

FCC Test Report

Report No.: RF190211C24 R1

FCC ID: A8J-EWS377AP

Test Model: EWS377AP

Series Model: ECW630 (Refer to item 3.1 for more details)

Received Date: Feb. 04, 2019

Test Date: Feb. 04 ~ Feb. 28, 2019

Issued Date: Apr. 02, 2019

Applicant: EnGenius Technologies

Address: 1580 Scenic Avenue, Costa Mesa, CA92626

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

Lab Address: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan, R.O.C.

Test Location: No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN (R.O.C.)

**FCC Registration /
Designation Number:** 788550 / TW0003



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Table of Contents

Release Control Record	4
1 Certificate of Conformity	5
2 Summary of Test Results	6
2.1 Measurement Uncertainty.....	6
2.2 Modification Record.....	6
3 General Information	7
3.1 General Description of EUT.....	7
3.2 Description of Test Modes.....	9
3.2.1 Test Mode Applicability and Tested Channel Detail.....	10
3.3 Duty Cycle of Test Signal.....	12
3.4 Description of Support Units.....	13
3.4.1 Configuration of System under Test.....	13
3.5 General Description of Applied Standards.....	14
4 Test Types and Results	15
4.1 Radiated Emission and Bandedge Measurement.....	15
4.1.1 Limits of Radiated Emission and Bandedge Measurement.....	15
4.1.2 Test Instruments.....	16
4.1.3 Test Procedures.....	17
4.1.4 Deviation from Test Standard.....	18
4.1.5 Test Set Up.....	18
4.1.6 EUT Operating Conditions.....	19
4.1.7 Test Results.....	20
4.2 Conducted Emission Measurement.....	36
4.2.1 Limits of Conducted Emission Measurement.....	36
4.2.2 Test Instruments.....	36
4.2.3 Test Procedures.....	37
4.2.4 Deviation from Test Standard.....	37
4.2.5 Test Setup.....	37
4.2.6 EUT Operating Conditions.....	37
4.2.7 Test Results.....	38
4.3 6dB Bandwidth Measurement.....	42
4.3.1 Limits of 6dB Bandwidth Measurement.....	42
4.3.2 Test Setup.....	42
4.3.3 Test Instruments.....	42
4.3.4 Test Procedure.....	42
4.3.5 Deviation from Test Standard.....	42
4.3.6 EUT Operating Conditions.....	42
4.3.7 Test Result.....	43
4.4 Conducted Output Power Measurement.....	46
4.4.1 Limits of Conducted Output Power Measurement.....	46
4.4.2 Test Setup.....	46
4.4.3 Test Instruments.....	46
4.4.4 Test Procedures.....	46
4.4.5 Deviation from Test Standard.....	46
4.4.6 EUT Operating Conditions.....	46
4.4.7 Test Results.....	47
4.5 Power Spectral Density Measurement.....	50
4.5.1 Limits of Power Spectral Density Measurement.....	50
4.5.2 Test Setup.....	50
4.5.3 Test Instruments.....	50
4.5.4 Test Procedure.....	50
4.5.5 Deviation from Test Standard.....	50
4.5.6 EUT Operating Condition.....	50

4.5.7 Test Results	51
4.6 Conducted Out of Band Emission Measurement.....	56
4.6.1 Limits of Conducted Out of Band Emission Measurement	56
4.6.2 Test Setup.....	56
4.6.3 Test Instruments	56
4.6.4 Test Procedure	56
4.6.5 Deviation from Test Standard	56
4.6.6 EUT Operating Condition	56
4.6.7 Test Results	56
5 Pictures of Test Arrangements.....	81
Appendix – Information of the Testing Laboratories	82

Release Control Record

Issue No.	Description	Date Issued
RF190211C24	Original release.	Mar. 18, 2019
RF190211C24 R1	Revised product name.	Apr. 02, 2019

1 Certificate of Conformity

Product: 802.11AX Indoor Ceiling Mount Access Point

Brand:

EnGenius[®]

Test Model: EWS377AP

Series Model: ECW630 (Refer to item 3.1 for more details)

Sample Status: Engineering sample

Applicant: EnGenius Technologies

Test Date: Feb. 04 ~ Feb. 28, 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 RF characteristics under the conditions specified in this report.

Prepared by : Pettie Chen , **Date:** Apr. 02, 2019
Pettie Chen / Senior Specialist

Approved by : Bruce Chen , **Date:** Apr. 02, 2019
Bruce Chen / Project Engineer

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 -6.34dB at 0.15000MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -1.1dB at 2390.00MHz.
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 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	2.94 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.04 dB
	30MHz ~ 200MHz	3.63 dB
	200MHz ~ 1000MHz	3.64 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.


3 General Information

3.1 General Description of EUT

Product	802.11AX Indoor Ceiling Mount Access Point
Brand	
Test Model	EWS377AP
Series Model	ECW630
Model Difference	Refer to Note for more details
Sample Status	Engineering sample
Power Supply Rating	12Vdc (adapter) 54Vdc (PoE)
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 1024QAM for OFDMA
Modulation Technology	DSSS, OFDM, OFDMA
Transfer Rate	802.11b: 11/5.5/2/1Mbps 802.11g: 54/48/36/24/18/12/9/6Mbps 802.11n: up to 600Mbps 802.11ax: up to 2400Mbps
Operating Frequency	2412~2462MHz
Number of Channel	802.11b, 802.11g, 802.11n (HT20), 802.11ax (HE20): 11 802.11n (HT40), 802.11ax (HE40): 7
Output Power	CDD Mode: 422.056mW Beamforming Mode: 97.368mW
Antenna Type	PIFA antenna with 3.1dBi gain
Antenna Connector	IPEX
Accessory Device	NA
Data Cable Supplied	NA

Note:

1. All models are listed as below.

Brand	Model	Difference
	EWS377AP	Marketing purposes
	ECW630	

2. The EUT incorporates a MIMO function. Physically, the EUT provides 4 completed transmitter and 4 receivers.

Band	Modulation Mode	CDD mode	Beamforming mode	TX Function
2.4GHz	802.11b	Support	Not Support	4TX
	802.11g	Support	Not Support	4TX
	802.11n(HT20)	Support	Support	4TX
	802.11n(HT40)	Support	Support	4TX
	802.11ax(HE20)	Support	Support	4TX
	802.11ax(HE40)	Support	Support	4TX
5GHz	802.11a	Support	Not Support	4TX
	802.11n(HT20)	Support	Support	4TX
	802.11n(HT40)	Support	Support	4TX
	802.11ac(VHT20)	Support	Support	4TX
	802.11ac(VHT40)	Support	Support	4TX
	802.11ac(VHT80)	Support	Support	4TX
	802.11ax(HE20)	Support	Support	4TX
	802.11ax(HE40)	Support	Support	4TX
	802.11ax(HE80)	Support	Support	4TX

* The bandwidth and modulation are similar for HT20/HT40 on 802.11n mode and HE20/HE40 on 802.11ax mode. Therefore the investigated worst case is the representative mode in test report. (Final test mode refer section 3.2.1)

* CDD mode and Beamforming mode are presented in output power test item. For other test items, CDD mode is the worst case for final tests after pretesting.

* 802.11ax mode only support full resource unit size.

3. The EUT consumes power from the following adapter and PoE. (Support unit only)

Adapter (Support unit)	
Brand	DVE
Model	DSA-24PFD-15
Input Power	100-240Vac~50/60Hz, 0.8A
Output Power	+12Vdc / 2A
Power Cord	1.5m power cable without core attached on adapter

PoE(Support unit)	
Brand	EnGenius
Model	EPA5006GP
Input Power	100-240Vac~0.8A, 50-60Hz
Output Power	54Vdc / 0.6A PIN 4,5:54V PIN 7,8:RETURN

4. 2.4GHz and 5GHz technologies can transmit at same time.

5. Spurious emission of the simultaneous operation (2.4GHz and 5GHz) has been evaluated and no non-compliance was found.

3.2 Description of Test Modes

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

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

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

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

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to				Description
	RE \geq 1G	RE<1G	PLC	APCM	
A	√	√	√	√	Power from adapter
B	-	√	√	-	Power from PoE

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

Note:

- The antenna had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on Z-plane for internal antenna.
- “-” means no effect.

Radiated Emission Test (Above 1GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)	Remark
A	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0	-
	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0	-
	802.11ax (HE20)	1 to 11	1, 6, 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.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)	Remark
A, B	802.11b	1 to 11	6,	DSSS	DBPSK	1.0	-

Power Line Conducted Emission Test:

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)	Remark
A, B	802.11b	1 to 11	6,	DSSS	DBPSK	1.0	-

Antenna Port Conducted Measurement:

- This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)	Remark
A	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0	-
	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0	-
	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	MCS0	-
	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	MCS0	-
	802.11ax (HE20)	1 to 11	1, 6, 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 \geq 1G	25deg. C, 65%RH	120Vac, 60Hz	Willy Cheng
RE<1G	22deg. C, 66%RH	120Vac, 60Hz	Adair Peng
PLC	22deg. C, 66%RH	120Vac, 60Hz	Willy Cheng
APCM	25deg. C, 60%RH	120Vac, 60Hz	Chris Lin

3.3 Duty Cycle of Test Signal

Duty cycle of test signal is $\geq 98\%$, duty factor is not required.

Duty cycle of test signal is $< 98\%$, duty factor is required.

802.11b: Duty cycle = $0.657/0.864 = 0.760$, Duty factor = $10 * \log(1/0.760) = 1.19$

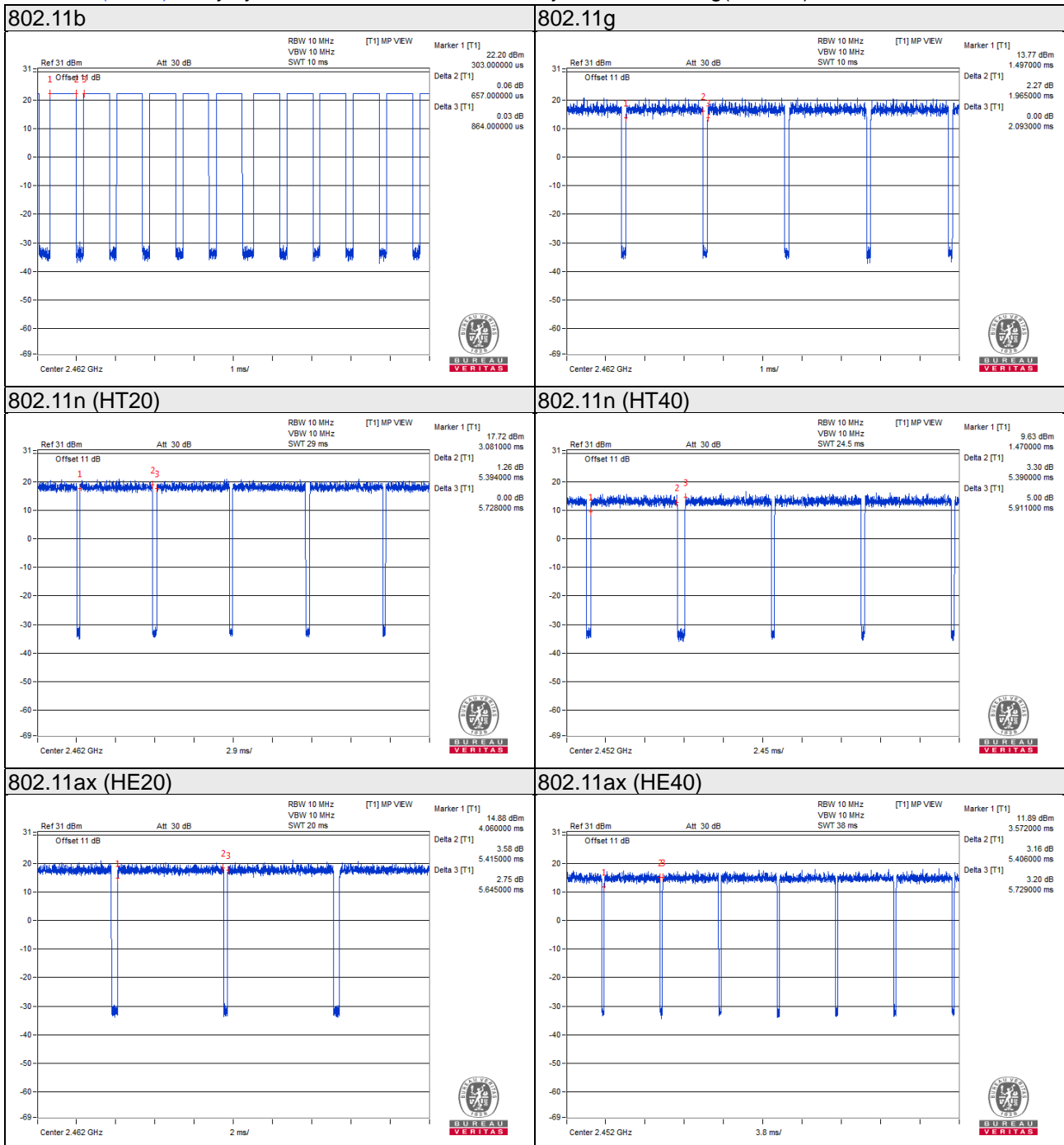
802.11g: Duty cycle = $1.965/2.093 = 0.939$, Duty factor = $10 * \log(1/0.939) = 0.27$

802.11n (HT20): Duty cycle = $5.394/5.728 = 0.942$, Duty factor = $10 * \log(1/0.942) = 0.26$

802.11n (HT40): Duty cycle = $5.390/5.911 = 0.912$, Duty factor = $10 * \log(1/0.912) = 0.40$

802.11ax (HE20): Duty cycle = $5.415/5.645 = 0.959$, Duty factor = $10 * \log(1/0.959) = 0.18$

802.11ax (HE40): Duty cycle = $5.406/5.729 = 0.944$, Duty factor = $10 * \log(1/0.944) = 0.25$



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.	Notebook	Lenovo	20J4 MD A003TW	PF-11H9AK	FCC DoC Approved	-
B.	Adapter	DVE	DSA-24PFD-15	NA	NA	Provided by client
C.	PoE	EnGenius	EPA5006GP	NA	NA	Provided by client

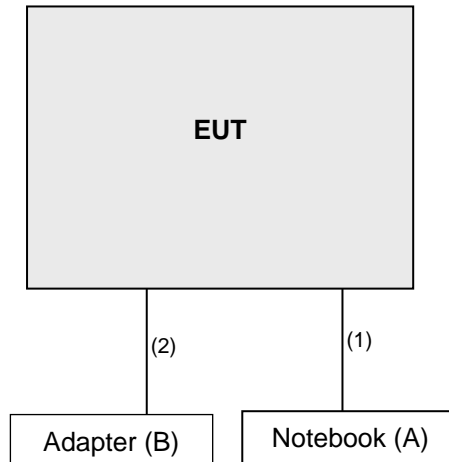
Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item A acted as a communication partner to transfer data.

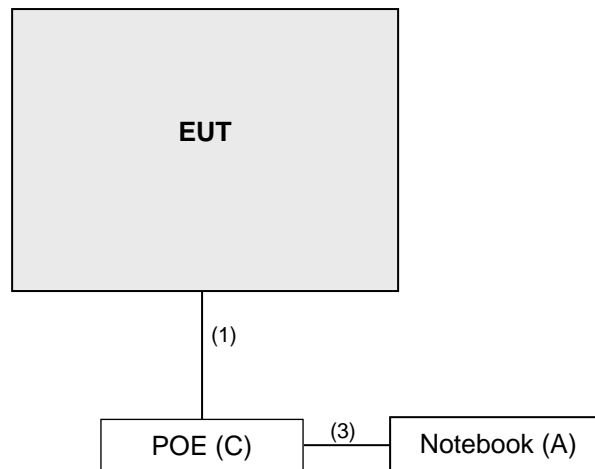
ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ45, Cat5e	1	6.0	N	0	-
2.	Power cord	1	1.5	N	0	Provided by client
3.	RJ45, Cat5e	1	1.0	N	0	-

3.4.1 Configuration of System under Test

Mode A



Mode B



3.5 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 DTS Meas Guidance v05r01
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 20dB below the highest level of the desired power:

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

Note:

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

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESIB7	100187	May 29, 2018	May 28, 2019
BILOG Antenna SCHWARZBECK	VULB9168	9168-171	Nov. 22, 2018	Nov. 21, 2019
HORN Antenna SCHWARZBECK	9120D	209	Nov. 25, 2018	Nov. 24, 2019
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Nov. 25, 2018	Nov. 24, 2019
Loop Antenna EMCI	EM-6879	269	Sep. 07, 2018	Sep. 06, 2019
Preamplifier Agilent (Below 1GHz)	8447D	2944A10738	Aug. 21, 2018	Aug. 20, 2019
Preamplifier Agilent (Above 1GHz)	8449B	3008A02465	Apr. 03, 2018	Apr. 02, 2019
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH3-03 (223653/4)	Aug. 21, 2018	Aug. 20, 2019
RF signal cable HUBER+SUHNER& EMCI	SUCOFLEX 104&EMC104-SM-S M-8000	Cable-CH3-03 (309224+170907)	Aug. 21, 2018	Aug. 20, 2019
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021702	NA	NA
Turn Table BV ADT	TT100	TT93021702	NA	NA
Turn Table Controller BV ADT	SC100	SC93021702	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
USB Wideband Power Sensor KEYSIGHT	U2021XA	MY55050005/MY5519000 4/MY55190007/MY55210 005	Jul. 17, 2018	Jul. 16, 2019

- 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 HwaYa Chamber 3.
3. The horn antenna and preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Designation Number is TW0003. The number will be varied with the Lab location and scope as attached.
5. The IC Site Registration No. is 7450F-3.

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 detect 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:

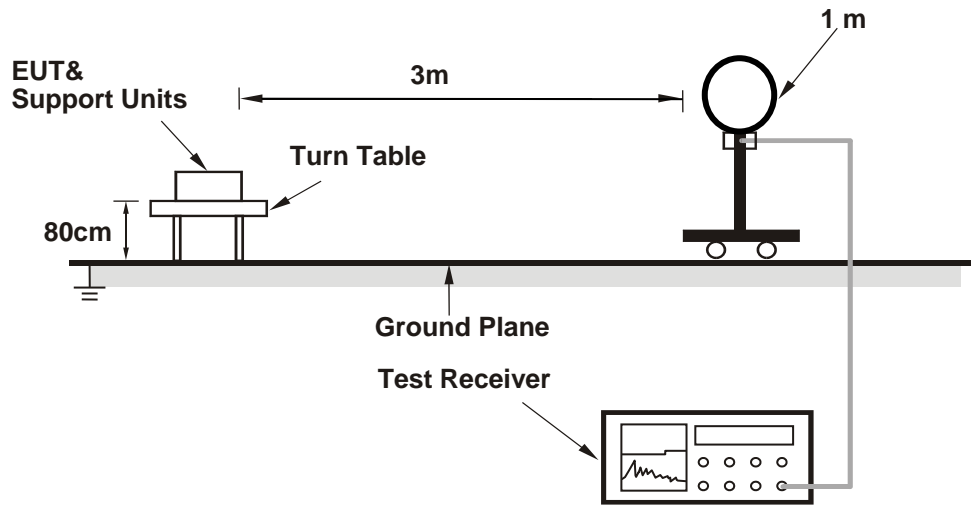
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

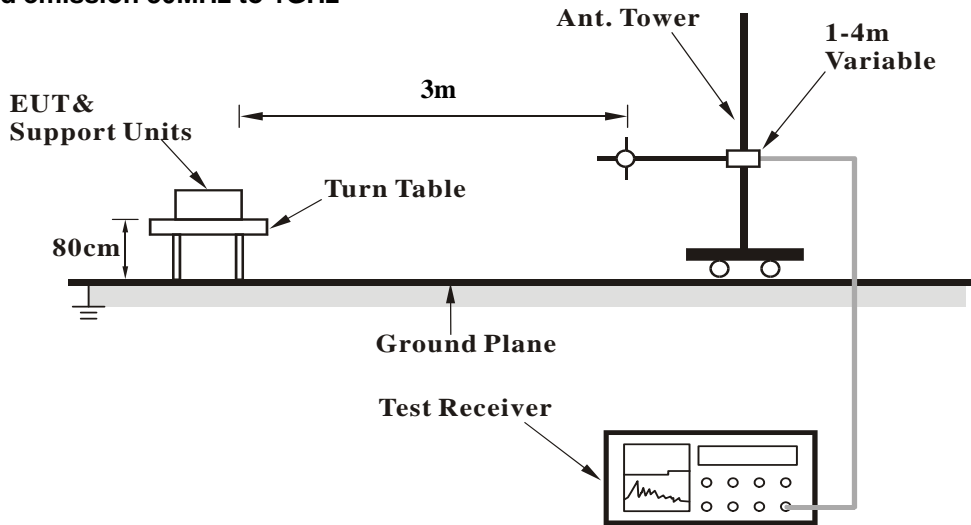
No deviation.

4.1.5 Test Set Up

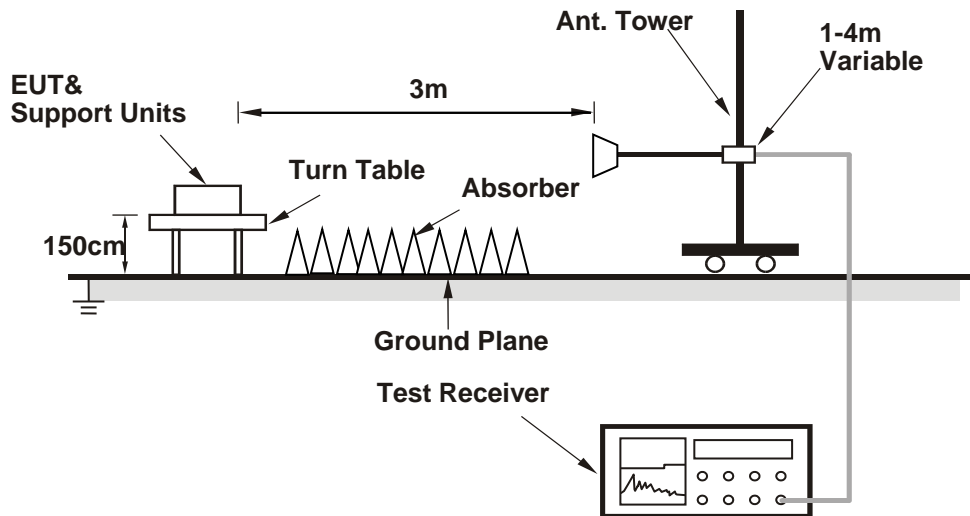
For Radiated emission below 30MHz



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

- Placed the EUT on the testing table.
- Prepared a notebook to act as a communication partner and placed it outside of testing area.
- The communication partner connected with EUT via a RJ45 cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
- The necessary accessories enable the system in full functions.

4.1.7 Test Results

Above 1GHz worst-case data:

802.11b

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

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	61.2 PK	74.0	-12.8	1.38 H	3	28.3	32.9
2	2390.00	52.1 AV	54.0	-1.9	1.38 H	3	19.2	32.9
3	*2412.00	117.2 PK			1.17 H	6	84.3	32.9
4	*2412.00	114.1 AV			1.17 H	6	81.2	32.9
5	4824.00	48.4 PK	74.0	-25.6	1.96 H	238	44.6	3.8
6	4824.00	34.4 AV	54.0	-19.6	1.96 H	238	30.6	3.8
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	60.5 PK	74.0	-13.5	1.73 V	256	27.6	32.9
2	2390.00	49.8 AV	54.0	-4.2	1.73 V	256	16.9	32.9
3	*2412.00	114.1 PK			2.03 V	287	81.2	32.9
4	*2412.00	111.0 AV			2.03 V	287	78.1	32.9
5	4824.00	47.2 PK	74.0	-26.8	1.95 V	34	43.4	3.8
6	4824.00	35.1 AV	54.0	-18.9	1.95 V	34	31.3	3.8

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

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

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	*2437.00	116.9 PK			1.00 H	5	84.0	32.9
2	*2437.00	113.7 AV			1.00 H	5	80.8	32.9
3	4874.00	47.6 PK	74.0	-26.4	1.05 H	5	44.0	3.6
4	4874.00	35.8 AV	54.0	-18.2	1.05 H	5	32.2	3.6

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	*2437.00	113.8 PK			1.49 V	336	80.9	32.9
2	*2437.00	110.6 AV			1.49 V	336	77.7	32.9
3	4874.00	47.0 PK	74.0	-27.0	2.49 V	73	43.4	3.6
4	4874.00	34.5 AV	54.0	-19.5	2.49 V	73	30.9	3.6

Remarks:

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

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

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	117.1 PK			1.40 H	2	84.2	32.9
2	*2462.00	113.9 AV			1.40 H	2	81.0	32.9
3	2483.50	61.7 PK	74.0	-12.3	1.41 H	1	28.7	33.0
4	2483.50	50.2 AV	54.0	-3.8	1.41 H	1	17.2	33.0
5	4924.00	47.5 PK	74.0	-26.5	1.38 H	24	44.0	3.5
6	4924.00	37.6 AV	54.0	-16.4	1.38 H	24	34.1	3.5

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	114.5 PK			1.42 V	48	81.6	32.9
2	*2462.00	111.4 AV			1.42 V	48	78.5	32.9
3	2483.50	60.5 PK	74.0	-13.5	1.66 V	73	27.5	33.0
4	2483.50	49.4 AV	54.0	-4.6	1.66 V	73	16.4	33.0
5	4924.00	47.5 PK	74.0	-26.5	1.44 V	322	44.0	3.5
6	4924.00	35.1 AV	54.0	-18.9	1.44 V	322	31.6	3.5

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

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

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	72.6 PK	74.0	-1.4	1.88 H	328	39.7	32.9
2	2390.00	50.7 AV	54.0	-3.3	1.88 H	328	17.8	32.9
3	*2412.00	114.4 PK			2.02 H	348	81.5	32.9
4	*2412.00	104.6 AV			2.02 H	348	71.7	32.9
5	4824.00	46.4 PK	74.0	-27.6	2.39 H	146	42.6	3.8
6	4824.00	32.7 AV	54.0	-21.3	2.39 H	146	28.9	3.8

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	67.6 PK	74.0	-6.4	1.63 V	349	34.7	32.9
2	2390.00	49.8 AV	54.0	-4.2	1.63 V	349	16.9	32.9
3	*2412.00	110.3 PK			1.47 V	324	77.4	32.9
4	*2412.00	100.6 AV			1.47 V	324	67.7	32.9
5	4824.00	46.8 PK	74.0	-27.2	2.36 V	243	43.0	3.8
6	4824.00	33.1 AV	54.0	-20.9	2.36 V	243	29.3	3.8

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

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

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	72.6 PK	74.0	-1.4	1.34 H	288	39.7	32.9
2	2390.00	51.9 AV	54.0	-2.1	1.34 H	288	19.0	32.9
3	*2437.00	118.4 PK			2.58 H	291	85.5	32.9
4	*2437.00	108.3 AV			2.58 H	291	75.4	32.9
5	4874.00	47.7 PK	74.0	-26.3	1.63 H	155	44.1	3.6
6	4874.00	33.6 AV	54.0	-20.4	1.63 H	155	30.0	3.6

