China

FCC - TEST REPORT

Report Number	:	**60.790.19.032.01R01**	Date of Issue	: November 6, 2019
Model	:	**E41230**		
Product Type	:	**E-Bike HMI**		
Applicant	:	DAYTON INDUSTRIAL CO., LTD		
Address	:	2-12 Kwai Fat Road, 11-A Kwai Chung, New Territories, Hong Kong		
Production Facility	:	KENDY ENTERPRISE LTD		
Address	:	2-12 Kwai Fat Road, 11-A Kwai Chung, New Territories, Hong Kong		
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:	E-Bike HMI
Model no.:	E41230
FCC ID:	O4GAR
Rating:	12V DC (E-Bike battery)
Frequency:	2402MHz-2480MHz (Tx and Rx)
Antenna gain:	0 dBi
Number of operated channel:	40
Modulation:	GFSK

Auxiliary Equipment and Software Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.	S/N
Computer	Lenovo	X220	0A72168

Auxiliary Software Used during Test:

DESCRIPTION	SOFTWARE NAME	VERSION	REMARK
RF Test Mode Software	nRFgo	1.16	Provided by applicant

China

3 Summary of Test Standards

Test Standards
FCC Part 15 Subpart C 10-1-18 Edition Federal Communications Commission, PART 15 — Radio Frequency Devices, Subpart C — Unintentional Radiators

All the tests were performed using the procedures from ANSI C63.4(2014) and ANSI C63.10 (2013).

4 Details about the Test Laboratory

Site 1

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 1
FCC Title 47 Part 15.207 Conduct Emission	NIL
FCC Title 47 Part 15.247(a)(1) 6dB & 99% Bandwidth	Site 1
FCC Title 47 Part 15.247(b) Peak Output Power	Site 1
FCC Title 47 Part 2.1051 & 15.247(d) Spurious Emissions at Antenna Terminals	Site 1
FCC Title 47 Part 15.247(d) 100kHz Bandwidth of band edges	Site 1
FCC Title 47 Part 15.247(e) Power Spectral Density	Site 1
FCC Title 47 Part 15.203 & 15.247(b) Antenna Requirement	Site 1

4.1 Test Equipment Site List

Radiated emission Test – Site 1

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2020-6-28
Signal Analyzer	Rohde & Schwarz	FSV40	101031	2020-6-28
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100398	2020-7-7
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2020-7-5
Horn Antenna	Rohde & Schwarz	HF907	102294	2020-6-22
Wideband Horn Antenna	Q-PAR	QWH-SL-18-40-K-SG	12827	2020-7-5
Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2020-6-28
Pre-amplifier	Rohde & Schwarz	SCU 40A	100432	2020-6-28
Attenuator	Agilent	8491A	MY39264334	2020-6-28
3m Semi-anechoic chamber	TDK	9X6X6	----	2020-7-7
Test software	Rohde & Schwarz	EMC32	Version 9.15.00	N/A

Conducted Emission Test – Site 1

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 3	101782	2020-6-28
LISN	Rohde & Schwarz	ENV4200	100249	2020-6-28
LISN	Rohde & Schwarz	ENV432	101318	2020-7-19
LISN	Rohde & Schwarz	ENV216	100326	2020-6-28
ISN	Rohde & Schwarz	ENY81	100177	2020-6-28
ISN	Rohde & Schwarz	ENY81-CA6	101664	2020-6-28
High Voltage Probe	Rohde & Schwarz	TK9420(VT9420)	9420-584	2020-6-24
RF Current Probe	Rohde & Schwarz	EZ-17	100816	2020-7-2
Attenuator	Shanghai Huaxiang	TS2-26-3	080928189	2020-6-28
Test software	Rohde & Schwarz	EMC32	Version9.15.00	N/A

20dB & 99% Bandwidth, Peak Output Power, Spurious Emissions at Antenna Terminals, 100kHz Bandwidth of band edges, Power Spectral Density – Site 1

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
Signal Analyzer	Rohde & Schwarz	FSV40	101030	2020-6-28
RF Switch Module	Rohde & Schwarz	OSP120/OSP-B157	101226/100851	2020-6-28

4.2 Measurement System Uncertainty

Measurement System Uncertainty Emissions

System Measurement Uncertainty	
Items	**Extended Uncertainty**
Uncertainty for Radiated Emission in 3m chamber 9kHz-30MHz	4.46dB
Uncertainty for Radiated Emission in 3m chamber 30MHz-1000MHz	Horizontal: 4.91dB; Vertical: 4.89dB;
Uncertainty for Radiated Emission in 3m chamber 1000MHz-25000MHz	Horizontal: 4.80dB; Vertical: 4.79dB;
Uncertainty for Conducted Emission at AC Power Line 150kHz-30MHz	3.21dB
Uncertainty for frequency test	0.6×10-7

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	12-15	☒	☐	☐
FCC Title 47 Part 15.207 Conduct Emission (1)	16	☐	☐	☒
FCC Title 47 Part 15.247(a)(2) 6dB & 99% Bandwidth	17-19	☒	☐	☐
FCC Title 47 Part 15.247(b) Peak Output Power	20-22	☒	☐	☐
FCC Title 47 Part 2.1051 & 15.247(d) Spurious Emissions at Antenna Terminals	23-28	☒	☐	☐
FCC Title 47 Part 15.247(d) 100kHz Bandwidth of band edges	29-31	☒	☐	☐
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) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines.

6 General Remarks

Remarks

This submittal(s) (test report) is intended for **FCC ID: O4GAR**, complies with Section 15.203, 15.205, 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C rules for the DTS grant

The TX and RX range is 2402MHz-2480MHz.

SUMMARY:

- All tests according to the regulations cited on page 8 were

■ - Performed

☐ - **Not** Performed

- The Equipment Under Test

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

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

Sample Received Date: September 12, 2019

Testing Start Date: September 16, 2019

Testing End Date: September 30, 2019

Reviewed by:

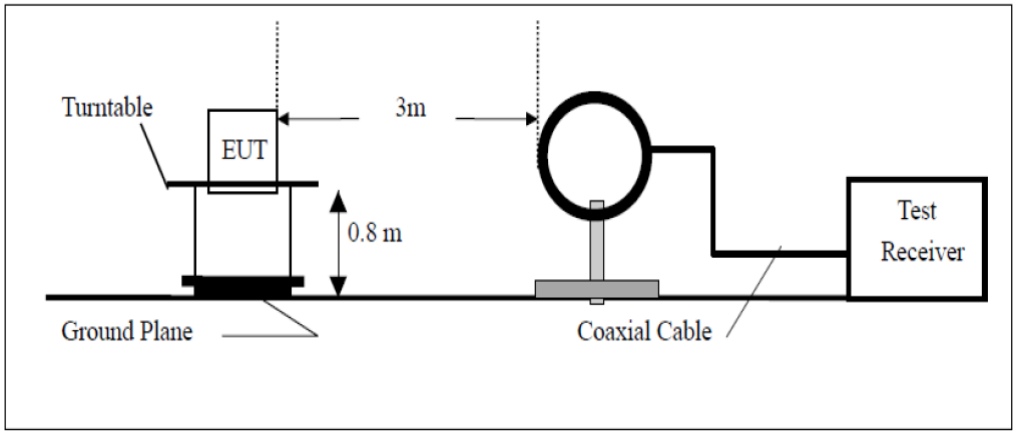
Hosea CHAN
EMC Project Engineer

Prepared by:

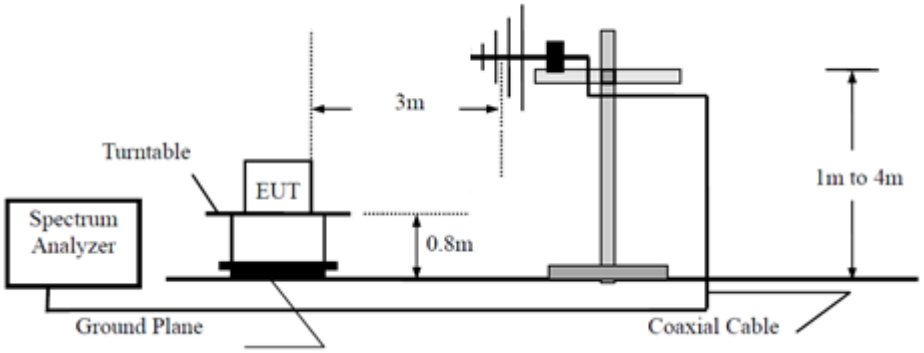
Eric LI
EMC Senior Project Engineer

7 Test Setups

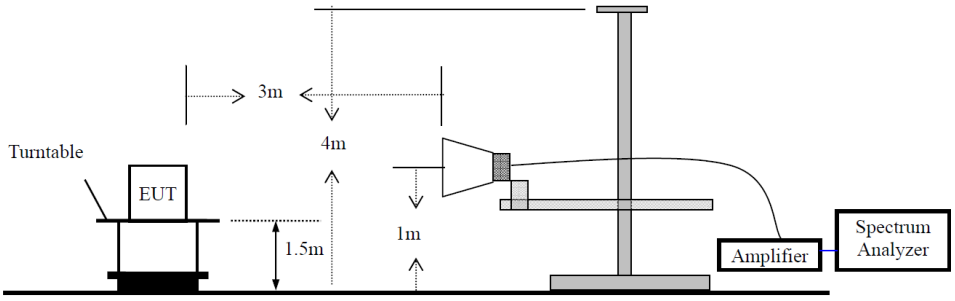
7.1 Radiated test setups 9kHz-30MHz



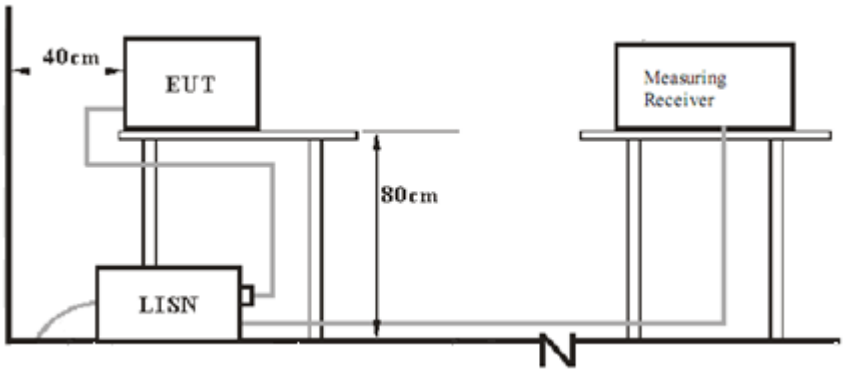
7.2 Radiated test setups Below 1GHz



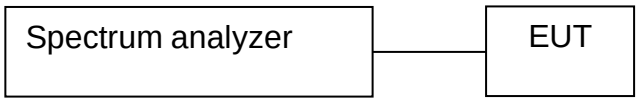
7.3 Radiated test setups Above 1GHz



7.4 AC Power Line Conducted Emission



7.5 Conducted RF test



China

8 Emission Test Results

8.1 Spurious Radiated Emission

EUT:	E41230
Op Condition:	Operated, TX Mode (Low channel is the worst case)
Test Specification:	FCC15.205, 15.209 & 15.247(d)
Comment:	12V DC
Remark:	9kHz to 1GHz

Test Result
☒ Passed
☐ Not Passed

Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector PK/QP/AV	Ant. Polarity H/V	Corr. (dB)
82.487778	31.55	40.00	-8.45	Peak	H	-31.4
381.301667	41.86	46.00	-4.14	Peak	H	-24.3
525.077222	38.64	46.00	-7.36	Peak	H	-21.4
37.059444	34.89	40.00	-5.11	Peak	V	-25.9
82.811111	36.65	40.00	-3.35	Peak	V	-31.3
524.107222	37.35	46.00	-8.65	Peak	V	-21.5

Remark:
1. As the measured peak value not exceeded the Quasi-peak limit, Quasi-peak value no need to be measured.

Spurious Radiated Emission

EUT: E41230
Op Condition: Operated, TX Mode (2402MHz)
Test Specification: FCC15.205, 15.209 & 15.247(d)
Comment: 12V DC
Remark: 1GHz to 25GHz

Test Result
☒ Passed
☐ Not Passed

Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector PK/QP/AV	Ant. Polarity H/V	Corr. (dB)
1428.000000	29.88	54.00	-24.12	Peak	H	-12.0
2017.812500	28.23	54.00	-25.77	Peak	H	-7.8
2514.375000	29.34	54.00	-24.66	Peak	H	-6.3
4804.000000	35.71	54.00	-18.29	Peak	H	1.3
9691.875000	39.87	54.00	-14.13	Peak	H	9.2
15937.968750	49.24	54.00	-4.76	Peak	H	20.9
1240.500000	30.35	54.00	-23.65	Peak	V	-13.1
1705.062500	28.24	54.00	-25.76	Peak	V	-10.0
2113.187500	30.28	54.00	-23.72	Peak	V	-7.5
6619.687500	36.86	54.00	-17.14	Peak	V	3.9
9195.937500	38.62	54.00	-15.38	Peak	V	8.0
15971.250000	48.23	54.00	-5.77	Peak	V	20.3

Remark:
1.As the measured peak value not exceeded the average limit, average value no need to be measured.

