

TEST REPORT

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|-----------|---|
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| Address: | Workshop No.1, 1/F, Kam Hon industrial Building, No.8 Wang Kwun Road, Kowloon Bay, Kowloon, Hong Kong |

| | |
|-------------------------------------|--|
| Manufacturer or Supplier | ZONDA HOBBY TECHNOLOGIES ELECTRONIC LIMITED |
| Address | Workshop No.1, 1/F, Kam Hon industrial Building, No.8 Wang Kwun Road, Kowloon Bay, Kowloon, Hong Kong. |
| Product | 2.4GHz wireless controler |
| Brand Name | GWY |
| Model | GWY004539 |
| Additional Model & Model Difference | N/A |
| Date of tests | May 07, 2013 ~ Jun. 10, 2013 |

the tests have been carried out according to the requirements of the following standards:

☒ **FCC Part 15, Subpart C (Section 15.247)**

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

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Approved by Sam Tung
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Date: Jun. 10, 2013

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Test Report No.: RF130507N003

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Test Report No.: RF130507N003

RELEASE CONTROL RECORD

| ISSUE NO. | REASON FOR CHANGE | DATE ISSUED |
|--------------|-------------------|---------------|
| RF130507N003 | Original release | Jun. 10, 2013 |

1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

| APPLIED STANDARD: FCC Part 15, Subpart C | | | |
|--|---|--------|---|
| STANDARD SECTION | TEST TYPE AND LIMIT | RESULT | REMARK |
| 15.207 | AC Power Conducted Emission | PASS | Meet the requirement of limit. Minimum passing margin is -12.48dB at 0.18147MHz |
| 15.247(a)(1) (iii) | Number of Hopping Frequency Used | PASS | Meet the requirement of limit. |
| 15.247(a)(1) (iii) | Dwell Time on Each Channel | PASS | Meet the requirement of limit. |
| 15.247(a)(1) | 1. Hopping Channel Separation 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System | PASS | Meet the requirement of limit. |
| 15.247(b) | Maximum Peak Output Power | PASS | Meet the requirement of limit. |
| 15.247(d) | Transmitter Radiated Emissions | PASS | Meet the requirement of limit. Minimum passing margin is -1.2dB at 4952MHz |
| 15.247(d) | Band Edge Measurement | PASS | Meet the requirement of limit. |
| 15.203 | Antenna Requirement | PASS | No antenna connector is used. |

NOTE: If The Frequency Hopping System operating in 2400-2483.5MHz band and the output power less than 125mW. The hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of hopping channel whichever is greater.

2 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 |
|---------------------|-----------------|-------------|
| Conducted emissions | 9kHz~30MHz | 2.94dB |
| Radiated emissions | 30MHz ~ 1000MHz | 3.6419dB |
| | 1GHz ~ 18GHz | 2.2dB |
| | 18GHz ~ 40GHz | 1.94dB |

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

| | |
|------------------------------|--|
| PRODUCT | 2.4GHz wireless controler |
| MODEL NO. | GWY004539 |
| FCC ID | 2AAB6-HK0001 |
| POWER SUPPLY | DC 3.7V By Battery (wireless controler) |
| MODULATION TECHNOLOGY | FHSS |
| MODULATION TYPE | GFSK |
| OPERATING FREQUENCY | 2406MHz ~ 2476MHz |
| NUMBER OF CHANNEL | 71 |
| MAX. OUTPUT POWER | 18.98dBm |
| ANTENNA TYPE | Integral external omni antenna; 2 dBi gain |
| I/O PORTS | Refer to user's manual |
| DATA CABLE | N/A |

NOTE:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
2. For the test results, the EUT had been tested within transmitter controler conditions. And only the worst case was shown in test report.
3. The data connection port on the device is for charging purposes when connected to a computer and can not carry data.

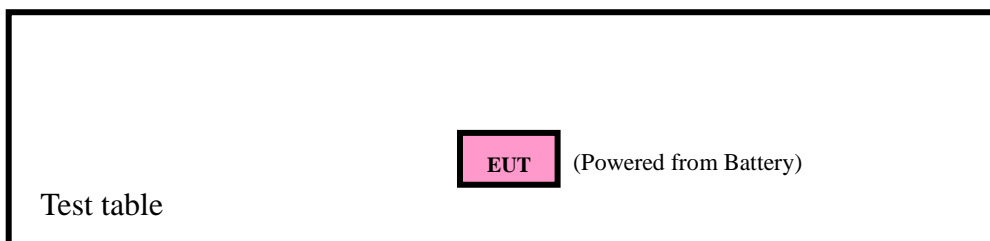
3.2 DESCRIPTION OF TEST MODES

71 channels are provided for GFSK

| Channel | Freq. (MHz) | Channel | Freq. (MHz) | Channel | Freq. (MHz) | Channel | Freq. (MHz) |
|---------|----------------|-----------|----------------|---------|----------------|-----------|----------------|
| 1 | 2406 | 19 | 2424 | 37 | 2442 | 55 | 2460 |
| 2 | 2407 | 20 | 2425 | 38 | 2443 | 56 | 2461 |
| 3 | 2408 | 21 | 2426 | 39 | 2444 | 57 | 2462 |
| 4 | 2409 | 22 | 2427 | 40 | 2445 | 58 | 2463 |
| 5 | 2410 | 23 | 2428 | 41 | 2446 | 59 | 2464 |
| 6 | 2411 | 24 | 2429 | 42 | 2447 | 60 | 2465 |
| 7 | 2412 | 25 | 2430 | 43 | 2448 | 61 | 2466 |
| 8 | 2413 | 26 | 2431 | 44 | 2449 | 62 | 2467 |
| 9 | 2414 | 27 | 2432 | 45 | 2450 | 63 | 2468 |
| 10 | 2415 | 28 | 2433 | 46 | 2451 | 64 | 2469 |
| 11 | 2416 | 29 | 2434 | 47 | 2452 | 65 | 2470 |
| 12 | 2417 | 30 | 2435 | 48 | 2453 | 66 | 2471 |
| 13 | 2418 | 31 | 2436 | 49 | 2454 | 67 | 2472 |
| 14 | 2419 | 32 | 2437 | 50 | 2455 | 68 | 2473 |
| 15 | 2420 | 33 | 2438 | 51 | 2456 | 69 | 2474 |
| 16 | 2421 | 34 | 2439 | 52 | 2457 | 70 | 2475 |
| 17 | 2422 | 35 | 2440 | 53 | 2458 | 71 | 2476 |
| 18 | 2423 | 36 | 2441 | 54 | 2459 | | |

3.2.1. CONFIGURATION OF SYSTEM UNDER TEST

TEST MODE



3.2.2. TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports .The worst case was found when positioned on X axis for radiated emission. Following modes were tested as listed below.

| EUT CONFIGURE MODE | APPLICABLE TO | | | | DESCRIPTION |
|--------------------------|---------------|-------|-----|------|----------------------------------|
| | RE \geq 1G | RE<1G | PLC | APCM | |
| A | √ | √ | - | √ | Tx controler + Battery mode |
| B | - | - | √ | - | Tx controler + USB charging mode |

Where **RE \geq 1G**: Radiated Emission above 1GHz
PLC: Power Line Conducted Emission

RE<1G: Radiated Emission below 1GHz
APCM: Antenna Port Conducted Measurement

POWER LINE CONDUCTED EMISSION TEST:

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, antenna ports (if EUT with antenna diversity architecture), and packet types.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

| EUT CONFIGURE MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE |
|--------------------------|----------------------|-------------------|--------------------------|-----------------|
| B | 1 to 71 | 71 | FHSS | GFSK |

RADIATED EMISSION TEST (BELOW 1 GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

| EUT CONFIGURE MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE |
|--------------------------|----------------------|-------------------|--------------------------|-----------------|
| A | 1 to 71 | 71 | FHSS | GFSK |

RADIATED EMISSION TEST (ABOVE 1 GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

| EUT CONFIGURE MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE |
|--------------------------|----------------------|-------------------|--------------------------|-----------------|
| A | 1 to 71 | 1, 36, 71 | FHSS | GFSK |

ANTENNA PORT CONDUCTED MEASUREMENT:

- ☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, antenna ports (if EUT with antenna diversity architecture), and packet types.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

| EUT CONFIGURE MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE |
|--------------------------|----------------------|-------------------|--------------------------|-----------------|
| A | 1 to 71 | 1, 36, 71 | FHSS | GFSK |

TEST CONDITION:

| APPLICABLE TO | ENVIRONMENTAL CONDITIONS | INPUT POWER (SYSTEM) | TESTED BY |
|---------------|--------------------------|-------------------------|--------------|
| RE≥1G | 23deg. C, 56%RH | 3.7Vdc | Yuqiang Yin |
| RE<1G | 23deg. C, 56%RH | 3.7Vdc | Yuqiang Yin |
| PLC | 23deg. C, 40%RH | 3.7Vdc | Bin Wei |
| APCM | 25deg. C, 60%RH | 3.7Vdc | Venless Long |

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C. (15.247)
ANSI C63.10-2009

All test items have been performed and recorded as per the above standards.

3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| NO. | PRODUCT | BRAND | MODEL NO. | SERIAL NO. | FCC ID |
|-----|----------|-------|-----------|-------------|--------|
| 1 | Notebook | Dell | 5P2PM2X | 12400120329 | N/A |

| NO. | SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS |
|-----|---|
| 1. | N/A |

NOTE: All power cords of the above support units are non shielded (1.8m).

4 TEST TYPES AND RESULTS

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

| FREQUENCY OF EMISSION (MHz) | CONDUCTED LIMIT (dB μ V) | |
|-----------------------------|------------------------------|----------|
| | Quasi-peak | Average |
| 0.15 ~ 0.5 | 66 to 56 | 56 to 46 |
| 0.5 ~ 5 | 56 | 46 |
| 5 ~ 30 | 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 0.15 to 0.50MHz.
3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.1.2 TEST INSTRUMENTS

| Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Next Cal. |
|--------------------------|---------------|------------------|------------|-----------|-----------|
| EMI Test Receiver | Rohde&Schwarz | ESU 26 | 100005 | May 14,13 | May 13,14 |
| Artificial Mains Network | Rohde&Schwarz | ENV216 | 101173 | May 14,13 | May 13,14 |
| Artificial Mains Network | Rohde&Schwarz | ESH3-Z5 | 100317 | May 14,13 | May 13,14 |
| Test software | ADT | ADT_Conc_ V7.3.7 | N/A | N/A | N/A |

- NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA and NIM/CHINA
2. The test was performed in Dongguan Shielded Room 553.

