

Radio Test Report

Report No.: RJBEKC-WTW-P22030152

Test Model: UD2301t1

Received Date: 2022/3/3

Test Date: 2022/3/10

Issued Date: 2022/4/12

Applicant: LITE-ON Technology Corp.

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

Issue No.	Description	Date Issued
RJBEKC-WTW-P22030152	Original release.	2022/4/12

1 Certificate of Conformity

Product: Dongle

Brand: DELL

Test Model: UD2301t1

Sample Status: Engineering sample

Applicant: LITE-ON Technology Corp.

Test Date: 2022/3/10

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 RF characteristics under the conditions specified in this report.

Prepared by :



Date:

2022/4/12

Jessica Cheng / Senior Specialist

Approved by :



Date:

2022/4/12

Jeremy Lin / Project Engineer

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	3.2 (2)	4.4	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)	4.5	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	NA
--	3.2 (2)	4.4	Antenna power	C
--	3.6 (2)	4.4	Absolute gain of transmitting antenna	C
--	3.6 (2)	4.4	Angular width of principal radiation (AWPR)	NA
--	3.2 (10)	--	Number of carriers within 1 MHz bandwidth in OFDM	NA
--	3.2 (8)	--	Diffusion bandwidth	NA
--	3.2 (9)	--	Spreading factor	NA
--	3.2 (11)	--	Frequency retention time (FH employed)	NA
--	3.4.1(1)	4.6	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	Cal. Method
MIMO Power measurement Test set (4X4) KEYSIGHT	U2021XA	U2021XA_001	2021/6/16	2022/6/15	ETC	c)
Spectrum Analyzer R&S	FSV40	101042	2021/9/9	2022/9/8	ETC	c)
Spectrum Analyzer KEYSIGHT	N9030A	MY54490260	2021/7/23	2022/7/22	ETC	c)
Pulse Power Sensor Anritsu	MA2411B	0738404	2021/4/15	2022/4/14	ETC	c)
Peak Power meter Anritsu	ML2495A	0842014	2021/4/15	2022/4/14	ETC	c)
MXG Vector Signal Generator KEYSIGHT	N5182B	MY53052658	2021/5/19	2022/5/18	ETC	c)
True RMS Clamp Meter Fluke	325	31130711WS	2021/6/2	2022/6/1	ETC	c)
Programmable DC Power Supply (IDRC)	DSP80-180WE	701217	Note 3	Note 3	BV CPS E&E	d)

NOTE:

1. 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) of the Radio Law.

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)

2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

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

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	206.50 Hz
Spurious emissions	3.93 dB
Output power density	1.11 dB
Out of band radiated power	3.93 dB
Frequency Tolerance	603.76 Hz

2.3 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Dongle
Brand	DELL
Test Model	UD2301t1
Status of EUT	Engineering sample
Nominal Voltage	5Vdc from host equipment
Modulation Type	GFSK
Operating Frequency	2402MHz ~ 2479MHz
Number of Channel	78
Rated RF Output Power	3mW
Conducted RF Output Power	2.415mW
Radiated RF Output Power	2.009 mW
Antenna Type	Chip antenna with -0.8dBi gain
Antenna Connector	N/A
Accessory Device	N/A
Data Cable Supplied	N/A

Note:

1. 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.
2. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

78 channels are provided to this EUT:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460		
19	2421	39	2441	59	2461		

Note: 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 provided by manufacture, the power levels during the tests were set according to the following codes:

Channel	Power setting
0	0
38	0
77	0

3.3 Test Conditions

Test Conditions		Voltage (Vdc)
V_{normal}	-	5
$V_{max.}$	+10%	5.5
$V_{min.}$	-10%	4.5

Test modes are presented in the report as below:

Test Item	Environmental Conditions
Frequency Tolerance	25 deg.C, 76% RH
Occupied Bandwidth	25 deg.C, 76% RH
Spurious Emissions for Transmitter	25 deg.C, 76% RH
Antenna Power	25 deg.C, 76% RH
Spurious Emissions for Receiver	25 deg.C, 76% RH
Interference Prevention Function	25 deg.C, 76% RH

3.4 Assembly

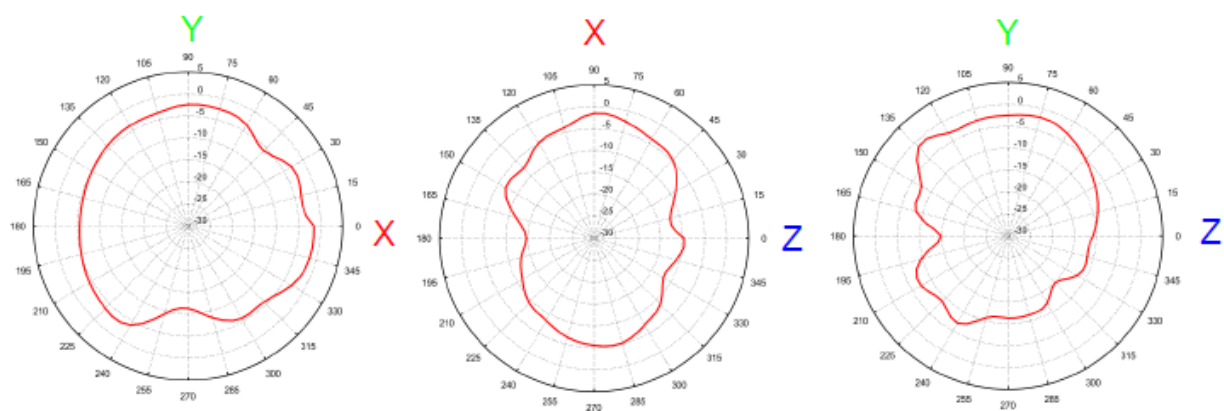
The EUT is constructed as a Dongle that use ultrasonic welding to seal the product. Separating the two parts (i.e operating of the housing) was only possible by means of brute force.

3.5 Antenna Specifications

3.5.1 Antenna Gain

Antenna Type	Max. Gain (dBi)
Chip antenna	-0.8

3.5.2 Antenna Pattern



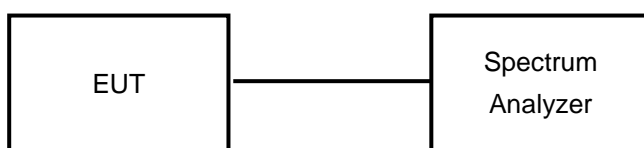
4 Test Results

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

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)
0	2402	2402.002680	1.115	2402.002639	1.098	2402.002680	1.115
38	2440	2440.002719	1.114	2440.002679	1.097	2440.002600	1.065
77	2479	2479.002520	1.016	2479.002519	1.016	2479.002279	0.919