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	63.5 PK	74.0	-10.5	1.99 V	305	30.6	32.9
2	2390.00	48.7 AV	54.0	-5.3	1.99 V	305	15.8	32.9
3	*2437.00	115.4 PK			2.12 V	341	82.5	32.9
4	*2437.00	105.4 AV			2.12 V	341	72.5	32.9
5	4874.00	47.0 PK	74.0	-27.0	2.26 V	192	43.4	3.6
6	4874.00	33.6 AV	54.0	-20.4	2.26 V	192	30.0	3.6

Remarks:

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

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

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	112.2 PK			2.16 H	348	79.3	32.9
2	*2462.00	102.0 AV			2.16 H	348	69.1	32.9
3	2483.50	72.3 PK	74.0	-1.7	2.06 H	291	39.3	33.0
4	2483.50	51.1 AV	54.0	-2.9	2.06 H	291	18.1	33.0
5	4924.00	47.7 PK	74.0	-26.3	1.83 H	136	44.2	3.5
6	4924.00	34.2 AV	54.0	-19.8	1.83 H	136	30.7	3.5

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	109.9 PK			1.43 V	318	77.0	32.9
2	*2462.00	99.9 AV			1.43 V	318	67.0	32.9
3	2483.50	62.2 PK	74.0	-11.8	1.63 V	347	29.2	33.0
4	2483.50	48.3 AV	54.0	-5.7	1.63 V	347	15.3	33.0
5	4924.00	47.4 PK	74.0	-26.6	2.28 V	237	43.9	3.5
6	4924.00	33.9 AV	54.0	-20.1	2.28 V	237	30.4	3.5

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

802.11ax (HE20)

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

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	68.9 PK	74.0	-5.1	1.47 H	339	36.0	32.9
2	2390.00	52.9 AV	54.0	-1.1	1.47 H	339	20.0	32.9
3	*2412.00	118.0 PK			1.26 H	290	85.1	32.9
4	*2412.00	104.7 AV			1.26 H	290	71.8	32.9
5	4824.00	46.0 PK	74.0	-28.0	2.55 H	156	42.2	3.8
6	4824.00	32.9 AV	54.0	-21.1	2.55 H	156	29.1	3.8
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	63.3 PK	74.0	-10.7	1.69 V	55	30.4	32.9
2	2390.00	49.9 AV	54.0	-4.1	1.69 V	55	17.0	32.9
3	*2412.00	115.4 PK			1.99 V	49	82.5	32.9
4	*2412.00	102.5 AV			1.99 V	49	69.6	32.9
5	4824.00	46.6 PK	74.0	-27.4	1.96 V	187	42.8	3.8
6	4824.00	33.4 AV	54.0	-20.6	1.96 V	187	29.6	3.8

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

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

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	*2437.00	121.3 PK			2.05 H	349	88.4	32.9
2	*2437.00	108.3 AV			2.05 H	349	75.4	32.9
3	2483.50	68.4 PK	74.0	-5.6	2.12 H	289	35.4	33.0
4	2483.50	51.8 AV	54.0	-2.2	2.12 H	289	18.8	33.0
5	4874.00	47.1 PK	74.0	-26.9	2.33 H	164	43.5	3.6
6	4874.00	33.5 AV	54.0	-20.5	2.33 H	164	29.9	3.6

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	*2437.00	117.3 PK			1.67 V	324	84.4	32.9
2	*2437.00	104.3 AV			1.67 V	324	71.4	32.9
3	2483.50	62.8 PK	74.0	-11.2	1.53 V	336	29.8	33.0
4	2483.50	49.2 AV	54.0	-4.8	1.53 V	336	16.2	33.0
5	4874.00	47.7 PK	74.0	-26.3	2.63 V	192	44.1	3.6
6	4874.00	34.1 AV	54.0	-19.9	2.63 V	192	30.5	3.6

Remarks:

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

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

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	116.1 PK			1.77 H	347	83.2	32.9
2	*2462.00	102.3 AV			1.77 H	347	69.4	32.9
3	2483.50	67.8 PK	74.0	-6.2	2.06 H	288	34.8	33.0
4	2483.50	52.6 AV	54.0	-1.4	2.06 H	288	19.6	33.0
5	4924.00	47.8 PK	74.0	-26.2	2.13 H	179	44.3	3.5
6	4924.00	34.1 AV	54.0	-19.9	2.13 H	179	30.6	3.5

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	113.1 PK			1.60 V	324	80.2	32.9
2	*2462.00	100.0 AV			1.60 V	324	67.1	32.9
3	2483.50	60.5 PK	74.0	-13.5	1.82 V	335	27.5	33.0
4	2483.50	48.9 AV	54.0	-5.1	1.82 V	335	15.9	33.0
5	4924.00	47.4 PK	74.0	-26.6	2.38 V	206	43.9	3.5
6	4924.00	34.1 AV	54.0	-19.9	2.38 V	206	30.6	3.5

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

802.11ax (HE40)

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

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	69.8 PK	74.0	-4.2	1.63 H	42	36.9	32.9
2	2390.00	52.2 AV	54.0	-1.8	1.63 H	42	19.3	32.9
3	*2422.00	115.9 PK			2.31 H	36	83.1	32.8
4	*2422.00	102.6 AV			2.31 H	36	69.8	32.8
5	4844.00	47.7 PK	74.0	-26.3	1.89 H	236	44.0	3.7
6	4844.00	33.6 AV	54.0	-20.4	1.89 H	236	29.9	3.7

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	65.7 PK	74.0	-8.3	1.60 V	343	32.8	32.9
2	2390.00	49.1 AV	54.0	-4.9	1.60 V	343	16.2	32.9
3	*2422.00	110.1 PK			1.48 V	325	77.3	32.8
4	*2422.00	97.7 AV			1.48 V	325	64.9	32.8
5	4844.00	47.3 PK	74.0	-26.7	2.96 V	79	43.6	3.7
6	4844.00	33.8 AV	54.0	-20.2	2.96 V	79	30.1	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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

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

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	69.2 PK	74.0	-4.8	2.45 H	42	36.3	32.9
2	2390.00	52.3 AV	54.0	-1.7	2.45 H	42	19.4	32.9
3	*2437.00	114.6 PK			2.42 H	294	81.7	32.9
4	*2437.00	101.7 AV			2.42 H	294	68.8	32.9
5	4874.00	47.2 PK	74.0	-26.8	1.73 H	199	43.6	3.6
6	4874.00	33.8 AV	54.0	-20.2	1.73 H	199	30.2	3.6

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	65.3 PK	74.0	-8.7	1.54 V	348	32.4	32.9
2	2390.00	49.5 AV	54.0	-4.5	1.54 V	348	16.6	32.9
3	*2437.00	112.0 PK			1.61 V	326	79.1	32.9
4	*2437.00	98.9 AV			1.61 V	326	66.0	32.9
5	4874.00	47.6 PK	74.0	-26.4	2.56 V	113	44.0	3.6
6	4874.00	34.2 AV	54.0	-19.8	2.56 V	113	30.6	3.6

Remarks:

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

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

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	112.4 PK			1.15 H	294	79.5	32.9
2	*2452.00	100.1 AV			1.15 H	294	67.2	32.9
3	2483.50	68.4 PK	74.0	-5.6	1.05 H	291	35.4	33.0
4	2483.50	52.4 AV	54.0	-1.6	1.05 H	291	19.4	33.0
5	4904.00	46.8 PK	74.0	-27.2	2.38 H	212	43.3	3.5
6	4904.00	33.7 AV	54.0	-20.3	2.38 H	212	30.2	3.5

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	109.4 PK			2.02 V	331	76.5	32.9
2	*2452.00	96.7 AV			2.02 V	331	63.8	32.9
3	2483.50	65.6 PK	74.0	-8.4	1.94 V	289	32.6	33.0
4	2483.50	49.0 AV	54.0	-5.0	1.94 V	289	16.0	33.0
5	4904.00	47.2 PK	74.0	-26.8	2.33 V	155	43.7	3.5
6	4904.00	33.6 AV	54.0	-20.4	2.33 V	155	30.1	3.5

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

Below 1GHz worst-case data:

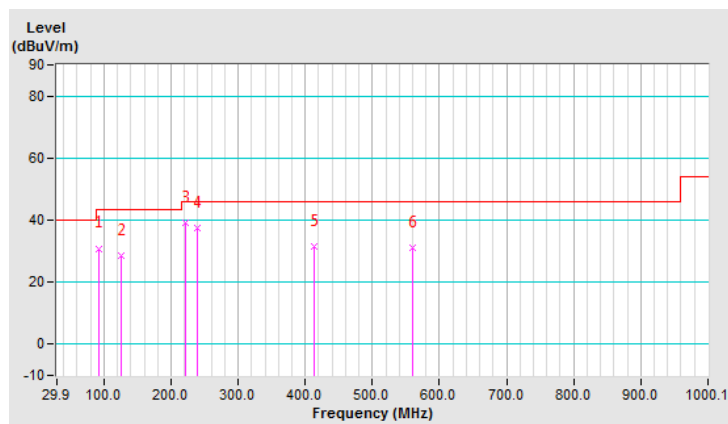
802.11b

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

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	92.12	30.9 QP	43.5	-12.6	2.00 H	79	45.3	-14.4
2	125.17	28.4 QP	43.5	-15.1	2.00 H	56	39.4	-11.0
3	222.38	39.1 QP	46.0	-6.9	1.00 H	96	49.7	-10.6
4	239.88	37.5 QP	46.0	-8.5	1.51 H	87	47.1	-9.6
5	412.92	31.4 QP	46.0	-14.6	1.00 H	142	36.7	-5.3
6	560.69	31.1 QP	46.0	-14.9	1.00 H	13	33.6	-2.5

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.

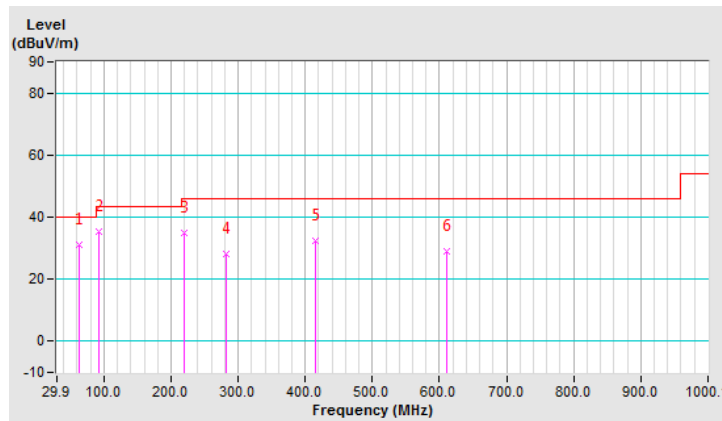


CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz	TEST MODE	A

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	62.95	31.3 QP	40.0	-8.7	1.00 V	17	41.6	-10.3
2	92.12	35.3 QP	43.5	-8.2	1.00 V	115	49.7	-14.4
3	220.44	34.8 QP	46.0	-11.2	1.00 V	5	45.4	-10.6
4	282.66	28.3 QP	46.0	-17.7	1.00 V	197	36.1	-7.8
5	414.87	32.2 QP	46.0	-13.8	1.00 V	187	37.5	-5.3
6	611.24	28.9 QP	46.0	-17.1	1.99 V	3	29.9	-1.0

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.

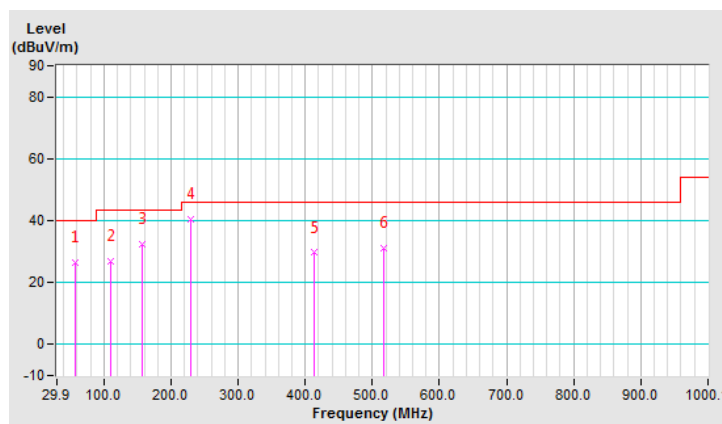


CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz	TEST MODE	B

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	57.12	26.3 QP	40.0	-13.7	2.00 H	117	36.4	-10.1
2	109.62	26.9 QP	43.5	-16.6	1.49 H	250	39.4	-12.5
3	156.28	32.4 QP	43.5	-11.1	1.00 H	248	41.5	-9.1
4	230.16	40.5 QP	46.0	-5.5	1.49 H	56	50.9	-10.4
5	412.92	29.6 QP	46.0	-16.4	1.49 H	150	34.9	-5.3
6	517.92	31.3 QP	46.0	-14.7	2.00 H	3	34.6	-3.3

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 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.

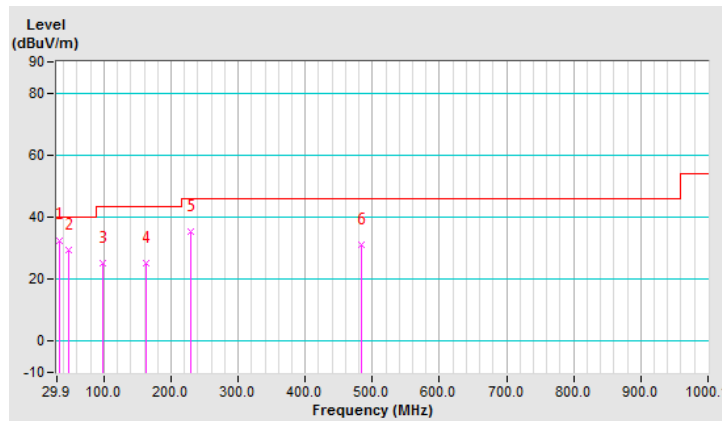


CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz	TEST MODE	B

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	33.79	32.6 QP	40.0	-7.4	1.51 V	188	43.8	-11.2
2	47.40	29.2 QP	40.0	-10.8	1.00 V	304	38.9	-9.7
3	97.95	25.1 QP	43.5	-18.4	1.00 V	272	39.1	-14.0
4	162.11	25.2 QP	43.5	-18.3	1.00 V	177	34.2	-9.0
5	230.16	35.5 QP	46.0	-10.5	1.00 V	172	45.9	-10.4
6	482.92	31.0 QP	46.0	-15.0	1.00 V	195	35.0	-4.0

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.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCS 30	100288	Jan. 03, 2019	Jan. 02, 2020
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond1-01	Sep. 05, 2018	Sep. 04, 2019
LISN ROHDE & SCHWARZ (EUT)	ENV216	101826	Feb. 26, 2018	Feb. 25, 2019
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 19, 2018	Aug. 18, 2019
Software ADT	BV ADT_Cond_ V7.3.7.4	NA	NA	NA

- Note:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The test was performed in HwaYa Shielded Room 1.
 3. The VCCI Site Registration No. is C-12040.
 4. Test date: Feb. 15, 2019

4.2.3 Test Procedures

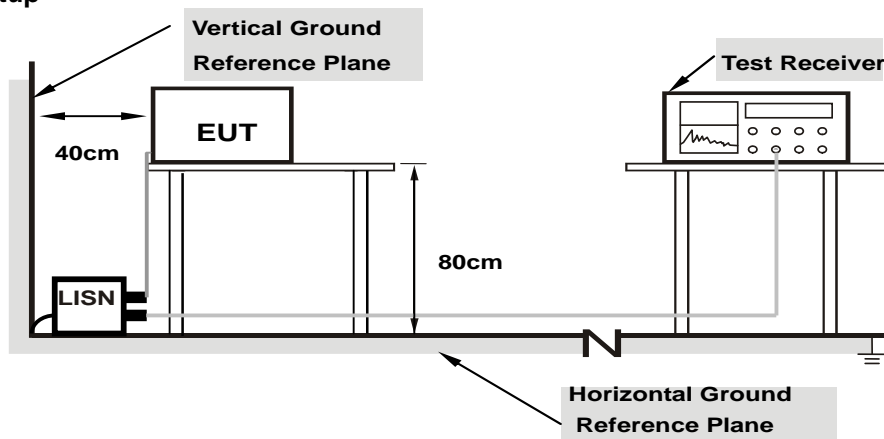
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

Note: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



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

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

4.2.6 EUT Operating Conditions

Same as item 4.3.6.

4.2.7 Test Results

Worst-case data:

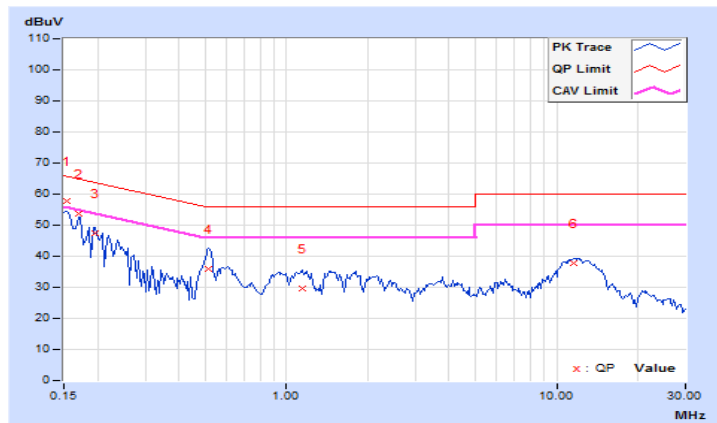
802.11b

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

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.15391	9.73	48.13	30.30	57.86	40.03	65.79
2	0.16953	9.73	44.12	25.19	53.85	34.92	64.98	54.98	-11.13	-20.06
3	0.19687	9.72	37.53	20.18	47.25	29.90	63.74	53.74	-16.49	-23.84
4	0.51719	9.74	26.17	19.16	35.91	28.90	56.00	46.00	-20.09	-17.10
5	1.14063	9.69	19.98	14.85	29.67	24.54	56.00	46.00	-26.33	-21.46
6	11.60547	9.89	27.85	22.70	37.74	32.59	60.00	50.00	-22.26	-17.41

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.

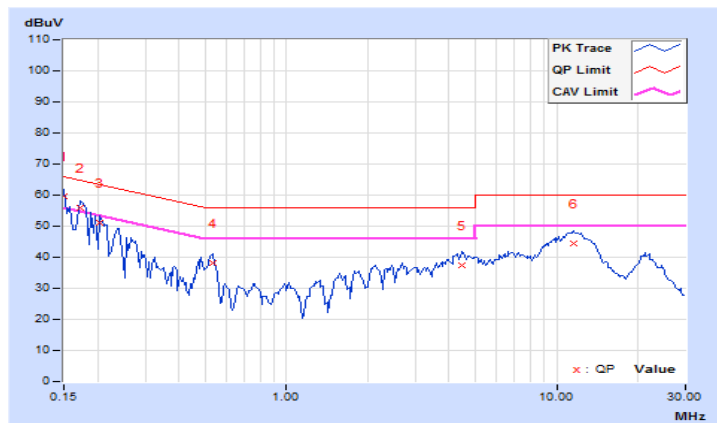


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	A		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.15000	9.72	49.94	37.35	59.66	47.07	66.00
2	0.17344	9.72	46.09	33.06	55.81	42.78	64.79	54.79	-8.98	-12.01
3	0.20469	9.73	41.25	29.51	50.98	39.24	63.42	53.42	-12.44	-14.18
4	0.53672	9.74	28.33	21.34	38.07	31.08	56.00	46.00	-17.93	-14.92
5	4.47656	9.82	27.54	20.37	37.36	30.19	56.00	46.00	-18.64	-15.81
6	11.55469	9.94	34.44	28.90	44.38	38.84	60.00	50.00	-15.62	-11.16

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.

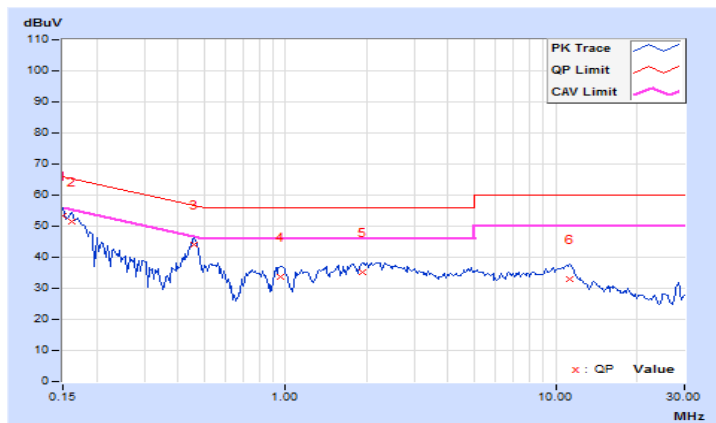


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.15000	9.73	43.46	30.65	53.19	40.38	66.00
2	0.16172	9.73	41.86	28.30	51.59	38.03	65.38	55.38	-13.79	-17.35
3	0.45859	9.74	34.18	29.42	43.92	39.16	56.72	46.72	-12.80	-7.56
4	0.96250	9.68	23.93	20.86	33.61	30.54	56.00	46.00	-22.39	-15.46
5	1.92969	9.74	25.60	20.80	35.34	30.54	56.00	46.00	-20.66	-15.46
6	11.31641	9.89	23.11	18.59	33.00	28.48	60.00	50.00	-27.00	-21.52

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.

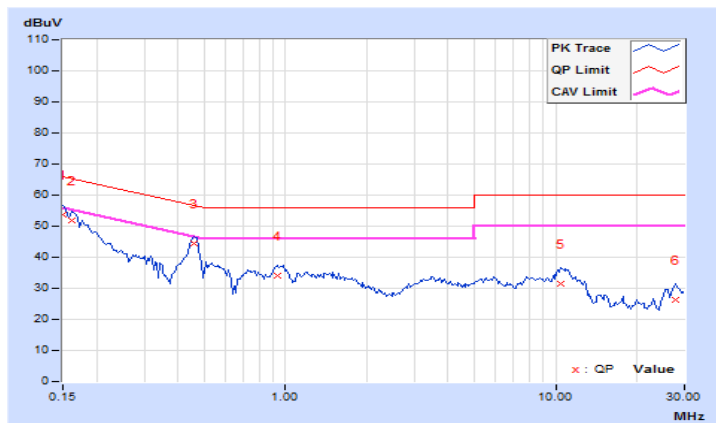


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.15000	9.72	43.86	30.73	53.58	40.45	66.00
2	0.16172	9.72	42.15	28.50	51.87	38.22	65.38	55.38	-13.51	-17.16
3	0.45859	9.75	34.61	29.96	44.36	39.71	56.72	46.72	-12.36	-7.01
4	0.93906	9.72	24.49	19.13	34.21	28.85	56.00	46.00	-21.79	-17.15
5	10.46875	9.92	21.50	16.62	31.42	26.54	60.00	50.00	-28.58	-23.46
6	27.78906	10.11	16.04	10.02	26.15	20.13	60.00	50.00	-33.85	-29.87

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.

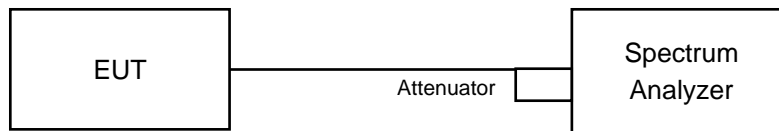


4.3 6dB Bandwidth Measurement

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) $\geq 3 \times$ 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	7.09	7.54	8.03	7.99	0.5	Pass
6	2437	8.06	8.10	8.07	8.07	0.5	Pass
11	2462	8.09	7.59	8.08	8.08	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	16.39	16.42	16.43	16.41	0.5	Pass
6	2437	16.39	16.42	16.38	16.38	0.5	Pass
11	2462	16.41	16.43	16.40	16.41	0.5	Pass

802.11n (HT20)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
1	2412	16.97	18.99	18.94	18.74	0.5	Pass
6	2437	16.75	18.98	18.86	18.98	0.5	Pass
11	2462	17.33	19.00	18.94	18.90	0.5	Pass

802.11n (HT40)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
3	2422	35.49	35.94	35.89	36.06	0.5	Pass
6	2437	35.76	35.57	35.82	36.14	0.5	Pass
9	2452	35.50	35.40	35.05	36.43	0.5	Pass

802.11ax (HE20)

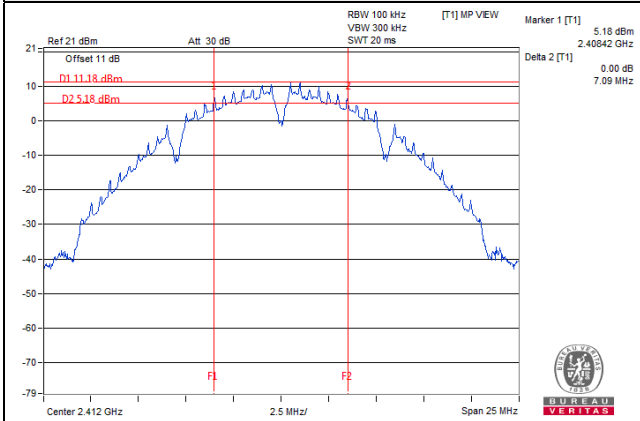
Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
1	2412	17.16	17.60	17.58	17.59	0.5	Pass
6	2437	16.95	17.62	17.19	17.59	0.5	Pass
11	2462	17.32	17.66	17.21	17.62	0.5	Pass

802.11ax (HE40)

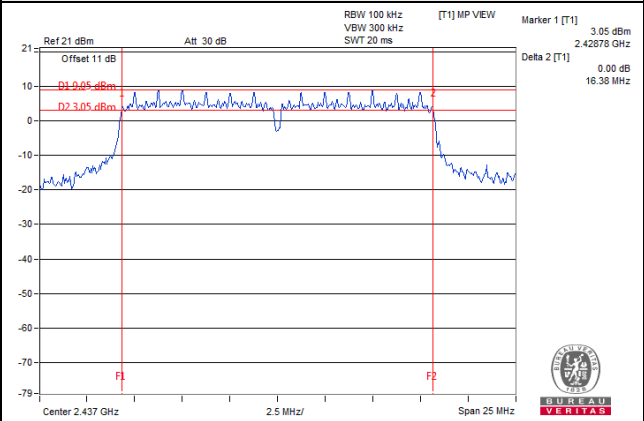
Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
3	2422	37.35	37.83	37.56	37.88	0.5	Pass
6	2437	37.53	37.97	38.00	37.97	0.5	Pass
9	2452	37.51	37.90	38.03	37.92	0.5	Pass

Spectrum Plot of Worst Value

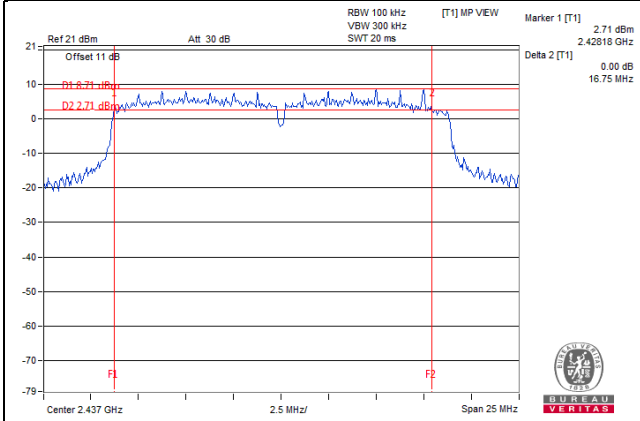
802.11b



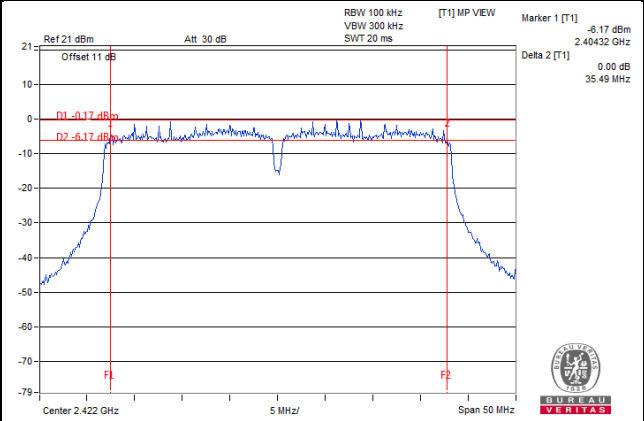
802.11g



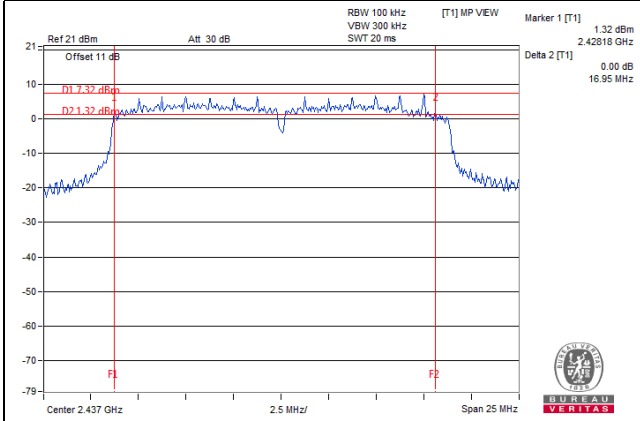
802.11n (HT20)



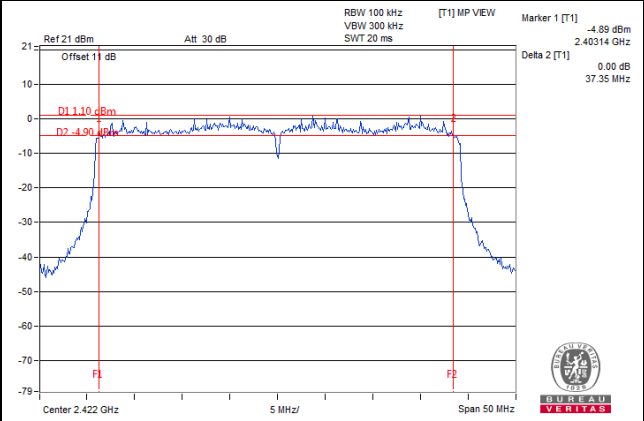
802.11n (HT40)



802.11ax (HE20)



802.11ax (HE40)



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,

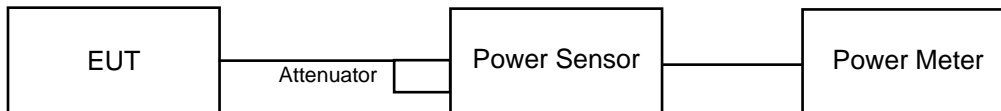
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

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

CDD 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	20.21	20.48	20.21	20.02	422.056	26.25	30	Pass
6	2437	20.13	20.21	20.04	19.93	407.319	26.10	30	Pass
11	2462	20.08	20.18	20.23	20.15	415.044	26.18	30	Pass

Note: Directional Gain = 3.10dBi < 6dBi, so the power limit no need to reduced.

