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## **Motorola Solutions, Inc**

Application  
For  
FCC Part 95 - Certification

Two Ways Radio of GMRS, FRS, Weather Band receiver

**(FCC ID: AZ489FT4927)**

15101029HKG-001

MN/ cl

December 09, 2015

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**Intertek Testing Services Hong Kong Ltd.**

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## INTERTEK TESTING SERVICES

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### MEASUREMENT/TECHNICAL REPORT

**Applicant** : Motorola Solutions, Inc  
**Trade Name/Model No** : Motorola / T600/ T603/ T605  
**Date** : December 09, 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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Report prepared by: Nip Ming Fung, Melvin  
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# INTERTEK TESTING SERVICES

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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 of GMRS, FRS, Weather Band receiver. GMRS and FRS operate between 462.5500MHz and 467.7125MHz. Weather band receiver operates between 161.650MHz and 162.550MHz.

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 x 1.5VDC AA size alkaline battery or 1 x 3.6VDC Ni-MH rechargeable battery pack.

The Model(s): T603 / T605 are the same as the Model: T600 in electrical designs including software & firmware, PCB layout and construction design/physical design/enclosure. The only differences between these models are color and model number to be sold for marketing purpose.

#### Transmitter Portion

- (i) Type of Emission with filtering : GMRS: 5K64F3E with filtering; FRS: 5K68F3E
- (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: 1.3W ERP; FRS: 0.37W ERP
- (iv) Antenna Type : Integral, vertically polarized with 2.15dBi antenna gain
- (iv) dc voltage of radio frequency amplifying device: 4.5V  
dc current of radio frequency amplifying device : 1000mA

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

## INTERTEK TESTING SERVICES

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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 (2014) and ANSI/TIA-603-C-2004. Conducted emission measurement were performed according to the procedures in ANSI C63.4 (2014). All radiated measurement 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**

## INTERTEK TESTING SERVICES

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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 1.5VDC AA size alkaline battery or 1 x 3.6VDC Ni-MH rechargeable battery pack..

The frequency range of transmitter from 30MHz to 10<sup>th</sup> 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

## INTERTEK TESTING SERVICES

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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. The values of the Measurement uncertainty for radiated emission test, AC line conducted emission test and RF conducted measurement test are  $\pm 5.3\text{dB}$ ,  $\pm 4.2\text{dB}$  and  $\pm 1\text{dB}$  respectively.

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

N/A

## INTERTEK TESTING SERVICES

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*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  
Email:melvin.mf.nip@intertek.com*

*December 09, 2015*            *Date*

**EXHIBIT 3**

**RF POWER OUTPUT**

## **INTERTEK TESTING SERVICES**

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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.

## **INTERTEK TESTING SERVICES**

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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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## INTERTEK TESTING SERVICES

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**Table 1**

**Motorola Solutions, Inc  
T600/ T603/ T605**

**Transmission Power**

Channel	Frequency (MHz)	Effective Radiated Power		FCC 95.639 Limit (W)	Margin (W)
		(dBm)	(W)		
1	462.5625	31.1	1.30	5.00	-3.70
2	462.5875	31.1	1.30	5.00	-3.70
3	462.6125	31.1	1.30	5.00	-3.70
4	462.6375	31.1	1.30	5.00	-3.70
5	462.6625	31.1	1.30	5.00	-3.70
6	462.6875	31.1	1.30	5.00	-3.70
7	462.7125	31.1	1.30	5.00	-3.70
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	31.1	1.30	5.00	-3.70
16	462.5750	31.1	1.30	5.00	-3.70
17	462.6000	31.1	1.30	5.00	-3.70
18	462.6250	31.1	1.30	5.00	-3.70
19	462.6500	31.1	1.30	5.00	-3.70
20	462.6750	31.1	1.30	5.00	-3.70
21	462.7000	31.1	1.30	5.00	-3.70
22	462.7250	31.1	1.30	5.00	-3.70

- 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: Oct 28,2015

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**EXHIBIT 4**

**MODULATION CHARACTERISTICS**

## **INTERTEK TESTING SERVICES**

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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.

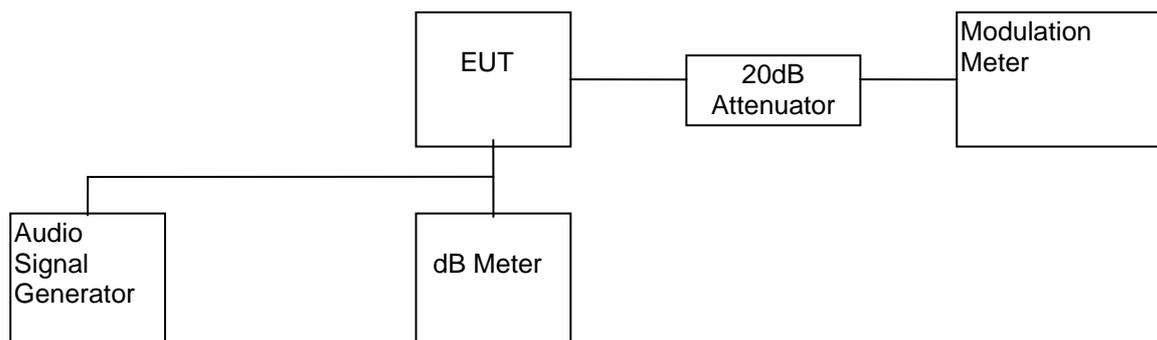
## INTERTEK TESTING SERVICES

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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:

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

$\text{DEV}_{\text{REF}}$  = Frequency deviation at 1000Hz ;

$\text{DEV}_{\text{FREQ}}$  = Frequency deviation at 100 - 5000Hz ;

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

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**INTERTEK TESTING SERVICES**

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**C. Test Result**

**Table 2**

**Motorola Solutions, Inc  
T600/ T603/ T605**

**Modulation Frequency Response**

Test Channel : 4  
Input level = 127.0dBSPL

Modulation Frequency(Hz)	Frequency Deviation(kHz)	Audio Frequency Response (dB)
100	1.980	-1.30
200	2.020	-1.13
300	2.040	-1.04
400	2.060	-0.96
500	2.380	0.30
600	2.380	0.30
700	2.380	0.30
800	2.380	0.30
900	2.320	0.08
1000	2.300	0.00
1250	2.280	-0.08
1500	2.260	-0.15
1750	2.240	-0.23
2000	2.220	-0.31
2250	2.220	-0.31
2500	2.220	-0.31
2750	2.220	-0.31
3000	2.180	-0.47
3125	2.120	-0.71
3250	1.820	-2.03
3500	1.440	-4.07
4000	0.680	-10.58
5000	0.400	-15.19

