FCC Test Report

for

WIRELESS TIRE PRESSURE MONITORING SYSTEM

Trade Name	:	**KUENDER**
Model No.	:	**KD-TPMS-T04R05**
FCC ID.	:	**UIT-KDTPMST04R05**
Report Number	:	**RF-A350-0805-140**
Date of Receipt	:	**Aug. 29, 2008**
Date of Report	:	**Sep. 4, 2008**

Prepared for

Kuender & Co., Ltd.

5F., No.22, Sec. 3, Zhongshan N.Rd., Zhongshan District, Taipei Taiwan R.O.C.

Prepared by

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NVLAP LAB CODE 200575-0

Verification of Compliance

Equipment under Test	**: WIRELESS TIRE PRESSURE MONITORING SYSTEM**
Trade Name	**: KUENDER**
Model No.	**: KD-TPMS-T04R05**
FCC ID	**: UIT-KDTPMST04R05**
Manufacturer	**: Kuender & Co., Ltd.**
Applicant	**: Kuender & Co., Ltd.**
Address	**: 5F., No.22, Sec. 3, Zhongshan N.Rd., Zhongshan District, Taipei Taiwan R.O.C.**
Applicable Standards	**: 47 CFR part 15, Subpart C**
Date of Testing	**: Sep. 1~2, 2008**
Deviation	**: N/A**
Condition of Test Sample	**: Engineering Sample**

We, **Central Research Technology Co**., hereby certify that one sample of the designated product was tested in our facility during the period mentioned above. The test records, data evaluation and Equipment Under Test (EUT) configurations shown in the present report are true and accurate representation of the measurements of the sample's RF characteristics under the conditions herein specified.

The test results show that the EUT as described in the present report is in compliance with the requirements set forth in the standards mentioned above and apply to the tested sample identified in the present report only. The test report shall not be reproduced, except in its entirety, without the written approval of Central Research Technology Co.

PREPARED BY : Cathy Chen (Cathy Chen/Technical Manager) , **DATE :** Sep 4, 2008

APPROVED BY : J. Y. Shih (Tsun-Yu Shih/Laboratory Head) , **DATE :** Sept. 4, 2008

Contents

1 General Description

1.1 General Description of EUT

Equipment underTest : KUENDER
Model No. : KD-TPMS-T04R05
Power in : DC 3.6V
Test Voltage : DC 3.6V (Battery*1)
Manufacturer : Kuender & Co., Ltd
Channel Numbers : 1
Frequency Range : 433.92 MHz
Function Modulation : FSK
Function Description :

The EUT is used to transmit control command only. Please refer to the user's manual for the details.

1.2 Test Methodology

For this E.U.T., the radiated emissions measurement performed according to the procedures illustrated in ANSI C63.4:2003 and other required were illustrated in separate sections of this test report for detail.

Since the EUT is considered a potable unit, it was pre-tested on the positioned of each 3 axes. Therefor only the test data of the worse case- z axis was used for Radiated test.

1.3 Applied standards

(1) Radiated Emission Requirement

The field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

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

** linear interpolations

[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, uV/m at 3 meters = 22.72727(F) - 2454.545; for the band 260-470 MHz, uV/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) Bandwidth

The bandwidth of the emission shall be 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 center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

(3) Dwell Time

The 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.

(4) Restricted Band

Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]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	2690 - 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	(2)
13.36 - 13.41			

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

[2] Above 38.6

1.4 The Support Units

No.	Unit	Model No./ Serial No.	Teade Name	PowerCode	Supported by lab.
NA	*	*	*	*	*

1.5 Layout of Setup

EUT

(Transmitter)

Connecting Cables :

No.	Cable	Length	Shielded	Core	Shielded Backshell	Supported by lab.	Note
NA	*	*	*	*	*	*	*

Justification:

For both conducted and radiated emission below 1GHz, the system was configured for typical fashion as a customer could normal use it.

For radiated emission, measurement of radiated emission from digital circuit is performed with normal transmitting.

1.6 Test Capability

Test Facility

The test facility used for evaluating the conformance of the EUT with each standard in the present report meets what required in CISPR16-1-4, CISPR16-2-3 and ANSI C63.4.

Test Room	Type of Test Room	Descriptions
TR1	10m semi-anechoic chamber (23m×14m×9m)	Complying with the NSA requirements in documents CISPR 22 and ANSI C63.4. For the radiated emission measurement.
TR10	3m semi-anechoic chamber (9m × 6m × 6m)	
TR11	3m semi-anechoic chamber (9m × 6m × 6m)	
TR4	Shielding Room (5m×3m×3m)	For the RF conducted emission measurement.
TR5	Shielding Room (8m×5m×4m)	For the conducted emission measurement.

Test Laboratory Competence Information

Central Research Technology Co. has been accredited/filed/authorized by the agencies listed in the following table.

Certificate	Nation	Agency	Code	Mark
Accreditation Certificate	USA	NVLAP	200575-0	ISO/IEC 17025
	R.O.C. (Taiwan)	TAF	0905	ISO/IEC 17025
	R.O.C. (Taiwan)	BSMI	SL2-IN-E-0033, SL2-IS-E-0033, SL2-R1/R2-E-0033, SL2-A1-E-0033	ISO/IEC 17025
Site Filing Document	USA	FCC	474046, TW-1021	Test facility list & NSA Data
	Canada	IC	4699A-1,-2,-3	Test facility list & NSA Data
	Japan	VCCI	R-1527,C-1609,T-131,T-1441	Test facility list & NSA Data
Authorization Certificate	Germany	TUV	10021687-2007	ISO/IEC 17025
	Norway	Nemko	ELA212	ISO/IEC 17025

The copy of each certificate can be downloaded from our web site: www.crc-lab.com

1.7 Measurement Uncertainty

The assessed measurement uncertainty with a suitable coverage factor K to ensure 95% confidence level for the normal distribution are shown as below, the values are less than U_{cispr} in table 1 of CISPR 16-4-2.

Test Item	Measurement Uncertainty
Radiated Emission: (30MHz~200MHz)	Horizontal: 2.8dB；Vertical: 3.5dB
Radiated Emission: (200MHz~1GHz)	Horizontal: 3.4dB；Vertical: 2.8dB
Radiated Emission: (1GHz~18GHz)	Horizontal: 2.5dB；Vertical: 2.4dB

2 Radiated Emission

Test Result: Pass

2.1 Applied standard

According to 15.231(e), 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:

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

** linear interpolations

The formula for calculating the limit of field strength of fundament is 16.6667*433.92-2833.3333=72.87dBuV/m(Average), the limit of spurious emission is 52.87dBuV/m (Average/QP)

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 Section 15.209, whichever limit permits a higher field strength.

