China

FCC - TEST REPORT

Report Number	:	**60.790.18.030.01R01**	Date of Issue	:	June 14, 2018
Model	:	**USEE**			
Product Type	:	**Head up display for bike helmets**			
Applicant	:	DAYTON INDUSTRIAL CO. LTD			
Address	:	11A, 2-12 KWAI FAT ROAD, KWAI CHUNG, NEW TERRITORIES, HONG KONG			
Production Facility	:	Kendy Electronics (Dongguan) Co. Ltd			
Address	:	Xingsi Huangtang Village, Hengli Town, Dongguan City, Guangdong Province, P. R. China			
Test Result	:	■**Positive** ☐**Negative**			
Total pages including Appendices	:	36			

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China

1 Table of Contents

2 Description of Equipment Under Test

Description of the Equipment Under Test

Product:	Head up display for bike helmets
Model no.:	USEE
FCC ID:	O4GUSEE
Rating:	3.0VDC (1x3.0VDC CR2032 Battery)
Frequency:	2457MHz, 2402MHz-2480MHz
Antenna gain:	0 dBi
Number of operated channel:	40
Modulation:	GFSK

3 Summary of Test Standards

Test Standards
FCC Part 15 Subpart C 10-1-17 Edition Federal Communications Commission, PART 15 — Radio Frequency Devices, Subpart C — Unintentional Radiators

4 Details about the Test Laboratory

Site 1

Company name: TÜV SÜD Hong Kong Ltd.
3/F, West Wing, Lakeside 2,
10 Science Park West Avenue,
Science Park, Shatin, Hong Kong

Site 2

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13 Zhiheng Wisdomland Business Park,
Nantou Checkpoint Road 2,
Shenzhen 518052, P.R.China
FCC Registration Number: 502708

Emission Tests	
Test Item	Test Site
FCC Part 15 Subpart C	
FCC Title 47 Part 15.205, 15.209 & 15.247(d) Spurious Radiated Emission	Site 2
FCC Title 47 Part 15.207 Conduct Emission	NIL
FCC Title 47 Part 15.247 Bandedge Emission	Site 2
FCC Title 47 Part 15.247(a)(1) 6dB & 99% Bandwidth	Site 2
FCC Title 47 Part 15.247(b) Peak Output Power	Site 2
FCC Title 47 Part 2.1051 & 15.247(d) Spurious Emissions at Antenna Terminals	Site 2
FCC Title 47 Part 15.247(d) 100kHz Bandwidth of band edges	Site 2
FCC Title 47 Part 15.247(e) Power Spectral Density	Site 2
FCC Title 47 Part 15.203 & 15.247(b) Antenna Requirement	Site 2

4.1 Test Equipment Site List

Radiated emission Test – Site 2

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2018-7-14
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
Signal Generator	Rohde & Schwarz	SMY01	839369/005	2018-7-7
Attenuator	Agilent	8491A	MY39264334	2018-7-7
3m Semi-anechoic chamber	TDK	9X6X6	----	2020-7-7
Test software	Rohde & Schwarz	EMC32	Version 9.15.00	N/A

20dB & 99% Bandwidth, Peak Output Power, Spurious Emissions at Antenna Terminals, 100kHz Bandwidth of band edges, Power Spectral Density – Site 2

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
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/OSP-B157	101226/100851	2018-7-7

4.2 Measurement System Uncertainty

Measurement System Uncertainty Emissions

System Measurement Uncertainty	
Items	**Extended Uncertainty**
Uncertainty for Radiated Emission in 3m chamber 9kHz-30MHz	4.54dB
Uncertainty for Radiated Emission in 3m chamber 30MHz-1000MHz	Horizontal: 4.83dB; Vertical: 4.91dB;
Uncertainty for Radiated Emission in 3m chamber 1000MHz-25000MHz	Horizontal: 4.89dB; Vertical: 4.88dB;
Uncertainty for Conducted RF test	2.04dB

China

5 Summary of Test Results

Emission Tests				
FCC Part 15 Subpart C				
Test Condition	Pages	Test Result		
		Pass	Fail	N/A
FCC Title 47 Part 15.205, 15.209 & 15.247(d) Spurious Radiated Emission	10-15	☒	☐	☐
FCC Title 47 Part 15.207 Conduct Emission (1)	NIL	☐	☐	☒
FCC Title 47 Part 15.247Bandedge Emission	16-17	☒	☐	☐
FCC Title 47 Part 15.247(a)(2) 6dB & 99% Bandwidth	18-20	☒	☐	☐
FCC Title 47 Part 15.247(b) Peak Output Power	21-23	☒	☐	☐
FCC Title 47 Part 2.1051 & 15.247(d) Spurious Emissions at Antenna Terminals	24-29	☒	☐	☐
FCC Title 47 Part 15.247(d) 100kHz Bandwidth of band edges	30-31	☒	☐	☐
FCC Title 47 Part 15.247(e) Power Spectral Density	32-34	☒	☐	☐
FCC Title 47 Part 15.203 & 15.247(b) Antenna Requirement	35	☒	☐	☐

Remark:

1) These requirements do not apply for equipment which employ battery power for operation and which do not operate from the AC power lines.

6 General Remarks

Remarks

NIL

SUMMARY:

- All tests according to the regulations cited on page 5 were

  ■ - Performed

  ☐ - **Not** Performed

- The Equipment Under Test

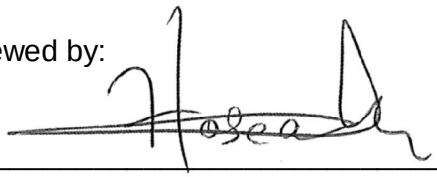
  ■ - **Fulfills** the general approval requirements.

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

Sample Received Date: April 30, 2018

Testing Start Date: May 2, 2018

Testing End Date: May 30, 2018

Reviewed by: 

Hosea CHAN
EMC Project Engineer

Prepared by: 

Eric LI
EMC Senior Project Engineer

7 Emission Test Results

7.1 Spurious Radiated Emission

EUT: USEE
Op Condition: Operated, TX Mode (2402MHz)
Test Specification: FCC15.205, 15.209 & 15.247(d) Antenna: Horizontal
Comment: 3 VDC
Remark: 9kHz to 25GHz

Test Result
☒ Passed
☐ Not Passed

Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector
43.095	17.91	40.00	-25.47	Quasi Peak
58.345	20.84	40.00	-21.81	Quasi Peak
175.015	13.23	43.50	-16.89	Quasi Peak
275.895	20.34	46.00	-15.25	Quasi Peak
439.016	22.85	46.00	-21.33	Quasi Peak
4803.750	62.04	74.00	-18.22	Peak
4803.750	31.02	54.00	-13.98	Average
6403.125	36.96	74.00	-15.35	Peak
6403.125	18.48	54.00	-26.52	Average
8155.312	40.20	74.00	-12.11	Peak
8155.312	20.10	54.00	-24.90	Average

China

Spurious Radiated Emission

EUT: USEE
Op Condition: Operated, TX Mode (2402MHz)
Test Specification: FCC15.205, 15.209 & 15.247(d) Antenna: Vertical
Comment: 3 VDC
Remark: 9kHz to 25GHz

