

FCC ID TEST REPORT

Prepared for.....:	Shenzhen Gembird Electronics Ltd
Address.....:	5/F, Building B, Shifeng Industry District, Huaning Road, Dalang Street, Longhua, Shenzhen, China.
Equipment Under Test(E.U.T.):	Wireless Mouse
Model.....:	MUSW-002
FCC ID.....:	2ACULMUSW002
Applicable Standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.249:2013
Test Date.....:	15 July 2014 to 25 July 2014
Issued Date.....:	25 July 2014
Report Number.....:	POCE14071631LRF
Test Engineer.....:	Bill Jing
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1.0 General Information

1.1 Client Details

Applicant:	Shenzhen Gembird Electronics ltd
Address:	5/F, Building B, Shifeng Industry District, Huaning Road, Dalang Street, Longhua, Shenzhen, China.
Manufacturer:	Shenzhen amd technology co;ltd
Address:	2/F Bldg 8, No.3 Industrial Zone, Heshuikou, Gongming, Guangming New District Shenzhen, China

1.2 Test Lab Details

Name :	Shenzhen POCE Technology Co.,Ltd.
Address:	Room 502, Bldg. 1, Xinghua Garden, Baoan Road Xixiang, Baoan District, Shenzhen, China
Telephone:	86-755-29113252
Fax:	86-755-29113135

Site Listed with Federal Communication Commission

Registration Number: 222278

For 3m chamber

1.3 Description of E.U.T.

Product:	Wireless Mouse
Model No.:	MUSW-002
Additional Model No.	ACT-MUSW-002
Brand Name:	N.A.
Rating:	DC 3V (1.5*2 AAA batteries)
Modulation Type:	MSK
Channel number:	8
Channel Spacing:	N.A.
Operation Frequency	2409 MHz-2476 MHz
Antenna Designation	An integral antenna and the maximum gain is 0 dBi

Channel list:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2409	5	2445
2	2417	6	2455
3	2426	7	2465
4	2440	8	2476

1.4 AE used during the test

Equipment type	Model	Manufacturer	FCC Approval
N.A.			
N.A.			
N.A.			

2.0 Test Summary

Section in CFR 47	Test Item	Result
15.203	Antenna Requirement	Complies
15.207	AC Power LineConducted Emission	N.A.
15.249(a), (d) /15.209	Radiated Emission Test	Complies
15.249/15.205	Band Edge	Complies
15.215(c)	20 dB OccupiedBandwidth	Complies

3.0 E.U.T. Modification

No modification by *Shenzhen POCE Technology Co., Ltd.*

4.0 Measurement Uncertainty

(95% confidence levels, k=2)

No.	Item	MU
1.	Radio Frequency	$\pm 1 \times 10^{-9}$
2.	Temperature	$\pm 0.1^{\circ}\text{C}$
3.	Humidity	$\pm 1.0\%$
4.	RF power, conducted	$\pm 0.34\text{dB}$
5.	Spurious emissions, conducted	$\pm 2.720\text{dB}$
6.	All emissions, radiated	$\pm 3.84\text{dB}$

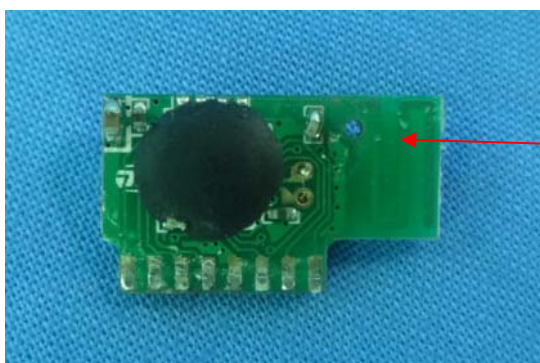
5.0 Antenna Requirement

5.1 Applicable Standard

According to FCC 47 CFR Section 15.203, 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 of this section.

5.2 Antenna Specification

The E.U.T. has An integral antenna and no consideration of replacement. Therefore the E.U.T. is considered sufficient to comply with the provision.



Antenna.

