FCC Test Report

Report No.: RF190515E04

FCC ID: Q87-03448

Test Model: MX5300

Received Date: May 15, 2019

Test Date: June 13 to July 03, 2019

Issued Date: July 19, 2019

Applicant: Linksys LLC

Address: 121 Theory Drive, Irvine, CA 92617, USA

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory

Lab Address: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.

Test Location : E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.

FCC Registration / Designation Number: 723255 / TW2022

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Release Control Record

Issue No.	Description	Date Issued
RF190515E04	Original release.	July 19, 2019

1 Certificate of Conformity

Product: Velop

Brand: Linksys

Test Model: MX5300

Sample Status: ENGINEERING SAMPLE

Applicant: Linksys LLC

Test Date: June 13 to July 03, 2019

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 : _____ , **Date:** **July 19, 2019**
Wendy Wu / Specialist

Approved by : _____ , **Date:** **July 19, 2019**
May Chen / 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 -6.08dB at 0.15000 MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -0.1dB at 2488.70MHz
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	Antenna connector is i-pex(mhf) not a standard connector.

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	1.8 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	4.9 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.1 dB
	6GHz ~ 18GHz	4.9 dB
	18GHz ~ 40GHz	5.2 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Velop
Brand	Linksys
Test Model	MX5300
Status of EUT	ENGINEERING SAMPLE
Driver Version	0.2.2
Power Supply Rating	12Vdc from power adapter
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode and VHT20/40 in 2.4GHz 1024QAM for OFDMA in 11ax HE mode
Modulation Technology	DSSS, OFDM, OFDMA
Transfer Rate	802.11b: up to 11Mbps 802.11a/g: up to 54Mbps 802.11n: up to 600Mbps 802.11ac: up to 1733.3Mbps 802.11ax: up to 2401.9Mbps
Operating Frequency	**2.4GHz:** 2.412 ~ 2.462GHz **5GHz:** 5.18~ 5.24GHz, 5.745 ~ 5.825GHz
Number of Channel	**2.4GHz:** 802.11b, 802.11g, 802.11n (HT20), VHT20, 802.11ax (HE20): 11 802.11n (HT40), VHT40, 802.11ax (HE40): 7 **5GHz (U-NII-1):** 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20): 4 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40): 2 802.11ac (VHT80), 802.11ax (HE80): 1 **5GHz (U-NII-3):** 802.11a, 802.11n (HT20), 802.11ac (VHT20): 5 802.11n (HT40), 802.11ac (VHT40): 2 802.11ac (VHT80): 1
Output Power	**Non-Beamforming Mode:** **2.4GHz:** 986.923mW **5.18 ~ 5.24GHz:** 922.721mW **5.745 ~ 5.825GHz:** 671.308mW **Beamforming Mode:** **2.4GHz:** 986.923mW **5.18 ~ 5.24GHz:** 914.12mW **5.745 ~ 5.825GHz:** 671.308mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter x 1
Data Cable Supplied	NA

Note:

1. Simultaneously transmission condition.

Condition	Technology				
1	WLAN 2.4GHz	WLAN 5GHz (low band)	WLAN 5GHz (high band)	Bluetooth	Zigbee
Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.					

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

No.	Brand	Model No.	Spec.
1	Ktec	KSAS0501200400HU	Input: 100-240Vac, 1.2A, 50/60Hz Output: 12V, 4.0A DC Output cable: Unshielded, 1.6m
2	Frecom	F48L-120400SPAU	Input: 100-240Vac, 1.4A, 50/60Hz Output: 12V, 4.0A DC Output cable: Unshielded, 1.5m
3	APD	WA-48B12FU	Input: 100-240Vac, 1.5A, 50/60Hz Output: 12V, 4.0A DC Output cable: Unshielded, 1.5m
4	APD	DA-48T12	Input: 100-240Vac, 1.4A, 50/60Hz AC Input cable: Unshielded, 1m Output: 12V, 4.0A DC Output cable: Unshielded, 1.5m
Note: From the above adapters, the worst Radiated Emissions was found in **Adapter 2 ;** the worst Conducted Emission was found in **Adapter 3.** Therefore only the test data of the mode was recorded in this report.			

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

Frequency Range (GHz)	Directional Antenna Gain (dBi)	Antenna Type	Antenna Connector
2.4~2.4835 (Bluetooth+Zigbee)	1.97	Dipole	i-pex(mhf)
2.4~2.4835 (WLAN)	3.98		
5.15~5.25	5.18		
5.25~5.35	5.98		
5.47~5.725	4.72		
5.725~5.85	5.73		
Note: More detailed information, please refer to operating description.			

4. The EUT incorporates a MIMO function:

2.4GHz Band		
MODULATION MODE	**TX & RX CONFIGURATION**	
802.11b	4TX	4RX
802.11g	4TX	4RX
802.11n (HT20)	4TX	4RX
802.11n (HT40)	4TX	4RX
VHT20	4TX	4RX
VHT40	4TX	4RX
802.11ax (HE20)	4TX	4RX
802.11ax (HE40)	4TX	4RX
5GHz Band		
MODULATION MODE	**TX & RX CONFIGURATION**	
802.11a	4TX	4RX
802.11n (HT20)	4TX	4RX
802.11n (HT40)	4TX	4RX
802.11ac (VHT20)	4TX	4RX
802.11ac (VHT40)	4TX	4RX
802.11ac (VHT80)	4TX	4RX
802.11ax (HE20)	4TX	4RX
802.11ax (HE40)	4TX	4RX
802.11ax (HE80)	4TX	4RX

Note:
1. All of modulation mode support beamforming function except 802.11a/b/g modulation mode.
2. The EUT support Beamforming and non-beamforming mode, therefore both mode were investigated and the worst case scenario was identified. The worst case data were presented in test report.
3. The modulation and bandwidth are similar for 802.11n mode for 20MHz (40MHz), 802.11ac mode for 20MHz (40MHz, 80MHz) and 802.11ax mode for 20MHz (40MHz, 80MHz), therefore investigated worst case to representative mode in test report. (Final test mode refer section 3.2.1)

5. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

11 channels are provided for 802.11b, 802.11g, 802.11n (HT20), 802.11ac (VHT20) and 802.11ax (HE20):

Channel	Frequency	Channel	Frequency
1	2412MHz	7	2442MHz
2	2417MHz	8	2447MHz
3	2422MHz	9	2452MHz
4	2427MHz	10	2457MHz
5	2432MHz	11	2462MHz
6	2437MHz		

7 channels are provided for 802.11n (HT40), 802.11ac (VHT40) and 802.11ax (HE40):

Channel	Frequency	Channel	Frequency
3	2422MHz	7	2442MHz
4	2427MHz	8	2447MHz
5	2432MHz	9	2452MHz
6	2437MHz		

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.

Non-Beamforming Mode					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	Data Rate Parameter
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
802.11ax (HE20)	1 to 11	1, 6,10, 11	OFDMA	BPSK	MCS0
802.11ax (HE40)	3 to 9	3, 6, 9	OFDMA	BPSK	MCS0

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.

Non-Beamforming Mode					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	Data Rate Parameter
802.11ax (HE20)	1 to 11	6	OFDMA	BPSK	MCS0

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.

Non-Beamforming Mode					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	Data Rate Parameter
802.11ax (HE20)	1 to 11	6	OFDMA	BPSK	MCS0

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.

Non-Beamforming Mode					
MODE	**AVAILABLE CHANNEL**	**TESTED CHANNEL**	**MODULATION TECHNOLOGY**	**MODULATION TYPE**	**Data Rate Parameter**
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
802.11n (HT20) (Output power only)	1 to 11	1, 6,10, 11	OFDM	BPSK	6.5
802.11n (HT40) (Output power only)	3 to 9	3, 6, 9	OFDM	BPSK	13.5
802.11ax (HE20)	1 to 11	1, 6,10, 11	OFDMA	BPSK	MCS0
802.11ax (HE40)	3 to 9	3, 6, 9	OFDMA	BPSK	MCS0
Beamforming Mode (output power only)					
MODE	**AVAILABLE CHANNEL**	**TESTED CHANNEL**	**MODULATION TECHNOLOGY**	**MODULATION TYPE**	**Data Rate Parameter**
802.11n (HT20)	1 to 11	1, 6,10, 11	OFDM	BPSK	6.5
802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5
802.11ax (HE20)	1 to 11	1, 6,10, 11	OFDMA	BPSK	MCS0
802.11ax (HE40)	3 to 9	3, 6, 9	OFDMA	BPSK	MCS0

Test Condition:

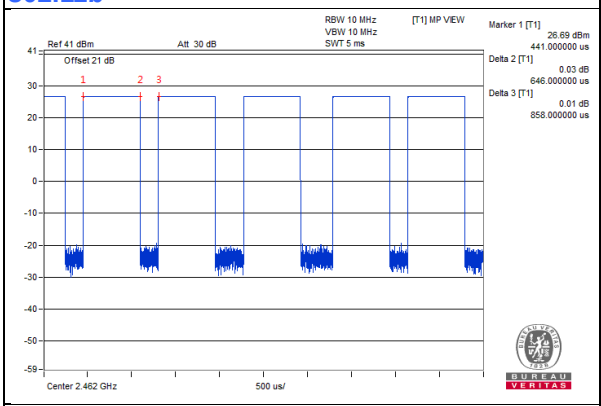
Applicable To	Environmental Conditions	Input Power	Tested By
RE≥1G	21deg. C, 67%RH	120Vac, 60Hz	Robert Cheng
RE<1G	23deg. C, 68%RH	120Vac, 60Hz	Robert Cheng
PLC	25deg. C, 75%RH	120Vac, 60Hz	Andy Ho
APCM	25deg. C, 60%RH	120Vac, 60Hz	Jyunchun Lin

3.3 Duty Cycle of Test Signal

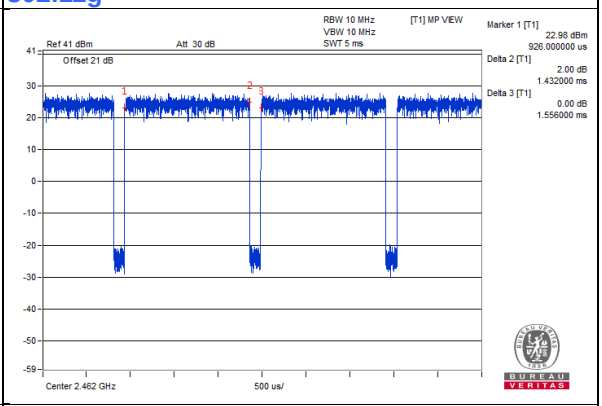
If duty cycle of test signal is < 98%, duty factor shall be considered.

802.11b: Duty cycle = 0.646 ms/0.858 ms = 0.753, Duty factor = 10 * log(1/Duty cycle) = 1.23
802.11g: Duty cycle = 1.432 ms/1.556 ms = 0.920, Duty factor = 10 * log(1/Duty cycle) = 0.36
802.11n (HT20): Duty cycle = 5.428 ms/5.733 ms = 0.947, Duty factor = 10 * log(1/Duty cycle) = 0.24
802.11n (HT40): Duty cycle = 5.425 ms/5.663 ms = 0.958, Duty factor = 10 * log(1/Duty cycle) = 0.19
802.11ax (HE20) : Duty cycle = 5.445 ms/5.668 ms = 0.961, Duty factor = 10 * log(1/Duty cycle) = 0.17
802.11ax (HE40) : Duty cycle = 5.435 ms/5.69 ms = 0.955, Duty factor = 10 * log(1/Duty cycle) = 0.2

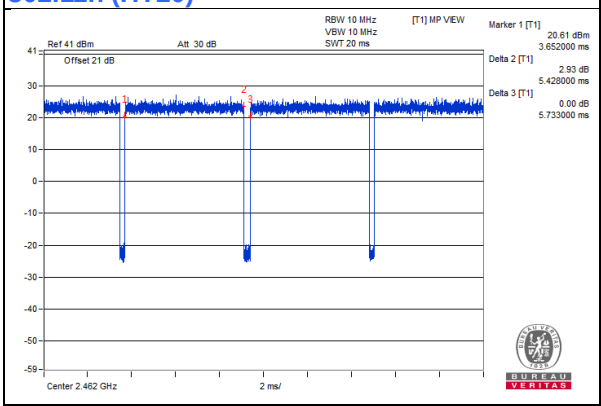
802.11b



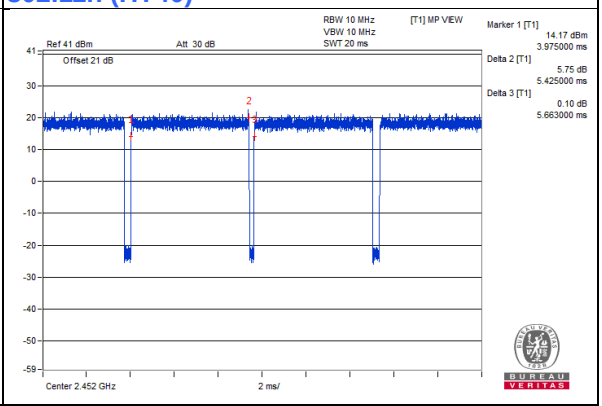
802.11g



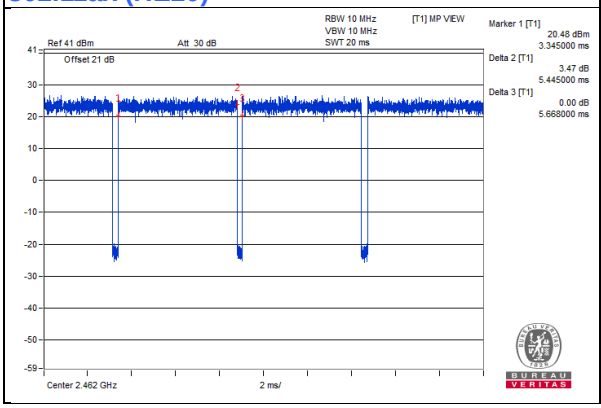
802.11n (HT20)



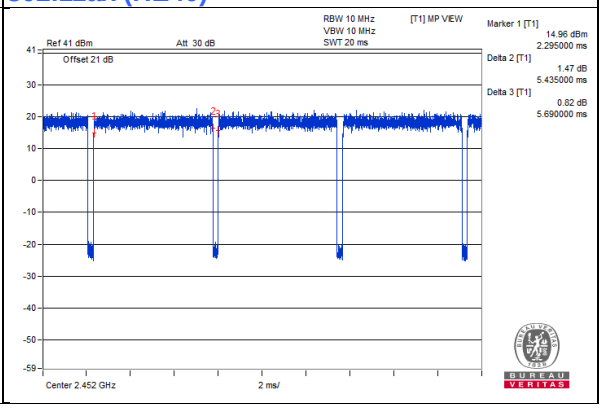
802.11n (HT40)



802.11ax (HE20)



802.11ax (HE40)



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.

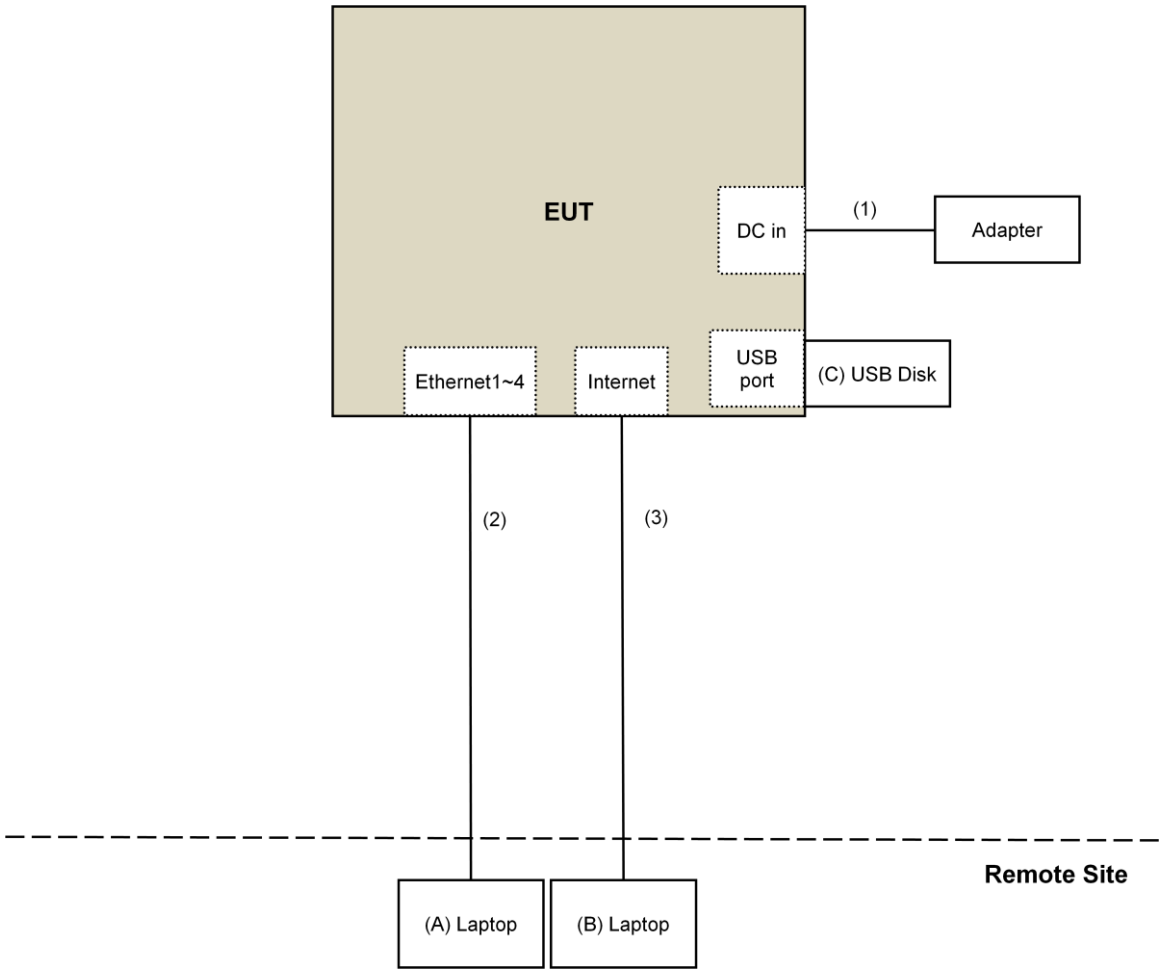
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Laptop	DELL	E5430	4YV4VY1	FCC DoC	Provided by Lab
B.	Laptop	Lenovo	81A4	YD02YN2A	PD93165NGU	Provided by Lab
C.	USB Disk	SanDisk	Ultra Flair USB 3.0(32GB)	NA	NA	Provided by Lab

