



FCC- TEST REPORT

Report Number : **66.940.18.0034.01** Date of Issue: July 7, 2018

Model : RECON HL 1600

Product Type : BICYCLE HEAD LIGHT

Applicant : Giant Manufacturing CO., Ltd.

Manufacturer : Giant Manufacturing CO., Ltd.

Address : No. 19, Shun-Farn Road, Tachia Area Taichung City, Taiwan

Test Result : ☒ **Positive** ☐ **Negative**

Total pages including
Appendices : 24

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2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
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P. R. China

FCC Registration Number: 514049

IC Registration Number: 10320A-1

Telephone: 86 755 8828 6998
Fax: 86 755 828 5299

3 Description of the Equipment under Test

Product: BICYCLE HEAD LIGHT

Model no.: RECON HL 1600

FCC ID: ZL7RECONHL1600

Input: DC5V, 2A

Battery type: 3.7V, 6000mAh Li-ion battery

RF Transmission Frequency: 2457MHz

Modulation: GFSK

Antenna Type: PCB Antenna

Antenna Gain: -4 dBi

Description of the EUT: The EUT is a BICYCLE HEAD LIGHT which can be controlled by connecting ANT+ network.

4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2017 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

All the test methods were according to KDB558074 D01 DTS Meas Guidance v04 and ANSI C63.10 (2013).

5 Summary of Test Results

Technical Requirements				
FCC Part 15 Subpart C				
Test Condition		Pages	Test Result	Test Site
§15.207	Conducted emission AC power port	10-12	Pass	Site 1
§15.247(b)(1)	Conducted peak output power	13	Pass	Site 1
§15.247(e)	Power spectral density	15	Pass	Site 1
§15.247(a)(2)	6dB bandwidth	14	Pass	Site 1
§15.247(d)	Spurious RF conducted emissions	16-17	Pass	Site 1
§15.247(d)	Band edge	18-19	Pass	Site 1
§15.247(d) & §15.209 &	Spurious radiated emissions for transmitter and receiver	20-22	Pass	Site 1
§15.203	Antenna requirement	See note 1	Pass	--

Note 1: The EUT uses an PCB Antenna, which gain is -4dBi. According to §15.203, it is considered sufficiently to comply with the provisions of this section.

6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: ZL7RECONHL1600 complies with Section 15.207, 15.247 of the FCC Part 15, Subpart C.
This report is for the ANT+ part.

SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

□ - **Not** Performed

The Equipment under Test

■ - **Fulfills** the general approval requirements.

□ - **Does not** fulfill the general approval requirements.

Sample Received Date: April 28, 2018

Testing Start Date: April 29, 2018

Testing End Date: June 6, 2018

- TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch -

Reviewed by:

Prepared by:

Tested by:



