FCC Test Report (Part 15 Subpart C)

Client Information:

Applicant: Emporia Corp

Applicant add.: 7901 SHAFFER PFWY, LITTLETON, CO 80127

Manufacturer: VVDN Technologies Pvt. Ltd.

Manufacturer add.: Plot no. 441, Sector 8, IMT Manesar, 122050, Gurugram (Haryana)

Product Information:

Product Name: Emporia Vue Energy Meter

Model No.: EMCTV2

Derivative model No.: N/A

Brand Name: Emporia Energy

Applied Standard:

FCC PART 15 Subpart C section 15.247

Prepared By:

Anshul Tyagi

Laboratory Details:

AA Electro Magnetic Test Laboratory Private Limited

PlotNo174, Udyog Vihar-Phase4, Sector18, Gurgaon, Haryana, India

Date of Receipt: Jul. 14, 2020 Date of Test: Jul. 14 - Jul. 28, 2020

Date of Issue: Aug. 10, 2020 Test Result: **In Compliance/Pass**

This device has been tested and found to comply with the stated standard(s), and indicated in the test report and are applicable only to the tested sample identified in the report.

Note: This report shall not be reproduced except in full, without the written approval of AA Electro Magnetic Test Laboratory Private Limited, this document may be altered or revised by AA Electro Magnetic Test Laboratory Private Limited, personal only, and shall be noted in the revision of the document. This test report must not be used by the client to claim product endorsement.

Reviewed by: _____ **Approved by:** _____

Dr. R Lenin Raja(Authorized Representative)(/ lenin83/) (Steven Wu)

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2 Test Summary

2.1 Compliance with FCC Part 15 subpart C

Test	Test Requirement	Standard Paragraph	Result
Antenna Requirement	FCC Part 15 C	Section 15.203	**PASS**
Conduction Emissions	FCC Part 15 C	Section 15.207(a)	**PASS**
Radiated Emissions	FCC Part 15 C	Section 15.247(d), 15.209, 15.205	**PASS**
Occupied Bandwidth	FCC Part 15 C	Section 15.247(a)(2)	**PASS**
Peak power density	FCC Part 15 C	Section 15.247(e)	**PASS**
Maximum Peak Output Power	FCC Part 15 C	Section 15.247(b)(1)	**PASS**
Band edge	FCC Part 15 C	Section 15.247(d)	**PASS**
Conducted Spurious Emissions	FCC Part 15 C	Section 15.247(d)	**PASS**

Note: N/A is an abbreviation for Not Applicable.

Model description: Emporia Vue2 is the Smart Home Energy Management Solution that provides 24/7 monitoring of home energy consumption and generation, including: appliances, heating, AC and solar. The Vue2 home energy monitoring system gives homeowners insight and assurance by preventing costly repairs, making homes more energy efficient, and saving you money in the process.

(1)	Reference to the KDB 558074 D01 DTS Meas Guidance v03r03
(2)	Reference to ANSI C63.10:2013.

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2.2 Test Location

All tests were performed at:

AA Electro Magnetic Test Laboratory Private Limited

Plot No 174, Udyog Vihar - Phase 4, Sector 18, Gurgaon, Haryana, India

Tel.: +91-0124-4235350

2.3 Measurement Uncertainty

All measurements involve certain levels of uncertainties, The following measurements uncertainty Levels have estimated based on ANSI C63.4:2009, the maximum value of the uncertainty as below

No.	Item	Uncertainty
1	Conducted Emission Test	2.79dB
2	Radiated Emission Test	2.81dB

3 Test Facility

AA Electro Magnetic Test Laboratory is an ISO 17025:2017 certified lab by NABL, Certification No.TC-8597, CE Marking Certificate from Phoenix Germany #800058_00 and lLC-MRA #0366. We are also accredited ISO17025:2017 by A2LA(American association for laboratory accreditation) #5593.0I ,FCC Recognized #137777, ISED recognized for wireless product #26046, VCCI(Japan) supporting member #4053..

3.1 Deviation from standard

None

3.2 Abnormalities from standard conditions

None

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4 General Information

4.1 General Description of EUT

Manufacturer:	VVDN Technologies Pvt. Ltd.
Manufacturer Address:	Plot no. 441, Sector 8, IMT Manesar, 122050, Gurugram (Haryana)
EUT Name:	Emporia Vue Energy Meter
Model No:	EMCTV2
Brand Name:	Emporia Energy
Serial No:	N/A
Derivative model No.:	N/A
Operation frequency:	2402 MHz to 2480 MHz
NUMBER OF CHANNEL:	40
Modulation Technology:	GFSK
Bluetooth version:	BT 4.0
Antenna Gain:	2 dBi
H/W No.:	REV 4
S/W No.:	Vue2-1594671260
Power Supply Range:	85-265VAC, 50/60Hz
Power Cord:	1.1 m x 2 wires unscreened AC cable
Note:	
1.	For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

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Description of Channel:			
Channel	Frequency (MHz)	Channel	Frequency (MHz)
37	2402	18	2442
00	2404	19	2444
01	2406	20	2446
02	2408	21	2448
03	2410	22	2450
04	2412	23	2452
05	2414	24	2454
06	2416	25	2456
07	2418	26	2458
08	2420	27	2460
09	2422	28	2462
10	2424	29	2464
38	2426	30	2466
11	2428	31	2468
12	2430	32	2470
13	2432	33	2472
14	2434	34	2474
15	2436	35	2476
16	2438	36	2478
17	2440	39	2480

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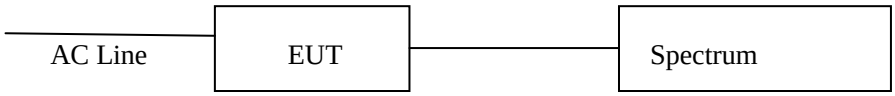
4.2 Description of Test conditions

(1) EUT was tested in normal configuration (Please See following Block diagram)

1. Block diagram of EUT configuration(TX Mode)



Note: 1.The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is not less than 98%.

(2) E.U.T. test conditions:

15.31(e): For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

(3) Test frequencies:

According to the 15.31(m) Measurements on intentional radiators or receivers, other than TV broadcast receivers, shall be performed and. If required reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table:

Frequency range over which device operates	Number of frequencies	Location in the range of operation
1 MHz or less	1	Middle
1 to 10 MHz	2	1 near top and 1 near bottom
More than 10 MHz	3	1 near top, 1 near middle and 1 near bottom

(4) Frequency range of radiated measurements:

According to the 15.33, the test range will be up to the tenth harmonic of the highest fundamental frequency.

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4.3 Test Peripheral List

No.	Equipment	Manufacturer	EMC Compliance	Model No.	Serial No.	Power cord	signal cable
1	N/A	N/A	N/A	N/A	N/A	N/A	N/A

4.4 EUT Peripheral List

No.	Equipment	Manufacturer	FCC ID	Model No.	Serial No.	Power cord	signal cable
1	Split Core Current Transformer (Quantity - 3)	XIAMEN ZTC TECHNOLOGY CO., LTD.	N/A	CT314F300	N/A	N/A	1.5m unshielded cable
2	Split Core Current Transformer (Quantity - 16)	XIAMEN ZTC TECHNOLOGY CO., LTD.	N/A	CT312F300	N/A	N/A	1.5m unshielded cable

5 Equipments List for All Test Items

No	Test Equipment	Manufacturer	Model No	Serial No	Cal. Date	Cal. Due Date
1	EMI TEST Receiver	Rohde and Schwarz	ESIB26	838786/010	2020/01/28	2021/01/27
2	Loop antenna	DAZE Beijing	ZN30900C	18052	2020/01/29	2021/01/28
3	Hi power horn antenna	DAZE Beijing	ZN30700	18012	2020/01/30	2021/01/29
4	Horn antenna	DAZE Beijing	ZN30702	18006	2020/01/30	2021/01/29
5	Horn antenna	DAZE Beijing	ZN30703	18005	2020/01/30	2021/01/29
6	Preamplifier	KELIANDA	LNA-0009295	-	2020/01/28	2021/01/29
7	Preamplifier	KELIANDA	CF-00218	-	2020/01/28	2021/01/27
8	Bi conical Antenna	DAZE Beijing	ZN30505C	17038	2020/01/28	2021/01/29
9	EMI-RECEIVER	Schwarzbeck	FCKL	1528194	2020/01/28	2021/01/27
10	Spectrum Analyzer	ADVANTEST	R3361	-	2020/05/15	2021/05/14
11	LISN	Kyoritsu	KNW-407	8-1789-5	2020/01/28	2021/01/27
12	Network-LISN	Schwarzbeck	NNBM8125	81251314	2020/01/28	2021/01/27
13	Network-LISN	Schwarzbeck	NNBM8125	81251315	2020/01/28	2021/01/27
14	PULSELIMITER	Rohde and Schwarz	ESH3-Z2	100681	2020/05/13	2021/05/12
15	50ΩCoaxialSwitch	DAIWA	1565157	-	2020/05/13	2021/05/12
16	50ΩCoaxialSwitch	-	-	-	2020/05/13	2021/05/12
17	Wireless signal power meter	DARE!!	RPR3006W	RFSW190220	2020/01/29	2021/01/28

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18	Signal Generator	KEYSIGHT	N5181A	512071	2020/01/29	2021/01/28
19	RF Vector Signal Generator	Keysight	N5182B	512094	2020/01/29	2021/01/28
20	Spectrum analyzer	R&S	FSV-40N	101385	2020/01/29	2021/01/28
21	Radio Communication Tester	R&S	CMW 500	124589	2020/5/15	2021/5/14
22	Signal Generator	R&S	SMP02	837017/004 836593/005	2020/5/15	2021/5/14
23	DC Power Supply	Guanker	JK15040K	TNC/ET/C/0 01/15	2020/2/2	2021/2/1
24	Pro. Temp & Humi. chamber	MENTEK	MHP-150-1C	MAA081125 01	2020/2/2	2021/2/1
25	Attenuators	AGILENT	8494B	-	-	-
26	Attenuators	AGILENT	8495B	-	-	-

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6 Test Result

6.1 Antenna Requirement

6.1.1 Standard requirement

15.203 requirements: For intentional device, according to 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.

15.247(c) (1)(i) requirement: (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

6.1.2 EUT Antenna

The antenna is layout on PCB board and no consideration of replacement. Antenna gain is maximum 2 dBi from 2.4GHz to 2.5GHz.

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6.2 Conduction Emissions Measurement

6.2.1 Applied procedures / Limit

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

Note: Decreases with the logarithm of the frequency.

6.2.2 Test procedure

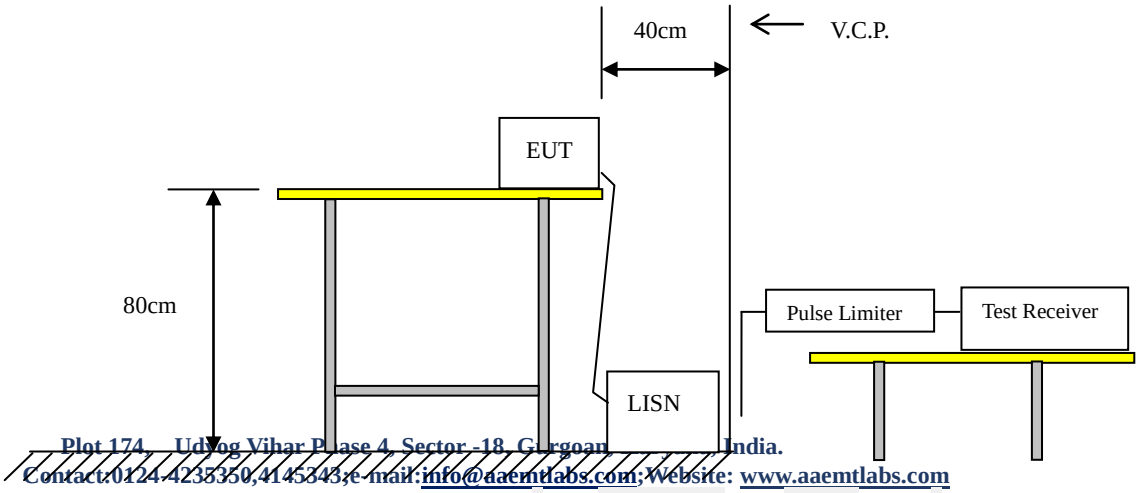
1. The mains terminal disturbance voltage test was conducted in a shielded room.

2. The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50µH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

3. The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by 0.1m of insulation.

4. The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0,4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0,8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0,8 m from the LISN 2.