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	1.5	10	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

3.4.1 Configuration of System under Test



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 Multiple Transmitter Output v02r01
ANSI C63.10-2013

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

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 30dB 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

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Keysight	N9038A	MY54450088	July 05, 2018	July 04, 2019
Pre-Amplifier EMCI	EMC001340	980142	Jan. 25, 2019	Jan. 24, 2020
Loop Antenna Electro-Metrics	EM-6879	269	Sep. 07, 2018	Sep. 06, 2019
RF Cable	NA	LOOPCAB-001	Jan. 14, 2019	Jan. 13, 2020
RF Cable	NA	LOOPCAB-002	Jan. 14, 2019	Jan. 13, 2020
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-01	Oct. 30, 2018	Oct. 29, 2019
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-406	Nov. 22, 2018	Nov. 21, 2019
RF Cable	8D	966-4-1	Mar. 19, 2019	Mar. 18, 2020
RF Cable	8D	966-4-2	Mar. 19, 2019	Mar. 18, 2020
RF Cable	8D	966-4-3	Mar. 19, 2019	Mar. 18, 2020
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-4-01	Sep. 27, 2018	Sep. 26, 2019
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-783	Nov. 25, 2018	Nov. 24, 2019
Pre-Amplifier EMCI	EMC12630SE	980385	Aug. 16, 2018	Aug. 15, 2019
RF Cable	EMC104-SM-SM-1200	160923	Jan. 28, 2019	Jan. 27, 2020
RF Cable	104 RF cable	131215	Jan. 10, 2019	Jan. 09, 2020
RF Cable	EMC104-SM-SM-6000	180418	May 03, 2019	May 02, 2020
Pre-Amplifier EMCI	EMC184045SE	980387	Jan. 28, 2019	Jan. 27, 2020
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170519	Nov. 25, 2018	Nov. 24, 2019
RF Cable	EMC102-KM-KM-1200	160924	Jan. 28, 2019	Jan. 27, 2020
RF Cable	EMC102-KM-KM-1200	160925	Jan. 28, 2019	Jan. 27, 2020
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	NA	NA
Spectrum Analyzer R&S	FSV40	100964	June 04, 2019	June 03, 2020
Power meter Anritsu	ML2495A	1014008	May 13, 2019	May 12, 2020
Power sensor Anritsu	MA2411B	0917122	May 13, 2019	May 12, 2020

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. Loop antenna was used for all emissions below 30 MHz.
4. Tested Date: June 29 to July 03, 2019

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:

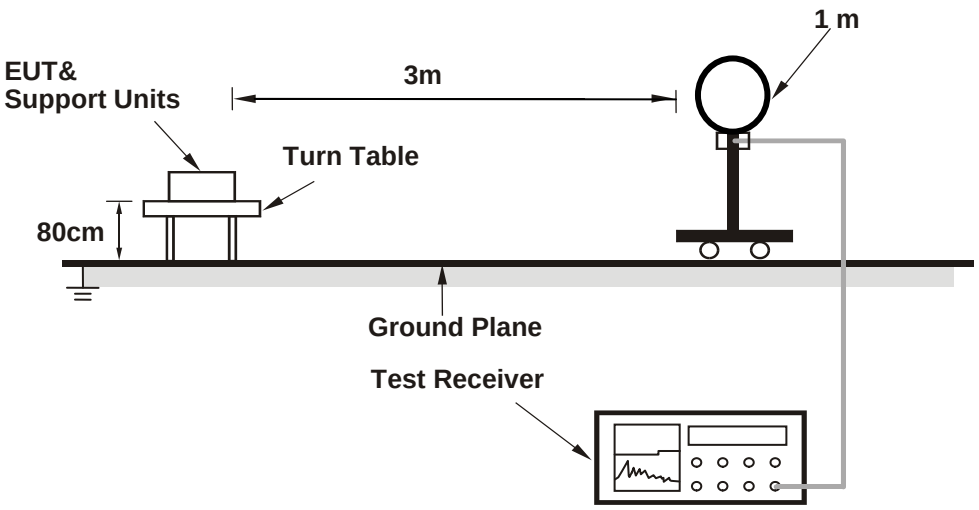
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 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

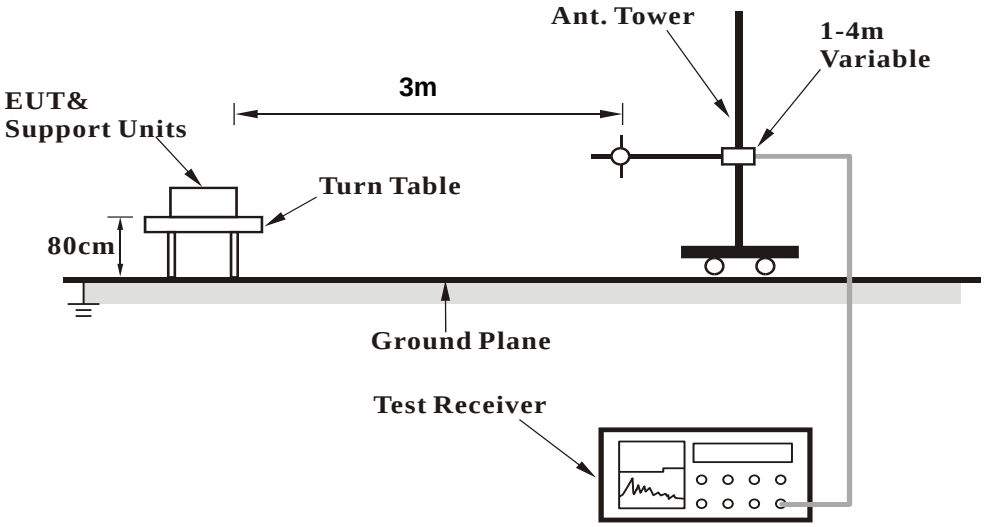
No deviation.

4.1.5 Test Setup

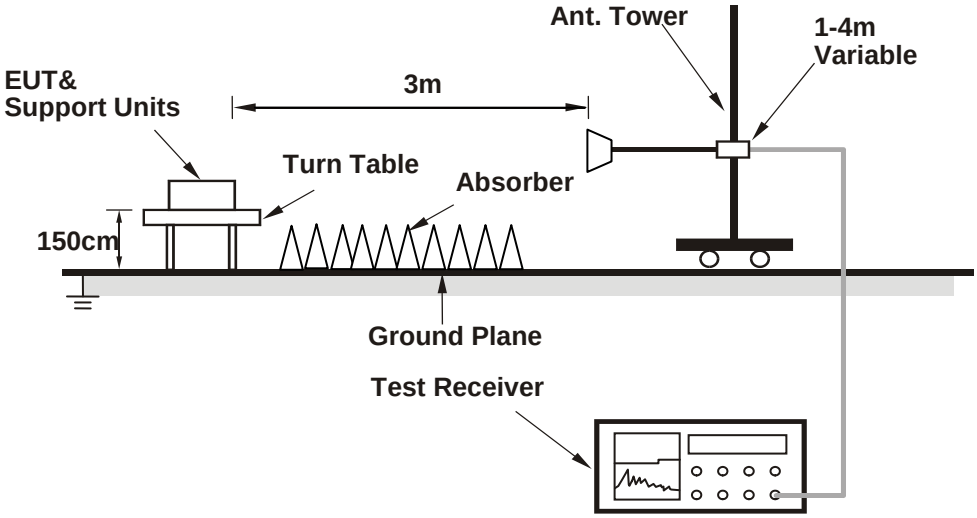
For Radiated emission below 30MHz



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

a. Connected the EUT with the Laptop which is placed on remote site.
b. Controlling software (QSPR (5.0-00160) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1GHz Data：

802.11b

CHANNEL	TX Channel 1	**DETECTOR FUNCTION**	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	2385.30	59.8 PK	74.0	-14.2	2.06 H	238	61.8	-2.0
2	2385.30	53.1 AV	54.0	-0.9	2.06 H	238	55.1	-2.0
3	2390.00	57.8 PK	74.0	-16.2	2.06 H	238	59.8	-2.0
4	2390.00	48.1 AV	54.0	-5.9	2.06 H	238	50.1	-2.0
5	*2412.00	118.7 PK			2.06 H	238	120.7	-2.0
6	*2412.00	116.3 AV			2.06 H	238	118.3	-2.0
7	4824.00	42.6 PK	74.0	-31.4	1.71 H	315	40.3	2.3
8	4824.00	40.1 AV	54.0	-13.9	1.71 H	315	37.8	2.3
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	2390.00	55.3 PK	74.0	-18.7	2.61 V	257	57.3	-2.0
2	2390.00	46.2 AV	54.0	-7.8	2.61 V	257	48.2	-2.0
3	*2412.00	116.8 PK			2.61 V	257	118.8	-2.0
4	*2412.00	114.6 AV			2.61 V	257	116.6	-2.0
5	4824.00	41.3 PK	74.0	-32.7	1.45 V	185	39.0	2.3
6	4824.00	38.1 AV	54.0	-15.9	1.45 V	185	35.8	2.3

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.

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	2390.00	60.1 PK	74.0	-13.9	2.13 H	240	62.1	-2.0
2	2390.00	50.4 AV	54.0	-3.6	2.13 H	240	52.4	-2.0
3	*2437.00	118.4 PK			2.13 H	240	120.5	-2.1
4	*2437.00	116.2 AV			2.13 H	240	118.3	-2.1
5	2483.50	60.2 PK	74.0	-13.8	2.13 H	240	62.4	-2.2
6	2483.50	52.8 AV	54.0	-1.2	2.13 H	240	55.0	-2.2
7	4874.00	42.7 PK	74.0	-31.3	1.68 H	316	40.4	2.3
8	4874.00	40.3 AV	54.0	-13.7	1.68 H	316	38.0	2.3
9	7311.00	39.0 PK	74.0	-35.0	1.57 H	216	30.7	8.3
10	7311.00	34.2 AV	54.0	-19.8	1.57 H	216	25.9	8.3
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	2390.00	57.9 PK	74.0	-16.1	2.64 V	274	59.9	-2.0
2	2390.00	48.1 AV	54.0	-5.9	2.64 V	274	50.1	-2.0
3	*2437.00	117.0 PK			2.64 V	274	119.1	-2.1
4	*2437.00	114.4 AV			2.64 V	274	116.5	-2.1
5	2483.50	58.2 PK	74.0	-15.8	2.64 V	274	60.4	-2.2
6	2483.50	50.4 AV	54.0	-3.6	2.64 V	274	52.6	-2.2
7	4874.00	41.0 PK	74.0	-33.0	1.40 V	173	38.7	2.3
8	4874.00	37.6 AV	54.0	-16.4	1.40 V	173	35.3	2.3
9	7311.00	38.0 PK	74.0	-36.0	1.65 V	47	29.7	8.3
10	7311.00	31.4 AV	54.0	-22.6	1.65 V	47	23.1	8.3

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.

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	*2462.00	118.0 PK			2.18 H	251	120.2	-2.2
2	*2462.00	115.7 AV			2.18 H	251	117.9	-2.2
3	2483.50	54.0 PK	74.0	-20.0	2.18 H	251	56.2	-2.2
4	2483.50	45.7 AV	54.0	-8.3	2.18 H	251	47.9	-2.2
5	2488.70	60.7 PK	74.0	-13.3	2.18 H	251	62.9	-2.2
6	**2488.70**	**53.9 AV**	**54.0**	**-0.1**	**2.18 H**	**251**	**56.1**	**-2.2**
7	4924.00	42.9 PK	74.0	-31.1	1.69 H	320	40.4	2.5
8	4924.00	40.7 AV	54.0	-13.3	1.69 H	320	38.2	2.5
9	7386.00	39.0 PK	74.0	-35.0	1.54 H	214	30.7	8.3
10	7386.00	34.0 AV	54.0	-20.0	1.54 H	214	25.7	8.3
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	*2462.00	117.1 PK			2.59 V	259	119.3	-2.2
2	*2462.00	114.7 AV			2.59 V	259	116.9	-2.2
3	2483.50	53.1 PK	74.0	-20.9	2.59 V	259	55.3	-2.2
4	2483.50	44.8 AV	54.0	-9.2	2.59 V	259	47.0	-2.2
5	2488.70	59.2 PK	74.0	-14.8	2.59 V	259	61.4	-2.2
6	2488.70	50.6 AV	54.0	-3.4	2.59 V	259	52.8	-2.2
7	4924.00	41.5 PK	74.0	-32.5	1.39 V	159	39.0	2.5
8	4924.00	38.0 AV	54.0	-16.0	1.39 V	159	35.5	2.5
9	7386.00	37.9 PK	74.0	-36.1	1.63 V	33	29.6	8.3
10	7386.00	31.2 AV	54.0	-22.8	1.63 V	33	22.9	8.3

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.

802.11g

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	2386.30	67.3 PK	74.0	-6.7	1.93 H	54	69.3	-2.0
2	2386.30	53.3 AV	54.0	-0.7	1.93 H	54	55.3	-2.0
3	2390.00	61.0 PK	74.0	-13.0	1.93 H	54	63.0	-2.0
4	2390.00	50.0 AV	54.0	-4.0	1.93 H	54	52.0	-2.0
5	*2412.00	120.4 PK			1.93 H	54	122.4	-2.0
6	*2412.00	111.8 AV			1.93 H	54	113.8	-2.0
7	4824.00	36.3 PK	74.0	-37.7	1.75 H	312	34.0	2.3
8	4824.00	33.0 AV	54.0	-21.0	1.75 H	312	30.7	2.3
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	2386.30	65.2 PK	74.0	-8.8	2.61 V	268	67.2	-2.0
2	2386.30	51.4 AV	54.0	-2.6	2.61 V	268	53.4	-2.0
3	2390.00	59.3 PK	74.0	-14.7	2.61 V	268	61.3	-2.0
4	2390.00	48.2 AV	54.0	-5.8	2.61 V	268	50.2	-2.0
5	*2412.00	118.1 PK			2.61 V	268	120.1	-2.0
6	*2412.00	109.8 AV			2.61 V	268	111.8	-2.0
7	4824.00	35.9 PK	74.0	-38.1	1.37 V	202	33.6	2.3
8	4824.00	32.5 AV	54.0	-21.5	1.37 V	202	30.2	2.3

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.

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	2390.00	64.5 PK	74.0	-9.5	1.92 H	54	66.5	-2.0
2	2390.00	51.8 AV	54.0	-2.2	1.92 H	54	53.8	-2.0
3	*2437.00	121.8 PK			1.92 H	54	123.9	-2.1
4	*2437.00	112.5 AV			1.92 H	54	114.6	-2.1
5	2483.50	61.0 PK	74.0	-13.0	1.92 H	54	63.2	-2.2
6	2483.50	47.2 AV	54.0	-6.8	1.92 H	54	49.4	-2.2
7	4874.00	36.8 PK	74.0	-37.2	1.70 H	304	34.5	2.3
8	4874.00	33.2 AV	54.0	-20.8	1.70 H	304	30.9	2.3
9	7311.00	39.2 PK	74.0	-34.8	1.61 H	216	30.9	8.3
10	7311.00	34.2 AV	54.0	-19.8	1.61 H	216	25.9	8.3
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	2390.00	62.3 PK	74.0	-11.7	2.55 V	269	64.3	-2.0
2	2390.00	49.9 AV	54.0	-4.1	2.55 V	269	51.9	-2.0
3	*2437.00	119.3 PK			2.55 V	269	121.4	-2.1
4	*2437.00	110.6 AV			2.55 V	269	112.7	-2.1
5	2483.50	59.8 PK	74.0	-14.2	2.55 V	269	62.0	-2.2
6	2483.50	45.1 AV	54.0	-8.9	2.55 V	269	47.3	-2.2
7	4874.00	36.3 PK	74.0	-37.7	1.38 V	186	34.0	2.3
8	4874.00	32.7 AV	54.0	-21.3	1.38 V	186	30.4	2.3
9	7311.00	37.4 PK	74.0	-36.6	1.68 V	40	29.1	8.3
10	7311.00	31.0 AV	54.0	-23.0	1.68 V	40	22.7	8.3

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.

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	*2462.00	119.9 PK			2.12 H	198	122.1	-2.2
2	*2462.00	111.3 AV			2.12 H	198	113.5	-2.2
3	2483.50	66.2 PK	74.0	-7.8	2.12 H	198	68.4	-2.2
4	2483.50	53.9 AV	54.0	-0.1	2.12 H	198	56.1	-2.2
5	4924.00	36.8 PK	74.0	-37.2	1.75 H	306	34.3	2.5
6	4924.00	33.1 AV	54.0	-20.9	1.75 H	306	30.6	2.5
7	7386.00	39.3 PK	74.0	-34.7	1.56 H	201	31.0	8.3
8	7386.00	34.3 AV	54.0	-19.7	1.56 H	201	26.0	8.3
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	*2462.00	117.5 PK			2.57 V	270	119.7	-2.2
2	*2462.00	109.4 AV			2.57 V	270	111.6	-2.2
3	2483.50	65.9 PK	74.0	-8.1	2.57 V	270	68.1	-2.2
4	2483.50	51.9 AV	54.0	-2.1	2.57 V	270	54.1	-2.2
5	4924.00	35.8 PK	74.0	-38.2	1.32 V	180	33.3	2.5
6	4924.00	32.2 AV	54.0	-21.8	1.32 V	180	29.7	2.5
7	7386.00	36.9 PK	74.0	-37.1	1.65 V	33	28.6	8.3
8	7386.00	30.6 AV	54.0	-23.4	1.65 V	33	22.3	8.3

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.

