



**FCC CFR47 PART 15 SUBPART C**

**Bluetooth**

**CERTIFICATION TEST REPORT**

**FOR**

**GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n, ANT+ and NFC**

**MODEL NUMBER : SM-A710M/DS, SM-A710M**

**FCC ID: A3LSMA710M**

**REPORT NUMBER: 15K22211-E3**

**ISSUE DATE: NOV 30, 2015**

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Revision History

| Rev. | Issue Date | Revisions     | Revised By  |
|------|------------|---------------|-------------|
| --   | 11/30/15   | Initial issue | Junwhan Lee |

## TABLE OF CONTENTS

|                                              |           |
|----------------------------------------------|-----------|
| <b>1. ATTESTATION OF TEST RESULTS</b>        | <b>4</b>  |
| <b>2. TEST METHODOLOGY</b>                   | <b>5</b>  |
| <b>3. FACILITIES AND ACCREDITATION</b>       | <b>5</b>  |
| <b>4. CALIBRATION AND UNCERTAINTY</b>        | <b>5</b>  |
| 4.1. MEASURING INSTRUMENT CALIBRATION        | 5         |
| 4.2. SAMPLE CALCULATION                      | 5         |
| 4.3. MEASUREMENT UNCERTAINTY                 | 5         |
| <b>5. EQUIPMENT UNDER TEST</b>               | <b>6</b>  |
| 5.1. DESCRIPTION OF EUT                      | 6         |
| 5.2. MAXIMUM OUTPUT POWER                    | 6         |
| 5.3. DESCRIPTION OF AVAILABLE ANTENNAS       | 6         |
| 5.4. WORST-CASE CONFIGURATION AND MODE       | 6         |
| 5.5. DESCRIPTION OF TEST SETUP               | 7         |
| <b>6. TEST AND MEASUREMENT EQUIPMENT</b>     | <b>9</b>  |
| <b>7. SUMMARY TABLE</b>                      | <b>10</b> |
| <b>8. ANTENNA PORT TEST RESULTS</b>          | <b>11</b> |
| 8.1. 20 dB AND 99% BANDWIDTH                 | 11        |
| 8.2. HOPPING FREQUENCY SEPARATION            | 11        |
| 8.3. NUMBER OF HOPPING CHANNELS              | 12        |
| 8.4. AVERAGE TIME OF OCCUPANCY               | 12        |
| 8.5. OUTPUT POWER                            | 13        |
| 8.6. AVERAGE POWER                           | 13        |
| 8.7. CONDUCTED SPURIOUS EMISSIONS            | 14        |
| <b>9. RADIATED TEST RESULTS</b>              | <b>15</b> |
| 9.1. LIMITS AND PROCEDURE                    | 15        |
| 9.1. TRANSMITTER ABOVE 1 GHz                 | 15        |
| 9.2. WORST-CASE BELOW 1 GHz                  | 15        |
| <b>10. AC POWER LINE CONDUCTED EMISSIONS</b> | <b>16</b> |
| <b>11. SETUP PHOTOS</b>                      | <b>17</b> |

## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** SAMSUNG ELECTRONICS CO., LTD.  
**EUT DESCRIPTION:** GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n, ANT+ and NFC  
**MODEL NUMBER:** SM-A710M/DS, SM-A710M  
**SERIAL NUMBER:** R38GA0JTKBJ (RADIATED); R38GA0JQBRZ (CONDUCTED)  
**DATE TESTED:** OCT 29, 2015 - NOV 26, 2015

| APPLICABLE STANDARDS     |              |
|--------------------------|--------------|
| STANDARD                 | TEST RESULTS |
| CFR 47 Part 15 Subpart C | Pass         |

UL Korea, Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Korea, Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Korea, Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by IAS, any agency of the Federal Government, or any agency of any government.

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## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea. Line conducted emissions are measured only at the 218 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

| 218 Maeyeong-ro                     |           |
|-------------------------------------|-----------|
| <input checked="" type="checkbox"/> | Chamber 1 |
| <input type="checkbox"/>            | Chamber 2 |

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at <http://www.iasonline.org/PDF/TL/TL-637.pdf>.

