

RF TEST REPORT

Test item : Wireless Mouse
Model No. : AA-SM9PWRW
Order No. : DEMC1305-01517, DEMC1305-01518
Date of receipt : 2013-05-08
Test duration : 2013-05-16~ 2013-05-23
Date of issue : 2013-06-27
Use of report : FCC & IC Original Grant

Applicant : Samsung Electronics Co Ltd
19 Chapin Rd., Building D Pine Brook, United States, NJ 07058

Test laboratory : Digital EMC Co., Ltd.
683-3, Yubang-Dong, Cheoin-Gu, Yongin-Si, Kyunggi-Do, 449-080, Korea

Test specification : FCC Part 15.249 Subpart C
RSS-210 Issue 8: 2010

Test environment : See appended test report

Test result : ☒ Pass ☐ Fail

The test results presented in this test report are limited only to the sample supplied by applicant and the use of this test report is inhibited other than its purpose. This test report shall not be reproduced except in full, without the written approval of DIGITAL EMC CO., LTD.

Tested by:

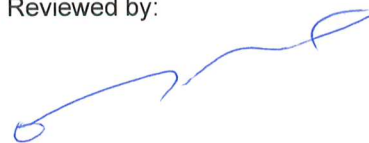
Witnessed by:

Reviewed by:



Engineer
HyunSu Son

N/A



Deputy General Manager
WonJung Lee

Test Report Version

Test Report No.	Date	Description
DRTFCC1306-0605	Jun. 18, 2013	Initial issue
DRTFCC1306-0605(1)	Jun. 27, 2013	Update Duty Cycle

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1. Equipment information

1.1 Equipment description

FCC Equipment Class	Part 15 Low Power Communication Device Transmitter
FCC ID	A3LSM9PWRW
IC ID	649E-SM9PWRW
Equipment type	Wireless Mouse
Equipment model name	AA-SM9PWRW
Equipment add model name	N/A
Equipment serial no.	Identical prototype
Frequency band	2412 ~ 2472MHz
Channel information	5 channels(2412MHz, 2427MHz, 2452MHz, 2467MHz, 2472MHz)
Power	DC 1.5 V
Antenna type	Internal Type: Internal antenna (Max. peak gain: 0.83 dBi)

1.2 Ancillary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
-	-	-	-	-
-	-	-	-	-

2. Information about test items

2.1 Test mode

This device was tested in maximum duty mode at maximum power.

Test Case 1	GFSK
Test Case 2	-
Test Case 3	-

2.2 Auxiliary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
-	-	-	-	-
-	-	-	-	-

2.3 Tested frequency

	TX Frequency (MHz)	RX Frequency (MHz)
Lowest Channel	2412	2412
Middle Channel	2452	2452
Highest Channel	2472	2472

2.4 Tested environment

Temperature	: 21 ~ 23 °C
Relative humidity content	: 43 ~ 44 % R.H.
Details of power supply	: DC 1.5 V

2.5 EMI Suppression Device(s)/Modifications

EMI suppression device(s) added and/or modifications made during testing
→ None

3. Test Report

3.1 Summary of tests

FCC Part RSS-210 & GEN	Parameter	Limit (Using in 2400 ~ 2483.5MHz)	Test Condition	Status Note 1
15.249 (a) RSS-210 [A2.9]	Field Strength Limits	Refer to the FCC 15.249(a)	Radiated	C
15.205, 209 RSS-210 [A2.9]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	< FCC 15.209 limits	Radiated	C
15.207 RSS-Gen [7.2.4]	AC Conducted Emissions	< FCC 15.207 limits	Line Conducted	N Note.2
RSS Gen [4.6.1]	Occupied Bandwidth (99%)	RSS-Gen(4.6.1)	Conducted	C

Note 1: **C**=Comply **NC**=Not Comply **NT**=Not Tested **NA**=Not Applicable

Note 2: This test is not applicable. Because the power of this device is supplied from batteries.

Note 3: The sample was tested according to the following specification:

ANSI C-63.10-2009, RSS-Gen Issue 3: 2010

3.2 Transmitter requirements

3.2.1 AC Conducted Emissions

Test Requirements and limit, §15.207& RSS-Gen [7.2.4]

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

Test Configuration

See test photographs for the actual connections.

Test Procedure

1. The EUT is placed on a wooden table 80 cm above the reference groundplane.
2. The EUT is connected via LISN to the test power supply.
3. The measurement results are obtained as described below:
4. Detectors – Quasi Peak and Average Detector.

