

Radio Test Report (BT-LE)

Report No.: RJBDKG-WTW-P21080001

Test Model: YR0081

Received Date: Aug. 01, 2021

Test Date: Aug. 10, 2021

Issued Date: Sep. 09, 2021

Applicant: LOGITECH FAR EAST LTD.

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

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Release Control Record

Issue No.	Description	Date Issued
RJBDBG-WTW-P21080001	Original release.	Sep. 09, 2021

1 Certificate of Conformity

Product: Wireless keyboard

Brand: Logicoool

Test Model: YR0081

Sample Status: Engineering sample

Applicant: LOGITECH FAR EAST LTD.

Test Date: Aug. 10, 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 :



Date:

Sep. 09, 2021

Claire Kuan / Specialist

Approved by :



Date:

Sep. 09, 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)	4.3	Spurious emissions	C
Transmitting Equipment				
F	--	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	C
--	3.2 (2)	4.4	Antenna power	C
--	3.6 (2)	4.4	Absolute gain of transmitting antenna	C
--	3.6 (2)	--	Angular width of principal radiation (AWPR)	NA
--	3.2 (10)	--	Number of carriers within 1 MHz bandwidth in OFDM	NA
--	3.2 (8)	--	Spreading 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	Calibration Method
Spectrum Analyzer R&S	FSV40	101516	Mar. 8, 2021	Mar. 7, 2022	ETC	(c)
ESG Vector signal generator Agilent	E4438C	MY45094468/005 506 602 UK6 UNJ	Nov. 18, 2020	Nov. 17, 2021	ETC	(c)
Power Meter Anritsu	ML2495A	1529002	June 21, 2021	June 20, 2022	ETC	(c)
Pulse 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 2, 2021	June 1, 2022	ETC	(c)

- 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: Aug. 10, 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 (BT-LE)

Product	Wireless keyboard
Brand	Logicool
Test Model	YR0081
Status of EUT	Engineering sample
Nominal Voltage	DC 5V from USB interface or DC 3.7V from battery
Modulation Type	GFSK
Modulation Technology	DTS
Transfer Rate	Up to 2Mbps (*Note 1)
Operating Frequency	2402MHz ~ 2480MHz (*Note 1)
Number of Channel	40 (*Note 1)
Rated RF Output Power	Refer to Note
Conducted RF Output Power	Refer to Note
Radiated RF Output Power	Refer to Note
Antenna Type	Refer to section 3.5
Antenna Connector	Refer to section 3.5
Accessory Device	NA
Data Cable Supplied	USB Cable Type A to Type C cable x 1 (Shielded, 1m), USB Cable Type C to Type C cable x 1 (Shielded, 1m)

Note:

1. BT-LE technique supports 1Mbps and 2Mbps data rates, both have been evaluated in this test report. Refer to **"section 3.2 Description of Test Modes"** for more detail specification.
2. This device have BT-LE and logi bolt functions. logi bolt is the same technology as BT-LE and is just a different marketing name. The worst case was found in BT-LE function. Therefore only the test data of the type recorded in the report.
3. The EUT may have a lot of colors for marketing requirement.
4. The EUT must be supplied with a battery as the following table:

Brand	Model No.	Spec.
Springpower technology(ShenZhen)Co., Ltd or Logitech	325085 or 533-000204	3.7Vdc, 1500 mAh, 5.550Wh

5. For input voltage of EUT, the worse case was found at the voltage 3.7Vdc condition. Therefore only the test data of the mode was recorded in this report individually.

6. The power table as below table:

Technology Mode	Rated output power (mW)	Conducted RF output power (mW)	Radiated RF output power (mW)
BT-LE 1M	3	2.307	3.631
BT-LE 2M	3	2.312	3.639

7. 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.

3.2 Description of Test Modes

BT-LE channels:

RF Channel	RF Center Frequency	Channel Index	Channels Type for BT 5.x		Channels Type for BT 4.x
			Maximum Data Rate 2Mbps	Maximum Data Rate 1Mbps	Maximum Data Rate 1Mbps
0	2402 MHz	37		●	●
1	2404 MHz	0	●		●
2	2406 MHz	1	●		●
3	2408 MHz	2	●		●
4	2410 MHz	3	●		●
5	2412 MHz	4	●		●
6	2414 MHz	5	●		●
7	2416 MHz	6	●		●
8	2418 MHz	7	●		●
9	2420 MHz	8	●		●
10	2422 MHz	9	●		●
11	2424 MHz	10	●		●
12	2426 MHz	38		●	●
13	2428 MHz	11	●		●
14	2430 MHz	12	●		●
15	2432 MHz	13	●		●
16	2434 MHz	14	●		●
17	2436 MHz	15	●		●
18	2438 MHz	16	●		●
19	2440 MHz	17	●		●
20	2442 MHz	18	●		●
21	2444 MHz	19	●		●
22	2446 MHz	20	●		●
23	2448 MHz	21	●		●
24	2450 MHz	22	●		●
25	2452 MHz	23	●		●
26	2454 MHz	24	●		●
27	2456 MHz	25	●		●
28	2458 MHz	26	●		●
29	2460 MHz	27	●		●
30	2462 MHz	28	●		●
31	2464 MHz	29	●		●
32	2466 MHz	30	●		●
33	2468 MHz	31	●		●
34	2470 MHz	32	●		●
35	2472 MHz	33	●		●
36	2474 MHz	34	●		●
37	2476 MHz	35	●		●
38	2478 MHz	36	●		●
39	2480 MHz	39		●	●

By means of test software (RF Sample with Receiver [Number Lock]) provided by manufacturer, the power levels during the tests were set according to the following codes:

BT-LE 1M		BT-LE 2M	
Channel	Power Setting	Channel	Power Setting
0	Default	1	Default
19	Default	19	Default
39	Default	38	Default

Test Item	Operation Discussion
Frequency Tolerance Measurement	◆ BLE1M TX Unmodulated on channel 2402MHz ◆ BLE1M TX Unmodulated on channel 2440MHz ◆ BLE1M TX Unmodulated on channel 2480MHz ◆ BLE2M TX Unmodulated on channel 2404MHz ◆ BLE2M TX Unmodulated on channel 2440MHz ◆ BLE2M TX Unmodulated on channel 2478MHz
Occupied Bandwidth Measurement / Spurious Emissions for Transmitter Measurement / Antenna Power Measurement / Spurious Emissions for Receiver	◆ BLE1M TX Modulated on channel 2402MHz ◆ BLE1M TX Modulated on channel 2440MHz ◆ BLE1M TX Modulated on channel 2480MHz ◆ BLE2M TX Modulated on channel 2404MHz ◆ BLE2M TX Modulated on channel 2440MHz ◆ BLE2M TX Modulated on channel 2478MHz ◆ BLE1M RX on channel 2402MHz ◆ BLE1M RX on channel 2440MHz ◆ BLE1M RX on channel 2480MHz ◆ BLE2M RX on channel 2404MHz ◆ BLE2M RX on channel 2440MHz ◆ BLE2M RX on channel 2478MHz
Interference Prevention Function	Operation in Normal mode.

3.3 Test Conditions

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

Test mode is presented in the report as below:

Test Item	Environmental Conditions
Frequency Tolerance	25 deg.C, 60 % RH
Occupied Bandwidth	25 deg.C, 60 % RH
Spurious Emissions for Transmitter	25 deg.C, 60 % RH
Antenna Power	25 deg.C, 60 % RH
Spurious Emissions for Receiver	25 deg.C, 60 % RH

3.4 Assembly

The housing consists of two plastic parts, and the plastic enclosure was fixed together with normal screws and covered with labels. So the screws cannot be observed directly. Also it won't be easy to be opened.