4.1.3 TEST PROCEDURES

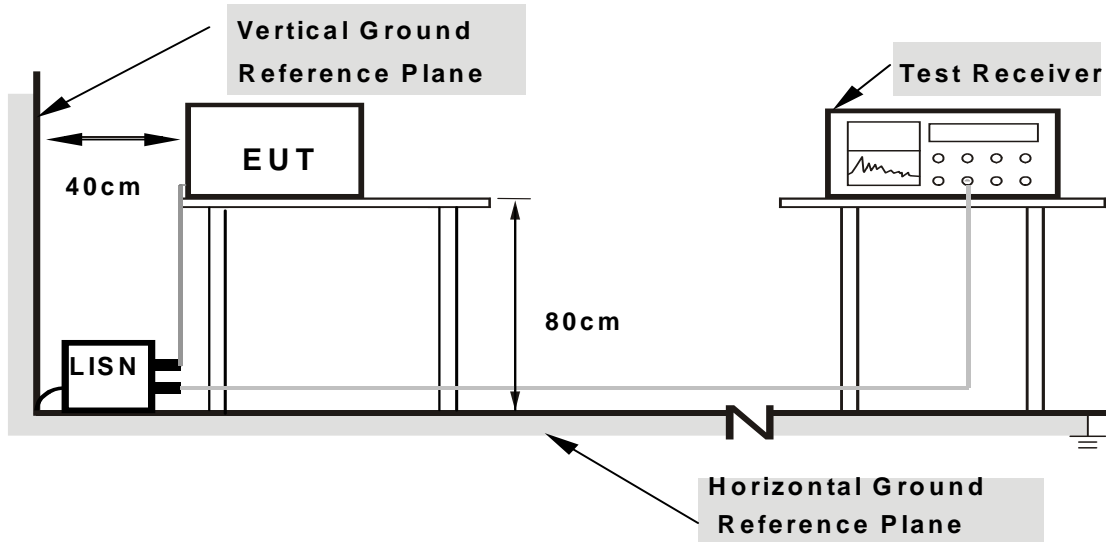
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE: All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation.

4.1.5 TEST SETUP



Note: 1. Support units were connected to second LISN.

2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT OPERATING CONDITIONS

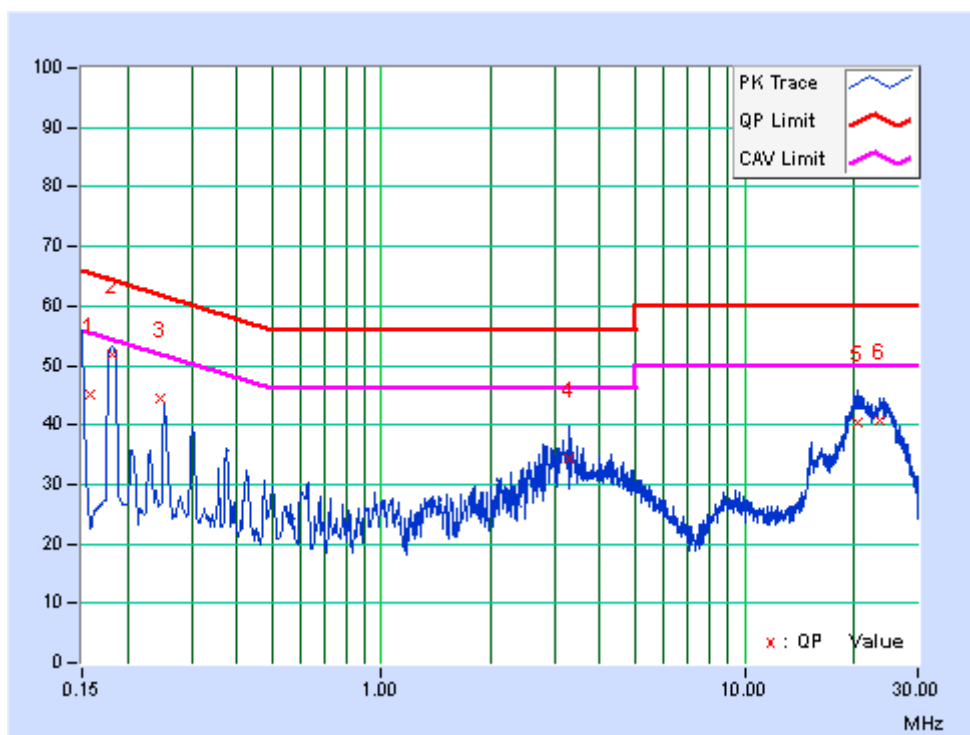
- Turned on the power and connected of all equipment.
- EUT was operated according to the type used was description in manufacturer's specifications or the User's Manual.

4.1.7 TEST RESULTS

| PHASE | Line | 6dB BANDWIDTH | 9kHz |
|-------|------|---------------|------|
|-------|------|---------------|------|

| No | Freq. [MHz] | Corr. Factor (dB) | Reading Value [dB (uV)] | | Emission Level [dB (uV)] | | Limit [dB (uV)] | | Margin (dB) | |
|----|----------------|-------------------------|----------------------------|--------------|-----------------------------|--------------|--------------------|--------------|----------------|---------------|
| | | | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| 1 | 0.15728 | 10.52 | 34.54 | 20.17 | 45.06 | 30.69 | 65.61 | 55.61 | -20.55 | -24.92 |
| 2 | 0.18147 | 10.47 | 41.47 | 25.11 | 51.94 | 35.58 | 64.42 | 54.42 | -12.48 | -18.84 |
| 3 | 0.24541 | 10.32 | 34.06 | 19.26 | 44.38 | 29.58 | 61.91 | 51.91 | -17.53 | -22.33 |
| 4 | 3.30146 | 9.79 | 24.44 | 17.57 | 34.23 | 27.36 | 56 | 46 | -21.77 | -18.64 |
| 5 | 20.3647 | 10.1 | 30.26 | 21.86 | 40.36 | 31.96 | 60 | 50 | -19.64 | -18.04 |
| 6 | 23.70384 | 10.24 | 30.39 | 22.72 | 40.63 | 32.96 | 60 | 50 | -19.37 | -17.04 |

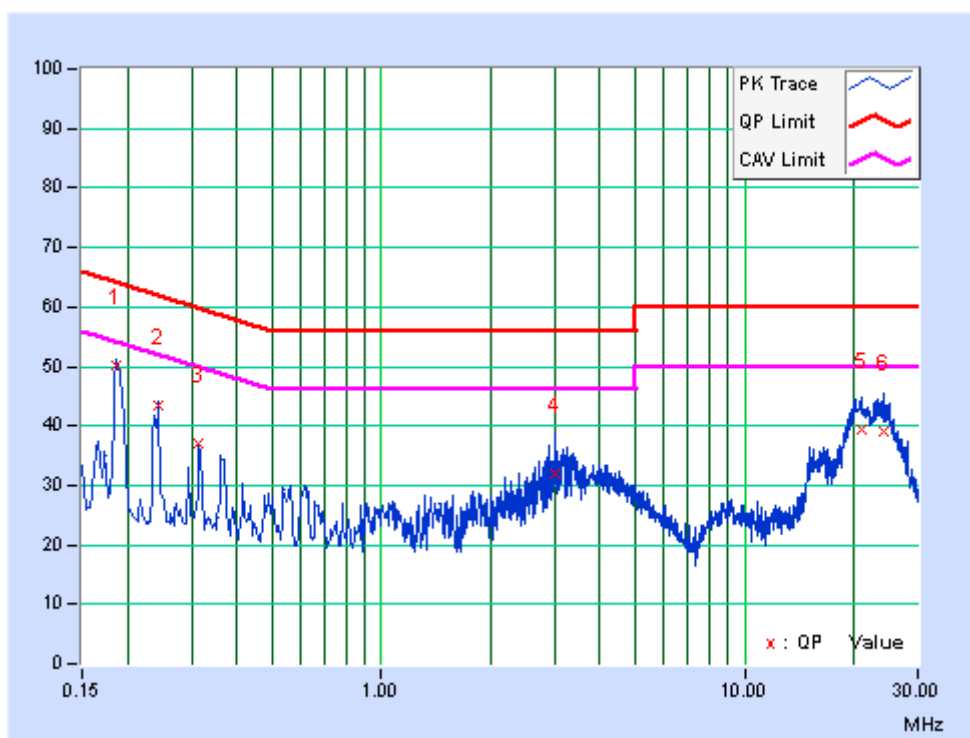
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Emission level - Limit value
 5. Correction factor = Insertion loss + Cable loss
 6. Emission Level = Correction Factor + Reading Value.



| | | | |
|-------|---------|---------------|------|
| PHASE | Neutral | 6dB BANDWIDTH | 9kHz |
|-------|---------|---------------|------|

| No | Freq. [MHz] | Corr. Factor (dB) | Reading Value [dB (uV)] | | Emission Level [dB (uV)] | | Limit [dB (uV)] | | Margin (dB) | |
|----|-------------|-------------------|-------------------------|-------|--------------------------|-------|-----------------|-------|-------------|--------|
| | | | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| 1 | 0.18557 | 10.42 | 39.74 | 24.97 | 50.16 | 35.39 | 64.23 | 54.23 | -14.08 | -18.85 |
| 2 | 0.24384 | 10.27 | 33 | 18.91 | 43.27 | 29.18 | 61.96 | 51.96 | -18.7 | -22.79 |
| 3 | 0.31432 | 10.36 | 26.76 | 11.39 | 37.12 | 21.75 | 59.86 | 49.86 | -22.74 | -28.11 |
| 4 | 3.02385 | 9.46 | 22.43 | 15.93 | 31.89 | 25.39 | 56 | 46 | -24.11 | -20.61 |
| 5 | 21.04504 | 10.05 | 29.24 | 21.78 | 39.29 | 31.83 | 60 | 50 | -20.71 | -18.17 |
| 6 | 24.05965 | 10.23 | 28.72 | 21.15 | 38.95 | 31.38 | 60 | 50 | -21.05 | -18.62 |

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Emission level - Limit value
 5. Correction factor = Insertion loss + Cable loss
 6. Emission Level = Correction Factor + Reading Value.