Test Result: N/A

3.2.2 Radiated Emission

Test Requirements and limit, §15.205, §15.209& RSS-210[A8.5], RSS-Gen [7.2.2]

▪ Fundamental / Harmonics emission: FCC Part 15.249(a)

Frequency (MHz)	Limit @ 3m	
	Fundamental (mV/m)	Harmonics (uV/m)
2400 ~ 2483.5	50	500

▪ FCC Part 15.209(a) and (b)

Frequency (MHz)	Limit (uV/m)	Measurement Distance (meter)
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

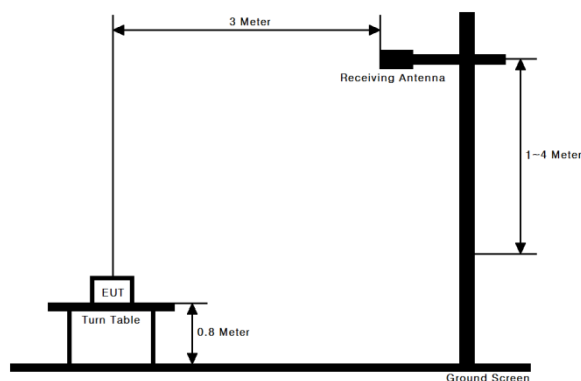
** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

▪ FCC Part 15.205 (a): Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	12.29 ~ 12.293	149.9 ~ 150.05	1645.5 ~ 1646.5	4.5 ~ 5.15	14.47 ~ 14.5
0.495 ~ 0.505	12.51975 ~ 12.52025	156.52475 ~	1660 ~ 1710	5.35 ~ 5.46	15.35 ~ 16.2
2.1735 ~ 2.1905	12.57675 ~ 12.57725	156.52525	1718.8 ~ 1722.2	7.25 ~ 7.75	17.7 ~ 21.4
4.125 ~ 4.128	13.36 ~ 13.41	156.7 ~ 156.9	2200 ~ 2300	8.025 ~ 8.5	22.01 ~ 23.12
4.17725 ~ 4.17775	16.42 ~ 16.423	162.0125 ~ 167.17	2310 ~ 2390	9.0 ~ 9.2	23.6 ~ 24.0
4.20725 ~ 4.20775	16.69475 ~ 16.69525	167.72 ~ 173.2	2483.5 ~ 2500	9.3 ~ 9.5	31.2 ~ 31.8
6.215 ~ 6.218	16.80425 ~ 16.80475	240 ~ 285	2655 ~ 2900	10.6 ~ 12.7	36.43 ~ 36.5
6.26775 ~ 6.26825	25.5 ~ 25.67	322 ~ 335.4	3260 ~ 3267	13.25 ~ 13.4	Above 38.6
6.31175 ~ 6.31225	37.5 ~ 38.25	399.90 ~ 410	3332 ~ 3339		
8.291 ~ 8.294	73 ~ 74.6	608 ~ 614	3345.8 ~ 3358		
8.362 ~ 8.366	74.8 ~ 75.2	960 ~ 1240	3600 ~ 4400		
8.37625 ~ 8.38675	108 ~ 121.94	1300 ~ 1427			
8.41425 ~ 8.41475	123 ~ 138	1435 ~ 1626.5			

▪ **FCC Part 15.205(b):** The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

Test Configuration



Note: See test photographs for the actual connections.

