



FCC TEST REPORT

According to

FCC Part 15, Subpart C (15.231) / ANSI C63.4: 2003

Applicant	: ATBS Technology Corporation
Address	: 3F-4, No. 200, Kang-Chien Rd., Taipei, 11494, Taiwan
Equipment	: Thru Flow TPMS External Sensor
Model No.	: AT6XT(X=0-9,A-Z,a-z,or blank)
FCC ID.	: UP5-AT69T
Trade Name	: ATBS

- 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.

Laboratory Accreditation





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History of this test report

☒ ORIGINAL.

☐ Additional attachment as following record:

Attachment No.	Issue Date	Description
TEFL1408164	Sep. 30, 2014	Original.



CERTIFICATE OF COMPLIANCE

According to

FCC Part 15, Subpart C (15.231) / ANSI C63.4: 2003

Applicant	: ATBS Technology Corporation
Address	: 3F-4, No. 200, Kang-Chien Rd., Taipei, 11494, Taiwan
Equipment	: Thru Flow TPMS External Sensor
Model No.	: AT6XT(X=0-9,A-Z,a-z,or blank)
FCC ID.	: UP5-AT69T

I HEREBY CERTIFY THAT :

The measurements shown in this test report were made in accordance with the procedures given in **ANSI C63.4**. The equipment was **passed** the test performed according to **FCC Part 15, Subpart C (15.231) / ANSI C63.4: 2003**.

The sample was received on Sep. 19, 2014 and the testing was carried out on Sep. 29, 2014 at Cerpass Technology Corp.

Approval by :

Test Engineer:

Hill Chen
EMC/RF B.U. Assistant Manager

Aiden Lu
Engineer



1. Report of Measurements and Examinations

1.1 List of Measurements and Examinations

FCC Rule	Test Type	Result
15.203	Antenna Requirement	Pass
15.207	Conducted Emission	Not Applicable
15.209 15.231	Radiated Emission	Pass
15.231	20dB Occupied Bandwidth Measurement	Pass

Note: the information of measurement uncertainty is available upon the customer's request.



2. Test Configuration of Equipment under Test

2.1 Feature of Equipment under Test

1. Operation Temperature: $-40\sim 125\pm 1^{\circ}\text{C}$
2. Operating Humidity: 100%
3. Frequency: 433.92MHz
4. Monitoring Pressure: $0\sim 132\pm 1$ PSI
5. Battery: 3.0V
6. Weight: 15.0g
7. Battery Lifespan: About 12 months

2.2 Test Mode and Test Software

- a. During testing, the interface cables and equipment positions were varied according to ANSI C63.4.
- 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.

2.3 Description of Test System

The EUT was tested alone. No support devices are needed for testing.



2.4 General Information of Test

Test Site :	CerpPASS Technology Corporation Test Laboratory No.10, Lane 2, Lianfu Street, Luzhu Township, Taoyuan County 33848, Taiwan(R.O.C.)
Test Site Location :	2F-11, No. 3, Yuan Qu St., (Nankang Software Park), Taipei, Taiwan 115, R.O.C.
Test Site Location :	No.68-1, Shihbachong Si, Shihding Dist., New Taipei City 22341, Taiwan (R.O.C.)
FCC Registration Number :	TW1079, TW1061, 488071, 390316, 228391, 641184
IC Registration Number :	4934B-1, 4934D-1, 4934E-1, 4934E-2
VCCI Registration Number :	T-1173 for Telecommunication Test C-4139 for Conducted emission test R-3428 for Radiated emission test G-97 for radiated disturbance above 1GHz
Frequency Range Investigated:	Conducted Emission Test: from 150kHz to 30 MHz Radiated Emission Test: from 30 MHz to 4,500 MHz
Test Distance:	The test distance of radiated emission from antenna to EUT is 3 M.

2.5 Measurement Uncertainty

Measurement Item	Measurement Frequency	Polarization	Uncertainty
Conducted Emission	9 kHz ~ 30 MHz	LINE/NEUTRAL	3.25 dB
Radiated Emission	30 MHz ~ 1,000 MHz	Vertical / Horizontal	3.93 dB
	1,000 MHz ~ 18,000 MHz	Vertical / Horizontal	5.18 dB



3. Antenna Requirements

3.1 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.

And according to FCC 47 CFR Section 15.247(b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

3.2 Antenna Construction and Directional Gain

Antenna Type: Embedded Antenna



4. Test of Conducted Emission

4.1 Test Limit

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 KHz on the 120 VAC power and return leads of the EUT according to the methods defined in ANSI C63.4-2009 Section 3.1. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane as shown in section 2.2. 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

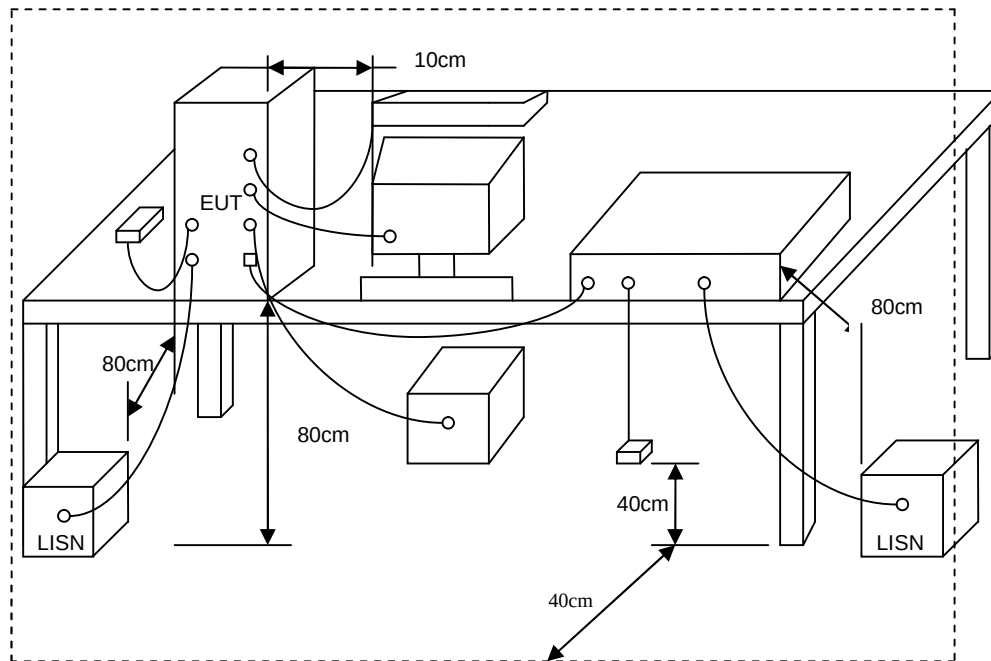
*Decreases with the logarithm of the frequency.

4.2 Test Procedures

- 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.
- Connect EUT to the power mains through a line impedance stabilization network (LISN).
- All the support units are connecting to the other LISN.
- The LISN provides 50 ohm coupling impedance for the measuring instrument.
- The FCC states that a 50 ohm, 50 micro-Henry LISN should be used.
- Both sides of AC line were checked for maximum conducted interference.
- The frequency range from 150 kHz to 30 MHz was searched.
- Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.



