LABCODE: 500069-0

FCC PART 15.249

TEST REPORT

For

Shenzhen Rapoo Technology Co., Ltd

22, Jinxiu Road East, Pingshan District, Shenzhen, China

FCC ID: PP21650

Report Type: Original Report	**Product Type:** Wireless Optical Mouse
Test Engineer:	Leon Chen
Report Number:	R2DG140409009-00
Report Date:	2014-05-09
Reviewed By:	Ivan Cao RF Leader
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Shenzhen Rapoo Technology Co., Ltd*'s product, model number: *1650 (FCC ID: PP21650)* (the "EUT") in this report was a *Wireless Optical Mouse*, was measured approximately: 11.6 cm (W) x 6.1 cm (H) x 3.8 cm (D), rated input voltage: DC 1.5V from 1*AA battery.

** All measurement and test data in this report was gathered from production sample serial number: 140409009 (Assigned by BACL.Dongguan). The EUT was received on 2014-04-11.*

Objective

This type approval report is prepared on behalf of *Shenzhen Rapoo Technology Co., Ltd* in accordance with Part 2-Subpart J, and Part 15-Subparts A, B and C of the Federal Communications Commission's rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.249 rules

Related Submittal(s)/Grant(s)

No related grants.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Dongguan).

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China

Test site at Bay Area Compliance Laboratories Corp. (Dongguan) has been fully described in reports submitted to the Federal Communications Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 02, 2012. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 273710. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratories Corp. (Dongguan) is an ISO/IEC 17025 accredited laboratory, and is accredited by National Voluntary Laboratory Accredited Program (Lab Code 500069-0).

The current scope of accreditations can be found at http://ts.nist.gov/standards/scopes/5000690.htm

SYSTEM TEST CONFIGURATION

Justification

The system was configured for testing in Engineering Mode, which was provided by the manufacturer. The engineering mode was configured as maximum power and switched the channels by keys.

16 channels were provided by the manufacturer:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2402	5	2425	9	2446	13	2471
2	2405	6	2428	10	2451	14	2474
3	2409	7	2431	11	2454	15	2477
4	2413	8	2434	12	2457	16	2479

EUT was tested with Channel 2402 MHz, 2446 MHz and 2479 MHz

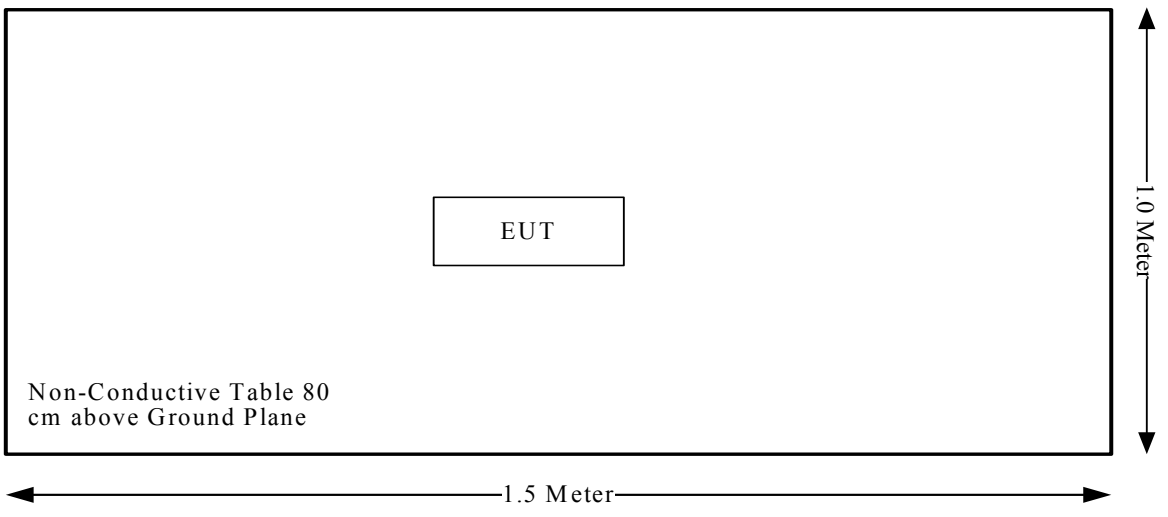
EUT Exercise Software

The test software was built in the equipment, and the maximum power configured by the system.

