

FCC Test Report (BT-LE)

Report No.: RF200514E05-3

FCC ID: K7S-03535

Test Model: E7350

Received Date: May 14, 2020

Test Date: June 01 to 10, 2020

Issued Date: June 18, 2020

Applicant: Belkin International, Inc.

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
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**FCC Registration /
Designation Number:** 723255 / TW2022



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Release Control Record

Issue No.	Description	Date Issued
RF200514E05-3	Original release.	June 18, 2020

1 Certificate of Conformity

Product: AX1800 Dual-Band WiFi 6 Router

Brand: Linksys

Test Model: E7350

Sample Status: ENGINEERING SAMPLE

Applicant: Belkin International, Inc.

Test Date: June 01 to 10, 2020

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

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, 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 : Vivian Huang , **Date:** June 18, 2020
Vivian Huang / Specialist

Approved by : Clark Lin , **Date:** June 18, 2020
Clark Lin / Technical Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -8.39 dB at 16.22614 MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -3.5 dB at 31.32 MHz.
15.247(d)	Antenna Port Emission	PASS	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	PASS	Meet the requirement of limit.
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.
-	Occupied Bandwidth Measurement	-	Reference only

Note:

Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 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:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.9 dB
Conducted Emissions	-	2.5 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.1 dB
	30MHz ~ 1GHz	5.5 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	5.1 dB
	18GHz ~ 40GHz	5.3 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT (BT-LE)

Product	AX1800 Dual-Band WiFi 6 Router
Brand	Linksys
Test Model	E7350
Status of EUT	ENGINEERING SAMPLE
Driver Version	7.1.0.2
Test Software Version	WCN_Combo_Tool
Power Supply Rating	12Vdc from power adapter
Modulation Type	GFSK
Modulation Technology	DTS
Transfer Rate	Up to 1 Mbps
Operating Frequency	2.402 ~ 2.480 GHz
Number of Channel	40
Output Power	2.143 mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter x 1
Data Cable Supplied	RJ-45 Cable x 1 (Unshielded, 1 m)

Note:

1. There are WLAN and Bluetooth technology used for the EUT. The EUT has two radios as following table:

Radio 1	Radio 2
WLAN 2.4GHz	WLAN 5GHz

2. Simultaneously transmission condition.

Condition	Technology	
1	WLAN (2.4GHz)	WLAN (5GHz)

Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.

3. The EUT must be supplied power adapter and following different models could be chosen as following table:

No.	Brand	Model No.	Spec.	Plug
1	APD	WB-24J12FU	AC Input: 100-240Vac, 0.7A Max, 50-60Hz DC Output: 12V, 2A DC Output Cable: 1.5m, Unshielded	FCC/IC
2	Ktec	KSA-24W-120200HU	AC Input: 100-240Vac, 0.6A, 50/60Hz DC Output: 12V, 2A DC Output Cable: 1.5m, Unshielded	FCC/IC
3	APD	WB-24J12R	AC Input: 100-240Vac, 0.7A Max, 50-60Hz DC Output: 12V, 2A DC Output Cable: 1.5m, Unshielded	interchangeable plug
4	Ktec	KSA-24W-120200D5	AC Input: 100-240Vac, 0.6A, 50/60Hz DC Output: 12V, 2A DC Output Cable: 1.5m, Unshielded	interchangeable plug

Note:

1. The adapter 1 is as same as adapter 3; except for plug shape is different.
2. The adapter 2 is as same as adapter 4; except for plug shape is different.
3. From the above adapters, the worst conducted emission was found in **Adapter 1** and radiated emission test was found in **Adapter 2**. Therefore only the test data of the modes were recorded in this report.

4. The antennas provided to the EUT, please refer to the following table:

Antenna NO.	Model	Antenna Net Gain(dBi)	Frequency range	Antenna Type	Connector Type	Cable Length (mm)
DB1	Galtronics	3.4	2.4~2.4835GHz	PCB	i-pex(MHF)	58
		3.99	5.15~5.25GHz			
		4.17	5.25~5.35GHz			
		4.74	5.47~5.725GHz			
		5.24	5.725~5.85GHz			
DB2	Galtronics	3.45	2.4~2.4835GHz	PCB	i-pex(MHF)	68
		3.52	5.15~5.25GHz			
		3.00	5.25~5.35GHz			
		3.08	5.47~5.725GHz			
		3.11	5.725~5.85GHz			
DFS Ant (RX only)	Galtronics	2.14	5.15~5.25GHz	metal	none	N/A
		2.86	5.25~5.35GHz			
		3.17	5.47~5.725GHz			
		3.38	5.725~5.85GHz			
BT Ant	Galtronics	4.28	2.4~2.4835GHz	metal	none	N/A

5. The power setting are list as below:

Modulation Type	Frequency (MHz)	Power Setting	Frequency (MHz)	Power Setting	Frequency (MHz)	Power Setting
GFSK	2402	4	2440	4	2480	4

6. 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.

3.2 Description of Test Modes

40 channels are provided to this EUT:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (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

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE≥1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

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

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.

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.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
0 to 39	39	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.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
0 to 39	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.

AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)
0 to 39	0, 19, 39	GFSK	1

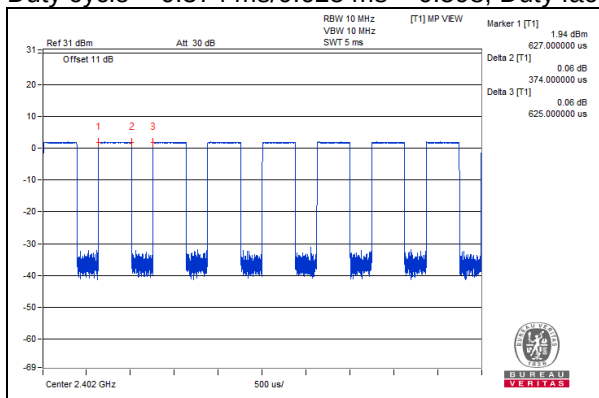
Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE $\geq$ 1G	25deg. C, 68%RH	120Vac, 60Hz	Tom Yang
RE<1G	18deg. C, 61%RH	120Vac, 60Hz	Sampon Chen
PLC	25deg. C, 75%RH	120Vac, 60Hz	Nick Lo
APCM	25deg. C, 60%RH	120Vac, 60Hz	Anderson Chen

3.3 Duty Cycle of Test Signal

Duty cycle of test signal is < 98 %, duty factor shall be considered.

Duty cycle = $0.374 \text{ ms} / 0.625 \text{ ms} = 0.598$, Duty factor = $10 * \log(1/\text{Duty cycle}) = 2.23 \text{ dB}$



3.4 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.

