FCC Test Report

Report No.:	RF190806E11
FCC ID:	I88EX5510-B0
Test Model:	EX5510-B0, PX7511-B0, DX5510-B0
Received Date:	Aug. 06, 2019
Test Date:	Aug. 17 to Sep. 07, 2019
Issued Date:	Oct. 04, 2019
Applicant:	Zyxel Communications Corporation
Address:	No.2 Industry East RD. IX, Hsinchu Science Park, Hsinchu 30075, Taiwan
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
Lab Address:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan.
Test Location:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan.
FCC Registration / Designation Number:	723255 / TW2022

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Release Control Record

Issue No.	Description	Date Issued
RF190806E11	Original release.	Oct. 04, 2019

1 Certificate of Conformity

Product:	Dual-Band Wireless AX Gigabit Ethernet Gateway, Wireless AX 10G PON Gateway with VoIP, Wireless AX VDSL Bonding Gateway
Brand:	ZYXEL
Test Model:	EX5510-B0, PX7511-B0, DX5510-B0
Sample Status:	ENGINEERING SAMPLE
Applicant:	Zyxel Communications Corporation
Test Date:	Aug. 17 to Sep. 07, 2019
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.247) ANSI C63.10: 2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : Wendy Wu , **Date:** Oct. 04, 2019

Wendy Wu / Specialist

Approved by : , **Date:** Oct. 04, 2019

May Chen / Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -11.06dB at 0.96641 MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -0.3dB 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 (MHF) not a standard connector.

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

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.8 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.0 dB
	30MHz ~ 1GHz	4.8 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.0 dB
	6GHz ~ 18GHz	5.0 dB
	18GHz ~ 40GHz	5.3 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Dual-Band Wireless AX Gigabit Ethernet Gateway, Wireless AX 10G PON Gateway with VoIP, Wireless AX VDSL Bonding Gateway
Brand	ZYXEL
Test Model	EX5510-B0, PX7511-B0, DX5510-B0
Status of EUT	ENGINEERING SAMPLE
CPU Model No.	EX5510-B0: BCM68360 PX7511-B0: BCM68580X DX5510-B0: BCM63158
RF Chip Model No.	2.4G Chip: BCM43684 5G Chip: BCM43684
FW Version	EX5510-B0: V5.15(ABQX.0)C0 PX7511-B0:V5.15(ABPT.0)b4 DX5510-B0:V5.16(ABRC.0)b3
Power Supply Rating	DC 12V from adapter or UPS
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode and VHT20/40 in 2.4GHz mode 1024QAM for OFDMA in 11ax HE mode
Modulation Technology	DSSS, OFDM, OFDMA
Transfer Rate	802.11b: up to 11Mbps 802.11a/g: up to 54Mbps 802.11n: up to 600Mbps 802.11ac: up to 3466.7Mbps 802.11ax: up to 4803.9Mbps
Operating Frequency	**2.4GHz:** 2.412 ~ 2.462GHz **5GHz:** 5.18~ 5.24GHz, 5.745 ~ 5.825GHz
Number of Channel	**2.4GHz:** 802.11b, 802.11g, 802.11n (HT20), VHT20, 802.11ax (HE20): 11 802.11n (HT40), VHT40, 802.11ax (HE40): 7 **5GHz:** 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20): 9 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40): 4 802.11ac (VHT80), 802.11ax (HE80): 2
Output Power	**Non-Beamforming Mode:** **2.4GHz:** 995.204mW **5.18 ~ 5.24GHz:** 975.47mW **5.745 ~ 5.825GHz:** 988.981mW **Beamforming Mode:** **2.4GHz:** 935.096mW **5.18 ~ 5.24GHz:** 975.47mW **5.745 ~ 5.825GHz:** 988.05mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note

Accessory Device	**for EX5510-B0** - AC Adaptor, Brand:DVE, Model:DSA-42PFH-12 FUS 120350 - Ethernet Cable , Non-shielded, 1m x1 - Wallmount kit x1 **for PX7511-B0** - AC Adaptor, Brand:DVE, Model:DSA-42PFH-12 FUS 120350 - Ethernet Cable , Non-shielded, 1.8m x1 - Phone Cable , Non-shielded, 1.8m x1 **for DX5510-B0** - AC Adaptor, Brand:DVE, Model:DSA-42PFH-12 FUS 120350 - Ethernet Cable , Non-shielded, 1.8m x1 - Phone Cable , Non-shielded, 1.8m x1 - Wallmount kit x1
Data Cable Supplied	NA

Note:

1. The EUT has below product names and model names which are identical to each other in all aspects except for the followings:

Equipment Name	Model	CPU	35b/g.fast Bonding	XGS-PON	WAN (2.5G)	LAN (10G/2.5G)	LAN (GE)	USB 3.1	FXS	Wi-Fi	Adapter	UPS
Dual-Band Wireless AX Gigabit Ethernet Gateway	EX5510-B0	BCM68360	-	-	x1	-	x4	x1	-	V	12V/3.5A	-
Wireless AX 10G PON Gateway with VoIP	PX7511-B0	BCM68580X	-	x1	-	x1	x4	x1	x2	V	12V/3.5A	V
Wireless AX VDSL Bonding Gateway	DX5510-B0	BCM63158	x1	-	x1	-	x4	x1	-	V	12V/3.5A	-

2. The EUT must be supplied power adapter or UPS (only for model: PX7511-B0) as following table:

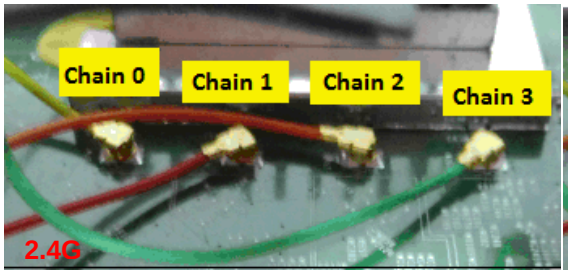
Adapter		
Brand	Model No.	Spec.
DVE	DSA-42PFH-12 FUS 120350	Input: 100-240Vac, 1.2A, 50/60Hz Output: 12V, 3.5A DC Output cable: Unshielded, 1.5m with one core
UPS (only for test, not for sale)		
Brand	Model No.	Spec.
CyberPower	DTC36U12V3-G	Input: 100-240Vac, 1.0A, 50-60Hz Output: 12V, 36W

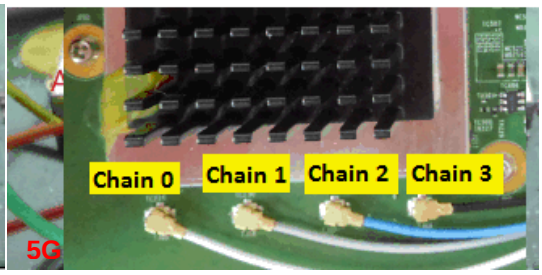
3. Simultaneously transmission condition.

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

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

Ant. No.	Chain No.	Brand	Model	Antenna Gain (dBi)	Frequency range (GHz)	Antenna Type	Connector Type	Cable Length (mm)
1	2G Chain 2	Airgain	65-034-000014B	0.12	2.4~2.4835	Dipole	i-pex (MHF)	150
2	2G Chain 3		65-034-000015B	0.12	2.4~2.4835 5.15~5.85 (5G for RX zero wait DFS)	Dipole	i-pex (MHF)	100
3	2G Chain 0		65-034-000016B	0.12	2.4~2.4835	Dipole	i-pex (MHF)	65
4	2G Chain 1		65-034-000017B	0.12	2.4~2.4835	Dipole	i-pex (MHF)	130
5	5G Chain 2	Airgain	65-034-000018B	0	5.15~5.85	Dipole	i-pex (MHF)	195
6	5G Chain 0		65-034-000019B	0	5.15~5.85	Dipole	i-pex (MHF)	150
7	5G Chain 3		65-034-000020B	0	5.15~5.85	Dipole	i-pex (MHF)	250
8	5G Chain 1		65-034-000021B	0	5.15~5.85	Dipole	i-pex (MHF)	230





* Antenna port location

5. For Model: PX7511-B0, AC power conducted emissions was pre-tested under the following modes:

Test Mode	Description
Mode A	Power from adapter
Mode B	**Power from UPS**
Note: From the above modes, the worst case was found in **Mode B**. Therefore only the test data of the mode was recorded in this report.	

6. For Model: PX7511-B0, radiated emissions was pre-tested under the following modes:

Test Mode	Description
Mode A	**Power from adapter**
Mode B	Power from UPS
Note: From the above modes, the worst case was found in **Mode A**. Therefore only the test data of the mode was recorded in this report.	

7. The EUT incorporates a MIMO function.

2.4GHz Band		
MODULATION MODE	**TX & RX CONFIGURATION**	
802.11b	4TX	4RX
802.11g	4TX	4RX
802.11n (HT20)	4TX	4RX
802.11n (HT40)	4TX	4RX
VHT20	4TX	4RX
VHT40	4TX	4RX
802.11ax (HE20)	4TX	4RX
802.11ax (HE40)	4TX	4RX
5GHz Band		
MODULATION MODE	**TX & RX CONFIGURATION**	
802.11a	4TX	4RX
802.11n (HT20)	4TX	4RX
802.11n (HT40)	4TX	4RX
802.11ac (VHT20)	4TX	4RX
802.11ac (VHT40)	4TX	4RX
802.11ac (VHT80)	4TX	4RX
802.11ac (VHT160)	4TX	4RX
802.11ax (HE20)	4TX	4RX
802.11ax (HE40)	4TX	4RX
802.11ax (HE80)	4TX	4RX
802.11ax (HE160)	4TX	4RX

Note:
1. All of modulation mode support beamforming function except 802.11a/b/g modulation mode.
2. The EUT support Beamforming and non-beamforming mode, therefore both mode were investigated and the worst case scenario was identified. The worst case data were presented in test report.
3. The modulation and bandwidth are similar for 802.11n mode for 20MHz (40MHz), 802.11ac mode for 20MHz (40MHz, 80MHz, 160MHz) and 802.11ax mode for 20MHz (40MHz, 80MHz, 160MHz), therefore the manufacturer will control the 802.11n mode power as same as 802.11ac and investigated worst case to representative mode in test report. (Final test mode refer section 3.2.1)

8. The power setting are list as below:

CDD Mode											
802.11b		**802.11g**		**VHT20**		**VHT40**		**802.11ax (HE20)**		**802.11ax (HE40)**	
Frequency (MHz)	**Power Setting**	**Frequency (MHz)**	**Power Setting**	**Frequency (MHz)**	**Power Setting**	**Frequency (MHz)**	**Power Setting**	**Frequency (MHz)**	**Power Setting**	**Frequency (MHz)**	**Power Setting**
2412	95	2412	82	2412	79	2422	79	2412	79	2422	79
2437	94	2417	86	2417	84	2437	83	2417	84	2437	83
2462	95	2437	94	2437	94	2452	74	2437	94	2452	74
		2457	85	2457	84			2457	84		
		2462	80	2462	80			2462	80		

Beamforming Mode							
VHT20		**VHT40**		**802.11ax (HE20)**		**802.11ax (HE40)**	
Frequency (MHz)	**Power Setting**	**Frequency (MHz)**	**Power Setting**	**Frequency (MHz)**	**Power Setting**	**Frequency (MHz)**	**Power Setting**
2412	79	2422	79	2412	79	2422	79
2417	84	2437	83	2417	84	2437	83
2437	92	2452	74	2437	92	2452	74
2457	84			2457	84		
2462	80			2462	80		

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

3.2 Description of Test Modes

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

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

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

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

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE≥1G	RE<1G	PLC	APCM	
1	√	√	√	√	Model: EX5501-B0
2	-	√	√	-	Model: PX7511-B0
3	-	√	√	-	Model: DX5510-B0

Where **RE≥1G:** Radiated Emission above 1GHz & Bandedge Measurement **RE<1G:** Radiated Emission below 1GHz

PLC: Power Line Conducted Emission **APCM:** Antenna Port Conducted Measurement

Radiated Emission Test (Above 1GHz):

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

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

Non-Beamforming Mode					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	Data Rate Parameter
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1Mb/s
802.11g	1 to 11	1, 2, 6, 10,11	OFDM	BPSK	6Mb/s
802.11ax (HE20)	1 to 11	1, 2, 6, 10,11	OFDMA	BPSK	MCS0
802.11ax (HE40)	3 to 9	3, 6, 9	OFDMA	BPSK	MCS0

Radiated Emission Test (Below 1GHz):

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

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

Non-Beamforming Mode					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	Data Rate Parameter
802.11b	1 to 11	6	DSSS	DBPSK	1Mb/s

Power Line Conducted Emission Test:

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

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

Non-Beamforming Mode					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	Data Rate Parameter
802.11b	1 to 11	6	DSSS	DBPSK	1Mb/s

Antenna Port Conducted Measurement:

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

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

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

Non-Beamforming Mode					
MODE	**AVAILABLE CHANNEL**	**TESTED CHANNEL**	**MODULATION TECHNOLOGY**	**MODULATION TYPE**	**Data Rate Parameter**
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1Mb/s
802.11g	1 to 11	1, 2, 6, 10,11	OFDM	BPSK	6Mb/s
VHT20 (Output power only)	1 to 11	1, 2, 6, 10,11	OFDM	BPSK	MCS0
VHT40 (Output power only)	3 to 9	3, 6, 9	OFDM	BPSK	MCS0
802.11ax (HE20)	1 to 11	1, 2, 6, 10,11	OFDMA	BPSK	MCS0
802.11ax (HE40)	3 to 9	3, 6, 9	OFDMA	BPSK	MCS0
Beamforming Mode (output power only)					
MODE	**AVAILABLE CHANNEL**	**TESTED CHANNEL**	**MODULATION TECHNOLOGY**	**MODULATION TYPE**	**Data Rate Parameter**
VHT20	1 to 11	1, 2, 6, 10,11	OFDM	BPSK	MCS0
VHT40	3 to 9	3, 6, 9	OFDM	BPSK	MCS0
802.11ax (HE20)	1 to 11	1, 2, 6, 10,11	OFDMA	BPSK	MCS0
802.11ax (HE40)	3 to 9	3, 6, 9	OFDMA	BPSK	MCS0

Test Condition:

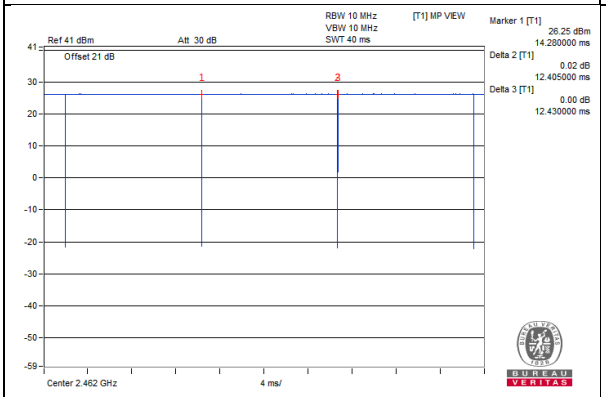
Applicable To	Environmental Conditions	Input Power	Tested By
RE≥1G	21deg. C, 70%RH	120Vac, 60Hz	Jeff Lee
RE<1G	22deg. C, 66%RH 23deg. C, 66%RH	120Vac, 60Hz	Andy Ho Ryan Du
PLC	25deg. C, 75%RH 23deg. C, 76%RH	120Vac, 60Hz	Andy Ho
APCM	25deg. C, 60%RH	120Vac, 60Hz	Robert Cheng

3.3 Duty Cycle of Test Signal

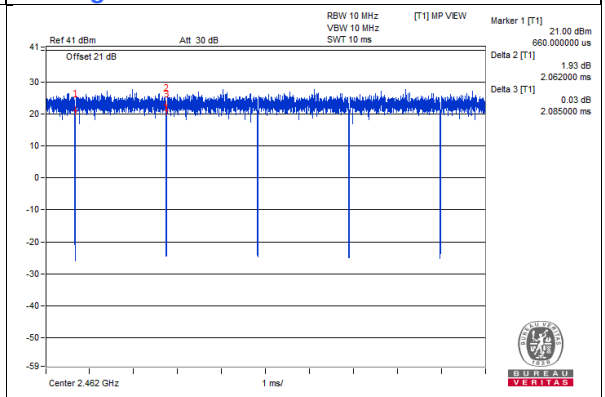
If duty cycle of test signal is ≥ 98 %, duty factor is not required.
If duty cycle of test signal is < 98%, duty factor shall be considered.

802.11b: Duty cycle = 12.405/12.43 = 0.998
802.11g: Duty cycle = 2.062/2.085 = 0.989
VHT20: Duty cycle = 1.485/1.516 = 0.98
VHT40: Duty cycle = 0.771/0.795 = 0.97, Duty factor = 10 * log(1/Duty cycle) = 0.13
802.11ax (HE20): Duty cycle = 1.485/1.516 = 0.98
802.11ax (HE40): Duty cycle = 0.771/0.795 = 0.97, Duty factor = 10 * log(1/Duty cycle) = 0.13

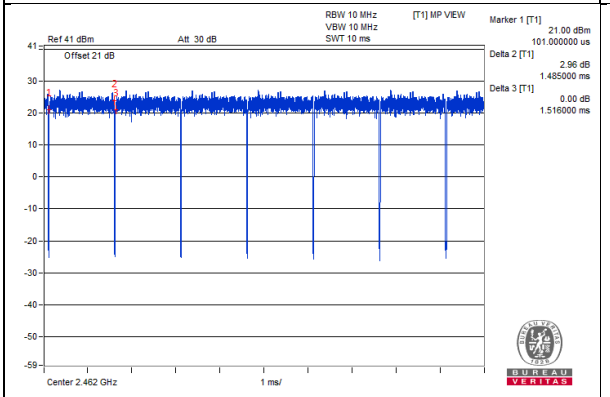
802.11b



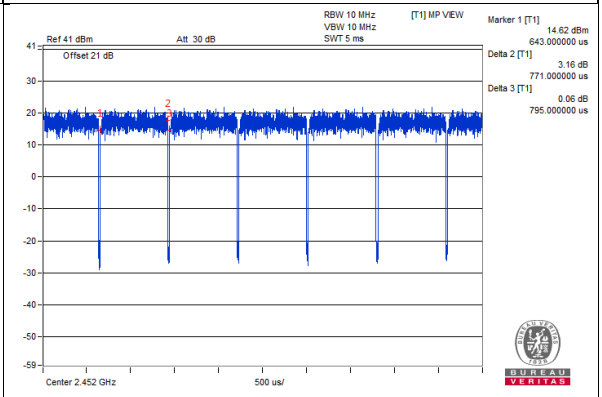
802.11g



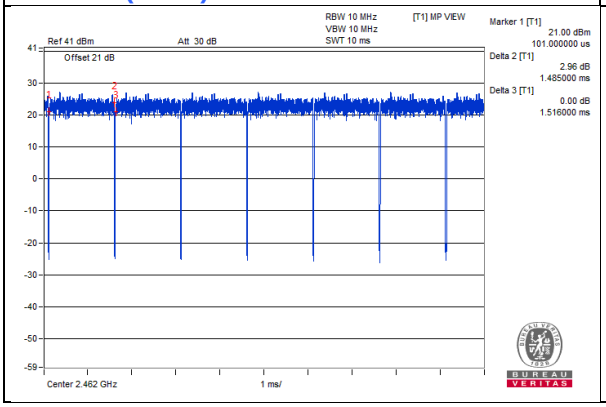
VHT20



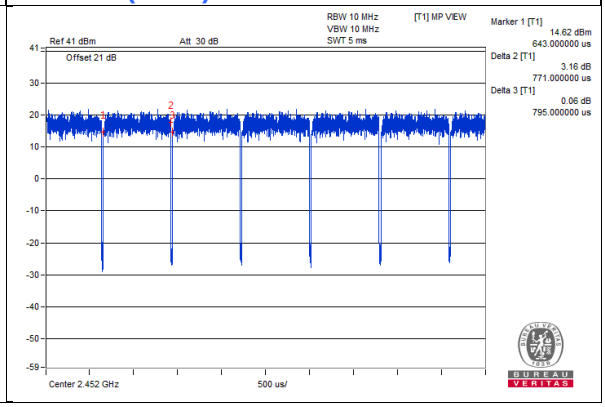
VHT40



802.11ax (HE20)



802.11ax (HE40)



3.4 Description of Support Units

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

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Laptop	Lenovo	81A4	YD02YN7P	FCC DoC	Provided by Lab
B.	UPS	CyberPower	DTC36U12V3-G	NA	NA	Supplied by client

Note:

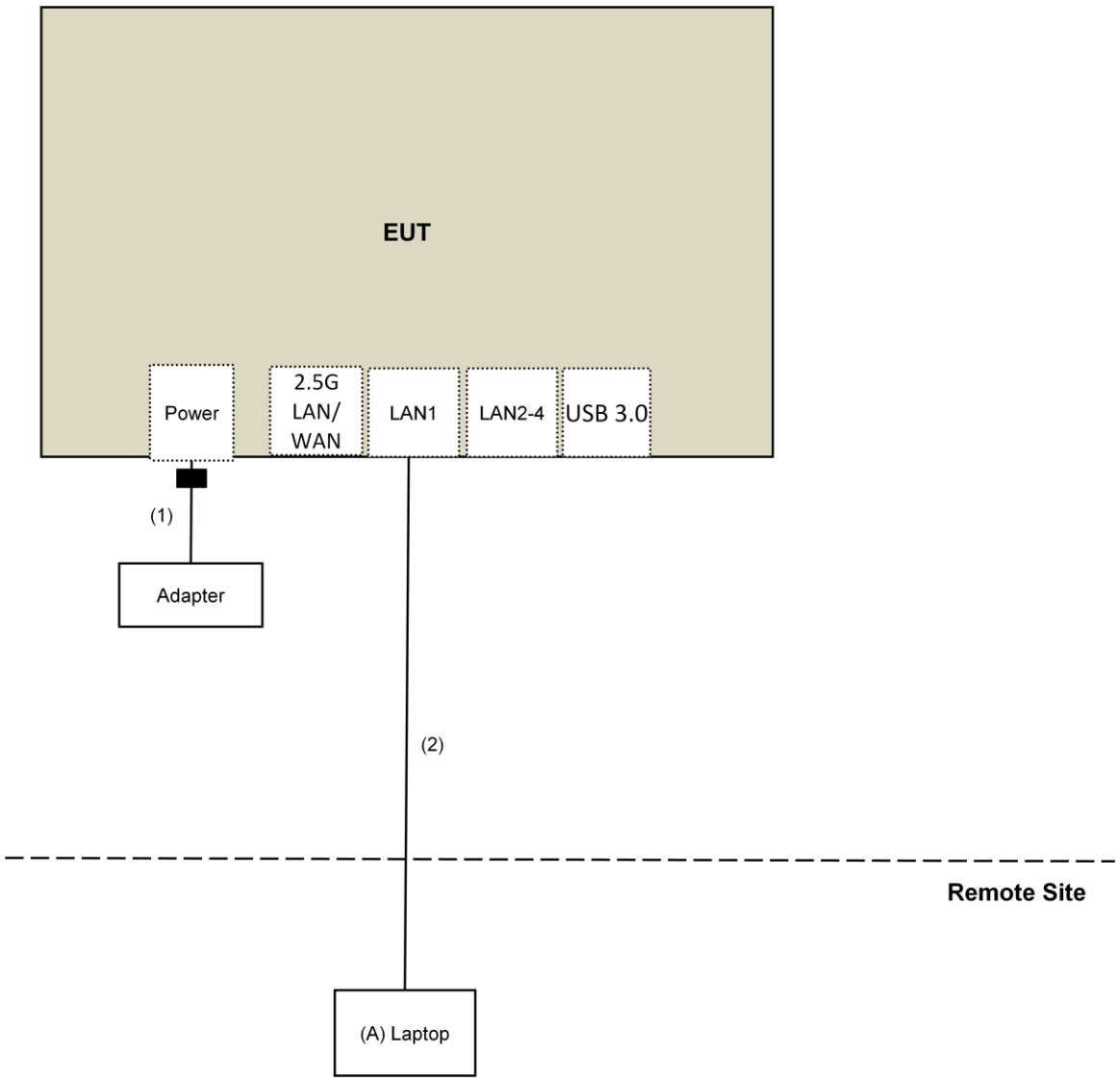
1. All power cords of the above support units are non-shielded (1.8m).

