China

FCC - TEST REPORT

Report Number	:	60.790.18.031.01R01	Date of Issue	: June 24, 2018
Model	:	SP-2D-M , SP-2D-W & hBAND		
Product Type	:	Optical Heart Rate(OHR) Tracker		
Applicant	:	Dayton Industrial Co., Ltd		
Address	:	11A, Tai Tak Industrial Building,2-12 Kwai Fat Road, Kwai Chung, N.T .Hong Kong		
Production Facility	:	Kendy Electronics (Dongguan) Co., Ltd		
Address	:	Xin Si Huang Tang Village, Heng Li Town, Dongguan City, Duangdong China		
Test Result	:	■Positive ☐Negative		
Total pages including Appendices	:	37		

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1 Table of Contents

2 Description of Equipment Under Test

Description of the Equipment Under Test

Product:	Optical Heart Rate(OHR) Tracker
Model no.:	SP-2D-M
FCC ID:	O4GPU426
Rating:	1. 3.7VDC (1 x 3.7VDC internal rechargeable battery) 2. 5.0VDC (USB cable)
Frequency:	2402MHz-2480MHz
Antenna gain:	0 dBi
Number of operated channel:	40 for BLE,
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

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

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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	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	24-26	☒	☐	☐
FCC Title 47 Part 15.247(d) 100kHz Bandwidth of band edges	27-28	☒	☐	☐
FCC Title 47 Part 15.247(e) Power Spectral Density	29-31	☒	☐	☐
FCC Title 47 Part 15.203 & 15.247(b) Antenna Requirement	32	☒	☐	☐

6 General Remarks

Remarks

All mode has been tested, only worst case has shown.

Client informs that the SP-2D-W , hBAND and SP-2D-M have the same technical construction including circuit diagram, PCB Layout, components and component layout, all electrical construction and mechanical construction. The difference lies only different color of the different model. (Client's conformation letter shown at appendix A)

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:	June 1, 2018
Testing Start Date:	June 4, 2018
Testing End Date:	June 15, 2018

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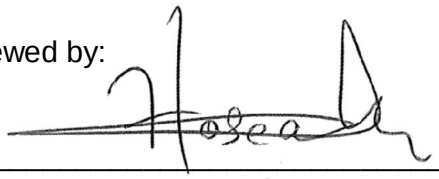
Reviewed by: 

Hosea CHAN
EMC Project Engineer

Prepared by: 

Eric LI
EMC Senior Project Engineer

7 Emission Test Results

7.1 Spurious Radiated Emission

EUT: SP-2D-M
Op Condition: Operated, TX Mode (worst case)
Test Specification: FCC15.205, 15.209 & 15.247(d) Antenna: Horizontal
Comment: 3.7VDC
Remark: 9kHz to 1GHz

Test Result
☒ Passed
☐ Not Passed

Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector
58.183	18.71	40.00	-21.29	Quasi Peak
96.552	11.87	43.50	-31.63	Quasi Peak
180.134	13.26	43.50	-30.24	Quasi Peak
277.727	20.52	46.00	-25.48	Quasi Peak
437.453	22.81	46.00	-23.19	Quasi Peak
869.750	30.48	46.00	-15.52	Quasi Peak

Spurious Radiated Emission

EUT: SP-2D-M
Op Condition: Operated, TX Mode (worst case)
Test Specification: FCC15.205, 15.209 & 15.247(d) Antenna: Vertical
Comment: 3.7VDC
Remark: 9kHz to 1GHz

Test Result
☒ Passed
☐ Not Passed

Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector
42.125	19.99	40.00	-20.01	Quasi Peak
60.932	21.41	40.00	-18.59	Quasi Peak
175.607	11.06	43.50	-32.44	Quasi Peak
274.332	19.77	46.00	-26.23	Quasi Peak
438.908	27.41	46.00	-18.59	Quasi Peak
864.469	33.61	46.00	-12.39	Quasi Peak

Spurious Radiated Emission

EUT:	SP-2D-M
Op Condition:	Operated, TX Mode (2402MHz)
Test Specification:	FCC15.205, 15.209 & 15.247(d) Antenna: Horizontal
Comment:	3.7VDC
Remark:	1GHz to 25GHz

Test Result
☒ Passed
☐ Not Passed

Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector
2337.687	46.09	74.00	-27.91	Peak
2337.687	38.27	54.00	-15.73	Average
4803.750	42.38*	54.00	-11.62	Peak
5321.137	38.21*	54.00	-15.79	Peak
8626.150	39.43*	54.00	-14.57	Peak

Remark*: As the peak value were below the average limit, so average value no need to be measured.

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Spurious Radiated Emission

EUT:	SP-2D-M
Op Condition:	Operated, TX Mode (2402MHz)
Test Specification:	FCC15.205, 15.209 & 15.247(d) Antenna: Vertical
Comment:	3.7VDC
Remark:	1GHz to 25GHz

Test Result
☒ Passed
☐ Not Passed

Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector
1273.593	29.33*	54.00	-24.67	Peak
2465.718	42.52*	54.00	-11.48	Peak
12058.500	43.61*	54.00	-10.39	Peak

Remark*: As the peak value were below the average limit, so average value no need to be measured.

Spurious Radiated Emission

EUT:	SP-2D-M
Op Condition:	Operated, TX Mode (2440MHz)
Test Specification:	FCC15.205, 15.209 & 15.247(d) Antenna: Horizontal
Comment:	3.7VDC
Remark:	1GHz to 25GHz

Test Result
☒ Passed
☐ Not Passed

Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector
2503.968	21.13*	54.00	-32.87	Peak
4879.718	28.45*	54.00	-25.55	Peak
8188.231	39.12*	54.00	-14.88	Peak

Remark*: As the peak value were below the average limit, so average value no need to be measured.

Spurious Radiated Emission

EUT:	SP-2D-M
Op Condition:	Operated, TX Mode (2440MHz)
Test Specification:	FCC15.205, 15.209 & 15.247(d) Antenna: Vertical
Comment:	3.7VDC
Remark:	1GHz to 25GHz

Test Result
☒ Passed
☐ Not Passed

Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector
1272.000	27.84*	54.00	-26.16	Peak
2503.968	39.08*	54.00	-14.92	Peak
6423.852	37.15*	54.00	-16.85	Peak
7458.593	39.16*	54.00	-14.84	Peak

Remark*: As the peak value were below the average limit, so average value no need to be measured.