3.5 Antenna Specifications

3.5.1 Antenna Gain

Antenna Gain (dBi)	Frequency range(GHz)	Antenna Type	Connector Type
1.97	2.4~2.4835	Printed Monopole Antenna	None

Note: 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

BT-LE 1M

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	2402.009275	3.861	2402.009283	3.864	2402.009254	3.852
19	2440	2440.009200	3.770	2440.009138	3.745	2440.009172	3.759
39	2480	2480.009419	3.797	2480.009419	3.797	2480.009419	3.797

BT-LE 2M

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	2404	2404.009196	3.825	2404.009143	3.803	2404.009114	3.791
19	2440	2440.008824	3.616	2440.008852	3.627	2440.008824	3.616
38	2478	2478.009225	3.722	2478.009225	3.722	2478.009254	3.734

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



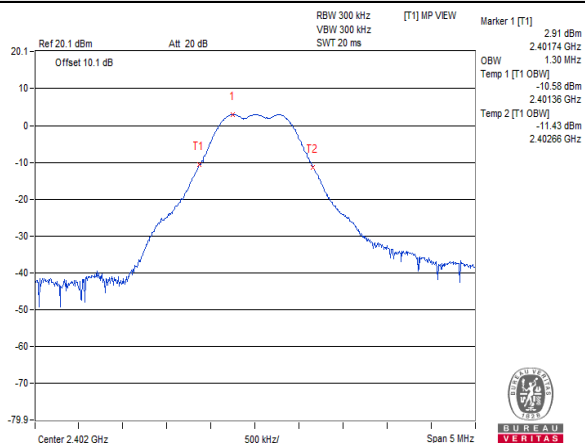
4.2.3 Test Results

BT-LE 1M

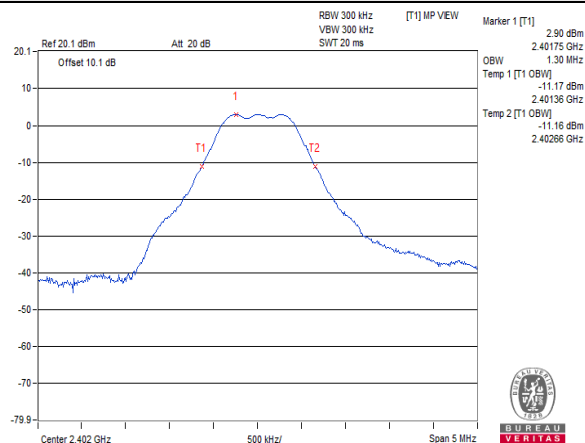
Channel	Frequency (MHz)	V_{normal}	$V_{max.}$	$V_{min.}$
		Occupied bandwidth (MHz)	Occupied bandwidth (MHz)	Occupied bandwidth (MHz)
0	2402	1.30	1.30	1.30
19	2440	1.32	1.31	1.32
39	2480	1.31	1.32	1.31

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

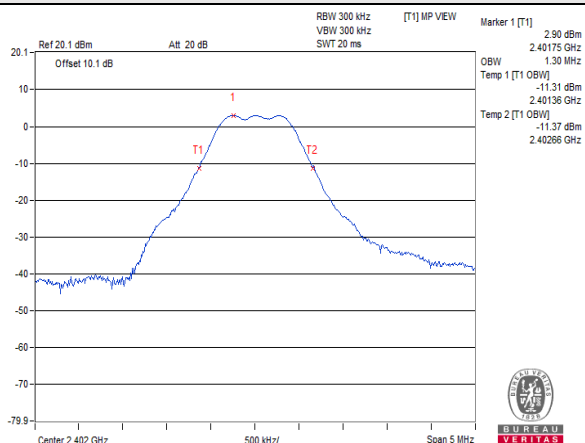
V_{normal}



V_{max.}

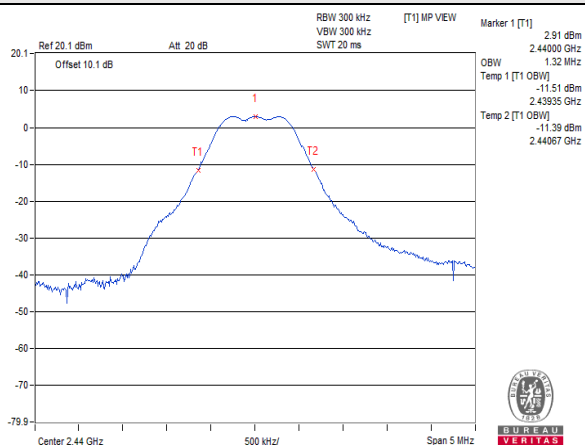


V_{min.}

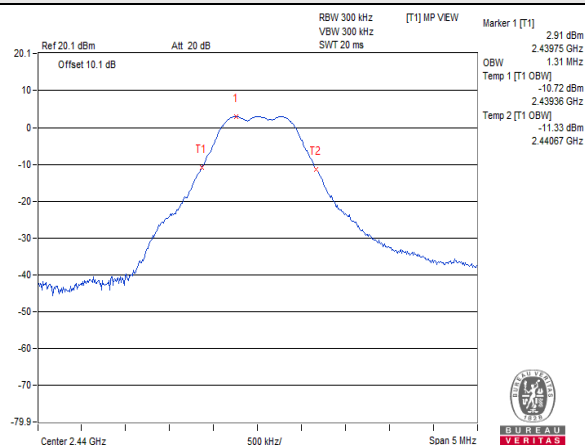


CH 0 (2402MHz)

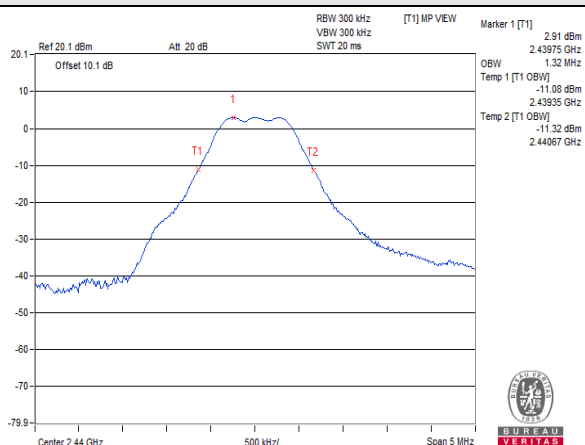
V_{normal}



V_{max.}

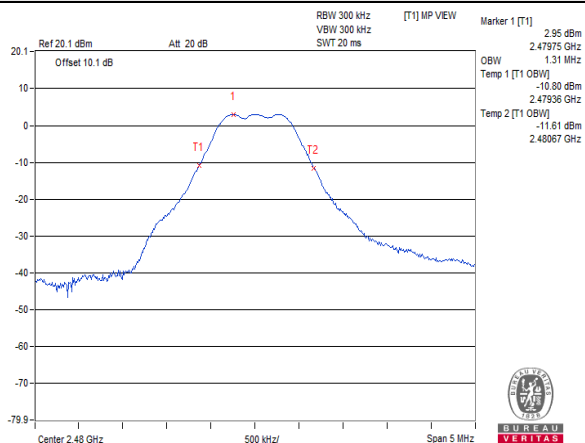


V_{min.}

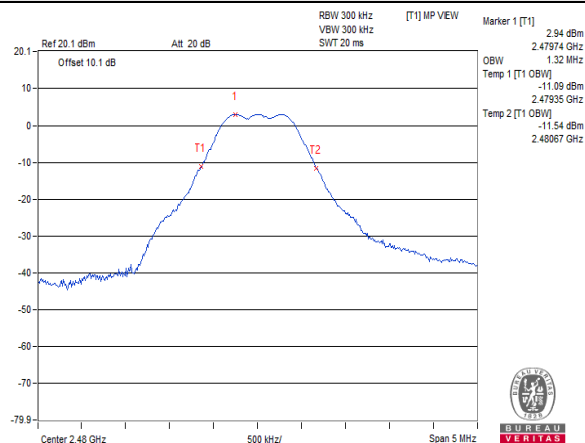


CH 19 (2440MHz)

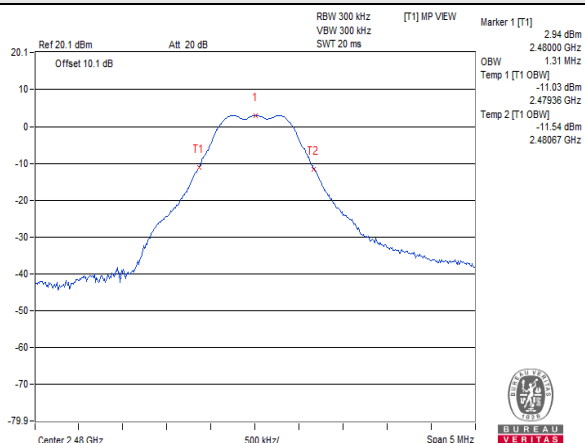
V_{normal}



V_{max.}



V_{min.}



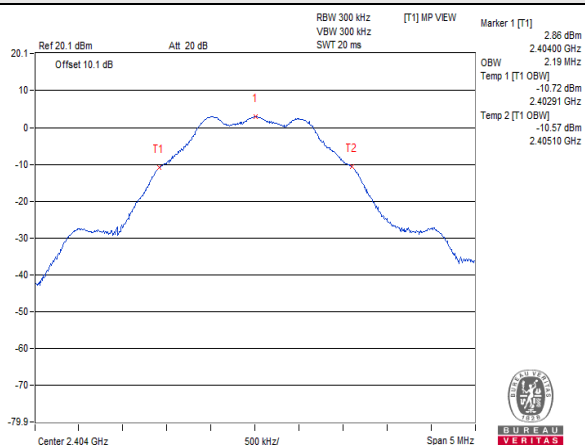
CH 39 (2480MHz)

