

Test Report

FCC ID: 2AI56-SC-4250GTV

Applicant: HKC Corporation Limited

Address: Building 1,2,3, Huike Industrial Park, Minying Industrial Zone, ShuiTian, ShiYan, Baoan

Manufacturer: Guangxi Huike Intelligent Display Co., Ltd

Address: NO.4,NO.5,NO12,NO14,in Xinyuan Science and Technology Park, NO.6 Taiwan Road, Beihai Industrial Park, Guangxi Autonomous Region, P.R. China

Product: LED TV

Brand: HKC, SONIQ, OKANO, RCA, PROSCAN, SLYVANIA, WESTINGHOUSE, IMPECCA, SUPERSONIC

Test Model(s): SC-4250GTV

Series Model(s): 42D1, RTA4202, SL421AN, RLDED4216A-C, RT4238-G, PLDED4216A-G, WD42FB1120-C, WD42FB1200, TL4200H, TL4200F

Test Date: Oct.19, 2020 ~ Oct. 26, 2020

Issued By: Hwa-Hsing (Dongguan) Testing Co., Ltd.

Address: No.101, Bld N1, Yuyuan 2Rd, Yuyuan Industrial Park, HuangJiang Town, Dongguan, China

FCC Designation No.: CN1255

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10:2013

The above equipment has been tested by **Hwa-Hsing (Dongguan) Testing Co., Ltd.**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared By :



Scott He/ Project Engineer

Date:

Oct. 30, 2020

Approved By :



Harry Li/ Technical Director

Date:

Jan. 06, 2021

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RELEASE CONTROL RECORD

Issue No.	Description	Date Issued
201031KH11-F2	Original Release	Jan. 06, 2021

1. Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247) ANSI C63.10:2013 KDB 558074 D01 15.247 Meas Guidance v05r02			
Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit.
15.205 & 209	Radiated Emissions	Pass	Meet the requirement of limit.
15.247(d)	Band Edge Measurement	Pass	Meet the requirement of limit.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6dB Bandwidth	Pass	Meet the requirement of limit.
---	Occupied Bandwidth Measurement	Pass	Reference only
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	No antenna connector is used. The device is professionally installed

1.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

The listed uncertainties are the worst cases uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

Measurement	Frequency	Expended Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.66 dB
Radiated Emissions up to 1 GHz	9KHz ~ 30MHz	2.90dB
	30MHz ~ 1000MHz	3.47 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	4.84 dB
	18GHz ~ 40GHz	4.62 dB

1.2 Modification Record

There were no modifications required for compliance.

2. General Information

2.1 General Description of EUT

Product	LED TV
Brand	HKC, SONIQ, OKANO, RCA, PROSCAN, SLYVANIA, WESTINGHOUSE, IMPECCA, SUPERSONIC
Test Model(s)	SC-4250GTV
Series Model(s)	42D1, RTA4202, SL421AN, RLDED4216A-C, RT4238-G, PLDED4216A-G, WD42FB1120-C, WD42FB1200, TL4200H, TL4200F
FCC ID:	2AI56-SC-4250GTV
Status of EUT	Engineering prototype
Power Supply Rating	AC100-240V 50/60Hz
Modulation Type	GFSK
Transfer Rate	1 Mbps
Operating Frequency	2402 ~ 2480MHz
Number of Channel	40
Maximum Output Power	0.783mW
Antenna Type	Dipole antenna with 3.64dBi gain
Antenna Connector	I-PEX
Accessory Device	AC Line: 2.0m, Un-shielding
Data Cable Supplied	N/A

Note:

1. Please refer to the EUT photo document (Reference No.: 201031KH11) for detailed product photo.
2. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.
3. Model difference: all of these models (SC-4250GTV, 42D1, RTA4202, SL421AN, RLDED4216A-C, RT4238-G, PLDED4216A-G, WD42FB1120-C, WD42FB1200, TL4200H, TL4200F) only difference for brand name and model name for trace purpose.

2.2 Description of Test Channels

40 channels are provided to this EUT:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

2.3 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable test items				Description
	RE $\geq$ 1G	RE<1G	PLC	APCM	
-	√	√	√	√	AC120V/60Hz

Where **RE $\geq$ 1G**: Radiated Emission above 1GHz **RE<1G**: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **APCM**: Antenna Port Conducted Measurement

Note:

1. For Radiated emission test, pre-tested GFSK, $\pi/4$ -DQPSK, 8DPSK modulation type and found GFSK was the worse, therefore chosen for the final test and presented in the test report.
2. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.
3. "-" means no effect.

Radiated Emission Test (Above 1GHz):

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (Mbps)
-	0 to 39	0, 19, 39	GFSK	1

Radiated Emission Test (Below 1GHz):

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (Mbps)
-	0 to 39	0	GFSK	1

Power Line Conducted Emission Test:

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (Mbps)
-	0 to 39	0, 19, 39	GFSK	1

Antenna Port Conducted Measurement:

This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (Mbps)
-	0 to 39	0, 19, 39	GFSK	1

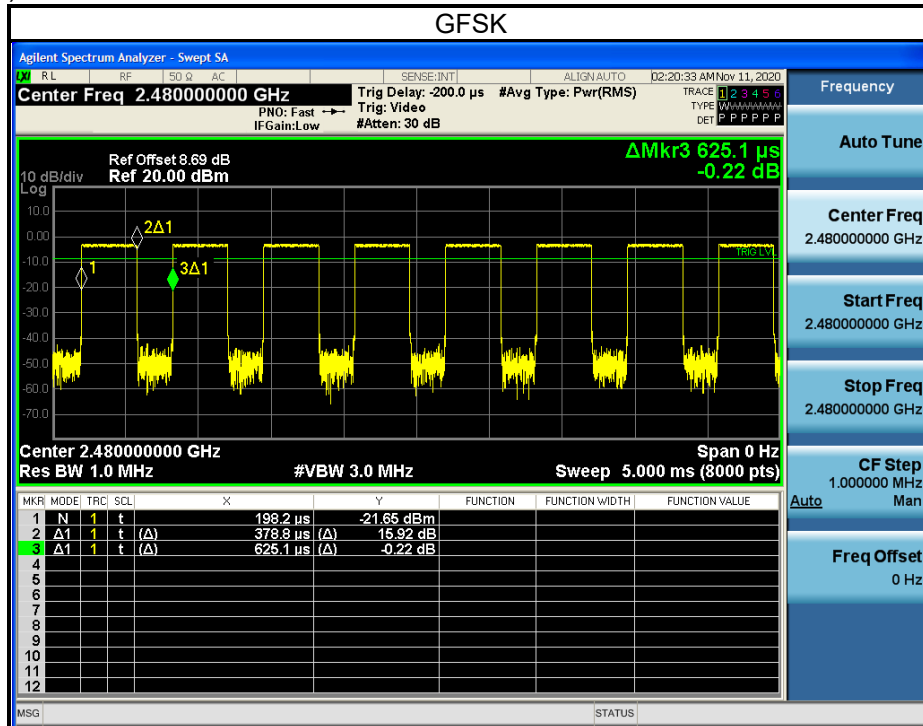
Test Condition:

Applicable test items	Environmental Conditions	Power supply	Tested by
RE≥1G	25deg. C, 65%RH	AC120V/60Hz	Tech Chen
RE<1G	25deg. C, 65%RH	AC120V/60Hz	Tech Chen
PLC	25 deg. C, 65 %RH	AC120V/60Hz	Tech Chen
APCM	25 deg. C, 65 %RH	AC120V/60Hz	Tech Chen

2.4 Duty Cycle of Test Signal

GFSK: Duty cycle of test signal is 60.59%, Duty cycle of test signal is < 98%

$$10 \cdot \log(1/0.606) = 2.18\text{dB}$$



2.5 Description of Support Units

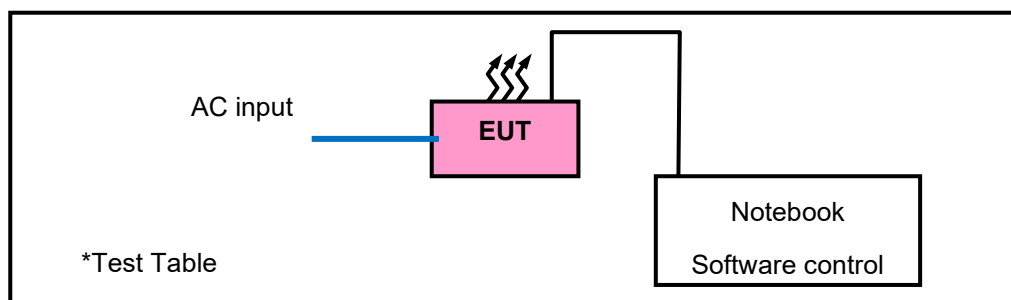
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Product	Brand	Model No.	Serial No.	FCC ID
1.	Notebook	Lenovo	TP0093A	PF-12HMBU	N/A
2.	Mouse	DELL	MS111-L	CN-09RRC7-44751-0C6-04TR	N/A
3.	N/A	N/A	N/A	N/A	N/A

Insert Cable Connections to/from EUT provided by test team.

No.	Signal Cable Description Of The Above Support Units
1.	USB Line: Un-shieldin 1.0m
2.	/
3.	/

2.6 Configuration of System under Test



2.7 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C (15.247)

KDB 558074 D01 15.247 Meas Guidance v05r02

KDB 662911 D01 v02r01

ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

Note: The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

3. Test Types and Results

3.1 Radiated Emission and Band-edge Measurement

3.1.1 Limits of radiated emission and band-edge measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

Frequencies (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
Above 960	500	3

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

3.1.2 Test Instruments

For radiated emission test (9kHz-30MHz)

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver (10kHz~7GHz)	Rohde&Schwarz	ESCI 7	100962	2020/05/14	2021/05/13
Loop antenna (9kHz~30MHz)	TESEQ	HLA 6121	56735	2020/04/15	2021/04/15
3m Semi-anechoic Chamber	MAORUI	9m*6m*6m	NSEMC003	2020/04/15	2021/04/14
Attenuator	R&S	TS2GA-6dB	18101101	N/A	N/A
Test software	EZ	EZ EMC V1.1.4.2	N/A	N/A	N/A

For radiated emission test (30MHz-1GHz)

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver (10kHz~7GHz)	Rohde&Schwarz	ESCI 7	100962	2020/05/14	2021/05/13
Broadband antenna (25MHz~2500MHz)	Schwarzbeck	VULB 9168	00937	2020/4/15	2021/04/15
3m Semi-anechoic Chamber	MAORUI	9m*6m*6m	NSEMC003	2020/04/15	2021/04/14
Signal Amplifier (30MHz~1000MHz)	Com-power	PAM-103	18020051	2020/4/15	2021/04/15
Attenuator	R&S	TS2GA-6dB	18101101	N/A	N/A
Test software	EZ	EZ EMC V1.1.4.2	N/A	N/A	N/A

For radiated emission test (1GHz-40GHz)

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Horn Antenna (1GHz-18GHz)	Schwarzbeck	BBHA 9170	01959	2020/4/15	2021/04/15
Broadband Coaxial Preamplifier (1GHz-18GHz)	Schwarzbeck	BBV 9718	00025	2020/04/15	2021/04/15
Spectrum Analyzer	Rohde&Schwarz	FSV-40N	10783	2020/04/15	2021/04/15
Horn Antenna (18GHz-40GHz)	Schwarzbeck	BBHA 9170	BBHA9170242	2020/04/15	2021/04/15
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	2020/04/15	2021/04/15
High pass filter	Micro-Tronics	HPM50107	G050	2020/09/16	2021/09/16
High pass filter	Micro-Tronics	HPM50117	G007	2020/09/16	2021/09/16
Test software	EZ	EZ EMC V1.1.4.2	N/A	N/A	N/A
Spectrum (10kHz~26.5GHz)	Keysight	N9020A	MY51240612	2020/09/16	2021/09/16

Note: 1. The calibration interval of the above test instruments is 12/24months and the calibrations are traceable to CEPREI/CHINA.
2. The test was performed in 966.

