

# FCC BT LE REPORT

## Class II Permissive Change

<b>Applicant Name:</b> SAMSUNG Electronics Co., Ltd.	<b>Date of Issue:</b> April 30, 2019
<b>Address:</b> 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea	<b>Location:</b> HCT CO., LTD., 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA
	<b>Report No.:</b> HCT-RF-1904-FC051

<b>FCC ID:</b>	<b>A3LSMA6060</b>
<b>APPLICANT:</b>	<b>SAMSUNG Electronics Co., Ltd.</b>

<b>Model:</b>	SM-A6060
<b>Additional Model:</b>	SM-M405F/DS
<b>EUT Type:</b>	Mobile Phone
<b>Average Output Power:</b>	5.51 dBm (3.556 mW)
<b>Frequency Range:</b>	2402 MHz -2480 MHz
<b>Modulation type</b>	GFSK
<b>FCC Classification:</b>	Digital Transmission System(DTS)
<b>FCC Rule Part(s):</b>	Part 15.247

Engineering Statement:

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998,21 U.S. C.853(a)



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**Manager of Telecommunication testing center**

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# Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-1904-FC051	April 30, 2019	- First Approval Report

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## 1. EUT DESCRIPTION

Model	SM-A6060	
Additional Model	SM-M405F/DS	
EUT Type	Mobile Phone	
Power Supply	DC 3.85 V	
Battery Information	Model: EB-BA606ABN Type: Li-ion battery	
Travel Adapter Information	Model : EP-TA200 Manufacture: DYREL	
Frequency Range	2402 MHz - 2480 MHz	
Max. RF Output Power	Peak (For information only)	1M Bit/s : 5.735 dBm (3.745 mW) 2M Bit/s : 6.328 dBm (4.293 mW) 125k Bit/s : 5.520 dBm (3.565 mW) 500k Bit/s : 5.498 dBm (3.547 mW)
	Average	1M Bit/s : 5.39 dBm (3.459 mW) 2M Bit/s : 5.51 dBm (3.556 mW) 125k Bit/s : 5.36 dBm (3.436 mW) 500k Bit/s : 5.38 dBm (3.451 mW)
Modulation Type	GFSK	
Bluetooth Version	5.0	
Number of Channels	40 Channels	
Antenna Specification	Antenna type: FPCB Peak Gain : -0.35 dBi	
Date(s) of Tests	January 31, 2019 ~ March 11, 2019 (SM-A6060) April 15, 2019 ~ April 26, 2019 (SM-M405F/DS)	

## **2. TEST METHODOLOGY**

The measurement procedure described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Device (ANSI C63.10-2013 & KDB 558074 v05r02) is used in the measurement of the test device.

### **EUT CONFIGURATION**

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

### **EUT EXERCISE**

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

## **GENERAL TEST PROCEDURES**

### **Conducted Emissions**

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2 of ANSI C63.10. (Version :2013) Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

### **Radiated Emissions**

The EUT is placed on a turn table, which is 0.8 m above ground plane below 1GHz. Above 1GHz with 1.5m using absorbers between the EUT and receive antenna. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3.75 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 6.6.5 of ANSI C63.10. (Version: 2013)

## **DESCRIPTION OF TEST MODES**

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

### **3. INSTRUMENT CALIBRATION**

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment's, which is traceable to recognized national standards.

Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2017).

### **4. FACILITIES AND ACCREDITATIONS**

#### **FACILITIES**

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA. The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2014) and CISPR Publication 22.

Detailed description of test facility was submitted to the Commission and accepted dated April 02, 2018 (Registration Number: KR0032 ).

#### **EQUIPMENT**

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

### **5. ANTENNA REQUIREMENTS**

#### **According to FCC 47 CFR §15.203:**

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 shall be considered sufficient to comply with the provisions of this section."

\* The antennas of this E.U.T are permanently attached.

\* The E.U.T Complies with the requirement of §15.203

## 6. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

All measurement uncertainty values are shown with a coverage factor of  $k = 2$  to indicate a 95 % level of confidence.

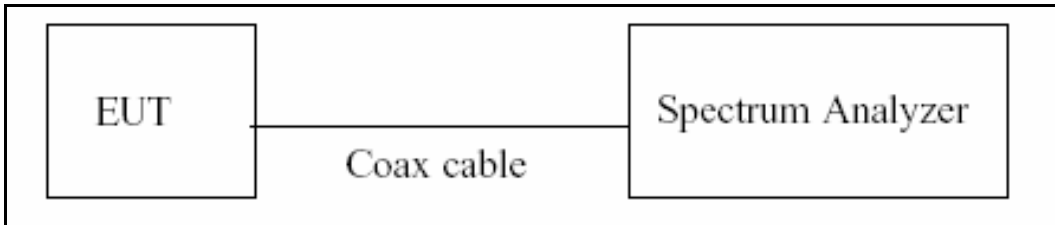
The measurement data shown herein meets or exceeds the  $U_{\text{CISPR}}$  measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty ( $\pm$ dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80
Radiated Disturbance (1 GHz ~ 18 GHz)	5.70
Radiated Disturbance (18 GHz ~ 40 GHz)	5.71

## 7. DESCRIPTION OF TESTS

### 7.1. Duty Cycle

#### Test Configuration



#### Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

We tested according to the zero-span measurement method, 6.0)b) in KDB 558074 v05r02.

The largest available value of RBW is 8 MHz and VBW is 50 MHz.

The zero-span method of measuring duty cycle shall not be used if  $T \leq 6.25$  microseconds. ( $50/6.25 = 8$ )

The zero-span method was used because all measured T data are  $> 6.25$  microseconds and both RBW and VBW are  $> 50/T$ .