802.11ax (HE20)

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	2387.70	68.2 PK	74.0	-5.8	1.92 H	55	70.2	-2.0
2	2387.70	53.9 AV	54.0	-0.1	1.92 H	55	55.9	-2.0
3	2390.00	64.6 PK	74.0	-9.4	1.92 H	55	66.6	-2.0
4	2390.00	52.7 AV	54.0	-1.3	1.92 H	55	54.7	-2.0
5	*2412.00	122.9 PK			1.92 H	55	124.9	-2.0
6	*2412.00	110.7 AV			1.92 H	55	112.7	-2.0
7	4824.00	37.2 PK	74.0	-36.8	1.69 H	311	34.9	2.3
8	4824.00	33.6 AV	54.0	-20.4	1.69 H	311	31.3	2.3
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	2387.70	61.2 PK	74.0	-12.8	3.05 V	19	63.2	-2.0
2	2387.70	49.2 AV	54.0	-4.8	3.05 V	19	51.2	-2.0
3	2390.00	62.7 PK	74.0	-11.3	3.05 V	19	64.7	-2.0
4	2390.00	50.2 AV	54.0	-3.8	3.05 V	19	52.2	-2.0
5	*2412.00	120.6 PK			3.05 V	19	122.6	-2.0
6	*2412.00	108.2 AV			3.05 V	19	110.2	-2.0
7	4824.00	36.4 PK	74.0	-37.6	1.42 V	194	34.1	2.3
8	4824.00	32.9 AV	54.0	-21.1	1.42 V	194	30.6	2.3

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.

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	2390.00	64.4 PK	74.0	-9.6	1.78 H	215	66.4	-2.0
2	2390.00	51.7 AV	54.0	-2.3	1.78 H	215	53.7	-2.0
3	*2437.00	121.9 PK			1.78 H	215	124.0	-2.1
4	*2437.00	112.5 AV			1.78 H	215	114.6	-2.1
5	2483.50	61.1 PK	74.0	-12.9	1.78 H	215	63.3	-2.2
6	2483.50	47.1 AV	54.0	-6.9	1.78 H	215	49.3	-2.2
7	4874.00	37.0 PK	74.0	-37.0	1.67 H	301	34.7	2.3
8	4874.00	33.2 AV	54.0	-20.8	1.67 H	301	30.9	2.3
9	7311.00	39.5 PK	74.0	-34.5	1.62 H	226	31.2	8.3
10	7311.00	34.6 AV	54.0	-19.4	1.62 H	226	26.3	8.3
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	2390.00	62.3 PK	74.0	-11.7	2.97 V	40	64.3	-2.0
2	2390.00	50.0 AV	54.0	-4.0	2.97 V	40	52.0	-2.0
3	*2437.00	119.8 PK			2.97 V	40	121.9	-2.1
4	*2437.00	110.1 AV			2.97 V	40	112.2	-2.1
5	2483.50	59.5 PK	74.0	-14.5	2.97 V	40	61.7	-2.2
6	2483.50	44.9 AV	54.0	-9.1	2.97 V	40	47.1	-2.2
7	4874.00	36.1 PK	74.0	-37.9	1.38 V	173	33.8	2.3
8	4874.00	32.5 AV	54.0	-21.5	1.38 V	173	30.2	2.3
9	7311.00	37.2 PK	74.0	-36.8	1.68 V	24	28.9	8.3
10	7311.00	30.8 AV	54.0	-23.2	1.68 V	24	22.5	8.3

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.

CHANNEL	TX Channel 10	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	*2457.00	121.9 PK			1.81 H	200	124.1	-2.2
2	*2457.00	112.5 AV			1.81 H	200	114.7	-2.2
3	2483.50	68.4 PK	74.0	-5.6	1.81 H	200	70.6	-2.2
4	2483.50	53.3 AV	54.0	-0.7	1.81 H	200	55.5	-2.2
5	4914.00	37.4 PK	74.0	-36.6	1.67 H	318	35.0	2.4
6	4914.00	33.6 AV	54.0	-20.4	1.67 H	318	31.2	2.4
7	7371.00	39.1 PK	74.0	-34.9	1.62 H	212	30.8	8.3
8	7371.00	34.0 AV	54.0	-20.0	1.62 H	212	25.7	8.3
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	*2457.00	119.9 PK			3.05 V	48	122.1	-2.2
2	*2457.00	110.0 AV			3.05 V	48	112.2	-2.2
3	2483.50	67.8 PK	74.0	-6.2	3.05 V	48	70.0	-2.2
4	2483.50	52.4 AV	54.0	-1.6	3.05 V	48	54.6	-2.2
5	4914.00	37.0 PK	74.0	-37.0	1.38 V	186	34.6	2.4
6	4914.00	33.2 AV	54.0	-20.8	1.38 V	186	30.8	2.4
7	7371.00	37.0 PK	74.0	-37.0	1.71 V	47	28.7	8.3
8	7371.00	30.5 AV	54.0	-23.5	1.71 V	47	22.2	8.3

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.

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	*2462.00	118.7 PK			2.12 H	220	120.9	-2.2
2	*2462.00	107.6 AV			2.12 H	220	109.8	-2.2
3	2483.50	69.2 PK	74.0	-4.8	2.12 H	220	71.4	-2.2
4	2483.50	53.8 AV	54.0	-0.2	2.12 H	220	56.0	-2.2
5	4924.00	37.2 PK	74.0	-36.8	1.73 H	317	34.7	2.5
6	4924.00	33.6 AV	54.0	-20.4	1.73 H	317	31.1	2.5
7	7386.00	39.4 PK	74.0	-34.6	1.55 H	207	31.1	8.3
8	7386.00	34.5 AV	54.0	-19.5	1.55 H	207	26.2	8.3
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	*2462.00	119.7 PK			3.01 V	34	121.9	-2.2
2	*2462.00	106.5 AV			3.01 V	34	108.7	-2.2
3	2483.50	67.3 PK	74.0	-6.7	3.01 V	34	69.5	-2.2
4	2483.50	52.0 AV	54.0	-2.0	3.01 V	34	54.2	-2.2
5	4924.00	36.5 PK	74.0	-37.5	1.39 V	191	34.0	2.5
6	4924.00	32.6 AV	54.0	-21.4	1.39 V	191	30.1	2.5
7	7386.00	37.1 PK	74.0	-36.9	1.70 V	36	28.8	8.3
8	7386.00	31.0 AV	54.0	-23.0	1.70 V	36	22.7	8.3

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.

802.11ax (HE40)

CHANNEL	TX Channel 3	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	2390.00	65.2 PK	74.0	-8.8	2.14 H	217	67.2	-2.0
2	2390.00	53.8 AV	54.0	-0.2	2.14 H	217	55.8	-2.0
3	*2422.00	114.8 PK			2.14 H	217	116.8	-2.0
4	*2422.00	104.0 AV			2.14 H	217	106.0	-2.0
5	4844.00	36.6 PK	74.0	-37.4	1.70 H	318	34.3	2.3
6	4844.00	33.3 AV	54.0	-20.7	1.70 H	318	31.0	2.3
7	7266.00	38.9 PK	74.0	-35.1	1.55 H	229	30.5	8.4
8	7266.00	34.2 AV	54.0	-19.8	1.55 H	229	25.8	8.4
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	2390.00	59.3 PK	74.0	-14.7	2.74 V	37	61.3	-2.0
2	2390.00	48.8 AV	54.0	-5.2	2.74 V	37	50.8	-2.0
3	*2422.00	113.8 PK			2.74 V	37	115.8	-2.0
4	*2422.00	101.1 AV			2.74 V	37	103.1	-2.0
5	4844.00	36.2 PK	74.0	-37.8	1.35 V	181	33.9	2.3
6	4844.00	32.5 AV	54.0	-21.5	1.35 V	181	30.2	2.3
7	7266.00	37.3 PK	74.0	-36.7	1.69 V	31	28.9	8.4
8	7266.00	31.0 AV	54.0	-23.0	1.69 V	31	22.6	8.4

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 6	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	2390.00	62.2 PK	74.0	-11.8	2.19 H	220	64.2	-2.0
2	2390.00	48.0 AV	54.0	-6.0	2.19 H	220	50.0	-2.0
3	*2437.00	119.0 PK			2.19 H	220	121.1	-2.1
4	*2437.00	107.2 AV			2.19 H	220	109.3	-2.1
5	2483.50	66.6 PK	74.0	-7.4	2.19 H	220	68.8	-2.2
6	2483.50	53.9 AV	54.0	-0.1	2.19 H	220	56.1	-2.2
7	4874.00	37.4 PK	74.0	-36.6	1.73 H	289	35.1	2.3
8	4874.00	33.5 AV	54.0	-20.5	1.73 H	289	31.2	2.3
9	7311.00	39.2 PK	74.0	-34.8	1.56 H	215	30.9	8.3
10	7311.00	34.0 AV	54.0	-20.0	1.56 H	215	25.7	8.3
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	2390.00	62.6 PK	74.0	-11.4	3.05 V	37	64.6	-2.0
2	2390.00	49.5 AV	54.0	-4.5	3.05 V	37	51.5	-2.0
3	*2437.00	117.0 PK			3.05 V	37	119.1	-2.1
4	*2437.00	104.4 AV			3.05 V	37	106.5	-2.1
5	2483.50	61.5 PK	74.0	-12.5	3.05 V	37	63.7	-2.2
6	2483.50	48.8 AV	54.0	-5.2	3.05 V	37	51.0	-2.2
7	4874.00	36.3 PK	74.0	-37.7	1.44 V	184	34.0	2.3
8	4874.00	32.9 AV	54.0	-21.1	1.44 V	184	30.6	2.3
9	7311.00	37.6 PK	74.0	-36.4	1.72 V	41	29.3	8.3
10	7311.00	30.9 AV	54.0	-23.1	1.72 V	41	22.6	8.3

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.

CHANNEL	TX Channel 9	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	*2452.00	114.7 PK			2.20 H	219	116.9	-2.2
2	*2452.00	104.2 AV			2.20 H	219	106.4	-2.2
3	2483.50	64.8 PK	74.0	-9.2	2.20 H	219	67.0	-2.2
4	2483.50	53.2 AV	54.0	-0.8	2.20 H	219	55.4	-2.2
5	4904.00	37.0 PK	74.0	-37.0	1.68 H	312	34.6	2.4
6	4904.00	33.6 AV	54.0	-20.4	1.68 H	312	31.2	2.4
7	7356.00	39.5 PK	74.0	-34.5	1.56 H	217	31.3	8.2
8	7356.00	34.3 AV	54.0	-19.7	1.56 H	217	26.1	8.2
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	*2452.00	112.3 PK			2.74 V	41	114.5	-2.2
2	*2452.00	101.5 AV			2.74 V	41	103.7	-2.2
3	2483.50	67.2 PK	74.0	-6.8	2.74 V	41	69.4	-2.2
4	2483.50	53.9 AV	54.0	-0.1	2.74 V	41	56.1	-2.2
5	4904.00	36.3 PK	74.0	-37.7	1.35 V	201	33.9	2.4
6	4904.00	32.8 AV	54.0	-21.2	1.35 V	201	30.4	2.4
7	7356.00	37.8 PK	74.0	-36.2	1.72 V	43	29.6	8.2
8	7356.00	31.5 AV	54.0	-22.5	1.72 V	43	23.3	8.2

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.

Below 1GHz Data:

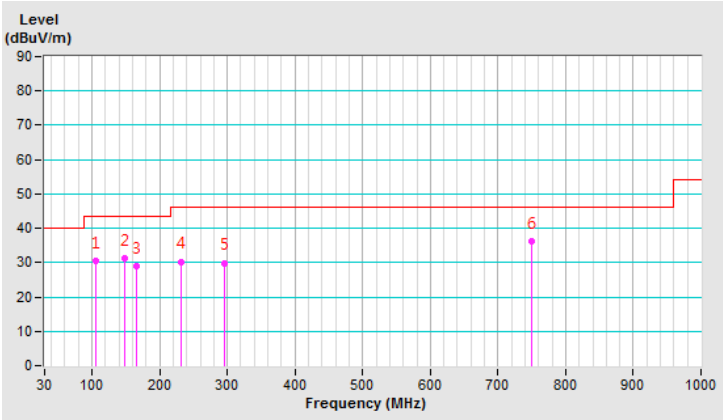
802.11ax (HE20)

CHANNEL	TX Channel 6	**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	104.91	30.5 QP	43.5	-13.0	2.05 H	268	41.7	-11.2
2	147.44	31.3 QP	43.5	-12.2	1.13 H	267	39.2	-7.9
3	166.75	29.0 QP	43.5	-14.5	1.27 H	261	37.2	-8.2
4	232.00	30.3 QP	46.0	-15.7	1.34 H	281	39.8	-9.5
5	295.37	29.9 QP	46.0	-16.1	1.48 H	322	37.1	-7.2
6	750.01	36.2 QP	46.0	-9.8	1.69 H	30	32.5	3.7

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.

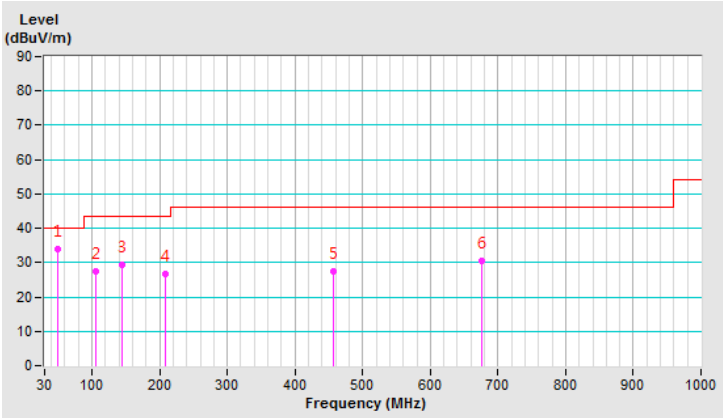


CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

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	50.30	33.8 QP	40.0	-6.2	1.13 V	130	41.9	-8.1
2	106.36	27.4 QP	43.5	-16.1	1.37 V	213	38.5	-11.1
3	144.17	29.4 QP	43.5	-14.1	1.45 V	360	37.4	-8.0
4	207.83	26.7 QP	43.5	-16.8	1.55 V	320	37.0	-10.3
5	456.63	27.4 QP	46.0	-18.6	1.69 V	351	29.9	-2.5
6	675.34	30.5 QP	46.0	-15.5	1.88 V	77	28.6	1.9

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. 24, 2018	Oct. 23, 2019
Line-Impedance Stabilization Network (for EUT) R&S	ESH3-Z5	848773/004	Oct. 22, 2018	Oct. 21, 2019
Line-Impedance Stabilization Network (for Peripheral) R&S	ESH3-Z5	835239/001	Mar. 17, 2019	Mar. 16, 2020
50 ohms Terminator	N/A	3	Oct. 22, 2018	Oct. 21, 2019
RF Cable	5D-FB	COCCAB-001	Sep. 28, 2018	Sep. 27, 2019
Fixed attenuator EMCI	STI02-2200-10	003	Mar. 14, 2019	Mar. 13, 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: July 02, 2019

4.2.3 Test Procedures

a. 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.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

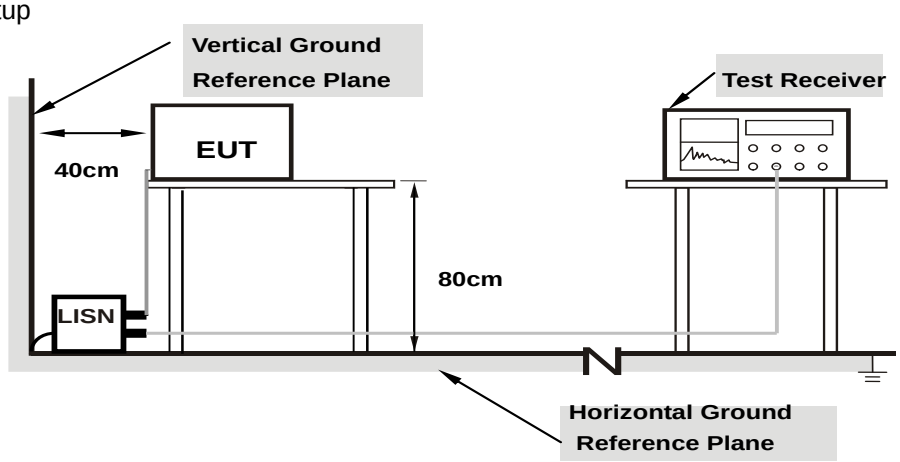
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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.

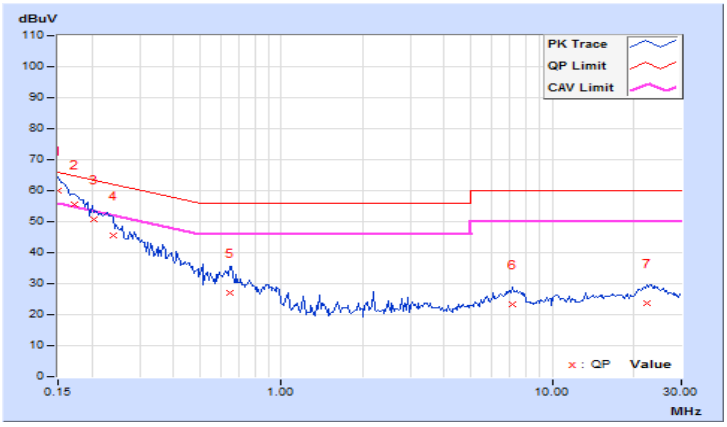
4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)

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	**0.15000**	**10.03**	**49.89**	**32.41**	**59.92**	**42.44**	**66.00**	**56.00**	**-6.08**	**-13.56**
2	0.17344	10.04	45.63	27.45	55.67	37.49	64.79	54.79	-9.12	-17.30
3	0.20469	10.05	40.58	22.24	50.63	32.29	63.42	53.42	-12.79	-21.13
4	0.23984	10.06	35.39	16.77	45.45	26.83	62.10	52.10	-16.65	-25.27
5	0.64609	10.10	17.11	11.53	27.21	21.63	56.00	46.00	-28.79	-24.37
6	7.16406	10.52	12.69	6.63	23.21	17.15	60.00	50.00	-36.79	-32.85
7	22.41016	11.42	12.27	7.08	23.69	18.50	60.00	50.00	-36.31	-31.50

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

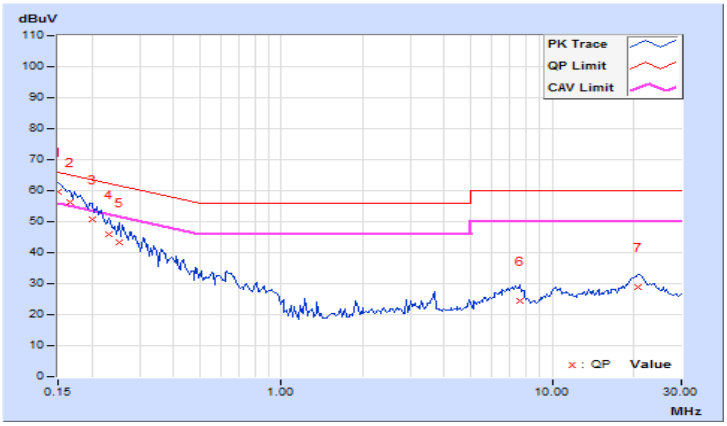


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

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	9.94	49.63	32.33	59.57	42.27	66.00	56.00	-6.43	-13.73
2	0.16562	9.94	46.33	27.32	56.27	37.26	65.18	55.18	-8.91	-17.92
3	0.20078	9.95	40.66	23.13	50.61	33.08	63.58	53.58	-12.97	-20.50
4	0.23203	9.95	36.02	18.56	45.97	28.51	62.38	52.38	-16.41	-23.87
5	0.25156	9.96	33.47	18.05	43.43	28.01	61.71	51.71	-18.28	-23.70
6	7.56641	10.38	14.11	8.15	24.49	18.53	60.00	50.00	-35.51	-31.47
7	20.87500	11.15	17.84	12.52	28.99	23.67	60.00	50.00	-31.01	-26.33

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

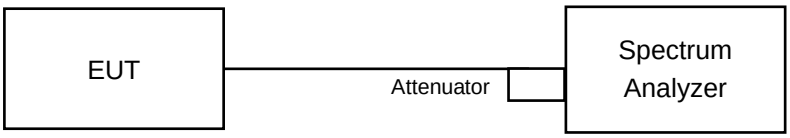


4.3 6dB Bandwidth Measurement

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

a. Set resolution bandwidth (RBW) = 100kHz
b. Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = Peak.
c. Trace mode = max hold.
d. Sweep = auto couple.
e. 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.

