

CFR 47 FCC Part 15.231

TEST REPORT

Product : **Water Sensor**

Trade Name : N/A

Model Number : WS-LD

FCC ID : ELVNTJD

Prepared for

Nutek Corporation

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Prepared by

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The test results in the report only to the tested sample.

Statement of Compliance

Applicant: Nutek Corporation

Manufacturer: Nutek Corporation

Product: Water Sensor

Model No.: WS-LD

Tested Power Supply: 9Vdc Battery

Date of Final Test: May 04, 2010

Configuration of Measurements and Standards Used :

FCC Rules and Regulations Part 15 Subpart C

1. The result of the testing report relate only to the item tested.
2. The testing report shall not be reproduced expect in full, without the written approval of IETC.

Report Issued: 20010/05/07

Project Engineer: Victor chen
Victor Chen

Approved: Jerry Liu
Jerry Liu

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1 Summary of Measurement

Report Clause	Test Parameter	Reference Document CFR47 Part15	Results
4	Radiated Emission	§15.231(b), 15.209	Pass
5	Emission bandwidth	§15.231(c)	Pass

2 General Information

2.1 Description of Equipment Under Test

Product : Water Sensor

Model Number : WS-LD

Applicant : **Nutek Corporation**
NO.167, Lane 235, Bauchiau Rd., Shindian City, Taipei County
23145, Taiwan

Manufacturer : **Nutek Corporation**
NO. 167, Lane 235, Bauchiau Rd., Shindian City, Taipei County
23145, Taiwan

Power Supply : 9Vdc Battery

Operating Frequency : 433.92MHz

Channel Number : 1 channel

Type of Modulation : ASK

Antenna description : This device uses Spring antenna.
The antenna is integral to the device, thereby meeting the
requirement of FCC 15.203.

Date of Receipt Sample : Apr. 21, 2010

Date of Test : May 04, 2010

Product information : Sensor Cable: Non-shielded Detachable, 1m w/o core

Additional Description : 1) The Model Number "**WS-LD**" is representative selected in the
test and included in this report.
2) For more detail specification about EUT, please refer to the
user's manual.

2.2 Details of tested peripheral equipment

N/A

2.3 Test Facility

- Site Description** : ☑OATS 2
- Name of Firm** : Interocean EMC Technology Corp.
- Company web** : <http://www.ietc.com.tw>
- Site 1, 2 Location** : No.5-2, Lin 1, Tin-Fu Tsun, Lin-Kou Hsiang,
Taipei County, Taiwan, R.O.C.
- Site 3, 4 Location** : No. 12, Ruei-Shu Valley, Ruei-Ping Tsun, Lin-Kou Hsiang,
Taipei County, Taiwan, R.O.C.
- Site Filing** :
- Federal Communication Commissions – USA
Registration No.: 96399 (OATS 1 & 2)
Registration No.: 518958 (OATS 3 & 4)
Designation No.: TW1020
 - Voluntary Control Council for Interference by Information
Technology Equipment (VCCI) – Japan
Member No.: 1349
Registration No. (Conducted Room): C-1094
Registration No. (Conducted Room): T-1562
Registration No. (OATS 1): R-1040
Registration No. (OATS 2): R-1041
 - Industry Canada (IC)
OUR FILE: 46405-4437 Submission: 130946
Registration No. (OATS 1): 4437A-1
Registration No. (OATS 2): 4437A-2
Registration No. (OATS 3): 4437A-3
Registration No. (OATS 4): 4437A-4
- Site Accreditation** :
- Bureau of Standards and Metrology and Inspection (BSMI) –
Taiwan, R.O.C.
Accreditation No.:
SL2-IN-E-0026 for CNS13438 / CISPR22
SL2-R1-E-0026 for CNS13439 / CISPR13
SL2-R2-E-0026 for CNS13439 / CISPR13
SL2-A1-E-0026 for CNS13783-1 / CISPR14-1
SL2-L1-E-0026 for CNS 14115 / CISPR 15
 - Taiwan Accreditation Foundation (TAF)
Accrditation No.: 1113
 - TÜV NORD
Certificate No: TNTW0801R-02

3 Test specifications

3.1 Test standard

The EUT was performed according to FCC Part 15 Subpart C Section 15.231 procedure and setup followed by ANSI C63.4, 2003 requirements.