1. RBW = 8 MHz (the largest available value)
2. VBW = 8 MHz ( $\geq$  RBW)
3. SPAN = 0 Hz
4. Detector = Peak
5. Number of points in sweep  $> 100$
6. Trace mode = Clear write
7. Measure  $T_{total}$  and  $T_{on}$
8. Calculate Duty Cycle =  $T_{on}/T_{total}$  and Duty Cycle Factor =  $10 \cdot \log(1/\text{Duty Cycle})$

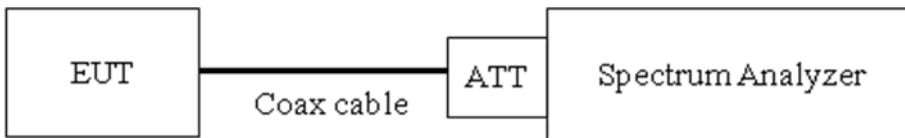


## 7.2. 6dB Bandwidth

### Limit

The minimum permissible 6 dB bandwidth is 500 kHz.

### Test Configuration



### Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

The Spectrum Analyzer is set to (Procedure 8.2 in KDB 558074 v05r02, Procedure 11.8.1 in ANSI 63.10-2013)

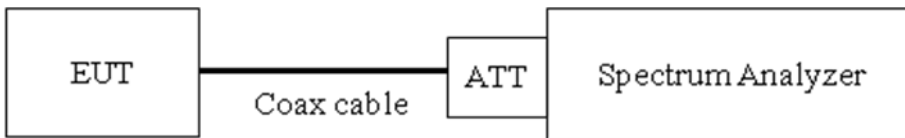
- 1) RBW = 100 kHz
- 2) VBW  $\geq 3 \times$  RBW
- 3) Detector = Peak
- 4) Trace mode = max hold
- 5) Sweep = auto couple
- 6) Allow the trace to stabilize
- 7) We tested 6 dB bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer. X dB is set 6 dB.

### 7.3. Output Power

#### Limit

The maximum permissible conducted output power is 1 Watt.

#### Test Configuration



#### Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

This EUT TX condition is actual operating mode by BT LE mode test program.

The Spectrum Analyzer is set to

- Peak Power (Procedure 8.3.1.1 in KDB 558074 v05r02, Procedure 11.9.1.1 in ANSI 63.10-2013)
  - 1) RBW  $\geq$  DTS Bandwidth
  - 2) VBW  $\geq$  3 x RBW
  - 3) SPAN  $\geq$  3 x RBW
  - 4) Detector Mode = Peak
  - 5) Sweep = auto couple
  - 6) race Mode = max hold
  - 7) Allow trace to fully stabilize.
  - 8) Use peak marker function to determine the peak amplitude level

- Average Power (Procedure 8.3.2.2 in KDB 558074 v05r02, Procedure 11.9.2.2 in ANSI 63.10-2013)
  - 1) We use the spectrum analyzer's integrated band power measurement function.
  - 2) Measure the duty cycle
  - 3) Set span to at least 1.5 times the OBW
  - 4) RBW = 1-5 % of the OBW, not to exceed 1 MHz.
  - 5) VBW  $\geq 3 \times$  RBW.
  - 6) Number of points in sweep  $\geq 2 \times$  span / RBW. (This gives bin-to-bin spacing  $\leq$  RBW/2, so that narrowband signals are not lost between frequency bins.)
  - 7) Sweep time = auto.
  - 8) Detector = RMS(i.e., power averaging)
  - 9) Do not use sweep triggering. Allow the sweep to "free run".
  - 10) Trace average at least 100 traces in power averaging(RMS) mode.
  - 11) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function with band limits set equal to the OBW band edges.
  - 12) Add  $10 \log(1/x)$ , where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.

**Sample Calculation**

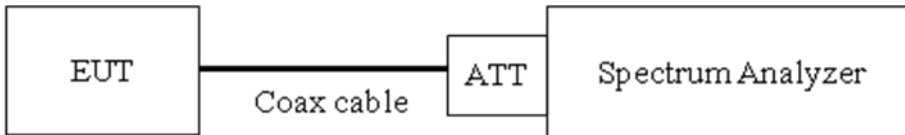
- Conducted Output Power(Peak) = Reading Value + ATT loss + Cable loss
- Conducted Output Power(Average) = Reading Value + ATT loss + Cable loss + Duty Cycle Factor

## 7.4. Power Spectral Density

### Limit

The transmitter power density average over 1-second interval shall not be greater than 8dBm in any 3kHz BW.

### Test Configuration



### Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

We tested according to Procedure 8.4 in KDB 558074 v05r02, Procedure 11.10 in ANSI 63.10-2013.

The spectrum analyzer is set to :

- 1) Set analyzer center frequency to DTS channel center frequency.
- 2) Set span to at least 1.5 times the OBW.
- 3)  $RBW = 3 \text{ kHz} \leq RBW \leq 100 \text{ kHz}$ .
- 4)  $VBW \geq 3 \times RBW$ .
- 5) Sweep = auto couple
- 6) Detector = power averaging (rms) or sample detector (when rms not available).
- 7) Ensure that the number of measurement points in the sweep  $\geq [2 \times \text{span} / RBW]$ .
- 8) Employ trace averaging (rms) mode over a minimum of 100 traces
- 9) Use the peak marker function to determine the maximum amplitude level.
- 10) Use the peak marker function to determine the maximum amplitude level within the RBW.

If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

### Sample Calculation

- Power Spectral Density = Reading Value + ATT loss + Cable loss

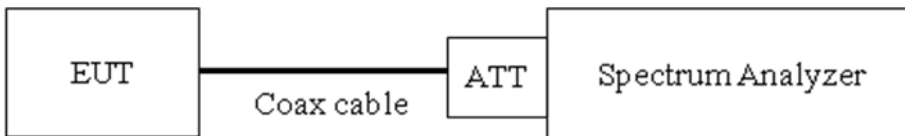
## 7.5. Conducted Band Edge(Out of Band Emissions) & Conducted Spurious Emissions

### Limit

The maximum conducted (average) output power was used to demonstrate compliance, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz.

