

Reference No.:A03121108 Report No.:FCCA03121108

FCC ID:14L-MS6850

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Date: Dec. 31, 2003

Product Name:

Bluetooth Mouse

Model Number:

MS-6850

Marketing Name:

BTMS

Applicant:

MICRO-STAR INT'L CO., LTD.

No 69, Li-De St, Jung-He City, Taipei Hsien, Taiwan

Date of Receipt:

Dec. 11, 2003

Finished date of Test:

Dec. 30, 2003

Applicable Standards:

47 CFR Part 15, Subpart C

ANSI C63.4:1992

We, **Spectrum Research & Testing Laboratory Inc.**, hereby certify that one sample of the above was tested in our laboratory with positive results according to the above-mentioned standards. The records in the report are an accurate account of the results. Details of the results are given in the subsequent pages of this report.

Checked By: :

Sunyon Chen)

Date:

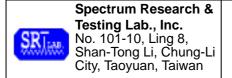
Approved By:

(Johnson Ho Director)

Date:

NVLAP

Lab Code: 200099-0



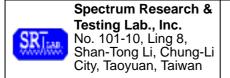
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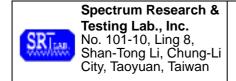
1. DOCUMENT POLICY AND TEST STATEMENT

1.1 DOCUMENT POLICY

 The report shall not be reproduced except in full, without the written approval of SRT Lab, Inc.

1.2 TEST STATEMENT

- The test results in the report apply only to the unit tested by SRT Lab.
- There was no deviation from the requirements of test standards during the test.
- AC power source, 120 VAC/60 Hz, was used during the test.



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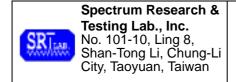
2. DESCRIPTION OF EUT AND TEST MODE

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Bluetooth Mouse		
MODEL NO.	MS-6850		
POWER SUPPLY	2.7~3.3		
CABLE	N/A		
I/O PORT	I2C、 SPI and USB		
FREQUENCY BAND	2400~2483.5MHz		
CARRIER FREQUENCY	CH0: 2402MHz~CH78: 2480MHz		
NUMBER OF CHANNEL	79		
RATED RF OUTPUT	2m/M (0, 4dPm)		
POWER	2mW (0~4dBm)		
ANTENNA TYPE	External		

NOTE:

For more detailed information, please refer to the EUT's specification or user's manual provided by manufacturer.



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2.2 DESCRIPTION OF SUPPORT UNIT

The transmitter part of EUT was tested with a PC system and configured by the requirement of ANSI C63.4. All interface ports were connected to the appropriate support units via specific cables. The support units and cables are listed below.

NO	DEVICE	BRAND	MODEL#	FCC ID / DOC	CABLE
1.	Notebook	DELL	PP01L	DOC	1.5m unshielded power cord
2	PRINTER	EPSON	STYLUS C20SX	DOC	1.5m unshielded power cord 1.2m shielded data cable
3	MODEM	ACEEX	DM-1414	DOC	1.5m unshielded power cord 1.2m shielded data cable
4	DONGLE	MSI	N/A	N/A	1.2m unshielded power cord1.2m unshielded data cable
5	MONITOR	SAMSUNG	PG171S	DOC	1.5m unshielded power cord 1.2m shielded data cable

NOTE: For the actual test configuration, please refer to the photos of testing.

2.3 DESCRIPTION OF TEST MODE

This EUT is a FHSS system, we use BlueTest to control the EUT withRS232, Let EUT hopping on and transmit at every channel with highest power, Only output power use conducted method, others are using radiated method. After Sirfdemo330R1 send the command to EUT, it can be removed, and the EUT keep hopping.79 channels are provided by EUT. The 3 channels of lower, medium and higher were chosen for test.

Channel	Frequency(MHz)
0	2402
39	2441
78	2480

NOTE:

- 1. Below 1 GHz, the channel 0, 39, and 78 were pre-tested in chamber. The channel 78, worst case one, was chosen for conducted and radiated emission test.
- 2. Above 1 GHz, the channel 0, 39 and 78 were tested individually



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3. DESCRIPTION OF APPLIED STANDARDS

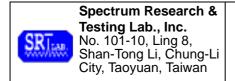
The EUT is a kind of wireless product and to be connected with a PC system for normal use. According to the specifications provided by the applicant, it must comply with the requirements of the following standards:

47 CFR Part 15, Subpart C

ANSI C63.4:1992

Public DA00-705 (March 2000)

All tests have been performed and recorded as the above standards.



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4 TECHNICAL CHARACTERISTICS TEST

4.1 CONDUCTED EMISSION TEST

4.1.1 **LIMIT**

Frequency (MHz)	Class A	(dBµV)	Class B (dBµV)		
Frequency (MH2)	Quasi-peak	Average	Quasi-peak	Average	
0.15 - 0.5	79	66	66 - 56	56 - 46	
0.50 - 5.0	73	60	56	46	
5.0 - 30.0	73	60	60	50	

NOTE:

- 1. The lower limit shall apply at the transition frequencies.
- 2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

4.1.2 TEST EQUIPMENT

The following test equipment was used for the test:

EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
EMI TEST	9 kHz TO	ROHDE &	ESHS30/	AUG. 2004
RECEIVER	30 MHz	SCHWARZ	826003/008	R&S
LISN (for EUT)	50 μH, 50 ohm	SOLAR	8012-50-R-24-BNC	JUN. 2004
LISIN (IOI EUT)	50 μπ, 50 σππ	ELECTRONICS	/ 924839	ETC
LISN	FOULL FO ohm	SOLAR	9252-50-R-24-BNC	JUN. 2004
(for Peripheral)	50μH, 50 ohm	ELECTRONICS	/ 951318	ETC
50 ohm	50 obm	<u> </u>	11593A/	MAY 2004
TERMINATOR	50 ohm	HP	2	ETC
COAXIAL	3m	CLINCITY	J400/	AUG. 2004
CABLE	3111	SUNCITY	3M	SRT
ISOLATION	N/A	APC	AFC-11015/	N/A
TRANSFORMER	IN/A	APC	F102040016	IN/A
FILTED		LII COII	FC-943/	NI/A
FILTER	2 LINE, 30A	FIL.COIL	771	N/A
CDOUND DI ANE	OROLING BLANE 2.3M (H) X		NI/A	APR. 2004
GROUND PLANE	2.4M (W)	SRT	N/A	SRT
ODOLIND DI ANE	2.4M (H) x	CDT	N1/A	APR. 2004
GROUND PLANE	2.4M (W)	SRT	N/A	SRT

NOTE: The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

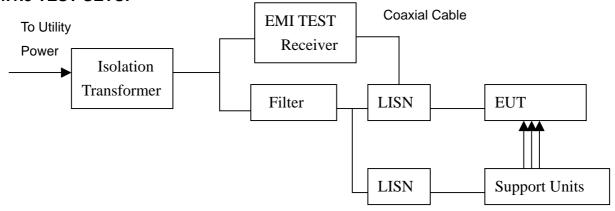


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4.1.3 TEST SETUP



NOTE:

- 1. The EUT was put on a wooden table with 0.8m height above ground plane, and 0.4m away from reference ground plane (> 2mx2m).
- 2. For the actual test configuration, please refer to the photos of testing.

