Radio Test Report

Report No.: RJBDKG-WTW-P21070273

Test Model: VR0030

Received Date: July 08, 2021

Test Date: July 16, 2021

Issued Date: Sep. 03, 2021

Applicant: LOGITECH FAR EAST LTD.

Address: #2 Creation Rd. 4, Science-Based Ind. Park Hsinchu Taiwan, R.O.C.

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

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Release Control Record

Issue No.	Description	Date Issued
RJBDKG-WTW-P21070273	Original release.	Sep. 03, 2021

1 Certificate of Conformity

Product:	RoomMate
Brand:	logicool
Test Model:	VR0030
Sample Status:	Engineering sample
Applicant:	LOGITECH FAR EAST LTD.
Test Date:	July 16, 2021
Standards:	ARIB STD-T66 (V3.7), MIC notice 88 Appendix 43 Certification Ordinance Article 2-1-19

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 : Phoenix Huang , **Date:** Sep. 03, 2021

Phoenix Huang / Specialist

Approved by : , **Date:** Sep. 03, 2021

Clark Lin / Technical Manager

2 Summary of Test Results

The EUT has been tested according to the following specifications:

Notice 88 Appendix 43 Reference	ARIB STD-T66 Ref.	Report Reference	Parameter	Test Results (Note)
General Provisions				
C	3.2 (4)	4.1	Frequency tolerance	C
D	3.2 (7)	4.2	Occupied bandwidth	C
E	3.2 (6)	4.4	Spurious emissions	C
Transmitting Equipment				
F	--	4.5	Antenna power	C
--	--	--	SAR	NA
Transmitting Antenna				
--	--	3.5	Type, configuration, etc. of transmitting antenna	C
--	--	3.5	Direction pattern of transmitting antenna	C
Receiving Equipment				
G	3.3 (1)	4.6	Spurious emissions of receiver	C
--	--	3.5	Refer to all articles for transmitting antenna	C
Operating Frequency 2400 to 2483.5MHz				
--	3.7 (1)	3.4	High frequency / modulation section cannot be opened easily	C
--	3.1 (1)	3.1	Communication method	C
--	3.2 (1)a	3.1	Modulation method	C
--	3.2 (1)a	3.1	Spread spectrum method	C
--	3.2 (2)	4.5	Antenna power	C
--	3.6 (2)	4.5	Absolute gain of transmitting antenna	C
--	3.6 (2)	--	Angular width of principal radiation (AWPR)	NA
--	3.2 (10)	4.8	Number of carriers within 1 MHz bandwidth in OFDM	C
--	3.2 (8)	4.3	Spreading bandwidth	C
--	3.2 (9)	4.3	Spreading factor	C
--	3.2 (11)	--	Frequency retention time (FH employed)	NA
--	3.4.1 (1)	4.7	Interference Prevention Function	C
--	3.4.1 (3)	--	Carrier Sense Capability	NA

Note: 1. C = Conform NC = Not Conform NT = Not Tested NA = Not Applicable
2. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Test Instruments

Description & Manufacturer	Model no.	Serial No.	Calibrated Date	Calibrated Until	Calibration Authority	Calibration Method
Spectrum Analyzer R&S	FSV40	101516	Mar. 08, 2021	Mar. 07, 2022	ETC	(c)
ESG Vector signal generator Agilent	E4438C	MY45094468	Nov. 18, 2020	Nov. 17, 2021	ETC	(c)
Power Meter Anritsu	ML2495A	1529002	June 21, 2021	June 20, 2022	ETC	(c)
Power Sensor Anritsu	MA2411B	1339443	May 31, 2021	May 30, 2022	ETC	(c)
DC Power Supply Topward	6603D	795558	NA	NA	NA	NA
AC Power Source Extech Electronics	6905S	1991551	NA	NA	NA	NA
True RMS Clamp Meter FLUKE	325	31130711WS	June 02, 2021	June 01, 2022	ETC	(c)
Power Combiner Mini-circuits	ZFRSC-123-S+	F698501347_02	Dec. 23, 2020	Dec. 22, 2021	BV CPS E&E	(d)
Power Divide Warison	WDIV-4R4029	0001	Jan. 11, 2021	Jan. 10, 2022	BV CPS E&E	(d)

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. Calibration method :

a) : Calibration conducted by the National Institute of Information and Communications Technology (NICT) or a designated calibration agency under Article 102-18 paragraph (1).

b) : Calibration conducted pursuant to the provisions of Article 135 or Article 144 of the Measurement Law (Law No. 51 of 1992) Japan Calibration Service System.

c) : Calibration conducted in foreign countries, which shall be equivalent to the calibration conducted by the NICT or a designated calibration agency under Article 102-18 paragraph (1).

d) : Calibration conducted by using other equipment that listed above from a) to c).

3. The power supply no evaluation calibrated, which used the digital multimeter to verify.

4. Tested Date: July 16, 2021

2.2 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in TR 100 028-1.
This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Parameter	Uncertainty
Occupied Bandwidth	±960 Hz
Spurious emissions	±2.5 dB
Output power density	±1.2 dB
Out of band radiated power	±2.5 dB
Frequency Tolerance	±960 Hz

2.3 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	RoomMate
Brand	logicool
Test Model	VR0030
Status of EUT	Engineering sample
Nominal Voltage	19 Vdc from power adapter
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: up to 11 Mbps 802.11g: up to 54 Mbps 802.11n: up to 144.4 Mbps
Operating Frequency	2.412 ~ 2.472 GHz
Number of Channel	802.11b/g/n (HT20): 13
Rated RF Output Power Density	Refer to Note
Conducted RF Output Power Density	Refer to Note
Radiated RF Output Power Density	Refer to Note
Antenna Type	Refer to section 3.5
Antenna Connector	Refer to section 3.5
Accessory Device	Adapter x 1; Remote x 1
Data Cable Supplied	NA

Note:

1. The EUT has below radios as following table:

Radio 1	Radio 2
WLAN (2.4GHz + 5GHz)	Bluetooth

2. Simultaneously transmission condition.

Condition	Technology	
1	WLAN (2.4GHz)	WLAN (5GHz)
2	WLAN (2.4GHz)	Bluetooth
3	WLAN (5GHz)	Bluetooth

3. The EUT must be supplied with a power adapter and following below table:

Brand	Model No.	Spec.
logitech	DSA-90PFE-19 3 190474	Input: 100-240 Vac, 1.5 A, 50/60Hz AC power cord (shielded, 0.9 m) Output: 19 Vdc, 4.74 A DC output cable (shielded, 1.5 m, with one core)

4. The EUT incorporates a MIMO function.

MODULATION MODE	TX & RX CONFIGURATION	
802.11b	2TX	2RX
802.11g	2TX	2RX
802.11n (HT20)	2TX	2RX

5. The power table as below table:

Modulation Mode	Rated output power density (mW/MHz)	Conducted RF output power density (mW/MHz)	Radiated RF output power density (mW/MHz)
2.4GHz Band			
802.11b	5	4.19	10.262
802.11g	1.9	2.205	5.4
802.11n (HT20)	1	1.18	2.89

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

3.2 Description of Test Modes

Operated in 2400 ~ 2483.5MHz band:

13 channels are provided for 802.11b, 802.11g, 802.11n (HT20):

Channel	Freq. (MHz)	Channel	Freq. (MHz)
1	**2412**	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432	12	2467
6	2437	**13**	**2472**
7	**2442**		

Note:

1. The channels which were indicated in bold type of the above channel list were selected as representative test channel. Therefore only the data of the test channels were recorded in this report.

By means of test software (qdart.win.4.8_installer_00074.101-30-20_06_01_09) provided by manufacturer, the power levels during the tests were set according to the following codes:

802.11b		802.11g		802.11n (HT20)	
Channel	**Power Setting**	**Channel**	**Power Setting**	**Channel**	**Power Setting**
1	14	1	9	1	7
7	14	7	14.5	7	12
13	14	13	7	13	5

3.3 Test Conditions

Test Conditions		Voltage (Vdc)
V_{normal}		19
$V_{max.}$	+10%	20.9
$V_{min.}$	-10%	17.1

Test modes are presented in the report as below:

Test Item	Test Conditions	Environmental Conditions
Frequency Tolerance	**Chain 0**	25 deg.C, 60 % RH
Occupied Bandwidth / Spreading Bandwidth	**Chain 0** **Chain 1**	25 deg.C, 60 % RH
Spurious Emissions for Transmitter	**Chain 0** **Chain 1** **W**	25 deg.C, 60 % RH
Antenna Power	**Chain 0** **Chain 1** **S**	25 deg.C, 60 % RH
Spurious Emissions for Receiver	**Chain 0** **Chain 1** **S**	25 deg.C, 60 % RH
S : Sum of each Chain, C : Use combiner, W : [Worst result] x [Number of antenna ports]		

3.4 Assembly

The EUT is constructed as a RoomMate. The RF circuit was covered by metal shielding case, and the metal shielding case won't be easy to be opened.

3.5 Antenna Specifications

3.5.1 Antenna Gain

Antenna No.	RF Chain No.	Brand	Model	Antenna Net Gain(dBi)	Frequency Range (GHz)	Antenna Type	Connector Type
1	Chain 0	Speed	F-0R-CC-6029-001-00	3.89 3.69 1.96 3.3 2.84	2.4~2.4835 5.15~5.25 5.25~5.35 5.47~5.725 5.725~5.850	Monopole	MHF(I-PEX)
2	Chain 1	Speed	F-0R-CC-6029-002-00	2.1 4.5 3.95 4.59 4.92	2.4~2.4835 5.15~5.25 5.25~5.35 5.47~5.725 5.725~5.850	Monopole	MHF(I-PEX)

Note:
1. Max. gain was selected for the final test.
2. The Bluetooth technology will fix transmission on Chain (0)

* The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

3.5.2 Antenna Pattern

Please refer to the attached file (Antenna pattern).

4 Test Results

4.1 Frequency Tolerance Measurement

4.1.1 Limits of Frequency Tolerance Measurement

Tolerance of frequency shall be +/- 50ppm

4.1.2 Test Setup

4.1.3 Test Results

802.11b / 802.11g / 802.11n (HT20)

Chain 0

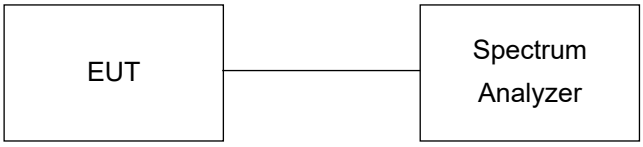
Channel	Frequency (MHz)	V_{normal}		$V_{max.}$		$V_{min.}$	
		Carrier frequency (MHz)	Frequency tolerance (ppm)	Carrier frequency (MHz)	Frequency tolerance (ppm)	Carrier frequency (MHz)	Frequency tolerance (ppm)
1	2412	2412.021839	9.054	2412.021410	8.876	2412.021223	8.798
7	2442	2442.021367	8.749	2442.021599	8.844	2442.021513	8.809
13	2472	2472.022076	8.930	2472.021530	8.709	2472.021792	8.815

4.2 Occupied Bandwidth Measurement (99% power bandwidth)

4.2.1 Limits of Occupied Bandwidth Measurement

Item	Limit	Remark
Occupied bandwidth	<26MHz	For 802.11b, g, 802.11n (HT20)

4.2.2 Test Setup



4.2.3 Test Results

802.11b

Chain 0

Channel	Frequency (MHz)	V_{normal}	$V_{max.}$	$V_{min.}$
		Occupied bandwidth (MHz)	Occupied bandwidth (MHz)	Occupied bandwidth (MHz)
1	2412	13.70	13.70	13.70
7	2442	14.10	14.10	14.10
13	2472	14.00	14.00	14.00

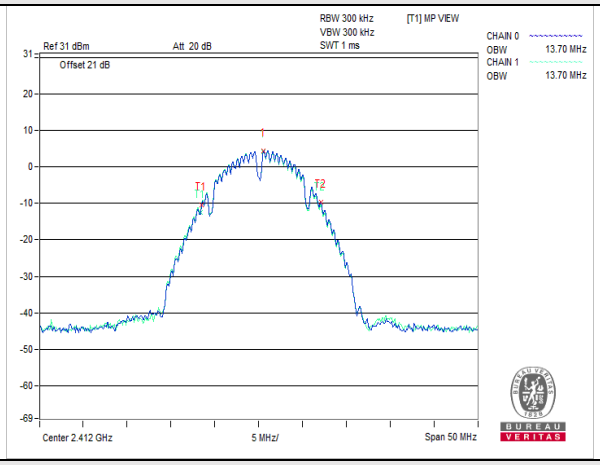
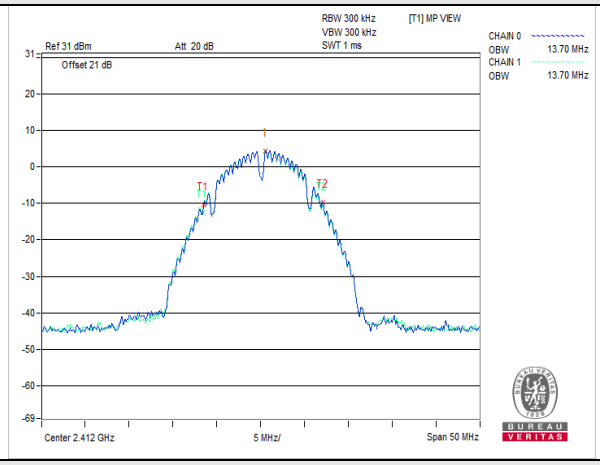
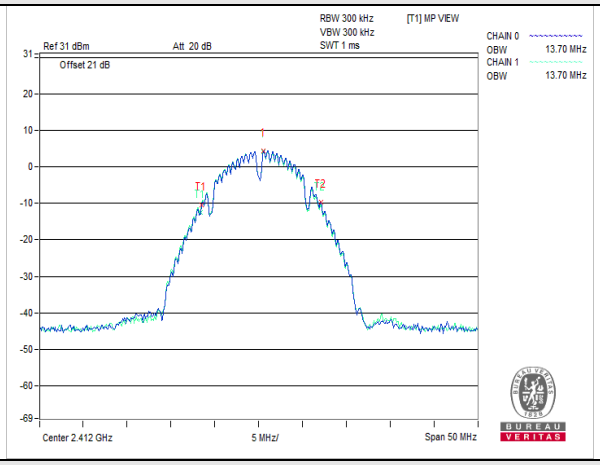
NOTE: For the test plots please refer to the below pages.

Chain 1

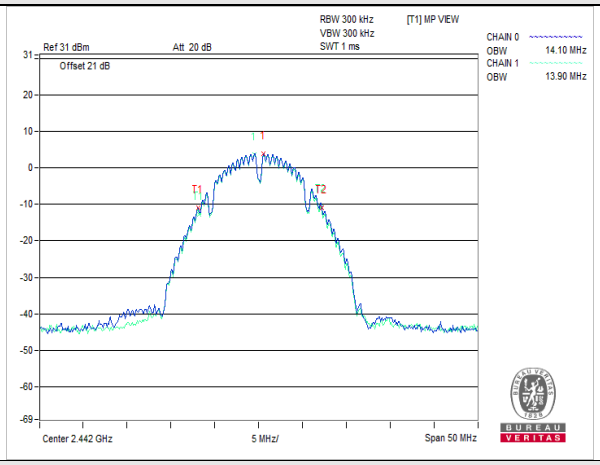
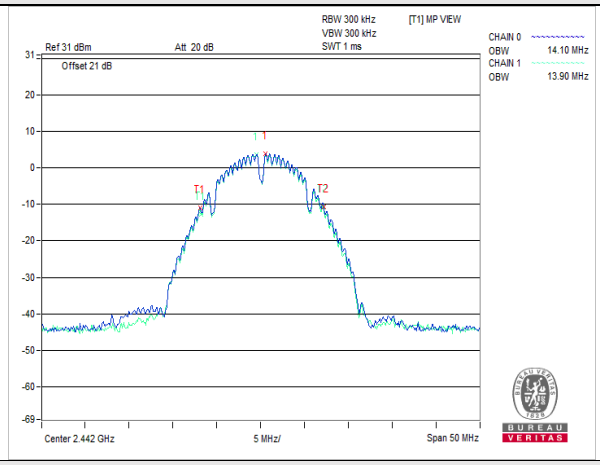
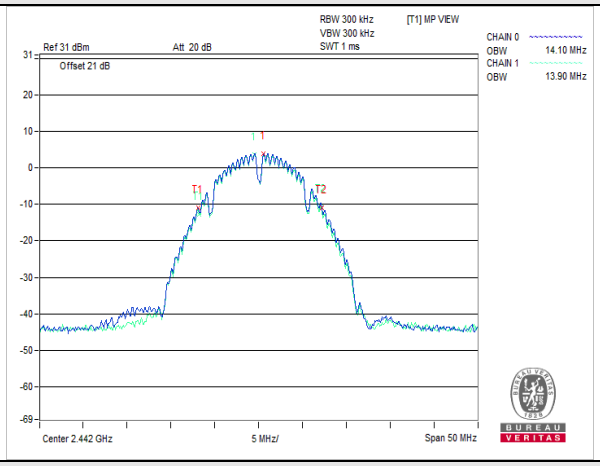
Channel	Frequency (MHz)	V_{normal}	$V_{max.}$	$V_{min.}$
		Occupied bandwidth (MHz)	Occupied bandwidth (MHz)	Occupied bandwidth (MHz)
1	2412	13.70	13.70	13.70
7	2442	13.90	13.90	13.90
13	2472	14.00	14.00	14.00

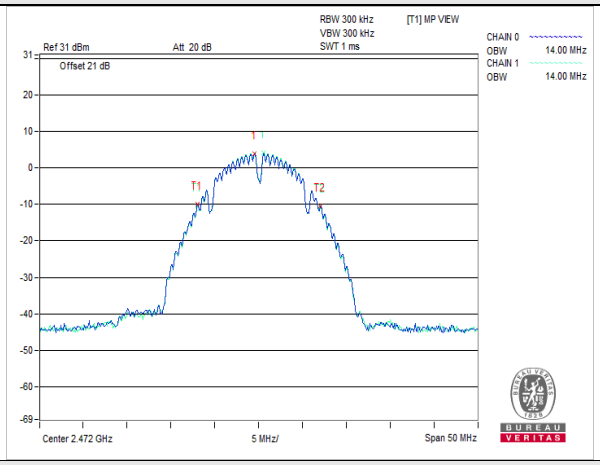
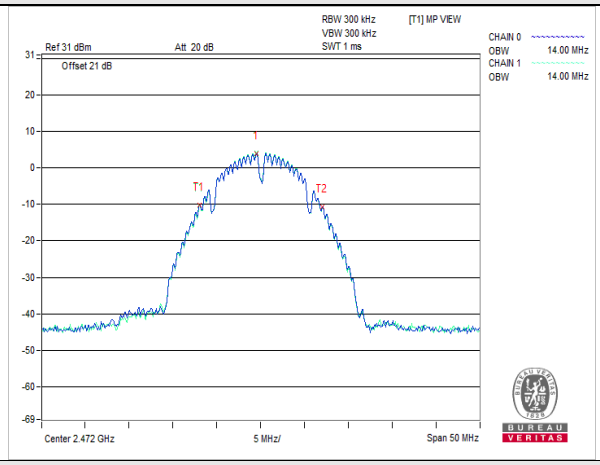
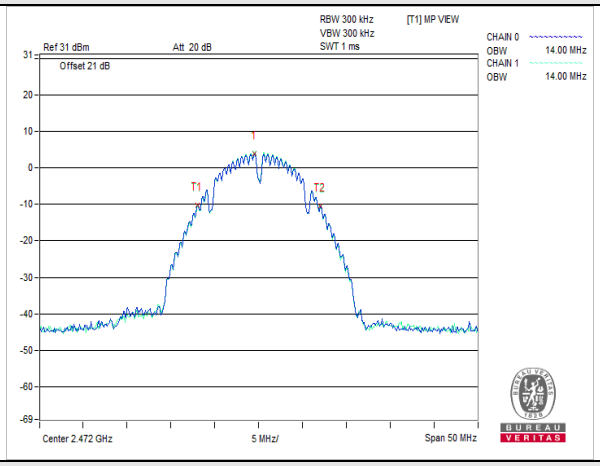
NOTE: For the test plots please refer to the below pages.

Graph

V_{normal}	$V_{max.}$
	
$V_{min.}$	
	

CH 1 (2412MHz)

V_{normal}	$V_{max.}$
	
$V_{min.}$	
	
CH 7 (2442MHz)	

V_{normal}	$V_{max.}$
	
$V_{min.}$	
	
CH 13 (2472MHz)	

802.11g

Chain 0

Channel	Frequency (MHz)	V_{normal}	$V_{max.}$	$V_{min.}$
		Occupied bandwidth (MHz)	Occupied bandwidth (MHz)	Occupied bandwidth (MHz)
1	2412	16.70	16.70	16.60
7	2442	16.90	16.90	16.90
13	2472	16.80	16.90	16.90

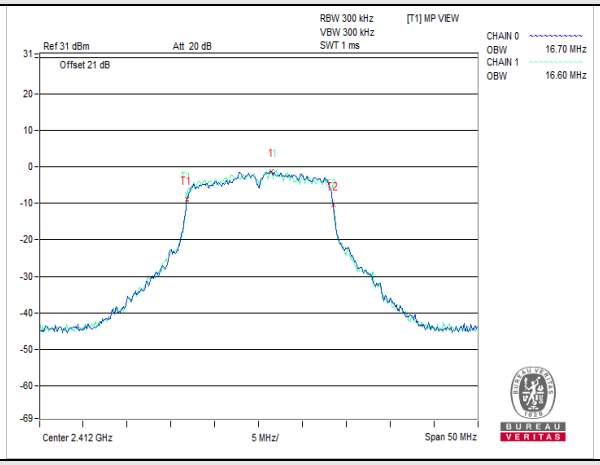
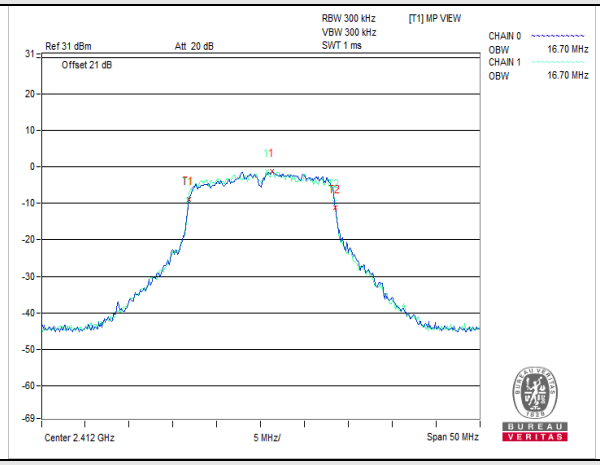
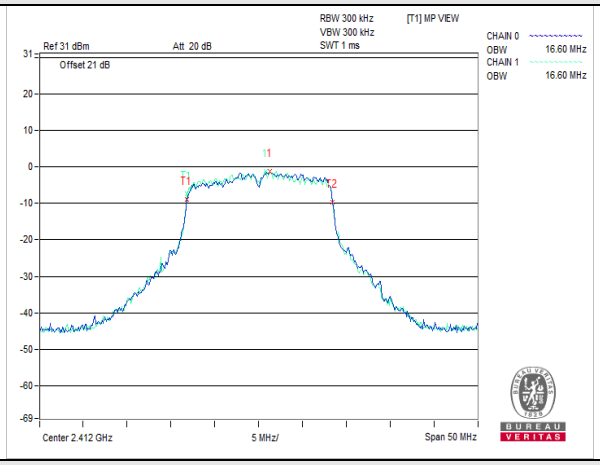
NOTE: For the test plots please refer to the below pages.

Chain 1

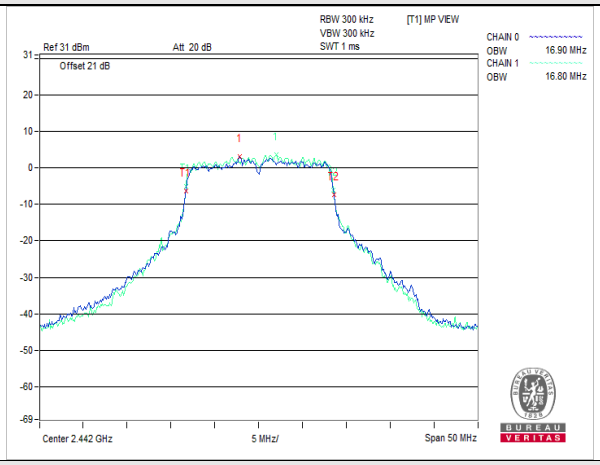
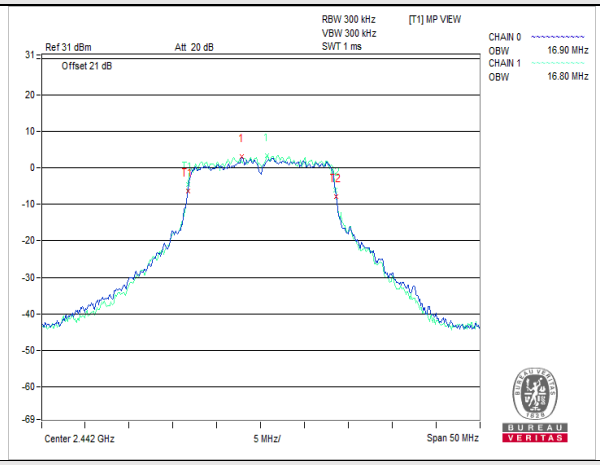
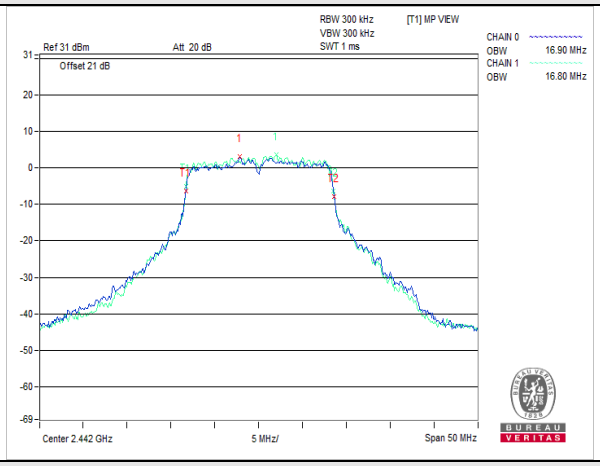
Channel	Frequency (MHz)	V_{normal}	$V_{max.}$	$V_{min.}$
		Occupied bandwidth (MHz)	Occupied bandwidth (MHz)	Occupied bandwidth (MHz)
1	2412	16.60	16.70	16.60
7	2442	16.80	16.80	16.80
13	2472	16.70	16.70	16.80

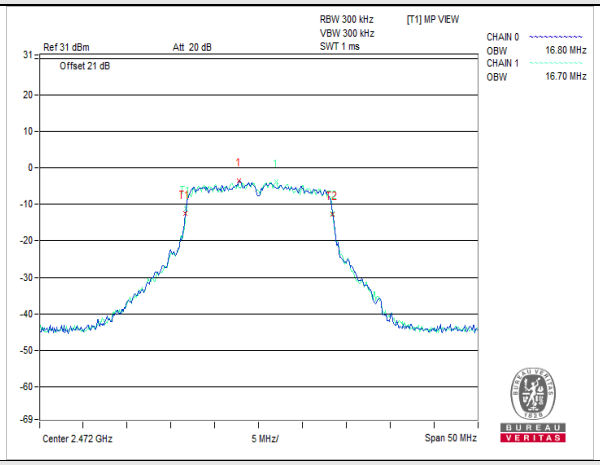
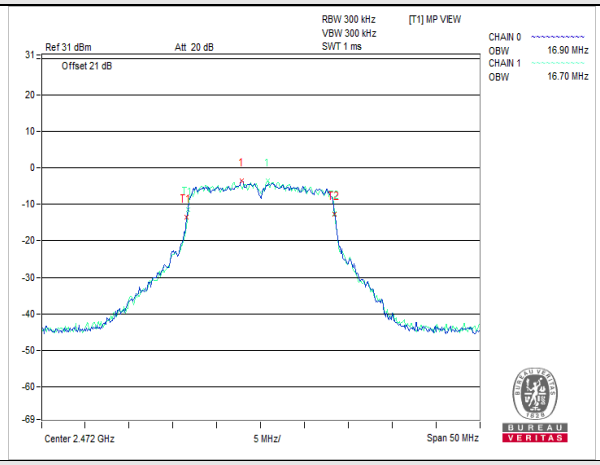
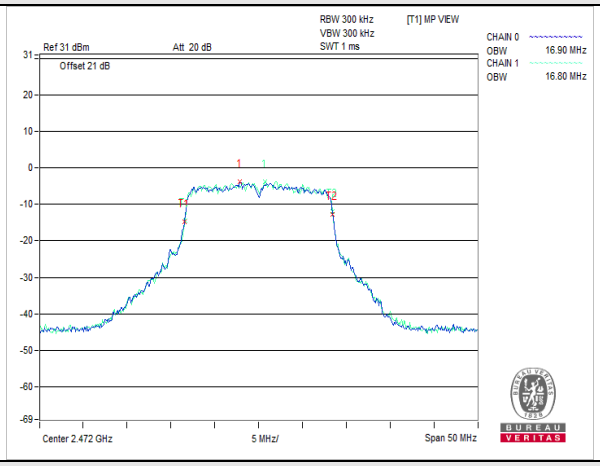
NOTE: For the test plots please refer to the below pages.

Graph

V_{normal}	$V_{max.}$
	
$V_{min.}$	
	

CH 1 (2412MHz)

V_{normal}	$V_{max.}$
	
$V_{min.}$	
	
CH 7 (2442MHz)	

V_{normal}	$V_{max.}$
	
$V_{min.}$	
	

CH 13 (2472MHz)

802.11n (HT20)

Chain 0

Channel	Frequency (MHz)	V_{normal}	$V_{max.}$	$V_{min.}$
		Occupied bandwidth (MHz)	Occupied bandwidth (MHz)	Occupied bandwidth (MHz)
1	2412	17.90	17.90	17.90
7	2442	18.10	18.10	18.10
13	2472	18.00	18.00	18.00

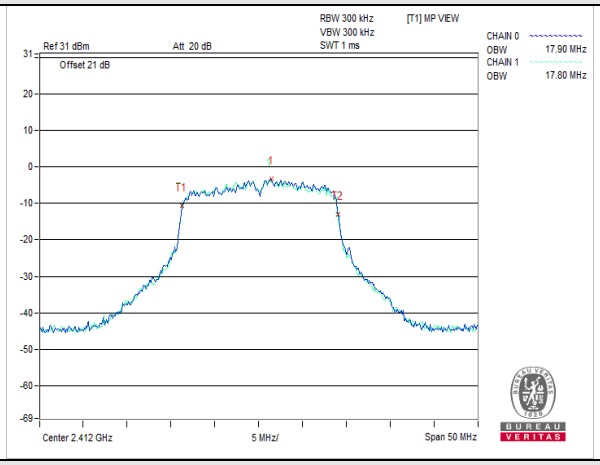
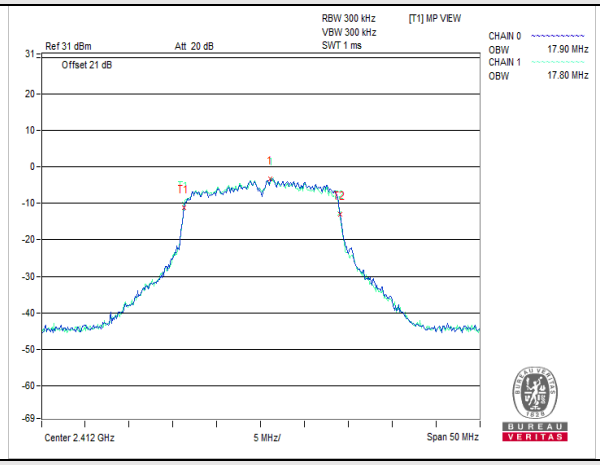
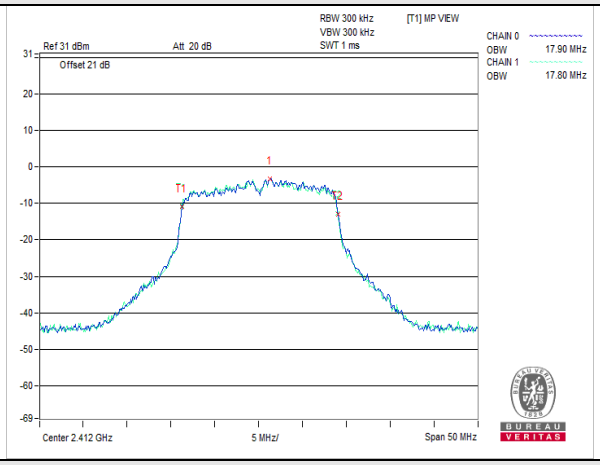
NOTE: For the test plots please refer to the below pages.

Chain 1

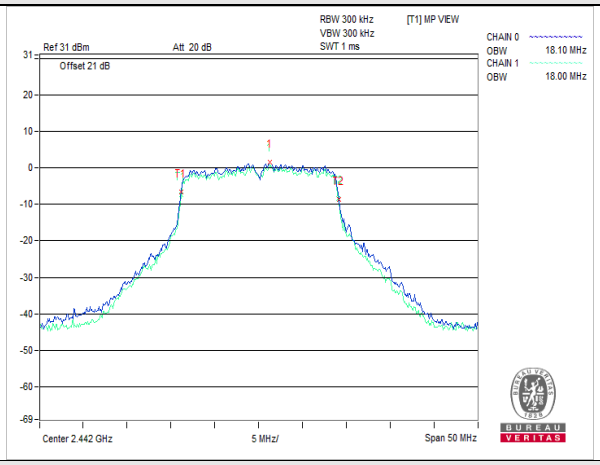
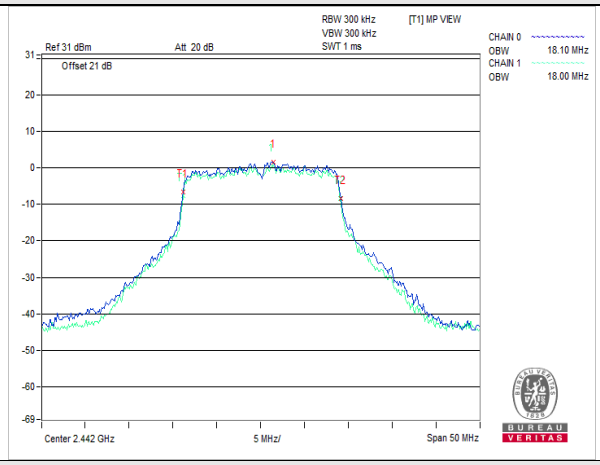
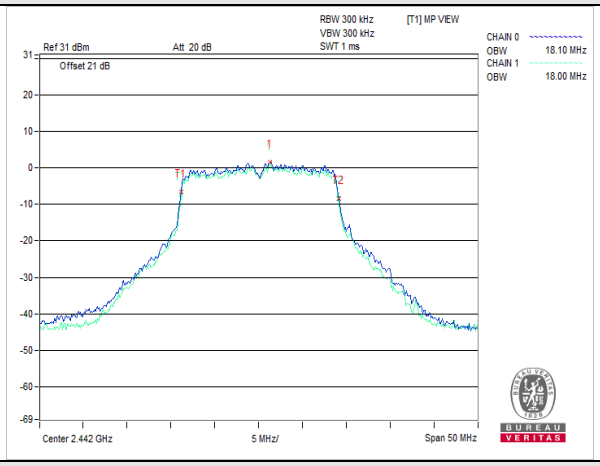
Channel	Frequency (MHz)	V_{normal}	$V_{max.}$	$V_{min.}$
		Occupied bandwidth (MHz)	Occupied bandwidth (MHz)	Occupied bandwidth (MHz)
1	2412	17.80	17.80	17.80
7	2442	18.00	18.00	18.00
13	2472	18.00	17.90	18.00

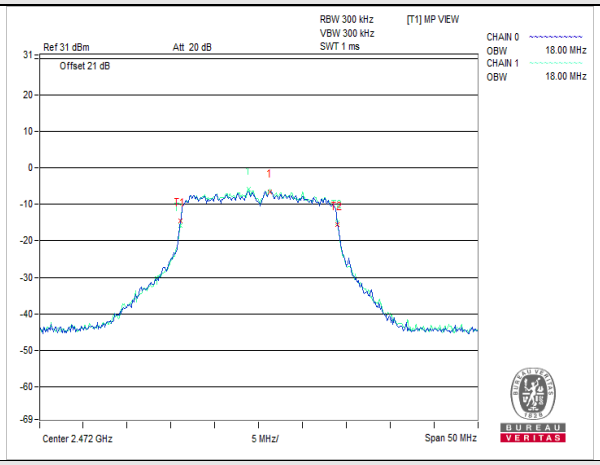
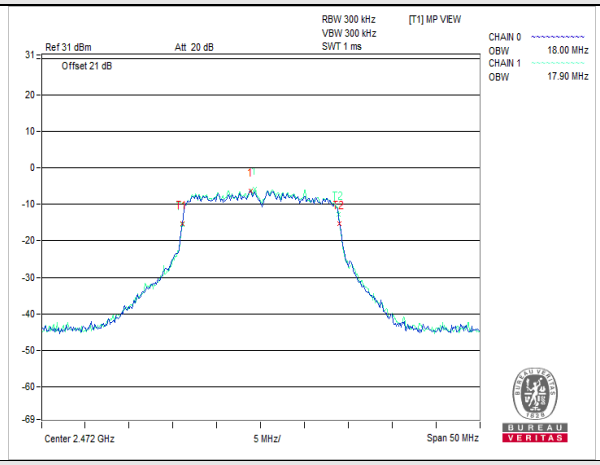
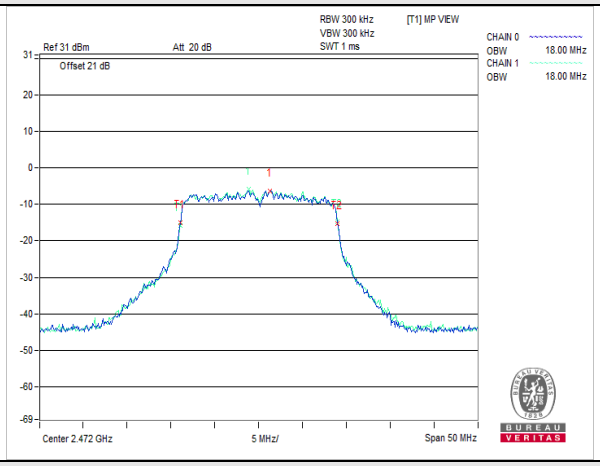
NOTE: For the test plots please refer to the below pages.