2.2 Test Instruments

Test Site and Equipment	Manufacturer	Model No./ Serial No.	Last Calibration Date	Calibration Due Date
EMI Test Receiver	R&S	ESI26/837491/015	2008/5/5	2009/5/4
Spectrum Analyzer	Agilent	E4407B/ MY45106706	2008/3/19	2009/3/18
Broadband Antenna	EMCO	3142C/ 52088	2008/7/27	2009/7/26
Horn Antenna	EMCO	3117/ 57408	2008/2/25	2009/2/24
Horn Antenna	EMCO	3116/ 58959	2008/2/14	2009/2/13
Pre-Amplifier	MITEQ	AFS6-02001800-35-10P-6/866643	2007/12/19	2008/12/18
Pre-Amplifier	Mini Circuit	ZKL-2/ 004	2008/8/14	2009/8/13
Semi - anechoic Chamber	ETS. LINDGREN	TR11/ 906-A	2008/6/30	2009/6/29

Note:
1. The calibrations are traceable to NML/ROC.
2. NCR : No Calibration Required.
3. The calibration date of the semi-anechoic chamber listed above is the date of NSA measurement.

Instrument Setting

RBW	VBW	Detector	Trace	Comment
100KHz	N/A	Peak/Average	Maxhold	Field Strength of Fundament
120kHz	N/A	Quasi-Peak	Maxhold	Below 1GHz
1MHz	1MHz/100Hz	Peak/Average	Maxhold	Above 1GHz Peak

Climatic Condition

Ambient Temperature：27°C; Relative Humidity : 65%

2.3 Measurement Procedure

a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.

b. A software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

c. If the EUT is tabletop equipment, it was placed on a wooden table with a height of 0.8 meters above the reference ground plane in the semi-anechoic chamber. If the EUT is floor-standing equipment, it was placed on a non-conducted support with a height of 12 millimeters above the reference ground plane in the semi-anechoic chamber.

d. The EUT was set 3m away from the interference receiving antenna.

e. Rapidly sweep the signal in the test frequency range by using the spectrum through the Maximum-peak detector.

f. Rotate the EUT from 0° to 360° and position the receiving antenna at heights from 1 to 4 meters above the reference ground plane continuously to determine at least six frequencies associated with higher emission levels and record them.

g. Then measure each frequency found from step f. by using the spectrum with rotating the EUT and positioning the receiving antenna height to determine the maximum level.

h. For measurement of frequency above 1000MHz, the beamwidth of receiving horn antenna should keep covering EUT when the receiving horn antenna height varied.

i. For measurement of frequency above 1000MHz, set the spectrum detector to be Peak or Average to find out the maximum level occurred, if any.

j. Record frequency, azimuth angle of the turntable, height, and polarization of the receiving antenna and compare the maximum level with the required limit.

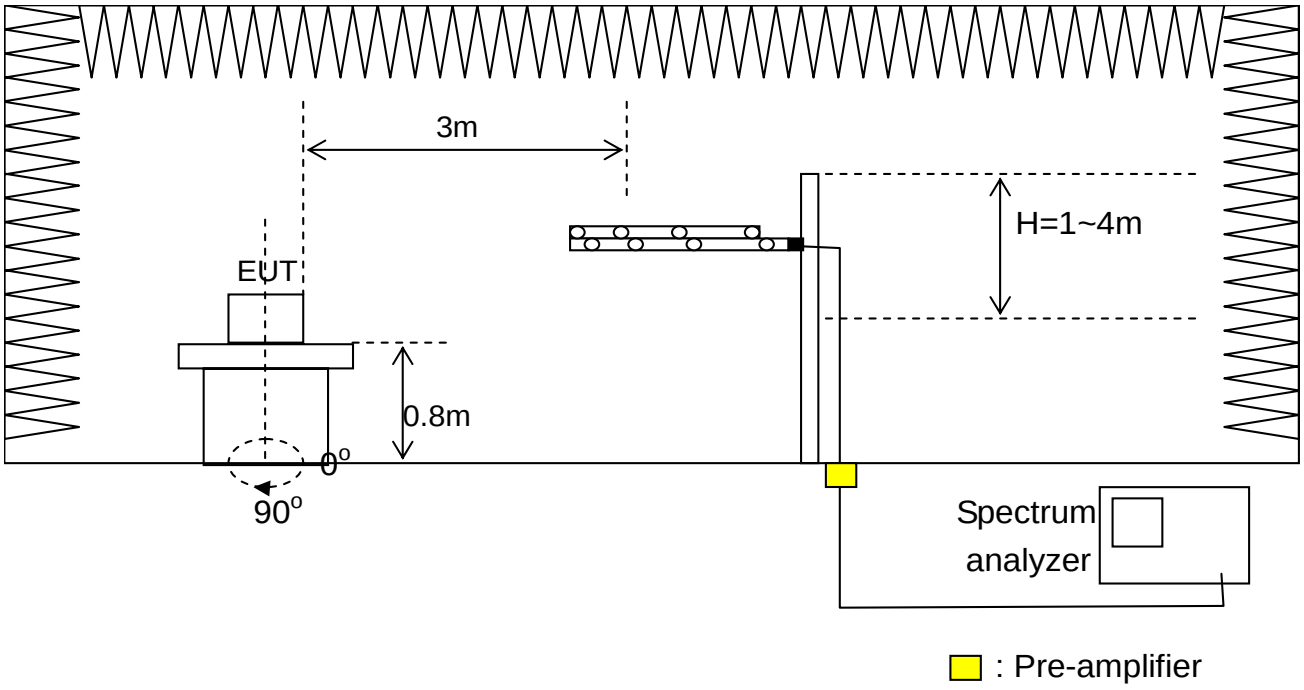
k. Change the receiving antenna to another polarization to measure radiated emission by following step e. to j. again.

l. If the peak emission level below 1000MHz measured from step f. is 4dB lower than the limit specified, then the emission values presented will be the peak value only. Otherwise, accurate Q.P. value will be measured and presented.

