

FCC COMPLIANCE REPORT

for

Ningbo Yaling Electric Appliance Co., Ltd

Remote Controller

Model Number: YLT-11C

Prepared for : Ningbo Yaling Electric Appliance Co., Ltd
Address : Zhangqi Town, Cixi City, Ningbo, China

Prepared By : NS Technology Co., Ltd.
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Report Number : NSE-F09053305
Date of Test : May 15~22, 2009
Date of Report : May 22, 2009



TABLE OF CONTENTS

	Page
Test Report Declaration	Page
1. GENERAL PRODUCT INFORMATION	4
1.1. Product Function	4
1.2. Description of Device (EUT)	4
1.3. Independent Operation Modes	4
2. TEST SITES	5
2.1. Test Facilities	5
2.2. List of Test and Measurement Instruments	6
3. TEST SET-UP AND OPERATION MODES	7
3.1. Principle of Configuration Selection.....	7
3.2. Block Diagram of Test Set-up.....	7
3.3. Test Operation Mode and Test Software.....	7
3.4. Special Accessories and Auxiliary Equipment	7
3.5. Countermeasures to Achieve EMC Compliance.....	7
4. TEST SUMMARY	8
Test Items and Result Lists.....	8
5. EMISSION TEST RESULTS	9
5.1. Conducted Emissions	9
5.2. Radiated emissions	9
5.3. Deactivation time	18
5.4. Duty Cycle	20
6. PHOTOGRAPHS OF TEST SET-UP	24
7. PHOTOGRAPHS OF THE EUT	25



NS Technology Co., Ltd.



NS Technology Co., Ltd. Report No. NSE-F09053305 Page 2 of 26

Applicant:	Ningbo Yaling Electric Appliance Co., Ltd		
Address:	Zhangqi Town, Cixi City, Ningbo, China		
Manufacturer:	Ningbo Yaling Electric Appliance Co., Ltd		
Address:	Zhangqi Town, Cixi City, Ningbo, China		
E.U.T:	Remote Controller		
Model Number:	YLT-11C		
Trade Name:	-----	Operating Frequency:	315MHz
Date of Receipt:	May 12, 2009	Date of Test:	May 15~22, 2009
Test Specification: FCC Part 15 Subpart C: July. 10, 2008 ANSI C63.4:2003			
Test Result:	The equipment under test was found to be compliance with the requirements of the standards applied.		
Issue Date: May 22,2009			
Tested by:	Reviewed by:	Approved by:	
			
Jade/ Engineer	Iceman Hu / Supervisor	Steven Lee / Manager	
Other Aspects: None.			
<i>Abbreviations: OK/P=passed fail/F=failed n.a/N=not applicable E.U.T=equipment under tested</i>			
<i>This test report is based on a single evaluation of one sample of above mentioned products ,It is not permitted to be duplicated in extracts without written approval of NS Technology Co., Ltd.</i>			



1. GENERAL PRODUCT INFORMATION

1.1. Product Function

The EUT is used to transmit control command only. The operation frequency is 315MHz. Press the button on remote transmitter, Press the “ON” button on the transmitter to turn the receiver “ON”,Press the “OFF” button on the receiver to turn the receiver “OFF”,Please refer to the user’s manual for the details.

1.2. Description of Device (EUT)

E.U.T.	: Remote Controller
Model No.	: YLT-11C
Operating Frequency	: 315MHz
Number of Channels	: 1 Channels
Type of Modulation	: ASK
Antenna Type	: Integral
System Input Voltage	: Nominal Voltage: DC 3V(Battery)
Temperature Range(Operating)	: 0 ~+ 40°C

1.3. Independent Operation Modes

The basic operation modes are:

1.3.1. TX Mode



2. TEST SITES

2.1. Test Facilities

EMC Lab : Certificated by TUV Rheinland, Germany.
Date of registration: July 28, 2003

Certificated by FCC, USA
Registration No.: 502831
Date of registration: February 09, 2009

Certificated by VCCI, Japan
Registration No.: R-2527 & C-2770
Date of registration: March 23, 2007

Certificated by CNAL, CHINA
Registration No.: L1744
Date of registration: November 25, 2004

Certificated by Intertek ETL SEMKO
Registration No.: TMP-013
Date of registration: June 11, 2005

Certificated by TUV/PS, Hong Kong
Date of registration: December 1, 2005

Certificated by Industry Canada
Registration No.: 5936A
Date of registration: March 4, 2009

Certificated by ATCB, America
Date of registration: August 03, 2006

Name of Firm : NS Technology Co., Ltd.

Site Location : Chenwu Industrial Zone, Houjie Town, Dongguan City,
Guangdong, China



2.2. List of Test and Measurement Instruments

2.2.1. For radiated emission test (30MHz-1GHz)

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde & Schwarz	ESCS30	100340	May 25,08	May 25,09
Spectrum Analyzer	HP	8593E	3448U00806	May 25,08	May 25,09
Bilog Antenna	Teseq	CBL 6111D	25758	Oct. 15,08	Oct. 15,09
Amplifier	Agilent	8447D	2944A10488	May 2,08	May 2,09
Coaxial Switch	Anritsu	MP59B	6200530579	May 2,08	May 2,09

2.2.2. For radiated emission test (above 1GHz)

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Spectrum Analyzer	HP	E7405A	MY45118807	May 25,08	May 25,09
Horn Antenna	ESCO	3117	00062558	May 02,08	May 02,09
Amplifier	BURGEON	PEC-38-30M18G -12-SFF	B001	Jun.02,08	Jun.02,09

2.2.3. For 20dB Occupied Bandwidth test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Spectrum Analyzer	Agilent	E411B	US39240290	Jan.9,09	Jan.9,10

2.2.4. For Deactivate time&Duty cycle test

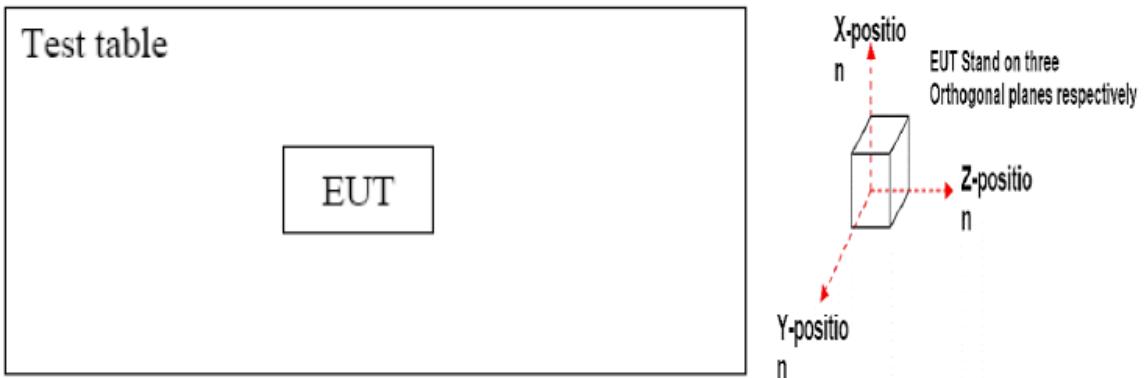
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Spectrum Analyzer	Agilent	E411B	US39240290	Jan.9,09	Jan.9,10

3. TEST SET-UP AND OPERATION MODES

3.1. Principle of Configuration Selection

The equipment under test (EUT) was configured to measure its highest possible radiated level. The test modes were adapted accordingly in reference to the Operating Instructions.

