

TEST REPORT

Product : Smart lock
Trade mark : ofo
Model/Type reference : TWX5G02
Serial Number : N/A
Report Number : EED32J00098302
FCC ID : 2AMBSTWX5G02-1
Date of Issue : Jun. 13, 2017
Test Standards : 47 CFR Part 15 Subpart C
Test result : PASS

Prepared for:

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Date:

Jun. 13, 2017

Check No.: 2447639457



Report No. : EED32J00098302

Page 2 of 45

2 Version

| Version No. | Date | Description |
|-------------|---------------|-------------|
| 00 | Jun. 13, 2017 | Original |
| | | |
| | | |

3 Test Summary

| Test Item | Test Requirement | Test method | Result |
|--|---|-------------------------------------|--------|
| Antenna Requirement | 47 CFR Part 15Subpart C Section 15.203/15.247 (c) | ANSI C63.10-2013 | PASS |
| AC Power Line Conducted Emission | 47 CFR Part 15Subpart C Section 15.207 | ANSI C63.10-2013 | N/A |
| Conducted Peak Output Power | 47 CFR Part 15Subpart C Section 15.247 (b)(3) | ANSI C63.10-2013/ KDB 558074 D01v04 | PASS |
| 6dB Occupied Bandwidth | 47 CFR Part 15Subpart C Section 15.247 (a)(2) | ANSI C63.10-2013/ KDB 558074 D01v04 | PASS |
| Power Spectral Density | 47 CFR Part 15Subpart C Section 15.247 (e) | ANSI C63.10-2013/ KDB 558074 D01v04 | PASS |
| Band-edge for RF Conducted Emissions | 47 CFR Part 15Subpart C Section 15.247(d) | ANSI C63.10-2013/ KDB 558074 D01v04 | PASS |
| RF Conducted Spurious Emissions | 47 CFR Part 15Subpart C Section 15.247(d) | ANSI C63.10-2013/ KDB 558074 D01v04 | PASS |
| Radiated Spurious Emissions | 47 CFR Part 15Subpart C Section 15.205/15.209 | ANSI C63.10-2013 | PASS |
| Restricted bands around fundamental frequency (Radiated Emission) | 47 CFR Part 15Subpart C Section 15.205/15.209 | ANSI C63.10-2013 | PASS |

Remark:

Test according to ANSI C63.4-2014 & ANSI C63.10-2013.

The tested sample and the sample information are provided by the client.

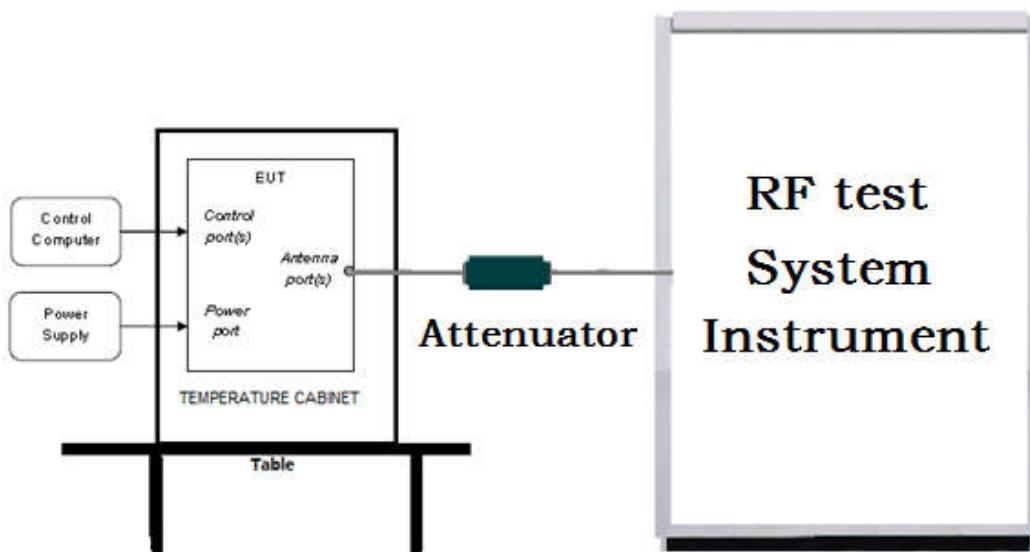
4 Content

| | |
|---|----|
| 1 COVER PAGE | 1 |
| 2 VERSION | 2 |
| 3 TEST SUMMARY | 3 |
| 4 CONTENT | 4 |
| 5 TEST REQUIREMENT | 5 |
| 5.1 TEST SETUP | 5 |
| 5.1.1 For Conducted test setup | 5 |
| 5.1.2 For Radiated Emissions test setup | 5 |
| 5.1.3 For Conducted Emissions test setup | 6 |
| 5.2 TEST ENVIRONMENT | 6 |
| 5.3 TEST CONDITION | 6 |
| 6 GENERAL INFORMATION | 7 |
| 6.1 CLIENT INFORMATION | 7 |
| 6.2 GENERAL DESCRIPTION OF EUT | 7 |
| 6.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD | 7 |
| 6.4 DESCRIPTION OF SUPPORT UNITS | 8 |
| 6.5 TEST LOCATION | 8 |
| 6.6 TEST FACILITY | 8 |
| 6.7 DEVIATION FROM STANDARDS | 9 |
| 6.8 ABNORMALITIES FROM STANDARD CONDITIONS | 9 |
| 6.9 OTHER INFORMATION REQUESTED BY THE CUSTOMER | 9 |
| 6.10 MEASUREMENT UNCERTAINTY (95% CONFIDENCE LEVELS, K=2) | 9 |
| 7 EQUIPMENT LIST | 10 |
| 8 RADIO TECHNICAL REQUIREMENTS SPECIFICATION | 12 |
| Appendix A): 6dB Occupied Bandwidth | 13 |
| Appendix B): Conducted Peak Output Power | 15 |
| Appendix C): Band-edge for RF Conducted Emissions | 17 |
| Appendix D): RF Conducted Spurious Emissions | 18 |
| Appendix E): Power Spectral Density | 21 |
| Appendix F): Antenna Requirement | 23 |
| Appendix G): Restricted bands around fundamental frequency (Radiated) | 24 |
| Appendix H): Radiated Spurious Emissions | 28 |
| PHOTOGRAPHS OF TEST SETUP | 33 |
| PHOTOGRAPHS OF EUT CONSTRUCTIONAL DETAILS | 35 |

5 Test Requirement

5.1 Test setup

5.1.1 For Conducted test setup



5.1.2 For Radiated Emissions test setup

Radiated Emissions setup:

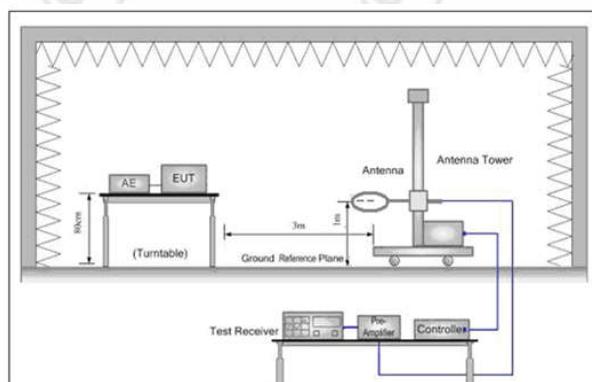


Figure 1. Below 30MHz

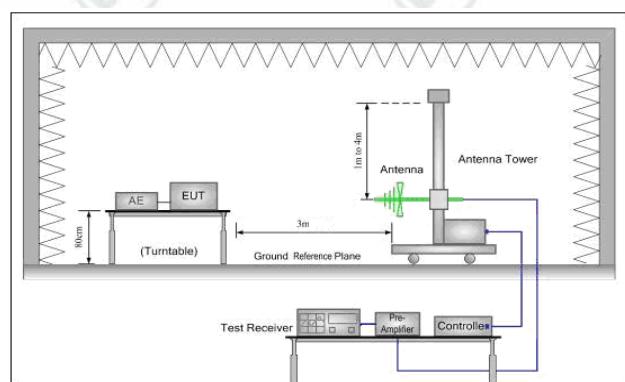


Figure 2. 30MHz to 1GHz

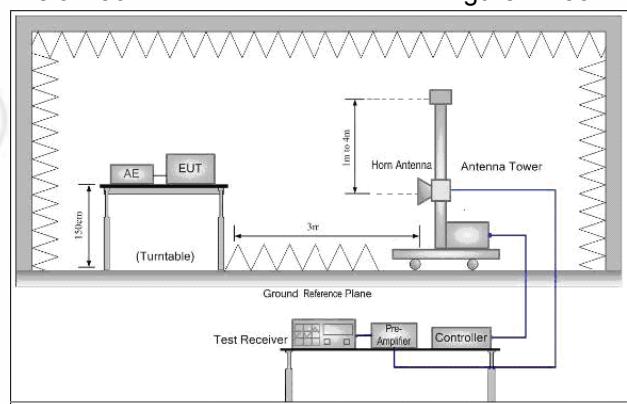
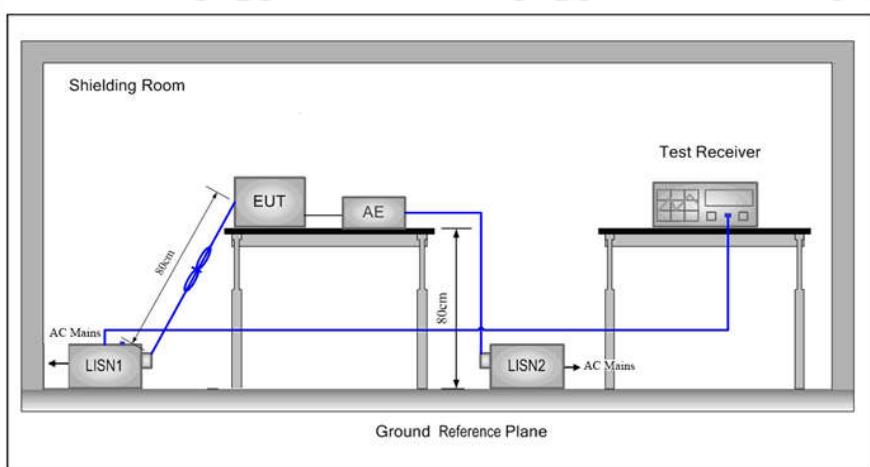


Figure 3. Above 1GHz

5.1.3 For Conducted Emissions test setup

Conducted Emissions setup



5.2 Test Environment

Operating Environment:

| | |
|-----------------------|-----------|
| Temperature: | 25°C |
| Humidity: | 52% RH |
| Atmospheric Pressure: | 1010 mbar |

5.3 Test Condition

Test channel:

| Test Mode | Tx | RF Channel | | |
|--------------------|---|----------------------|-----------------------|-----------------------|
| | | Low(L) | Middle(M) | High(H) |
| GFSK | 2402MHz ~2480 MHz | Channel 1 2402MHz | Channel 20 2440MHz | Channel 40 2480MHz |
| Transmitting mode: | The EUT transmitted the continuous modulation test signal at the specific channel(s). | | | |

6 General Information

6.1 Client Information

| | |
|--------------------------|---|
| Applicant: | Dongxia Datong(Beijing) Management and Consulting Co.,Ltd |
| Address of Applicant: | 11th Floor, Ideal Plaza, No.58, North 4th Ring Road West, Haidian District, Beijing, P.R. China |
| Manufacturer: | Dongxia Datong(Beijing) Management and Consulting Co.,Ltd. |
| Address of Manufacturer: | 11th Floor, Ideal Plaza, No.58, North 4th Ring Road West, Haidian District, Beijing, P.R. China |
| Factory 1: | Hi-P(Shanghai)Housing APPLIANCE Co.,Ltd. |
| Address of Factory 1: | Factory buildings 4#, No.79 Jinwen road, Zhuqiao Airport Industrial ZONE, Pudong New Area Shanghai China 201323 |
| Factory 1: | Flextronics Computing (SuZhou) Co.,Ltd |
| Address of Factory 1: | No. 1 Guanpu Road, Guoxiang Street, Wuzhong District Suzhou, Jiangsu, China, 215124 |

6.2 General Description of EUT

| | |
|----------------------------------|--|
| Product Name: | Smart lock |
| Model No.: | TWX5G02 |
| Trade Mark: | ofo |
| EUT Supports Radios application: | GSM 850/1900 GPRS,EGPRS, WCDMA Band II(1900MHz), Band V(850MHz), BT 4.0 BLE, GPS L1:1575.42MHz |
| Battery | 3.6V,19Ah |
| Sample Received Date: | May 23, 2017 |
| Sample tested Date: | May 23, 2017 to Jun. 12, 2017 |

6.3 Product Specification subjective to this standard

| | |
|-----------------------|--|
| Operation Frequency: | 2402MHz~2480MHz |
| Bluetooth Version: | BT 4.0 |
| Modulation Technique: | DSSS |
| Modulation Type: | GFSK |
| Number of Channel: | 40 |
| Antenna Type: | PIFA |
| Antenna Gain: | BT: 2.2dBi |
| Test Power Grade: | N/A |
| Test Software of EUT: | nRFgo Studio V 1.20.0.2 (manufacturer declare) |
| Test Voltage: | DC 3.6V |

Operation Frequency each of channel

| Channel | Frequency | Channel | Frequency | Channel | Frequency | Channel | Frequency |
|---------|-----------|---------|-----------|---------|-----------|---------|-----------|
| 1 | 2402MHz | 11 | 2422MHz | 21 | 2442MHz | 31 | 2462MHz |
| 2 | 2404MHz | 12 | 2424MHz | 22 | 2444MHz | 32 | 2464MHz |
| 3 | 2406MHz | 13 | 2426MHz | 23 | 2446MHz | 33 | 2466MHz |
| 4 | 2408MHz | 14 | 2428MHz | 24 | 2448MHz | 34 | 2468MHz |
| 5 | 2410MHz | 15 | 2430MHz | 25 | 2450MHz | 35 | 2470MHz |
| 6 | 2412MHz | 16 | 2432MHz | 26 | 2452MHz | 36 | 2472MHz |

| | | | | | | | |
|----|---------|----|---------|----|---------|----|---------|
| 7 | 2414MHz | 17 | 2434MHz | 27 | 2454MHz | 37 | 2474MHz |
| 8 | 2416MHz | 18 | 2436MHz | 28 | 2456MHz | 38 | 2476MHz |
| 9 | 2418MHz | 19 | 2438MHz | 29 | 2458MHz | 39 | 2478MHz |
| 10 | 2420MHz | 20 | 2440MHz | 30 | 2460MHz | 40 | 2480MHz |

6.4 Description of Support Units

The EUT has been tested with associated equipment below.

| Test Ancillary equipment | Manufacturer | Model No. | Remark |
|--------------------------|--------------|-----------|--------|
| EUT A | -- | -- | -- |

6.5 Test Location

All tests were performed at:

Centre Testing International Group Co., Ltd.

