



Valued Quality. Delivered.

Motorola Solutions, Inc

Application
For
FCC Part 95 - Certification

Two Ways Radio of GMRS, FRS, Weather Band receiver and FM receiver

(FCC ID: AZ489FT4925)

This report supersedes previous report with report number(s) 15050487HKG-001 dated June 01, 2015.

15050487HKG-001R1

MN/ cl

June 10, 2015

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INTERTEK TESTING SERVICES

MEASUREMENT/TECHNICAL REPORT

Applicant : Motorola Solutions, Inc
Trade Name/Model No : Motorola / T480
Date : June 10, 2015

This report concerns (check one:) Original Grant Class II Change

Equipment Type: FRF – Part 95 Family Radio Face Held Transmitter
CXX - Communications Rcvr for use w/ licensed Tx and CBs

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? Yes No
If yes, defer until: _____
date

Company Name agrees to notify the Commission by: _____
date

of the intended date of announcement of the product so that the grant can be issued on that date.

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EXHIBIT 1

GENERAL DESCRIPTION

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1.0 General Description

1.1 Product Description

The Equipment Under Test (EUT) is a Two Ways Radio with GMRS and FRS, Weather Band and FM receiver. GMRS and FRS operate between 462.5500MHz and 467.7125MHz. Weather band receiver operates between 161.650MHz and 162.550MHz. FM receiver operates between 87.5-108MHz.

The Channel 1 - 7 are shared channels for GMRS and FRS. Channel 4 is the representable channel to the test.

The EUT is powered by 3.6V (1 x 3.6V "Ni-MH" type rechargeable battery) or 4.5V (3 x "AA" size 1.5V alkaline batteries).

Transmitter Portion

- (i) Type of Emission with filtering : GMRS: 5K64F3E with filtering; FRS: 5K64F3E
- (ii) Frequency Range : GMRS/FRS: 462.5625MHz to 462.7125MHz
FRS: 467.5625MHz to 467.7125MHz
GMRS: 462.5500MHz to 462.7250MHz
Channel 1,2,3,4,5,6&7 are common channels for GMRS&FRS
- (iii) Maximum Power Rating : GMRS: 1.39W ERP; FRS: 0.37W ERP
- (iv) Antenna Type : Integral, vertically polarized with 2.17dBi antenna gain
- (iv) dc voltage of radio frequency amplifying device: 4.5V
dc current of radio frequency amplifying device : 1100mA

Channel	Frequency	Description	Channel	Frequency	Description
1	462.5625 MHz	GMRS/FRS	12	467.6625 MHz	FRS
2	462.5875 MHz	GMRS/FRS	13	467.6875 MHz	FRS
3	462.6125 MHz	GMRS/FRS	14	467.7125 MHz	FRS
4	462.6375 MHz	GMRS/FRS	15	462.5500 MHz	GMRS
5	462.6625 MHz	GMRS/FRS	16	462.5750 MHz	GMRS
6	462.6875 MHz	GMRS/FRS	17	462.6000 MHz	GMRS
7	462.7125 MHz	GMRS/FRS	18	462.6250 MHz	GMRS
8	467.5625 MHz	FRS	19	462.6500 MHz	GMRS
9	467.5875 MHz	FRS	20	462.6750 MHz	GMRS
10	467.6125 MHz	FRS	21	462.7000 MHz	GMRS
11	467.6375 MHz	FRS	22	462.7250 MHz	GMRS

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1.2 Related Submittal(s) Grants

This is an Application for Certification of the transmitter portion of a GMRS + FRS Transceiver and weather band receiver. The receiver section of this Transceiver and digital device portion is subject to verification process.

1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.4 (2009) and ANSI/TIA-603-C-2004. Conducted emission measurement were performed according to the procedures in ANSI C63.4 (2009). All radiated measurements were performed in 3m Chamber. All Radiated tests were performed at an antenna the EUT distance of 3 meters, unless stated otherwise in the “**Justification Section**” of this Application.

1.4 Test Facility

The 3m Chamber (FCC Site registration number : 435539) and conducted measurement facility used to collect the radiated data is located at Workshop No. 3, G/F., World-Wide Industrial Centre, 43-47 Shan Mei Street, Fo Tan, Sha Tin, N.T., Hong Kong. This test facility and site measurement data have been placed on file with the FCC.

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EXHIBIT 2

SYSTEM TEST CONFIGURATION

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2.0 System Test Configuration

2.1 Justification

The device was configured for testing in a typical fashion (as a customer would normally use it). The device was placed on a turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes. The device has been tested with headset and without headset when the radiated emissions are measured.

The device was powered by 3 x AA Size New Alkaline Battery / 3.6V Fully Charged rechargeable battery.

The frequency range of transmitter from 30MHz to 10th harmonics was searched for spurious emissions from the device. The frequency range of weather band receiver from 30MHz to 2GHz was searched for spurious emissions from the device. Only those emissions reported were detected. All other emissions were at least 20 dB below the applicable limits.

For transmitter radiated spurious measurement, the spectrum analyzer resolution bandwidth was 10kHz for emissions below 1GHz, and 1MHz for emissions above 1GHz. Video bandwidth was 300kHz for emissions below 1GHz, and 3MHz for emissions above 1GHz. For receiver radiated spurious measurement, the spectrum analyzer resolution bandwidth was 100kHz for emission below 1GHz, and 1MHz for emissions above 1GHz. Video bandwidth was 3 times greater than resolution bandwidth.

All power-up methods were tested and the worst-case data were reported.

The following are all the test modes (only the worst-case was reported):

GMRS, Tx without headset

GMRS, Tx with headset

FRS (same as the all above cases)

Weather band receiver, without headset

Weather band receiver, with headset

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2.2 EUT Exercising Software

There was no special software to exercise the device. Once the PTT button was pushed, a signal was transmitted.

2.3 Special Accessories

No special accessory is needed for compliance of this device.

2.4 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

Uncertainty and Compliance - Unless the standard specifically states that measured values are to be extended by the measurement uncertainty in determining compliance, all compliance determinations are based on the actual measured value.

2.5 Equipment Modification

No modifications by Motorola Solutions, Inc will be incorporated in each production model sold/leased in the United States.

2.6 Support Equipment

A headset with 1.2m unshielded cable.

An adaptor with micro-usb port, input: 100-240VAC 0.15A to 5VDC 500mA, Model no: FMP5541A

The EUT has been tested in accordance with the standards identified in this test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report. All instrumentations and accessories used to verify the EUT for compliance to the indicated standards are calibrated in accordance with ISO 17025:2005 requirements.

Testing was performed at Intertek Testing Services Hong Kong Ltd. Where meets the FCC listed site for certification application requirements stated in FCC Part 2 Section 2.948.

I attest that the necessary measurements were made under my supervision.

Attested by

*Intertek Testing Services Hong Kong Ltd.
Agent for Motorola Solutions, Inc*

Tested and Prepared by:

Approved by:

*Koo Wai Ip
Assistant Supervisor*

*Nip Ming Fung, Melvin
Assistant Manager
melvin.mf.nip@intertek.com*

June 10, 2015 Date

EXHIBIT 3

RF POWER OUTPUT

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3.0 RF Power Output (Section 2.1046(a), 95.639(a), 95.639(d))

Testing Procedure

1. On a test site, the EUT shall be placed at 0.8m height on a wooden turntable, and in the position closest to normal use as declared by the applicant.
2. The test antenna shall be oriented initially for vertical polarisation located 3m from EUT to correspond to the frequency of the transmitter.
3. The output of the test antenna shall be connected to the measuring receiver and the peak detector is used for the measurement.
4. The transmitter shall be switched on, if possible, without modulation and the measuring receiver shall be tuned to the frequency of the transmitter under test.
5. The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.

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6. The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
7. The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
8. The maximum signal level detected by the measuring receiver shall be noted.
9. The transmitter shall be replaced by a tuned dipole (substitution antenna).
10. The substitution antenna shall be orientated for vertical polarisation and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
11. The substitution antenna shall be connected to a calibrated signal generator.
12. If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
13. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
14. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
15. The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
16. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarisation.
17. The measure of the effective radiated power is the larger of the two levels recorded, at the input to the substitution antenna, corrected for gain of the substitution antenna if necessary.

