FCC&ISED RF TEST REPORT

No. 170501158SHA-001

Applicant	:	ISKN 52 cours Jean Jaurès. 38000 Grenoble. FRANCE
Manufacturing site	:	Technochina Industries(ShangHai) Co., Ltd 152⁄1421 Zhuan Xin Dong Lu, Minhang Industrial Park 201108 Shanghai, China
Product Name	:	The Slate 2+
Type/Model	:	TS2E2
TEST RESULT	**:**	**PASS**

SUMMARY

The equipment complies with the requirements according to the following standard(s) or specification:

47CFR Part 15 (2016): Radio Frequency Devices (Subpart C)

ANSI C63.10 (2013): American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

RSS-210 Issue 9 (August 2016): Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

RSS-Gen Issue 4 (November 2014): General Requirements for Compliance of Radio Apparatus

Date of issue: July 4, 2017

Prepared by:

Wade Zhang

Wade Zhang (Project engineer)

Reviewed by:

Daniel Zhao (Reviewer)

Description of Test Facility

Name: Intertek Testing Service Limited Shanghai
Address: Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, P.R. China

FCC Registration Number: 236597
IC Assigned Code: 2402B-1

Name of contact: Jonny Jing
Tel: 86 21 61278271
Fax: 86 21 54262353

Content

1 GENERAL INFORMATION

1.1 Description of Client

Applicant	:	ISKN 52 cours Jean Jaurès. 38000 Grenoble. FRANCE
Manufacturer	:	Technochina Industries(ShangHai) Co., Ltd 152/1421 Zhuan Xin Dong Lu, Minhang Industrial Park 201108 Shanghai, China

1.2 Identification of the EUT

Product Name	:	The Slate 2+
Type/model	:	TS2E2
FCC ID	:	2ACQC-TS2E2
IC	:	12188A-TS2E2

1.3 Technical Specification

Operation Frequency Band	:	2400 – 2483.5MHz
Modulation	:	GFSK
Channel Frequency	:	2402 – 2480MHz
Description of EUT	:	The EUT supports BLE 4.1 function, it has only one model, we tested it and listed the BLE result in this report.
Antenna	:	Internal PCB antenna, 0dBi Peak gain
Rating	:	DC 5V
Category of EUT	:	Class B
EUT type	:	☒ Table top ☐ Floor standing
Sample received date	:	June 6, 2017
Date of test	:	June 6, 2017 to June 22, 2017

2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2016)
ANSI C63.10 (2013)
RSS-210 Issue 9 (August 2016)
RSS-Gen Issue 4 (November 2014)

2.2 Mode of operation during the test

While testing transmitting mode of EUT, the internal modulation and continuously transmission was applied.

The EUT is a handheld device, so three axes (X, Y, Z) were observed while the test receiver worked as “max hold” continuously and the highest reading among the whole test procedure was recorded.

The lowest, middle and highest channel were tested as representatives.

Frequency Band (MHz)				2402 ~ 2480			
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	**2402**	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	**19**	**2440**	29	2460	**39**	**2480**

The test setting software is offered by the manufactory. The pre-scan for the conducted power with all rates in each modulation and bands was used, and the worst case was found and used in all test cases.

Test software and Power Setting parameter			
Test Software	Certif_Slate		
Working Mode	BLE		
Test Channel	2402MHz	2440MHz	2480MHz
Power Setting	0	0	0

While testing transmitting mode of EUT, the internal modulation and continuously transmission was applied.

Radiated test mode:
Mode 1: EUT transmitted signal with BT antenna;

Conducted test mode:
Mode 2: EUT transmitted signal from BT RF port connected to SPA directly;

2.3 Test software list

Test Items	Software	Manufacturer	Version
Conducted emission	ESxS-K1	R&S	V2.1.0
Radiated emission	ES-K1	R&S	V1.71

2.4 Test peripherals list

Equipment	Brand Name	Model	Note
Notebook	HP	6470b	
Note: The accessories are used for configuration only and not used during test.			

2.5 Instrument list

Selected	Equipment	Type	Manu.	Internal no.	Cal. Date	Due date
☒	PXA Analyzer	N9030A	Agilent	EC5338	2017/3/3	2018/3/2
☒	Vector SG	N5182B	Agilent	EC5175	2017/3/3	2018/3/2
☒	Power sensor	U2021XA	Agilent	EC5338-1	2017/3/3	2018/3/2
☒	MXG Analog SG	N5181A	Agilent	EC5338-2	2017/3/3	2018/3/2
☒	Power meter	N1911A/N1921A	Agilent	EC4318	2016/5/18	2017/5/17
☒	EMI Receiver	ESCS 30	R&S	EC 2107	2016/10/19	2017/10/18
☒	A.M.N.	ESH2-Z5	R&S	EC 3119	2015/12/16	2017/12/15
☒	I.S.N.	FCC-TLISN-T8-02	FCC	EC3756	2017/2/15	2018/2/14
☒	EMI chamber	3m	Albatross	EC 3048	2016/9/10	2017/9/9
☒	Test Receiver	ESIB 26	R&S	EC 3045	2016/10/19	2017/10/18
☒	Test Receiver	ESCI 7	R&S	EC4501	2017/2/23	2018/2/22
☒	Bilog Antenna	CBL 6112D	TESEQ	EC 4206	2016/6/2	2017/6/1
☒	Horn antenna	HF 906	R&S	EC 3049	2016/9/24	2017/9/23
☒	Horn antenna	HAP18-26W	TOYO	EC 4792-3	2016/6/12	2017/6/11
☒	Pre-amplifier	Pre-amp 18	R&S	EC 5262	2016/6/30	2017/6/29
☒	Pre-amplifier	Tpa0118-40	R&S	EC 4792-2	2017/4/10	2018/4/9
☒	Shielded room	-	Zhongyu	EC 2838	2017/1/8	2018/1/7

