FCC Test Report

FCC ID	:	**2AHKLJY16008RSF**
Equipment	:	**RADIO FREQUENCY REMOTE CONTROL SWITCH**
Model No.	:	**JY16008RSF**
Brand Name	:	SAN FORD DUST COLLECTOR
Applicant	:	**SAN FORD MACHINERY CO., LTD**
Address	:	**NO. 169, CHUN SHAN ROAD, FENG YUAN DISTRICT, TAICHUNG CITY, TAIWAN 420**
Standard	:	**47 CFR FCC Part 15.231**
Received Date	:	**Feb 26, 2016**
Tested Date	:	**May 20, 2016**

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Approved & Reviewed by:

Gary Chang / Manager

Testing Laboratory 2732

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Release Record

Report No.	Version	Description	Issued Date
FR622601	Rev. 01	Initial issue	Jun. 16, 2016
FR622601	Rev. 02	Modified section 3.1.4	Jun. 23, 2016

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	AC Power Line Conducted Emissions	Note[1]	N/A
15.231(b)	Field Strength of Fundamental emissions	Meet the requirement of limit	Pass
15.231(b) 15.209	Unwanted Emissions	Meet the requirement of limit	Pass
15.231(a)	Transmission and Deactivation Time	Meet the requirement of limit	Pass
15.231(c)	20dB bandwidth	Meet the requirement of limit	Pass
15.203	Antenna Requirement	Meet the requirement of limit	Pass

N/A means Not Applicable.
Note[1]: The EUT consumes DC power from battery, so the test is not required.

1 General Description

1.1.1 Specification of the Equipment under Test (EUT)

RF General Information			
Frequency Range (MHz)	**Modulation**	**Ch. Freq. (MHz)**	**Channel Number**
433-434	ASK	433.54	1

1.1.2 Antenna Details

Ant. No.	Type	Gain (dBi)	Connector
1	LOOP	---	---

1.1.3 EUT Operational Condition

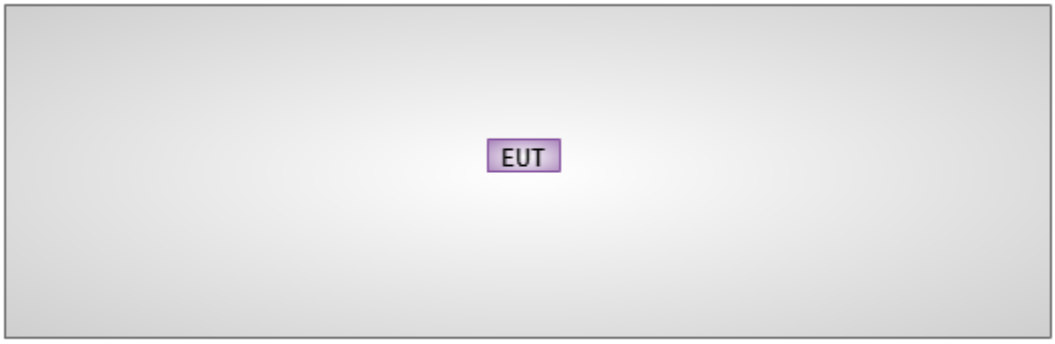
Power Supply Type	From 1.5Vdc AAA battery

Note: The equipment tests are performed using a new battery.

1.2 Local Support Equipment List

N/A

1.3 Test Setup Chart

Test Setup Diagram


1.4 The Equipment List

Test Item	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101498	Dec. 13, 2015	Dec. 12, 2016
Receiver	R&S	ESR3	101658	Nov. 04, 2015	Nov. 03, 2016
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Aug. 20, 2015	Aug. 19, 2016
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 16, 2015	Dec. 15, 2016
Loop Antenna	R&S	HFH2-Z2	11900	Nov. 16, 2015	Nov. 15, 2016
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Dec. 10, 2015	Dec. 09, 2016
Preamplifier	Burgeon	BPA-530	SN:100219	Sep. 10, 2015	Sep. 09, 2016
Preamplifier	Agilent	83017A	MY39501308	Oct. 02, 2015	Oct. 01, 2016
Preamplifier	EMC	EMC184045B	980192	Sep. 01, 2015	Aug. 31, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Dec. 10, 2015	Dec. 09, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Dec. 10, 2015	Dec. 09, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16139/4	Dec. 10, 2015	Dec. 09, 2016
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Dec. 10, 2015	Dec. 09, 2016
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-002	Dec. 10, 2015	Dec. 09, 2016
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

According to the specification of EUT, the EUT must comply with following standards and KDB documents.

