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FCC PART 90 TEST REPORT

APPLICANT	SHENZHEN CONSTANT ELECTRONICS CO., LTD.
	F5, NO. 2 BLDG., EAST BRIGHT INDUSTRY REGION NO. 83 DABAO ROAD BAO'AN 33 DISTRICT
	SHENZHEN, GUANGDONG
FCC ID	WH2-2611TA
MODEL NUMBER	MMC-2611T
PRODUCT DESCRIPTION	WIRELESS CALLING HOST
DATE SAMPLE RECEIVED	10/24/2013
DATE TESTED	11/15/2013
TESTED BY	NAM NGUYEN
APPROVED BY	NAM NGUYEN
TIMCO REPORT NO.	1806AUT13TestReport.docx
TEST RESULTS	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL

**THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL
WITHOUT THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.**



Certificate # 0955-01

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GENERAL REMARKS

The attached report shall not be reproduced except in full without the written permission of Timco Engineering Inc.

Summary

The device under test does:

- ☒ fulfill the general approval requirements as identified in this test report
☐ not fulfill the general approval requirements as identified in this test report

Attestations

This equipment 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 instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025 requirements.



Testing Certificate # 0955-01

I attest that the necessary measurements were made, under my supervision, at:

Timco Engineering Inc.
849 NW State Road 45
Newberry, Fl 32669



Authorized Signatory Name:

Nam Nguyen
Engineering Project Manager

Date: 2/5/2014

FCC PART RULES

Applicable Rule(s)	ANSI/TIA 603-C: 2004 CFR 47 Part 90
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TEST ENVIRONMENT

Test Facility	Timco Engineering, Inc. 849 NW State Road 45 Newberry, FL 32669 USA.
Test Condition in the laboratory	Temperature: 26°C Relative humidity: 50%

TEST SETUP SUMMARY

Test Setup Diagram/ Description	The DUT was placed in continuous transmit mode and on the turntable per setup per ANSI C63.4: 2003. A test set up explanation is provided in each test section of this report for clarification.
Modification to the DUT	No modification was made.

GENERAL INFORMATION

DUT Specification

DUT Description	MMC-2611TA sends alphanumeric message to pager MMC-NC-8E. The functions are: wireless alphanumeric message paging, wireless deletion, duty repage, dispatch, urge dishes, monitoring function, USB data download and program update etc. It is suitable for restaurants, hotels, banks, bars etc.
FCC ID	WH2-2611TA
Model Number	MMC-2611T
Operating Frequency	(462.750, 462.775, 462.800, 462.825, 462.850, 462.875, 462.900, 462.925, and 465.000) MHz
No. of Channels	1
Type of Emission	14K0F1D
Modulation	FSK
DUT Power Source	<input type="checkbox"/> 110-120Vac/50- 60Hz
	<input checked="" type="checkbox"/> DC Power 12V
	<input type="checkbox"/> Battery Operated Exclusively
Test Item	<input type="checkbox"/> Prototype
	<input checked="" type="checkbox"/> Pre-Production
	<input type="checkbox"/> Production
Type of Equipment	<input checked="" type="checkbox"/> Fixed
	<input type="checkbox"/> Mobile
	<input type="checkbox"/> Portable

