

Page 1 of 15

## Table of Contents

|                                                           |    |
|-----------------------------------------------------------|----|
| 1.0. General Information .....                            | 3  |
| 2.0. Summary of Test Results.....                         | 4  |
| 3.0. Measurement Uncertainty .....                        | 4  |
| 4.0. Equipment List.....                                  | 5  |
| 5.0. Test Mode Applicability and Test Channel Detail..... | 6  |
| 6.0. Transmitter Test Parameters .....                    | 8  |
| 6.1. Radiated Emission within restricted Bands .....      | 8  |
| 6.1.1. Test Setup .....                                   | 8  |
| 6.1.2. Test Limits: .....                                 | 9  |
| 6.1.3. Test Data:.....                                    | 10 |
| 6.2. AC Powerline Conducted Emission .....                | 14 |
| 6.2.1. Test Setup .....                                   | 14 |
| 6.2.2. Test Limits: .....                                 | 15 |
| 6.2.3. Test Result .....                                  | 15 |

### REVISION HISTORY

| Revision History | Description                                                                                                         | Date        | Originator            |
|------------------|---------------------------------------------------------------------------------------------------------------------|-------------|-----------------------|
| Rev. A           | Initial Report                                                                                                      | 17-Dec-2019 | Azil Ezzaddin Khalil  |
| Rev. B           | Updated:<br>1) Applicant Name<br>2) Applicant Address<br>3) Changed wording: Approved<br>by: to Approved Signatory: | 20-Feb-2020 | Mohd Helmy Shamsuddin |

## 1.0. General Information

### EUT Description:

|                           |                                        |
|---------------------------|----------------------------------------|
| <b>Technologies</b>       | 2.4GHz Wi-Fi                           |
| <b>TX Frequency range</b> | 2412MHz – 2462MHz                      |
| <b>Modulation Type</b>    | DSSS, OFDM                             |
| <b>Input/Output</b>       | RF Port                                |
| <b>Connector type</b>     | PROGRAMMING, TEST & ALIGNMENT CABLE    |
| <b>Antenna type</b>       | INTERNAL BT/WLAN ANTENNA (RADIO ONLY), |
| <b>No. of Antenna</b>     | 1                                      |
| <b>Antenna Gain</b>       | 2.0DBI                                 |
| <b>MIMO supported</b>     | No                                     |

The EUT contains following accessory devices and data cable:

| <b>Item</b>                               | <b>Brand</b> | <b>Model or P/N</b> |
|-------------------------------------------|--------------|---------------------|
| BATT IMP STD DELTA T RUGGED LIION 5000T   | MOTOROLA     | PMNN4494A           |
| Antenna U1/GPS STUBBY 380-472MHz, 1575MHz | MOTOROLA     | FAF5259A            |

Channel number and frequency information:

There are two bandwidth systems.

For 20MHz Bandwidth systems (802.11b, 802.11g, 802.11n), use channel 1 ~ channel 11

For 40MHz Bandwidth systems (802.11n), use channel 3 ~ channel 9

| Channel | Frequency | Channel | Frequency |
|---------|-----------|---------|-----------|
| 1       | 2412      | 7       | 2442      |
| 2       | 2417      | 8       | 2447      |
| 3       | 2422      | 9       | 2452      |
| 4       | 2427      | 10      | 2457      |
| 5       | 2432      | 11      | 2462      |
| 6       | 2437      |         |           |

### General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, the EUT is to comply with the requirements of the following standards:

**FCC 47 CFR Part 15 Subpart C**  
**KDB 558074 D01 15.247 Meas Guidance v05**  
**ANSI C63.10-2013**

A pigtail was soldered out of the Bluetooth/WiFi subsection to allow for conducted tests in this report.