4.2 Occupied Bandwidth Measurement (99% power bandwidth)

4.2.1 Limits of Occupied Bandwidth Measurement

Item	Limit
Occupied bandwidth	<26MHz

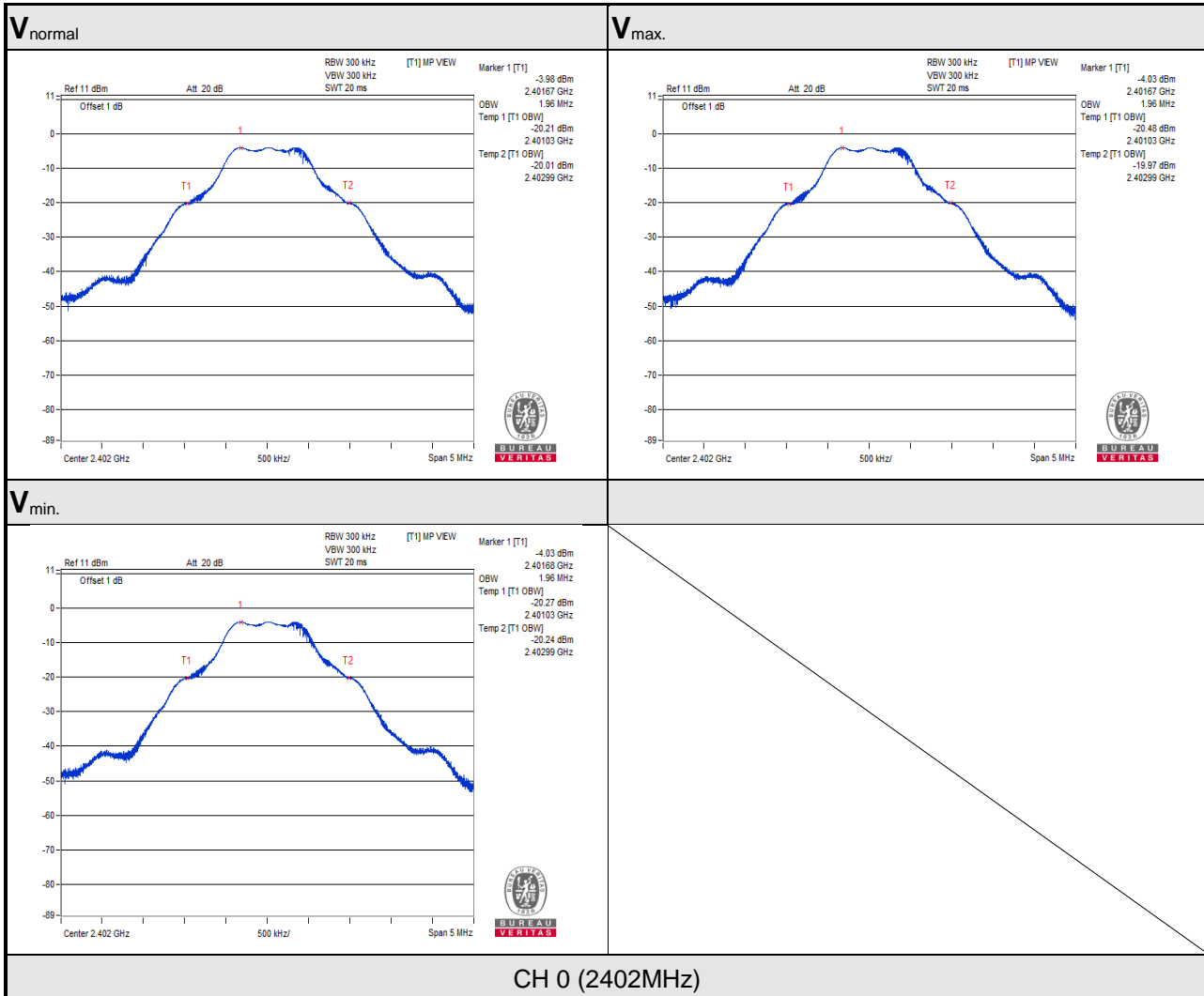
4.2.2 Test Setup

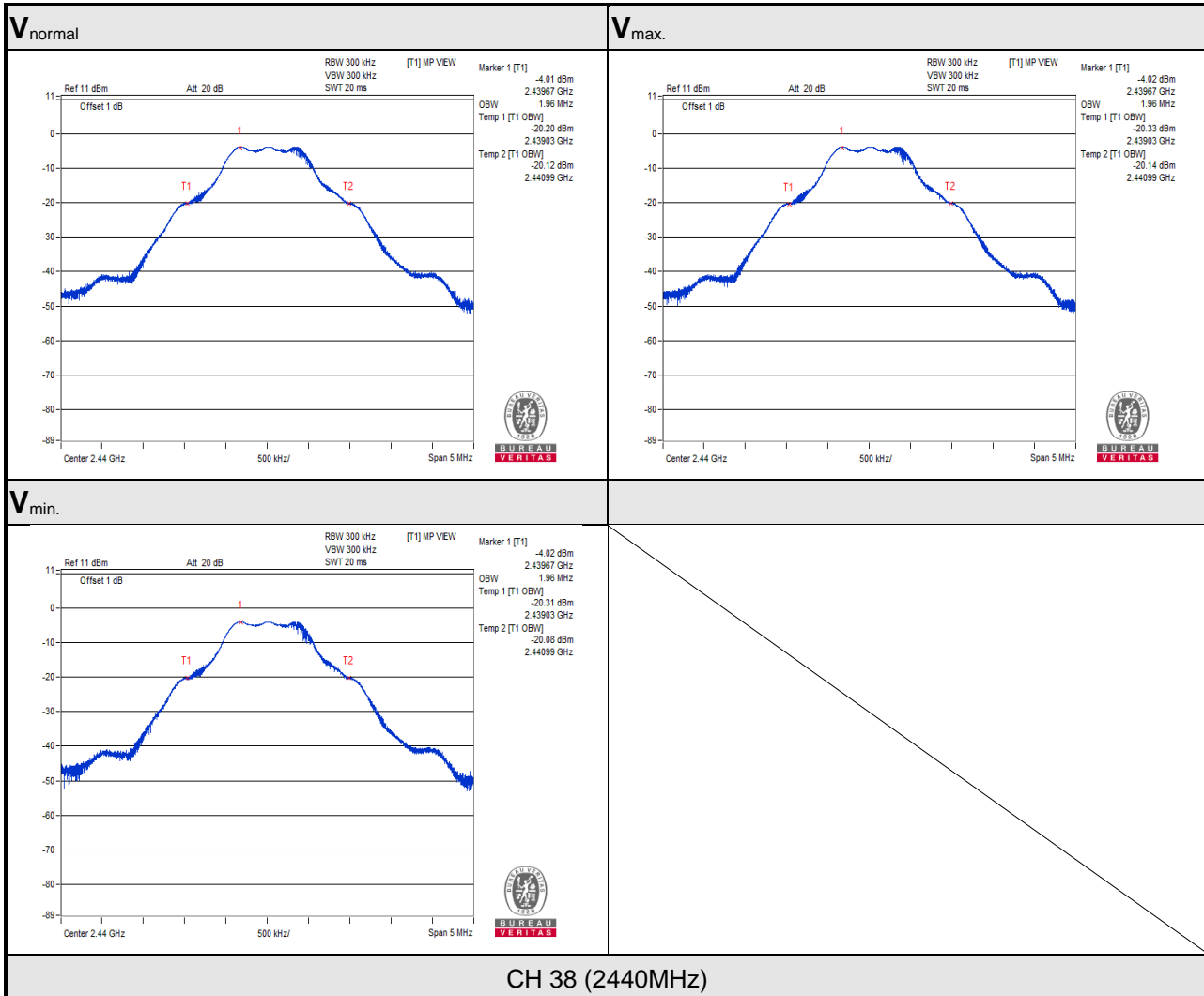


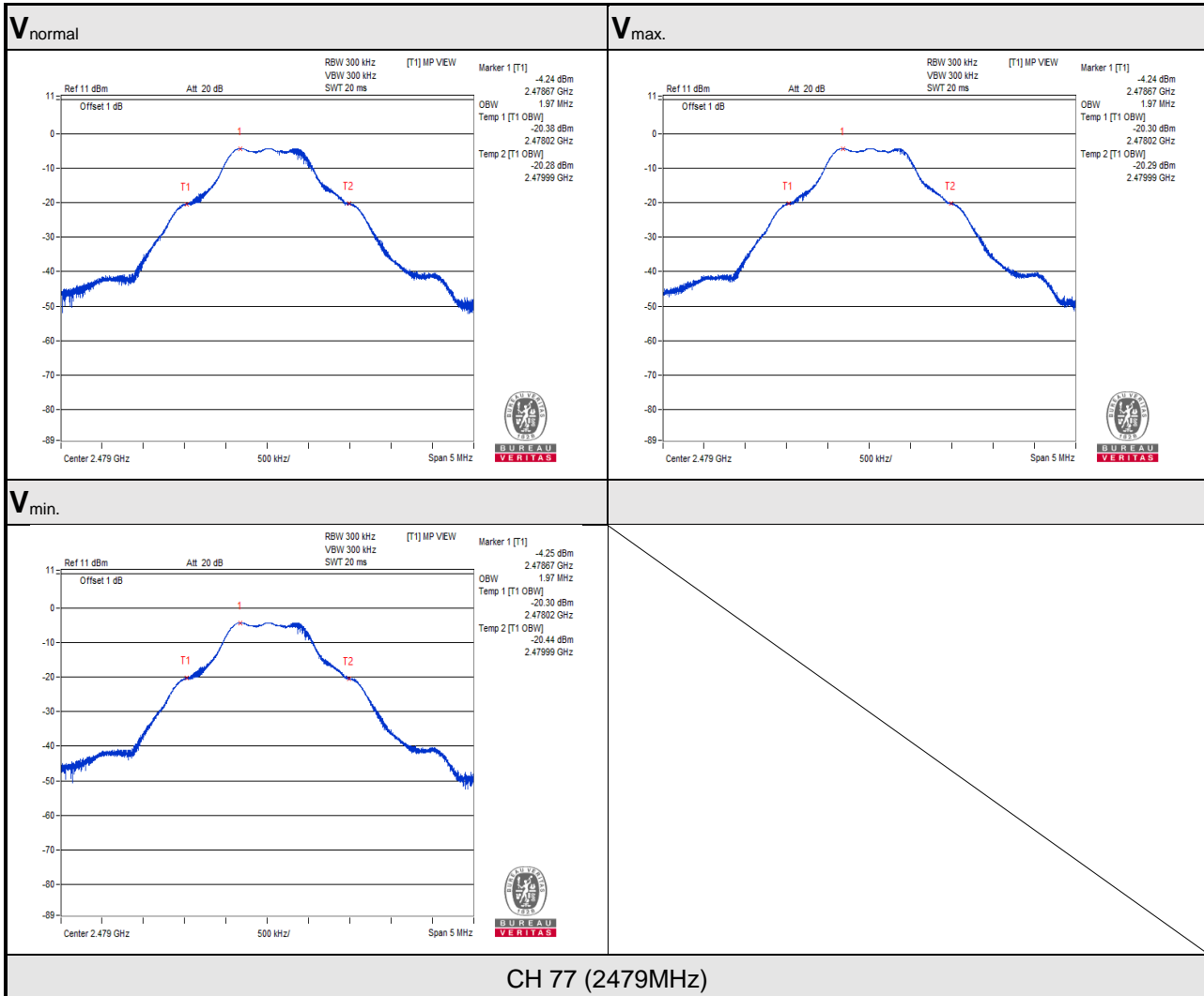
4.2.3 Test Results

Channel	Frequency (MHz)	V_{normal}	$V_{max.}$	$V_{min.}$
		Occupied bandwidth (MHz)	Occupied bandwidth (MHz)	Occupied bandwidth (MHz)
0	2402	1.96	1.96	1.96
38	2440	1.96	1.96	1.96
77	2479	1.97	1.97	1.97

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







4.3 Spurious Emissions for Transmitter Measurement

4.3.1 Limits of Spurious Emissions

Frequencies (MHz)	Limit
Operating frequency 2400 to 2483.5MHz	
30.0MHz to 1000.0MHz	$\leq 0.25 \text{ uW/100kHz}$
1000.0MHz to 2387MHz	$\leq 2.5 \text{ uW/MHz}$
2387.0MHz to 2400.0MHz	$\leq 25 \text{ uW/MHz}$
2483.5MHz to 2496.5MHz	$\leq 25 \text{ uW/MHz}$
2496.5MHz to 12500.0MHz	$\leq 2.5 \text{ uW/MHz}$

