

FCC Test Report

for

Water Sensor

Model No. : WS-7
FCC ID : SJLWS7315
IC ID : 5362A-WS7315
Report Number : RF-U070-0810-105
Date of Receipt : Oct. 16, 2008
Date of Report : Oct. 22, 2008

Prepared for

AlarmForce Industries Inc.

675 Garyray Dr. North York ON M9L 1R2 Canada

Prepared by



**Central Research Technology Co.
EMC Test Laboratory**

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Verification of Compliance

Equipment under Test : Water Sensor
Model No. : WS-7
FCC ID : SJLWS7315
IC ID : 5362A-WS7315
Applicant : AlarmForce Industries Inc.
Address : 675 Garyray Dr. North York ON M9L 1R2 Canada
Applicable Standards : 47 CFR part 15, Subpart C
Date of Testing : Oct. 17~20, 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.

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Attachment 1 – Photographs of the Test Configurations

Attachment 2 –External Photographs of EUT

Attachment 3 –Internal Photographs of EUT

1 General Description

1.1 General Description of EUT

Equipment underTest : Water Sensor

Model No. : WS-7

Power in : DC 6V

Test Voltage : DC 6V (Battery*4)

Channel Numbers : 1

Frequency Range : 315.06MHz

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.

1.3 Applied standards

(1) Radiated Emission Requirement

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 Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66 - 40.70	2,250	225
70 - 130	1,250	125
130 - 174	1,250 to 3,750 **	125 to 375 **
174 - 260	3,750	375
260 - 470	3,750 to 12,500 **	375 to 1,250 **
Above 470	12,500	1,250

** 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, $\mu\text{V/m}$ at 3 meters = $56.81818(F) - 6136.3636$; for the band 260-470 MHz, $\mu\text{V/m}$ at 3 meters = $41.6667(F) - 7083.3333$. 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

A transmitter activated automatically shall cease transmission within 5 seconds after activation.

(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



(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)	
TR13	Chamebr	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(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:

Fundamental Frequency (MHz)	Field Strength of Fundament (uV/m)	Field Strength of Spurious Emission (uV/m)
40.66 - 40.70	2250	225
70 – 130	1250	125
130 – 174	1250 to 3750**	125 to 375**
174 – 260	3750	375
260 – 470	3750 to 12500**	375 to 1250**
Above 470	12500	1250

** linear interpolations

The formula for calculating the limit of field strength of fundament is $41.6667 \times 315.06 - 7083.3333 = 6044.18 \text{ uV/m} = 75.6 \text{ dBuV/m}$, the limit of spurious emission is 55.6 dBuV/m

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

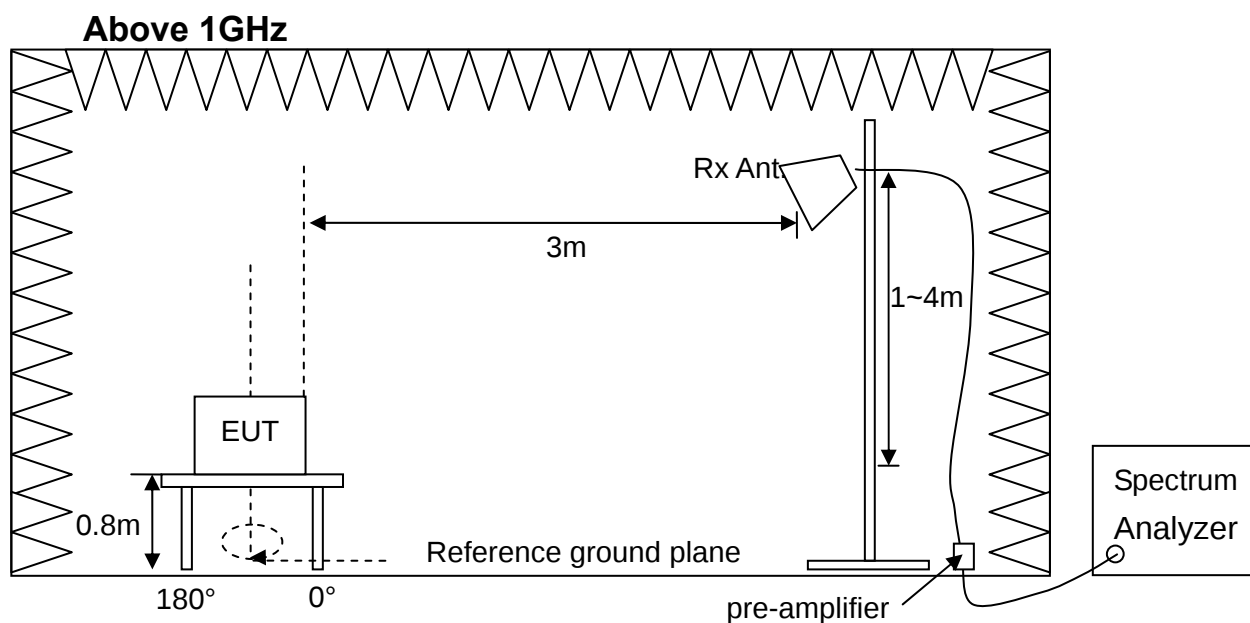
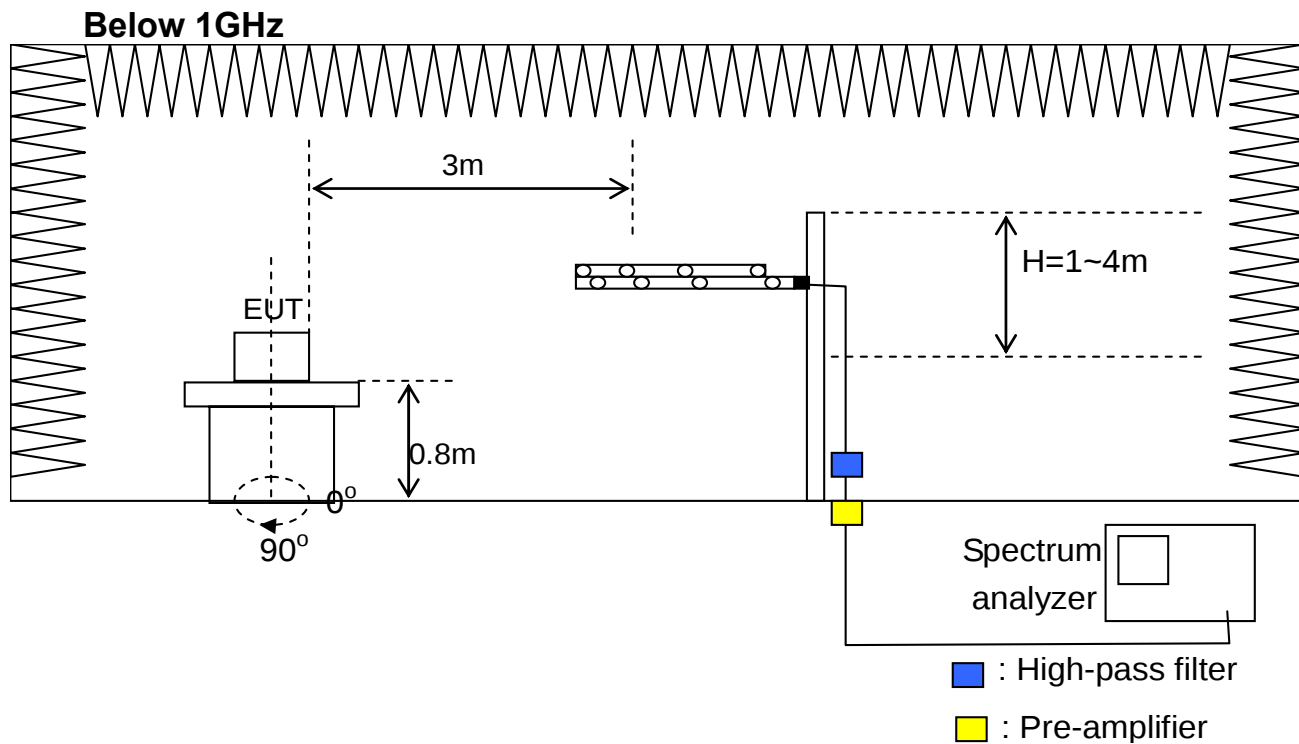
Ambient Temperature : 27°C;

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



2.5 Test Data

Field Strength of Fundament

Operating Frequency : 315.06 MHz

Test Mode : Transmitting

Test Distance : 3m

Tester : Jacky

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
315.06	V	83.80	N/A	-11.88	71.92	55.58	95.6	75.6	23.68	20.02
315.06	H	101.30	N/A	-11.88	89.42	73.08	95.6	75.6	6.18	2.52

