

Test Report

Report No.: HQ200701EL01-FI

FCC ID: 2AGJ41KP

Applicant: Specialty Technologies LLC

Address: 340 Victoria Rd Youngstown Ohio 44515 United States

Manufacturer: Specialty Technologies LLC

Address: 340 Victoria Rd Youngstown Ohio 44515 United States

Product: Powered Subwoofer

Brand: **SVS**_(SVS)

Test Model(s): SB-1000 Pro

Series Model(s): PB-1000 Pro

Test Date: Jul.16, 2020 ~ Jul. 29, 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 Number: 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 :



, Date:

Aug. 01, 2020

Tank Tan//Engineer

Approved by :



, Date:

Sep. 16, 2020

Harry Li/ Supervisor

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Table of Contents

Release Control Record	4
1. Summary of Test Results	5
1.1 Measurement Uncertainty	5
1.2 Modification Record	5
2. General Information	6
2.1 General Description of EUT	6
2.2 Description of Test Channels	7
2.3 Test Mode Applicability and Tested Channel Detail	8
2.4 DutyCycle of Test Signal	9
2.5 Description of Support Units	10
2.6 Configuration of System under Test.....	10
2.7 General Description of Applied Standards.....	10
3. Test types and results	11
3.1 Radiated Emission and Bandedge Measurement	11
3.1.1 Limits of radiated emission and bandedge measurement.....	11
3.1.2 Test Instruments	12
3.1.3 Test Procedures.....	13
3.1.4 Deviationfrom Test Standard	13
3.1.5 Test Set up.....	14
3.1.6 EUT Operating Conditions.....	15
3.1.7 Test Results	16
3.2 Conducted Emission Measurement.....	23
3.2.1 Limits of Conducted Emission Measurement	23
3.2.2 Test Instruments	23
3.2.3 Test Procedures.....	23
3.2.4 Deviationfrom Test Standard	23
3.2.5 Test setup	24
3.2.6 EUT Operating Conditions.....	24
3.2.7 Test Results	25
3.3 6dB Bandwidth Measurement.....	27
3.3.1 Limits of 6dB Bandwidth Measurement	27
3.3.2 Test Setup.....	27
3.3.3 Test Instruments	27
3.3.4 Test Procedure	27
3.3.5 Deviation fromTest Standard	27
3.3.6 EUT Operating Conditions.....	27
3.3.7 Test Result	28
3.4 Occupied Bandwidth Measurement.....	29
3.4.1 Test Setup.....	29
3.4.2 Test Instruments	29
3.4.3 Test Procedure	29
3.4.4 Deviation from Test Standard	29
3.4.5 EUT Operating Conditions.....	29
3.4.6 Test Results	30
3.5 Conducted Output Power Measurement	31
3.5.1 Limits of Conducted Output Power Measurement.....	31
3.5.2 Test Setup.....	31
3.5.3 Test Instruments	31
3.5.4 Test Procedures.....	31
3.5.5 Deviation from Test Standard	31
3.5.6 EUT Operating Conditions.....	31
3.5.7 Test Results	32



3.6 Power Spectral Density Measurement	33
3.6.1 Limits of Power Spectral Density Measurement.....	33
3.6.2 Test Setup.....	33
3.6.3 Test Instruments	33
3.6.4 Test Procedure	33
3.6.5 Deviation from Test Standard	33
3.6.6 EUT Operating Condition	33
3.6.7 Test Results	34
3.7 Conducted Out of Band Emission Measurement	35
3.7.1 Limits of Conducted Out of Band Emission Measurement.....	35
3.7.2 Test Setup.....	35
3.7.3 Test Instruments	35
3.7.4 Test Procedure	35
3.7.5 Measurement procedure OOBE	35
3.7.6 Deviation from Test Standard	35
3.7.7 EUT Operating Condition	36
3.7.8 Test results.....	36
4. Pictures of Test Arrangements.....	39
5. Test instruments	39
Appendix – Information on the Testing Laboratories	40

Release Control Record

Issue No.	Description	Date Issued
HQ200701EL01-FI	Original Release	Sep. 16, 2020

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			
FCC 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 EUTas 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	Expanded Uncertainty (k=2) (\pm)
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	Powered Subwoofer
Brand	SVS _(SVS)
FCC ID:	2AGJ41KP
Test Model Number(s)	SB-1000 Pro
Additional Model(s):	PB-1000 Pro
Status of EUT	Engineering prototype
Power Supply Rating	AC120V
Modulation Type	GFSK
Transfer Rate	1 Mbps
Operating Frequency	2402 ~ 2480MHz
Number of Channel	40
Maximum Output Power	2.339mW
Antenna Type	PCB antenna with 4.16dBi gain
Antenna Connector	N/A
Accessory Device	AC Line: 2.0m, Un-shielding
Data Cable Supplied	N/A

Note:

1. Please refer to the EUT photo document (Reference No. : HQ200701EL01) 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. Models difference:
 - 1) Different appearance size (PB-1000 Pro is larger than SB-1000 Pro)
 - 2) PB-1000 Pro has two more air ducts than SB-1000 Pro. SB-1000 Pro has no air ducts.
 - 3) The overall structure of the horn is different.
 - 4) The frame size of the speaker is also different.

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≥1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

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

Note: “-”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.

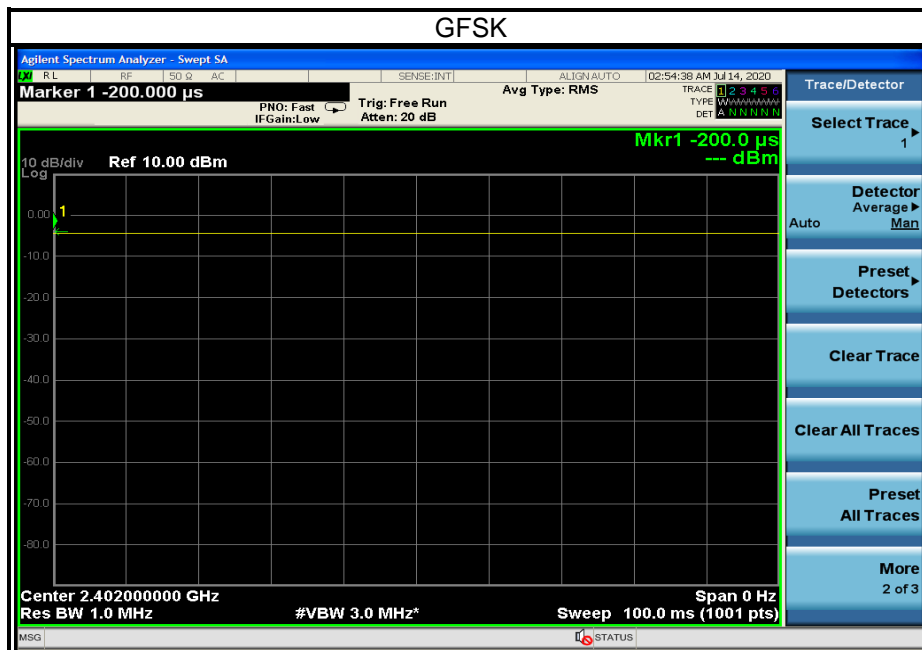
EUT Configure Mode	Available Channel	Tested Channel	Modulation Type	Data Rate (Mbps)
-	0 to 39	0, 19, 39	GFSK	1

Test Condition:

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

2.4 DutyCycle of Test Signal

GFSK: Duty cycle of test signal is 100 %, Duty cycle of test signal is > 98%



2.5 Description of Support Units

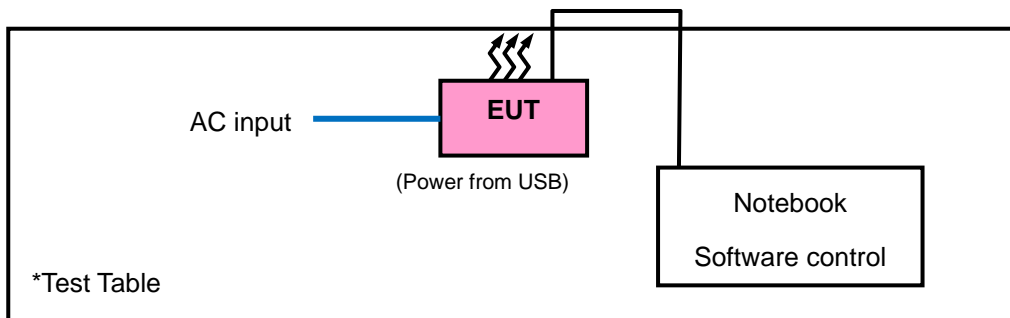
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

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 Bandedge Measurement

3.1.1 Limits of radiated emission and bandedge 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

Description & Manufacturer	Model No.	Serial No.	Due Date of Calibration
EMI Test Receiver Rohde&Schwarz	ESCI 7	100962	2021-5-13
Broadband antenna Schwarzbeck	VULB 9168	00937	2020-10-20
3m Semi-anechoic Chamber MAORUI	9m*6m*6m	NSEMC003	2021-04-16
Signal Amplifier Com-power	PAM-103	18020051	2020-10-17
Attenuator Rohde&Schwarz	TS2GA-6dB	18101101	N/A
Test software FARAD	FARAD	EZ_EMCV1.1.4.2	N/A
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	2020-10-17
Loop Antenna	HLA 6121	45745	2020-10-17
Preamplifier EMCI	EMC001340	980201	2019-10-21
Digital Multimeter FLUKE	15B+	43512617WS	2020-10-17
Horn Antenna Schwarzbeck	BBHA 9170	01959	2020-10-18
Spectrum Analyzer Rohde&Schwarz	FSV-40N	101783	2020-10-17
Broadband Coaxial Preamplifier Schwarzbeck	BBV 9718	00025	2020-10-17
Horn Antenna Schwarzbeck	BBHA 9170	BBHA9170242	2020-10-18
Pre-Amplifier EMCI	EMC 184045	980102	2020-10-18
Spectrum Keysight	N9020A	MY51240612	2020-10-17
Antenna Tower MF	MFA-440H	NA	NA
Turn Table MF	MFT-201SS	NA	NA
Antenna Tower&Turn Table Controller MF	MF-7802	NA	NA

- 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.