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Table 1

**Motorola Solutions, Inc
T480**

Transmission Power

Channel	Frequency (MHz)	Effective Radiated Power		FCC 95.639 Limit (W)	Margin (W)
		(dBm)	(W)		
1	462.5625	31.4	1.39	5.00	-3.61
2	462.5875	31.4	1.39	5.00	-3.61
3	462.6125	31.4	1.39	5.00	-3.61
4	462.6375	31.4	1.39	5.00	-3.61
5	462.6625	31.4	1.39	5.00	-3.61
6	462.6875	31.4	1.39	5.00	-3.61
7	462.7125	31.4	1.39	5.00	-3.61
8	467.5625	25.7	0.37	0.50	-0.13
9	467.5875	25.7	0.37	0.50	-0.13
10	467.6125	25.7	0.37	0.50	-0.13
11	467.6375	25.7	0.37	0.50	-0.13
12	467.6625	25.7	0.37	0.50	-0.13
13	467.6875	25.7	0.37	0.50	-0.13
14	467.7125	25.7	0.37	0.50	-0.13
15	462.5500	31.4	1.39	5.00	-3.61
16	462.5750	31.4	1.39	5.00	-3.61
17	462.6000	31.4	1.39	5.00	-3.61
18	462.6250	31.4	1.39	5.00	-3.61
19	462.6500	31.4	1.39	5.00	-3.61
20	462.6750	31.4	1.39	5.00	-3.61
21	462.7000	31.4	1.39	5.00	-3.61
22	462.7250	31.4	1.39	5.00	-3.61

- Notes: 1) Negative sign in the margin column shows the value below limits.
2) Channel 1 - 7 are the shared channels for GMRS and FRS, data shown above is for GMRS. FRS data of Channel 1-7 are same as Channel 8-14.
3) FRS channels meet the power requirement of 0.5W ERP.

Verdict: Pass

Test Engineer: Koo Wai Ip

Date of Test: May 30,2015

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EXHIBIT 4

MODULATION CHARACTERISTICS

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4.0 Modulation Characteristics (Section 2.1047(a)(b), 95.637(a))

In order to satisfy the 95.637(a) and 2.1047(b) requirements, Modulation Frequency Response and Modulation Limiting Characteristics are attached in Exhibit 4.1 & 4.2.

In order to satisfy the 2.1047(a) requirement, Audio Low Pass Filter Response is attached in Exhibit 4.3.

The modulation frequency response curve and modulation limiting characteristic curve are saving in following page.

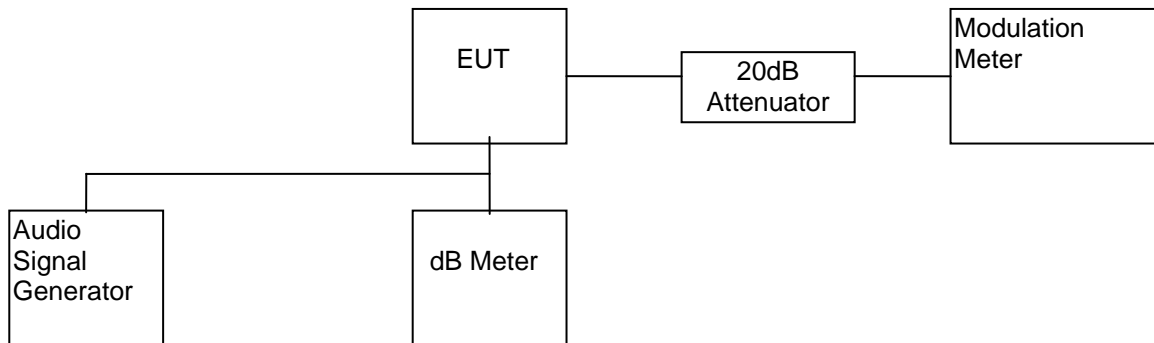
The audio low pass frequency response curve is saving in following page.

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4.1 Modulation Frequency Response (Section 2.1047(a), 95.637(a))

Testing Procedure

- 1) Set-up the test equipment in the following configuration:



- 2) Set the audio signal generator frequency to the sound pressure level 127.0dB SPL at the microphone of the EUT.
- 3) The frequency of the audio signal generator is changed from 100Hz to 5kHz.
- 4) Record the frequency deviation.
- 5) The peak frequency deviation must not exceed:

GMRS + FRS : $\pm 2.5\text{kHz}$

- 6) Calculate the audio frequency response at each frequency as:

$$\text{response} = 20 \log_{10}(\text{DEV}_{\text{FREQ}} / \text{DEV}_{\text{REF}});$$

DEV_{REF} = Frequency deviation at 1000Hz ;

DEV_{FREQ} = Frequency deviation at 100 - 5000Hz ;

- 7) From the plot, audio frequency response rolls off before 3.125kHz.

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C. Test Result

Table 2

**Motorola Solutions, Inc
T480**

Modulation Frequency Response

Test Channel : 4
Input level = 127.0dBSPL

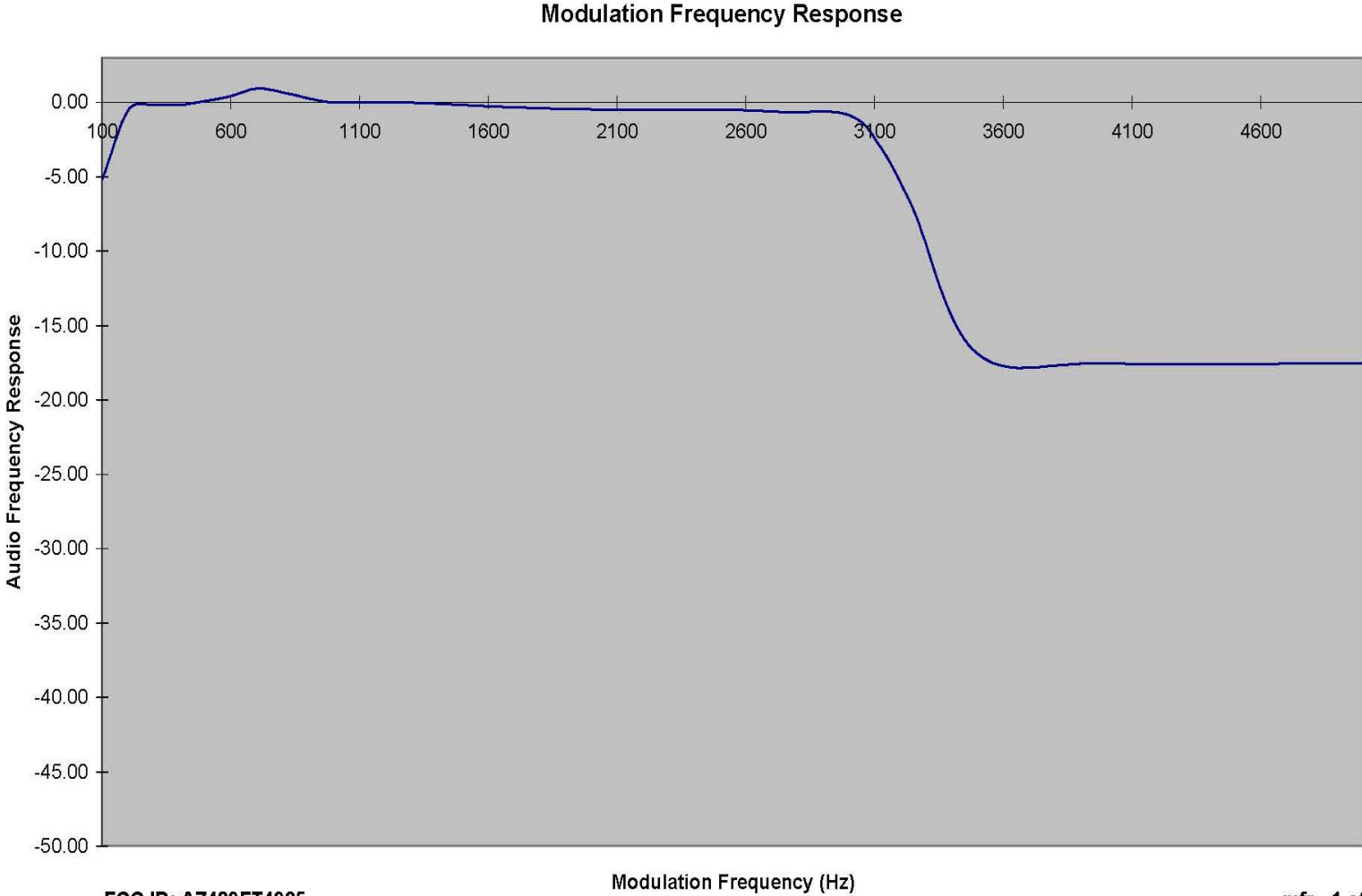
Modulation Frequency(Hz)	Frequency Deviation(kHz)	Audio Frequency Response (dB)
100	1.080	-5.18
200	1.840	-0.55
300	1.920	-0.18
400	1.920	-0.18
500	1.980	0.09
600	2.060	0.43
700	2.180	0.92
800	2.120	0.68
900	2.020	0.26
1000	1.960	0.00
1250	1.960	0.00
1500	1.920	-0.18
1750	1.880	-0.36
2000	1.860	-0.45
2250	1.860	-0.45
2500	1.860	-0.45
2750	1.820	-0.64
3000	1.780	-0.84
3125	1.380	-3.05
3250	0.860	-7.16
3500	0.280	-16.90
4000	0.260	-17.55
5000	0.260	-17.55