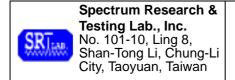
4.1.4 TEST PROCEDURE

The EUT was tested according to the requirement of ANSI C63.4 and CISPR 22. The frequency spectrum from 0.15 MHz to 30 MHz was investigated. The LISN used was 50 ohm/50µH as specified. All readings were quasi-peak and average values with 10 kHz resolution bandwidth of the test receiver. The EUT system was operated in all typical methods by users. Both lines of the power mains of EUT were measured and the cables connected to EUT and support units were moved to find the maximum emission levels for each frequency.

4.1.5 EUT OPERATING CONDITION

Set the EUT under transmission condition continuously at a specific channel frequency. Under Windows XP ran "EMI TEST" and "BLUETOOTH SOLEIL" programs, PC sent "H" pattern or accessed the following peripherals:

- RS232 (modem)
- Printer
- FDD
- HDD



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4.1.6 TEST RESULT

Temperature: 25 °C Humidity: 56 %RH

Ferquency Range: 0.15 – 30 MHz Test Mode: N/A

Receiver Detector: Q.P. and AV. Tested By: Jackson Lai

Tested Date: Dec. 17, 2003

Power Line Measured : Line

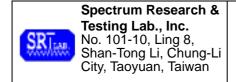
Freq.	Correct. Factor	Reading Value (dBµV)				nit μV)		gin B)	
	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.170	0.20	45.1	41.1	45.3	41.3	65.0	55.0	-19.7	-13.7
0.298	0.20	37.8	37.2	38.0	37.4	60.3	50.3	-22.3	-12.9
0.884	0.20	41.8	40.1	42.0	40.3	56.0	46.0	-14.0	-5.7
5.357	0.32	21.3	19.4	21.6	19.7	60.0	50.0	-38.4	-30.3
15.447	0.51	21.6	20.2	22.1	20.7	60.0	50.0	-37.9	-29.3
18.349	0.57	25.1	22.1	25.7	22.7	60.0	50.0	-34.3	-27.3

Power Line Measured : Neutral

Freq. (MHz)	$\frac{1}{1H_2}$ ractor ($\frac{1}{1H_2}$) ractor ($\frac{1}{1H_2}$) ractor ($\frac{1}{1H_2}$)				rgin B)				
	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.173	0.20	44.9	41.1	45.1	41.3	64.8	54.8	-19.7	-13.5
0.345	0.20	33.0	25.1	33.2	25.3	59.1	49.1	-25.9	-23.8
0.884	0.20	32.2	29.5	32.4	29.7	56.0	46.0	-23.6	-16.3
1.173	0.20	32.2	30.6	32.4	30.8	56.0	46.0	-23.6	-15.2
4.068	0.30	27.5	18.0	27.8	18.3	56.0	46.0	-28.2	-27.7
7.791	0.36	25.4	21.6	25.8	22.0	60.0	50.0	-34.2	-28.0

NOTE:

- 1. Measurement uncertainty is less than 2dB
- 2. Emission level = Reading valus + Correction factor
- 3. Correction Factor = Cable loss + Insertion loss of LISN
- 4. "*": Measurement does not apply for this frequency.
- 5. Margin value = Emission level Limit
- 6. The emission of other frequencies were very low against the limit.
- 7. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.



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4.2 CHANNEL SEPARATION TEST

4.2.1 **LIMIT**

FCC Part15, Subpart C Section 15.247(a)(1). 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.

FREQUENCY RANGE (MHz)	Limit(kHz)
902-928	>25kHz
2400-2483.5	>25kHz
5725-5850	>25kHz

4.2.2 TEST EQUIPMENT

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

EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
SPECTRUM	l9kHz-7GHz	ROHDE &	FSP7/	MAR.2004
SPECTROW		SCHWARZ	839511/010	R&S

NOTE: The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

4.2.3 TEST SET-UP



The EUT was connected to a spectrum through a 50 RF cable.

4.2.4 TEST PROCEDURE

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

4.2.5 EUT OPERATING CONDITION

Same as section 4.1.5 of this report.



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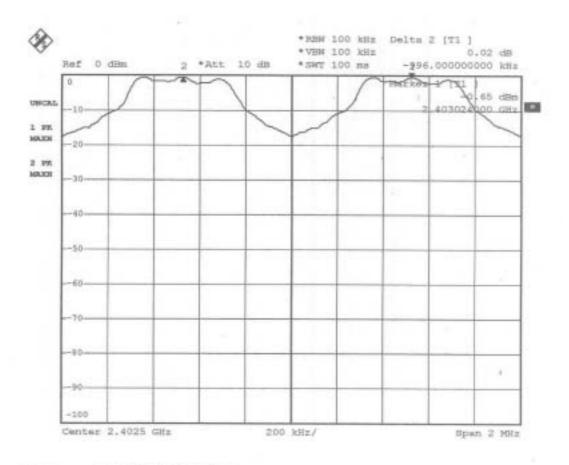
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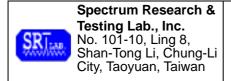
4.2.6 TEST RESULT

Temperature:26°CHumidity:55%RHSpectrum Detector:PKTested byJackson LaiTest ResultPASSTested Date:Dec. 01, 2003

CHANNEL NUMBER	CHANNEL FREQUENCY (MHz)	SEPARATION READ VALUE (kHz)	SEPARATION LIMIT (kHz)
0	2402	1000.000	>25kHz
39	2441	1000.000	>25kHz
78	2480	1000.000	>25kHz

CH0:



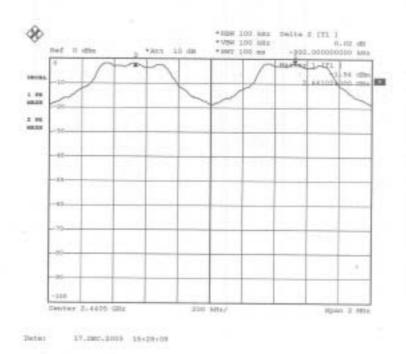


Reference No.:A03121108 Report No.:FCCA03121108

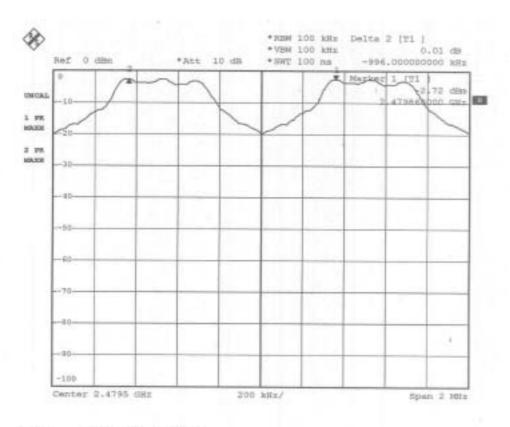
FCC ID:I4L-MS6850

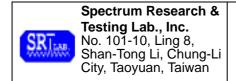
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CH39:



CH78:





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4.3 20dB Bandwidth

4.3.1 LIMIT

	Limit(kHz)				
FREQUENCY	Quantity of				
Range (MHz)	Hopping	50	25	15	75
	Channel				
902-928		<250	>250	NA	NA
2400-2483.5		NA	NA	>1000	<1000

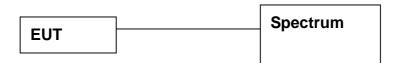
4.3.2 TEST EQUIPMENT

The following test equipment was used during the test:

EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
SPECTRUM	9kHz-7GHz	ROHDE &	FSP7/	MAR.2004
OF LOTINOW	9KHZ-7GHZ	SCHWARZ	839511/010	R&S

NOTE: The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

4.3.3 TEST SET-UP



The EUT was connected to a spectrum through a 50 RF cable.

4.3.4 TEST PROCEDURE

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

4.3.5 EUT OPERATING CONDITION

Same as section 4.1.5 of this report.



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4.3.6 TEST RESULT

Humidity: Temperature: 26°C 55%RH Tested by Spectrum Detector: PΚ Jackson Lai Test Result Tested Date: **PASS** Dec. 17, 2003

CHANNEL NUMBER	CHANNEL FREQUENCY (MHz)	20dB DOWN BW (KHz)	MINIMUM LIMIT (MHz)
0	2402	888	1
39	2441	840	1
78	2480	840	1

CH0:



17.DEC.2003 15:39:55

121 21W F 19

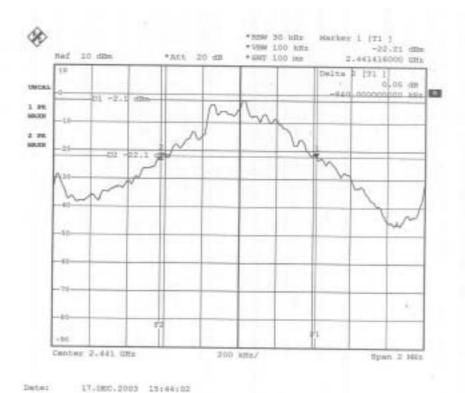


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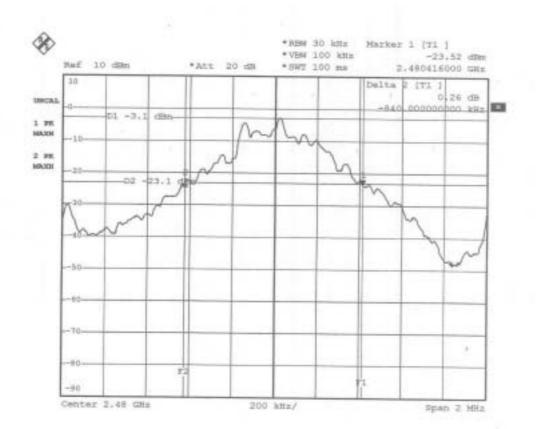
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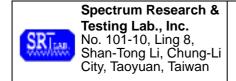
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Ch39:



CH78:





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4.4 QUANTITY OF HOPPING CHANNEL TEST

4.4.1 **LIMIT**

FCC Part15, Subpart C Section 15.247.

FREQUENCY RANGE	Limit (Quantity of Hopping Channel)					
(MHz)	20dB bandwidth <250kHZ	20dB bandwidth >250kHZ	20dB bandwidth <1MHz	20dB bandwidth >1MHz		
902-928	50	25	N/A	N/A		
2400-2483.5	N/A	N/A	75	15		
5725-5850	N/A	N/A	75	N/A		

4.4.2 TEST EQUIPMENT

The following test equipment was used during the test:

EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
SPECTRUM	9kHz-7GHz	ROHDE &	FSP7/	MAR.2004
OI LOTIVOW	9KHZ-7GHZ	SCHWARZ	839511/010	R&S

NOTE: The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

4.4.3 TEST SET-UP



The EUT was connected to a spectrum through a 50 RF cable.

4.4.4 TEST PROCEDURE

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

4.4.5 EUT OPERATING CONDITION

Same as section 4.1.5 of this report.



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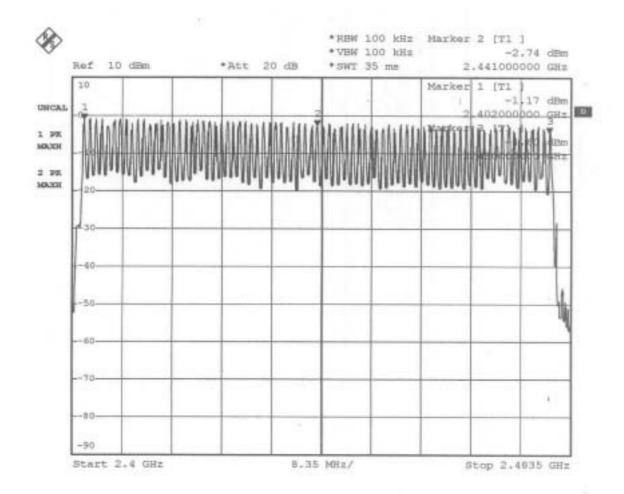
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4.4.6 TEST RESULT

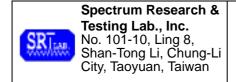
Temperature:26°CHumidity:55%RHSpectrum Detector:PKTested byJackson LaiTest ResultPASSTested Date:Dec. 17, 2003

HOPPING CHANNEL FREQUENCY RANGE	QUANTITY OF HOPPING CHANNEL READ VALUE	QUANTITY OF HOPPING CHANNEL LIMIT
2402~2480	79	75

CH0-CH78



Date: 17.DEC.2003 16:26:54



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4.5 Time of occupancy (Dwell Time)

4.5.1 LIMIT

FCC Part15, Subpart C Section 15.247.