3.1.3 Test Procedures

- a. The EUT was placed on the top of a rotating table 0.8 meters (below 1GHz) / 1.5 meters (1-18GHz) / 1.5 meters (18-40GHz) above the reference ground. 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 (Below 1GHz)& (Above 1-18GHz), which was mounted on the top of a variable-height antenna tower. The EUT was set 1 meters away from the interference-receiving antenna (18-40GHz).
- c. The height of antenna 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 and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detected function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

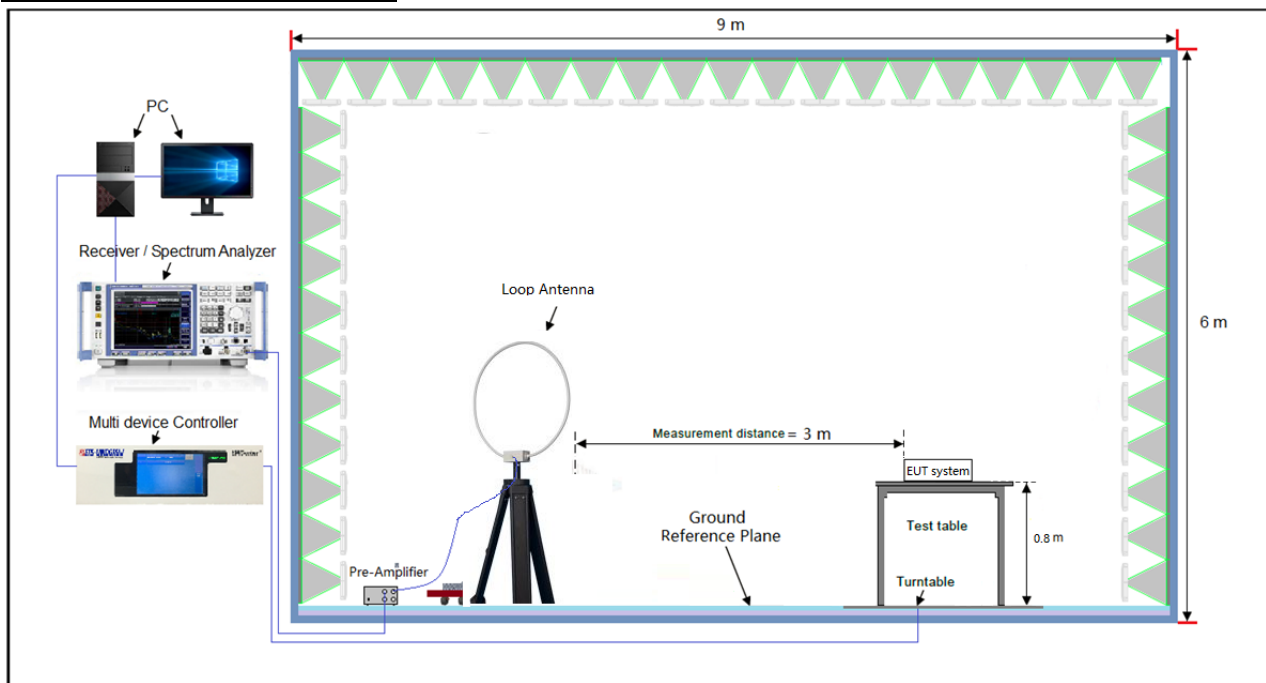
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz & 360kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 1/T for Average (Duty cycle < 98 %) detection at frequency above 1 GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
5. All modes of operation were investigated and the worst-case emissions are reported.

3.1.4 Deviation from Test Standard

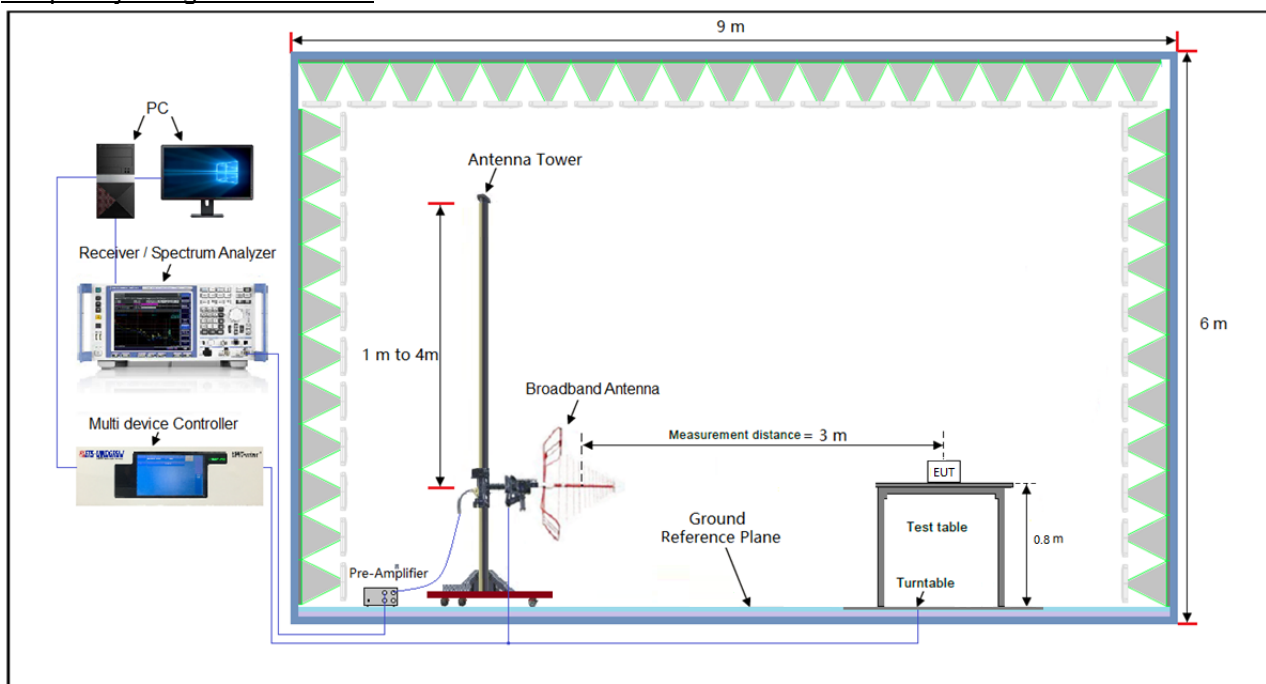
No deviation.

3.1.5 Test Setup

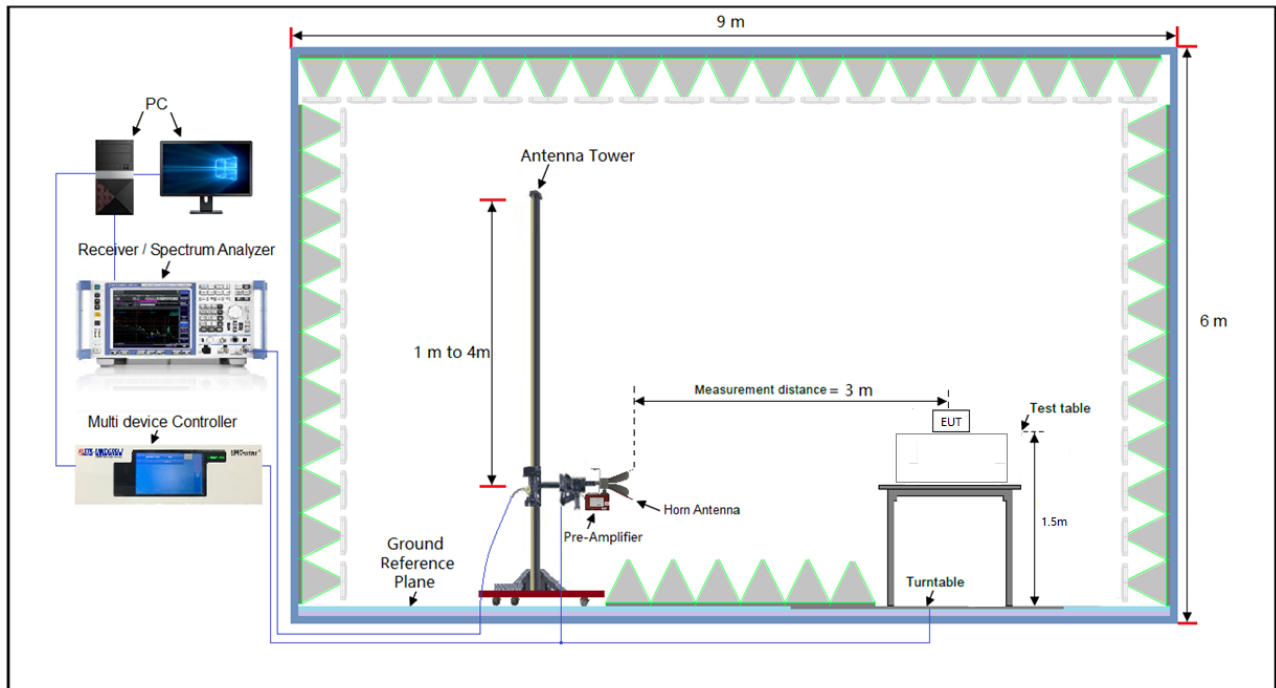
Radiated emission below 30MHz:



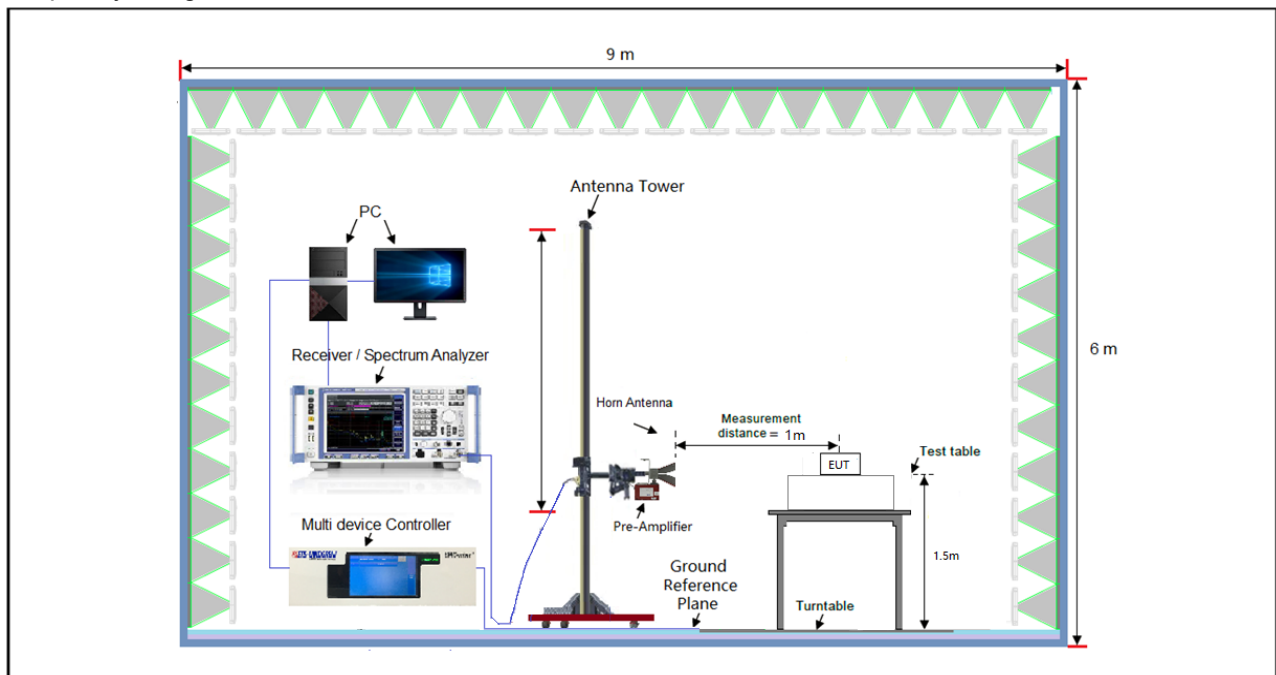
Frequency Range below 1GHz:



Frequency Range 1-18GHz:



Frequency Range 18-40GHz:



For the actual test configuration, please refer to the attached file (Test Setup Photo).

3.1.6 EUT Operating Conditions

- Placed the EUT on the testing table.
- Set the EUT under transmission condition continuously at specific channel frequency.

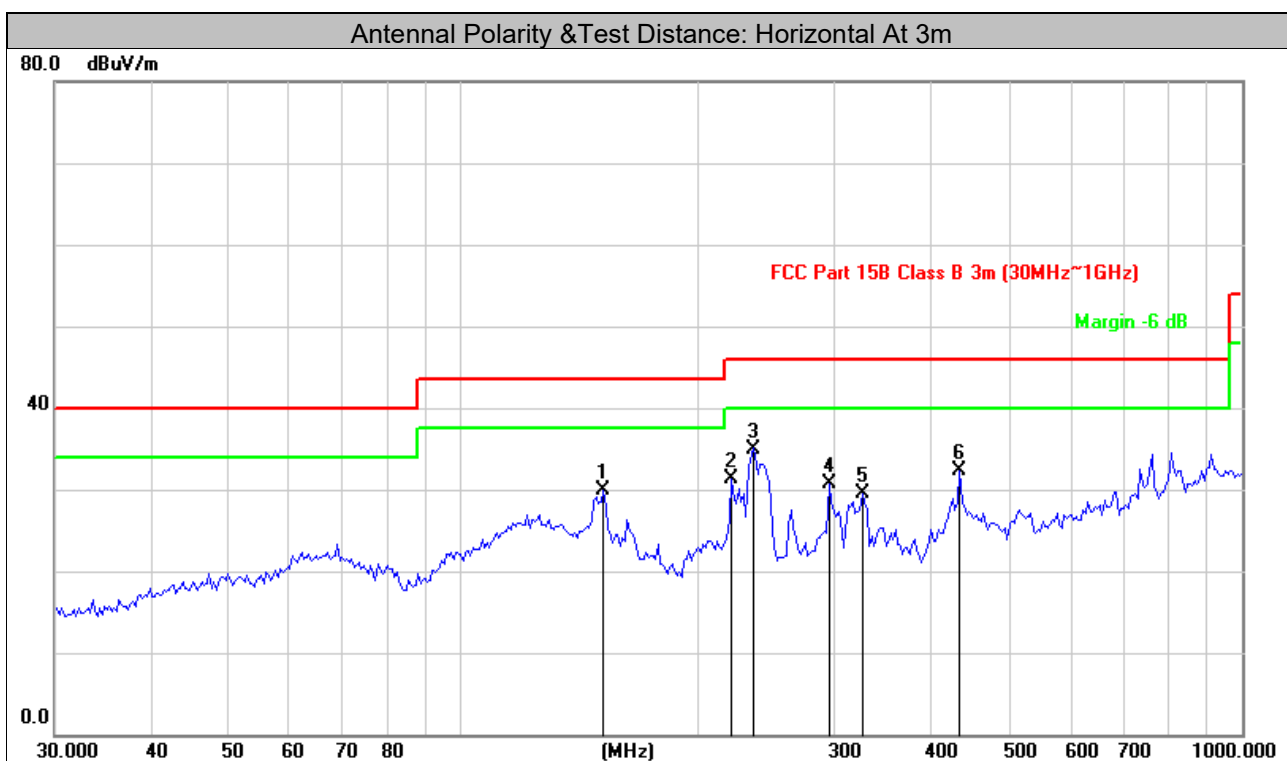
3.1.7 Test Results

9kHz ~ 30MHz Data:

The amplitude of spurious emissions attenuated more than 20dB below the permissible value is not required to be report.

30MHz ~ 1GHz Worst-Case Data:

Test Channel	Channel 0	Frequency Range	30MHz ~ 1GHz
Power supply	AC120V 60Hz	Detector Function	Peak (PK) Quasi-peak (QP)
Environmental Conditions	24deg. C, 57%RH	Tested By	Tech Chen

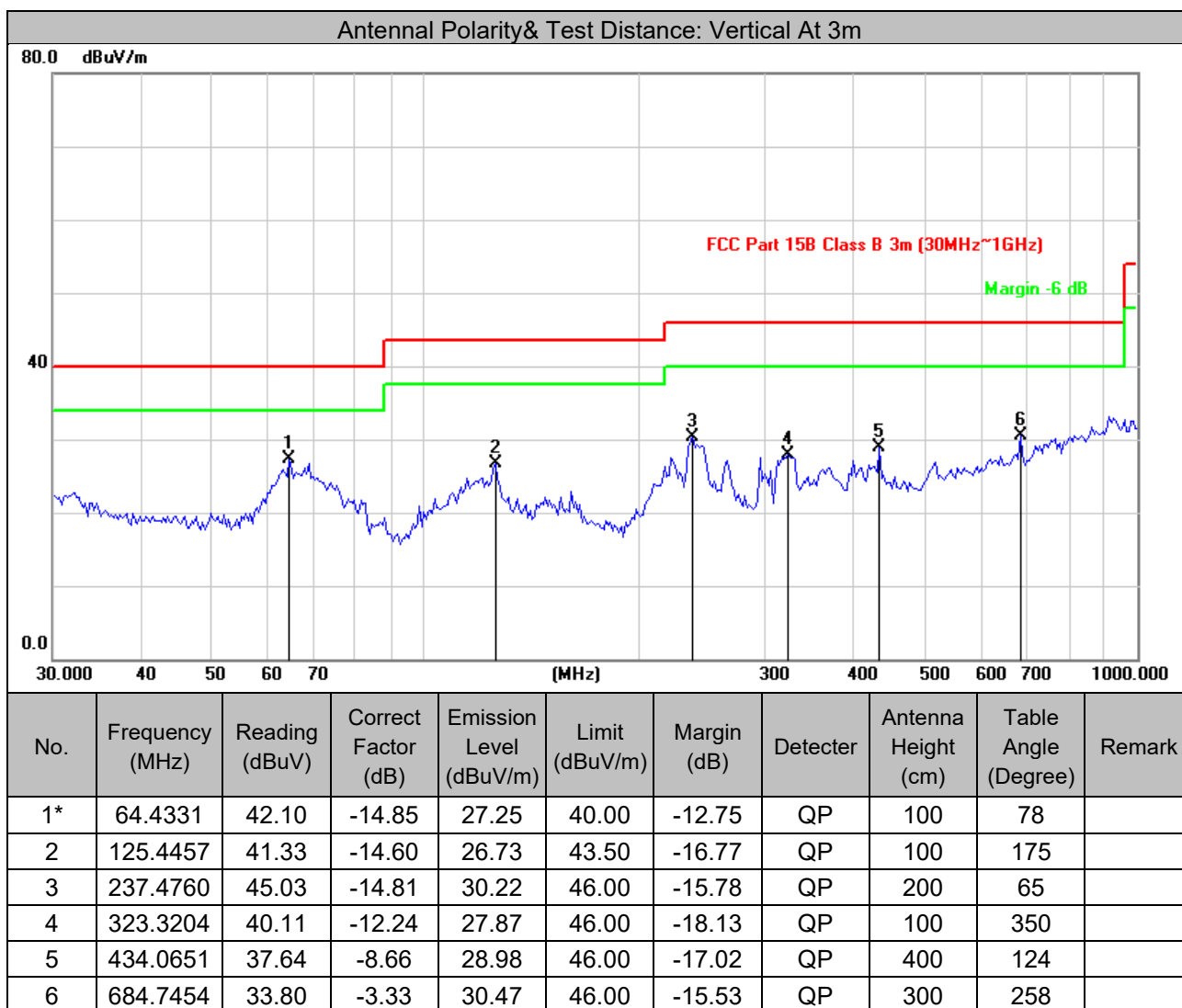


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)	Remark
1	151.5972	43.10	-13.16	29.94	43.50	-13.56	QP	100	312	
2	221.3921	47.02	-15.75	31.27	46.00	-14.73	QP	200	162	
3*	235.8164	49.76	-14.76	35.00	46.00	-11.00	QP	300	85	
4	295.1469	44.18	-13.43	30.75	46.00	-15.25	QP	100	38	
5	325.5958	41.62	-12.13	29.49	46.00	-16.51	QP	400	123	
6	434.0651	40.99	-8.66	32.33	46.00	-13.67	QP	100	254	

Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
2. Margin value = Emission level – Limit value

Channel	Channel 0	Frequency Range	30MHz ~ 1GHz
Power supply	AC120V 60Hz	Detector Function	Peak (PK) Quasi-peak (QP)
Environmental Conditions	24deg. C, 57%RH	Tested By	Tech Chen

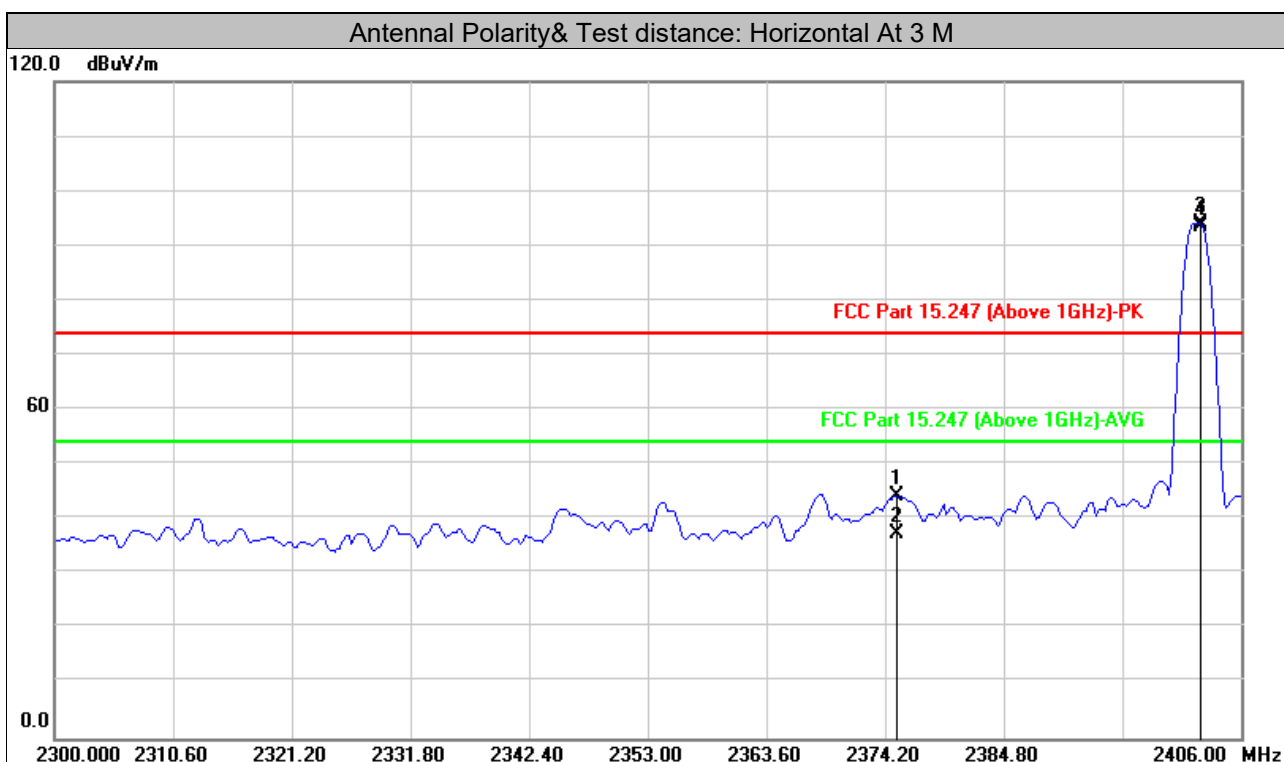


Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
2. Margin value = Emission level – Limit value

Above 1GHz Data:

Test Channel	Channel 0	Frequency Range	1GHz ~ 25GHz
Power supply	AC120V 60Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	24deg. C, 57%RH	Tested By	Tech Chen

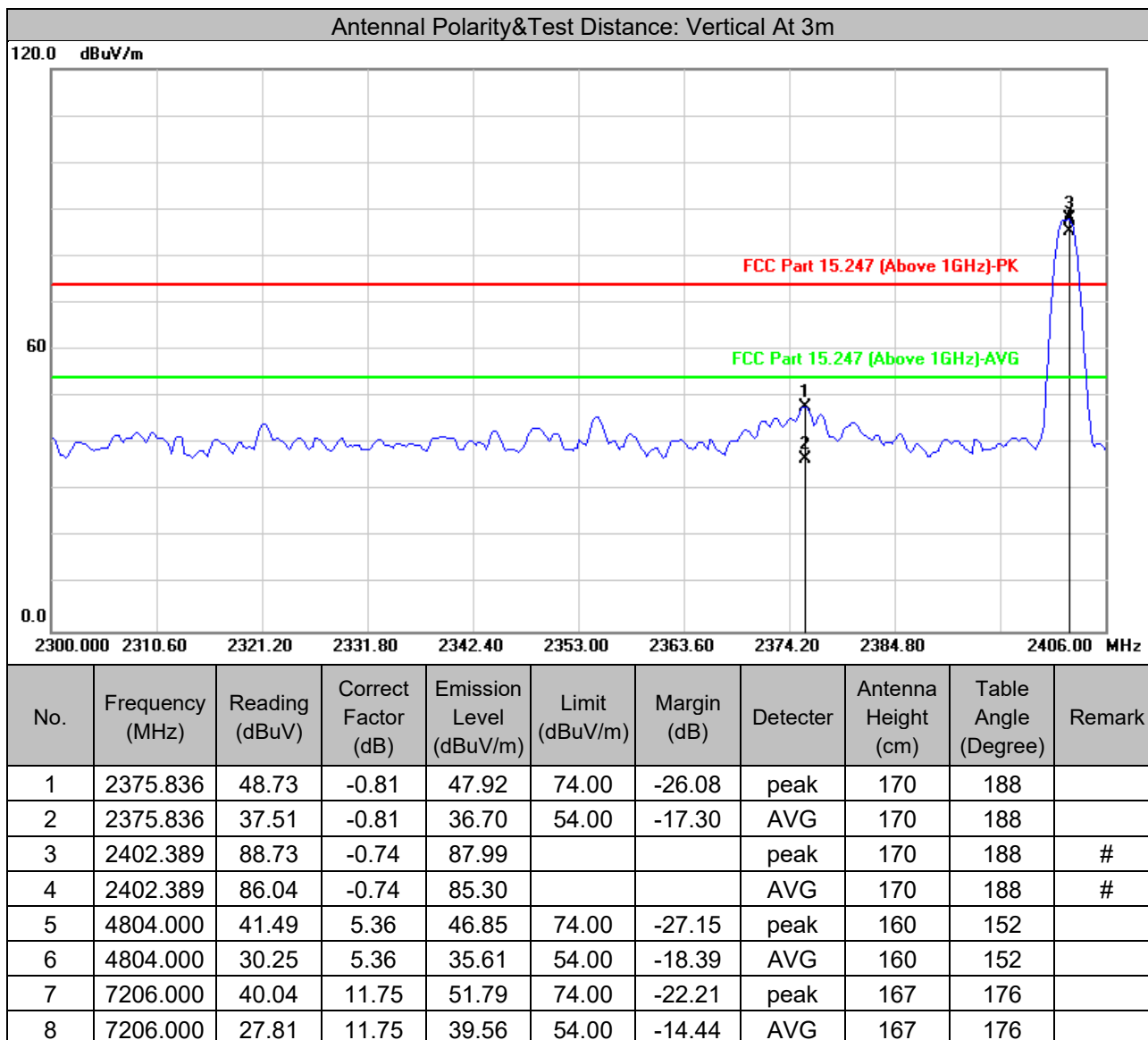


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)	Remark
1	2375.198	45.14	-0.81	44.33	74.00	-29.67	peak	130	217	
2	2375.198	38.21	-0.81	37.40	54.00	-16.60	AVG	130	217	
3	2402.389	94.87	-0.74	94.13			peak	240	179	#
4	2402.389	94.27	-0.74	93.53			AVG	240	179	#
5	4804.000	41.41	5.36	46.77	74.00	-27.23	peak	139	267	
6	4804.000	29.21	5.36	34.57	54.00	-19.43	AVG	139	267	
7	7206.000	39.64	11.75	51.39	74.00	-22.61	peak	120	314	
8	7206.000	29.58	11.75	41.33	54.00	-12.67	AVG	120	314	

Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
2. Margin value = Emission level – Limit value
3. 2402MHz: Fundamental frequency.

Test Channel	Channel 0	Frequency Range	1GHz ~ 25GHz
Power supply	AC120V 60Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	24deg. C, 57%RH	Tested By	Tech Chen



Remarks:

- Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
- Margin value = Emission level – Limit value
- 2402MHz: Fundamental frequency.