### Deviation from standard

Not applicable as no deviation from standard test method

## 2.0. Summary of Test Results

| FCC Clause                    | ISED Clause | Test Item                                    | Result | Remark                                                          | Serial number tested |
|-------------------------------|-------------|----------------------------------------------|--------|-----------------------------------------------------------------|----------------------|
| 15.205, 15.209,<br>15.247 (d) | RSS-247 5.5 | Radiated Emission within<br>Restricted Bands | Pass   | Evaluate on worst<br>case channel from<br>SR05882-EMC-<br>00065 | 756TVX0059           |
| 15.207                        | RSS-Gen 8.8 | AC Powerline Conducted<br>Emission           | NA     | Not Performed.                                                  | Not Performed.       |
| 15.203                        | -           | Antenna Requirement                          | NA     | No antenna connector<br>is used.                                | Not Performed.       |

## 3.0. Measurement Uncertainty

| Measurement                                  | Frequency           | Expended Uncertainty (k=1.96)<br>(±dB) |
|----------------------------------------------|---------------------|----------------------------------------|
| AC Power Line Conducted Spurious<br>Emission | 150KHz ~ 30MHz      | 3.43                                   |
| Radiated Emissions up to 1 GHz               | 30MHz ~ 200MHz      | 5.01                                   |
|                                              | 200MHz ~<br>1000MHz | 5.01                                   |
| Radiated Emissions above 1 GHz               | 1GHz ~ 18GHz        | 5.01                                   |
|                                              | 18GHz ~ 25GHz       | 5.01                                   |

#### 4.0. Equipment List

##### **Radiated Emission Station (SW Version: EMC FCC RE v1.6.0)**

| DESCRIPTION                           | MODEL                        | SERIAL NUMBER | CALIBRATION DATE | CALIBRATION DUE DATE |
|---------------------------------------|------------------------------|---------------|------------------|----------------------|
| DRG HORN FREQ.                        | SAS-571                      | 720           | 21-Mar-19        | 21-Mar-21            |
| DRG HORN FREQ.                        | SAS-571                      | 1143          | 14-Feb-19        | 14-Feb-21            |
| POWER SUPPLY ( 0-60V / 0-50A, 1000W ) | 6032A                        | MY41001736    | 25-May-19        | 25-May-20            |
| SIGNAL GENERATOR                      | SMB 100A                     | 181117        | 8-Nov-18         | 8-Nov-21             |
| EMI TEST RECEIVER                     | ESW44                        | 101750        | 24-Jul-19        | 24-Jul-20            |
| EMI TEST RECEIVER                     | ESIB26                       | 100017        | 19-Jul-19        | 19-Jul-20            |
| 5m Semi-anechoic Chamber              | S800-HX                      | J2308         | No Cal. Req'd    | No Cal. Req'd        |
| BILOG ANTENNA                         | CBL6112D                     | 30991         | 5-Aug-19         | 5-Aug-20             |
| BILOG ANTENNA                         | CBL6112B                     | 2964          | 16-Feb-18        | 16-Feb-20            |
| DATA LOGGER                           | SDL500                       | A.016800      | 19-Mar-19        | 18-Mar-20            |
| SYSTEM CONTROLLER                     | SC104V                       | 050806-1      | No Cal. Req'd    | No Cal. Req'd        |
| TURNTABLE FLUSH MOUNT 2M              | FM2011                       | NA            | No Cal. Req'd    | No Cal. Req'd        |
| ANTENNA POSITIONING TOWER             | TLT2                         | NA            | No Cal. Req'd    | No Cal. Req'd        |
| BROAD-BAND HORN ANTENNA               | BBHA9170                     | BBHA9170255   | 21-Dec-18        | 21-Dec-19            |
| 18 - 40GHz PREAMPLIFIER               | Miteq Hi Gain Sucoflex       | 001           | No Cal. Req'd    | No Cal. Req'd        |
| PREAMPLIFIER                          | PAM-0118                     | 269           | 24-May-19        | 24-May-22            |
| LOOP ANTENNA                          | 6502                         | 00208416      | 5-Sep-19         | 5-Sep-20             |
| Test Software                         | EMC_FCC_IC_Bluetooth_RE_Test |               |                  |                      |
| Version                               | EMC_FCC_RE_v1.6.1            |               |                  |                      |

## 5.0. Test Mode Applicability and Test Channel Detail

### **Radiated Emission Test (Above 1GHz)**

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

| EUT Configure Mode | Modulation     | Available Channel | Tested Channel | Modulation Technology | Data Modulation Type | Date Rate (Mbps) | Mode | Environmental Conditions |
|--------------------|----------------|-------------------|----------------|-----------------------|----------------------|------------------|------|--------------------------|
| Test Mode          | 802.11n (HT20) | 1 to 11           | 1              | OFDM                  | BPSK                 | 6.5              | SISO | 23.6°C, 70.3%RH          |

