



FCC RADIO TEST REPORT

Applicant : JPW Industries

Address : 427 New Sanford Rd LaVergne, TN 37086
 : USA

Equipment : Remote Control

Model No. : IAFS-RC

FCC ID. : 2AX7W-IAFSRC

Trade Name : JET

I HEREBY CERTIFY THAT :

The sample was received on Nov. 19, 2020 and the testing was completed on Dec. 24, 2020 at Cerpass Technology Corp. The test result refers exclusively to the test presented test model / sample. Without written approval of Cerpass Technology Corp., the test report shall not be reproduced except in full.

Approved by:

Mark Liao / Supervisor

Laboratory Accreditation:

Cerpass Technology Corporation Test Laboratory





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History of this test report



1. Summary of Test Procedure and Test Results

1.1 Applicable Standards

ANSI C63.10:2013

FCC Rules and Regulations Part 15 Subpart C §15.231

FCC Rule	Test Type	Result
15.203	Antenna Requirement	PASS
15.209 15.231	Radiated Emission	PASS
15.231	20dB Bandwidth Measurement	PASS
15.231	Transmission Time Control	PASS

*The lab has reduced the uncertainty risk factor from test equipment, environment and staff technicians which according to the standard on contract. Therefore, the test result will only be determined by standard requirement.



2. Test Configuration of Equipment under Test

2.1 Feature of Equipment under Test

Frequency Range	433.92 MHz
Modulation Type	ASK
Antenna Type	Single-Ended Printed Antennas
Antenna Gain	-18.5dBi

Note: For more details, please refer to the User's manual of the EUT.

2.2 Test Mode and Test Software

- a. During testing, the interface cables and equipment positions were varied according to ANSI C63.10.
- b. The complete test system included EUT for the test.
- c. XYZ 3 axis of the EUT have been tested, only the worst axis was reported.
- d. New battery was used for all the testing on this report.
- e. Hardware control was executed to transmit data.
- f. The following test modes were performed for the test:

Test Mode	Operating Description
1	ASK

2.3 Description of Test System

N/A



2.4 General Information of Test

Test Site	Cerpass Technology Corporation Test Laboratory Address: No.10, Ln. 2, Lianfu St., Luzhu Dist., Taoyuan City 33848, Taiwan (R.O.C.) Tel:+886-3-3226-888 Fax:+886-3-3226-881						
	FCC	TW1439, TW1079					
	IC	4934E-1, 4934E-2					
	VCCI	T-2205 for Telecommunication test C-4663 for Conducted emission test R-4218 for Radiated emission test G-10812, G-10813 for radiated disturbance above 1GHz					
Frequency Range Investigated:	Conducted: from 150kHz to 30 MHz Radiation: from 30 MHz to 5,000MHz						
Test Distance:	The test distance of radiated emission from antenna to EUT is 3 M.						

Test Item	Test Site	Test period	Environmental Conditions	Tested By
Radiated Emissions	3M02-NK	2020/12/23~2020/12/24	20~22°C / 48~49%	Leon Huang

2.5 Measurement Uncertainty

Measurement Item	Uncertainty
Radiated Spurious Emission(9KHz~30MHz)	±3.404dB
Radiated Spurious Emission(30MHz~1GHz)	±5.690dB
Radiated Spurious Emission(1GHz~18GHz)	±6.434dB
20dB Bandwidth	±4.646%
Deactivation Time	±3.73%



3. Test Equipment and Ancillaries Used for Tests

Test Item	Radiated Emissions				
Test Site	Semi Anechoic Room(3M02-NK)				
Instrument	Manufacturer	Model No	Serial No	Calibration Date	Valid Date
Bilog Antenna	Schwarzbeck	VULB9168	369	2020/04/10	2021/04/09
Active Loop Antenna	EMCO	6507	40855	2020/05/21	2021/05/20
Horn Antenna	EMCO	3115	31601	2020/10/16	2021/10/15
EMI Receiver	ROHDE & SCHWARZ	ESCI	101423	2020/06/23	2021/06/22
Spectrum Analyzer	ROHDE & SCHWARZ	FSV 40-N	102151	2020/08/03	2021/08/02
Preamplifier	EM Electronics corp.	EM330	60660	2020/03/16	2021/03/15
Preamplifier	Agilent	8449B	3008A01954	2020/03/16	2021/03/15
Cable-3in1(30M-1G)	HARBOUR INDUSTRIES	LL142	CCE1315	2020/04/09	2021/04/08
Cable-0.5m(1G-18G)	HUBER SUHNER	SUCOFLEX 100	805443/4	2020/05/27	2021/05/26
Cable-3m(1G-18G)	HUBER SUHNER	SUCOFLEX 100	805796/4	2020/05/27	2021/05/26
Cable-8m(1G-18G)	HUBER SUHNER	SUCOFLEX 100	805795/4	2020/05/27	2021/05/26
Cable-0.5m(30M-40G)	HUBER SUHNER	SUCOFLEX 102	28420/2	2020/04/01	2021/03/31
Cable-3m(30M-40G)	HUBER SUHNER	SUCOFLEX 102	MY2608/2	2020/04/01	2021/03/31
Cable-0.5m(1G-40G)	Rapidtek	40GHZ 50CM	38MS-38MS50314	2020/04/09	2021/04/08
Cable-6m(9k~300M)	NA	EMC5D-BM-BM-6	130606	2020/03/11	2021/03/10
E3	AUDIX	v8.2014-8-6	RK-000529	NA	NA



4. Antenna Requirements

4.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

4.2 Antenna Construction and Directional Gain

Antenna Type	Single-Ended Printed Antennas
Antenna Gain	-18.5dBi



5. Test of AC Power Line Conducted Emission

5.1 Test Limit

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 KHz, according to the methods defined in ANSI C63.4-2014. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions.

