



BUREAU
VERITAS

Test Report No.: RF180604W006-2



VARIANT FCC TEST REPORT

(Part 15, Subpart C)



| | |
|------------|--|
| Applicant: | FIH International Co., Ltd. |
| Address: | No.18, Tongji zhonglu, Beijing Economic & Technological Development Area |

| | |
|---------------------------|----------------------------------|
| Manufacturer or Supplier: | HMD Global Oy |
| Address: | Karaportti 2 02610 Espoo FINLAND |
| Product: | GSM/WCDMA/LTE Mobile Phone |
| Brand Name: | Nokia |
| Model Name: | TA-1049 |
| FCC ID: | 2AJOTTA-1049 |
| Date of tests: | Jun. 05, 2018 ~ Jun. 25, 2018 |

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

- FCC Part 15, Subpart C, Section 15.247
- ANSI C63.10-2013

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

| | |
|---|---|
| Prepared by Roger Li Engineer / Mobile Department | Approved by Sam Tung Manager / Mobile Department |
|  |  |
| Date: Jul. 02, 2018 | Date: Jul. 02, 2018 |

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**BUREAU
VERITAS**

Test Report No.: RF180604W006-2

RELEASE CONTROL RECORD

| ISSUE NO. | REASON FOR CHANGE | DATE ISSUED |
|----------------|-------------------|---------------|
| RF180604W006-2 | Original release | Jul. 02, 2018 |



1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

| APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.247) | | | |
|---|----------------------------------|--------|--|
| STANDARD SECTION | TEST TYPE AND LIMIT | RESULT | REMARK |
| 15.207 | AC Power Conducted Emission | PASS | Meet the requirement of limit. Minimum passing margin is -9.59dB at 0.516000MHz. |
| 15.205 15.209 | Radiated Emissions | PASS | Meet the requirement of limit. Minimum passing margin is -5.38dB at 2483.5MHz. |
| 15.247(d) | Out of band Emission Measurement | N/A | N/A |
| 15.247(a)(2) | 6dB bandwidth | N/A | N/A |
| 15.247(b) | Conducted Output power | N/A | N/A |
| 15.247(e) | Power Spectral Density | N/A | N/A |
| 15.203 | Antenna Requirement | N/A | N/A |

1.1 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 | 2.66dB |
| Radiated emissions | 9KHz ~ 30MHz | 2.68dB |
| | 30MHz ~ 1GMHz | 3.26dB |
| | 1GHz ~ 18GHz | 4.48dB |
| | 18GHz ~ 40GHz | 4.12dB |

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



2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

| | |
|------------------------------|---|
| PRODUCT | GSM/WCDMA/LTE Mobile Phone |
| BRAND NAME | Nokia |
| MODEL NAME | TA-1049 |
| NOMINAL VOLTAGE | 5.0Vdc (adapter or host equipment) 3.9Vdc (Li-ion, battery) |
| MODULATION TECHNOLOGY | DSSS, OFDM, DTS |
| MODULATION TYPE | CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM BT-LE(GFSK) for DTS |
| TRANSMISSION RATE | 802.11b: 11/ 5.5/ 2.0 / 1.0 Mbps 802.11g: 54/ 48/ 36 / 24 / 18 / 9/ 6 Mbps 802.11n: up to 135 Mbps BT_LE: 1 Mbps |
| OPERATING FREQUENCY | 2412-2462MHz for 11b/g/n(HT20) 2402-2480MHz for BT-LE(GFSK) |
| ANTENNA TYPE | PIFA Antenna with -0.77dBi gain |
| HW VERSION | HW0309 |
| SW VERSION | 000C_0_34A |
| I/O PORTS | Refer to user's manual |
| CABLE SUPPLIED | USB cable: non-shielded, detachable, 1.0m Earphone cable: non-shielded, detachable, 1.5m |

NOTE:

- For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
- The EUT incorporates a SISO function. Physically, the EUT provides one transmitter and one receiver.

| MODULATION MODE | TX/RX FUNCTION |
|-----------------|----------------|
| 802.11b | 1TX /1RX |
| 802.11g | 1TX /1RX |
| 802.11n (20MHz) | 1TX /1RX |
| BT_LE | 1TX /1RX |

- This report is issued as a supplementary report to the original report RF180131W003-2. The differences compared with original report are updated HW and adding 2nd Manufacturer of components and antenna.



List of Accessories:

| ACCESSORIES | BRAND | MANUFACTURER | MODEL | SPECIFICATION |
|--------------------|--------------|--|--------------|---|
| Adapter 1 | Salcomp | Salcomp (Shenzhen) Co., Ltd. | FC0202 | I/P: 100-240Vac, 150mA O/P: 5Vdc, 1000mA |
| Adapter 2 | Aohai | DONGGUAN AOHA TECHNOLOGY CO., LTD. | AD-5WU | I/P: 100-240Vac, 150mA O/P: 5Vdc, 1000mA |
| Battery | SCUD | SCUD (Fujian) Electronics CO., Ltd. | HE336 | Rating: 3.85Vdc, 2900mAh |
| Earphone 1 | Nokia | FIT | WH-108 | 1.5m non-shielded cable w/o core |
| Earphone 2 | Nokia | OBO | WH-108 | 1.5m non-shielded cable w/o core |
| USB Cable | Nokia | FIH | CA-190CD | 1.0m non-shielded cable w/o core |