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	14.93	15.02	14.97	14.75	124.145	20.94	30	Pass
6	2437	19.77	19.93	19.94	19.81	387.590	25.88	30	Pass
11	2462	13.86	13.65	13.96	13.79	96.318	19.84	30	Pass

Note: Directional Gain = 3.10dBi < 6dBi, so the power limit no need to reduced.

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	15.98	15.89	15.84	15.70	153.968	21.87	30	Pass
6	2437	19.65	19.99	19.97	19.68	384.236	25.85	30	Pass
11	2462	14.29	14.04	14.32	14.12	105.067	20.21	30	Pass

Note: Directional Gain = 3.10dBi < 6dBi, so the power limit no need to 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	15.33	15.40	15.31	15.39	137.350	21.38	30	Pass
6	2437	15.59	15.61	15.85	15.76	148.745	21.72	30	Pass
9	2452	13.44	13.47	13.71	13.72	91.359	19.61	30	Pass

Note: Directional Gain = 3.10dBi < 6dBi, so the power limit no need to 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	15.94	16.01	15.86	15.76	155.384	21.91	30	Pass
6	2437	19.73	19.91	20.00	19.85	388.526	25.89	30	Pass
11	2462	14.15	14.21	14.44	14.14	106.104	20.26	30	Pass

Note: Directional Gain = 3.10dBi < 6dBi, so the power limit no need to 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	15.34	15.31	15.48	15.43	138.393	21.41	30	Pass
6	2437	15.73	15.71	15.88	15.79	151.307	21.80	30	Pass
9	2452	13.41	13.54	13.72	13.75	91.786	19.63	30	Pass

Note: Directional Gain = 3.10dBi < 6dBi, so the power limit no need to reduced.

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	9.96	9.87	9.82	9.68	38.497	15.85	26.88	Pass
6	2437	13.63	13.97	13.95	13.66	96.071	19.83	26.88	Pass
11	2462	8.27	8.02	8.30	8.10	26.271	14.19	26.88	Pass

Note: Directional Gain = $3.10\text{dBi} + 10\log(4) = 9.12\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $30 - (9.12 - 6) = 26.88\text{dBm}$.

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	9.31	9.38	9.29	9.37	34.343	15.36	26.88	Pass
6	2437	9.57	9.59	9.83	9.74	37.191	15.70	26.88	Pass
9	2452	7.42	7.45	7.69	7.70	22.843	13.59	26.88	Pass

Note: Directional Gain = $3.10\text{dBi} + 10\log(4) = 9.12\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $30 - (9.12 - 6) = 26.88\text{dBm}$.

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	9.93	10.00	9.85	9.75	38.942	15.90	26.88	Pass
6	2437	13.72	13.90	13.99	13.84	97.368	19.88	26.88	Pass
11	2462	8.14	8.20	8.43	8.13	26.590	14.25	26.88	Pass

Note: Directional Gain = $3.10\text{dBi} + 10\log(4) = 9.12\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $30 - (9.12 - 6) = 26.88\text{dBm}$.

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	9.32	9.29	9.46	9.41	34.604	15.39	26.88	Pass
6	2437	9.71	9.69	9.86	9.77	37.832	15.78	26.88	Pass
9	2452	7.39	7.52	7.70	7.73	22.949	13.61	26.88	Pass

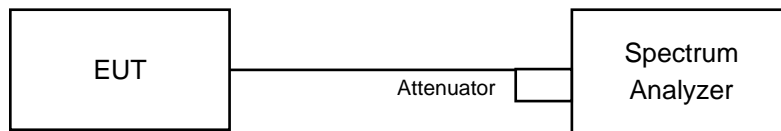
Note: Directional Gain = $3.10\text{dBi} + 10\log(4) = 9.12\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $30 - (9.12 - 6) = 26.88\text{dBm}$.

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8dBm.

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

For AVG. power (duty cycle $\geq 98\%$)

- Set instrument center frequency to DTS channel center frequency.
- Set span to at least 1.5 times the OBW.
- Set RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- Set VBW $\geq 3 \times \text{RBW}$.
- Detector = power averaging (RMS) or sample detector (when RMS not available).
- Ensure that the number of measurement points in the sweep $\geq 2 \times \text{span}/\text{RBW}$.
- Sweep time = auto couple.
- Employ trace averaging (RMS) mode over a minimum of 100 traces.
- Use the peak marker function to determine the maximum amplitude level.

For AVG. power (duty cycle $< 98\%$)

- Measure the duty cycle (x).
- Set instrument center frequency to DTS channel center frequency.
- Set span to at least 1.5 times the OBW.
- Set RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- Set VBW $\geq 3 \times \text{RBW}$.
- Detector = power averaging (RMS) or sample detector (when RMS not available).
- Ensure that the number of measurement points in the sweep $\geq 2 \times \text{span}/\text{RBW}$.
- Sweep time = auto couple.
- Do not use sweep triggering. Allow sweep to "free run".
- Employ trace averaging (RMS) mode over a minimum of 100 traces.
- Use the peak marker function to determine the maximum amplitude level.
- 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 (dBm/10kHz)	10 log (N=4) dB	Duty factor (dB)	Total PSD With Duty Factor (dBm/10kHz)	Limit (dBm/3kHz)	Pass / Fail
0	1	2412	-12.71	6.02	1.19	-5.50	4.88	Pass
	6	2437	-11.16	6.02	1.19	-3.95	4.88	Pass
	11	2462	-12.64	6.02	1.19	-5.43	4.88	Pass
1	1	2412	-11.13	6.02	1.19	-3.92	4.88	Pass
	6	2437	-11.04	6.02	1.19	-3.83	4.88	Pass
	11	2462	-11.43	6.02	1.19	-4.22	4.88	Pass
2	1	2412	-10.63	6.02	1.19	-3.42	4.88	Pass
	6	2437	-11.75	6.02	1.19	-4.54	4.88	Pass
	11	2462	-12.34	6.02	1.19	-5.13	4.88	Pass
3	1	2412	-11.97	6.02	1.19	-4.76	4.88	Pass
	6	2437	-12.29	6.02	1.19	-5.08	4.88	Pass
	11	2462	-11.78	6.02	1.19	-4.57	4.88	Pass

Note:

- Method a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
- Directional Gain = $3.10\text{dBi} + 10\log(4) = 9.12\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $8 - (9.12 - 6) = 4.88\text{dBm}$.
- Refer to section 3.3 for duty cycle spectrum plot.

802.11g

TX chain	Channel	Freq. (MHz)	PSD (dBm/10kHz)	10 log (N=4) dB	Duty factor (dB)	Total PSD With Duty Factor (dBm/10kHz)	Limit (dBm/3kHz)	Pass / Fail
0	1	2412	-15.12	6.02	0.27	-8.83	4.88	Pass
	6	2437	-10.18	6.02	0.27	-3.89	4.88	Pass
	11	2462	-16.94	6.02	0.27	-10.65	4.88	Pass
1	1	2412	-15.72	6.02	0.27	-9.43	4.88	Pass
	6	2437	-10.83	6.02	0.27	-4.54	4.88	Pass
	11	2462	-16.61	6.02	0.27	-10.32	4.88	Pass
2	1	2412	-15.77	6.02	0.27	-9.48	4.88	Pass
	6	2437	-10.65	6.02	0.27	-4.36	4.88	Pass
	11	2462	-16.91	6.02	0.27	-10.62	4.88	Pass
3	1	2412	-15.85	6.02	0.27	-9.56	4.88	Pass
	6	2437	-10.55	6.02	0.27	-4.26	4.88	Pass
	11	2462	-16.69	6.02	0.27	-10.40	4.88	Pass

Note:

1. Method a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional Gain = $3.10\text{dBi} + 10\log(4) = 9.12\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $8 - (9.12 - 6) = 4.88\text{dBm}$.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (HT20)

TX chain	Channel	Freq. (MHz)	PSD (dBm/10kHz)	10 log (N=4) dB	Duty factor (dB)	Total PSD With Duty Factor (dBm/10kHz)	Limit (dBm/3kHz)	Pass / Fail
0	1	2412	-15.59	6.02	0.26	-9.31	4.88	Pass
	6	2437	-11.68	6.02	0.26	-5.40	4.88	Pass
	11	2462	-17.05	6.02	0.26	-10.77	4.88	Pass
1	1	2412	-16.50	6.02	0.26	-10.22	4.88	Pass
	6	2437	-13.07	6.02	0.26	-6.79	4.88	Pass
	11	2462	-18.55	6.02	0.26	-12.27	4.88	Pass
2	1	2412	-17.05	6.02	0.26	-10.77	4.88	Pass
	6	2437	-12.81	6.02	0.26	-6.53	4.88	Pass
	11	2462	-18.14	6.02	0.26	-11.86	4.88	Pass
3	1	2412	-16.90	6.02	0.26	-10.62	4.88	Pass
	6	2437	-12.64	6.02	0.26	-6.36	4.88	Pass
	11	2462	-18.56	6.02	0.26	-12.28	4.88	Pass

Note:

1. Method a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional Gain = $3.10\text{dBi} + 10\log(4) = 9.12\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $8 - (9.12 - 6) = 4.88\text{dBm}$.
3. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (HT40)

TX chain	Channel	Freq. (MHz)	PSD (dBm/10kHz)	10 log (N=4) dB	Duty factor (dB)	Total PSD With Duty Factor (dBm/10kHz)	Limit (dBm/3kHz)	Pass / Fail
0	3	2422	-20.02	6.02	0.40	-13.60	4.88	Pass
	6	2437	-19.92	6.02	0.40	-13.50	4.88	Pass
	9	2452	-21.76	6.02	0.40	-15.34	4.88	Pass
1	3	2422	-20.90	6.02	0.40	-14.48	4.88	Pass
	6	2437	-20.22	6.02	0.40	-13.80	4.88	Pass
	9	2452	-22.20	6.02	0.40	-15.78	4.88	Pass
2	3	2422	-20.50	6.02	0.40	-14.08	4.88	Pass
	6	2437	-19.71	6.02	0.40	-13.29	4.88	Pass
	9	2452	-21.77	6.02	0.40	-15.35	4.88	Pass
3	3	2422	-20.27	6.02	0.40	-13.85	4.88	Pass
	6	2437	-19.60	6.02	0.40	-13.18	4.88	Pass
	9	2452	-21.68	6.02	0.40	-15.26	4.88	Pass

- Method a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
- Directional Gain = $3.10\text{dBi} + 10\log(4) = 9.12\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $8 - (9.12 - 6) = 4.88\text{dBm}$.
- Refer to section 3.3 for duty cycle spectrum plot.

802.11ax (HE20)

TX chain	Channel	Freq. (MHz)	PSD (dBm/10kHz)	10 log (N=4) dB	Duty factor (dB)	Total PSD With Duty Factor (dBm/10kHz)	Limit (dBm/3kHz)	Pass / Fail
0	1	2412	-15.40	6.02	0.18	-9.20	4.88	Pass
	6	2437	-11.55	6.02	0.18	-5.35	4.88	Pass
	11	2462	-16.72	6.02	0.18	-10.52	4.88	Pass
1	1	2412	-16.26	6.02	0.18	-10.06	4.88	Pass
	6	2437	-12.63	6.02	0.18	-6.43	4.88	Pass
	11	2462	-18.00	6.02	0.18	-11.80	4.88	Pass
2	1	2412	-16.06	6.02	0.18	-9.86	4.88	Pass
	6	2437	-12.27	6.02	0.18	-6.07	4.88	Pass
	11	2462	-17.85	6.02	0.18	-11.65	4.88	Pass
3	1	2412	-15.69	6.02	0.18	-9.49	4.88	Pass
	6	2437	-12.04	6.02	0.18	-5.84	4.88	Pass
	11	2462	-16.85	6.02	0.18	-10.65	4.88	Pass

Note:

- Method a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
- Directional Gain = $3.10\text{dBi} + 10\log(4) = 9.12\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $8 - (9.12 - 6) = 4.88\text{dBm}$.
- Refer to section 3.3 for duty cycle spectrum plot.

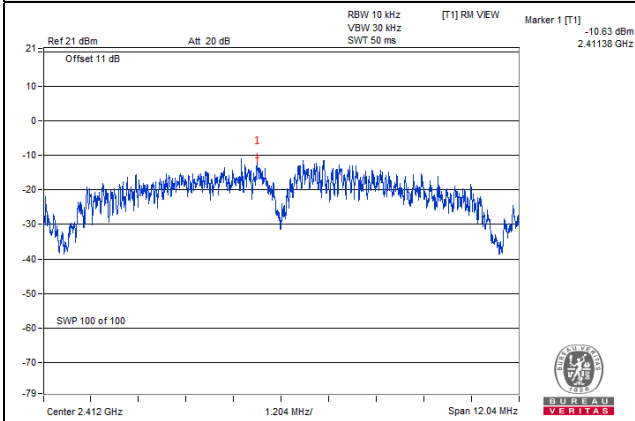
802.11ax (HE40)

TX chain	Channel	Freq. (MHz)	PSD (dBm/10kHz)	10 log (N=4) dB	Duty factor (dB)	Total PSD With Duty Factor (dBm/10kHz)	Limit (dBm/3kHz)	Pass / Fail
0	3	2422	-19.59	6.02	0.25	-13.32	4.88	Pass
	6	2437	-19.43	6.02	0.25	-13.16	4.88	Pass
	9	2452	-20.76	6.02	0.25	-14.49	4.88	Pass
1	3	2422	-19.78	6.02	0.25	-13.51	4.88	Pass
	6	2437	-19.42	6.02	0.25	-13.15	4.88	Pass
	9	2452	-21.01	6.02	0.25	-14.74	4.88	Pass
2	3	2422	-20.00	6.02	0.25	-13.73	4.88	Pass
	6	2437	-18.99	6.02	0.25	-12.72	4.88	Pass
	9	2452	-21.35	6.02	0.25	-15.08	4.88	Pass
3	3	2422	-19.69	6.02	0.25	-13.42	4.88	Pass
	6	2437	-18.47	6.02	0.25	-12.20	4.88	Pass
	9	2452	-21.33	6.02	0.25	-15.06	4.88	Pass

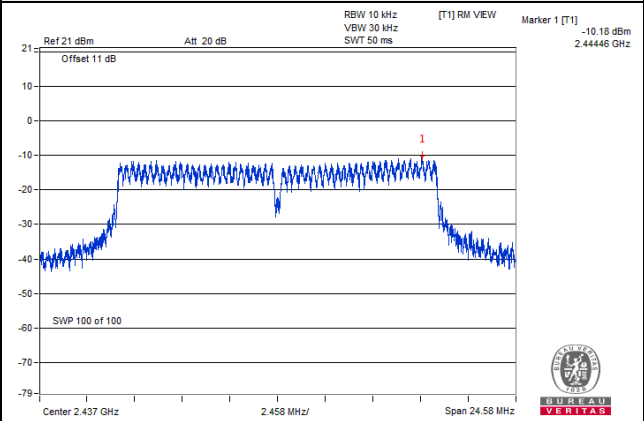
1. Method a) of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional Gain = $3.10\text{dBi} + 10\log(4) = 9.12\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $8 - (9.12 - 6) = 4.88\text{dBm}$.
3. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

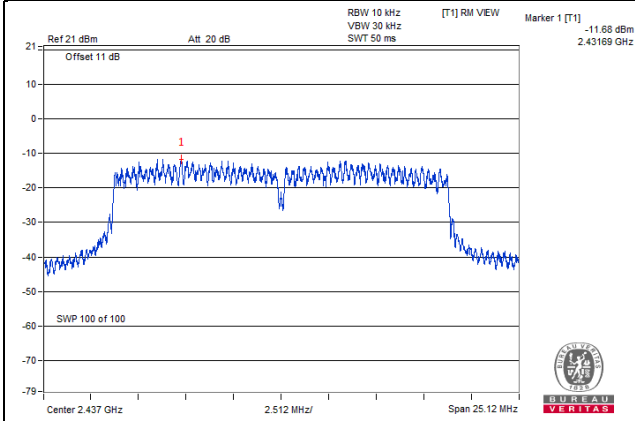
802.11b



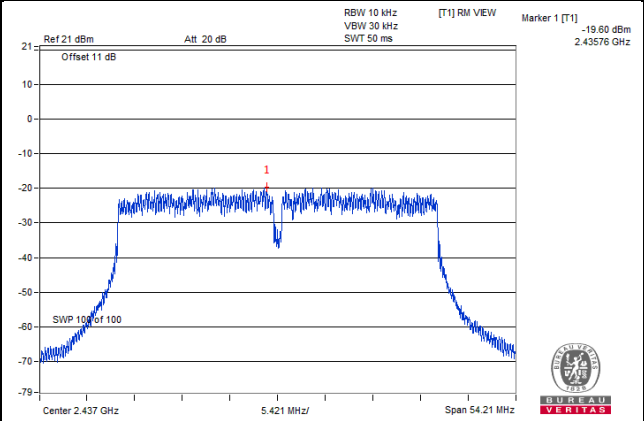
802.11g



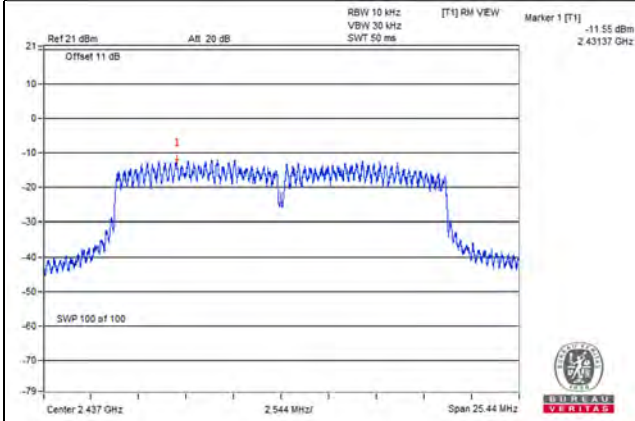
802.11n (HT20)



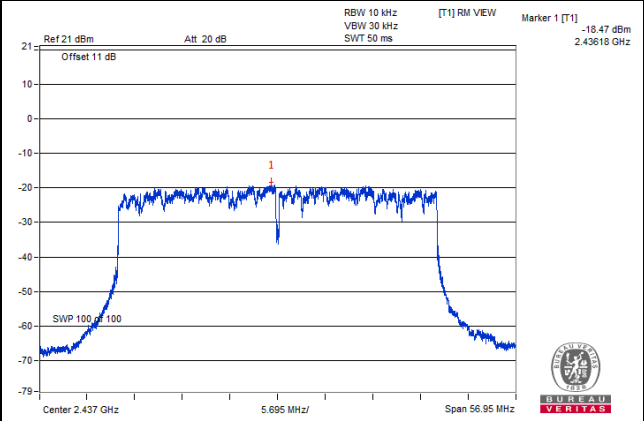
802.11n (HT40)



802.11ax (HE20)



802.11ax (HE40)

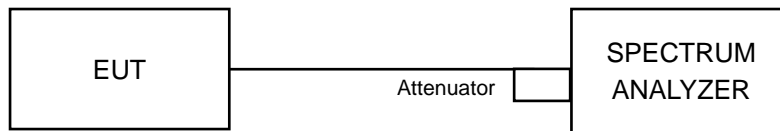


4.6 Conducted Out of Band Emission Measurement

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

MEASUREMENT PROCEDURE OOB

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

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

Same as item 4.3.6.

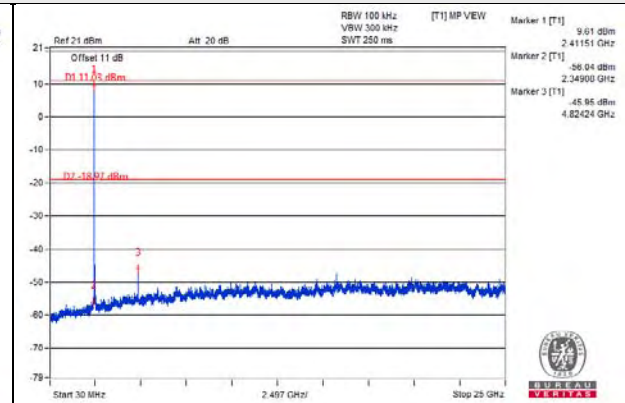
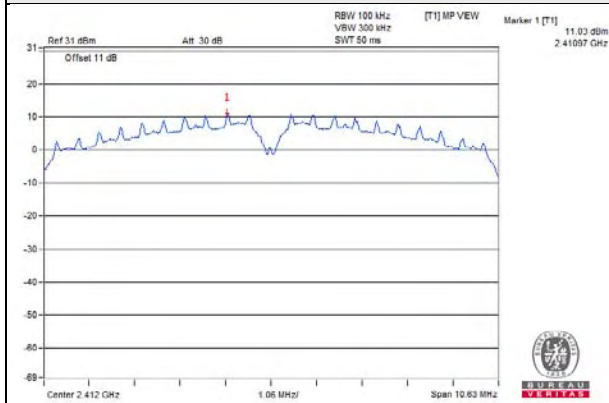
4.6.7 Test Results

The conducted emission test is performed on each TX port of operating mode without summing or adding 10log (N) since the limit is relative emission limit.

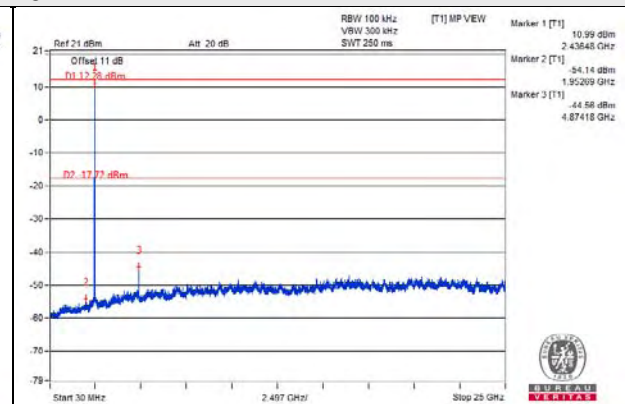
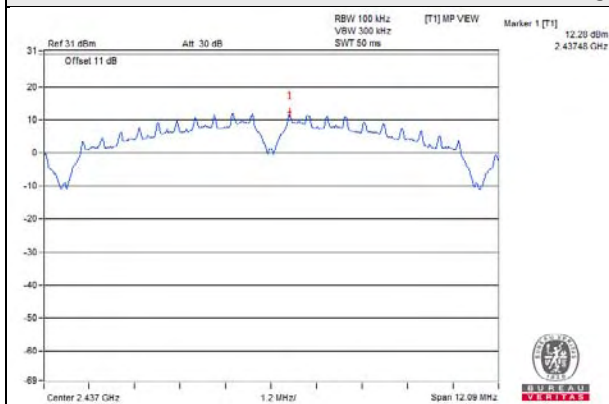
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 30dB offset below D1. It shows compliance with the requirement.