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamplifier Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

### 4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

| PARAMETER                             | UNCERTAINTY |
|---------------------------------------|-------------|
| Conducted Disturbance, 0.15 to 30 MHz | 2.32 dB     |
| Radiated Disturbance, Below 1GHz      | 4.14 dB     |
| Radiated Disturbance, Above 1 GHz     | 5.97 dB     |

Uncertainty figures are valid to a confidence level of 95%.

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is GSM/WCDMA/LTE Phone + BT/BLE, DTS/UNII a/b/g/n, ANT+ and NFC.  
This test report addresses the DSS (BT) operational mode.

SM-A710M and SM-A710M/DS are same hardware but for different number of SIM card slot.  
SM-A710M has one slot. SM-A710M/DS is dual SIM version.

### 5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

| Frequency Range<br>[MHz] | Mode               | Power<br>Mode | Output Power<br>[dBm] | Output Power<br>[mW] |
|--------------------------|--------------------|---------------|-----------------------|----------------------|
| 2402 - 2480              | Basic GFSK         | Average       | 9.68                  | 9.28                 |
|                          |                    | Peak          | 10.15                 | 10.35                |
|                          | Enhanced Pi/4-DPSK | Average       | 5.09                  | 3.23                 |
|                          |                    | Peak          | 7.42                  | 5.52                 |
|                          | Enhanced 8PSK      | Average       | 5.10                  | 3.24                 |
|                          |                    | Peak          | 7.83                  | 6.07                 |

Note: GFSK, Pi/4-DQPSK, 8PSK average Power are all investigated, The GFSK & 8PSK Power are the worst case. Testing is based on this mode to showing compliance. For average power data please refer to section 8.6.

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an FPCB antenna, with a maximum gain of 1.63 dBi.

### 5.4. WORST-CASE CONFIGURATION AND MODE

Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z it was determined that X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

## 5.5. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

| Support Equipment List |              |            |                |        |
|------------------------|--------------|------------|----------------|--------|
| Description            | Manufacturer | Model      | Serial Number  | FCC ID |
| Charger                | SAMSUNG      | EP-TA20EWE | R37G8H02Q92SE3 | N/A    |
| Data Cable             | SAMSUNG      | ECB-DU4AWE | N/A            | N/A    |
| Earphone               | SAMSUNG      | EHS64AVFWE | N/A            | N/A    |