3.2 Operation mode

During the test the EUT was operated at operating mode.

3.3 Test Equipment

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Spectrum Analyzer	R&S	FSP30	100002	2010/12/08
Spectrum Analyzer	R&S	FSP40	100478	2011/04/20
Preamplifier	Agilent	8449B	3008A01434	2011/04/20
Preamplifier	Agilent	83050A	3950A00225	2010/08/10
Preamplifier	SCHAFFNER	CA30100	2	2010/11/03
Horn Antenna	Schwarzbeck	BBHA 9120	9120D-583	2011/02/09
Horn Antenna	Schwarzbeck	BBHA 9170	213	2010/06/08
Wide Bandwidth Sensor	Anritsu	MA2491A	728133	2010/11/13
Power Meter	Anritsu	ML2495A	736010	2010/11/13
Temp & Humidity chamber	GIAN FORCE	GTH-150-40-2P-U	MAA0305-012	2011/05/07

Note: The above equipments are within the valid calibration period.

4 Radiated emission test

4.1 Limits

According to FCC 15.231(b) requirement:

In addition to the provisions of §15.205, the field strength of emissions from intentional radiator operated under this section shall not exceed the following:

Fundamental and harmonics emission limits

Frequency (MHz)	Field Strength of Fundamental		Field Strength of Harmonics	
	(μ V/m@3m)	(dB μ V/m@3m)	(μ V/m@3m)	(dB μ V/m@3m)
433.92	10996	80.8	1099.6	60.8

General Radiated emission Limit

Spurious Emission tested through until 10th harmonic. Radiated emissions, which fall in the restricted bands, as defined in §15.205 (a), comply with the radiated emission limits specified in §15.209 (a).

Frequency (MHz)	15.209 Limits	
	(μ V/m@3m)	(dB μ V/m@3m)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Remark :

1. The table above tighter limit applies at the band edges.
2. The measurement distance in meters, which that between form closest point of EUT to instrument antenna.

4.2 Calculation of Average Factor

The output field strengths of specification in accordance with the FCC rules specify measurements with an average detector. During the test, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

The duty cycle is measured in 100 ms or the repetition cycle period, whichever is a shorter time frame. The duty cycle is measured by placing the spectrum analyzer to set zero span at 100kHz resolution bandwidth.

Averaging factor in dB = $20 \log (\text{duty cycle})$

The duration of one cycle = 109ms

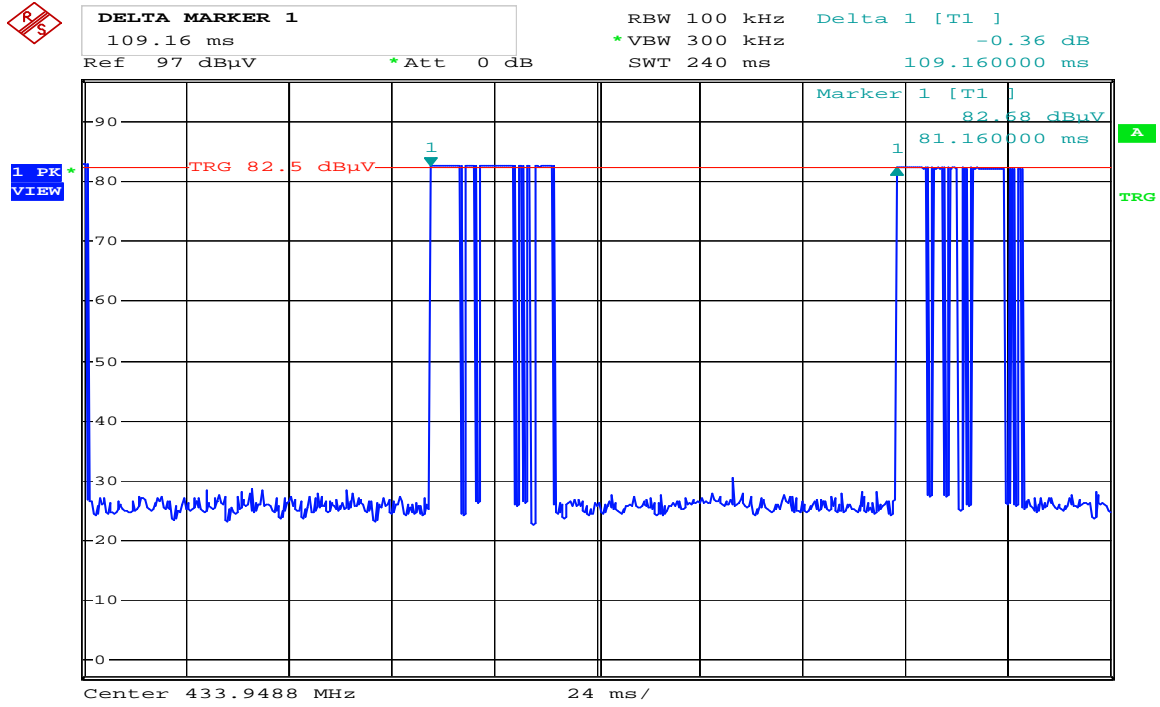
The duty cycle is simply the on-time divided by 100ms