4.2 RADIATED EMISSION AND BANDEDGE MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION AND BANDEDGE MEASUREMENT

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a). Other emissions shall be at least 20dB below the highest level of the desired power.

| FREQUENCIES (MHz) | FIELD STRENGTH (microvolts/meter) | MEASUREMENT DISTANCE (meters) |
|-------------------|-----------------------------------|-------------------------------|
| 0.009 ~ 0.490 | 2400/F(kHz) | 300 |
| 0.490 ~ 1.705 | 24000/F(kHz) | 30 |
| 1.705 ~ 30.0 | 30 | 30 |
| 30 ~ 88 | 100 | 3 |
| 88 ~ 216 | 150 | 3 |
| 216 ~ 960 | 200 | 3 |
| Above 960 | 500 | 3 |

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.2.2 TEST INSTRUMENTS

| Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Next Cal. |
|-----------------------------------|---------------|--------------------------|-----------------|------------|------------|
| Spectrum Analyzer | Agilent | E4446A | MY46180622 | Apr. 24,13 | Apr. 23,14 |
| EMI Test Receiver | Rohde&Schwarz | ESVD | 847398/003 | May 14,13 | May 13,14 |
| Bilog Antenna (25MHz-2GHz) | Teseq | CBL 6111D | 27089 | Jul. 16,12 | Jul. 15,13 |
| Horn Antenna (1GHz -18GHz) | EMCO | 3117 | 00062558 | Oct.18,12 | Oct.17,13 |
| Pre-Amplifier (20MHz-3GHz) | EMCI | EMC 330 | 980095 | Nov. 02,12 | Nov.01,13 |
| Pre-Amplifier (100MHz-26.5GHz) | Agilent | 8449B | 3008A00409 | May 14,13 | May 13,14 |
| 10m Semi-anechoic Chamber | CHANGLING | 21.4m*12.1m*8 .8m | NSEMC006 | Mar. 24,13 | Mar. 23,14 |
| Digital Multimeter | FLUKE | 15B | A1220010D G | Oct. 31,12 | Oct. 30,13 |
| Horn Antenna (15GHz-40GHz) | SCHWARZBECK | BBHA 9170 | BBHA91702 42 | Jan. 04,11 | Jan. 03,14 |
| Pre-Amplifier (18GHz-40GHz) | EMCI | EMC 184045 | 980102 | Nov. 04,12 | Nov. 03,13 |
| Bluetooth Tester | Rohde&Schwarz | CBT32 | N/A | N/A | N/A |
| Test Software | ADT | ADT_Radiated _V7.6.15 | N/A | N/A | N/A |

- NOTE:**
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA and NIM/CHINA.
 2. The test was performed in Dongguan Chamber 10m.
 3. The horn antenna are used only for the measurement of emission frequency above 1GHz if tested.

4.2.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, For battery operated equipment, the equipment tests shall be perform using fresh batteries. The turntable was rotated to maximize the emission level.

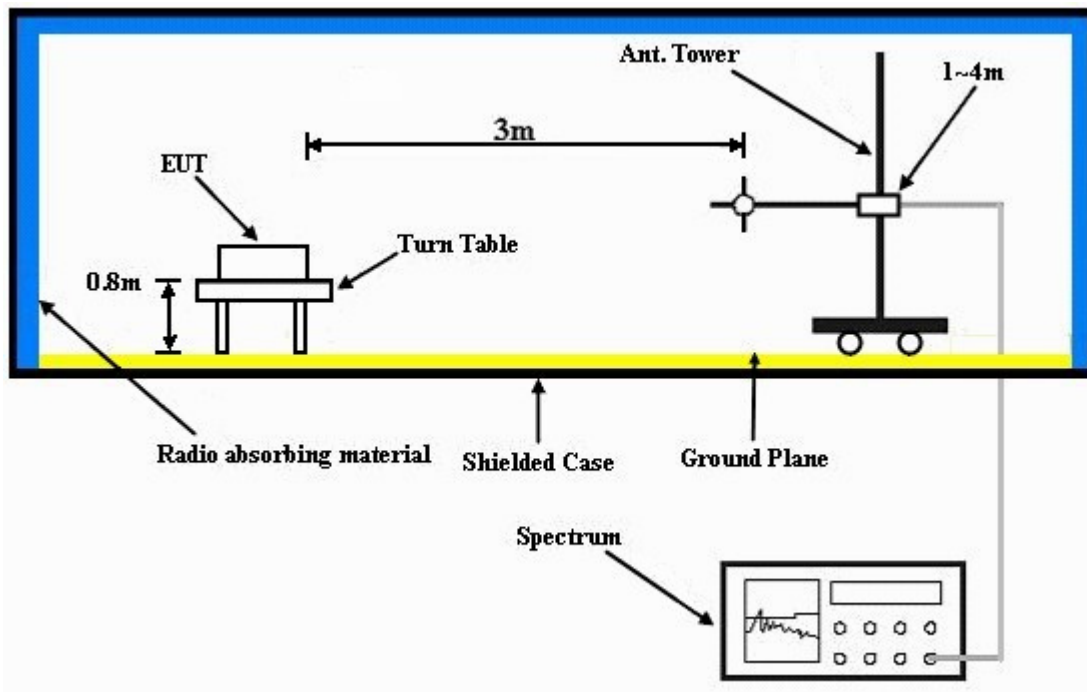
NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 10Hz for Average detection at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

4.2.5 TEST SETUP



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.2.6 EUT OPERATING CONDITIONS

- Set the EUT under full load condition and placed them on a testing table.
- Set the transmitter part of EUT under transmission condition continuously at specific channel frequency.
- The necessary accessories enable the EUT in full functions.

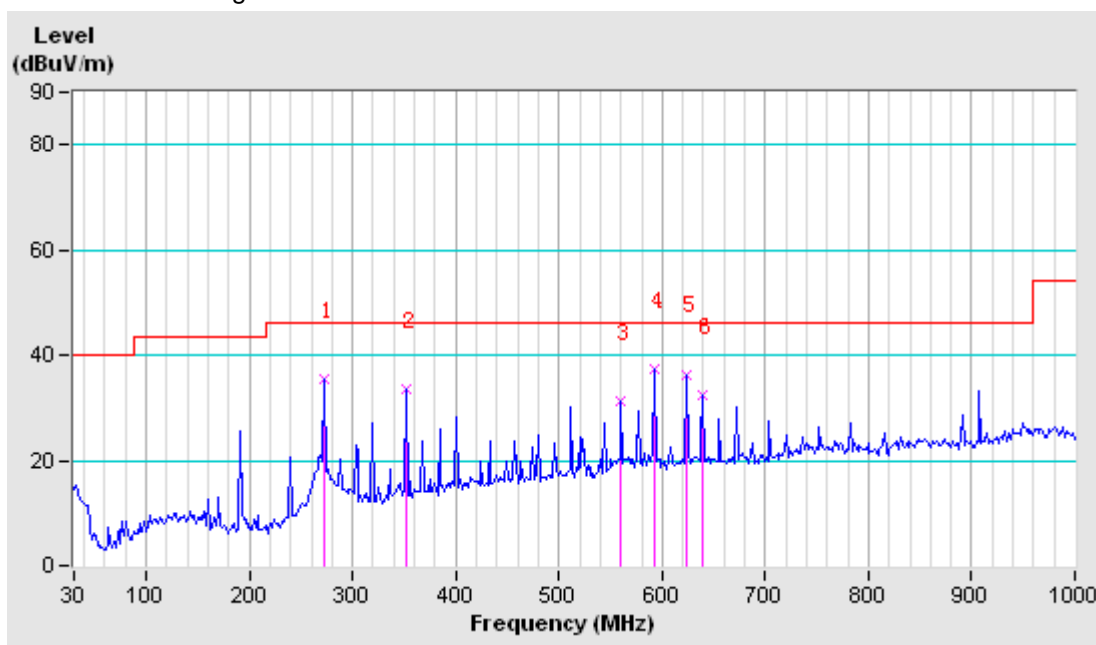
4.2.7 TEST RESULTS

BELOW 1GHz DATA

| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|----------------------|------------|--------------------|---------------|
| CHANNEL | Channel 71 | FREQUENCY RANGE | Below 1000MHz |
| INPUT POWER (SYSTEM) | 3.7Vdc | DETECTOR FUNCTION | Quasi-Peak |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | |
|---|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | 272.50 | 35.5 QP | 46.0 | -10.5 | 1.01 H | 281 | 20.52 | 14.96 |
| 2 | 351.72 | 33.4 QP | 46.0 | -12.6 | 1.08 H | 298 | 16.09 | 17.34 |
| 3 | 560.27 | 31.3 QP | 46.0 | -14.8 | 1.63 H | 359 | 7.44 | 23.81 |
| 4 | 592.60 | 37.2 QP | 46.0 | -8.8 | 1.00 H | 252 | 14.06 | 23.14 |
| 5 | 623.32 | 36.4 QP | 46.0 | -9.6 | 1.22 H | 316 | 12.44 | 23.97 |
| 6 | 639.48 | 32.4 QP | 46.0 | -13.6 | 1.46 H | 347 | 8.25 | 24.19 |