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:

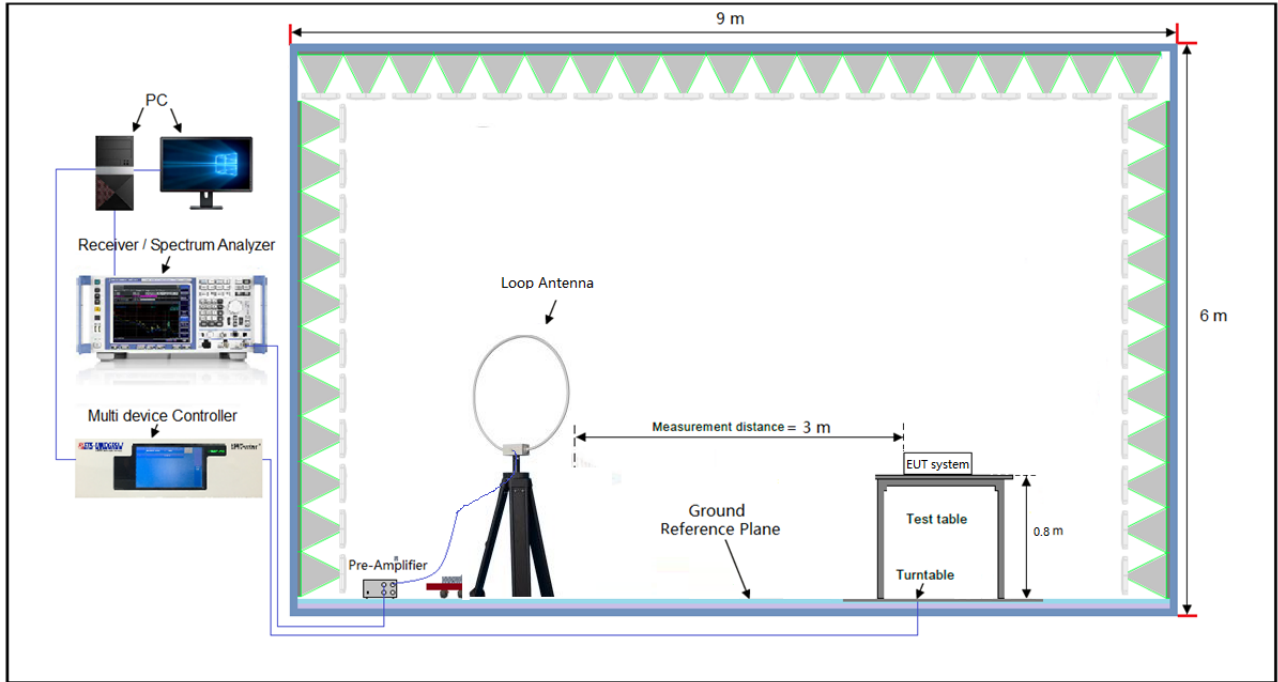
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz & 360kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency 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

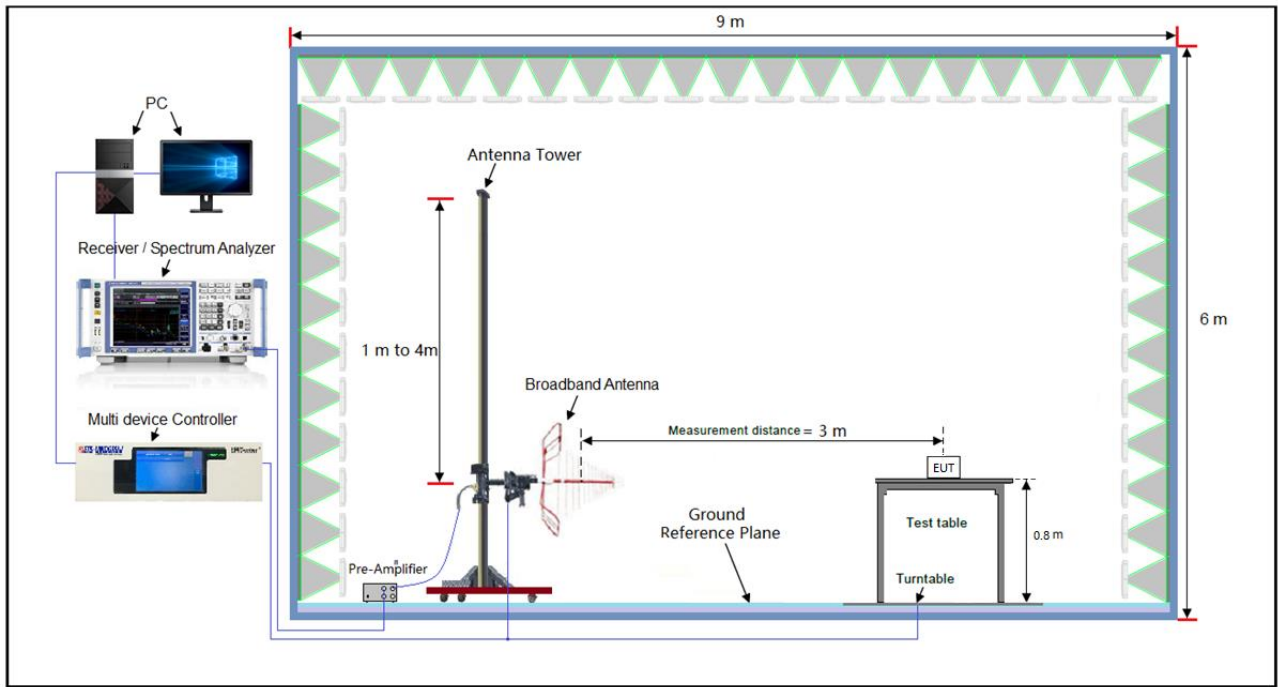
No deviation.

3.1.5 Test Set up

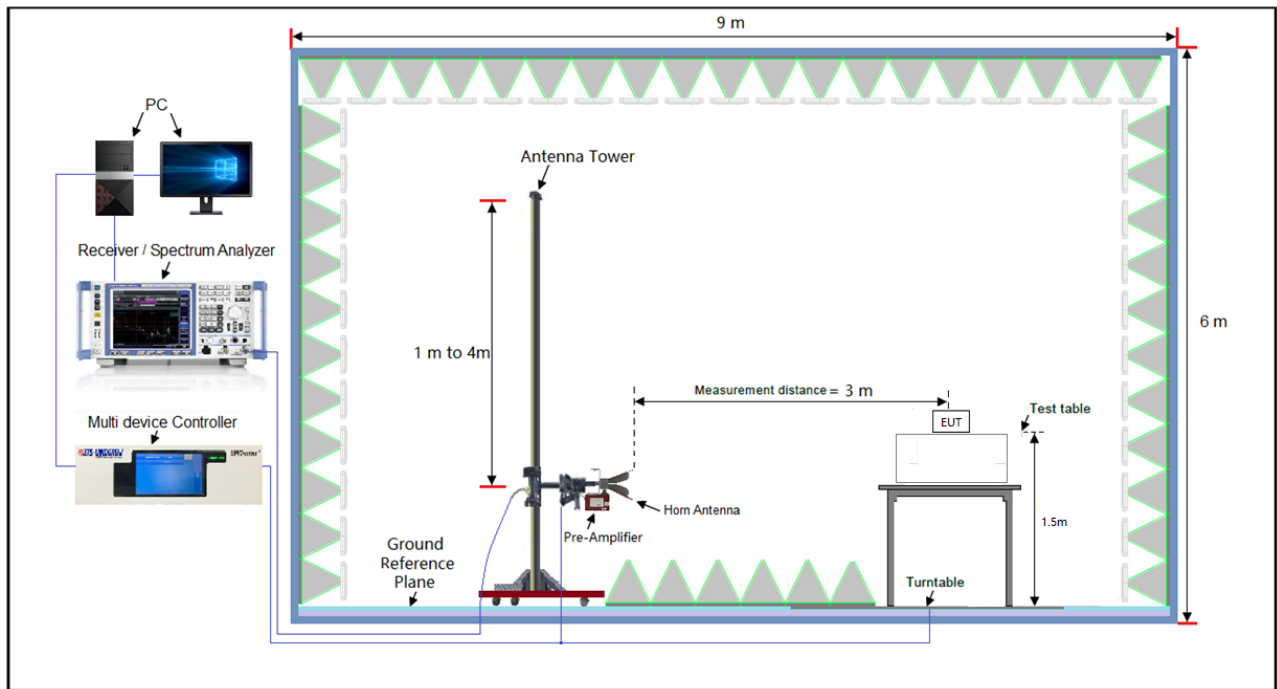
Radiated emission below 30MHz:



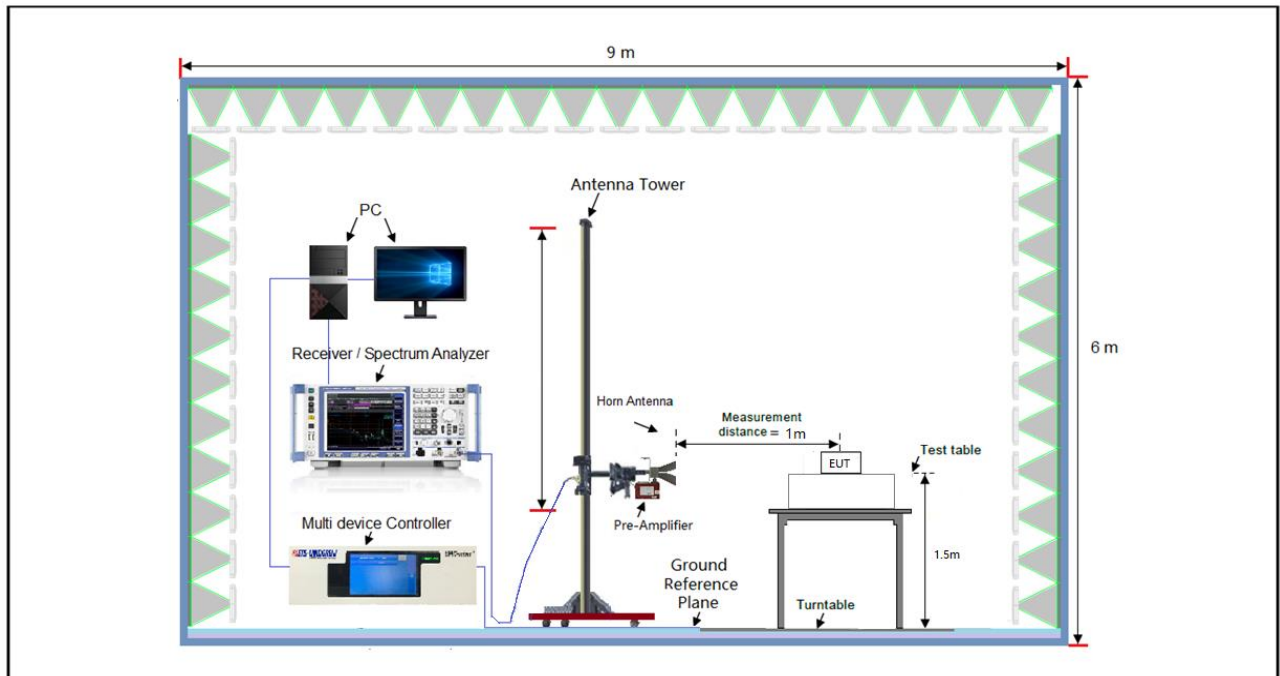
Frequency Range below 1GHz:



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

- a. Placed the EUT on the testing table.