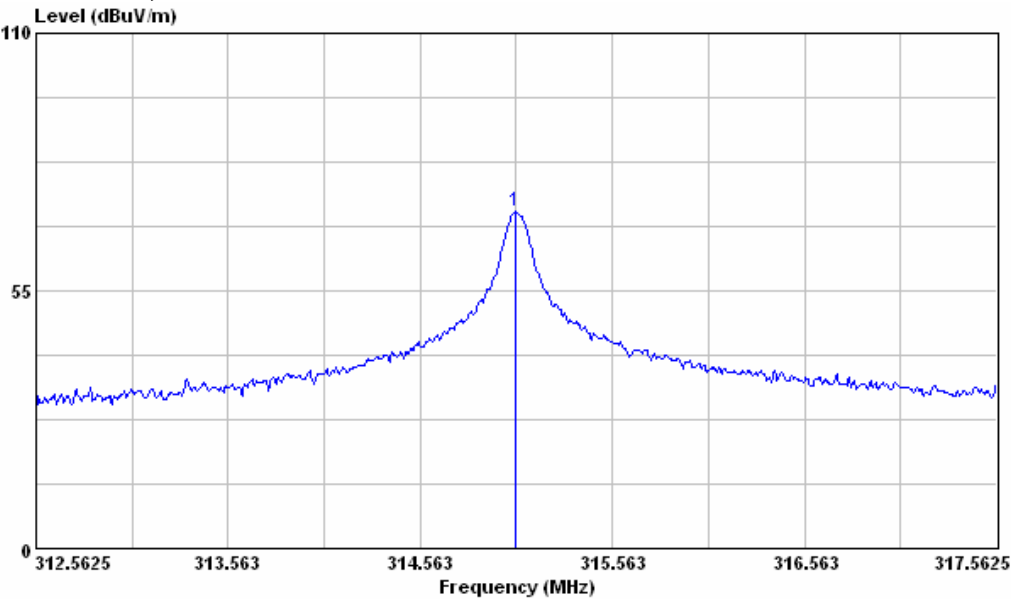
Note :

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:

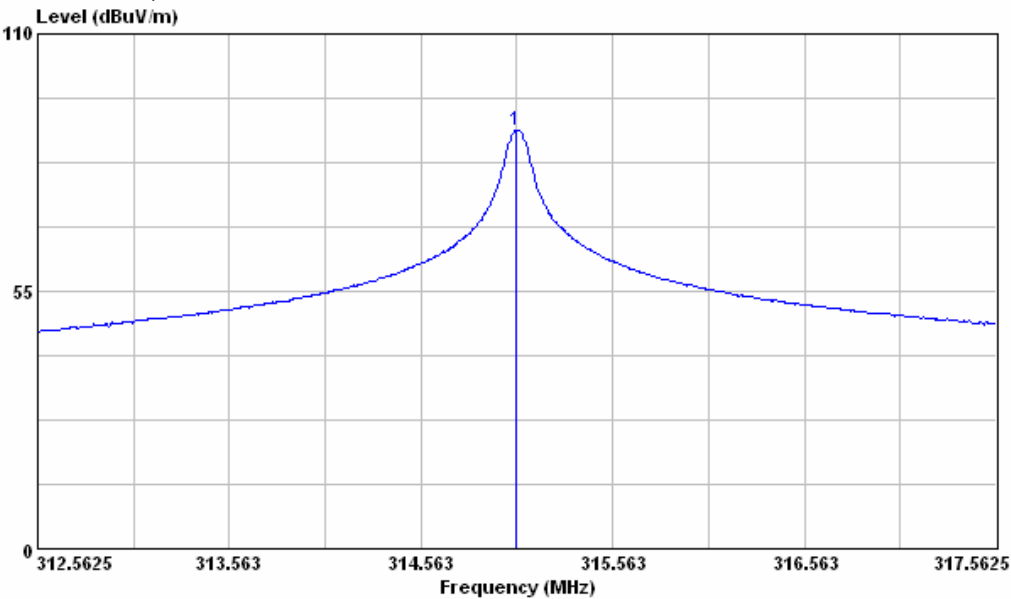
$$20\log(\text{Duty cycle}) = 20\log \frac{1.368 + 0.5863 \times 2 + 0.9772 \times 5 + 1.173 \times 4 + 0.7818 \times 4}{100} = -16.34 \text{ dB}$$

The cycle time is longer than 100ms, so the cycle time uses 100ms to express.
please see page 16-25 for plotted duty cycle.

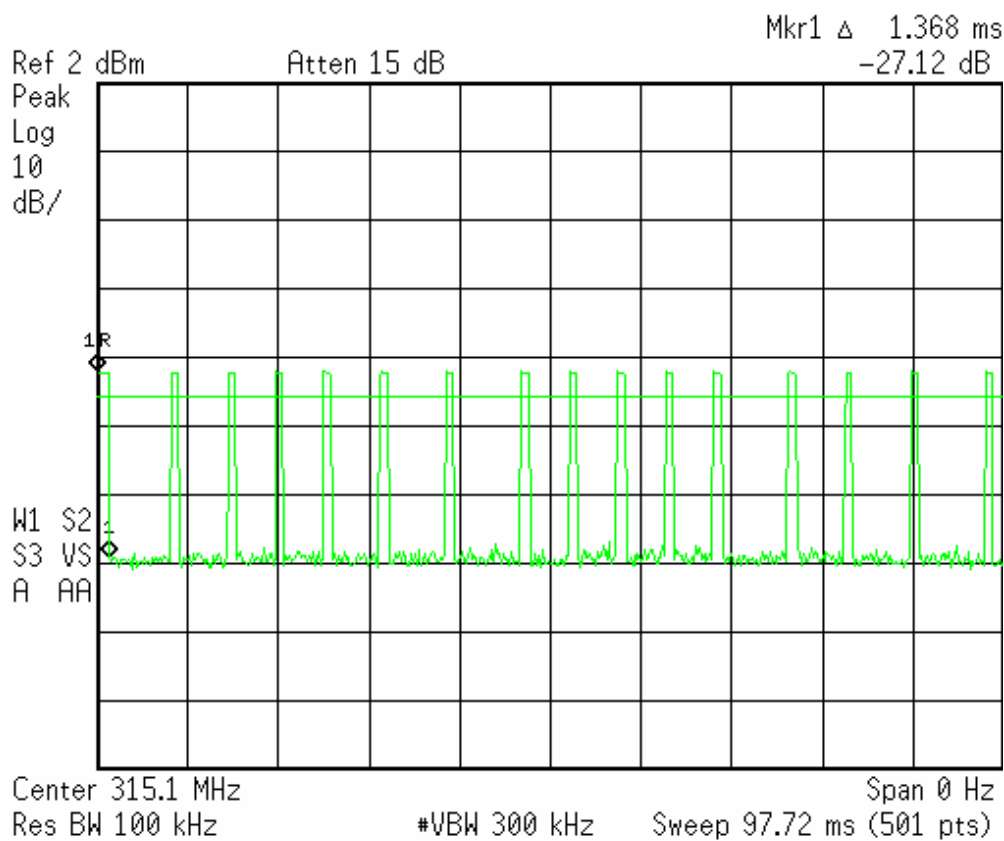
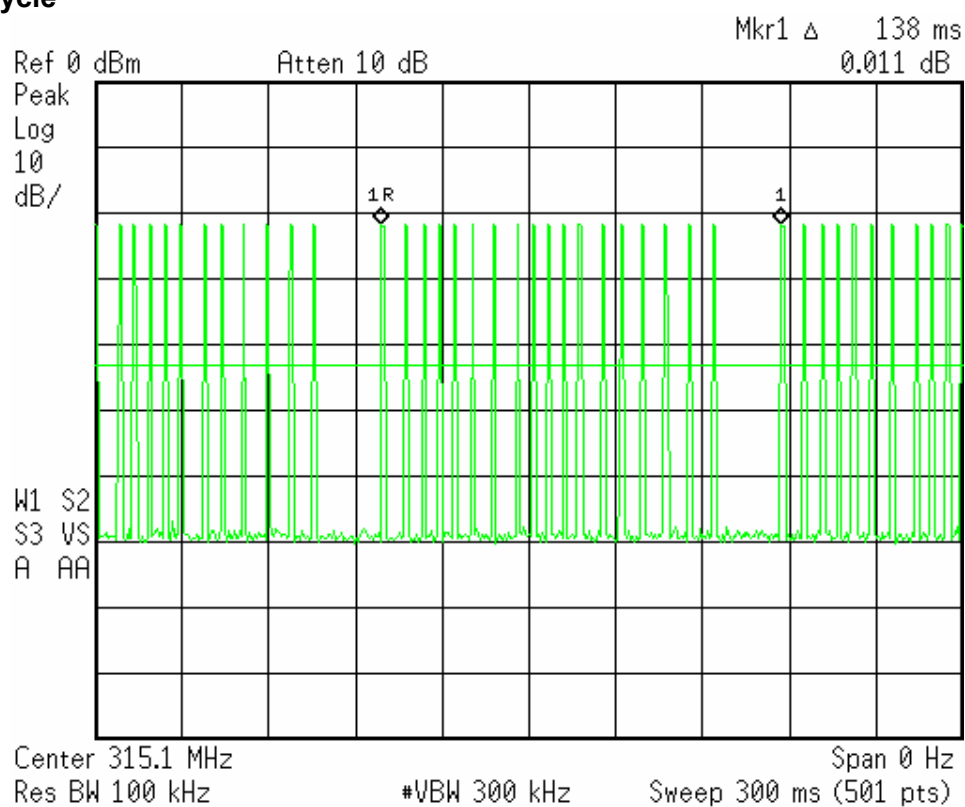
V Polarization, PK