BT-LE 2M

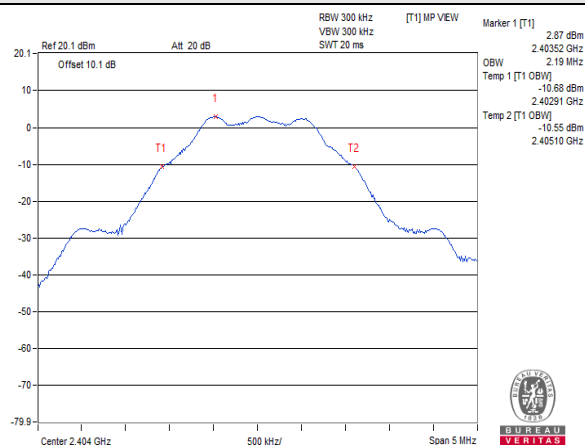
Channel	Frequency (MHz)	V_{normal}	$V_{max.}$	$V_{min.}$
		Occupied bandwidth (MHz)	Occupied bandwidth (MHz)	Occupied bandwidth (MHz)
1	2404	2.19	2.19	2.19
19	2440	2.20	2.20	2.20
38	2478	2.20	2.20	2.20

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

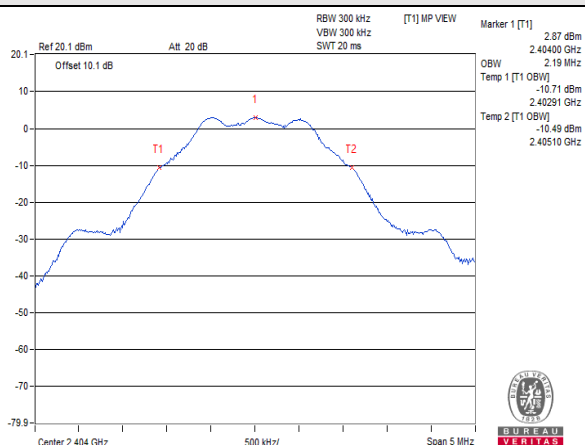
V_{normal}



V_{max.}

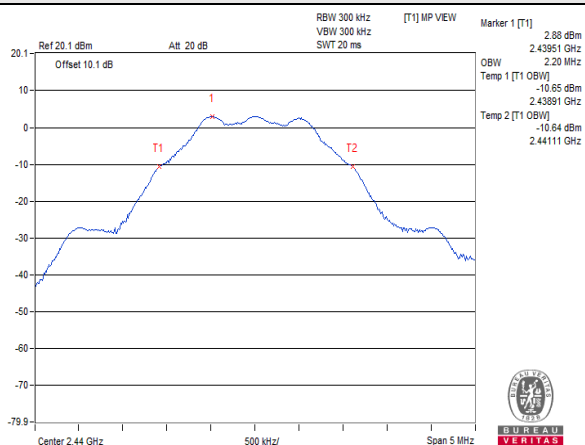


V_{min.}

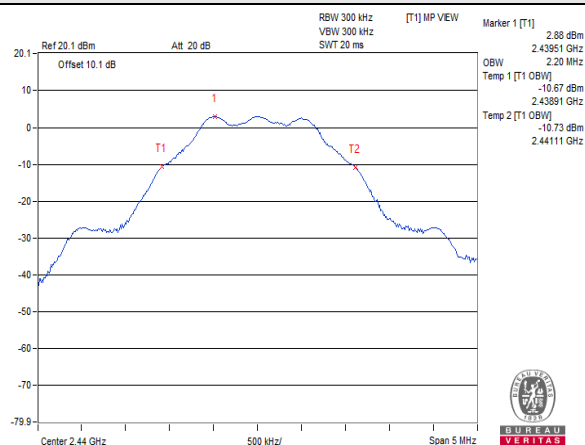


CH 1 (2404MHz)

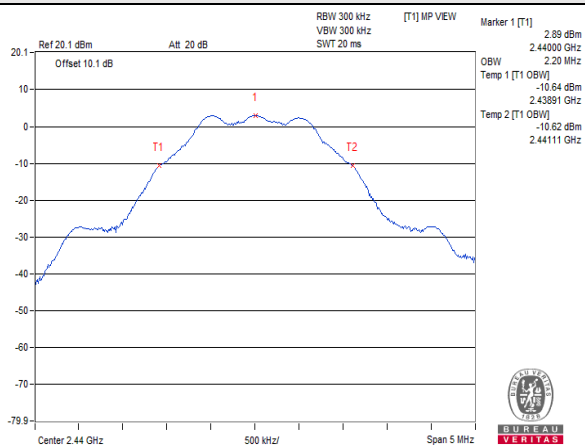
V_{normal}



V_{max.}

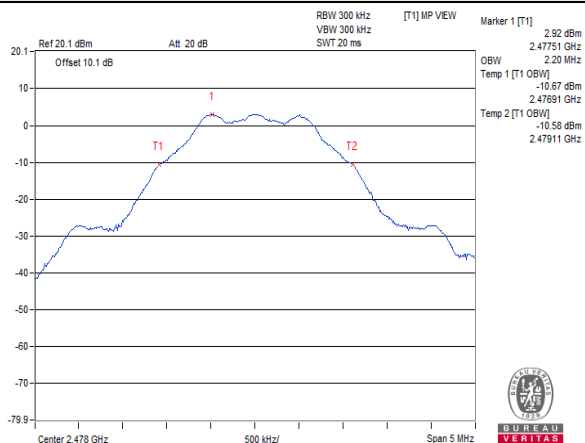


V_{min.}

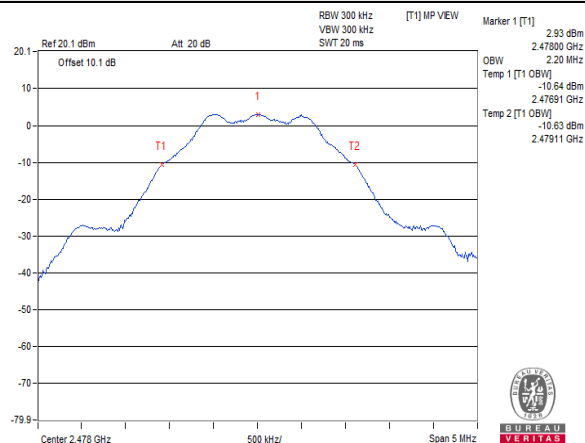


CH 19 (2440MHz)

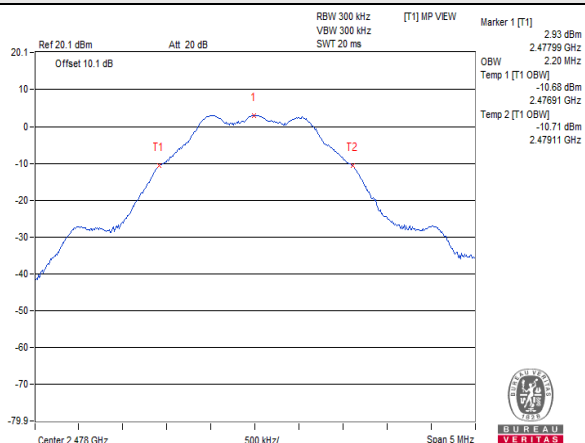
V_{normal}



V_{max.}



V_{min.}



CH 38 (2478MHz)

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	$\leq 0.25 \mu\text{W}/100\text{kHz}$
1000.0MHz to 2387MHz	$\leq 2.5 \mu\text{W}/\text{MHz}$
2387.0MHz to 2400.0MHz	$\leq 25 \mu\text{W}/\text{MHz}$
2483.5MHz to 2496.5MHz	$\leq 25 \mu\text{W}/\text{MHz}$
2496.5MHz to 12500.0MHz	$\leq 2.5 \mu\text{W}/\text{MHz}$