Graph

V_{normal}	$V_{max.}$
	
$V_{min.}$	
	

CH 1 (2412MHz)

V_{normal}	$V_{max.}$
	
$V_{min.}$	
	
CH 7 (2442MHz)	

V_{normal}	$V_{max.}$
	
$V_{min.}$	
	
CH 13 (2472MHz)	

4.3 Spreading Bandwidth Measurement (90% power bandwidth)

4.3.1 Limits of Spreading Bandwidth and Spreading Factor Measurement

Item	Limit	Remark
Spreading Bandwidth	≧500kHz	(For DSSS, FHSS)
Spreading Factor	≧5	Operating frequency 2400 to 2483.5MHz

4.3.2 Test Setup

4.3.3 Test Results

802.11b_Data Rate: 1Mbps

Chain 0

Channel	Frequency (MHz)	V_{normal}		$V_{max.}$		$V_{min.}$	
		Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
1	2412	8.70	8.70	8.70	8.70	8.70	8.70
7	2442	8.90	8.90	8.90	8.90	8.90	8.90
13	2472	9.00	9.00	9.00	9.00	9.00	9.00

NOTE: For the test plots please refer to the below pages.

Spreading Factor: 90% channel power bandwidth / 1

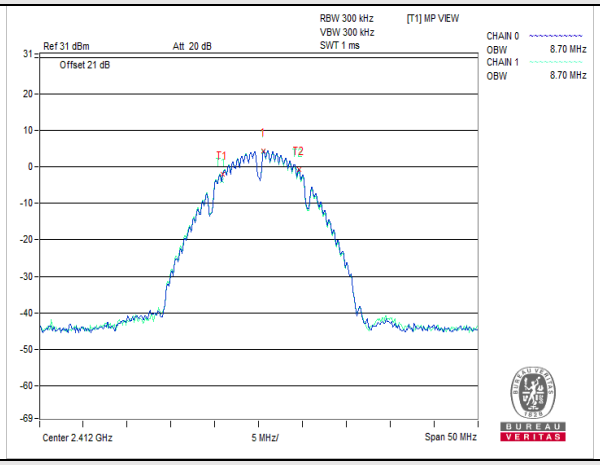
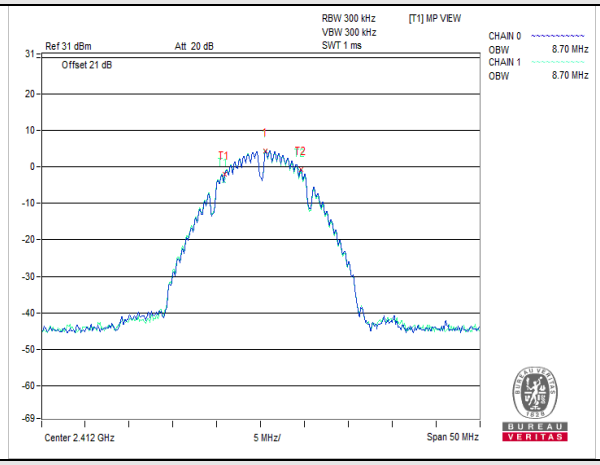
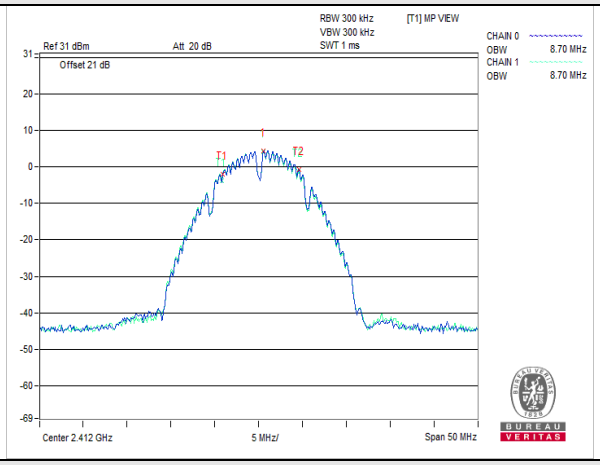
Chain 1

Channel	Frequency (MHz)	V_{normal}		$V_{max.}$		$V_{min.}$	
		Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
1	2412	8.70	8.70	8.70	8.70	8.70	8.70
7	2442	8.80	8.80	8.80	8.80	8.80	8.80
13	2472	8.80	8.80	8.80	8.80	8.80	8.80

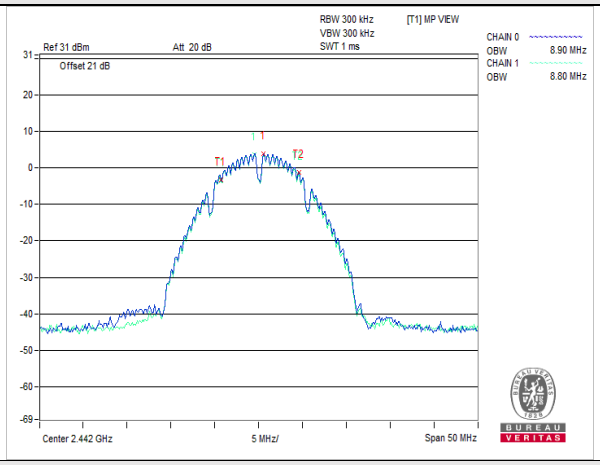
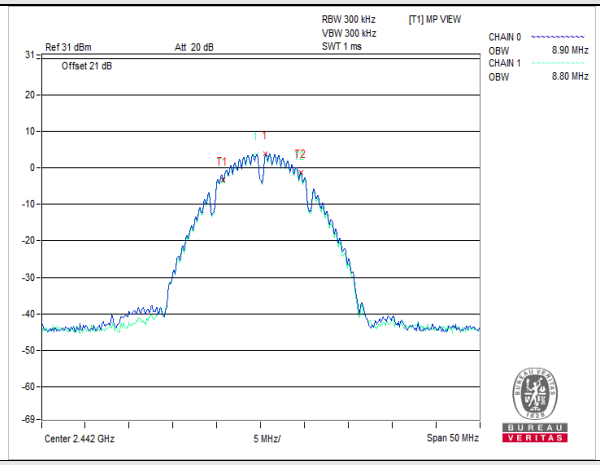
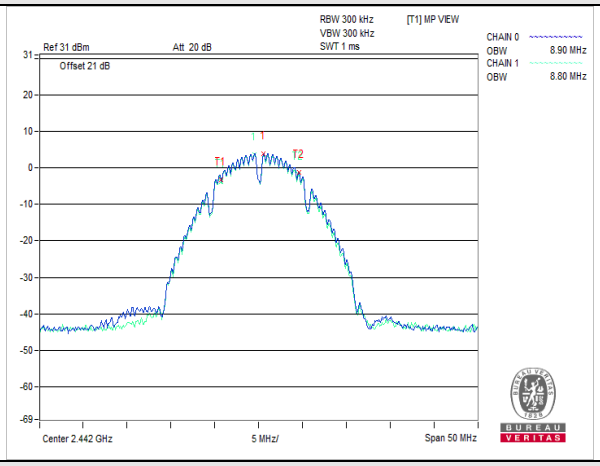
NOTE: For the test plots please refer to the below pages.

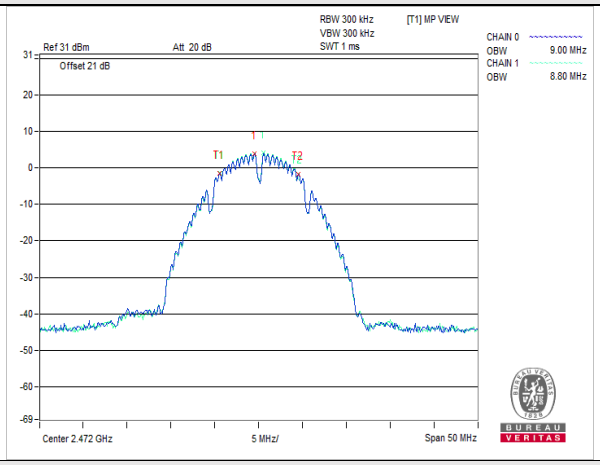
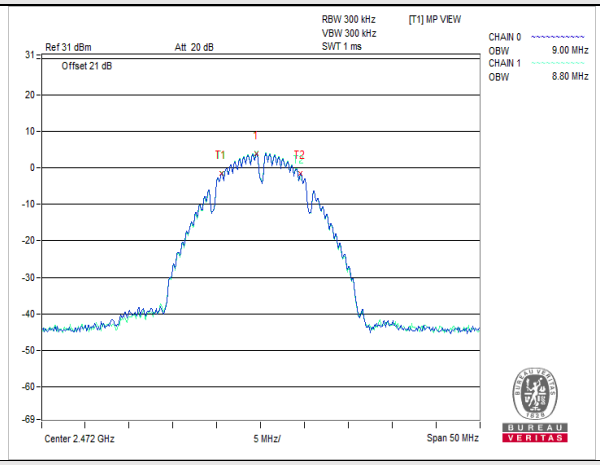
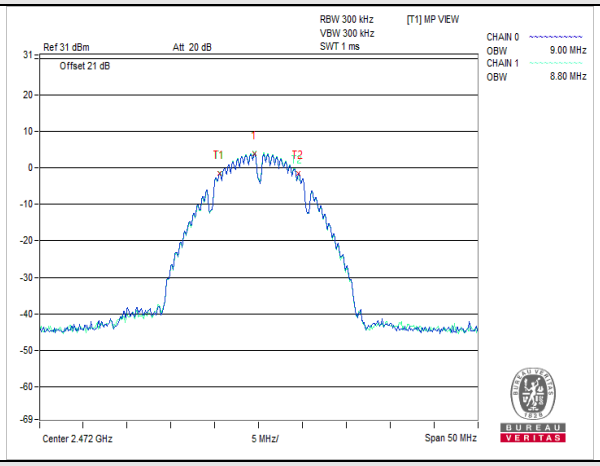
Spreading Factor: 90% channel power bandwidth / 1

Graph

V_{normal}	$V_{max.}$
	
$V_{min.}$	
	

CH 1 (2412MHz)

V_{normal}	$V_{max.}$
	
$V_{min.}$	
	
CH 7 (2442MHz)	

V_{normal}	$V_{max.}$
	
$V_{min.}$	
	
CH 13 (2472MHz)	

802.11b_Data Rate: 2Mbps

Chain 0

Channel	Frequency (MHz)	V_{normal}		$V_{max.}$		$V_{min.}$	
		Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
1	2412	8.70	8.70	8.70	8.70	8.70	8.70
7	2442	8.90	8.90	8.90	8.90	8.90	8.90
13	2472	9.00	9.00	9.00	9.00	9.00	9.00

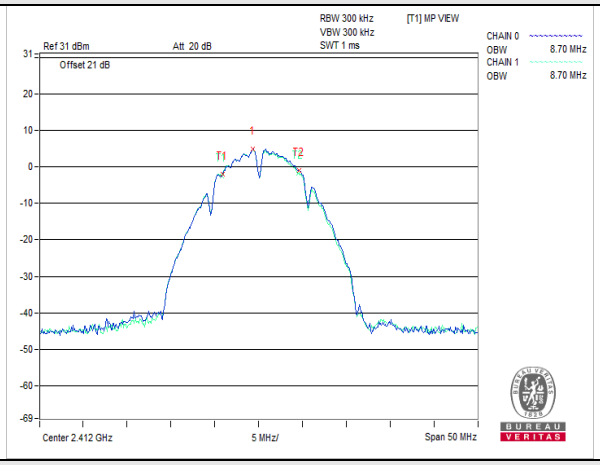
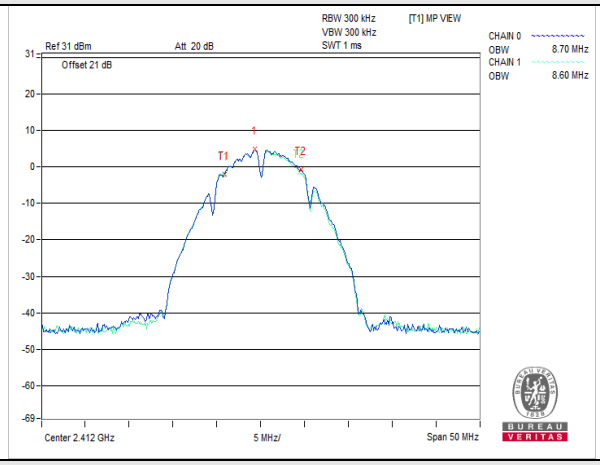
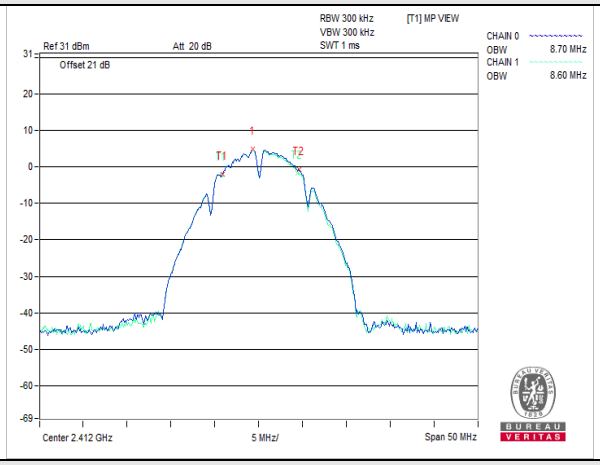
NOTE: For the test plots please refer to the below pages.
Spreading Factor: 90% channel power bandwidth / 1

Chain 1

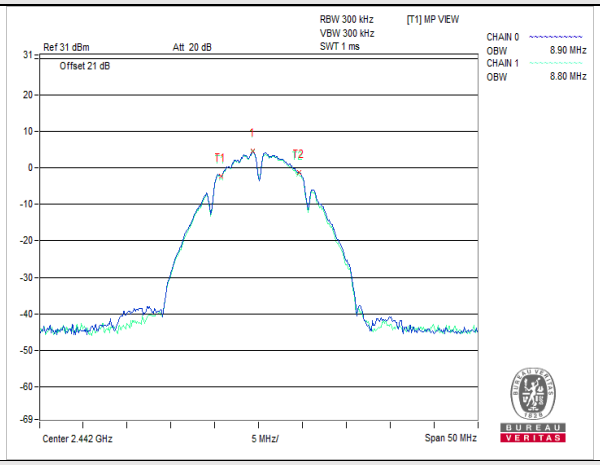
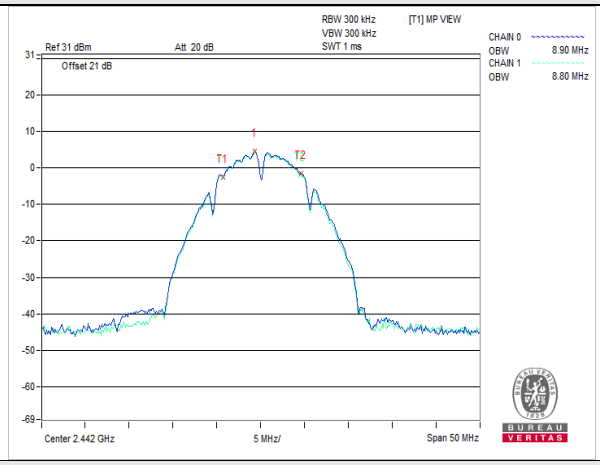
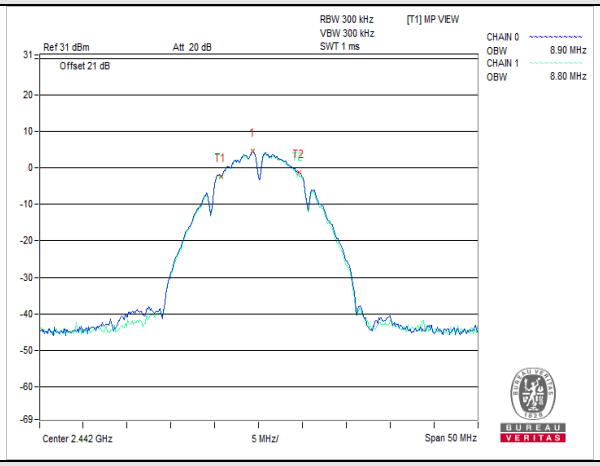
Channel	Frequency (MHz)	V_{normal}		$V_{max.}$		$V_{min.}$	
		Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
1	2412	8.70	8.70	8.60	8.60	8.60	8.60
7	2442	8.80	8.80	8.80	8.80	8.80	8.80
13	2472	8.80	8.80	8.80	8.80	8.80	8.80

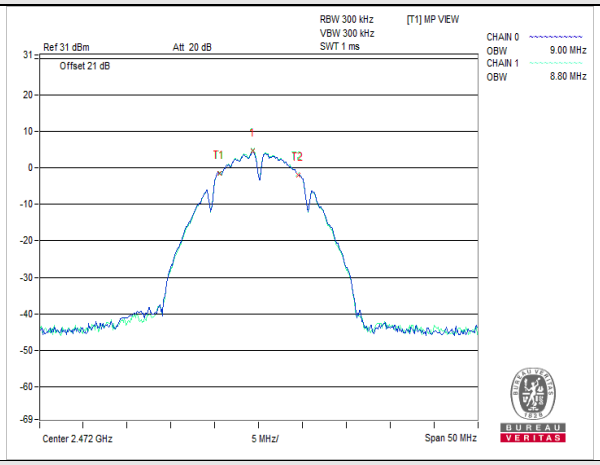
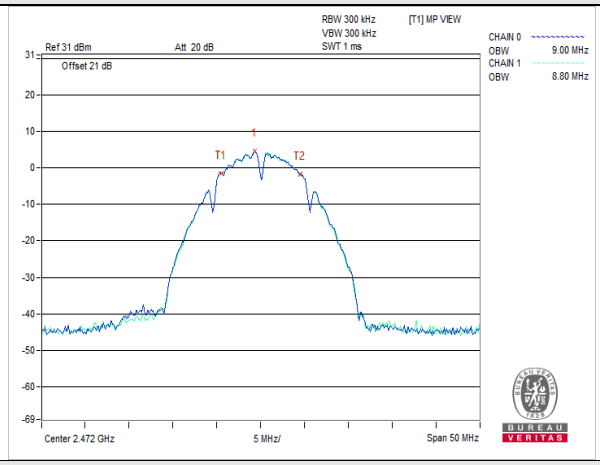
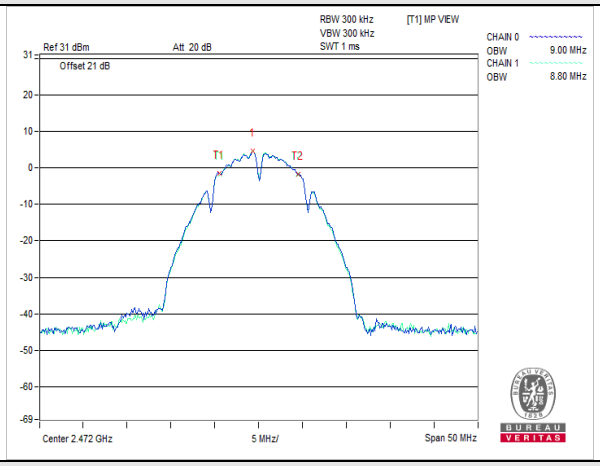
NOTE: For the test plots please refer to the below pages.
Spreading Factor: 90% channel power bandwidth / 1

Graph

V_{normal}	$V_{max.}$
	
$V_{min.}$	
	

CH 1 (2412MHz)

V_{normal}	$V_{max.}$
	
$V_{min.}$	
	
CH 7 (2442MHz)	

V_{normal}	$V_{max.}$
	
$V_{min.}$	
	
CH 13 (2472MHz)	

802.11b_Data Rate: 5.5Mbps

Chain 0

Channel	Frequency (MHz)	V_{normal}		$V_{max.}$		$V_{min.}$	
		Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
1	2412	8.80	6.40	8.80	6.40	8.80	6.40
7	2442	9.00	6.54	9.00	6.54	9.00	6.54
13	2472	9.00	6.54	9.00	6.54	9.00	6.54

NOTE: For the test plots please refer to the below pages.

Spreading Factor: 90% channel power bandwidth / 1.375

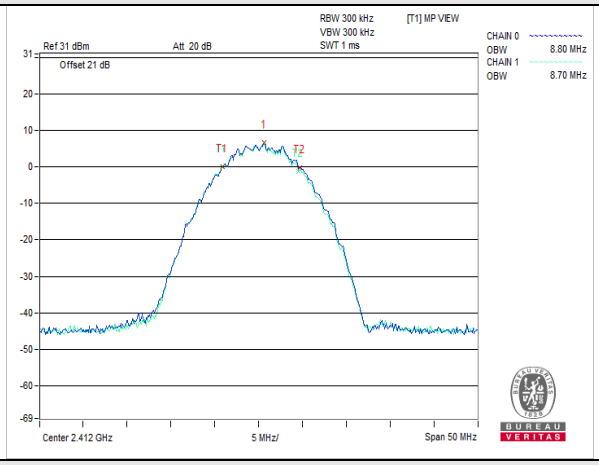
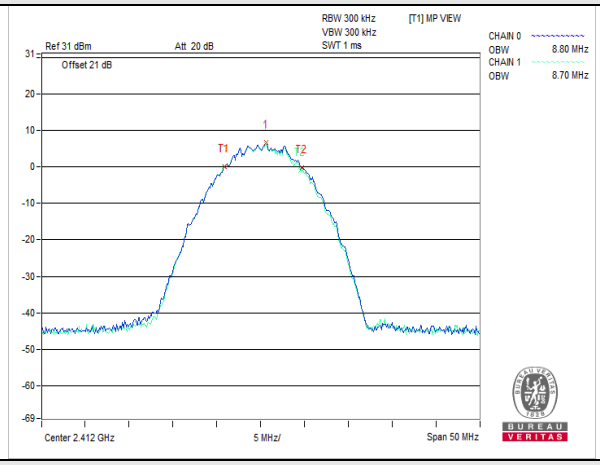
Chain 1

Channel	Frequency (MHz)	V_{normal}		$V_{max.}$		$V_{min.}$	
		Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
1	2412	8.70	6.32	8.70	6.32	8.70	6.32
7	2442	8.90	6.47	8.90	6.47	8.90	6.47
13	2472	8.90	6.47	8.90	6.47	8.90	6.47

NOTE: For the test plots please refer to the below pages.

Spreading Factor: 90% channel power bandwidth / 1.375

Graph

V_{normal}	$V_{max.}$
	
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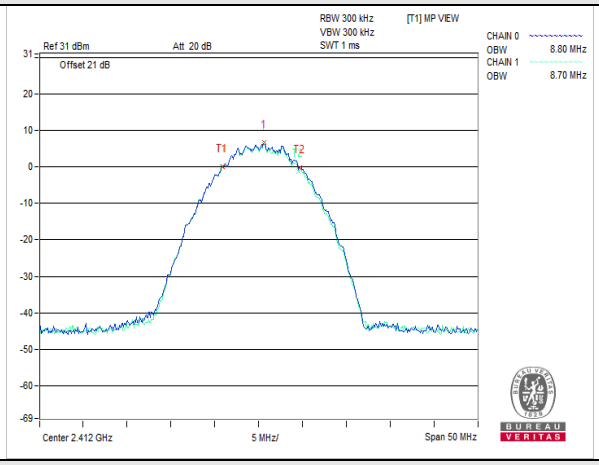
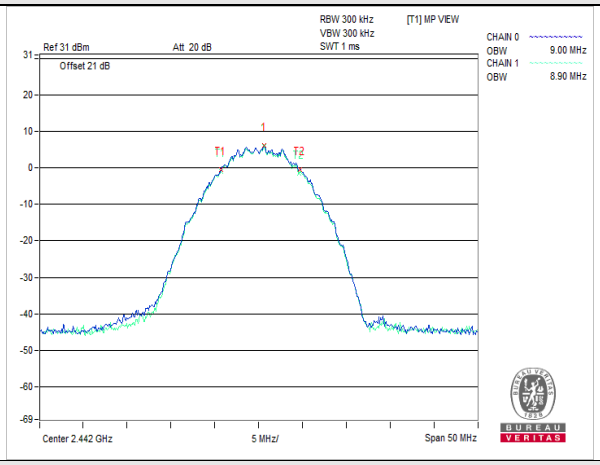
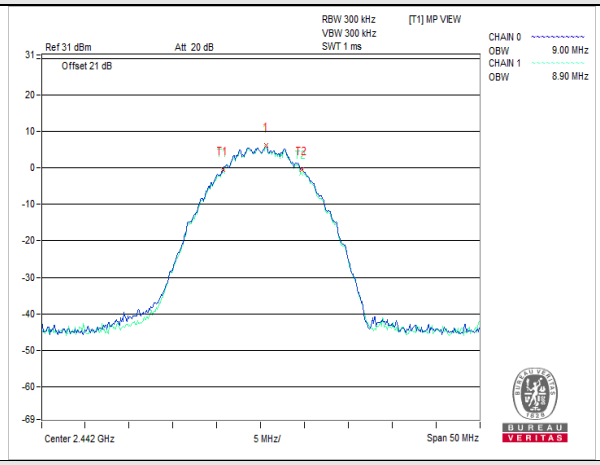
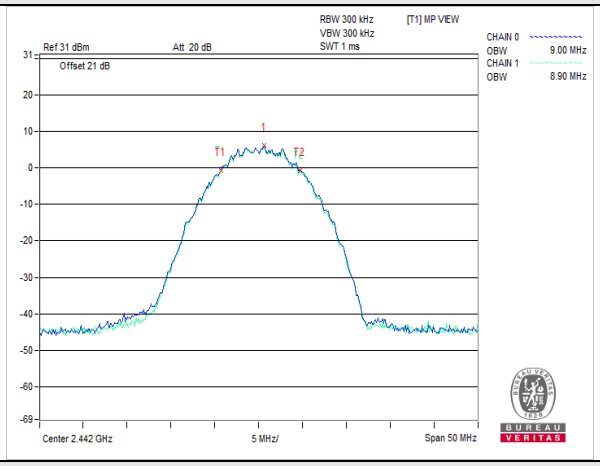
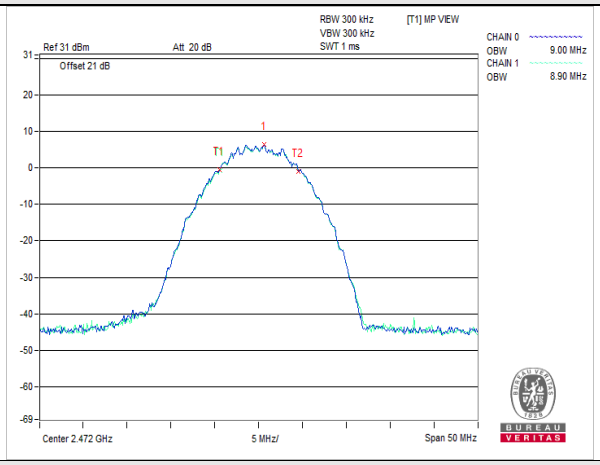
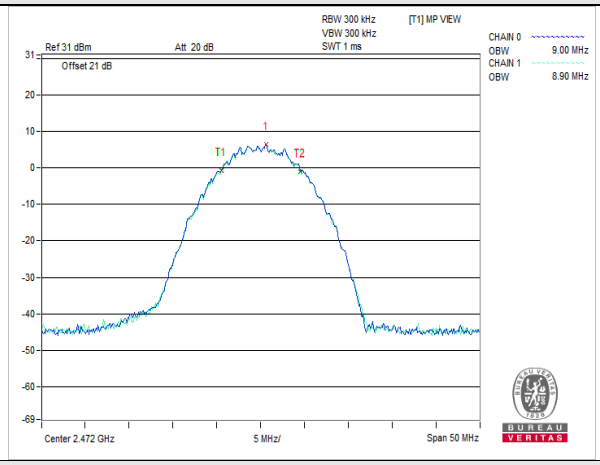
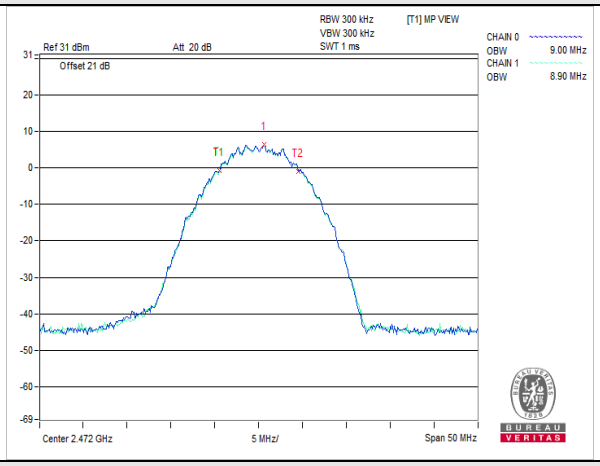
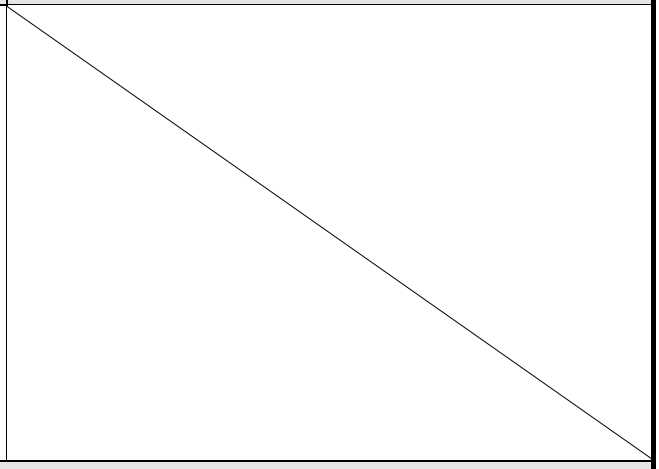
	

CH 1 (2412MHz)

V_{normal}	$V_{max.}$
	
$V_{min.}$	
	
CH 7 (2442MHz)	

V_{normal}	$V_{max.}$
	
$V_{min.}$	
	
CH 13 (2472MHz)	

802.11b_Data Rate: 11Mbps

Chain 0

Channel	Frequency (MHz)	V_{normal}		$V_{max.}$		$V_{min.}$	
		Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
1	2412	8.80	6.40	8.80	6.40	8.80	6.40
7	2442	9.10	6.61	9.10	6.61	9.10	6.61
13	2472	9.10	6.61	9.10	6.61	9.10	6.61

NOTE: For the test plots please refer to the below pages.

Spreading Factor: 90% channel power bandwidth / 1.375

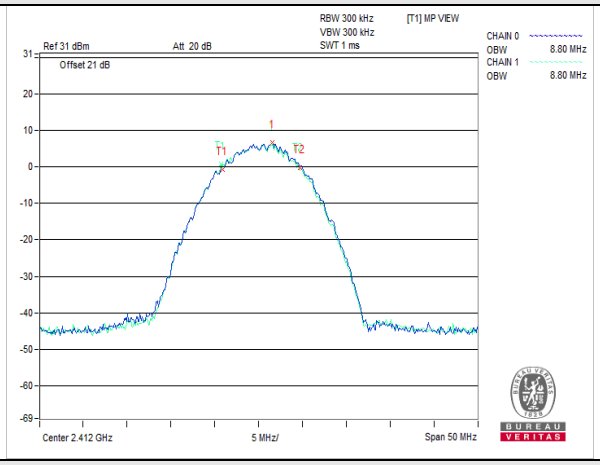
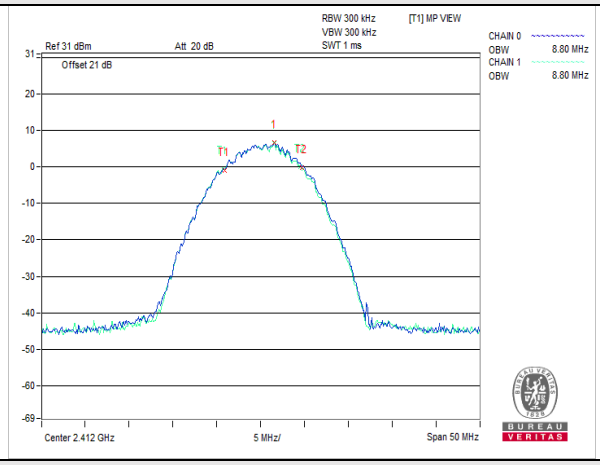
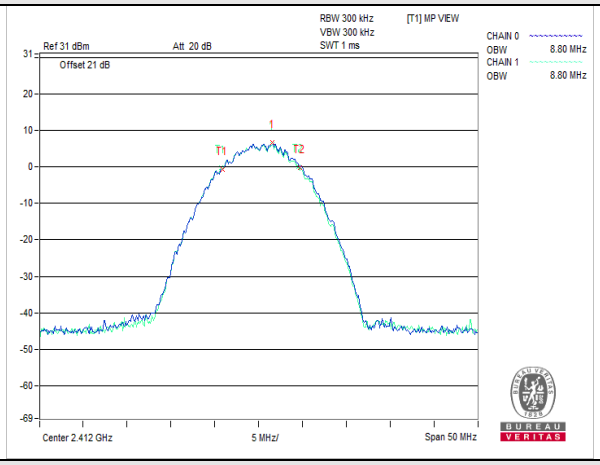
Chain 1

Channel	Frequency (MHz)	V_{normal}		$V_{max.}$		$V_{min.}$	
		Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor	Occupied bandwidth (MHz)	Spreading factor
1	2412	8.80	6.40	8.80	6.40	8.80	6.40
7	2442	9.00	6.54	9.00	6.54	9.00	6.54
13	2472	9.10	6.61	9.10	6.61	9.10	6.61

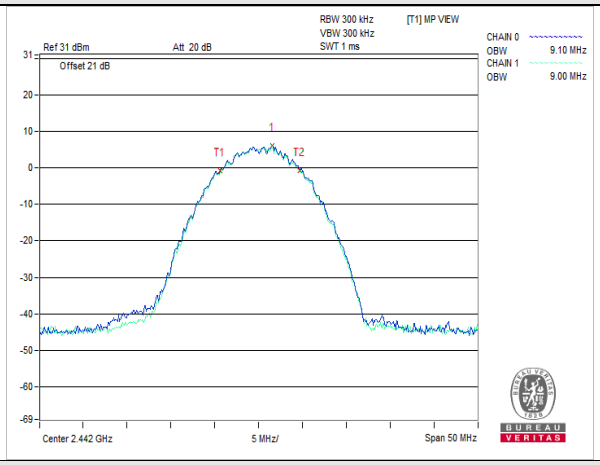
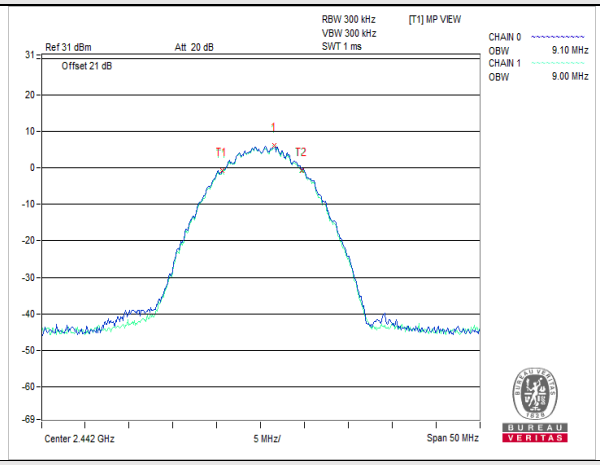
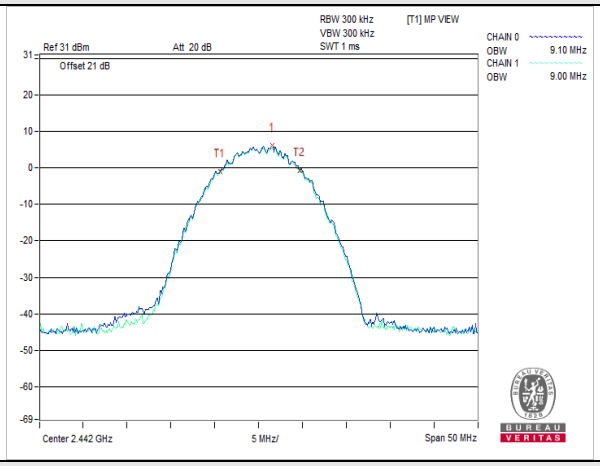
NOTE: For the test plots please refer to the below pages.

