

Radio Test Report

FCC ID: H4IMS9065

Issued Date	: Nov. 24, 2011
Project No.	: R1111003
Equipment	: Wireless Mouse
Model Name	: SM-9065
Applicant	 LITE-ON TECHNOLOGY CORP. 90, Chien 1 Road, Chung Ho City, Taipei
Address	Hsien 235, Taiwan, R.O.C.

Tested by: Neutron Engineering Inc. EMC Laboratory Date of Receipt: Nov. 10, 2011 Date of Test: Nov. 10, 2011 ~ Nov. 16, 2011

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Lab Code: 200145-0	AC-MRA	Testing Laboratory 0659



Declaration

Neutron represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with the standards traceable to National Measurement Laboratory (**NML**) of **R.O.C.**, or National Institute of Standards and Technology (**NIST**) of **U.S.A.**

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Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

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1. CERTIFICATION

Equipment:	Wireless Mouse
Brand Name :	Liteon
Model Name :	SM-9065
Applicant:	LITE-ON TECHNOLOGY CORP.
Date of Test:	Nov. 10, 2011 ~ Nov. 16, 2011
Standards:	FCC Part15, Subpart C(15.249) / ANCI C63.4: 2009

The above equipment has been tested and found compliance with the requirement of the relative standards by Neutron Engineering Inc. EMC Laboratory.

The test data, data evaluation, and equipment configuration contained in our test report (Ref No. NEI-FCCP-1-R1111003) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of NVLAP and TAF according to the ISO-17025 quality assessment standard and technical standard(s).

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2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15, Subpart C					
Standard Section FCC Part15, Subpart C	Test Item	Judgment	Remark		
15.207	Conducted Emission	N/A			
15.209	Radiated Emission	PASS			
15.249	Radiated Spurious Emission	PASS			

NOTE:

(1) " N/A" denotes test is not applicable in this Test Report.



2.1 TEST FACILITY

The test facilities used to collect the test data in this report:

CB08: (VCCI RN: G-91; FCC RN: 614388; FCC DN: TW1054; IC Assigned Code: 4428C-1)

1F., No. 61, Ln. 77, Sing-ai Rd., Neihu Dist., Taipei City 114, Taiwan (R.O.C.)

2.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of **k=2**, providing a level of confidence of approximately **95**%.

The measurement instrumentation uncertainty considerations contained in CISPR 16-4-2.

Test Site	Item	Measurement	Frequency Range	Uncertainty	NOTE				
					30 - 200MHz	3.35 dB			
		Horizontal	200 - 1000MHz	3.11 dB					
	Dedicted	Polarization	1 - 18GHz	3.97 dB					
CB08	Radiated Emission at 3m		18 - 40GHz	4.01 dB					
CDUO			30 - 200MHz	3.22 dB					
		5111	311	311	511	Vertical	200 - 1000MHz	3.24 dB	
		Polarization	1 - 18GHz	4.05 dB					
			18 - 40GHz	4.04 dB					

Our calculated Measurement Instrumentation Uncertainty is shown in the tables above. These are our U_{lab} values in CISPR 16-4-2 terminology.

Since Table 1 of CISPR 16-4-2 has values of measurement instrumentation uncertainty, called U_{CISPR} , as follows:

Conducted Disturbance (mains port) - 150 kHz - 30 MHz : 3.6 dB

Radiated Disturbance (electric field strength on an open area test site or alternative test site) - 30 MHz - 1000 MHz : 5.2 dB

It can be seen that our U_{lab} values are smaller than $U_{\text{CISPR}}.$



3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	Wireless Mouse		
Brand Name	Liteon		
Model Name	SM-9065		
OEM Brand/Model Name	N/A		
Model Difference	N/A		
	The EUT is a Wireless	Mouse.	
	Operation Frequency:	2404~2478 MHz	
	Modulation Type:	GFSK	
	Bit Rate of Transmitter:	1Mbps	
	Number Of Channel	Please see Note 2.	
Product Description	Antenna Designation:	Please see Note 3.	
	Antenna Gain(Peak)	Please see Note 3.	
	Max Output Power	91.85 dBuV/m	
		on, features, or specification exhibited	
	,	EUT is considered as an	
		. More details of EUT technical	
	•	efer to the User's Manual.	
Power Source	Battery supplied.		
Power Rating	I/P: DC 1.5V		
Connecting I/O Port(s)	Please refer to the User's Manual		
Products Covered	N/A		
EUT Modification(s)	N/A		

