

FCC Test Report

for

Industrial Remote Control

Trade Name : Fomotech
Model No. : Alpha 580 Series
FCC ID. : LZ6ALPHA580SERIES
IC ID. : 2838A-A580
Report No. : RF-A340-0701-344
Date of Receipt : Feb.26, 2007
Date of Report : March 1, 2007

Prepared for

Fomotech International Corp.

2F-1, 286-3, Hsin Ya Road,Chien Chen District, Kaohsiung, Taiwan, R.O.C.

Prepared by



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Certification of Compliance

Equipment under Test : Industrial Remote Control
Trade Name : Fomotech
Model No. : Alpha 580 Series
FCC ID. : LZ6ALPHA580SERIES
IC ID. : 2838A-A580
Manufacturer : Fomotech International Corp.
Applicant : Fomotech International Corp.
Address : 2F-1, 286-3, Hsin Ya Road, Chien Chen District,
Kaohsiung, Taiwan, R.O.C.
Applicable Standards : 47 CFR part 15, Subpart C
RSS-210 Issue 6
Date of Testing : Feb. 27, 2007
Deviation : N/A
Condition of Test Sample : Prototype



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 , **DATE** : Mar. 1, 2007
(Cathy Chen/ Technical Manager)

APPROVED BY : J. Y. Shih , **DATE** : Mar. 1, 2007
(Tsun-Yu Shih/Laboratory Head)

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1 General Description

1.1 General Description of EUT

Equipment underTest : Industrial Remote Control

Model No. : Alpha 580 Series

Power in : 3Vdc

Test Voltage : 3Vdc(Battery*2)

Channel Numbers : 30

Frequency Range : 301.105~301.830MHz

Function Modulation : FSK

Function Description :

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

The channel and the operation frequency are listed below:

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
201	301.105	211	301.355	221	301.605
202	301.130	212	301.380	222	301.630
203	301.155	213	301.405	223	301.655
204	301.180	214	301.430	224	301.680
205	301.205	215	301.455	225	301.705
206	301.230	216	301.480	226	301.730
207	301.255	217	301.505	227	301.755
208	301.280	218	301.530	228	301.780
209	301.305	219	301.555	229	301.805
210	301.330	220	301.580	230	301.830

1.2 Test Methodology

For this E.U.T, radiated emissions was performed according to the procrdures illustrated in ANSI C63.4 and other required measurements 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 axis. There for only the test data of the worse case- y axiz was used for Radiated test.

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, uV/m at 3 meters = 56.81818(F) - 6136.3636; for the band 260-470 MHz, uV/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	16.420 – 16.423	399.9 – 410.0	4.50 – 5.15
10.495 - 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 – 41.28	25.50 – 25.67	1300 – 1427	8.025 – 8.5
4.17725 – 4.17775	37.50 – 38.25	1435.0 – 1626.5	9.0 –9.2
4.20725 – 4.20775	73.0 – 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	108.00 – 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	149.90 – 150.05	2310 – 2390	15.35 – 16.2
8.362 – 8.366	156.52475 – 156.52525	2483.5 – 2500.0	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	2655 - 2900	22.01 – 23.12
8.41425 – 8.41475	162.0125 – 167.1700	3260 – 3267	23.6 – 24.0
12.290 – 12.293	167.72 – 173.20	3332 – 3339	31.2 – 31.8
12.51975 – 12.52025	240 – 285	3345.8 – 3358.0	36.43 – 36.5
12.57675 – 12.57725	322.0 – 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 radiated emission below 1GHz, the system was configured for typical fashion as a customer could normal use it.

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
<input type="checkbox"/> 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.
<input type="checkbox"/> TR10	3m semi-anechoic chamber (9m × 6m × 6m)	
<input checked="" type="checkbox"/> TR11	3m semi-anechoic chamber (9m × 6m × 6m)	
<input type="checkbox"/> TR4	Shielding Room (5m×3m×3m)	For the RF conducted emission measurement.
<input type="checkbox"/> 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, TW1021	Test facility list & NSA Data
	Canada	IC	4699A-1,-2,-3	Test facility list & NSA Data
	Japan	VCCI	R-1527,C-1609,T-131	Test facility list & NSA Data
Authorization Certificate	Norway	Nemko	ELA 212	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 to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$. The values are less than U_{cisp} in table 1 of CISPR 16-4-2 and which are shown as below.

Test Item	Measurement Uncertainty
Radiated Emission: (30MHz~200MHz)	Horizontal: 3.3dB ; Vertical: 3.4dB
Radiated Emission: (200MHz~1GHz)	Horizontal: 3.7dB ; Vertical: 3.7dB
Radiated Emission: (above 1GHz)	Horizontal: 4.4dB ; Vertical: 4.4dB

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 $41.6667 \times 301.46 - 7083.3333 = 5477.51 \text{ uV/m} = 74.77 \text{ dBuV/m}$, the limit of spurious emission is 54.77 dBuV/m (Average)

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 Data	Calibration Due Data
Semi-anechoic Chamber	ETS.LINDGREN	TR11/13455	June 13, 2006	June 13, 2007
Test Receiver	R&S	ESCI/100019	Nov. 22,2006	Nov. 22, 2007
Spectrum Analyzer*	Agilent	E4407B/ MY451067977	March 7, 2006	March 7, 2007
Antenna	EMCO	3142C/35035	Aug. 13, 2006	Aug. 13, 2007
Antenna*	EMCO	3117/ 57408	Feb. 9, 2007	Feb. 9, 2008
Antenna*	EMCO	3116/ 20533	Dec. 13, 2006	Dec. 13, 2007
Pre-amplifier*	MITEQ	AMF-4D-005180-2 4-10P/1072961	June 7, 2006	June 7, 2007
Pre-amplifier*	MITEQ	JS4-18002600-30- 5A/ 741923	June 27, 2006	June 27, 2007
Pre-amplifier*	MITEQ	AMF-6F-260400-33 -8P/ 928336	June 27, 2006	June 27, 2007
Pre-amplifier	Mini Circuit	ZKL-2/ 008	Aug. 31, 2006	Aug. 31, 2007