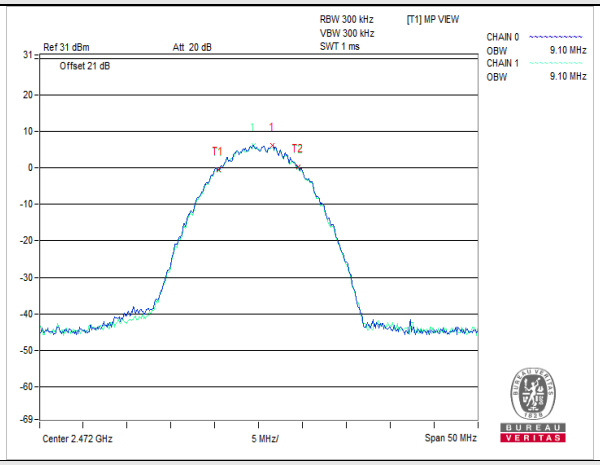
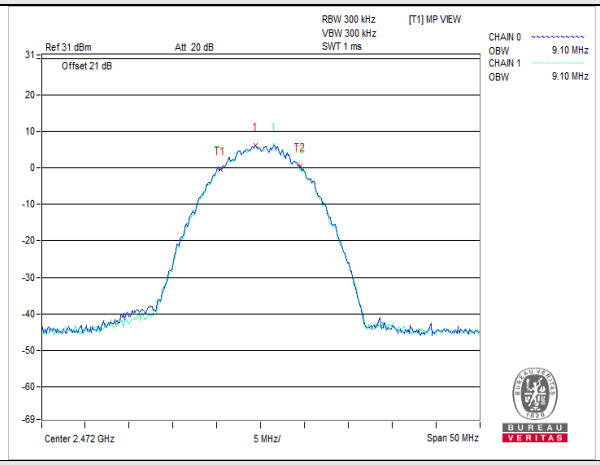
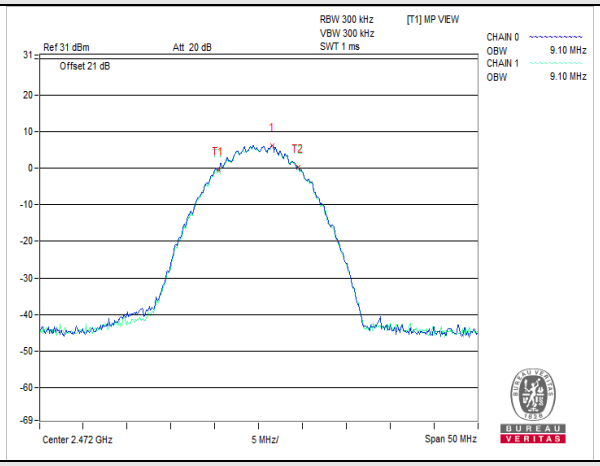
Spreading Factor: 90% channel power bandwidth / 1.375

Graph

V_{normal}	$V_{max.}$
	
$V_{min.}$	
	

CH 1 (2412MHz)

V_{normal}	$V_{max.}$
	
$V_{min.}$	
	
CH 7 (2442MHz)	

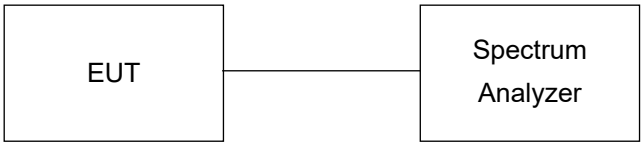
V_{normal}	$V_{max.}$
	
$V_{min.}$	
	
CH 13 (2472MHz)	

4.4 Spurious Emissions for Transmitter Measurement

4.4.1 Limits of Spurious Emissions

Frequencies (MHz)	Limit
Operating frequency 2400 to 2483.5MHz	
30.0MHz to 1000.0MHz	≦ 0.25 uW/100kHz
1000.0MHz to 2387MHz	≦ 2.5 uW/MHz
2387.0MHz to 2400.0MHz	≦ 25 uW/MHz
2483.5MHz to 2496.5MHz	≦ 25 uW/MHz
2496.5MHz to 12500.0MHz	≦ 2.5 uW/MHz

4.4.2 Test Setup



4.4.3 Test Results

802.11b

Chain 0

TEST CHANNEL		CH 1 (2412MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(uW)	LIMIT (uW)	RESULT
V_{normal}	30.0 to 1000.0	988.966	0.001746	0.125	PASS
	1000.0 to 2387.0	2043.890	0.169044	1.25	PASS
	2387.0 to 2400.0	2397.866	0.350752	12.5	PASS
	2483.5 to 2496.5	2492.668	0.208930	12.5	PASS
	2496.5 to 12500.0	6833.017	0.042954	1.25	PASS
$V_{max.}$	30.0 to 1000.0	911.608	0.001774	0.125	PASS
	1000.0 to 2387.0	2327.705	0.155597	1.25	PASS
	2387.0 to 2400.0	2399.839	0.368129	12.5	PASS
	2483.5 to 2496.5	2492.730	0.235505	12.5	PASS
	2496.5 to 12500.0	5863.928	0.047206	1.25	PASS
$V_{min.}$	30.0 to 1000.0	926.886	0.001832	0.125	PASS
	1000.0 to 2387.0	1635.419	0.179887	1.25	PASS
	2387.0 to 2400.0	2399.834	0.356451	12.5	PASS
	2483.5 to 2496.5	2487.375	0.254097	12.5	PASS
	2496.5 to 12500.0	6721.728	0.044566	1.25	PASS
TEST CHANNEL		CH 7 (2442MHz)			
V_{normal}	30.0 to 1000.0	862.987	0.001750	0.125	PASS
	1000.0 to 2387.0	1395.815	0.167494	1.25	PASS
	2387.0 to 2400.0	2398.350	0.183231	12.5	PASS
	2483.5 to 2496.5	2487.700	0.247172	12.5	PASS
	2496.5 to 12500.0	5948.957	0.051523	1.25	PASS
$V_{max.}$	30.0 to 1000.0	950.287	0.001968	0.125	PASS
	1000.0 to 2387.0	2304.126	0.161436	1.25	PASS
	2387.0 to 2400.0	2395.924	0.225424	12.5	PASS
	2483.5 to 2496.5	2488.688	0.179473	12.5	PASS
	2496.5 to 12500.0	6933.052	0.053211	1.25	PASS
$V_{min.}$	30.0 to 1000.0	921.308	0.001690	0.125	PASS
	1000.0 to 2387.0	1845.029	0.136458	1.25	PASS
	2387.0 to 2400.0	2387.169	0.196789	12.5	PASS
	2483.5 to 2496.5	2486.584	0.200447	12.5	PASS
	2496.5 to 12500.0	5917.697	0.045709	1.25	PASS

TEST CHANNEL		CH 13 (2472MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(uW)	LIMIT (uW)	RESULT
V_{normal}	30.0 to 1000.0	979.751	0.002080	0.125	PASS
	1000.0 to 2387.0	1342.935	0.174582	1.25	PASS
	2387.0 to 2400.0	2395.141	0.161808	12.5	PASS
	2483.5 to 2496.5	2483.519	0.522396	12.5	PASS
	2496.5 to 12500.0	5883.935	0.050582	1.25	PASS
$V_{max.}$	30.0 to 1000.0	913.791	0.001641	0.125	PASS
	1000.0 to 2387.0	2200.101	0.140281	1.25	PASS
	2387.0 to 2400.0	2397.099	0.199986	12.5	PASS
	2483.5 to 2496.5	2483.524	0.404576	12.5	PASS
	2496.5 to 12500.0	6988.071	0.055847	1.25	PASS
$V_{min.}$	30.0 to 1000.0	941.072	0.002051	0.125	PASS
	1000.0 to 2387.0	2209.637	0.160325	1.25	PASS
	2387.0 to 2400.0	2399.337	0.207970	12.5	PASS
	2483.5 to 2496.5	2483.519	0.352371	12.5	PASS
	2496.5 to 12500.0	6429.125	0.040738	1.25	PASS

NOTE: 1. The spectrum plots are attached on the following pages.

Chain 1

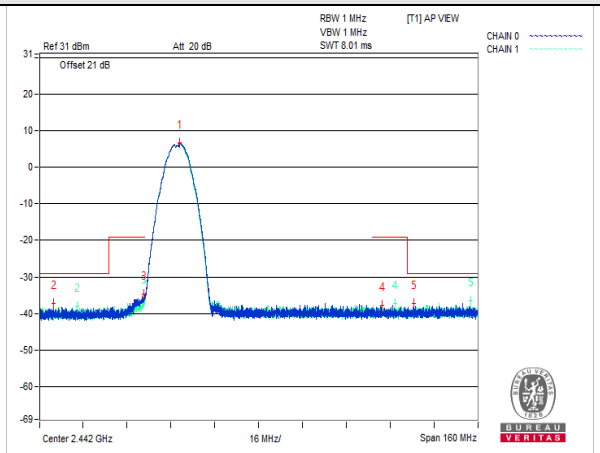
TEST CHANNEL		CH 1 (2412MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(uW)	LIMIT (uW)	RESULT
V_{normal}	30.0 to 1000.0	969.566	0.002265	0.125	PASS
	1000.0 to 2387.0	2093.129	0.171791	1.25	PASS
	2387.0 to 2400.0	2399.923	0.321366	12.5	PASS
	2483.5 to 2496.5	2489.229	0.231206	12.5	PASS
	2496.5 to 12500.0	5960.211	0.048084	1.25	PASS
$V_{max.}$	30.0 to 1000.0	862.260	0.001683	0.125	PASS
	1000.0 to 2387.0	1545.784	0.161808	1.25	PASS
	2387.0 to 2400.0	2399.566	0.296483	12.5	PASS
	2483.5 to 2496.5	2483.963	0.173780	12.5	PASS
	2496.5 to 12500.0	6925.549	0.044978	1.25	PASS
$V_{min.}$	30.0 to 1000.0	775.445	0.001845	0.125	PASS
	1000.0 to 2387.0	2060.881	0.181970	1.25	PASS
	2387.0 to 2400.0	2399.996	0.303389	12.5	PASS
	2483.5 to 2496.5	2486.296	0.226986	12.5	PASS
	2496.5 to 12500.0	5870.180	0.047315	1.25	PASS
TEST CHANNEL		CH 7 (2442MHz)			
V_{normal}	30.0 to 1000.0	938.768	0.002004	0.125	PASS
	1000.0 to 2387.0	2368.102	0.162555	1.25	PASS
	2387.0 to 2400.0	2395.237	0.200447	12.5	PASS
	2483.5 to 2496.5	2488.314	0.254683	12.5	PASS
	2496.5 to 12500.0	6994.323	0.055719	1.25	PASS
$V_{max.}$	30.0 to 1000.0	862.745	0.001849	0.125	PASS
	1000.0 to 2387.0	2204.956	0.171002	1.25	PASS
	2387.0 to 2400.0	2388.673	0.209894	12.5	PASS
	2483.5 to 2496.5	2484.125	0.207970	12.5	PASS
	2496.5 to 12500.0	5843.921	0.045709	1.25	PASS
$V_{min.}$	30.0 to 1000.0	882.387	0.001828	0.125	PASS
	1000.0 to 2387.0	2103.878	0.146893	1.25	PASS
	2387.0 to 2400.0	2399.946	0.197697	12.5	PASS
	2483.5 to 2496.5	2484.096	0.212814	12.5	PASS
	2496.5 to 12500.0	5760.141	0.044978	1.25	PASS

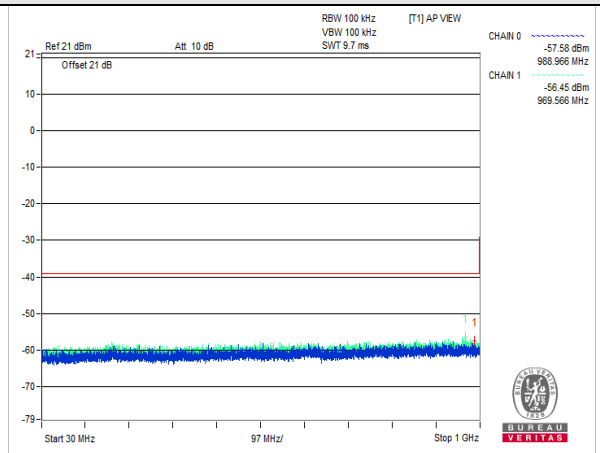
TEST CHANNEL		CH 13 (2472MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(uW)	LIMIT (uW)	RESULT
V_{normal}	30.0 to 1000.0	876.931	0.001754	0.125	PASS
	1000.0 to 2387.0	2384.572	0.213304	1.25	PASS
	2387.0 to 2400.0	2395.458	0.219280	12.5	PASS
	2483.5 to 2496.5	2483.608	0.441570	12.5	PASS
	2496.5 to 12500.0	6774.246	0.042462	1.25	PASS
$V_{max.}$	30.0 to 1000.0	915.973	0.001722	0.125	PASS
	1000.0 to 2387.0	1528.273	0.158125	1.25	PASS
	2387.0 to 2400.0	2398.896	0.190546	12.5	PASS
	2483.5 to 2496.5	2483.550	0.405509	12.5	PASS
	2496.5 to 12500.0	6883.034	0.047206	1.25	PASS
$V_{min.}$	30.0 to 1000.0	976.720	0.001786	0.125	PASS
	1000.0 to 2387.0	2365.328	0.149624	1.25	PASS
	2387.0 to 2400.0	2395.120	0.188365	12.5	PASS
	2483.5 to 2496.5	2483.511	0.422669	12.5	PASS
	2496.5 to 12500.0	5851.423	0.052240	1.25	PASS

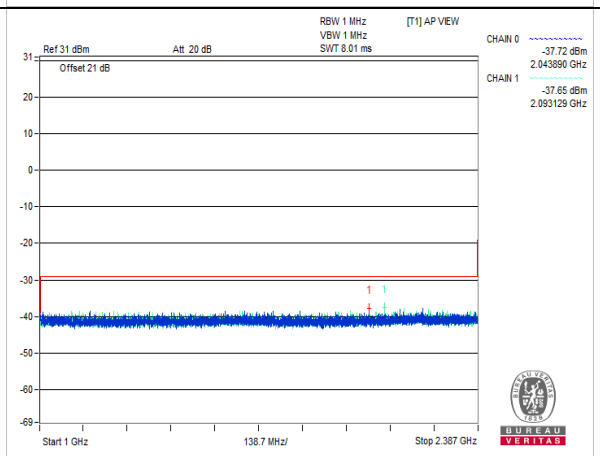
NOTE: 1. The spectrum plots are attached on the following pages.

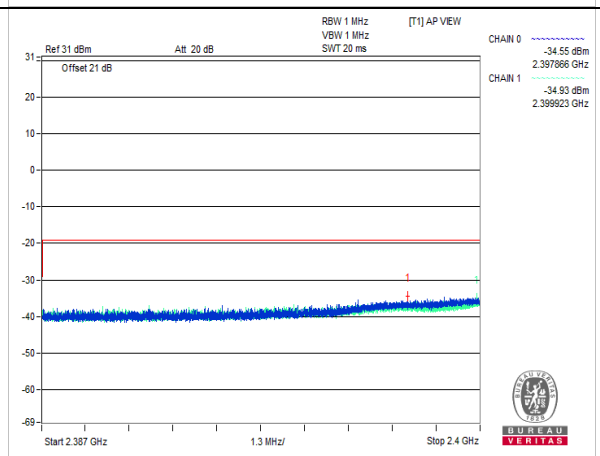
Graph

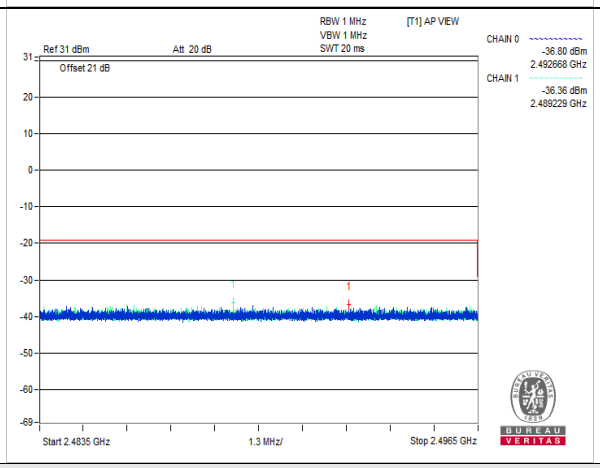
Vnormal

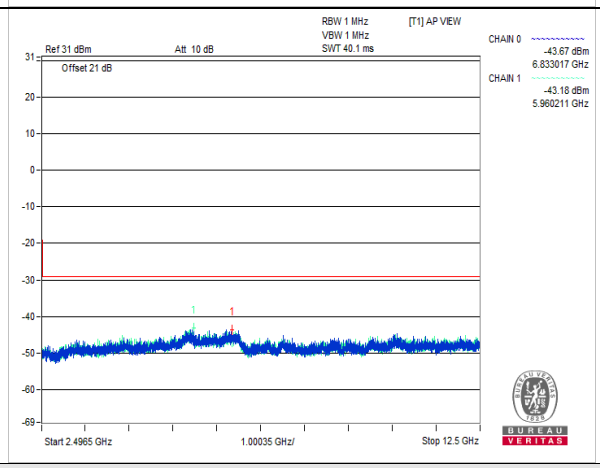






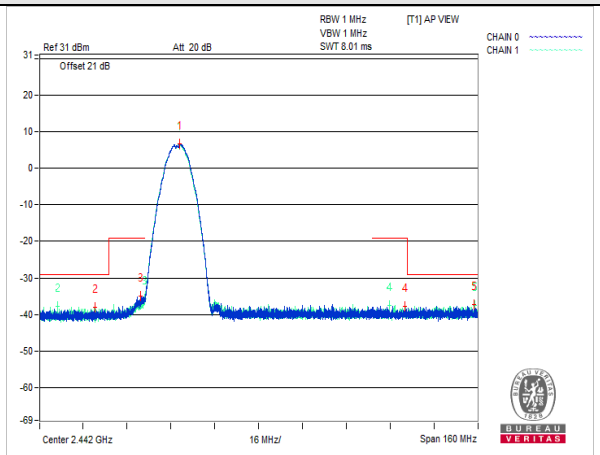


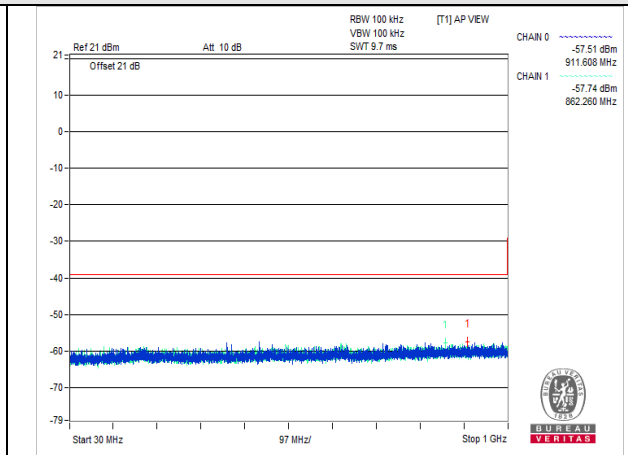


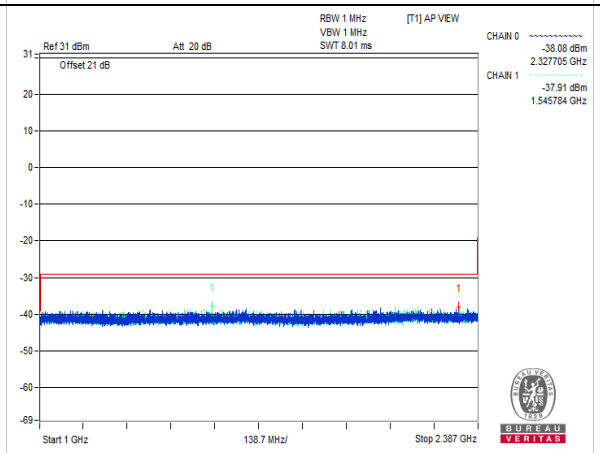


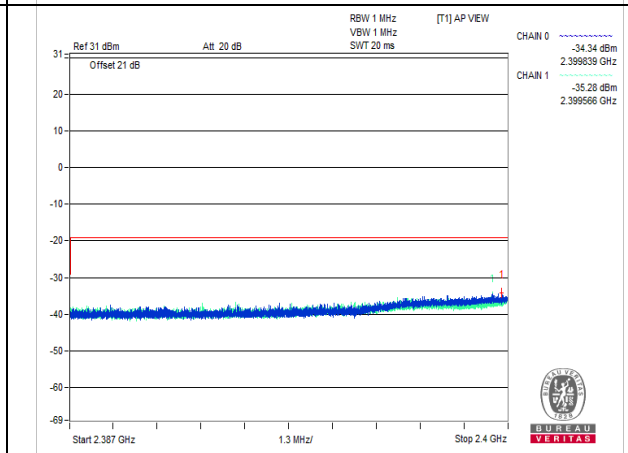
CH 1 (2412MHz)

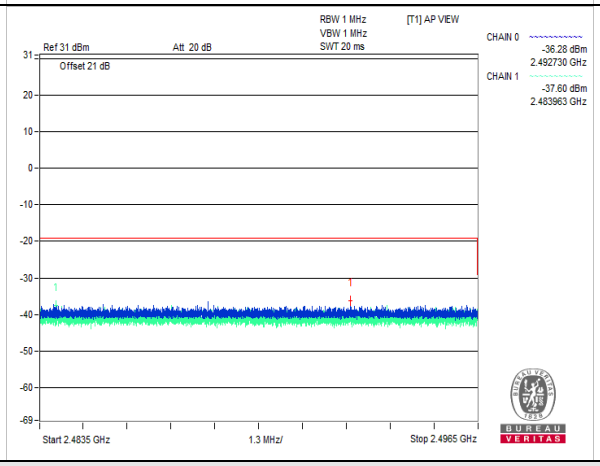
Vmax.

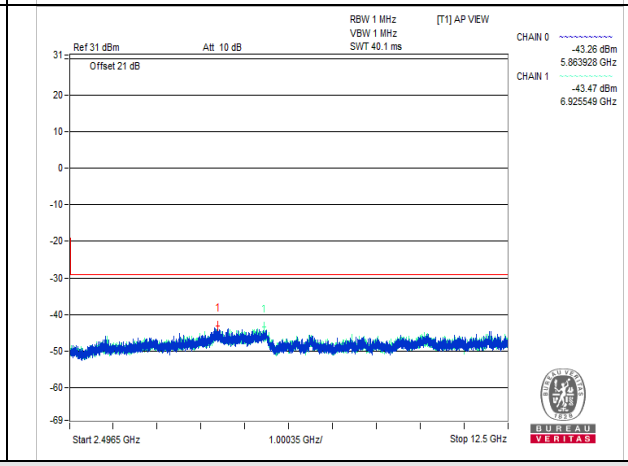






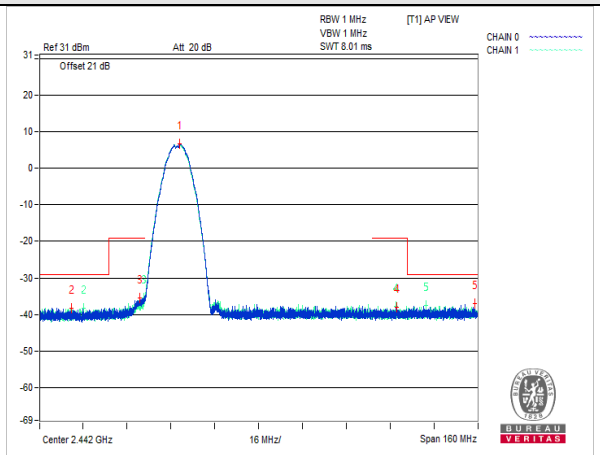


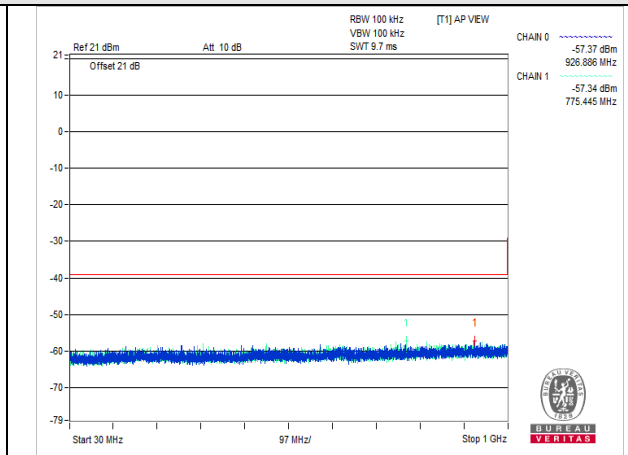


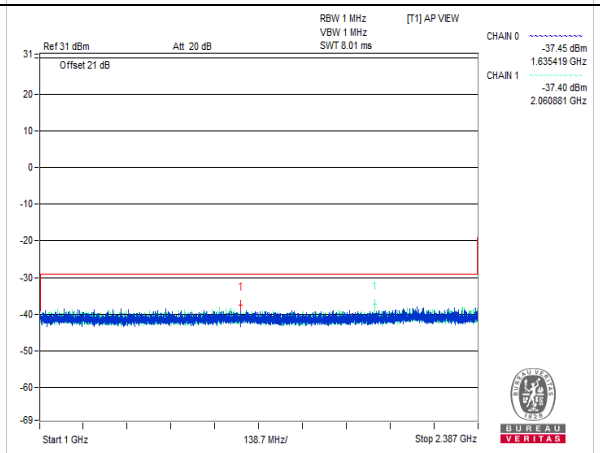


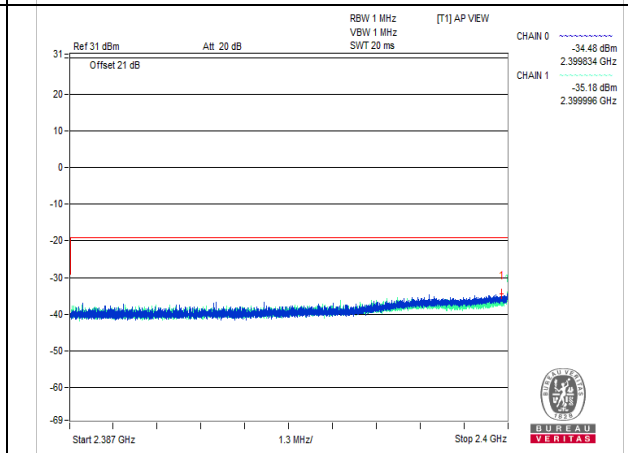
CH 1 (2412MHz)

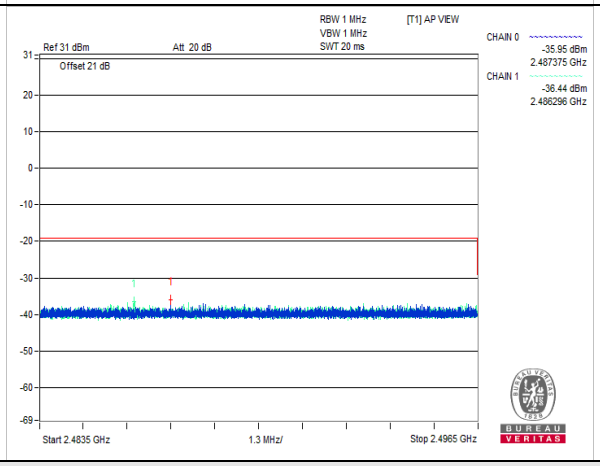
Vmin.

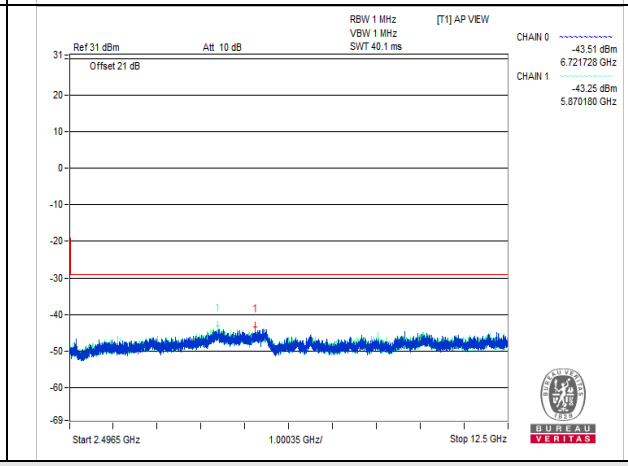






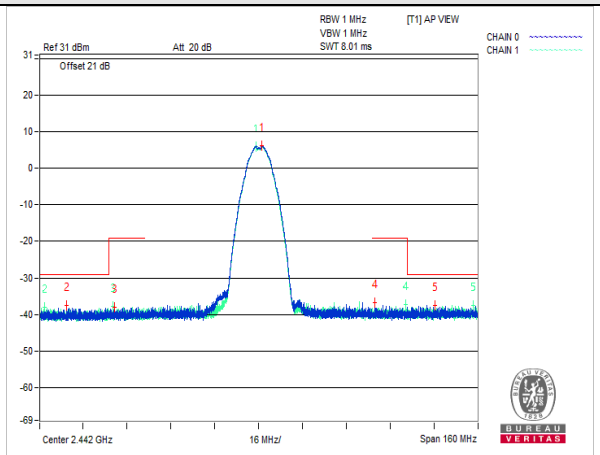


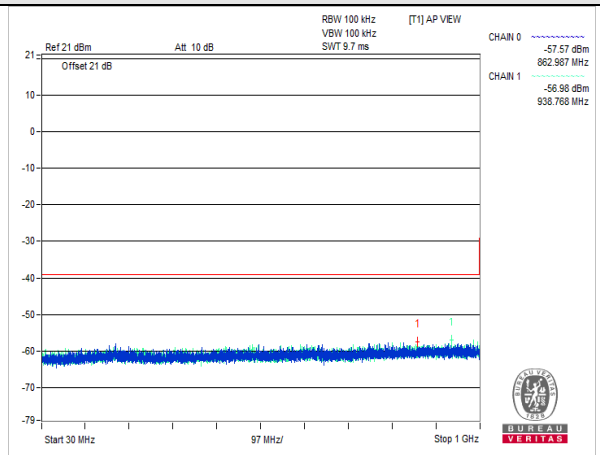


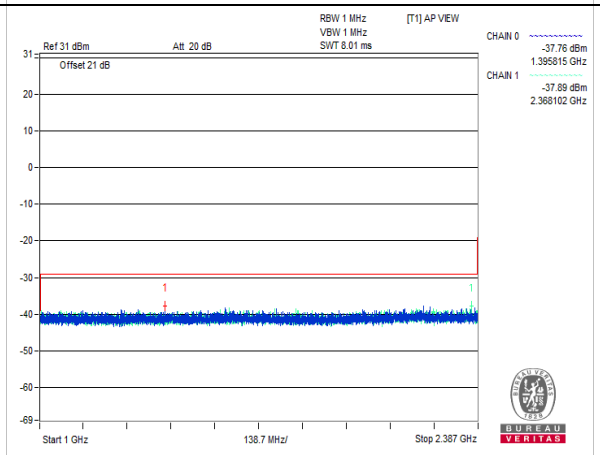


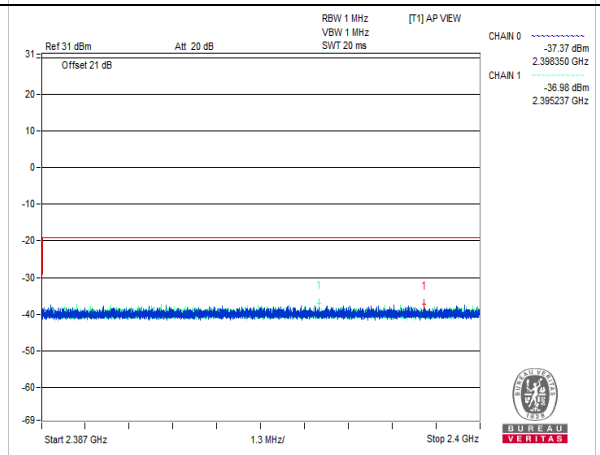
CH 1 (2412MHz)

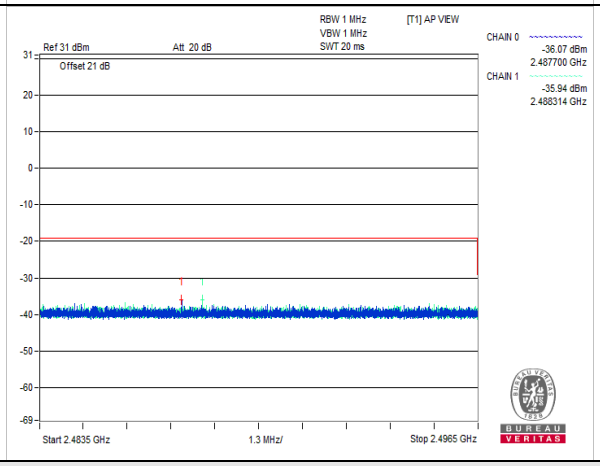
Vnormal

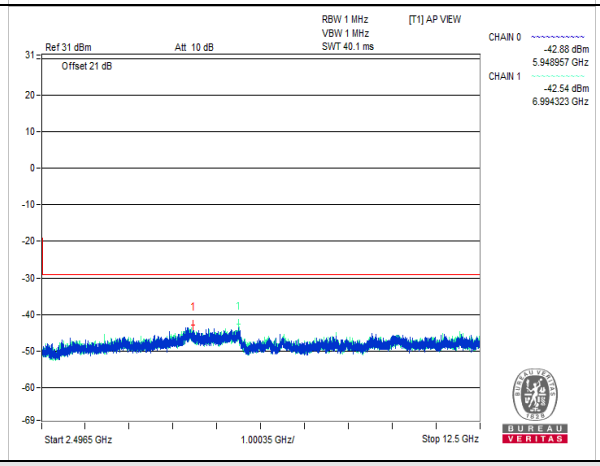






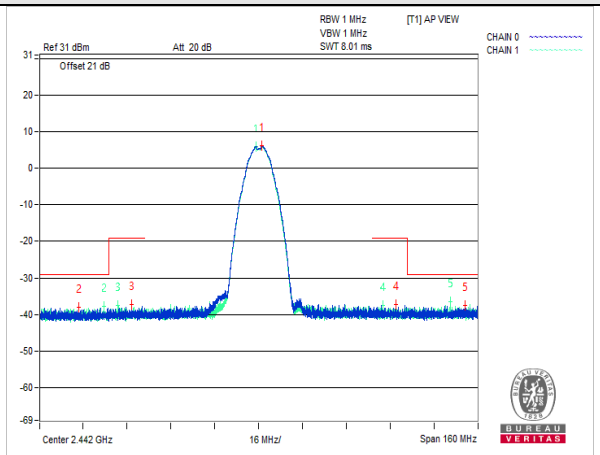


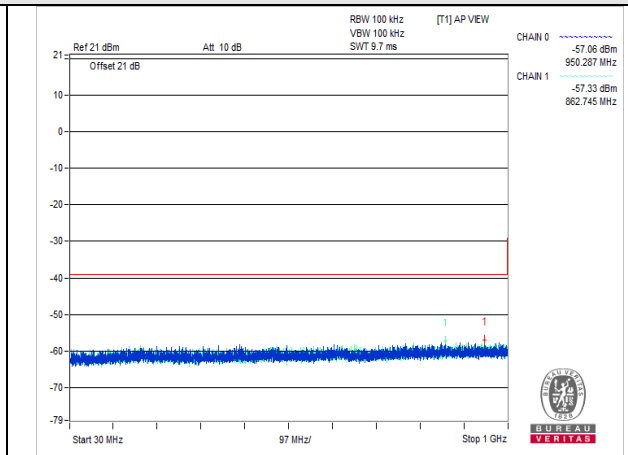


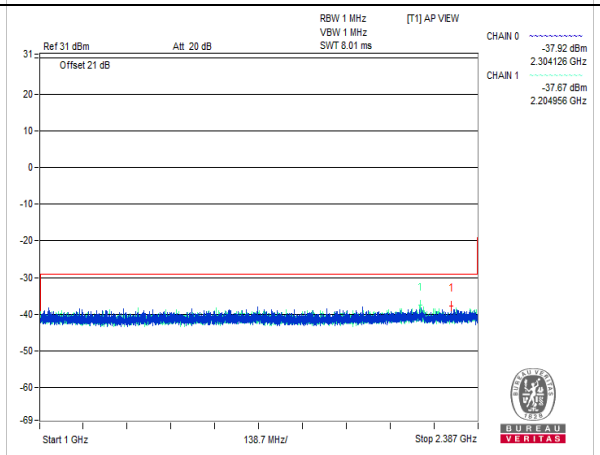


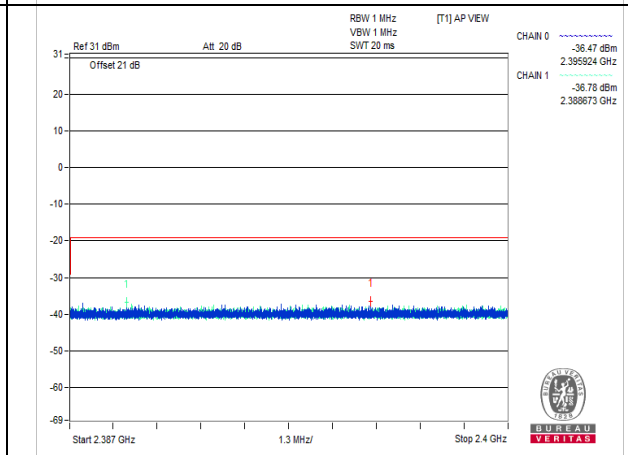
CH 7 (2442MHz)

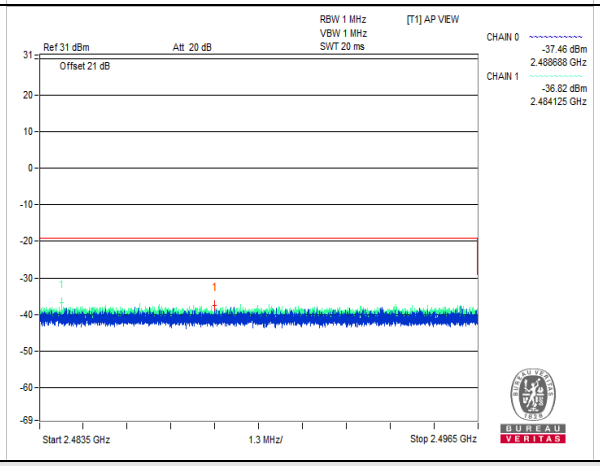
Vmax.