4.3 Typical Test Setup



4.4 Test Result and Data

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



5. Test of Radiated Emission

5.1 Test Limit

According to 15.231(e) 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	
	$\mu\text{V}/\text{m}$	$\text{dB}\mu\text{V}/\text{m}$	$\mu\text{V}/\text{m}$	$\text{dB}\mu\text{V}/\text{m}$
40.66 ~ 40.70	1000	60	100	40
70 ~ 130	500	54	50	34
130 ~ 174	500 ~ 1500	54 ~ 63.5	50 ~ 150	34 ~ 43.5
174 ~ 260	1500	63.5	150	43.5
260 ~ 470	1500 ~ 5000	63.5 ~ 74	150 ~ 500	43.5 ~ 54
Above 470	5000	74	500	54

NOTE:

1. Where F is the frequency in MHz, the formula for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, $\mu\text{V}/\text{m}$ at 3 meters = $22.72727(F)-2454.545$; for the band 260-470 MHz, $\mu\text{V}/\text{m}$ at 3 meters = $16.6667(F)-2833.3333$. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.
2. 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 ($\mu\text{V}/\text{m}$)
0.09 ~ 0.490	300m	$2400/F(\text{kHz})$
0.490 ~ 1.705	30m	$24000/ F(\text{kHz})$
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.



5.2 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 + $20\log(\text{Duty cycle})$
4. Duty Factor = $20\log(\text{total duty} / \text{period of pulse train})$
 $= 20\log[(10.92\text{ms} \times 1) / 100\text{ms}]$
 $= -19.24$