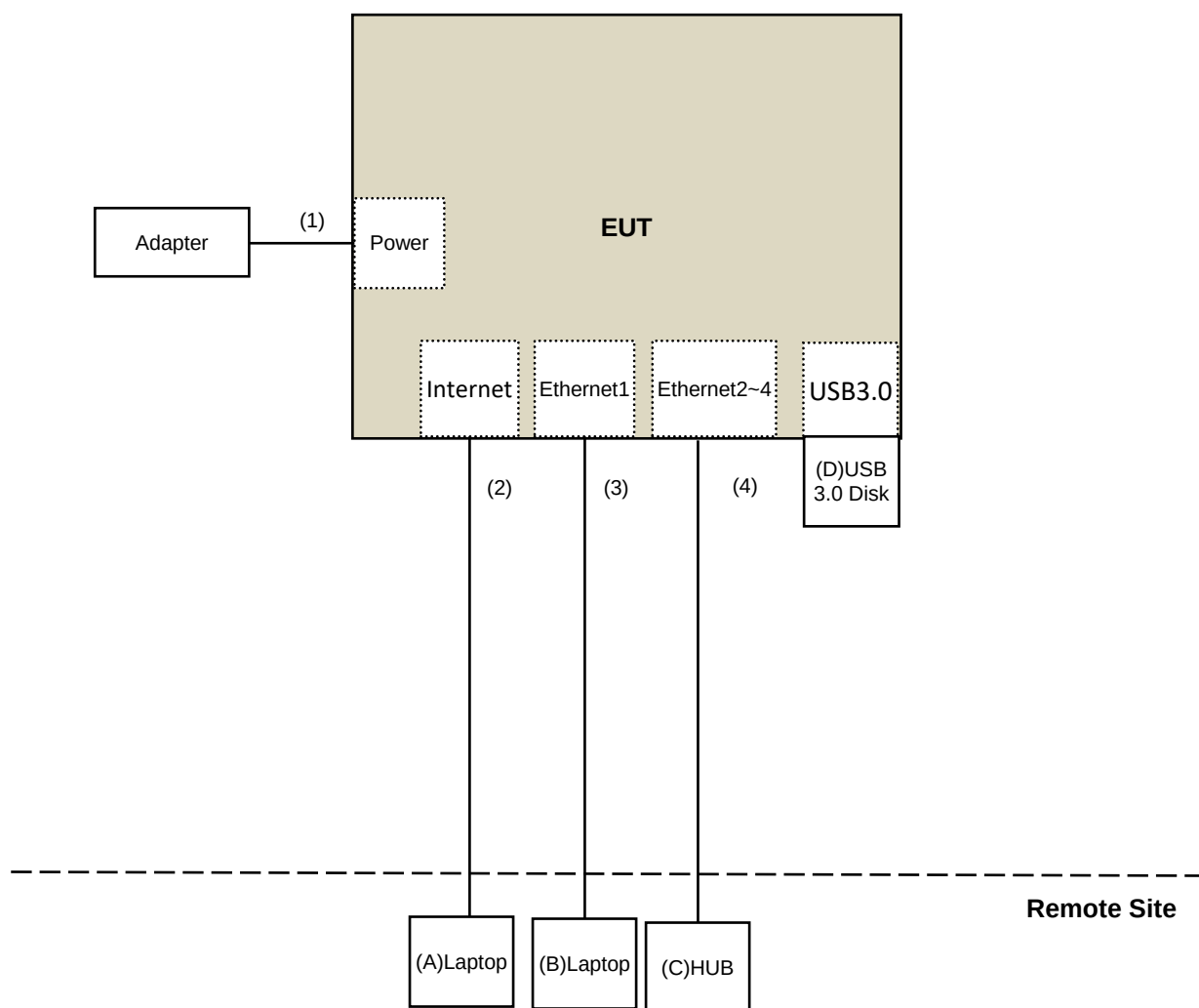
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Laptop	Lenovo	81A4	YD02YN76	NA	Provided by Lab
B.	Laptop	DELL	E5430	HYV4VY1	FCC DoC	Provided by Lab
C.	HUB	ZyXEL	GS1100-16	S150H44000046	FCC DoC	Provided by Lab
D.	USB 3.0 Disk	SanDisk	Ultra Flair USB 3.0	NA	NA	Provided by Lab

Note:

1. All power cords of the above support units are non-shielded (1.8m).

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC Cable	1	1.5	No	0	Supplied by client
2.	RJ-45 Cable	1	10	No	0	Provided by Lab
3.	RJ-45 Cable	1	10	No	0	Provided by Lab
4.	RJ-45 Cable	3	10	No	0	Provided by Lab

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards and References

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

Test Standard:

FCC Part 15, Subpart C (15.247)

ANSI C63.10-2013

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

References Test Guidance:

KDB 558074 D01 15.247 Meas Guidance v05r02

All test items have been performed as a reference to the above KDB test guidance.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 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.

4.1.2 Test Instruments

For Radiated Emission & Bangedge test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY51210202	Dec. 13, 2019	Dec. 12, 2020
Pre-Amplifier EMCI	EMC001340	980142	May 25, 2020	May 24, 2021
Loop Antenna Electro-Metrics	EM-6879	264	Feb. 18, 2020	Feb. 17, 2021
RF Cable	NA	LOOPCAB-001	Jan. 08, 2020	Jan. 07, 2021
RF Cable	NA	LOOPCAB-002	Jan. 08, 2020	Jan. 07, 2021
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-01	Oct. 23, 2019	Oct. 22, 2020
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-406	Nov. 11, 2019	Nov. 10, 2020
RF Cable	8D	966-4-1	Mar. 18, 2020	Mar. 17, 2021
RF Cable	8D	966-4-2	Mar. 18, 2020	Mar. 17, 2021
RF Cable	8D	966-4-3	Mar. 18, 2020	Mar. 17, 2021
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-4-01	Sep. 26, 2019	Sep. 25, 2020
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-783	Nov. 24, 2019	Nov. 23, 2020
Pre-Amplifier EMCI	EMC12630SE	980385	Aug. 15, 2019	Aug. 14, 2020
RF Cable	EMC104-SM-SM-1200	160923	Jan. 15, 2020	Jan. 14, 2021
RF Cable	EMC104-SM-SM-2000	180502	Apr. 29, 2020	Apr. 28, 2021
RF Cable	EMC104-SM-SM-6000	180418	Apr. 29, 2020	Apr. 28, 2021
Pre-Amplifier EMCI	EMC184045SE	980387	Jan. 15, 2020	Jan. 14, 2021
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170519	Nov. 24, 2019	Nov. 23, 2020
RF Cable	EMC102-KM-KM-1200	160924	Jan. 15, 2020	Jan. 14, 2021
RF Cable	EMC-KM-KM-4000	200214	Mar. 11, 2020	Mar. 10, 2021
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	NA	NA

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in 966 Chamber No. 4.
3. Tested Date: June 04 to 05, 2020

For other test items:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSV40	100964	May 29, 2020	May 28, 2021
Power meter Anritsu	ML2495A	1529002	July 26, 2019	July 25, 2020
Power sensor Anritsu	MA2411B	1339443	July 26, 2019	July 25, 2020
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 14, 2020	Apr. 13, 2021
Software	ADT_RF Test Software V6.6.5.4	NA	NA	NA

