Test Report

Product Name : RFID Hand Held Reader

Model No. : SLH-10200

FCC ID. : T39SLH10200

Applicant : Sunlit SystemTechnology Corp.

Address : 8F., No. 19, Land 120, Sec. 1, Neihu Rd., Taipei 114, Taiwan R.O.C.

Date of Receipt : March 15, 2006

Issued Date : March 31, 2006

Report No. : 063L094-RF-US-P06V01

The Test Results relate only to the samples tested.
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This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government

Test Report Certification

Issued Date: March 31, 2006
Report No.: 063L094-RF-US-P06V01

QuieTek Corporation

Accredited by NIST (NVLAP)
NVLAP Lab Code: 200533-0

Product Name	:	RFID Hand Held Reader
Applicant	:	Sunlit SystemTechnology Corp.
Address	:	8F., No. 19, Land 120, Sec. 1, Neihu Rd., Taipei 114, Taiwan R.O.C.
Manufacturer	:	Sunlit SystemTechnology Corp.
Model No.	:	SLH-10200
FCC ID.	:	T39SLH10200
Rated Voltage	:	AC 120V/60Hz
Working Voltage	:	DC 4.5V
Trade Name	:	日晶科技股份有限公司 / Sunlit System Technology Corp. μ-Chip System Development
Applicable Standard	:	FCC CFR Title 47 Part 15 Subpart C: 2005 ANSI C63.4: 2003 CISPR 22: 2005
Test Result	:	Complied

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Documented By : Genie Chang

(Genie Chang)

CNLA 0914

Tested By : Tom Hsieh

(Tom Hsieh)

Approved By : Gene Chang

(Gene Chang)

FC

TABLE OF CONTENTS

	Description	Page
1.	**GENERAL INFORMATION**	**5**
1.1.	EUT Description	5
1.2.	Operational Description	6
1.3.	Tested System Details	7
1.4.	Configuration of Tested System	7
1.5.	EUT Exercise Software	8
1.6.	Test Facility	9
2.	**CONDUCTED EMISSION**	**10**
2.1.	Test Equipment	10
2.2.	Test Setup	10
2.3.	Limits	11
2.4.	Test Procedure	11
2.5.	Uncertainty	11
2.6.	Test Result of Conducted Emission	12
3.	**PEAK POWER OUTPUT**	**13**
3.1.	Test Equipment	13
3.2.	Test Setup	13
3.3.	Limit	13
3.4.	Uncertainty	13
3.5.	Test Result of Peak Power Output	14
4.	**RADIATED EMISSION**	**15**
4.1.	Test Equipment	15
4.2.	Test Setup	16
4.3.	Limits	16
4.4.	Test Procedure	17
4.5.	Uncertainty	17
4.6.	Test Result of Radiated Emission	18
5.	**BAND EDGE**	**24**
5.1.	Test Equipment	24
5.2.	Test Setup	24
5.3.	Limit	25
5.4.	Test Procedure	25
5.5.	Uncertainty	25
5.6.	Test Result of Band Edge	26
6.	**CHANNEL NUMBER**	**34**
6.1.	Test Equipment	34
6.2.	Test Setup	34
6.3.	Limit	34
6.4.	Uncertainty	34
6.5.	Test Result of Channel Number	35
7.	**CHANNEL SEPARATION**	**37**
7.1.	Test Equipment	37
7.2.	Test Setup	37
7.3.	Limit	37
7.4.	Uncertainty	37
7.5.	Test Result of Channel Separation	38
8.	**DWELL TIME**	**39**
8.1.	Test Equipment	39
8.2.	Test Setup	39
8.3.	Limit	39
8.4.	Uncertainty	39
8.5.	Test Result of Dwell Time	40

9. OCCUPIED BANDWIDTH 42
9.1. Test Equipment 42
9.2. Test Setup 42
9.3. Limits 42
9.4. Uncertainty 42
9.5. Test Result of Occupied Bandwidth 43
10. EMI REDUCTION METHOD DURING COMPLIANCE TESTING 46
Attachment 1: EUT Test Photographs
Attachment 2: EUT Detailed Photographs

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	:	RFID Hand Held Reader
Trade Name	:	日晶科技股份有限公司 / Sunlit System Technology Corp. μ-Chip System Development
FCC ID.	:	T39SLH10200
Model No.	:	SLH-10200
Frequency Range	:	2402 - 2477MHz
Channel Number	:	76
Type of Modulation	:	FHSS
Antenna Type	:	Printed
Antenna Gain	:	0 dBi
Channel Control	:	Auto

Center Frequency of Each Channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 00:	2402 MHz	Channel 20:	2422 MHz	Channel 40:	2442 MHz	Channel 60:	2462 MHz
Channel 01:	2403 MHz	Channel 21:	2423 MHz	Channel 41:	2443 MHz	Channel 61:	2463 MHz
Channel 02:	2404 MHz	Channel 22:	2424 MHz	Channel 42:	2444 MHz	Channel 62:	2464 MHz
Channel 03:	2405 MHz	Channel 23:	2425 MHz	Channel 43:	2445 MHz	Channel 63:	2465 MHz
Channel 04:	2406 MHz	Channel 24:	2426 MHz	Channel 44:	2446 MHz	Channel 64:	2466 MHz
Channel 05:	2407 MHz	Channel 25:	2427 MHz	Channel 45:	2447 MHz	Channel 65:	2467 MHz
Channel 06:	2408 MHz	Channel 26:	2428 MHz	Channel 46:	2448 MHz	Channel 66:	2468 MHz
Channel 07:	2409 MHz	Channel 27:	2429 MHz	Channel 47:	2449 MHz	Channel 67:	2469 MHz
Channel 08:	2410 MHz	Channel 28:	2430 MHz	Channel 48:	2450 MHz	Channel 68:	2470 MHz
Channel 09:	2411 MHz	Channel 29:	2431 MHz	Channel 49:	2451 MHz	Channel 69:	2471 MHz
Channel 10:	2412 MHz	Channel 30:	2432 MHz	Channel 50:	2452 MHz	Channel 70:	2472 MHz
Channel 11:	2413 MHz	Channel 31:	2433 MHz	Channel 51:	2453 MHz	Channel 71:	2473 MHz
Channel 12:	2414 MHz	Channel 32:	2434 MHz	Channel 52:	2454 MHz	Channel 72:	2474 MHz
Channel 13:	2415 MHz	Channel 33:	2435 MHz	Channel 53:	2455 MHz	Channel 73:	2475 MHz
Channel 14:	2416 MHz	Channel 34:	2436 MHz	Channel 54:	2456 MHz	Channel 74:	2476 MHz
Channel 15:	2417 MHz	Channel 35:	2437 MHz	Channel 55:	2457 MHz	Channel 75:	2477 MHz
Channel 16:	2418 MHz	Channel 36:	2438 MHz	Channel 56:	2458 MHz		
Channel 17:	2419 MHz	Channel 37:	2439 MHz	Channel 57:	2459 MHz		
Channel 18:	2420 MHz	Channel 38:	2440 MHz	Channel 58:	2460 MHz		
Channel 19:	2421 MHz	Channel 39:	2441 MHz	Channel 59:	2461 MHz		

The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals

Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. The transmitter is presented with a continuous data stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its 76 channels and over the minimum number of hopping channels (75 channels).

The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

Note:

1. This device is RFID Hand Held Reader with a built-in 2.4GHz transceiver.
2. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.247 for spread spectrum devices.
3. Regarding to the operation frequency, the lowest, middle, and highest frequency are selected to perform the test.
4. This device is a composite device in accordance with Part 15 Subpart B regulations. The function for the receiver was measured and made a test report that the report number is 063L094-RF-US-P01V02, certified under Declaration of Conformity.
5. QuieTek verified among construction and function in typical operation, then shown in this test report.

1.2. Operational Description

The EUT is a RFID Hand Held Reader with 76 channels.

This device provides wireless technology that revolutionizes personal connectivity. It is the solution for the seamless integration of RFID technology into an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders

Test Mode:	Mode 1: Transmitter

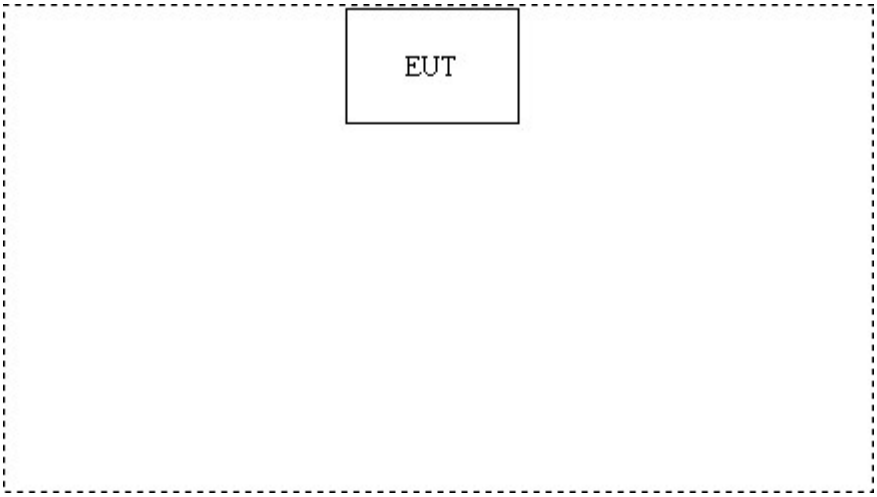
1.3. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

	Product	Manufacturer	Model No.	Serial No.	Power Cord
(1)	N/A	N/A	N/A	N/A	N/A

Signal Cable Type		Signal cable Description
A.	N/A	N/A

1.4. Configuration of Tested System



1.5. EUT Exercise Software

(1) Setup the EUT as shown in Section 1.4.

(2) Install the batteries of the EUT.

(3) Setup the test TX channel.

(4) Press the right button to start the continuous transmission.

(5) Verify the EUT operation properly.

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	30-65
Barometric pressure (mbar)	860-1060	950-1000

Site Description: June 22, 2001 File on
Federal Communications Commission
FCC Engineering Laboratory
7435 Oakland Mills Road
Columbia, MD 21046
Reference 31040/SIT1300F2

0914

July 03, 2001 Accreditation on NVLAP
NVLAP Lab Code: 200533-0

Site Name: Quietek Corporation

Site Address: No. 5-22, Ruei-Shu Valley, Ruei-Ping Tsuen,
Lin-Kou Shiang, Taipei,
Taiwan, R.O.C.
TEL: 886-2-8601-3788 / FAX : 886-2-8601-3789
E-Mail : service@quietek.com

NVLAP Lab Code: 200533-0

2. Conducted Emission

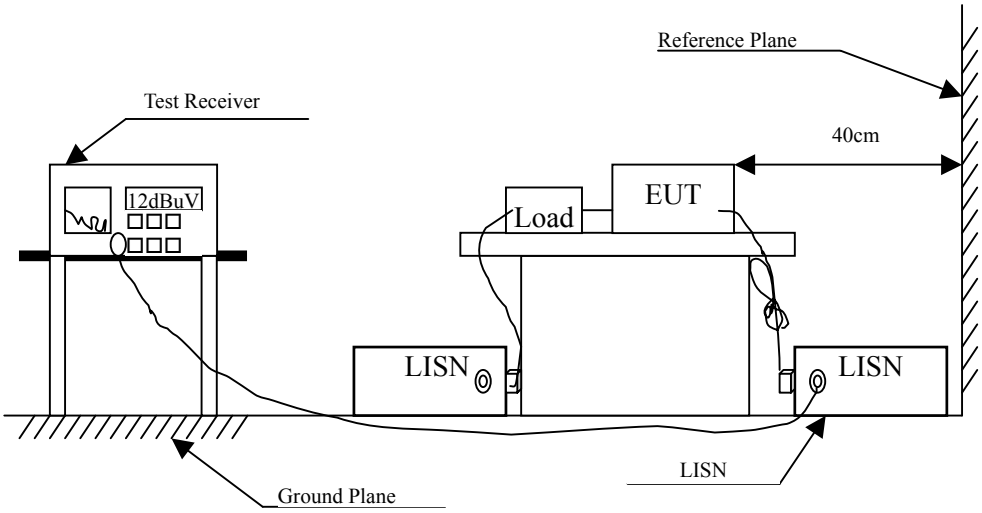
2.1. Test Equipment

The following test equipment are used during the conducted emission test:

Item	Instrument	Manufacturer	Type No./Serial No	Last Cal.	Remark
1	Test Receiver	R & S	ESCS 30 / 825442/018	Sep., 2005	
2	L.I.S.N.	R & S	ENV4200 / 848411/10	Feb., 2006	EUT
3	L.I.S.N.	Kyoritsu	KNW-407/8-1420-3	May, 2005	Peripherals
4	Pulse Limiter	R & S	ESH3-Z2 / 357.8810.52	Feb., 2006	
5	No.1 Shielded Room				

Note: All equipment upon which need to calibrated are with calibration period of 1 year.

2.2. Test Setup



2.3. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

Remarks: In the above table, the tighter limit applies at the band edges.

2.4. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2003 on conducted measurement.

Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

2.5. Uncertainty

The measurement uncertainty is defined as ± 2.02 dB

2.6. Test Result of Conducted Emission

The EUT is powered by batteries. This test item is not performed.