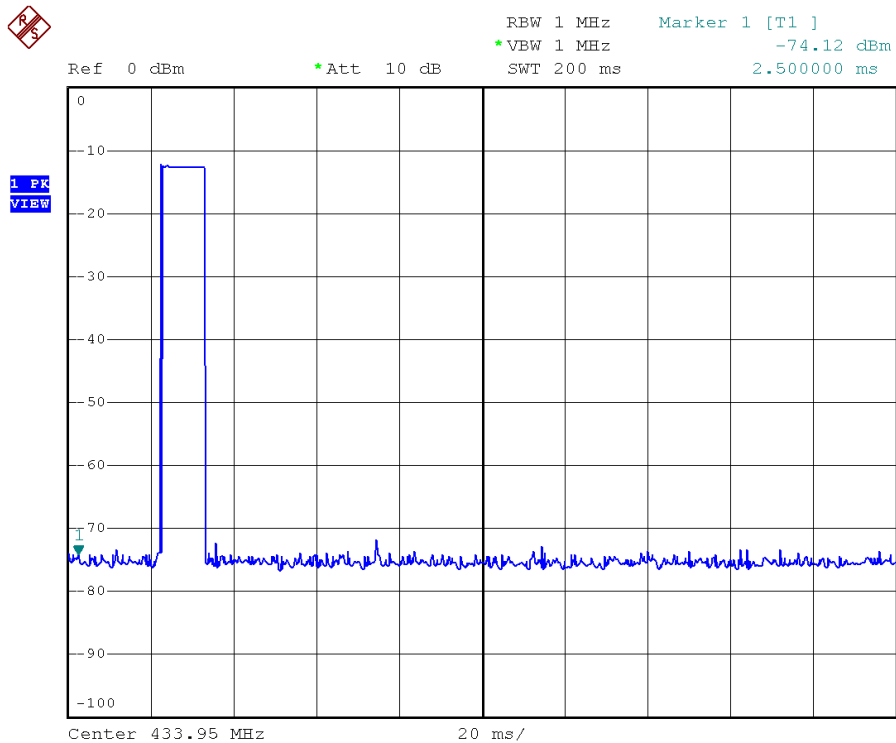
Test Date: Sep. 29, 2014

Temperature: 26°C

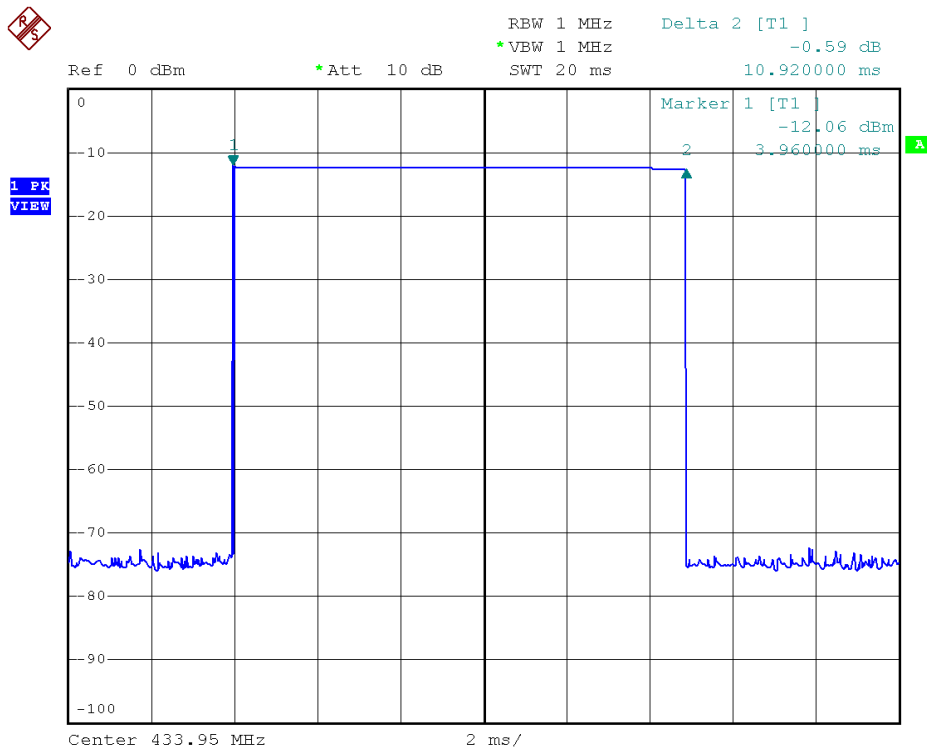
Atmospheric pressure: 1008 hPa

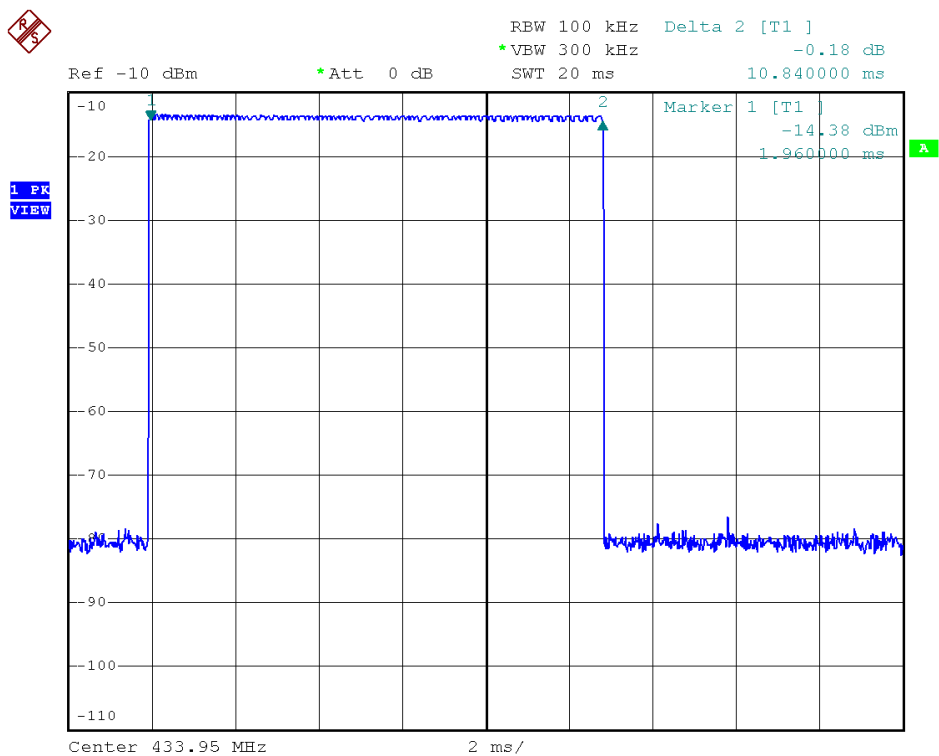
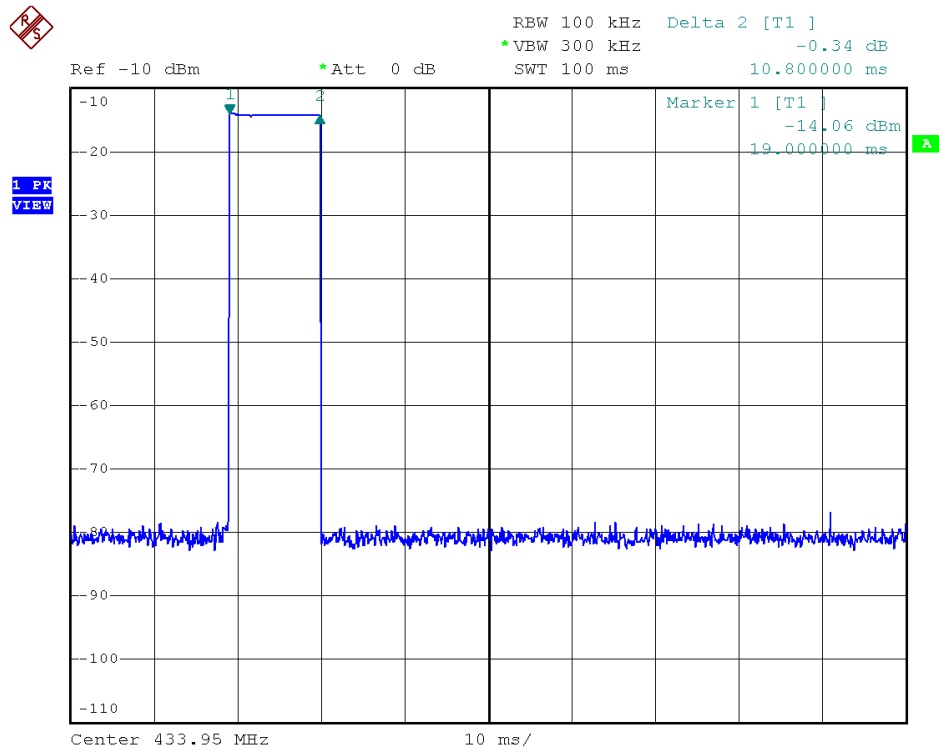
Humidity: 50%

