



**MOTOROLA PENANG ADV. COMM. LABORATORY**

Motorola Solutions Malaysia Sdn Bhd  
Innoplex Plot 2A, Medan Bayan Lepas,  
Mukim 12 S.W.D, 11900 Bayan Lepas,  
Penang, Malaysia.

**FCC TEST REPORT**

**Report Revision : Rev.B**

**Date/s Tested** : 17-JAN-2017 - 03-MAR-2017  
**Report Issue Date** : 07-JUN-2017  
**Manufacturer/Location** : Motorola Solutions Malaysia Sdn Bhd  
**Requestor** : Low Yoong Sing  
**Product Type** : Mobile  
**Model Number** : AAM28TRN9RA1AN  
**Frequency Band** : 450-527 MHz  
**Low / Max RF Output Power** : 1 Watts / 48 Watts  
**Applicant Name** : Motorola Solutions Malaysia Sdn Bhd  
**Applicant Address** : Innoplex Plot 2A, Medan Bayan Lepas,  
Mukim 12 S.W.D, 11900 Bayan Lepas,  
Penang, Malaysia  
**FCC Registrations** : 772092  
**IC Registrations** : 109AK



**The equipment was tested accordance to the requirement listed below:**

**(LMR )**  
**FCC 47 CFR Part 22 / 74**

**PASS**

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Prepared By:

Approved By:

\_\_\_\_\_  
**Edmond Too**  
**Test Personnel**

\_\_\_\_\_  
**Goh Aik Hong**  
**Responsible Engineer**

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## Report Revision History

| Revision History | Description                                        | Date        | Originator |
|------------------|----------------------------------------------------|-------------|------------|
| Rev. A           | Initial Report                                     | 04-APR-2017 | Edmond Too |
| Rev. B           | Add note to Band Edge Emission – Digital (Page 24) | 07-JUN-2017 | Edmond Too |

## **1.0 General Information**

### **EUT Description:**

|                        |                         |
|------------------------|-------------------------|
| <b>Technologies</b>    | Land Mobile Radio (LMR) |
| <b>Modulation Type</b> | Analog, 4FSK            |

### **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:

**ANSI/TIA/-603-D**  
**ANSI C63.4.2014**  
**TIA-102 CCAA-A**  
**TIA-102 CAAB-D**  
**TIA-102 CAAA-D**  
**ANSI C63.26-2015**

## 2.0 Summary of Test Results

| FCC General Rules Part (47CFR) | IC General Rules Part | Test Item                                 | Result |
|--------------------------------|-----------------------|-------------------------------------------|--------|
| -                              | -                     | RF Power Output                           | NA     |
| -                              | -                     | Frequency Stability                       | NA     |
| -                              | -                     | Audio Frequency Response                  | NA     |
| -                              | -                     | Audio Low Pass Filter Response            | NA     |
| -                              | -                     | Modulation limiting                       | NA     |
| 22.359, 74.462(b)              | -                     | Occupied Bandwidth                        | Pass   |
| 22.359(a),(b)                  | -                     | Band Edge Conducted Spurious Emission     | Pass   |
| -                              | -                     | Transient Frequency Behavior              | NA     |
| -                              | -                     | Adjacent Channel Power                    | NA     |
| 22.359,74.462(c)               | -                     | Conducted Spurious Emissions              | Pass   |
| 22.359,74.462(c)               | -                     | Radiated Spurious Emission                | Pass   |
| -                              | -                     | GNSS (EIRP for 1559 – 1610MHz)            | NA     |
| -                              | -                     | Effective Radiated Power (ERP)            | NA     |
| -                              | -                     | AC Power Line Conducted Spurious Emission | NA     |

NA → Not Applicable

## 3.0 Measurement Uncertainty

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

#### 4.0 Equipment List

##### FCC Transient ATE #1: (SW Version: FCC Transient ATE\_R 1.0.3)

| Description               | Model    | Serial Number | Calibration Date | Calibration Due Date |
|---------------------------|----------|---------------|------------------|----------------------|
| POWER SUPPLY              | 6032A    | 2723A02219    | 19-Apr-16        | 19-Apr-17            |
| POWER SENSOR              | E4412A   | MY41498918    | 21-Jun-16        | 21-Jun-17            |
| POWER METER               | E4416A   | GB41293866    | 21-Apr-16        | 21-Apr-17            |
| ATTENUATORS/SWITCH DRIVER | 11713A   | 2508A10141    | CNR              | CNR                  |
| STEP ATTENUATOR/11dB      | 8494G    | MY52300223    | 16-Jun-16        | 16-Jun-17            |
| STEP ATTENUATOR/110dB     | 8496G    | MY52300176    | 15-Jun-16        | 15-Jun-17            |
| OSCILLOSCOPE              | MSO8064A | MY48240107    | 26-Apr-16        | 26-Apr-17            |
| AUDIO ANALYZER            | 8903B    | 3729A17409    | 14-Apr-16        | 14-Apr-17            |
| AUDIO ANALYZER            | 8903B    | 3011A08952    | 13-Apr-16        | 13-Apr-17            |
| MODULATION ANALYZER       | 8901B    | 3019A02766    | 13-Apr-16        | 13-Apr-17            |
| SIGNAL GENERATOR          | 8657A    | 3323A05725    | 13-Apr-16        | 13-Apr-17            |
| SPECTRUM ANALYZER         | E4440A   | MY46185415    | 22-Apr-16        | 22-Apr-17            |
| SWITCH CONTROL UNIT       | 3488A    | 2719A36210    | CNR              | CNR                  |

##### Conducted Spurious Emission ATE # 1: (SW Version: Conducted Spur ATE\_rev 1.22.06)

| Description                 | Model  | Serial Number | Calibration Date | Calibration Due Date |
|-----------------------------|--------|---------------|------------------|----------------------|
| SWITCH CONTROL UNIT         | 3488A  | 2719A32735    | CNR              | CNR                  |
| SPECTRUM ANALYZER           | E4445A | MY4618732     | 16-Feb-17        | 19-Feb-19            |
| POWER SUPPLY                | 6032A  | 3319A08920    | 19-Apr-16        | 19-Apr-17            |
| HIGH PASS FILTER SWITCH BOX | CS     | CS001         | 25-Aug-16        | 25-Aug-17            |
| MICROWAVE GENERATOR         | SMP02  | 830682/015    | 18-Oct-16        | 18-Oct-17            |
| MODULATION ANALYZER         | 8901B  | 3438A05278    | 12-Apr-16        | 12-Apr-17            |

##### Radiated Emission Station: (SW Version: EMC\_FCC\_IC\_BT\_RE\_V 1.5.1)

|                            |           |             |           |           |
|----------------------------|-----------|-------------|-----------|-----------|
| DRG HORN FREQ.             | SAS-571   | 719         | 28-Apr-15 | 28-Apr-17 |
| BILOG ANTENNA              | CBL6112B  | 2964        | 23-Jan-15 | 23-Jan-17 |
| POWER SUPPLY               | 6674A     | 3126A00133  | 12-Nov-15 | 12-Nov-17 |
| MICROWAVE SIGNAL GENERATOR | SMP04     | 100127      | 03-Jul-16 | 03-Jul-17 |
| EMI TEST RECEIVER          | ESIB26    | 100336      | 19-Oct-16 | 19-Oct-17 |
| SIGNAL ANALYZER            | FSV40     | 101431      | 02-Jul-16 | 02-Jul-18 |
| 5m Semi-anechoic Chamber   | S800-HX   | J2308       | 29-Jul-16 | 29-Jul-17 |
| BILOG ANTENNA              | CBL6112D  | 25516       | 23-Jan-16 | 23-Jan-17 |
| BROAD-BAND HORN ANTENNA    | BBHA9170  | BBHA9170143 | 24-Nov-14 | 24-Feb-17 |
| DATA LOGGER                | TM320     | 12249289    | 27-Apr-16 | 27-Apr-17 |
| SYSTEM CONTROLLER          | SC104V    | 050806-1    | CNR       | CNR       |
| TURNTABLE FLUSH MOUNT 2M   | FM2011    | NA          | CNR       | CNR       |
| ANTENNA POSITIONING TOWER  | TLT2      | NA          | CNR       | CNR       |
| 18 - 40GHz PREAMPLIFIER    | BBV9721   | 9721-007    | CNR       | CNR       |
| PREAMPLIFIER               | PAM-0118P | 361         | CNR       | CNR       |

**CNR → Calibration Not Required**

## 5.0 Test Condition

### 5.1. Transmitter Test Conditions

| Test Item,<br>(Channel Spacing)                                               | Temperature<br>(°C) | Voltage Supply<br>(V)         | Power<br>(W) | Modulation         | Test<br>Frequency<br>(MHz)                     |
|-------------------------------------------------------------------------------|---------------------|-------------------------------|--------------|--------------------|------------------------------------------------|
| RF Output Power                                                               | 25°C                | Nominal                       | Low /<br>Max | Analog             | NA                                             |
| Frequency Stability                                                           | -30°C ~ 60°C        | 80% ~ 120% of<br>Nominal Volt | Max          | Analog             | NA                                             |
| Audio Frequency Response<br>(12.5kHz / 25kHz)                                 | 25°C                | Nominal                       | Max          | Analog             | NA                                             |
| Audio Low Pass Filter Response<br>(12.5kHz / 25kHz)                           | 25°C                | Nominal                       | Max          | Analog             | NA                                             |
| Modulation limiting<br>(12.5kHz / 25kHz)                                      | 25°C                | Nominal                       | Max          | Analog             | NA                                             |
| Occupied Bandwidth<br>(12.5kHz / 20kHz / 25kHz)                               | 25°C                | Nominal                       | Max          | Analog,<br>Digital | 459.125                                        |
| Band Edge Conducted Spurious<br>Emission<br>(12.5kHz / 20kHz / 25kHz)         | 25°C                | Nominal                       | Max          | Analog,<br>Digital | 459.025,<br>459.65,<br>473.0125,<br>479.2875   |
| Transient Frequency Behavior<br>(UHF & VHF Band)<br>(12.5kHz / 25kHz)         | 25°C                | Nominal                       | Max          | Analog,<br>Digital | NA                                             |
| Adjacent Channel Power<br>(700MHz Band)<br>(12.5kHz / 25kHz)                  | 25°C                | Nominal                       | Max          | Analog,<br>Digital | NA                                             |
| Conducted Spurious Emissions<br>(12.5kHz / 20kHz / 25kHz)                     | 25°C                | Nominal                       | Low /<br>Max | Analog,<br>Digital | 459.125,<br>482.0125,<br>511.9875,<br>526.9875 |
| Radiated Spurious Emission<br>(12.5kHz / 25kHz)                               | 25°C                | Nominal                       | Low /<br>Max | Analog,<br>Digital | 459.125,<br>482.0125,<br>511.9875,<br>526.9875 |
| GNSS (700MHz Band)<br>(EIRP for 1559-1610MHz)<br>(12.5kHz / 25kHz)            | 25°C                | Nominal                       | Max          | Analog             | NA                                             |
| Effective Radiated Power (ERP)<br>(700MHz & 900MHz Band)<br>(12.5kHz / 25kHz) | 25°C                | Nominal                       | Max          | Analog             | NA                                             |
| AC Power Line Conducted<br>Spurious Emissions* (12.5kHz)                      | 25°C                | Nominal                       | Max          | Analog             | NA                                             |

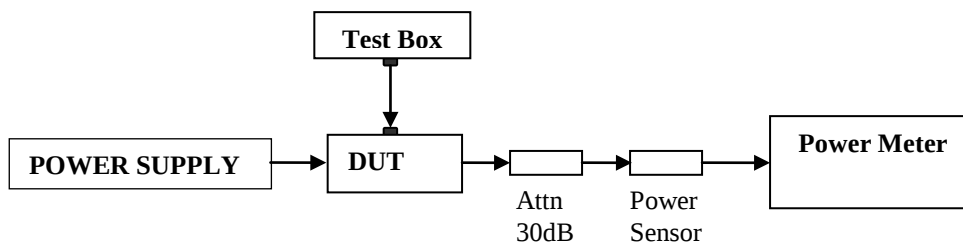
\* – ONLY tested if portables can be operated during charging OR mobiles can be used in desktop operation connected to a power supply

NA → Not Applicable

## 6.0 Transmitter Test Parameters

### 6.1. RF Output Power

#### 6.1.1. Test Setup

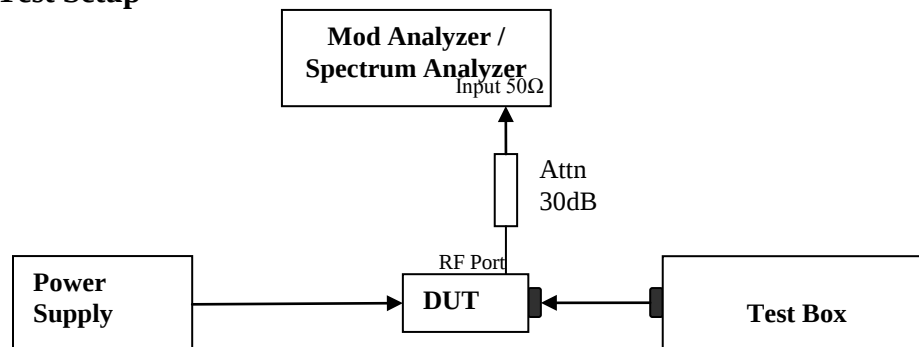


- 1) The DUT transmitter connected to Power Meter using the 30 dB attenuator and power sensor with above setup.
- 2) Path loss for the measurement included.
- 3) All the measurement was done at low, mid, high frequency for each band.
- 4) Record the power into the test report.

#### 6.1.2. Test Result **Not Applicable**

## 6.2. Frequency Stability

### 6.2.1. Test Setup



- 1) The DUT transmitter output port was connected to Modulation Analyzer.
- 2) Path loss for the measurement included.
- 3) Transmit the DUT and record the freq in  $MCF_{MHz}$ .
- 4) Test in 2 conditions: Different Temperature & Supply Voltage input.
  - Temperature: Vary voltage per test condition in Clause 5.1
  - Supply Voltage: Vary temperature per test condition in Clause 5.1
- 5) Calculate the ppm frequency error by the following:

$$ppm\ error = \left( \frac{MCF_{MHz}}{ACF_{MHz}} - 1 \right) * 10^6$$

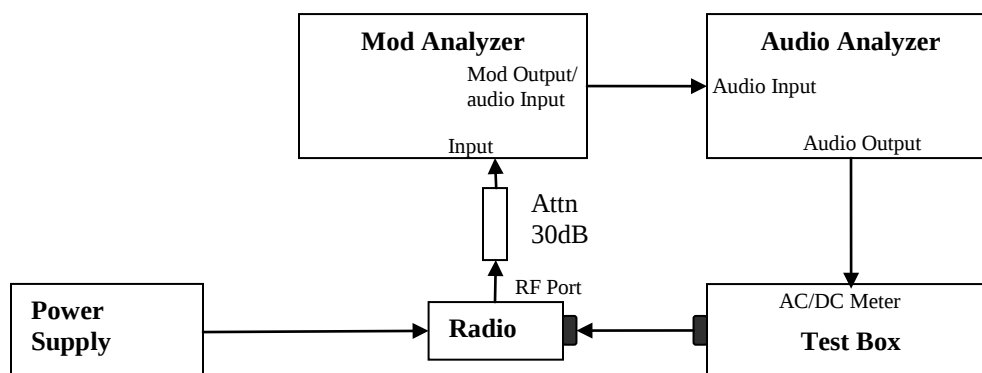
Where:  $MCF_{MHz}$  is the Measured Carrier Frequency in MHz  
 $ACF_{MHz}$  is the Assigned Carrier Frequency in MHz

**6.2.2. Test Result**  
**Not Applicable**

**6.2.3. Test Limit**  
**Not Applicable**

## 6.3. Audio Frequency Response

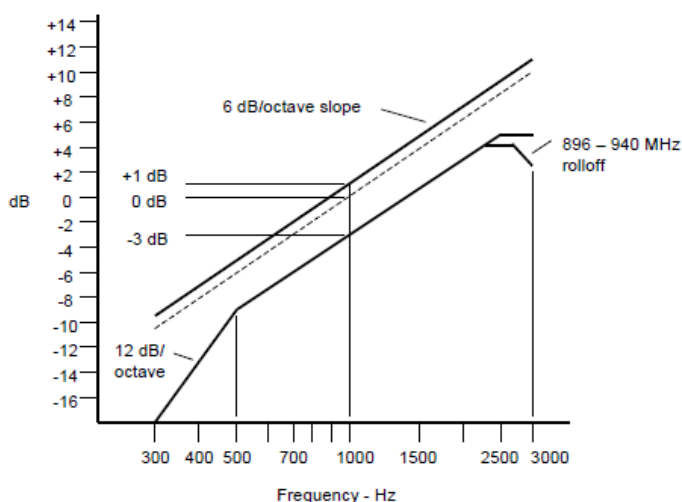
### 6.3.1. Test Setup



- 1) The DUT transmitter output port was connected to Modulation Analyzer.
- 2) Path loss for the measurement included.
- 3) Set the audio bandwidth filter to 15 kHz and 50 kHz.
- 4) Transmit the radio and set the audio analyzer to 1 kHz audio frequency and 20% of the maximum deviation.
- 5) On audio analyzer, set the rated level as reference to zero.
- 6) Vary the audio frequency from 300 Hz to 3 kHz. Record the change in dB on the audio analyzer.

### 6.3.2. Test Result Not Applicable

### 6.3.3. Test Limit

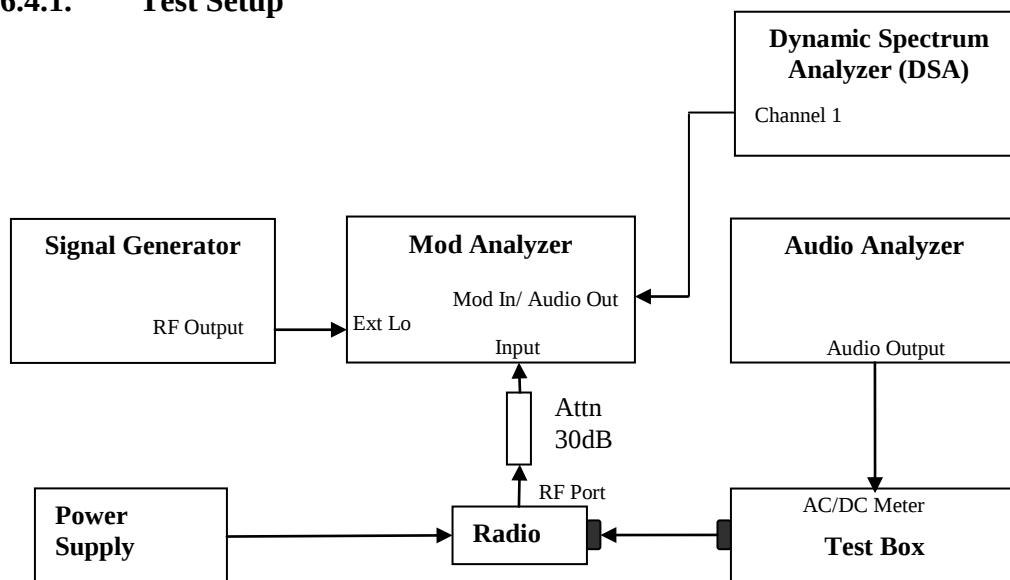


Note:

- o There are additional 6 dB per octave attenuation is allowed from 2.5KHz to 3KHz in equipment 25MHz to 869MHz radio.
- o Additional 6 dB per octave attenuation is allowed from 2.3KHz to 2.7KHz & additional 12 dB per octave attenuation is allowed from 2.7KHz to 3KHz in equipment 896MHz to 940MHz radio.

## 6.4. Audio Low Pass Filter Response

### 6.4.1. Test Setup

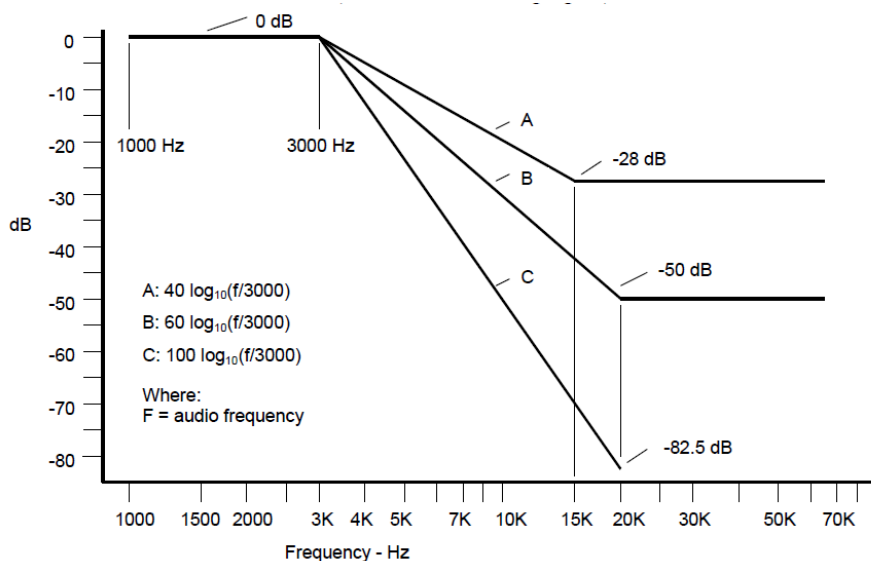


- 1) The DUT transmitter output port was connected to Modulation Analyzer.
- 2) Path loss for the measurement included.
- 3) Press 23.1SPCL on modulation analyzer to enable the external LO from Sigen.
- 4) Set the Sigen frequency to  $F_c + 1.5$  MHz, RF output level to 0dBm without modulation.
- 5) Transmit the radio and set the audio analyzer to 1 kHz audio frequency and 60% of the maximum deviation.
- 6) Up the amplitude by 20dB.
- 7) On DSA, get the reference point to 0dB.
- 8) Vary the frequency on audio analyzer from 3 kHz to 20 kHz, record the audio tone from DSA.

### 6.4.2. Test Result

**Not Applicable**

### 6.4.3. Test Limit



For audio frequencies above 3000 Hz, the audio response of the post limiter low-pass filter shall meet or exceed the following requirements:

- a) For equipment operating on 20, 25 or 30 kHz channel bandwidth in the 25 MHz to 174 MHz range:

At frequencies from 3000 Hz through 15,000 Hz the attenuation shall be greater than the attenuation at 1000 Hz by at least:  $40 \log_{10}(f/3000)$  dB

where:  $f$  is the audio frequency in Hz.

At frequencies above 15,000 Hz, the attenuation shall be greater than the attenuation at 1000 Hz, by at least: 28 dB.

- b) For equipment operating with 25 kHz bandwidth channels between 406 and 512 MHz through 896 MHz, and between 929 MHz through 930 MHz:

At frequencies from 3000 Hz through 20,000 Hz, the attenuation shall be greater than the attenuation at 1000 Hz by at least:  $60 \log_{10}(f/3000)$  dB

where:  $f$  is the audio frequency in Hz.

At frequencies above 20,000 Hz the attenuation shall be greater than the attenuation at 1000 Hz by at least: 50 dB.

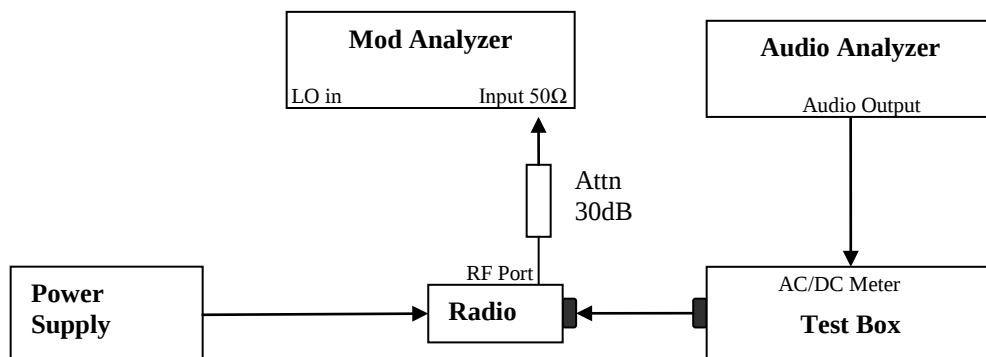
- c) For equipment operating on channels between 896 MHz through 901 MHz, between 935 MHz through 940 MHz, and 12.5 or 15 kHz spaced channels in the frequency range 138-174 MHz and 406-512 MHz.

At frequencies from 3000 Hz through 20,000 Hz the attenuation shall be greater than the attenuation at 1000 Hz by at least:  $100 \log_{10}(f/3000)$  dB

where:  $f$  is the audio frequency in Hz.