4.3.2 Test Setup



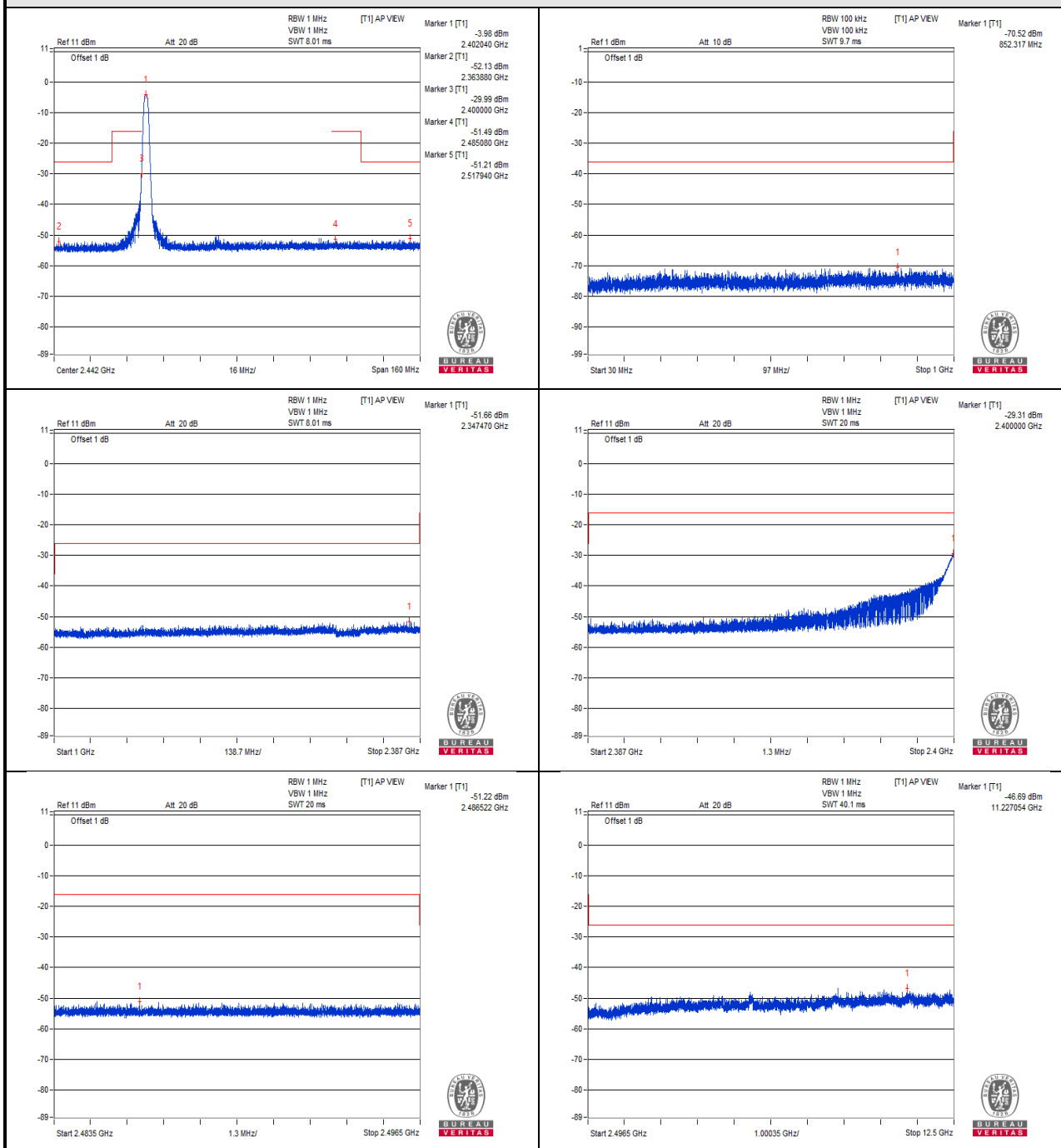
4.3.3 Test Results

TEST CHANNEL		CH 0 (2402MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(uW)	LIMIT (uW)	RESULT
V_{normal}	30MHz to 1000MHz	852.317	0.000089	0.25	PASS
	1000MHz to 2387MHz	2347.470	0.006823	2.5	PASS
	2387MHz to 2400MHz	2400.000	1.172195	25	PASS
	2483.5MHz to 2496.5MHz	2486.522	0.007551	25	PASS
	2496.5MHz to 12500MHz	11227.054	0.021429	2.5	PASS
V_{max.}	30MHz to 1000MHz	927.856	0.000087	0.25	PASS
	1000MHz to 2387MHz	1965.178	0.005821	2.5	PASS
	2387MHz to 2400MHz	2400.000	1.164126	25	PASS
	2483.5MHz to 2496.5MHz	2485.531	0.008690	25	PASS
	2496.5MHz to 12500MHz	12344.945	0.020941	2.5	PASS
V_{min.}	30MHz to 1000MHz	908.577	0.000085	0.25	PASS
	1000MHz to 2387MHz	2331.866	0.007211	2.5	PASS
	2387MHz to 2400MHz	2400.000	1.150800	25	PASS
	2483.5MHz to 2496.5MHz	2495.955	0.007031	25	PASS
	2496.5MHz to 12500MHz	11104.511	0.019953	2.5	PASS
TEST CHANNEL		CH 38 (2440MHz)			
V_{normal}	30MHz to 1000MHz	747.072	0.000097	0.25	PASS
	1000MHz to 2387MHz	2296.151	0.006966	2.5	PASS
	2387MHz to 2400MHz	2397.378	0.006668	25	PASS
	2483.5MHz to 2496.5MHz	2493.948	0.008222	25	PASS
	2496.5MHz to 12500MHz	11278.322	0.023988	2.5	PASS
V_{max.}	30MHz to 1000MHz	746.708	0.000090	0.25	PASS
	1000MHz to 2387MHz	2023.259	0.006761	2.5	PASS
	2387MHz to 2400MHz	2391.150	0.006194	25	PASS
	2483.5MHz to 2496.5MHz	2486.852	0.007962	25	PASS
	2496.5MHz to 12500MHz	11258.315	0.020230	2.5	PASS
V_{min.}	30MHz to 1000MHz	879.720	0.000083	0.25	PASS
	1000MHz to 2387MHz	2322.157	0.005649	2.5	PASS
	2387MHz to 2400MHz	2393.166	0.007112	25	PASS
	2483.5MHz to 2496.5MHz	2493.090	0.008492	25	PASS
	2496.5MHz to 12500MHz	11298.329	0.022029	2.5	PASS

TEST CHANNEL		CH 77 (2479MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(uW)	LIMIT (uW)	RESULT
V_{normal}	30MHz to 1000MHz	746.708	0.000091	0.25	PASS
	1000MHz to 2387MHz	1948.014	0.006668	2.5	PASS
	2387MHz to 2400MHz	2392.159	0.006577	25	PASS
	2483.5MHz to 2496.5MHz	2483.706	0.032810	25	PASS
	2496.5MHz to 12500MHz	9268.869	0.018113	2.5	PASS
V_{max.}	30MHz to 1000MHz	746.708	0.000097	0.25	PASS
	1000MHz to 2387MHz	2270.665	0.005610	2.5	PASS
	2387MHz to 2400MHz	2398.183	0.007129	25	PASS
	2483.5MHz to 2496.5MHz	2483.587	0.027479	25	PASS
	2496.5MHz to 12500MHz	11245.811	0.017539	2.5	PASS
V_{min.}	30MHz to 1000MHz	919.126	0.000095	0.25	PASS
	1000MHz to 2387MHz	1332.186	0.005248	2.5	PASS
	2387MHz to 2400MHz	2398.714	0.006998	25	PASS
	2483.5MHz to 2496.5MHz	2483.555	0.049431	25	PASS
	2496.5MHz to 12500MHz	11237.058	0.022336	2.5	PASS

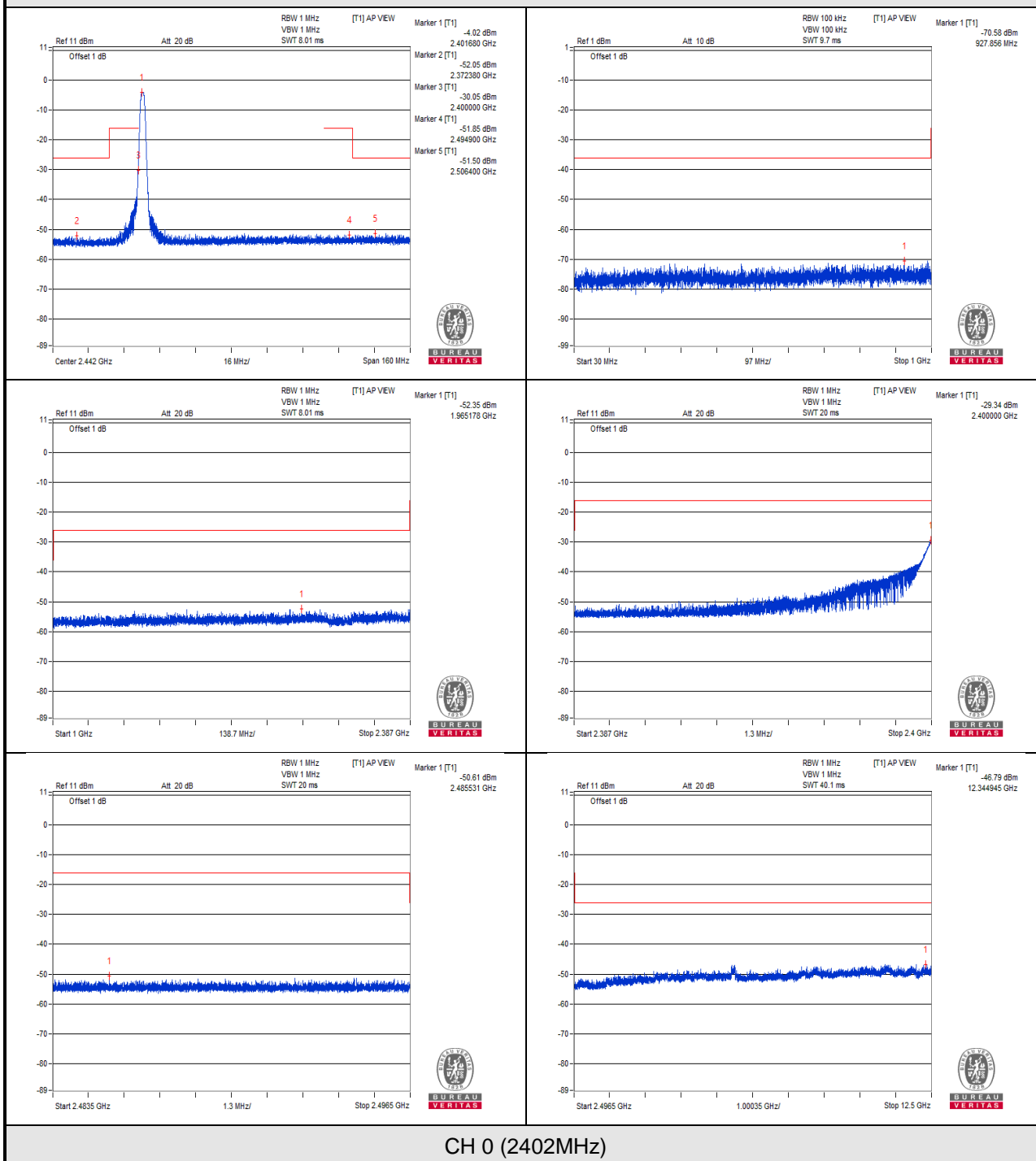
NOTE: The spectrum plots are attached on the following pages.