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

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Channel List Frequency Frequency Frequency Channel Channel Channel (MHz) (MHz)

3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	Ant. On PCB	N/A	-2.42

(MHz)



3.2 DESCRIPTION OF TEST MODES

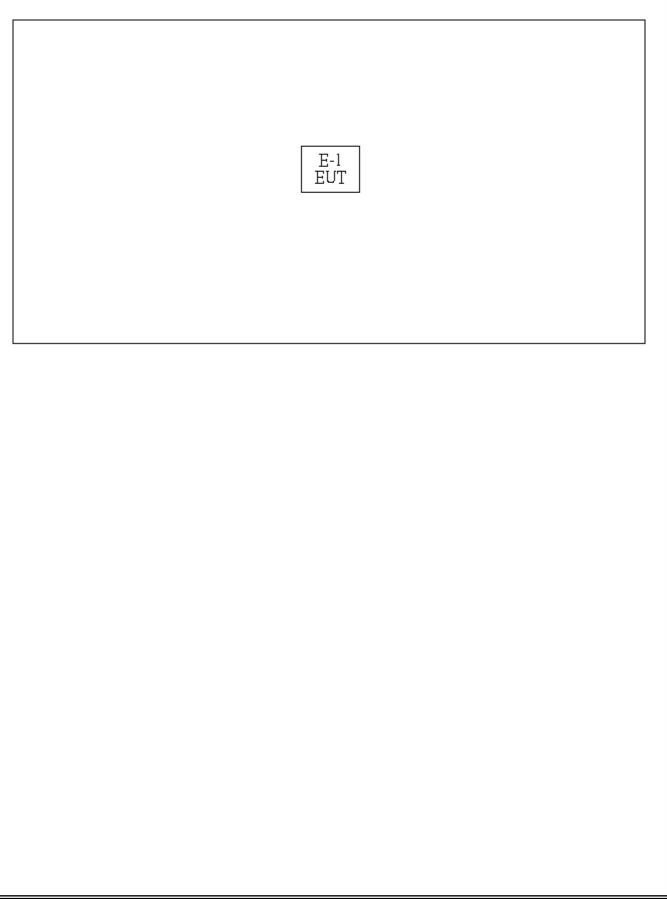
To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Test Mode	Description
Mode 1	2404 MHz
Mode 2	2442 MHz
Mode 3	2478 MHz

For Radiated Test				
Final Test Mode	Description			
Mode 1	2404 MHz			
Mode 2	2442 MHz			
Mode 3	2478 MHz			



3.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED





3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.	Note
E-1	Wireless Mouse	Liteon	SM-9065	H4IMS9065	N/A	EUT
It a ma	Chielded Turne	Corrito Corro	ما به مربع ا		Nata	

Item	Shielded Type	Ferrite Core	Length	Note
N/A	-	-	-	-

Note:

- (1) The support equipment was authorized by Declaration of Conformity.
- (2) For detachable type I/O cable should be specified the length in cm in ^[]Length ^[] column.



4. EMC EMISSION TEST

4.1 RADIATED EMISSION MEASUREMENT

4.1.1 RADIATED EMISSION LIMITS (FCC 15.209)

Frequencies (MHz)	Field Strength (micorvolts/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

Harmonic emissions limits comply with below 54 dBuV/m at 3m. Other 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 comply with the radiated emissions limits specified in section 15.209(a) limit in the table below has to be followed.

Note:

- (1) The tighter limit applies at the band edges.
- (2) Emission level (dBuV/m)=20log Emission level (uV/m).