- NOTE:**
1. The test was performed in Oven room 2.
 2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 3. Tested Date: June 10, 2020

4.1.3 Test Procedures

For Radiated emission below 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case 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.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The 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 detects 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:

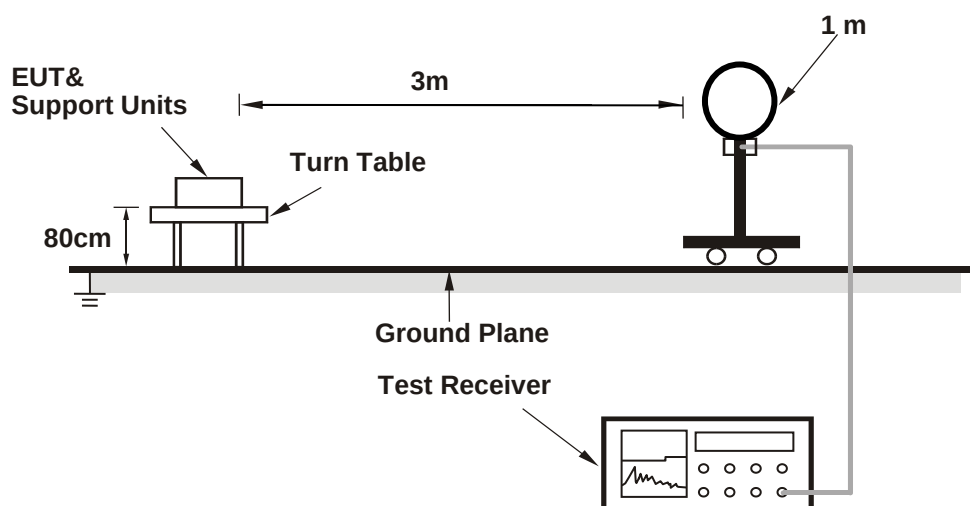
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.1.4 Deviation from Test Standard

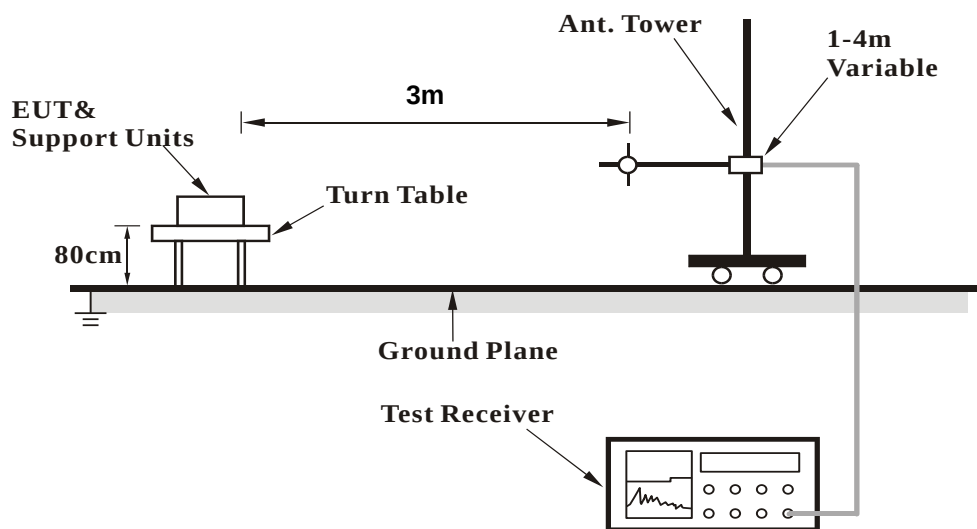
No deviation.

4.1.5 Test Setup

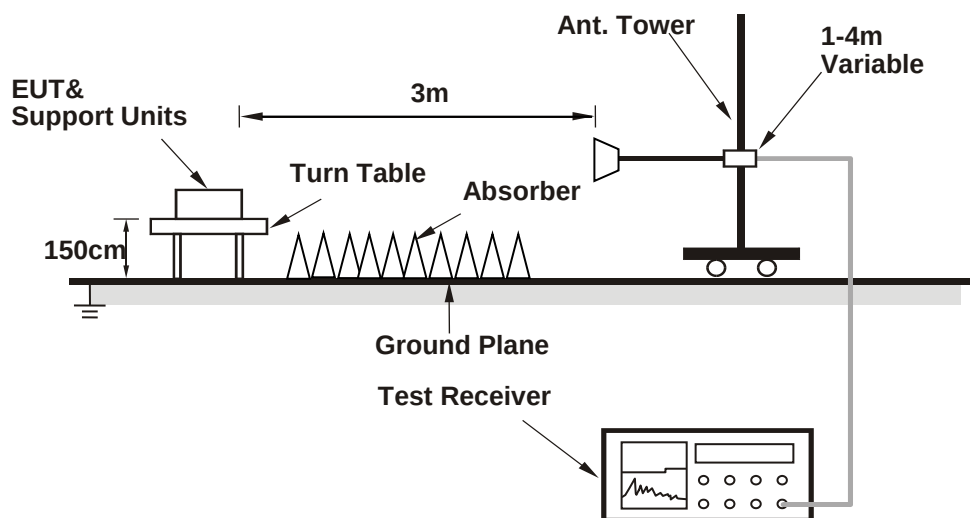
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Conditions

- Connected the EUT with the Laptop which is placed on remote site.
- Controlling software (WCN_Combo_Tool) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1GHz Data:

Channel	TX Channel 0	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2384.12	54.8 PK	74.0	-19.2	1.27 H	162	56.6	-1.8
2	2384.12	44.3 AV	54.0	-9.7	1.27 H	162	46.1	-1.8
3	*2402.00	100.3 PK			1.27 H	162	102.1	-1.8
4	*2402.00	99.2 AV			1.27 H	162	101.0	-1.8
5	4804.00	33.5 PK	74.0	-40.5	1.03 H	71	31.3	2.2
6	4804.00	24.7 AV	54.0	-29.3	1.03 H	71	22.5	2.2
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2361.18	56.4 PK	74.0	-17.6	1.66 V	129	58.3	-1.9
2	2361.18	44.4 AV	54.0	-9.6	1.66 V	129	46.3	-1.9
3	*2402.00	97.0 PK			1.66 V	129	98.8	-1.8
4	*2402.00	95.6 AV			1.66 V	129	97.4	-1.8
5	4804.00	33.0 PK	74.0	-41.0	1.47 V	5	30.8	2.2
6	4804.00	28.4 AV	54.0	-25.6	1.47 V	5	26.2	2.2

