the cable may be terminated if required using correct terminating impedance. The total length shall not exceed 1 m.

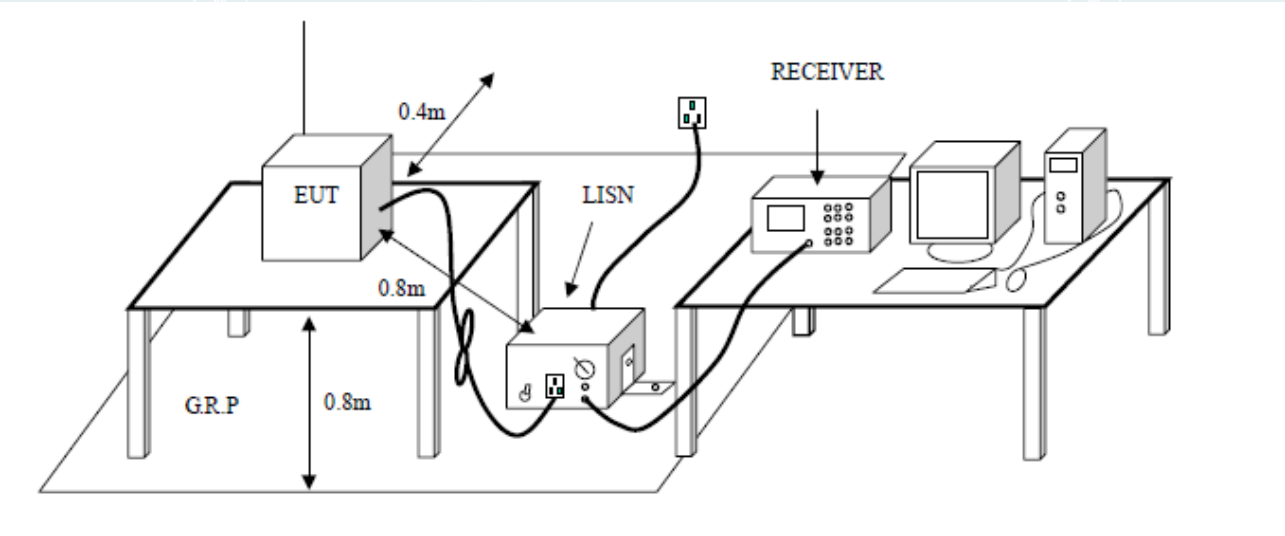
– Use serial board or connecting line to make EUT and notebook to communicate, according to the actual need to make EUT send constant frequency signal continuously.

The test mode(s) described in Item 2.5 were scanned during the preliminary test. After the preliminary scan, we found the test mode described in Item 2.5 producing the highest emission level. The EUT configuration and cable configuration of the above highest emission levels were recorded for reference of the final test.

Procedure of Final Test

EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test. A scan was taken on both power lines, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. The test data of the worst-case condition(s) was recorded.

5.3 TEST SETUP



5.4 DATA SAMPLE

| Frequency (MHz) | QuasiPeak Reading (dBuV) | Average Reading (dBuV) | Correction Factor (dB) | QuasiPeak Result (dBuV) | Average Result (dBuV) | QuasiPeak Limit (dBuV) | Average Limit (dBuV) | QuasiPeak Margin (dB) | Average Margin (dB) | Remark (Pass/Fail) |
|-----------------|--------------------------|------------------------|------------------------|-------------------------|-----------------------|------------------------|----------------------|-----------------------|---------------------|--------------------|
| X.XXXX | 32.69 | 25.65 | 11.52 | 44.21 | 37.17 | 65.78 | 55.79 | -21.57 | -18.62 | Pass |

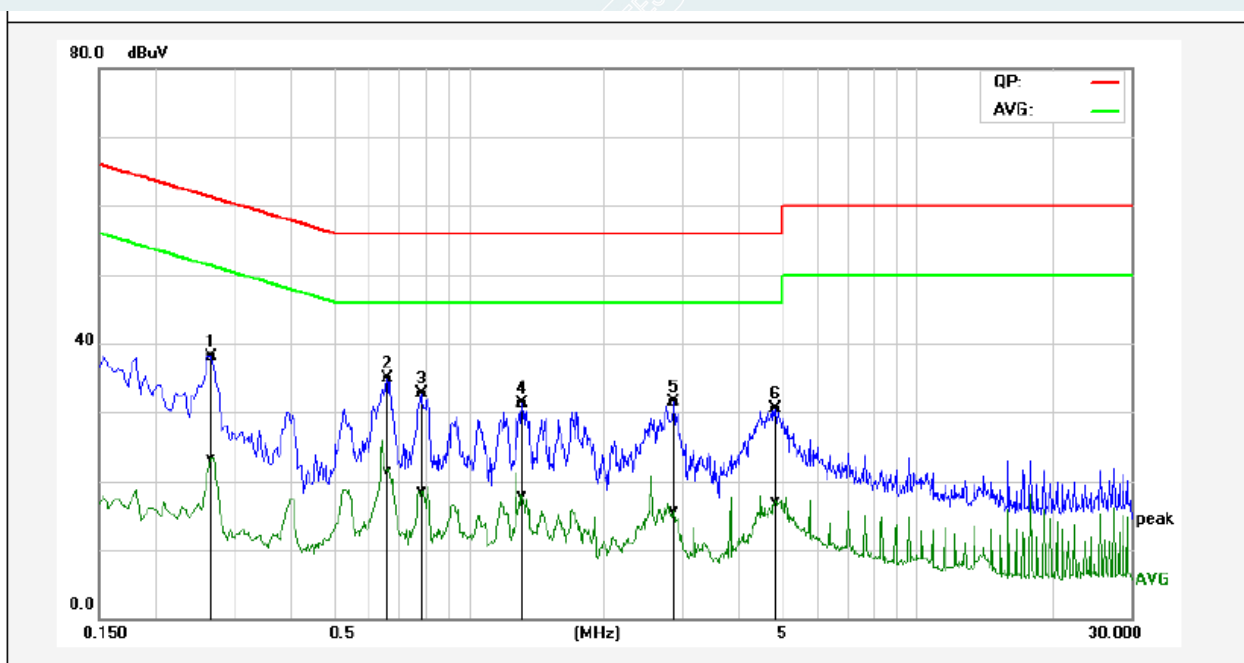
- Factor = Insertion loss of LISN + Cable Loss
- Result = Quasi-peak Reading/ Average Reading + Factor
- Limit = Limit stated in standard
- Margin = Result (dBuV) – Limit (dBuV)

----- The following blanks -----

5.5 TEST RESULTS

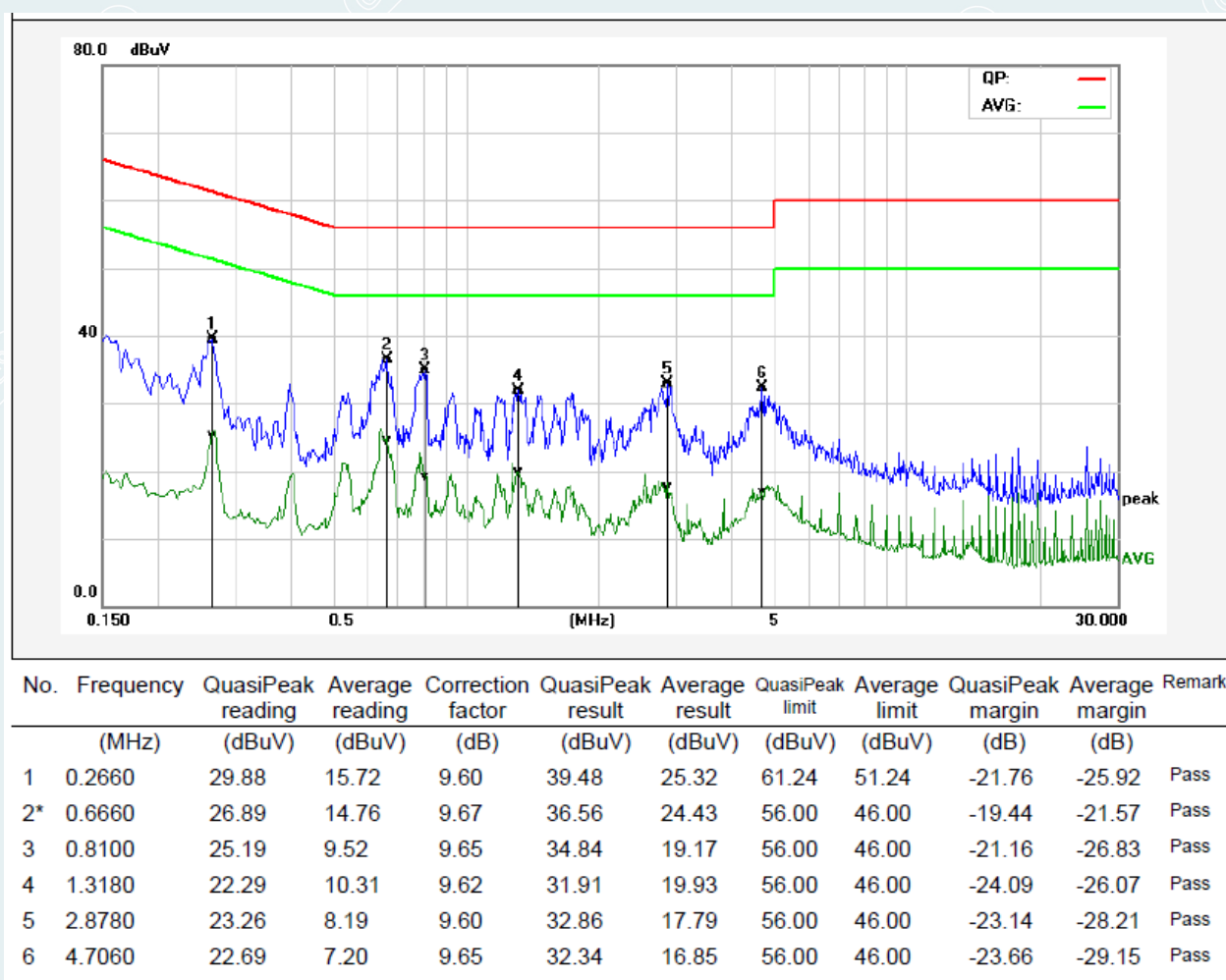
All models were pretested and only the worst modes and channels were recorded in this report. (Zigbee 2405MHz)

| | | | |
|---------------------------------|----------------|---------------------|----------------|
| EUT Name | Hub M1S Gen 2 | Model | HM1S-G02 |
| Environmental Conditions | 23.5°C/47%RH | Test Mode | Zigbee 2405MHz |
| Tested By | Zeng Xianglong | Line | L1 |
| Tested Date | 2022/02/16 | Test Voltage | AC120V/60Hz |



| No. | Frequency (MHz) | QuasiPeak reading (dBuV) | Average reading (dBuV) | Correction factor (dB) | QuasiPeak result (dBuV) | Average result (dBuV) | QuasiPeak limit (dBuV) | Average limit (dBuV) | QuasiPeak margin (dB) | Average margin (dB) | Remark |
|-----|--------------------|--------------------------------|------------------------------|------------------------------|-------------------------------|-----------------------------|------------------------------|----------------------------|-----------------------------|---------------------------|--------|
| 1 | 0.2660 | 28.53 | 13.67 | 9.60 | 38.13 | 23.27 | 61.24 | 51.24 | -23.11 | -27.97 | Pass |
| 2* | 0.6580 | 25.16 | 11.83 | 9.67 | 34.83 | 21.50 | 56.00 | 46.00 | -21.17 | -24.50 | Pass |
| 3 | 0.7860 | 23.10 | 8.93 | 9.65 | 32.75 | 18.58 | 56.00 | 46.00 | -23.25 | -27.42 | Pass |
| 4 | 1.3180 | 21.62 | 8.21 | 9.62 | 31.24 | 17.83 | 56.00 | 46.00 | -24.76 | -28.17 | Pass |
| 5 | 2.8699 | 21.82 | 6.11 | 9.60 | 31.42 | 15.71 | 56.00 | 46.00 | -24.58 | -30.29 | Pass |
| 6 | 4.8380 | 20.93 | 7.42 | 9.66 | 30.59 | 17.08 | 56.00 | 46.00 | -25.41 | -28.92 | Pass |

| | | | |
|---------------------------------|----------------|---------------------|----------------|
| EUT Name | Hub M1S Gen 2 | Model | HM1S-G02 |
| Environmental Conditions | 23.5°C/47%RH | Test Mode | Zigbee 2405MHz |
| Tested By | Zeng Xianglong | Line | N |
| Tested Date | 2022/02/16 | Test Voltage | AC120V/60Hz |



