



FCC PART 15 SUBPART C

CERTIFICATION TEST REPORT

For

CONSTANT CURRENT DRIVER

MODEL NUMBER: T1R1UNV150P-40C-XXX

FCC ID: 2AJ9LT1R1UNV150P40C

REPORT NUMBER: 4788360038.1

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Prepared for

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Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
--	2/07/2018	Initial Issue	



Summary of Test Results			
Clause	Test Items	FCC/IC Rules	Test Results
1	6dB Bandwidth Bandwidth	FCC 15.247 (a) (2)	Pass
2	Peak Conducted Output Power	FCC 15.247 (b) (3)	Pass
3	Power Spectral Density	FCC 15.247 (e)	Pass
4	Conducted Bandedge and Spurious Emission	FCC 15.247 (d)	Pass
5	Radiated Bandedge and Spurious Emission	FCC 15.247 (d) FCC 15.209 FCC 15.205	Pass
6	Conducted Emission Test For AC Power Port	FCC 15.207	Pass
7	Antenna Requirement	FCC 15.203	Pass



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1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name: Fulham Electronic Co., Ltd
Address: No. 9 Xingchang Road, Nanshaozhen Changping Science Park
Beijing
102200 P.R. China

Manufacturer Information

Company Name: Fulham Electronic Co., Ltd
Address: No. 9 Xingchang Road, Nanshaozhen Changping Science Park
Beijing
102200 P.R. China

EUT Description

EUT Name: CONSTANT CURRE NTDRIVER
Model: T1R1UNV150P-40C-XXX
Brand Name: N/A
Sample Status: Normal
Sample ID: 1102464
Sample Received Date: 17 Jan. 2018
Date of Tested: 17 Jan. 2018 ~ 02 Feb. 2018

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC Part 15 Subpart C	PASS

Tested By:

Checked By:

Leo li
Engineer Project Associate
Approved By:

Shawn Wen
Laboratory Leader

Stephen Guo
Laboratory Manager



2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with 558074 D01 DTS Meas Guidance v04, 414788 D01 Radiated Test Site v01, FCC CFR 47 Part 2, FCC CFR 47 Part 15 and ANSI C63.10-2013.

3. FACILITIES AND ACCREDITATION

Accreditation Certificate	A2LA (Certificate No.: 4338.01) Shenzhen STS Test Services Co., Ltd. has been assessed and proved to be in compliance with A2LA.
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Note: All tests measurement facilities use to collect the measurement data are located at **1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China**



4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognize national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test Item	Uncertainty
Conducted Emission (9KHz-150KHz)	±2.88dB
Conducted Emission (150KHz-30MHz)	±2.67dB
RF power,conducted	±0.70dB
Spurious emissions,conducted	±1.19dB
All emissions,radiated(<30M) (9KHz-30MHz)	±2.45dB
All emissions,radiated(<1G) 30MHz-200MHz	±2.83dB
All emissions,radiated(<1G) 200MHz-1000MHz	±2.94dB
All emissions,radiated(>1G)	±3.03dB
Temperature	±0.5°C
Humidity	±2%

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



5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

EUT Name	CONSTANT CURRE NTDRIVER		
EUT Description	The EUT is a CONSTANT CURRE NTDRIVER.		
Model	Original Model is T1R1UNV150P-40C XXX=Business or Buyer code		
Series Model	N/A		
Model Difference	N/A		
Radio Technology	ZigBee		
Operation frequency	2405MHz-2480MHz		
Modulation	OQPSK		
Rated Input	AC 100-277V, 60Hz		
Power Supply	Power Adapter	Input	AC 100-277V, 60Hz
		Output	DC 58V, 0.64Ma, 40w
Hardware Version	N/A		
Software Version	N/A		

5.2. MAXIMUM OUTPUT POWER

Frequency Range (MHz)	Number of Transmit Chains (NTX)	Modulation	Frequency (MHz)	Channel Number	Max PK Conducted Power (dBm)
2400-2483.5	1	OQPSK	2405-2480	1-16[16]	0.57

5.3. CHANNEL LIST

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2405	5	2425	9	2445	13	2465
2	2410	6	2430	10	2450	14	2470
3	2415	7	2435	11	2455	15	2475
4	2420	8	2440	12	2460	16	2480

5.4. TEST CHANNEL CONFIGURATION

Test Mode	Test Channel	Frequency
OQPSK	CH 1, CH 8, CH 16	2405MHz, 2440MHz, 2480MHz



5.5. THE WORSE CASE CONFIGURATIONS

The Worse Case Power Setting Parameter under 2400 ~ 2483.5MHz Band				
Modulation Mode	Transmit Antenna Number	Test Channel		
		NCB: 20MHz		
		CH 1	CH 8	CH 16
OQPSK	1	0.45	0.53	0.57

5.6. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
1	2405-2480	External Antenna	0

Test Mode	Transmit and Receive Mode	Description
OQPSK	<input checked="" type="checkbox"/> 1TX, 1RX	Chain 1 can be used as transmitting/receiving antenna.

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	P/N
1	PC	HP	500-320cx	N/A

I/O CABLES

Cable No	Port	Connector Type	Cable Type	Cable Length(cm)	Remarks
1	Shielded Line	N/A	N/A	110	N/A
2	USB Cable	N/A	N/A	100	N/A

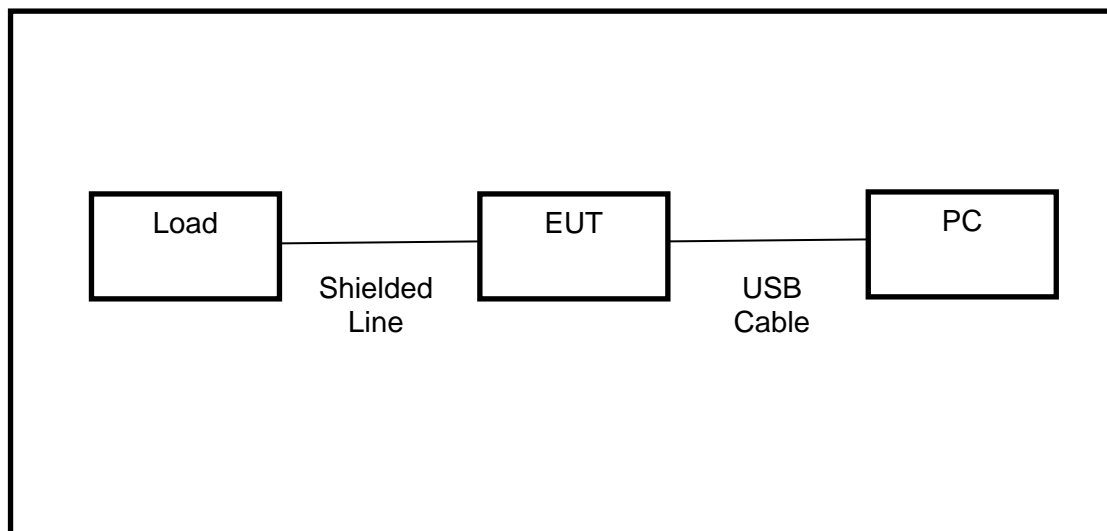
ACCESSORY

Item	Accessory	Brand Name	Model Name	Description
1	Light	N/A	N/A	N/A

TEST SETUP

The EUT can work in engineering mode with firmware QRCT from QUALCOMM through a Laptop.

SETUP DIAGRAM FOR TESTS





6. MEASURING INSTRUMENT AND SOFTWARE USED

Conducted Emissions						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
	EMI Test Receiver	R&S	ESPI	102086	2017.10.23	2018.10.22
	LISN	R&S	ENV216	101242	2017.10.23	2018.10.22
	LISN	EMCO	3810/2NM	000-23625	2017.10.23	2018.10.22
	Conduction Cable	EM	C01	N/A	NCR	NCR
	Shielding Room	Changling	854	N/A	2017.10.23	2018.10.22
Radiated Emissions						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
	Spectrum Analyzer	Agilent	E4407B	MY501403 40	2017.10.23	2018.10.22
	Test Receiver	R&S	ESCI	101427	2017.10.23	2018.10.22
	Bilog Antenna	TESEQ	CBL6111D	34678	2017.11.24	2020.11.23
	Horn Antenna	Schwarzbeck	BBHA 9120D(1201)	9120D- 1343	2015.03.05	2018.03.04
	Horn Antenna	Schwarzbeck	BBHA 9170	9170-0741	2016.03.06	2019.03.05
	50Ω Coaxial Switch	Anritsu	MP59B	620026441 6	2017.06.06	2018.06.05
	PreAmplifier	Agilent	8449B	60538	2017.10.23	2018.10.22
	Loop Antenna	EMCO	6502	9003-2485	2016.03.06	2019.03.05
	Preamplifier	Agilent	8449B	60538	2017.10.23	2018.10.22
	Low frequency cable	EM	R01	N/A	NCR	NCR
	High frequency cable	SCHWARZBEC K	AK9515H	SN- 96286/962 87	NCR	NCR
	Semi-anechoic chamber	Changling	966	N/A	2017.10.23	2018.10.22
Other instruments						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
	USB RF power sensor	DARE	RPR3006 W	15100041SNO0 3	2017.10.23	2018.10.22
	Spectrum Analyzer	Agilent	E4407B	MY50140340	2017.10.23	2018.10.22
	Signal Analyzer	Agilent	N9020A	MY49100060	2017.10.23	2018.10.22



7. MEASUREMENT METHODS

No.	Test Item	KDB Name	Section
1	6dB Bandwidth Bandwidth	KDB 558074 D01 DTS Meas Guidance v04	8.0
2	Peak Output Power	KDB 558074 D01 DTS Meas Guidance v04	9.1.3
3	Power Spectral Density	KDB 558074 D01 DTS Meas Guidance v04	10.2
4	Out-of-band emissions in non-restricted bands	KDB 558074 D01 DTS Meas Guidance v04	11.0
5	Out-of-band emissions in restricted bands	KDB 558074 D01 DTS Meas Guidance v04	12.1
6	Band-edge	KDB 558074 D01 DTS Meas Guidance v04	13.3.2
7	Conducted Emission Test For AC Power Port	ANSI C63.10-2013	7.3



8. ANTENNA PORT TEST RESULTS

8.1. ON TIME AND DUTY CYCLE

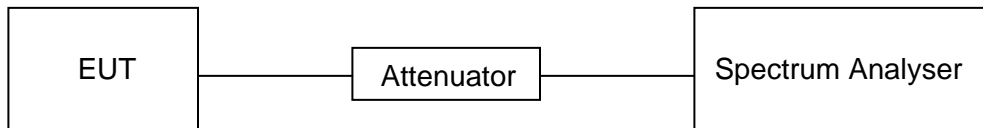
LIMITS

None; for reporting purposes only

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

TEST SETUP



TEST ENVIRONMENT

Temperature	25°C	Relative Humidity	60%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V

RESULTS

Note: not apply.