### **Radiated Emission Test (Below 1GHz)**

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

| EUT Configure Mode | Modulation     | Available Channel | Tested Channel | Modulation Technology | Data Modulation Type | Date Rate (Mbps) | Mode | Environmental Conditions |
|--------------------|----------------|-------------------|----------------|-----------------------|----------------------|------------------|------|--------------------------|
| Test Mode          | 802.11n (HT20) | 1 to 11           | 1              | OFDM                  | BPSK                 | 6.5              | SISO | 23.6°C, 70.3%RH          |

### **Power Line Conducted Emission Test**

☐ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☐ Following channel(s) was (were) selected for the final test as listed below.

| EUT Configure Mode | Modulation      | Available Channel | Tested Channel | Modulation Technology | Data Modulation Type | Date Rate (Mbps) | Environmental Conditions |
|--------------------|-----------------|-------------------|----------------|-----------------------|----------------------|------------------|--------------------------|
| Application Mode   | 802.11bgn mixed | 1 to 11           | AUTO           | DSSS, OFDM            | AUTO                 | AUTO             | Not Performed.           |

### **Antenna Port Conducted Measurement:**

☐ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

☐ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☐ Following channel(s) was (were) selected for the final test as listed below.

| EUT Configure Mode | Modulation     | Available Channel | Tested Channel | Modulation Technology | Data Modulation Type | Data Rate (Mbps) | Mode | Environmental Conditions |
|--------------------|----------------|-------------------|----------------|-----------------------|----------------------|------------------|------|--------------------------|
| Test Mode          | 802.11b        | 1 to 11           | 1,6,11         | DSSS                  | QPSK                 | 2                | SISO | Not Performed.           |
| Test Mode          | 802.11g        | 1 to 11           | 1,6,11         | OFDM                  | BPSK                 | 6                | SISO | Not Performed.           |
| Test Mode          | 802.11n (HT20) | 1 to 11           | 1,6,11         | OFDM                  | BPSK                 | 6.5              | SISO | Not Performed.           |

### **Duty Cycle of Test Signal**

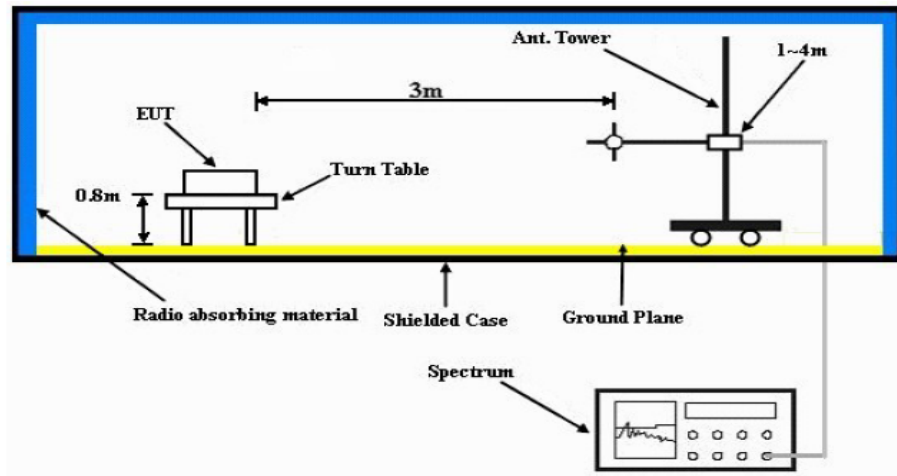
802.11b: Duty cycle of test signal is  $\geq 98\%$ . (Refer to Clause 6.3 for duty cycle test signal)

802.11g and 802.11n (HT20 & HT40): Duty cycle of test signal is  $\leq 98\%$ . (Refer to Clause 6.3 for duty cycle test signal)

## 6.0. Transmitter Test Parameters

### 6.1. Radiated Emission within restricted Bands

#### 6.1.1. Test Setup



- The EUT is placed on the top of a rotating table 0.8m above the ground (<1GHz) and 1.5m above the ground (>1GHz) at a 3m semi-anechoic chamber. The table is rotated 360 degrees to determine the position of the highest radiation.
- The EUT is set 3m away from the interference-receiving antenna, which is mounted on the top of a variable-height antenna tower.
- The antenna is Bilog/Horn antenna depend on which frequency range uses, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT is arranged to its worst case and then the antenna is tuned to heights from 1m to 4m and the rotatable table is turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system is set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode is fall within the range of 10dB from the limit specified, the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. Otherwise, the testing could be stopped and the peak values of the EUT would be reported.