Duty Cycle = $(5.2\text{ms} \cdot 1 + 1.36\text{ms} \cdot 7 + 0.88\text{ms} \cdot 6) = 20 \text{ ms} / 100\text{ms}$

Therefore, the averaging factor is found by $20 \log 0.2 = -13.98\text{dB}$

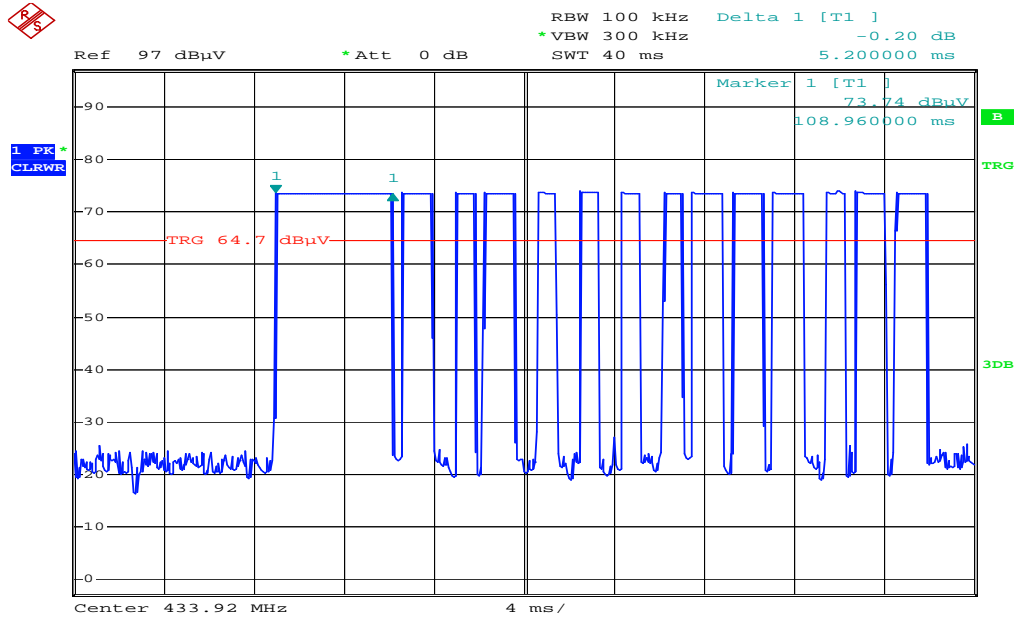
Please see the diagrams below.

