

FCC TEST REPORT

REPORT NO.: RF980423H01

MODEL NO.: M-R0001

RECEIVED: Apr. 23, 2009

TESTED: Apr. 28 to 29, 2009

ISSUED: May 04, 2009

APPLICANT: LOGITECH FAR EAST LTD.

ADDRESS: #2 Creation Rd. 4, Science-Based Ind. Park

Hsinchu Taiwan, R.O.C.

ISSUED BY: Bureau Veritas Consumer Products Services

(H.K.) Ltd., Taoyuan Branch

TEST LOCATION: No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung

Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307,

Taiwan

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CERTIFICATION

2.4GHz Cordless Mouse PRODUCT:

BRAND NAME: Logitech MODEL NO.: M-R0001

> TESTED: Apr. 28 to 29, 2009

MASS-PRODUCTION TEST SAMPLE:

APPLICANT: LOGITECH FAR EAST LTD.

STANDARDS: 47 CFR Part 15, Subpart C (Section 15.249),

ANSI C63.4-2003

The above equipment (Model: M-R0001) has been tested by Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

(Sunny Wen, Specialist) , DATE: <u>May 04, 2009</u>

TECHNICAL DATE: May 04, 2009 ACCEPTANCE

Responsible for RF (Hank Chung, Deputy Manager)

APPROVED BY: DATE: May 04, 2009

(May Chen, Deputy Manager)



2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: 47 CFR Part 15, Subpart C							
Standard Paragraph	Test Type	Result	Remark				
15.207	Conducted Emission Test	NA	Power supply is DC 1.5V from batteries				
15.249	Radiated Emission Test	PASS	Minimum passing margin is -8.82dB at 2400.00MHz				
15.249	Conducted - Out Band Measurement	PASS	Meet the requirement of limit				

2.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement	Value
Radiated emissions (30MHz-1GHz)	3.94 dB
Radiated emissions (1GHz -18GHz)	2.49 dB
Radiated emissions (18GHz -40GHz)	2.70 dB



3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	2.4GHz Cordless Mouse			
MODEL NO.	M-R0001			
FCC ID	JNZMR0001			
POWER SUPPLY	DC 1.5V from batteries			
MODULATION TYPE	GFSK			
CARRIER FREQUENCY OF EACH CHANNEL	2405MHz ~ 2474MHz			
NUMBER OF CHANNEL	12			
ANTENNA TYPE	PCB printed quarter wave antenna with -1.94dBi antenna gain			
DATA CABLE	NA			
I/O PORTS	NA			
ASSOCIATED DEVICES	NA			

NOTE:

1. The above EUT information was declared by the manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.



3.2 DESCRIPTION OF TEST MODES

Twelve channels are provided in this EUT.

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
1	2405	4	2417	7	2441	10	2465
2	2408	5	2432	8	2444	11	2471
3	2414	6	2435	9	2462	12	2474

NOTE:

- 1. Below 1 GHz, the channel 1, 8, and 12 were pre-tested in chamber. The channel 12, worst case one, was chosen for final test.
- 2. Above 1 GHz, the channel 1, 8, and 12 were tested individually.

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a 2.4GHz Cordless Mouse. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

47 CFR Part 15, Subpart C (Section 15.249) ANSI C63.4: 2003

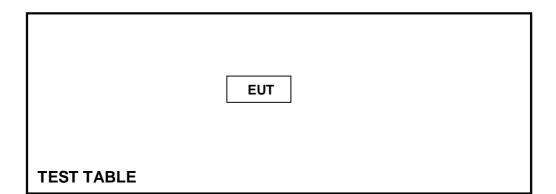
All tests have been performed and recorded as per the above standards.



3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit.

3.5 CONFIGURATION OF SYSTEM UNDER TEST





4 TEST PROCEDURES AND RESULTS

4.1 RADIATED EMISSION MEASUREMENT

4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

According to 15.249 the field strength of emissions from intentional radiators operated under these frequencies bands shall not exceed the following:

Fundamental Frequency	Field Strength of Fundamental (dBuV/m)			
(MHz)	Peak	Average		
	114	94		
2400 ~ 2483.5	Field Strength of Ha	rmonics (dBuV/m)		
	74	54		

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

Frequencies (MHz)	Field strength (microvolts/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

As shown in 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.