Test Result
☒ Passed
☐ Not Passed

Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector
36.843	17.23	40.00	-22.77	Quasi Peak
58.237	20.64	40.00	-19.36	Quasi Peak
109.216	11.15	43.50	-32.35	Quasi Peak
274.440	19.12	46.00	-26.88	Quasi Peak
436.376	25.72	46.00	-20.28	Quasi Peak
4803.750	53.99	74.00	-20.01	Peak
4803.750	33.20	54.00	-20.80	Average
8202.187	41.20	74.00	-32.80	Peak
8202.187	25.34	54.00	-28.66	Average
11187.656	42.19	74.00	-31.81	Peak
11187.656	25.95	54.00	-28.05	Average

Spurious Radiated Emission

EUT: USEE
Op Condition: Operated, TX Mode (2440MHz)
Test Specification: FCC15.205, 15.209 & 15.247(d) Antenna: Horizontal
Comment: 3 VDC
Remark: 9kHz to 25GHz

Test Result
☒ Passed
☐ Not Passed

Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector
43.095	16.12	40.00	-23.88	Quasi Peak
58.345	20.35	40.00	-19.65	Quasi Peak
175.015	13.18	43.50	-30.32	Quasi Peak
275.895	20.24	46.00	-25.76	Quasi Peak
439.016	21.63	46.00	-24.37	Quasi Peak
4879.687	61.00	74.00	-13.00	Peak
4879.687	37.52	54.00	-16.49	Average
7068.750	39.46	74.00	-34.54	Peak
7068.750	24.27	54.00	-29.73	Average
8755.781	42.08	74.00	-31.92	Peak
8755.781	25.88	54.00	-28.12	Average

China

Spurious Radiated Emission

EUT: USEE
Op Condition: Operated, TX Mode (2440MHz)
Test Specification: FCC15.205, 15.209 & 15.247(d) Antenna: Vertical
Comment: 3 VDC
Remark: 9kHz to 25GHz

Test Result
☒ Passed
☐ Not Passed

Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector
36.843	16.84	40.00	-22.77	Quasi Peak
58.237	23.21	40.00	-19.36	Quasi Peak
109.216	11.15	43.50	-32.35	Quasi Peak
274.440	20.48	46.00	-26.88	Quasi Peak
436.376	21.46	46.00	-20.28	Quasi Peak
4014.843	33.45	74.00	-40.55	Peak
4014.843	20.57	54.00	-33.43	Average
4879.687	51.67	74.00	-22.33	Peak
4879.687	30.78	54.00	-23.22	Average
7106.718	38.97	74.00	-35.03	Peak
7106.718	23.97	54.00	-30.03	Average

China

Spurious Radiated Emission

EUT: USEE
Op Condition: Operated, TX Mode (2480MHz)
Test Specification: FCC15.205, 15.209 & 15.247(d) Antenna: Horizontal
Comment: 3 VDC
Remark: 9kHz to 25GHz

Test Result
☒ Passed
☐ Not Passed

Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector
43.095	17.43	40.00	-22.57	Quasi Peak
58.345	18.61	40.00	-21.39	Quasi Peak
175.015	12.02	43.50	-31.48	Quasi Peak
275.895	21.54	46.00	-24.46	Quasi Peak
439.016	20.17	46.00	-25.83	Quasi Peak
4109.062	34.48	74.00	-39.52	Peak
4109.062	21.21	54.00	-32.79	Average
4959.843	55.96	74.00	-18.04	Peak
4959.843	34.42	54.00	-19.58	Average
8757.656	41.85	74.00	-32.15	Peak
8757.656	25.74	54.00	-28.26	Average

China

Spurious Radiated Emission

EUT: USEE
Op Condition: Operated, TX Mode (2480MHz)
Test Specification: FCC15.205, 15.209 & 15.247(d) Antenna: Vertical
Comment: 3 VDC
Remark: 9kHz to 25GHz

Test Result
☒ Passed
☐ Not Passed

Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector
36.843	16.45	40.00	-23.55	Quasi Peak
58.237	23.84	40.00	-16.16	Quasi Peak
109.216	11.54	43.50	-31.96	Quasi Peak
274.440	20.31	46.00	-25.69	Quasi Peak
436.376	20.10	46.00	-25.90	Quasi Peak
3962.343	34.01	74.00	-39.99	Peak
3962.343	20.92	54.00	-33.08	Average
4959.843	49.21	74.00	-24.79	Peak
4959.843	30.26	54.00	-23.74	Average
7440.000	39.96	74.00	-34.04	Peak
7440.000	24.58	54.00	-29.42	Average

7.2 Bandedge Emission

EUT: USEE
Op Condition: Operated, TX Mode (2402 and 2480)
Test Specification: FCC15.247, Antenna: Horizontal
Comment: 3 VDC

Test Result
☒ Passed
☐ Not Passed

Band	Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector
Low	2399.875	45.63	74	-28.37	Peak
Low	2399.875	37.28	54	-16.72	Average
High	2483.500	42.61	74	-31.39	Peak
High	2483.500	32.79	54	-21.21	Average

Bandedge Emission9

EUT: USEE
Op Condition: Operated, TX Mode (2402 and 2480)
Test Specification: FCC15.247, Antenna: Vertical
Comment: 3 VDC

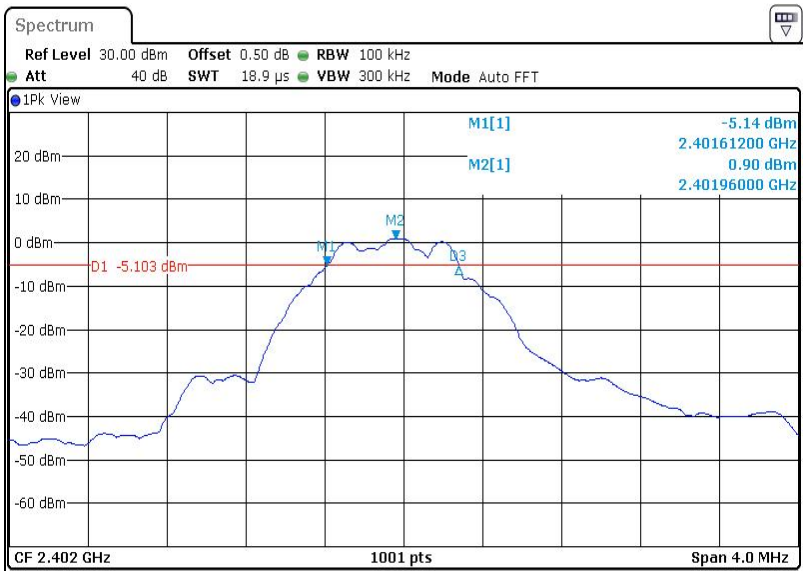
Test Result
☒ Passed
☐ Not Passed

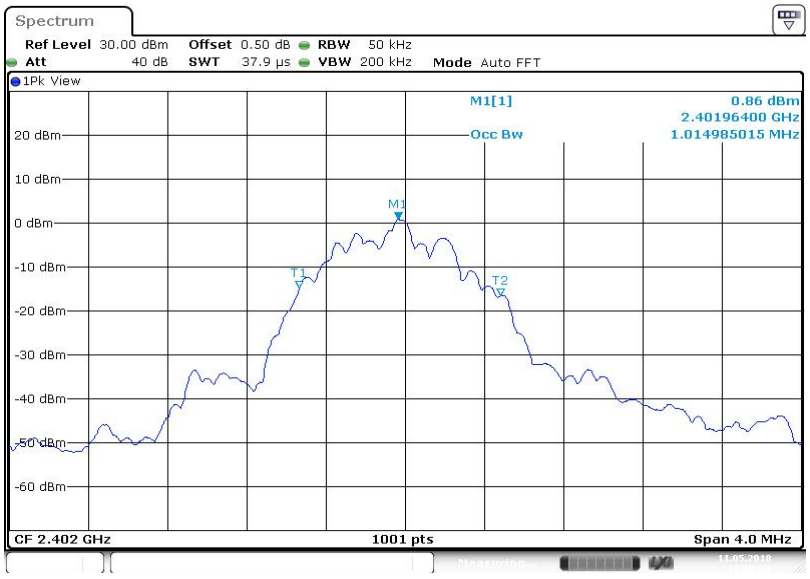
Band	Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector
Low	2399.875	42.61	74	-31.39	Peak
Low	2399.875	35.23	54	-18.77	Average
High	2483.500	40.21	74	-33.79	Peak
High	2483.500	32.66	54	-21.34	Average