6. RADIATED SPURIOUS EMISSIONS

6.1 LIMITS

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

| Frequency (MHz) | Quasi-peak($\mu\text{V/m}$) | Measurement distance(m) | Quasi-peak(dB $\mu\text{V/m}$)@distance 3m |
|-----------------|-------------------------------|-------------------------|---|
| 0.009-0.490 | 2400/F(kHz) | 300 | 53.8~88.5 |
| 0.490-1.705 | 24000/F(kHz) | 30 | 43~53.8 |
| 1.705-30.0 | 30 | 30 | 49.5 |
| 30 ~ 88 | 100 | 3 | 40 |
| 88~216 | 150 | 3 | 43.5 |
| 216 ~ 960 | 200 | 3 | 46 |
| Above 960 | 500 | 3 | 54 |

NOTE:

- (1) The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.
- (2) The lower limit shall apply at the transition frequencies.
- (3) Above 18GHz test distance is 1m, so the Peak Limit=74+20*log(3/1)=83.54 (dB $\mu\text{V/m}$).
The Avg Limit=54+20*log(3/1)=63.54 (dB $\mu\text{V/m}$).

6.2 TEST PROCEDURES

1) Sequence of testing 9kHz to 30MHz

Setup:

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.
- If the EUT is a floor standing device, it is placed on the ground.
- Use serial board or connecting line to make EUT and notebook to communicate, according to the actual need to make EUT send constant frequency signal continuously.
- The EUT is placed on a desktop position in the center of the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

Pre measurement:

- The turntable rotates from 0 ° to 360 °.
- The antenna height is 1.0 meter.
- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

--- Identified emissions during the pre measurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QP detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the pre measurement and the limit will be stored.

2) Sequence of testing 30MHz to 1GHz**Setup:**

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Use serial board or connecting line to make EUT and notebook to communicate, according to the actual need to make EUT send constant frequency signal continuously.

--- The EUT is placed on a desktop position in the center of the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Pre measurement:

--- The turntable rotates from 0° to 360° .

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 4 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable rotates from 0° to 360° and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) Sequence of testing 1GHz to 18GHz

Setup:

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Use serial board or connecting line to make EUT and notebook to communicate, according to the actual need to make EUT send constant frequency signal continuously.
- The EUT is placed on a desktop position in the center of the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

Pre measurement:

- The turntable rotates from 0 ° to 360 °.
- The antenna is polarized vertical and horizontal.
- The antenna height scan range is 1 meter to 4 meter.
- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

- The final measurement will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable rotates from 0 ° to 360 ° and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.
- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.
- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the pre measurement with marked maximum final measurements and the limit will be stored.

4) Sequence of testing above 18GHz

Setup:

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Use serial board or connecting line to make EUT and notebook to communicate, according to the actual need to make EUT send constant frequency signal continuously.
- The EUT is placed on a desktop position in the center of the turntable.
- The measurement distance is 1 meter.
- The EUT was set into operation.

Pre measurement:

--- The antenna is moved spherical over the EUT in different polarisations of the antenna.

Final measurement:

--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

NOTE:

- (a).The frequency from 9kHz to 150kHz, Set RBW=300Hz(for Peak&AVG), RBW=300Hz(for Peak&AVG).
the frequency from 150kHz to 30MHz, Set RBW=9kHz, RBW=9kHz, (for QP Detector).
- (b).The frequency from 30MHz to 1GHz, Set RBW=120kHz, RBW=300kHz, (for QP Detector).
- (c).The frequency above 1GHz, for Peak detector: Set RBW=1MHz, RBW=3MHz.
- (d).The frequency above 1GHz, for Avg detector: Set RBW=1MHz, if the EUT is configured to transmit with duty cycle $\geq 98\%$, set VBW \leq RBW/100 (i.e.,10kHz) but not less than 10 Hz, if the EUT duty cycle is $< 98\%$, set VBW $\geq 1/T$. Where T is defined in section 2.8.

----- The following blanks -----

6.3 TEST SETUP

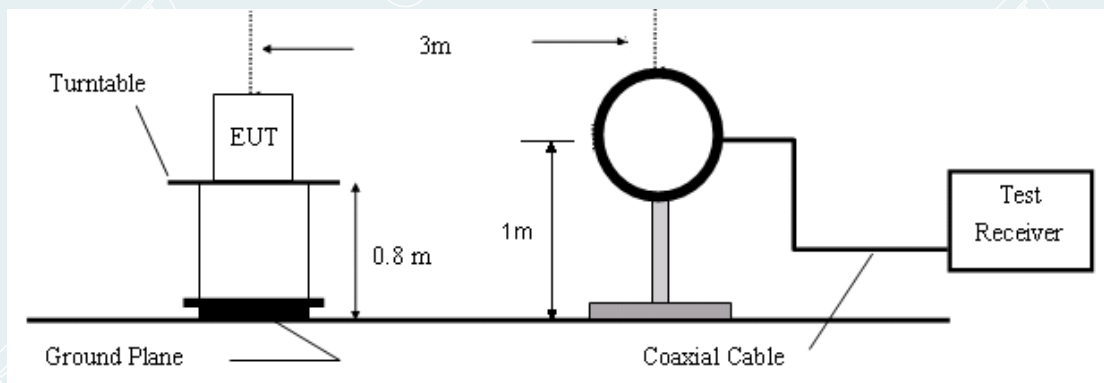


Figure 1. 9kHz to 30MHz radiated emissions test configuration

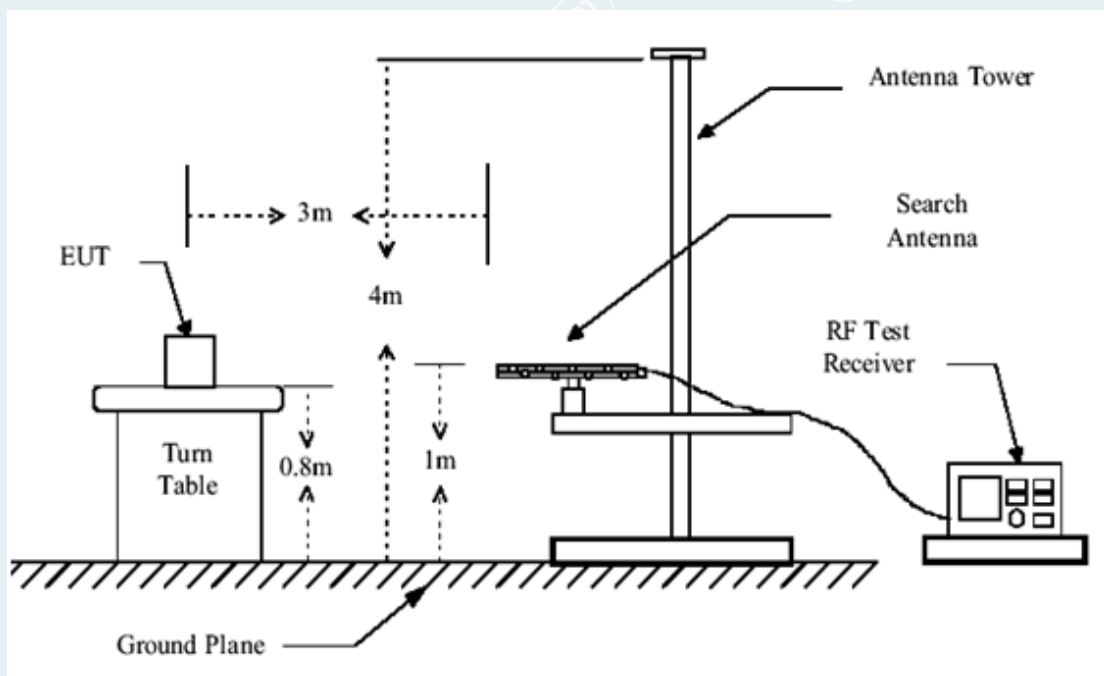


Figure 2. 30MHz to 1GHz radiated emissions test configuration

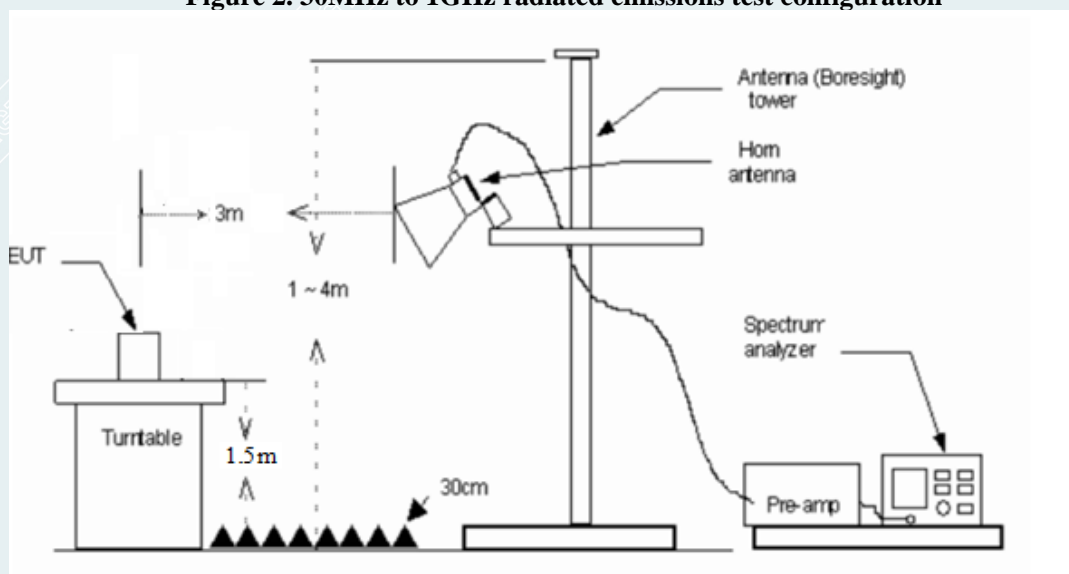


Figure 3. 1GH to 18GHz radiated emissions test configuration

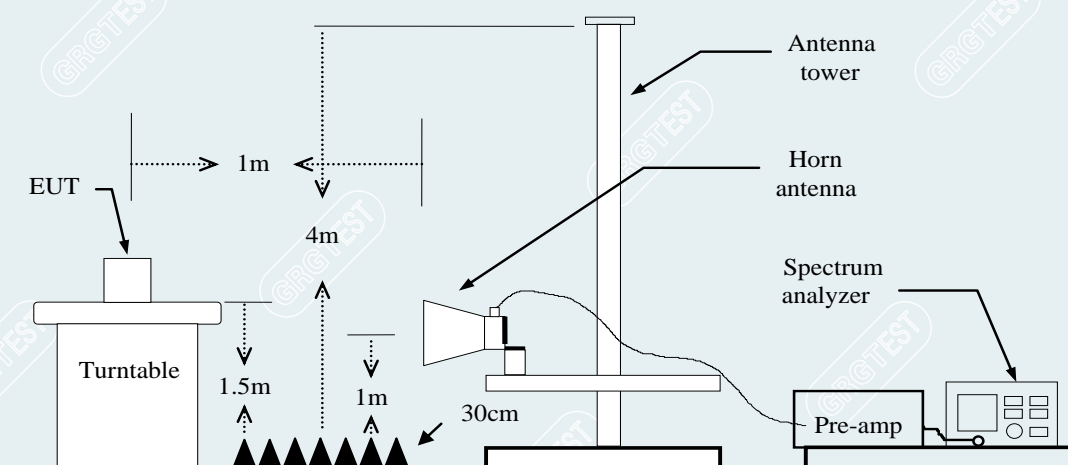


Figure 4. 18GHz to 26.5GHz radiated emissions test configuration

6.4 DATA SAMPLE

30MHz to 1GHz

| No. | Frequency (MHz) | Reading (dBuV/m) | Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Pole |
|-----|--------------------|---------------------|----------------|-------------------|-------------------|----------------|--------|----------|
| xxx | xxx | 37.06 | -15.48 | 21.58 | 40.00 | -18.42 | QP | Vertical |

