Zacta

# TEST REPORT

Report number : JPD-TR-18035-0
Issue date : May 25, 2018

The device, as described herewith, was tested pursuant to applicable test procedure and complies with the requirements of;

## FCC Part15 Subpart C

The test results are traceable to the international or national standards.

| | | |
|---|---|---|
| Applicant | : | KYOCERA Corporation |
| Equipment under test (EUT) | : | Mobile Phone |
| Model number | : | YKHA81 |
| FCC ID | : | JOYYKHA81 |

| | | |
|---|---|---|
| Date of test | : | April 26, 28, 2018<br>May 1, 8, 17, 2018 |
| Test place | : | TÜV SÜD Zacta Ltd. Yonezawa Testing Center<br>5-4149-7, Hachimanpara, Yonezawa-shi,<br>Yamagata, 992-1128 Japan<br>Phone: +81-238-28-2881 Fax: +81-238-28-2888 |
| Test results | : | Complied |

The results in this report are applicable only to the equipment tested.
This report shall not be re-produced except in full without the written approval of TÜV SÜD Zacta Ltd.
This test report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, ILAC-MRA, or any agency of the federal government.

Tested by : Tadahiro Seino
Tadahiro Seino

Approved by : Hiroaki Suzuki
Hiroaki Suzuki
Lab Manager of RF Lab

NVLAP TESTING
NVLAP LAB CODE 200306-0

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# 1. Summary of Test

## 1.1 Purpose of test

It is the original test in order to verify conformance to FCC Part 15 Subpart C.

## 1.2 Standards

CFR47 FCC Part 15 Subpart C

### 1.2.1 Test Methods

ANSI C63.10-2013, KDB558074 D01 DTS Meas Guidance v04

### 1.2.2 Deviation from standards

None

## 1.3 List of applied test to the EUT

| Test items Section | Test items | Condition | Result |
|---|---|---|---|
| 15.247(a)(2) | 6dB Bandwidth | Conducted | PASS |
| 15.247(b)(3) | Maximum Peak Output Power | Conducted | PASS |
| 15.247(d) | Band Edge Compliance of RF Conducted Emissions | Conducted | PASS |
| 15.247(d)<br>15.205<br>15.209 | Spurious Emissions | Conducted<br>Radiated | PASS |
| 15.247(d)<br>15.205<br>15.209 | Restricted Bands of Operation | Radiated | PASS |
| 15.247(e) | Transmitter Power Spectral Density | Conducted | PASS |
| 15.207 | AC Power Line Conducted Emissions | Conducted | PASS |

### 1.3.1 Test set up

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## 1.4 Modification to the EUT by laboratory

None

# 2. Equipment Under Test

## 2.1 General Description of equipment

EUT is the Mobile Phone.

## 2.2 EUT information

| | | |
|---|---|---|
| Applicant | : | KYOCERA Corporation<br>Yokohama Office 2-1-1 Kagahara, Tsuzuki-ku Yokohama-shi, Kanagawa, Japan<br>Phone: +81-45-943-6253 Fax: +81-45-943-6314 |
| Equipment under test | : | Mobile Phone |
| Trade name | : | Kyocera |
| Model number | : | YKHA81 |
| Serial number | : | N/A |
| EUT condition | : | Pre-Production |
| Power ratings | : | Battery: DC 3.8V |
| Size | : | (W) 71.0mm × (D) 9.7mm × (H) 147.3mm |
| Environment | : | Indoor and Outdoor use |
| Operating environment | : | Temperature: 5˚C to 40˚C<br>Humidity: 35% to 90% |
| RF Specification | | |
| Protocol | : | Bluetooth 4.2 + EDR |
| Frequency range | : | 2402MHz-2480MHz |
| Number of RF Channels | : | 40 Channels |
| Modulation method/ Data rate | : | GFSK (1Mbps) |
| Channel separation | : | 2MHz |
| Conducted power | : | 0.843mW |
| Antenna type | : | Internal antenna |
| Antenna gain | : | -1.4dBi |

## 2.3 Variation of the family model(s)

Not applicable

## 2.4 Operating channels and frequencies

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

## 2.5 Operating mode

The EUT had been tested under operating condition.
There are three channels have been tested as following:

| Tested Channel | Frequency [MHz] |
|---|---|
| Low | 2402 |
| Middle | 2440 |
| High | 2480 |

The pre-test has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates.

| Tested Channel | Modulation Type | Data Rate |
|---|---|---|
| Low, Middle, High | GFSK | 1Mbps |

The field strength of spurious emissions was measured at each position of all three axis X, Y and Z to compare the level, and the maximum noise.
The worst emission was found in X axis and the worst case recorded.

## 2.6 Operating flow

[Tx mode]
i) Test program setup to the DM tool
ii) Select a Test mode
Operating frequency: Channel Low: 2402MHz, Channel Middle: 2440MHz, Channel High: 2480MHz
iii) Start test mode

[Rx mode]
i) Test program setup to the DM tool
ii) Select a Test mode
Operating frequency: Channel Low: 2402MHz, Channel Middle: 2440MHz, Channel High: 2480MHz
iii) Start test mode

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# 3. Configuration of equipment

## 3.1 Equipment(s) used

| No. | Equipment | Company | Model No. | Serial No. | FCC ID / DoC | Comment |
|---|---|---|---|---|---|---|
| 1 | Mobile Phone | KYOCERA | YKHA81 | N/A | JOYYKHA81 | EUT |
| 2 | AC Adapter | au | N/A | N/A | N/A | * |

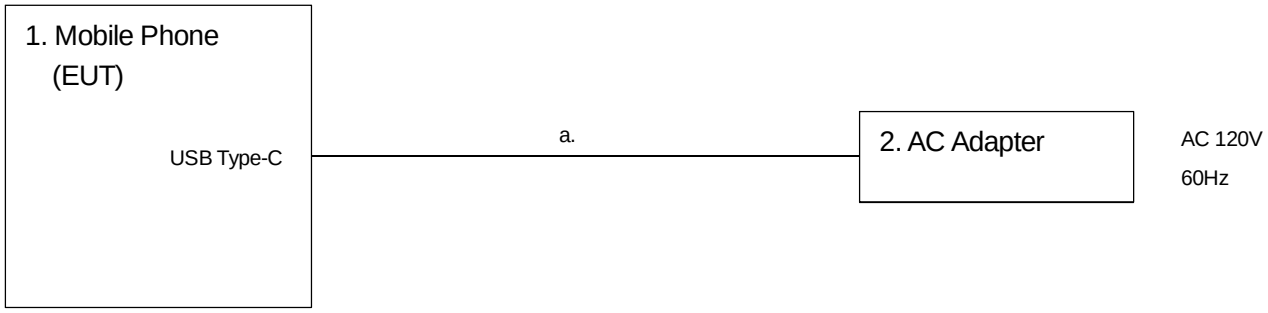
*: AC power line Conducted Emission Test.

## 3.2 Cable(s) used

| No. | Cable | Length[m] | Shield | Connector | Comment |
|---|---|---|---|---|---|
| a | USB cable (for AC Adapter) | 0.8 | Yes | Metal | * |

*: AC power line Conducted Emission Test.

## 3.3 System configuration




Note1: Numbers assigned to equipment or cables on this diagram correspond to the list in “3.1 Equipment(s) used” and “3.2 Cable(s) used”.

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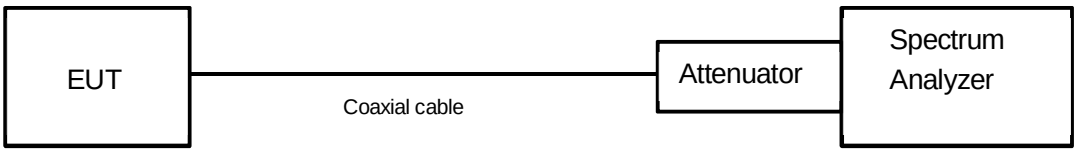
# 4. 6dB Bandwidth

## 4.1 Measurement procedure
**[FCC 15.247(a)(2), KDB558074 D01 v04, Section 8.2]**

The bandwidth at 6dB down from the highest inband spectral density is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

The spectrum analyzer is set to;
a) RBW = 100kHz.
b) VBW ≥ 3 x RBW.
c) Sweep time = auto-couple.
d) Detector = peak.
e) Trace mode = max hold.

- Test configuration




## 4.2 Limit

The minimum permissible 6dB bandwidth is 500kHz.

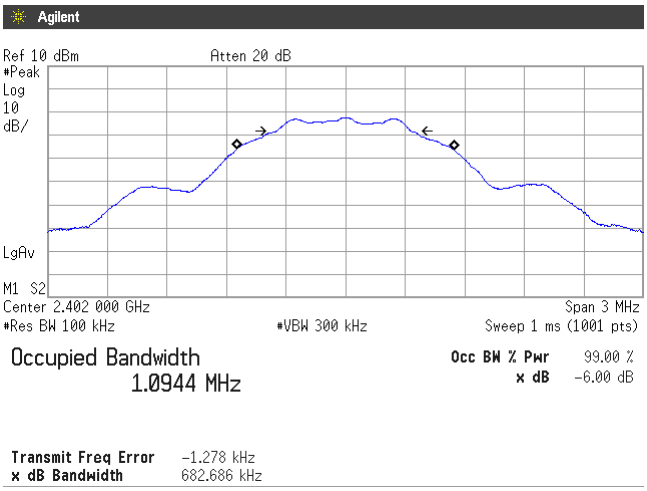
## 4.3 Measurement result

| | | | | |
|---|---|---|---|---|
| Date | : | May 17, 2018 | | |
| Temperature | : | 22.3 [˚C] | | |
| Humidity | : | 55.1 [%] | Test engineer | : |
| Test place | : | Shielded room No.3 | | Tadahiro Seino |

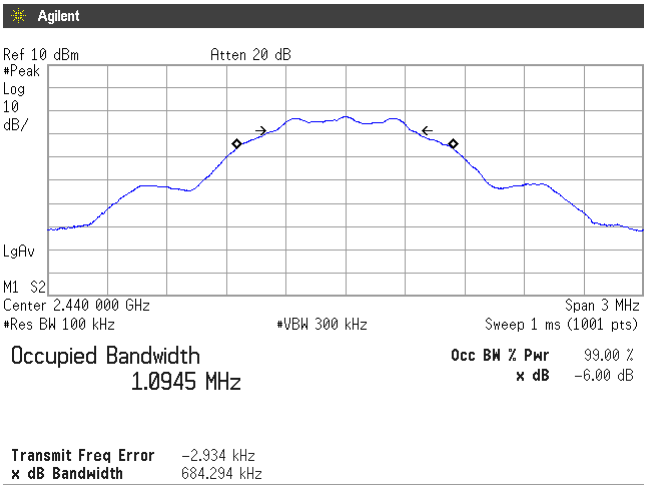
| Channel | Frequency [MHz] | 6dB bandwidth [MHz] |
|---|---|---|
| Low | 2402 | 0.683 |
| Middle | 2440 | 0.684 |
| High | 2480 | 0.685 |

## 4.4 Trace data

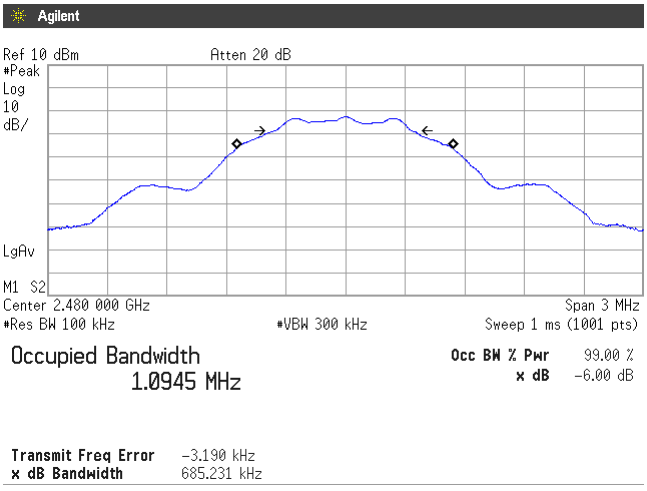
### Channel Low




### Channel Middle




### Channel High



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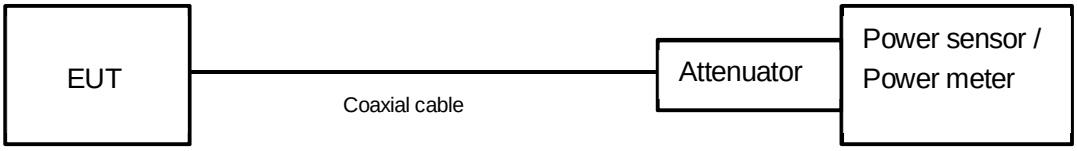
# 5. Maximum Peak Output Power

## 5.1 Measurement procedure
**[FCC 15.247(b)(3), KDB558074 D01 v04, Section 9.1.3]**

The peak power is measured with a power sensor connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

- Test configuration




## 5.2 Limit

1W(1000mW) or less

## 5.3 Measurement result

| | | | | |
|---|---|---|---|---|
| Date | : | May 17, 2018 | | |
| Temperature | : | 22.3 [˚C] | | |
| Humidity | : | 55.1 [%] | Test engineer | : |
| Test place | : | Shielded room No.3 | | Tadahiro Seino |

**Battery Full**

| Channel | Center Frequency (MHz) | Reading (dBm) | Factor (dB) | Level (dBm) | Peak Output Power (mW) | Limit (mW) | Result |
|---|---|---|---|---|---|---|---|
| Low | 2402 | -11.91 | 11.17 | -0.74 | 0.843 | ≦1000 | PASS |
| Middle | 2440 | -12.12 | 11.17 | -0.95 | 0.804 | ≦1000 | PASS |
| High | 2480 | -12.12 | 11.17 | -0.95 | 0.804 | ≦1000 | PASS |

Calculation;
Reading (dBm) + Factor (dB) = Level (dBm)
10logP = Level (dBm)
$P = 10^{(\text{Maximum Peak Output Power} / 10)}$ (mW)

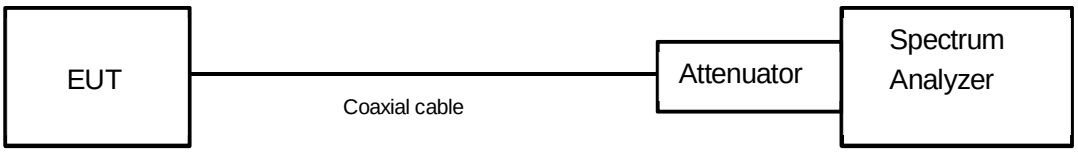
# 6. Band Edge Compliance of RF Conducted Emissions

## 6.1 Measurement procedure
**[FCC 15.247(d), KDB558074 D01 v04, Section 11.0]**

The Band Edge is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

The spectrum analyzer is set to;
a) Span = Arbitrary setting. (Setting suitable for measurement.)
b) RBW = 100kHz.
c) VBW ≥ 3 x RBW
d) Sweep time = auto-couple.
e) Detector = peak.
f) Trace mode = max hold.