3.2. Block Diagram of Test Set-up



(EUT: Remote Controller)

Note: We test X-axis, Y-axis, and Z-axis,. The Y-axis is the worst mode, so only the worst mode test data was included in the report.

3.3. Test Operation Mode and Test Software

Refer to clause 1.4

3.4. Special Accessories and Auxiliary Equipment

None.

3.5. Countermeasures to Achieve EMC Compliance

None.

4. TEST SUMMARY

Test Items and Result Lists

No.	Item	Specification	Results
1	Conducted emissions	FCC Part15.207	N/A
2	Radiated emissions	FCC Part 15.231(b)	PASS
3	20dB Occupied Bandwidth	FCC Part 15.231(c)	PASS
4	Deactivate time	FCC Part 15.231(a)	PASS



5. EMISSION TEST RESULTS

5.1. Conducted Emissions

According to paragraph(f) of FCC Part 15 Section 15.207, measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation, and which do not operate from the AC power lines or contain provision for operation while connected to the AC power.

5.2. Radiated emissions

5.2.1. Applied Standard

According to 15.231(b), the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

Fundamental Frequencies (MHz)	Field strength of Fundamental (uV/meter at 3m)	Unwanted emissions (uV/meter at 3m)
40.66-40.70	2250	225
70-130	1250(470nW)	125
130-174	1250 to 3750**	125 to 375**
174-260	3750(4.2uW)	375
260-470	3750 to 12500**	375 to 1250**
Above470	12500(47uW)	1250

**Linear interpolation with frequency F in MHz

For the band 130-174MHz: Field strength=56.81818(F)-6136.3636

For the band 260-470MHz: Field strength=41.6667(F)-7083.3333

The maximum permitted unwanted emissions level is 20dB below the maximum permitted fundamental level

The field strength of spurious emissions which appear outside of this band shall not exceed the general radiated emission limits in Section 15.209 as following:

Frequencies (MHz)	Field strength uV/meter	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

According to 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.



5.2.2. Test procedure

The EUT was placed on a turn table which was 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna which was mounted on a antenna tower. At the frequency band of 30MHz to 1GHz, The measuring antenna moved up and down to find out the maximum emission level. It moved from 1 to 4 m for horizontal and vertical polarizations. The broadband antenna (calibrated by dipole antenna) was used as a receiving antenna. At the frequency band of 1GHz to 4GHz, The measuring antenna moved from 1 to 4 m for horizontal and vertical polarization. The horn antenna was used as a receiving antenna.

The resolution bandwidth and video bandwidth of the test receiver was 120 KHz and 300KHz for Quasi-peak detection at frequency below 1GHz.

The resolution bandwidth and video bandwidth of the test receiver was 1MHz and 1MHz for Peak detection at frequency above 1GHz.

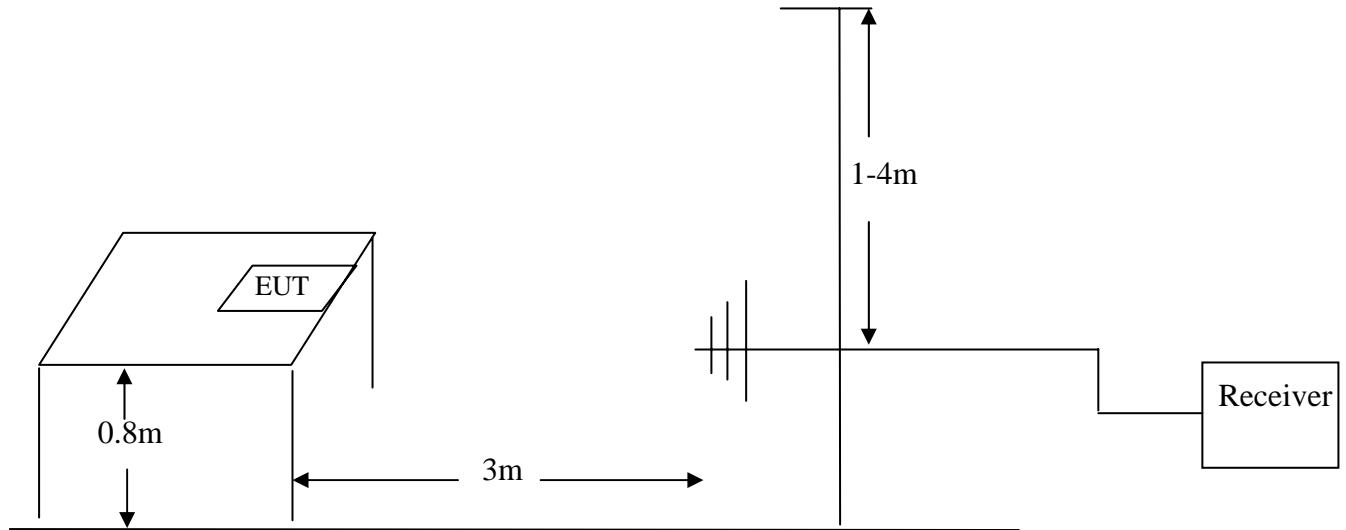
The EUT position(X.-axis, Y-axis, Z-axis) were checked and worse case was happened in Y-axis position. So Y-axis position was chose for find measurement.

The EUT was tested in Chamber Site.