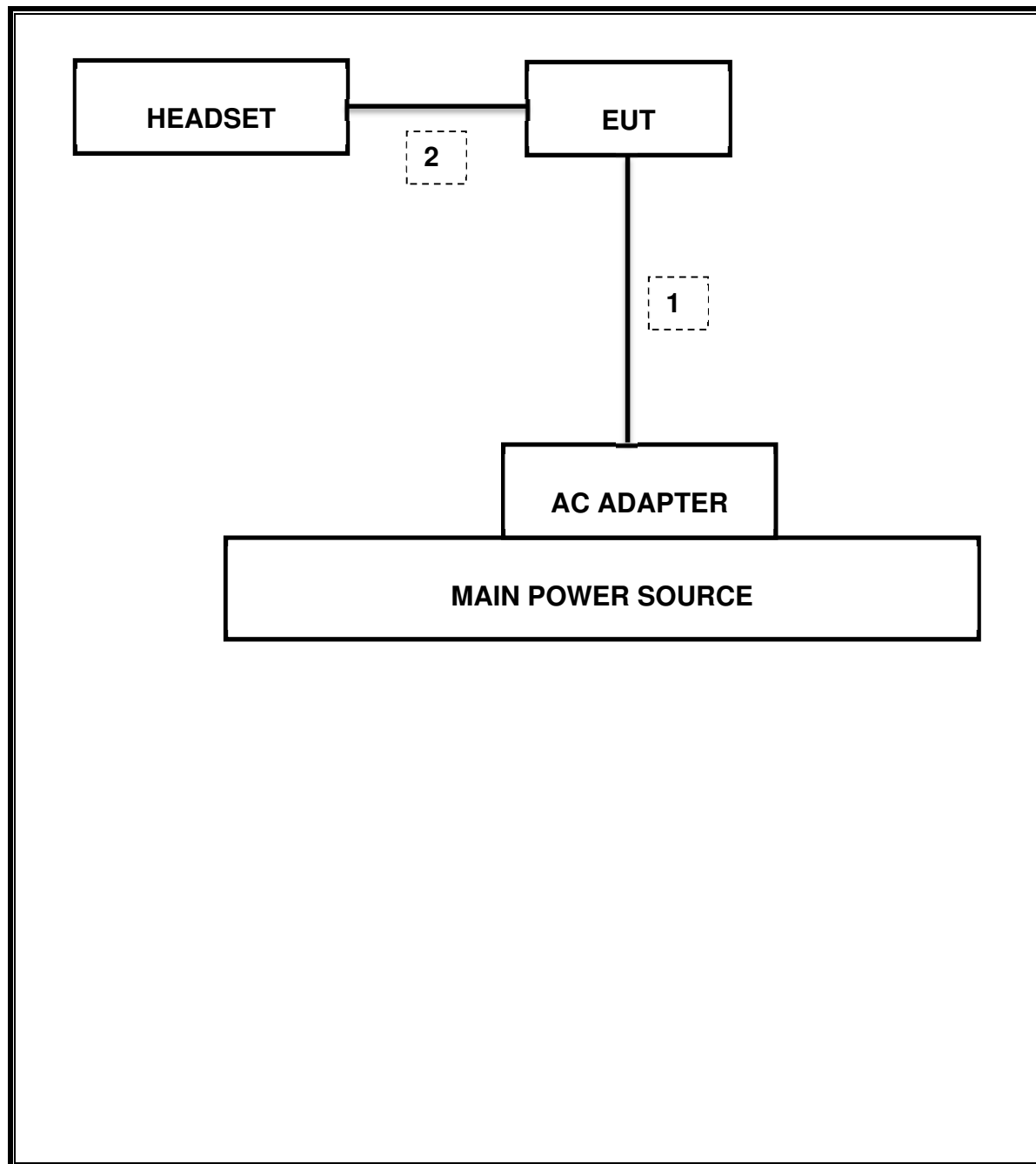
### I/O CABLES

| I/O Cable List |          |                      |                |            |                  |         |
|----------------|----------|----------------------|----------------|------------|------------------|---------|
| Cable No       | Port     | # of identical ports | Connector Type | Cable Type | Cable Length (m) | Remarks |
| 1              | DC Power | 1                    | Mini-USB       | Shielded   | 0.8m             | N/A     |
| 1              | Audio    | 1                    | Mini-Jack      | Unshielded | 1.0m             | N/A     |

### TEST SETUP

The EUT is continuously communicating to the Bluetooth tester during the tests.  
EUT was set in the Hidden menu mode to enable BT communications.