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

Channel	TX Channel 19	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2440.00	100.7 PK			1.23 H	174	102.5	-1.8
2	*2440.00	99.4 AV			1.23 H	174	101.2	-1.8
3	4880.00	33.1 PK	74.0	-40.9	1.04 H	65	31.0	2.1
4	4880.00	24.2 AV	54.0	-29.8	1.04 H	65	22.1	2.1
5	7320.00	33.1 PK	74.0	-40.9	1.05 H	123	24.0	9.1
6	7320.00	21.2 AV	54.0	-32.8	1.05 H	123	12.1	9.1

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2440.00	97.0 PK			1.71 V	137	98.8	-1.8
2	*2440.00	95.4 AV			1.71 V	137	97.2	-1.8
3	4880.00	33.5 PK	74.0	-40.5	1.44 V	4	31.4	2.1
4	4880.00	28.9 AV	54.0	-25.1	1.44 V	4	26.8	2.1
5	7320.00	32.1 PK	74.0	-41.9	1.30 V	178	23.0	9.1
6	7320.00	21.5 AV	54.0	-32.5	1.30 V	178	12.4	9.1

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

Channel	TX Channel 39	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	101.1 PK			1.31 H	160	103.0	-1.9
2	*2480.00	100.0 AV			1.31 H	160	101.9	-1.9
3	2488.50	54.6 PK	74.0	-19.4	1.31 H	160	56.5	-1.9
4	2488.50	44.2 AV	54.0	-9.8	1.31 H	160	46.1	-1.9
5	4960.00	33.0 PK	74.0	-41.0	1.09 H	65	30.5	2.5
6	4960.00	24.0 AV	54.0	-30.0	1.09 H	65	21.5	2.5
7	7440.00	33.7 PK	74.0	-40.3	1.12 H	123	24.4	9.3
8	7440.00	21.9 AV	54.0	-32.1	1.12 H	123	12.6	9.3
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	100.7 PK			1.91 V	134	102.6	-1.9
2	*2480.00	99.5 AV			1.91 V	134	101.4	-1.9
3	2483.50	56.1 PK	74.0	-17.9	1.91 V	134	58.0	-1.9
4	2483.50	44.5 AV	54.0	-9.5	1.91 V	134	46.4	-1.9
5	4960.00	33.2 PK	74.0	-40.8	1.51 V	14	30.7	2.5
6	4960.00	29.1 AV	54.0	-24.9	1.51 V	14	26.6	2.5
7	7440.00	31.9 PK	74.0	-42.1	1.36 V	193	22.6	9.3
8	7440.00	21.5 AV	54.0	-32.5	1.36 V	193	12.2	9.3

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

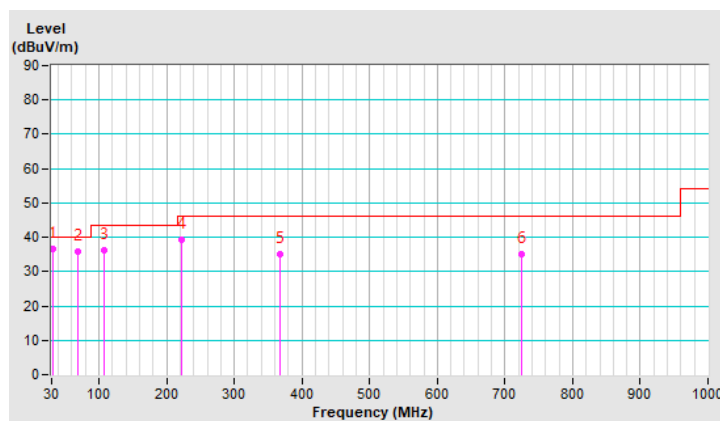
Below 1GHz Data:

CHANNEL	TX Channel 39	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	31.32	36.5 QP	40.0	-3.5	1.18 H	10	45.9	-9.4
2	68.12	35.8 QP	40.0	-4.2	1.71 H	345	45.6	-9.8
3	107.02	36.2 QP	43.5	-7.3	2.19 H	284	47.0	-10.8
4	221.32	39.2 QP	46.0	-6.8	1.17 H	269	50.0	-10.8
5	367.12	35.1 QP	46.0	-10.9	1.10 H	31	39.8	-4.7
6	724.98	35.1 QP	46.0	-10.9	1.27 H	126	31.9	3.2

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

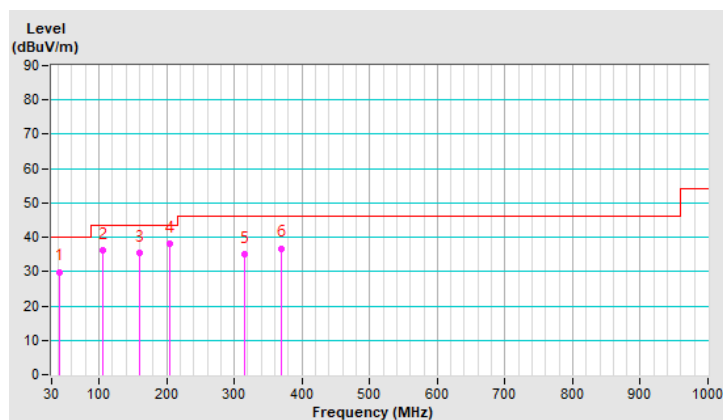


CHANNEL	TX Channel 39	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	40.92	29.9 QP	40.0	-10.1	3.06 V	263	38.2	-8.3
2	106.52	36.1 QP	43.5	-7.4	3.16 V	279	47.0	-10.9
3	159.41	35.5 QP	43.5	-8.0	2.22 V	109	42.9	-7.4
4	205.56	38.1 QP	43.5	-5.4	1.07 V	129	48.8	-10.7
5	314.68	35.1 QP	46.0	-10.9	1.25 V	315	41.1	-6.0
6	369.85	36.8 QP	46.0	-9.2	1.43 V	55	41.4	-4.6

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



4.2 Conducted Emission Measurement

4.2.1 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.

4.2.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESCS 30	847124/029	Oct. 23, 2019	Oct. 22, 2020
Line-Impedance Stabilization Network (for EUT) R&S	ESH3-Z5	848773/004	Oct. 23, 2019	Oct. 22, 2020
Line-Impedance Stabilization Network (for Peripheral) R&S	ESH3-Z5	835239/001	Mar. 19, 2020	Mar. 18, 2021
50 ohms Terminator	50	3	Oct. 23, 2019	Oct. 22, 2020
RF Cable	5D-FB	COCCAB-001	Sep. 27, 2019	Sep. 26, 2020
Fixed attenuator EMCI	STI02-2200-10	005	Aug. 30, 2019	Aug. 29, 2020
Software BVADT	BVADT_Cond_V7.3.7.4	NA	NA	NA

Note:

1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Conduction 1.
- 3 Tested Date: June 01, 2020