Verdict: Pass

Test Engineer: Koo Wai Ip

Date of Test: May 12,2015

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FCC ID: AZ489FT4925

Modulation Frequency (Hz)

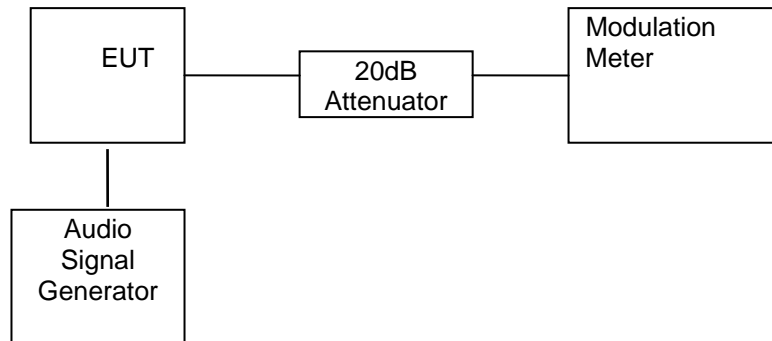
mfr - 1 of 1

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4.2 Modulation Limiting Characteristics (Section 2.1047(b), 95.637(a))

Testing Procedure

- 1) Set-up the test equipment in the following configuration:



- 2) Set the frequency of the audio signal generator to 500Hz and adjust the level from 47dB SPL to 137dB SPL.
- 3) Record the maximum value of plus or minus peak frequency deviation.
- 4) Repeat the above procedure with frequency 1000Hz, 2500Hz & 3125Hz.
- 5) The peak frequency deviation must not exceed:

GMRS + FRS : ± 2.5 kHz

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C. Test Result

Table 3

**Motorola Solutions, Inc
T480**

Modulation Limiting Characteristics

Test Channel : 4

Modulation Input (dB SPL)	Peak Frequency Deviation (kHz) at 500Hz	Peak Frequency Deviation (kHz) at 1000Hz	Peak Frequency Deviation (kHz) at 2500Hz	Peak Frequency Deviation (kHz) at 3125Hz
47	0.400	0.400	0.420	0.420
57	0.420	0.420	0.440	0.480
67	0.420	0.480	0.480	0.680
77	0.480	0.660	0.680	0.780
87	0.980	1.700	1.780	0.860
97	1.740	1.720	1.780	1.220
107	1.780	1.720	1.880	1.380
117	1.900	1.880	1.860	1.390
127	1.980	1.960	1.860	1.380
137	1.980	1.960	1.860	1.380

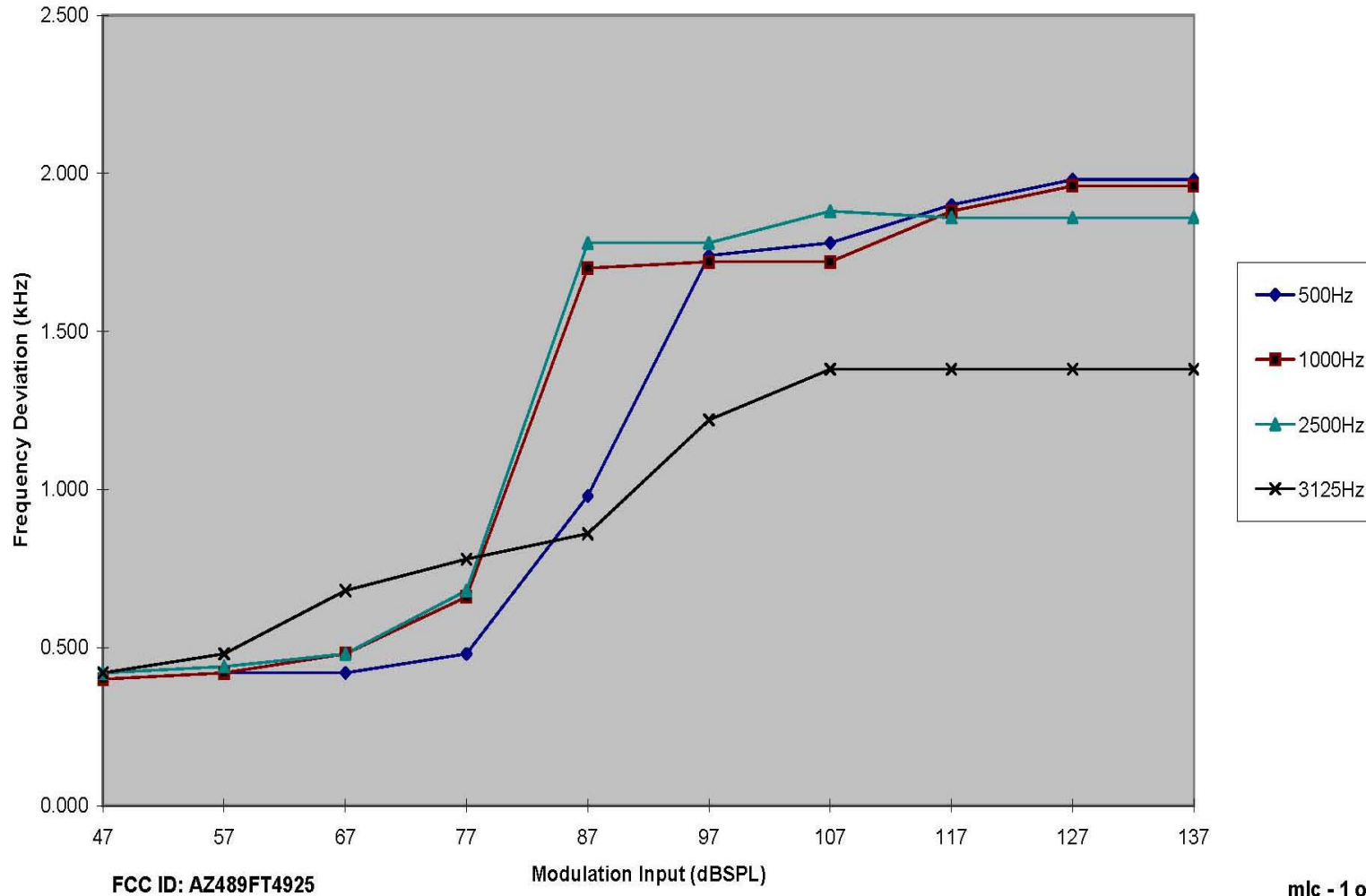
Verdict: Pass

Test Engineer: Koo Wai Ip

Date of Test: May 12,2015

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Modulation Limiting Characteristic



FCC ID: AZ489FT4925

Modulation Input (dB SPL)

mlc - 1 of 1

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4.3 Audio Low Pass Filter Response (Section 2.1047(a), 95.637(b))

Testing Procedure

- 1) Connect the audio signal generator to the input of the post limiter low pass filter and the dB meter to the output of the post limiter low pass filter.
- 2) Apply a 1000 Hz tone from the audio signal generator and adjust the level per manufacturer's specifications. Record the dB level of the 1000 Hz tone as LEV_{REF} .
- 3) Set the audio signal generator to the desired test frequency between 3000 Hz and the upper low pass filter limit. Record the dB level at the test frequency as LEV_{FREQ} .
- 4) Calculate the audio frequency response at the test frequency as:

$$\text{low pass filter response} = LEV_{FREQ} - LEV_{REF}$$

- 5) Repeat the above procedure for all the desired test frequencies.