4.3.2 Test Setup



4.3.3 Test Results

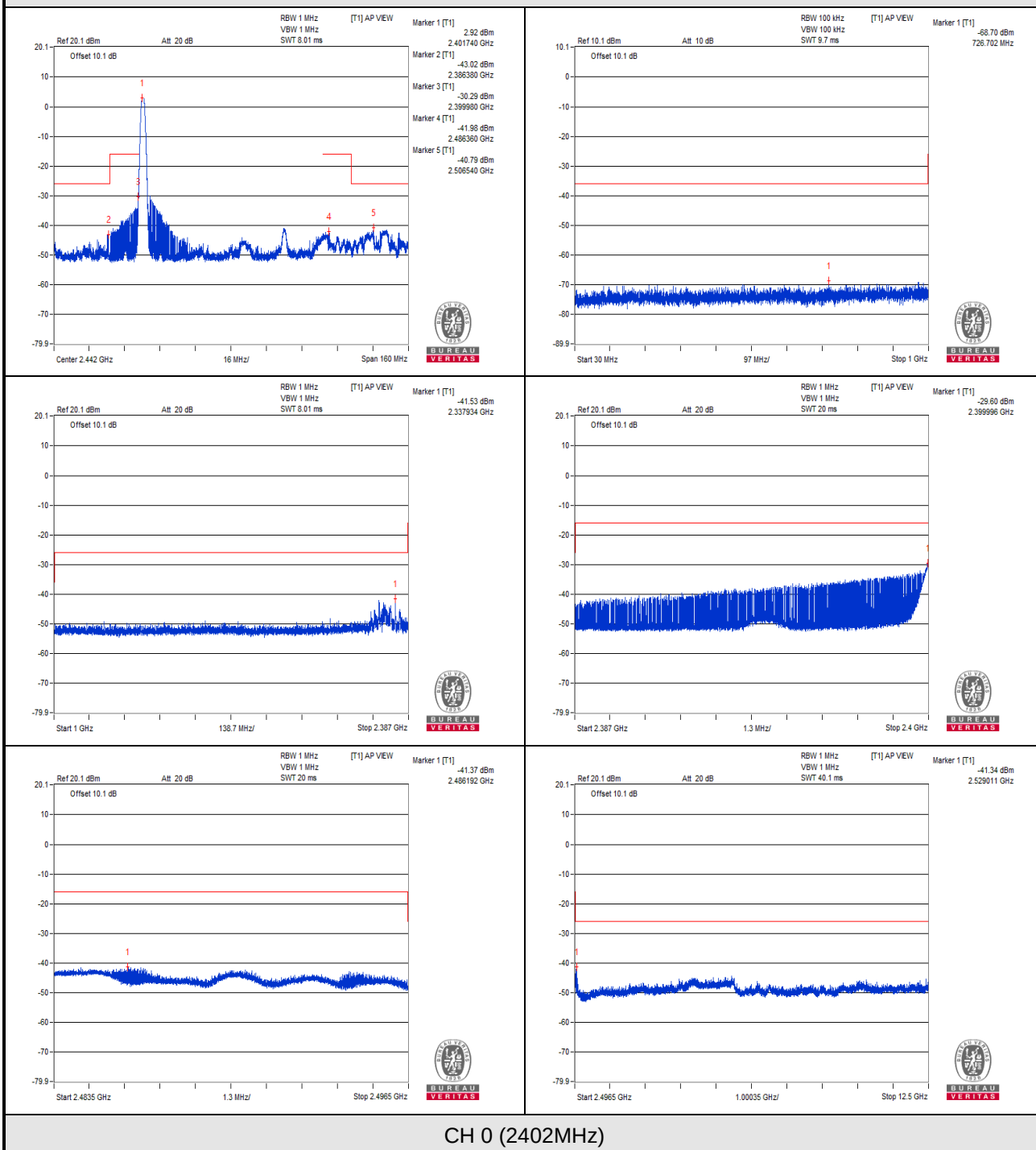
BT-LE 1M

TEST CHANNEL		CH 0 (2402MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(uW)	LIMIT (uW)	RESULT
V_{normal}	30MHz to 1000MHz	726.702	0.000135	0.25	PASS
	1000MHz to 2387MHz	2337.934	0.070307	2.5	PASS
	2387MHz to 2400MHz	2399.996	1.096478	25	PASS
	2483.5MHz to 2496.5MHz	2486.192	0.072946	25	PASS
	2496.5MHz to 12500MHz	2529.011	0.073451	2.5	PASS
V_{max.}	30MHz to 1000MHz	991.512	0.000156	0.25	PASS
	1000MHz to 2387MHz	2274.132	0.078163	2.5	PASS
	2387MHz to 2400MHz	2399.985	0.993116	25	PASS
	2483.5MHz to 2496.5MHz	2486.207	0.073790	25	PASS
	2496.5MHz to 12500MHz	2529.011	0.063387	2.5	PASS
V_{min.}	30MHz to 1000MHz	946.407	0.000141	0.25	PASS
	1000MHz to 2387MHz	2273.959	0.090991	2.5	PASS
	2387MHz to 2400MHz	2399.993	1.081434	25	PASS
	2483.5MHz to 2496.5MHz	2485.944	0.075858	25	PASS
	2496.5MHz to 12500MHz	2530.261	0.072778	2.5	PASS
TEST CHANNEL		CH 19 (2440MHz)			
V_{normal}	30MHz to 1000MHz	964.110	0.000160	0.25	PASS
	1000MHz to 2387MHz	2375.904	0.073961	2.5	PASS
	2387MHz to 2400MHz	2396.257	0.047315	25	PASS
	2483.5MHz to 2496.5MHz	2485.758	0.048195	25	PASS
	2496.5MHz to 12500MHz	2567.774	0.072946	2.5	PASS
V_{max.}	30MHz to 1000MHz	998.666	0.000130	0.25	PASS
	1000MHz to 2387MHz	2376.077	0.068549	2.5	PASS
	2387MHz to 2400MHz	2396.207	0.050816	25	PASS
	2483.5MHz to 2496.5MHz	2486.325	0.040832	25	PASS
	2496.5MHz to 12500MHz	2504.002	0.064121	2.5	PASS
V_{min.}	30MHz to 1000MHz	215.997	0.000147	0.25	PASS
	1000MHz to 2387MHz	2312.275	0.081846	2.5	PASS
	2387MHz to 2400MHz	2393.794	0.046881	25	PASS
	2483.5MHz to 2496.5MHz	2483.803	0.040832	25	PASS
	2496.5MHz to 12500MHz	2567.774	0.084333	2.5	PASS

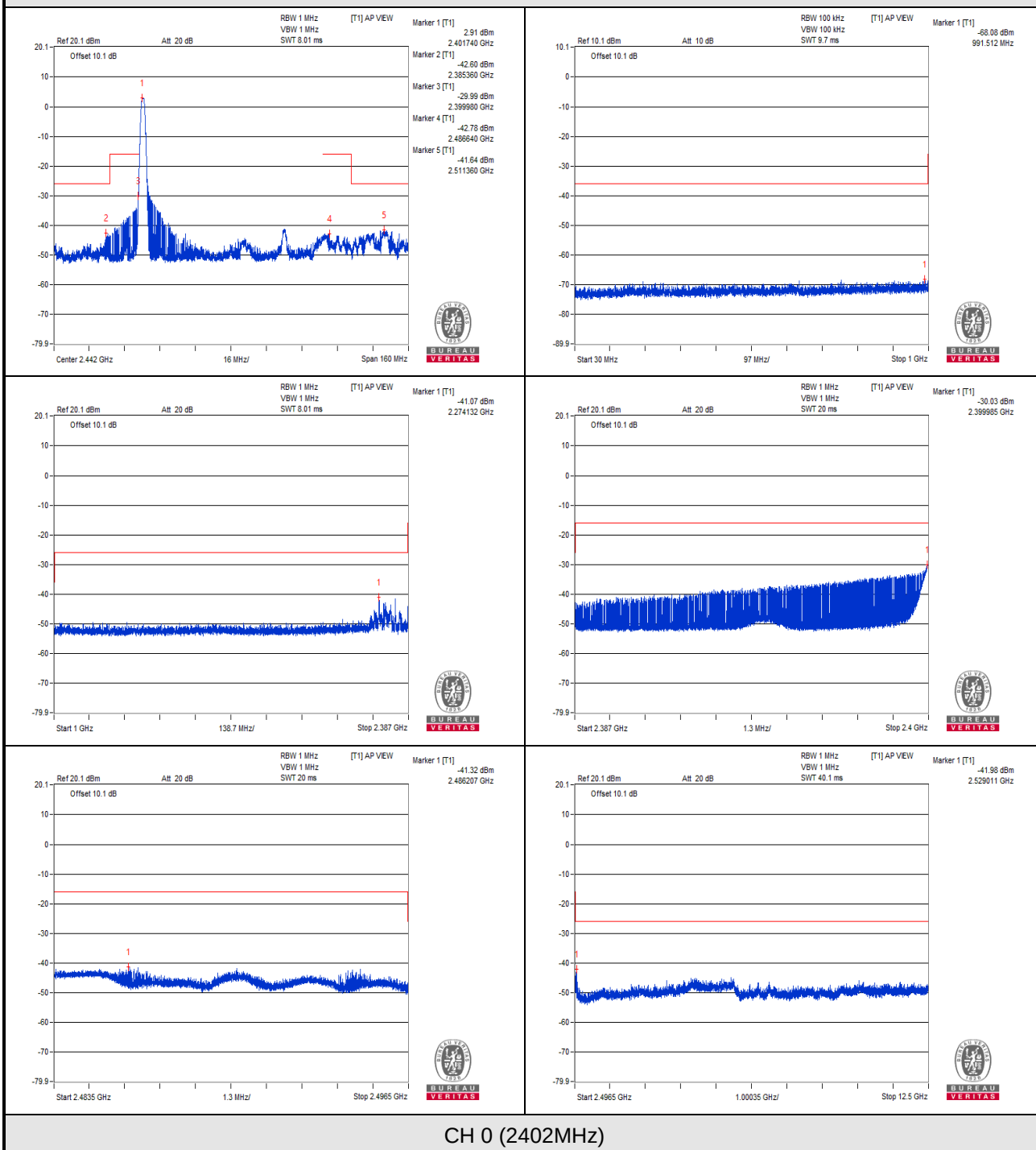
TEST CHANNEL		CH 39 (2480MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(uW)	LIMIT (uW)	RESULT
V_{normal}	30MHz to 1000MHz	903.121	0.000157	0.25	PASS
	1000MHz to 2387MHz	2351.631	0.080910	2.5	PASS
	2387MHz to 2400MHz	2396.272	0.068391	25	PASS
	2483.5MHz to 2496.5MHz	2483.542	0.974990	25	PASS
	2496.5MHz to 12500MHz	2607.788	0.079250	2.5	PASS
V_{max.}	30MHz to 1000MHz	848.801	0.000146	0.25	PASS
	1000MHz to 2387MHz	2352.325	0.076384	2.5	PASS
	2387MHz to 2400MHz	2397.746	0.060674	25	PASS
	2483.5MHz to 2496.5MHz	2483.513	1.013911	25	PASS
	2496.5MHz to 12500MHz	2544.016	0.060534	2.5	PASS
V_{min.}	30MHz to 1000MHz	900.332	0.000168	0.25	PASS
	1000MHz to 2387MHz	2351.978	0.073451	2.5	PASS
	2387MHz to 2400MHz	2396.239	0.061518	25	PASS
	2483.5MHz to 2496.5MHz	2483.576	1.000000	25	PASS
	2496.5MHz to 12500MHz	2607.788	0.075683	2.5	PASS