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC Cable	1	1.5	No	1	Supplied by client
2.	RJ-45 Cable	1	10	No	0	Provided by Lab
3.	UPS Cable	1	2.95	No	0	Supplied by client
4.	AC Cable	1	1.8	No	0	Supplied by client

Note: The core(s) is(are) originally attached to the cable(s).

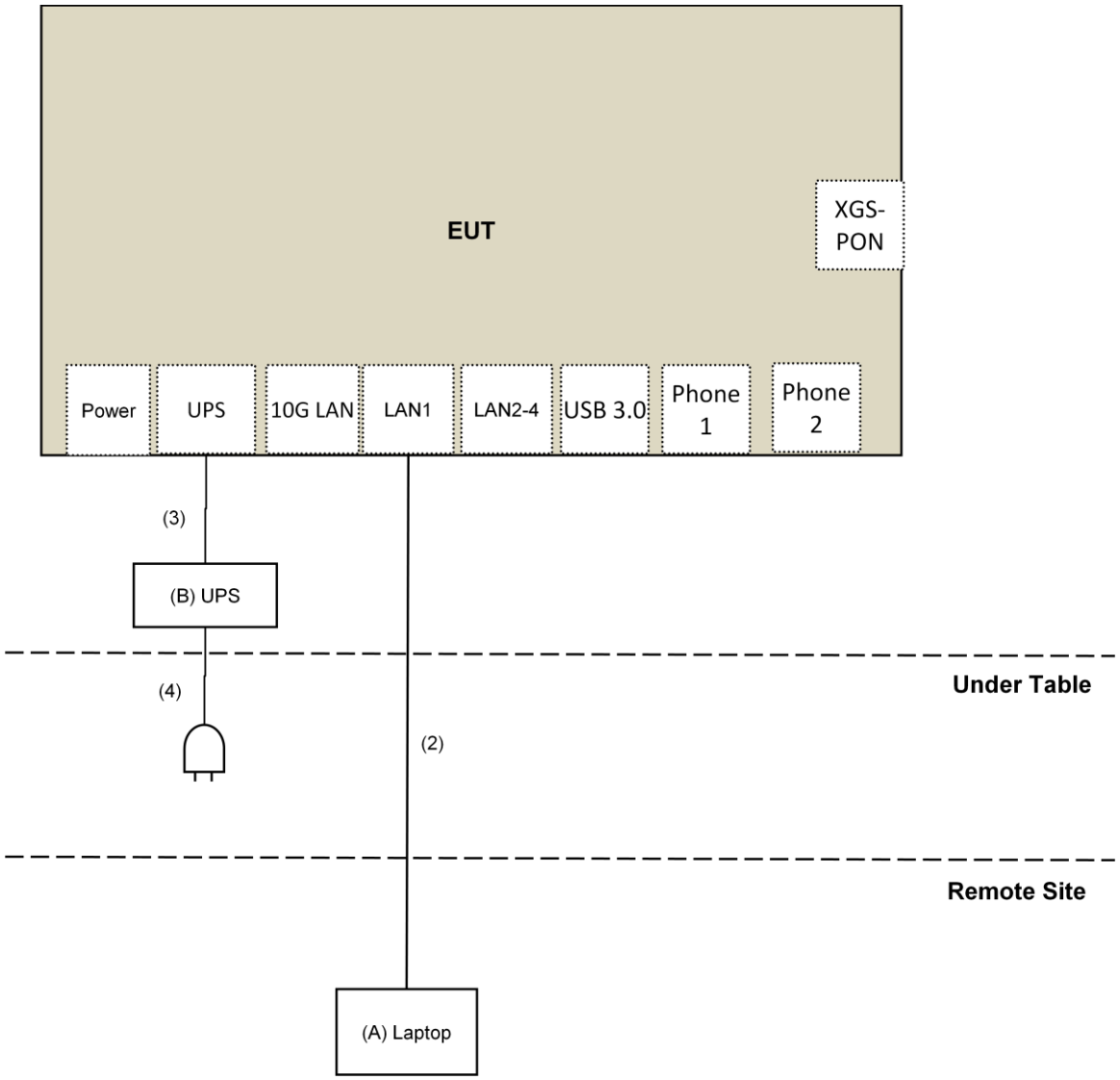
3.4.1 Configuration of System under Test

For Model: EX5501-B0:



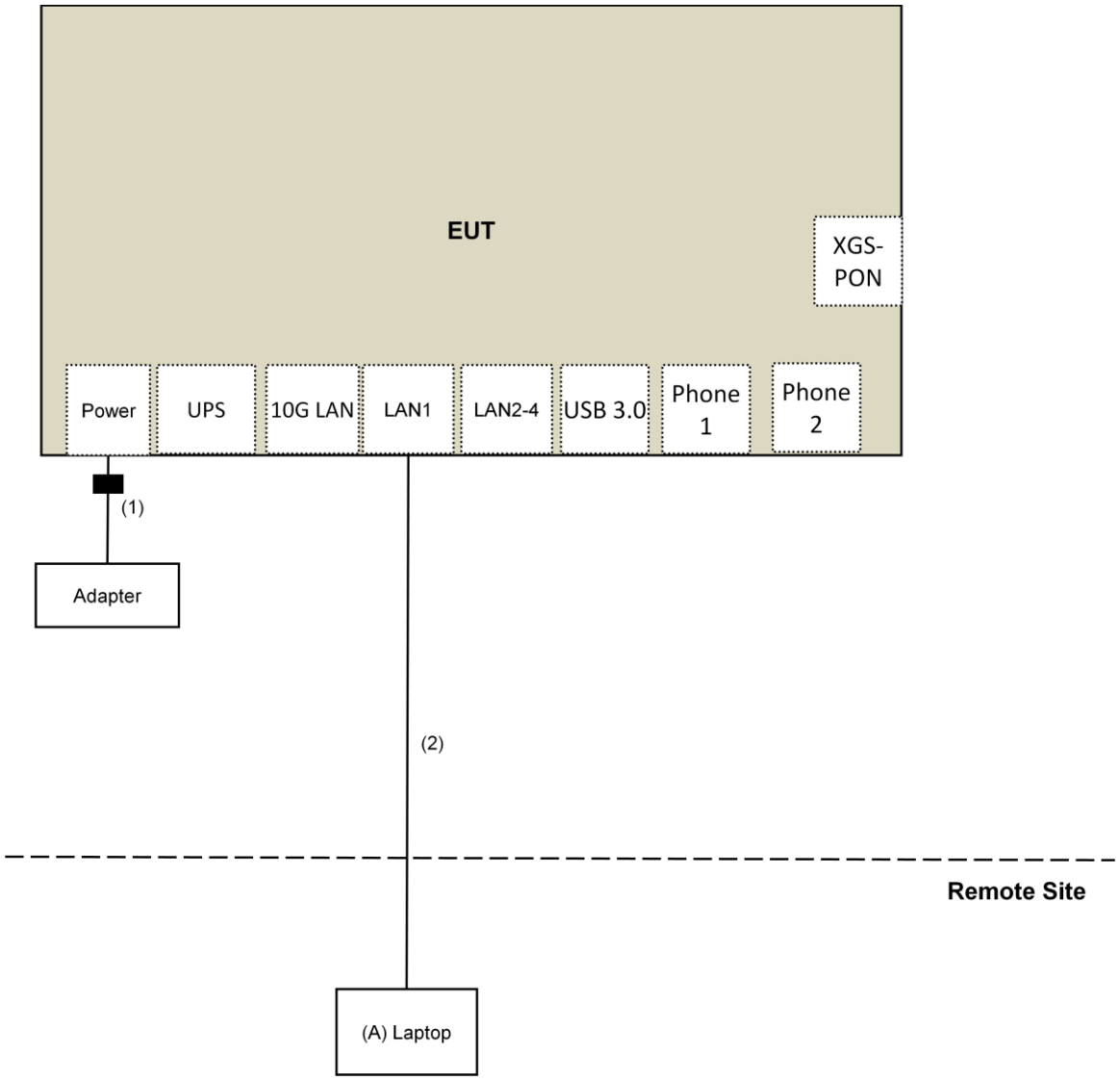
NOTE: The test Configuration was defined by the applicant requirement.

Conducted Emissions test for Model: PX7511-B0:



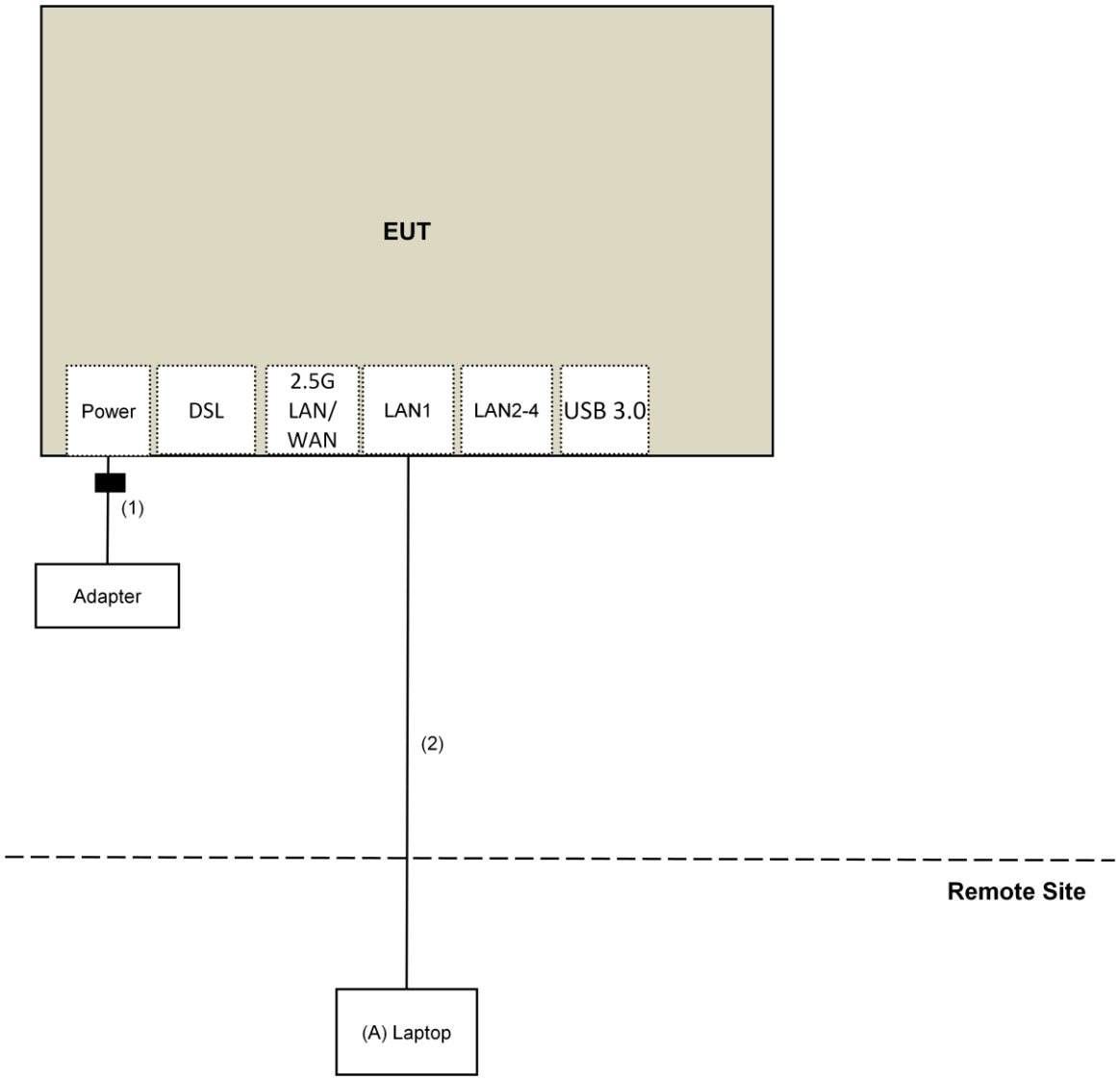
NOTE: The test Configuration was defined by the applicant requirement.

other test for Model: PX7511-B0:



NOTE: The test Configuration was defined by the applicant requirement.

For Model: DX5510-B0:



NOTE: The test Configuration was defined by the applicant requirement.

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 15.247 Meas Guidance v05r02
KDB 662911 D01 Multiple Transmitter Output v02r01
ANSI C63.10-2013

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

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 30dB below the highest level of the desired power:

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

NOTE:

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

4.1.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver ESR7 R&S	ESR7	102026	Apr. 24, 2019	Apr. 23, 2020
Spectrum Analyzer Keysight	N9030B	MY57141948	May 25, 2019	May 24, 2020
Pre-Amplifier EMCI	EMC001340	980142	May 30, 2019	May 29, 2020
Loop Antenna Electro-Metrics	EM-6879	264	Jan. 22, 2019	Jan. 21, 2020
RF Cable	NA	LOOPCAB-001	Jan. 14, 2019	Jan. 13, 2020
RF Cable	NA	LOOPCAB-002	Jan. 14, 2019	Jan. 13, 2020
Pre-Amplifier EMCI	EMC330N	980538	Apr. 30, 2019	Apr. 29, 2020
Trilog Broadband Antenna SCHWARZBECK	VULB9168	9168-0842	Nov. 21, 2018	Nov. 20, 2019
RF Cable	8D	966-5-1	May 03, 2019	May 02, 2020
RF Cable	8D	966-5-2	May 03, 2019	May 02, 2020
RF Cable	8D	966-5-3	May 03, 2019	May 02, 2020
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-ATT5-02	Jan. 28, 2019	Jan. 27, 2020
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-1819	Nov. 25, 2018	Nov. 24, 2019
Pre-Amplifier EMCI	EMC12630SE	980509	May 03, 2019	May 02, 2020
RF Cable EMCI	EMC104-SM-SM-1500	180503	May 03, 2019	May 02, 2020
RF Cable EMCI	EMC104-SM-SM-2000	180501	May 03, 2019	May 02, 2020
RF Cable EMCI	EMC104-SM-SM-6000	180505	May 03, 2019	May 02, 2020
Pre-Amplifier EMCI	EMC184045SE	980387	Jan. 28, 2019	Jan. 27, 2020
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170519	Nov. 25, 2018	Nov. 24, 2019
RF Cable	EMC102-KM-KM-1200	160924	Jan. 28, 2019	Jan. 27, 2020
RF Cable	EMC102-KM-KM-1200	160925	Jan. 28, 2019	Jan. 27, 2020
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	NA	NA
Spectrum Analyzer R&S	FSV40	100964	June 04, 2019	June 03, 2020
Power meter Anritsu	ML2495A	1014008	May 13, 2019	May 12, 2020
Power sensor Anritsu	MA2411B	0917122	May 13, 2019	May 12, 2020
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 15, 2019	Apr. 14, 2020

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in 966 Chamber No. 5.
3. Loop antenna was used for all emissions below 30 MHz.
4. Tested Date: Aug. 17 to Sep. 07, 2019

4.1.3 Test Procedures

For Radiated emission below 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

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

For Radiated emission above 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

f. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

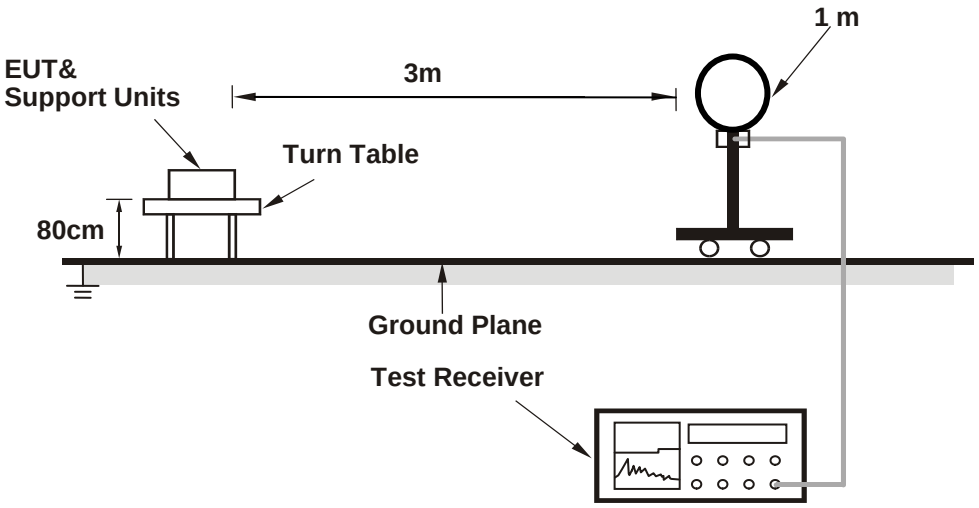
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.1.4 Deviation from Test Standard

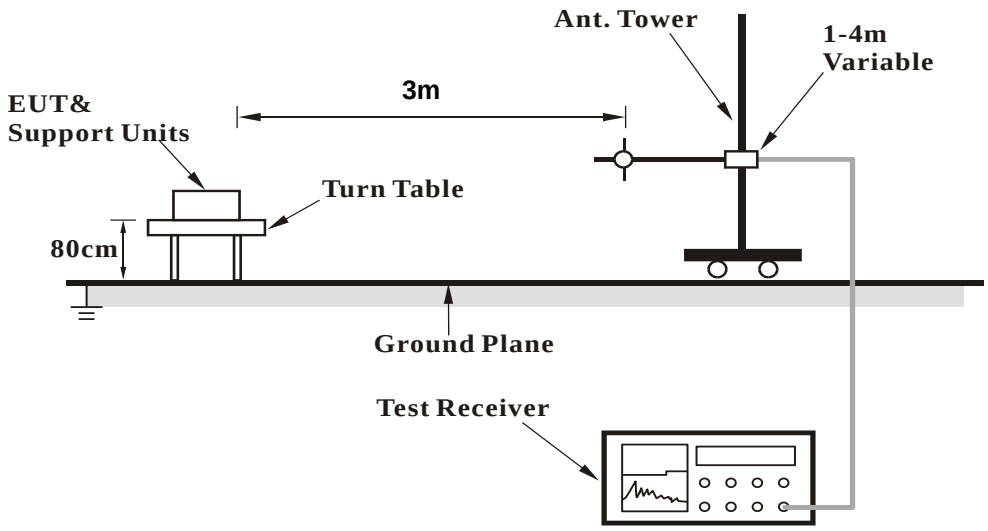
No deviation.

4.1.5 Test Setup

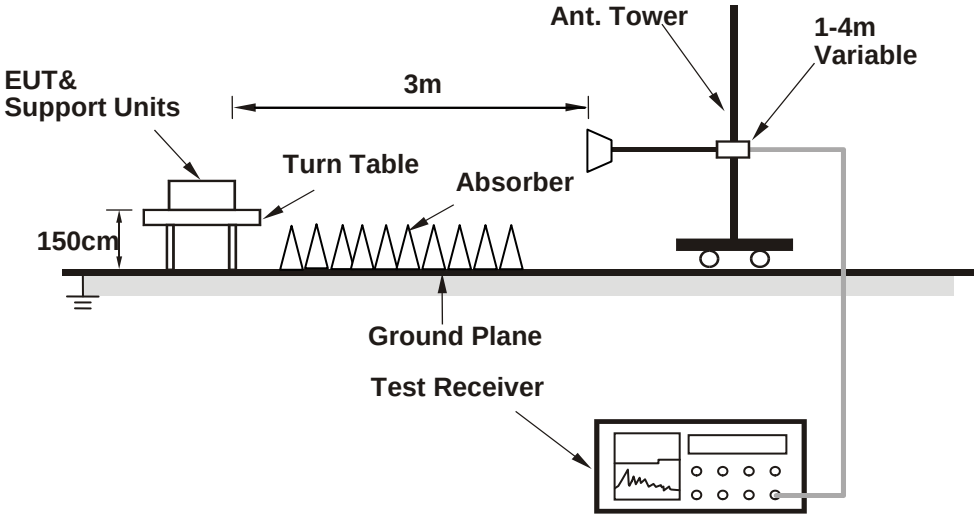
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Conditions

a. Connected the EUT with the Laptop which is placed on remote site.
b. Controlling software (2.4G Mtool v3.0.0.6, 2.4G 11ax40) has been activated to set the EUT under transmission condition continuously.