Hongwei Industrial Zone, Bao'an 70 District, Shenzhen, Guangdong, China 518101

Telephone: +86 (0) 755 33683668 Fax:+86 (0) 755 33683385

No tests were sub-contracted.

6.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L1910

Centre Testing International Group Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories..

A2LA-Lab Cert. No. 3061.01

Centre Testing International Group Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

FCC-Registration No.: 886427

Centre Testing International Group Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 886427.

IC-Registration No.: 7408A-2

The 3m Alternate Test Site of Centre Testing International Group Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 7408A-2 .

IC-Registration No.: 7408B-1

The 10m Alternate Test Site of Centre Testing International Group Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 7408B-1.

NEMKO-Aut. No.: ELA503

Centre Testing International Group Co., Ltd. has been assessed the quality assurance system, the testing facilities, qualifications and testing practices of the relevant parts of the organization. The quality assurance system of the Laboratory has been validated against ISO/IEC 17025 or equivalent. The laboratory also fulfils the conditions described in Nemko Document NLA-10.

VCCI

The Radiation 3 & 10 meters site of Centre Testing International Group Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-4096.

Main Ports Conducted Interference Measurement of Centre Testing International Group Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: C-4563.

Telecommunication Ports Conducted Disturbance Measurement of Centre Testing International Group Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: T-2146.

The Radiation 3 meters site of Centre Testing International Group Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-758

6.7 Deviation from Standards

None.

6.8 Abnormalities from Standard Conditions

None.

6.9 Other Information Requested by the Customer

None.

6.10 Measurement Uncertainty (95% confidence levels, k=2)

| No. | Item | Measurement Uncertainty |
|-----|---------------------------------|-------------------------|
| 1 | Radio Frequency | 7.9×10^{-8} |
| 2 | RF power, conducted | 0.31dB (30MHz-1GHz) |
| | | 0.57dB (1GHz-18GHz) |
| 3 | Radiated Spurious emission test | 4.5dB (30MHz-1GHz) |
| | | 4.8dB (1GHz-12.75GHz) |
| 4 | Conduction emission | 3.6dB (9kHz to 150kHz) |
| | | 3.2dB (150kHz to 30MHz) |
| 5 | Temperature test | 0.64°C |
| 6 | Humidity test | 2.8% |
| 7 | DC power voltages | 0.025% |

7 Equipment List

| RF test system | | | | | |
|----------------------------------|---------------|------------------------------|---------------|------------------------|----------------------------|
| Equipment | Manufacturer | Mode No. | Serial Number | Cal. Date (mm-dd-yyyy) | Cal. Due date (mm-dd-yyyy) |
| Signal Generator | Keysight | E8257D | MY53401106 | 03-14-2017 | 03-13-2018 |
| Spectrum Analyzer | Keysight | N9010A | MY54510339 | 03-14-2017 | 03-13-2018 |
| Signal Generator | Keysight | N5182B | MY53051549 | 03-14-2017 | 03-13-2018 |
| High-pass filter | Sinoscite | FL3CX03WG18 NM12-0398-002 | --- | 01-12-2017 | 01-11-2018 |
| High-pass filter | MICRO-TRONICS | SPA-F-63029-4 | --- | 01-12-2017 | 01-11-2018 |
| DC Power | Keysight | E3642A | MY54436035 | 04-01-2017 | 03-31-2018 |
| PC-1 | Lenovo | R4960d | --- | 04-01-2017 | 03-31-2018 |
| power meter & power sensor | R&S | OSP120 | 101374 | 03-14-2017 | 03-13-2018 |
| RF control unit | JS Tonscend | JS0806-2 | 158060006 | 03-14-2017 | 03-13-2018 |
| BT&WI-FI Automatic test software | JS Tonscend | JS1120-2 | --- | 03-14-2017 | 03-13-2018 |

| Conducted disturbance Test | | | | | |
|---------------------------------|--------------|----------|---------------|------------------------|----------------------------|
| Equipment | Manufacturer | Mode No. | Serial Number | Cal. date (mm-dd-yyyy) | Cal. Due date (mm-dd-yyyy) |
| Receiver | R&S | ESCI | 100009 | 06-16-2016 | 06-15-2017 |
| Temperature/ Humidity Indicator | TAYLOR | 1451 | 1905 | 05-08-2017 | 05-07-2018 |
| LISN | R&S | ENV216 | 100098 | 06-16-2016 | 06-15-2017 |
| LISN | schwarzbeck | NNLK8121 | 8121-529 | 06-16-2016 | 06-15-2017 |
| Voltage Probe | R&S | ESH2-Z3 | -- | 07-09-2014 | 07-07-2017 |
| Current Probe | R&S | EZ17 | 100106 | 06-16-2016 | 06-15-2017 |
| ISN | TESEQ GmbH | ISN T800 | 30297 | 02-23-2017 | 02-22-2018 |

| 3M Semi/full-anechoic Chamber | | | | | |
|----------------------------------|---------------|---------------------------|---------------|------------------------|----------------------------|
| Equipment | Manufacturer | Mode No. | Serial Number | Cal. date (mm-dd-yyyy) | Cal. Due date (mm-dd-yyyy) |
| 3M Chamber & Accessory Equipment | TDK | SAC-3 | --- | 06-05-2016 | 06-05-2019 |
| TRILOG Broadband Antenna | SCHWARZBECK | VULB9163 | 9163-484 | 05-23-2017 | 05-22-2018 |
| Microwave Preamplifier | Agilent | 8449B | 3008A02425 | 02-16-2017 | 02-15-2018 |
| Horn Antenna | ETS-LINDGREN | 3117 | 00057410 | 06-30-2015 | 06-28-2018 |
| Horn Antenna | A.H.SYSTEMS | SAS-574 | 374 | 06-30-2015 | 06-28-2018 |
| Loop Antenna | ETS | 6502 | 00071730 | 07-30-2015 | 07-28-2017 |
| Microwave Preamplifier | A.H.SYSTEMS | PAP-1840-60 | 6041.6042 | 06-30-2015 | 06-28-2018 |
| Horn Antenna | A.H.SYSTEMS | SAS-574 | 374 | 06-30-2015 | 06-28-2018 |
| Spectrum Analyzer | R&S | FSP40 | 100416 | 06-16-2016 | 06-15-2017 |
| Receiver | R&S | ESCI | 100435 | 06-16-2016 | 06-15-2017 |
| Multi device Controller | maturo | NCD/070/1071 1112 | --- | 01-12-2017 | 01-11-2018 |
| LISN | schwarzbeck | NNBM8125 | 81251547 | 06-16-2016 | 06-15-2017 |
| LISN | schwarzbeck | NNBM8125 | 81251548 | 06-16-2016 | 06-15-2017 |
| Signal Generator | Agilent | E4438C | MY45095744 | 03-14-2017 | 03-13-2018 |
| Signal Generator | Keysight | E8257D | MY53401106 | 03-14-2017 | 03-13-2018 |
| Temperature/ Humidity Indicator | TAYLOR | 1451 | 1905 | 05-08-2017 | 05-07-2018 |
| Cable line | Fulai(7M) | SF106 | 5219/6A | 01-12-2017 | 01-11-2018 |
| Cable line | Fulai(6M) | SF106 | 5220/6A | 01-12-2017 | 01-11-2018 |
| Cable line | Fulai(3M) | SF106 | 5216/6A | 01-12-2017 | 01-11-2018 |
| Cable line | Fulai(3M) | SF106 | 5217/6A | 01-12-2017 | 01-11-2018 |
| High-pass filter | Sinoscite | FL3CX03WG1 8NM12-0398-002 | --- | 01-12-2017 | 01-11-2018 |
| High-pass filter | MICRO-TRONICS | SPA-F-63029-4 | --- | 01-12-2017 | 01-11-2018 |
| band rejection filter | Sinoscite | FL5CX01CA09 CL12-0395-001 | --- | 01-12-2017 | 01-11-2018 |
| band rejection filter | Sinoscite | FL5CX01CA08 CL12-0393-001 | --- | 01-12-2017 | 01-11-2018 |
| band rejection filter | Sinoscite | FL5CX02CA04 CL12-0396-002 | --- | 01-12-2017 | 01-11-2018 |
| band rejection filter | Sinoscite | FL5CX02CA03 CL12-0394-001 | --- | 01-12-2017 | 01-11-2018 |

8 Radio Technical Requirements Specification

Reference documents for testing:

| No. | Identity | Document Title |
|-----|------------------|---|
| 1 | FCC Part15C | Subpart C-Intentional Radiators |
| 2 | ANSI C63.10-2013 | American National Standard for Testing Unlicesed Wireless Devices |

Test Results List:

| Test Requirement | Test method | Test item | Verdict | Note |
|-----------------------------------|-------------|---|---------|-------------|
| Part15C Section 15.247 (a)(2) | ANSI C63.10 | 6dB Occupied Bandwidth | PASS | Appendix A) |
| Part15C Section 15.247 (b)(3) | ANSI C63.10 | Conducted Peak Output Power | PASS | Appendix B) |
| Part15C Section 15.247(d) | ANSI C63.10 | Band-edge for RF Conducted Emissions | PASS | Appendix C) |
| Part15C Section 15.247(d) | ANSI C63.10 | RF Conducted Spurious Emissions | PASS | Appendix D) |
| Part15C Section 15.247 (e) | ANSI C63.10 | Power Spectral Density | PASS | Appendix E) |
| Part15C Section 15.203/15.247 (c) | ANSI C63.10 | Antenna Requirement | PASS | Appendix F) |
| Part15C Section 15.207 | ANSI C63.10 | AC Power Line Conducted Emission | PASS | N/A |
| Part15C Section 15.205/15.209 | ANSI C63.10 | Restricted bands around fundamental frequency (Radiated Emission) | PASS | Appendix G) |
| Part15C Section 15.205/15.209 | ANSI C63.10 | Radiated Spurious Emissions | PASS | Appendix H) |

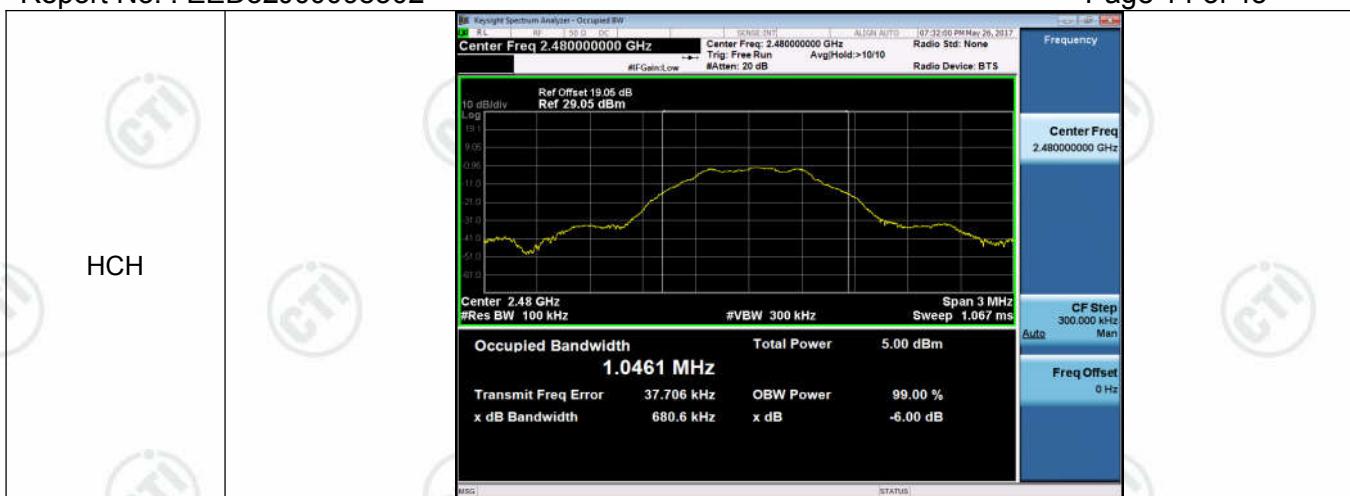
Appendix A): 6dB Occupied Bandwidth

Test Result

| Mode | Channel | 6dB Bandwidth [MHz] | 99% OBW[MHz] | Verdict | Remark |
|------|---------|---------------------|--------------|---------|------------------|
| BLE | LCH | 0.6760 | 1.0584 | PASS | Peak detector |
| BLE | MCH | 0.6896 | 1.0533 | PASS | |
| BLE | HCH | 0.6806 | 1.0461 | PASS | |