Equipment Modifications

No modifications were made to the unit tested.

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207(a)	Conduction Emissions	Not Applicable*
15.205, §15.209, §15.249	Radiated Emissions	Compliance
FCC§15.249(d)	Out of band emission (50dB attenuation)	Compliance

Not applicable*: the EUT is battery operated equipment.

FCC§15.203 - ANTENNA REQUIREMENT

Applicable Standard

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used.

Antenna Connector Construction

The EUT has one integral antenna arrangement and the antenna gain is 1.52 dBi, fulfill the requirement of this section. Please refer to the internal photos.

Result: Compliant.

FCC§15.205, §15.209&§15.249- RADIATED EMISSIONS

Applicable Standard

As per FCC§15.249 (a), except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

As per FCC§15.249 (c), Field strength limits are specified at a distance of 3 meters.

(d) 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 §15.209, whichever is the lesser attenuation.

Measurement Uncertainty

Compliance or non- compliance with a disturbance limit shall be determined in the following manner：

If U_{lab} is less than or equal to U_{cispr} of Table 1, then:
- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non - compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If U_{lab} is greater than U_{cispr} of Table 1, then:
- compliance is deemed to occur if no measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit;
- non - compliance is deemed to occur if any measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit.

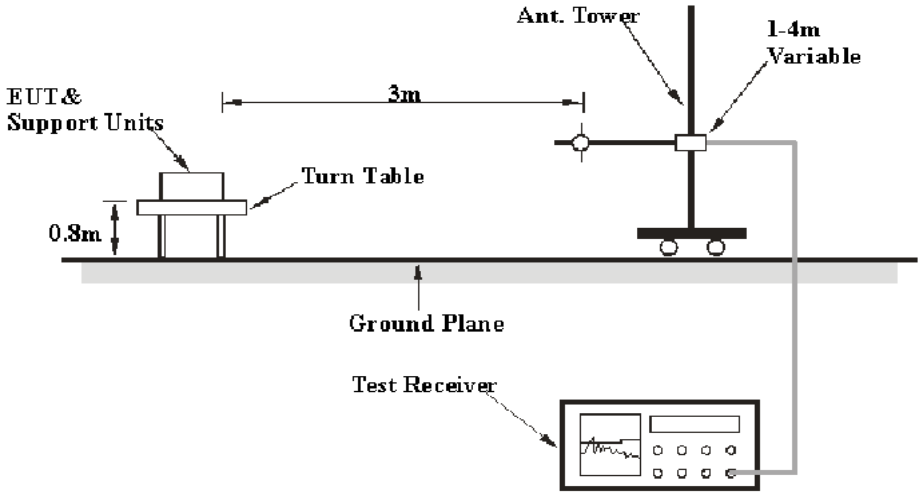
Based on CISPR 16-4-2: 2011, measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Dongguan) is:
30M~200MHz: 5.0 dB
200M~1GHz: 6.2 dB
1G~6GHz: 4.45 dB
6G~18GHz: 5.23 dB