Duty Cycle



Comment: Duty cycle
Date: 3.MAY.2010 18:56:58

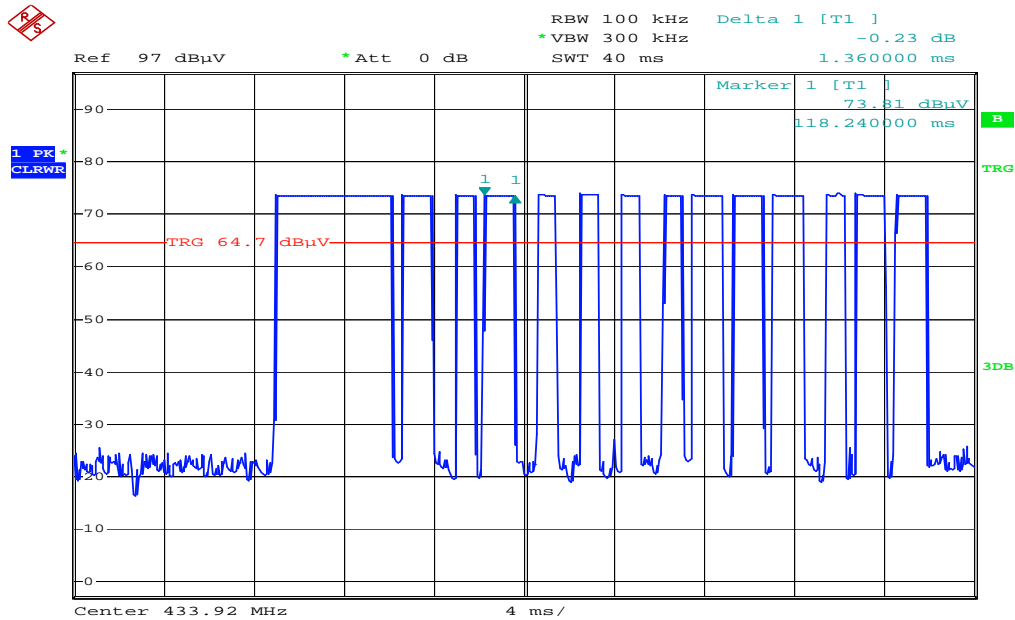
Time Slot



Ton1

Date: 4.MAY.2010 14:30:57

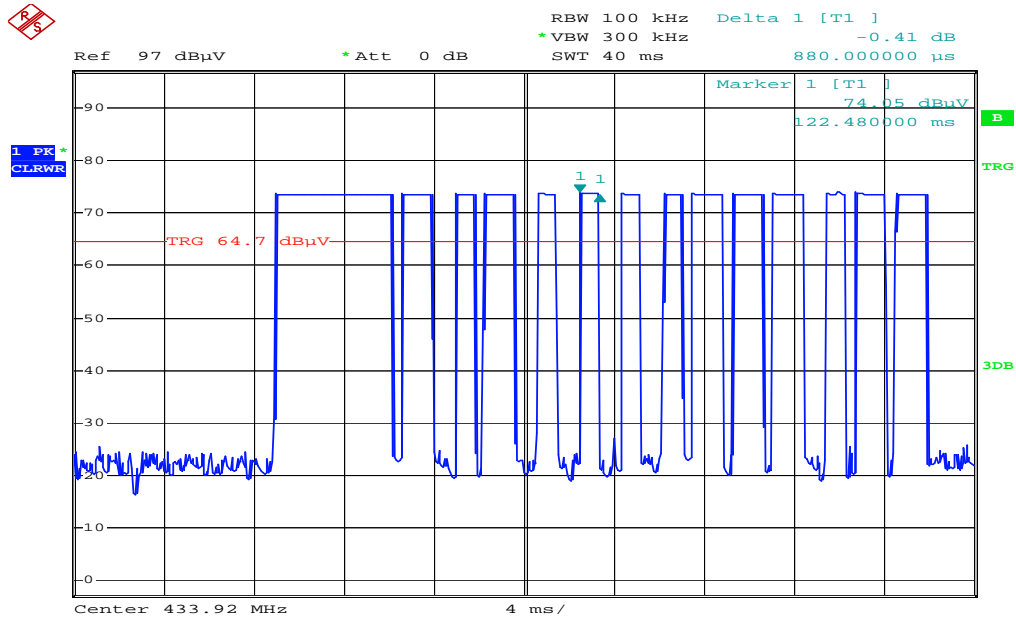
Time Slot 1



Ton2

Date: 4.MAY.2010 14:32:39

Time Slot 2

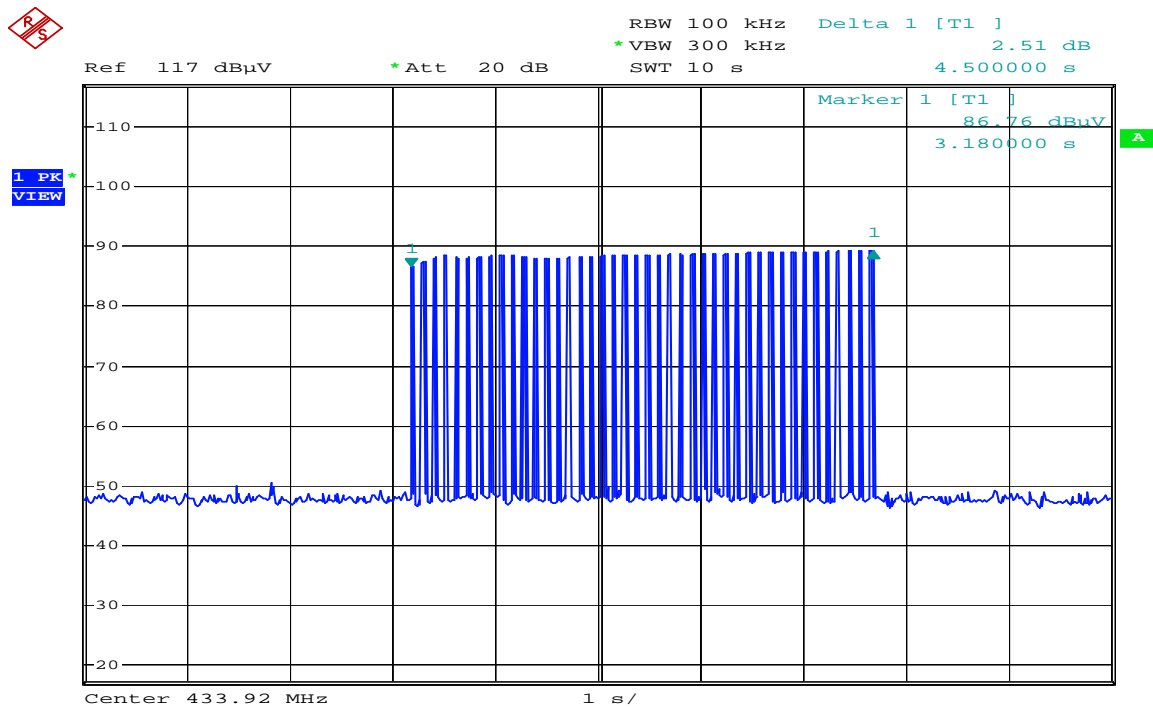


Ton3

Date: 4.MAY.2010 14:36:33

Time Slot 3

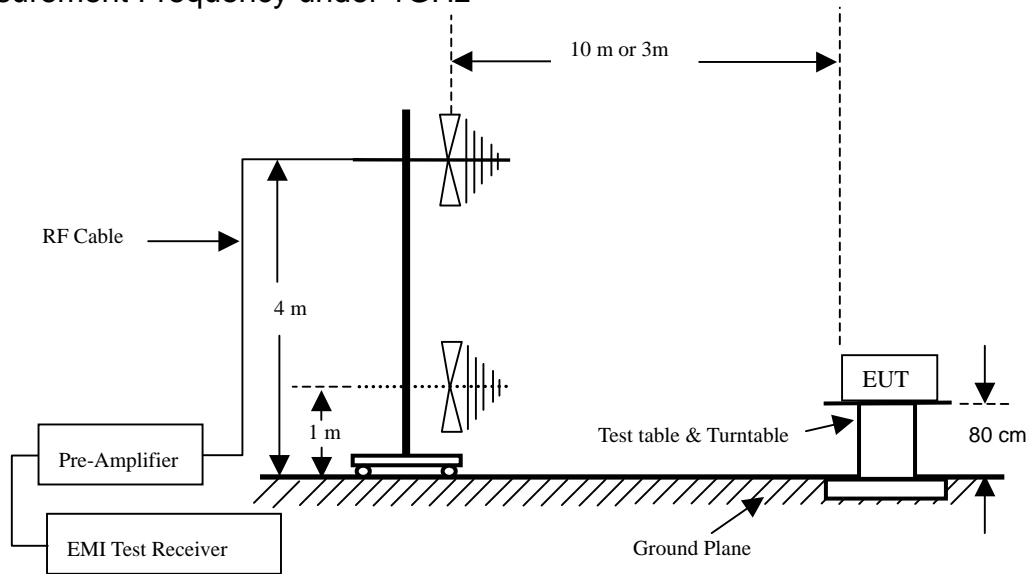
The EUT was complied with the requirement of FCC 15.231 (a)(1), which employed a switch that will automatically deactivate the transmitter within less than 5 seconds of being released.