2.6 Test Summary

This report applies to tested sample only. The test results have been compared directly with the limits, and the measurement uncertainty is recorded. This report shall not be reproduced in part without written approval of Intertek Testing Service Shanghai Limited.

Test item	FCC REFERANCE	Result
Radiated emission	15.249 & 15.209	Pass
Assigned bandwidth (20dB bandwidth)	15.215(c)	Pass
Power line conducted emission	15.207	Pass

Notes: 1: NA =Not Applicable

2: This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

2.7 Measurement uncertainty

The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test item	Measurement uncertainty
Maximum peak output power	± 0.74dB
Radiated Emissions in restricted frequency bands below 1GHz	± 4.90dB
Radiated Emissions in restricted frequency bands above 1GHz	± 5.02dB
Emission outside the frequency band	± 2.89dB
Power line conducted emission	± 3.19dB

3 Radiated emission

Test result: Pass

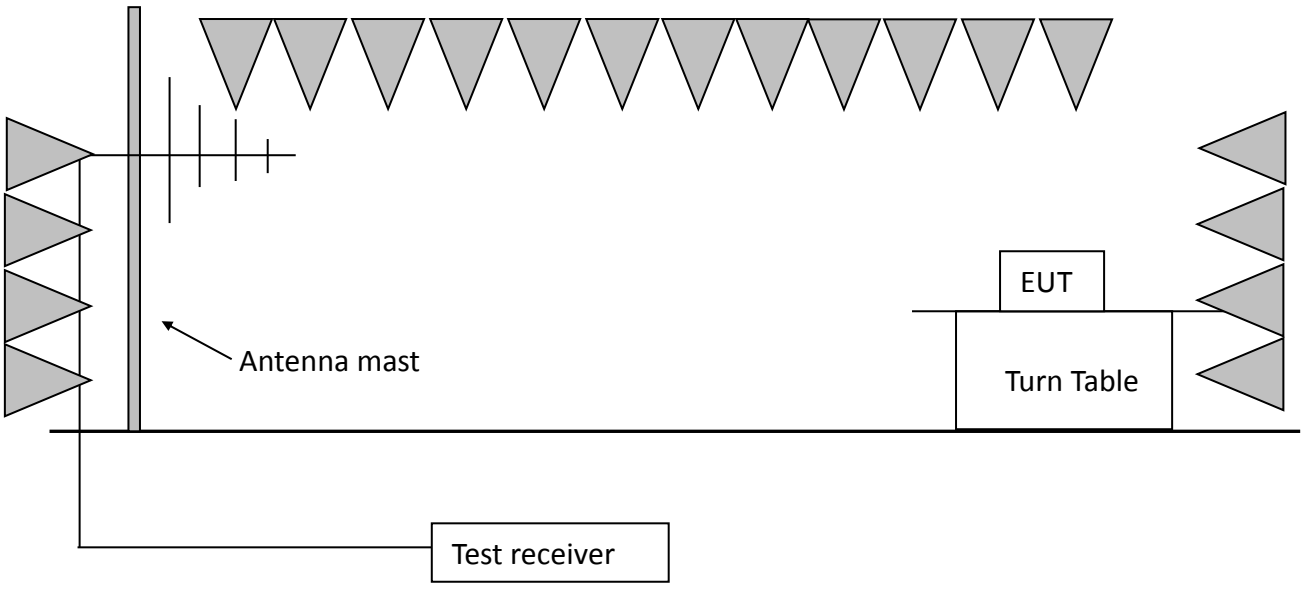
3.1 Test limit

Fundamental Frequency (MHz)	Fundamental limit (dBuV/m)	Harmonic limit (dBuV/m)
☐ 902 - 928	94	54
☒ 2400 - 2483.5	94	54
☐ 5725 - 5875	94	54
☐ 24000 - 24250	108	68

The radiated emissions which fall outside allocated band, must also comply with the radiated emission limits specified in §15.209(a) showed as below:

Frequency (MHz)	Field Strength (dBuV/m)	Measurement Distance (m)
30 - 88	40.0	3
88 - 216	43.5	3
216 - 960	46.0	3
Above 960	54.0	3

3.2 Test Configuration



3.3 Test procedure and test setup

The measurement was applied in a semi-anechoic chamber. While testing for spurious emission higher than 1GHz, if applied, the pre-amplifier would be equipped just at the output terminal of the antenna.

Tabletop devices shall be placed on a nonconducting platform with nominal top surface dimensions 1 m by 1.5 m. For emissions testing at or below 1 GHz, the table height shall be 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m.

The turn table rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna which was mounted on an antenna mast. The antenna moved up and down between from 1meter to 4 meters to find out the maximum emission level.