1GHz-18GHz

| No. | Frequency (MHz) | Reading (dBuV/m) | Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Pole |
|-----|--------------------|---------------------|----------------|-------------------|-------------------|----------------|--------|----------|
| xxx | xxx | 65.45 | -11.12 | 54.33 | 74.00 | -19.67 | peak | Vertical |
| xxx | xxx | 63.00 | -11.12 | 51.88 | 54.00 | -2.12 | AVG | Vertical |

Above 18GHz

| No. | Frequency (MHz) | Reading (dBuV/m) | Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark | Pole |
|-----|--------------------|---------------------|----------------|-------------------|-------------------|----------------|--------|----------|
| xxx | xxx | 68.86 | 57.66 | -11.20 | 83.54 | 25.88 | peak | Vertical |
| xxx | xxx | 68.89 | -11.20 | 57.69 | 63.54 | 5.85 | AVG | Vertical |

Frequency (MHz) = Emission frequency in MHz

Ant.Pol. (H/V) = Antenna polarization

Reading (dBuV) = Uncorrected Analyzer / Receiver reading

Correction Factor (dB/m) = Antenna factor + Cable loss – Amplifier gain

Result (dBuV/m) = Reading (dBuV) + Correction Factor (dB/m)

Limit (dBuV/m) = Limit stated in standard

Margin (dB) = Remark Result (dBuV/m) – Limit (dBuV/m)

Peak = Peak Reading

QP = Quasi-peak Reading

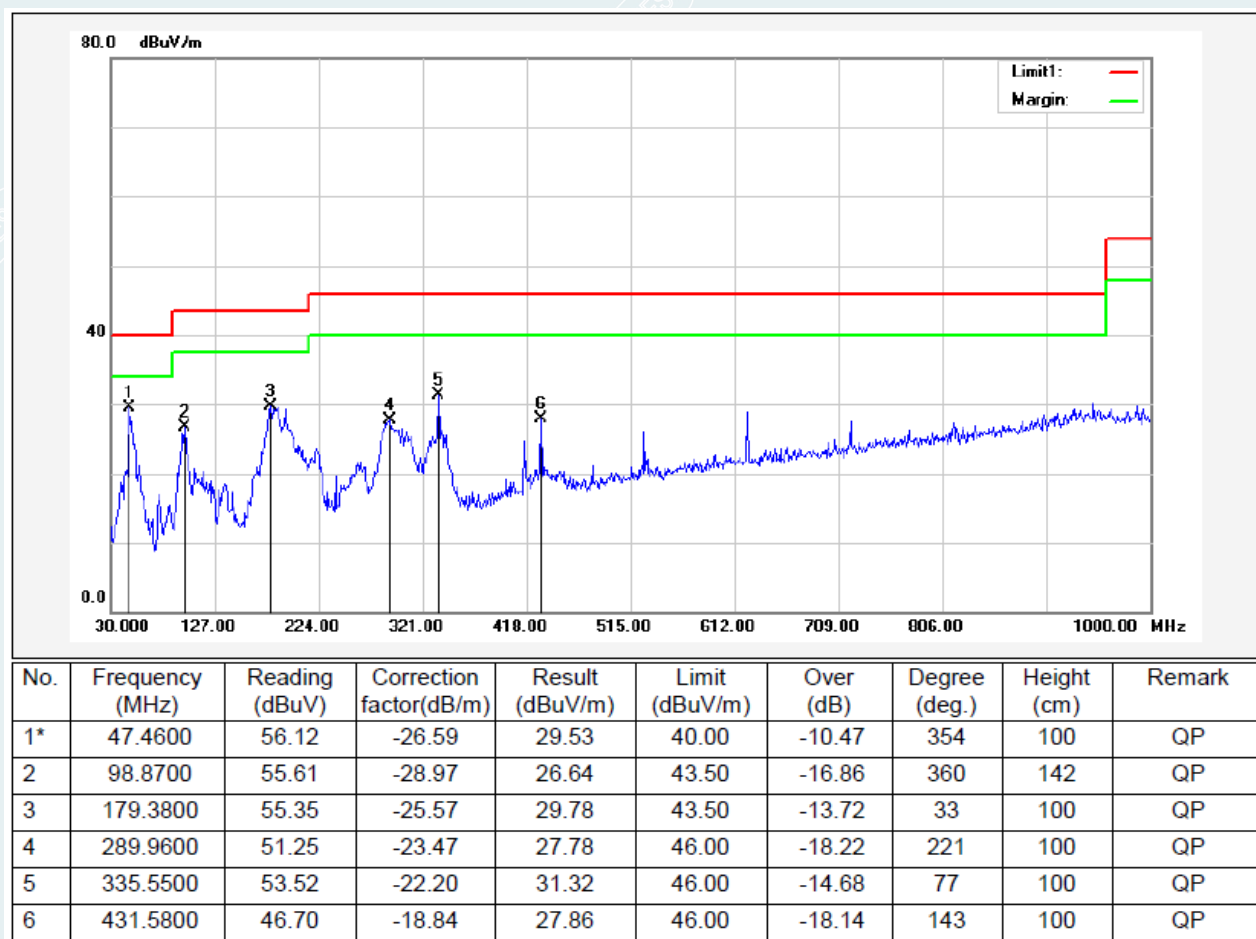
AVG = Average Reading

6.5 TEST RESULTS

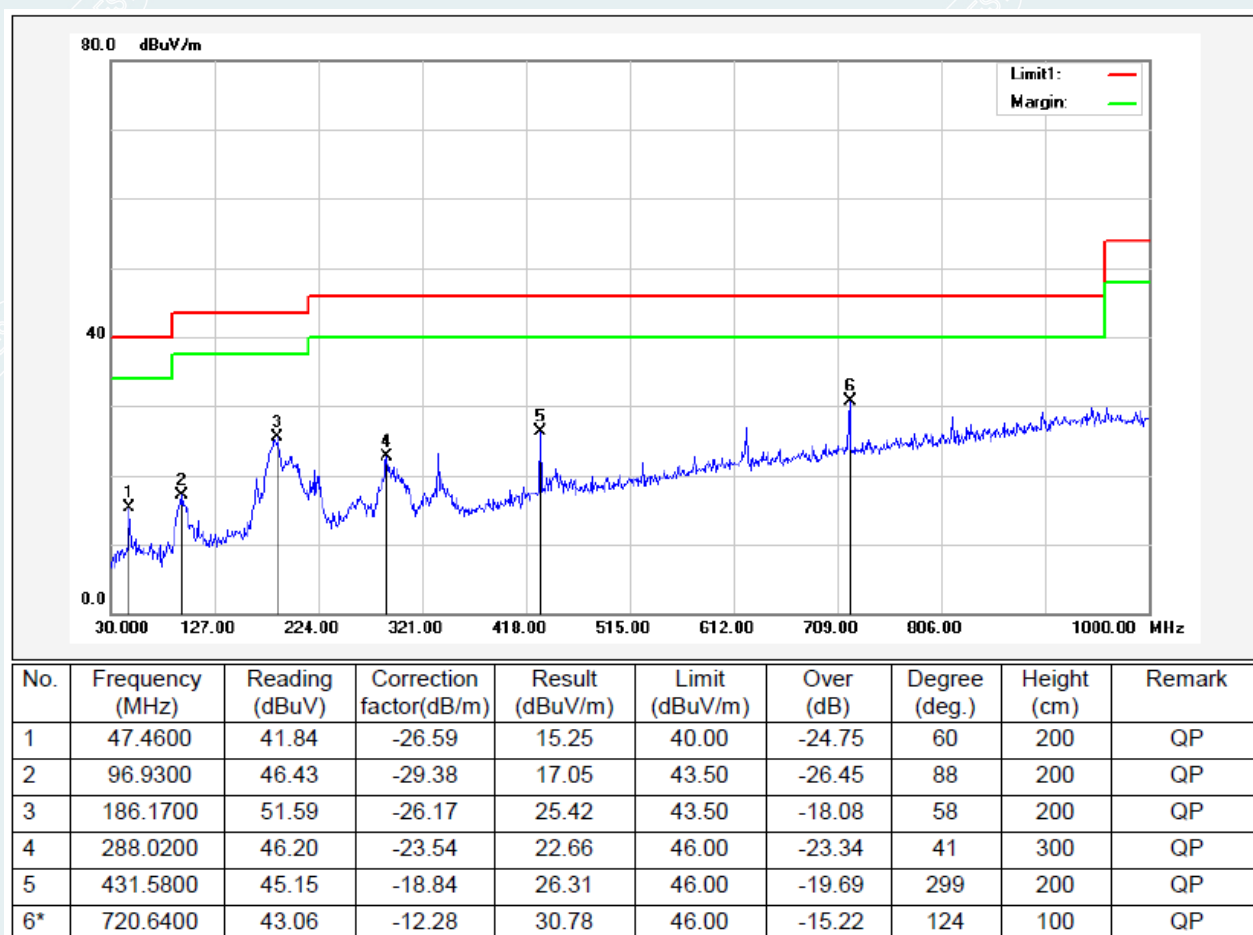
Below 1GHz

All models were pretested and only the worst modes and channels were recorded in this report. (Zigbee 2405MHz)

| | | | |
|---------------------------------|----------------|---------------------|-------------|
| EUT Name | Hub M1S Gen 2 | Model | HM1S-G02 |
| Environmental Conditions | 25.1°C/55%RH | Test Voltage | AC120V/60Hz |
| Test Mode | Zigbee 2405MHz | Polarity | Vertical |
| Tested By | Tang Shenghui | Tested Date | 2022/02/21 |



| | | | |
|---------------------------------|----------------|---------------------|-------------|
| EUT Name | Hub M1S Gen 2 | Model | HM1S-G02 |
| Environmental Conditions | 25.1°C/55%RH | Test Voltage | AC120V/60Hz |
| Test Mode | Zigbee 2405MHz | Polarity | Horizontal |
| Tested By | Tang Shenghui | Tested Date | 2022/02/21 |

**Remark:**

- 1 No emission found between lowest internal used/generated frequency to 30MHz.
- 2 Radiated emissions measured in frequency range from 9 kHz to 1GHz were made with an instrument using Quasi-peak detector mode.
- 3 Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 4 The IF bandwidth of Receiver between 30MHz to 1GHz was 120 kHz.