6.0 Power Line Conducted Emission Test

6.1 Test Equipment

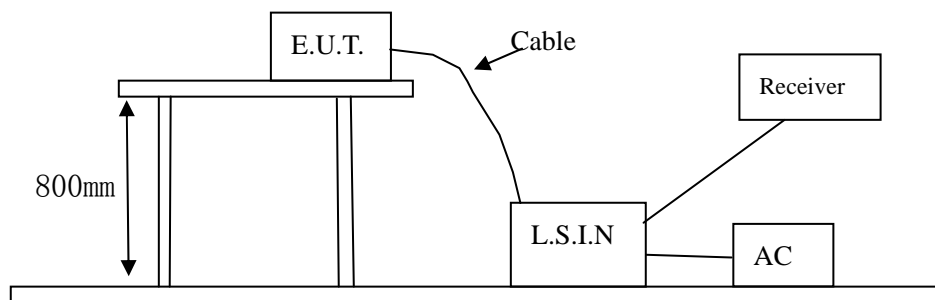
Instrument Type	Model	Serial No.	Manufacturer	Date of Cal.	Due Date
EMI Test Receiver	ESCS30	100139	R&S	Nov. 20, 2013	Nov. 19, 2014
LISN	LS16C	16010222119	AFJ	Nov. 20, 2013	Nov. 19, 2014

6.2 Test Method and test Procedure

The E.U.T. was tested according to ANSI C63.10-2009. The Frequency spectrum From 0.15MHz to 30MHz was investigated.

Test Voltage: 120V~, 60Hz

Block diagram of Test setup



6.3 E.U.T. Operating Condition

Operating condition is according to ANSI C63.10 -2009

- 1) Setup the E.U.T. and simulators as shown on the following
- 2) Enable AF signal and confirm E.U.T. active to normal condition

6.4 Power line conducted Emission Limit according to Paragraph 15.207

Frequency(MHz)	Class A Limits (dB μ V)		Class B Limits (dB μ V)	
	Quasi-peak Level	Average Level	Quasi-peak Level	Average Level
0.15 ~ 0.50	79.0	66.0	66.0~56.0*	56.0~46.0*
0.50 ~ 5.00	73.0	60.0	56.0	46.0
5.00 ~ 30.00	73.0	60.0	60.0	50.0

- Notes:
1. *Decreasing linearly with logarithm of frequency.
 2. The tighter limit shall apply at the transition frequencies

6.5 Test specification:

Environmental conditions: Temperature: 23° C Humidity: 51% Atmospheric pressure: 103kPa

6.6 Test Result:

Remark: The E.U.T. is powered by batteries, so the test item is N.A.

Conducted Emission on Line Terminal of the power line (150kHz to 30MHz)

E.U.T. Description:	
Operation Mode:	
Tested By:	
Test Date:	

Start Frequency	Stop Frequency	Step	IF BW	Detector	Final M-Time
0.15MHz	30MHz	4.5KHz	10KHz	QP+AV	1s

Frequency (MHz)	Reading(dB μ V)				Limit (dB μ V)	
	Line		Neutral			
	Quasi-peak	Average	Quasi-peak	Average	Quasi-peak	Average
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--
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Conducted Emission on Neutral Terminal of the power line (150kHz to 30MHz)

E.U.T. Description:	
Operation Mode:	
Tested By:	
Test Date:	

Start Frequency	Stop Frequency	Step	IF BW	Detector	Final M-Time
0.15MHz	30MHz	4.5KHz	10KHz	QP+AV	1s

Frequency (MHz)	Reading(dB μ V)				Limit (dB μ V)	
	Live		Neutral			
	Quasi-peak	Average	Quasi-peak	Average	Quasi-peak	Average
--	--	--	--	--	--	--
--	--	--	--	--	--	--
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7.0 Radiated Emission Test

7.1 Test Equipment

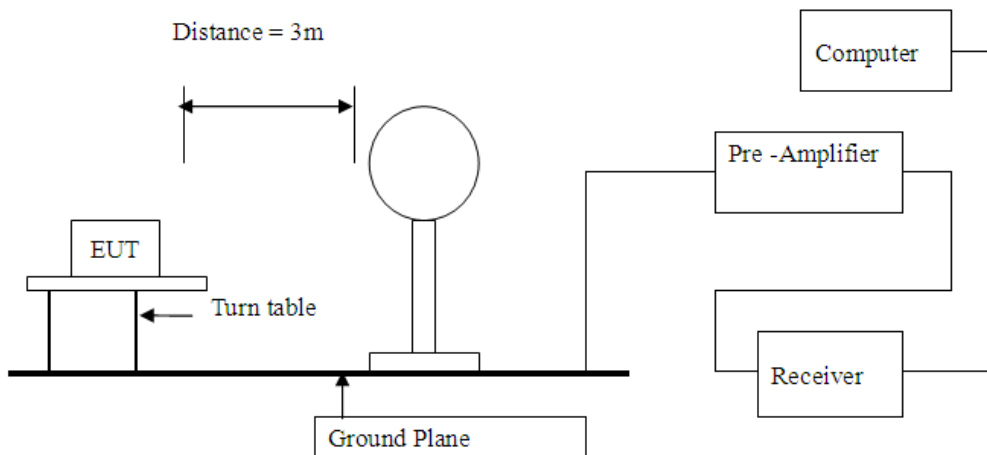
Instrument Type	Model	Serial No.	Manufacturer	Date of Cal.	Due Date
ESPI Test Receiver	ESPI 3	100379	ROHDE&SCHWARZ	Nov. 20, 2013	Nov. 19, 2014
Spectrum Analyzer	FSEM	848597/001	ROHDE&SCHWARZ	Nov. 20, 2013	Nov. 19, 2014
Pre-amplifier	LNA6900	--	Teseq	Nov. 21, 2013	Nov. 20, 2014
Pre-amplifier	8447D	83153007374	Agilent	Nov. 21, 2013	Nov. 20, 2014
Pre-amplifier	8449B	3008A01738	Agilent	Nov. 21, 2013	Nov. 20, 2014
Loop antenna	PLA-1030/B	1029	A.R.A.	Nov. 21, 2013	Nov. 20, 2014
Ultra Broadband ANT	HL562	100157	ROHDE&SCHWARZ	Nov. 21, 2013	Nov. 20, 2014
Horn Antenna	3117	--	ETS LINDGREN	Nov. 21, 2013	Nov. 20, 2014
Horn Antenna	3160	--	ETS LINDGREN	Nov. 21, 2013	Nov. 20, 2014