Verdict: Pass

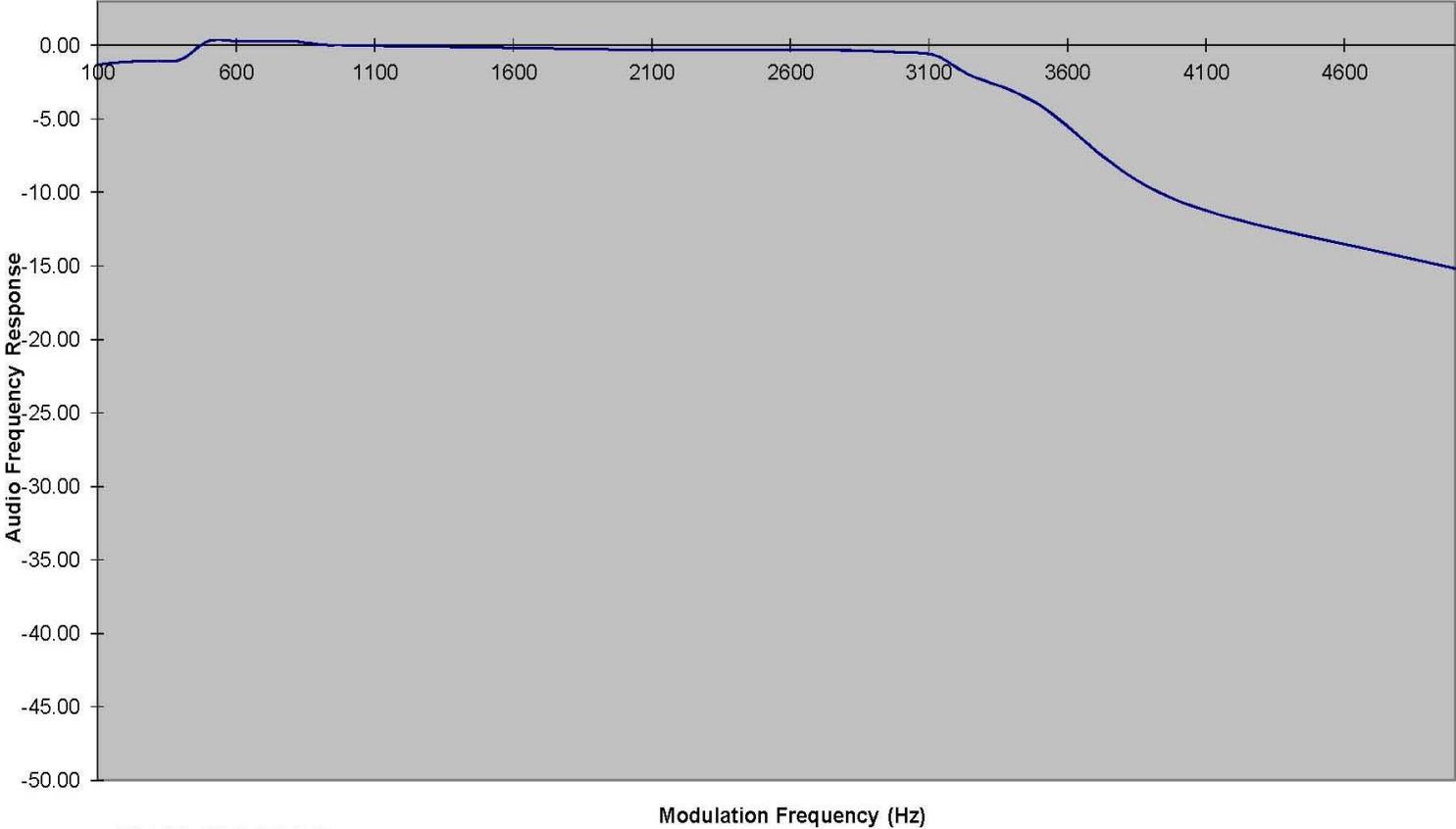
Test Engineer: Koo Wai Ip

Date of Test: Nov 08,2015

INTERTEK TESTING SERVICES

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Modulation Frequency Response



FCC ID: AZ489FT4927

Modulation Frequency (Hz)

mfr - 1 of 1

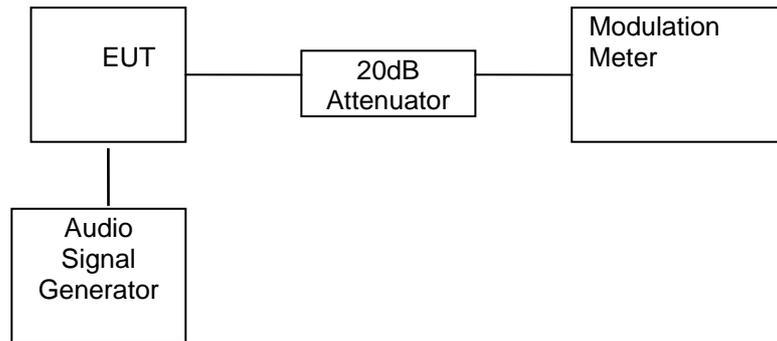
## INTERTEK TESTING SERVICES

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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 :  $\pm 2.5\text{kHz}$

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## INTERTEK TESTING SERVICES

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### C. Test Result

**Table 3**

**Motorola Solutions, Inc  
T600/ T603/ T605**

### Modulation Limiting Characteristics

Test Channel : 4

<b>Modulation Input (dB SPL)</b>	<b>Peak Frequency Deviation (kHz) at 500Hz</b>	<b>Peak Frequency Deviation (kHz) at 1000Hz</b>	<b>Peak Frequency Deviation (kHz) at 2500Hz</b>	<b>Peak Frequency Deviation (kHz) at 3125Hz</b>
47	0.400	0.400	0.400	0.400
57	0.400	0.400	0.400	0.400
67	0.400	0.400	0.420	0.400
77	0.980	0.980	0.880	0.480
87	1.980	1.240	0.980	0.780
97	2.120	2.020	1.960	1.220
107	2.320	2.320	2.320	1.240
117	2.360	2.300	2.280	1.280
127	2.380	2.300	2.220	2.120
137	2.370	2.200	2.210	2.110