2.2 DESCRIPTION OF TEST MODES

11 channels are provided for 802.11b, 802.11g and 802.11n (HT20):

| CHANNEL | FREQUENCY | CHANNEL | FREQUENCY |
|---------|-----------|---------|-----------|
| 1 | 2412 MHz | 7 | 2442 MHz |
| 2 | 2417 MHz | 8 | 2447 MHz |
| 3 | 2422 MHz | 9 | 2452 MHz |
| 4 | 2427 MHz | 10 | 2457 MHz |
| 5 | 2432 MHz | 11 | 2462 MHz |
| 6 | 2437 MHz | | |

40 channels are provided for BT-LE (GFSK):

| CHANNEL | FREQ. (MHZ) | CHANNEL | FREQ. (MHZ) | CHANNEL | FREQ. (MHZ) | CHANNEL | FREQ. (MHZ) |
|---------|-------------|---------|-------------|---------|-------------|---------|-------------|
| 0 | 2402 | 10 | 2422 | 20 | 2442 | 30 | 2462 |
| 1 | 2404 | 11 | 2424 | 21 | 2444 | 31 | 2464 |
| 2 | 2406 | 12 | 2426 | 22 | 2446 | 32 | 2466 |
| 3 | 2408 | 13 | 2428 | 23 | 2448 | 33 | 2468 |
| 4 | 2410 | 14 | 2430 | 24 | 2450 | 34 | 2470 |
| 5 | 2412 | 15 | 2432 | 25 | 2452 | 35 | 2472 |
| 6 | 2414 | 16 | 2434 | 26 | 2454 | 36 | 2474 |
| 7 | 2416 | 17 | 2436 | 27 | 2456 | 37 | 2476 |
| 8 | 2418 | 18 | 2438 | 28 | 2458 | 38 | 2478 |
| 9 | 2420 | 19 | 2440 | 29 | 2460 | 39 | 2480 |



2.2.1 CONFIGURATION OF SYSTEM UNDER TEST

Please see section 5 photographs of the test configuration for reference.

2.2.2 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 Y axis for radiated emission. Following test modes were selected for the final test, and the final worst case is marked in boldface and recorded in the report:

| EUT CONFIGURE MODE | APPLICABLE TO | | | | MODE |
|--------------------|---------------|-------|-----|------|------|
| | RE<1G | RE≥1G | PLC | APCM | |
| - | √ | √ | √ | - | - |

Where **RE<1G**: Radiated Emission below 1GHz **RE≥1G**: Radiated Emission above 1GHz
PLC: Power Line Conducted Emission **APCM**: Antenna Port Conducted Measurement

NOTE: No need to concern of Conducted Emission due to the EUT is powered by battery.

RADIATED EMISSION TEST (BELOW 1GHz):

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

| MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | DATA RATE (Mbps) |
|--------------|-------------------|----------------|-----------------------|-----------------|------------------|
| 802.11n HT20 | 1 to 11 | 11 | OFDM | BPSK | 6.5 |
| BT-LE | 0 to 39 | 39 | DTS | GFSK | 1 |



RADIATED EMISSION TEST (ABOVE 1GHz):

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

| MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | DATA RATE (Mbps) |
|--------------|-------------------|----------------|-----------------------|-----------------|------------------|
| 802.11n HT20 | 1 to 11 | 11 | OFDM | BPSK | 6.5 |
| BT-LE | 0 to 39 | 39 | DTS | GFSK | 1 |

POWER LINE CONDUCTED EMISSION TEST:

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

| MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | DATA RATE (Mbps) |
|--------------|-------------------|----------------|-----------------------|-----------------|------------------|
| 802.11n HT20 | 1 to 11 | 11 | OFDM | BPSK | 6.5 |

TEST CONDITION:

| APPLICABLE TO | ENVIRONMENTAL CONDITIONS | TEST VOLTAGE | TESTED BY |
|---------------|--------------------------|--------------------|-----------|
| RE<1G | 22deg. C, 54%RH | DC 5V from adaptor | Vincent |
| RE≥1G | 22deg. C, 54%RH | DC 5V from adaptor | Vincent |
| PLC | 24deg. C, 55%RH | DC 5V from adaptor | John Wen |



2.3 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, Section 15.247

KDB 558074 D01 DTS Meas Guidance v04

ANSI C63.10-2013

Note:

1. All test items have been performed and recorded as per the above standards.
2. The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (Certification). The test report has been issued separately.

2.4 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 | DC source | LONG WEI | PS-6403D | 010934269 | N/A |
| 2 | PC | HP | A6608CN | 3CR83825X3 | N/A |

| NO. | SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS |
|-----|---|
| 1 | DC Line: Unshielded, Detachable 1.0m |
| 2 | AC Line: Unshielded, Detachable 1.5m |



3 TEST TYPES AND RESULTS

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

| FREQUENCY OF EMISSION (MHz) | CONDUCTED LIMIT (dBµV) | |
|-----------------------------|------------------------|----------|
| | 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.

3.1.2 TEST INSTRUMENTS

| Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Next Cal. |
|---------------------|---------------|-----------|------------|------------|------------|
| EMI Test Receiver | Rohde&Schwarz | ESR3 | 101900 | Jun. 28,17 | Jun. 27,18 |
| EMC32 test software | Rohde&Schwarz | EMC32 | NA | NA | NA |
| LISN network | Rohde&Schwarz | ENV216 | 101922 | Sep. 18,17 | Sep. 17,18 |

- NOTE:**
1. The test was performed in CE shielded room.
 2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.



3.1.3 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.