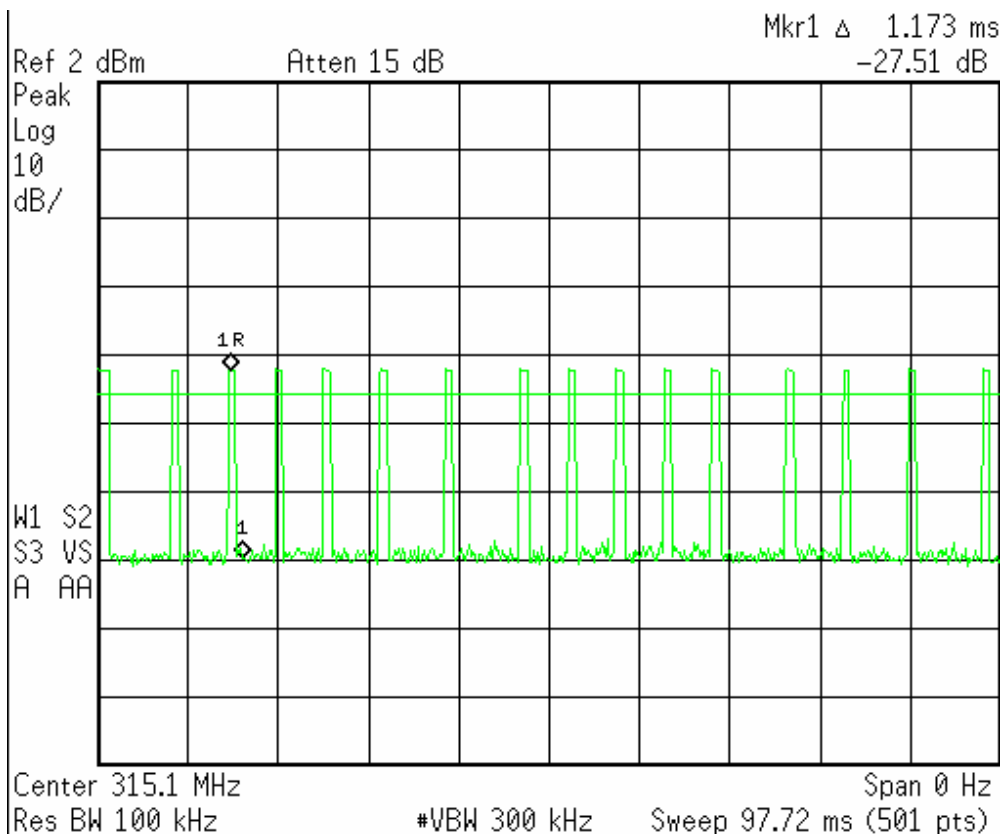
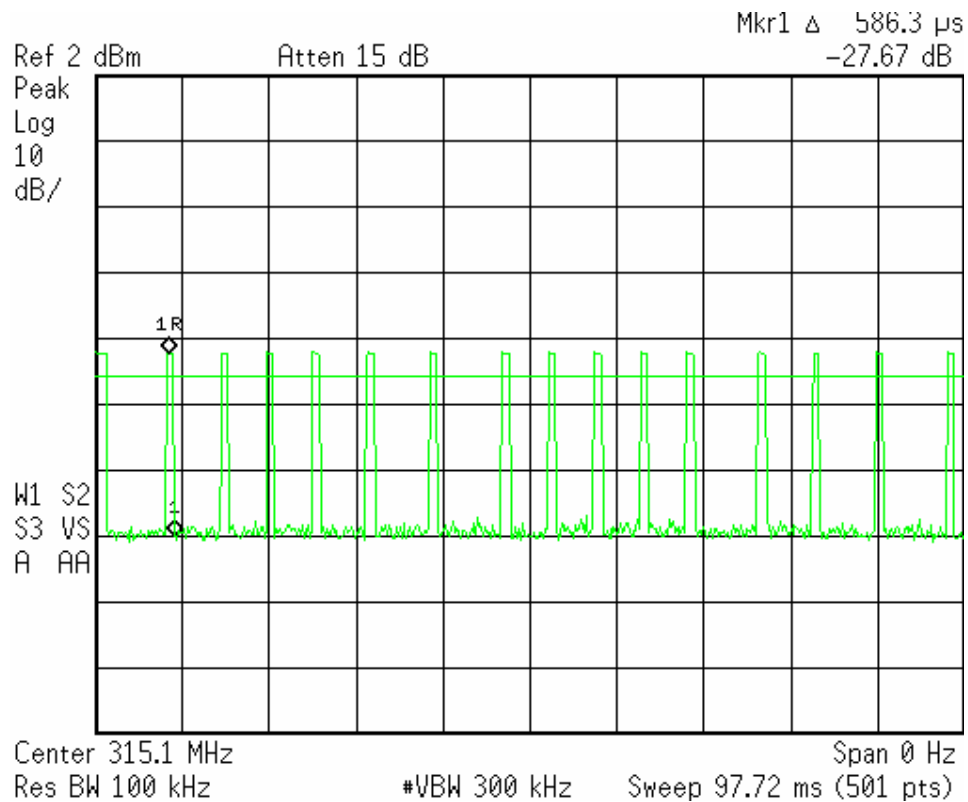


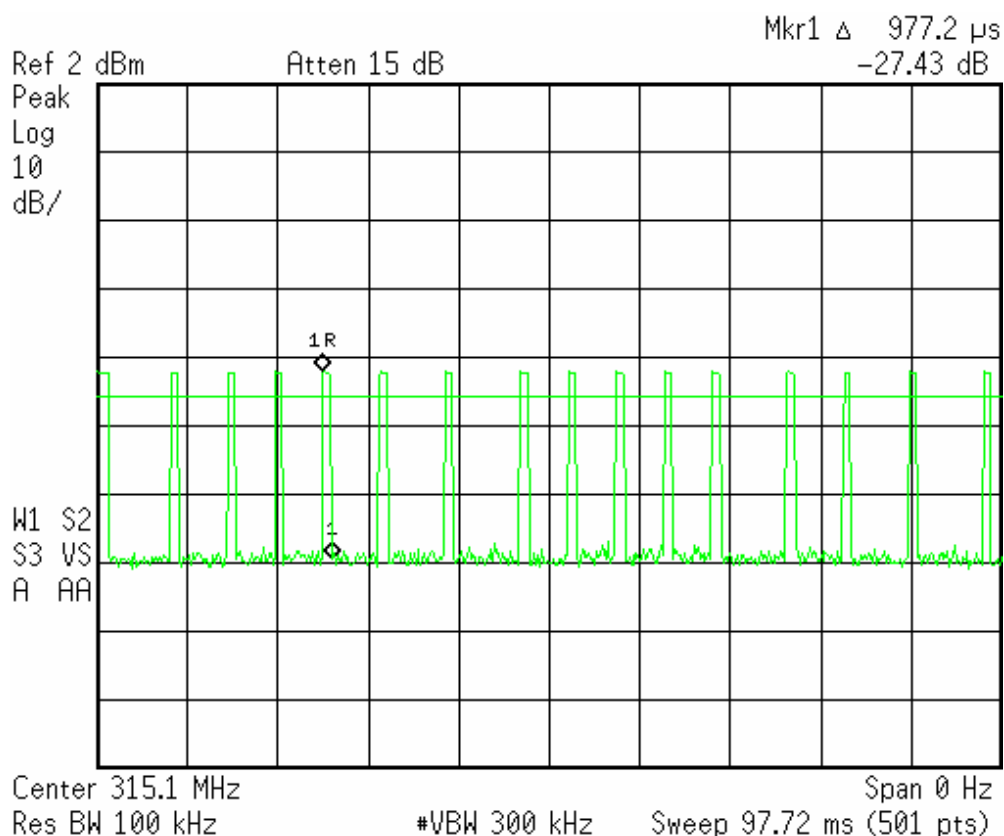
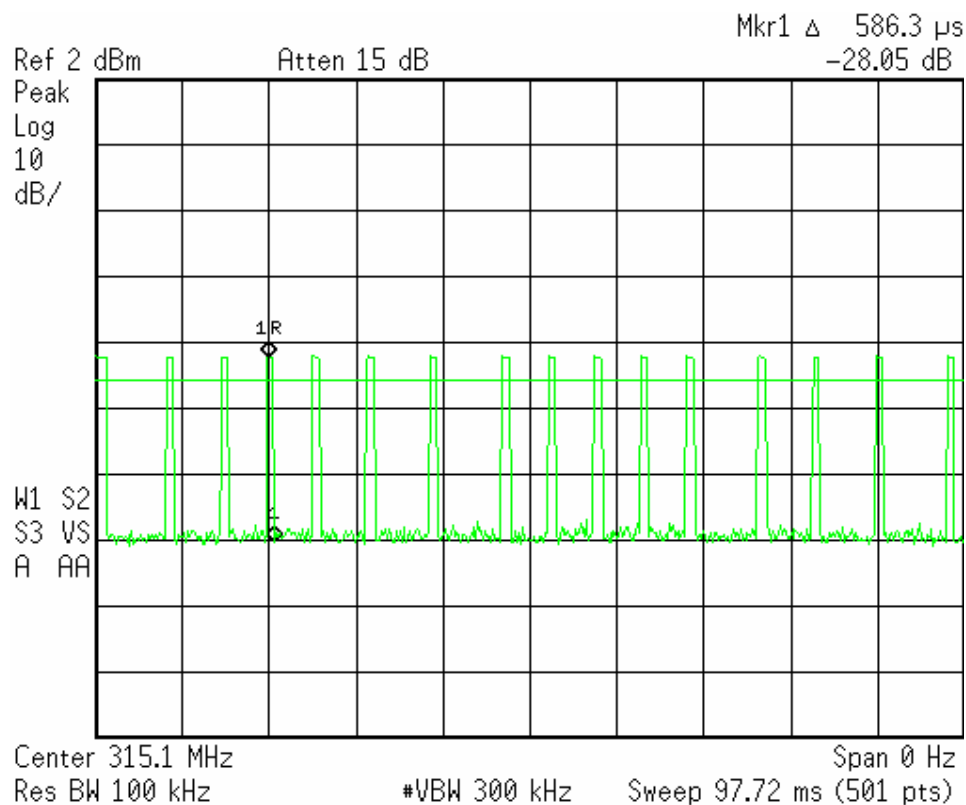
H Polarization, PK

