



CONFORMANCE TEST REPORT FOR FCC 47 CFR, Part 15 Subpart C

Report No.: 13-03-MAS-190

Client: Shingki Inc. DBA Micro Alarm Systems
Product: Transmitter
Model: TX-24A421
FCC ID: JRMSK001
Manufacturer/supplier: Promaster Security Ltd.

Date test item received: 2013/03/13
Date test campaign completed: 2013/03/27
Date of issue: 2013/03/27

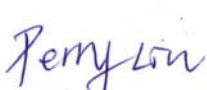
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Total number of pages of this test report: 23 pages

Total number of pages of photos: External photos 1 pages

Internal photos 3 pages

Setup photos 2 pages

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Manufacturer : Promaster Security Ltd.
Address : 13F, No.240, Ta-Tung Rd Sec. 2, His-Chih District, New-Taipei City,
Taiwan, ROC
EUT : Transmitter
Trade name : MICRO
Model No. : TX-24A421
Power Source : DC 3V (Lithium Battery)
Regulations applied : FCC 47 CFR, Part 15 Subpart C

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Table of Contents

Page

1. GENERAL INFORMATION	4
1.1 PRODUCT DESCRIPTION.....	4
1.2 CHARACTERISTICS OF DEVICE:.....	4
1.3 TEST METHODOLOGY.....	4
1.4 TEST FACILITY	4
1.5 TEST SUMMARY	4
2. DEFINITION AND LIMITS	5
2.1 DEFINITION	5
2.2 RESTRICTED BANDS OF OPERATION	5
2.3 LIMITATION.....	6
2.4 LABELING REQUIREMENT.....	7
2.5 USER INFORMATION	7
3. SYSTEM TEST CONFIGURATION	8
3.1 JUSTIFICATION	8
3.2 DEVICES FOR TESTED SYSTEM	8
4. RADIATED EMISSION MEASUREMENT	9
4.1 APPLICABLE STANDARD.....	9
4.2 MEASUREMENT PROCEDURE	9
4.3 TEST DATA.....	11
4.4 FIELD STRENGTH CALCULATION.....	15
4.5 RADIATED TEST EQUIPMENT.....	15
4.6 MEASURING INSTRUMENT SETUP	18
5. BANDWIDTH OF EMISSION.....	19
5.1 APPLICABLE STANDARD PLOT GRAPHIC OF BANDWIDTH	19
5.2 TEST EQUIPMENT	19
5.3 TEST RESULT	19
6. CONDUCTED EMISSION MEASUREMENT	21
7. LIMIT OF TRANSMISSION TIME	22
7.1 APPLICABLE STANDARD	22
7.2 TEST EQUIPMENT	22
7.3 TEST RESULT	22

1. GENERAL INFORMATION

1.1 Product Description

- a) Type of EUT : Transmitter
- b) Model No. : TX-24A421
- c) Serial No. : ----
- d) FCC ID : JRMSK001
- e) Working Frequency : 433.92 MHz

1.2 Characteristics of Device:

- (1) TX-24A421 is a wireless transmitter
- (2) To functional the PM-T77 main unit is via R15 transceiver by pressing the buttons on the TX-24A421transmitter.

1.3 Test Methodology

Both Conducted and radiated testing were performed according to the procedures in chapter 13 of ANSI C63.4 (2003).

The equipment under test was operated continuously in its normal operating mode for the purpose of the measurements. In order to secure the continuous operation of the device under test, the circuit rewired by the manufacturer to affect its intended operation. The receiving antenna was varied from 1 to 4 meters and the wooden turntable was rotated through 360 degrees to obtain the highest reading on the field strength meter or on the display of the spectrum analyzer. And also, each emission was to be maximized by changing the orientation of the equipment Transmitter under test.

1.4 Test Facility

The semi-anechoic chamber and conducted measurement facility used to collect the radiated and conducted data are located inside the Building at No.8, Lane 29, Wen-ming Road, Lo-shan Tsun, Kweishan Hsiang, Taoyuan, Taiwan, R.O.C.

This site has been accreditation as a FCC filing site.

1.5 Test Summary

Requirement	FCC Paragraph #	Test Pass
Radiated Emission	15.231(b)(e)&15.209	☒
Bandwidth of Emission	15.231(c)	☒
Conducted Emission	15.207	N/A
Limit of Transmission Time	15.231(a)(1)&15.231(e)	☒

2. DEFINITION AND LIMITS

2.1 Definition

Intentional radiator:

A device that intentionally generates and emits radio frequency energy by radiation or induction.

2.2 Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42-16.423	399.9-410	4.5-5.25
0.495 - 0.505 **	16.69475 - 16.69525	608-614	5.35-5.46
2.1735 - 2.1905	16.80425 - 16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475 - 156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

Remark "***" : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

2.3 Limitation

(1) Conducted Emission Limits :

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the conducted limit is the following:

Frequency MHz	Quasi Peak dB μ V	Average dB μ V
0.15 - 0.5	66-56	56-46
0.5 - 5.0	56	46
5.0 - 30.0	60	50

(2) Radiated Emission Limits :

According to 15.231 (b) , in addition to the provisions of section 15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Frequency Band (MHz)	Field strength of Fundamental (uV/m)	Field strength of Spurious (uV/m)
40.66-40.70	2250	225
70-130	1250	125
130-174	*1,250 to 3,750	*125 to 375
174-260	3750	375
260-470	*3,750 to 12,500	*375 to 1250
Above 470	12500	1250

* Linear interpolations.