Period of Pulse Train



Pulse Transmit Time

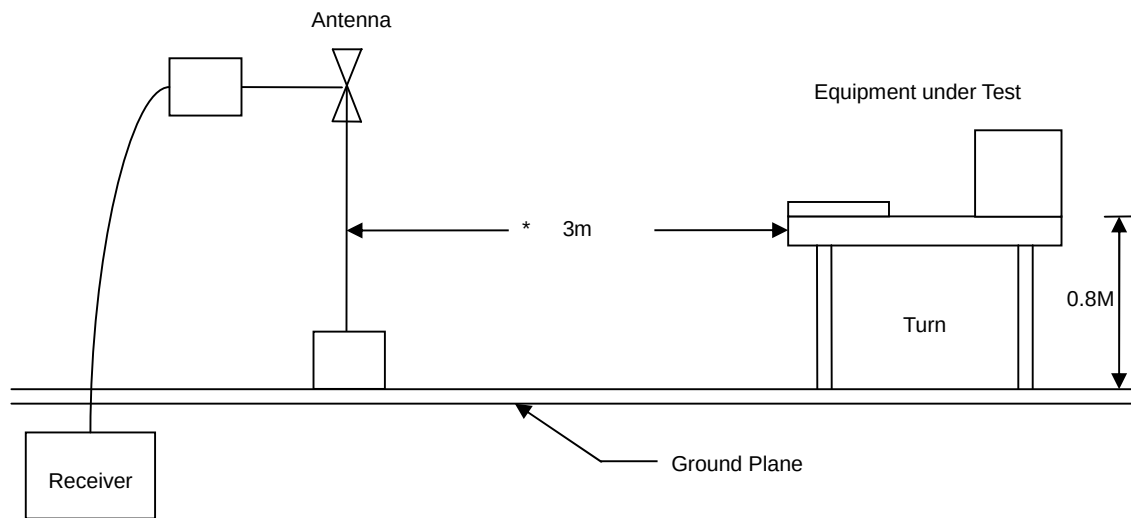




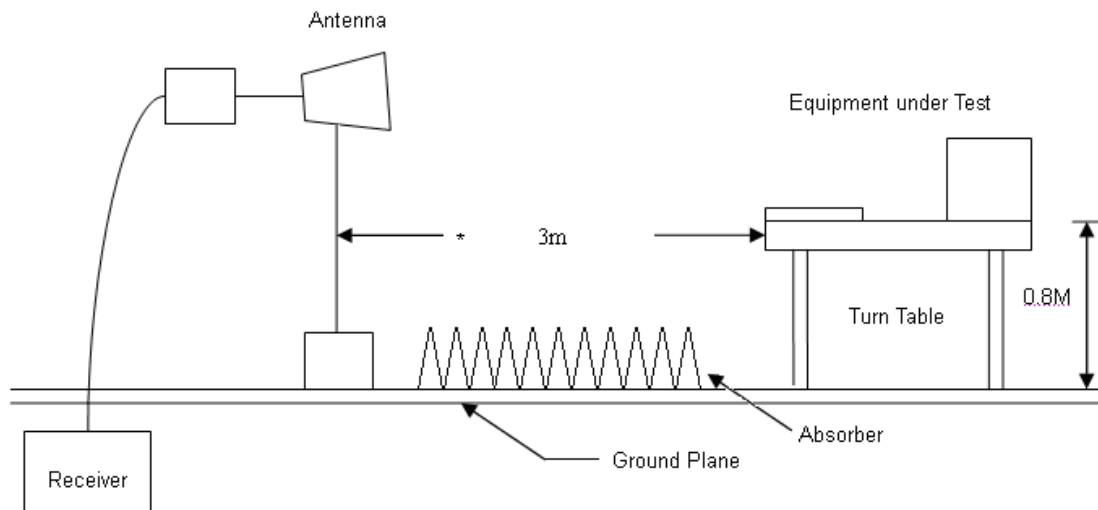


5.3 Typical Test Setup

Below 1GHz Test Setup



Above 1GHz Test Setup



5.4 Measurement Equipment

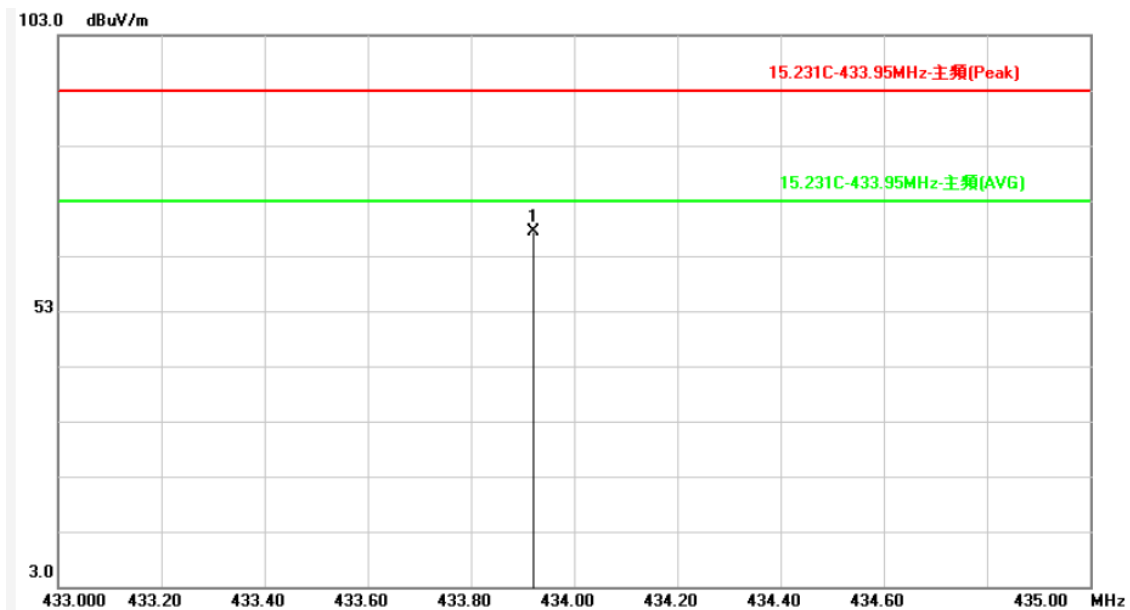
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date
EMI Receiver	R&S	ESCI	100443	2014/04/09	2015/04/08
Bilog Antenna	Schwarzbeck	VULB 9168	275	2014/09/18	2015/09/17
Amplifier	QuieTek	AP/0100A	CHM0906075	2014/09/17	2015/09/16
SPECTRUM ANALYZER	R&S	FSP40	100219	2014/09/03	2015/09/02
HORN ANTENNA	EMCO	3115	31601	2014/07/09	2015/07/08
PREAMPLIFIER	AGILENT	8449B	3008A01954	2014/03/28	2015/03/27
Software	Farad	Ez-EMC	ver.ct3a1	N/A	N/A



5.5 Test Result and Data

5.5.1 Test Result of Fundamental Emission

Power	: DC 3V	Pol/Phase	: VERTICAL
Test Mode	: Transmit	Temperature	: 26 °C
Test Date	: Sep. 19, 2014	Humidity	: 50 %
Memo	:	Atmospheric Pressure	: 1009 hpa



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (°)	P/F
1	433.9200	-10.99	78.43	67.44	92.87	-25.43	peak	112	0	P

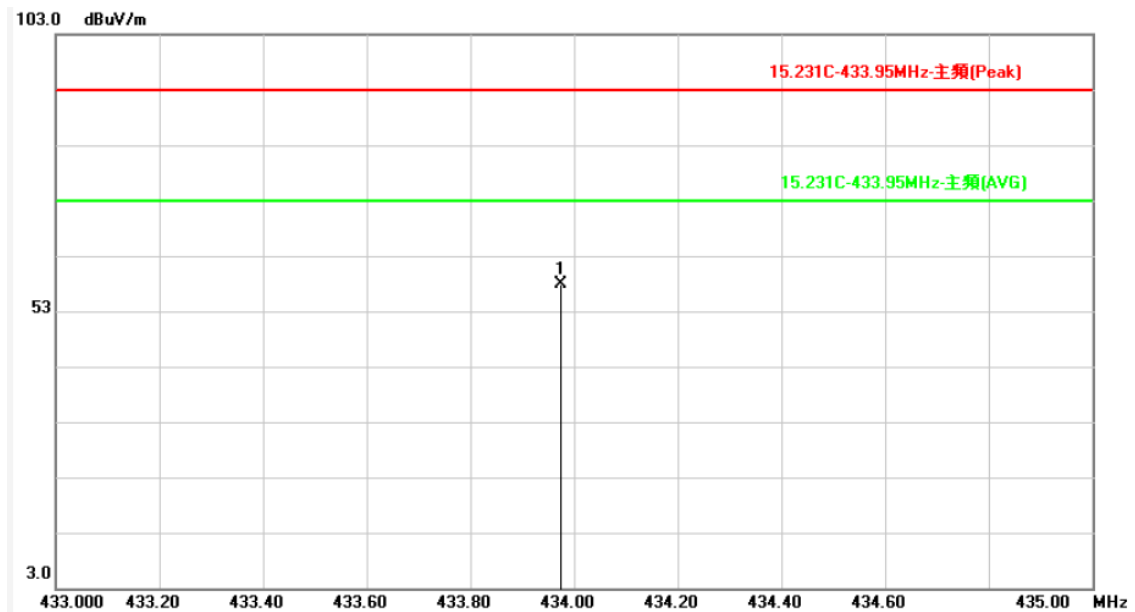
Note: Level = Reading + Factor

Margin = Level – Limit

AV=Peak value+ Duty cycle factor= 67.44+ (-19.24) = 48.2 dBuV/m < Limit 72.87dBuV/m



Power	: DC 3V	Pol/Phase	: HORIZONTAL
Test Mode	: Transmit	Temperature	: 26 °C
Test Date	: Sep. 19, 2014	Humidity	: 50 %
Memo	:	Atmospheric Pressure	: 1009 hpa



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (°)	P/F
1	433.9759	-9.91	67.68	57.77	92.87	-35.10	peak	118	0	P

Note: Level = Reading + Factor

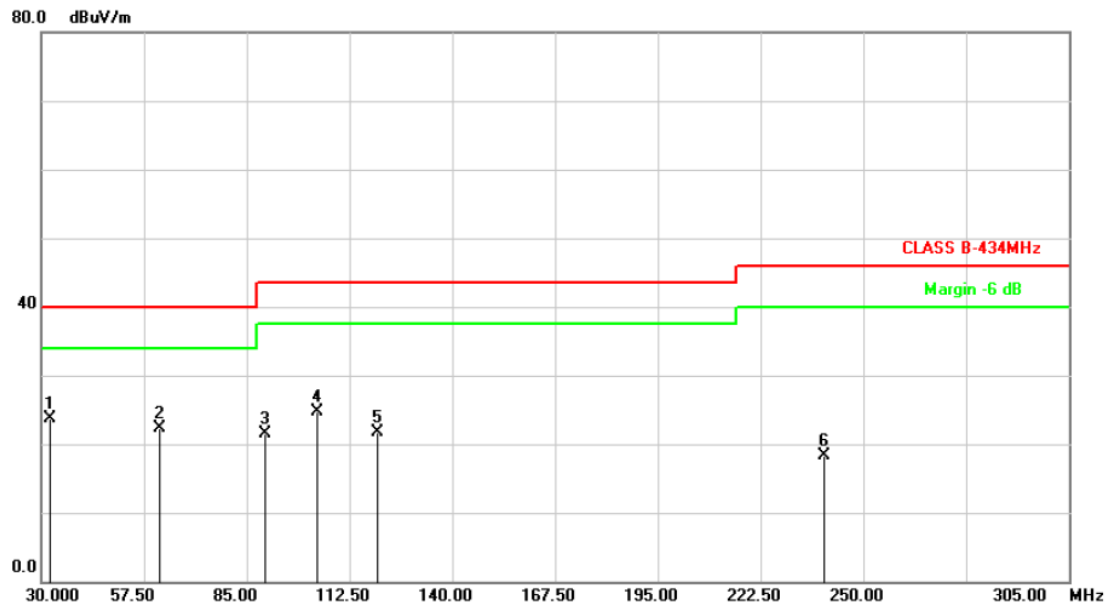
Margin = Level – Limit

AV=Peak value+ Duty cycle factor= 57.77+ (-19.24) = 38.53dBuV/m < Limit 72.87dBuV/m