Test Graphs



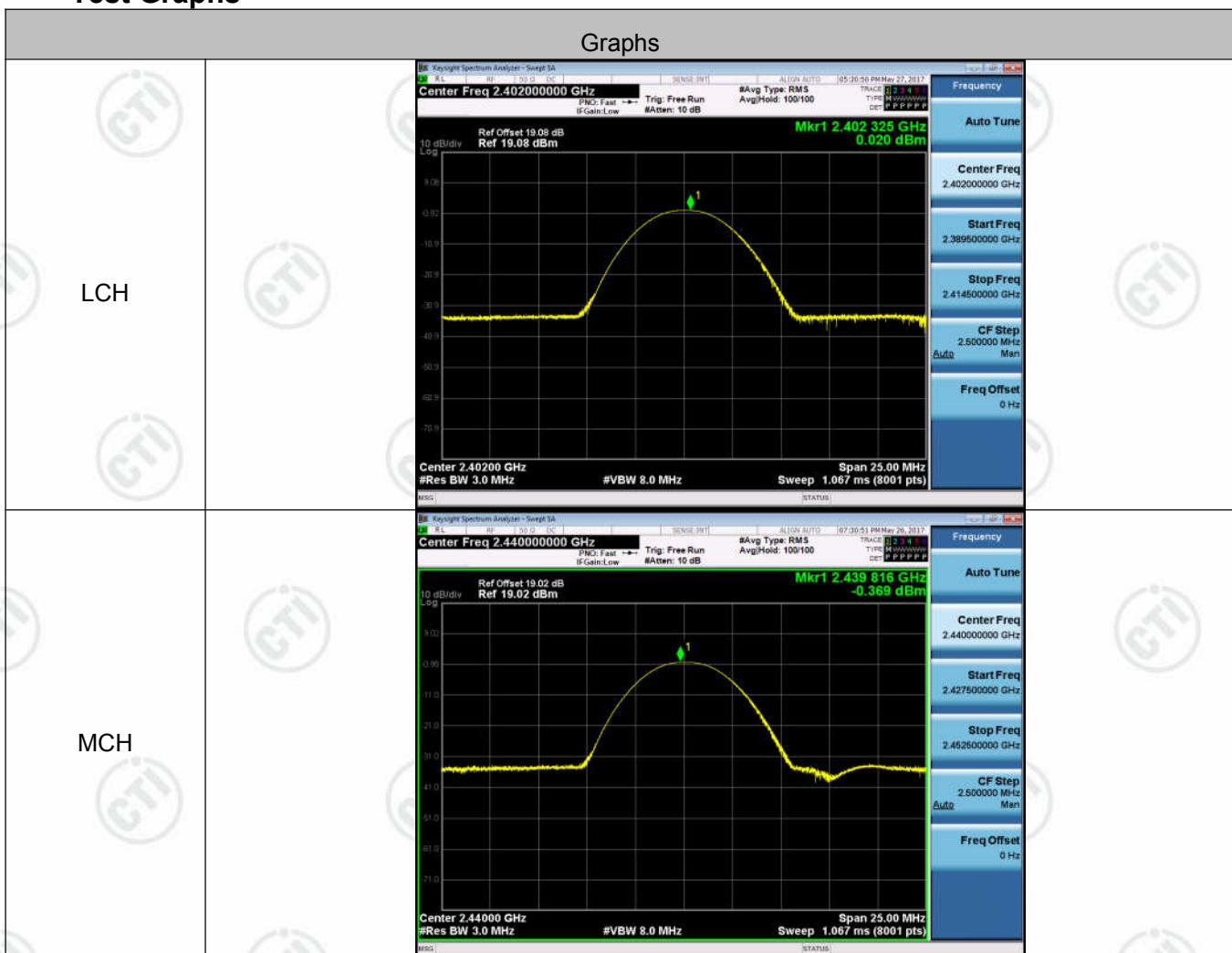


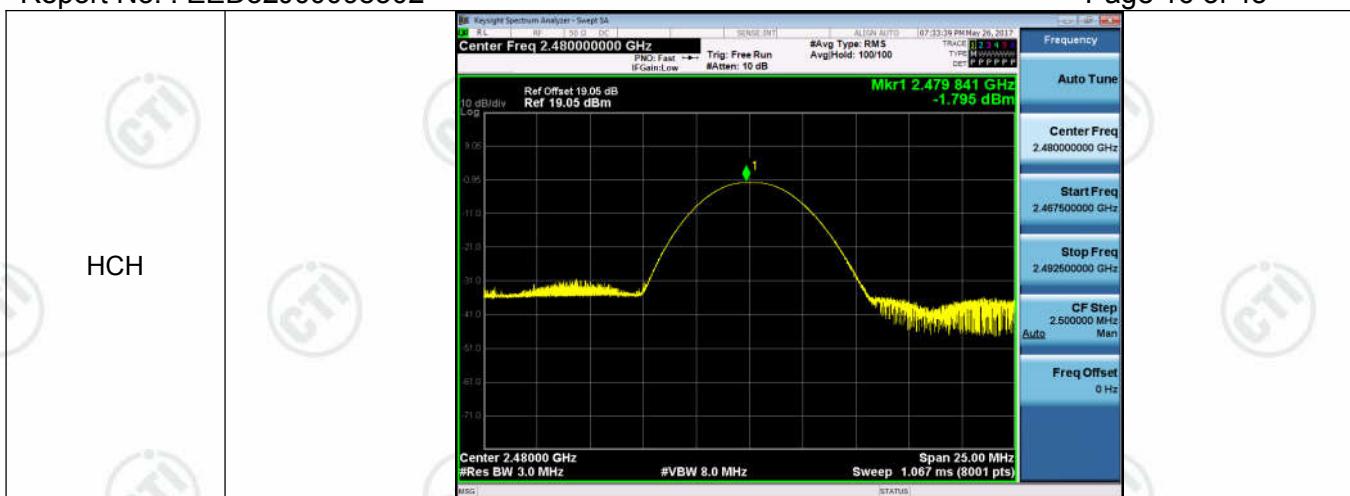
Appendix B): Conducted Peak Output Power

Test Result

| Mode | Channel | Conduct Peak Power[dBm] | Verdict |
|------|---------|-------------------------|---------|
| BLE | LCH | 0.02 | PASS |
| BLE | MCH | -0.369 | PASS |
| BLE | HCH | -1.795 | PASS |

Test Graphs



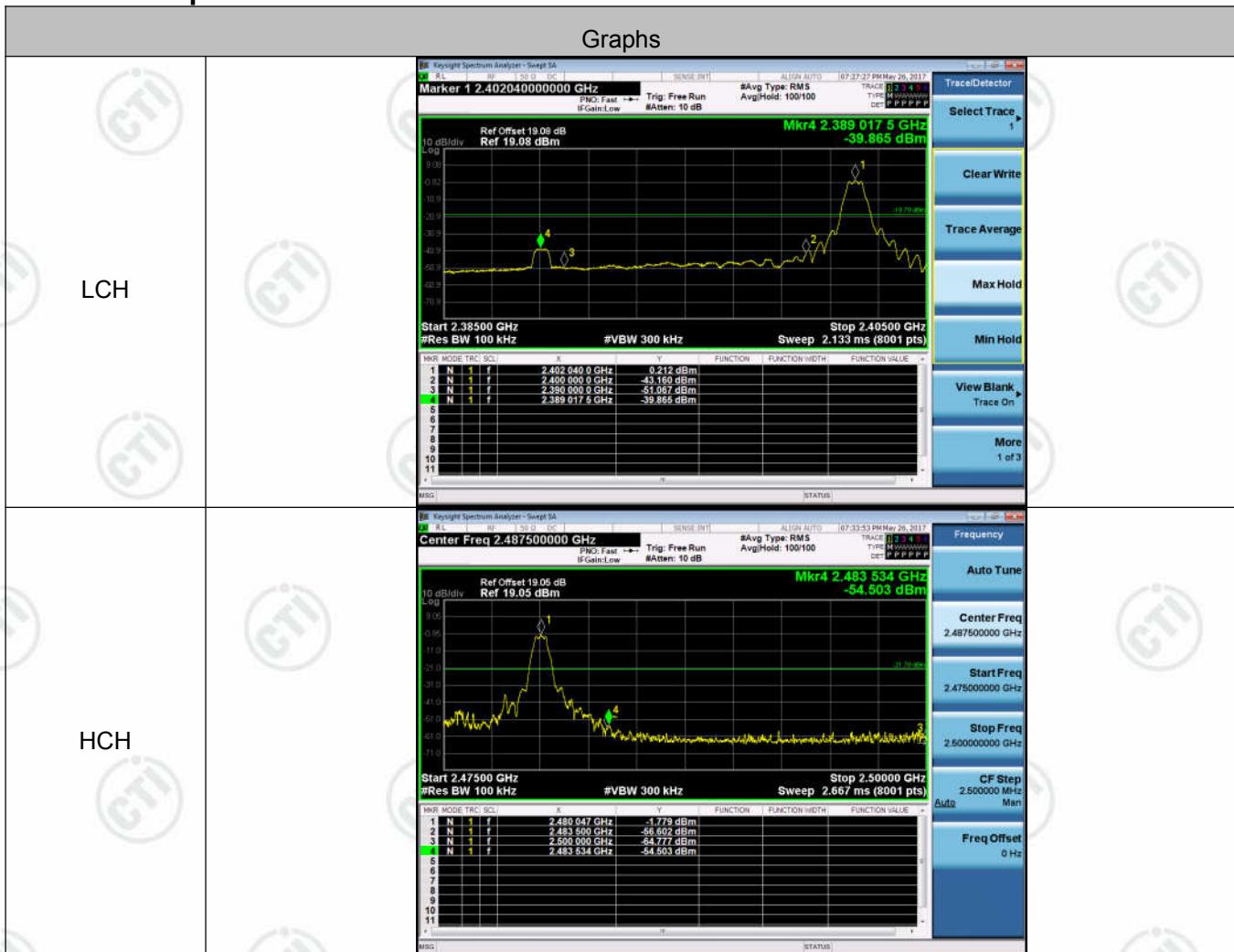


Appendix C): Band-edge for RF Conducted Emissions

Result Table

| Mode | Channel | Carrier Power[dBm] | Max.Spurious Level [dBm] | Limit [dBm] | Verdict |
|------|---------|--------------------|--------------------------|-------------|---------|
| BLE | LCH | 0.212 | -39.865 | -19.79 | PASS |
| BLE | HCH | -1.779 | -54.503 | -21.78 | PASS |