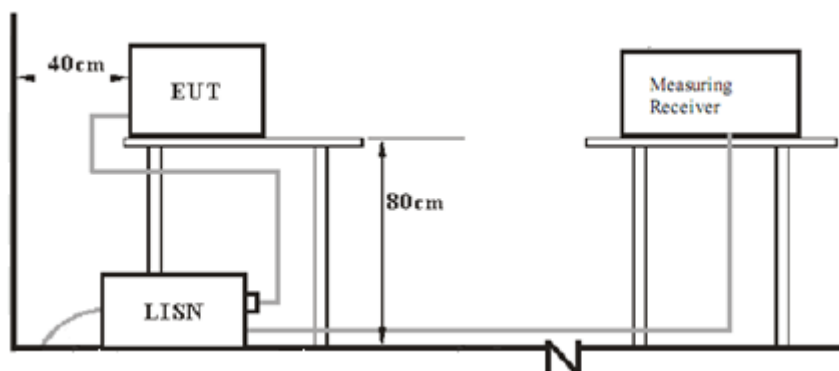
Peter Jia

Matt Zhang

Joe Gu

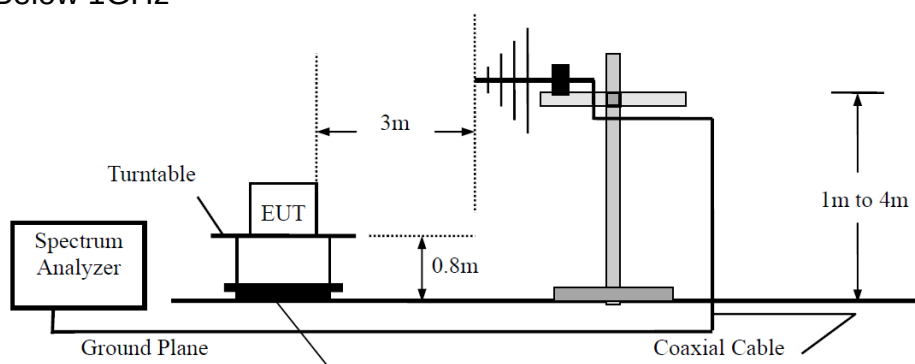
7 Test Setups

7.1 AC Power Line Conducted Emission test setups

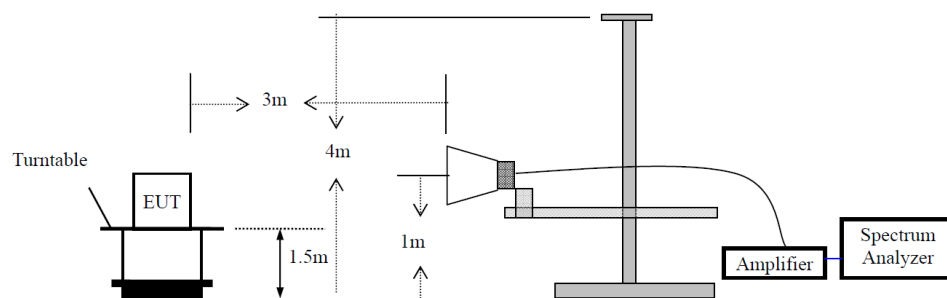


7.2 Radiated test setups

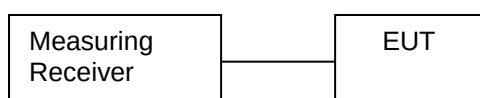
Below 1GHz



Above 1GHz



7.3 Conducted RF test setups



8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
Stopwatch	Giant	Neostrack	---
Laptop	Lenovo	X240	L34015282

9 Technical Requirement

9.1 Conducted Emission

Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line

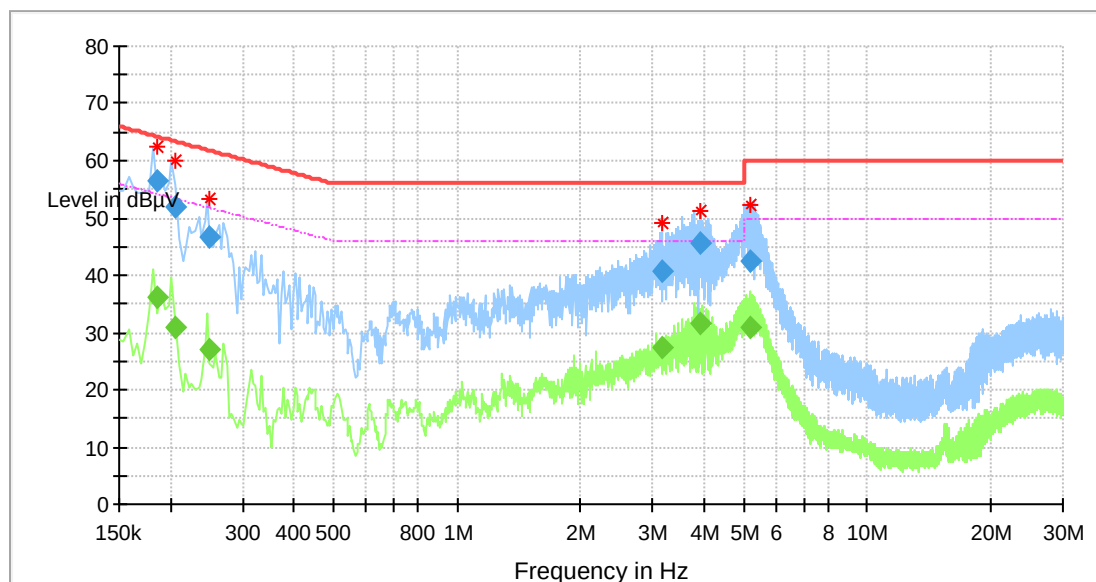
Limit

Frequency MHz	QP Limit dB μ V	AV Limit dB μ V
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