LIMITS OF RADIATED EMISSION MEASUREMENT (FCC 15.209)

	(dBuV/m) (at 3m)		
FREQUENCY (MHz)	PEAK	AVERAGE	
Above 1000	74	54	

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

LIMITS OF RADIATED EMISSION MEASUREMENT (FCC Part 15.249)

FCC Part15 (15.249), Subpart C				
Limit	Frequency Range (MHz)			
Field strength of fundamental 50000 μV/m (94 dBμV/m) @ 3 m	2400-2483.5			
Field strength of harmonics 500 μV/m (54 dBμV/m) @ 3 m	Above 2483.5			

4.1.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Oct. 06, 2012
2	Horn Antenna	Schwarzbeck	BBHA 9120	D-325	Dec. 08, 2011
3	Microwave Pre_amplifier	Agilent	8449B	3008A01714	Apr. 18, 2012
4	Microflex Cable	N/A	N/A	1m	May. 18, 2012
5	Microflex Cable	AISI	S104-SMAP-1	10m	Aug. 22, 2012
6	Microflex Cable	N/A	N/A	3m	Aug. 22, 2012
7	Test Cable	N/A	LMR-400	966_12m	Jun. 16, 2012
8	Test Cable	N/A	LMR-400	966_3m	Jun. 16, 2012
9	Pre-Amplifier	EMC	EMC-330	980001	Jun. 02, 2012
10	Log-Bicon Antenna	Schwarzbeck	VULB9168-352	9168-352	Jun. 16, 2012

Remark: " N/A" denotes No Model Name / Serial No. and No Calibration specified.



4.1.3 TEST PROCEDURE

- a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3m or 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. The initial step in collecting radiated emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos.
- g. A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.
- h. EUT Orthogonal Axis:

"X" - denotes Laid on Table; "Y" - denotes Vertical Stand; "Z" - denotes Side Stand

i. During the measurements above 1 GHz it is taken care of that the EUT is always within the 3 dB cone of radiation BW of the used antenna

NOTE: (30-1000MHz)

- a. Reading in which marked as QP or Peak means measurements by using are Quasi-Peak Mode with Detector BW=120 kHz; SPA setting in RBW=120 kHz, VBW =120 kHz, Swp. Time = 0.3 sec./ MHz.
- b. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform.

NOTE: (Above 1000MHz)

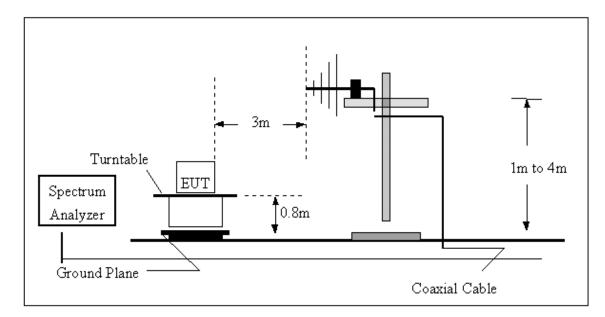
- a. Reading in which marked as Peak means measurements by using are Peak Mode with instrument setting in RBW= 1 MHz, VBW= 1 MHz, Swp. Time = Auto.
 Reading in which marked as AV means measurements by using are Average Mode with instrument setting in RBW= 1 MHz, VBW= 10 Hz, Swp. Time = Auto.
- b. All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform.



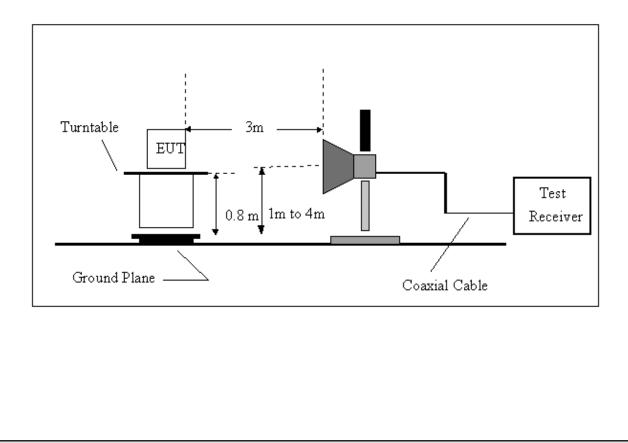
4.1.4 DEVIATION FROM TEST STANDARD No deviation

4.1.5 TEST SETUP

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-Up Frequency Above 1 GHz





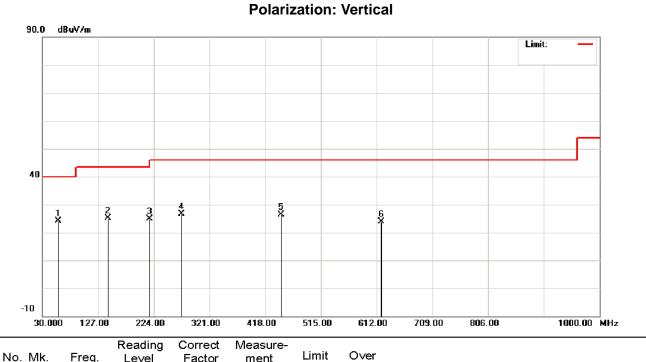
4.1.6 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit and receive during test. This operating condition was tested and used to collect the included data.