7.2 Test Method and test Procedure:

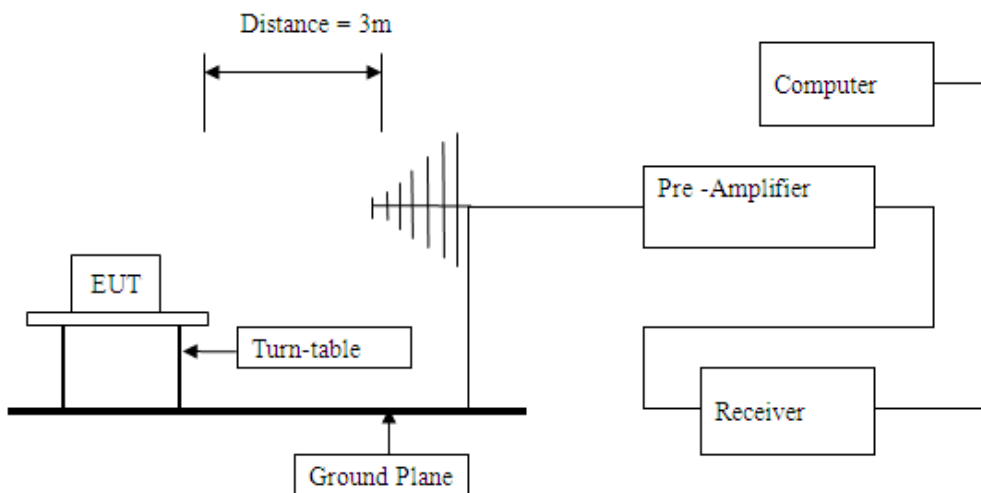
- 1) The E.U.T. was tested according to ANSI C63.10 –2009.
- 2) The E.U.T., peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m. All set up is according to ANSI C63.10-2009.
- 3) The frequency spectrum from 30 MHz to 25 GHz was investigated. All readings from 30 MHz to 1 GHz are quasi-peak values with a resolution bandwidth of 120 kHz. All readings are above 1 GHz, peak values with a resolution bandwidth of 1 MHz. Measurements were made at 3 meters.
- 4) The antenna high is varied from 1 m to 4 m high to find the maximum emission for each frequency.
- 5) The antenna polarization: Vertical polarization and Horizontal polarization.

7.3 Block diagram of test setup

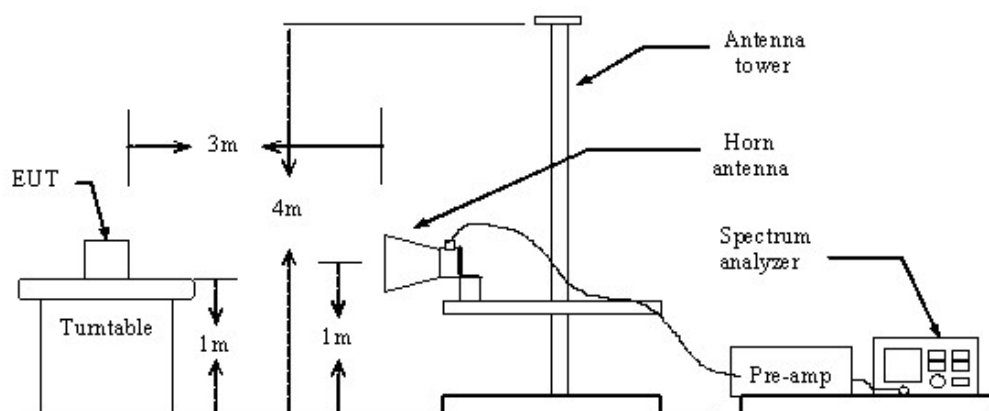
Block diagram of Test setup for frequency below 30MHz