FREQUENCY RANGE	LIMIT (ms)				
(MHz)	20dB bandwidth <250kHZ(50Channel)	20dB bandwidth >250kHZ(25Channel)	20dB bandwidth <1MHz(75Channel)		
902-928	400(20s)	400(10s)	NA		
2400-2483.5	NA	NA	400(30s)		
5725-5850	NA	NA	400(30s)		

NOTE: The "()" is all channel's average time of occupancy.

4.5.2 TEST EQUIPMENT

The following test equipment was used during the test:

EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
SPECTRUM		ROHDE &	FSP7/	MAR.2004
SPECIKUW	9kHz-7GHz	SCHWARZ	839511/010	R&S

NOTE: The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

4.5.3 TEST SET-UP



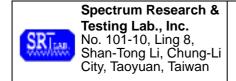
The EUT was connected to a spectrum through a 50 RF cable.

4.5.4 TEST PROCEDURE

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

4.5.5 EUT OPERATING CONDITION

Same as section 4.1.5 of this report.



Reference No.:A03121108 Report No.:FCCA03121108

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4.5.6 TEST RESULT

Temperature:26°CHumidity:55%RHSpectrum Detector:PKTested byJacksonLaiTest ResultPASSTested Date:Dec. 17, 2003

CHANNEL	CHANNEL FREQUENCY (MHz)	Pulse Time (µs)	Burts (in 1 sec.)	Time of occupancy (Dwell Time) (ms)	Average time of occupancy LIMIT (ms)
0	2402.00	530	10	164.3	400
39	2441.00	530	10	164.3	400
78	2480.00	530	10	164.3	400

Note:

Dwell Time:

Pulse Time*Burts*0.4*79

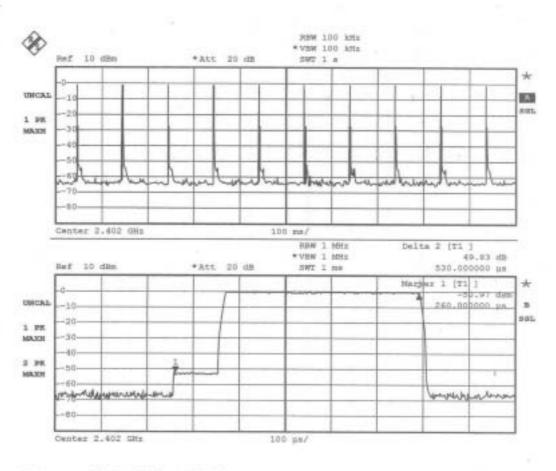


Reference No.:A03121108 Report No.:FCCA03121108

FCC ID:I4L-MS6850

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CH0:



Date:

17.DEC.2003 16:18:26

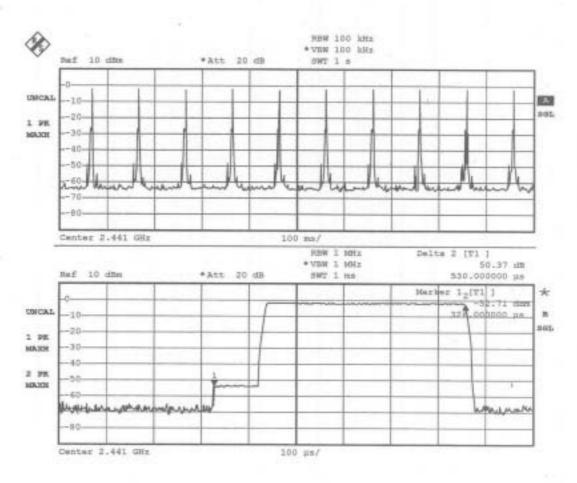


Reference No.:A03121108 Report No.:FCCA03121108

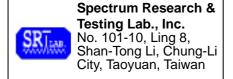
FCC ID:14L-MS6850

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Ch39:



Date: 17.DEC.2003 16:20:58

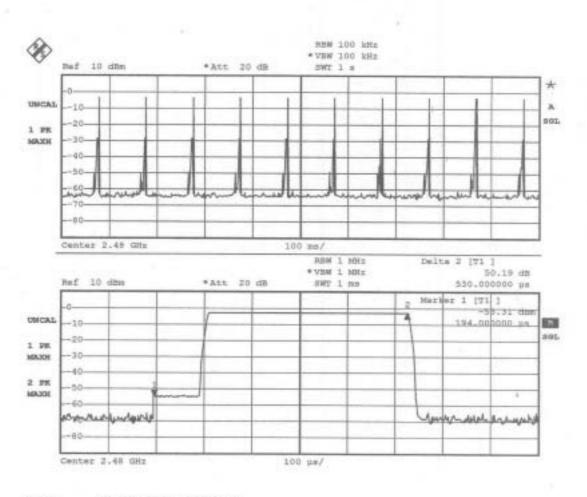


Reference No.:A03121108 Report No.:FCCA03121108

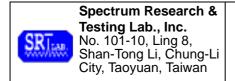
FCC ID:I4L-MS6850

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CH78:



Date: 17.DEC.2003 16:23:41



Reference No.:A03121108 Report No.:FCCA03121108

FCC ID:I4L-MS6850

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4.6 PEAK POWER TEST

4.6.1 **LIMIT**

FCC Part15, Subpart C Section 15.247.