Test setup



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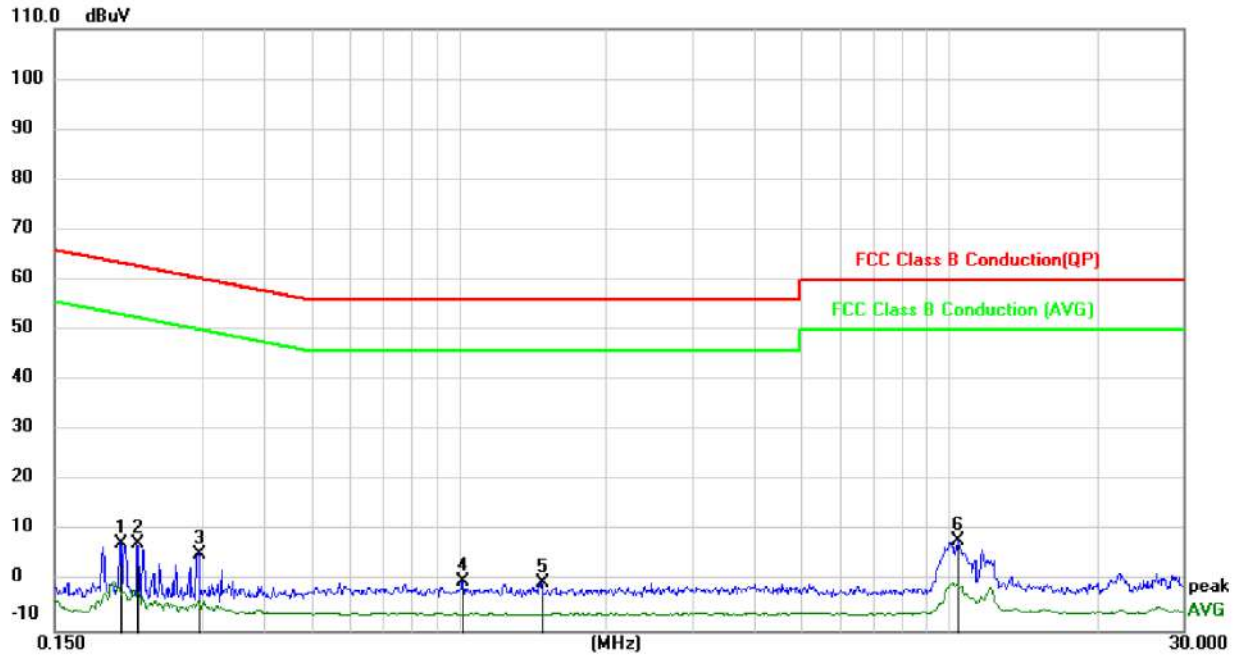
6.2.3 Test results(Worst Case)

EUT:	Emporia Vue Energy Meter	Model Name. :	EMCTV2
Temperature:	25 ℃	Relative Humidity:	51%
Pressure:	1010hPa	Test Date :	2020-07-28
Test Mode:	TX CH37 2402MHz	Phase :	Ambient
Test Voltage :	AC 120V, 60Hz		

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.2042	6.27	1.27	7.54	63.43	-55.89	peak
2		0.2210	6.34	1.26	7.60	62.78	-55.18	peak
3		0.2942	4.12	1.25	5.37	60.40	-55.03	peak
4		1.0175	-0.73	0.90	0.17	56.00	-55.83	peak
5		1.4720	-1.20	0.85	-0.35	56.00	-56.35	peak
6	*	10.3500	7.36	0.85	8.21	60.00	-51.79	peak

Remark: Factor = LISN factor + Cable Loss + Pulse limiter factor.



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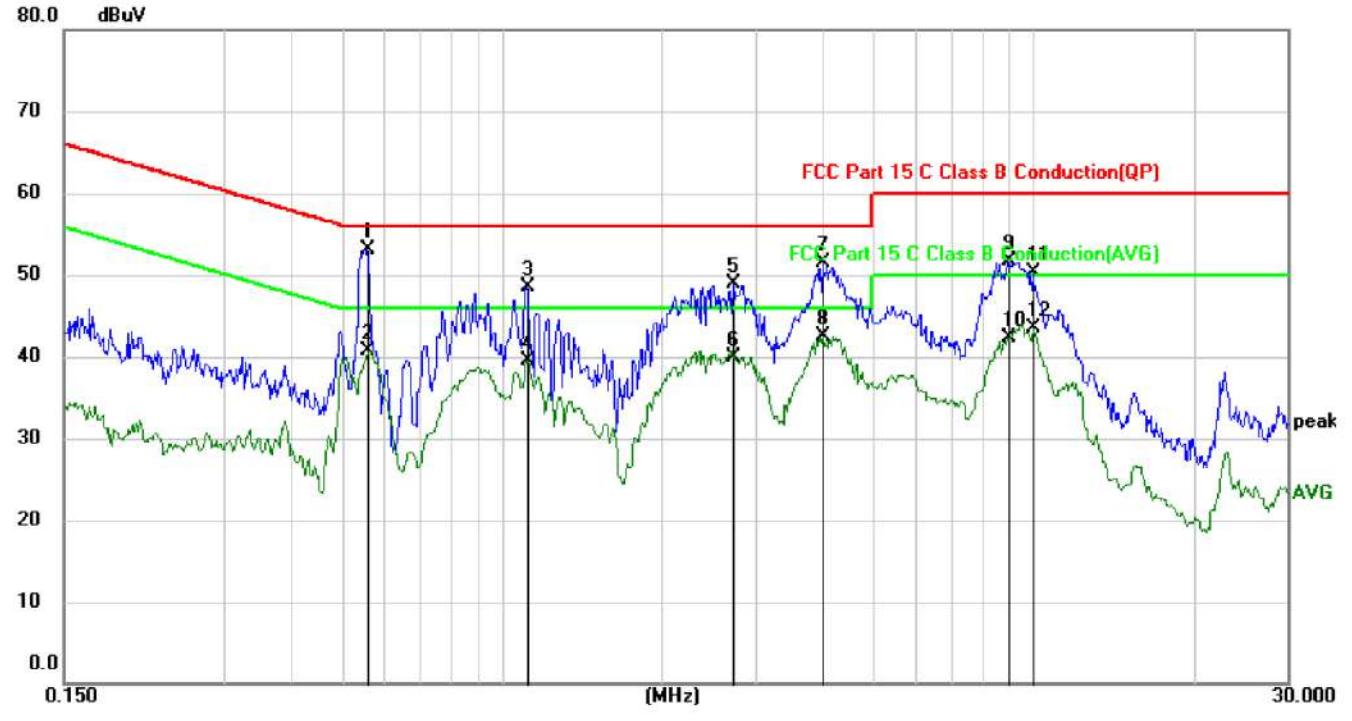
EUT:	Emporia Vue Energy Meter	Model Name. :	EMCTV2
Temperature:	25 ℃	Relative Humidity:	51%
Pressure:	1010hPa	Test Date :	2020-07-28
Test Mode:	TX CH37 2402MHz	Phase :	Line
Test Voltage :	AC 120V, 60Hz		

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	*	0.5584	36.91	16.10	53.01	56.00	-2.99	peak
2		0.5584	24.53	16.10	40.63	46.00	-5.37	AVG
3		1.1119	32.63	15.89	48.52	56.00	-7.48	peak
4		1.1164	23.57	15.89	39.46	46.00	-6.54	AVG
5		2.7094	33.01	15.83	48.84	56.00	-7.16	peak
6		2.7094	24.09	15.83	39.92	46.00	-6.08	AVG
7		4.0099	35.57	15.88	51.45	56.00	-4.55	peak
8		4.0099	26.56	15.88	42.44	46.00	-3.56	AVG
9		8.9250	35.76	15.86	51.62	60.00	-8.38	peak
10		8.9250	26.38	15.86	42.24	50.00	-7.76	AVG
11		9.9250	34.53	15.85	50.38	60.00	-9.62	peak
12		9.9250	27.59	15.85	43.44	50.00	-6.56	AVG

Remark: Factor = LISN factor + Cable Loss + Pulse limiter factor.



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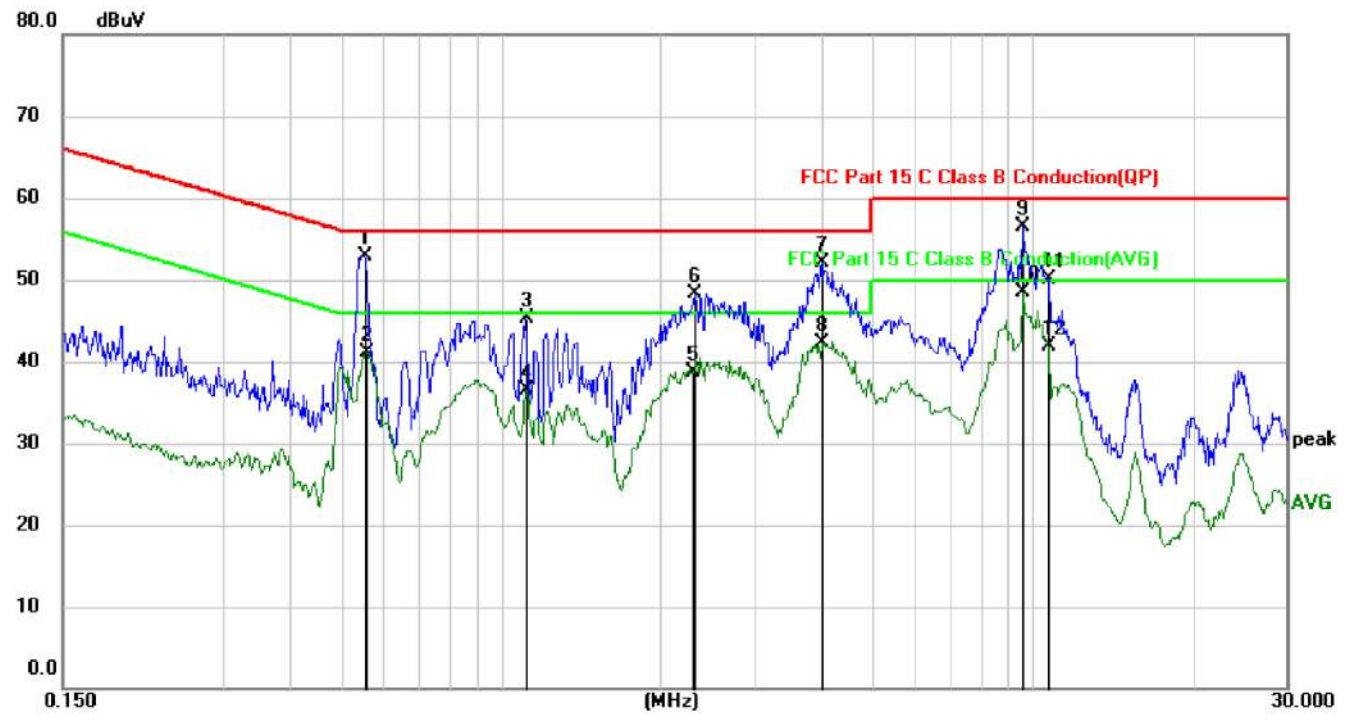
EUT:	Emporia Vue Energy Meter	Model Name. :	EMCTV2
Temperature:	25 ℃	Relative Humidity:	51%
Pressure:	1010hPa	Test Date :	2020-07-28
Test Mode:	TX CH37 2402MHz	Phase :	Neutral
Test Voltage :	AC 120V, 60Hz		

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.5534	36.66	16.17	52.83	56.00	-3.17	peak
2		0.5584	24.96	16.17	41.13	46.00	-4.87	AVG
3		1.1119	29.27	16.07	45.34	56.00	-10.66	peak
4		1.1119	20.51	16.07	36.58	46.00	-9.42	AVG
5		2.2863	22.87	15.82	38.69	46.00	-7.31	AVG
6		2.3088	32.56	15.82	48.38	56.00	-7.62	peak
7		4.0010	36.15	15.88	52.03	56.00	-3.97	peak
8		4.0010	26.48	15.88	42.36	46.00	-3.64	AVG
9		9.5500	40.58	15.85	56.43	60.00	-3.57	peak
10	*	9.5500	32.61	15.85	48.46	50.00	-1.54	AVG
11		10.6996	34.28	15.85	50.13	60.00	-9.87	peak
12		10.6996	26.07	15.85	41.92	50.00	-8.08	AVG

Remark: Factor = LISN factor + Cable Loss + Pulse limiter factor.