* Decreasing linear

Conducted Emission

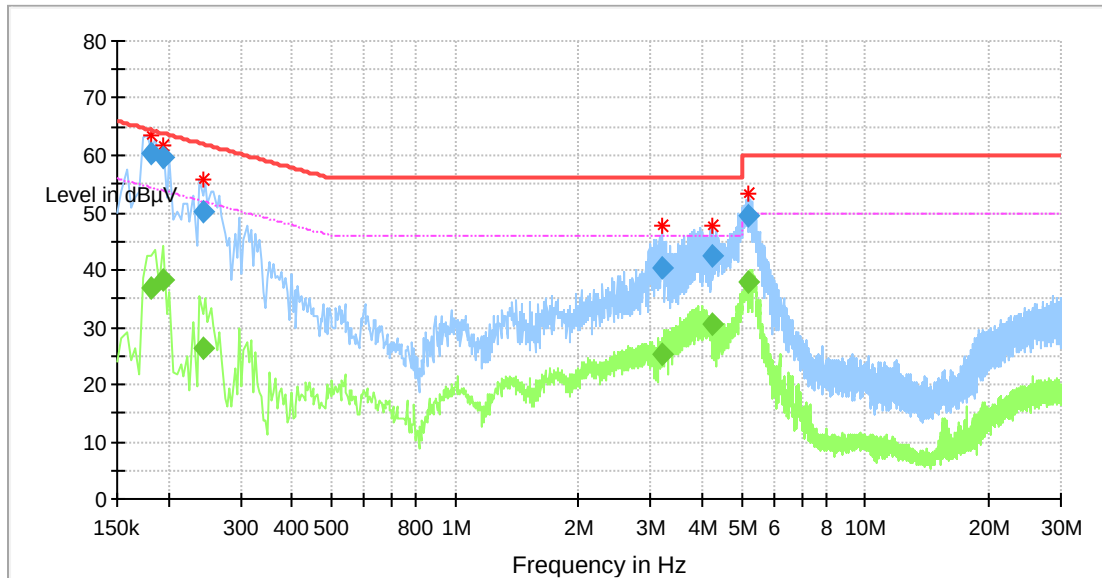
Product Type : BICYCLE HEAD LIGHT
M/N : RECON HL 1600
Operating Condition : USB Charging
Conduct Line : L



Final_Result

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line	Corr. (dB)
0.185500	---	36.23	54.24	18.01	L1	10.2
0.185500	56.48	---	64.24	7.76	L1	10.2
0.205500	---	31.05	53.39	22.34	L1	10.2
0.205500	51.95	---	63.39	11.44	L1	10.2
0.249500	---	27.03	51.77	24.74	L1	10.2
0.249500	46.72	---	61.77	15.05	L1	10.2
3.174500	---	27.48	46.00	18.52	L1	10.3
3.174500	40.83	---	56.00	15.17	L1	10.3
3.929500	---	31.64	46.00	14.36	L1	10.3
3.929500	45.51	---	56.00	10.49	L1	10.3
5.181500	---	30.89	50.00	19.11	L1	10.4
5.181500	42.63	---	60.00	17.37	L1	10.4

Product Type : BICYCLE HEAD LIGHT
 M/N : RECON HL 1600
 Operating Condition : USB Charging
 Conduct Line : N



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.182500	---	36.96	54.37	17.41	N	10.3
0.182500	60.34	---	64.37	4.03	N	10.3
0.193500	---	38.32	53.88	15.56	N	10.3
0.193500	59.53	---	63.88	4.35	N	10.3
0.242500	---	26.39	52.01	25.62	N	10.3
0.242500	50.29	---	62.01	11.72	N	10.3
3.198500	---	25.41	46.00	20.59	N	10.5
3.198500	40.19	---	56.00	15.81	N	10.5
4.249500	---	30.36	46.00	15.64	N	10.5
4.249500	42.40	---	56.00	13.60	N	10.5
5.178500	---	37.90	50.00	12.10	N	10.6
5.178500	49.54	---	60.00	10.46	N	10.6