Spurious Radiated Emission

EUT:	SP-2D-M
Op Condition:	Operated, TX Mode (2480MHz)
Test Specification:	FCC15.205, 15.209 & 15.247(d) Antenna: Horizontal
Comment:	3.7VDC
Remark:	1GHz to 25GHz

Test Result
☒ Passed
☐ Not Passed

Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector
2415.781	45.58	74.00	-28.42	Peak
2415.781	39.58	54.00	-14.42	Average
2543.812	45.78	74.00	-28.22	Peak
2543.812	37.36	54.00	-16.64	Average
4959.406	42.74*	54.00	-11.26	Peak
7013.425	36.41*	54.00	-17.59	Peak

Remark*: As the peak value were below the average limit, so average value no need to be measured.

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Spurious Radiated Emission

EUT:	SP-2D-M
Op Condition:	Operated, TX Mode (2480MHz)
Test Specification:	FCC15.205, 15.209 & 15.247(d) Antenna: Vertical
Comment:	3.7VDC
Remark:	1GHz to 25GHz

Test Result
☒ Passed
☐ Not Passed

Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector
1253.937	28.43*	54.00	-25.57	Peak
3985.613	32.79*	54.00	-21.21	Peak
5184.728	36.23*	54.00	-17.77	Peak
7065.281	40.18*	54.00	-13.82	Peak

Remark*: As the peak value were below the average limit, so average value no need to be measured.

7.2 Bandedge Emission

EUT: SP-2D-M
Op Condition: Operated, TX Mode
Test Specification: FCC15.247, Antenna: Horizontal
Comment: 3.7VDC

Test Result
☒ Passed
☐ Not Passed

Band	Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector
Low	2398.350	31.25	74	-42.75	Peak
Low	2398.350	25.15	54	-28.85	Average
High	2494.000	30.84	74	-43.16	Peak
High	2494.000	24.23	54	-29.77	Average

Bandedge Emission

EUT: SP-2D-M
Op Condition: Operated, TX Mode
Test Specification: FCC15.247, Antenna: Vertical
Comment: 3.7VDC

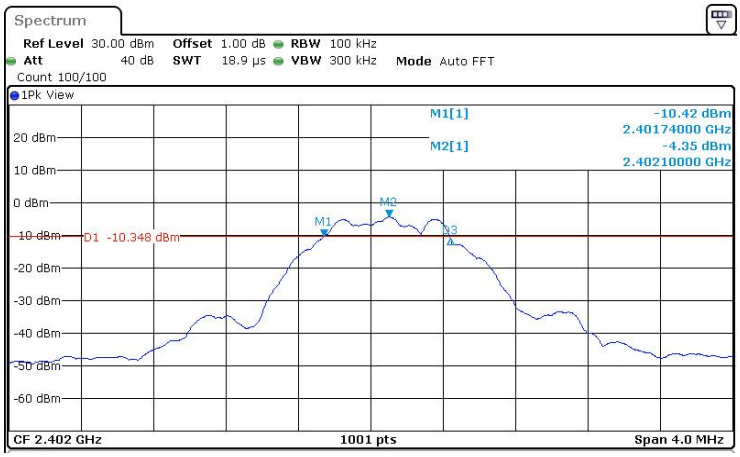
Test Result
☒ Passed
☐ Not Passed

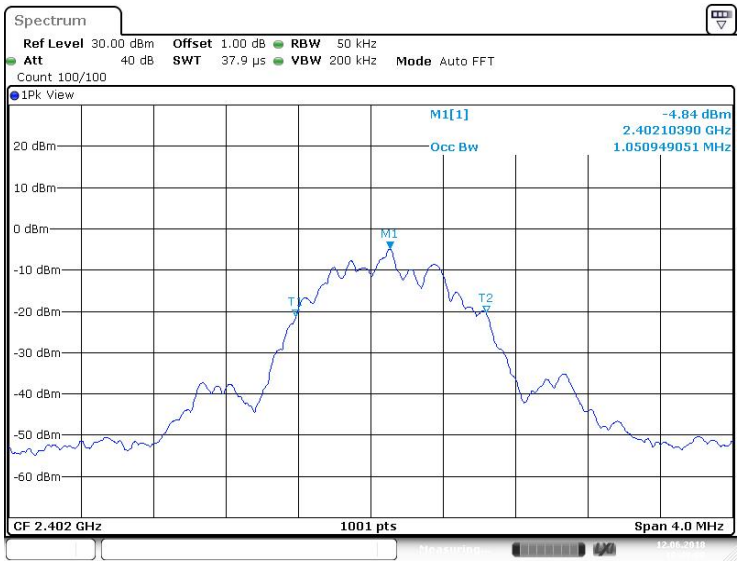
Band	Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector
Low	2398.350	31.16	74	-42.84	Peak
Low	2398.350	25.18	54	-28.82	Average
High	2494.000	32.23	74	-41.77	Peak
High	2494.000	26.15	54	-27.85	Average

7.3 6dB & 99% Bandwidth

EUT:	SP-2D-M
Op Condition:	Operated, TX Mode (2402MHz)
Test Specification:	FCC15.247(a)(2), 6dB Bandwidth & 99% Bandwidth
Comment:	3.7VDC