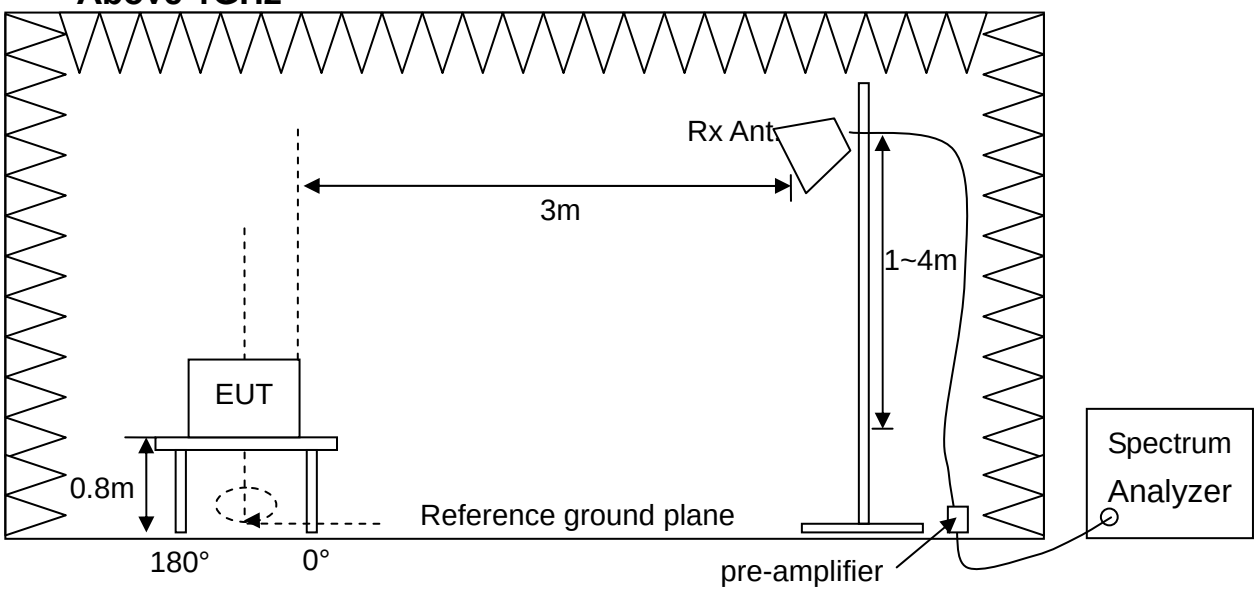
m. If the peak emission level above 1000MHz measured from step f. is 20dB lower than the limit specified, then the emission values presented will be the peak value only. Otherwise, accurate A.V. value will be measured and presented.

2.4 Test configuration

Below 1GHz



Above 1GHz



2.5 Test Data

Field Strength of Fundament

Operating Frequency : 433.92 MHz **Test Mode** : Transmitting

Test Distance : 3m **Tester** : Bill

Frequency (MHz)	Polarization	Reading Data (dBuV)		Correction Factor (dB/m)	Field Strength (dBμV/m)		Limit (dBμV/m)		Margin (dB)	
		PK	AV		PK	AV	PK	AV	PK	AV
433.94	V	84.56	N/A	-8.64	75.92	56.59	92.87	72.87	16.95	16.28
433.94	H	96.19	N/A	-8.64	87.55	68.22	92.87	72.87	5.32	4.65

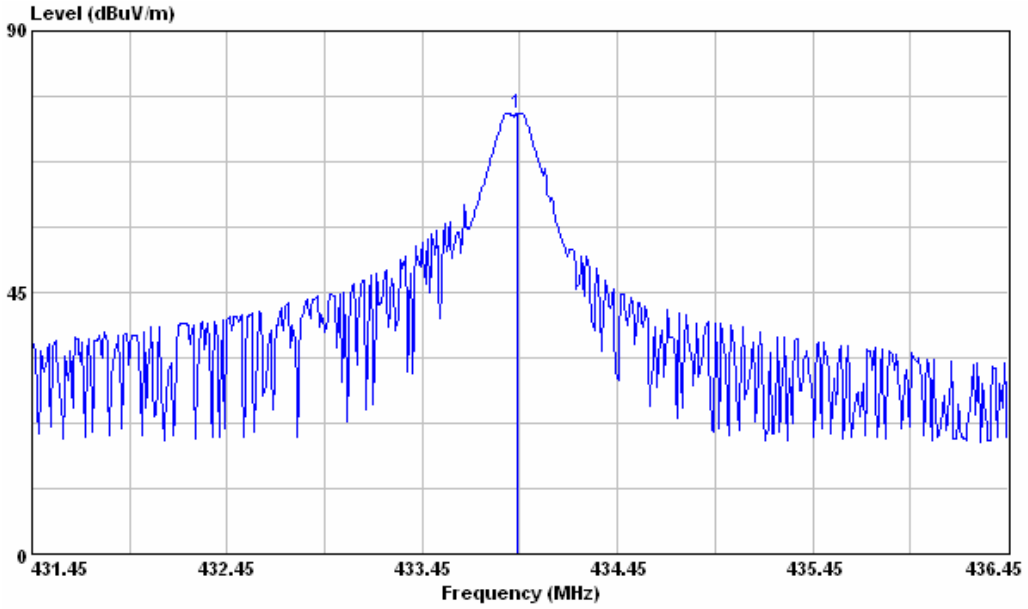
Note：

1. Correction Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Preamplifier
2. Field Strength (dBuV/m) = Reading Data + Correction Factor
3. Margin (dB) = Limit – Field Strength
4. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle)
   Where the duty factor is calculated from following formula:

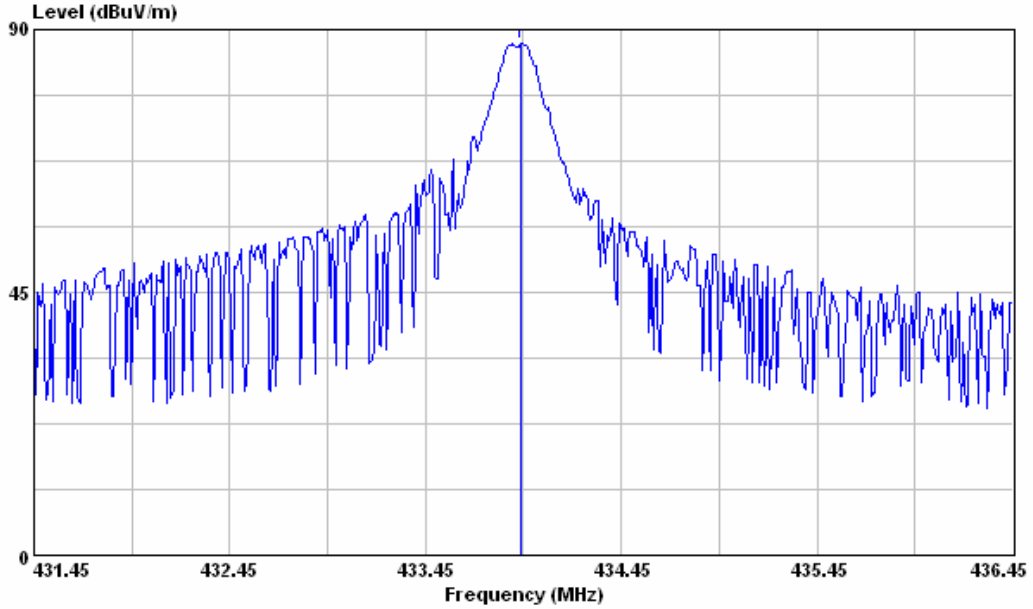
   20log(Duty cycle) = 20log $\frac{10.8}{100}$ =-19.33dB

   The total time is longer than 100ms, so the total time uses 100ms to express.
   please see page 18 for plotted duty cycle.

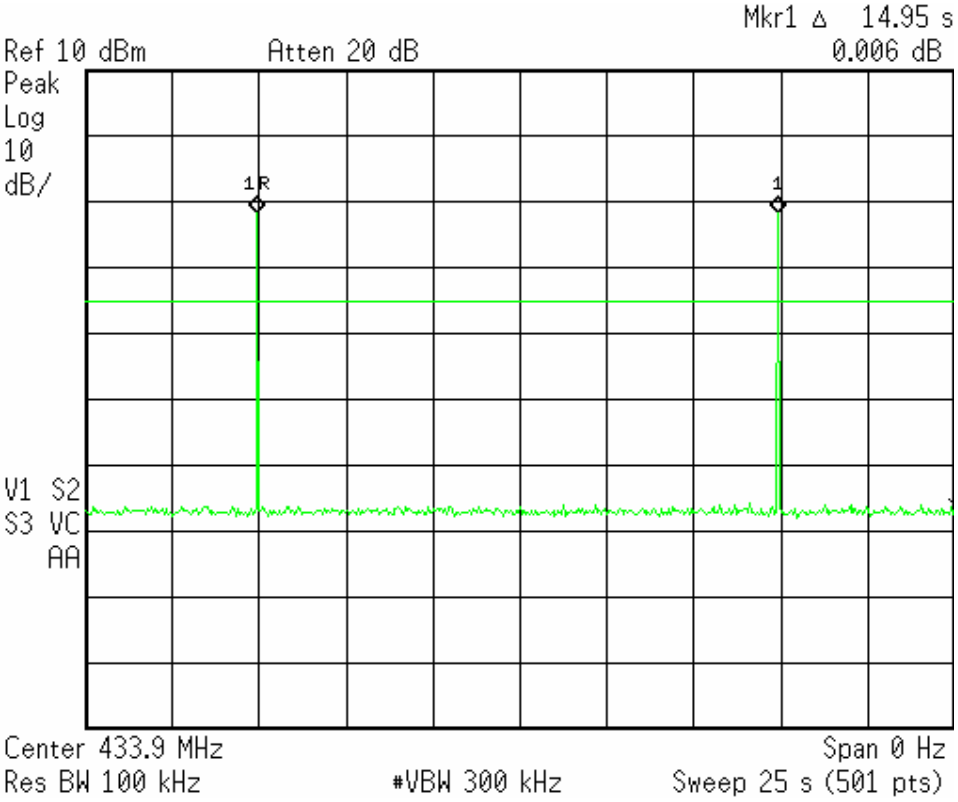
V Polarization, PK

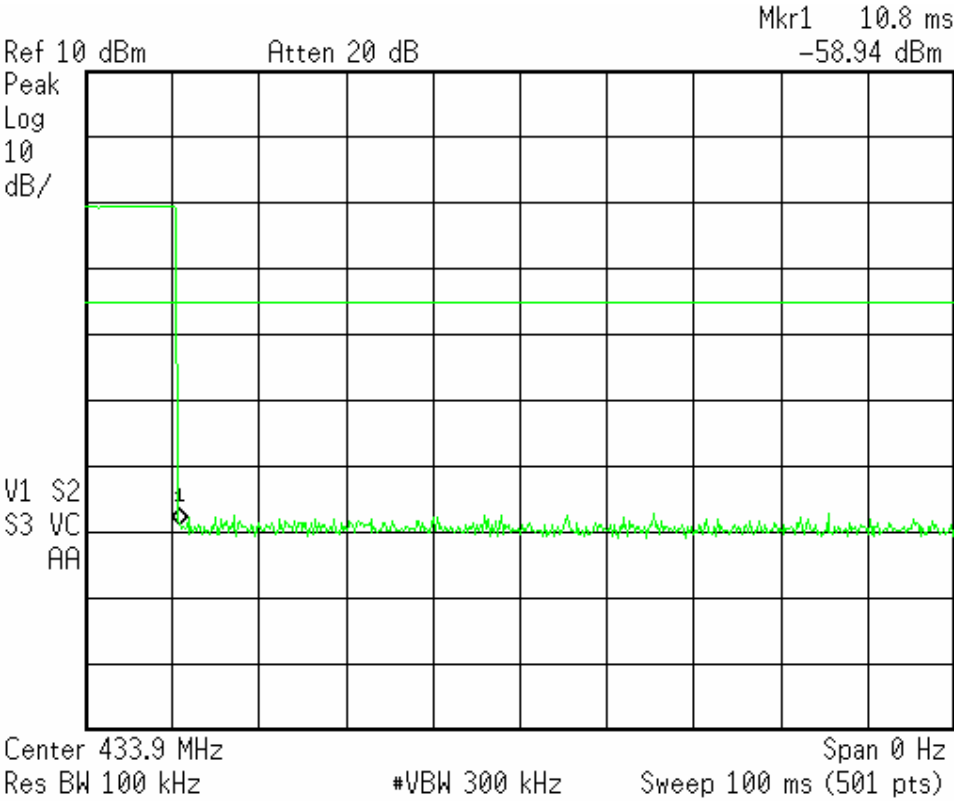


H Polarization, PK



Duty cycle


Mkr1 Δ 14.95 s
0.006 dB
Ref 10 dBm
Atten 20 dB
Peak
Log
10
dB/
1R
1
V1 S2
S3 VC
AA
Center 433.9 MHz
Span 0 Hz
Res BW 100 kHz
#VBW 300 kHz
Sweep 25 s (501 pts)