9.2 Conducted peak output power

Test Method

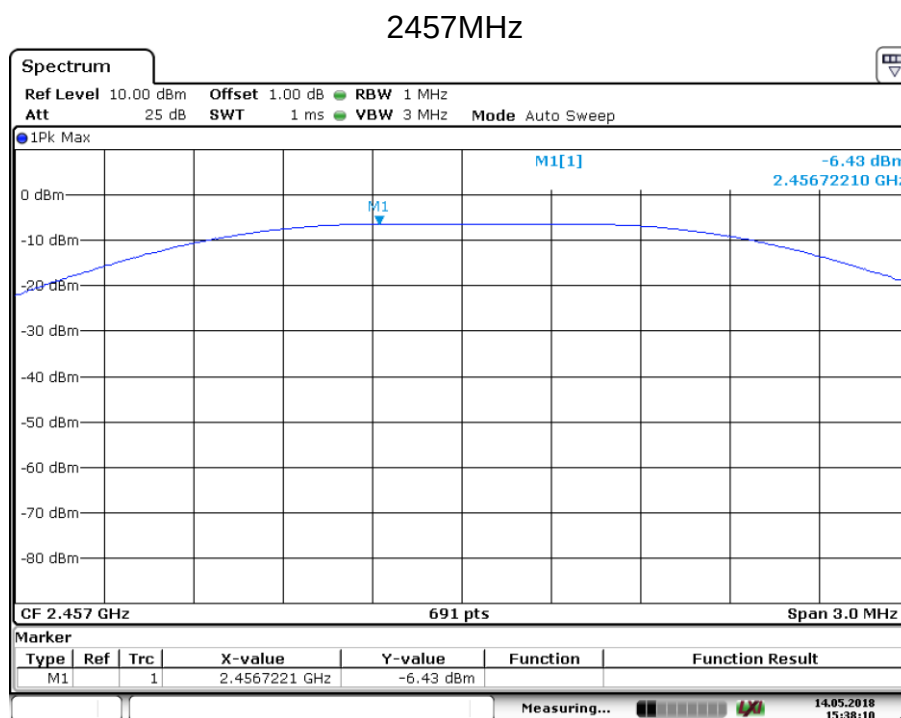
1. Use the following spectrum analyzer settings:
RBW > the 6 dB bandwidth of the emission being measured, VBW ≥ 3RBW, Span ≥ 3RBW
Sweep = auto, Detector function = peak, Trace = max hold.
2. Add a correction factor to the display.
3. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power.

Limits

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤1	≤30

Test result as below table

Frequency MHz	Conducted Peak Output Power dBm	Result
2457MHz	-6.43	Pass



Date: 14.MAY.2018 15:38:10

9.3 6dB bandwidth and 99% Occupied Bandwidth

Test Method

1. Use the following spectrum analyzer settings:
RBW=100K, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.
3. Allow the trace to stabilize, record the X dB Bandwidth value.

Limit

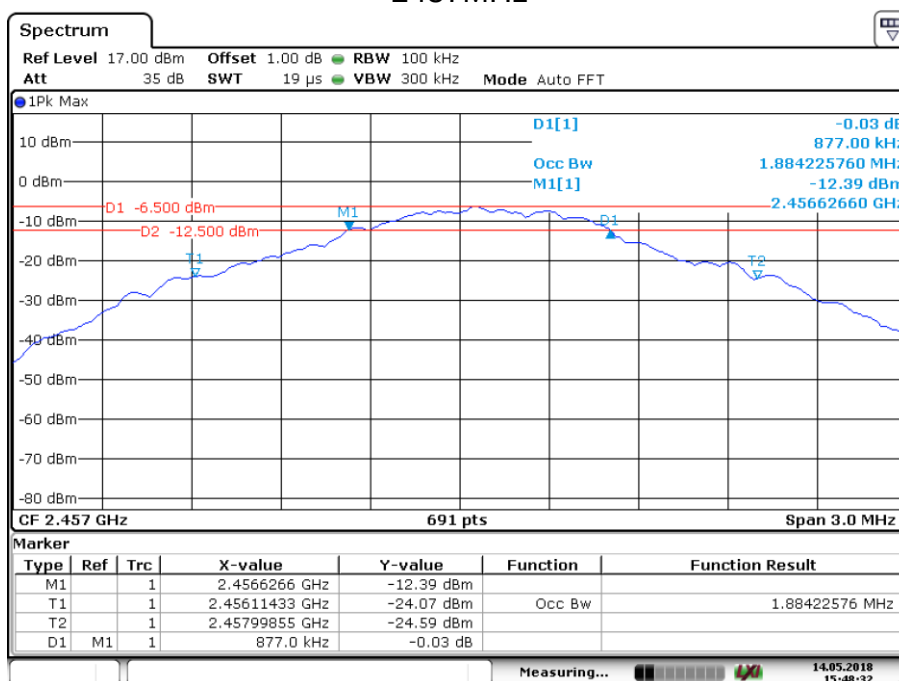
Limit [kHz]