Verdict: Pass

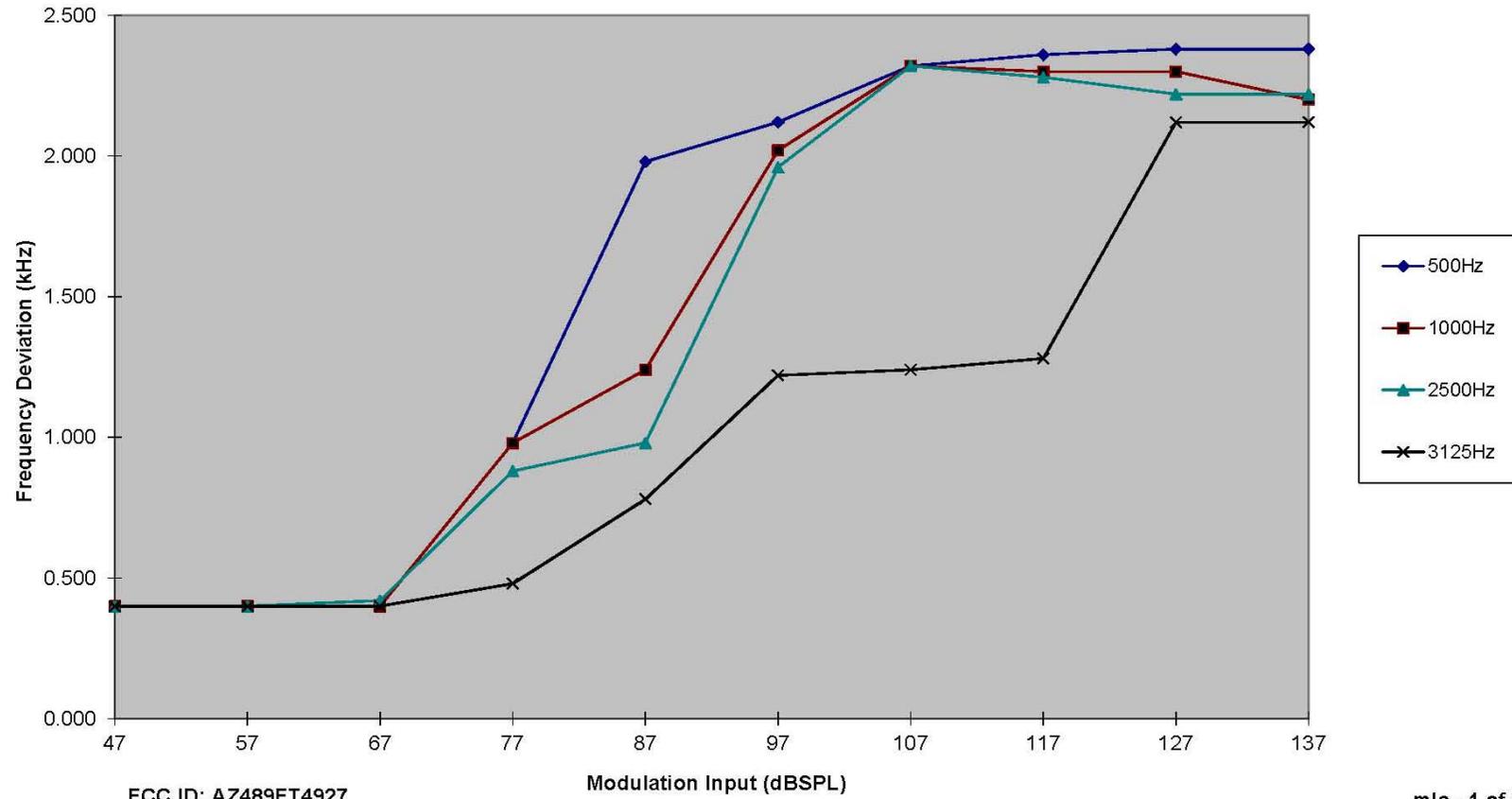
Test Engineer: Koo Wai Ip

Date of Test: Nov 08,2015

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## INTERTEK TESTING SERVICES

### Modulation Limiting Characteristic



FCC ID: AZ489FT4927

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## INTERTEK TESTING SERVICES

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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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**INTERTEK TESTING SERVICES**

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**C. Test Result**

**Table 4**

**Motorola Solutions, Inc  
T600/ T603/ T605**

**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	-11.0	0.0
4	-49.0	-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: 14.0dBV