7.3 6dB & 99% Bandwidth

EUT:	USEE
Op Condition:	Operated, TX Mode (2402MHz)
Test Specification:	FCC15.247(a)(2), 6dB Bandwidth & 99% Bandwidth
Comment:	3 VDC

Test Result
☒ Passed
☐ Not Passed



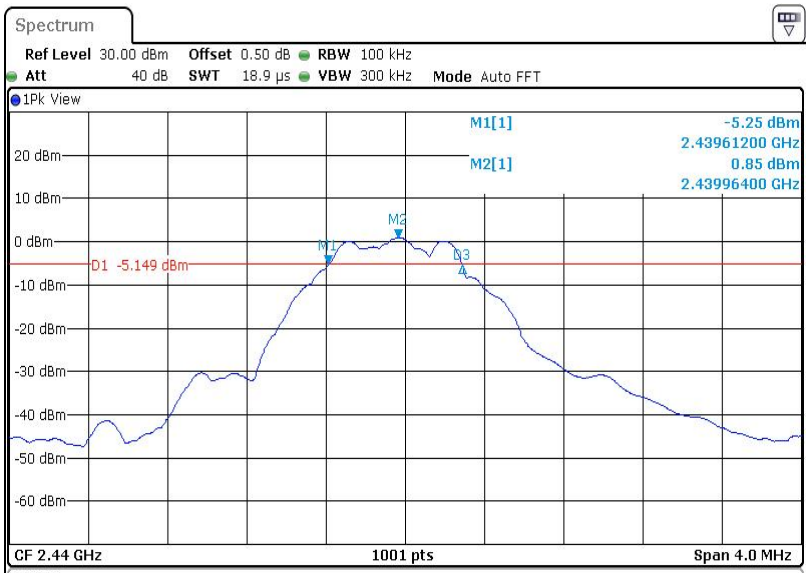


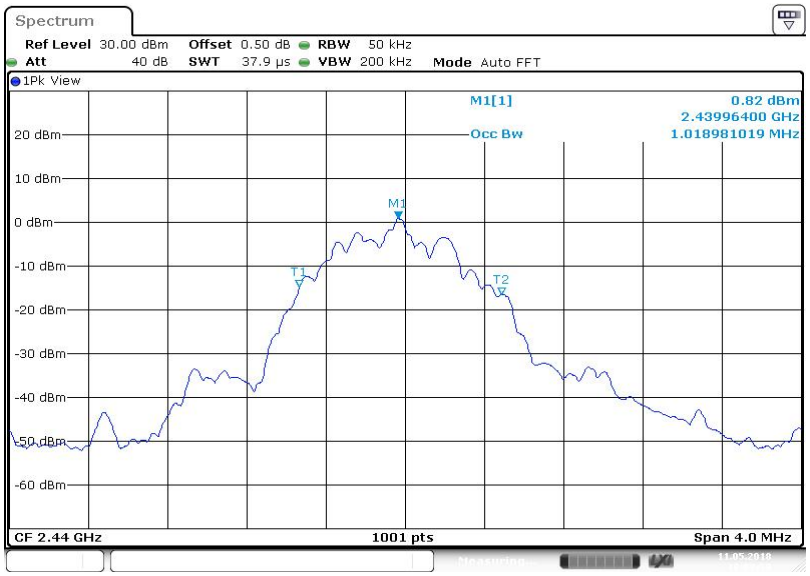
6dB bandwidth	6dB BW Limit	99% bandwidth
668.000 kHz	> 500 kHz	1014.985 kHz

6dB & 99% Bandwidth

EUT: USEE
Op Condition: Operated, TX Mode (2440MHz)
Test Specification: FCC15.247(a)(2), 6dB Bandwidth & 99% Bandwidth
Comment: 3 VDC

Test Result
☒ Passed
☐ Not Passed



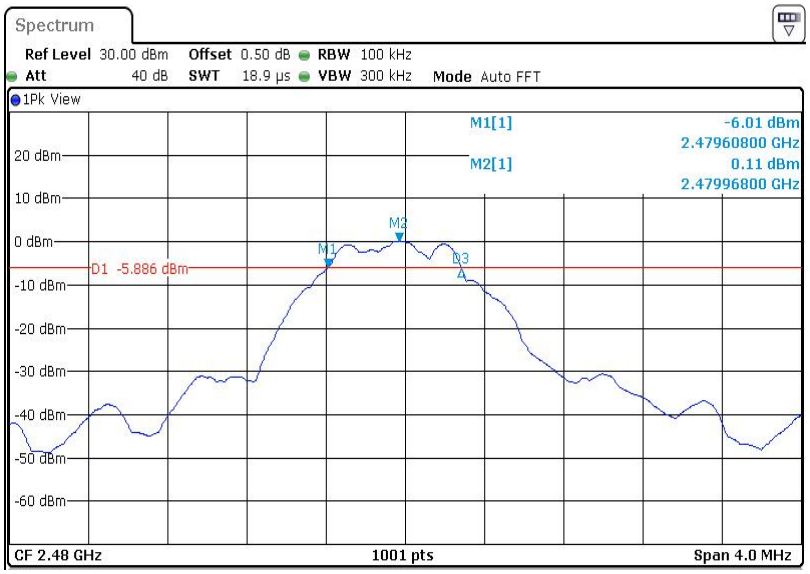


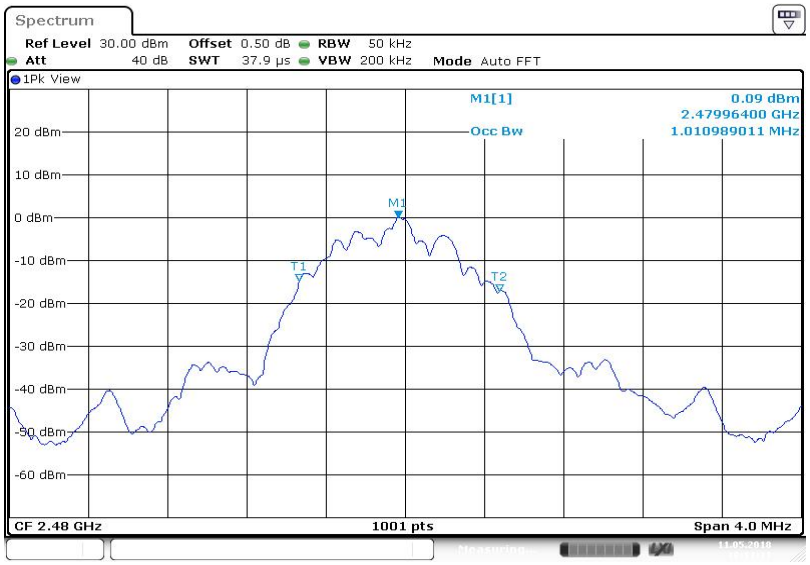
6dB bandwidth	6dB BW Limit	99% bandwidth
676.000 kHz	> 500 kHz	1018.981 kHz