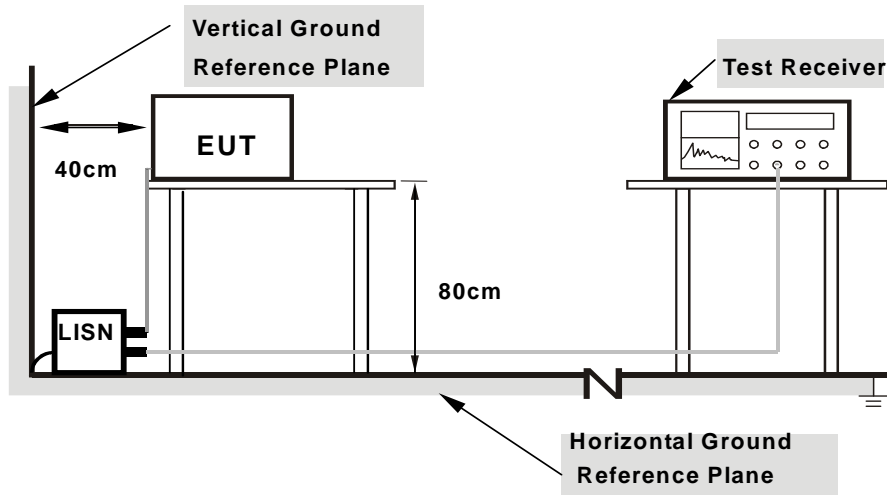
NOTE: All modes of operation were investigated and the worst-case emissions are reported.

3.1.4 DEVIATION FROM TEST STANDARD

No deviation.



3.1.5 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 cm from other units and other metal planes

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

3.1.6 EUT OPERATING CONDITIONS

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



3.1.7 TEST RESULTS

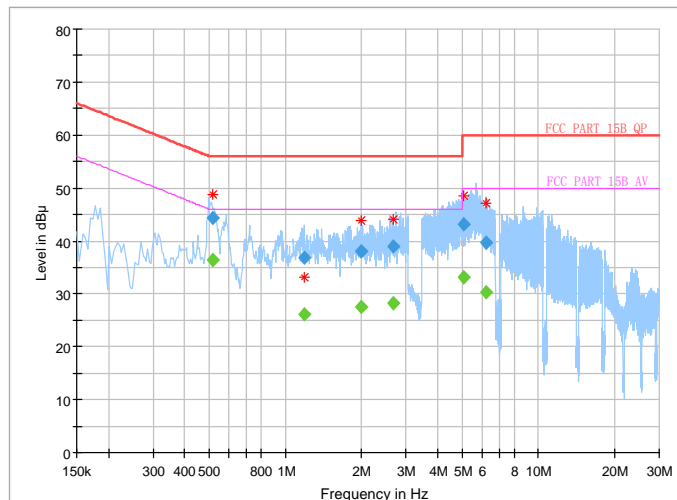
CONDUCTED WORST-CASE DATA:

| | | | |
|------------------------|----------------|---|---------------------------------------|
| Frequency Range | 150KHz ~ 30MHz | Detector Function & Resolution Bandwidth | Quasi-Peak (QP) / Average (AV), 9 kHz |
| Input Power | 120Vac, 60Hz | Environmental Conditions | 24deg. C, 55RH |
| Tested By | John Wen | TEST DATE | 2018/6/20 |

| Frequency (MHz) | QuasiPeak (dB μ V) | CAverage (dB μ V) | Limit (dB μ V) | Margin (dB) | Line | Filter | Corr. (dB) |
|-----------------|------------------------|-----------------------|--------------------|--------------|----------|-----------|------------|
| 0.516000 | --- | 36.41 | 46.00 | -9.59 | L | ON | 9.7 |
| 0.516000 | 44.29 | --- | 56.00 | -11.71 | L | ON | 9.7 |
| 1.192000 | --- | 26.11 | 46.00 | -19.89 | L | ON | 9.7 |
| 1.192000 | 36.96 | --- | 56.00 | -19.04 | L | ON | 9.7 |
| 1.992000 | --- | 27.50 | 46.00 | -18.50 | L | ON | 9.7 |
| 1.992000 | 38.11 | --- | 56.00 | -17.89 | L | ON | 9.7 |
| 2.672000 | --- | 28.27 | 46.00 | -17.73 | L | ON | 9.7 |
| 2.672000 | 38.95 | --- | 56.00 | -17.05 | L | ON | 9.7 |
| 5.072000 | --- | 33.02 | 50.00 | -16.98 | L | ON | 9.7 |
| 5.072000 | 43.16 | --- | 60.00 | -16.84 | L | ON | 9.7 |
| 6.196000 | --- | 30.32 | 50.00 | -19.68 | L | ON | 9.8 |
| 6.196000 | 39.69 | --- | 60.00 | -20.31 | L | ON | 9.8 |

- 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.