Test Channel	Channel 19	Frequency Range	1GHz ~ 25GHz
Power supply	AC120V 60Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	24deg. C, 57%RH	Tested By	Tech Chen

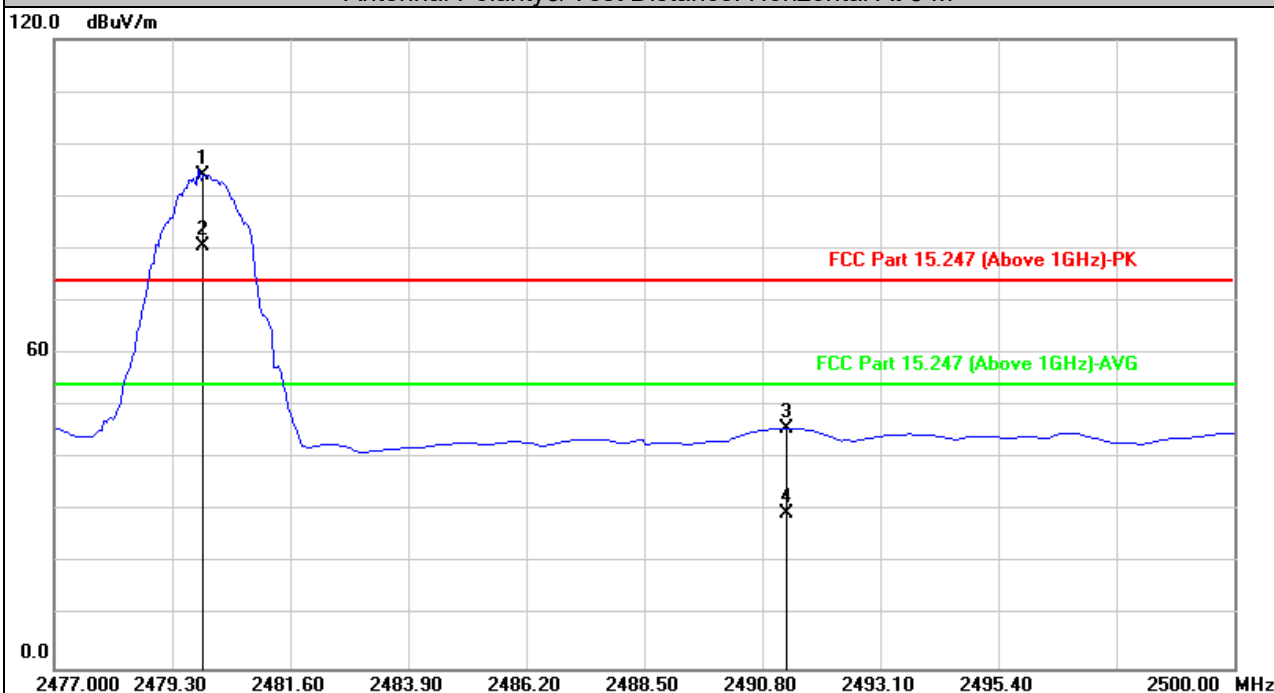
Antennal Polarity& Test Distance: Horizontal At 3m										
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)	Remark
1	2441.000	97.81	-0.64	97.17			peak	211	180	#
2	2441.000	97.09	-0.64	96.45			AVG	211	180	#
3	4882.000	41.96	6.27	48.23	74.00	-25.77	peak	160	152	
4	4882.000	29.71	6.27	35.98	54.00	-18.02	AVG	160	152	
5	7323.000	40.33	12.14	52.47	74.00	-21.53	peak	167	176	
6	7323.000	28.54	12.14	40.68	54.00	-13.32	AVG	167	176	
Antennal Polarity& Test Distance: Vertical at 3 m										
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)	Remark
1	2441.000	87.21	-0.64	86.57			peak	100	181	
2	2441.000	86.31	-0.64	85.67			AVG	100	181	
3	4882.000	41.96	6.27	48.23	74.00	-25.77	peak	160	152	
4	4882.000	29.71	6.27	35.98	54.00	-18.02	AVG	160	152	
5	7323.000	40.33	12.14	52.47	74.00	-21.53	peak	167	176	
6	7323.000	28.54	12.14	40.68	54.00	-13.32	AVG	167	176	

Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
2. Margin value = Emission level – Limit value
3. 2440MHz: Fundamental frequency.

Test channel	Channel 39	Frequency Range	1GHz ~ 25GHz
Power supply	AC120V 60Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	24deg. C, 57%RH	Tested By	Tech Chen

Antennal Polarity& Test Distance: Horizontal At 3 M

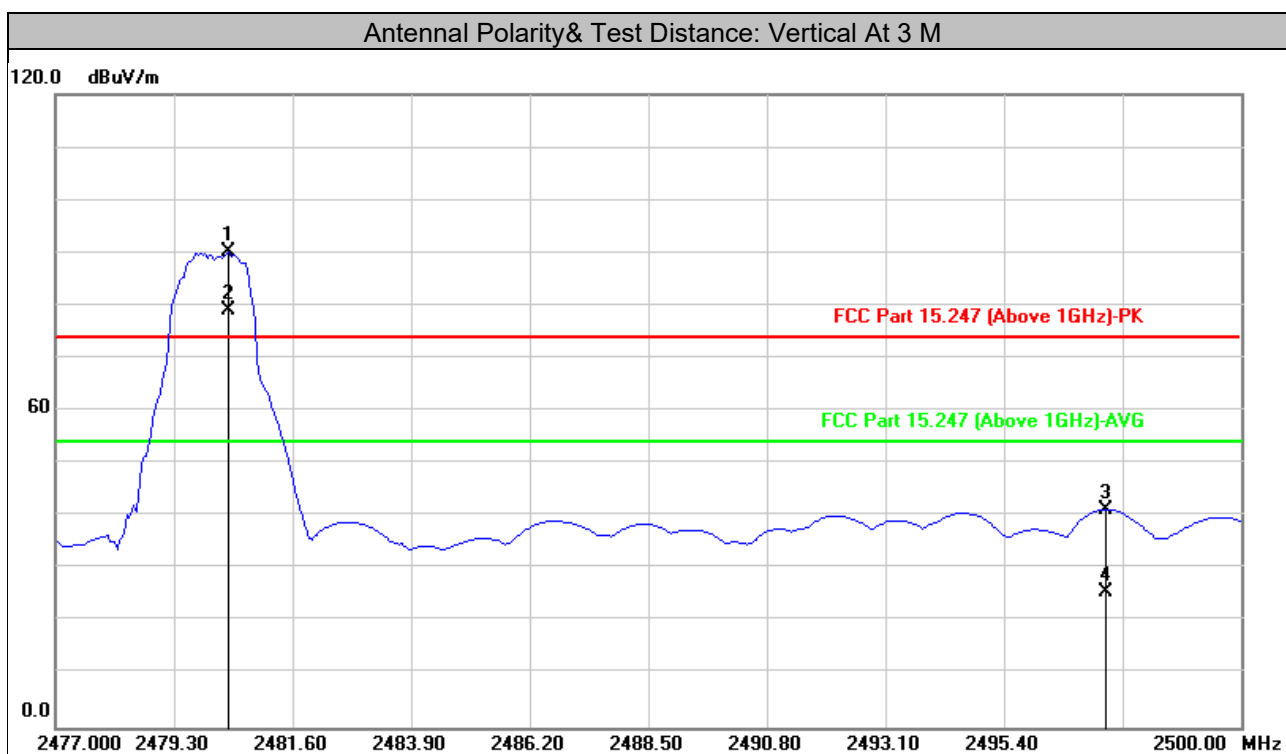


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)	Remark
1	2479.904	94.50	-0.52	93.98			peak	251	175	#
2	2479.904	81.15	-0.52	80.63			AVG	251	175	#
3	2491.289	46.32	-0.49	45.83	74.00	-28.17	peak	100	205	
4	2491.289	29.94	-0.49	29.45	54.00	-24.55	AVG	100	205	
5	4960.000	33.79	6.09	39.88	74.00	-34.12	peak	178	185	
6	4960.000	24.27	6.09	30.36	54.00	-23.64	AVG	178	185	
7	7440.000	30.02	12.53	42.55	74.00	-31.45	peak	100	10	
8	7440.000	20.15	12.53	32.68	54.00	-21.32	AVG	100	10	

Remarks:

1. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
2. Margin value = Emission level – Limit value
3. 2480MHz: Fundamental frequency.

Test channel	Channel 39	Frequency Range	1GHz ~ 25GHz
Power supply	AC120V 60Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	24deg. C, 57%RH	Tested By	Tech Chen



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)	Remark
1	2480.365	90.58	-0.52	90.06			peak	128	209	#
2	2480.365	79.43	-0.52	78.91			AVG	128	209	#
3	2497.373	41.85	-0.47	41.38	74.00	-32.62	peak	378	127	
4	2497.373	26.12	-0.47	25.65	54.00	-28.35	AVG	378	127	
5	4960.000	34.78	6.09	40.87	74.00	-33.13	peak	196	256	
6	4960.000	26.35	6.09	32.44	54.00	-21.56	AVG	196	256	
7	7440.000	36.13	12.53	48.66	74.00	-25.34	peak	230	155	
8	7440.000	26.92	12.53	39.45	54.00	-14.55	AVG	230	155	

Remarks:

- Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamplifier Factor)
- Margin value = Emission level – Limit value
- 2480MHz: Fundamental frequency.

3.2 Conducted Emission Measurement

3.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

- Note: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

3.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Due Date of Calibration
EMI Test Receiver Rohde&Schwarz	ESCI3	101418	2021/09/05
Artificial Mains Network Rohde&Schwarz	ENV216	3560.6550.15	2021/09/16
Test software FARAD	EZ_EMC V1.1.4.2	N/A	N/A
Hygrothermograph Yuhuaaze	HTC-1	NA	2021/09/16
Digital Multimeter FLUKE	15B+	43512617WS	2021/09/16

- Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA.
2. The test was performed in Shielded Room 1.

3.2.3 Test Procedures

- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit – 20dB) was not recorded.

Note: All modes of operation were investigated and the worst-case emissions are reported.