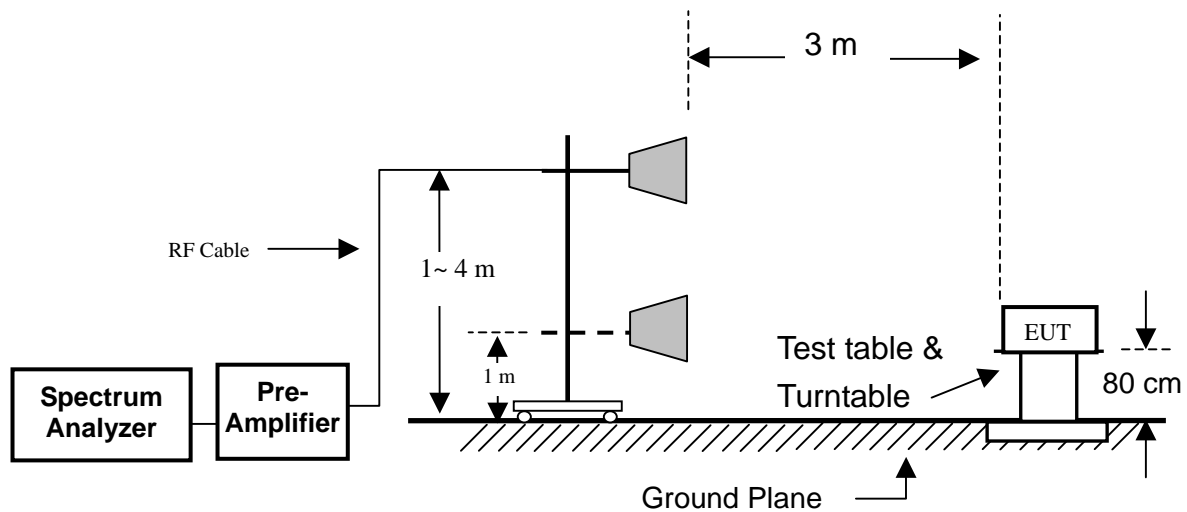
Comment: Deactivation
Date: 4.MAY.2010 11:09:48

4.3 Configuration of Measurement

Measurement Frequency under 1GHz



Measurement Frequency above 1GHz



4.4 Test Procedure

Radiated emission measurements frequency range were performed from 30MHz to 5GHz. Spectrum Analyzer Resolution Bandwidth set to 100kHz or greater for frequencies from 30MHz to 1GHz, and set 1MHz Resolution Bandwidth for frequencies above 1GHz.

The EUT is place on non-conductive turntable for the test. If peripheral devices apply to the EUT, the peripheral devices will be connected to EUT and whole system. During the emission test, the signal is maximized through rotation and all cables were present worst-case emissions. The height of antenna and polarization is constantly changed for exploring maximum signal reading. The height of antenna can be up form reference ground to 4 meter and down to 1 meter.