Hwa-Hsing (Dongguan) Testing Co., Ltd.

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

Tel: 0769-83078199

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E-Mail: customerservice.dg@hwa-hsing.com

b. Set the EUT under transmission condition continuously at specific channel frequency.

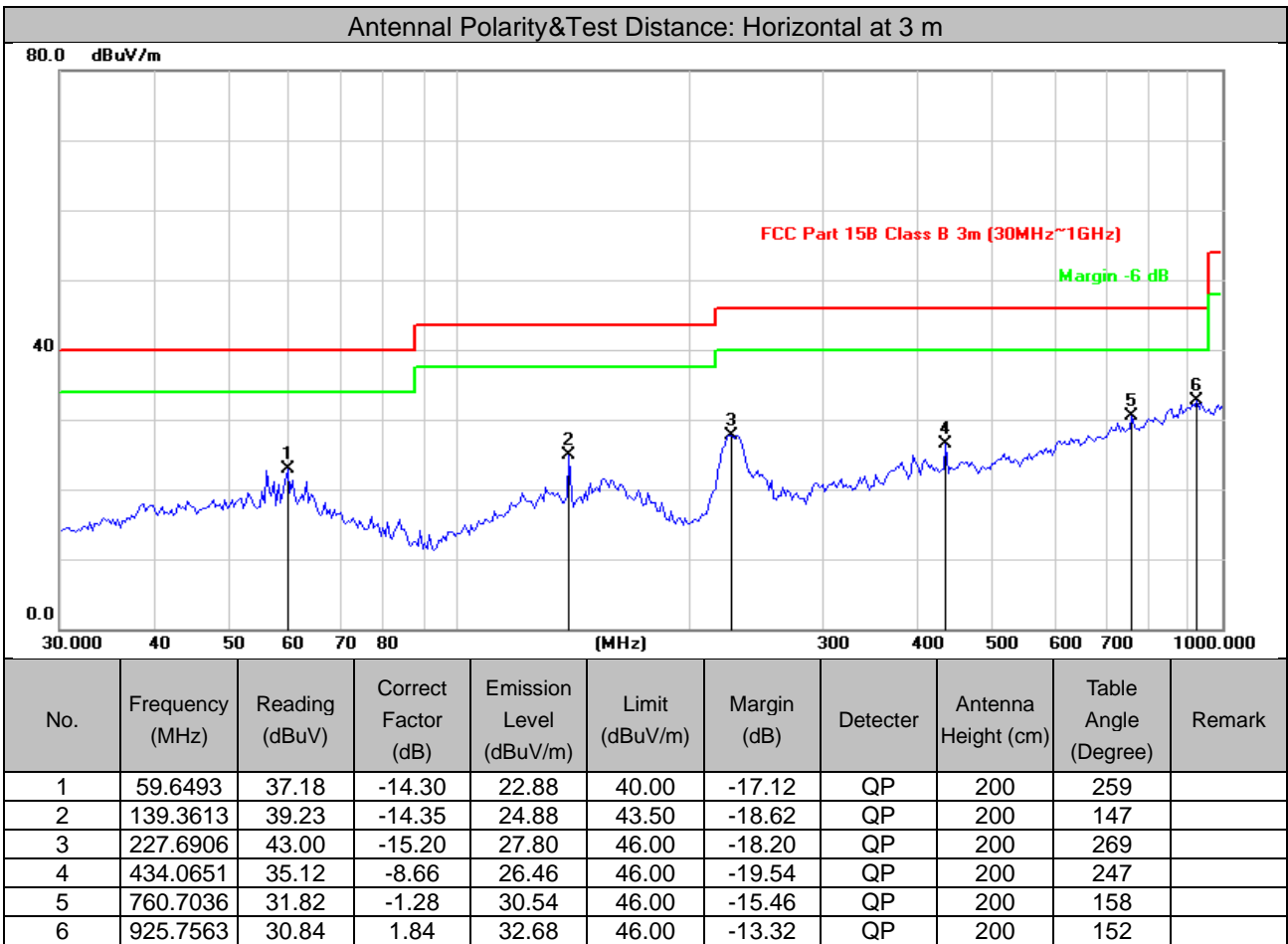
3.1.7 Test Results

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:

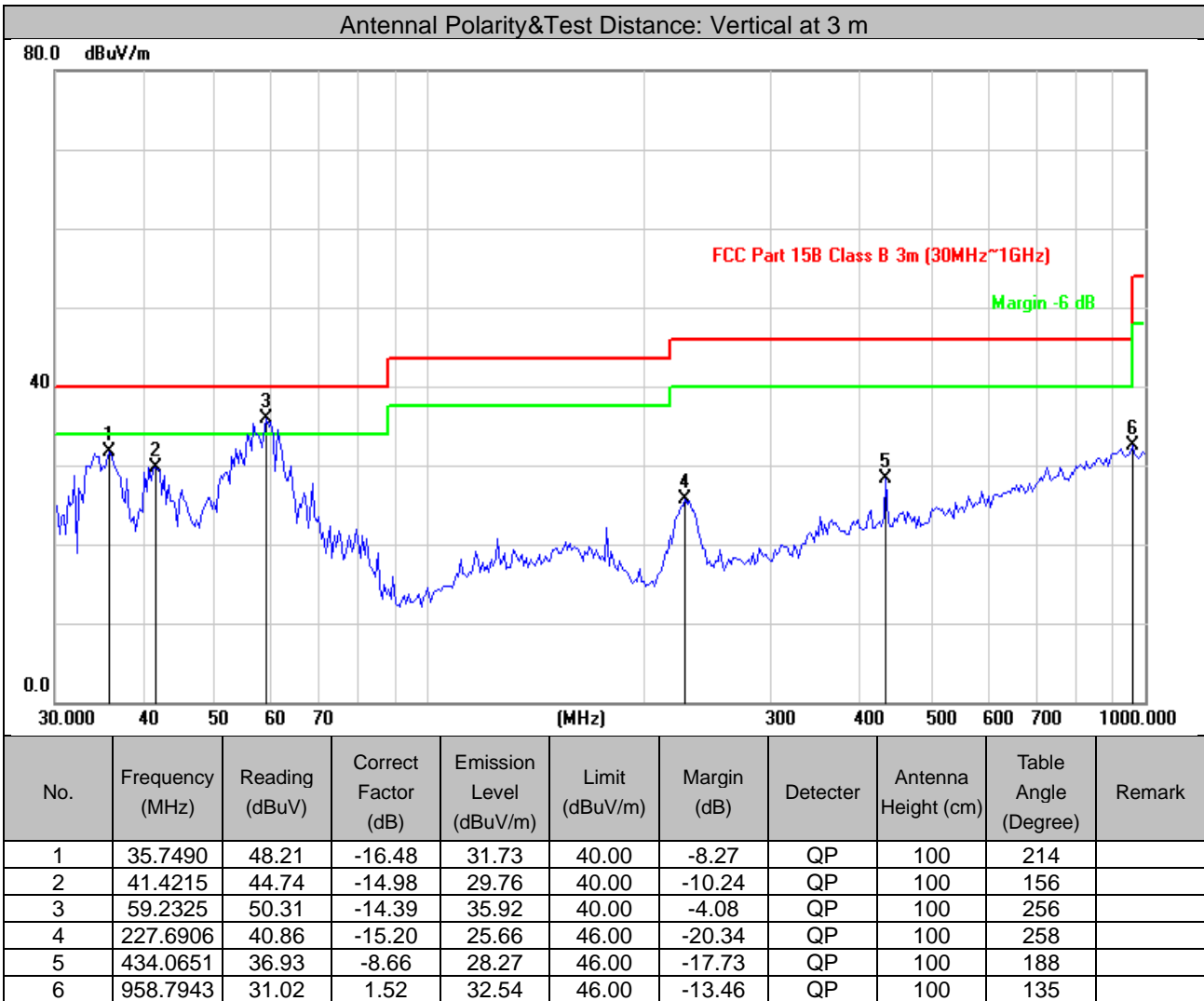
Test Channel	Channel 0	Frequency Range	30MHz ~ 1GHz
Power supply	AC120V 60Hz	Detector Function	Peak (PK) Quasi-peak (QP)
Environmental Conditions	24deg. C, 57%RH	Tested By	Tank tan