Table 1 – Values of U_{cispr}

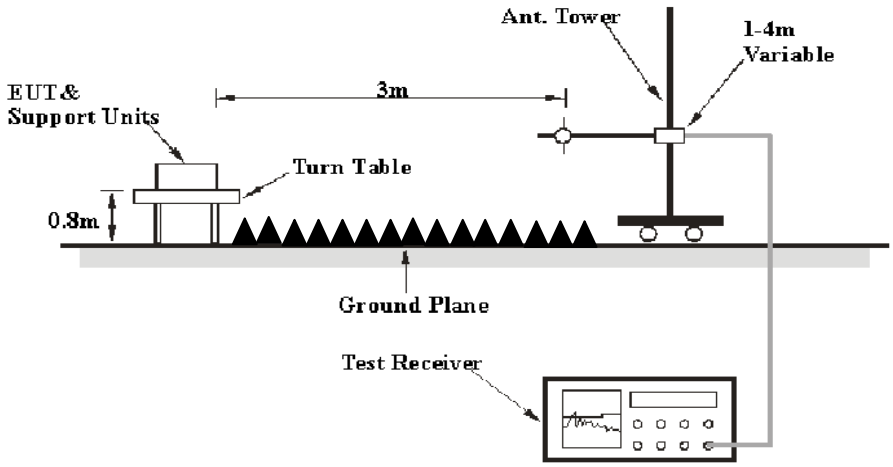
Measurement	U_{cispr}
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.5 dB

EUT Setup

Below 1 GH



Above 1 GHz



The radiated emission and out of band emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC 15.209/15.205 and FCC 15.249 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

Test Equipment Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	Ave.

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the Quasi-peak detection mode from 30MHz to 1GHz, Peak and average detection mode above 1 GHz.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit –Extrapolation result

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100224	2014-05-06	2015-05-05
Sunol Sciences	Antenna	JB3	A060611-1	2011-09-06	2014-09-05
HP	Amplifier	8447E	2434A02181	2013-09-06	2014-09-05
ETS LINDGREN	Horn Antenna	3115	000 527 35	2012-09-06	2015-09-05
Mini-Circuit	Amplifier	ZVA-213-S+	054201245	2014-02-19	2015-02-18
R&S	Spectrum Analyzer	FSP 38	100478	2013-06-16	2014-06-15
Ducommun Technolagies	Horn Antenna	ARH-4223-02	1007726-01 1304	2013-06-16	2014-06-15
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2013-09-06	2014-09-05

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

Test Results Summary

According to the data in the following table, the EUT complied with the FCC Part 15.209 &15.205 & 15.249, with the worst margin reading of:

14.95 dB at **2483.6 MHz** in the **Horizontal** polarization

Test Data

Environmental Conditions

Temperature:	26.3 °C
Relative Humidity:	72 %
ATM Pressure:	100.8 kPa

The testing was performed by Leon Chen on 2014-05-09.