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

Power	: DC 3V	Pol/Phase	: VERTICAL
Test Mode	: Transmit	Temperature	: 26 °C
Test Date	: Sep. 19, 2014	Humidity	: 50 %
Memo	:	Atmospheric Pressure	: 1009 hpa



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (°)	P/F
1	32.4750	-15.16	38.86	23.70	40.00	-16.30	peak	100	0	P
2	61.8999	-15.72	38.02	22.30	40.00	-17.70	peak	100	0	P
3	89.9500	-8.86	30.42	21.56	43.50	-21.94	peak	100	0	P
4	103.9749	-8.24	32.94	24.70	43.50	-18.80	peak	100	0	P
5	119.9249	-9.06	30.77	21.71	43.50	-21.79	peak	100	0	P
6	239.5500	-11.88	30.17	18.29	46.00	-27.71	peak	100	0	P

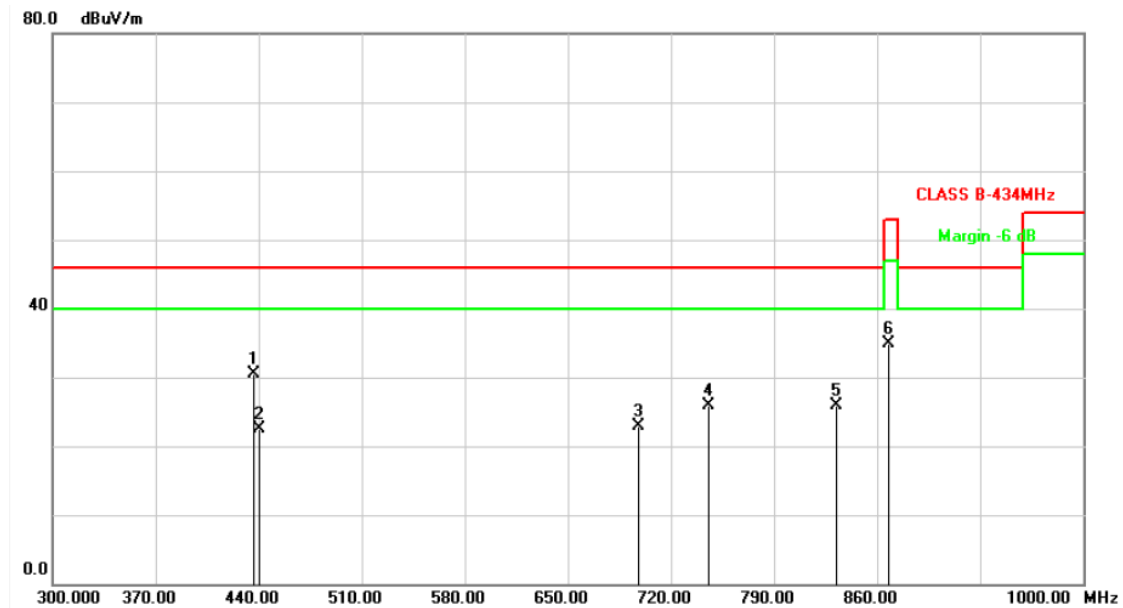
Note: Level = Reading + Factor

Margin = Level – Limit

Peak reading is below AV limit, no AV reading is reported.



Power	: DC 3V	Pol/Phase	: VERTICAL
Test Mode	: Transmit	Temperature	: 26 °C
Test Date	: Sep. 19, 2014	Humidity	: 50 %
Memo	:	Atmospheric Pressure	: 1009 hpa



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (°)	P/F
1	437.1999	-10.89	41.46	30.57	46.00	-15.43	peak	100	0	P
2	440.0000	-10.80	33.39	22.59	46.00	-23.41	peak	100	0	P
3	698.2999	-4.43	27.42	22.99	46.00	-23.01	peak	100	0	P
4	745.2000	-2.04	27.91	25.87	46.00	-20.13	peak	100	0	P
5	832.7000	-1.15	26.98	25.83	46.00	-20.17	peak	100	0	P
6	868.3999	-0.86	35.82	34.96	52.87	-17.91	peak	100	0	P

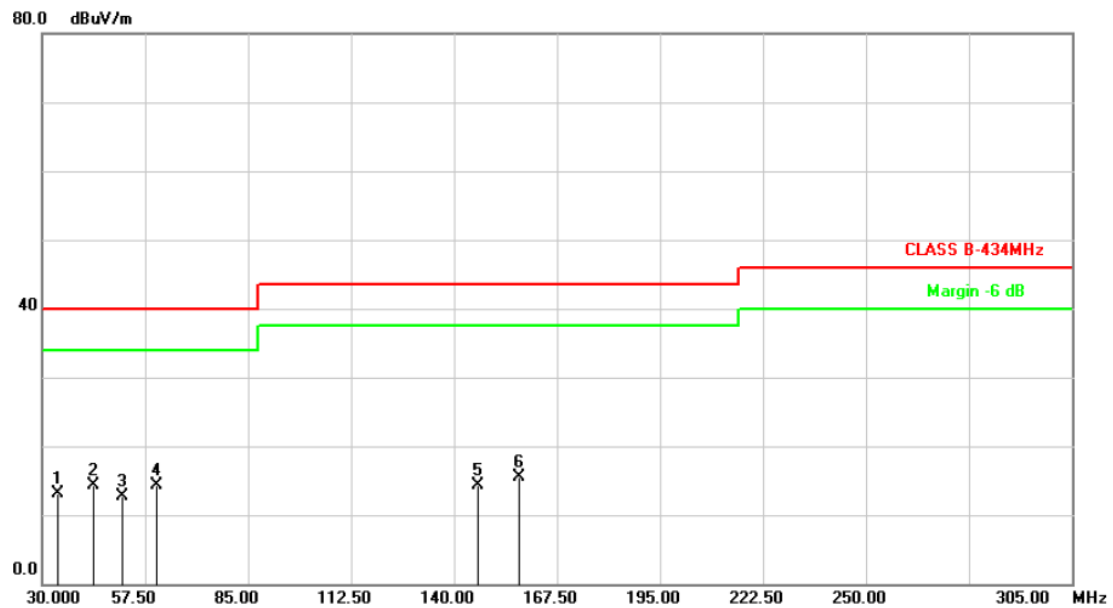
Note: Level = Reading + Factor

Margin = Level – Limit

Peak reading is below AV limit, no AV reading is reported.