1GHz-18GHz:

Mode: Zigbee

Lowest Frequency (2405MHz)

Environment: 25°C/60%RH

Tested By:Lu Qiang

Date: 2022/02/16

Voltage:AC120V/60Hz

/

| Suspected Data List | | | | | | | | | |
|---------------------|----------------|---------------------|-------------------|----------------|-------------------|----------------|----------------|--------------|------------|
| NO. | Freq. [MHz] | Reading [dBμV/m] | Level [dBμV/m] | Factor [dB] | Limit [dBμV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 1088.0110 | 59.08 | 34.15 | -24.93 | 74.00 | 39.85 | 200 | 251 | Horizontal |
| 2 | 1580.5726 | 56.82 | 33.93 | -22.89 | 74.00 | 40.07 | 100 | 27 | Horizontal |
| 3 | 3202.5253 | 53.18 | 37.31 | -15.87 | 74.00 | 36.69 | 200 | 293 | Horizontal |
| 4 | 4811.4764 | 53.03 | 43.27 | -9.76 | 74.00 | 30.73 | 200 | 286 | Horizontal |
| 5 | 7215.5269 | 52.04 | 48.74 | -3.30 | 74.00 | 25.26 | 200 | 238 | Horizontal |
| 6 | 9643.9555 | 44.78 | 46.88 | 2.10 | 74.00 | 27.12 | 200 | 286 | Horizontal |

| AV Final Data List | | | | | | | | | |
|--------------------|----------------|----------------|---------------------------|----------------------|----------------------|----------------------|----------------|--------------|------------|
| NO. | Freq. [MHz] | Factor [dB] | AV Reading [dBμV/m] | AV Value [dBμV/m] | AV Limit [dBμV/m] | AV Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 7215.8155 | -3.30 | 37.06 | 33.76 | 54.00 | 20.24 | 200 | 279 | Horizontal |

| Suspected Data List | | | | | | | | | |
|---------------------|----------------|---------------------|-------------------|----------------|-------------------|----------------|----------------|--------------|----------|
| NO. | Freq. [MHz] | Reading [dBμV/m] | Level [dBμV/m] | Factor [dB] | Limit [dBμV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 1083.7605 | 58.12 | 33.18 | -24.94 | 74.00 | 40.82 | 200 | 47 | Vertical |
| 2 | 1487.5609 | 56.52 | 33.56 | -22.96 | 74.00 | 40.44 | 200 | 33 | Vertical |
| 3 | 1998.8749 | 57.10 | 35.54 | -21.56 | 74.00 | 38.46 | 100 | 53 | Vertical |
| 4 | 3624.4531 | 52.74 | 38.25 | -14.49 | 74.00 | 35.75 | 200 | 116 | Vertical |
| 5 | 4811.4764 | 52.73 | 42.97 | -9.76 | 74.00 | 31.03 | 200 | 314 | Vertical |
| 6 | 7215.5269 | 49.98 | 46.68 | -3.30 | 74.00 | 27.32 | 100 | 245 | Vertical |

Mode: Zigbee
 Middle Frequency (2440MHz)
 Environment: 25°C/60%RH
 Tested By:Lu Qiang

Date: 2022/02/16
 Voltage:AC120V/60Hz
 /

| Suspected Data List | | | | | | | | | |
|---------------------|----------------|---------------------|-------------------|----------------|-------------------|----------------|----------------|---------------|------------|
| NO. | Freq. [MHz] | Reading [dBμV/m] | Level [dBμV/m] | Factor [dB] | Limit [dBμV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 1112.0140 | 60.15 | 35.34 | -24.81 | 74.00 | 38.66 | 200 | 246 | Horizontal |
| 2 | 1544.3180 | 56.92 | 34.07 | -22.85 | 74.00 | 39.93 | 100 | 191 | Horizontal |
| 3 | 2015.6270 | 56.65 | 35.13 | -21.52 | 74.00 | 38.87 | 100 | 123 | Horizontal |
| 4 | 3628.2035 | 53.85 | 39.33 | -14.52 | 74.00 | 34.67 | 200 | 356 | Horizontal |
| 5 | 4877.1096 | 55.18 | 45.32 | -9.86 | 74.00 | 28.68 | 200 | 190 | Horizontal |
| 6 | 7313.0391 | 56.20 | 51.93 | -4.27 | 74.00 | 22.07 | 200 | 217 | Horizontal |

| AV Final Data List | | | | | | | | | |
|--------------------|----------------|----------------|---------------------------|----------------------|----------------------|----------------------|----------------|---------------|------------|
| NO. | Freq. [MHz] | Factor [dB] | AV Reading [dBμV/m] | AV Value [dBμV/m] | AV Limit [dBμV/m] | AV Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 7313.4048 | -4.28 | 45.46 | 41.18 | 54.00 | 12.82 | 200 | 359 | Horizontal |

| Suspected Data List | | | | | | | | | |
|---------------------|----------------|---------------------|-------------------|----------------|-------------------|----------------|----------------|---------------|----------|
| NO. | Freq. [MHz] | Reading [dBμV/m] | Level [dBμV/m] | Factor [dB] | Limit [dBμV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 1078.5098 | 60.82 | 35.86 | -24.96 | 74.00 | 38.14 | 200 | 48 | Vertical |
| 2 | 1584.0730 | 57.88 | 34.98 | -22.90 | 74.00 | 39.02 | 200 | 61 | Vertical |
| 3 | 4194.5243 | 52.37 | 39.25 | -13.12 | 74.00 | 34.75 | 200 | 285 | Vertical |
| 4 | 4878.9849 | 52.40 | 42.52 | -9.88 | 74.00 | 31.48 | 200 | 237 | Vertical |
| 5 | 6585.4482 | 48.36 | 42.66 | -5.70 | 74.00 | 31.34 | 100 | 359 | Vertical |
| 6 | 7313.0391 | 52.95 | 48.68 | -4.27 | 74.00 | 25.32 | 200 | 359 | Vertical |

| AV Final Data List | | | | | | | | | |
|--------------------|----------------|----------------|---------------------------|----------------------|----------------------|----------------------|----------------|---------------|----------|
| NO. | Freq. [MHz] | Factor [dB] | AV Reading [dBμV/m] | AV Value [dBμV/m] | AV Limit [dBμV/m] | AV Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 7320.2059 | -4.28 | 45.81 | 41.53 | 54.00 | 12.47 | 200 | 203 | Vertical |

Mode: Zigbee
 Highest Frequency (2475MHz)
 Environment: 25°C/60%RH
 Tested By:Lu Qiang

Date: 2022/02/16
 Voltage:AC120V/60Hz
 /

| Suspected Data List | | | | | | | | | |
|---------------------|----------------|---------------------|-------------------|----------------|-------------------|----------------|----------------|--------------|------------|
| NO. | Freq. [MHz] | Reading [dBμV/m] | Level [dBμV/m] | Factor [dB] | Limit [dBμV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 1081.5102 | 59.08 | 34.13 | -24.95 | 74.00 | 39.87 | 200 | 129 | Horizontal |
| 2 | 1815.8520 | 55.98 | 33.98 | -22.00 | 74.00 | 40.02 | 200 | 352 | Horizontal |
| 3 | 3603.8255 | 52.87 | 38.57 | -14.30 | 74.00 | 35.43 | 100 | 157 | Horizontal |
| 4 | 4346.4183 | 51.69 | 39.32 | -12.37 | 74.00 | 34.68 | 100 | 232 | Horizontal |
| 5 | 4950.2438 | 52.93 | 42.86 | -10.07 | 74.00 | 31.14 | 200 | 292 | Horizontal |
| 6 | 7719.9650 | 47.89 | 45.41 | -2.48 | 74.00 | 28.59 | 200 | 21 | Horizontal |

| Suspected Data List | | | | | | | | | |
|---------------------|----------------|---------------------|-------------------|----------------|-------------------|----------------|----------------|--------------|----------|
| NO. | Freq. [MHz] | Reading [dBμV/m] | Level [dBμV/m] | Factor [dB] | Limit [dBμV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 1085.2607 | 58.08 | 33.14 | -24.94 | 74.00 | 40.86 | 200 | 136 | Vertical |
| 2 | 1584.0730 | 57.20 | 34.30 | -22.90 | 74.00 | 39.70 | 100 | 149 | Vertical |
| 3 | 3735.0919 | 52.96 | 38.29 | -14.67 | 74.00 | 35.71 | 200 | 34 | Vertical |
| 4 | 4952.1190 | 53.68 | 43.62 | -10.06 | 74.00 | 30.38 | 200 | 217 | Vertical |
| 5 | 7641.2052 | 47.89 | 45.32 | -2.57 | 74.00 | 28.68 | 100 | 143 | Vertical |
| 6 | 10784.0980 | 45.03 | 48.76 | 3.73 | 74.00 | 25.24 | 200 | 279 | Vertical |

Remark:

- Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- The amplitude of 18GHz to 26.5GHz spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.
- Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
- Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
- Spectrum setting:
 - Peak Setting 1GHz – 26.5GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = auto.
 - AV Setting 1GHz – 26.5GHz, RBW = 1MHz, VBW = 10Hz (if the EUT duty cycle is <98% , set VBW≥1/T),Sweep time = auto.

Test result: The unit does meet the requirements.

7. 6DB BANDWIDTH

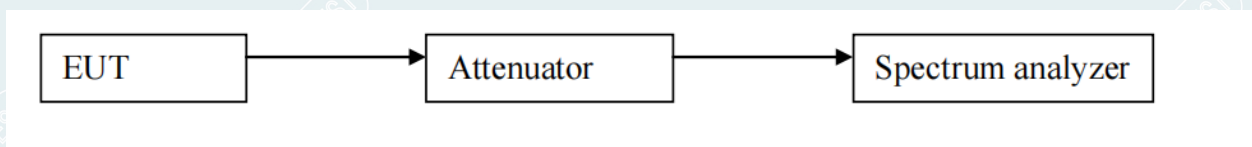
7.1 LIMITS

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

7.2 TEST PROCEDURES

- 1) Remove the antenna from the EUT, and then connect a low loss RF cable from antenna port to the spectrum analyzer.
- 2) Set resolution bandwidth (RBW) = 100kHz. Set the video bandwidth (VBW) $\geq 3 \times$ RBW. Detector = Peak. Trace mode = max hold. Sweep = auto couple. Allow the trace to stabilize, record 6dB bandwidth value.
- 3) Repeat above procedures until all frequencies measured were complete.

7.3 TEST SETUP



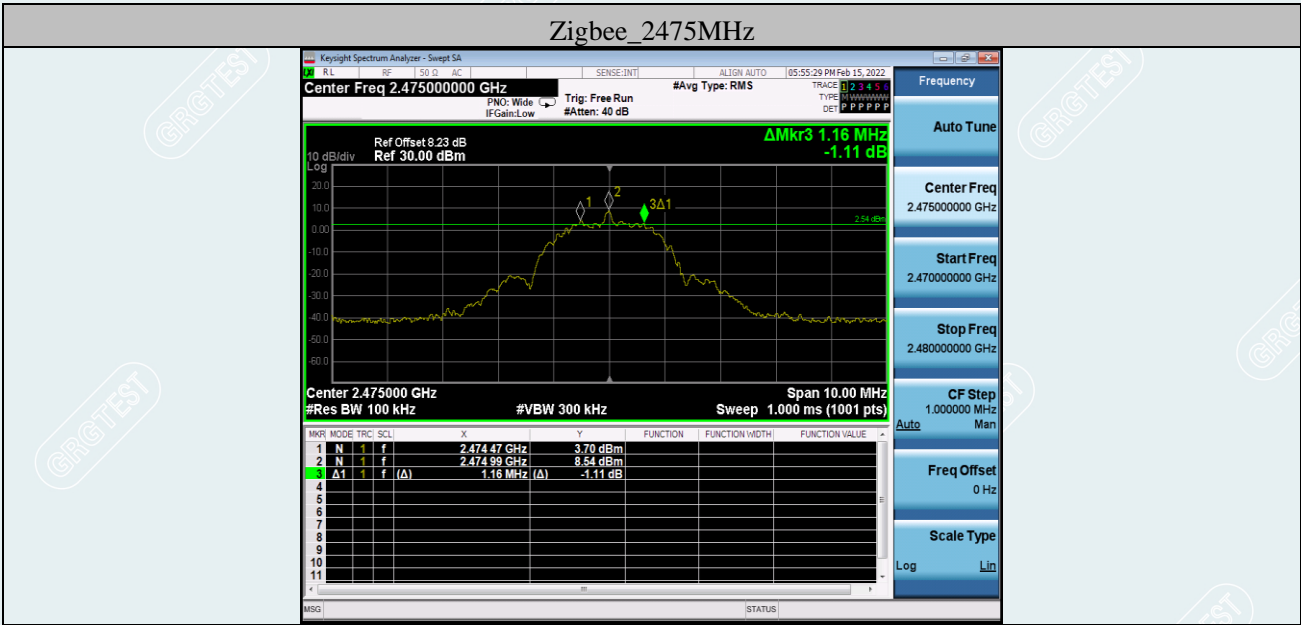
----- The following blanks -----

Environment: 22.4°C/51%RH
Tested By:Deng Weihao

Voltage: AC120V/60Hz
Date: 2022/02/15

| Test Mode | Antenna | Frequency[MHz] | DTS BW[MHz] | Limit[MHz] | Verdict |
|-----------|---------|----------------|-------------|------------|---------|
| Zigbee | Ant1 | 2405 | 1.090 | ≥0.5 | PASS |
| | Ant1 | 2440 | 1.440 | ≥0.5 | PASS |
| | Ant1 | 2475 | 1.160 | ≥0.5 | PASS |





----- The following blanks -----

8. MAXIMUM PEAK OUTPUT POWER

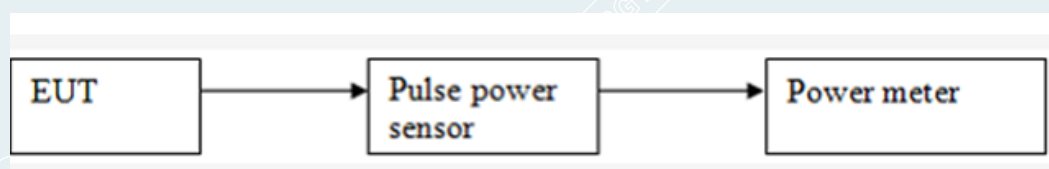
8.1 LIMITS

The maximum Peak output power measurement is 1W

8.2 TEST PROCEDURES

- 1) RF output of EUT was connected to the broadband peak RF power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 2) Set to the maximum power setting and enable the EUT transmit continuously.
- 3) Measure the conducted output power and record the results in the test report.