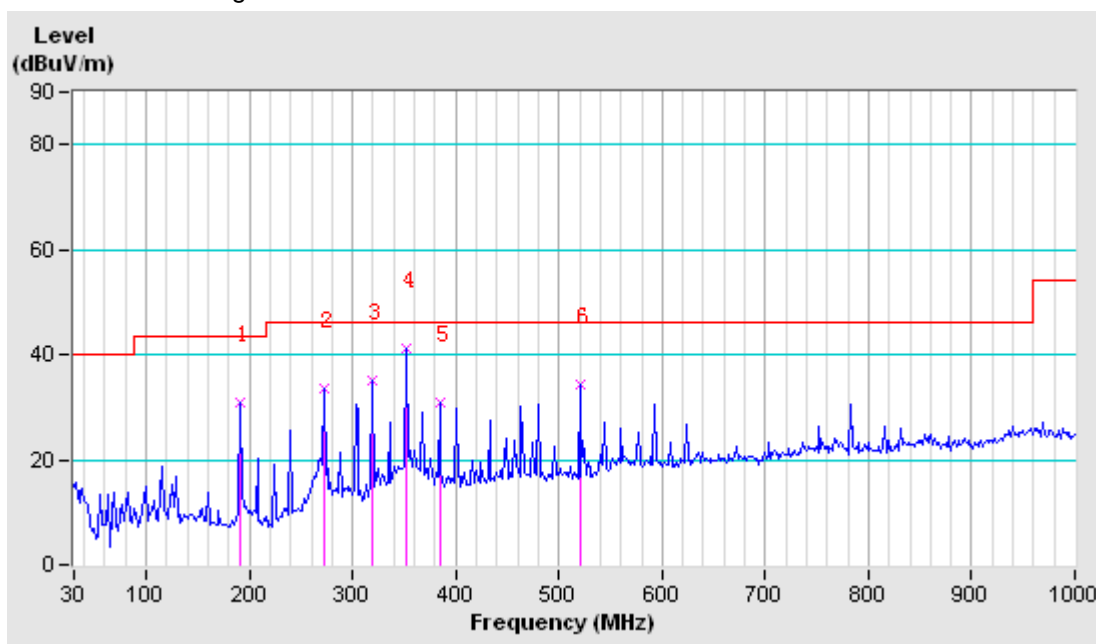
- REMARKS:**
1. Emission level (dBuV/m) = Reading (dBuV) + Factor (dB/m).
 2. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.



| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|----------------------|------------|--------------------|---------------|
| CHANNEL | Channel 71 | FREQUENCY RANGE | Below 1000MHz |
| INPUT POWER (SYSTEM) | 3.7Vdc | DETECTOR FUNCTION | Quasi-Peak |

| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | |
|---|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | 191.67 | 31.0 QP | 43.5 | -12.5 | 1.00 V | 244 | 20.33 | 10.69 |
| 2 | 272.50 | 33.7 QP | 46.0 | -12.3 | 1.00 V | 172 | 18.71 | 14.96 |
| 3 | 319.38 | 35.2 QP | 46.0 | -10.8 | 1.00 V | 222 | 19.11 | 16.09 |
| 4 | 351.72 | 41.2 QP | 46.0 | -4.8 | 1.00 V | 262 | 23.89 | 17.34 |
| 5 | 384.05 | 30.8 QP | 46.0 | -15.2 | 1.00 V | 142 | 12.69 | 18.11 |
| 6 | 519.85 | 34.4 QP | 46.0 | -11.6 | 1.00 V | 194 | 13.08 | 21.32 |

- REMARKS:**
1. Emission level (dBuV/m) = Reading (dBuV) + Factor (dB/m).
 2. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.



ABOVE 1GHz DATA

GFSK

| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|----------------------|-----------|--------------------|---------------------------|
| CHANNEL | Channel 1 | FREQUENCY RANGE | 1 ~ 25GHz |
| INPUT POWER (SYSTEM) | 3.7Vdc | DETECTOR FUNCTION | Peak (PK) Average (AV) |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | |
|---|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | 2390.00 | 67.5 PK | 74.0 | -6.5 | 1.00 H | 261 | 30.25 | 37.25 |
| 2 | 2390.00 | 48.2 AV | 54.0 | -5.8 | 1.00 H | 261 | 10.95 | 37.25 |
| 3 | *2406.00 | 104.8 PK | | | 1.00 H | 261 | 67.52 | 37.28 |
| 4 | *2406.00 | 99.3 AV | | | 1.00 H | 261 | 62.02 | 37.28 |
| 5 | 4812.00 | 65.2 PK | 74.0 | -8.8 | 1.12 H | 258 | 23.58 | 41.62 |
| 6 | 4812.00 | 49.8 AV | 54.0 | -4.2 | 1.12 H | 258 | 8.18 | 41.62 |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | |
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | 2390.00 | 67.3 PK | 74.0 | -6.7 | 1.13 V | 325 | 30.05 | 37.25 |
| 2 | 2390.00 | 48.6 AV | 54.0 | -5.4 | 1.13 V | 325 | 11.35 | 37.25 |
| 3 | *2406.00 | 103.9 PK | | | 1.13 V | 325 | 66.62 | 37.28 |
| 4 | *2406.00 | 98.1 AV | | | 1.13 V | 325 | 60.82 | 37.28 |
| 5 | 4812.00 | 56.5 PK | 74.0 | -17.5 | 1.08 V | 236 | 14.88 | 41.62 |
| 6 | 4812.00 | 49.5 AV | 54.0 | -4.5 | 1.08 V | 236 | 7.88 | 41.62 |

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.

| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|----------------------|------------|--------------------|---------------------------|
| CHANNEL | Channel 36 | FREQUENCY RANGE | 1 ~ 25GHz |
| INPUT POWER (SYSTEM) | 3.7Vdc | DETECTOR FUNCTION | Peak (PK) Average (AV) |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | |
|---|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | *2441.00 | 105.6 PK | | | 1.00 H | 168 | 68.26 | 37.34 |
| 2 | *2441.00 | 99.8 AV | | | 1.00 H | 168 | 62.46 | 37.34 |
| 3 | 4882.00 | 56.4 PK | 74.0 | -17.6 | 1.12 H | 235 | 14.70 | 41.70 |
| 4 | 4882.00 | 50.7 AV | 54.0 | -3.3 | 1.12 H | 235 | 9.00 | 41.70 |
| 5 | 7323.00 | 57.4 PK | 74.0 | -16.6 | 1.00 H | 228 | 11.61 | 45.79 |
| 6 | 7323.00 | 50.9 AV | 54.0 | -3.1 | 1.00 H | 228 | 5.11 | 45.79 |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | |
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | *2441.00 | 105.1 PK | | | 1.14 V | 321 | 67.76 | 37.34 |
| 2 | *2441.00 | 99.7 AV | | | 1.14 V | 321 | 62.36 | 37.34 |
| 3 | 4882.00 | 56.5 PK | 74.0 | -17.5 | 1.07 V | 286 | 14.80 | 41.70 |
| 4 | 4882.00 | 50.3 AV | 54.0 | -3.7 | 1.07 V | 286 | 8.60 | 41.70 |
| 5 | 7323.00 | 58.2 PK | 74.0 | -15.8 | 1.23 V | 152 | 12.41 | 45.79 |
| 6 | 7323.00 | 50.1 AV | 54.0 | -3.9 | 1.23 V | 152 | 4.31 | 45.79 |

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.

| EUT TEST CONDITION | | MEASUREMENT DETAIL | |
|----------------------|------------|--------------------|---------------------------|
| CHANNEL | Channel 71 | FREQUENCY RANGE | 1 ~ 25GHz |
| INPUT POWER (SYSTEM) | 3.7Vdc | DETECTOR FUNCTION | Peak (PK) Average (AV) |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | |
|---|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | *2476.00 | 105.5 PK | | | 1.13 H | 312 | 68.10 | 37.40 |
| 2 | *2476.00 | 100.2 AV | | | 1.13 H | 312 | 62.80 | 37.40 |
| 3 | 2483.50 | 57.6 PK | 74.0 | -16.4 | 1.13 H | 312 | 20.19 | 37.41 |
| 4 | 2483.50 | 39.8 AV | 54.0 | -14.2 | 1.13 H | 312 | 2.39 | 37.41 |
| 5 | 4952.00 | 57.6 PK | 74.0 | -16.4 | 1.28 H | 215 | 15.81 | 41.79 |
| 6 | 4952.00 | 52.4 AV | 54.0 | -1.6 | 1.28 H | 215 | 10.63 | 41.79 |
| 7 | 7428.00 | 58.5 PK | 74.0 | -15.5 | 1.00 H | 311 | 12.68 | 45.82 |
| 8 | 7428.00 | 52.0 AV | 54.0 | -2.0 | 1.00 H | 311 | 6.18 | 45.82 |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | |
| NO. | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1 | *2476.00 | 116.9 PK | | | 1.00 V | 5 | 79.50 | 37.40 |
| 2 | *2476.00 | 111.8 AV | | | 1.00 V | 5 | 74.41 | 37.40 |
| 3 | 2483.50 | 68.1 PK | 74.0 | -5.9 | 1.00 V | 5 | 30.69 | 37.41 |
| 4 | 2483.50 | 49.2 AV | 54.0 | -4.8 | 1.00 V | 5 | 11.79 | 37.41 |
| 5 | 4952.00 | 58.3 PK | 74.0 | -15.7 | 1.00 V | 114 | 16.51 | 41.79 |
| 6 | 4952.00 | 52.8 AV | 54.0 | -1.2 | 1.00 V | 114 | 11.01 | 41.79 |
| 7 | 7428.00 | 55.3 PK | 74.0 | -18.7 | 1.00 V | 189 | 9.48 | 45.82 |
| 8 | 7428.00 | 46.9 AV | 54.0 | -7.1 | 1.00 V | 189 | 1.08 | 45.82 |

REMARKS:

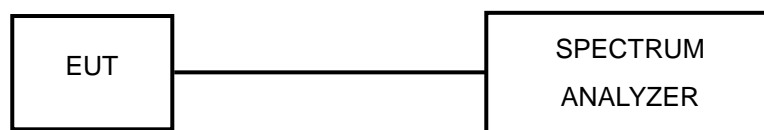
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.

4.3 NUMBER OF HOPPING FREQUENCY USED

4.3.1. LIMIT OF HOPPING FREQUENCY USED

At least 15 channels frequencies, and should be equally spaced.