47 CFR FCC Part 15.231
ANSI C63.10-2013

1.6 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

Measurement Uncertainty	
Parameters	**Uncertainty**
Radiated emission ≤ 1GHz	±3.66 dB
Radiated emission > 1GHz	±5.63 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
Radiated Emissions	03CH01-WS	20°C / 63%	Warren Lee
RF Conducted	TH01-WS	20°C / 63%	Felix Sung

- FCC site registration No.: 181692
- IC site registration No.: 10807A-1

2.2 The Worst Test Modes and Channel Details

Test item	Mode	Test Frequency (MHz)	Test Configuration
Field Strength of Fundamental emissions	ASK	433.54	---
Unwanted Emissions	ASK	433.54	---
Deactivation Time	ASK	433.54	---
20dB bandwidth	ASK	433.54	---

Note:

1. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **X-plane** results were found as the worst case and were shown in this report.

3 Transmitter Test Results

3.1 Radiated Emission

This section includes field strength of fundamental, field strength of harmonics and emissions radiated outside of the operating frequency bands.

3.1.1 Limit of field strength of fundamental and field strength of harmonics

Fundamental Frequency (MHz)	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
40.66~40.70	2250	225
70 -130 (included)	1250	125
130 (excluded) -174 (included)	1250 to 3750[Note]	125 to 375 [Note]
174 (excluded) -260 (included)	3750	375
260 (excluded) -470 (included)	3750 to 12500[Note]	375 to 1250 [Note]
above 470 (excluded)	12500	1250
Note: Linear interpolations.		

3.1.2 Limit of Unwanted Emissions

The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

Radiated emission limits			
Frequency Range (MHz)	**Field Strength (uV/m)**	**Field Strength (dBuV/m)**	**Measure Distance (m)**
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1:
Qusai-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit
Note 2:
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

3.1.3 Test Procedures

1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at test table. For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Note:

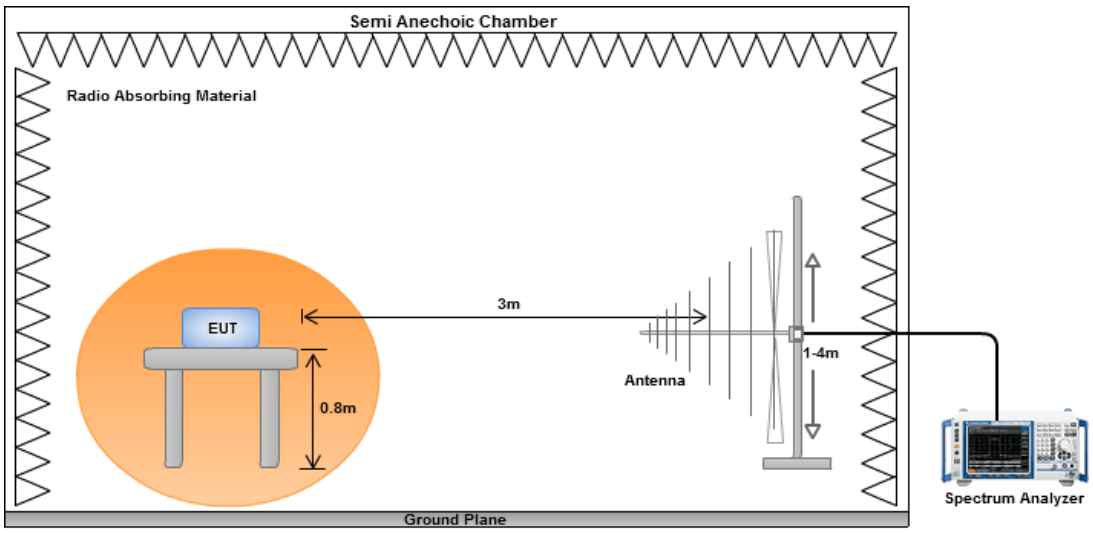
1. Radiated emission below 1GHz
   120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission
2. Radiated emission Peak value for harmonics
   RBW=1MHz, VBW=3MHz and Peak detector
3. Radiated emission Peak value for fundamental
   RBW=1MHz, VBW=3MHz and Peak detector
4. Radiated emission Average value for field strength of fundamental and harmonics
   The average value is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:

$$20\log(\text{Duty cycle}) = 20\log\frac{1.1\text{ ms} * 20 + 0.37391\text{ms} * 36}{100\text{ ms}} = -9.01\text{dB}$$