8.3 TEST SETUP



8.4 TEST RESULT

Environment: 25°C/60%RH

Tested By:Deng Weihao

Voltage:AC120V/60Hz

Date: 2022/02/16

| Channel No. | Frequency (MHz) | Measured Channel Power (dBm) | Peak / AVG | Limit | Result |
|-------------|-----------------|------------------------------|------------|-------|--------|
| 11 | 2405 | 8.70 | Peak | 30dBm | Pass |
| 18 | 2440 | 8.75 | | | Pass |
| 25 | 2475 | 8.86 | | | Pass |

9. POWER SPECTRAL DENSITY

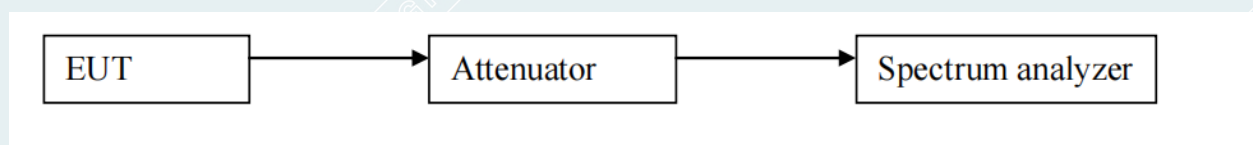
9.1 LIMITS

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

9.2 TEST PROCEDURES

- 1) Remove the antenna from the EUT, and then connect a low loss RF cable from antenna port to the spectrum analyzer.
- 2) Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
- 3) The following procedure shall be used if maximum peak conducted output power was used to determine compliance, and it is optional if the maximum conducted (average) output power was used to determine compliance:
 - a) Set analyzer center frequency to DTS channel center frequency.
 - b) Set the span to 1.5 times the DTS bandwidth.
 - c) Set the RBW to $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
 - d) Set the VBW $\geq [3 \times \text{RBW}]$.
 - e) Detector = Peak
 - f) Sweep time = auto couple.
 - g) Trace mode = max hold.
 - h) Allow trace to fully stabilize.
 - i) Use the peak marker function to determine the maximum amplitude level within the RBW.
 - j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.
- 4) Repeat above procedures until all frequencies measured were complete.

9.3 TEST SETUP



9.4 TEST RESULTS

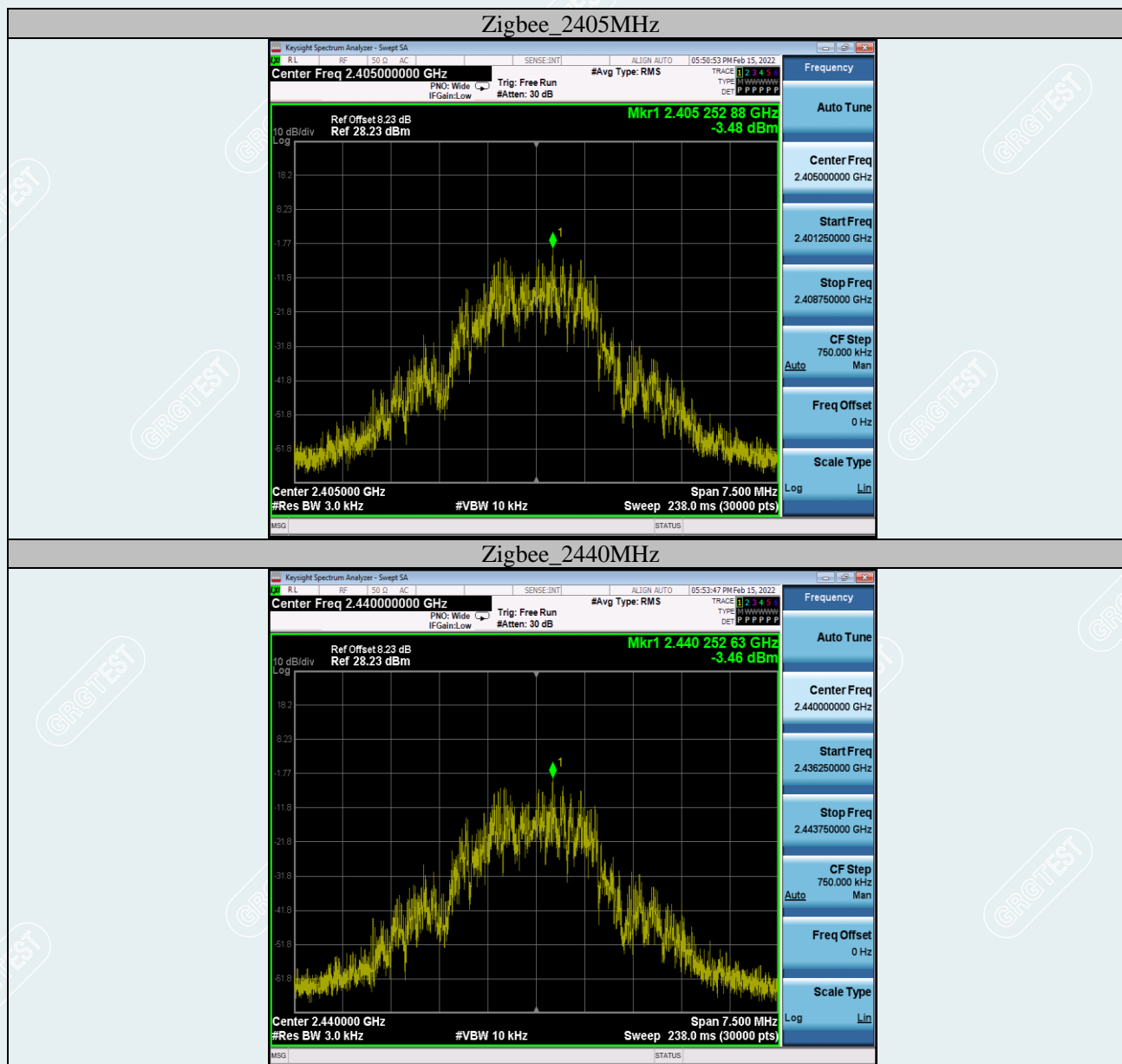
Environment: 25°C/60%RH

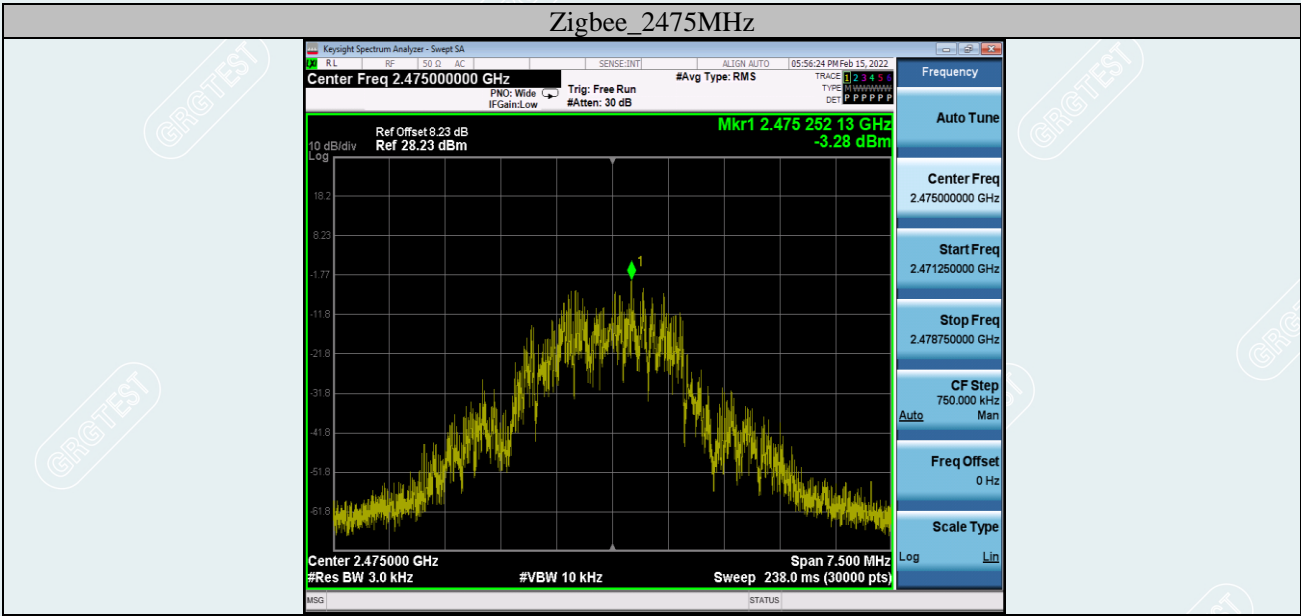
Tested By:Deng Weihao

Voltage:AC120V/60Hz

Date: 2022/02/15

| Channel No. | Frequency (MHz) | PSD (dBm/3kHz) | Limit (dBm/3kHz) | Result |
|-------------|-----------------|----------------|------------------|--------|
| 11 | 2405 | -3.48 | 8.00 | Pass |
| 18 | 2440 | -3.46 | 8.00 | Pass |
| 25 | 2475 | -3.28 | 8.00 | Pass |





----- The following blanks -----

10. CONDUCTED BAND EDGES AND SPURIOUS EMISSIONS

10.1 LIMITS

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

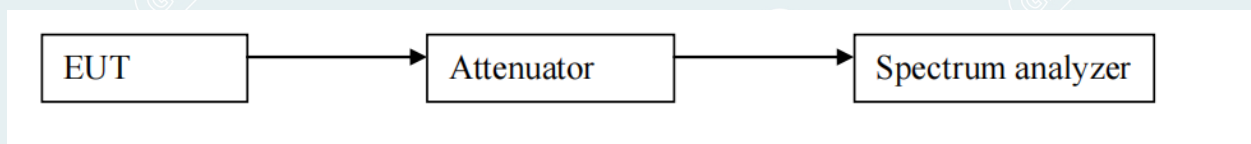
10.2 TEST PROCEDURES

Test procedures follow KDB 558074 D01 DTS Measurement Guidance.

Remove the antenna from the EUT and then connect a low attenuation cable from the antenna port to the spectrum.