Spurious Radiated Emission

EUT: E41230
Op Condition: Operated, TX Mode (2440MHz)
Test Specification: FCC15.205, 15.209 & 15.247(d)
Comment: 12V DC
Remark: 1GHz to 25GHz

Test Result
☒ Passed
☐ Not Passed

Frequency	Result	Limit	Margin	Detector	Ant. Polarity	Corr.
MHz	dBµV/m	dBµV/m	dB	PK/QP/AV	H/V	(dB)
1237.500000	26.77	54.00	-27.23	Peak	H	-13.1
1947.000000	27.73	54.00	-26.27	Peak	H	-8.2
2537.250000	28.85	54.00	-25.15	Peak	H	-6.2
5314.687500	36.27	54.00	-17.73	Peak	H	2.5
9406.406250	40.86	54.00	-13.14	Peak	H	7.5
15937.500000	49.22	54.00	-4.78	Peak	H	20.9
1253.000000	30.78	54.00	-23.22	Peak	V	-13.0
1999.812500	33.01	54.00	-20.99	Peak	V	-7.8
2669.375000	27.96	54.00	-26.04	Peak	V	-5.6
4879.687500	36.22	54.00	-17.78	Peak	V	1.8
8573.437500	38.99	54.00	-15.01	Peak	V	8.1
15943.125000	49.43	54.00	-4.57	Peak	V	20.9

Remark:
1.As the measured peak value not exceeded the average limit, average value no need to be measured.

China

Spurious Radiated Emission

EUT: E41230
Op Condition: Operated, TX Mode (2480MHz)
Test Specification: FCC15.205, 15.209 & 15.247(d)
Comment: 12V DC
Remark: 1GHz to 25GHz

Test Result
☒ Passed
☐ Not Passed

Frequency	Result	Limit	Margin	Detector	Ant. Polarity	Corr.
MHz	dBµV/m	dBµV/m	dB	PK/QP/AV	H/V	(dB)
1235.812500	27.49	54.00	-26.51	Peak	H	-13.1
1416.000000	29.58	54.00	-24.42	Peak	H	-12.1
2369.375000	26.70	54.00	-27.30	Peak	H	-6.7
5697.656250	36.21	54.00	-17.79	Peak	H	3.0
9401.250000	40.73	54.00	-13.27	Peak	H	7.6
15907.031250	48.67	54.00	-5.33	Peak	H	19.9
1255.000000	30.29	54.00	-23.71	Peak	V	-13.0
1991.500000	31.35	54.00	-22.65	Peak	V	-7.9
2606.312500	29.25	54.00	-24.75	Peak	V	-5.9
4688.437500	34.28	54.00	-19.72	Peak	V	1.1
7440.000000	38.63	54.00	-15.37	Peak	V	3.4
15946.875000	48.56	54.00	-5.44	Peak	V	20.8

Remark:
1.As the measured peak value not exceeded the average limit, average value no need to be measured.

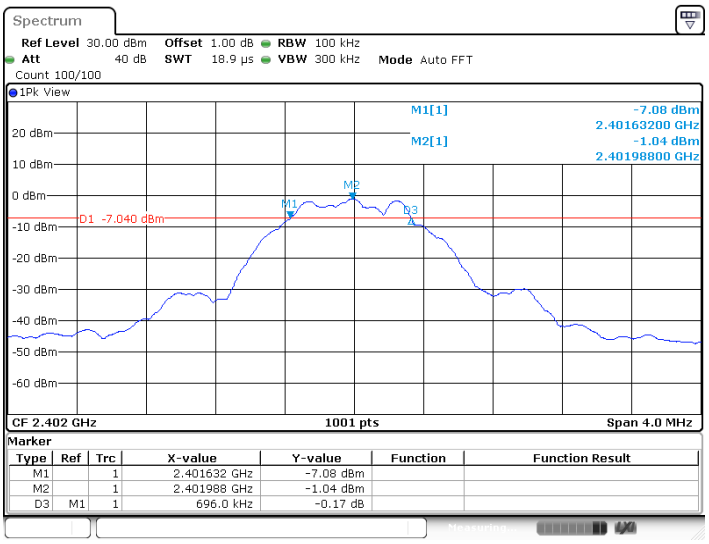
8.2 Conducted Emission at AC Power line

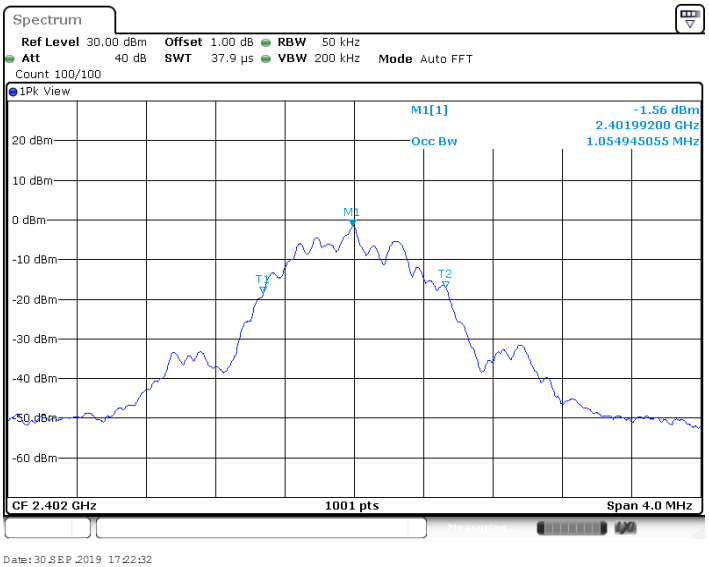
Conducted Emission testing is not applicable for this device as it is a battery operating device.

8.3 6dB & 99% Bandwidth

EUT:	E41230
Op Condition:	Operated, TX Mode (2402MHz)
Test Specification:	FCC15.247(a)(2), 6dB Bandwidth & 99% Bandwidth
Comment:	12V DC