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	Tank Tan

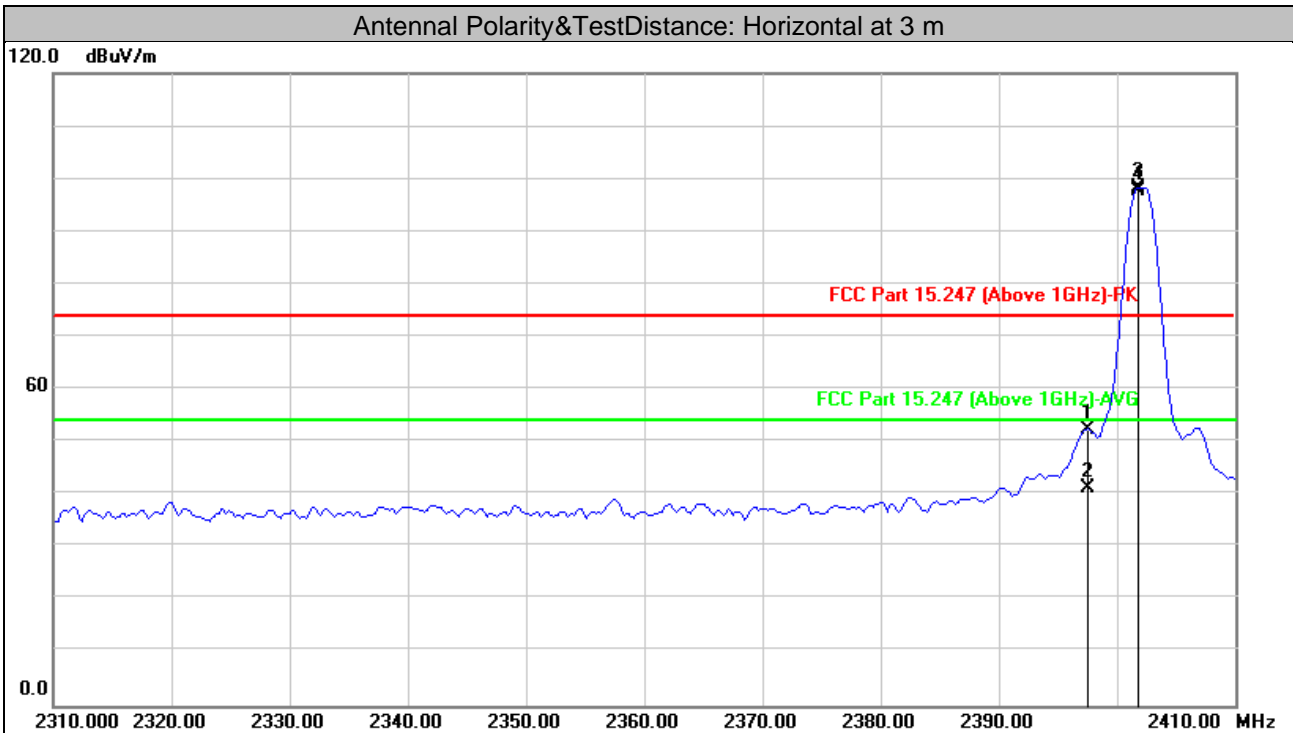


Remarks:

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	Tank tan



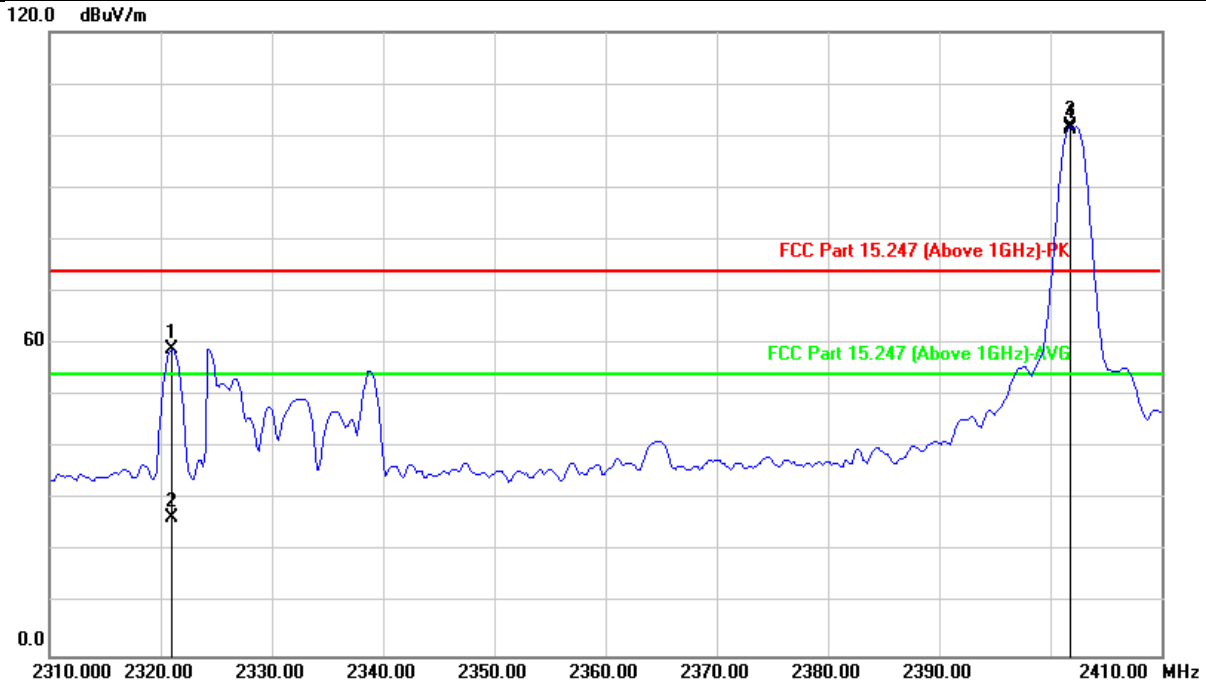
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)	Remark
1*	2397.575	53.26	-0.76	52.50	74.00	-21.50	peak	100	55	
2*	2397.575	41.88	-0.76	41.12	54.00	-12.88	AVG	100	55	
3	2401.784	99.07	-0.75	98.32			peak	100	55	
4	2401.784	98.50	-0.75	97.75			AVG	100	55	
5	4804.000	42.07	5.36	47.43	74.00	-26.57	peak	285	297	
6	4804.000	35.71	5.36	41.07	54.00	-12.93	AVG	285	297	
7	7206.000	37.97	11.75	49.72	74.00	-24.28	peak	100	20	
8	7206.000	27.86	11.75	39.61	54.00	-14.39	AVG	100	20	

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	Tank tan

Antennal Polarity&Test Distance: Vertical 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	2321.022	59.94	-0.97	58.97	74.00	-15.03	peak	100	92	
2	2321.022	27.51	-0.97	26.54	54.00	-27.46	AVG	100	92	
3	2401.784	102.48	-0.75	101.73			peak	100	145	
4	2401.784	101.91	-0.75	101.16			AVG	100	145	
5 *	4804.000	49.37	5.36	54.73	74.00	-19.27	peak	285	297	
6 *	4804.000	45.43	5.36	50.79	54.00	-3.21	AVG	285	297	worst
7	7206.000	44.11	11.75	55.86	74.00	-18.14	peak	376	284	
8	7206.000	37.05	11.75	48.80	54.00	-5.20	AVG	376	284	

Remarks:

4. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
5. Margin value = Emission level – Limit value
6. 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	Tank tan

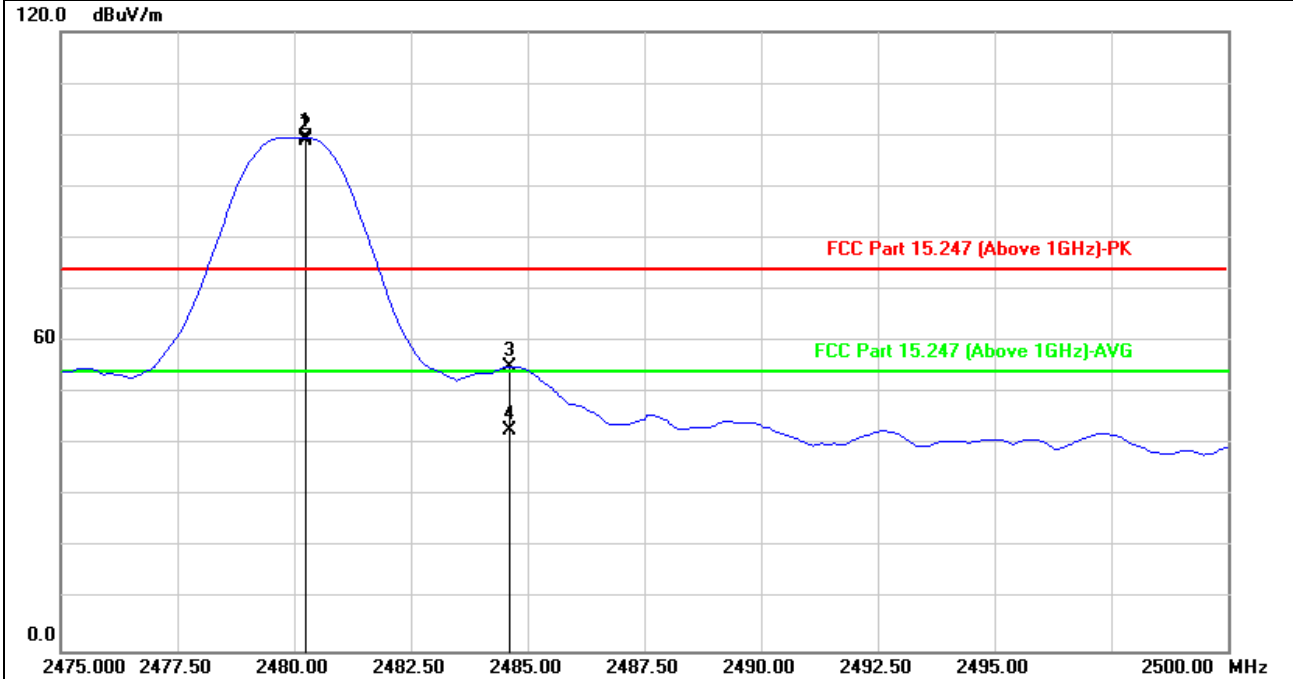
Antennal Polarity&Test Distance: Horizontal at 3 m										
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)	Remark
1 *	2440.000	98.89	-0.64	98.25			peak	100	158	
2 *	2440.000	97.15	-0.64	96.51			AVG	100	158	
3	4880.000	40.65	6.24	46.89	74.00	-27.11	peak	100	138	
4	4880.000	32.26	6.24	38.50	54.00	-15.50	AVG	100	138	
5	7320.000	36.75	12.13	48.88	74.00	-25.12	peak	100	96	
6	7320.000	27.53	12.13	39.66	54.00	-14.34	AVG	100	96	
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 *	2440.000	98.19	-0.64	97.55			peak	190	155	
2 *	2440.000	96.86	-0.64	96.22			AVG	190	155	
3	4880.000	43.53	6.24	49.77	74.00	-24.23	peak	260	290	
4	4880.000	38.09	6.24	44.33	54.00	-9.67	AVG	260	290	
5	7320.000	45.73	12.13	57.86	74.00	-16.14	peak	140	288	
6	7320.000	38.65	12.13	50.78	54.00	-3.22	AVG	140	288	