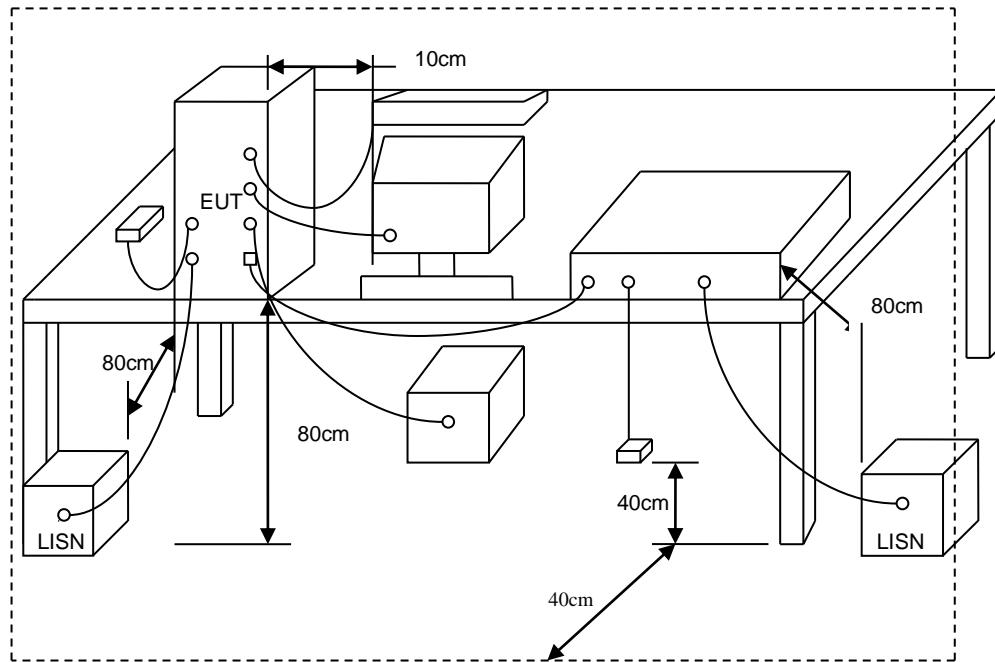
Frequency (MHz)	Quasi Peak (dB μ V)	Average (dB μ V)
0.15 – 0.5	66-56*	56-46*
0.5 – 5.0	56	46
5.0 – 30.0	60	50

*Decreases with the logarithm of the frequency.

5.2 Test Procedures

- a. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
- b. Connect EUT to the power mains through a line impedance stabilization network (LISN).
- c. All the support units are connecting to the other LISN.
- d. The LISN provides 50 ohm coupling impedance for the measuring instrument.
- e. The FCC states that a 50 ohm, 50 micro-Henry LISN should be used.
- f. Both sides of AC line were checked for maximum conducted interference.
- g. The frequency range from 150 kHz to 30 MHz was searched.
- h. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

5.3 Typical Test Setup



5.4 Test Result and Data

The test item is not applicable because the EUT is powered from DC.



6. Test of Radiated Emission

6.1 Test Limit

According to 15.231(b) the field strength of emissions from intentional radiators operated under these frequencies bands shall not exceed the following:

Frequency (MHz)	Field Strength of Fundamental	Field Strength of Spurious
	μV/ m	μV/ m
40.66 ~ 40.70	2250	225
70 ~130	1250	125
130 ~ 174	1250 ~ 3750	125 ~ 375
174 ~ 260	3750	375
260 ~ 470	3750 ~ 12500	375 ~ 1250
Above 470	12500	1250

NOTE:

1. The above field strength limits are specified at a distance of 3meters. The tighter limits apply at the band edges.

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

Frequency (MHz)	Distance	Limit (μV/ m)
0.09 ~ 0.490	300m	2400/F(kHz)
0.490 ~ 1.705	30m	24000/ F(kHz)
1.705 ~ 30	30m	30
30 ~ 88	3m	100
88 ~ 216	3m	150
216 ~ 960	3m	200
Above 960	3m	500

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 20dB under any condition of modulation.



6.2 Test Procedures

- a. The EUT was placed on a rotatable table top 0.8 meter above ground.
- b. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- c. The table was rotated 360 degrees to determine the position of the highest radiation.
- d. The antenna is a broadband antenna and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
- e. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
- f. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.
- h. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
- i. "Cone of radiation" has been considered to be 3dB beamwidth of the measurement antenna.

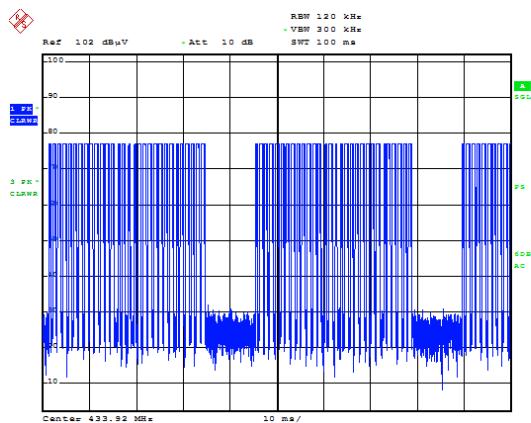
NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection at frequency above 1GHz.
3. The Average value = Peak value + 20log(Duty cycle)
4. Duty Factor = $20\log(\text{total duty} / \text{period of pulse train})$
= $20\log((\text{Long Pulse} + \text{Short Pulse}) / \text{period of pulse train})$
= $20\log[(66 * 0.7875\text{ms} + 3 * 0.4075\text{ms}) / 100\text{ms}]$
= -5.48

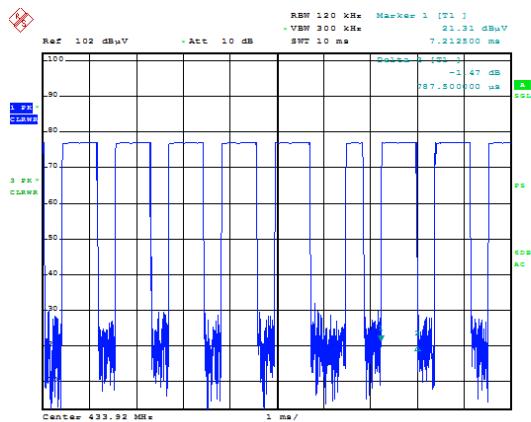
Note: The supporting fixture shall permit orientation of the EUT in each of three orthogonal axis positions such that emissions from the EUT are maximized.
(Y-AXIS is the worst.)