Test Result
☒ Passed
☐ Not Passed



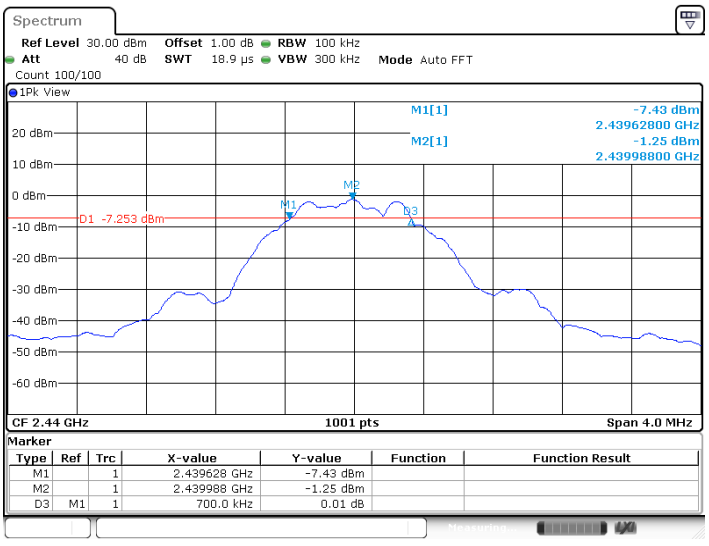


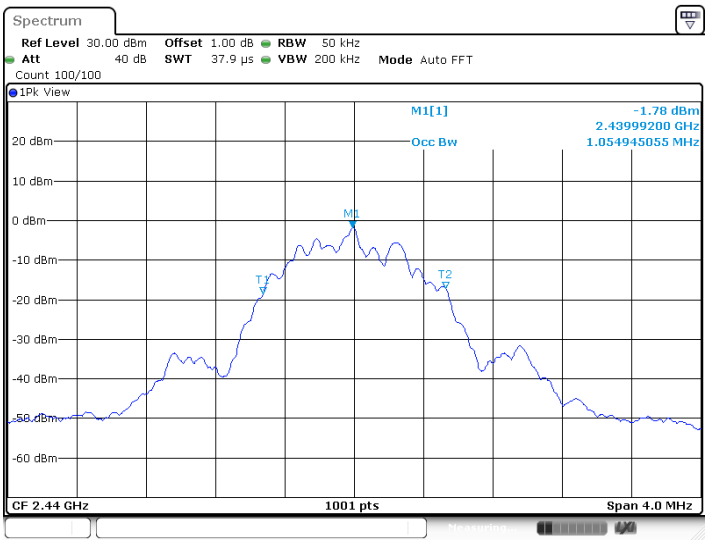
Bandwidth	Measured Value	Limit
6dB bandwidth	0.696 MHz	> 0.5MHz
99% OCB	1.055 MHz	NA

6dB & 99% Bandwidth

EUT:	E41230
Op Condition:	Operated, TX Mode (2440MHz)
Test Specification:	FCC15.247(a)(2), 6dB Bandwidth & 99% Bandwidth
Comment:	12V DC

Test Result
☒ Passed
☐ Not Passed



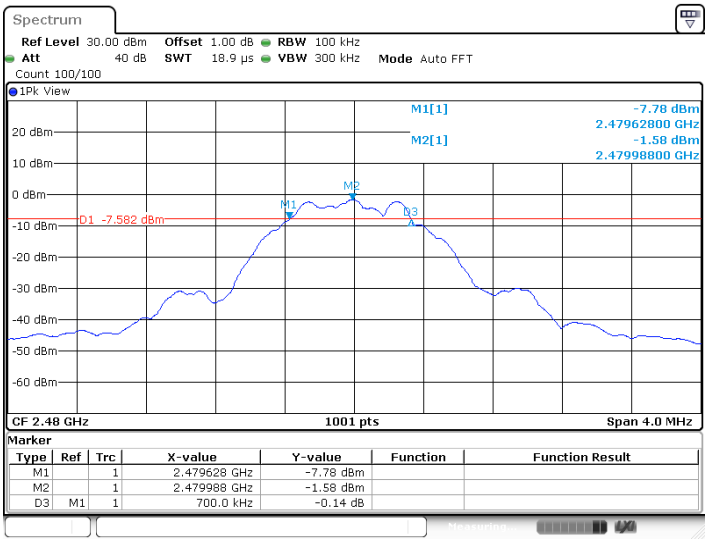


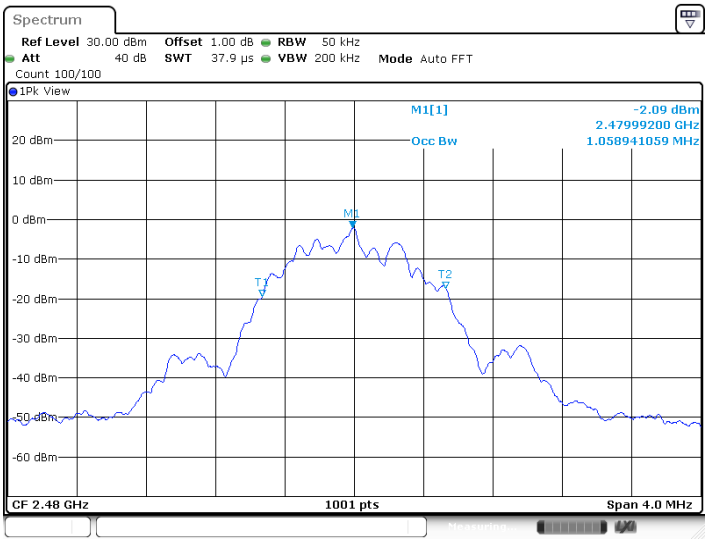
Bandwidth	Measured Value	Limit
6dB bandwidth	0.700 MHz	> 0.5 MHz
99% OCB	1.055 MHz	NA

6dB & 99% Bandwidth

EUT:	E41230
Op Condition:	Operated, TX Mode (2480MHz)
Test Specification:	FCC15.247(a)(2), 6dB Bandwidth & 99% Bandwidth
Comment:	12V DC

Test Result
☒ Passed
☐ Not Passed



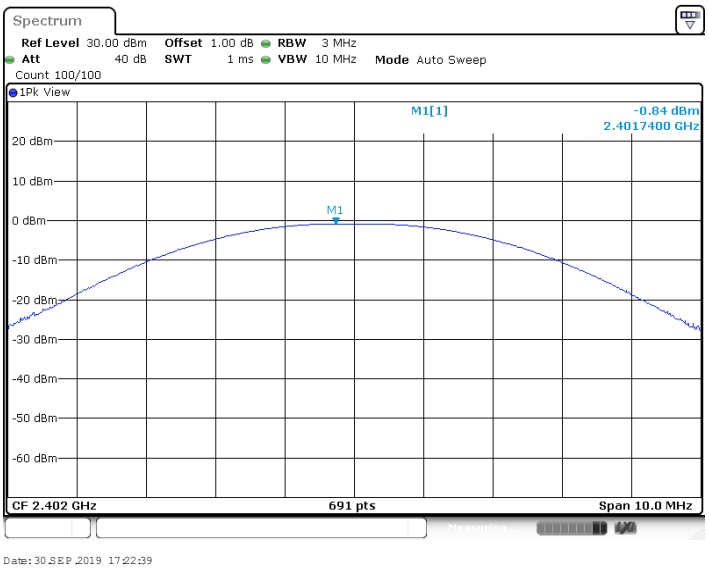


Bandwidth	Measured Value	Limit
6dB bandwidth	0.700 MHz	> 0.5 MHz
99% OCB	1.059 MHz	NA

8.4 Peak Output Power

EUT: E41230
Op Condition: Operated, TX Mode (2402MHz)
Test Specification: FCC15.247(b)
Comment: 12V DC