- 1) Remove the antenna from the EUT and then connect a low attenuation cable from the antenna port to the spectrum.
- 2) Set the spectrum analyzer: RBW = 100kHz; VBW = 300kHz, Frequency range = 30MHz to 26.5GHz; Sweep = auto; Detector Function = Peak; Trace = Max hold.
- 3) Measure and record the results in the test report.
- 4) The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

10.3 TEST SETUP



10.4 TEST RESULTS

Environment: 25°C/60%RH

Tested By:Deng Weihao

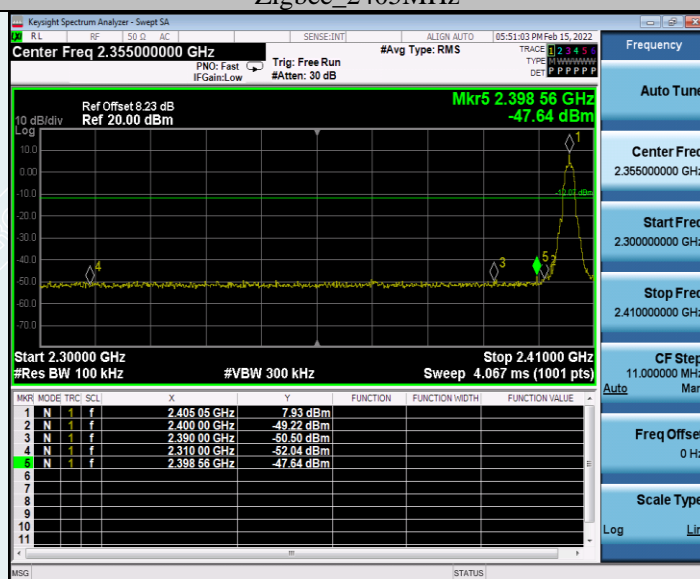
Voltage:AC120V/60Hz

Date: 2022/02/15

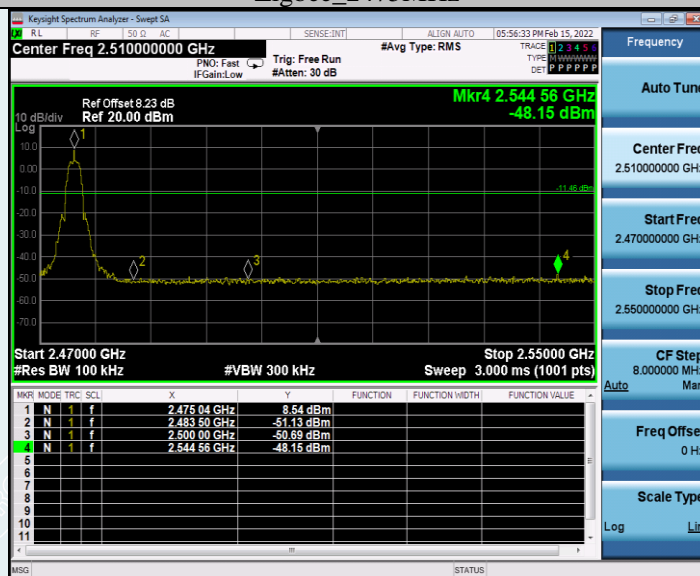
Band edge

| Test Mode | Antenna | ChName | Frequency[MHz] | RefLevel[dBm] | Result[dBm] | Limit[dBm] | Verdict |
|-----------|---------|--------|----------------|---------------|-------------|------------|---------|
| Zigbee | Ant1 | Low | 2405 | 7.93 | -47.64 | ≤-12.07 | PASS |
| | Ant1 | High | 2475 | 8.54 | -48.15 | ≤-11.46 | PASS |

Zigbee_2405MHz



Zigbee_2475MHz



Conducted Spurious Emission:

Test Result

Environment: 25°C/60%RH

Tested By:Deng Weihao

Voltage:AC120V/60Hz

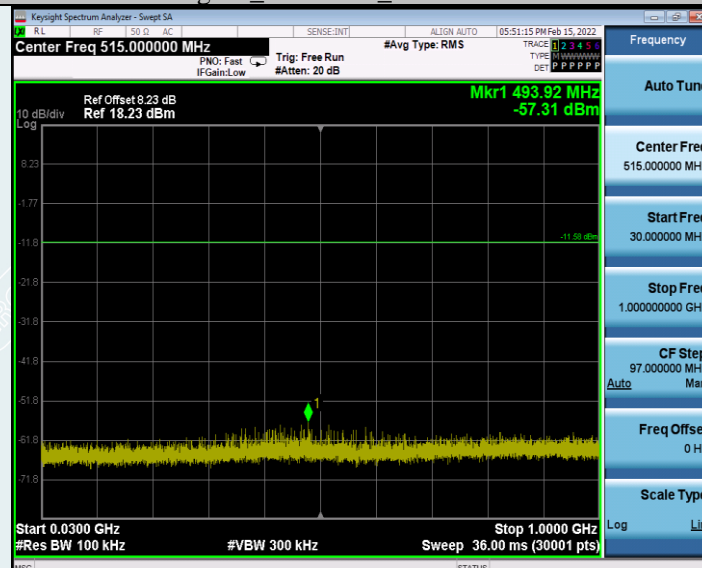
Date: 2022/02/15

| Test Mode | Antenna | Frequency[MHz] | FreqRange [MHz] | RefLevel [dBm] | Result [dBm] | Limit [dBm] | Verdict |
|-----------|---------|----------------|-----------------|----------------|--------------|---------------|---------|
| Zigbee | Ant1 | 2405 | Reference | 8.42 | 8.42 | --- | PASS |
| | | | 30~1000 | 8.42 | -57.31 | ≤ -11.58 | PASS |
| | | | 1000~26500 | 8.42 | -42.66 | ≤ -11.58 | PASS |
| | Ant1 | 2440 | Reference | 7.66 | 7.66 | --- | PASS |
| | | | 30~1000 | 7.66 | -57.64 | ≤ -12.34 | PASS |
| | | | 1000~26500 | 7.66 | -42.25 | ≤ -12.34 | PASS |
| | Ant1 | 2475 | Reference | 7.14 | 7.14 | --- | PASS |
| | | | 30~1000 | 7.14 | -57.38 | ≤ -12.87 | PASS |
| | | | 1000~26500 | 7.14 | -41.17 | ≤ -12.87 | PASS |

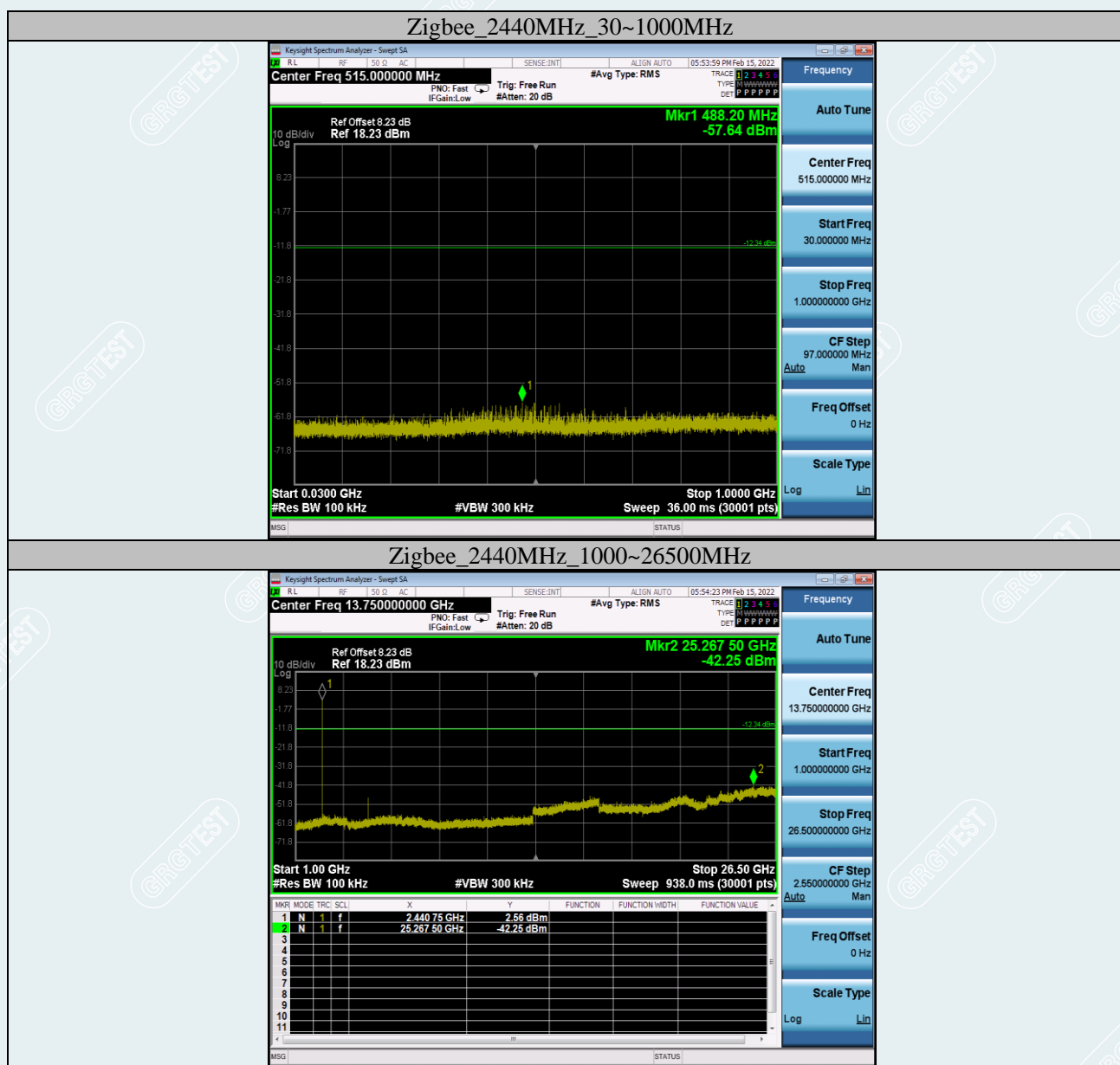
Zigbee_2405MHz_0~Reference



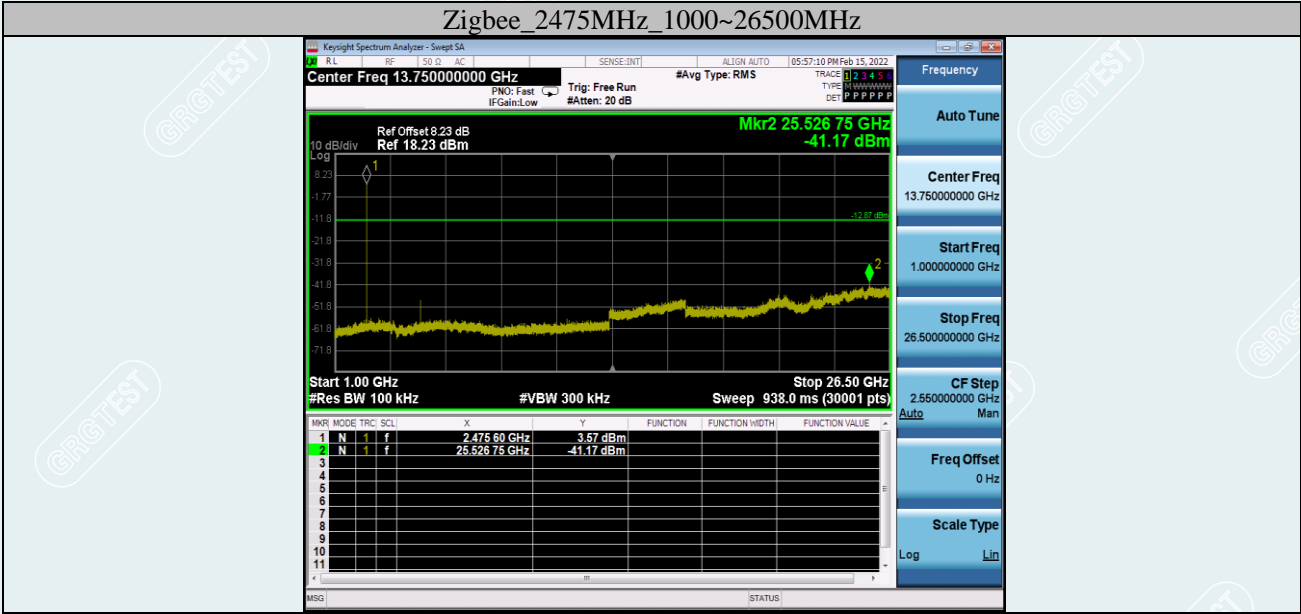
Zigbee_2405MHz_30~1000MHz











11. RESTRICTED BANDS OF OPERATION

11.1 LIMITS

Section 15.247(d) In addition, Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

| MHz | MHz | MHz | GHz |
|----------------------------|-----------------------|-----------------|---------------|
| 0.090 - 0.110 | 16.42 - 16.423 | 399.9 - 410 | 4.5 - 5.15 |
| ¹ 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 | 2655 - 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 | |
| 13.36 - 13.41 | | | |