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EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
Analyzer Silver Tower Spectrum Analyzer	HP	8566B Opt 462	3552A22064 3638A08608	06/05/13	06/05/15
Analyzer Silver Tower Preamplifier	HP	8449B	3008A00372	06/05/13	06/05/15
Analyzer Silver Tower RF Preselector	HP	85685A	2926A00983	06/05/13	06/05/15
Analyzer Silver Tower Quasi-Peak Adapter	HP	85650A	2811A01175	06/05/13	06/05/15
Power Meter	Boonton Electronics	4531	11793	1/9/13	1/9/15
Sensor	Boonton	51072A	34647	01/19/13	01/19/15
Antenna: Biconnical	Eaton	94455-1	1096	05/10/13	05/10/15
Antenna: Log-Periodic	Electro-Metrics	LPA-25	1122	05/09/13	05/09/15
Horn Antenna	ETS	3117	35923	12/7/11	12/7/13
Antenna: Dipole Kit	Electro-Metrics	TDA-30/1-4	152	11/01/13	11/01/15
DC Power Supply	HP	6264B		03/21/12	03/21/14
Digital Multimeter	Fluke	77	35053830	06/20/13	06/20/15
Frequency Counter	HP	5385A	2730A03025	08/17/12	08/17/14
Signal Generator	HP	8640B	2308A21464	02/23/12	02/23/14
Hygro-Thermometer	Extech	445703	0602	06/15/13	06/15/15
Digital Multimeter	Fluke	77	35053830	06/20/13	06/20/15
Hygro-Thermometer	Extech	445703	0602	06/15/13	06/15/15
EMI Receiver	Rohde & Schwarz	ESIB40	100274	3/16/12	3/16/14
EMI Receiver	Rohde & Schwarz	ESU40	100320	3/21/13	3/21/15
Directional Coupler	HP	778D	1144A08107	5/14/12	5/14/14
Temperature Chamber	Tenney Engineering	TTRC	11717-7	07/03/12	07/03/14
Notch Filter	Microlab	HA-10N		6/14/12	6/14/14
3-Meter Semi-Anechoic Chamber	Panashield	N/A	N/A	12/31/11	12/31/13

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TEST PROCEDURE

Power Line Conducted Interference: The procedure used was ANSI/TIA 603-C:2004, using a 50uH LISN. Both lines were observed with the UUT transmitting. The bandwidth of the spectrum analyzer was 10 kHz with an appropriate sweep speed.

Bandwidth 20 dB: The measurements were made with the spectrum analyzer's resolution bandwidth (RBW) = 1 MHz and the video bandwidth (VBW) = 3 MHz and the span set as shown on plot.

Power Output: The RF power output was measured at the antenna feed point using a peak power meter.

Antenna Conducted Emissions: The RBW = 100 kHz, VBW = 300 kHz and the span set to 10.0 MHz and the spectrum was scanned from 30 MHz to the 10th harmonic of the fundamental. Above 1 GHz the resolution bandwidth was 1 MHz and the VBW = 3 MHz and the span to 50 MHz.

Radiation Interference: The test procedure used was ANSI/TIA 603-C:2004, using an Agilent spectrum receiver with pre-selector. The bandwidth (RBW) of the spectrum ANSI/TIA 603-C:2004, receiver was 100 kHz up to 1 GHz and 1 MHz above 1 GHz with an appropriate sweep speed. The VBW above 1 GHz was 3 MHz. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The ambient temperature of the UUT was 76°F with a humidity of 55%.

RF POWER OUTPUT

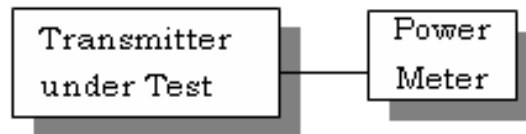
Rule Part No.: Part 2.1046(a), Part 90

Test Requirements:

Method of Measurement: RF power is measured by using a 50-ohm, resistive wattmeter to the RF output connector. With a nominal battery voltage (if battery operated), or a properly adjusted power supply (if not battery operated), and the transmitter properly adjusted the RF output measures:

For the device with a fixed or integral antenna, the RF power is measured as ERP. The substitution method was used. The RF output measures:

Test Setup Diagram:



Test Data:

OUTPUT POWER:

Tuned Frequency (MHz)	RF POWER (W)
462.85	0.104
465.00	0.097

Part 2.1033 (C)(8) DC Input into the final amplifier

FOR POWER SETTING INPUT POWER: $(12.0V)(0.54A) = 6.48$ Watts

MODULATION CHARACTERISTICS

Rule Part No.: Part 2.1047(a)(b)

Test Requirements:

Method of Measurement:

Audio frequency response

The audio frequency response was measured in accordance with TIA/EIA Specification 603 with no exception. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 – 5000Hz shall be submitted. The audio frequency response curve is shown below.

NA – THERE IS NO AUDIO INPUT

AUDIO INPUT VERSUS MODULATION

Rule Part No.: Part 2.1047(b) & 90

Test Requirements:

Method of Measurement: **Modulation cannot exceed 100%,** The audio input level needed for a particular percentage of modulation was measured in accordance with ANSI/TIA 603-C: 2004. The audio input curves versus modulation are shown below. Curves are provided for audio input frequencies of 300, 1000, and 3000 Hz.