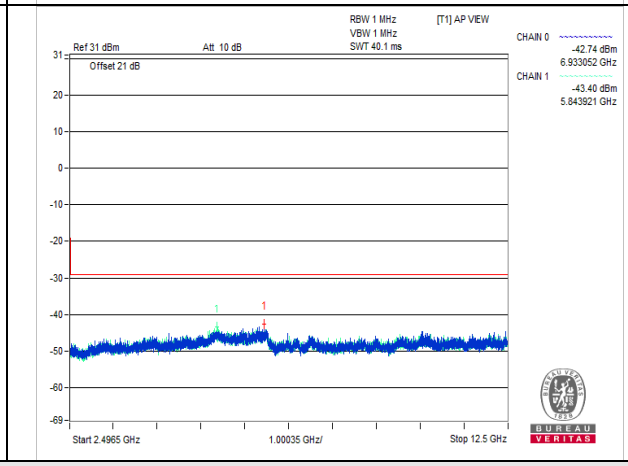






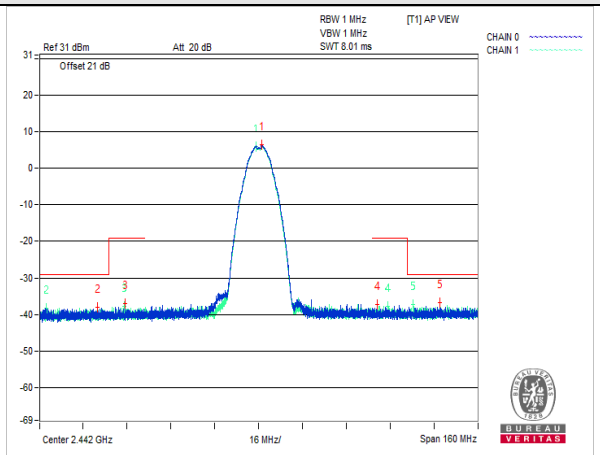


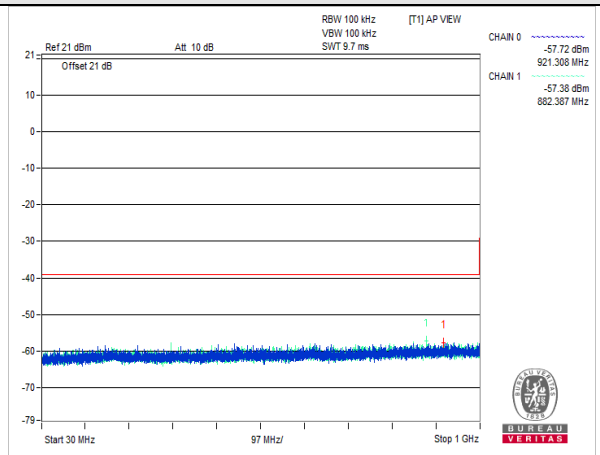


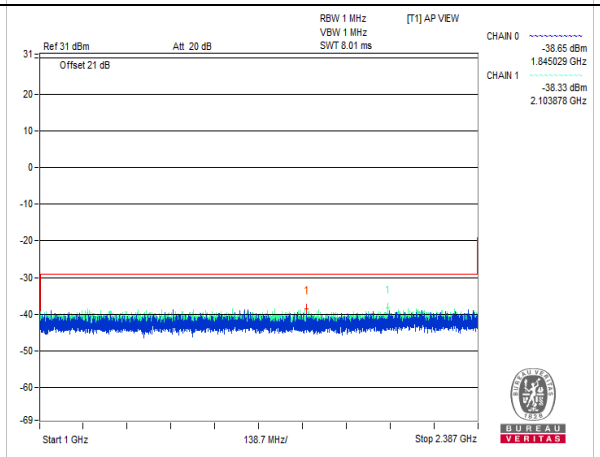


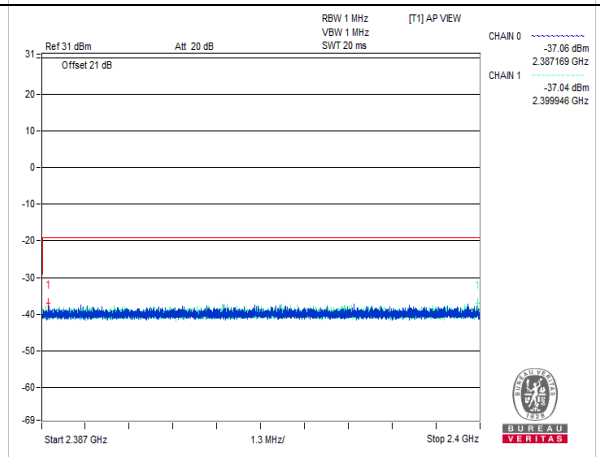
CH 7 (2442MHz)

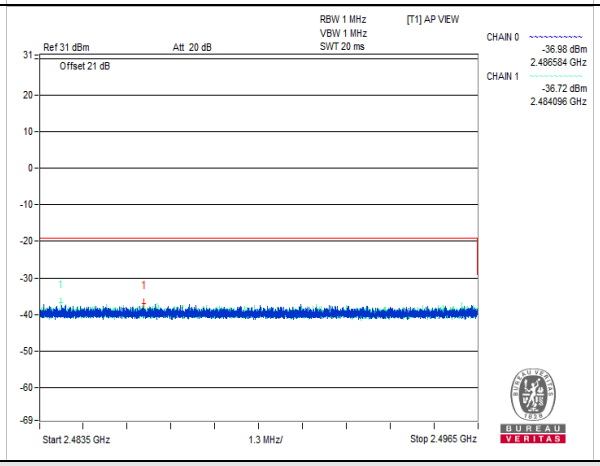
Vmin.

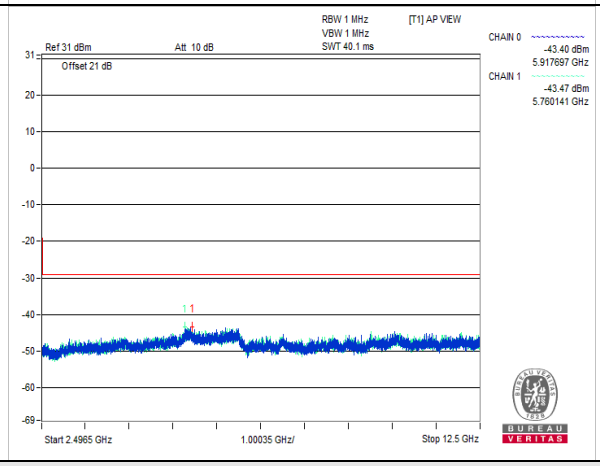






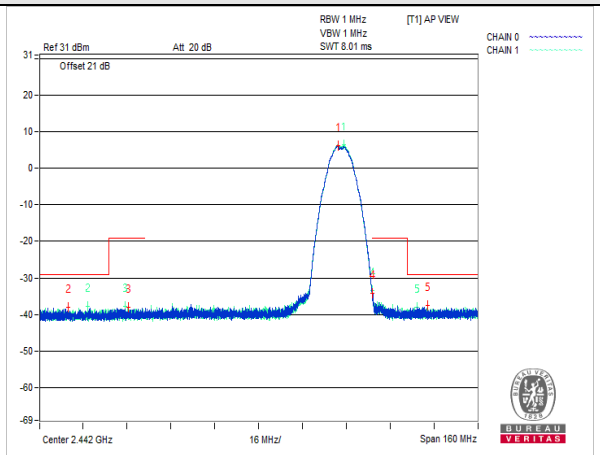


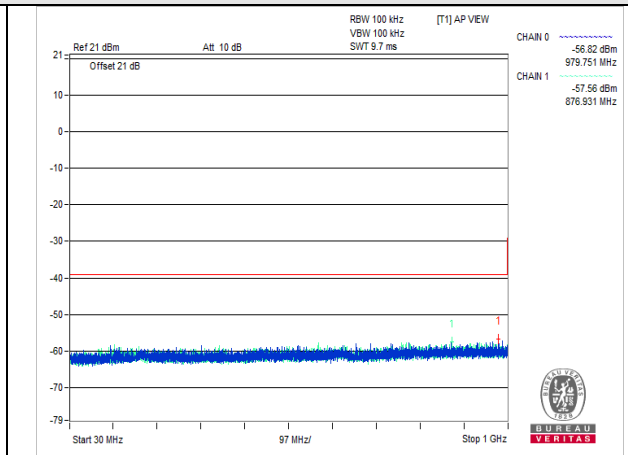


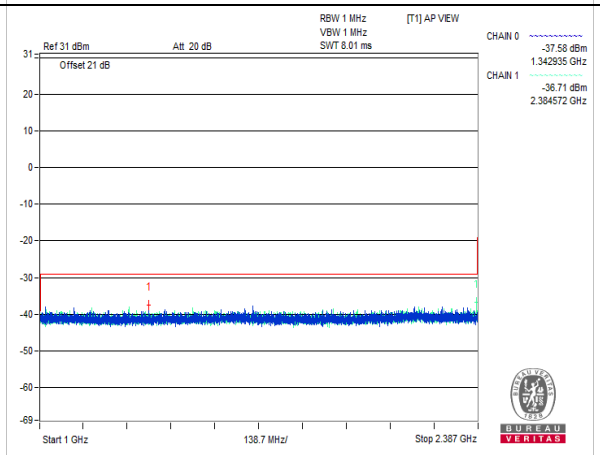


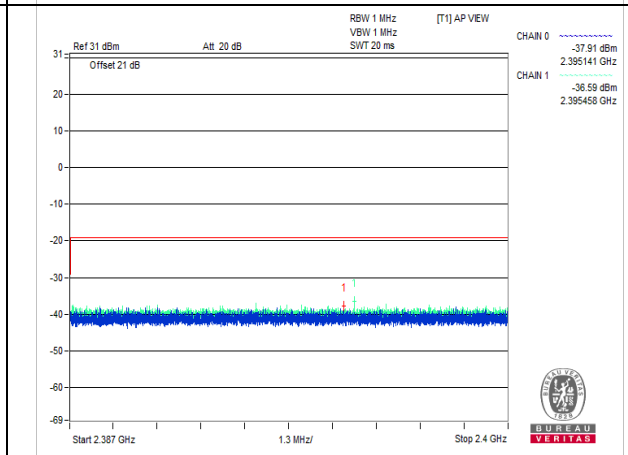
CH 7 (2442MHz)

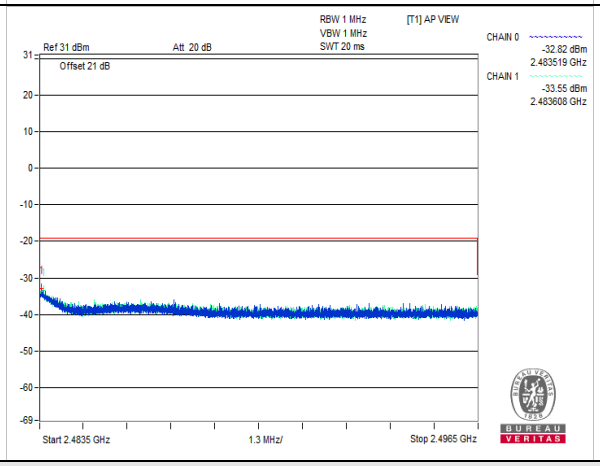
Vnormal

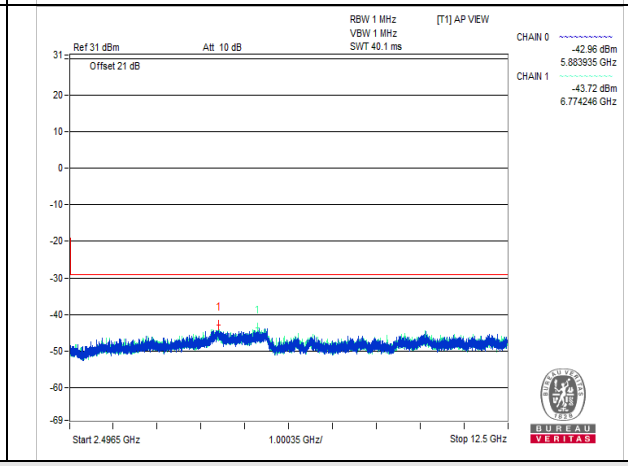






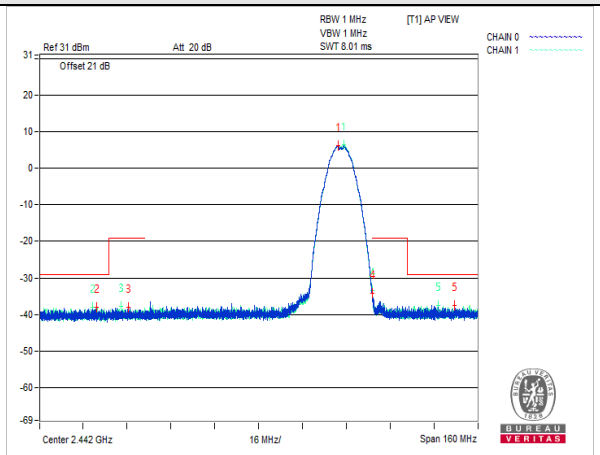


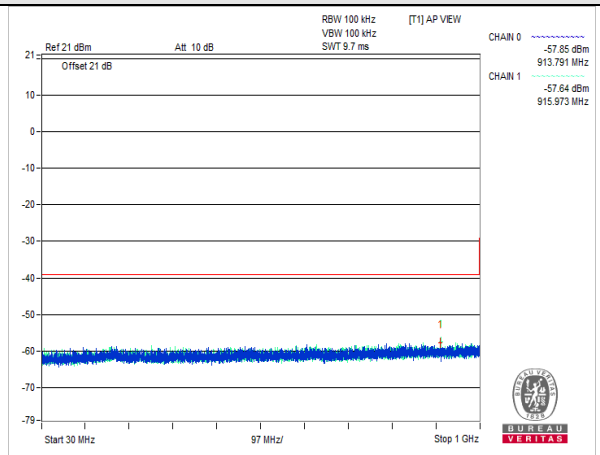


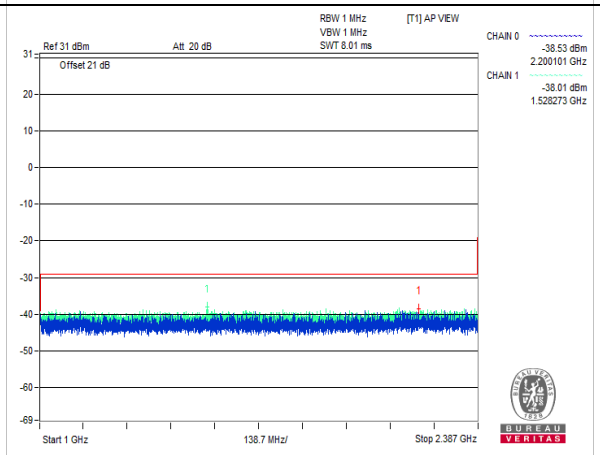


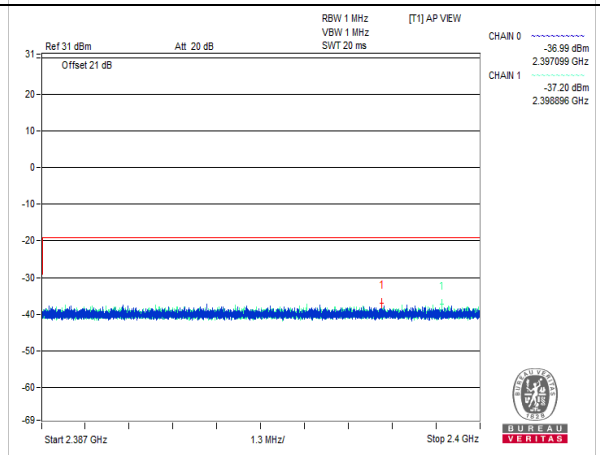
CH 13 (2472MHz)

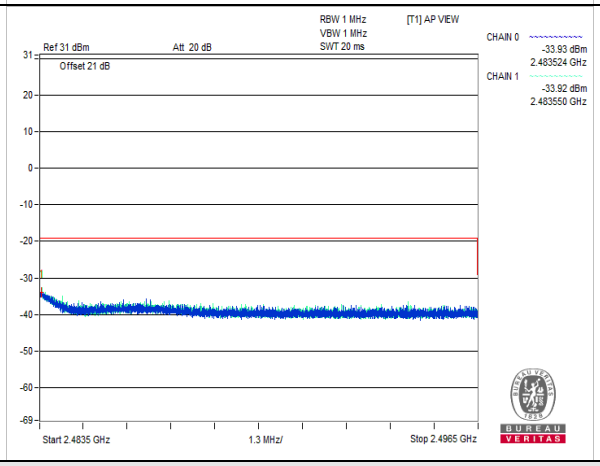
Vmax.

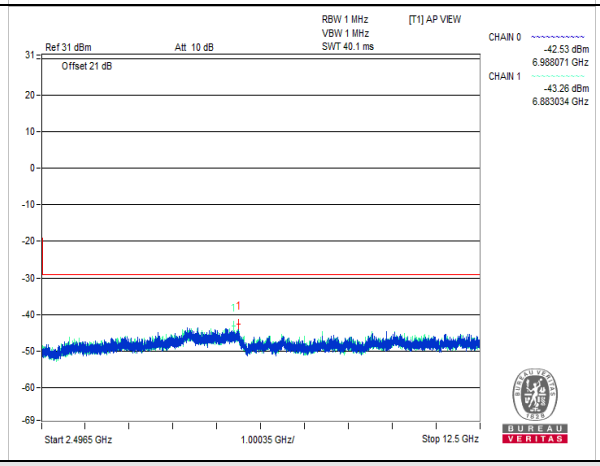






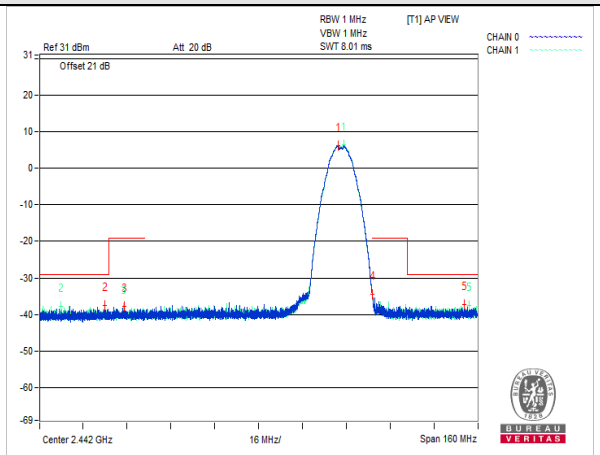


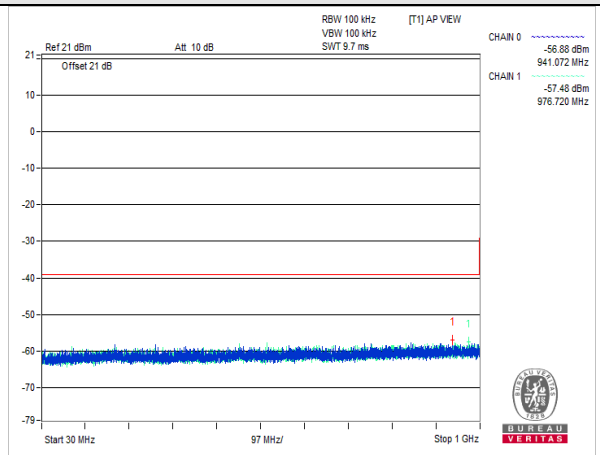


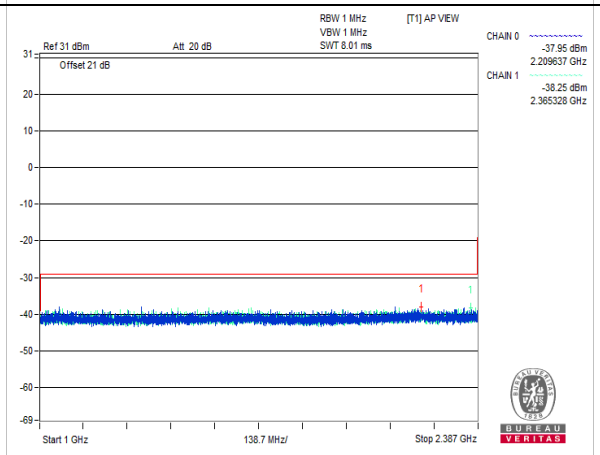


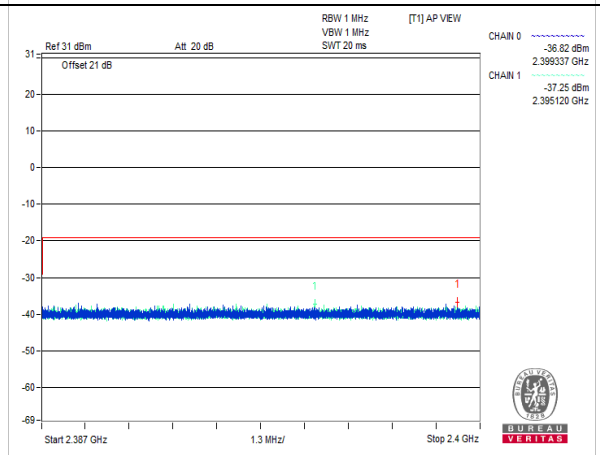
CH 13 (2472MHz)

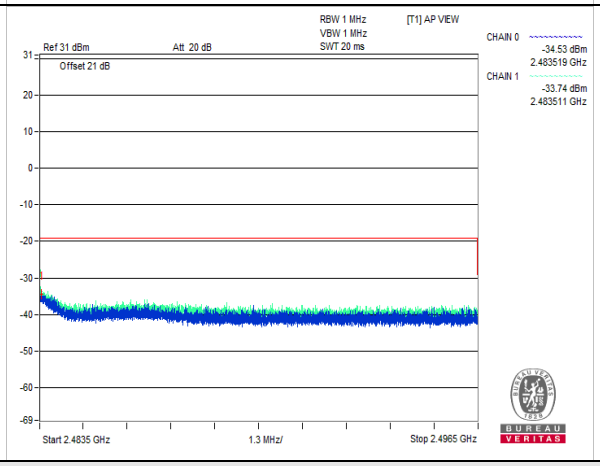
Vmin.

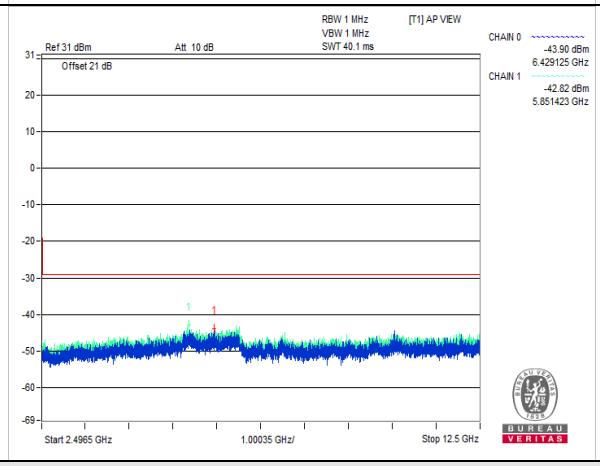












CH 13 (2472MHz)

[Worst result] x [Number of antenna ports]

TEST CHANNEL		CH 1 (2412MHz)		
TEST CONDITION	FREQUENCY RANGE(MHz)	MEASURE. VALUE (uW)	LIMIT (uW)	RESULT
V_{normal}	30.0 to 1000.0	0.004530	0.25	PASS
	1000.0 to 2387.0	0.343582	2.5	PASS
	2387.0 to 2400.0	0.701504	25	PASS
	2483.5 to 2496.5	0.462412	25	PASS
	2496.5 to 12500.0	0.096168	2.5	PASS
$V_{max.}$	30.0 to 1000.0	0.003548	0.25	PASS
	1000.0 to 2387.0	0.323616	2.5	PASS
	2387.0 to 2400.0	0.736258	25	PASS
	2483.5 to 2496.5	0.471010	25	PASS
	2496.5 to 12500.0	0.094412	2.5	PASS
$V_{min.}$	30.0 to 1000.0	0.003690	0.25	PASS
	1000.0 to 2387.0	0.363940	2.5	PASS
	2387.0 to 2400.0	0.712902	25	PASS
	2483.5 to 2496.5	0.508194	25	PASS
	2496.5 to 12500.0	0.094630	2.5	PASS
TEST CHANNEL		CH 7 (2442MHz)		
V_{normal}	30.0 to 1000.0	0.004008	0.25	PASS
	1000.0 to 2387.0	0.334988	2.5	PASS
	2387.0 to 2400.0	0.400894	25	PASS
	2483.5 to 2496.5	0.509366	25	PASS
	2496.5 to 12500.0	0.111438	2.5	PASS
$V_{max.}$	30.0 to 1000.0	0.003936	0.25	PASS
	1000.0 to 2387.0	0.342004	2.5	PASS
	2387.0 to 2400.0	0.450848	25	PASS
	2483.5 to 2496.5	0.415940	25	PASS
	2496.5 to 12500.0	0.106422	2.5	PASS
$V_{min.}$	30.0 to 1000.0	0.003656	0.25	PASS
	1000.0 to 2387.0	0.293786	2.5	PASS
	2387.0 to 2400.0	0.395394	25	PASS
	2483.5 to 2496.5	0.425628	25	PASS
	2496.5 to 12500.0	0.091418	2.5	PASS

TEST CHANNEL		CH 13 (2472MHz)		
TEST CONDITION	FREQUENCY RANGE(MHz)	MEASURE. VALUE (uW)	LIMIT (uW)	RESULT
V_{normal}	30.0 to 1000.0	0.004160	0.25	PASS
	1000.0 to 2387.0	0.426608	2.5	PASS
	2387.0 to 2400.0	0.438560	25	PASS
	2483.5 to 2496.5	1.044792	25	PASS
	2496.5 to 12500.0	0.101164	2.5	PASS
$V_{max.}$	30.0 to 1000.0	0.003444	0.25	PASS
	1000.0 to 2387.0	0.316250	2.5	PASS
	2387.0 to 2400.0	0.399972	25	PASS
	2483.5 to 2496.5	0.811018	25	PASS
	2496.5 to 12500.0	0.111694	2.5	PASS
$V_{min.}$	30.0 to 1000.0	0.004102	0.25	PASS
	1000.0 to 2387.0	0.320650	2.5	PASS
	2387.0 to 2400.0	0.415940	25	PASS
	2483.5 to 2496.5	0.845338	25	PASS
	2496.5 to 12500.0	0.104480	2.5	PASS

802.11g
Chain 0

TEST CHANNEL		CH 1 (2412MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(uW)	LIMIT (uW)	RESULT
V_{normal}	30.0 to 1000.0	977.932	0.001875	0.125	PASS
	1000.0 to 2387.0	2151.036	0.143219	1.25	PASS
	2387.0 to 2400.0	2399.951	4.570882	12.5	PASS
	2483.5 to 2496.5	2486.230	0.233884	12.5	PASS
	2496.5 to 12500.0	5866.429	0.042073	1.25	PASS
$V_{max.}$	30.0 to 1000.0	850.983	0.001807	0.125	PASS
	1000.0 to 2387.0	2297.191	0.162555	1.25	PASS
	2387.0 to 2400.0	2399.985	4.677351	12.5	PASS
	2483.5 to 2496.5	2485.121	0.222331	12.5	PASS
	2496.5 to 12500.0	6789.251	0.039084	1.25	PASS
$V_{min.}$	30.0 to 1000.0	779.082	0.001977	0.125	PASS
	1000.0 to 2387.0	1730.255	0.132434	1.25	PASS
	2387.0 to 2400.0	2399.995	4.645153	12.5	PASS
	2483.5 to 2496.5	2490.375	0.224905	12.5	PASS
	2496.5 to 12500.0	5858.926	0.042560	1.25	PASS
TEST CHANNEL		CH 7 (2442MHz)			
V_{normal}	30.0 to 1000.0	873.172	0.002018	0.125	PASS
	1000.0 to 2387.0	1292.136	0.189671	1.25	PASS
	2387.0 to 2400.0	2394.785	0.214289	12.5	PASS
	2483.5 to 2496.5	2495.018	0.215774	12.5	PASS
	2496.5 to 12500.0	6883.034	0.043853	1.25	PASS
$V_{max.}$	30.0 to 1000.0	892.693	0.002089	0.125	PASS
	1000.0 to 2387.0	1584.100	0.145881	1.25	PASS
	2387.0 to 2400.0	2394.255	0.183654	12.5	PASS
	2483.5 to 2496.5	2483.678	0.211836	12.5	PASS
	2496.5 to 12500.0	5808.908	0.057412	1.25	PASS
$V_{min.}$	30.0 to 1000.0	863.593	0.001730	0.125	PASS
	1000.0 to 2387.0	2162.306	0.186209	1.25	PASS
	2387.0 to 2400.0	2390.292	0.222844	12.5	PASS
	2483.5 to 2496.5	2485.934	0.198153	12.5	PASS
	2496.5 to 12500.0	5811.409	0.046774	1.25	PASS

TEST CHANNEL		CH 13 (2472MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(uW)	LIMIT (uW)	RESULT
V_{normal}	30.0 to 1000.0	809.880	0.002173	0.125	PASS
	1000.0 to 2387.0	2208.770	0.187068	1.25	PASS
	2387.0 to 2400.0	2388.678	0.168267	12.5	PASS
	2483.5 to 2496.5	2483.712	4.864072	12.5	PASS
	2496.5 to 12500.0	5895.189	0.044771	1.25	PASS
$V_{max.}$	30.0 to 1000.0	930.160	0.002371	0.125	PASS
	1000.0 to 2387.0	2158.318	0.155239	1.25	PASS
	2387.0 to 2400.0	2390.347	0.191426	12.5	PASS
	2483.5 to 2496.5	2483.732	4.446313	12.5	PASS
	2496.5 to 12500.0	5783.900	0.044566	1.25	PASS
$V_{min.}$	30.0 to 1000.0	872.202	0.002023	0.125	PASS
	1000.0 to 2387.0	2206.516	0.156315	1.25	PASS
	2387.0 to 2400.0	2396.584	0.182390	12.5	PASS
	2483.5 to 2496.5	2483.660	4.405549	12.5	PASS
	2496.5 to 12500.0	6514.155	0.051050	1.25	PASS

NOTE: 1. The spectrum plots are attached on the following pages.