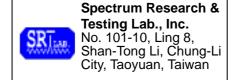
FREQUENCY	LIMIT (W)					
RANGE (MHz)	Quantity of Hopping Channel	50	25	15	75	
902-9	928	1(30dBm)	0.125(21dBm)	NA	NA	
2400-2483.5		-2483.5 NA NA 0.125(21dBm)		1(30dBm)		
5725-	5850	NA	NA	NA	1(30dBm)	

4.6.2 TEST EQUIPMENT

The following test equipment was used during the test:

EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
SPECTRUM	9kHz-7GHz		FSP7/ 839511/010	MAR. 2004 R & S
POWER METER	N/A	BOONTON		MAY 2004 ETC
POWER SENSOR	DC-18GHz 0.3 µ W-100mW 50	BOONTON	51011-EMC/ 31184	JUN. 2004 ETC

NOTE: The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

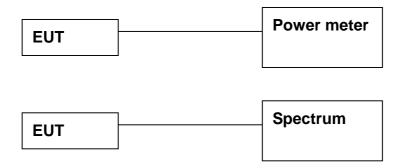


Reference No.:A03121108 Report No.:FCCA03121108

FCC ID:I4L-MS6850

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4.6.3 TEST SET-UP



The EUT was connected to a spectrum through a 50 RF cable.

4.6.4 TEST PROCEDURE

The EUT was operating in hopping mode or could control its channel. Printed out the test result from the spectrum by hard copy function. Recorded the read value of the power meter.

4.6.5 EUT OPERATING CONDITION

Same as section 4.1.5 of this report.

4.6.6 TEST RESULT

Temperature:	26°C	Humidity:	55%RH
Spectrum Detector:	PK	Tested by	Jackson Lai
Test Result	PASS	Tested Date:	Dec. 17, 2003

CHANNEL NUMBER	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)	
0	2402.0000	-1.60	30	
39	2441.0000	-2.87	30	
78	2480.0000	-3.80	30	

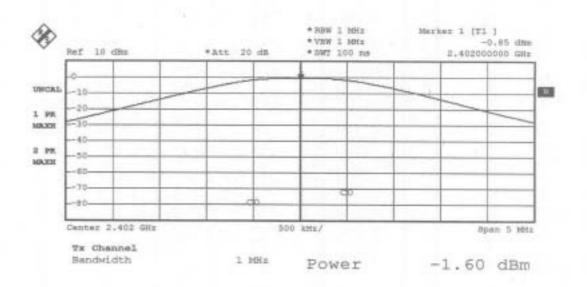


Reference No.:A03121108 Report No.:FCCA03121108

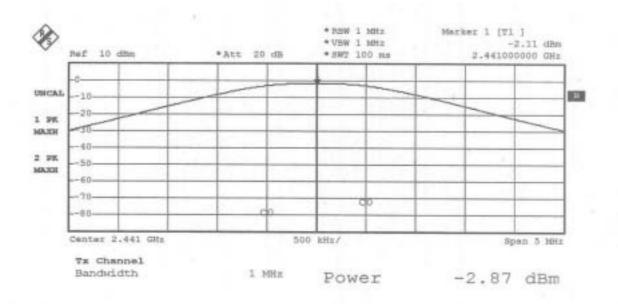
FCC ID:I4L-MS6850

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CH0:



CH39:



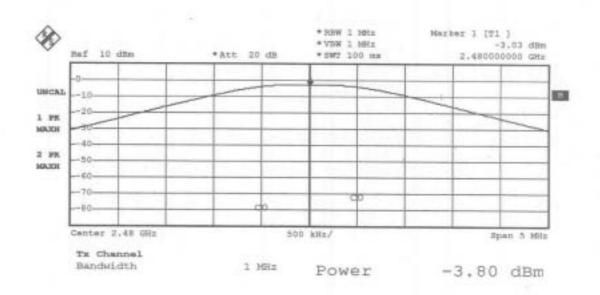


Reference No.:A03121108 Report No.:FCCA03121108

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CH78:





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4.7 BAND EDGE TEST

4.7.1 LIMIT

FCC Part15, Subpart C Section 15.247. 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)).

OPERATING STATES	SPURIOUS EMISSION	LIMIT		
FREQUENCY RANGE (MHz)	FREQUENCY (MHz)	Peak power ration to emission(dBc)	Emission level(dBuV/m)	
902-928	<902	>20	NA	
	>928	>20	NA	
	960-1240	NA	54	
2400-2483.5	<2400	>20	NA	
	>2483.5-2500	NA	54	
5725-5850	<5350-5460	NA	54	
	<5725	>20	NA	
	>5850	>20	NA	



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4.7.2 TEST EQUIPMENT

The following test equipment was used during the test:

EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
SPECTRUM	9kHz-7GHz	ROHDE &	FSP7/	MAR.2004
3F LOTROW	3KI 12-7 GI 12	SCHWARZ	839511/010	R & S
EMI TEST	9 kHz TO 2750	ROHDE &	ESCS30/	AUG. 2004
RECEIVER	MHz	SCHWARZ	830245/012	R&S
ODEOTRUM OKU OO FOU		HP	8953E/	MAY. 2004
SPECTRUM	9KHz-26.5GHz	ПР	3710A03220	ETC
DDE AMBLIEIED	1GHz-26.5GHz	HP	8449B/	DEC. 2003
PRE-AMPLIFIER	Gain:30dB	INP	3008A01019	ETC
BI-LOG	25 MHz TO	EMCO	24.42/0704.4424	APR. 2004
ANTENNA	2 GHz	EMCO	3142/9701-1124	SRT
LIODNI ANITENNIA	40U= to 400U=	EMCO	3115/	DEC. 2003
HORN ANTENNA	1GHz to 18GHz	EMCO	9602-4681	ETC
OATO	3 - 10 M	CDT	CDT 4	APR. 2004
OATS	measurement	SRT	SRT-1	SRT
CDECTRUM	0kU- 70U-	ROHDE &	FSP7/	MAR.2004
SPECTRUM	9kHz-7GHz	SCHWARZ	839511/010	R & S

NOTE: The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.



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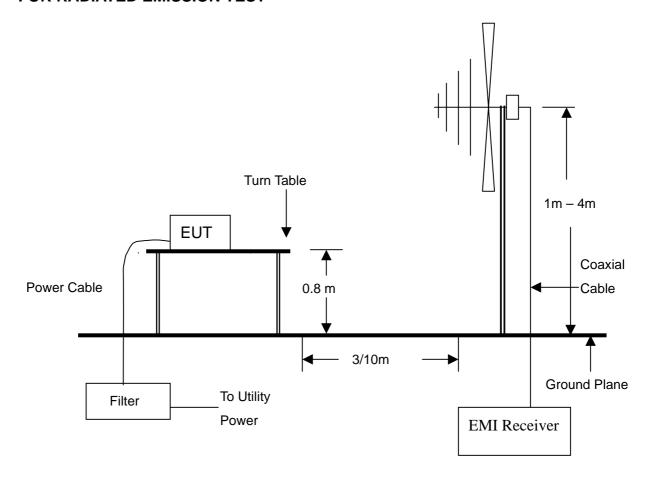
4.7.3 TEST SET-UP

FOR RF CONDUCTED TEST (dBc)



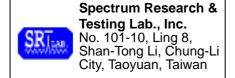
The EUT was connected to the spectrum through a 50 RF cable.