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	Tank tan

Antennal Polarity&Test Distance: Horizontal at 3 m

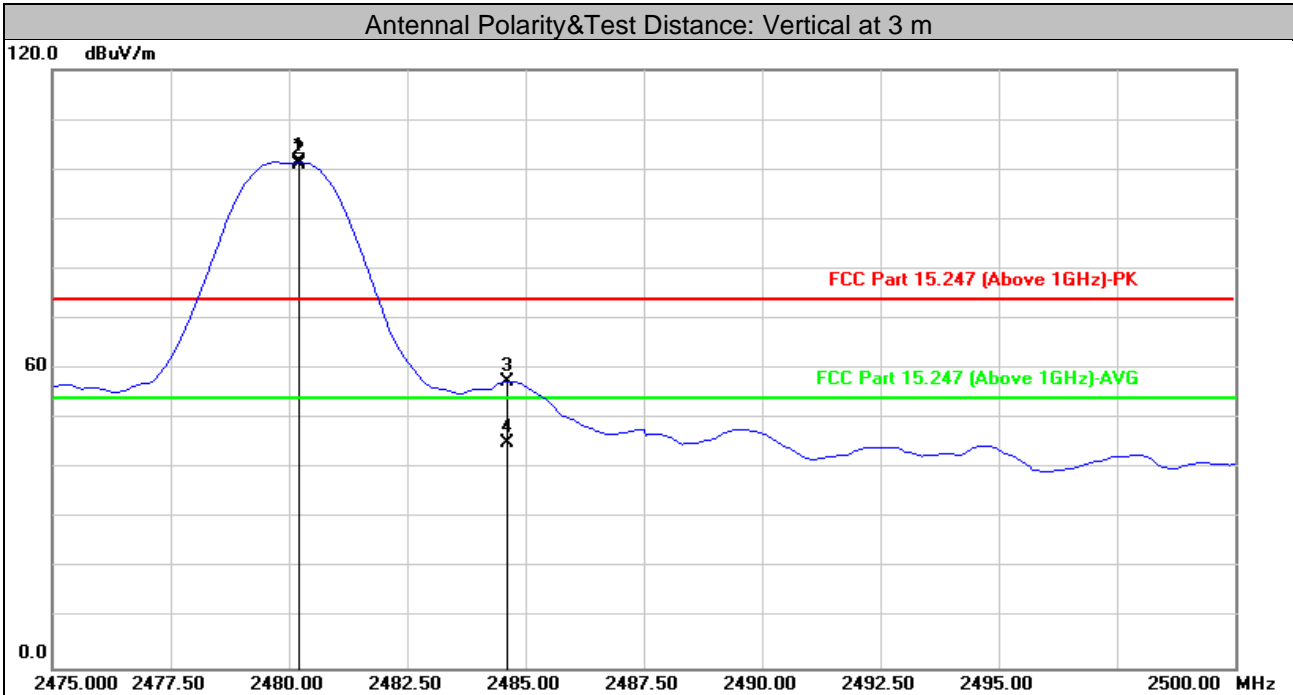


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Height (cm)	Table Angle (Degree)	Remark
1	2480.260	99.98	-0.52	99.46			peak	100	63	
2	2480.260	99.36	-0.52	98.84			AVG	100	63	
3	2484.619	55.68	-0.50	55.18	74.00	-18.82	peak	100	63	
4	2484.619	43.29	-0.50	42.79	54.00	-11.21	AVG	100	63	
5	4960.000	41.97	6.09	48.06	74.00	-25.94	peak	295	278	
6	4960.000	36.15	6.09	42.24	54.00	-11.76	AVG	295	278	
7 *	7440.000	39.91	12.53	52.44	74.00	-21.56	peak	112	173	
8 *	7440.000	32.01	12.53	44.54	54.00	-9.46	AVG	112	173	

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	Tank tan



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	2480.210	101.94	-0.52	101.42			peak	100	85	
2	2480.210	101.34	-0.52	100.82			AVG	100	85	
3	2484.619	58.02	-0.50	57.52	74.00	-16.48	peak	100	85	
4	2484.619	45.67	-0.50	45.17	54.00	-8.83	AVG	100	85	
5	4960.000	43.27	6.09	49.36	74.00	-24.64	peak	372	4	
6	4960.000	38.32	6.09	44.41	54.00	-9.59	AVG	372	4	
7*	7440.000	43.69	12.53	56.22	74.00	-17.78	peak	252	245	
8*	7440.000	36.58	12.53	49.11	54.00	-4.89	AVG	252	245	

Remarks:

4. Emission Level = Read Level + Factor (Antenna Factor + Cable Loss - Preamp Factor)
5. Margin value = Emission level – Limit value
6. 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	2020-09-18
Artificial Mains Network Rohde&Schwarz	ENV216	3560.6550.15	2020-10-17
Test software FARAD	EZ_EMCC V1.1.4.2	N/A	N/A
Hygrothermograph Yuhuaze	HTC-1	NA	2020-10-19
Digital Multimeter FLUKE	15B+	43512617WS	2020-10-20

- 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

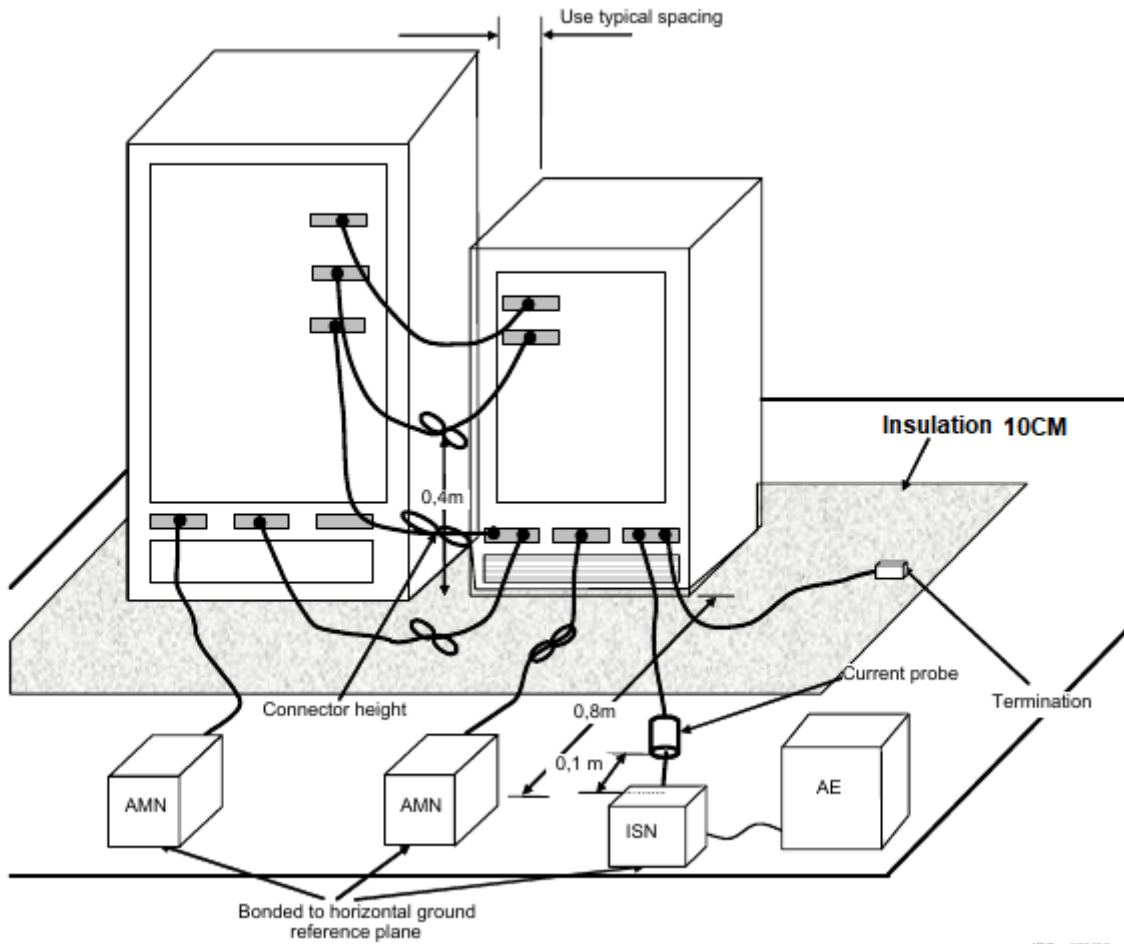
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50uH of coupling impedance 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.