Test Result
☒ Passed
☐ Not Passed



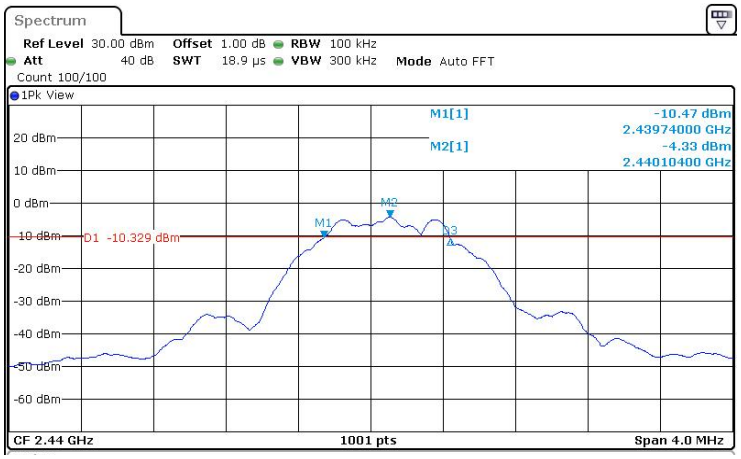


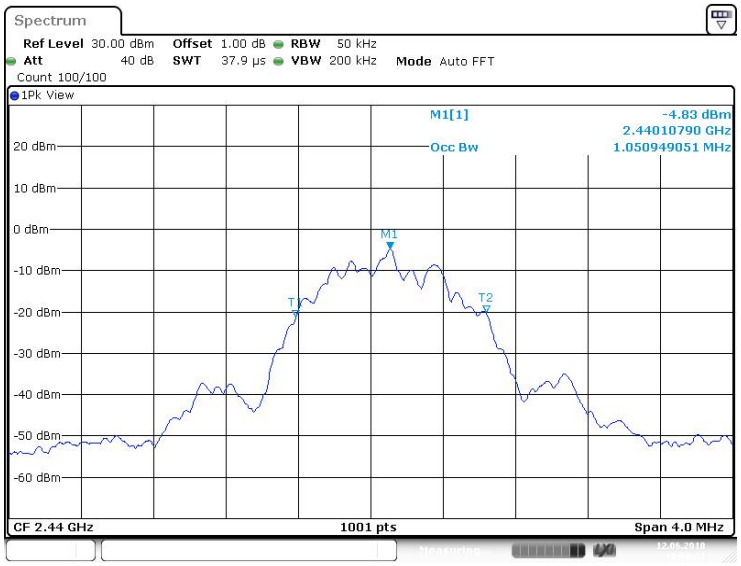
6dB bandwidth	6dB BW Limit	99% bandwidth
700.000 kHz	> 500 kHz	1050.949 kHz

6dB & 99% Bandwidth

EUT:	SP-2D-M
Op Condition:	Operated, TX Mode (2440MHz)
Test Specification:	FCC15.247(a)(2), 6dB Bandwidth & 99% Bandwidth
Comment:	3.7VDC

Test Result
☒ Passed
☐ Not Passed



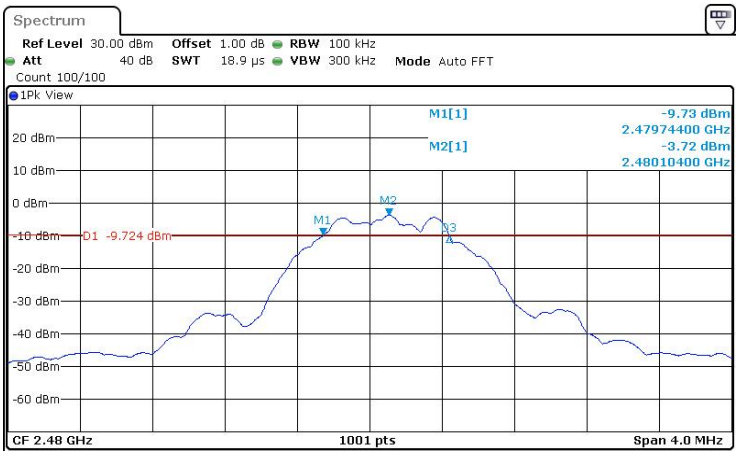


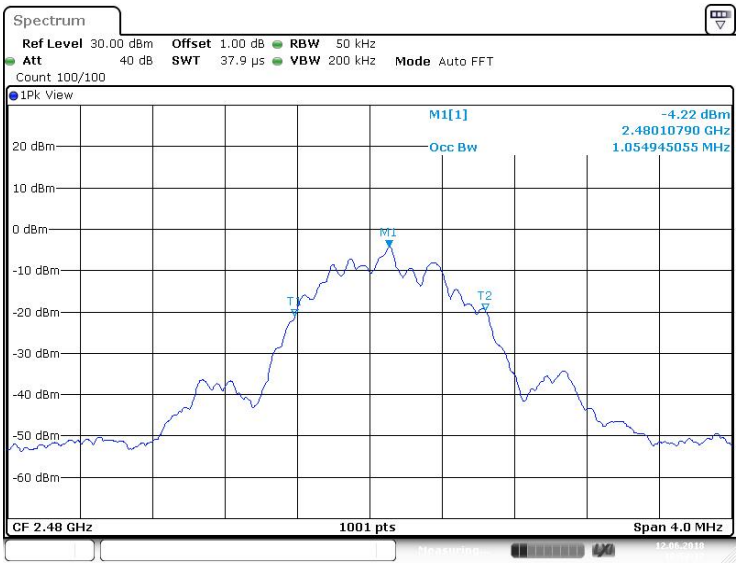
6dB bandwidth	6dB BW Limit	99% bandwidth
700.000 kHz	> 500 kHz	1050.949 kHz

6dB & 99% Bandwidth

EUT:	SP-2D-M
Op Condition:	Operated, TX Mode (2480MHz)
Test Specification:	FCC15.247(a)(2), 6dB Bandwidth & 99% Bandwidth
Comment:	3.7VDC

Test Result
☒ Passed
☐ Not Passed





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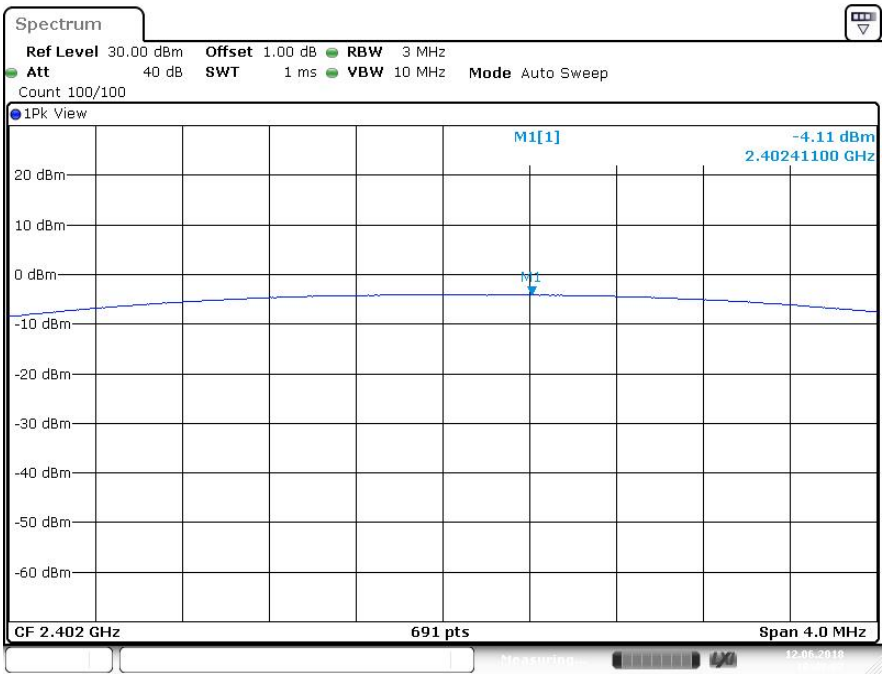
6dB bandwidth	6dB BW Limit	99% bandwidth
696.000 kHz	> 500 kHz	1051.945 kHz