FOR RADIATED EMISSION TEST



NOTE:

- 1. The EUT system was put on a wooden table with 0.8m heights above a ground plane.
- 2. For the actual test configuration, please refer to the photos of testing.



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4.7.4 TEST PROCEDURE

1. The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

2. The EUT was tested according to the requirement of ANSI C63.4 and CISPR 22. The measurements were made at an open area test site with 10 meter measurement distance under 1 GHz and with 3m distance above 1GHz. The frequency spectrum measured started from 30 MHz. Under 1 GHz. All readings were quasi-peak values with 120 kHz resolution bandwidth of the test receiver. Above 1 GHz, the measurements were made at an open area test site with 3 meter measurement distance and all readings were peak and average values with 1 MHz resolution bandwidth of the test receiver. The EUT system was operated in all typical methods by users. The cables connected to EUT and support units were moved to find the maximum emission levels for each frequency.

4.7.5 EUT OPERATING CONDITION

Same as section 4.1.5 of this report.

4.7.6 TEST RESULT

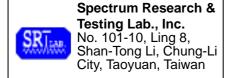
Temperature:	26°C	Humidity:	55%RH
Spectrum Detector:	PK & AV	Tested by	Jackson Lai
Test Result	PASS	Tested Date:	Dec. 23, 2003

1.Conducted test

Frequency (MHz)	PEAK POWER OUTPUT (dBm)	Emission read Value(dBm)	Result of Band edge (dBc)	Band edge LIMIT (dBc)
<2400	-1.55	-43.33	41.78	>20dBc
>2483.5	-0.92	-45.56	44.64	>20dBc

2.Radiated emission test

Frequency (MHz)	Antenna polarization (H/V)	PEAK POWER OUTPUT (dBuV/m)	Emission read Value(dBuV/m)	Band edge LIMIT (dBuV/m)
<2400	V	47.8	43.7	54
>2483.5	V	49.9	45.8	54

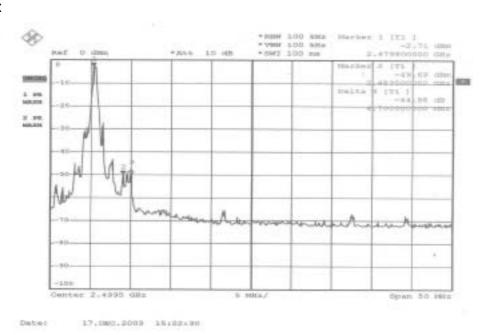


Reference No.:A03121108 Report No.:FCCA03121108

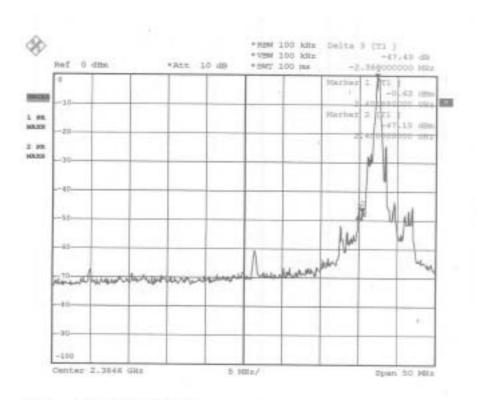
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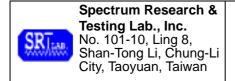
Date:Dec. 31, 2003

<2400MHz:



>2483.5MHz





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4.8 SPURIOUS RADIATED EMISSION TEST

4.8.1 LIMIT

FCC Part15, Subpart C Section 15.209 limit of radiated emission for frequency below1000MHz. The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

FREQUENCY (MHz)	DISTANCE (m)	FIELD STRENGTH (dBμV/m)
30 - 88	3	40.0
88 - 216	3	43.5
216 - 960	3	46.0
ABOVE 960	3	54.0

- **NOTE**: 1. In the emission tables above, the tighter limit applies at the band edges.
 - 2. Distance refers to the distance between measuring instrument, antenna, and the closest point of any part of the device or system.

FCC Part 15, Section15.35(b) limit of radiated emission for frequency above 1000 MHz

FREQUENCY (MHz)	Class A (dBu	ıV/m) (at 3m)	Class B (dBuV/m) (at 3m)		
FREQUENCT (MHZ)	PEAK	AVERAGE	PEAK	AVERAGE	
Above 1000	80.0	60.0	74.0	54.0	

FCC Part 15, Subpart C Section 15.249. The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

FUNDAMENTAL FREQUENCY (MHz)	FILED STRE FUNDAM (dBuV/m)	IENTAL	FIELD STRENGTH OF HARMONICS (dBuV/m) (at 3m)		
	PEAK	AVERAGE	PEAK	AVERAGE	
902-928	114	94	74.0	54.0	
2400-2483.5	114	94	74.0	54.0	
5725-5875	114	94	74.0	54.0	
24000-24250	128	108	88	68	



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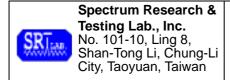
4.8.2 TEST EQUIPMENT

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

EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
EMI TEST	9 kHz TO	ROHDE &	ESCS30/	AUG. 2004
RECEIVER	2750 MHz	SCHWARZ	830245/012	R&S
BI-LOG	25 MHz TO	EMCO	3142/	APR. 2004
ANTENNA	2 GHz	EIVICO	9701-1124	SRT
OATS	3 – 10 M		SRT-1	APR. 2004
OATS	MEASUREMENT	SRT	381-1	SRT
COAXIAL	25M	SUNCITY	J400/	AUG. 2004
CABLE	25IVI	SUNCITY	25M	SRT
FILTER	OLINE 20A	FIL.COIL	FC-943/	N/A
FILIER	2 LINE, 30A	FIL.COIL	869	IN/A
FREQUENCY	NI/A	ADC	AFC-1KW/	AUG. 2004
CONVERTER	N/A	APC	860612	SRT

NOTE:

- 1. The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.
- 2. The Open Area Test Site (SRT-1) is registered by FCC with No. 90957 and VCCI with No. R-1081.
- 3. The Open Area Test Site (SRT-2) is registered by FCC with No. 98458 and VCCI with No. R-1168.