Verdict: Pass

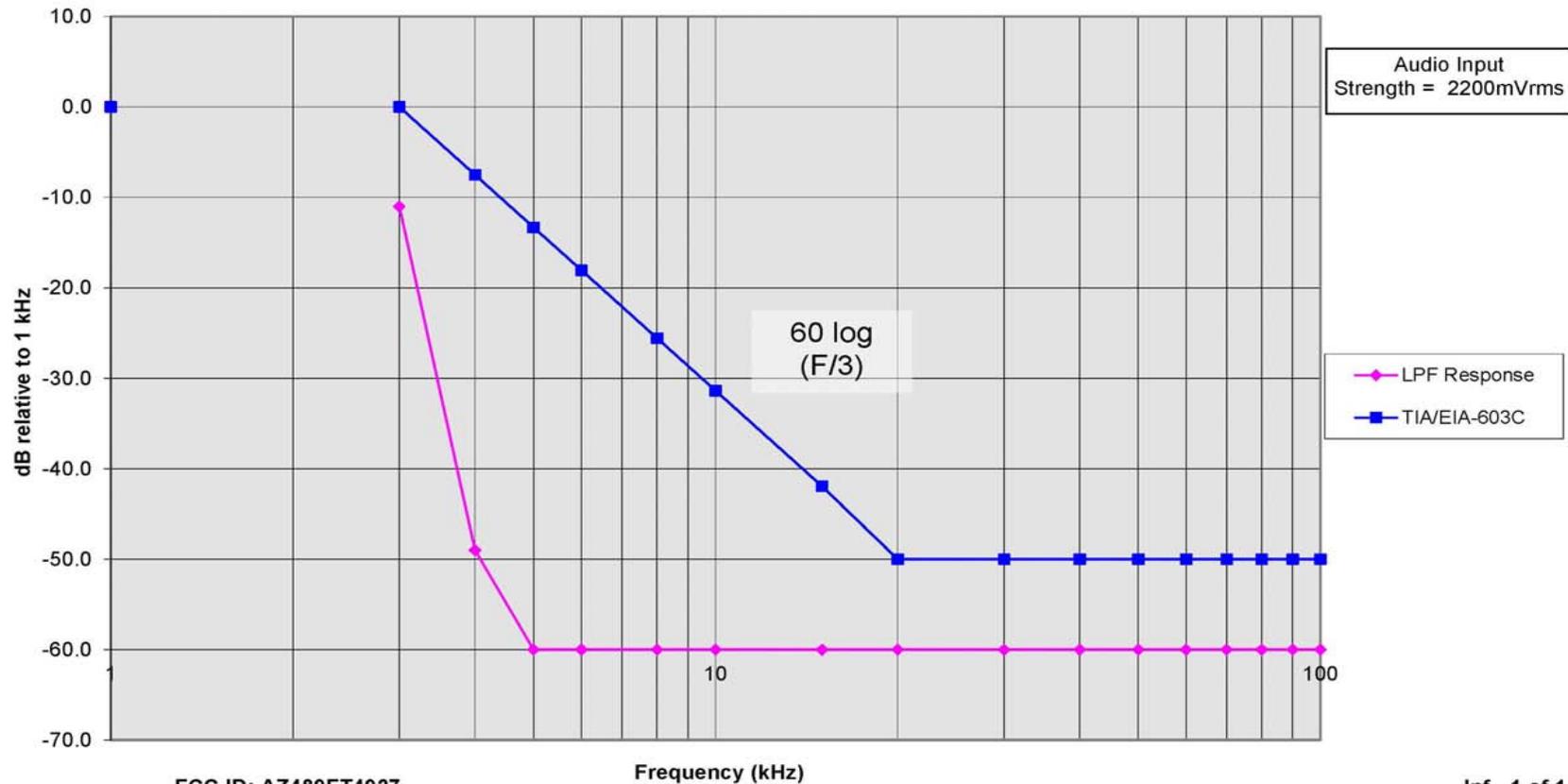
Test Engineer: Koo Wai Ip

Date of Test: Nov 08,2015

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## INTERTEK TESTING SERVICES

### Audio Low Pass Filter Response



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**EXHIBIT 5**

**OCCUPIED BANDWIDTH**

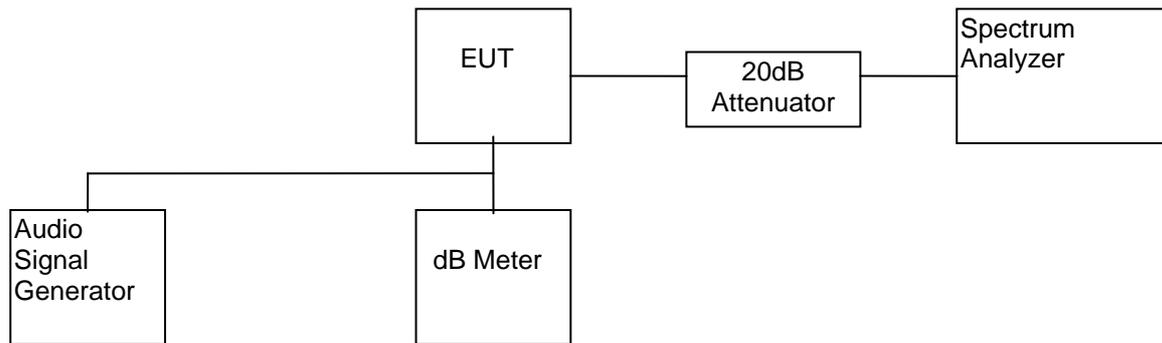
## INTERTEK TESTING SERVICES

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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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**INTERTEK TESTING SERVICES**

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**C. Test Result**

**Table 5**

**Motorola Solutions, Inc  
T600/ T603/ T605**

<b>System</b>	<b>Channel</b>	<b>Measured Bandwidth (kHz)</b>	<b>Limit (kHz)</b>
GMRS	4	5.64	≤20
FRS	11	5.68	≤12.5

Verdict: Pass

The bandwidth plot is saving in following page.