[ Conducted > 30 dBc ]

### Test Configuration



### Test Procedure

The transmitter output is connected to the spectrum analyzer.

(Procedure 8.5 in KDB 558074 v05r02, Procedure 11.11 in ANSI 63.10-2013)

- 1) RBW = 100 kHz
- 2) VBW  $\geq 3 \times$  RBW
- 3) Set span to encompass the spectrum to be examined
- 4) Detector = Peak
- 5) Trace Mode = max hold
- 6) Sweep time = auto couple
- 7) Ensure that the number of measurement points  $\geq 2 \times$  Span/RBW
- 8) Allow trace to fully stabilize.
- 9) Use peak marker function to determine the maximum amplitude level.

Measurements are made over the 30 MHz to 25 GHz range with the transmitter set to the lowest, middle, and highest channels.

**Factors for frequency**

Freq(MHz)	Factor(dB)
30	11.30
100	9.83
200	10.19
300	10.13
400	10.23
500	10.25
600	10.32
700	10.35
800	10.35
900	10.34
1000	10.39
2000	10.64
2400*	10.65
2500*	10.67
3000	10.68
4000	10.89
5000	11.07
6000	11.06
7000	11.35
8000	11.32
9000	11.48
10000	11.56
11000	11.56
12000	11.68
13000	11.83
14000	11.90
15000	11.98
16000	12.04
17000	12.02
18000	12.08
19000	12.07
20000	12.14
21000	12.17
22000	12.31
23000	12.60
24000	12.34
25000	12.53
26000	12.02

Note : 1. ‘\*’ is fundamental frequency range.

2. Factor = Attenuator loss + Cable loss

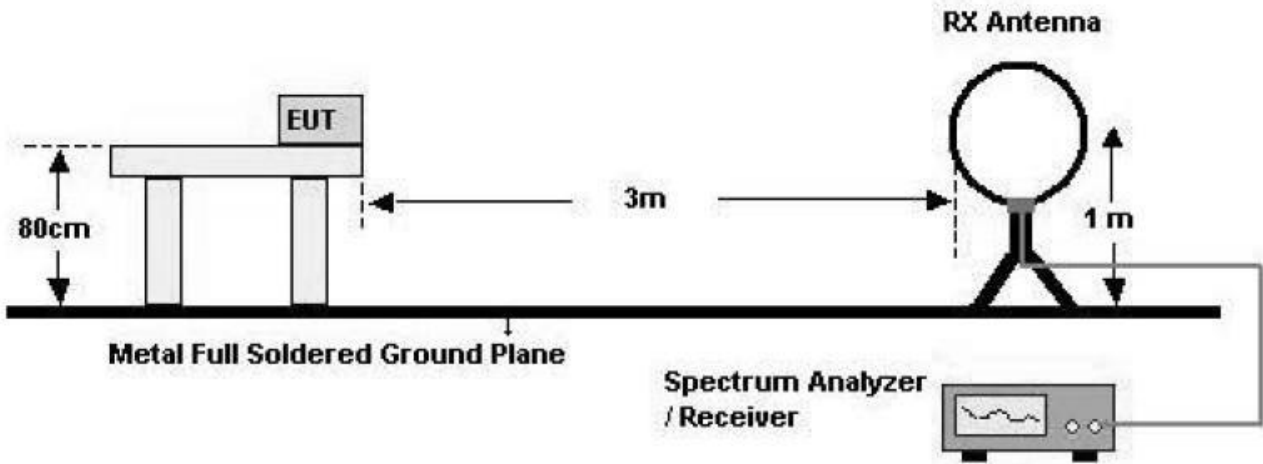
**7.6. Radiated Test**

**Limit**

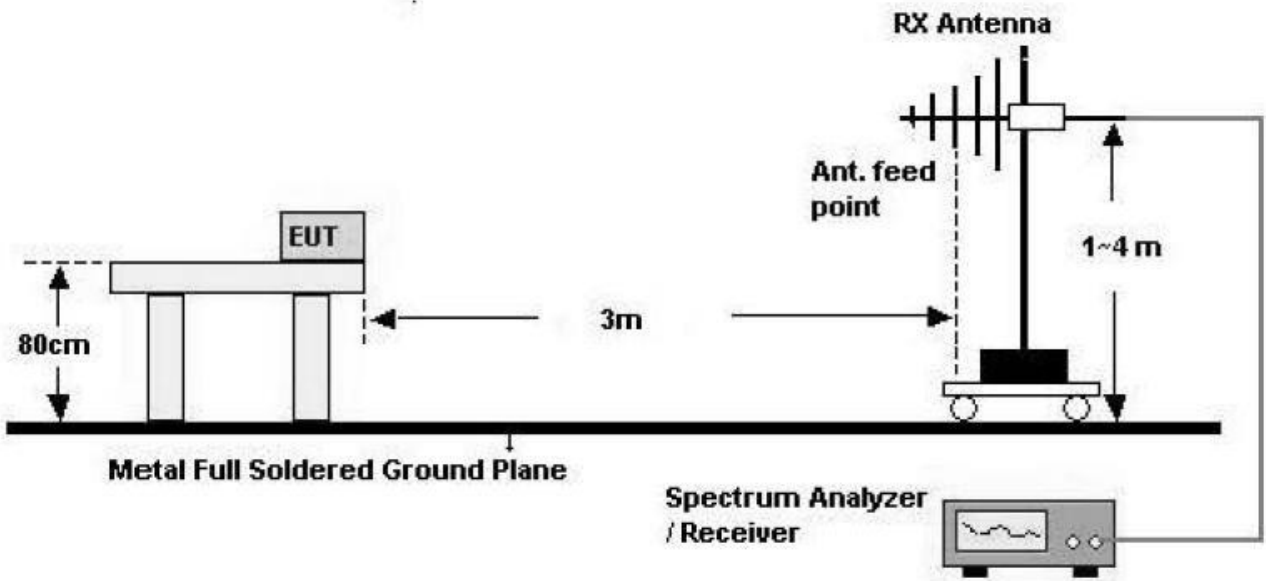
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