4.1.7 Test Results (Mode 1)

Above 1GHz Data:

802.11b

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	60.8 PK	74.0	-13.2	1.55 H	31	63.9	-3.1
2	2390.00	52.2 AV	54.0	-1.8	1.55 H	31	55.3	-3.1
3	*2412.00	118.9 PK			1.55 H	31	122.0	-3.1
4	*2412.00	116.1 AV			1.55 H	31	119.2	-3.1
5	4824.00	49.2 PK	74.0	-24.8	2.53 H	308	48.0	1.2
6	4824.00	46.5 AV	54.0	-7.5	2.53 H	308	45.3	1.2
7	14472.00	55.5 PK	74.0	-18.5	1.83 H	328	40.2	15.3
8	14472.00	49.7 AV	54.0	-4.3	1.83 H	328	34.4	15.3
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	60.2 PK	74.0	-13.8	1.93 V	306	63.3	-3.1
2	2390.00	51.1 AV	54.0	-2.9	1.93 V	306	54.2	-3.1
3	*2412.00	121.3 PK			1.93 V	306	124.4	-3.1
4	*2412.00	118.7 AV			1.93 V	306	121.8	-3.1
5	4824.00	48.0 PK	74.0	-26.0	1.56 V	89	46.8	1.2
6	4824.00	44.7 AV	54.0	-9.3	1.56 V	89	43.5	1.2
7	14472.00	55.8 PK	74.0	-18.2	2.34 V	111	40.5	15.3
8	14472.00	48.3 AV	54.0	-5.7	2.34 V	111	33.0	15.3

REMARKS:

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

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
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	56.9 PK	74.0	-17.1	1.73 H	238	60.0	-3.1
2	2390.00	43.9 AV	54.0	-10.1	1.73 H	238	47.0	-3.1
3	*2437.00	116.7 PK			1.73 H	238	119.8	-3.1
4	*2437.00	114.5 AV			1.73 H	238	117.6	-3.1
5	2483.50	55.3 PK	74.0	-18.7	1.73 H	238	58.4	-3.1
6	2483.50	41.8 AV	54.0	-12.2	1.73 H	238	44.9	-3.1
7	4874.00	48.9 PK	74.0	-25.1	1.89 H	138	47.7	1.2
8	4874.00	44.6 AV	54.0	-9.4	1.89 H	138	43.4	1.2
9	7311.00	51.0 PK	74.0	-23.0	1.77 H	56	43.8	7.2
10	7311.00	43.6 AV	54.0	-10.4	1.77 H	56	36.4	7.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	56.8 PK	74.0	-17.2	1.89 V	313	59.9	-3.1
2	2390.00	46.1 AV	54.0	-7.9	1.89 V	313	49.2	-3.1
3	*2437.00	119.6 PK			1.89 V	313	122.7	-3.1
4	*2437.00	116.3 AV			1.89 V	313	119.4	-3.1
5	2483.50	54.8 PK	74.0	-19.2	1.89 V	313	57.9	-3.1
6	2483.50	43.0 AV	54.0	-11.0	1.89 V	313	46.1	-3.1
7	4874.00	47.8 PK	74.0	-26.2	1.68 V	114	46.6	1.2
8	4874.00	43.7 AV	54.0	-10.3	1.68 V	114	42.5	1.2
9	7311.00	48.7 PK	74.0	-25.3	1.72 V	115	41.5	7.2
10	7311.00	44.0 AV	54.0	-10.0	1.72 V	115	36.8	7.2

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	117.2 PK			1.50 H	302	120.3	-3.1
2	*2462.00	114.3 AV			1.50 H	302	117.4	-3.1
3	2483.50	54.9 PK	74.0	-19.1	1.50 H	302	58.0	-3.1
4	2483.50	42.1 AV	54.0	-11.9	1.50 H	302	45.2	-3.1
5	4924.00	49.7 PK	74.0	-24.3	2.47 H	310	48.4	1.3
6	4924.00	47.4 AV	54.0	-6.6	2.47 H	310	46.1	1.3
7	7386.00	47.8 PK	74.0	-26.2	2.47 H	215	40.5	7.3
8	7386.00	39.7 AV	54.0	-14.3	2.47 H	215	32.4	7.3
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	120.0 PK			1.60 V	59	123.1	-3.1
2	*2462.00	117.5 AV			1.60 V	59	120.6	-3.1
3	2483.50	56.0 PK	74.0	-18.0	1.60 V	59	59.1	-3.1
4	2483.50	43.9 AV	54.0	-10.1	1.60 V	59	47.0	-3.1
5	4924.00	48.2 PK	74.0	-25.8	1.87 V	258	46.9	1.3
6	4924.00	45.9 AV	54.0	-8.1	1.87 V	258	44.6	1.3
7	7386.00	46.3 PK	74.0	-27.7	1.95 V	286	39.0	7.3
8	7386.00	37.7 AV	54.0	-16.3	1.95 V	286	30.4	7.3

REMARKS:

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

802.11g

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	69.8 PK	74.0	-4.2	1.45 H	243	72.9	-3.1
2	2390.00	49.0 AV	54.0	-5.0	1.45 H	243	52.1	-3.1
3	*2412.00	115.8 PK			1.45 H	243	118.9	-3.1
4	*2412.00	104.3 AV			1.45 H	243	107.4	-3.1
5	4824.00	42.2 PK	74.0	-31.8	2.57 H	69	41.0	1.2
6	4824.00	31.3 AV	54.0	-22.7	2.57 H	69	30.1	1.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	73.3 PK	74.0	-0.7	1.57 V	81	76.4	-3.1
2	2390.00	50.1 AV	54.0	-3.9	1.57 V	81	53.2	-3.1
3	*2412.00	120.0 PK			1.57 V	81	123.1	-3.1
4	*2412.00	117.5 AV			1.57 V	81	120.6	-3.1
5	4824.00	45.0 PK	74.0	-29.0	1.82 V	101	43.8	1.2
6	4824.00	33.2 AV	54.0	-20.8	1.82 V	101	32.0	1.2

REMARKS:

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

CHANNEL	TX Channel 2	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	69.7 PK	74.0	-4.3	1.46 H	235	72.8	-3.1
2	2390.00	50.6 AV	54.0	-3.4	1.46 H	235	53.7	-3.1
3	*2417.00	116.9 PK			1.46 H	235	120.0	-3.1
4	*2417.00	105.5 AV			1.46 H	235	108.6	-3.1
5	4834.00	44.7 PK	74.0	-29.3	1.97 H	150	43.5	1.2
6	4834.00	32.7 AV	54.0	-21.3	1.97 H	150	31.5	1.2
7	7251.00	48.6 PK	74.0	-25.4	2.40 H	17	41.5	7.1
8	7251.00	38.5 AV	54.0	-15.5	2.40 H	17	31.4	7.1
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	73.5 PK	74.0	-0.5	1.59 V	72	76.6	-3.1
2	2390.00	51.9 AV	54.0	-2.1	1.59 V	72	55.0	-3.1
3	*2417.00	117.6 PK			1.59 V	72	120.7	-3.1
4	*2417.00	107.4 AV			1.59 V	72	110.5	-3.1
5	4834.00	47.3 PK	74.0	-26.7	1.69 V	113	46.1	1.2
6	4834.00	34.8 AV	54.0	-19.2	1.69 V	113	33.6	1.2
7	7251.00	47.8 PK	74.0	-26.2	1.77 V	294	40.7	7.1
8	7251.00	34.1 AV	54.0	-19.9	1.77 V	294	27.0	7.1

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	62.5 PK	74.0	-11.5	1.72 H	304	65.6	-3.1
2	2390.00	46.5 AV	54.0	-7.5	1.72 H	304	49.6	-3.1
3	*2437.00	121.4 PK			1.72 H	304	124.5	-3.1
4	*2437.00	110.9 AV			1.72 H	304	114.0	-3.1
5	2483.50	58.5 PK	74.0	-15.5	1.72 H	304	61.6	-3.1
6	2483.50	45.1 AV	54.0	-8.9	1.72 H	304	48.2	-3.1
7	4874.00	44.7 PK	74.0	-29.3	1.97 H	138	43.5	1.2
8	4874.00	32.5 AV	54.0	-21.5	1.97 H	138	31.3	1.2
9	7311.00	48.2 PK	74.0	-25.8	2.34 H	28	41.0	7.2
10	7311.00	38.4 AV	54.0	-15.6	2.34 H	28	31.2	7.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	66.5 PK	74.0	-7.5	1.86 V	300	69.6	-3.1
2	2390.00	46.8 AV	54.0	-7.2	1.86 V	300	49.9	-3.1
3	*2437.00	122.0 PK			1.86 V	300	125.1	-3.1
4	*2437.00	111.3 AV			1.86 V	300	114.4	-3.1
5	2483.50	65.8 PK	74.0	-8.2	1.86 V	300	68.9	-3.1
6	2483.50	47.7 AV	54.0	-6.3	1.86 V	300	50.8	-3.1
7	4874.00	47.4 PK	74.0	-26.6	1.69 V	110	46.2	1.2
8	4874.00	34.7 AV	54.0	-19.3	1.69 V	110	33.5	1.2
9	7311.00	47.4 PK	74.0	-26.6	1.82 V	305	40.2	7.2
10	7311.00	34.0 AV	54.0	-20.0	1.82 V	305	26.8	7.2

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2457.00	117.3 PK			1.63 H	233	120.4	-3.1
2	*2457.00	105.7 AV			1.63 H	233	108.8	-3.1
3	2483.50	70.4 PK	74.0	-3.6	1.63 H	233	73.5	-3.1
4	2483.50	48.2 AV	54.0	-5.8	1.63 H	233	51.3	-3.1
5	4914.00	47.3 PK	74.0	-26.7	2.04 H	39	46.0	1.3
6	4914.00	34.4 AV	54.0	-19.6	2.04 H	39	33.1	1.3
7	7371.00	46.1 PK	74.0	-27.9	1.75 H	204	38.9	7.2
8	7371.00	35.3 AV	54.0	-18.7	1.75 H	204	28.1	7.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2457.00	118.1 PK			1.85 V	306	121.2	-3.1
2	*2457.00	107.8 AV			1.85 V	306	110.9	-3.1
3	2483.50	73.6 PK	74.0	-0.4	1.85 V	306	76.7	-3.1
4	2483.50	52.0 AV	54.0	-2.0	1.85 V	306	55.1	-3.1
5	4914.00	41.4 PK	74.0	-32.6	2.67 V	107	40.1	1.3
6	4914.00	30.1 AV	54.0	-23.9	2.67 V	107	28.8	1.3
7	7371.00	45.0 PK	74.0	-29.0	1.89 V	331	37.8	7.2
8	7371.00	33.4 AV	54.0	-20.6	1.89 V	331	26.2	7.2

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	116.0 PK			1.60 H	246	119.1	-3.1
2	*2462.00	104.4 AV			1.60 H	246	107.5	-3.1
3	2483.50	70.6 PK	74.0	-3.4	1.60 H	246	73.7	-3.1
4	2483.50	48.3 AV	54.0	-5.7	1.60 H	246	51.4	-3.1
5	4924.00	47.9 PK	74.0	-26.1	2.09 H	24	46.6	1.3
6	4924.00	34.8 AV	54.0	-19.2	2.09 H	24	33.5	1.3
7	7386.00	45.6 PK	74.0	-28.4	1.69 H	204	38.3	7.3
8	7386.00	34.9 AV	54.0	-19.1	1.69 H	204	27.6	7.3
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	116.8 PK			1.90 V	309	119.9	-3.1
2	*2462.00	106.6 AV			1.90 V	309	109.7	-3.1
3	2483.50	73.3 PK	74.0	-0.7	1.90 V	309	76.4	-3.1
4	2483.50	51.8 AV	54.0	-2.2	1.90 V	309	54.9	-3.1
5	4924.00	40.9 PK	74.0	-33.1	2.69 V	105	39.6	1.3
6	4924.00	29.7 AV	54.0	-24.3	2.69 V	105	28.4	1.3
7	7386.00	45.0 PK	74.0	-29.0	1.93 V	329	37.7	7.3
8	7386.00	33.2 AV	54.0	-20.8	1.93 V	329	25.9	7.3

REMARKS:

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

802.11ax (HE20)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	72.0 PK	74.0	-2.0	1.75 H	306	75.1	-3.1
2	2390.00	51.1 AV	54.0	-2.9	1.75 H	306	54.2	-3.1
3	*2412.00	116.8 PK			1.75 H	306	119.9	-3.1
4	*2412.00	103.7 AV			1.75 H	306	106.8	-3.1
5	4824.00	46.1 PK	74.0	-27.9	2.12 H	147	44.9	1.2
6	4824.00	33.3 AV	54.0	-20.7	2.12 H	147	32.1	1.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	72.8 PK	74.0	-1.2	1.93 V	276	75.9	-3.1
2	2390.00	49.2 AV	54.0	-4.8	1.93 V	276	52.3	-3.1
3	*2412.00	118.4 PK			1.93 V	276	121.5	-3.1
4	*2412.00	105.3 AV			1.93 V	276	108.4	-3.1
5	4824.00	47.9 PK	74.0	-26.1	1.89 V	214	46.7	1.2
6	4824.00	32.4 AV	54.0	-21.6	1.89 V	214	31.2	1.2

REMARKS:

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

CHANNEL	TX Channel 2	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	71.7 PK	74.0	-2.3	1.77 H	318	74.8	-3.1
2	2390.00	50.6 AV	54.0	-3.4	1.77 H	318	53.7	-3.1
3	*2417.00	118.1 PK			1.77 H	318	121.2	-3.1
4	*2417.00	105.0 AV			1.77 H	318	108.1	-3.1
5	4834.00	45.2 PK	74.0	-28.8	1.60 H	289	44.0	1.2
6	4834.00	34.6 AV	54.0	-19.4	1.60 H	289	33.4	1.2
7	7251.00	42.8 PK	74.0	-31.2	1.39 H	204	35.7	7.1
8	7251.00	31.5 AV	54.0	-22.5	1.39 H	204	24.4	7.1
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**	**73.7 PK**	**74.0**	**-0.3**	**1.87 V**	**273**	**76.8**	**-3.1**
2	2390.00	51.2 AV	54.0	-2.8	1.87 V	273	54.3	-3.1
3	*2417.00	119.7 PK			1.87 V	273	122.8	-3.1
4	*2417.00	106.5 AV			1.87 V	273	109.6	-3.1
5	4834.00	46.8 PK	74.0	-27.2	2.20 V	117	45.6	1.2
6	4834.00	32.3 AV	54.0	-21.7	2.20 V	117	31.1	1.2
7	7251.00	46.9 PK	74.0	-27.1	1.83 V	185	39.8	7.1
8	7251.00	34.9 AV	54.0	-19.1	1.83 V	185	27.8	7.1

REMARKS:

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

CHANNEL	TX Channel 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	65.7 PK	74.0	-8.3	1.62 H	306	68.8	-3.1
2	2390.00	48.8 AV	54.0	-5.2	1.62 H	306	51.9	-3.1
3	*2437.00	122.4 PK			1.62 H	306	125.5	-3.1
4	*2437.00	109.2 AV			1.62 H	306	112.3	-3.1
5	2483.50	57.9 PK	74.0	-16.1	1.62 H	306	61.0	-3.1
6	2483.50	44.3 AV	54.0	-9.7	1.62 H	306	47.4	-3.1
7	4874.00	45.4 PK	74.0	-28.6	1.66 H	305	44.2	1.2
8	4874.00	34.5 AV	54.0	-19.5	1.66 H	305	33.3	1.2
9	7311.00	42.9 PK	74.0	-31.1	1.44 H	200	35.7	7.2
10	7311.00	31.3 AV	54.0	-22.7	1.44 H	200	24.1	7.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	68.4 PK	74.0	-5.6	2.23 V	36	71.5	-3.1
2	2390.00	51.7 AV	54.0	-2.3	2.23 V	36	54.8	-3.1
3	*2437.00	125.9 PK			2.23 V	36	129.0	-3.1
4	*2437.00	115.1 AV			2.23 V	36	118.2	-3.1
5	2483.50	62.3 PK	74.0	-11.7	2.23 V	36	65.4	-3.1
6	2483.50	48.6 AV	54.0	-5.4	2.23 V	36	51.7	-3.1
7	4874.00	46.9 PK	74.0	-27.1	2.18 V	106	45.7	1.2
8	4874.00	32.5 AV	54.0	-21.5	2.18 V	106	31.3	1.2
9	7311.00	46.7 PK	74.0	-27.3	1.78 V	194	39.5	7.2
10	7311.00	34.5 AV	54.0	-19.5	1.78 V	194	27.3	7.2

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2457.00	118.4 PK			1.47 H	316	121.5	-3.1
2	*2457.00	104.9 AV			1.47 H	316	108.0	-3.1
3	2483.50	69.7 PK	74.0	-4.3	1.46 H	288	72.8	-3.1
4	2483.50	49.2 AV	54.0	-4.8	1.46 H	288	52.3	-3.1
5	4914.00	46.1 PK	74.0	-27.9	1.50 H	318	44.8	1.3
6	4914.00	33.0 AV	54.0	-21.0	1.50 H	318	31.7	1.3
7	7371.00	44.5 PK	74.0	-29.5	1.30 H	171	37.3	7.2
8	7371.00	31.3 AV	54.0	-22.7	1.30 H	171	24.1	7.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2457.00	119.4 PK			1.93 V	313	122.5	-3.1
2	*2457.00	107.6 AV			1.93 V	313	110.7	-3.1
3	2483.50	73.4 PK	74.0	-0.6	1.90 V	297	76.5	-3.1
4	2483.50	51.9 AV	54.0	-2.1	1.90 V	297	55.0	-3.1
5	4914.00	47.8 PK	74.0	-26.2	1.71 V	229	46.5	1.3
6	4914.00	32.7 AV	54.0	-21.3	1.71 V	229	31.4	1.3
7	7371.00	47.7 PK	74.0	-26.3	1.88 V	165	40.5	7.2
8	7371.00	33.4 AV	54.0	-20.6	1.88 V	165	26.2	7.2

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	117.2 PK			1.49 H	304	120.3	-3.1
2	*2462.00	103.8 AV			1.49 H	304	106.9	-3.1
3	2483.50	69.2 PK	74.0	-4.8	1.49 H	304	72.3	-3.1
4	2483.50	48.6 AV	54.0	-5.4	1.49 H	304	51.7	-3.1
5	4924.00	46.5 PK	74.0	-27.5	1.46 H	304	45.2	1.3
6	4924.00	33.2 AV	54.0	-20.8	1.46 H	304	31.9	1.3
7	7386.00	44.7 PK	74.0	-29.3	1.28 H	160	37.4	7.3
8	7386.00	31.4 AV	54.0	-22.6	1.28 H	160	24.1	7.3
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	118.4 PK			1.93 V	310	121.5	-3.1
2	*2462.00	106.7 AV			1.93 V	310	109.8	-3.1
3	2483.50	72.9 PK	74.0	-1.1	1.93 V	310	76.0	-3.1
4	2483.50	52.2 AV	54.0	-1.8	1.93 V	310	55.3	-3.1
5	4924.00	48.2 PK	74.0	-25.8	1.66 V	222	46.9	1.3
6	4924.00	32.9 AV	54.0	-21.1	1.66 V	222	31.6	1.3
7	7386.00	47.9 PK	74.0	-26.1	1.88 V	156	40.6	7.3
8	7386.00	33.5 AV	54.0	-20.5	1.88 V	156	26.2	7.3

REMARKS:

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

802.11ax (HE40)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	68.1 PK	74.0	-5.9	1.73 H	302	71.2	-3.1
2	2390.00	52.1 AV	54.0	-1.9	1.73 H	302	55.2	-3.1
3	*2422.00	115.2 PK			1.73 H	302	118.3	-3.1
4	*2422.00	102.6 AV			1.73 H	302	105.7	-3.1
5	4844.00	45.9 PK	74.0	-28.1	1.46 H	92	44.7	1.2
6	4844.00	34.6 AV	54.0	-19.4	1.46 H	92	33.4	1.2
7	7266.00	45.1 PK	74.0	-28.9	1.73 H	105	38.0	7.1
8	7266.00	35.7 AV	54.0	-18.3	1.73 H	105	28.6	7.1
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	69.8 PK	74.0	-4.2	2.28 V	39	72.9	-3.1
2	2390.00	53.2 AV	54.0	-0.8	2.28 V	39	56.3	-3.1
3	*2422.00	116.5 PK			2.28 V	39	119.6	-3.1
4	*2422.00	105.3 AV			2.28 V	39	108.4	-3.1
5	4844.00	45.9 PK	74.0	-28.1	1.73 V	93	44.7	1.2
6	4844.00	35.1 AV	54.0	-18.9	1.73 V	93	33.9	1.2
7	7266.00	46.4 PK	74.0	-27.6	1.67 V	216	39.3	7.1
8	7266.00	35.7 AV	54.0	-18.3	1.67 V	216	28.6	7.1

REMARKS:

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

CHANNEL	TX Channel 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	68.4 PK	74.0	-5.6	1.62 H	302	71.5	-3.1
2	2390.00	49.5 AV	54.0	-4.5	1.62 H	302	52.6	-3.1
3	*2437.00	116.4 PK			1.62 H	302	119.5	-3.1
4	*2437.00	103.7 AV			1.62 H	302	106.8	-3.1
5	2483.50	64.8 PK	74.0	-9.2	1.62 H	302	67.9	-3.1
6	2483.50	49.1 AV	54.0	-4.9	1.62 H	302	52.2	-3.1
7	4874.00	45.9 PK	74.0	-28.1	3.11 H	115	44.7	1.2
8	4874.00	36.6 AV	54.0	-17.4	3.11 H	115	35.4	1.2
9	7311.00	46.9 PK	74.0	-27.1	2.86 H	217	39.7	7.2
10	7311.00	37.8 AV	54.0	-16.2	2.86 H	217	30.6	7.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	70.0 PK	74.0	-4.0	2.32 V	293	73.1	-3.1
2	2390.00	50.0 AV	54.0	-4.0	2.32 V	293	53.1	-3.1
3	*2437.00	117.8 PK			2.32 V	293	120.9	-3.1
4	*2437.00	105.4 AV			2.32 V	293	108.5	-3.1
5	2483.50	70.3 PK	74.0	-3.7	2.32 V	293	73.4	-3.1
6	2483.50	53.6 AV	54.0	-0.4	2.32 V	293	56.7	-3.1
7	4874.00	45.9 PK	74.0	-28.1	2.99 V	257	44.7	1.2
8	4874.00	39.1 AV	54.0	-14.9	2.99 V	257	37.9	1.2
9	7311.00	45.7 PK	74.0	-28.3	2.11 V	167	38.5	7.2
10	7311.00	35.4 AV	54.0	-18.6	2.11 V	167	28.2	7.2