## 6.5. Modulation Limiting

### 6.5.1. Test Setup



- 1) The DUT transmitter output port was connected to Modulation Analyzer.
- 2) Path loss for the measurement included.
- 3) Set the audio bandwidth filter to 15 kHz.
- 4) Transmit the radio and set the audio analyzer to 1 kHz audio frequency and 60% of the maximum deviation.
- 5) Record the frequency deviation as 0dB input level at 1kHz audio frequency.
- 6) Repeat the step and record the frequency deviation from -20 dB to 20dB by 5 dB increments and different audio freq 300 Hz, 2.5 kHz and 3 kHz.

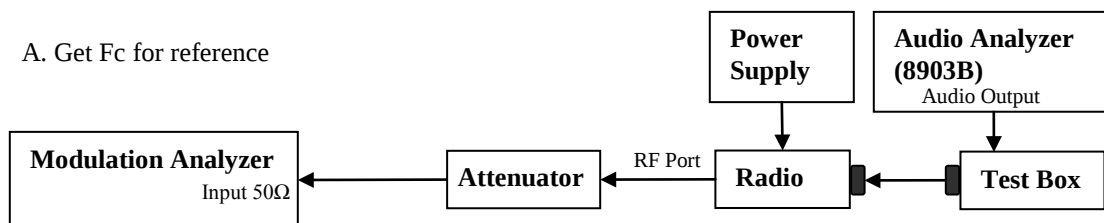
### 6.5.2. Test Result **Not Applicable**

### 6.5.3. Test Limit Modulation shall not exceed 100 percent if amplitude modulation is employed.

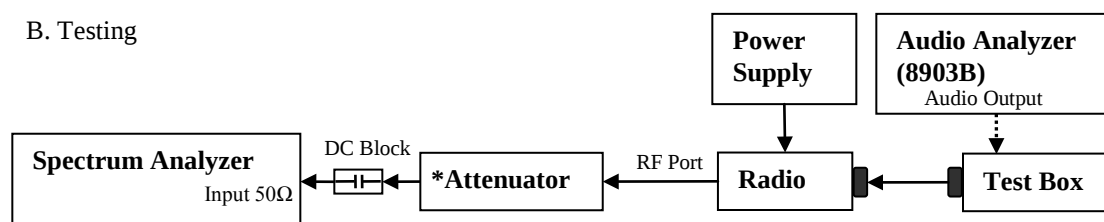
## 6.6. Occupied Bandwidth

### 6.6.1. Test Setup (Analog)

A. Get Fc for reference



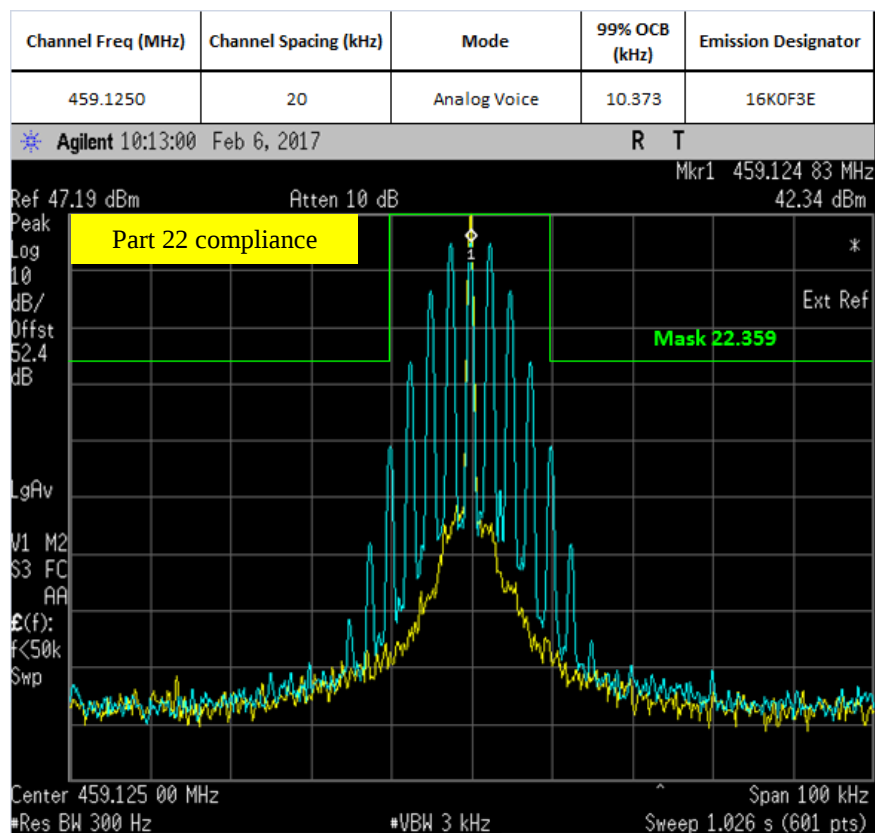
B. Testing



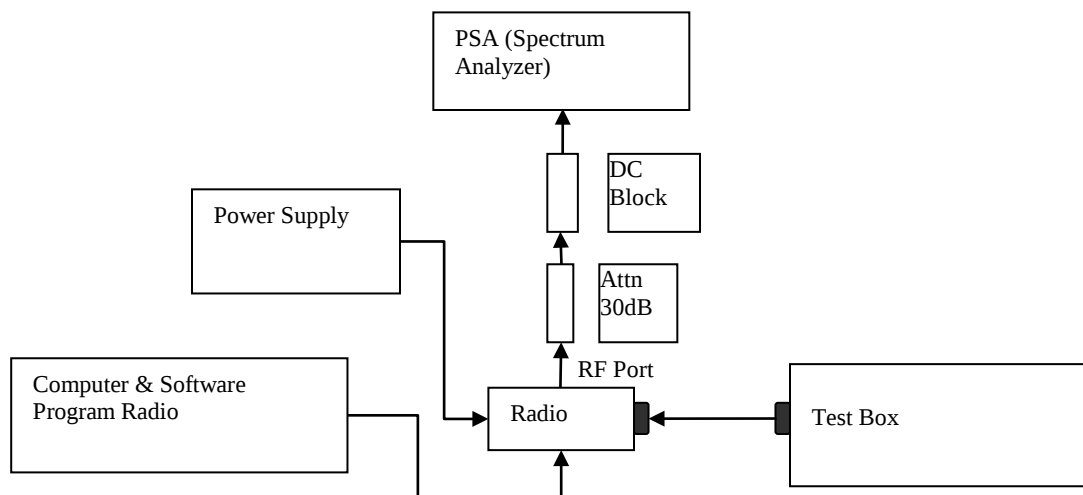
- 1) The DUT transmitter output port was connected to Modulation Analyzer.
- 2) Set the audio bandwidth filter to 15 kHz low pass filter and 50 kHz high pass filter.
- 3) Transmit the radio and set the audio analyzer to 2.5 kHz audio frequency and 50% of the rated deviation. Up the amplitude by 16 dB. Dekey the DUT.
- 4) Path loss for the measurement included.
- 5) Select the Occupied Bandwidth measurement for 99% Bandwidth Measurement.
- 6) Key in the Fc and Resolution Bandwidth (1 ~ 5 % of emission designator).
- 7) Transmit the DUT and record the occupied Bandwidth frequency.
- 8) Preset the spectrum analyzer for sideband spectrum measurement.
- 9) Set the span to 100 KHz and Resolution Bandwidth (according to FCC/ ISED standard).
- 10) Save the screen shot as modulated signal
- 11) Remove the audio tone from audio analyzer to capture unmodulated signal.

\* Only HPF added for Mask 80.211 measurement with attenuator.

## 6.6.2. Test Result (Analog)



### 6.6.3. Test Setup (Digital)



- 1) Program and set radio to operate in desire test frequency and digital mode with modulation. (4FSK, C4FM, CQPSK or other digital modulation form).
- 2) Path loss for the measurement included.
- 3) Select the Occupied Bandwidth measurement for 99% Bandwidth Measurement.
- 4) Key in the Fc and RBW (1 ~ 5 % of emission designator).
- 5) Transmit the DUT and record the occupied Bandwidth frequency.
- 6) Preset the spectrum analyzer for modulation emission spectrum measurement.
- 7) Set the span to 100 KHz and Resolution Bandwidth (according to FCC/ ISED standard).
- 8) Capture the screen shot as modulated signal.

### 6.6.4. Test Result (Digital)

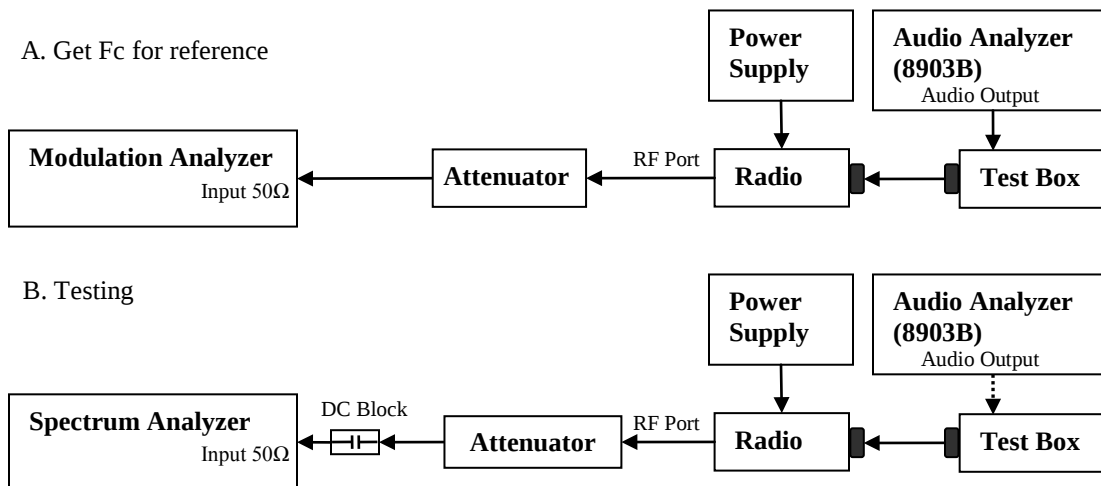
**Not Applicable**

### 6.6.5. Test Limit

The 99% occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean transmitted power.

## 6.7. Band Edge Conducted Spurious Emission (Part 22)

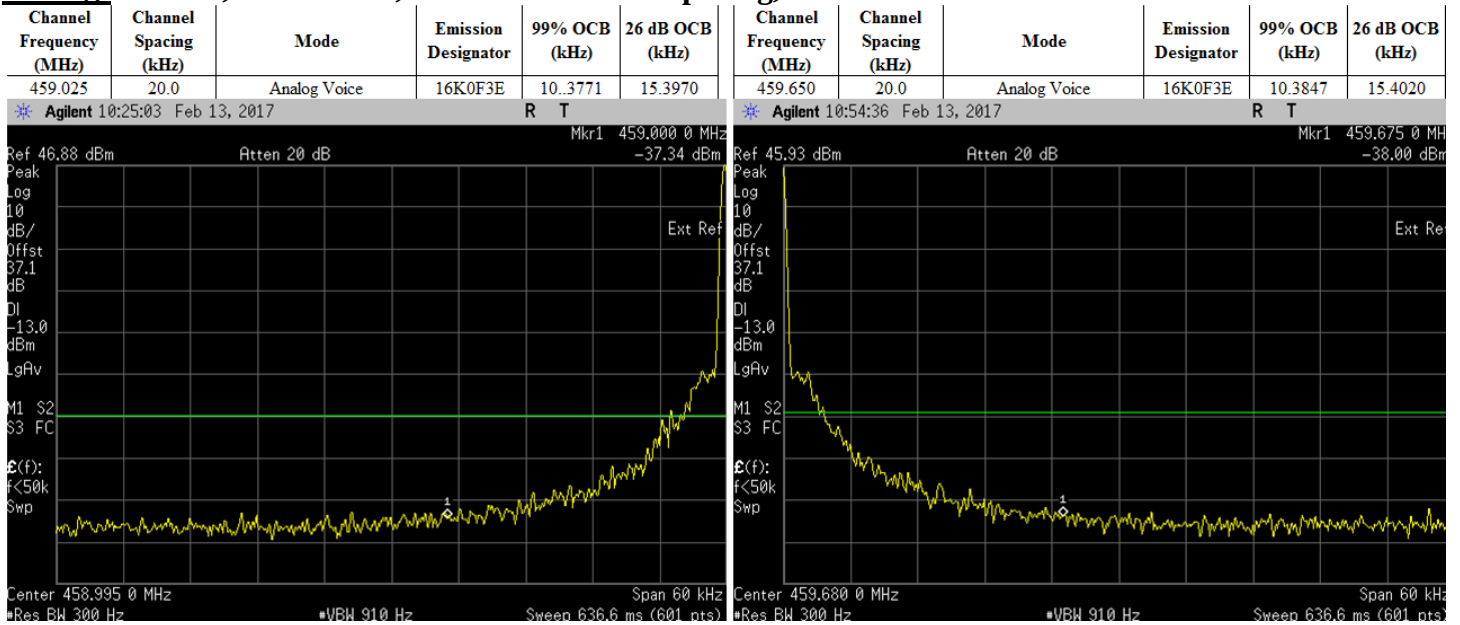
### 6.7.1. Test Setup (Analog)



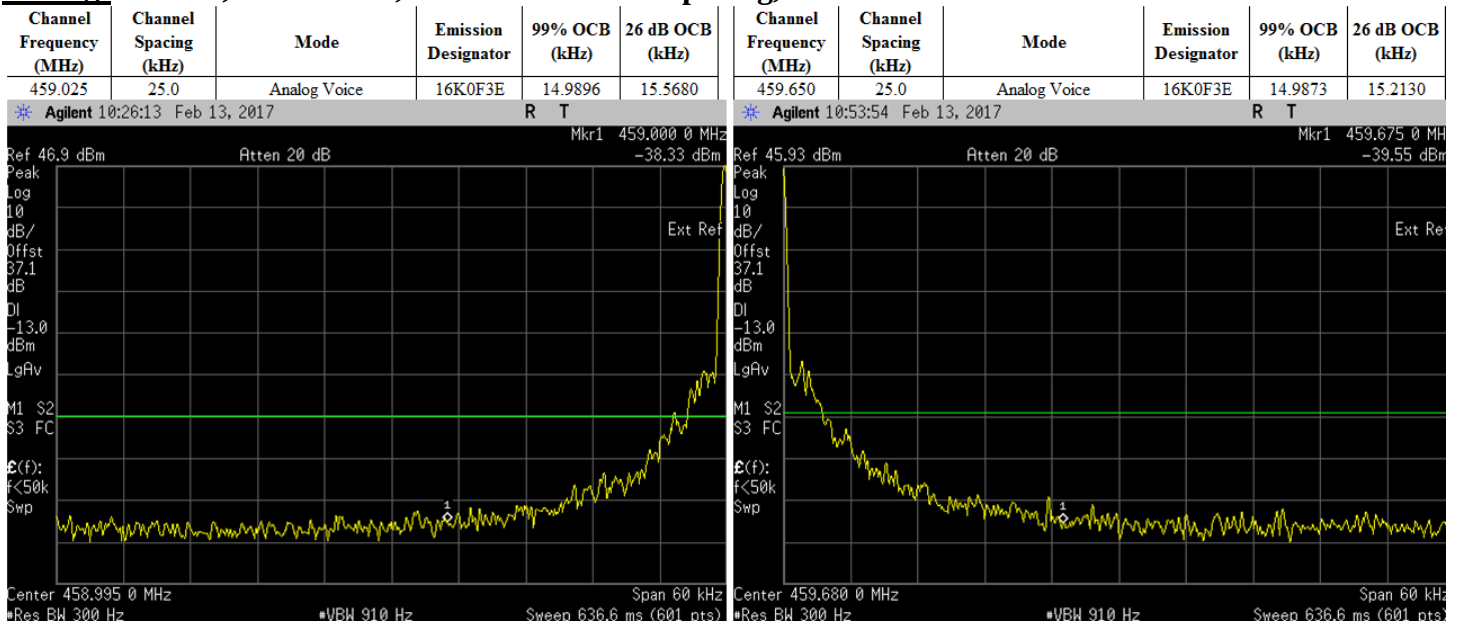
- 1) The DUT transmitter output port was connected to Modulation Analyzer.
- 2) Set the audio bandwidth filter to 15 kHz low pass filter and 50 kHz high pass filter.
- 3) Path loss for the measurement included.
- 4) Select the Occupied Bandwidth measurement for 99% and 26dB Emissions Bandwidth Measurement.
- 5) Key in the Fc and RBW= 100Hz.
- 6) Transmit the DUT and record the occupied Bandwidth frequencies.
- 7) Preset the spectrum analyzer for band edge measurement.
- 8) The band edges of lowest and highest channels were measured.
- 9) The center frequency of spectrum is the band edge frequency, span is 60 kHz and RBW is at least 1% of Emission Bandwidth.
- 10) Save the screen shot as modulated signal.
- 11) Remove the audio tone from audio analyzer to capture unmodulated signal.

## 6.7.2. Test Result (Analog)

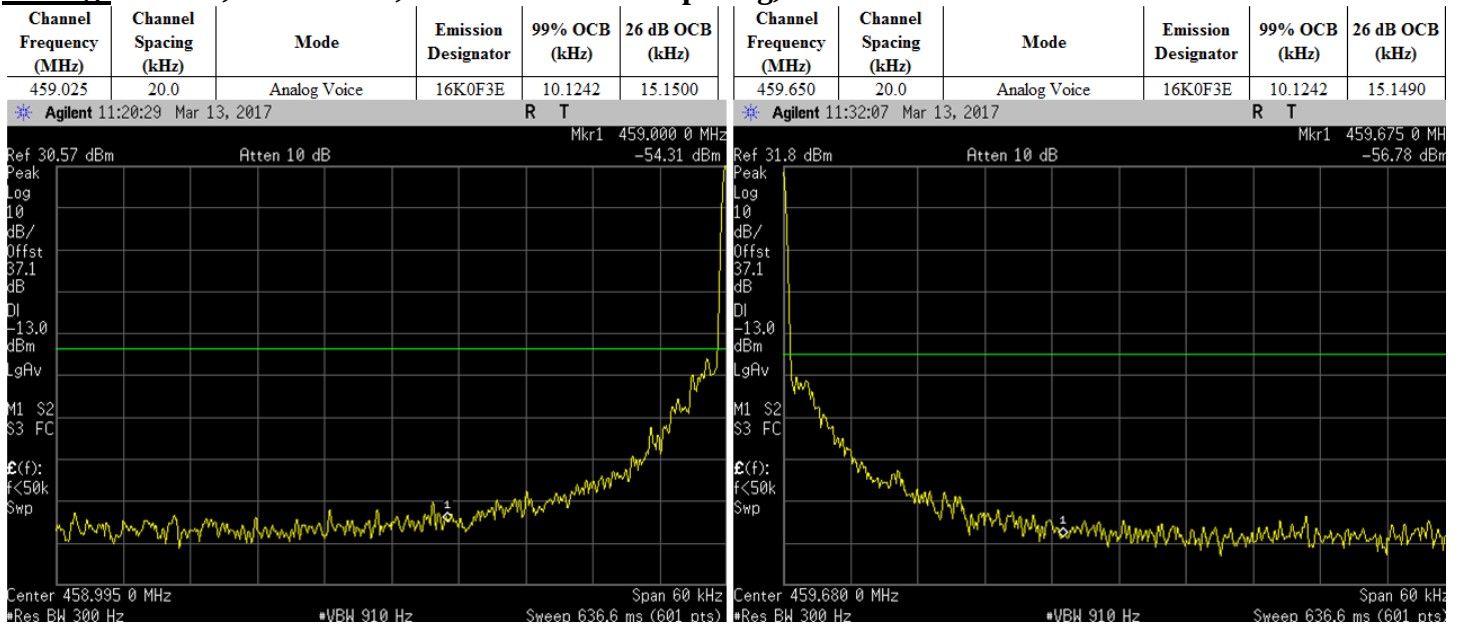
### Analog: 459.025,459.65 MHz, 20.0 kHz Channel Spacing, Max Power



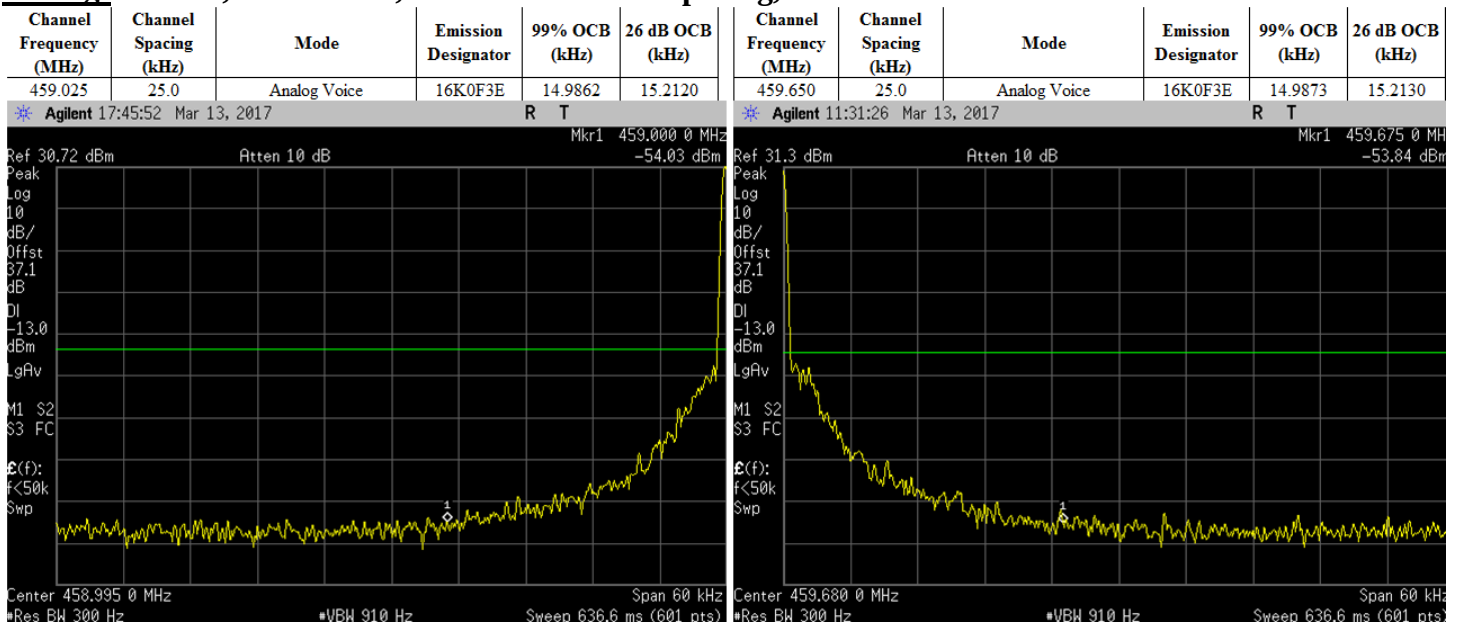
### Analog: 459.025,459.65 MHz, 25.0 kHz Channel Spacing, Max Power



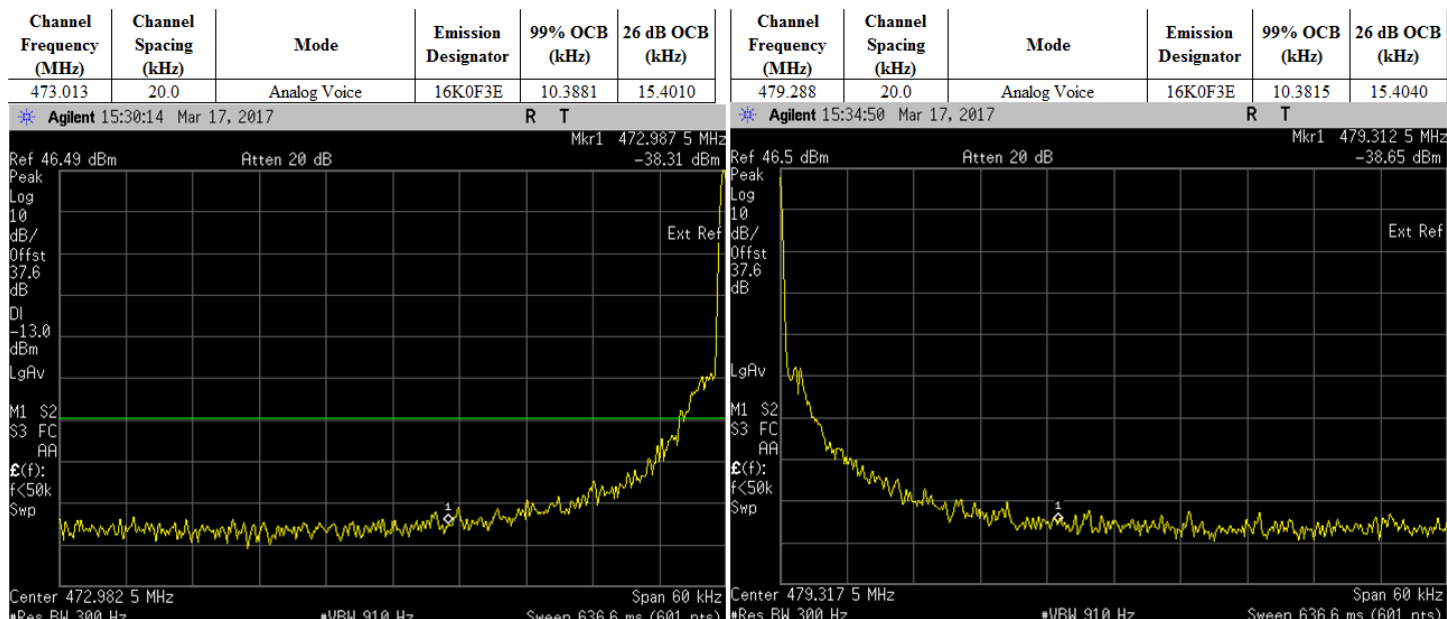
### Analog: 459.025,459.65 MHz, 20.0 kHz Channel Spacing, Low Power