6.3 Radiated Emissions Measurement

6.3.1 Applied procedures / Limit

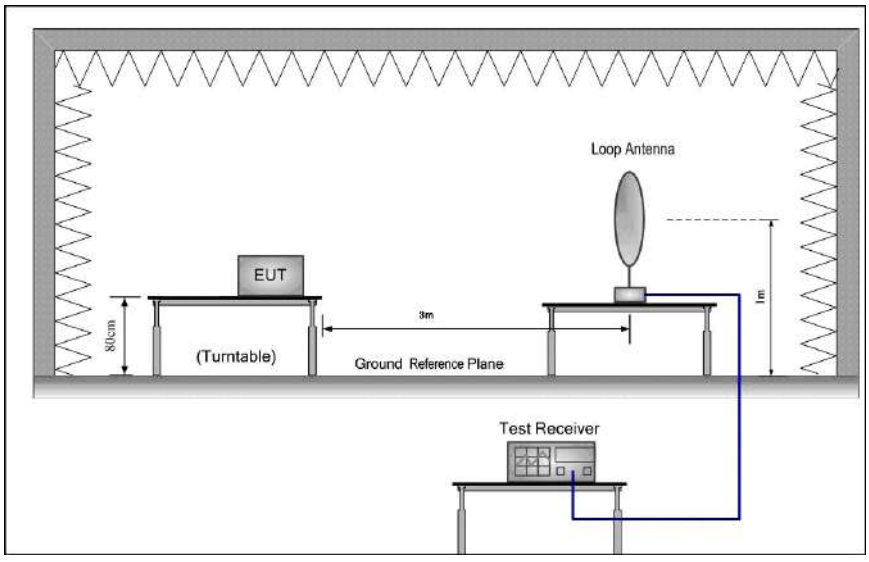
15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Frequency of Emission (MHz)	Field Strength		Measurement Distance (meters)
	µV/m	dBµV/m	
0.009-0.49	2400/F(kHz)		300
0.49-1.705	24000/F(kHz)		30
1.705-30	30		30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

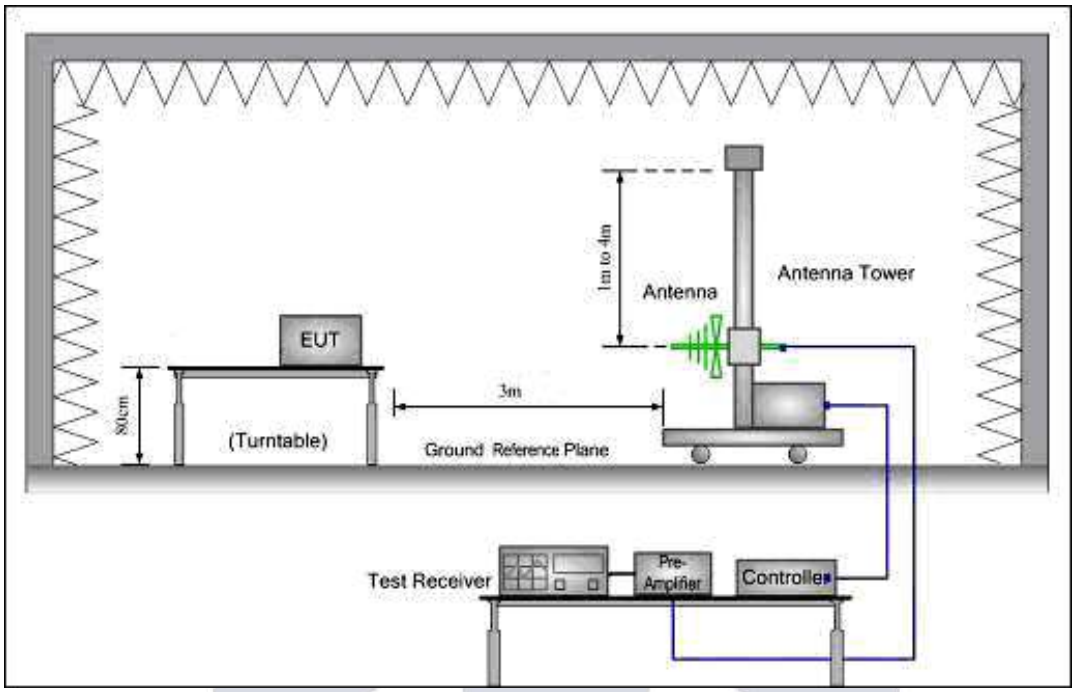
6.3.2 Test setup

Test Configuration:

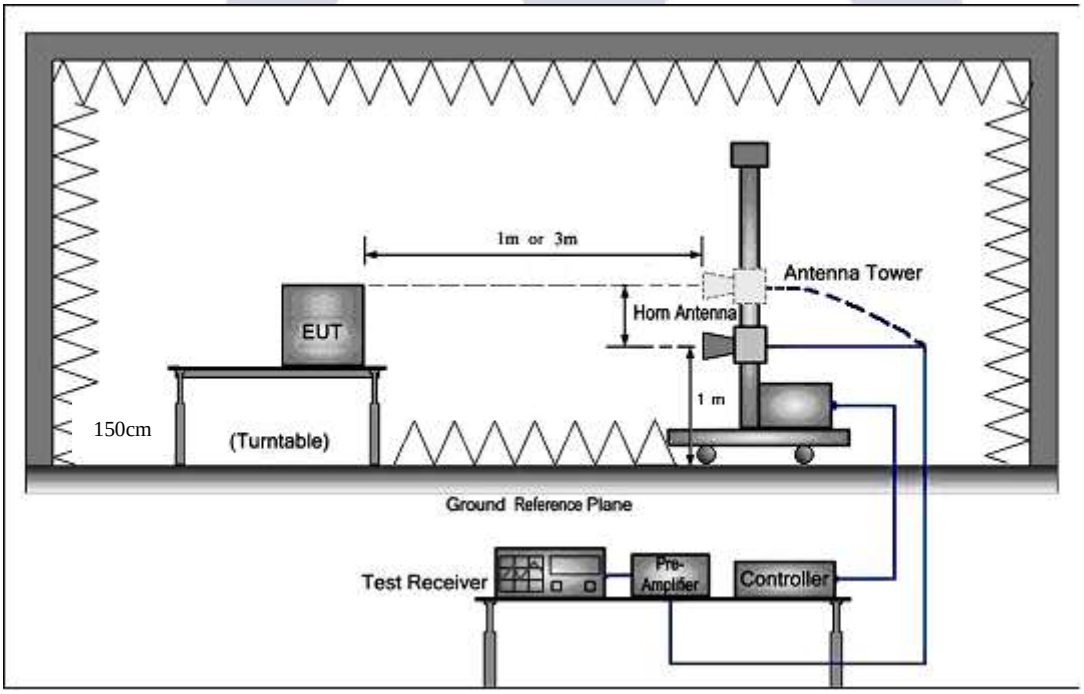
1) 9 kHz to 30 MHz emissions:



2) 30 MHz to 1 GHz emissions:



3) 1 GHz to 25 GHz emissions:



6.3.3 Test procedure

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna height 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.

d. 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter, for the test frequency of above 1GHz, horn antenna opening in the test would have been facing the EUT when rise or fall) and the table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. The resolution bandwidth and video bandwidth of the test receiver was 1MHz and 1MHz for Peak detection at frequency above 1GHz.

g. Test the EUT in the lowest channel (2402MHz), the middle channel (2440MHz), the Highest channel (2480MHz)

h. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.

i. Repeat above procedures until all frequencies measured was complete.

For measurement at frequency above 1GHz

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

For Average measurement at frequency above 1GHz.

The resolution bandwidth of the test receiver was 1MHz; due to the shortest pulse width T is 116us, according the video bandwidth should not smaller than 1/T, so the video bandwidth is 10Hz.

In 18GHz to 25GHz, The EUT was checked by Horn ANT. But the test result at least have 20dB margin.

The EUT was tested in Chamber Site.

6.3.4 Test Result(Worst Case)

Radiated Emissions Test Data Below 30MHz

EUT:	Emporia Vue Energy Meter	Model Name :	EMCTV2
Temperature:	25 ℃	Test Data	2020-07-28
Pressure:	1005 hPa	Relative Humidity:	60%
Test Mode :	TX	Test Voltage :	AC 120V, 60Hz
Measurement Distance	3 m	Frequency Range	9KHz to 30MHz
RBW/VBW	9KHz~150KHz/RB 200Hz for QP, 150KHz~30MHz/RB 9KHz for QP		

No emission found between lowest internal used/generated frequencies to 30MHz.

Radiated Emissions Test Data Below 1GHz

EUT:	Emporia Vue Energy Meter	Model Name :	EMCTV2
Temperature:	25 ℃	Test Data	2020-07-28
Pressure:	1005 hPa	Relative Humidity:	60%
Test Mode :	TX	Test Voltage :	AC 120V, 60Hz
Measurement Distance	3 m	Frequency Range	30MHz to 1GHz
RBW/VBW	100KHz / 300KHz for spectrum, RBW=120KHz for receiver.		

Test at Channel 37 (2.402 GHz) in transmitting status

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

Ambient:

Peak scan

Level (dBµV/m)

Quasi-peak measurement

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		33.8878	16.77	-15.52	1.25	40.00	-38.75	peak
2		661.7635	23.16	-6.75	16.41	46.00	-29.59	peak
3		782.2846	22.88	-4.78	18.10	46.00	-27.90	peak
4		877.5351	25.54	-4.61	20.93	46.00	-25.07	peak
5	*	902.8056	36.60	-4.49	32.11	46.00	-13.89	peak
6		941.6834	34.74	-3.31	31.43	46.00	-14.57	peak

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Note: '*' means the worst case

Measurement Level = Reading Level + Factor

Factor= Ant Factor + Cable Loss - Pre-amplifier

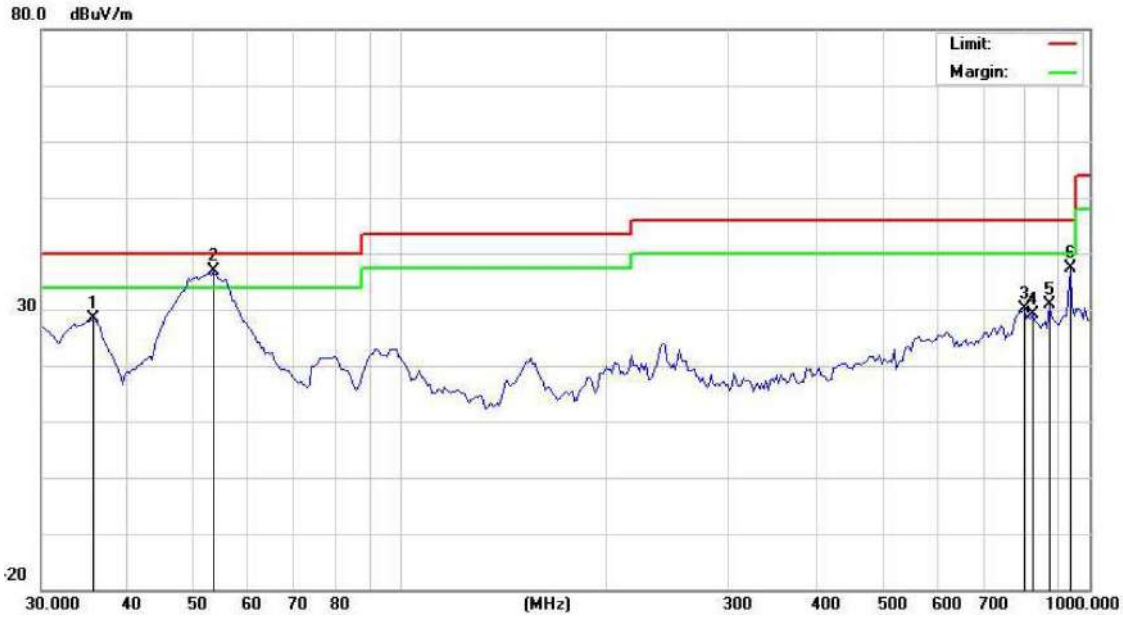
Test at Channel 37 (2.402 GHz) in transmitting status

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

Vertical:

Peak scan

Level (dBμV/m)



Quasi-peak measurement

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		35.8316	62.34	-33.88	28.46	40.00	-11.54	QP
2	*	53.3793	66.70	-29.74	36.96	40.00	-3.04	QP
3		805.6112	34.44	-4.42	30.02	46.00	-15.98	QP
4		828.9378	33.63	-4.53	29.10	46.00	-16.90	QP
5		875.5910	35.54	-4.63	30.91	46.00	-15.09	QP
6		941.6833	40.66	-3.31	37.35	46.00	-8.65	QP

Note: '*' means the worst case

Measurement Level = Reading Level + Factor

Factor= Ant Factor + Cable Loss - Pre-amplifier

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Test at Channel 37 (2.402 GHz) in transmitting status

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

Horizontal:

Peak scan

Level (dBμV/m)

Quasi-peak measurement

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		30.0000	63.19	-34.26	28.93	40.00	-11.07	QP
2		35.8316	65.93	-33.88	32.05	40.00	-7.95	QP
3	*	53.3265	63.98	-29.74	34.24	40.00	-5.76	QP
4		80.5408	53.97	-28.50	25.47	40.00	-14.53	QP
5		826.9939	33.28	-4.53	28.75	46.00	-17.25	QP
6		939.7394	33.51	-3.38	30.13	46.00	-15.87	QP