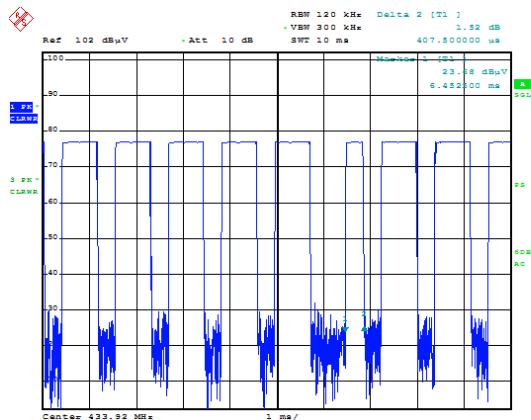
Period of Pulse Train



Long Pulse Transmit Time



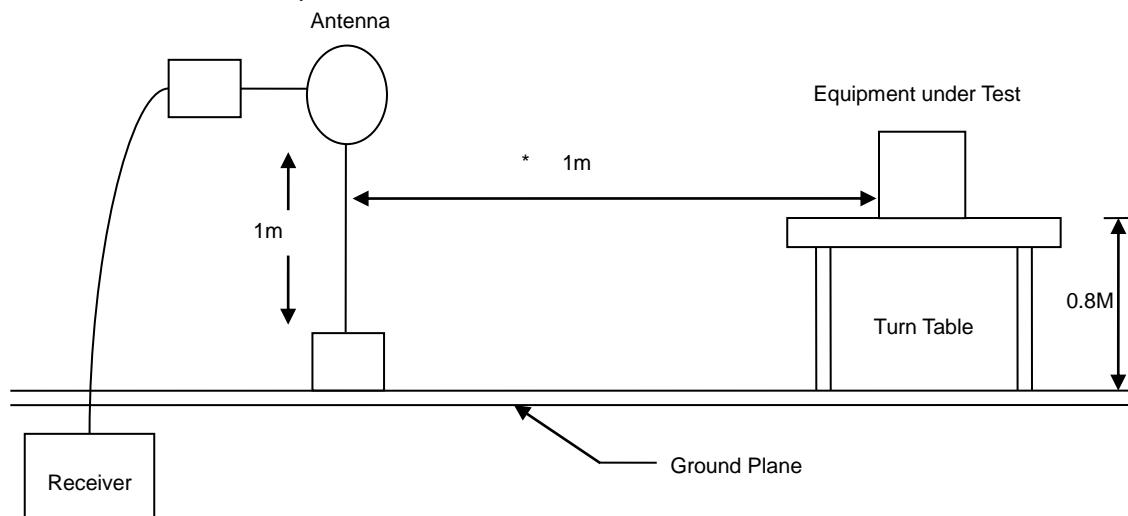
Short Pulse Transmit Time



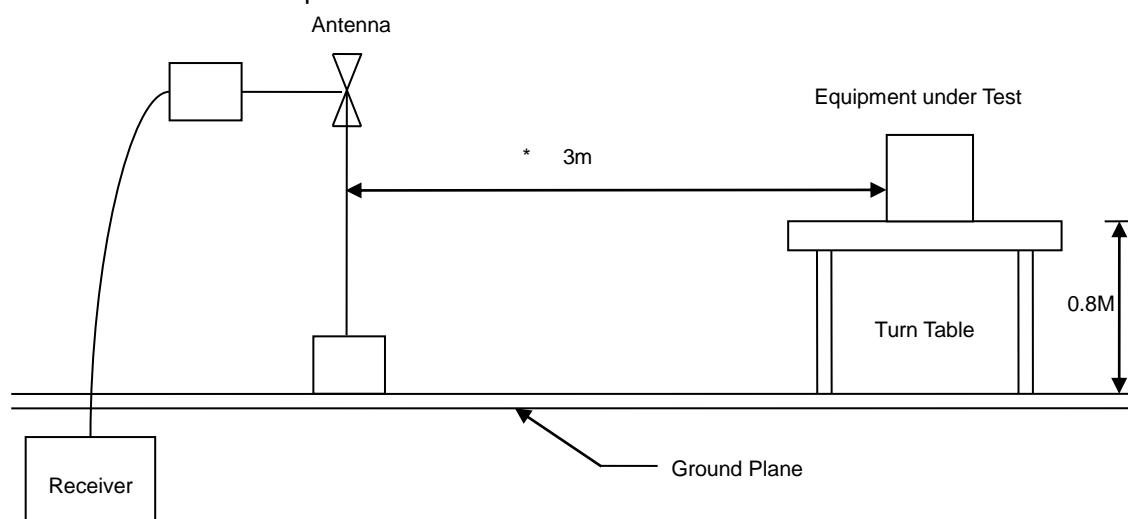


6.3 Typical Test Setup

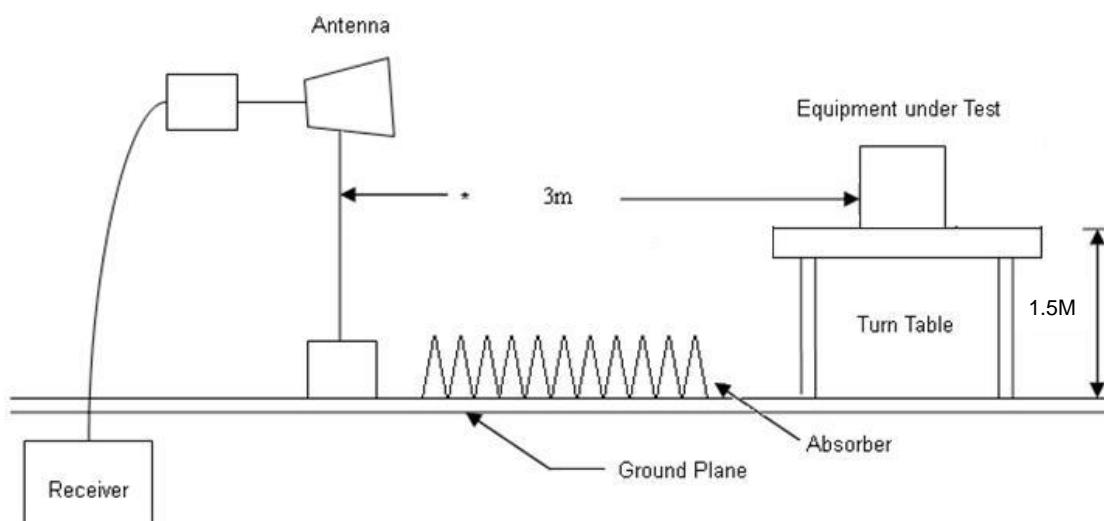
Below 30MHz test setup



30MHz- 1GHz Test Setup



Above 1GHz Test Setup

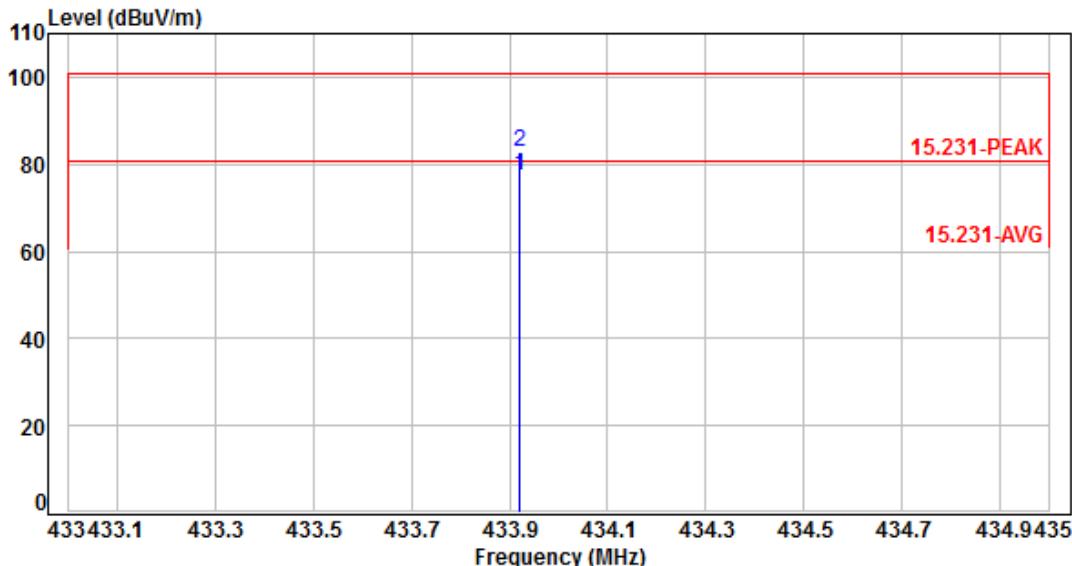




6.4 Test Result and Data

6.4.1 Test Result of Fundamental Emission

Power	:	From Battery	Pol/Phase	:	VERTICAL