Chain 1

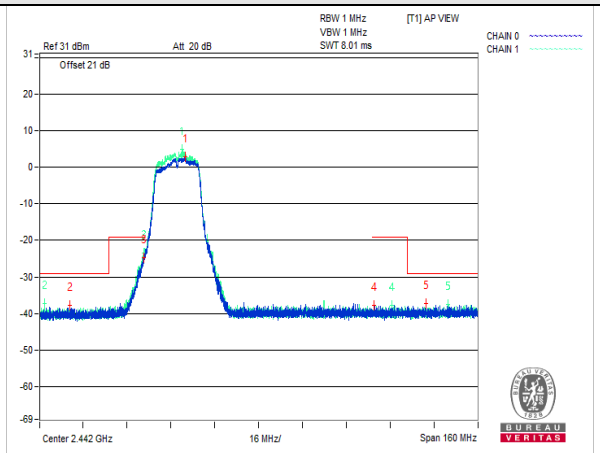
TEST CHANNEL		CH 1 (2412MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(uW)	LIMIT (uW)	RESULT
V_{normal}	30.0 to 1000.0	962.655	0.001770	0.125	PASS
	1000.0 to 2387.0	2268.584	0.187068	1.25	PASS
	2387.0 to 2400.0	2399.944	4.830588	12.5	PASS
	2483.5 to 2496.5	2484.384	0.222844	12.5	PASS
	2496.5 to 12500.0	5858.926	0.043853	1.25	PASS
$V_{max.}$	30.0 to 1000.0	872.202	0.001879	0.125	PASS
	1000.0 to 2387.0	2175.482	0.149279	1.25	PASS
	2387.0 to 2400.0	2399.868	4.731513	12.5	PASS
	2483.5 to 2496.5	2489.450	0.190546	12.5	PASS
	2496.5 to 12500.0	5931.451	0.045920	1.25	PASS
$V_{min.}$	30.0 to 1000.0	923.370	0.001866	0.125	PASS
	1000.0 to 2387.0	1596.063	0.159221	1.25	PASS
	2387.0 to 2400.0	2399.910	4.965923	12.5	PASS
	2483.5 to 2496.5	2490.325	0.224905	12.5	PASS
	2496.5 to 12500.0	5847.672	0.043551	1.25	PASS
TEST CHANNEL		CH 7 (2442MHz)			
V_{normal}	30.0 to 1000.0	968.596	0.002004	0.125	PASS
	1000.0 to 2387.0	2336.894	0.123880	1.25	PASS
	2387.0 to 2400.0	2388.116	0.211836	12.5	PASS
	2483.5 to 2496.5	2494.254	0.212814	12.5	PASS
	2496.5 to 12500.0	5847.672	0.044771	1.25	PASS
$V_{max.}$	30.0 to 1000.0	816.427	0.002028	0.125	PASS
	1000.0 to 2387.0	2264.944	0.157398	1.25	PASS
	2387.0 to 2400.0	2396.308	0.203704	12.5	PASS
	2483.5 to 2496.5	2491.402	0.219280	12.5	PASS
	2496.5 to 12500.0	6396.614	0.043551	1.25	PASS
$V_{min.}$	30.0 to 1000.0	822.126	0.002118	0.125	PASS
	1000.0 to 2387.0	2119.655	0.181970	1.25	PASS
	2387.0 to 2400.0	2391.949	0.214289	12.5	PASS
	2483.5 to 2496.5	2483.909	0.213304	12.5	PASS
	2496.5 to 12500.0	6711.724	0.054450	1.25	PASS

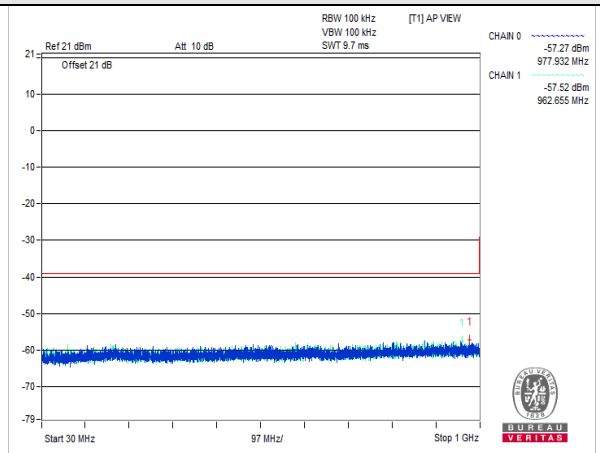
TEST CHANNEL		CH 13 (2472MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(uW)	LIMIT (uW)	RESULT
V_{normal}	30.0 to 1000.0	741.495	0.001770	0.125	PASS
	1000.0 to 2387.0	1319.876	0.157761	1.25	PASS
	2387.0 to 2400.0	2396.943	0.199067	12.5	PASS
	2483.5 to 2496.5	2483.693	3.908409	12.5	PASS
	2496.5 to 12500.0	5967.714	0.046666	1.25	PASS
$V_{max.}$	30.0 to 1000.0	999.757	0.001754	0.125	PASS
	1000.0 to 2387.0	2295.978	0.177419	1.25	PASS
	2387.0 to 2400.0	2399.588	0.207491	12.5	PASS
	2483.5 to 2496.5	2483.693	4.920395	12.5	PASS
	2496.5 to 12500.0	6965.563	0.047534	1.25	PASS
$V_{min.}$	30.0 to 1000.0	861.290	0.002080	0.125	PASS
	1000.0 to 2387.0	2210.504	0.137404	1.25	PASS
	2387.0 to 2400.0	2399.132	0.181970	12.5	PASS
	2483.5 to 2496.5	2483.506	4.130475	12.5	PASS
	2496.5 to 12500.0	5862.677	0.063096	1.25	PASS

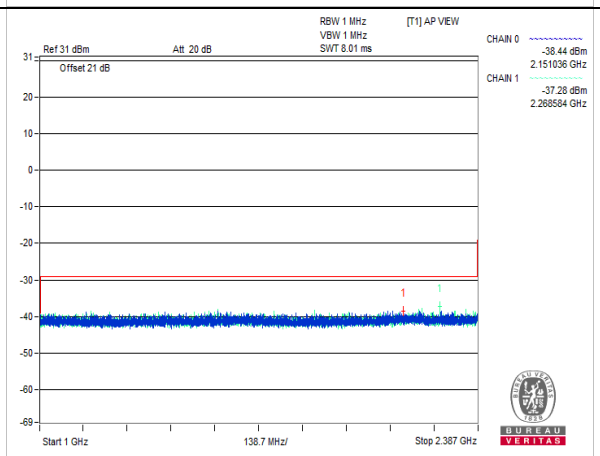
NOTE: 1. The spectrum plots are attached on the following pages.

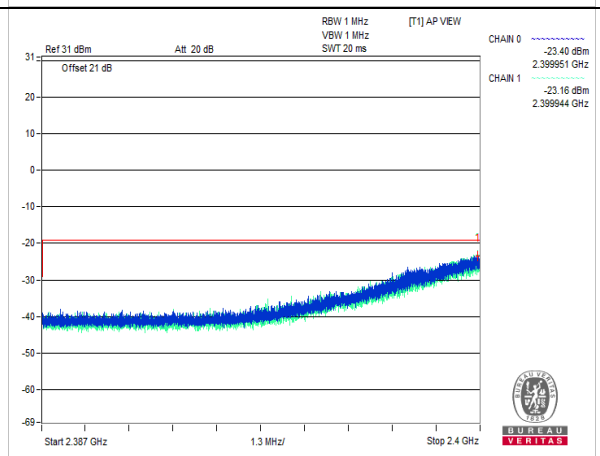
Graph

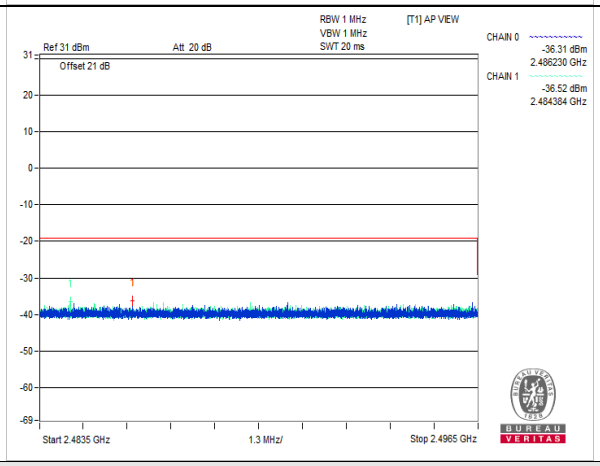
Vnormal

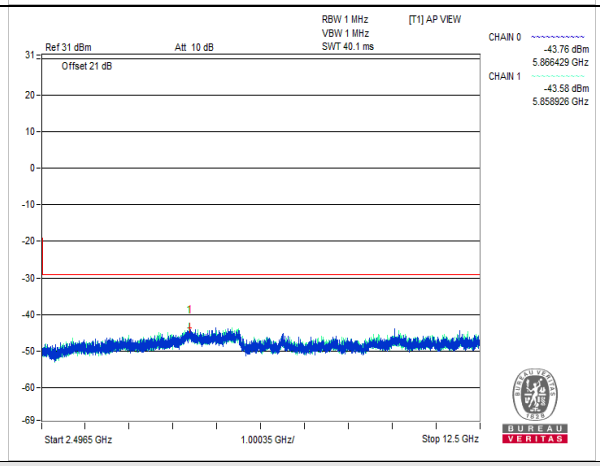






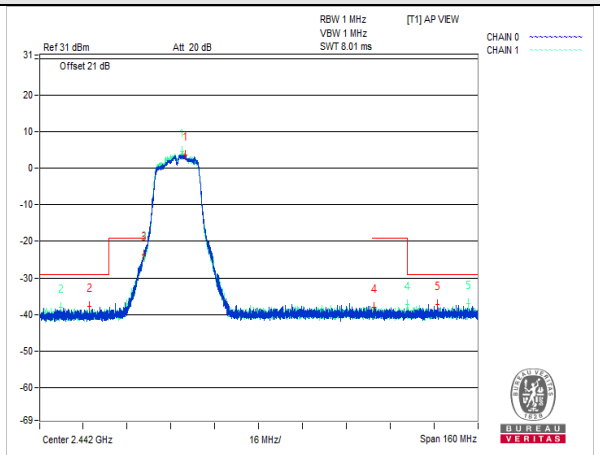


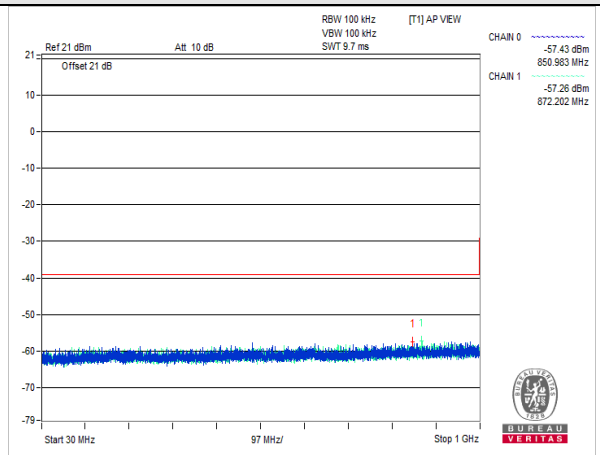


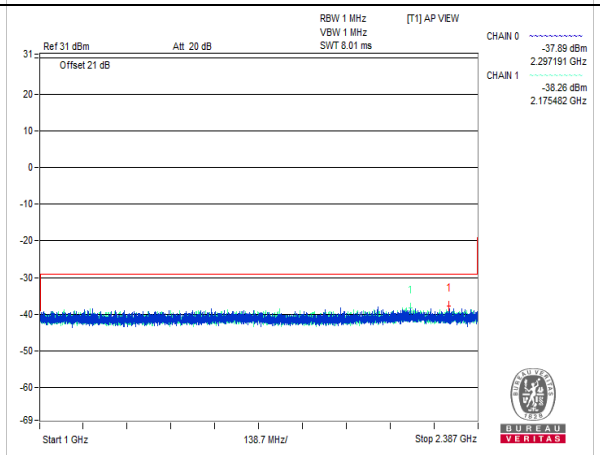


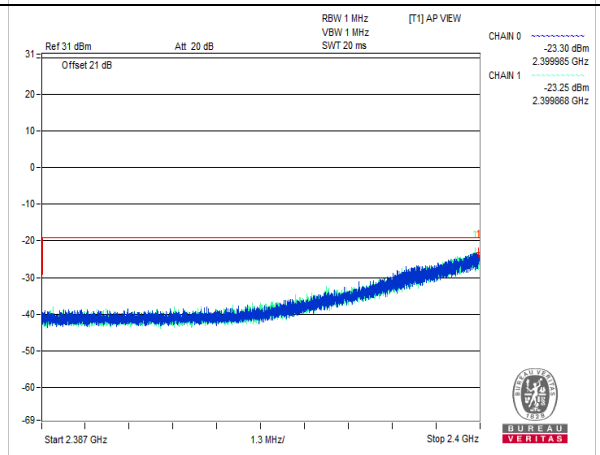
CH 1 (2412MHz)

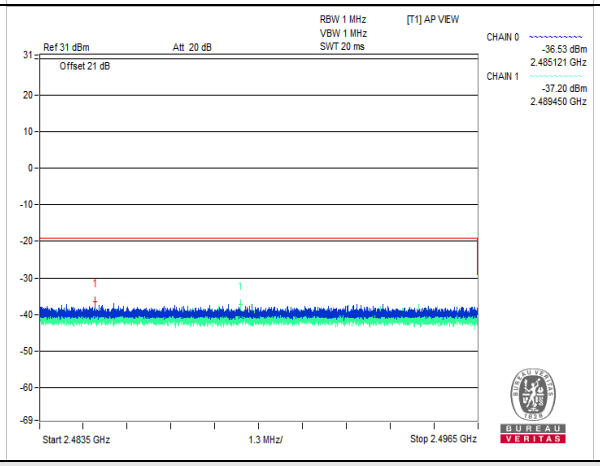
Vmax.

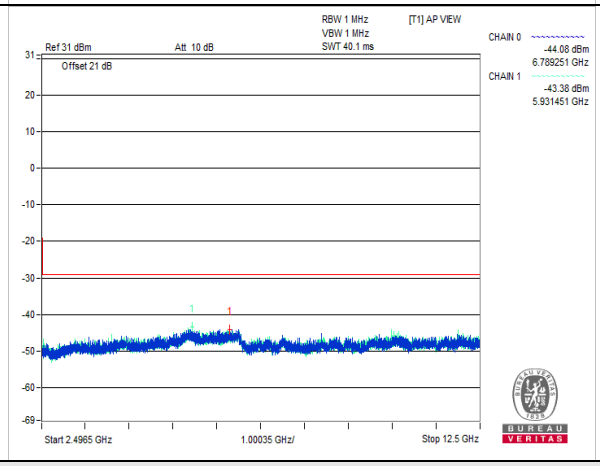






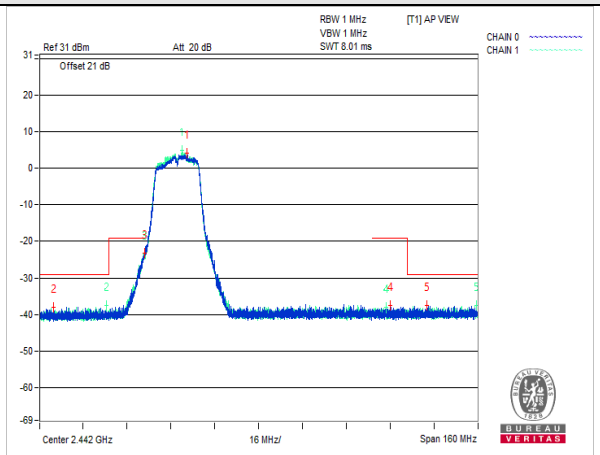


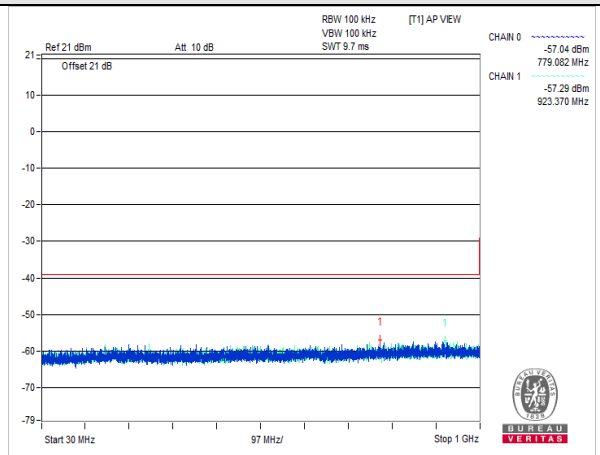


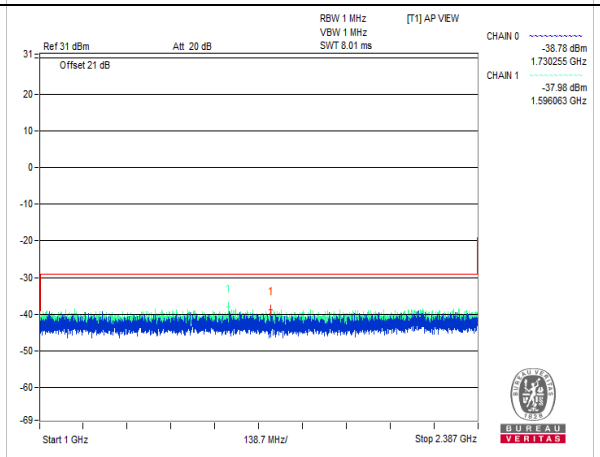


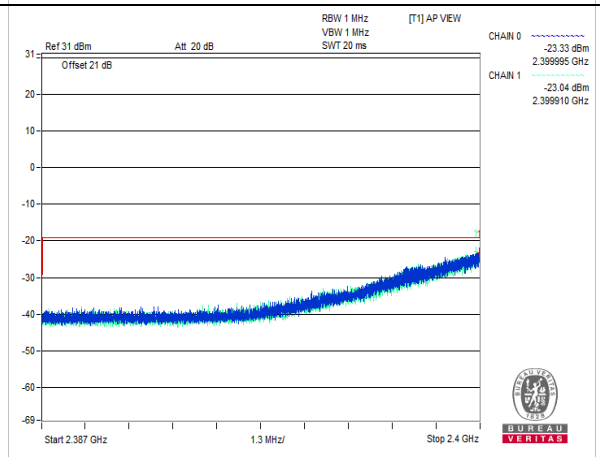
CH 1 (2412MHz)

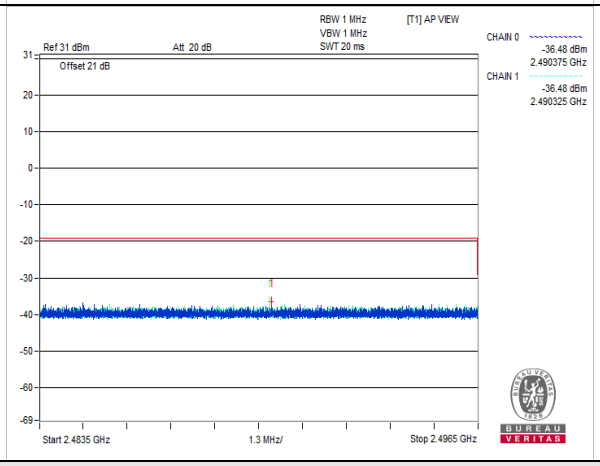
Vmin.

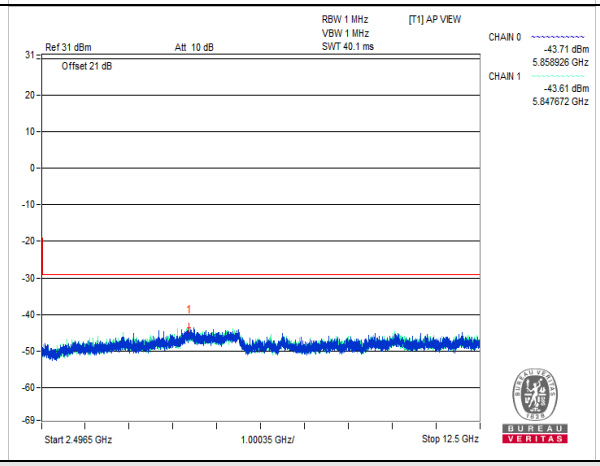






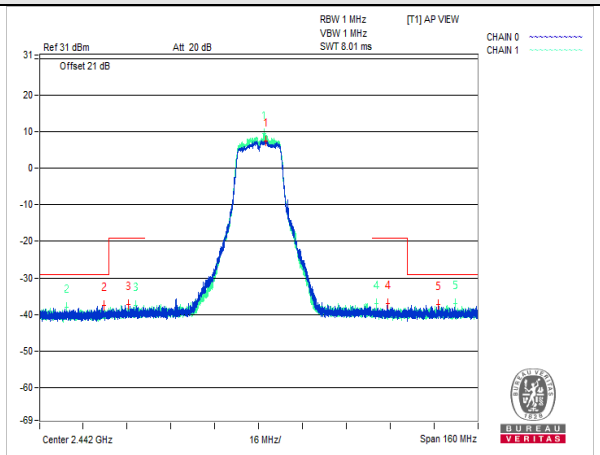


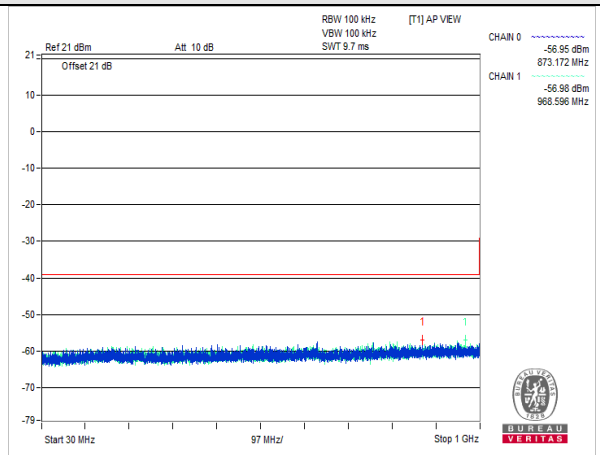


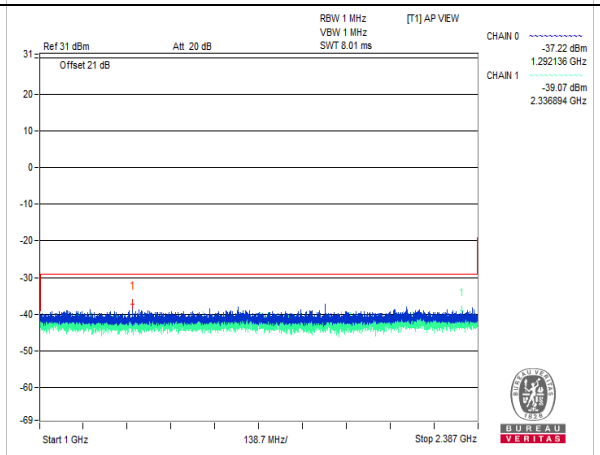


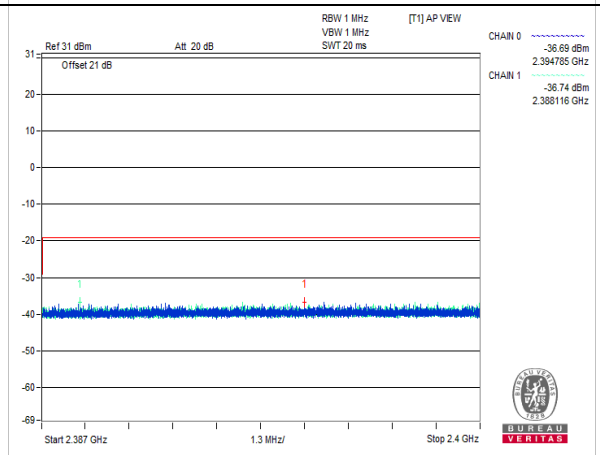
CH 1 (2412MHz)

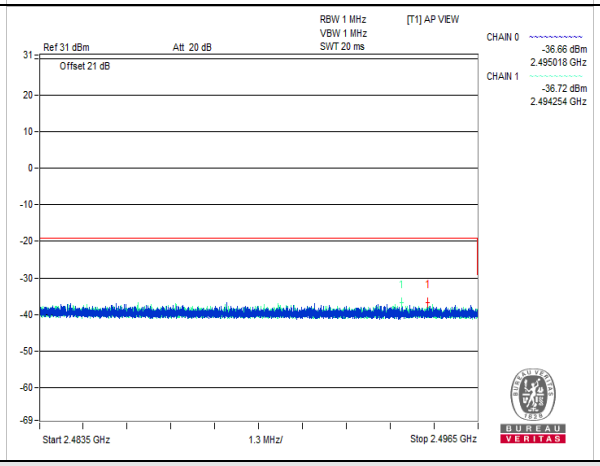
Vnormal

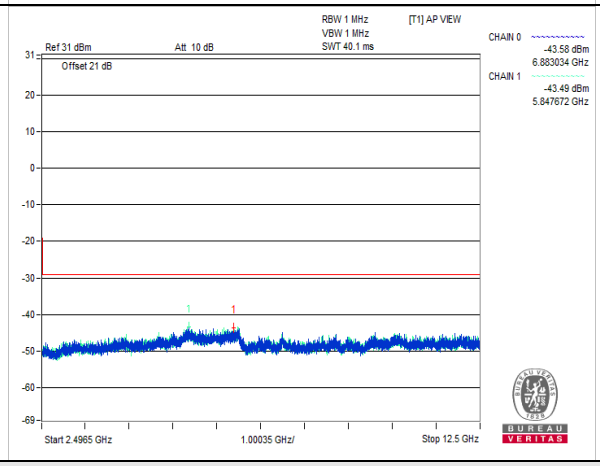






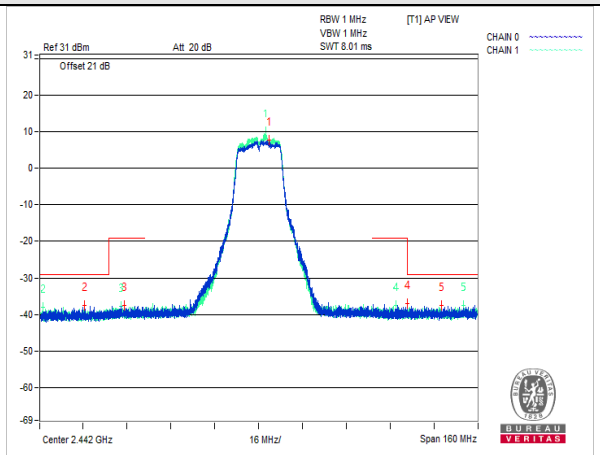


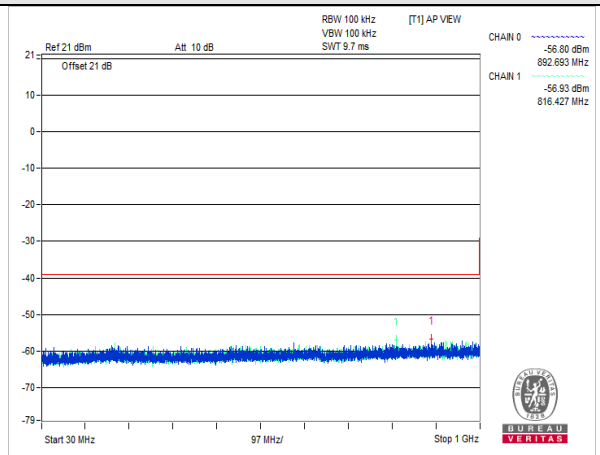


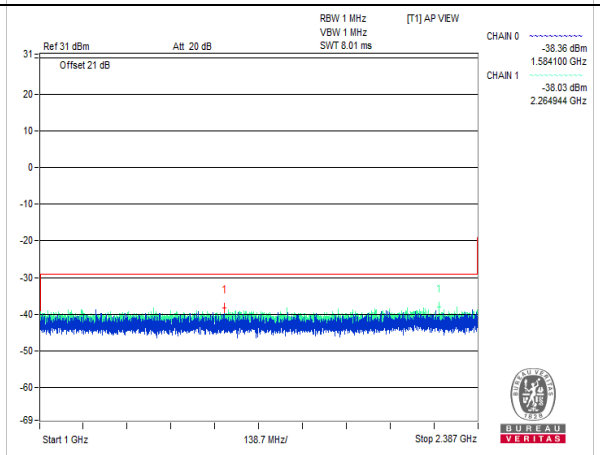


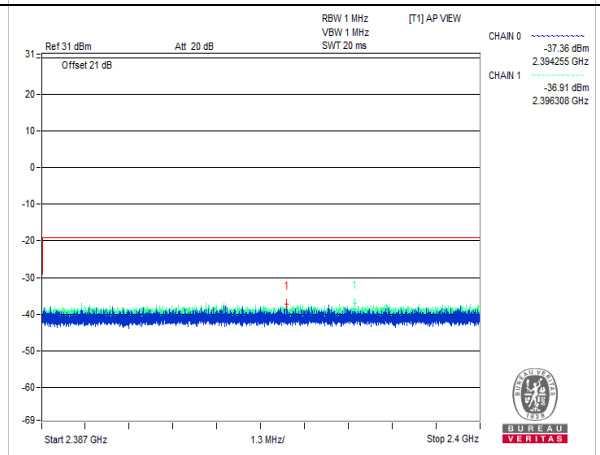
CH 7 (2442MHz)

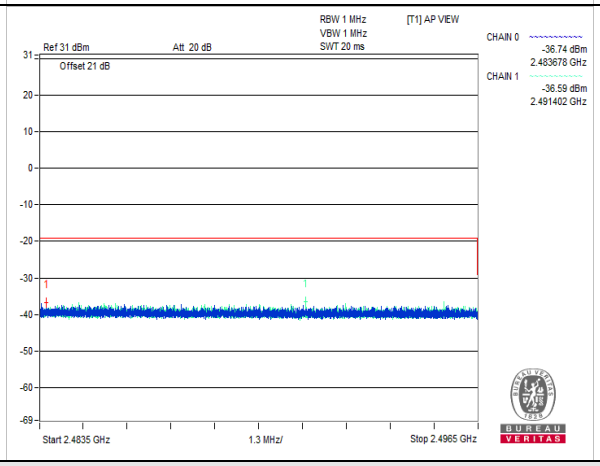
Vmax.

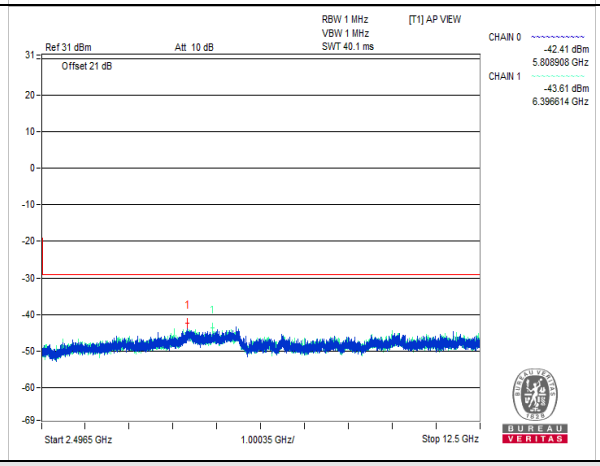






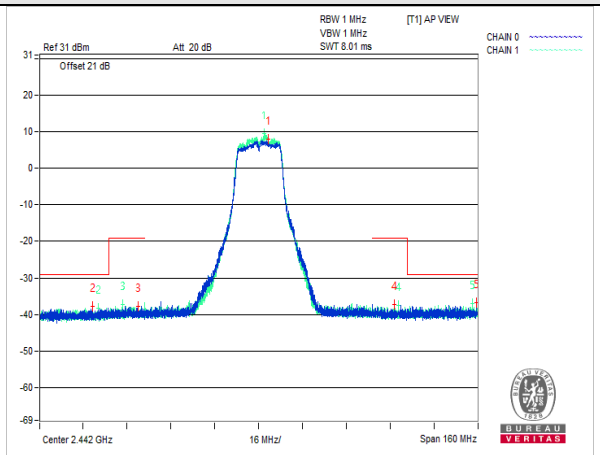


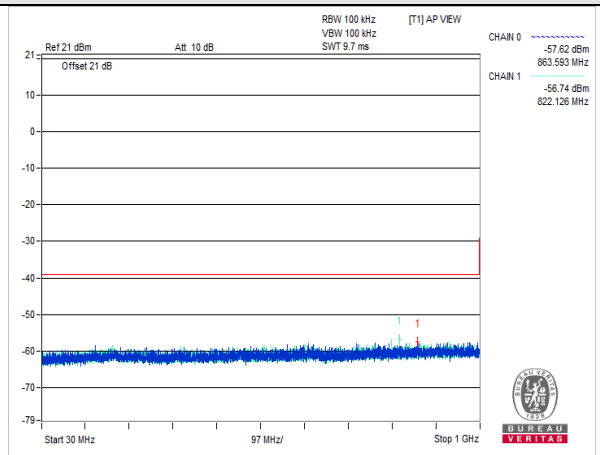


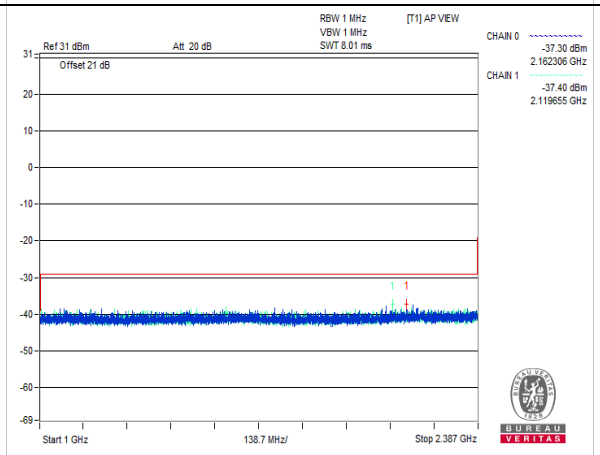


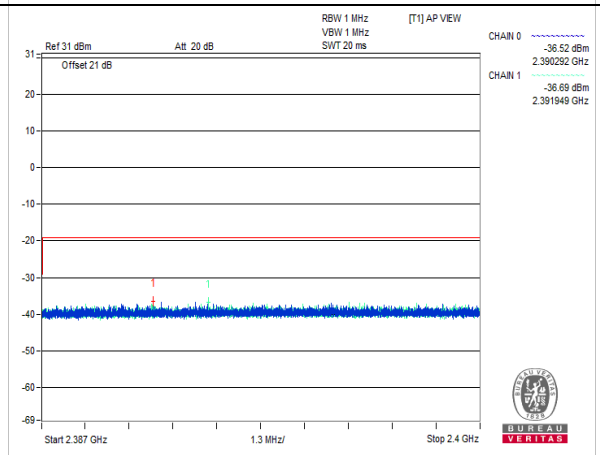
CH 7 (2442MHz)

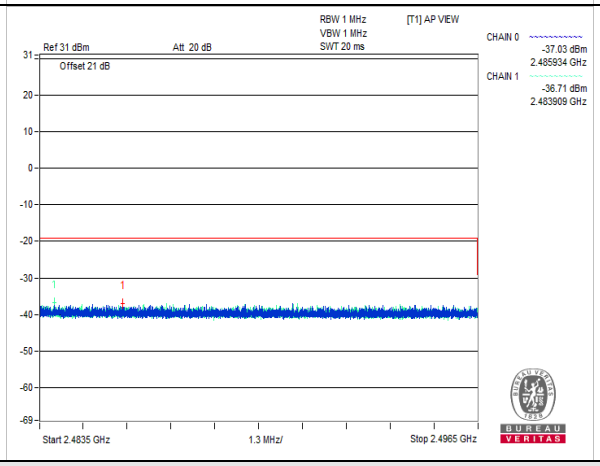
Vmin.