8.2. 6 dB DTS BANDWIDTH

LIMITS

FCC Part15 (15.247) Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.247(a)(2)	6 dB Bandwidth	$\geq 500\text{KHz}$	2400-2483.5

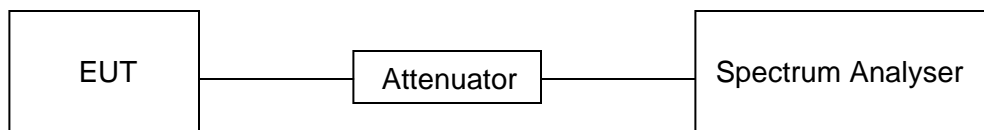
TEST PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	For 6dB Bandwidth :100K
VBW	For 6dB Bandwidth : $\geq 3 \times \text{RBW}$
Trace	Max hold
Sweep	Auto couple

Allow the trace to stabilize and measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

TEST SETUP





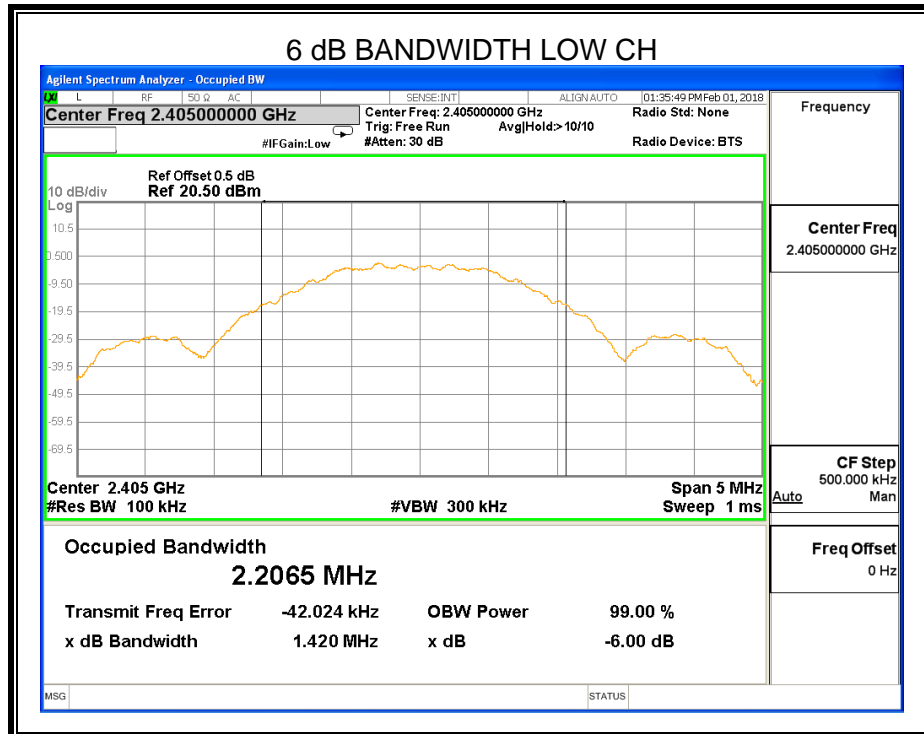
TEST ENVIRONMENT

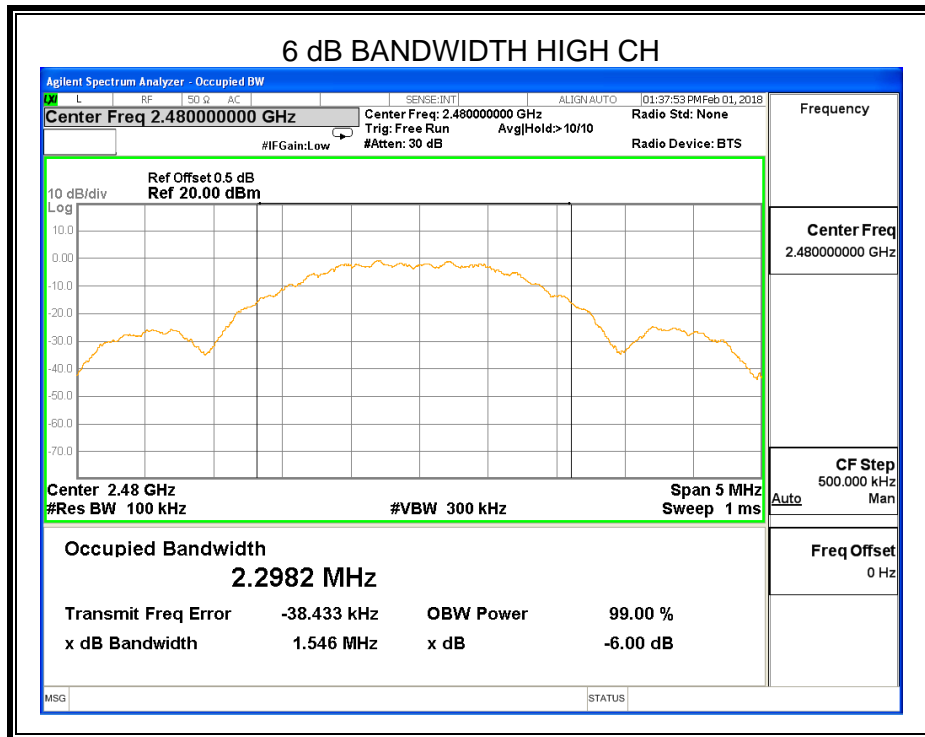
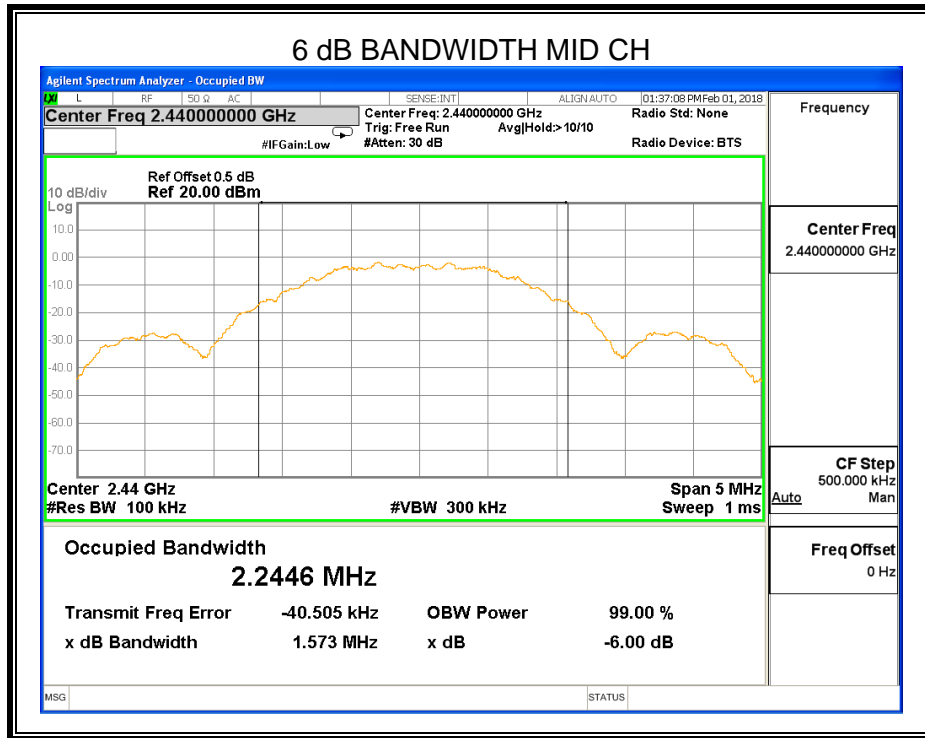
Temperature	25°C	Relative Humidity	60%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V

RESULTS

8.2.1. OQPSK MODE

Channel	Frequency (MHz)	6dB bandwidth (MHz)	Limit (kHz)	Result
Low	2405	1.420	500	Pass
Middle	2440	1.573	500	Pass
High	2480	1.546	500	Pass







8.3. PEAK CONDUCTED OUTPUT POWER

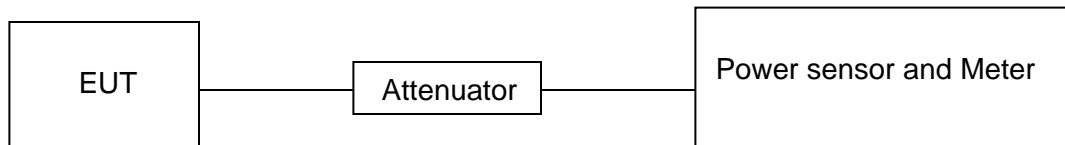
LIMITS

FCC Part15 (15.247) Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.247(b)(3)	Peak Output Power	1 watt or 30dBm	2400-2483.5

TEST PROCEDURE

Place the EUT on the table and set it in the transmitting mode.
Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Power sensor.
Measure peak power each channel.

TEST SETUP



TEST ENVIRONMENT

Temperature	25°C	Relative Humidity	60%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V



RESULTS

8.3.1. OQPSK MODE

Test Channel	Frequency	Maximum Conducted Output Power(PK)	LIMIT
	(MHz)	(dBm)	dBm
Low	2405	0.45	30
Middle	2440	0.53	30
High	2480	0.57	30



8.4. POWER SPECTRAL DENSITY

LIMITS

FCC Part15 (15.247) Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
FCC §15.247 (e)	Power Spectral Density	8 dBm in any 3 kHz band	2400-2483.5

TEST PROCEDURE

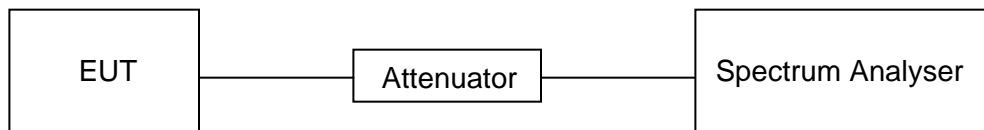
Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	$3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$
VBW	$\geq 3 \times \text{RBW}$
Span	1.5 x DTS bandwidth
Trace	Max hold
Sweep time	Auto couple.

Allow trace to fully stabilize and use the peak marker function to determine the maximum amplitude level within the RBW.

If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

TEST SETUP



TEST ENVIRONMENT

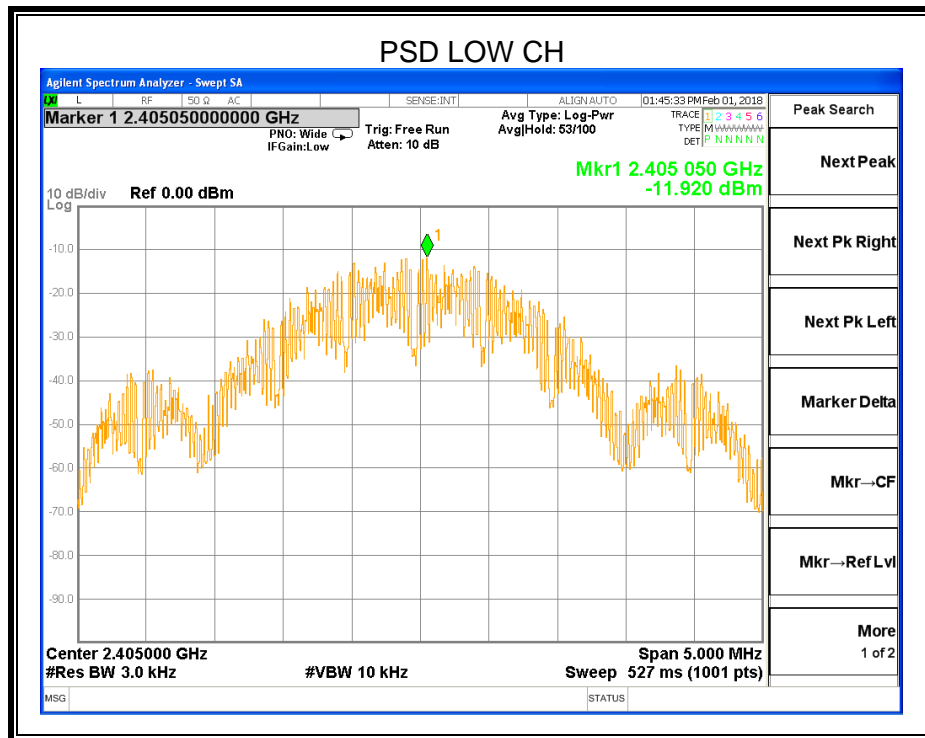
Temperature	25°C	Relative Humidity	60%
Atmosphere Pressure	101kPa	Test Voltage	DC 58V