4.1.7 TEST RESULTS-BETWEEN 30MHZ AND 1000MHZ

E.U.T :	Wireless Mouse	Model Name :	SM-9065
Temperature :	26°C	Relative Humidity :	60%
Test Voltage :	DC 1.5V		
Test Mode :	2442 MHz		



No.	MK.	. ⊢req.	Level	Factor	ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	57.1599	37.20	-13.02	24.18	40.00	-15.82	peak	
2		144.4600	38.35	-13.22	25.13	43.50	-18.37	peak	
3		216.2400	40.51	-15.57	24.94	46.00	-21.06	peak	
4		272.5000	39.99	-13.32	26.67	46.00	-19.33	peak	
5		445.1600	35.21	-8.88	26.33	46.00	-19.67	peak	
6		619.7600	29.58	-5.67	23.91	46.00	-22.09	peak	



.U. ⁻	Г:		Wireless	s Mouse		M	odel Nar	me :	SM-906	5	
emp	bera	ature :	26 ° C			Re	elative H	lumidity :	60%		
est	Volt	age :	DC 1.5\	/					·		
est	Mo	de :	2442 M	Hz							
					Polariza	ation: H	lorizont	al			
	90.0	dBu∀/m								Limit: —	
	40										
		1 2	3 4 X X	5 X	6						
			ŤÎ	X	é X						
	-										
_	10										
	30.	000 127.			418.00	515.00	612.00	709.00	806.00	1000.00 MH	Ηz
No.	Mk	. Freq	Reading . Level	Correct Factor	Measure- ment	Limit	O∨er				
		MHz	dBu∨	dB	dBuV/m	dBuV/m	dB	Detector	Comment		
	*	66.8600		-14.49	25.97	40.00	-14.03	peak			
1		115.3600) 41.75	-15.65	26.10	43.50	-17.40	peak			
2							10 50				
2		165.8000	0 40.40	-13.46	26.94	43.50	-16.56	peak			
2			0 40.40 9 43.69	-13.46 -15.99 -12.76	26.94 27.70 26.67	43.50 43.50 46.00	-16.56 -15.80 -19.33	реак peak peak			