≥500

Test result

Frequency MHz	6dB bandwidth kHz	99% Bandwidth kHz	Result
2457MHz	877.0	1884.226	Pass

2457MHz



Date: 14.MAY.2018 15:48:32

9.4 Power spectral density

Test Method

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance:

1. Set analyzer center frequency to DTS channel center frequency.
RBW=3kHz,VBW≥3RBW,Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold.
2. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
3. Repeat above procedures until other frequencies measured were completed.

Limit

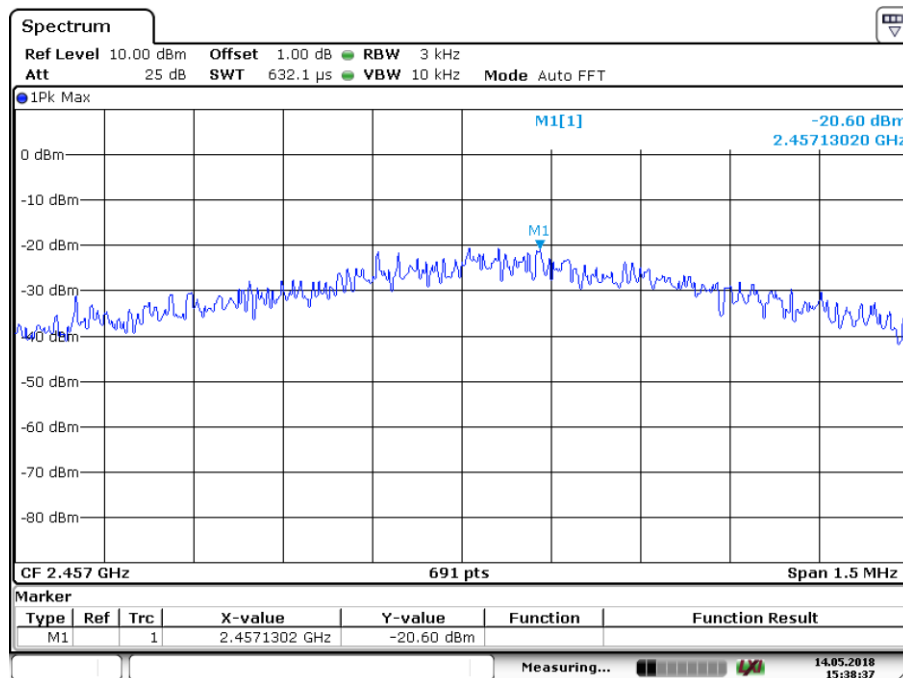
Limit [dBm]

≤8

Test result

Frequency MHz	Power spectral density dBm	Result
2457MHz	-20.60	Pass

2457MHz



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9.5 Spurious RF conducted emissions