According to 15.231(e) ,Periodic operation in the band 40.66-40.70 MHz and above 70 MHz, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Frequency Band (MHz)	Field strength of Fundamental (uV/m)	Field strength of Spurious (uV/m)
40.66-40.70	1000	100
70-130	500	50
130-174	*500-1500	*50-150
174-260	1500	150
260-470	*1500-5000	*150-500
Above 470	5000	500

* Linear interpolations.

According to 15.205 (b), the field strength of emissions appearing within the Restricted Bands shall not exceed. The general radiated limits in 15.209, as following table:

Frequency (MHz)	Field Strength		Measurement Distance (meters)
	$\mu\text{V}/\text{meter}$	$\text{dB}\mu\text{V}/\text{meter}$	
30 - 88	100	40.0	3
88 - 216	150	43.5	3
216 - 960	200	46.0	3
Above 960	500	54.0	3

As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

(3) Limit of transmission time

According to 15.231(a)(1), a manually operated Transmitter shall employ a switch that will automatically deactivate the Transmitter within not more than 5 seconds of being released.

According to 15.231(e), devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

2.4 Labeling Requirement

The device shall bear the following statement in a conspicuous location on the device :

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

2.5 User Information

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

To comply with the FCC RF exposure compliance requirement, this device and its antenna must not be co-located or operating in conjunction with any other antenna or Transmitter.

3. SYSTEM TEST CONFIGURATION

3.1 Justification

For the purposes of this test report ancillary equipment is defined as equipment which is used in conjunction with the EUT to provide operational and control features to the EUT during the test.

3.2 Devices for Tested System

Device	Manufacture	Model	Cable Description
* Transmitter	Promaster Security Ltd.	TX-24A421	----

Remark :“*” means equipment under test.

4. RADIATED EMISSION MEASUREMENT

4.1 Applicable Standard

For periodic operation intentional radiator, the radiated emission shall comply with § 15.231(b).

4.2 Measurement Procedure

A. Preliminary Measurement For Portable Devices.

For portable devices, the following procedure was performed to determine the maximum emission axis of EUT (X, Y and Z axis):

1. With the receiving antenna is H polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
2. With the receiving antenna is V polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
3. Compare the results derived from above two steps. The axis of maximum emission from EUT was determined and the configuration was used to perform the final measurement.
4. The position in which the maximum noise occurred was "X axis". (Please see the test setup photos)

B. Final Measurement

1. Setup the configuration per figure 3 and 4 for frequencies measured below and above 1 GHz respectively.
2. For emission frequencies measured below 1 GHz, it is performed in a semi-anechoic chamber to determine the accurate frequencies of higher emissions. For emission frequencies measured above 1 GHz, a pre-scan be performed with a 1 meter measuring distance before final test.
3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 120 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.
4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0 ° to 360 ° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading. A RF test receiver is also used to confirm emissions measured.

Note : A filter was used to avoid pre-amplifier saturated when measure TX operation mode.

5. Repeat step 4 until all frequencies need to be measured were complete.
6. Repeat step 5 with search antenna in vertical polarized orientations.
7. Check the three frequencies of highest emission with varying the data rate, placement of ANT. cables associated with EUT to obtain the worse case and record the result.

Figure 1 : Frequencies measured below 1 GHz configuration

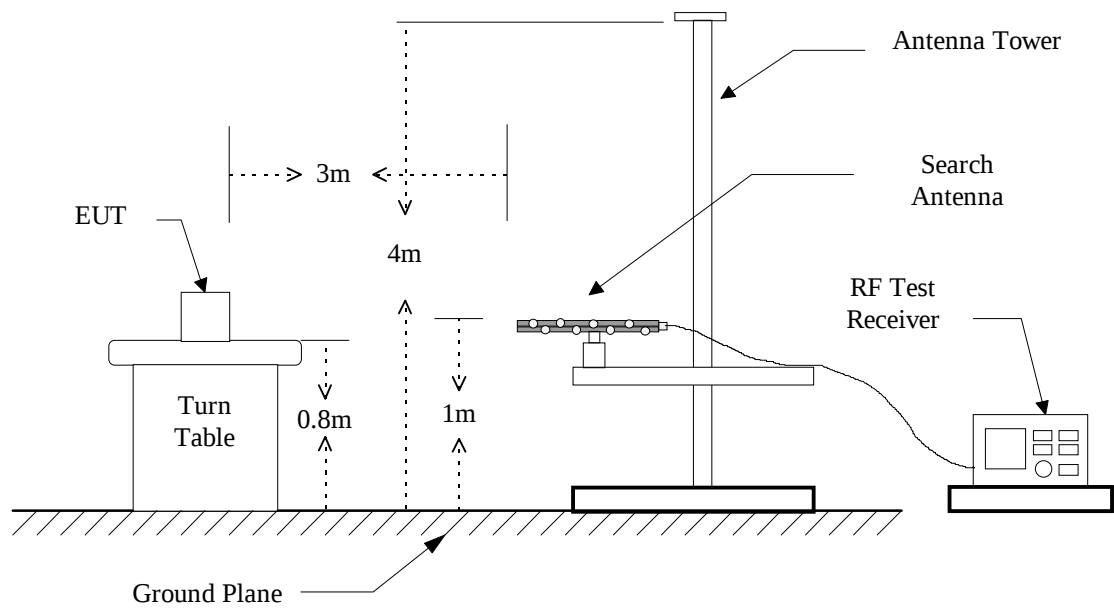
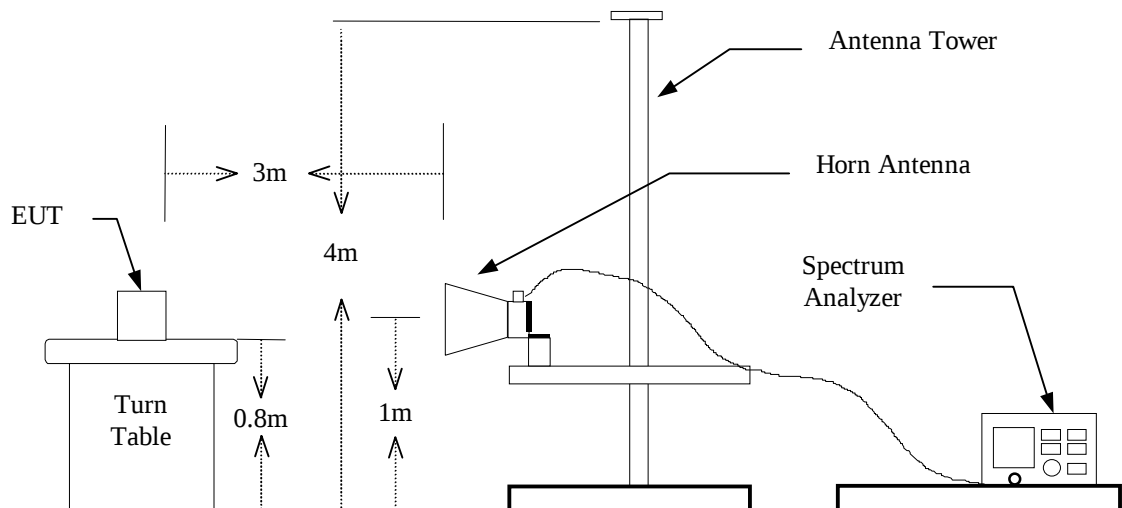