Note: '*' means the worst case

Measurement Level = Reading Level + Factor

Factor= Ant Factor + Cable Loss - Pre-amplifier

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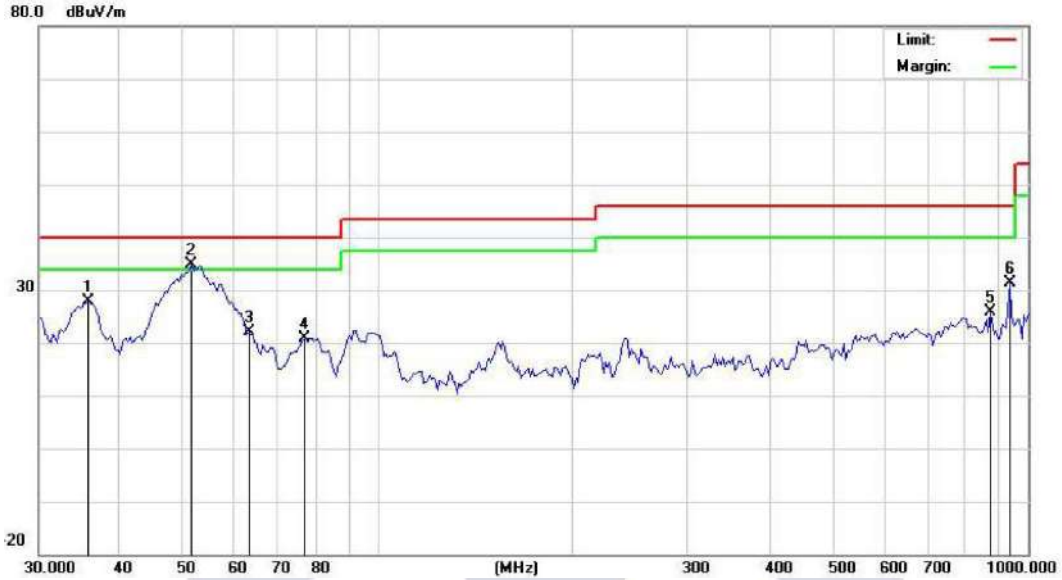
Test at Channel 17 (2.440 GHz) in transmitting status

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

Vertical:

Peak scan

Level (dBµV/m)



Quasi-peak measurement

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		35.8316	61.84	-33.88	27.96	40.00	-12.04	QP
2	*	51.5363	64.78	-29.81	34.97	40.00	-5.03	QP
3		63.1856	51.38	-29.34	22.04	40.00	-17.96	QP
4		76.9252	49.62	-28.69	20.93	40.00	-19.07	QP
5		875.5910	30.54	-4.63	25.91	46.00	-20.09	QP
6		941.6833	34.66	-3.31	31.35	46.00	-14.65	QP

Note: '*' means the worst case

Measurement Level = Reading Level + Factor

Factor= Ant Factor + Cable Loss - Pre-amplifier

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Test at Channel 17 (2.440 GHz) in transmitting status

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

Horizontal:

Peak scan

Level (dBμV/m)

Quasi-peak measurement

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		36.0138	64.44	-33.88	30.56	40.00	-9.44	QP
2	*	53.3265	62.48	-29.74	32.74	40.00	-7.26	QP
3		88.3164	50.11	-27.44	22.67	43.50	-20.83	QP
4		780.3405	30.98	-4.81	26.17	46.00	-19.83	QP
5		885.3106	30.43	-4.55	25.88	46.00	-20.12	QP
6		937.7952	30.64	-3.44	27.20	46.00	-18.80	QP

Note: '*' means the worst case

Measurement Level = Reading Level + Factor

Factor= Ant Factor + Cable Loss - Pre-amplifier

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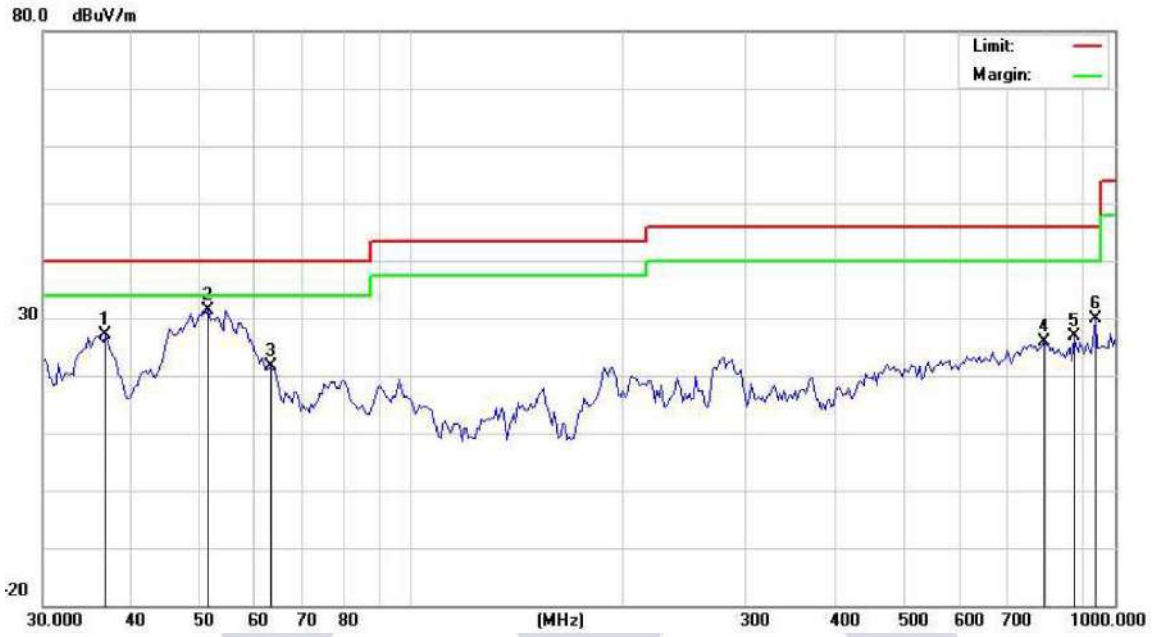
Test at Channel 39 (2.480 GHz) in transmitting status

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

Vertical:

Peak scan

Level (dBμV/m)



Quasi-peak measurement

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		36.7811	60.94	-33.82	27.12	40.00	-12.88	QP
2	*	51.5363	61.28	-29.81	31.47	40.00	-8.53	QP
3		63.1856	50.88	-29.34	21.54	40.00	-18.46	QP
4		793.9477	30.53	-4.63	25.90	46.00	-20.10	QP
5		875.5910	31.54	-4.63	26.91	46.00	-19.09	QP
6		941.6833	33.16	-3.31	29.85	46.00	-16.15	QP

Note: '*' means the worst case

Measurement Level = Reading Level + Factor

Factor= Ant Factor + Cable Loss - Pre-amplifier

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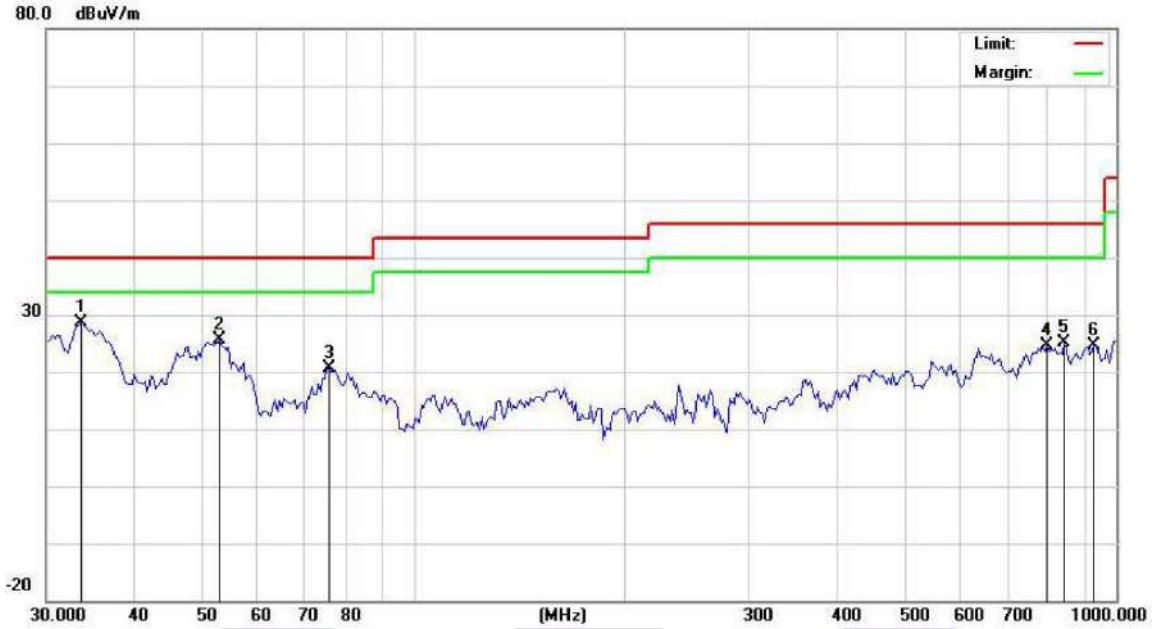
Test at Channel 39 (2.480 GHz) in transmitting status

30 MHz~1 GHz Spurious Emissions .Quasi-Peak Measurement

Horizontal:

Peak scan

Level (dBμV/m)



Quasi-peak measurement

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1	*	33.5698	62.75	-34.03	28.72	40.00	-11.28	QP
2		53.3265	55.48	-29.74	25.74	40.00	-14.26	QP
3		75.8519	49.40	-28.73	20.67	40.00	-19.33	QP
4		799.7794	29.24	-4.51	24.73	46.00	-21.27	QP
5		850.3206	29.65	-4.51	25.14	46.00	-20.86	QP
6		937.7952	28.14	-3.44	24.70	46.00	-21.30	QP

Note: '*' means the worst case

Measurement Level = Reading Level + Factor

Factor= Ant Factor + Cable Loss - Pre-amplifier

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Radiated Emissions Test Data Above 1GHz

EUT:	Emporia Vue Energy Meter	Model Name :	EMCTV2
Temperature:	25 ℃	Test Data	2020-07-28
Pressure:	1010 hPa	Relative Humidity:	60%
Test Mode :	TX	Test Voltage :	AC 120V, 60Hz
Measurement Distance	3 m	Frequency Range	1GHz to 25GHz
RBW/VBW	Spurious emission: 1MHz/1MHz for Peak, 1MHz/10Hz for Average. non-restricted band: 100KHz/300KHz for Peak.		

(a) Antenna polarization: Horizontal

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4804	51.75	5.06	56.81	74	-17.19	PEAK
4804	38.73	5.06	43.79	54	-10.21	AVERAGE
7206	47.19	7.03	54.22	74	-19.78	PEAK
7206	35.24	7.03	42.27	54	-11.73	AVERAGE

(b) Antenna polarization: Vertical

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4804	50.25	5.06	55.31	74	-18.69	PEAK
4804	36.78	5.06	41.84	54	-12.16	AVERAGE
7206	45.16	7.03	52.19	74	-21.81	PEAK
7206	34.13	7.03	41.16	54	-12.84	AVERAGE

Note:

8~25GHz at least have 20dB margin. No recording in the test report.

Measurement Level = Reading Level + Factor

Factor= Ant Factor + Cable Loss - Pre-amplifier

Low Channel 37: 2402 MHz

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(a) Antenna polarization: Horizontal

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4880	49.47	5.14	54.61	74	-19.39	PEAK
4880	37.07	5.14	42.21	54	-11.79	AVERAGE
7320	44.83	7.52	52.35	74	-21.65	PEAK
7320	32.49	7.52	40.01	54	-13.99	AVERAGE

(b) Antenna polarization: Vertical

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4880	49.05	5.14	54.19	74	-19.81	PEAK
4880	35.63	5.14	40.77	54	-13.23	AVERAGE
7320	43.20	7.52	50.72	74	-23.28	PEAK
7320	33.87	7.52	41.39	54	-12.61	AVERAGE

Note:

8~25GHz at least have 20dB margin. No recording in the test report.

Measurement Level = Reading Level + Factor

Factor= Ant Factor + Cable Loss - Pre-amplifier

Middle Channel 17: 2440 MHz

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(a) Antenna polarization: Horizontal

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4960	48.95	5.14	54.09	74	-19.91	PEAK
4960	38.31	5.14	43.45	54	-10.55	AVERAGE
7440	45.27	7.52	52.79	74	-21.21	PEAK
7440	35.08	7.52	42.60	54	-11.40	AVERAGE

(b) Antenna polarization: Vertical

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
4960	47.87	5.14	53.01	74	-20.99	PEAK
4960	37.00	5.14	42.14	54	-11.86	AVERAGE
7440	45.70	7.52	53.22	74	-20.78	PEAK
7440	35.12	7.52	42.64	54	-11.36	AVERAGE

Note:

8~25GHz at least have 20dB margin. No recording in the test report.

Measurement Level = Reading Level + Factor

Factor= Ant Factor + Cable Loss - Pre-amplifier

High Channel 39: 2480 MHz

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6.3.5 TEST RESULTS (Restricted Bands Requirements)

EUT:	Emporia Vue Energy Meter	Model Name :	EMCTV2
Temperature:	25 ℃	Test Data	2020-07-28
Pressure:	1010 hPa	Relative Humidity:	60%
Test Mode :	TX CH37 2402MHz (Worst case)	Test Voltage :	AC 120V, 60Hz
RBW/VBW	1MHz/1MHz for Peak, 1MHz/10Hz for Average.		
Note:	1. The transmitter was setup to transmit at the lowest channel. Then the field strength was measured at 2310-2390 MHz. 2. The transmitter was setup to transmit at the highest channel. Then the field strength was measured at 2483.5-2500 MHz. 3. The data of 2390MHz and 2483.5MHz was the worst.		