Note:

1. “*” : These instruments are used only for the measurement of emission frequency above 1000MHz.
2. The calibrations are traceable to NML/ROC.
3. NCR : No Calibration Required.
4. 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	Peak	Maxhold	Above 1GHz Peak

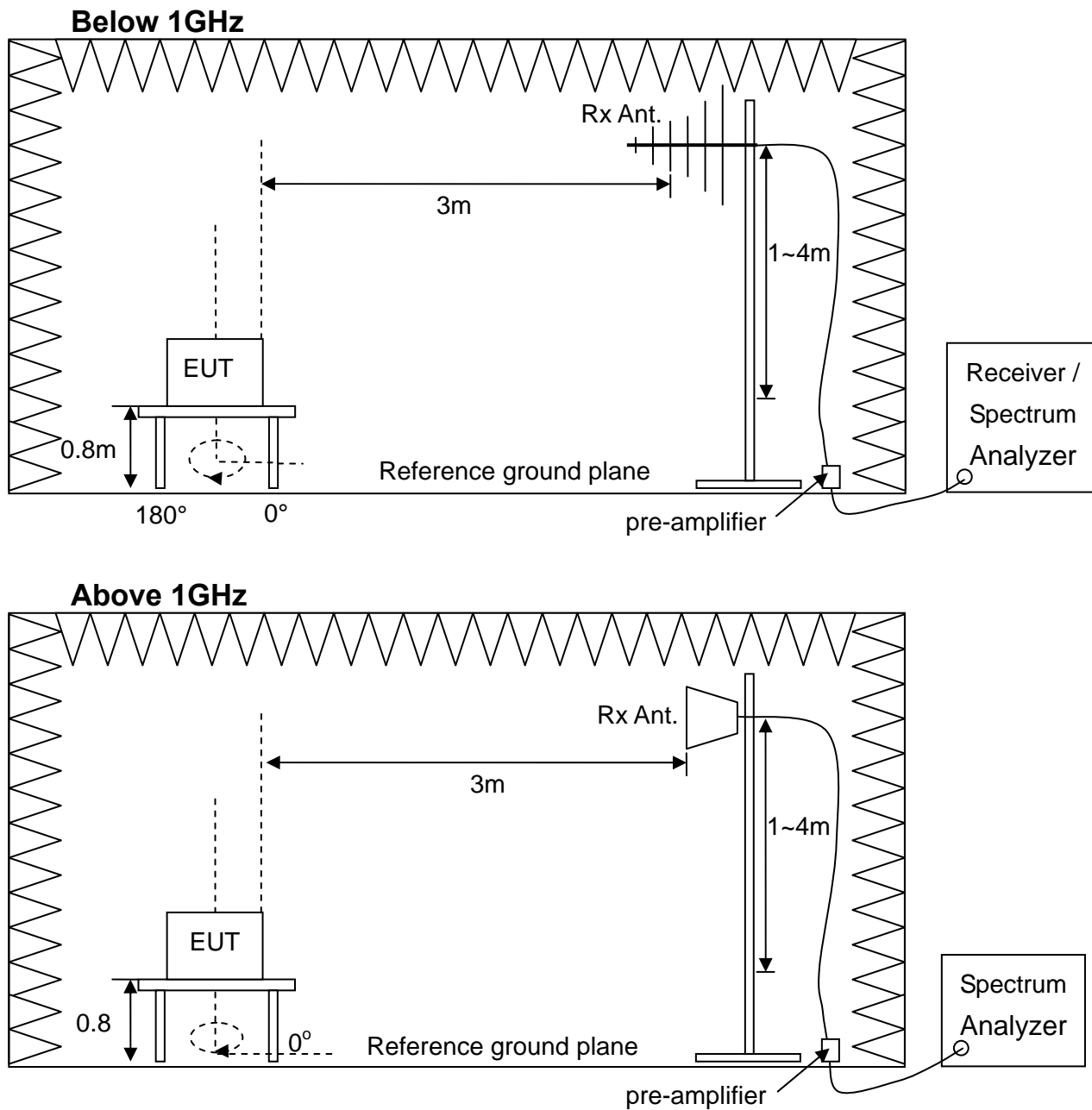
Climatic Condition

Ambient Temperature : 28°C ; Relative Humidity : 64%

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 below 1000MHz, set the receiver detector to be Quasi-Peak per CISPR 16-1 to find out the maximum level occurred.
- 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

Operation Frequency : 301.455MHz

Test Distance : 3m

Tester : Bill

Frequency (MHz)	Polarization	Reading Data (dBuV)		Correction Factor (dB/m)	Field Strength (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
		PK	AV		PK	AV	PK	AV	PK	AV
301.46	V	87.48	85.48	-14.53	72.95	70.95	94.77	74.77	21.82	3.82
301.46	H	69.76	67.76	-14.53	55.23	53.23	94.77	74.77	39.54	21.54

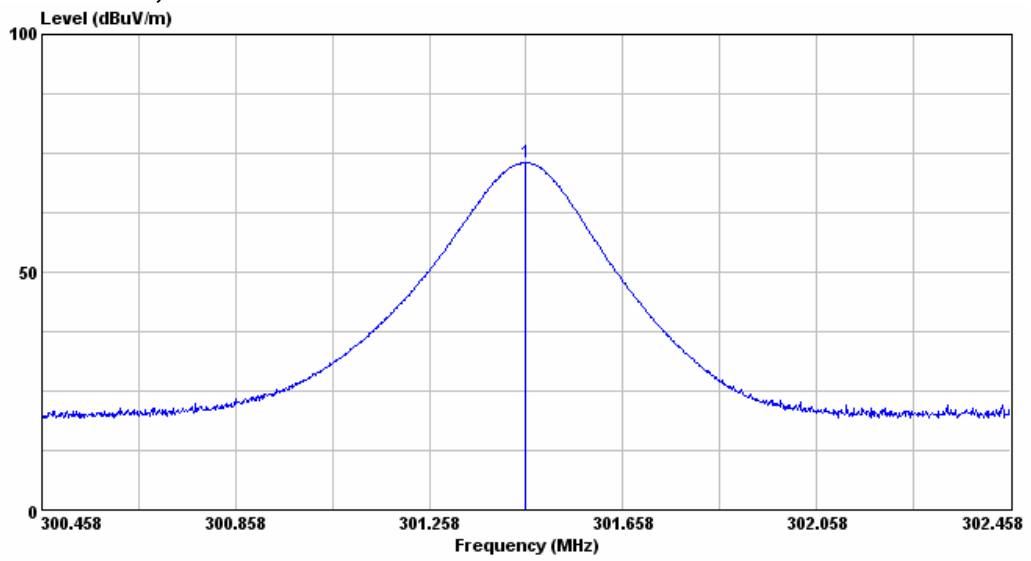
Note :