Power	: DC 3V	Pol/Phase	: HORIZONTAL
Test Mode	: Transmit	Temperature	: 26 °C
Test Date	: Sep. 19, 2014	Humidity	: 50 %
Memo	:	Atmospheric Pressure	: 1009 hpa



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (°)	P/F
1	34.1250	-21.17	34.37	13.20	40.00	-26.80	peak	400	0	P
2	43.7500	-19.55	33.95	14.40	40.00	-25.60	peak	400	0	P
3	51.4500	-20.64	33.31	12.67	40.00	-27.33	peak	400	0	P
4	60.7999	-21.72	36.04	14.32	40.00	-25.68	peak	400	0	P
5	146.5999	-16.36	30.74	14.38	43.50	-29.12	peak	400	0	P
6	157.5999	-15.91	31.39	15.48	43.50	-28.02	peak	400	0	P

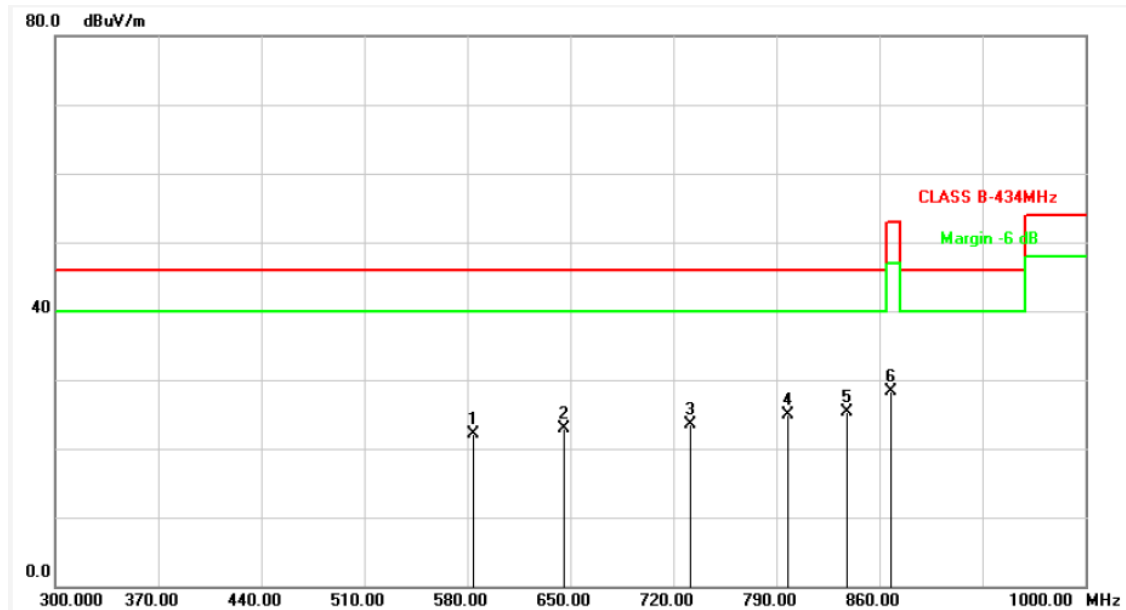
Note: Level = Reading + Factor

Margin = Level – Limit

Peak reading is below AV limit, no AV reading is reported.



Power	: DC 3V	Pol/Phase	: HORIZONTAL
Test Mode	: Transmit	Temperature	: 26 °C
Test Date	: Sep. 19, 2014	Humidity	: 50 %
Memo	:	Atmospheric Pressure	: 1009 hpa



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (°)	P/F
1	584.2000	-6.35	28.51	22.16	46.00	-23.84	peak	400	0	P
2	645.7999	-5.27	28.12	22.85	46.00	-23.15	peak	400	0	P
3	731.8999	-3.24	26.79	23.55	46.00	-22.45	peak	400	0	P
4	797.7000	-2.01	26.94	24.93	46.00	-21.07	peak	400	0	P
5	838.2999	-2.41	27.71	25.30	46.00	-20.70	peak	400	0	P
6	868.3999	-2.52	30.77	28.25	52.87	-24.62	peak	400	0	P

Note: Level = Reading + Factor

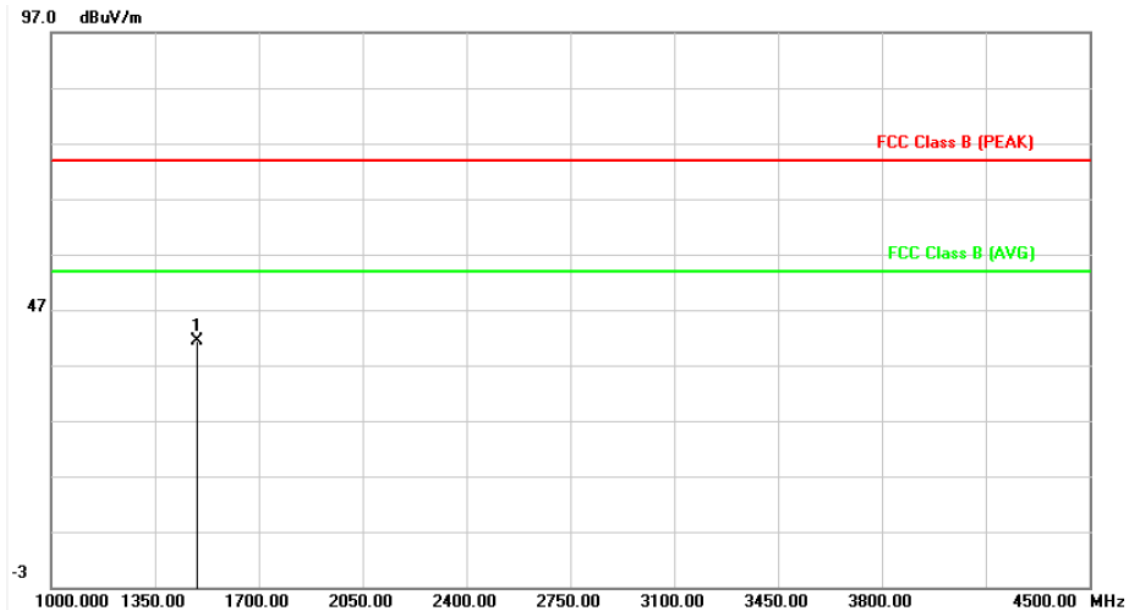
Margin = Level – Limit

Peak reading is below AV limit, no AV reading is reported.



5.5.3 Test Result of Unwanted Spurious emission(Above 1GHz)

Power	: DC 3V	Pol/Phase	: VERTICAL
Test Mode	: Transmit	Temperature	: 26 °C
Test Date	: Sep. 19, 2014	Humidity	: 50 %
Memo	:	Atmospheric Pressure	: 1009 hpa



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (°)	P/F
1	1493.500	-6.01	47.27	41.26	74.00	-32.74	peak	100	0	P

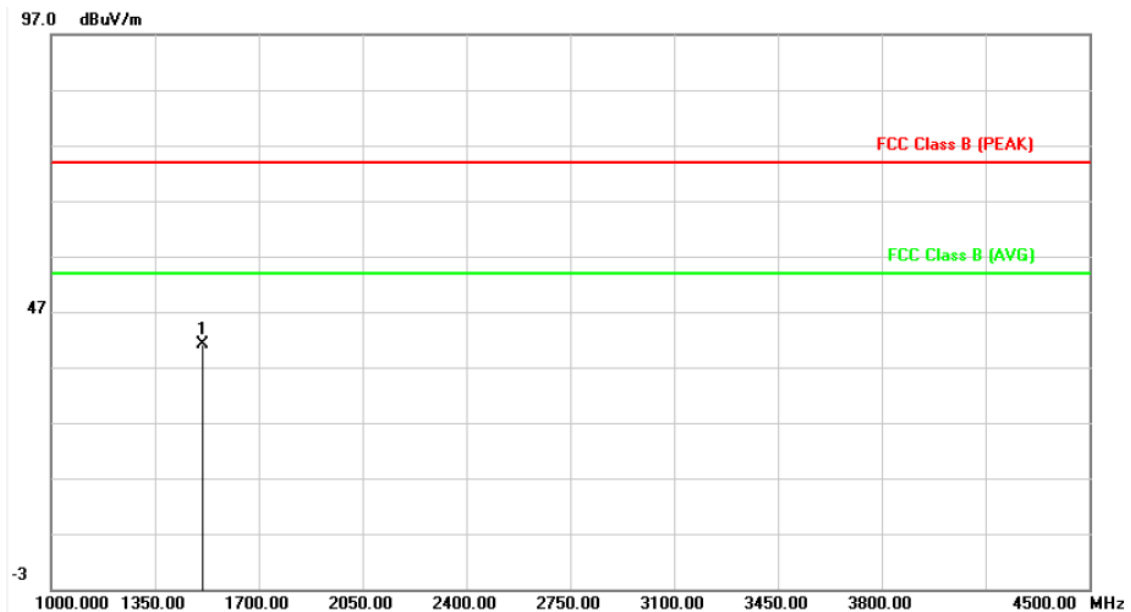
Note: Level = Reading + Factor

Margin = Level – Limit

Peak reading is below AV limit, no AV reading is reported.