Vnormal

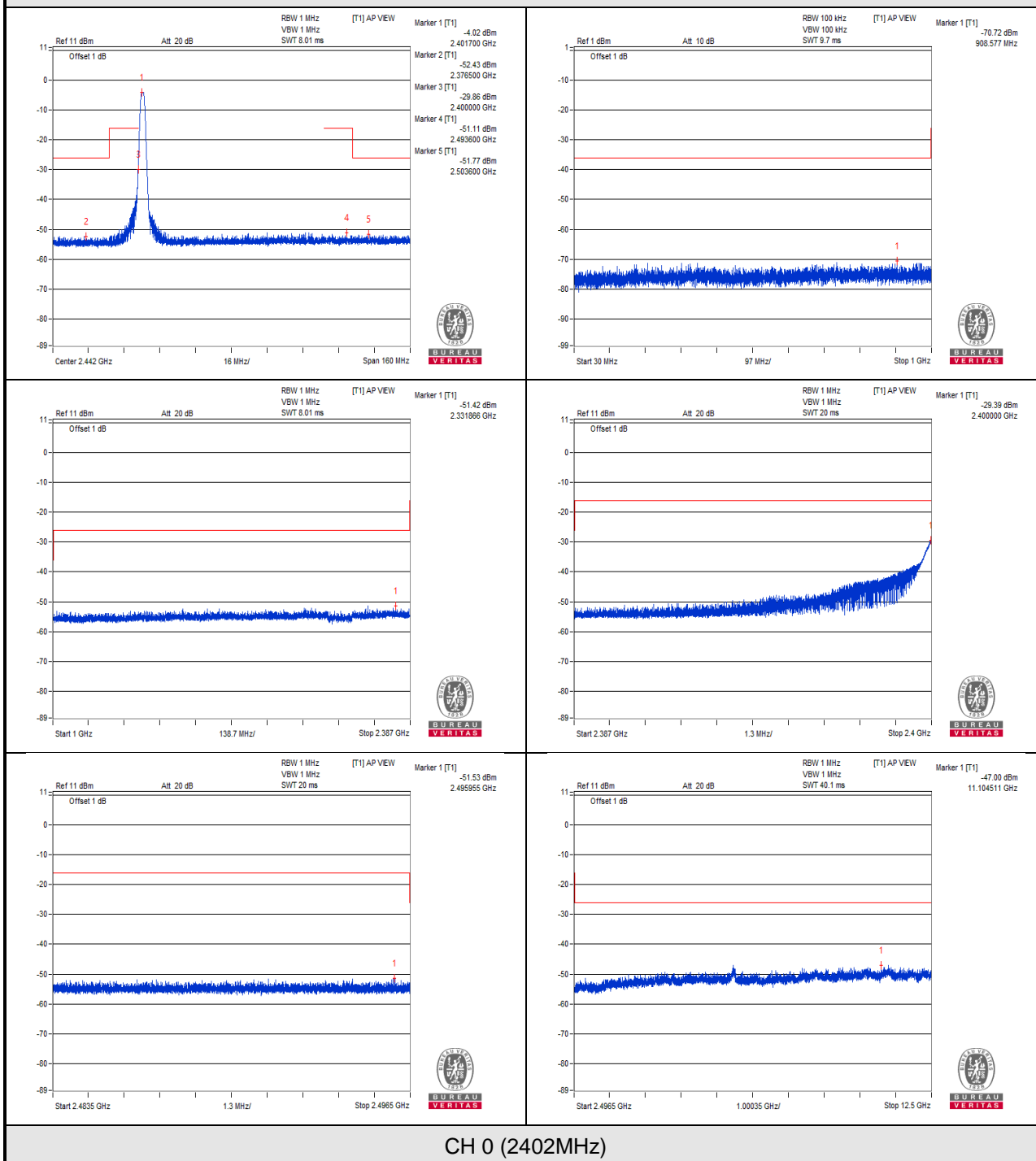


CH 0 (2402MHz)

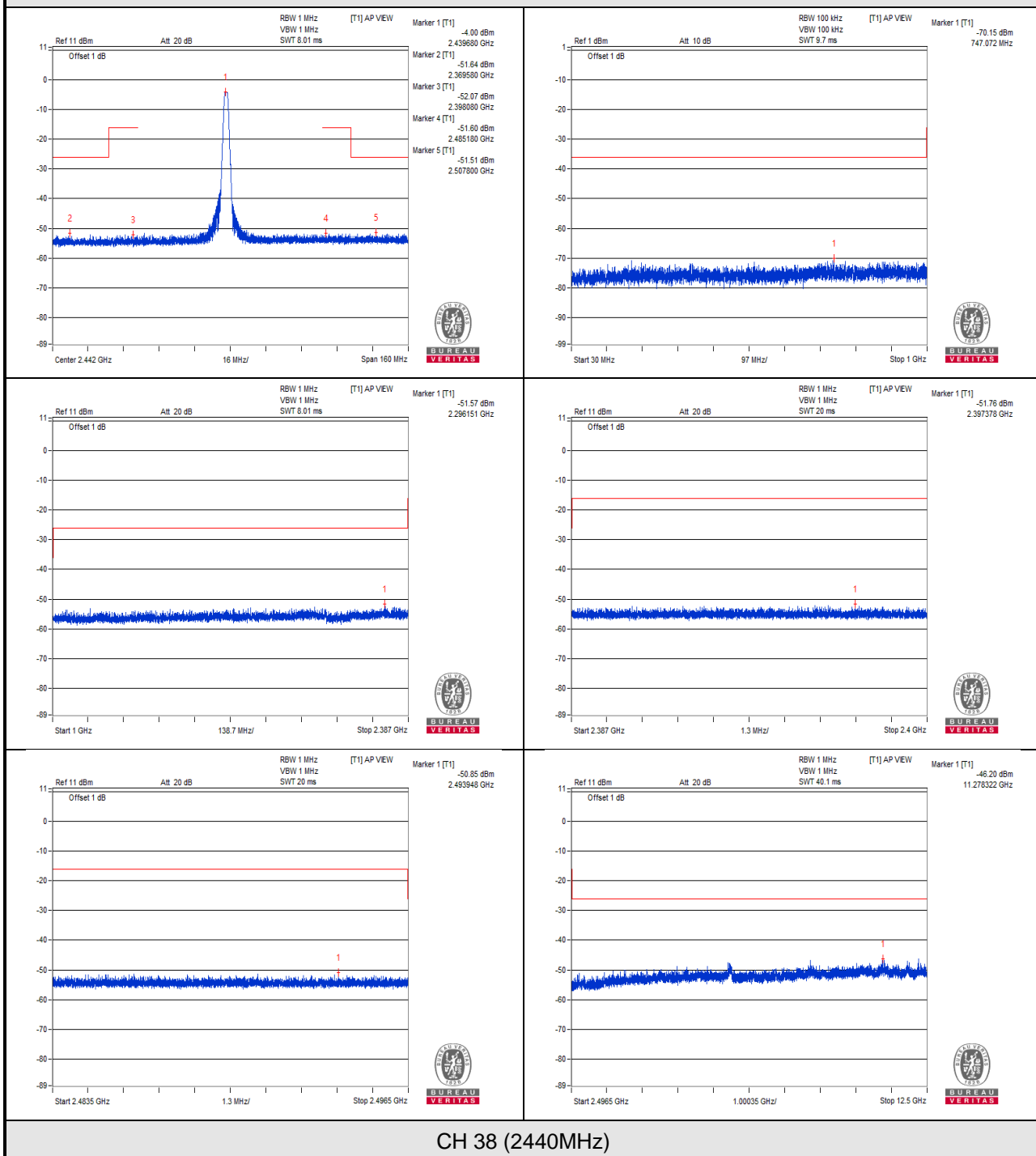
V max.



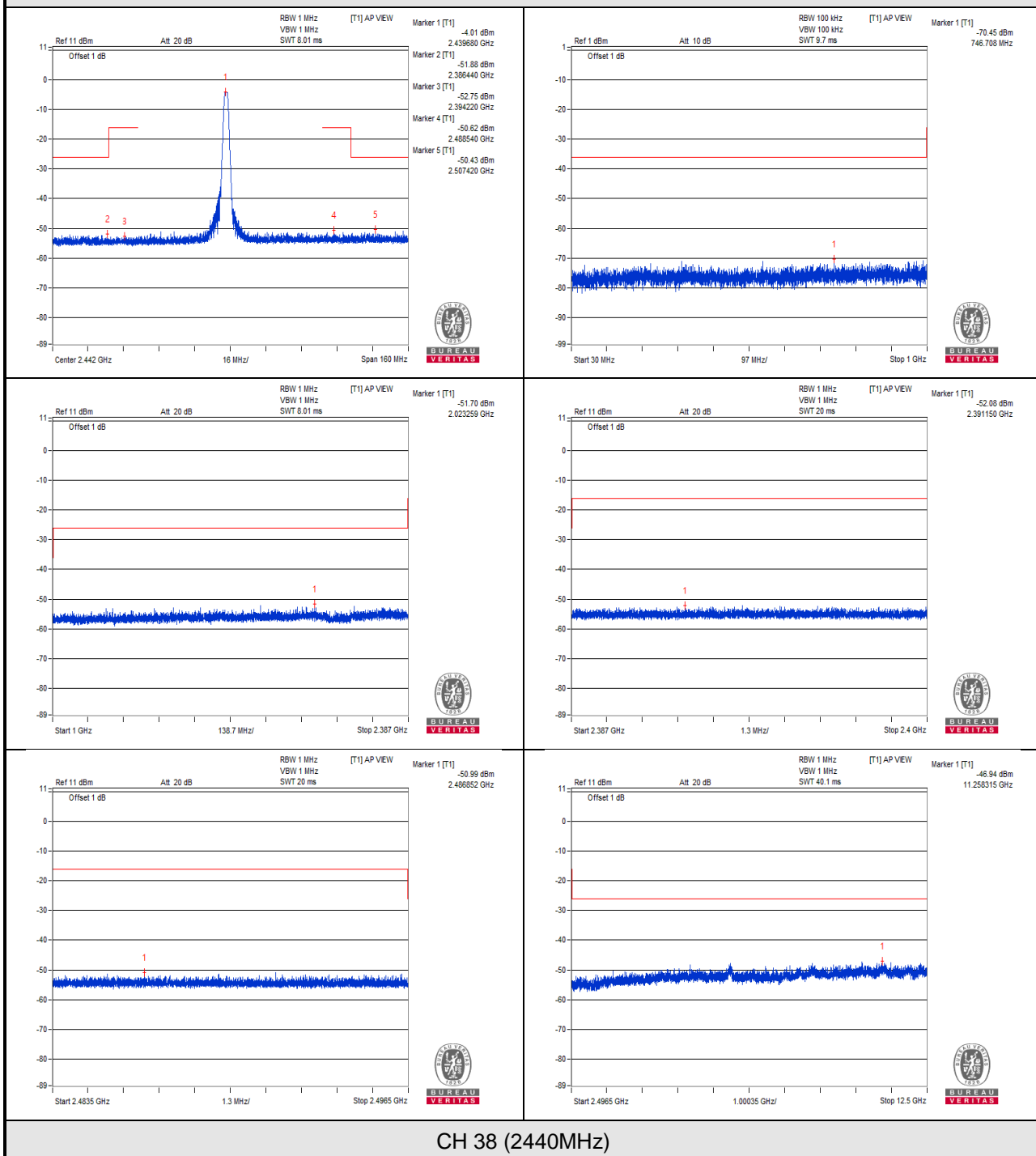
V_{min}.