Full Spectrum

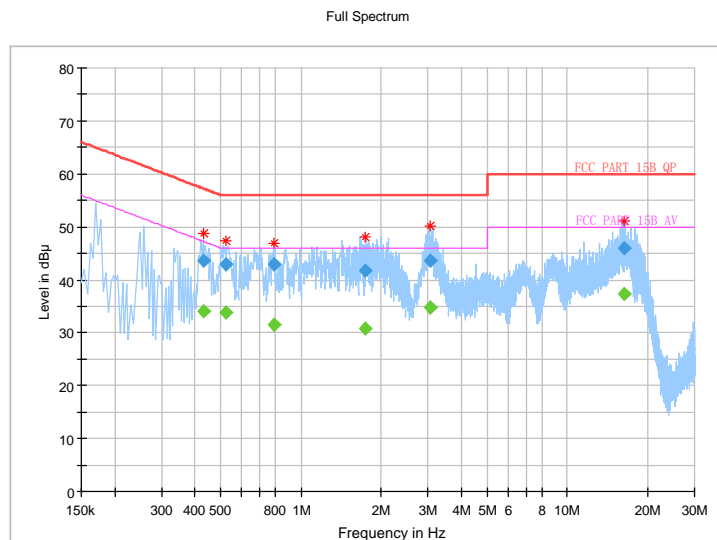




| | | | |
|------------------------|----------------|---|---------------------------------------|
| Frequency Range | 150KHz ~ 30MHz | Detector Function & Resolution Bandwidth | Quasi-Peak (QP) / Average (AV), 9 kHz |
| Input Power | 120Vac, 60Hz | Environmental Conditions | 24deg. C, 55RH |
| Tested By | John Wen | TEST DATE | 2018/6/20 |

| Frequency (MHz) | QuasiPeak (dBµV) | CAverage (dBµV) | Limit (dBµV) | Margin (dB) | Line | Filter | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|------|--------|------------|
| 0.432000 | --- | 34.11 | 47.21 | -13.10 | N | ON | 10.1 |
| 0.432000 | 43.70 | --- | 57.21 | -13.51 | N | ON | 10.1 |
| 0.520000 | --- | 33.81 | 46.00 | -12.19 | N | ON | 10.1 |
| 0.520000 | 42.83 | --- | 56.00 | -13.17 | N | ON | 10.1 |
| 0.792000 | --- | 31.40 | 46.00 | -14.60 | N | ON | 10.0 |
| 0.792000 | 42.94 | --- | 56.00 | -13.06 | N | ON | 10.0 |
| 1.734000 | --- | 30.90 | 46.00 | -15.10 | N | ON | 9.8 |
| 1.734000 | 41.74 | --- | 56.00 | -14.26 | N | ON | 9.8 |
| 3.064000 | --- | 34.69 | 46.00 | -11.31 | N | ON | 9.8 |
| 3.064000 | 43.60 | --- | 56.00 | -12.40 | N | ON | 9.8 |
| 16.432000 | --- | 37.40 | 50.00 | -12.60 | N | ON | 10.0 |
| 16.432000 | 45.84 | --- | 60.00 | -14.16 | N | ON | 10.0 |

- 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.





3.2 RADIATED EMISSION MEASUREMENT

3.2.1 LIMITS OF RADIATED EMISSION 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).

| 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.



3.2.2 TEST INSTRUMENTS

| Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Next Cal. |
|----------------------------|--------------|-----------------------------|-----------------------------|------------|------------|
| 3m Semi-anechoic Chamber | ETS-LINDGREN | 9m*6m*6m | Euroshieldpn-CT0001143-1216 | Apr. 21,18 | Apr. 20,19 |
| Bilog Antenna | ETS-LINDGREN | 3143B | 00161965 | Nov. 26,16 | Nov. 25,18 |
| Horn Antenna | ETS-LINDGREN | 3117 | 00168728 | Nov. 26,16 | Nov. 25,18 |
| Loop antenna | Daze | ZN30900A | 0708 | Nov. 20,17 | Nov. 19,18 |
| Horn Antenna (18GHz-40GHz) | N/A | QWH-SL-18-40-K-SG/QMS-00361 | 15433 | Dec. 16,16 | Dec. 15,18 |
| Test Software | E3 | V 9.160323 | N/A | N/A | N/A |
| Test Software | ADT | ADT_Radiated_V7.6.15.9.2 | N/A | N/A | N/A |
| 10dB Attenuator | JFW/USA | 50HF-010-SMA | 1505 | Jul. 24,17 | Jul. 23,18 |
| MXE EMI Receiver | KEYSIGHT | N9038A-544 | MY54450026 | Mar. 16,18 | Mar. 15,19 |
| Signal Pre-Amplifier | EMSI | EMC 9135 | 980249 | Jul. 24,17 | Jul. 23,18 |
| Signal Pre-Amplifier | EMSI | EMC 012645B | 980257 | Jul. 24,17 | Jul. 23,18 |
| Signal Pre-Amplifier | EMSI | EMC 184045B | 980259 | Jul. 24,17 | Jul. 23,18 |

- NOTE:**
1. The calibration interval of the above test instruments is 12 months or 24 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
 2. The test was performed in 3m Chamber.
 3. The FCC Site Registration No. is 525120.



3.2.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters (for below 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. 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 (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average (Duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor ($10 \log(1/\text{duty cycle})$).
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (Duty cycle \geq 98%) for Average detection (AV) at frequency above 1GHz.
5. All modes of operation were investigated and the worst-case emissions are reported.