Test Mode	:	Mode 1		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	433.92	-4.98	82.28	77.30	80.83	-3.53	Average	115	0	P
2	433.92	-4.98	87.76	82.78	100.83	-18.05	Peak	115	0	P

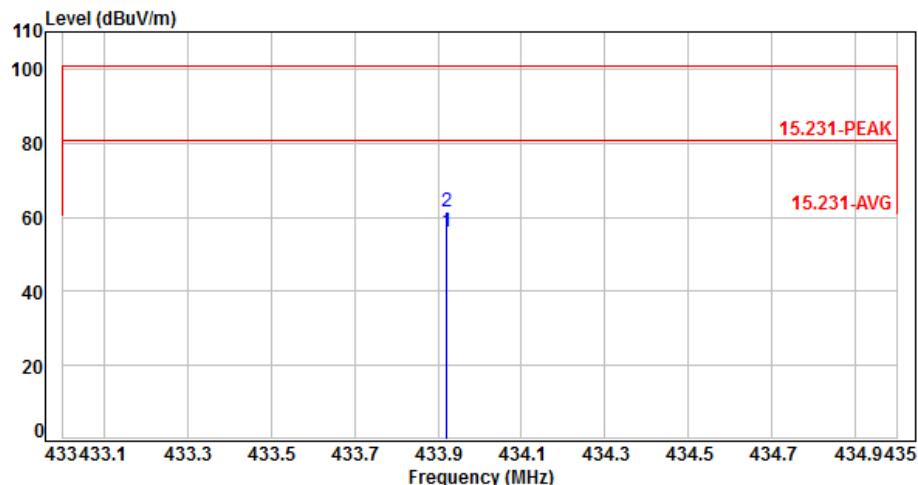
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	:	From Battery	Pol/Phase	:	HORIZONTAL
Test Mode	:	Mode 1		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	433.92	-4.98	61.08	56.10	80.83	-24.73	Average	100	210	P
2	433.92	-4.98	66.56	61.58	100.83	-39.25	Peak	100	210	P