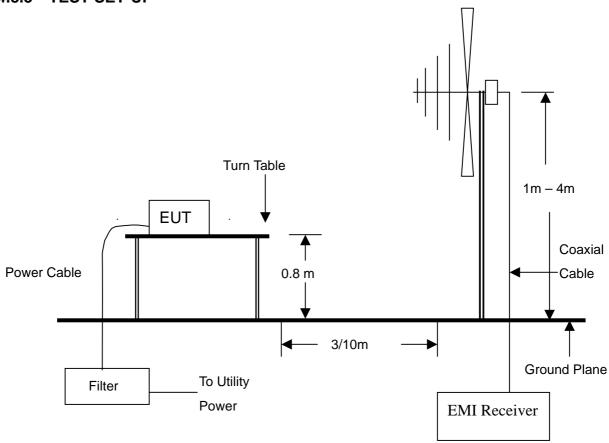


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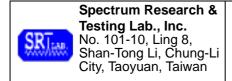
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4.8.3 TEST SET-UP



NOTE:

- 3. The EUT system was put on a wooden table with 0.8m heights above a ground plane.
- 4. For the actual test configuration, please refer to the photos of testing.



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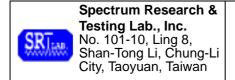
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4.8.4 TEST PROCEDURE

The EUT was tested according to the requirement of ANSI C63.4 and CISPR 22. The measurements were made at an open area test site with 10 meter measurement distance under 1 GHz and with 3m distance above 1GHz. The frequency spectrum measured started from 30 MHz. Under 1 GHz. All readings were quasi-peak values with 120 kHz resolution bandwidth of the test receiver. Above 1 GHz, the measurements were made at an open area test site with 3 meter measurement distance and all readings were peak and average values with 1 MHz resolution bandwidth of the test receiver. The EUT system was operated in all typical methods by users. The cables connected to EUT and support units were moved to find the maximum emission levels for each frequency.

4.8.5 EUT OPERATING CONDITION

Same as section 4.1.5 of this report.



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4.8.6 TEST RESULT

Temperature: 25°C Humidity: 56%RH

Ferquency Range: 30 – 1000 MHz Test mode: RX
Receiver Detector: Q.P. or AV. Measured Distance: 3m

Tested by: Jackson Lai

Antenna Polarization: Horizontal

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBµV)	Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	EL(m)	AZ(°)
107.6000	1.22	8.53	21.2	31.0	43.5	-12.5	11.4	1.10
132.5500	1.38	8.24	27.7	37.3	43.5	-6.2	2.4	1.21
210.4400	1.67	10.90	17.4	30.0	43.5	-13.5	355.4	1.54
397.6000	2.61	16.26	23.3	42.2	46.0	-3.8	198.1	1.71
454.8600	2.67	17.15	20.3	40.1	46.0	-5.9	122.1	1.20
661.4500	2.60	20.93	18.1	41.6	46.0	-4.4	179.0	1.12

Antenna Polarization: Vertical

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBµV)	Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	EL(m)	AZ(°)
132.8200	1.38	8.24	27.2	36.8	43.5	-6.7	351.2	1.00
232.7300	1.89	11.90	19.5	33.3	46.0	-12.7	277.8	1.37
531.4200	3.16	18.78	17.2	39.1	46.0	-6.9	1.0	1.41
663.3200	2.58	20.98	18.4	42.0	46.0	-4.0	9.3	1.62
992.4500	3.10	23.94	17.1	44.1	54.0	-9.9	152.3	1.53
967.9900	3.18	23.64	16.4	43.2	54.0	-10.8	199.1	1.18

NOTE: 1. Measurement uncertainty is less than +/-4dB

- 2. "*": Measurement does not apply for this frequency.
- 3. Emissiom Level = Reading Value + Ant. Factor + Cable Loss
- 4. The field strength of other emission frequencies were very low against the limit.



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Temperature:	26°C	Humidity:	55%RH	
Ferquency Range:	1 – 25 GHz	Test mode:	Ch0	
Receiver Detector:	PK. or AV.	Measured Distance:	3m	
		-		

Antenna Polarization: Horizontal

Jackson Lai

Tested by:

Freq./MHz	Cable Ant. Reading Loss Fact. (dBuV)							gin V/m)	AZ	EL		
	(dB)	(dB)	PK	AV	PK	AV	PK	AV	PK	AV	(o)	(m)
2402.00(F)	-32.16	28.00	83.9	53.1	79.7	49.0	N/A	N/A	N/A	N/A	279	1.00
2400.00	-32.16	28.00	66.4	40.9	62.2	36.7	74.0	54.0	-11.8	-17.3	24.3	1.02
2397.56	-32.17	27.99	47.4	*	43.2	*	74.0	54.0	-30.8	*	19.1	1.00
2406.31	-32.17	28.01	47.7	*	43.5	*	74.0	54.0	-30.5	*	11.2	1.12
4804.00	-30.47	33.64	44.0	*	47.2	*	74.0	54.0	-26.8	*	298.6	1.06
7206.00	-28.90	36.26	42.8	*	50.2	*	74.0	54.0	-23.8	*	132.1	1.32

Antenna Polarization: Vertical

Freq/MHz	Cable Loss					Emission (dBuV/m)		Limit Line (dBuV/m)		Margin (dBuV/m)		EL
	(dB)	(dB)	PK	AV	PK	AV	PK	AV	PK	AV	(o)	(m)
2402.00(F)	-32.16	28.54	88.6	54.1	85.0	50.5	N/A	N/A	N/A	N/A	279	1.01
2397.25	-32.17	27.99	47.8	*	43.7	*	74.0	54.0	-30.3	*	10.2	1.03
2406.75	-32.17	28.01	50.4	37.4	46.3	33.2	74.0	54.0	-27.7	-20.8	9.1	1.12
2400.00	-32.16	28.00	62.3	43.1	58.1	38.9	74.0	54.0	-15.9	-15.1	334.5	1.11
4804.00	-30.47	33.64	44.7	*	47.9	*	74.0	54.0	-26.1	*	277.3	1.00
7206.00	-28.90	36.26	47.3	*	54.7	*	74.0	54.0	-19.3	*	351.8	1.03

NOTE: 1. Measurement uncertainty is less than +/-4dB

- 2. "*": Measurement does not apply for this frequency.
- 3. Emissiom Level = Reading Value + Ant. Factor + Cable Loss
- 4. The field strength of other emission frequencies were very low against the limit.
- 5.(F):The field stregth of fundamental frequency.