4.3.2. TEST SETUP



4.3.3. TEST INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

4.3.4. TEST PROCEDURES

- a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- b. Turn on the EUT and connect its antenna terminal to measurement 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.
- c. Set the SA on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
- d. Set the SA on View mode and then plot the result on SA screen.
- e. Repeat above procedures until all frequencies measured were complete.

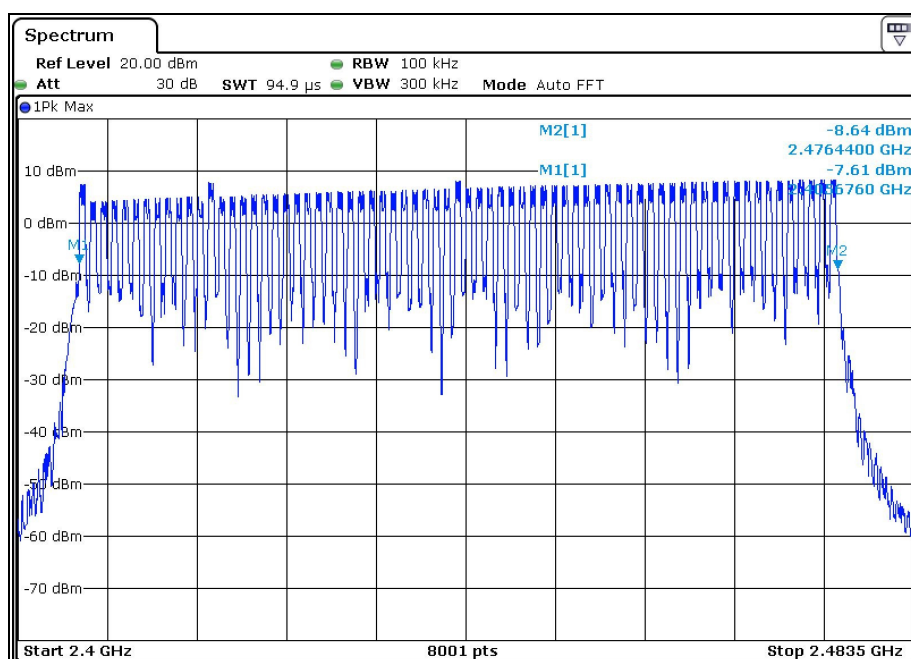
4.3.5. DEVIATION FROM TEST STANDARD

No deviation.

4.3.6. TEST RESULTS

There are 71 hopping frequencies in the hopping mode. Please refer to next two pages for the test result. On the plots, it shows that the hopping frequencies are equally spaced.

GFSK

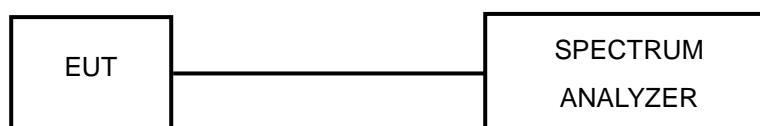


4.4 DWELL TIME ON EACH CHANNEL

4.4.1 LIMIT OF DWELL TIME USED

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

4.4.2 TEST SETUP



4.4.3 TEST INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

4.4.4 TEST PROCEDURES

- a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- b. Turn on the EUT and connect its antenna terminal to measurement 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.
- c. Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
- d. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
- e. Repeat above procedures until all different time-slot modes have been completed.

4.4.5 DEVIATION FROM TEST STANDARD

No deviation.

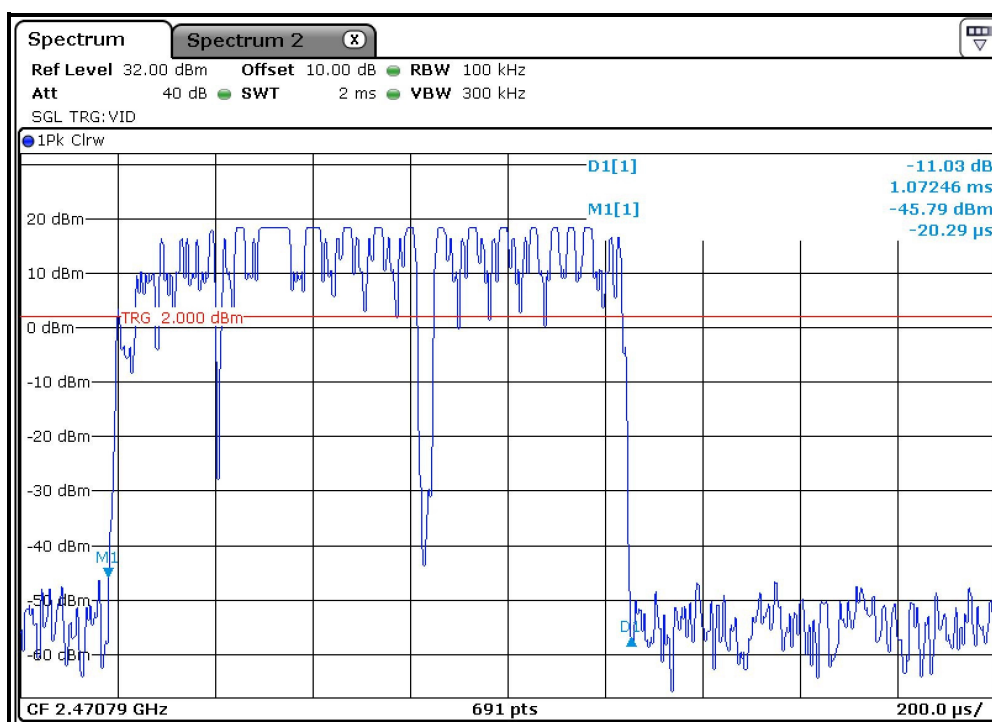
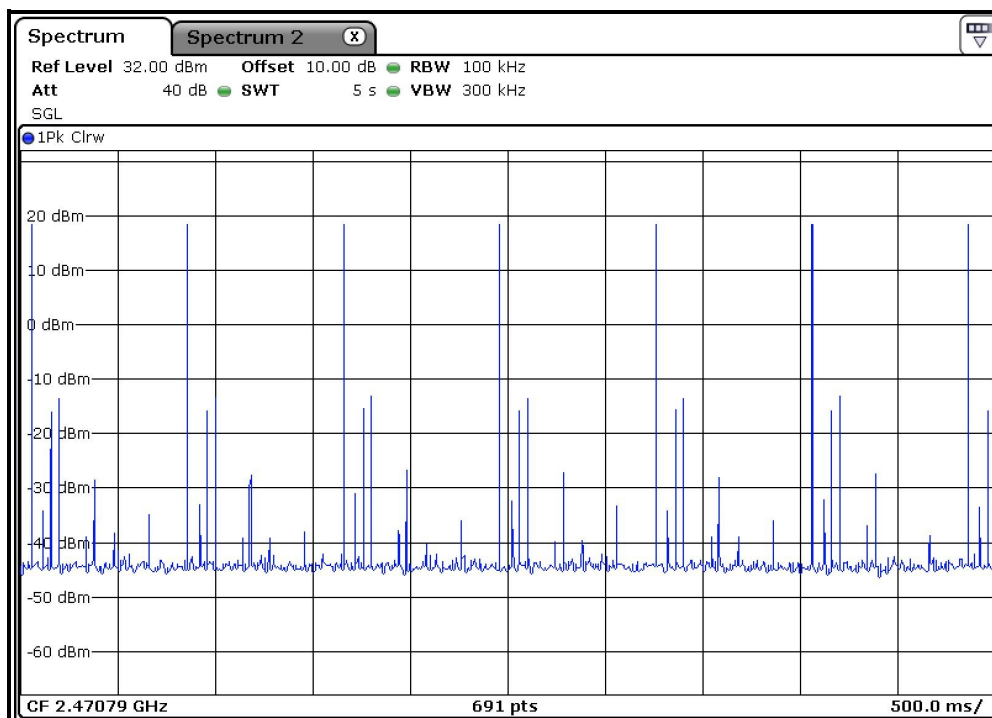
4.4.6 TEST RESULTS

GFSK

| Mode | Number of Hopping Channel | Number of transmission in a period(channel number*0.4 sec) | | | | Length of transmission time (msec) | Result (msec) | Limit (msec) | PASS / FAIL |
|------|---------------------------|--|------------------|------------------|-------------------|------------------------------------|---------------|--------------|-------------|
| | | period (sec) | sweep time (sec) | times in a sweep | times in a period | | | | |
| GFSK | 71 | 28.4 | 5 | 7 | 39.76 | 1.072 | 42.623 | 400 | PASS |

NOTE: Test plots of the transmitting time slot are shown on next pages.

GFSK

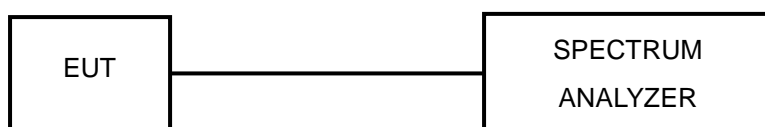


4.5 CHANNEL BANDWIDTH

4.5.1 LIMITS OF CHANNEL BANDWIDTH

For frequency hopping system operating in the 2400-2483.5MHz, If the 20dB bandwidth of hopping channel is greater than 25kHz, two-thirds 20dB bandwidth of hopping channel shall be a minimum limit for the hopping channel separation.

4.5.2 TEST SETUP



4.5.3 TEST INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

4.5.4 TEST PROCEDURE

- a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- c. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
- d. Repeat above procedures until all frequencies measured were complete.

4.5.5 DEVIATION FROM TEST STANDARD

No deviation.