6

431.5798

35.64

-9.23

26.41

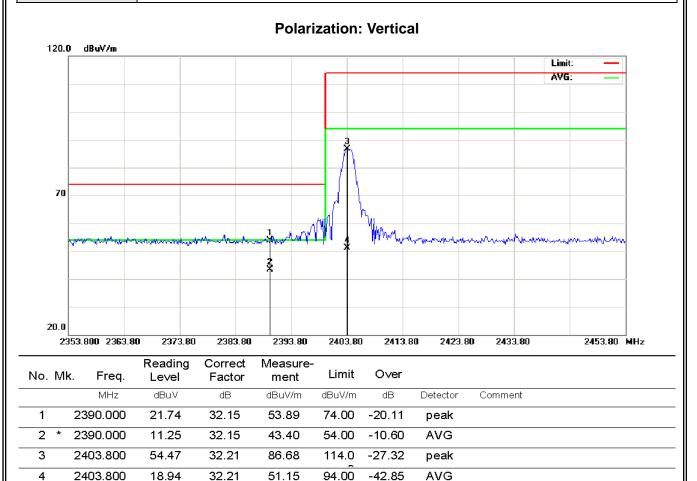
46.00 -19.59

peak

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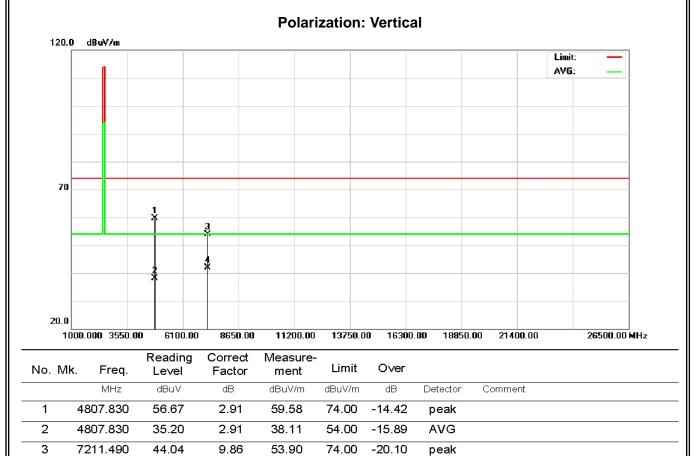
4.1.8 TEST RESULTS- FUNDAMENTAL FREQUENCY & ABOVE 1000MHZ

E.U.T :	Wireless Mouse	Model Name :	SM-9065
Temperature :	26°C	Relative Humidity :	60%
Test Voltage :	DC 1.5V	EUT Orthogonal Axis:	Х
Test Mode :	2404 MHz		





E.U.T :	Wireless Mouse	Model Name :	SM-9065
Temperature :	26°C	Relative Humidity :	60%
Test Voltage :	DC 1.5V	EUT Orthogonal Axis:	X
Test Mode :	2404 MHz		



-12.20

AVG

7211.490

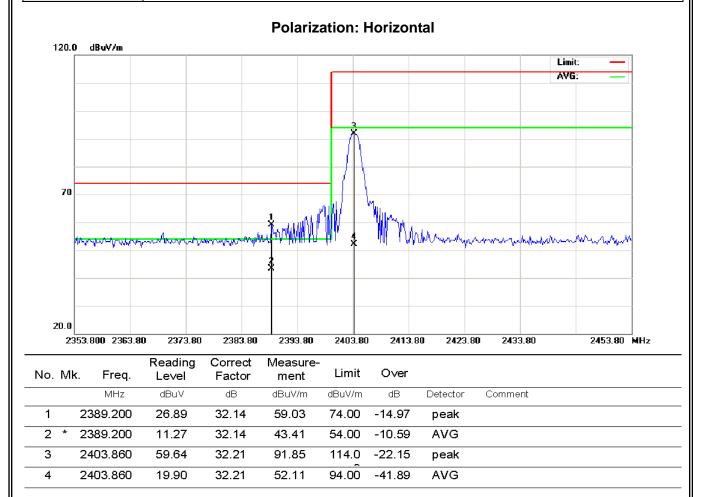
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9.86

31.94

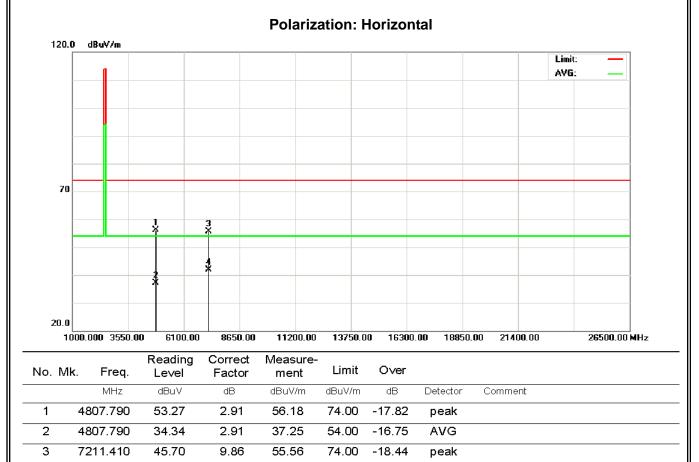


E.U.T :	Wireless Mouse	Model Name :	SM-9065
Temperature :	26°C	Relative Humidity :	60%
Test Voltage :	DC 1.5V	EUT Orthogonal Axis:	Х
Test Mode :	2404 MHz		





E.U.T :	Wireless Mouse	Model Name :	SM-9065
Temperature :	26°C	Relative Humidity :	60%
Test Voltage :	DC 1.5V	EUT Orthogonal Axis:	Х
Test Mode :	2404 MHz		



