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# TEST REPORT

**Report Number: 18030957HKG-001**

Application for Original Grant of 47 CFR Part 15 Certification

**FCC ID: 2APYU-DK7050**

**Transceiver**

Modular Approval

| Prepared and Checked by: | Approved by: |
|---|---|
| Signed On File<br>Wong Cheuk Ho, Herbert<br>Lead Engineer | Digitally signed by Kenneth Wong<br>Location: Intertek Testing Services Hong Kong Ltd.<br>Wong Kwok Yeung, Kenneth<br>Senior Lead Engineer<br>Date: May 09, 2018 |

# TEST REPORT

## GENERAL INFORMATION

| | |
|---|---|
| **Applicant Name:** | Shenzhen Da Kai Industries Ltd. |
| **Applicant Address:** | 3/F., Blk 4, Lianjian Technology Industrial Park, Hua Rong Road, Longhua District, Shenzhen, Guangdong, China |
| **FCC Specification Standard:** | FCC Part 15, October 1, 2016 Edition |
| **FCC ID:** | 2APYU-DK7050 |
| **FCC Model(s):** | DK7050 |
| **Type of EUT:** | Spread Spectrum Transmitter |
| **Description of EUT:** | BLE 4.2 Module |
| **Serial Number:** | N/A |
| **Sample Receipt Date:** | March 22, 2018 |
| **Date of Test:** | March 22, 2018 to May 05, 2018 |
| **Report Date:** | May 09, 2018 |
| **Environmental Conditions:** | Temperature: +10 to 40°C<br>Humidity: 10 to 90% |

## TEST REPORT

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# TEST REPORT

## 1.0 TEST RESULTS SUMMARY & STATEMENT OF COMPLIANCE

### 1.1 Summary of Test Results

| Test Items | FCC Part 15 Section | Results | Details See Section |
|---|---|---|---|
| Antenna Requirement | 15.203 | Pass | 2.1 |
| Max. Conducted Output Power (Peak) | 15.247(b)(3)&(4) | Pass | 4.1 |
| Min. 6dB RF Bandwidth | 15.247(a)(2) | Pass | 4.2 |
| Max. Power Density (average) | 15.247(e) | Pass | 4.3 |
| Out of Band Antenna Conducted Emission | 15.247(d) | Pass | 4.4 |
| Radiated Emission in Restricted Bands and Spurious Emissions | 15.247(d), 15.209 & 15.109 | Pass | 4.6 |
| AC Power Line Conducted Emission | 15.207 & 15.107 | Pass | 4.7 |

Note: Pursuant to FCC Part 15 Section 15.215(c), the 20dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over expected variations in temperature and supply voltage were considered.

### 1.2 Statement of Compliance

The equipment under test is found to be complying with the following standard:

FCC Part 15, October 1, 2016 Edition

**TEST REPORT**

## 2.0 GENERAL DESCRIPTION

### 2.1 Product Description

The Equipment Under Test (Model: DK7050) is a BLE 4.2 Module which is operating at frequency range of 2402MHz to 2480MHz with 40 channels (2MHz channel spacing). It is intended to be used as short range radio communication for embedded application inside a host. The EUT is powered by the host (3.3VDC).

This module is only approved for use when installed in devices produced by a specific manufacturer for professional installation.

The antenna(s) used in the EUT is integral, and the test sample is a prototype.

The circuit description is saved with filename: descri.pdf.

## TEST REPORT

### 2.2 Test Methodology

Both AC power line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.10 (2013). Preliminary radiated scans and all radiated measurements were performed in radiated emission test sites. All Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application. Antenna port conducted measurements were performed according to ANSI C63.10 (2013) and KDB Publication No.558074 D01 v04 (05-April-2017) All other measurements were made in accordance with the procedures in 47 CFR Part 2.

### 2.3 Test Facility

The radiated emission test site and antenna port conducted measurement facility used to collect the radiated data and conductive data are at Workshop No. 3, G/F., World-Wide Industrial Centre, 43-47 Shan Mei Street, Fo Tan, Sha Tin, N.T., Hong Kong. This test facility and site measurement data have been fully placed on file with the FCC.

### 2.4 Related Submittal(s) Grants

This is a single application for certification of a transceiver (Bluetooth portion).

## TEST REPORT

# 3.0 SYSTEM TEST CONFIGURATION

3.1 Justification

For radiated emissions testing, the equipment under test (EUT) was setup to transmit / receive continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, all cables (if any) were manipulated to produce worst case emissions.

The EUT was powered by a test-jig. An external AC/DC adaptor (3.3VDC) is connected to the test-jig.

For the measurements, the EUT was attached to a plastic stand if necessary and placed on the wooden turntable. If the base unit attached to peripherals, they were connected and operational (as typical as possible).

The signal was maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization were varied during the search for maximum signal level. The antenna height was varied from 1 to 4 meters. Radiated emissions were taken at three meters unless the signal level was too low for measurement at that distance. If necessary, a pre-amplifier was used and/or the test was conducted at a closer distance.

For any intentional radiator powered by AC power line, measurements of the radiated signal level of the fundamental frequency component of the emission was performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage.

Radiated emission measurement for transmitter were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

Emission that are directly caused by digital circuits in the transmit path and transmitter portion were measured, and the limit are according to FCC Part 15 Section 15.209. Digital circuitries used to control additional functions other than the operation of the transmitter are subject to FCC Part 15 Section 15.109.

## TEST REPORT

3.1 Justification – Cont'd

Detector function for radiated emissions was in peak mode. Average readings, when required, were taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in section 4.8.3.

Determination of pulse desensitization was made according to *Hewlett Packard Application Note 150-2, Spectrum Analysis... Pulsed RF.* The effective period (Teff) was referred to Exhibit 4.8.3. With the resolution bandwidth 1MHz and spectrum analyzer IF bandwidth 3dB, the pulse desensitization factor was 0dB.

For AC line conducted emission test, the EUT along with its peripherals were placed on a 1.0m(W)x1.5m(L) and 0.8m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane. The EUT was connected to power mains through a line impedance stabilization network (LISN), which provided 50ohm coupling impedance for measuring instrument. The LISN housing, measuring instrument case, reference ground plane, and vertical ground plane were bounded together. The excess power cable between the EUT and the LISN was bundled.

All connecting cables of EUT and peripherals were manipulated to find the maximum emission.

All data rates were tested under normal mode of Bluetooth 4.0 BLE. Only the worst-case data is shown in the report.

3.2 EUT Exercising Software

The EUT exercise program (if any) used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use.

## TEST REPORT

3.3 Details of EUT and Description of Accessories

*Details of EUT:*

The EUT is powered by a test-jig.
(Provided by Applicant)

*Description of Accessories:*

(1) AC/DC adaptor (3.3VDC) (Provided by Intertek)

3.4 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test at a level of confidence of 95% has been considered. The values of the Measurement uncertainty for radiated emission test and RF conducted measurement test are ± 5.3dB and ±0.99dB respectively. The value of the Measurement uncertainty for conducted emission test is ±4.2dB.

Uncertainty and Compliance - Unless the standard specifically states that measured values are to be extended by the measurement uncertainty in determining compliance, all compliance determinations are based on the actual measured value.