4.5 Test Result

PASS.

The final test emission data is shown as following tables.

Radiated Emission below 1GHz

Frequency (MHz)	Antenna Polarization	Reading (dB μ V)	Preamp (dB)	Correction Factor (dB/m)	Corrected Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Det. Mode
84.260	H	45.26	27.79	8.18	25.65	40.00	-14.35	QP
113.260	H	43.85	28.30	12.79	28.34	43.00	-14.66	QP
215.230	H	45.32	29.90	19.12	34.54	43.00	-8.46	QP
633.825	H	36.82	30.10	23.52	30.24	46.00	-15.76	QP
755.075	H	38.90	29.10	25.15	34.95	46.00	-11.05	QP
796.300	H	36.56	28.80	25.53	33.29	46.00	-12.71	QP
74.260	V	42.23	27.59	7.40	22.04	40.00	-17.96	QP
165.800	V	38.48	29.22	17.73	26.99	43.00	-16.01	QP
319.260	V	42.85	30.29	16.71	29.27	46.00	-16.73	QP
481.230	V	36.78	29.48	20.76	28.06	46.00	-17.94	QP
632.250	V	45.85	30.10	23.33	39.08	46.00	-6.92	QP
740.230	V	36.95	29.30	24.66	32.31	46.00	-13.69	QP

Remark : Corrected Level = Reading – Preamp + Correction Factor
 Correction Factor = Antenna Factor + Cable Loss

Fundamental and harmonics emissions

Freq. (MHz)	Antenna Polarization	Reading (dB μ V)	Preamp (dB)	Correction Factor (dB/m)	Average Factor (dB)	Corrected Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Det. Mode
433.92	H	69.16	0.00	20.02	--	89.18	100.8	-11.62	PK
433.92	H	69.16	0.00	20.02	-13.98	75.20	80.8	-5.60	AV
867.84	H	51.67	28.24	26.79	--	50.22	60.8	-10.58	PK
1301.76	H	49.00	26.16	27.84	--	50.68	54.0	-3.32	PK
1735.68	H	49.09	26.16	28.58	--	51.51	60.8	-9.29	PK
2169.60	H	50.23	26.23	30.46	--	54.46	60.8	-6.34	PK
2603.52	H	55.18	26.25	31.90	--	60.83	80.8	-19.97	PK
2603.52	H	55.18	26.25	31.90	-13.98	46.85	60.8	-13.95	AV
3037.44	H	56.25	26.20	32.71	--	62.76	80.8	-18.04	PK
3037.44	H	56.25	26.20	32.71	-13.98	48.78	60.8	-12.02	AV
3471.36	H	62.57	26.32	33.31	--	69.56	80.8	-11.24	PK
3471.36	H	62.57	26.32	33.31	-13.98	55.58	60.8	-5.22	AV
3905.28	H	46.78	26.21	34.71	--	55.28	74.0	-18.72	PK
3905.28	H	46.78	26.21	34.71	-13.98	41.30	54.0	-12.70	AV
4339.20	H	36.76	26.12	36.35	--	46.99	54.0	-7.01	PK
433.92	V	63.55	0.00	19.78	--	83.33	100.8	-17.47	PK
433.92	V	63.55	0.00	19.78	-13.98	69.35	80.8	-11.45	AV
867.84	V	46.89	28.24	26.37	--	45.02	60.8	-15.78	PK
1301.76	V	42.85	25.98	27.84	--	44.71	54.0	-9.29	PK
1735.68	V	46.85	26.16	28.58	--	49.27	60.8	-11.53	PK
2169.96	V	47.23	26.23	30.46	--	51.46	60.8	-9.34	PK
2603.52	V	57.01	26.25	31.90	--	62.66	80.8	-18.14	PK
2603.52	V	57.01	26.25	31.90	-13.98	48.68	60.8	-12.12	AV
3037.44	V	56.34	26.20	32.71	--	62.85	80.8	-17.95	PK
3037.44	V	56.34	26.20	32.71	-13.98	48.87	60.8	-11.93	AV
3471.36	V	61.64	26.32	33.31	--	68.63	80.8	-12.17	PK
3471.36	V	61.64	26.32	33.31	-13.98	54.65	60.8	-6.15	AV
3905.28	V	46.03	26.21	34.71	--	54.53	74.0	-19.47	PK
3905.28	V	46.03	26.21	34.71	-13.98	40.55	54.0	-13.45	AV
4339.20	V	35.85	26.12	36.35	--	46.08	54.0	-7.92	PK