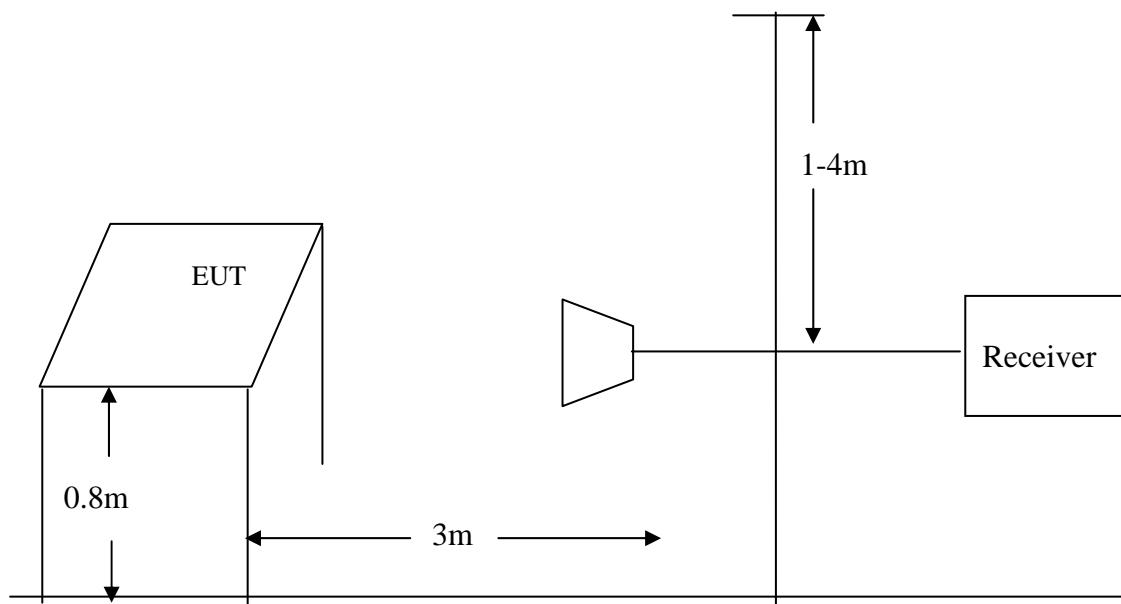


5.2.3. Test Setup Diagram

For frequency range: 30MHz-1000MHz



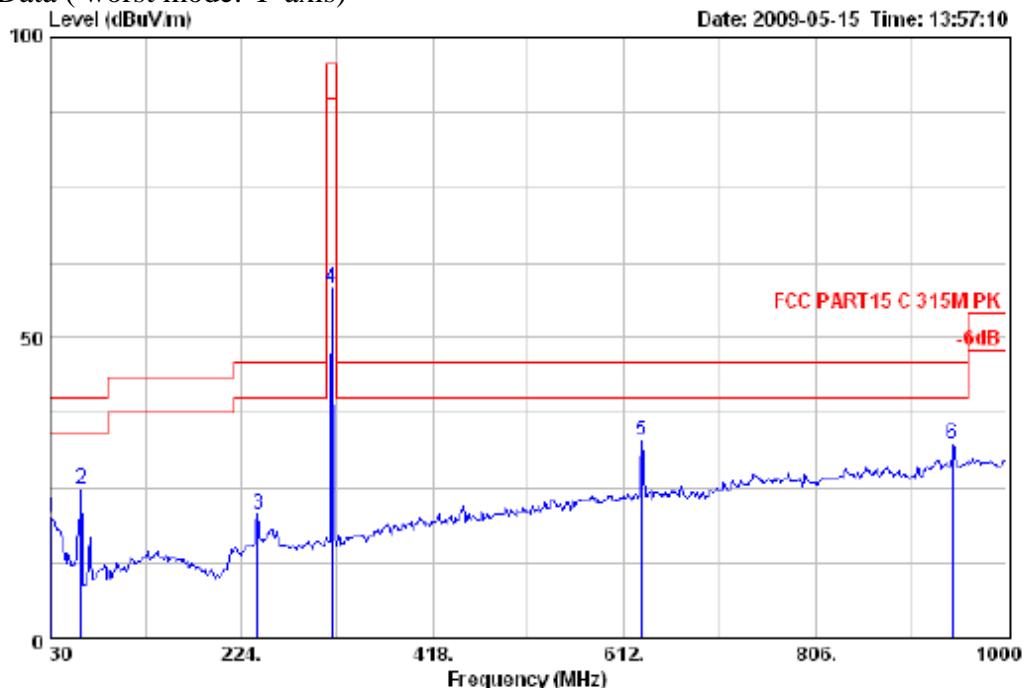
For frequency range: 1 GHz -4GHz



5.2.4. Test result

Pass.

Test Data (worst mode: Y-axis)



Test Site : 966 Chamber
 Limit : FCC PART15 C 315M PK
 Dis. / Ant. : 3m 25750 Ant. Pol.: VERTICAL
 EUT : Remote Controller
 Power : DC 3V
 M/N : YLT-11C
 Test Engineer : Jade
 Comment : Temp:25.3'C Humi:50%
 Test Mode : TK Mode
 Ant high:1.2m; Table angle:53'

Freq. (MHz)	Emission			Margin (dB)	Reading (dBuV)	Ant. Factor (dB)	Cable Loss (dB)	Remark
	Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)					
1 31.94	20.04	40.00	19.96	2.23	17.28	0.53	QP	
2 61.04	24.66	40.00	15.34	18.78	5.28	0.60	QP	
3 240.49	20.51	45.00	25.49	8.61	10.96	0.94	QP	
4 315.00	58.19	95.60	37.41	43.13	14.02	1.04	Peak	
5 630.00	32.73	45.00	13.27	10.78	20.55	1.40	Peak	
6 945.00	32.34	45.00	13.56	5.50	25.02	1.82	Peak	

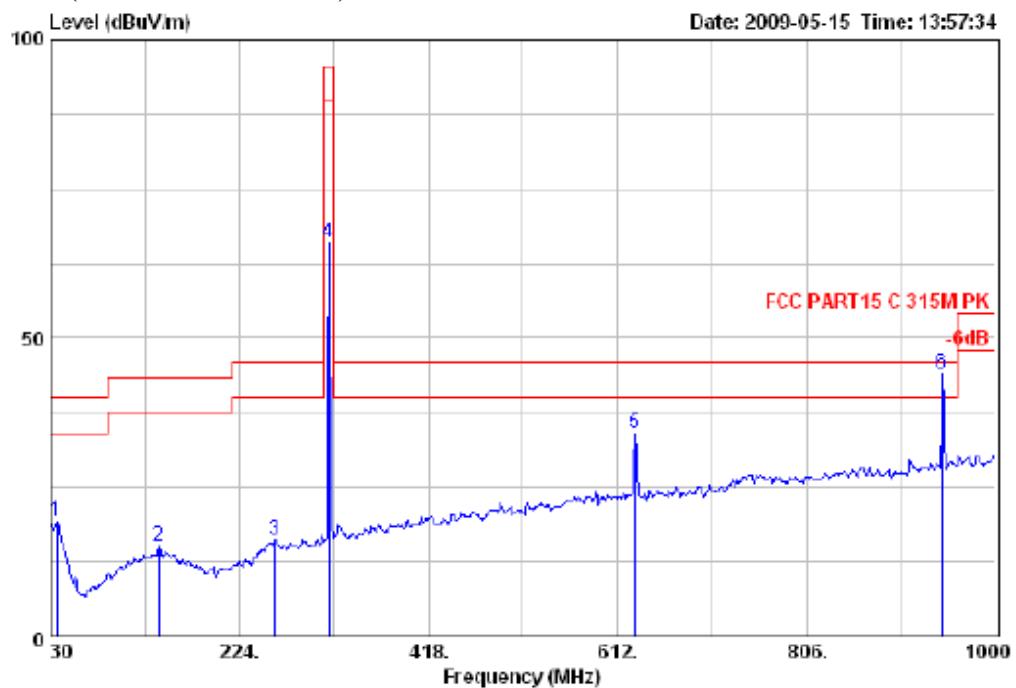
Remark:

1. Emission Level = Antenna Factor + Cable Loss + Meter Reading
2. Peak Limit=Average Limit+20dB
3. Test uncertainty: ± 4.76 dB at a level of confidence of 95%.