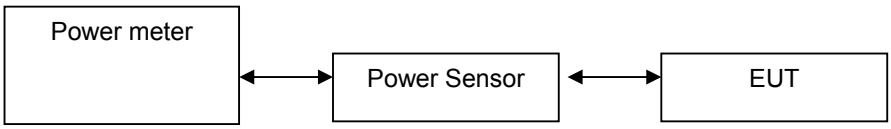
## TEST REPORT

## 4.0 TEST RESULTS

4.1 Maximum Conducted (peak) Output Power at Antenna Terminals

RF Conduct Measurement Test Setup

The figure below shows the test setup, which is utilized to make these measurements.




The antenna port of the EUT was connected to the input of a spectrum analyzer.

☒ The antenna power of the EUT was connected to the input of a power meter. Power was read directly and cable loss correction was added to the reading to the obtain power at the EUT antenna terminals. The measurement procedure 9.1.2 was used

☐ The EUT should be configured to transmit continuously (at a minimum duty cycle of 98%) at full power over the measurement duration. The measurement procedure AVG1 was used.

Antenna Gain = 2.1 dBi

| Frequency (MHz) | Output in dBm | Output in mWatt |
|---|---|---|
| Low Channel: 2402 | 1.80 | 1.51 |
| Middle Channel: 2440 | 0.76 | 1.19 |
| High Channel: 2480 | -0.98 | 0.80 |

Cable loss : 0.5 dB External Attenuation : 0 dB

Cable loss, external attenuation: ☒ included in OFFSET function
☐ added to SA raw reading

max. conducted (peak) output level = 1.8 dBm

Limits:
☒ 1W (30dBm) for antennas with gains of 6dBi or less

☐ ___W (___dBm) for antennas with gains more than 6dBi

The plots of conducted output power are saved as below.

## TEST REPORT

4.2 Minimum 6dB RF Bandwidth

The antenna port of the EUT was connected to the input of a spectrum analyzer. The EBW measurement procedure was used. A PEAK output reading was taken, a DISPLAY line was drawn 6dB lower than PEAK level. The 6dB bandwidth was determined from where the channel output spectrum intersected the display line.

Bluetooth 4.0 BLE

| Frequency (MHz) | 6dB Bandwidth (MHz) |
|---|---|
| Low Channel: 2402 | 0.708 |
| Middle Channel: 2440 | 0.708 |
| High Channel: 2480 | 0.708 |

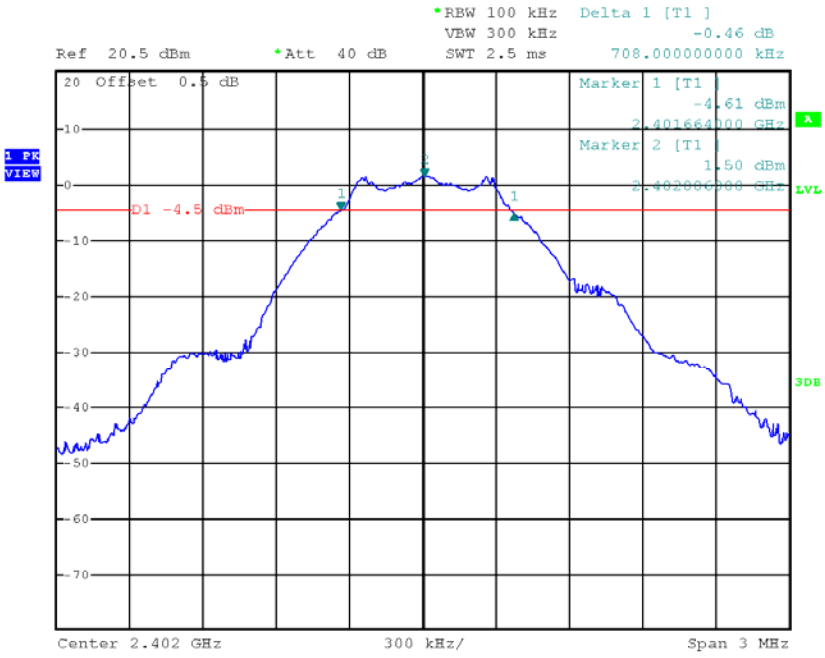
Limits
6 dB bandwidth shall be at least 500kHz

The plots of 6dB RF bandwidth are saved as below.

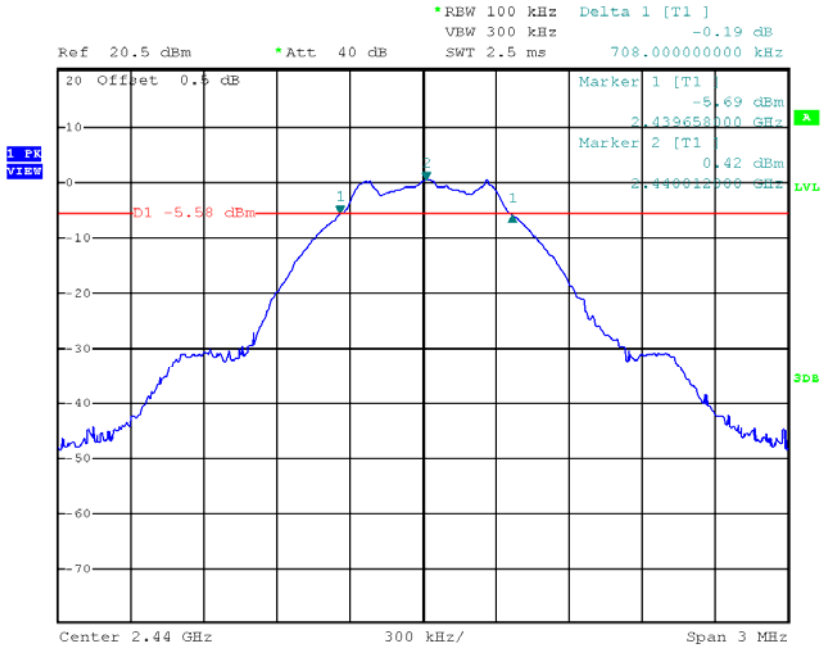
# TEST REPORT

## PLOTS OF 6dB RF BANDWIDTH

Lowest Channel



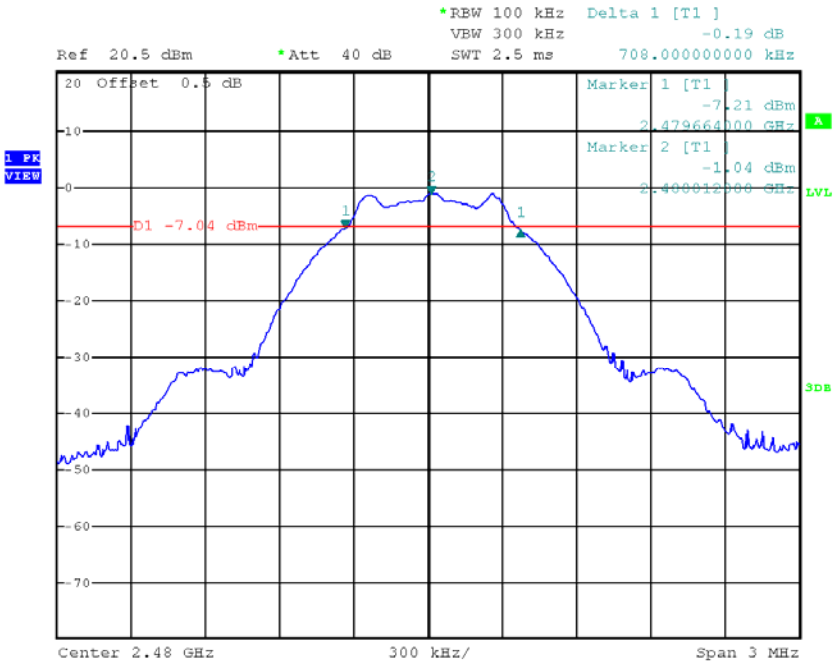

Middle Channel



## TEST REPORT

## PLOTS OF 6dB RF BANDWIDTH

Highest Channel



## TEST REPORT

4.3 Maximum Power Spectral Density

Antenna output of the EUT was coupled directly to spectrum analyzer. The measurement procedure 10.2 PKPSD was used. If an external attenuator and/or cable was used, these losses are compensated for using the OFFSET function of the analyser.