Block diagram of Test setup for frequency from 30MHz to 1GHz



Block diagram of Test setup for frequency above 1GHz



7.4 E.U.T. Operating Condition

Operating condition is according to ANSI C63.10-2009 & ANSI C63.4-2003

7.5 Radiated Emission Limit

All emission from a digital device, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strength specified below:

FCC Part 15:2013 Subpart C Paragraph 15.249(a) Limit

Fundamental Frequency (MHz)	Field Strength of Fundamental (3m)		Field Strength of Harmonics (3m)		
	mV/m	dBuV/m		uV/m	dBuV/m
2400-2483.5	50	94 (Average)	114 (Peak)	500	54 (Average) 74 (Peak)

Note: 1) RF Field Strength (dBuV) = 20 log RF Voltage (uV)

- 2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
- 3) The emission limit in this paragraph is based on measurement instrumentation employing an average detector.

Frequencies in restricted band are complied to limit on Paragraph 15.209.

Frequency Range (MHz)	Distance (m)	Field strength (dB μ V/m)
0.009-0.490	3	$20\log 2400/F$ (kHz) + 80
0.490-1.705	3	$20\log 24000/F$ (kHz) + 40
1.705-30	3	$20\log 30 + 40$
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

Note: 1) RF Voltage (dBuV) = 20 log RF Voltage (uV)

- 2) In the Above Table, the tighter limit applies at the band edges.
- 3) Distance refers to the distance in meters between the measuring instrument antenna and the E.U.T.
- 4) This is a handheld device. The radiated emissions should be tested under 3-axes position (Lying, Side, and Stand), After pre-test. It was found that the worse radiated emission was get at the lying position.
- 5) All scanning using PK detector. And the final emission level was get using QP detector for frequency range from 30-1000MHz. Peak values with RBW=VBW=1MHz and PK detector. AV value with RBW=1MHz, VBW=10Hz and PK detector
- 6) If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula $Ld1 = Ld2 * (d2/d1)$

7.6 Test specification:

Environmental conditions: Temperature 24° C Humidity: 51% Atmospheric pressure: 103kPa

7.7 Test result

Radiated Emission (9 kHz----30 MHz)

Result: Pass

Frequency (MHz)	Level@3m (dB μ V/m)	Limit@3m (dB μ V/m)
--	--	--
--	--	--
--	--	--
--	--	--

Note: 1) Emission Level=Reading+ Cable loss-Antenna factor-Amp factor

2) The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement

Radiated Emission (30MHz----1000MHz)

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp (dB)	Final Level (dBuV/m)	Limit (dBuV/m)	Antenna Polarity
43.3645	33.87	13.22	0.35	26.68	20.76	40.00	Horizontal
65.9853	28.71	14.52	0.46	26.84	16.85	40.00	Horizontal
94.0563	26.72	14.86	0.51	26.72	15.37	43.50	Horizontal
107.7553	26.91	15.24	0.58	26.81	15.92	43.50	Horizontal
255.4742	26.6	16.82	0.84	26.91	17.35	46.00	Horizontal
879.4465	37.69	19.67	1.76	26.75	32.37	46.00	Horizontal
36.0962	32.43	13.52	0.33	26.54	19.74	40.00	Vertical
42.6547	28.62	13.94	0.42	26.82	16.16	40.00	Vertical
103.8721	27.82	14.86	0.59	26.91	16.36	43.50	Vertical
239.9464	26.64	16.64	0.78	26.34	17.72	46.00	Vertical
642.3583	35.17	18.53	0.92	26.75	27.87	46.00	Vertical
883.3418	37.75	19.81	1.76	26.88	32.44	46.00	Vertical

Remark: Final Level= Read Level+Antenna Factor+Cable Loss-Preamp

Radiated Emission (1000MHz-25000MHz)

Low channel: 2409 MHz							
Frequency (MHz)	Read Level PK/AV (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Final Level (dBuV/m)	Limits PK/AV (dBuV/m)	Antenna Polarity
2409	85.33	28.43	2.76	32.26	84.26(PK)	114/94	Horizontal
4818	46.78	30.56	5.60	33.53	49.41(PK)	74/54	Horizontal
7227	34.29	35.41	7.24	33.82	43.12(PK)	74/54	Horizontal
9636					--	74/54	Horizontal
12045					--	74/54	Horizontal
14454					--	74/54	Horizontal
16863					--	74/54	Horizontal
19272					--	74/54	Horizontal
21681					--	74/54	Horizontal
24090					--	74/54	Horizontal
2409	78.41	28.43	2.76	32.26	77.34(PK)	114/94	Vertical
4818	43.90	30.56	5.60	33.53	46.53(PK)	74/54	Vertical
7227	35.45	35.41	7.24	33.82	44.28(PK)	74/54	Vertical
9636					--	74/54	Vertical
12045					--	74/54	Vertical
14454					--	74/54	Vertical
16863					--	74/54	Vertical
19272					--	74/54	Vertical
21681					--	74/54	Vertical
24090					--	74/54	Vertical