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2452.00	113.5 PK			1.44 H	309	116.6	-3.1
2	*2452.00	100.9 AV			1.44 H	309	104.0	-3.1
3	2483.50	65.0 PK	74.0	-9.0	1.44 H	309	68.1	-3.1
4	2483.50	51.0 AV	54.0	-3.0	1.44 H	309	54.1	-3.1
5	4904.00	46.5 PK	74.0	-27.5	1.79 H	156	45.2	1.3
6	4904.00	36.4 AV	54.0	-17.6	1.79 H	156	35.1	1.3
7	7356.00	46.7 PK	74.0	-27.3	1.65 H	155	39.5	7.2
8	7356.00	37.5 AV	54.0	-16.5	1.65 H	155	30.3	7.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2452.00	115.6 PK			2.51 V	34	118.7	-3.1
2	*2452.00	102.7 AV			2.51 V	34	105.8	-3.1
3	2483.50	69.2 PK	74.0	-4.8	2.51 V	34	72.3	-3.1
4	2483.50	53.6 AV	54.0	-0.4	2.51 V	34	56.7	-3.1
5	4904.00	47.1 PK	74.0	-26.9	2.22 V	252	45.8	1.3
6	4904.00	34.2 AV	54.0	-19.8	2.22 V	252	32.9	1.3
7	7356.00	46.9 PK	74.0	-27.1	2.44 V	256	39.7	7.2
8	7356.00	33.9 AV	54.0	-20.1	2.44 V	256	26.7	7.2

REMARKS:

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

Below 1GHz Data:

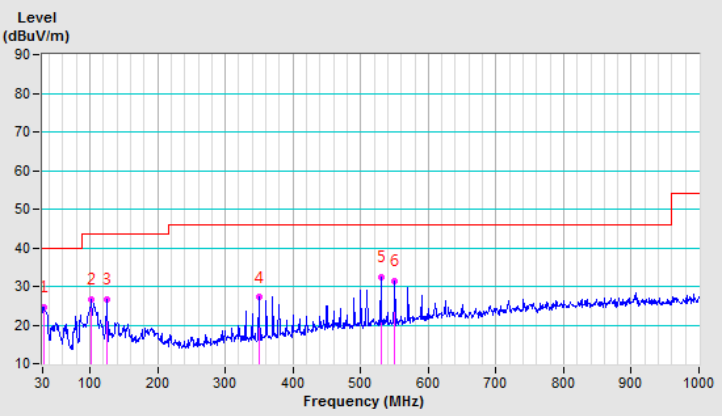
802.11b

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	32.33	24.5 QP	40.0	-15.5	2.00 H	360	38.9	-14.4
2	101.88	26.7 QP	43.5	-16.8	2.00 H	260	43.7	-17.0
3	124.97	26.6 QP	43.5	-16.9	3.00 H	254	41.2	-14.6
4	349.97	27.2 QP	46.0	-18.8	1.00 H	292	38.5	-11.3
5	530.01	32.5 QP	46.0	-13.5	1.50 H	345	39.6	-7.1
6	549.99	31.3 QP	46.0	-14.7	1.00 H	360	38.2	-6.9

REMARKS:

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

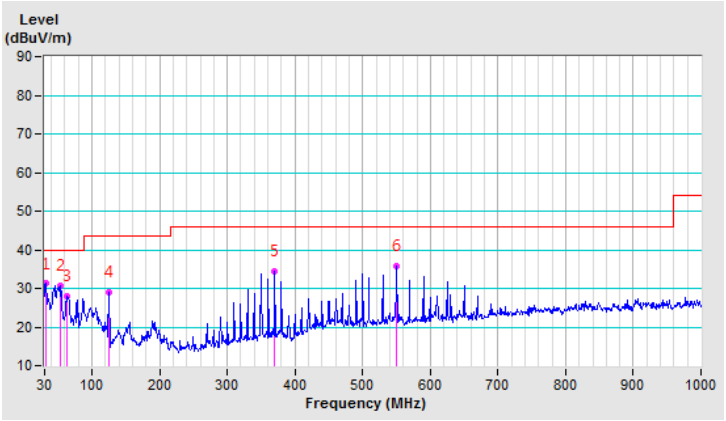


CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	31.36	31.2 QP	40.0	-8.8	1.00 V	159	45.7	-14.5
2	53.43	30.7 QP	40.0	-9.3	1.00 V	74	43.8	-13.1
3	63.85	28.1 QP	40.0	-11.9	1.50 V	175	42.4	-14.3
4	124.97	29.0 QP	43.5	-14.5	1.50 V	203	43.6	-14.6
5	370.00	34.4 QP	46.0	-11.6	1.50 V	78	45.0	-10.6
6	549.99	35.9 QP	46.0	-10.1	1.00 V	97	42.8	-6.9

REMARKS:

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



4.1.8 Test Results (Mode 2)

Below 1GHz Data:

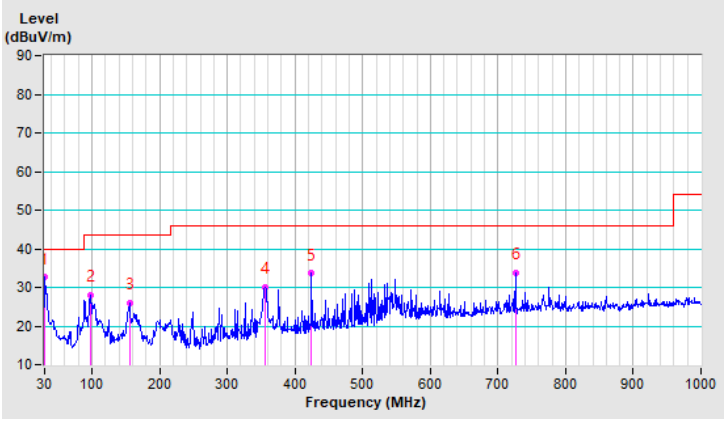
802.11b

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	30.68	32.6 QP	40.0	-7.4	1.50 H	2	47.2	-14.6
2	97.52	28.0 QP	43.5	-15.5	2.00 H	280	45.7	-17.7
3	155.14	25.9 QP	43.5	-17.6	2.00 H	276	38.7	-12.8
4	355.60	30.0 QP	46.0	-16.0	1.00 H	156	41.1	-11.1
5	424.57	33.6 QP	46.0	-12.4	2.00 H	52	42.8	-9.2
6	726.30	33.7 QP	46.0	-12.3	1.00 H	206	37.2	-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. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

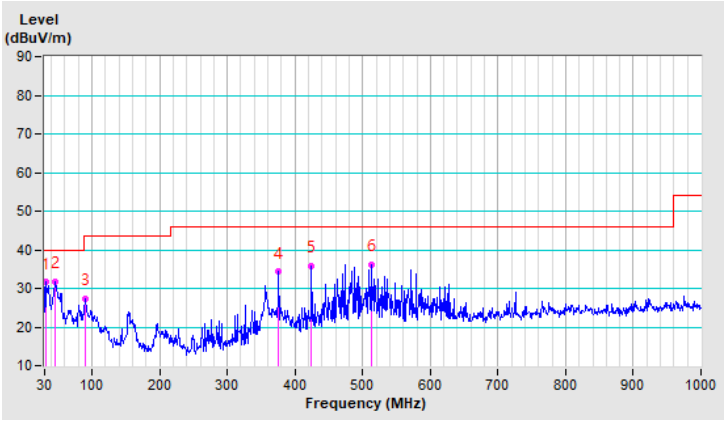


CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	32.18	31.6 QP	40.0	-8.4	1.00 V	44	46.0	-14.4
2	45.57	31.8 QP	40.0	-8.2	1.00 V	133	44.8	-13.0
3	89.95	27.3 QP	43.5	-16.2	1.50 V	360	45.7	-18.4
4	375.43	34.3 QP	46.0	-11.7	1.50 V	124	44.8	-10.5
5	424.57	35.7 QP	46.0	-10.3	1.00 V	211	44.9	-9.2
6	512.65	36.2 QP	46.0	-9.8	1.00 V	115	43.5	-7.3

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.



4.1.9 Test Results (Mode 3)

Below 1GHz Data:

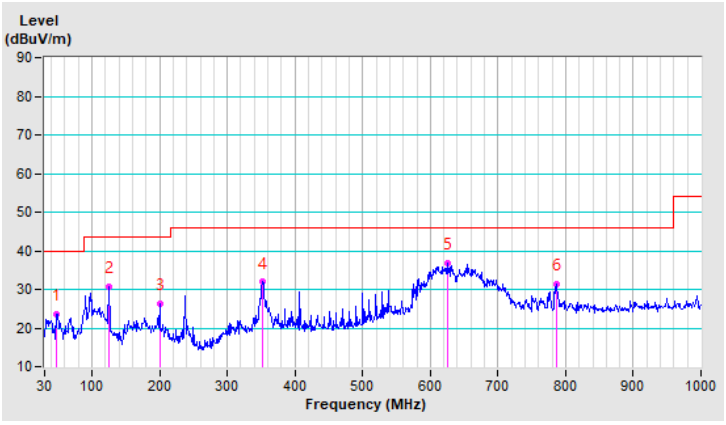
802.11b

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	48.09	23.7 QP	40.0	-16.3	1.00 H	1	36.6	-12.9
2	124.97	30.8 QP	43.5	-12.7	1.50 H	295	45.4	-14.6
3	200.00	26.3 QP	43.5	-17.2	1.00 H	300	41.9	-15.6
4	352.98	31.9 QP	46.0	-14.1	1.00 H	351	43.0	-11.1
5	625.17	36.7 QP	46.0	-9.3	1.50 H	331	41.7	-5.0
6	786.35	31.3 QP	46.0	-14.7	1.00 H	216	33.8	-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.

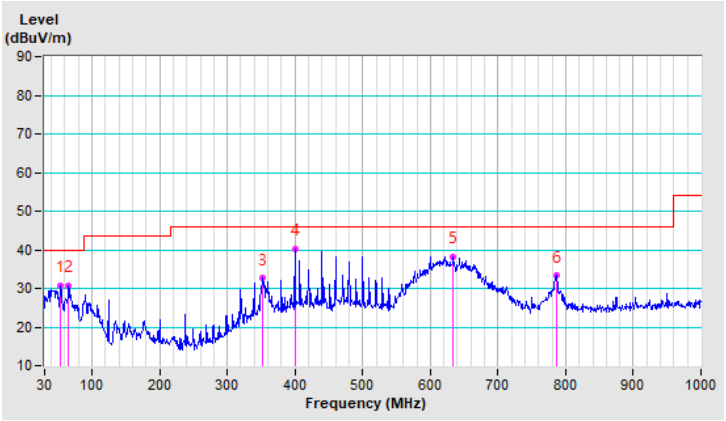


CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

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	53.77	30.7 QP	40.0	-9.3	1.00 V	138	44.0	-13.3
2	65.50	30.7 QP	40.0	-9.3	1.50 V	360	45.3	-14.6
3	352.25	32.6 QP	46.0	-13.4	1.50 V	264	43.7	-11.1
4	399.98	40.1 QP	46.0	-5.9	1.00 V	226	50.1	-10.0
5	634.00	38.3 QP	46.0	-7.7	1.50 V	234	43.2	-4.9
6	787.17	33.2 QP	46.0	-12.8	1.50 V	1	35.7	-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.



4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

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

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

4.2.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESCS 30	847124/029	Oct. 24, 2018	Oct. 23, 2019
Line-Impedance Stabilization Network (for EUT) R&S	ESH3-Z5	848773/004	Oct. 22, 2018	Oct. 21, 2019
Line-Impedance Stabilization Network (for Peripheral) R&S	ESH3-Z5	835239/001	Mar. 17, 2019	Mar. 16, 2020
50 ohms Terminator	N/A	3	Oct. 22, 2018	Oct. 21, 2019
RF Cable	5D-FB	COCCAB-001	Sep. 28, 2018	Sep. 27, 2019
Fixed attenuator EMCI	STI02-2200-10	003	Mar. 14, 2019	Mar. 13, 2020
Software BVADT	BVADT_Cond_ V7.3.7.4	NA	NA	NA

Note:
1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Conduction 1.
3 Tested Date: Aug. 19 to Sep. 06, 2019

4.2.3 Test Procedures

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

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

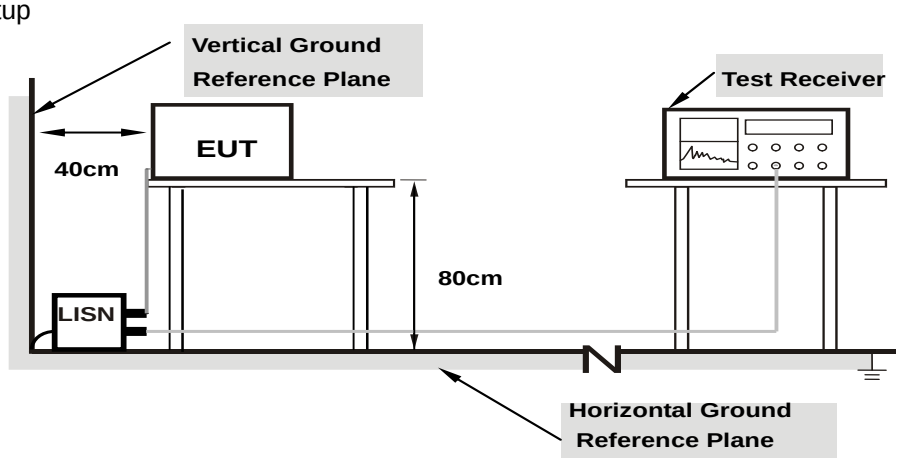
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



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

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

4.2.6 EUT Operating Conditions

Same as 4.1.6.

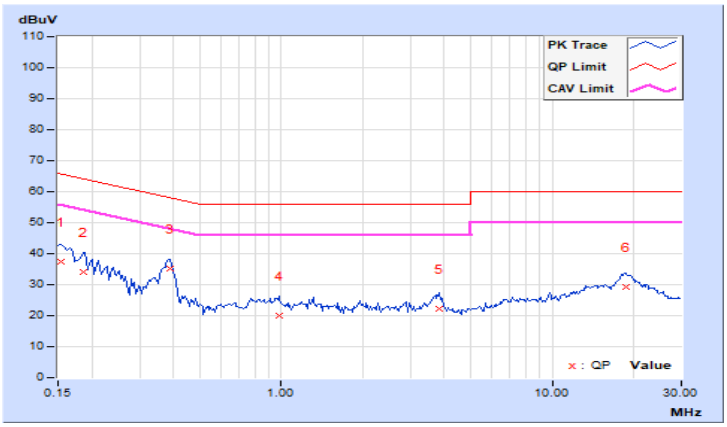
4.2.7 Test Results (Mode 1)

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

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	9.97	27.57	11.43	37.54	21.40	65.79	55.79	-28.25	-34.39
2	0.18516	9.98	23.95	10.34	33.93	20.32	64.25	54.25	-30.32	-33.93
3	0.38828	9.99	25.19	17.33	35.18	27.32	58.10	48.10	-22.92	-20.78
4	0.98203	10.04	9.94	2.93	19.98	12.97	56.00	46.00	-36.02	-33.03
5	3.83203	10.26	11.97	5.05	22.23	15.31	56.00	46.00	-33.77	-30.69
6	18.64063	11.27	18.11	13.09	29.38	24.36	60.00	50.00	-30.62	-25.64

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.

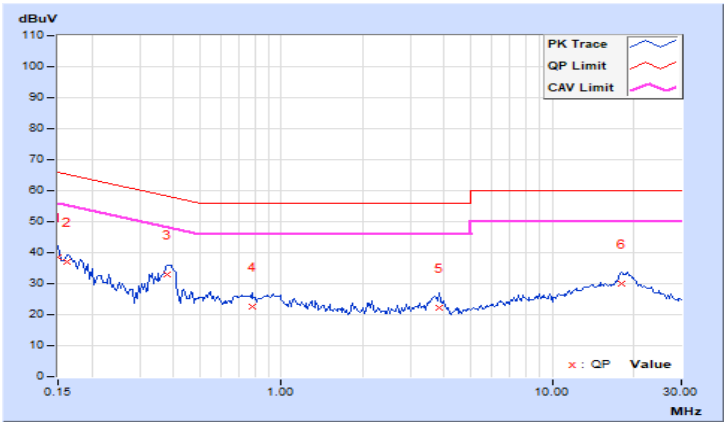


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	9.95	28.40	12.45	38.35	22.40	66.00	56.00	-27.65	-33.60
2	0.16172	9.95	27.15	12.17	37.10	22.12	65.38	55.38	-28.28	-33.26
3	0.38047	9.98	23.01	14.81	32.99	24.79	58.27	48.27	-25.28	-23.48
4	0.77891	10.01	12.73	5.38	22.74	15.39	56.00	46.00	-33.26	-30.61
5	3.81641	10.19	12.03	5.23	22.22	15.42	56.00	46.00	-33.78	-30.58
6	18.12500	11.00	18.98	13.92	29.98	24.92	60.00	50.00	-30.02	-25.08

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.



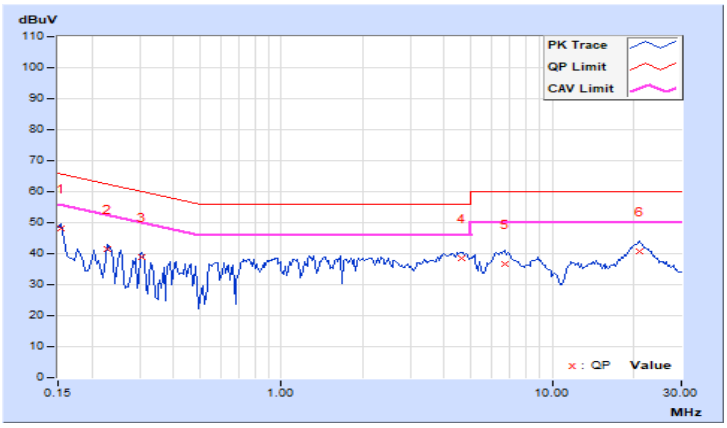
4.2.8 Test Results (Mode 2)

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

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	9.95	38.03	32.12	47.98	42.07	65.79	55.79	-17.81	-13.72
2	0.22812	9.96	31.41	29.93	41.37	39.89	62.52	52.52	-21.15	-12.63
3	0.30625	9.97	29.06	28.23	39.03	38.20	60.07	50.07	-21.04	-11.87
4	4.60938	10.20	28.43	20.67	38.63	30.87	56.00	46.00	-17.37	-15.13
5	6.71484	10.31	26.53	20.99	36.84	31.30	60.00	50.00	-23.16	-18.70
6	20.97266	11.07	29.64	24.50	40.71	35.57	60.00	50.00	-19.29	-14.43

REMARKS:

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

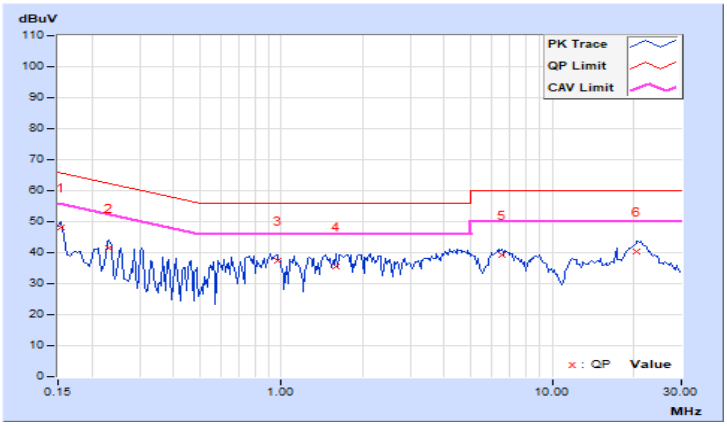


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	9.93	38.21	32.52	48.14	42.45	65.79	55.79	-17.65	-13.34
2	0.23203	9.94	31.56	30.05	41.50	39.99	62.38	52.38	-20.88	-12.39
3	**0.96641**	**9.99**	**27.27**	**24.95**	**37.26**	**34.94**	**56.00**	**46.00**	**-18.74**	**-11.06**
4	1.59375	10.02	25.52	11.29	35.54	21.31	56.00	46.00	-20.46	-24.69
5	6.52344	10.23	28.95	22.50	39.18	32.73	60.00	50.00	-20.82	-17.27
6	20.39063	10.80	29.56	24.50	40.36	35.30	60.00	50.00	-19.64	-14.70

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.



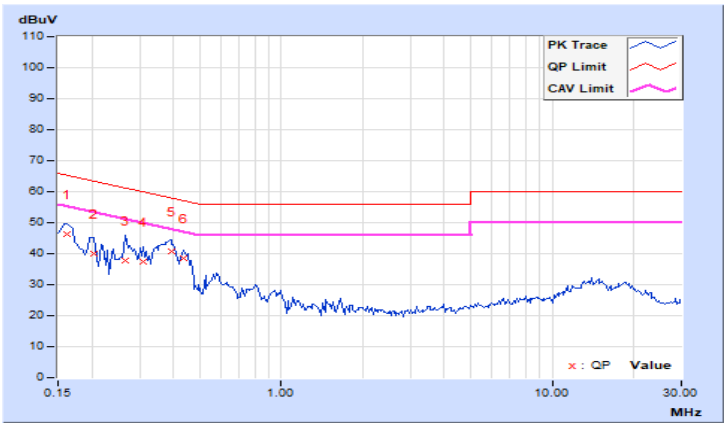
4.2.9 Test Results (Mode 3)

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

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16172	9.97	36.51	23.57	46.48	33.54	65.38	55.38	-18.90	-21.84
2	0.20469	9.98	30.01	16.97	39.99	26.95	63.42	53.42	-23.43	-26.47
3	0.26719	9.98	27.75	17.04	37.73	27.02	61.20	51.20	-23.47	-24.18
4	0.31016	9.99	27.33	15.71	37.32	25.70	59.97	49.97	-22.65	-24.27
5	0.39219	9.99	30.70	22.88	40.69	32.87	58.02	48.02	-17.33	-15.15
6	0.43516	9.99	28.56	22.32	38.55	32.31	57.15	47.15	-18.60	-14.84

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.