Bluetooth 4.0 BLE

| Frequency (MHz) | PSD in 100kHz (dBm) |
|---|---|
| Low Channel: 2405 | 1.64 |
| Middle Channel: 2440 | 0.56 |
| High Channel: 2480 | -1.02 |

Cable Loss: 0.5 dB

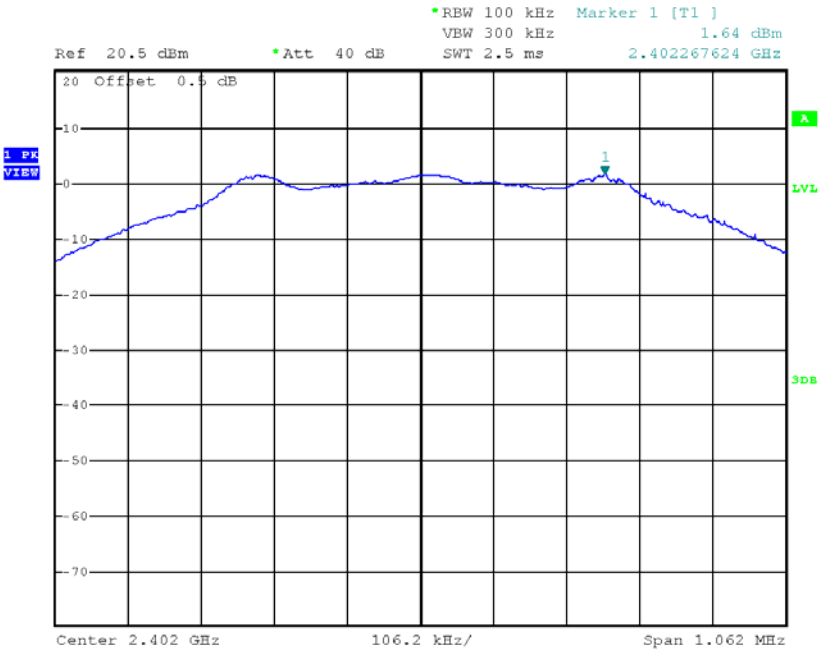
Limit:
8dBm

The plots of power spectral density are as below.
4.3 Maximum Power Spectral Density

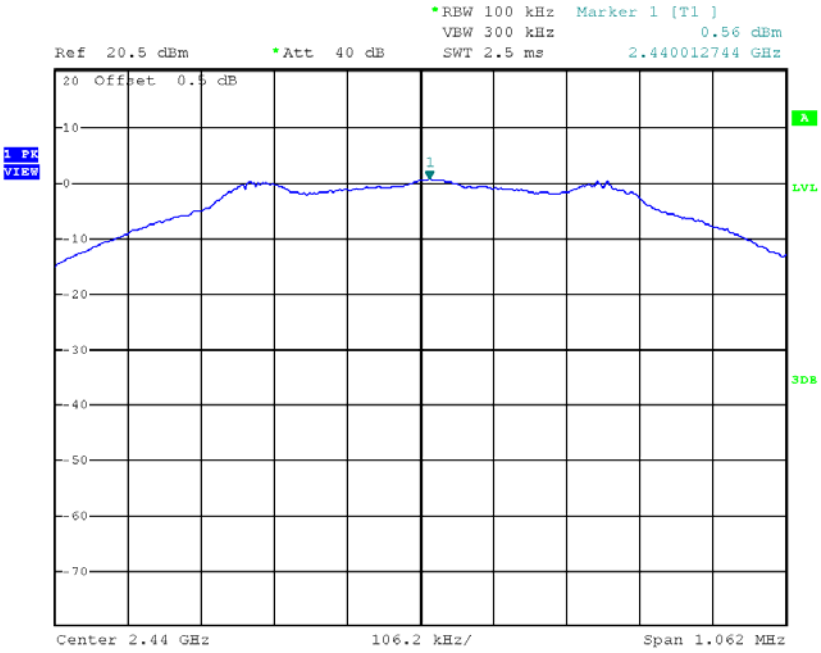
## TEST REPORT

## PLOTS OF POWER SPECTRAL DENSITY

Lowest channel



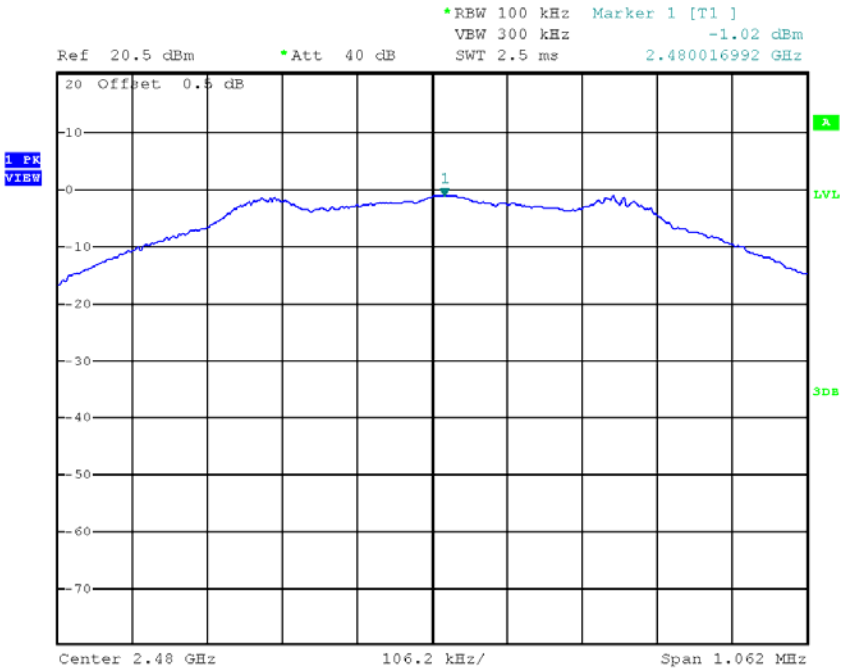

Middle channel



## TEST REPORT

## PLOTS OF POWER SPECTRAL DENSITY

Highest channel



## TEST REPORT

4.4 Out of Band Conducted Emissions

For Bluetooth 4.0 BLE, the maximum conducted (peak) output power was used to demonstrate compliance as described in 9.1. Then the display line (in red) shown in the following plots denotes the limit at 20dB below maximum measured in-band peak PSD level in 100 KHz bandwidth for Bluetooth 4.0 BLE.

The measurement procedures under sections 11 of KDB558074 D01 v04 (05-April-2017) were used.