-12.14

AVG

7211.410

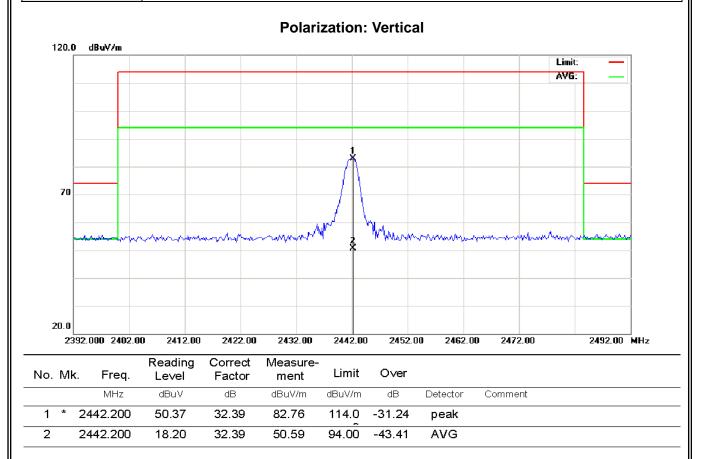
4 *

9.86

32.00

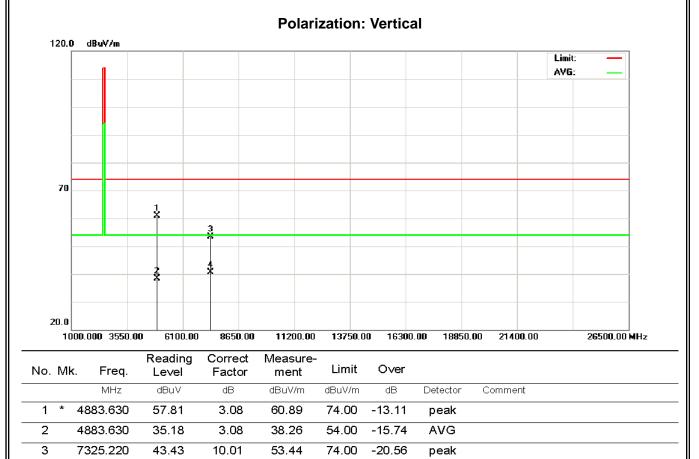


			
E.U.T :	Wireless Mouse	Model Name :	SM-9065
Temperature :	26°C	Relative Humidity :	60%
Test Voltage :	DC 1.5V	EUT Orthogonal Axis:	X
Test Mode :	2442 MHz		





E.U.T :	Wireless Mouse	Model Name :	SM-9065
Temperature :	26°C	Relative Humidity :	60%
Test Voltage :	DC 1.5V	EUT Orthogonal Axis:	X
Test Mode :	2442 MHz		