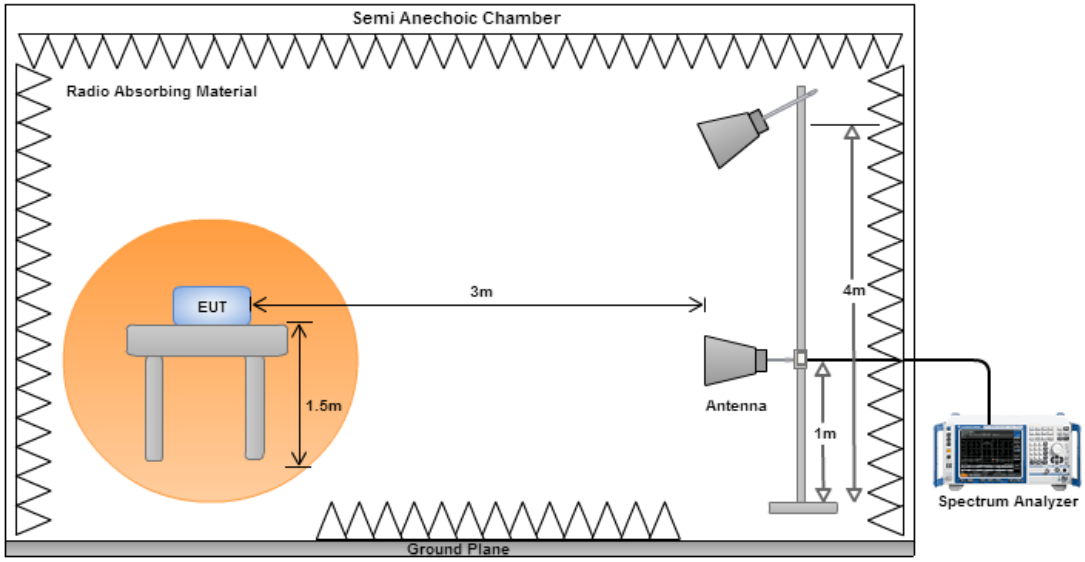
   Please see page 17 for plotted duty

3.1.4 Test Setup

Radiated Emissions below 1 GHz

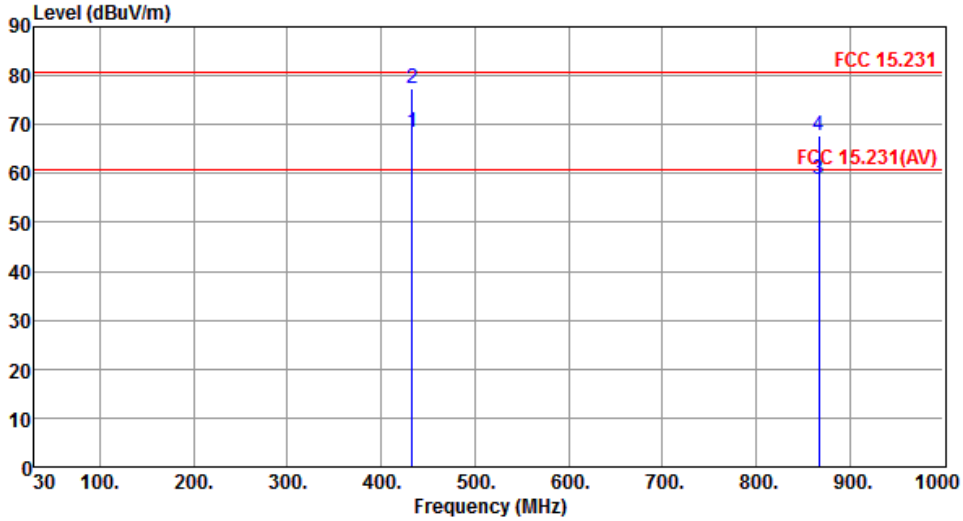


Radiated Emissions above 1 GHz



3.1.5 Transmitter Field strength of fundamental emissions and harmonic

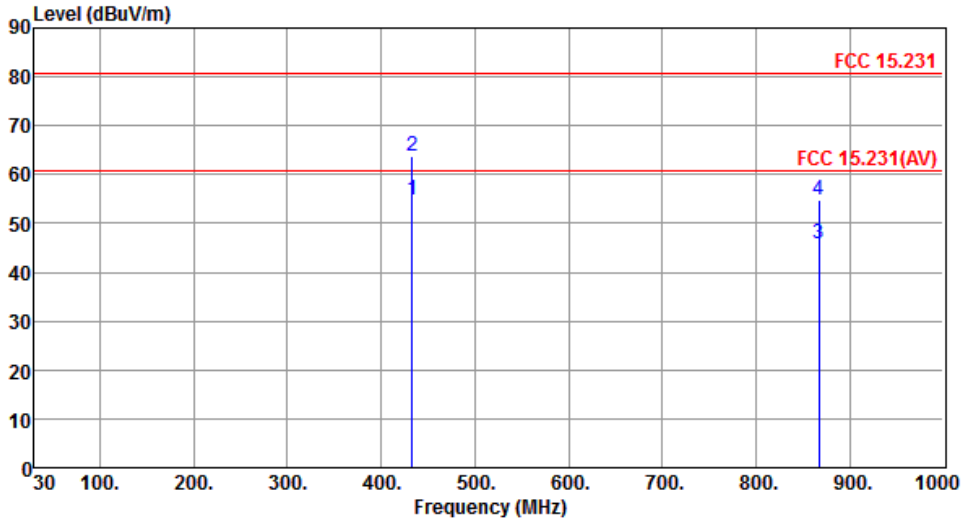
Modulation	ASK	**Test Freq. (MHz)**	433.54
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	433.54	68.38	80.80	-12.42	80.95	-12.57	Average	200	82
2	433.54	77.39	100.80	-23.41	89.96	-12.57	Peak	200	82
3	867.08	58.85	60.80	-1.95	64.51	-5.66	Average	100	211
4	867.08	67.86	80.80	-12.94	73.52	-5.66	Peak	100	211