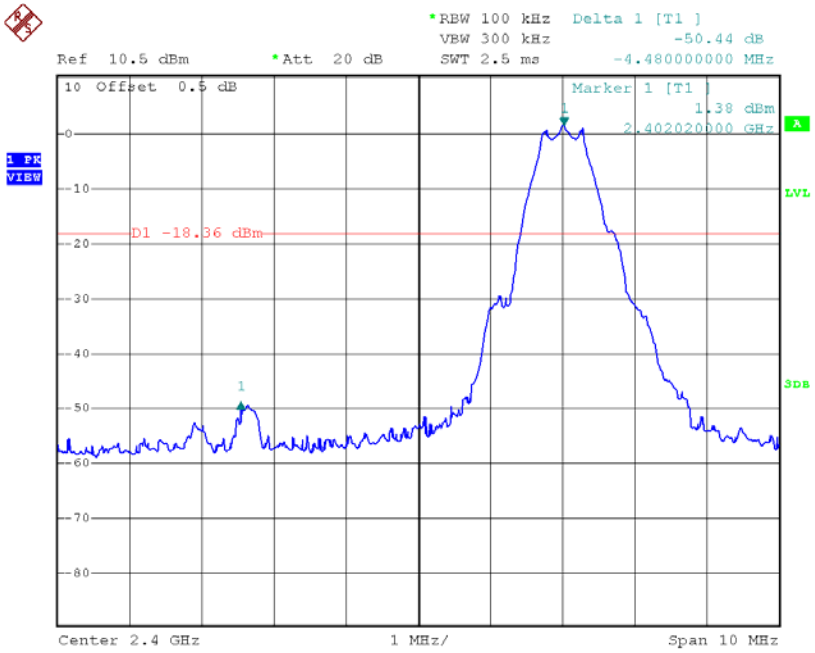
Furthermore, delta measurement technique for measuring bandedge emissions was incorporated in the test of the edge at 2483.5MHz.

Limits:
All spurious emission and up to the tenth harmonic was measured and they were found to be at least for Bluetooth 4.0 BLE below the maximum measured in-band peak PSD level.

## TEST REPORT

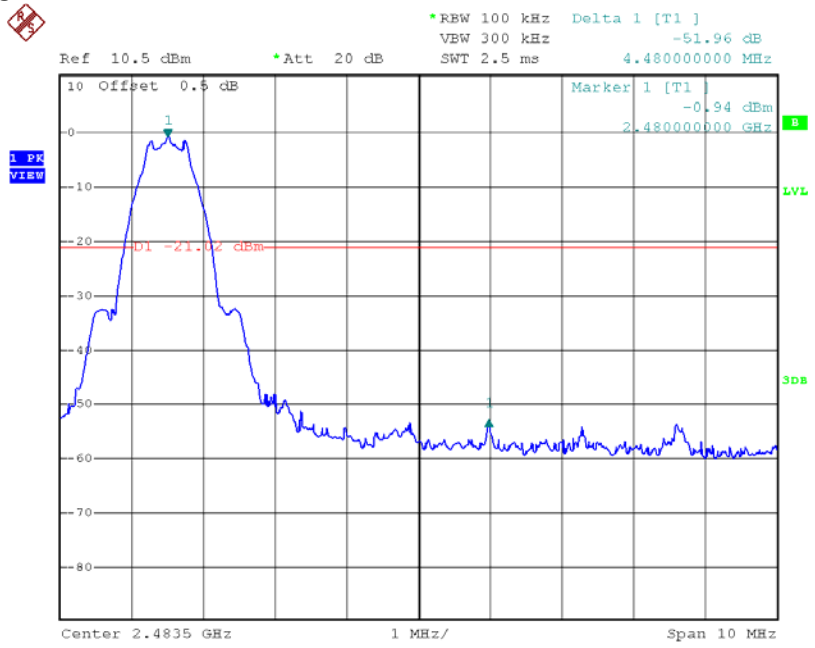
## PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Bandedge, Lowest Channel