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

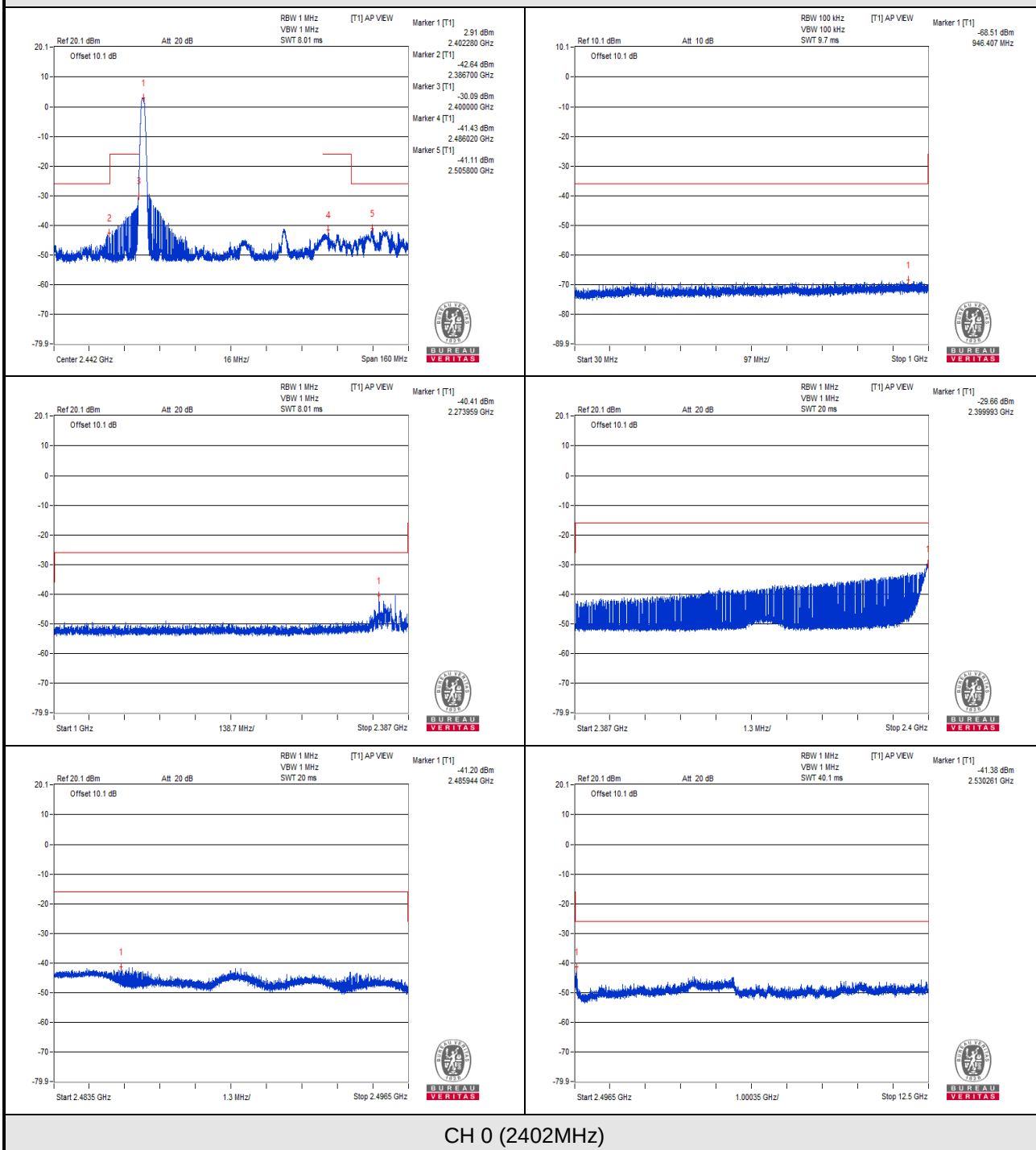
Vnormal



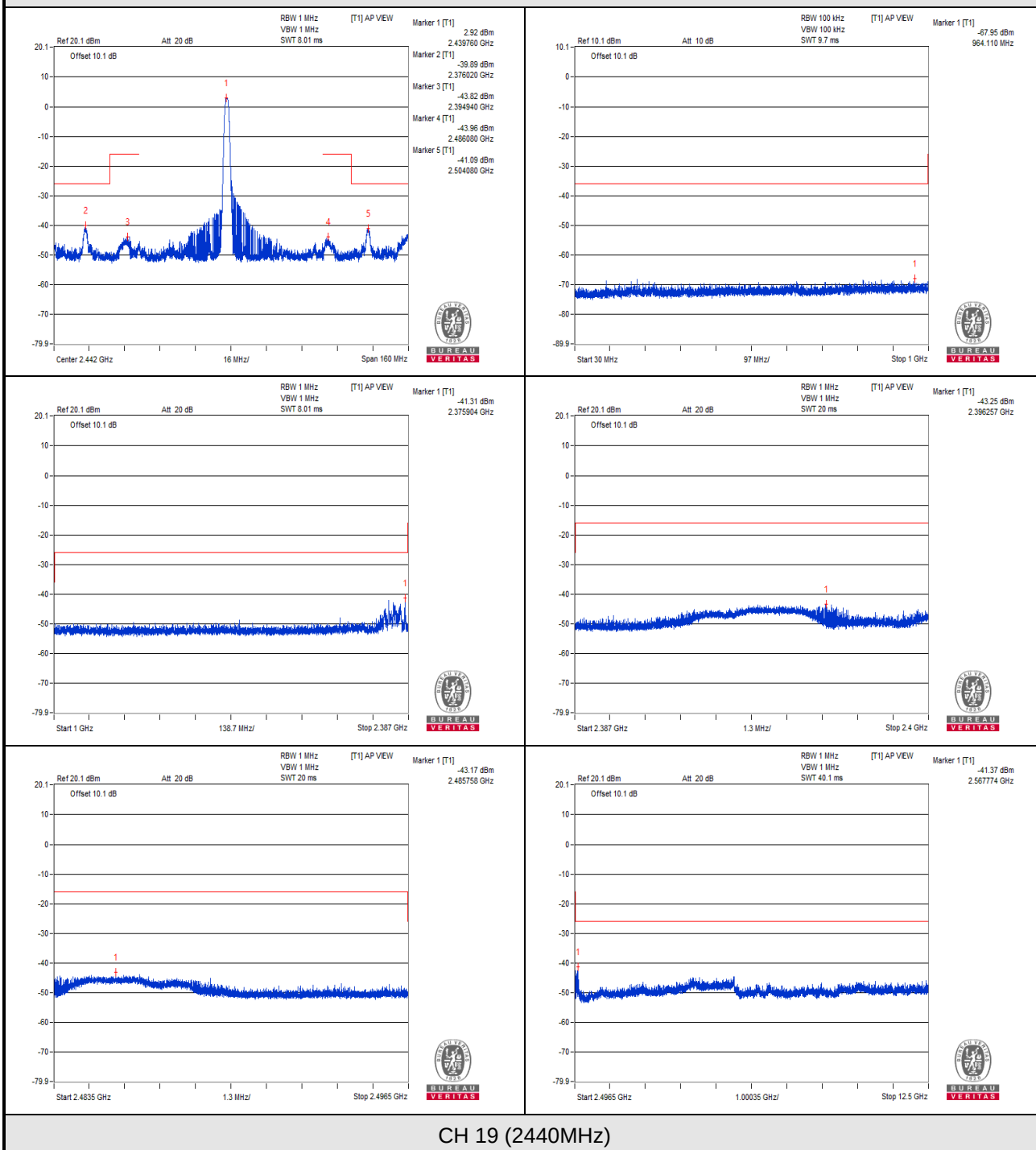
V_{max}.