Middle channel: 2440 MHz

Frequency (MHz)	Read Level PK/AV (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Final Level (dBuV/m)	Limits PK/AV (dBuV/m)	Antenna Polarity
2440	84.45	28.48	2.96	32.64	83.25(PK)	114/94	Horizontal
4880	46.54	30.69	5.82	33.78	49.27(PK)	74/54	Horizontal
7320	33.88	35.82	7.43	33.91	43.22(PK)	74/54	Horizontal
9760					--	74/54	Horizontal
12200					--	74/54	Horizontal
14640					--	74/54	Horizontal
17080					--	74/54	Horizontal
19520					--	74/54	Horizontal
21960					--	74/54	Horizontal
24400					--	74/54	Horizontal
2440	78.88	28.48	2.96	32.64	77.68(PK)	114/94	Vertical
4880	42.63	30.69	5.82	33.78	45.36(PK)	74/54	Vertical
7320	33.27	35.82	7.43	33.91	42.61(PK)	74/54	Vertical
9760					--	74/54	Vertical
12200					--	74/54	Vertical
14640					--	74/54	Vertical
17080					--	74/54	Vertical
19520					--	74/54	Vertical
21960					--	74/54	Vertical
24400					--	74/54	Vertical

Middle channel: 2476 MHz

Frequency (MHz)	Read Level PK/AV (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Final Level (dBuV/m)	Limits PK/AV (dBuV/m)	Antenna Polarity
2476	87.2	28.29	2.67	32.88	85.28(PK)	114/94	Horizontal
4952	47.53	30.37	5.81	33.85	49.86(PK)	74/54	Horizontal
7428	34.33	35.48	7.65	33.37	44.09(PK)	74/54	Horizontal
9904					--	74/54	Horizontal
12380					--	74/54	Horizontal
14856					--	74/54	Horizontal
17332					--	74/54	Horizontal
19808					--	74/54	Horizontal
22284					--	74/54	Horizontal
24760					--	74/54	Horizontal
2476	79.78	28.29	2.67	32.88	77.86(PK)	114/94	Vertical
4952	43.82	30.37	5.81	33.85	46.15(PK)	74/54	Vertical
7428	34.82	35.48	7.65	33.37	44.58(PK)	74/54	Vertical
9904					--	74/54	Vertical
12380					--	74/54	Vertical
14856					--	74/54	Vertical
17332					--	74/54	Vertical
19808					--	74/54	Vertical
22284					--	74/54	Vertical
24760					--	74/54	Vertical

Remark:

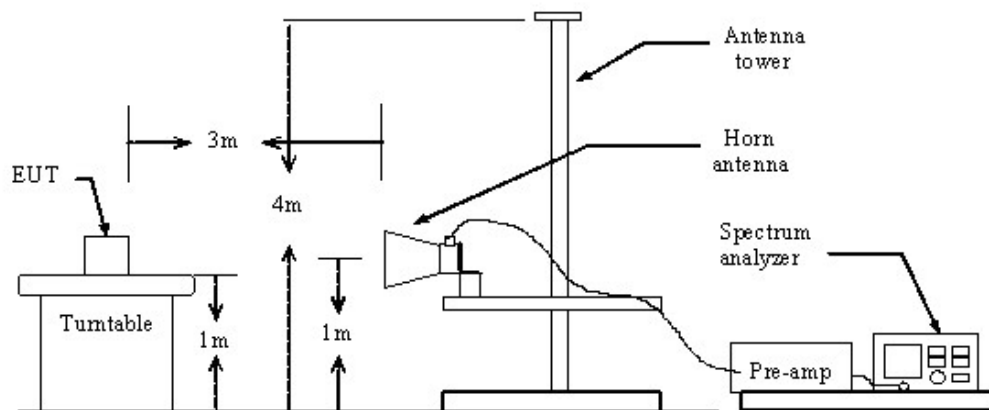
- 1) According to section 15.35(b), the peak limit is 20dB higher than the average limit
- 2) If the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.
- 3) "--" means this data is too weak to be able to test.
- 4) The emission levels of other frequencies are very lower than the limit and not shown in the report.