The radiated emission was measured using the Spectrum Analyzer with the resolutions bandwidth set as:

RBW = 300 Hz, VBW = 1 kHz (9 kHz~150 kHz);
RBW = 10 kHz, VBW = 30 kHz (150 kHz~30MHz);
RBW = 100 kHz, VBW = 300 kHz (30MHz~1GHz for PK)
RBW = 1MHz, VBW = 3MHz (>1GHz for PK);

Remark:
1. Correct Factor = Antenna Factor + Cable Loss (-Amplifier, is employed);
2. Corrected Reading = Original Receiver Reading + Correct Factor;
3. Margin = Limit – Corrected Reading;
4. If the PK Corrected reading is lower than AV limit, the AV test can be elided;

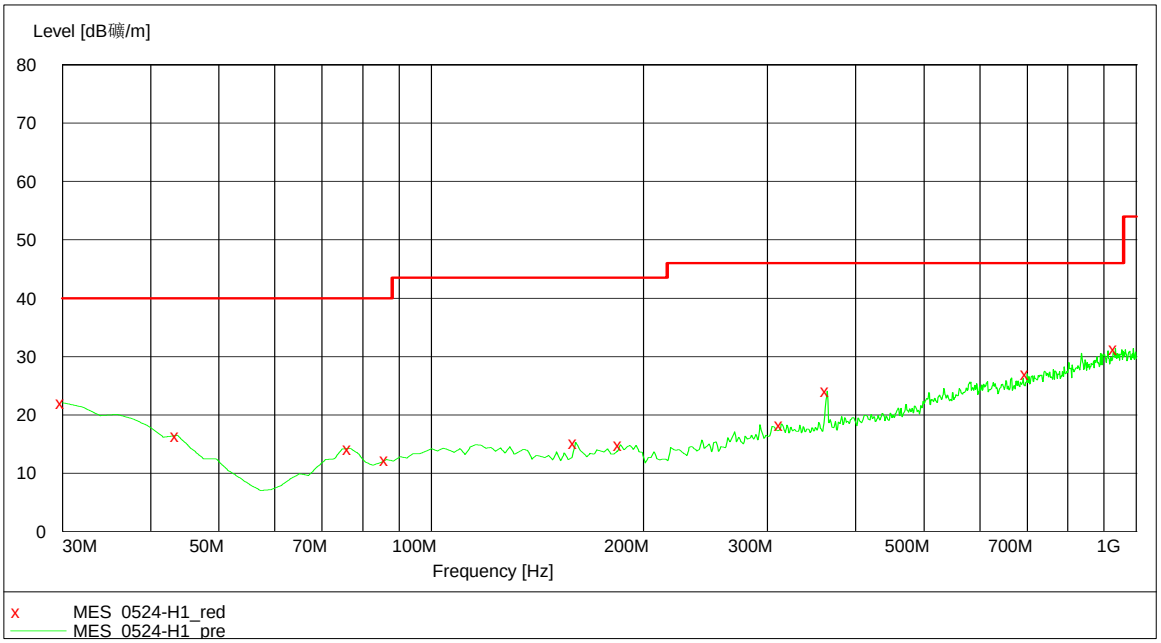
Example:
Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10dBuV,
Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m,
Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m,
Assuming limit = 54dBuV/m, Corrected Reading = 10.20dBuV/m,
Then Margin = 54 -10.20 = 43.80dBuV/m.

3.4 Test protocol

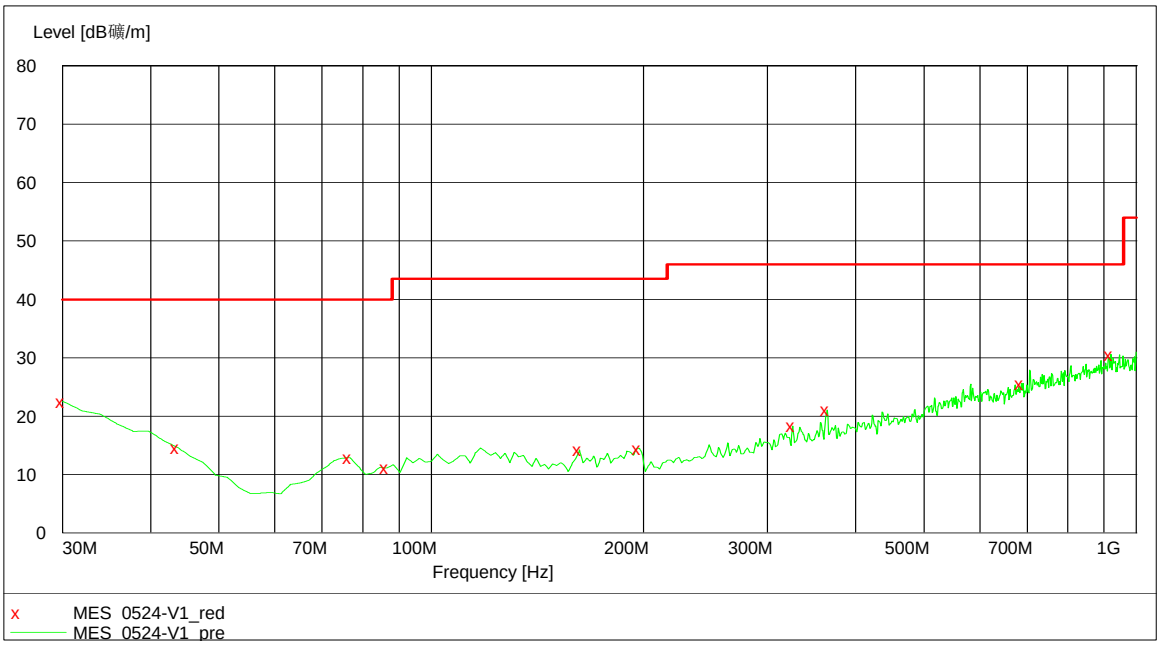
Temperature : 20 °C
Relative Humidity : 52 %