V_{min}.

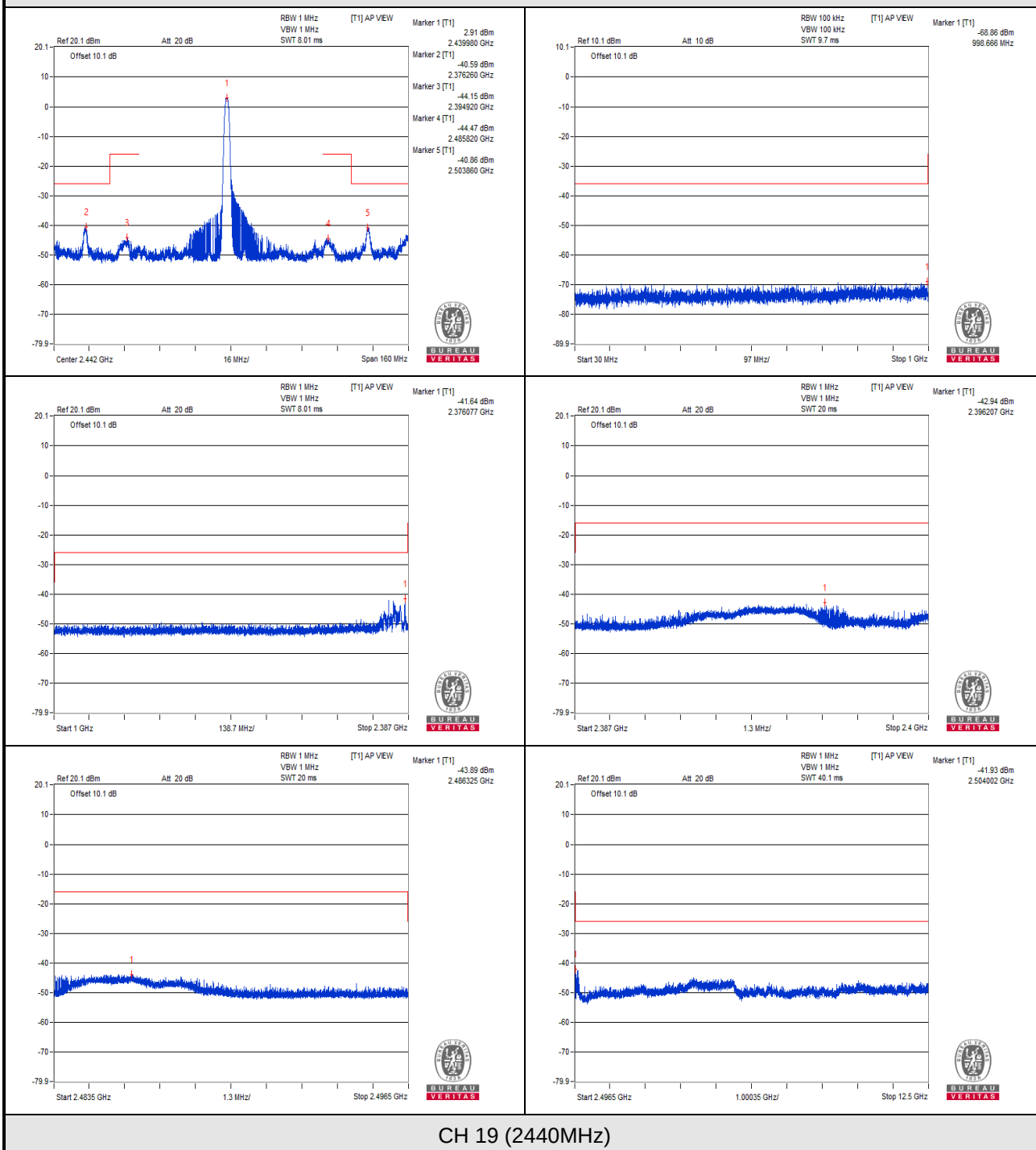


Vnormal



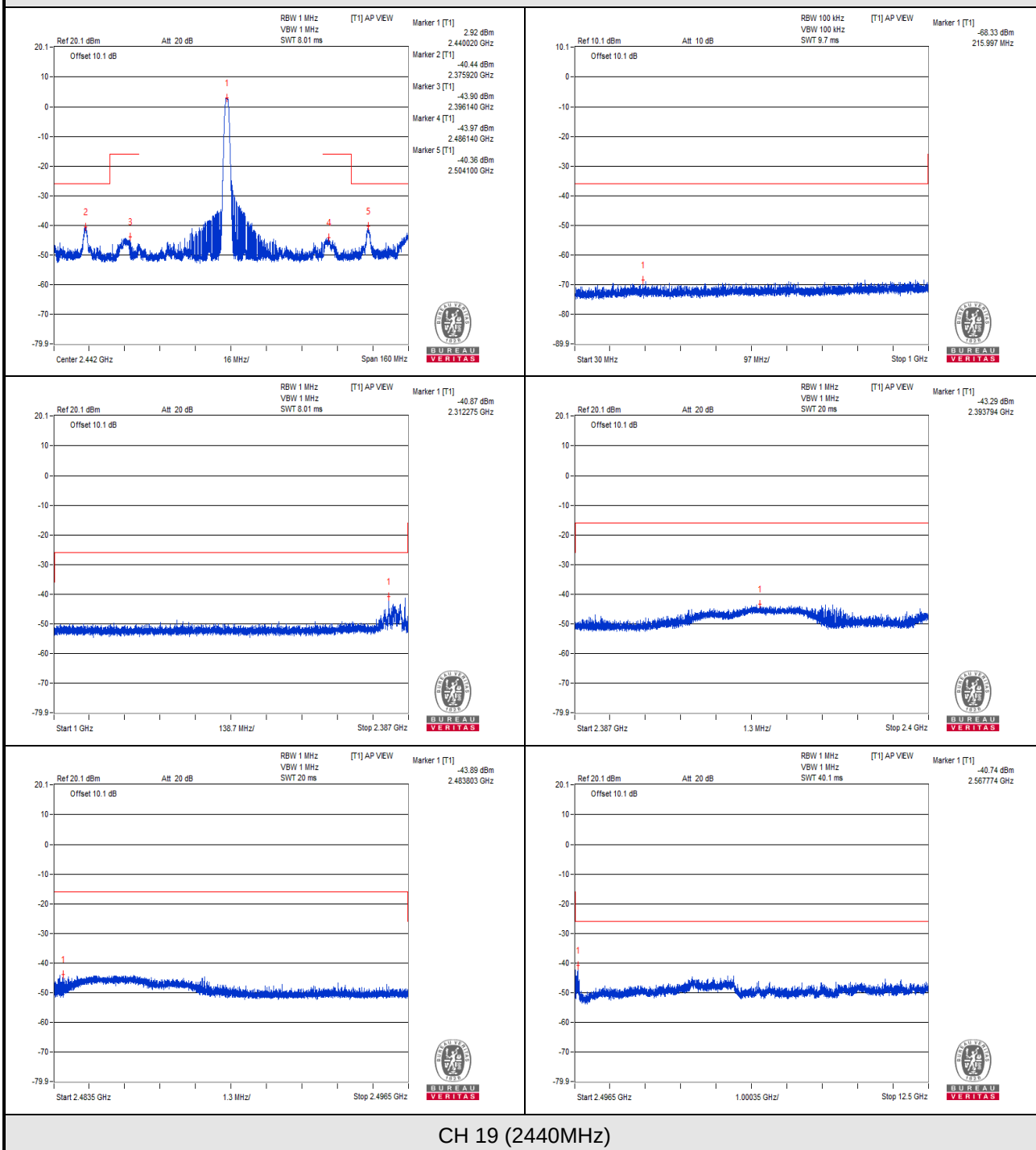
CH 19 (2440MHz)

V_{max}.