3. Peak Power Output

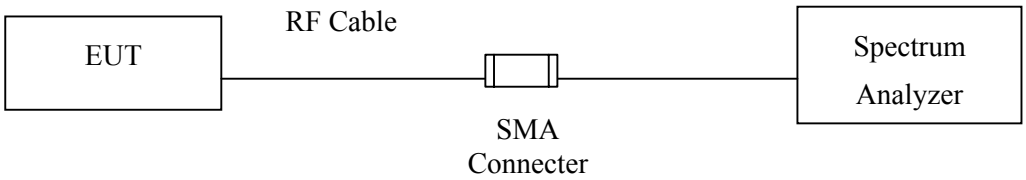
3.1. Test Equipment

The following test equipments are used during the radiated emission tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2005

Note: 1. All equipment upon which need to calibrated are with calibration period of 1 year.
2. Mark "X" test instruments are used to measure the final test results.

3.2. Test Setup



3.3. Limit

The maximum peak power shall be less 1Watt.

3.4. Uncertainty

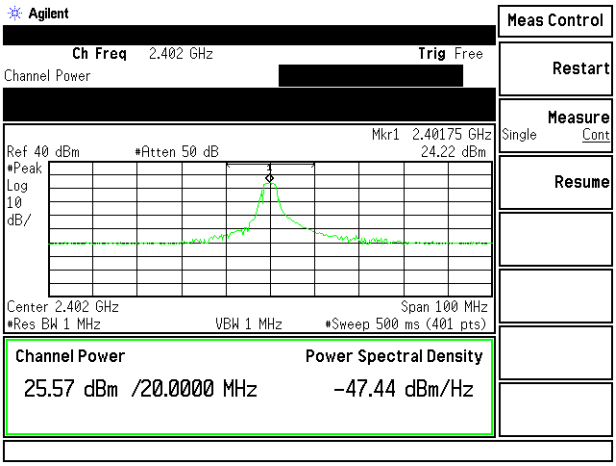
The measurement uncertainty is defined as ± 1.27 dB

3.5. Test Result of Peak Power Output

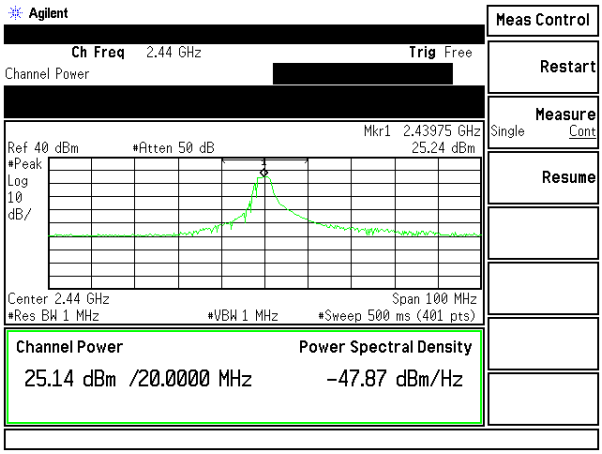
Product : RFID Hand Held Reader
Test Item : Peak Power Output
Test Site : CTR01
Test Mode : Mode 1: Transmitter

Channel No.	Frequency (MHz)	Measurement	Required Limit	Result
Channel 01	2402.00	25.57dBm	1 Watt= 30 dBm	Pass
Channel 38	2440.00	25.14dBm	1 Watt= 30 dBm	Pass
Channel 75	2477.00	25.58dBm	1 Watt= 30 dBm	Pass

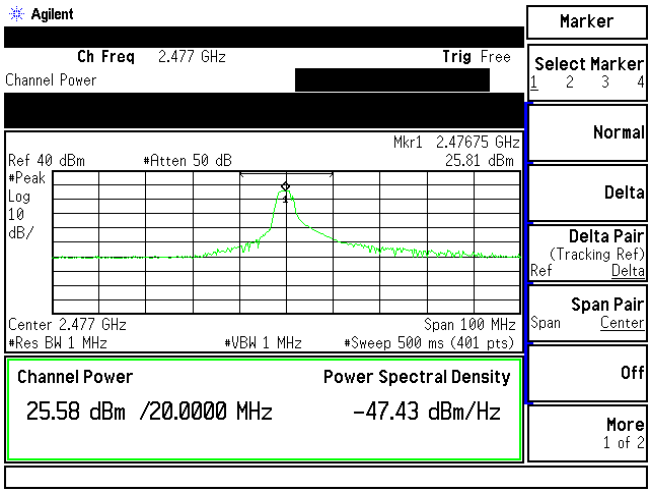
Channel 01



Channel 38



Channel 76



4. Radiated Emission

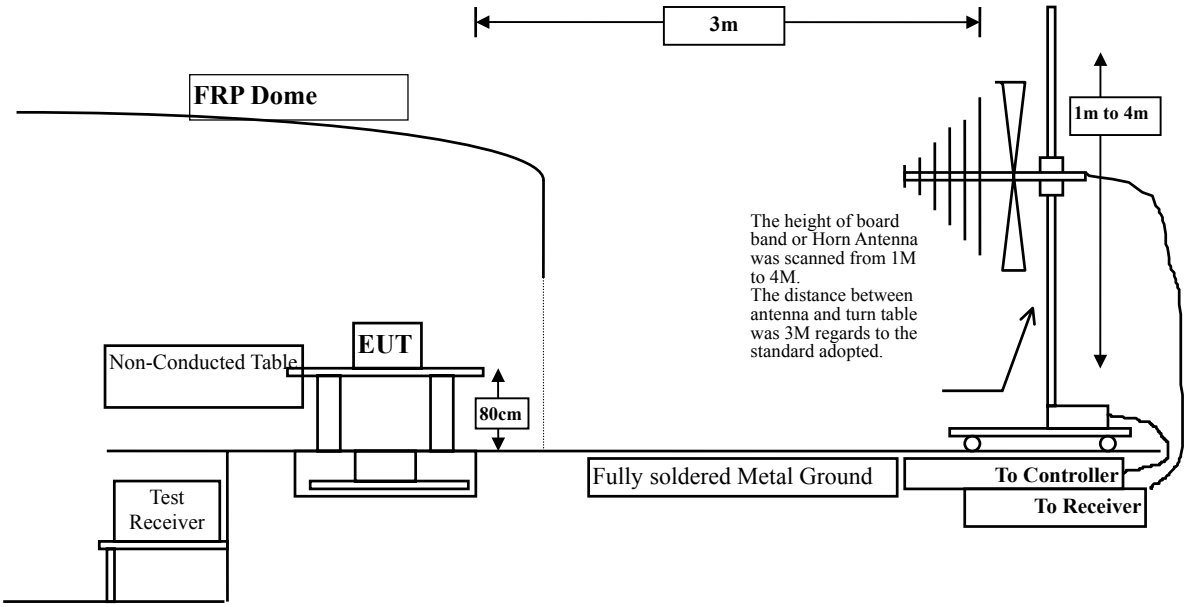
4.1. Test Equipment

The following test equipment are used during the radiated emission test:

Test Site	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
☐Site # 1	Test Receiver	R & S	ESVS 10 / 834468/003	May, 2005
	Spectrum Analyzer	Advantest	R3162/ 00803480	May, 2005
	Pre-Amplifier	Advantest	BB525C/ 3307A01812	May, 2005
	Bilog Antenna	SCHAFFNER	CBL6112B / 2697	Sep., 2005
☐Site # 2	Test Receiver	R & S	ESCS 30 / 836858 / 022	May, 2005
	Spectrum Analyzer	Advantest	R3162 / 100803466	May, 2005
	Pre-Amplifier	Advantest	BB525C/3307A01814	May, 2005
	Bilog Antenna	SCHAFFNER	CBL6112B / 2705	May, 2005
	Horn Antenna	ETS	3115 / 0005-6160	Sep., 2005
	Pre-Amplifier	QTK	QTK-AMP-01/ 0001	May, 2005
☒Site # 3	Test Receiver	R & S	ESI 26 / 838786 / 004	May, 2005
	Spectrum Analyzer	Advantest	R3162 / 100803480	May, 2005
	Pre-Amplifier	QTK	QTK-AMP-03 / 0003	May, 2005
	Bilog Antenna	SCHAFFNER	CBL6112B / 2697	May, 2005
	Horn Antenna	Schwarzbeck	9120D / 305, 306	July, 2005
	Horn Antenna	Schwarzbeck	BBHA9170 / 208, 209	July, 2005
	Pre-Amplifier	QTK	QTK-AMP-01 / 0001	July, 2005
	Pre-Amplifier	HP	8449B / 3008A01123	July, 2005
	Pre-Amplifier	MITEQ	AMF-4D-180400-45-6P	May, 2005

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.
2. Mark “X” test instruments are used to measure the final test results.

4.2. Test Setup



4.3. Limits

➢ **General Radiated Emission Limits**

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

FCC Part 15 Subpart C Paragraph 15.209 Limits		
Frequency MHz	uV/m @3m	dBuV/m@3m
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Remarks: 1. RF Voltage (dBuV) = 20 log RF Voltage (uV)
2. In the Above Table, the tighter limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

4.4. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level.
The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.
Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.4: 2003 on radiated measurement.
The additional latch filter below 1GHz was used to measure the level of harmonics radiated emission during field dtrength of harmonics measurement.
The bandwidth below 1GHz setting on the field strength meter (R&S Test Receiver ESCS 30)is 120 kHz, above 1GHz are 1 MHz.
The frequency range from 30MHz to 10th harminics is checked.

4.5. Uncertainty

The measurement uncertainty above 1G is defined as ± 3.9 dB
under 1G is defined as ± 3.8 dB

4.6. Test Result of Radiated Emission

Product : RFID Hand Held Reader
Test Item : Harmonic Radiated Emission
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter (Channel 00)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
4804.000	4.345	44.398	48.743	-25.227	74.000
7206.000	11.561	42.186	53.747	-20.223	74.000
9608.000	15.813	38.703	54.516	-19.454	74.000
12010.000	17.911	36.157	54.068	-19.902	74.000
Average Detector:					
9608.000	15.814	32.253	48.066	-5.904	74.000
12010.000	17.911	32.250	50.161	-3.809	74.000
Vertical					
Peak Detector:					
4804.000	4.345	43.161	47.506	-26.464	74.000
7206.000	11.557	43.795	55.352	-18.618	74.000
9608.000	15.813	40.148	55.961	-18.009	74.000
Average Detector:					
7206.000	11.559	33.332	44.891	-9.079	74.000
9608.000	15.813	31.408	47.221	-6.749	74.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz。
3. Receiver setting (AVG Detector) : RBW:1MHz; VBW:30Hz; Span:10MHz。
4. Emission Level = Reading Level + Correct Factor.
5. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : RFID Hand Held Reader
Test Item : Harmonic Radiated Emission
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter (Channel 38)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
4880.000	4.555	42.702	47.257	-26.713	74.000
7320.000	12.443	42.175	54.618	-19.352	74.000
9760.000	14.650	38.575	53.224	-20.746	74.000
Average Detector:					
7320.000	12.444	35.665	48.108	-5.862	74.000
Vertical					
Peak Detector:					
4880.000	4.554	45.068	49.622	-24.348	74.000
7320.000	12.445	42.328	54.773	-19.197	74.000
9760.000	14.657	42.029	56.686	-17.284	74.000
Average Detector:					
7320.000	12.442	35.306	47.748	-6.222	74.000
9760.000	14.657	33.253	47.910	-6.060	74.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz。
3. Receiver setting (AVG Detector) : RBW:1MHz; VBW:30Hz; Span:10MHz。
4. Emission Level = Reading Level + Correct Factor.
5. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : RFID Hand Held Reader
Test Item : Harmonic Radiated Emission
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter (Channel 75)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
4954.600	4.782	43.202	47.985	-25.985	74.000
7431.000	12.876	41.108	53.985	-19.985	74.000
9908.000	14.269	42.999	57.268	-16.702	74.000
Average Detector:					
9908.000	14.269	36.138	50.407	-3.563	74.000
Vertical					
Peak Detector:					
4954.600	4.782	42.802	47.584	-26.386	74.000
7431.000	12.878	40.266	53.145	-20.825	74.000
9908.000	14.270	43.025	57.294	-16.676	74.000
Average Detector:					
9908.000	14.269	34.107	48.376	-5.594	74.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz。
3. Receiver setting (AVG Detector) : RBW:1MHz; VBW:30Hz; Span:10MHz。
4. Emission Level = Reading Level + Correct Factor.
5. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : RFID Hand Held Reader
Test Item : General Radiated Emission
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter (Channel 00)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
37.280	16.378	19.400	35.778	-4.222	40.000
42.100	13.527	14.600	28.128	-11.872	40.000
71.200	7.650	13.100	20.749	-19.251	40.000
449.500	18.236	19.100	37.336	-8.664	46.000
454.300	18.478	9.280	27.758	-18.242	46.000
694.000	21.092	15.100	36.192	-9.808	46.000
Vertical					
37.200	15.490	18.800	34.290	-5.710	40.000
42.100	12.264	20.300	32.564	-7.436	40.000
46.900	8.880	15.010	23.891	-16.109	40.000
442.200	18.958	15.700	34.658	-11.342	46.000
454.300	18.667	9.280	27.947	-18.053	46.000
932.100	24.140	6.360	30.500	-15.500	46.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " " means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : RFID Hand Held Reader
Test Item : General Radiated Emission
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter (Channel 38)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
163.300	10.384	12.160	22.544	-20.956	43.500
199.700	9.709	11.700	21.408	-22.092	43.500
231.200	10.997	17.600	28.597	-17.403	46.000
461.600	18.641	15.600	34.241	-11.759	46.000
478.600	18.930	11.860	30.790	-15.210	46.000
493.100	18.351	18.100	36.451	-9.549	46.000
Vertical					
262.800	14.735	16.700	31.435	-14.565	46.000
451.900	18.739	10.760	29.499	-16.501	46.000
459.230	18.400	12.680	31.080	-14.920	46.000
466.500	18.457	16.800	35.257	-10.743	46.000
505.300	18.595	16.100	34.695	-11.305	46.000
539.200	19.991	15.630	35.621	-10.379	46.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " " means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : RFID Hand Held Reader
Test Item : General Radiated Emission
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter (Channel 75)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
262.800	14.395	16.700	31.095	-14.905	46.000
284.600	13.562	14.780	28.341	-17.659	46.000
459.200	18.565	12.580	31.145	-14.855	46.000
466.600	18.605	12.840	31.445	-14.555	46.000
519.800	18.603	15.400	34.004	-11.996	46.000
544.100	19.945	16.100	36.045	-9.955	46.000
Vertical					
46.890	8.886	16.100	24.986	-15.014	40.000
199.700	9.711	10.110	19.821	-23.679	43.500
231.200	11.297	17.700	28.997	-17.003	46.000
461.600	18.488	15.100	33.588	-12.412	46.000
478.600	18.642	11.300	29.943	-16.057	46.000
493.100	18.451	17.100	35.551	-10.449	46.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " " means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