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C. Test Result

Table 4

**Motorola Solutions, Inc
T480**

Low-Pass Filter Response

Test Channel : 4

Audio Input Strength = 2200mVrms

Frequency (kHz)	dB relative to 1 kHz	Part 95.637(b)
1	0.0	0.0
3	-10.0	0.0
4	-58.5	-7.5
5	-60.0	-13.3
6	-60.0	-18.1
8	-60.0	-25.6
10	-60.0	-31.4
15	-60.0	-41.9
20	-60.0	-50.0
30	-60.0	-50.0
40	-60.0	-50.0
50	-60.0	-50.0
60	-60.0	-50.0
70	-60.0	-50.0
80	-60.0	-50.0
90	-60.0	-50.0
100	-60.0	-50.0

Audio Output at 1kHz: 15.0dBV

Verdict: Pass

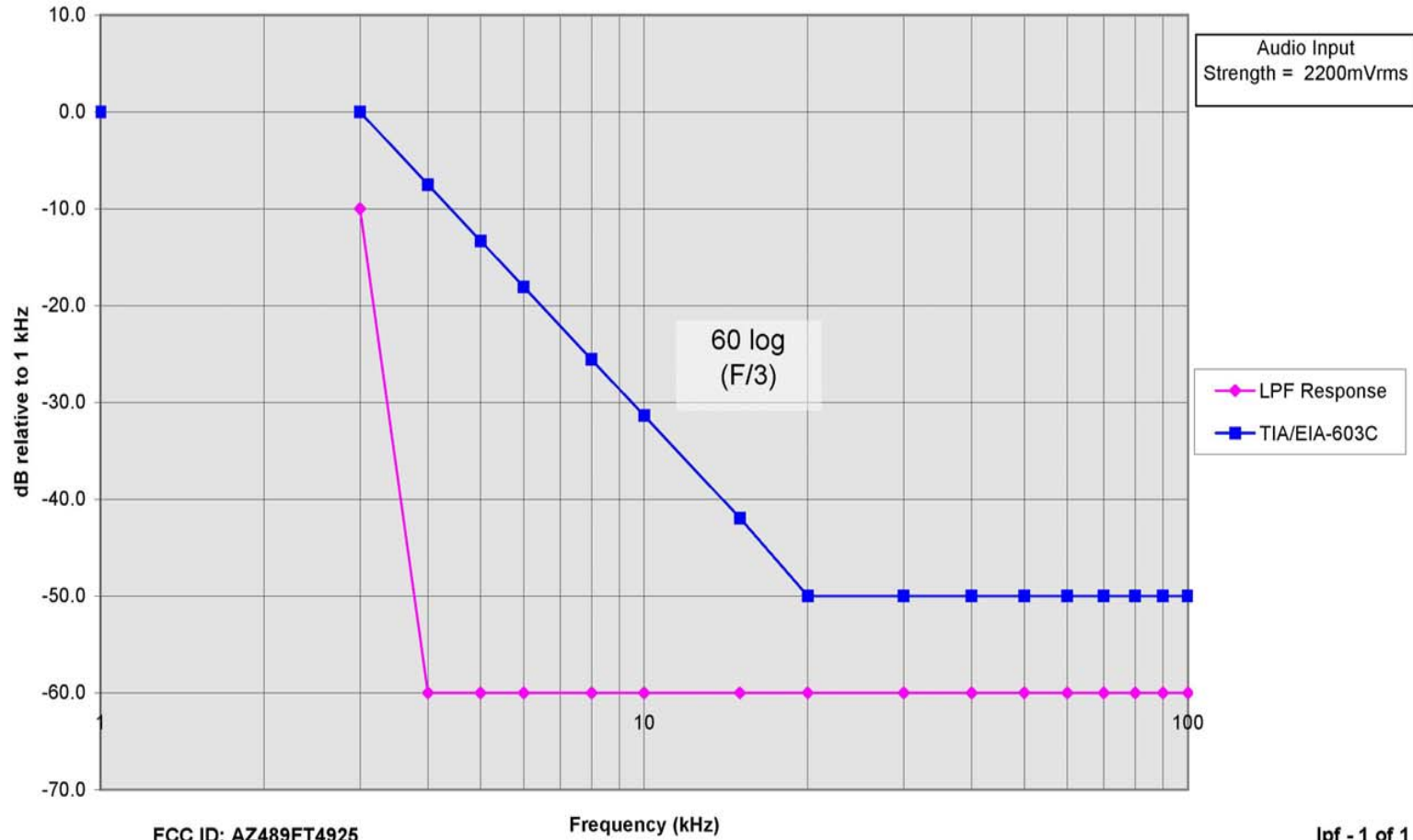
Test Engineer: Koo Wai Ip

Date of Test: May 12,2015

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Audio Low Pass Filter Response



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EXHIBIT 5

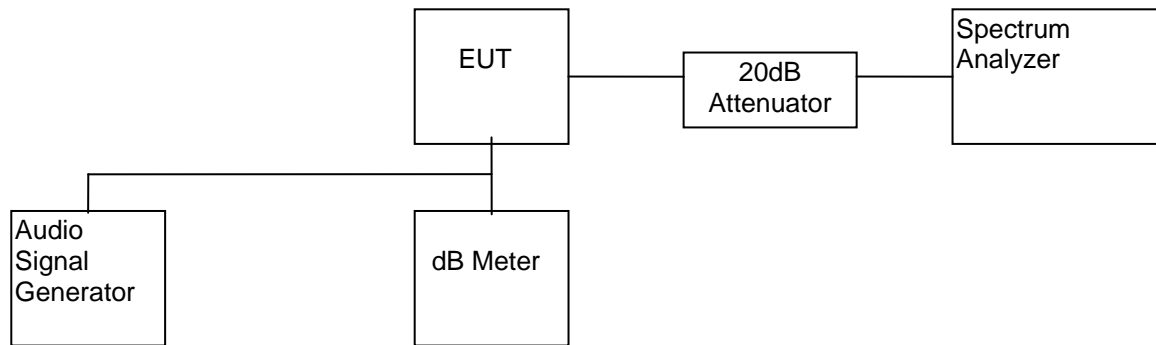
OCCUPIED BANDWIDTH

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5.0 Occupied Bandwidth (Section 2.1049, 95.633(c))

Testing Procedure

- 1) Set-up the test equipment in the following configuration:



- 2) Set the level of audio signal generator to obtain 16 dB greater than required for 50% modulation.
- 3) The occupied bandwidth is measured with the spectrum analyzer set at 2kHz/div scan and 10dB/div.

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C. Test Result

Table 5

**Motorola Solutions, Inc
T480**

System	Channel	Measured Bandwidth (kHz)	Limit (kHz)
GMRS	4	5.64	≤20
FRS	11	5.64	≤12.5

Verdict: Pass

The bandwidth plot is saving in following page.