- Test configuration




## 6.2 Limit

In any 100kHz bandwidth outside the frequency band the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.

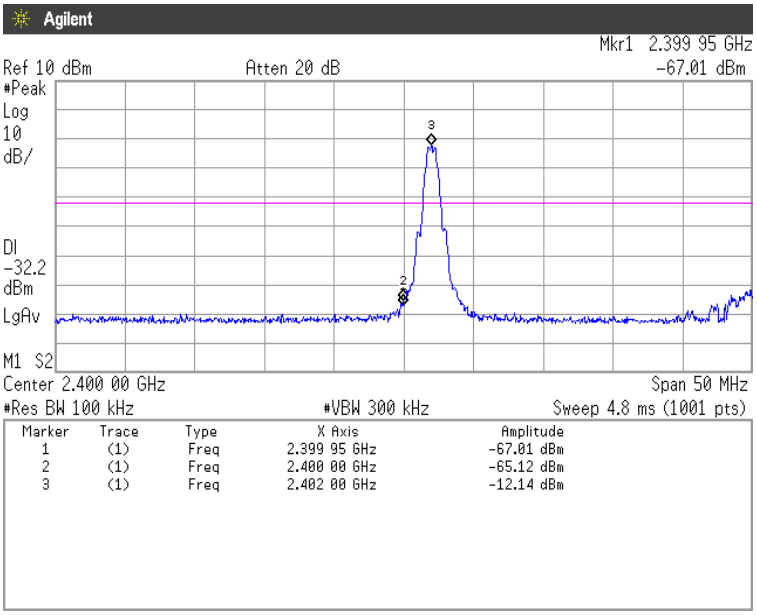
## 6.3 Measurement result

| | | | | | |
|---|---|---|---|---|---|
| Date | : | May 17, 2018 | | | |
| Temperature | : | 22.3 [˚C] | | | |
| Humidity | : | 55.1 [%] | Test engineer | : | |
| Test place | : | Shielded room No.3 | | | Tadahiro Seino |

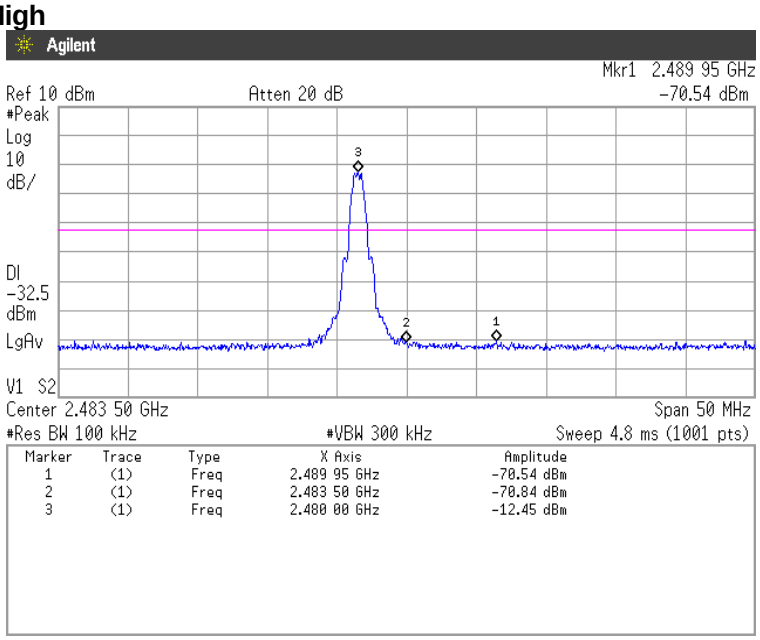
| Channel | Frequency (MHz) | RF Power Level (dBm) | Band-edge Frequency (MHz) | Band-edge Level (dBm) | Difference Level (dBm) | Limit (dBm) | Result |
|---|---|---|---|---|---|---|---|
| Low | 2402 | -12.14 | 2400.00 | -65.12 | 52.98 | At least 20dB below from peak of RF | PASS |
| High | 2480 | -12.45 | 2489.95 | -70.54 | 58.09 | At least 20dB below from peak of RF | PASS |

## 6.4 Trace data

### Channel Low




### Channel High



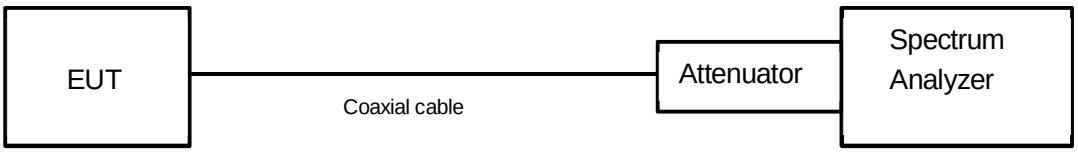
# 7. Spurious emissions - Conducted -

## 7.1 Measurement procedure
**[FCC 15.247(d), KDB558074 D01 v04, Section 11.0]**

The spurious emissions (Conducted) are measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

The spectrum analyzer is set to;
a) Span = wide enough to fully capture the emission being measured.
b) RBW = 100 kHz.
c) VBW ≥ RBW.
d) Sweep time = auto-couple.
e) Detector = peak.
f) Trace mode = max hold.

- Test configuration




## 7.2 Limit

In any 100kHz bandwidth outside the frequency band the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.

## 7.3 Measurement result

| | | | | |
|---|---|---|---|---|
| Date | : | May 17, 2018 | | |
| Temperature | : | 22.3 [˚C] | | |
| Humidity | : | 55.1 [%] | Test engineer | : |
| Test place | : | Shielded room No.3 | | Tadahiro Seino |

| Channel | Frequency [MHz] | Limit [dB] | Results Chart | Result |
|---|---|---|---|---|
| Low | 2402 | At least 20dB below from peak of RF | See the trace Data | PASS |
| Middle | 2440 | At least 20dB below from peak of RF | See the trace Data | PASS |
| High | 2480 | At least 20dB below from peak of RF | See the trace Data | PASS |

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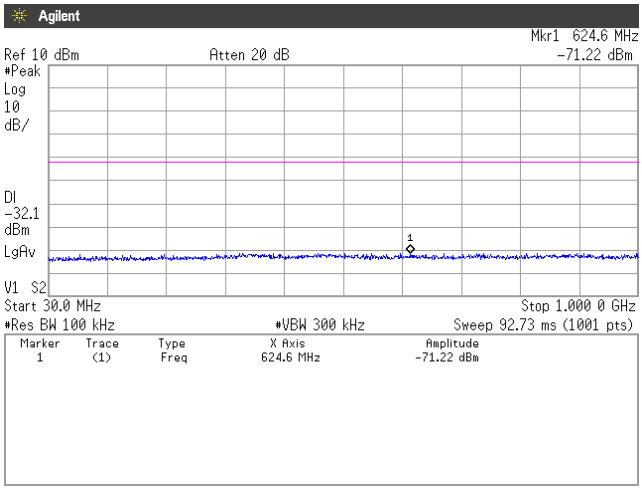
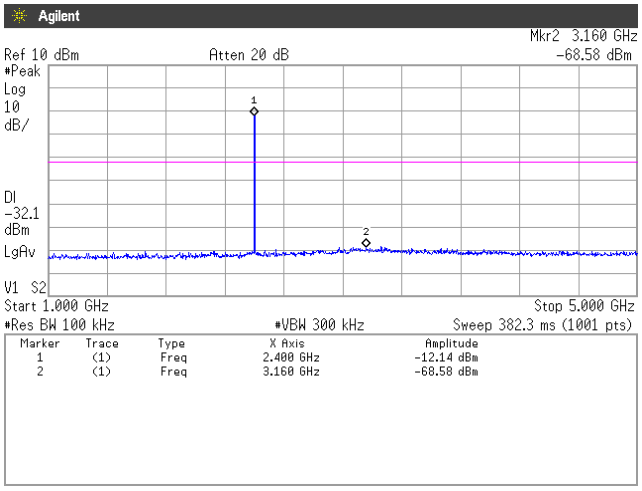
## 7.4 Trace data

### Channel Low

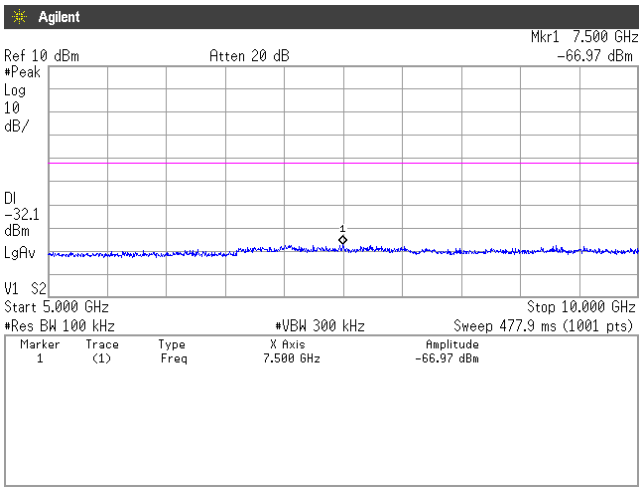
#### 30MHz-1GHz



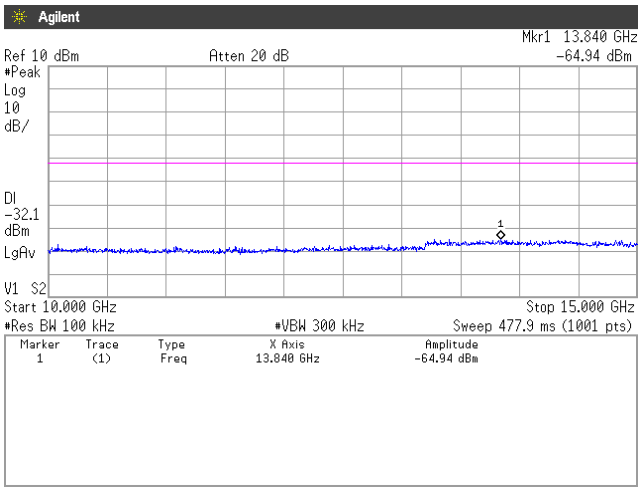

#### 1GHz-5GHz



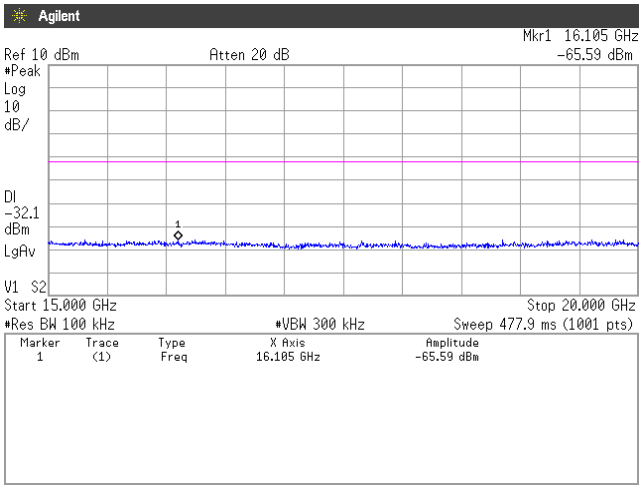

#### 5GHz-10GHz



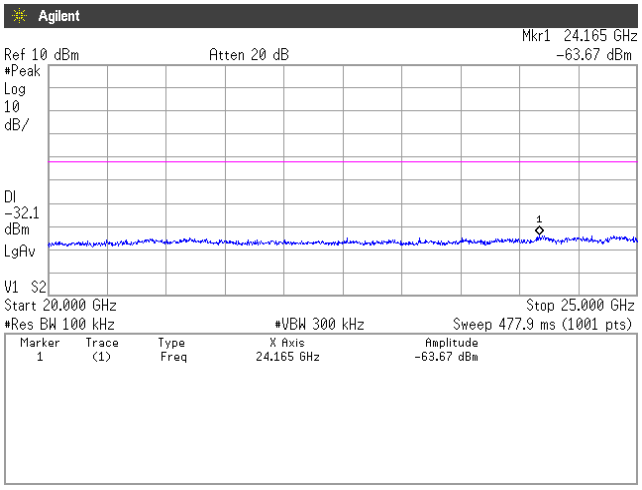

#### 10GHz-15GHz




#### 15GHz-20GHz




#### 20GHz-25GHz



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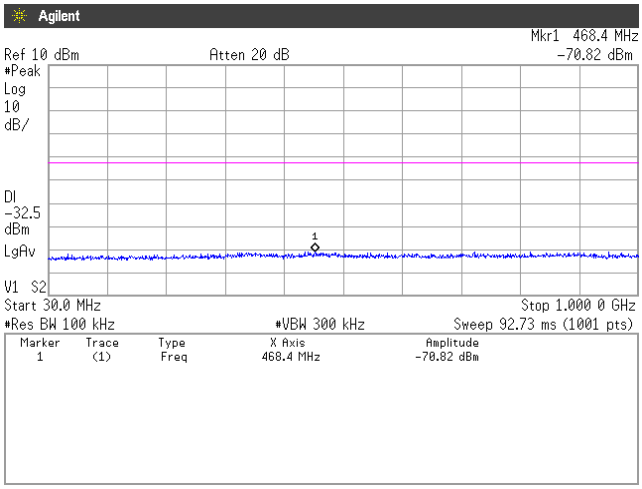
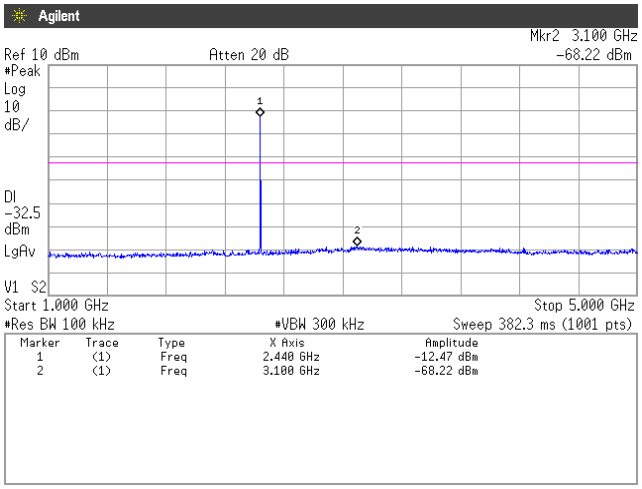
## Channel Middle