**Test Configuration**

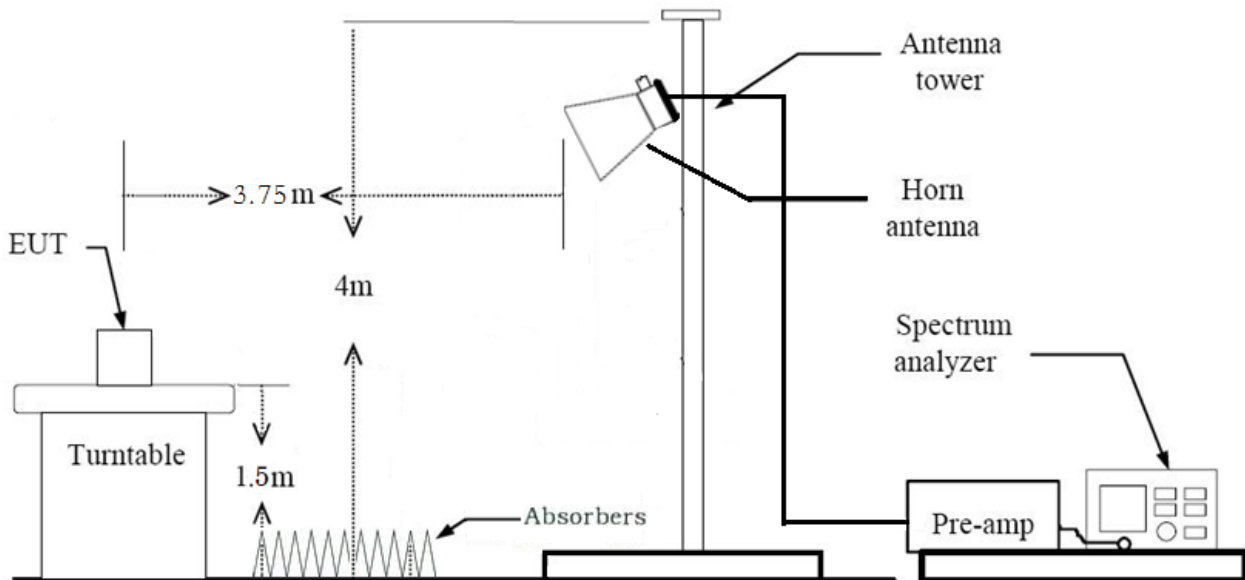
Below 30 MHz



30 MHz - 1 GHz



Above 1 GHz





**Test Procedure of Radiated spurious emissions(Below 30 MHz)**

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The loop antenna was placed at a location 3m from the EUT
3. The EUT is placed on a turntable, which is 0.8m above ground plane.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Distance Correction Factor(0.009 MHz – 0.490 MHz) =  $40 \cdot \log(3 \text{ m}/300 \text{ m}) = - 80 \text{ dB}$   
Measurement Distance : 3 m
7. Distance Correction Factor(0.490 MHz – 30 MHz) =  $40 \cdot \log(3 \text{ m}/30 \text{ m}) = - 40 \text{ dB}$   
Measurement Distance : 3 m
8. Spectrum Setting
  - Frequency Range = 9 kHz ~ 30 MHz
  - Detector = Peak
  - Trace = Maxhold
  - RBW = 9 kHz
  - VBW  $\geq 3 \cdot$ RBW
9. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)
10. The test results for below 30 MHz is correlated to an open site.  
The result on OFS is about 2 dB higher than semi-anechoic chamber(10 m chamber)

**Test Procedure of Radiated spurious emissions(Below 1GHz)**

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The EUT is placed on a turntable, which is 0.8m above ground plane.
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
4. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
5. Spectrum Setting
  - (1) Measurement Type(Peak):
    - Measured Frequency Range : 30 MHz – 1 GHz
    - Detector = Peak
    - Trace = Maxhold
    - RBW = 100 kHz
    - VBW  $\geq 3 \cdot$ RBW
  - (2) Measurement Type(Quasi-peak):
    - Measured Frequency Range : 30 MHz – 1 GHz
    - Detector = Quasi-Peak
    - RBW = 120 kHz
- \*In general, (1) is used mainly
6. Total = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L)

**Test Procedure of Radiated spurious emissions (Above 1 GHz)**

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3.75 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. According to SVSWR requirement in ANSI 63.4-2014, We performed the radiated test at 3.75 m distance from center of turn table. So, we applied the distance factor( reference distance : 3 m).  
\*Distance extrapolation factor =  $20 \cdot \log(\text{test distance} / \text{specific distance})$  (dB)
6. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
7. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
8. The unit was tested with its standard battery.
9. Spectrum Setting (Method 8.6 in KDB 558074 v05r02, Procedure 11.12 in ANSI 63.10-2013)

(1) Measurement Type(Peak):

- Measured Frequency Range : 1 GHz – 25 GHz
- Detector = Peak
- Trace = Maxhold
- RBW = 1 MHz
- VBW  $\geq 3 \cdot$ RBW

(2) Measurement Type(Average):

- Duty cycle < 98%, duty cycle variations are less than  $\pm 2\%$
- Measured Frequency Range : 1 GHz – 25 GHz
- Detector = RMS
- Averaging type = power (*i.e.*, RMS)
- RBW = 1 MHz
- VBW  $\geq 3 \cdot$ RBW
- Sweep time = auto.
- Trace mode = average (at least 100 traces).
- Correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle.
- Duty Cycle Factor (dB) : Please refer to the please refer to section 9.1.

10. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

11. Total(Measurement Type : Peak)

= Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G) + Distance Factor(D.F)

Total(Measurement Type : Average)

= Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G) + Distance Factor(D.F)

+ Duty Cycle Factor

### **Test Procedure of Radiated Restricted Band Edge**

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3.75 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. According to SVSWR requirement in ANSI 63.4-2014, We performed the radiated test at 3.75 m distance from center of turn table. So, we applied the distance factor( reference distance : 3 m).  
\*Distance extrapolation factor =  $20 \cdot \log(\text{test distance} / \text{specific distance})$  (dB)
6. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
7. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
8. The unit was tested with its standard battery.
9. Spectrum Setting

(1) Measurement Type(Peak):

- Measured Frequency Range : 2310 MHz ~ 2390 MHz/ 2483.5 MHz ~ 2500 MHz
- Detector = Peak
- Trace = Maxhold
- RBW = 1 MHz
- VBW  $\geq 3 \cdot$ RBW

(2) Measurement Type(Average):

- Duty cycle < 98%, duty cycle variations are less than  $\pm 2\%$
- Measured Frequency Range : 2310 MHz ~ 2390 MHz/ 2483.5 MHz ~ 2500 MHz
- Detector = RMS
- Averaging type = power (*i.e.*, RMS)
- RBW = 1 MHz
- VBW  $\geq 3 \cdot$ RBW
- Sweep time = auto.
- Trace mode = average (at least 100 traces).
- Correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle.
- Duty Cycle Factor (dB) : Please refer to the please refer to section 9.1.

10. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

11. Total(Measurement Type : Peak)

= Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)

Total(Measurement Type : Average)

= Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F) + Duty Cycle Factor

## 7.7. AC Power line Conducted Emissions

### Limit

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN).

Frequency Range (MHz)	Limits (dB $\mu$ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

\*Decreases with the logarithm of the frequency.

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

### Test Configuration

See test photographs attached in Annex A for the actual connections between EUT and support equipment.

### Test Procedure

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Detectors : Quasi Peak and Average Detector.

### Sample Calculation

Quasi-peak(Final Result) = Reading Value + Correction Factor

## **7.8. Worst case configuration and mode**

### **Radiated test**

1. All modes of operation were investigated and the worst case configuration results are reported.
2. EUT Axis
  - Radiated Spurious Emissions : Y
  - Radiated Restricted Band Edge : Z
3. All packet length of operation were investigated and the test results are worst case in lowest packet length.
  - \*Worst case :
    - LE 5.0(1M Bit/s) : 37 Byte
    - LE 5.0(2M Bit/s) : 37 Byte

### **AC Power line Conducted Emissions**

1. All modes of operation were investigated and the worst case configuration results are reported.

### **Conducted test**

The EUT was configured with packet length of highest power.

- \* Packet length of highest power :
  - LE 5.0(1M Bit/s) : 37 Byte
  - LE 5.0(2M Bit/s) : 37 Byte
  - LE 5.0(125k Bit/s) : 37 Byte
  - LE 5.0(500k Bit/s) : 37 Byte

### **Test scenario**

: The test scenario for spot check is based on the worst-case of original report results.

## 8. SUMMARY TEST OF RESULTS

Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result	Status
6 dB Bandwidth	§15.247(a)(2)	> 500 kHz	Conducted	PASS	NT <sup>Note2</sup>
Conducted Maximum Average Output Power	§15.247(b)(3)	< 1 Watt		<b>See Note4</b>	C <sup>Note5</sup>
Power Spectral Density	§15.247(e)	< 8 dBm / 3 kHz Band		PASS	NT <sup>Note2</sup>
Band Edge (Out of Band Emissions)	§15.247(d)	Conducted > 30 dBc		PASS	NT <sup>Note2</sup>
AC Power line Conducted Emissions	§15.207	cf. Section 7.7		PASS	PASS
Radiated Spurious Emissions	§15.247(d), 15.205, 15.209	cf. Section 7.6	Radiated	PASS	C <sup>Note3</sup>
Radiated Restricted Band Edge	§15.247(d), 15.205, 15.209	cf. Section 7.6		PASS	C <sup>Note3</sup>

**Note:**

1. C = Comply, NT = Not Tested, NA = Not Applicable, NC = Not Comply

2. C2PC model is electrically identical to the Original model.

The Product Equality Declaration includes detailed information about the changes between the devices.

3. The data from that application has been verified through appropriate spot checks to demonstrate compliance for this device as shown in the test result of section 9

4. See SAR Report

5. Output power was verified to be within the expected tune up tolerances prior to performing the spot checks for radiated spurious emissions and band edge to confirm that the proposed changes to the digital circuitry had not adversely affected the previously reported values in the original filing.