802.11b_Chain 0

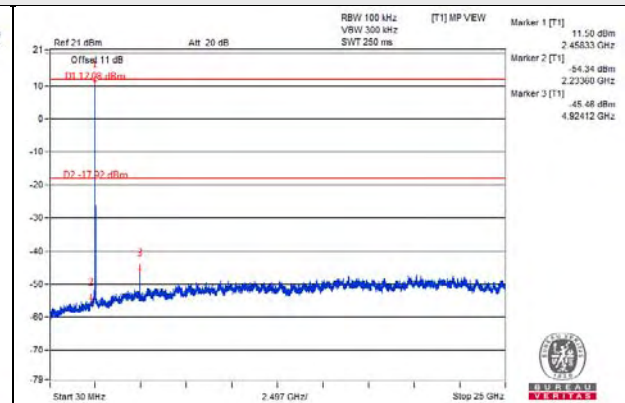
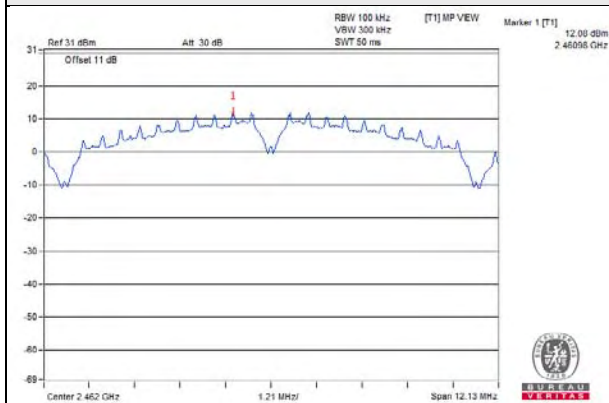
CH 1



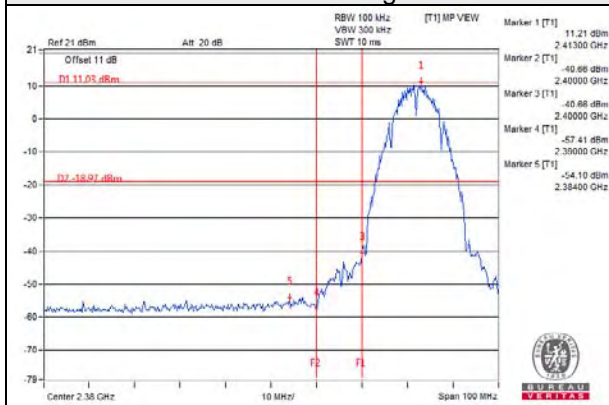
CH 6



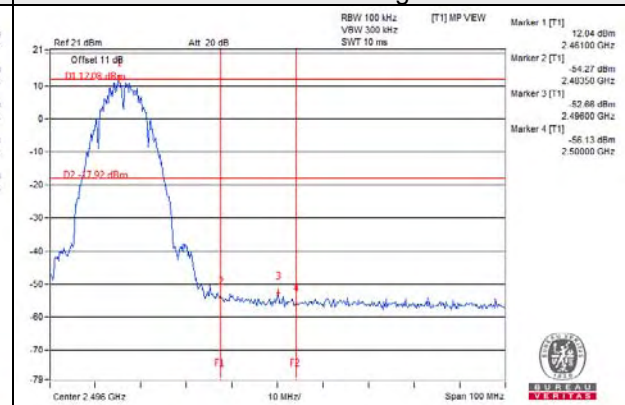
CH 11



CH 1 Band edge

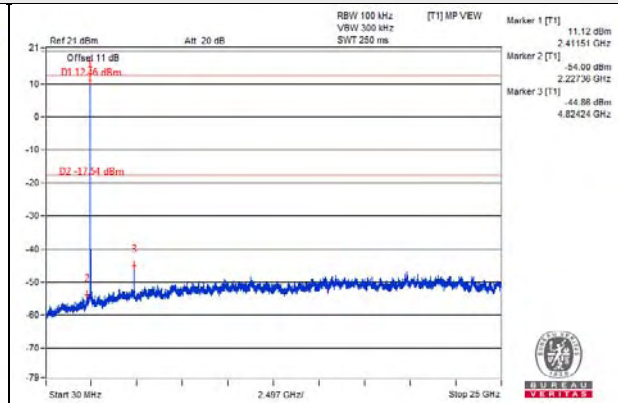
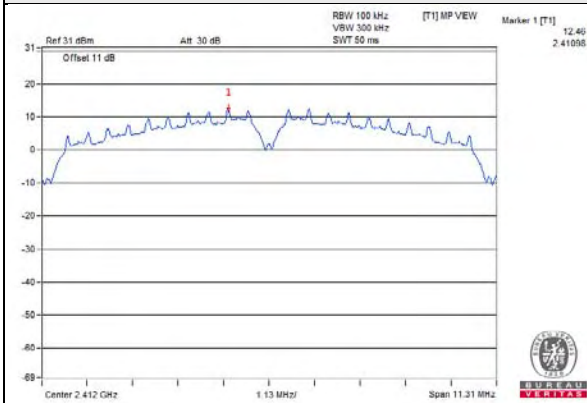


CH 11 Band edge

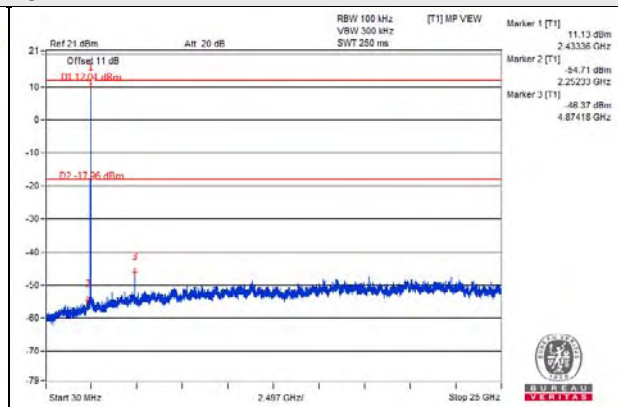
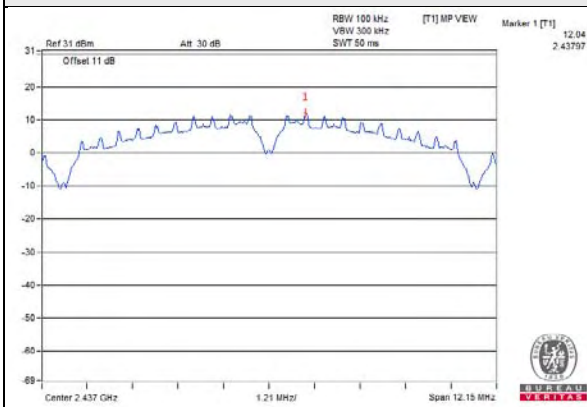


802.11b_Chain 1

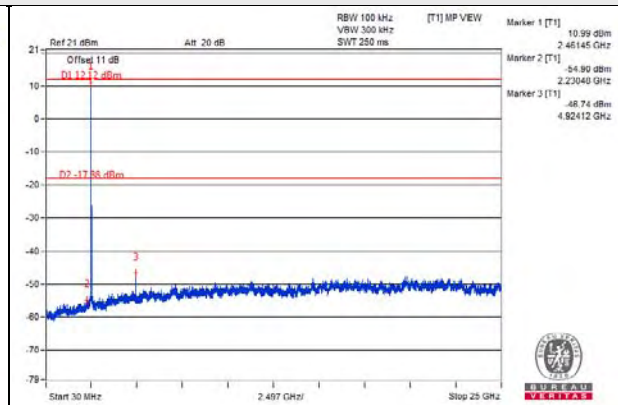
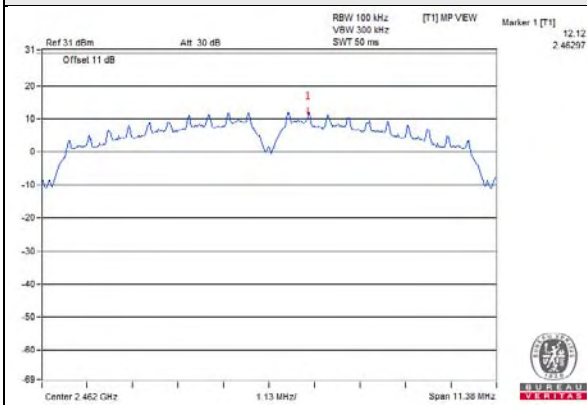
CH 1



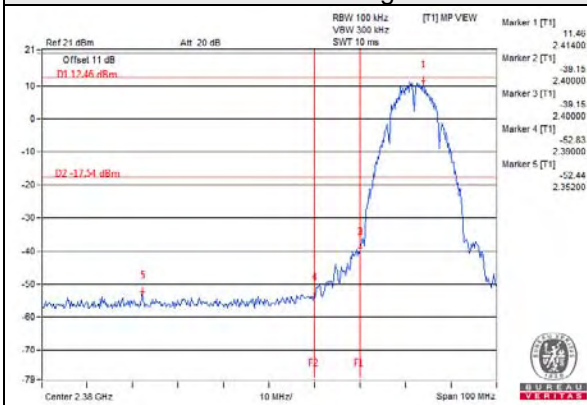
CH 6



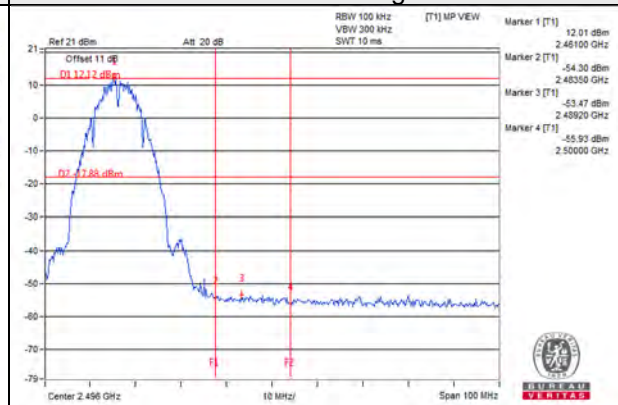
CH 11



CH 1 Band edge

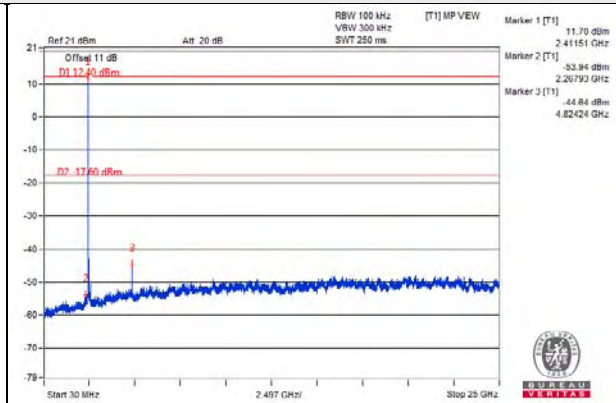
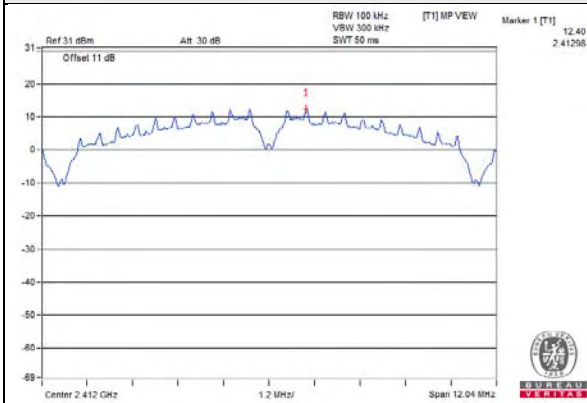


CH 11 Band edge

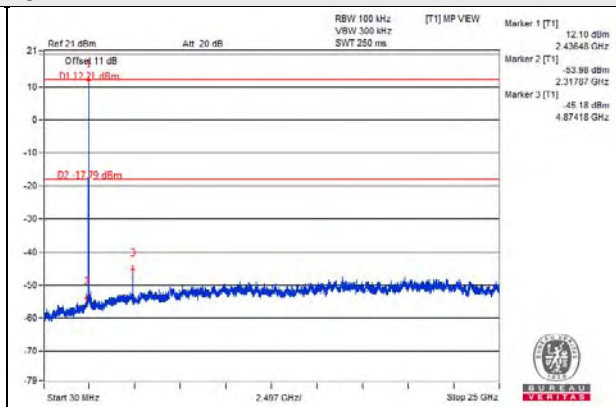
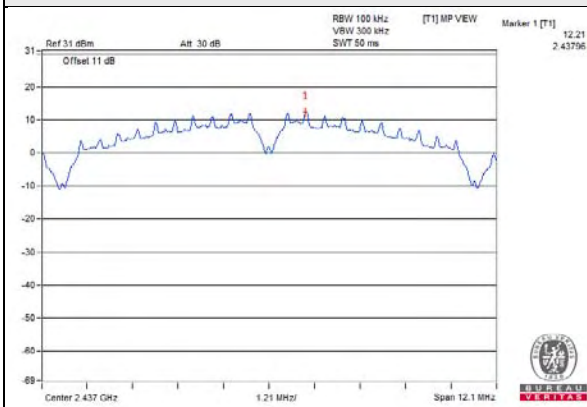


802.11b_Chain 2

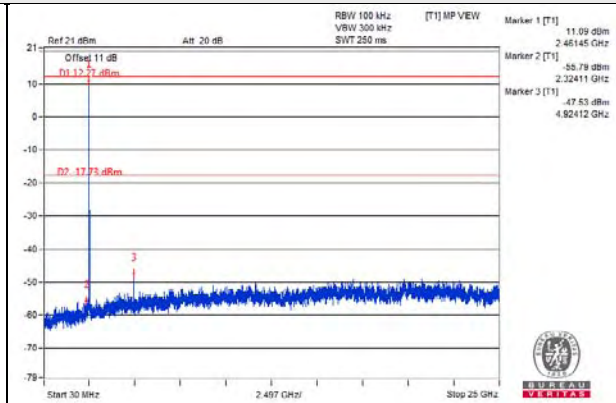
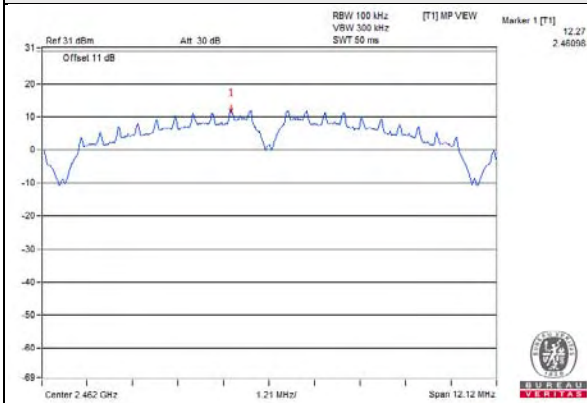
CH 1



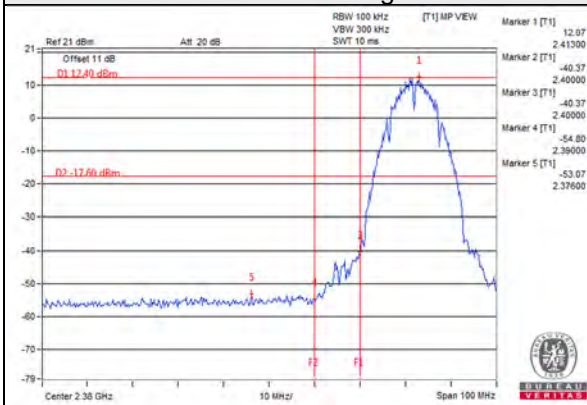
CH 6



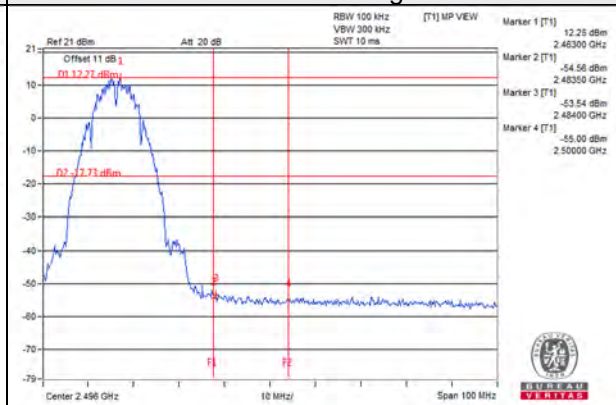
CH 11



CH 1 Band edge

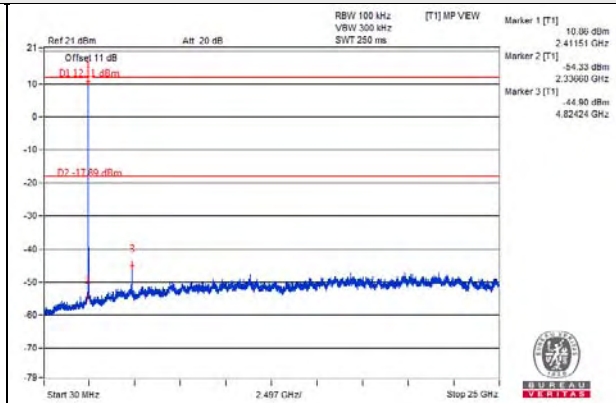
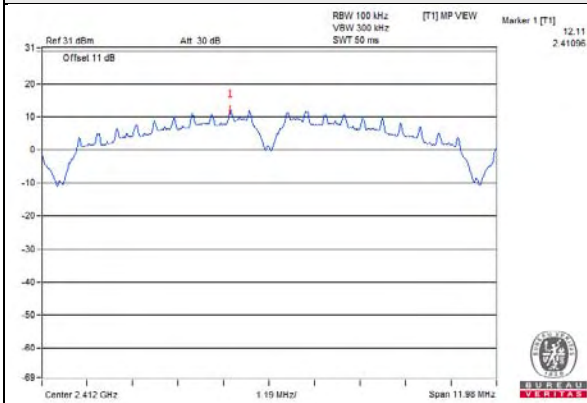


CH 11 Band edge

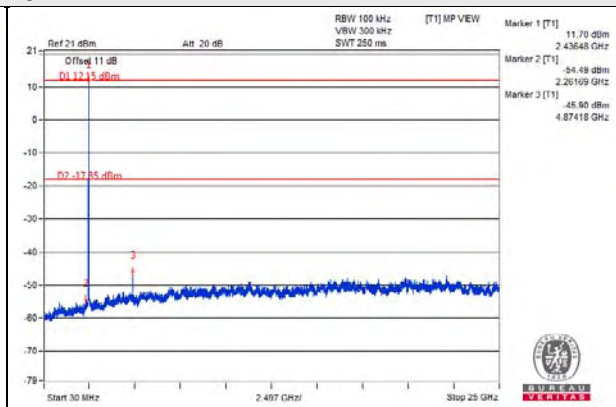
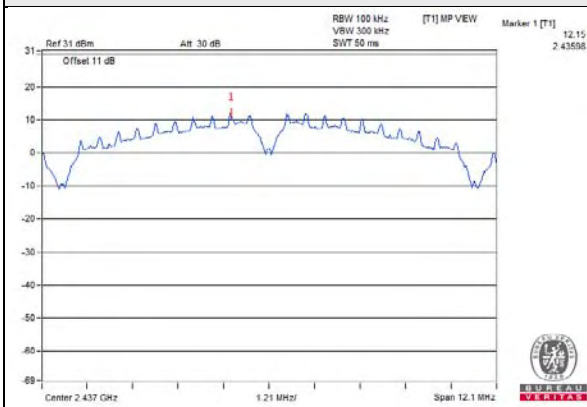


802.11b_Chain 3

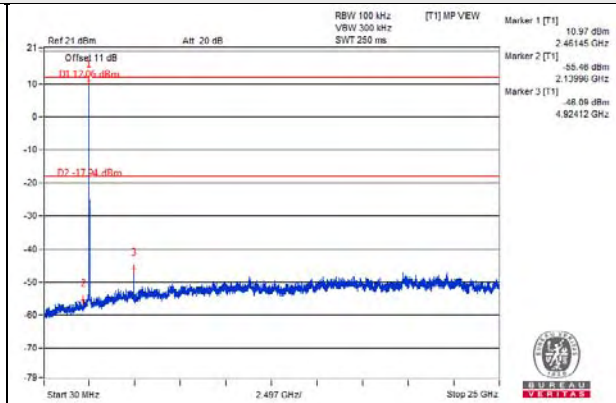
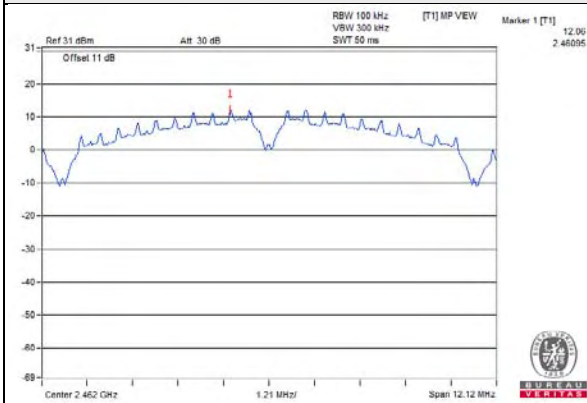
CH 1



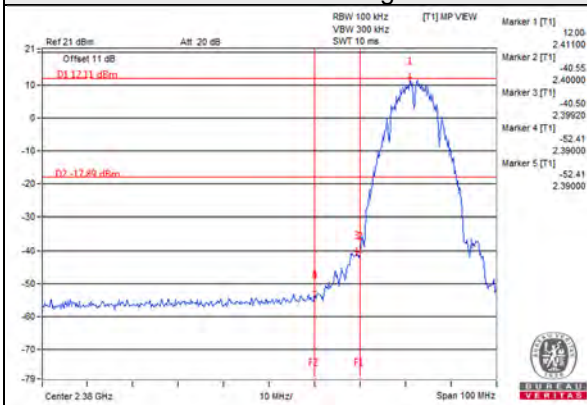
CH 6



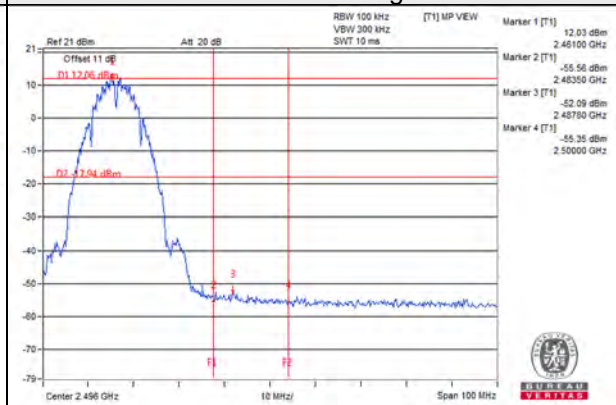
CH 11



CH 1 Band edge

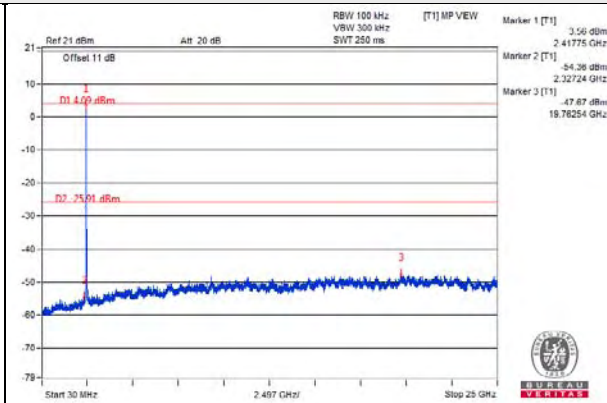
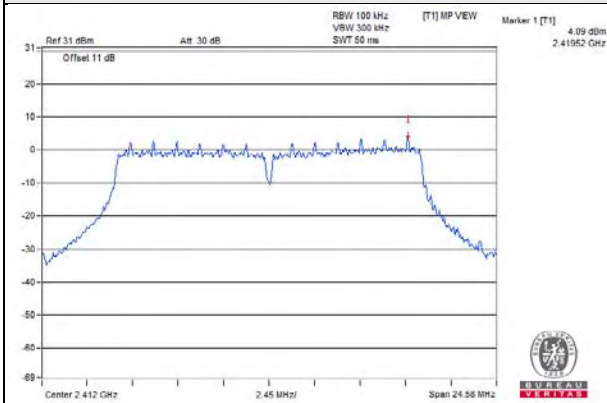


CH 11 Band edge

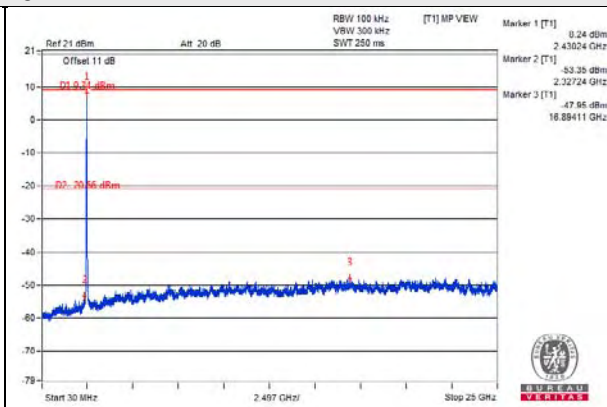
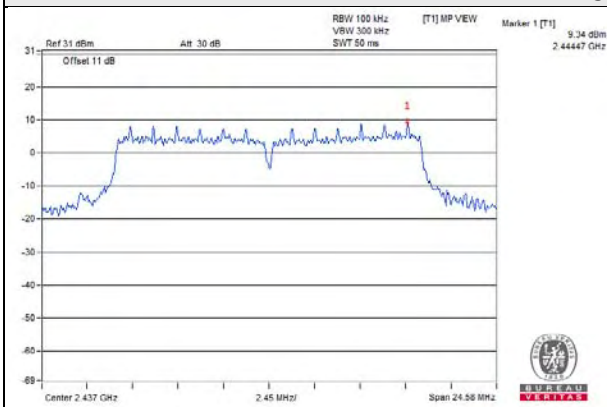


802.11g_Chain 0

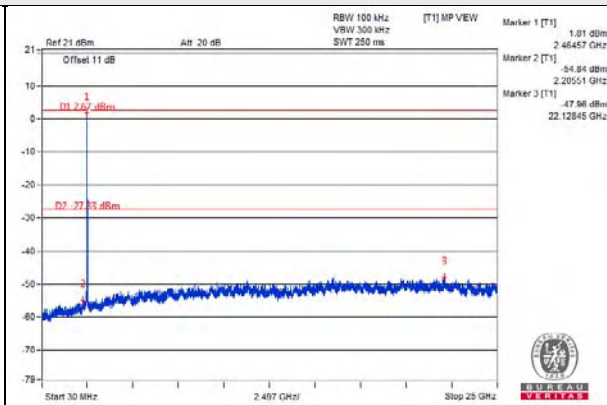
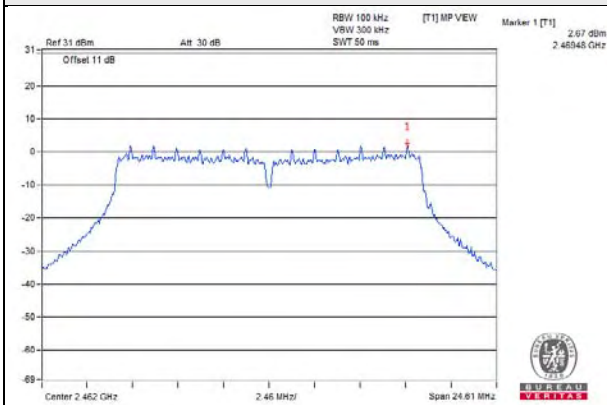
CH 1