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:

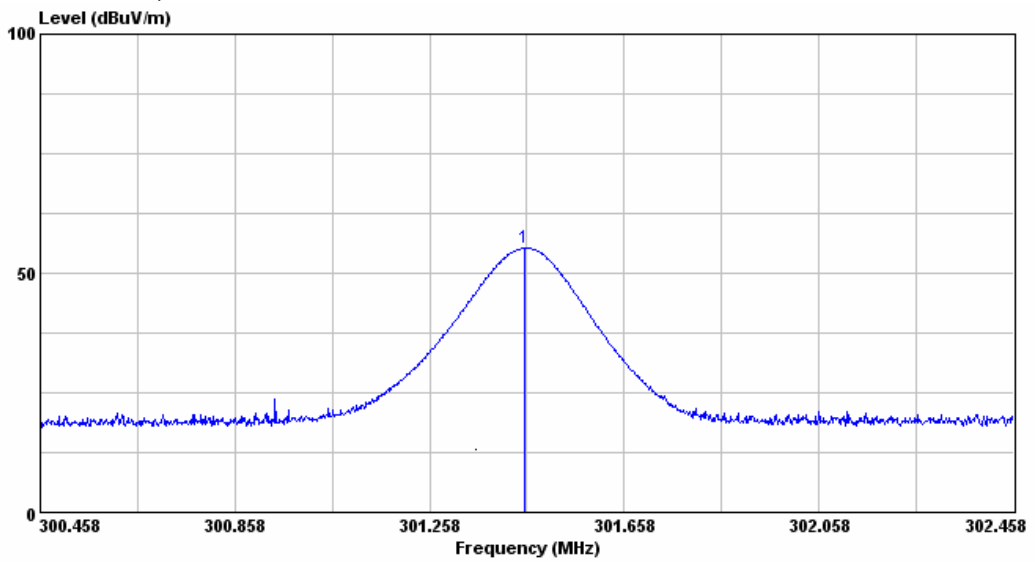
$$20\log(\text{Duty cycle}) = 20\log \frac{79}{100} = -2\text{dB}$$

The total time is longer than 100ms, so the total time use 100ms to express.
please see page 17 for plotted duty cycle.

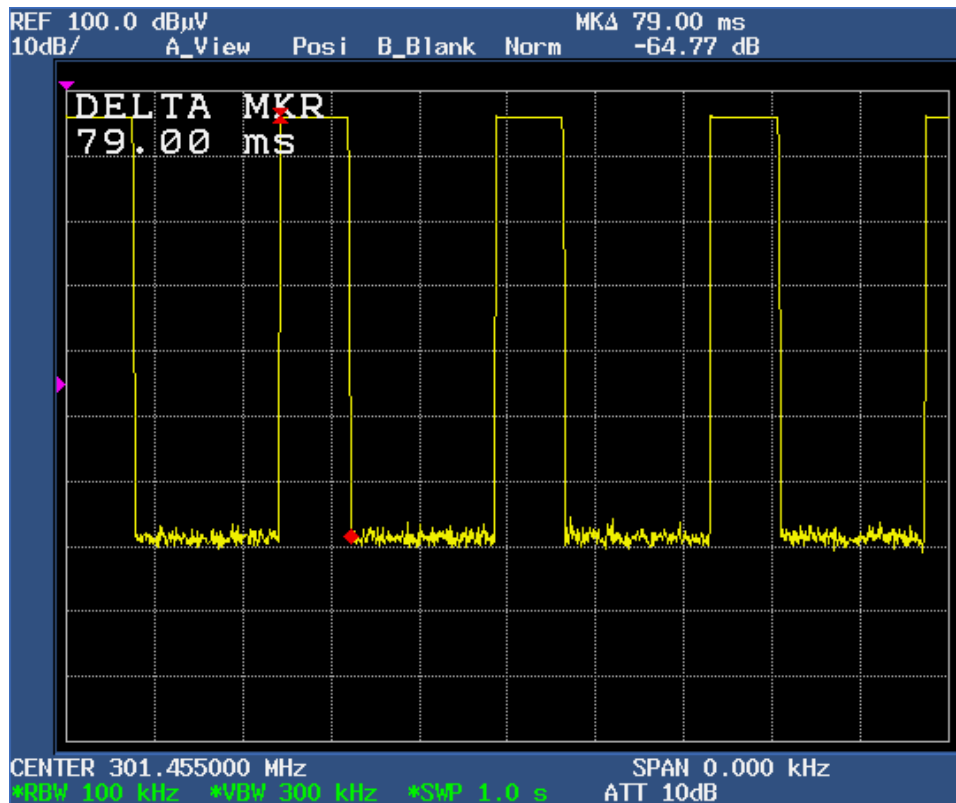
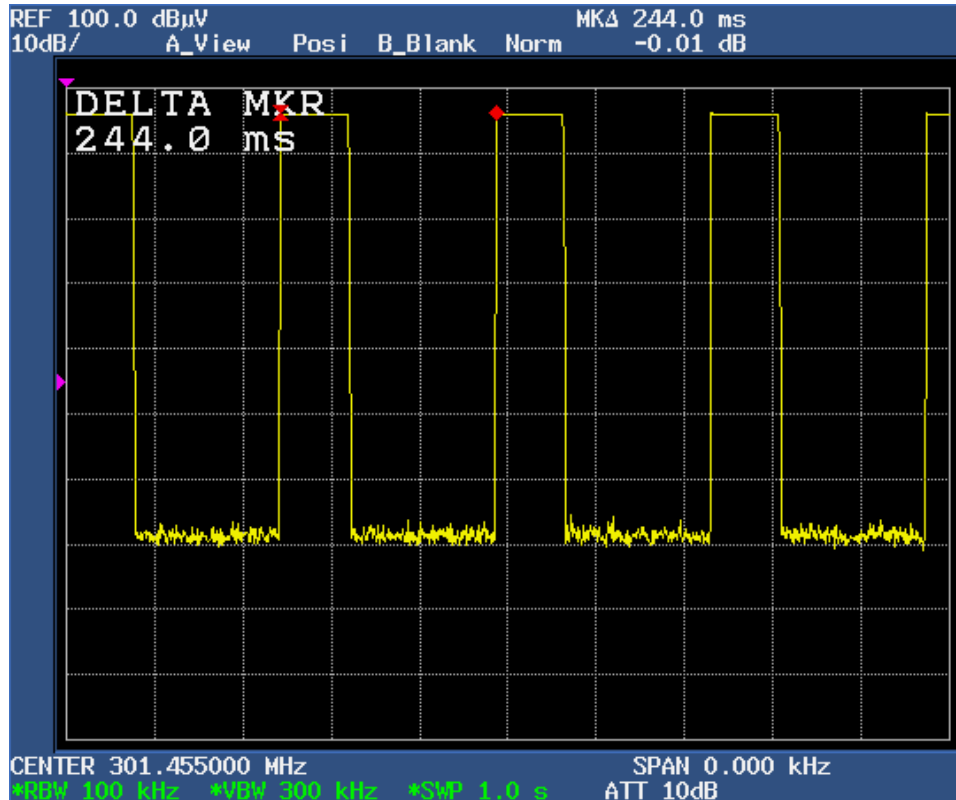
V Polarization, PK