4.2.3 Test Procedures

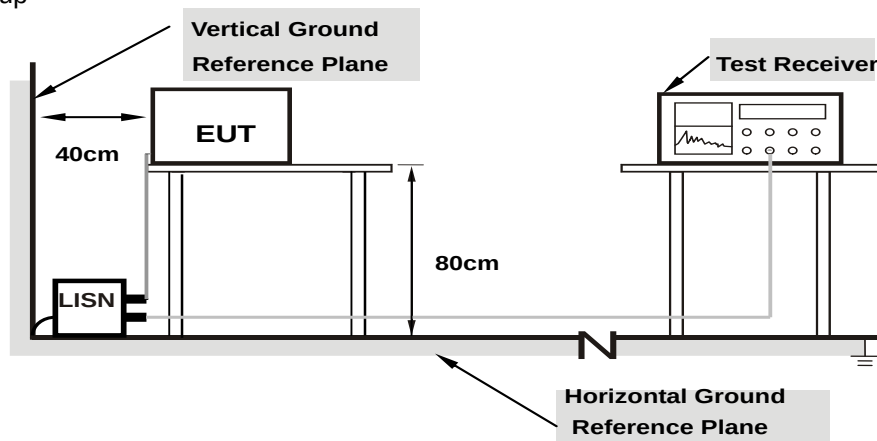
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance 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: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



Note: 1.Support units were connected to second LISN.

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

4.2.6 EUT Operating Conditions

Same as 4.1.6.

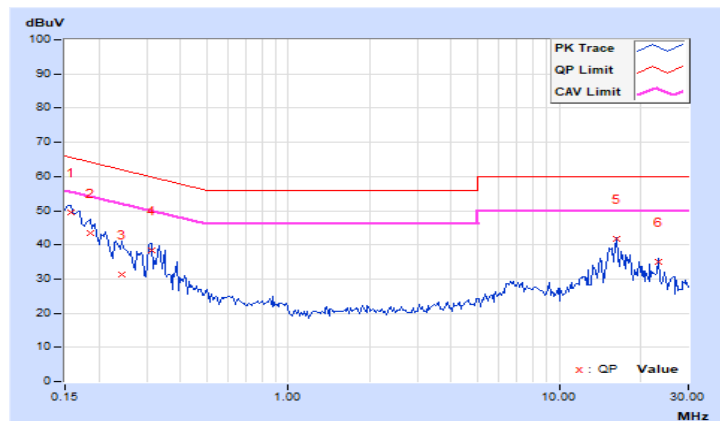
4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
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Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15743	10.03	39.53	25.46	49.56	35.49	65.60	55.60	-16.04	-20.11
2	0.18553	10.04	33.53	21.86	43.57	31.90	64.23	54.23	-20.66	-22.33
3	0.24363	10.04	21.43	7.53	31.47	17.57	61.97	51.97	-30.50	-34.40
4	0.31413	10.05	28.43	21.61	38.48	31.66	59.86	49.86	-21.38	-18.20
5	16.22643	11.20	30.43	28.65	41.63	39.85	60.00	50.00	-18.37	-10.15
6	23.12883	11.60	23.41	21.97	35.01	33.57	60.00	50.00	-24.99	-16.43

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

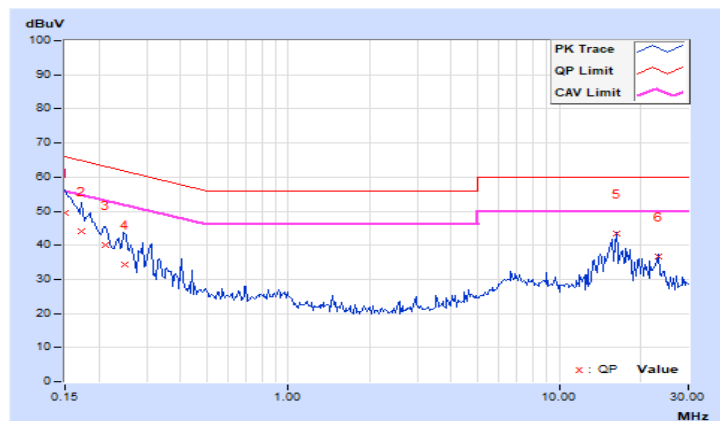


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
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Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.02	39.43	24.36	49.45	34.38	66.00	56.00	-16.55	-21.62
2	0.17352	10.02	34.24	17.36	44.26	27.38	64.79	54.79	-20.53	-27.41
3	0.21216	10.03	30.13	18.54	40.16	28.57	63.12	53.12	-22.96	-24.55
4	0.24789	10.03	24.32	5.43	34.35	15.46	61.83	51.83	-27.48	-36.37
5	16.22614	11.00	32.42	30.61	43.42	41.61	60.00	50.00	-16.58	-8.39
6	23.12915	11.29	25.53	23.54	36.82	34.83	60.00	50.00	-23.18	-15.17

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

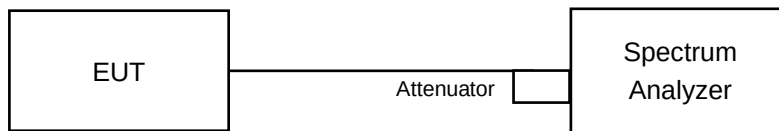


4.3 6dB Bandwidth Measurement

4.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 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

4.3.5 Deviation from Test Standard

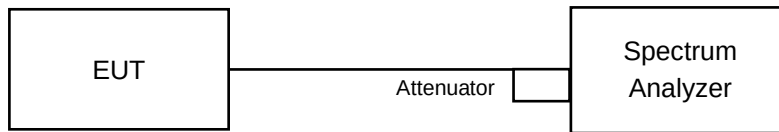
No deviation.

4.3.6 EUT Operating Conditions

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

4.4 Occupied Bandwidth Measurement

4.4.1 Test Setup



4.4.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.3 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 sampling. 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.