**NOTE:**

- The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection at frequency below 1GHz.
- The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3 MHz for Peak detection at frequency above 1 GHz.
- All modes of operation were investigated and the worst-case emissions are reported.

**6.1.2. Test Limits:**

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power.

| Frequency (MHz) | Field strength (microvolts/meter) | Measurement distance (meters) |
|-----------------|-----------------------------------|-------------------------------|
| 0.009-0.490     | 2400/F(kHz)                       | 300                           |
| 0.490-1.705     | 24000/F(kHz)                      | 30                            |
| 1.705-30.0      | 30                                | 30                            |
| 30-88           | 100**                             | 3                             |
| 88-216          | 150**                             | 3                             |
| 216-960         | 200**                             | 3                             |
| Above 960       | 500                               | 3                             |

**NOTE:**

- The lower limit shall apply at the transition frequencies.
- Emission level (dBuV/m) = 20 log Emission level (uV/m).
- For frequencies above 1000 MHz, 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 of modulation.

FCC ID: AZ489FT7077, IC ID: 109U-89FT7077

Model#: H98QDH9PW7BN S/N: 756TVX0059 EMC SR ID#: 03195-EMC-00099  
Battery: PMNN4494A Accessory: FAF5259A  
Test Channel: Low Test Frequency: 2412.0000 MHz Test Standard: ANSI C63.10-2013  
Worst Case Plane: X-Plane (802.11n)

[illegible]

|                         |                 |             |
|-------------------------|-----------------|-------------|
| Remarks:<br>Pass Result | Marginal Result | Fail Result |
|-------------------------|-----------------|-------------|

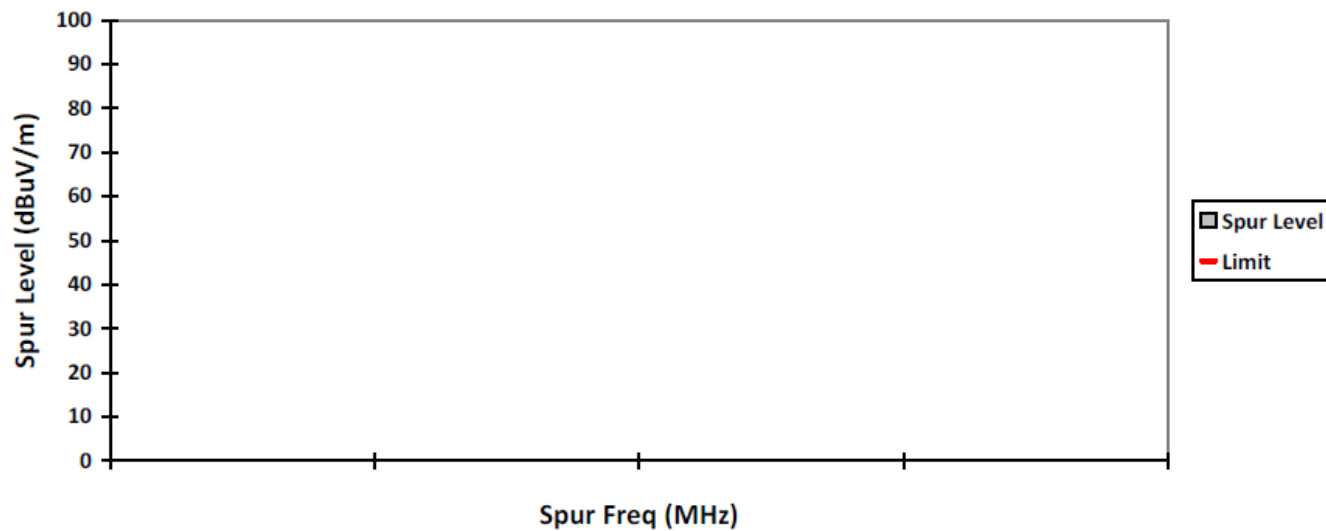
**Humidity (%): 70.1**  
**Test Date: Tue, Dec 10, 2019**