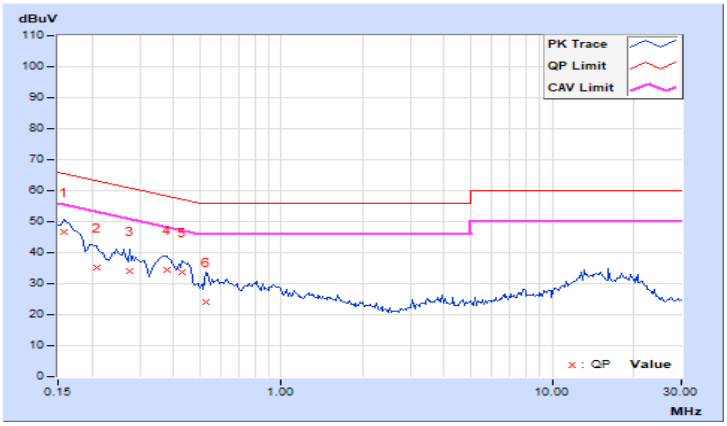


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15781	9.95	36.79	22.72	46.74	32.67	65.58	55.58	-18.84	-22.91
2	0.20859	9.96	25.15	11.61	35.11	21.57	63.26	53.26	-28.15	-31.69
3	0.27500	9.97	24.26	17.29	34.23	27.26	60.97	50.97	-26.74	-23.71
4	0.38047	9.98	24.35	7.76	34.33	17.74	58.27	48.27	-23.94	-30.53
5	0.43125	9.98	23.80	13.78	33.78	23.76	57.23	47.23	-23.45	-23.47
6	0.52500	9.99	14.03	4.91	24.02	14.90	56.00	46.00	-31.98	-31.10

REMARKS:

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

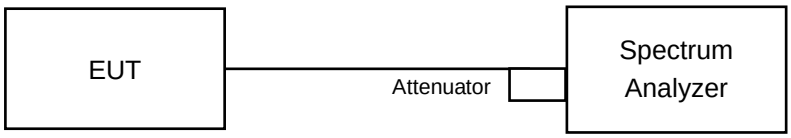


4.3 6dB Bandwidth Measurement

4.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

a. Set resolution bandwidth (RBW) = 100kHz
b. Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = Peak.
c. Trace mode = max hold.
d. Sweep = auto couple.
e. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

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

4.3.7 Test Result

802.11b

Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
1	2412	7.10	7.09	7.09	7.09	0.5	Pass
6	2437	7.08	7.13	7.08	7.10	0.5	Pass
11	2462	7.14	7.10	7.07	6.62	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	16.44	16.43	16.42	16.43	0.5	Pass
2	2417	16.36	16.39	16.40	16.45	0.5	Pass
6	2437	16.41	16.40	16.43	16.02	0.5	Pass
10	2457	16.42	16.42	16.43	16.44	0.5	Pass
11	2462	16.42	16.42	16.43	16.35	0.5	Pass

802.11ax (HE20)

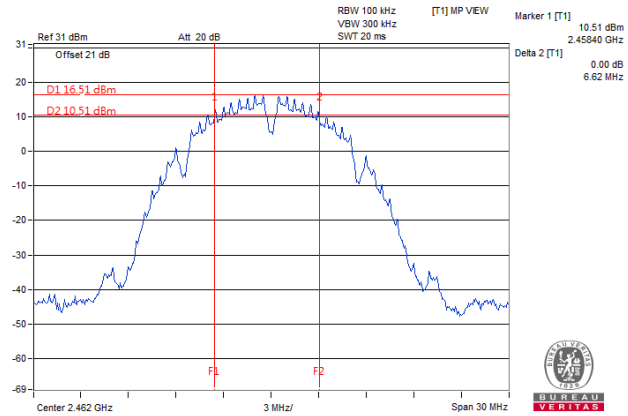
Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
1	2412	18.95	19.00	19.04	19.04	0.5	Pass
2	2417	19.07	19.01	19.03	19.09	0.5	Pass
6	2437	19.01	19.00	19.01	18.89	0.5	Pass
10	2457	19.07	19.06	19.00	19.00	0.5	Pass
11	2462	19.05	19.03	19.00	18.37	0.5	Pass

802.11ax (HE40)

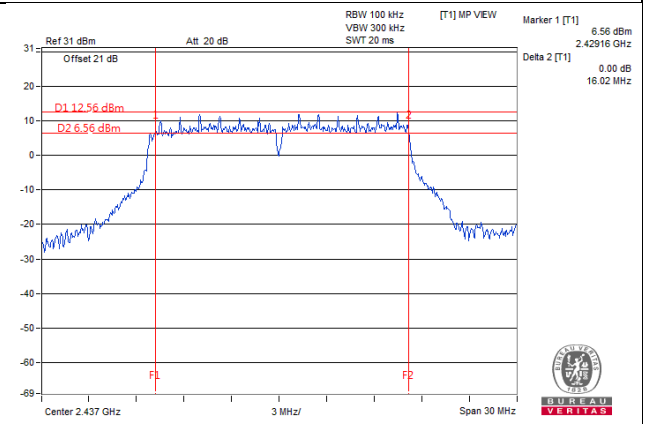
Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
3	2422	37.41	37.38	37.74	37.71	0.5	Pass
6	2437	37.71	37.60	37.77	37.21	0.5	Pass
9	2452	37.45	37.33	37.47	36.10	0.5	Pass

Spectrum Plot of Worst Value

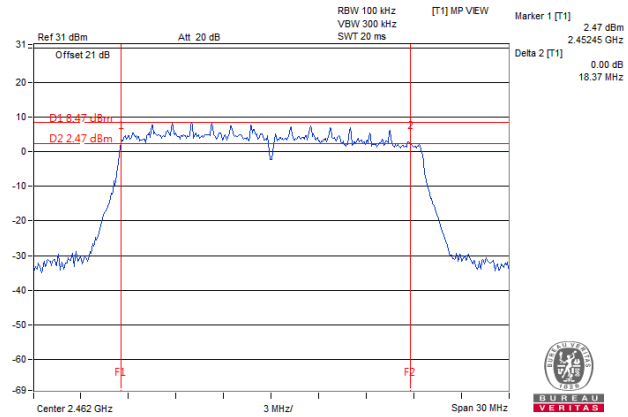
802.11b / Chain 3 : CH11



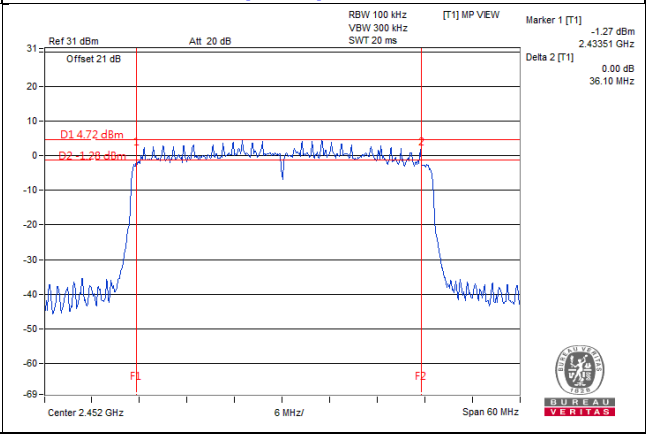
802.11g / Chain 3 : CH6



802.11ax (HE20) / Chain 3 : CH11



802.11ax (HE40) / Chain 3 : CH9



4.4 Conducted Output Power Measurement

4.4.1 Limits of Conducted Output Power Measurement

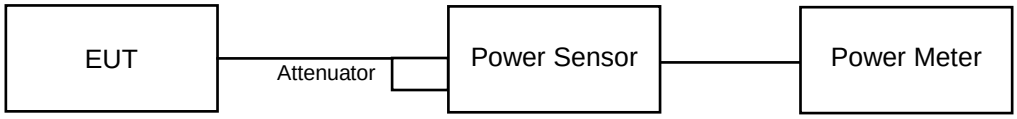
For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

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

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

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

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedures

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

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Conditions

Same as Item 4.3.6.

4.4.7 Test Results

Non-Beamforming Mode

802.11b

Chan.	Chan. Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
1	2412	24.08	23.61	23.22	24.28	963.285	29.84	30.00	Pass
6	2437	24.45	24.01	23.51	23.81	995.204	29.98	30.00	Pass
11	2462	24.20	23.68	23.15	24.06	957.594	29.81	30.00	Pass

802.11g

Chan.	Chan. Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
1	2412	20.49	20.55	19.97	20.26	430.927	26.34	30.00	Pass
2	2417	21.56	21.63	21.02	21.29	549.825	27.40	30.00	Pass
6	2437	24.39	24.02	23.55	23.22	963.495	29.84	30.00	Pass
10	2457	21.36	21.29	20.63	20.84	508.309	27.06	30.00	Pass
11	2462	20.04	19.91	19.34	19.54	374.725	25.74	30.00	Pass

VHT20

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	20.03	19.53	19.22	19.34	359.897	25.56	30.00	Pass
2	2417	21.27	20.81	20.49	20.63	482.027	26.83	30.00	Pass
6	2437	24.18	23.76	23.23	23.37	927.15	29.67	30.00	Pass
10	2457	21.01	20.79	20.21	20.67	467.768	26.70	30.00	Pass
11	2462	19.95	19.64	19.15	19.68	366.021	25.64	30.00	Pass

VHT40

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	19.45	19.14	18.95	19.40	335.76	25.26	30.00	Pass
6	2437	20.39	20.59	20.36	20.56	446.353	26.50	30.00	Pass
9	2452	18.12	18.31	17.65	18.35	259.228	24.14	30.00	Pass

802.11ax (HE20)

Chan.	Chan. Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
1	2412	20.07	19.99	19.44	19.63	381.13	25.81	30.00	Pass
2	2417	21.33	21.27	20.73	20.95	512.554	27.10	30.00	Pass
6	2437	24.56	24.08	23.64	23.42	992.61	29.97	30.00	Pass
10	2457	21.44	21.02	20.59	20.88	502.803	27.01	30.00	Pass
11	2462	20.37	19.97	19.53	19.87	394.999	25.97	30.00	Pass

802.11ax (HE40)

Chan.	Chan. Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
3	2422	19.58	19.42	19.29	19.81	358.917	25.55	30.00	Pass
6	2437	20.76	20.71	20.57	20.68	467.86	26.70	30.00	Pass
9	2452	18.33	18.38	18.14	18.56	273.884	24.38	30.00	Pass

Beamforming Mode

VHT20

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	20.03	19.53	19.22	19.34	359.897	25.56	29.86	Pass
2	2417	21.27	20.81	20.49	20.63	482.027	26.83	29.86	Pass
6	2437	24.18	23.76	23.23	23.37	927.15	29.67	29.86	Pass
10	2457	21.01	20.79	20.21	20.67	467.768	26.70	29.86	Pass
11	2462	19.95	19.64	19.15	19.68	366.021	25.64	29.86	Pass

Note: 1. Directional gain = 0.12dBi + 10log(4) = 6.14dBi > 6dBi , so the power limit shall be reduced to 30-(6.14-6) = 29.86dBm.

VHT40

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	19.45	19.14	18.95	19.40	335.76	25.26	29.86	Pass
6	2437	20.39	20.59	20.36	20.56	446.353	26.50	29.86	Pass
9	2452	18.12	18.31	17.65	18.35	259.228	24.14	29.86	Pass

Note: 1. Directional gain = 0.12dBi + 10log(4) = 6.14dBi > 6dBi , so the power limit shall be reduced to 30-(6.14-6) = 29.86dBm.

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	20.07	19.99	19.44	19.63	381.13	25.81	29.86	Pass
2	2417	21.33	21.27	20.73	20.95	512.554	27.10	29.86	Pass
6	2437	24.24	23.89	23.49	23.04	935.096	29.71	29.86	Pass
10	2457	21.44	21.02	20.59	20.88	502.803	27.01	29.86	Pass
11	2462	20.37	19.97	19.53	19.87	394.999	25.97	29.86	Pass

Note: 1. Directional gain = 0.12dBi + 10log(4) = 6.14dBi > 6dBi , so the power limit shall be reduced to 30-(6.14-6) = 29.86dBm.

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	19.58	19.42	19.29	19.81	358.917	25.55	29.86	Pass
6	2437	20.76	20.71	20.57	20.68	467.86	26.70	29.86	Pass
9	2452	18.33	18.38	18.14	18.56	273.884	24.38	29.86	Pass

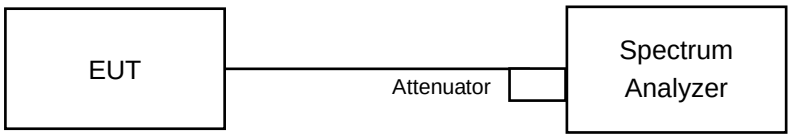
Note: 1. Directional gain = 0.12dBi + 10log(4) = 6.14dBi > 6dBi , so the power limit shall be reduced to 30-(6.14-6) = 29.86dBm.

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

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

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

802.11b, 802.11g, 802.11ax (HE20)

a) Set instrument center frequency to DTS channel center frequency.
b) Set span to at least 1.5 times the OBW.
c) Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz. .
d) Set VBW ≥3 x RBW.
e) Detector = power averaging (RMS) or sample detector (when RMS not available).
f) Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.
g) Sweep time = auto couple.
h) Employ trace averaging (RMS) mode over a minimum of 100 traces.
i) Use the peak marker function to determine the maximum amplitude level.

802.11ax (HE40)

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

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

Same as Item 4.3.6

4.5.7 Test Results

802.11b

TX chain	Channel	Freq. (MHz)	PSD (dBm/3kHz)	10 log (N=4) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	1	2412	-9.03	6.02	-3.01	7.86	Pass
	6	2437	-8.03	6.02	-2.01	7.86	Pass
	11	2462	-8.94	6.02	-2.92	7.86	Pass
1	1	2412	-9.05	6.02	-3.03	7.86	Pass
	6	2437	-8.22	6.02	-2.20	7.86	Pass
	11	2462	-9.10	6.02	-3.08	7.86	Pass
2	1	2412	-9.55	6.02	-3.53	7.86	Pass
	6	2437	-8.66	6.02	-2.64	7.86	Pass
	11	2462	-9.72	6.02	-3.70	7.86	Pass
3	1	2412	-8.18	6.02	-2.16	7.86	Pass
	6	2437	-8.62	6.02	-2.60	7.86	Pass
	11	2462	-8.55	6.02	-2.53	7.86	Pass

Note: 1. Directional gain = 0.12dBi + 10log(4) = 6.14dBi > 6dBi , so the power density limit shall be reduced to 8-(6.14-6) = 7.86dBm.

802.11g

TX chain	Channel	Freq. (MHz)	PSD (dBm/3kHz)	10 log (N=4) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	1	2412	-12.26	6.02	-6.24	7.86	Pass
	2	2417	-10.55	6.02	-4.53	7.86	Pass
	6	2437	-8.24	6.02	-2.22	7.86	Pass
	10	2457	-9.69	6.02	-3.67	7.86	Pass
	11	2462	-12.34	6.02	-6.32	7.86	Pass
1	1	2412	-12.82	6.02	-6.80	7.86	Pass
	2	2417	-10.36	6.02	-4.34	7.86	Pass
	6	2437	-8.55	6.02	-2.53	7.86	Pass
	10	2457	-9.17	6.02	-3.15	7.86	Pass
	11	2462	-12.52	6.02	-6.50	7.86	Pass
2	1	2412	-13.03	6.02	-7.01	7.86	Pass
	2	2417	-8.14	6.02	-2.12	7.86	Pass
	6	2437	-9.97	6.02	-3.95	7.86	Pass
	10	2457	-10.44	6.02	-4.42	7.86	Pass
	11	2462	-12.89	6.02	-6.87	7.86	Pass
3	1	2412	-11.89	6.02	-5.87	7.86	Pass
	2	2417	-10.34	6.02	-4.32	7.86	Pass
	6	2437	-8.44	6.02	-2.42	7.86	Pass
	10	2457	-9.50	6.02	-3.48	7.86	Pass
	11	2462	-12.46	6.02	-6.44	7.86	Pass

Note: 1. Directional gain = 0.12dBi + 10log(4) = 6.14dBi > 6dBi , so the power density limit shall be reduced to 8-(6.14-6) = 7.86dBm.

802.11ax (HE20)

TX chain	Channel	Freq. (MHz)	PSD (dBm/3kHz)	10 log (N=4) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	1	2412	-13.44	6.02	-7.42	7.86	Pass
	2	2417	-11.63	6.02	-5.61	7.86	Pass
	6	2437	-9.26	6.02	-3.24	7.86	Pass
	10	2457	-11.53	6.02	-5.51	7.86	Pass
	11	2462	-13.35	6.02	-7.33	7.86	Pass
1	1	2412	-14.54	6.02	-8.52	7.86	Pass
	2	2417	-11.75	6.02	-5.73	7.86	Pass
	6	2437	-10.16	6.02	-4.14	7.86	Pass
	10	2457	-11.09	6.02	-5.07	7.86	Pass
	11	2462	-13.76	6.02	-7.74	7.86	Pass
2	1	2412	-14.43	6.02	-8.41	7.86	Pass
	2	2417	-11.87	6.02	-5.85	7.86	Pass
	6	2437	-9.74	6.02	-3.72	7.86	Pass
	10	2457	-12.24	6.02	-6.22	7.86	Pass
	11	2462	-13.78	6.02	-7.76	7.86	Pass
3	1	2412	-13.83	6.02	-7.81	7.86	Pass
	2	2417	-10.87	6.02	-4.85	7.86	Pass
	6	2437	-9.25	6.02	-3.23	7.86	Pass
	10	2457	-10.23	6.02	-4.21	7.86	Pass
	11	2462	-13.98	6.02	-7.96	7.86	Pass

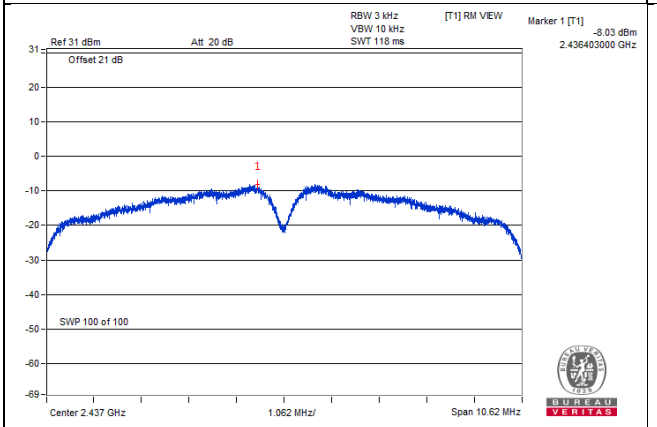
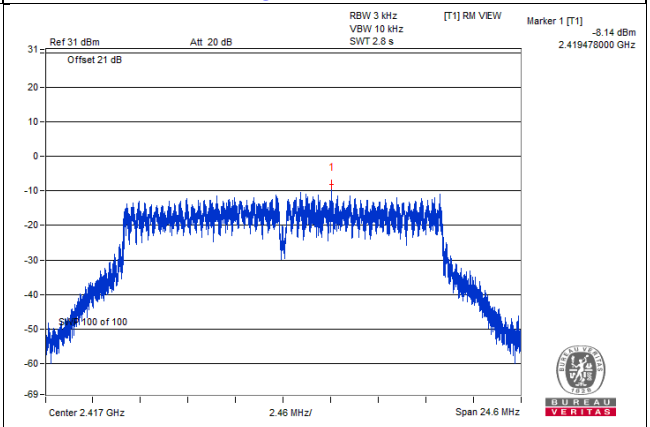
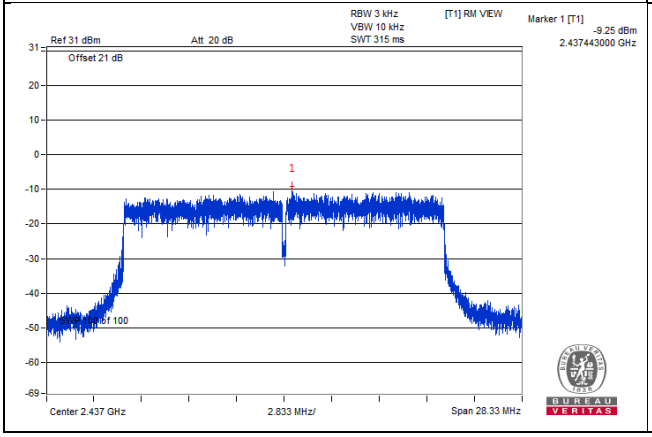
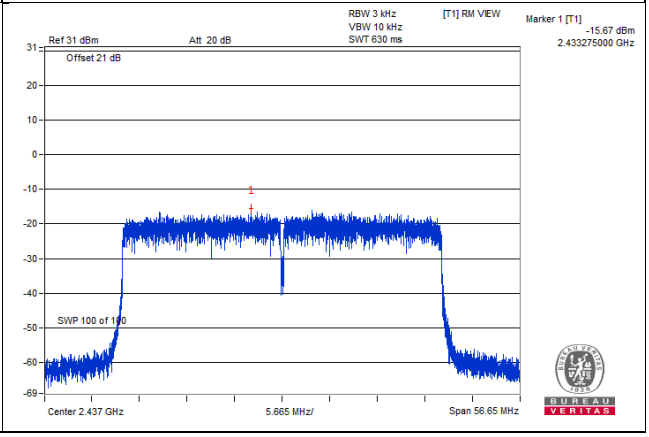
Note: 1. Directional gain = 0.12dBi + 10log(4) = 6.14dBi > 6dBi , so the power density limit shall be reduced to 8-(6.14-6) = 7.86dBm..

802.11ax (HE40)

TX chain	Channel	Freq. (MHz)	PSD W/O Duty Factor (dBm/3kHz)	10 log (N=4) dB	Duty Factor (dB)	TOTAL PSD With Duty Factor (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	3	2422	-16.84	6.02	0.13	-10.69	7.86	Pass
	6	2437	-15.83	6.02	0.13	-9.68	7.86	Pass
	9	2452	-18.33	6.02	0.13	-12.18	7.86	Pass
1	3	2422	-17.22	6.02	0.13	-11.07	7.86	Pass
	6	2437	-16.11	6.02	0.13	-9.96	7.86	Pass
	9	2452	-18.34	6.02	0.13	-12.19	7.86	Pass
2	3	2422	-15.76	6.02	0.13	-9.61	7.86	Pass
	6	2437	-15.67	6.02	0.13	-9.52	7.86	Pass
	9	2452	-17.79	6.02	0.13	-11.64	7.86	Pass
3	3	2422	-16.70	6.02	0.13	-10.55	7.86	Pass
	6	2437	-15.74	6.02	0.13	-9.59	7.86	Pass
	9	2452	-17.40	6.02	0.13	-11.25	7.86	Pass

Note: 1. Directional gain = 0.12dBi + 10log(4) = 6.14dBi > 6dBi , so the power density limit shall be reduced to 8-(6.14-6) = 7.86dBm..