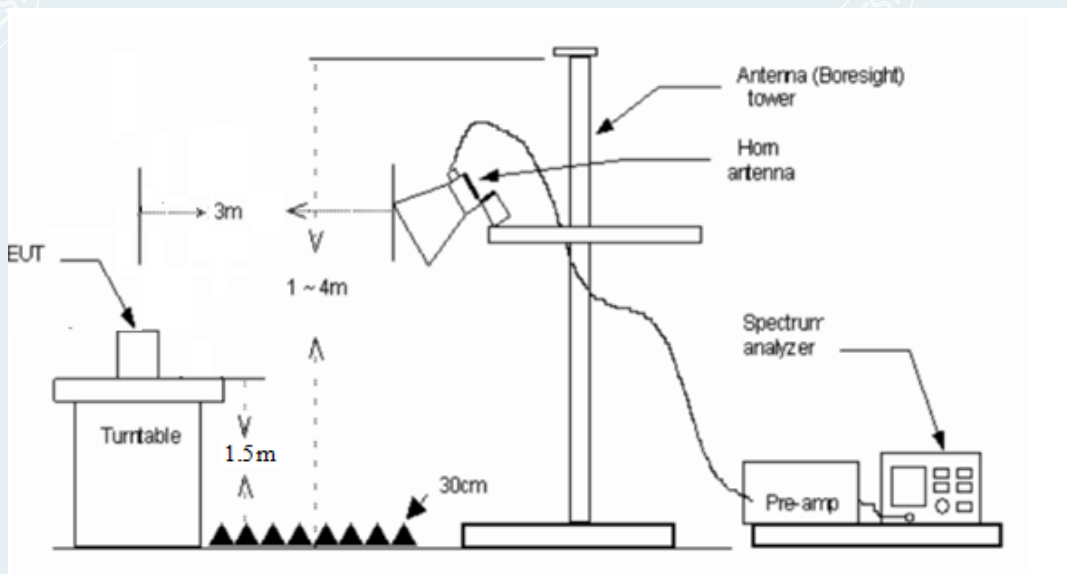
| Frequency (MHz) | Quasi-peak(μ V/m) | Measurement distance(m) | Quasi-peak(dB μ V/m)@distance 3m |
|-----------------|------------------------|-------------------------|--------------------------------------|
| 0.009-0.490 | 2400/F(kHz) | 300 | 53.8~88.5 |
| 0.490-1.705 | 24000/F(kHz) | 30 | 43~53.8 |
| 1.705-30.0 | 30 | 30 | 49.5 |
| 30 ~ 88 | 100 | 3 | 40 |
| 88~216 | 150 | 3 | 43.5 |
| 216 ~ 960 | 200 | 3 | 46 |
| Above 960 | 500 | 3 | 54 |

11.2 TEST PROCEDURES

Test procedures follow KDB 558074 D01 DTS Measurement Guidance.

- 1) The EUT is placed on a turntable, which is 1.5m above the ground plane.
- 2) The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- 3) EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
- 4) Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
 - a) PEAK: RBW=1MHz / VBW=1MHz / Sweep=AUTO
 - b) AVERAGE: RBW=1MHz / VBW=1/T / Sweep=AUTO
 - c) The frequency above 1GHz, for Peak detector: Set RBW=1MHz, RBW=3MHz.
 - d) The frequency above 1GHz, for Avg detector: Set RBW=1MHz, if the EUT is configured to transmit with duty cycle $\geq 98\%$, set $VBW \leq RBW/100$ (i.e., 10kHz) but not less than 10 Hz, if the EUT duty cycle is $< 98\%$, set $VBW \geq 1/T$. Where T is defined in section 2.8.
- 5) Repeat the procedures until all the PEAK and AVERAGE versus polarization are measured.

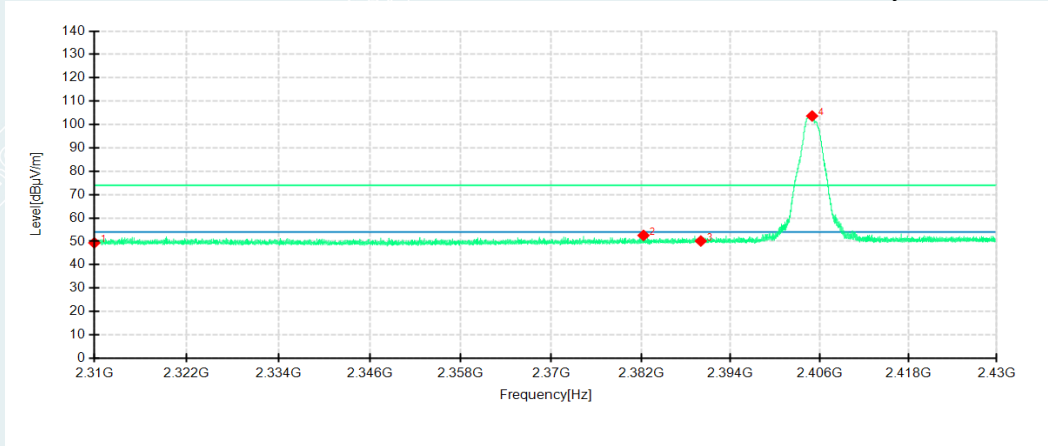
11.3 TEST SETUP



11.4 TEST RESULTS

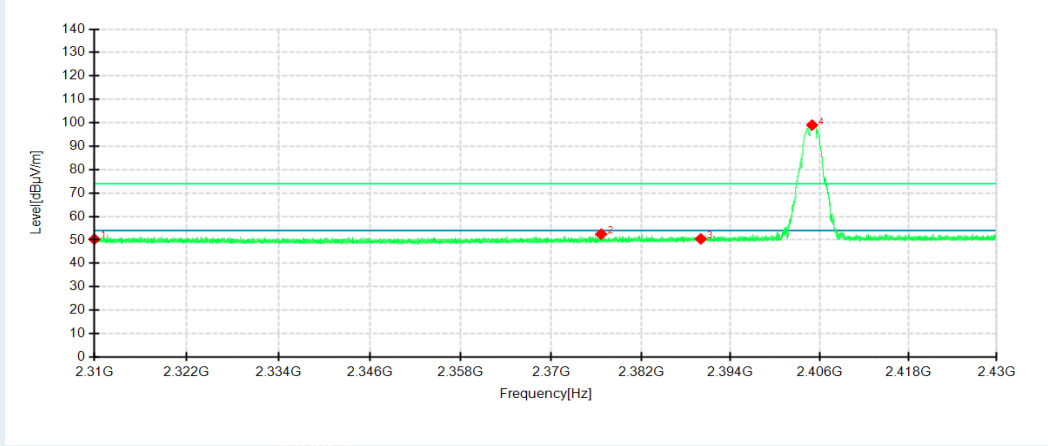
Zigbee
Lowest Channel
Frequency 2405MHz
Environment: 25℃/60%RH
Tested By: Lu Qiang
Detector mode: Peak

Voltage: AC120V/60Hz
Date: 2022/02/16
Polarity: Horizontal



Detector mode: Peak

Polarity: Vertical



| No. | Frequency MHz | Reading dBμV/m | Level dBμV/m | Factor dB | Limit dBμV/m | Margin dB | Height cm | Angle ° | Pole | Comment |
|-----|------------------|-------------------|-----------------|--------------|-----------------|--------------|--------------|------------|------------|----------|
| 1 | 2310.0000 | 45.88 | 49.36 | 3.48 | 74.00 | 24.64 | 200 | 176 | Horizontal | / |
| 2 | 2382.3240 | 48.87 | 52.55 | 3.68 | 74.00 | 21.45 | 100 | 218 | Horizontal | / |
| 3 | 2390.0000 | 46.34 | 50.15 | 3.81 | 74.00 | 23.85 | 100 | 0 | Horizontal | / |
| 4 | 2404.9800 | 99.67 | 103.67 | 4.00 | 74.00 | -29.67 | 200 | 142 | Horizontal | No limit |
| 1 | 2310.0000 | 46.82 | 50.30 | 3.48 | 74.00 | 23.70 | 100 | 238 | Vertical | / |
| 2 | 2376.6720 | 48.90 | 52.48 | 3.58 | 74.00 | 21.52 | 100 | 176 | Vertical | / |
| 3 | 2390.0000 | 46.62 | 50.43 | 3.81 | 74.00 | 23.57 | 200 | 218 | Vertical | / |
| 4 | 2404.9800 | 95.02 | 99.02 | 4.00 | 74.00 | -25.02 | 200 | 54 | Vertical | No limit |