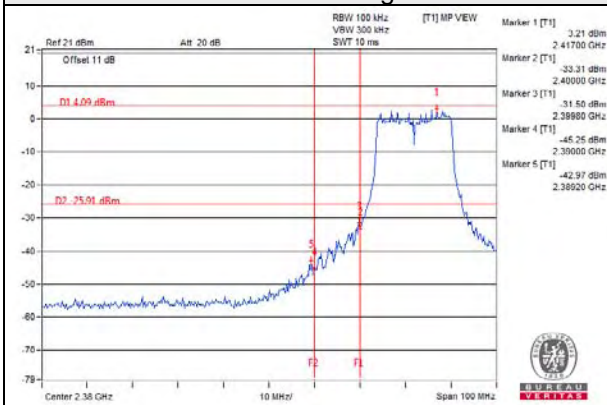
CH 6



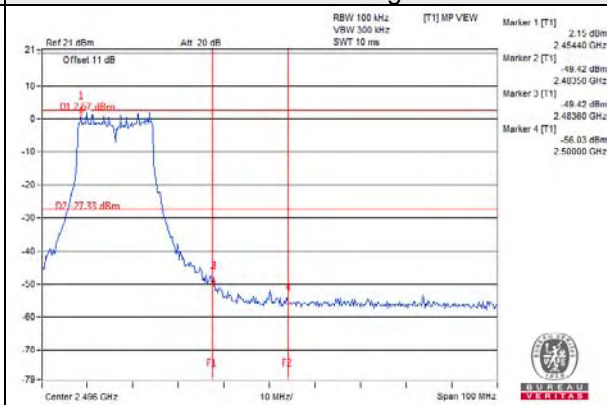
CH 11



CH 1 Band edge

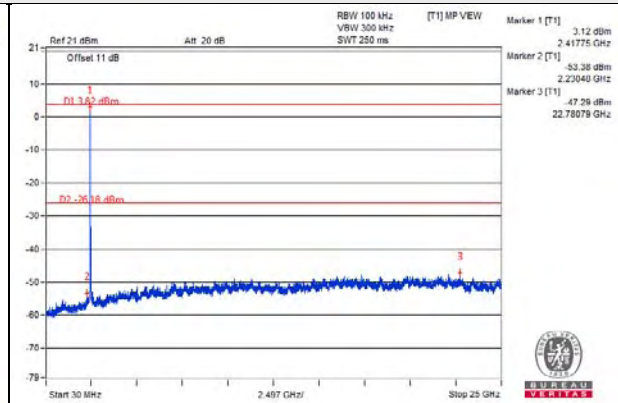
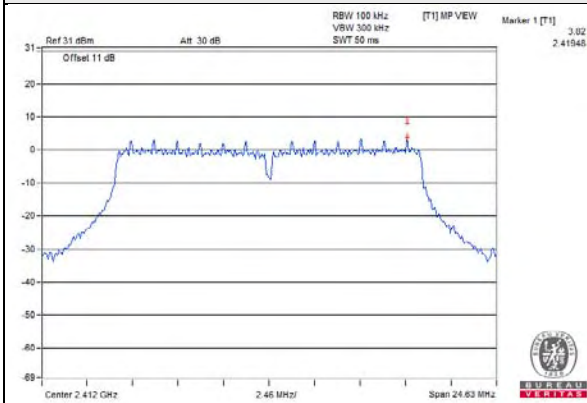


CH 11 Band edge

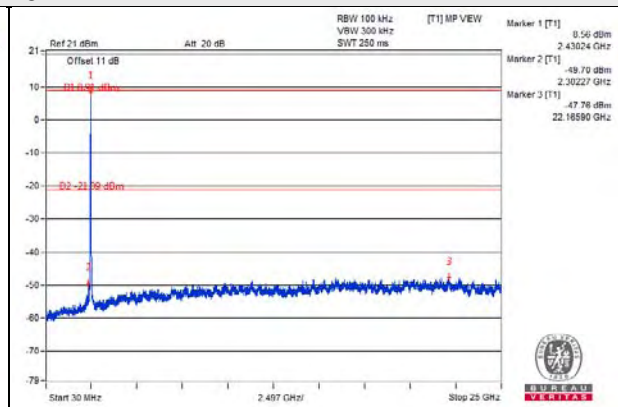
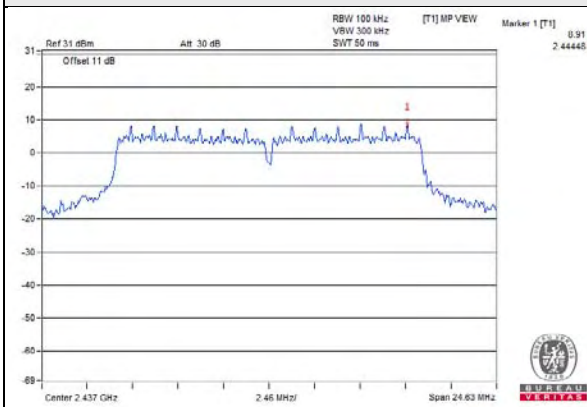


802.11g_Chain 1

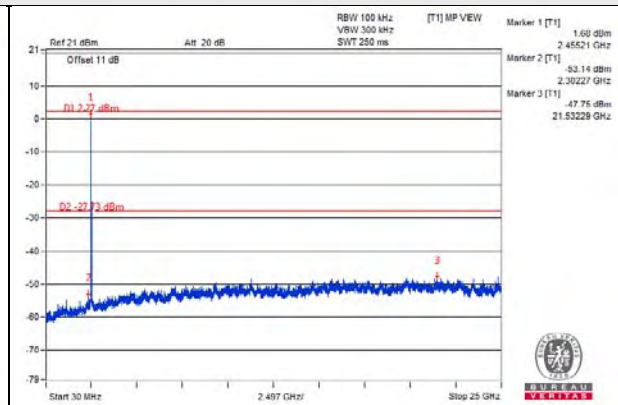
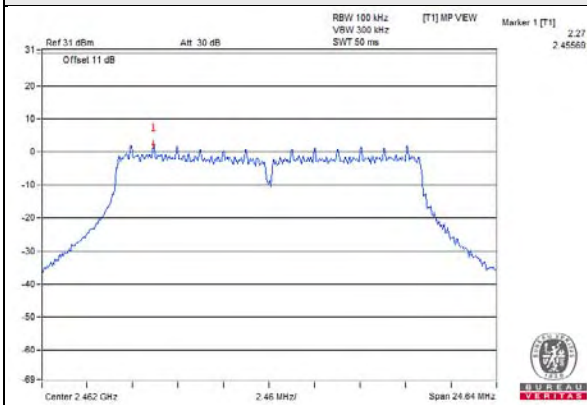
CH 1



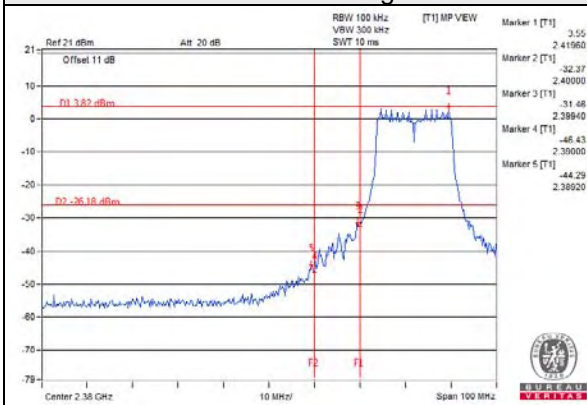
CH 6



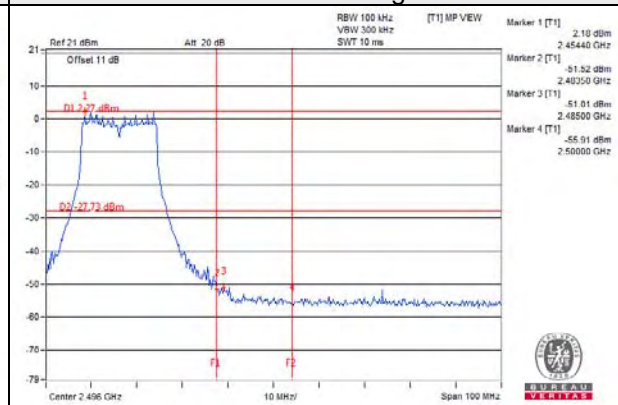
CH 11



CH 1 Band edge

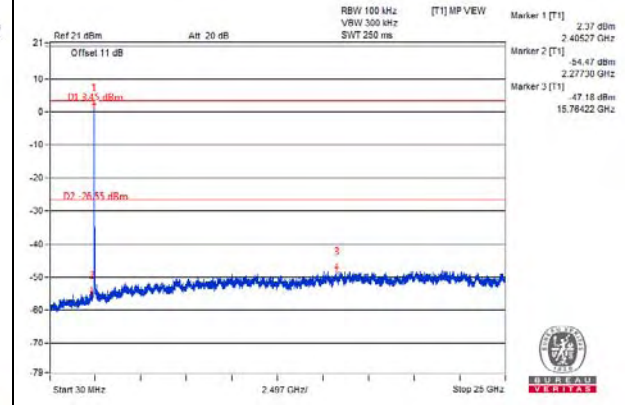
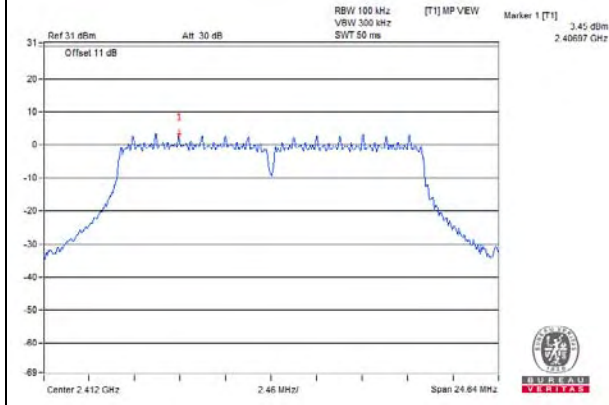


CH 11 Band edge

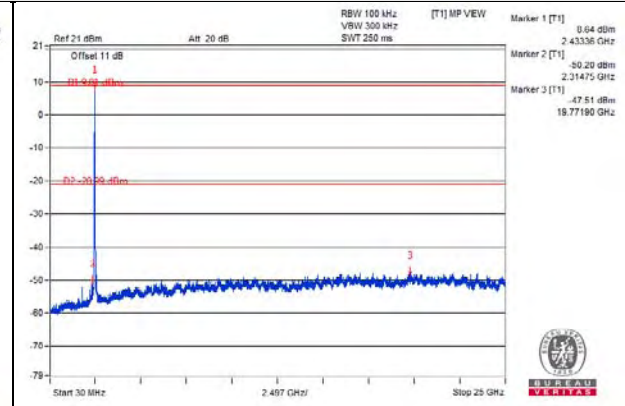
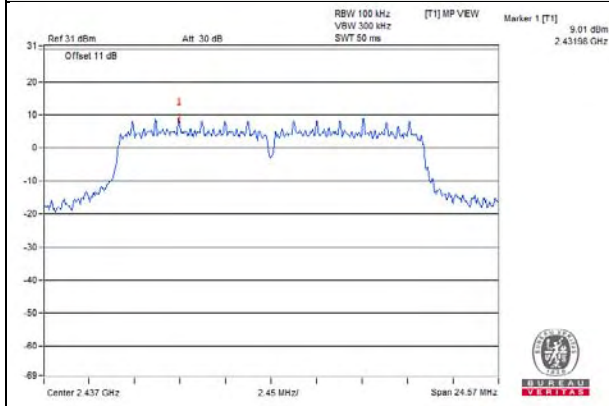


802.11g_Chain 2

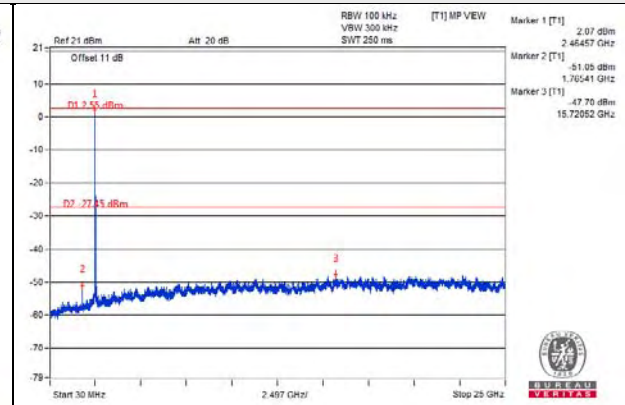
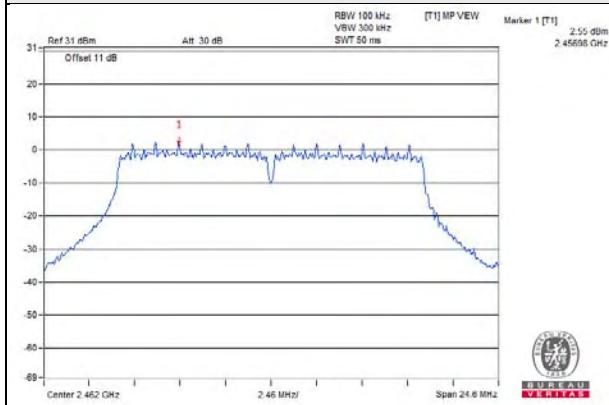
CH 1



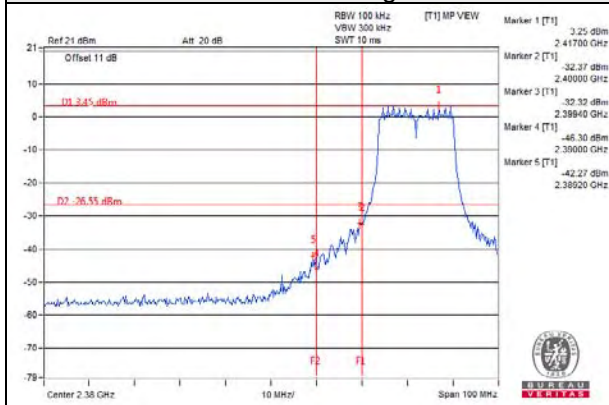
CH 6



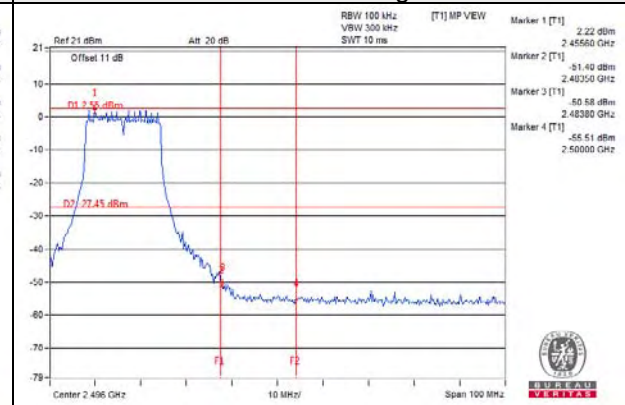
CH 11



CH 1 Band edge

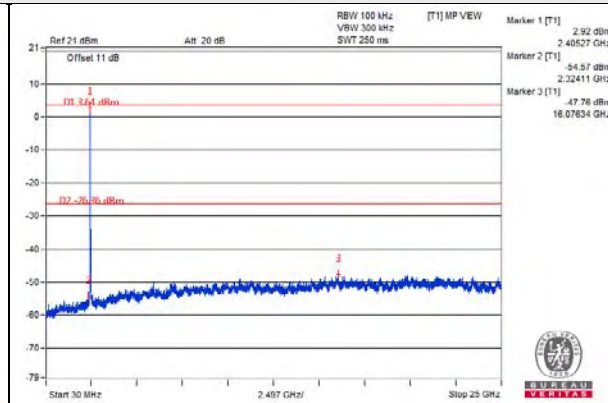
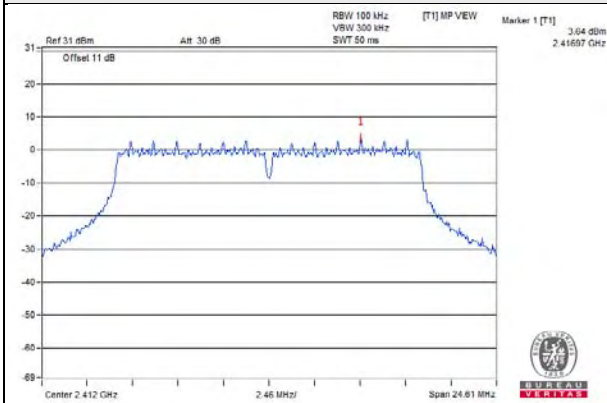


CH 11 Band edge

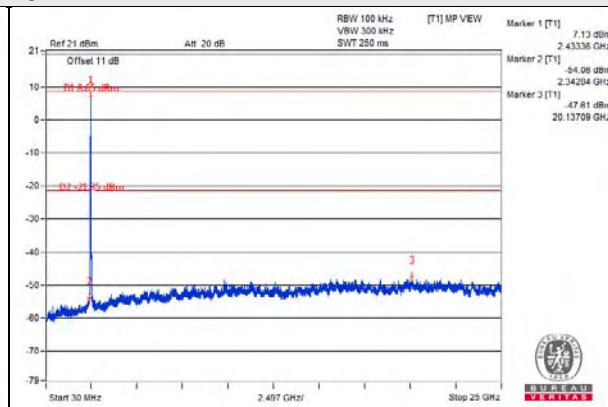
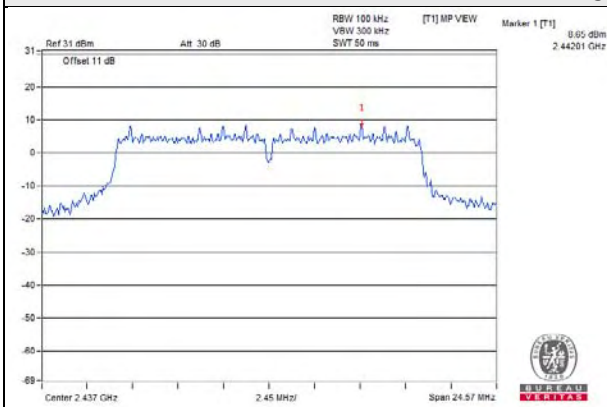


802.11g_Chain 3

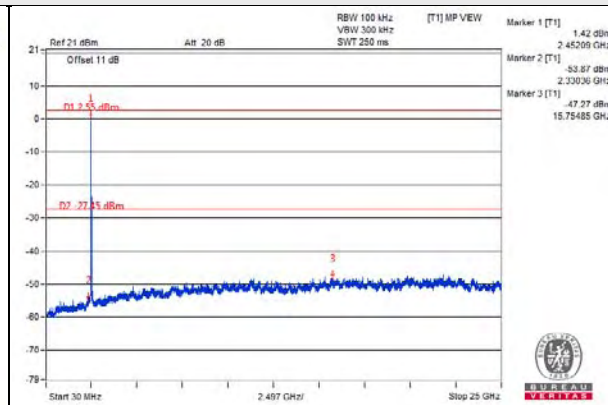
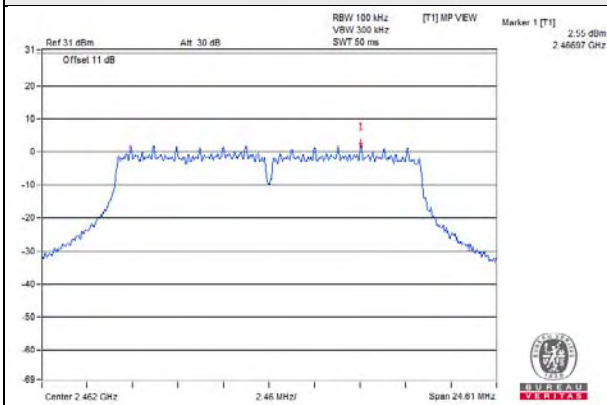
CH 1



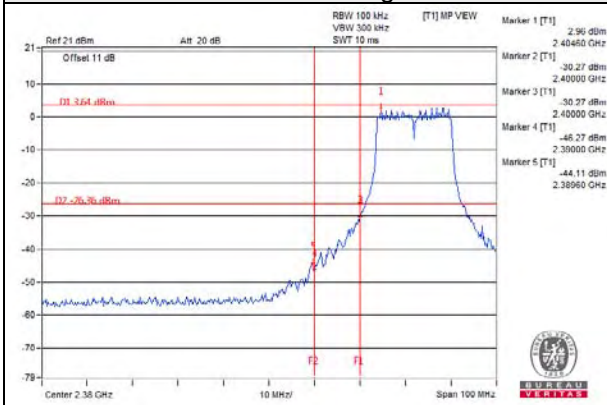
CH 6



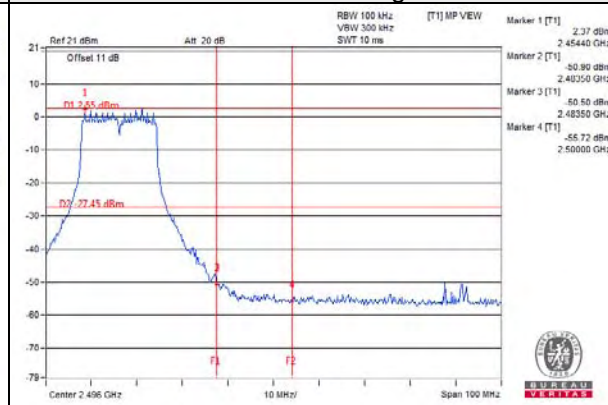
CH 11



CH 1 Band edge

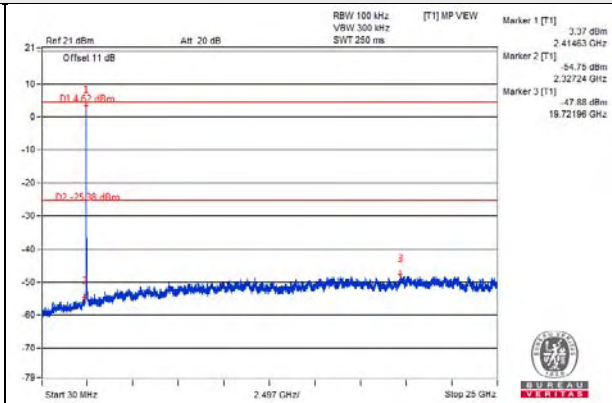
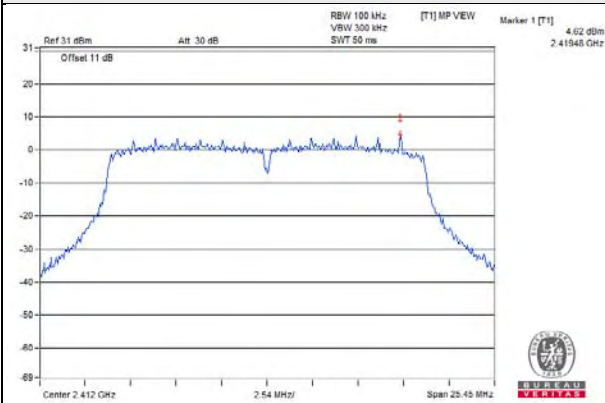


CH 11 Band edge

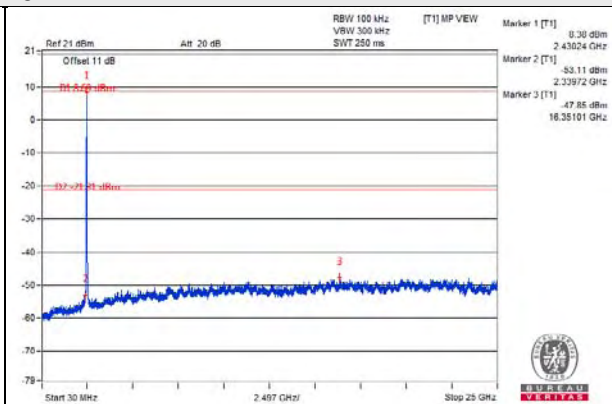
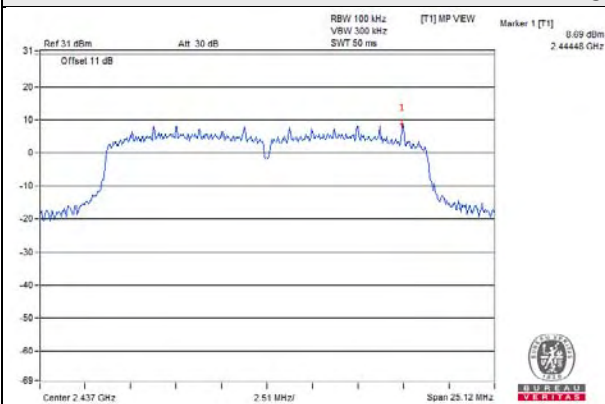


802.11n (HT20)_Chain 0

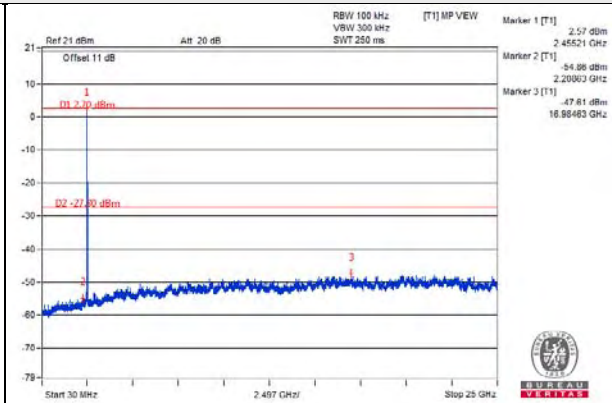
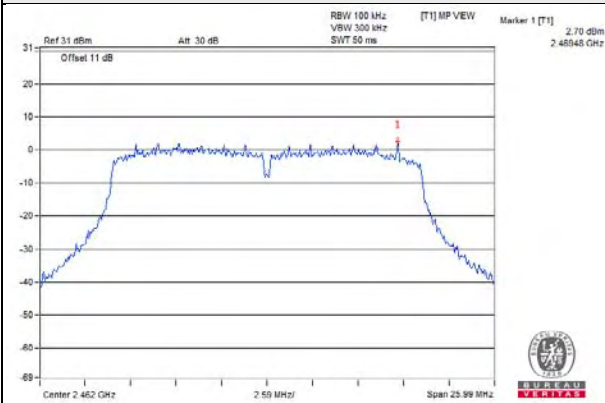
CH 1