The worst waveform from 30MHz to 1000MHz is listed as below:

Horizontal



Vertical



Test result below 1GHz:

Polarization	Frequency (MHz)	Measured level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
H	30.00	22.1	40.0	17.9	PK
	43.61	16.5	40.0	23.5	PK
	76.65	14.2	40.0	25.8	PK
	86.37	12.3	40.0	27.7	PK
	160.24	15.3	43.5	28.2	PK
	185.51	14.9	43.5	28.6	PK
	313.81	18.4	46.0	27.6	PK
	364.35	24.1	46.0	21.9	PK
	700.64	27.0	46.0	19.0	PK
	933.91	31.4	46.0	14.6	PK
V	30.00	22.5	40.0	17.5	PK
	43.61	14.6	40.0	25.4	PK
	76.65	12.9	40.0	27.1	PK
	86.37	11.1	40.0	28.9	PK
	162.18	14.2	43.5	29.3	PK
	197.17	14.5	43.5	29.0	PK
	325.47	18.3	46.0	27.7	PK
	364.35	21.1	46.0	24.9	PK
	687.03	25.6	46.0	20.4	PK
	920.30	30.6	46.0	15.4	PK

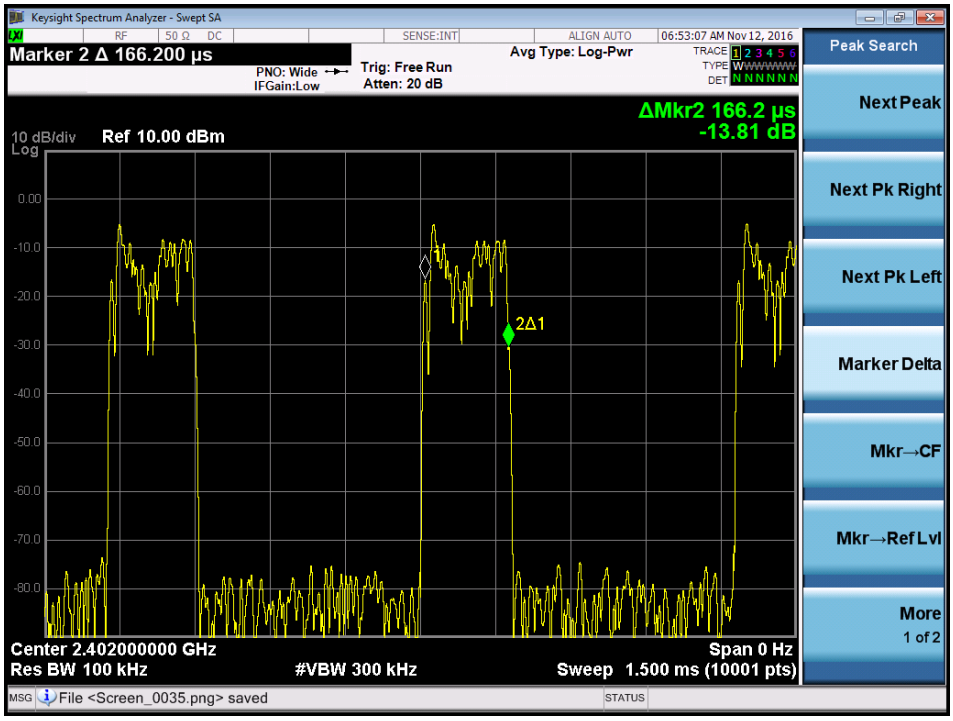
Note: The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