**SETUP DIAGRAM FOR TESTS**



## 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

| Test Equipment List        |               |                        |             |          |
|----------------------------|---------------|------------------------|-------------|----------|
| Description                | Manufacturer  | Model                  | S/N         | Cal Due  |
| Antenna, Bilog, 30MHz-1GHz | SCHWARZBECK   | VULB9163               | 749         | 04-25-16 |
| Antenna, Horn, 18 GHz      | ETS           | 3115                   | 00161451    | 05-17-16 |
| Antenna, Horn, 18 GHz      | ETS           | 3117                   | 00168724    | 06-17-16 |
| Antenna, Horn, 18 GHz      | ETS           | 3117                   | 00168717    | 06-17-16 |
| Antenna, Horn, 40 GHz      | ETS           | 3116C                  | 00166255    | 09-23-16 |
| Antenna, Horn, 40 GHz      | ETS           | 3116C-PA               | 00168841    | 09-29-16 |
| Preamplifier, 1000 MHz     | Sonoma        | 310N                   | 341282      | 08-18-16 |
| Preamplifier, 1000 MHz     | Sonoma        | 310N                   | 351741      | 08-18-16 |
| Preamplifier, 18 GHz       | Miteq         | AFS42-00101800-25-S-42 | 1876511     | 08-18-16 |
| Preamplifier, 18 GHz       | Miteq         | AFS42-00101800-25-S-42 | 1896138     | 08-18-16 |
| Spectrum Analyzer, 44 GHz  | Agilent / HP  | N9030A                 | MY54170614  | 08-19-16 |
| Spectrum Analyzer, 44 GHz  | Agilent / HP  | N9030A                 | MY54490312  | 08-19-16 |
| Bluetooth Tester           | TESCOM        | TC-3000C               | 3000C000546 | 08-18-16 |
| Average Power Sensor       | R&S           | NRZ-Z91                | 102681      | 08-18-16 |
| Average Power Sensor       | Agilent / HP  | U2000                  | MY54270007  | 08-18-16 |
| EMI Test Receive, 40 GHz   | R&S           | ESU40                  | 100439      | 08-19-16 |
| EMI Test Receive, 40 GHz   | R&S           | ESU40                  | 100457      | 08-19-16 |
| EMI Test Receive, 3 GHz    | R&S           | ESR3                   | 101832      | 08-19-16 |
| Attenuator / Switch driver | HP            | 11713A                 | 3748A04272  | N/A      |
| Low Pass Filter 3GHz       | Micro-Tronics | LPS17541               | 009         | 08-18-16 |
| Low Pass Filter 3GHz       | Micro-Tronics | LPS17541               | 015         | 08-18-16 |
| High Pass Filter 5GHz      | Micro-Tronics | HPS17542               | 009         | 08-18-16 |
| High Pass Filter 6GHz      | Micro-Tronics | HPM17543               | 010         | 08-18-16 |
| High Pass Filter 5GHz      | Micro-Tronics | HPS17542               | 016         | 08-18-16 |
| High Pass Filter 6GHz      | Micro-Tronics | HPM17543               | 015         | 08-18-16 |
| LISN                       | R&S           | ENV-216                | 101836      | 08-19-16 |
| LISN                       | R&S           | ENV-216                | 101837      | 08-19-16 |
| Combiner                   | WEINSCHEL     | 1575                   | 2151        | 08-20-16 |

## 7. SUMMARY TABLE

The FCC ID: A3LSMA710M shares the same enclosure and circuit board as FCC ID: A3LSMA710F. The BT circuitry and layout, including antennas, are almost identical between the two units. The BT antennas and surrounding circuitry are the same between these two units.

After confirming through preliminary radiated emissions that the performance of the FCC ID: A3LSMA710F remains representative of FCC ID: A3LSMA710M, test data for FCC ID: A3LSMA710F is being submitted for this application to cover BT features.

| FCC Part Section   | Test Description                        | Test Limit                            | Test Condition       | Test Result | Worst Case        |
|--------------------|-----------------------------------------|---------------------------------------|----------------------|-------------|-------------------|
| 2.1049             | Occupied Band width (99%)               | N/A                                   | Conducted            | Pass        | 1.200 MHz         |
| 2.1051, 15.247 (d) | Band Edge / Conducted Spurious Emission | -20dBc                                |                      | Pass        | -49.14 dBm        |
| 15.247 (b)(1)      | TX conducted output power               | <21dBm                                |                      | Pass        | 10.149 dBm (Peak) |
| 15.247 (a)(1)      | Hopping frequency separation            | > 25KHz                               |                      | Pass        | 1 MHz             |
| 15.247 (a)(1)(iii) | Number of Hopping channels              | More than 15 non-overlapping channels |                      | Pass        | 79                |
| 15.247 (a)(1)(iii) | Avg Time of Occupancy                   | < 0.4sec                              |                      | Pass        | 0.346 sec         |
| 15.207 (a)         | AC Power Line conducted emissions       | Section 10                            | Power Line conducted | Pass        | 39.11 dBuV (QP)   |
| 15.205, 15.209     | Radiated Spurious Emission              | < 54dBuV/m                            | Radiated             | Pass        | 43.71 dBuV/m (AV) |

## 8. ANTENNA PORT TEST RESULTS

### 8.1. 20 dB AND 99% BANDWIDTH

#### LIMITS

None; for reporting purposes only.