7.4 Peak Output Power

EUT:	SP-2D-M
Op Condition:	Operated, TX Mode (2402MHz)
Test Specification:	FCC15.247(b)
Comment:	3.7VDC, Antenna gain: 0 dBi, Cable Loss: 0.5 dB

Test Result
☒ Passed
☐ Not Passed

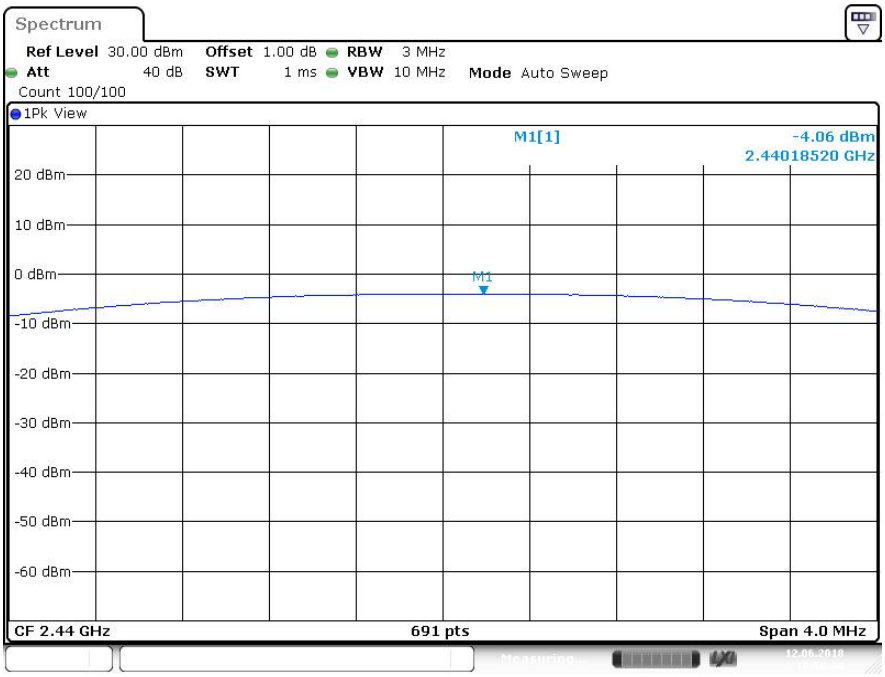


Conducted Output Power	Limit
-4.11dBm	< 30dBm

Peak Output Power

EUT:	SP-2D-M
Op Condition:	Operated, TX Mode (2440MHz)
Test Specification:	FCC15.247(b)
Comment:	3.7VDC, Antenna gain: 0 dBi, Cable Loss: 0.5 dB

Test Result
☒ Passed
☐ Not Passed

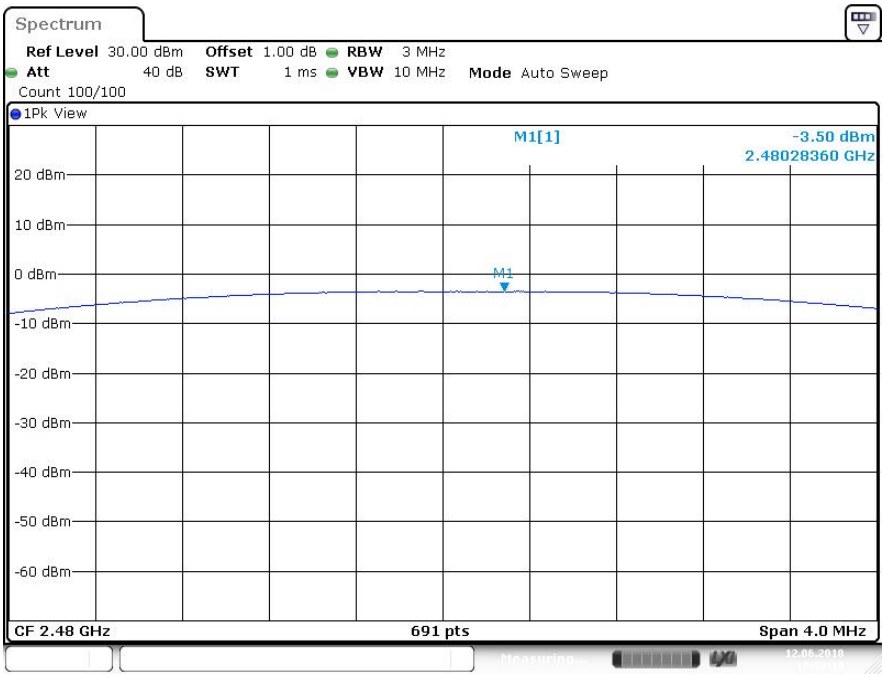


Conducted Output Power	Limit
-4.06 dBm	< 30dBm

Peak Output Power

EUT:	SP-2D-M
Op Condition:	Operated, TX Mode (2480MHz)
Test Specification:	FCC15.247(b)
Comment:	3.7VDC, Antenna gain: 0 dBi, Cable Loss: 0.5 dB