4.3.7 Test Result

802.11b

Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
1	2412	7.60	8.10	8.09	7.60	0.5	Pass
6	2437	8.08	7.57	7.60	8.08	0.5	Pass
11	2462	8.03	8.07	7.59	8.07	0.5	Pass

802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
1	2412	16.35	16.37	16.38	16.37	0.5	Pass
6	2437	16.34	16.36	16.36	16.36	0.5	Pass
11	2462	16.35	16.36	16.35	16.35	0.5	Pass

802.11ax (HE20)

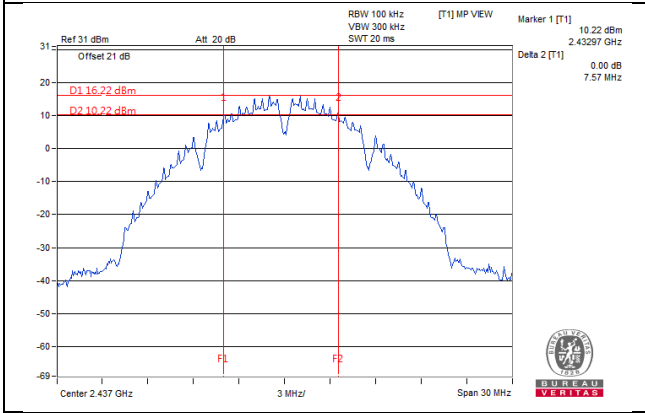
Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
1	2412	18.97	18.97	18.97	18.93	0.5	Pass
6	2437	18.84	18.95	18.94	18.86	0.5	Pass
10	2457	18.75	19.01	18.90	18.87	0.5	Pass
11	2462	18.98	18.98	18.98	18.93	0.5	Pass

802.11ax (HE40)

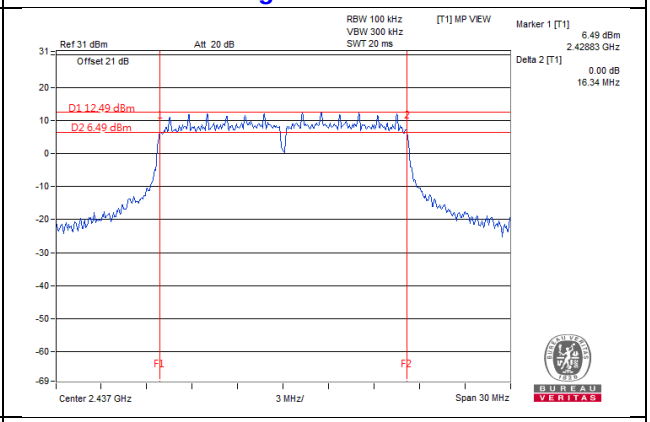
Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
3	2422	38.19	38.06	38.01	38.11	0.5	Pass
6	2437	38.11	38.01	38.15	38.04	0.5	Pass
9	2452	38.10	38.15	38.13	38.01	0.5	Pass

Spectrum Plot of Worst Value

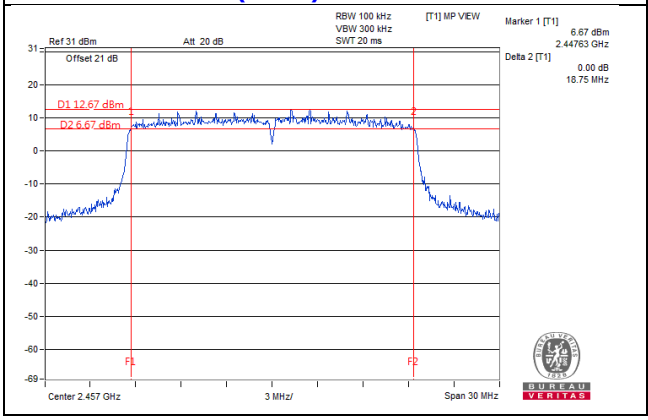
802.11b / Chain 1 : CH6



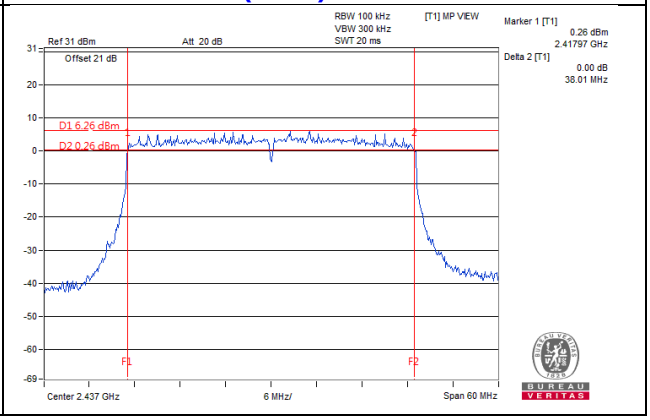
802.11g / Chain 0 : CH6



802.11ax (HE20) / Chain 0 : CH10



802.11ax (HE40) / Chain 1 : CH6



4.4 Conducted Output Power Measurement

4.4.1 Limits of Conducted Output Power Measurement

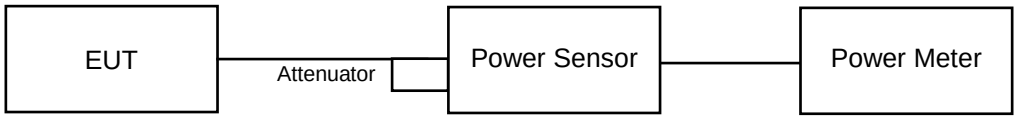
For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

Per KDB 662911 D01 Multiple Transmitter Output Method of conducted output power measurement on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;
Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT};
Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less for 20-MHz channel widths with $N_{ANT} \geq 5$.

For power measurements on all other devices: Array Gain = 10 log(N_{ANT}/N_{SS}) dB.

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedures

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.

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Conditions

Same as Item 4.3.6.

4.4.7 Test Results

Non-Beamforming Mode

802.11b

Chan.	Chan. Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
1	2412	23.61	23.63	23.42	23.80	919.959	29.64	30.00	Pass
6	2437	23.73	23.79	23.62	23.94	953.266	29.79	30.00	Pass
11	2462	23.23	23.31	22.91	23.47	842.432	29.26	30.00	Pass

802.11g

Chan.	Chan. Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
1	2412	22.32	22.39	22.10	22.53	685.23	28.36	30.00	Pass
6	2437	23.76	23.81	23.68	24.06	966.149	29.85	30.00	Pass
11	2462	22.39	22.48	22.22	22.57	697.833	28.44	30.00	Pass

802.11n (HT20)

Chan.	Chan. Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
1	2412	22.36	22.42	22.11	22.58	690.458	28.39	30.00	Pass
6	2437	23.81	23.83	23.69	24.05	969.963	29.87	30.00	Pass
10	2457	23.77	23.79	23.65	23.87	953.084	29.79	30.00	Pass
11	2462	19.96	20.11	19.79	20.36	405.571	26.08	30.00	Pass

802.11n (HT40)

Chan.	Chan. Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
3	2422	17.52	17.77	17.58	18.02	237.002	23.75	30.00	Pass
6	2437	20.50	20.69	20.49	20.92	464.961	26.67	30.00	Pass
9	2452	17.63	17.90	17.60	17.99	240.098	23.80	30.00	Pass

802.11ax (HE20)

Chan.	Chan. Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
1	2412	22.42	22.49	22.17	22.64	700.471	28.45	30.00	Pass
6	2437	23.89	23.92	23.74	24.13	986.923	29.94	30.00	Pass
10	2457	23.83	23.85	23.71	24.02	971.518	29.87	30.00	Pass
11	2462	20.01	20.18	19.86	20.43	411.699	26.15	30.00	Pass

802.11ax (HE40)

Chan.	Chan. Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
3	2422	17.61	17.84	17.66	18.13	241.849	23.84	30.00	Pass
6	2437	20.62	20.77	20.56	21.03	475.272	26.77	30.00	Pass
9	2452	17.72	17.97	17.69	18.11	245.28	23.90	30.00	Pass

Beamforming Mode

802.11n (HT20)

Chan.	Chan. Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
1	2412	22.36	22.42	22.11	22.58	690.458	28.39	30.00	Pass
6	2437	23.81	23.83	23.69	24.05	969.963	29.87	30.00	Pass
10	2457	23.77	23.79	23.65	23.87	953.084	29.79	30.00	Pass
11	2462	19.96	20.11	19.79	20.36	405.571	26.08	30.00	Pass

Note: 1. Directional gain = 3.98dBi < 6dBi , so the power limit shall not be reduced.

802.11n (HT40)

Chan.	Chan. Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
3	2422	17.52	17.77	17.58	18.02	237.002	23.75	30.00	Pass
6	2437	20.50	20.69	20.49	20.92	464.961	26.67	30.00	Pass
9	2452	17.63	17.90	17.60	17.99	240.098	23.80	30.00	Pass

Note: 1. Directional gain = 3.98dBi < 6dBi , so the power limit shall not be reduced.

802.11ax (HE20)

Chan.	Chan. Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
1	2412	22.42	22.49	22.17	22.64	700.471	28.45	30.00	Pass
6	2437	23.89	23.92	23.74	24.13	986.923	29.94	30.00	Pass
10	2457	23.83	23.85	23.71	24.02	971.518	29.87	30.00	Pass
11	2462	20.01	20.18	19.86	20.43	411.699	26.15	30.00	Pass

Note: 1. Directional gain = 3.98dBi < 6dBi , so the power limit shall not be reduced.

802.11ax (HE40)

Chan.	Chan. Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
3	2422	17.61	17.84	17.66	18.13	241.849	23.84	30.00	Pass
6	2437	20.62	20.77	20.56	21.03	475.272	26.77	30.00	Pass
9	2452	17.72	17.97	17.69	18.11	245.28	23.90	30.00	Pass

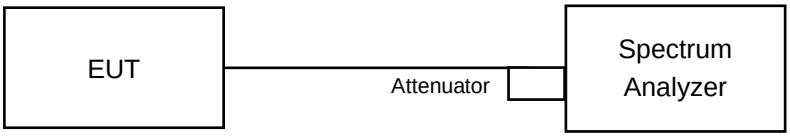
Note: 1. Directional gain = 3.98dBi < 6dBi , so the power limit shall not be reduced.

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

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

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 Procedure

802.11b, 802.11g

802.11ax (HE20), 802.11ax (HE40)

a) Measure the duty cycle (x).
b) Set instrument center frequency to DTS channel center frequency.
c) Set span to at least 1.5 times the OBW.
d) Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz..
e) Set VBW ≥3 x RBW.
f) Detector = power averaging (RMS) or sample detector (when RMS not available).
g) Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.
h) Sweep time = auto couple.
i) Do not use sweep triggering. Allow sweep to “free run”.
j) Employ trace averaging (RMS) mode over a minimum of 100 traces.
k) Use the peak marker function to determine the maximum amplitude level.
l) Add 10 log (1/x), where x is the duty cycle measured in step (a, to the measured PSD to compute the average PSD during the actual transmission time.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

Same as Item 4.3.6

4.5.7 Test Results

802.11b

TX chain	Channel	Freq. (MHz)	PSD W/O Duty Factor (dBm/3kHz)	10 log (N=4) dB	Duty Factor (dB)	TOTAL PSD With Duty Factor (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	1	2412	-7.31	6.02	1.23	-0.06	8.00	Pass
	6	2437	-8.27	6.02	1.23	-1.02	8.00	Pass
	11	2462	-8.43	6.02	1.23	-1.18	8.00	Pass
1	1	2412	-7.51	6.02	1.23	-0.26	8.00	Pass
	6	2437	-7.98	6.02	1.23	-0.73	8.00	Pass
	11	2462	-8.28	6.02	1.23	-1.03	8.00	Pass
2	1	2412	-5.86	6.02	1.23	1.39	8.00	Pass
	6	2437	-5.27	6.02	1.23	1.98	8.00	Pass
	11	2462	-6.94	6.02	1.23	0.31	8.00	Pass
3	1	2412	-5.75	6.02	1.23	1.50	8.00	Pass
	6	2437	-5.29	6.02	1.23	1.96	8.00	Pass
	11	2462	-4.46	6.02	1.23	2.79	8.00	Pass

Note:
1. Directional gain = 3.98dBi < 6dBi , so the power density limit shall not be reduced.
2. Refer to section 3.3 for duty cycle spectrum plot.

802.11g

TX chain	Channel	Freq. (MHz)	PSD W/O Duty Factor (dBm/3kHz)	10 log (N=4) dB	Duty Factor (dB)	TOTAL PSD With Duty Factor (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	1	2412	-11.38	6.02	0.36	-5.00	8.00	Pass
	6	2437	-10.26	6.02	0.36	-3.88	8.00	Pass
	11	2462	-11.67	6.02	0.36	-5.29	8.00	Pass
1	1	2412	-11.69	6.02	0.36	-5.31	8.00	Pass
	6	2437	-10.31	6.02	0.36	-3.93	8.00	Pass
	11	2462	-11.56	6.02	0.36	-5.18	8.00	Pass
2	1	2412	-9.63	6.02	0.36	-3.25	8.00	Pass
	6	2437	-7.85	6.02	0.36	-1.47	8.00	Pass
	11	2462	-9.53	6.02	0.36	-3.15	8.00	Pass
3	1	2412	-9.59	6.02	0.36	-3.21	8.00	Pass
	6	2437	-6.57	6.02	0.36	-0.19	8.00	Pass
	11	2462	-9.21	6.02	0.36	-2.83	8.00	Pass

Note:
1. Directional gain = 3.98dBi < 6dBi , so the power density limit shall not be reduced.
2. Refer to section 3.3 for duty cycle spectrum plot.

802.11ax (HE20)

TX chain	Channel	Freq. (MHz)	PSD W/O Duty Factor (dBm/3kHz)	10 log (N=4) dB	Duty Factor (dB)	TOTAL PSD With Duty Factor (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	1	2412	-14.63	6.02	0.17	-8.44	8.00	Pass
	6	2437	-13.06	6.02	0.17	-6.87	8.00	Pass
	10	2457	-13.11	6.02	0.17	-6.92	8.00	Pass
	11	5462	-16.32	6.02	0.17	-10.13	8.00	Pass
1	1	2412	-14.83	6.02	0.17	-8.64	8.00	Pass
	6	2437	-12.98	6.02	0.17	-6.79	8.00	Pass
	10	2457	-13.32	6.02	0.17	-7.13	8.00	Pass
	11	5462	-16.91	6.02	0.17	-10.72	8.00	Pass
2	1	2412	-14.92	6.02	0.17	-8.73	8.00	Pass
	6	2437	-13.27	6.02	0.17	-7.08	8.00	Pass
	10	2457	-11.65	6.02	0.17	-5.46	8.00	Pass
	11	5462	-17.09	6.02	0.17	-10.90	8.00	Pass
3	1	2412	-14.58	6.02	0.17	-8.39	8.00	Pass
	6	2437	-12.86	6.02	0.17	-6.67	8.00	Pass
	10	2457	-13.14	6.02	0.17	-6.95	8.00	Pass
	11	5462	-16.35	6.02	0.17	-10.16	8.00	Pass

Note:

1. Directional gain = 3.98dBi < 6dBi , so the power density limit shall not be reduced.
2. Refer to section 3.3 for duty cycle spectrum plot.