#### TEST PROCEDURE

DA 00-705: The transmitter output is connected to a spectrum analyzer. The RBW is set to  $\geq$  1% of the 20 dB bandwidth. The VBW is set to  $\geq$  RBW. The sweep time is coupled.

#### RESULTS

Please refer to BT test report of FCC ID : A3LSMA710F

### 8.2. HOPPING FREQUENCY SEPARATION

#### LIMIT

FCC §15.247 (a) (1)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

#### TEST PROCEDURE

DA 00-705: The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

#### RESULTS

Please refer to BT test report of FCC ID : A3LSMA710F

### **8.3. NUMBER OF HOPPING CHANNELS**

#### **LIMIT**

FCC §15.247 (a) (1) (iii)

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

#### **TEST PROCEDURE**

DA 00-705: The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

#### **RESULTS**

Please refer to BT test report of FCC ID : A3LSMA710F

### **8.4. AVERAGE TIME OF OCCUPANCY**

#### **LIMIT**

FCC §15.247 (a) (1) (iii)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

#### **TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 31.6 second period (79 channels \* 0.4 s) is equal to  $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{ pulse width}$ .

For AFH mode, the average time of occupancy in the specified 8 second period (20 channels \* 0.4 seconds) is equal to  $10 * (\# \text{ of pulses in } 0.8 \text{ s}) * \text{ pulse width}$ .

#### **RESULTS**

Please refer to BT test report of FCC ID : A3LSMA710F

## **8.5. OUTPUT POWER**

### **LIMIT**

§15.247 (b) (1)

The maximum antenna gain is less than 6 dBi, therefore the limit is 21 dBm.

### **TEST PROCEDURE**

DA 00-705: The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

### **RESULTS**

Please refer to BT test report of FCC ID : A3LSMA710F

## **8.6. AVERAGE POWER**

### **LIMIT**

None; for reporting purposes only.

### **TEST PROCEDURE**

DA 00-705: The transmitter output is connected to a power meter.

### **RESULTS**

Please refer to BT test report of FCC ID : A3LSMA710F

## **8.7. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

FCC §15.247 (d)

Limit = -20 dBc

### **TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

### **RESULTS**

Please refer to BT test report of FCC ID : A3LSMA710F

## 9. RADIATED TEST RESULTS

### 9.1. LIMITS AND PROCEDURE

#### LIMITS

FCC §15.205 and §15.209

| Frequency Range (MHz) | Field Strength Limit (uV/m) at 3 m | Field Strength Limit (dBuV/m) at 3 m |
|-----------------------|------------------------------------|--------------------------------------|
| 30 - 88               | 100                                | 40                                   |
| 88 - 216              | 150                                | 43.5                                 |
| 216 - 960             | 200                                | 46                                   |
| Above 960             | 500                                | 54                                   |

#### TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For band edge measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 1/T (on time) for average measurement.

GFSK =  $1/T = 1 / 0.0029S = 350Hz$ .

The spectrum from 1GHzHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

### 9.1. TRANSMITTER ABOVE 1 GHz

#### RESULTS

Please refer to BT test report of FCC ID : A3LSMA710F

### 9.2. WORST-CASE BELOW 1 GHz

#### RESULTS

Please refer to BT test report of FCC ID : A3LSMA710F

## 10. AC POWER LINE CONDUCTED EMISSIONS

### LIMITS

FCC §15.207 (a)

| Frequency of Emission (MHz) | Conducted Limit (dBuV) |           |
|-----------------------------|------------------------|-----------|
|                             | Quasi-peak             | Average   |
| 0.15-0.5                    | 66 to 56*              | 56 to 46* |
| 0.5-5                       | 56                     | 46        |
| 5-30                        | 60                     | 50        |

\* Decreases with the logarithm of the frequency.

### TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

### RESULTS

Please refer to BT test report of FCC ID : A3LSMA710F