Figure 2 : Frequencies measured above 1 GHz configuration



4.3 Test Data

4.3.1 Fundamental and Harmonic of Transmitter

Operated mode : TransmittingTest Date : Mar. 19, 2013Temperature : 22°CHumidity : 58%

Frequency	Ant Pol	Reading (dBuV/m) @3m		Correct Factor	Duty Factor	Result (dBuV/m) @3m			Limit (dBuV/m) @3m			Margin
(MHz)	H/V	Peak	QP	(dB)	(dB)	Peak	QP	AVG	Peak	QP	AVG	(dB)
Fundamental												
433.9200	H	46.9	----	19.58	-25.33	66.5	----	41.2	100.8	----	80.8	-34.3
433.9200	V	30.2	----	19.58	-25.33	49.8	----	24.5	100.8	----	80.8	-51.0
Harmonic												
867.8400	H	40.9	----	25.30	-25.33	66.2	----	40.9	80.8	----	60.8	-14.6
867.8400	V	28.1	----	25.30	-25.33	53.4	----	28.1	80.8	----	60.8	-27.4
*1301.7600	H	54.1	----	-12.86	-25.33	41.2	----	15.9	74.0	----	54.0	-32.8
*1301.7600	V	61.8	----	-12.86	-25.33	48.9	----	23.6	74.0	----	54.0	-25.1
1735.6800	H	64.4	----	-10.65	-25.33	53.8	----	28.5	80.8	----	60.8	-27.0
1735.6800	V	54.8	----	-10.65	-25.33	44.2	----	18.9	80.8	----	60.8	-36.6
2169.6000	H	58.6	----	-8.69	-25.33	49.9	----	24.6	80.8	----	60.8	-30.9
2169.6000	V	55.3	----	-8.69	-25.33	46.6	----	21.3	80.8	----	60.8	-34.2
2603.5200	H	56.5	----	-7.28	-25.33	49.2	----	23.9	80.8	----	60.8	-31.6
2603.5200	V	54.9	----	-7.28	-25.33	47.6	----	22.3	80.8	----	60.8	-33.2
3037.4400	H	57.8	----	-5.84	-25.33	52.0	----	26.7	80.8	----	60.8	-28.8
3037.4400	V	59.1	----	-5.84	-25.33	53.3	----	28.0	80.8	----	60.8	-27.5
3471.3600	H	63.4	----	-4.60	-25.33	58.8	----	33.5	80.8	----	60.8	-22.0
3471.3600	V	64.4	----	-4.60	-25.33	59.8	----	34.5	80.8	----	60.8	-21.0
*3905.2800	H	63.4	----	-2.96	-25.33	60.4	----	35.1	74.0	----	54.0	-13.6
*3905.2800	V	64.4	----	-2.96	-25.33	61.4	----	36.1	74.0	----	54.0	-12.6
*4339.2000	H	62.3	----	-2.63	-25.33	59.7	----	34.4	74.0	----	54.0	-14.3
*4339.2000	V	67.0	----	-2.63	-25.33	64.4	----	39.1	74.0	----	54.0	-9.6