Test Graphs

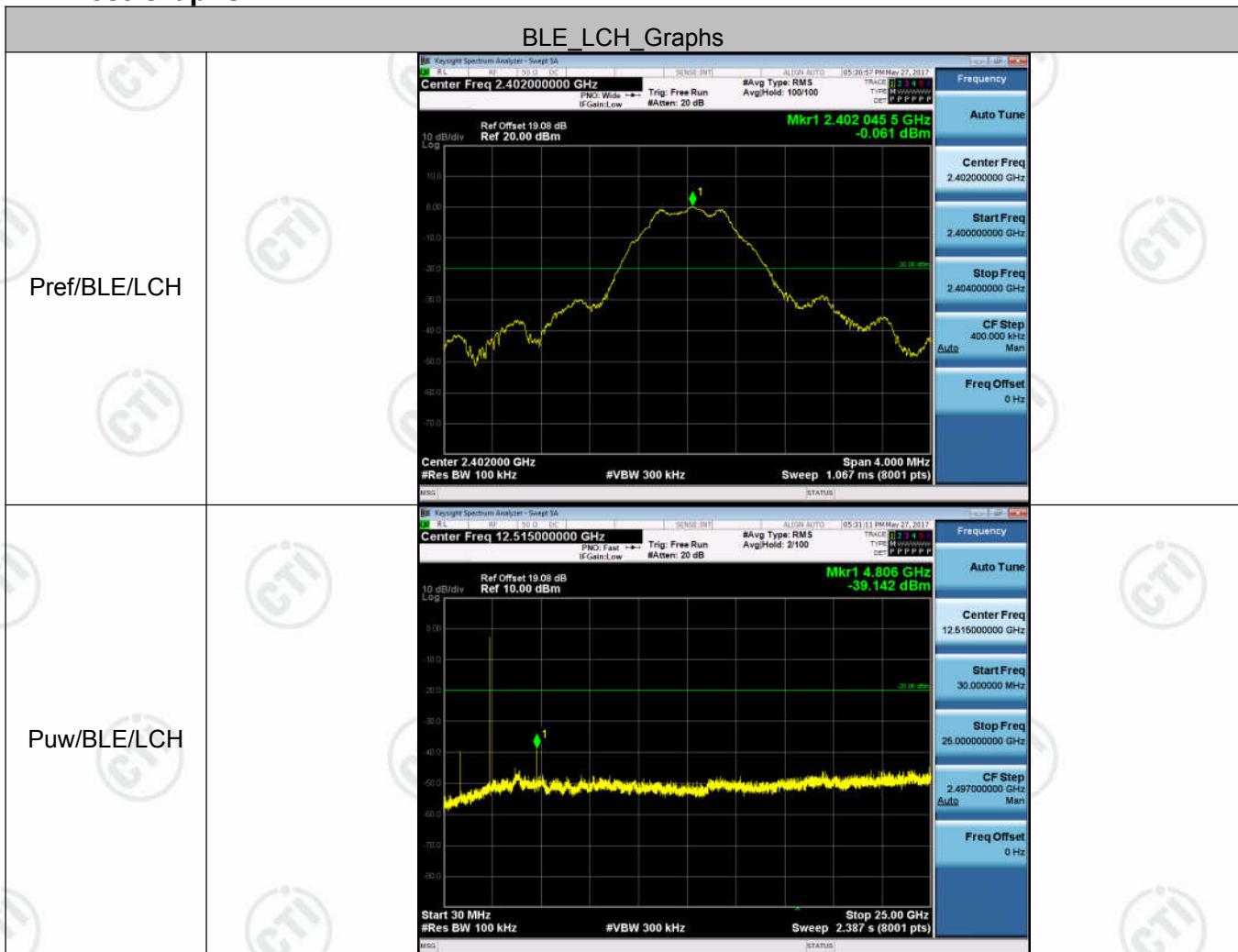


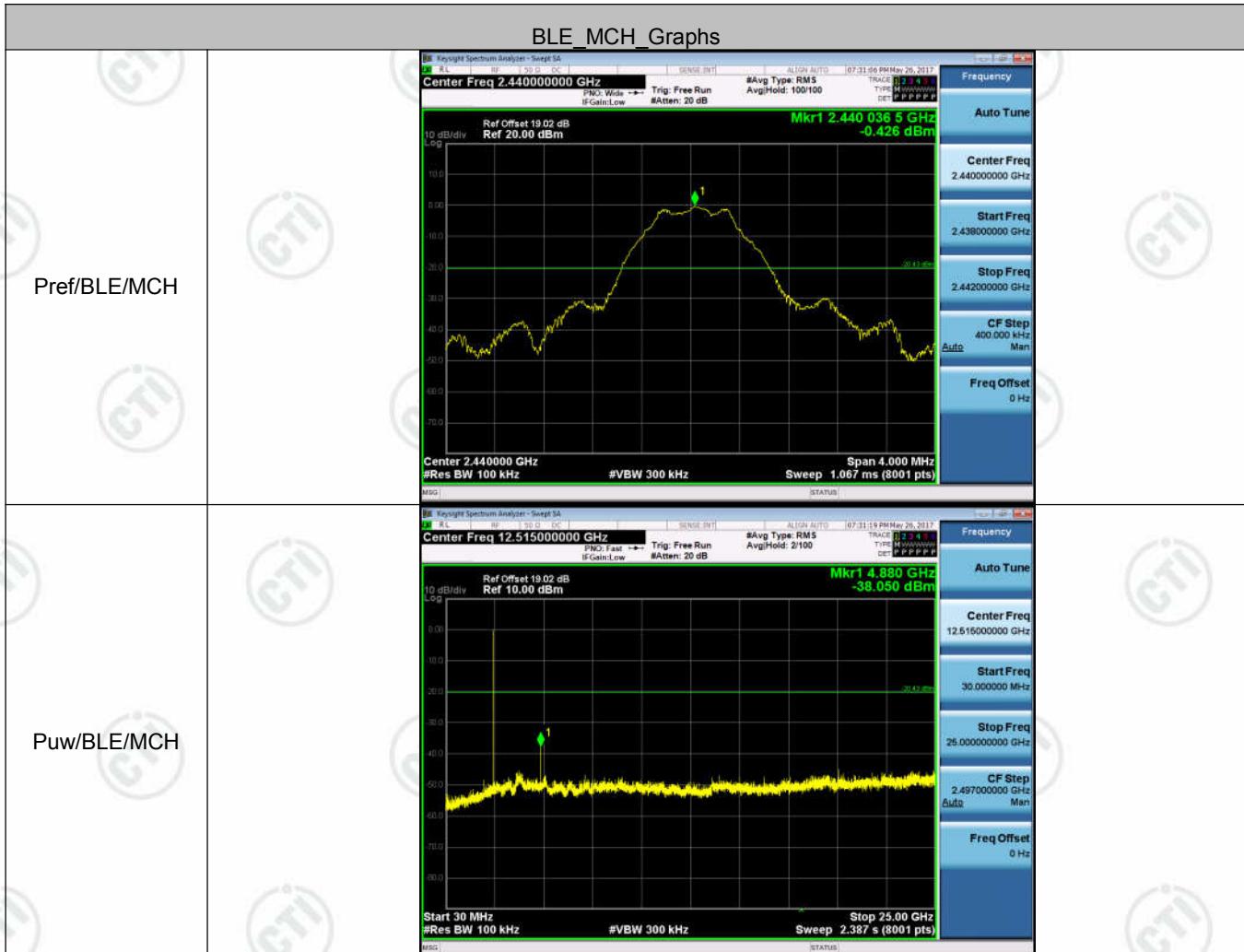
Appendix D): RF Conducted Spurious Emissions

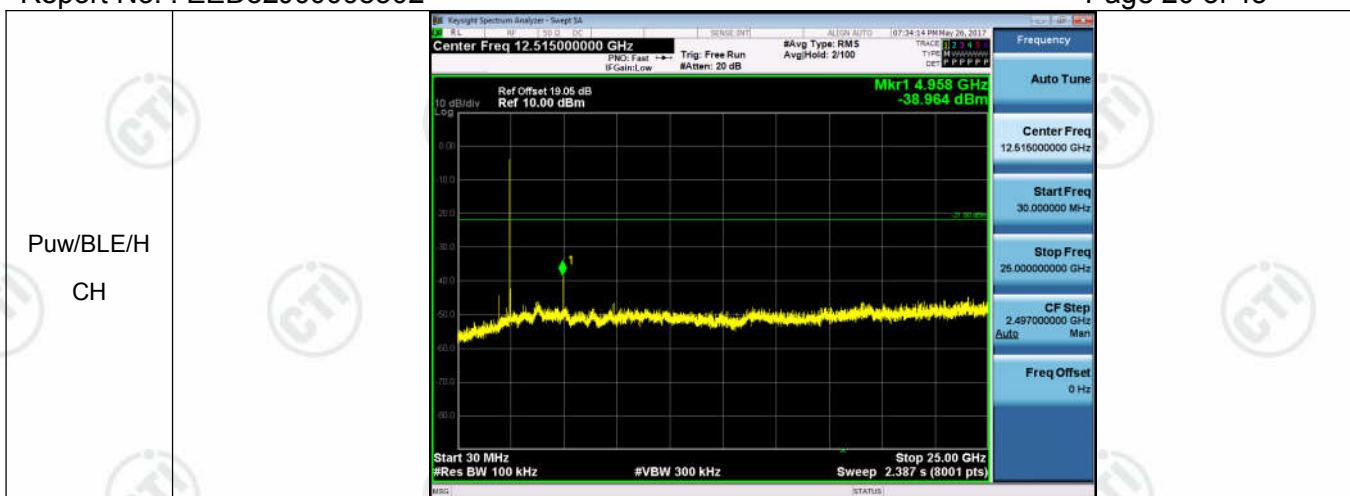
Result Table

| Mode | Channel | Pref [dBm] | Puw[dBm] | Verdict |
|------|---------|------------|----------|---------|
| BLE | LCH | -0.061 | <Limit | PASS |
| BLE | MCH | -0.426 | <Limit | PASS |
| BLE | HCH | -1.904 | <Limit | PASS |

Test Graphs





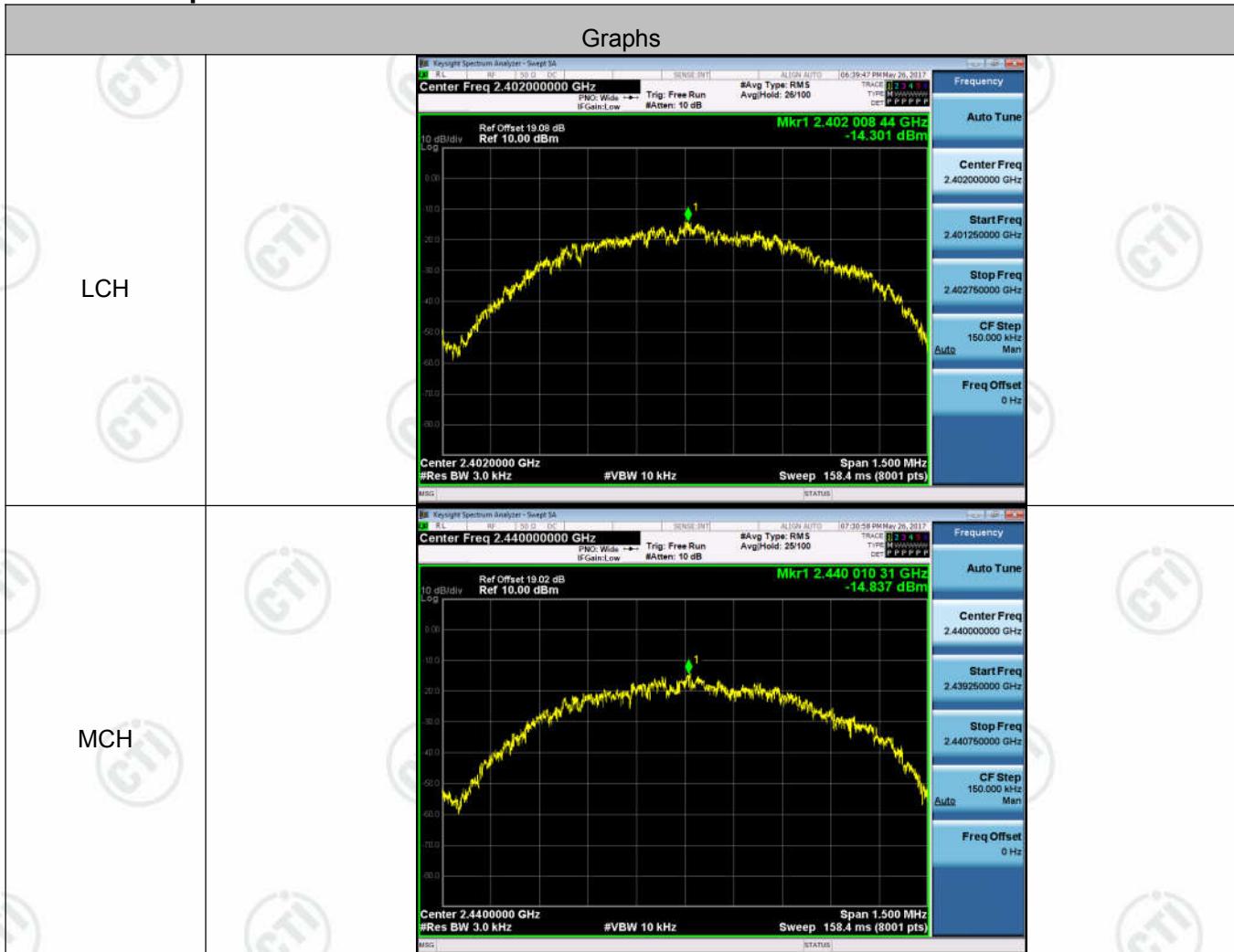


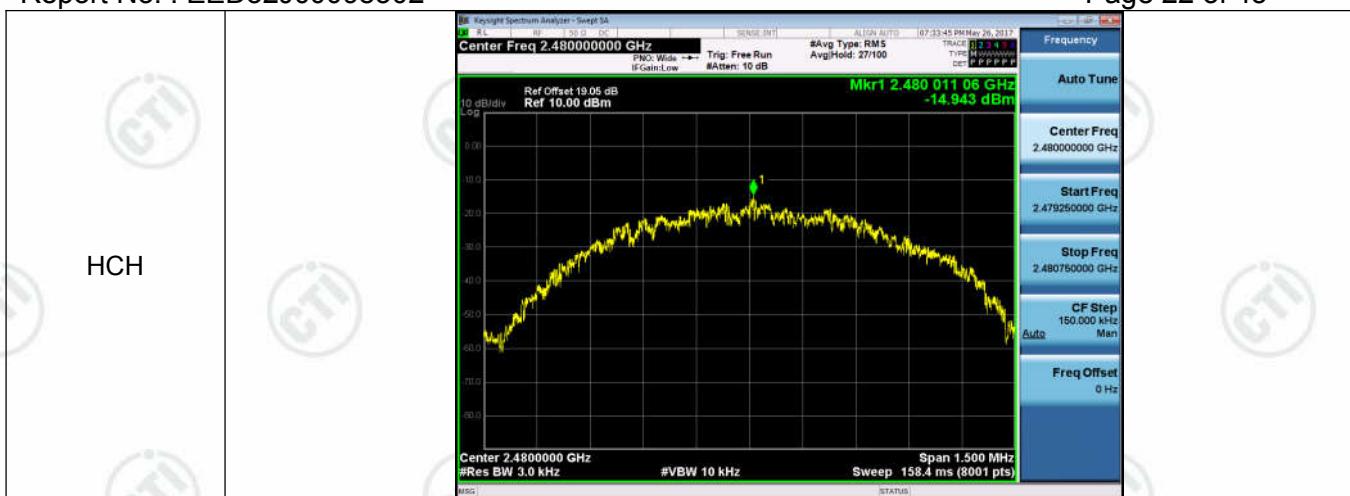
Appendix E): Power Spectral Density

Result Table

| Mode | Channel | PSD [dBm/3kHz] | Limit [dBm/3kHz] | Verdict |
|------|---------|----------------|------------------|---------|
| BLE | LCH | -14.301 | 8 | PASS |
| BLE | MCH | -14.837 | 8 | PASS |
| BLE | HCH | -14.943 | 8 | PASS |

Test Graphs





Appendix F): Antenna Requirement

15.203 requirement:

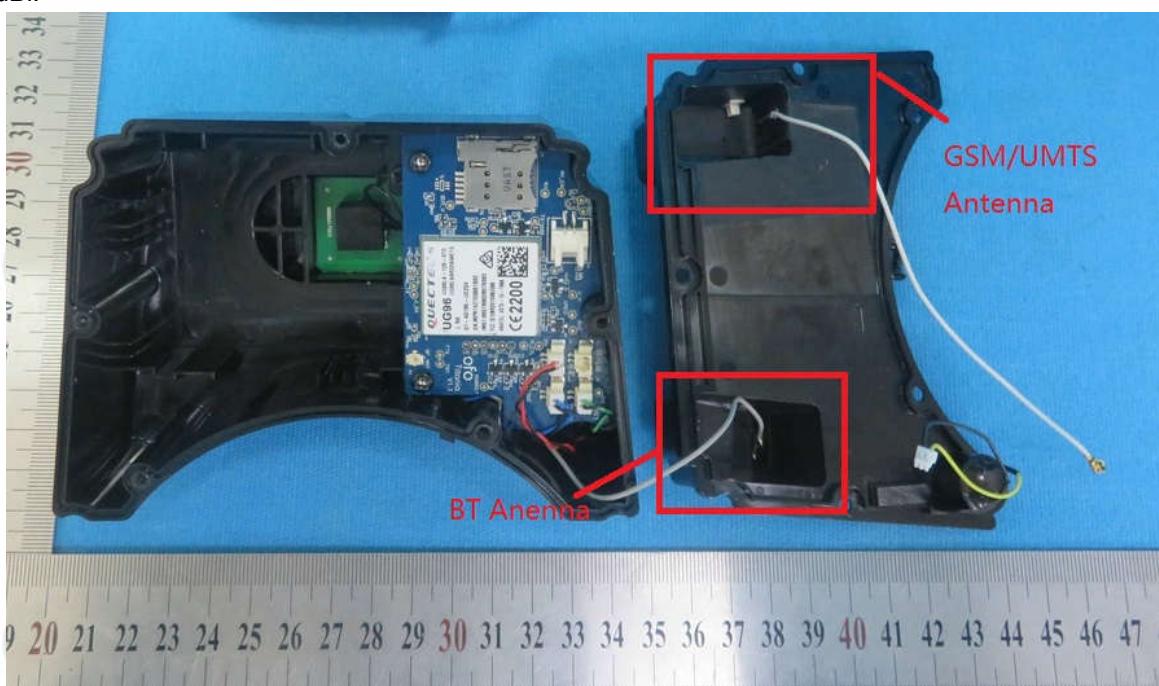
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

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

EUT Antenna:

The antenna is Integral antenna and no consideration of replacement. The best case gain of the BT antenna is 2.2dBi.