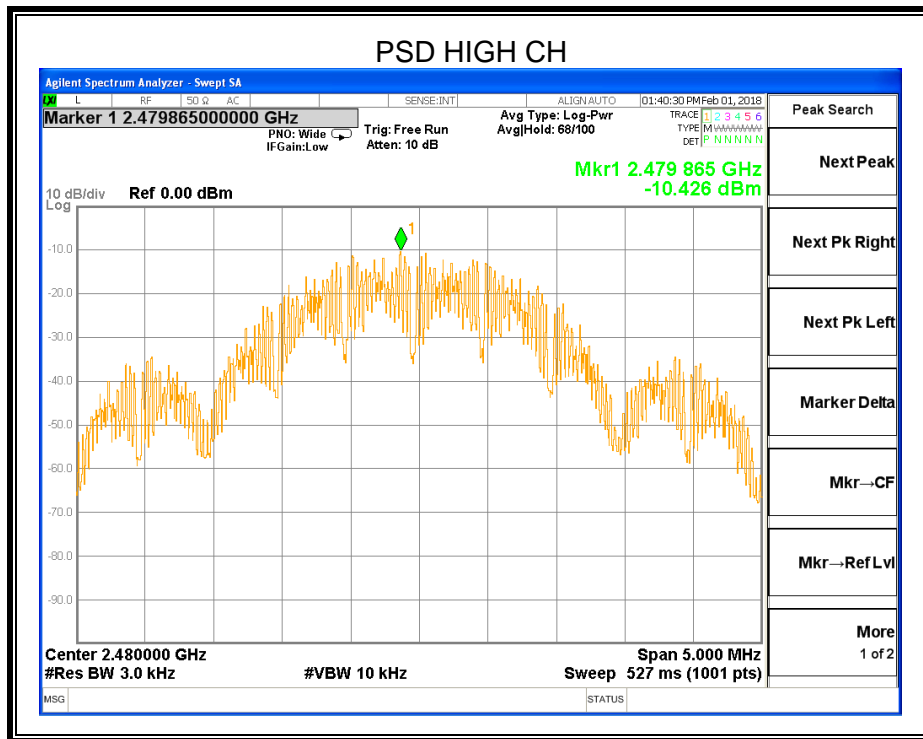
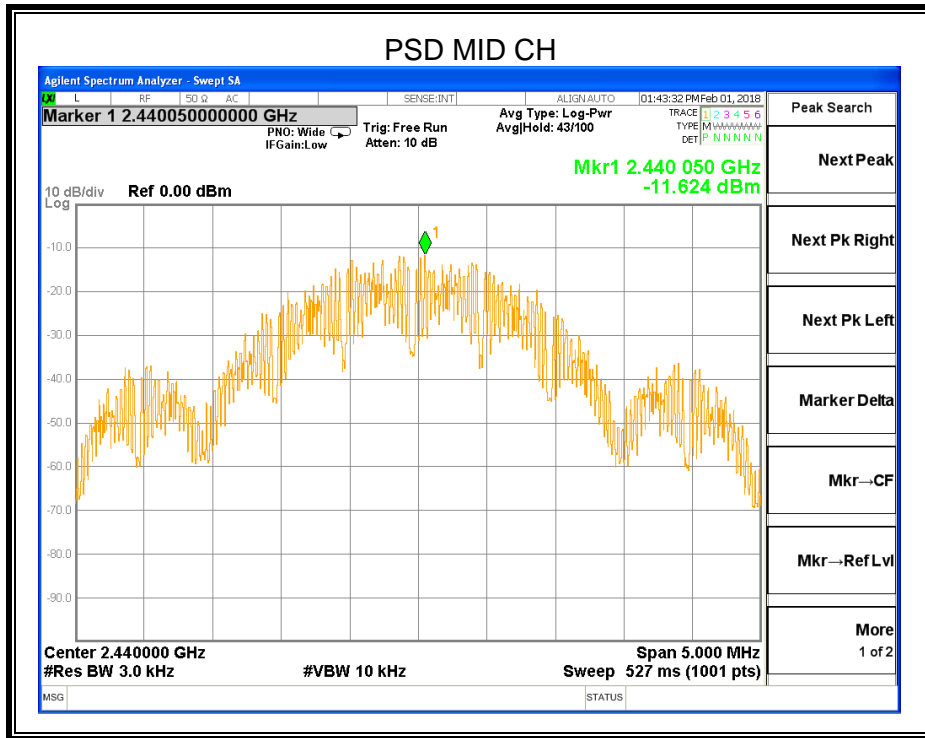


RESULTS

8.4.1. OQPSK MODE

Test Channel	Frequency	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
Low	2405MHz	-11.920	8	PASS
Middle	2440MHz	-11.624	8	PASS
High	2480MHz	-10.426	8	PASS







8.5. CONDUCTED BANDEGE AND SPURIOUS EMISSIONS

LIMITS

FCC Part15 (15.247) Subpart C		
Section	Test Item	Limit
FCC §15.247 (d)	Conducted Bandedge and Spurious Emissions	at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power

TEST PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

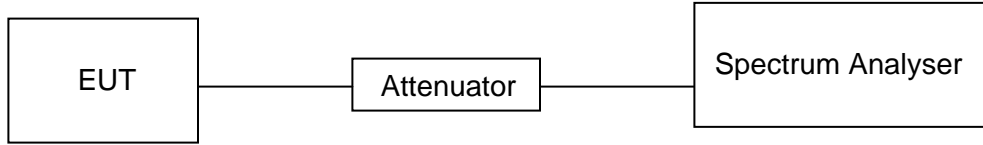
Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	100K
VBW	$\geq 3 \times \text{RBW}$
Span	1.5 x DTS bandwidth
Trace	Max hold
Sweep time	Auto couple.

Use the peak marker function to determine the maximum PSD level.

Span	Set the center frequency and span to encompass frequency range to be measured
Detector	Peak
RBW	100K
VBW	$\geq 3 \times \text{RBW}$
measurement points	$\geq \text{span}/\text{RBW}$
Trace	Max hold
Sweep time	Auto couple.

Use the peak marker function to determine the maximum amplitude level.

TEST SETUP

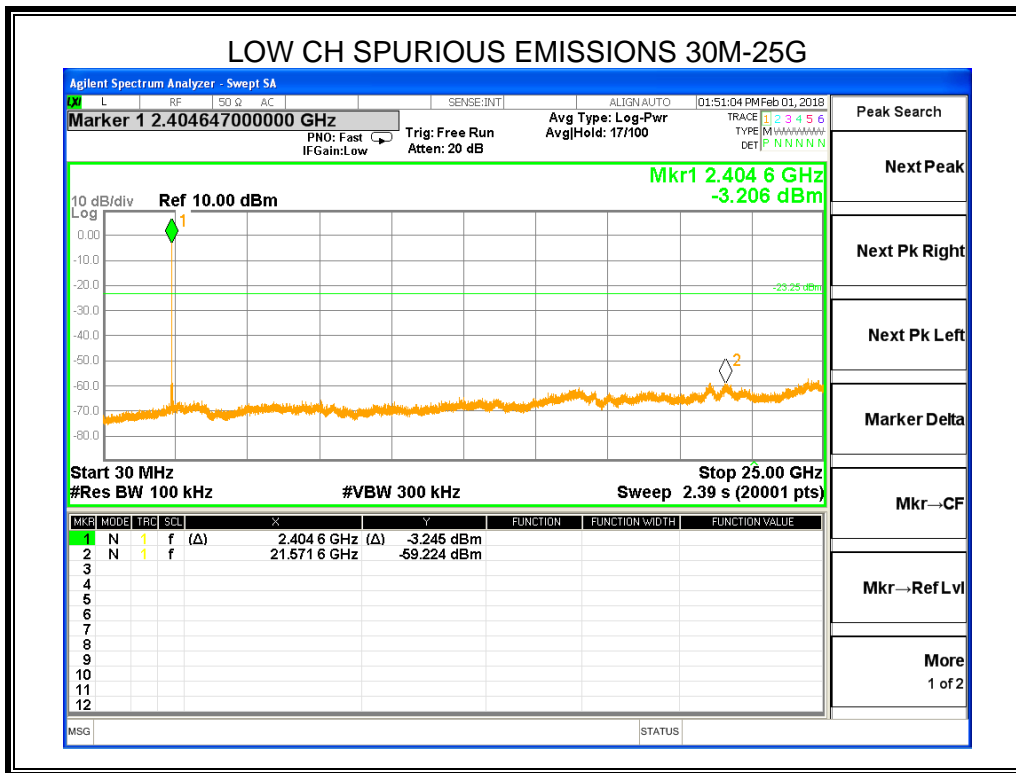


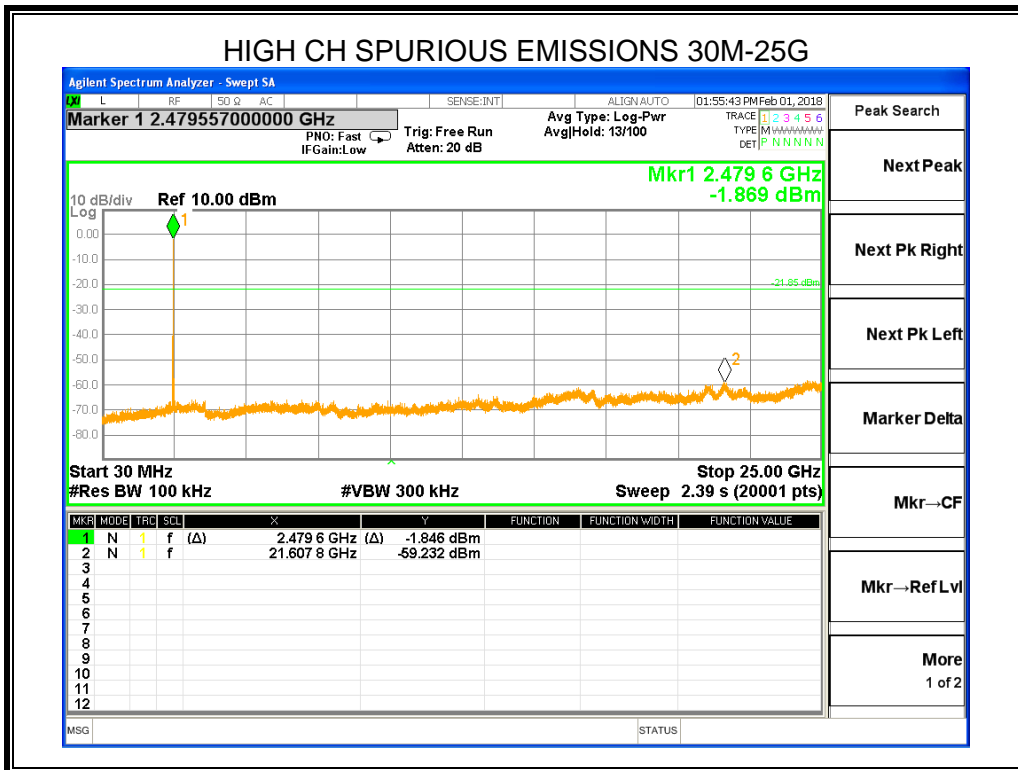
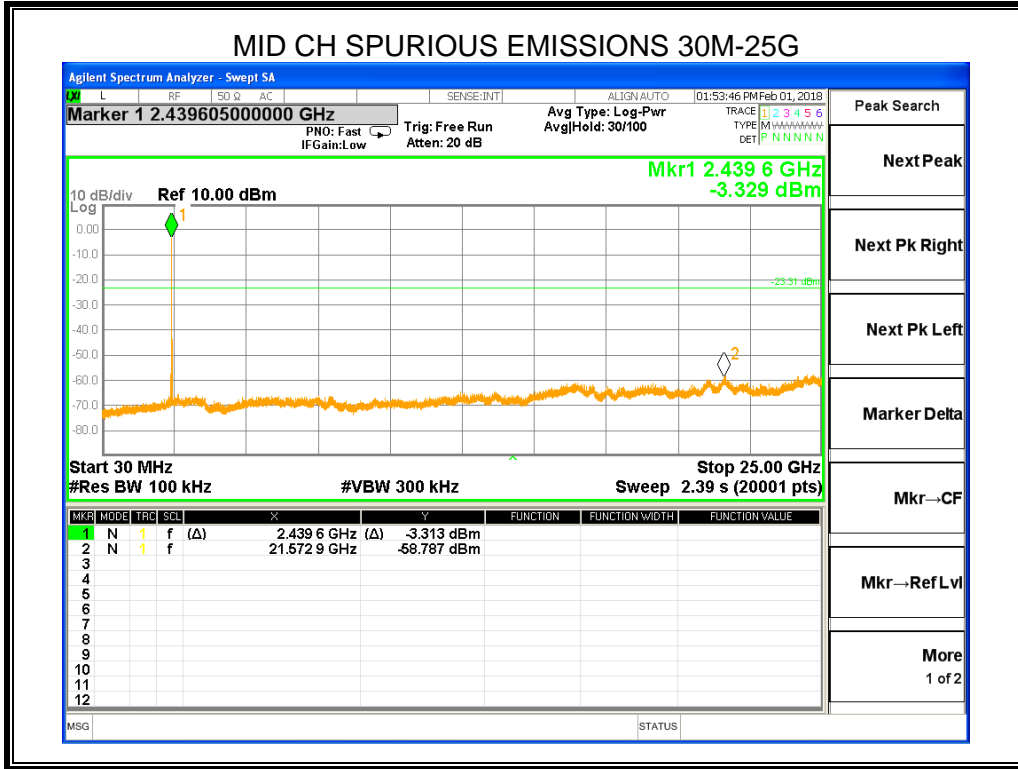
TEST ENVIRONMENT