4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
ROHDE & SCHWARZ Spectrum Analyzer	FSP40	100036	Dec. 09, 2008	Dec. 08, 2009
HP Pre_Amplifier	8449B	3008A01923	Nov. 10, 2008	Nov. 09, 2009
ROHDE & SCHWARZ Test Receiver	ESCS30	847124/029	Sep. 09, 2008	Sep. 08, 2009
SCHWARZBECK TRILOG Broadband Antenna	VULB 9168	138	April 30, 2008	April 29, 2009
Schwarzbeck Horn_Antenna	BBHA9120	D124	Dec. 09, 2008	Dec. 08, 2009
Schwarzbeck Horn_Antenna	BBHA 9170	BBHA9170153	Jan. 22, 2009	Jan. 21, 2010
RF Switches	EMH-011	08009	Oct. 07, 2008	Oct. 06, 2009
RF CABLE (Chaintek)	Sucoflex 106	28077	Aug. 15, 2008	Aug. 14, 2009
RF Cable	8DFB	STCCAB-30M- 1GHz	Oct. 07, 2008	Oct. 06, 2009
Software	ADT_Radiated_ V7.6.15.9.2	NA	NA	NA
CT Antenna Tower & Turn Table	NA	NA .	NA	NA NA

- Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

 2. The horn antenna, HP preamplifier (model: 8449B) and Spectrum Analyzer (model: FSP40) are used only for the measurement of emission frequency above 1GHz if tested.

 3. The test was performed in Open Site No. C.

 4. The FCC Site Registration No. is 656396.

 5. The VCCI Site Registration No. is R-1626.

 6. The CANADA Site Registration No. is IC 7450G-3.



4.1.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

NOTE:

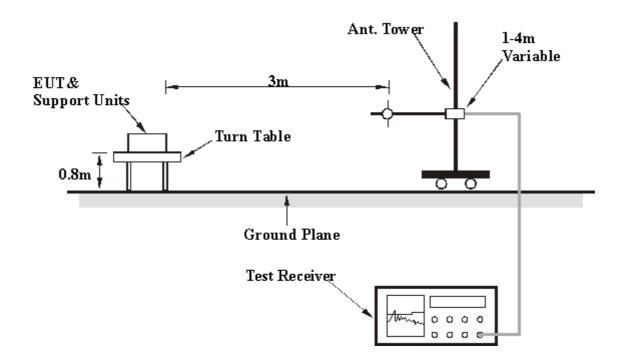
- 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
- 2. The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1GHz.
- 3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1GHz.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation



4.1.5 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.1.6 EUT OPERATING CONDITIONS

Set the EUT under transmission / receiver condition continuously at specific channel frequency.



4.1.7 TEST RESULTS

MODE	Channel 12	INPUT POWER	DC 1.5V from batteries
FREQUENCY RANGE	30-1000 MHz	DETECTOR FUNCTION & BANDWIDTH	Quasi-Peak, 120kHz
ENVIRONMENTAL CONDITIONS	26 deg. C, 60%RH, 965 hPa	TESTED BY	Wen Yu

	ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	43.86	20.92 QP	40.00	-19.08	1.17 H	0	7.35	13.57
2	62.29	20.91 QP	40.00	-19.09	1.30 H	197	6.88	14.03
3	180.00	26.88 QP	43.50	-16.62	1.41 H	100	12.35	14.53
4	210.00	25.14 QP	43.50	-18.36	1.18 H	234	11.67	13.47
5	419.50	27.63 QP	46.00	-18.37	1.18 H	13	6.20	21.43
6	710.33	28.38 QP	46.00	-17.62	1.69 H	151	1.05	27.33

	ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
No.	Freq.	Emission Level	Limit	Margin	Antenna Height	Table Angle	Raw Value	Correction Factor
	(MHz)	(dBuV/m)	(ubuv/III)	dBuV/m) (dB)	(m)	(Degree)	(dBuV)	(dB/m)
1	36.87	24.83 QP	40.00	-15.17	1.26 V	20	11.53	13.30
2	160.00	24.42 QP	43.50	-19.08	1.12 V	169	8.35	16.07
3	180.00	24.38 QP	43.50	-19.12	1.00 V	139	9.85	14.53
4	210.20	25.05 QP	43.50	-18.45	1.00 V	306	11.57	13.48
5	419.54	28.12 QP	46.00	-17.88	1.04 V	20	6.68	21.44
6	710.33	27.40 QP	46.00	-18.60	1.53 V	258	0.07	27.33

REMARKS:

- 1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
- 2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
- 3. The other emission levels were very low against the limit.
- 4. Margin value = Emission level Limit value.