Date: 3.MAY.2018 16:11:31

Bandedge, Highest Channel

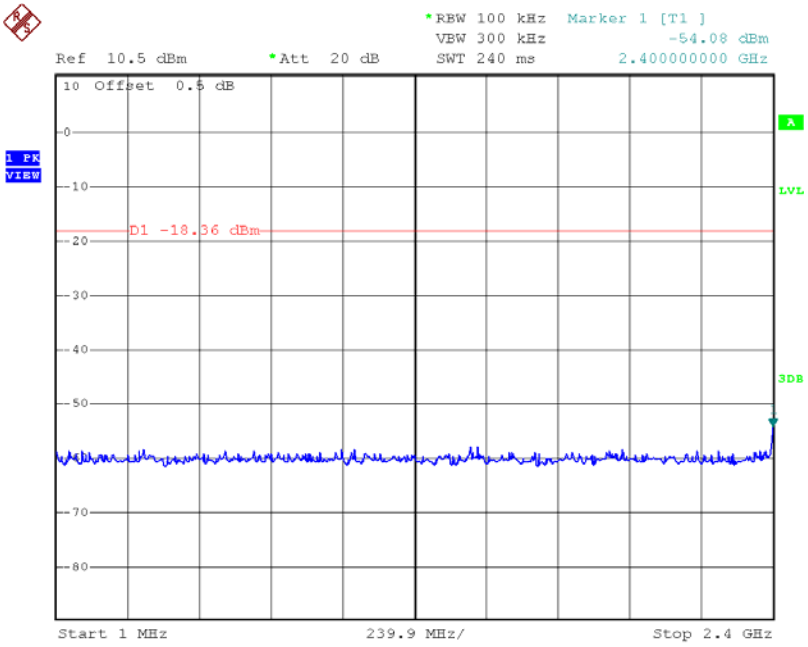



Date: 3.MAY.2018 16:09:43

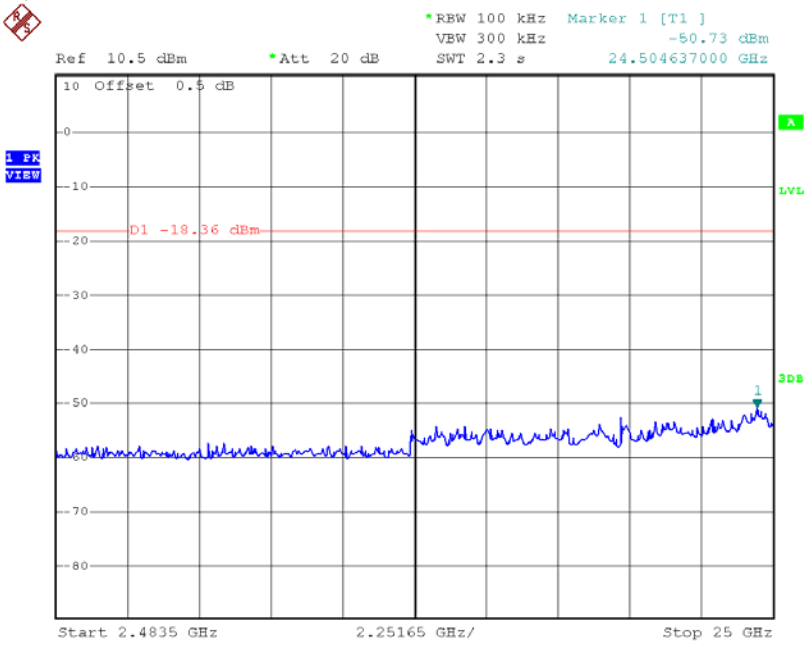
## TEST REPORT

## PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Lowest Channel, Plot A



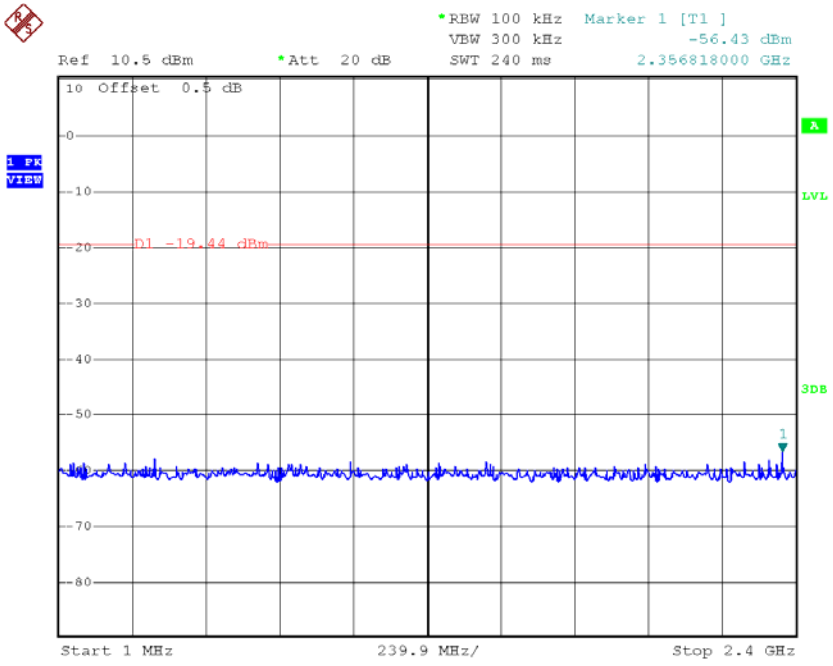

Lowest Channel, Plot B



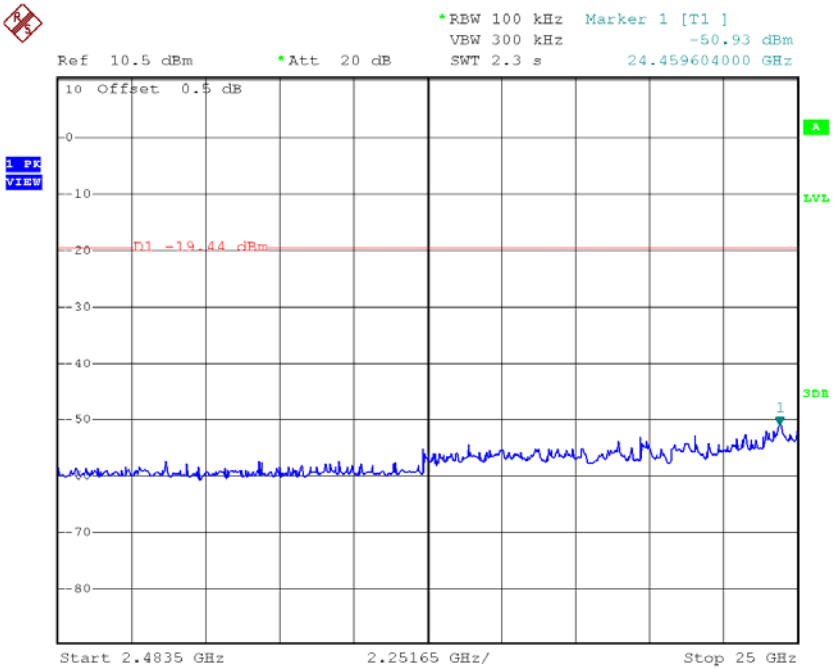
## TEST REPORT

## PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Middle Channel, Plot A



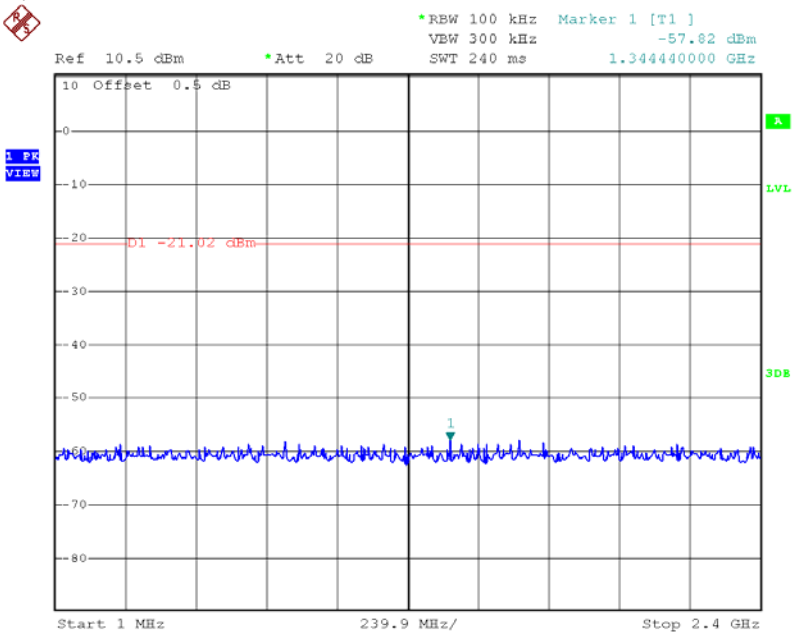

Middle Channel, Plot B



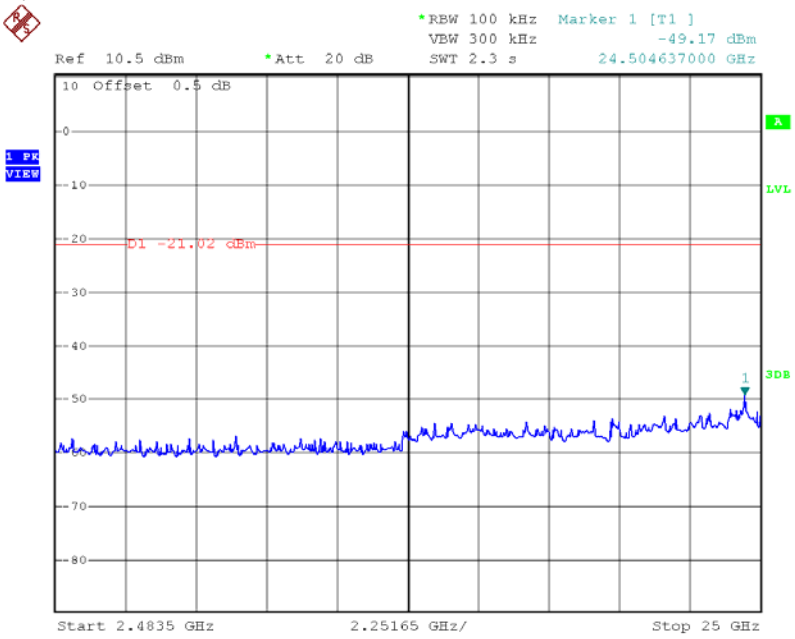
## TEST REPORT

## PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Highest Channel, Plot A




Highest Channel, Plot B



## TEST REPORT

4.5 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

FS = RA + AF + CF - AG + PD + AV

Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB
PD = Pulse Desensitization in dB
AV = Average Factor in -dB

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

FS = RA + AF + CF - AG + PD + AV

Example
Assume a receiver reading of 62.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29.0 dB is subtracted. The pulse desensitization factor of the spectrum analyzer is 0.0 dB, and the resultant average factor is -10.0 dB. The net field strength for comparison to the appropriate emission limit is 32.0 dBμV/m. This value in dBμV/m is converted to its corresponding level in μV/m.