2. Refer to section 3.3 for duty cycle spectrum plot.

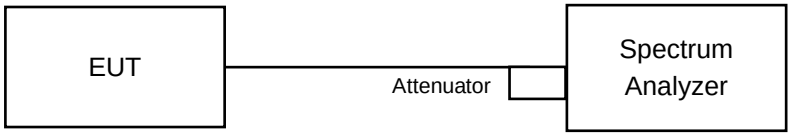
Spectrum Plot of Worst Value	
802.11b / Chain 0: CH6	**802.11g / Chain 2 : CH2**
	
802.11ax (HE20) / Chain 3: CH6	**802.11ax (HE40) / Chain 2: CH6**
	

4.6 Conducted Out of Band Emission Measurement

4.6.1 Limits of Conducted Out of Band Emission Measurement

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

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

MEASUREMENT PROCEDURE REF

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

MEASUREMENT PROCEDURE OOBE

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

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

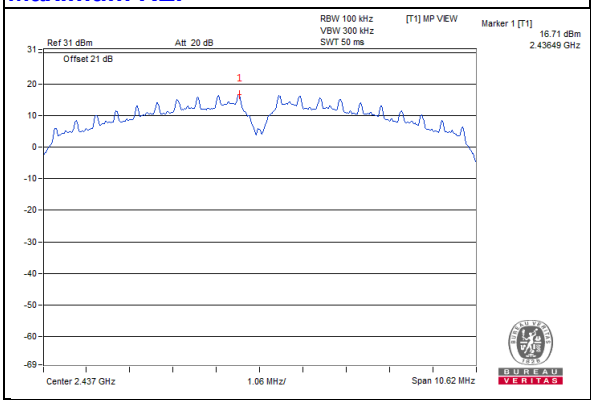
Same as Item 4.3.6

4.6.7 Test Results

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

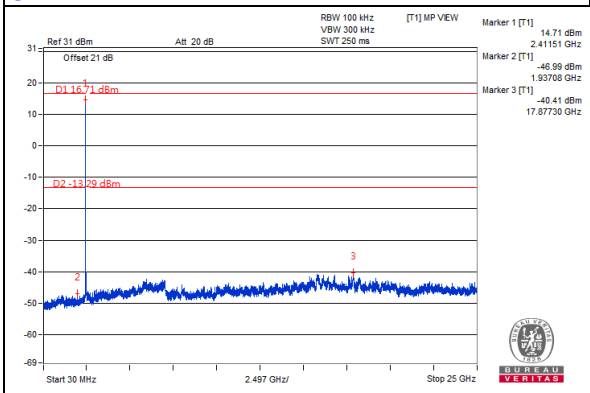
802.11b

Maximum REF

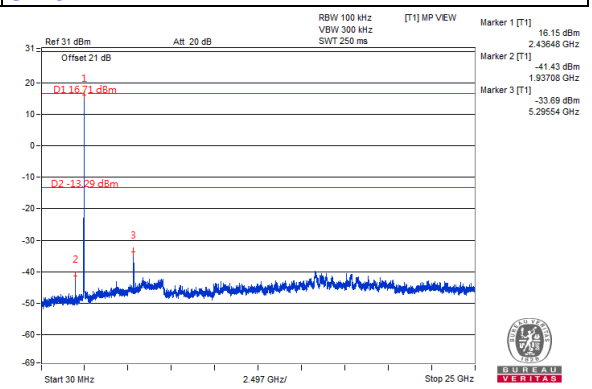


Chain 0

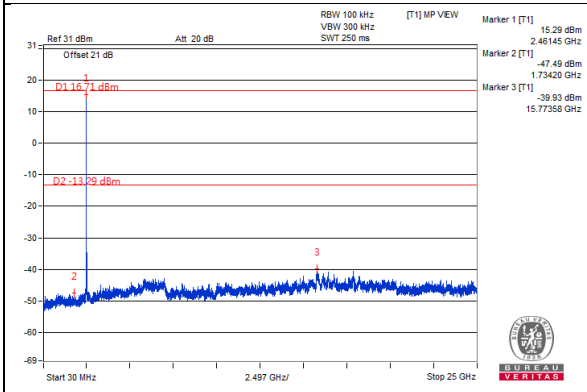
CH 1



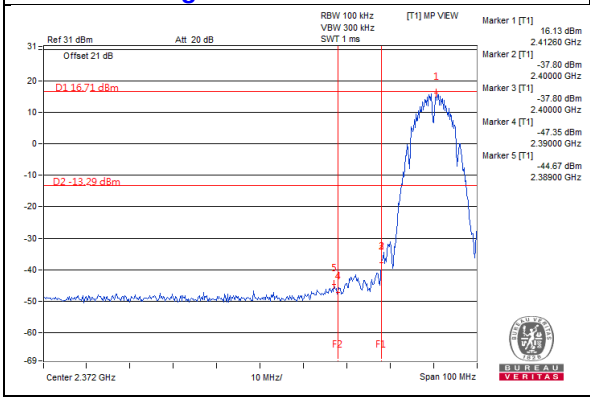
CH 6



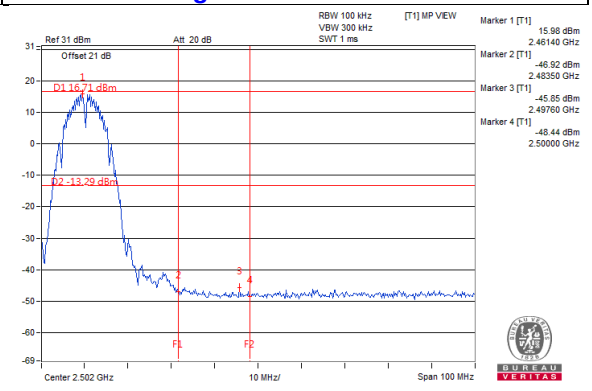
CH 11



CH 1 Band edge

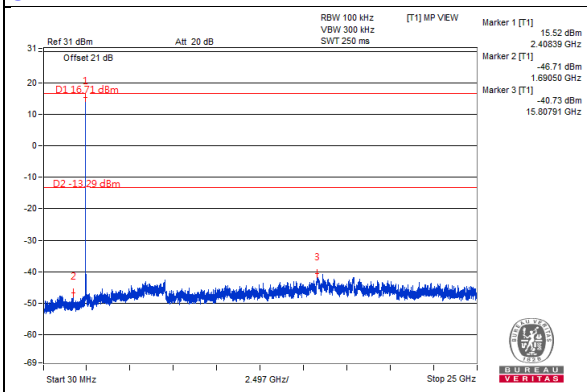


CH 11 Band edge

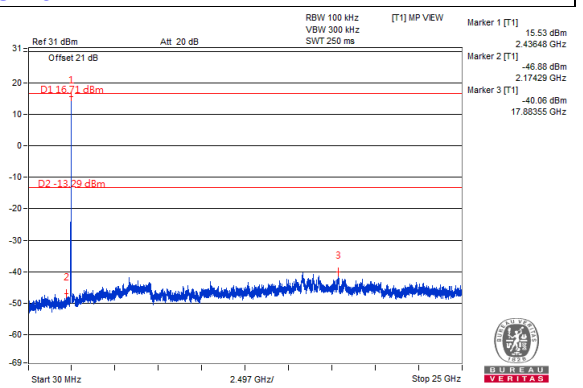


Chain 1

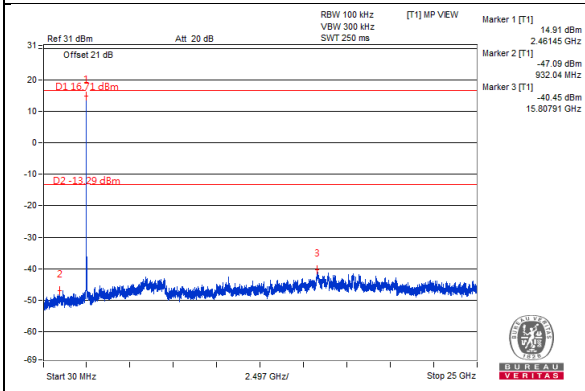
CH 1



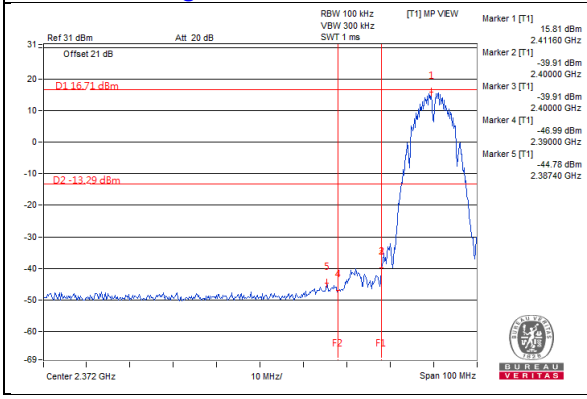
CH 6



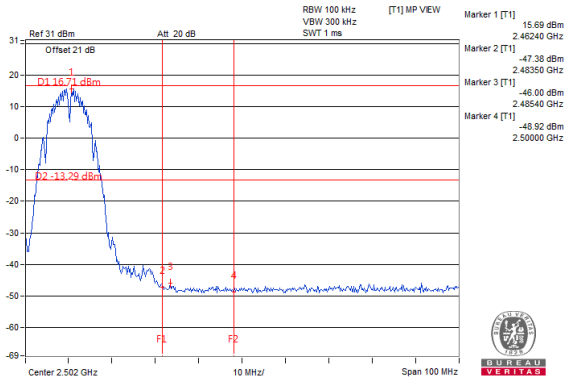
CH 11



CH 1 Band edge

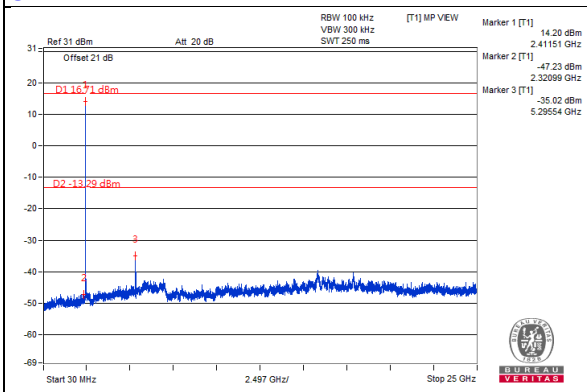


CH 11 Band edge

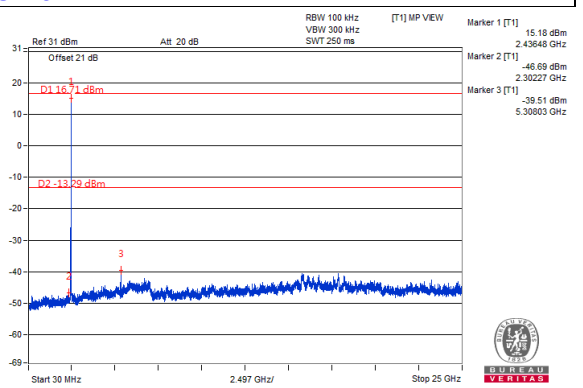


Chain 2

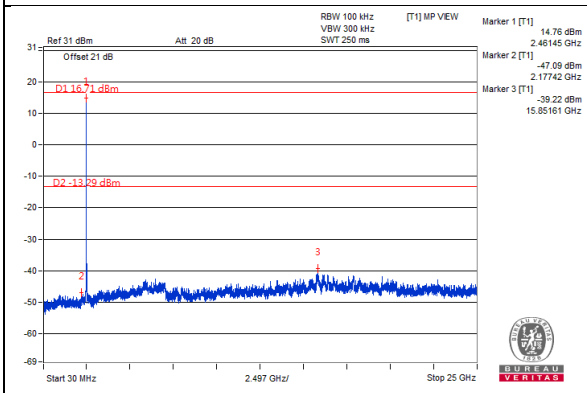
CH 1



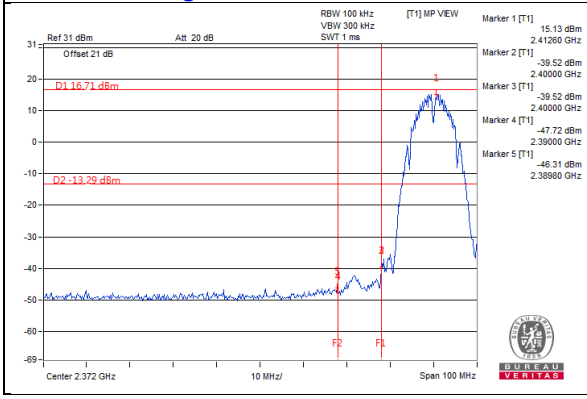
CH 6



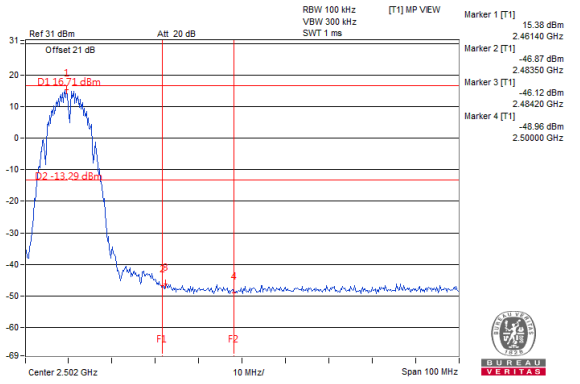
CH 11



CH 1 Band edge

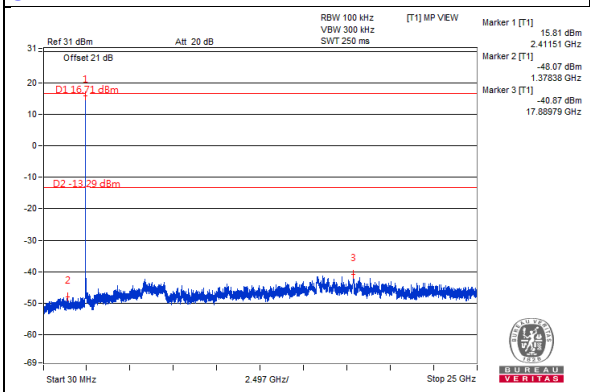


CH 11 Band edge

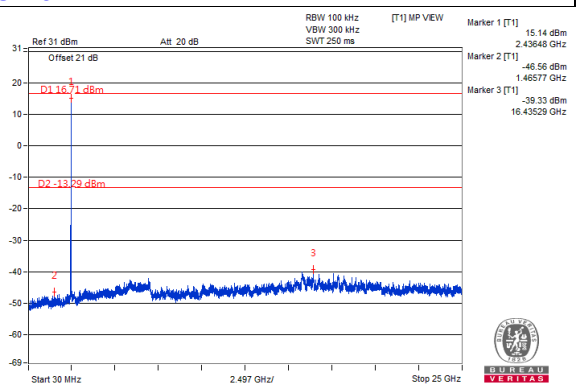


Chain 3

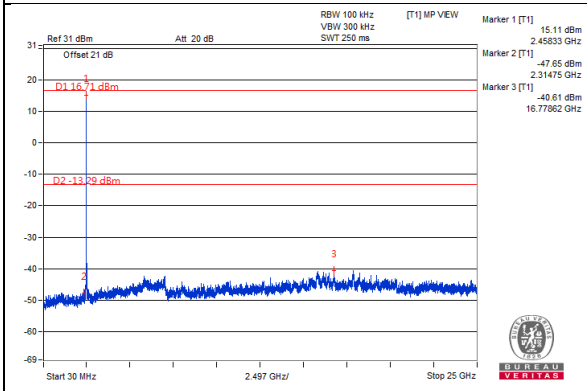
CH 1



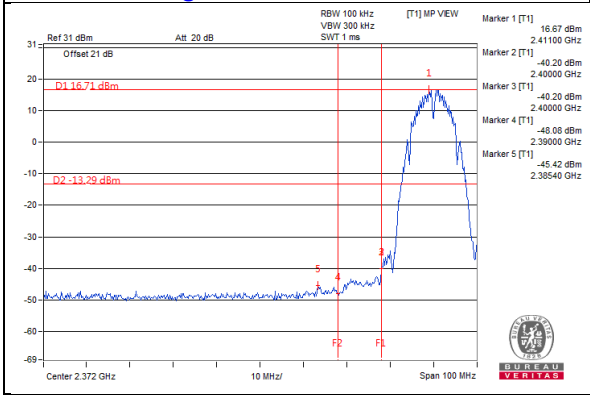
CH 6



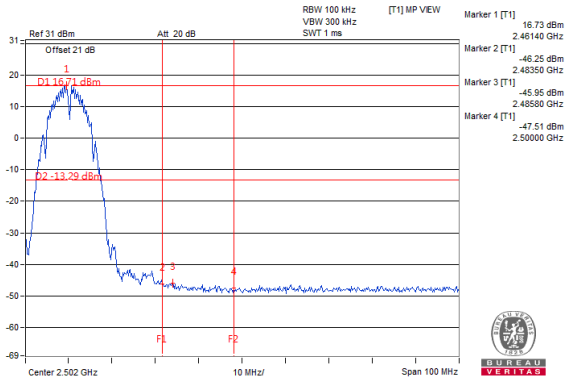
CH 11



CH 1 Band edge

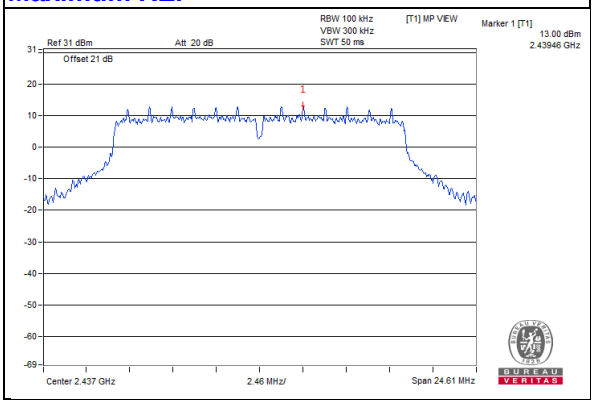