5. Band Edge

5.1. Test Equipment

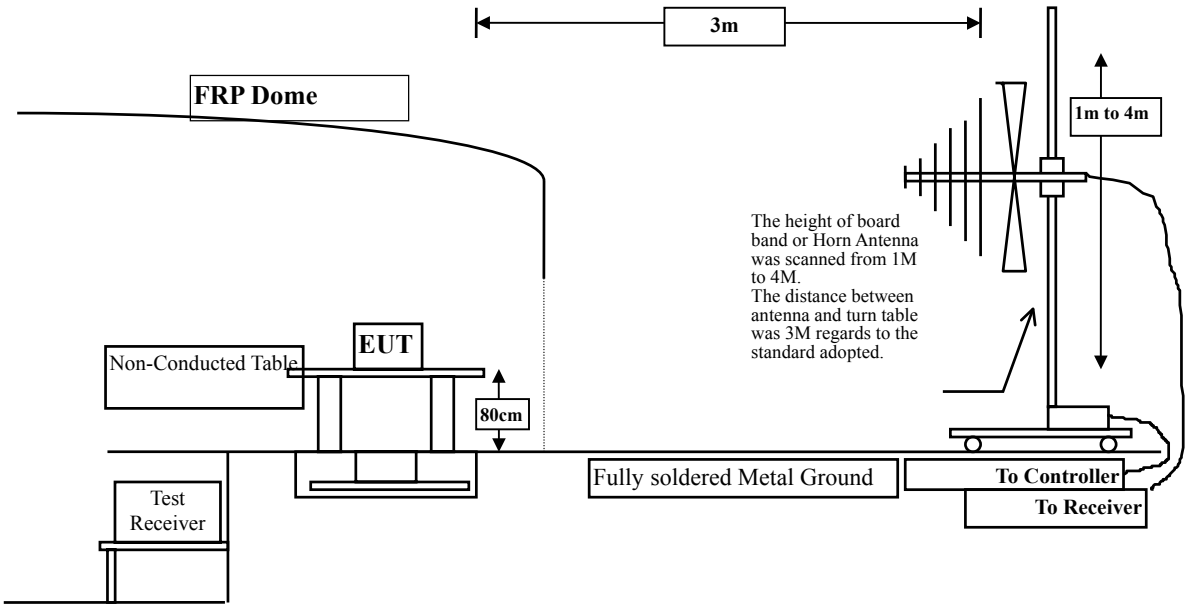
The following test equipments are used during the band edge tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Test Receiver	R & S	ESI 26 / 838786 / 004	May, 2005
X	Spectrum Analyzer	Advantest	R3162 / 100803480	May, 2005
X	Pre-Amplifier	QTK	QTK-AMP-03 / 0003	May, 2005
X	Bilog Antenna	SCHAFFNER	CBL6112B / 2697	May, 2005
X	Horn Antenna	Schwarzbeck	9120D / 305, 306	July, 2005
X	Horn Antenna	Schwarzbeck	BBHA9170 / 208, 209	July, 2005
X	Pre-Amplifier	QTK	QTK-AMP-01 / 0001	July, 2005
X	Pre-Amplifier	HP	8449B / 3008A01123	July, 2005
X	Pre-Amplifier	MITEQ	AMF-4D-180400-45-6P	May, 2005
	Test Site: No.3 OATS			

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.
2. Mark "X" test instruments are used to measure the final test results.

5.2. Test Setup

RF Radiated Measurement:



5.3. Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

5.4. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.
Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.4:2003 on radiated measurement.
The bandwidth below 1GHz setting on the field strength meter (R&S Test Receiver ESCS 30)is 120 kHz, above 1GHz are 1 MHz.

5.5. Uncertainty

The measurement uncertainty above 1G is defined as ± 3.9 dB
under 1G is defined as ± 3.8 dB

5.6. Test Result of Band Edge

Product : RFID Hand Held Reader
Test Item : Band Edge
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter (Channel 00)

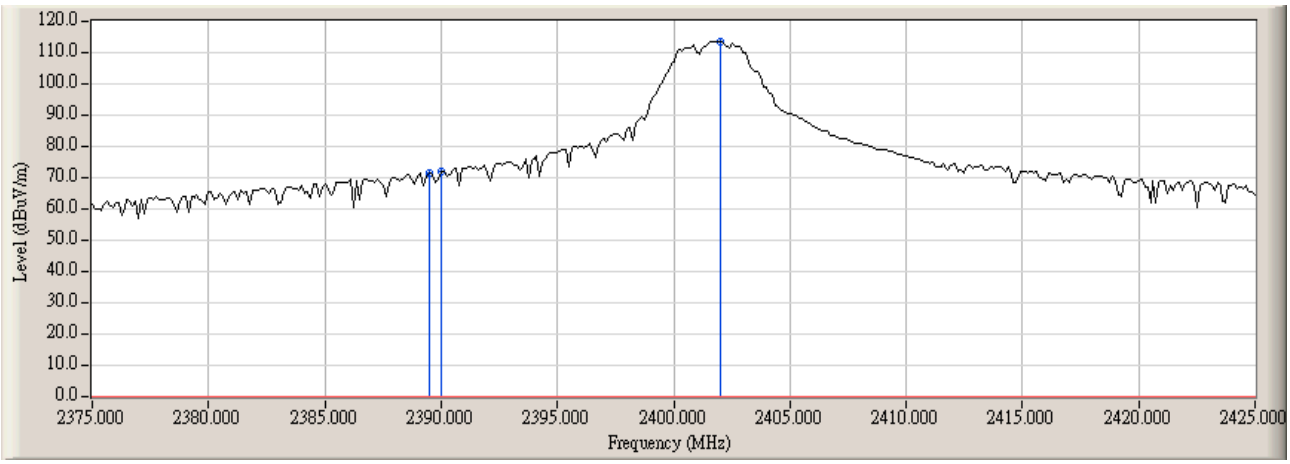
RF Radiated Measurement:

Channel No.	Frequency (MHz)	Required Limit (dBc)	Result
00	<2400	>20	Pass

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
00 (Peak)	2389.500	73.790	71.410	74.00	54.00	Pass
00 (Average)	2389.500	48.760	46.380	74.00	54.00	Pass

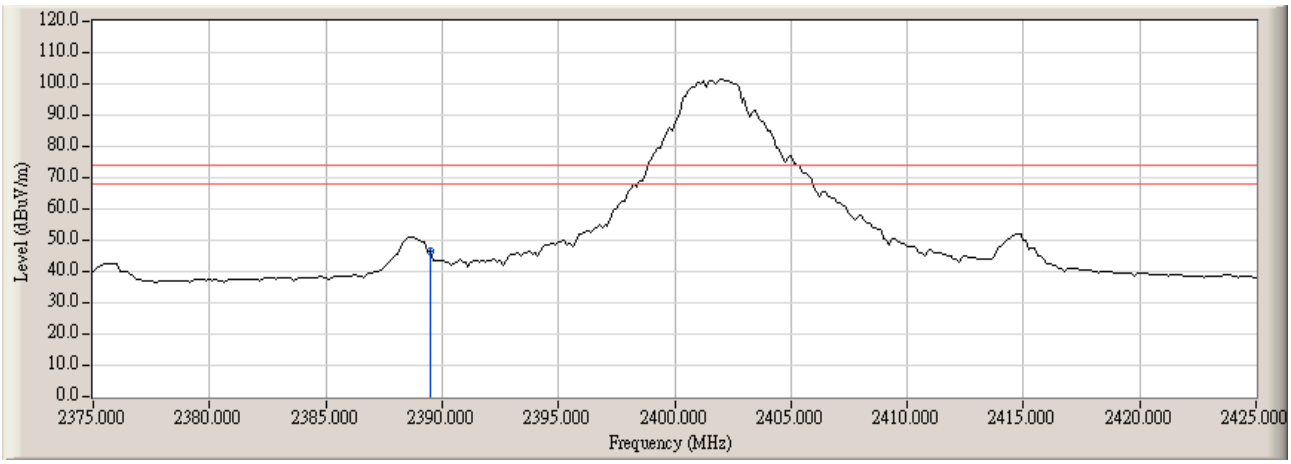
Figure Channel 00: Horizontal (Peak)



Note:

RBW=1MHz, VBW=1MHz, Sweep Time=500ms.

Figure Channel 00: Horizontal (Average)



Note:

RBW=1MHz, VBW=30Hz, Sweep Time=Auto

Product : RFID Hand Held Reader
Test Item : Band Edge
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter (Channel 00)

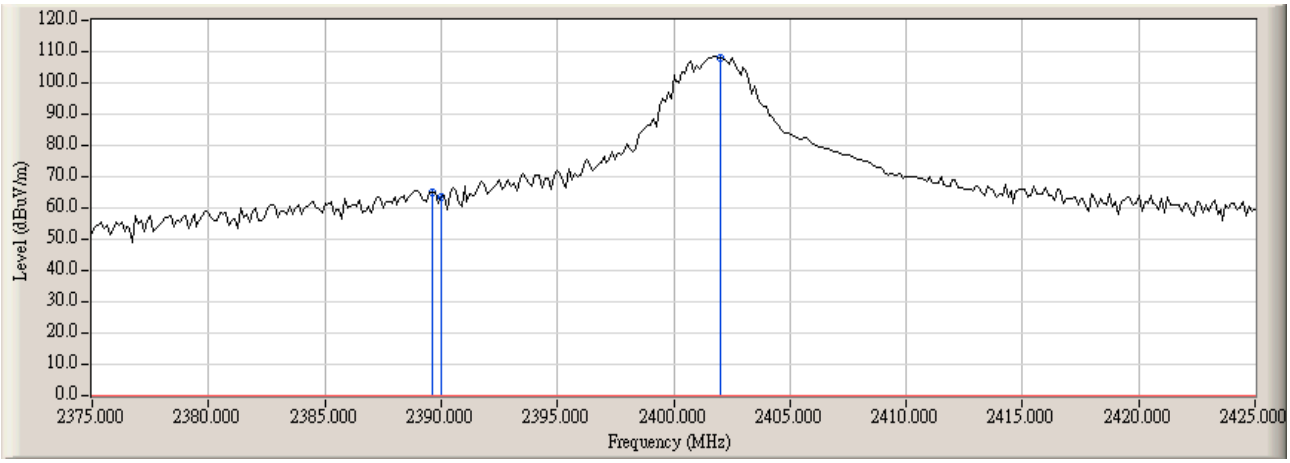
RF Radiated Measurement:

Channel No.	Frequency (MHz)	Required Limit (dBc)	Result
00	<2400	>20	Pass

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
00 (Peak)	2389.620	67.479	65.100	74.00	54.00	Pass
00 (Average)	2389.620	44.849	42.470	74.00	54.00	Pass

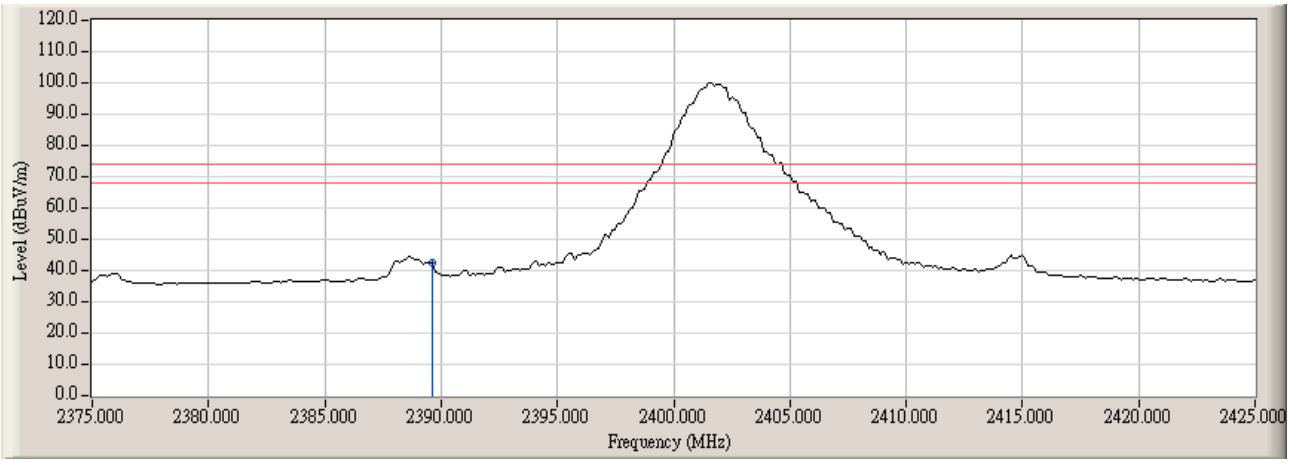
Figure Channel 00: Vertical (Peak)



Note:

RBW=1MHz, VBW=1MHz, Sweep Time=500ms.