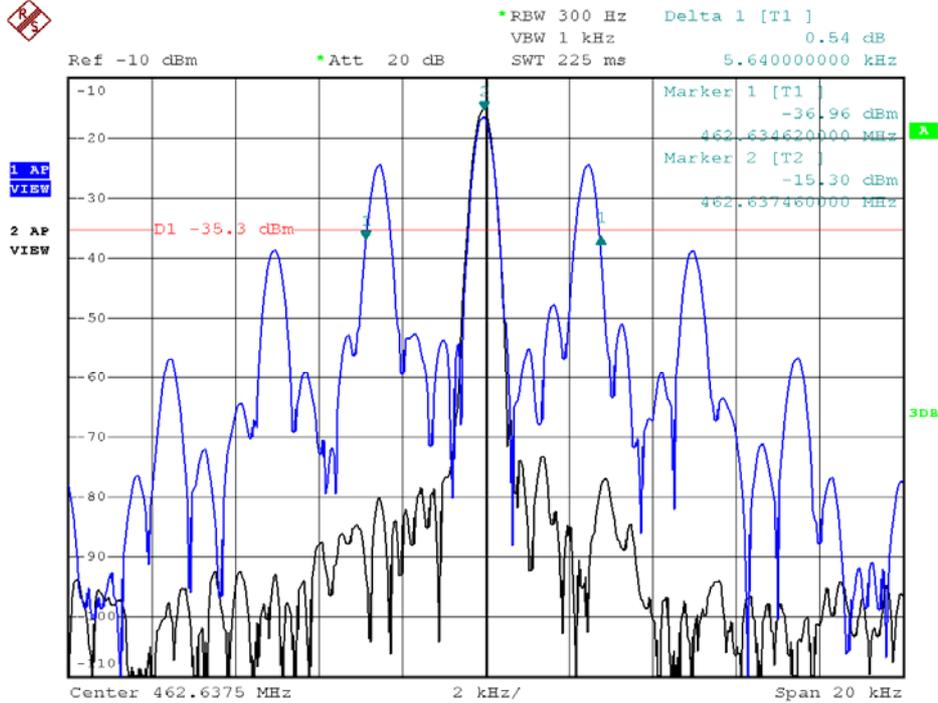
Test Engineer: Koo Wai Ip

Date of Test: Nov 08,2015

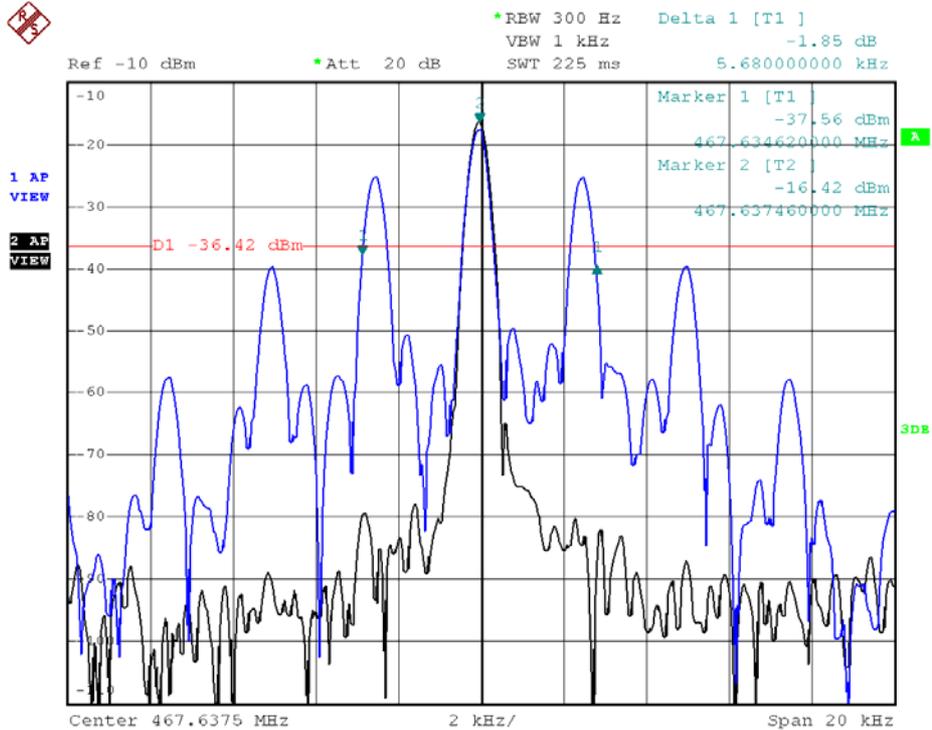
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## Occupied Bandwidth Plots

### 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.

## INTERTEK TESTING SERVICES

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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

## **INTERTEK TESTING SERVICES**

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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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## INTERTEK TESTING SERVICES

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### Configuration Photograph

Worst Case Radiated Emission

Model: T600/ T603/ T605



# INTERTEK TESTING SERVICES

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## Configuration Photograph

Worst Case Radiated Emission

Model: T600/ T603/ T605



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## INTERTEK TESTING SERVICES

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### C. Test Result

**Motorola Solutions, Inc  
T600/ T603/ T605**

**Table 6(a)**

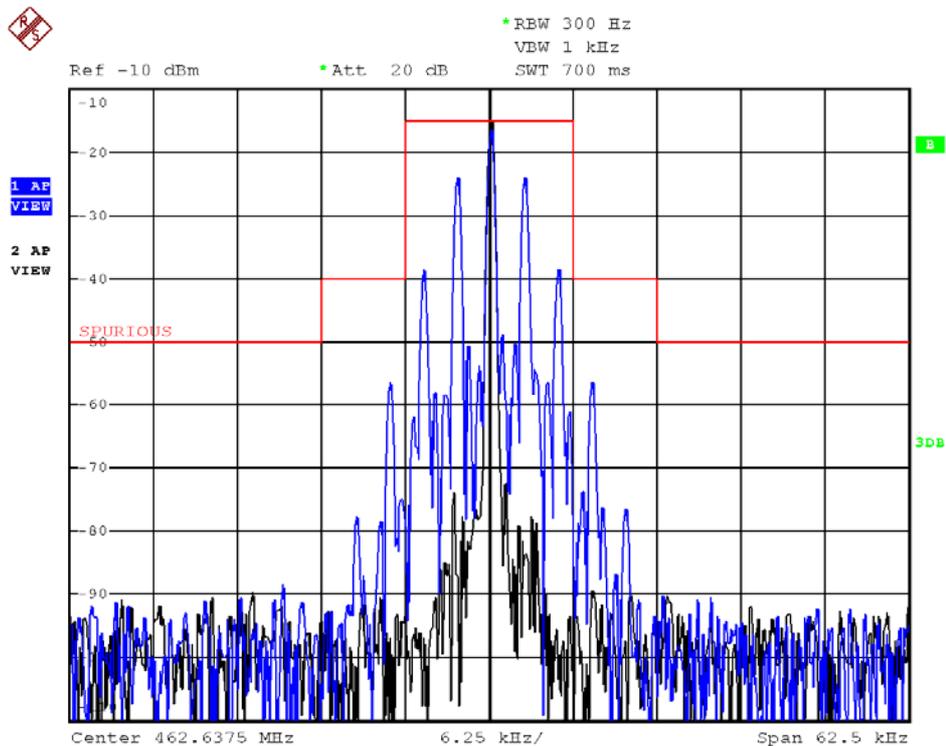
1) Unwanted emission from CARRIER  $\pm 6.25\text{kHz}$  to CARRIER  $\pm 31.25\text{kHz}$

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

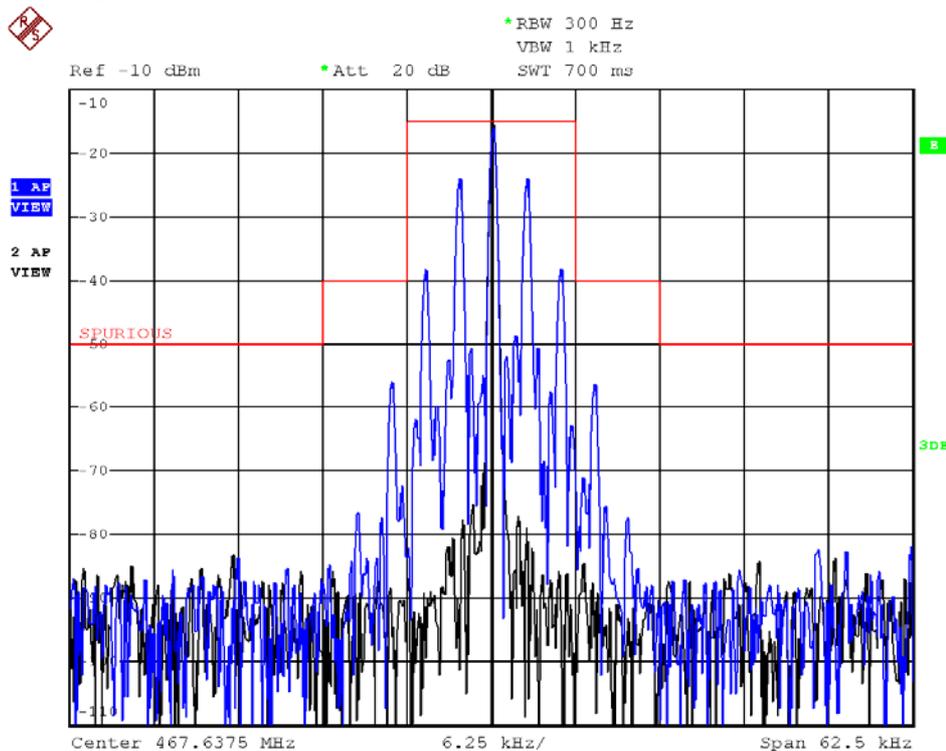
# INTERTEK TESTING SERVICES

## Spurious Emission Plots

### Plot CH4



### Plot CH11



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## INTERTEK TESTING SERVICES