Power	: DC 3V	Pol/Phase	: HORIZONTAL
Test Mode	: Transmit	Temperature	: 26 °C
Test Date	: Sep. 19, 2014	Humidity	: 50 %
Memo	:	Atmospheric Pressure	: 1009 hpa



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (°)	P/F
1	1511.000	-5.90	46.92	41.02	74.00	-32.98	peak	100	0	P

Note: Level = Reading + Factor

Margin = Level – Limit

Peak reading is below AV limit, no AV reading is reported.

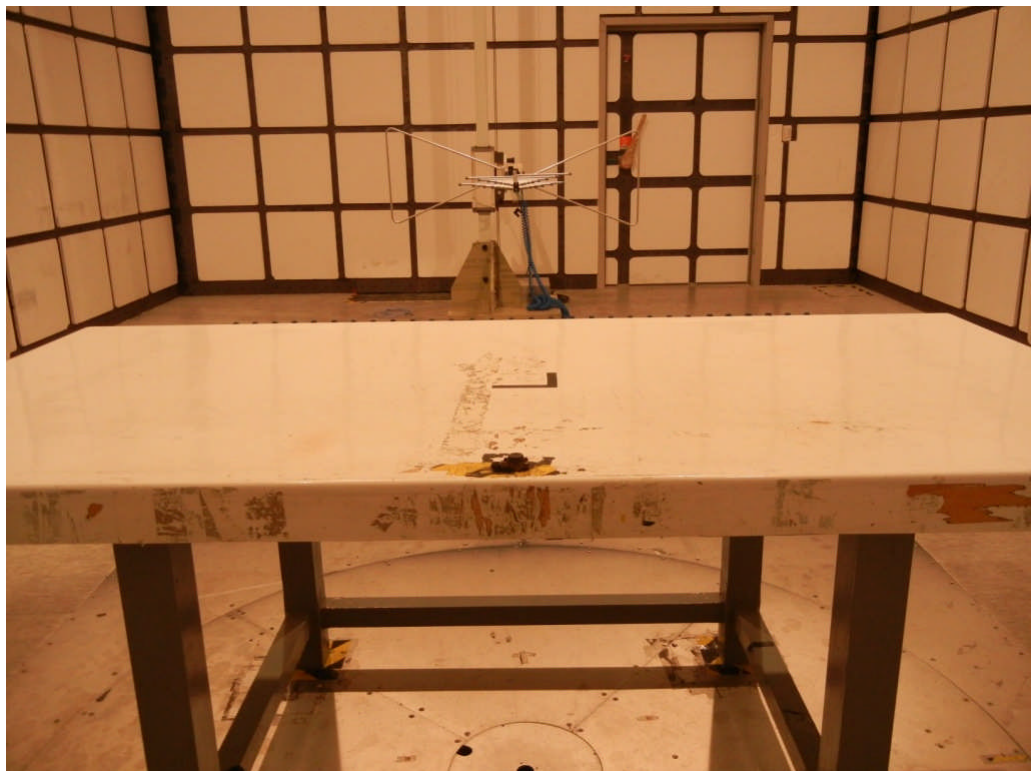


5.6 Test Photographs (30MHz~1GHz)

Front View



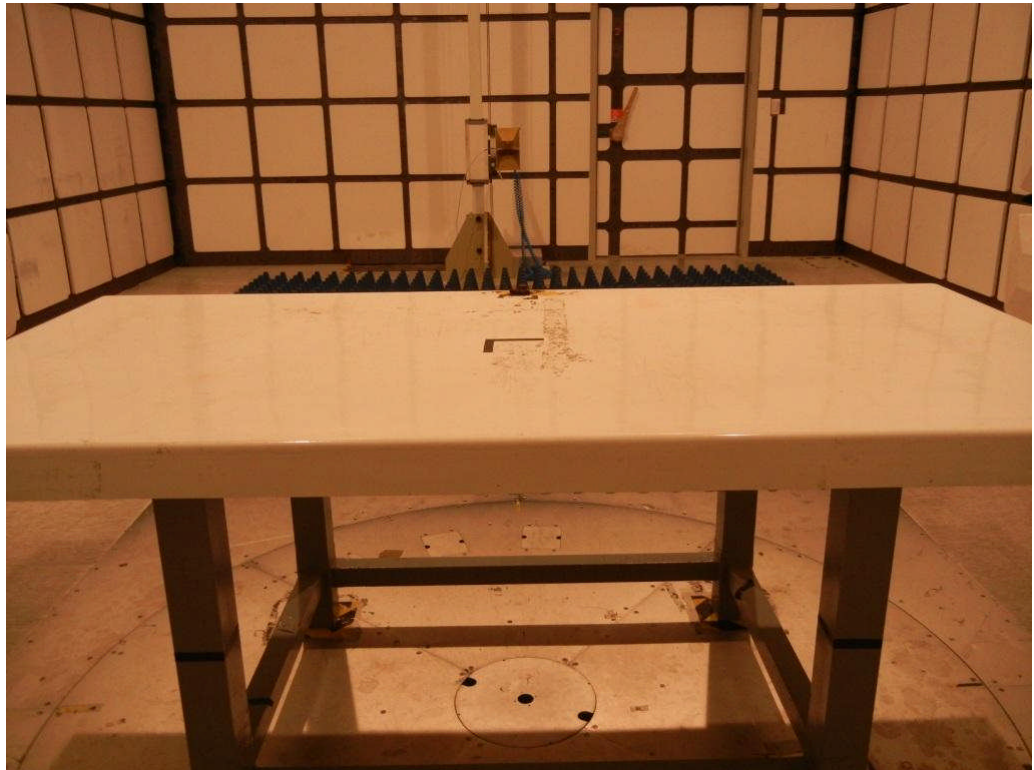
Rear View



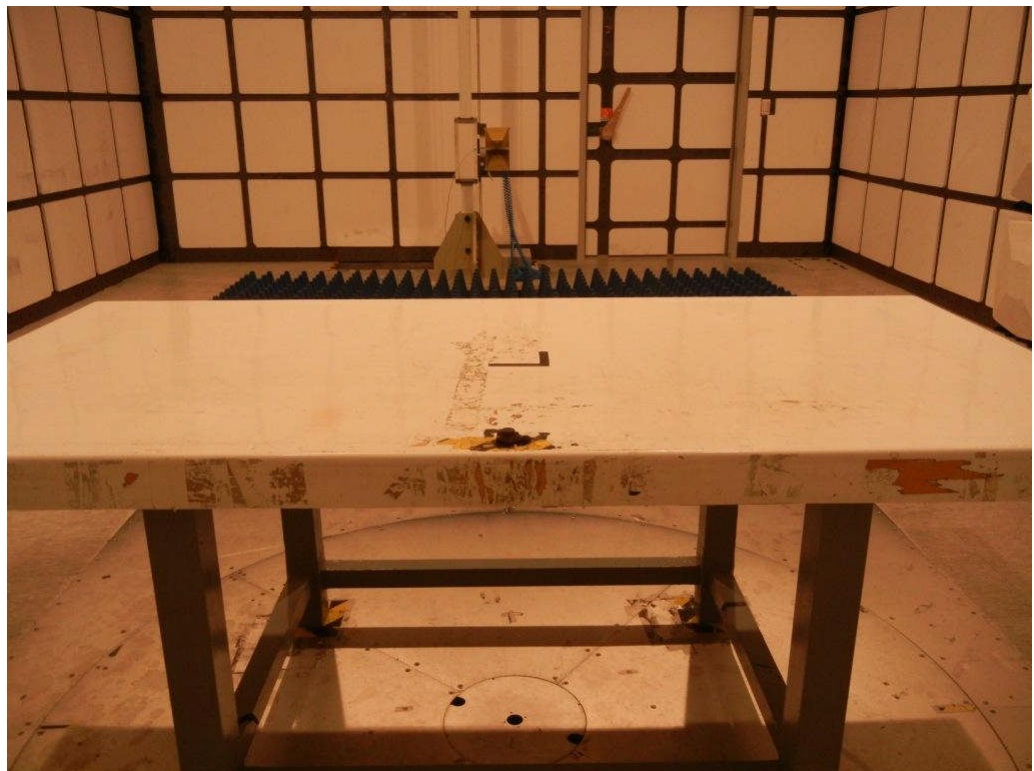


5.7 Test Photographs (Above 1GHz)

Front View



Rear View



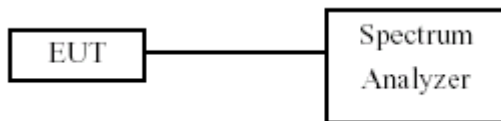


6. 20dB Occupied Bandwidth Measurement

6.1 Test Procedure

- The EUT placed on the turning table.
- The signal was coupled to the spectrum analyzer through an antenna.
- Set the resolution bandwidth to 100kHz and video bandwidth to 100kHz then select Peak function to scan the channel frequency.
- The 20dB bandwidth was measured and recorded.

6.2 Test Setup Layout



6.3 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.

Frequency (MHz)	Limit of 20dB Bandwidth (MHz)