H Polarization, PK



Duty cycle



Radiated Emission Measurement below 1000MHz

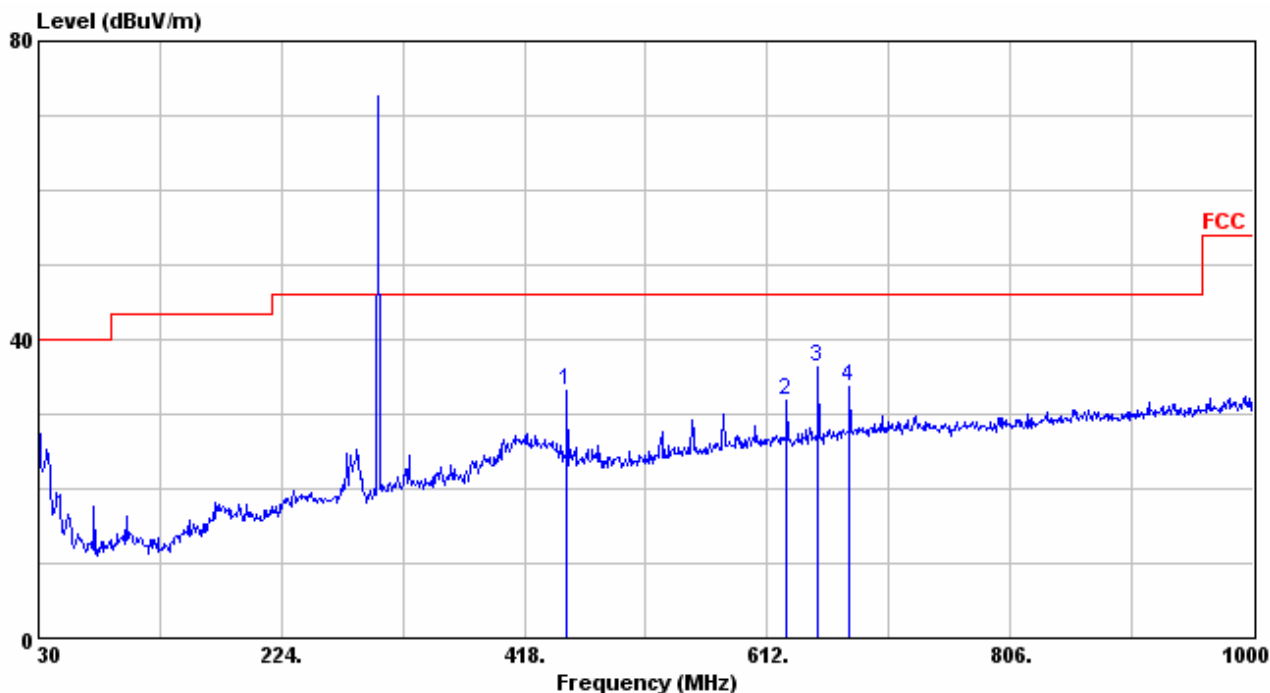
Operation Frequency : 301.455MHz

Test Distance : 3m

Polarization : Vertical

Tester : Bill

Frequency Range : 30MHz~1GHz



	Freq	Level	Factor	Read Level	Limit Line	Over Limit	Ant Pos	Table Pos	Pol/Phase	Remark
	MHz	dBuV/m	dB/m	dBuV	dBuV/m	dB	cm	deg		
1 !	451.950	33.04	-10.18	43.22	46.00	-12.96	---	---	VERTICAL	
2 !	627.520	31.74	-6.46	38.20	46.00	-14.26	---	---	VERTICAL	
3 !	652.740	36.35	-6.18	42.53	46.00	-9.65	---	---	VERTICAL	
4 !	677.960	33.67	-5.46	39.13	46.00	-12.33	---	---	VERTICAL	

Note:

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

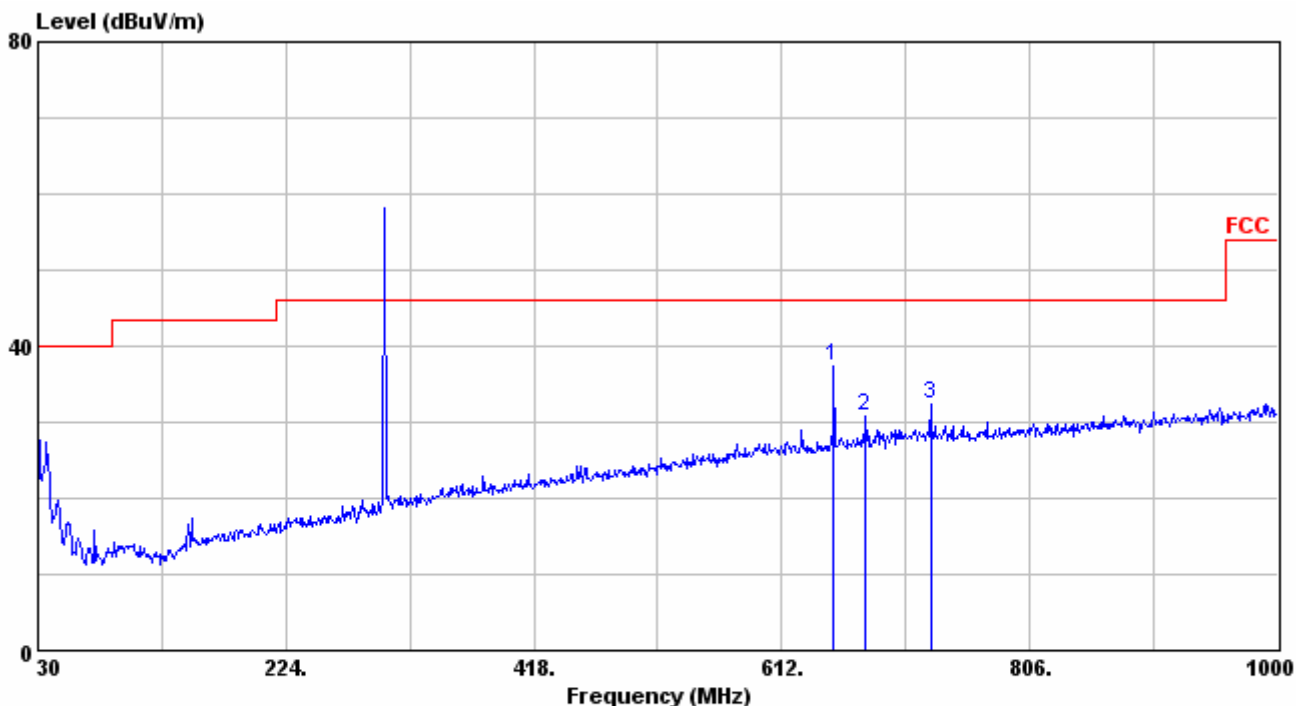
Operation Frequency : 301.455MHz

Test Distance : 3m

Polarization : Horizontal

Tester : Bill

Frequency Range : 30MHz~1GHz



	Freq	Level	Factor	Read Level	Limit Line	Over Limit	Ant Pos	Table Pos	Pol/Phase	Remark
	MHz	dBuV/m	dB/m	dBuV	dBuV/m	dB	cm	deg		
1 !	652.740	37.31	-6.18	43.49	46.00	-8.69	---	---	HORIZONTAL	
2 !	677.960	30.86	-5.46	36.32	46.00	-15.14	---	---	HORIZONTAL	
3 !	728.400	32.25	-4.58	36.83	46.00	-13.75	---	---	HORIZONTAL	

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

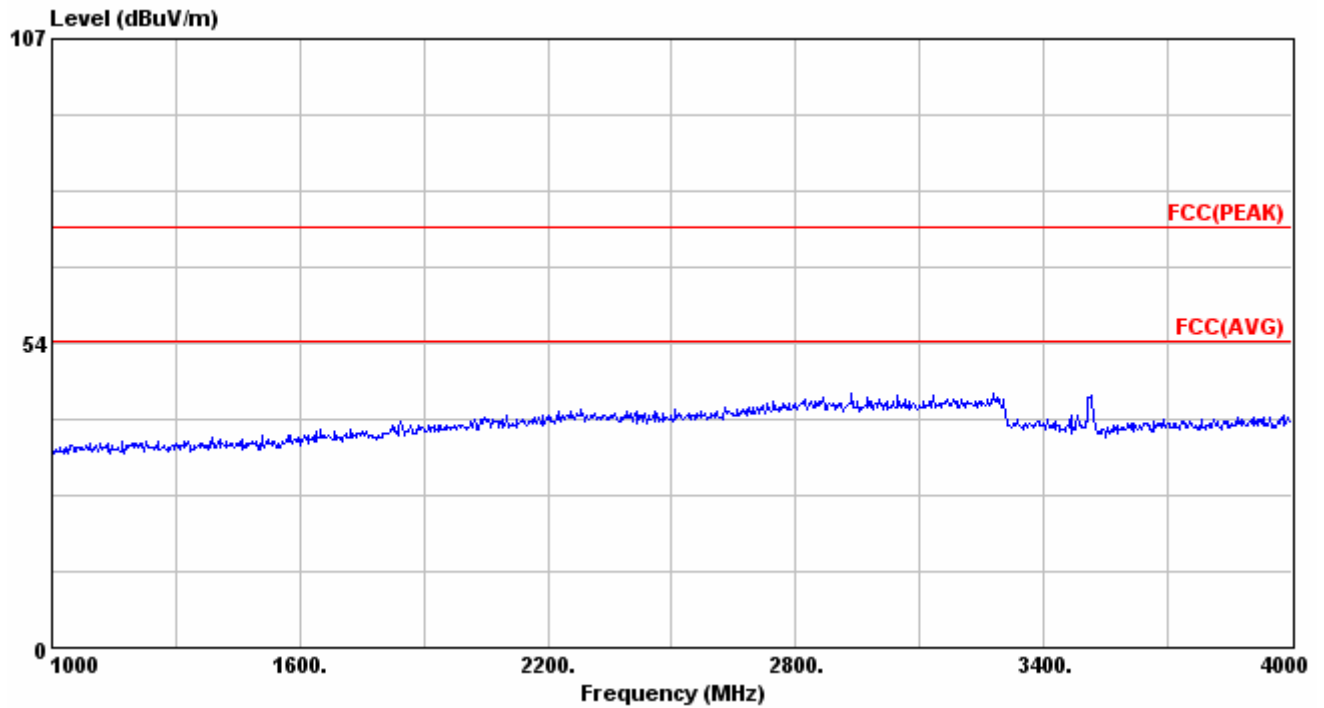
Operation Frequency : 301.455MHz

Test Distance : 3m

Polarization : Vertical

Tester : Bill

Frequency Range : 1GHz~4GHz



Note:

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

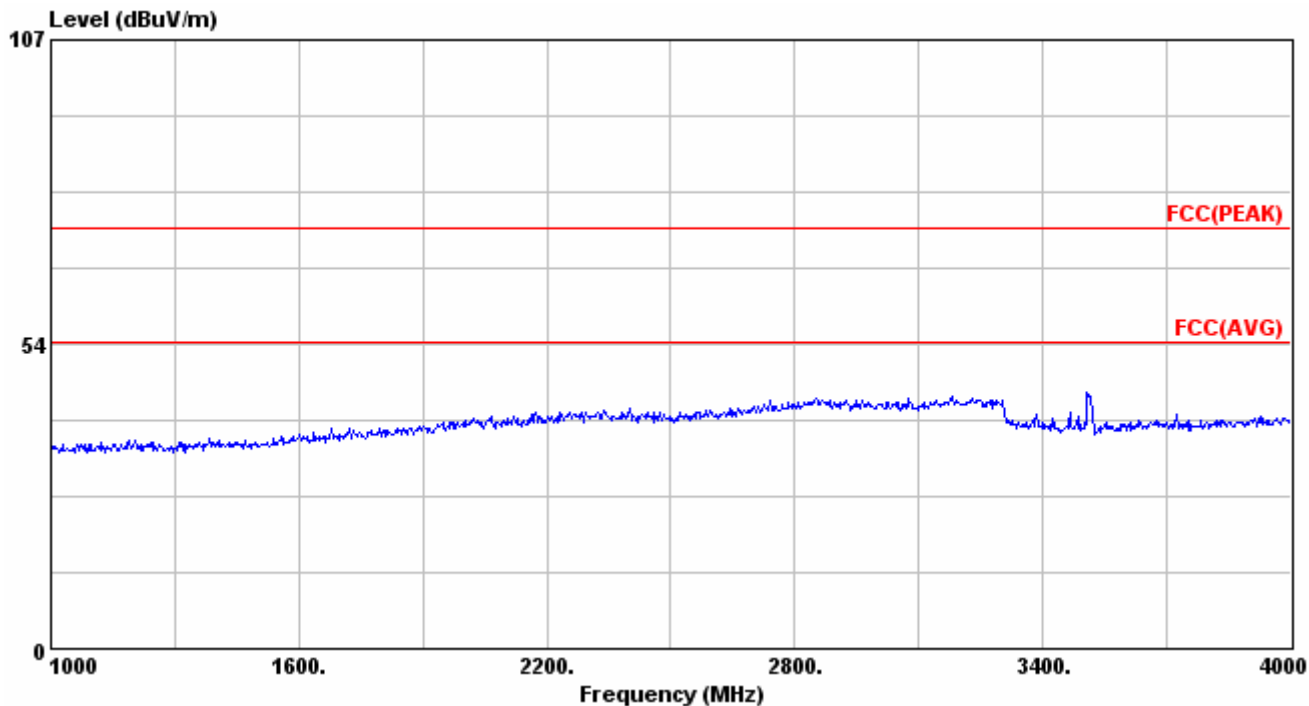
Operation Frequency : 301.455MHz

Test Distance : 3m

Polarization : Horizontal

Tester : Bill

Frequency Range : 1GHz~4GHz



Note:

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

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	E4407B/ MY451067977	March 8, 2007	March 8, 2008

Note:

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

Instrument Setting

RBW	VBW	Span	Detector	Comment
30kHz	300kHz	Peak	Maxhold	

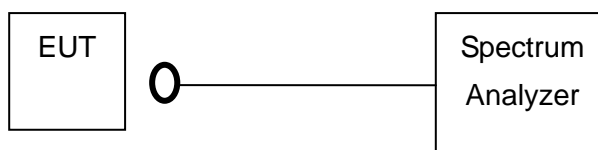
Climatic Condition

Ambient Temperature : 28°C ; Relative Humidity : 64%

3.3 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.
- c. Measure the 20dB bandwidth and compare with the required limit.

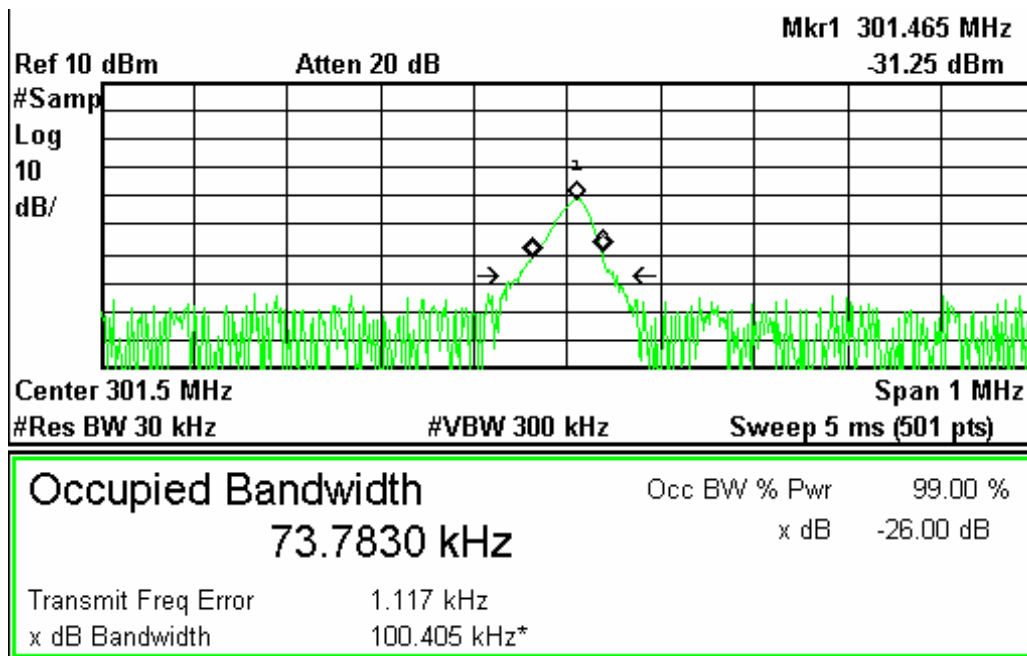
3.4 Test configuration



3.5 Test Data

Operation Frequency : 301.455MHz

Tester : Bill



Measured 20dB bandwidth is 73.7830 kHz < 315.455MHzX0.25% = 788.64kHz.