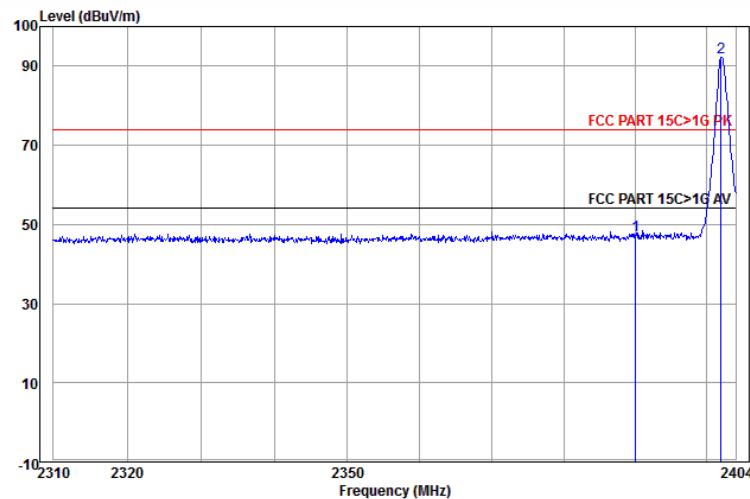


Appendix G): Restricted bands around fundamental frequency (Radiated)

| Receiver Setup: | Frequency | Detector | RBW | VBW | Remark | | | | | | | | | | | | | | | | | | | | | |
|-----------------|--------------------------|---|--------|--------|------------|--|-----------|--------------------------|--------|-------------|------|------------------|--------------|------|------------------|---------------|------|------------------|-------------|------|------------------|------------|------|---------------|------|------------|
| | 30MHz-1GHz | Quasi-peak | 120kHz | 300kHz | Quasi-peak | | | | | | | | | | | | | | | | | | | | | |
| | Above 1GHz | Peak | 1MHz | 3MHz | Peak | | | | | | | | | | | | | | | | | | | | | |
| | | Peak | 1MHz | 10Hz | Average | | | | | | | | | | | | | | | | | | | | | |
| Test Procedure: | | Below 1GHz test procedure as below: <ol style="list-style-type: none"> The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. The antenna 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. 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 was turned from 0 degrees to 360 degrees to find the maximum reading. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel Above 1GHz test procedure as below: <ol style="list-style-type: none"> Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter). Test the EUT in the lowest channel , the Highest channel The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case. Repeat above procedures until all frequencies measured was complete. | | | | | | | | | | | | | | | | | | | | | | | | |
| Limit: | | <table border="1"> <thead> <tr> <th>Frequency</th><th>Limit (dBμV/m @3m)</th><th>Remark</th></tr> </thead> <tbody> <tr> <td>30MHz-88MHz</td><td>40.0</td><td>Quasi-peak Value</td></tr> <tr> <td>88MHz-216MHz</td><td>43.5</td><td>Quasi-peak Value</td></tr> <tr> <td>216MHz-960MHz</td><td>46.0</td><td>Quasi-peak Value</td></tr> <tr> <td>960MHz-1GHz</td><td>54.0</td><td>Quasi-peak Value</td></tr> <tr> <td rowspan="2">Above 1GHz</td><td>54.0</td><td>Average Value</td></tr> <tr> <td>74.0</td><td>Peak Value</td></tr> </tbody> </table> | | | | | Frequency | Limit (dB μ V/m @3m) | Remark | 30MHz-88MHz | 40.0 | Quasi-peak Value | 88MHz-216MHz | 43.5 | Quasi-peak Value | 216MHz-960MHz | 46.0 | Quasi-peak Value | 960MHz-1GHz | 54.0 | Quasi-peak Value | Above 1GHz | 54.0 | Average Value | 74.0 | Peak Value |
| Frequency | Limit (dB μ V/m @3m) | Remark | | | | | | | | | | | | | | | | | | | | | | | | |
| 30MHz-88MHz | 40.0 | Quasi-peak Value | | | | | | | | | | | | | | | | | | | | | | | | |
| 88MHz-216MHz | 43.5 | Quasi-peak Value | | | | | | | | | | | | | | | | | | | | | | | | |
| 216MHz-960MHz | 46.0 | Quasi-peak Value | | | | | | | | | | | | | | | | | | | | | | | | |
| 960MHz-1GHz | 54.0 | Quasi-peak Value | | | | | | | | | | | | | | | | | | | | | | | | |
| Above 1GHz | 54.0 | Average Value | | | | | | | | | | | | | | | | | | | | | | | | |
| | 74.0 | Peak Value | | | | | | | | | | | | | | | | | | | | | | | | |

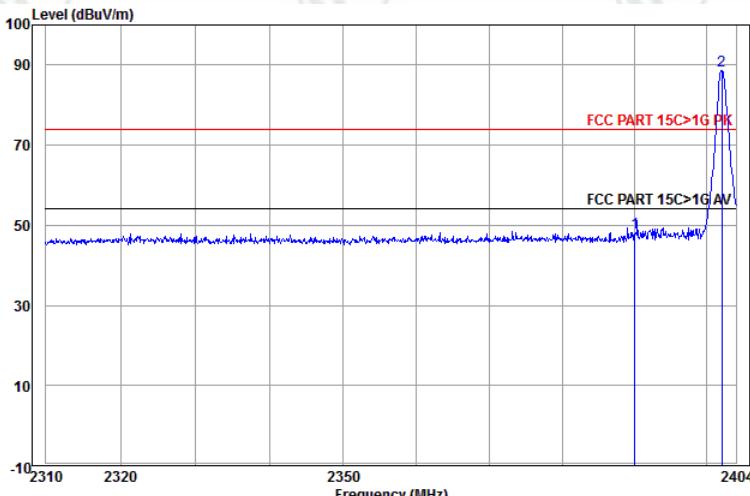
Test plot as follows:

| | | | |
|----------------------|----------------------|--------------------------|--------------|
| Worse case mode: | GFSK(1-DH5) | | |
| Frequency: 2390.0MHz | Test channel: Lowest | Polarization: Horizontal | Remark: Peak |



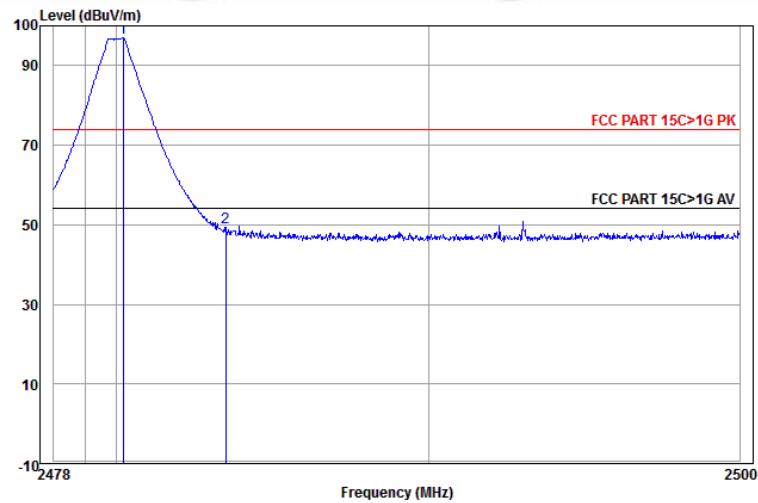
| | Ant Freq | Cable Factor | Preamp Loss | Read Level | Limit Level | Line Limit | Over Limit | Over Pol/Phase | Remark |
|------|----------|--------------|-------------|------------|-------------|------------|------------|----------------|------------|
| | MHz | dB/m | dB | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 2390.000 | 32.53 | 4.28 | 34.39 | 44.84 | 47.26 | 74.00 | -26.74 | Horizontal |
| 2 pp | 2401.987 | 32.56 | 4.31 | 34.39 | 89.70 | 92.18 | 74.00 | 18.18 | Horizontal |

| | | | |
|----------------------|----------------------|------------------------|--------------|
| Worse case mode: | GFSK(1-DH5) | | |
| Frequency: 2390.0MHz | Test channel: Lowest | Polarization: Vertical | Remark: Peak |



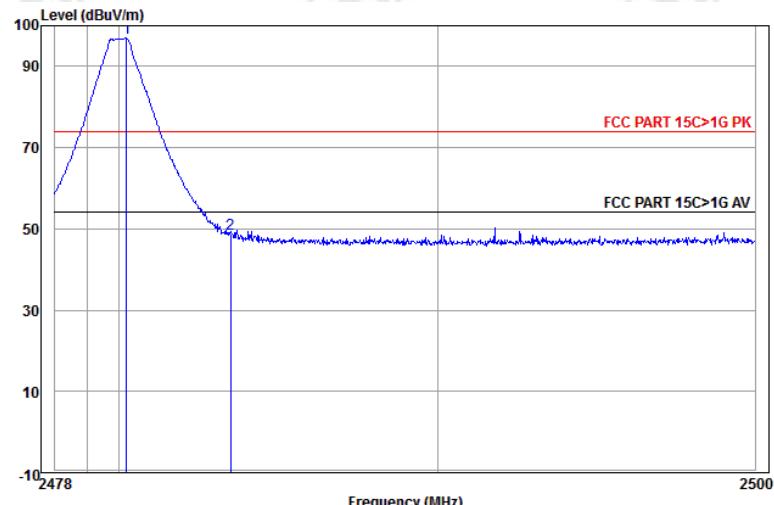
| | Ant Freq | Cable Factor | Preamp Loss | Read Level | Limit Level | Line Limit | Over Limit | Over Pol/Phase | Remark |
|------|----------|--------------|-------------|------------|-------------|------------|------------|----------------|----------|
| | MHz | dB/m | dB | dB | dBuV | dBuV/m | dBuV/m | dB | |
| 1 | 2390.000 | 32.53 | 4.28 | 34.39 | 45.59 | 48.01 | 74.00 | -25.99 | Vertical |
| 2 pp | 2402.083 | 32.56 | 4.31 | 34.39 | 86.04 | 88.52 | 74.00 | 14.52 | Vertical |

| | | | |
|----------------------|-----------------------|--------------------------|--------------|
| Worse case mode: | GFSK | | |
| Frequency: 2483.5MHz | Test channel: Highest | Polarization: Horizontal | Remark: Peak |



| Freq | Ant Factor | Cable Loss | Preamp Factor | Read Level | Limit Level | Line Limit | Over Limit | Over Pol/Phase | Remark |
|------|------------|------------|---------------|------------|-------------|------------|------------|----------------|------------|
| MHz | dB/m | dB | dB | dBuV | dBuV/m | dBuV/m | dBuV/m | dB | |
| 1 pp | 2480.213 | 32.71 | 4.50 | 34.41 | 94.16 | 96.96 | 74.00 | 22.96 | Horizontal |
| 2 | 2483.500 | 32.71 | 4.51 | 34.41 | 46.49 | 49.30 | 74.00 | -24.70 | Horizontal |

| | | | |
|----------------------|-----------------------|------------------------|--------------|
| Worse case mode: | GFSK | | |
| Frequency: 2483.5MHz | Test channel: Highest | Polarization: Vertical | Remark: Peak |



| Freq | Ant Factor | Cable Loss | Preamp Factor | Read Level | Limit Level | Line Limit | Over Limit | Over Pol/Phase | Remark |
|------|------------|------------|---------------|------------|-------------|------------|------------|----------------|----------|
| MHz | dB/m | dB | dB | dBuV | dBuV/m | dBuV/m | dBuV/m | dB | |
| 1 pp | 2480.235 | 32.71 | 4.50 | 34.41 | 94.18 | 96.98 | 74.00 | 22.98 | Vertical |
| 2 | 2483.500 | 32.71 | 4.51 | 34.41 | 45.85 | 48.66 | 74.00 | -25.34 | Vertical |

Note:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading - Correct Factor

Correct Factor = Preamplifier Factor - Antenna Factor - Cable Factor

Appendix H): Radiated Spurious Emissions

| Receiver Setup: | Frequency | Detector | RBW | VBW | Remark | |
|-----------------|-------------------|------------|--------|--------|------------|--|
| | 0.009MHz-0.090MHz | Peak | 10kHz | 30kHz | Peak | |
| | 0.009MHz-0.090MHz | Average | 10kHz | 30kHz | Average | |
| | 0.090MHz-0.110MHz | Quasi-peak | 10kHz | 30kHz | Quasi-peak | |
| | 0.110MHz-0.490MHz | Peak | 10kHz | 30kHz | Peak | |
| | 0.110MHz-0.490MHz | Average | 10kHz | 30kHz | Average | |
| | 0.490MHz -30MHz | Quasi-peak | 10kHz | 30kHz | Quasi-peak | |
| | 30MHz-1GHz | Quasi-peak | 120kHz | 300kHz | Quasi-peak | |
| | Above 1GHz | Peak | 1MHz | 3MHz | Peak | |
| | | Peak | 1MHz | 10Hz | Average | |

Test Procedure:

Below 1GHz test procedure as below:

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna 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.
- 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Above 1GHz test procedure as below:

- Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).
- Test the EUT in the lowest channel ,the middle channel ,the Highest channel
- The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case.
- Repeat above procedures until all frequencies measured was complete.

| Limit: | Frequency | Field strength (microvolt/meter) | Limit (dB μ V/m) | Remark | Measurement distance (m) |
|--------|-------------------|----------------------------------|----------------------|------------|--------------------------|
| | 0.009MHz-0.490MHz | 2400/F(kHz) | - | - | 300 |
| | 0.490MHz-1.705MHz | 24000/F(kHz) | - | - | 30 |
| | 1.705MHz-30MHz | 30 | - | - | 30 |
| | 30MHz-88MHz | 100 | 40.0 | Quasi-peak | 3 |
| | 88MHz-216MHz | 150 | 43.5 | Quasi-peak | 3 |
| | 216MHz-960MHz | 200 | 46.0 | Quasi-peak | 3 |
| | 960MHz-1GHz | 500 | 54.0 | Quasi-peak | 3 |
| | Above 1GHz | 500 | 54.0 | Average | 3 |