Figure Channel 00: Vertical (Average)



Note:

RBW=1MHz, VBW=30Hz, Sweep Time=Auto

Product : RFID Hand Held Reader
Test Item : Band Edge
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter (Channel 78)

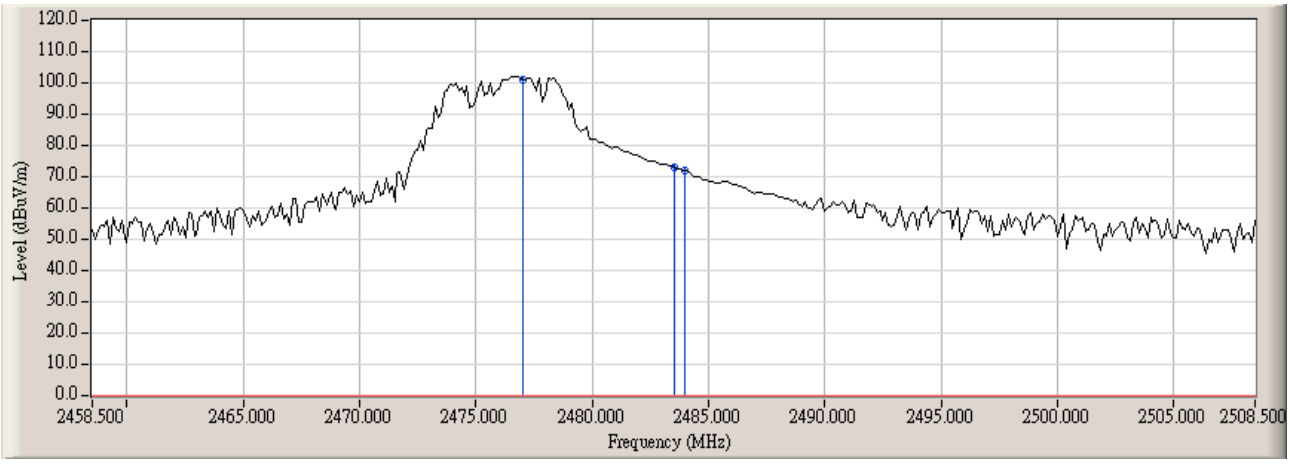
RF Radiated Measurement:

Channel No.	Frequency (MHz)	Required Limit (dBc)	Result
75	>2483.5	>20	Pass

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
75(Peak)	2484.000	73.695	71.760	74.00	54.00	Pass
75(Average)	2484.000	44.695	42.760	74.00	54.00	Pass

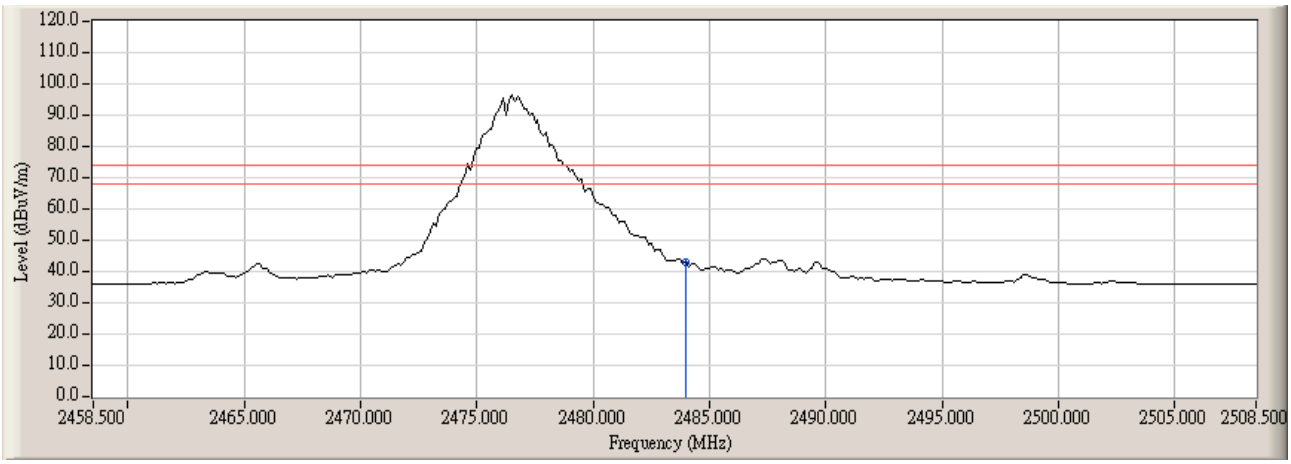
Figure Channel 75: Horizontal (Peak)



Note:

RBW=1MHz, VBW=1MHz, Sweep Time=500ms

Figure Channel 75: Horizontal (Average)



Note:
RBW=1MHz, VBW=30Hz, Sweep Time=Auto

Product : RFID Hand Held Reader
Test Item : Band Edge
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter (Channel 78)

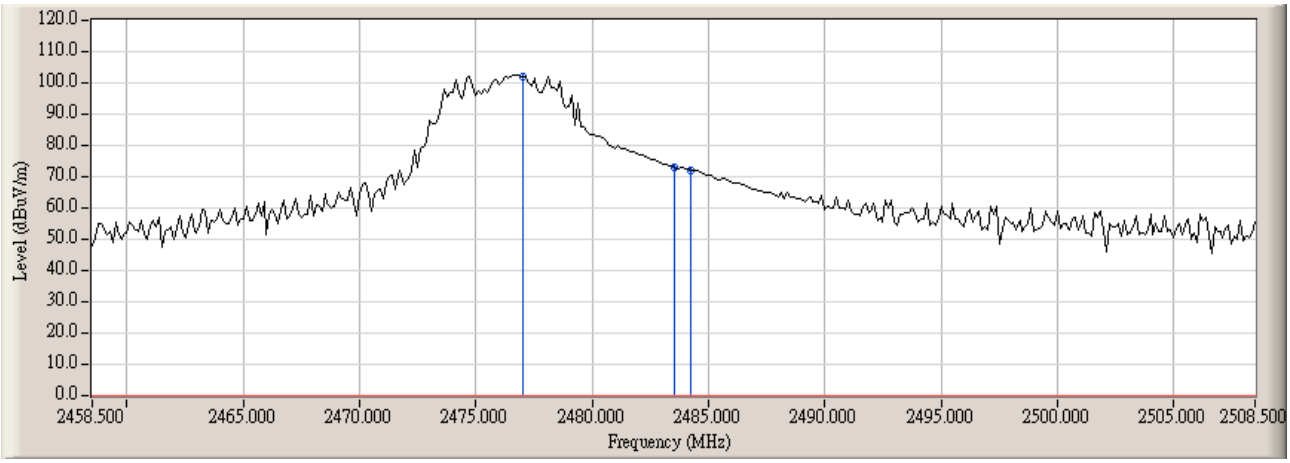
RF Radiated Measurement:

Channel No.	Frequency (MHz)	Required Limit (dBc)	Result
75	>2483.5	>20	Pass

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
75(Peak)	2484.250	74.165	72.230	74.00	54.00	Pass
75(Average)	2484.250	44.785	42.850	74.00	54.00	Pass

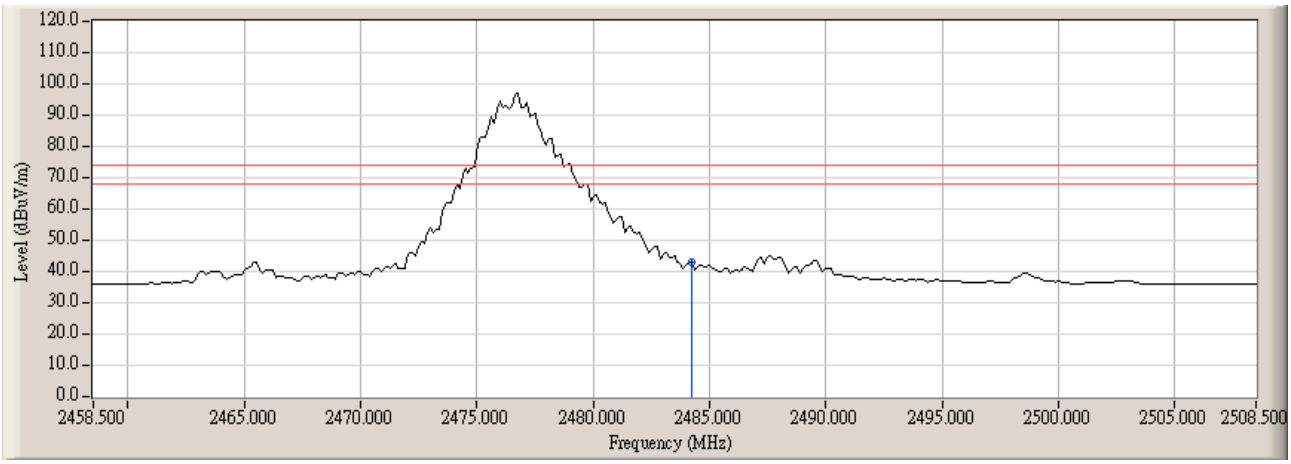
Figure Channel 75: Vertical (Peak)



Note:

RBW=1MHz, VBW=1MHz, Sweep Time=500ms.

Figure Channel 75: Vertical (Average)



Note:
RBW=1MHz, VBW=30Hz, Sweep Time=Auto

Note: The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

6. Channel Number

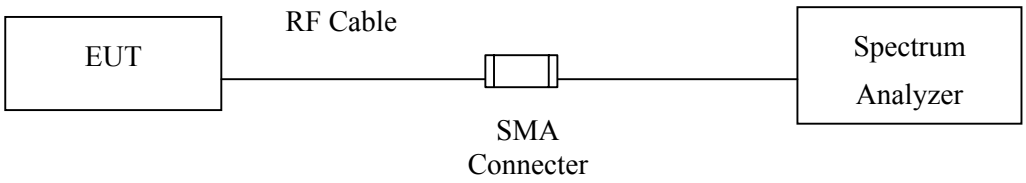
6.1. Test Equipment

The following test equipments are used during the radiated emission tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2005

Note: 1. All equipment upon which need to calibrated are with calibration period of 1 year.
2. Mark "X" test instruments are used to measure the final test results.

6.2. Test Setup



6.3. Limit

Frequency hopping systems operating in the 2400-2483.5 MHz bands shall use at least 75 hopping frequencies.

6.4. Uncertainty

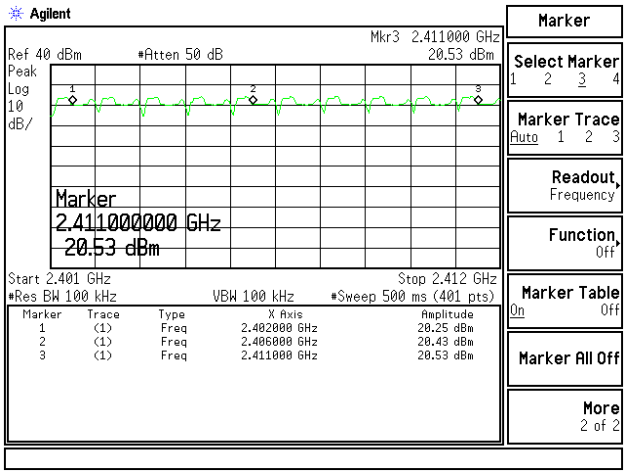
The measurement uncertainty is defined as ± 200kHz

6.5. Test Result of Channel Number

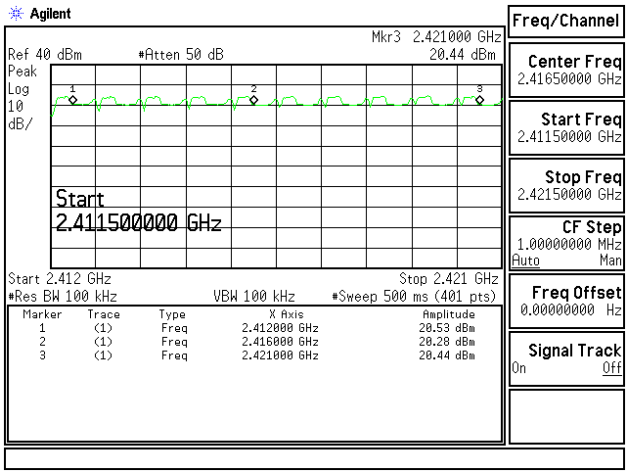
Product : RFID Hand Held Reader
Test Item : Channel Number
Test Site : CTR01
Test Mode : Mode 1: Transmitter

Frequency Range (MHz)	Measurement (Hopping Channel)	Required Limit (Hopping Channel)	Result
2402 ~ 2477	76	>75	Pass