Page 10 of 15

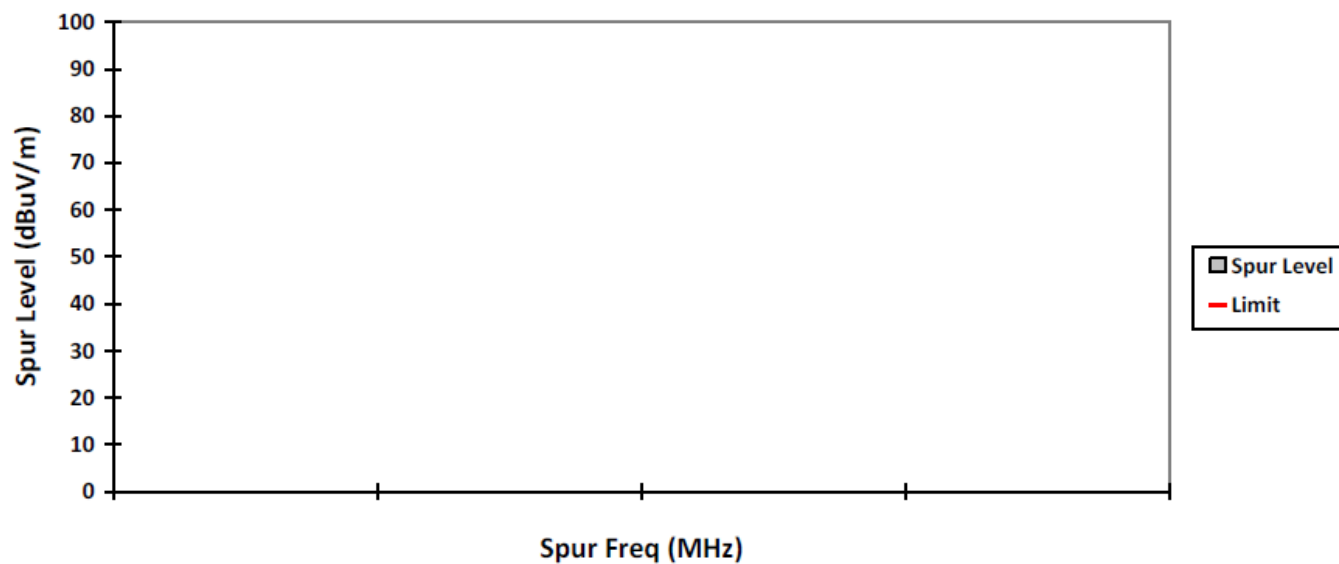
Motorola Solutions.