Zigbee**Lowest Channel**

Frequency 2405MHz

Environment: 25°C/60%RH

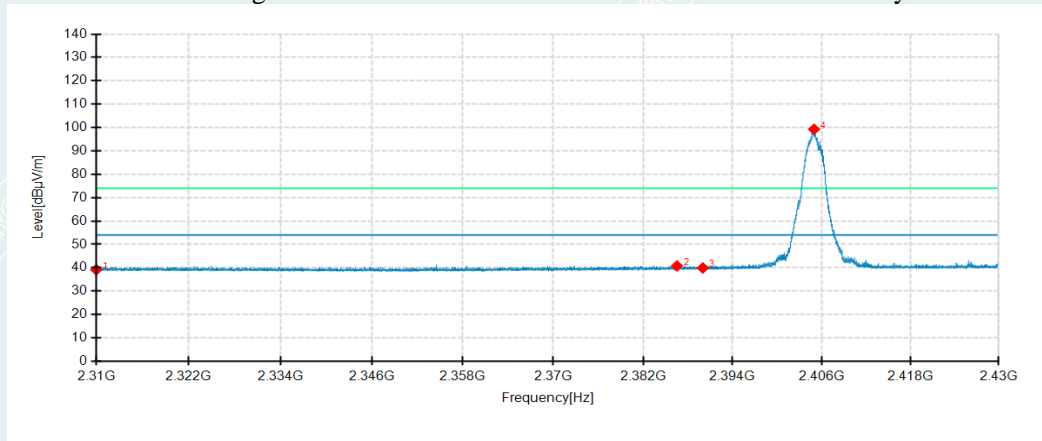
Tested By: Lu Qiang

Detector mode: Average

Voltage: AC120V/60Hz

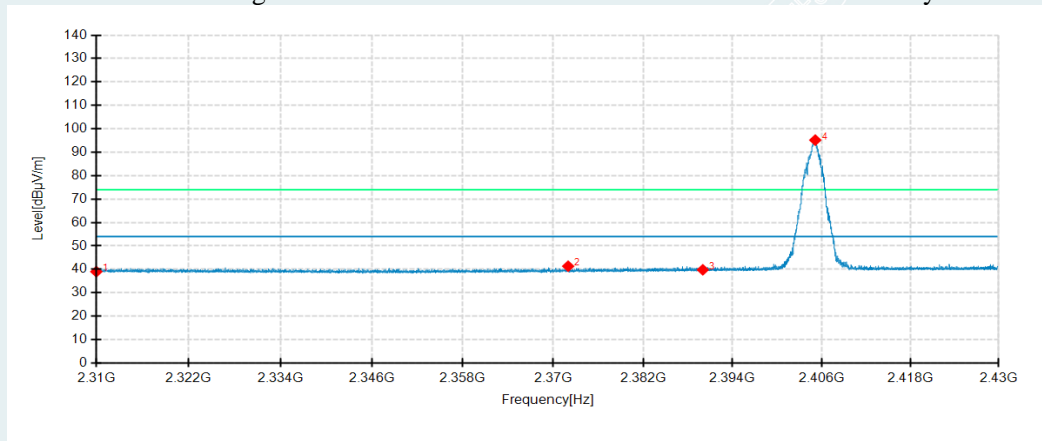
Date: 2022/02/16

Polarity: Horizontal



Detector mode: Average

Polarity: Vertical



| No. | Frequency MHz | Reading dBμV/m | Level dBμV/m | Factor dB | Limit dBμV/m | Margin dB | Height cm | Angle ° | Pole | Comment |
|-----|---------------|----------------|--------------|-----------|--------------|-----------|-----------|---------|------------|----------|
| 1 | 2310.0000 | 35.66 | 39.14 | 3.48 | 54.00 | 14.86 | 100 | 218 | Horizontal | / |
| 2 | 2386.5360 | 37.02 | 40.77 | 3.75 | 54.00 | 13.23 | 100 | 33 | Horizontal | / |
| 3 | 2390.0000 | 36.09 | 39.90 | 3.81 | 54.00 | 14.10 | 100 | 177 | Horizontal | |
| 4 | 2404.9680 | 95.25 | 99.25 | 4.00 | 54.00 | -45.25 | 200 | 142 | Horizontal | No limit |
| 1 | 2310.0000 | 35.52 | 39.00 | 3.48 | 54.00 | 15.00 | 100 | 142 | Vertical | / |
| 2 | 2372.0040 | 37.82 | 41.32 | 3.50 | 54.00 | 12.68 | 200 | 218 | Vertical | / |
| 3 | 2390.0000 | 35.99 | 39.80 | 3.81 | 54.00 | 14.20 | 200 | 3 | Vertical | / |
| 4 | 2405.1360 | 91.16 | 95.17 | 4.01 | 54.00 | -41.17 | 200 | 53 | Vertical | No limit |

Zigbee**Highest Channel**

Frequency 2475MHz

Environment: 25°C/60%RH

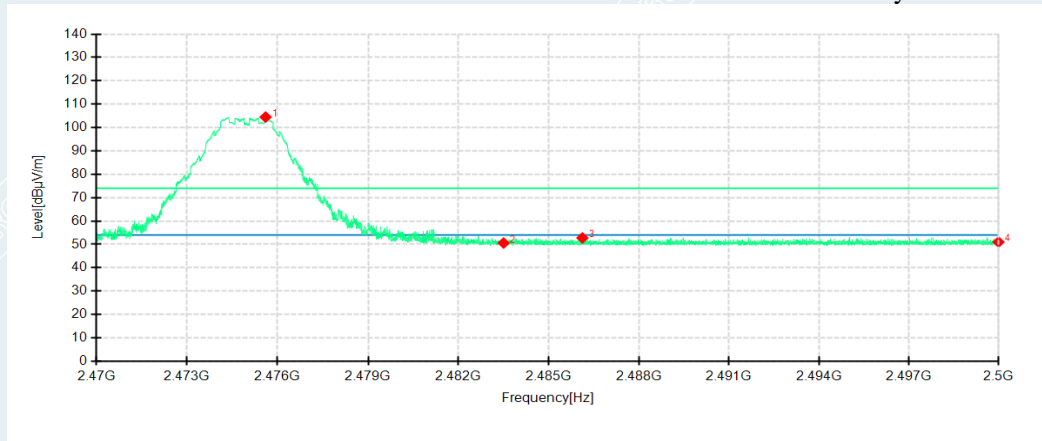
Tested By: Lu Qiang

Detector mode: Peak

Voltage: AC120V/60Hz

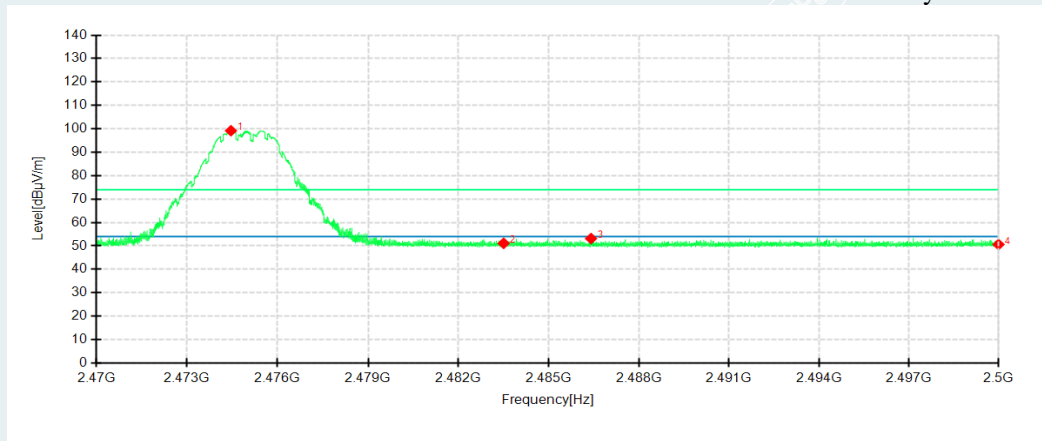
Date: 2022/02/16

Polarity: Horizontal



Detector mode: Peak

Polarity: Vertical



| No. | Frequency MHz | Reading dBμV/m | Level dBμV/m | Factor dB | Limit dBμV/m | Margin dB | Height cm | Angle ° | Pole | Comment |
|-----|---------------|----------------|--------------|-----------|--------------|-----------|-----------|---------|------------|----------|
| 1 | 2475.6010 | 100.15 | 104.46 | 4.31 | 74.00 | -30.46 | 200 | 142 | Horizontal | No limit |
| 2 | 2483.5000 | 46.23 | 50.56 | 4.33 | 74.00 | 23.44 | 200 | 288 | Horizontal | / |
| 3 | 2486.1190 | 48.42 | 52.76 | 4.34 | 74.00 | 21.24 | 100 | 218 | Horizontal | / |
| 4 | 2500.0000 | 46.60 | 50.98 | 4.38 | 74.00 | 23.02 | 200 | 177 | Horizontal | / |
| 1 | 2474.4550 | 94.89 | 99.19 | 4.30 | 74.00 | -25.19 | 200 | 54 | Vertical | No limit |
| 2 | 2483.5000 | 46.76 | 51.09 | 4.33 | 74.00 | 22.91 | 200 | 218 | Vertical | / |
| 3 | 2486.4070 | 48.81 | 53.15 | 4.34 | 74.00 | 20.85 | 200 | 218 | Vertical | / |
| 4 | 2500.0000 | 46.21 | 50.59 | 4.38 | 74.00 | 23.41 | 200 | 218 | Vertical | / |

Zigbee**Highest Channel**

Frequency 2475MHz

Environment: 25°C/60%RH

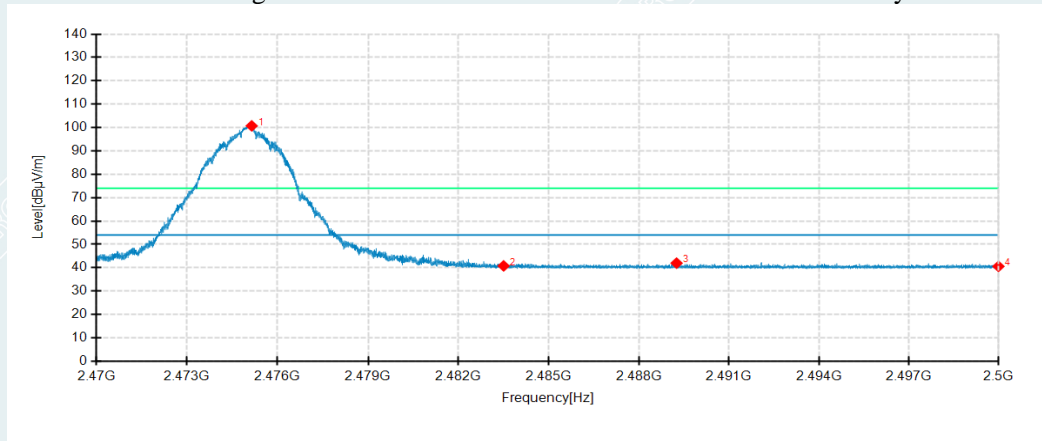
Tested By: Lu Qiang

Detector mode: Average

Voltage: AC120V/60Hz

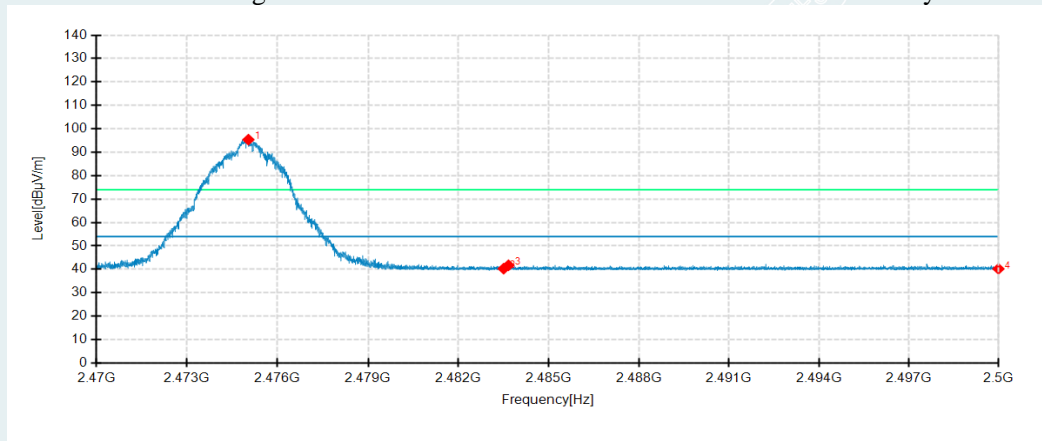
Date: 2022/02/16

Polarity: Horizontal



Detector mode: Average

Polarity: Vertical



| No. | Frequency MHz | Reading dBμV/m | Level dBμV/m | Factor dB | Limit dBμV/m | Margin dB | Height cm | Angle ° | Pole | Comment |
|-----|---------------|----------------|--------------|-----------|--------------|-----------|-----------|---------|------------|----------|
| 1 | 2475.1420 | 96.39 | 100.70 | 4.31 | 54.00 | -46.70 | 200 | 142 | Horizontal | No limit |
| 2 | 2483.5000 | 36.45 | 40.78 | 4.33 | 54.00 | 13.22 | 200 | 142 | Horizontal | / |
| 3 | 2489.2540 | 37.63 | 41.98 | 4.35 | 54.00 | 12.02 | 100 | 218 | Horizontal | / |
| 4 | 2500.0000 | 36.20 | 40.58 | 4.38 | 54.00 | 13.42 | 200 | 357 | Horizontal | / |
| 1 | 2475.0340 | 91.06 | 95.37 | 4.31 | 54.00 | -41.37 | 200 | 60 | Vertical | No limit |
| 2 | 2483.5000 | 35.95 | 40.28 | 4.33 | 54.00 | 13.72 | 200 | 53 | Vertical | / |
| 3 | 2483.6620 | 37.40 | 41.73 | 4.33 | 54.00 | 12.27 | 200 | 170 | Vertical | / |
| 4 | 2500.0000 | 35.81 | 40.19 | 4.38 | 54.00 | 13.81 | 200 | 39 | Vertical | / |

APPENDIX A. PHOTOGRAPH OF THE TEST CONNECTION DIAGRAM

Please refer to the attached document E20220126665001-1-Test setup photo.

APPENDIX B. PHOTOGRAPH OF THE EUT

Please refer to the attached document E20220126665001-1-EUT Photo.

----- End of Report -----