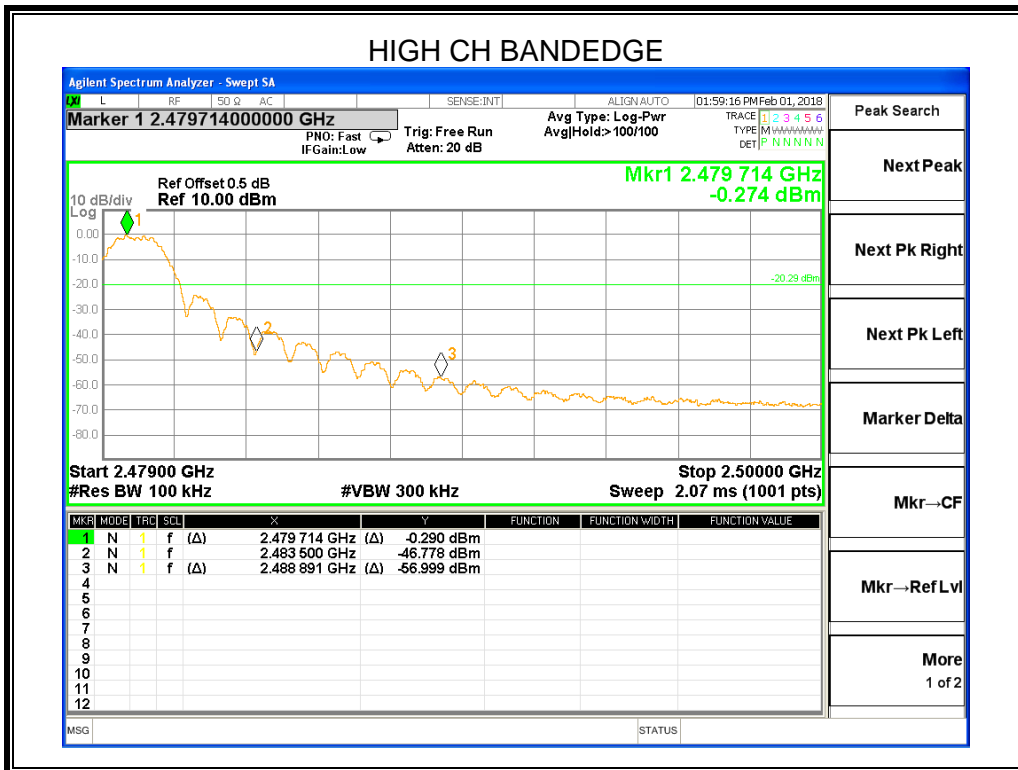
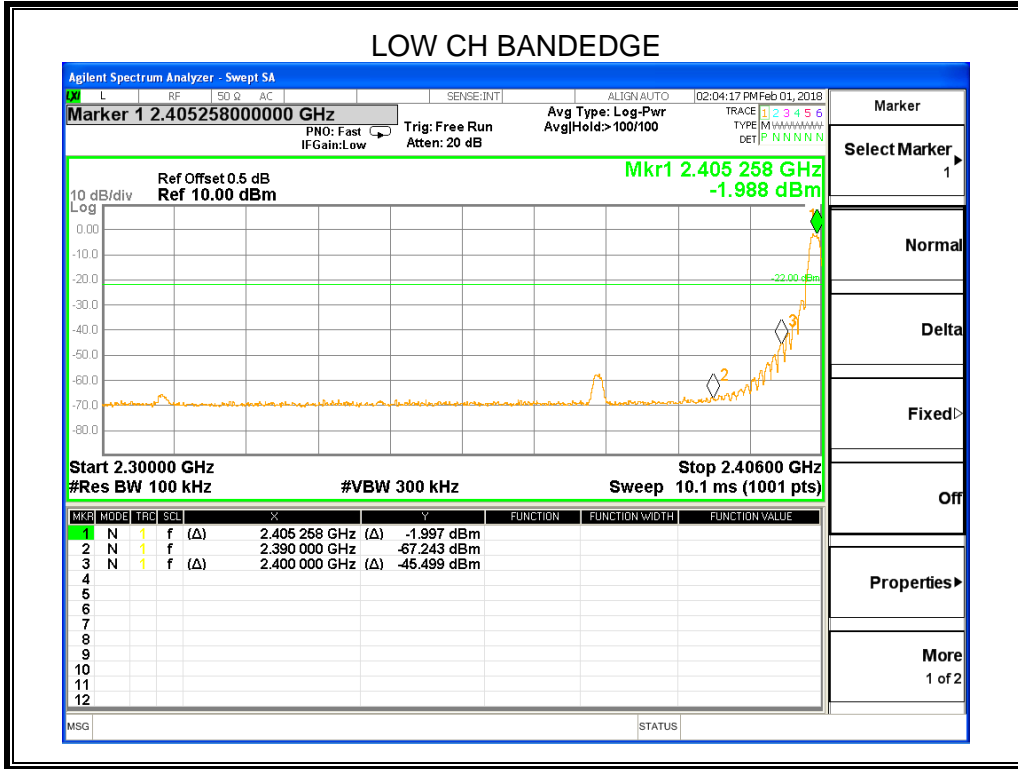
Temperature	25°C	Relative Humidity	60%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V

RESULTS

8.5.1. OQPSK MODE









9. RADIATED TEST RESULTS

LIMITS

Please refer to FCC §15.205 and §15.209

Radiation Disturbance Test Limit for FCC (Class B)(9KHz-1GHz)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
960~1000	500	3

Note: 1) At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

(2) At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). This paragraph (f) shall not apply to Access BPL devices operating below 30 MHz.

Radiation Disturbance Test Limit for FCC (Above 1G)



Frequency (MHz)	dB(uV/m) (at 3 meters)	
	Peak	Average
Above 1000	74	54

Restricted bands of operation

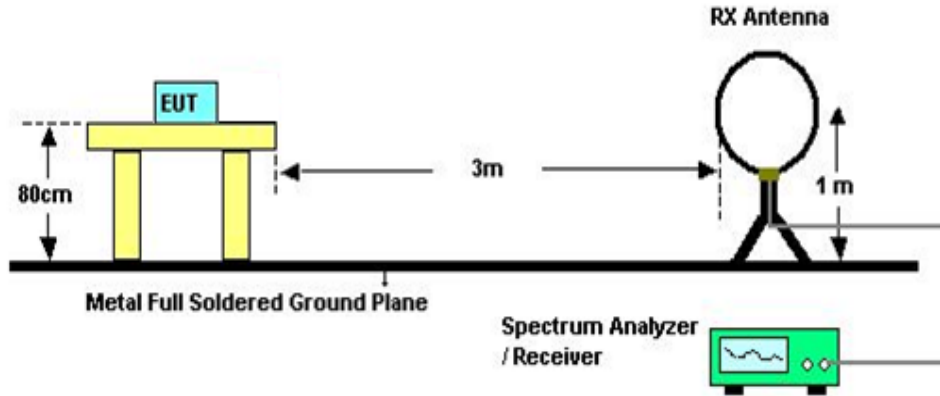
MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
¹ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(²)
13.36-13.41			

Note: ¹Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

²Above 38.6c

TEST SETUP AND PROCEDURE

Below 30MHz

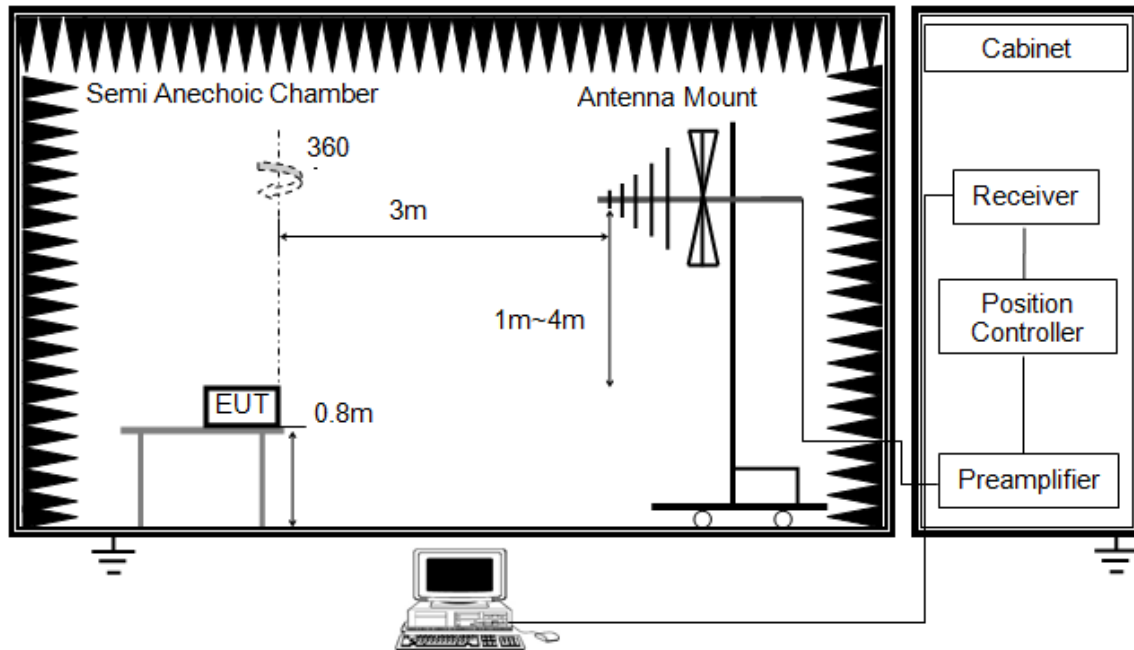


The setting of the spectrum analyser

RBW	200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz)
VBW	200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz)
Sweep	Auto
Detector	Peak/QP/ Average
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013
2. The EUT was arranged to its worst case and then turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 0.8 meter above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
6. For the actual test configuration, please refer to the related item in this test report (Photographs of the Test Configuration)