3.2.5 Test setup (floor-standing equipment)



IEC 470/05

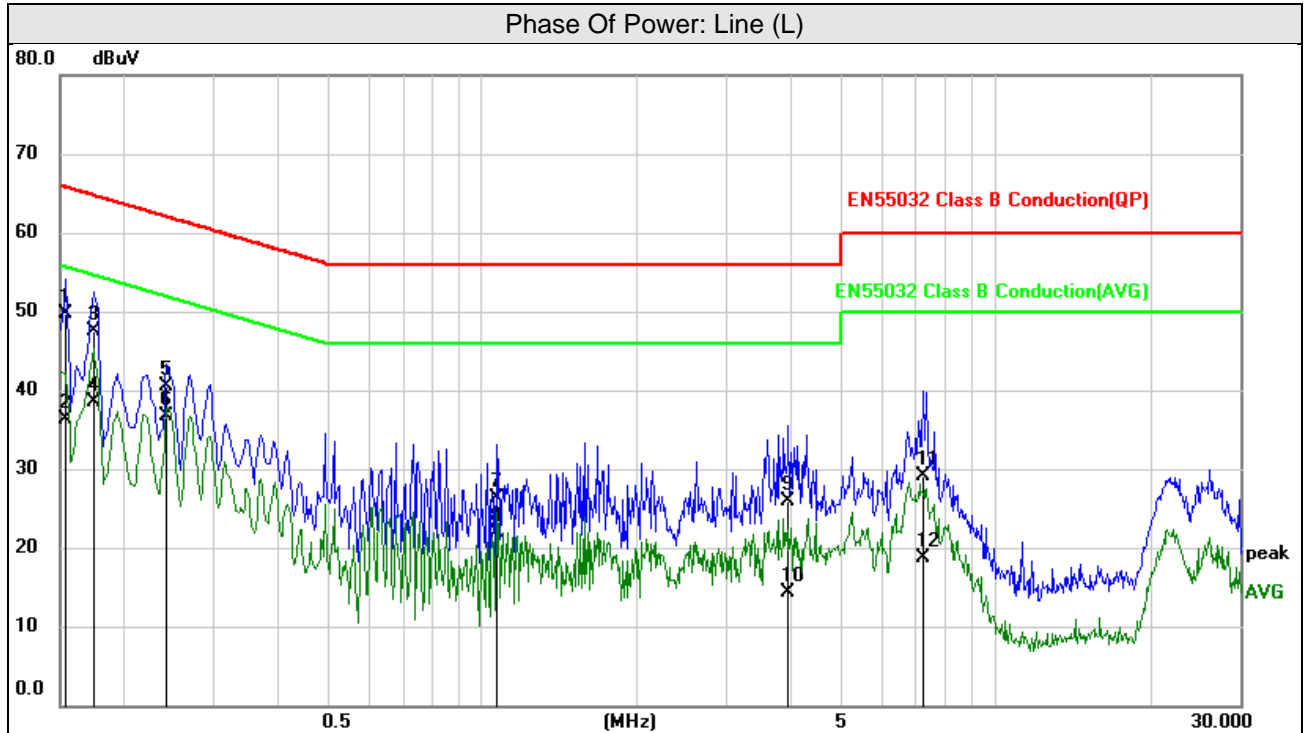
3.2.6 EUT Operating Conditions

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

3.2.7 Test Results

Conducted worst-case data

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

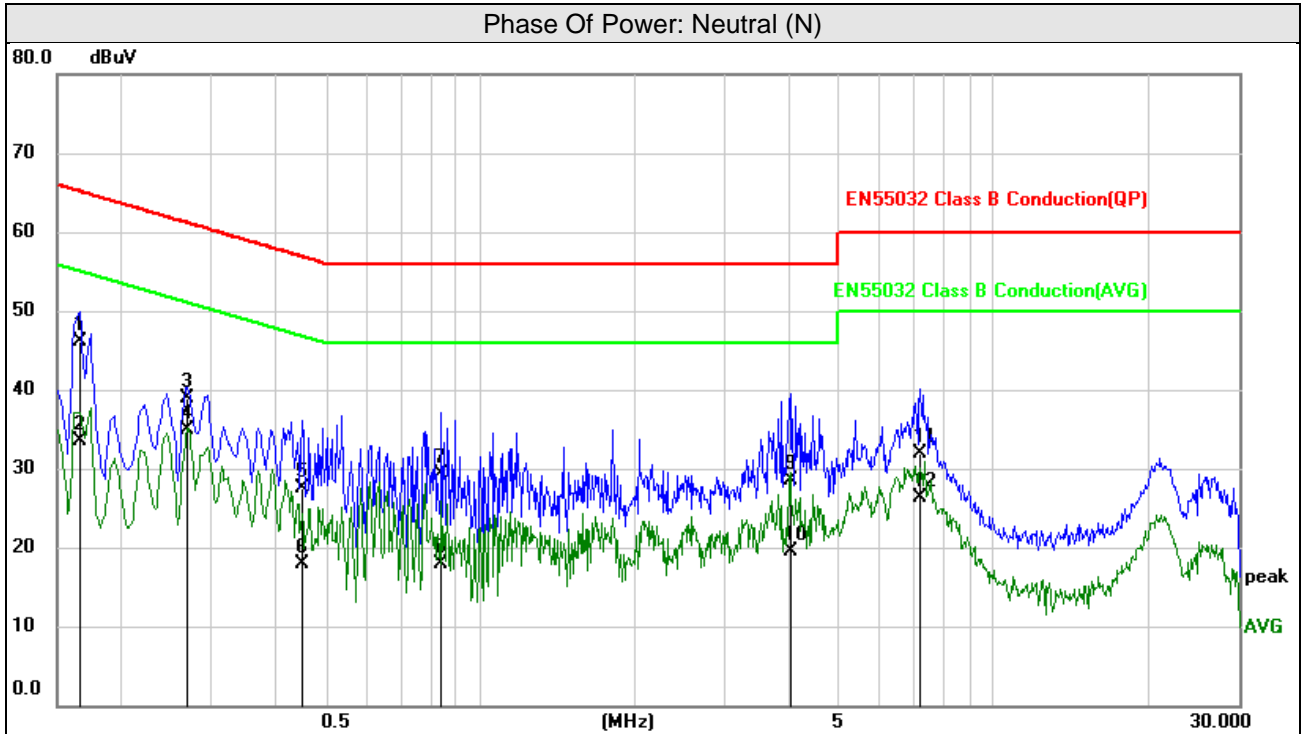


No	Frequency (MHz)	Reading (dBuV)	Correct Factor	Emission Level	Limit	Margin	Remark
			dB	(dBuV)	(dBuV)	(dB)	
1	0.1539	39.97	9.65	49.62	65.79	-16.17	QP
2	0.1539	26.66	9.65	36.31	55.79	-19.48	AVG
3	0.1740	37.94	9.64	47.58	64.77	-17.19	QP
4	0.1740	28.85	9.64	38.49	54.77	-16.28	AVG
5	0.2420	30.87	9.62	40.49	62.03	-21.54	QP
6	0.2420	27.16	9.62	36.78	52.03	-15.25	AVG
7	1.0700	16.82	9.55	26.37	56.00	-29.63	QP
8	1.0700	12.27	9.55	21.82	46.00	-24.18	AVG
9	3.9620	16.36	9.63	25.99	56.00	-30.01	QP
10	3.9620	4.73	9.63	14.36	46.00	-31.64	AVG
11	7.2420	19.44	9.63	29.07	60.00	-30.93	QP
12	7.2420	9.10	9.63	18.73	50.00	-31.27	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

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



No	Frequency (MHz)	Reading (dBuV)	Correct Factor	Emission Level	Limit	Margin	Remark
			dB	(dBuV)	(dBuV)	(dB)	Detector
1	0.1660	36.39	9.64	46.03	65.16	-19.13	QP
2	0.1660	23.84	9.64	33.48	55.16	-21.68	AVG
3	0.2700	29.34	9.62	38.96	61.12	-22.16	QP
4	0.2700	25.19	9.62	34.81	51.12	-16.31	AVG
5	0.4500	17.86	9.58	27.44	56.88	-29.44	QP
6	0.4500	8.31	9.58	17.89	46.88	-28.99	AVG
7	0.8420	19.64	9.57	29.21	56.00	-26.79	QP
8	0.8420	8.35	9.57	17.92	46.00	-28.08	AVG
9	4.0100	18.97	9.63	28.60	56.00	-27.40	QP
10	4.0100	9.94	9.63	19.57	46.00	-26.43	AVG
11	7.1860	22.26	9.63	31.89	60.00	-28.11	QP
12	7.1860	16.60	9.63	26.23	50.00	-23.77	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 0.5 MHz.

3.3.2 Test Setup



3.3.3 Test Instruments

Refer to section 10.1 to get information of above instrument.

3.3.4 Test Procedure

- Set resolution bandwidth (RBW) = 100kHz
- 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

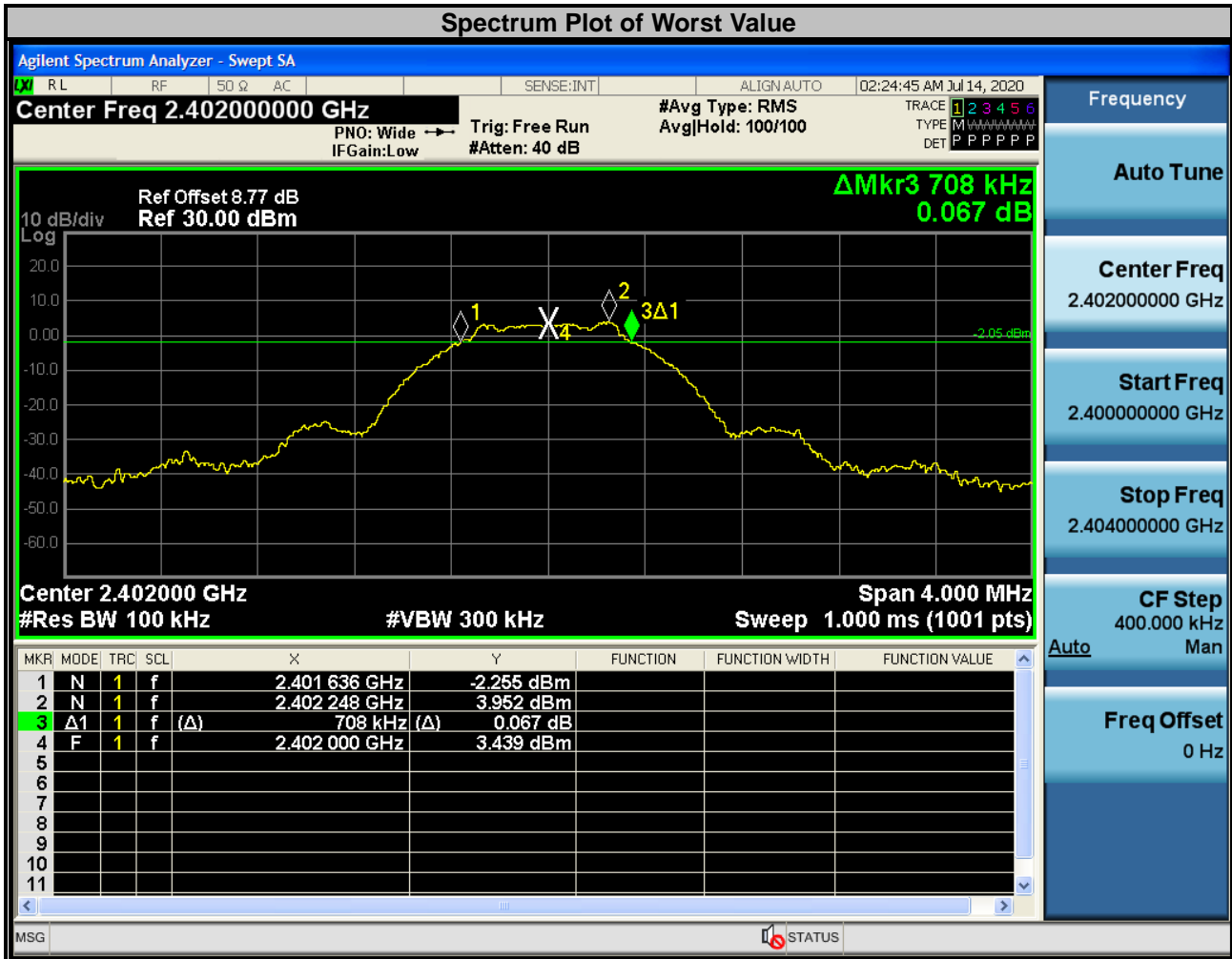
No deviation.