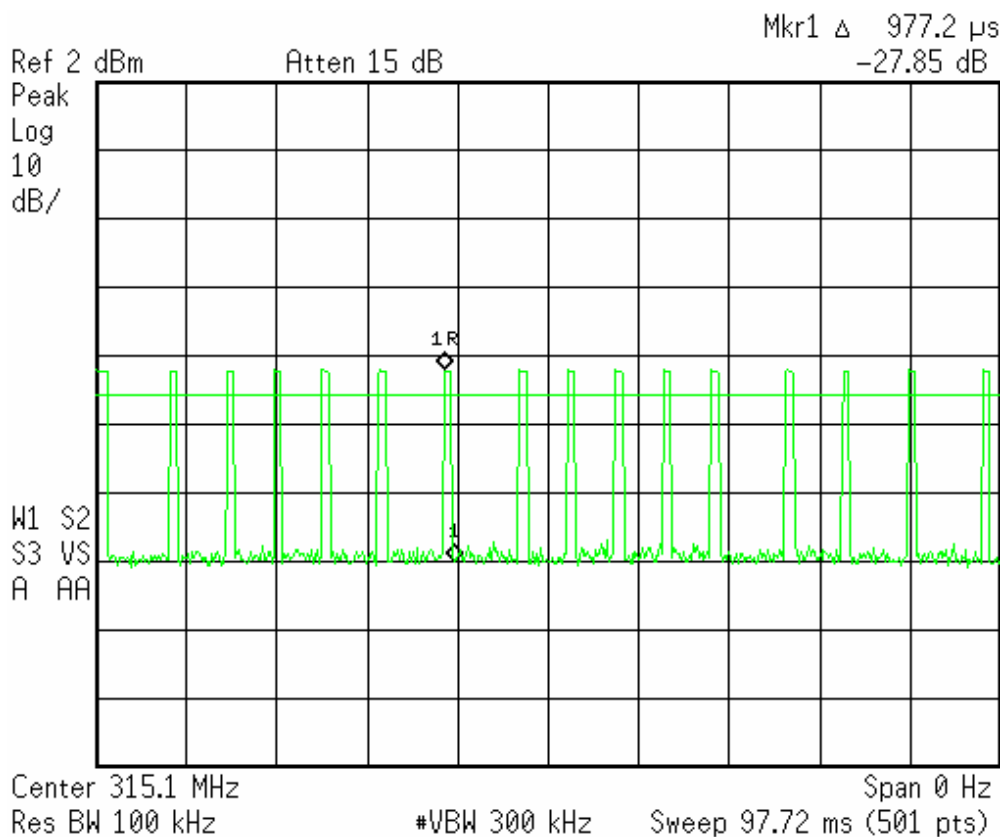
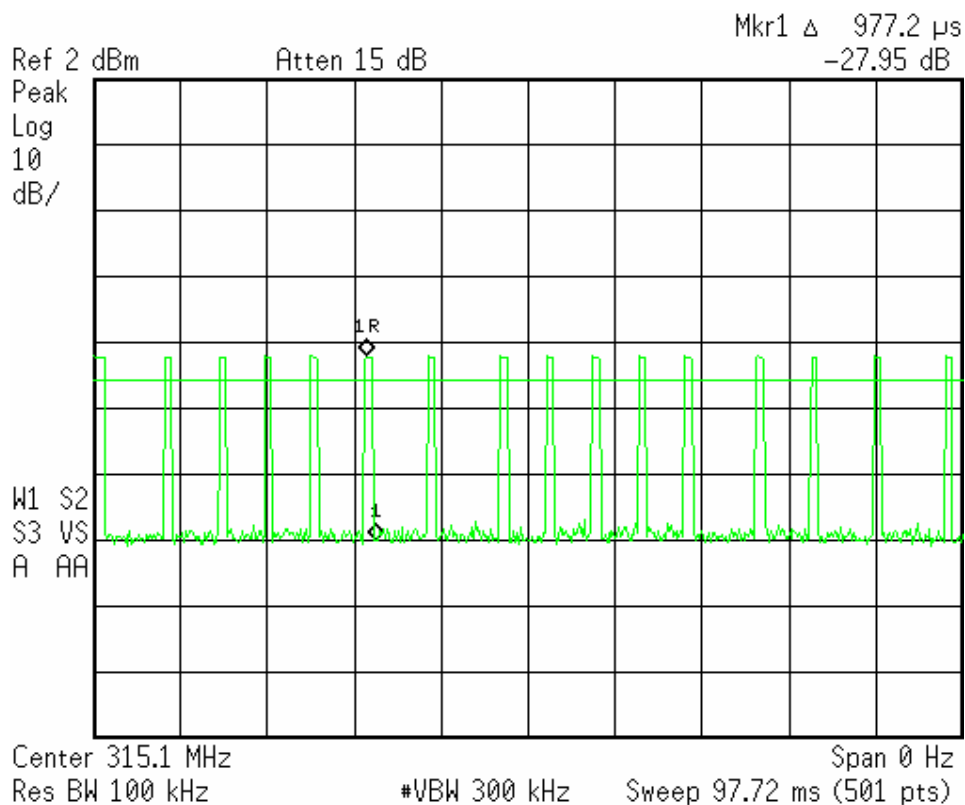


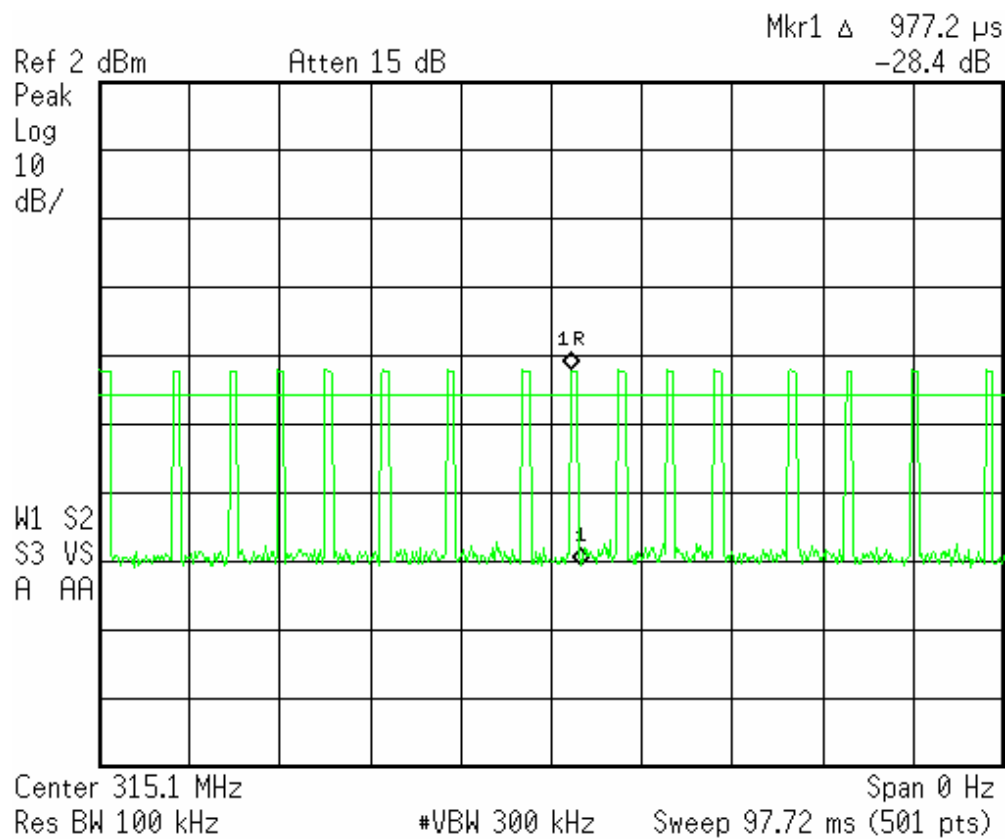
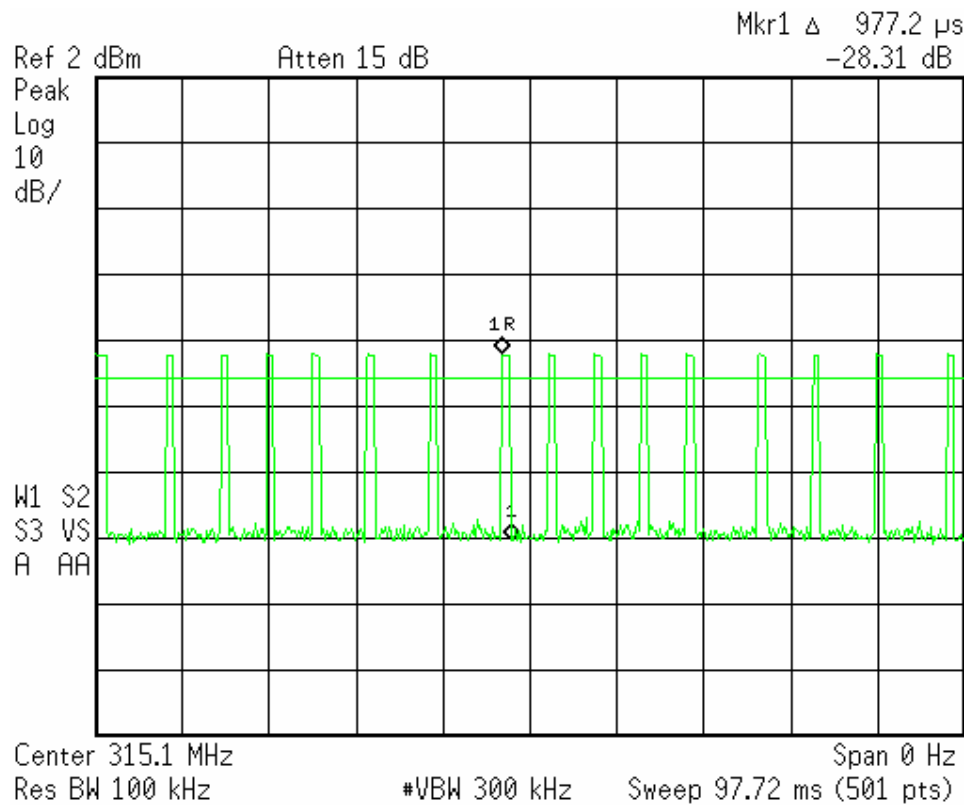
Duty cycle