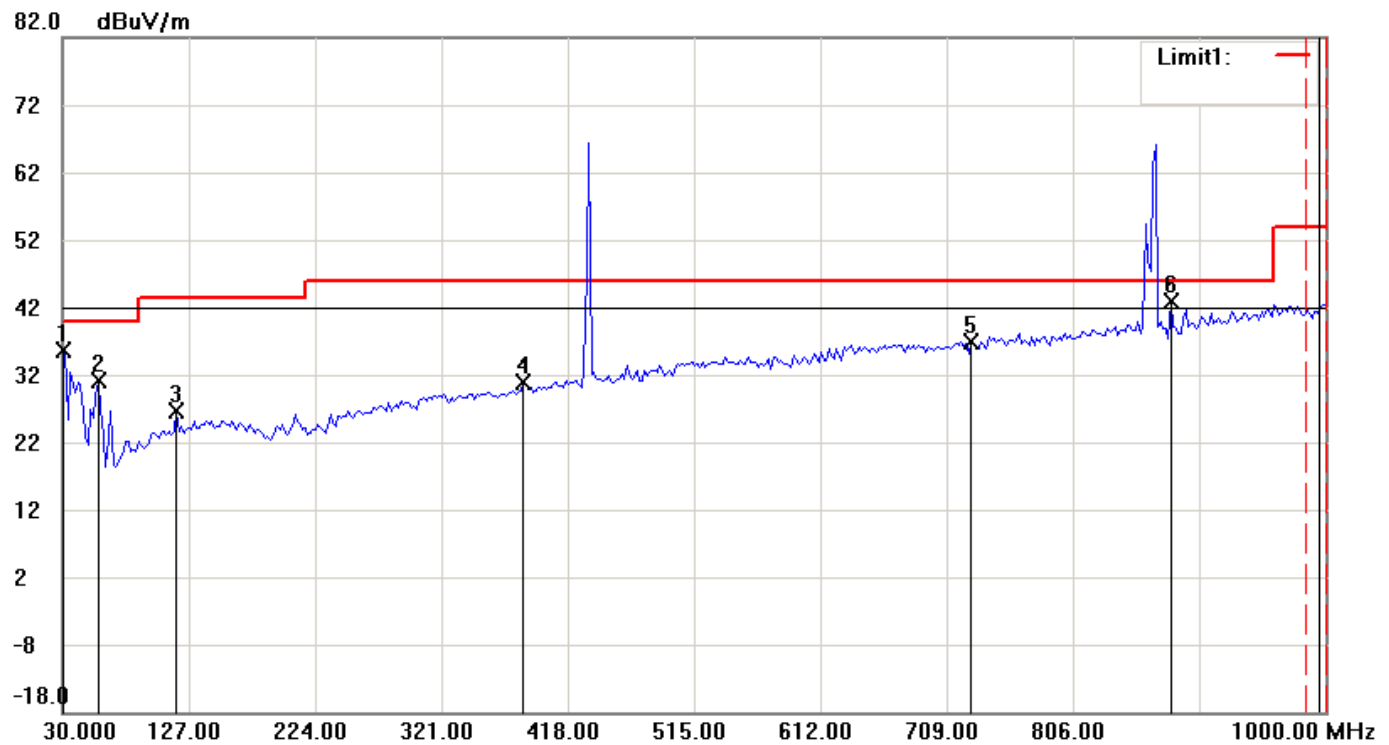
Note:

1. Peak Result = Peak Reading + Correct Factor
2. AVG Result = Peak Result + Duty Factor
3. If the result of peak value is under the limit of average, the average value doesn't need to be measured.
4. "*" means the frequency is in the Restricted Bands.

4.3.2 Other Emission

A. below 1GHz

File: Data: #27 Date: 2013/3/19 Temperature: 22 °C
Time: AM 11:40:03 Humidity: 58 %