CH 11 Band edge



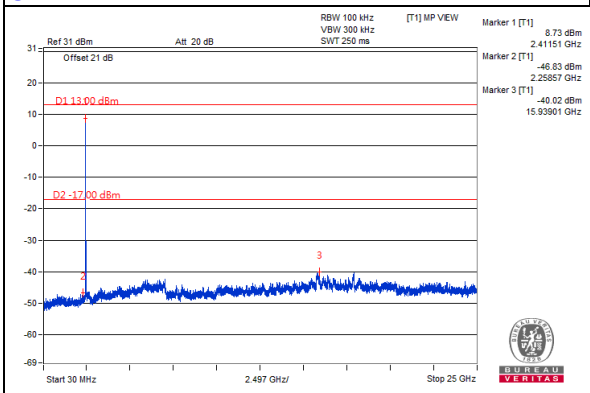
802.11g

Maximum REF

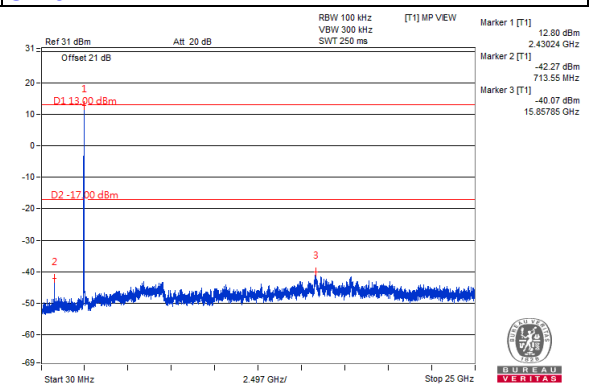


Chain 0

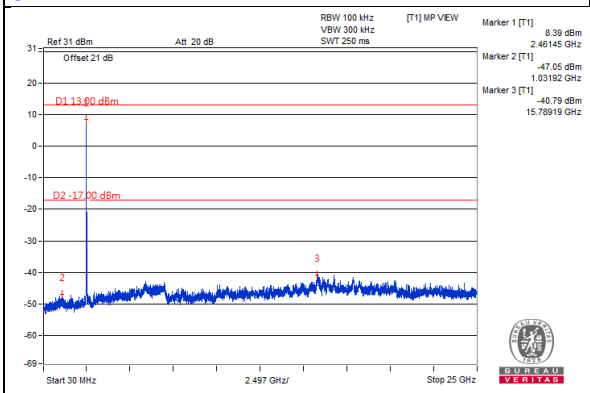
CH 1



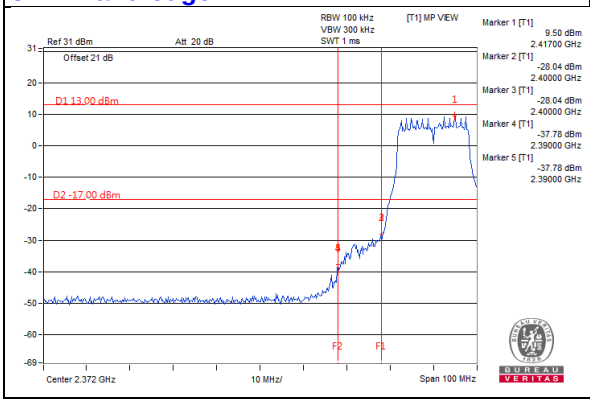
CH 6



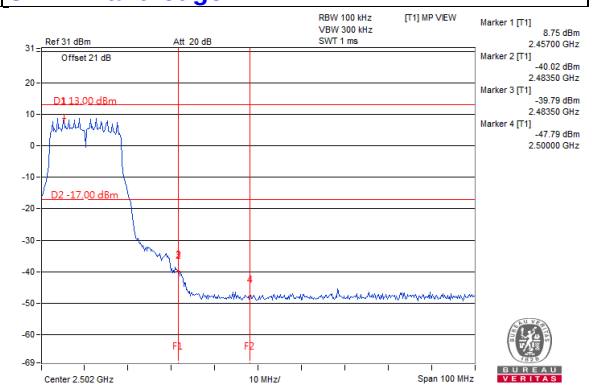
CH 11



CH 1 Band edge

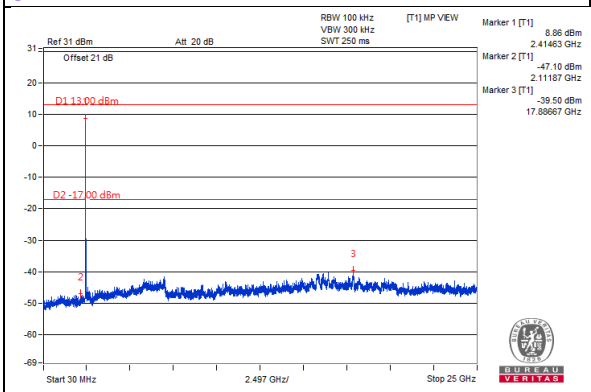


CH 11 Band edge

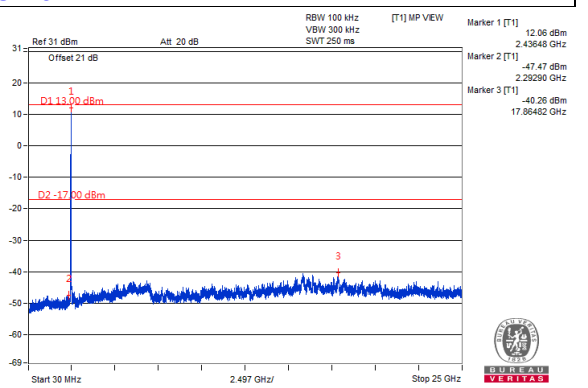


Chain 1

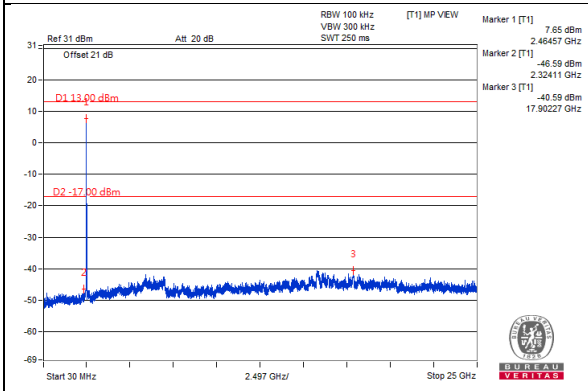
CH 1



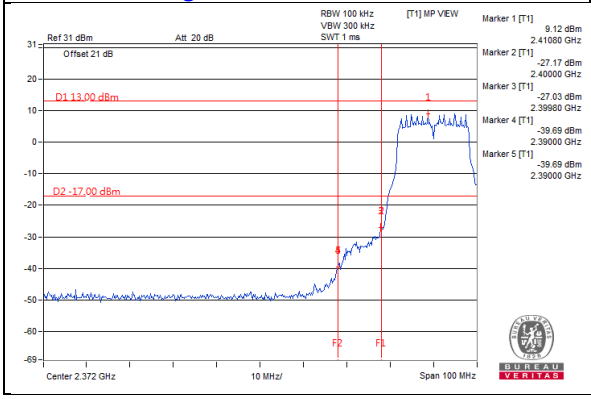
CH 6



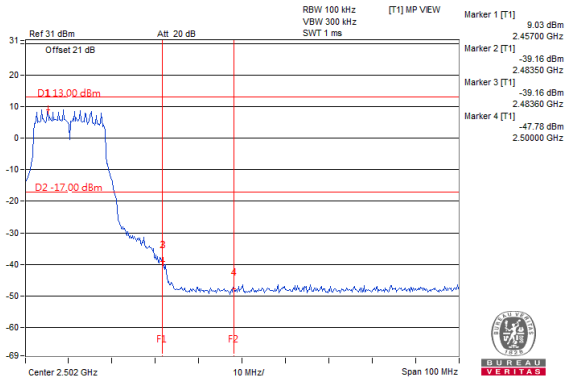
CH 11



CH 1 Band edge

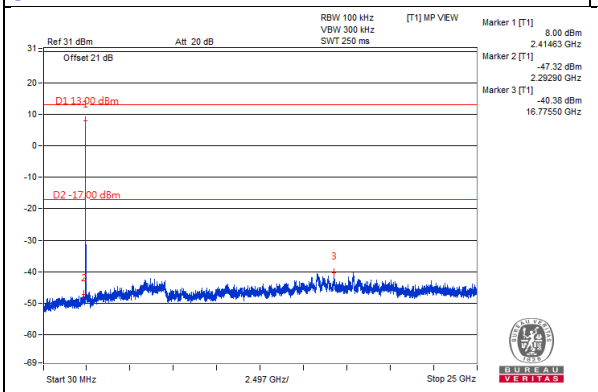


CH 11 Band edge

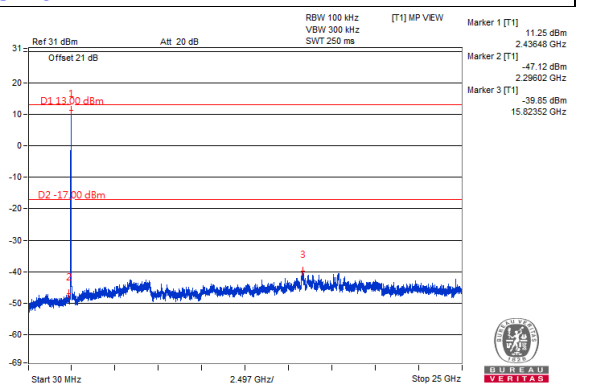


Chain 2

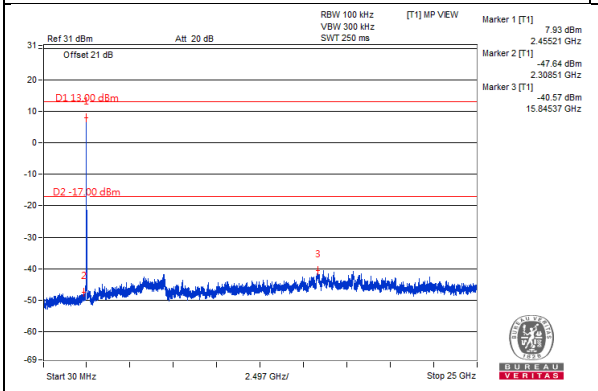
CH 1



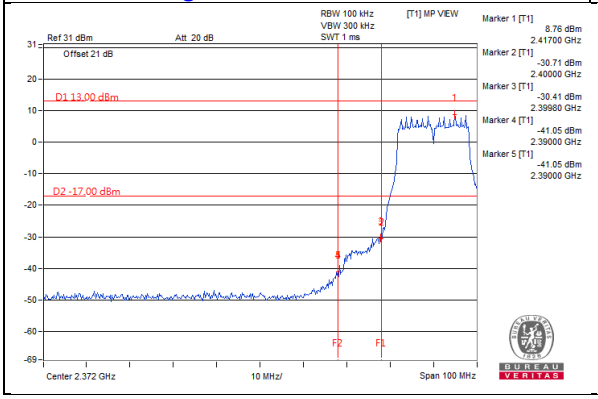
CH 6



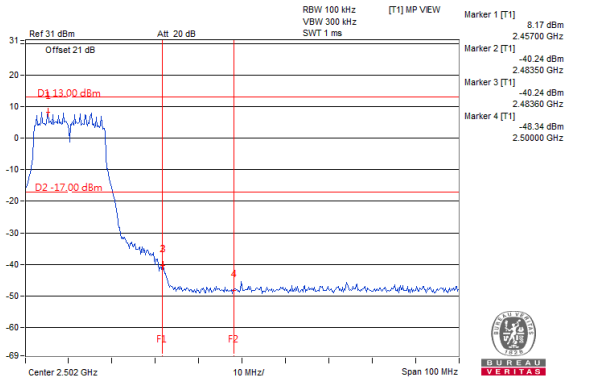
CH 11



CH 1 Band edge

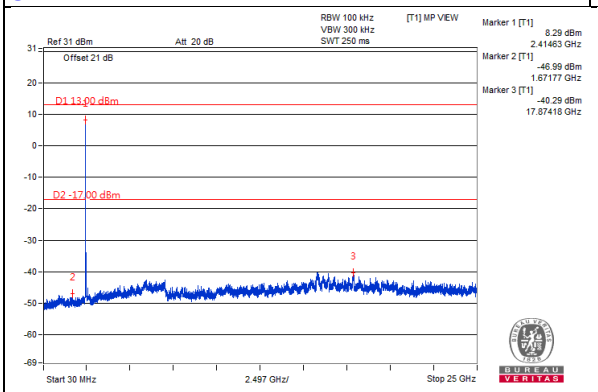


CH 11 Band edge

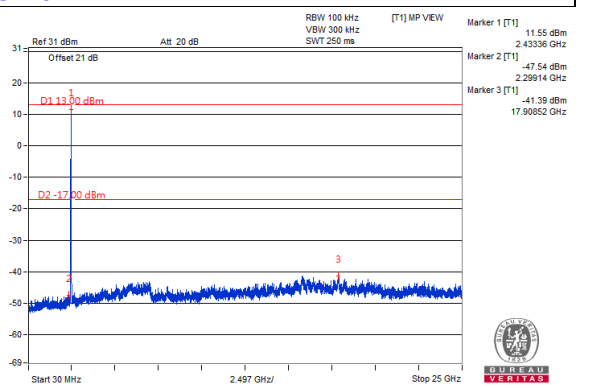


Chain 3

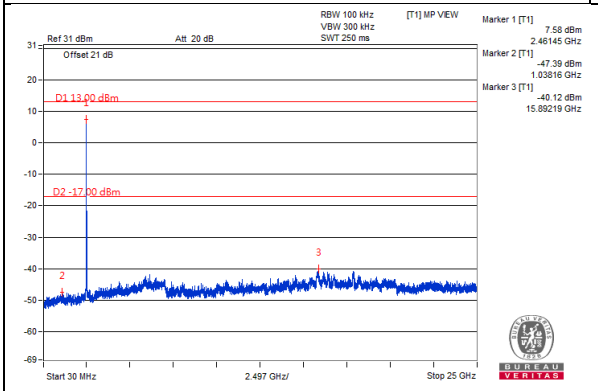
CH 1



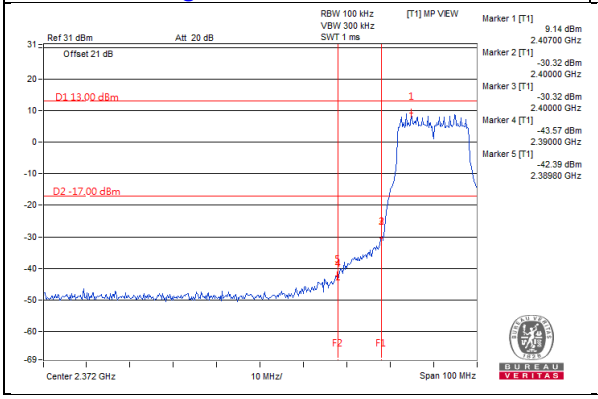
CH 6



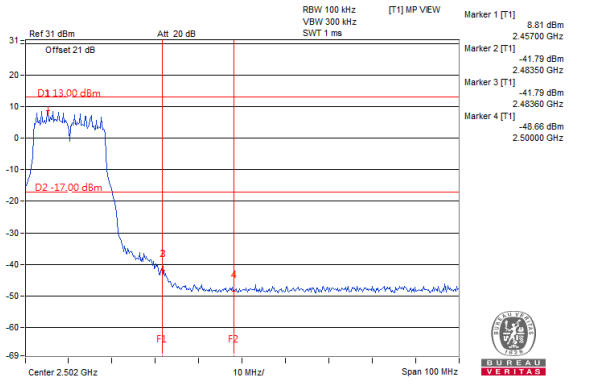
CH 11



CH 1 Band edge

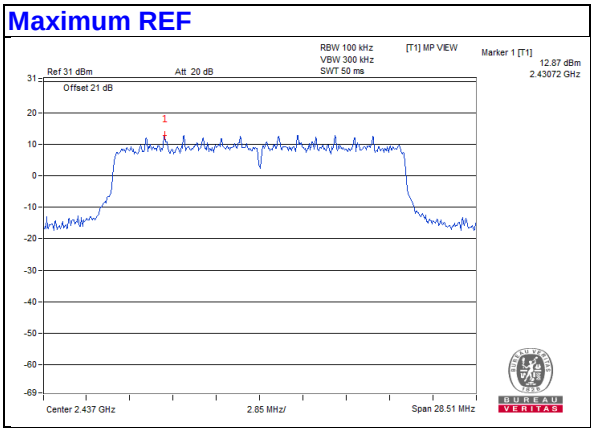


CH 11 Band edge



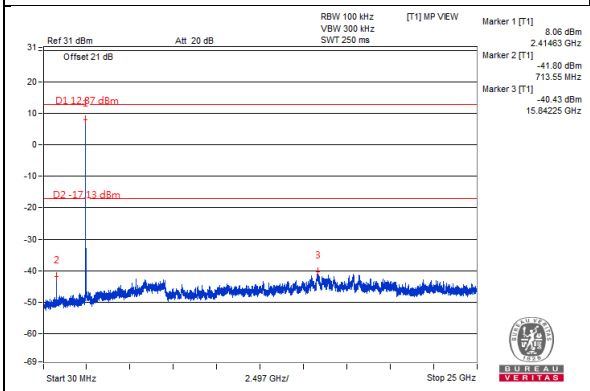
802.11ax (HE20)

Maximum REF

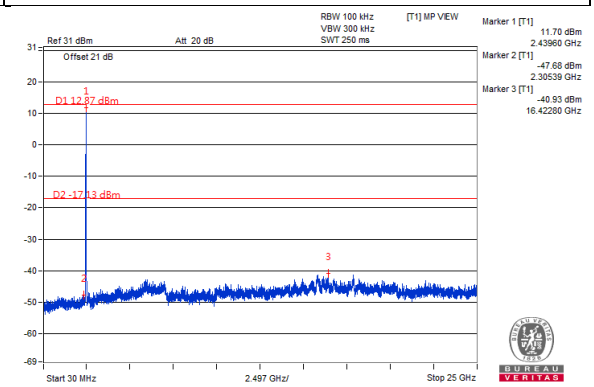


Chain 0

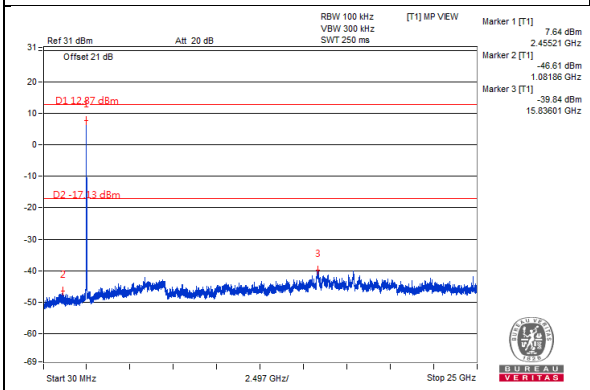
CH 1



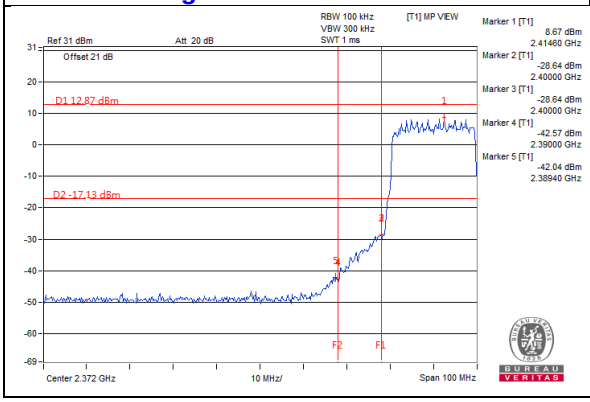
CH 6



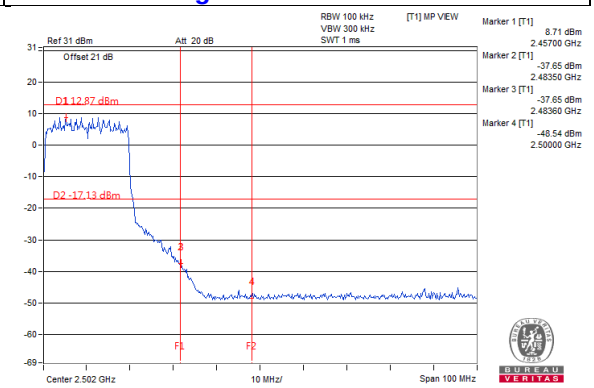
CH 11



CH 1 Band edge

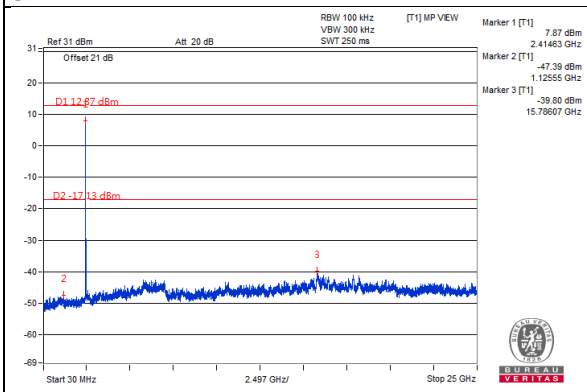


CH 11 Band edge

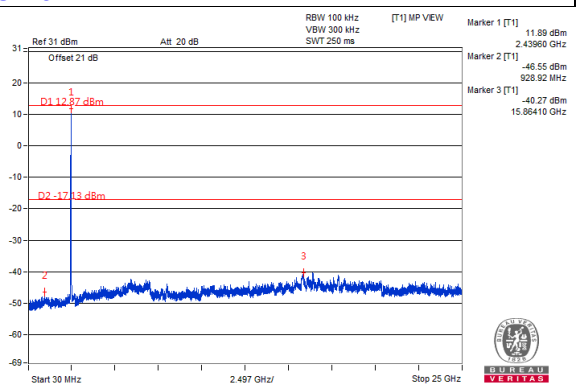


Chain 1

CH 1



CH 6



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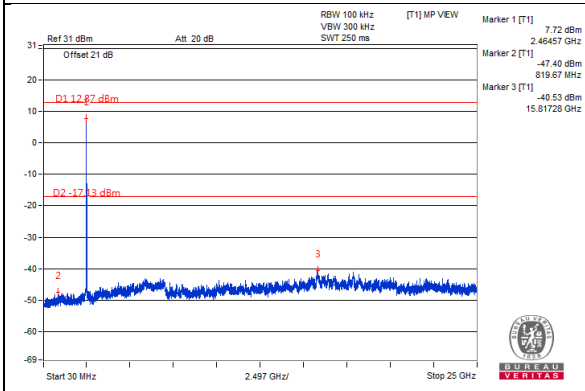

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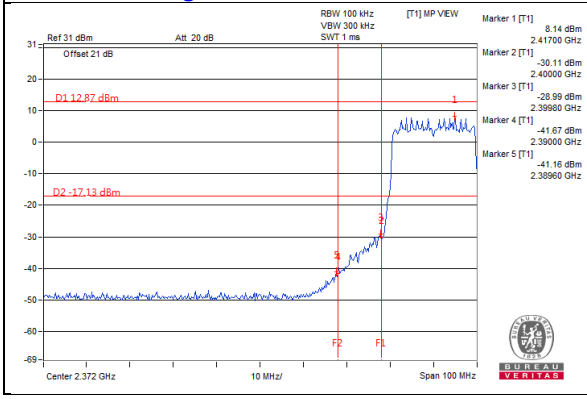

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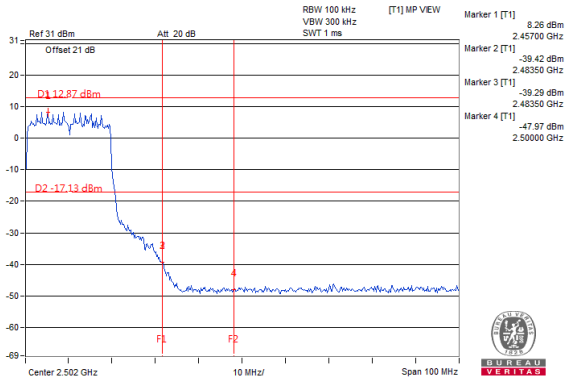
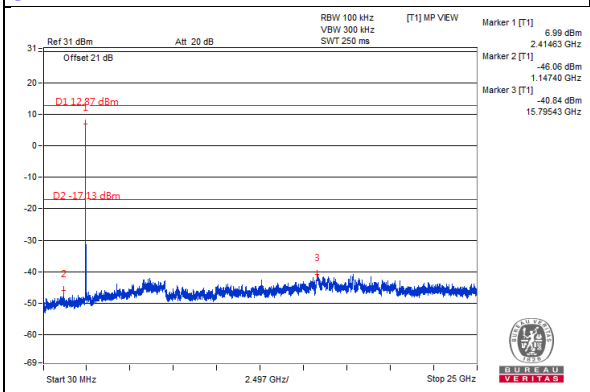
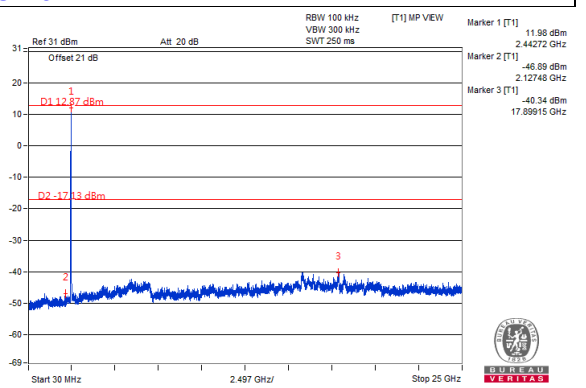