Test Mode	Ant.Pol. H/V	Freq. (MHz)	Reading		Ant/CF CF(dB)	Act		Limit	
			Peak (dBuv)	AV (dBuv)		Peak (dBuv/m)	AV (dBuv/m)	Peak (dBuv/m)	AV (dBuv/m)
TX CH37 (Worst case)	H	2390	44.66	36.91	-5.79	38.87	31.12	74	54
	V	2390	43.59	37.18	-5.79	37.8	31.39	74	54
	H	2483.5	42.68	31.28	-4.98	37.7	26.3	74	54
	V	2483.5	42.61	32.51	-4.98	37.63	27.53	74	54

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6.4 BANDWIDTH TEST

6.4.1 Applied procedures / Limit

15.247(a) (2) Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

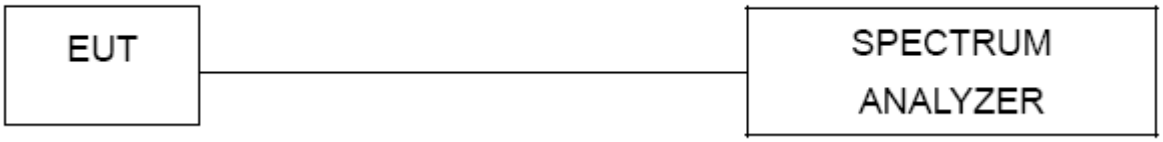
6.4.2 Test procedure

a. The testing follows FCC KDB publication No. 558074 D01 DTS Meas. Guidance v03r03
b. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
c. Spectrum Setting: RBW= 100KHz, VBW≧3×RBW, Sweep time = Auto, Detector Function = Peak, centering on a hopping channel Trace = Max Hold.
d. Mark the peak frequency and -6 dB points bandwidth.

6.4.3 Deviation from standard

No deviation.

6.4.4 Test setup

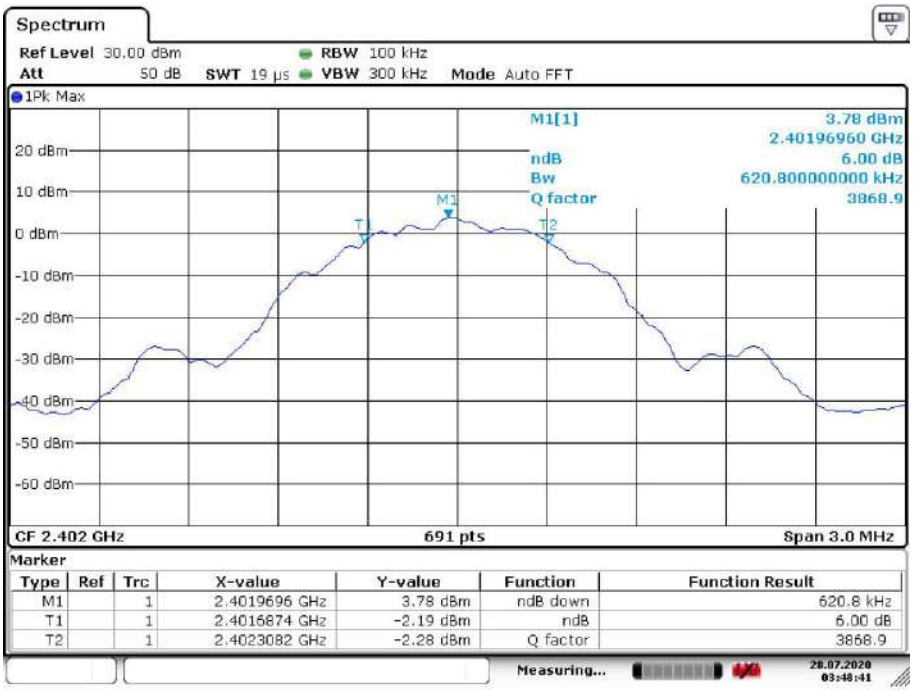


6.4.5 Test results(Worst Case)

EUT：	Emporia Vue Energy Meter	Model Name ：	EMCTV2
Temperature：	26 ℃	Relative Humidity：	53%
Pressure：	1010 hPa	Test Power ：	AC 120V, 60Hz
Test Mode ：	TX		

Test Mode	Test Channel	Frequency (MHz)	6 dB Bandwidth (KHz)	Limit （kHz）
TX	CH37	2402	620.8	≧500
	CH17	2440	616.5	≧500
	CH39	2480	612.2	≧500

Channel 37: 2402 MHz



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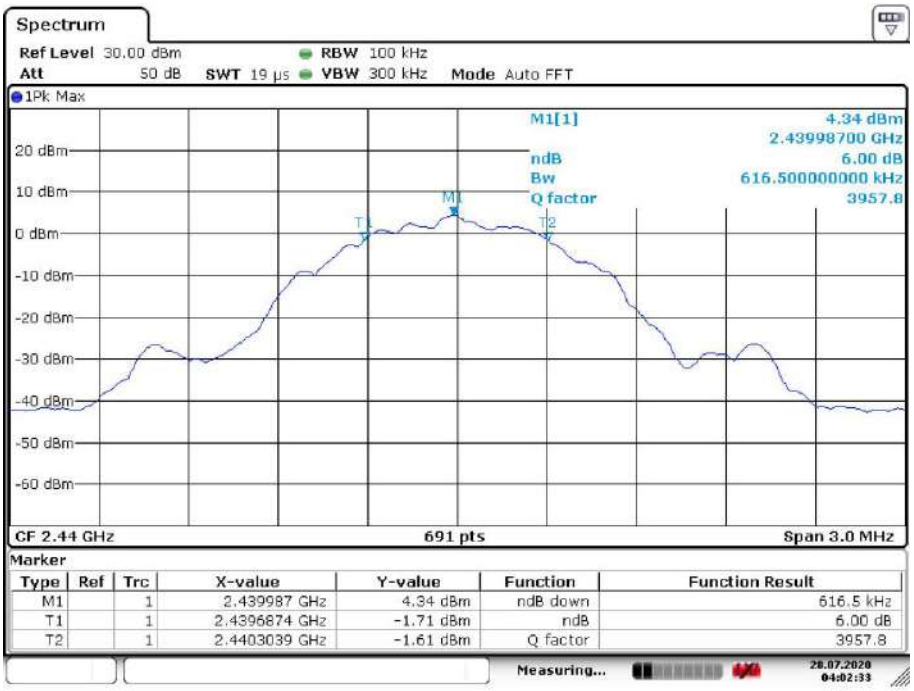
Channel 17: 2440 MHz



Date: 28.JUL.2020 04:02:33

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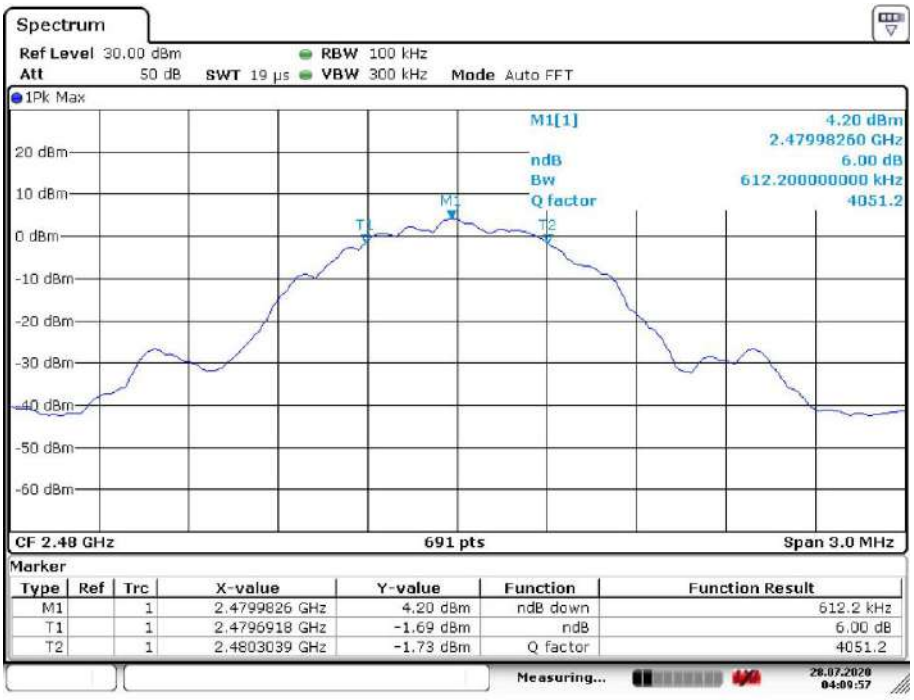
Channel 39: 2480MHz



6.5 Peak Power Density

6.5.1 Applied procedures / Limit

15.247(a) (e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

6.5.2 Test procedure

a. The testing follows Measurement procedure 10.2 Method PKPSD of FCC KDB publication No. 558074 D01 DTS Meas. Guidance v03r03
b. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
c. Connected the antenna port to the Spectrum Analyzer, set the Spectrum Analyzer as center frequency to channel center frequency, span=1.5 times the bandwith, detector = peak
3kHz≤RBW≤100kHz, VBW≥3×RBW kHz, Sweep time=Auto.
d. Trace mode = max hold. Mark the peak.
e. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

6.5.3 Deviation from standard

No deviation.

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6.5.4 Test results(Worst Case)

EUT:	Emporia Vue Energy Meter	Model Name :	EMCTV2
Temperature:	26 ℃	Relative Humidity:	53%
Pressure:	1010 hPa	Test Power :	AC 120V, 60Hz
Test Mode :	TX		

Test Mode	Channel frequency (MHz)	Power Density PSD (dBm/100KHz)	Power Density PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
TX	2402	3.89	-11.34	8	Pass
	2440	4.19	-11.04	8	Pass
	2480	4.25	-10.98	8	Pass

Note: The cable loss is 1.0dB

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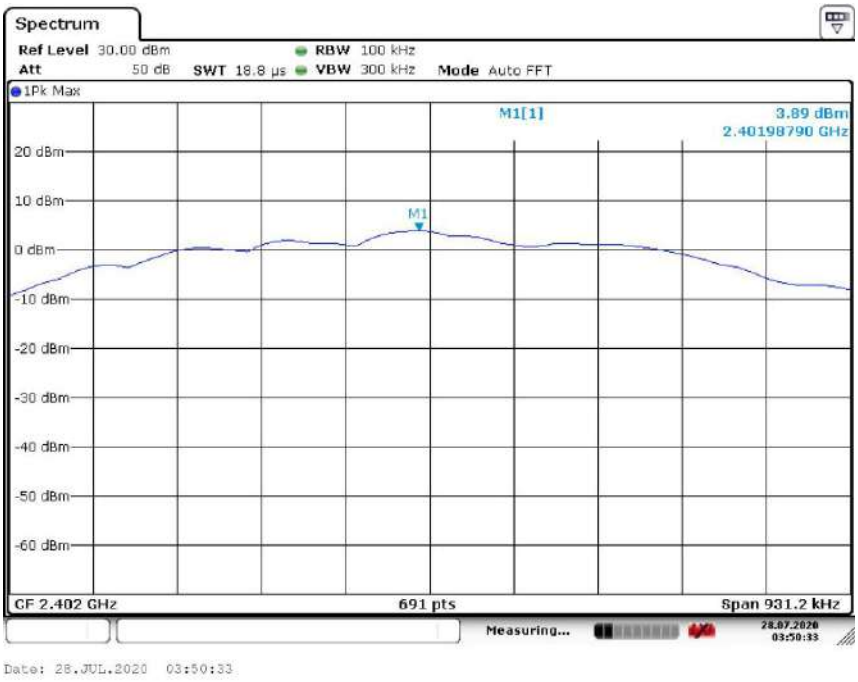
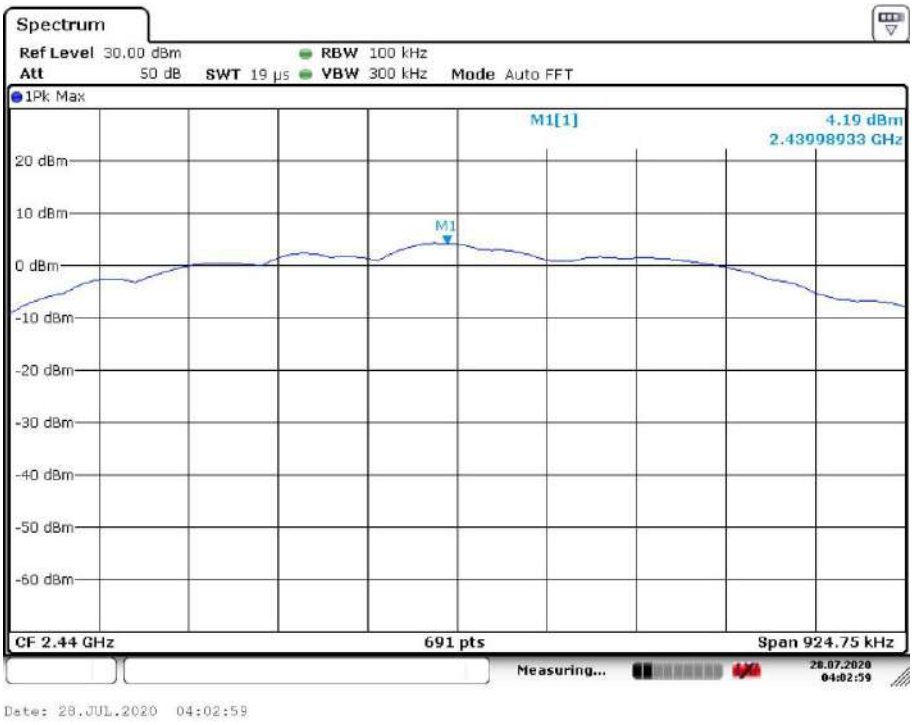
PSD 100kHz