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.

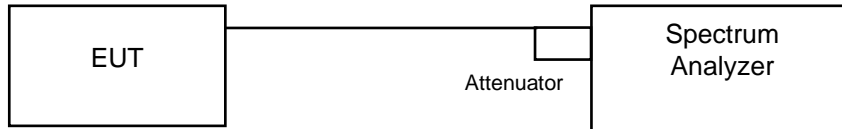
3.3.7 Test Result

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	0.708	0.5	Pass
19	2440	0.744	0.5	Pass
39	2480	0.764	0.5	Pass



3.4 Occupied Bandwidth Measurement

3.4.1 Test Setup



3.4.2 Test Instruments

Refer to section 10.1 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

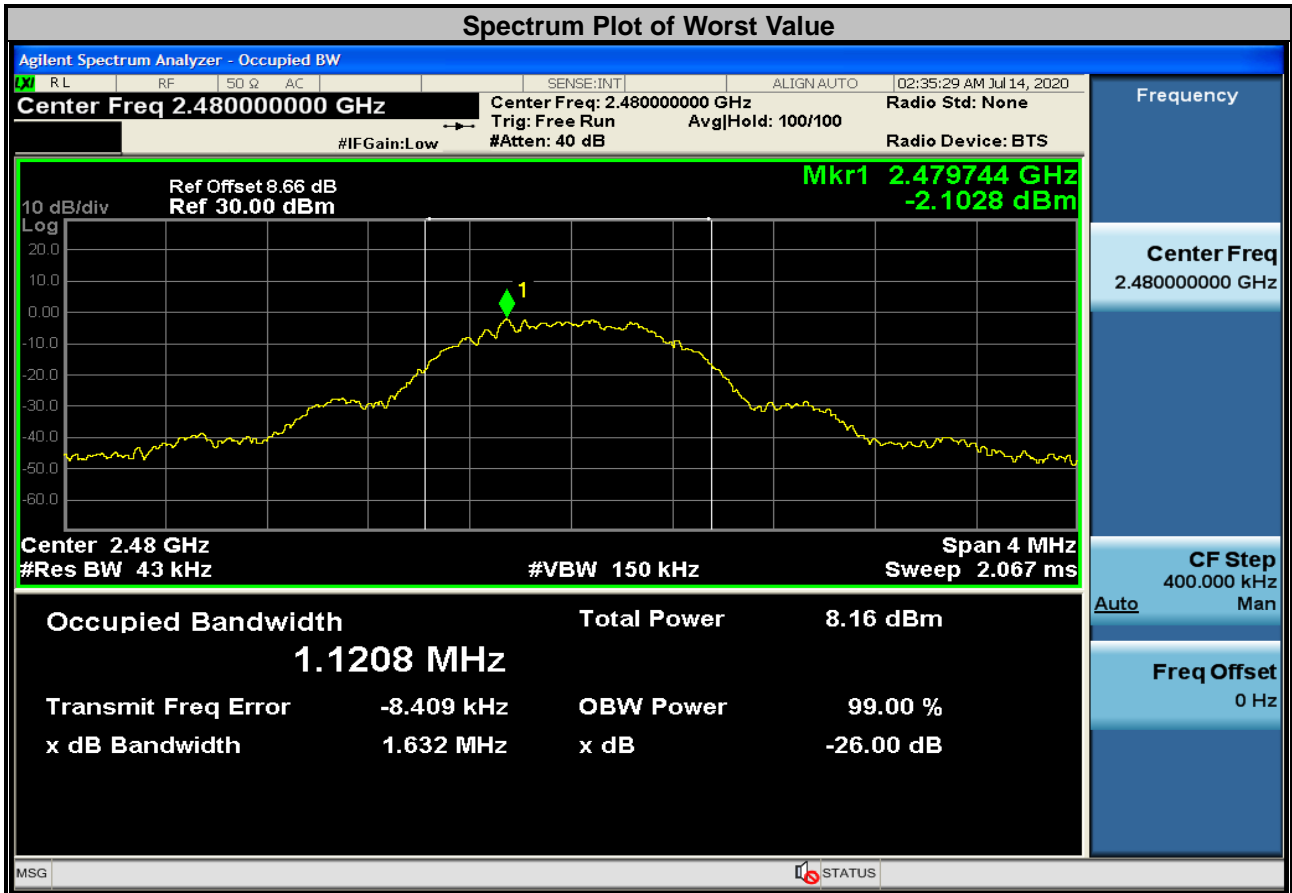
No deviation.

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	1.0563	Pass
19	2440	1.0910	Pass
39	2480	1.1208	Pass

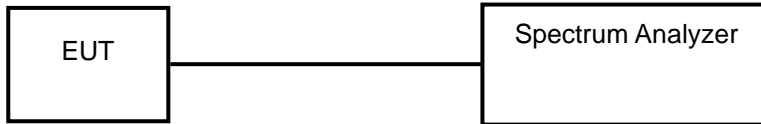


3.5 Conducted Output Power Measurement

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 4.1.2 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 3 MHz RBW and 10 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

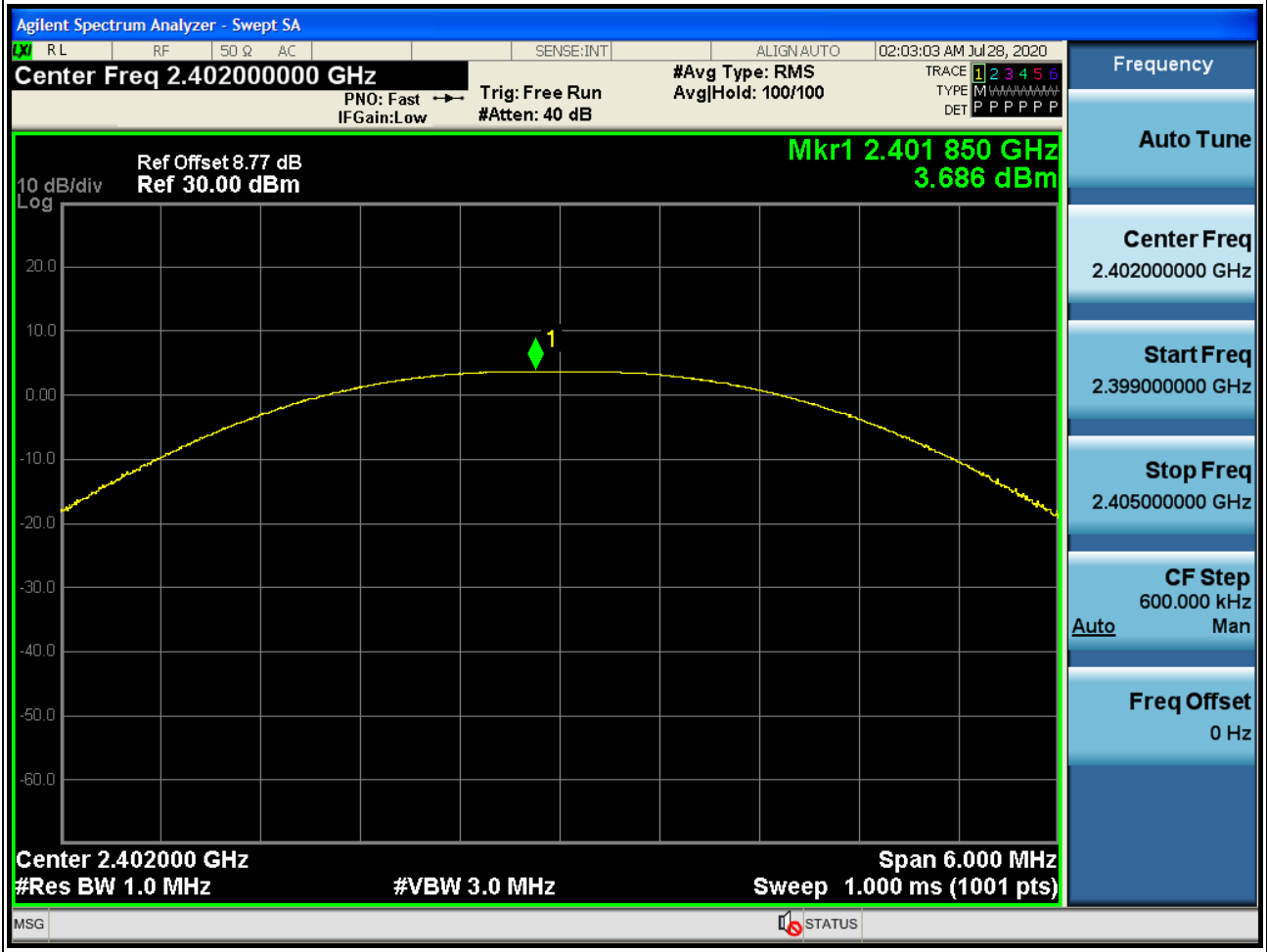
No deviation.

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	2.339	3.69	30	Pass
19	2440	1.738	2.40	30	Pass
39	2480	1.096	0.40	30	Pass

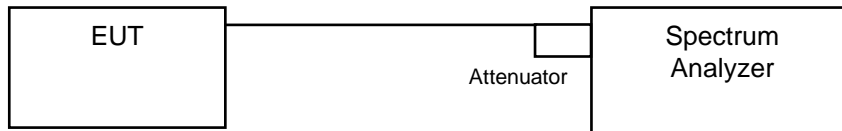


3.6 Power Spectral Density Measurement

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 10.1 to get information of above instrument.