Below 1G

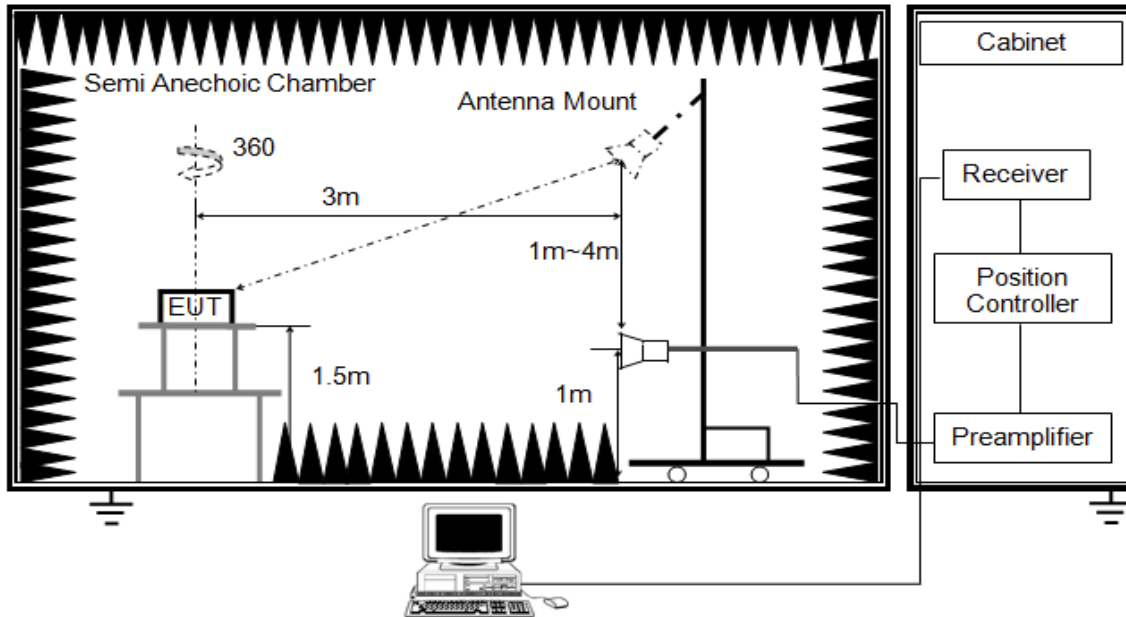


The setting of the spectrum analyser

RBW	120K
VBW	300K
Sweep	Auto
Detector	Peak/QP
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 0.8 meter above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
6. For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration)

ABOVE 1G



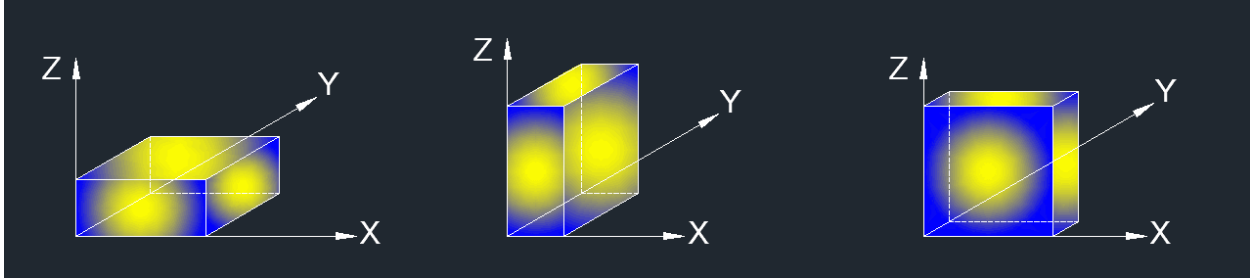
The setting of the spectrum analyser

RBW	1M
VBW	PEAK: 3M AVG: see note 6
Sweep	Auto
Detector	Peak
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 1.5m above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. For measurement above 1GHz, the emission measurement will be measured by the peak detector. This peak level, once corrected, must comply with the limit specified in Section 15.209.
6. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector for average measurements.
7. For the actual test configuration, please refer to the related item in this test report (Photographs of the Test Configuration)

8. 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.

X axis, Y axis, Z axis positions:



TEST ENVIRONMENT

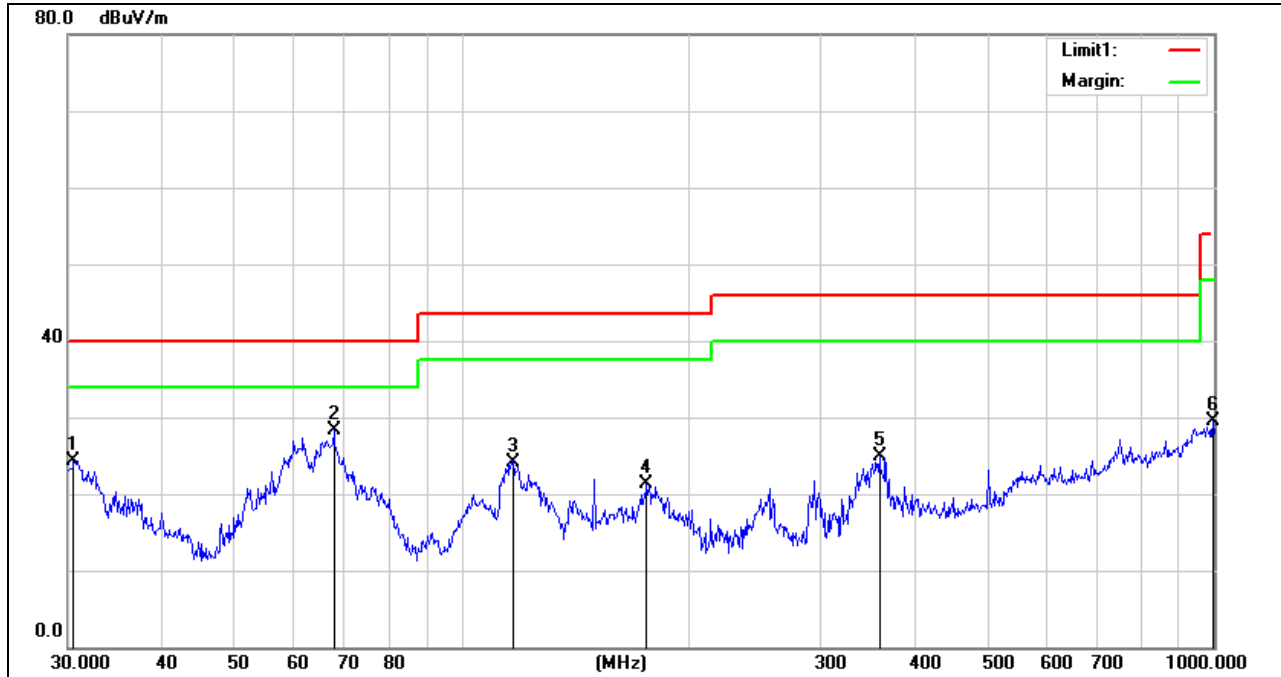
Temperature	25°C	Relative Humidity	60%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V/277V



9.1. SPURIOUS EMISSIONS (30M-1GHz)

High Channel worst case

HARMONICS AND SPURIOUS EMISSIONS (AC 120V/60Hz, HORIZONTAL)

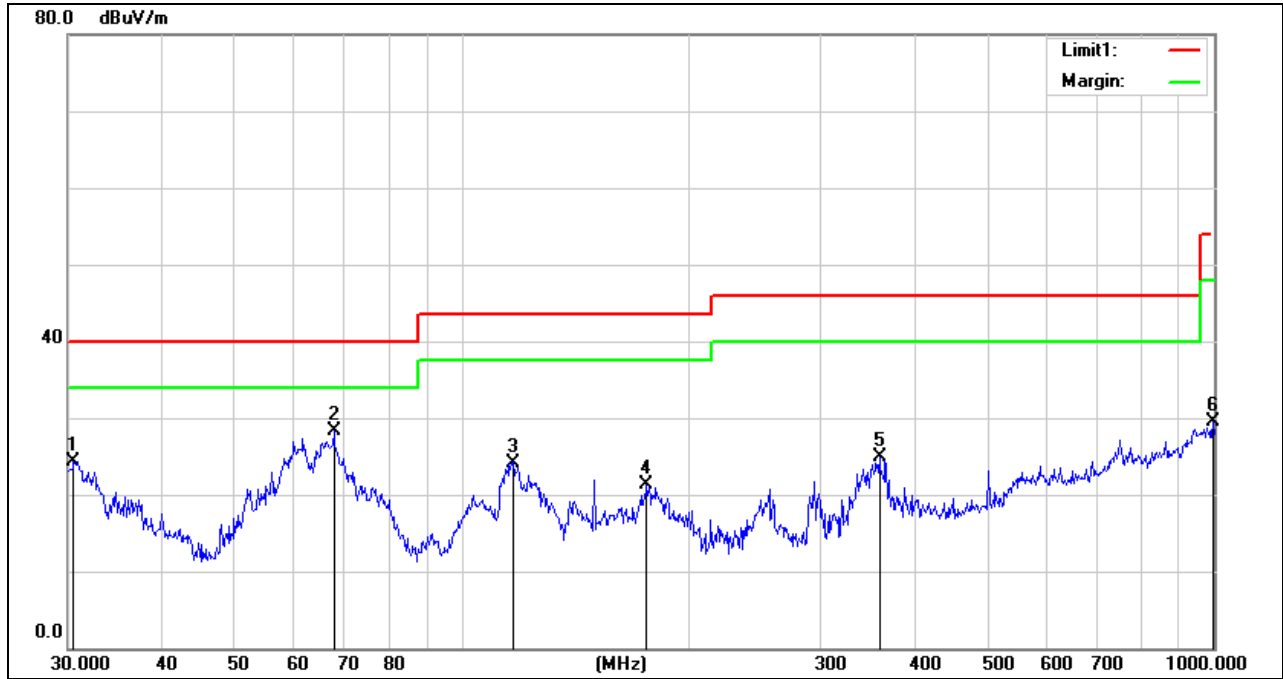


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.5306	35.83	-11.47	24.36	40.00	-15.64	QP
2	67.6751	52.41	-24.16	28.25	40.00	-11.75	QP
3	117.3603	42.06	-17.86	24.20	43.50	-19.30	QP
4	176.2686	40.76	-19.41	21.35	43.50	-22.15	QP
5	359.1860	37.99	-13.17	24.82	46.00	-21.18	QP
6	996.4996	29.53	-0.09	29.44	54.00	-24.56	QP
7	30.5306	35.83	-11.47	24.36	40.00	-15.64	QP

Note: 1. Measurement = Reading Level + Correct Factor.