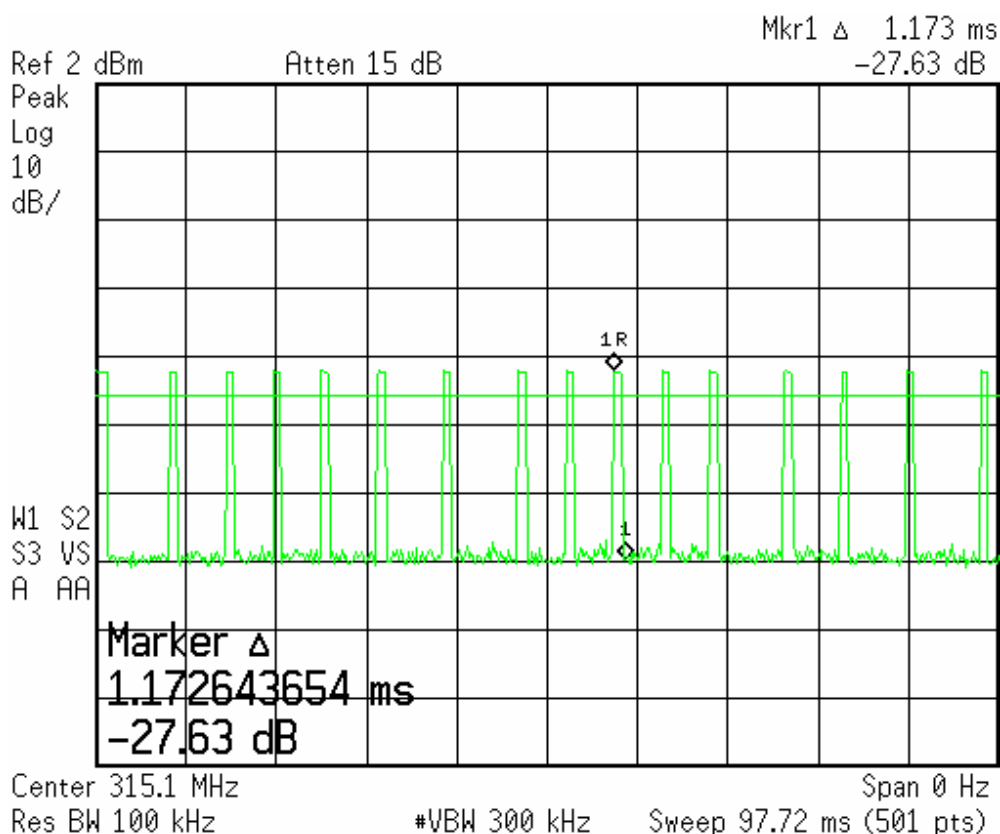
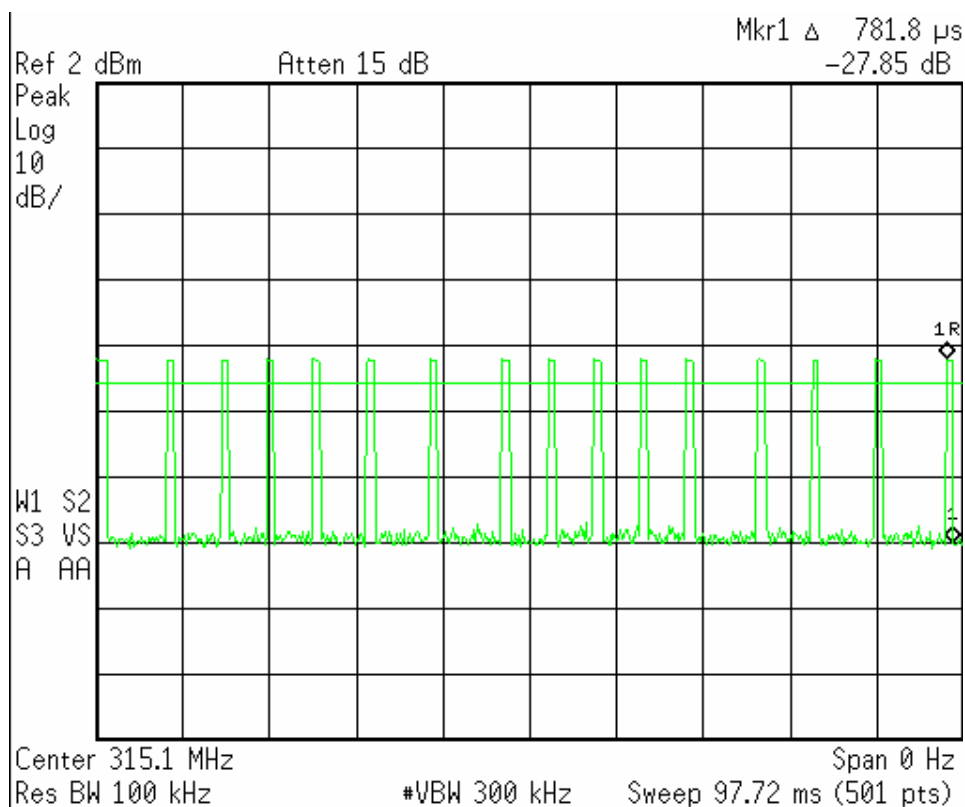


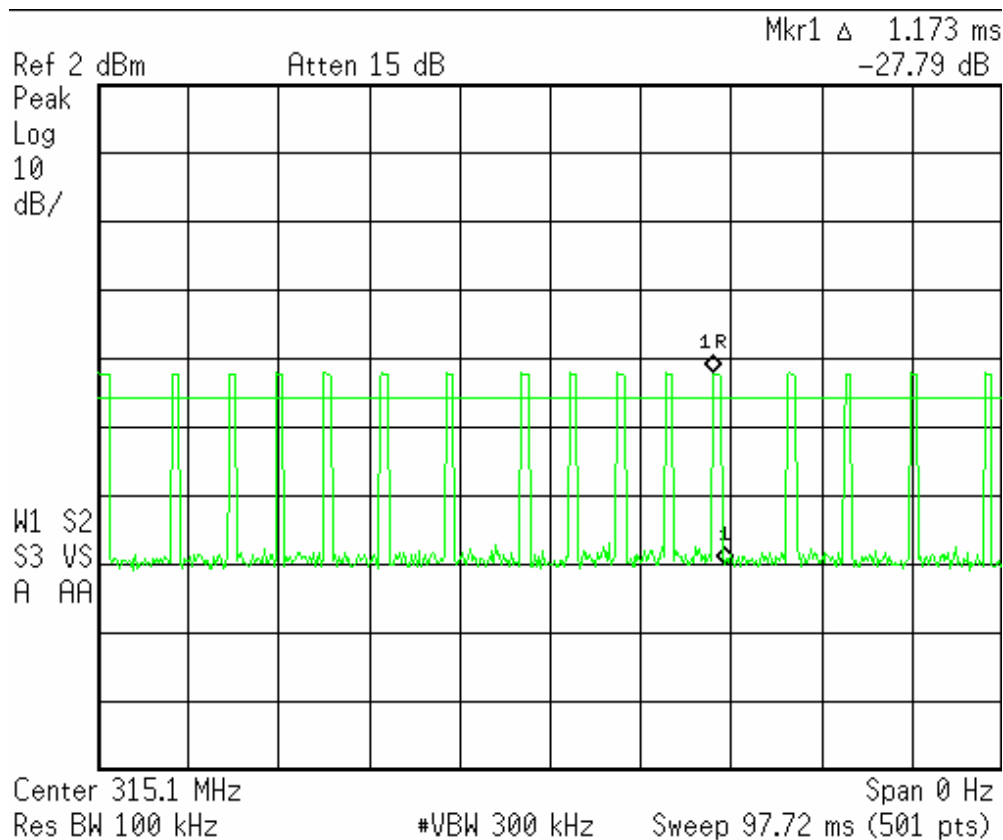
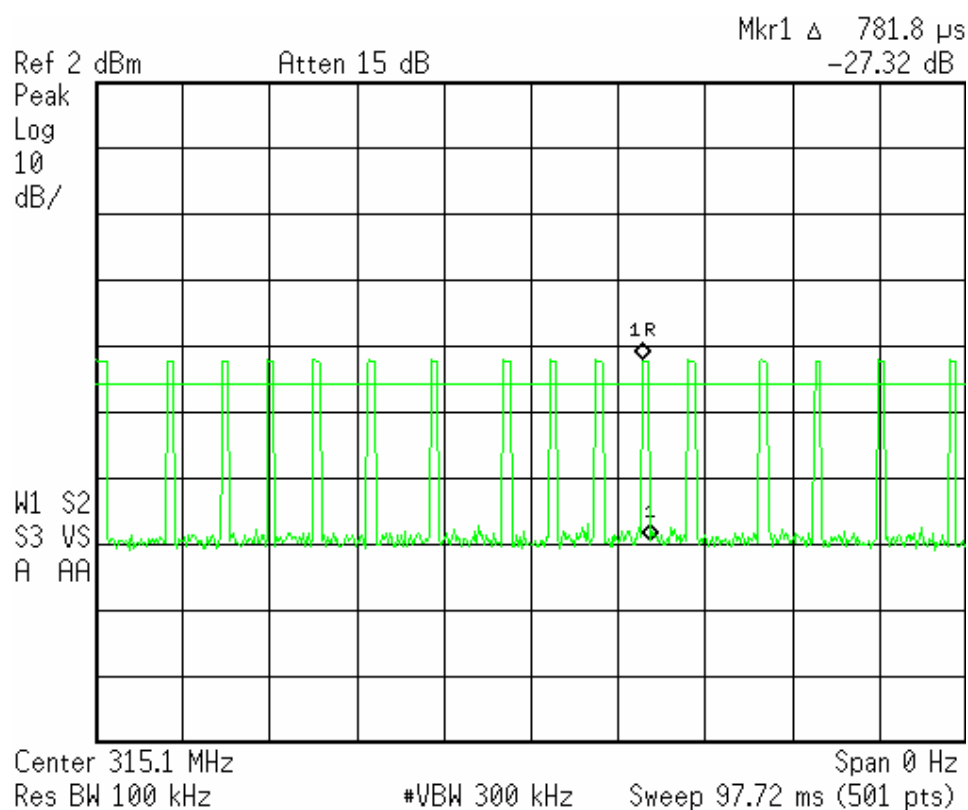