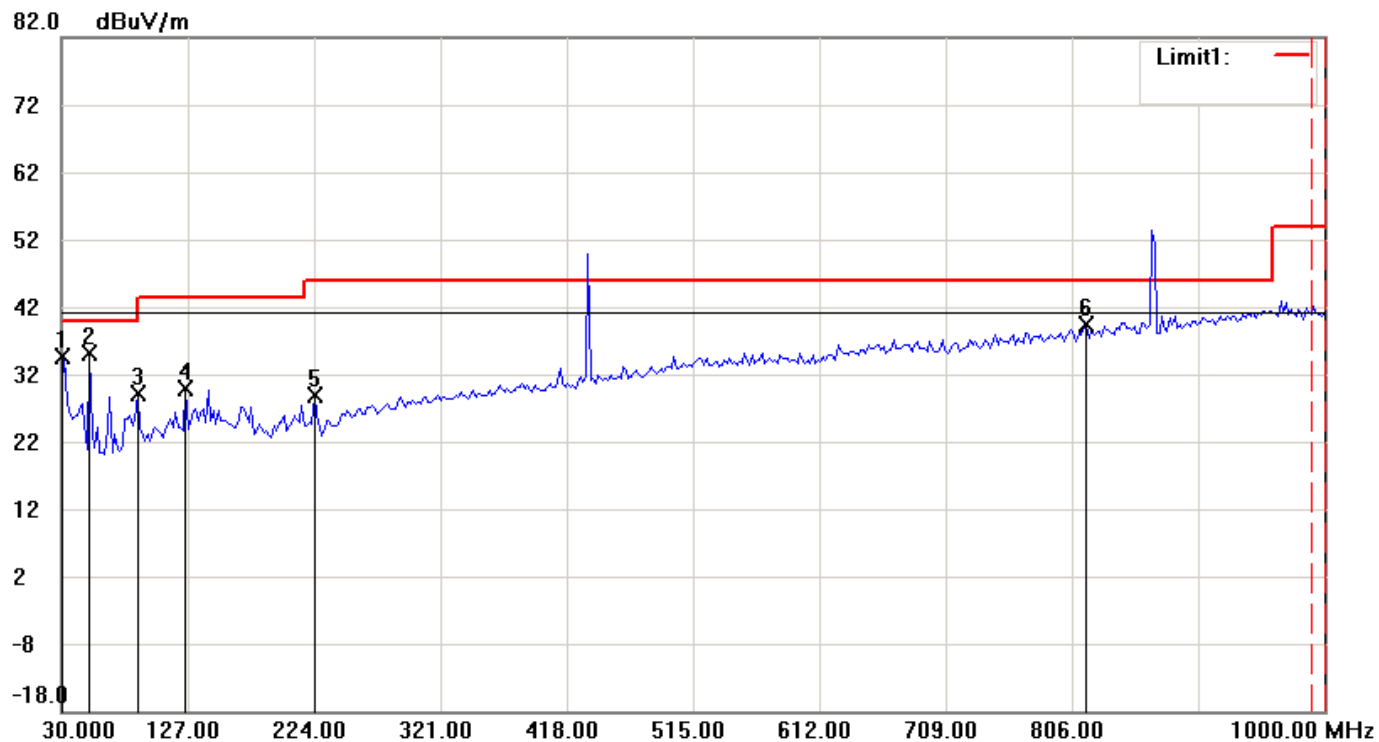


Condition: FCC Part15 RE-Class B
EUT:
Model: A421
Test Mode:
Note:

Polarization: Horizontal
Distance:

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Corrected dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	31.9438	16.15	peak	19.39	35.54	40.00	-4.46
2	57.2143	23.05	peak	8.14	31.19	40.00	-8.81
3	117.4750	13.72	peak	12.90	26.62	43.50	-16.88
4	383.7875	10.88	peak	20.07	30.95	46.00	-15.05
5	727.8555	11.27	peak	25.64	36.91	46.00	-9.09
6	881.4228	14.75	peak	28.05	42.80	46.00	-3.20

File: Data: #28 Date: 2013/3/19 Temperature: 22 °C
Time: AM 11:41:47 Humidity: 58 %



Condition: FCC Part15 RE-Class B
EUT:
Model: A421
Test Mode:
Note:

Polarization: Vertical
Distance:

No.	Frequency (MHz)	Reading (dBuV/m)	Detector	Corrected dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	31.9438	15.23	peak	19.39	34.62	40.00	-5.38
2	51.3828	24.97	peak	10.13	35.10	40.00	-4.90
3	88.3165	18.96	peak	10.26	29.22	43.50	-14.28
4	125.2505	16.54	peak	13.30	29.84	43.50	-13.66
5	224.3888	14.70	peak	14.10	28.80	46.00	-17.20
6	817.2744	12.31	peak	27.10	39.41	46.00	-6.59

B. above 1GHz

Frequency (MHz)	Ant Pol H / V	Reading (dBuV/m) Peak	Correct Factor (dB)	Duty Factor (dB)	Result @3m (dBuV/m) Peak AVG		Limit @3m (dBuV/m) Peak AVG		Margins (dB)
Radiated emission frequencies above 1 GHz to 4.5 GHz were too low to be measured.									

Note:

1. Place of Measurement: Measuring site of the ETC.
2. If the data table appeared symbol of "****" means the value was too low to be measured.
3. The estimated measurement uncertainty of the result measurement is
 - $\pm 4.6\text{dB}$ ($30\text{MHz} \leq f < 300\text{MHz}$).
 - $\pm 4.4\text{dB}$ ($300\text{MHz} \leq f < 1000\text{MHz}$).
 - $\pm 4.1\text{dB}$ ($1\text{GHz} \leq f \leq 18\text{GHz}$).

4.4 Field Strength Calculation

(a) Field Strength:

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$\text{RESULT} = \text{READING} + \text{CORR. FACTOR}$$

where CORR. FACTOR = Antenna FACTOR + Cable FACTOR

(b) Duty Factor:

$$20\log \frac{2.706 \times 2(\text{ms})}{100(\text{ms})} = -25.33 \text{ dB}$$

The plotted graph of Duty Factor please see page 16 ~ 17.