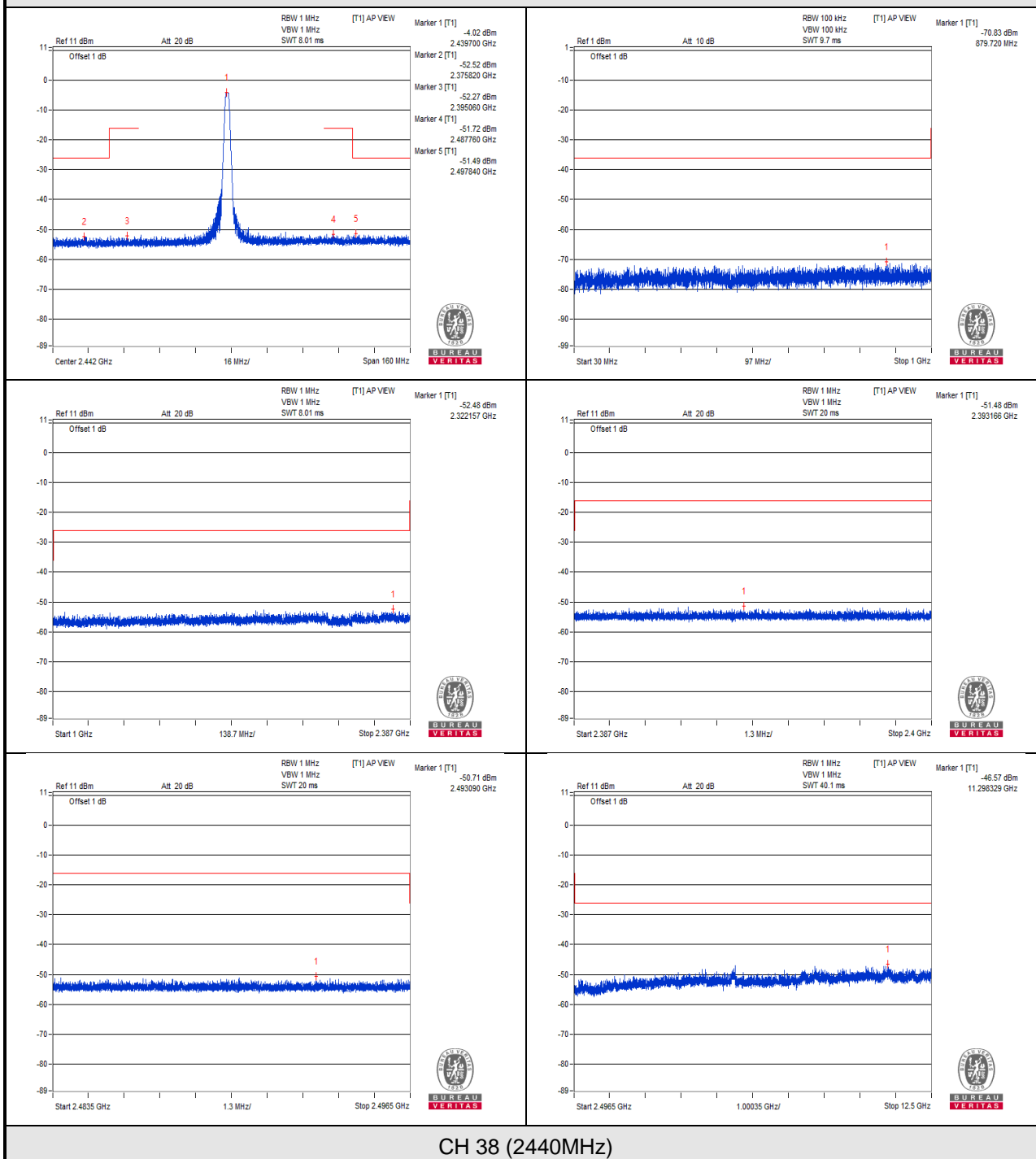
V normal



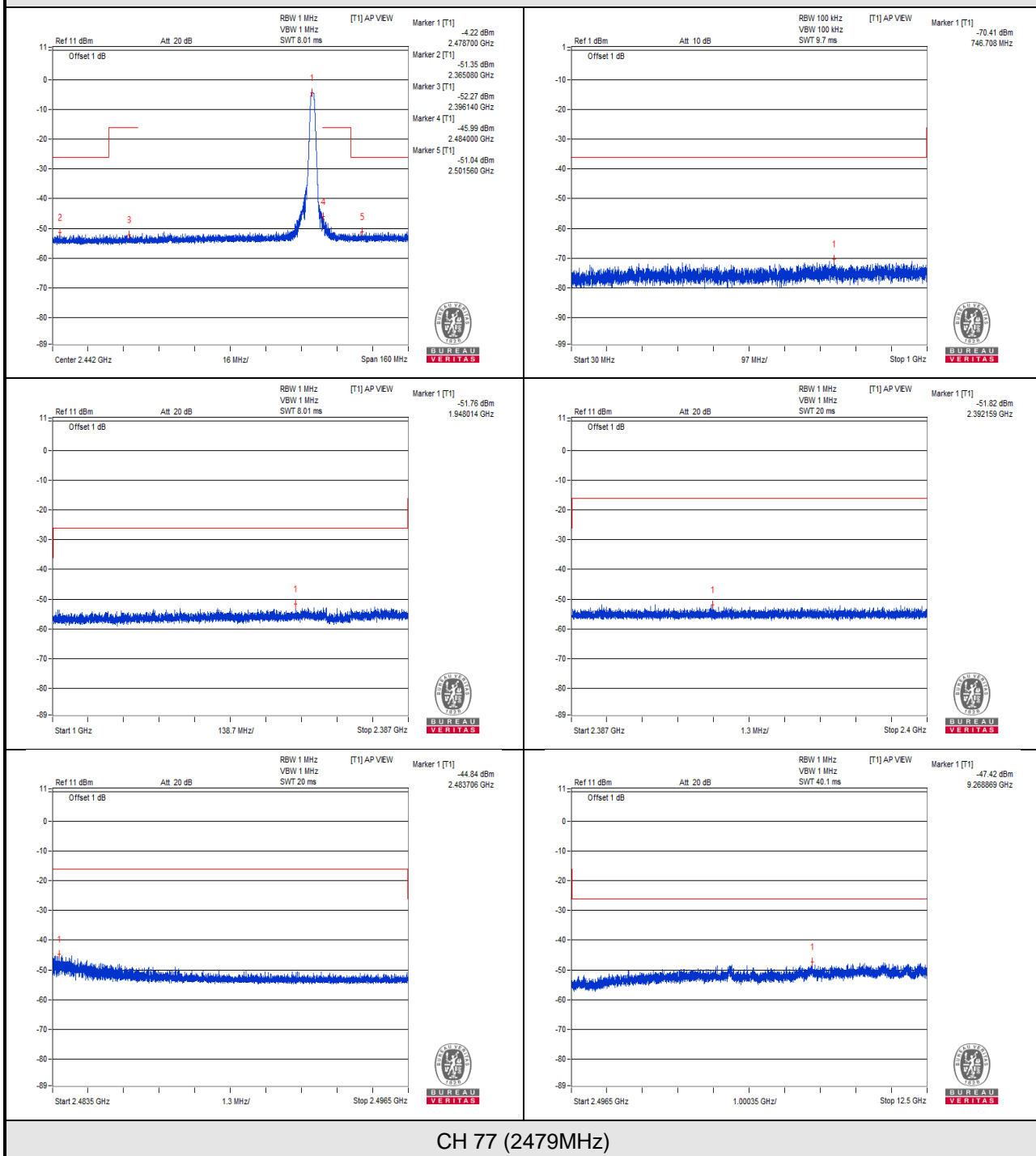
V max.