Test Method

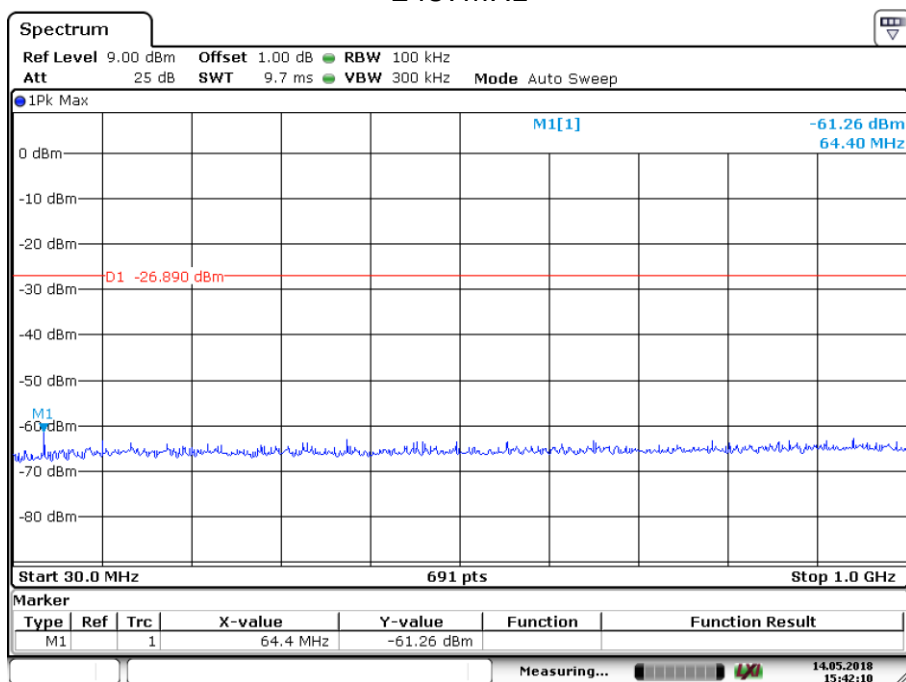
1. Establish a reference level by using the following procedure:
 - a. Set RBW=100 kHz. VBW $\geq$ 3RBW. Detector =peak, Sweep time = auto couple, Trace mode = max hold.
 - b. Allow trace to fully stabilize, use the peak marker function to determine the maximum PSD level.
2. Use the maximum PSD level to establish the reference level.
 - a. Set the center frequency and span to encompass frequency range to be measured.
 - b. Use the peak marker function to determine the maximum amplitude level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements, report the three highest emissions relative to the limit.
3. Repeat above procedures until other frequencies measured were completed.

Limit

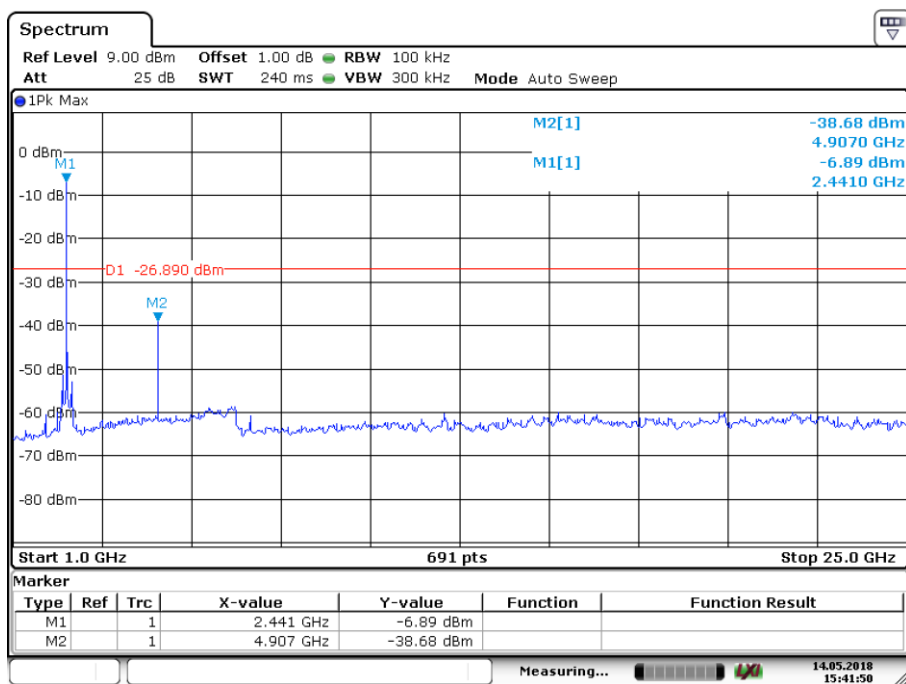
Frequency Range MHz	Limit (dBc)
30-25000	-20