NA – THERE IS NO AUDIO INPUT

OTHER MODULATION CHARACTERISTICS

Part 2.1033(c)

Part 2.1033(c) (4) Type of Emission: 14K0F1D (for non-voice paging operations)

Part 90.209

Part 90.203 j(7): Transmitters designed only for one-way paging operations may be certificated with up to a 25 kHz bandwidth and are exempt from the spectrum efficiency requirements of paragraphs (j)(3) and (j)(5) of this section.

This EUT uses the POCSAG (Post Office Code Standardization Advisory Group) code format:

Message Coding Format: alphanumeric

Modulation: FSK

Data rate: 512 bps

OCCUPIED BANDWIDTH

Part 2.1049(c) EMISSION BANDWIDTH:

Part 90.210(b) 25kHz Channel Spacing

Data in the plots show that on any frequency removed from the assigned frequency by more than 50%, but not more than 100%: At least 25dB. On any frequency removed from the assigned frequency by more than 100%, but not more than 250%: At least 35 dB. On any frequency removed from the assigned frequency by more than 250%, of the authorized bandwidth: At least $43 + 10\log(P)$ dB.

Part 90.210(c) 12.5kHz Channel Spacing Not Equipped with a Low Pass Filter

For transmitters that are not equipped with an audio low pass filter pursuant to S90.211 (b), the power of any emission must be attenuated below the un-modulated carrier output power as follows; (1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5 kHz but not more than 10 kHz: At least $83 \log(f_d/5)$ dB; (2) ON any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 10 kHz, but not more than 250% of the authorized bandwidth: At least $29 \log(f_d^2/11)$ dB or 50 dB, whichever is the lesser attenuation; (3) On any frequency removed from the center of the authorized bandwidth by more than 250% of the authorized bandwidth: At least $43 + 10 \log(P_o)$ dB.

Part 90.210(d) Emission Mask D - 12.5 kHz channel BW equipment.

For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

- (1) On any frequency from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0 : Zero dB.
- (2) On any frequency from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least $7.27(f_d - 2.88 \text{ kHz})$ dB.
- (3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz: At least $50 + 10\log(P)$ dB or 70 dB, whichever is the lesser attenuation.

Part 90.210(e) Emission Mask E – 6.25 kHz channel BW equipment.

For transmitters designed to operate with a 6.25 kHz bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

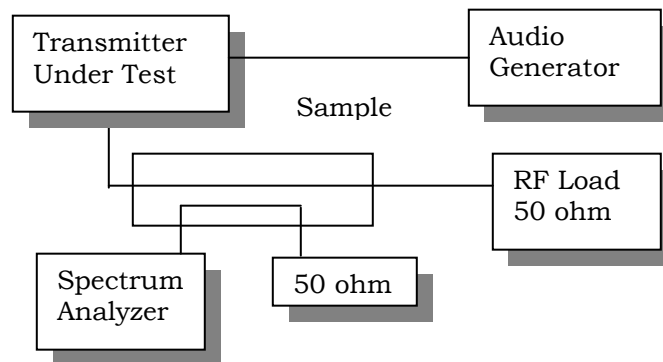
- (1) On any frequency from the center of the authorized bandwidth f_0 to 3.0 kHz removed from f_0 : Zero dB.
- (2) On any frequency from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 3.0 kHz but no more than 4.6 kHz: At least $30 + 16.67(f_d - 3.0 \text{ kHz})$ or $55 + 10 \log(P)$ or 65, whichever us the lesser attenuation.
- (3) On any frequency removed from the center of the authorized bandwidth by more than 4.6kHz: At least $55 + 10\log(P)$ dB or 65 dB, whichever is the lesser attenuation.

Part 90.210(g) Emission Mask G Not Equipped with a Low Pass Filter

For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

- (1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 10 kHz, but no more than 250 percent of the authorized bandwidth: At least $116 \log (f_d/6.1)$ dB, or $50 + 10 \log (P)$ dB, or 70 dB, whichever is the lesser attenuation;
- (2) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log (P)$ dB.