4.5.6 EUT OPERATING CONDITION

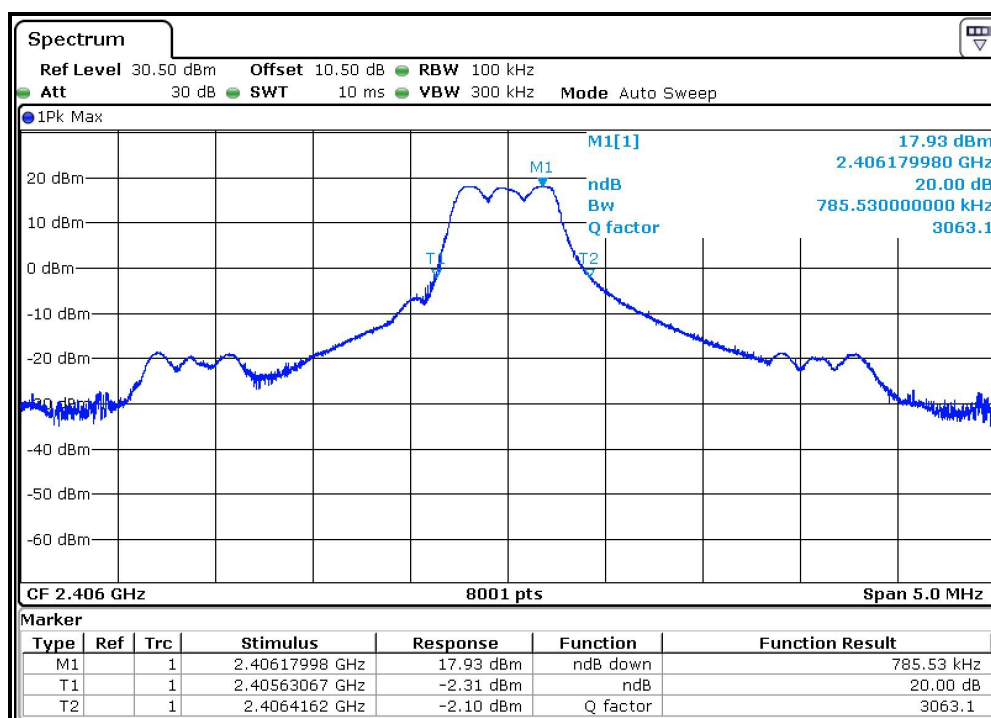
Same as item 4.2.6

4.5.7 TEST RESULTS

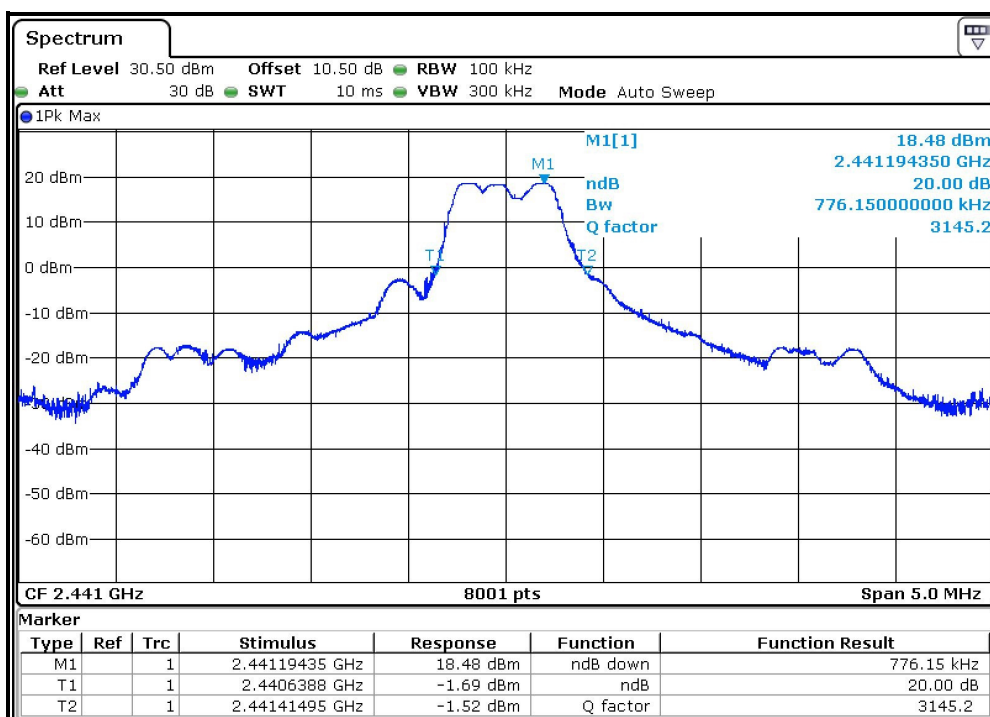
GFSK

| CHANNEL | CHANNEL FREQUENCY (MHz) | 20dB BANDWIDTH (MHz) |
|---------|-------------------------|----------------------|
| 1 | 2406 | 0.785 |
| 36 | 2441 | 0.776 |
| 71 | 2476 | 1.126 |

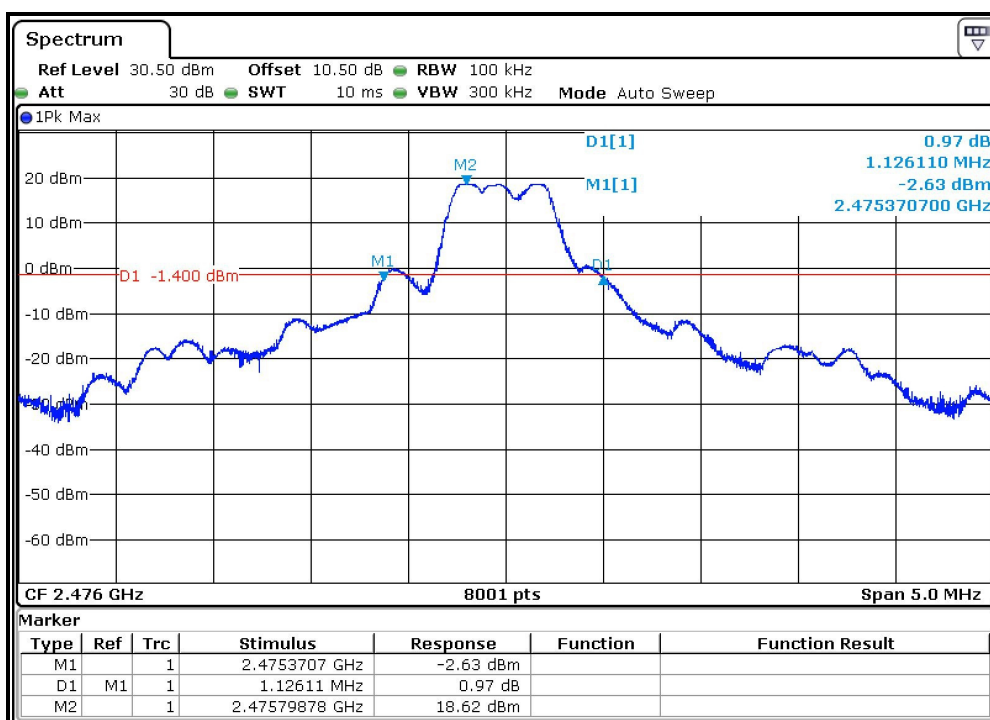
CH 1



CH 36



CH 71

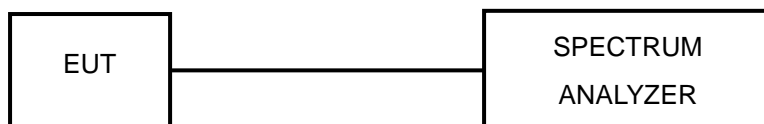


4.6 HOPPING CHANNEL SEPARATION

4.6.1. LIMIT OF HOPPING CHANNEL SEPARATION

At least 25kHz or two-third of 20dB hopping channel bandwidth (whichever is greater).

4.6.2. TEST SETUP



4.6.3. TEST INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

4.6.4. TEST PROCEDURES

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
3. By using the MaxHold function record the separation of two adjacent channels.
4. Measure the frequency difference of these two adjacent channels by SA MARK function. And then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

4.6.5. DEVIATION FROM TEST STANDARD

No deviation.