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	ASK	Test Freq. (MHz)	433.54
Polarization	Vertical		

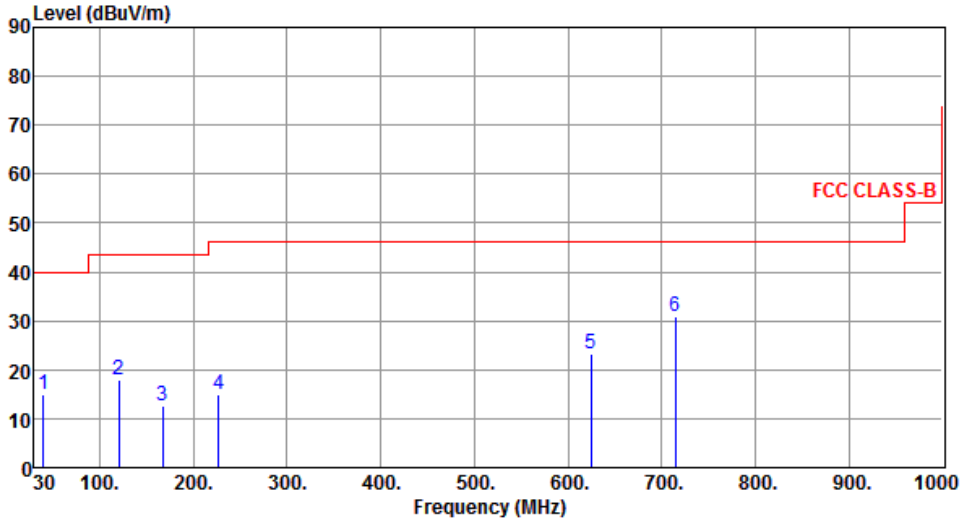


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	433.54	54.64	80.80	-26.16	67.21	-12.57	Average	300	70
2	433.54	63.65	100.80	-37.15	76.22	-12.57	Peak	119	138
3	867.08	45.75	60.80	-15.05	51.41	-5.66	Average	300	70
4	867.08	54.76	80.80	-26.04	60.42	-5.66	Peak	300	70

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

3.1.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)

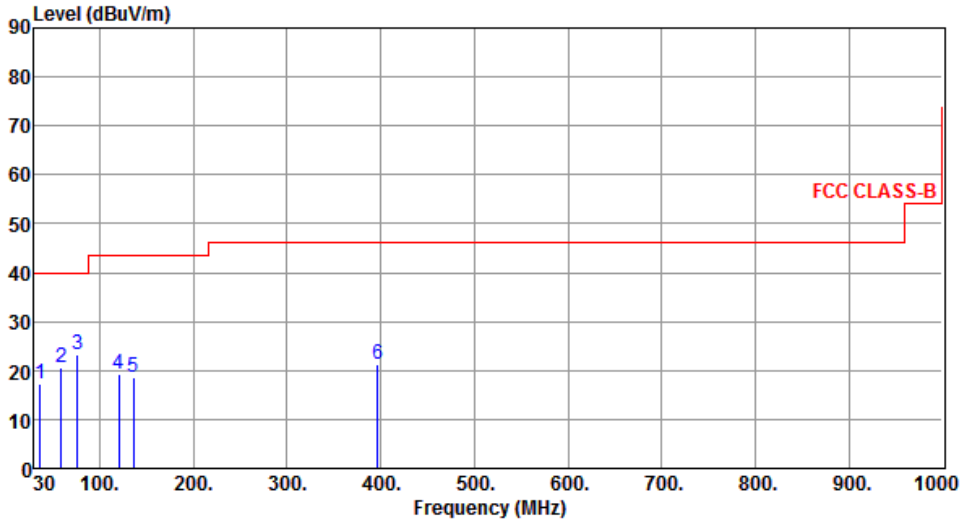
Modulation	ASK	**Test Freq. (MHz)**	433.54
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	39.70	14.90	40.00	-25.10	31.78	-16.88	Peak	---	---
2	120.21	17.87	43.50	-25.63	36.69	-18.82	Peak	---	---
3	166.77	12.63	43.50	-30.87	29.58	-16.95	Peak	---	---
4	226.91	15.09	46.00	-30.91	33.80	-18.71	Peak	---	---
5	624.61	23.23	46.00	-22.77	32.34	-9.11	Peak	---	---
6	714.82	30.96	46.00	-15.04	38.69	-7.73	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	ASK	Test Freq. (MHz)	433.54
Polarization	Vertical		