Note: Level=Reading+Factor

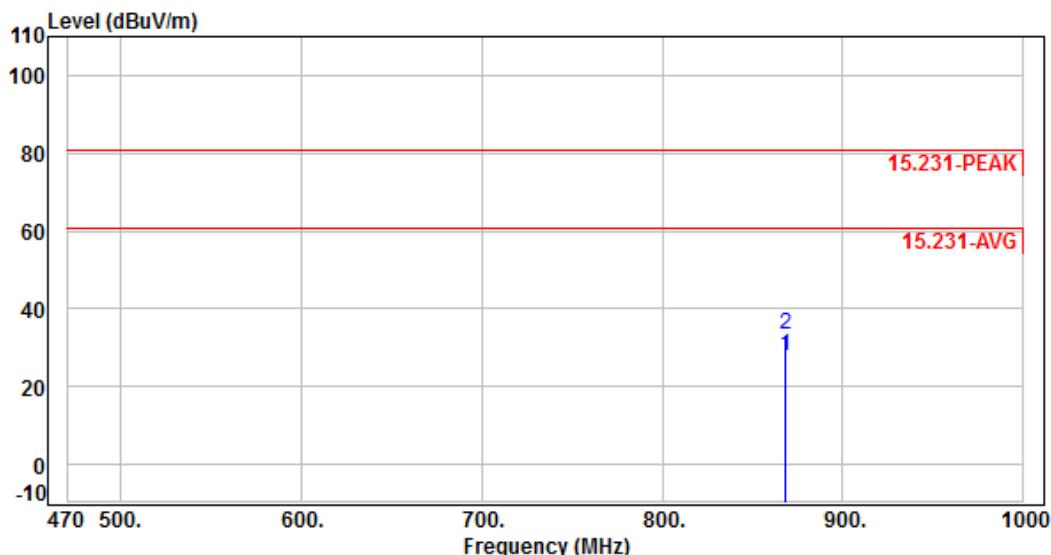
Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



6.4.2 Field strength of spurious emissions

Power	:	From Battery	Pol/Phase	:	VERTICAL
Test Mode	:	Mode 1		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	867.84	2.73	24.94	27.67	60.83	-33.16	Average	100	0	P
2	867.84	2.73	30.42	33.15	80.83	-47.68	Peak	100	0	P

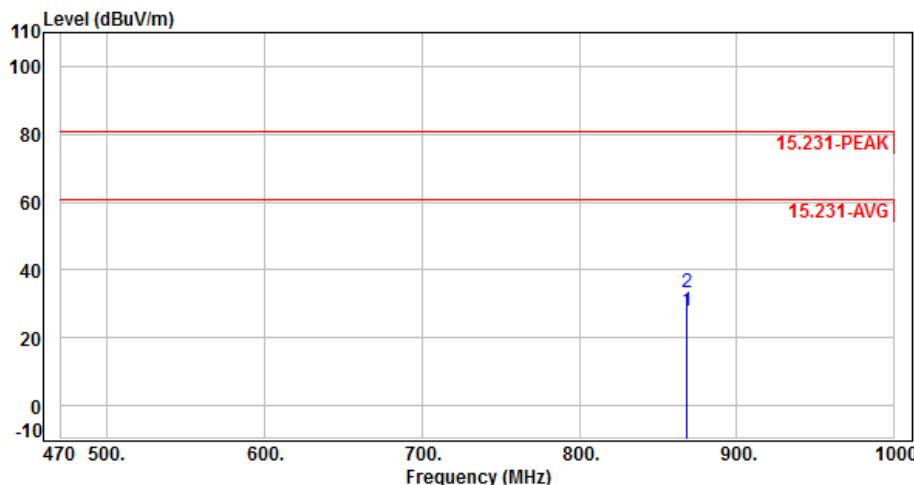
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	:	From Battery	Pol/Phase	:	HORIZONTAL
Test Mode	:	Mode 1		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	867.84	2.73	25.10	27.83	60.83	-33.00	Average	100	0	P
2	867.84	2.73	30.58	33.31	80.83	-47.52	Peak	100	0	P

Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor

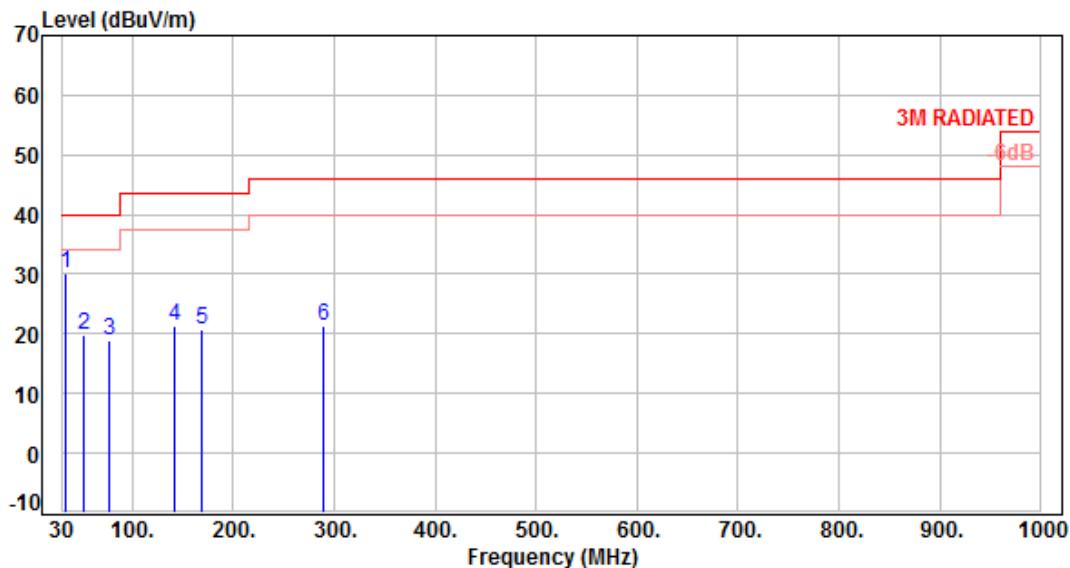


6.4.3 Test Result and Data(9kHz ~ 30MHz)

The 9kHz - 30MHz spurious emission is under limit 20dB more.