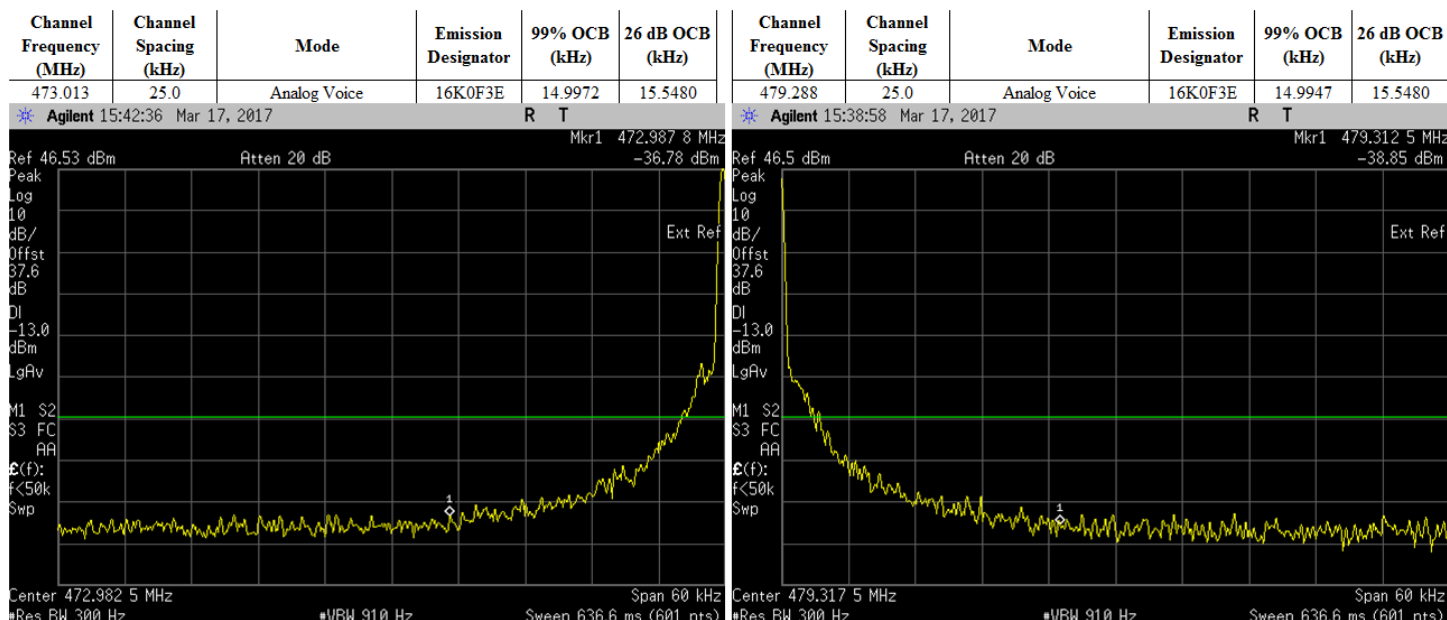
### Analog: 459.025,459.65 MHz, 25.0 kHz Channel Spacing, Low Power



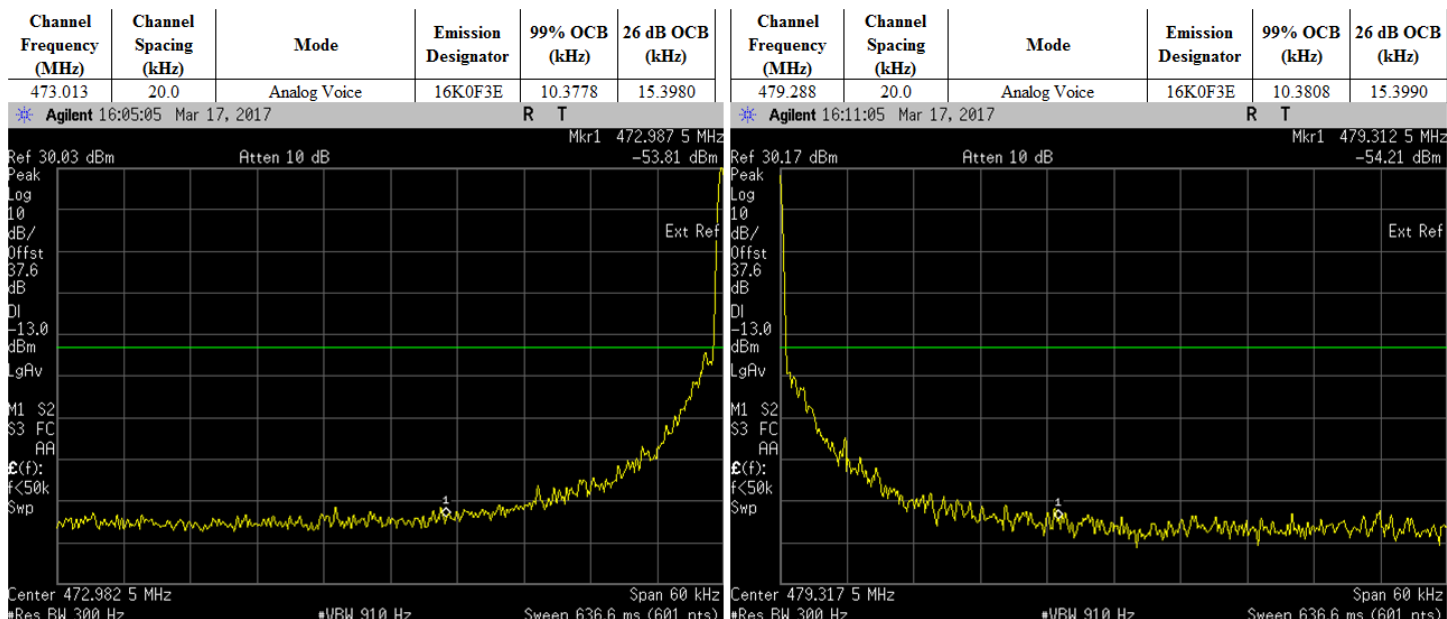
**Analog: 473.0125,479.2875 MHz, 20.0 kHz Channel Spacing, Max Power**



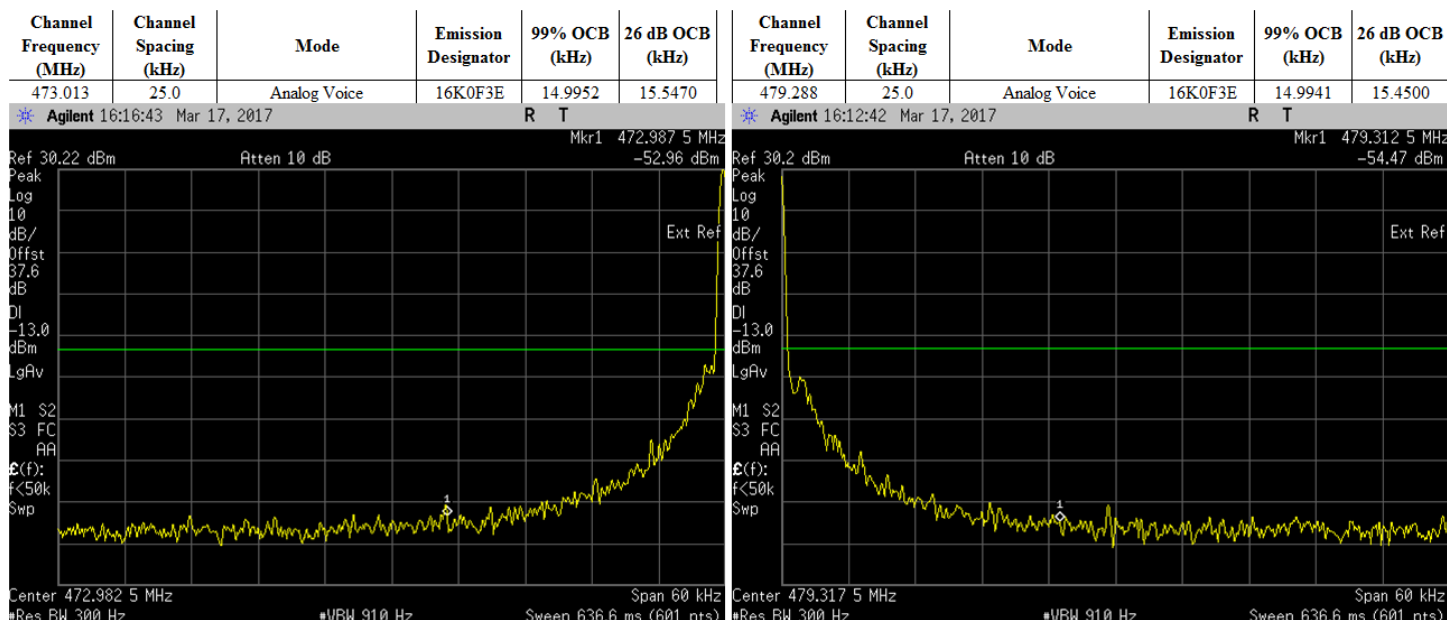
**Analog: 473.0125,479.2875 MHz, 25.0 kHz Channel Spacing, Max Power**



# **Analog: 473.0125,479.2875 MHz, 25.0 kHz Channel Spacing, Low Power**



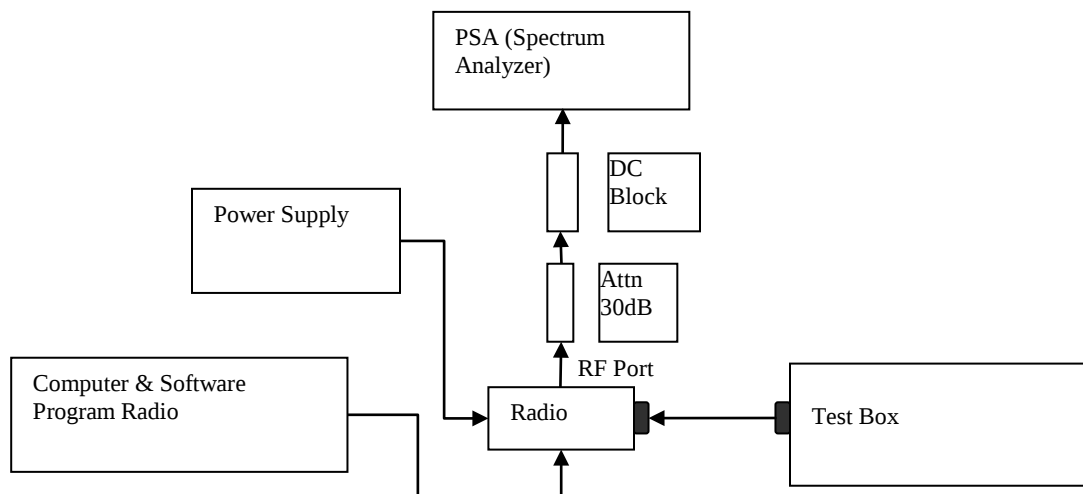
# **Analog: 473.0125,479.2875 MHz, 25.0 kHz Channel Spacing, Low Power**



## **\*\*Note:**

- Results for Analog Modulation Voice (F3E) with 12.5 kHz and 25 kHz would be the same. Therefore only measurements with 25kHz channel spacing is reported.

### 6.7.3. Test Setup (Digital)



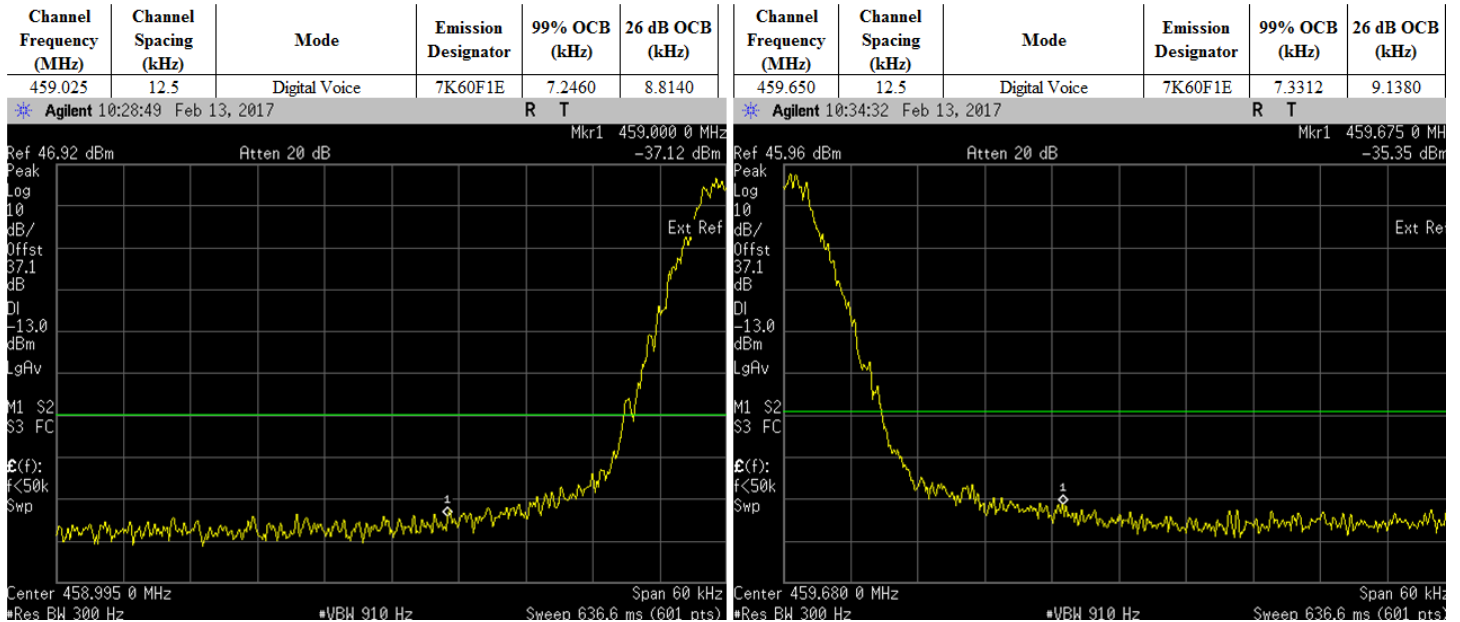
- 1) Program and set radio to operate in desire test frequency and digital mode with modulation. (4FSK\*\*, C4FM or other digital modulation form).
- 2) Path loss for the measurement included.
- 3) Select the Occupied Bandwidth measurement for 99% and 26dB Emissions Bandwidth Measurement.
- 4) Key in the Fc and RBW= 100Hz.
- 5) Transmit radio record the occupied Bandwidth frequencies.
- 6) Preset the spectrum analyzer for band edge measurement.
- 7) The band edges of lowest and highest channels were measured.
- 8) The center frequency of spectrum is the band edge frequency, span is 60 kHz and RBW is at least 1% of Emission Bandwidth.
- 9) Save the screen shot.

**\*\*Note:**

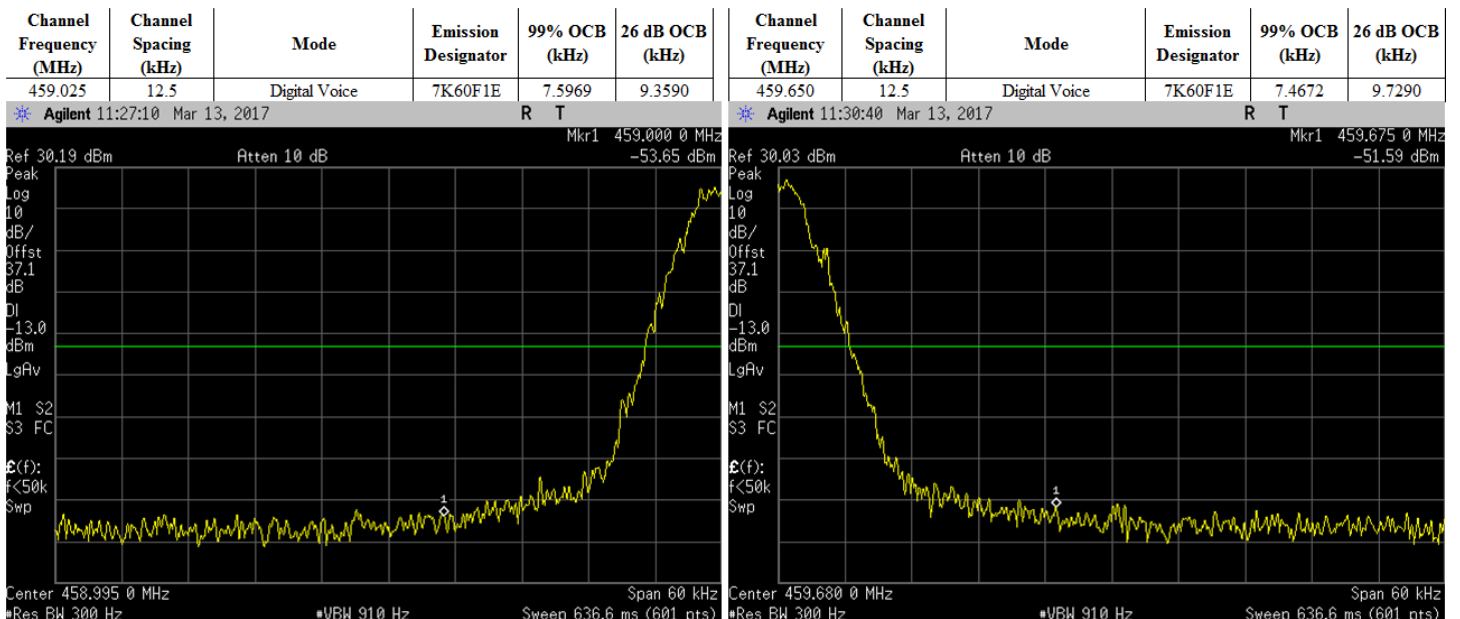
- For Digital Modulation for 12.5 kHz Voice (F1E) and 12.5 kHz Data (F1D) would be the same. Therefore only measurements with F1E modulation shown below.

#### 6.7.4. Test Result (Digital)

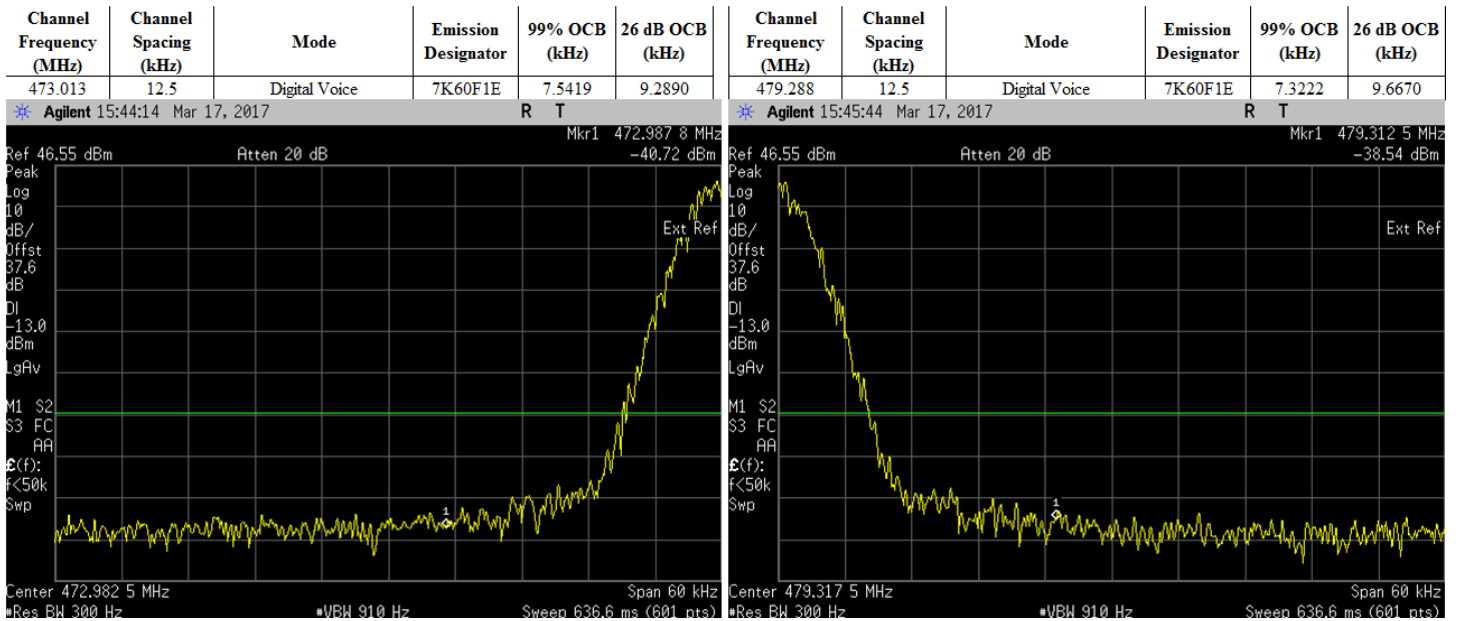
##### 4FSK: 459.025,459.65 MHz, 12.5 kHz Channel Spacing, Max Power



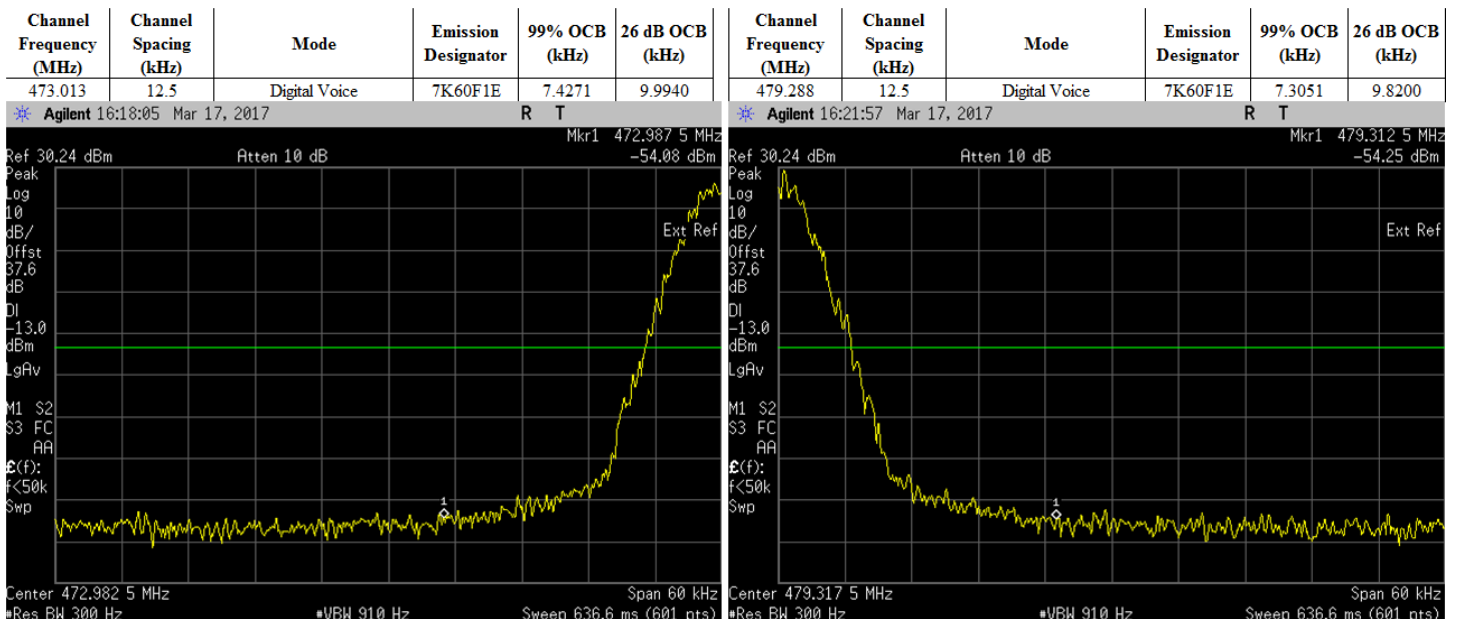
##### 4FSK: 459.025,459.65 MHz, 12.5 kHz Channel Spacing, Low Power



#### 4FSK: 473.0125,479.2875 MHz, 12.5 kHz Channel Spacing, Max Power



#### 4FSK: 473.0125,479.2875 MHz, 12.5 kHz Channel Spacing, Low Power



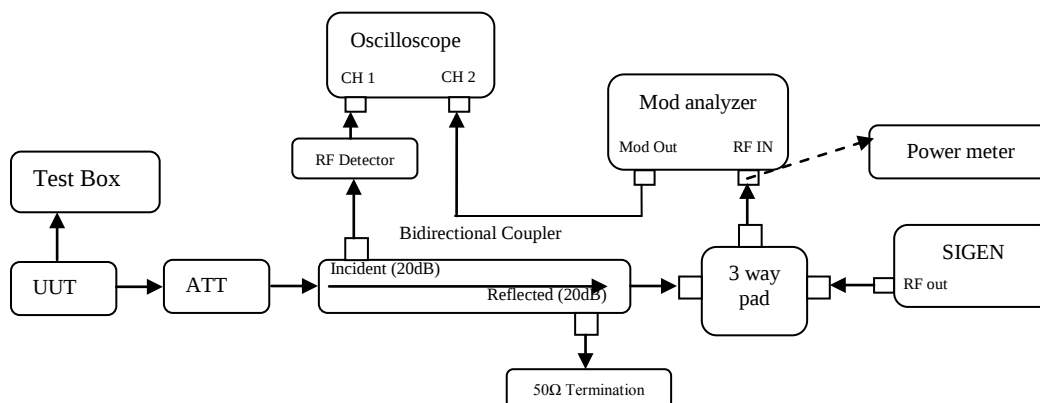
**\*\*Note:** All digital emission IDs (7K60F1E, 7K60F1D, 7K60F1W, 7K60FXE, 7K60FXD) utilize the same bit pattern, therefore yielding identical results for this test. Hence, only 7K60F1E will be shown.