Test Result
☒ Passed
☐ Not Passed

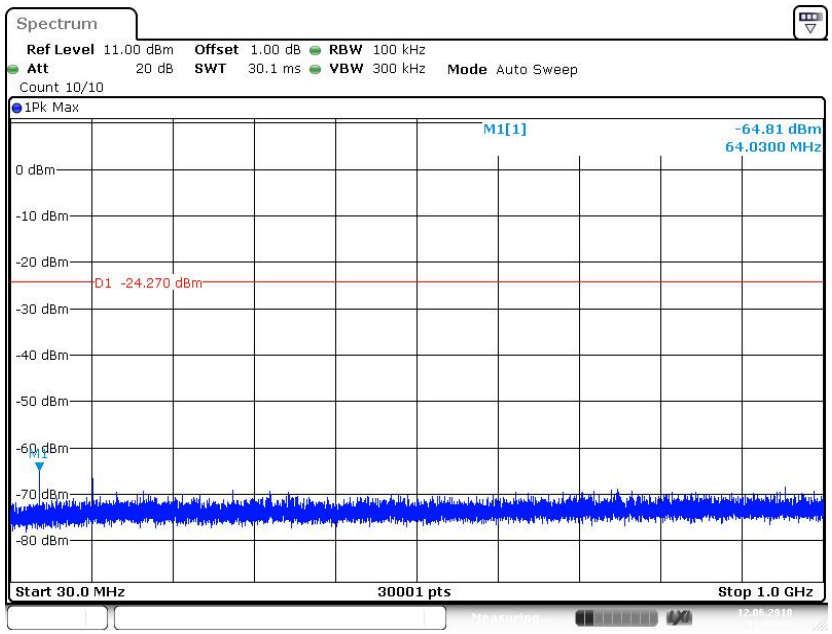


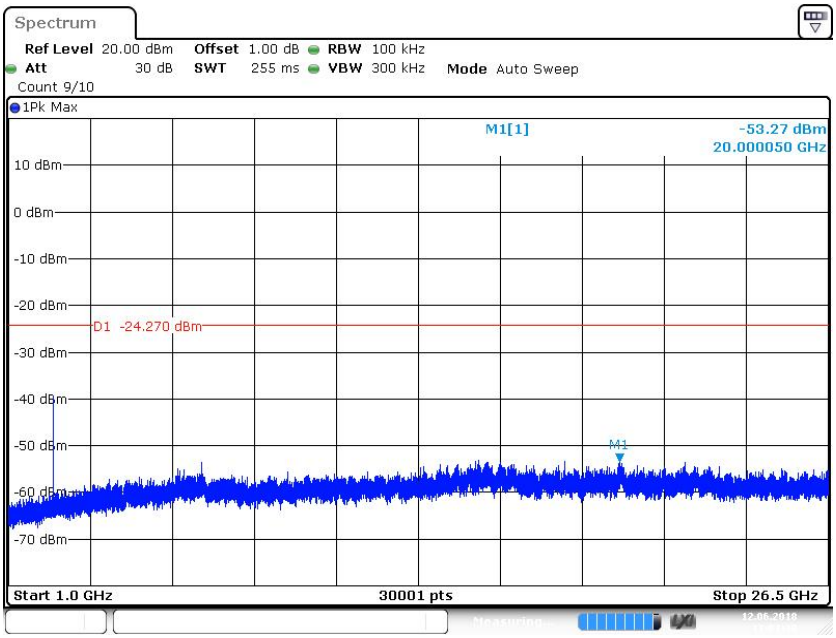
Conducted Output Power	Limit
-3.50 dBm	< 30dBm

7.5 Spurious Emissions at Antenna Terminals

EUT:	SP-2D-M
Op Condition:	Operated, TX Mode (2402MHz)
Test Specification:	FCC2.1051 & 15.247(d)
Comment:	3.7VDC

Test Result
☒ Passed
☐ Not Passed

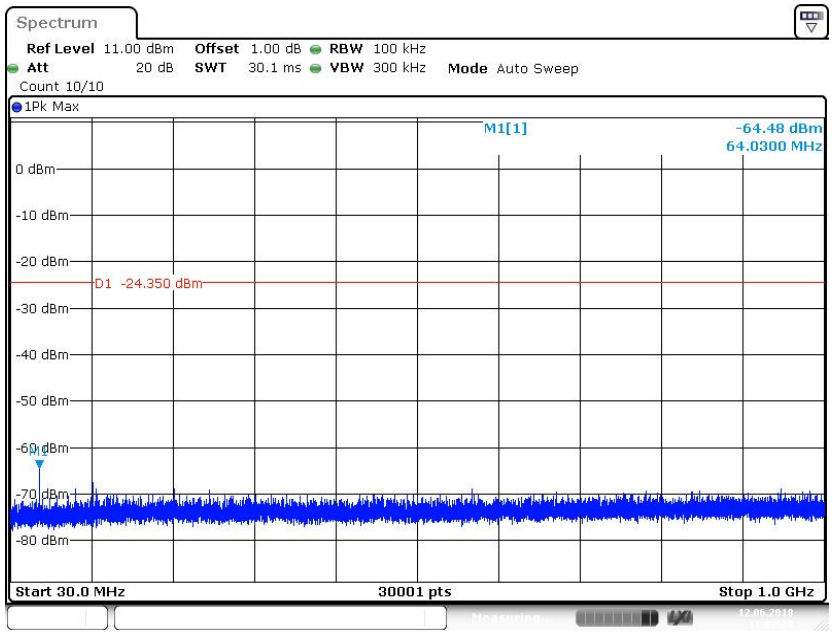


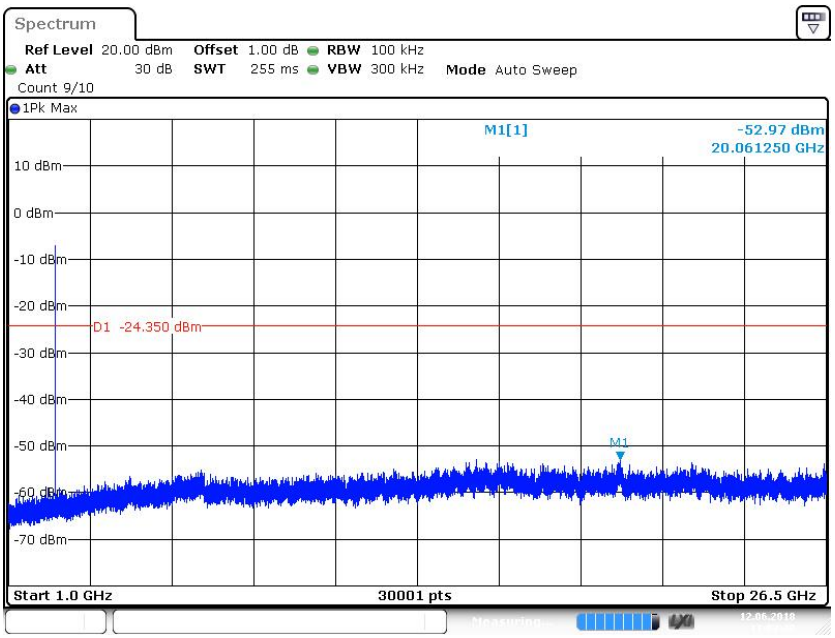


Spurious Emissions at Antenna Terminals

EUT:	SP-2D-M
Op Condition:	Operated, TX Mode (2440MHz)
Test Specification:	FCC2.1051 & 15.247(d)
Comment:	3.7VDC