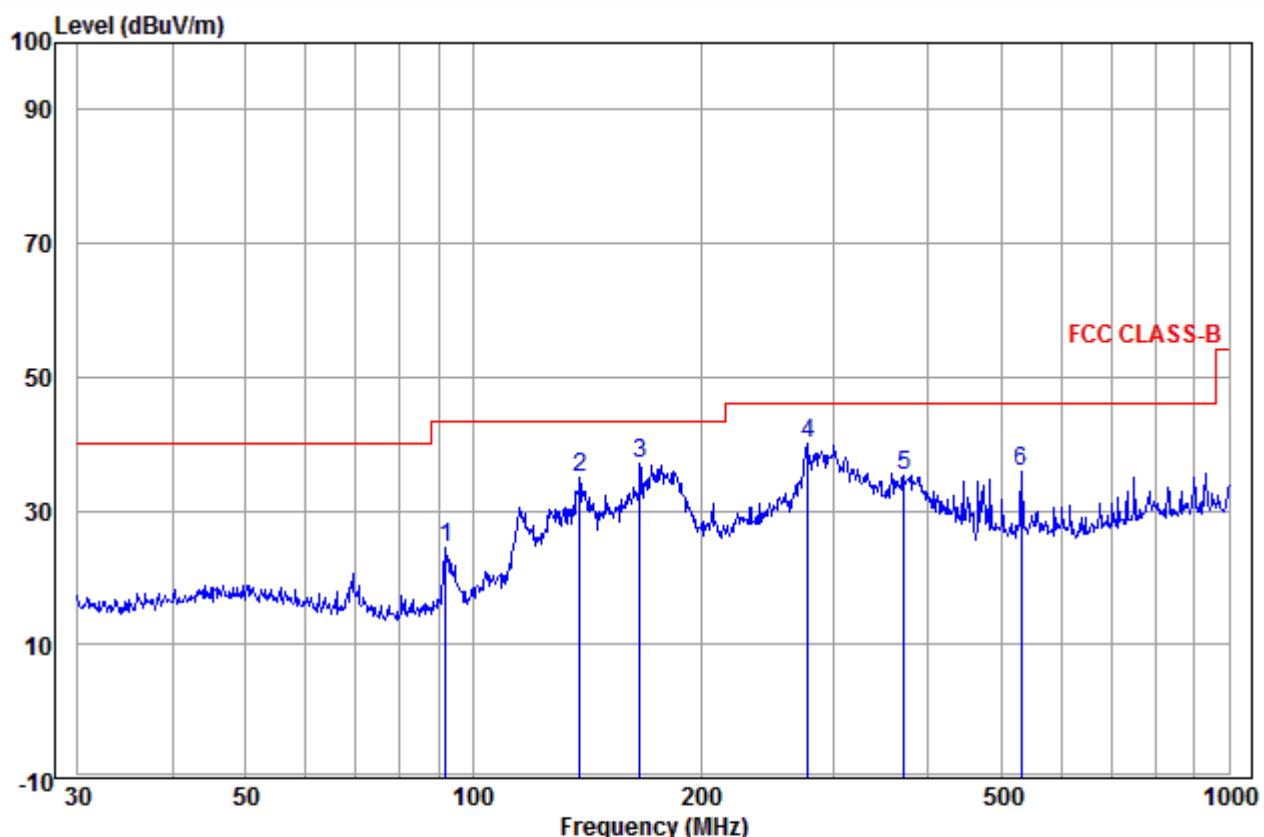
Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

Report No. : EED32J00098302

Page 29 of 45

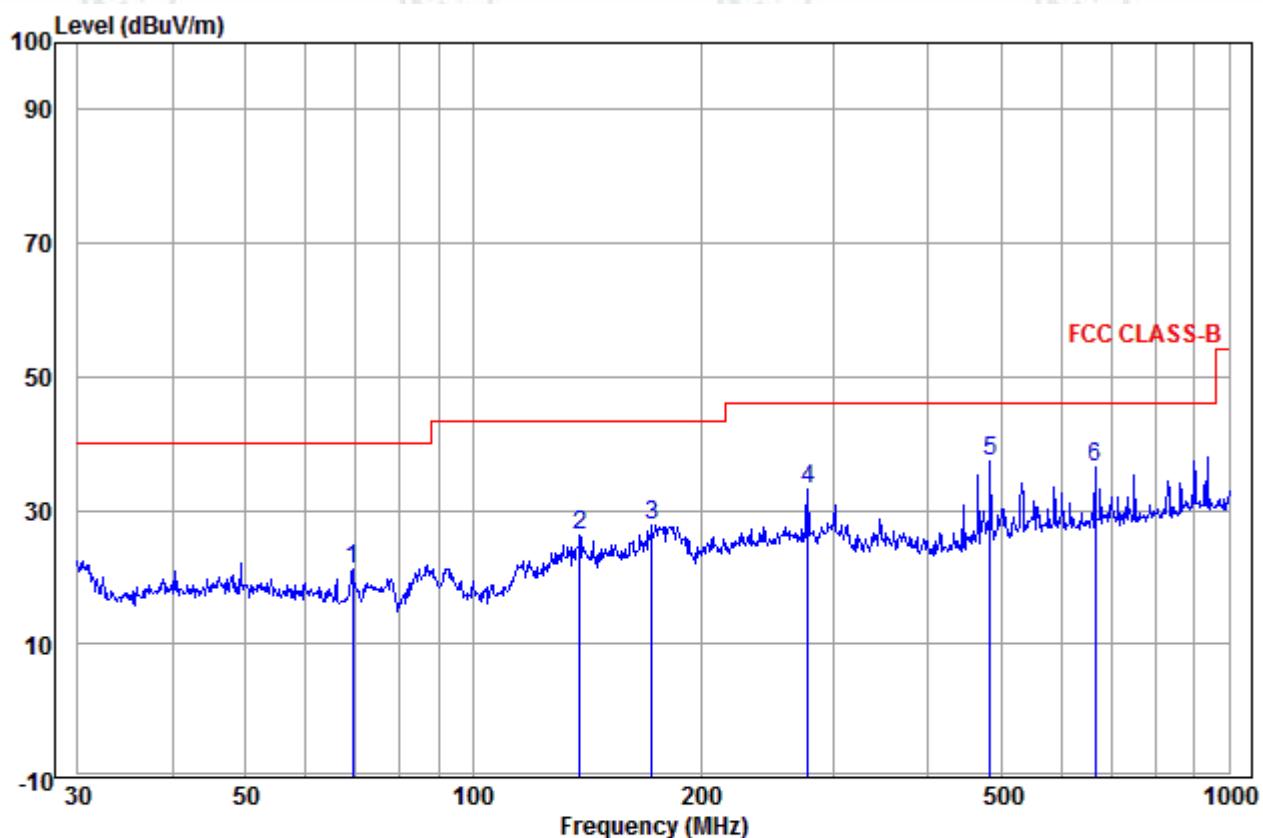
**Radiated Spurious Emissions test Data:
Radiated Emission below 1GHz**

| | | |
|-----------------|--------------|------------|
| 30MHz~1GHz (QP) | | |
| Test mode: | Transmitting | Horizontal |



| Freq | Ant Factor | Cable Loss | Read Level | Limit | | Over Limit | Pol/Phase | Remark |
|------|------------|------------|------------|-------|-------|------------|-----------|------------|
| | | | | MHz | dB/m | dB | dBuV | dBuV/m |
| 1 | 92.139 | 9.93 | 0.44 | 14.05 | 24.42 | 43.50 | -19.08 | Horizontal |
| 2 | 138.387 | 8.46 | 0.61 | 25.94 | 35.01 | 43.50 | -8.49 | Horizontal |
| 3 | 166.068 | 8.93 | 0.78 | 27.33 | 37.04 | 43.50 | -6.46 | Horizontal |
| 4 pp | 277.094 | 12.85 | 1.19 | 25.98 | 40.02 | 46.00 | -5.98 | Horizontal |
| 5 | 372.005 | 14.96 | 1.32 | 19.13 | 35.41 | 46.00 | -10.59 | Horizontal |
| 6 | 531.964 | 17.72 | 1.53 | 16.56 | 35.81 | 46.00 | -10.19 | Horizontal |

| | | |
|------------|--------------|----------|
| Test mode: | Transmitting | Vertical |
|------------|--------------|----------|



| Freq | Ant Factor | Cable Loss | Read Level | Level | Limit Line | Over Limit | Over Limit Pol/Phase | | Remark |
|------|------------|------------|------------|-------|------------|------------|----------------------|-----------|--------|
| | | | | | | | dB | Pol/Phase | |
| | | | | | | | | | |
| 1 | 69.357 | 9.33 | 0.25 | 11.65 | 21.23 | 40.00 | -18.77 | Vertical | |
| 2 | 138.387 | 8.46 | 0.61 | 17.28 | 26.35 | 43.50 | -17.15 | Vertical | |
| 3 | 172.599 | 9.36 | 0.85 | 17.61 | 27.82 | 43.50 | -15.68 | Vertical | |
| 4 | 277.094 | 12.85 | 1.19 | 19.17 | 33.21 | 46.00 | -12.79 | Vertical | |
| 5 pp | 483.910 | 16.92 | 1.50 | 19.07 | 37.49 | 46.00 | -8.51 | Vertical | |
| 6 | 665.804 | 19.29 | 1.89 | 15.22 | 36.40 | 46.00 | -9.60 | Vertical | |

Transmitter Emission above 1GHz

| Worse case mode: | | GFSK | | Test channel: | | Lowest | Remark: Peak | | |
|------------------|-----------------------|-----------------|------------------|-------------------------|---------------------------------|---------------------------|-----------------|--------|-----------------|
| Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Gain (dB) | Read Level (dB μ V) | Final Test Level (dB μ V/m) | Limit Line (dB μ V/m) | Over Limit (dB) | Result | Antenna Polaxis |
| 1350.362 | 30.57 | 2.68 | 44.18 | 49.51 | 38.58 | 74.00 | -35.42 | Pass | H |
| 1832.785 | 31.45 | 3.11 | 43.65 | 49.55 | 40.46 | 74.00 | -33.54 | Pass | H |
| 4804.000 | 34.69 | 5.11 | 44.60 | 47.57 | 42.77 | 74.00 | -31.23 | Pass | H |
| 6001.768 | 35.90 | 7.43 | 44.50 | 49.59 | 48.42 | 74.00 | -25.58 | Pass | H |
| 7206.000 | 36.42 | 6.66 | 44.77 | 48.00 | 46.31 | 74.00 | -27.69 | Pass | H |
| 9608.000 | 37.88 | 7.73 | 45.58 | 48.29 | 48.32 | 74.00 | -25.68 | Pass | H |
| 1257.465 | 30.36 | 2.58 | 44.30 | 49.56 | 38.20 | 74.00 | -35.80 | Pass | V |
| 1818.842 | 31.43 | 3.10 | 43.66 | 49.19 | 40.06 | 74.00 | -33.94 | Pass | V |
| 4804.000 | 34.69 | 5.11 | 44.60 | 47.36 | 42.56 | 74.00 | -31.44 | Pass | V |
| 6078.644 | 35.94 | 7.35 | 44.51 | 49.22 | 48.00 | 74.00 | -26.00 | Pass | V |
| 7206.000 | 36.42 | 6.66 | 44.77 | 44.02 | 42.33 | 74.00 | -31.67 | Pass | V |
| 9608.000 | 37.88 | 7.73 | 45.58 | 49.12 | 49.15 | 74.00 | -24.85 | Pass | V |

| Worse case mode: | | GFSK | | Test channel: | | Middle | Remark: Peak | | |
|------------------|-----------------------|-----------------|------------------|-------------------------|---------------------------------|---------------------------|-----------------|--------|-----------------|
| Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Gain (dB) | Read Level (dB μ V) | Final Test Level (dB μ V/m) | Limit Line (dB μ V/m) | Over Limit (dB) | Result | Antenna Polaxis |
| 1232.117 | 30.30 | 2.55 | 44.34 | 49.67 | 38.18 | 74.00 | -35.82 | Pass | H |
| 1842.139 | 31.46 | 3.11 | 43.64 | 50.14 | 41.07 | 74.00 | -32.93 | Pass | H |
| 4880.000 | 34.85 | 5.08 | 44.60 | 48.38 | 43.71 | 74.00 | -30.29 | Pass | H |
| 5956.109 | 35.87 | 7.33 | 44.50 | 48.75 | 47.45 | 74.00 | -26.55 | Pass | H |
| 7320.000 | 36.43 | 6.77 | 44.87 | 48.36 | 46.69 | 74.00 | -27.31 | Pass | H |
| 9760.000 | 38.05 | 7.60 | 45.55 | 48.51 | 48.61 | 74.00 | -25.39 | Pass | H |
| 1329.894 | 30.52 | 2.66 | 44.21 | 50.00 | 38.97 | 74.00 | -35.03 | Pass | V |
| 1884.829 | 31.53 | 3.15 | 43.60 | 49.22 | 40.30 | 74.00 | -33.70 | Pass | V |
| 4880.000 | 34.85 | 5.08 | 44.60 | 49.48 | 44.81 | 74.00 | -29.19 | Pass | V |
| 6063.190 | 35.93 | 7.36 | 44.51 | 49.07 | 47.85 | 74.00 | -26.15 | Pass | V |
| 7320.000 | 36.43 | 6.77 | 44.87 | 47.23 | 45.56 | 74.00 | -28.44 | Pass | V |
| 9760.000 | 38.05 | 7.60 | 45.55 | 49.12 | 49.22 | 74.00 | -24.78 | Pass | V |

| Worse case mode: | | GFSK | | Test channel: | | Highest | Remark: Peak | | |
|------------------|-----------------------|-----------------|------------------|-------------------------|---------------------------------|---------------------------|-----------------|--------|-----------------|
| Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Gain (dB) | Read Level (dB μ V) | Final Test Level (dB μ V/m) | Limit Line (dB μ V/m) | Over Limit (dB) | Result | Antenna Polaxis |
| 1289.885 | 30.43 | 2.62 | 44.26 | 49.31 | 38.10 | 74.00 | -35.90 | Pass | H |
| 1943.292 | 31.62 | 3.19 | 43.55 | 48.38 | 39.64 | 74.00 | -34.36 | Pass | H |
| 4960.000 | 35.02 | 5.05 | 44.60 | 47.97 | 43.44 | 74.00 | -30.56 | Pass | H |
| 6445.156 | 36.13 | 6.98 | 44.55 | 48.79 | 47.35 | 74.00 | -26.65 | Pass | H |
| 7440.000 | 36.45 | 6.88 | 44.97 | 47.71 | 46.07 | 74.00 | -27.93 | Pass | H |
| 9920.000 | 38.22 | 7.47 | 45.52 | 47.36 | 47.53 | 74.00 | -26.47 | Pass | H |
| 1257.465 | 30.36 | 2.58 | 44.30 | 49.11 | 37.75 | 74.00 | -36.25 | Pass | V |
| 1809.605 | 31.41 | 3.09 | 43.67 | 49.20 | 40.03 | 74.00 | -33.97 | Pass | V |
| 4960.000 | 35.02 | 5.05 | 44.60 | 46.63 | 42.10 | 74.00 | -31.90 | Pass | V |
| 5895.771 | 35.82 | 7.20 | 44.51 | 48.62 | 47.13 | 74.00 | -26.87 | Pass | V |
| 7440.000 | 36.45 | 6.88 | 44.97 | 47.61 | 45.97 | 74.00 | -28.03 | Pass | V |
| 9920.000 | 38.22 | 7.47 | 45.52 | 47.48 | 47.65 | 74.00 | -26.35 | Pass | V |