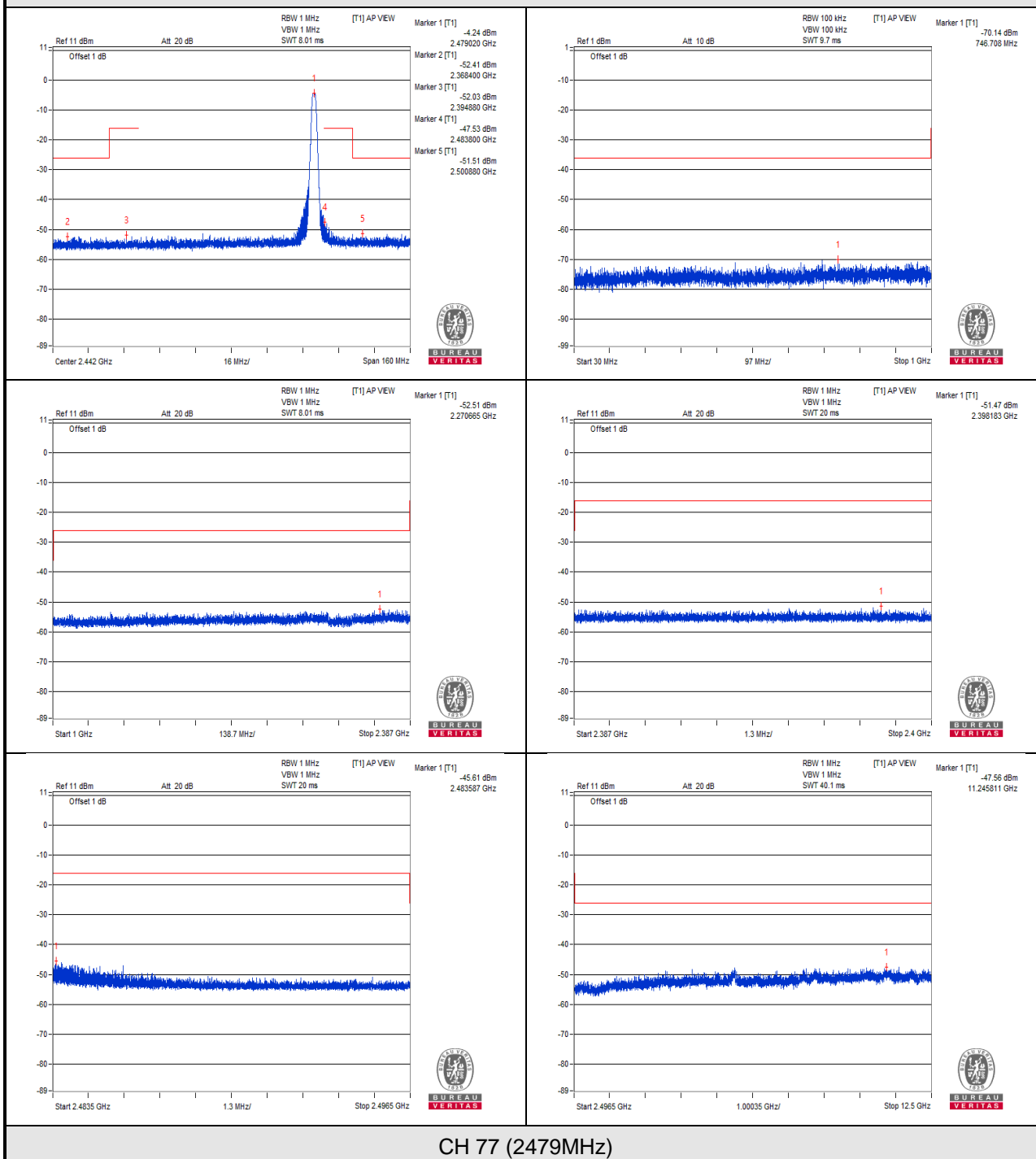
V_{min}.



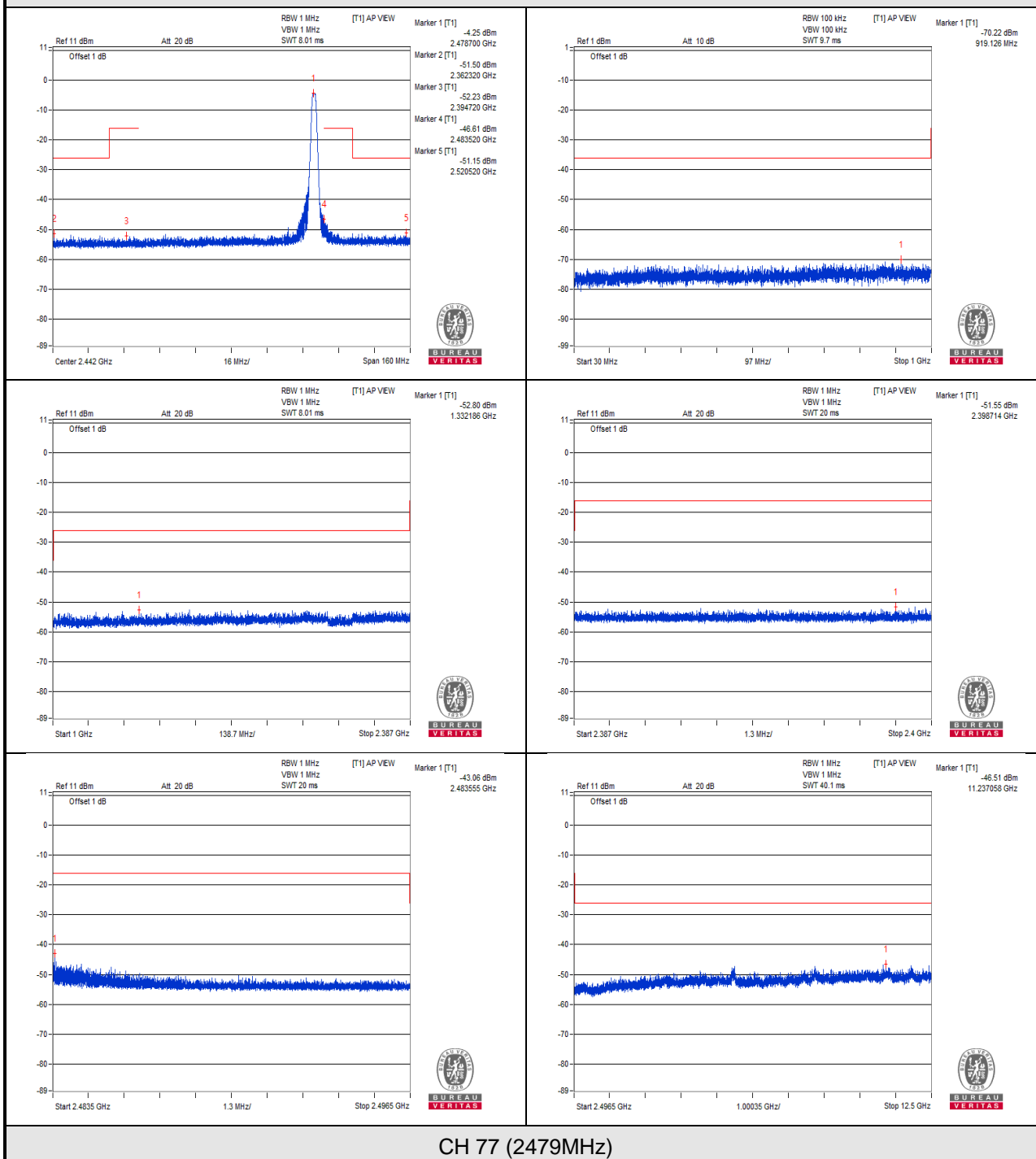
Vnormal



V max.



V_{min}.



4.4 Antenna Power Measurement

4.4.1 Limits of Antenna Power

Modulation System	Frequency Band Used	Antenna Power (Max.)	EIRP Limit (Note 3)
DS	2400 – 2483.5 MHz	10mW/MHz	12.14 dBm/MHz ~ 22.14 dBm/MHz (16.368 mW/MHz ~ 163.68 mW/MHz)
OFDM (Note 1)	2400 – 2483.5 MHz	10mW/MHz	12.14 dBm/MHz ~ 22.14 dBm/MHz (16.368 mW/MHz ~ 163.68 mW/MHz)
OFDM (Note 2)	2400 – 2483.5 MHz	5mW/MHz	9.13 dBm/MHz ~ 19.13 dBm/MHz (8.185 mW/MHz ~ 81.846 mW/MHz)
Other than the above	2400 – 2483.5 MHz	10mW	12.14 dBm ~ 22.14 dBm (16.368 mW ~ 163.68 mW)

Note:

1. Occupied bandwidth is less than 26MHz
2. Occupied bandwidth is more than 26MHz and less than 40MHz
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 $A = \text{EIRP}/(2.14 \text{ dBi} + \text{"Antenna Power (limit)})$.
4. Tolerance of antenna power shall be +20% (upper value) and -80% (lower value).

4.4.2 Test Setup



4.4.3 Test Results

Voltage	Channel Number	Frequency (MHz)	Conducted RF Output Power (mW)	Radiated RF Output Power (mW)
V_{normal}	0	2402	1.928	1.604
	38	2440	2.198	1.828
	77	2479	2.323	1.932
V_{max.}	0	2402	1.905	1.585
	38	2440	2.153	1.791
	77	2479	2.239	1.862
V_{min.}	0	2402	1.972	1.64
	38	2440	2.244	1.866
	77	2479	2.415	2.009
Max. Limit (mW):			10	-
Rated Power (mW):			3	-
Tolerance of Antenna Power (mW):			0.6 ~ 3.6	-
Max. EIRP Limit (mW):			-	16.368

Note: 1. Antenna gain is -0.8 dBi.