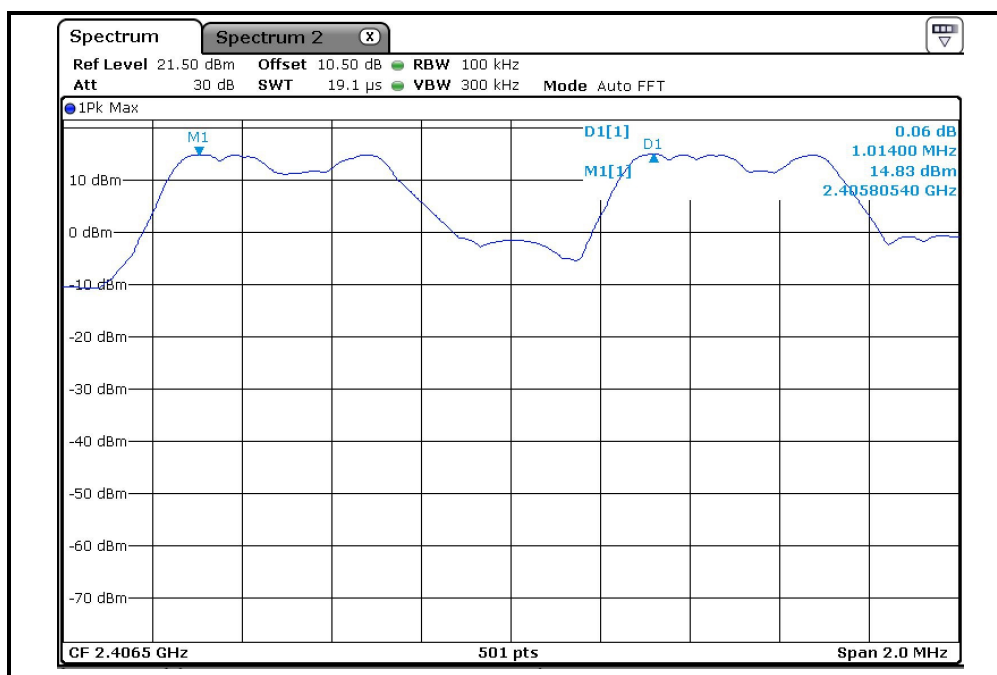
4.6.6. TEST RESULTS

GFSK

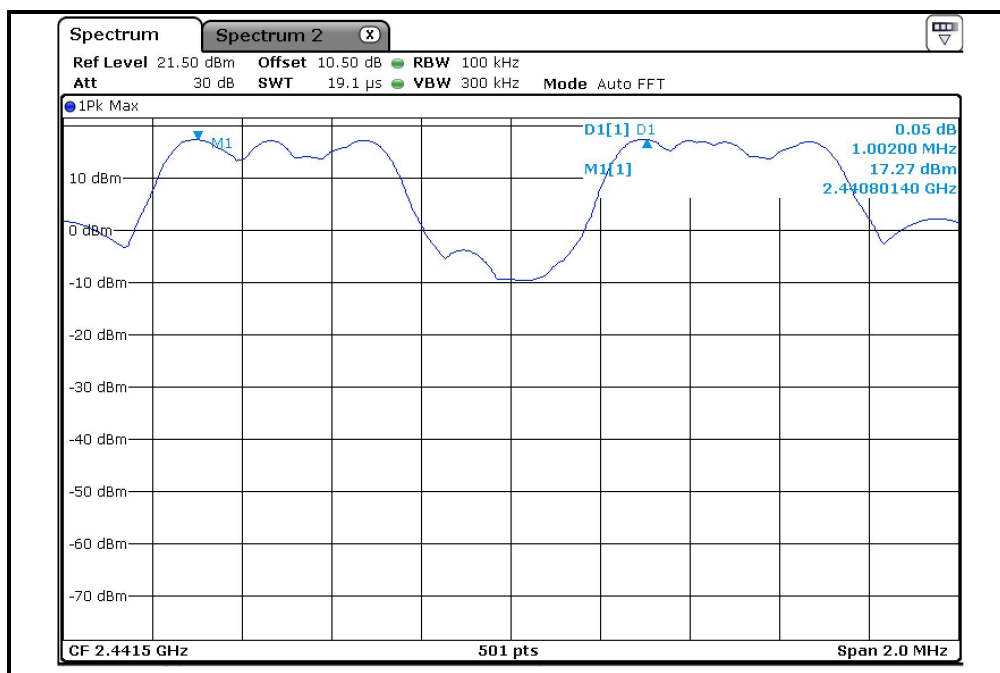
| CHANNEL | FREQUENCY (MHz) | ADJACENT CHANNEL SEPARATION (MHz) | 20dB BANDWIDTH (MHz) | MINIMUM LIMIT (MHz) | PASS / FAIL |
|---------|-----------------|-----------------------------------|----------------------|---------------------|-------------|
| 1 | 2406 | 1.01 | 0.846 | 0.56 | PASS |
| 36 | 2441 | 1.00 | 0.853 | 0.57 | PASS |
| 71 | 2476 | 1.00 | 1.027 | 0.68 | PASS |

NOTE: The minimum limit is two-third 20dB bandwidth.

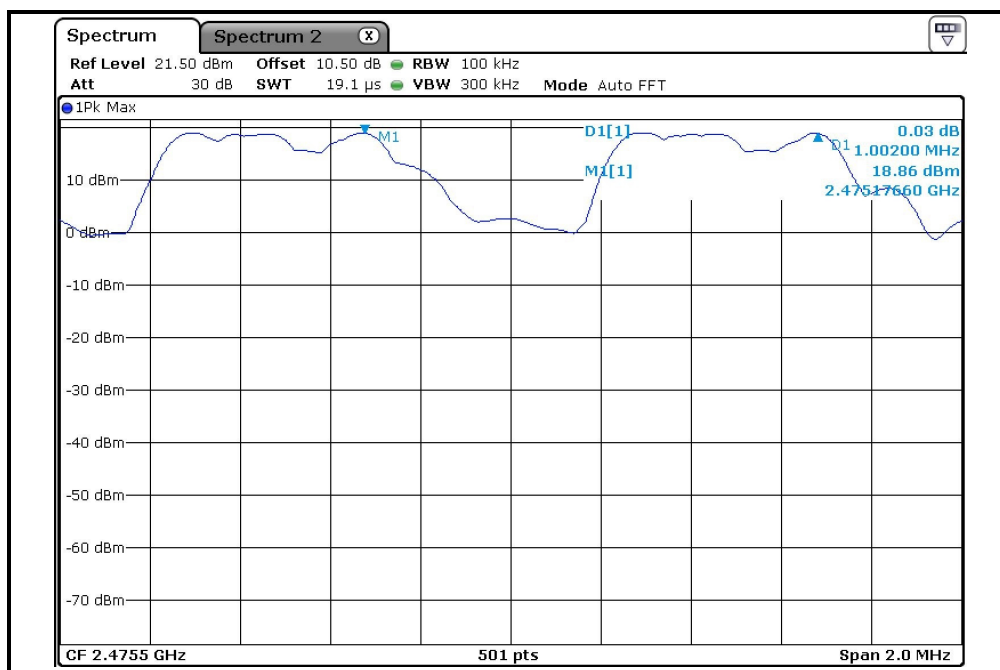
GFSK CH 1



GFSK CH 36



GFSK CH 71

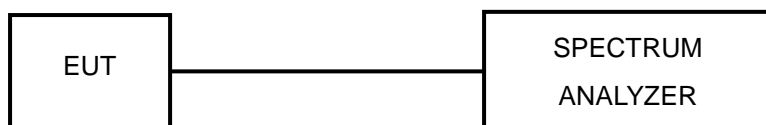


4.7 MAXIMUM OUTPUT POWER

4.7.1 LIMITS OF MAXIMUM OUTPUT POWER MEASUREMENT

The Maximum Output Power Measurement is 125mW.

4.7.2 TEST SETUP



4.7.3 TEST INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

4.7.4 TEST PROCEDURES

- a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- c. The center frequency of the spectrum analyzer is set to the fundamental frequency and using 3MHz RBW and 10 MHz VBW.
- d. Measure the captured power within the band and recording the plot.
- e. Repeat above procedures until all frequencies required were complete.

4.7.5 DEVIATION FROM TEST STANDARD

No deviation.

4.7.6 EUT OPERATING CONDITION

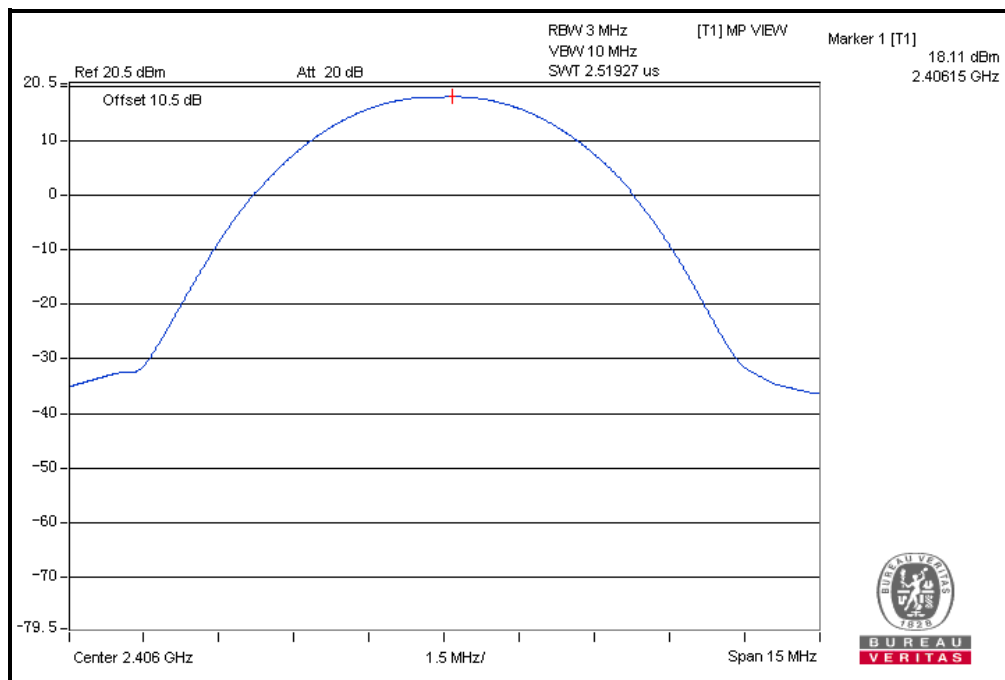
Same as item 4.1.6.

4.7.7 TEST RESULTS

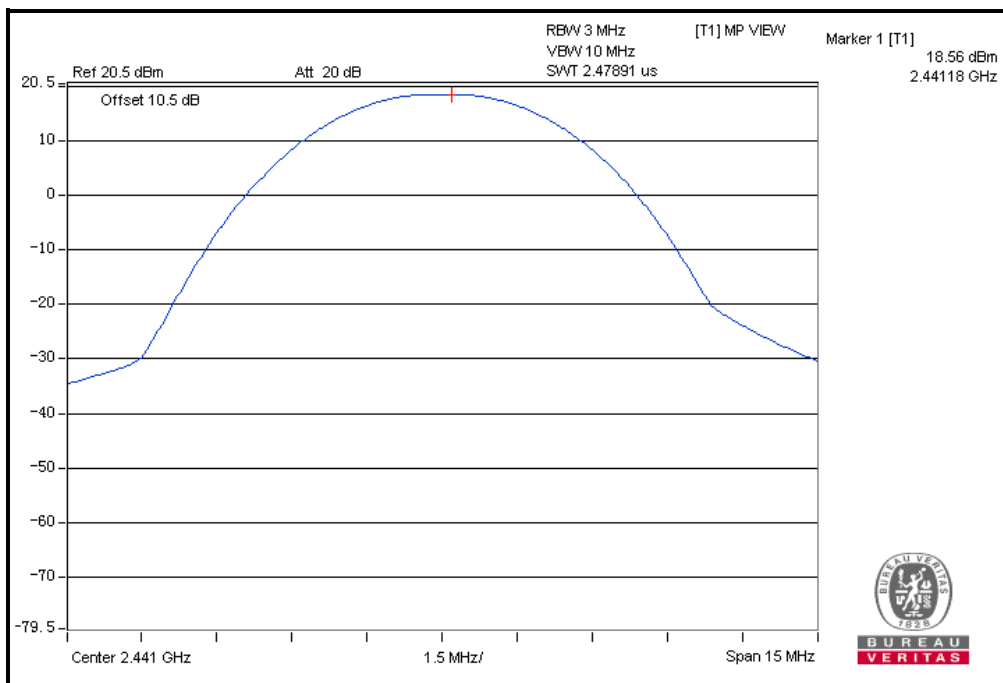
GFSK

| CHANNEL | CHANNEL FREQUENCY (MHz) | POWER OUTPUT (dBm) | POWER OUTPUT (mW) | POWER LIMIT (mW) | PASS/FAIL |
|---------|-------------------------------|--------------------------|-------------------------|---------------------|-----------|
| 1 | 2406 | 18.11 | 64.714 | 125 | PASS |
| 36 | 2441 | 18.56 | 71.779 | 125 | PASS |
| 71 | 2476 | 18.98 | 79.068 | 125 | PASS |