Mkr1 10.8 ms
-58.94 dBm
Ref 10 dBm
Atten 20 dB
Peak
Log
10
dB/
1
V1 S2
S3 VC
AA
Center 433.9 MHz
Span 0 Hz
Res BW 100 kHz
#VBW 300 kHz
Sweep 100 ms (501 pts)

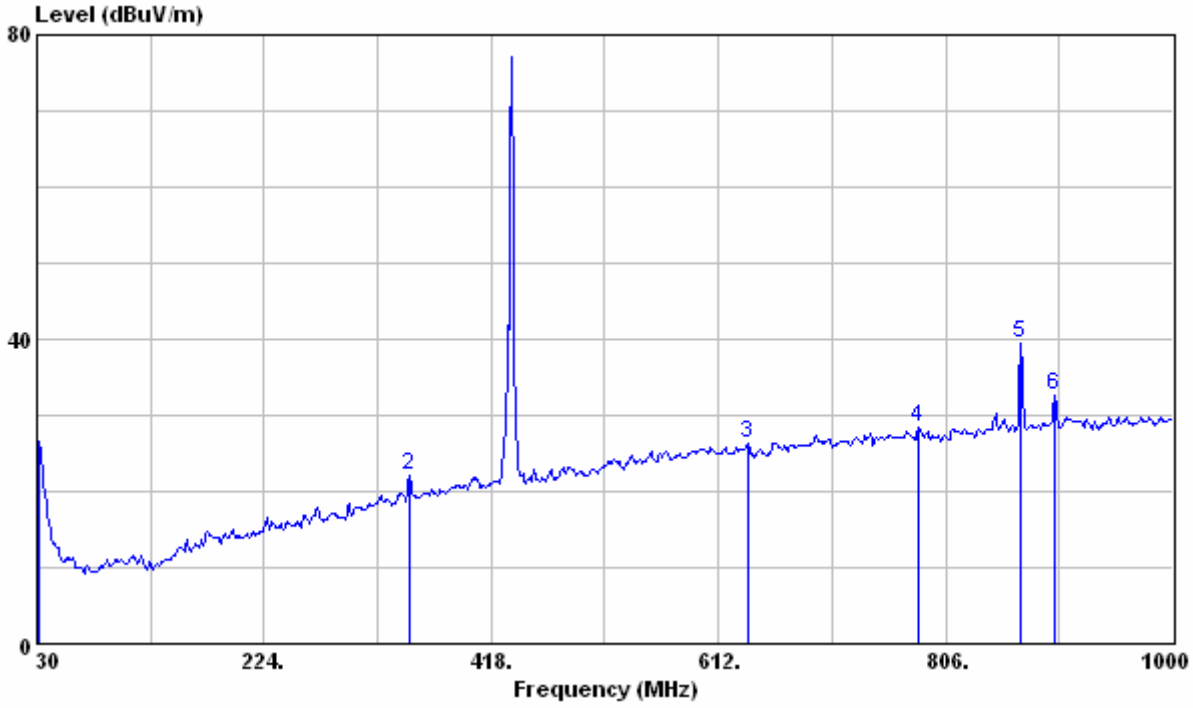
Radiated Emission Measurement below 1000MHz

Operating Frequency	: 433.92 MHz	**Test Mode**	: Transmitting
Test Distance	: 3m	**Tester**	: Bill
Polarization	: Vertical	**Frequency Range**	: 30MHz~1GHz

	Freq. (MHz)	Reading Data (dBuV)	Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	31.94	36.29	-9.75	26.54	52.87	26.33
2	348.16	32.71	-10.62	22.09	52.87	30.78
3	637.22	31.01	-4.7	26.31	52.87	26.56
4	782.72	30.94	-2.65	28.29	52.87	24.58
5	870.02	40.71	-1.22	39.49	52.87	13.38
6	899.12	33.29	-0.64	32.65	52.87	20.22

Note:

1. Correction Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Pre-amplifier
2. Emission Level (dBuV/m) = Reading Data + Correction Factor
3. Margin (dB) = Limit – Emission Level

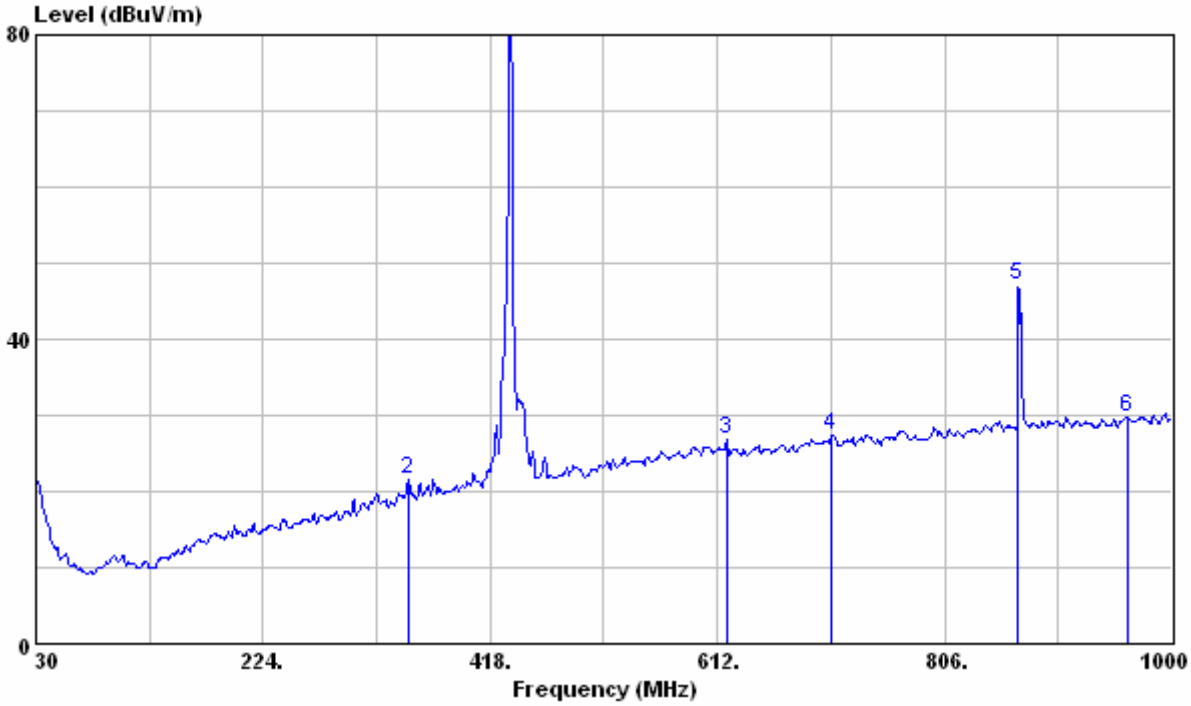


Operating Frequency	: 433.92 MHz	**Test Mode**	: Transmitting
Test Distance	: 3m	**Tester**	: Bill
Polarization	: Horizontal	**Frequency Range**	: 30MHz~1GHz