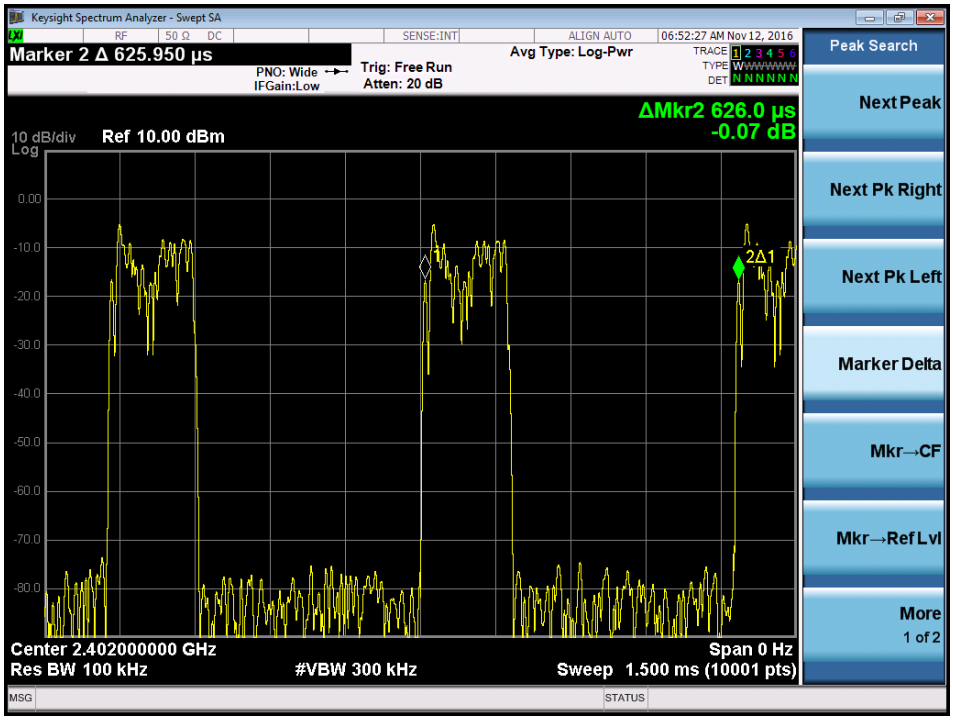
Test result above 1GHz:

CH	Antenna	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2402.00	34.34	97.24	114.00	16.76	PK
	V	2402.00	34.34	85.34	114.00	28.66	PK
	H	2400.00	34.29	49.32	74.00	24.68	PK
	V	2400.00	34.29	45.51	74.00	28.49	PK
	H	4804.00	6.50	44.36	74.00	29.64	PK
	V	4804.00	6.50	42.32	74.00	31.68	PK
	H	7206.00	9.30	48.62	74.00	25.38	PK
	V	7206.00	9.30	44.56	74.00	29.44	PK
M	H	2440.00	34.36	**97.50**	114.00	16.50	PK
	V	2440.00	34.36	85.55	114.00	28.45	PK
	H	4880.00	6.50	49.31	74.00	24.69	PK
	V	4880.00	6.50	45.16	74.00	28.84	PK
	H	7320.00	9.30	48.45	74.00	25.55	PK
	V	7320.00	9.30	43.45	74.00	30.55	PK
H	H	2480.00	34.38	96.56	114.00	17.44	PK
	V	2480.00	34.38	83.67	114.00	30.33	PK
	H	2483.50	34.63	46.41	74.00	27.59	PK
	V	2483.50	34.63	43.65	74.00	30.35	PK
	H	4960.00	6.70	45.35	74.00	28.65	PK
	V	4960.00	6.70	43.11	74.00	30.89	PK
	H	7440.00	9.30	45.78	74.00	28.22	PK
	V	7440.00	9.30	42.12	74.00	31.88	PK

Duty Cycle

The test data with maximum duty cycle was listed below.
The worst Duty cycle= 166.2 / 626.0 = 0.2655





Calculating the AV value according to the duty cycle

Antenna	Frequency (MHz)	PK Reading (dBuV/m)	Correct Factor (dB)	AV Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)
H	2402.00	97.24	**-11.52**	85.72	94.00	8.28
V	2402.00	85.34		73.82	94.00	20.18
H	2440.00	97.50		85.98	94.00	8.02
V	2440.00	85.55		74.03	94.00	19.97
H	2480.00	96.56		85.04	94.00	8.96
V	2480.00	83.67		72.15	94.00	21.85

Remark:

1. Correct Factor = 20lg (duty cycle) = 20lg (166.2 / 626.0) = **-11.52;**
2. AV Reading = PK Reading + Correct Factor;
3. Margin = limit - AV Reading.

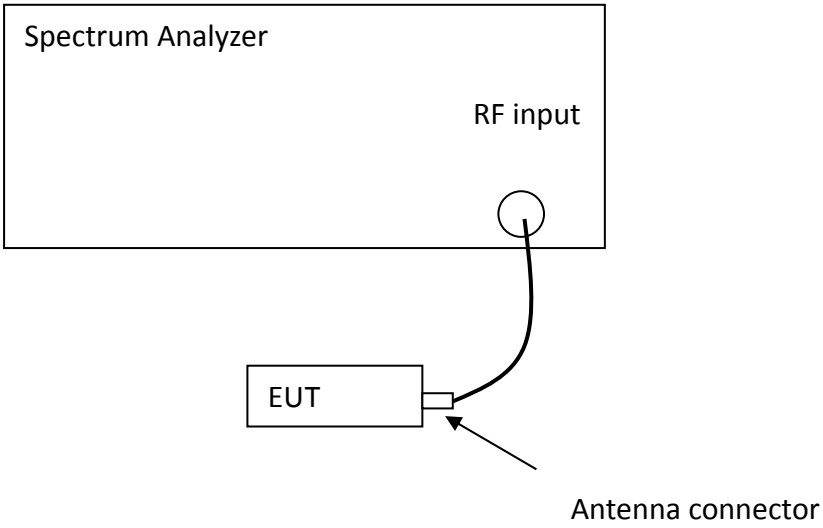
4 Assigned bandwidth (20dB bandwidth)

Test result: Pass

4.1 Limit

Intentional radiators must be designed to ensure that the 20 dB bandwidth of the emission is contained within the allocated frequency band.