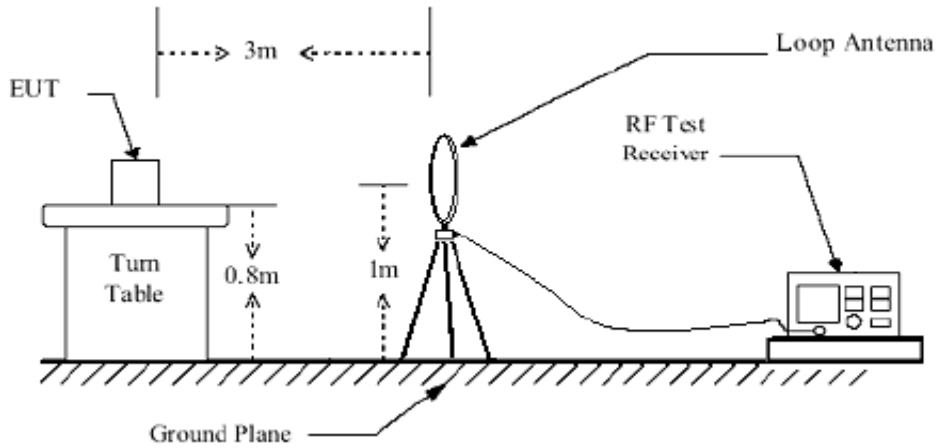
3.2.4 DEVIATION FROM TEST STANDARD

No deviation

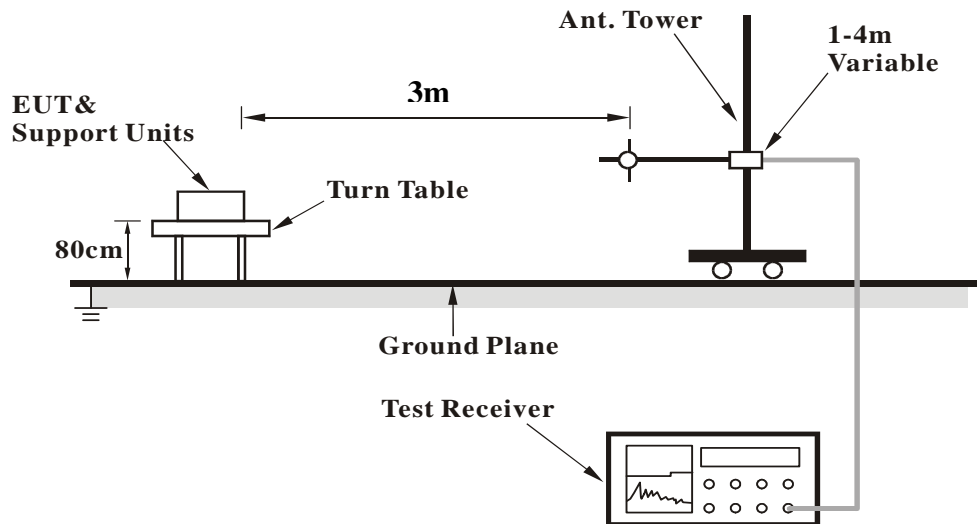


3.2.5 TEST SETUP

< Frequency Range below 30MHz >

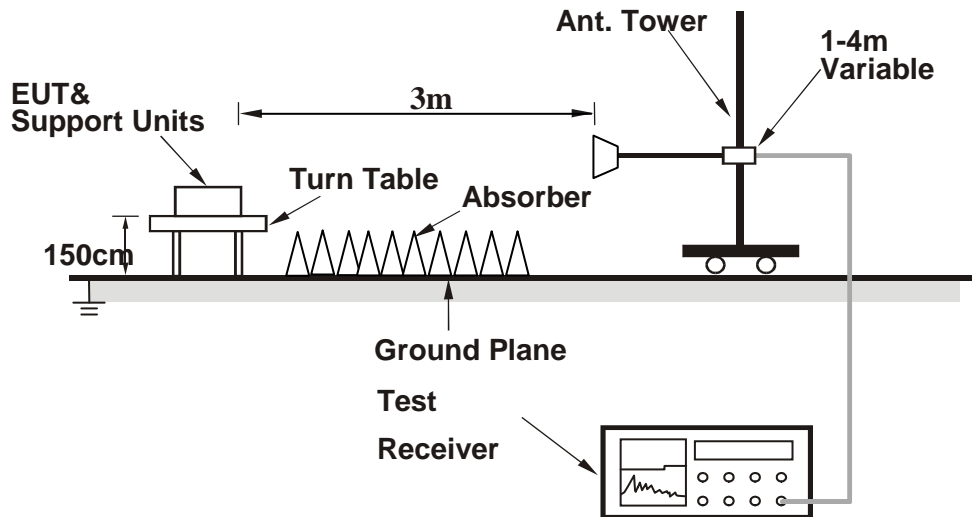


< Frequency Range 30MHz~1GHz >





<Frequency Range above 1GHz>



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

3.2.6 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.



3.2.7 TEST RESULTS

BELOW 1GHz WORST-CASE DATA:

9 KHz – 30 MHz data: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required in the report.

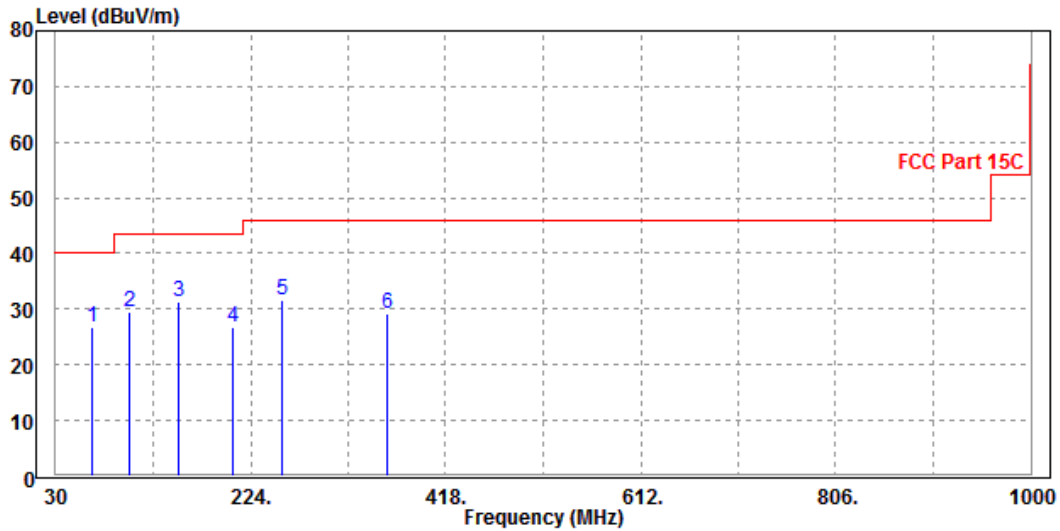
30 MHz – 1GHz data:
802.11n (20MHz)