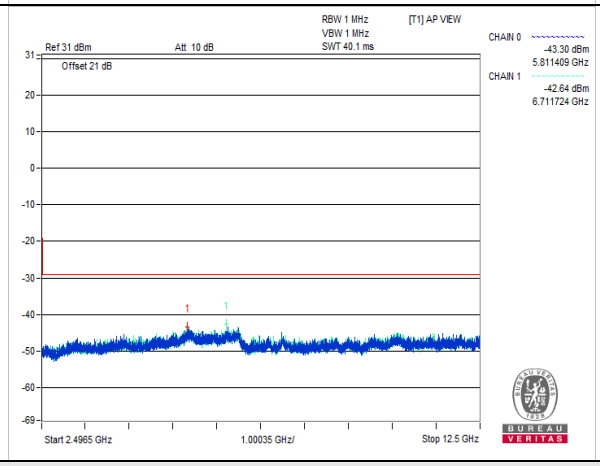






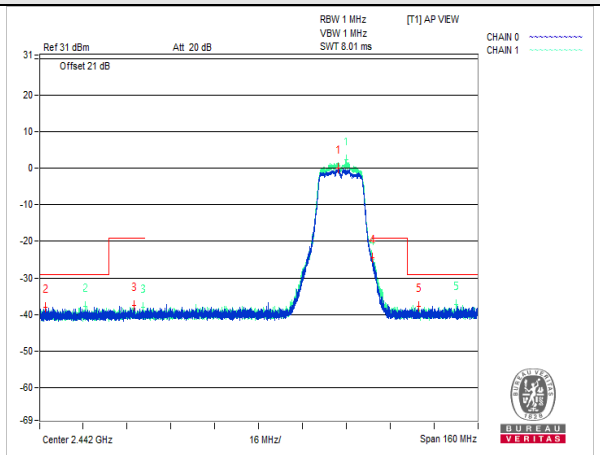


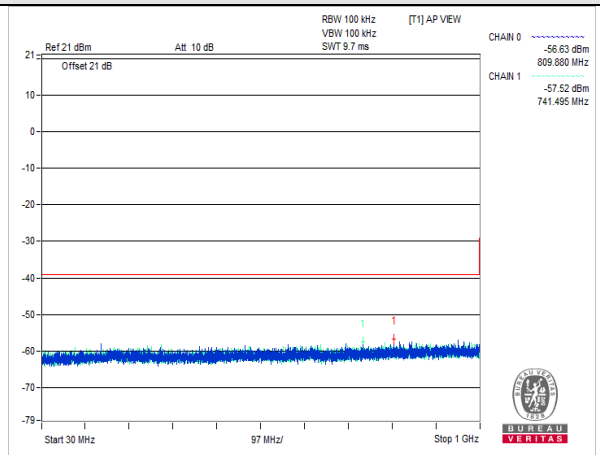


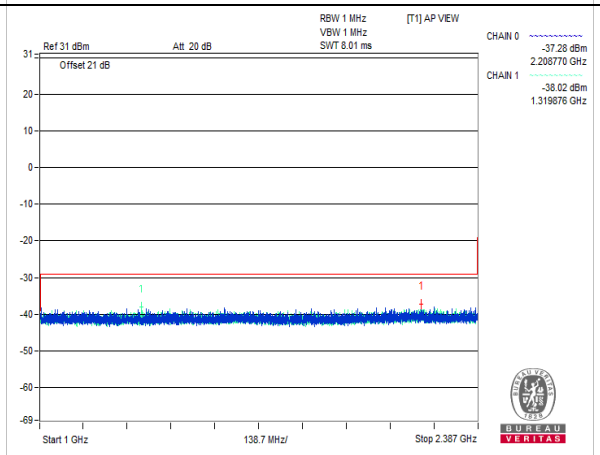


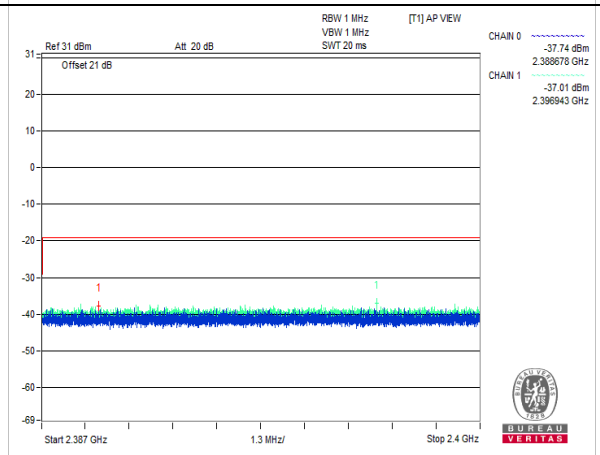
CH 7 (2442MHz)

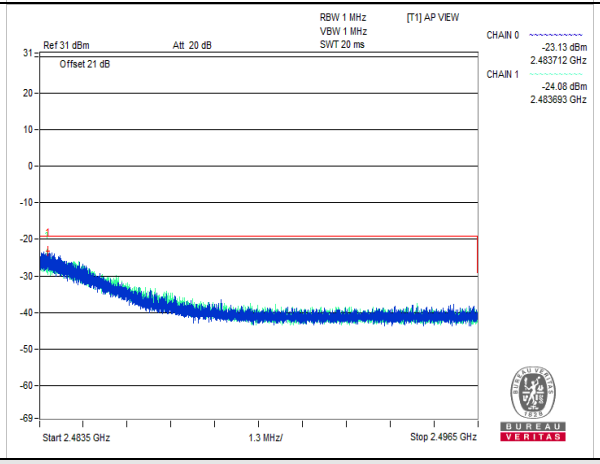
Vnormal

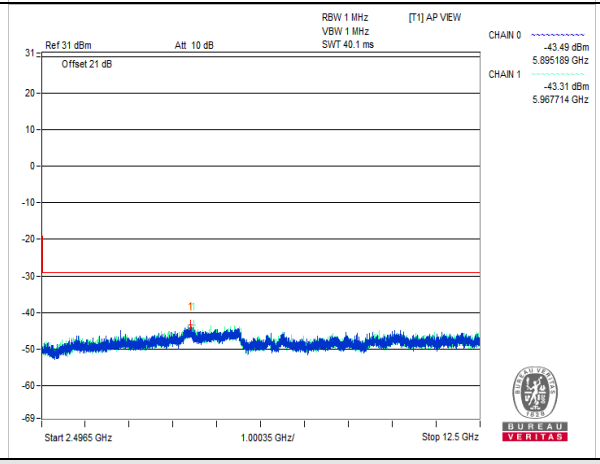






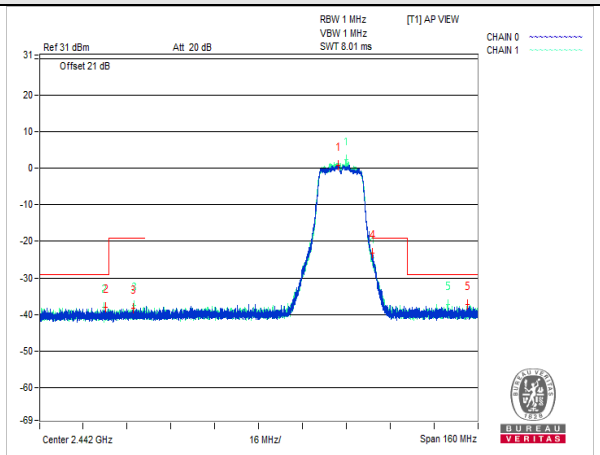


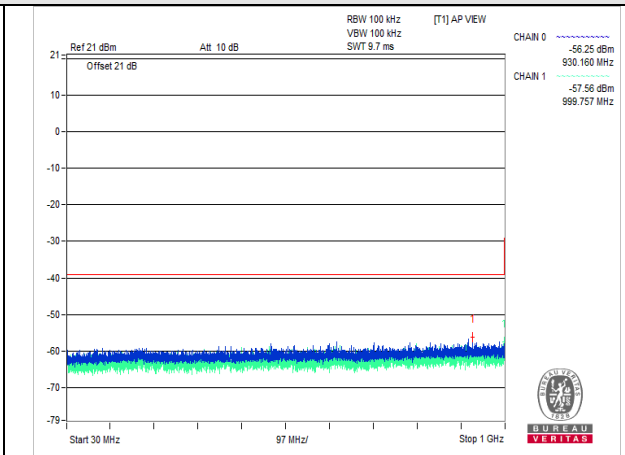


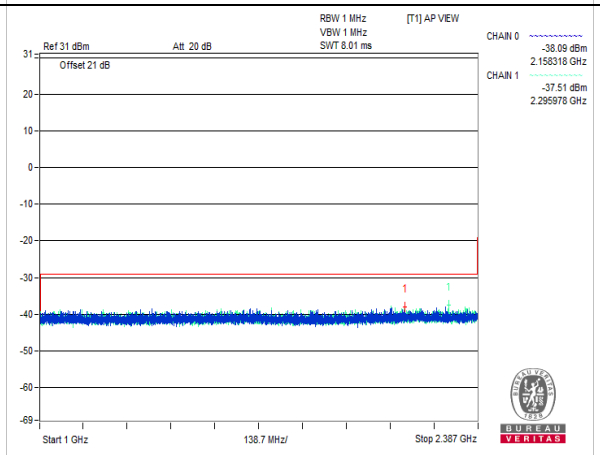


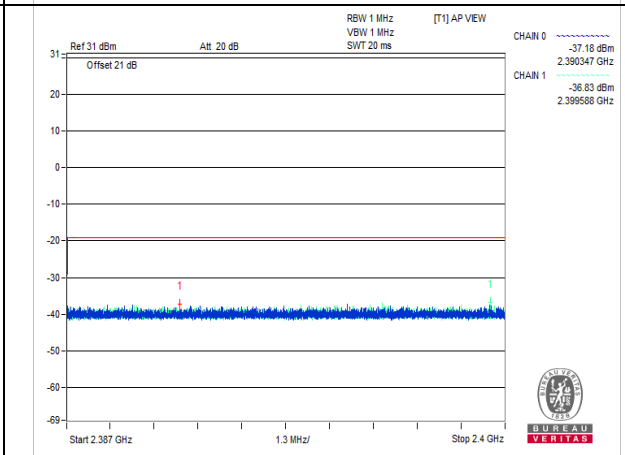
CH 13 (2472MHz)

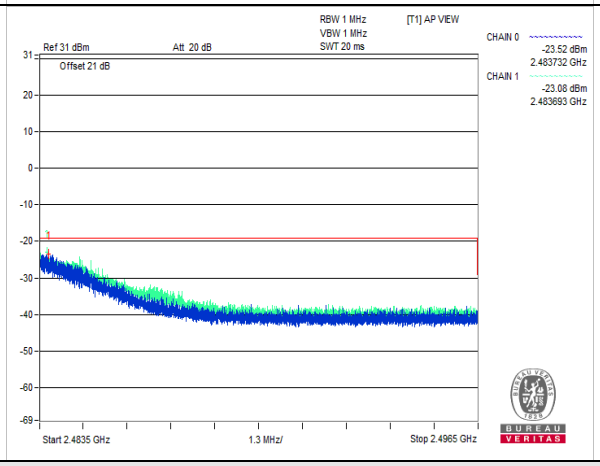
Vmax.

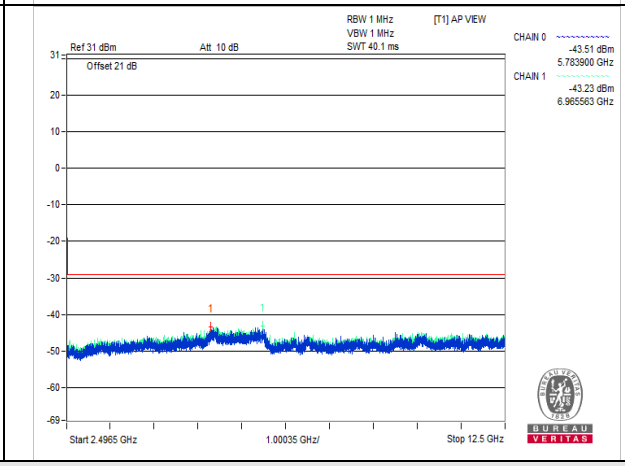






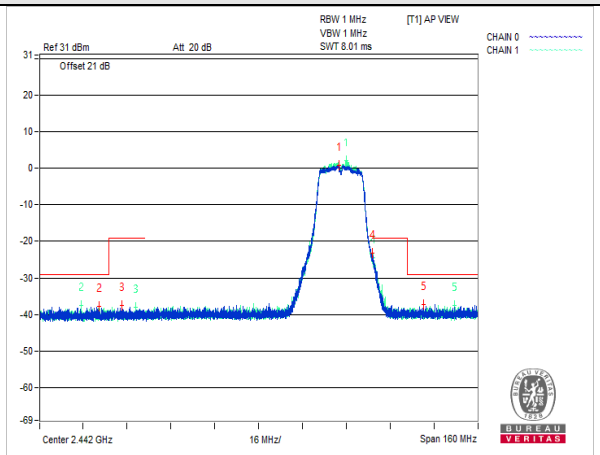


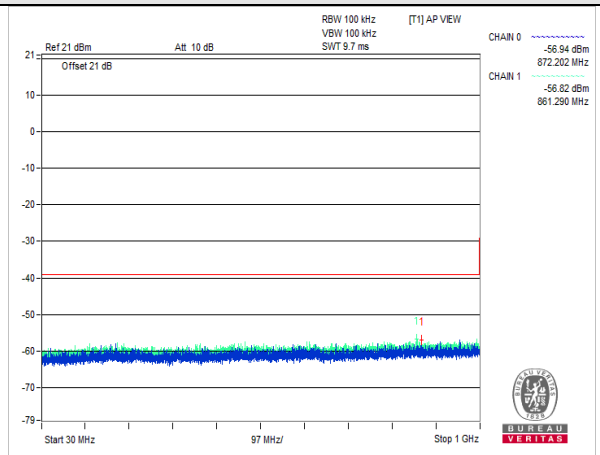


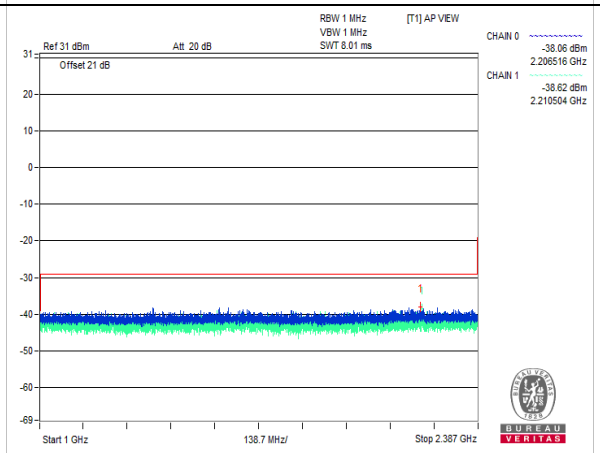


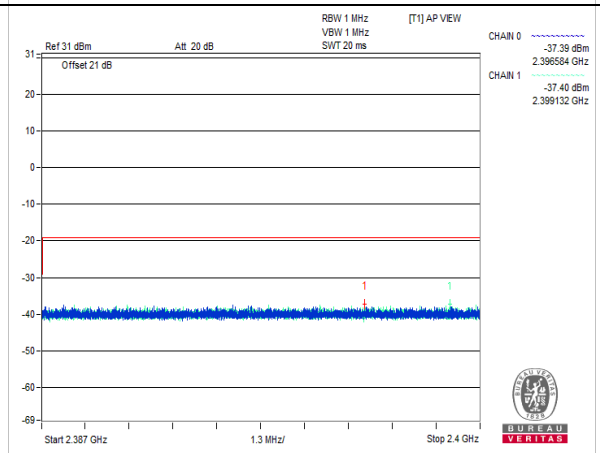
CH 13 (2472MHz)

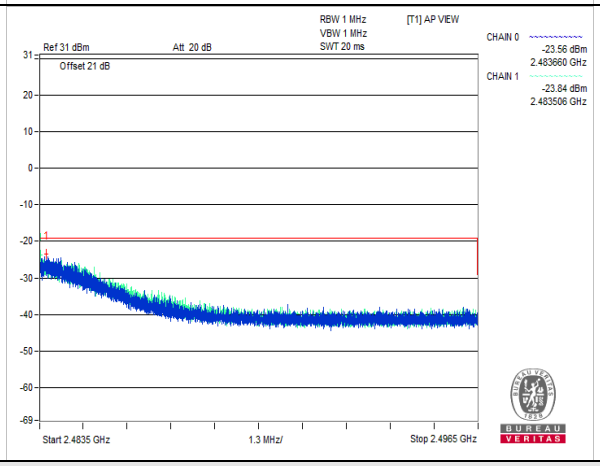
Vmin.

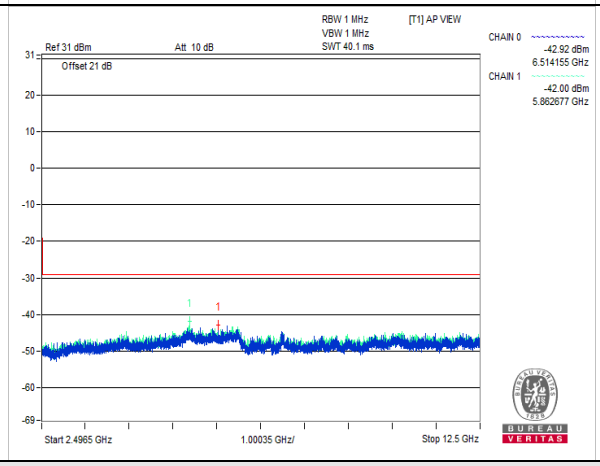












CH 13 (2472MHz)

[Worst result] x [Number of antenna ports]

TEST CHANNEL		CH 1 (2412MHz)		
TEST CONDITION	FREQUENCY RANGE(MHz)	MEASURE. VALUE (uW)	LIMIT (uW)	RESULT
V_{normal}	30.0 to 1000.0	0.003750	0.25	PASS
	1000.0 to 2387.0	0.374136	2.5	PASS
	2387.0 to 2400.0	9.661176	25	PASS
	2483.5 to 2496.5	0.467768	25	PASS
	2496.5 to 12500.0	0.087706	2.5	PASS
$V_{max.}$	30.0 to 1000.0	0.003758	0.25	PASS
	1000.0 to 2387.0	0.325110	2.5	PASS
	2387.0 to 2400.0	9.463026	25	PASS
	2483.5 to 2496.5	0.444662	25	PASS
	2496.5 to 12500.0	0.091840	2.5	PASS
$V_{min.}$	30.0 to 1000.0	0.003954	0.25	PASS
	1000.0 to 2387.0	0.318442	2.5	PASS
	2387.0 to 2400.0	9.931846	25	PASS
	2483.5 to 2496.5	0.449810	25	PASS
	2496.5 to 12500.0	0.087102	2.5	PASS
TEST CHANNEL		CH 7 (2442MHz)		
V_{normal}	30.0 to 1000.0	0.004036	0.25	PASS
	1000.0 to 2387.0	0.379342	2.5	PASS
	2387.0 to 2400.0	0.428578	25	PASS
	2483.5 to 2496.5	0.431548	25	PASS
	2496.5 to 12500.0	0.089542	2.5	PASS
$V_{max.}$	30.0 to 1000.0	0.004178	0.25	PASS
	1000.0 to 2387.0	0.314796	2.5	PASS
	2387.0 to 2400.0	0.407408	25	PASS
	2483.5 to 2496.5	0.438560	25	PASS
	2496.5 to 12500.0	0.114824	2.5	PASS
$V_{min.}$	30.0 to 1000.0	0.004236	0.25	PASS
	1000.0 to 2387.0	0.372418	2.5	PASS
	2387.0 to 2400.0	0.445688	25	PASS
	2483.5 to 2496.5	0.426608	25	PASS
	2496.5 to 12500.0	0.108900	2.5	PASS

TEST CHANNEL		CH 13 (2472MHz)		
TEST CONDITION	FREQUENCY RANGE(MHz)	MEASURE. VALUE (uW)	LIMIT (uW)	RESULT
V_{normal}	30.0 to 1000.0	0.004346	0.25	PASS
	1000.0 to 2387.0	0.374136	2.5	PASS
	2387.0 to 2400.0	0.398134	25	PASS
	2483.5 to 2496.5	9.728144	25	PASS
	2496.5 to 12500.0	0.093332	2.5	PASS
$V_{max.}$	30.0 to 1000.0	0.004742	0.25	PASS
	1000.0 to 2387.0	0.354838	2.5	PASS
	2387.0 to 2400.0	0.414982	25	PASS
	2483.5 to 2496.5	9.840790	25	PASS
	2496.5 to 12500.0	0.095068	2.5	PASS
$V_{min.}$	30.0 to 1000.0	0.004160	0.25	PASS
	1000.0 to 2387.0	0.312630	2.5	PASS
	2387.0 to 2400.0	0.364780	25	PASS
	2483.5 to 2496.5	8.811098	25	PASS
	2496.5 to 12500.0	0.126192	2.5	PASS

802.11n (HT20)
Chain 0

TEST CHANNEL		CH 1 (2412MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(uW)	LIMIT (uW)	RESULT
V_{normal}	30.0 to 1000.0	859.592	0.001807	0.125	PASS
	1000.0 to 2387.0	2323.544	0.137088	1.25	PASS
	2387.0 to 2400.0	2399.874	4.864072	12.5	PASS
	2483.5 to 2496.5	2493.459	0.197697	12.5	PASS
	2496.5 to 12500.0	5915.196	0.046666	1.25	PASS
$V_{max.}$	30.0 to 1000.0	858.016	0.001321	0.125	PASS
	1000.0 to 2387.0	2111.853	0.126765	1.25	PASS
	2387.0 to 2400.0	2399.985	4.591980	12.5	PASS
	2483.5 to 2496.5	2489.428	0.225424	12.5	PASS
	2496.5 to 12500.0	6990.572	0.045814	1.25	PASS
$V_{min.}$	30.0 to 1000.0	963.867	0.002244	0.125	PASS
	1000.0 to 2387.0	2182.244	0.149968	1.25	PASS
	2387.0 to 2400.0	2399.949	4.255984	12.5	PASS
	2483.5 to 2496.5	2491.054	0.205589	12.5	PASS
	2496.5 to 12500.0	6933.052	0.039355	1.25	PASS
TEST CHANNEL		CH 7 (2442MHz)			
V_{normal}	30.0 to 1000.0	923.976	0.001791	0.125	PASS
	1000.0 to 2387.0	2257.142	0.152757	1.25	PASS
	2387.0 to 2400.0	2393.851	0.235505	12.5	PASS
	2483.5 to 2496.5	2485.934	0.205116	12.5	PASS
	2496.5 to 12500.0	5773.896	0.046345	1.25	PASS
$V_{max.}$	30.0 to 1000.0	908.213	0.001581	0.125	PASS
	1000.0 to 2387.0	2378.678	0.181552	1.25	PASS
	2387.0 to 2400.0	2391.372	0.226464	12.5	PASS
	2483.5 to 2496.5	2485.809	0.216770	12.5	PASS
	2496.5 to 12500.0	6994.323	0.045920	1.25	PASS
$V_{min.}$	30.0 to 1000.0	982.782	0.001910	0.125	PASS
	1000.0 to 2387.0	2259.396	0.164816	1.25	PASS
	2387.0 to 2400.0	2394.397	0.199067	12.5	PASS
	2483.5 to 2496.5	2483.626	0.222844	12.5	PASS
	2496.5 to 12500.0	5900.190	0.042560	1.25	PASS

TEST CHANNEL		CH 13 (2472MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(uW)	LIMIT (uW)	RESULT
V_{normal}	30.0 to 1000.0	943.012	0.002143	0.125	PASS
	1000.0 to 2387.0	2316.783	0.164816	1.25	PASS
	2387.0 to 2400.0	2395.599	0.190108	12.5	PASS
	2483.5 to 2496.5	2483.560	4.405549	12.5	PASS
	2496.5 to 12500.0	5870.180	0.045709	1.25	PASS
$V_{max.}$	30.0 to 1000.0	866.382	0.002065	0.125	PASS
	1000.0 to 2387.0	1026.006	0.158855	1.25	PASS
	2387.0 to 2400.0	2396.696	0.204644	12.5	PASS
	2483.5 to 2496.5	2483.550	4.375221	12.5	PASS
	2496.5 to 12500.0	5885.185	0.042855	1.25	PASS
$V_{min.}$	30.0 to 1000.0	906.516	0.001941	0.125	PASS
	1000.0 to 2387.0	2181.897	0.135207	1.25	PASS
	2387.0 to 2400.0	2388.602	0.199067	12.5	PASS
	2483.5 to 2496.5	2483.628	4.055085	12.5	PASS
	2496.5 to 12500.0	6850.523	0.039446	1.25	PASS

NOTE: 1. The spectrum plots are attached on the following pages.

Chain 1

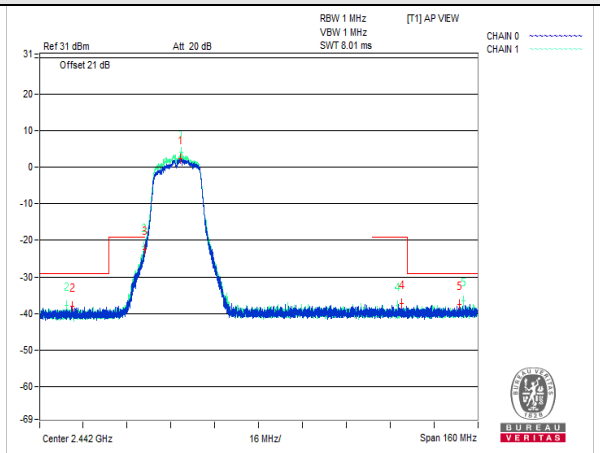
TEST CHANNEL		CH 1 (2412MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(uW)	LIMIT (uW)	RESULT
V_{normal}	30.0 to 1000.0	948.226	0.001754	0.125	PASS
	1000.0 to 2387.0	1083.220	0.169044	1.25	PASS
	2387.0 to 2400.0	2399.980	4.436086	12.5	PASS
	2483.5 to 2496.5	2489.632	0.187499	12.5	PASS
	2496.5 to 12500.0	6519.157	0.053580	1.25	PASS
$V_{max.}$	30.0 to 1000.0	865.655	0.002301	0.125	PASS
	1000.0 to 2387.0	2239.111	0.166725	1.25	PASS
	2387.0 to 2400.0	2399.995	4.720630	12.5	PASS
	2483.5 to 2496.5	2495.084	0.228034	12.5	PASS
	2496.5 to 12500.0	5756.390	0.041687	1.25	PASS
$V_{min.}$	30.0 to 1000.0	949.075	0.001923	0.125	PASS
	1000.0 to 2387.0	1462.737	0.153462	1.25	PASS
	2387.0 to 2400.0	2399.894	4.375221	12.5	PASS
	2483.5 to 2496.5	2486.847	0.217771	12.5	PASS
	2496.5 to 12500.0	6860.526	0.042364	1.25	PASS
TEST CHANNEL		CH 7 (2442MHz)			
V_{normal}	30.0 to 1000.0	996.241	0.002317	0.125	PASS
	1000.0 to 2387.0	2370.876	0.170216	1.25	PASS
	2387.0 to 2400.0	2399.764	0.215774	12.5	PASS
	2483.5 to 2496.5	2484.827	0.220800	12.5	PASS
	2496.5 to 12500.0	5891.437	0.048753	1.25	PASS
$V_{max.}$	30.0 to 1000.0	918.641	0.001766	0.125	PASS
	1000.0 to 2387.0	2254.714	0.152405	1.25	PASS
	2387.0 to 2400.0	2387.027	0.210863	12.5	PASS
	2483.5 to 2496.5	2483.846	0.205589	12.5	PASS
	2496.5 to 12500.0	6926.800	0.046026	1.25	PASS
$V_{min.}$	30.0 to 1000.0	927.735	0.001770	0.125	PASS
	1000.0 to 2387.0	1107.319	0.177011	1.25	PASS
	2387.0 to 2400.0	2389.876	0.190108	12.5	PASS
	2483.5 to 2496.5	2495.029	0.226464	12.5	PASS
	2496.5 to 12500.0	5733.882	0.046026	1.25	PASS

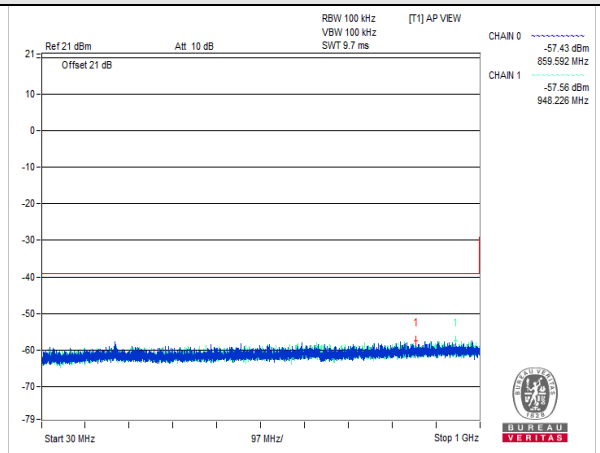
TEST CHANNEL		CH 13 (2472MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(uW)	LIMIT (uW)	RESULT
V_{normal}	30.0 to 1000.0	928.583	0.001687	0.125	PASS
	1000.0 to 2387.0	1934.664	0.167880	1.25	PASS
	2387.0 to 2400.0	2387.983	0.202768	12.5	PASS
	2483.5 to 2496.5	2483.623	3.006076	12.5	PASS
	2496.5 to 12500.0	6510.404	0.048978	1.25	PASS
$V_{max.}$	30.0 to 1000.0	918.641	0.001866	0.125	PASS
	1000.0 to 2387.0	2204.956	0.167880	1.25	PASS
	2387.0 to 2400.0	2399.770	0.216272	12.5	PASS
	2483.5 to 2496.5	2483.532	4.036454	12.5	PASS
	2496.5 to 12500.0	5902.691	0.041783	1.25	PASS
$V_{min.}$	30.0 to 1000.0	855.955	0.001683	0.125	PASS
	1000.0 to 2387.0	1534.168	0.157398	1.25	PASS
	2387.0 to 2400.0	2395.557	0.193197	12.5	PASS
	2483.5 to 2496.5	2483.517	3.723917	12.5	PASS
	2496.5 to 12500.0	5933.952	0.047534	1.25	PASS

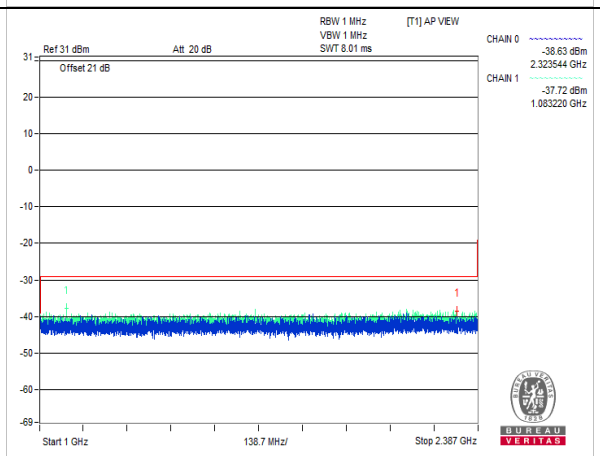
NOTE: 1. The spectrum plots are attached on the following pages.

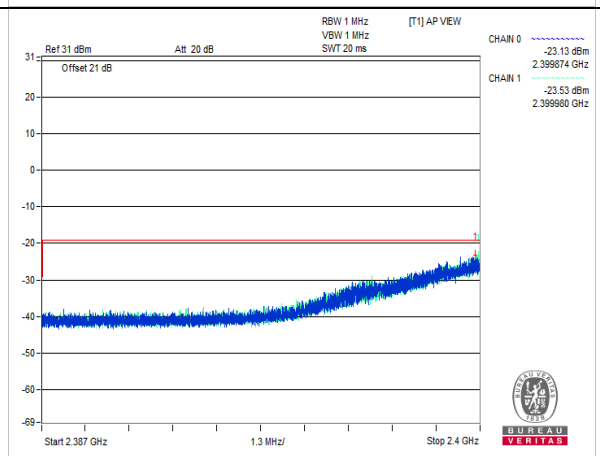
Graph

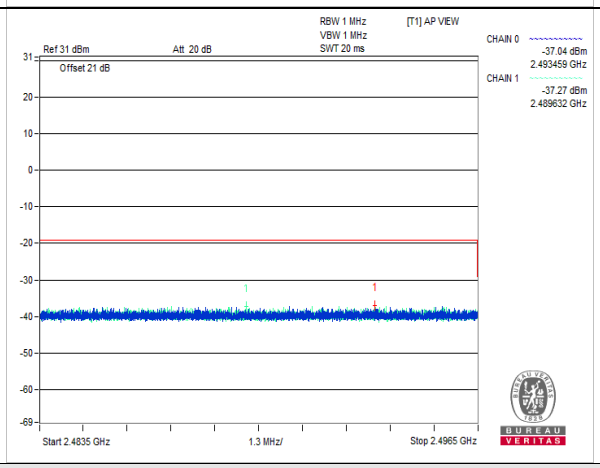
Vnormal

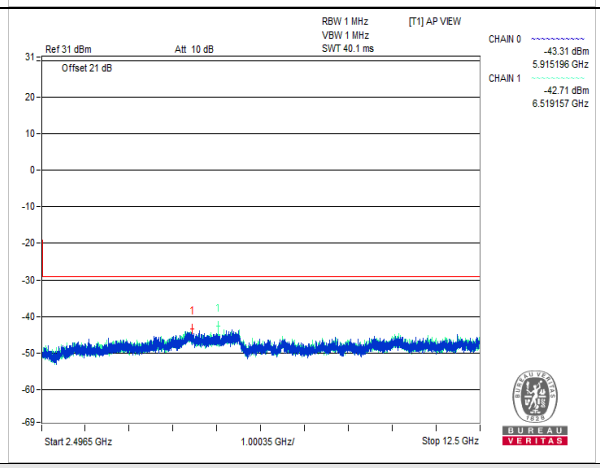






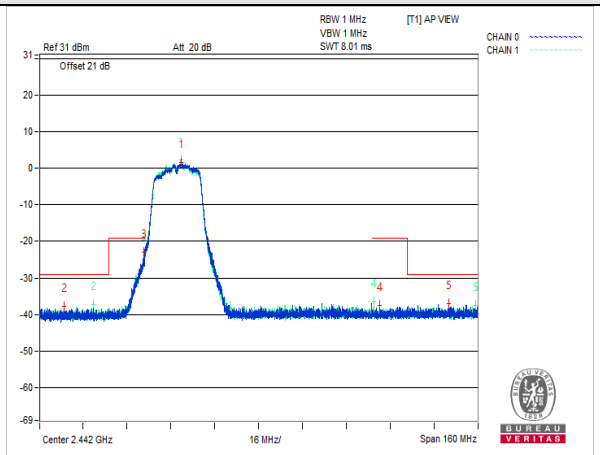


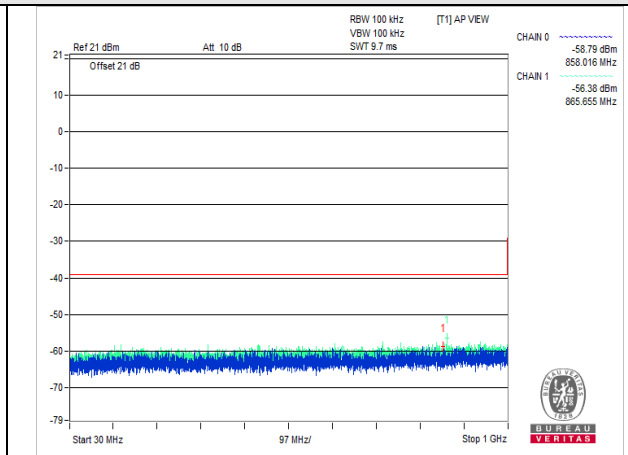


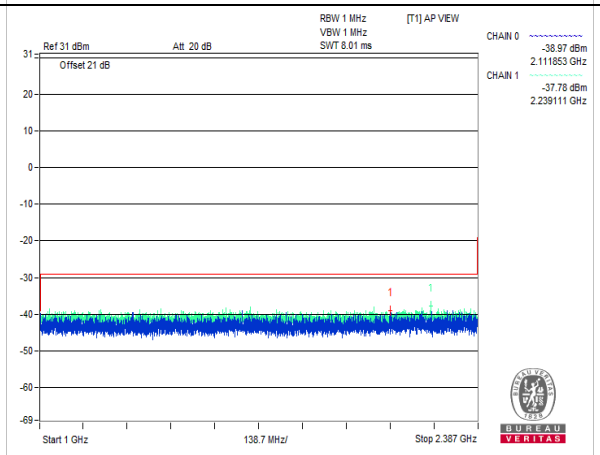


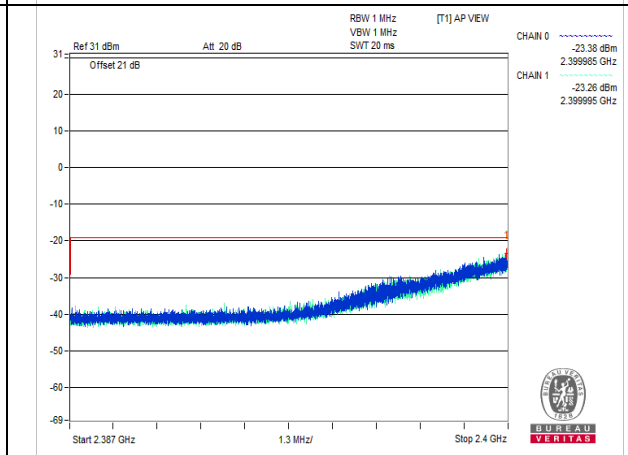
CH 1 (2412MHz)

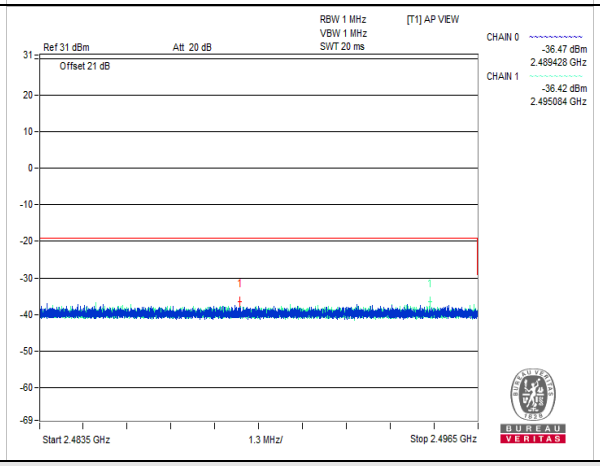
Vmax.