HARMONICS AND SPURIOUS EMISSIONS (AC 120V/60Hz, VERTICAL)

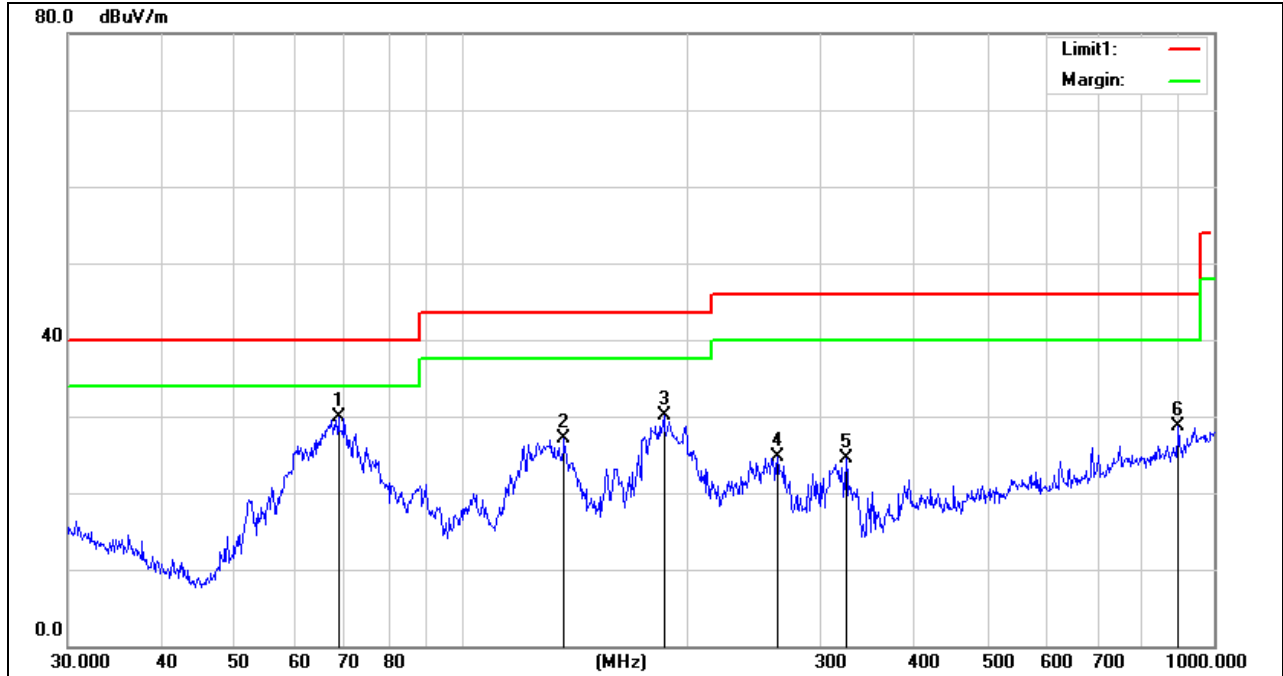


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.5306	35.83	-11.47	24.36	40.00	-15.64	QP
2	67.6751	52.41	-24.16	28.25	40.00	-11.75	QP
3	117.3603	42.06	-17.86	24.20	43.50	-19.30	QP
4	176.2686	40.76	-19.41	21.35	43.50	-22.15	QP
5	359.1860	37.99	-13.17	24.82	46.00	-21.18	QP
6	996.4996	29.53	-0.09	29.44	54.00	-24.56	QP
7	30.5306	35.83	-11.47	24.36	40.00	-15.64	QP
8	67.6751	52.41	-24.16	28.25	40.00	-11.75	QP
9	117.3603	42.06	-17.86	24.20	43.50	-19.30	QP

Note: 1. Measurement = Reading Level + Correct Factor.



HARMONICS AND SPURIOUS EMISSIONS (AC 277V/60Hz, HORIZONTAL)

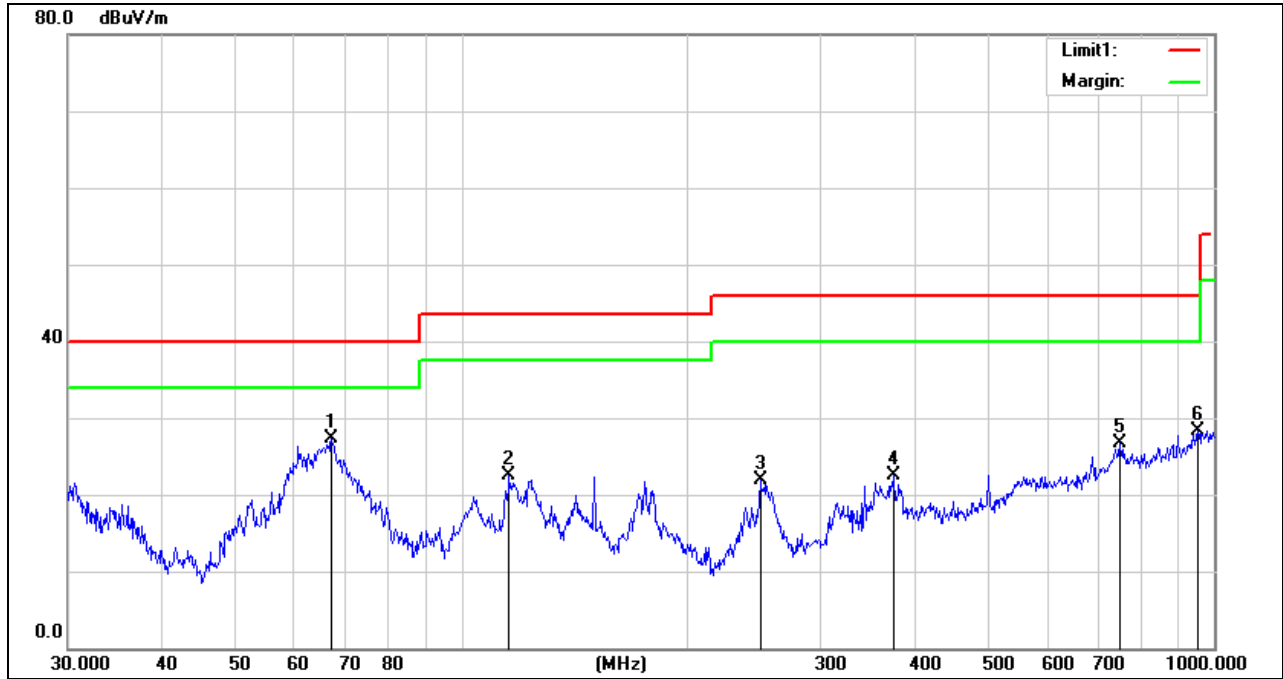


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	68.6310	54.11	-24.14	29.97	40.00	-10.03	QP
2	136.9391	44.70	-17.52	27.18	43.50	-16.32	QP
3	185.7882	50.03	-19.91	30.12	43.50	-13.38	QP
4	262.8955	39.81	-15.17	24.64	46.00	-21.36	QP
5	324.4561	38.72	-14.14	24.58	46.00	-21.42	QP
6	896.9965	30.92	-2.30	28.62	46.00	-17.38	QP
7	68.6310	54.11	-24.14	29.97	40.00	-10.03	QP

Note: 1. Measurement = Reading Level + Correct Factor.



HARMONICS AND SPURIOUS EMISSIONS (AC 277V/60Hz, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	67.2022	51.53	-24.17	27.36	40.00	-12.64	QP
2	115.7256	40.40	-17.97	22.43	43.50	-21.07	QP
3	249.4250	38.23	-16.41	21.82	46.00	-24.18	QP
4	374.6225	35.23	-12.77	22.46	46.00	-23.54	QP
5	750.1083	30.27	-3.56	26.71	46.00	-19.29	QP
6	952.0937	28.68	-0.36	28.32	46.00	-17.68	QP
7	67.2022	51.53	-24.17	27.36	40.00	-12.64	QP
8	115.7256	40.40	-17.97	22.43	43.50	-21.07	QP
9	249.4250	38.23	-16.41	21.82	46.00	-24.18	QP

Note: 1. Measurement = Reading Level + Correct Factor.



9.2. SPURIOUS EMISSIONS (Above 1GHz) Low Channel

Frequency (MHz)	Reading (dB μ V)	Amplifier (dB)	Loss (dB)	Antenna Factor (dB/m)	Corrected Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type	Comment
Low Channel (2405 MHz)										
3264.61	48.93	44.70	6.70	28.20	-9.80	39.13	74.00	-34.87	PK	Vertical
3264.61	38.67	44.70	6.70	28.20	-9.80	28.87	54.00	-25.13	AV	Vertical
3264.71	47.98	44.70	6.70	28.20	-9.80	38.18	74.00	-35.82	PK	Horizontal
3264.71	39.01	44.70	6.70	28.20	-9.80	29.21	54.00	-24.79	AV	Horizontal
4804.30	58.95	44.20	9.04	31.60	-3.56	55.39	74.00	-18.61	PK	Vertical
4804.30	38.53	44.20	9.04	31.60	-3.56	34.97	54.00	-19.03	AV	Vertical
4804.42	59.01	44.20	9.04	31.60	-3.56	55.45	74.00	-18.55	PK	Horizontal
4804.42	39.29	44.20	9.04	31.60	-3.56	35.73	54.00	-18.27	AV	Horizontal
5359.69	45.87	44.20	9.86	32.00	-2.34	43.53	74.00	-30.47	PK	Vertical
5359.69	37.33	44.20	9.86	32.00	-2.34	34.99	54.00	-19.01	AV	Vertical
5359.59	45.38	44.20	9.86	32.00	-2.34	43.04	74.00	-30.96	PK	Horizontal
5359.59	38.00	44.20	9.86	32.00	-2.34	35.66	54.00	-18.34	AV	Horizontal
7205.70	51.53	43.50	11.40	35.50	3.40	54.93	74.00	-19.07	PK	Vertical
7205.70	33.91	43.50	11.40	35.50	3.40	37.31	54.00	-16.69	AV	Vertical
7205.74	50.62	43.50	11.40	35.50	3.40	54.02	74.00	-19.98	PK	Horizontal
7205.74	32.67	43.50	11.40	35.50	3.40	36.07	54.00	-17.93	AV	Horizontal



Mid Channel

Frequency (MHz)	Reading (dB μ V)	Amplifier (dB)	Loss (dB)	Antenna Factor (dB/m)	Corrected Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type	Comment
Mid Channel (2440 MHz)										
3264.60	47.98	44.70	6.70	28.20	-9.80	38.18	74.00	-35.82	PK	Vertical
3264.60	39.81	44.70	6.70	28.20	-9.80	30.01	54.00	-23.99	AV	Vertical
3264.83	48.81	44.70	6.70	28.20	-9.80	39.01	74.00	-34.99	PK	Horizontal
3264.83	38.30	44.70	6.70	28.20	-9.80	28.50	54.00	-25.50	AV	Horizontal
4880.44	58.26	44.20	9.04	31.60	-3.56	54.70	74.00	-19.30	PK	Vertical
4880.44	38.72	44.20	9.04	31.60	-3.56	35.16	54.00	-18.84	AV	Vertical
4880.44	58.81	44.20	9.04	31.60	-3.56	55.25	74.00	-18.75	PK	Horizontal
4880.44	39.34	44.20	9.04	31.60	-3.56	35.78	54.00	-18.22	AV	Horizontal
5359.72	45.27	44.20	9.86	32.00	-2.34	42.93	74.00	-31.07	PK	Vertical
5359.72	37.21	44.20	9.86	32.00	-2.34	34.87	54.00	-19.13	AV	Vertical
5359.68	45.54	44.20	9.86	32.00	-2.34	43.20	74.00	-30.80	PK	Horizontal
5359.68	38.26	44.20	9.86	32.00	-2.34	35.92	54.00	-18.08	AV	Horizontal
7310.95	50.55	43.50	11.40	35.50	3.40	53.95	74.00	-20.05	PK	Vertical
7310.95	33.92	43.50	11.40	35.50	3.40	37.32	54.00	-16.68	AV	Vertical
7310.77	50.85	43.50	11.40	35.50	3.40	54.25	74.00	-19.75	PK	Horizontal
7310.77	33.68	43.50	11.40	35.50	3.40	37.08	54.00	-16.92	AV	Horizontal