#### **6.7.5. Test Limit**

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

## 6.8. Transient Frequency Behavior

### 6.8.1. Test Setup



- 1) Connect the setup as figure above.
- 2) Path loss for the measurement included.
- 3) Set on Siggen with the assigned center frequency, internal 1 kHz FM tone.  
FM Deviation: Analog 25kHz Channel Spacing = 25 kHz  
Analog 12.5 kHz Channel Spacing = 12.5 kHz  
C4FM = 12.5 kHz
- 4) Turn on 50 kHz high pass filter and 15 kHz low pass filter on modulation analyzer.
- 5) Supply sufficient attenuation ATT to provide the output power of  $\leq -11\text{dBm}$  into power meter when UUT is keying up.
- 6) Note the power level on power meter and dekey the UUT.
- 7) Adjust the amplitude of the signal generator to the level power meter, maintained the amplitude throughout the rest of the measurement.
- 8) Connect the output to modulation analyzer.
- 9) Set the horizontal sweep rate on the storage oscilloscope to 10 milliseconds per division and adjust the display to continuously view the 1000 Hz. Adjust the vertical amplitude control of the oscilloscope to display the 1000 Hz at  $\square 4$  divisions vertically centered on the display.
- 10) Reduce 30dB attenuation and transmit the radio to get the trigger line.
- 11) Capture the screen shot for key-up (rising edge) and de-key (falling edge) mode.

### 6.8.2. Test Result

**Not Applicable**

### 6.8.3. Test Limit

Transmitters designed to operate in the 150-174 MHz and 421-512 MHz frequency bands must maintain transient frequencies within the maximum frequency difference limits during the time intervals indicated:

| Time intervals <sup>1 2</sup>                                                       | Maximum frequency difference <sup>3</sup> | All equipment  |                |
|-------------------------------------------------------------------------------------|-------------------------------------------|----------------|----------------|
|                                                                                     |                                           | 150 to 174 MHz | 421 to 512 MHz |
| Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels   |                                           |                |                |
| t <sub>1</sub> <sup>4</sup>                                                         | ±25.0 kHz                                 | 5.0 ms         | 10.0 ms        |
| t <sub>2</sub>                                                                      | ±12.5 kHz                                 | 20.0 ms        | 25.0 ms        |
| t <sub>3</sub> <sup>4</sup>                                                         | ±25.0 kHz                                 | 5.0 ms         | 10.0 ms        |
| Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels |                                           |                |                |
| t <sub>1</sub> <sup>4</sup>                                                         | ±12.5 kHz                                 | 5.0 ms         | 10.0 ms        |
| t <sub>2</sub>                                                                      | ±6.25 kHz                                 | 20.0 ms        | 25.0 ms        |
| t <sub>3</sub> <sup>4</sup>                                                         | ±12.5 kHz                                 | 5.0 ms         | 10.0 ms        |
| Transient Frequency Behavior for Equipment Designed to Operate on 6.25 kHz Channels |                                           |                |                |
| t <sub>1</sub> <sup>4</sup>                                                         | ±6.25 kHz                                 | 5.0 ms         | 10.0 ms        |
| t <sub>2</sub>                                                                      | ±3.125 kHz                                | 20.0 ms        | 25.0 ms        |
| t <sub>3</sub> <sup>4</sup>                                                         | ±6.25 kHz                                 | 5.0 ms         | 10.0 ms        |

<sup>1</sup><sub>on</sub> is the instant when a 1 kHz test signal is completely suppressed, including any capture time due to phasing.

$t_1$  is the time period immediately following  $t_{on}$ .

$t_2$  is the time period immediately following  $t_1$ .

$t_3$  is the time period from the instant when the transmitter is turned off until  $t_{off}$ .

$t_{off}$  is the instant when the 1 kHz test signal starts to rise.

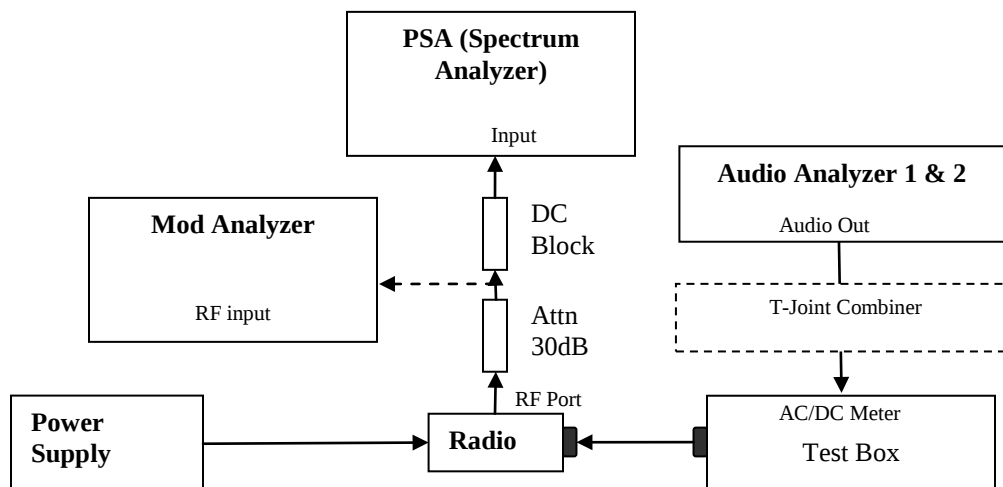
<sup>2</sup> During the time from the end of  $t_2$  to the beginning of  $t_3$ , the frequency difference must not exceed the limits specified in §90.213.

<sup>3</sup> Difference between the actual transmitter frequency and the assigned transmitter frequency.

<sup>4</sup> If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

## 6.9. Adjacent Channel Power

### 6.9.1. Test Setup (Analog)

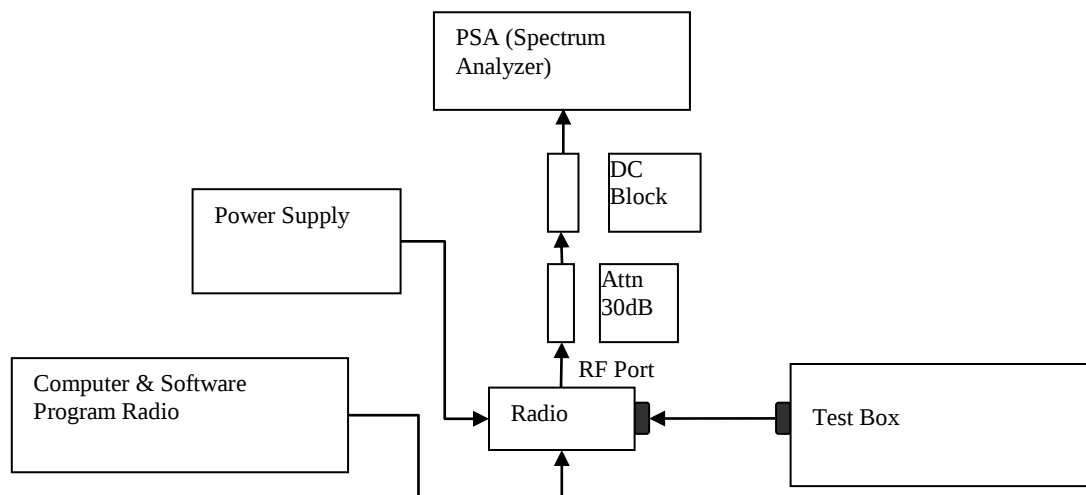


- 1) The DUT transmitter output port was connected to modulation analyzer.
- 2) Path loss for the measurement included.
- 3) Transmit the radio and turn on 1<sup>st</sup> audio analyzer with audio frequency 650Hz, 50% rated deviation, and record the amplitude value as AmpT1.
- 4) Turn off Audio analyzer 1 and turn on audio analyzer 2, set the audio frequency to 2.2 kHz and 50% deviation. Record the amplitude as AmpT2.
- 5) Turn both audio analyzers ON and up 10dB amplitude level.
- 6) Connect the output to PSA and set to assigned center frequency.
- 7) Set Span, RBW and VBW as shown in FCC rules part 90.543.
- 8) Transmit the radio and record the ACP value in dBc.

### 6.9.2. Test Result

**Not Applicable**

### 6.9.3. Test Setup (Digital)



- 1) Program and set radio to operate in desire test frequency and digital mode with modulation. (4FSK, C4FM, CQPSK or other digital modulation form).
- 2) Path loss for the measurement included.
- 3) Prepare setup as per picture.
- 4) Turn on the ACP Measurement – Press Measure, ACP.
- 5) Set Span, RBW and VBW as shown in FCC rules part 90.543.
- 6) Transmit the radio and record the ACP value in dBc.

### 6.9.4. Test Result **Not Applicable**

## 6.9.5. Test Limit

### 12.5 kHz MOBILE TRANSMITTER ACP REQUIREMENTS

| Offset from center frequency (kHz) | Measurement bandwidth (kHz) | Maximum ACP relative (dBc) |
|------------------------------------|-----------------------------|----------------------------|
| 9.375                              | 6.25                        | -40                        |
| 15.625                             | 6.25                        | -60                        |
| 21.875                             | 6.25                        | -60                        |
| 37.50                              | 25.00                       | -60                        |
| 62.50                              | 25.00                       | -65                        |
| 87.50                              | 25.00                       | -65                        |
| 150.00                             | 100                         | -65                        |
| 250.00                             | 100                         | -65                        |
| 350.00                             | 100                         | -65                        |
| >400 to 12 MHz                     | 30 (s)                      | -75                        |
| 12 MHz to paired receive band      | 30 (s)                      | -75                        |
| In the paired receive band         | 30 (s)                      | -100                       |

### 25 kHz MOBILE TRANSMITTER ACP REQUIREMENTS

| Offset from center frequency (kHz) | Measurement bandwidth (kHz) | Maximum ACP relative (dBc) |
|------------------------------------|-----------------------------|----------------------------|
| 15.625                             | 6.25                        | -40                        |
| 21.875                             | 6.25                        | -60                        |
| 37.50                              | 25                          | -60                        |
| 62.50                              | 25                          | -65                        |
| 87.50                              | 25                          | -65                        |
| 150.00                             | 100                         | -65                        |
| 250.00                             | 100                         | -65                        |
| 350.00                             | 100                         | -65                        |
| >400 kHz to 12 MHz                 | 30 (s)                      | -75                        |
| 12 MHz to paired receive band      | 30 (s)                      | -75                        |
| In the paired receive band         | 30 (s)                      | -100                       |

**12.5 kHz BASE TRANSMITTER ACP REQUIREMENTS**

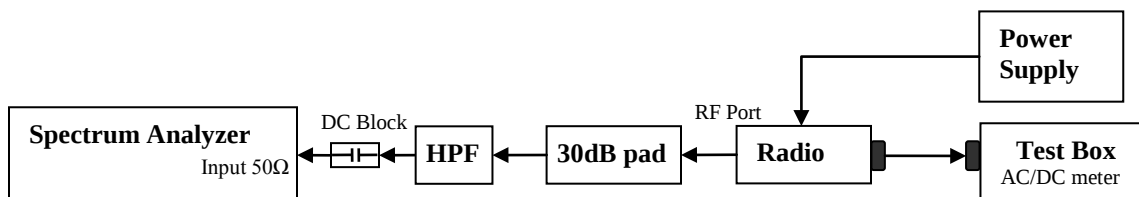
| Offset from center frequency (kHz) | Measurement bandwidth (kHz) | Maximum ACP (dBc) |
|------------------------------------|-----------------------------|-------------------|
| 9.375                              | 6.25                        | -40               |
| 15.625                             | 6.25                        | -60               |
| 21.875                             | 6.25                        | -60               |
| 37.5                               | 25                          | -60               |
| 62.5                               | 25                          | -65               |
| 87.5                               | 25                          | -65               |
| 150                                | 100                         | -65               |
| 250                                | 100                         | -65               |
| 350.00                             | 100                         | -65               |
| >400 kHz to 12 MHz                 | 30 (s)                      | -80               |
| 12 MHz to paired receive band      | 30 (s)                      | -80               |
| In the paired receive band         | 30 (s)                      | <sup>1</sup> -85  |

**25 kHz BASE TRANSMITTER ACP REQUIREMENTS**

| Offset from center frequency (kHz) | Measurement bandwidth (kHz) | Maximum ACP (dBc) |
|------------------------------------|-----------------------------|-------------------|
| 15.625                             | 6.25                        | -40               |
| 21.875                             | 6.25                        | -60               |
| 37.5                               | 25                          | -60               |
| 62.5                               | 25                          | -65               |
| 87.5                               | 25                          | -65               |
| 150                                | 100                         | -65               |
| 250                                | 100                         | -65               |
| 350                                | 100.00                      | -65               |
| >400 kHz to 12 MHz                 | 30 (s)                      | -80               |
| 12 MHz to paired receive band      | 30 (s)                      | -80               |
| In the paired receive band         | 30 (s)                      | <sup>1</sup> -85  |

## 6.10. Conducted Spurious Emission

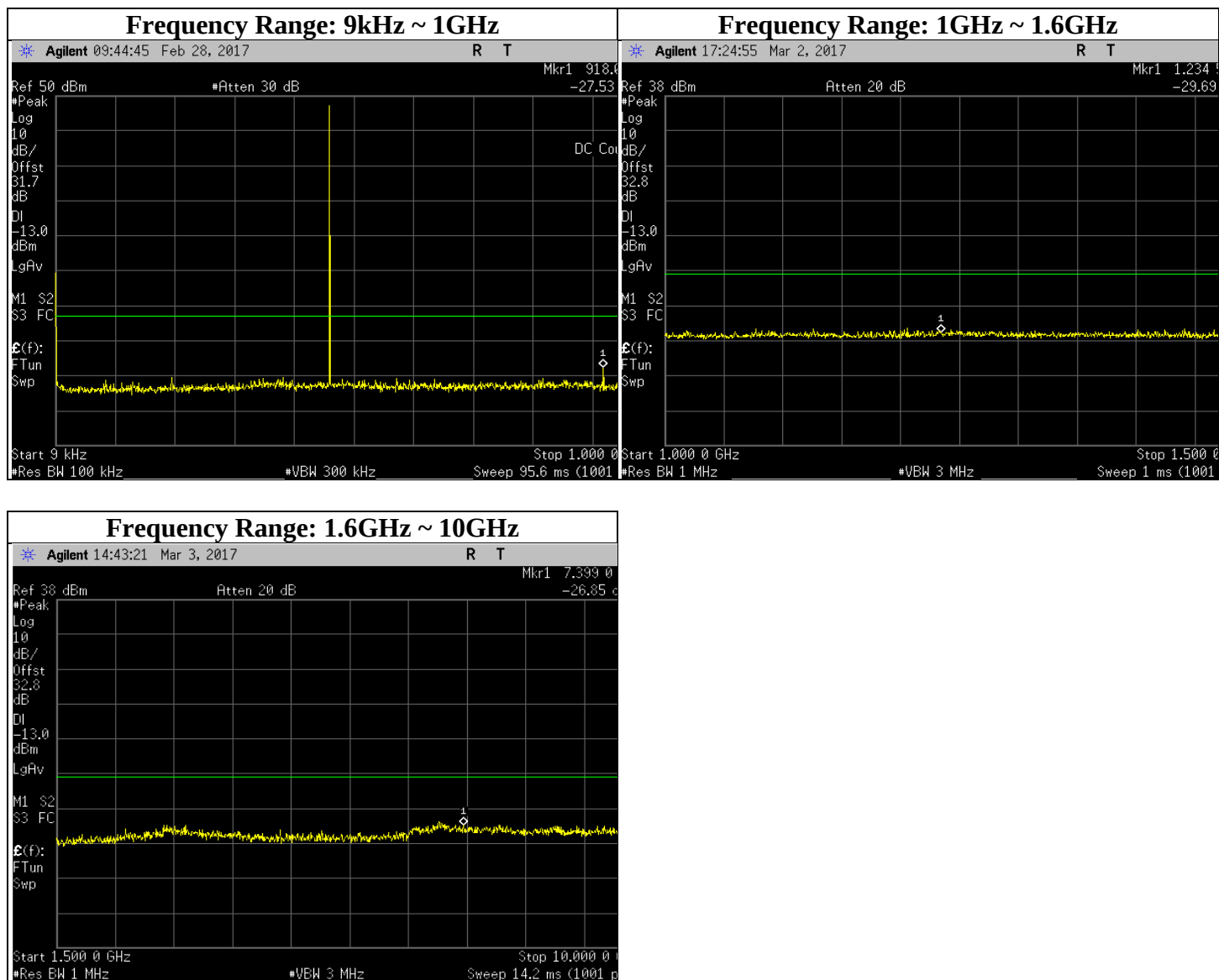
### 6.10.1. Test Setup



- 1) The DUT transmitter output port was connected to Spectrum Analyzer with above setup.
- 2) Program and set radio to operate in desire test frequency and mode. (Analog / digital modulation form).
- 3) Adjust the PSA RBW = 100kHz for spur emission below 1GHz, and 1MHz for spur emission above 1GHz.
- 4) Set the Ref offset from the pathloss offset calibration file.
- 5) Adjust the center frequency of the spectrum analyzer for incremental coverage of the range from:  
(a) The lowest radio frequency to  $F_c - \text{Test BW}$   
(b)  $F_c + \text{Test BW}$  to  $\text{Freq} < 2F_c$ .
- 6) Record the levels of spurious emissions and dekey the UUT.
- 7) Turn On HPF path and Key up the UUT.
- 8) Adjust the PSA Freq for incremental coverage of range from  $2F_c$  to  $10F_c$ .
- 9) The levels recorded are the absolute levels of conducted spurious emissions in dBm.

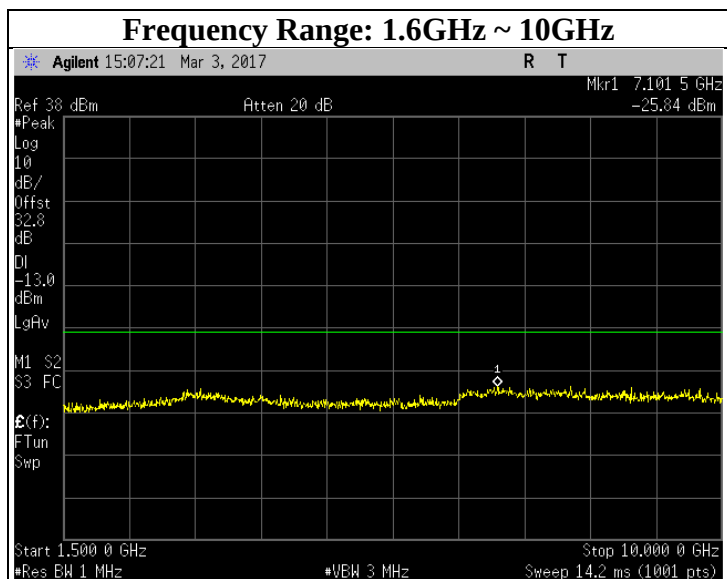
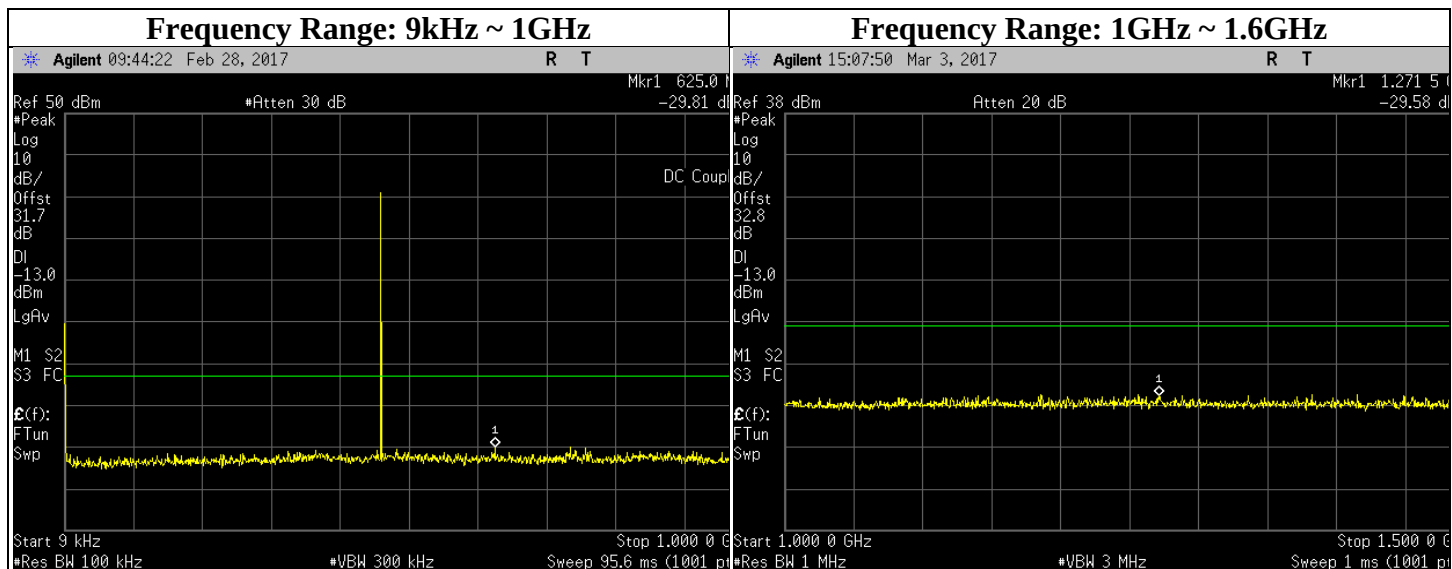
## 6.10.2. Test Result (Analog)