6dB & 99% Bandwidth

EUT:	USEE
Op Condition:	Operated, TX Mode (2480MHz)
Test Specification:	FCC15.247(a)(2), 6dB Bandwidth & 99% Bandwidth
Comment:	3 VDC

Test Result
☒ Passed
☐ Not Passed



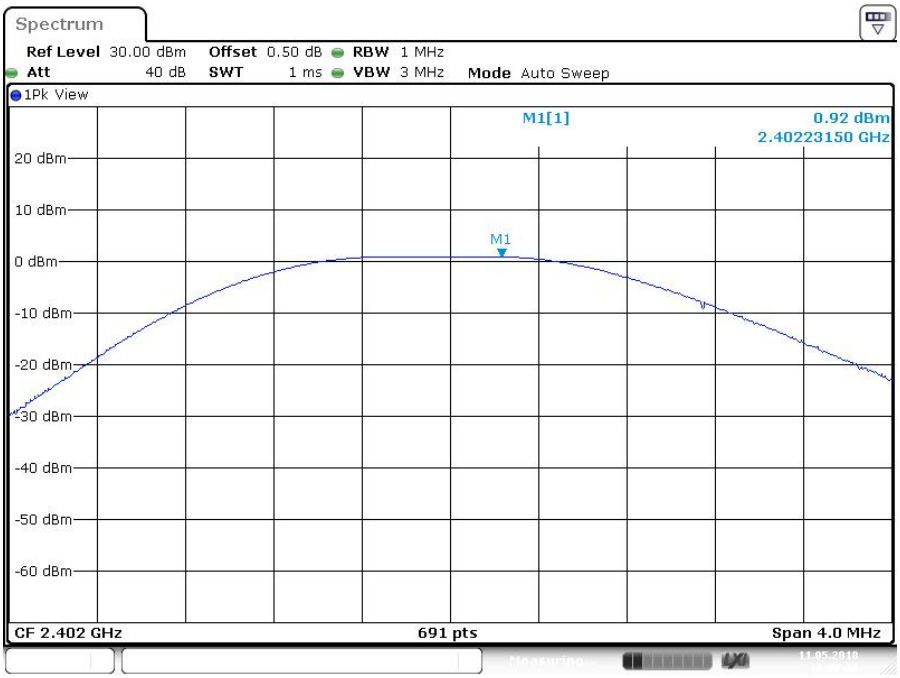


6dB bandwidth	6dB BW Limit	99% bandwidth
676.000 kHz	> 500 kHz	1018.981 kHz

7.4 Peak Output Power

EUT:	USEE
Op Condition:	Operated, TX Mode (2402MHz)
Test Specification:	FCC15.247(b)
Comment:	3 VDC, Antenna gain: 0 dBi, Cable Loss: 0.5 dB

Test Result
☒ Passed
☐ Not Passed



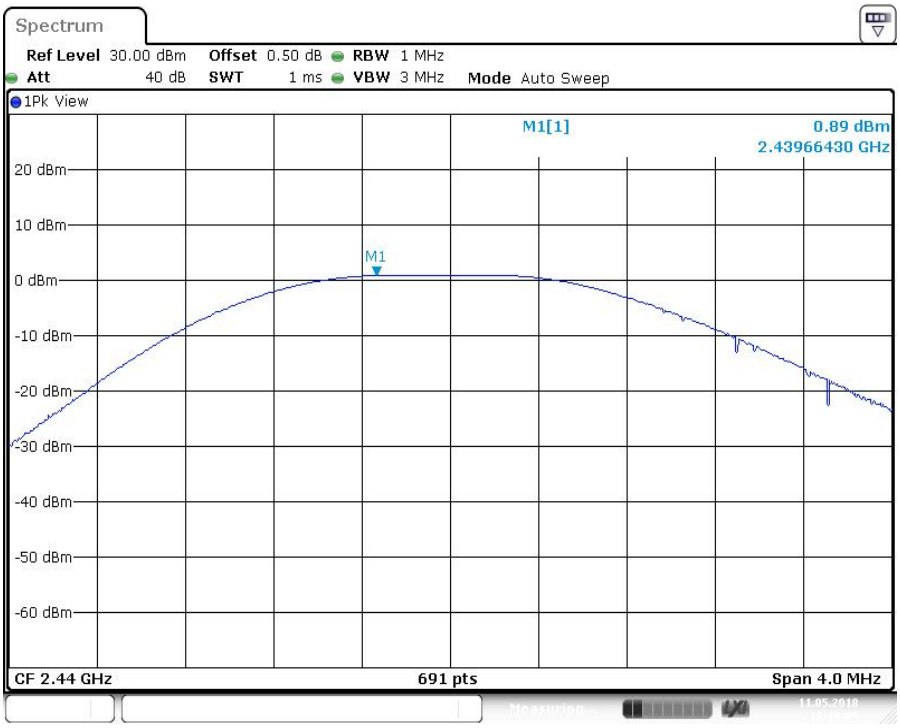
Conducted Output Power	Limit
0.92 dBm	< 30dBm

China

Peak Output Power

EUT: USEE
Op Condition: Operated, TX Mode (2440MHz)
Test Specification: FCC15.247(b)
Comment: 3 VDC, Antenna gain: 0 dBi, Cable Loss: 0.5 dB

Test Result
☒ Passed
☐ Not Passed

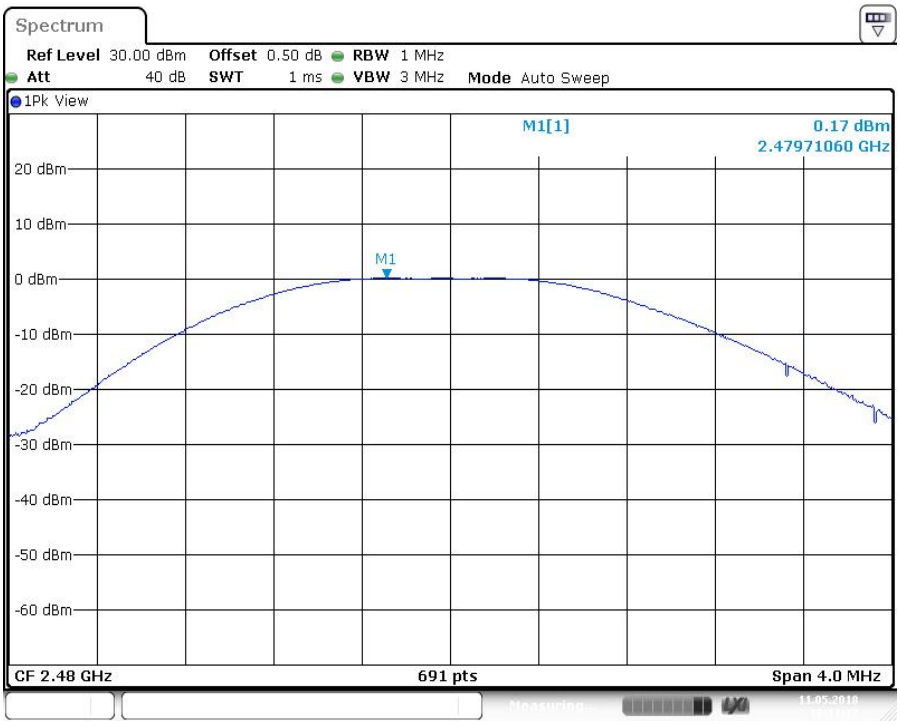


Conducted Output Power	Limit
0.89 dBm	< 30dBm

Peak Output Power

EUT:	USEE
Op Condition:	Operated, TX Mode (2480MHz)
Test Specification:	FCC15.247(b)
Comment:	3 VDC, Antenna gain: 0 dBi, Cable Loss: 0.5 dB