Fundamental and Harmonics Result					
Freq(MHz)	Peak Level (dB μ V/m)	PDCF(dB μ V/m) (See Section 5.4)	Average Level (dB μ V/m)	Limit(dB μ V/m) average	Conclusion
315.00	58.19	-9.7	48.49	75.6	Pass
630.00	32.73	-9.7	23.03	55.6	Pass
945.00	32.34	-9.7	22.64	55.6	Pass



Test Data (worst mode: Y-axis)



Test Site : 966 Chamber
 Limit : FCC PART15 C 315M PK
 Dis. / Ant. : 3m 25758 Ant. Pol.: HORIZONTAL
 EUT : Remote Controller
 Power : DC 3V
 M/N : YLT-11C
 Test Engineer : Jade
 Comment : Temp:25.3'C Humi:58%
 Test Mode : TX Mode
 int high:3.1m; Table angle:96'

Freq. (MHz)	Emission		Margin (dB)	Reading (dBuV)	Ant. Factor	Loss (dB)	Cable (dB)	Remark
	Level (dBuV/m)	Limits (dBuV/m)						
1 36.79	19.17	40.00	20.83	2.87	15.76	0.54	0.54	QP
2 140.58	15.09	43.50	28.41	2.27	12.05	0.77	0.77	QP
3 259.69	16.27	46.00	29.73	1.70	13.60	0.97	0.97	QP
4 315.00	66.05	95.60	29.54	51.00	14.02	1.04	1.04	Peak
5 630.00	34.01	46.00	11.99	12.06	20.55	1.40	1.40	Peak
6 945.00	44.13	46.00	1.87	17.29	25.02	1.82	1.82	Peak

Remark:

1. Emission Level = Antenna Factor + Cable Loss + Meter Reading
2. Peak Limit=Average Limit+20dB
3. Test uncertainty: ± 4.76 dB at a level of confidence of 95%.

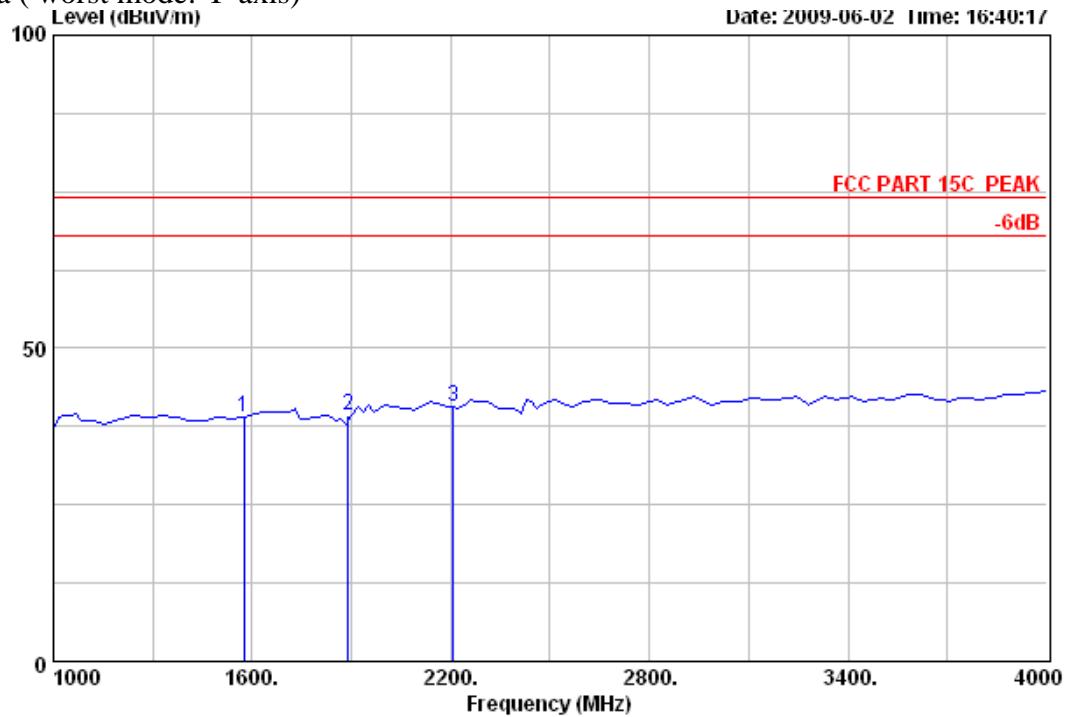
Fundamental and Harmonics Result					
Freq(MHz)	Peak Level (dB μ V/m)	PDCF(dB μ V/m) (See Section 5.4)	Average Level (dB μ V/m)	Limit(dB μ V/m) average	Conclusion
315.00	66.05	-9.7	56.35	75.6	Pass
630.00	34.01	-9.7	24.31	55.6	Pass
945.00	44.13	-9.7	34.43	55.6	Pass



5.2.5. Test result

Pass

Test Data (worst mode: Y-axis)



Test Site : 10m Chamber
 Limit : FCC PART 15C PEAK
 Dis. / Ant. : 3m 3117 Ant. Pol.: HORIZONTAL
 EUT : Remote Controller
 M/N : YLT-11C
 Power : DC 3V
 Test Engineer : Jade
 Comment : Temp.:25.2'C Humi.:56%
 Test Mode : TX Mode
 Ant high:2.3m; Table angle:153'

Freq. (MHz)	Level (dB _u V/m)	Emission			Ant. Factor (dBuV)	Cable Loss (dB)	Remark
		Limits (dBuV/m)	Margin (dB)	Reading (dBuV)			
1 1575.00	39.12	74.00	34.88	8.76	28.20	2.16	Peak
2 1890.00	39.33	74.00	34.67	6.80	30.34	2.19	Peak
3 2207.00	40.61	74.00	33.39	7.09	31.31	2.21	Peak

Remark:

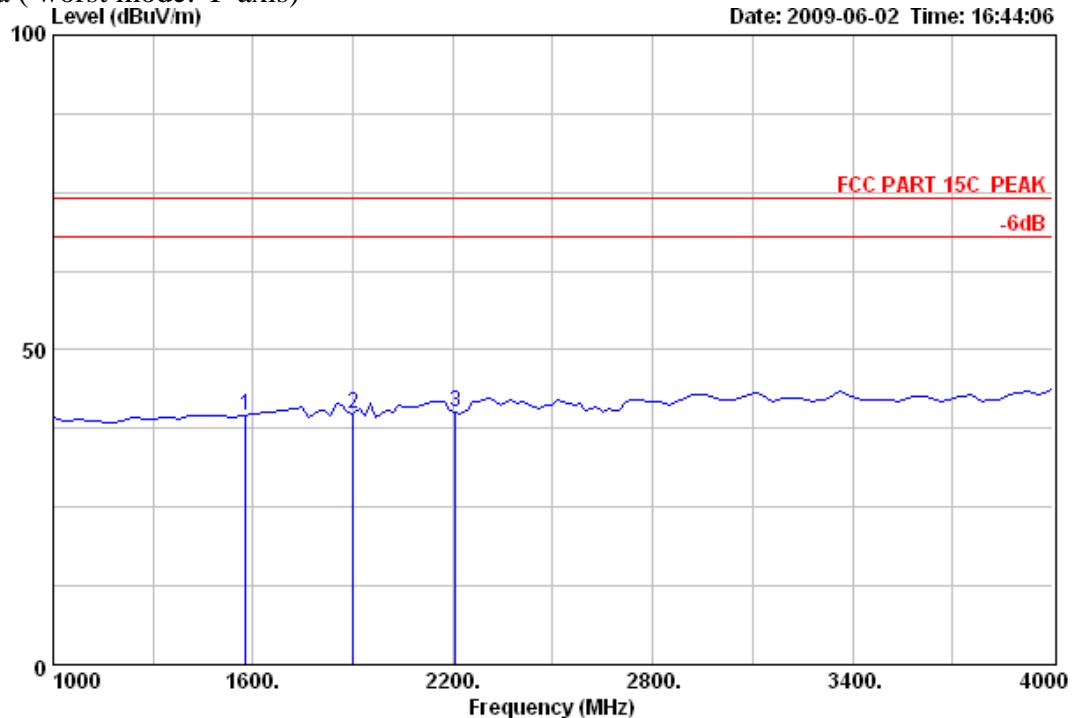
1. Emission Level = Antenna Factor + Cable Loss + Meter Reading
2. Peak Limit=Average Limit+20dB
3. Test uncertainty: $\pm 4.76\text{dB}$ at a level of confidence of 95%.