	Freq. (MHz)	Reading Data (dBuV)	Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	30.00	29.88	-8.53	21.35	52.87	31.52
2	348.16	32.14	-10.62	21.52	52.87	31.35
3	619.76	31.50	-4.70	26.80	52.87	26.07
4	709.97	30.49	-3.09	27.40	52.87	25.47
5	867.88	48.49	-1.26	47.23	52.87	5.64
6	963.14	30.29	-0.47	29.82	52.87	23.05

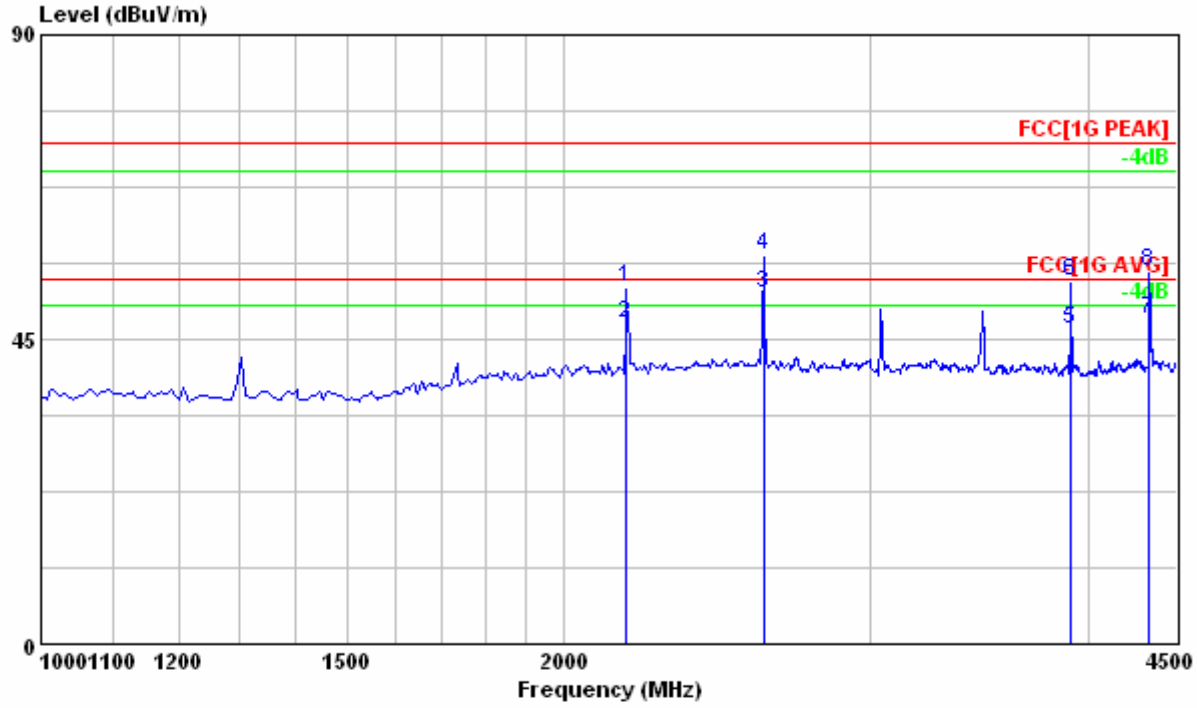
Note:

1. Correction Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Pre-amplifier
2. Emission Level (dBuV/m) = Reading Data + Correction Factor
3. Margin (dB) = Limit – Emission Level



Radiated Emission Measurement above 1000MHz

Operating Frequency	: 433.92MHz	**Test Mode**	: Transmitting
Test Distance	: 3m	**Tester**	: Bill
Polarization	: Vertical	**Frequency Range**	: 1GHz~4.5GHz