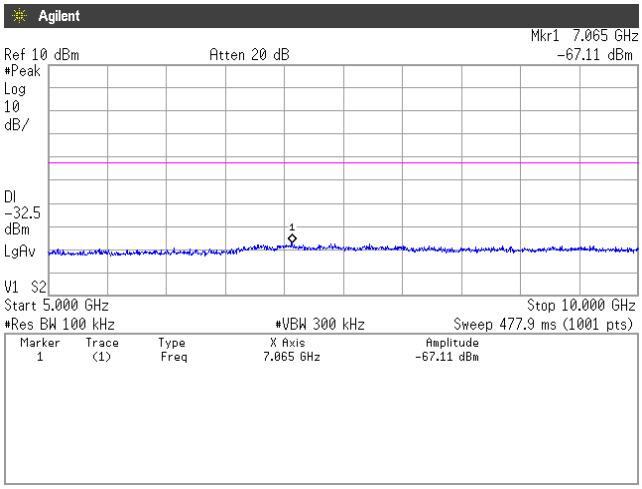
### 30MHz-1GHz



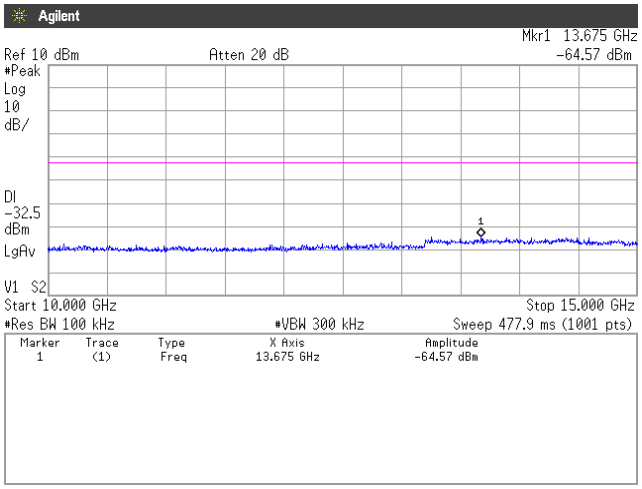

### 1GHz-5GHz



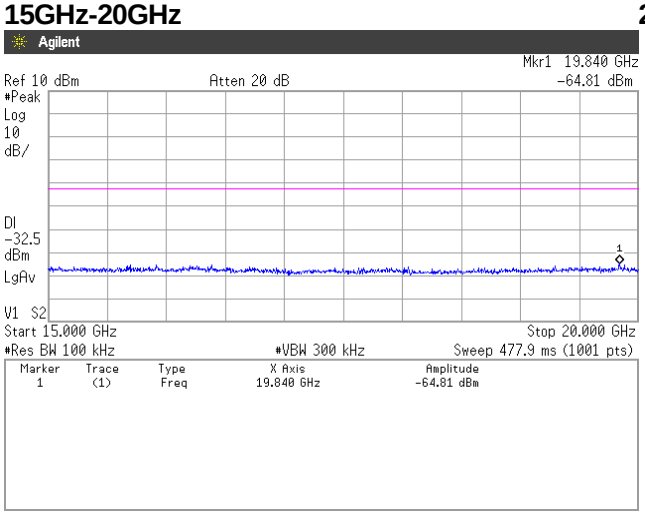

### 5GHz-10GHz



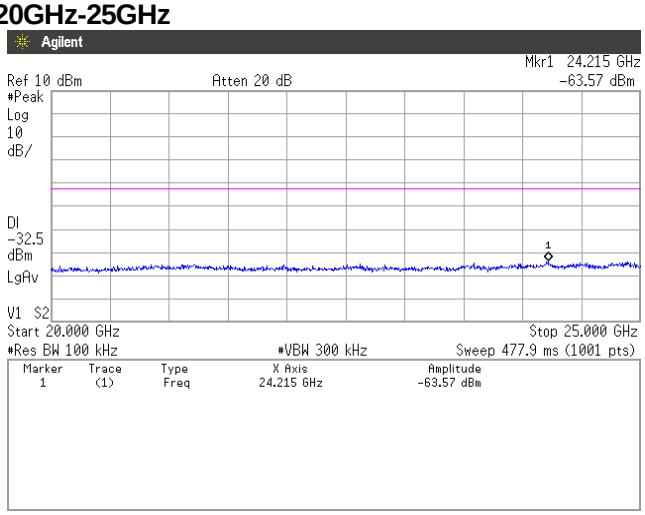

### 10GHz-15GHz




### 15GHz-20GHz




### 20GHz-25GHz



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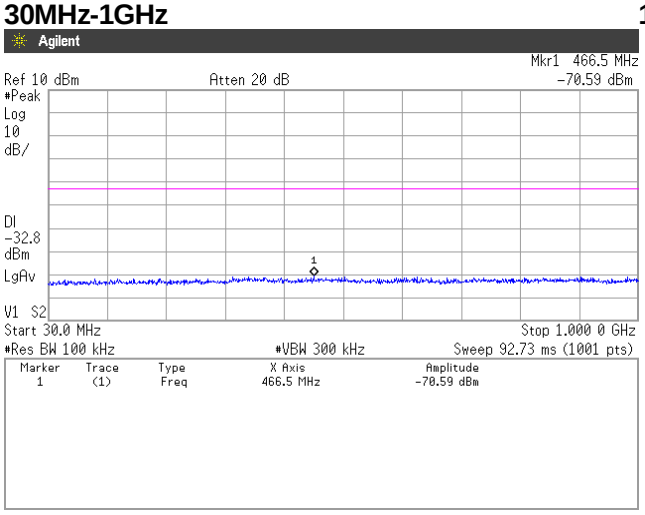
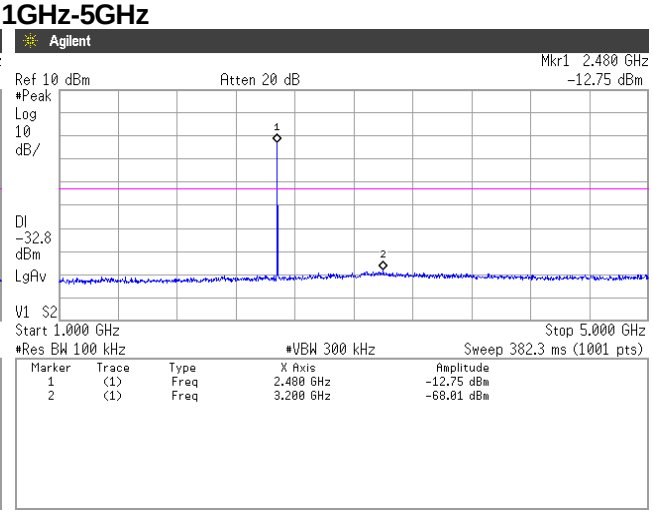
## Channel High

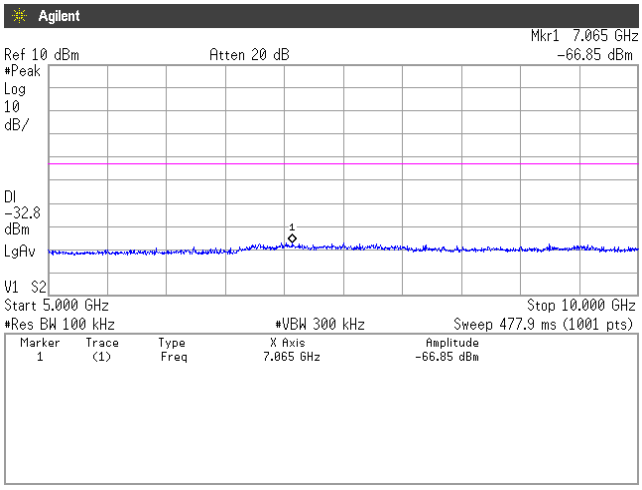
### 30MHz-1GHz



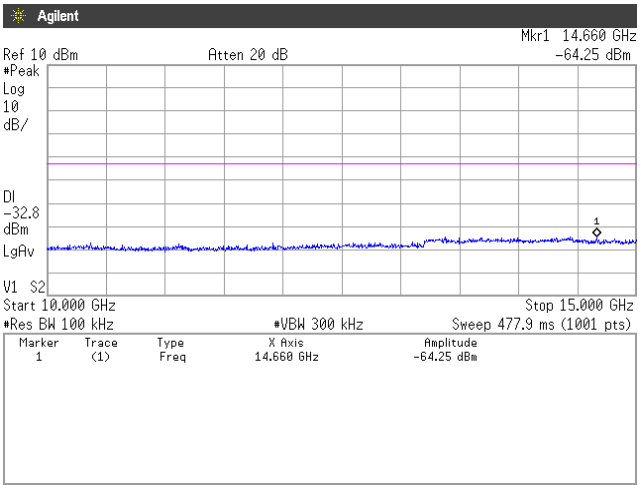

### 1GHz-5GHz



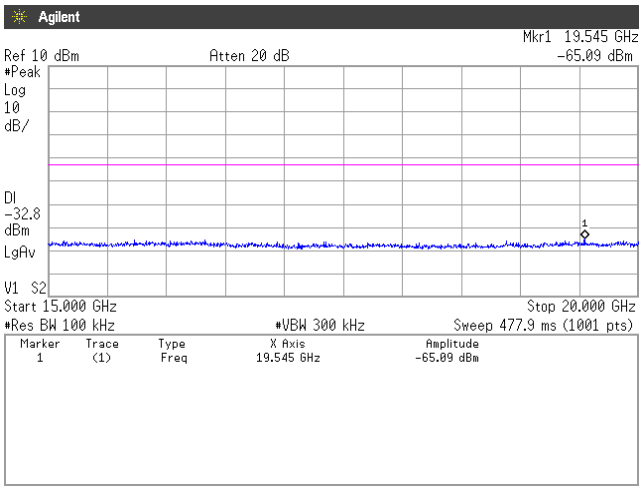

### 5GHz-10GHz



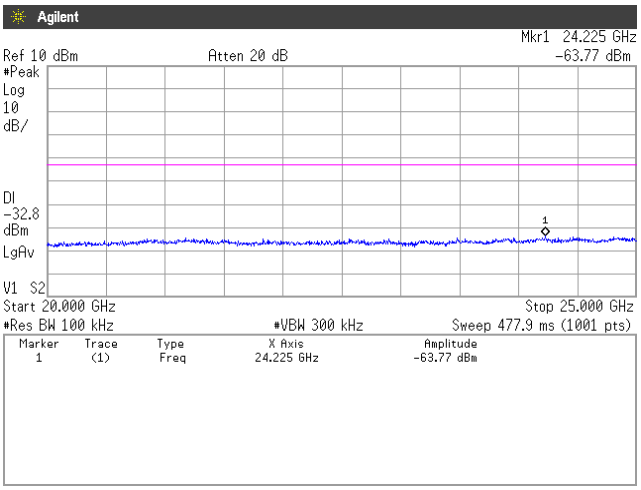

### 10GHz-15GHz




### 15GHz-20GHz




### 20GHz-25GHz



# 8. Spurious Emissions - Radiated -

## 8.1 Measurement procedure
**[FCC 15.247(d), 15.205, 15.209, KDB 558074 D01 v04, Section 12.0]**

Test was applied by following conditions.

| | | |
|---|---|---|
| Test method | : | ANSI C63.10 |
| Frequency range | : | 9kHz to 25GHz |
| Test place | : | 3m Semi-anechoic chamber |
| EUT was placed on | : | Styrofoam table / (W)1.0m × (D)1.0m × (H)0.8m (below 1GHz)<br>Styrofoam table / (W)0.6m × (D)0.6m ×(H)1.5m (above 1GHz) |
| Antenna distance | : | 3m |
| Test receiver setting | | Below 1GHz |
| - Detector | : | Average (9kHz-90kHz, 110kHz-490kHz), Quasi-peak |
| - Bandwidth | : | 200Hz, 120kHz |
| Spectrum analyzer setting | | Above 1GHz |
| - Peak | : | RBW=1MHz, VBW=3MHz, Span=0Hz, Sweep=auto |
| - Average | : | RBW=1MHz, VBW=3kHz, Span=0Hz, Sweep=auto<br>Display mode=Linear |

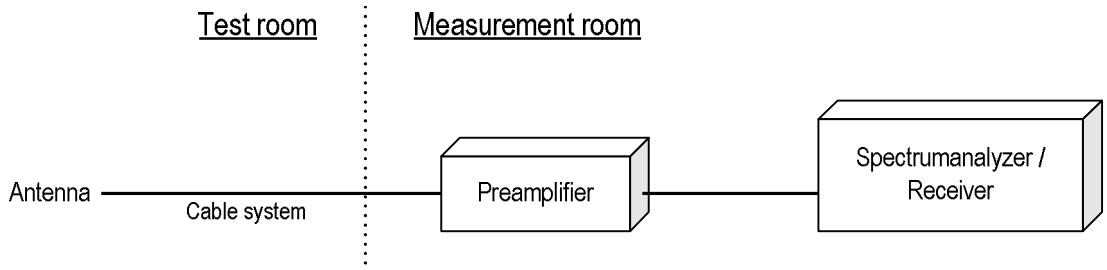
Average Measurement Setting [VBW]

| Mode | Duty Cycle (%) | $T_{on}$ (us) | $T_{off}$ (us) | $1/T_{on}$ (kHz) | Determined VBW Setting |
|---|---|---|---|---|---|
| Bluetooth 4.2 LE | 62.14 | 389 | 237 | 2.571 | 3kHz |

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site.
Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 937606.