6.4.4 Result of Unwanted Spurious emission(30MHz-1GHz)

Power	:	From Battery	Pol/Phase	:	VERTICAL
Test Mode	:	Mode 1		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	33.88	20.18	9.90	30.08	40.00	-9.92	Peak	400	0	P
2	52.31	21.27	-1.43	19.84	40.00	-20.16	Peak	400	0	P
3	76.56	17.14	1.90	19.04	40.00	-20.96	Peak	400	0	P
4	141.55	21.07	0.40	21.47	43.50	-22.03	Peak	400	0	P
5	168.71	21.07	-0.50	20.57	43.50	-22.93	Peak	400	0	P
6	288.99	21.72	-0.53	21.19	46.00	-24.81	Peak	400	0	P

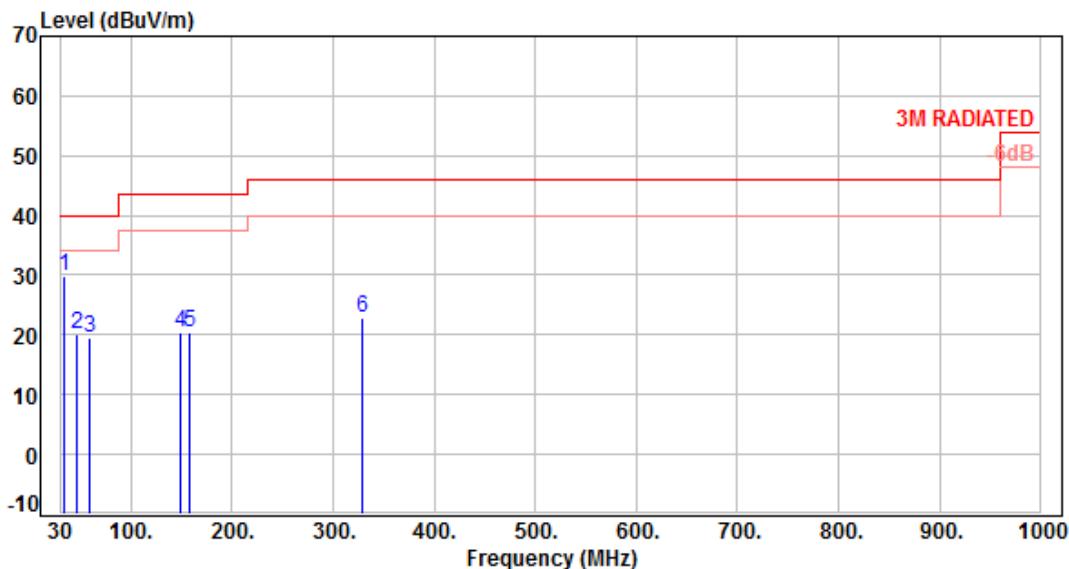
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power :	From Battery	Pol/Phase :	HORIZONTAL
Test Mode :	Mode 1		



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	33.88	20.18	9.68	29.86	40.00	-10.14	Peak	100	0	P
2	47.46	21.30	-1.15	20.15	40.00	-19.85	Peak	100	0	P
3	59.10	20.70	-1.25	19.45	40.00	-20.55	Peak	100	0	P
4	148.34	21.23	-0.83	20.40	43.50	-23.10	Peak	100	0	P
5	158.04	21.04	-0.66	20.38	43.50	-23.12	Peak	100	0	P
6	328.76	22.83	-0.01	22.82	46.00	-23.18	Peak	100	0	P

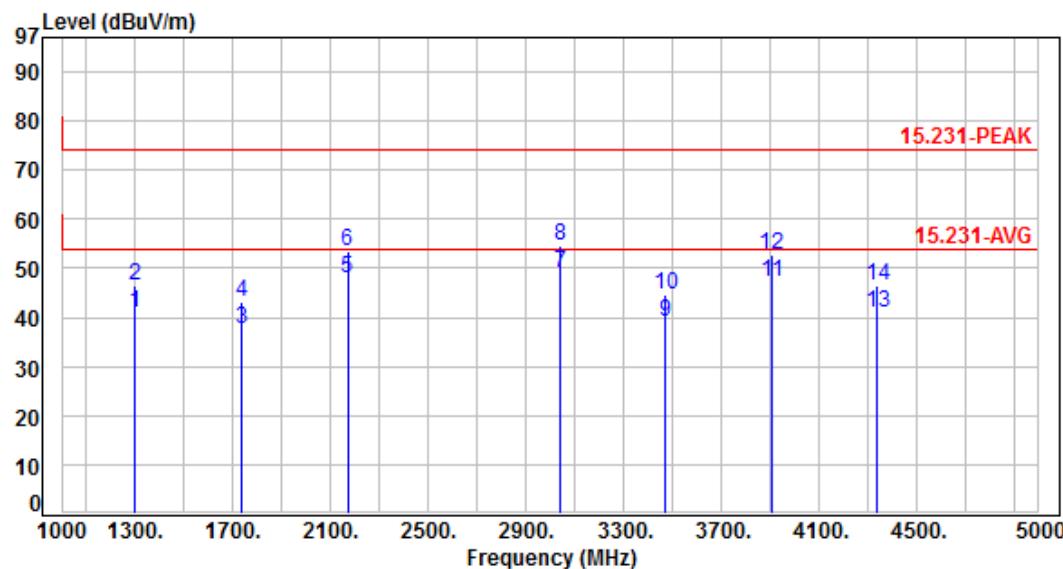
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor

**6.4.5 Test Result of Unwanted Spurious emission(Above 1GHz)**

Power	:	From Battery	Pol/Phase	:	VERTICAL
Test Mode	:	Mode 1		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth P/F (deg)	P
1	1301.76	-8.05	49.01	40.96	54.00	-13.04	Average	360	300	P
2	1301.76	-8.05	54.49	46.44	74.00	-27.56	Peak	360	300	P
3	1735.68	-5.64	43.43	37.79	54.00	-16.21	Average	150	100	P
4	1735.68	-5.64	48.91	43.27	74.00	-30.73	Peak	150	100	P
5	2169.60	-3.68	51.78	48.10	54.00	-5.90	Average	300	160	P
6	2169.60	-3.68	57.26	53.58	74.00	-20.42	Peak	300	160	P
7	3037.44	-0.03	48.99	48.96	54.00	-5.04	Average	190	185	P
8	3037.44	-0.03	54.47	54.44	74.00	-19.56	Peak	190	185	P
9	3471.36	1.25	37.77	39.02	54.00	-14.98	Average	220	195	P
10	3471.36	1.25	43.25	44.50	74.00	-29.50	Peak	220	195	P
11	3905.28	3.19	44.14	47.33	54.00	-6.67	Average	400	210	P
12	3905.28	3.19	49.62	52.81	74.00	-21.19	Peak	400	210	P
13	4339.20	3.25	37.71	40.96	54.00	-13.04	Average	100	210	P
14	4339.20	3.25	43.19	46.44	74.00	-27.56	Peak	100	210	P

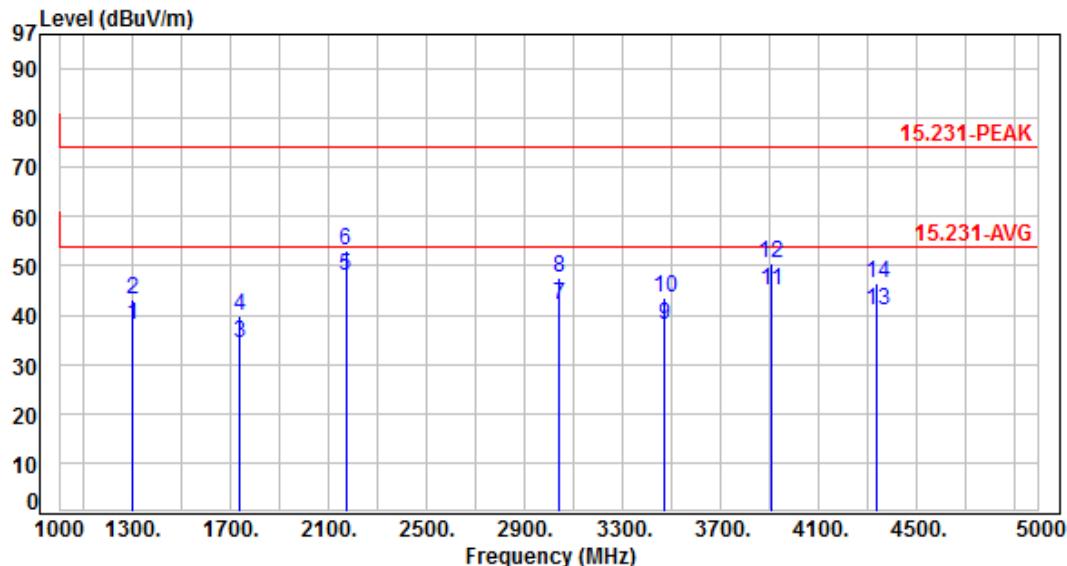
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power :	From Battery	Pol/Phase :	HORIZONTAL
Test Mode :	Mode 1		



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	1301.76	-8.05	45.87	37.82	54.00	-16.18	Average	350	205	P
2	1301.76	-8.05	51.35	43.30	74.00	-30.70	Peak	350	205	P
3	1735.68	-5.64	40.07	34.43	54.00	-19.57	Average	255	160	P
4	1735.68	-5.64	45.55	39.91	74.00	-34.09	Peak	255	160	P
5	2169.60	-3.68	51.48	47.80	54.00	-6.20	Average	305	200	P
6	2169.60	-3.68	56.96	53.28	74.00	-20.72	Peak	305	200	P
7	3037.44	-0.03	42.15	42.12	54.00	-11.88	Average	100	15	P
8	3037.44	-0.03	47.63	47.60	74.00	-26.40	Peak	100	15	P
9	3471.36	1.25	36.63	37.88	54.00	-16.12	Average	160	180	P
10	3471.36	1.25	42.11	43.36	74.00	-30.64	Peak	160	180	P
11	3905.28	3.19	41.89	45.08	54.00	-8.92	Average	100	330	P
12	3905.28	3.19	47.37	50.56	74.00	-23.44	Peak	100	330	P
13	4339.20	3.25	37.82	41.07	54.00	-12.93	Average	100	20	P
14	4339.20	3.25	43.30	46.55	74.00	-27.45	Peak	100	20	P