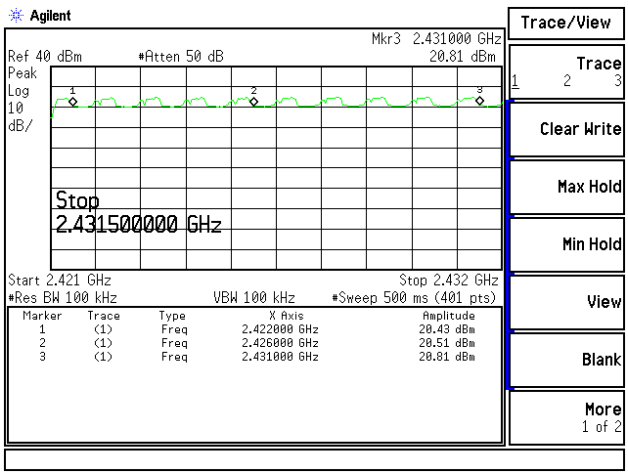
2402-2411MHz



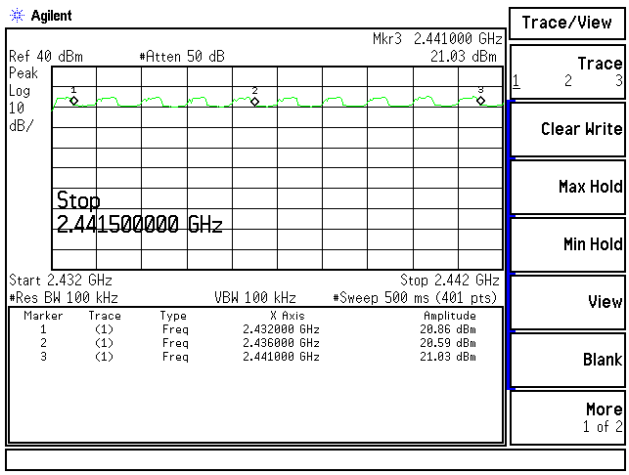
2412-2421MHz



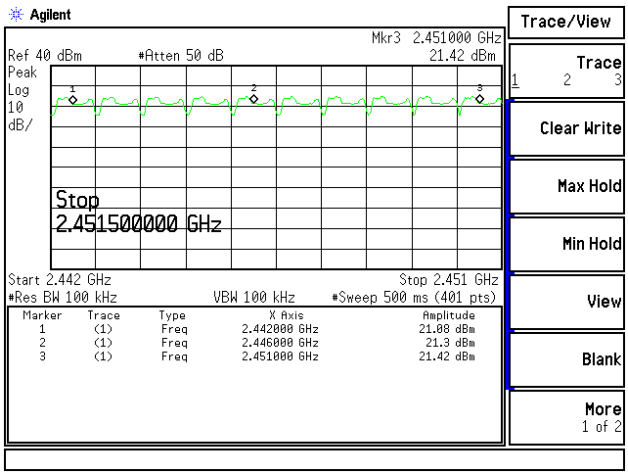
2422-2431MHz



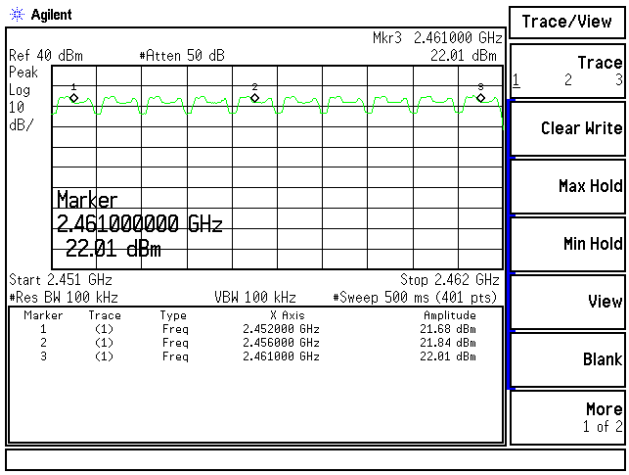
2432-2441MHz



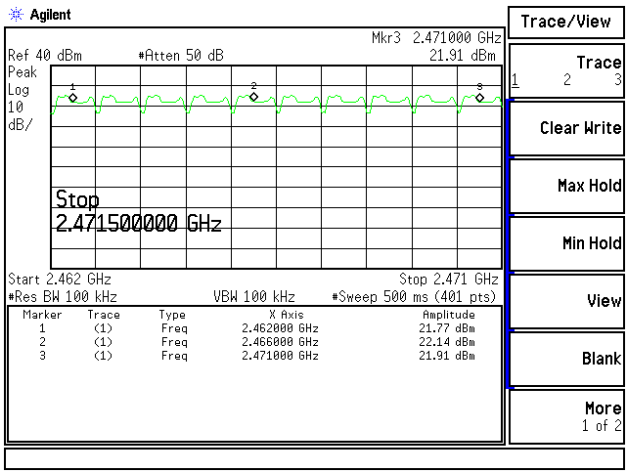
2442-2451MHz



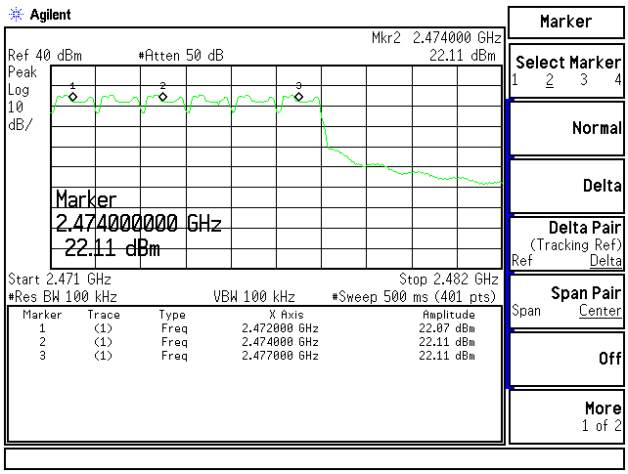
2452-2461MHz



2462-2471MHz



2472-2477MHz



7. Channel Separation

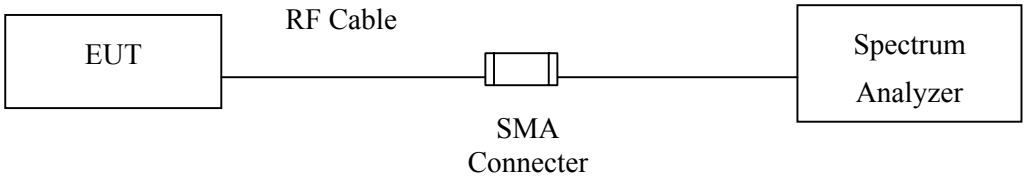
7.1. Test Equipment

The following test equipments are used during the radiated emission tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2005

Note: 1. All equipment upon which need to calibrated are with calibration period of 1 year.
2. Mark "X" test instruments are used to measure the final test results.

7.2. Test Setup



7.3. Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

7.4. Uncertainty

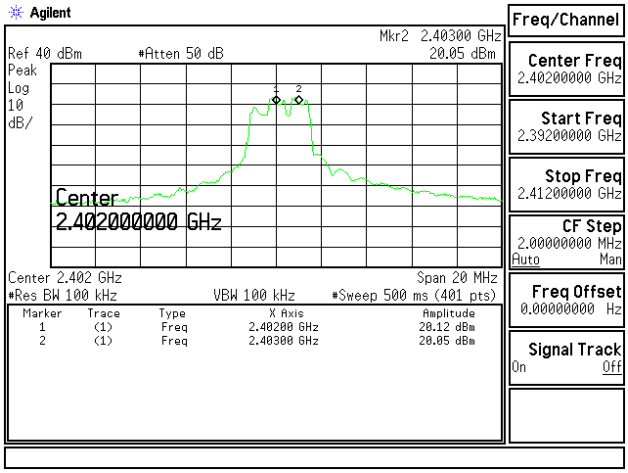
The measurement uncertainty is defined as ± 150Hz

7.5. Test Result of Channel Separation

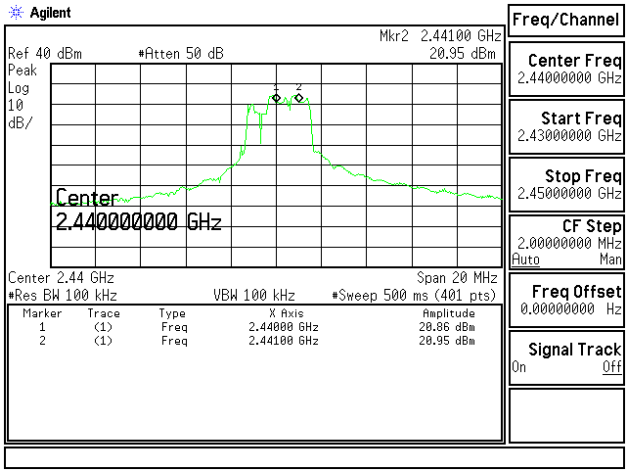
Product : RFID Hand Held Reader
Test Item : Channel Separation
Test Site : CTR01
Test Mode : Mode 1: Transmitter

Frequency (MHz)	Measurement Level (MHz)	Required Limit	Result
2402	1.00	>25 kHz or 2/3 * 20 dB BW	Pass
2440	1.00	>25 kHz or 2/3 * 20 dB BW	Pass
2477	1.00	>25 kHz or 2/3 * 20 dB BW	Pass

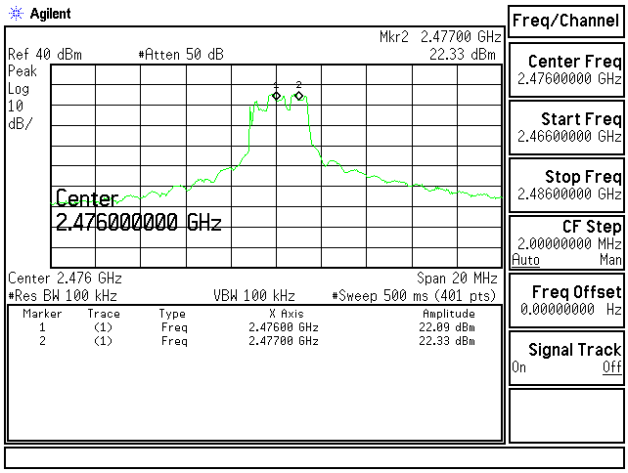
Channel 01 2402MHz



Channel 38 2440MHz



Channel 75 2477 MHz



8. Dwell Time

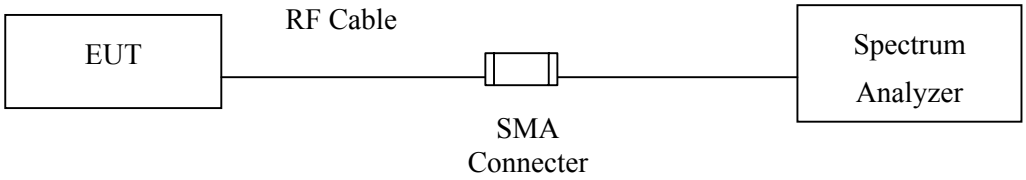
8.1. Test Equipment

The following test equipments are used during the radiated emission tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2005

Note: 1. All equipment upon which need to calibrated are with calibration period of 1 year.
2. Mark "X" test instruments are used to measure the final test results.

8.2. Test Setup



8.3. Limit

The dwell time shall be the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

8.4. Uncertainty

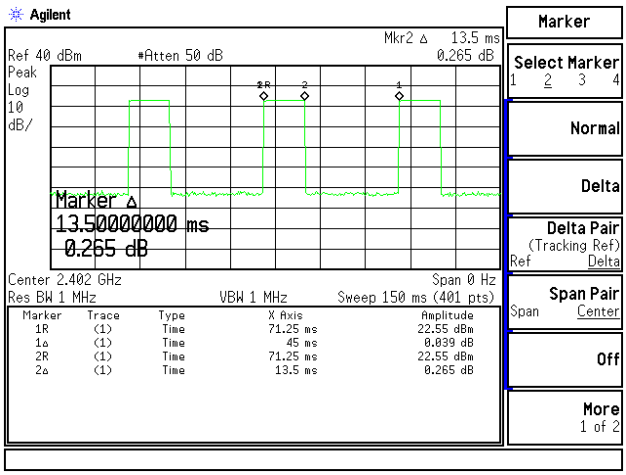
The measurement uncertainty is defined as ± 25msec

8.5. Test Result of Dwell Time

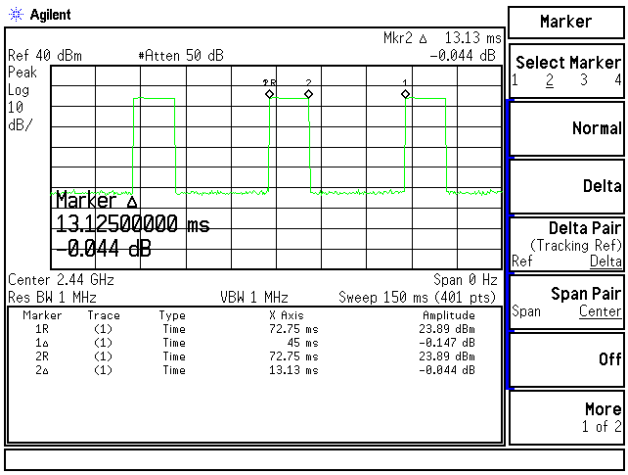
Product : RFID Hand Held Reader
Test Item : Dwell Time
Test Site : CTR01
Test Mode : Mode 1: Transmitter (Channel 00,38,75)

Channel (MHz)	Measurement Level (ms)	Required Limit (sec.)	Result
CH 00 2402	116.863	< 0.4	Pass
CH 38 2440	113.660	< 0.4	Pass
CH 75 2477	116.863	< 0.4	Pass

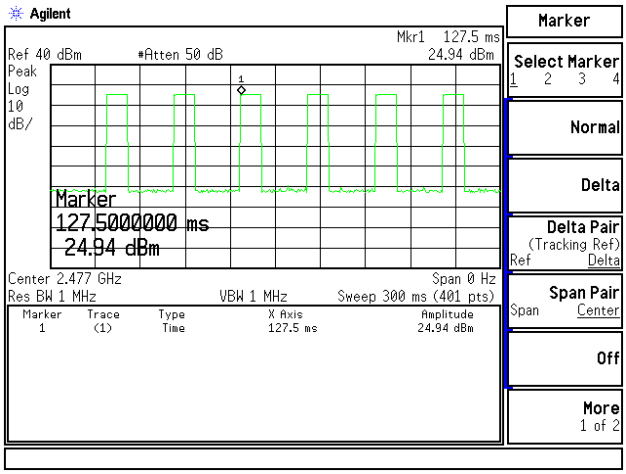
CH01 2402MHz



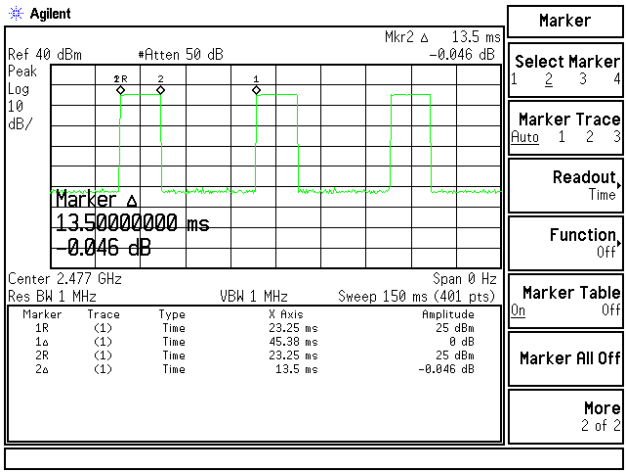
CH 38 2440MHz



CH75 2477MHz



Total



Note: Dwell time＝time slot length * hop rate / number of hopping channels * period

Occupancy Time of Frequency Hopping System

Test Time Period: 0.4*76=30.4sec，Hopping Times Within 1sec: 6/300msec=0.02 hops/msec.