Method of Measurement: ANSI/TIA 603-C: 2004

Test Setup Diagram:

Test Data: See the plots below

OCCUPIED BANDWIDTH PLOT

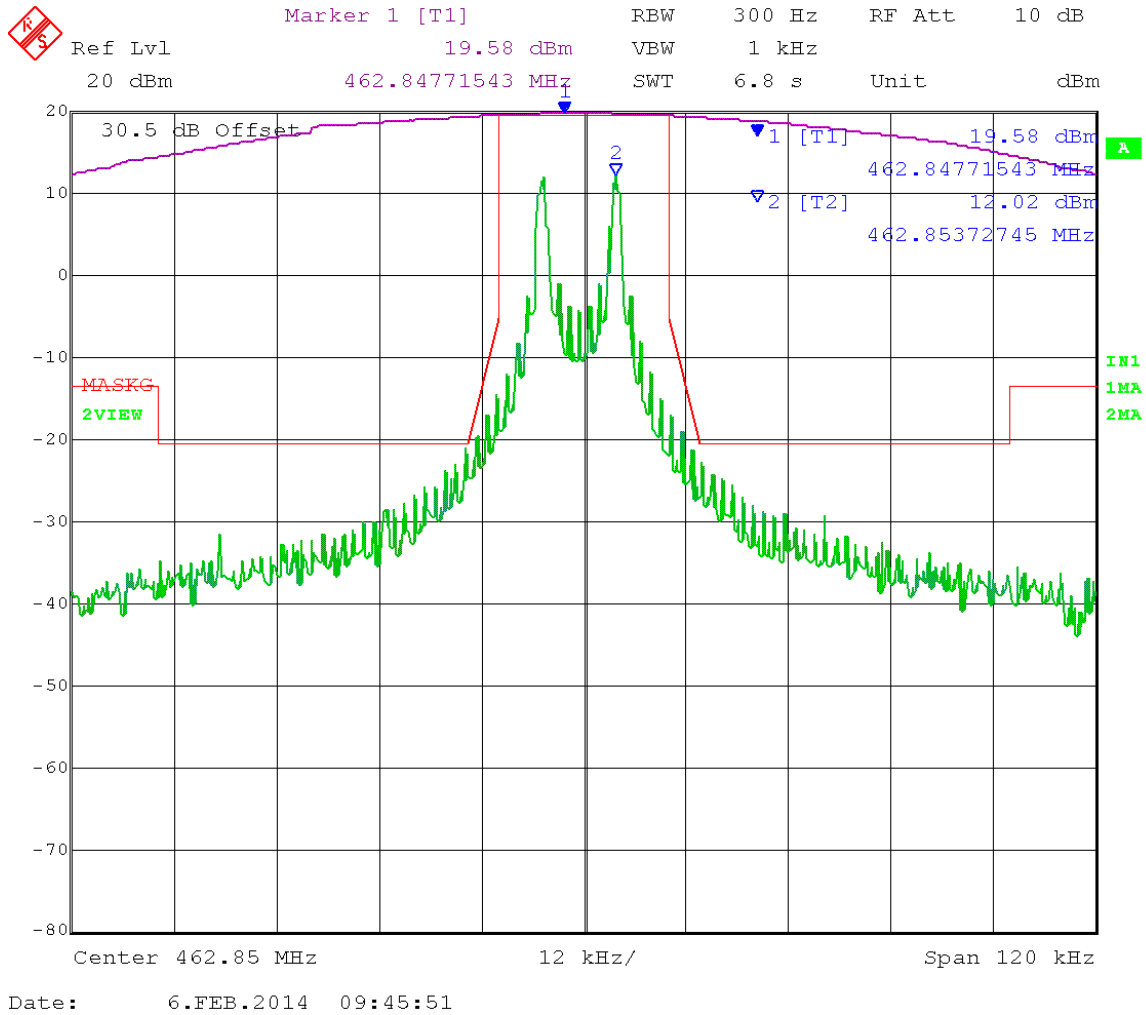
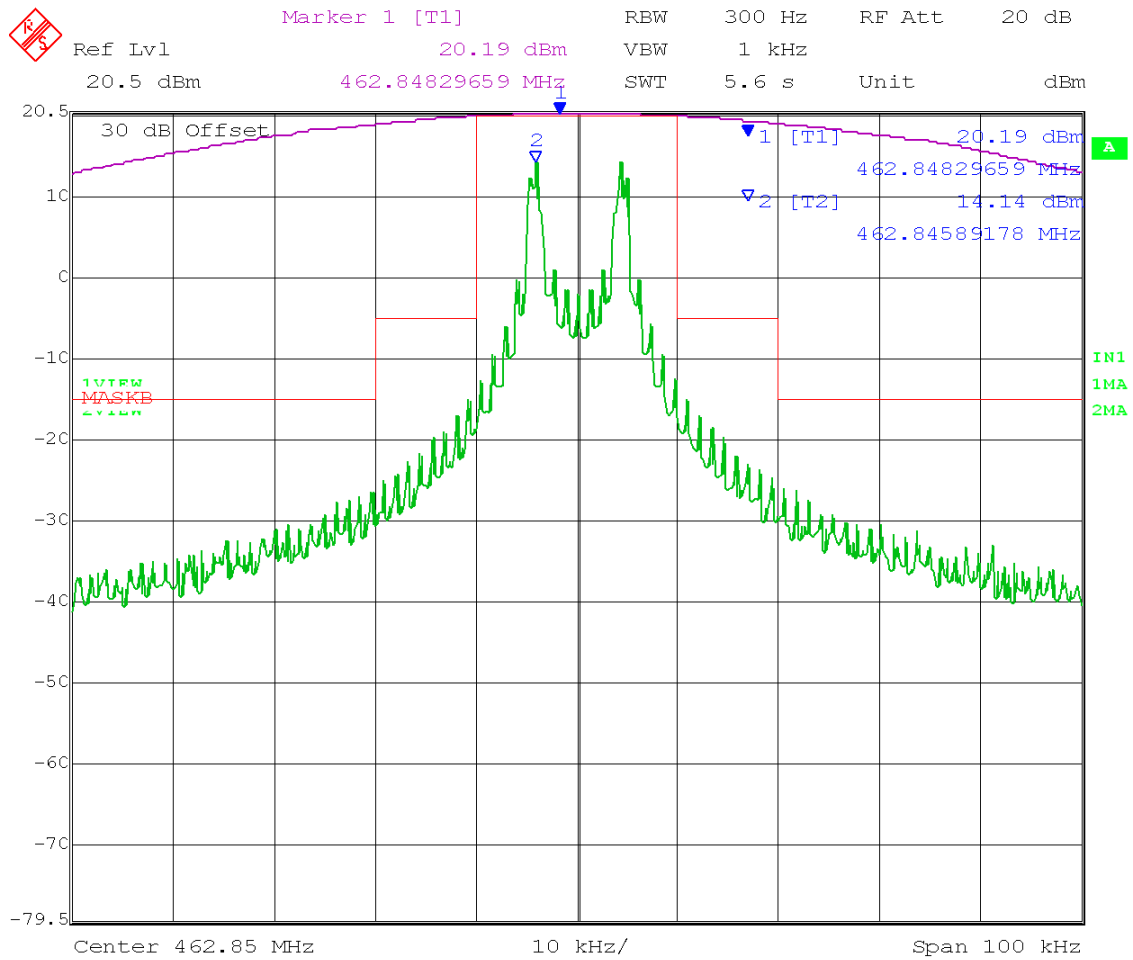