6. Original model : SM-A6060

C2PC model : SM-M405F/DS



### 9. TEST RESULT

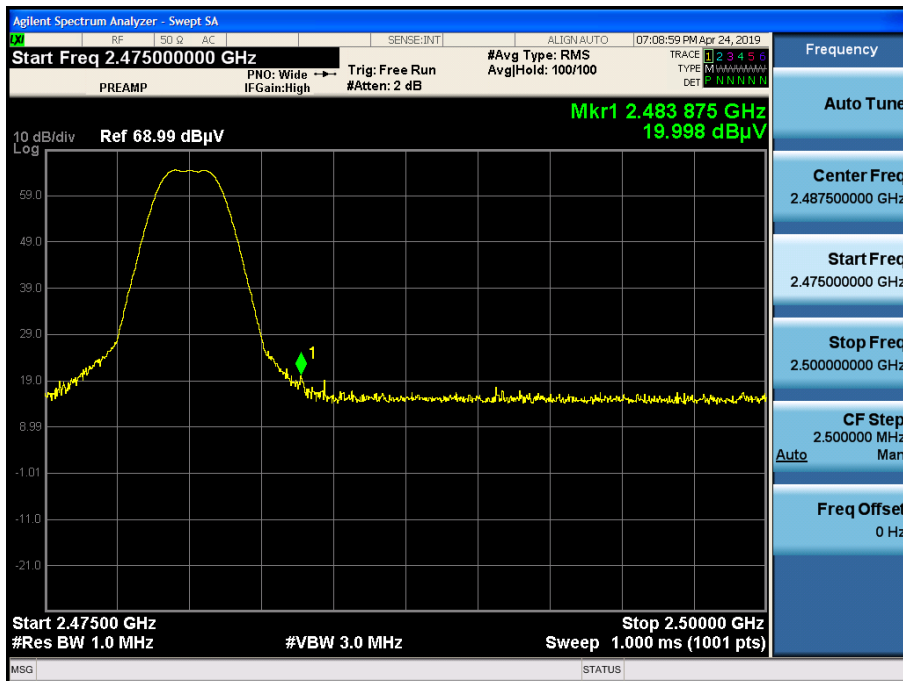
Test Item	Data Rate	Channel	Measured Frequency (MHz)	SM-A6060 (dBuV/m)		SM-M405F/DS (dBuV/m)		Deviation (dB)	
				Average	Peak	Average	Peak	Average	Peak
Band Edge	2M Bit/s	Ch.39	2483.5 ~ 2500.0	45.80	55.70	45.67	53.39	0.13	2.31
RSE	2M Bit/s	Ch.39	7440.0	48.36	56.01	49.53	56.61	-1.17	-0.60

## 10. TEST PLOT

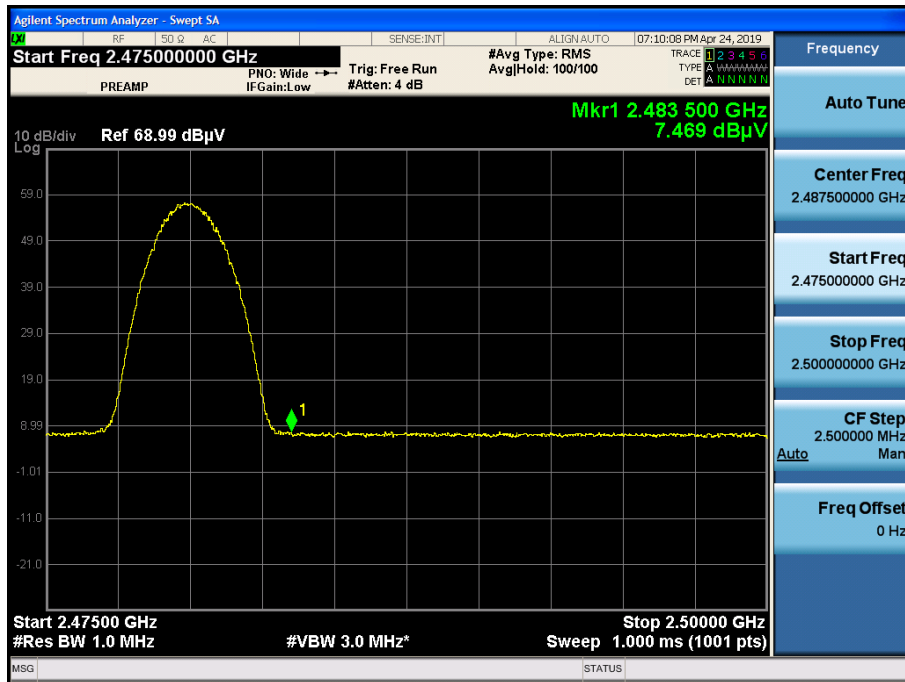
### Bandedge

Frequency [MHz]	Reading [dBuV]	Duty cycle Factor [dB]	A.F + C.L + D.F [dB]	Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
2483.5	20.00	0.00	33.39	V	53.39	73.98	20.59	PK
2483.5	7.47	4.81	33.39	V	45.67	53.98	8.31	AV