Note:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

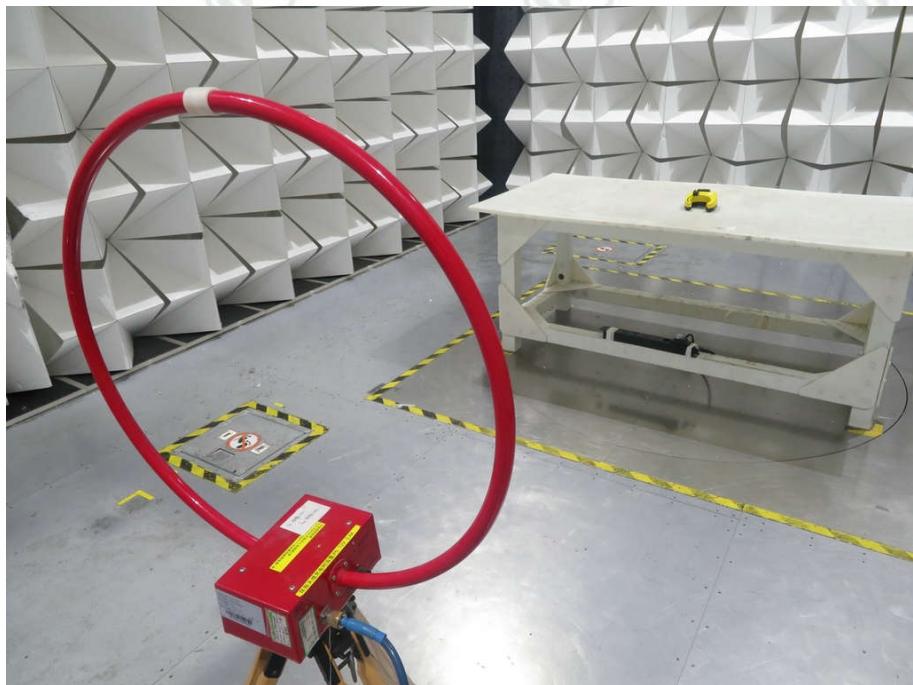
Final Test Level = Receiver Reading - Correct Factor

Correct Factor = Preamplifier Factor - Antenna Factor - Cable Factor

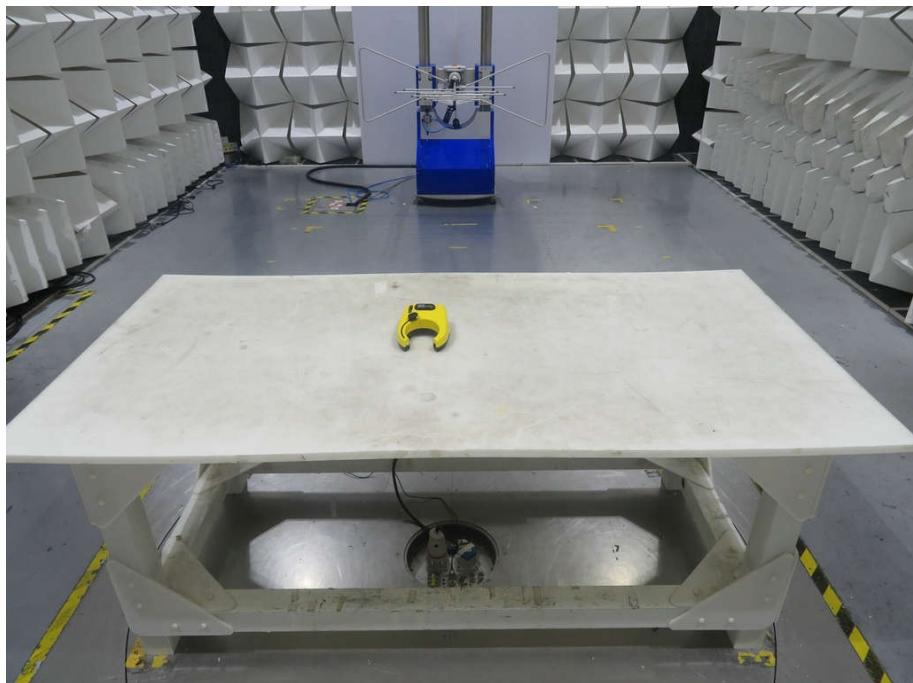
2) Scan from 9kHz to 25GHz, the disturbance above 13GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

PHOTOGRAPHS OF TEST SETUP

Test Model No.: TWX5G02



Radiated spurious emission Test Setup-1(Below 30MHz)



Radiated spurious emission Test Setup-2(30MHz-1GHz)



Radiated spurious emission Test Setup-3(Above 1GHz)