Spurious RF conducted emissions

2457MHz



Date: 14.MAY.2018 15:42:11



Date: 14.MAY.2018 15:41:50

9.6 Band edge

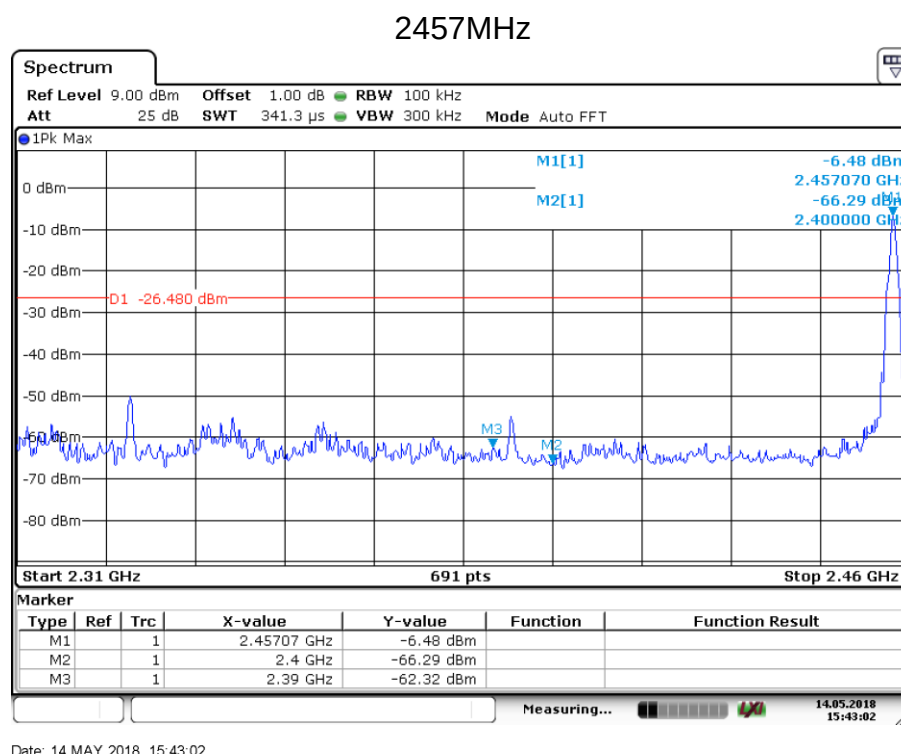
Test Method

- 1 Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz, VBW $\geq$ RBW, Sweep = auto, Detector function = peak, Trace = max hold.
- 2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
- 3 The level displayed must comply with the limit specified in this Section.