802.11ax (HE40)

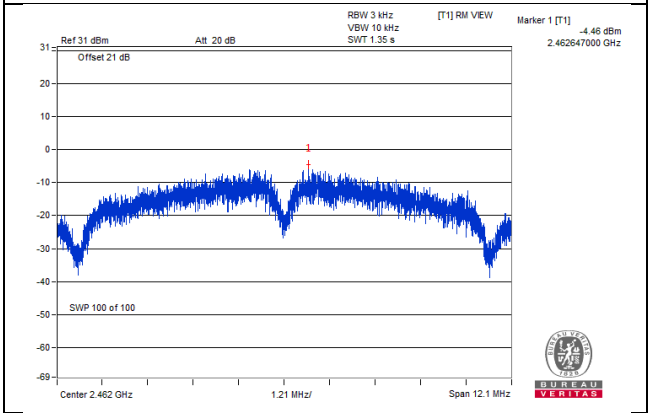
TX chain	Channel	Freq. (MHz)	PSD W/O Duty Factor (dBm/3kHz)	10 log (N=4) dB	Duty Factor (dB)	TOTAL PSD With Duty Factor (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	3	2422	-21.67	6.02	0.20	-15.45	8.00	Pass
	6	2437	-18.32	6.02	0.20	-12.10	8.00	Pass
	9	2452	-21.31	6.02	0.20	-15.09	8.00	Pass
1	3	2422	-21.62	6.02	0.20	-15.40	8.00	Pass
	6	2437	-18.66	6.02	0.20	-12.44	8.00	Pass
	9	2452	-21.29	6.02	0.20	-15.07	8.00	Pass
2	3	2422	-21.53	6.02	0.20	-15.31	8.00	Pass
	6	2437	-18.34	6.02	0.20	-12.12	8.00	Pass
	9	2452	-21.33	6.02	0.20	-15.11	8.00	Pass
3	3	2422	-21.39	6.02	0.20	-15.17	8.00	Pass
	6	2437	-18.28	6.02	0.20	-12.06	8.00	Pass
	9	2452	-20.91	6.02	0.20	-14.69	8.00	Pass

Note:

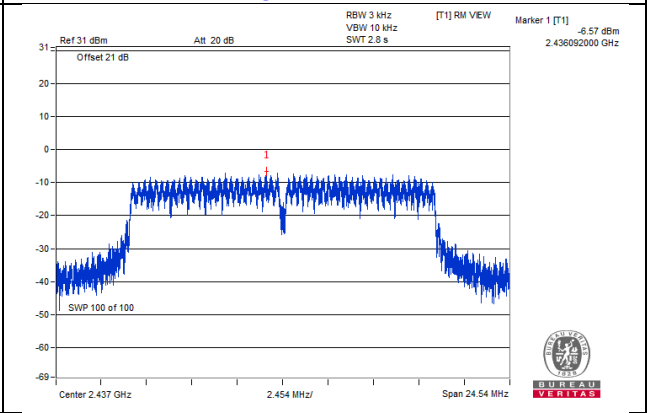
1. Directional gain = 3.98dBi < 6dBi , so the power density limit shall not be reduced.
2. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

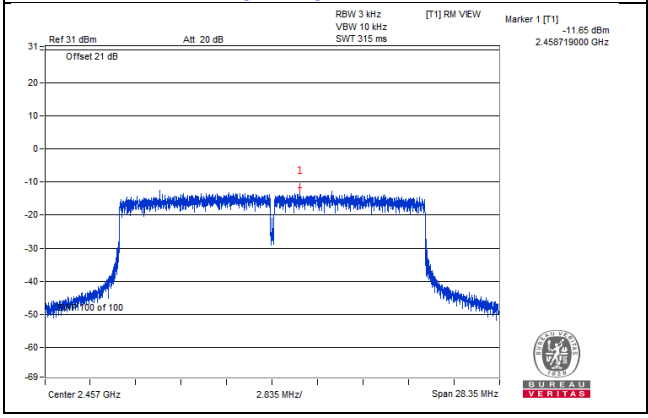
802.11b / Chain 3: CH11



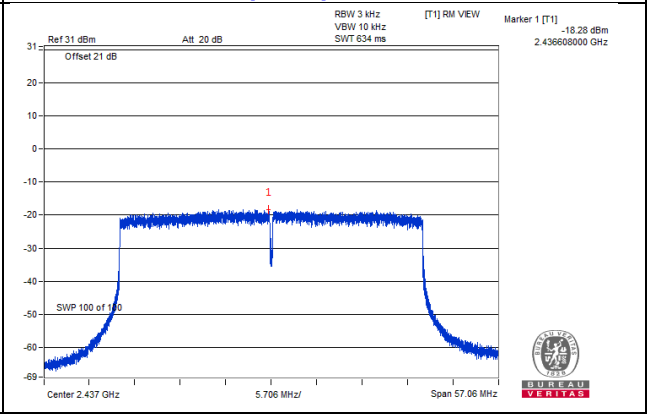
802.11g / Chain 3 : CH6



802.11ax (HE20) / Chain 2: CH10



802.11ax (HE40) / Chain 3: CH6

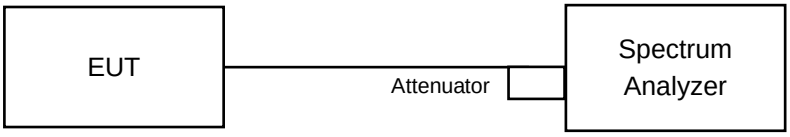


4.6 Conducted Out of Band Emission Measurement

4.6.1 Limits of Conducted Out of Band Emission Measurement

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

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

MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW ≥ 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 OOBE

1. Set RBW = 100 kHz.
2. Set VBW ≥ 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.

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

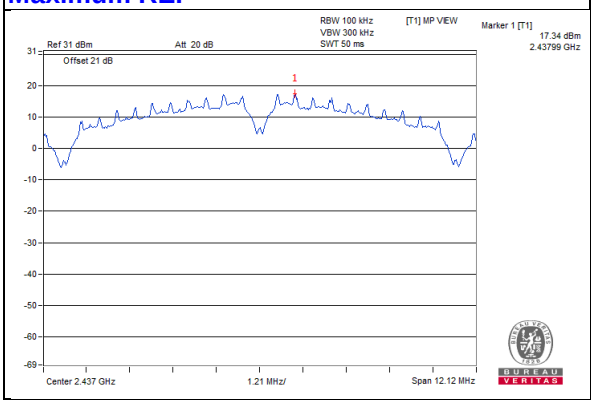
Same as Item 4.3.6

4.6.7 Test Results

The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 30dB offset below D1. It shows compliance with the requirement.