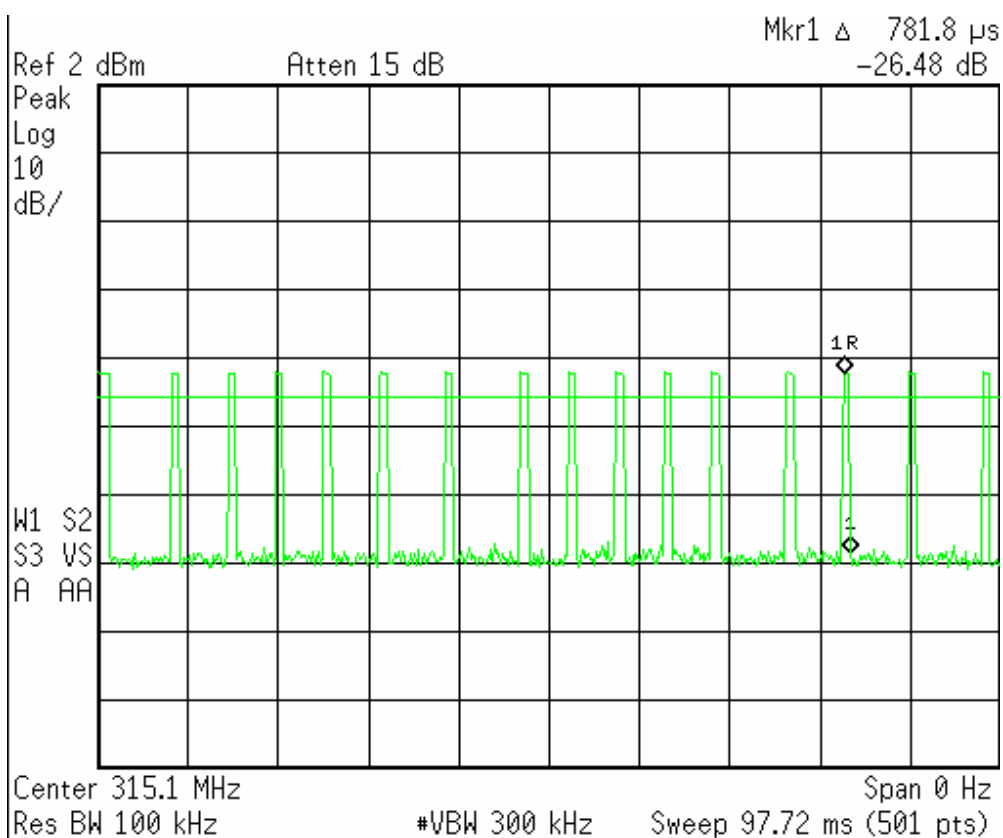
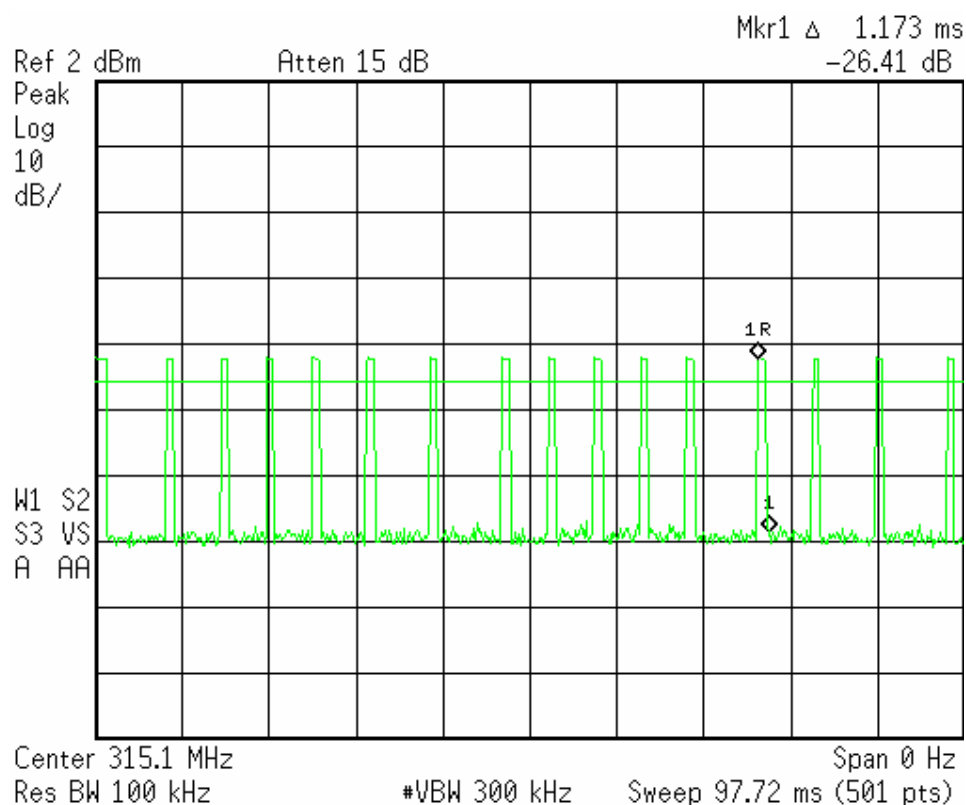