Test Result
☒ Passed
☐ Not Passed



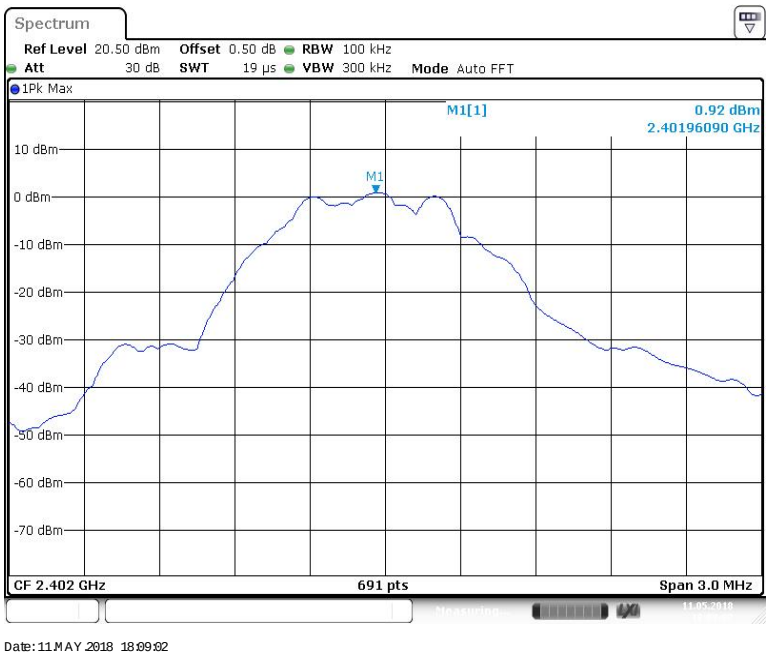
Conducted Output Power	Limit
0.17 dBm	< 30dBm

7.5 Spurious Emissions at Antenna Terminals

EUT: USEE
Op Condition: Operated, TX Mode (2402MHz)
Test Specification: FCC2.1051 & 15.247(d)
Comment: 3 VDC

Test Result
☒ Passed
☐ Not Passed

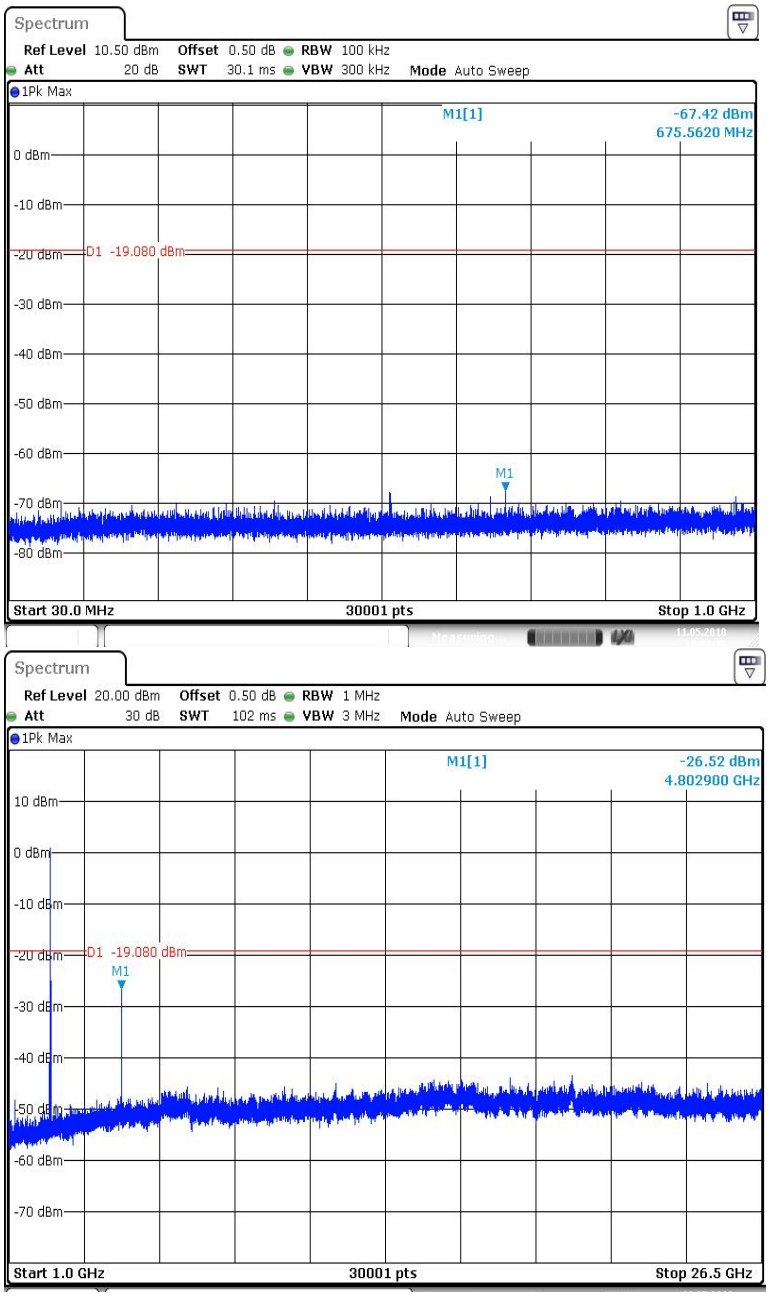
Channel	FreqRange	RefLevel	Result	Limit	Verdict
2402	30~1000	0.92	-67.42	-19.08	PASS
2402	1000~26500	0.92	-26.52	-19.08	PASS



Spurious Emissions at Antenna Terminals

EUT:	USEE
Op Condition:	Operated, TX Mode (2402MHz)
Test Specification:	FCC2.1051 & 15.247(d)
Comment:	3 VDC

Test Result
☒ Passed
☐ Not Passed



Spurious Emissions at Antenna Terminals

EUT: USEE
Op Condition: Operated, TX Mode (2440MHz)
Test Specification: FCC2.1051 & 15.247(d)
Comment: 3 VDC