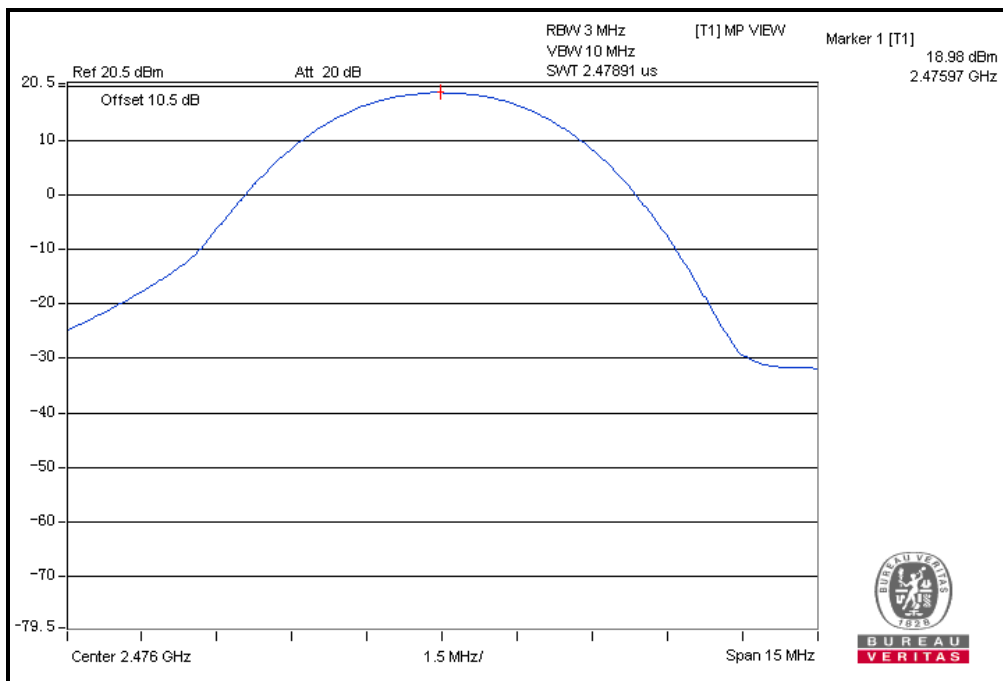
CH 1



CH 36



CH 71



4.8 BAND EDGES MEASUREMENT

4.8.1 LIMITS OF BAND EDGES MEASUREMENT

Below -20dB of the highest emission level of operating band (in 100KHz RBW).

4.8.2 TEST INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

4.8.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 100 kHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

4.8.4 DEVIATION FROM TEST STANDARD

No deviation.

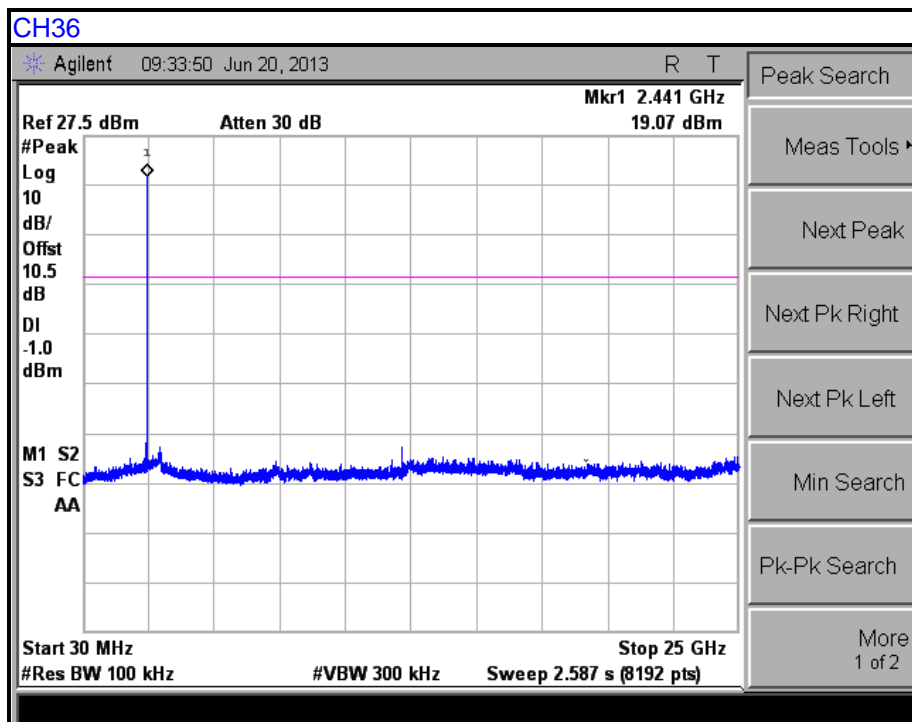
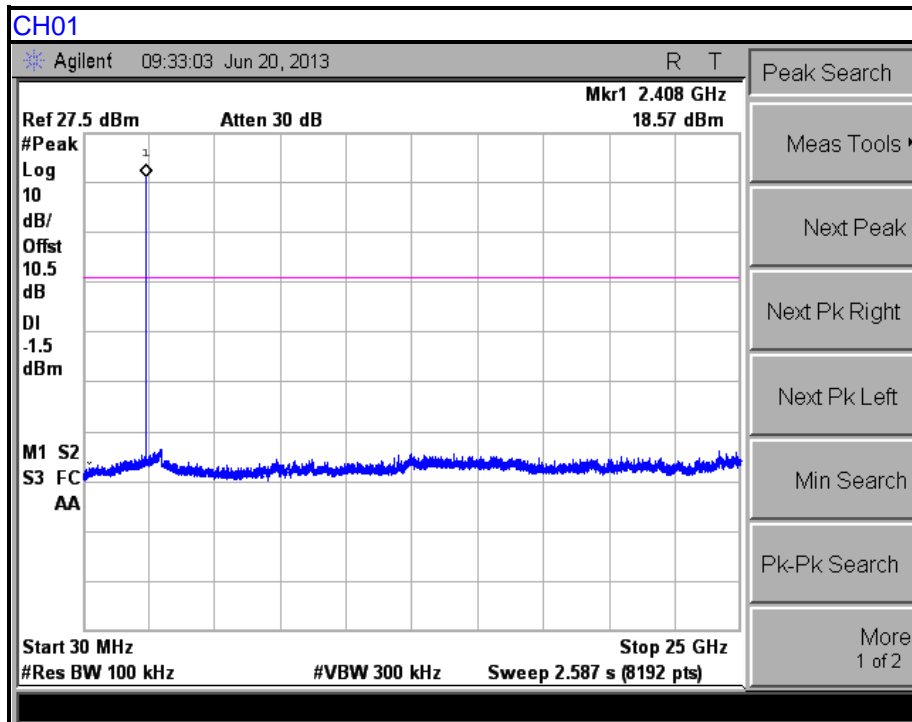
4.8.5 EUT OPERATING CONDITION

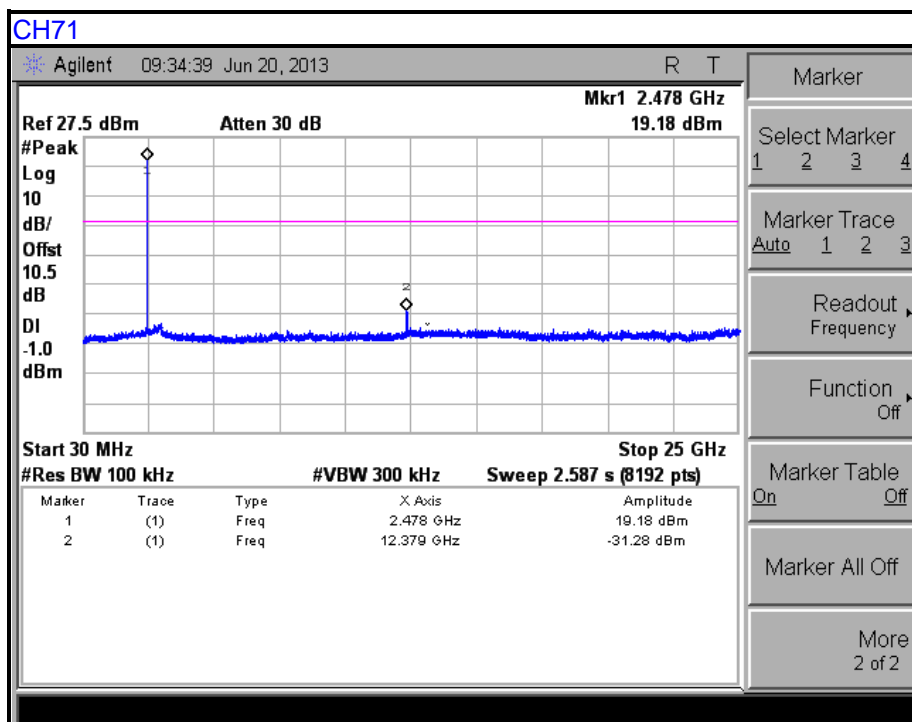
Same as item 4.2.6

4.8.6 TEST RESULTS

The spectrum plots are attached on the following images., D1 line indicates the 20dB offset below D1.

GFSK







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5. PHOTOGRAPHS OF THE TEST CONFIGURATION

Please refer to the attached file (Test Setup Photo).

6. APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

---END---