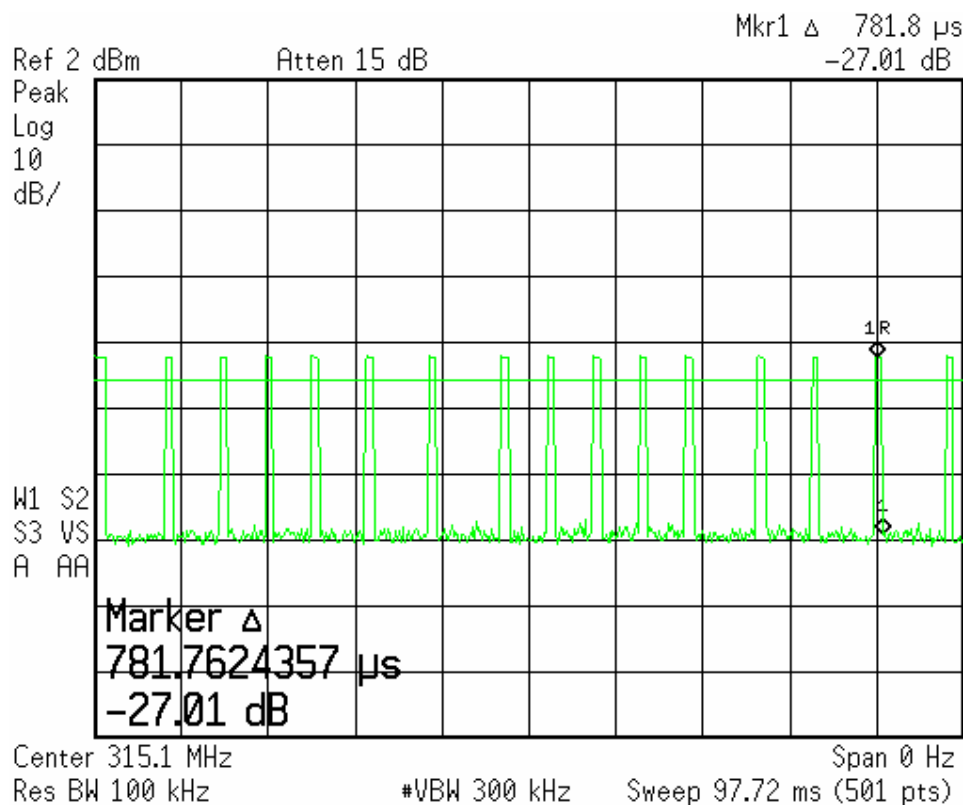












Radiated Emission Measurement below 1000MHz

Operating Frequency : 315.06MHz

Test Mode : Transmitting

Test Distance : 3m

Tester : Jacky

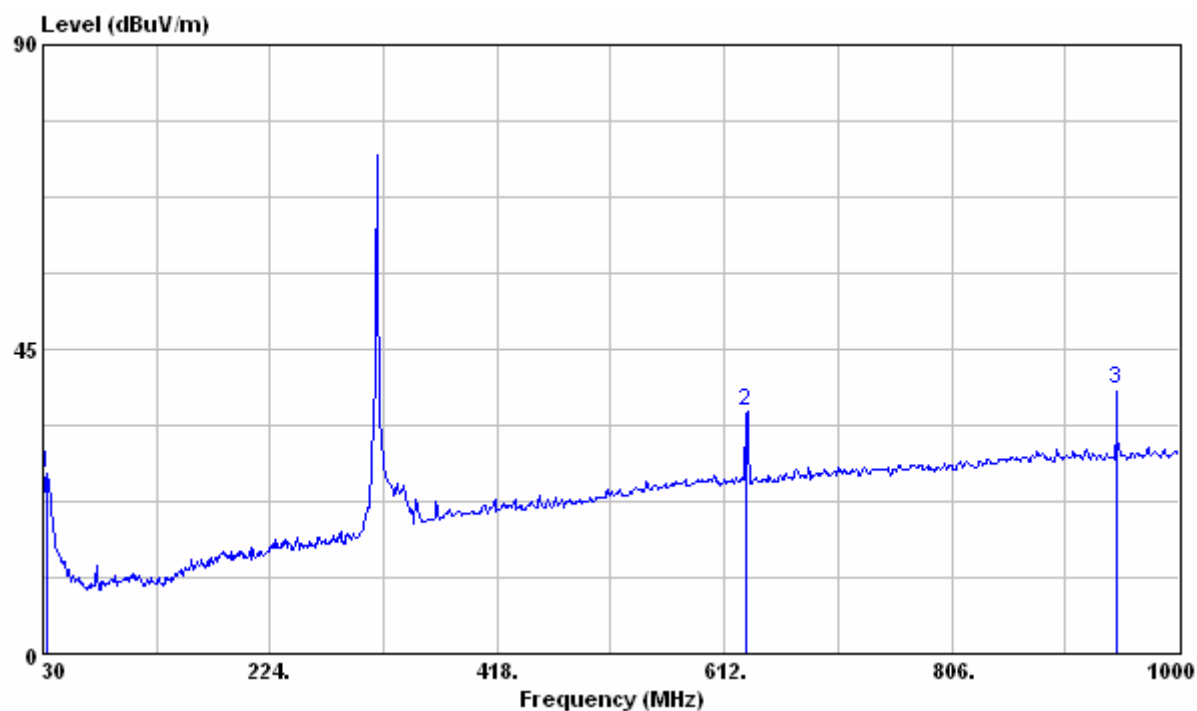
Polarization : Vertical

Frequency Range : 30MHz~1GHz

	Freq. (MHz)	Reading Data (dBuV)	Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	33.78	37.49	-10.90	26.59	55.60	29.01
2	631.10	40.52	-4.70	35.82	55.60	19.78
3	946.8	39.63	-0.61	39.02	55.60	16.58

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 : 315.06MHz

Test Mode : Transmitting

Test Distance : 3m

Tester : Jacky

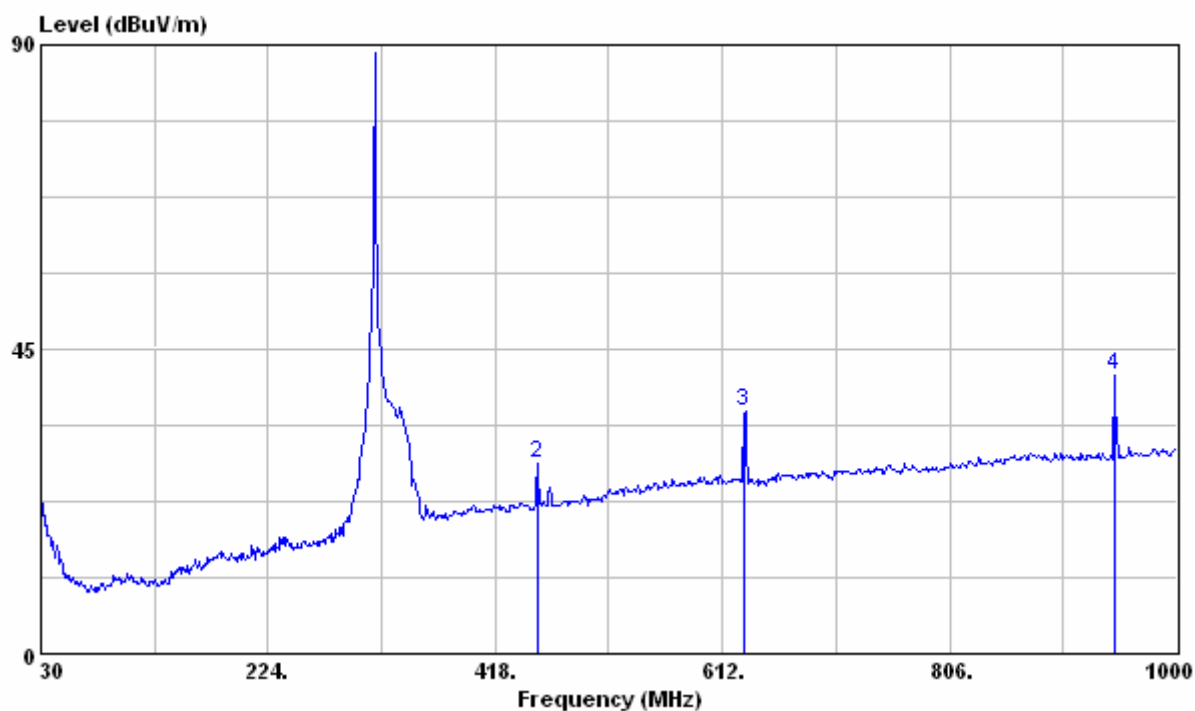
Polarization : Horizontal

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	31.31	-8.83	22.48	55.6	33.12
2	454.00	36.39	-8.33	28.06	55.6	27.54
3	631.10	40.81	-4.70	36.11	55.6	19.49
4	946.80	41.05	-0.61	40.44	55.6	15.16

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 : 315.06MHz

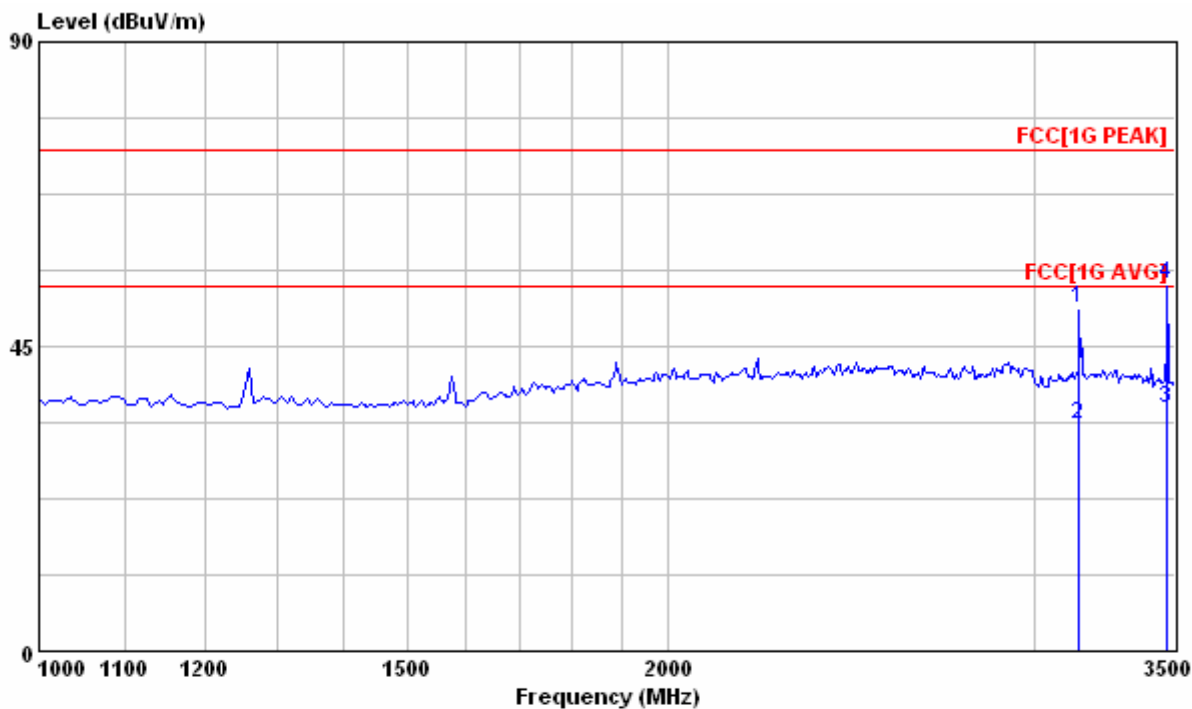
Test Mode : Transmitting

Test Distance : 3m

Tester : Jacky

Polarization : Vertical

Frequency Range : 1GHz~3.5GHz



	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	3150.690	50.57	77.37	-26.80	74.00	-23.43	110	34	VERTICAL	Peak
2	3150.690	33.44	60.24	-26.80	54.00	-20.56	110	34	VERTICAL	Average
3 @	3465.600	35.92	62.31	-26.39	54.00	-18.08	104	263	VERTICAL	Average
4	3465.600	54.09	80.48	-26.39	74.00	-19.91	104	263	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 : 315.06MHz