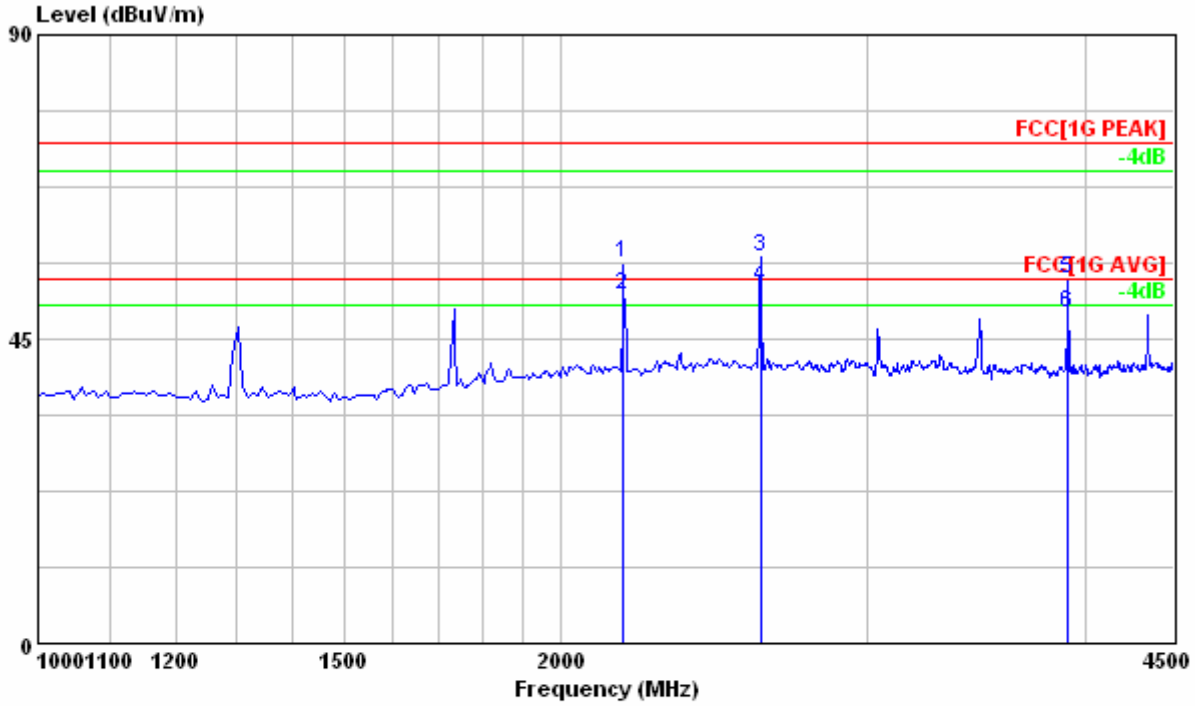


	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Ant Pos	Table Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg		
1	2169.500	52.65	80.89	-28.24	74.00	-21.35	101	4	VERTICAL	Peak
2	2169.500	47.25	75.49	-28.24	54.00	-6.75	101	4	VERTICAL	Average
3 !	2603.387	51.80	79.38	-27.58	54.00	-2.20	101	263	VERTICAL	Average
4	2603.387	57.50	85.08	-27.58	74.00	-16.50	101	263	VERTICAL	Peak
5	3905.000	46.51	72.18	-25.67	54.00	-7.49	116	211	VERTICAL	Average
6	3905.000	53.50	79.17	-25.67	74.00	-20.50	116	211	VERTICAL	Peak
7	4338.975	47.95	72.85	-24.90	54.00	-6.05	109	277	VERTICAL	Average
8	4338.975	55.11	80.01	-24.90	74.00	-18.89	109	277	VERTICAL	Peak

Note:

1. Emission Level (dBuV/m) = Reading Value + Correction Factor.
2. Correction Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Pre-amplifier.

Operating Frequency	: 433.92 MHz	**Test Mode**	: Transmitting
Test Distance	: 3m	**Tester**	: Bill
Polarization	: Horizontal	**Frequency Range**	: 1GHz~4.5GHz



	Freq	Level	Read Level	Factor	Limit Line	Over Limit	Ant Pos	Table Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV	dB/m	dBuV/m	dB	cm	deg		
1	2169.488	56.31	84.55	-28.24	74.00	-17.69	136	236	HORIZONTAL	Peak
2 !	2169.488	51.48	79.72	-28.24	54.00	-2.52	136	236	HORIZONTAL	Average
3	2603.000	57.11	84.69	-27.58	74.00	-16.89	100	191	HORIZONTAL	Peak
4 @	2603.000	52.72	80.30	-27.58	54.00	-1.28	100	191	HORIZONTAL	Average
5	3905.512	53.93	79.60	-25.67	74.00	-20.07	100	256	HORIZONTAL	Peak
6	3905.512	48.86	74.53	-25.67	54.00	-5.14	100	256	HORIZONTAL	Average

Note:

1. Emission Level (dBuV/m) = Reading Value + Correction Factor.
2. Correction Factor (dB/m) = Cable Loss + Antenna Factor – Gain of Pre-amplifier.

3 Bandwidth

Test Result: Pass

3.1 Applied standard

According to 15.231(c), The bandwidth of the emission shall be 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 center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

3.2 Test Instruments

Test Site and Equipment	Manufacturer	Model No./ Serial No.	Last Calibration Data	Calibration Due Data
Shielded Room	ETS.LINDGREN	TR4/ 15353-E	NCR	NCR
Spectrum Analyzer	Agilent	E4405B/ MY45106706	2008/3/25	2009/3/24

Note:

1. The calibrations are traceable to NML/ROC.
2. NCR:No Calibration Required.

Instrument Setting

RBW	VBW	Span	Detector	Comment
1kHz	3kHz	Peak	Maxhold	

Climatic Condition

Ambient Temperature：26°C; Relative Humidity : 64%

3.3 Measurement Procedure

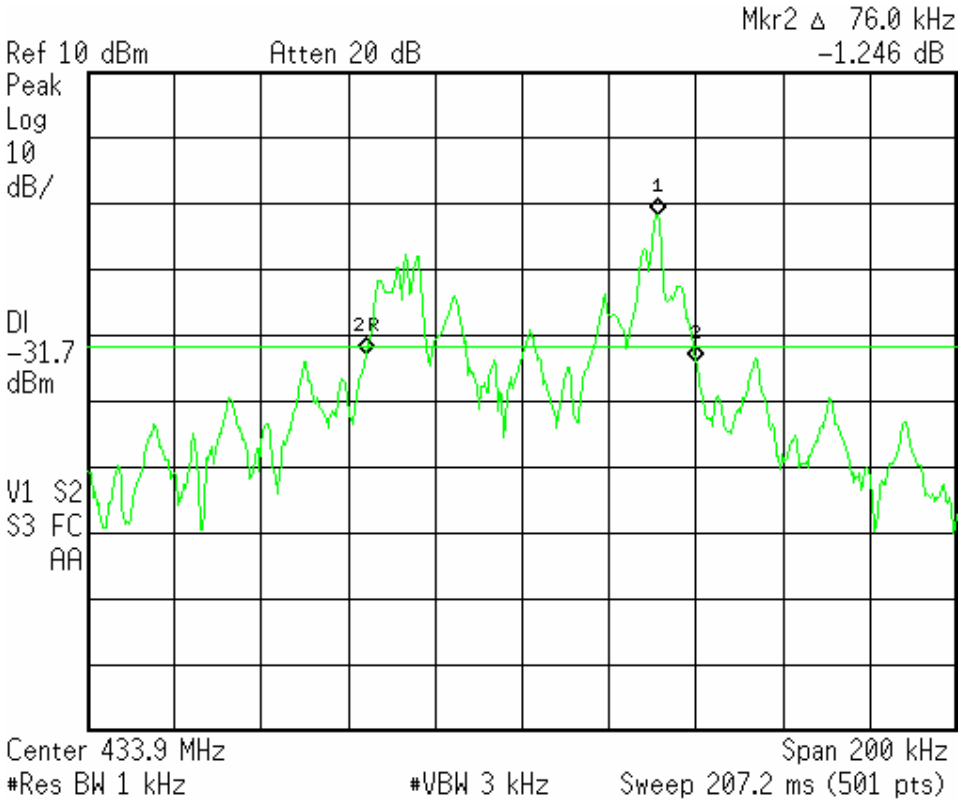
1. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.
2. The Transmitter output of EUT was connected to the spectrum analyzer.
3. Measure the bandwidth and compare with the required limit.