Chain 2

CH 1



CH 6



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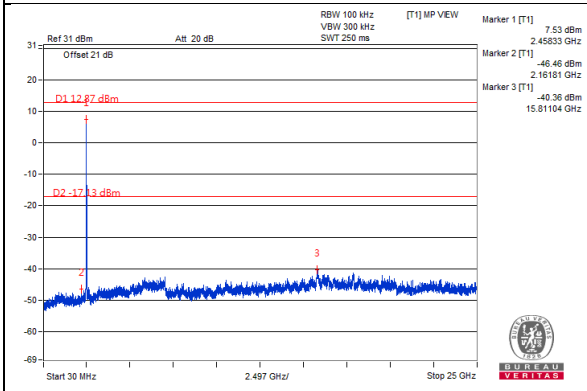

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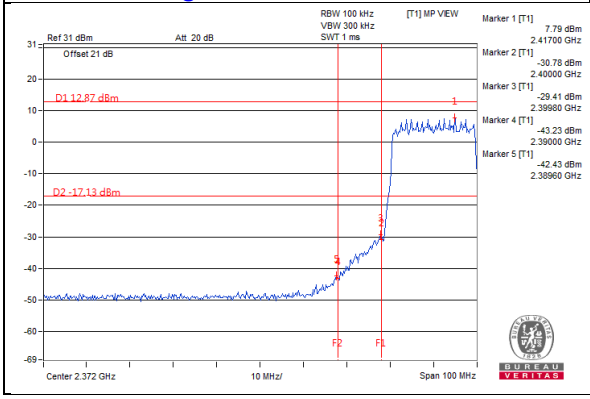
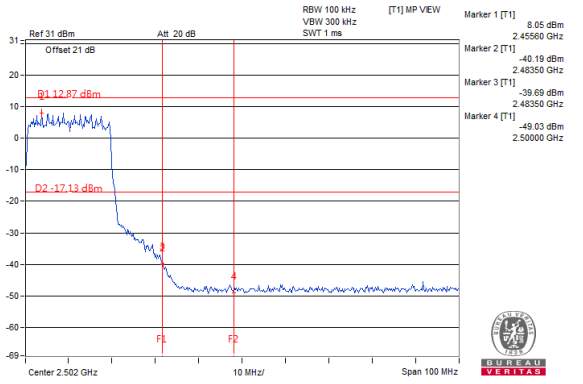
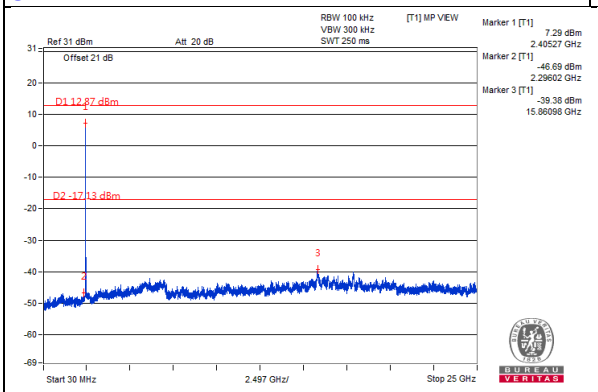


CH 11 Band edge

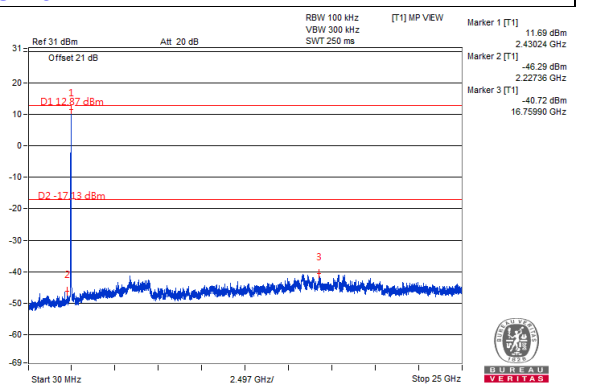


Chain 3

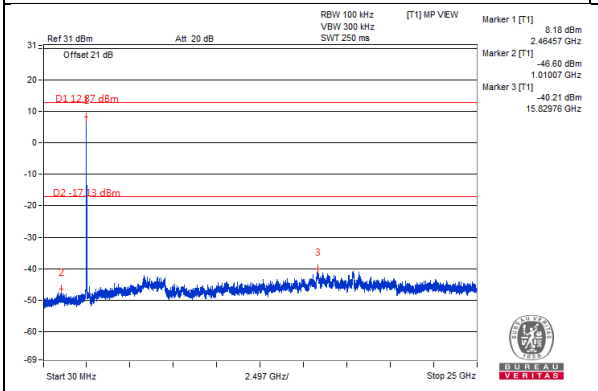
CH 1



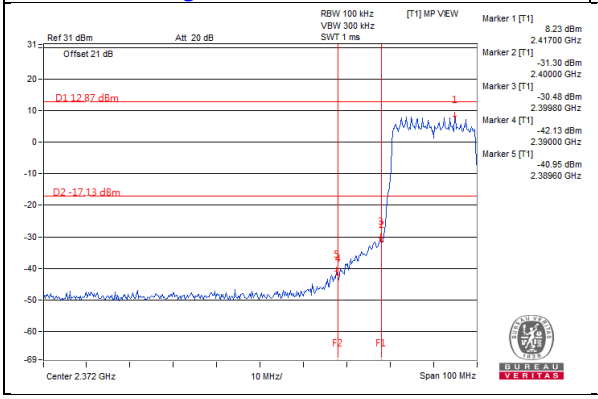
CH 6



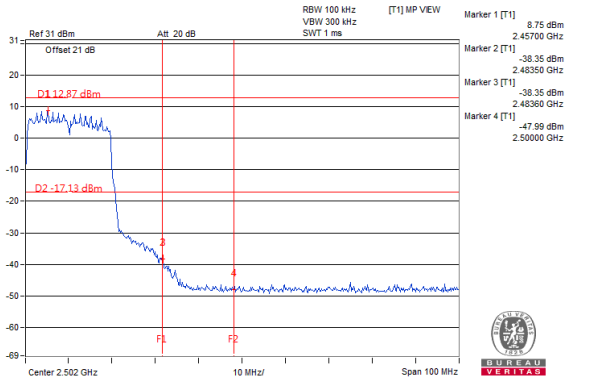
CH 11



CH 1 Band edge

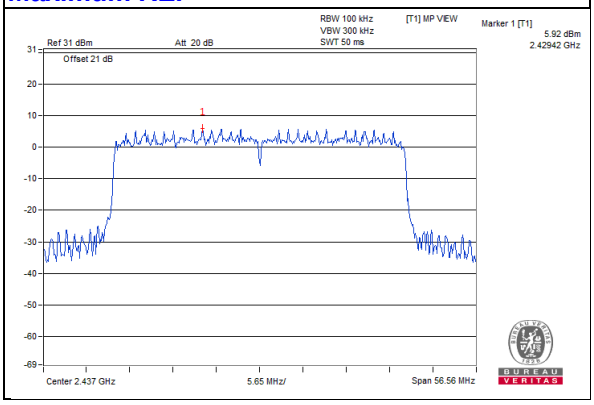


CH 11 Band edge



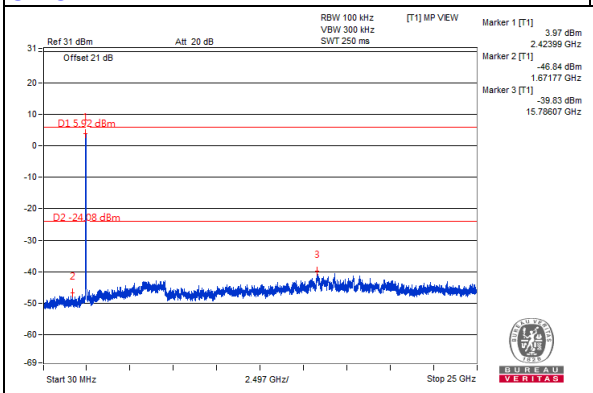
802.11ax (HE40)

Maximum REF

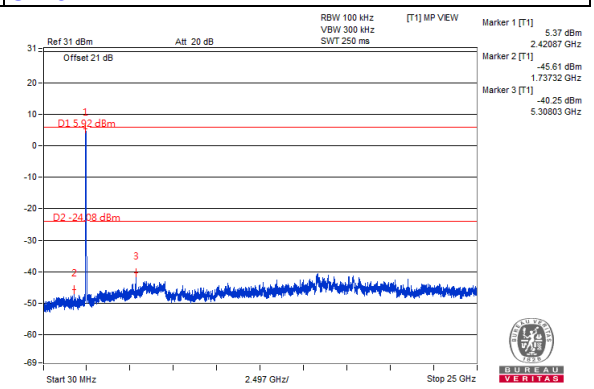


Chain 0

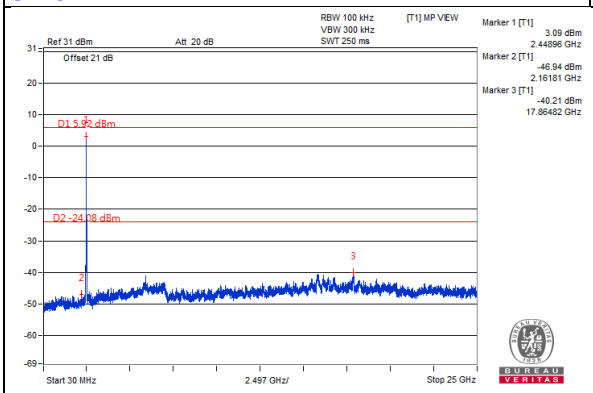
CH 3



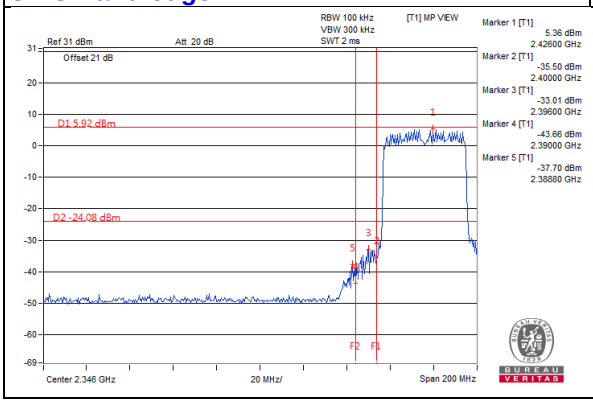
CH 6



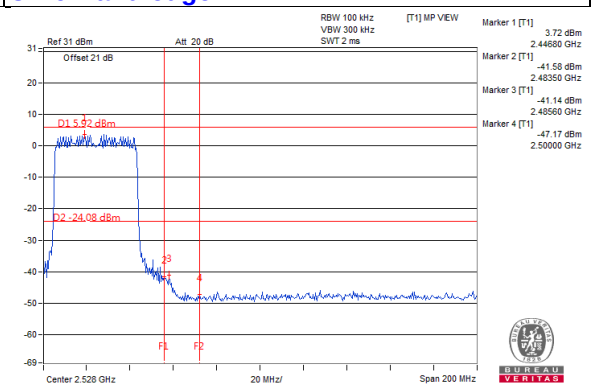
CH 9



CH 3 Band edge

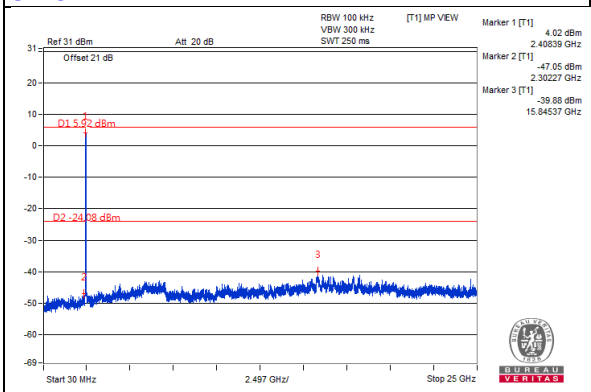


CH 9 Band edge

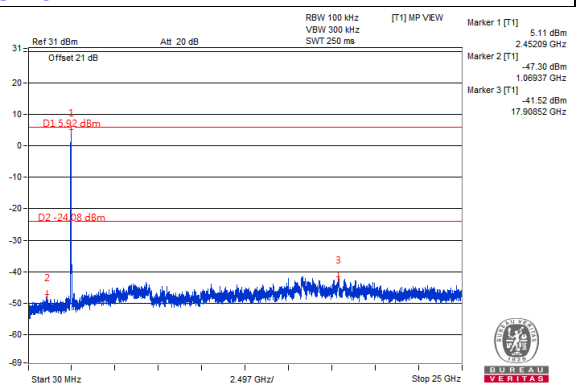


Chain 1

CH 3



CH 6



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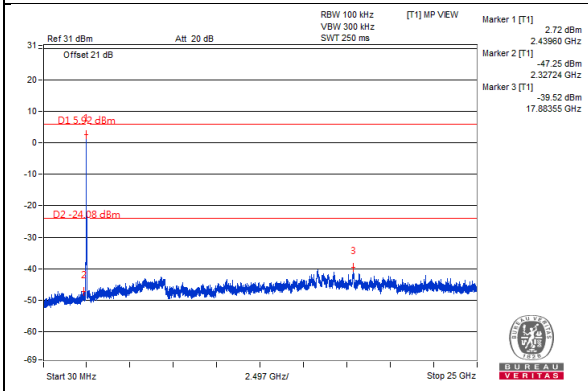
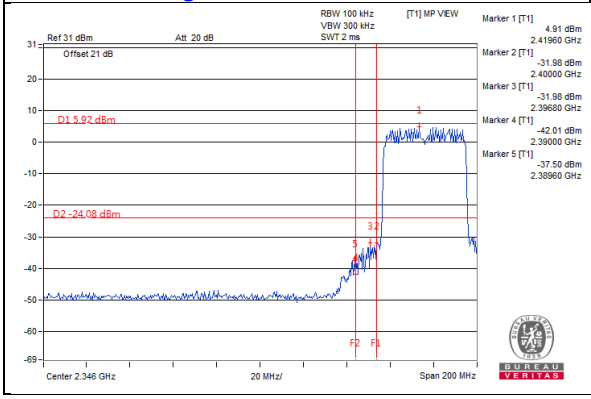
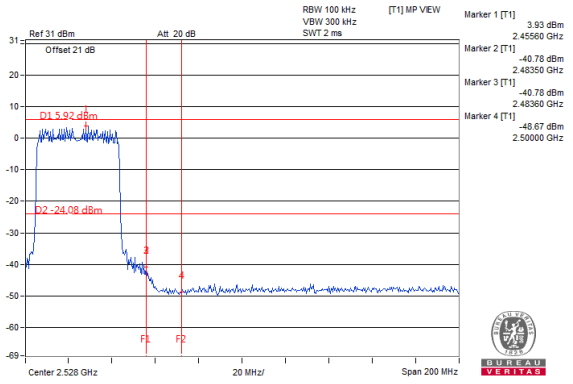


CH 3 Band edge

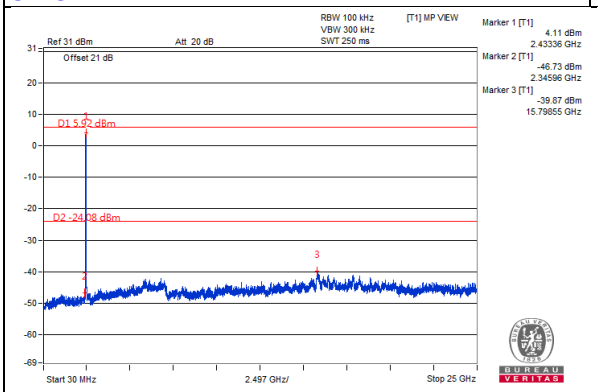


CH 9 Band edge



Chain 2

CH 3



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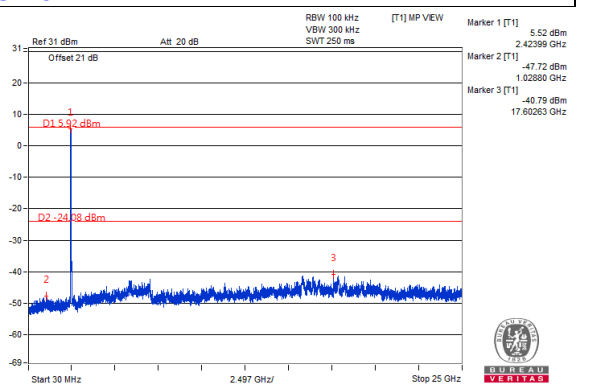
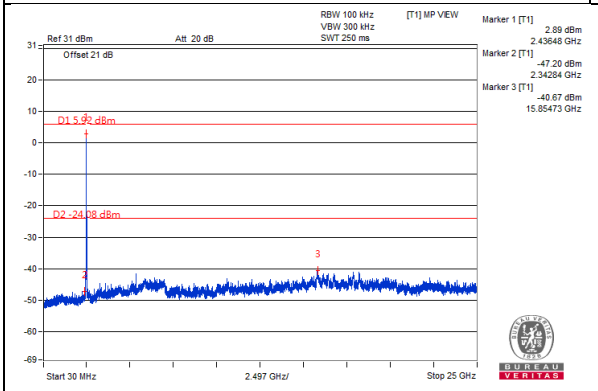


CH 9



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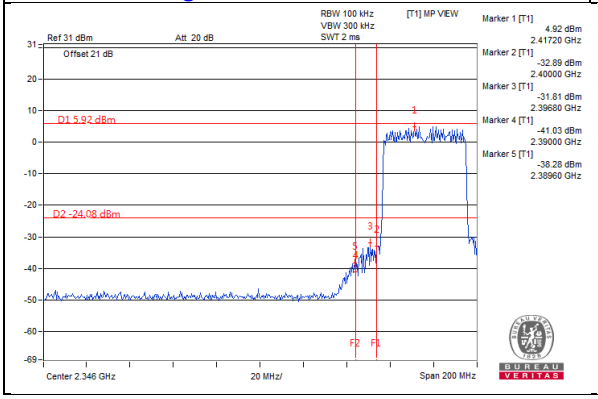

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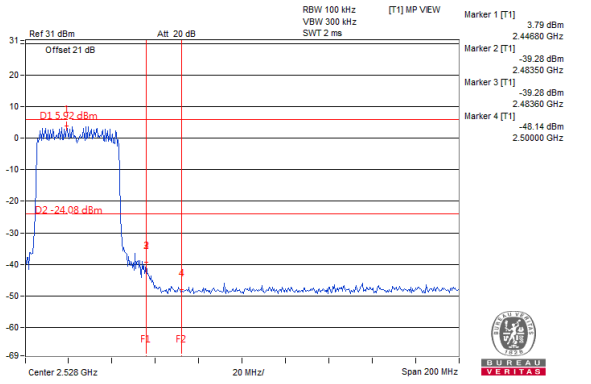
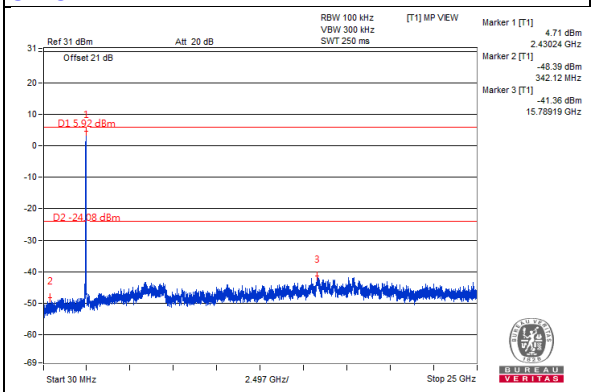


Chain 3

CH 3



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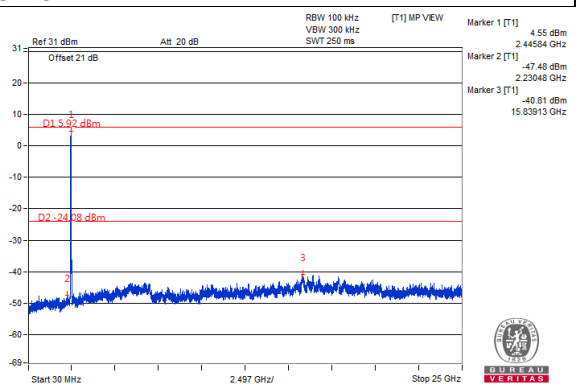

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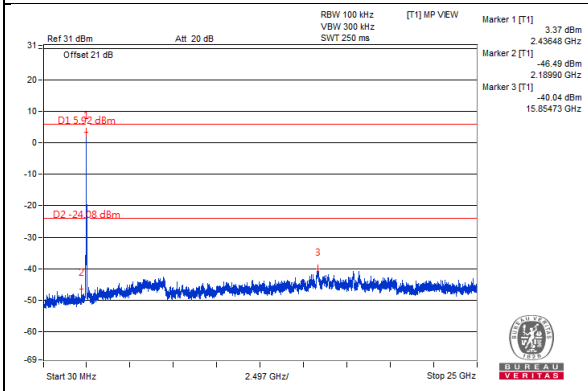
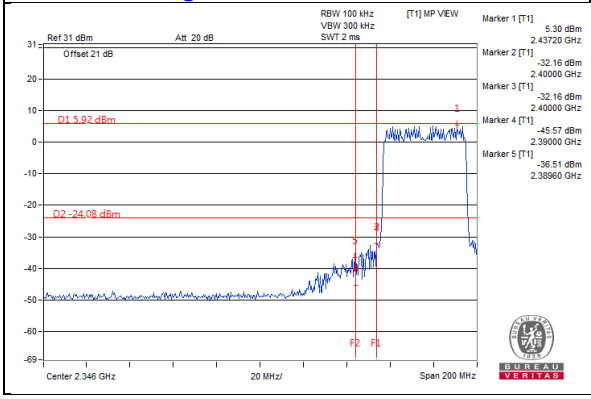


CH 3 Band edge



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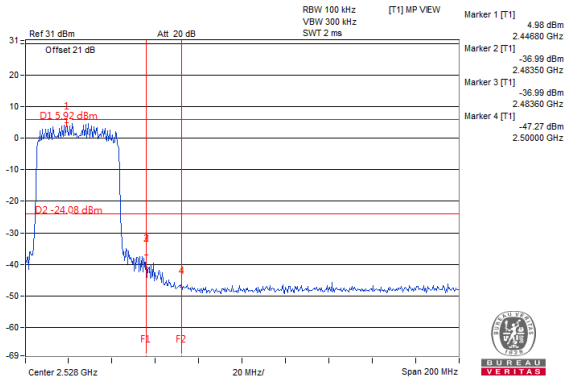

5 Pictures of Test Arrangements

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

Appendix – Information of the Testing Laboratories

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

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

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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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