4.4.4 Deviation from Test Standard

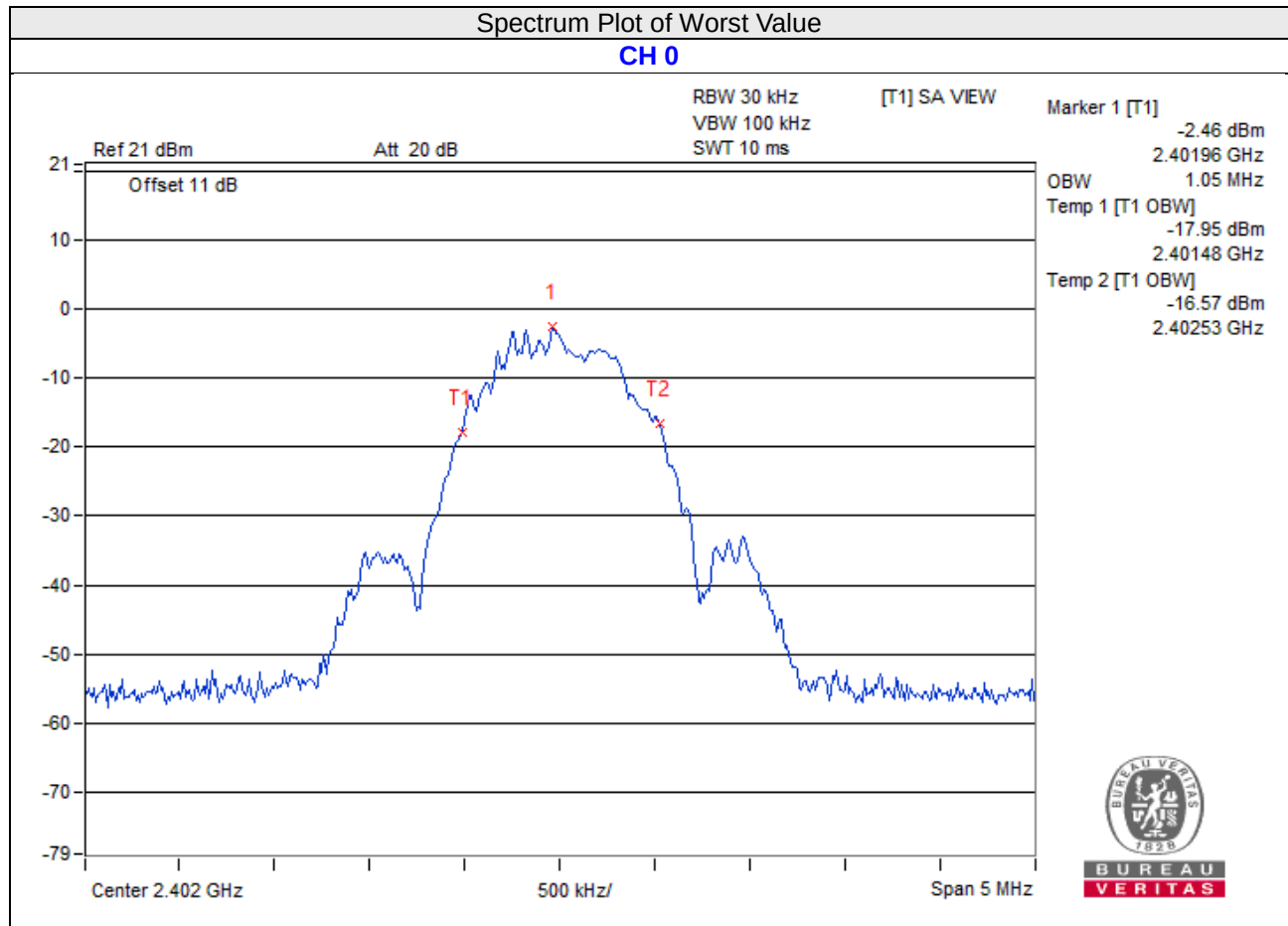
No deviation.

4.4.5 EUT Operating Conditions

Same as Item 4.3.6.

4.4.6 Test Results

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)
0	2402	1.05
19	2440	1.05
39	2480	1.05

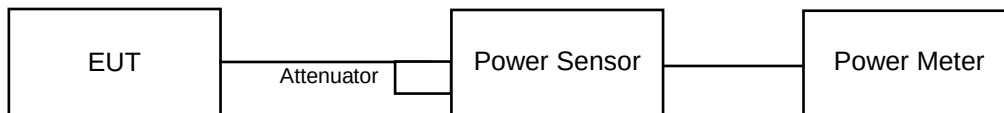


4.5 Conducted Output Power Measurement

4.5.1 Limits of Conducted Output Power Measurement

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

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedures

A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Conditions

Same as Item 4.3.6.

4.5.7 Test Results

FOR PEAK POWER

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
0	2402	1.936	2.87	30	Pass
19	2440	2.065	3.15	30	Pass
39	2480	2.143	3.31	30	Pass

FOR AVERAGE POWER

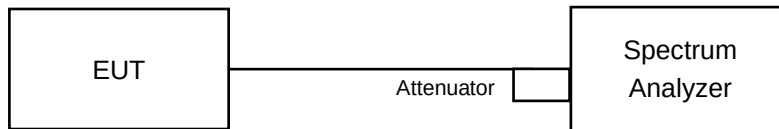
Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
0	2402	1.556	1.92
19	2440	1.746	2.42
39	2480	1.754	2.44

4.6 Power Spectral Density Measurement

4.6.1 Limits of Power Spectral Density Measurement

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

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

- Set analyzer center frequency to DTS channel center frequency.
- Set the span to 1.5 times the DTS bandwidth.
- Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- Set the VBW $\geq 3 \times \text{RBW}$.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level within the RBW.

4.6.5 Deviation from Test Standard

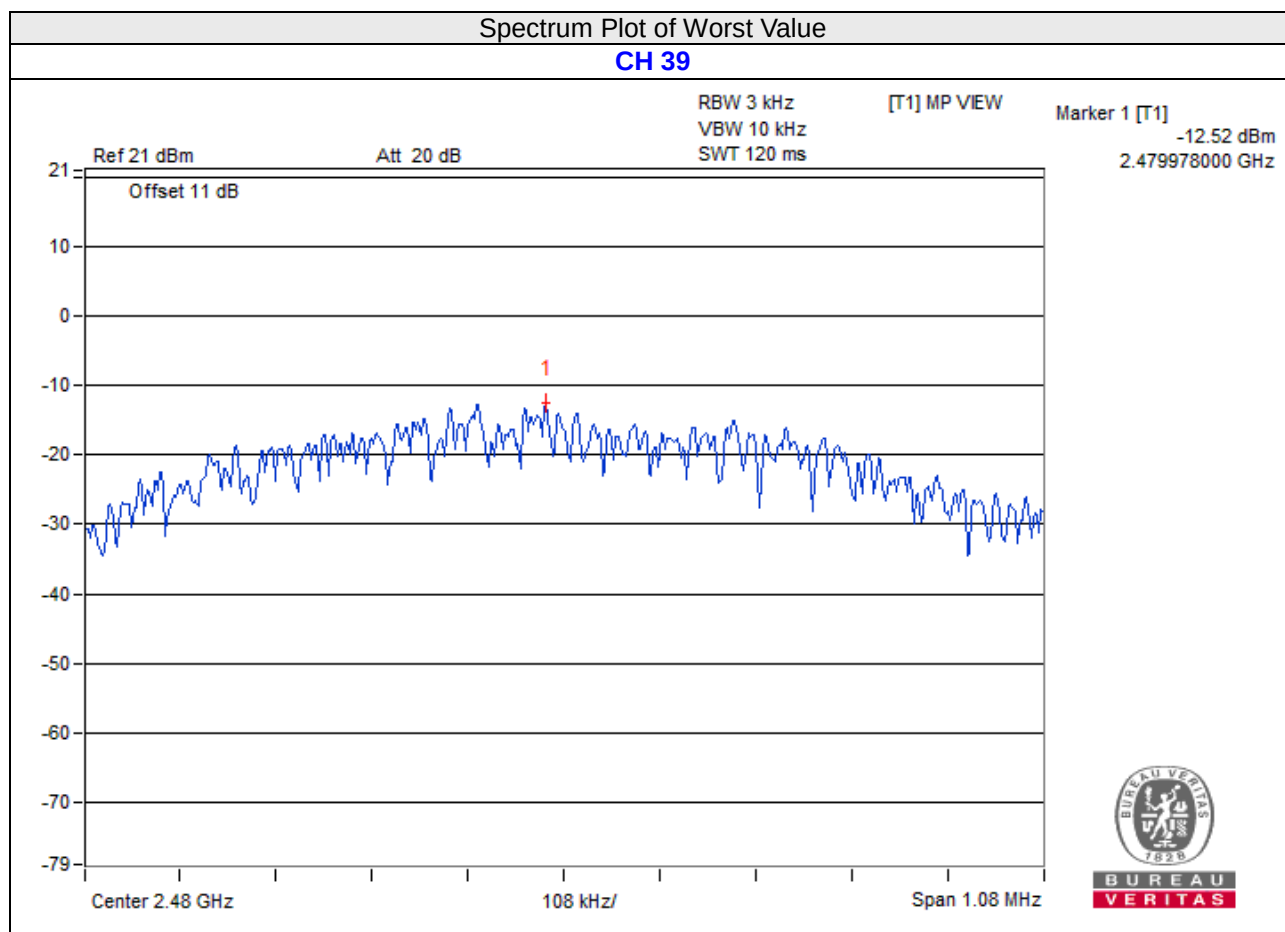
No deviation.