Test Result
☒ Passed
☐ Not Passed

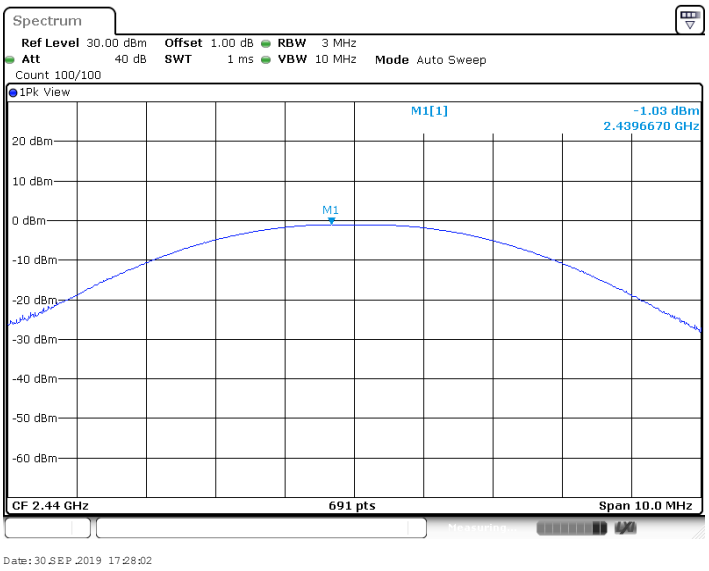


Conducted Output Power	Limit
-0.84 dBm	< 30dBm

Peak Output Power

EUT:	E41230
Op Condition:	Operated, TX Mode (2440MHz)
Test Specification:	FCC15.247(b)
Comment:	12V DC

Test Result
☒ Passed
☐ Not Passed

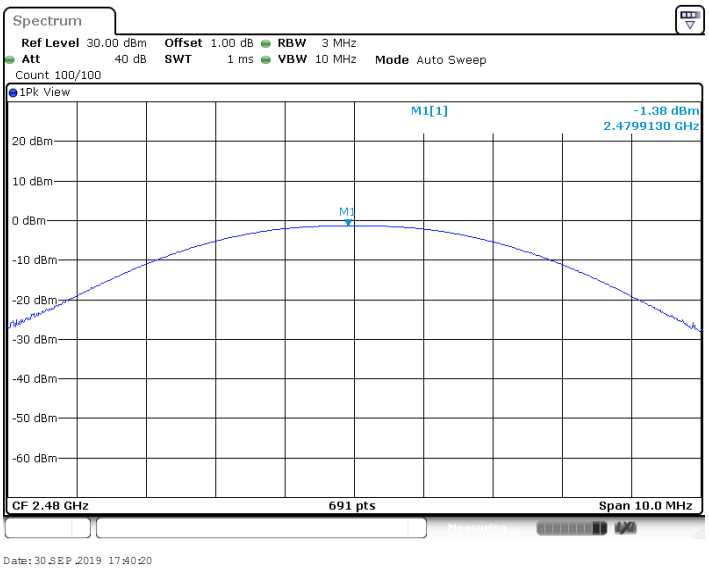


Conducted Output Power	Limit
-1.03 dBm	< 30dBm

Peak Output Power

EUT:	E41230
Op Condition:	Operated, TX Mode (2480MHz)
Test Specification:	FCC15.247(b)
Comment:	12V DC

Test Result
☒ Passed
☐ Not Passed



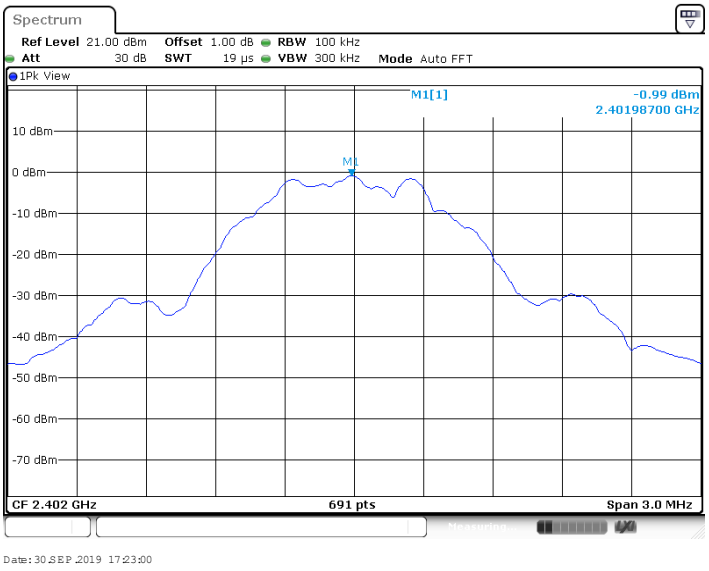
Conducted Output Power	Limit
-1.38 dBm	< 30dBm

8.5 Spurious Emissions at Antenna Terminals

EUT: E41230
Op Condition: Operated, TX Mode (2402MHz)
Test Specification: FCC2.1051 & 15.247(d)
Comment: 12V DC

Test Result
☒ Passed
☐ Not Passed

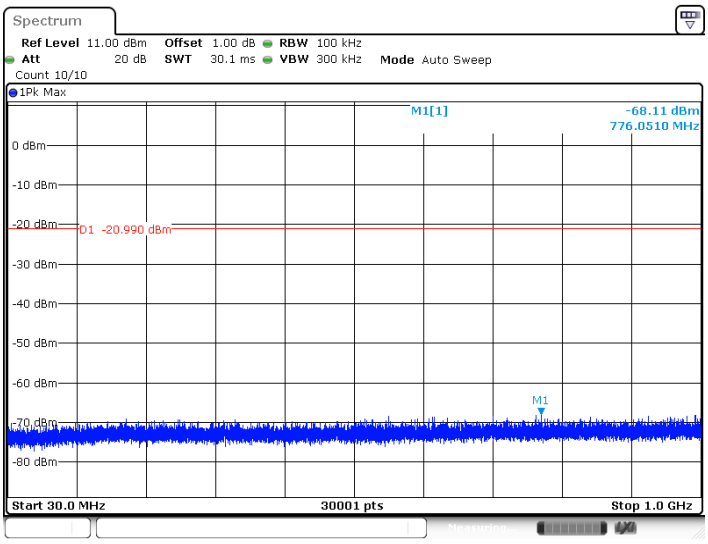
Channel	FreqRange	RefLevel	Result	Limit	Verdict
2402	Reference	-0.99	-0.99	---	PASS
2402	30~1000	30~1000	-68.11	<=-20.99	PASS
2402	1000~26500	1000~26500	-51.95	<=-20.99	PASS