3.4 Test configuration

3.5 Test Data

Operating Frequency : 433.92 MHz **Test Mode :** Transmitting

Tester : Bill



Measured 20dB bandwidth is 76kHz < 433.96 MHzX0.25% = 1084.9kHz.

4 Dwell Time

Test Result: Pass

4.1 Applied standard

According to 15.231(e), 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.

4.2 Test Instruments

Test Site and Equipment	Manufacturer	Model No./ Serial No.	Last Calibration Data	Calibration Due Data
Shielded Room	ETS.LINDGREN	TR4/ 15353-E	NCR	NCR
Spectrum Analyzer	Agilent	E4405B/ MY45106706	2008/3/25	2009/3/24

Note:

1. The calibrations are traceable to NML/ROC.
2. NCR:No Calibration Required.

Instrument Setting

RBW	VBW	Detector	Trace	Comment
100KHz	300kHz	Peak	Maxhold	

Climatic Condition

Ambient Temperature：26°C; Relative Humidity : 64%

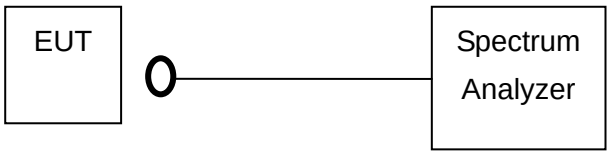
4.3 Measurement Procedure

a. The EUT was set up per the test configuration figured in the next section of this chapter to simulate the typical usage per the user's manual.

b. The Transmitter output of EUT was connected to the spectrum analyzer through an attenuator.

c. Measure the dwell time and compare with the required limit.

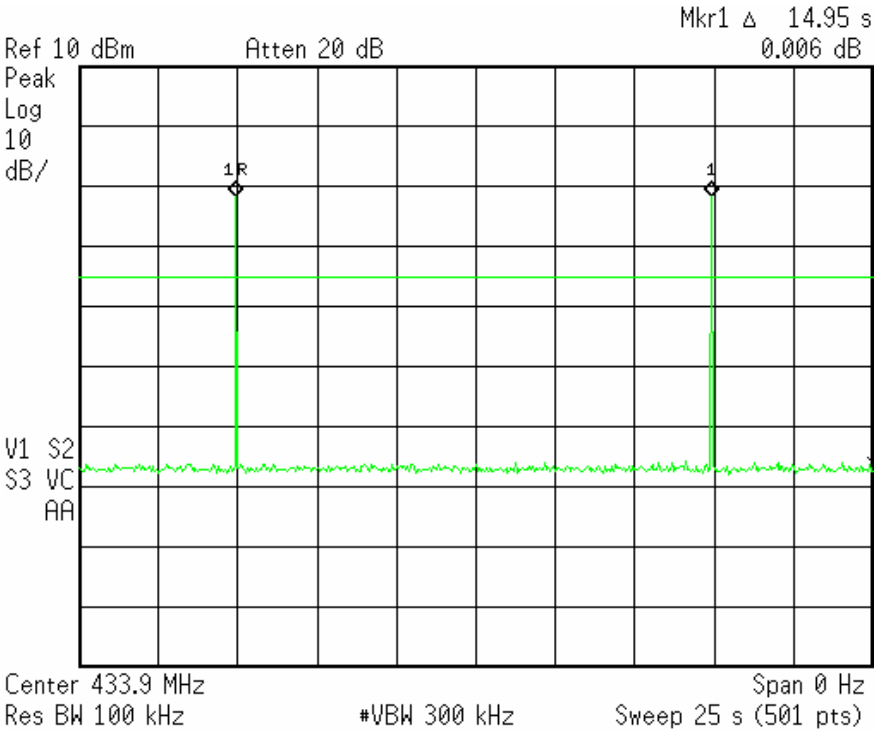
4.4 Test configuration

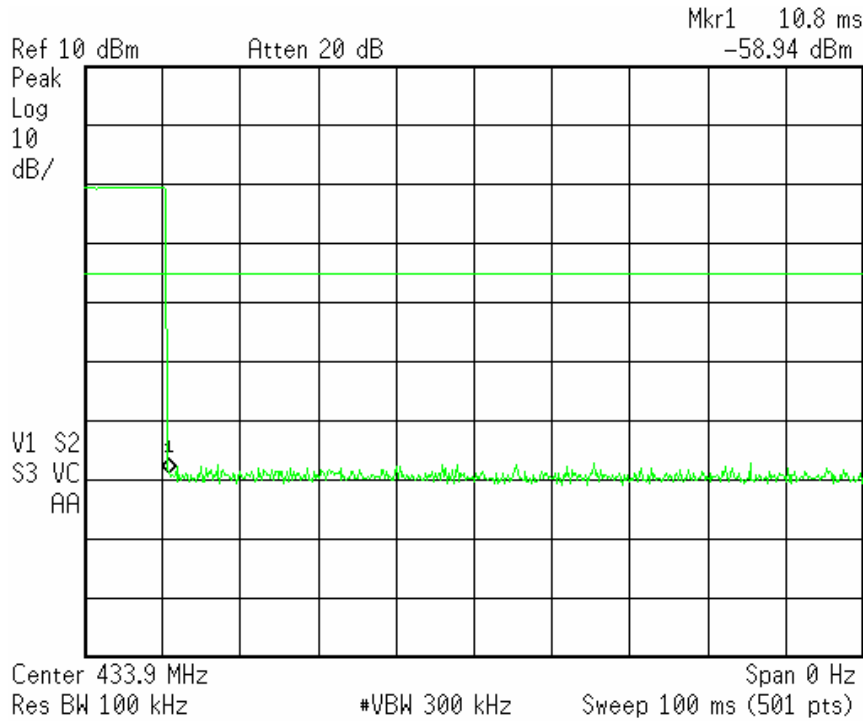


4.5 Test Data

Operating Frequency : 433.92 MHz **Test Mode** **:** Transmitting

Tester **:** Bill





The duration of each transmission is 10.8ms less than 1s .The silent period between transmissions is 14.95s more than 30 times the duration of the transmission and more than 10s.