4.2 Test Configuration



4.3 Test procedure and test setup

The 20dB Bandwidth per FCC §15.215(c) is measured using the Spectrum Analyzer.
Set Span = 2 to 3 times the 20 dB bandwidth, RBW = approximately 1% of the 20 dB bandwidth, VBW>RBW, Sweep = auto, Detector = peak, Trace = max hold.
The test was performed at 2 channels (lowest and highest channel).

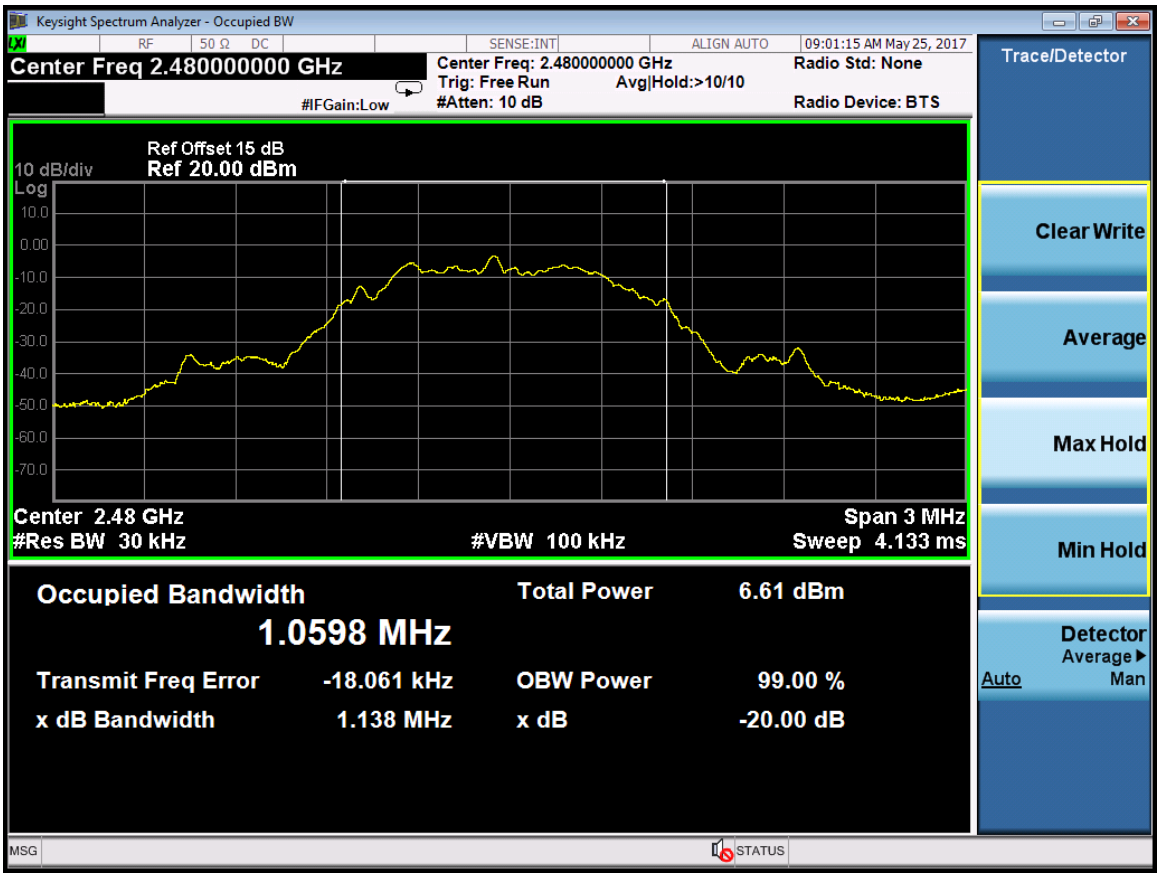
4.4 Test protocol

Temperature : 20°C
Relative Humidity : 52 %

Test Mode	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)	F_L at 20dB BW (MHz)	F_H at 20dB BW (MHz)
BLE	2402	1.124	1.0484	>2400	/
	2480	1.138	1.0598	/	<2483.5
Limit		N/A	N/A	F_L>2400	F_H<2483.5
Result		**Complied**			

Channel L

Channel H


Keysight Spectrum Analyzer - Occupied BW
RF
50 Ω DC
SENSE:INT
ALIGN AUTO
09:01:15 AM May 25, 2017
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 10 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
Trace/Detector
Ref Offset 15 dB
10 dB/div
Ref 20.00 dBm
Log
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
Center 2.48 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3 MHz
Sweep 4.133 ms
Occupied Bandwidth
1.0598 MHz
Total Power
6.61 dBm
Transmit Freq Error
-18.061 kHz
OBW Power
99.00 %
x dB Bandwidth
1.138 MHz
x dB
-20.00 dB
Clear Write
Average
Max Hold
Min Hold
Detector
Average
Auto
Man
MSG
STATUS