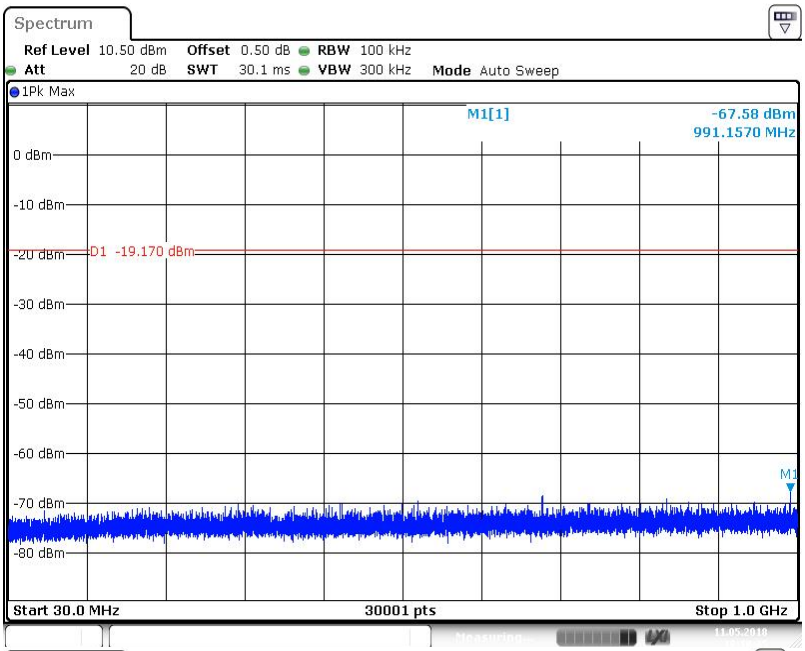
Test Result
☒ Passed
☐ Not Passed

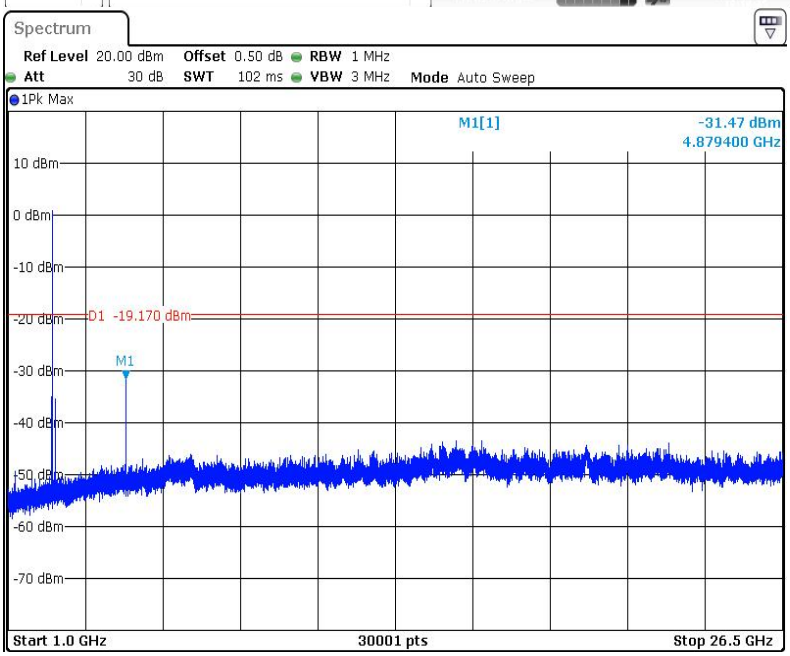
Channel	FreqRange	RefLevel	Result	Limit	Verdict
2440	30~1000	0.83	-67.58	-19.17	PASS
2440	1000~26500	0.83	-31.47	-19.17	PASS

Spurious Emissions at Antenna Terminals

EUT:	USEE
Op Condition:	Operated, TX Mode (2440MHz)
Test Specification:	FCC2.1051 & 15.247(d)
Comment:	3 VDC

Test Result
☒ Passed
☐ Not Passed



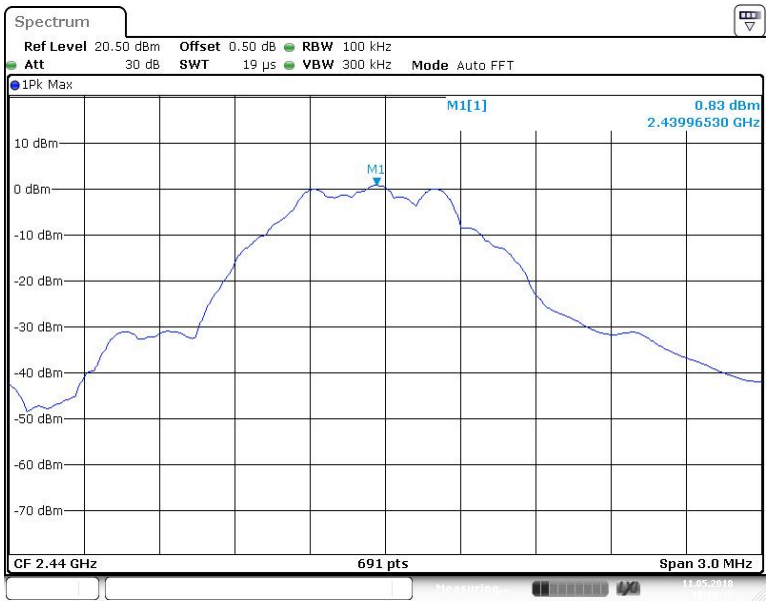


Spurious Emissions at Antenna Terminals

EUT: USEE
Op Condition: Operated, TX Mode (2480MHz)
Test Specification: FCC2.1051 & 15.247(d)
Comment: 3 VDC

Test Result
☒ Passed
☐ Not Passed

Channel	FreqRange	RefLevel	Result	Limit	Verdict
2480	30~1000	0.07	-68.59	-19.93	PASS
2480	1000~26500	0.07	-34.46	-19.93	PASS



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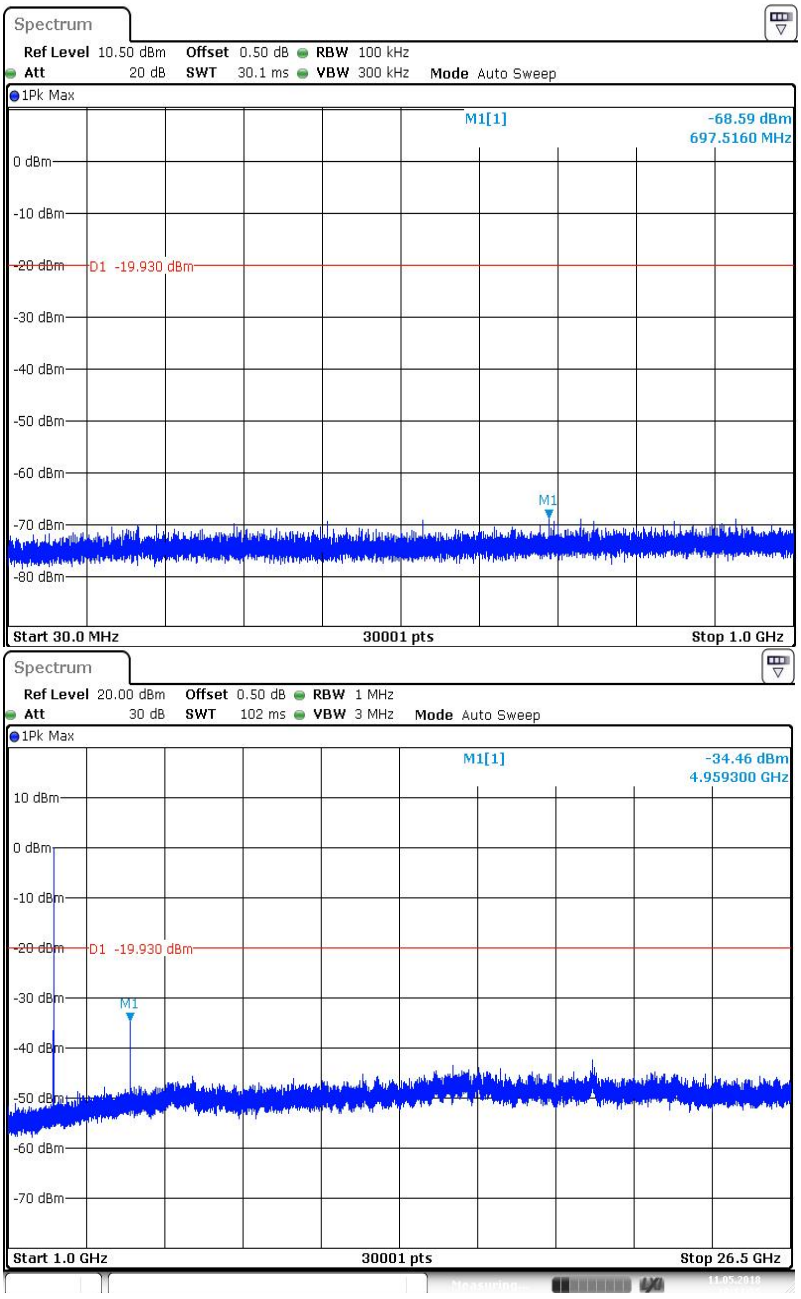
Spurious Emissions at Antenna Terminals