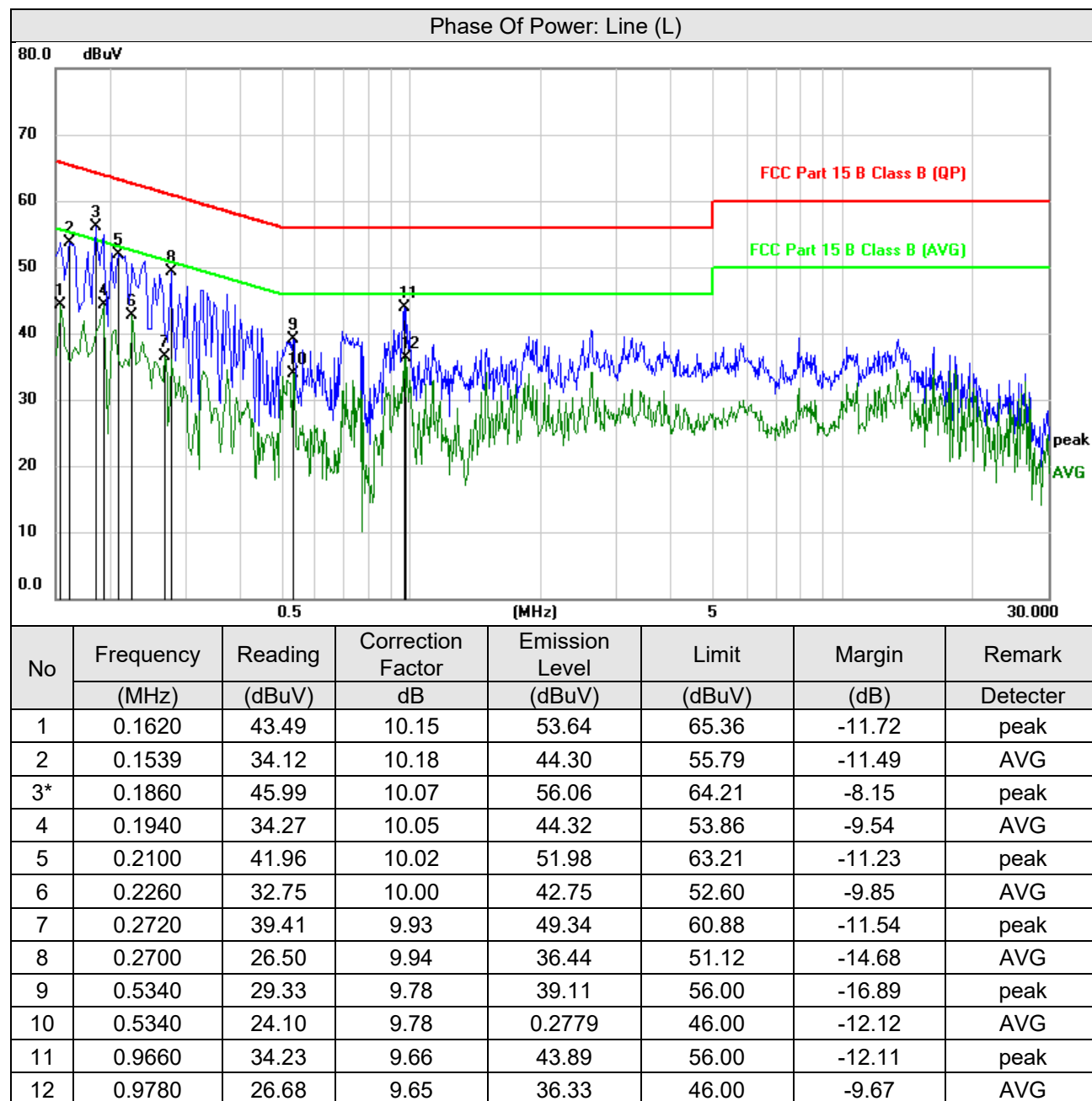
3.2.4 Deviation from Test Standard

No deviation.

3.2.7 Test Results

Conducted worst-case data

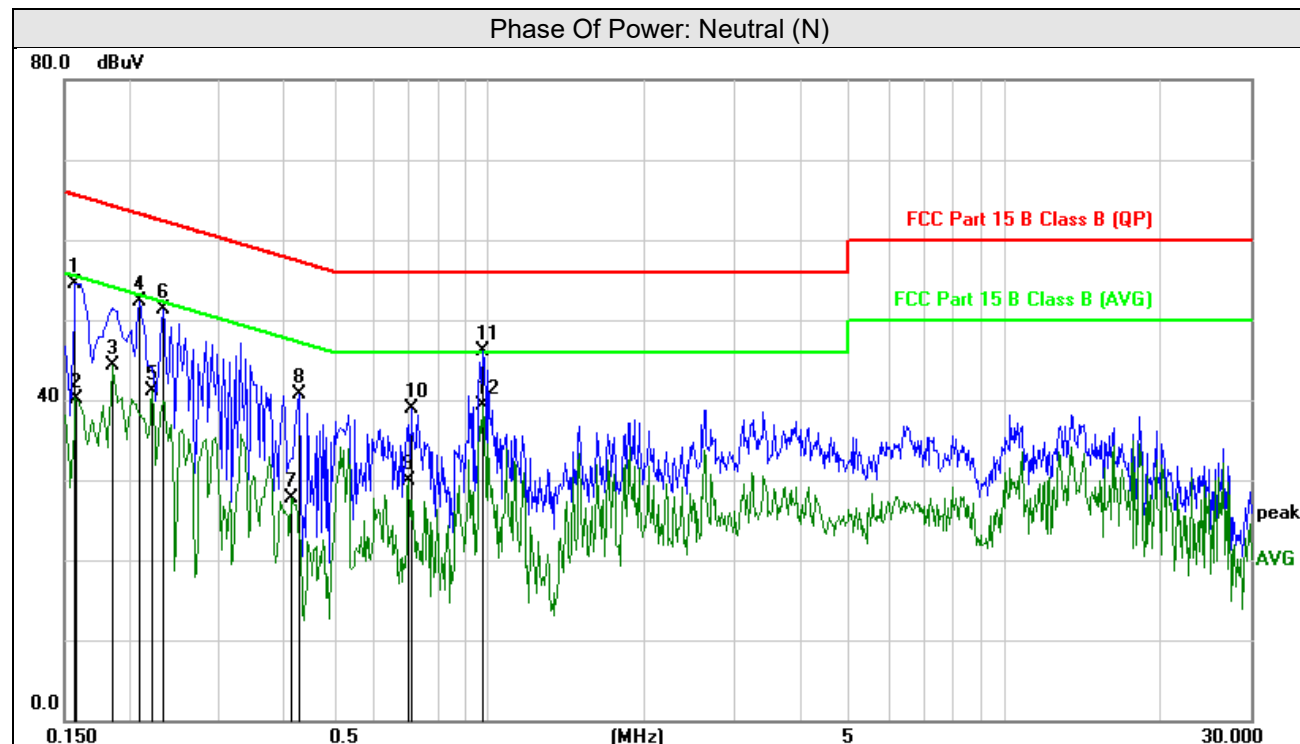
Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution and width	Quasi-Peak (QP) / Average (AV), 9kHz
Power supply	AC120V 60Hz	Environmental Conditions	25°C, 60%RH



Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution and width	Quasi-Peak (QP) / Average (AV), 9kHz
Power supply	AC120V 60Hz	Environmental Conditions	25°C, 60%RH



No.	Frequency (MHz)	Reading (dBuV)	Correction Factor dB	Emission Level (dBuV)	Limit (dBuV)	Margin (dB)	Remark Detector
1	0.1580	44.41	10.16	54.57	65.57	-11.00	peak
2	0.1582	30.02	10.16	40.18	55.56	-15.38	AVG
3	0.2100	42.26	10.02	52.28	63.21	-10.93	peak
4	0.1860	34.23	10.07	44.30	54.21	-9.91	AVG
5	0.2340	41.26	9.99	51.25	62.31	-11.06	peak
6	0.2220	31.06	10.00	41.06	52.74	-11.68	AVG
7	0.4300	30.95	9.81	40.76	57.25	-16.49	peak
8	0.4140	17.95	9.82	27.77	47.57	-19.80	AVG
9	0.7060	29.06	9.77	38.83	56.00	-17.17	peak
10	0.6980	20.17	9.77	29.94	46.00	-16.06	AVG
11	0.9700	36.46	9.66	46.12	56.00	-9.88	peak
12*	0.9700	29.69	9.66	39.35	46.00	-6.65	AVG

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

3.3 6dB Bandwidth Measurement

3.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5MHz.

3.3.2 Test Setup



3.3.3 Test Instruments

Refer to section 5 to get information of above instrument.

3.3.4 Test Procedure

- Set resolution bandwidth (RBW) = 30kHz
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

3.3.5 Deviation from Test Standard

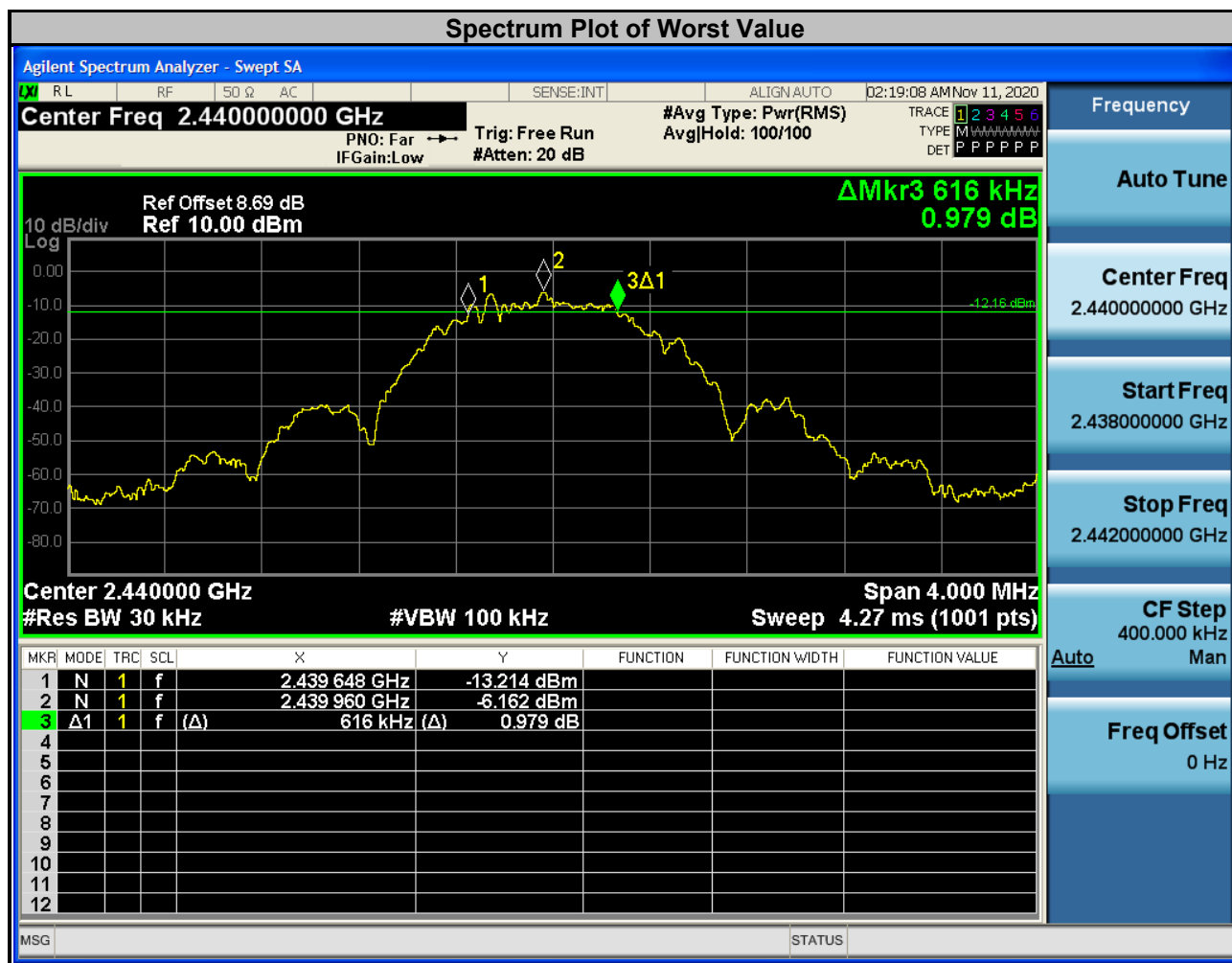
No deviation.