2. The radiated RF output power is a "calculated" value derived from the conducted value.
3. Formula: Radiated RF output power = Conducted RF output power + Antenna gain

4.5 Spurious Emissions for Receiver

4.5.1 Limits of Spurious Emissions for Receiver

Frequencies (MHz)	Limit
Below 1GHz	$\leq 4\text{nW}$ (-54dBm)
Above 1GHz	$\leq 20\text{nW}$ (-47dBm)

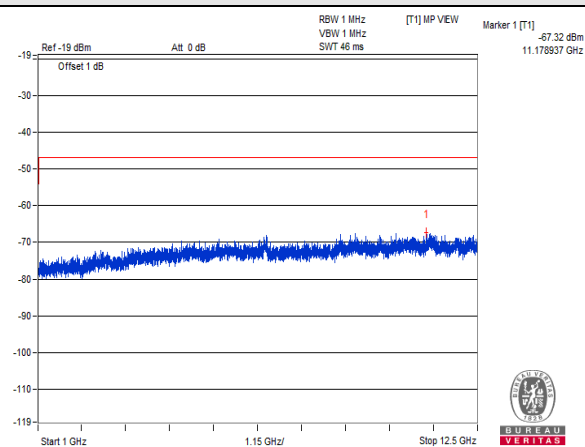
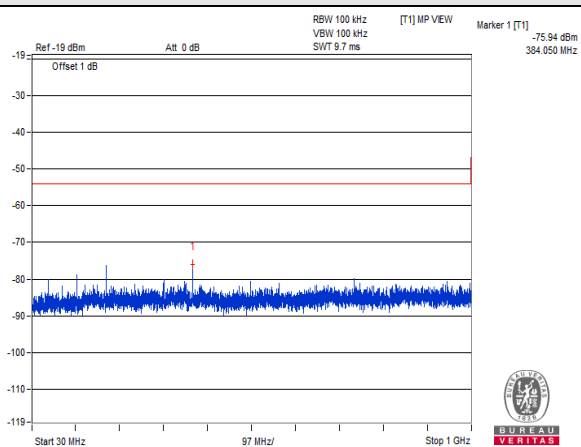
4.5.2 Test Setup



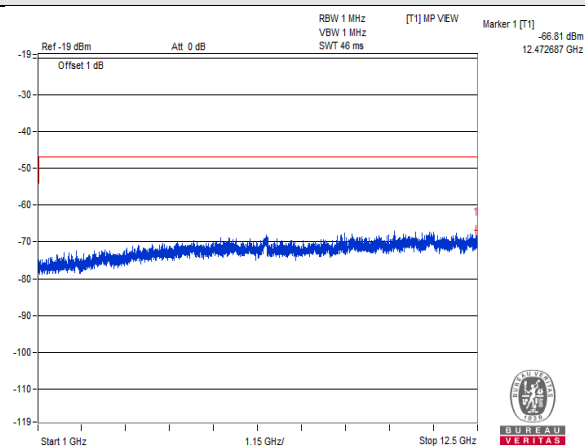
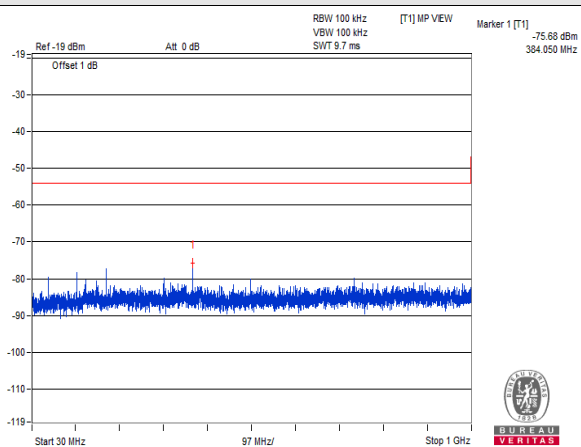
4.5.3 Test Result

TEST CHANNEL		CH 0 (2402MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(nW)	LIMIT (nW)	RESULT
V_{normal}	30MHz to 1000MHz	384.050	0.025468	4.0	PASS
	1000MHz to 12500MHz	11178.937	0.185353	20.0	PASS
V_{max.}	30MHz to 1000MHz	384.050	0.027040	4.0	PASS
	1000MHz to 12500MHz	12472.687	0.208449	20.0	PASS
V_{min.}	30MHz to 1000MHz	384.050	0.022439	4.0	PASS
	1000MHz to 12500MHz	9292.937	0.167494	20.0	PASS
TEST CHANNEL		CH 38 (2440MHz)			
V_{normal}	30MHz to 1000MHz	384.050	0.024099	4.0	PASS
	1000MHz to 12500MHz	10537.812	0.187499	20.0	PASS
V_{max.}	30MHz to 1000MHz	384.050	0.024210	4.0	PASS
	1000MHz to 12500MHz	11396.000	0.208930	20.0	PASS
V_{min.}	30MHz to 1000MHz	384.050	0.020512	4.0	PASS
	1000MHz to 12500MHz	10667.187	0.205116	20.0	PASS
TEST CHANNEL		CH 77 (2479MHz)			
V_{normal}	30MHz to 1000MHz	384.050	0.022646	4.0	PASS
	1000MHz to 12500MHz	11351.437	0.203236	20.0	PASS
V_{max.}	30MHz to 1000MHz	384.050	0.021827	4.0	PASS
	1000MHz to 12500MHz	12357.687	0.205589	20.0	PASS
V_{min.}	30MHz to 1000MHz	384.050	0.027416	4.0	PASS
	1000MHz to 12500MHz	11350.000	0.196336	20.0	PASS

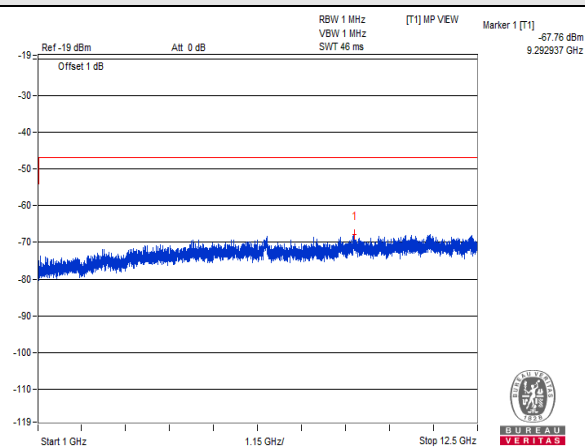
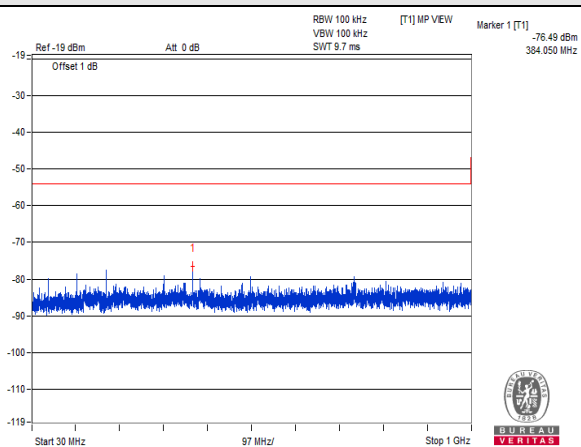
V normal



V max.

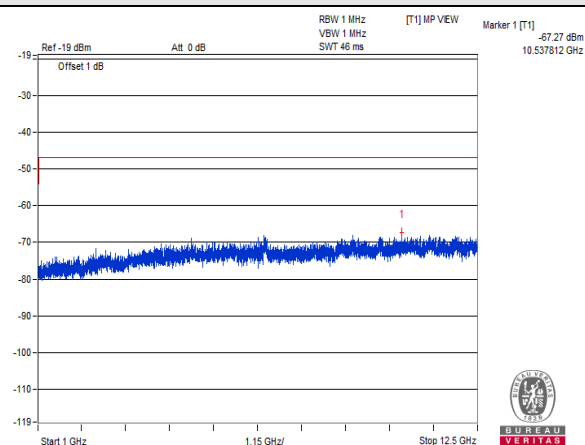
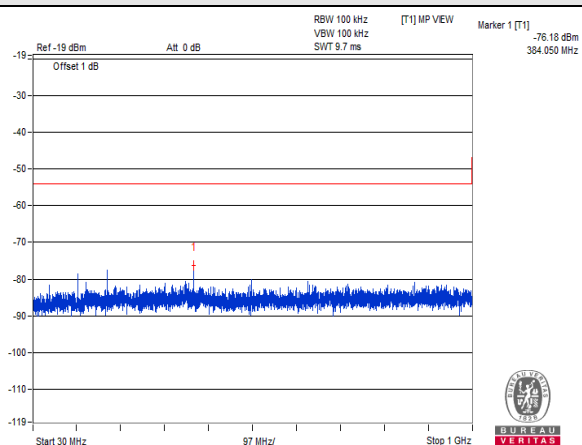


V min.

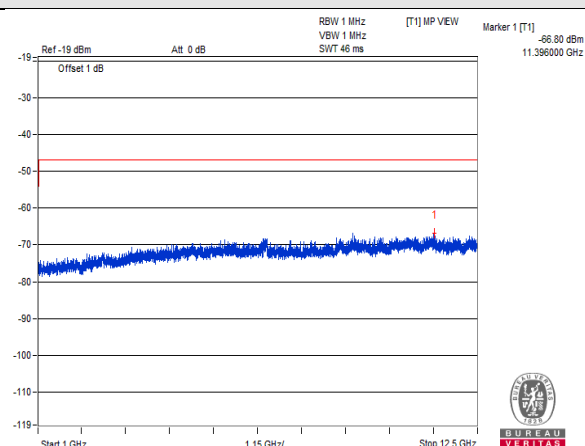
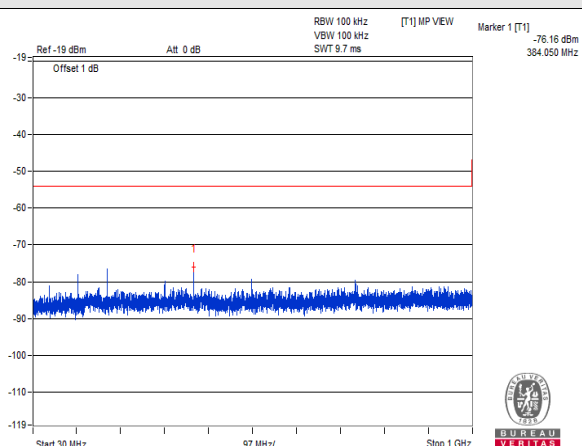


CH 0 (2402MHz)

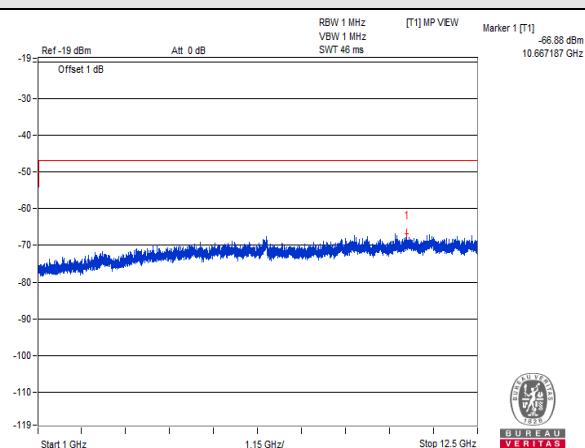
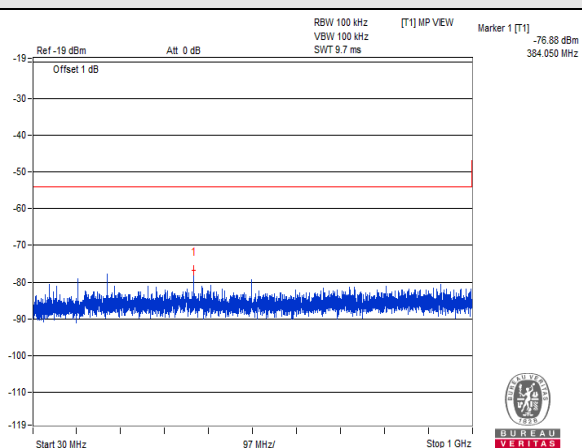
V normal



V max.