Detect : PK



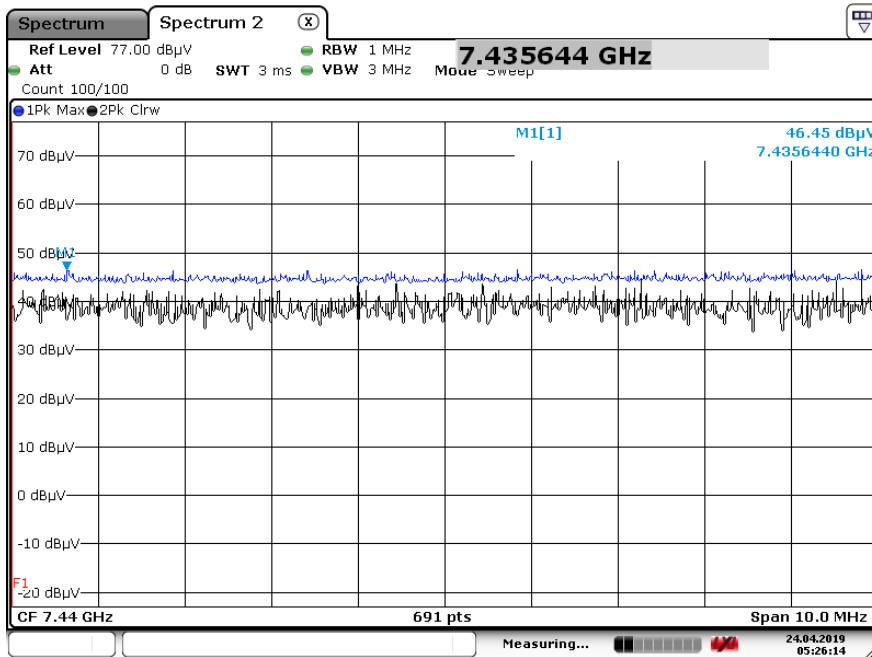
Detect : AV



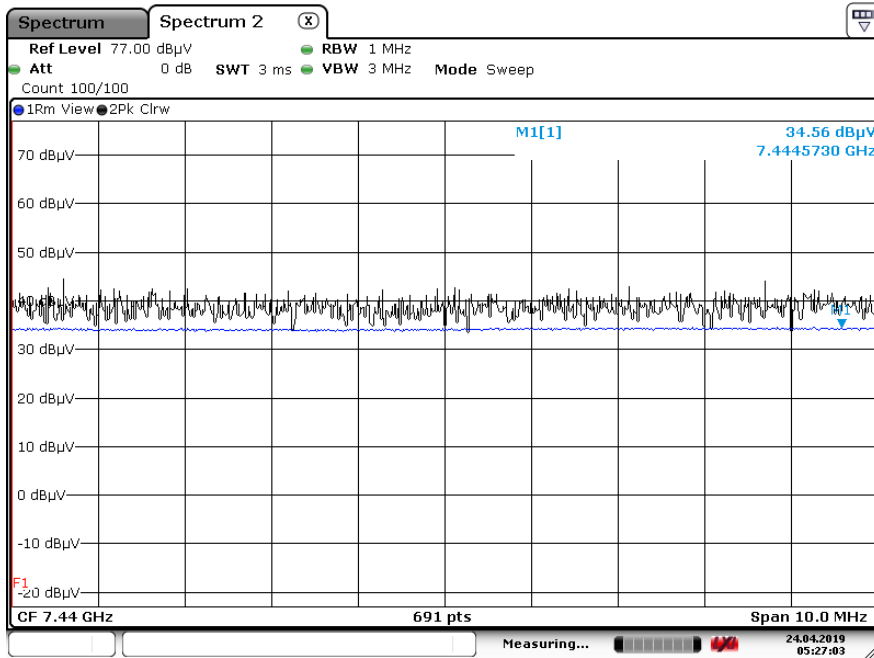
**RSE**

Frequency [MHz]	Reading [dBuV]	Duty cycle Factor [dB]	A.F + C.L - A.G + D.F [dB]	Pol. [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Measurement Type
7440	46.45	0.00	10.16	H	56.61	73.98	17.37	PK
7440	34.56	4.81	10.16	H	49.53	53.98	4.45	AV

Detect : PK



Detect : AV



# 11. POWERLINE CONDUCTED EMISSIONS

## Conducted Emissions (Line 1)

BTLE MODE L1

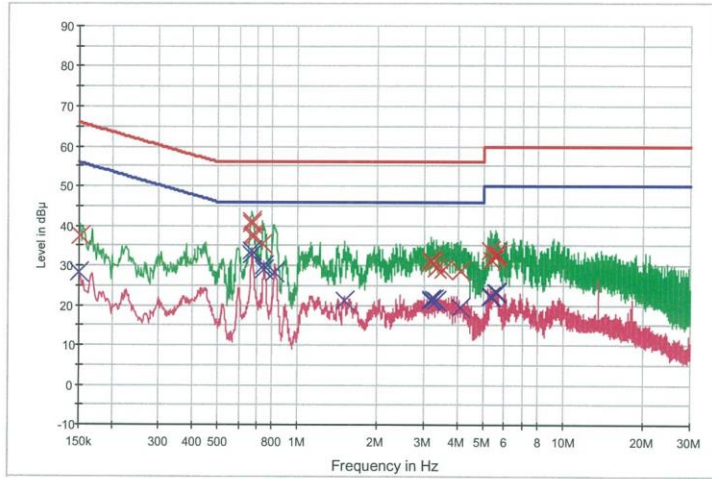
1 / 2

### HCT TEST Report

#### Common Information

EUT: SM-M405FDS  
 Manufacturer: SAMSUNG  
 Test Site: SHIELD ROOM  
 Operating Conditions: BTLE MODE L1

FCC CLASS B\_Exten Cable



— FCC CLASS B\_QP      — FCC CLASS B\_AV      — Preview Result 1-PK+  
 — Preview Result 2-AVG      × Final Result 1-QPK      × Final Result 2-CAV

#### Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.152000	37.3	9.000	Off	L1	9.7	28.6	65.9
0.670000	41.3	9.000	Off	L1	9.8	14.7	56.0
0.674000	40.6	9.000	Off	L1	9.8	15.4	56.0
0.678000	37.8	9.000	Off	L1	9.8	18.2	56.0
0.682000	37.1	9.000	Off	L1	9.8	18.9	56.0
0.738000	35.6	9.000	Off	L1	9.8	20.4	56.0
3.168000	31.4	9.000	Off	L1	9.9	24.6	56.0
3.172000	31.0	9.000	Off	L1	9.9	25.0	56.0
3.250000	30.8	9.000	Off	L1	9.9	25.2	56.0
3.344000	29.3	9.000	Off	L1	9.9	26.7	56.0
3.526000	28.9	9.000	Off	L1	9.9	27.1	56.0
4.108000	28.7	9.000	Off	L1	10.0	27.3	56.0
5.298000	33.6	9.000	Off	L1	10.0	26.4	60.0
5.388000	31.5	9.000	Off	L1	10.0	28.5	60.0
5.542000	32.7	9.000	Off	L1	10.0	27.3	60.0
5.592000	32.2	9.000	Off	L1	10.1	27.8	60.0
5.600000	32.9	9.000	Off	L1	10.1	27.1	60.0
5.610000	33.1	9.000	Off	L1	10.1	26.9	60.0