| | | | |
|------------------------|---------------|--------------------------|-----------------|
| CHANNEL | TX Channel 11 | DETECTOR FUNCTION | Quasi-Peak (QP) |
| FREQUENCY RANGE | 30MHz ~ 1GHz | | |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | |
|---|-------------------------|-------------------|----------------|-------------|------------------------|-----------------|--------------------|---------------------|----------------------|--------|
| FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK |
| 66.86 | 26.72 | 56.01 | 40 | -13.28 | 6.74 | 1.25 | 37.28 | 200 | 0 | QP |
| 103.72 | 29.44 | 56.98 | 43.5 | -14.06 | 7.87 | 1.57 | 36.98 | 200 | 0 | QP |
| 152.22 | 31.3 | 56.77 | 43.5 | -12.2 | 9.42 | 1.89 | 36.78 | 200 | 0 | QP |
| 205.57 | 26.84 | 50.82 | 43.5 | -16.66 | 10.36 | 2.2 | 36.54 | 200 | 0 | QP |
| 256.01 | 31.77 | 53.34 | 46 | -14.23 | 12.47 | 2.48 | 36.52 | 200 | 0 | QP |
| 359.8 | 29.14 | 47.28 | 46 | -16.86 | 15.51 | 2.98 | 36.63 | 200 | 0 | QP |

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
 Margin value = Emission level – Limit value.



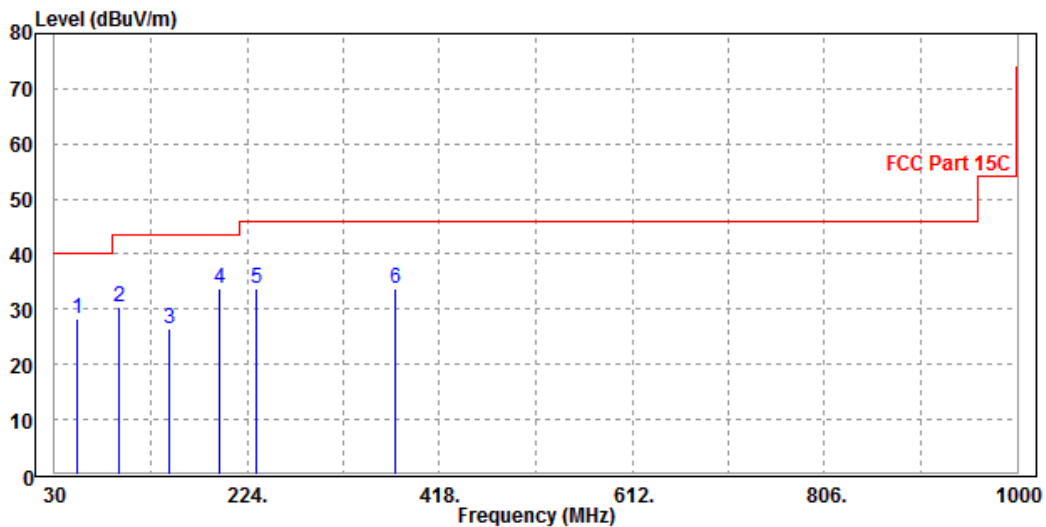


| | | | |
|------------------------|---------------|--------------------------|-----------------|
| CHANNEL | TX Channel 11 | DETECTOR FUNCTION | Quasi-Peak (QP) |
| FREQUENCY RANGE | 30MHz ~ 1GHz | | |

| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | |
|---|-------------------------|-------------------|----------------|-------------|------------------------|-----------------|--------------------|---------------------|----------------------|--------|
| FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK |
| 52.31 | 28.42 | 58.21 | 40 | -11.58 | 6.48 | 1.1 | 37.37 | 100 | 0 | QP |
| 94.99 | 30.34 | 58.41 | 43.5 | -13.16 | 7.45 | 1.5 | 37.02 | 100 | 0 | QP |
| 145.43 | 26.32 | 52.63 | 43.5 | -17.18 | 8.65 | 1.85 | 36.81 | 100 | 0 | QP |
| 195.87 | 33.88 | 58.24 | 43.5 | -9.62 | 10.06 | 2.15 | 36.57 | 100 | 0 | QP |
| 233.7 | 33.88 | 56.4 | 46 | -12.12 | 11.65 | 2.36 | 36.53 | 100 | 0 | QP |
| 373.38 | 33.68 | 51.22 | 46 | -12.32 | 16.08 | 3.04 | 36.66 | 100 | 0 | QP |

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.





ABOVE 1GHZ WORST-CASE DATA:

Note: For higher frequency, the emission is too low to be detected.