Radiated emission measurements are performed at 3m distance with the broadband antenna (Loop antenna, Biconical antenna, Log periodic antenna, Double ridged guide antenna and Broad-band horn Antenna). The antenna is positioned both the horizontal and vertical planes of polarization and height is varied 1m to 4m and stopped at height producing the maximum emission. As for the Loop antenna, it is positioned with its plane vertical, and the center of the Loop antenna is 1m above the ground plane.
The EUT is Placed on a turntable, which is 0.8m/1.5m above ground plane. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level. The test results represent the worst case emission for each emission with manipulating the EUT, support equipment, interconnecting cables and varying the mode of operation. Sufficient time for the EUT, support equipment, and test equipment are allowed in order for them to warm up to their normal operating condition.

- Test configuration



## 8.2 Calculation method

[9kHz to 150kHz]
Emission level = Reading + (Ant factor + Cable system loss)
Margin = Limit – Emission level

[150kHz to 25GHz]
Emission level = Reading + (Ant factor + Cable system loss - Amp. Gain)
Margin = Limit – Emission level

Example:
Limit @ 4804.0MHz : 74.0dBuV/m (Peak Limit)
S.A Reading = 39.9dBuV Cable system loss = 8.3dB
Result = 39.9 + 8.3 = 48.2dBuV/m
Margin = 74.0 - 48.2 = 25.8dB

## 8.3 Limit

| Frequency [MHz] | Field strength | | Distance [m] |
|---|---|---|---|
| | [uV/m] | [dBuV/m] | |
| 0.009-0.490 | 2400 / F [kHz] | 20logE [uV/m] | 300 |
| 0.490-1.705 | 24000 / F [kHz] | 20logE [uV/m] | 30 |
| 1.705-30 | 30 | 29.5 | 30 |
| 30-88 | 100 | 40.0 | 3 |
| 88-216 | 150 | 43.5 | 3 |
| 216-960 | 200 | 46.0 | 3 |
| Above 960 | 500 | 54.0 | 3 |

Note:
1. The lower limit shall apply at the transition frequencies.
2. Emission level [dBuV/m] = 20log Emission [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 modulation.

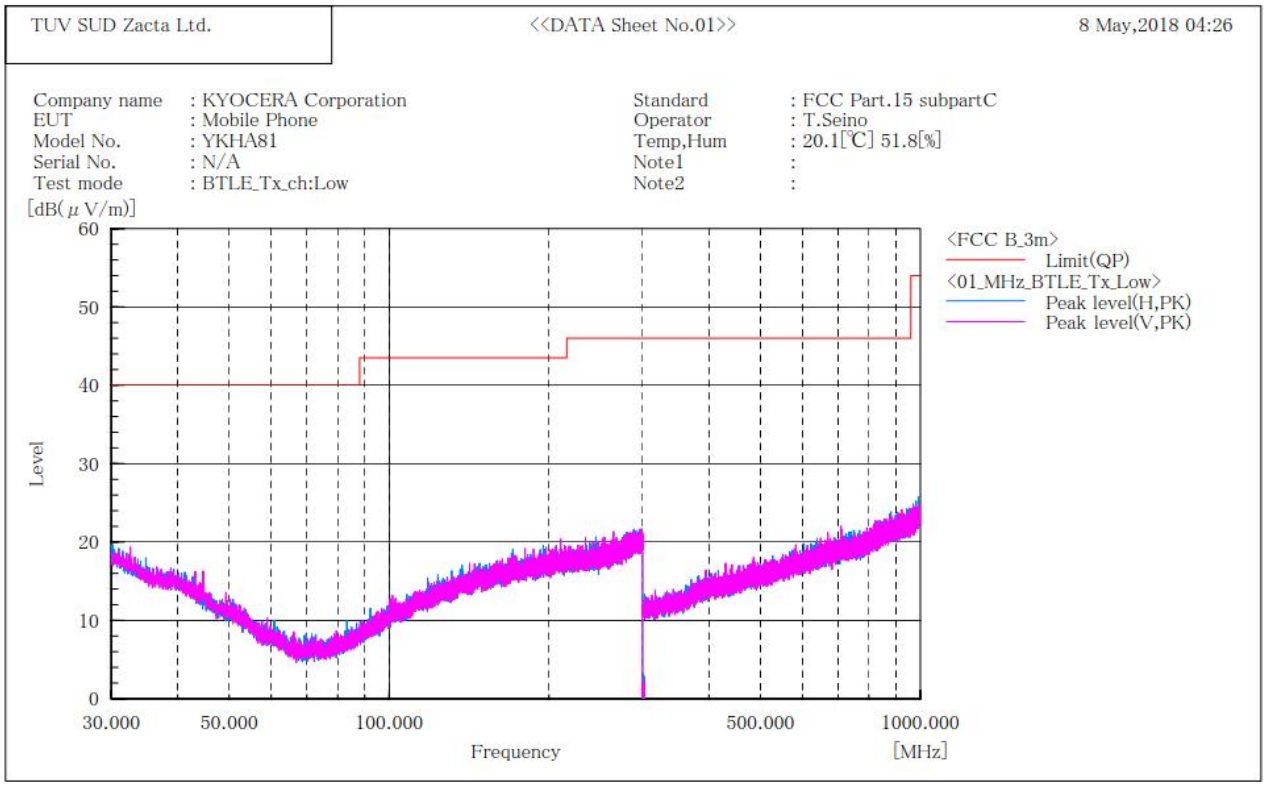
## 8.4 Test data

| | | | | | |
|---|---|---|---|---|---|
| Date | : | May 1, 2018 | | | |
| Temperature | : | 20.9 [˚C] | | | |
| Humidity | : | 34.1 [%] | Test engineer | : | |
| Test place | : | 3m Semi-anechoic chamber | | | Tadahiro Seino |
| Date | : | May 8, 2018 | | | |
| Temperature | : | 20.1 [˚C] | | | |
| Humidity | : | 51.8 [%] | Test engineer | : | |
| Test place | : | 3m Semi-anechoic chamber | | | Tadahiro Seino |

## 8.4.1 Transmission mode

### Channel Low
### BELOW 1GHz

******* RADIATED EMISSION *******
[ 3m Semi-anechoic chamber ]



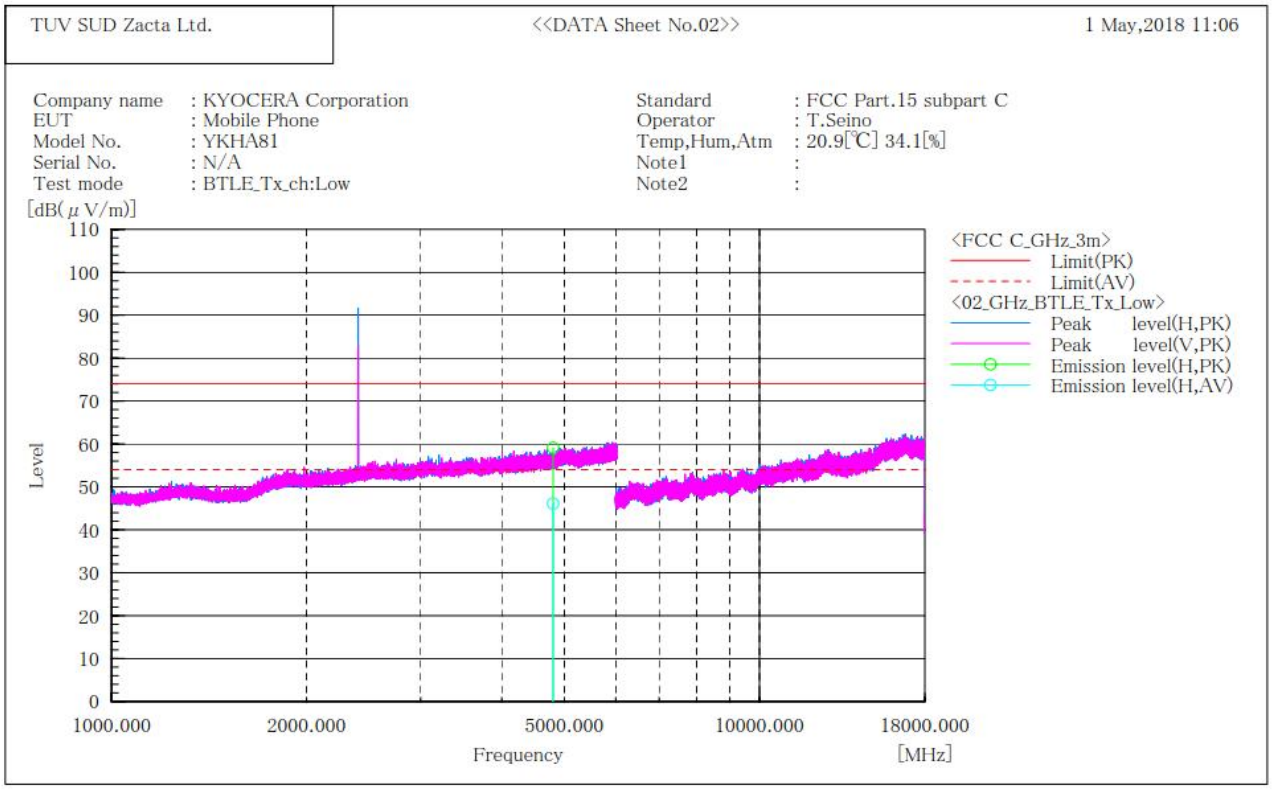

Final Result

| No. | Frequency [MHz] | (P) | c.f [dB(1/m)] | Height [cm] | Angle [° ] |
|---|---|---|---|---|---|

Note:
1. Emission Level (Margin) = Limit - [Reading + Factor ( Antenna + Cable – Amp)]
2. No emission were detected in frequency range 9kHz to 30MHz at the 3 meters distance.

## Channel Low
### ABOVE 1GHz

******* RADIATED EMISSION *******
[ 3m Semi-anechoic chamber ]



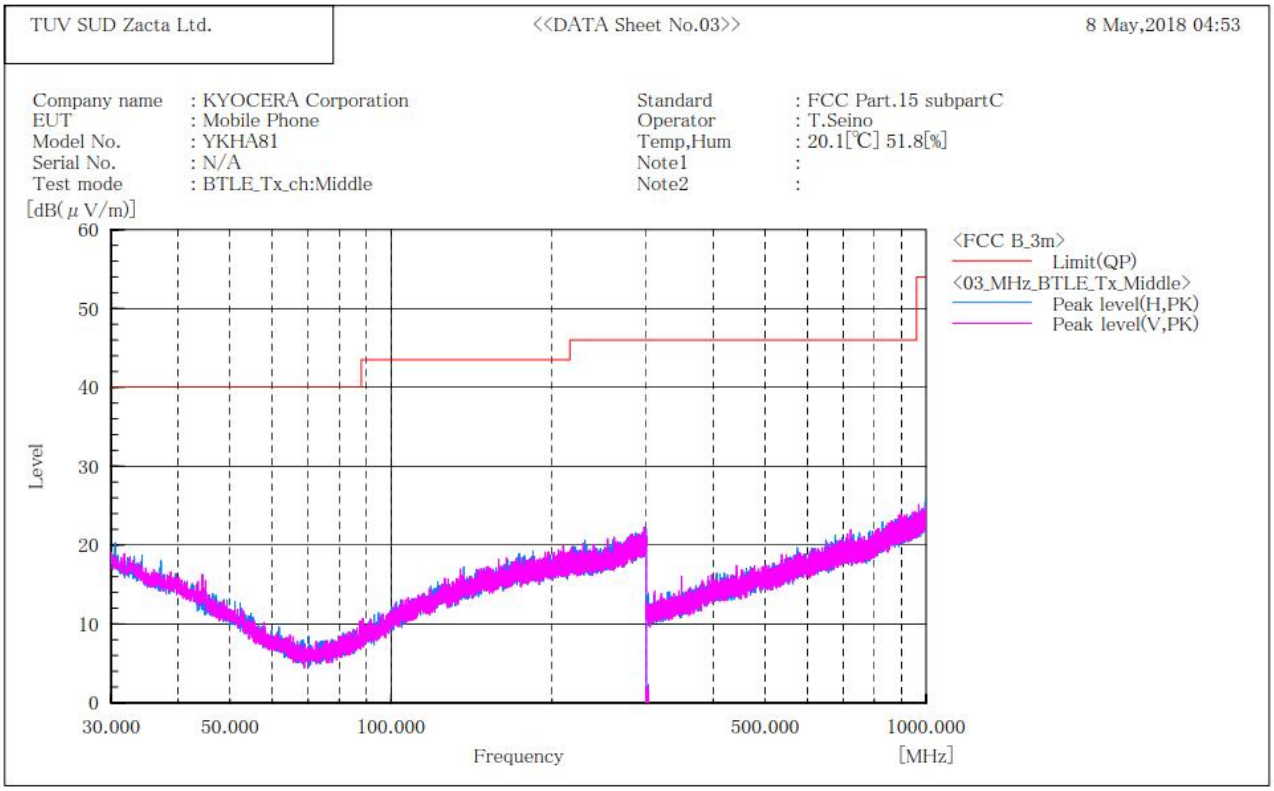

Final Result

| No. | Frequency | (P) | Reading PK | Reading AV | c.f | Result PK | Result AV | Limit PK | Limit AV | Margin PK | Margin AV | Height | Angle |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | [MHz] | | [dB(μV)] | [dB(μV)] | [dB(1/m)] | [dB(μV/m)] | [dB(μV/m)] | [dB(μV/m)] | [dB(μV/m)] | [dB] | [dB] | [cm] | [° ] |
| 1 | 4804.000 | H | 50.2 | 37.2 | 8.9 | 59.1 | 46.1 | 74.0 | 54.0 | 14.9 | 7.9 | 154.0 | 81.0 |

Note:
1. Emission Level (Margin) = Limit - [Reading + Factor ( Antenna + Cable – Amp)]
2. No emission were detected in frequency range 18GHz to 25GHz at the 3 meters distance.