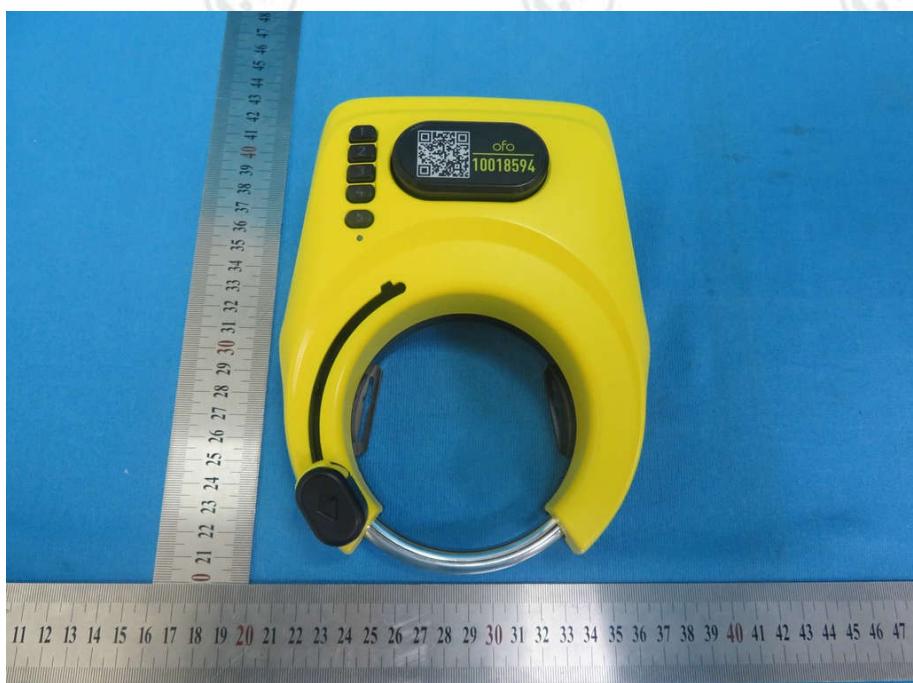


Report No. : EED32J00098302

Page 35 of 45

PHOTOGRAPHS OF EUT Constructional Details

Test Model No.: TWX5G02



View of Product-1



View of Product-2



View of Product-3



View of Product-4



View of Product-5



View of Product-6



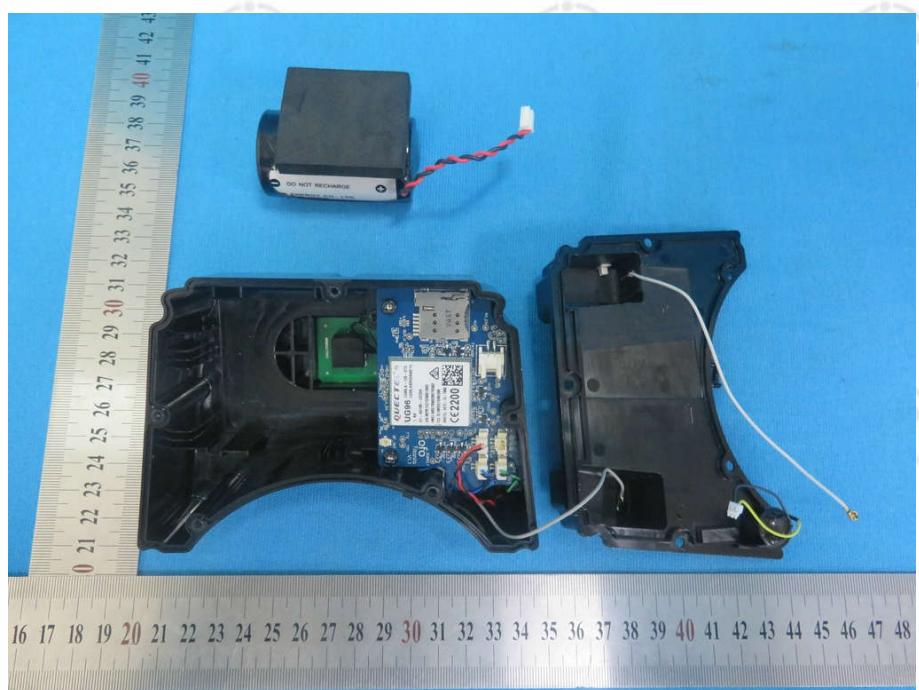
View of Product-7



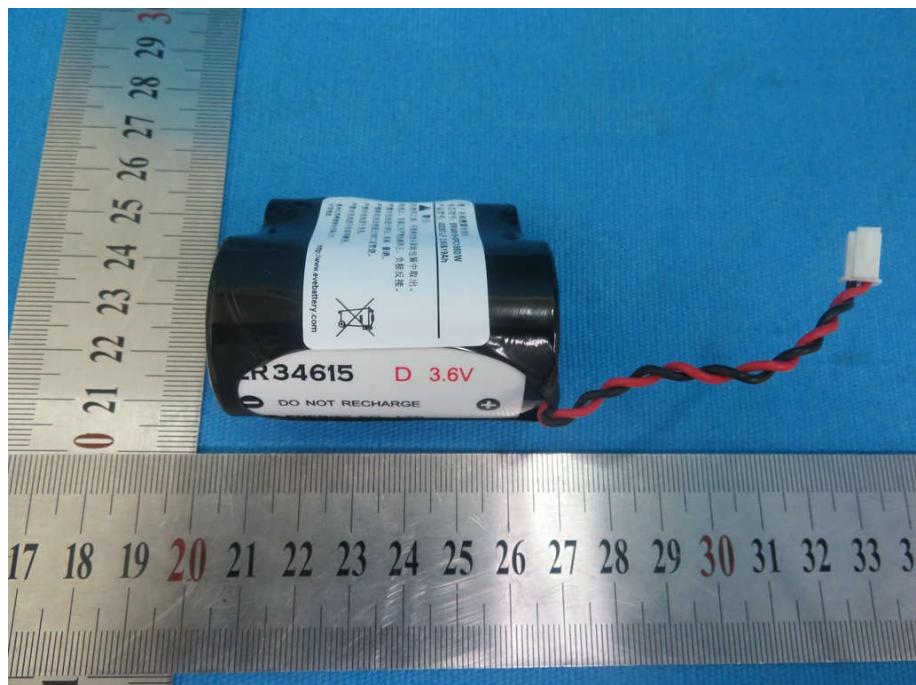
View of Product-8



View of Product-9



View of Product-10



View of Product-11



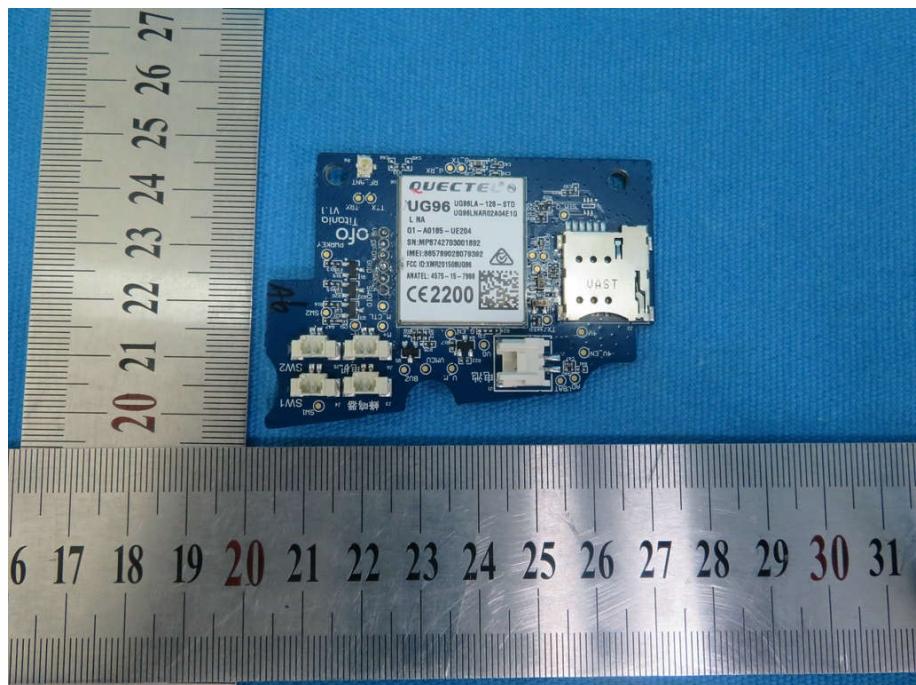
View of Product-12



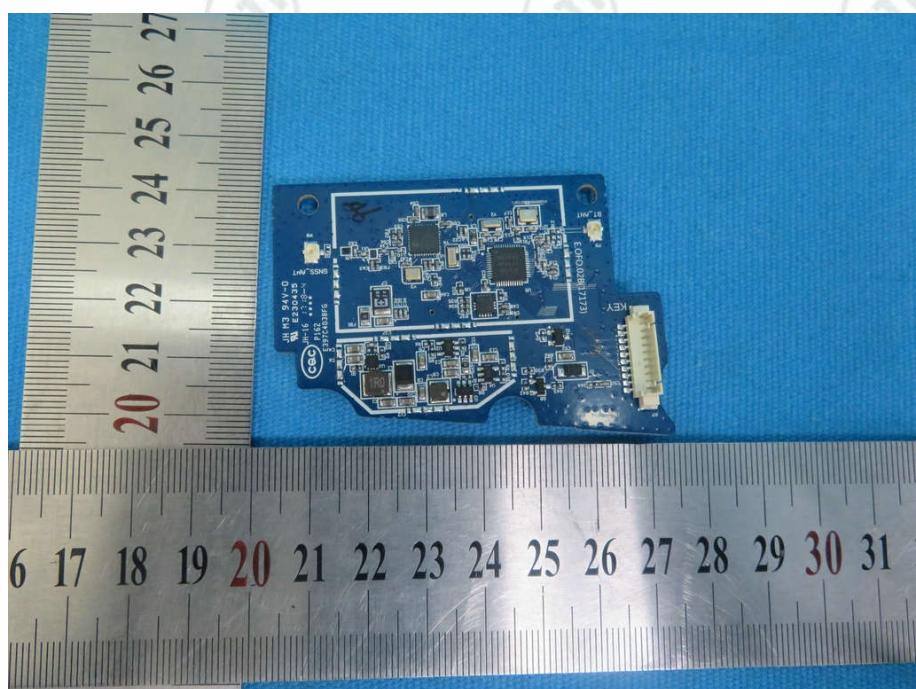
View of Product-13



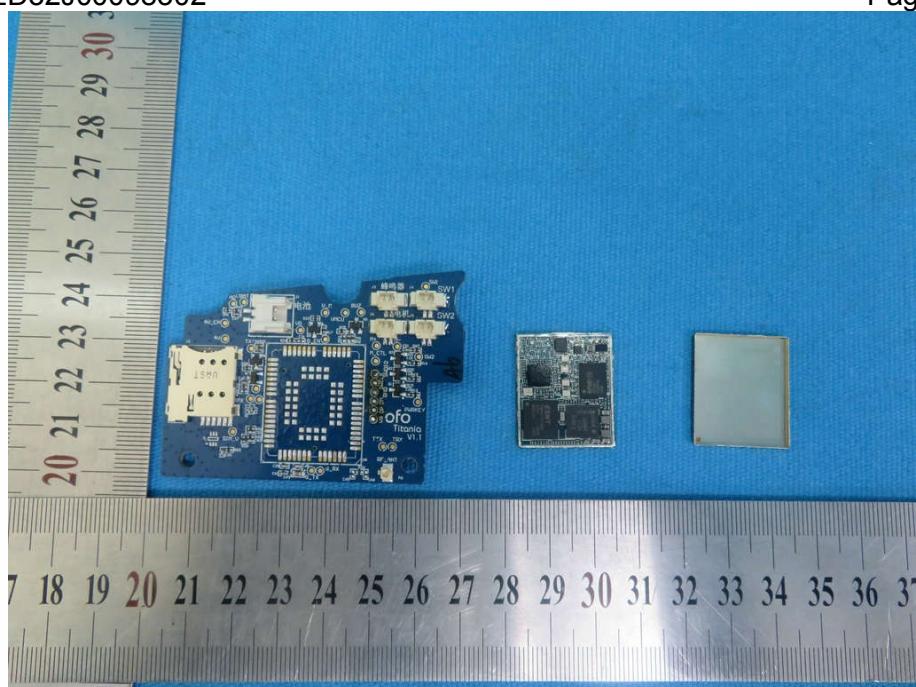
View of Product-14



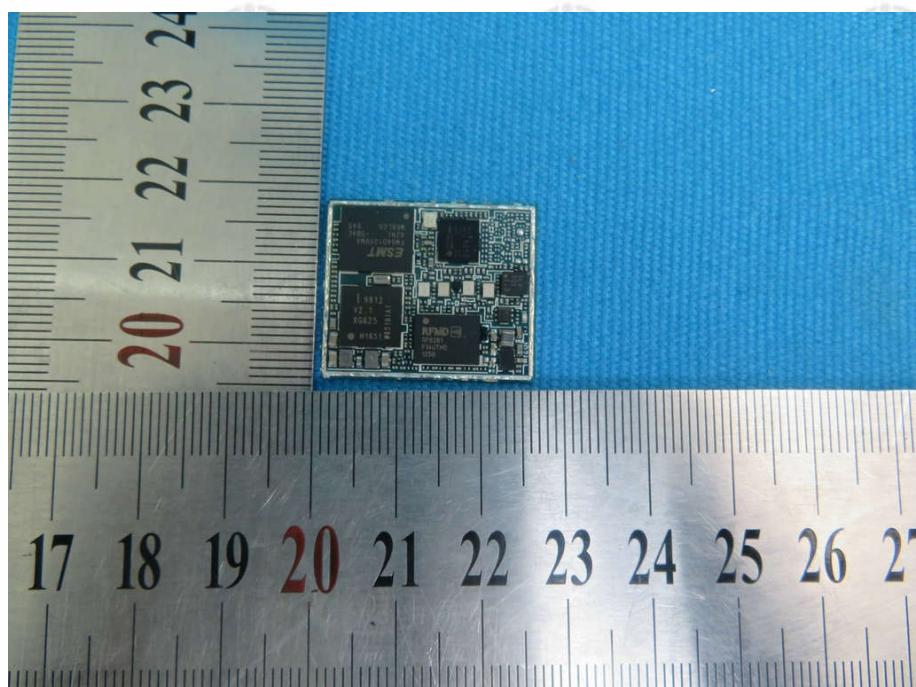
View of Product-15



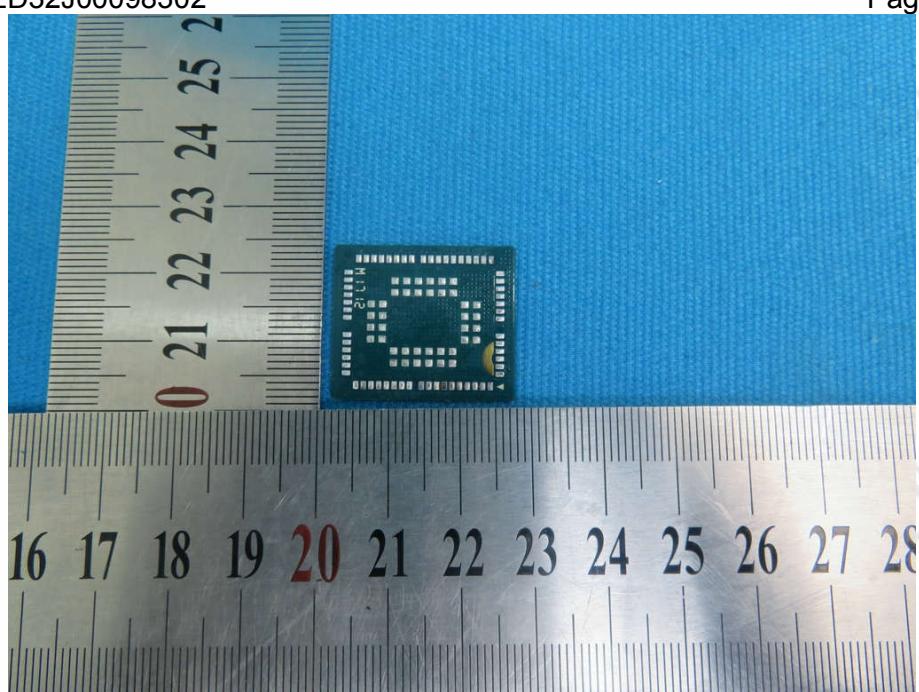
View of Product-16



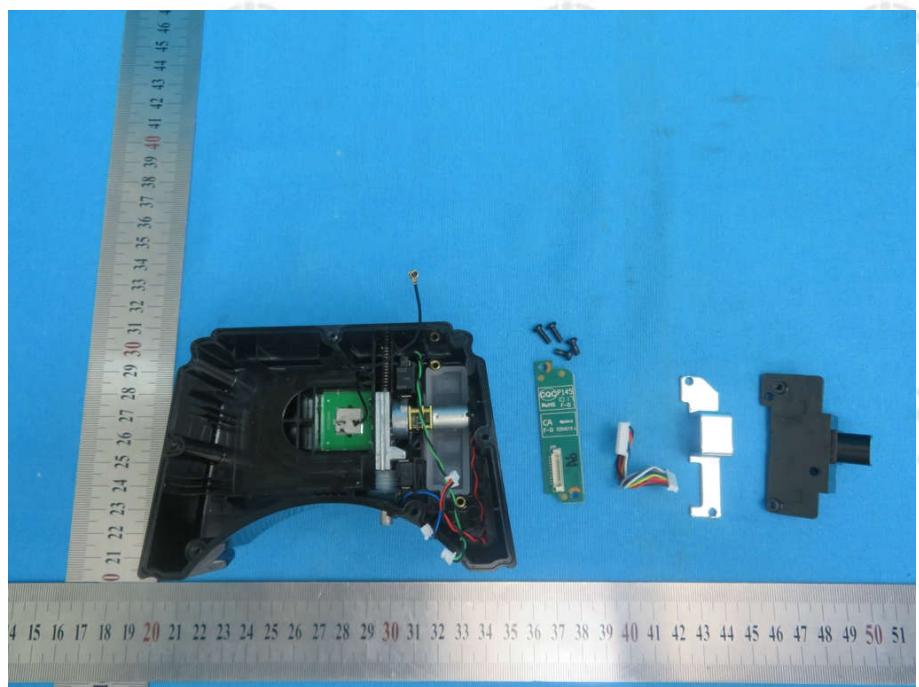
View of Product-17



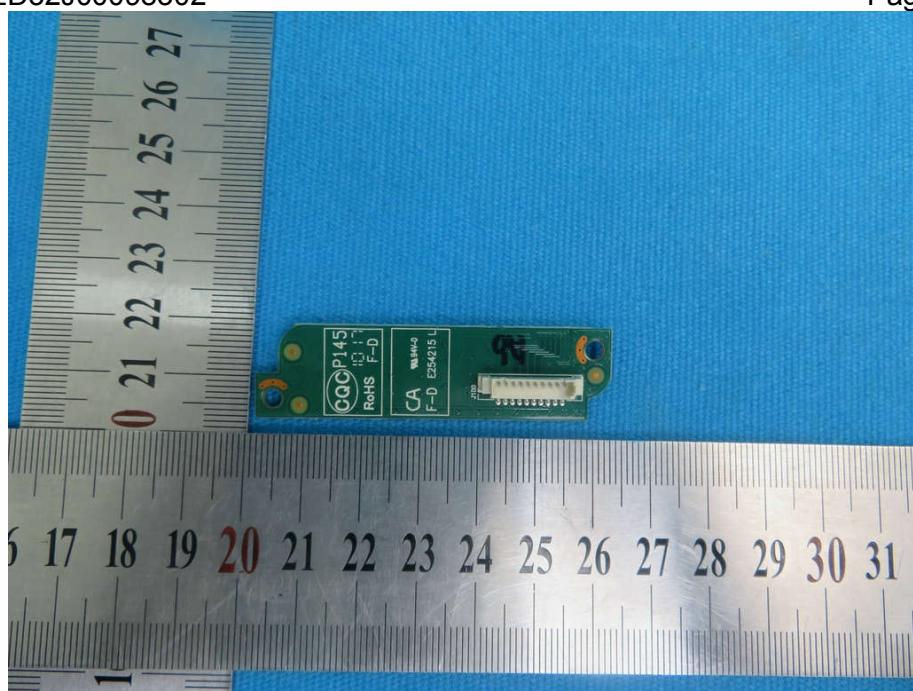
View of Product-18



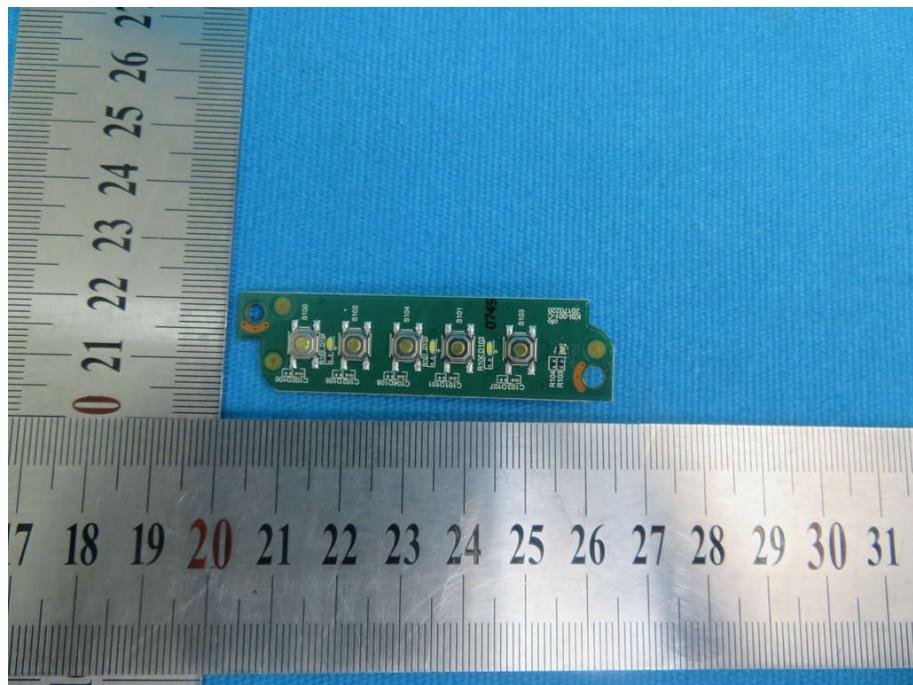
View of Product-19



View of Product-20



View of Product-21



View of Product-22

*** End of Report ***

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