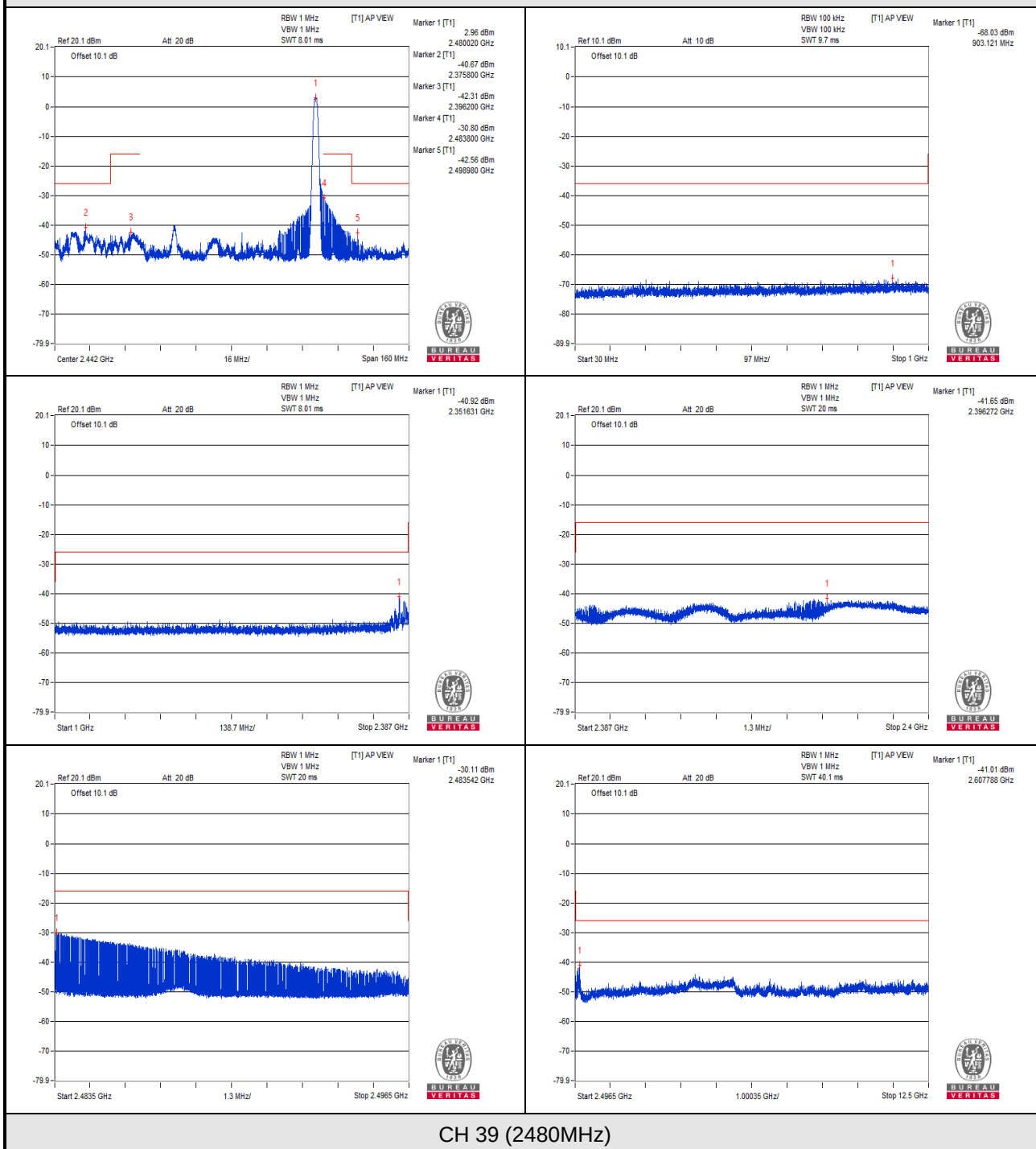


CH 19 (2440MHz)

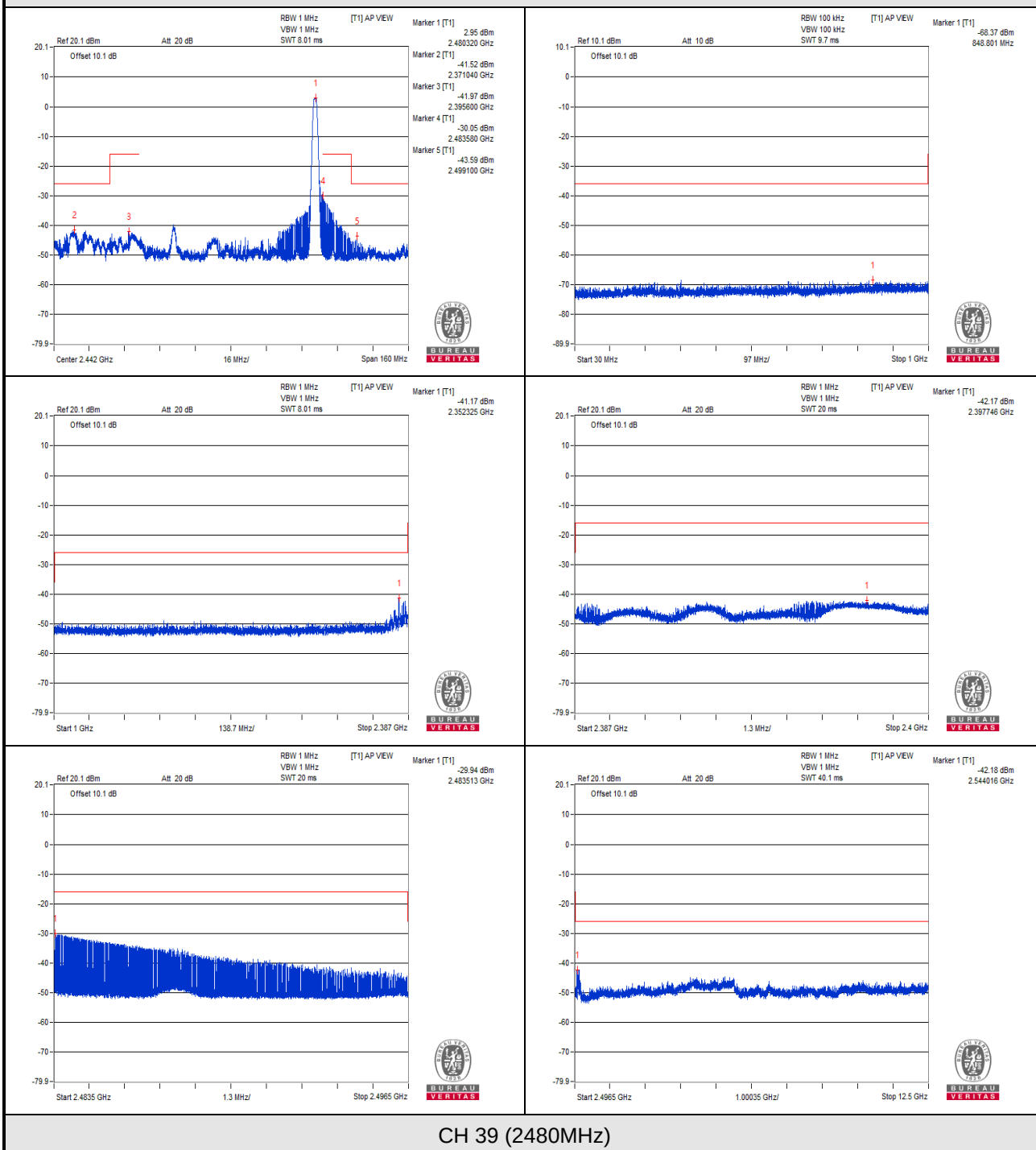
V_{min}.