802.11n (20MHz)

| | | | |
|------------------------|---------------|--------------------------|--------------|
| CHANNEL | TX Channel 11 | DETECTOR FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 25GHz | | Average (AV) |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | |
|--|-------------------------|-------------------|----------------|--------------|------------------------|-----------------|--------------------|---------------------|----------------------|----------------|
| FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK |
| 2390 | 41.02 | 49.19 | 54 | -12.98 | 32.87 | 4.88 | 45.92 | 200 | 190 | Average |
| 2390 | 53.15 | 61.32 | 74 | -20.85 | 32.87 | 4.88 | 45.92 | 200 | 190 | Peak |
| 2462 | 95.24 | 103.23 | | | 32.95 | 4.96 | 45.9 | 200 | 190 | Average |
| 2462 | 103.49 | 111.48 | | | 32.95 | 4.96 | 45.9 | 200 | 190 | Peak |
| 2483.5 | 48.62 | 56.55 | 54 | -5.38 | 32.98 | 4.98 | 45.89 | 200 | 190 | Average |
| 2483.5 | 66.34 | 74.27 | 74 | -7.66 | 32.98 | 4.98 | 45.89 | 200 | 190 | Peak |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | |
| FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK |
| 2390 | 39.3 | 47.47 | 54 | -14.7 | 32.87 | 4.88 | 45.92 | 100 | 110 | Average |
| 2390 | 55.07 | 63.24 | 74 | -18.93 | 32.87 | 4.88 | 45.92 | 100 | 110 | Peak |
| 2462 | 96.69 | 104.68 | | | 32.95 | 4.96 | 45.9 | 100 | 110 | Average |
| 2462 | 106.27 | 114.26 | | | 32.95 | 4.96 | 45.9 | 100 | 110 | Peak |
| 2483.5 | 46.29 | 54.22 | 54 | -7.71 | 32.98 | 4.98 | 45.89 | 100 | 110 | Average |
| 2483.5 | 64.51 | 72.44 | 74 | -9.49 | 32.98 | 4.98 | 45.89 | 100 | 110 | Peak |

REMARKS:

- Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
- 2462MHz: Fundamental frequency.



BELOW 1GHz WORST-CASE DATA:

9 KHz – 30 MHz data: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required in the report.

30 MHz – 1GHz data:

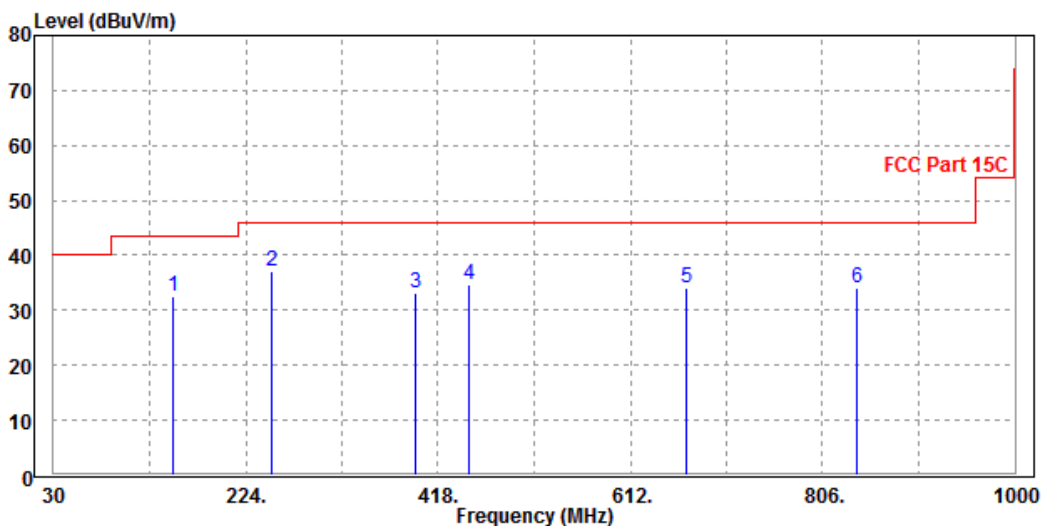
BT-LE (GFSK)

| | | | |
|-----------------|---------------|-------------------|-----------------|
| CHANNEL | TX Channel 39 | DETECTOR FUNCTION | Quasi-Peak (QP) |
| FREQUENCY RANGE | 30MHz ~ 1GHz | | |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | |
|---|-------------------------|-------------------|----------------|-------------|------------------------|-----------------|--------------------|---------------------|----------------------|--------|
| FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK |
| 150.28 | 32.68 | 58.36 | 43.5 | -10.82 | 9.23 | 1.88 | 36.79 | 100 | 360 | QP |
| 250.19 | 37.01 | 58.68 | 46 | -8.99 | 12.4 | 2.45 | 36.52 | 100 | 360 | QP |
| 395.69 | 33.15 | 49.71 | 46 | -12.85 | 17.02 | 3.13 | 36.71 | 100 | 360 | QP |
| 450.01 | 34.76 | 50.49 | 46 | -11.24 | 17.8 | 3.31 | 36.84 | 100 | 360 | QP |
| 669.23 | 34.22 | 45.11 | 46 | -11.78 | 22.24 | 4.2 | 37.33 | 100 | 360 | QP |
| 840.92 | 34 | 43.82 | 46 | -12 | 23 | 4.8 | 37.62 | 100 | 360 | QP |

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) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value