Fundamental and Harmonics Result

Freq(MHz)	Peak Level (dB μ V/m)	PDCF(dB μ V/m) (See Section 5.4)	Average Level (dB μ V/m)	Limit(dB μ V/m) average	Conclusion
1575.00	39.12	-9.7	29.24	54.00	Pass
1890.00	39.33	-9.7	29.63	54.00	Pass
2207.00	40.61	-9.7	30.91	54.00	Pass



Test Data (worst mode: Y-axis)



Test Site : 10m Chamber
 Limit : FCC PART 15C PEAK
 Dis. / Ant. : 3m 3117 Ant. Pol.: VERTICAL
 EUT : Remote Controller
 M/N : YLT-11C
 Power : DC 3V
 Test Engineer : Jade
 Comment : Temp.:25.2'C Humi.:56%
 Test Mode : TX Mode
 Ant high:1.1m; Table angle:86'

Freq. (MHz)	Emission			Ant. Margin (dB)	Reading (dB _u V)	Factor (dBuV)	Cable Loss (dB/m)	Remark
	Level (dB _u V/m)	Limits (dB _u V/m)	Margin (dB)					
1 1578.00	39.69	74.00	34.31	9.33	28.20	2.16	2.16	Peak
2 1901.00	39.79	74.00	34.21	7.26	30.34	2.19	2.19	Peak
3 2207.00	40.19	74.00	33.81	6.67	31.31	2.21	2.21	Peak

Remark:

1. Emission Level = Antenna Factor + Cable Loss + Meter Reading
2. Peak Limit=Average Limit+20dB
3. Test uncertainty: $\pm 4.76\text{dB}$ at a level of confidence of 95%.

Fundamental and Harmonics Result

Freq(MHz)	Peak Level (dB μ V/m)	PDCF(dB μ V/m) (See Section 5.4)	Average Level (dB μ V/m)	Limit(dB μ V/m) average	Conclusion
1578.00	39.69	-9.7	29.99	54.00	Pass
1901.00	39.79	-9.7	30.09	54.00	Pass
2207.00	40.19	-9.7	30.49	54.00	Pass



20dB Occupied Bandwidth

5.2.6. 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.

5.2.7. Test procedure

Step 1: The EUT was placed on a table which is 0.8m above ground plane.

Step 2: EUT was set to transmit continuously.

Step 3: Set SA Center Frequency = fundamental frequency , RBW=100kHz,VBW=300kHz

Step 4: Set SA trace max hold, then view.

5.2.8. Test Result

Pass.

Test Data

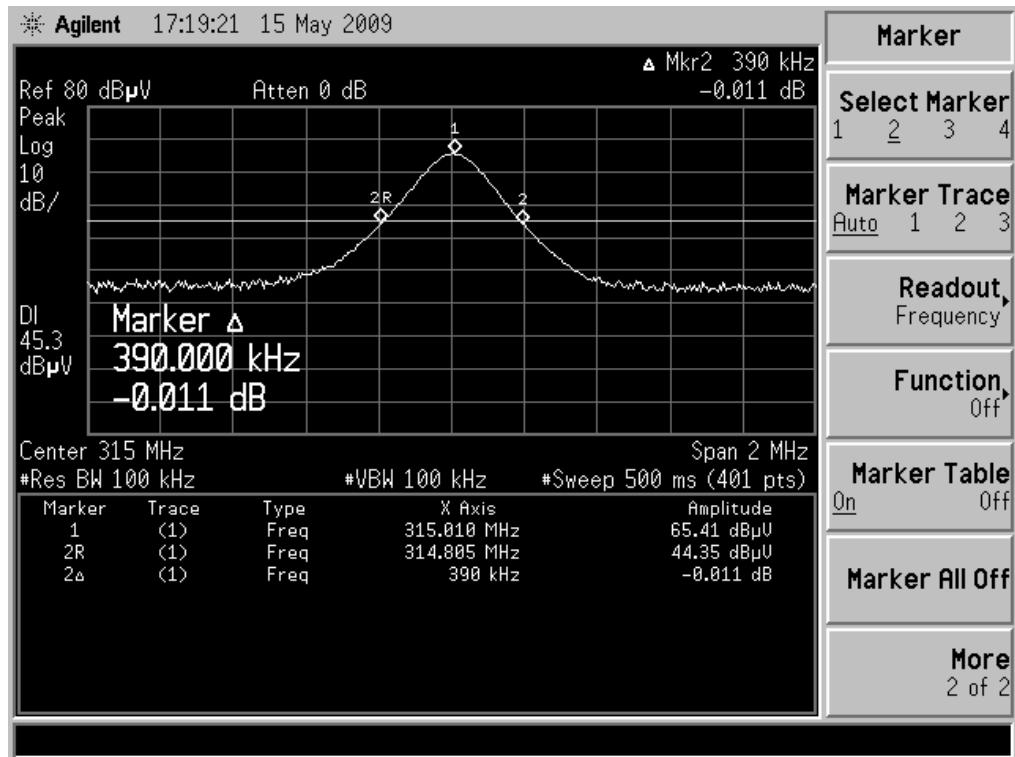
EUT:	Remote Controller	Temperature:	25.4°C
Model No.:	YLT-11C	Humidity:	55%
Test Mode :	TX Mode	Test Engineer:	Jade

Fundamental frequency (MHz)	Bandwidth Measurement (kHz)	Limit (kHz)	Result
315MHz	390.0kHz	787.5 kHz	PASS

Note: Limit= Fundamental frequency \times 0.25% = $315 \times 0.25\% = 787.5$ kHz



The test plots as following:



5.3. Deactivation time

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

5.3.2. Test procedure

Step 1: The EUT was placed on a table which is 0.8m above ground plane.

Step 2: Set EUT as normal operation.

Step 3: Set SA Center Frequency = fundamental frequency , RBW=100kHz,VBW=300kHz

Step 4: Set SA trace max hold, then view.

5.3.3. Test Setup Diagram

Refer to clause 5.3.3

5.3.4. Test Result

Pass.