**Analog: 459.125 MHz, 20.0 kHz Channel Spacing, Max Power**



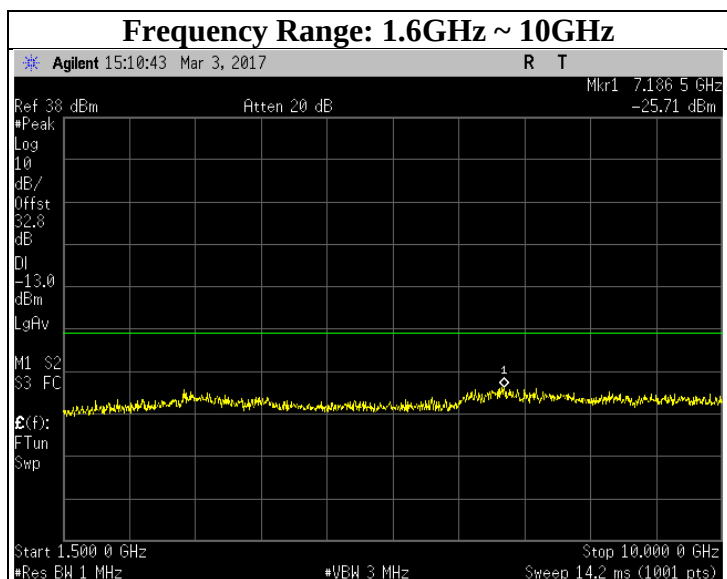
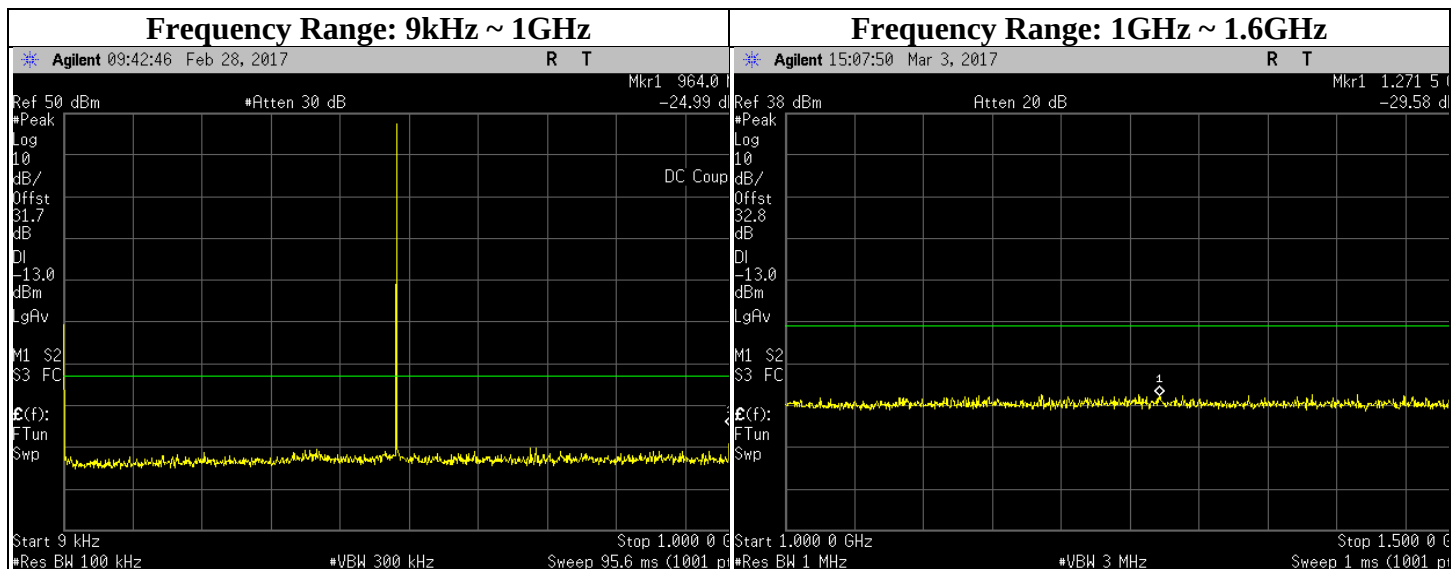
| Frequency Range | Highest Spur Freq (MHz) | Spurious Level (dBm) | Failing Limit (dBm) | Remark |
|-----------------|-------------------------|----------------------|---------------------|--------|
| 9kHz ~ 1GHz     | 918                     | -27.53               | -13                 | Pass   |
| 1GHz ~ 1.6GHz   | 1234                    | -29.69               | -13                 | Pass   |
| 1.6GHz ~ 10GHz  | 7399                    | -26.85               | -13                 | Pass   |

**Analog: 459.125 MHz, 20.0 kHz Channel Spacing, Low Power**



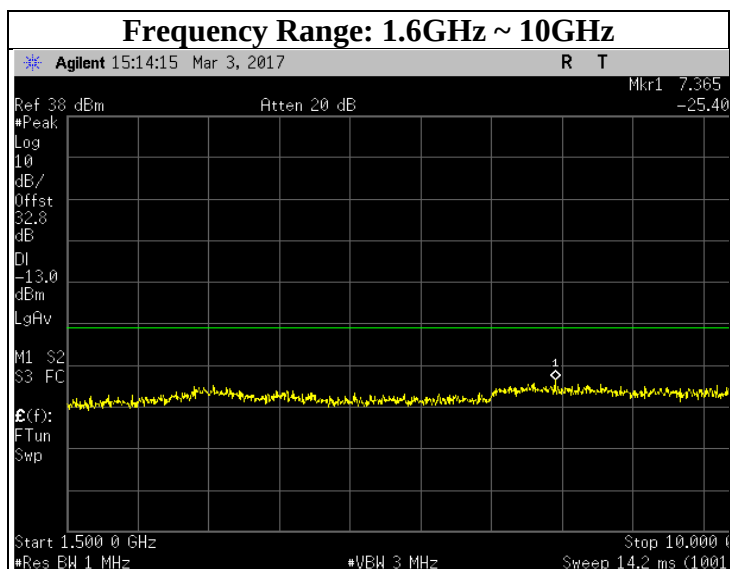
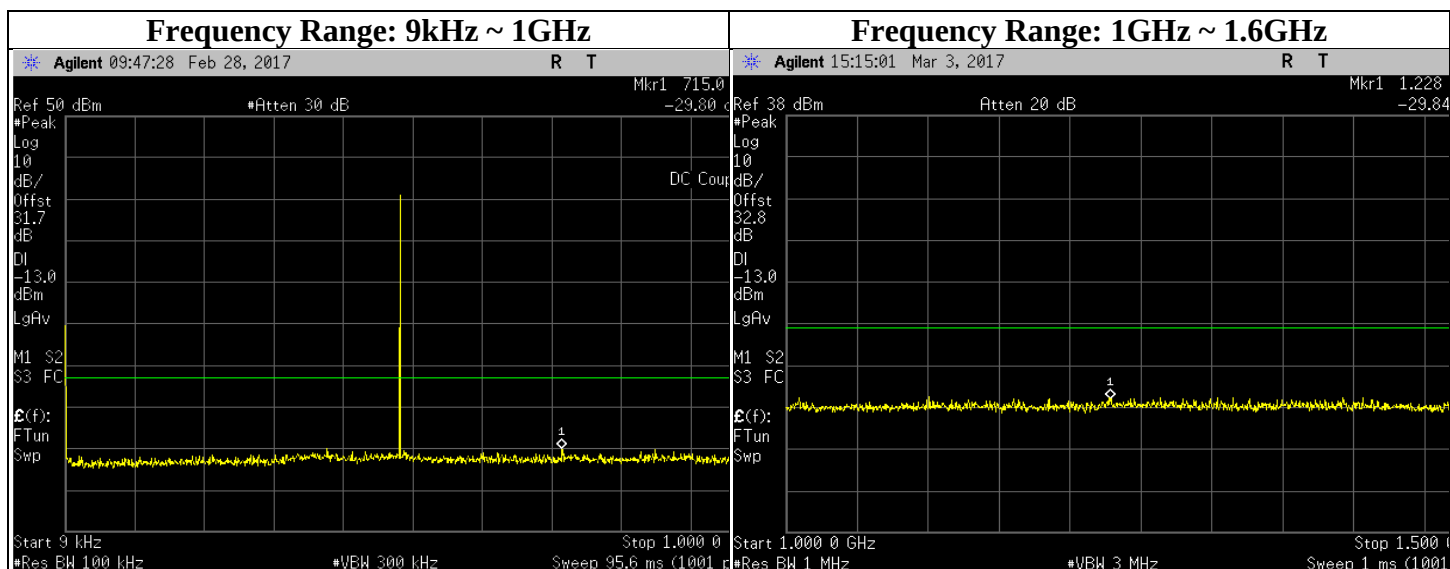
| Frequency Range | Highest Spur Freq (MHz) | Spurious Level (dBm) | Failing Limit (dBm) | Remark |
|-----------------|-------------------------|----------------------|---------------------|--------|
| 9kHz ~ 1GHz     | 625                     | -29.81               | -13                 | Pass   |
| 1GHz ~ 1.6GHz   | 1275                    | -29.58               | -13                 | Pass   |
| 1.6GHz ~ 10GHz  | 7101.5                  | -25.84               | -13                 | Pass   |

**Analog: 482.0125 MHz, 20.0 kHz Channel Spacing, Max Power**



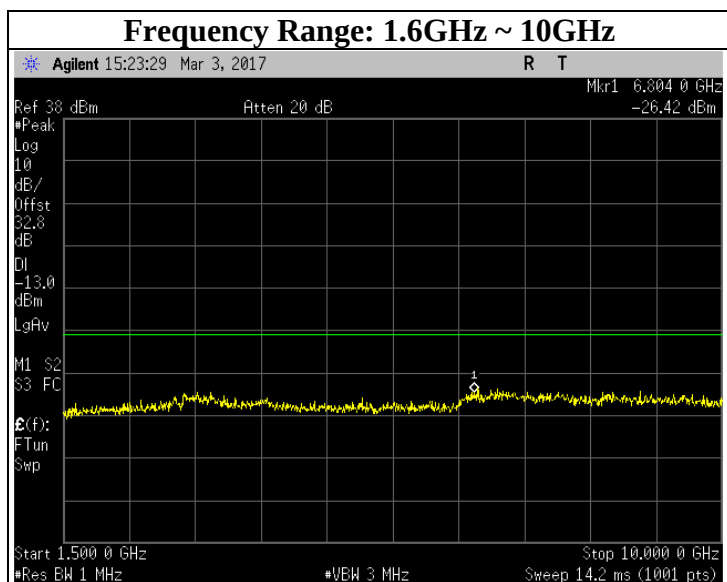
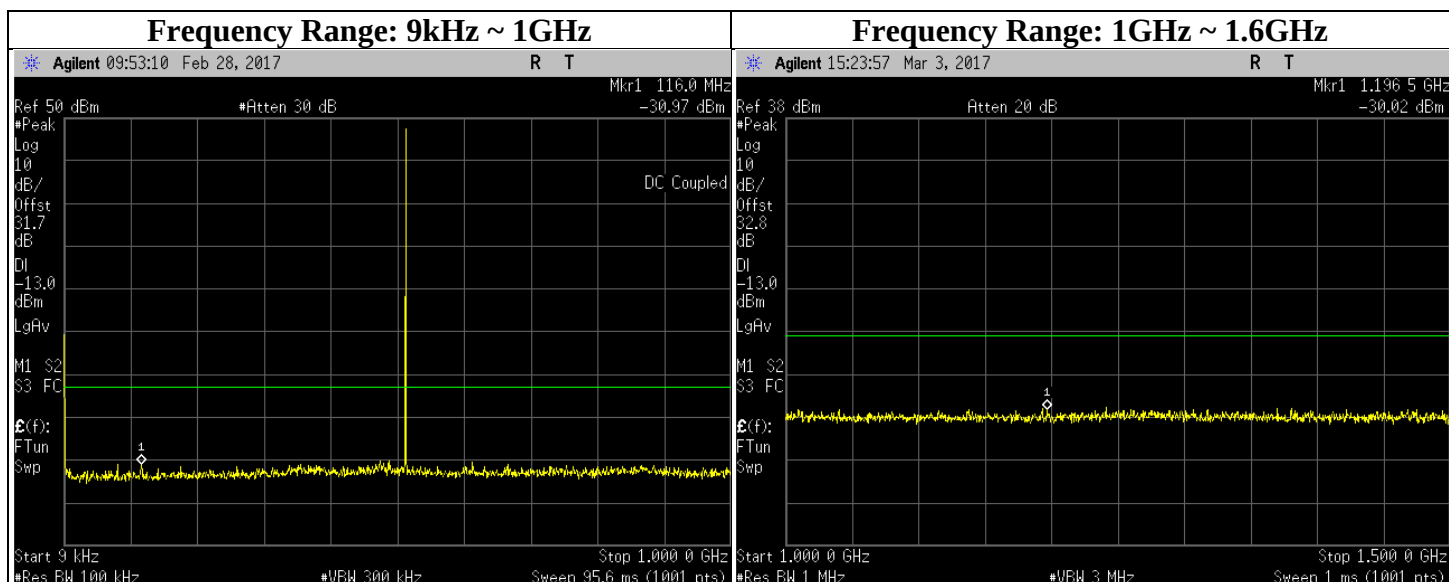
| Frequency Range | Highest Spur Freq (MHz) | Spurious Level (dBm) | Failing Limit (dBm) | Remark |
|-----------------|-------------------------|----------------------|---------------------|--------|
| 9kHz ~ 1GHz     | 964                     | -24.99               | -13                 | Pass   |
| 1GHz ~ 1.6GHz   | 1271                    | -29.58               | -13                 | Pass   |
| 1.6GHz ~ 10GHz  | 7186.5                  | -25.71               | -13                 | Pass   |

**Analog: 482.0125 MHz, 20.0 kHz Channel Spacing, Low Power**



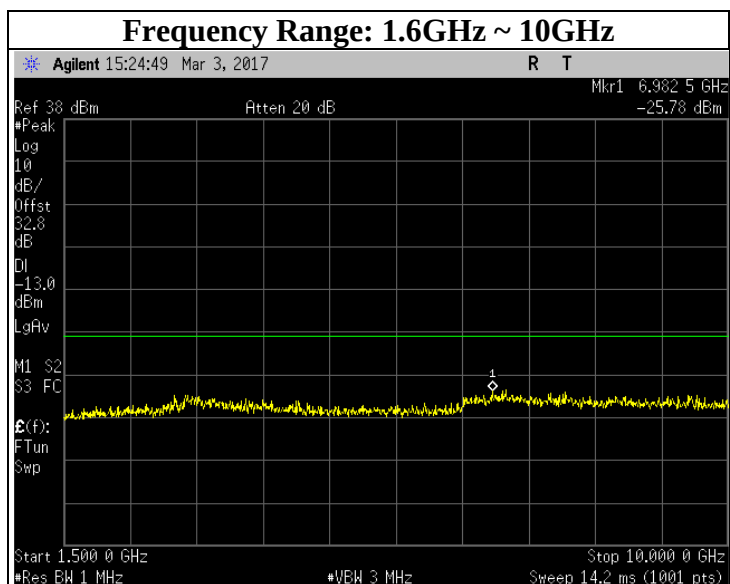
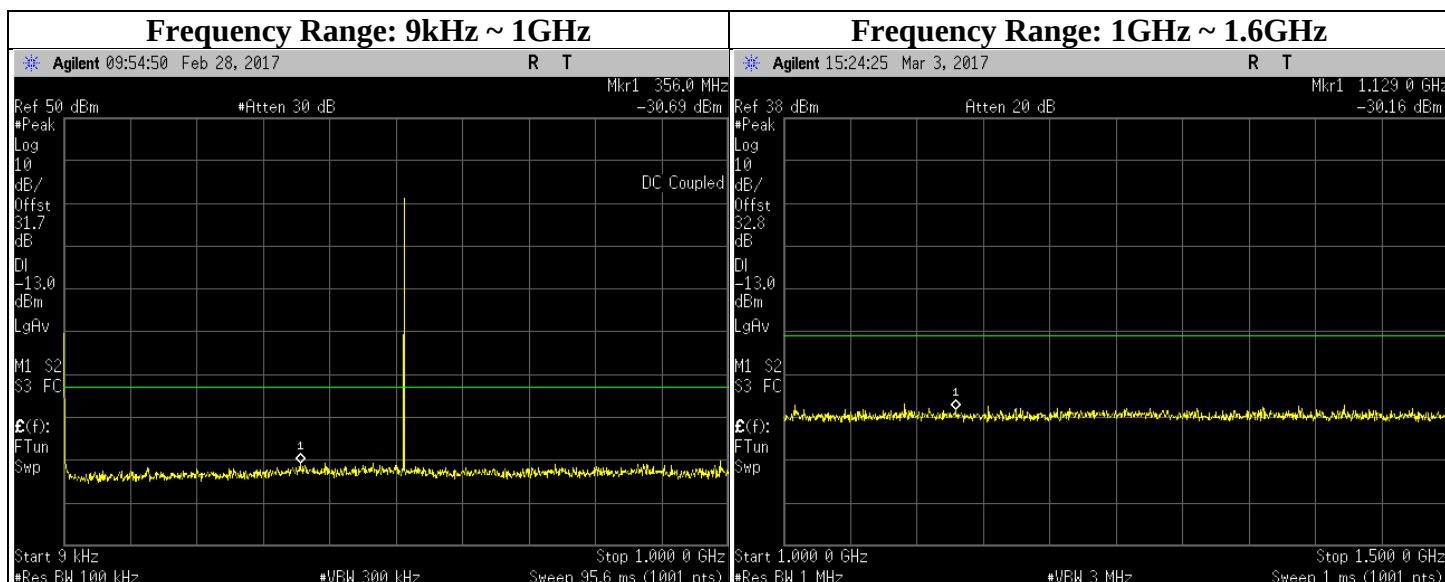
| Frequency Range | Highest Spur Freq (MHz) | Spurious Level (dBm) | Failing Limit (dBm) | Remark |
|-----------------|-------------------------|----------------------|---------------------|--------|
| 9kHz ~ 1GHz     | 715                     | -29.80               | -13                 | Pass   |
| 1GHz ~ 1.6GHz   | 1228                    | -29.84               | -13                 | Pass   |
| 1.6GHz ~ 10GHz  | 7365                    | -25.40               | -13                 | Pass   |

**Analog: 511.9875 MHz, 20.0 kHz Channel Spacing, Max Power**



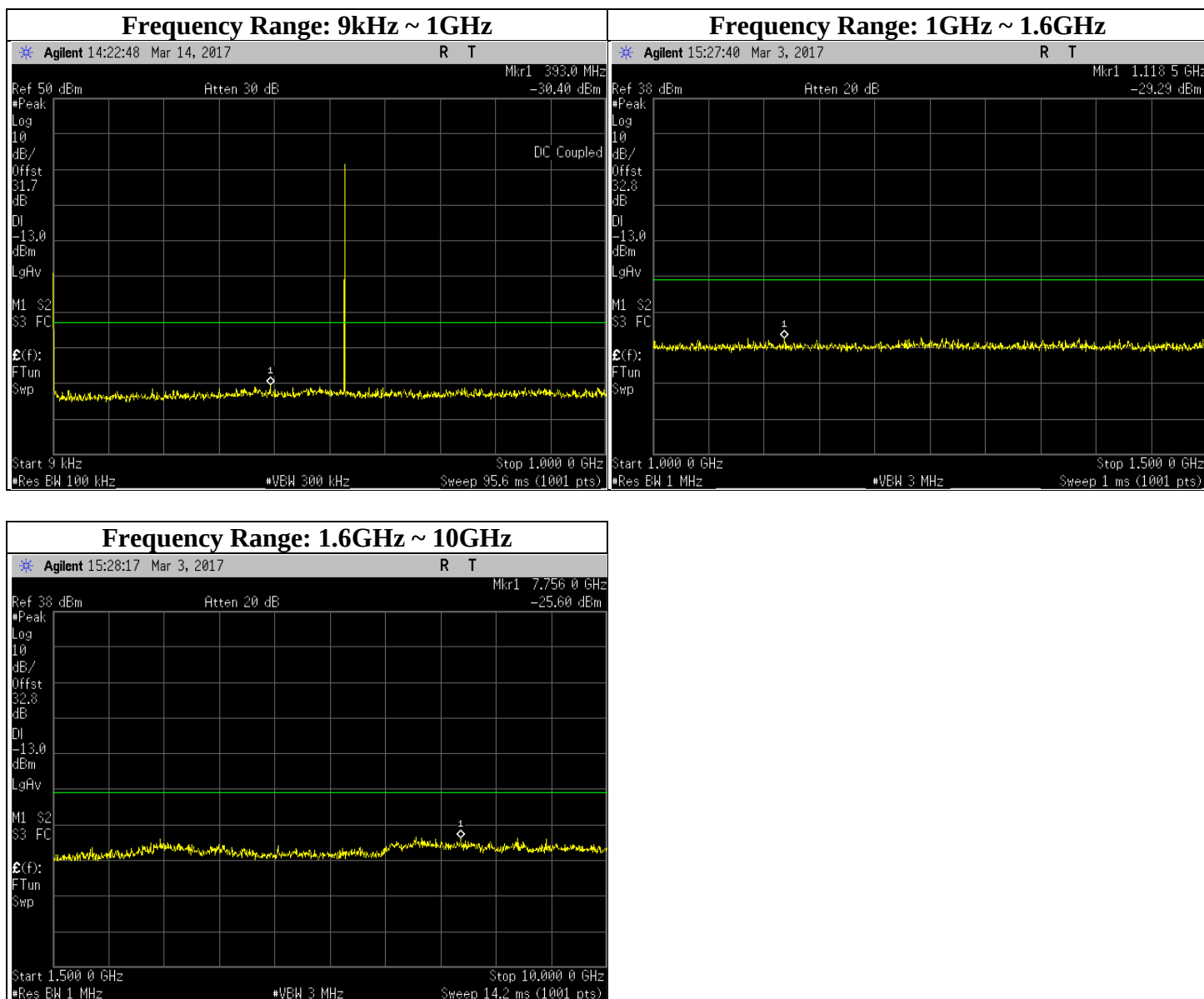
| Frequency Range | Highest Spur Freq (MHz) | Spurious Level (dBm) | Failing Limit (dBm) | Remark |
|-----------------|-------------------------|----------------------|---------------------|--------|
| 9kHz ~ 1GHz     | 116                     | -30.97               | -13                 | Pass   |
| 1GHz ~ 1.6GHz   | 1196.5                  | -30.02               | -13                 | Pass   |
| 1.6GHz ~ 10GHz  | 6804                    | -26.42               | -13                 | Pass   |

**Analog: 511.9875 MHz, 20.0 kHz Channel Spacing, Low Power**



| Frequency Range | Highest Spur Freq (MHz) | Spurious Level (dBm) | Failing Limit (dBm) | Remark |
|-----------------|-------------------------|----------------------|---------------------|--------|
| 9kHz ~ 1GHz     | 359                     | -30.69               | -13                 | Pass   |
| 1GHz ~ 1.6GHz   | 1129                    | -30.16               | -13                 | Pass   |
| 1.6GHz ~ 10GHz  | 6982.5                  | -25.78               | -13                 | Pass   |