Test Procedure

1. The EUT is placed on a turntable, which is 0.8 m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.

Measurement instrument setting

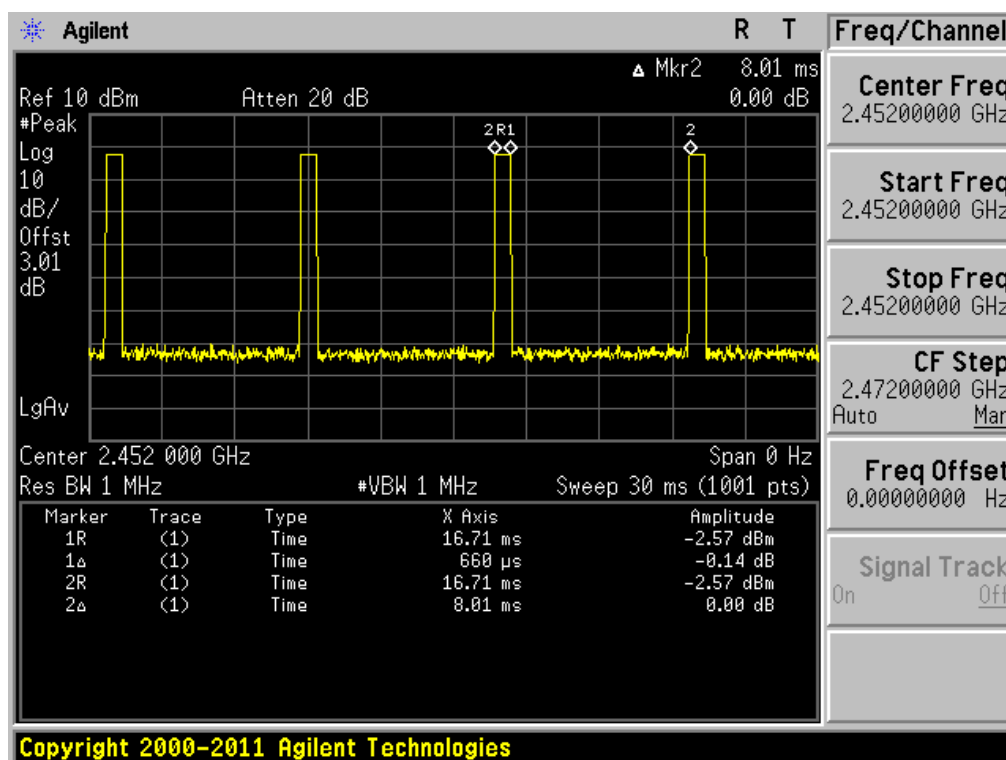
Frequency range < 1GHz

- RBW = 100kHz or 120kHz & VBW ≥ RBW
- Detector mode = Peak or Quasi-Peak

Frequency range > 1GHz

- Peak Measurement: RBW = 1MHz & VBW ≥ RBW
- Average Measurement: RBW = 1MHz & **VBW = 2kHz**
(Reduce VBW to at least 100 times less than the RBW, but no less than 10 Hz.)
- Detector mode = Peak

Note1: The reduced VBW measurement method of Section 4.2.3.2.3 in ANSI C63.10 is used.



< Duty cycle factor = $20 \log(\text{Duty Cycle}) = 20 \log(0.66 \text{ ms}/8.01 \text{ ms})$, Duty cycle factor = -21.68 dB >

9 KHz ~ 25GHz Radiated Spurious Emissions

▪ Lowest Channel

	Freq. (MHz)	ANT Pol	The worst case EUT Position	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
F	2411.390	H	Y axis	PK	102.10	-4.97	97.13	114.00	16.87
F	-	-	-	-	-	-	65.43 **	94.00	28.57
BE	2390.000	H	Y axis	PK	58.97	-5.24	53.73***	74.00	20.27
BE	2389.440	H	Y axis	AV	36.50	-5.24	31.26***	54.00	22.74
BE	2399.890	H	Y axis	PK	66.61	-5.11	61.50	74.00	12.50
BE	-	-	-	-	-	-	39.82 **	54.00	14.18
S	4823.250	H	Z axis	PK	66.50	1.91	68.41	74.00	5.59
S	-	-	-	-	-	-	46.73 **	54.00	7.27

▪ Middle Channel

	Freq. (MHz)	ANT Pol	The worst case EUT Position	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
F	2452.555	H	Y axis	PK	102.72	-4.97	97.75	114.00	16.25
F	-	-	-	-	-	-	76.07 **	94.00	17.93
S	4903.825	H	Z axis	PK	65.39	1.93	67.32	74.00	6.68
S	-	-	-	-	-	-	45.64 **	54.00	8.36

▪ Highest Channel

	Freq. (MHz)	ANT Pol	The worst case EUT Position	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
F	2472.235	H	Y axis	PK	101.21	-4.97	96.24	114.00	17.76
F	-	-	-	-	-	-	74.56 **	94.00	19.44
BE	2483.533	H	Y axis	PK	65.14	-4.99	60.15	74.00	13.85
BE	-	-	-	-	-	-	38.47 **	54.00	15.53
S	4944.265	H	Z axis	PK	66.50	1.70	68.20	74.00	5.80
S	-	-	-	-	-	-	46.52 **	54.00	7.48

Note.

1. No other spurious and harmonic emissions were detected greater than listed emissions on above table.
And above listed data is the worst case data.
2. **: These test data are corrected a factor as below calculation,
Duty cycle factor = $20 \log (\text{Duty Cycle}) = 20 \log (0.66 \text{ ms} / 8.01 \text{ ms})$, Duty cycle factor = -21.68 dB
AV(dBuV/m) = PK + duty cycle factor
3. *** : Noise floor data
4. Sample Calculation.
Margin = Limit – Result / Result = Reading + T.F / T.F = AF + CL – AG
Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

3.2.3 Antenna Requirements

Test Procedure

Describe how the EUT complies with the requirement that either its antenna is permanently attached, or that it employs a unique antenna connector, for every antenna proposed for use with the EUT.

Test Result: **Comply**

The antenna is PCB type. (Refer to Internal Photo file.)

- Minimum Standard:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions.

3.2.4 Occupied Bandwidth (99%)

Test Procedure: RSS Gen [4.6.1]

The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth.