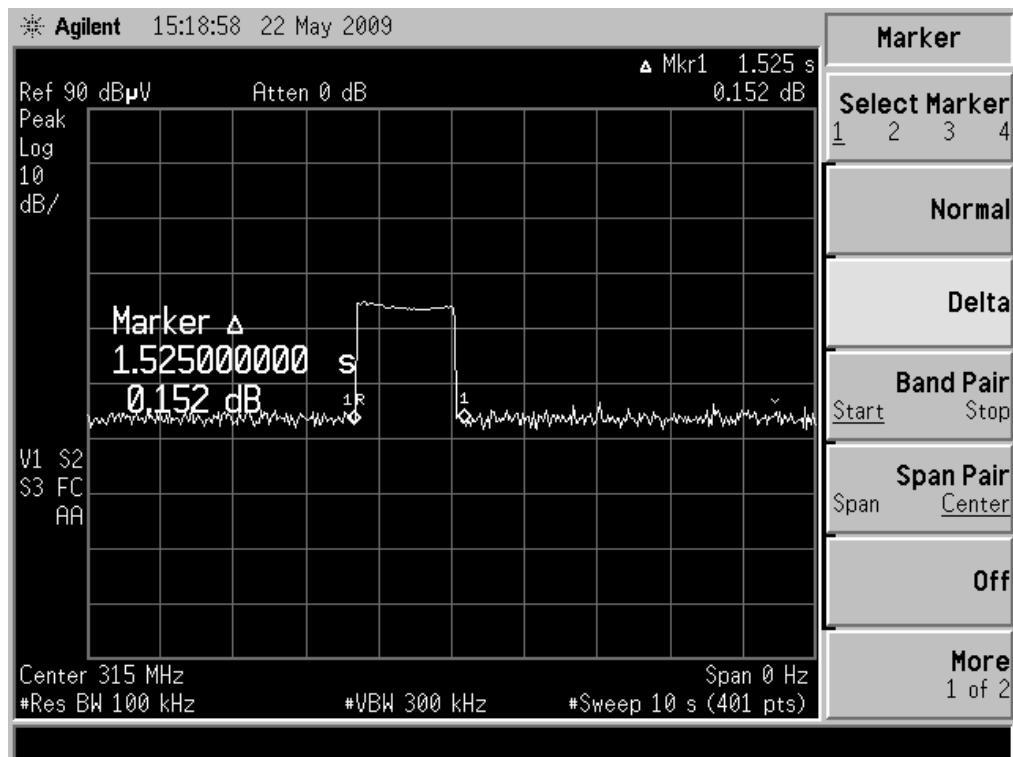
Test Data

EUT	: <u>Wireless Remote Control</u>	Temperature:	<u>25.4°C</u>
Model No.	: <u>TH8</u>	Humidity	<u>55%</u>
Test Mode	: <u>TX mode</u>	Test Engineer :	<u>David</u>

Fundamental frequency (MHz)	Transmission time (ms)	Limit (s)	Result
315MHz	1.525s	5s	PASS



The test plots as following:



5.4. Duty Cycle

5.4.1. Test procedure&condition

Step 1: The EUT was placed on a table which is 0.8m above ground plane.

Step 2: EUT was set to transmit continuously.

Step 3: Set SA Center Frequency = fundamental frequency , RBW=100kHz,VBW=300kHz

Step 4: Set SA trace max hold, then view.

The duty cycle was determined by the following equation :

$$\text{Duty Cycle}(\%) = \frac{(\text{Total On Interval in a Complete Pulse Train})}{(\text{Length of a Complete Pulse Train or 100ms})} \times 100\%$$

Note: Length of a Complete Pulse Train or 100ms, whichever is less.

5.4.2. Test Data

EUT	: Wireless Remote Control	Temperature:	25.4°C
Model No.	: TH8	Humidity	: 55%
Test Mode	: TX mode	Test Engineer	: David

Pulse Train	Number of Pulse	T(ms)	Total Time
Pulse1	6	1.325ms	7.95ms
Pulse2	19	0.475ms	9.025ms
Total ON interval in a complete pulse train(ms)			16.975ms

$$\text{Duty Cycle}(\%) = \frac{16.975\text{ms}}{51.6\text{ms}} \times 100\% = 32.9\%$$

$$\begin{aligned} \text{Pulse Desensitization Correction Factor(PDCF)} &= 20 \times \log(\text{Duty Cycle}) \\ &= 20 \times \log(32.9\%) = -9.7 \end{aligned}$$



The test plots as following:

Table 1

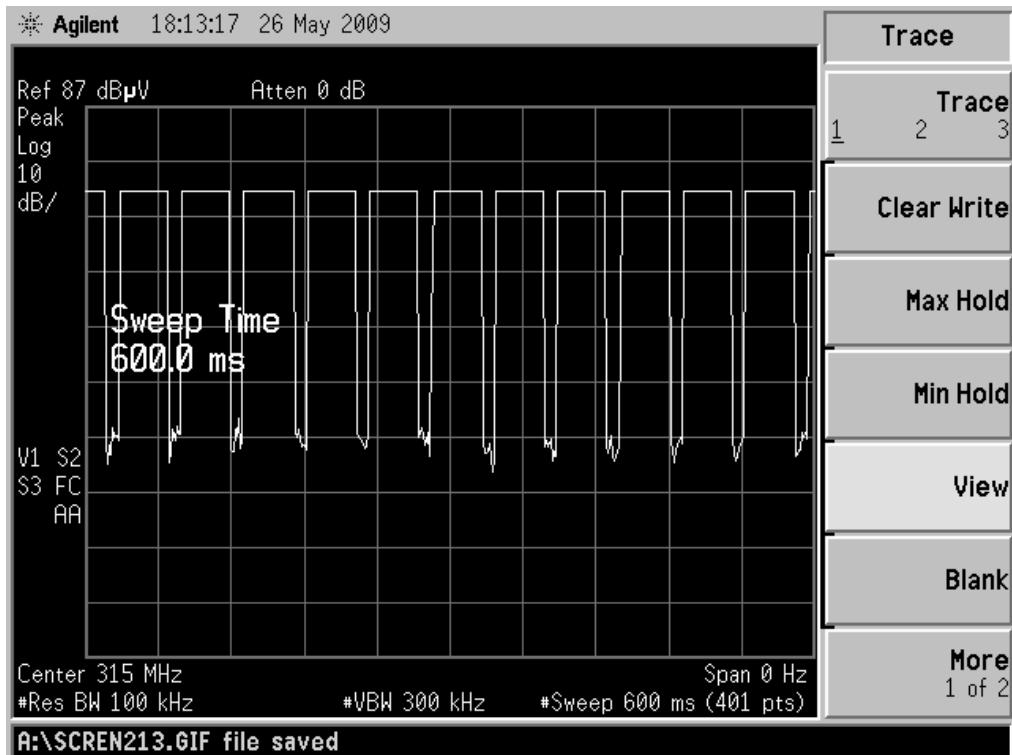


Table 2

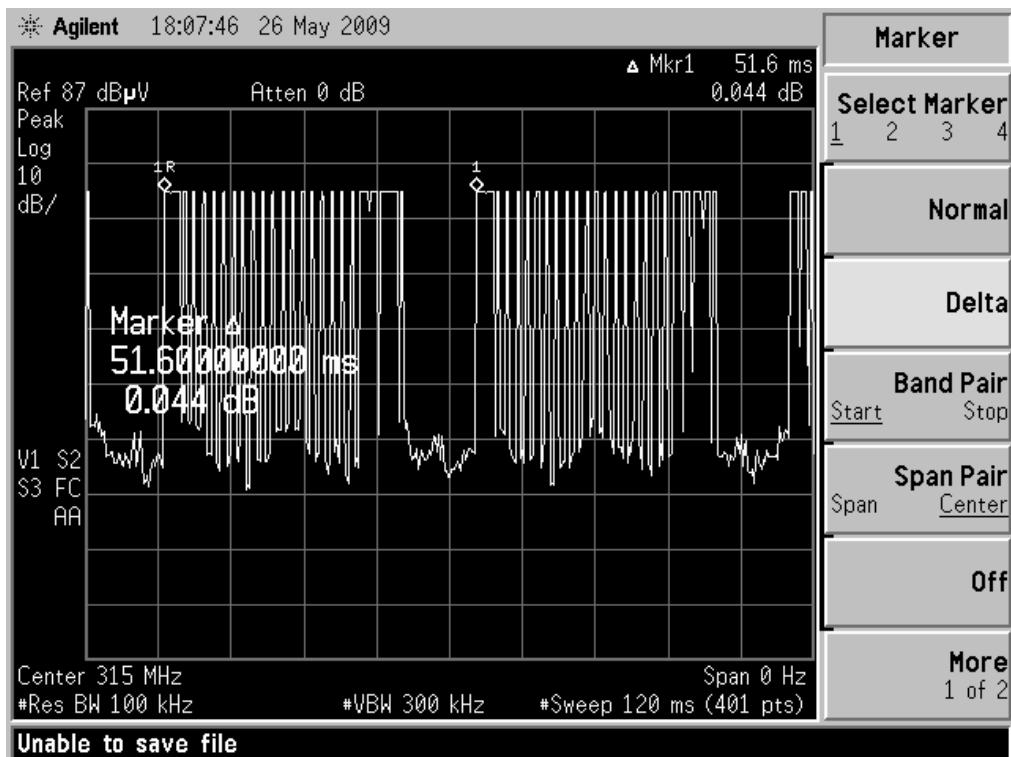


Table 3

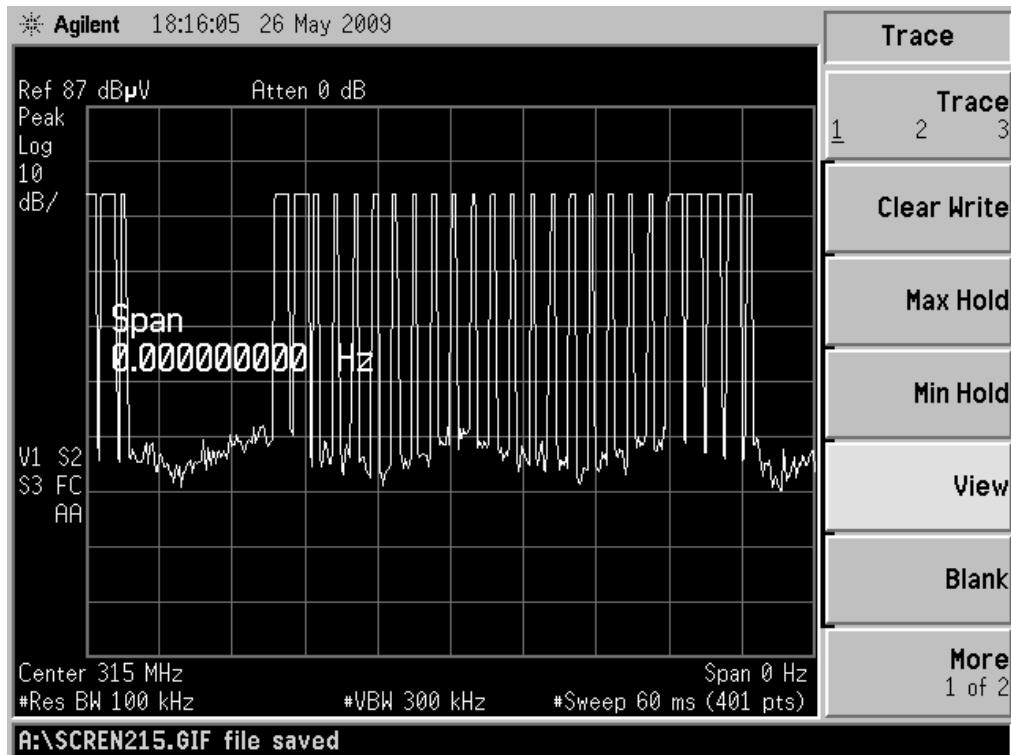


Table 4 Pulse 1

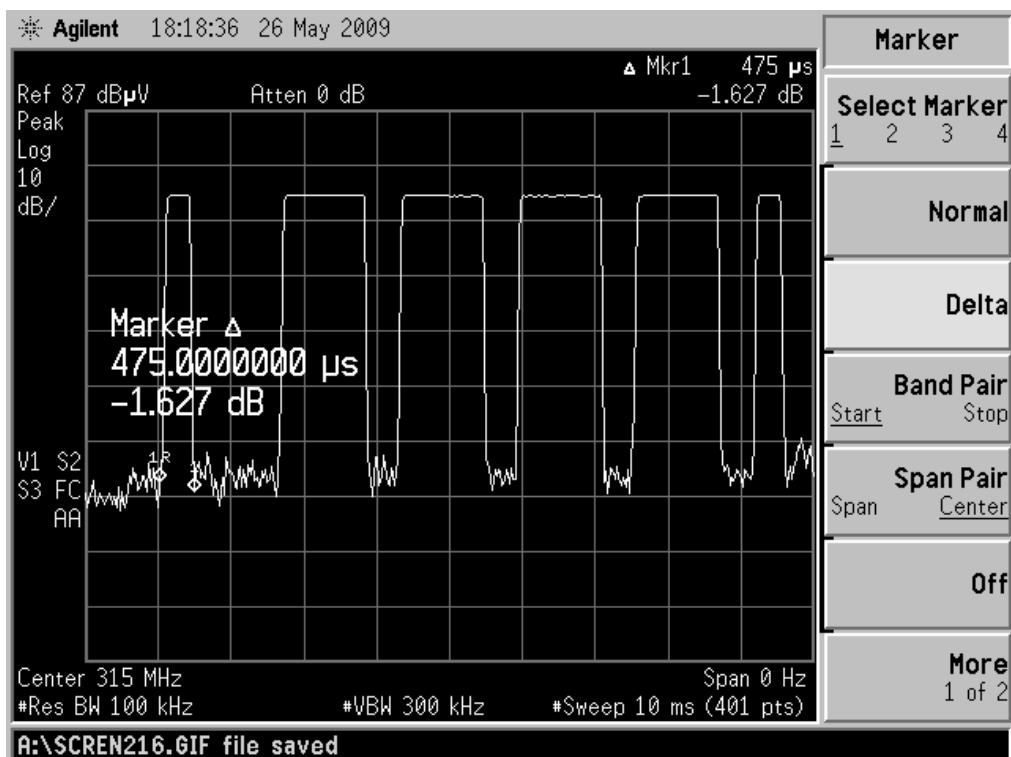
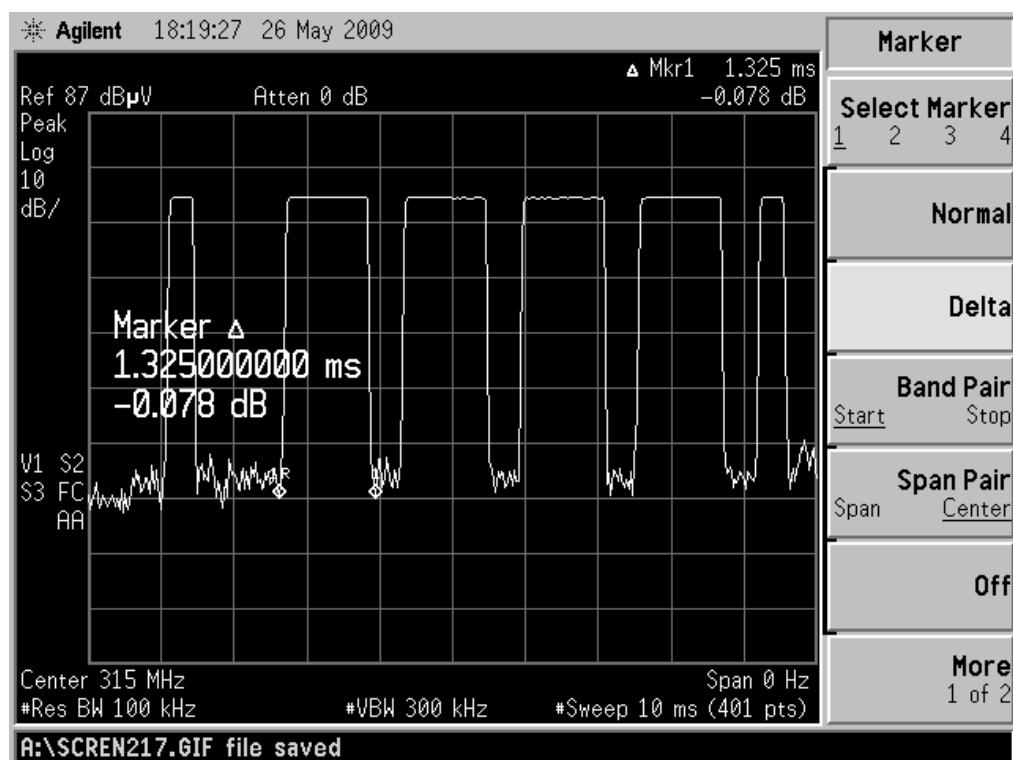


Table 5 Pulse 2



6. PHOTOGRAPHS OF TEST SET-UP

Figure 1

Set-up for radiated measurements (30MHz to 1000MHz)