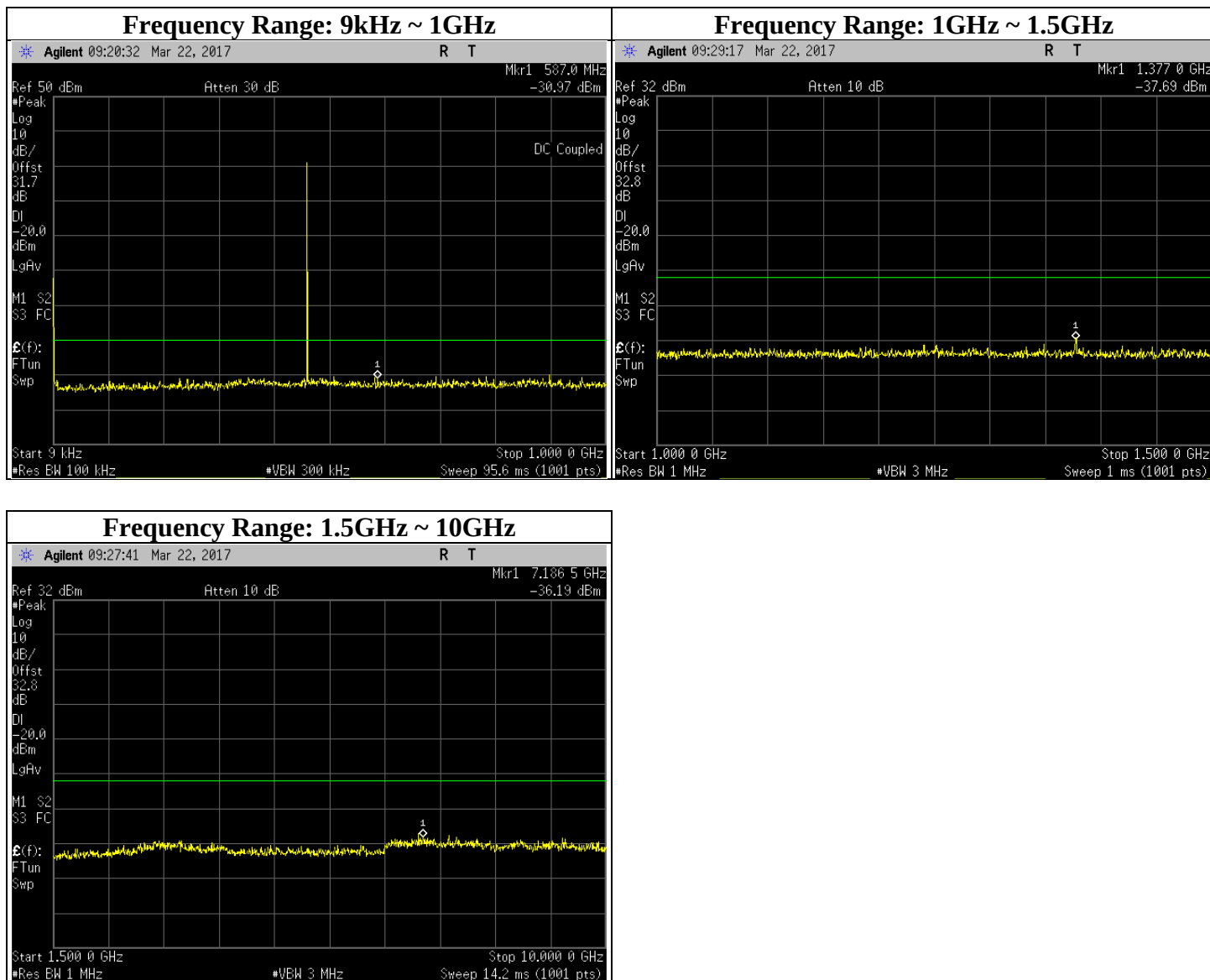
**Analog: 526.9875 MHz, 25.0 kHz Channel Spacing, Low Power (Not for FCC Review)**



| Frequency Range | Highest Spur Freq (MHz) | Spurious Level (dBm) | Failing Limit (dBm) | Remark |
|-----------------|-------------------------|----------------------|---------------------|--------|
| 9kHz ~ 1GHz     | 393                     | -30.40               | -13                 | Pass   |
| 1GHz ~ 1.6GHz   | 1185                    | -29.29               | -13                 | Pass   |
| 1.6GHz ~ 10GHz  | 7756                    | -25.60               | -13                 | Pass   |

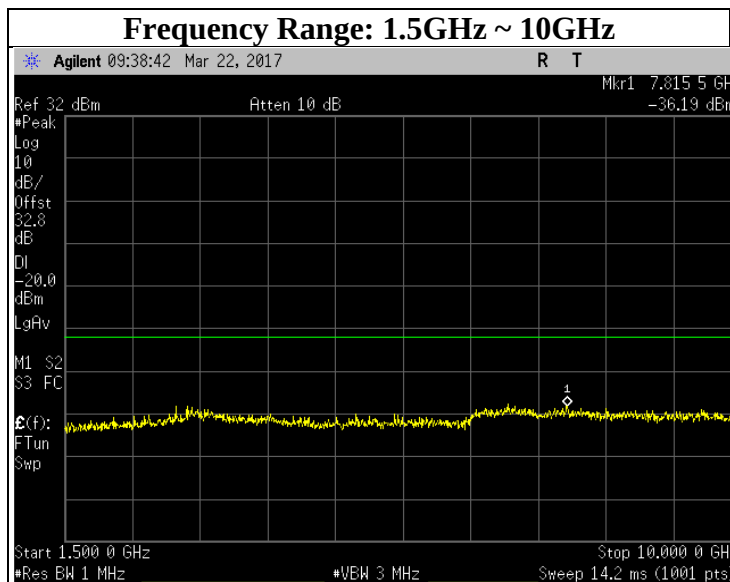
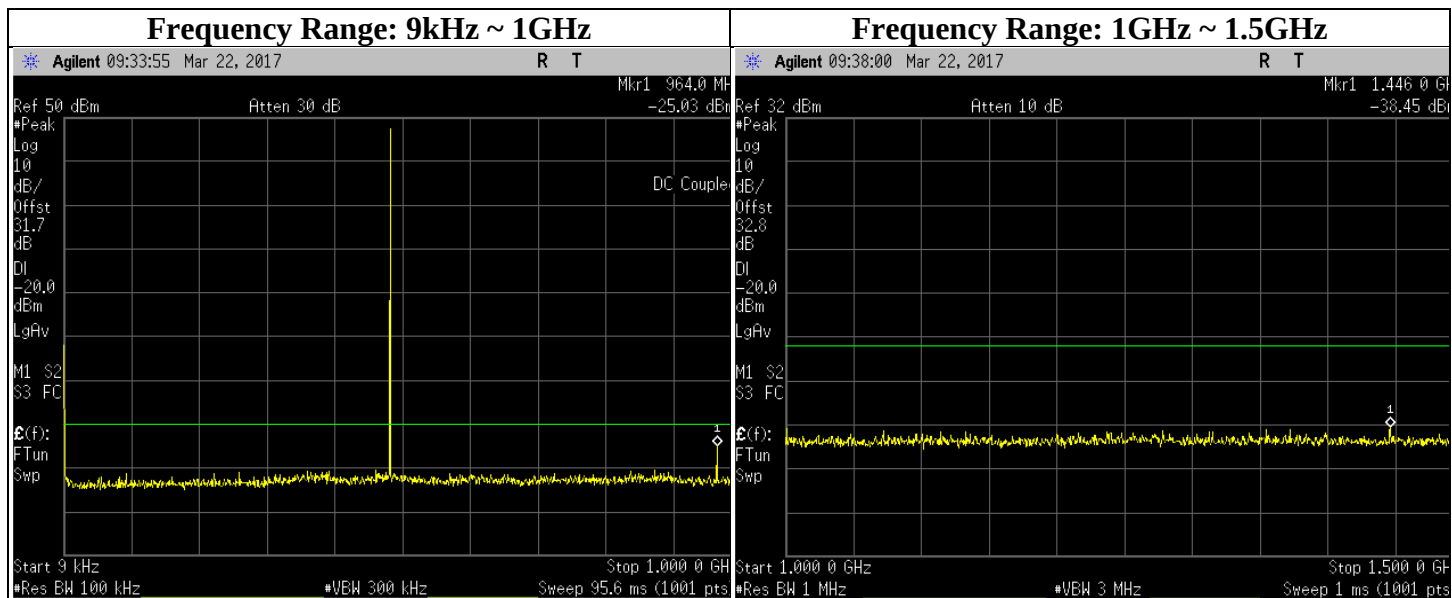
### 6.10.1. Test Result (Digital)

#### 4FSK: 459.125 MHz, 12.5 kHz Channel Spacing, Low Power



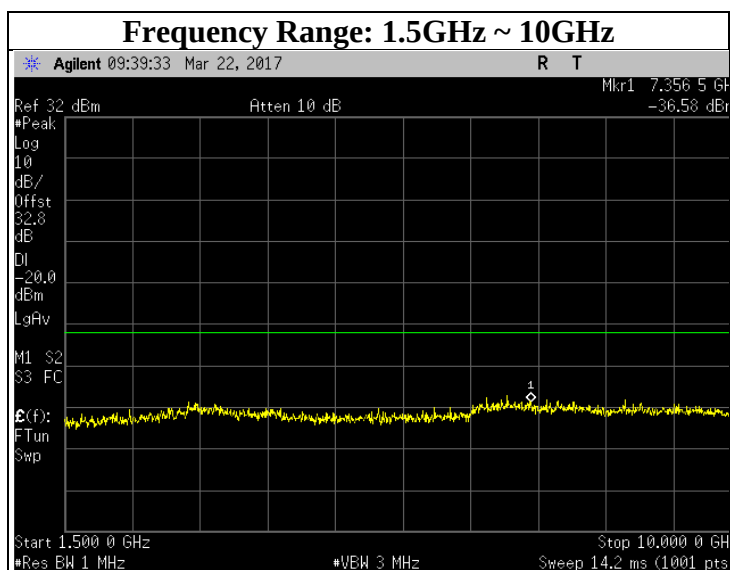
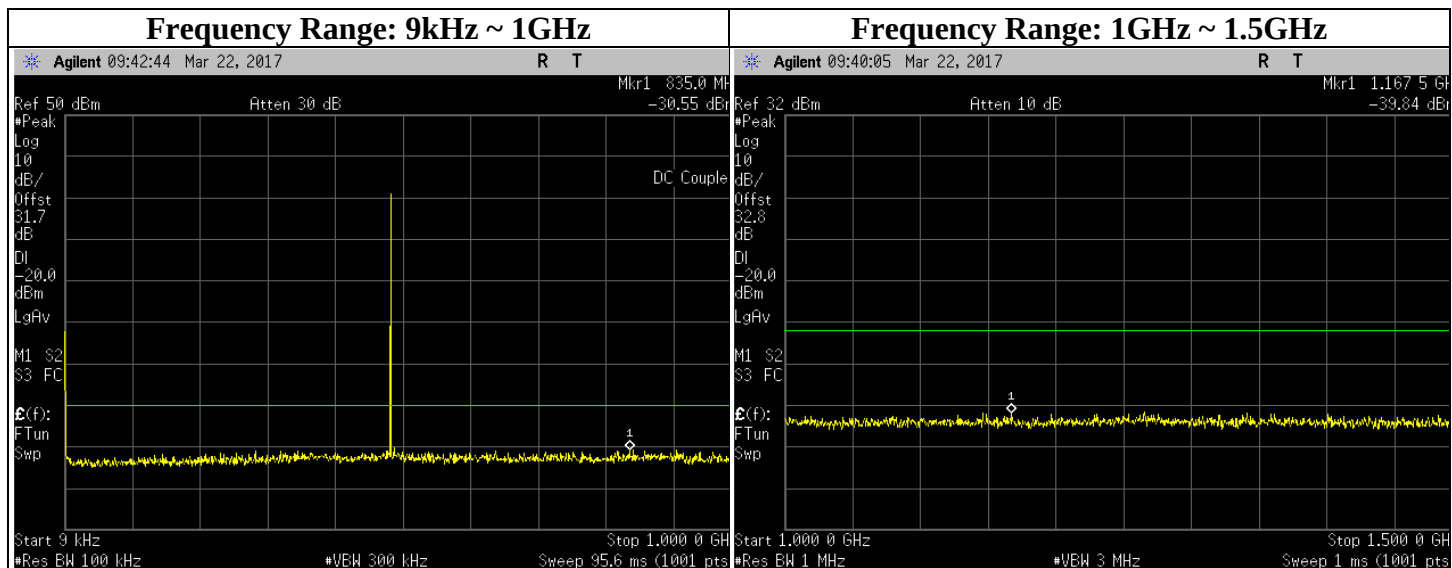
| Frequency Range | Highest Spur Freq (MHz) | Spurious Level (dBm) | Failing Limit (dBm) | Remark |
|-----------------|-------------------------|----------------------|---------------------|--------|
| 9kHz ~ 1GHz     | 587                     | -30.97               | -20                 | Pass   |
| 1GHz ~ 1.5GHz   | 1377                    | -37.69               | -20                 | Pass   |
| 1.5GHz ~ 10GHz  | 7186.5                  | -36.19               | -20                 | Pass   |

# **4FSK: 482.0125 MHz, 12.5 kHz Channel Spacing, Max Power**



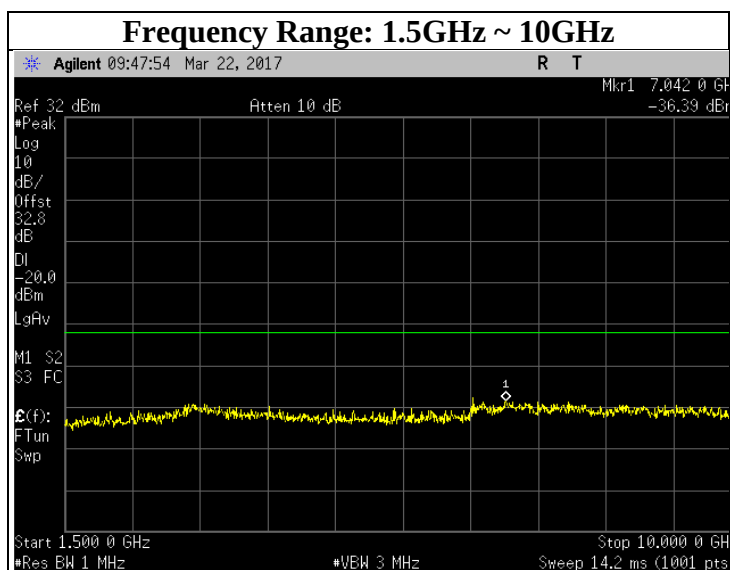
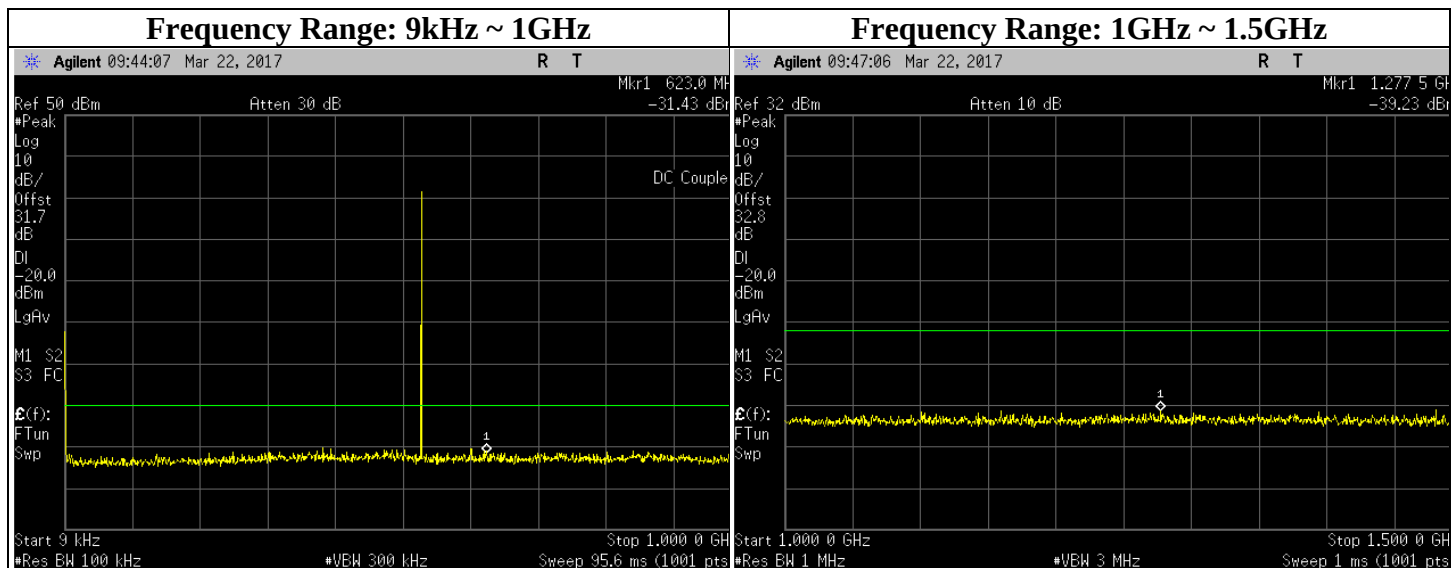
| Frequency Range | Highest Spur Freq (MHz) | Spurious Level (dBm) | Failing Limit (dBm) | Remark |
|-----------------|-------------------------|----------------------|---------------------|--------|
| 9kHz ~ 1GHz     | 964                     | -25.03               | -20                 | Pass   |
| 1GHz ~ 1.5GHz   | 1446                    | -38.45               | -20                 | Pass   |
| 1.5GHz ~10GHz   | 7815.5                  | -36.19               | -20                 | Pass   |

# **4FSK: 482.0125 MHz, 12.5 kHz Channel Spacing, Low Power**



| Frequency Range | Highest Spur Freq (MHz) | Spurious Level (dBm) | Failing Limit (dBm) | Remark |
|-----------------|-------------------------|----------------------|---------------------|--------|
| 9kHz ~ 1GHz     | 835                     | -30.55               | -20                 | Pass   |
| 1GHz ~ 1.5GHz   | 1167.5                  | -39.84               | -20                 | Pass   |
| 1.5GHz ~ 10GHz  | 7356.5                  | -36.58               | -20                 | Pass   |

**4FSK: 526.9875 MHz, 12.5 kHz Channel Spacing, Low Power (Not for FCC Review)**



| Frequency Range | Highest Spur Freq (MHz) | Spurious Level (dBm) | Failing Limit (dBm) | Remark |
|-----------------|-------------------------|----------------------|---------------------|--------|
| 9kHz ~ 1GHz     | 623                     | -31.43               | -20                 | Pass   |
| 1GHz ~ 1.5GHz   | 1277.5                  | -39.32               | -20                 | Pass   |
| 1.5GHz ~ 10GHz  | 7042                    | -36.39               | -20                 | Pass   |

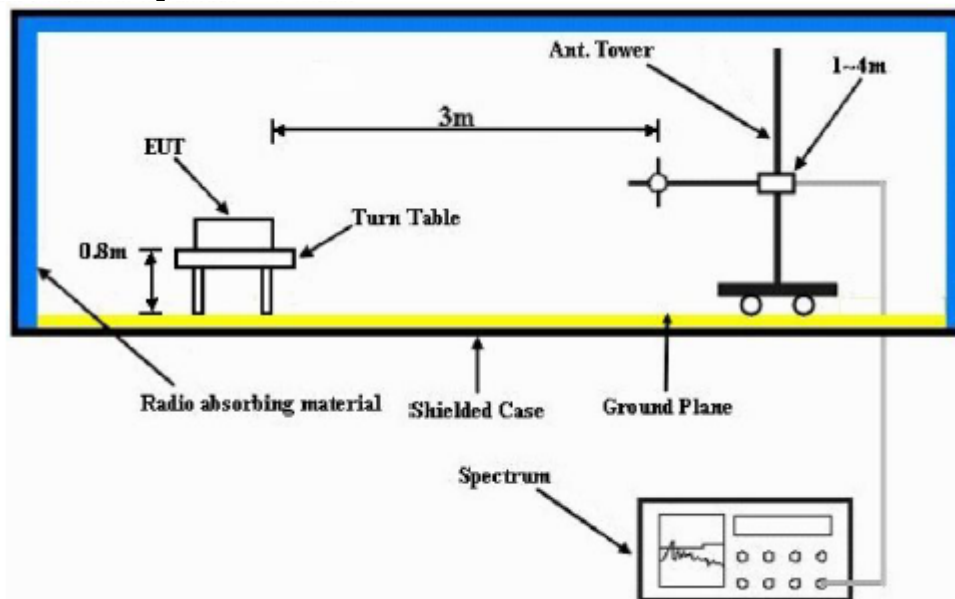
### 6.10.2. Test Limit

Table below summarized the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least

| Channel Spacing | Part 22                                 | Part 24D                                | Part 74                                 | Part 80                                 | Part 90                                 |
|-----------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|
| 12.5kHz         | 43 + log <sub>10</sub> (P)<br>(-13 dBm) | 43 + log <sub>10</sub> (P)<br>(-13 dBm) | 43 + log <sub>10</sub> (P)<br>(-13 dBm) | Not Applicable                          | 50 + log <sub>10</sub> (P)<br>(-20 dBm) |
| 25kHz           |                                         | Not Applicable                          |                                         | 43 + log <sub>10</sub> (P)<br>(-13 dBm) | Not Applicable                          |

## 6.11. Radiated Spurious Emission

### 6.11.1. Test Setup



- 1) The spectrum setting for scanning Radiated Emission below 1 GHz is RBW = 100 kHz, VBW = 300 kHz and above 1 GHz is RBW = 1 MHz, VBW = 3 MHz. Detector mode is positive peak.
- 2) In the semi-anechoic chamber, setup as illustrated above the EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.
- 3) The substitution antenna is substituted for EUT at the same position and signals generator (S.G) export the CW signal to the substitution antenna via a TX cable. The receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum radiation power. Record the power level of maximum radiation power from spectrum. So, the measured substitution value = Ref level of S.G + TX cables loss – Substituted Antenna Gain.
- 4) Final Radiated Spurious Emission = “Read Value” + Measured substitution value.

## 6.11.2. Test Result (Analog)

SAC Transmitter Radiated Emission:

Model Number: AAM28TRN9RA1AN

S/N: 511TRMA4958

SR:02776-RF-00054

Battery Part No: NA

Accy Part No: RMN5127C

Test Mode: TX Analog

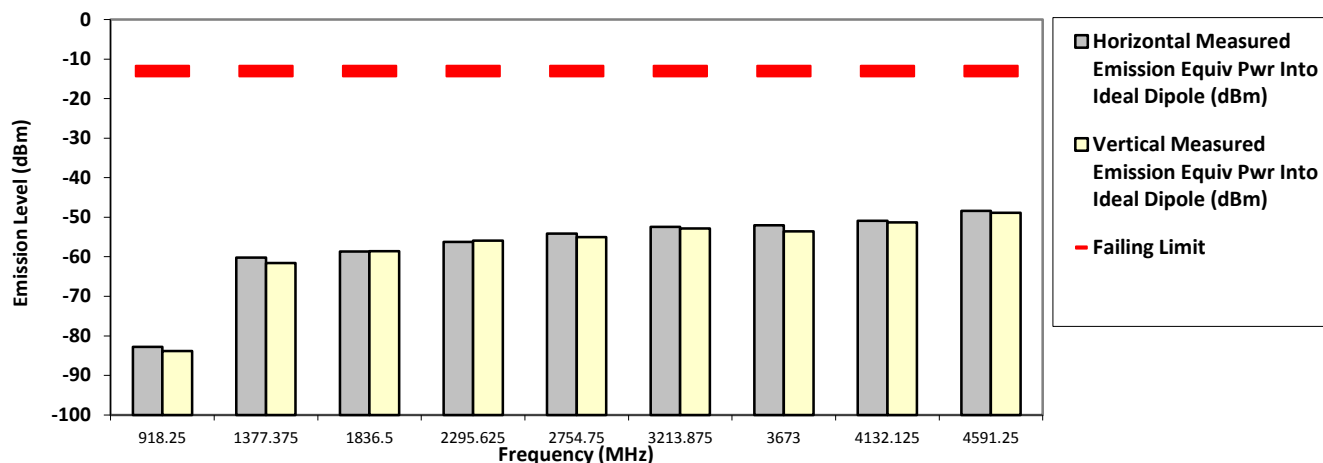
459.125000 MHz

20 kHz

1.000 Watt(s) /Low Power

| Frequency (MHz) | Limit    | Horizontal Measured Emission Equiv Pwr Into Ideal Dipole (dBm) | Vertical Measured Emission Equiv Pwr Into ideal Dipole (dBm) |
|-----------------|----------|----------------------------------------------------------------|--------------------------------------------------------------|
| 918.2500        | -13.0000 | -82.7717 **                                                    | -83.8267 **                                                  |
| 1377.3750       | -13.0000 | -60.2295 **                                                    | -61.5555 **                                                  |
| 1836.5000       | -13.0000 | -58.6534 **                                                    | -58.5600 **                                                  |
| 2295.6250       | -13.0000 | -56.2445 **                                                    | -55.8832 **                                                  |
| 2754.7500       | -13.0000 | -54.1071 **                                                    | -55.0492 **                                                  |
| 3213.8750       | -13.0000 | -52.4718 **                                                    | -52.8400 **                                                  |
| 3673.0000       | -13.0000 | -52.0677 **                                                    | -53.5917 **                                                  |
| 4132.1250       | -13.0000 | -50.8724 **                                                    | -51.2778 **                                                  |
| 4591.2500       | -13.0000 | -48.3992 **                                                    | -48.8499 **                                                  |

### RADIATED SPURIOUS EMISSIONS



The data presented here was taken using the substitution method as found in the TIA/EIA-603D document.

Motorola Penang EMC Lab - Test Performed by: Nazrin&Qawiman

Wed, Jan 18, 2017

FCC Registration: 772092

Industry Canada: 109AK

Remarks: \*\* Indicates the spurious emission could not be detected due to noise limitations or ambient.