RA = 62.0 dBμV
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
PD = 0.0 dB
AV = -10 dB

FS = 62.0 + 7.4 + 1.6 – 29.0 + 0.0 + (-10.0) = 32.0 dBμV/m

Level in μV/m = Common Antilogarithm [(32.0 dBμV/m)/20] = 39.8 μV/m

## TEST REPORT

4.6 Transmitter Radiated Emissions in Restricted Bands and Spurious Emissions

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

4.6.1 Radiated Emission Configuration Photograph

Worst Case Restricted Band Radiated Emission
at

2390.000 MHz

The worst case radiated emission configuration photographs are saved with filename: config photos.pdf

4.6.2 Radiated Emission Data

The data in tables 1-4 list the significant emission frequencies, the limit and the margin of compliance.

Judgement -

Passed by 1.4 dB margin

## TEST REPORT

## RADIATED EMISSION DATA

Mode: TX-Channel 0

Table 1
Bluetooth 4.0 BLE

| Polari-zation | Frequency (MHz) | Reading (dBµV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m (dBµV/m) | Average Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| ***H*** | ***2390.000*** | ***56.2*** | ***33*** | ***29.4*** | ***52.6*** | ***54.0*** | ***-1.4*** |
| ***H*** | ***4804.000*** | ***41.5*** | ***33*** | ***34.9*** | ***43.4*** | ***54.0*** | ***-10.6*** |
| ***H*** | ***12010.000*** | ***39.4*** | ***33*** | ***40.5*** | ***46.9*** | ***54.0*** | ***-7.1*** |

| Polari-zation | Frequency (MHz) | Reading (dBµV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBµV/m) | Peak Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| ***H*** | ***2390.000*** | ***56.2*** | ***33*** | ***29.4*** | ***52.6*** | ***74.0*** | ***-21.4*** |
| ***H*** | ***4804.000*** | ***41.5*** | ***33*** | ***34.9*** | ***43.4*** | ***74.0*** | ***-30.6*** |
| ***H*** | ***12010.000*** | ***39.4*** | ***33*** | ***40.5*** | ***46.9*** | ***74.0*** | ***-27.1*** |

NOTES:

1. Peak detector is used for the emission measurement.
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.

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Mode: TX-Channel 19

Table 2
Bluetooth 4.0 BLE

| Polari-zation | Frequency (MHz) | Reading (dBµV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m (dBµV/m) | Average Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| ***H*** | ***4880.000*** | ***41.8*** | ***33*** | ***34.9*** | ***43.7*** | ***54.0*** | ***-10.3*** |
| ***H*** | ***7320.000*** | ***39.6*** | ***33*** | ***37.9*** | ***44.5*** | ***54.0*** | ***-9.5*** |
| ***H*** | ***12200.000*** | ***38.9*** | ***33*** | ***40.5*** | ***46.4*** | ***54.0*** | ***-7.6*** |

| Polari-zation | Frequency (MHz) | Reading (dBµV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBµV/m) | Peak Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| ***H*** | ***4880.000*** | ***41.8*** | ***33*** | ***34.9*** | ***43.7*** | ***74.0*** | ***-30.3*** |
| ***H*** | ***7320.000*** | ***39.6*** | ***33*** | ***37.9*** | ***44.5*** | ***74.0*** | ***-29.5*** |
| ***H*** | ***12200.000*** | ***38.9*** | ***33*** | ***40.5*** | ***46.4*** | ***74.0*** | ***-27.6*** |

NOTES:

1. Peak detector is used for the emission measurement.
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.

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Mode: TX-Channel 39

Table 3
Bluetooth 4.0 BLE

| Polari-zation | Frequency (MHz) | Reading (dBµV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m (dBµV/m) | Average Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| ***H*** | ***2483.500*** | ***56.0*** | ***33*** | ***29.4*** | ***52.4*** | ***54.0*** | ***-1.6*** |
| ***H*** | ***4960.000*** | ***41.3*** | ***33*** | ***34.9*** | ***43.2*** | ***54.0*** | ***-10.8*** |
| ***H*** | ***7440.000*** | ***39.5*** | ***33*** | ***37.9*** | ***44.4*** | ***54.0*** | ***-9.6*** |
| ***H*** | ***12400.000*** | ***39.2*** | ***33*** | ***40.5*** | ***46.7*** | ***54.0*** | ***-7.3*** |

| Polari-zation | Frequency (MHz) | Reading (dBµV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBµV/m) | Peak Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| ***H*** | ***2483.500*** | ***56.0*** | ***33*** | ***29.4*** | ***52.4*** | ***74.0*** | ***-21.6*** |
| ***H*** | ***4960.000*** | ***41.3*** | ***33*** | ***34.9*** | ***43.2*** | ***74.0*** | ***-30.8*** |
| ***H*** | ***7440.000*** | ***39.5*** | ***33*** | ***37.9*** | ***44.4*** | ***74.0*** | ***-29.6*** |
| ***H*** | ***12400.000*** | ***39.2*** | ***33*** | ***40.5*** | ***46.7*** | ***74.0*** | ***-27.3*** |

NOTES:

1. Peak detector is used for the emission measurement.
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.

## TEST REPORT

Mode: Bluetooth Operating

Table 4

| Polarization | Frequency (MHz) | Reading (dBµV) | Pre-amp (dB) | Antenna Factor (dB) | Net at 3m (dBµV/m) | Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| V | 31.294 | 32.5 | 16 | 10.0 | 26.5 | 40.0 | -13.5 |
| V | 43.904 | 26.8 | 16 | 10.0 | 20.8 | 40.0 | -19.2 |
| ***V*** | ***119.294*** | ***24.2*** | ***16*** | ***14.0*** | ***22.2*** | ***43.5*** | ***-21.3*** |
| ***V*** | ***131.634*** | ***25.8*** | ***16*** | ***14.0*** | ***23.8*** | ***43.5*** | ***-19.7*** |
| H | 161.596 | 25.8 | 16 | 16.0 | 25.8 | 43.5 | -17.7 |
| H | 177.764 | 26.5 | 16 | 19.0 | 29.5 | 43.5 | -14.0 |
| H | 193.876 | 32.2 | 16 | 16.0 | 32.2 | 43.5 | -11.3 |
| H | 210.042 | 24.5 | 16 | 17.0 | 25.5 | 43.5 | -18.0 |
| H | 226.210 | 23.4 | 16 | 18.0 | 25.4 | 46.0 | -20.6 |
| ***H*** | ***274.710*** | ***18.5*** | ***16*** | ***22.0*** | ***24.5*** | ***46.0*** | ***-21.5*** |
| H | 339.322 | 12.5 | 16 | 24.0 | 20.5 | 46.0 | -25.5 |
| V | 468.602 | 12.2 | 16 | 26.0 | 22.2 | 46.0 | -23.8 |
| V | 799.802 | 13.0 | 16 | 31.0 | 28.0 | 46.0 | -18.0 |

NOTES:
1. Quasi-Peak detector is used for the emission measurement.