Test Result
☒ Passed
☐ Not Passed

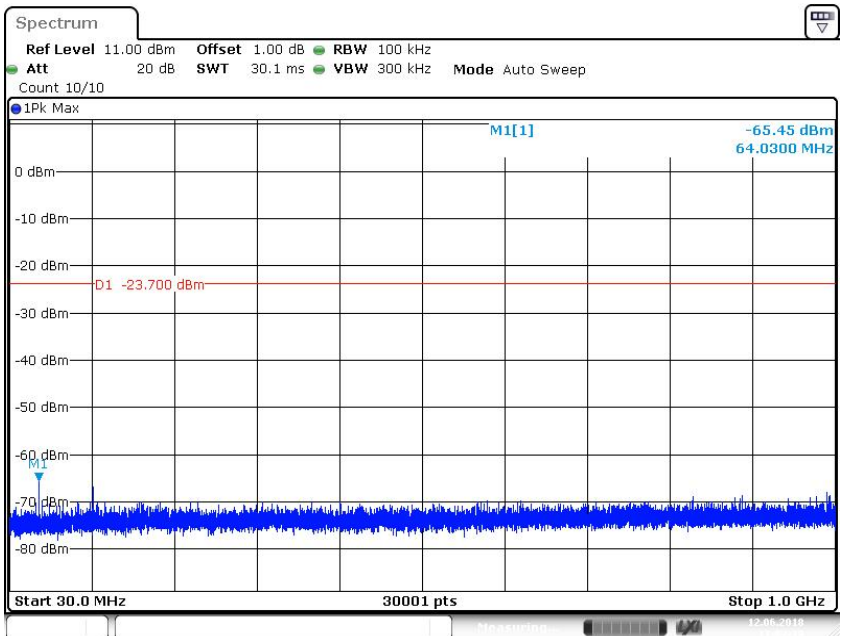


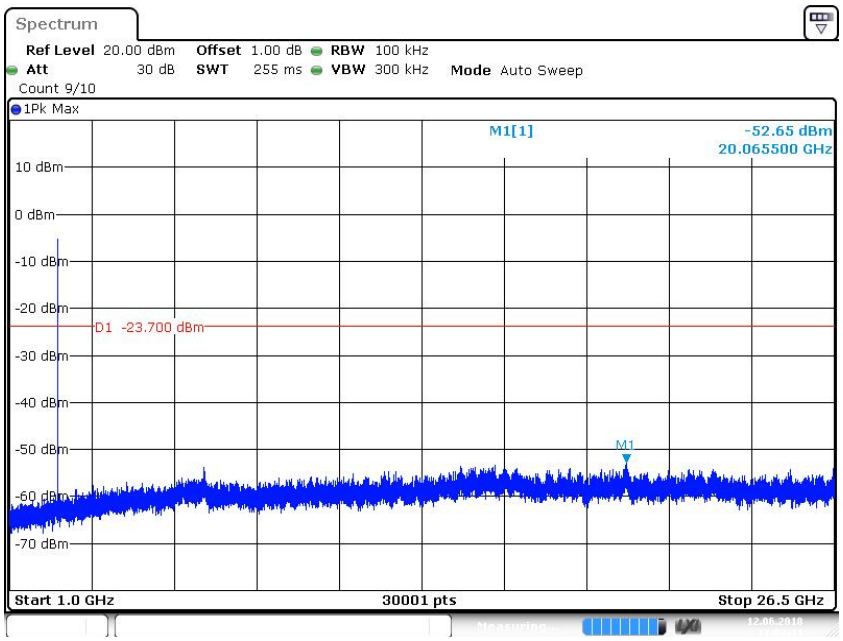


Spurious Emissions at Antenna Terminals

EUT:	SP-2D-M
Op Condition:	Operated, TX Mode (2480MHz)
Test Specification:	FCC2.1051 & 15.247(d)
Comment:	3.7VDC

Test Result
☒ Passed
☐ Not Passed

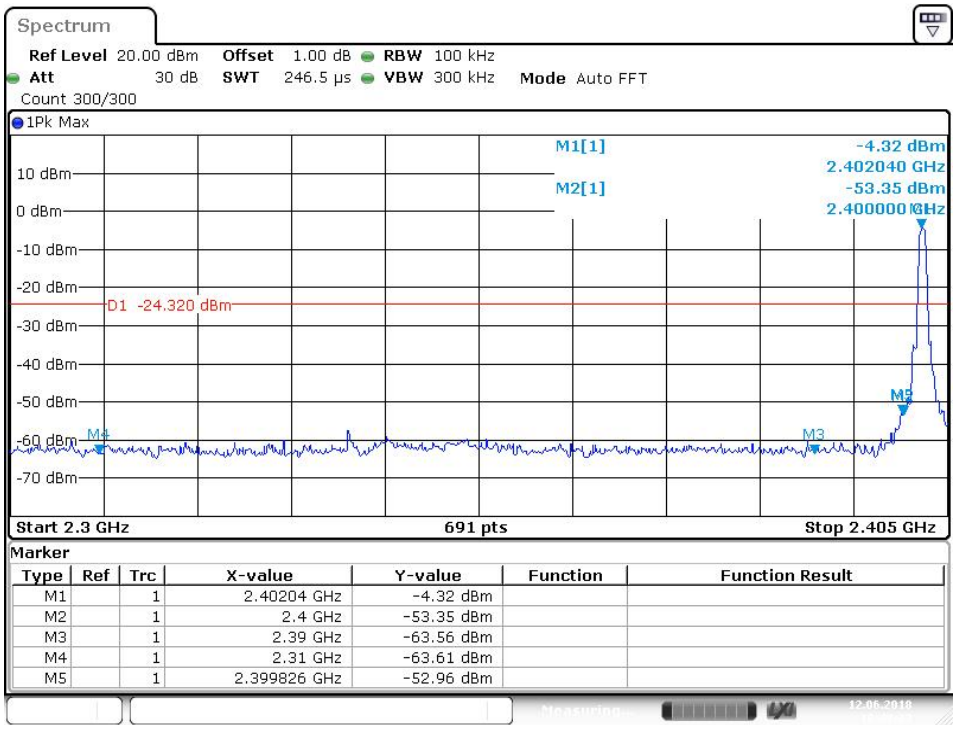




7.6 100kHz Bandwidth of band edges

EUT:	SP-2D-M
Op Condition:	Operated, TX Mode (2402MHz)
Test Specification:	FCC15.247(d), Conducted
Comment:	3.7VDC