3.3.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

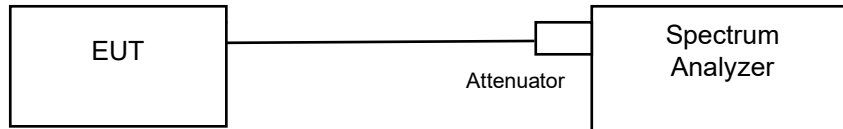
3.3.7 Test Result

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	0.640	0.5	Pass
19	2440	0.616	0.5	Pass
39	2480	0.648	0.5	Pass



3.4 Occupied Bandwidth Measurement

3.4.1 Test Setup



3.4.2 Test Instruments

Refer to section 5 to get information of above instrument.

3.4.3 Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth and set the detector to peak. The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 %of the total mean power of a given emission.

3.4.4 Deviation from Test Standard

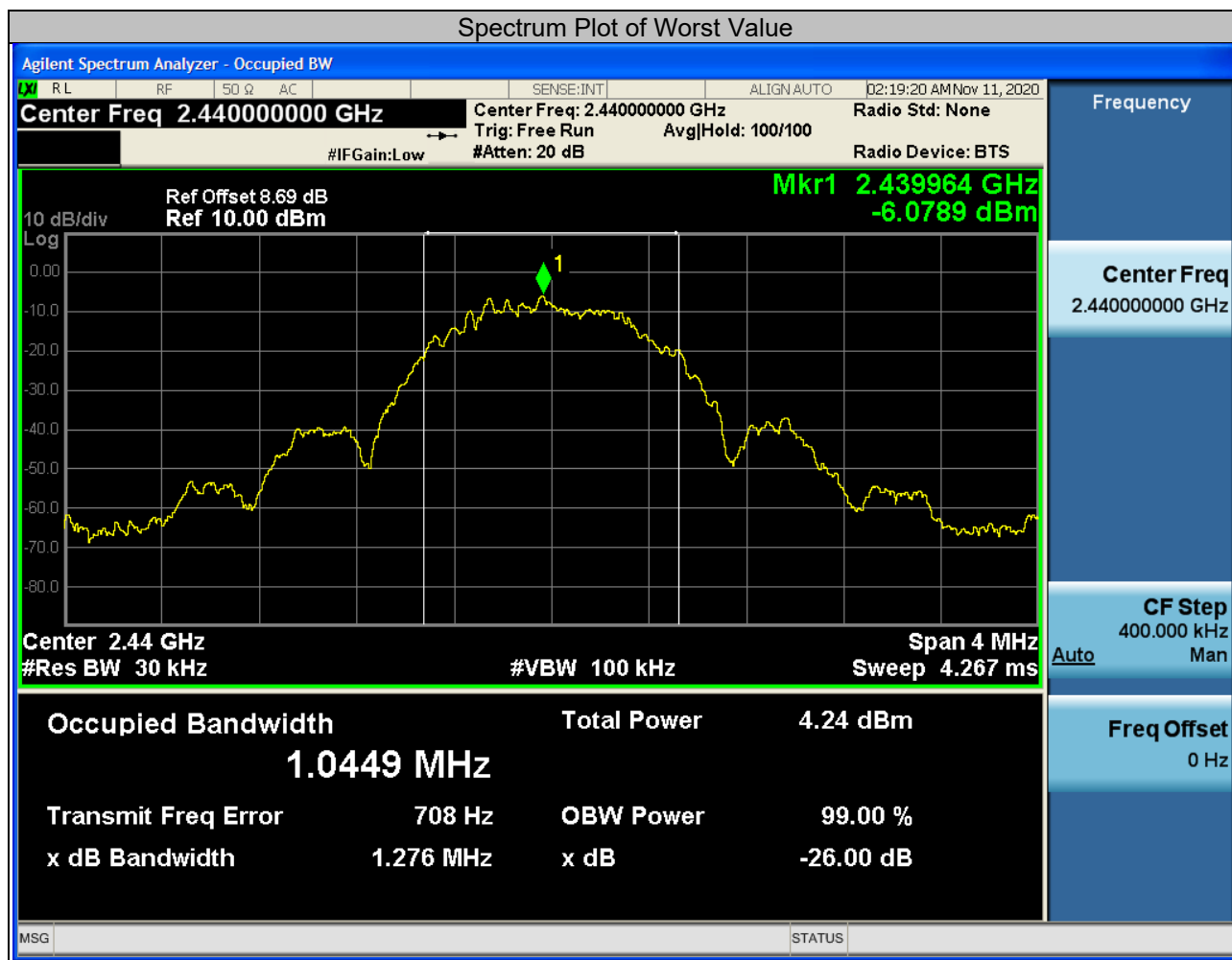
No deviation.

3.4.5 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

3.4.6 Test Results

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	Pass / Fail
0	2402	1.0383	Pass
19	2440	1.0449	Pass
39	2480	1.0393	Pass

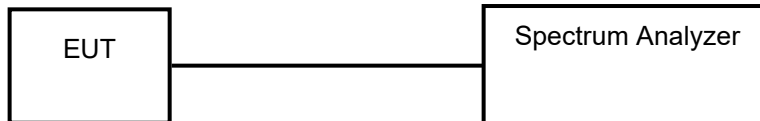


3.5 Conducted Output Power Measurement

3.5.1 Limits of Conducted Output Power Measurement

For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

3.5.2 Test Setup



3.5.3 Test Instruments

Refer to section 4 to get information of above instrument.

3.5.4 Test Procedures

- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- The center frequency of the spectrum analyzer is set to the fundamental frequency and using 1 MHz RBW and 3 MHz VBW.
- Measure the captured power within the band and recording the plot.
- Repeat above procedures until all frequencies required were complete.

3.5.5 Deviation from Test Standard

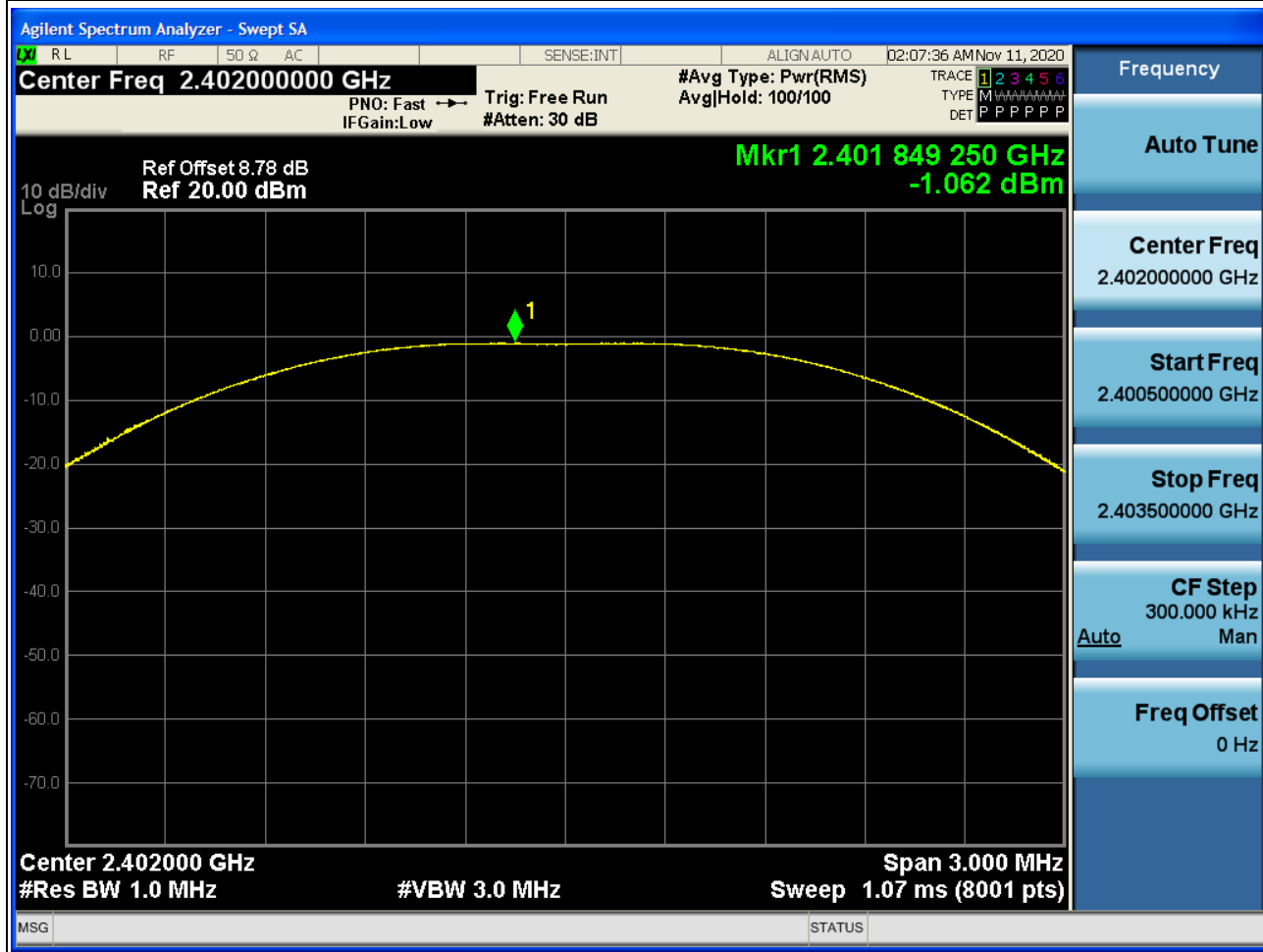
No deviation.

3.5.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

3.5.7 Test Results

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
0	2402	0.783	-1.06	30	Pass
19	2440	0.678	-1.69	30	Pass
39	2480	0.526	-2.79	30	Pass

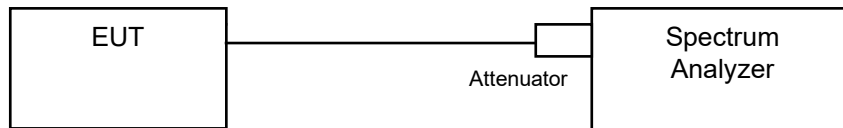


3.6 Power Spectral Density Measurement

3.6.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8dBm/3kHz.

3.6.2 Test Setup



3.6.3 Test Instruments

Refer to section 5 to get information of above instrument.