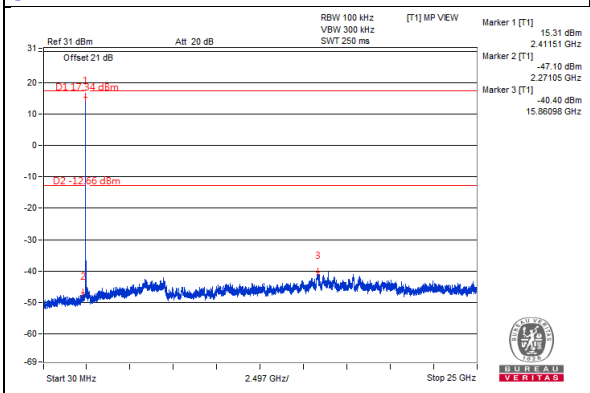
802.11b

Maximum REF

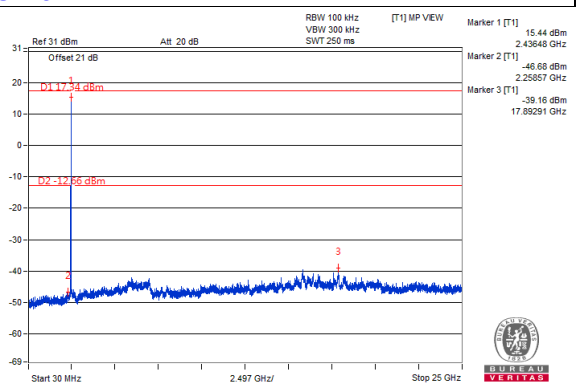


Chain 0

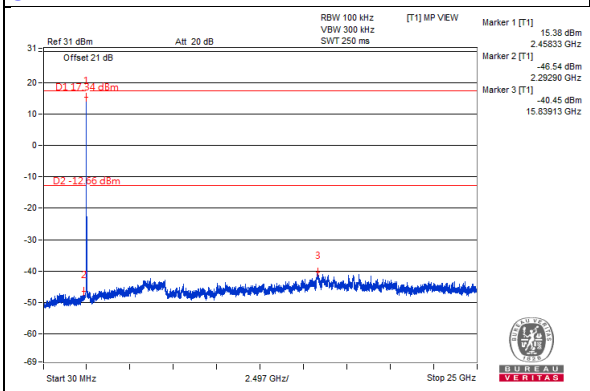
CH 1



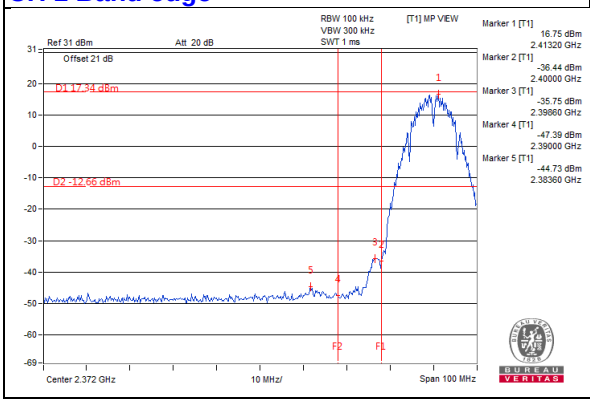
CH 6



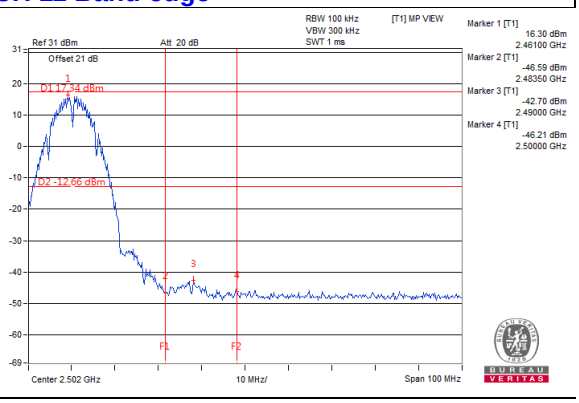
CH 11



CH 1 Band edge

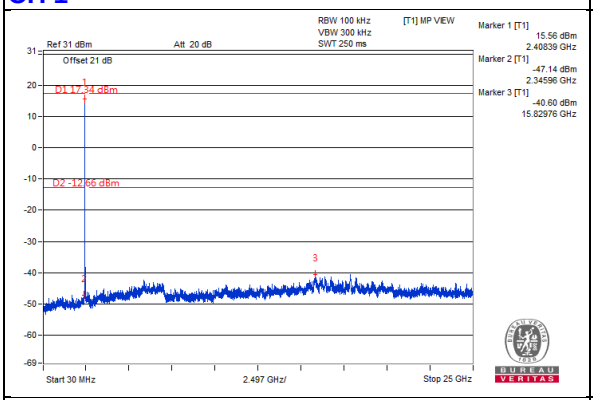


CH 11 Band edge

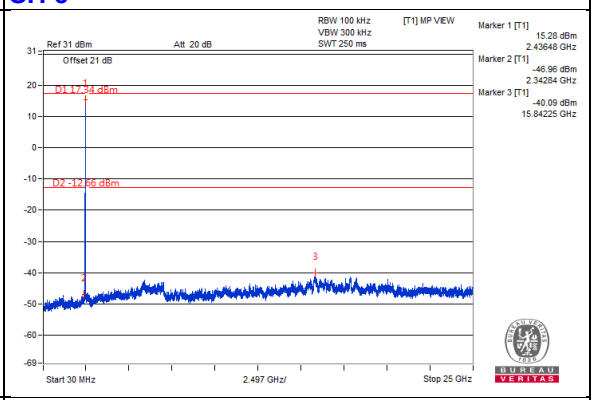


Chain 1

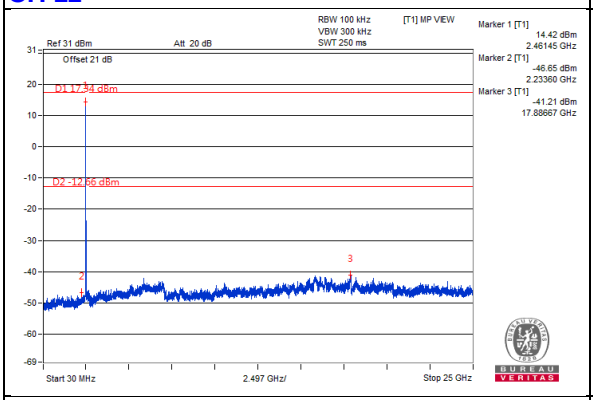
CH 1



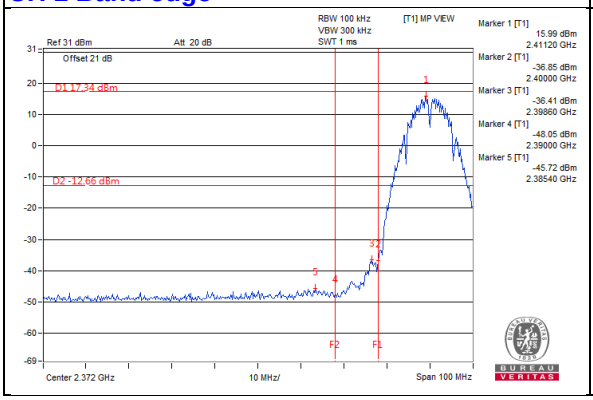
CH 6



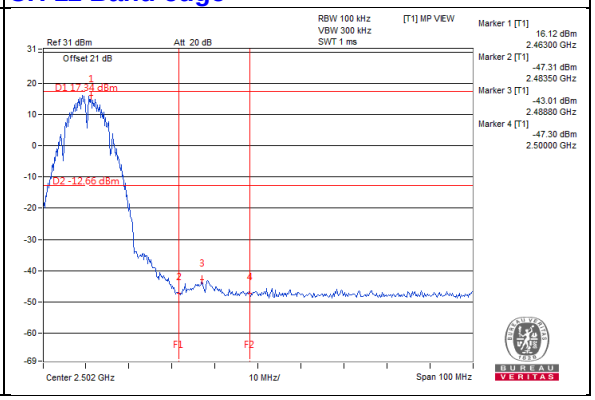
CH 11



CH 1 Band edge

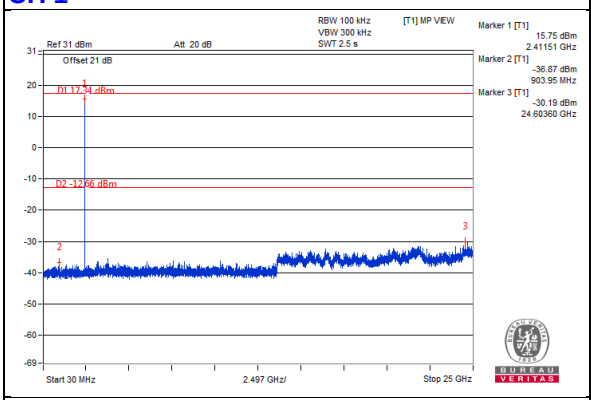


CH 11 Band edge

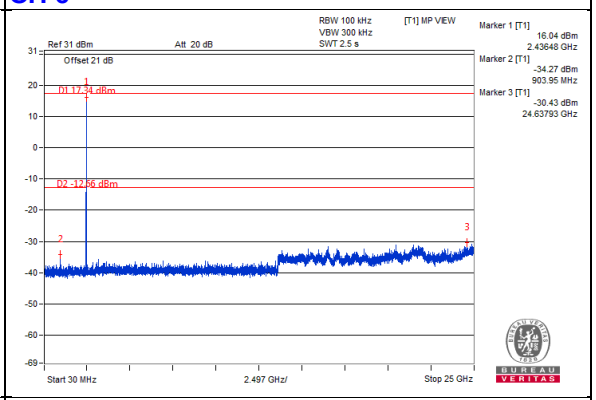


Chain 2

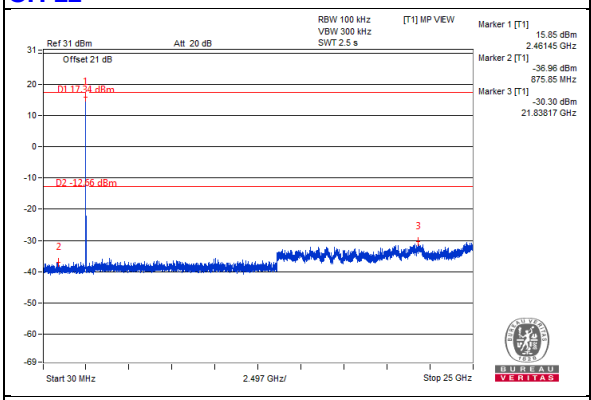
CH 1



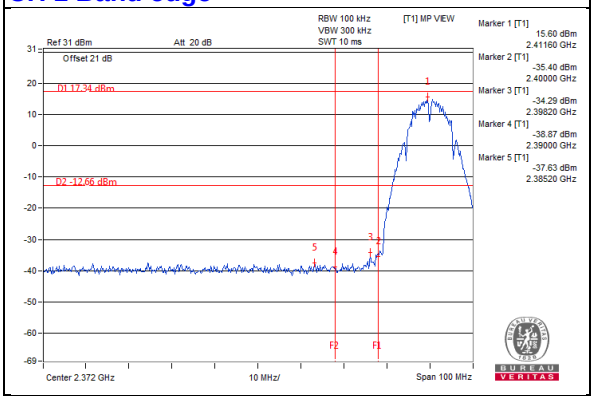
CH 6



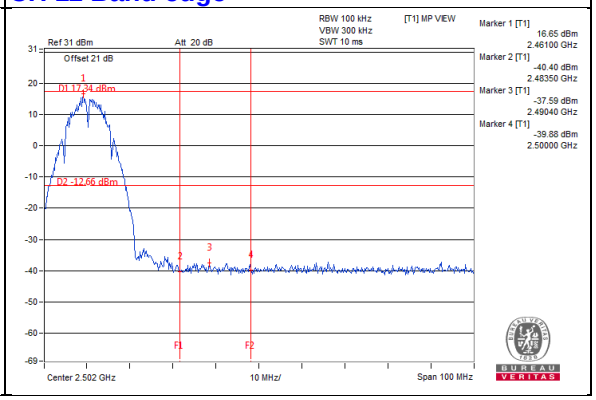
CH 11



CH 1 Band edge

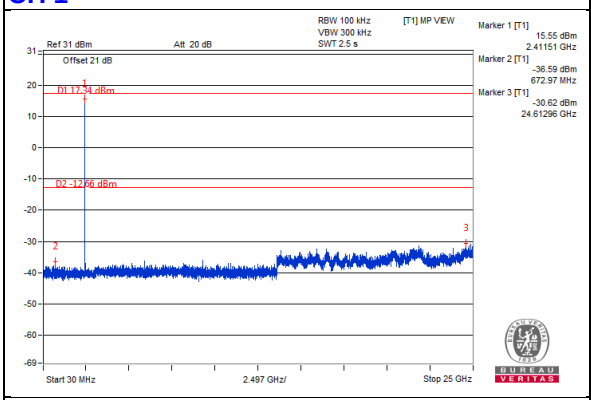


CH 11 Band edge

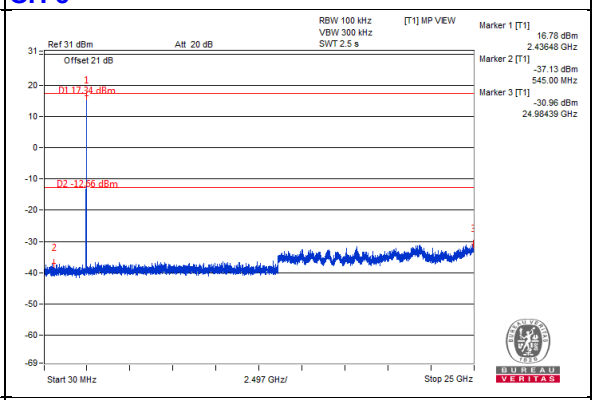


Chain 3

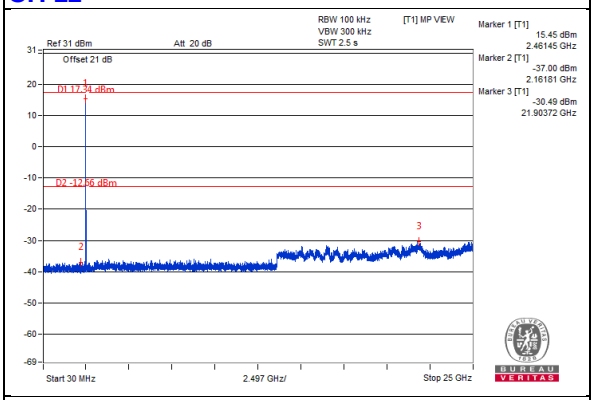
CH 1



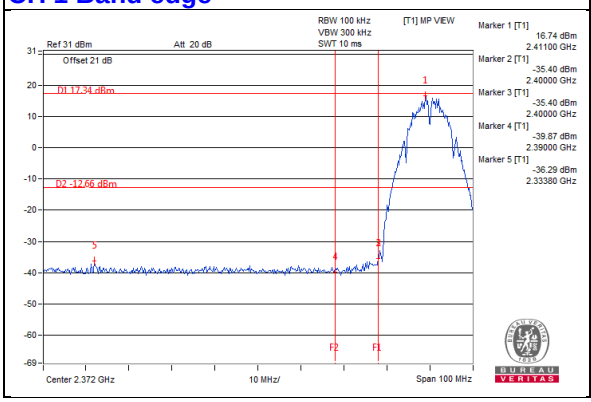
CH 6



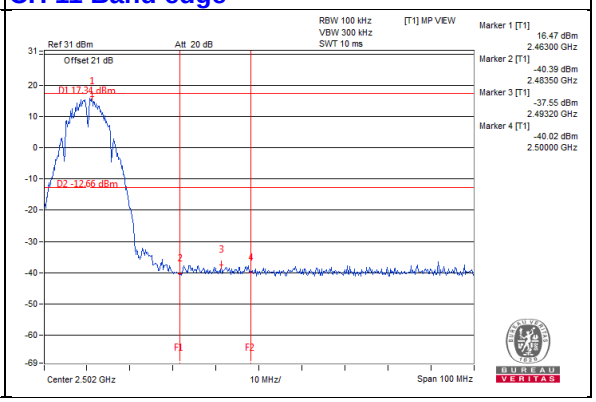
CH 11



CH 1 Band edge

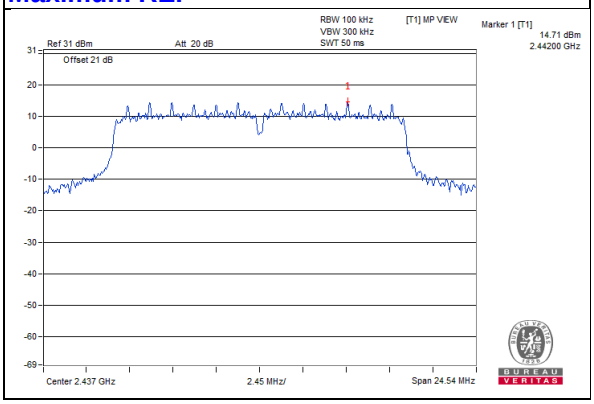


CH 11 Band edge



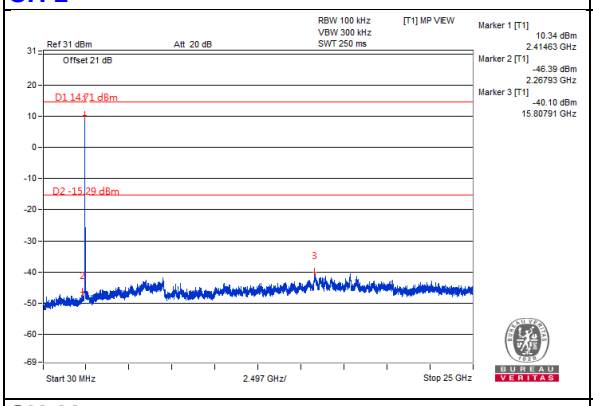
802.11g

Maximum REF

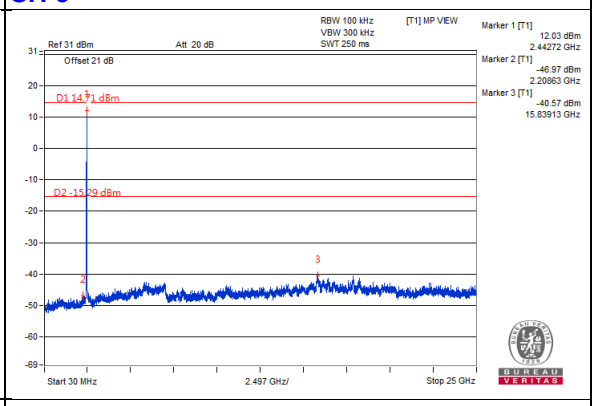


Chain 0

CH 1



CH 6



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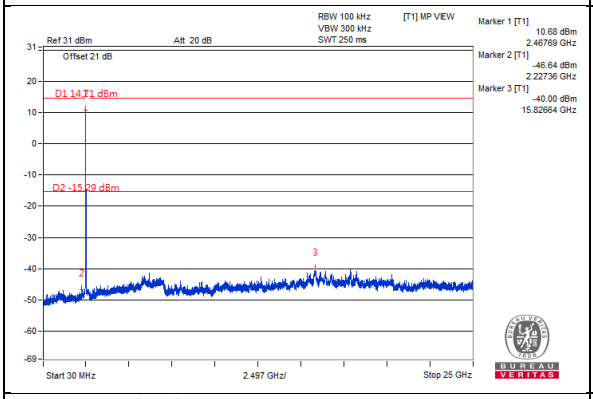
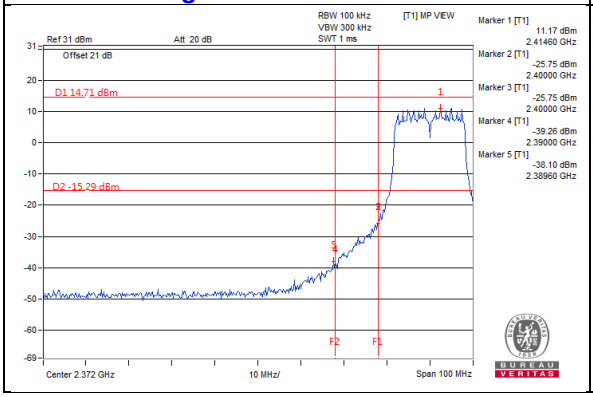
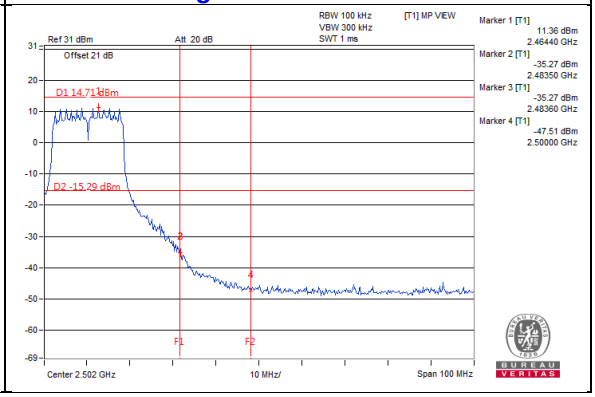


CH 1 Band edge

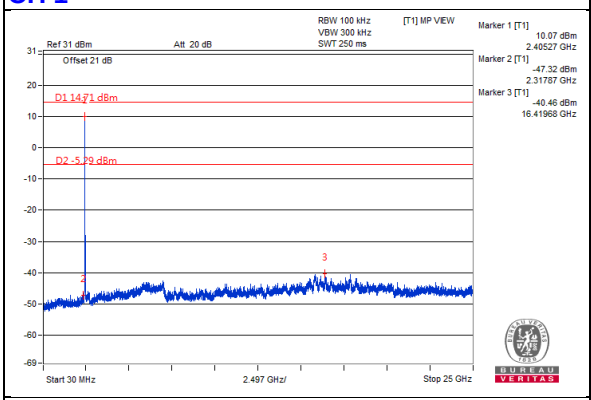


CH 11 Band edge

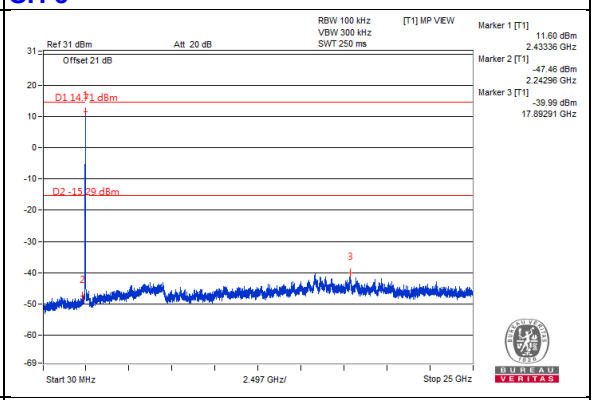


Chain 1

CH 1



CH 6



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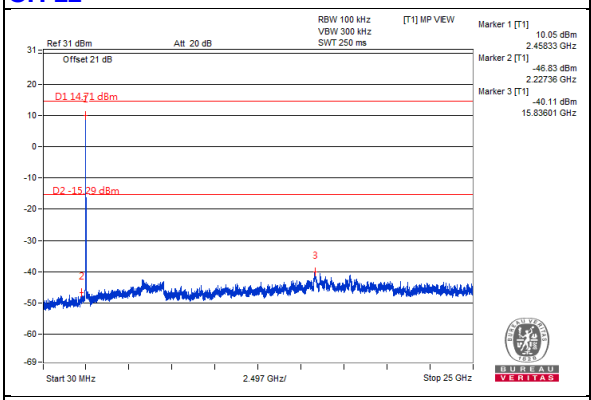
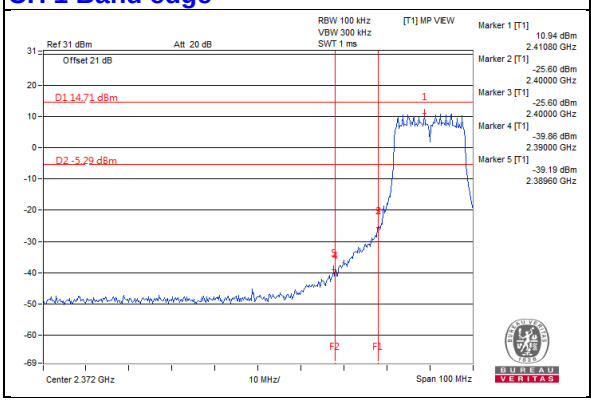
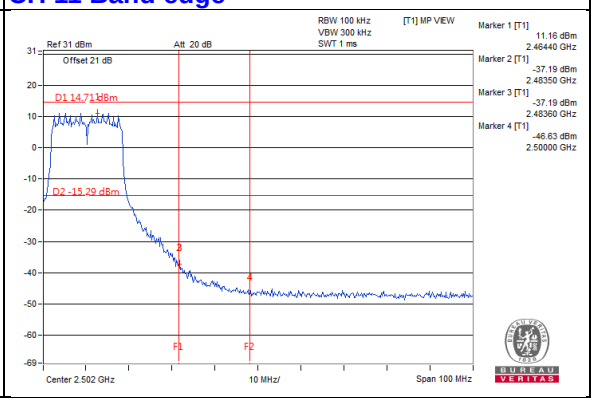