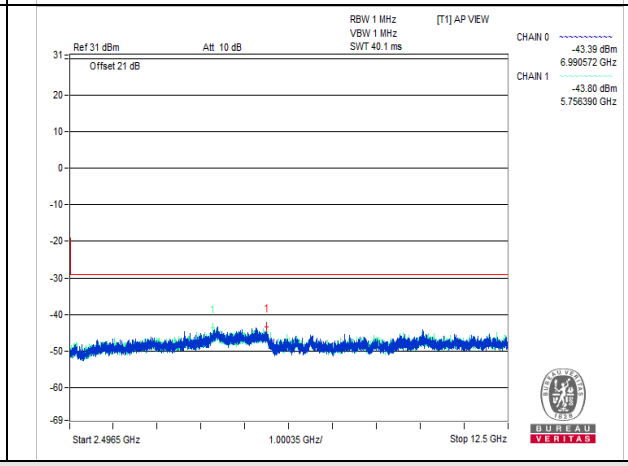






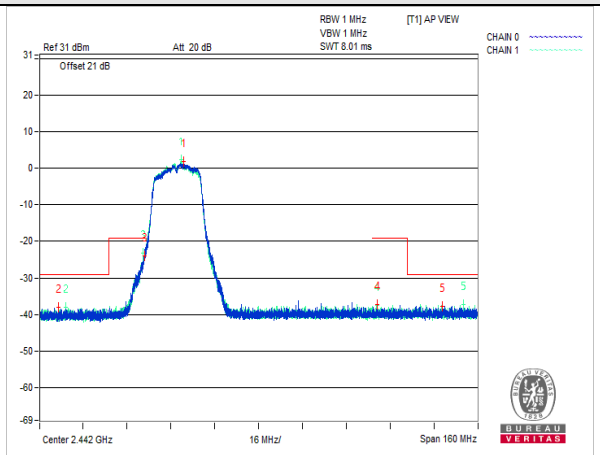


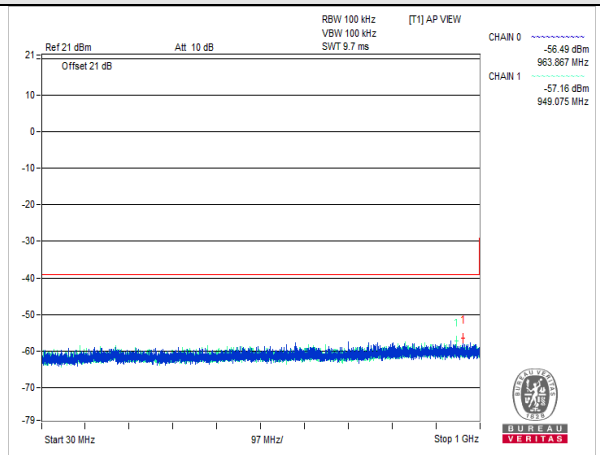


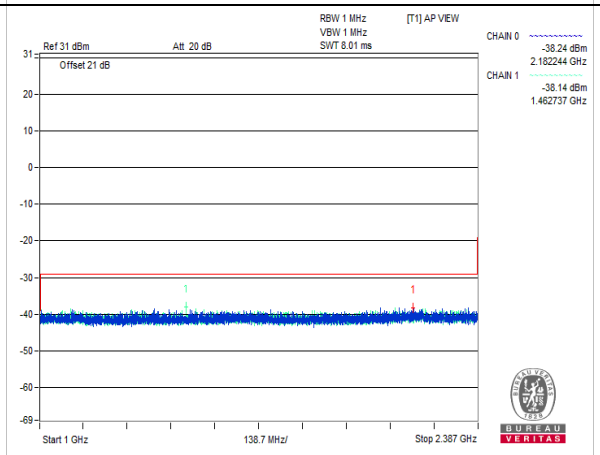


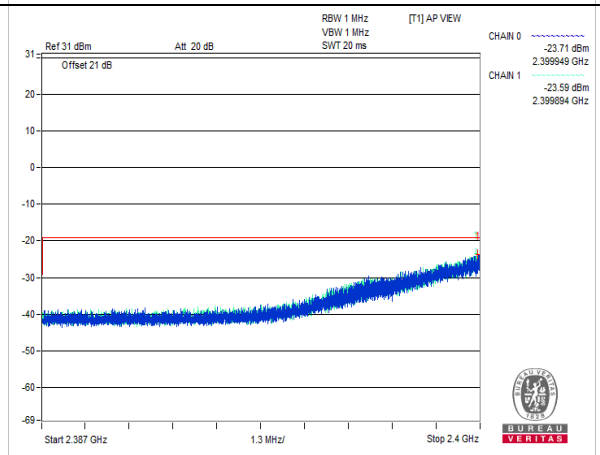
CH 1 (2412MHz)

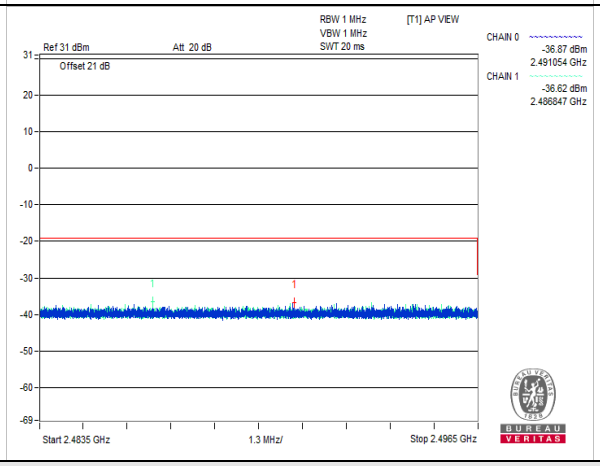
Vmin.

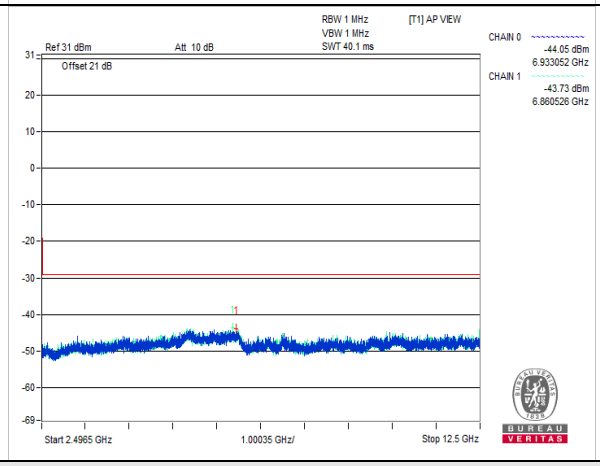






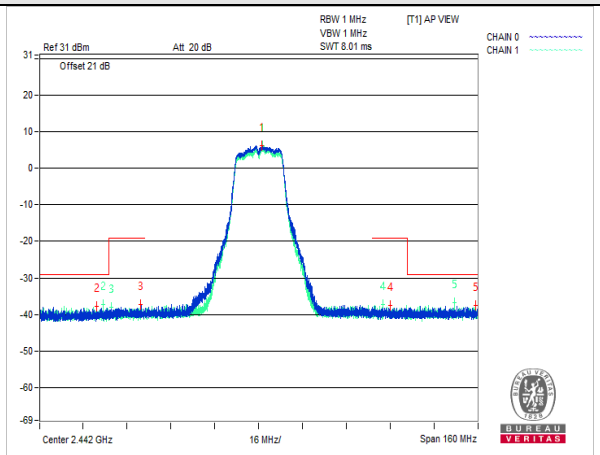


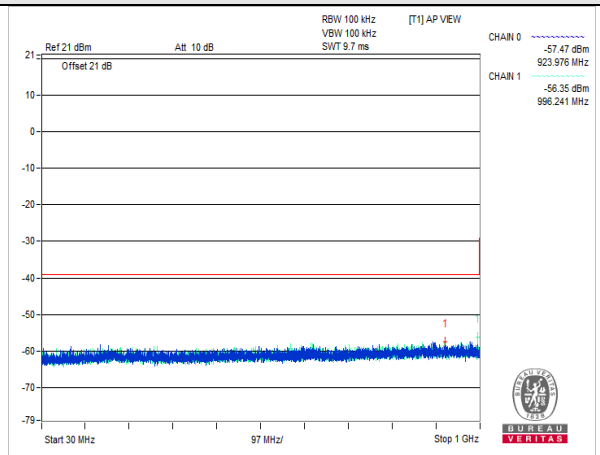


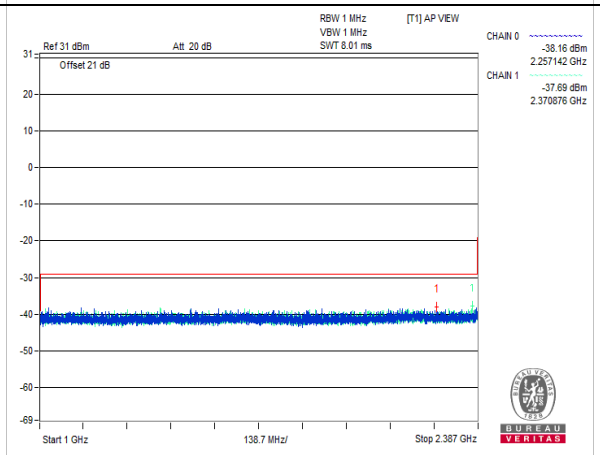


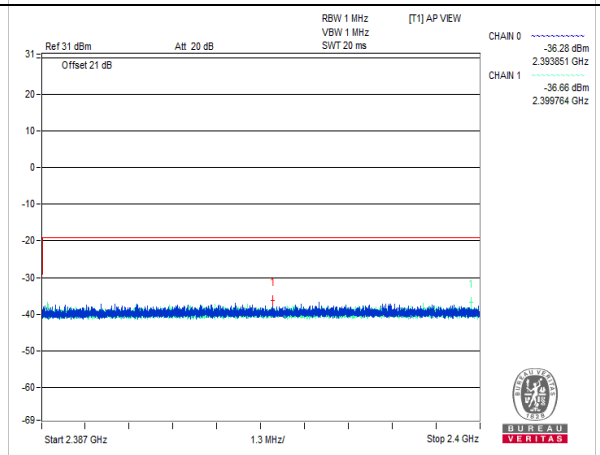
CH 1 (2412MHz)

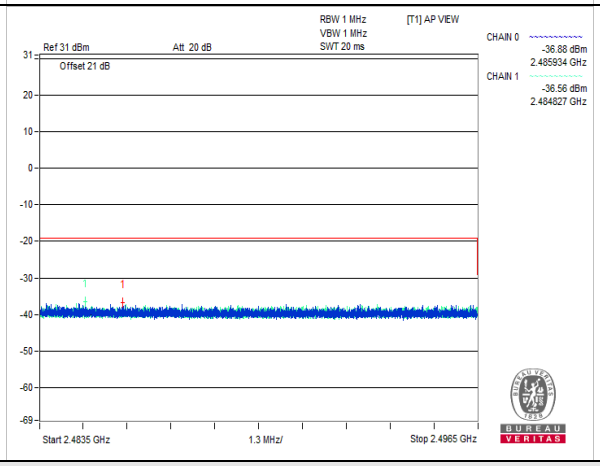
Vnormal

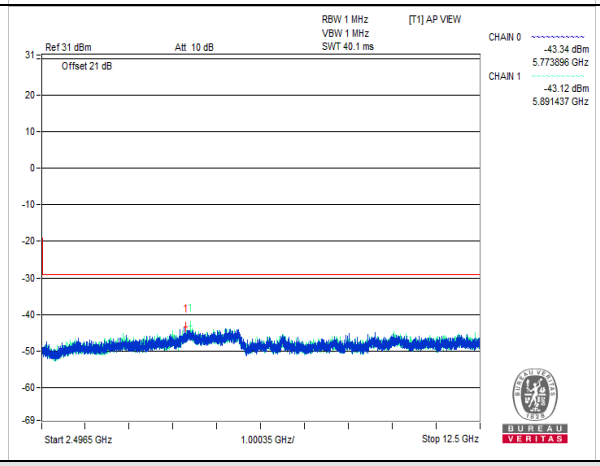






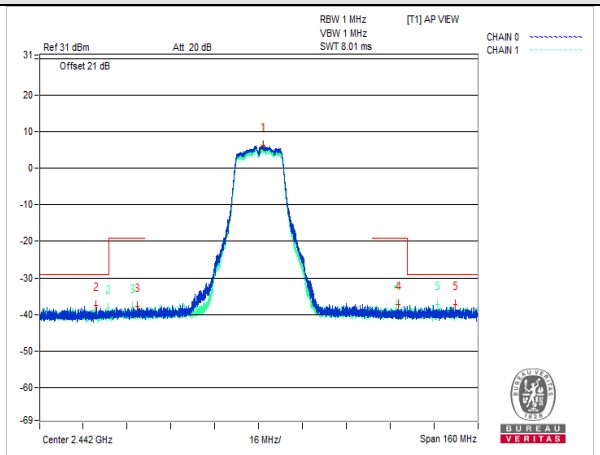


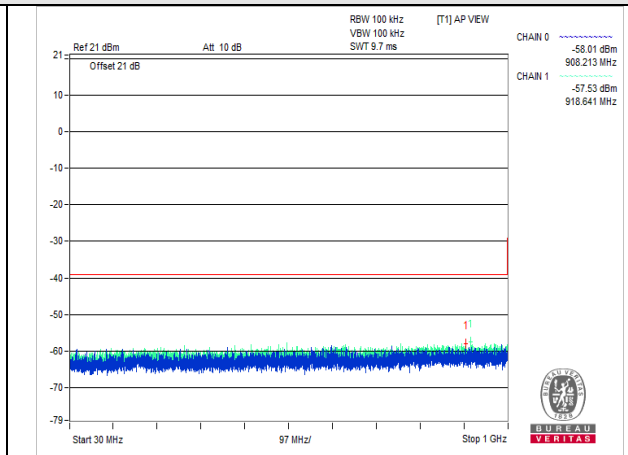


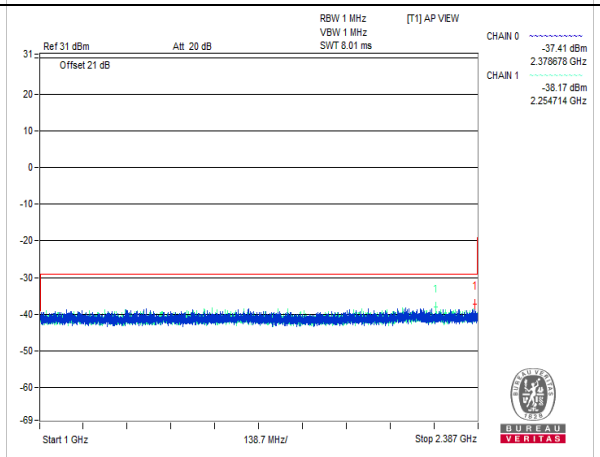


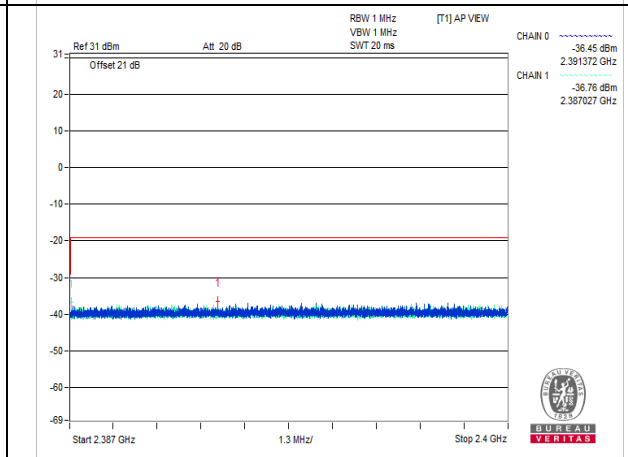
CH 7 (2442MHz)

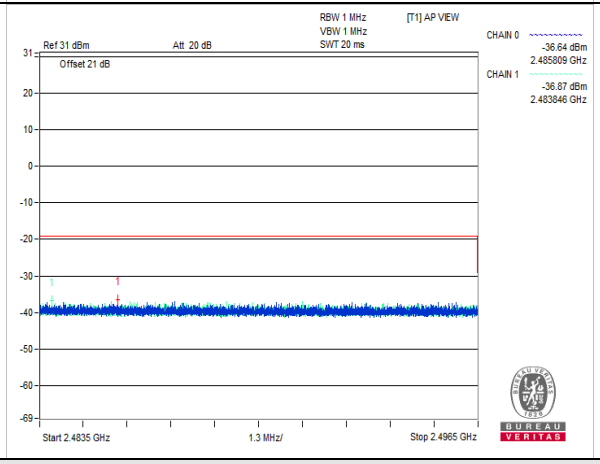
Vmax.

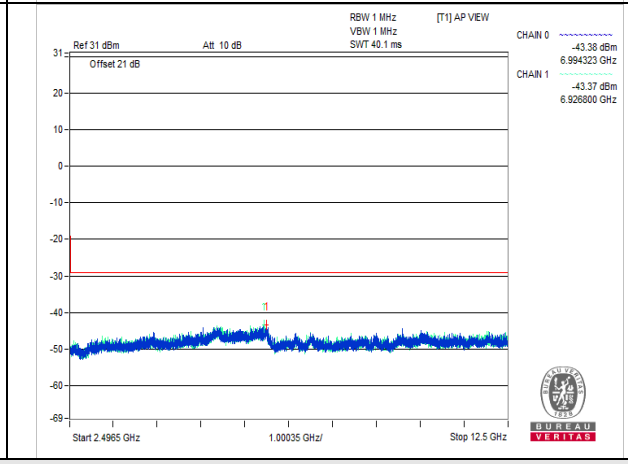






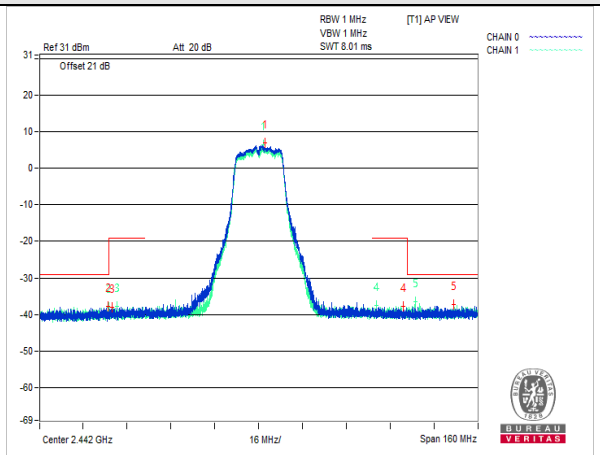


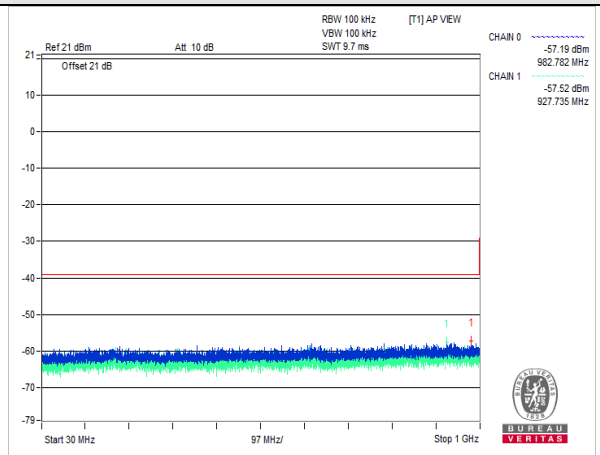


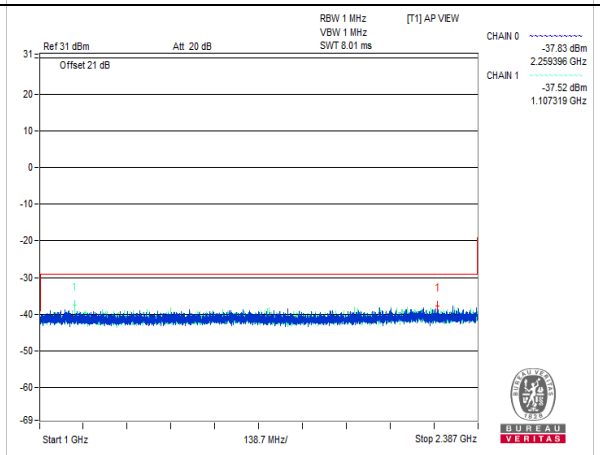


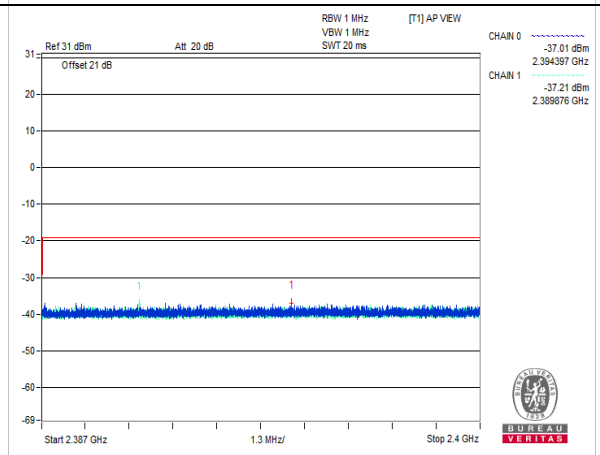
CH 7 (2442MHz)

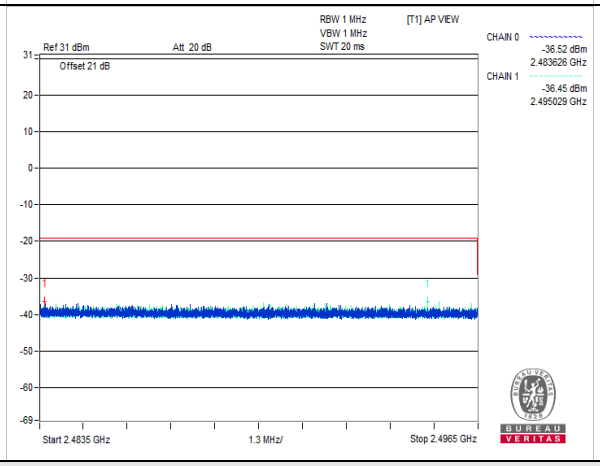
Vmin.

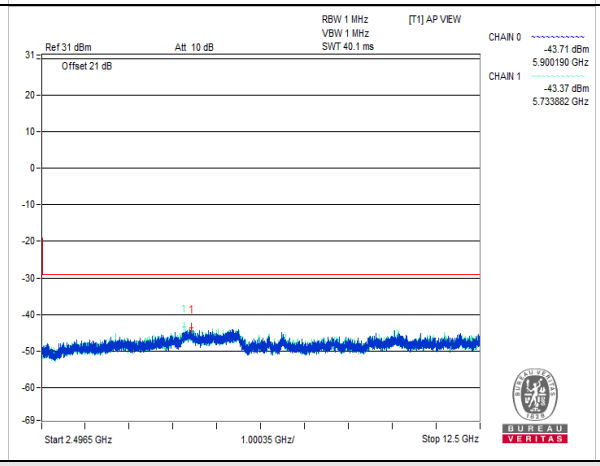






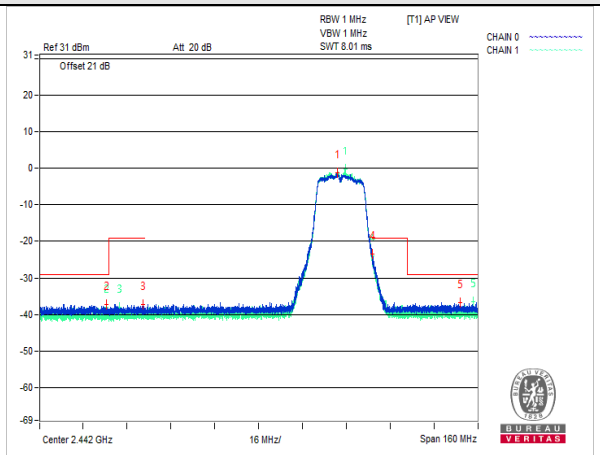


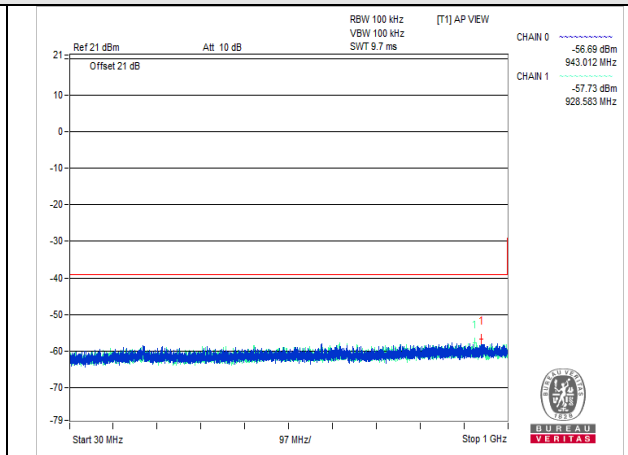


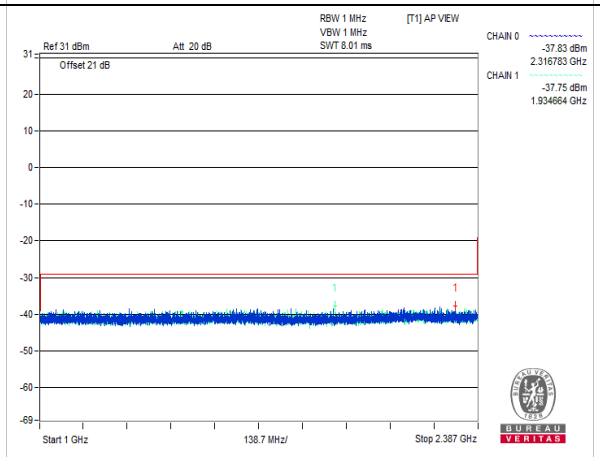


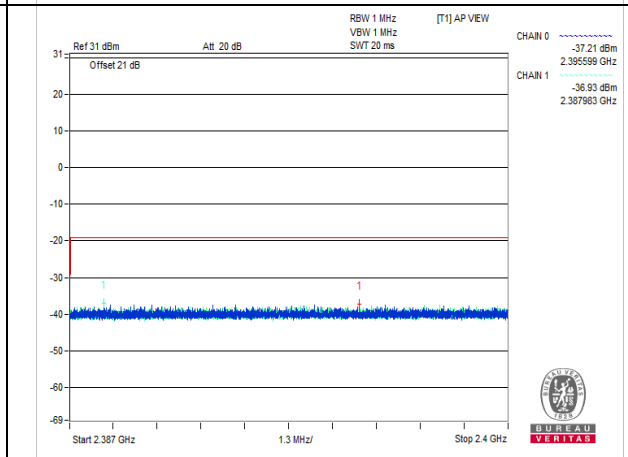
CH 7 (2442MHz)

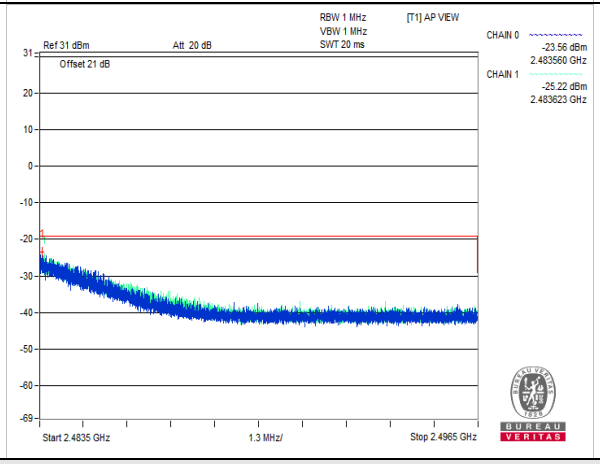
Vnormal

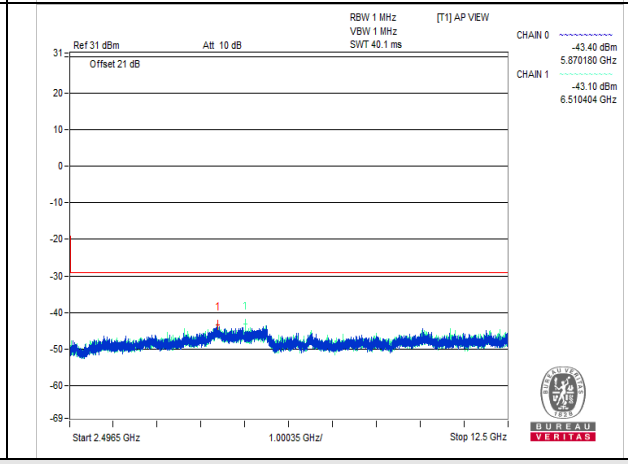






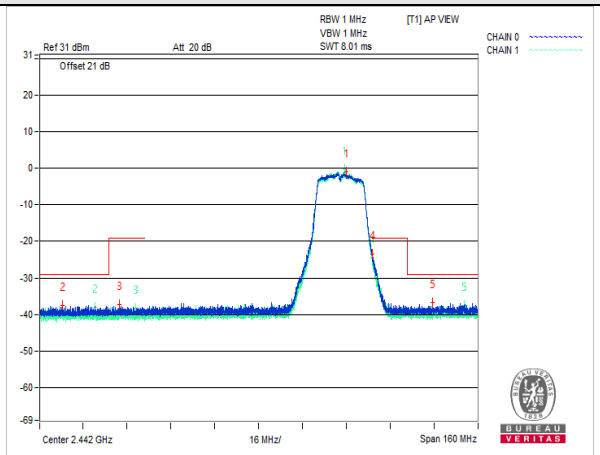


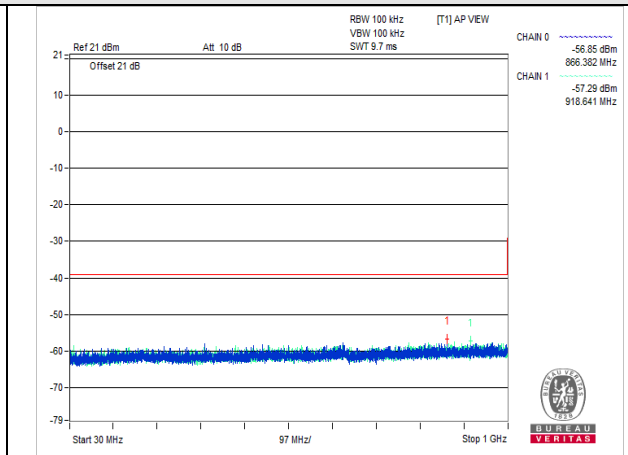


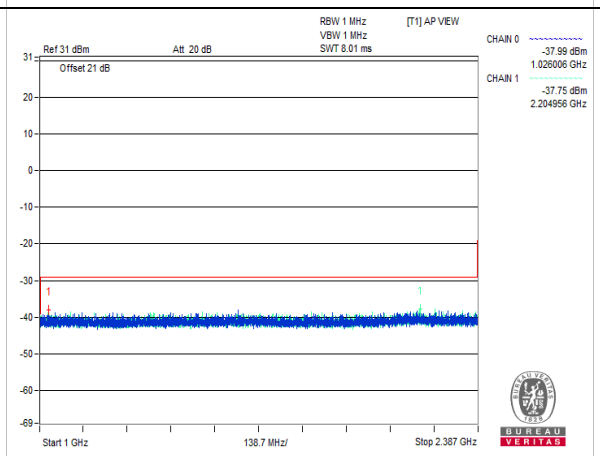


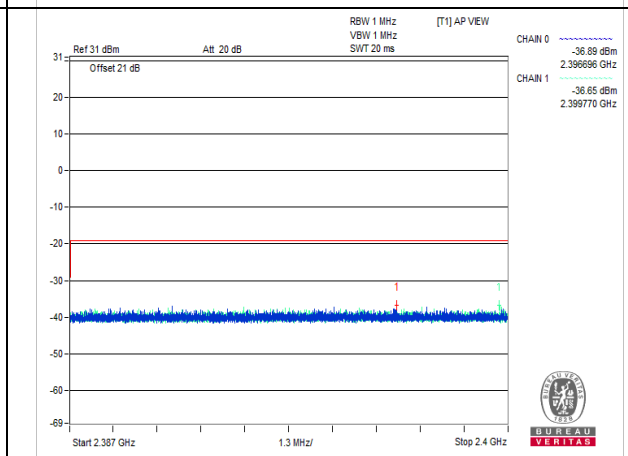
CH 13 (2472MHz)

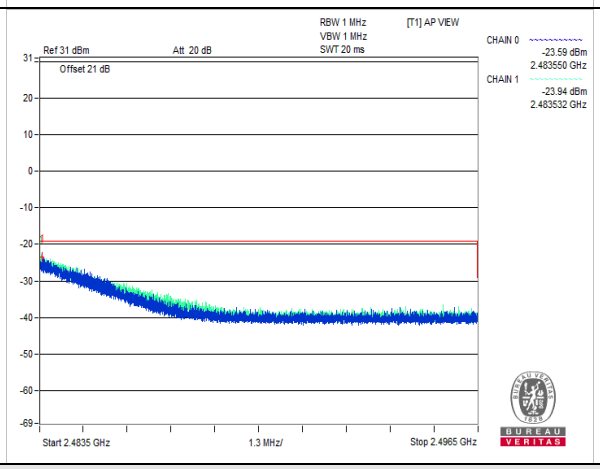
Vmax.

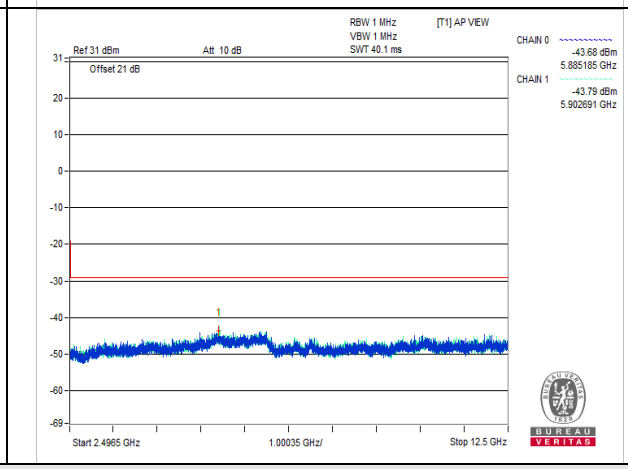






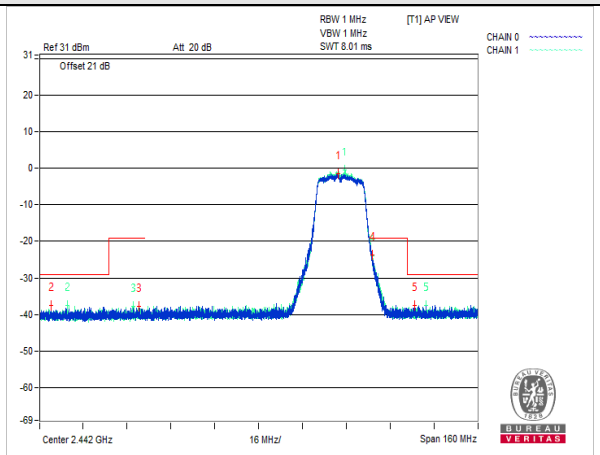


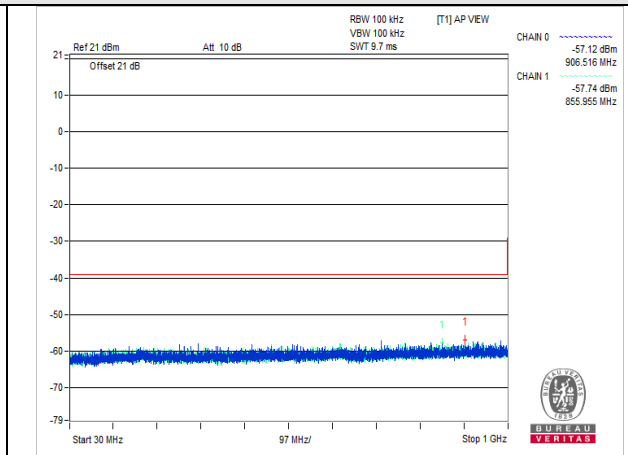


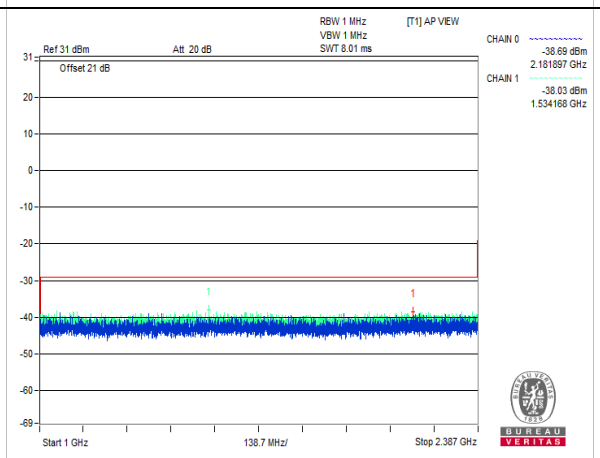


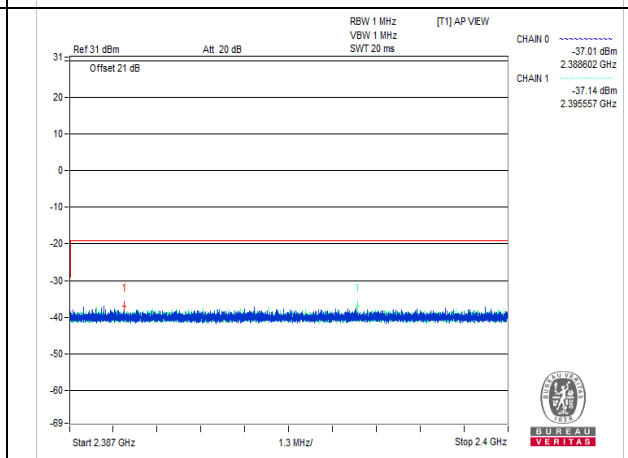
CH 13 (2472MHz)

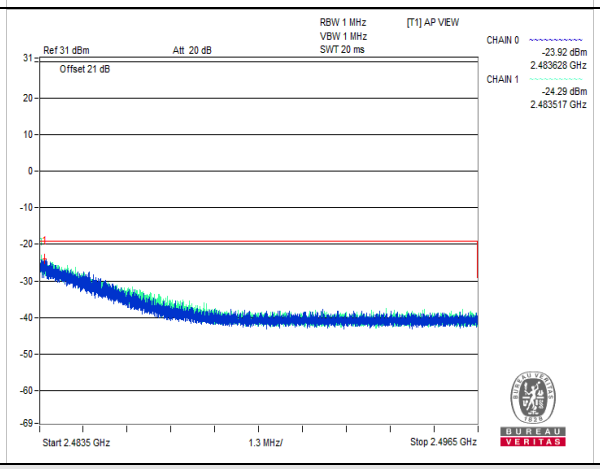
Vmin.