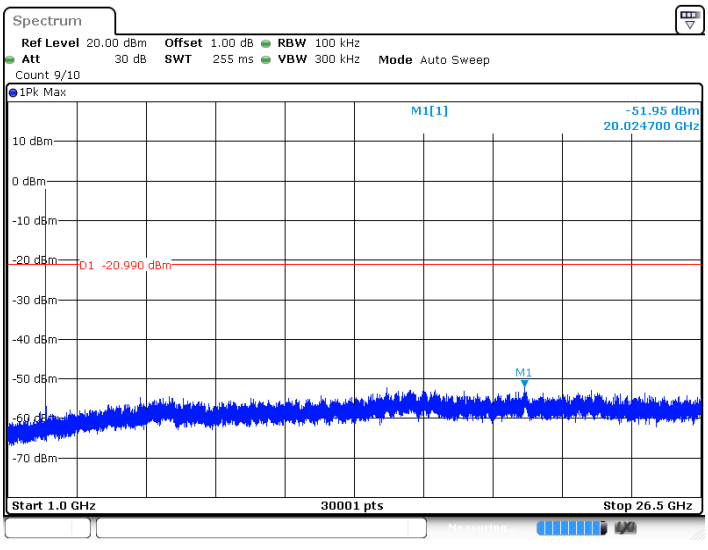


Spurious Emissions at Antenna Terminals

EUT:	E41230
Op Condition:	Operated, TX Mode (2402MHz)
Test Specification:	FCC2.1051 & 15.247(d)
Comment:	12V DC

Test Result
☒ Passed
☐ Not Passed



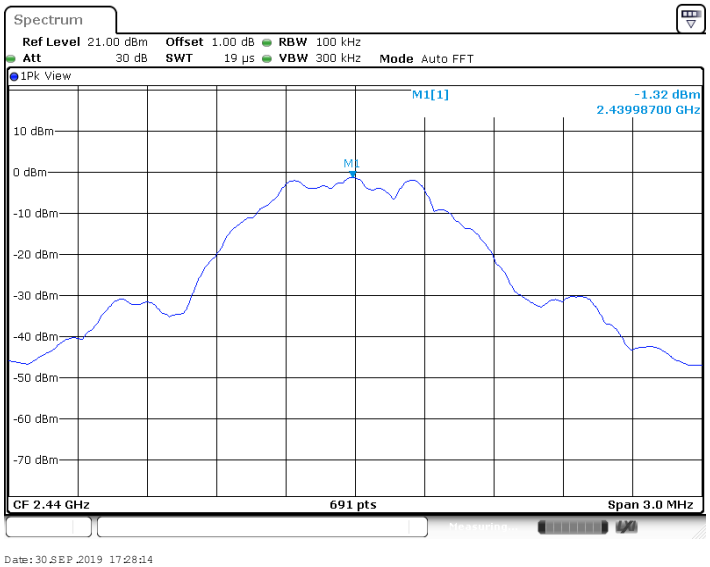


Spurious Emissions at Antenna Terminals

EUT: E41230
Op Condition: Operated, TX Mode (2440MHz)
Test Specification: FCC2.1051 & 15.247(d)
Comment: 12V DC

Test Result
☒ Passed
☐ Not Passed

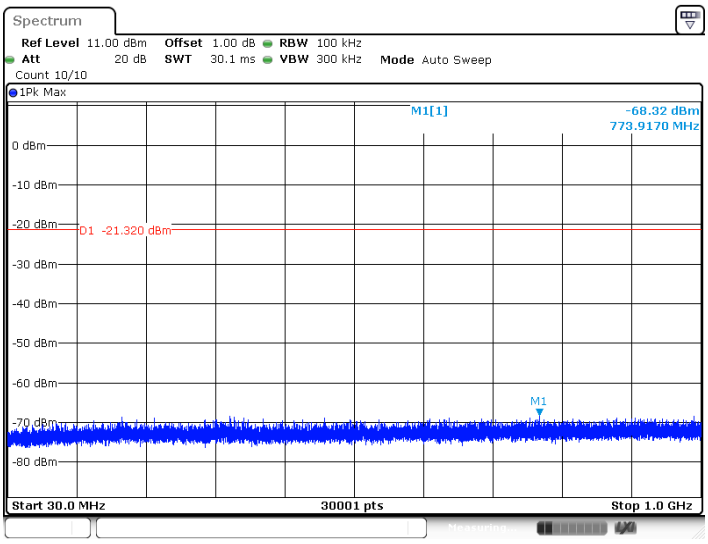
Channel	FreqRange	RefLevel	Result	Limit	Verdict
2440	Reference	-1.32	-1.32	---	PASS
2440	30~1000	30~1000	-68.32	<=-21.32	PASS
2440	1000~26500	1000~26500	-51.61	<=-21.32	PASS

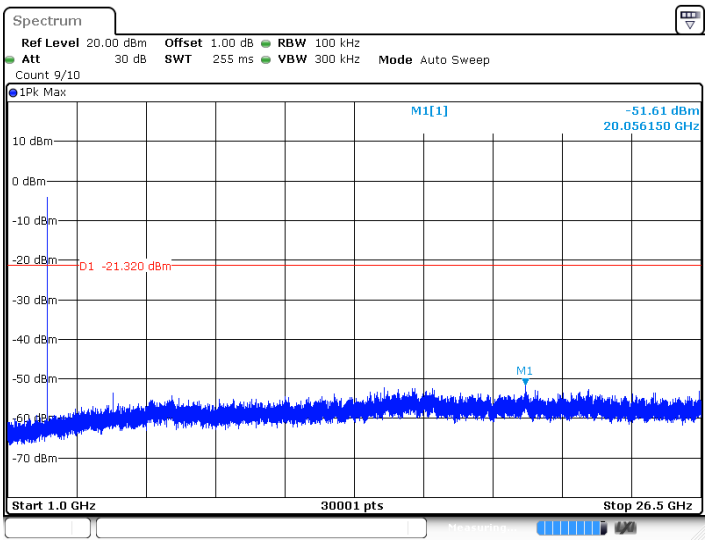


Spurious Emissions at Antenna Terminals

EUT:	E41230
Op Condition:	Operated, TX Mode (2440MHz)
Test Specification:	FCC2.1051 & 15.247(d)
Comment:	12V DC

Test Result
☒ Passed
☐ Not Passed





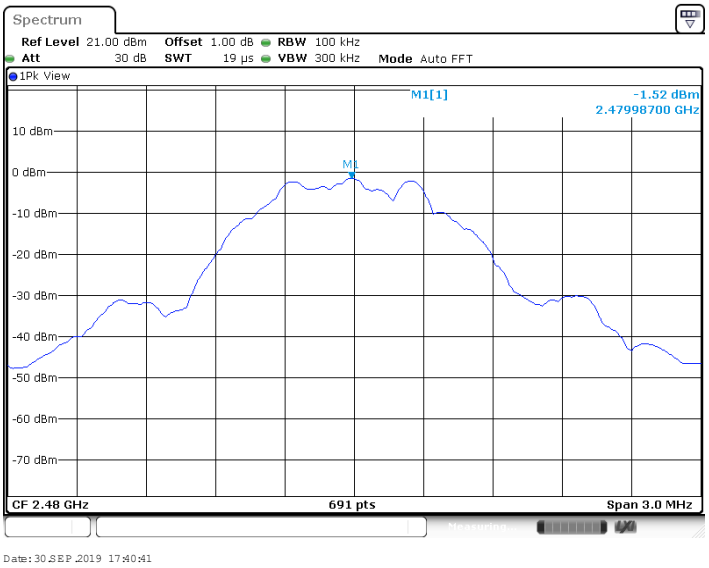
China

Spurious Emissions at Antenna Terminals

EUT: E41230
Op Condition: Operated, TX Mode (2480MHz)
Test Specification: FCC2.1051 & 15.247(d)
Comment: 12V DC