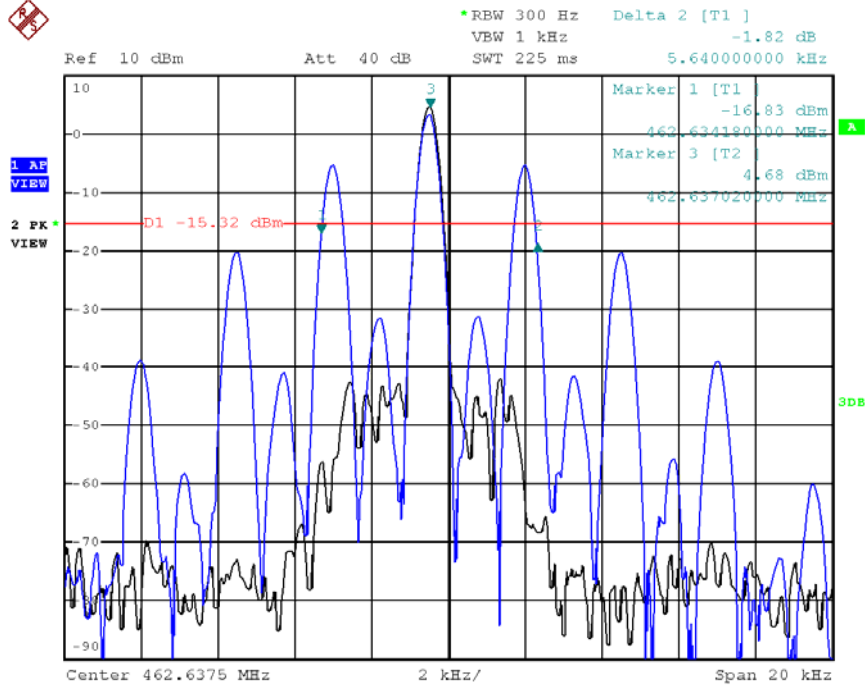
Test Engineer: Koo Wai Ip

Date of Test: May 12,2015

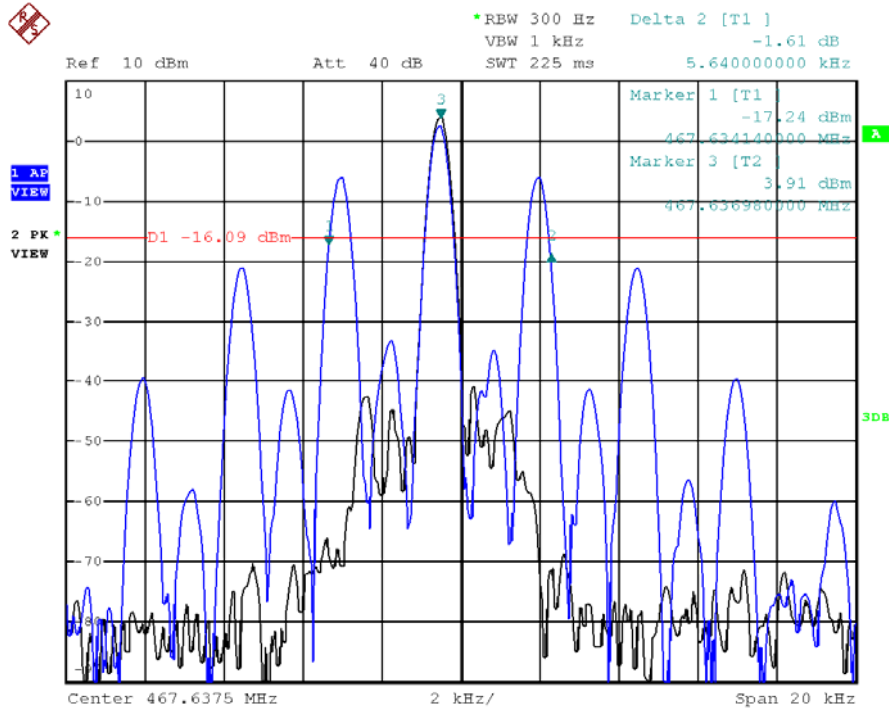
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Occupied Bandwidth Plots

Plot CH4



Plot CH11



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EXHIBIT 6

SPURIOUS EMISSION

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6.0 Spurious Emission

In order to satisfy the 95.635(b) requirement, the spurious emission from the EUT are measured and shown in the Exhibit 6.1.

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6.1 Power of Spurious Radiation (Section 2.1053, 95.635(b))

Testing Procedure

Radiated emission measurements were performed according to the procedures in ANSI/TIA-603-C-2004. All measurements were performed at Workshop No. 3, G/F., World-Wide Industrial Centre, 43-47 Shan Mei Street, Fo Tan, Sha Tin, N.T., Hong Kong

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C. Radiated Emission Configuration Photograph

Worst Case Radiated Emission

The radiated emission configurations photograph is saving in the following page.

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Configuration Photograph

Worst Case Radiated Emission

Model: T480



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Configuration Photograph

Worst Case Radiated Emission

Model: T480



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C. Test Result

**Motorola Solutions, Inc
T480**

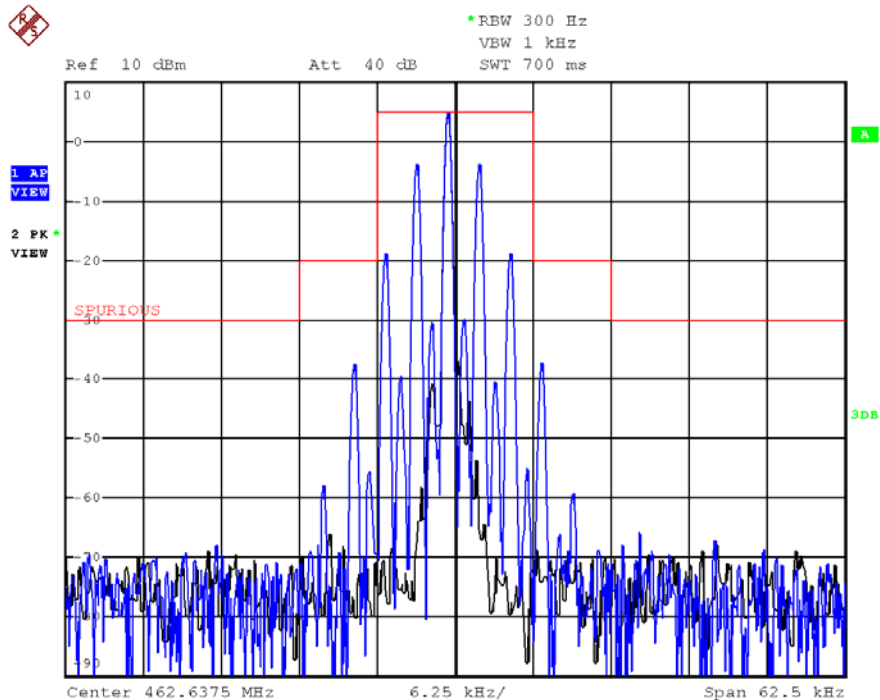
Table 6(a)

1) Unwanted emission from CARRIER $\pm 6.25\text{kHz}$ to CARRIER $\pm 31.25\text{kHz}$

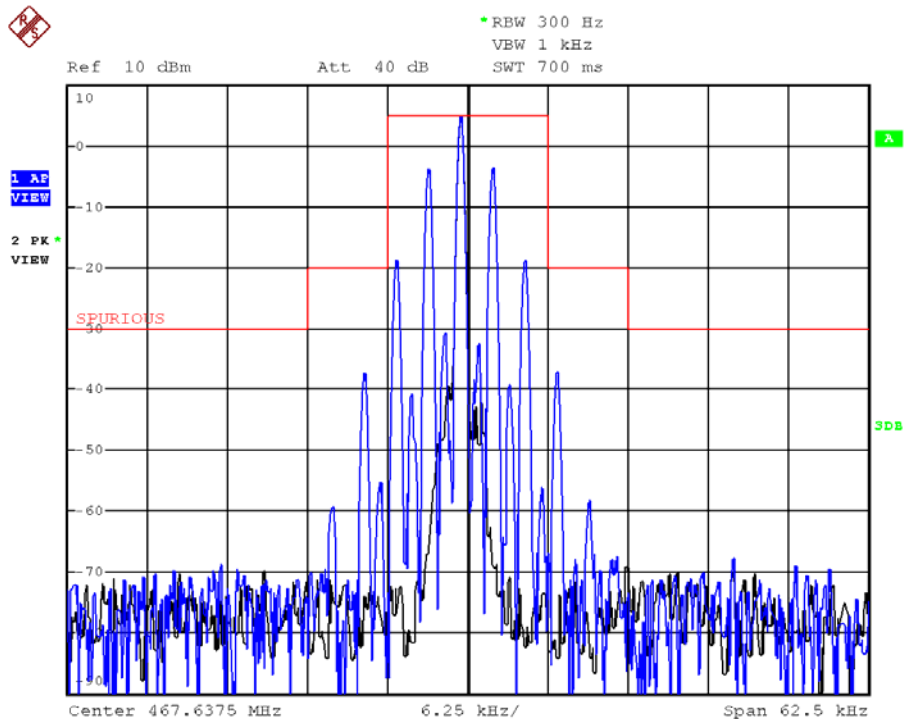
Region	Unwanted emission	
	Channel 4	Channel 11
CARRIER $\pm 6.25\text{kHz}$ to $\pm 12.5\text{kHz}$	<25dB	<25dB
CARRIER $\pm 12.5\text{kHz}$ to $\pm 31.25\text{kHz}$	<35dB	<35dB