-13.27

AVG

30.72

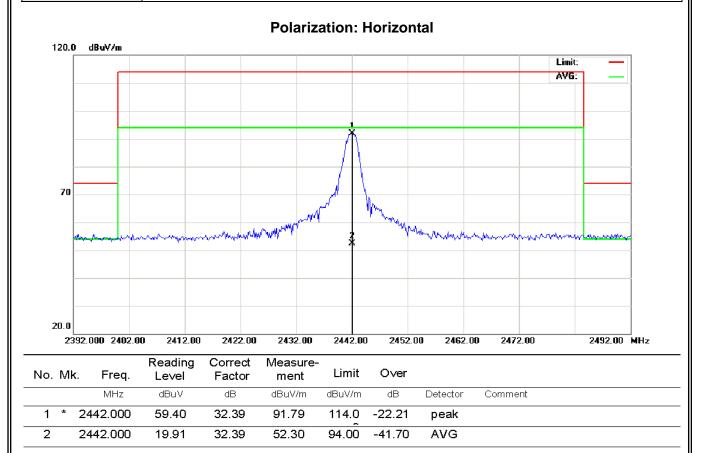
4

7325.220

10.01



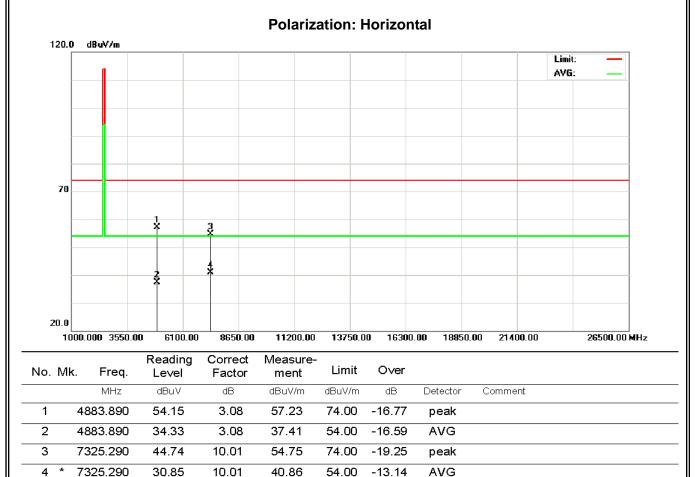
E.U.T :	Wireless Mouse	Model Name :	SM-9065
Temperature :	26°C	Relative Humidity :	60%
Test Voltage :	DC 1.5V	EUT Orthogonal Axis:	Х
Test Mode :	2424 MHz		



Report No.: NEI-FCCP-1-R1111003

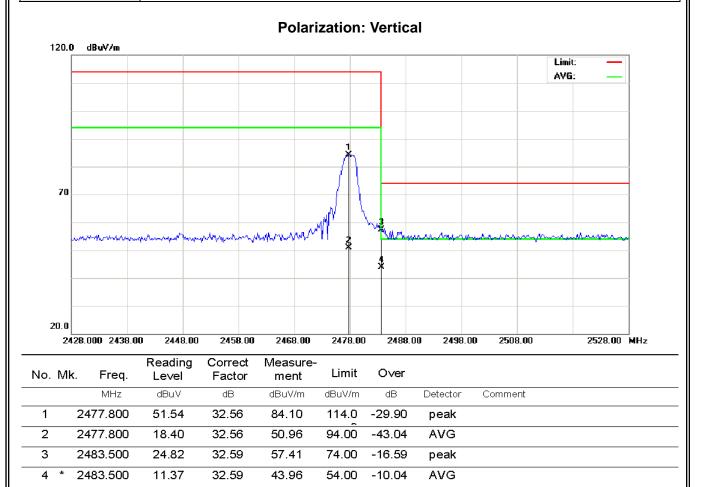


E.U.T :	Wireless Mouse	Model Name :	SM-9065
Temperature :	26°C	Relative Humidity :	60%
Test Voltage :	DC 1.5V	EUT Orthogonal Axis:	Х
Test Mode :	2424 MHz		





E.U.T :	Wireless Mouse	Model Name :	SM-9065
Temperature :	26°C	Relative Humidity :	60%
Test Voltage :	DC 1.5V	EUT Orthogonal Axis:	X
Test Mode :	2478 MHz		



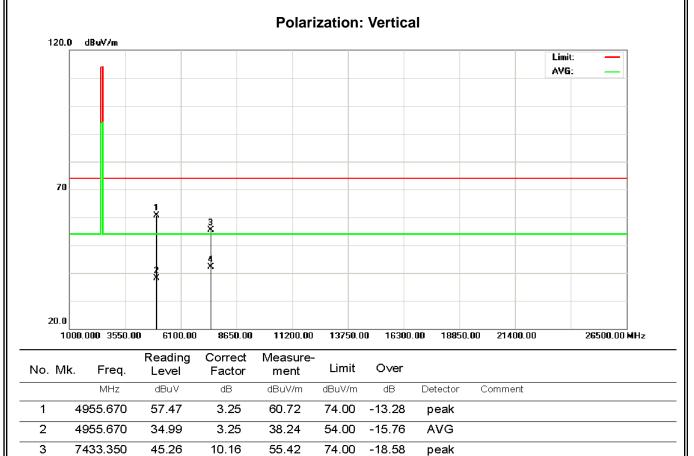
Report No.: NEI-FCCP-1-R1111003



42.13

31.97

E.U.T :	Wireless Mouse	Model Name :	SM-9065
Temperature :	26°C	Relative Humidity :	60%
Test Voltage :	DC 1.5V	EUT Orthogonal Axis:	X
Test Mode :	2478 MHz		