Test Result
☒ Passed
☐ Not Passed

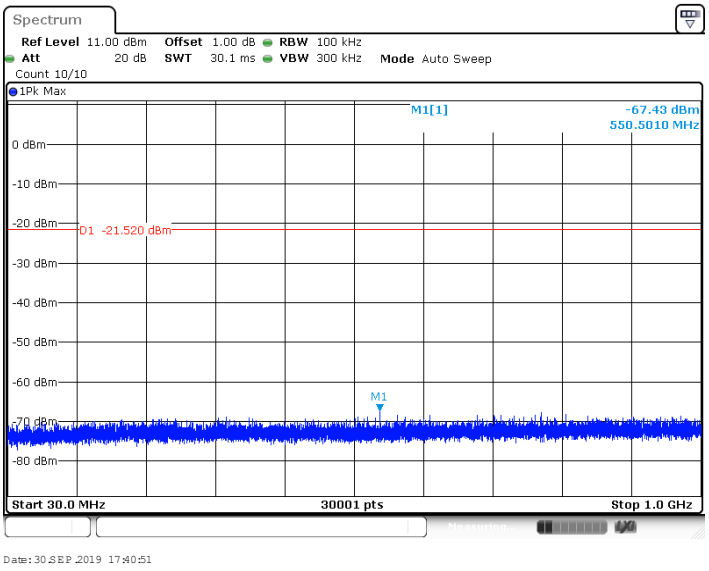
Channel	FreqRange	RefLevel	Result	Limit	Verdict
2480	Reference	-1.52	-1.52	---	PASS
2480	30~1000	30~1000	-67.43	<=-21.52	PASS
2480	1000~26500	1000~26500	-52.12	<=-21.52	PASS

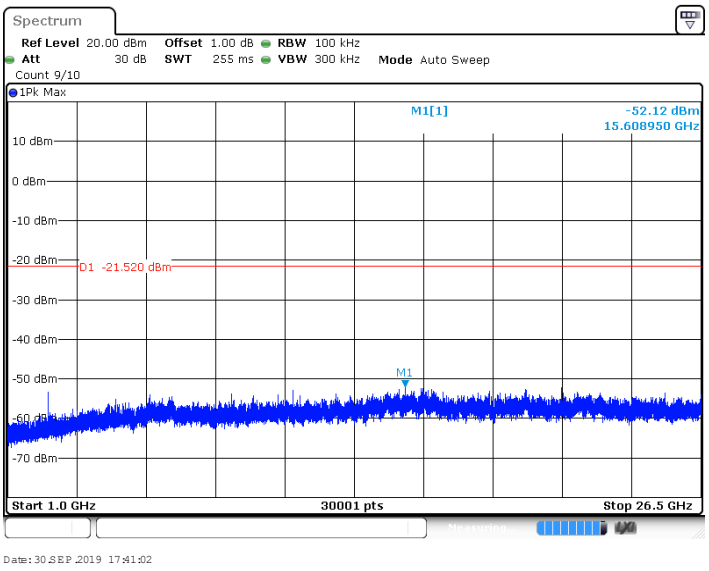


Spurious Emissions at Antenna Terminals

EUT:	E41230
Op Condition:	Operated, TX Mode (2480MHz)
Test Specification:	FCC2.1051 & 15.247(d)
Comment:	12V DC

Test Result
☒ Passed
☐ Not Passed

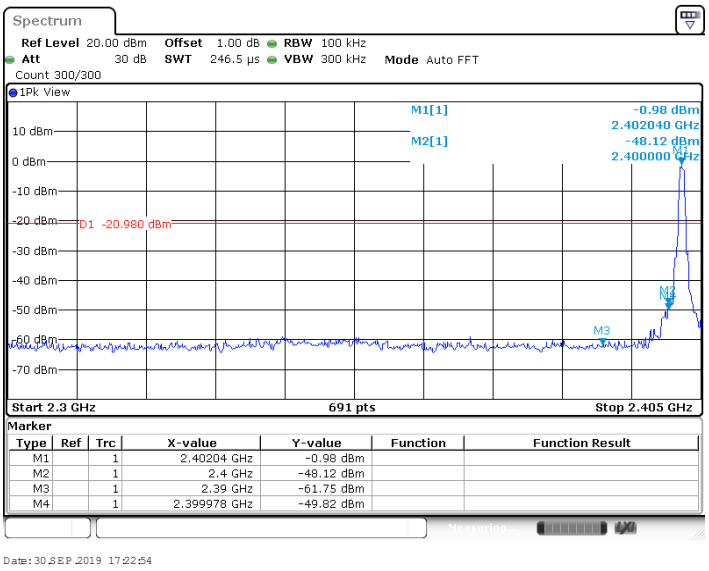




8.6 100kHz Bandwidth of band edges

EUT: E41230
Op Condition: Operated, TX Mode (2402MHz)
Test Specification: FCC15.247(d), Conducted
Comment: 12V DC

Test Result
☒ Passed
☐ Not Passed

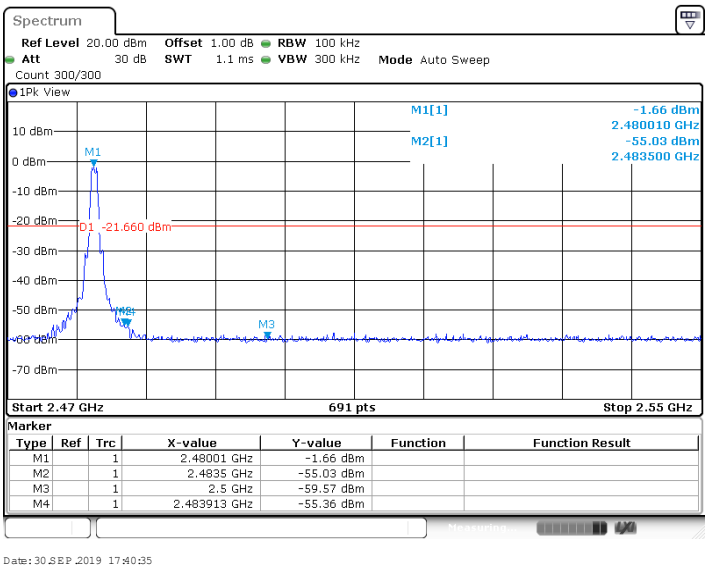


Band edges	Limit
47.14 dB	> 20dB

100kHz Bandwidth of band edges

EUT:	E41230
Op Condition:	Operated, TX Mode (2480MHz)
Test Specification:	FCC15.247(d), Conducted
Comment:	12V DC