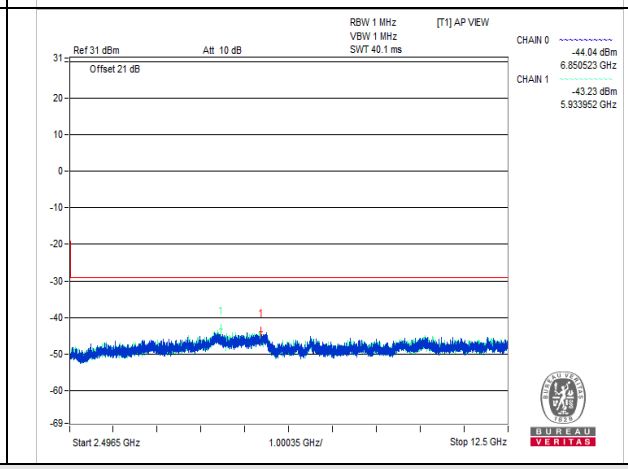












CH 13 (2472MHz)

[Worst result] x [Number of antenna ports]

TEST CHANNEL		CH 1 (2412MHz)		
TEST CONDITION	FREQUENCY RANGE(MHz)	MEASURE. VALUE (uW)	LIMIT (uW)	RESULT
V_{normal}	30.0 to 1000.0	0.003614	0.25	PASS
	1000.0 to 2387.0	0.338088	2.5	PASS
	2387.0 to 2400.0	9.728144	25	PASS
	2483.5 to 2496.5	0.395394	25	PASS
	2496.5 to 12500.0	0.107160	2.5	PASS
$V_{max.}$	30.0 to 1000.0	0.004602	0.25	PASS
	1000.0 to 2387.0	0.333450	2.5	PASS
	2387.0 to 2400.0	9.441260	25	PASS
	2483.5 to 2496.5	0.456068	25	PASS
	2496.5 to 12500.0	0.091628	2.5	PASS
$V_{min.}$	30.0 to 1000.0	0.004488	0.25	PASS
	1000.0 to 2387.0	0.306924	2.5	PASS
	2387.0 to 2400.0	8.750442	25	PASS
	2483.5 to 2496.5	0.435542	25	PASS
	2496.5 to 12500.0	0.084728	2.5	PASS
TEST CHANNEL		CH 7 (2442MHz)		
V_{normal}	30.0 to 1000.0	0.004634	0.25	PASS
	1000.0 to 2387.0	0.340432	2.5	PASS
	2387.0 to 2400.0	0.471010	25	PASS
	2483.5 to 2496.5	0.441600	25	PASS
	2496.5 to 12500.0	0.097506	2.5	PASS
$V_{max.}$	30.0 to 1000.0	0.003532	0.25	PASS
	1000.0 to 2387.0	0.363104	2.5	PASS
	2387.0 to 2400.0	0.452928	25	PASS
	2483.5 to 2496.5	0.433540	25	PASS
	2496.5 to 12500.0	0.092052	2.5	PASS
$V_{min.}$	30.0 to 1000.0	0.003820	0.25	PASS
	1000.0 to 2387.0	0.354022	2.5	PASS
	2387.0 to 2400.0	0.398134	25	PASS
	2483.5 to 2496.5	0.452928	25	PASS
	2496.5 to 12500.0	0.092052	2.5	PASS

TEST CHANNEL		CH 13 (2472MHz)		
TEST CONDITION	FREQUENCY RANGE(MHz)	MEASURE. VALUE (uW)	LIMIT (uW)	RESULT
V_{normal}	30.0 to 1000.0	0.004286	0.25	PASS
	1000.0 to 2387.0	0.335760	2.5	PASS
	2387.0 to 2400.0	0.405536	25	PASS
	2483.5 to 2496.5	8.811098	25	PASS
	2496.5 to 12500.0	0.097956	2.5	PASS
$V_{max.}$	30.0 to 1000.0	0.004130	0.25	PASS
	1000.0 to 2387.0	0.335760	2.5	PASS
	2387.0 to 2400.0	0.432544	25	PASS
	2483.5 to 2496.5	8.750442	25	PASS
	2496.5 to 12500.0	0.085710	2.5	PASS
$V_{min.}$	30.0 to 1000.0	0.003882	0.25	PASS
	1000.0 to 2387.0	0.314796	2.5	PASS
	2387.0 to 2400.0	0.398134	25	PASS
	2483.5 to 2496.5	8.110170	25	PASS
	2496.5 to 12500.0	0.095068	2.5	PASS

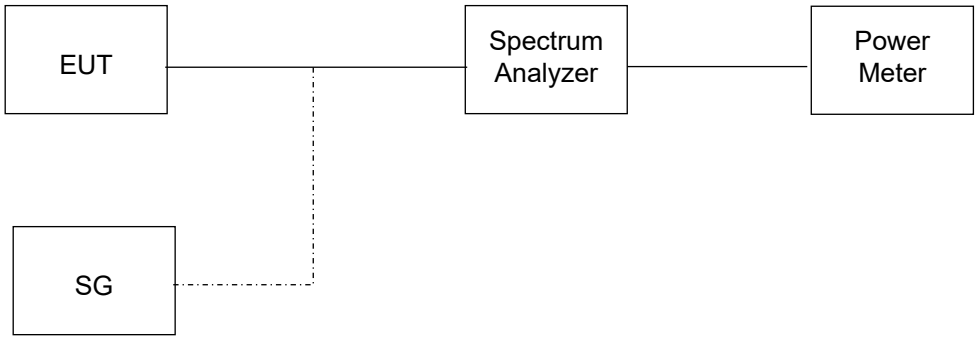
4.5 Antenna Power Measurement

4.5.1 Limits of Antenna Power

Modulation Method	Frequency Band Used	Antenna Power (Max.)	EIRP Limit (Note 3)
DSSS	2400 – 2483.5 MHz	10 mW/MHz	12.14 dBm/MHz ~ 22.14 dBm/MHz (16.368 mW/MHz ~ 163.68 mW/MHz)
OFDM (Note 1)	2400 – 2483.5 MHz	10 mW/MHz	12.14 dBm/MHz ~ 22.14 dBm/MHz (16.368 mW/MHz ~ 163.68 mW/MHz)
OFDM (Note 2)	2400 – 2483.5 MHz	5 mW/MHz	9.13 dBm/MHz ~ 19.13 dBm/MHz (8.184 mW/MHz ~ 81.84 mW/MHz)

Note:
1. Occupied bandwidth is less than 26MHz
2. Occupied bandwidth is more that 26MHz and less than 38MHz
3. EIRP limit is variable by the HPBA, the HPBA (half-power beam width) of the antenna shall be 360/A degrees or less, where A = EIRP/(2.14 dBi + “Antenna Power (limit)).
4. Tolerance of antenna power shall be +20% (upper value) and –80% (lower value).

4.5.2 Test Setup



4.5.3 Test Results

802.11b

Voltage (Vdc)	Channel Number	Frequency (MHz)	Conducted RF Output Power Density (mW/MHz)			Radiated RF Output Power Density (mW/MHz)
			Chain 0	Chain 1	Total Power Density	
19	1	2412	2.134	2.056	4.19	10.262
	7	2442	1.906	1.71	3.616	8.856
	13	2472	1.787	2.019	3.806	9.321
20.9	1	2412	2.109	2.052	4.161	10.191
	7	2442	2.01	1.824	3.834	9.39
	13	2472	1.85	1.996	3.846	9.419
17.1	1	2412	2.056	2.042	4.098	10.036
	7	2442	1.991	1.703	3.694	9.047
	13	2472	1.703	2.01	3.713	9.093
Max. Limit (mW/MHz):					10	-
Rated Power (mW/MHz):					5	-
Tolerance of Antenna Power (mW/MHz):					1 ~ 6	-
Max. EIRP Limit (mW/MHz):					-	16.368

Note: 1. Antenna gain is 3.89 dBi.

2. The radiated RF output power density is a “calculated” value derived from the conducted value.

3. Formula: Radiated RF output power density = Conducted RF output power density + Antenna gain

802.11g

Voltage (Vdc)	Channel Number	Frequency (MHz)	Conducted RF Output Power Density (mW/MHz)			Radiated RF Output Power Density (mW/MHz)
			Chain 0	Chain 1	Total Power Density	
19	1	2412	0.357	0.335	0.692	1.695
	7	2442	1.117	1.067	2.184	5.349
	13	2472	0.188	0.208	0.396	0.97
20.9	1	2412	0.338	0.339	0.677	1.658
	7	2442	1.138	1.067	2.205	5.4
	13	2472	0.187	0.207	0.394	0.965
17.1	1	2412	0.339	0.352	0.691	1.692
	7	2442	1.109	1.062	2.171	5.317
	13	2472	0.195	0.212	0.407	0.997
Max. Limit (mW/MHz):					10	-
Rated Power (mW/MHz):					1.9	-
Tolerance of Antenna Power (mW/MHz):					0.38 ~ 2.28	-
Max. EIRP Limit (mW/MHz):					-	16.368

Note: 1. Antenna gain is 3.89 dBi.

2. The radiated RF output power density is a “calculated” value derived from the conducted value.

3. Formula: Radiated RF output power density = Conducted RF output power density + Antenna gain

802.11n (HT20)

Voltage (Vdc)	Channel Number	Frequency (MHz)	Conducted RF Output Power Density (mW/MHz)			Radiated RF Output Power Density (mW/MHz)
			Chain 0	Chain 1	Total Power Density	
19	1	2412	0.188	0.183	0.371	0.909
	7	2442	0.565	0.615	1.18	2.89
	13	2472	0.111	0.117	0.228	0.558
20.9	1	2412	0.191	0.197	0.388	0.95
	7	2442	0.545	0.58	1.125	2.755
	13	2472	0.11	0.113	0.223	0.546
17.1	1	2412	0.192	0.196	0.388	0.95
	7	2442	0.573	0.589	1.162	2.846
	13	2472	0.109	0.112	0.221	0.541
Max. Limit (mW/MHz):					10	-
Rated Power (mW/MHz):					1	-
Tolerance of Antenna Power (mW/MHz):					0.2 ~ 1.2	-
Max. EIRP Limit (mW/MHz):					-	16.368

Note: 1. Antenna gain is 3.89 dBi.

2. The radiated RF output power density is a “calculated” value derived from the conducted value.

3. Formula: Radiated RF output power density = Conducted RF output power density + Antenna gain

4.6 Spurious Emissions for Receiver

4.6.1 Limits of Spurious Emissions for Receiver

Frequencies (MHz)	Limit
Below 1GHz	≦4nW/100kHz (-54dBm)
Above 1GHz	≦20nW/MHz (-47dBm)

4.6.2 Test Setup

4.6.3 Test Results

802.11b / 802.11g / 802.11n (HT20)

Chain 0

TEST CHANNEL		CH 1 (2412MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(nW)	LIMIT (nW)	RESULT
V_{normal}	30.0 to 1000.0	323.061	0.001549	2.0	PASS
	1000.0 to 12500.0	9649.437	0.220293	10.0	PASS
$V_{max.}$	30.0 to 1000.0	923.733	0.001799	2.0	PASS
	1000.0 to 12500.0	9648.000	0.192309	10.0	PASS
$V_{min.}$	30.0 to 1000.0	919.247	0.001734	2.0	PASS
	1000.0 to 12500.0	9648.000	0.224388	10.0	PASS
TEST CHANNEL		CH 7 (2442MHz)			
V_{normal}	30.0 to 1000.0	913.185	0.001758	2.0	PASS
	1000.0 to 12500.0	9768.750	0.250035	10.0	PASS
$V_{max.}$	30.0 to 1000.0	937.192	0.001875	2.0	PASS
	1000.0 to 12500.0	9768.750	0.236592	10.0	PASS
$V_{min.}$	30.0 to 1000.0	628.368	0.001633	2.0	PASS
	1000.0 to 12500.0	9768.750	0.241546	10.0	PASS
TEST CHANNEL		CH 13 (2472MHz)			
V_{normal}	30.0 to 1000.0	632.976	0.001466	2.0	PASS
	1000.0 to 12500.0	9889.500	0.258226	10.0	PASS
$V_{max.}$	30.0 to 1000.0	845.163	0.001679	2.0	PASS
	1000.0 to 12500.0	9888.062	0.263027	10.0	PASS
$V_{min.}$	30.0 to 1000.0	945.801	0.001928	2.0	PASS
	1000.0 to 12500.0	9888.062	0.238232	10.0	PASS

NOTE: 1. The spectrum plots are attached on the following pages.

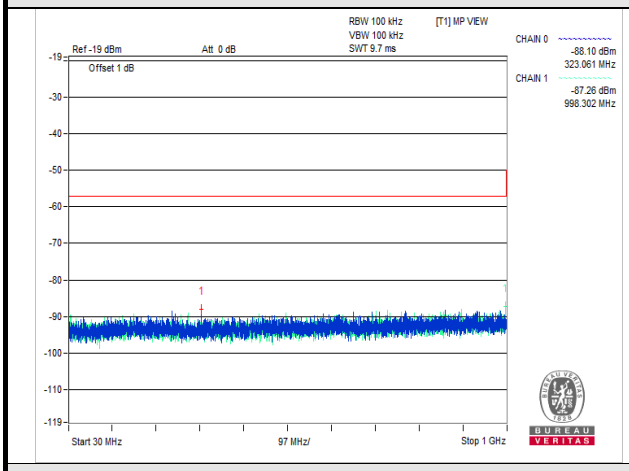
Chain 1

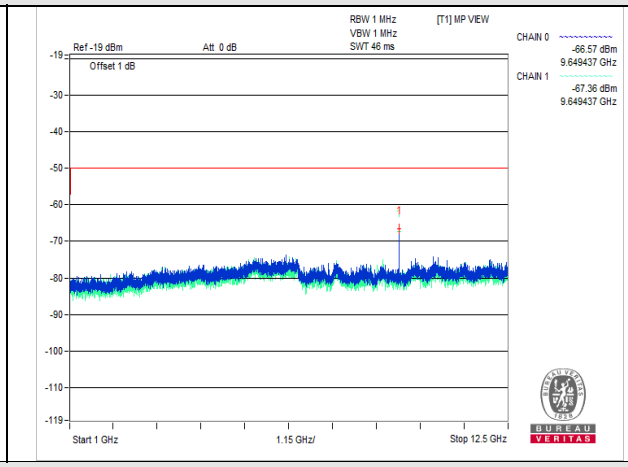
TEST CHANNEL		CH 1 (2412MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(nW)	LIMIT (nW)	RESULT
V_{normal}	30.0 to 1000.0	998.302	0.001879	2.0	PASS
	1000.0 to 12500.0	9649.437	0.183654	10.0	PASS
$V_{max.}$	30.0 to 1000.0	932.585	0.001556	2.0	PASS
	1000.0 to 12500.0	9648.000	0.227510	10.0	PASS
$V_{min.}$	30.0 to 1000.0	531.368	0.001603	2.0	PASS
	1000.0 to 12500.0	9649.437	0.216770	10.0	PASS
TEST CHANNEL		CH 7 (2442MHz)			
V_{normal}	30.0 to 1000.0	793.026	0.001774	2.0	PASS
	1000.0 to 12500.0	9768.750	0.229615	10.0	PASS
$V_{max.}$	30.0 to 1000.0	884.327	0.002037	2.0	PASS
	1000.0 to 12500.0	9768.750	0.218273	10.0	PASS
$V_{min.}$	30.0 to 1000.0	425.517	0.001422	2.0	PASS
	1000.0 to 12500.0	9768.750	0.219280	10.0	PASS
TEST CHANNEL		CH 13 (2472MHz)			
V_{normal}	30.0 to 1000.0	916.095	0.001782	2.0	PASS
	1000.0 to 12500.0	9888.062	0.252930	10.0	PASS
$V_{max.}$	30.0 to 1000.0	925.310	0.001841	2.0	PASS
	1000.0 to 12500.0	9888.062	0.238232	10.0	PASS
$V_{min.}$	30.0 to 1000.0	975.265	0.001758	2.0	PASS
	1000.0 to 12500.0	9889.500	0.253513	10.0	PASS

NOTE: 1. The spectrum plots are attached on the following pages.

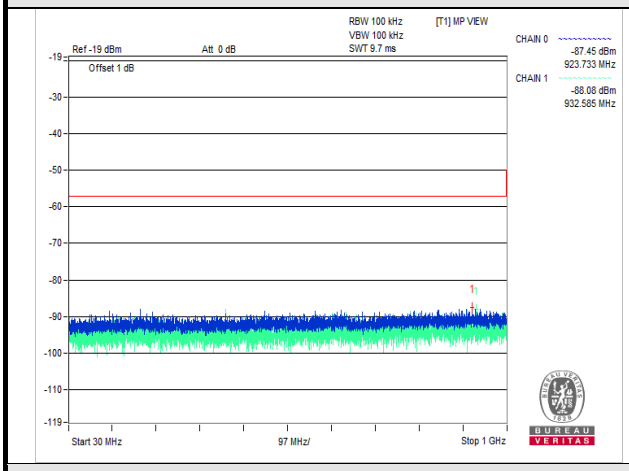
Graph

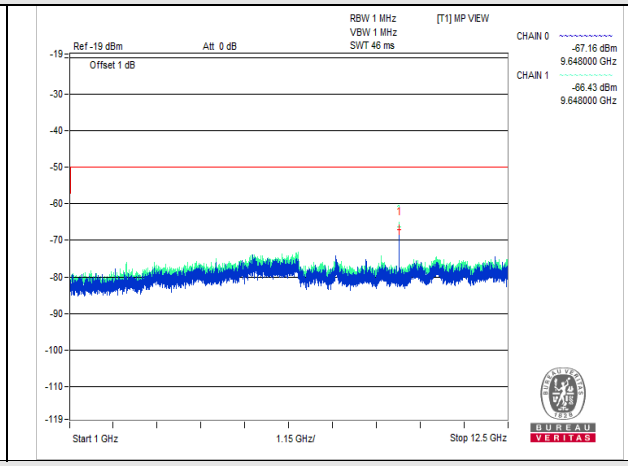
Vnormal



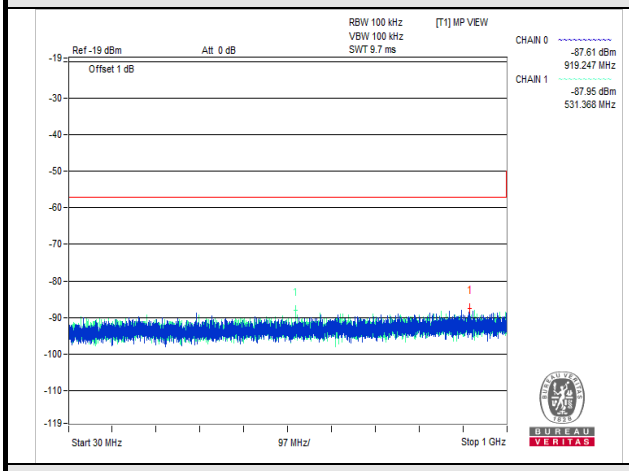


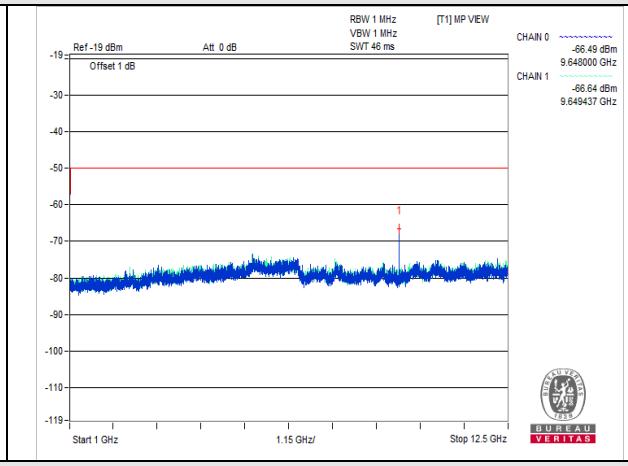
Vmax.





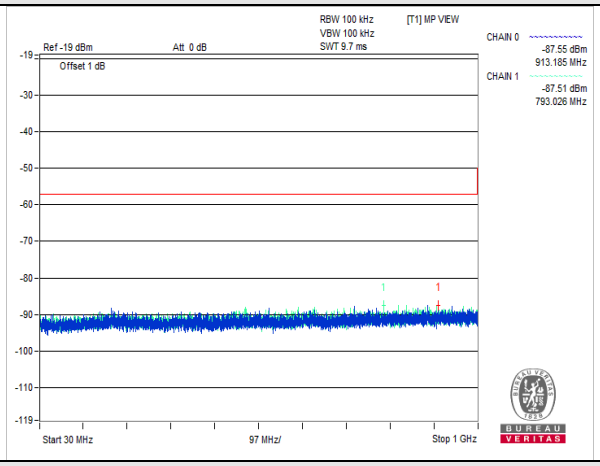
Vmin.

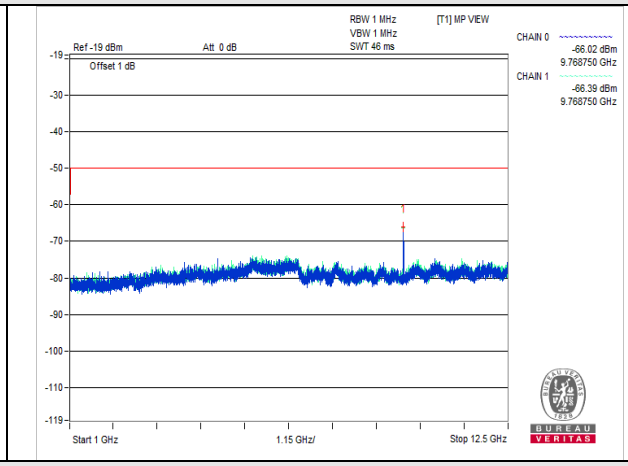




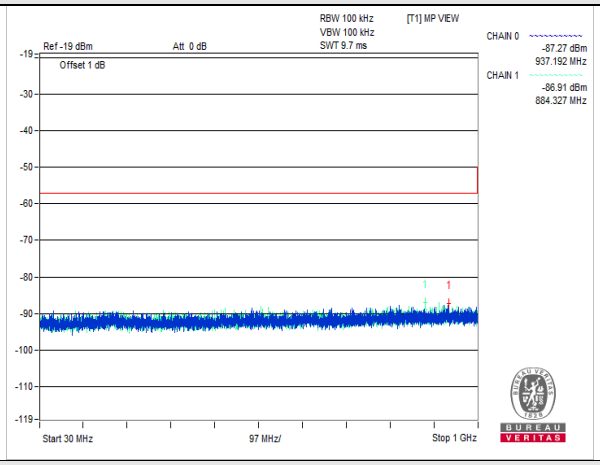
CH 1 (2412MHz)

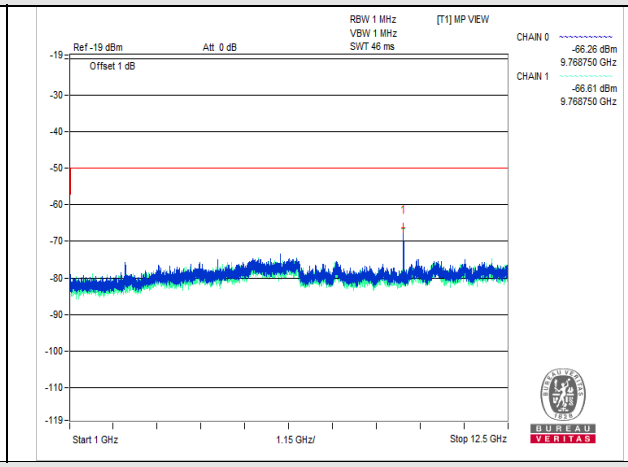
Vnormal



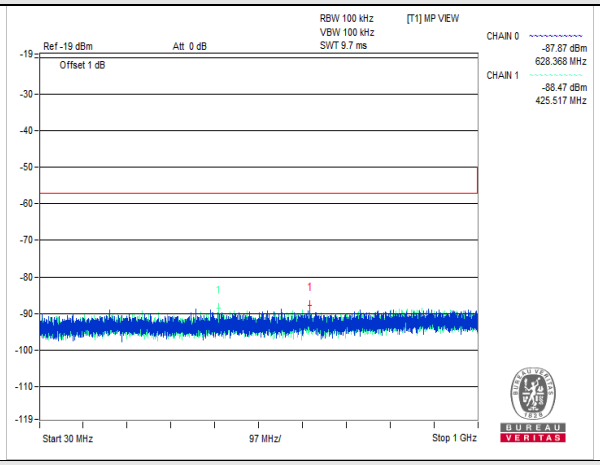


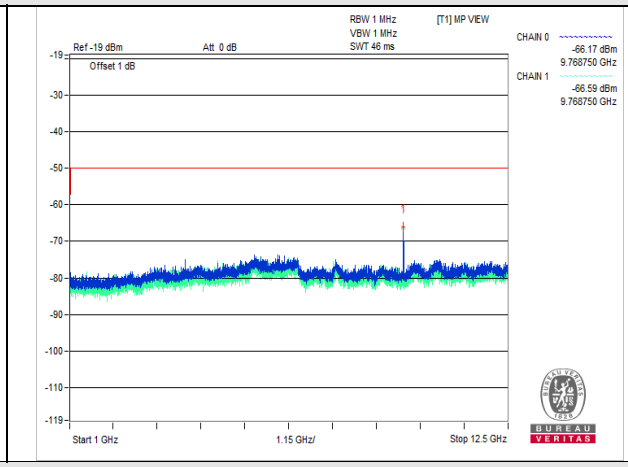
Vmax.





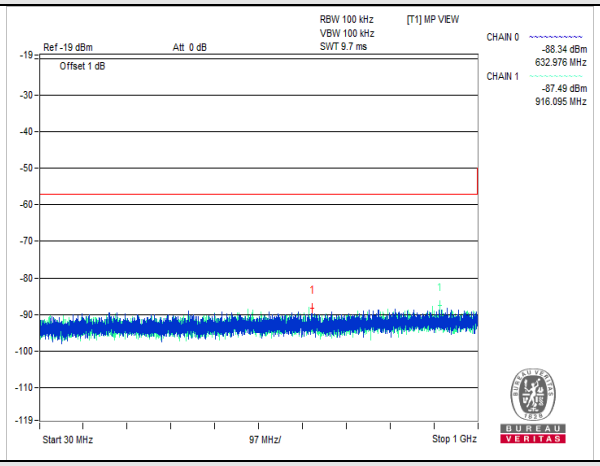
Vmin.

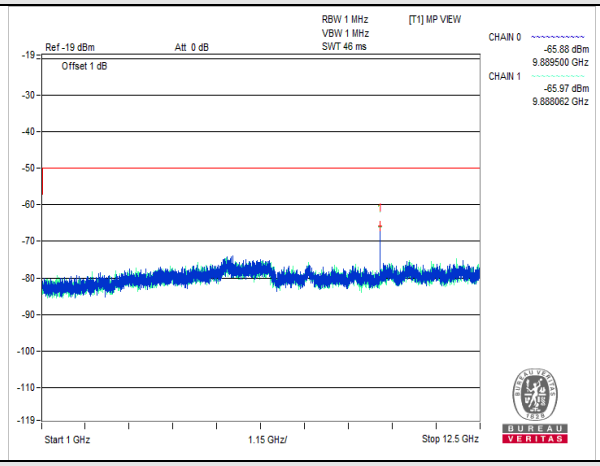




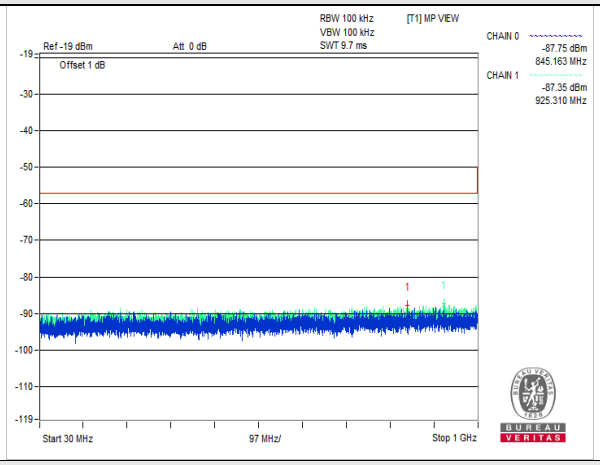
CH 7 (2442MHz)

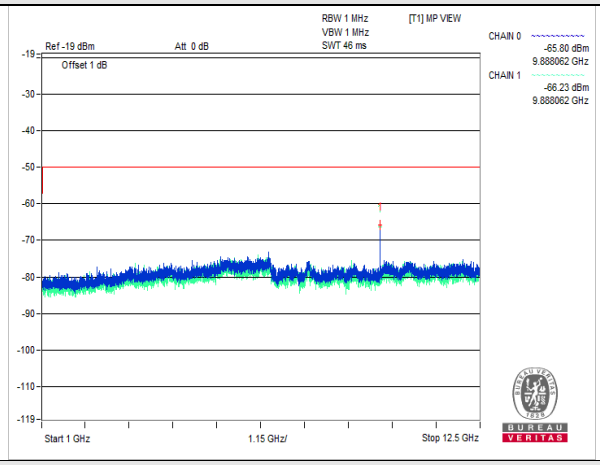
Vnormal



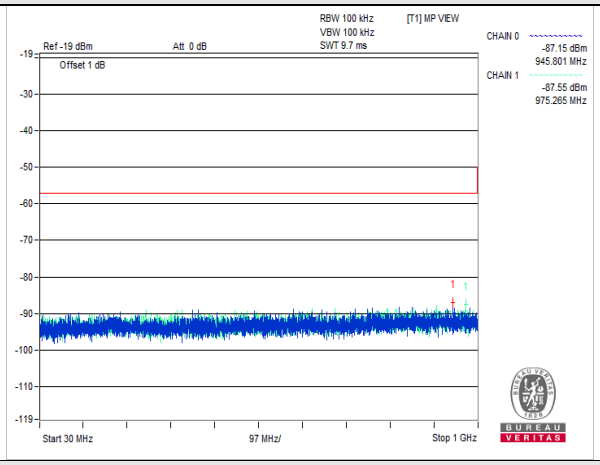


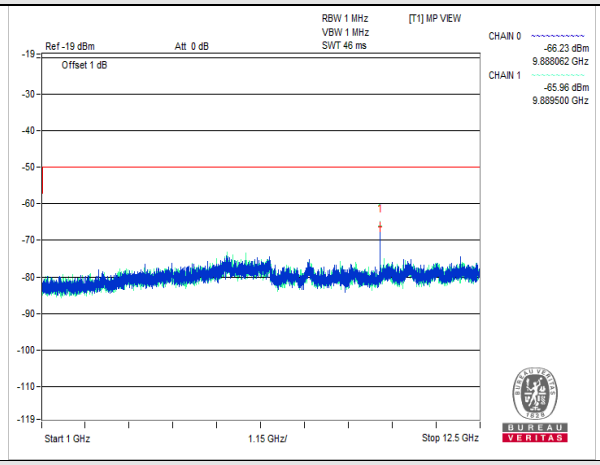
Vmax.





Vmin.





CH 13 (2472MHz)

Sum of each Chain

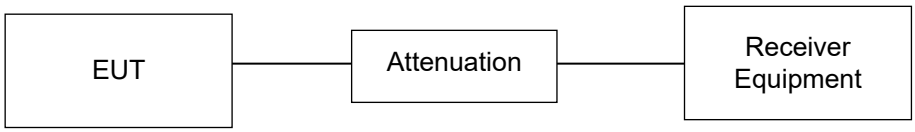
TEST CHANNEL		CH 1 (2412MHz)		
TEST CONDITION	FREQUENCY RANGE(MHz)	MEASURE. VALUE (nW)	LIMIT (nW)	RESULT
V_{normal}	30.0 to 1000.0	0.003428	4	PASS
	1000.0 to 12500.0	0.403947	20	PASS
$V_{max.}$	30.0 to 1000.0	0.003355	4	PASS
	1000.0 to 12500.0	0.419819	20	PASS
$V_{min.}$	30.0 to 1000.0	0.003337	4	PASS
	1000.0 to 12500.0	0.441158	20	PASS
TEST CHANNEL		CH 7 (2442MHz)		
V_{normal}	30.0 to 1000.0	0.003532	4	PASS
	1000.0 to 12500.0	0.479650	20	PASS
$V_{max.}$	30.0 to 1000.0	0.003912	4	PASS
	1000.0 to 12500.0	0.454865	20	PASS
$V_{min.}$	30.0 to 1000.0	0.003055	4	PASS
	1000.0 to 12500.0	0.460826	20	PASS
TEST CHANNEL		CH 13 (2472MHz)		
V_{normal}	30.0 to 1000.0	0.003248	4	PASS
	1000.0 to 12500.0	0.511156	20	PASS
$V_{max.}$	30.0 to 1000.0	0.003520	4	PASS
	1000.0 to 12500.0	0.501259	20	PASS
$V_{min.}$	30.0 to 1000.0	0.003686	4	PASS
	1000.0 to 12500.0	0.491745	20	PASS

4.7 Interference Prevention Function

4.7.1 Limits of Interference Prevention Function

Radio equipment used mainly on the same premises and automatically transmits or receives identification code.

4.7.2 Test Setup



4.7.3 Test Results

Environmental Conditions	25 deg.C, 60 % RH
Link Mode	**Test Result**
WiFi	Pass

4.8 Number of Carriers within 1 MHz Bandwidth in OFDM

4.8.1 Limit of Number of Carriers

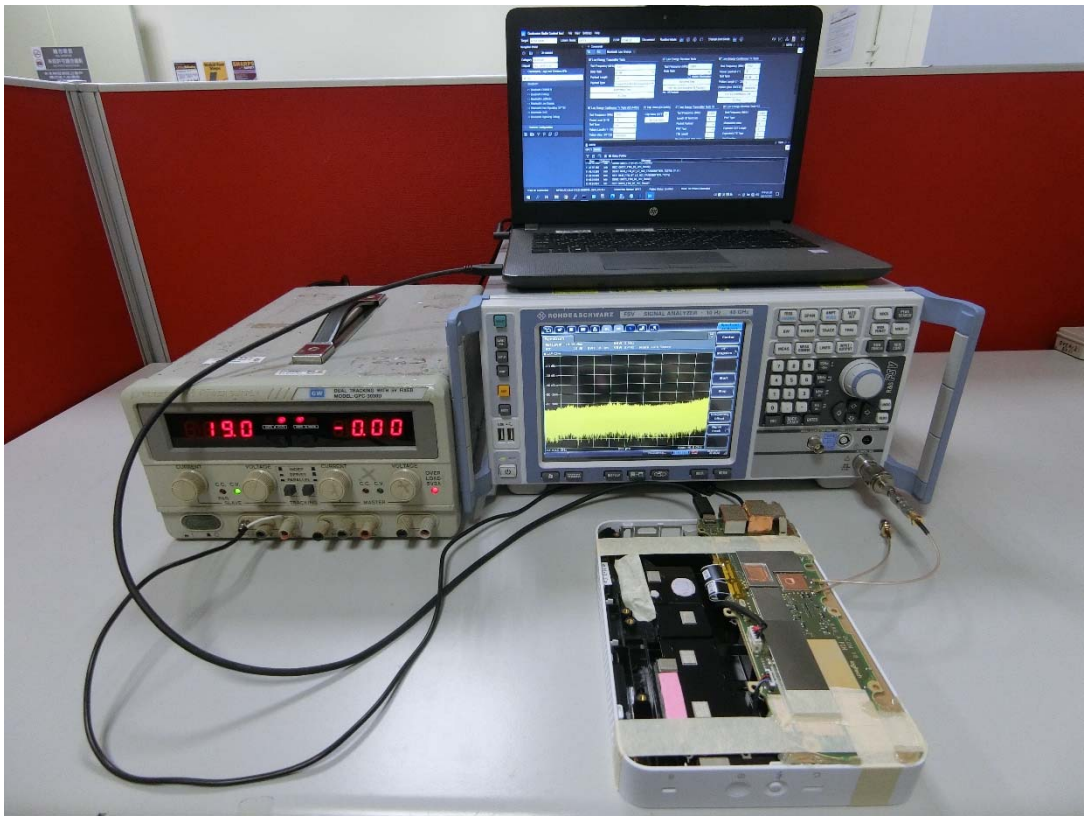
For each 1MHz bandwidth in OFDM, there should be at least 1 carrier.

4.8.2 Test Setup

4.8.3 Test Result

About OFDM Technical, one OFDM Channel will have 52 sub-carriers. At present, we observe this product via the spectrum, and we know that there are 3 carriers in 1 MHz bandwidth in OFDM.

5 Photographs of the Test Configuration



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 accredited and approved according to ISO/IEC 17025.

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

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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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