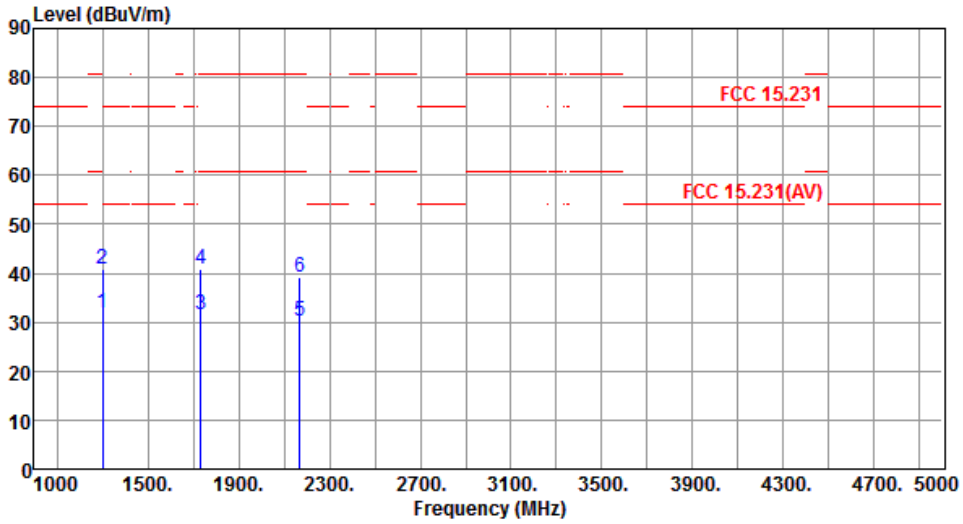


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	36.79	17.43	40.00	-22.57	34.76	-17.33	Peak	---	---
2	59.10	20.58	40.00	-19.42	37.98	-17.40	Peak	---	---
3	76.56	23.16	40.00	-16.84	43.76	-20.60	Peak	---	---
4	120.21	19.40	43.50	-24.10	38.22	-18.82	Peak	---	---
5	135.73	18.50	43.50	-25.00	35.91	-17.41	Peak	---	---
6	396.66	21.11	46.00	-24.89	34.62	-13.51	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

3.1.7 Transmitter Radiated Unwanted Emissions (Above 1GHz)

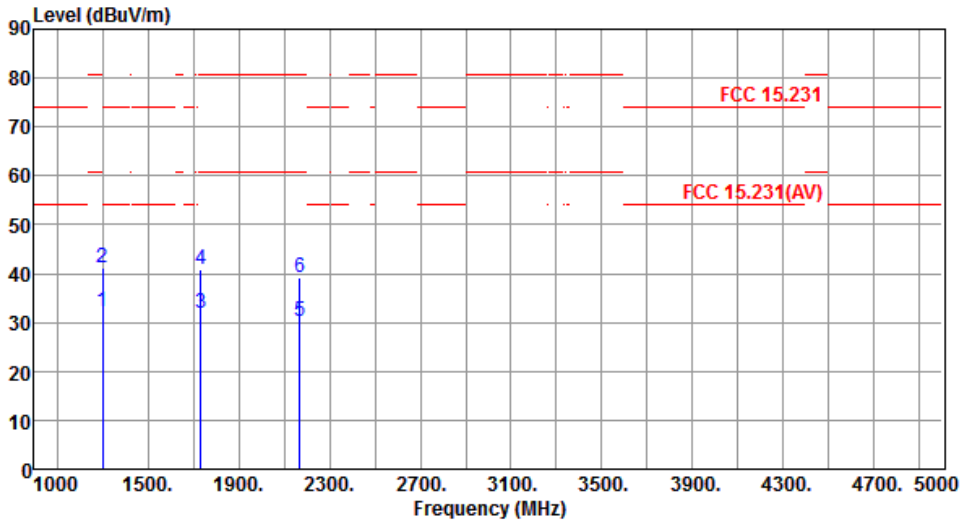
Modulation	ASK	**Test Freq. (MHz)**	433.54
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1300.62	31.82	60.80	-28.98	39.96	-8.14	Average	103	66
2	1300.62	40.83	80.80	-39.97	48.97	-8.14	Peak	103	66
3	1734.16	31.69	60.80	-29.11	37.61	-5.92	Average	111	275
4	1734.16	40.70	80.80	-40.10	46.62	-5.92	Peak	111	275
5	2167.70	30.16	60.80	-30.64	34.41	-4.25	Average	208	145
6	2167.70	39.17	80.80	-41.63	43.42	-4.25	Peak	208	145