433.92	1.08

6.4 Measurement Equipment

Instrument/Ancillary	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date
Spectrum Analyzer	R&S	FSP40	100047	2014/03/27	2015/03/26

6.5 Test Result and Data

Test Date: Sep. 29, 2014

Temperature: 26°C

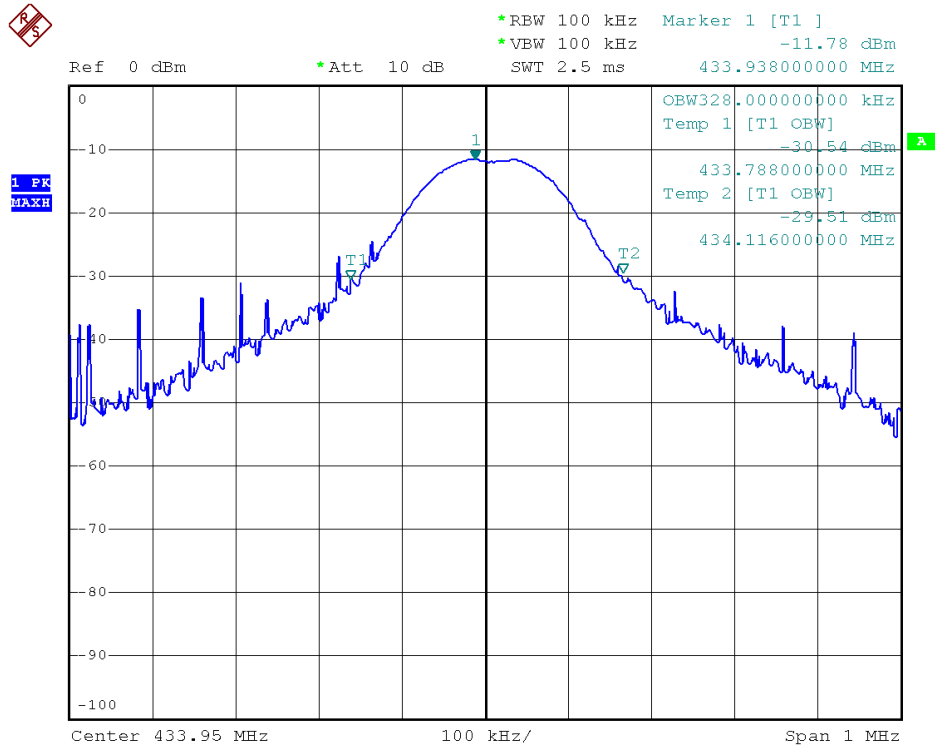
Atmospheric pressure: 1008 hPa

Humidity: 50%

Frequency (MHz)	20 dB bandwidth (MHz)	PASS / FAIL
433.95	0.328	PASS



Frequency: 433.95MHz, CH1



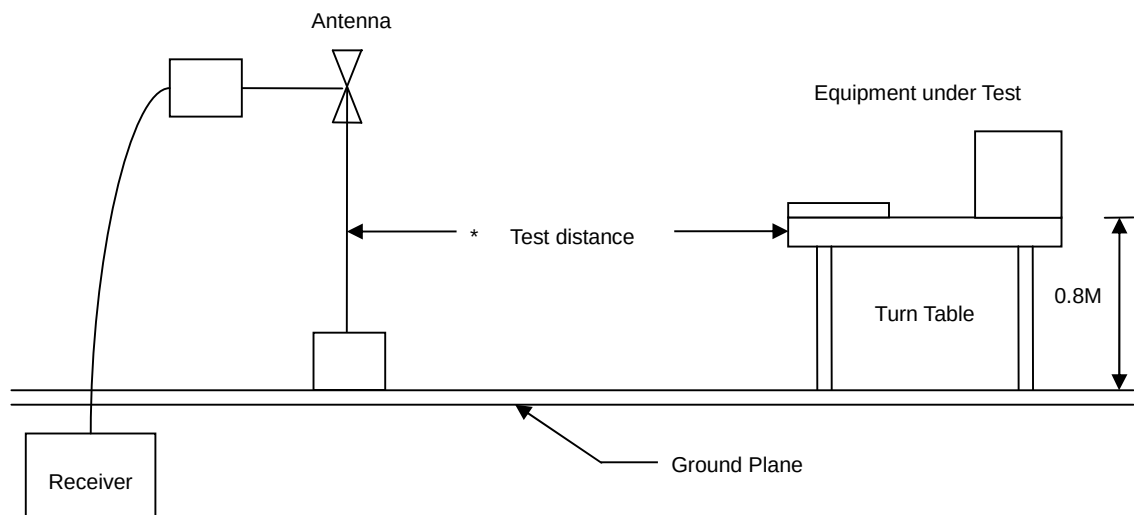


7. Transmission Time Control

7.1 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.

7.2 Test Setup Layout



7.3 Test Limit

Limits: 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.

7.4 Measurement Equipment

Instrument/Ancillary	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date
Spectrum Analyzer	R&S	FSP40	100047	2014/03/27	2015/03/26

7.5 Test Result and Data

Test Date: Sep. 29, 2014

Temperature: 26°C

Atmospheric pressure: 1008 hPa

Humidity: 50%

Frequency (MHz)	Operation time(Sec.)	Limit	PASS / FAIL
433.92	0.011	<1 sec. and least 30 times the duration of the transmission, in no case less than 10 sec.	PASS



Frequency: 433.95MHz