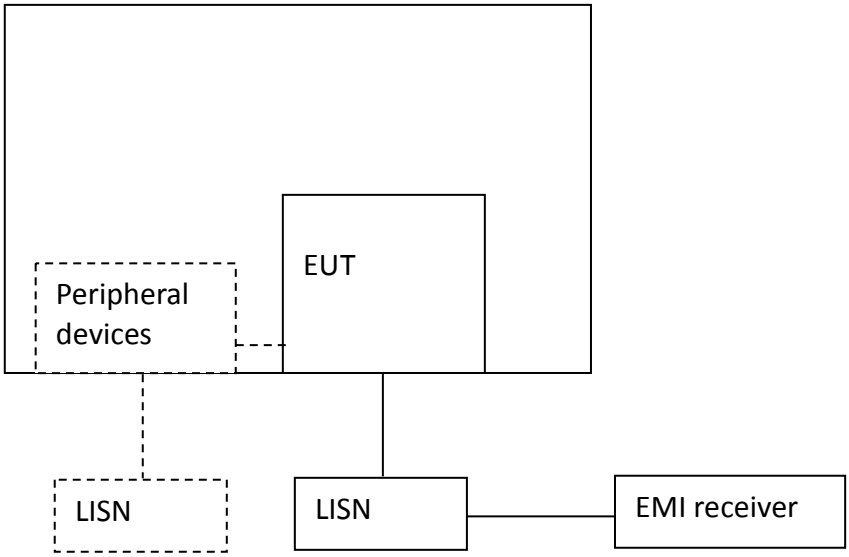
5 Power line conducted emission

Test result: Pass

5.1 Limit

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	QP	AV
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.		

5.2 Test configuration



☒ For table top equipment, wooden support is 0.8m height table

☐ For floor standing equipment, wooden support is 0.1m height rack.

5.3 Test procedure and test set up

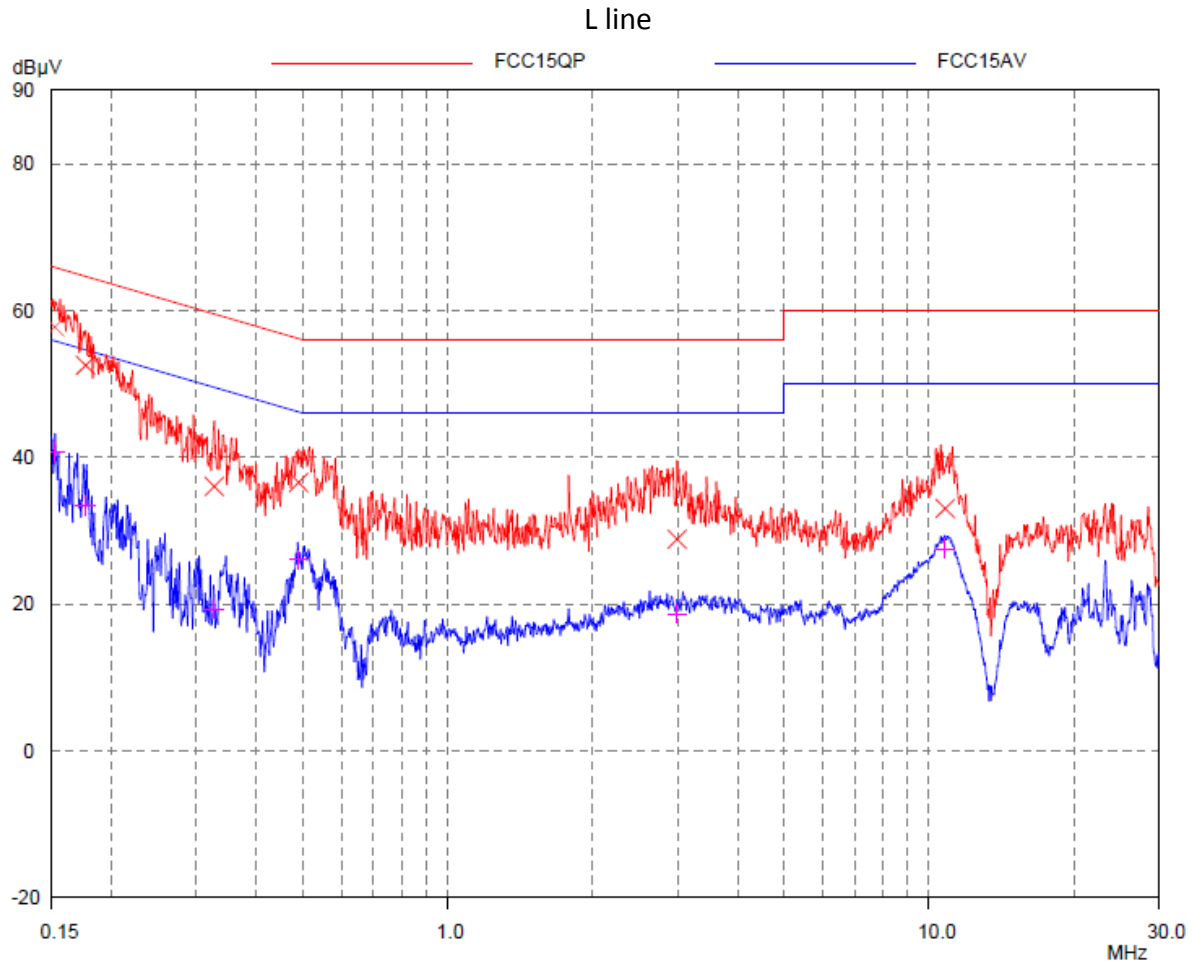
Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50 Ω LISN port (to which the EUT is connected), where permitted, terminated into a 50 Ω measuring instrument. All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer. For those measurements using a LISN, the 50 Ω measuring port is terminated by a measuring instrument having 50 Ω input impedance. All other ports are terminated in 50 Ω loads.

Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground-plane or on insulating material as described in ANSI C63.4. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

The bandwidth of the test receiver is set at 9 kHz.

5.4 Test protocol

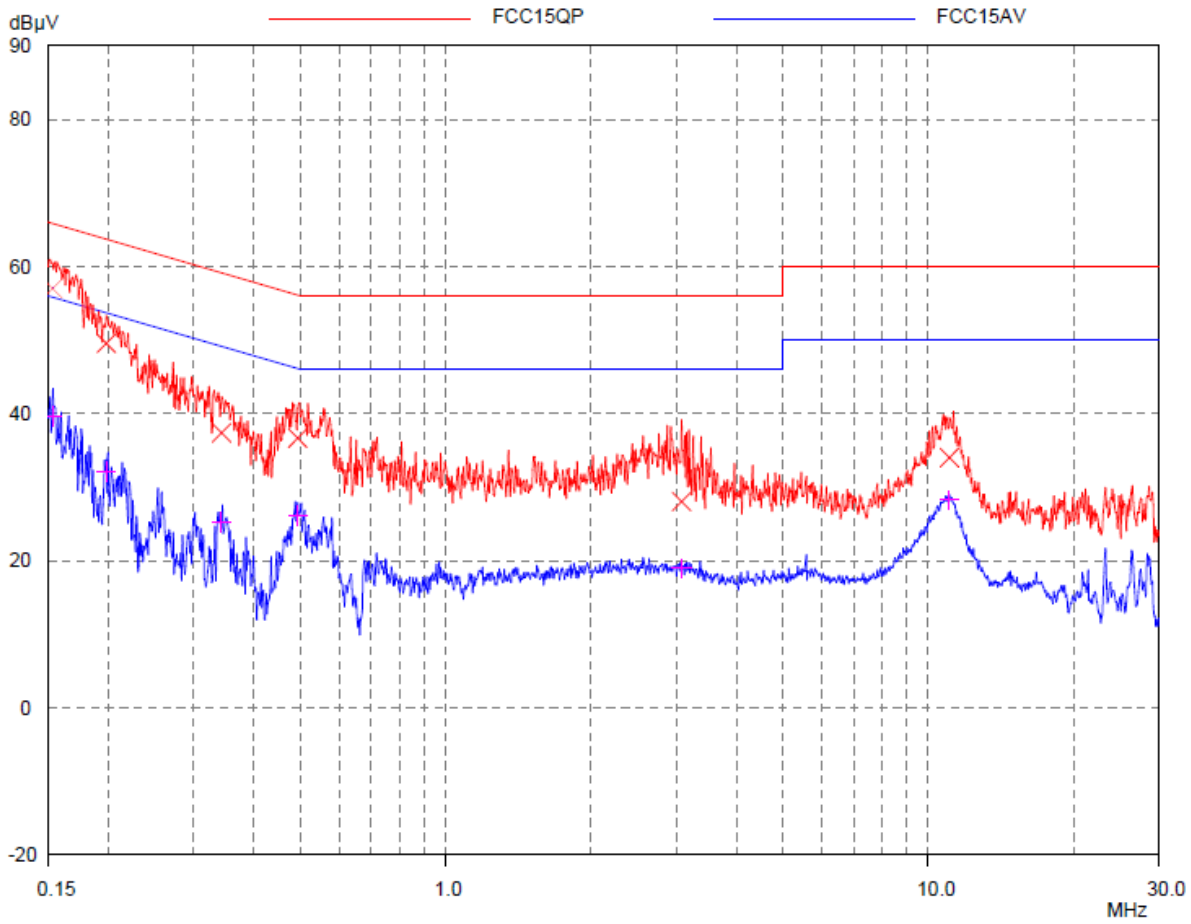
Temperature : 20°C
Relative Humidity : 54%



Test Data:

Frequency (MHz)	Quasi-peak			Average		
	level dB(µV)	Limit dB(µV)	Margin (dB)	level dB(µV)	limit dB(µV)	Margin (dB)
0.152	57.76	65.87	8.11	40.75	55.87	15.12
0.177	52.53	64.64	12.11	33.43	54.64	21.21
0.327	36.04	59.53	23.49	19.31	49.53	30.22
0.489	36.56	56.19	19.63	26.13	46.19	20.06
2.995	28.83	56.00	27.12	18.65	46.00	27.35
10.787	33.01	60.00	26.99	27.55	50.00	22.45

N line



Test Data:

Frequency (MHz)	Quasi-peak			Average		
	level dB(µV)	Limit dB(µV)	Margin (dB)	level dB(µV)	limit dB(µV)	Margin (dB)
0.153	57.06	65.83	8.77	39.52	55.83	16.11
0.198	49.51	63.71	14.20	32.04	53.71	21.67
0.343	37.45	59.14	21.69	25.36	49.14	23.78
0.493	36.61	56.12	19.51	26.14	46.12	19.98
3.080	28.08	56.00	27.92	18.94	46.00	27.06
11.048	34.11	60.00	25.89	28.21	50.00	21.79

Note: The worst mode working frequency at Channel M was chosen to list in the report as representative.