## Channel Middle
### BELOW 1GHz

******* RADIATED EMISSION *******
[ 3m Semi-anechoic chamber ]




Final Result

| No. | Frequency [MHz] | (P) | c.f [dB(1/m)] | Height [cm] | Angle [° ] |
|---|---|---|---|---|---|

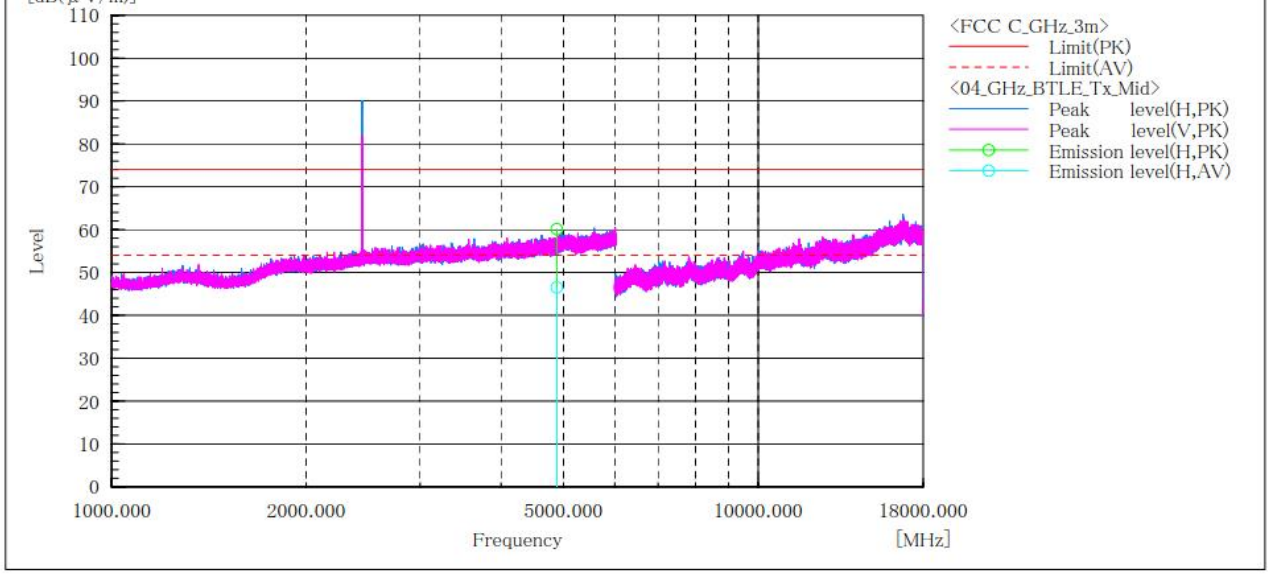
Note:
1. Emission Level (Margin) = Limit - [Reading + Factor ( Antenna + Cable – Amp)]
2. No emission were detected in frequency range 9kHz to 30MHz at the 3 meters distance.

## Channel Middle
## ABOVE 1GHz

******* RADIATED EMISSION *******
[ 3m Semi-anechoic chamber ]

TUV SUD Zacta Ltd. <<DATA Sheet No.04>> 1 May,2018 13:06

| | | | |
|---|---|---|---|
| Company name | : KYOCERA Corporation | Standard | : FCC Part.15 subpart C |
| EUT | : Mobile Phone | Operator | : T.Seino |
| Model No. | : YKHA81 | Temp,Hum,Atm | : 20.9[℃] 34.1[%] |
| Serial No. | : N/A | Note1 | : |
| Test mode | : BTLE_Tx_ch:Middle | Note2 | : |



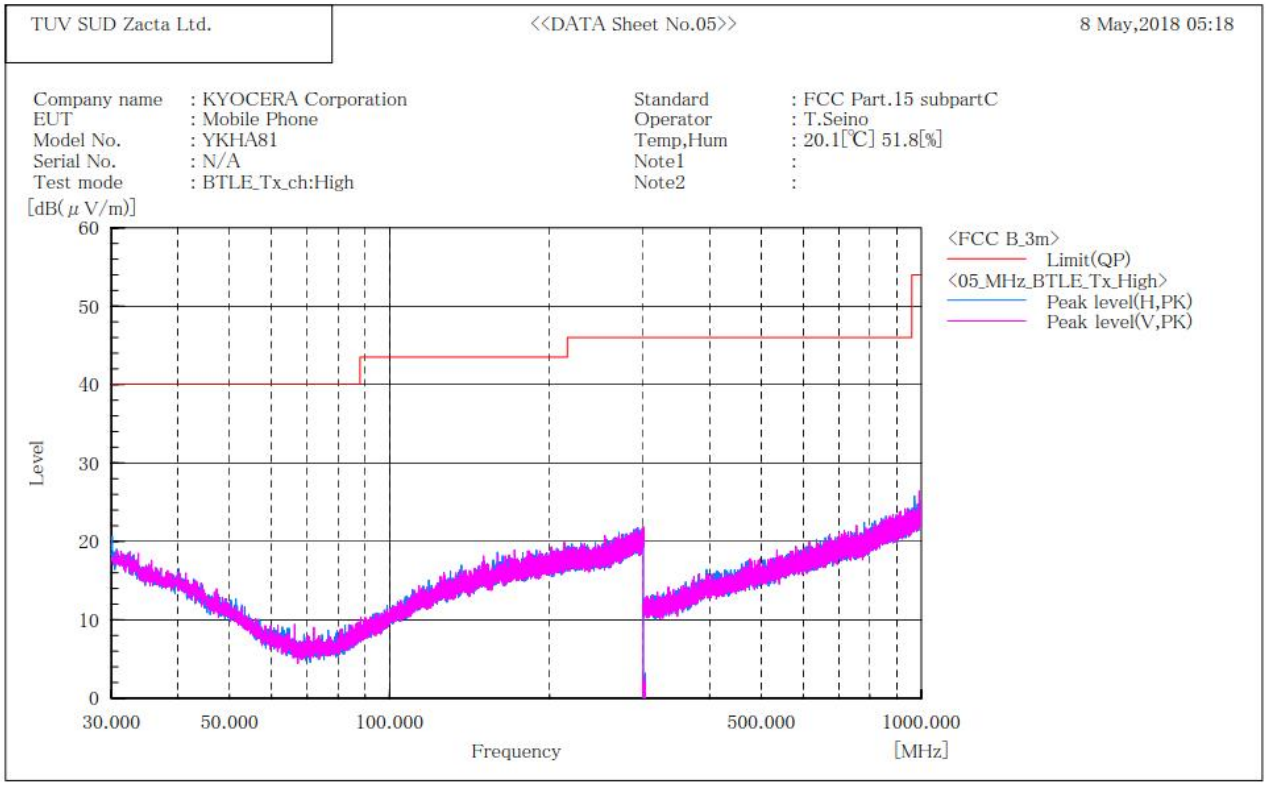

Final Result

| No. | Frequency | (P) | Reading PK | Reading AV | c.f | Result PK | Result AV | Limit PK | Limit AV | Margin PK | Margin AV | Height | Angle |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | [MHz] | | [dB(μV)] | [dB(μV)] | [dB(1/m)] | [dB(μV/m)] | [dB(μV/m)] | [dB(μV/m)] | [dB(μV/m)] | [dB] | [dB] | [cm] | [° ] |
| 1 | 4880.000 | H | 50.9 | 37.3 | 9.2 | 60.1 | 46.5 | 74.0 | 54.0 | 13.9 | 7.5 | 150.0 | 127.0 |

Note:
1. Emission Level (Margin) = Limit - [Reading + Factor ( Antenna + Cable – Amp)]
2. No emission were detected in frequency range 18GHz to 25GHz at the 3 meters distance.

## Channel High
### BELOW 1GHz

******* RADIATED EMISSION *******
[ 3m Semi-anechoic chamber ]




Final Result

| No. | Frequency [MHz] | (P) | c.f [dB(1/m)] | Height [cm] | Angle [° ] |
|---|---|---|---|---|---|

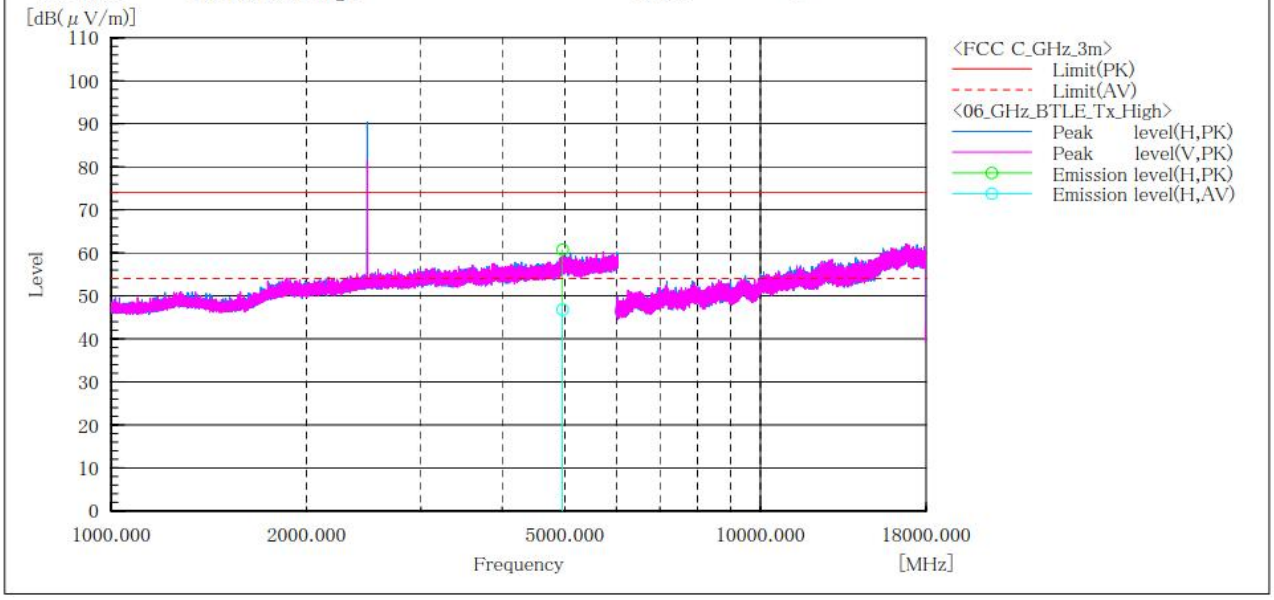
Note:
1. Emission Level (Margin) = Limit - [Reading + Factor ( Antenna + Cable – Amp)]
2. No emission were detected in frequency range 9kHz to 30MHz at the 3 meters distance.

## Channel High
### ABOVE 1GHz

******* RADIATED EMISSION *******
[ 3m Semi-anechoic chamber ]

TUV SUD Zacta Ltd. <<DATA Sheet No.06>> 1 May,2018 13:32

| | | | |
|---|---|---|---|
| Company name | : KYOCERA Corporation | Standard | : FCC Part.15 subpart C |
| EUT | : Mobile Phone | Operator | : T.Seino |
| Model No. | : YKHA81 | Temp,Hum,Atm | : 20.9[℃] 34.1[%] |
| Serial No. | : N/A | Note1 | : |
| Test mode | : BTLE_Tx_ch:High | Note2 | : |




Final Result

| No. | Frequency | (P) | Reading PK | Reading AV | c.f | Result PK | Result AV | Limit PK | Limit AV | Margin PK | Margin AV | Height | Angle |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | [MHz] | | [dB(μV)] | [dB(μV)] | [dB(1/m)] | [dB(μV/m)] | [dB(μV/m)] | [dB(μV/m)] | [dB(μV/m)] | [dB] | [dB] | [cm] | [° ] |
| 1 | 4960.000 | H | 50.9 | 37.0 | 9.8 | 60.7 | 46.8 | 74.0 | 54.0 | 13.3 | 7.2 | 128.0 | 56.0 |

Note:
1. Emission Level (Margin) = Limit - [Reading + Factor ( Antenna + Cable – Amp)]
2. No emission were detected in frequency range 18GHz to 25GHz at the 3 meters distance.