\*Pursuant to CFR 47 Part 2.1057 ( c ), emissions attenuated more than 20 dB below the permissible limit are not reported

Temp(Deg): 23.6 Hum(%RH): 71.1

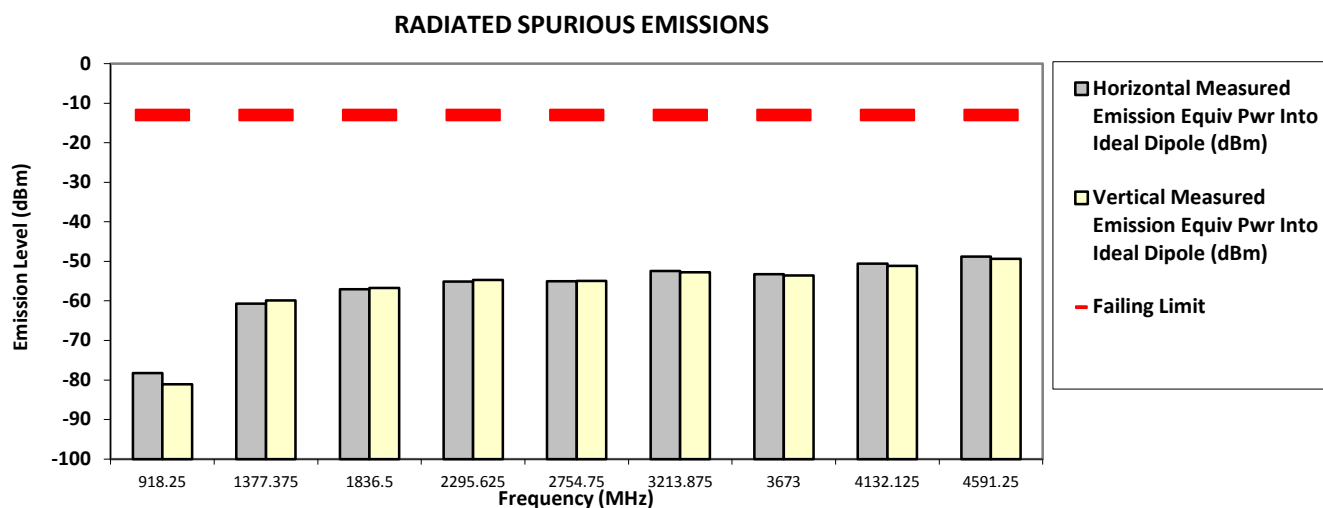
System MU: 5.01 dB

Remarks:

|                |                  |                |
|----------------|------------------|----------------|
| Passed Results | Marginal Results | Failed Results |
|----------------|------------------|----------------|

Model Number: AAM28TRN9RA1AN      SAC Transmitter Radiated Emission:      S/N: 511TRMA4958      SR:02776-RF-00054  
 Battery Part No: NA      Accy Part No: RMN5127C  
 Test Mode: TX Analog  
 459.125000 MHz      20 kHz      48.000 Watt(s) /Max Power

| Frequency (MHz) | Limit    | Horizontal Measured Emission Equiv Pwr Into Ideal Dipole (dBm) | Vertical Measured Emission Equiv Pwr Into ideal Dipole (dBm) |
|-----------------|----------|----------------------------------------------------------------|--------------------------------------------------------------|
| 918.2500        | -13.0000 | -78.2279 **                                                    | -81.1099 **                                                  |
| 1377.3750       | -13.0000 | -60.6929 **                                                    | -59.8883 **                                                  |
| 1836.5000       | -13.0000 | -57.0538 **                                                    | -56.6894 **                                                  |
| 2295.6250       | -13.0000 | -55.0765 **                                                    | -54.6804 **                                                  |
| 2754.7500       | -13.0000 | -55.0135 **                                                    | -54.9455 **                                                  |
| 3213.8750       | -13.0000 | -52.3966 **                                                    | -52.7584 **                                                  |
| 3673.0000       | -13.0000 | -53.2171 **                                                    | -53.5312 **                                                  |
| 4132.1250       | -13.0000 | -50.5609 **                                                    | -51.1653 **                                                  |
| 4591.2500       | -13.0000 | -48.7778 **                                                    | -49.3976 **                                                  |



The data presented here was taken using the substitution method as found in the TIA/EIA-603D document.

Motorola Penang EMC Lab - Test Performed by: Nazrin&Qawiman

Wed, Jan 18, 2017

FCC Registration: 772092

Industry Canada: 109AK

Remarks: \*\* Indicates the spurious emission could not be detected due to noise limitations or ambient.

\*Pursuant to CFR 47 Part 2.1057 ( c ), emissions attenuated more than 20 dB below the permissible limit are not reported  
 Temp(Deg): 23.6 Hum(%RH): 71.1

System MU: 5.01 dB

Remarks:

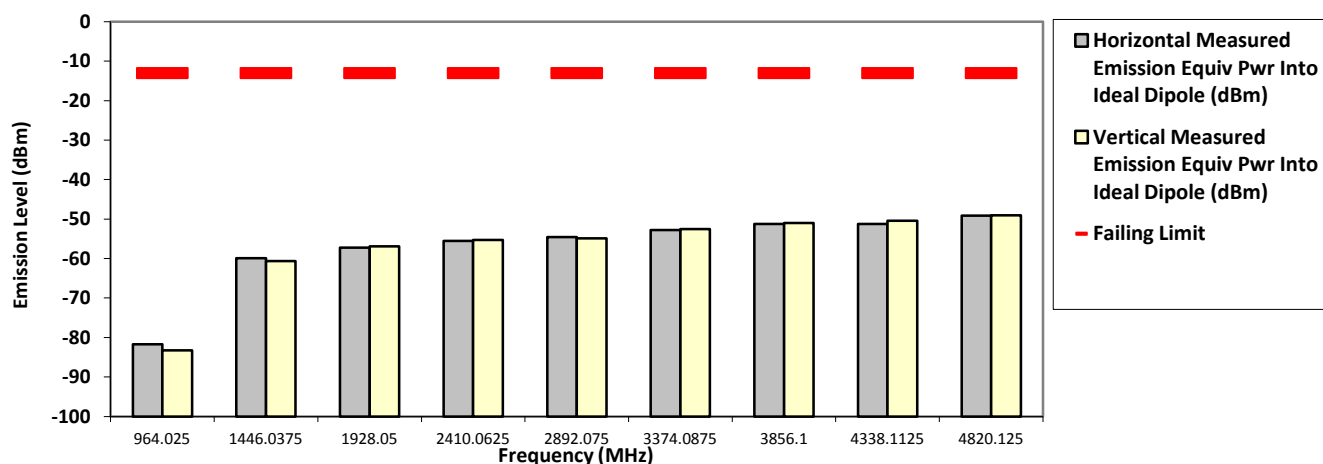
|                |                  |                |
|----------------|------------------|----------------|
| Passed Results | Marginal Results | Failed Results |
|----------------|------------------|----------------|

Model Number: AAM28TRN9RA1AN  
Battery Part No: NA  
SAC Transmitter Radiated Emission:  
S/N: 511TRMA4958  
Accy Part No: RMN5127C  
Test Mode: TX Analog  
482.012500 MHz  
20 kHz  
1.000 Watt(s) /Low Power

SR:02776-RF-00054

| Frequency (MHz) | Limit    | Horizontal Measured Emission Equiv Pwr Into Ideal Dipole (dBm) | Vertical Measured Emission Equiv Pwr Into ideal Dipole (dBm) |
|-----------------|----------|----------------------------------------------------------------|--------------------------------------------------------------|
| 964.0250        | -13.0000 | -81.7476 **                                                    | -83.2814 **                                                  |
| 1446.0375       | -13.0000 | -59.8877 **                                                    | -60.6832 **                                                  |
| 1928.0500       | -13.0000 | -57.2443 **                                                    | -56.9559 **                                                  |
| 2410.0625       | -13.0000 | -55.5638 **                                                    | -55.3328 **                                                  |
| 2892.0750       | -13.0000 | -54.5465 **                                                    | -54.9034 **                                                  |
| 3374.0875       | -13.0000 | -52.8177 **                                                    | -52.5140 **                                                  |
| 3856.1000       | -13.0000 | -51.2812 **                                                    | -51.0053 **                                                  |
| 4338.1125       | -13.0000 | -51.2599 **                                                    | -50.4662 **                                                  |
| 4820.1250       | -13.0000 | -49.0999 **                                                    | -49.0602 **                                                  |

#### RADIATED SPURIOUS EMISSIONS



The data presented here was taken using the substitution method as found in the TIA/EIA-603D document.

Motorola Penang EMC Lab - Test Performed by: Nazrin&Qawiman

Wed, Jan 18, 2017

FCC Registration: 772092

Industry Canada: 109AK

Remarks: \*\* Indicates the spurious emission could not be detected due to noise limitations or ambient.

\*Pursuant to CFR 47 Part 2.1057 ( c ), emissions attenuated more than 20 dB below the permissible limit are not reported  
Temp(Deg): 23.6 Hum(%RH): 71.1

System MU: 5.01 dB

Remarks:

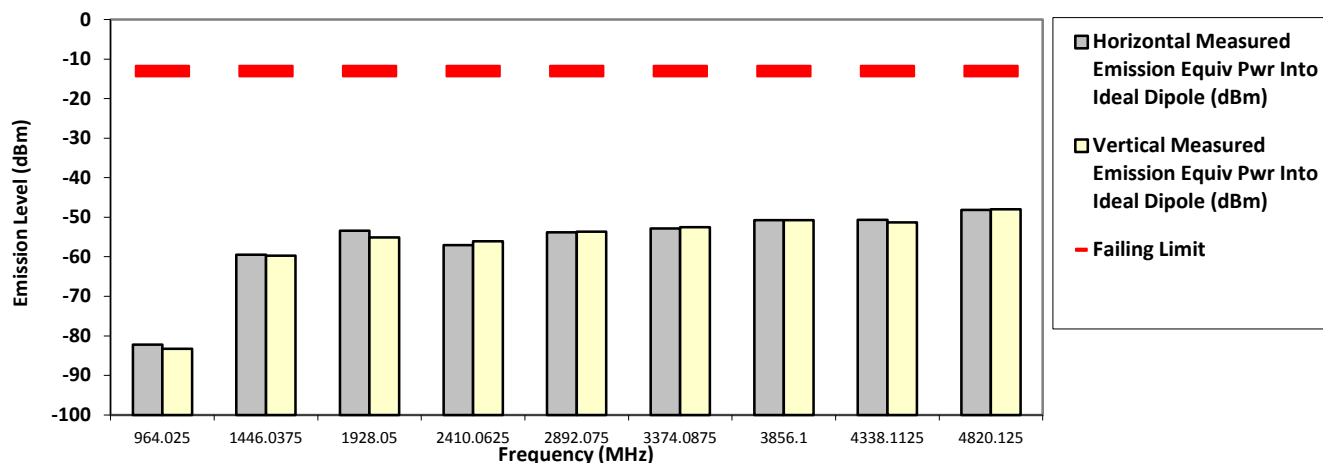
|                |                  |                |
|----------------|------------------|----------------|
| Passed Results | Marginal Results | Failed Results |
|----------------|------------------|----------------|

Model Number: AAM28TRN9RA1AN  
Battery Part No: NA  
SAC Transmitter Radiated Emission:  
S/N: 511TRMA4958  
Accy Part No: RMN5127C  
Test Mode: TX Analog  
482.012500 MHz 20 kHz 48.000 Watt(s) /Max Power

SR:02776-RF-00054

| Frequency (MHz) | Limit    | Horizontal Measured Emission Equiv Pwr Into Ideal Dipole (dBm) | Vertical Measured Emission Equiv Pwr Into ideal Dipole (dBm) |
|-----------------|----------|----------------------------------------------------------------|--------------------------------------------------------------|
| 964.0250        | -13.0000 | -82.2015 **                                                    | -83.2383 **                                                  |
| 1446.0375       | -13.0000 | -59.4808 **                                                    | -59.7022 **                                                  |
| 1928.0500       | -13.0000 | -53.3981 **                                                    | -55.1097 **                                                  |
| 2410.0625       | -13.0000 | -57.0701 **                                                    | -56.0649 **                                                  |
| 2892.0750       | -13.0000 | -53.7979 **                                                    | -53.6333 **                                                  |
| 3374.0875       | -13.0000 | -52.8581 **                                                    | -52.4965 **                                                  |
| 3856.1000       | -13.0000 | -50.7032 **                                                    | -50.6984 **                                                  |
| 4338.1125       | -13.0000 | -50.6743 **                                                    | -51.2859 **                                                  |
| 4820.1250       | -13.0000 | -48.1678 **                                                    | -48.0035 **                                                  |

#### RADIATED SPURIOUS EMISSIONS



The data presented here was taken using the substitution method as found in the TIA/EIA-603D document.

Motorola Penang EMC Lab - Test Performed by: Nazrin&Qawiman

Wed, Jan 18, 2017

FCC Registration: 772092

Industry Canada: 109AK

Remarks: \*\* Indicates the spurious emission could not be detected due to noise limitations or ambient.

\*Pursuant to CFR 47 Part 2.1057 ( c ), emissions attenuated more than 20 dB below the permissible limit are not reported  
Temp(Deg): 23.6 Hum(%RH): 71.1

System MU: 5.01 dB

Remarks:

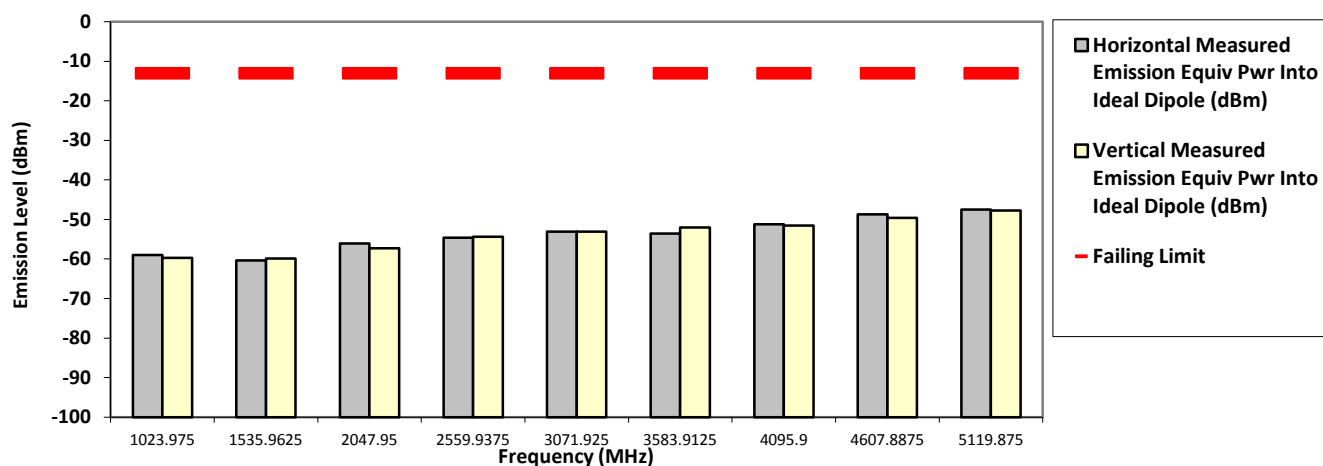
|                |                  |                |
|----------------|------------------|----------------|
| Passed Results | Marginal Results | Failed Results |
|----------------|------------------|----------------|

Model Number: AAM28TRN9RA1AN  
Battery Part No: NA  
SAC Transmitter Radiated Emission:  
S/N: 511TRMA4958  
Accy Part No: RMN5127C  
Test Mode: TX Analog  
511.987500 MHz 20 kHz 1.000 Watt(s) /Low Power

SR:02776-RF-00054

| Frequency (MHz) | Limit    | Horizontal Measured Emission Equiv Pwr Into Ideal Dipole (dBm) | Vertical Measured Emission Equiv Pwr Into ideal Dipole (dBm) |
|-----------------|----------|----------------------------------------------------------------|--------------------------------------------------------------|
| 1023.9750       | -13.0000 | -58.9625 **                                                    | -59.7192 **                                                  |
| 1535.9625       | -13.0000 | -60.3687 **                                                    | -59.8794 **                                                  |
| 2047.9500       | -13.0000 | -56.0398 **                                                    | -57.3119 **                                                  |
| 2559.9375       | -13.0000 | -54.5812 **                                                    | -54.4129 **                                                  |
| 3071.9250       | -13.0000 | -53.0959 **                                                    | -53.0516 **                                                  |
| 3583.9125       | -13.0000 | -53.5457 **                                                    | -52.0463 **                                                  |
| 4095.9000       | -13.0000 | -51.1817 **                                                    | -51.5623 **                                                  |
| 4607.8875       | -13.0000 | -48.7177 **                                                    | -49.5899 **                                                  |
| 5119.8750       | -13.0000 | -47.5258 **                                                    | -47.7014 **                                                  |

#### RADIATED SPURIOUS EMISSIONS



The data presented here was taken using the substitution method as found in the TIA/EIA-603D document.

Motorola Penang EMC Lab - Test Performed by: Nazrin&Qawiman

Wed, Jan 18, 2017

FCC Registration: 772092

Industry Canada: 109AK

Remarks: \*\* Indicates the spurious emission could not be detected due to noise limitations or ambient.

\*Pursuant to CFR 47 Part 2.1057 ( c ), emissions attenuated more than 20 dB below the permissible limit are not reported  
Temp(Deg): 23.6 Hum(%RH): 71.1

System MU: 5.01 dB

Remarks:

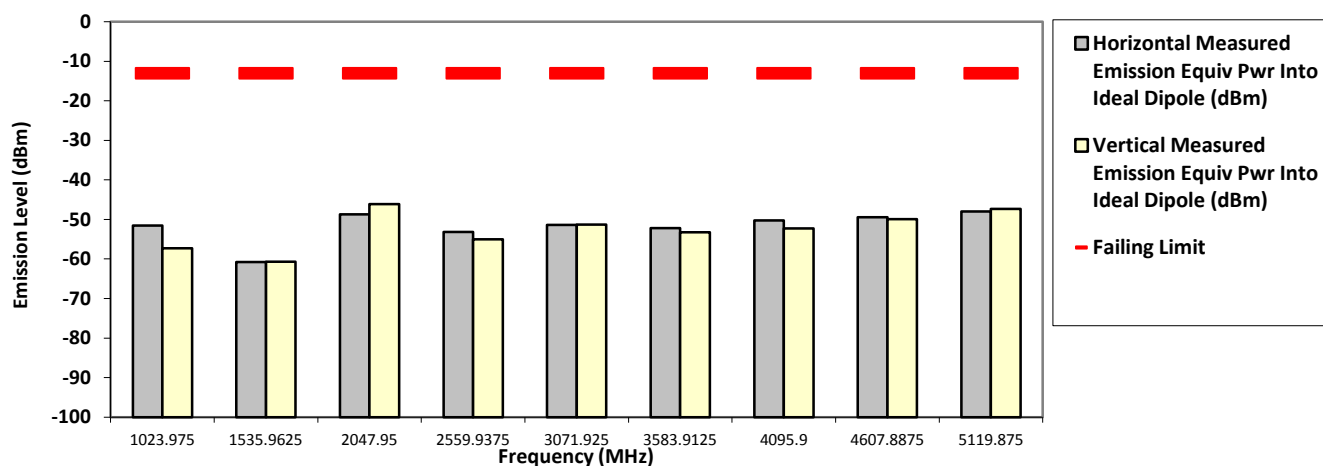
|                |                  |                |
|----------------|------------------|----------------|
| Passed Results | Marginal Results | Failed Results |
|----------------|------------------|----------------|

Model Number: AAM28TRN9RA1AN  
Battery Part No: NA  
SAC Transmitter Radiated Emission:  
S/N: 511TRMA4958  
Accy Part No: RMN5127C  
Test Mode: TX Analog  
511.987500 MHz 20 kHz 48.000 Watt(s) /Max Power

SR:02776-RF-00054

| Frequency (MHz) | Limit    | Horizontal Measured Emission Equiv Pwr Into Ideal Dipole (dBm) | Vertical Measured Emission Equiv Pwr Into ideal Dipole (dBm) |
|-----------------|----------|----------------------------------------------------------------|--------------------------------------------------------------|
| 1023.9750       | -13.0000 | -51.5200 *                                                     | -57.2900 *                                                   |
| 1535.9625       | -13.0000 | -60.7916 **                                                    | -60.6760 **                                                  |
| 2047.9500       | -13.0000 | -48.7400 *                                                     | -46.1100 *                                                   |
| 2559.9375       | -13.0000 | -53.1720 **                                                    | -54.9952 **                                                  |
| 3071.9250       | -13.0000 | -51.4182 **                                                    | -51.3242 **                                                  |
| 3583.9125       | -13.0000 | -52.1540 **                                                    | -53.2760 **                                                  |
| 4095.9000       | -13.0000 | -50.2551 **                                                    | -52.2873 **                                                  |
| 4607.8875       | -13.0000 | -49.4579 **                                                    | -49.9426 **                                                  |
| 5119.8750       | -13.0000 | -47.9488 **                                                    | -47.3400 **                                                  |

#### RADIATED SPURIOUS EMISSIONS



The data presented here was taken using the substitution method as found in the TIA/EIA-603D document.

Motorola Penang EMC Lab - Test Performed by: Nazrin&Qawiman

Wed, Jan 18, 2017

FCC Registration: 772092

Industry Canada: 109AK

Remarks: \*\* Indicates the spurious emission could not be detected due to noise limitations or ambient.

\*Pursuant to CFR 47 Part 2.1057 ( c ), emissions attenuated more than 20 dB below the permissible limit are not reported  
Temp(Deg): 23.6 Hum(%RH): 71.1

System MU: 5.01 dB

Remarks:

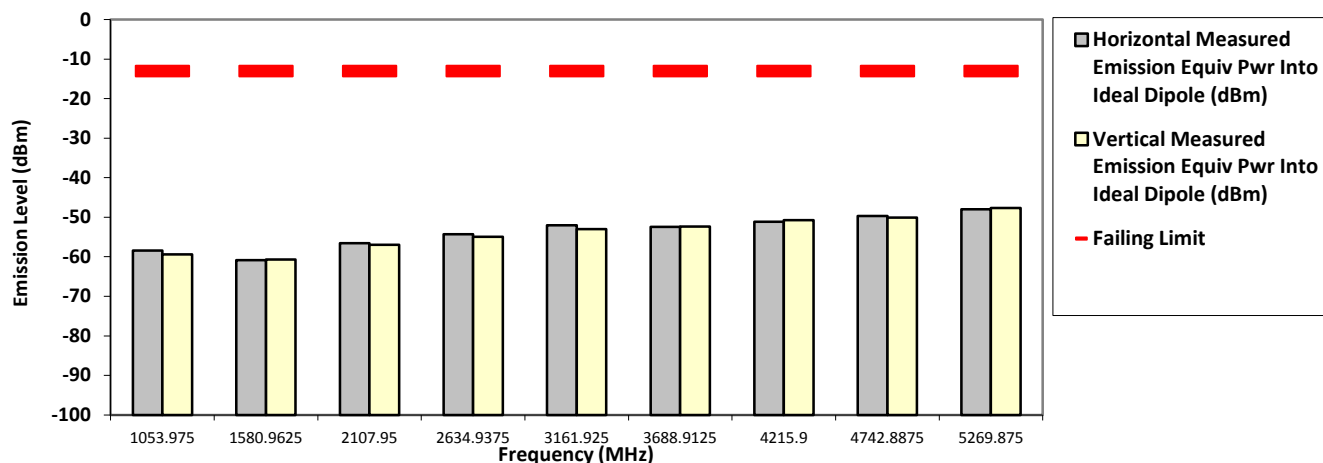
|                |                  |                |
|----------------|------------------|----------------|
| Passed Results | Marginal Results | Failed Results |
|----------------|------------------|----------------|

Model Number: AAM28TRN9RA1AN      SAC Transmitter Radiated Emission: S/N: 511TRMA4958  
Battery Part No: NA      Accy Part No: RMN5127C  
Test Mode: TX Analog  
526.987500 MHz      25 kHz      1.000 Watt(s) /Low Power

SR:02776-RF-00054

| Frequency (MHz) | Limit    | Horizontal Measured Emission Equiv Pwr Into Ideal Dipole (dBm) | Vertical Measured Emission Equiv Pwr Into ideal Dipole (dBm) |
|-----------------|----------|----------------------------------------------------------------|--------------------------------------------------------------|
| 1053.9750       | -13.0000 | -58.4164 **                                                    | -59.3689 **                                                  |
| 1580.9625       | -13.0000 | -60.8871 **                                                    | -60.6601 **                                                  |
| 2107.9500       | -13.0000 | -56.5379 **                                                    | -56.9978 **                                                  |
| 2634.9375       | -13.0000 | -54.2616 **                                                    | -54.9621 **                                                  |
| 3161.9250       | -13.0000 | -51.9906 **                                                    | -53.0172 **                                                  |
| 3688.9125       | -13.0000 | -52.4125 **                                                    | -52.3352 **                                                  |
| 4215.9000       | -13.0000 | -51.1755 **                                                    | -50.7308 **                                                  |
| 4742.8875       | -13.0000 | -49.6869 **                                                    | -50.1242 **                                                  |
| 5269.8750       | -13.0000 | -48.0204 **                                                    | -47.6451 **                                                  |

#### RADIATED SPURIOUS EMISSIONS



The data presented here was taken using the substitution method as found in the TIA/EIA-603D document.