8.0 Band Edge

8.1 Test Equipment

Instrument Type	Model	Serial No.	Manufacturer	Date of Cal.	Due Date
Spectrum Analyzer	FSEM	848597/001	ROHDE&SCHWARZ	Nov. 20, 2013	Nov. 19, 2014
Pre-amplifier	8449B	3008A01738	Agilent	Nov. 21, 2013	Nov. 20, 2014
Horn Antenna	3117	--	ETS LINDGREN	Nov. 21, 2013	Nov. 20, 2014

8.2 Block diagram of test setup



8.3 Band Edge Limit

- 1) 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.
- 2) For Emissions in Restricted band, the limit is below the general radiated emission limits in Section 15.209. The provisions in Section 15.35 apply to these measurements.

8.4 Test Produce

According to KDB 913591:

- 1) Perform an in-band field strength measurement of the fundamental emission using the RBW and detector function for the frequency being measured, as required by C63.4 and FCC Rules.
- 2) Choose the span that encompasses both the peak of the fundamental emission and the band edge emission under investigation. Set the analyzer RBW to 1% of the total span (but never less than 30 kHz) with a video bandwidth equal to or greater than the RBW. Observe the amplitude delta between the peak of the fundamental and the peak of the band edge emission and record.
- 3) Subtract the delta measured in step 2) from the field strengths measured in step 1). The resultant field strengths (CISPR QP, average, or peak, as appropriate) are then used to determine band edge compliance as required by Section 15.205.

8.5 Test Result

Low channel: 2409 MHz							
Frequency (MHz)	Read Level PK/AV (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Final Level (dBuV/m)	Limits PK/AV (dBuV/m)	Antenna Polarity
2310	41.83	27.34	2.32	32.14	39.35	74	Horizontal
2385.64	46.2	28.29	2.45	32.33	44.61	74	Horizontal
2390	51.42	28.29	2.45	32.33	49.83	74	Horizontal
2310	40.12	27.34	2.32	32.14	37.64	74	Vertical
2385.64	45.15	28.29	2.45	32.33	43.56	74	Vertical
2390	48.78	28.29	2.45	32.33	47.19	74	Vertical
High channel: 2476 MHz							
Frequency (MHz)	Read Level PK/AV (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Final Level (dBuV/m)	Limits PK/AV (dBuV/m)	Antenna Polarity
2483.5	52.61	28.29	2.67	32.33	51.24	74	Horizontal
2492.67	48.92	28.29	2.67	32.33	47.55	74	Horizontal
2500	43.52	28.29	2.67	32.33	42.15	74	Horizontal
2483.5	51.05	28.29	2.67	32.33	49.68	74	Vertical
2492.67	45.6	28.29	2.67	32.33	44.23	74	Vertical
2500	39.98	28.29	2.67	32.33	38.61	74	Vertical

Remark:

- 1) According to section 15.35(b), the peak limit is 20dB higher than the average limit
- 2) If the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.
- 3) The emission levels of other frequencies are very lower than the limit and not shown in the report.

9.0 20dB Bandwidth Measurement

9.1 Test Equipment

Instrument Type	Model	Serial No.	Manufacturer	Date of Cal.	Due Date
Spectrum Analyzer	FSEM	848597/001	ROHDE&SCHWARZ	Nov. 20, 2013	Nov. 21, 2014

9.2 Test specification:

Environmental conditions: Temperature 24° C Humidity: 52% Atmospheric pressure: 103kPa