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BTLE MODE L1

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**Final Result 2**

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	28.2	9.000	Off	L1	9.7	27.8	56.0
0.670000	32.8	9.000	Off	L1	9.8	13.2	46.0
0.674000	33.7	9.000	Off	L1	9.8	12.3	46.0
0.744000	28.9	9.000	Off	L1	9.8	17.1	46.0
0.748000	29.9	9.000	Off	L1	9.8	16.1	46.0
0.818000	28.4	9.000	Off	L1	9.8	17.6	46.0
1.506000	21.3	9.000	Off	L1	9.9	24.7	46.0
3.168000	21.3	9.000	Off	L1	9.9	24.7	46.0
3.172000	21.4	9.000	Off	L1	9.9	24.6	46.0
3.250000	21.6	9.000	Off	L1	9.9	24.4	46.0
3.344000	21.2	9.000	Off	L1	9.9	24.8	46.0
4.108000	19.4	9.000	Off	L1	10.0	26.6	46.0
5.298000	22.3	9.000	Off	L1	10.0	27.7	50.0
5.388000	22.2	9.000	Off	L1	10.0	27.8	50.0
5.586000	23.3	9.000	Off	L1	10.1	26.7	50.0
5.594000	23.2	9.000	Off	L1	10.1	26.8	50.0
5.600000	23.2	9.000	Off	L1	10.1	26.8	50.0
5.608000	23.1	9.000	Off	L1	10.1	26.9	50.0

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**Conducted Emissions (Line 2)**

**12. LIST OF TEST EQUIPMENT**

**Conducted Test**

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Rohde & Schwarz	ENV216 / LISN	12/12/2018	Annual	102245
Rohde & Schwarz	ESCI / Test Receiver	06/27/2018	Annual	100033
ESPACE	SU-642 / Temperature Chamber	08/07/2019	Annual	93000718
Agilent	N9020A / Signal Analyzer	06/08/2018	Annual	MY51110085
Agilent	N9020A / Signal Analyzer	06/08/2018	Annual	MY52090906
Agilent	N9030A / Signal Analyzer	01/10/2019	Annual	MY49431210
Rohde & Schwarz	OSP 120 / Power Measurement Set	07/26/2018	Annual	101231
Agilent	N1911A / Power Meter	04/10/2019	Annual	MY45100523
Agilent	N1921A / Power Sensor	04/10/2019	Annual	MY52260025
Agilent	87300B / Directional Coupler	11/20/2018	Annual	3116A03621
Hewlett Packard	11667B / Power Splitter	06/07/2018	Annual	05001
Hewlett Packard	E3632A / DC Power Supply	06/26/2018	Annual	KR75303960
Agilent	8493C / Attenuator(10 dB)	07/10/2018	Annual	07560
Rohde & Schwarz	EMC32 / Software	N/A	N/A	N/A
HCT CO., LTD.	FCC WLAN&BT&BLE Conducted Test Software v3.0	N/A	N/A	N/A

**Note:**

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.



**Radiated Test**

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Innco system	CO3000 / Controller(Antenna mast)	N/A	N/A	CO3000-4p
Innco system	MA4640/800-XP-EP / Antenna Position Tower	N/A	N/A	N/A
Audix	EM1000 / Controller	N/A	N/A	060520
Audix	Turn Table	N/A	N/A	N/A
Rohde & Schwarz	Loop Antenna	08/23/2018	Biennial	1513-175
Schwarzbeck	VULB 9168 / Hybrid Antenna	03/22/2019	Biennial	760
Schwarzbeck	VULB 9160 / TRILOG Antenna	08/09/2018	Biennial	9160-3368
Schwarzbeck	BBHA 9120D / Horn Antenna	08/01/2017	Biennial	1151
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	12/04/2017	Biennial	BBHA9170541
Rohde & Schwarz	FSP(9 kHz ~ 30 GHz) / Spectrum Analyzer	09/03/2018	Annual	100688
Rohde & Schwarz	FSV40-N / Spectrum Analyzer	09/28/2018	Annual	101068-SZ
Agilent	N9020A / Signal Analyzer	06/08/2018	Annual	MY51110085
Wainwright Instruments	WHK3.0/18G-10EF / High Pass Filter	06/07/2018	Annual	8
Wainwright Instruments	WHKX7.0/18G-8SS / High Pass Filter	05/09/2018	Annual	29
Wainwright Instruments	WRCJV2400/2483.5-2370/2520-60/12SS / Band Reject Filter	06/29/2018	Annual	2
Wainwright Instruments	WRCJV5100/5850-40/50-8EEK / Band Reject Filter	01/03/2019	Annual	2
Api tech.	18B-03 / Attenuator (3 dB)	06/07/2018	Annual	1
Agilent	8493C-10 / Attenuator(10 dB)	07/17/2018	Annual	08285
CERNEX	CBLU1183540 / Power Amplifier	07/10/2018	Annual	22964
CERNEX	CBL06185030 / Power Amplifier	07/10/2018	Annual	22965
CERNEX	CBL18265035 / Power Amplifier	01/03/2019	Annual	22966
CERNEX	CBL26405040 / Power Amplifier	06/29/2018	Annual	25956
TESCOM	TC-3000C / Bluetooth Tester	03/26/2019	Annual	3000C000276

**Note:**

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

### 13. ANNEX A\_ TEST SETUP PHOTO

Please refer to test setup photo file no. as follows;

No.	Description
1	HCT-RF-1904-FC051-P