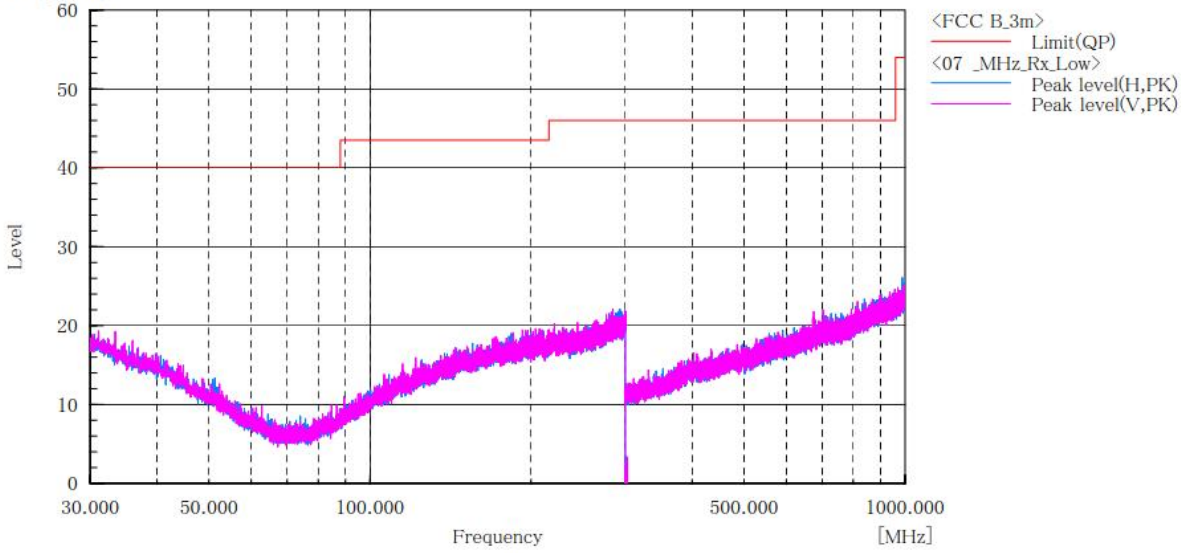
## 8.4.2 Receive mode

### Channel Low
### BELOW 1GHz

******* RADIATED EMISSION *******
[ 3m Semi-anechoic chamber ]

TUV SUD Zacta Ltd. <<DATA Sheet No.07 >> 8 May,2018 05:41

| | | | |
|---|---|---|---|
| Company name | : KYOCERA Corporation | Standard | : FCC Part.15 subpartC |
| EUT | : Mobile Phone | Operator | : T.Seino |
| Model No. | : YKHA81 | Temp,Hum,Atm | : 20.1[℃] 51.8[%] |
| Serial No. | : N/A | Note1 | : |
| Test mode | : BTLE_Rx_ch:Low | Note2 | : |




Final Result

| No. | Frequency [MHz] | (P) | c.f [dB(1/m)] | Height [cm] | Angle [° ] |
|---|---|---|---|---|---|

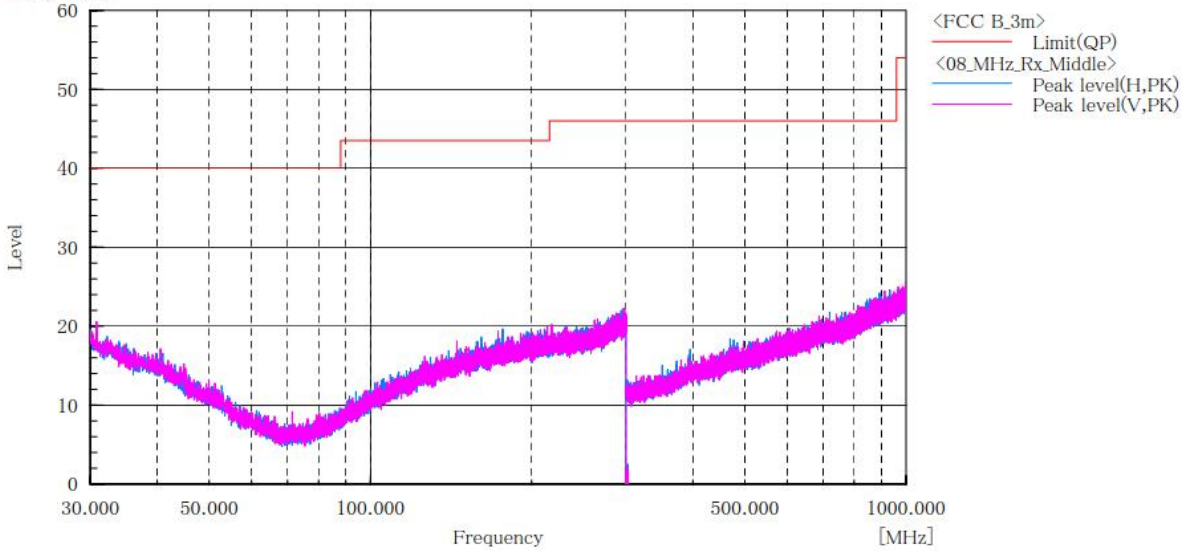
Note:
1. Emission Level (Margin) = Limit - [Reading + Factor ( Antenna + Cable – Amp)]
2. No emission were detected in frequency range 9kHz to 30MHz and 1GHz to 25GHz at the 3 meters distance.

## Channel Middle
### BELOW 1GHz

******* RADIATED EMISSION *******
[ 3m Semi-anechoic chamber ]

TUV SUD Zacta Ltd. <<DATA Sheet No.08>> 8 May,2018 06:09

| | | | |
|---|---|---|---|
| Company name | : KYOCERA Corporation | Standard | : FCC Part.15 subpartC |
| EUT | : Mobile Phone | Operator | : T.Seino |
| Model No. | : YKHA81 | Temp,Hum,Atm | : 20.1[℃] 51.8[%] |
| Serial No. | : N/A | Note1 | : |
| Test mode | : BTLE_Rx_ch:Middle | Note2 | : |




Final Result

| No. | Frequency [MHz] | (P) | c.f [dB(1/m)] | Height [cm] | Angle [° ] |
|---|---|---|---|---|---|

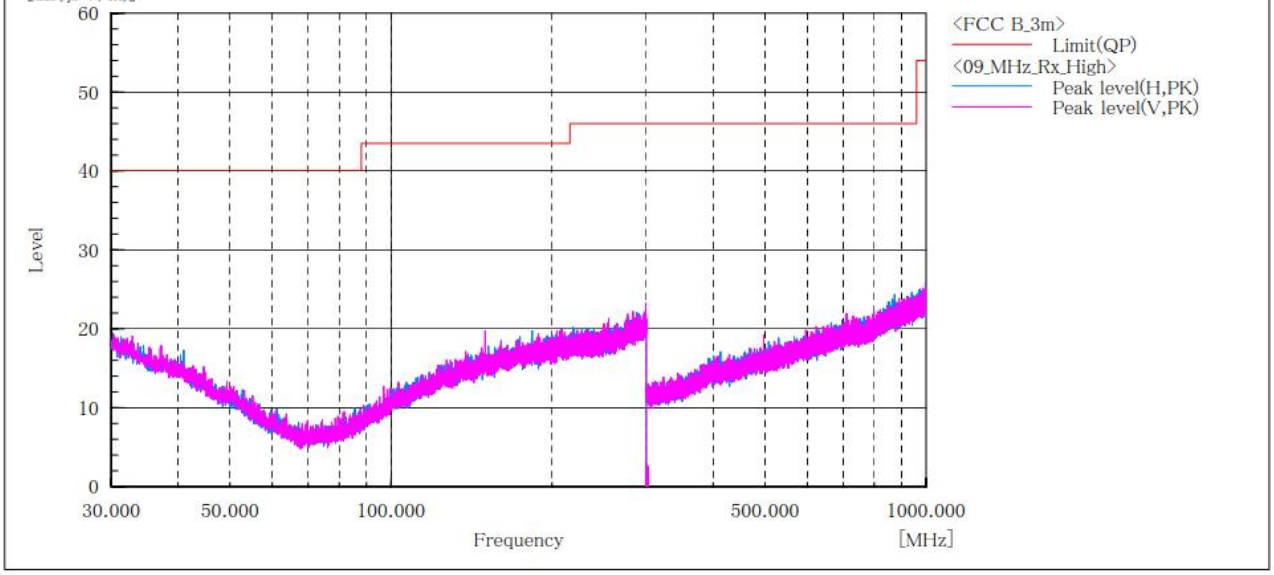
Note:
1. Emission Level (Margin) = Limit - [Reading + Factor ( Antenna + Cable – Amp)]
2. No emission were detected in frequency range 9kHz to 30MHz and 1GHz to 25GHz at the 3 meters distance.

## Channel High
### BELOW 1GHz

******* RADIATED EMISSION *******
[ 3m Semi-anechoic chamber ]

TUV SUD Zacta Ltd. <<DATA Sheet No.09>> 8 May,2018 06:29

| | | | |
|---|---|---|---|
| Company name | : KYOCERA Corporation | Standard | : FCC Part.15 subpartC |
| EUT | : Mobile Phone | Operator | : T.Seino |
| Model No. | : YKHA81 | Temp,Hum,Atm | : 20.1[℃] 51.8[%] |
| Serial No. | : N/A | Note1 | : |
| Test mode | : BTLE_Rx_ch:High | Note2 | : |




Final Result

| No. | Frequency [MHz] | (P) | c.f [dB(1/m)] | Height [cm] | Angle [° ] |
|---|---|---|---|---|---|

Note:
1. Emission Level (Margin) = Limit - [Reading + Factor ( Antenna + Cable – Amp)]
2. No emission were detected in frequency range 9kHz to 30MHz and 1GHz to 25GHz at the 3 meters distance.

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# 9. Restricted Band of Operation

## 9.1 Measurement procedure
**[FCC 15.247(d), 15.205, 15.209, KDB 558074 D01 v04, Section 12.0]**

Test was applied by following conditions.

| | | |
|---|---|---|
| Test method | : | ANSI C63.10 |
| Test place | : | 3m Semi-anechoic chamber |
| EUT was placed on | : | Styrofoam table / (W)1.0m × (D)1.0m × (H)0.8m (below 1GHz)<br>Styrofoam table / (W)0.6m × (D)0.6m ×(H)1.5m (above 1GHz) |
| Antenna distance | : | 3m |

Spectrum analyzer setting

| | | |
|---|---|---|
| - Peak | : | RBW=1MHz, VBW=3MHz, Span=Arbitrary setting, Sweep=auto |
| - Average | : | RBW=1MHz, VBW=3kHz, Span=Arbitrary setting, Sweep=auto<br>Display mode=Linear |

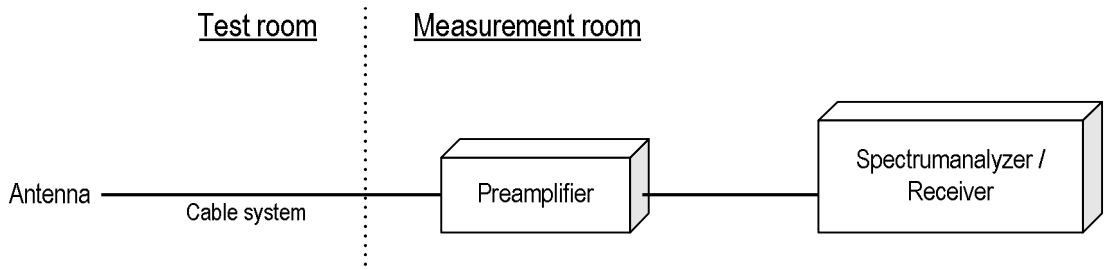
Average Measurement Setting [VBW]

| Mode | Duty Cycle (%) | $T_{on}$ (us) | $T_{off}$ (us) | $1/T_{on}$ (kHz) | Determined VBW Setting |
|---|---|---|---|---|---|
| Bluetooth 4.2 LE | 62.14 | 389 | 237 | 2.571 | 3kHz |

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site.
Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 937606.

Radiated emission measurements are performed at 3m distance with the broadband antenna (Double ridged guide antenna). The antenna is positioned both the horizontal and vertical planes of polarization and height is varied 1m to 4m and stopped at height producing the maximum emission.
The EUT is Placed on a turntable, which is 0.8m/1.5m above ground plane. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level. The test results represent the worst case emission for each emission with manipulating the EUT, support equipment, interconnecting cables and varying the mode of operation. Sufficient time for the EUT, support equipment, and test equipment are allowed in order for them to warm up to their normal operating condition.

- Test configuration




## 9.2 Limit

Emission at the boundary of the restricted band provided by 15.205 shall be lower than 15.209 limit.

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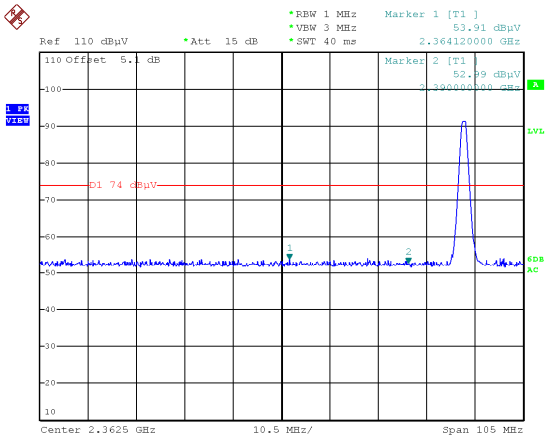
### 9.3 Measurement Result

| Channel | Frequency [MHz] | Results Chart | Result |
|---|---|---|---|
| Low | 2402 | See the Trace Data | Pass |
| High | 2480 | See the Trace Data | Pass |

### 9.4 Test data

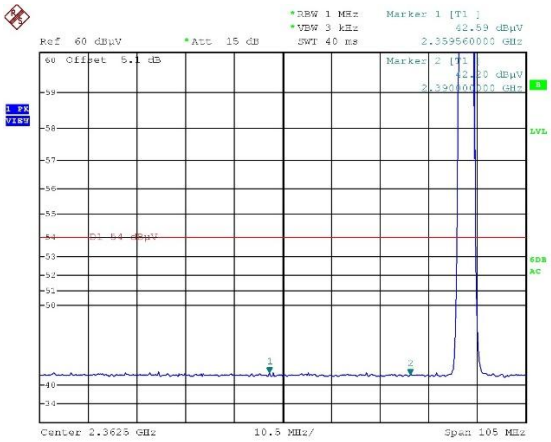
| | | | | | |
|---|---|---|---|---|---|
| Date | : | April 28, 2018 | | | |
| Temperature | : | 22.3 [˚C] | | | |
| Humidity | : | 46.1 [%] | Test engineer | : | |
| Test place | : | 3m Semi-anechoic chamber | | | Tadahiro Seino |