EUT:	USEE
Op Condition:	Operated, TX Mode (2480MHz)
Test Specification:	FCC2.1051 & 15.247(d)
Comment:	3 VDC

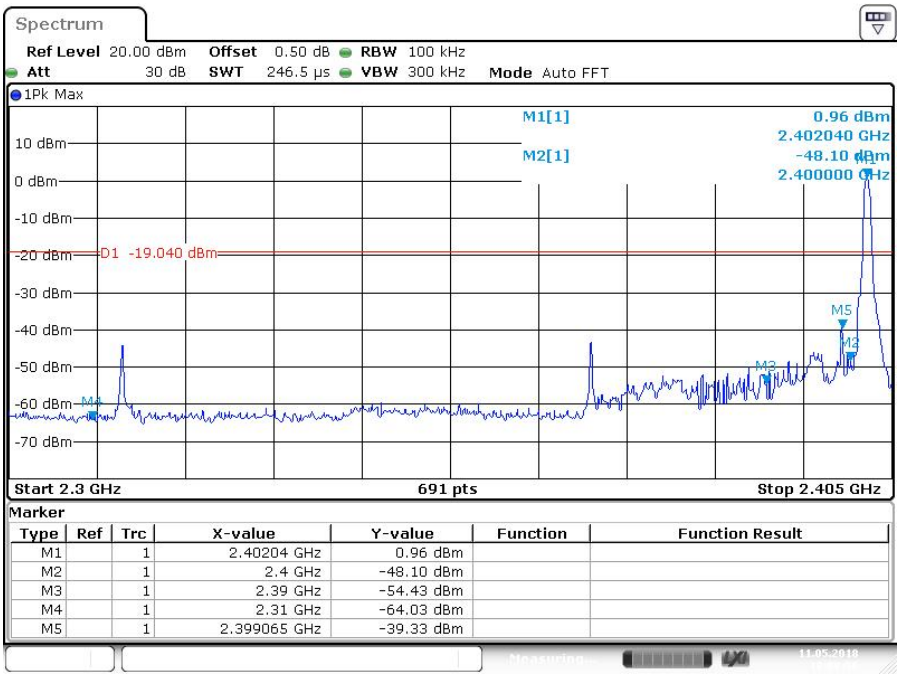
Test Result
☒ Passed
☐ Not Passed



7.6 100kHz Bandwidth of band edges

EUT: USEE
Op Condition: Operated, TX Mode (2402MHz)
Test Specification: FCC15.247(d), Conducted
Comment: 3 VDC

Test Result
☒ Passed
☐ Not Passed



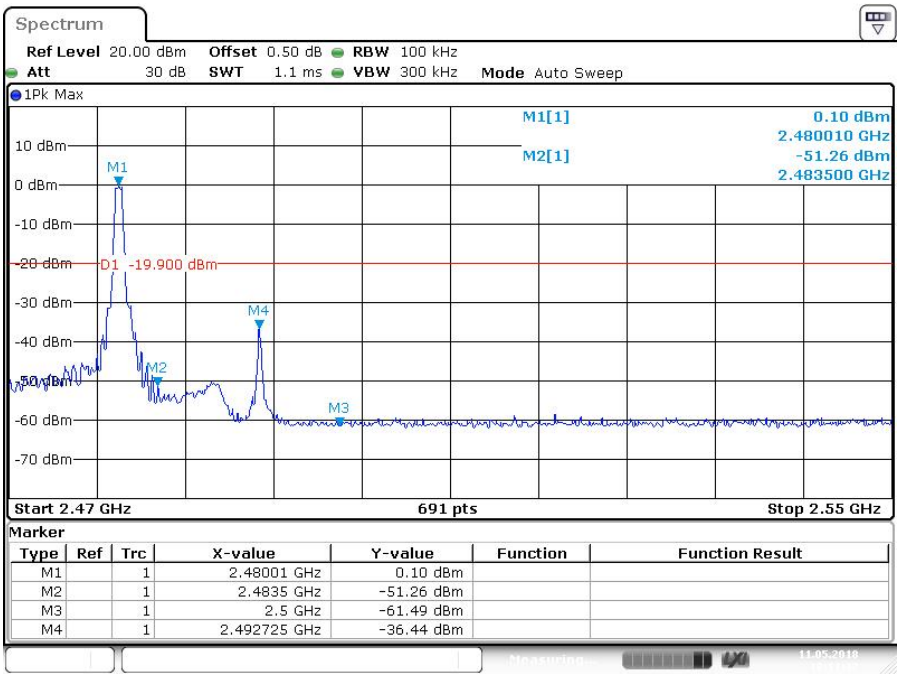
Band edges	Limit
38.04 dB	> 20dB

China

100kHz Bandwidth of band edges

EUT: USEE
Op Condition: Operated, TX Mode (2480MHz)
Test Specification: FCC15.247(d), Conducted
Comment: 3 VDC

Test Result
☒ Passed
☐ Not Passed



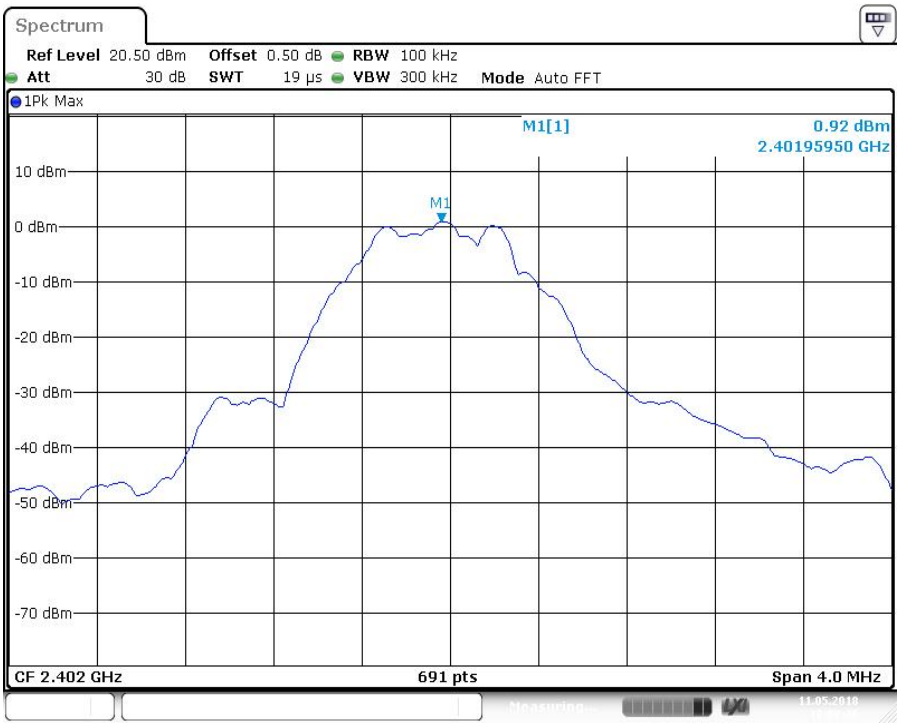
Date: 11.MAY.2018 18:11:32

Band edges	Limit
36.34 dB	> 20dB

7.7 Power Spectral Density

EUT: USEE
Op Condition: Operated, TX Mode (2402MHz)
Test Specification: FCC15.247(e)
Comment: 3 VDC