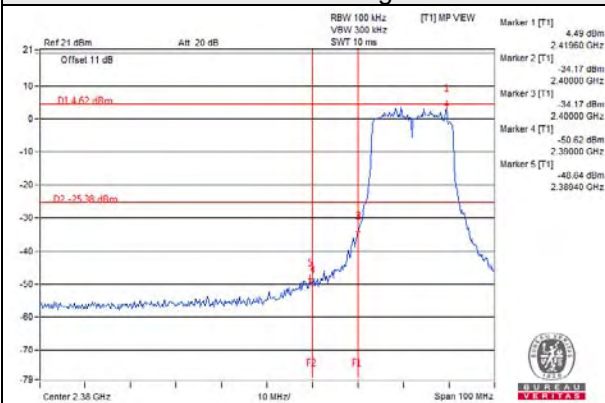
CH 6



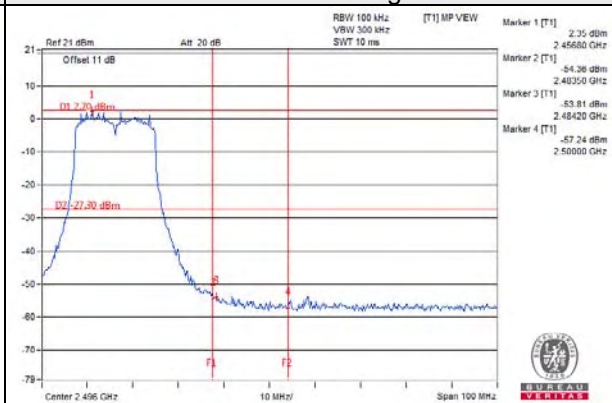
CH 11



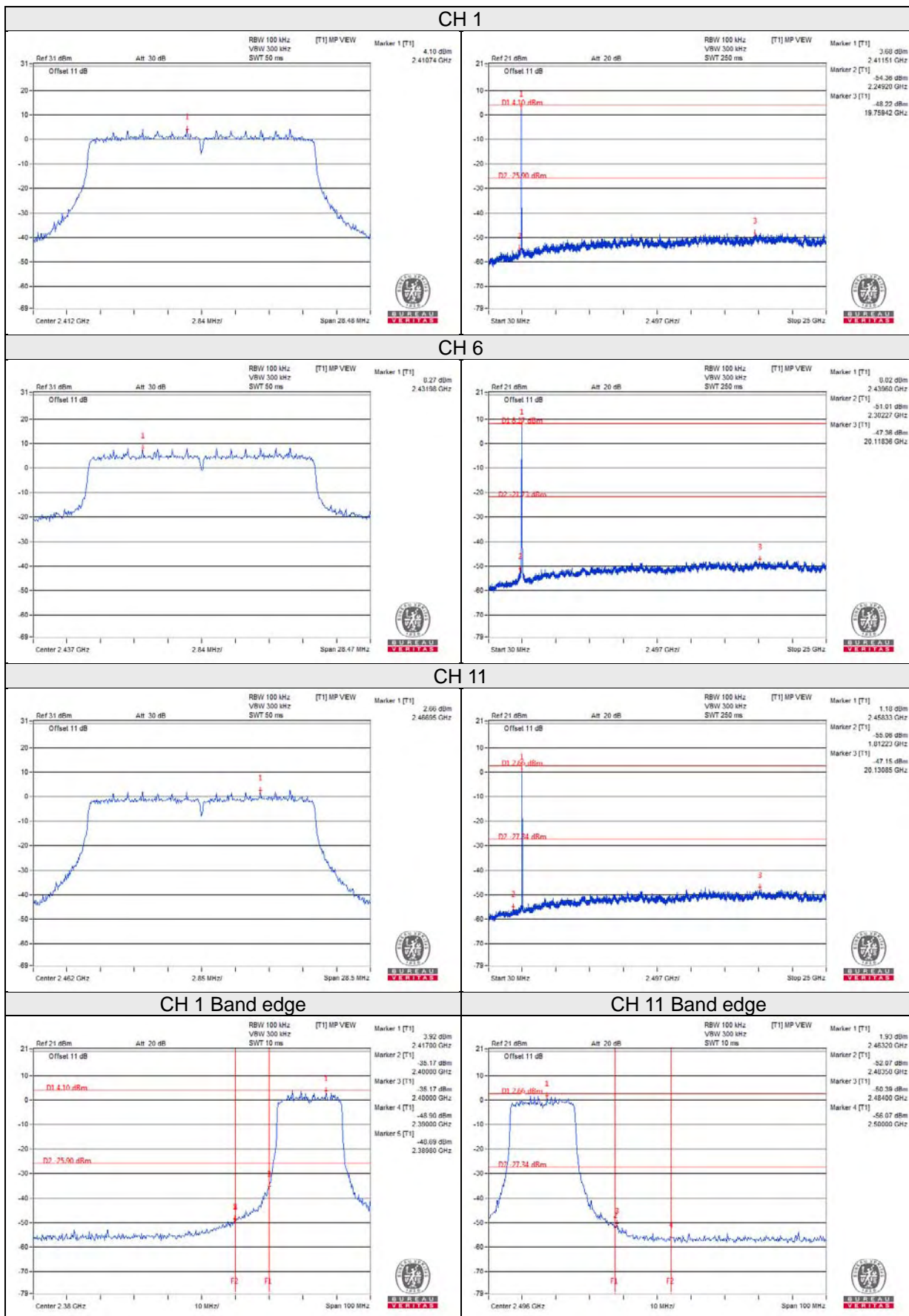
CH 1 Band edge



CH 11 Band edge

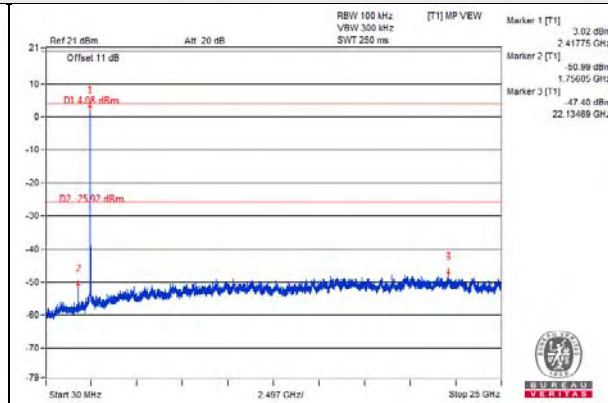
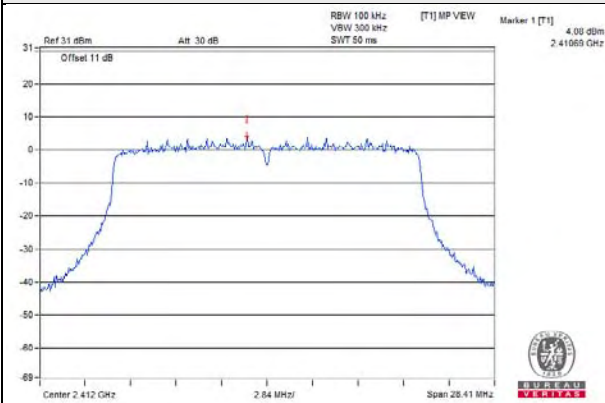


802.11n (HT20)_Chain 1

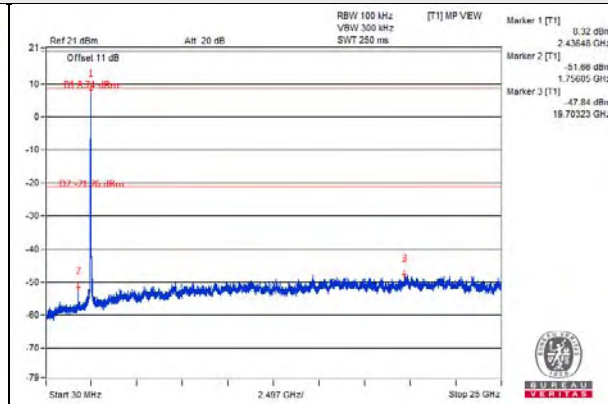
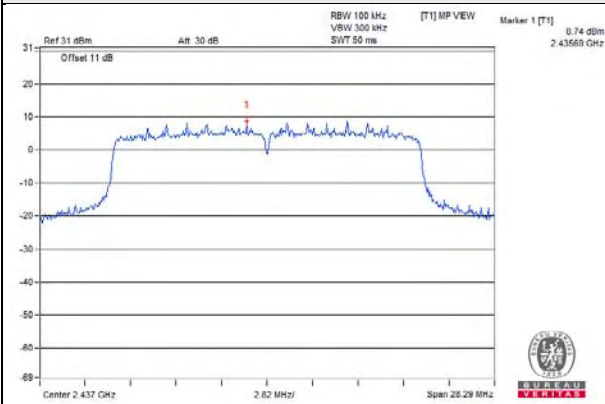


802.11n (HT20)_Chain 2

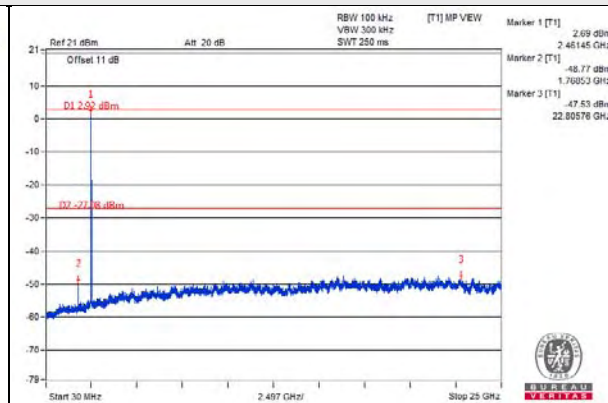
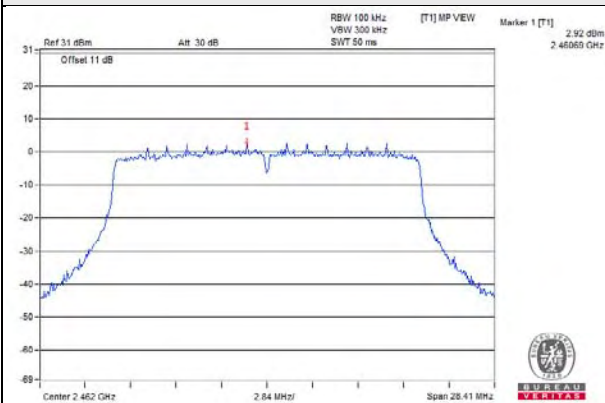
CH 1



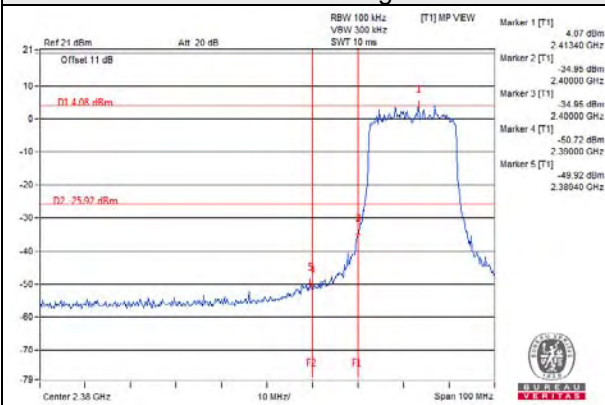
CH 6



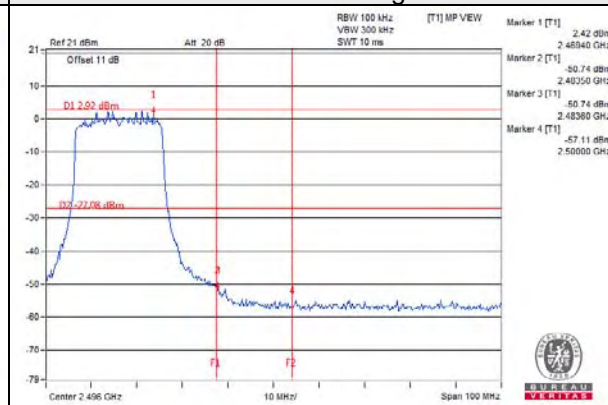
CH 11



CH 1 Band edge

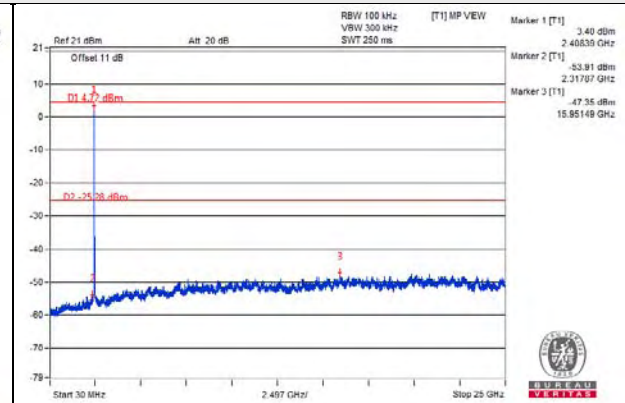
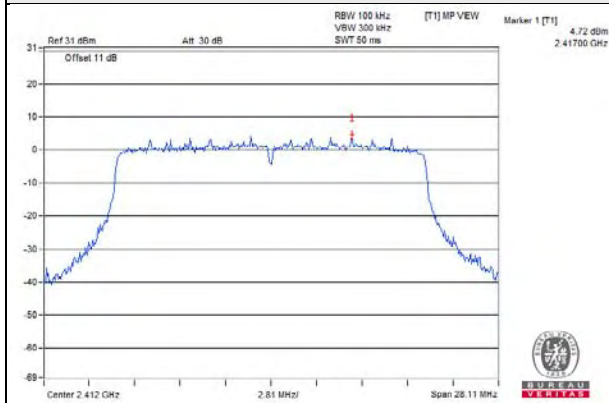


CH 11 Band edge

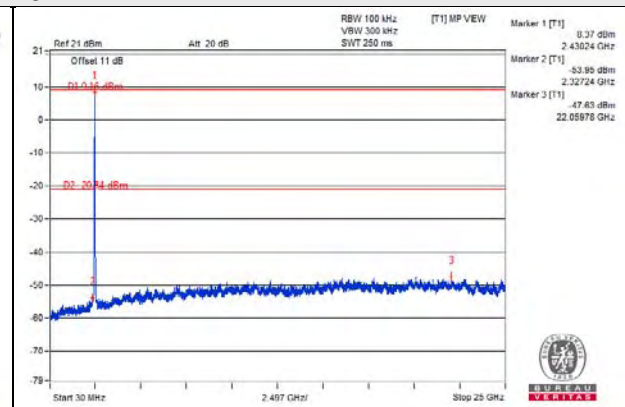
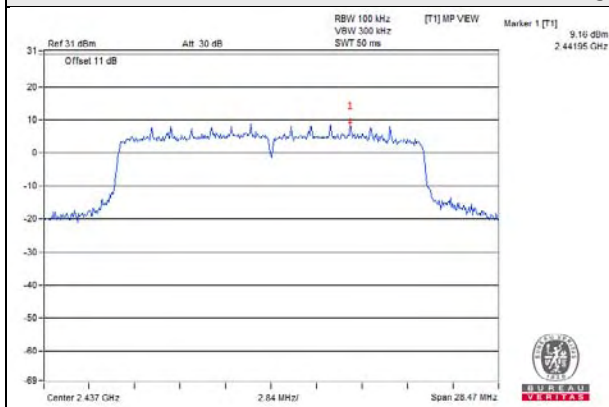


802.11n (HT20)_Chain 3

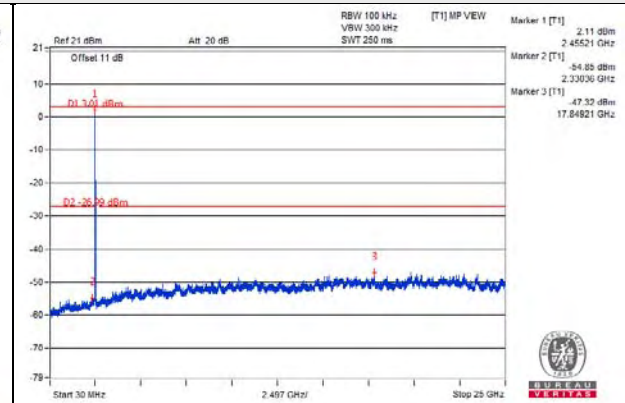
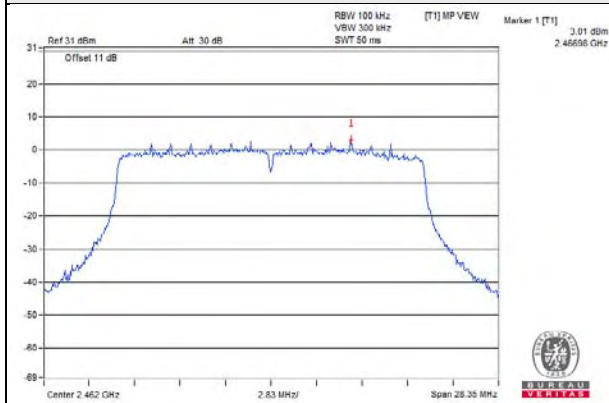
CH 1



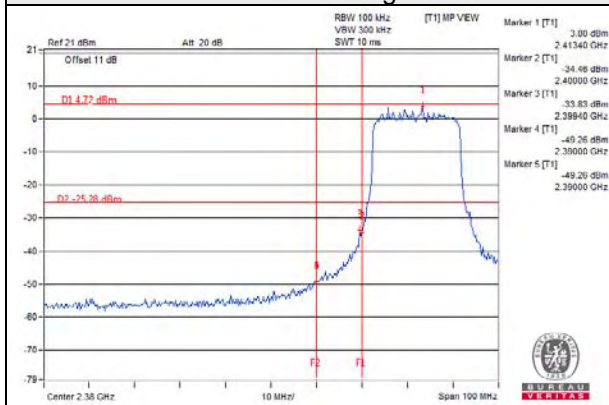
CH 6



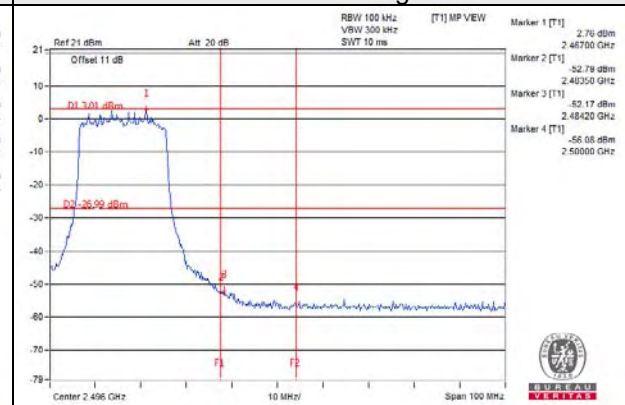
CH 11



CH 1 Band edge

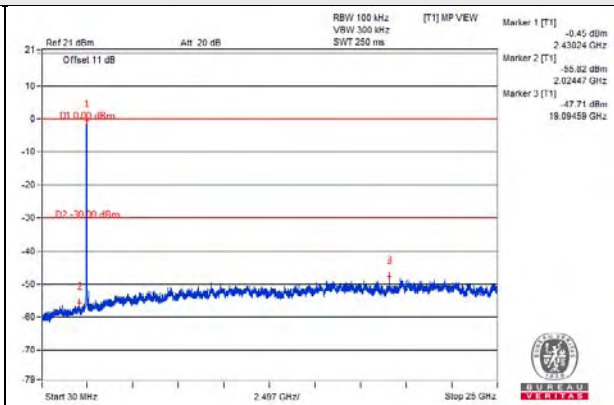
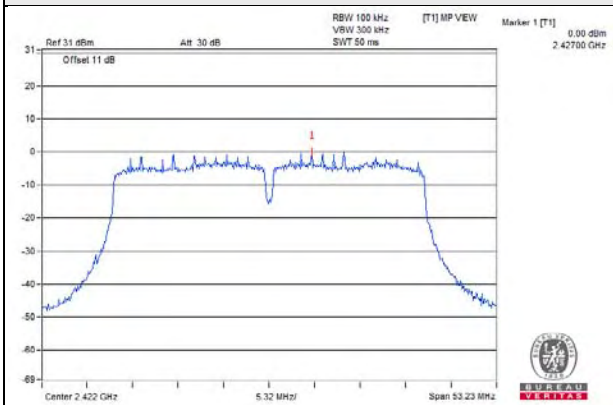


CH 11 Band edge

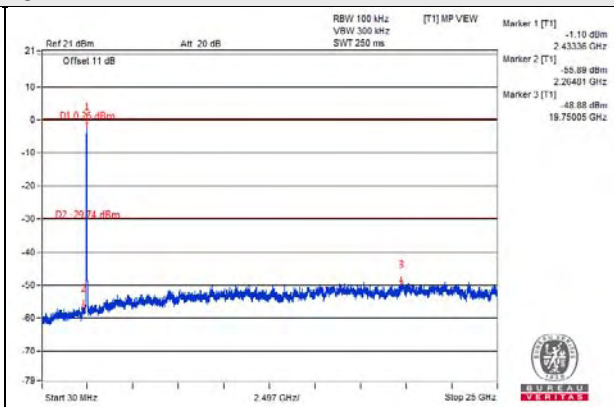
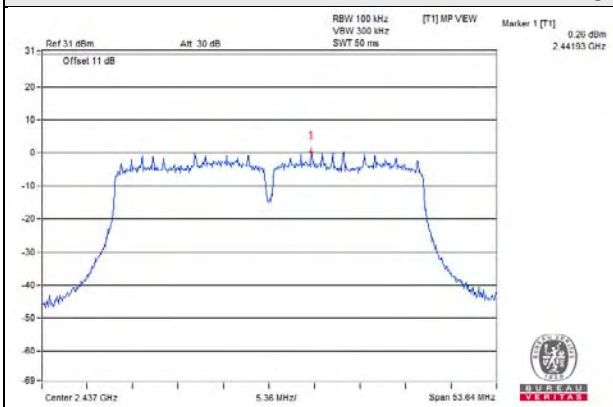


802.11n (HT40)_Chain 0

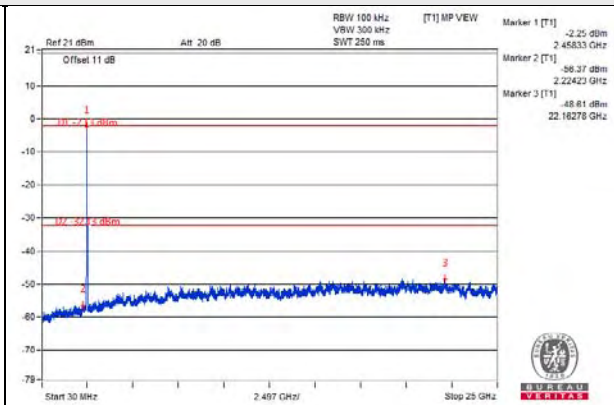
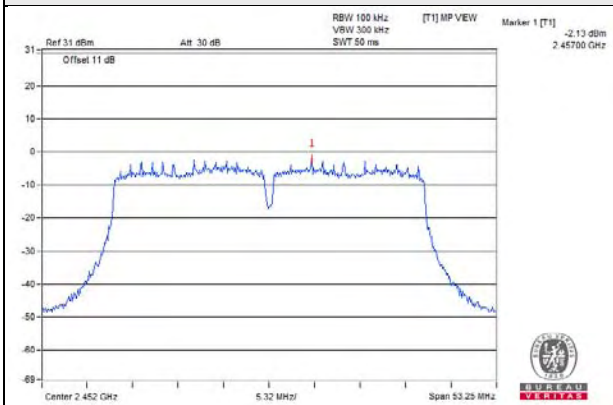
CH 3



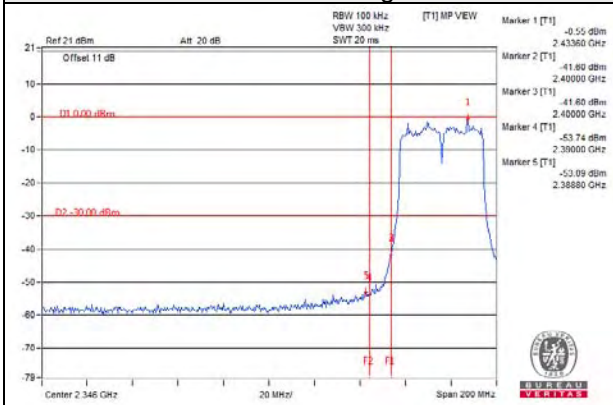
CH 6



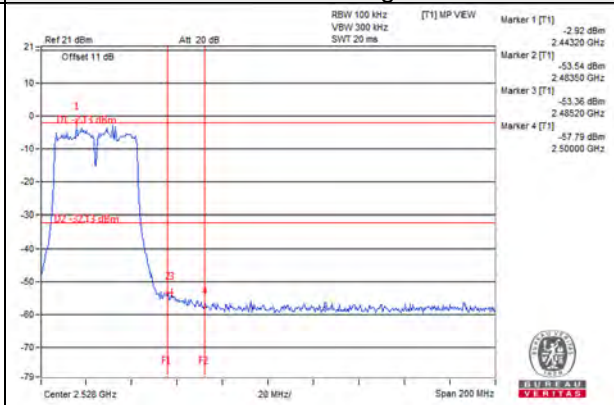
CH 9



CH 3 Band edge

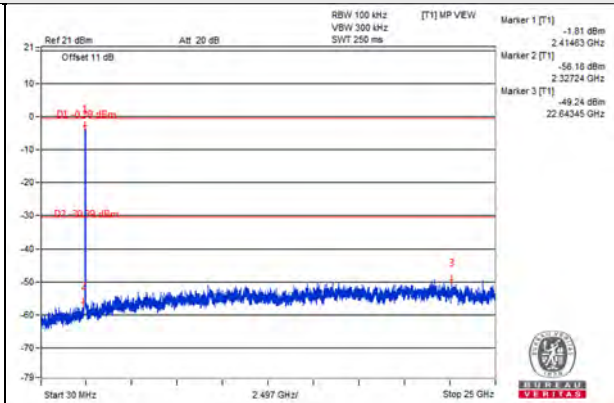
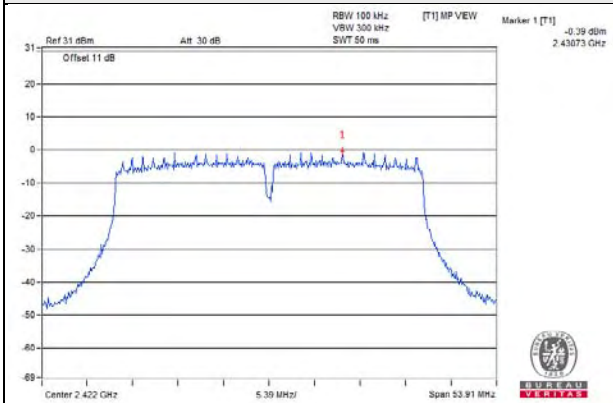


CH 9 Band edge

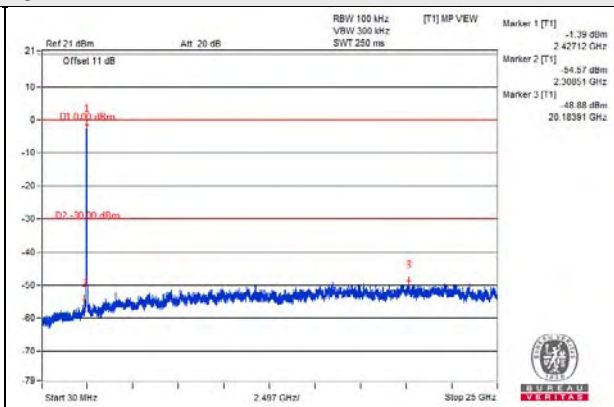
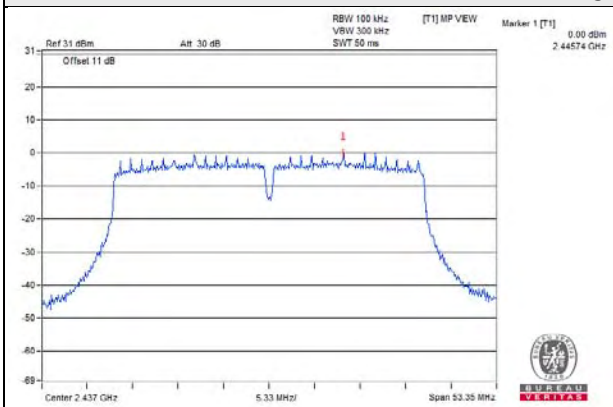