3.6.4 Test Procedure

- a. Set the RBW = 3 kHz, VBW = 10 kHz, Detector = peak.
- b. Sweep time = auto couple, Trace mode = max hold, allow trace to fully stabilize.
- c. Use the peak marker function to determine the maximum power level in any 100 kHz bandsegment 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	-6.67	8	Pass
19	2440	-8.16	8	Pass
39	2480	-10.52	8	Pass



3.7 Conducted Out of Band Emission Measurement

3.7.1 Limits of Conducted Out of Band Emission Measurement

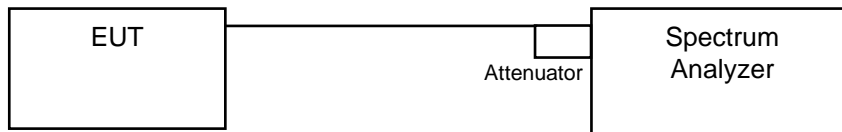
For average power:

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 kHzband segment within the fundamental EBW.

3.7.5 Measurement procedure OOBE

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.

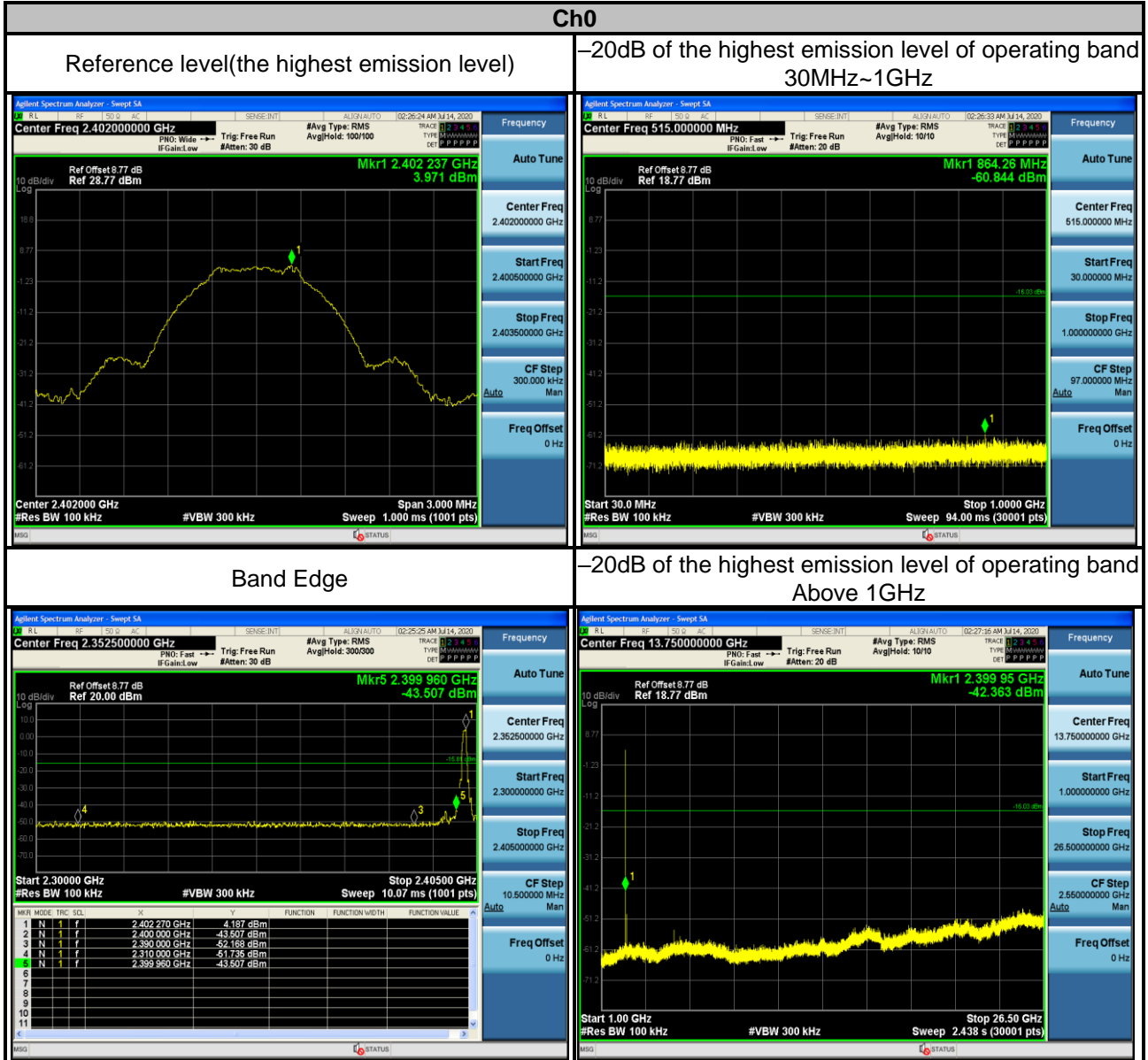
3.7.6 Deviation from Test Standard

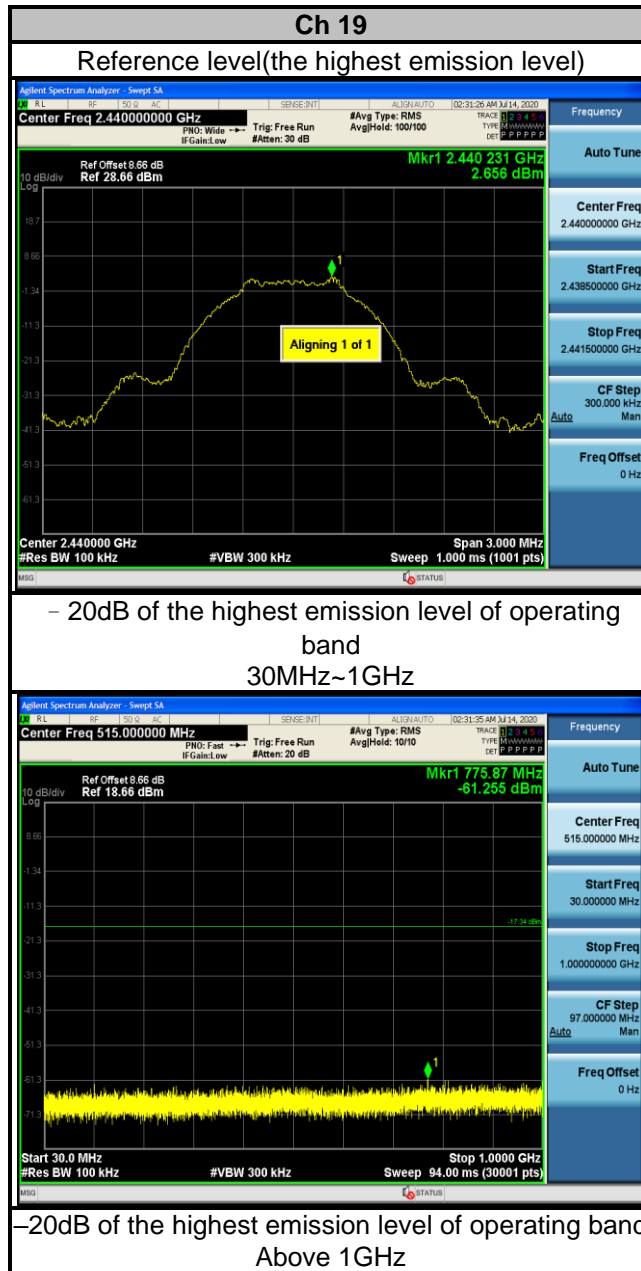
No deviation.

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





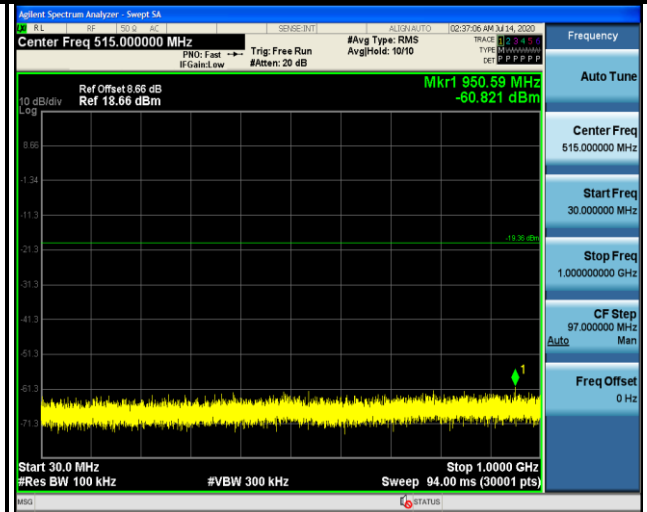


Ch 39

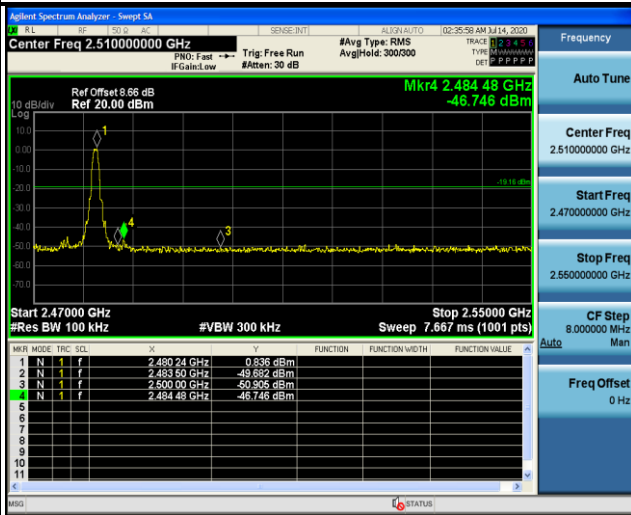
Reference level(the highest emission level)



-20dB of the highest emission level of operating band 30MHz~1GHz



Band Edge



-20dB of the highest emission level of operating band Above 1GHz



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	2020-10-17
Spectrum Analyzer Rohde&Schwarz	FSV-40N	101783	2020-10-17
Power Meter10Hz~18GHz Tonscend	JS0806-2	188060126	2020-10-17
Signal generator Keysight	N5182A	GB40051020	2020-10-17
Signal generator Keysight	N5182A	MY47420944	2020-10-17
Test Software Tonscend	JS0806-2	NA	NA
Hygrothermograph Yuhuaze	HTC-1	NA	2020-10-17

- 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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