Test Result
☒ Passed
☐ Not Passed

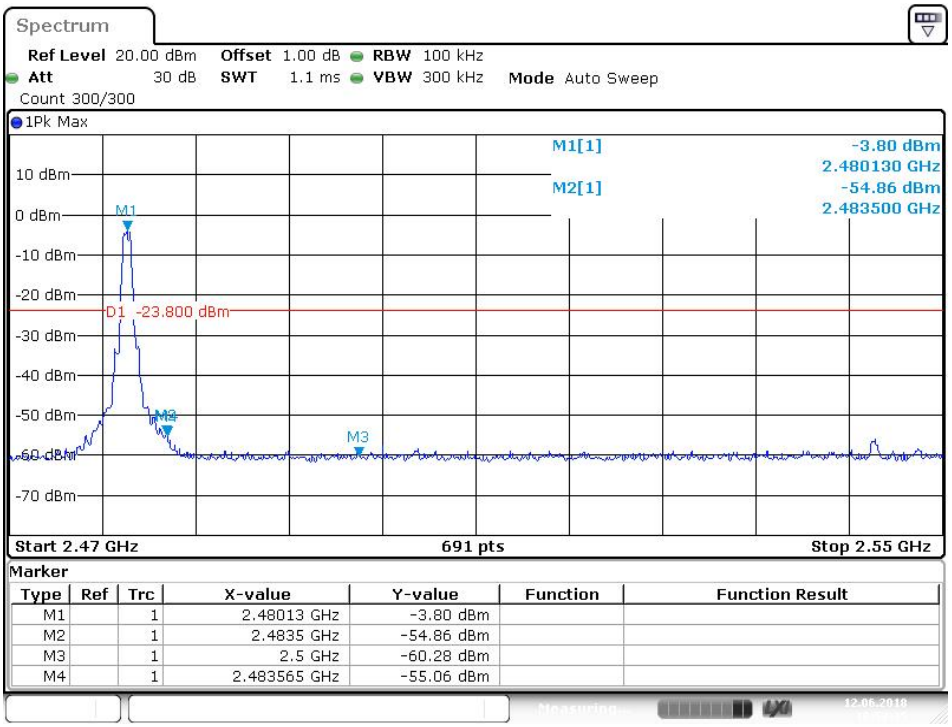


Band edges	Limit
52.96 dB	> 20dB

100kHz Bandwidth of band edges

EUT: SP-2D-M
Op Condition: Operated, TX Mode (2480MHz)
Test Specification: FCC15.247(d), Conducted
Comment: 3.7VDC

Test Result
☒ Passed
☐ Not Passed

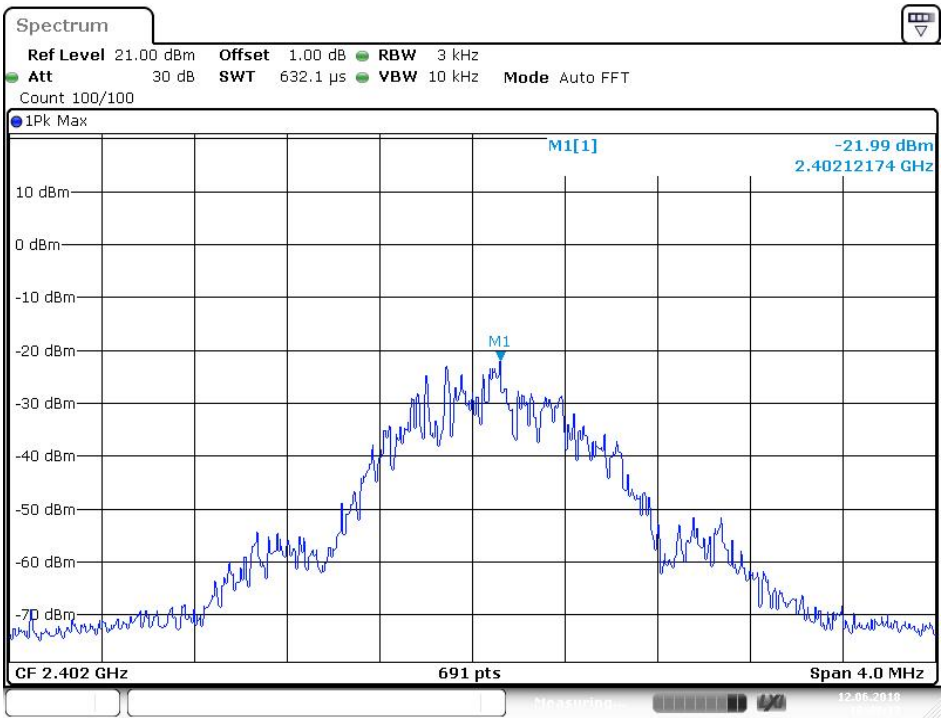


Band edges	Limit
55.06 dB	> 20dB

7.7 Power Spectral Density

EUT:	SP-2D-M
Op Condition:	Operated, TX Mode (2402MHz)
Test Specification:	FCC15.247(e)
Comment:	3.7VDC