802.11n (HT40)_Chain 1

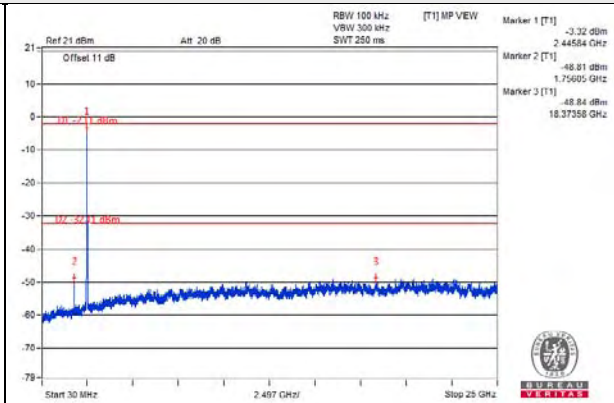
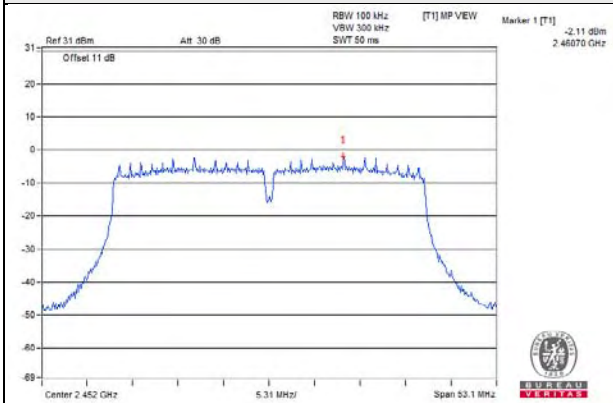
CH 3



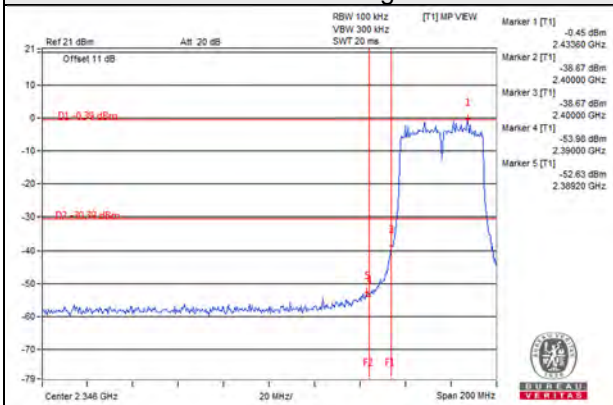
CH 6



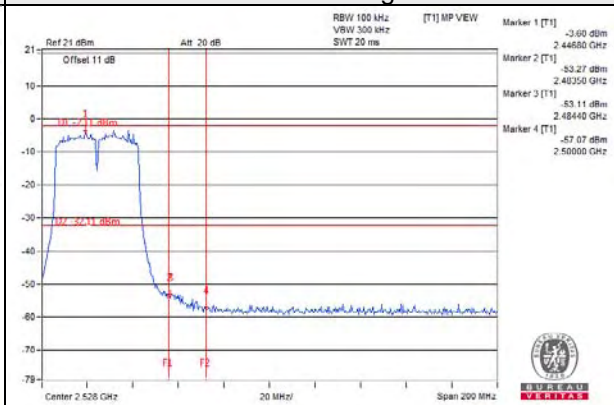
CH 9



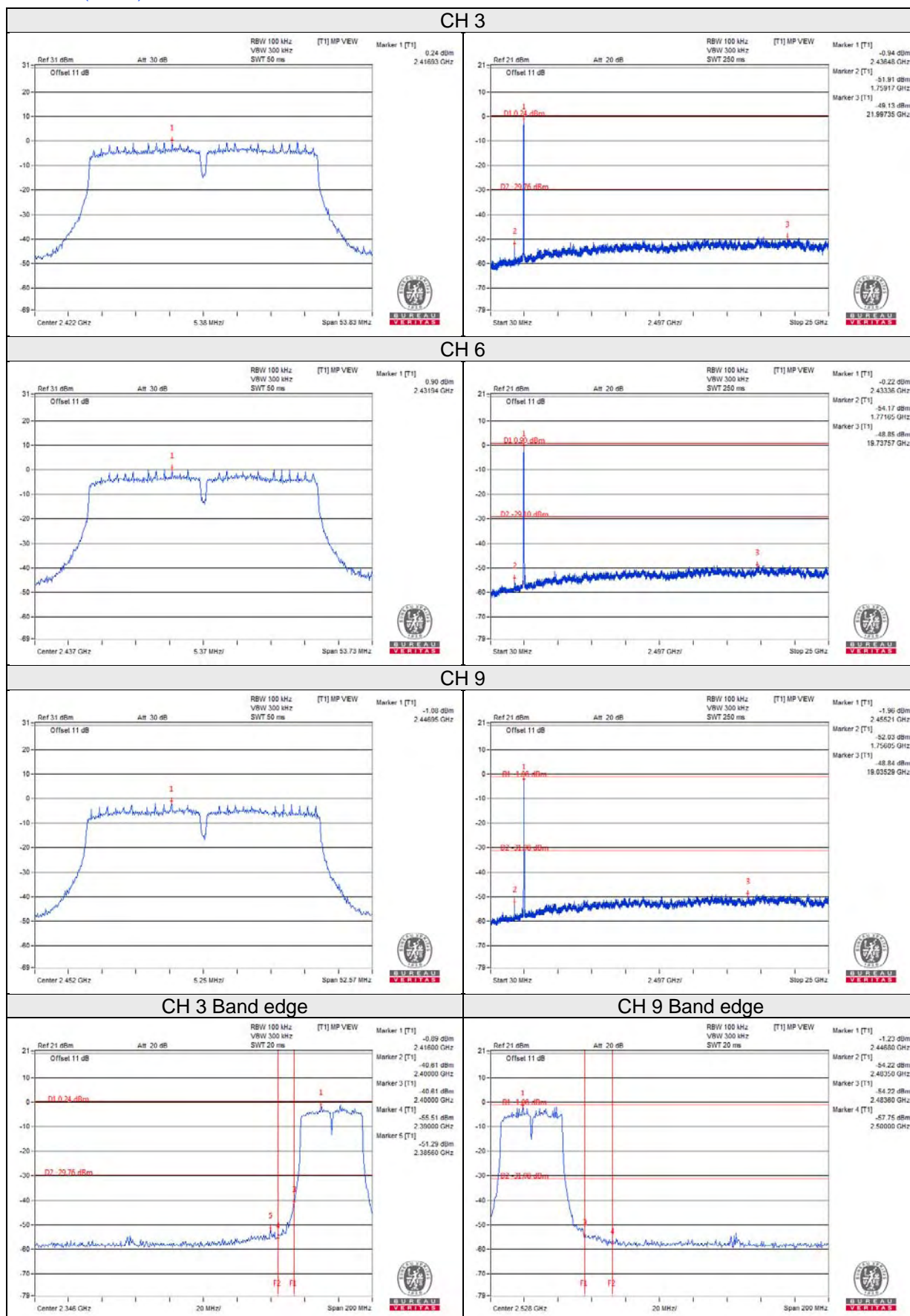
CH 3 Band edge



CH 9 Band edge

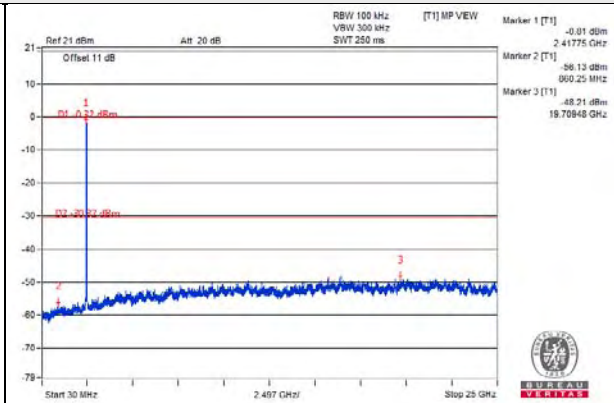
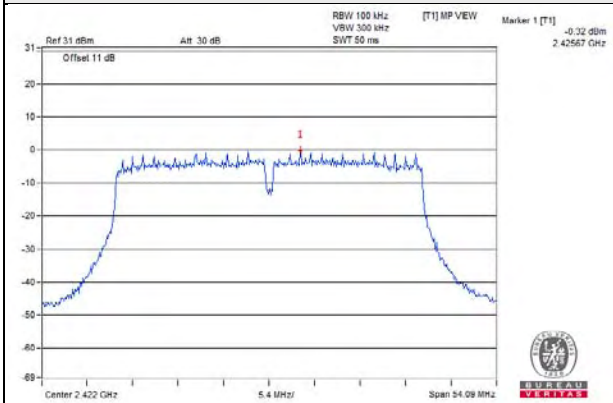


802.11n (HT40)_Chain 2

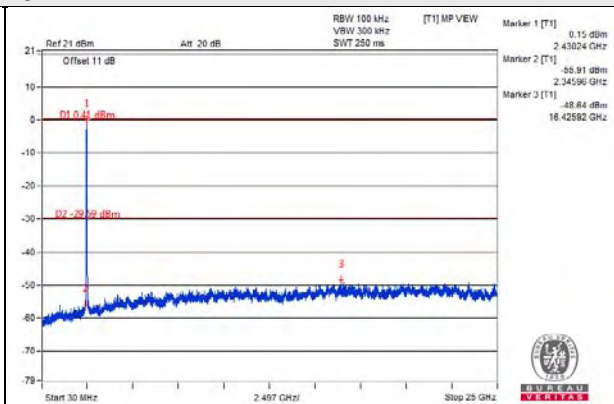
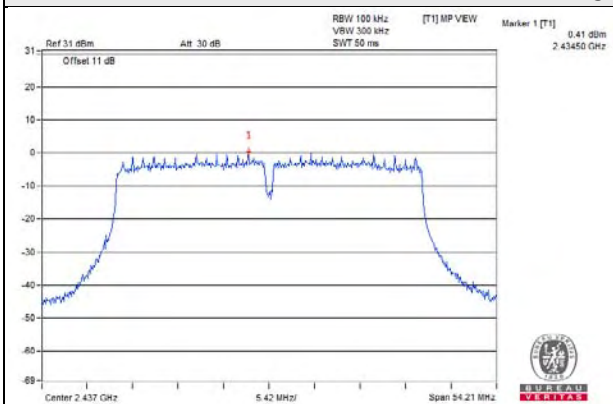


802.11n (HT40)_Chain 3

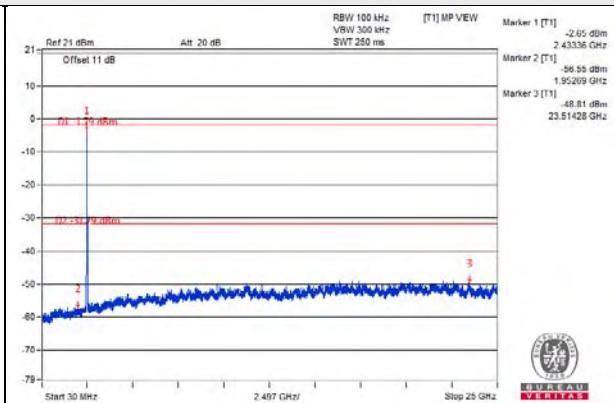
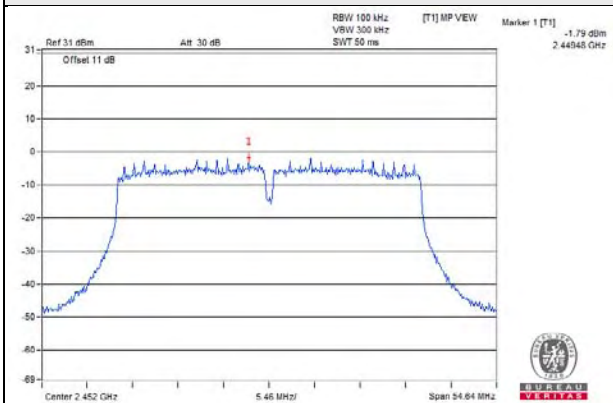
CH 3



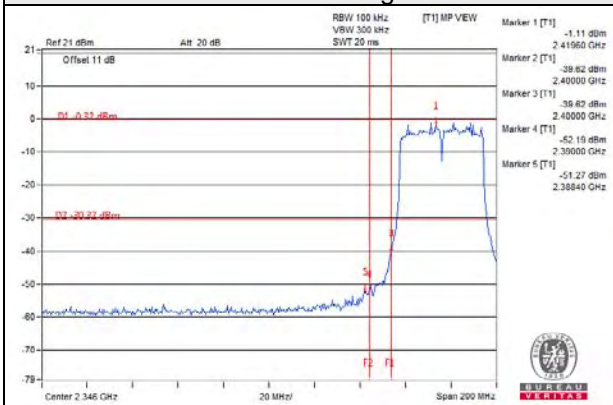
CH 6



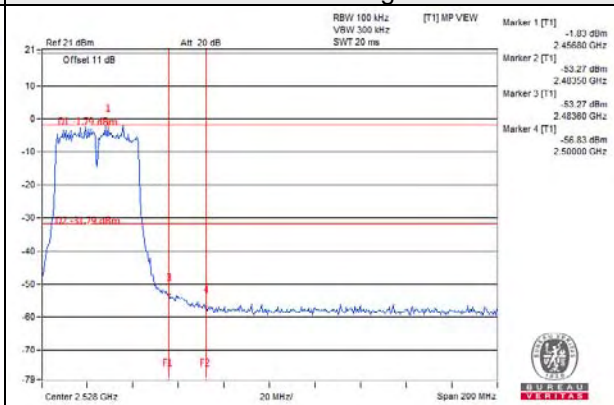
CH 9



CH 3 Band edge

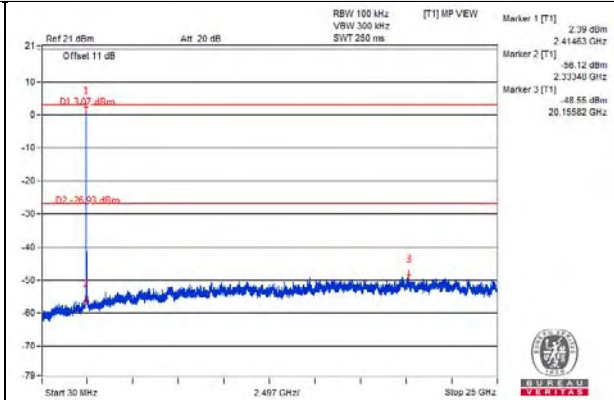
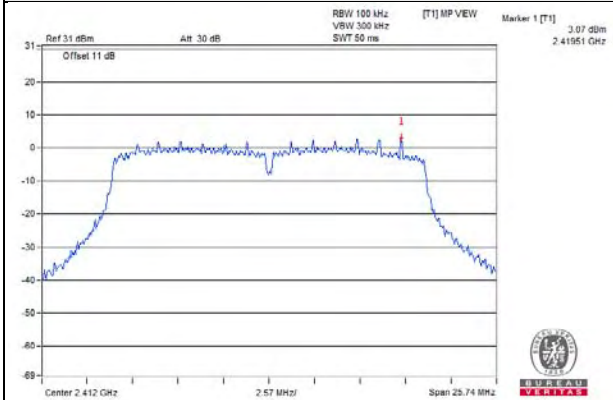


CH 9 Band edge

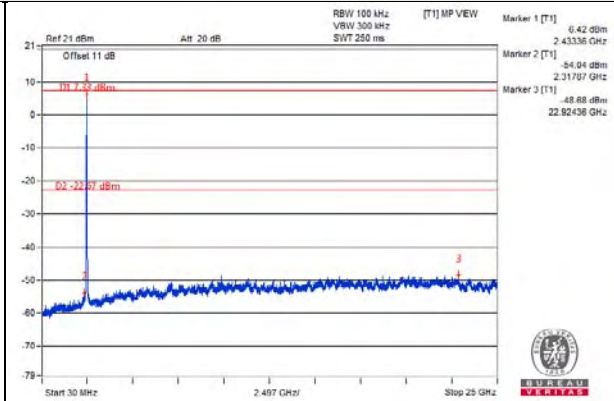
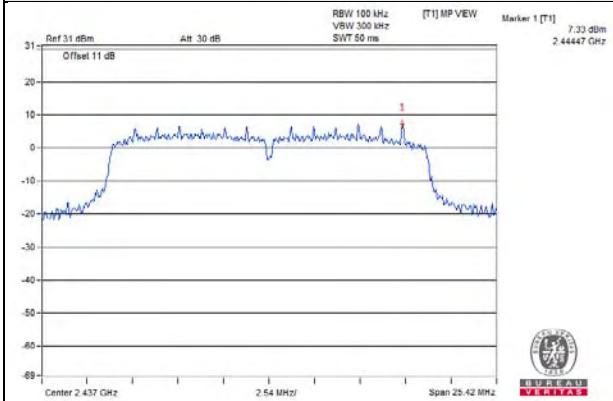


802.11ax (HE20)_Chain 0

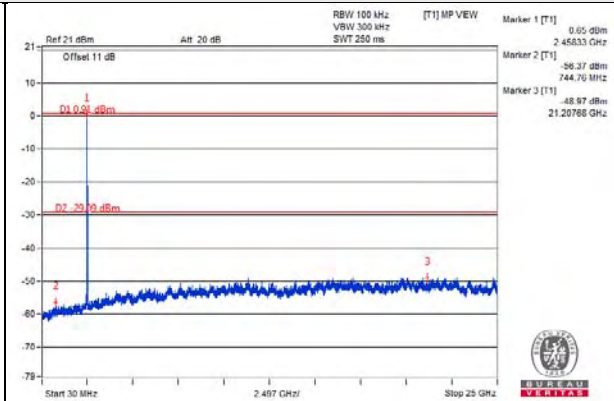
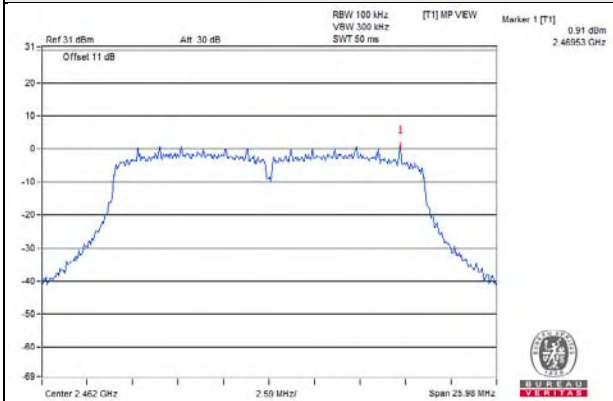
CH 1



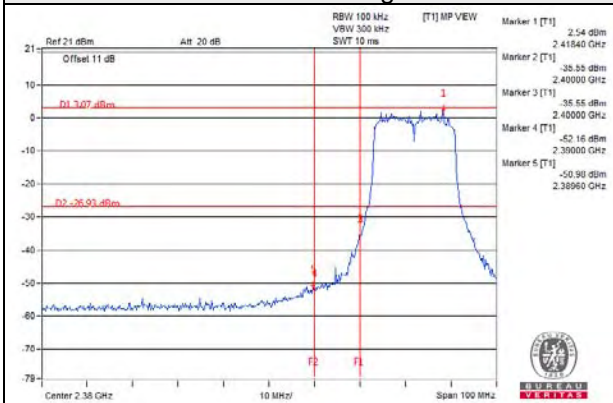
CH 6



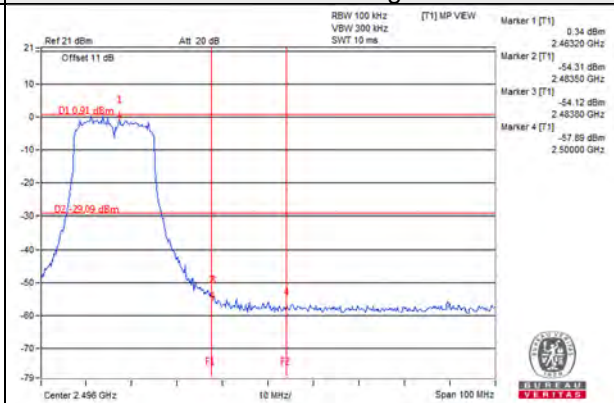
CH 11



CH 1 Band edge

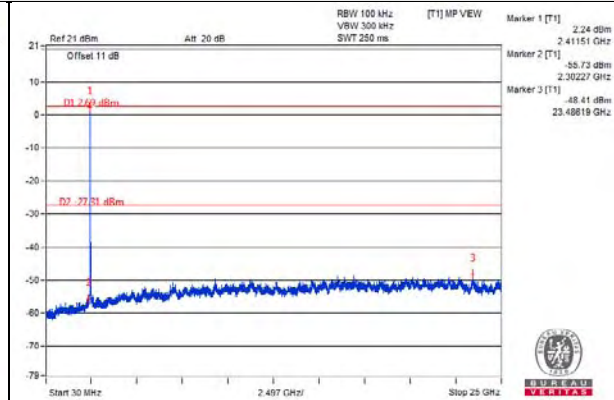
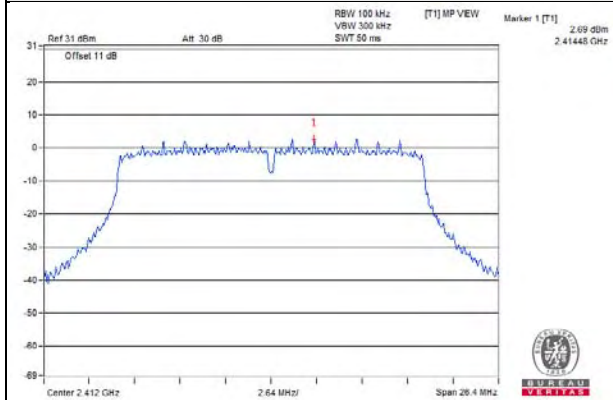


CH 11 Band edge

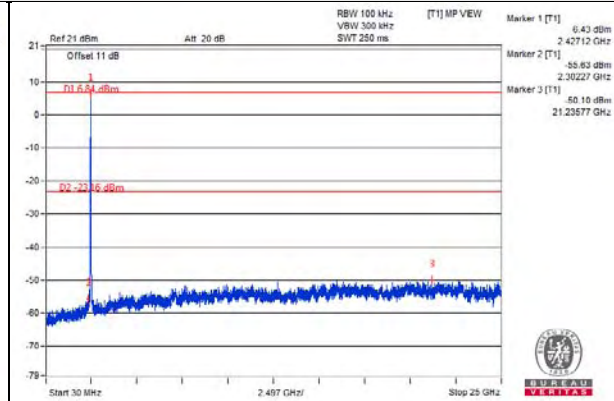
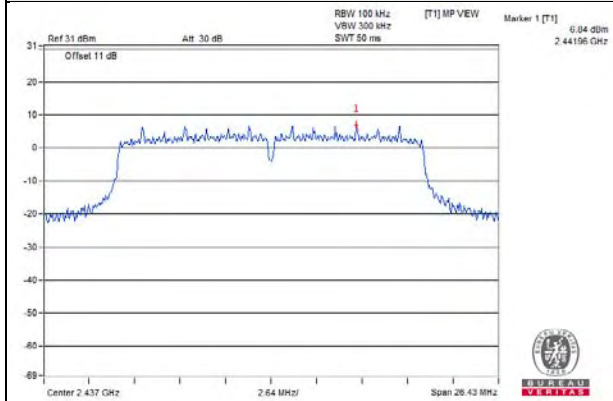


802.11ax (HE20)_Chain 1

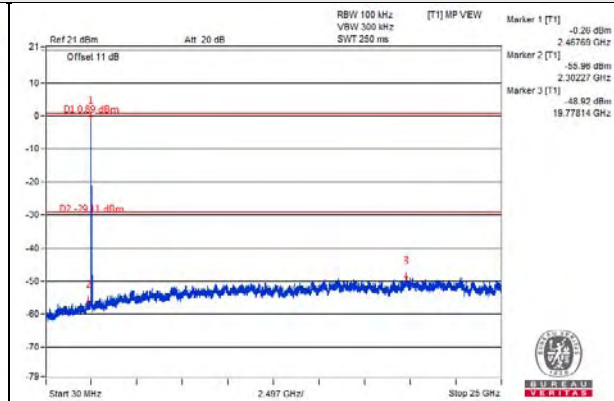
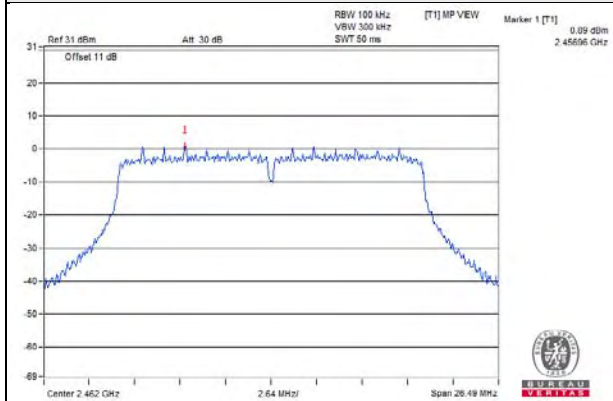
CH 1