FCC ID: AZ489FT7077, IC ID: 109U-89FT7077

### VERTICAL, QPK



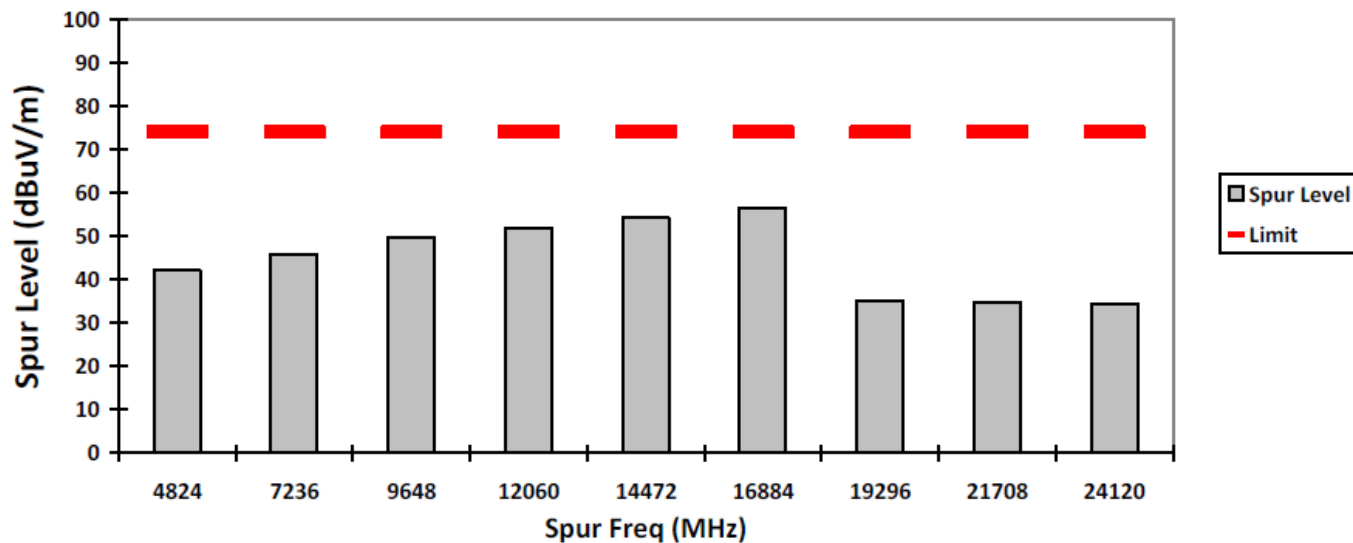
### HORIZONTAL, QPK



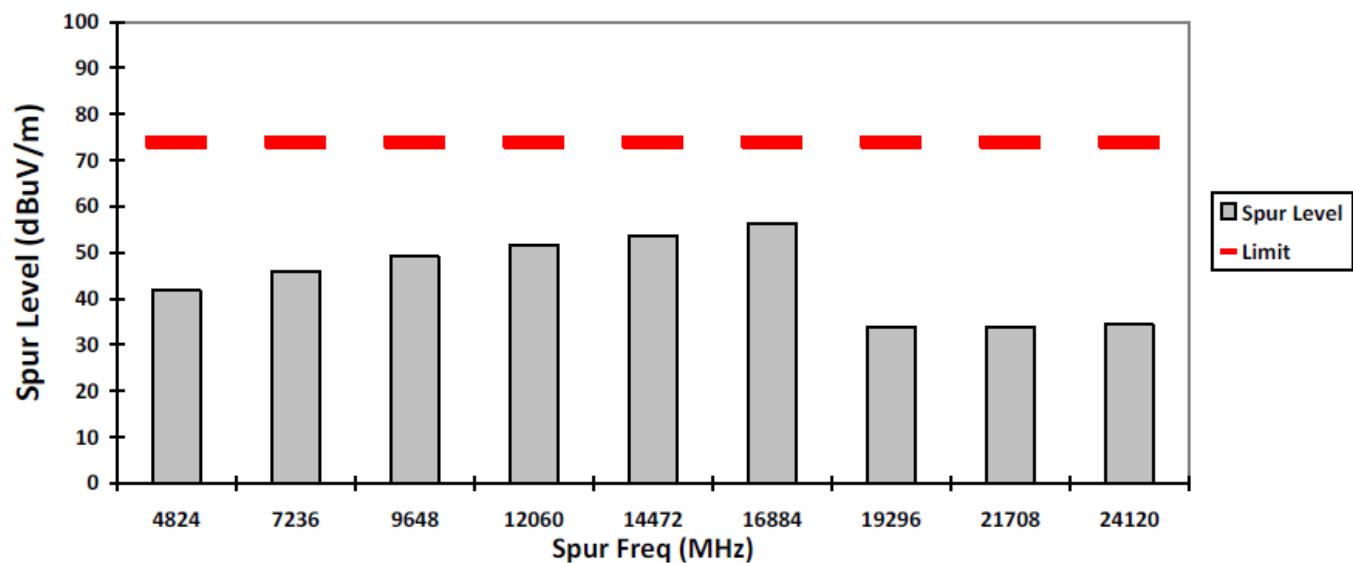
Motorola Solutions.