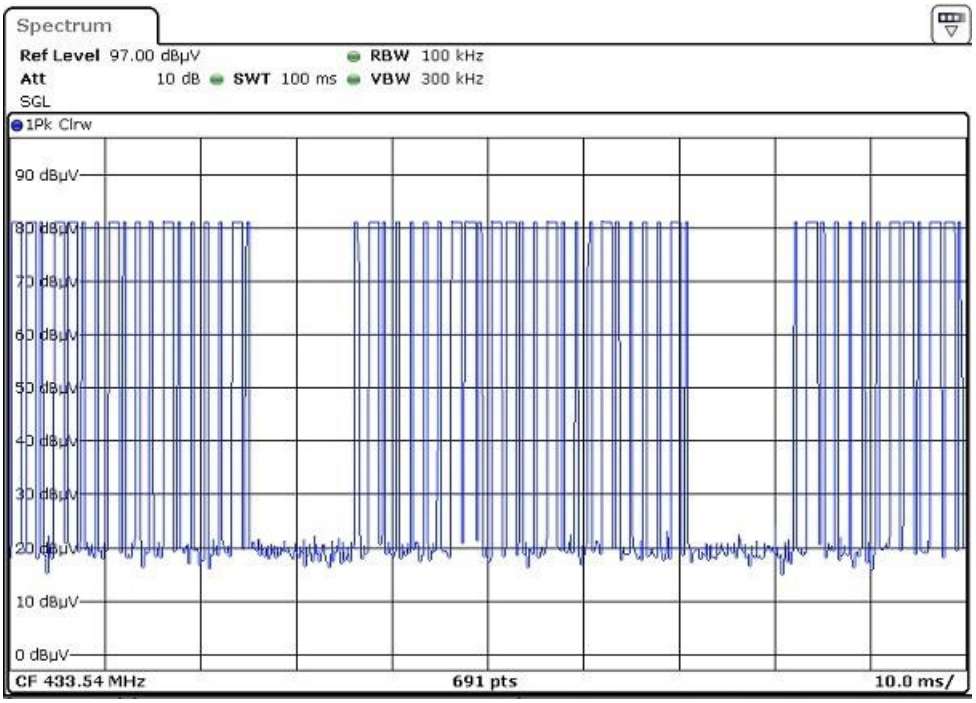
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

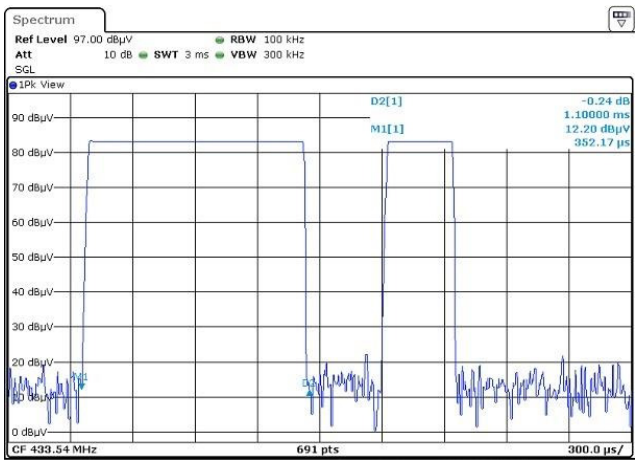
Modulation	ASK	Test Freq. (MHz)	433.54
Polarization	Vertical		