## Channel Low
## Horizontal
## Peak



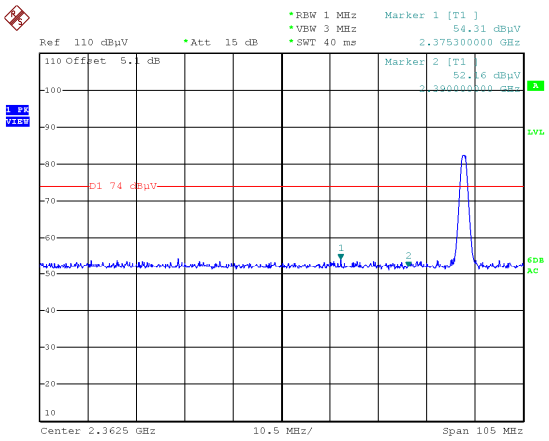

Date: 28.APR.2018 03:52:48

## Average



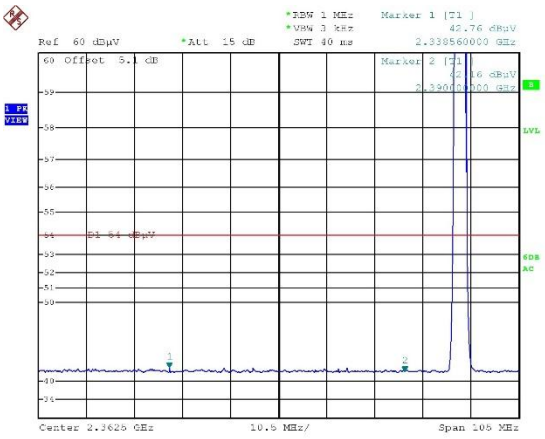

Date: 28.APR.2018 03:53:57

## Vertical
## Peak



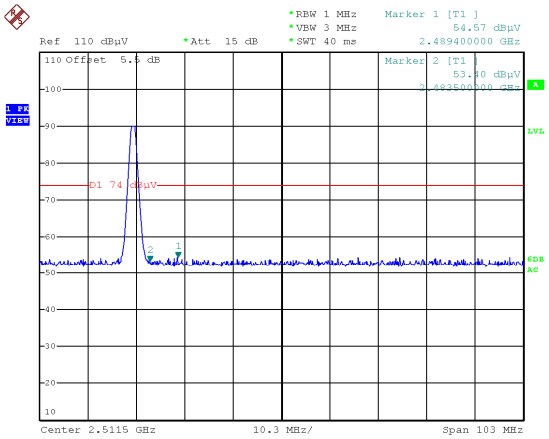

Date: 28.APR.2018 03:56:55

## Average



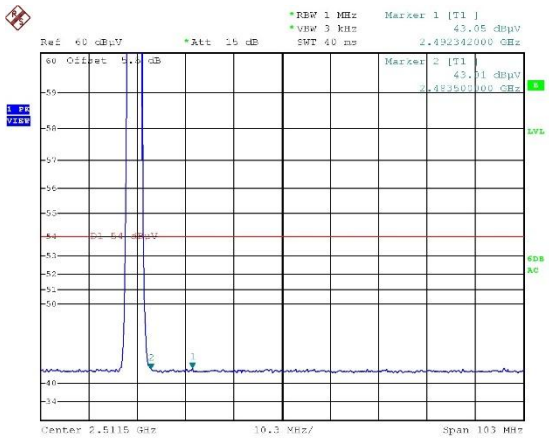

Date: 28.APR.2018 03:58:18

## Channel High
## Horizontal
## Peak



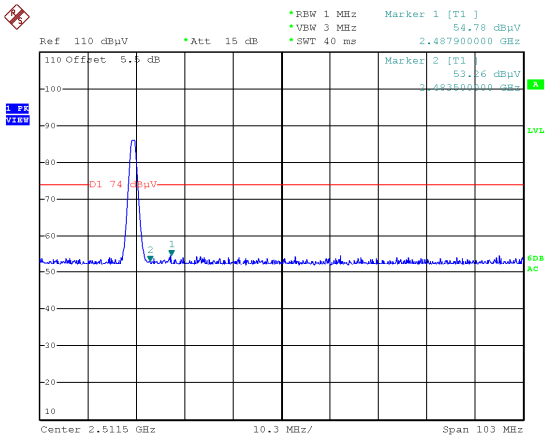

Date: 28.APR.2018 04:03:22

## Average



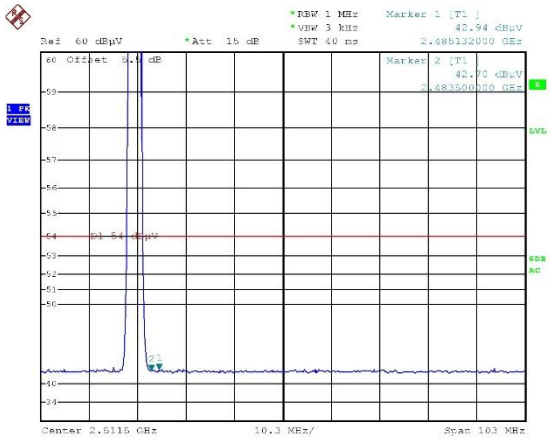

Date: 28.APR.2018 04:04:01

## Vertical
## Peak




Date: 28.APR.2018 04:07:09

## Average




Date: 28.APR.2018 04:07:48

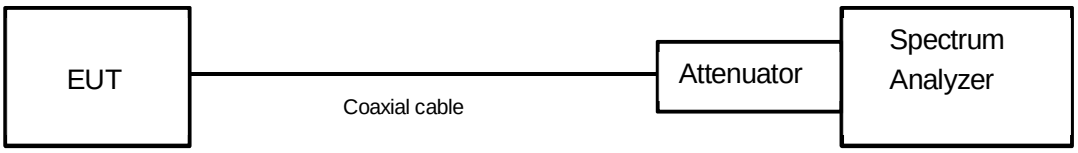
# 10. Transmitter Power Spectral Density

## 10.1 Measurement procedure
**[FCC 15.247(e), KDB558074 D01 v04, Section 10.2]**

The peak power is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

The spectrum analyzer is set to;
a) Span = 1.5 times the 6 dB bandwidth.
b) RBW = 3kHz - 100kHz.
c) VBW ≥ 3 x RBW.
d) Sweep time = auto-couple.
e) Detector = peak.
f) Trace mode = max hold.

- Test configuration




## 10.2 Limit

The peak power spectral density shall not be greater than 8dBm in any 3kHz band.

## 10.3 Measurement result

Date : May 17, 2018
Temperature : 22.3 [˚C]
Humidity : 55.1 [%]
Test place : Shielded room No.3

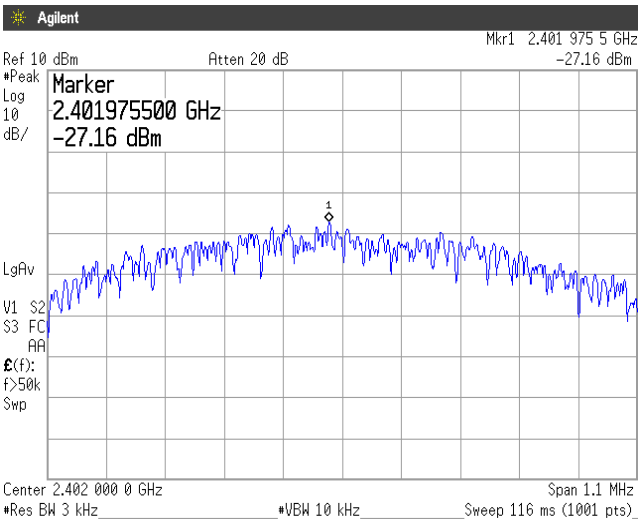
Test engineer : Tadahiro Seino

| Channel | Center Frequency (MHz) | Reading (dBm) | Factor (dB) | Level (dBm) | Limit (dBm) | Margin (dBm) | Result |
|---|---|---|---|---|---|---|---|
| Low | 2402 | -27.16 | 11.17 | -15.99 | 8.00 | 23.99 | PASS |
| Middle | 2440 | -27.47 | 11.17 | -16.30 | 8.00 | 24.30 | PASS |
| High | 2480 | -27.50 | 11.17 | -16.33 | 8.00 | 24.33 | PASS |

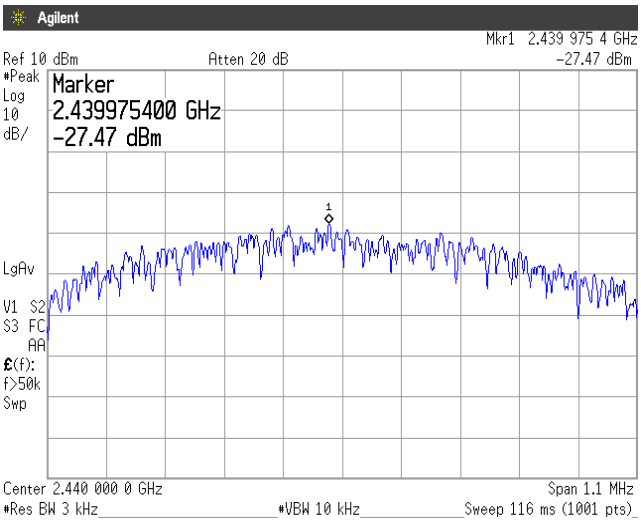
Calculation;
Transmitter Power Spectral Density Level (Margin) = Limit – (Reading + Factor)

## 10.4 Trace data

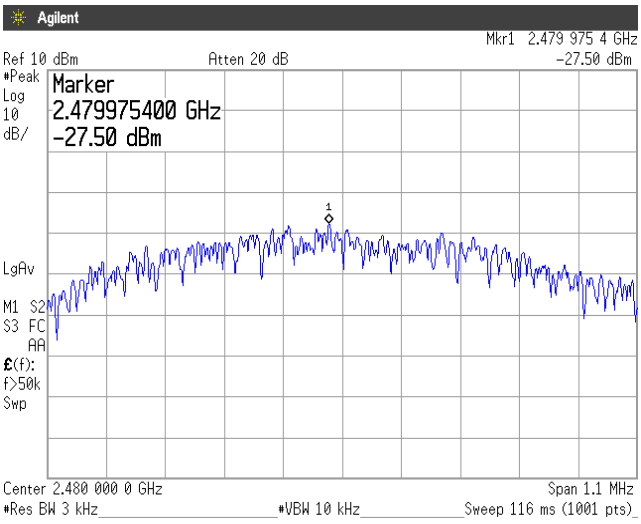
### Channel Low




### Channel Middle




### Channel High



# 11. AC Power Line Conducted Emissions

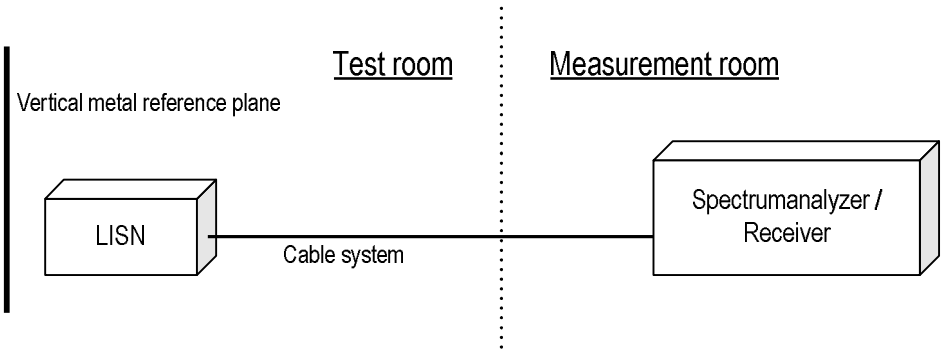
## 11.1 Measurement procedure [FCC 15.207]

Test was applied by following conditions.

| | | |
|---|---|---|
| Test method | : | ANSI C63.10 |
| Frequency range | : | 0.15MHz to 30MHz |
| Test place | : | 3m Semi-anechoic chamber |
| EUT was placed on | : | FRP table / (W)2.0m × (D)1.0m × (H)0.8m |
| Vertical Metal Reference Plane | : | (W)2.0m × (H)2.0m 0.4m away from EUT |
| Test receiver setting | | |
| - Detector | : | Quasi-peak, Average |
| - Bandwidth | : | 9kHz |

EUT and peripherals are connected to 50Ω/50μH Line Impedance Stabilization Network (LISN) which are connected to reference ground plane, and are placed 80cm away from EUT. Excess of AC power cable is bundled in center.
LISN for peripheral is terminated in 50Ω.
EUT operating mode is selected to emit the maximum noise. Overall frequency range is investigated with spectrum analyzer using peak detector. Maximum emission configuration is determined by manipulating the EUT, peripherals, interconnecting cables. Then, emission measurements are performed with test receiver in above setting to each current-carrying conductor of the mains port. Sufficient time for EUT, peripherals and test equipment is provided in order for them to warm up to their normal operating condition. If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits.

- Test configuration




## 11.2 Calculation method

Emission level = Reading + (LISN. Factor + Cable system loss)
Margin = Limit – Emission level

Example:
Limit @ 6.770MHz : 60.0dBμV(Quasi-peak)
: 50.0dBμV(Average)
(Quasi peak) Reading = 41.2dBμV c.f = 10.3dB
Emission level = 41.2 + 10.3 = 51.5dBμV
Margin = 60.0 – 51.5 = 8.5dB
(Average) Reading = 35.0dBμV c.f = 10.3dB
Emission level = 35.0 + 10.3 = 45.3dBμV
Margin = 50.0 – 45.3 = 4.7dB

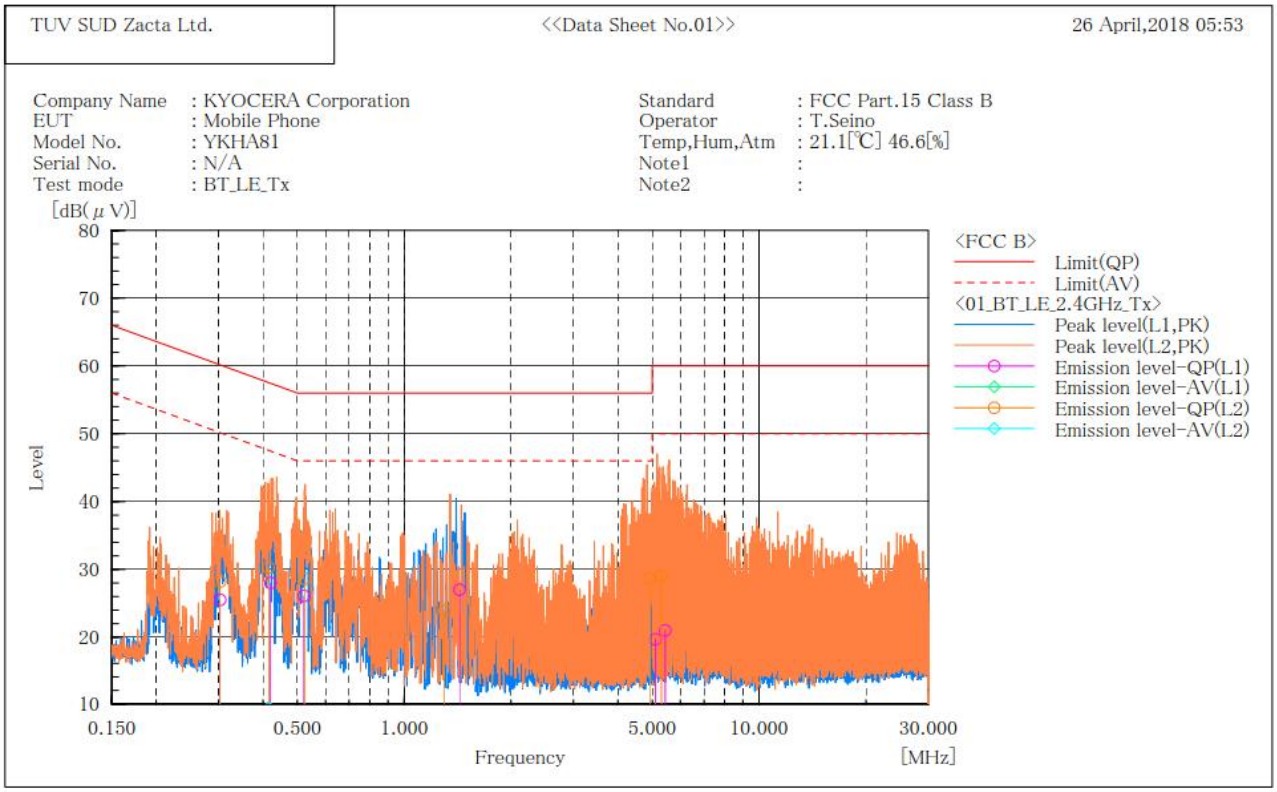
## 11.3 Limit

| Frequency [MHz] | Limit | |
|---|---|---|
| | QP [dBuV] | AV [dBuV] |
| 0.15-0.5 | 66-56* | 56-46* |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