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**Table 6(b): Channel 4**

<b>Frequency (MHz)</b>	<b>Effective Radiated Power (dBm)</b>	<b>Transmission Power (dBm)</b>	<b>Attenuation (dBc)</b>	<b>Limit (dBc)</b>	<b>Margin (dB)</b>
925.272	-46.0	31.1	77.1	44.1	-33.0
1387.908	-53.7	31.1	84.8	44.1	-40.7
1850.544	-60.7	31.1	91.8	44.1	-47.7
2313.180	-49.7	31.1	80.8	44.1	-36.7
2775.816	-58.9	31.1	90.0	44.1	-45.9
3238.452	-57.2	31.1	88.3	44.1	-44.2
3701.088	-56.1	31.1	87.2	44.1	-43.1
4163.724	-53.4	31.1	84.5	44.1	-40.4
4626.360	-55.6	31.1	86.7	44.1	-42.6

- Remark: 1. Transmission power is 31.1 dBm or 1.1 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 44.1 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: **Oct 28,2015**

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## INTERTEK TESTING SERVICES

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**Table 6(c): Channel 11**

<b>Frequency (MHz)</b>	<b>Effective Radiated Power (dBm)</b>	<b>Transmission Power (dBm)</b>	<b>Attenuation (dBc)</b>	<b>Limit (dBc)</b>	<b>Margin (dB)</b>
935.272	-46.9	25.7	72.6	38.7	-33.9
1402.908	-57.1	25.7	82.8	38.7	-44.1
1870.544	-59.9	25.7	85.6	38.7	-46.9
2338.180	-57.3	25.7	83.0	38.7	-44.3
2805.816	-60.2	25.7	85.9	38.7	-47.2
3273.452	-50.6	25.7	76.3	38.7	-37.6
3741.088	-49.1	25.7	74.8	38.7	-36.1
4208.724	-49.3	25.7	75.0	38.7	-36.3
4676.360	-56.1	25.7	81.8	38.7	-43.1

- 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: Oct 28,2015

## INTERTEK TESTING SERVICES

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### 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.

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## INTERTEK TESTING SERVICES

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### 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 $\mu$ V/m
- RA = Receiver Amplitude (including preamplifier) in dB $\mu$ 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:

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

## INTERTEK TESTING SERVICES

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### A. Field Strength Calculation (cont'd)

#### Example

Assume a receiver reading of 62.0 dB $\mu$ 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 $\mu$ V/m. This value in dB $\mu$ V/m was converted to its corresponding level in  $\mu$ V/m.

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

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

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

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

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

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

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

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

## INTERTEK TESTING SERVICES

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### **B. Radiated Emission Configuration Photograph - Weather Band Receiver**

Worst Case Radiated Emission  
at  
808.250MHz

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

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## INTERTEK TESTING SERVICES

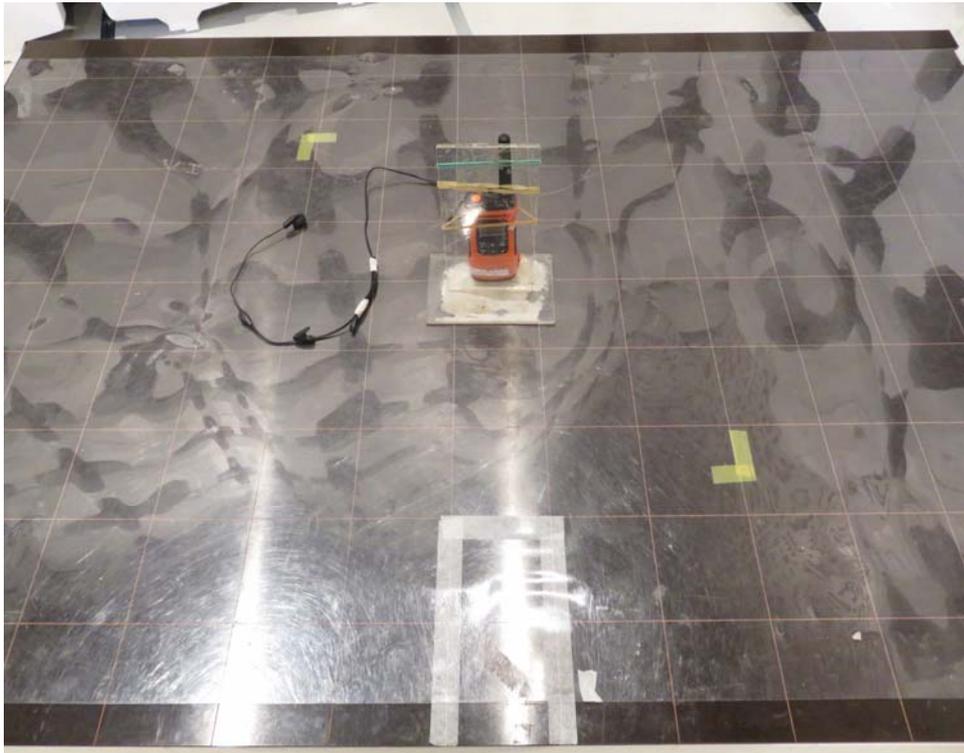
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### Configuration Photograph

Worst Case Radiated Emission

Weather Band Receiver

Model: T600/ T603/ T605



# INTERTEK TESTING SERVICES

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## Configuration Photograph

Worst Case Radiated Emission

Weather Band Receiver

Model: T600/ T603/ T605



## INTERTEK TESTING SERVICES

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### 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 20.4 dB margin

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## INTERTEK TESTING SERVICES

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Company: Motorola Solutions, Inc  
Model: T600/ T603/ T605  
Mode: Weather Band Receiver

Date of Test: 28 Oct, 2015

Table 7(a)

### Radiated Emissions

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dB $\mu$ V/m)	Limit at 3m (dB $\mu$ V/m)	Margin (dB)
V	161.650	20.1	16	16.0	20.1	43.5	-23.4
V	323.300	28.5	16	24.0	20.5	46.0	-25.5
V	484.950	31.2	16	26.0	21.2	46.0	-24.8
V	646.600	35.7	16	29.0	22.7	46.0	-23.3
V	808.250	40.6	16	31.0	25.6	46.0	-20.4
V	969.900	44.2	16	33.0	27.2	54.0	-26.8

- 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

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### D. Conducted Emission Configuration Photograph