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

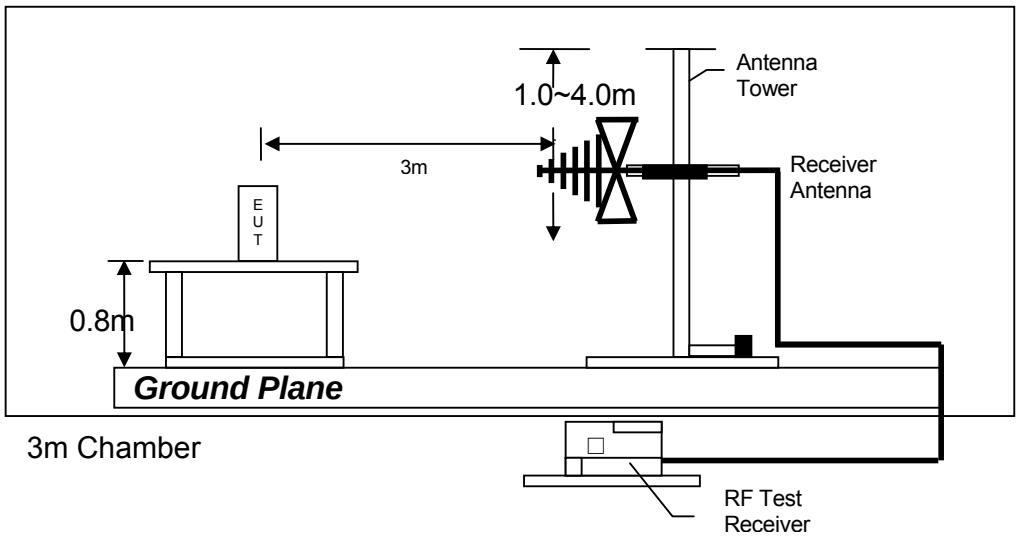
3. Negative value in the margin column shows emission below limit.

4. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.

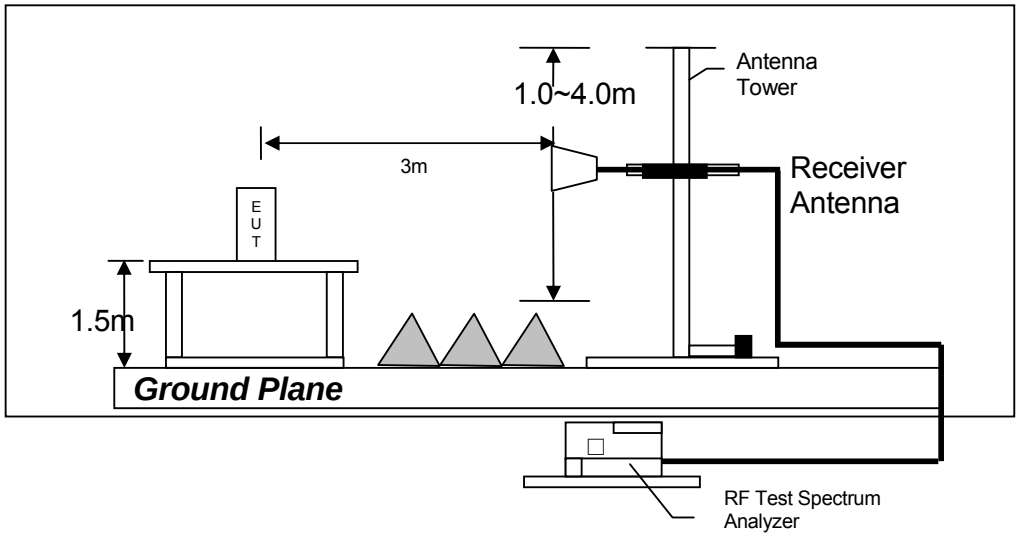
## TEST REPORT

4.6.3 Radiated Emission Test Setup

The figure below shows the test setup, which is utilized to make these measurements.




Test setup of radiated emissions up to 1GHz




Test setup of radiated emissions above 1GHz

## TEST REPORT

### 4.6.4 Transmitter Duty Cycle Calculation

Not applicable – No average factor is required.

## TEST REPORT

4.7 AC Power Line Conducted Emission

☐ Not applicable – EUT is only powered by battery for operation.

☒ EUT connects to AC power line. Emission Data is listed in following pages.

☐ Base Unit connects to AC power line and has transmission. Handset connects to AC power line but has no transmission. Emission Data of Base Unit is listed in following pages.

4.7.1 AC Power Line Conducted Emission Configuration Photograph

Worst Case Line-Conducted Configuration
at

0.168 MHz

The worst case line conducted configuration photographs are attached in the Appendix and saved with filename: config photos.pdf

4.7.2 AC Power Line Conducted Emission Data

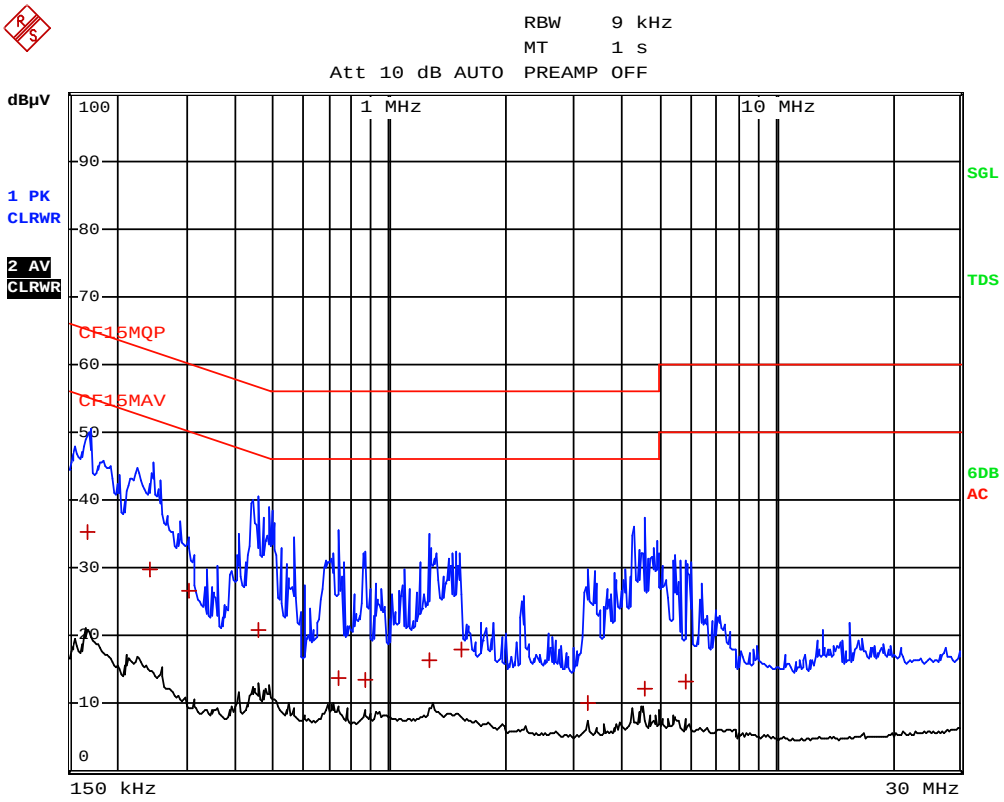
The plot(s) and data in the following pages list the significant emission frequencies, the limit and the margin of compliance.