Test Result
☒ Passed
☐ Not Passed



Band edges	Limit
53.37 dB	> 20dB

100kHz Bandwidth of band edges

EUT: E41230
Op Condition: Operated, TX Mode (2402MHz & 2480MHz)
Test Specification: FCC15.247(d), Radiated method
Comment: 12V DC

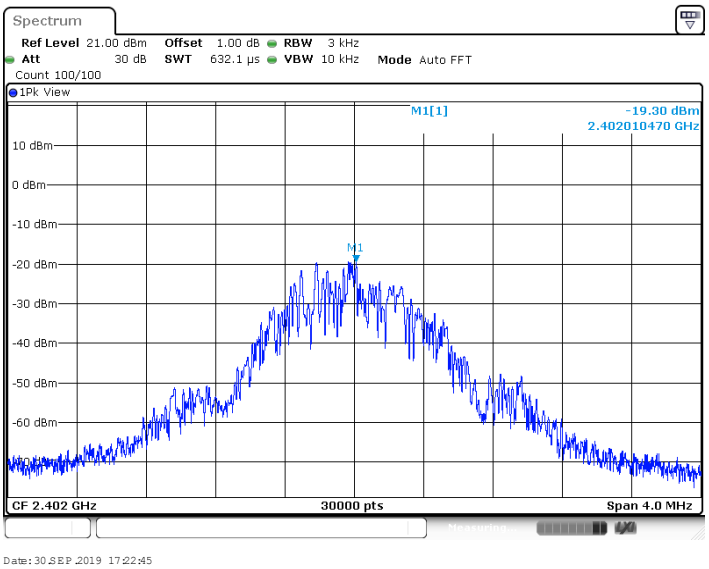
Test Result
☒ Passed
☐ Not Passed

Channel	Frequency MHz	Result dBµV/m	Limit dBµV/m	Margin dB	Detector PK /AV	Ant. Polarity H/V	Corr. (dB)
2402	2400.00	46.11	74.00	-27.89	Peak	H	-5.5
2402	2400.00	38.52	54.00	-15.48	Average	H	-5.5
2402	2400.00	44.78	74.00	-29.22	Peak	V	-5.5
2402	2400.00	34.15	54.00	-19.85	Average	V	-5.5
2480	2483.50	42.16	74.00	-31.84	Peak	H	-4.8
2480	2483.50	33.87	54.00	-20.13	Average	H	-4.8
2480	2483.50	41.98	74.00	-32.02	Peak	V	-4.8
2480	2483.50	33.26	54.00	-20.74	Average	V	-4.8

8.7 Power Spectral Density

EUT: E41230
Op Condition: Operated, TX Mode (2402MHz)
Test Specification: FCC15.247(e)
Comment: 12V DC

Test Result
☒ Passed
☐ Not Passed

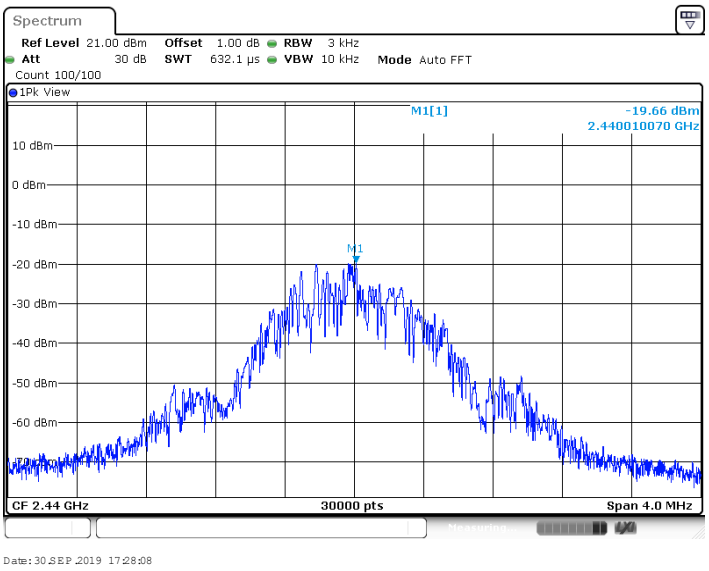


PSD	Limit
-19.30 dBm	< 8 dBm

Power Spectral Density

EUT:	E41230
Op Condition:	Operated, TX Mode (2440MHz)
Test Specification:	FCC15.247(e)
Comment:	12V DC

Test Result
☒ Passed
☐ Not Passed

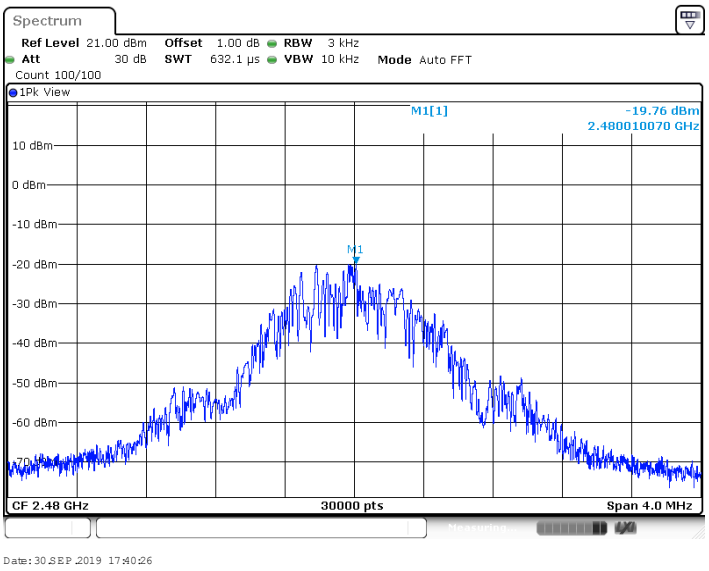


PSD	Limit
-19.66 dBm	< 8 dBm

Power Spectral Density

EUT:	E41230
Op Condition:	Operated, TX Mode (2480MHz)
Test Specification:	FCC15.247(e)
Comment:	12V DC

Test Result
☒ Passed
☐ Not Passed



PSD	Limit
-19.76 dBm	< 8 dBm

8.8 Antenna Requirement

EUT:	E41230
Op Condition:	Operated, TX Mode
Test Specification:	FCC15.203 & 15.247(b)
Comment:	12V DC

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 build-in antenna on PCB, and the maximum gain of this antenna is 0.0 dBi.

9 Appendix A - General Product Information

Radiofrequency radiation exposure evaluation

This exposure evaluation is intended for **FCC ID: O4GAR**

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: 5mm)

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

>> Numeric threshold (2440MHz), mW / 5mm * √2.440GHz ≤ 3.0
Numeric threshold (2440MHz) ≤ 9.602mW

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

>> The power of EUT measured (2402MHz) is: -0.84dBm = 0.824mW
The power of EUT measured (2440MHz) is: -1.03dBm = 0.789mW
The power of EUT measured (2480MHz) is: -1.38dBm = 0.728mW

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