High Channel

Frequency (MHz)	Reading (dB μ V)	Amplifier (dB)	Loss (dB)	Antenna Factor (dB/m)	Corrected Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type	Comment
High Channel (2480 MHz)										
3264.89	48.72	44.70	6.70	28.20	-9.80	38.92	74.00	-35.08	PK	Vertical
3264.89	39.17	44.70	6.70	28.20	-9.80	29.37	54.00	-24.63	AV	Vertical
3264.79	48.59	44.70	6.70	28.20	-9.80	38.79	74.00	-35.21	PK	Horizontal
3264.79	38.98	44.70	6.70	28.20	-9.80	29.18	54.00	-24.82	AV	Horizontal
4960.37	58.76	44.20	9.04	31.60	-3.56	55.20	74.00	-18.80	PK	Vertical
4960.37	38.29	44.20	9.04	31.60	-3.56	34.73	54.00	-19.27	AV	Vertical
4960.46	59.14	44.20	9.04	31.60	-3.56	55.58	74.00	-18.42	PK	Horizontal
4960.46	39.00	44.20	9.04	31.60	-3.56	35.44	54.00	-18.56	AV	Horizontal
5359.60	45.20	44.20	9.86	32.00	-2.34	42.86	74.00	-31.14	PK	Vertical
5359.60	37.26	44.20	9.86	32.00	-2.34	34.92	54.00	-19.08	AV	Vertical
5359.73	45.41	44.20	9.86	32.00	-2.34	43.07	74.00	-30.93	PK	Horizontal
5359.73	37.76	44.20	9.86	32.00	-2.34	35.42	54.00	-18.58	AV	Horizontal
7439.77	50.84	43.50	11.40	35.50	3.40	54.24	74.00	-19.76	PK	Vertical
7439.77	33.36	43.50	11.40	35.50	3.40	36.76	54.00	-17.24	AV	Vertical
7439.86	50.88	43.50	11.40	35.50	3.40	54.28	74.00	-19.72	PK	Horizontal
7439.86	33.53	43.50	11.40	35.50	3.40	36.93	54.00	-17.07	AV	Horizontal

Note:

1) Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Emission Level = Reading + Factor

2) The frequency emission of peak points that did not show above the forms are at least 20dB below the limit, the frequency emission is mainly from the environment noise.



9.3. RESTRICTED BANDEDGE

Frequency (MHz)	Reading (dB μ V)	Amplifier (dB)	Loss (dB)	Antenna Factor (dB/m)	Corrected Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type	Comment
OQPSK										
2390.00	67.78	43.80	4.91	25.90	-12.99	54.79	74.00	-19.21	PK	Vertical
2390.00	53.84	43.80	4.91	25.90	-12.99	40.85	54.00	-13.15	AV	Vertical
2390.00	69.47	43.80	4.91	25.90	-12.99	56.48	74.00	-17.52	PK	Horizontal
2390.00	52.43	43.80	4.91	25.90	-12.99	39.44	54.00	-14.56	AV	Horizontal
2483.50	70.33	43.80	5.12	25.90	-12.78	57.55	74.00	-16.45	PK	Vertical
2483.50	52.06	43.80	5.12	25.90	-12.78	39.28	54.00	-14.72	AV	Vertical
2483.50	70.16	43.80	5.12	25.90	-12.78	57.38	74.00	-16.62	PK	Horizontal
2483.50	52.14	43.80	5.12	25.90	-12.78	39.36	54.00	-14.64	AV	Horizontal
<p>Low measurement frequencies is range from 2300 to 2403 MHz, high measurement frequencies is range from 2479 to 2500 MHz. Only show the worst point data of the emissions in the frequency 2300-2403 MHz and 2479-2500 MHz.</p>										

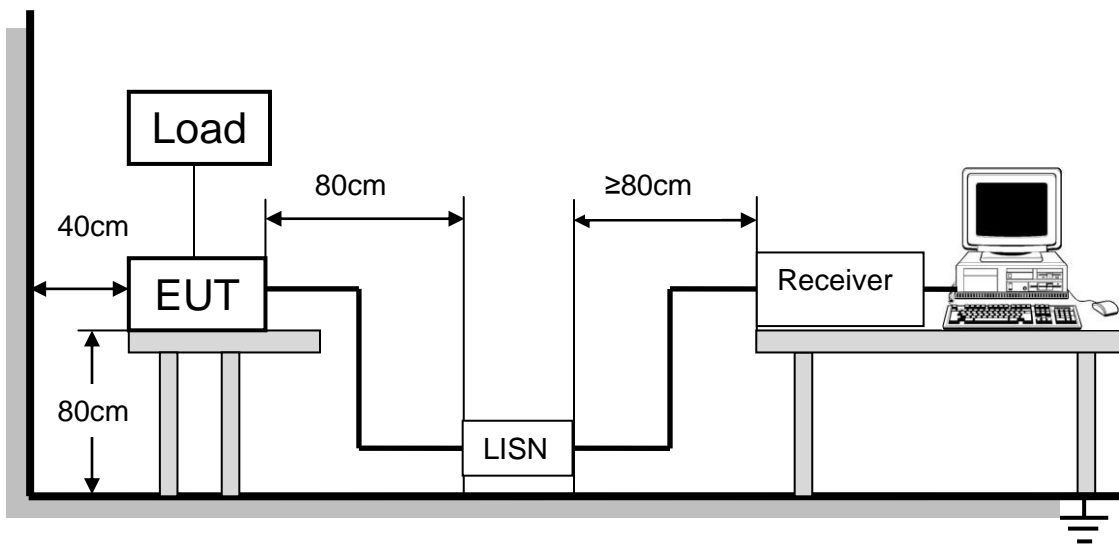
10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

Please refer to FCC §15.207 (a) and RSS-Gen Clause 8.8

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *
0.50 -5.0	73.00	60.00	56.00	46.00
5.0 -30.0	73.00	60.00	60.00	50.00

TEST SETUP AND PROCEDURE



The EUT is put on a table of non-conducting material that is 80cm high. The vertical conducting wall of shielding is located 40cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI Measurement Receiver (R&S Test Receiver ESR3) is used to test the emissions from both sides of AC line. According to the requirements in Section 7 and 13 of ANSI C63.10-2013. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode. The bandwidth of EMI test receiver is set at 9kHz.

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application.

TEST ENVIRONMENT

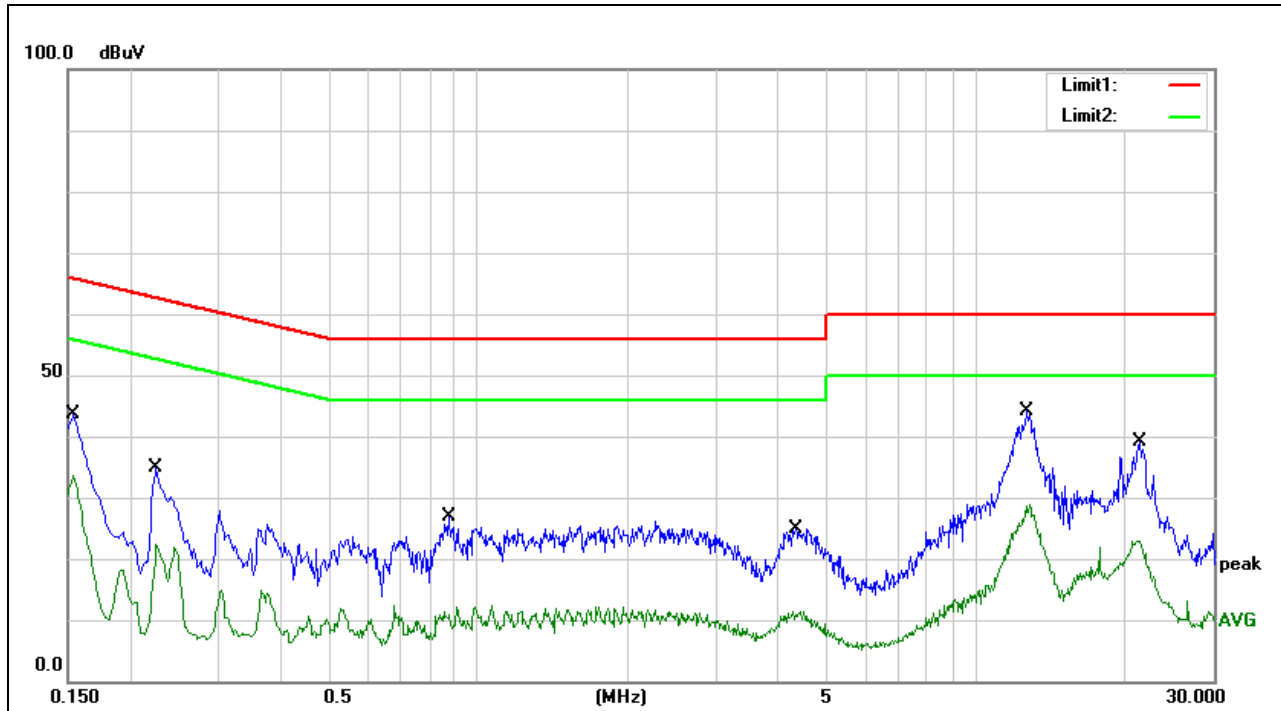


Temperature	23.5°C	Relative Humidity	59%
Atmosphere Pressure	101kPa	Test Voltage	AC120/277V

TEST RESULTS

10.1.1. OQPSK MODE

LINE N RESULTS (AC120V/60Hz)