MODE	Channel 1	INPUT POWER	DC 1.5V from batteries
FREQUENCY RANGE	1000~25000MHz	DETECTOR FUNCTION & BANDWIDTH	Peak (PK) Average (AV) 1 MHz
ENVIRONMENTAL CONDITIONS	26 deg. C, 60%RH, 965 hPa	TESTED BY	Wen Yu

	ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M									
	Freg.	Emission	Limit	Margin	Antenna	Table	Raw	Correction		
No.	(MHz)	Level	(dBuV/m)	(dB)	Height	Angle	Value	Factor		
	(IVIITZ)	(dBuV/m)	(ubuv/III)	(ub)	(m)	(Degree)	(dBuV)	(dB/m)		
1	2400.00	65.18 PK	74.00	-8.82	1.35 H	10	34.86	30.32		
2	2400.00	33.08 AV	54.00	-20.92	1.35 H	10	2.76	30.32		
3	*2405.00	92.81 PK	114.00	-21.19	1.35 H	10	62.47	30.34		
4	*2405.00	60.71 AV	94.00	-33.29	1.35 H	10	30.37	30.34		
5	4810.00	50.39 PK	74.00	-23.61	1.70 H	34	13.64	36.75		
6	4810.00	18.29 AV	54.00	-35.71	1.70 H	34	-18.46	36.75		
7	7215.00	54.38 PK	74.00	-19.62	1.21 H	310	11.24	43.14		
8	7215.00	22.28 AV	54.00	-31.72	1.21 H	310	-20.86	43.14		

	ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M									
	Freq.	Emission	Limit	Margin	Antenna	Table	Raw	Correction		
No.	(MHz)	Level	(dBuV/m)	(dB)	Height	Angle	Value	Factor		
	(1411 12)	(dBuV/m)	(dbd v/III)	(GD)	(m)	(Degree)	(dBuV)	(dB/m)		
1	2400.00	62.38 PK	74.00	-11.62	1.13 V	281	32.06	30.32		
2	2400.00	30.28 AV	54.00	-23.72	1.13 V	281	-0.04	30.32		
3	*2405.00	89.66 PK	114.00	-24.34	1.13 V	281	59.32	30.34		
4	*2405.00	57.56 AV	94.00	-36.44	1.13 V	281	27.22	30.34		
5	4810.00	49.62 PK	74.00	-24.38	1.89 V	0	12.87	36.75		
6	4810.00	17.52 AV	54.00	-36.48	1.89 V	0	-19.23	36.75		
7	7215.00	54.01 PK	74.00	-19.99	1.06 V	2	10.87	43.14		
8	7215.00	21.91 AV	54.00	-32.09	1.06 V	2	-21.23	43.14		

REMARKS: 1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).

- 2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
- 3. The other emission levels were very low against the limit.
- 4. Margin value = Emission level Limit value.
- 5. " * ": Fundamental frequency.
- 6. Duty cycle = 2.48%
- 7. Average value = peak reading + 20log(duty cycle).



MODE	Channel 8	INPUT POWER	DC 1.5V from batteries
FREQUENCY RANGE	1000~25000MHz	DETECTOR FUNCTION & BANDWIDTH	Peak (PK) Average (AV) 1 MHz
ENVIRONMENTAL CONDITIONS	26 deg. C, 60%RH, 965 hPa	TESTED BY	Wen Yu