A) 2402MHz The Maximum Occupancy Time Within 30.4sec: (13500 μs*20) / (76*30.4)= 116.863msec。

B) 2441MHz The Maximum Occupancy Time Within 30.4sec: (13130 μs*20) / (76*30.4)= 113.660msec。

C) 2480MHz The Maximum Occupancy Time Within 30.4sec: (13500 μs*20) / (76*30.4)= 116.863msec。

Test Result: The Average Occupancy Time of Each Highest，Middle and Lowest Channel Is Less Than 0.4sec，And Corresponds to The Standard。

PS: (1) From Bluetooth Specification， It Hops 1640 Times in 1sec。The Average Occupancy Time of Each 79 Channels is 1600/79 Times，Therefore，We Calculate The Maximum Occupancy Time (worse cars)As Below:

A) 2402Mhz The Occupancy Time of Each Pulse is 0.4msec，The Maximum Occupancy Time within 31.6sec is 0.4msec*1640/79*31.6=289.056msec

B) 2441MHz The Occupancy Time of Each Pulse is 0.4msec，The Maximum Occupancy Time within 31.6sec is 0.4msec*1640/79*31.6=289.056msec

C) 2480MHz The Occupancy Time of Each Pulse is 0.4msec，The Maximum Occupancy Time within 31.6sec is 0.4msec*1640/79*31.6=289.056msec

Test Result: The Maximum Occupancy Time of Each Highest，Middle and Lowest Channel Is Less Than 0.4sec，And Corresponds to The Standard。

9. Occupied Bandwidth

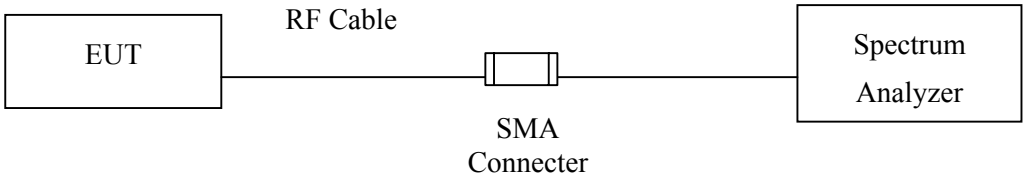
9.1. Test Equipment

The following test equipments are used during the radiated emission tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2005

Note: 1. All equipment upon which need to calibrated are with calibration period of 1 year.
2. Mark "X" test instruments are used to measure the final test results.

9.2. Test Setup



9.3. Limits

The minimum bandwidth shall be at least 500kHz.

9.4. Uncertainty

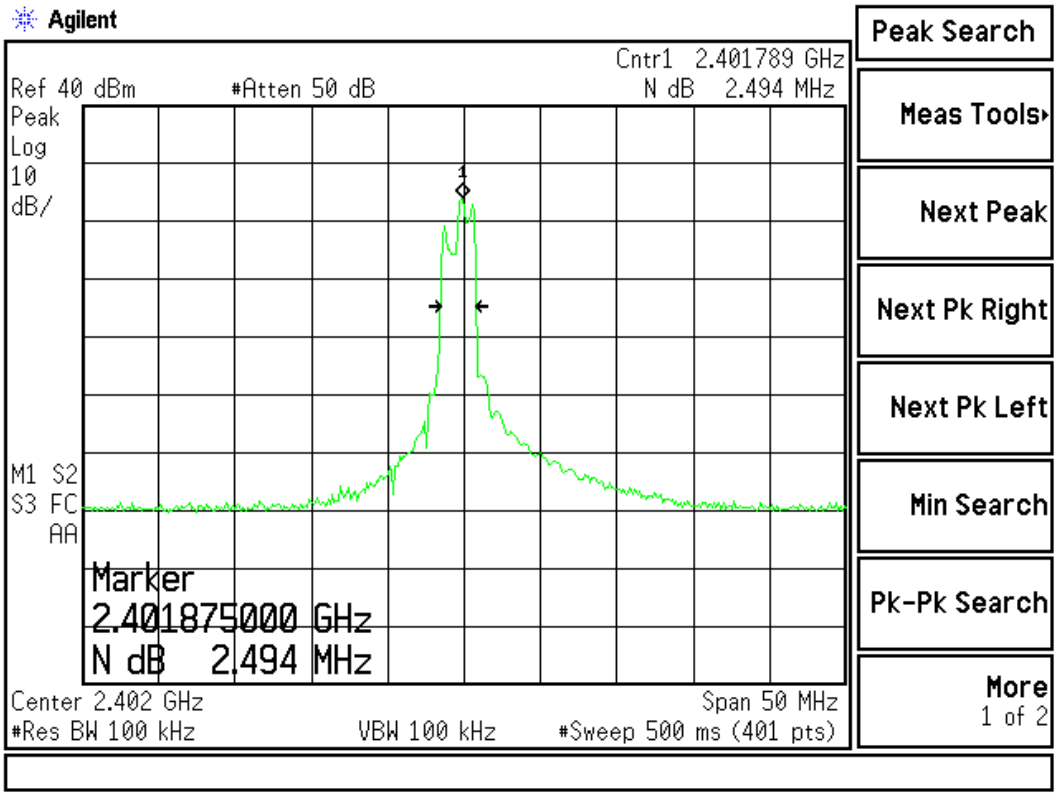
The measurement uncertainty is defined as ± 1.27 dB

9.5. Test Result of Occupied Bandwidth

Product : RFID Hand Held Reader
Test Item : Occupied Bandwidth Data
Test Site : CTR01
Test Mode : Mode 1: Transmitter (2402MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	2494	>500	Pass

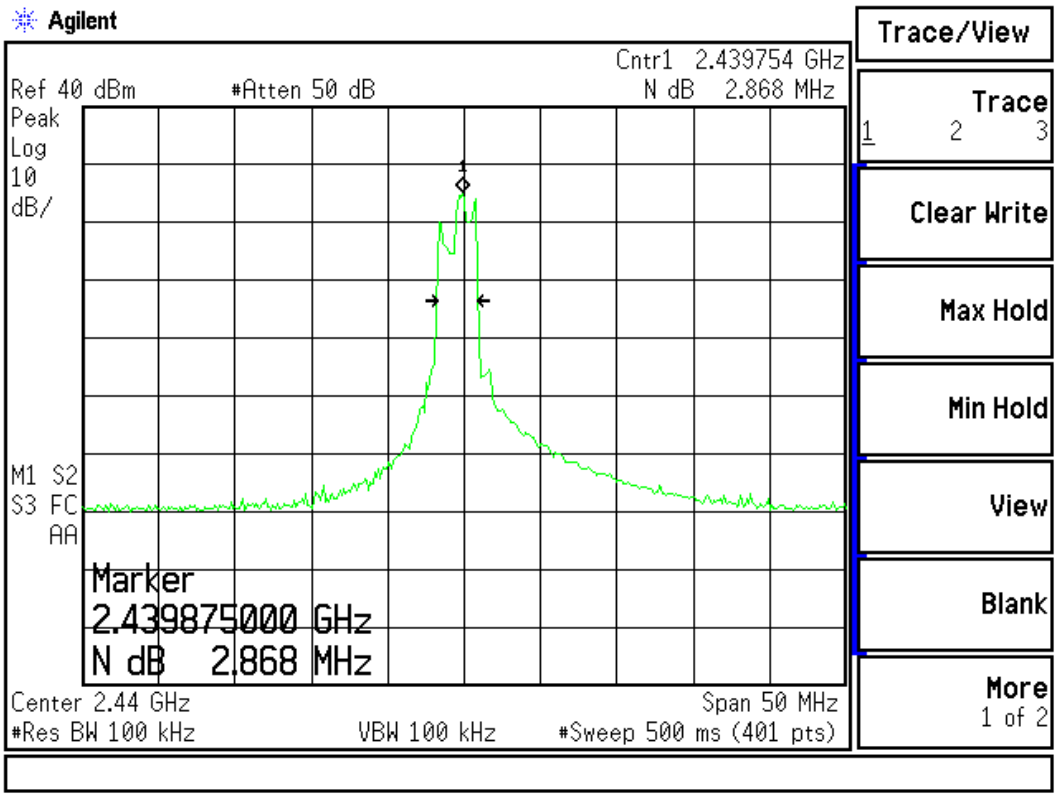
Figure Channel 00:



Product : RFID Hand Held Reader
Test Item : Occupied Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter (2440MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
38	2440	2868	>500	Pass

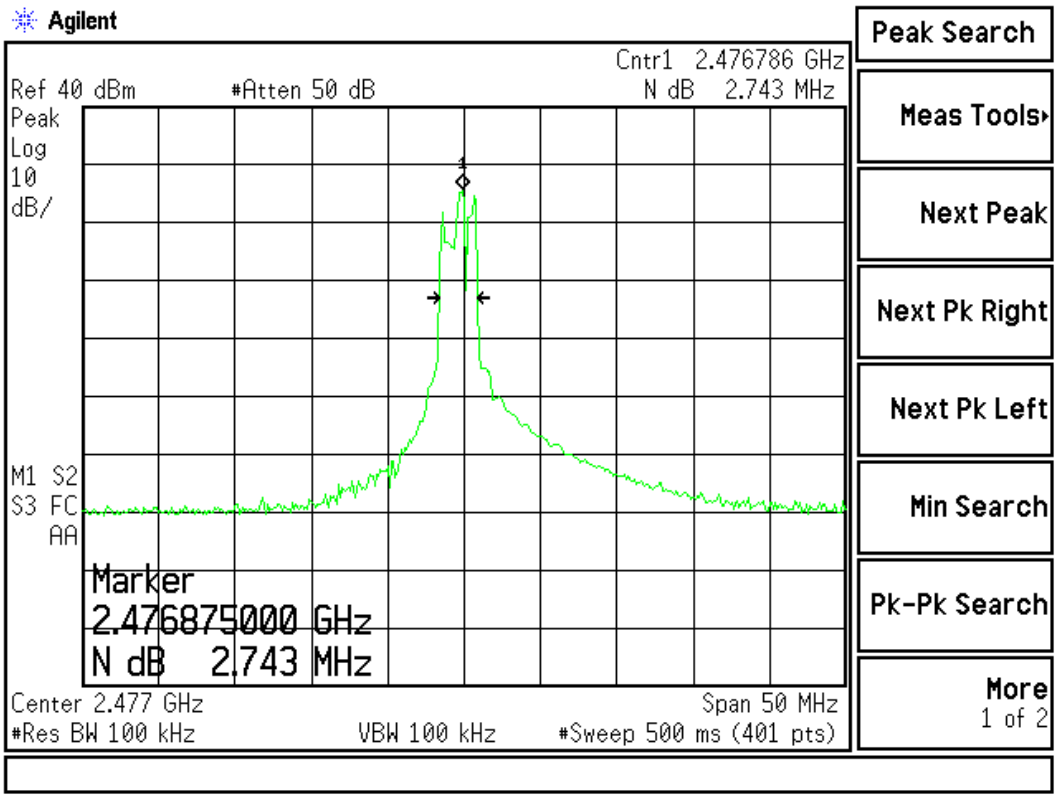
Figure Channel 39:



Product : RFID Hand Held Reader
Test Item : Occupied Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter (2477MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
75	2477	2743	>500	Pass

Figure Channel 78:



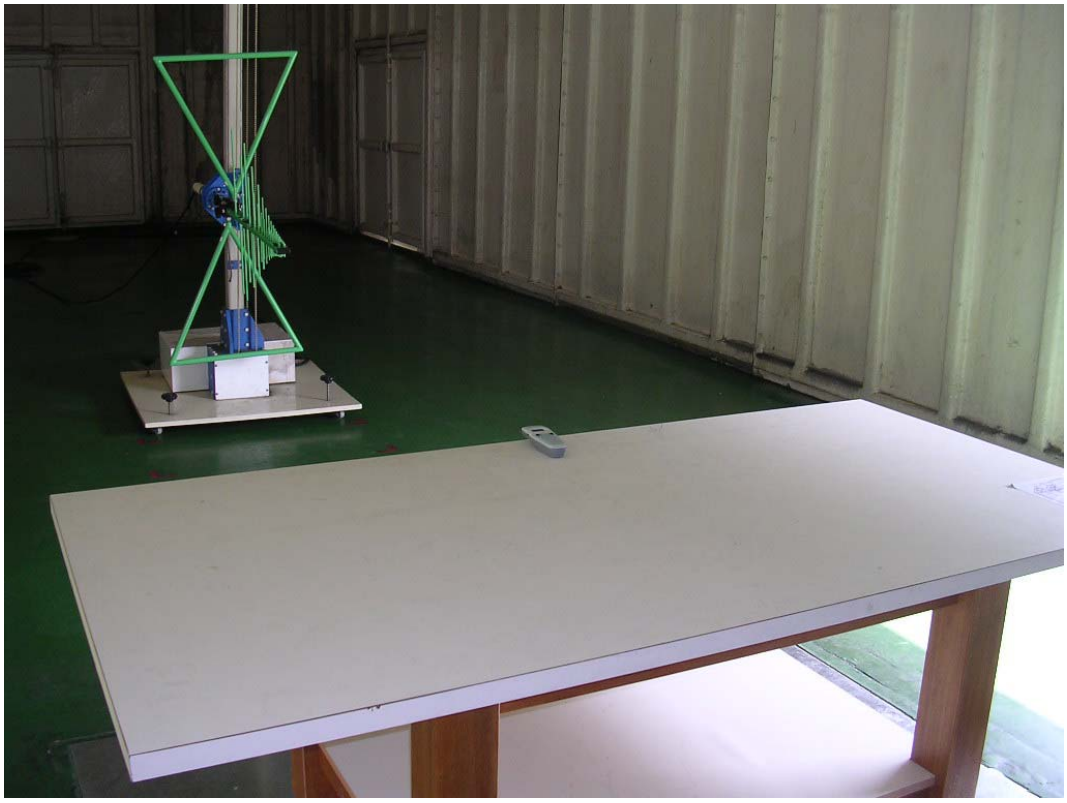
10. EMI Reduction Method During Compliance Testing

No modification was made during testing.