Test Mode: Transmitting

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB(1/m))					
frequency: 2402MHz									
2402	86.31	PK	V	25.65	4.42	27.32	89.06	114.00	24.94
2402	74.57	AV	V	25.65	4.42	27.32	77.32	94.00	16.68
2402	93.30	PK	H	25.65	4.42	27.32	96.05	114.00	17.95
2402	80.81	AV	H	25.65	4.42	27.32	83.56	94.00	10.44
2390	36.34	PK	H	25.61	4.39	27.32	39.02	74.00	34.98
2390	21.06	AV	H	25.61	4.39	27.32	23.74	54.00	30.26
2399.9	52.32	PK	H	25.64	4.42	27.32	55.06	74.00	18.94
2399.9	33.16	AV	H	25.64	4.42	27.32	35.90	54.00	18.10
4804	43.38	PK	H	30.59	5.98	27.41	52.54	74.00	21.46
4804	22.93	AV	H	30.59	5.98	27.41	32.09	54.00	21.91
7206	42.05	PK	H	34.09	7.45	25.91	57.68	74.00	16.32
7206	21.57	AV	H	34.09	7.45	25.91	37.20	54.00	16.80
1735	36.40	PK	H	24.28	3.71	27.52	36.87	74.00	37.13
1735	22.19	AV	H	24.28	3.71	27.52	22.66	54.00	31.34
7315	31.56	PK	H	34.61	7.57	25.92	47.82	74.00	26.18
7315	17.68	AV	H	34.61	7.57	25.92	33.94	54.00	20.06
159.98	27.90	QP	H	12.78	1.53	21.44	20.77	43.50	22.73
frequency: 2446MHz									
2446	85.59	PK	V	25.76	4.40	27.34	88.41	114.00	25.59
2446	73.51	AV	V	25.76	4.40	27.34	76.33	94.00	17.67
2446	92.83	PK	H	25.76	4.40	27.34	95.65	114.00	18.35
2446	80.62	AV	H	25.76	4.40	27.34	83.44	94.00	10.56
4892	44.97	PK	H	30.82	6.08	27.42	54.45	74.00	19.55
4892	23.96	AV	H	30.82	6.08	27.42	33.44	54.00	20.56
7338	40.57	PK	H	34.41	7.52	25.88	56.62	74.00	17.38
7338	22.25	AV	H	34.41	7.52	25.88	38.30	54.00	15.70
2020	37.09	PK	H	24.25	3.63	27.52	37.45	74.00	36.55
2020	22.94	AV	H	24.25	3.63	27.52	23.30	54.00	30.70
1735	32.64	PK	H	34.46	7.53	25.87	48.76	74.00	25.24
1735	18.67	AV	H	34.46	7.53	25.87	34.79	54.00	19.21
7315	30.42	PK	H	22.97	2.86	26.87	29.38	74.00	44.62
7315	22.15	AV	H	22.97	2.86	26.87	21.11	54.00	32.89
159.98	28.00	QP	H	12.78	1.53	21.44	20.87	43.50	22.63
frequency: 2479MHz									
2479	85.13	PK	V	25.85	4.48	27.36	88.10	114.00	25.90
2479	72.86	AV	V	25.85	4.48	27.36	75.83	94.00	18.17
2479	93.13	PK	H	25.85	4.48	27.36	96.10	114.00	17.90
2479	80.78	AV	H	25.85	4.48	27.36	83.75	94.00	10.25
2483.6	55.36	PK	H	25.86	4.49	27.36	58.35	74.00	15.65
2483.6	36.06	AV	H	25.86	4.49	27.36	39.05	54.00	14.95
4958	44.98	PK	H	30.99	5.89	27.43	54.43	74.00	19.57
4958	23.05	AV	H	30.99	5.89	27.43	32.50	54.00	21.50
7437	41.39	PK	H	34.65	7.58	25.96	57.66	74.00	16.34
7437	21.77	AV	H	34.65	7.58	25.96	38.04	54.00	15.96
1720	37.23	PK	H	24.13	3.63	27.58	37.41	74.00	36.59
1720	23.37	AV	H	24.13	3.63	27.58	23.55	54.00	30.45
6985	32.08	PK	H	34.61	7.57	25.92	48.34	74.00	25.66
6985	18.26	AV	H	34.61	7.57	25.92	34.52	54.00	19.48
159.98	27.4	QP	H	12.78	1.53	21.44	20.27	43.50	23.23

FCC§15.249(d) - OUT OF BAND EMISSION (50 dB ATTENUATION)

Applicable Standard

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 §15.209, whichever is the lesser attenuation

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSP 38	100478	2013-06-16	2014-06-15

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	25.4 ºC
Relative Humidity:	66 %
ATM Pressure:	101 kPa