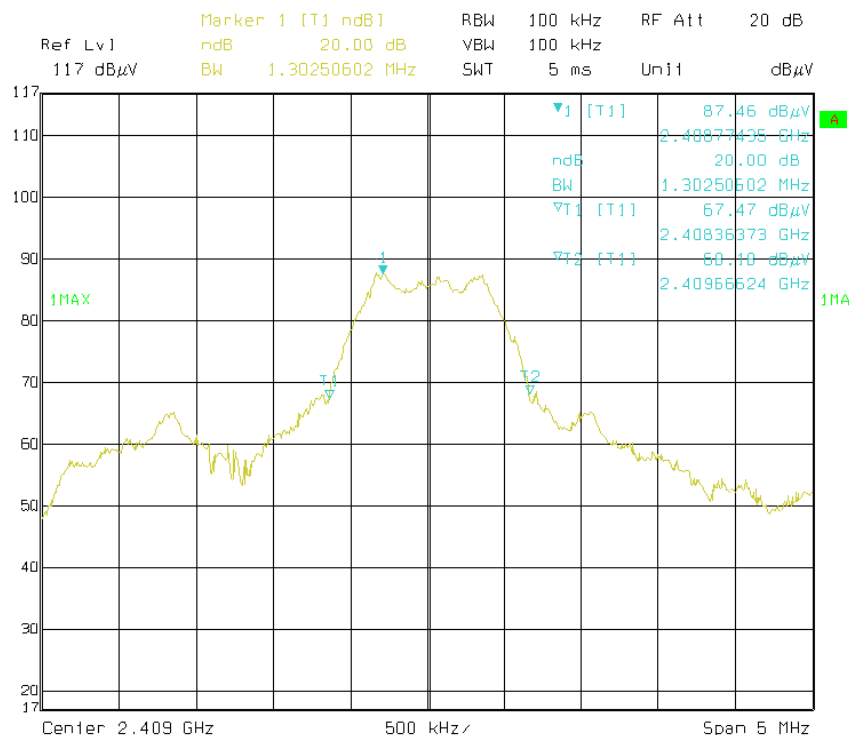
9.3 Limit

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

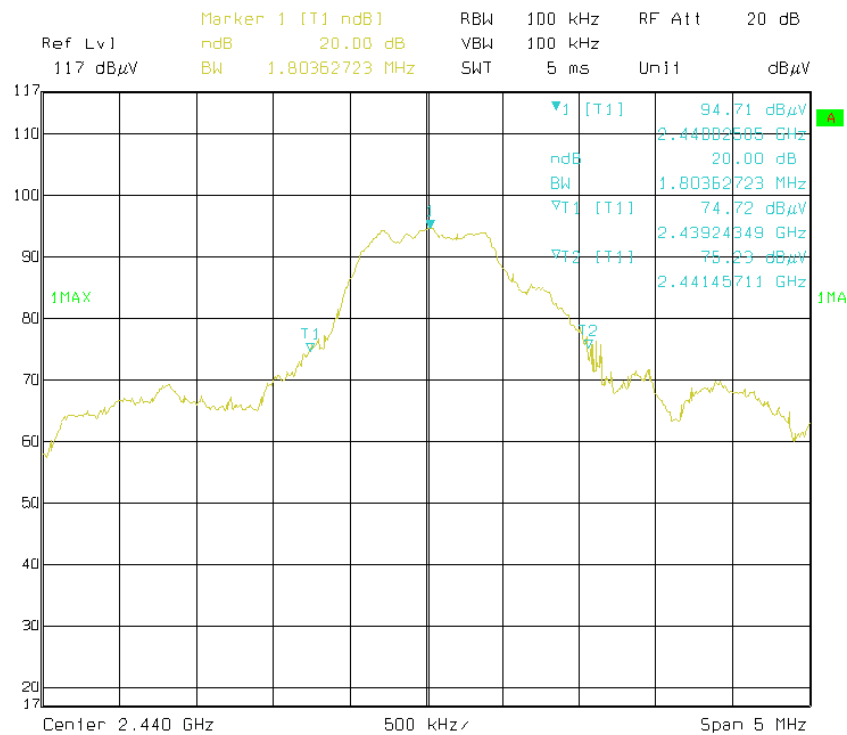
9.4 Test Result:

Channel number	20dB Bandwidth (kHz)	Limit (kHz)	Conclusion
(Low)	1302.5	---	PASS
(Middle)	1803.6	---	PASS
(High)	1753.5	---	PASS