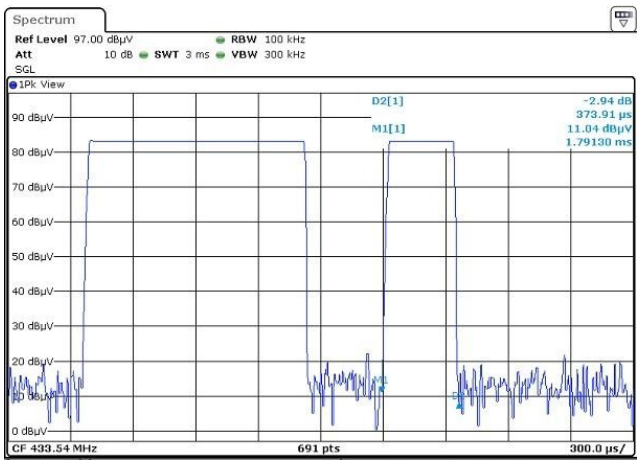


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1300.62	32.11	60.80	-28.69	40.25	-8.14	Average	100	108
2	1300.62	41.12	80.80	-39.68	49.26	-8.14	Peak	100	108
3	1734.16	31.90	60.80	-28.90	37.82	-5.92	Average	100	35
4	1734.16	40.91	80.80	-39.89	46.83	-5.92	Peak	100	35
5	2167.70	30.33	60.80	-30.47	34.58	-4.25	Average	186	305
6	2167.70	39.34	80.80	-41.46	43.59	-4.25	Peak	186	305

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).







$$20\log(\text{Duty cycle}) = 20\log\frac{1.1\text{ ms} * 20 + 0.37391\text{ms} * 36}{100\text{ ms}} = -9.01\text{dB}$$

3.2 Transmission and Deactivation Time

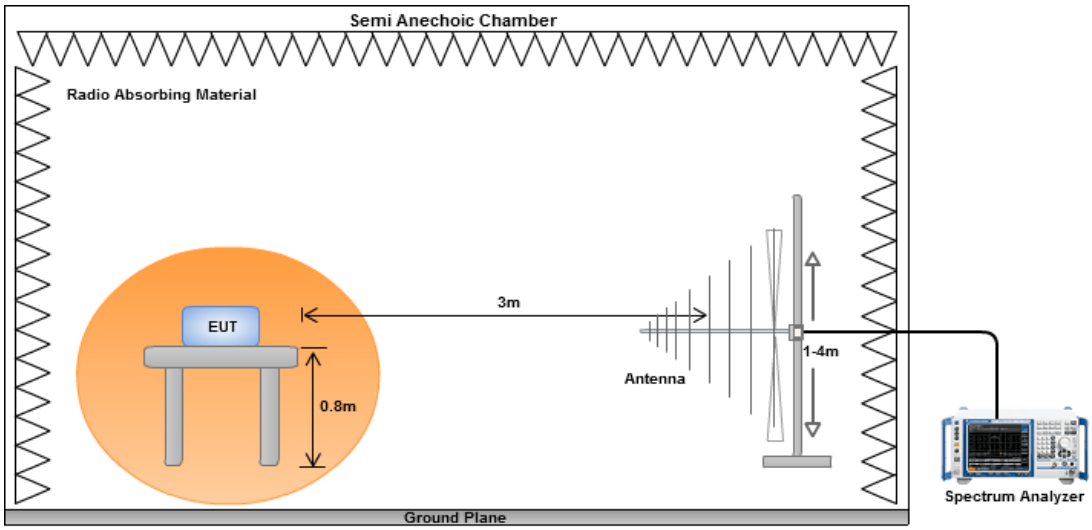
3.2.1 Limit of Transmission and Deactivation Time

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

3.2.2 Test Procedures

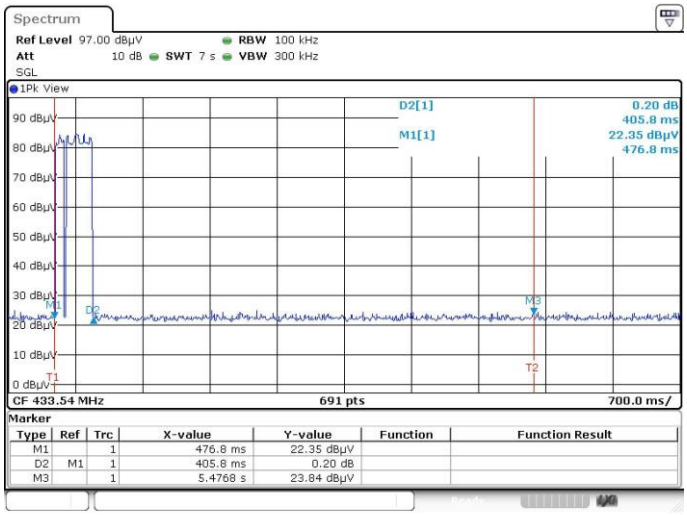
1. Set resolution bandwidth (RBW) = 100 kHz, Video bandwidth = 300 kHz.
2. Detector = Peak, Trace mode = max hold.
3. Set Sweep = fitting time as shown on plots of next pages, Allow the trace to stabilize.
4. Set the EUT to operates at operation modes then record the transmission and deactivation time.