FCC ID: AZ489FT7077, IC ID: 109U-89FT7077

### VERTICAL, PK



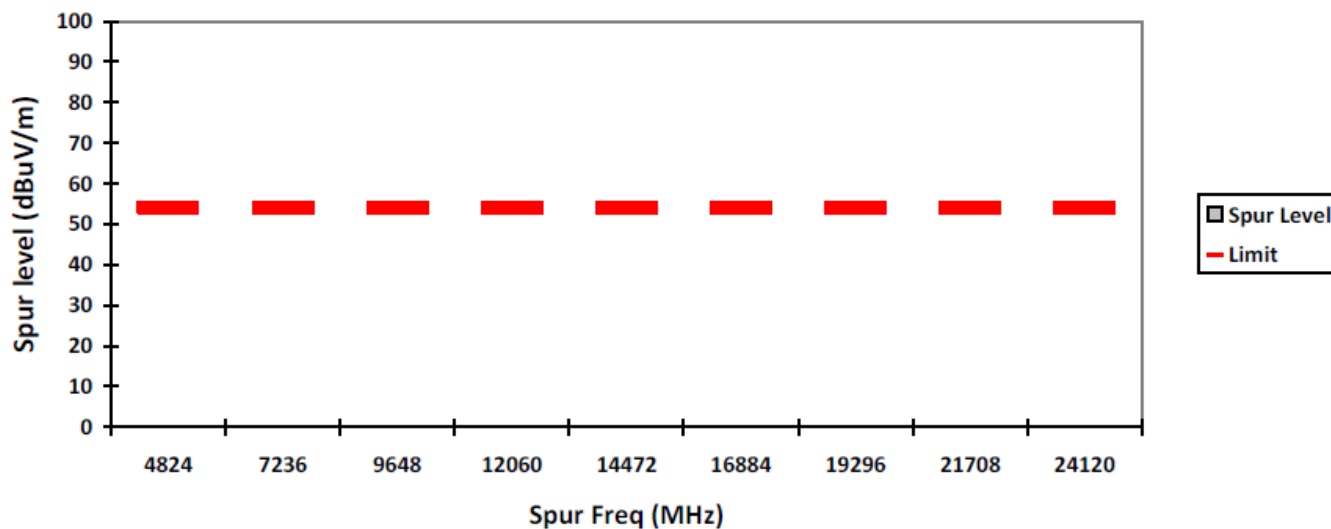
### HORIZONTAL, PK



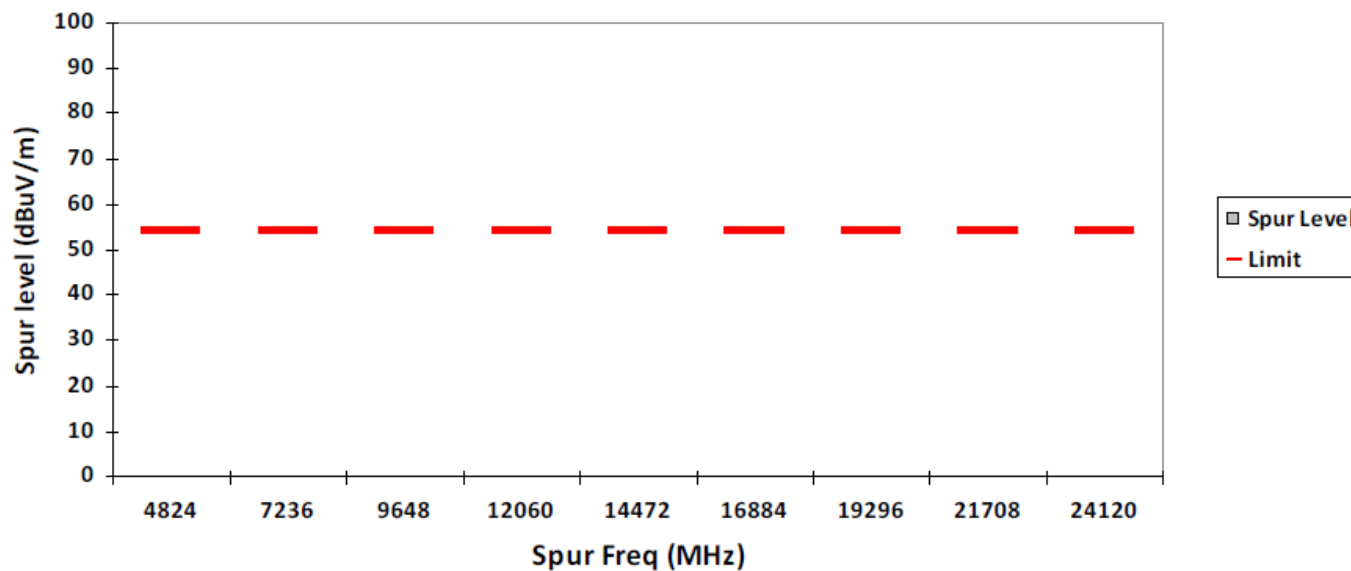
Motorola Solutions.