Figure 1: OCCUPIED BANDWIDTH PLOT – MASK G



Date: 21.NOV.2013 10:17:09

Figure 2: OCCUPIED BANDWIDTH PLOT – MASK B

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99% OCCUPIED BANDWIDTH PLOT

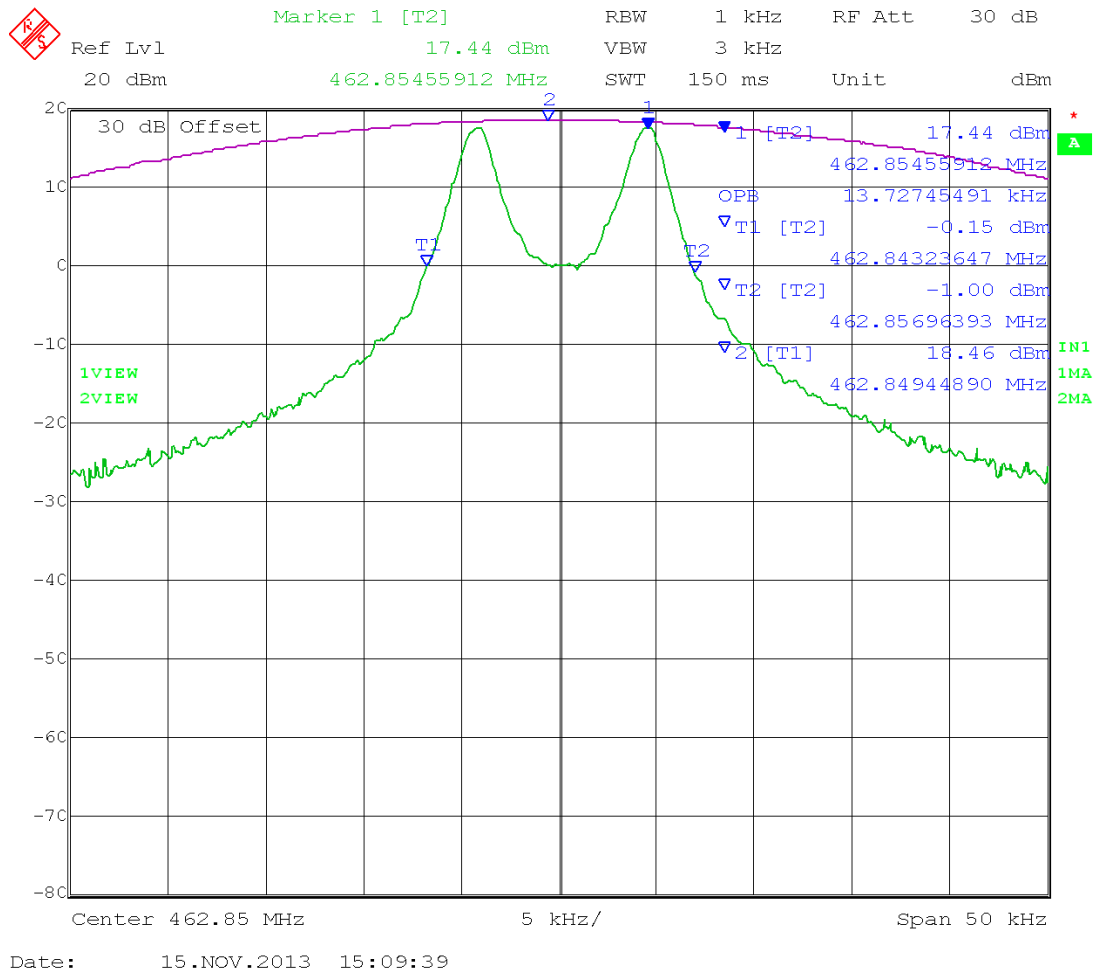


Figure 3: 99% BANDWIDTH PLOT (13.72 kHz)

SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

Rule Part No.: Part 2.1051(a)

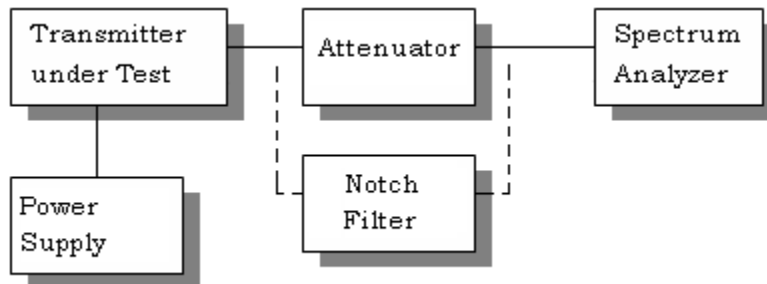
Requirements:

$$12.5\text{kHz Channel Spacing} = 43 + 10\log(0.1) = 33\text{dBc}$$

Method of Measurement: The carrier was modulated 100% using a 2500 Hz tone. The spectrum was scanned from 0.4 to at least the 10th harmonic of the fundamental. The measurements were made in accordance with standard ANSI/TIA 603-C: 2004.

NA – THERE IS NO RF CONNECTOR OUTPUT.