Spurious Emission Plots

Plot CH4



Plot CH11



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Table 6(b): Channel 4

Frequency (MHz)	Effective Radiated Power (dBm)	Transmission Power (dBm)	Attenuation (dBc)	Limit (dBc)	Margin (dB)
925.280	-19.8	31.4	51.2	44.4	-6.8
1387.920	-34.4	31.4	65.8	44.4	-21.4
1850.560	-25.8	31.4	57.2	44.4	-12.8
2313.200	-30.7	31.4	62.1	44.4	-17.7
2775.840	-42.2	31.4	73.6	44.4	-29.2
3238.480	-40.2	31.4	71.6	44.4	-27.2
3701.120	-35.4	31.4	66.8	44.4	-22.4
4163.760	-40.8	31.4	72.2	44.4	-27.8
4626.400	-41.1	31.4	72.5	44.4	-28.1

- Remark: 1. Transmission power is 31.4 dBm or 1.4 dB(W).
2. According to Section 95.635(b7), the unwanted emission should be attenuated below TP by at least $43 + 10 \log_{10} (TP)$ dB or 44.4 dB.
3. The test is performed according to ANSI/TIA-603-C-2004.
4. For emission <1000MHz, RBW = 100kHz, VBW \geq RBW
For emission >1000MHz, RBW = 1MHz, VBW \geq RBW

Verdict: Pass

Test Engineer: Koo Wai Ip

Date of Test: May 30,2015

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Table 6(c): Channel 11

Frequency (MHz)	Effective Radiated Power (dBm)	Transmission Power (dBm)	Attenuation (dBc)	Limit (dBc)	Margin (dB)
935.274	-21.9	25.7	47.6	38.7	-8.9
1402.911	-43.2	25.7	68.9	38.7	-30.2
1870.548	-27.3	25.7	53.0	38.7	-14.3
2338.185	-41.9	25.7	67.6	38.7	-28.9
2805.822	-42.9	25.7	68.6	38.7	-29.9
3273.459	-38.0	25.7	63.7	38.7	-25.0
3741.096	-33.0	25.7	58.7	38.7	-20.0
4208.733	-39.3	25.7	65.0	38.7	-26.3
4676.370	-41.1	25.7	66.8	38.7	-28.1

- Remark: 1. Transmission power is 25.7 dBm or -4.3 dB(W).
2. According to Section 95.635(b7), the unwanted emission should be attenuated below TP by at least $43 + 10 \log_{10} (TP)$ dB or 38.7 dB.
3. The test is performed according to ANSI/TIA-603-C-2004.
4. For emission <1000MHz, RBW = 100kHz, VBW \geq RBW
For emission >1000MHz, RBW = 1MHz, VBW \geq RBW

Verdict: Pass

Test Engineer: Koo Wai Ip

Date of Test: May 30,2015

INTERTEK TESTING SERVICES

6.2 Field Strength of Radiation Emission and AC line Conducted Emission (Section 15.109 & 15.107)

Data is included worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

INTERTEK TESTING SERVICES

A. Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

$$FS = RA + AF + CF - AG + PD + AV$$

where

- FS = Field Strength in dB μ V/m
- RA = Receiver Amplitude (including preamplifier) in dB μ V
- CF = Cable Attenuation Factor in dB
- AF = Antenna Factor in dB
- AG = Amplifier Gain in dB
- PD = Pulse Desensitization in dB
- AV = Average Factor in -dB

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

$$FS = RA + AF + CF - AG + PD + AV$$

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A. Field Strength Calculation (cont'd)

Example

Assume a receiver reading of 62.0 dB μ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0 dB, and the resultant average factor was -10 dB. The net field strength for comparison to the appropriate emission limit is 32 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

$$RA = 62.0 \text{ dB}\mu\text{V}$$

$$AF = 7.4 \text{ dB}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$PD = 0 \text{ dB}$$

$$AV = -10 \text{ dB}$$

$$FS = 62 + 7.4 + 1.6 - 29 + 0 + (-10) = 32 \text{ dB}\mu\text{V/m}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm} [(32 \text{ dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}$$

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B. Radiated Emission Configuration Photograph - Weather Band Receiver

Worst Case Radiated Emission
at
808.250 MHz

The worst case radiated emission configuration photograph is saving in the following page.

INTERTEK TESTING SERVICES

Configuration Photograph

Worst Case Radiated Emission

Weather Band Receiver

Model: T480



INTERTEK TESTING SERVICES

Configuration Photograph

Worst Case Radiated Emission

Weather Band Receiver

Model: T480



INTERTEK TESTING SERVICES

C. Radiated Emission Data - Weather Band Receiver

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgement: Passed by 9.8 dB margin

INTERTEK TESTING SERVICES

Company: Motorola Solutions, Inc
Model: T480
Mode: Weather Band Receiver

Date of Test: May 30,2015

Table 7(a)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)
V	161.650	28.7	16	16.0	31.2	43.5	-12.3
V	323.300	24.4	16	24.0	32.0	46.0	-14.0
V	484.950	23.8	16	26.0	33.6	46.0	-12.4
V	646.600	22.4	16	29.0	35.2	46.0	-10.8
V	808.250	21.7	16	31.0	36.2	46.0	-9.8
V	969.900	21.0	16	33.0	38.8	54.0	-15.2

- NOTES: 1. Peak detector is used for the emission measurement.
2. All measurements were made at 3 meters.
3. Negative value in the margin column shows emission below limit.

Test Engineer: Koo Wai Ip

INTERTEK TESTING SERVICES

D. Conducted Emission Configuration Photograph

Worst Case Conducted Emission

GMRS/ FRS / Tx at N/A MHz

Weather band receiver at 0.541 MHz

The conducted emission configurations photograph is saving in the following page.

INTERTEK TESTING SERVICES

Configuration Photograph

Worst Case Conducted Emission

Model: T480

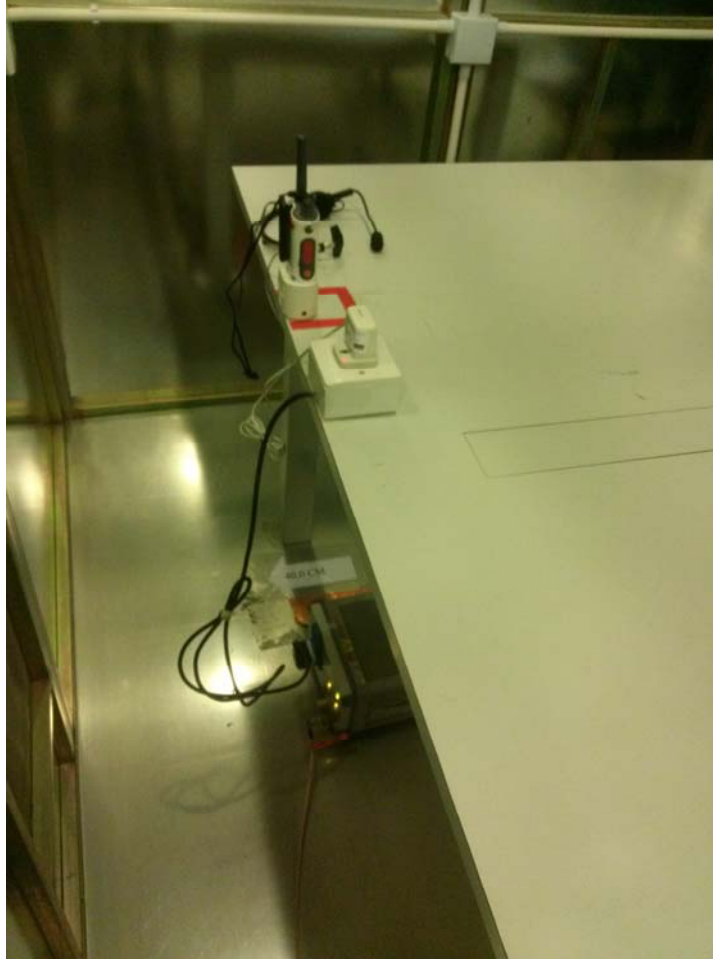


INTERTEK TESTING SERVICES

Configuration Photograph

Worst Case Conducted Emission

Model: T480



INTERTEK TESTING SERVICES

Configuration Photograph

Worst Case Conducted Emission

Model: T480



INTERTEK TESTING SERVICES

D. AC Line Conducted Emission Data

Judgement:

GMRS/ FRS/ Tx: Passed by >20 dB margin

Weather band receiver: Passed by 14.43 dB margin

The conducted emission test result is saving in the following page.