4.6.6 EUT Operating Condition

Same as Item 4.3.6.

4.6.7 Test Results

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	2402	-13.44	8	Pass
19	2440	-12.76	8	Pass
39	2480	-12.52	8	Pass

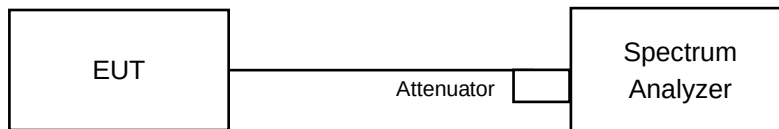


4.7 Conducted Out of Band Emission Measurement

4.7.1 Limits of Conducted Out of Band Emission Measurement

Below 20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

4.7.2 Test Setup



4.7.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.7.4 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.

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.

4.7.5 Deviation from Test Standard

No deviation.

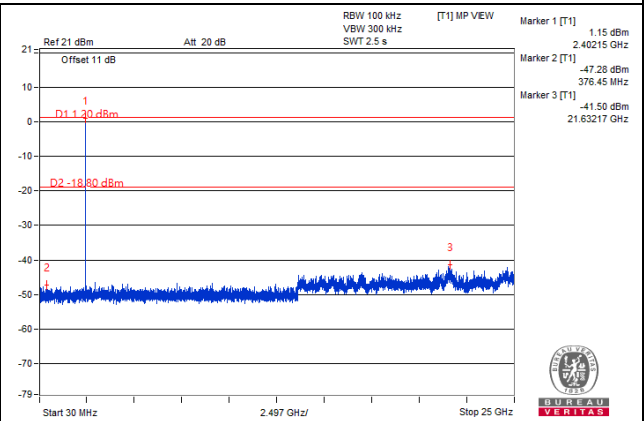
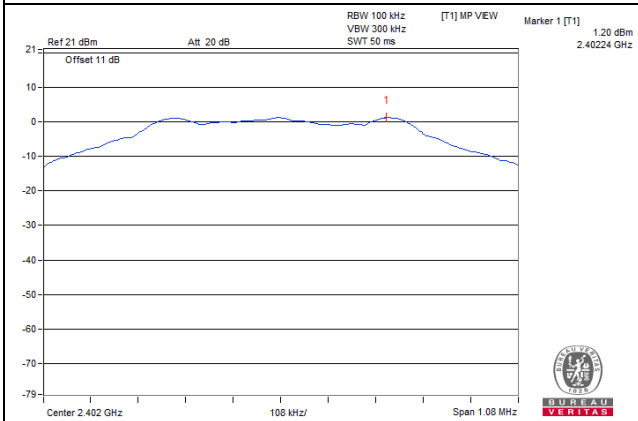
4.7.6 EUT Operating Condition

The software provided by client enabled the EUT to transmit and receive data at lowest and highest channel frequencies individually.

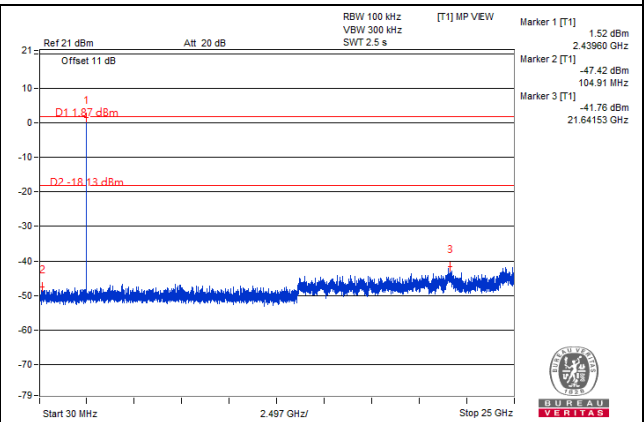
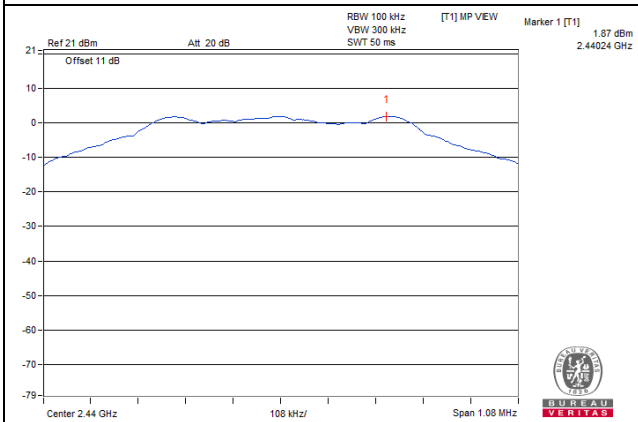
4.7.7 Test Results