Method of Measuring Conducted Spurious Emissions



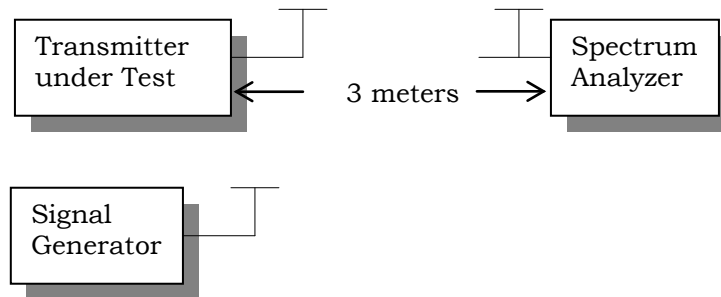
FIELD STRENGTH OF SPURIOUS EMISSIONS

Rule Parts. No.: Part 2.1053

Requirements: 25kHz Channel Spacing = $43 + 10 \log(0.10) = 33.0$ dBc

METHOD OF MEASUREMENT: The tabulated data shows the results of the radiated field strength emissions test. The spectrum was scanned from 30 MHz to at least the tenth harmonic of the fundamental. This test was conducted per ANSI/TIA 603-C: 2004 using the substitution method. Measurements were made at the test site of TIMCO ENGINEERING, INC. located at 849 NW State Road 45, Newberry, FL 32669.

Test Setup Diagram:



Test Data:

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)	Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
462.85	0	0	465.00	0	0
925.70	H	60.8	930.00	H	48.4
1388.55	H	73.1	1395.00	H	59.3
1851.40	H	78.9	1860.00	V	62.6
2314.25	V	54.5	2325.00	V	47.9
2777.10	V	61.7	2790.00	V	59.2
3239.95	H	50.7	3255.00	H	47.6
3702.80	V	42.5	3720.00	H	41.8
4165.65	H	43.6	4185.00	H	49.3
4628.50	H	45.5	4650.00	H	50.4

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FREQUENCY STABILITY

Rule Parts. No.: Part 2.1055, Part 90.213

Requirements: Temperature range requirements: -30 to +50° C.
Voltage Variation $\pm 15\%$.

Paging transmitters operating on paging-only frequencies must operate with frequency stability of 5 ppm in the 150-174 MHz band and 2.5 ppm in the 421-512 MHz band.

Method of Measurements: ANSI/TIA 603-C: 2004.

Test Data:

Assigned Frequency (Ref. Frequency) (MHz)		462.849202
Temperature (°C)	Frequency (MHz)	Frequency Stability (PPM)
-30	462.849445	0.53
-20	462.849536	0.72
-10	462.849561	0.78
0	462.849459	0.56
+10	462.849396	0.42
+20	462.849320	0.25
+30	462.849494	0.63
+40	462.849358	0.34
+50	462.849094	-0.23

Assigned Frequency (Ref. Frequency) (MHz)		
% Battery	Frequency (MHz)	Frequency Stability (PPM)
-15%	462.849247	0.10
0	462.849202	0.0
+15%	462.849184	-0.04

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TRANSIENT FREQUENCY BEHAVIOR

Part 90.214 Transient Frequency Behavior

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

Time Intervals	Maximum frequency difference	All Equipment	
		150-174 MHz	421-512 MHz

Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels

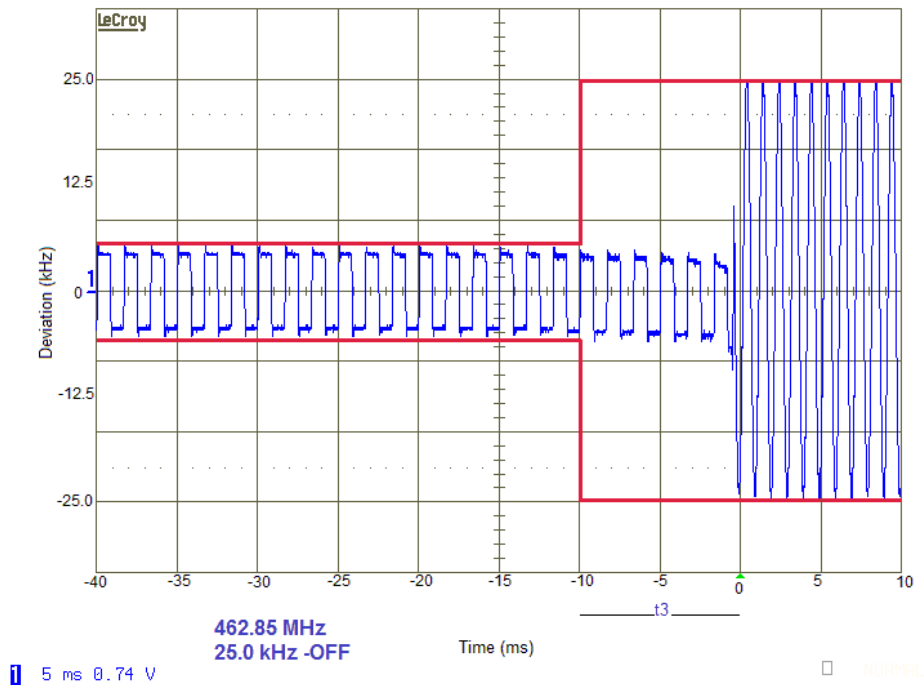
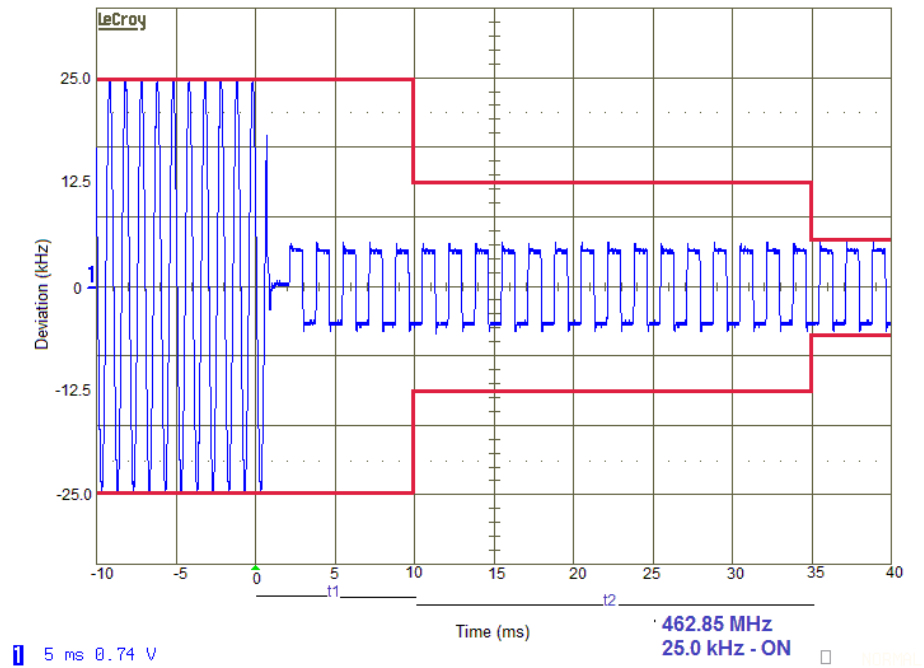
t_1^4	± 25.0 kHz	5.0 ms	10.0 ms
t_2	± 12.5 kHz	20.0 ms	25.0 ms
t_3^4	± 25.0 kHz	5.0 ms	10.0 ms

Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels

t_1^4	± 12.5 kHz	5.0 ms	10.0 ms
t_2	± 6.25 kHz	20.0 ms	25.0 ms
t_3^4	± 12.5 kHz	5.0 ms	10.0 ms

Transient Frequency Behavior for Equipment Designed to Operate on 6.25 kHz Channels

t_1^4	± 6.25 kHz	5.0 ms	10.0 ms
t_2	± 3.125 kHz	20.0 ms	25.0 ms
t_3^4	± 6.25 kHz	5.0 ms	10.0 ms



TEST PROCEEDURE: ANSI/TIA 603-C:2004, the levels were set as follows:

1. Using the variable attenuator the transmitter level was set to 40 dB below the test receivers maximum input level, then the transmitter was turned off.
2. With the transmitter off the signal generator was set 20dB below the level of the transmitter in the above step, this level will be maintained with the signal generator through-out the test.
3. Reduce the attenuation between the transmitter and the RF detector by 30 dB.
4. With the levels set as above, the transient frequency behavior was observed and recorded.