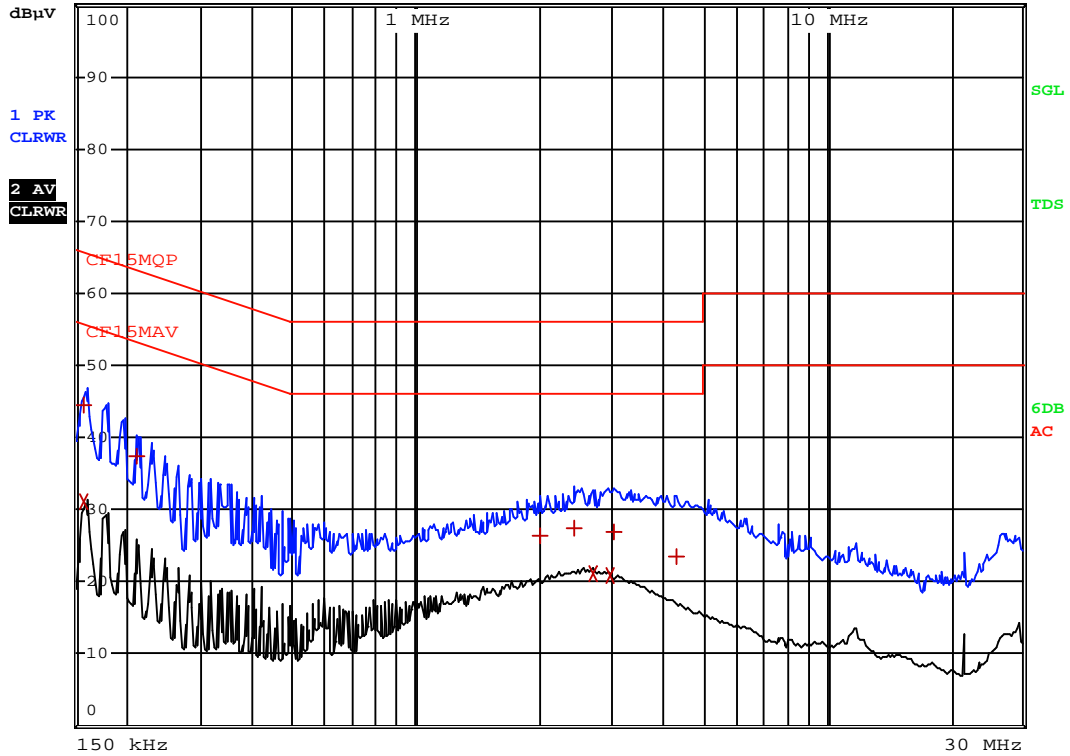
INTERTEK TESTING SERVICES

Mode: TX On



RBW 9 kHz
MT 1 s

Att 10 dB AUTO PREAMP OFF



Date: 18.MAY.2015 07:00:35

INTERTEK TESTING SERVICES

Mode: TX On

EDIT PEAK LIST (Final Measurement Results)					
TRACE		FREQUENCY	LEVEL dB μ V		DELTA LIMIT dB
Trace1:	CF15MQP				
Trace2:	CF15MAV				
Trace3:	---				
1	Quasi Peak	159 kHz	44.40	L1	-21.11
2	CISPR Average	159 kHz	30.98	N	-24.53
1	Quasi Peak	213 kHz	37.52	N	-25.56
1	Quasi Peak	2.004 MHz	26.44	N	-29.55
1	Quasi Peak	2.4225 MHz	27.51	L1	-28.48
2	CISPR Average	2.715 MHz	21.07	L1	-24.92
2	CISPR Average	2.9625 MHz	20.89	L1	-25.10
1	Quasi Peak	3.0525 MHz	26.91	N	-29.08
1	Quasi Peak	4.2945 MHz	23.60	L1	-32.39

Date: 18.MAY.2015 07:00:17

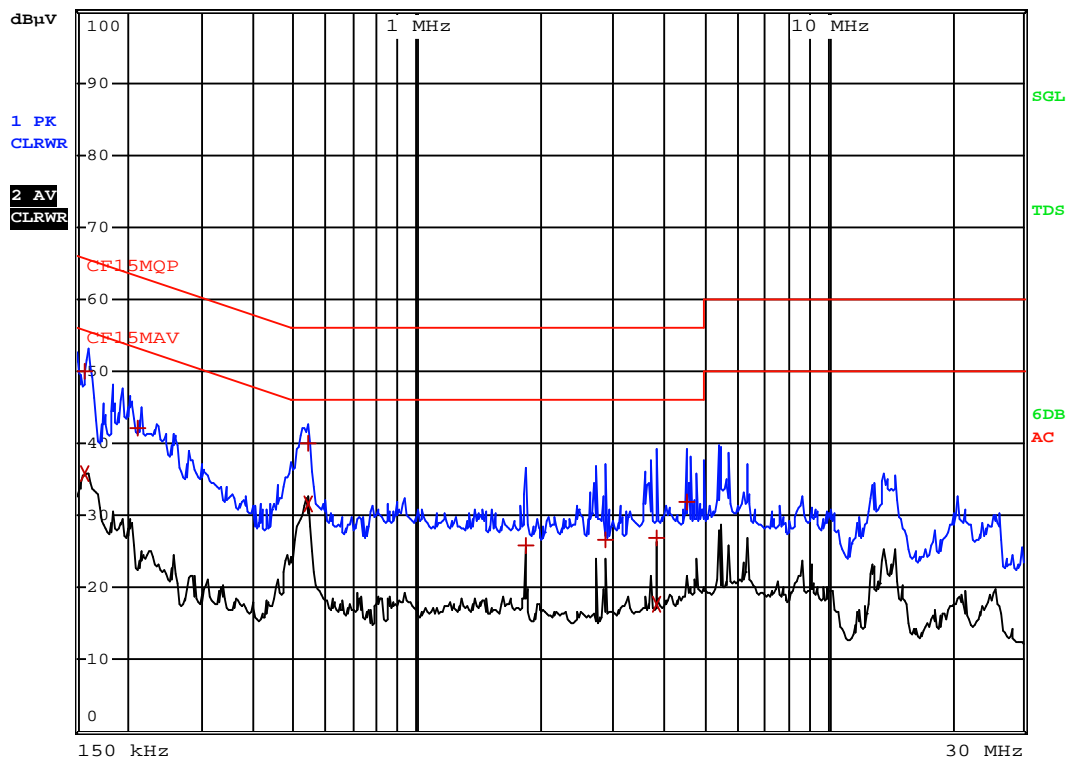
INTERTEK TESTING SERVICES

Mode: Weather Band Receiver



RBW 9 kHz
MT 1 s

Att 10 dB AUTO PREAMP OFF



Date: 18.MAY.2015 07:11:01

INTERTEK TESTING SERVICES

Mode: Weather Band Receiver

EDIT PEAK LIST (Final Measurement Results)				
Trace1:	CF15MQP			
Trace2:	CF15MAV			
Trace3:	---			
TRACE	FREQUENCY	LEVEL dB μ V		DELTA LIMIT dB
1 Quasi Peak	159 kHz	49.94 L1		-15.56
2 CISPR Average	159 kHz	35.77 L1		-19.74
1 Quasi Peak	213 kHz	42.10 L1		-20.98
1 Quasi Peak	541.5 kHz	40.11 L1		-15.88
2 CISPR Average	541.5 kHz	31.56 L1		-14.43
1 Quasi Peak	1.8465 MHz	25.86 L1		-30.13
1 Quasi Peak	2.895 MHz	26.73 N		-29.26
1 Quasi Peak	3.8355 MHz	26.98 L1		-29.01
2 CISPR Average	3.8355 MHz	17.64 N		-28.35
1 Quasi Peak	4.5645 MHz	31.91 L1		-24.09

Date: 18.MAY.2015 07:10:43

INTERTEK TESTING SERVICES

EXHIBIT 7

FREQUENCY STABILITY

INTERTEK TESTING SERVICES

7.0 Frequency Stability (Section 2.1055(a)(b)(d), 95.626(b) for FRS, 95.621(b) for GMRS)

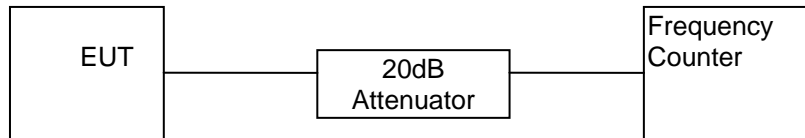
The frequency tolerance was tested in normal condition & over extreme ambient conditions with respect to voltage and temperature variation.