The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

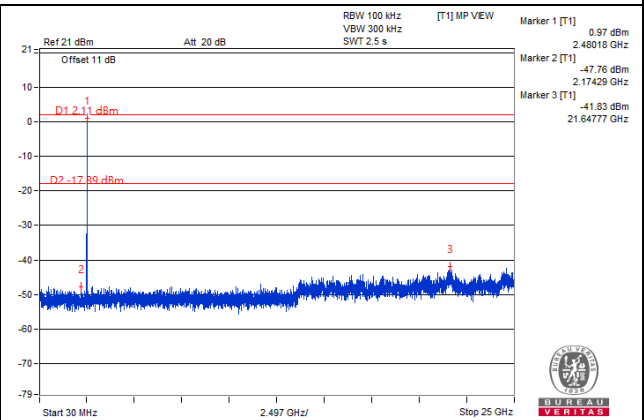
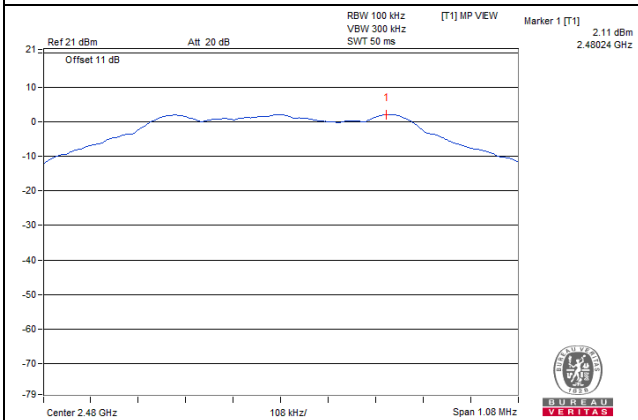
CH 0



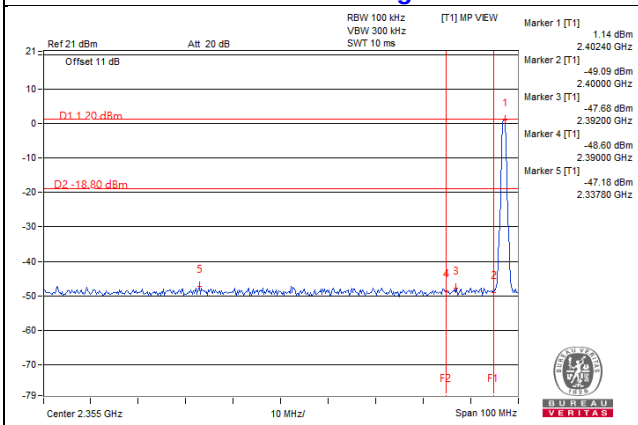
CH 19



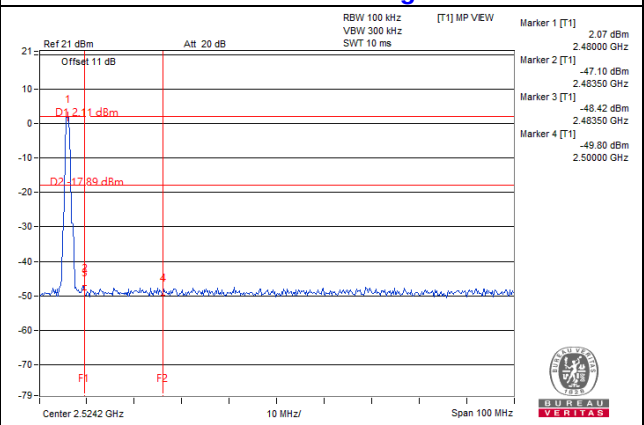
CH 39



CH 0 Band edge



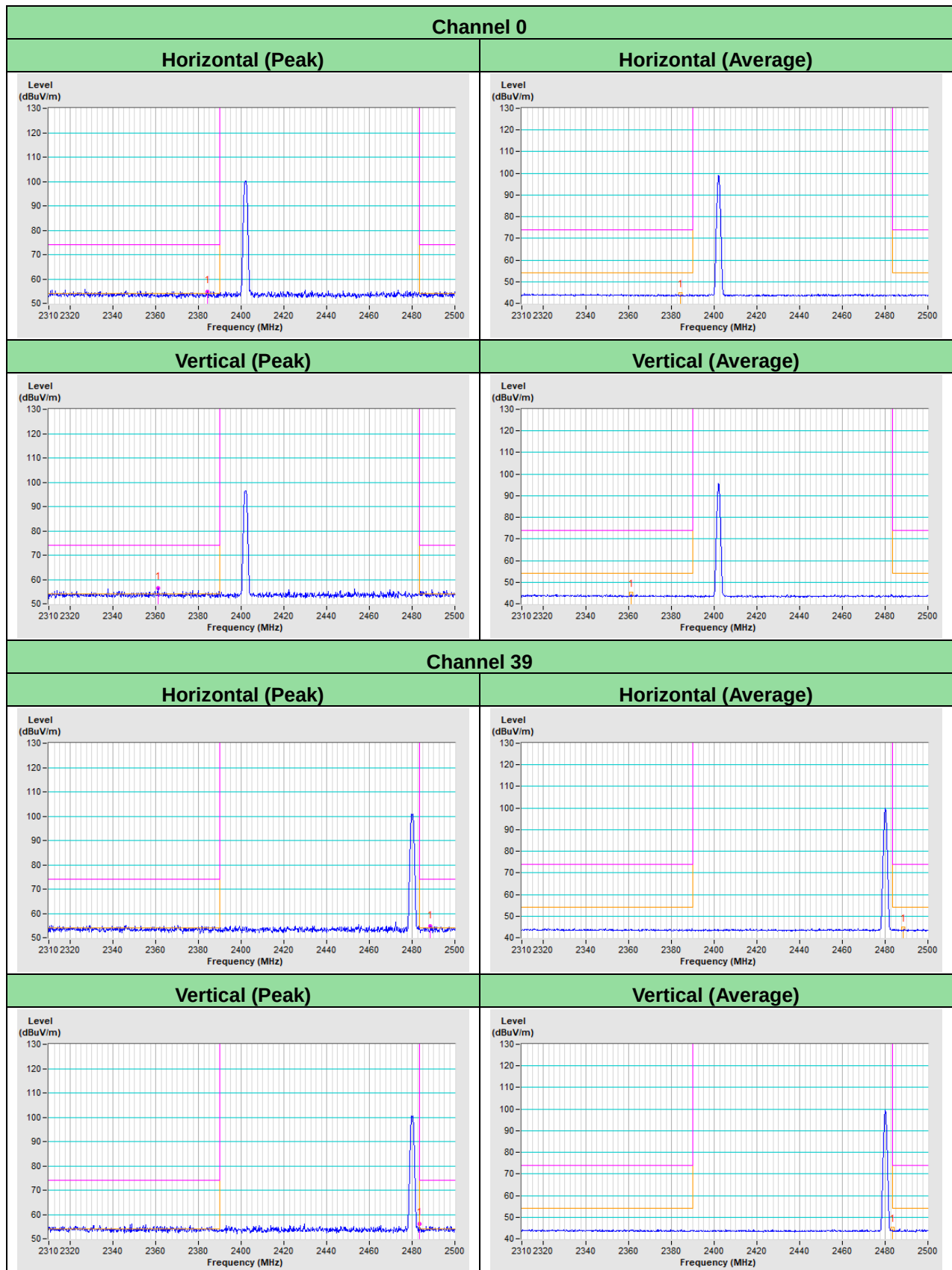
CH 39 Band edge



5 Pictures of Test Arrangements

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

Annex A - Band-Edge Measurement



Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

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

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Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

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Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

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