Worst Case Conducted Emission

GMRS/ FRS / Tx at N/A MHz

Weather band receiver at N/A MHz

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

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## INTERTEK TESTING SERVICES

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### Configuration Photograph

Worst Case Conducted Emission

Model: T600/ T603/ T605



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# INTERTEK TESTING SERVICES

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## Configuration Photograph

Worst Case Conducted Emission

Model: T600/ T603/ T605



---

# INTERTEK TESTING SERVICES

---

## Configuration Photograph

Worst Case Conducted Emission

Model: T600/ T603/ T605



## INTERTEK TESTING SERVICES

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### D. AC Line Conducted Emission Data

Judgement:

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

Weather band receiver: Passed by >20 dB margin

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

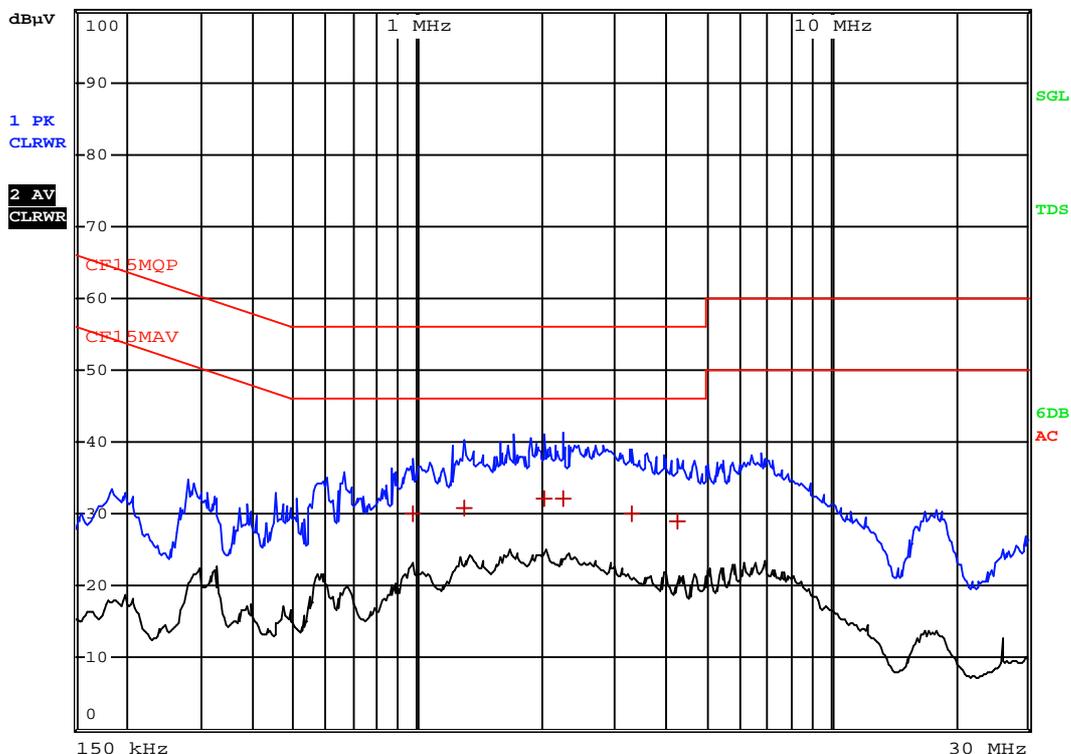
# INTERTEK TESTING SERVICES

Mode: TX On



RBW 9 kHz  
MT 1 s

Att 10 dB AUTO PREAMP OFF



Date: 10.NOV.2015 06:17:09

# INTERTEK TESTING SERVICES

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Mode: TX On

EDIT PEAK LIST (Final Measurement Results)					
TRACE		FREQUENCY	LEVEL dB $\mu$ V		DELTA LIMIT dB
Trace1:	CF15MQP				
Trace2:	CF15MAV				
Trace3:	---				
1	Quasi Peak	978 kHz	30.17	L1	-25.82
1	Quasi Peak	1.302 MHz	30.87	L1	-25.12
1	Quasi Peak	2.031 MHz	32.11	L1	-23.88
1	Quasi Peak	2.2515 MHz	32.22	L1	-23.77
1	Quasi Peak	3.3225 MHz	30.14	L1	-25.85
1	Quasi Peak	4.2855 MHz	29.03	L1	-26.97