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
Shielded Room	ETS.LINDGREN	TR4/ 15353-E	NCR	NCR
Spectrum Analyzer	Agilent	E4407B/ MY451067977	March 8, 2007	March 8, 2008

Note:

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

Instrument Setting

RBW	VBW	Detector	Trace	Comment
100KHz	100KHz	Peak	Maxhold	

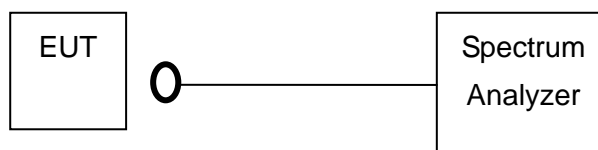
Climatic Condition

Ambient Temperature : 28°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.

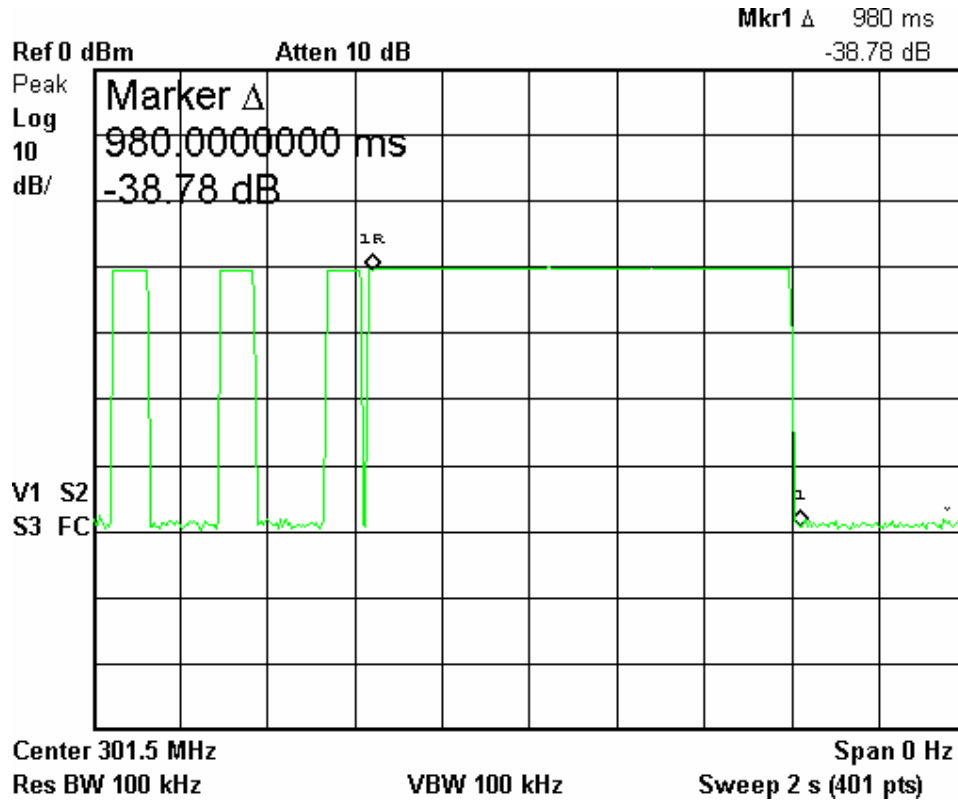
4.4 Test configuration



4.5 Test Data

Operation Frequency : 301.455MHz

Tester : Bill



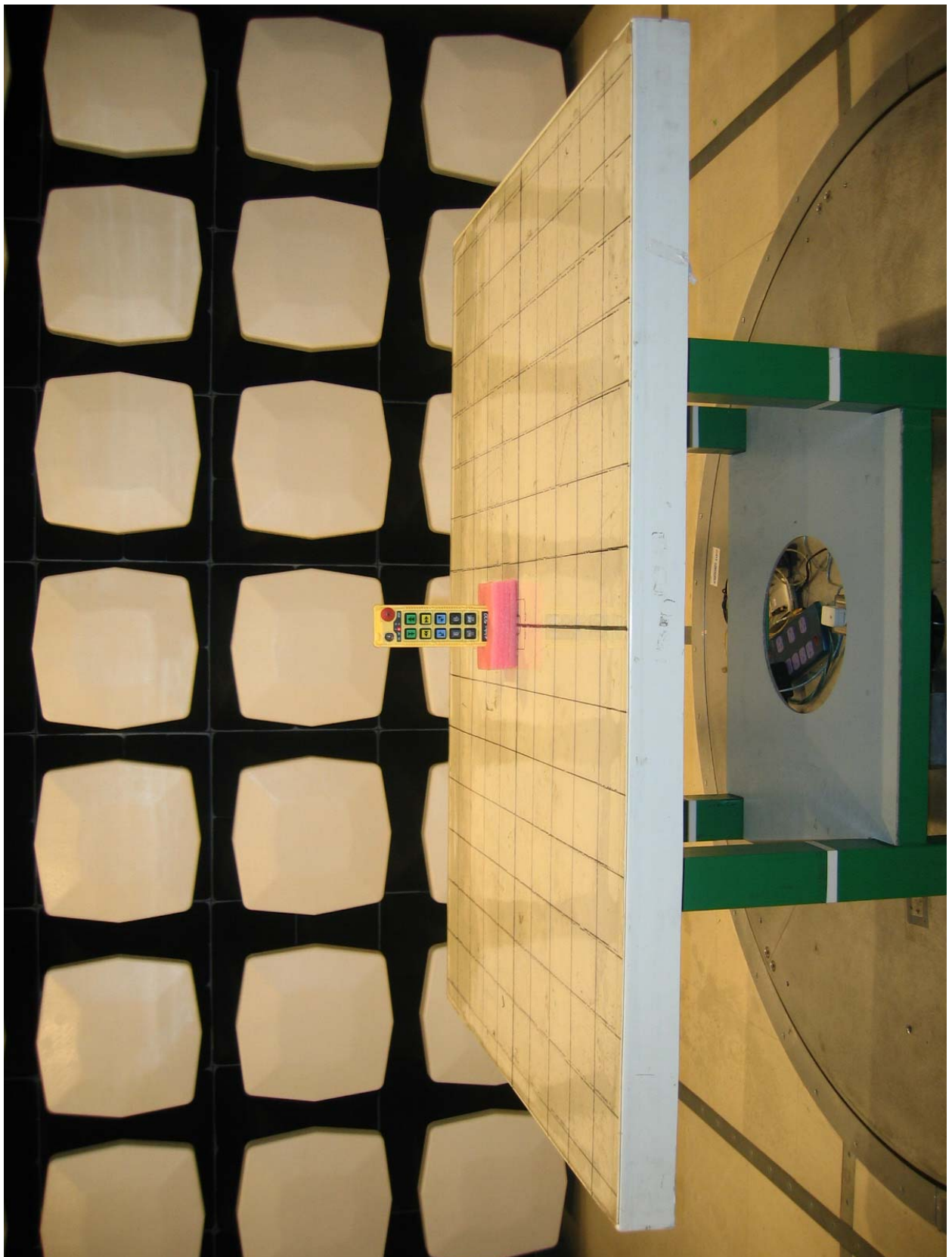
The transmitter will automatically deactivate within 0.98 second after release the button of the transmitter.

Attachment 1

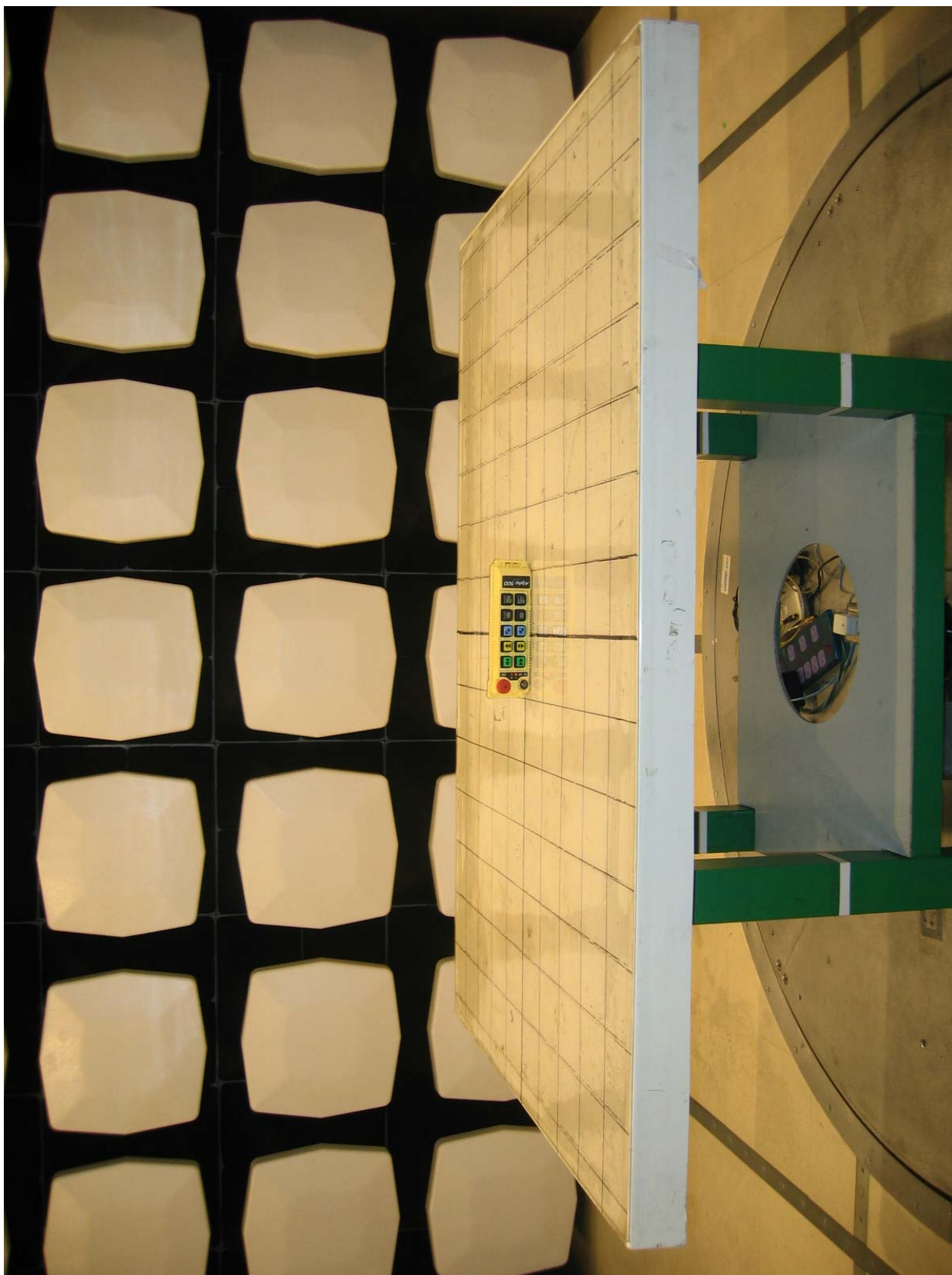
Photographs of the Test Configurations

Radiated Emission Measurement

Z axis



Y axis



X axis