3.2.3 Test Setup



3.2.4 Test Result

Transmission Time			
Frequency(MHz)	**Transmission time (S)**	**Limit (s)**	**Pass/Fail**
433.54	0.4058	5.0	PASS

alert mode


3.3 20dB and Occupied Bandwidth

3.3.1 Limit of 20 dB Bandwidth

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz.

3.3.2 Test Procedures

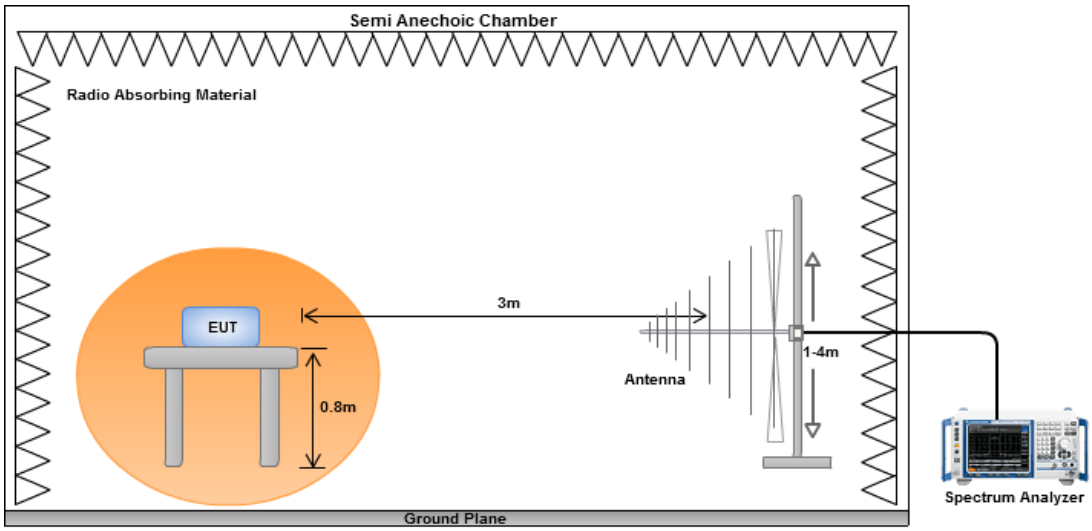
For 20dB bandwidth

1. Set resolution bandwidth (RBW) = 10 kHz, Video bandwidth = 30 kHz
2. Detector = Peak, Trace mode = max hold.
3. Sweep = auto couple, Allow the trace to stabilize.
4. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 20dB relative to the maximum level measured in the fundamental emission.

For Occupied bandwidth

1. Set resolution bandwidth (RBW) = 10 kHz, Video bandwidth = 30 kHz
2. Detector = Peak, Trace mode = max hold.
3. Sweep = auto couple, Allow the trace to stabilize.
4. Use the occupied measurement function of specturm analyzer to measure 99% occupied bandwidth

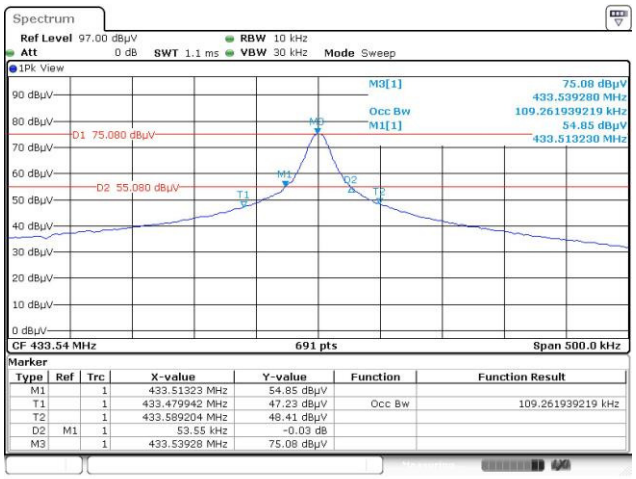
3.3.3 Test Setup



3.3.4 20dB and Occupied Bandwidth

20dB and Occupied Bandwidth				
Frequency(MHz)	**20dB Bandwidth (MHz)**	**20dB BW Limit (MHz)**	**99% BW (MHz)**	**Pass/Fail**
433.54	0.05355	1.08385	0.1093	PASS

20dB BW & 99% BW



4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp, it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan Hsiang. Location map can be found on our website http://www.icertifi.com.tw.

Linkou	**Kwei Shan**	**Kwei Shan Site II**
Tel: 886-2-2601-1640	Tel: 886-3-271-8666	Tel: 886-3-271-8640
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If you have any suggestion, please feel free to contact us as below information

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