54.00

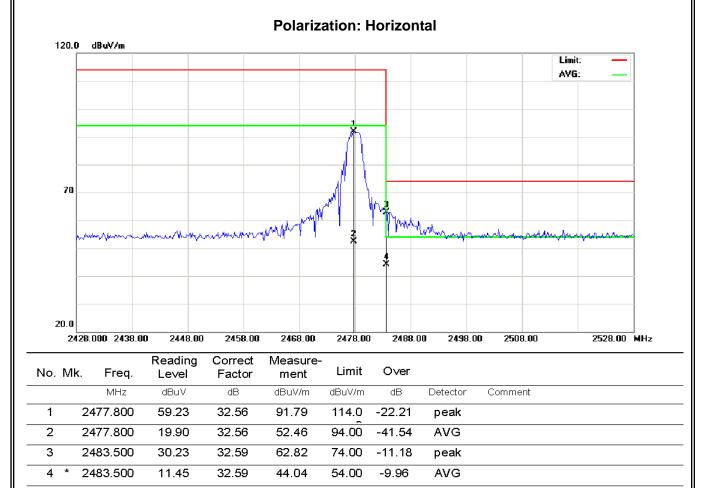
-11.87

AVG

4 *

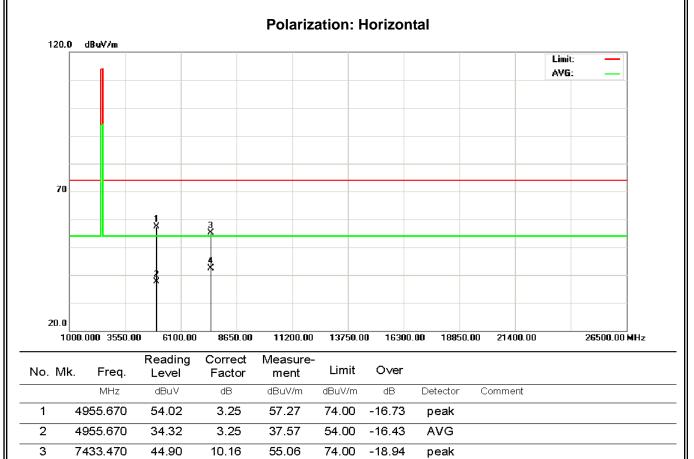


E.U.T :	Wireless Mouse	Model Name :	SM-9065
Temperature :	26°C	Relative Humidity :	60%
Test Voltage :	DC 1.5V	EUT Orthogonal Axis:	X
Test Mode :	2478 MHz		





E.U.T :	Wireless Mouse	Model Name :	SM-9065
Temperature :	26°C	Relative Humidity :	60%
Test Voltage :	DC 1.5V	EUT Orthogonal Axis:	Х
Test Mode :	2478 MHz		



-11.57

AVG

7433.470

4 *

10.16

32.27



5. ANTENNA CONDUCTED SPURIOUS EMISSION

5.1 APPLIED PROCEDURES / LIMIT

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/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

5.1.1 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Oct. 06, 2012

Remark: " N/A" denotes No Model Name. , Serial No. or No Calibration specified.

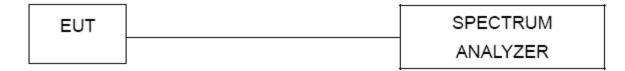
5.1.2 TEST PROCEDURE

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- b. Spectrum Setting : RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms.

5.1.3 DEVIATION FROM STANDARD

No deviation.

5.1.4 TEST SETUP



5.1.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.6 Unless otherwise a special operating condition is specified in the follows during the testing.



5.1.6 TEST RESULTS

E.U.T :	Wireless Mouse	Model Name :	SM-9065
Temperature :	26°C	Relative Humidity :	60%
Test Voltage :	DC 1.5V	EUT Orthogonal Axis:	х
Test Mode :	2404 MHz / 2478 MHz		

Channel of Worst Data				
The max. radio frequent bandwidth outside		The max. radio frequency power in any 100 kHz bandwidth within the frequency band.		
FREQUENCY(MHz)	POWER(dBm)	FREQUENCY(MHz)	POWER(dBm)	
2389.60	-59.62	2484.10	-52.82	
Result				

In any 100kHz bandwidth outside the frequency band, the radio frequency power is at least 50dB below that in the 100kHz bandwidth within the band that contains the highest lever of the desired power.