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Temperature: 26°C Humidity: 55%RH

Ferquency Range: 1 – 25 GHz Test mode: Ch39

Receiver Detector: PK. or AV. Measured Distance: 3m

Tested by: Jackson Lai

Antenna Polarization: Horizontal

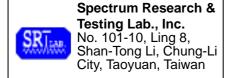
Freq./MHz	Cable Loss								gin V/m)	AZ	EL	
	(dB)	(dB)	PK	AV	PK	AV	PK	AV	PK	AV	(0)	(m)
2441.00(F)	-32.23	28.08	81.3	51.5	77.2	47.4	N/A	N/A	N/A	N/A	278.5	1.00
2445.60	-32.23	28.09	47.3	*	43.1	*	74.0	54.0	-30.9	*	187.3	1.11
2452.75	-32.24	28.10	48.2	*	44.0	*	74.0	54.0	-30.0	*	153.4	1.07
2429.00	-32.21	28.06	48.0	*	43.8	*	74.0	54.0	-30.2	*	176.3	1.43
4882.00	-30.26	33.71	43.1	*	46.6	*	74.0	54.0	-27.4	*	276.3	1.32
7323.00	-29.04	36.36	42.6	*	49.9	*	74.0	54.0	-24.1	*	300.4	1.00

Antenna Polarization: Vertical

Freq./MHz	Cable Loss	Ant. Fact.	3					Limit Line (dBuV/m)		Margin (dBuV/m)		EL
	(dB)	(dB)	PK	AV	PK	AV	PK	AV	PK	AV	(0)	(m)
2441.00(F)	-32.23	28.62	85.7	53.8	82.1	50.2	N/A	N/A	N/A	N/A	277.1	1.00
2445.88	-32.23	28.09	48.3	*	44.1	*	74.0	54.0	-29.9	*	178.2	1.03
2435.38	-32.22	28.07	45.3	*	41.2	*	74.0	54.0	-32.8	*	235.3	1.12
2462.00	-32.22	28.12	47.8	35.8	43.7	31.7	74.0	54.0	-30.3	-22.3	1.2	1.09
4882.00	-30.26	33.71	44.9	*	48.3	*	74.0	54.0	-25.7	*	266.3	1.33
7323.00	-29.04	36.36	47.7	*	55.0	*	74.0	54.0	-19.0	*	187.5	1.10

NOTE: 1. Measurement uncertainty is less than +/-4dB

- 2. "*": Measurement does not apply for this frequency.
- 3. Emissiom Level = Reading Value + Ant. Factor + Cable Loss
- 4. The field strength of other emission frequencies were very low against the limit.
- 5.(F):The field stregth of fundamental frquency.



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Temperature:26°CHumidity:55%RHFerquency Range:1 – 25GHzTest mode:Ch78Receiver Detector:PK. or AV.Measured Distance:3m

Tested by: Jackson Lai

Antenna Polarization: Horizontal

Freq./MHz	Cable Loss	Ant. Fact.		ding uV)		sion V/m)		Line V/m)	Mar (dBu	gin V/m)	AZ	EL
	(dB)	(dB)	PK	AV	PK	AV	PK	AV	PK	AV	(0)	(m)
2480.00(F)	-32.19	28.16	81.5	53.3	77.4	49.3	N/A	N/A	N/A	N/A	287.9	1.00
2483.50	-32.19	28.17	48.6	36.9	44.6	32.9	74.0	54.0	-29.4	-21.1	128.2	1.22
2484.40	-32.19	28.17	47.4	*	43.4	*	74.0	54.0	-30.6	*	198.3	1.17
2475.40	-32.20	28.15	47.4	*	43.3	*	74.0	54.0	-30.7	*	177.2	1.09
4960.00	-30.26	33.77	44.1	*	47.6	*	74.0	54.0	-26.4	*	12.8	1.32
7440.00	-28.95	36.45	42.8	*	50.3	*	74.0	54.0	-23.7	*	21.2	1.03

Antenna Polarization: Vertical

Freq./MHz	Cable Loss						Limit Line (dBuV/m)		Margin (dBuV/m)		EL	
	(dB)	(dB)	PK	AV	PK	AV	PK	AV	PK	AV	(0)	(m)
2480.00(F)	-32.19	28.73	85.3	57.1	81.9	53.7	N/A	N/A	N/A	N/A	276.2	1.00
2483.50	-32.19	28.17	50.2	38.9	46.2	34.9	74.0	54.0	-27.8	-19.1	224.7	1.30
2484.80	-32.19	28.17	49.9	*	45.8	*	74.0	54.0	-28.2	*	254.7	1.12
2468.50	-32.21	28.14	47.7	*	43.6	*	74.0	54.0	-30.4	*	139.6	1.18
4960.00	-30.26	33.77	46.6	*	50.1	*	74.0	54.0	-23.9	*	182.4	1.02
7440.00	-28.95	36.45	47.8	*	55.3	*	74.0	54.0	-18.7	*	199.7	1.41

NOTE: 1. Measurement uncertainty is less than +/- 4dB

- 2. "*": Measurement does not apply for this frequency.
- 3. Emissiom Level = Reading Value + Ant. Factor + Cable Loss
- 4. The field strength of other emission frequencies were very low against the limit.
- 5.(F):The field stregth of fundamental frquency.



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5. Antenna application

5.1 Antenna requirement

The EUT's antenna is met the requirement of FCC part15C section15.203 and 15.204.

FCC part15C section15.247 requirement:

Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

5.2 Result

The EUT's antenna used a dipole antenna and integrated on PCB. The antenna's gain is -3dBi and meets the requirement.



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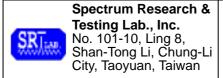
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6. PHOTOS OF TESTING

- Couducted test







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- Radiated test(RX)







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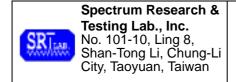
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- Radiated test(TX)







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7. TERMS OF ABRIVATION

AV.	Average detection
AZ(°)	Turn table azimuth
Correct.	Correction
EL(m)	Antenna height (meter)
EUT	Equipment Under Test
Horiz.	Horizontal direction
LISN	Line Impedance Stabilization Network
NSA	Normalized Site Attenuation
Q.P.	Quasi-peak detection
SRT Lab	Spectrum Research & Testing Laboratory, Inc.
Vert.	Vertical direction