Note: Level=Reading+Factor

Margin=Level-Limit

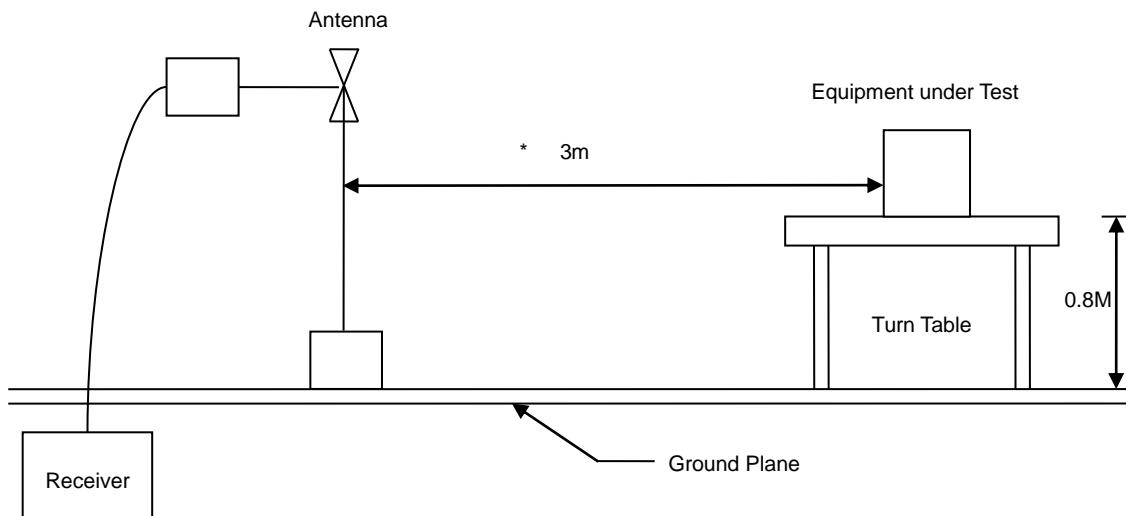
Factor=Antenna Factor + cable loss - Amplifier Factor

7. 20dB Bandwidth Measurement

7.1 Test Procedure

- a. The EUT placed on the turning table.
- b. The signal was coupled to the spectrum analyzer through an antenna.
- c. Set the resolution bandwidth to 3kHz and video bandwidth to 10kHz then select Peak function to scan the channel frequency.
- d. The 20dB bandwidth was measured and recorded.

7.2 Test Setup Layout



7.3 Limits of Band Edges Measurement

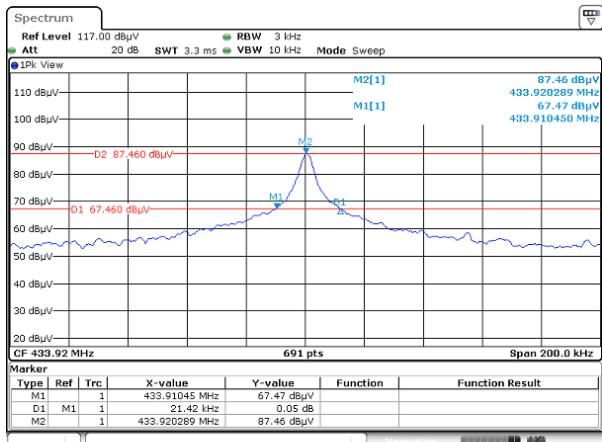
The bandwidth of the emission shall be no wider than 0.25% of the center frequency for device operating above 70 MHz and above 900 MHz.

7.4 Test Result and Data

Frequency (MHz)	20dB Bandwidth (MHz)	20dB Bandwidth Limit (MHz)	Pass/Fail
433.92	0.02	1.0848	PASS



Modulation Type: ASK



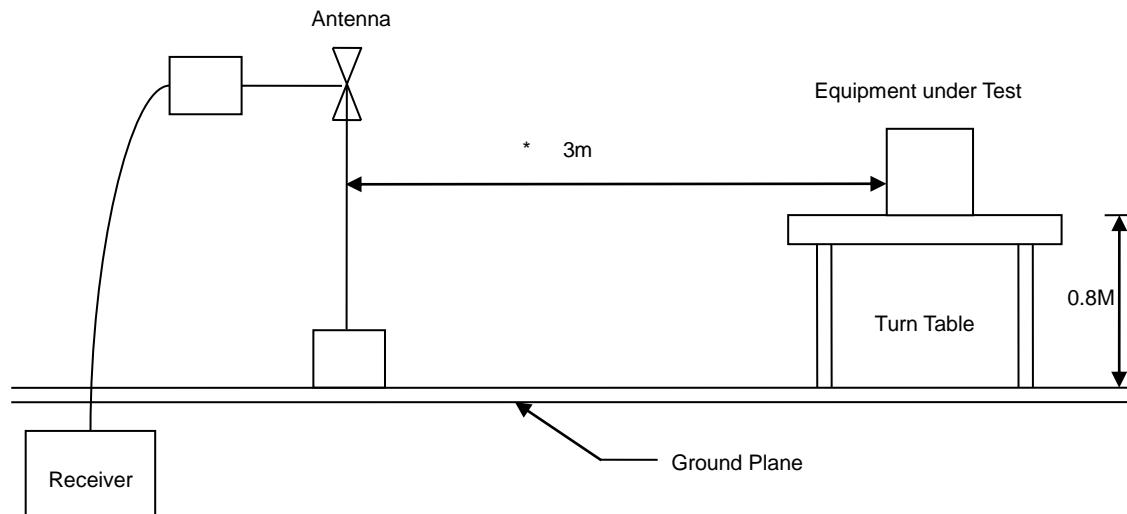


8. Transmission Time Control

8.1 Test Procedure

1. Set up the EUT in the state of Transmitter.
2. Set up the Spectrum, judge whether to accord with the regulation demand or not.

8.2 Test Setup Layout



8.3 Test Limit

- a. In addition, 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.
- b. A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
- c. polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.



8.4 Test Result and Data

Deactivation Time			
Frequency (MHz)	Duration of each transmission(S)	Limit (s)	Pass/Fail
433.92	0.236	5.0	PASS



Modulation Type: ASK