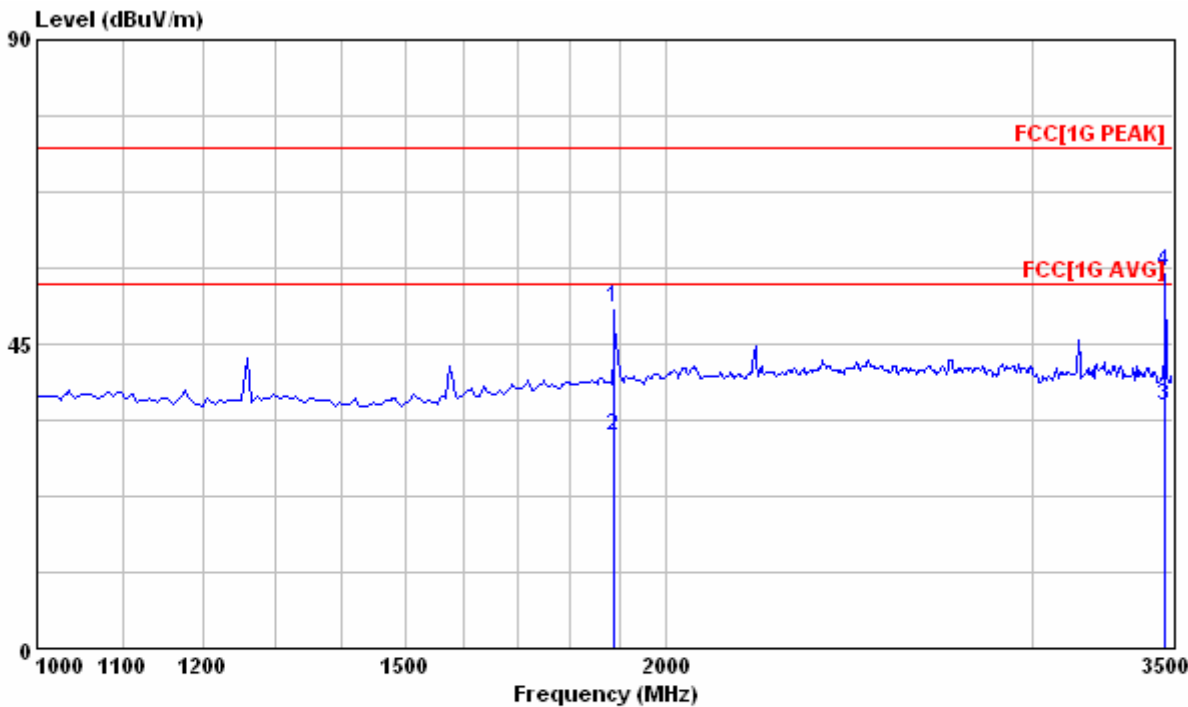
Test Mode : Transmitting

Test Distance : 3m

Tester : Jacky

Polarization : Horizontal

Frequency Range : 1GHz~3.5GHz



	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	1890.338	50.22	79.63	-29.41	74.00	-23.78	169	359	HORIZONTAL	Peak
2	1890.338	31.46	60.87	-29.41	54.00	-22.54	169	359	HORIZONTAL	Average
3	3465.700	35.74	62.13	-26.39	54.00	-18.26	165	29	HORIZONTAL	Average
4	3465.700	55.74	82.13	-26.39	74.00	-18.26	165	29	HORIZONTAL	Peak

- 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
Chamber	NA	TR13	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
1 kHz	3 kHz	Peak	Maxhold	

Climatic Condition

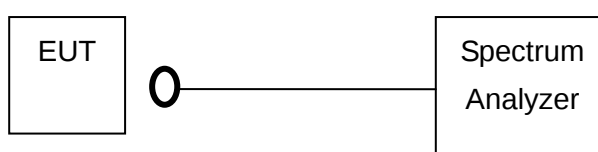
Ambient Temperature : 26°C;

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



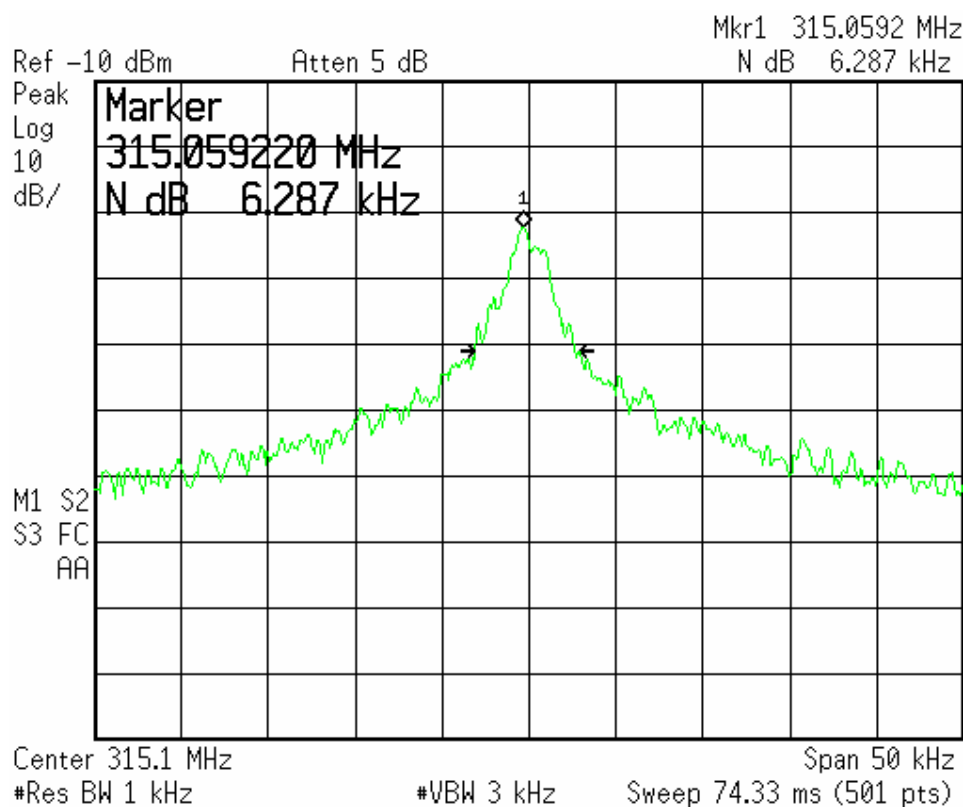
3.5 Test Data

Operating Frequency : 315.06MHz

Test Mode

: Transmitting

Tester : Bill



Measured 20dB bandwidth is 6.287kHz < 315.06 MHzX0.25% = 787.6kHz.

4 Dwell Time

Test Result: Pass

4.1 Applied standard

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

4.2 Test Instruments

Test Site and Equipment	Manufacturer	Model No./ Serial No.	Last Calibration Data	Calibration Due Data
Chamber	NA	TR13	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

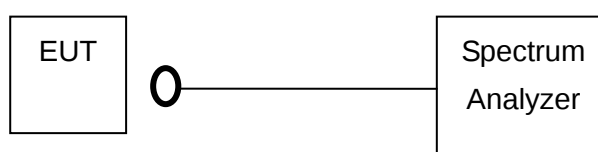
Ambient Temperature : 26°C;

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

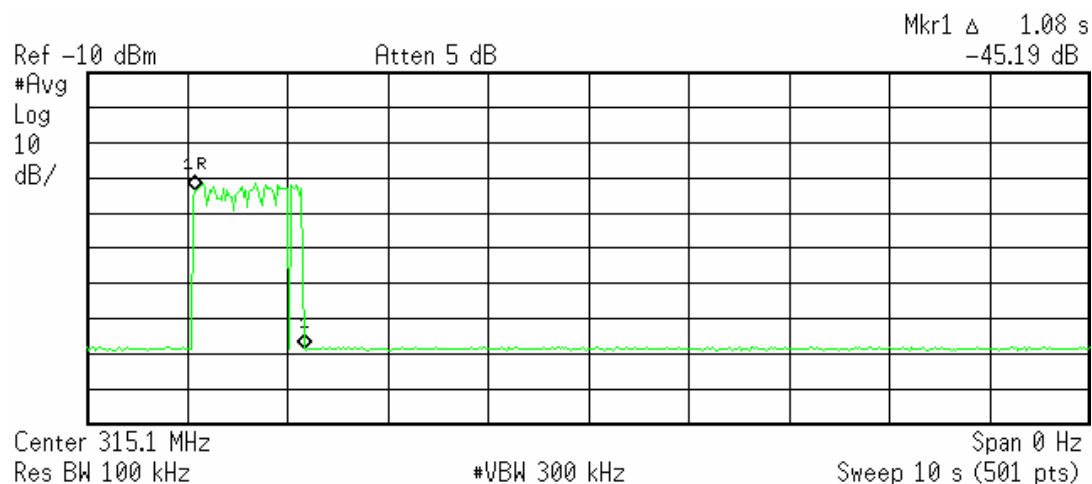
Operating Frequency : 315.06MHz

Test Mode

: Transmitting

Tester

: Bill



The transmitter will automatically deactivate within 1.08 second after release the button of the transmitter.