Date: 10.NOV.2015 06:16:49

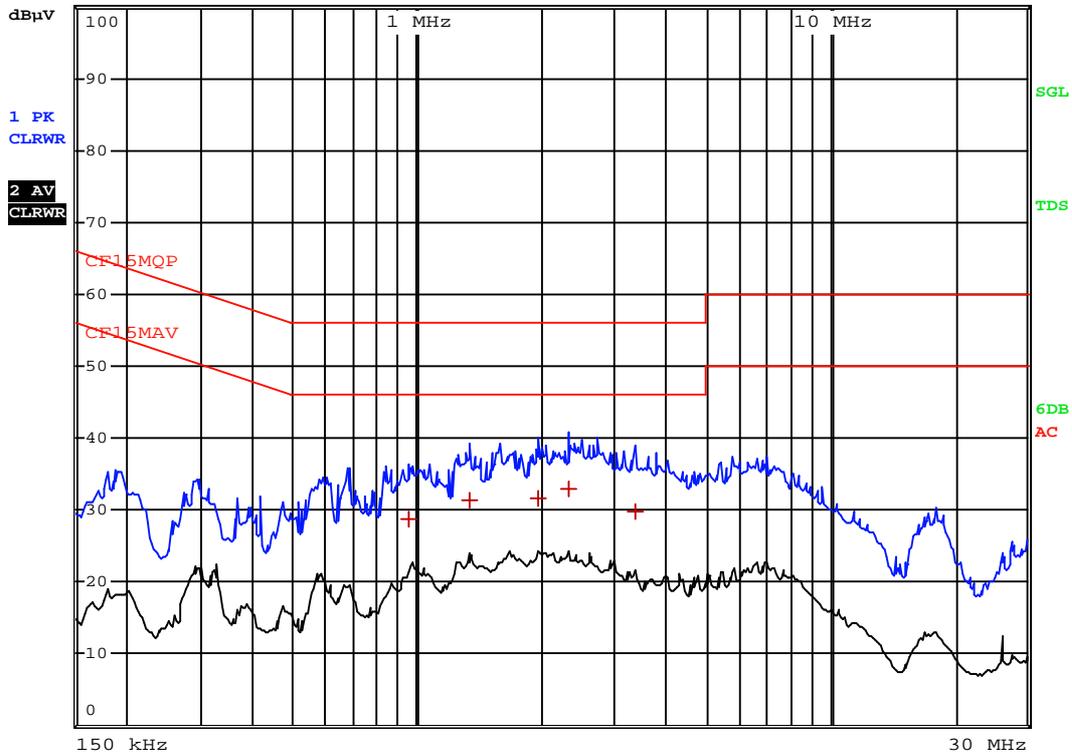
# INTERTEK TESTING SERVICES

Mode: Weather Band Receiver



RBW 9 kHz  
MT 1 s

Att 10 dB AUTO PREAMP OFF



Date: 10.NOV.2015 05:58:09

# INTERTEK TESTING SERVICES

Mode: Weather Band Receiver

EDIT PEAK LIST (Final Measurement Results)				
TRACE		FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
Trace1:	CF15MQP			
Trace2:	CF15MAV			
Trace3:	---			
1	Quasi Peak	951 kHz	28.79 L1	-27.20
1	Quasi Peak	1.3425 MHz	31.34 L1	-24.65
1	Quasi Peak	1.968 MHz	31.70 L1	-24.29
1	Quasi Peak	2.337 MHz	32.98 L1	-23.01
1	Quasi Peak	3.363 MHz	29.74 L1	-26.25

Date: 10.NOV.2015 05:57:47

**INTERTEK TESTING SERVICES**

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**EXHIBIT 7**

**FREQUENCY STABILITY**

## INTERTEK TESTING SERVICES

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### 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.

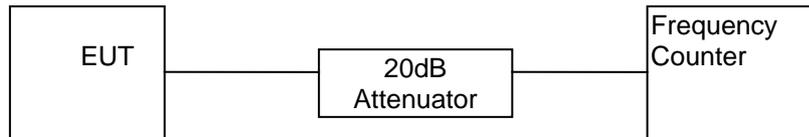
## INTERTEK TESTING SERVICES

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### 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.

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## INTERTEK TESTING SERVICES

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### C. Test Result

**Table 7**

**Motorola Solutions, Inc  
T600/ T603/ T605**

**Frequency Tolerance**

Channel	Frequency (MHz)	Measured Frequency (MHz)	Tolerance (%)
1	462.5625	462.56234	-0.000035
2	462.5875	462.58738	-0.000026
3	462.6125	462.61238	-0.000026
4	462.6375	462.63744	-0.000013
5	462.6625	462.66234	-0.000035
6	462.6875	462.68736	-0.000030
7	462.7125	462.71238	-0.000026
8	467.5625	467.56236	-0.000030
9	467.5875	467.58732	-0.000038
10	467.6125	467.61234	-0.000034
11	467.6375	467.63736	-0.000030
12	467.6625	467.66234	-0.000034
13	467.6875	467.68736	-0.000030
14	467.7125	467.71238	-0.000026
15	462.5500	462.54986	-0.000030
16	462.5750	462.57482	-0.000039
17	462.6000	462.59988	-0.000026
18	462.6250	462.62484	-0.000035
19	462.6500	462.64988	-0.000026
20	462.6750	462.67486	-0.000030
21	462.7000	462.69986	-0.000030
22	462.7250	462.72484	-0.000035

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: Nov 08,2015

## INTERTEK TESTING SERVICES

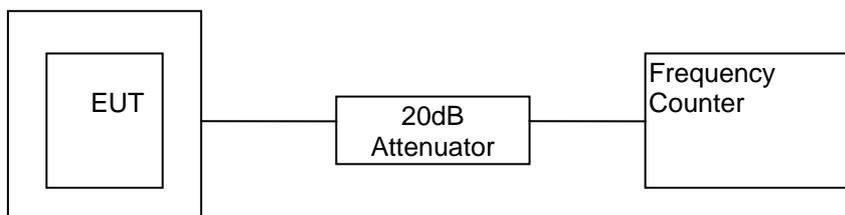
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### 7.2 Frequency Stability - Temperature (Section 2.1055(a)(b), 95.626(b) for FRS, 95.621(b) for GMRS)

#### 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.

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**INTERTEK TESTING SERVICES**

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**C. Test Result**

**Table 8(a)**

**Motorola Solutions, Inc  
T600/ T603/ T605**

**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	462.63734	-0.000035	-0.2
-20	462.63750	462.63736	-0.000030	-0.2
-10	462.63750	462.63738	-0.000026	-0.1
0	462.63750	462.63742	-0.000017	0.0
10	462.63750	462.63742	-0.000017	0.0
20	462.63750	462.63744	-0.000013	0.0
30	462.63750	462.63756	0.000013	0.3
40	462.63750	462.63768	0.000039	0.5
50	462.63750	462.63778	0.000061	0.7

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: Nov 08,2015

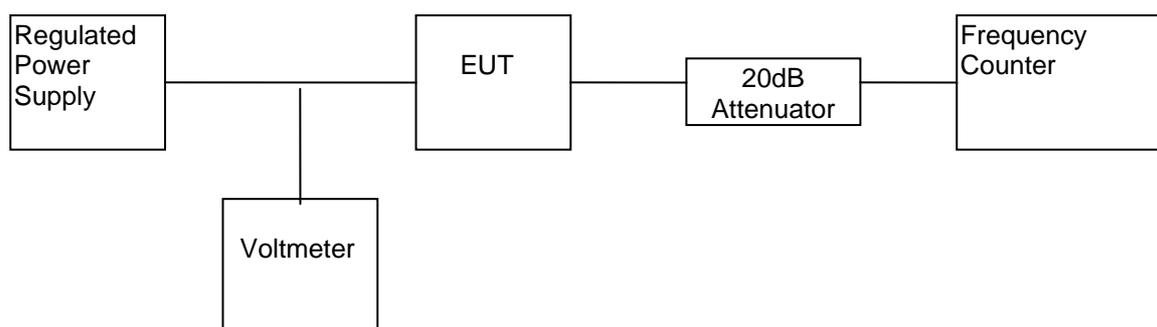
## INTERTEK TESTING SERVICES

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### 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.

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## INTERTEK TESTING SERVICES

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### C. Test Result

**Table 9**

**Motorola Solutions, Inc  
T600/ T603/ T605**

### Frequency Deviation with Voltage Variation

The manufacturer specified battery end point 3.2V

Channel	Frequency (MHz)	Measured Frequency (MHz)	Tolerance (%)
4	462.63750	462.63738	-0.000026

- 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: Nov 08,2015

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# INTERTEK TESTING SERVICES

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## 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	Jun. 5, 2014	Oct. 28, 2014
Calibration Due Date	Nov 19, 2015	Dec. 5, 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 Characteristic

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	Sep. 14, 2015
Calibration Due Date	Nov. 22, 2015	Sep. 14, 2016