Attachment 1: EUT Test Photographs

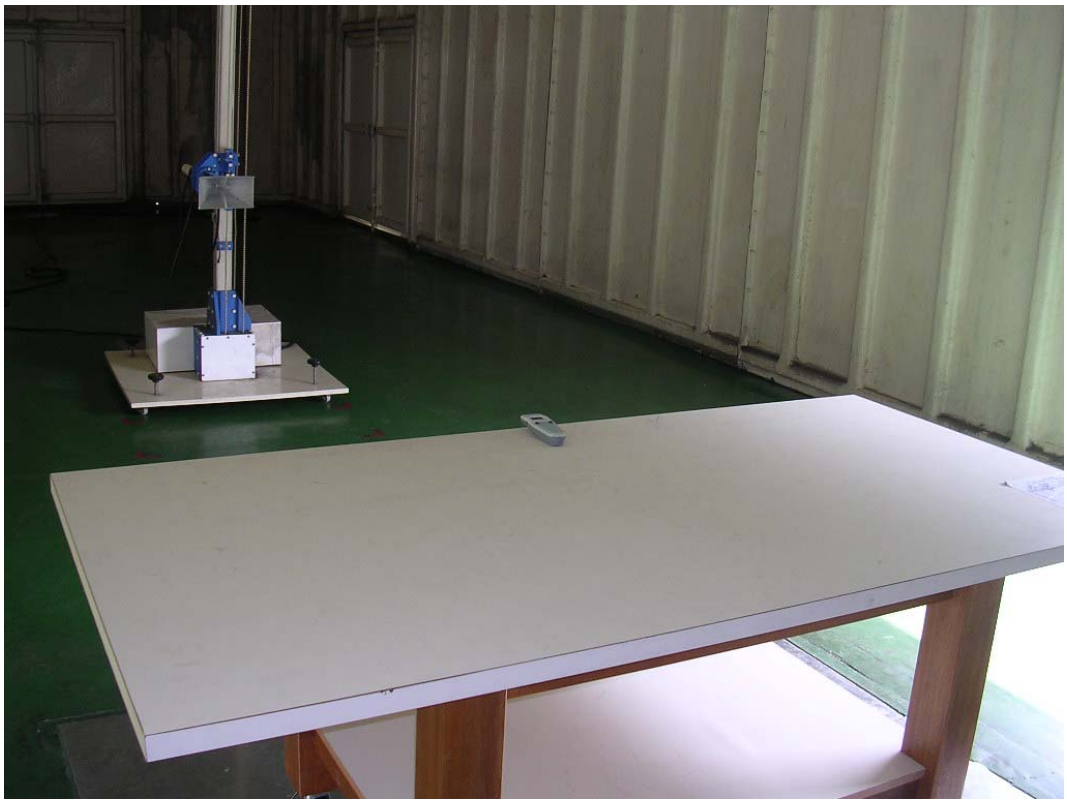
Attachment 1: EUT Test Setup Photographs

Front View of Radiated Test



Back View of Radiated Test

Front View of Radiated Test (Horn)



Back View of Radiated Test (Horn)