Channel 37: 2402MHz



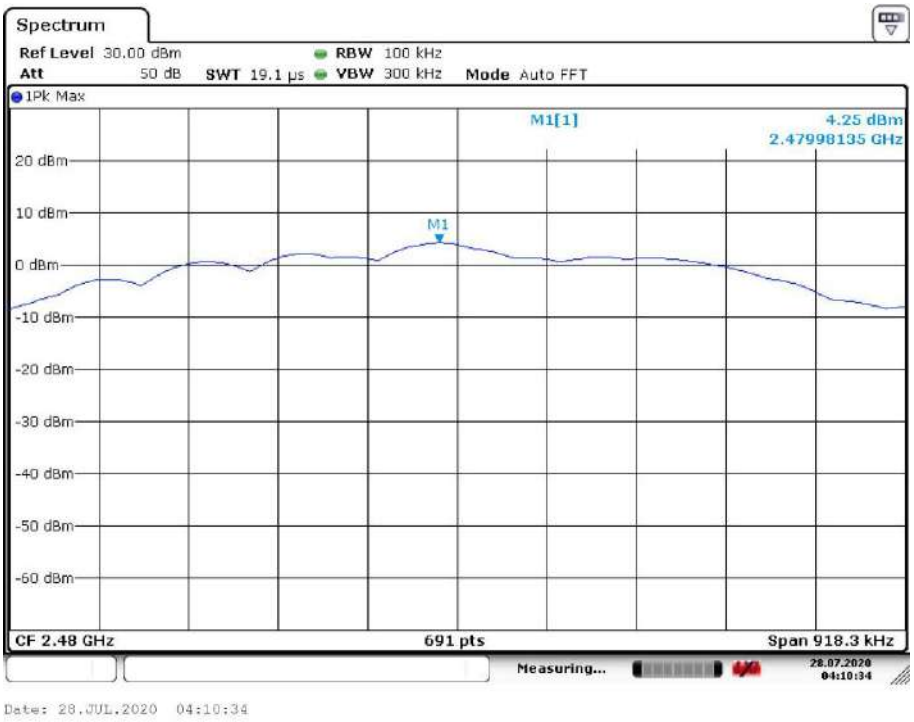
PSD 100kHz

Channel 17: 2440MHz



PSD 100kHz

Channel 39: 2480MHz



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Contact:0124-4235350,4145343;e-mail:info@aaemtlabs.com;Website: www.aaemtlabs.com
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6.6 Maximum Peak Output Power

6.6.1 Applied procedures / Limit

15.247(b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

6.6.2 Test procedure

a. The testing follows FCC KDB publication No. 558074 D01 DTS Meas. Guidance v03r03
b. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
c. Spectrum Setting: RBW≥Bandwidth, VBW≥3×RBW, Sweep time = Auto, Span≥3×RBW,
d. Detector = peak. Trace mode = max hold.
e. Use peak marker function to determine the peak amplitude level.

6.6.3 Deviation from standard

No deviation.

6.6.4 Test setup

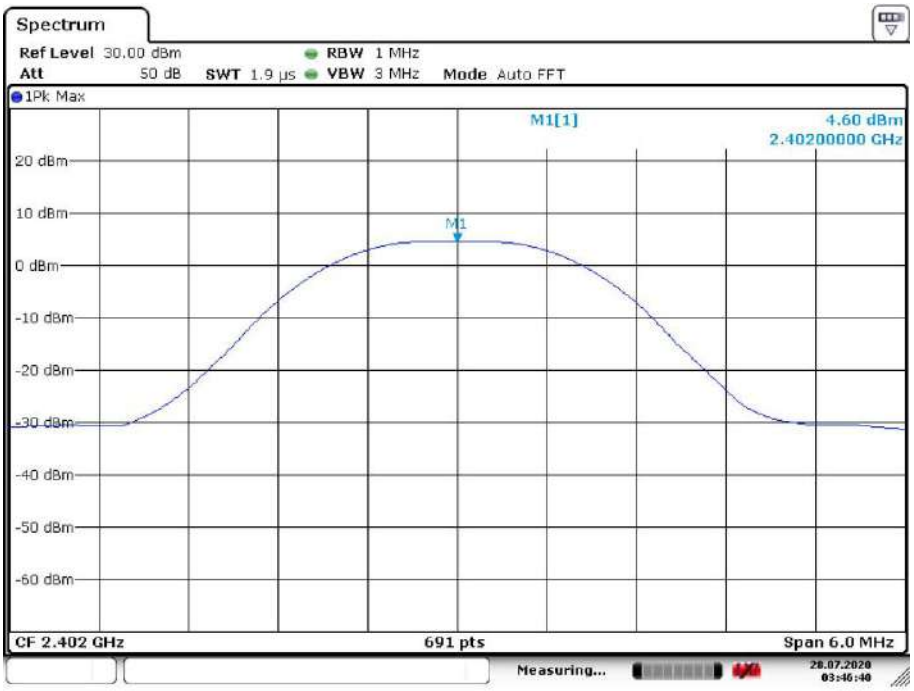
6.6.5 Test results(Worst Case)

EUT:	Emporia Vue Energy Meter	Model Name :	EMCTV2
Temperature:	26 ℃	Relative Humidity:	53%
Pressure:	1010 hPa	Test Power :	AC 120V, 60Hz
Test Mode :	TX		
Note: N/A			

Test Mode	Frequency	Peak Output Power (dBm)	Limit (dBm)	Result
TX	2402 MHz	4.60	30	Pass
	2440 MHz	4.47	30	Pass
	2480 MHz	4.50	30	Pass

Note: The cable loss is 1.0dB

Channel 37: 2402MHz



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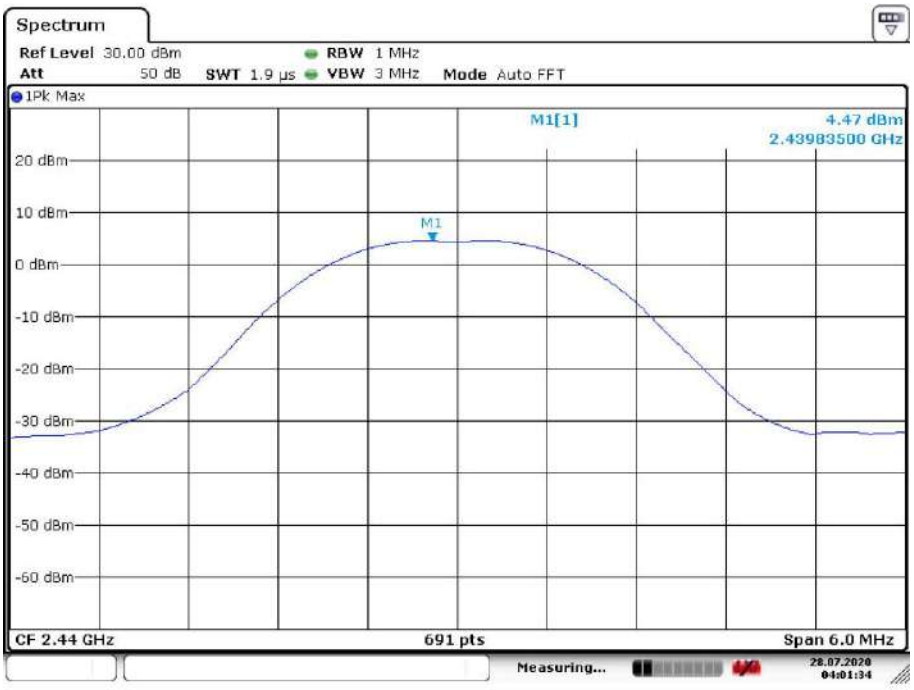
Channel 17: 2440MHz



Date: 28.JUL.2020 04:01:34

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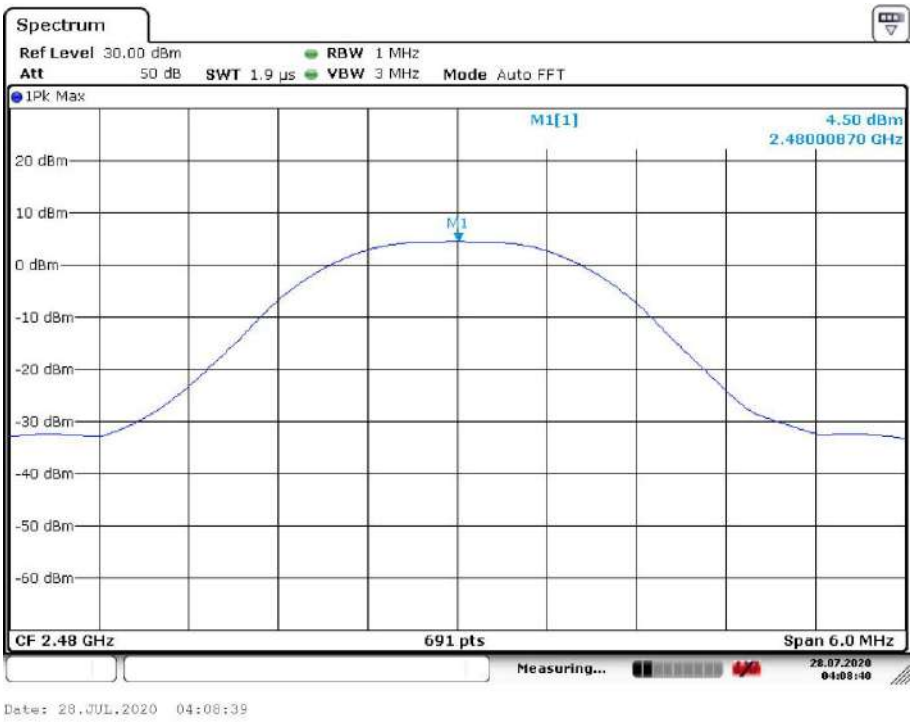
Channel 39: 2480MHz



6.7 Band edge

6.7.1 Applied procedures / Limit

15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

6.7.2 Test procedure

a. The testing follows FCC KDB publication No. 558074 D01 DTS Meas. Guidance v03r03
b. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
c. Spectrum Setting: RBW=100kHz, VBW≧300kHz, Sweep time=Auto, Detector Function=Peak.
d. The band edges was measured and recorded Result:

The Lower Edges attenuated more than 20dB.
The Upper Edges attenuated more than 20dB.

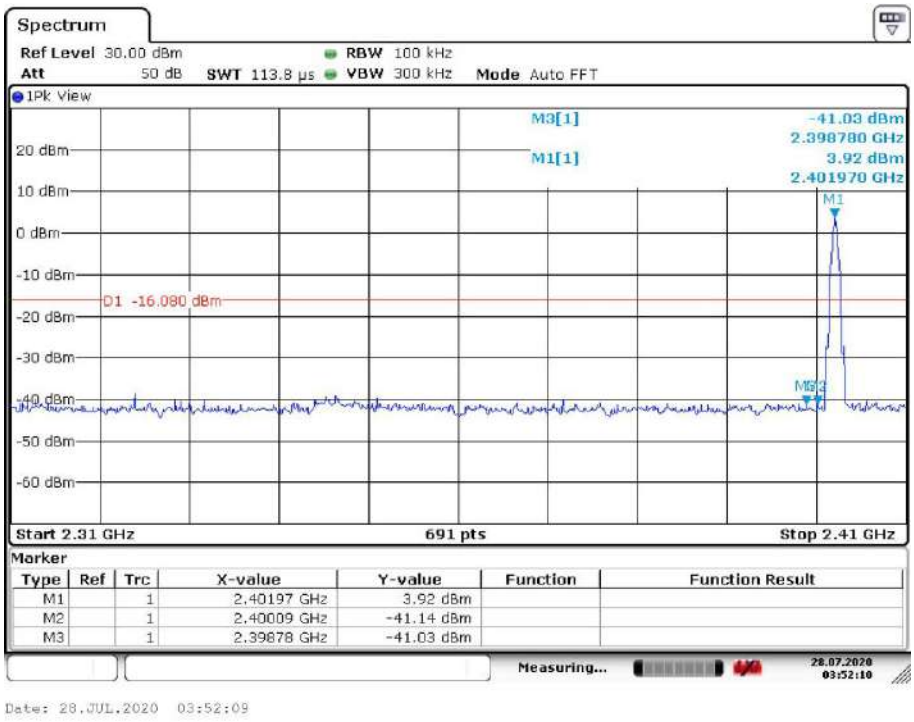
6.7.3 Deviation from standard

No deviation.