Video averaging is not permitted. Where practical, a sampling detector shall be used given that a peak or peak hold.

- The 99% power bandwidth was measured with a calibrated spectrum analyzer.
- Spectrum analyzer plots are included on the following pages.

Test Result: **Comply**

Tested Channel	Test Results (MHz)
Lowest	1.9769
Middle	2.0278
Highest	1.9980

Note 1: See next pages for actual measured spectrum plots.

- **Minimum Standard:**

N/A

Occupied Bandwidth (99%)

Lowest Frequency



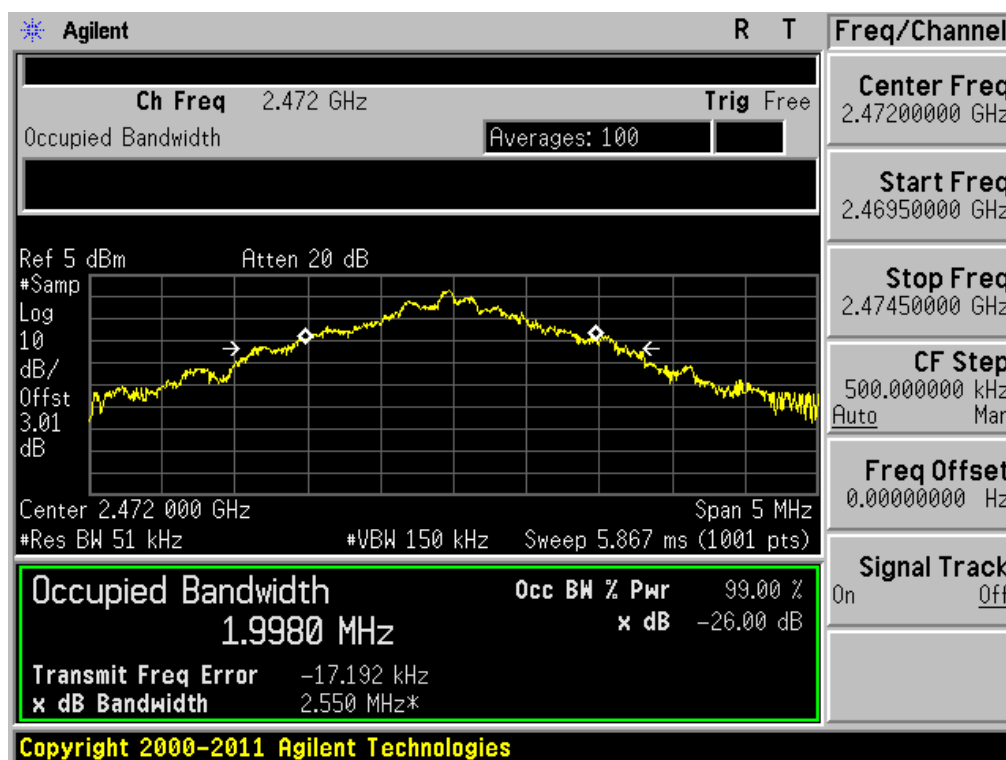
Occupied Bandwidth (99%)

Middle Frequency



Occupied Bandwidth (99%)

Highest Frequency



APPENDIX I

TEST EQUIPMENT FOR TESTS

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment.

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent	N9020A	13/01/08	14/01/08	MY49100833
Spectrum Analyzer	Agilent	E4440A	12/09/18	13/09/18	MY45304199
Digital Multimeter	H.P	34401A	13/02/27	14/02/27	3146A13475
Signal Generator	Rohde Schwarz	SMR20	13/02/27	14/02/27	101251
Vector Signal Generator	Rohde Schwarz	SMJ100A	13/01/08	14/01/08	100148
Thermo hygrometer	BODYCOM	BJ5478	12/06/20	13/06/20	120612-2
			13/06/01	14/06/01	
DC Power Supply	HP	6622A	13/02/27	14/02/27	3448A03760
High-pass filter	Wainwright	WHNX3.0	12/09/17	13/09/17	9
BILOG ANTENNA	SCHAFFNER	CBL6112B	12/11/06	14/11/06	2737
LOOP Antenna	Schwarzbeck	FMZB1513	12/09/24	13/09/24	1513-128
HORN ANT	ETS	3115	12/02/20	14/02/20	6419
HORN ANT	A.H.Systems	SAS-574	13/03/20	15/03/20	154
Attenuator (3dB)	WEINSCHL	56-3	12/09/17	13/09/17	Y2342
Amplifier (22dB)	H.P	8447E	13/01/08	14/01/08	2945A02865
Amplifier (30dB)	Agilent	8449B	13/02/27	14/02/27	3008A00370
EMI TEST RECEIVER	R&S	ESCI	13/02/27	14/02/27	100364