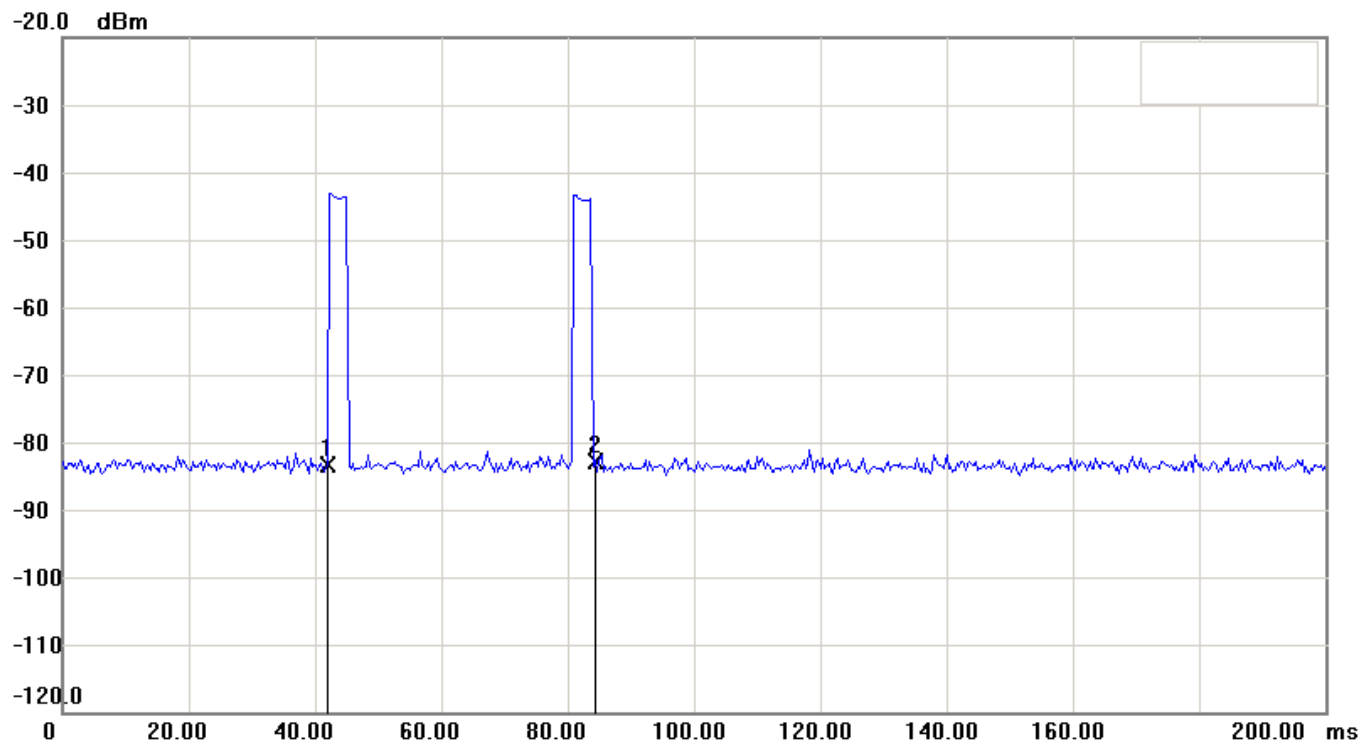
4.5 Radiated Test Equipment

The following instrument are used for radiated emissions measurement :

Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
EMI Receiver	R&S	ESIB7	13054414-001	07/10/2013
BiLog Antenna	ETC	MCTD2986	----	11/25/2013
Horn Antenna	EMCO	3115	9107-3729	07/17/2013
PRE-Amplifier	Agilent	8449B	----	03/26/2013
Spectrum Analyzer	Rohde & Schwarz	FSU46	13040904-001	01/08/2014

Note: The standards used to perform this calibration are traceable to NML/ROC, NIST/USA and NPL.

File: Data: #12 Date: 2013/3/13 Temperature: 20 °C
Time: PM 02:32:53 Humidity: 54 %

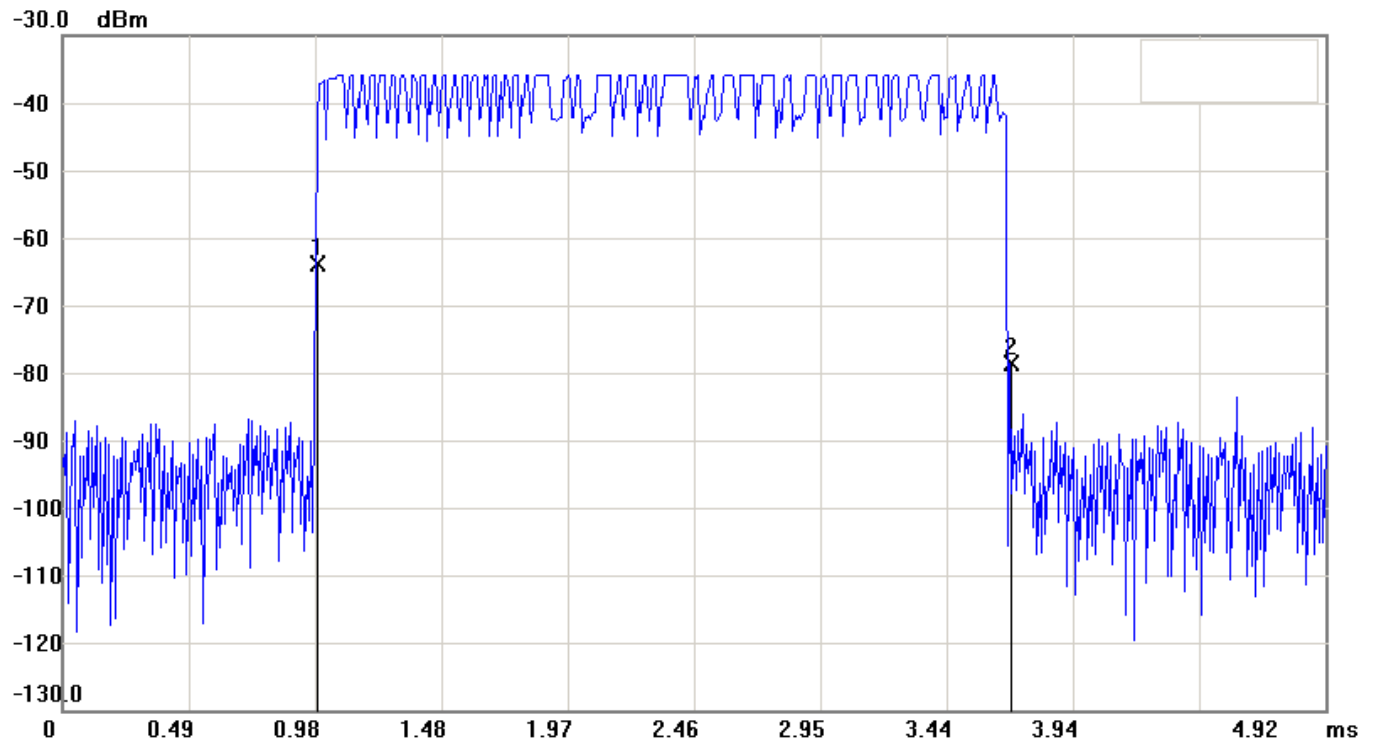


Condition:
EUT:
Model: TX-24A421
Test Mode:
Note:

RF Conducted
Sweep Time: 200ms Att.: 10dB
RBW: 100 KHz VBW: 100 KHz

No.	Sweep time(ms)	Level(dBm)
1	42.0000	-83.49
2	84.3333	-82.75

File: Data: #1 Date: 2013/3/13 Temperature: 20 °C
Time: PM 02:09:41 Humidity: 54 %



Condition: RF Conducted
EUT: Sweep Time: 4.92ms Att.: 10dB
Model: TX-24A421 RBW: 100 KHz VBW: 300 KHz
Test Mode:
Note:

No.	Frequency(MHz)	Level(dBm)
1	0.9840	-63.83
2	3.6900	-78.50

No.		Δ Time(ms)	Δ Level(dB)
1	mk2-mk1	2.706	-14.67

4.6 Measuring Instrument Setup

Measuring instrument setup in measured frequency band when specified detector function is used :

Frequency Band (MHz)	Instrument	Function	Resolution Bandwidth	Video Bandwidth
30 to 1000	EMI Test Receiver	Peak	120 kHz	300 kHz
1000 to 4500	EMI Test Receiver	Peak	1 MHz	1 MHz

5. BANDWIDTH OF EMISSION

5.1 Applicable Standard Plot Graphic of Bandwidth

Per FCC rule §15.231(c), the permitted emission bandwidth is no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the centre frequency.

5.2 Test Equipment

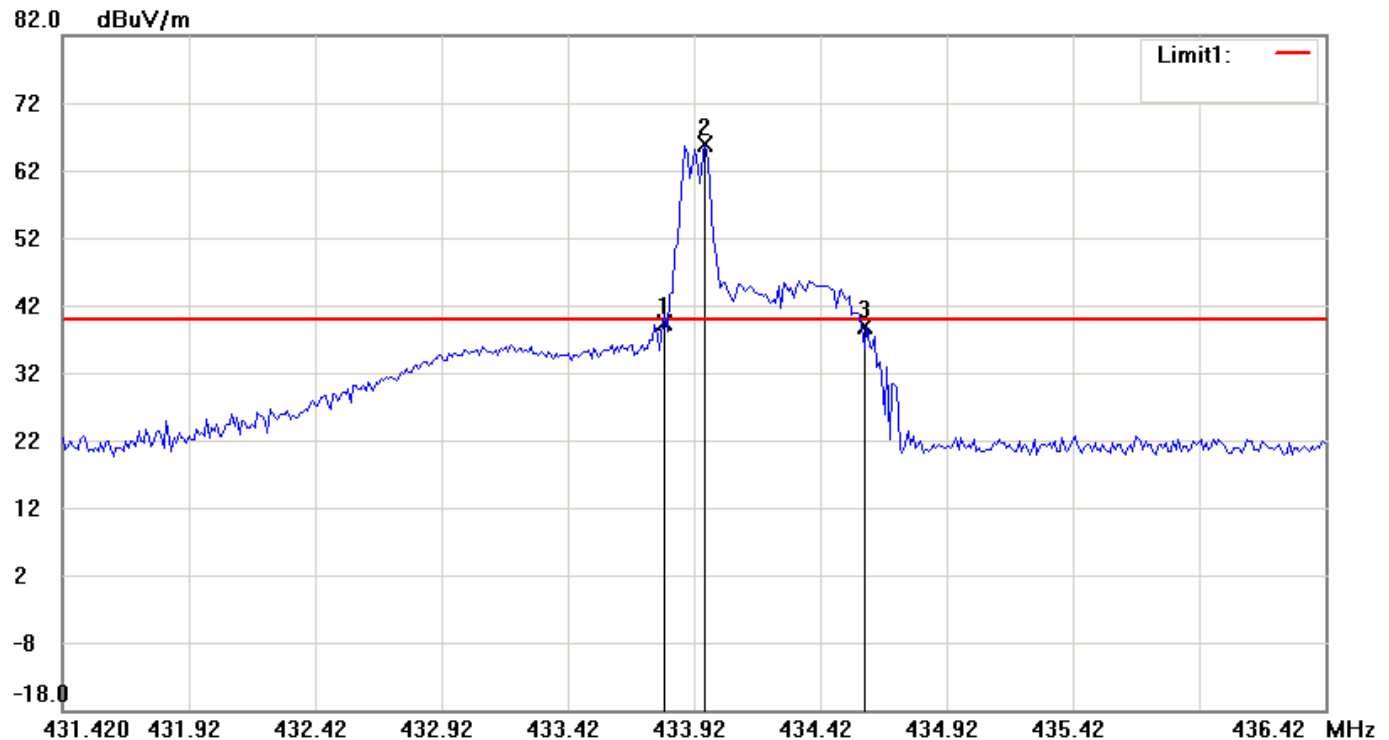
Equipment	Manufacturer	Model No.	Next Cal. Date
Spectrum Analyzer	Agilent	E4446A	09/27/2013