Passed by 29.8 dB margin compare with Quasi-peak limit

# TEST REPORT

## AC POWER LINE CONDUCTED EMISSION

Worst Case: Bluetooth Operating




Date: 4.MAY.2018 09:06:47

# TEST REPORT

Worst Case: Bluetooth Operating

EDIT PEAK LIST (Final Measurement Results)

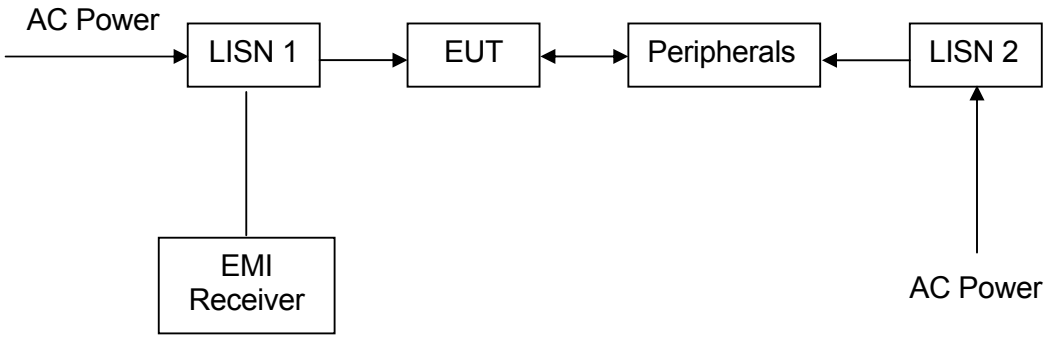
Trace1: CF15MQP
Trace2: CF15MAV
Trace3: ---

| | TRACE | FREQUENCY | LEVEL dBµV | | DELTA LIMIT dB |
|---|---|---|---|---|---|
| 1 | Quasi Peak | 168 kHz | 35.24 | L1 | -29.81 |
| 1 | Quasi Peak | 244.5 kHz | 29.86 | L1 | -32.07 |
| 1 | Quasi Peak | 303 kHz | 26.66 | N | -33.49 |
| 1 | Quasi Peak | 456 kHz | 20.93 | N | -35.82 |
| 1 | Quasi Peak | 739.5 kHz | 13.83 | L1 | -42.16 |
| 1 | Quasi Peak | 870 kHz | 13.39 | L1 | -42.60 |
| 1 | Quasi Peak | 1.275 MHz | 16.45 | L1 | -39.54 |
| 1 | Quasi Peak | 1.5405 MHz | 17.86 | N | -38.13 |
| 1 | Quasi Peak | 3.255 MHz | 10.22 | N | -45.77 |
| 1 | Quasi Peak | 4.5825 MHz | 12.16 | N | -43.84 |
| 1 | Quasi Peak | 5.883 MHz | 13.18 | N | -46.81 |

Date: 4.MAY.2018 09:06:26

## TEST REPORT

4.7.3 Conducted Emission Test Setup



**TEST REPORT**

# 5.0 EQUIPMENT

Radiated Emissions Test

| EQUIPMENT | EMI Test Receiver | BICONICAL ANTENNA | LOG PERIODIC ANTENNA |
|---|---|---|---|
| Registration No. | EW-2500 | EW-0571 | EW-1042 |
| Manufacturer | ROHDESCHWARZ | EMCO | EMCO |
| Model No. | ESCI | 3104C | 3148 |
| Calibration Date | Oct. 13, 2017 | Feb. 27, 2018 | Jun. 19, 2017 |
| Calibration Due Date | Oct. 13, 2018 | Aug. 27, 2019 | Dec. 19, 2018 |

| EQUIPMENT | SPECTRUM ANALYZER | Pyramidal Horn Antenna | DOUBLE RIDGED GUIDE ANTENNA |
|---|---|---|---|
| Registration No. | EW-2253 | EW-0905 | EW-1015 |
| Manufacturer | ROHDESCHWARZ | EMCO | EMCO |
| Model No. | FSP40 | 3160-09 | 3115 |
| Calibration Date | Jul. 24, 2017 | Aug. 18, 2017 | Nov. 17, 2017 |
| Calibration Due Date | Jul. 24, 2018 | Feb. 18, 2019 | May. 17, 2019 |

| Equipment | Active Loop H-field (9kHz to 30MHz) | 12m Double Shield RF Cable (20MHz to 6GHz) | RF Cable 14m (1GHz to 26.5GHz) |
|---|---|---|---|
| Registration No. | EW-3326 | EW-1852 | EW-2781 |
| Manufacturer | EMCO | RADIALL | GREATBILLION |
| Model No. | 6502 | N(m)-RG142 - N(m) | SMA m/SHF5MPU /SMA m ra14m,26G |
| Calibration Date | Sep. 27, 2017 | Jan. 19, 2018 | Sep. 25, 2017 |
| Calibration Due Date | Mar. 27, 2019 | Jan. 19, 2019 | Sep. 25, 2018 |

| Equipment | Notch Filter (cutoff frequency 2.4GHz to 2.5GHz) | RF PRE-AMPLIFIER 3 PCS (9KHZ TO 40GHZ) |
|---|---|---|
| Registration No. | EW-2213 | EW-3229 |
| Manufacturer | MICROTRONICS | BONN ELEKTRO |
| Model No. | BRM50701-02 | BLMA 0118-5G |
| Calibration Date | May. 26, 2017 | Jan. 30, 2018 |
| Calibration Due Date | May. 26, 2018 | Jan. 30, 2019 |

## TEST REPORT

2) Conducted Emissions Test

| Equipment | EMI Test Receiver | RF Cable 120cm (RG142) (9kHz to 30MHz) | Artificial Mains Network |
|---|---|---|---|
| Registration No. | EW-3156 | EW-2453 | EW-0192 |
| Manufacturer | R&S | RADIALL | ROHDESCHWARZ |
| Model No. | ESR26 | bnc m st / 142 / bnc m st 100c | ESH3-Z5 |
| Calibration Date | November 10, 2017 | Sep. 15, 2017 | Oct. 27, 2017 |
| Calibration Due Date | November 10, 2018 | Sep. 15, 2018 | Aug. 25, 2018 |

3) Conductive Measurement Test

| Equipment | Spectrum Analyzer | RF Cable 30cm (1-26)GHz | RF Power Meter with Power Sensor (N1921A) |
|---|---|---|---|
| Registration No. | EW-2466 | EW-2268 | EW-2270 |
| Manufacturer | R&S | RADIALL | N/A |
| Model No. | FSP30 | SMA(M)/SHF5M/SMA(M)30cm | AGILENTTECH |
| Calibration Date | September 04, 2017 | Aug. 23, 2017 | January 15, 2018 |
| Calibration Due Date | July 16, 2018 | Aug. 23, 2018 | January 15, 2019 |

4) Bandedge/Bandwidth Measurement

| EQUIPMENT | RF Cable 30cm (1-26)GHz | SPECTRUM ANALYZER |
|---|---|---|
| Registration No. | EW-2268 | EW-2253 |
| Manufacturer | RADIALL | ROHDESCHWARZ |
| Model No. | SMA(M)/SHF5M/SMA(M)30cm | FSP40 |
| Calibration Date | Aug. 23, 2017 | Jul. 24, 2017 |
| Calibration Due Date | Aug. 23, 2018 | Jul. 24, 2018 |

**END OF TEST REPORT**