CH 1 Band edge

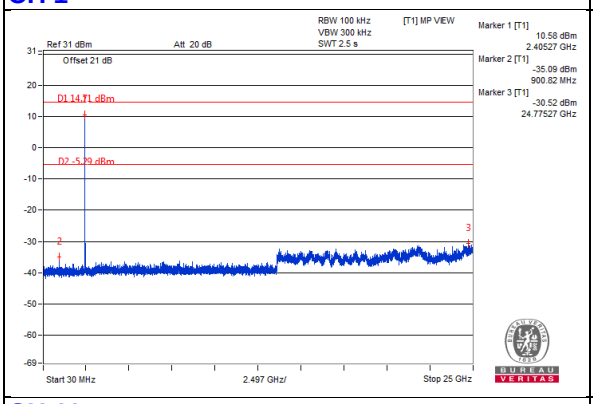


CH 11 Band edge

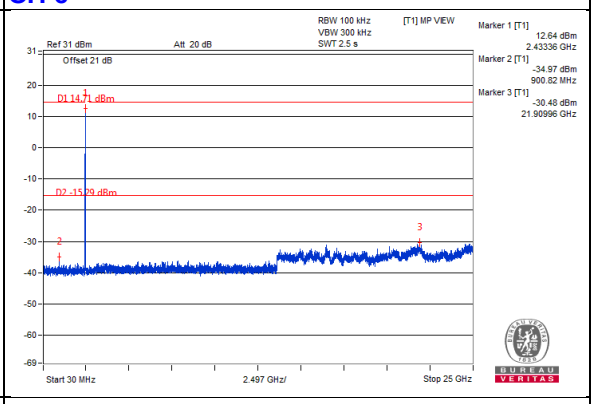


Chain 2

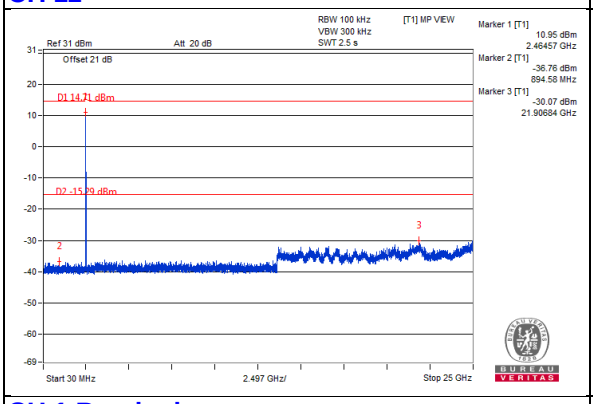
CH 1



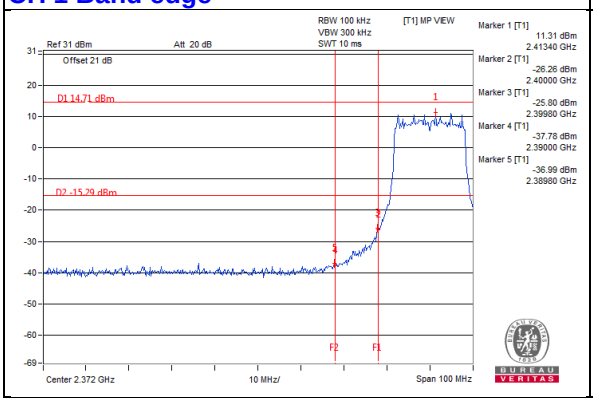
CH 6



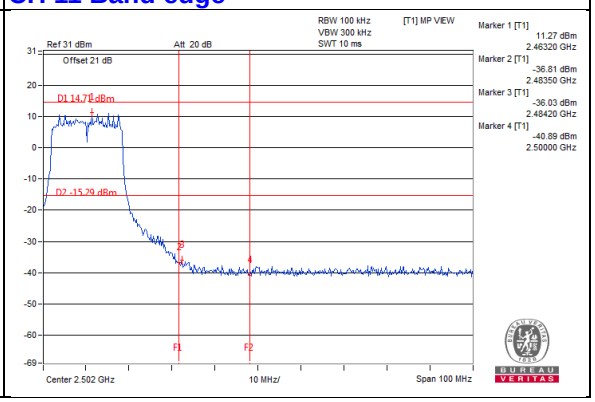
CH 11



CH 1 Band edge

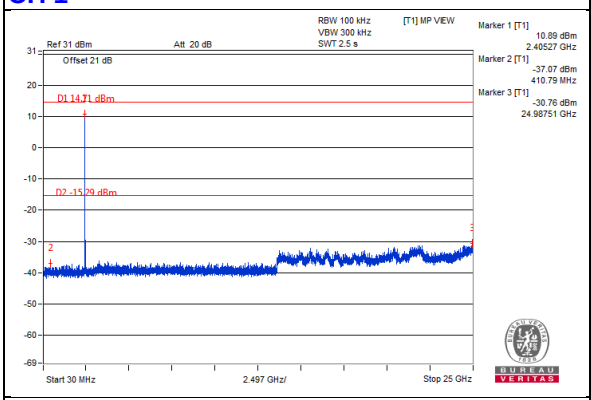


CH 11 Band edge

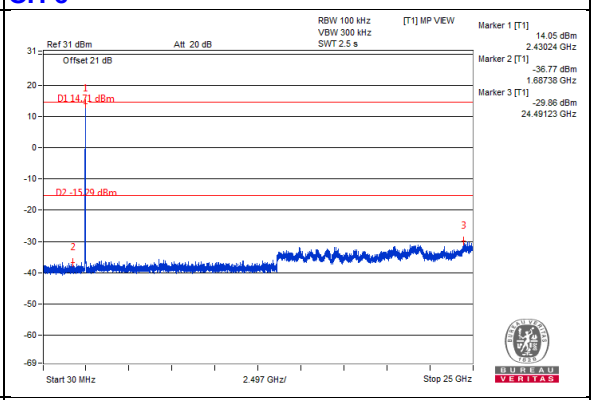


Chain 3

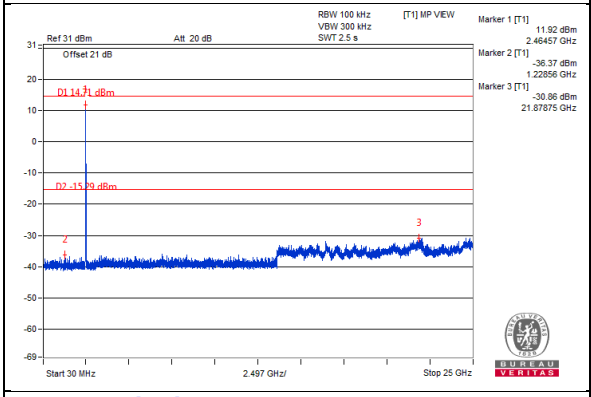
CH 1



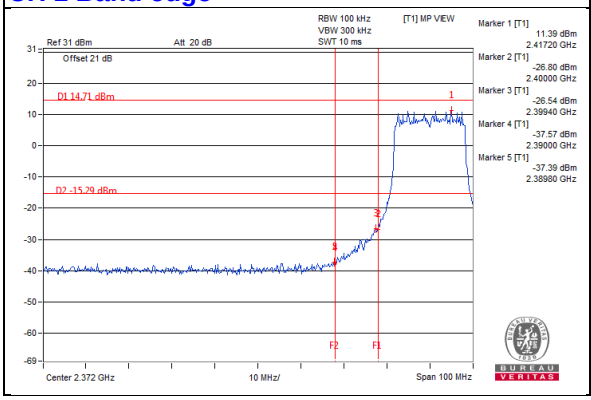
CH 6



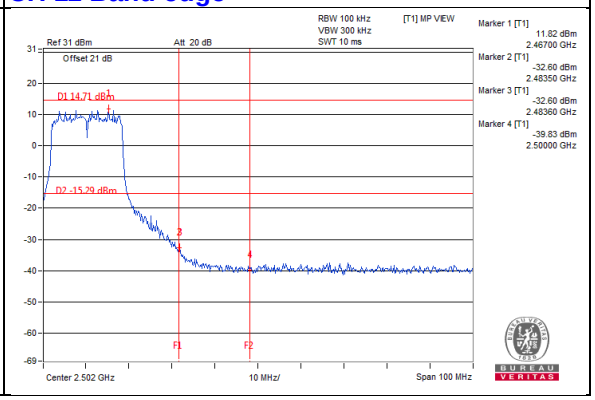
CH 11



CH 1 Band edge

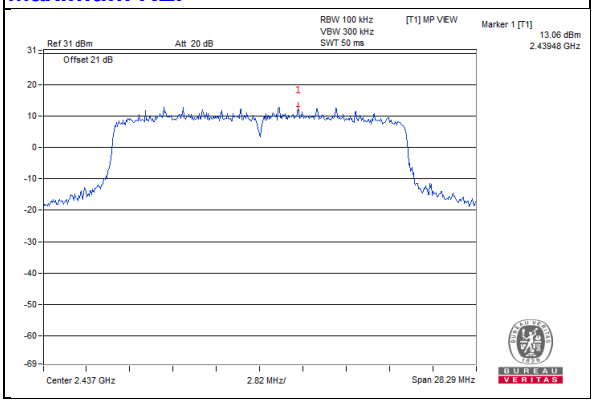


CH 11 Band edge



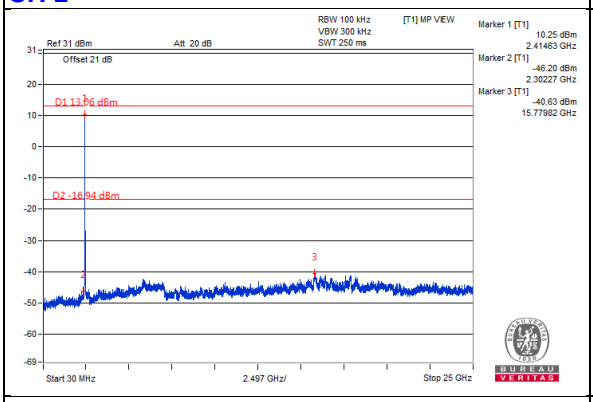
802.11ax (HE20)

Maximum REF

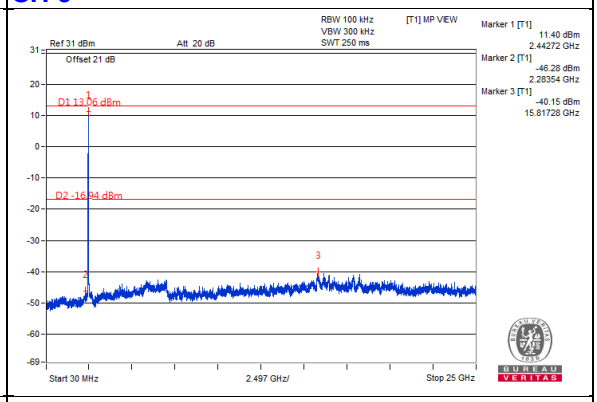


Chain 0

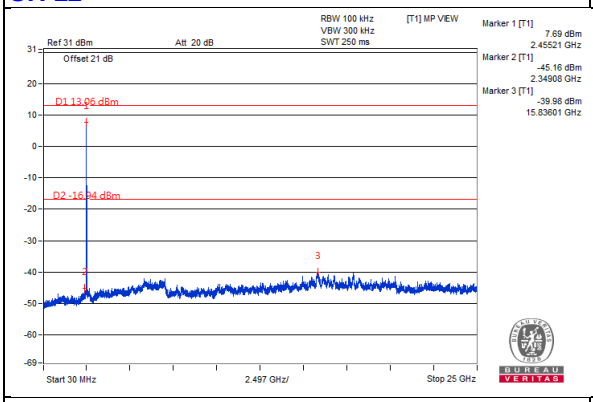
CH 1



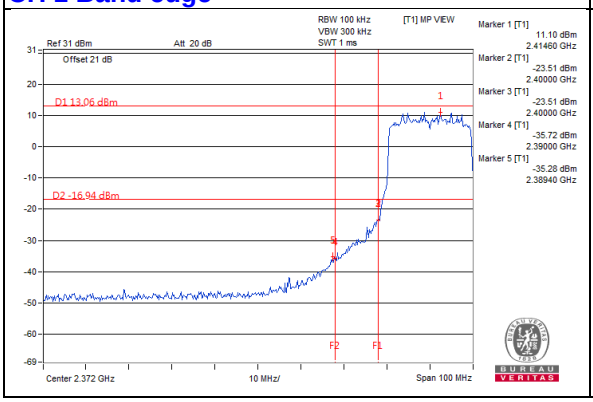
CH 6



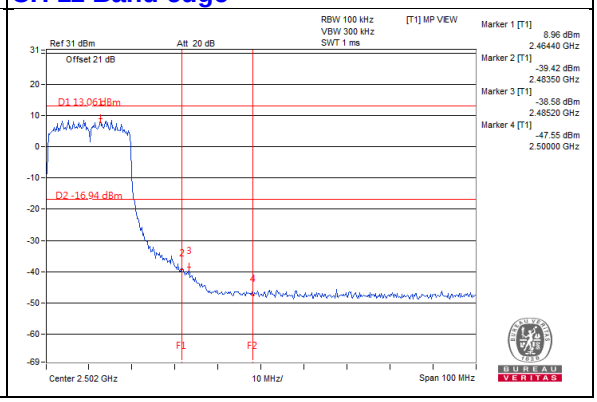
CH 11



CH 1 Band edge

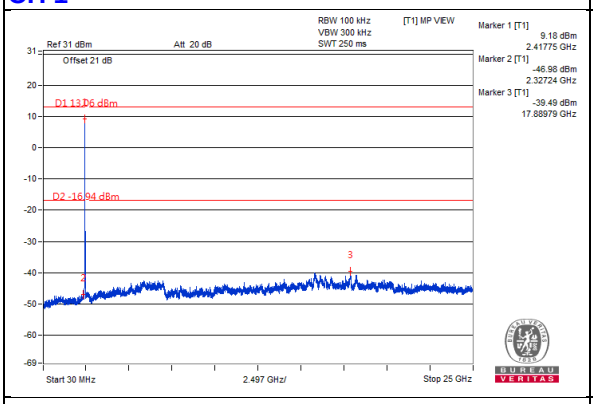


CH 11 Band edge



Chain 1

CH 1



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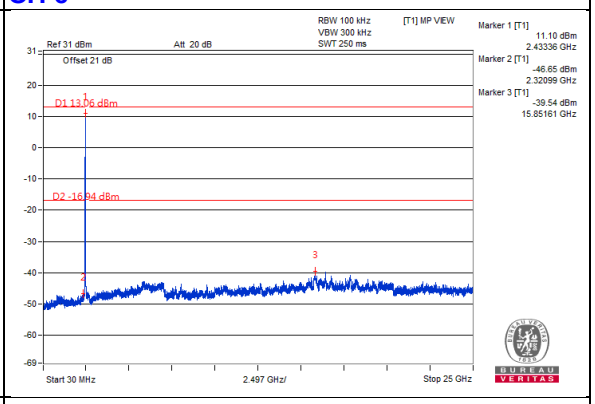

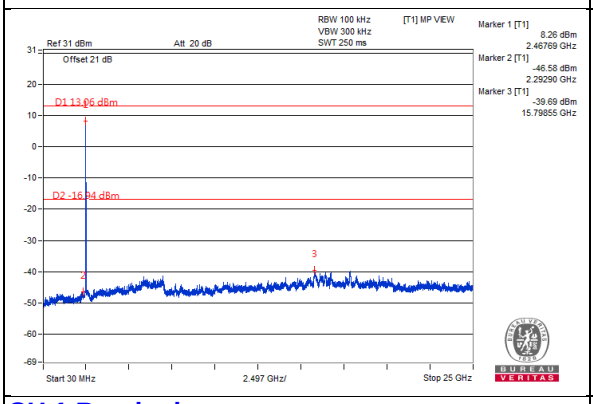

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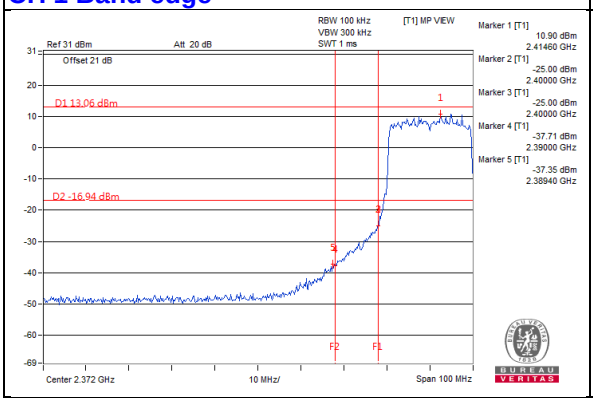

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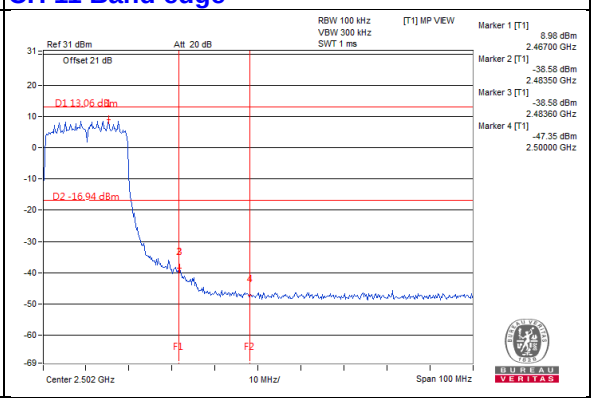
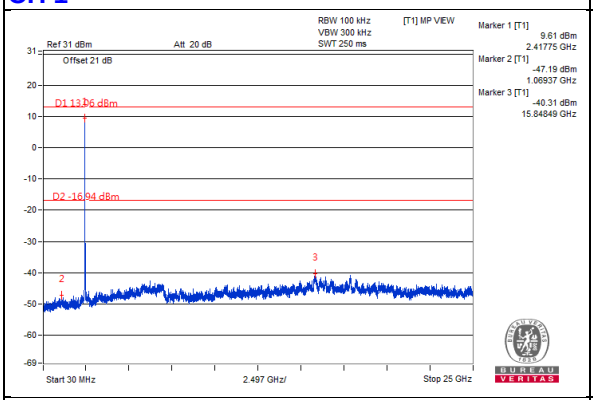


Chain 2

CH 1



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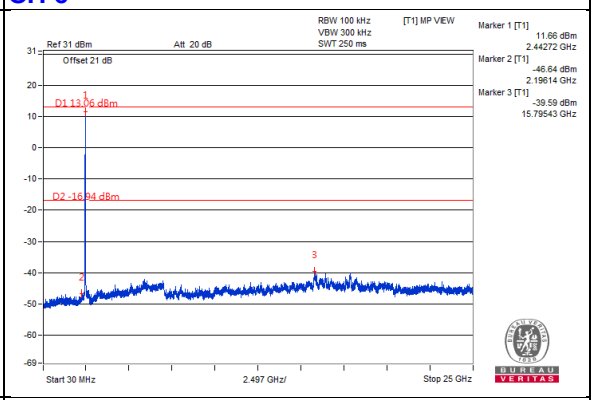

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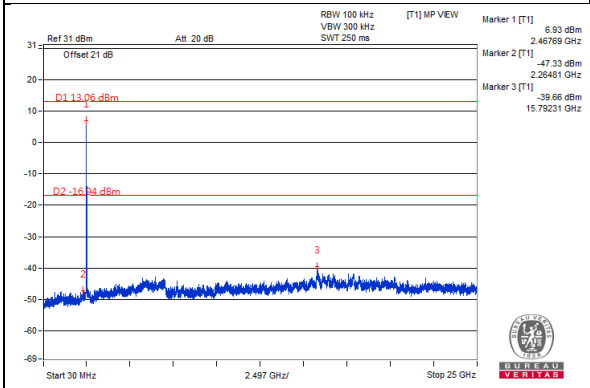

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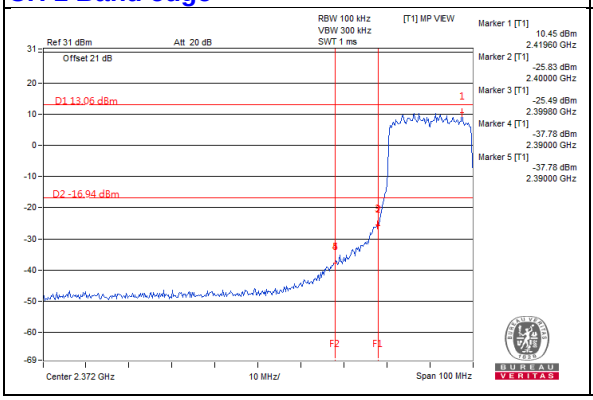

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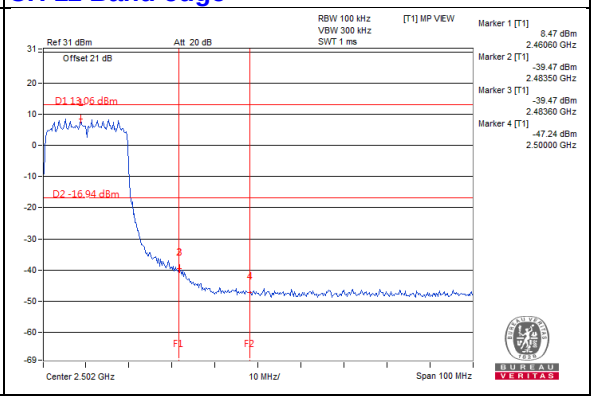
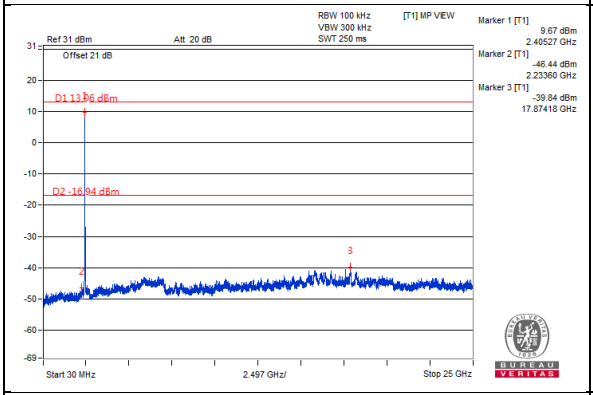


Chain 3

CH 1



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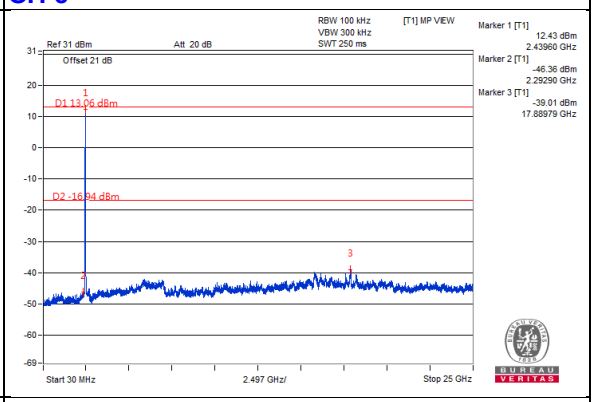

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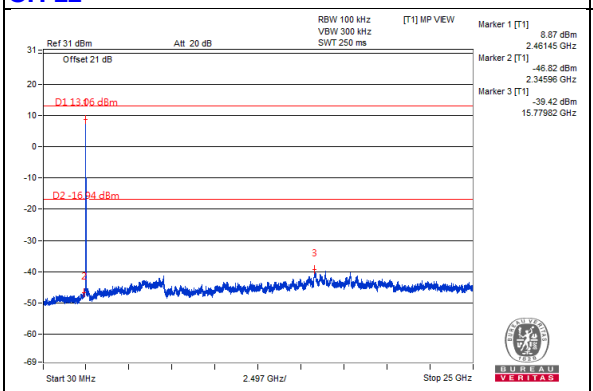

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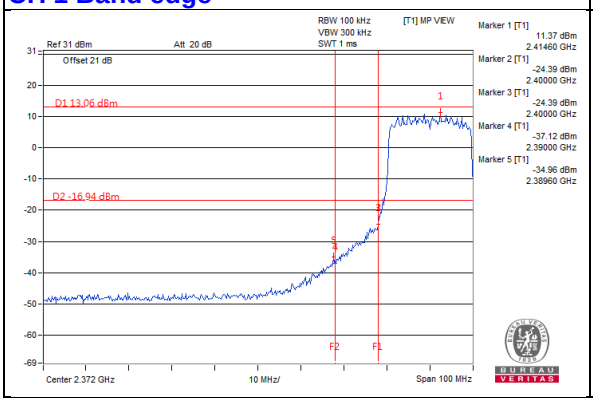