Attachment 2: EUT Detailed Photographs

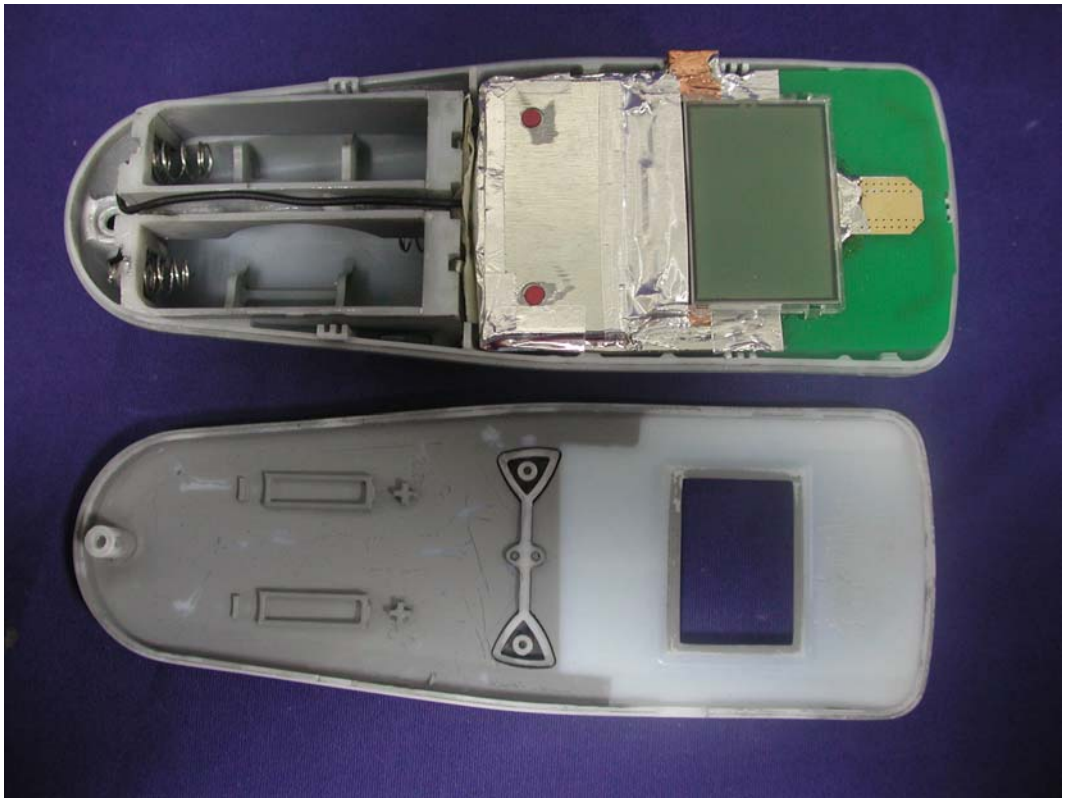
Attachment 2 : EUT Detailed Photographs

(1) EUT Photo

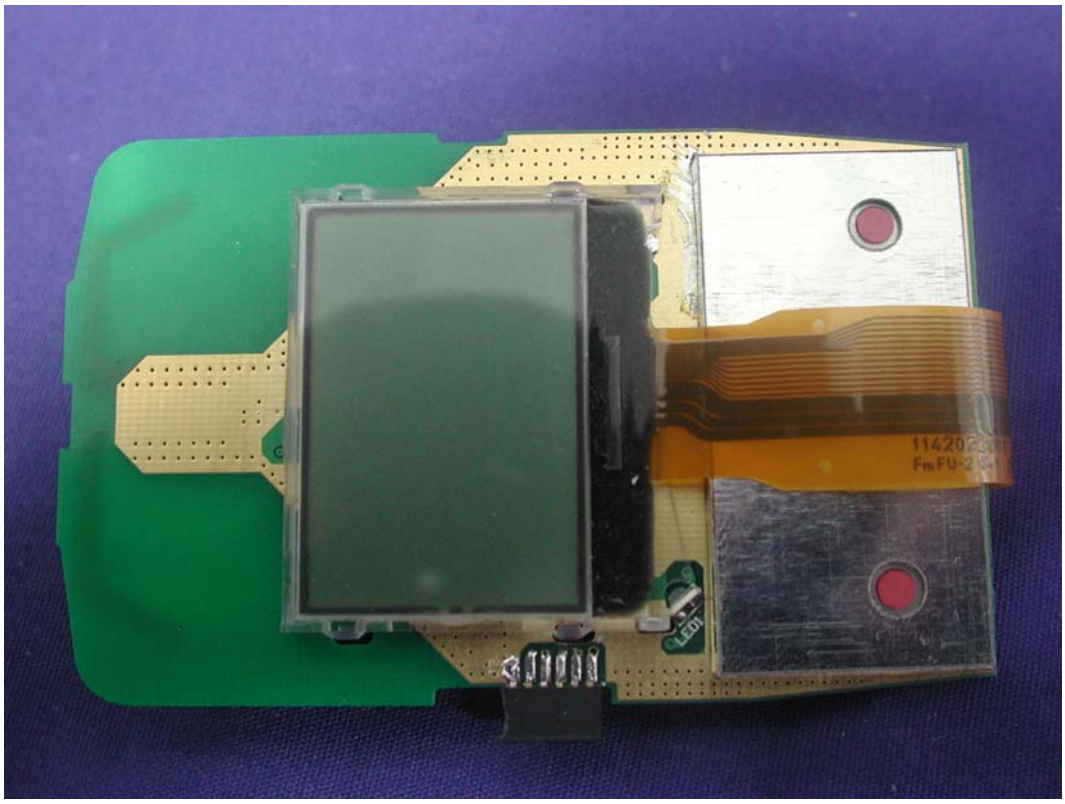
(2) EUT Photo

(3) EUT Photo

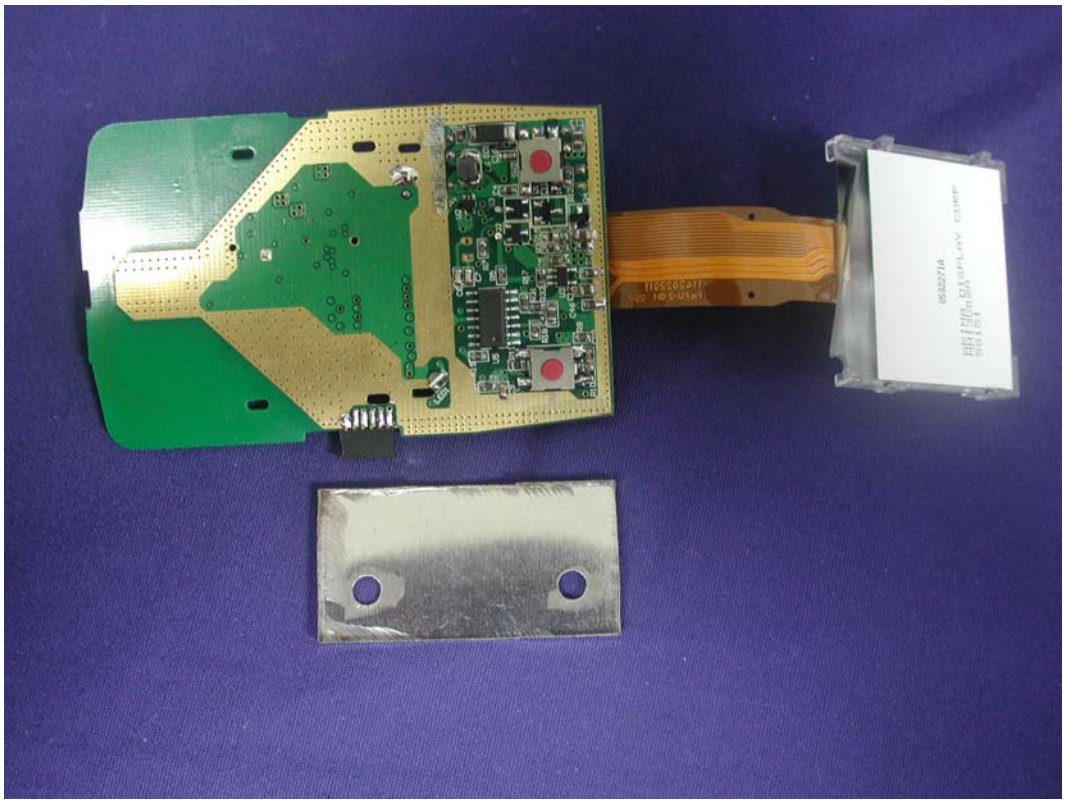
(4) EUT Photo



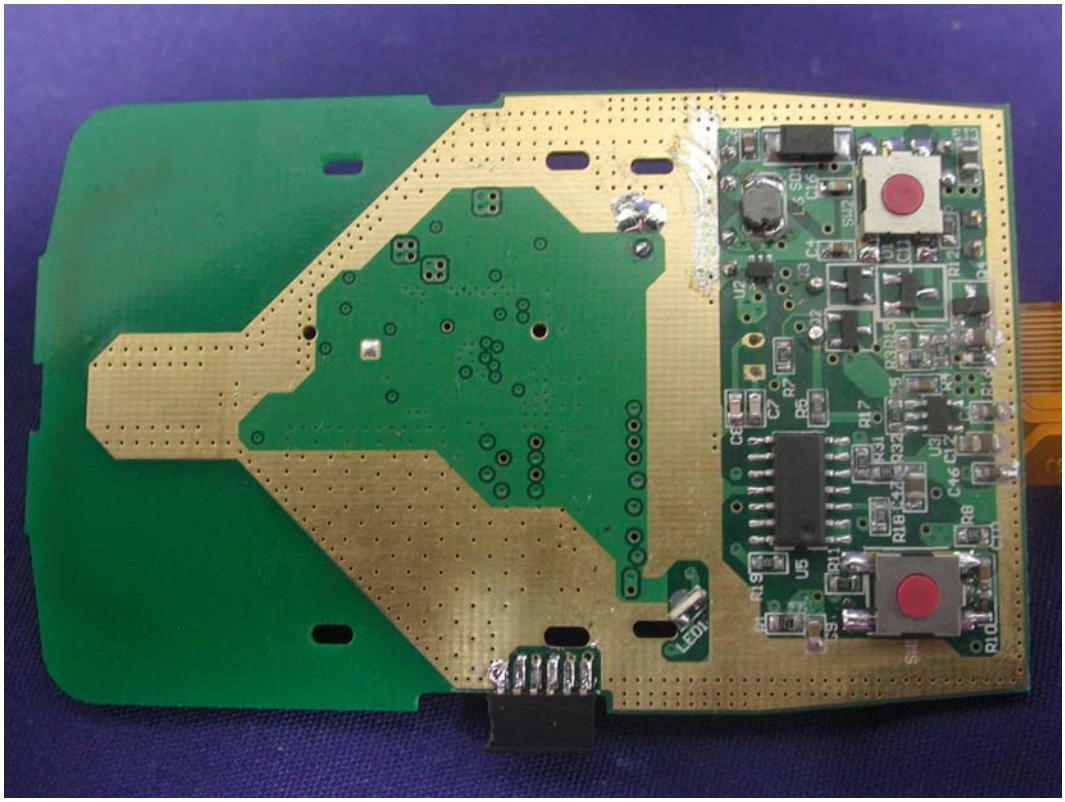
(5) EUT Photo



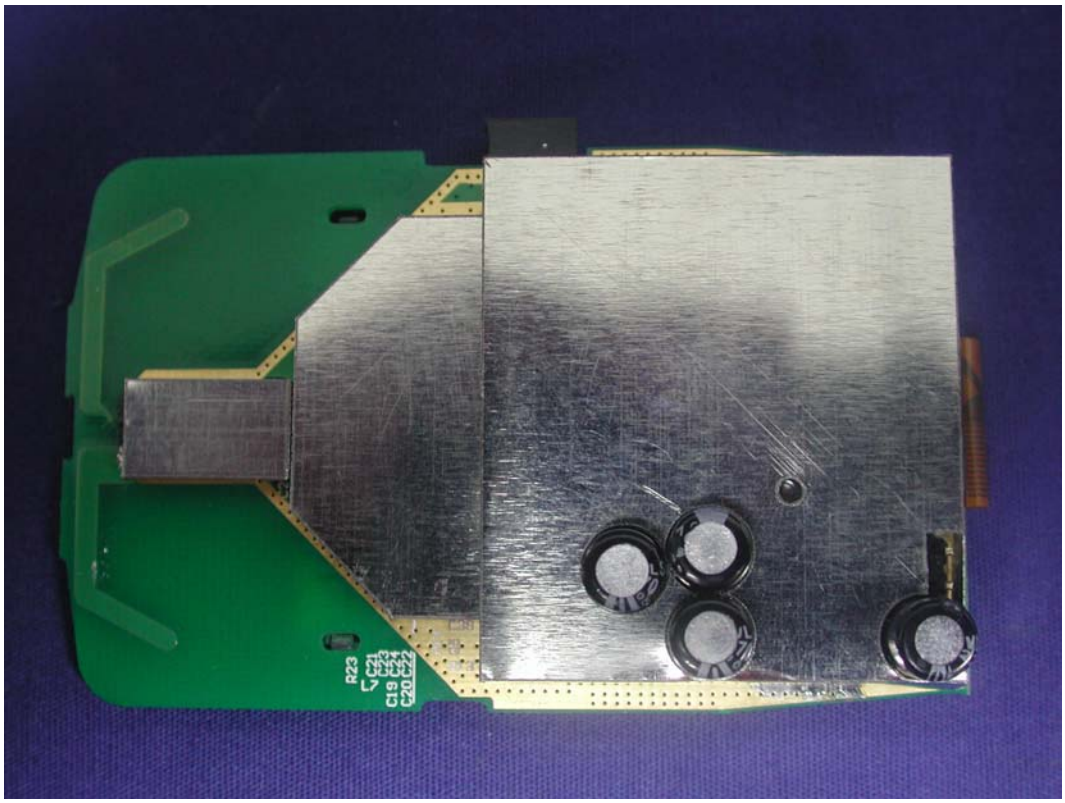
(6) EUT Photo



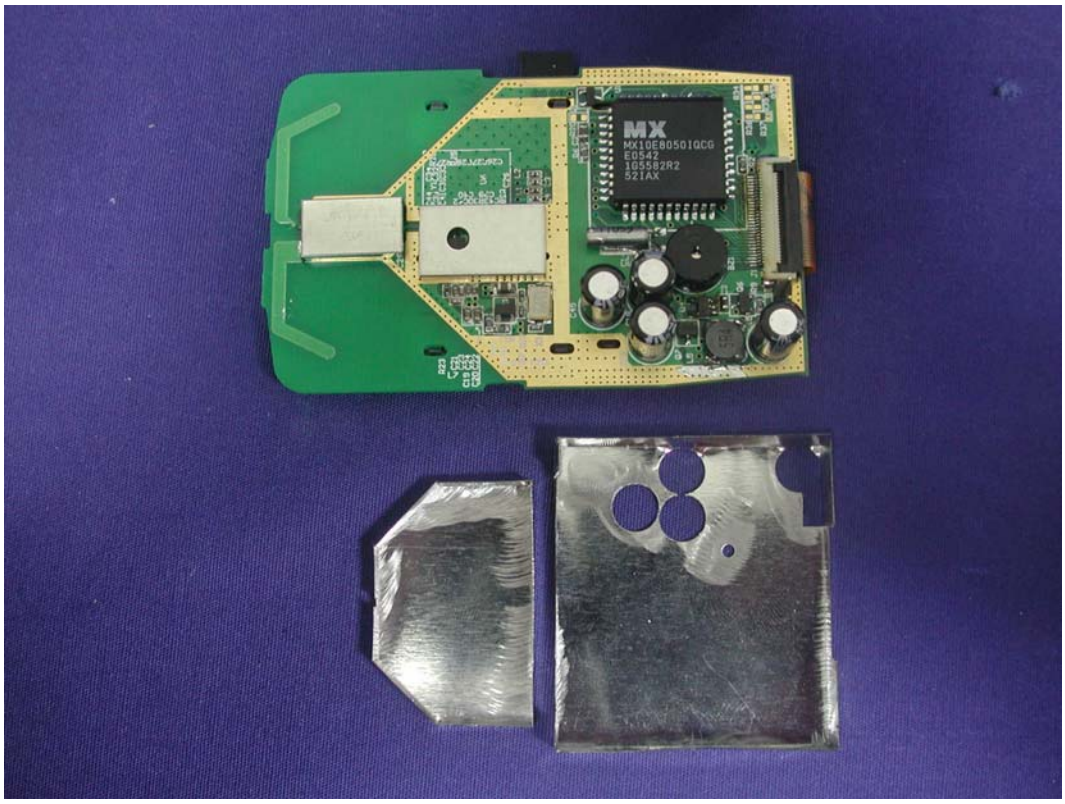
(7) EUT Photo



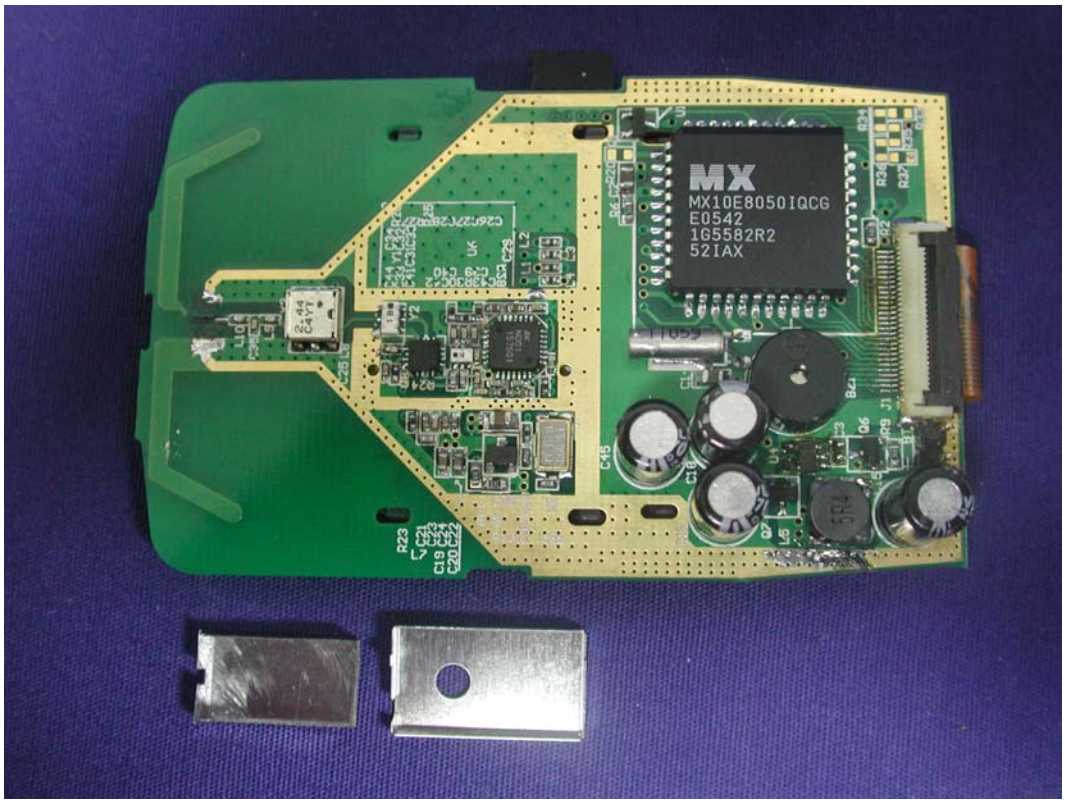
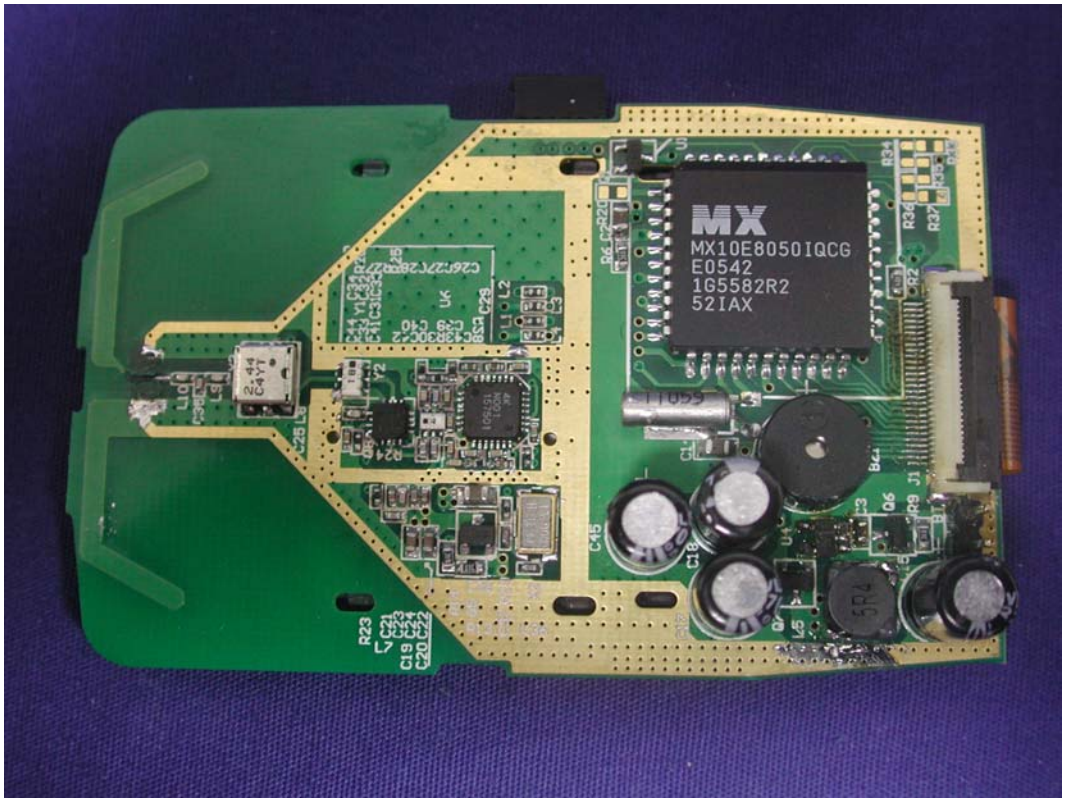
(8) EUT Photo



(9) EUT Photo



(10) EUT Photo



(11) EUT Photo