	ANTENN	NA POLARI	TY & TE	ST DIST	ANCE: I	HORIZO	NTAL AT	3 M
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2444.00	91.77 PK	114.00	-22.23	1.36 H	339	61.29	30.48
2	*2444.00	59.67 AV	94.00	-34.33	1.36 H	339	29.19	30.48
3	4888.00	50.57 PK	74.00	-23.43	2.13 H	20	13.61	36.96
4	4888.00	18.47 AV	54.00	-35.53	2.13 H	20	-18.49	36.96
5	7332.00	54.15 PK	74.00	-19.85	1.62 H	328	11.02	43.13
6	7332.00	22.05 AV	54.00	-31.95	1.62 H	328	-21.08	43.13
	ANTE	NNA POLAF	RITY & T	EST DIS	TANCE	: VERTIC	CAL AT 3	M
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2444.00	90.54 PK	114.00	-23.46	1.11 V	280	60.06	30.48
2	*2444.00	58.44 AV	94.00	-35.56	1.11 V	280	27.96	30.48
3	4888.00	49.98 PK	74.00	-24.02	1.02 V	336	13.02	36.96
4	4888.00	17.88 AV	54.00	-36.12	1.02 V	336	-19.08	36.96
5	7332.00	54.07 PK	74.00	-19.93	1.26 V	33	10.94	43.13
6	7332.00	21.97 AV	54.00	-32.03	1.26 V	33	-21.16	43.13

REMARKS: 1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).

- 2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
- 3. The other emission levels were very low against the limit.
- 4. Margin value = Emission level Limit value.
- 5. " * ": Fundamental frequency.
- 6. Duty cycle = 2.48%
- 7. Average value = peak reading + 20log(duty cycle).



MODE	Channel 12	INPUT POWER	DC 1.5V from batteries
FREQUENCY RANGE	1000~25000MHz	DETECTOR FUNCTION & BANDWIDTH	Peak (PK) Average (AV) 1 MHz
ENVIRONMENTAL CONDITIONS	26 deg. C, 60%RH, 965 hPa	TESTED BY	Wen Yu

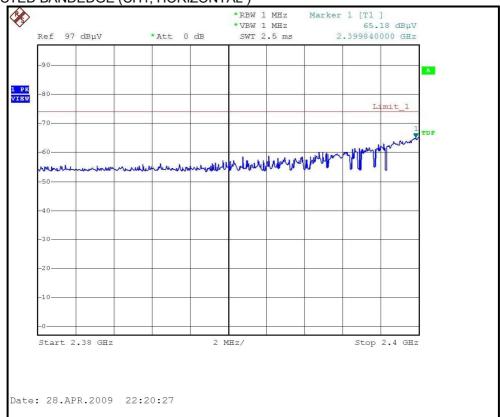
	ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)	
1	*2474.00	90.96 PK	114.00	-23.04	1.37 H	340	60.37	30.59	
2	*2474.00	58.86 AV	94.00	-35.14	1.37 H	340	28.27	30.59	
3	2483.50	58.41 PK	74.00	-15.59	1.37 H	339	27.78	30.63	
4	2483.50	26.31 AV	54.00	-27.69	1.37 H	339	-4.32	30.63	
5	4948.00	49.24 PK	74.00	-24.76	2.13 H	216	12.12	37.12	
6	4948.00	17.14 AV	54.00	-36.86	2.13 H	216	-19.98	37.12	
7	7422.00	52.94 PK	74.00	-21.06	1.27 H	0	9.81	43.13	
8	7422.00	20.84 AV	54.00	-33.16	1.27 H	0	-22.29	43.13	
	ANTE	NNA POLAI	RITY & T	EST DIS	STANCE	: VERTIC	CAL AT 3	M	
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)	
1	*2474.00	90.35 PK	114.00	-23.65	1.10 V	261	59.76	30.59	
2	*2474.00	58.25 AV	94.00	-35.75	1.10 V	261	27.66	30.59	
3	2483.50	58.36 PK	74.00	-15.64	1.10 V	261	27.73	30.63	
4	2483.50	26.26 AV	54.00	-27.74	1.10 V	261	-4.37	30.63	
5	4948.00	49.14 PK	74.00	-24.86	1.09 V	351	12.02	37.12	
6	4948.00	17.04 AV	54.00	-36.96	1.09 V	351	-20.08	37.12	
0									
7	7422.00	52.87 PK	74.00	-21.13	1.38 V	254	9.74	43.13	

REMARKS: 1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).