INTERTEK TESTING SERVICES

7.1 Frequency Tolerance (Section 95.626(b) for FRS, 95.621(b) for GMRS)

Testing Procedure

- 1) Set-up the test equipment in the following configuration:



- 2) Measure all transmit channel frequencies in MHz.

INTERTEK TESTING SERVICES

C. Test Result

Table 7

**Motorola Solutions, Inc
T480**

Frequency Tolerance

Channel	Frequency (MHz)	Measured Frequency (MHz)	Tolerance (%)
1	462.5625	462.56222	-0.000061
2	462.5875	462.58728	-0.000048
3	462.6125	462.61238	-0.000026
4	462.6375	462.63744	-0.000013
5	462.6625	462.66248	-0.000004
6	462.6875	462.68742	-0.000017
7	462.7125	462.71248	-0.000004
8	467.5625	467.56246	-0.000009
9	467.5875	467.58738	-0.000026
10	467.6125	467.61236	-0.000030
11	467.6375	467.63724	-0.000056
12	467.6625	467.66212	-0.000081
13	467.6875	467.68712	-0.000081
14	467.7125	467.71212	-0.000081
15	462.5500	462.54988	-0.000026
16	462.5750	462.57488	-0.000026
17	462.6000	462.59986	-0.000030
18	462.6250	462.62486	-0.000030
19	462.6500	462.64982	-0.000039
20	462.6750	462.67481	-0.000041
21	462.7000	462.69984	-0.000035
22	462.7250	462.72482	-0.000039

FCC Limit for FRS (95.626(b)): $\leq \pm 0.00025\%$

FCC Limit for GMRS (95.621(b)): $\leq \pm 0.0005\%$

Verdict: Passed

Test Engineer: Koo Wai Ip

Date of Test: May 12,2015

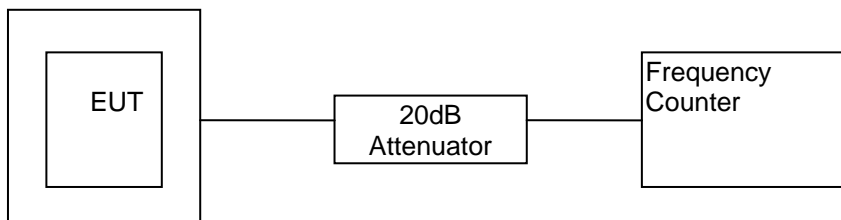
INTERTEK TESTING SERVICES

7.2 Frequency Stability - Temperature (Section 2.1055(a)(b), 95.626(b) for FRS, 95.621(b) for GMRS)

Testing Procedure

- 1) Set-up the test equipment in the following configuration:

Temperature Chamber



- 2) Set the Temperature Chamber to 20°C and stabilize the EUT temperature for one hour. Set transmitter ON for two minutes.
- 3) Measure the channel frequency of channel 4 in MHz.
- 4) Turn the EUT OFF.
- 5) Repeat the above procedure from -30°C to 50°C with 10°C increment for GMRS.
- 6) Repeat the above procedure from -20°C to 50°C with 10°C increment for FRS.

INTERTEK TESTING SERVICES

C. Test Result

Table 8(a)

**Motorola Solutions, Inc
T480**

Frequency Tolerance with Temperature Variation

Channel : 4

Temperature (°C)	Assigned Frequency (MHz)	Measured Frequency (MHz)	Tolerance (%)	*Frequency Tolerance with reference to its value at +20°C (ppm)
-30#	462.63750	462.63834	0.000182	0.8
-20	462.63750	462.63828	0.000169	-0.4
-10	462.63750	462.63818	0.000147	0.5
0	462.63750	462.63804	0.000117	1.2
10	462.63750	462.63786	0.000078	1.2
20	462.63750	462.63744	-0.000013	0.0
30	462.63750	462.63728	-0.000048	-1.4
40	462.63750	462.63698	-0.000112	-1.8
50	462.63750	462.63686	-0.000138	0.5

Remark: 1) For GMRS, frequency tolerance must be maintained within a frequency tolerance of 0.0005%.

2) #Data is for GMRS compliance, not for FRS.

Verdict: Passed

Test Engineer: Koo Wai Ip

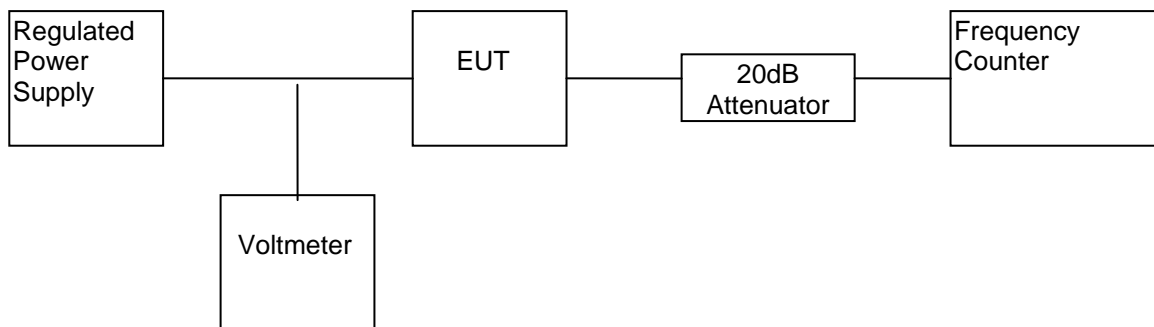
Date of Test: May 12,2015

INTERTEK TESTING SERVICES

7.3 Frequency Stability - Voltage (Section 2.1055(d), 95.626(b) for FRS, 95.621(b) for GMRS)

Testing Procedure

- 1) Set-up the test equipment in the following configuration:



- 2) Vary the level of regulated power supply to the manufacturer specified battery end point of the EUT.
- 3) Measure the channel frequency of channel 4 in MHz.

INTERTEK TESTING SERVICES

C. Test Result

Table 9

**Motorola Solutions, Inc
T480**

Frequency Deviation with Voltage Variation

The manufacturer specified battery end point 3.2V

Channel	Frequency (MHz)	Measured Frequency (MHz)	Tolerance (%)
4	462.63750	462.63698	-0.000112

- Remark: 1) For FRS, frequency tolerance must be maintained within a frequency tolerance of 0.00025%.
2) For GMRS, frequency tolerance must be maintained within a frequency tolerance of 0.0005%.
3) The test voltage is from primary supply voltage to 3.2V

Test Engineer: Koo Wai Ip

Date of Test: May 12,2015

INTERTEK TESTING SERVICES

EXHIBIT 8

EQUIPMENT LIST

Equipment List

1) Radiated Emissions Test

Equipment	EMI Test Receiver	Roberts Antenna
Registration No.	EW-2251	EW-0159
Manufacturer	R&S	CDI
Model No.	ESCI	A100
Calibration Date	Dec. 04, 2014	May. 09, 2014
Calibration Due Date	Dec. 04, 2015	Nov. 09, 2015

Equipment	Spectrum Analyzer	Pyramidal Horn Antenna	Double Ridged Guide Antenna
Registration No.	EW-2249	EW-0905	EW-1015
Manufacturer	R&S	EMCO	EMCO
Model No.	FSP30	3160-09	3115
Calibration Date	Nov 19, 2014	Jan. 28, 2014	Oct. 28, 2014
Calibration Due Date	Nov 19, 2015	Jul. 28, 2015	Apr. 28, 2016

2) Conducted Emissions Test

Equipment	EMI Test Receiver	LISN
Registration No.	EW-2251	EW-2501
Manufacturer	R&S	R&S
Model No.	ESCI	ESCI
Calibration Date	Dec. 04, 2014	Jan. 15, 2015
Calibration Due Date	Dec. 04, 2015	Jan. 15, 2016

3) Modulation Characteristics

Equipment	Communication Service Monitor	Humidity Chamber
Registration No.	EW-1775	EW-2395
Manufacturer	R&S	Giant Force
Model No.	CMS54	AR
Calibration Date	Dec. 04, 2014	Oct. 09, 2014
Calibration Due Date	Nov. 22, 2015	Oct. 09, 2015