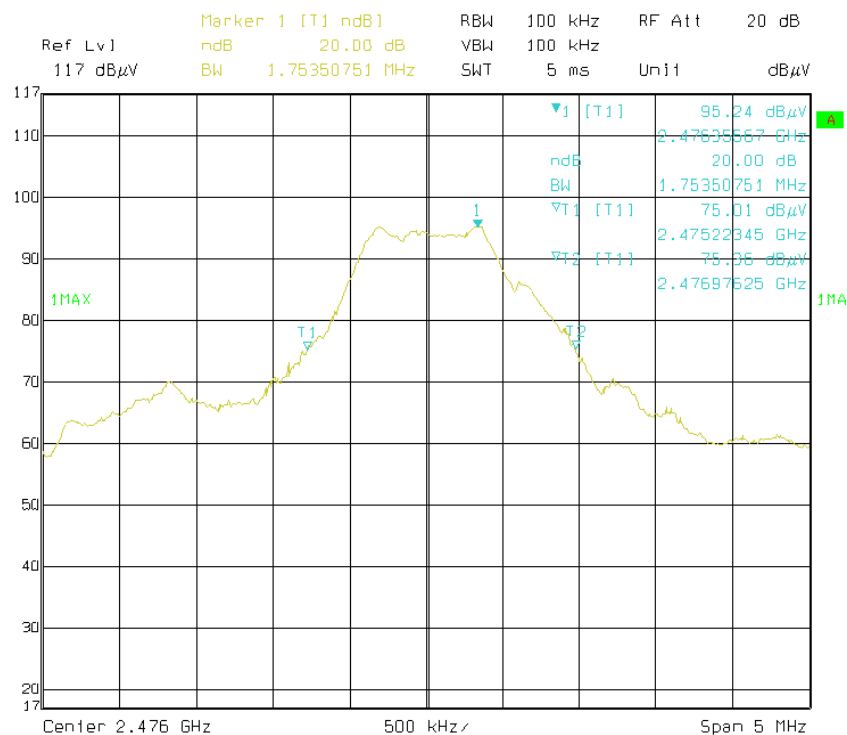
Low channel: 2409 MHz



Middle channel: 2440 MHz

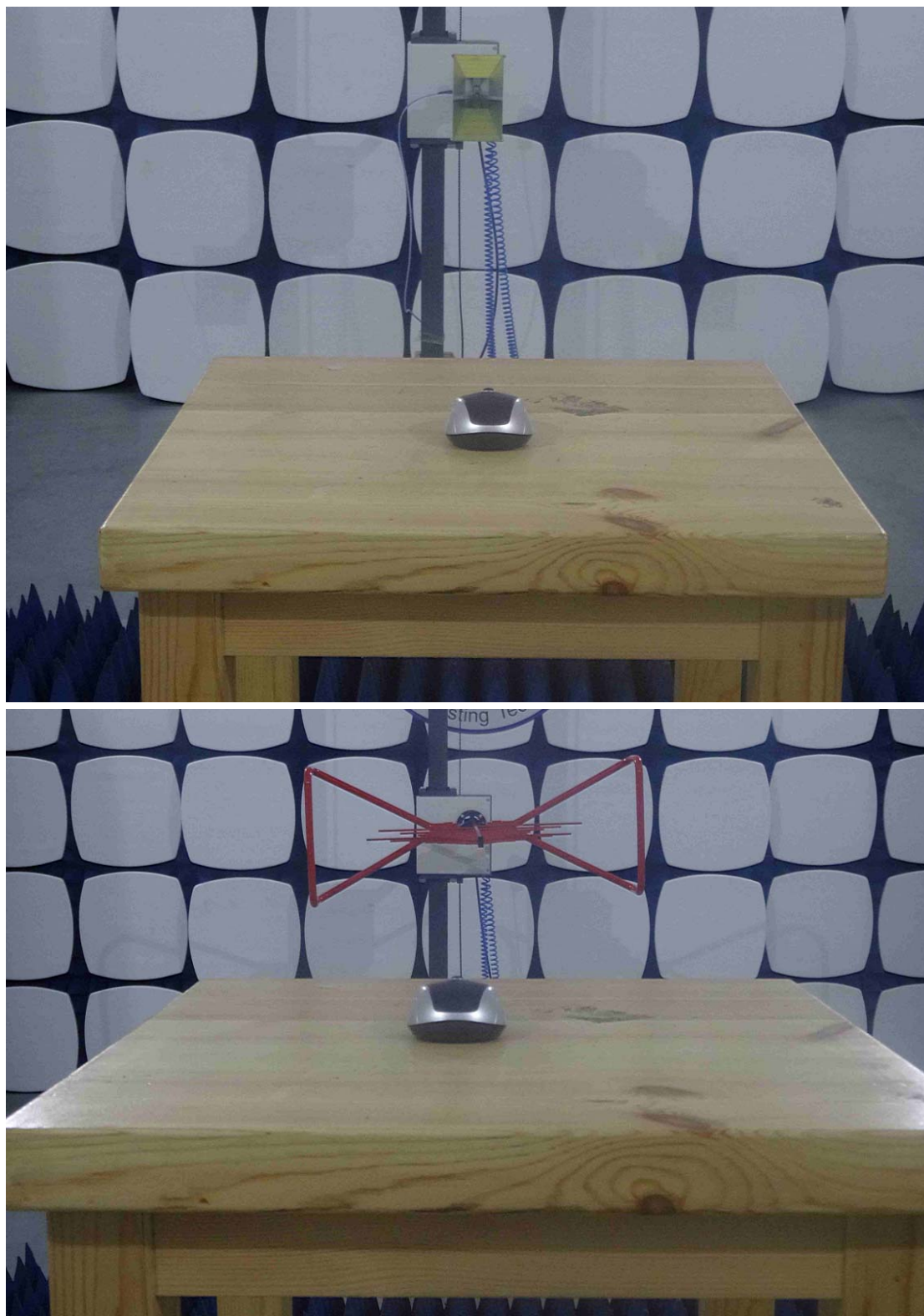


High channel: 2476 MHz



10.0 Photos of test setup

10.1 Radiated emission test view



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