3.6.4 Test Procedure

- Set the RBW = 3 kHz, VBW = 10 kHz, Detector = peak.
- Sweep time = auto couple, Trace mode = max hold, allow trace to fully stabilize.
- Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

3.6.5 Deviation from Test Standard

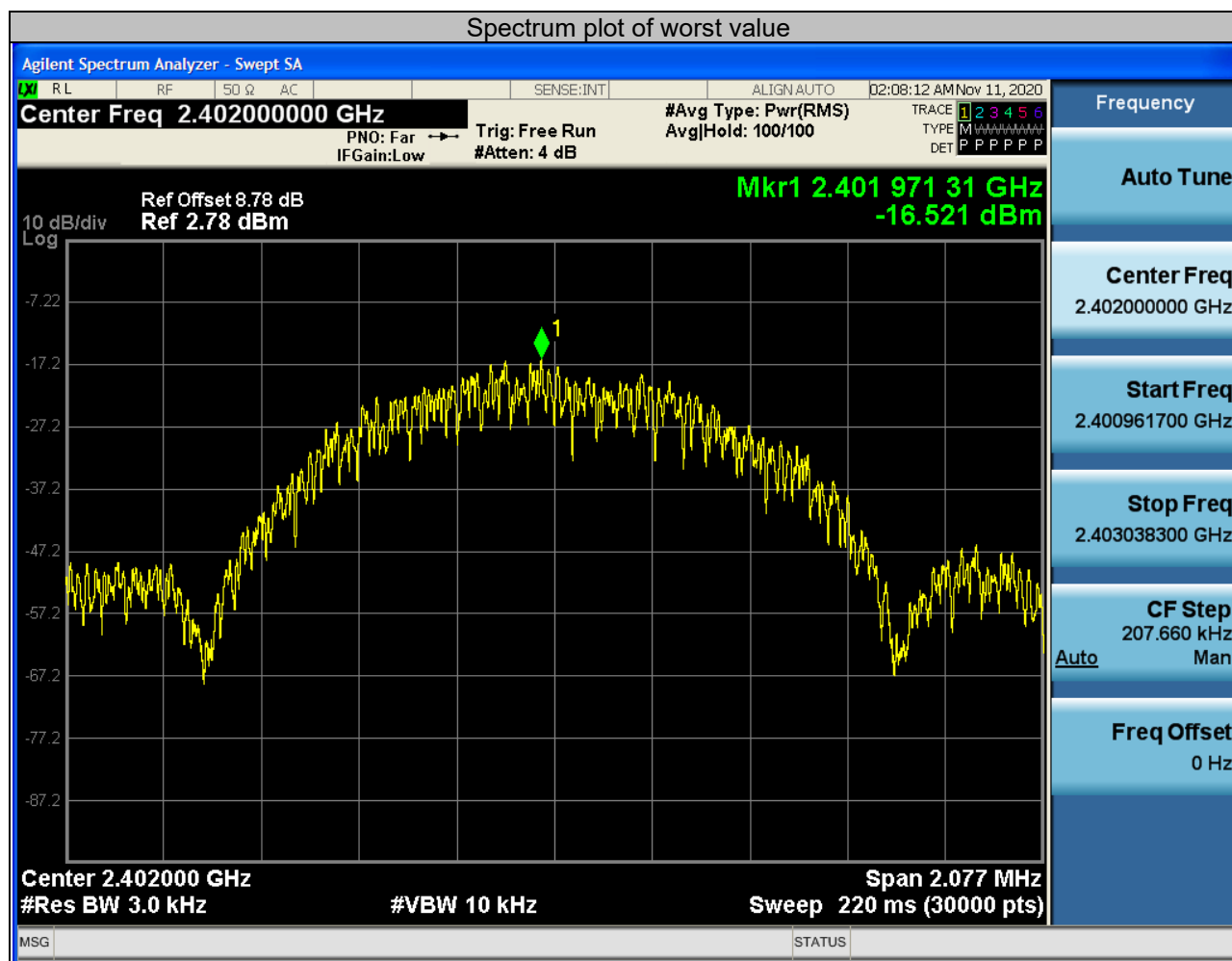
No deviation.

3.6.6 EUT Operating Condition

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

3.6.7 Test Results

Channel	Frequency (MHz)	PSD (dBm/10kHz)	Limit (dBm/3kHz)	Pass / Fail
0	2402	-16.52	8	Pass
19	2440	-17.14	8	Pass
39	2480	-18.23	8	Pass



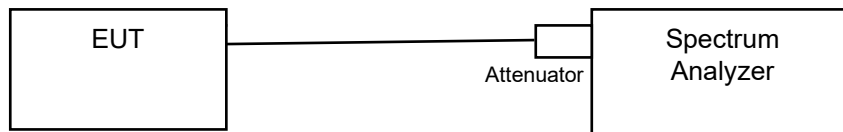
3.7 Conducted Out of Band Emission Measurement

3.7.1 Limits of Conducted Out of Band Emission Measurement

For average power: Below -30dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

For peak power: Below -20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth)

3.7.2 Test Setup



3.7.3 Test Instruments

Refer to section 10.1 to get information of above instrument.

3.7.4 Test Procedure

Measurement procedure REF

1. Set the RBW = 100 kHz.
2. Set the VBW $\geq$ 300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

3.7.5 Measurement procedure OOB

1. Set RBW = 100 kHz.
2. Set VBW $\geq$ 300 kHz.
3. Detector = peak.
4. Sweep = auto couple.
5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

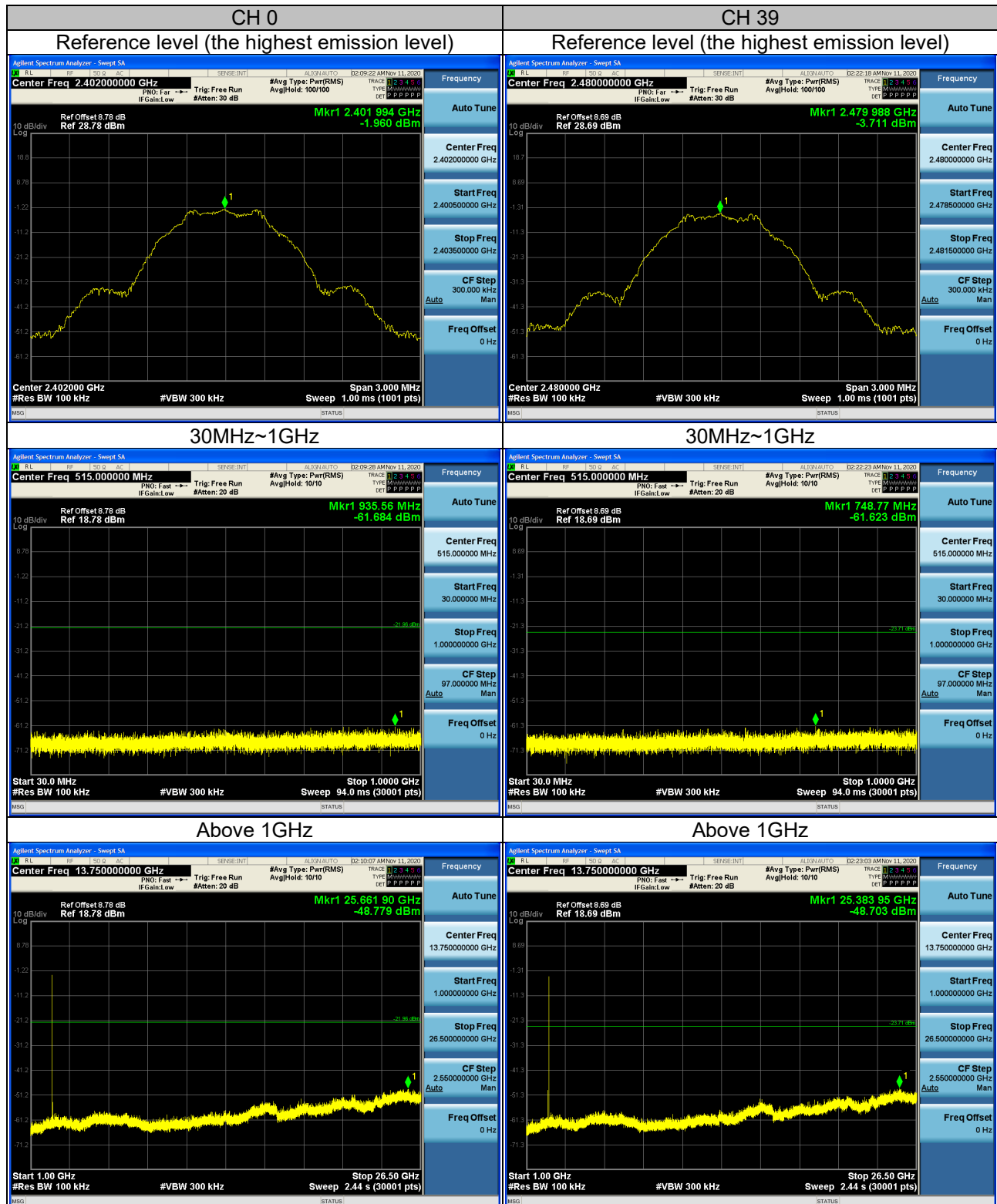
3.7.6 Deviation from Test Standard

No deviation.

3.7.7 EUT Operating Condition

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

3.7.8 Test results



4. Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

5. Test instruments

Description & Manufacturer	Model No.	Serial No.	Due Date of Calibration
Spectrum Keysight	N9020A	MY51240612	2021/09/16
Spectrum Analyzer Rohde&Schwarz	FSV-40N	101783	2021/09/16
Power Meter10Hz~18GHz Tonscend	JS0806-2	188060126	2021/09/16
Signal generator Keysight	E4421B	GB40051020	2021/09/16
Signal generator Keysight	N5182A	MY47420944	2021/09/16
Test Software Tonscend	JS0806-2	NA	NA
Hygrothermograph Yuhuaaze	HTC-1	NA	2021/09/16

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA.

2. The test was performed in Chamber 1.

Appendix – Information On The Testing Laboratories

We, [Hwa-Hsing \(Dongguan\) Co., Ltd.](#), A global provider of TESTING and CERTIFICATION services for consumer products, electronic products and wireless information technology products. Adhering to the core values “HONEST and TRUSTWORTHY, OBJECTIVE and IMPARTIALITY, RIGOROUS and AFFICIENT”, commitment to provide professional, perfect and efficient comprehensive ONE-STOP solution of TESTING and CERTIFICATION services for Manufacturers, Buyers, Traders, Brands, Retailers. Assist client to better manage risk, protect their brands, reduce costs and cut time to over 150 markets in global. Our laboratories are FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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