6.7.4 Test setup

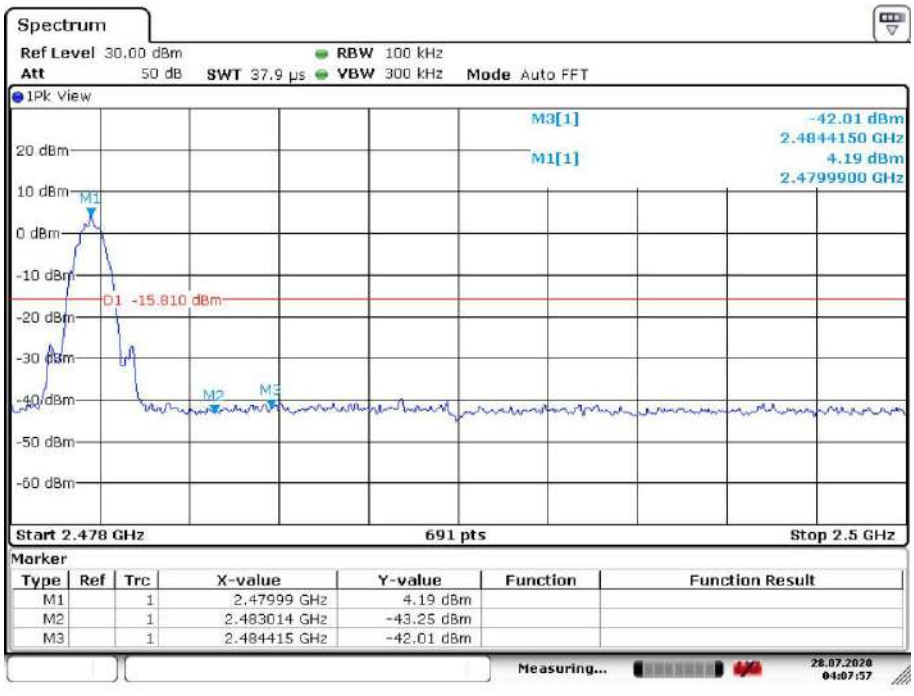
6.7.5 Test results(Worst Case)

Tx Channel 37: 2402MHz



Date: 28.JUL.2020 03:52:09

Tx Channel 39: 2480MHz



Date: 28.JUL.2020 04:07:56

6.8 Conducted Spurious Emissions

6.8.1 Applied procedures / Limit

15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

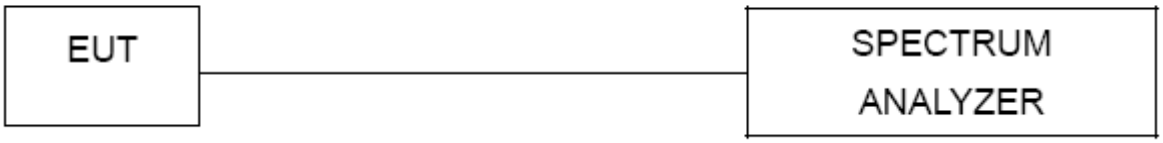
6.8.2 Test procedure

a. The testing follows FCC KDB publication No. 558074 D01 DTS Meas. Guidance v03r03
b. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
c. Spectrum Setting: RBW=100kHz, VBW=300kHz, Sweep time=Auto, Detector Function=Peak, sweep points ≥ investigated frequency range/RBW.

6.8.3 Deviation from standard

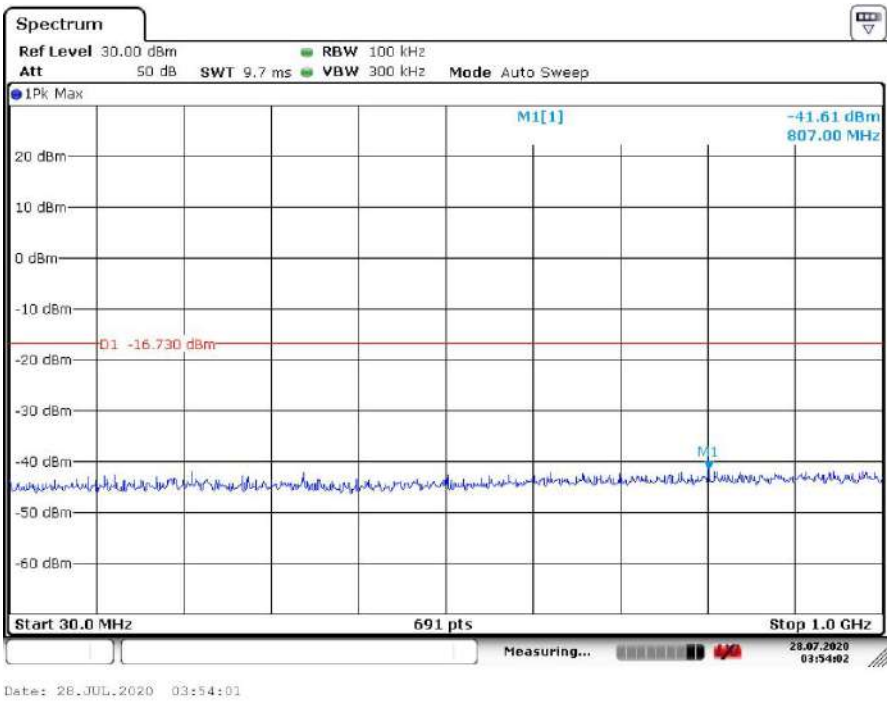
No deviation.