FCC ID: AZ489FT7077, IC ID: 109U-89FT7077

### VERTICAL, AV

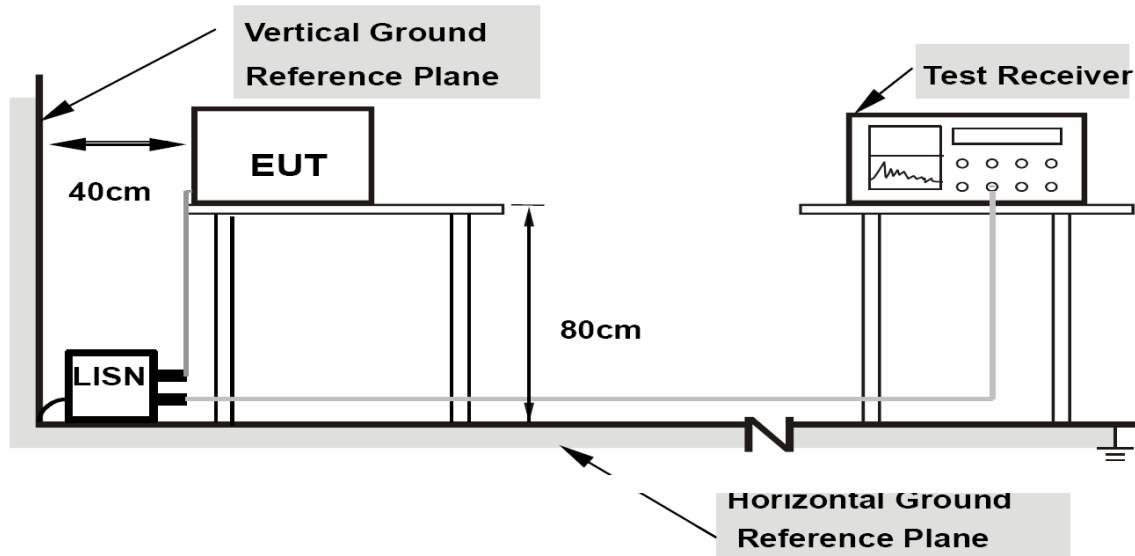


### HORIZONTAL, AV



## AC Powerline Conducted Emission

### 6.1.3. Test Setup



- 1) Tests were conducted for both Receive and Transmit Mode of the EUT.
- 2) The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50uH of coupling impedance for the measuring instrument.
- 3) Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- 4) The frequency range from 150 kHz to 30MHz was measured.

#### 6.1.4. Test Limits:

**For AC Power Line Conducted Test Limit can be Class A or B depends on product classification.**

**Limits for conducted disturbance at the mains ports  
of class A ITE**

| Frequency range<br>MHz                                        | Limits<br>dB( $\mu$ V) |         |
|---------------------------------------------------------------|------------------------|---------|
|                                                               | Quasi-peak             | Average |
| 0,15 to 0,50                                                  | 79                     | 66      |
| 0,50 to 30                                                    | 73                     | 60      |
| NOTE The lower limit shall apply at the transition frequency. |                        |         |

**Table 1: Limits for Conducted Disturbance at the Mains Ports of Class A ITE.**

**Limits for conducted disturbance at the mains ports  
of class B ITE**

| Frequency range<br>MHz                                                                                     | Limits<br>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       |
| NOTE 1 The lower limit shall apply at the transition frequencies.                                          |                        |          |
| NOTE 2 The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz. |                        |          |

**Table 2: Limits for Conducted Disturbance at the Mains Ports of Class B ITE**

#### 6.1.5. Test Result

**Not Applicable. Testing is not required, radio shall turn off during charging mode**

**END OF TEST REPORT**