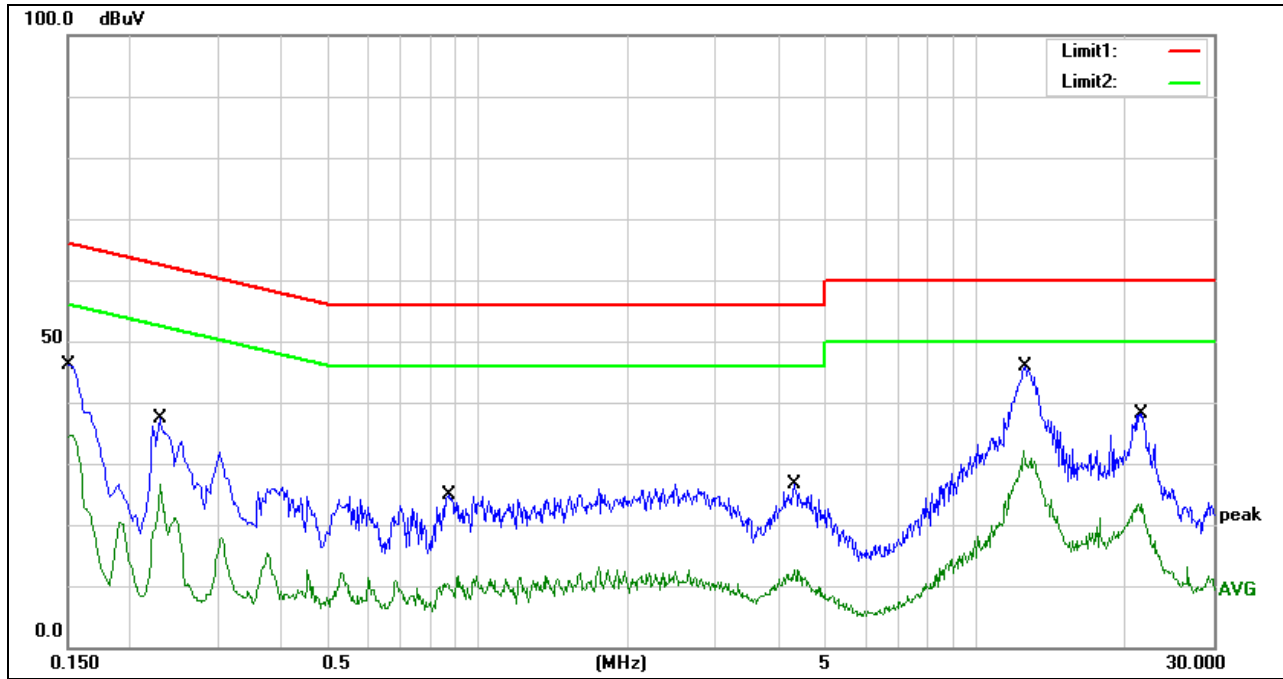


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1540	33.83	9.76	43.59	65.78	-22.19	QP
2	0.1540	23.96	9.76	33.72	55.78	-22.06	AVG
3	0.2260	24.88	9.97	34.85	62.60	-27.75	QP
4	0.2260	12.06	9.97	22.03	52.60	-30.57	AVG
5	0.8740	17.10	9.83	26.93	56.00	-29.07	QP
6	0.8740	-0.36	9.83	9.47	46.00	-36.53	AVG
7	4.3460	14.97	9.94	24.91	56.00	-31.09	QP
8	4.3460	0.95	9.94	10.89	46.00	-35.11	AVG
9	12.6780	34.16	10.01	44.17	60.00	-15.83	QP
10	12.6780	18.84	10.01	28.85	50.00	-21.15	AVG
11	21.3300	28.64	10.42	39.06	60.00	-20.94	QP
12	21.3300	12.44	10.42	22.86	50.00	-27.14	AVG

- Note: 1. Result = Reading +Correct Factor.
 2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
 3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).
 4. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.



LINE L RESULTS (AC120V/60Hz)

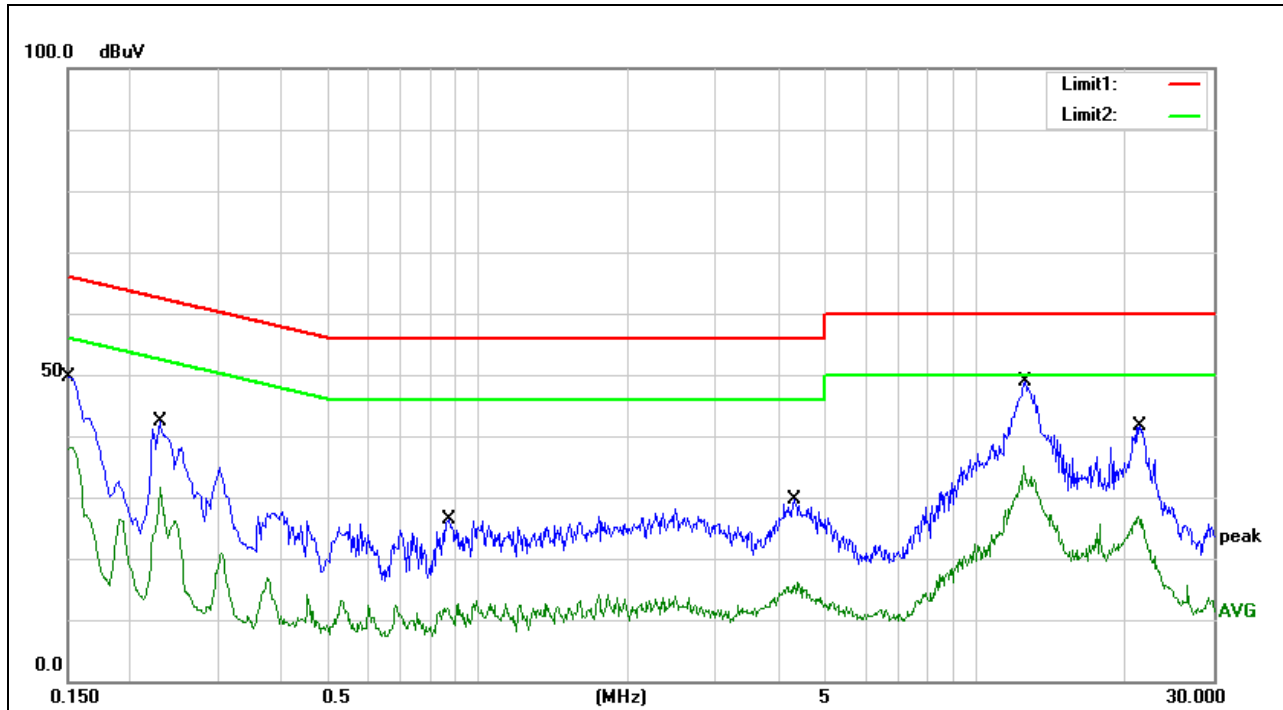


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1500	36.34	9.79	46.13	66.00	-19.87	QP
2	0.1500	24.84	9.79	34.63	56.00	-21.37	AVG
3	0.2300	27.47	9.91	37.38	62.45	-25.07	QP
4	0.2300	16.63	9.91	26.54	52.45	-25.91	AVG
5	0.8780	15.12	9.82	24.94	56.00	-31.06	QP
6	0.8780	-0.51	9.82	9.31	46.00	-36.69	AVG
7	4.3260	16.67	9.84	26.51	56.00	-29.49	QP
8	4.3260	0.97	9.84	10.81	46.00	-35.19	AVG
9	12.5660	35.66	10.22	45.88	60.00	-14.12	QP
10	12.5660	19.70	10.22	29.92	50.00	-20.08	AVG
11	21.5220	27.85	10.37	38.22	60.00	-21.78	QP
12	21.8300	10.80	10.35	21.15	50.00	-28.85	AVG

- Note: 1. Result = Reading +Correct Factor.
 2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
 3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).
 4. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.



LINE N RESULTS (AC 277V/60Hz)

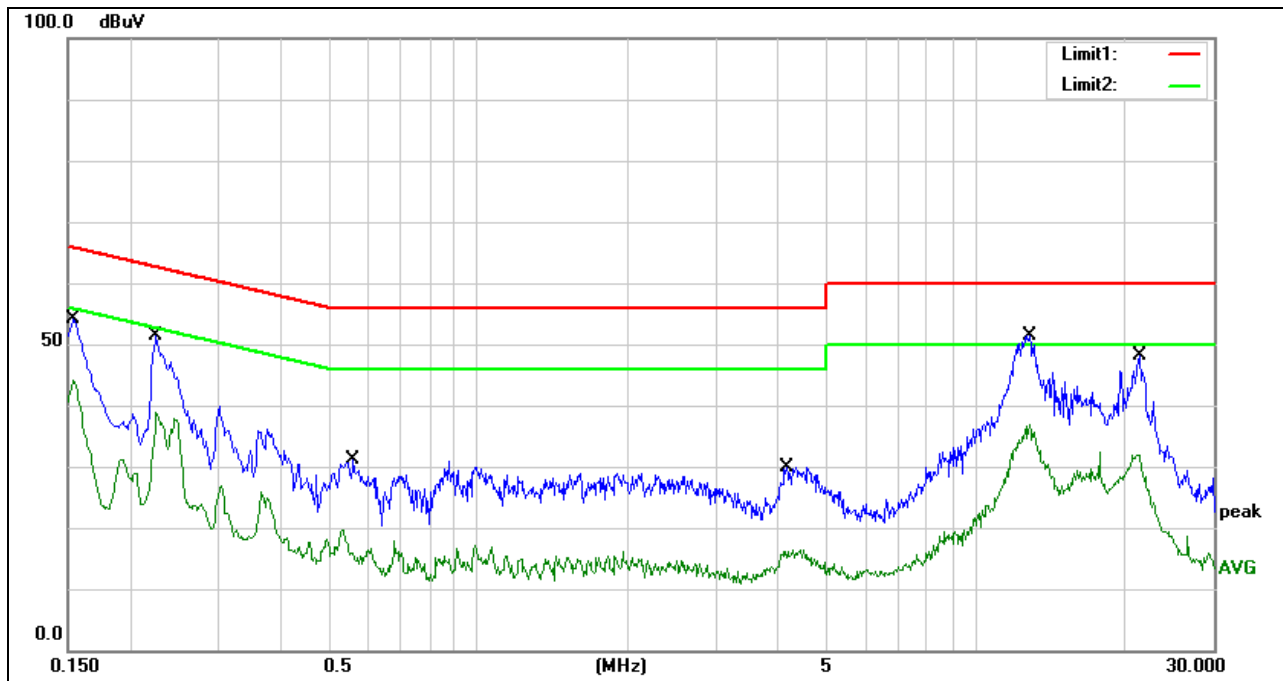


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1500	39.84	9.79	49.63	66.00	-16.37	QP
2	0.1500	28.26	9.79	38.05	56.00	-17.95	AVG
3	0.2300	32.47	9.91	42.38	62.45	-20.07	QP
4	0.2300	16.03	9.91	25.94	52.45	-26.51	AVG
5	0.8780	16.62	9.82	26.44	56.00	-29.56	QP
6	0.8780	0.65	9.82	10.47	46.00	-35.53	AVG
7	4.3260	19.67	9.84	29.51	56.00	-26.49	QP
8	4.3260	5.95	9.84	15.79	46.00	-30.21	AVG
9	12.5660	38.66	10.22	48.88	60.00	-11.12	QP
10	12.5660	22.39	10.22	32.61	50.00	-17.39	AVG
11	21.3060	31.23	10.38	41.61	60.00	-18.39	QP
12	21.3060	15.05	10.38	25.43	50.00	-24.57	AVG

- Note: 1. Result = Reading +Correct Factor.
 2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
 3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).
 4. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.



LINE L RESULTS (AC277V/60Hz)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1540	44.33	9.76	54.09	65.78	-11.69	QP
2	0.1540	34.20	9.76	43.96	55.78	-11.82	AVG
3	0.2260	41.38	9.97	51.35	62.60	-11.25	QP
4	0.2260	28.56	9.97	38.53	52.60	-14.07	AVG
5	0.5620	21.28	9.94	31.22	56.00	-24.78	QP
6	0.5620	5.29	9.94	15.23	46.00	-30.77	AVG
7	4.1780	20.02	9.95	29.97	56.00	-26.03	QP
8	4.1780	5.39	9.95	15.34	46.00	-30.66	AVG
9	12.8260	41.39	10.01	51.40	60.00	-8.60	QP
10	12.8260	25.22	10.01	35.23	50.00	-14.77	AVG
11	21.3300	37.64	10.42	48.06	60.00	-11.94	QP
12	21.3300	18.61	10.42	29.03	50.00	-20.97	AVG

- Note: 1. Result = Reading +Correct Factor.
 2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
 3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).
 4. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.



11. ANTENNA REQUIREMENTS

APPLICABLE REQUIREMENTS

Please refer to FCC §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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Please refer to FCC §15.247(b)(4)

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

ANTENNA CONNECTOR

EUT has a External Antenna with antenna connector.

ANTENNA GAIN

The antenna gain of EUT is less than 6 dBi.

END OF REPORT