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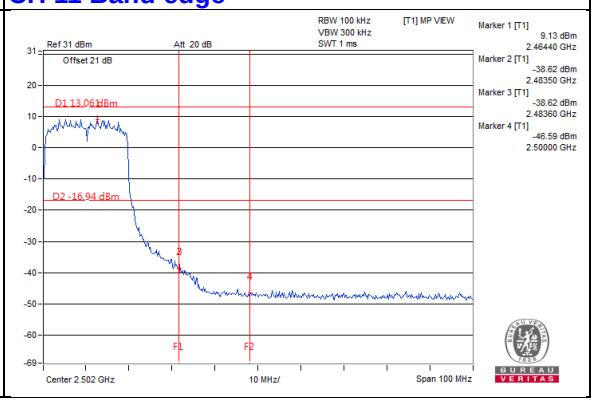
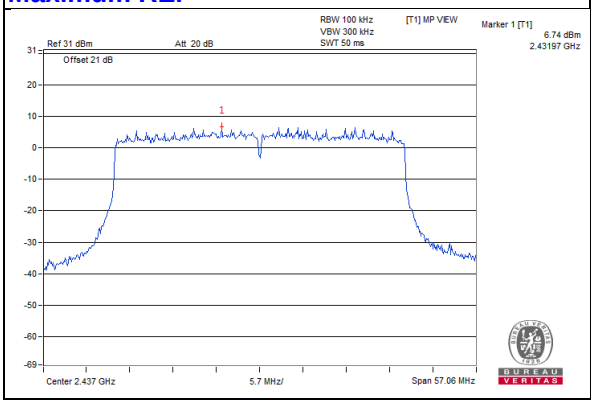


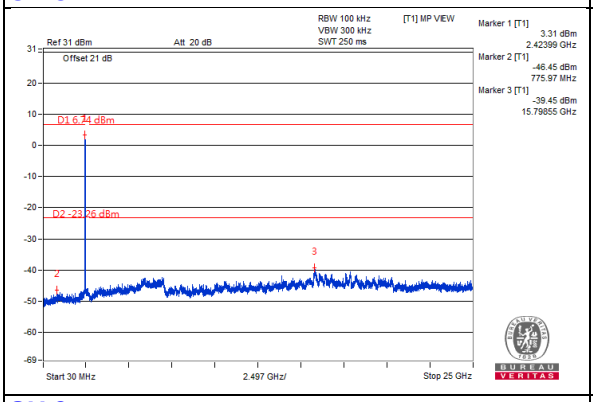
802.11ax (HE40)

Maximum REF



Chain 0

CH 3



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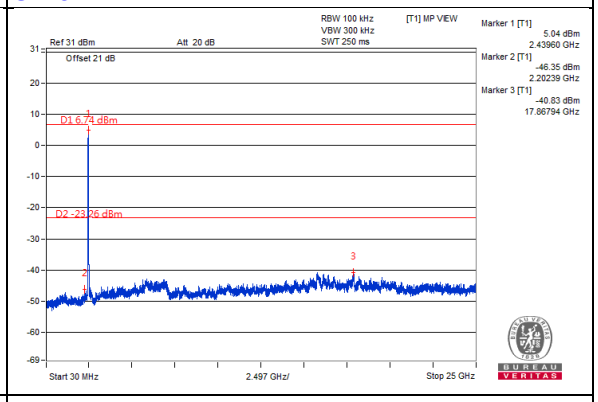

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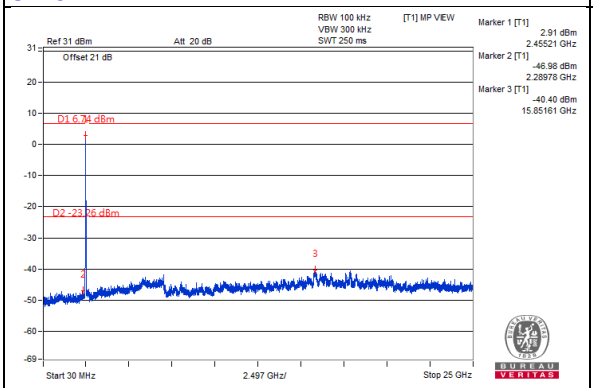

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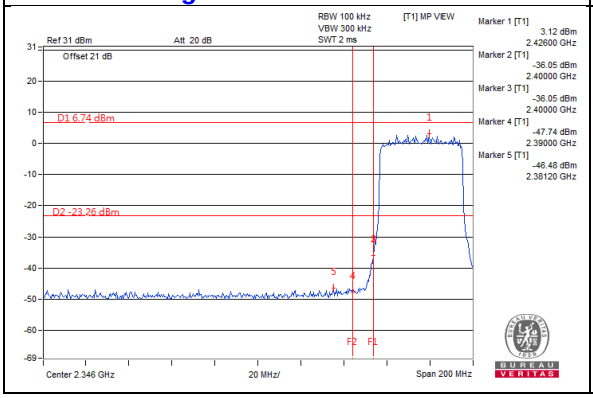

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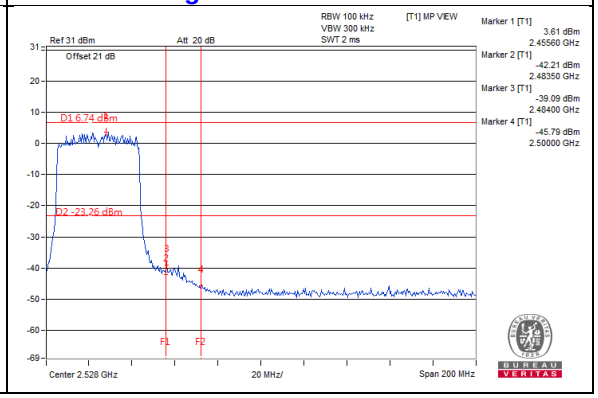
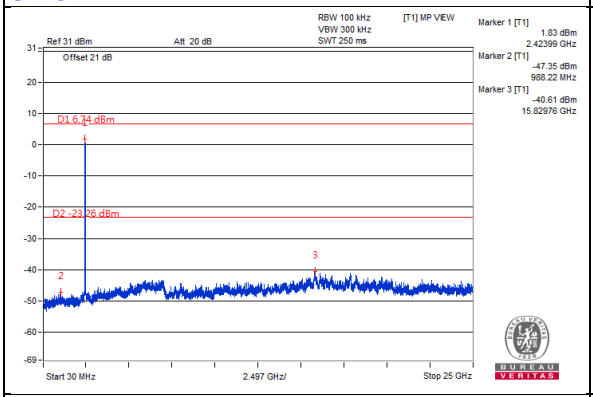


Chain 1

CH 3



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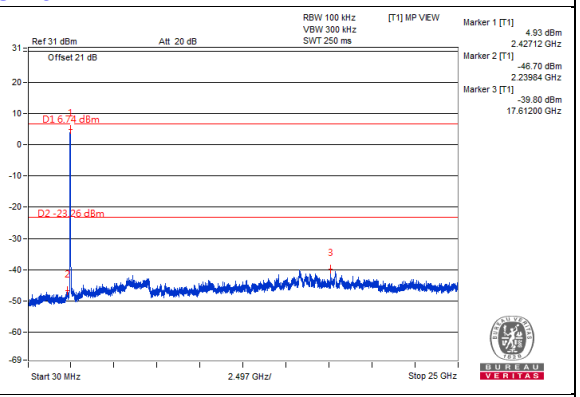

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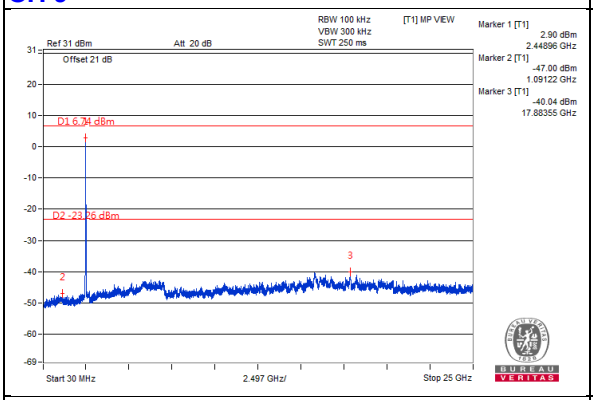

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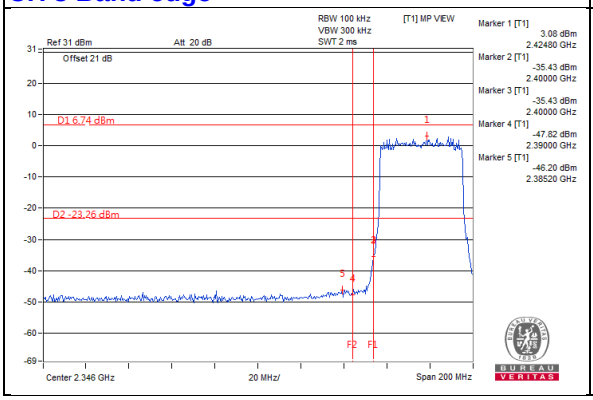

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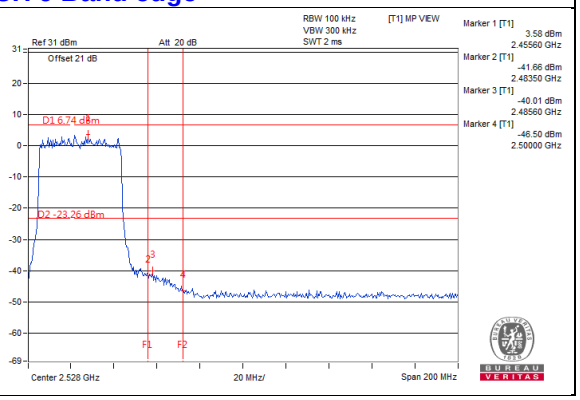
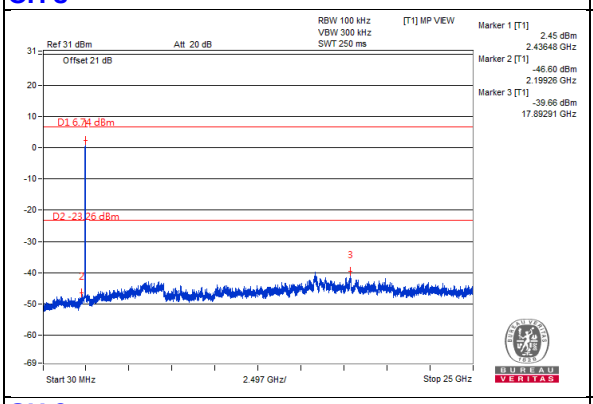


Chain 2

CH 3



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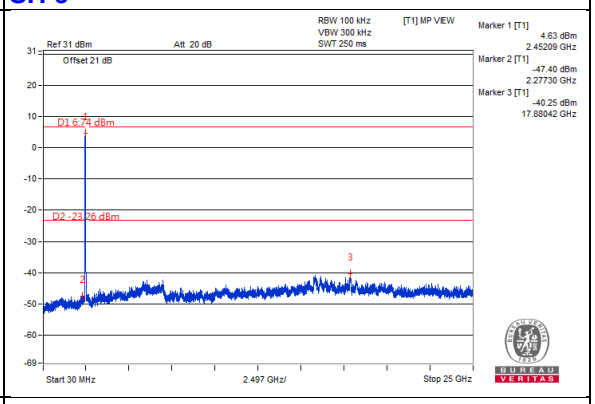

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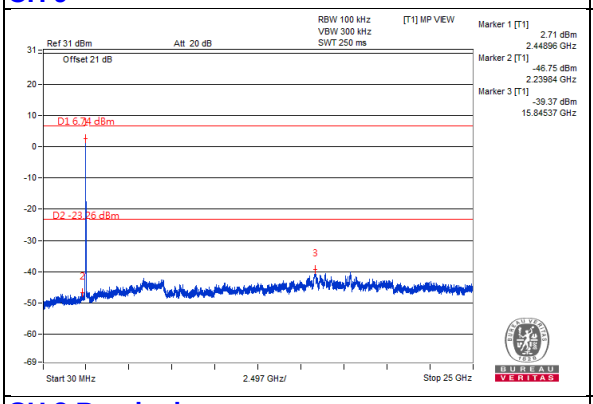

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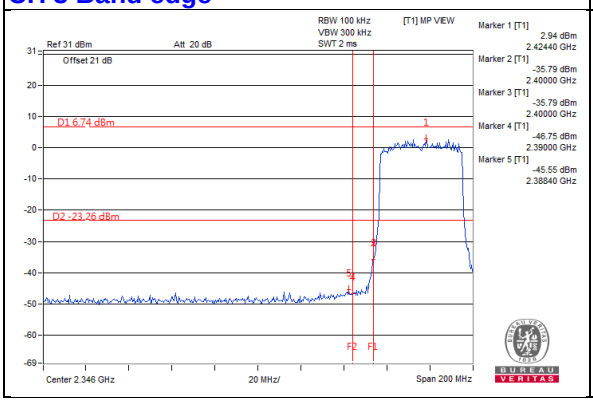

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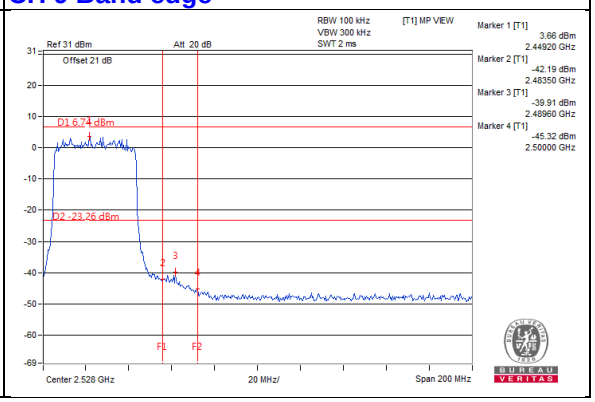
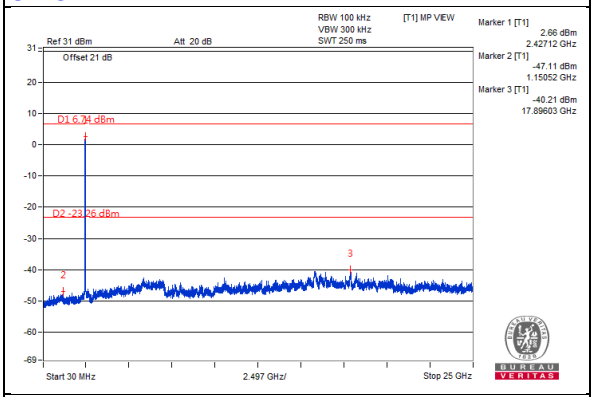


Chain 3

CH 3



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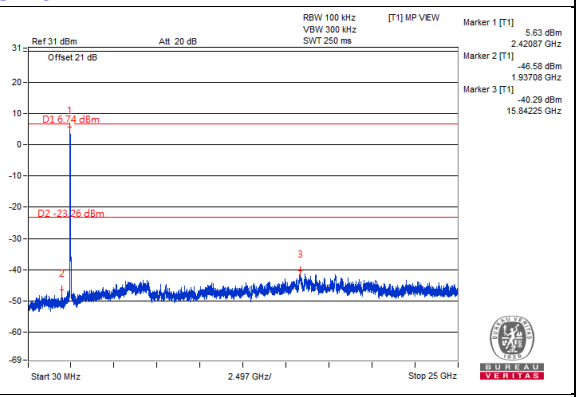

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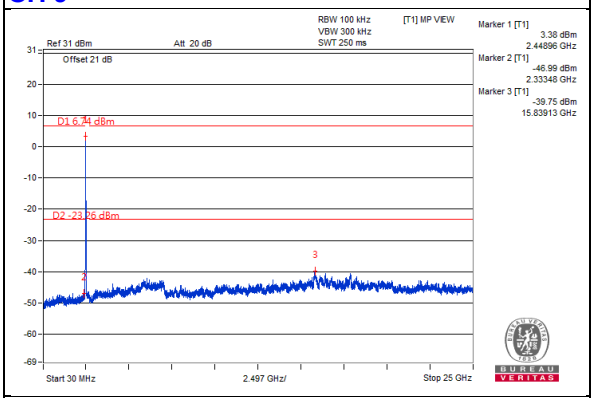

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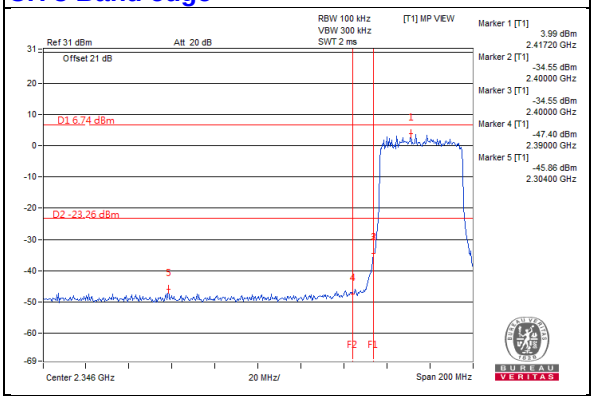

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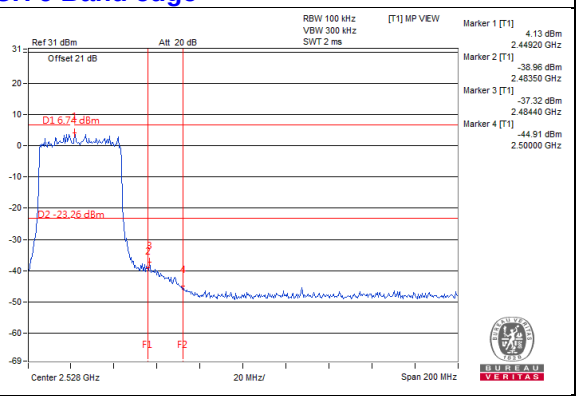

5 Pictures of Test Arrangements

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

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:

Lin Kou EMC/RF Lab
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
Tel: 886-3-6668565
Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab
Tel: 886-3-3183232
Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com
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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