5.3 Test Result

Test Date : Mar. 19, 2013Temperature : 22°CHumidity : 58%

Center Frequency	433.92 MHz
Limit	$433.92 \text{ MHz} \times 0.25\% = 1084.8 \text{ kHz}$
20dB Bandwidth of Emission	791.6 kHz
Chart	Page 20
Result	PASS

File: Data: #26 Date: 2013/3/19 Temperature: 22 °C
Time: AM 11:38:27 Humidity: 58 %



Condition: FCC Part15
EUT:
Model: A421
Test Mode:
Note:

Polarization: Horizontal
Distance:

No.	Frequency (MHz)	Reading (dBuV/m)	Detector
1	433.7947	18.12	peak
2	433.9651	44.62	peak
3	434.5863	17.57	peak

No.		Δ Frequency(MHz)	Δ Level(dB)
1	mk3-mk1	0.7916	-0.54

6. CONDUCTED EMISSION MEASUREMENT

This EUT is excused from investigation of conducted emission, for it is powered by battery only. According to §15.207 (d), measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.
specification.

7. LIMIT OF TRANSMISSION TIME

7.1 Applicable Standard

According to 15.231(a)(1), a manually operated Transmitter shall employ a switch that will automatically deactivate the Transmitter within not more than 5 seconds of being released.

7.2 Test Equipment

Equipment	Manufacturer	Model No.	Next Cal. Date
Spectrum Analyzer	Agilent	E4446A	09/27/2013

7.3 Test Result

Test Date : Mar. 13, 2013

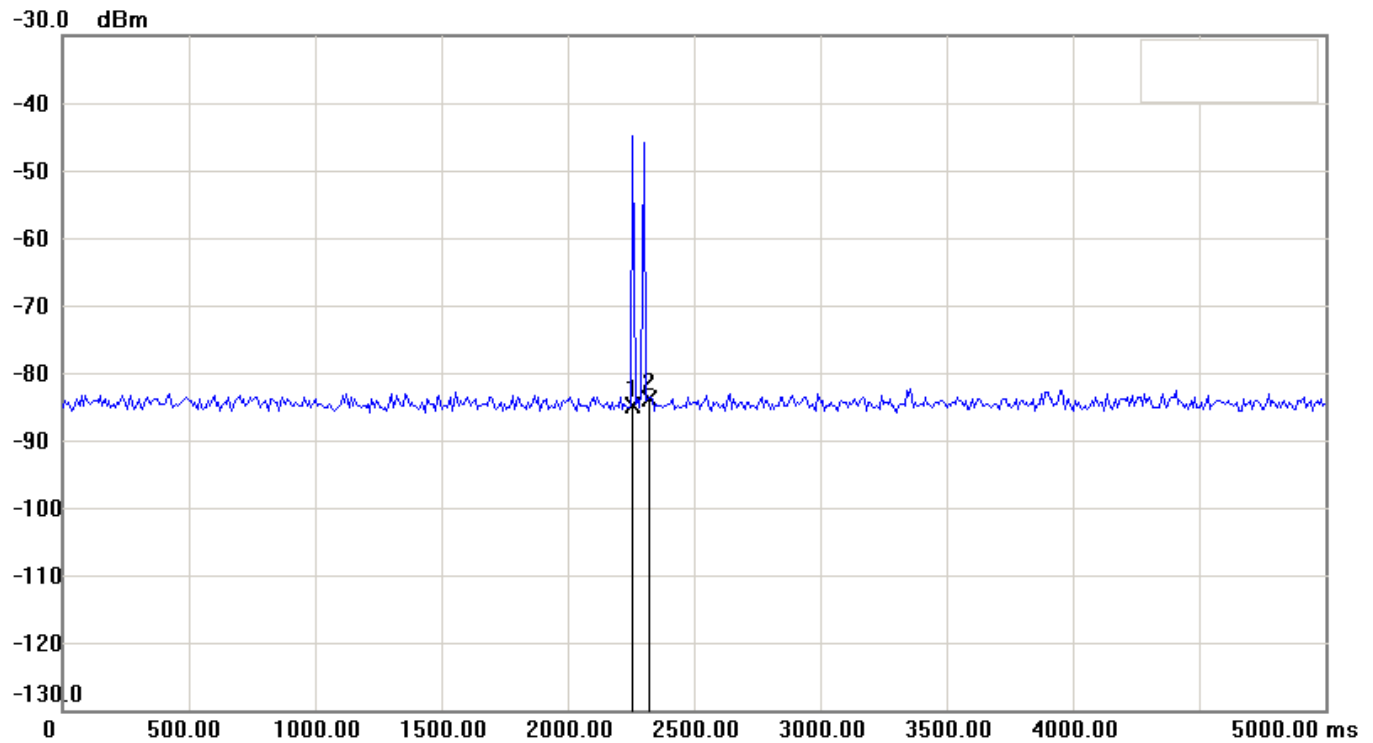
Temperature : 20°C

Humidity : 54%

This Transmitter is operated by manual and active time is 0.066 second after being released.

Note : Please refer to page 23 for chart

File: Data: #4

Date: 2013/3/13
Time: PM 02:42:38Temperature: 20 °C
Humidity: 54 %

Condition:
EUT:
Model: TX-24A421
Test Mode:
Note:

RF Conducted
Sweep Time: 5000ms Att.: 10dB
RBW: 100 KHz VBW: 300 KHz

No.	Sweep time(ms)	Level(dBm)
1	2250.00000	-84.90
2	2316.66670	-83.86

No.		Δ Time(ms)	Δ Level(dB)
1	mk2-mk1	66.6667	1.04