** The testing was performed by Leon Chen on 2014-05-09.*

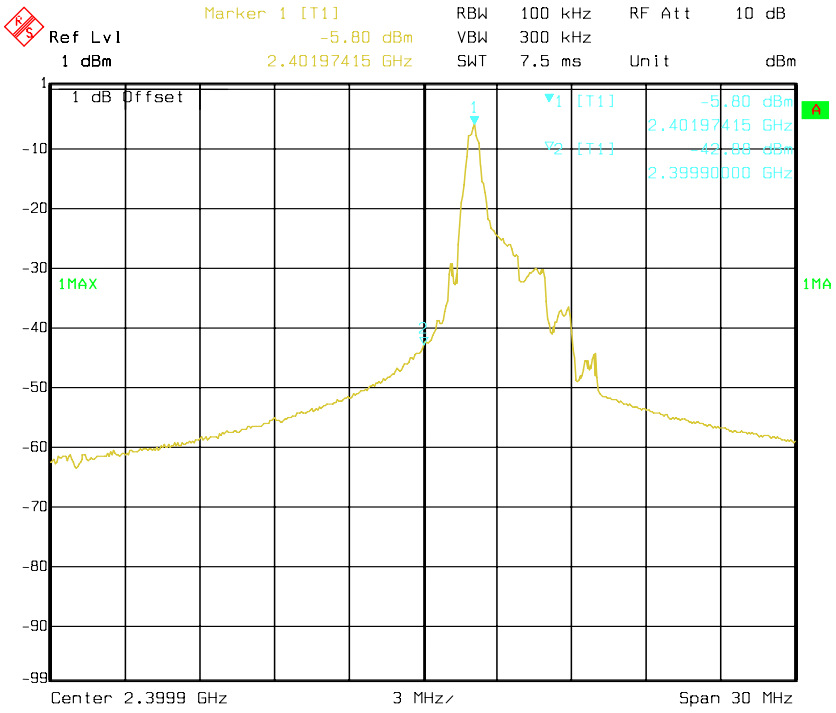
Test Result: Compliance.

Please refer to the following table and plots:

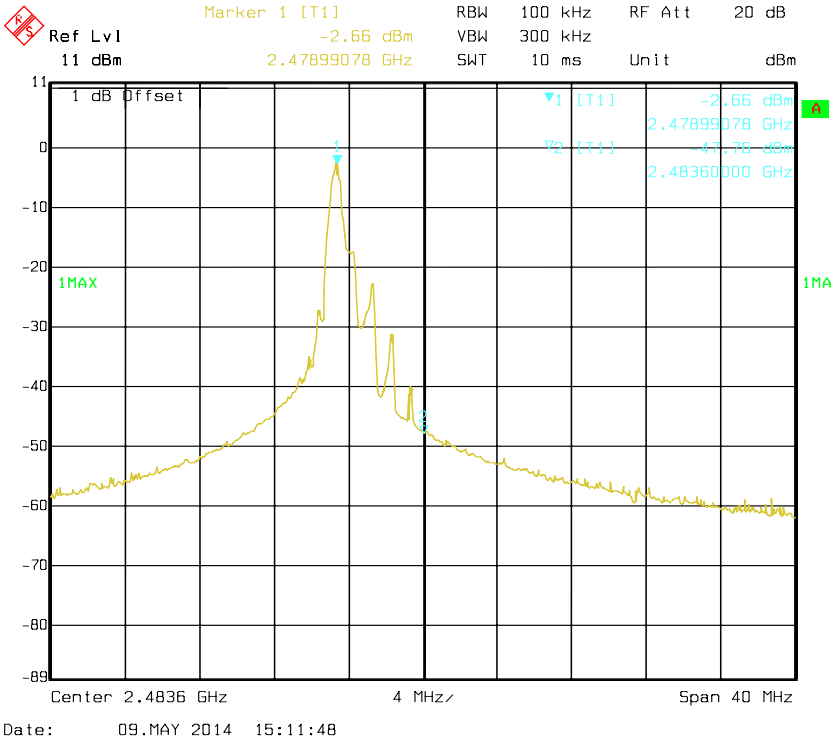
Frequency (MHz)	Delta Peak to Band Emission (dBc)	Delta Limit (dBc)
2399.9	37.08(note)	50
2483.6	45.10(note)	50

note：The delta peak to band emission compliance with 15.209 requirement

Band Edge, Left Side



Band Edge, Right Side



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