Test Result
☒ Passed
☐ Not Passed

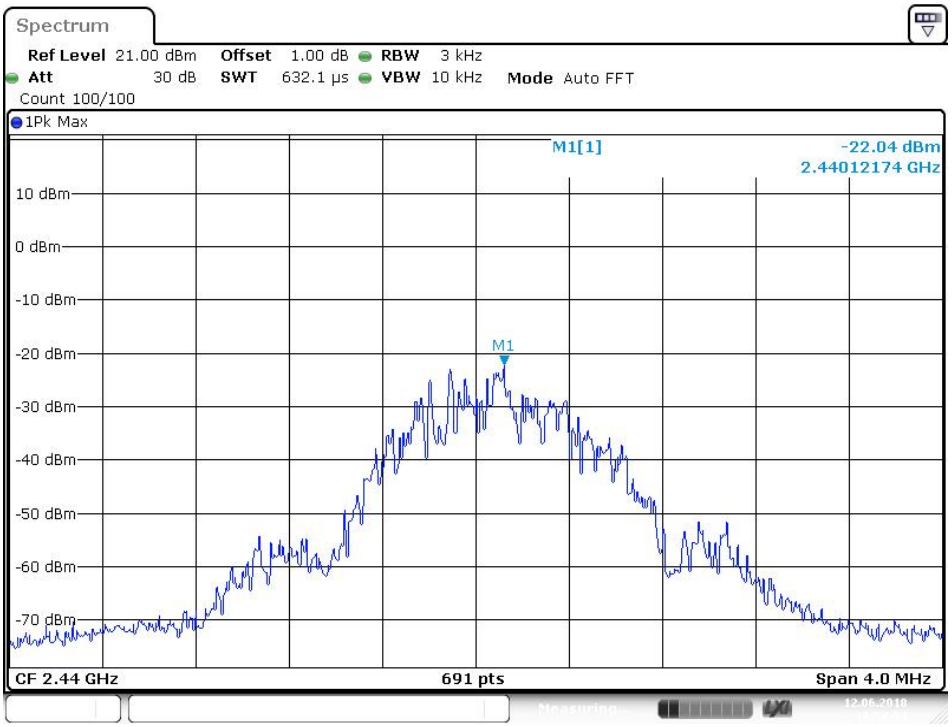


PSD	Limit
-21.99 dBm	< 8 dBm

Power Spectral Density

EUT: SP-2D-M
Op Condition: Operated, TX Mode (2440MHz)
Test Specification: FCC15.247(e)
Comment: 3.7VDC

Test Result
☒ Passed
☐ Not Passed

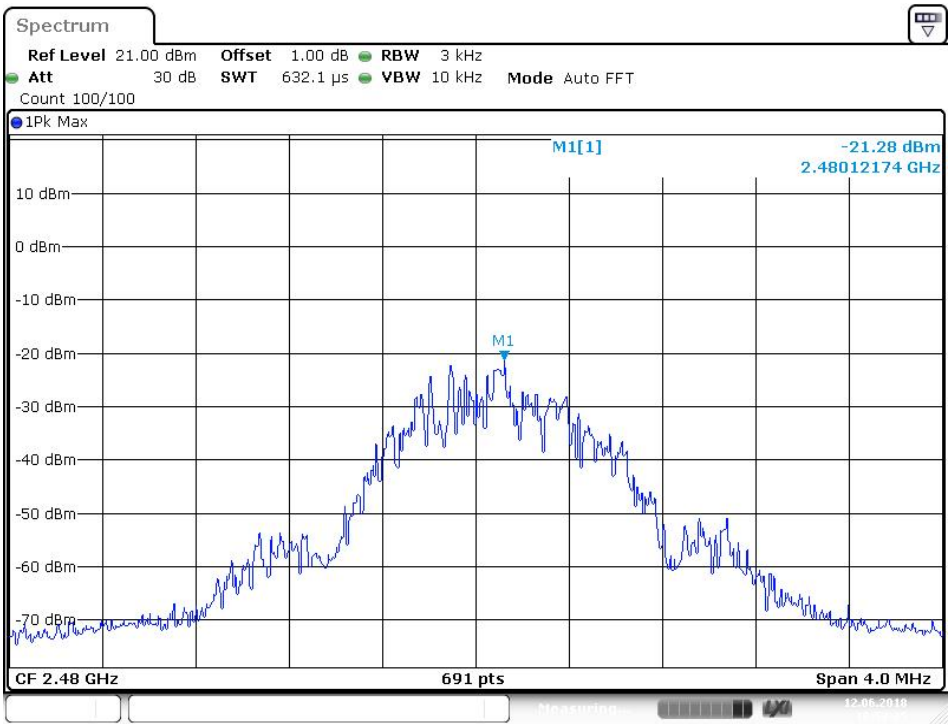


PSD	Limit
-22.04 dBm	< 8 dBm

Power Spectral Density

EUT: SP-2D-M
Op Condition: Operated, TX Mode (2480MHz)
Test Specification: FCC15.247(e)
Comment: 3.7VDC

Test Result
☒ Passed
☐ Not Passed



PSD	Limit
-21.28 dBm	< 8 dBm

7.8 Antenna Requirement

EUT:	SP-2D-M
Op Condition:	Operated, TX Mode
Test Specification:	FCC15.203 & 15.247(b)
Comment:	3.7VDC

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 PCB antenna, 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
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: 5mm)

Step a)
>> Numeric threshold (2402MHz), mW / 5mm * √2.402GHz ≤ 3.0
Numeric threshold (2402MHz) ≤ 9.678mW

>> Numeric threshold (2440MHz), mW / 5mm * √2.441GHz ≤ 3.0
Numeric threshold (2440MHz) ≤ 9.601mW

>> Numeric threshold (2480MHz), mW / 5mm * √2.480GHz ≤ 3.0
Numeric threshold (2480MHz) ≤ 9.525mW

>> The power of EUT measured (2402MHz) is: -4.11dBm = 0.388mW
The power of EUT measured (2440MHz) is: -4.06dBm = 0.293mW
The power of EUT measured (2480MHz) is: -3.50dBm = 0.447mW

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

China

General Product Information

To: TÜV SÜD HKG Ltd.

Attention: **Mr. Edmond Fung**
From:
Fax No:

Date: June 13, 2018
Total Page (Cover Included): 1

Declaration Letter

Subject: Declaration Letter for Model Number

We:

Officially notify TÜV SÜD HKG Ltd. that the << hBAND, SP-2D-W >> have the same technical construction including circuit diagram, PCB Layout, components and component layout, all electrical construction and mechanical construction, with << Optical Heart Rate (OHR) Tracker >>, << SP-2D-M >>.
The difference lies only on different color of the different models.

<<Additional Model >>: hBAND, SP-2D-W

<<Main Test Model >>: SP-2D-M

<<Product>>: Optical Heart Rate (OHR) Tracker

Applicant:

13 JUN 2018

(Date)

(Applicant's authorized signature and company Chop)