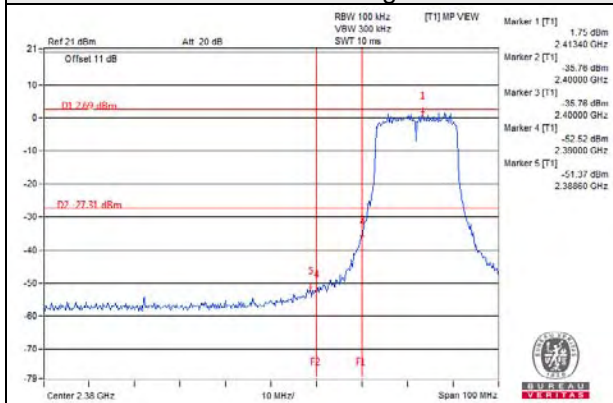
CH 6



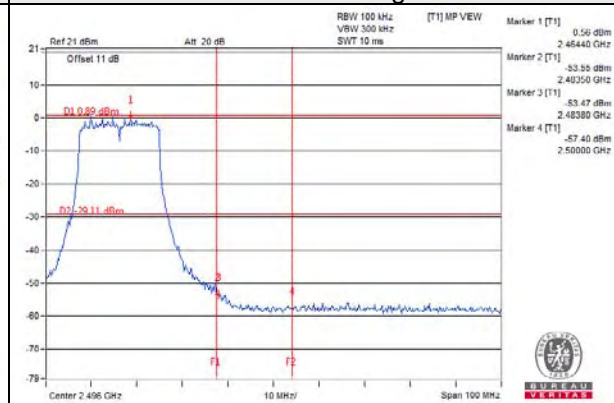
CH 11



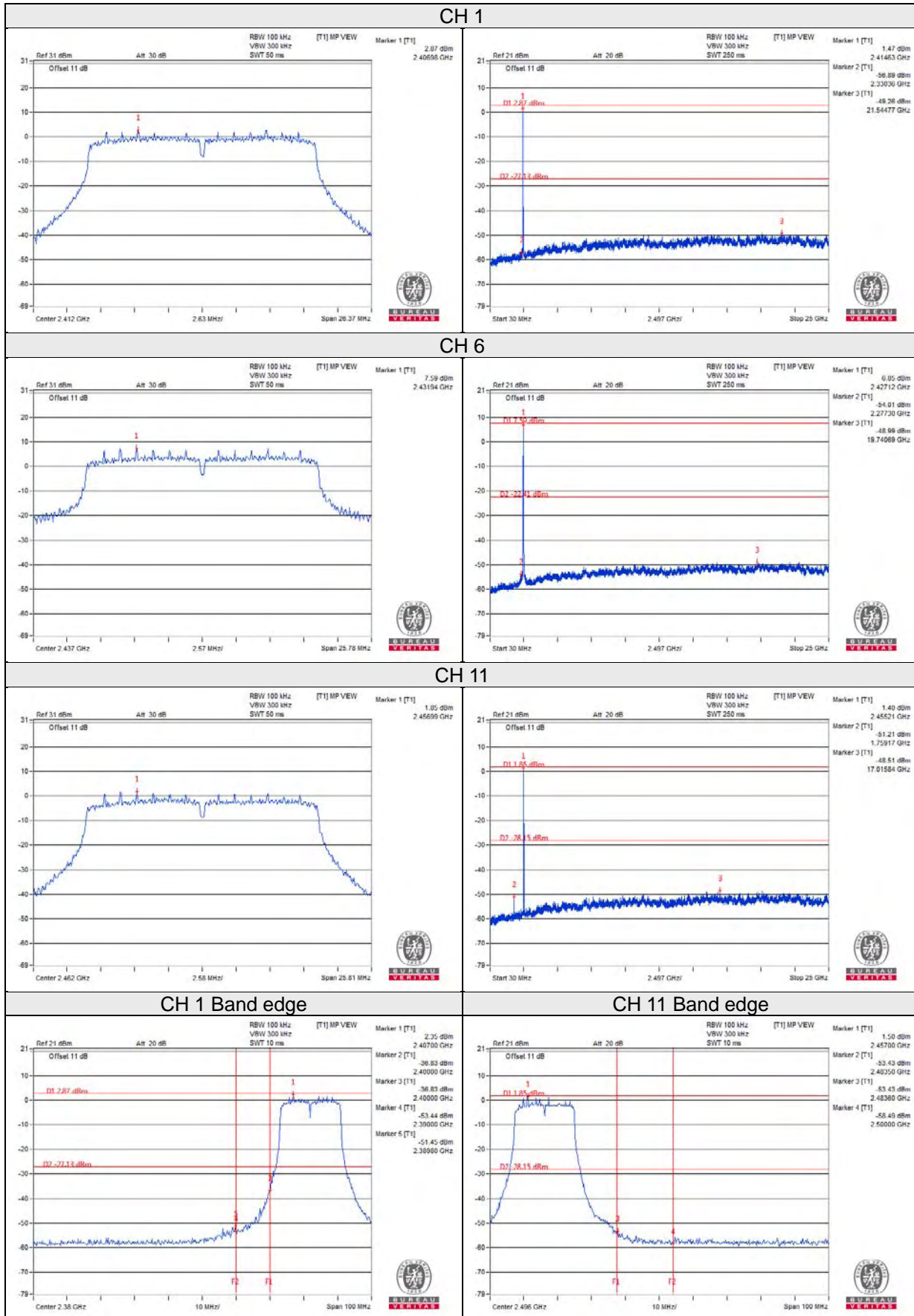
CH 1 Band edge



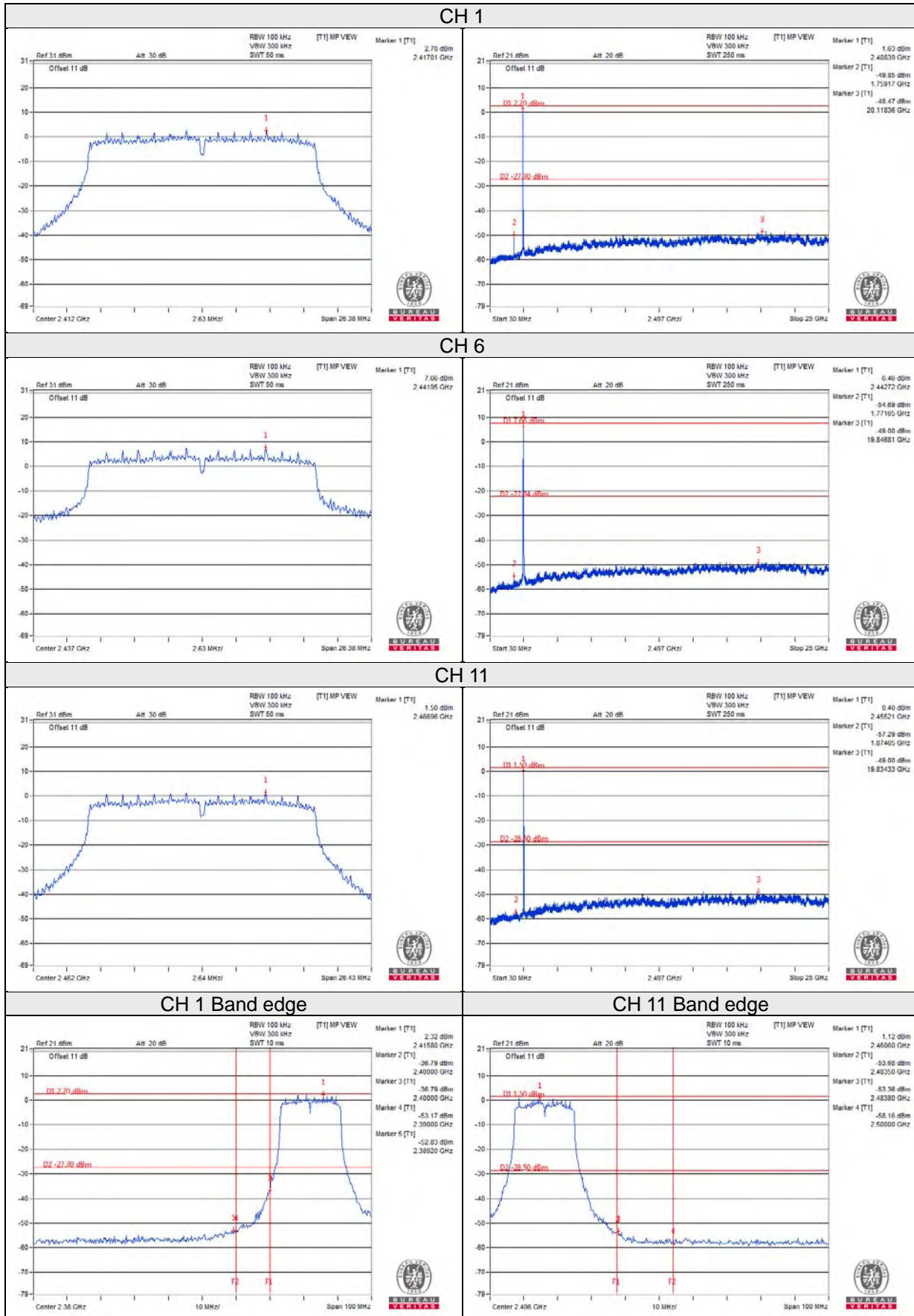
CH 11 Band edge



802.11ax (HE20)_Chain 2

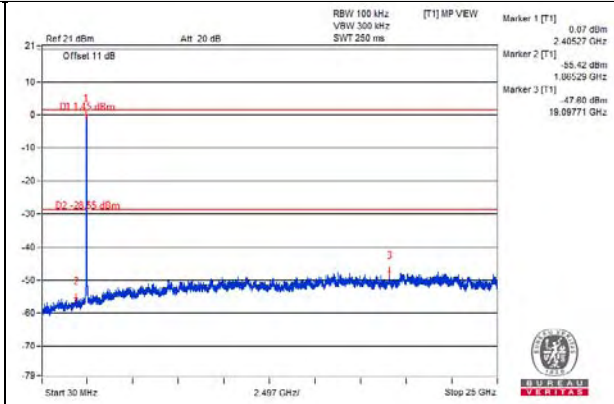
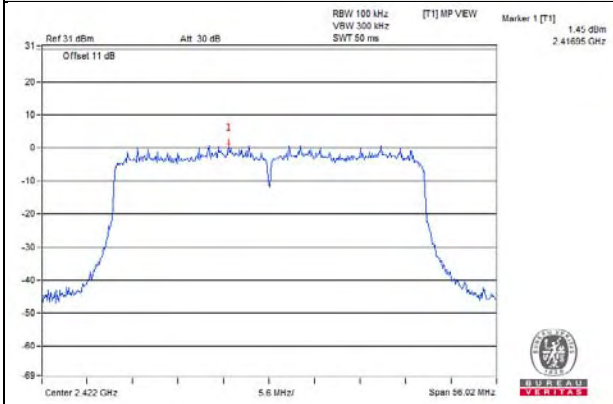


802.11ax (HE20)_Chain 3

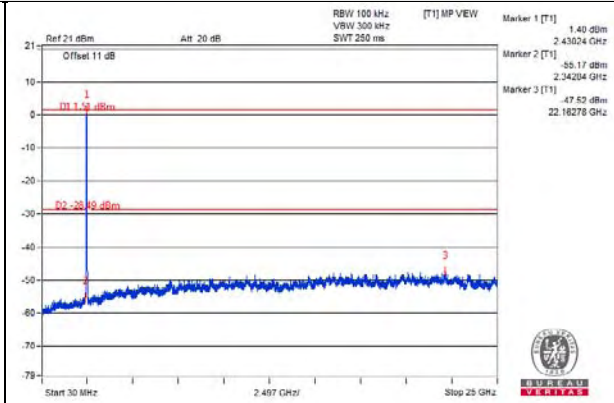
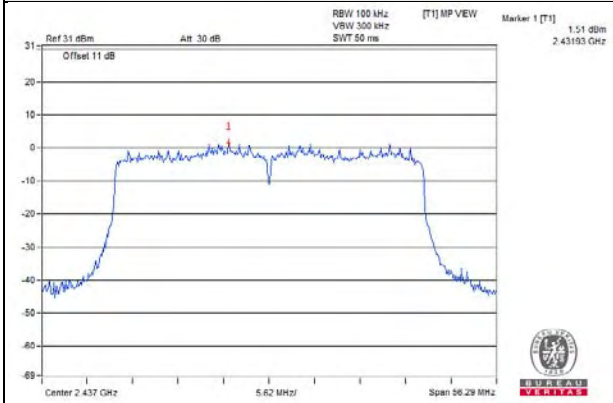


802.11ax (HE40)_Chain 0

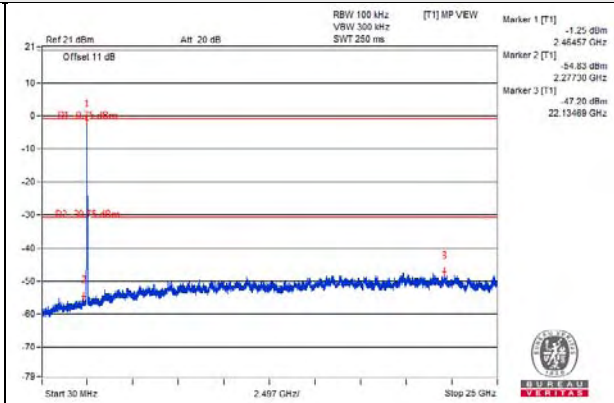
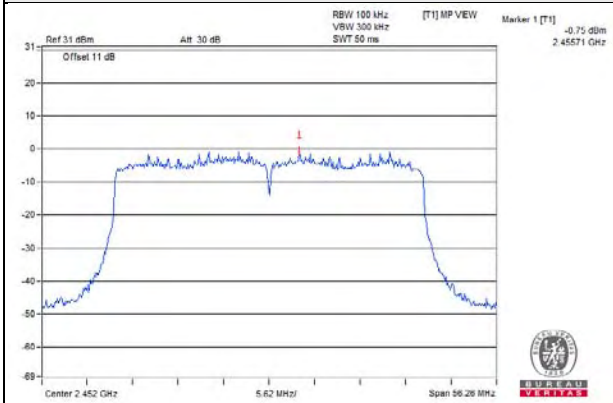
CH 3



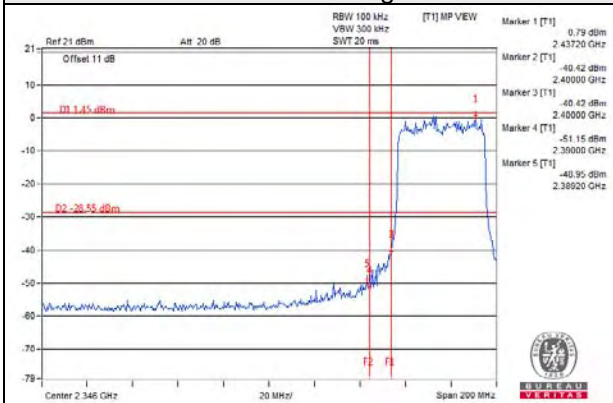
CH 6



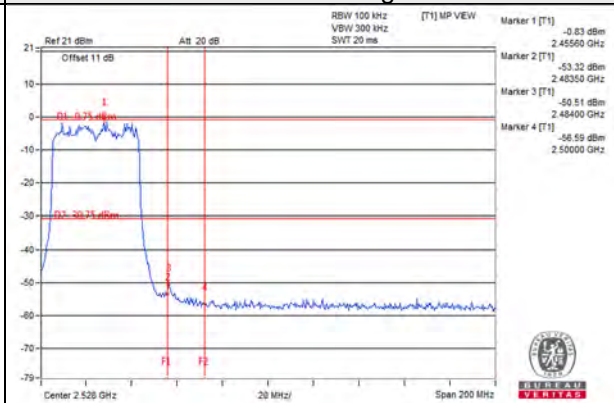
CH 9



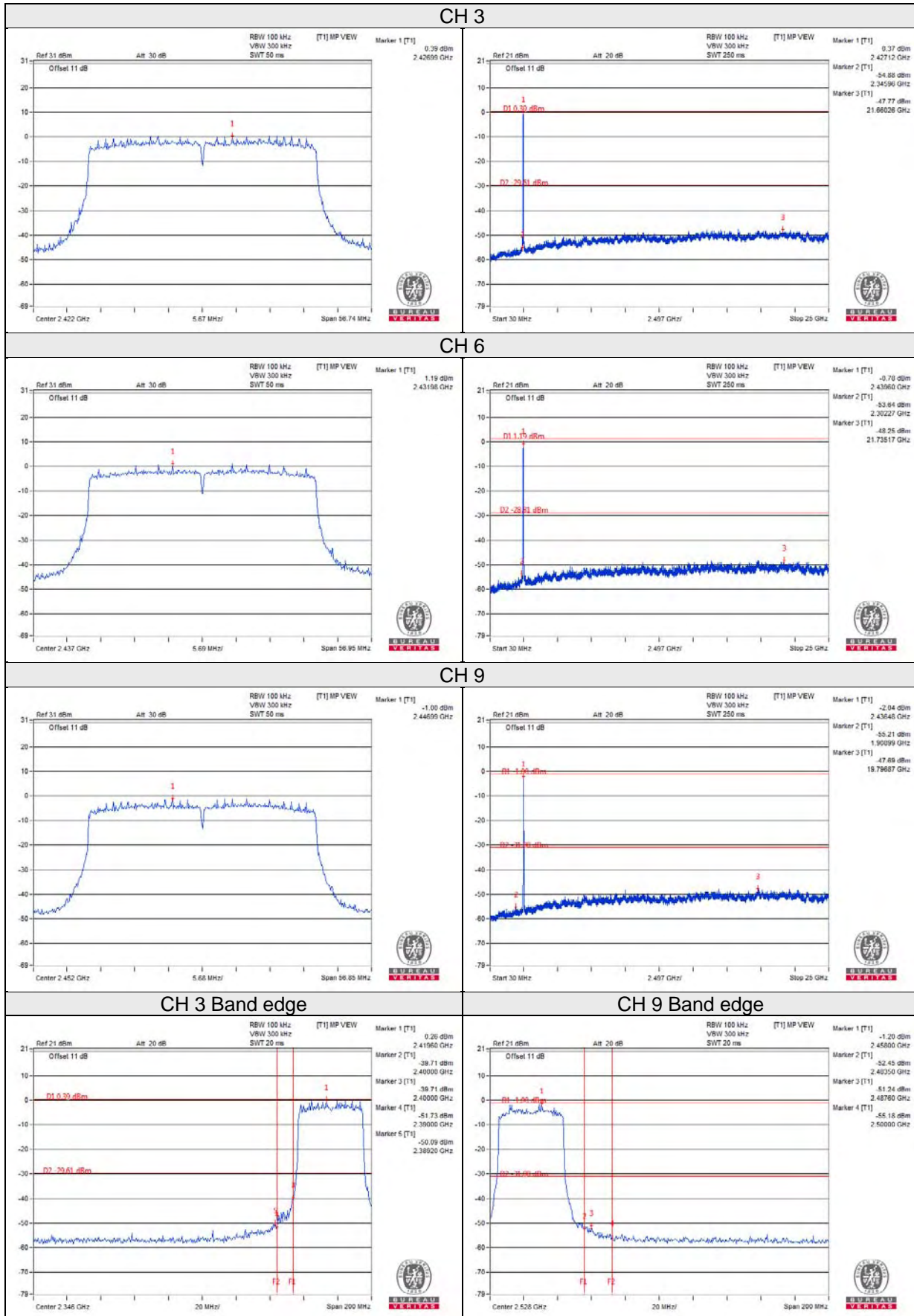
CH 3 Band edge



CH 9 Band edge

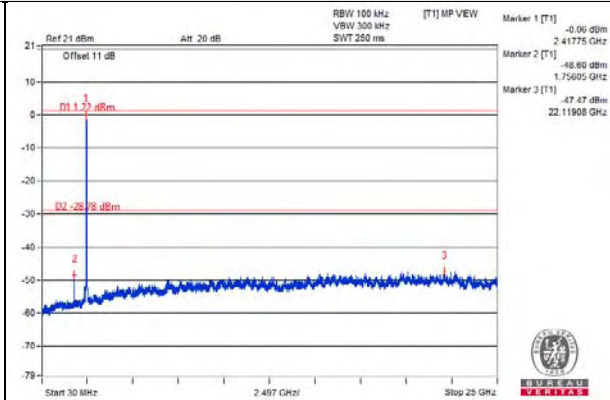
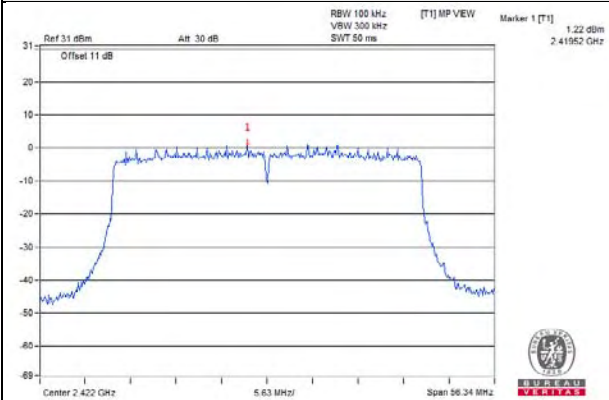


802.11ax (HE40)_Chain 1

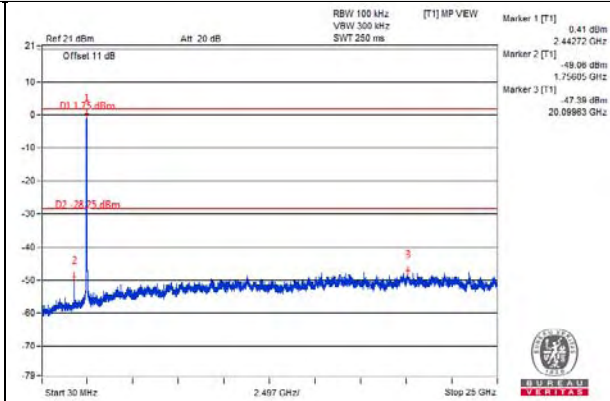
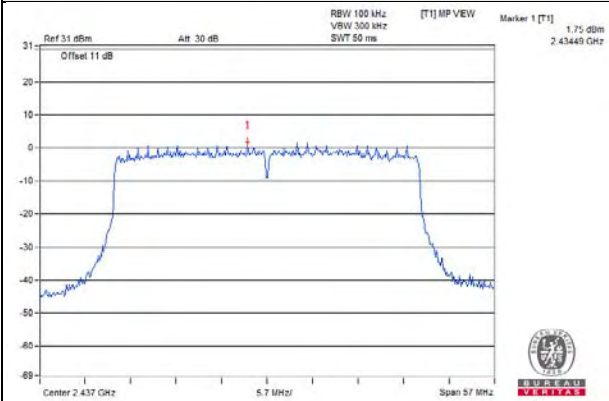


802.11ax (HE40)_Chain 2

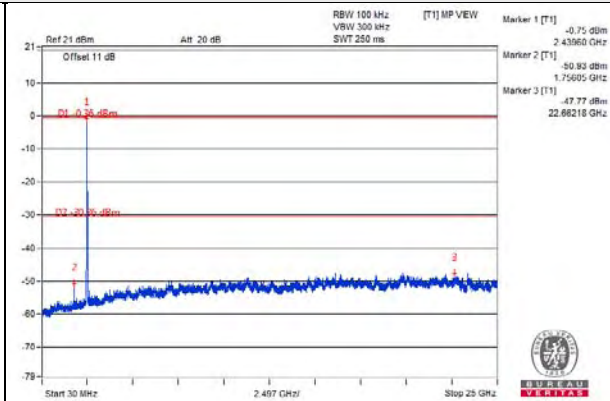
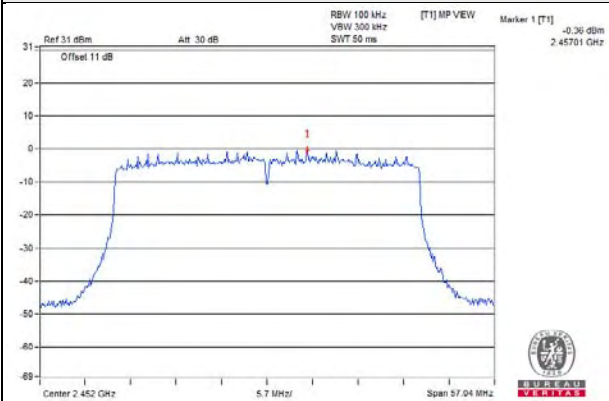
CH 3



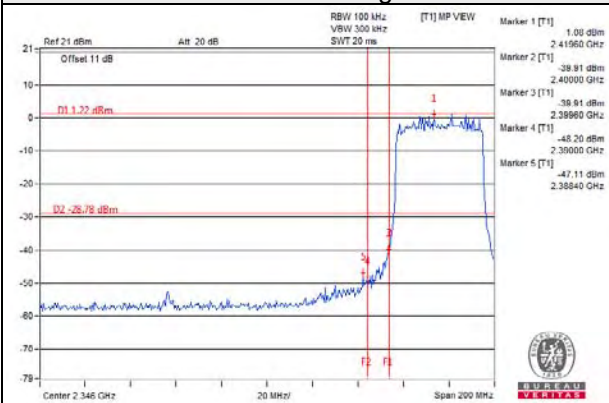
CH 6



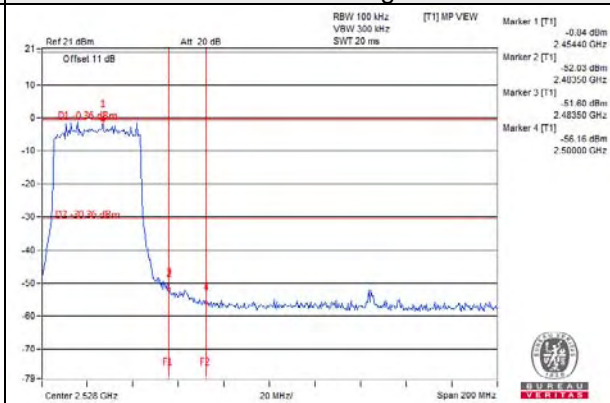
CH 9



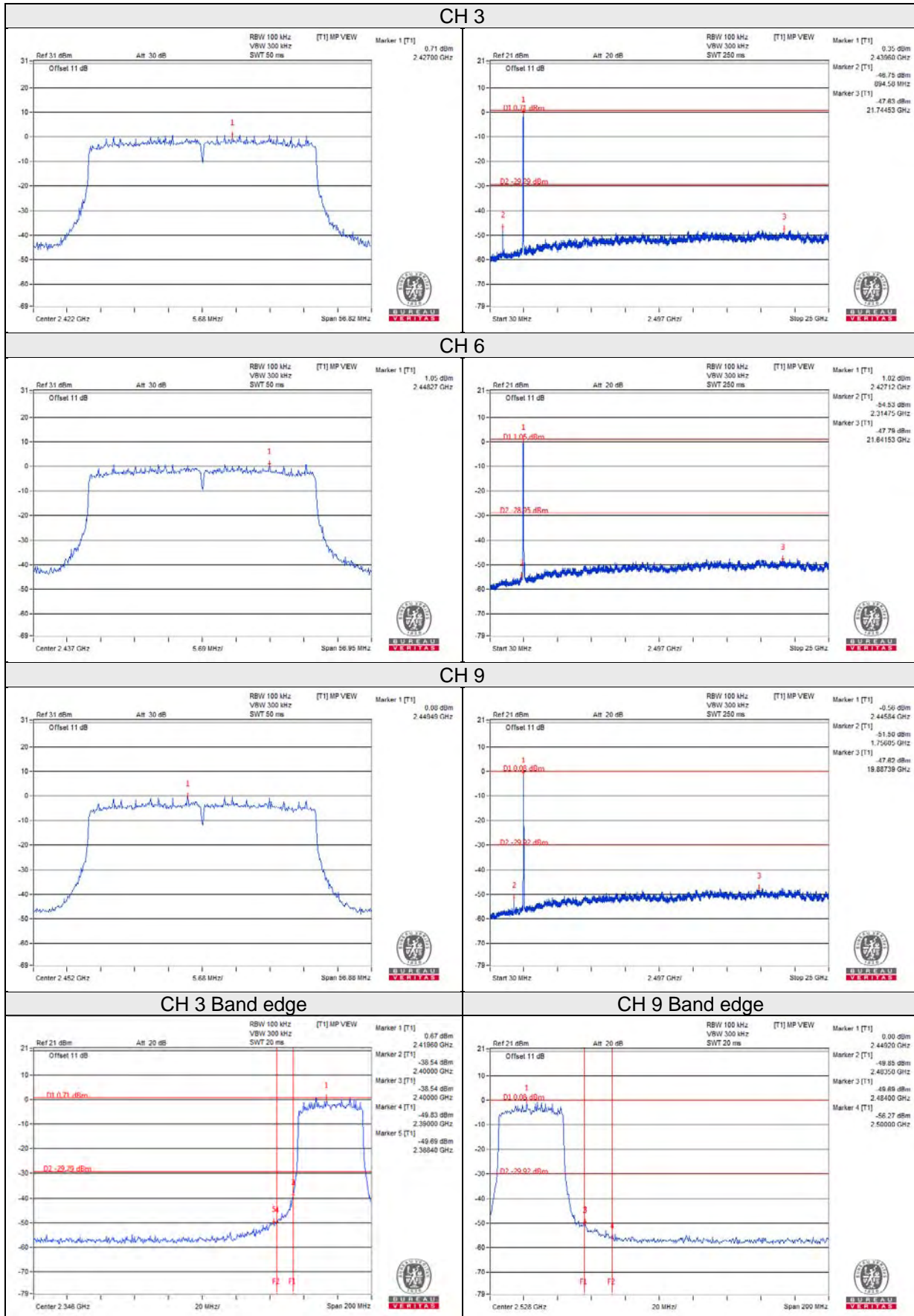
CH 3 Band edge



CH 9 Band edge



802.11ax (HE40)_Chain 3



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 and approved 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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