Test Result
☒ Passed
☐ Not Passed

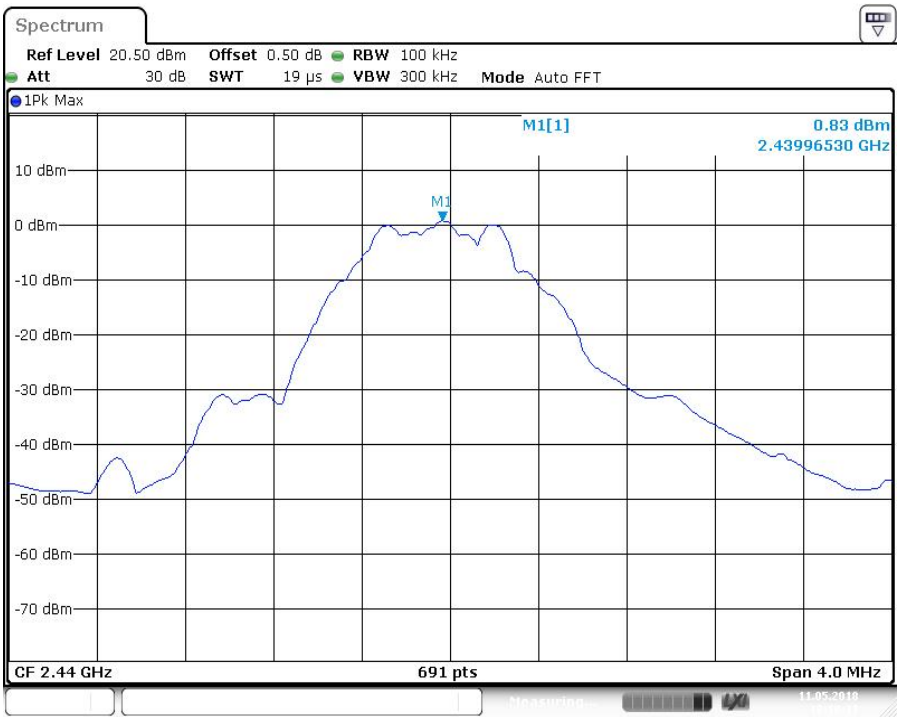


PSD	Limit
0.92 dBm	< 8 dBm

Power Spectral Density

EUT: USEE
Op Condition: Operated, TX Mode (2440MHz)
Test Specification: FCC15.247(e)
Comment: 3 VDC

Test Result
☒ Passed
☐ Not Passed

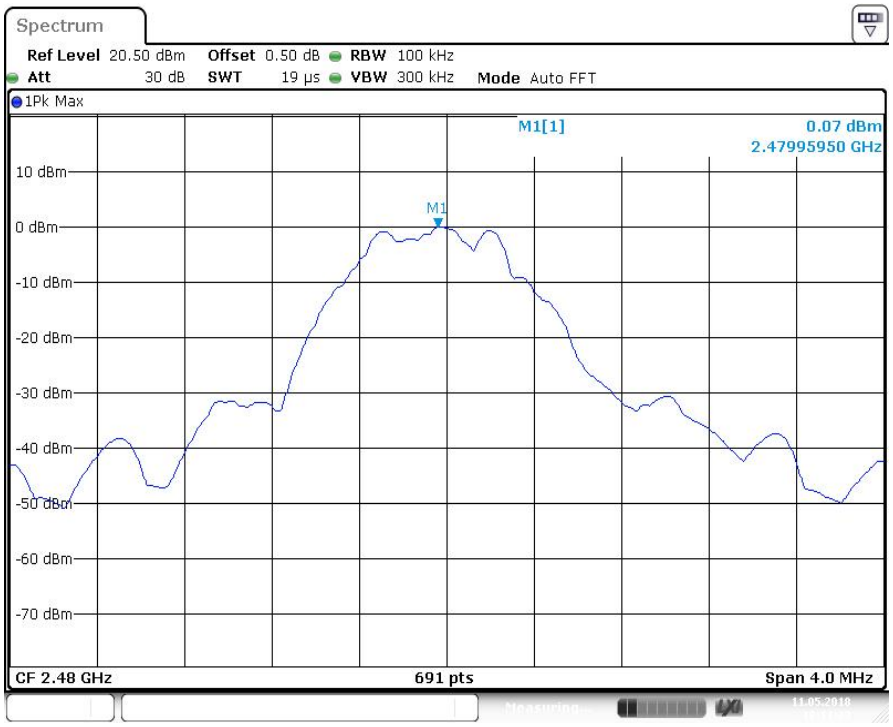


PSD	Limit
0.83 dBm	< 8 dBm

Power Spectral Density

EUT: USEE
Op Condition: Operated, TX Mode (2480MHz)
Test Specification: FCC15.247(e)
Comment: 3 VDC

Test Result
☒ Passed
☐ Not Passed



PSD	Limit
0.07 dBm	< 8 dBm

7.8 Antenna Requirement

EUT:	USEE
Op Condition:	Operated, TX Mode
Test Specification:	FCC15.203 & 15.247(b)
Comment:	3 VDC

Test Result
☒ Passed
☐ Not Passed

Limit

For intentional device, according to FCC Title 47 Part 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. And according to FCC Title 47 Part 15.247(b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The antenna used in this product is integrated antenna on PCB, and the maximum gain of this antenna is 0.0 dBi.

8 Appendix A - General Product Information

Radiofrequency radiation exposure evaluation

According to KDB 447498 D01v06 section 4.3.1, For frequencies between 100 MHz to 6GHz and test separation distances ≤ 50 mm, the Numeric threshold is determined as:

Step a)
[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR

>> The fundamental frequency of the EUT is 2402-2480MHz,
the test separation distance is ≤ 50mm.
(Manufacturer specified the separation distance is: 20mm)

Step a)
>> Numeric threshold (2402MHz), mW / 20mm * √2.402GHz ≤ 3.0
Numeric threshold (2402MHz) ≤ 38.713mW

>> Numeric threshold (2440MHz), mW / 20mm * √2.440GHz ≤ 3.0
Numeric threshold (2440MHz) ≤ 38.411mW

>> Numeric threshold (2480MHz), mW / 20mm * √2.480GHz ≤ 3.0
Numeric threshold (2480MHz) ≤ 38.100mW

>> The power of EUT measured (2402MHz) is: 0.92dBm = 1.236mW
The power of EUT measured (2440MHz) is: 0.89dBm = 1.227mW
The power of EUT measured (2480MHz) is: 0.17dBm = 1.040mW

Which is smaller than the Numeric threshold.
Therefore, the device is exempt from stand-alone SAR test requirements.