*: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

## 11.4 Test data

*****  CONDUCTED EMISSION at MAINS PORT  *****
[ 3m Semi-anechoic chamber ]




Final Result

--- L1 Phase ---

| No. | Frequency [MHz] | Reading QP [dB(μV)] | Reading AV [dB(μV)] | c.f [dB] | Result QP [dB(μV)] | Result AV [dB(μV)] | Limit QP [dB(μV)] | Limit AV [dB(μV)] | Margin QP [dB] | Margin AV [dB] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.303 | 15.1 | -2.0 | 10.4 | 25.5 | 8.4 | 60.2 | 50.2 | 34.7 | 41.8 |
| 2 | 0.420 | 17.6 | -1.5 | 10.4 | 28.0 | 8.9 | 57.4 | 47.4 | 29.4 | 38.5 |
| 3 | 0.522 | 15.7 | -2.3 | 10.4 | 26.1 | 8.1 | 56.0 | 46.0 | 29.9 | 37.9 |
| 4 | 1.432 | 16.6 | -2.3 | 10.4 | 27.0 | 8.1 | 56.0 | 46.0 | 29.0 | 37.9 |
| 5 | 5.111 | 9.0 | -4.4 | 10.7 | 19.7 | 6.3 | 60.0 | 50.0 | 40.3 | 43.7 |
| 6 | 5.440 | 10.3 | -4.3 | 10.7 | 21.0 | 6.4 | 60.0 | 50.0 | 39.0 | 43.6 |

--- L2 Phase ---

| No. | Frequency [MHz] | Reading QP [dB(μV)] | Reading AV [dB(μV)] | c.f [dB] | Result QP [dB(μV)] | Result AV [dB(μV)] | Limit QP [dB(μV)] | Limit AV [dB(μV)] | Margin QP [dB] | Margin AV [dB] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.303 | 17.8 | -1.3 | 10.4 | 28.2 | 9.1 | 60.2 | 50.2 | 32.0 | 41.1 |
| 2 | 0.415 | 19.9 | -0.9 | 10.4 | 30.3 | 9.5 | 57.5 | 47.5 | 27.2 | 38.0 |
| 3 | 0.524 | 18.2 | -1.8 | 10.4 | 28.6 | 8.6 | 56.0 | 46.0 | 27.4 | 37.4 |
| 4 | 1.300 | 13.5 | -3.3 | 10.4 | 23.9 | 7.1 | 56.0 | 46.0 | 32.1 | 38.9 |
| 5 | 4.921 | 17.9 | -2.8 | 10.7 | 28.6 | 7.9 | 56.0 | 46.0 | 27.4 | 38.1 |
| 6 | 5.305 | 18.3 | -2.7 | 10.7 | 29.0 | 8.0 | 60.0 | 50.0 | 31.0 | 42.0 |

## *12. Antenna requirement*

According to FCC section 15.203, 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 antenna is a special antenna mounted inside of the EUT. Therefore, the EUT complies with the antenna requirement of FCC section 15.203.

Zacta

## 13. Uncertainty of measurement

Expanded uncertainties stated are calculated with a coverage Factor k=2.
Please note that these results are not taken into account when measurement uncertainty considerations contained in ETSI TR 100 028-0011 determining compliance or non-compliance with test result

| Test item | Measurement uncertainty |
|---|---|
| Conducted emission, AMN (9kHz – 150kHz) | ±3.8dB |
| Conducted emission, AMN (150kHz – 30MHz) | ±3.3dB |
| Radiated emission (9kHz – 30MHz) | ±3.0dB |
| Radiated emission (30MHz – 1000MHz) | ±4.7dB |
| Radiated emission (1GHz – 6GHz) | ±4.9dB |
| Radiated emission (6GHz – 18GHz) | ±5.2dB |
| Radiated emission (18GHz – 40GHz) | ±5.8dB |

# *14. Laboratory Information*

**1. Location**

Name: Yonezawa Testing Center
Address: 5-4149-7, Hachimanpara, Yonezawa-shi, Yamagata, 992-1128 Japan
Phone: +81-238-28-2881
Fax: +81-238-28-2888

**2. Accreditation and Registration**

1) VLAC
Accreditation No.: VLAC-013

2) NVLAP
LAB CODE: 200306-0

3) BSMI
Laboratory Code: SL2-IN-E-6018, SL2-A1-E-6018

4) Industry Canada

| Site number | Facility | Expiration date |
|---|---|---|
| 4224A-4 | 3m Semi-anechoic chamber | 2020-11-27 |
| 4224A-5 | 10m Semi-anechoic chamber No.1 | 2020-11-27 |
| 4224A-6 | 10m Semi-anechoic chamber No.2 | 2019-12-14 |

5) VCCI Council

| Registration number | Expiration date |
|---|---|
| A-0166 | 2019-07-03 |

# *Appendix A. Test equipment*

## Antenna port conducted test

| Equipment | Company | Model No. | Serial No. | Cal. Due | Cal. Date |
|---|---|---|---|---|---|
| Spectrum analyzer | Agilent Technologies | E4440A | US44302655 | Jun. 30, 2018 | Jun. 28, 2017 |
| Attenuator | HUBER+SUHNER | 6810.19.A | N/A(S450) | Jan. 31, 2019 | Jan. 18, 2018 |
| Power meter | ROHDE&SCHWARZ | NRP2 | 103269 | Jul. 31, 2018 | Jul. 11, 2017 |
| Power sensor | ROHDE&SCHWARZ | NRP-Z81 | 102459 | Jul. 31, 2018 | Jul. 11, 2017 |

## Radiated emission

| Equipment | Company | Model No. | Serial No. | Cal. Due | Cal. Date |
|---|---|---|---|---|---|
| EMI Receiver | ROHDE&SCHWARZ | ESCI | 100765 | Sep. 30, 2018 | Sep. 13, 2017 |
| Spectrum analyzer | Agilent Technologies | E4440A | US40420937 | Oct. 31, 2018 | Oct. 19, 2017 |
| Preamplifier | SONOMA | 310 | 372170 | Sep. 30, 2018 | Sep. 12, 2017 |
| Loop antenna | ROHDE&SCHWARZ | HFH2-Z2 | 100515 | Feb. 28, 2019 | Feb. 20, 2018 |
| Attenuator | TDC | TAT-43B-06 | N/A(S209) | May 31, 2018 | May 23, 2017 |
| Biconical antenna | Schwarzbeck | VHA9103/BBA9106 | 2155 | Jul. 31, 2018 | Jul. 18, 2017 |
| Log periodic antenna | Schwarzbeck | UHALP9108A | 0560 | Jul. 31, 2018 | Jul. 18, 2017 |
| Attenuator | TME | CFA-01NPJ-6 | N/A(S275) | Jan. 31, 2019 | Jan. 18, 2018 |
| Attenuator | TME | CFA-01NPJ-3 | N/A(S272) | Jan. 31, 2019 | Jan. 18, 2018 |
| Preamplifier | TSJ | MLA-100M18-B02-40 | 1929118 | Jan. 31, 2019 | Jan. 18, 2018 |
| Attenuator | AEROFLEX | 26A-10 | 081217-08 | Jan. 31, 2019 | Jan. 18, 2018 |
| Double ridged guide antenna | ETS LINDGREN | 3117 | 00052315 | Mar. 14, 2019 | Mar. 14, 2018 |
| Attenuator | Agilent Technologies | 8491B | MY39268633 | Mar. 14, 2019 | Mar. 14, 2018 |
| Double ridged guide antenna | A.H.Systems Inc. | SAS-574 | 469 | Aug. 31, 2018 | Aug. 8, 2017 |
| Preamplifier | TSJ | MLA-1840-B03-35 | 1240332 | Aug. 31, 2018 | Aug. 8, 2017 |
| Notch filter | Micro-Tronics | BRM50702 | 045 | Apr. 30, 2018 | Apr. 26, 2017 |
| Notch filter | Micro-Tronics | BRM50702 | 045 | Apr. 30, 2019 | Apr. 16, 2018 |
| Microwave cable | HUBER+SUHNER | SUCOFLEX104/9m | MY30037/4 | Jan. 31, 2019 | Jan. 18, 2018 |
| | | SUCOFLEX104/1m | my24610/4 | Jan. 31, 2019 | Jan. 18, 2018 |
| | | SUCOFLEX104/8m | SN MY30031/4 | Jan. 31, 2019 | Jan. 18, 2018 |
| | | SUCOFLEX104/1.5m | MY32976/4 | Jan. 31, 2019 | Jan. 18, 2018 |
| | | SUCOFLEX104/1.5m | MY19309/4 | Jan. 31, 2019 | Jan. 19, 2018 |
| | | SUCOFLEX104/7m | 41625/6 | Jan. 31, 2019 | Jan. 19, 2018 |
| PC | DELL | DIMENSION E521 | 75465BX | N/A | N/A |
| Software | TOYO Corporation | EP5/RE-AJ | 0611193/V5.6.0 | N/A | N/A |
| Absorber | RIKEN | PFP30 | N/A | N/A | N/A |
| 3m Semi an-echoic Chamber | TOKIN | N/A | N/A(9002-NSA) | May 31, 2018 | May 30, 2017 |
| 3m Semi an-echoic Chamber | TOKIN | N/A | N/A(9002-SVSWR) | May 31, 2018 | May 31, 2017 |

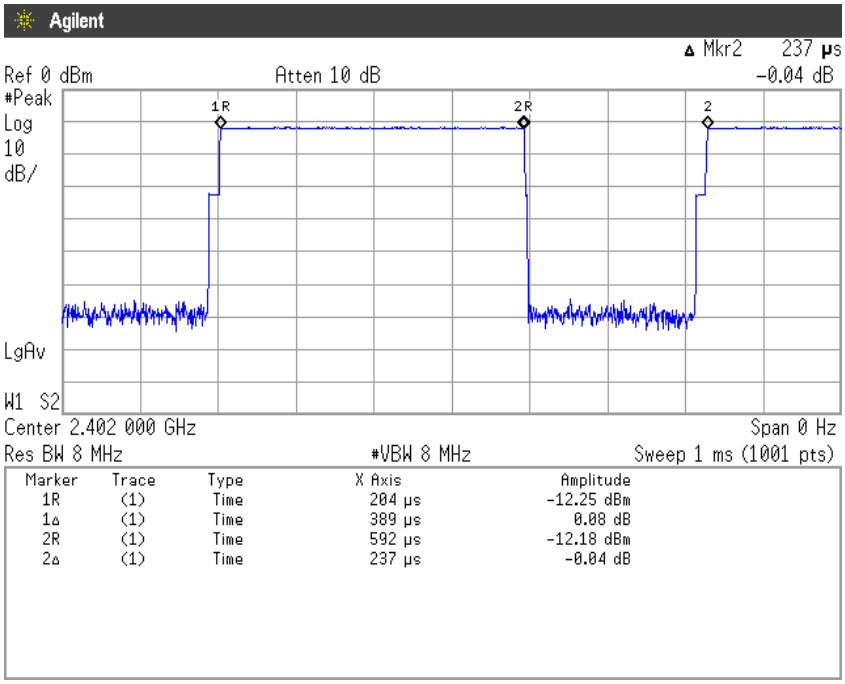
## Conducted emission at mains port

| Equipment | Company | Model No. | Serial No. | Cal. Due | Cal. Date |
|---|---|---|---|---|---|
| EMI Receiver | ROHDE&SCHWARZ | ESCI | 100765 | Sep. 30, 2018 | Sep. 13, 2017 |
| Attenuator | HUBER+SUHNER | 6810.01.A | N/A (S411) | Jan. 31, 2019 | Jan. 18, 2018 |
| Line impedance stabilization network | Kyoritsu Electrical Works, Ltd. | KNW-407F | 8-2003-1 | Feb. 28, 2019 | Feb. 28, 2018 |
| Coaxial cable | FUJIKURA | 5D-2W/4m | N/A (S350) | Jan. 31, 2019 | Jan. 18, 2018 |
| Coaxial cable | FUJIKURA | 5D-2W/1m | N/A (S193) | Jan. 31, 2019 | Jan. 18, 2018 |
| Coaxial cable | HUBER+SUHNER | RG214/U/10m | N/A (S194) | Jan. 31, 2019 | Jan. 18, 2018 |
| PC | DELL | DIMENSION | 75465BX | N/A | N/A |
| Software | TOYO Corporation | EP5/CE-AJ | 0611193/V5.4.11 | N/A | N/A |

*: The calibrations of the above equipment are traceable to NIST or equivalent standards of the reference organizations.

# *Appendix B. Duty Cycle*

## [Plot & Calculation]




Duty Cycle = Ton / (Ton + Toff) = 389[µs] / (389[µs] + 237[µs]) = 62.14[%]