6.8.4 Test setup

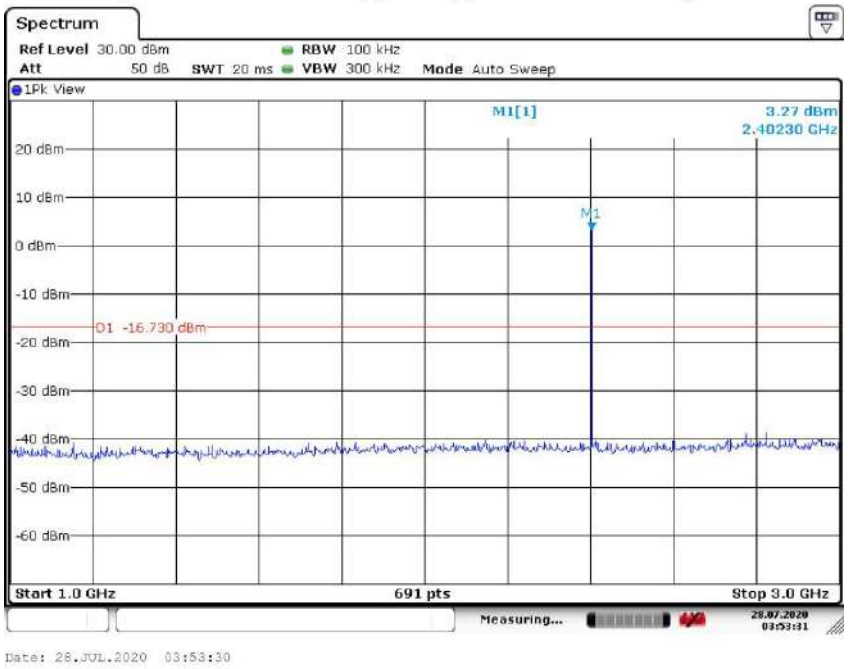


6.8.5 Test results(Worst Case)

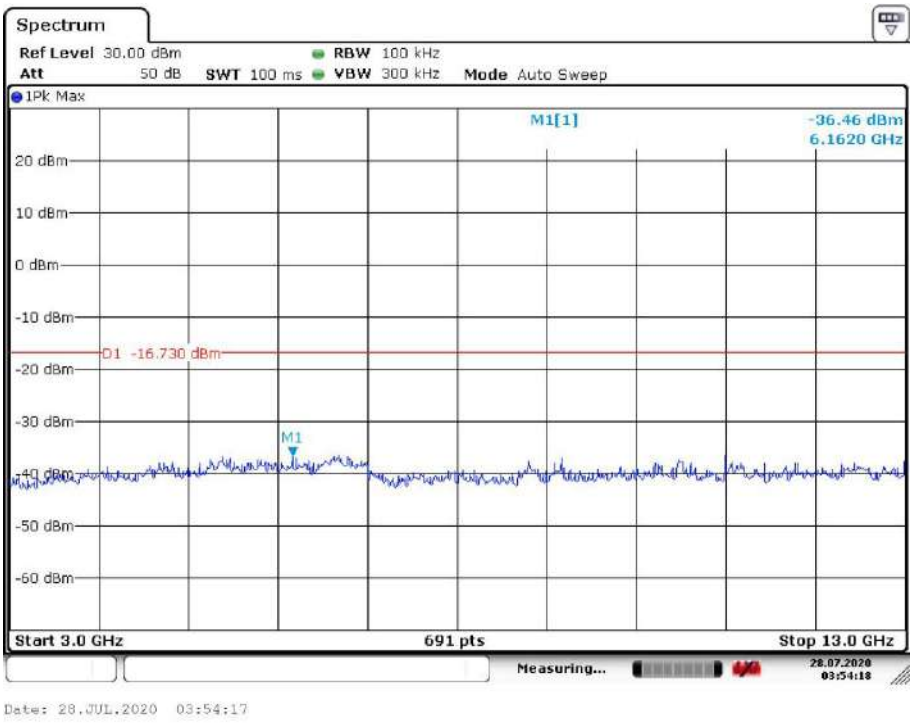
Tx Channel 37: 2402MHz



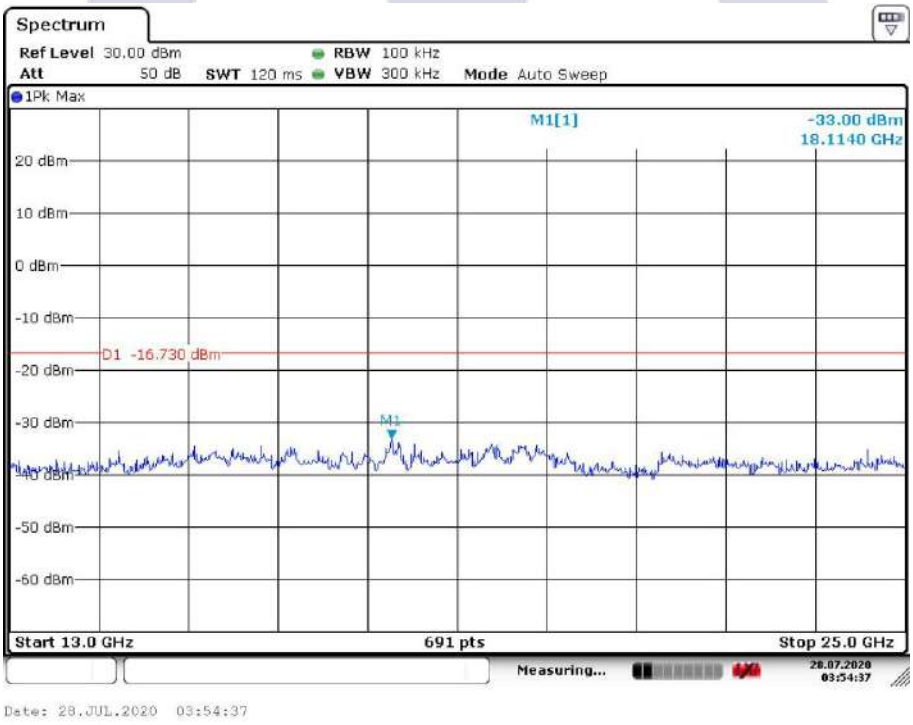
Note: Sweep Points=9700



Note: Sweep Points=20000

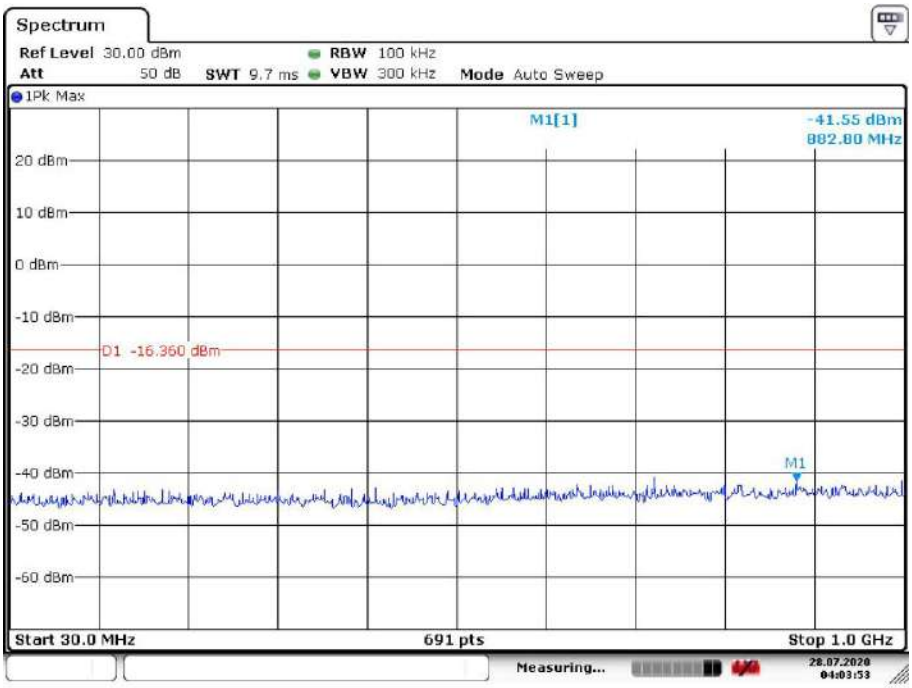


Note: Sweep Points=100000



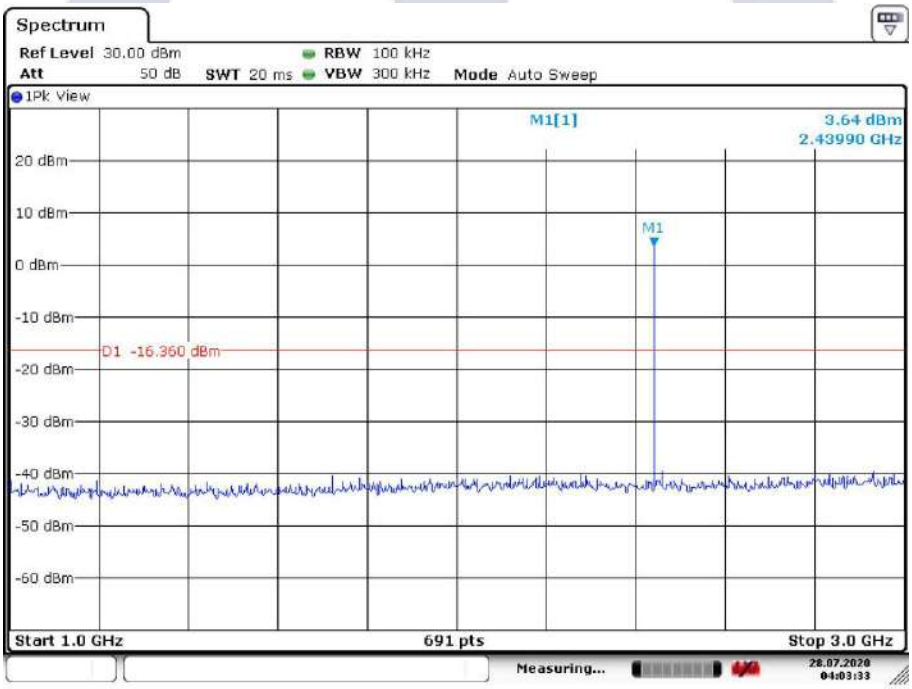
Note: Sweep Points=120000

Tx Channel 17: 2440MHz



Date: 28.JUL.2020 04:03:52

Note: Sweep Points=9700



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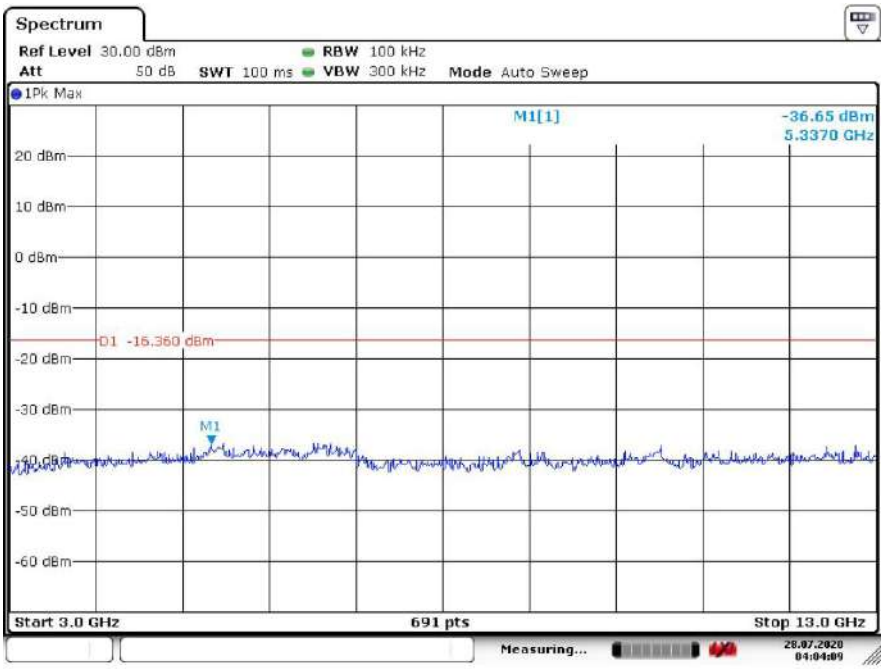
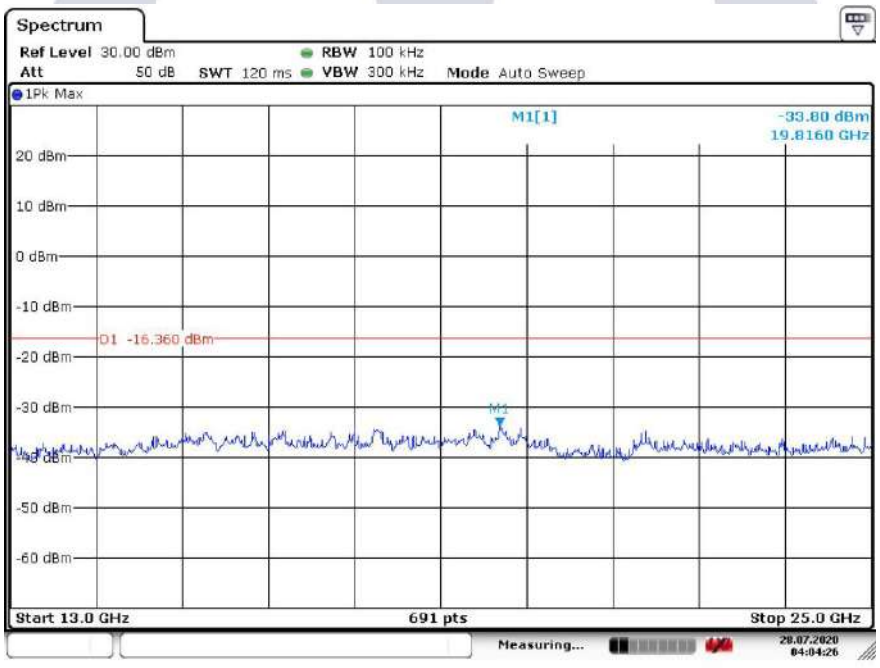
Note: Sweep Points=20000

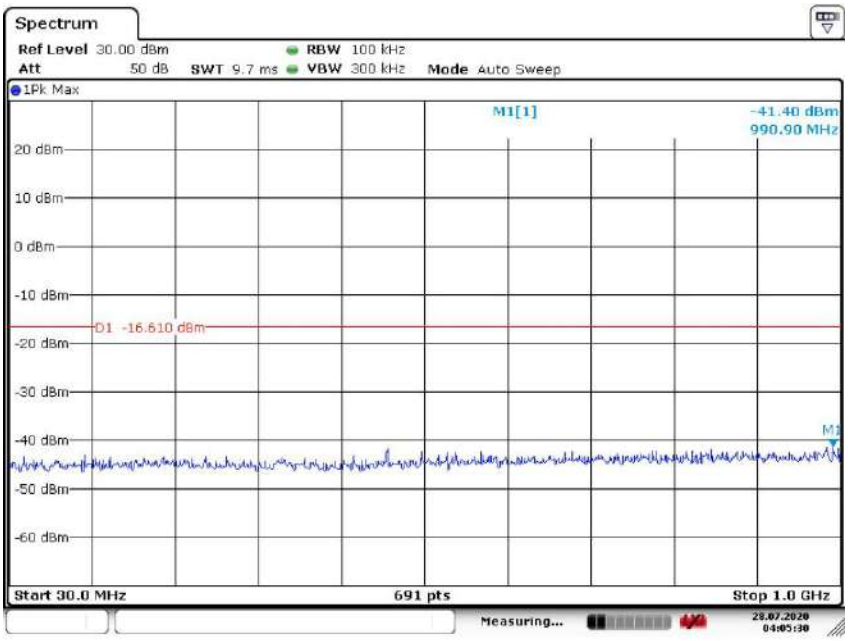


Note: Sweep Points=100000

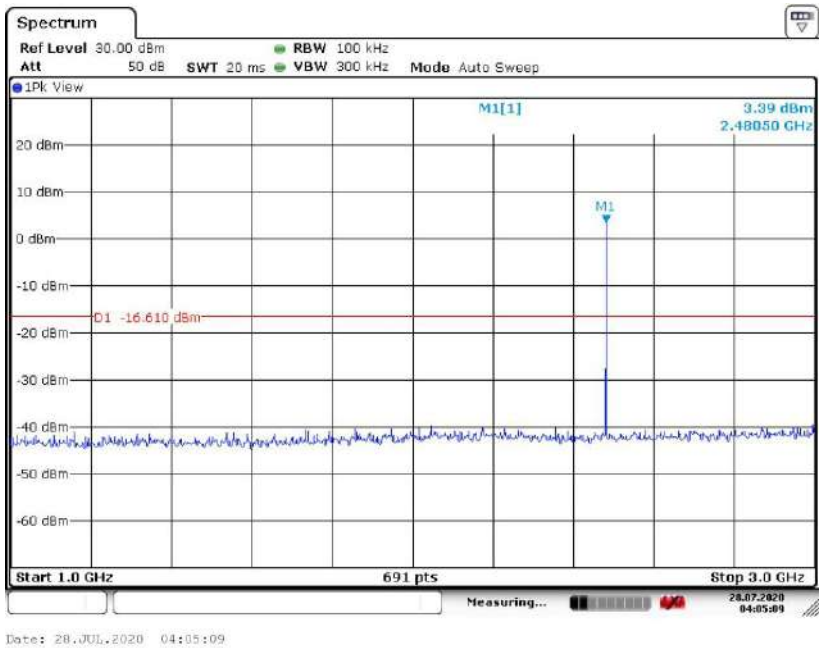


Note: Sweep Points=120000

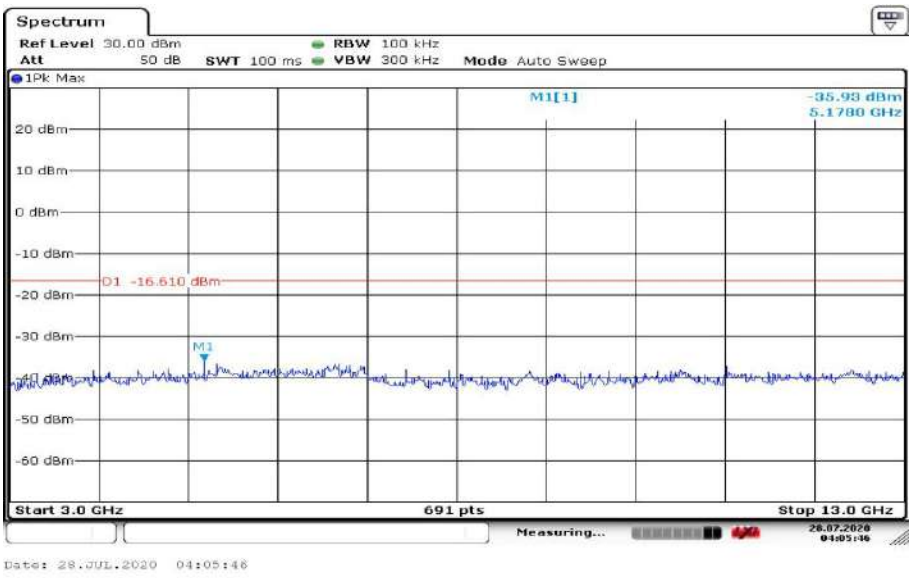
Tx Channel 39: 2480MHz



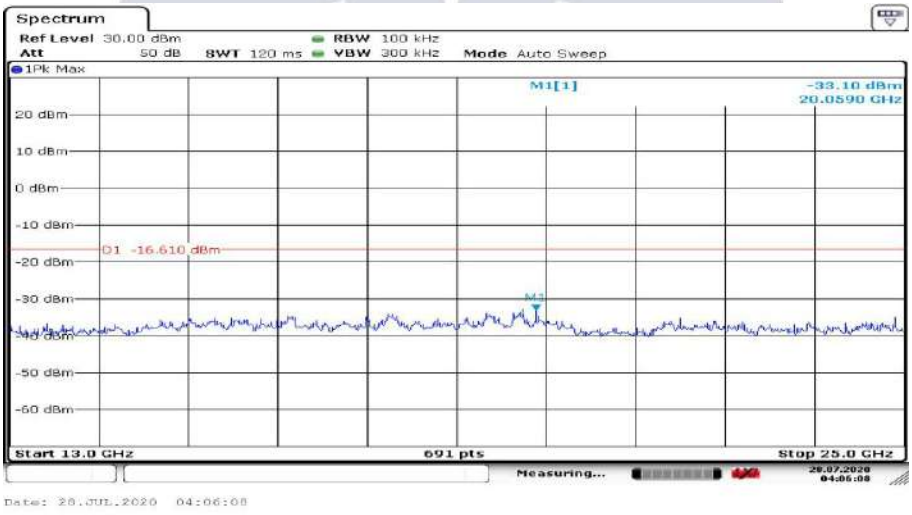
Note: Sweep Points=9700



Note: Sweep Points=20000



Note: Sweep Points=100000



Note: Sweep Points=120000

****End of Report****