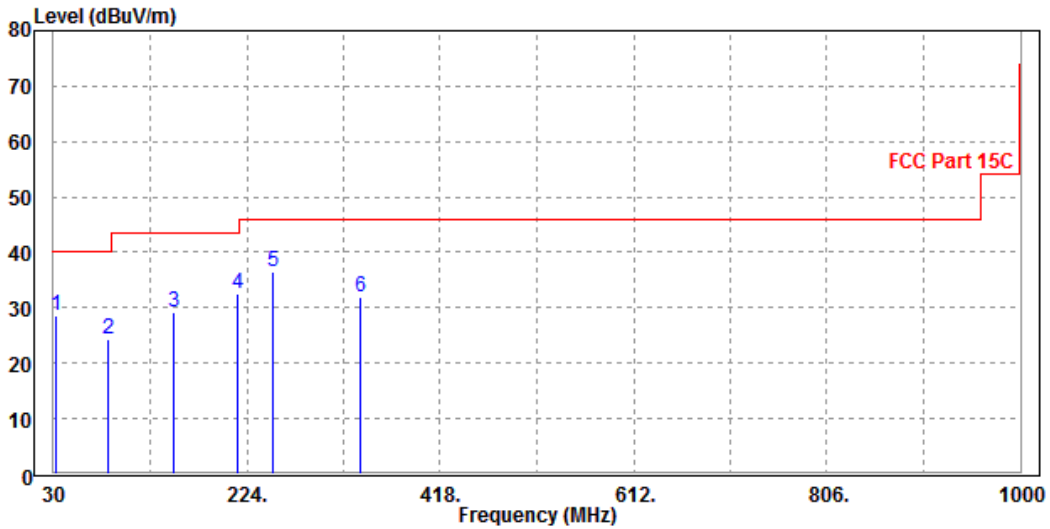


| | | | |
|------------------------|---------------|------------------------------|-----------------|
| CHANNEL | TX Channel 39 | DETECTOR FUNCTION | Quasi-Peak (QP) |
| FREQUENCY RANGE | 30MHz ~ 1GHz | | |

| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | |
|---|-------------------------|-------------------|----------------|-------------|------------------------|-----------------|--------------------|---------------------|----------------------|--------|
| FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK |
| 33.25 | 28.48 | 50.3 | 40 | -11.52 | 14.86 | 0.85 | 37.53 | 100 | 0 | QP |
| 84.32 | 24.42 | 53.38 | 40 | -15.58 | 6.73 | 1.41 | 37.1 | 100 | 0 | QP |
| 150.28 | 29.2 | 54.88 | 43.5 | -14.3 | 9.23 | 1.88 | 36.79 | 100 | 0 | QP |
| 214.3 | 32.4 | 55.92 | 43.5 | -11.1 | 10.76 | 2.25 | 36.53 | 100 | 0 | QP |
| 250.19 | 36.61 | 58.28 | 46 | -9.39 | 12.4 | 2.45 | 36.52 | 100 | 0 | QP |
| 337.49 | 32.07 | 51.2 | 46 | -13.93 | 14.57 | 2.88 | 36.58 | 100 | 0 | QP |

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) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value



**ABOVE 1GHz TEST DATA:****Note:** For higher frequency, the emission is too low to be detected.**BT-LE (GFSK)**

| | | | |
|------------------------|---------------|------------------------------|--------------|
| CHANNEL | TX Channel 39 | DETECTOR FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 25GHz | | Average (AV) |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | |
|--|-------------------------|-------------------|----------------|-------------|------------------------|-----------------|--------------------|---------------------|----------------------|---------|
| FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK |
| 2390 | 40.75 | 46.23 | 54 | -13.25 | 32.29 | 8.15 | 45.92 | 110 | 130 | Average |
| 2390 | 54.97 | 60.45 | 74 | -19.03 | 32.29 | 8.15 | 45.92 | 110 | 130 | Peak |
| 2480 | 90.06 | 95.27 | | | 32.38 | 8.31 | 45.9 | 110 | 130 | Average |
| 2480 | 97.76 | 102.97 | | | 32.38 | 8.31 | 45.9 | 110 | 130 | Peak |
| 2483.5 | 46.05 | 51.24 | 54 | -7.95 | 32.38 | 8.32 | 45.89 | 110 | 130 | Average |
| 2483.5 | 58.04 | 63.23 | 74 | -15.96 | 32.38 | 8.32 | 45.89 | 110 | 130 | Peak |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | |
| FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | READ LEVEL (dBuV) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA FACTOR (dB /m) | CABLE LOSS (dB) | PREAMP FACTOR (dB) | ANTENNA HEIGHT (cm) | TABLE ANGLE (Degree) | REMARK |
| 2390 | 41.84 | 50.01 | 54 | -12.16 | 32.87 | 4.88 | 45.92 | 104 | 100 | Average |
| 2390 | 53.74 | 61.91 | 74 | -20.26 | 32.87 | 4.88 | 45.92 | 104 | 100 | Peak |
| 2480 | 89.37 | 97.31 | | | 32.98 | 4.98 | 45.9 | 104 | 100 | Average |
| 2480 | 94.51 | 102.45 | | | 32.98 | 4.98 | 45.9 | 104 | 100 | Peak |
| 2483.5 | 44.18 | 52.11 | 54 | -9.82 | 32.98 | 4.98 | 45.89 | 104 | 100 | Average |
| 2483.5 | 56.3 | 64.23 | 74 | -17.7 | 32.98 | 4.98 | 45.89 | 104 | 100 | Peak |

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
2. 2480MHz: Fundamental frequency.



BUREAU Test Report No.: RF180604W006-2
VERITAS

4 PHOTOGRAPHS OF THE TEST CONFIGURATION

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



**BUREAU
VERITAS**

Test Report No.: RF180604W006-2

5 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---