Motorola Penang EMC Lab - Test Performed by: Nazrin&Qawiman

Wed, Jan 18, 2017

FCC Registration: 772092

Industry Canada: 109AK

Remarks: \*\* Indicates the spurious emission could not be detected due to noise limitations or ambient.

\*Pursuant to CFR 47 Part 2.1057 ( c ), emissions attenuated more than 20 dB below the permissible limit are not reported  
Temp(Deg): 23.6 Hum(%RH): 71.1

System MU: 5.01 dB

Remarks:

|                |                  |                |
|----------------|------------------|----------------|
| Passed Results | Marginal Results | Failed Results |
|----------------|------------------|----------------|

NOT FOR FCC REVIEW

### 6.11.3. Test Result (Digital)

SAC Transmitter Radiated Emission:

Model Number: AAM28TRN9RA1AN

S/N: 511TRMA4958

SR:02776-RF-00054

Battery Part No: NA

Accy Part No: RMN5127C

Test Mode: TX Digital

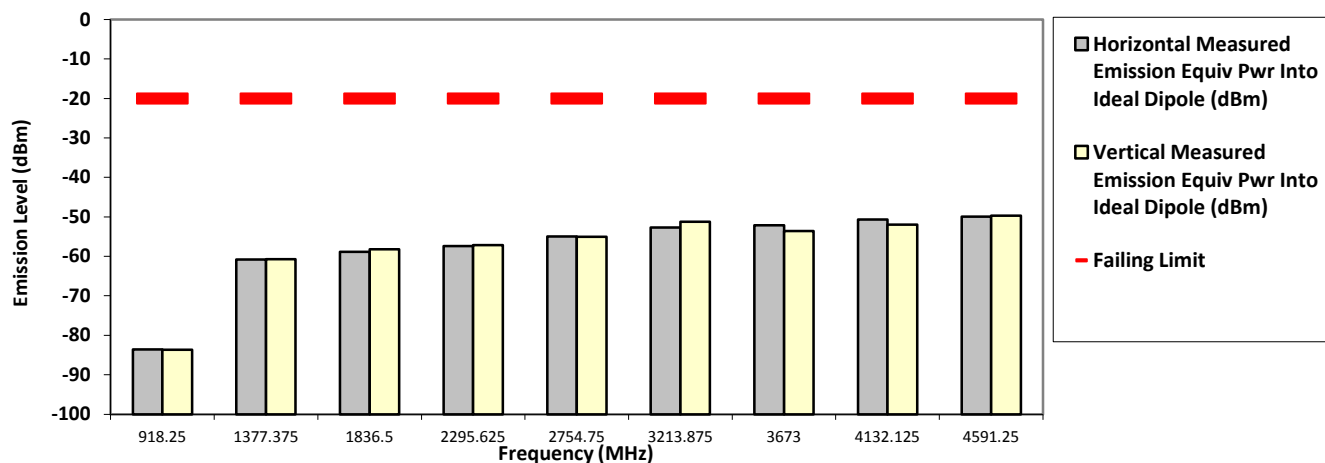
459.125000 MHz

12.5 kHz

1.000 Watt(s) /Low Power

| Frequency (MHz) | Limit    | Horizontal Measured Emission Equiv Pwr Into Ideal Dipole (dBm) | Vertical Measured Emission Equiv Pwr Into ideal Dipole (dBm) |
|-----------------|----------|----------------------------------------------------------------|--------------------------------------------------------------|
| 918.2500        | -20.0000 | -83.6003 **                                                    | -83.6384 **                                                  |
| 1377.3750       | -20.0000 | -60.7929 **                                                    | -60.7072 **                                                  |
| 1836.5000       | -20.0000 | -58.8387 **                                                    | -58.2503 **                                                  |
| 2295.6250       | -20.0000 | -57.4313 **                                                    | -57.1204 **                                                  |
| 2754.7500       | -20.0000 | -55.0011 **                                                    | -55.0696 **                                                  |
| 3213.8750       | -20.0000 | -52.7025 **                                                    | -51.2195 **                                                  |
| 3673.0000       | -20.0000 | -52.1224 **                                                    | -53.6315 **                                                  |
| 4132.1250       | -20.0000 | -50.6677 **                                                    | -52.0129 **                                                  |
| 4591.2500       | -20.0000 | -49.9295 **                                                    | -49.7086 **                                                  |

#### RADIATED SPURIOUS EMISSIONS



The data presented here was taken using the substitution method as found in the TIA/EIA-603D document.

Motorola Penang EMC Lab - Test Performed by: Nazrin&Qawiman

Wed, Jan 18, 2017

FCC Registration: 772092

Industry Canada: 109AK

Remarks: \*\* Indicates the spurious emission could not be detected due to noise limitations or ambient.

\*Pursuant to CFR 47 Part 2.1057 ( c ), emissions attenuated more than 20 dB below the permissible limit are not reported

Temp(Deg): 23.6 Hum(%RH): 71.1

System MU: 5.01 dB

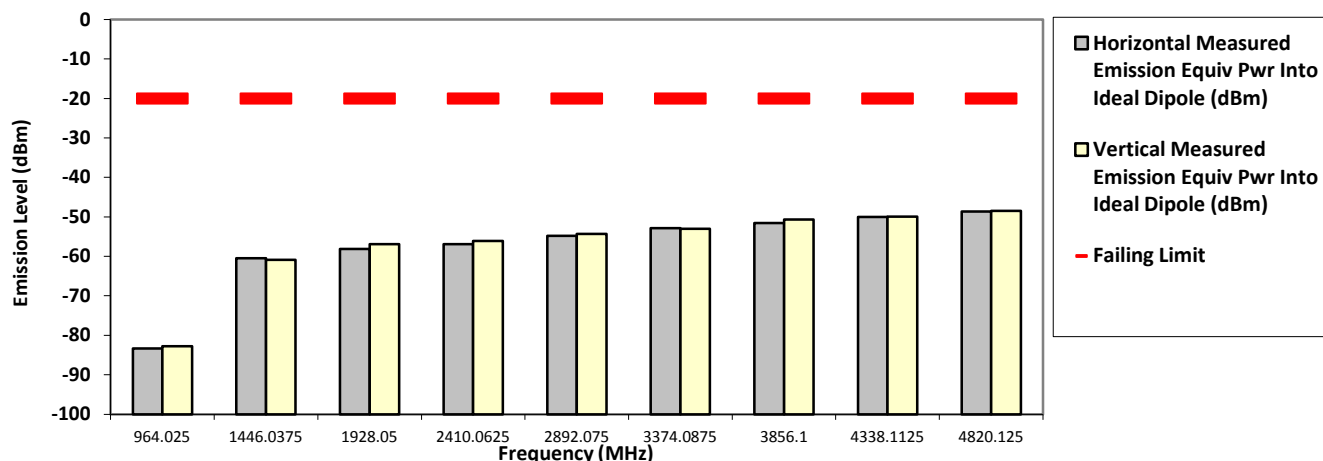
Remarks:

|                |                  |                |
|----------------|------------------|----------------|
| Passed Results | Marginal Results | Failed Results |
|----------------|------------------|----------------|

**SAC Transmitter Radiated Emission:**  
**Model Number:** AAM28TRN9RA1AN **S/N:** 511TRMA4958 **SR:**02776-RF-00054  
**Battery Part No:** NA **Accy Part No:** RMN5127C  
**Test Mode:** TX Digital  
**482.012500 MHz** **12.5 kHz** **1.000 Watt(s) /Low Power**

| Frequency (MHz) | Limit    | Horizontal Measured Emission Equiv Pwr Into Ideal Dipole (dBm) | Vertical Measured Emission Equiv Pwr Into ideal Dipole (dBm) |
|-----------------|----------|----------------------------------------------------------------|--------------------------------------------------------------|
| 964.0250        | -20.0000 | -83.3653 **                                                    | -82.7387 **                                                  |
| 1446.0375       | -20.0000 | -60.4839 **                                                    | -60.9029 **                                                  |
| 1928.0500       | -20.0000 | -58.1466 **                                                    | -56.9227 **                                                  |
| 2410.0625       | -20.0000 | -56.9378 **                                                    | -56.0919 **                                                  |
| 2892.0750       | -20.0000 | -54.8325 **                                                    | -54.3484 **                                                  |
| 3374.0875       | -20.0000 | -52.8657 **                                                    | -53.0308 **                                                  |
| 3856.1000       | -20.0000 | -51.6045 **                                                    | -50.6383 **                                                  |
| 4338.1125       | -20.0000 | -50.0179 **                                                    | -49.9063 **                                                  |
| 4820.1250       | -20.0000 | -48.6562 **                                                    | -48.4569 **                                                  |

#### RADIATED SPURIOUS EMISSIONS



The data presented here was taken using the substitution method as found in the TIA/EIA-603D document.

Motorola Penang EMC Lab - Test Performed by: Nazrin&Qawiman

Wed, Jan 18, 2017

FCC Registration: 772092

Industry Canada: 109AK

Remarks: \*\* Indicates the spurious emission could not be detected due to noise limitations or ambient.

\*Pursuant to CFR 47 Part 2.1057 ( c ), emissions attenuated more than 20 dB below the permissible limit are not reported

Temp(Deg): 23.6 Hum(%RH): 71.1

System MU: 5.01 dB

Remarks:

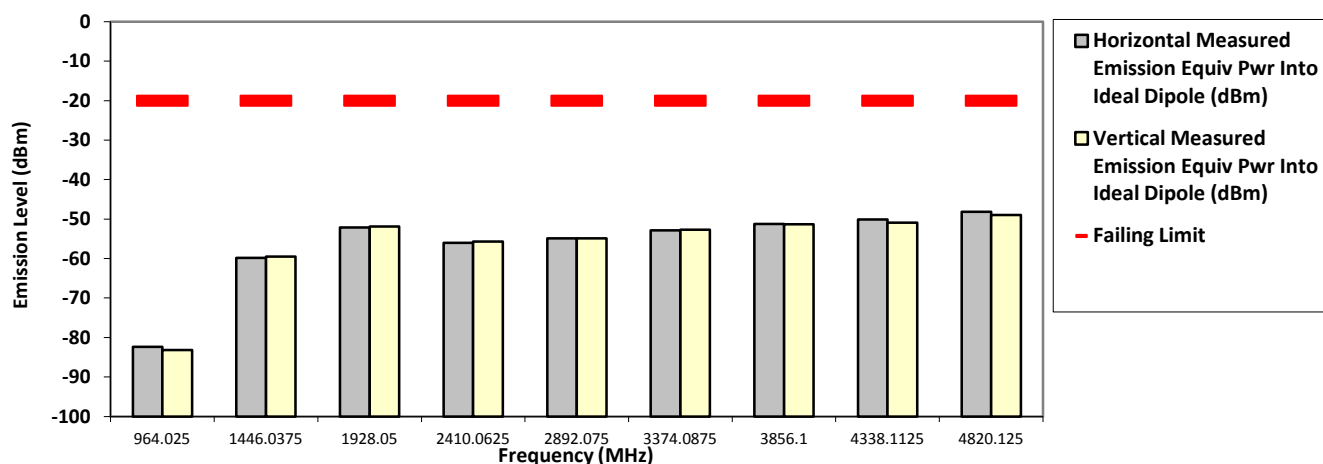
|                |                  |                |
|----------------|------------------|----------------|
| Passed Results | Marginal Results | Failed Results |
|----------------|------------------|----------------|

Model Number: AAM28TRN9RA1AN  
Battery Part No: NA  
SAC Transmitter Radiated Emission:  
S/N: 511TRMA4958  
Accy Part No: RMN5127C  
Test Mode: TX Digital  
482.012500 MHz  
12.5 kHz  
48.000 Watt(s) /Max Power

SR:02776-RF-00054

| Frequency (MHz) | Limit    | Horizontal Measured Emission Equiv Pwr Into Ideal Dipole (dBm) | Vertical Measured Emission Equiv Pwr Into ideal Dipole (dBm) |
|-----------------|----------|----------------------------------------------------------------|--------------------------------------------------------------|
| 964.0250        | -20.0000 | -82.3709 **                                                    | -83.1473 **                                                  |
| 1446.0375       | -20.0000 | -59.8066 **                                                    | -59.5278 **                                                  |
| 1928.0500       | -20.0000 | -52.1700 *                                                     | -51.9200 *                                                   |
| 2410.0625       | -20.0000 | -56.0170 **                                                    | -55.6787 **                                                  |
| 2892.0750       | -20.0000 | -54.8599 **                                                    | -54.8784 **                                                  |
| 3374.0875       | -20.0000 | -52.8543 **                                                    | -52.6951 **                                                  |
| 3856.1000       | -20.0000 | -51.2358 **                                                    | -51.3596 **                                                  |
| 4338.1125       | -20.0000 | -50.1156 **                                                    | -50.9400 **                                                  |
| 4820.1250       | -20.0000 | -48.1563 **                                                    | -48.9941 **                                                  |

#### RADIATED SPURIOUS EMISSIONS



The data presented here was taken using the substitution method as found in the TIA/EIA-603D document.

Motorola Penang EMC Lab - Test Performed by: Nazrin&Qawiman

Wed, Jan 18, 2017

FCC Registration: 772092

Industry Canada: 109AK

Remarks: \*\* Indicates the spurious emission could not be detected due to noise limitations or ambient.

\*Pursuant to CFR 47 Part 2.1057 ( c ), emissions attenuated more than 20 dB below the permissible limit are not reported  
Temp(Deg): 23.6 Hum(%RH): 71.1

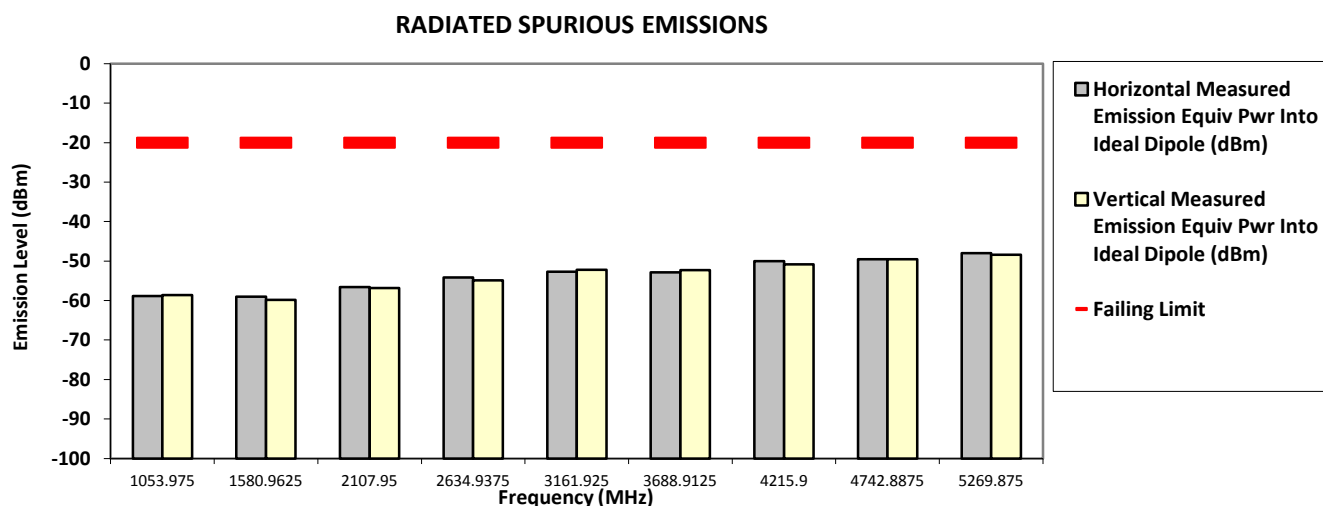
System MU: 5.01 dB

Remarks:

|                |                  |                |
|----------------|------------------|----------------|
| Passed Results | Marginal Results | Failed Results |
|----------------|------------------|----------------|

Model Number: AAM28TRN9RA1AN      SAC Transmitter Radiated Emission: S/N: 511TRMA4958  
Battery Part No: NA      Accy Part No: RMN5127C  
Test Mode: TX Digital  
526.987500 MHz      12.5 kHz      1.000 Watt(s) /Low Power

| Frequency (MHz) | Limit    | Horizontal Measured Emission Equiv Pwr Into Ideal Dipole (dBm) | Vertical Measured Emission Equiv Pwr Into ideal Dipole (dBm) |
|-----------------|----------|----------------------------------------------------------------|--------------------------------------------------------------|
| 1053.9750       | -20.0000 | -58.8918 **                                                    | -58.6424 **                                                  |
| 1580.9625       | -20.0000 | -59.0407 **                                                    | -59.8079 **                                                  |
| 2107.9500       | -20.0000 | -56.6053 **                                                    | -56.8687 **                                                  |
| 2634.9375       | -20.0000 | -54.1716 **                                                    | -54.9006 **                                                  |
| 3161.9250       | -20.0000 | -52.6702 **                                                    | -52.2037 **                                                  |
| 3688.9125       | -20.0000 | -52.8516 **                                                    | -52.3297 **                                                  |
| 4215.9000       | -20.0000 | -50.0416 **                                                    | -50.8788 **                                                  |
| 4742.8875       | -20.0000 | -49.5778 **                                                    | -49.5602 **                                                  |
| 5269.8750       | -20.0000 | -48.0109 **                                                    | -48.4156 **                                                  |



The data presented here was taken using the substitution method as found in the TIA/EIA-603D document.

Motorola Penang EMC Lab - Test Performed by: Nazrin&Qawiman

Wed, Jan 18, 2017

FCC Registration: 772092

Industry Canada: 109AK

Remarks: \*\* Indicates the spurious emission could not be detected due to noise limitations or ambient.

\*Pursuant to CFR 47 Part 2.1057 ( c ), emissions attenuated more than 20 dB below the permissible limit are not reported  
Temp(Deg): 23.6 Hum(%RH): 71.1

System MU: 5.01 dB

Remarks:

|                |                  |                |
|----------------|------------------|----------------|
| Passed Results | Marginal Results | Failed Results |
|----------------|------------------|----------------|

**NOT FOR FCC REVIEW**

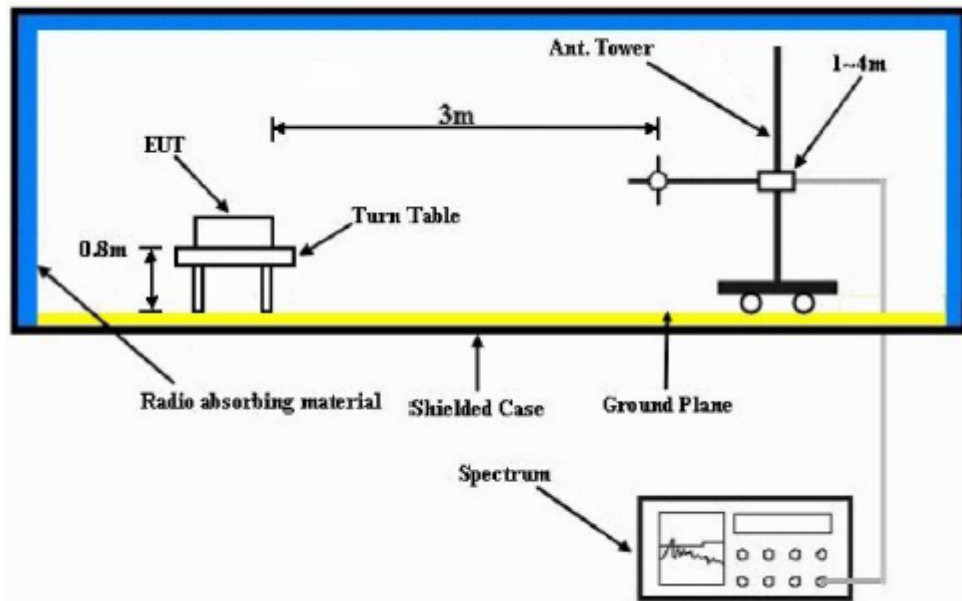
#### 6.11.4. Test Limit

Table below summarized the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least

| Channel Spacing | Part 22                                 | Part 24D                                | Part 74                                 | Part 80                                 | Part 90                                 |
|-----------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|
| 12.5kHz         | 43 + log <sub>10</sub> (P)<br>(-13 dBm) | 43 + log <sub>10</sub> (P)<br>(-13 dBm) | 43 + log <sub>10</sub> (P)<br>(-13 dBm) | Not Applicable                          | 50 + log <sub>10</sub> (P)<br>(-20 dBm) |
| 25kHz           |                                         | Not Applicable                          |                                         | 43 + log <sub>10</sub> (P)<br>(-13 dBm) | Not Applicable                          |

## 6.12. Effective Radiated Power (ERP) / GNSS (EIRP for 1559 - 1610MHz)

### 6.12.1. Test Setup



- 1) The spectrum setting for Equivalent Isotropically Radiated Power (EIRP) is RBW = 100 kHz, VBW = 300 kHz. Detector Mode is RMS.
- 2) In the semi-anechoic chamber, setup as illustrated above the EUT placed on the 0.8m height of Turn Table, rotated the table 45 degree each interval to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power for each degree interval. The “Read Value” is the spectrum reading of maximum power value.
- 3) The substitution antenna is substituted for EUT at the same position and signals generator (S.G) export the CW signal to the substitution antenna via a TX cable. The receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum radiation power. Record the power level of maximum radiation power from spectrum. So, the Measured substitution value = Ref level of S.G + TX cables loss – Substituted Antenna Gain.
- 4)  $EIRP = \text{“Read Value”} + \text{Measured substitution value} + 2.15$ .

### 6.12.2. Test Result **Not Applicable**

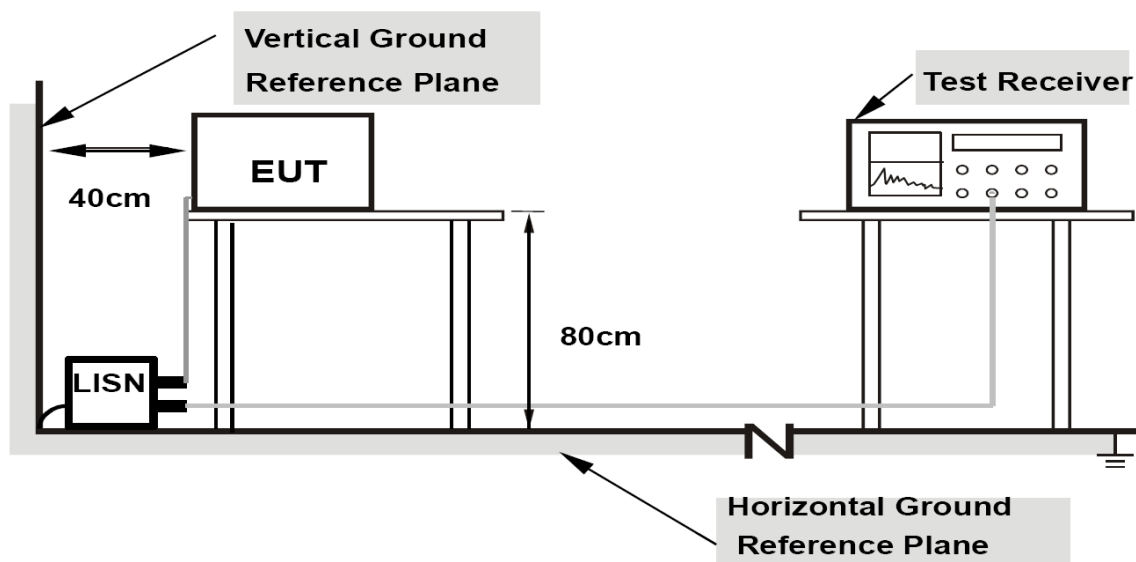
### 6.12.3. Test Limit

The maximum output power of the transmitter for mobile stations is 100 watts (20 dBW). Power is given in terms of effective radiated power (ERP).

For operations in the 758-775 MHz and 788-805 MHz bands, all emissions including harmonics in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth.

## 6.13. AC Power Line Conducted Spur Emissions

### 6.13.1. 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 / 50  $\mu$ H 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 30 MHz was measured.

### 6.13.2. Test Result **Not Applicable**

### 6.13.3. Test Limit

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. |                        |         |

#### 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. |                        |          |