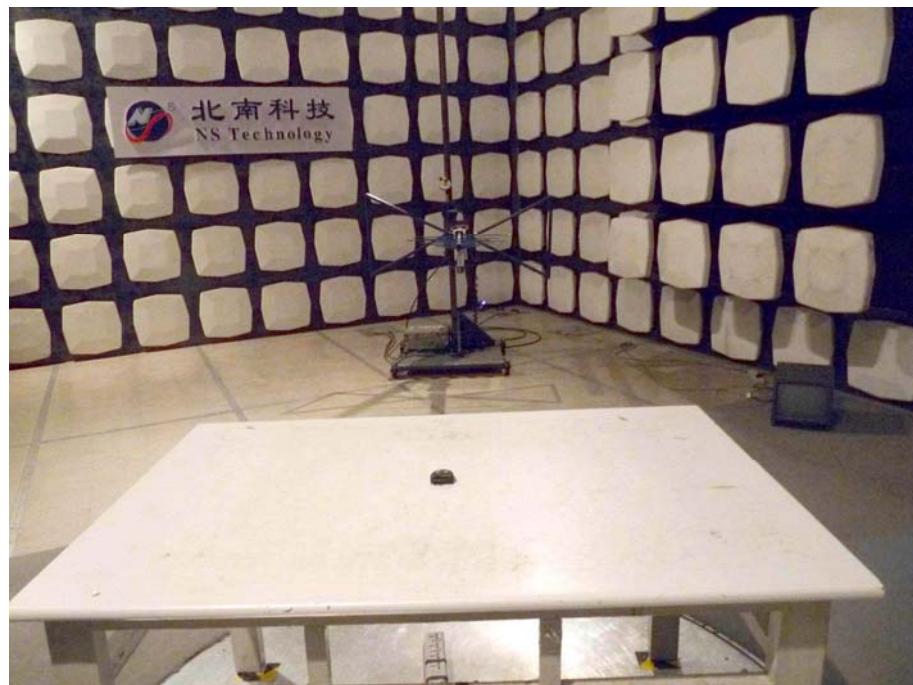


Figure 2

Set-up for radiated measurements (1000MHz to 4000MHz)



7. PHOTOGRAPHS OF THE EUT

Figure 1
General Appearance of the EUT



Figure 2
General Appearance of the EUT



Figure 3
General Appearance of the PCB

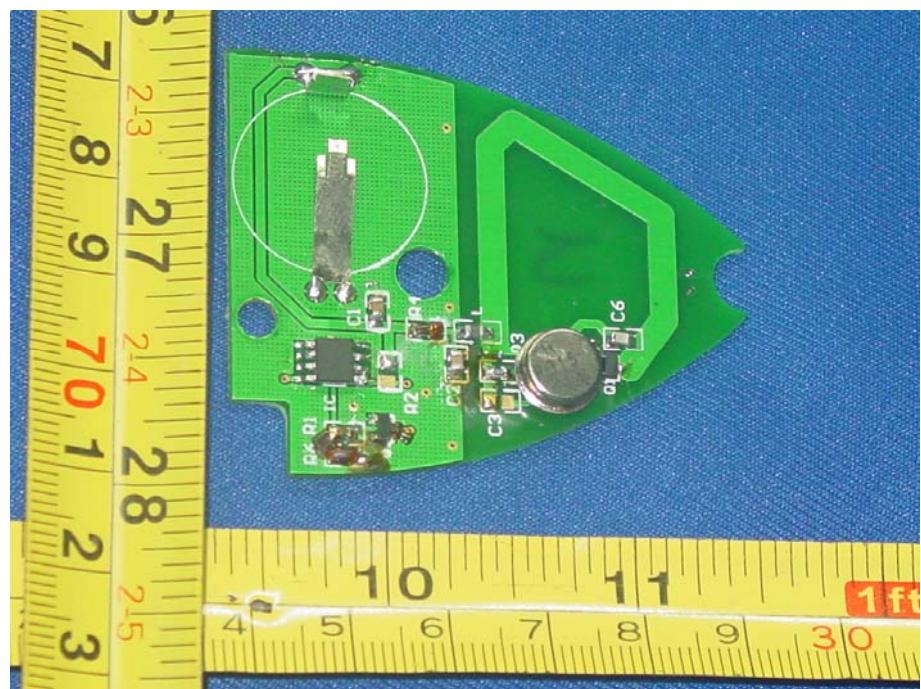


Figure 4
General Appearance of the PCB