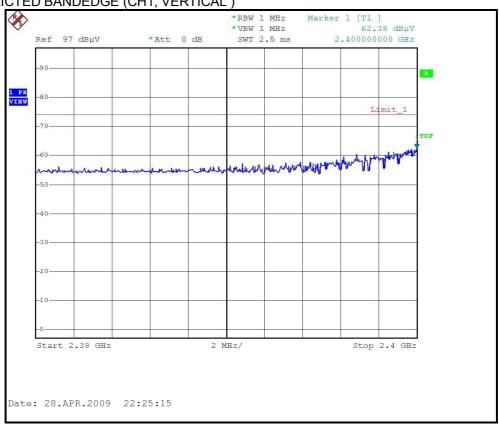
- 2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
- 3. The other emission levels were very low against the limit.
- 4. Margin value = Emission level Limit value.
- 5. " * ": Fundamental frequency.
- 6. Duty cycle = 2.48%
- 7. Average value = peak reading + 20log(duty cycle).



RESTRICTED BANDEDGE (CH1, HORIZONTAL)

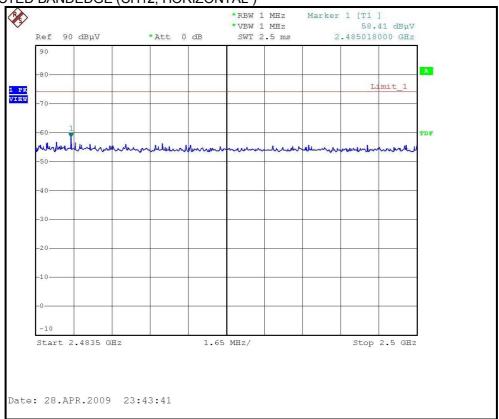


RESTRICTED BANDEDGE (CH1, VERTICAL)





RESTRICTED BANDEDGE (CH12, HORIZONTAL)



RESTRICTED BANDEDGE (CH12, VERTICAL)





4.2 CONDUCTED - OUT BAND MEASUREMENT

4.2.1 LIMITS OF CONDUCTED - OUT BAND MEASUREMENT

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100037	Aug. 09, 2008	Aug. 08, 2009

NOTE:

4.2.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 100 kHz with suitable frequency span including 300 MHz bandwidth from band edge. The band edges was measured and recorded.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation

4.2.5 EUT OPERATING CONDITION

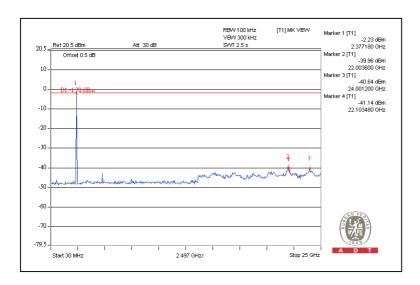
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

^{1.} The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

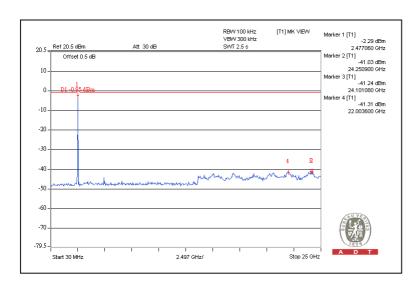


4.2.6 TEST RESULTS

Emissions radiated outside of the specified frequency bands, please refer pages form 13 to 15 for met the requirement of the general radiated emission limits in § 15.209. CH1



CH12





5 INFORMATION ON THE TESTING LABORATORIES

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

USAGermanyFCC, NVLAPTUV Rheinland

Japan VCCI Norway NEMKO

Canada INDUSTRY CANADA, CSA

R.O.C. TAF, BSMI, NCC

Netherlands Telefication

Singapore GOST-ASIA (MOU)
Russia CERTIS (MOU)

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site: www.adt.com.tw/index.5/phtml. If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab: Hsin Chu EMC/RF Lab:

Tel: 886-2-26052180 Tel: 886-3-5935343 Fax: 886-2-26051924 Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety/Telecom Lab:

Tel: 886-3-3183232 Fax: 886-3-3185050

Email: service@adt.com.tw
Web Site: www.adt.com.tw

The address and road map of all our labs can be found in our web site also.



6 APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

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