Remark :

1. Corrected Level = Reading – Preamp + Correction Factor
2. Correction Factor = Antenna Factor + Cable Loss
3. “ * ” Mark indicated Background Noise Level

5 Emission bandwidth

5.1 Limits

According to FCC 15.231(c) requirement:

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating between 70 MHz to 900 MHz. Those devices operating above 900 MHz, the emission spurious shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

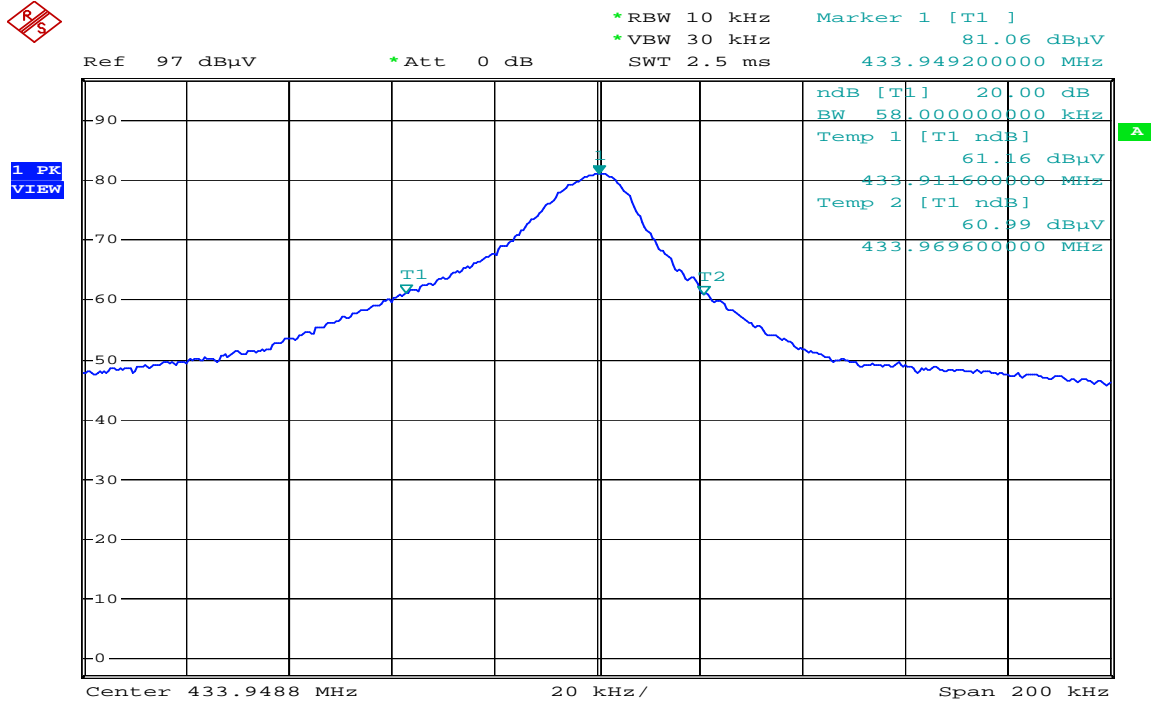
B.W (20dBc) Limit = 0.25% * f(MHz) = 0.25% * 433.92MHz = 1084.8kHz

5.2 Test Result

PASS.

The final test data is shown as following.

Channel Frequency (MHz)	Measured 20dB Bandwidth (kHz)	Limit (kHz)	Result
433.92	58	1084.8	PASS



Comment: 20dB BandWith
 Date: 3.MAY.2010 18:17:24