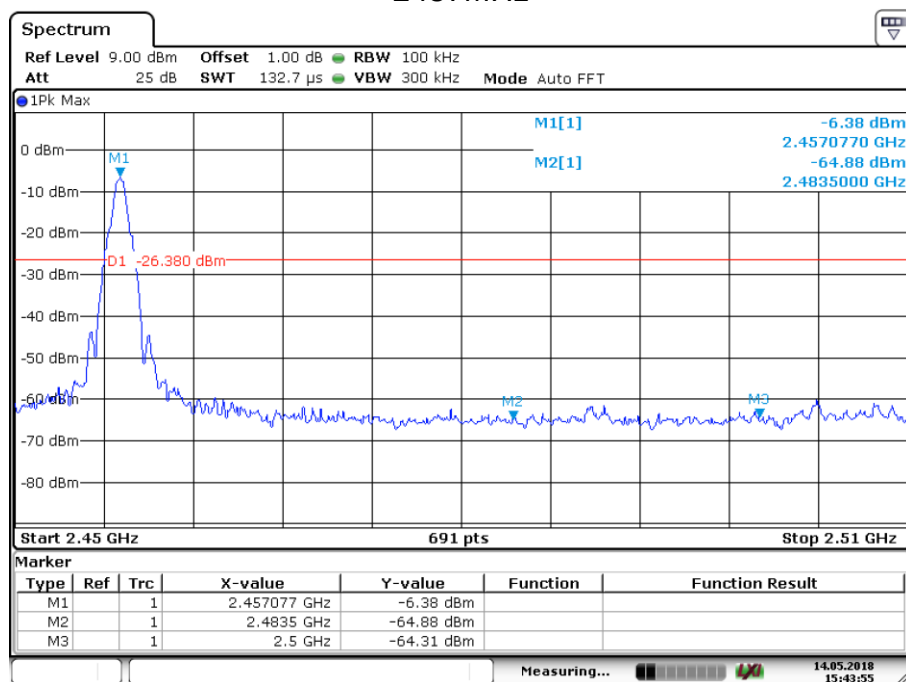
Limit

In any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)).

Test result



2457MHz



Date: 14.MAY.2018 15:43:55

9.7 Spurious radiated emissions for transmitter

Test Method

- 1: The EUT was placed on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3-meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
- 3: The height of antenna 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.
- 4: 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.
- 5: Use the following spectrum analyzer settings According to C63.10:

For Above 1GHz

Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 1MHz, VBW $\geq$ RBW for peak measurement and VBW = 10Hz for average measurement, Sweep = auto, Detector function = peak, Trace = max hold.

For Below 1GHz

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 KHz, VBW $\geq$ RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

Note:

- 1: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Quasi-peak detection (QP) at frequency below 1GHz.
- 2: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for peak detection (PK) at frequency above 1GHz.
- 3: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average ((duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor ($20\log(1/\text{duty cycle})$).
- 4: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.

Limit

The radio emission outside the operating frequency band shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. Radiated emissions which fall in the restricted bands, as defined in section 15.205, must comply with the radiated emission limits specified in section 15.209.

Frequency MHz	Field Strength uV/m	Field Strength dBµV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Transmitting spurious emission test result as below:

2457MHz (30MHz – 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Detector	Result
877.18	29.73	Horizontal	46.00	QP	Pass
874.60	31.54	Vertical	46.00	QP	Pass

2457MHz (Above 1GHz)

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Detector	Result
4813.90	50.26	Horizontal	74.00	PK	Pass
2329.12	46.15	Vertical	74.00	PK	Pass

10 Test Equipment List

List of Test Instruments

	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
CE	EMI Test Receiver	Rohde & Schwarz	ESR 3	101782	2018-7-14
	LISN	Rohde & Schwarz	ENV4200	100249	2018-7-17
	LISN	Rohde & Schwarz	ENV216	100326	2018-7-14
	ISN	Rohde & Schwarz	ENY81	100177	2018-7-14
	ISN	Rohde & Schwarz	ENY81-CAT6	101664	2018-7-14
	High Voltage Probe	Rohde & Schwarz	TK9420(VT9 420)	9420-58	2018-7-14
	RF Current probe	Rohde & Schwarz	EZ-17	100816	2018-7-14
C	Signal Generator	Rohde & Schwarz	SMB100A	108272	2018-7-7
	Signal Analyzer	Rohde & Schwarz	FSV40	101030	2018-7-7
	Vector Signal Generator	Rohde & Schwarz	SMU 200A	105324	2018-7-7
	RF Switch Module	Rohde & Schwarz	OSP120/OS P-B157	101226/100851	2018-7-7
	EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2018-7-14
RE	Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2018-7-14
	Horn Antenna	Rohde & Schwarz	HF907	102294	2018-7-14
	Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2018-7-14
	3m Semi-anechoic chamber	TDK	9X6X6	----	2019-5-29

C - Conducted RF tests

- Conducted peak output power
- 6dB bandwidth
- Power spectral density*
- Spurious RF conducted emissions
- Band edge
- Conducted emission AC power port

RE - Radiated RF tests

- Spurious radiated emissions for transmitter

11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty	
Items	Extended Uncertainty
Uncertainty for Radiated Emission in 3m chamber 30MHz-1000MHz	Horizontal: 4.83dB; Vertical: 4.91dB;
Uncertainty for Radiated Emission in 3m chamber 1000MHz-18000MHz	Horizontal: 4.89dB; Vertical: 4.88dB;
Uncertainty for Conducted RF test	2.04dB