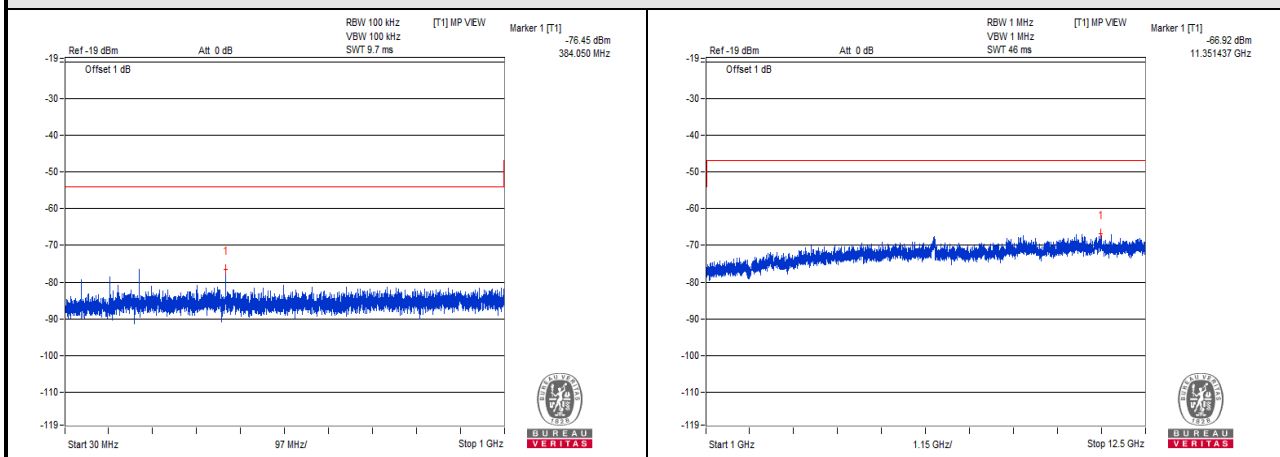


V min.

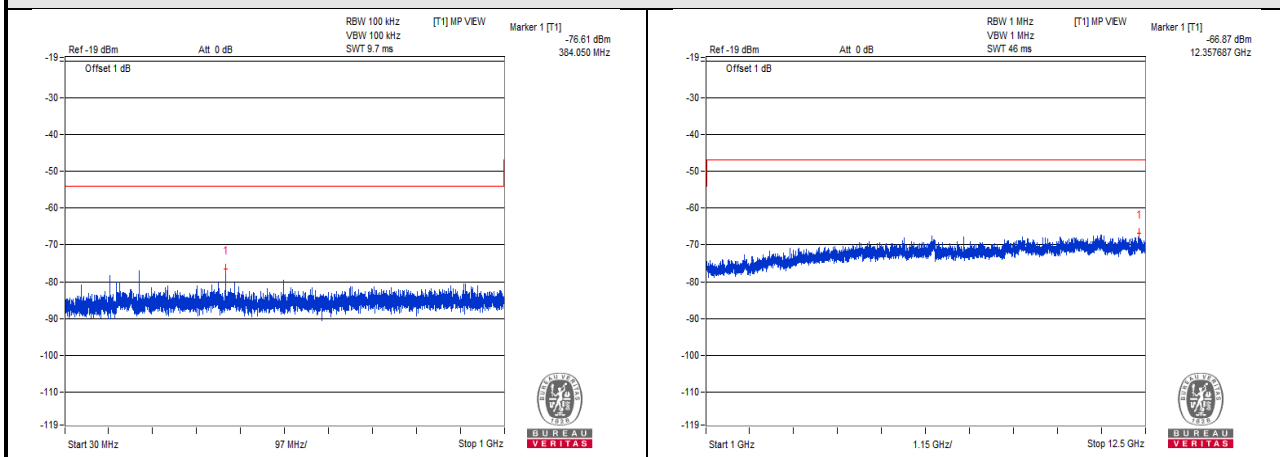


CH 38 (2440MHz)

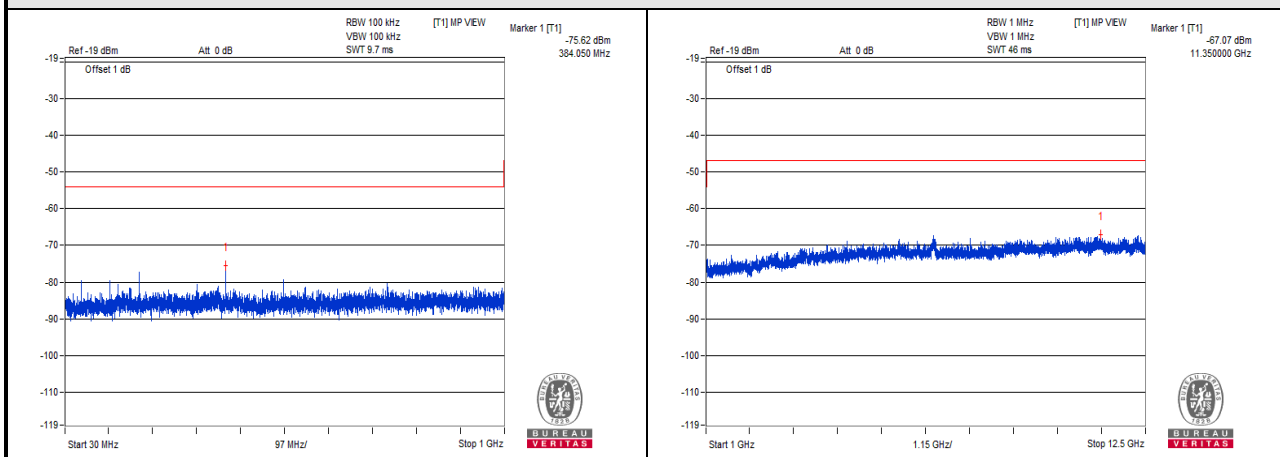
V_{normal}



V_{max.}



V_{min.}



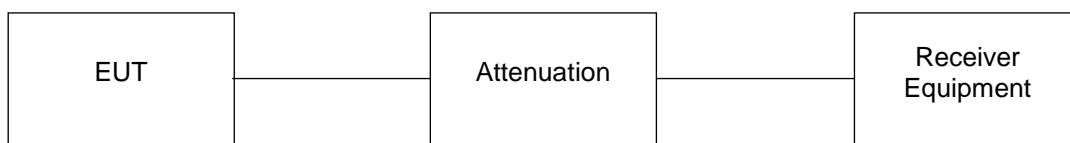
CH 77 (2479MHz)

4.6 Interference Prevention Function

4.6.1 Limits of Interference Prevention Function

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

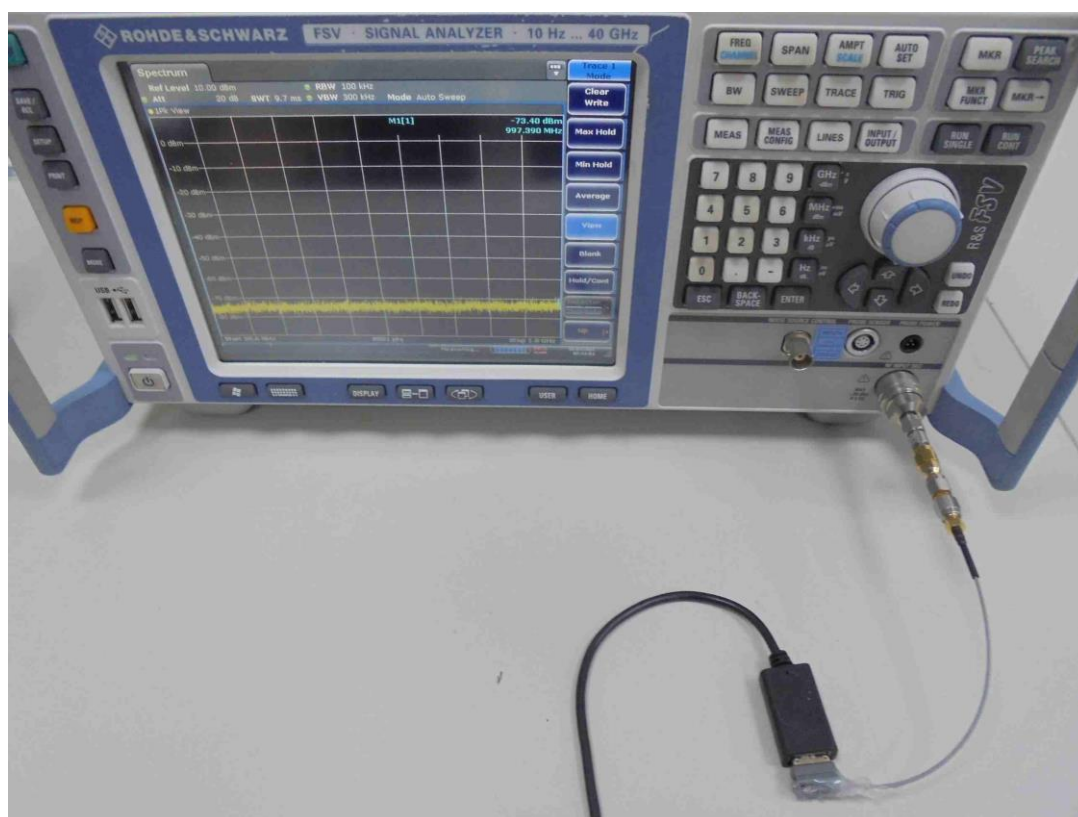
4.6.2 Test Setup



4.6.3 Test Results

Link Mode	Test Result
Normal	Pass

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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