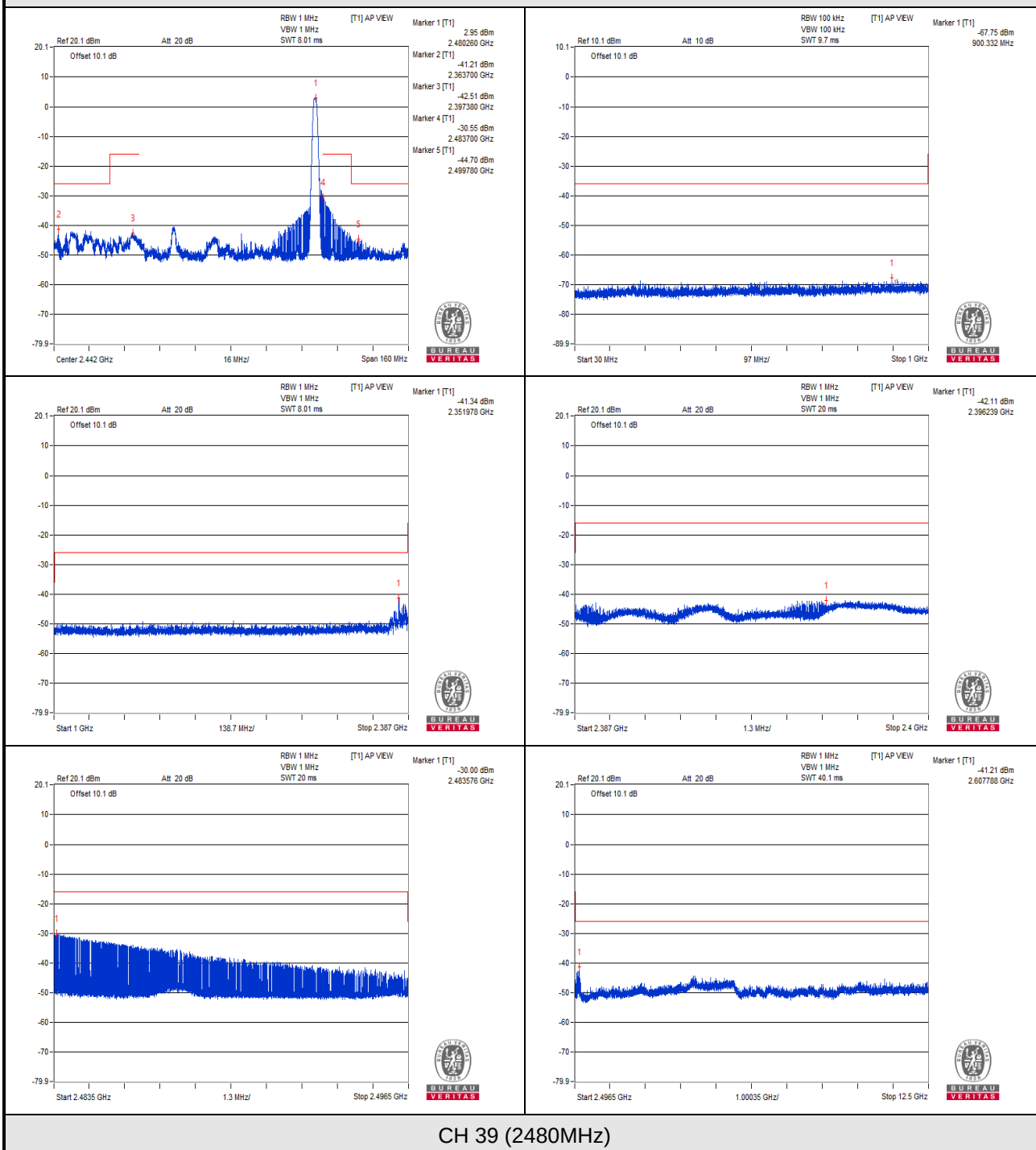
Vnormal



V_{max}.



V_{min}.



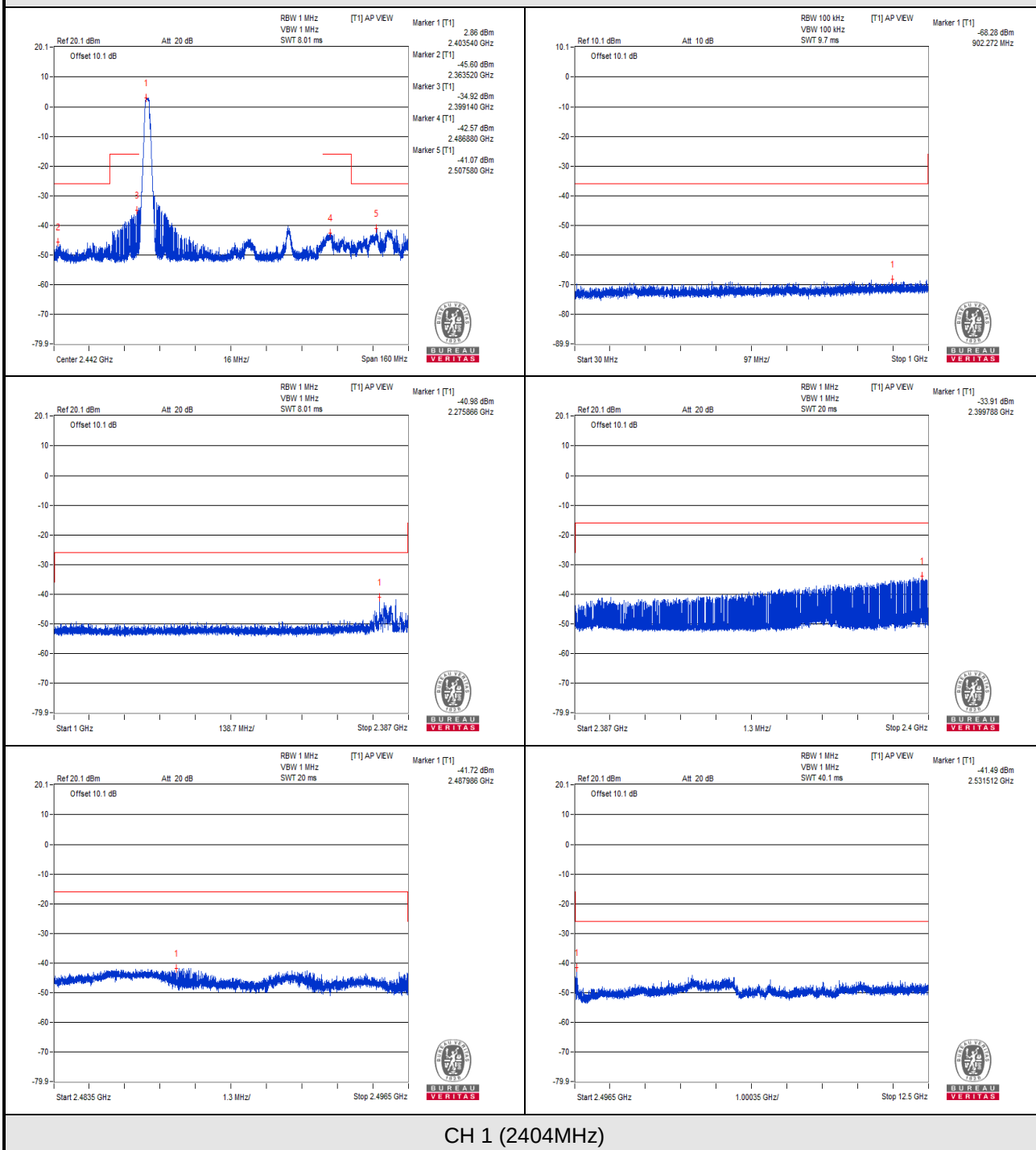
BT-LE 2M

TEST CHANNEL		CH 1 (2404MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(μ W)	LIMIT (μ W)	RESULT
V_{normal}	30MHz to 1000MHz	902.272	0.000149	0.25	PASS
	1000MHz to 2387MHz	2275.866	0.079799	2.5	PASS
	2387MHz to 2400MHz	2399.788	0.406443	25	PASS
	2483.5MHz to 2496.5MHz	2487.986	0.067298	25	PASS
	2496.5MHz to 12500MHz	2531.512	0.070958	2.5	PASS
V_{max.}	30MHz to 1000MHz	903.000	0.000133	0.25	PASS
	1000MHz to 2387MHz	2340.362	0.089125	2.5	PASS
	2387MHz to 2400MHz	2399.678	0.349140	25	PASS
	2483.5MHz to 2496.5MHz	2488.457	0.068707	25	PASS
	2496.5MHz to 12500MHz	2531.512	0.102094	2.5	PASS
V_{min.}	30MHz to 1000MHz	129.910	0.000127	0.25	PASS
	1000MHz to 2387MHz	2340.188	0.078705	2.5	PASS
	2387MHz to 2400MHz	2399.806	0.407380	25	PASS
	2483.5MHz to 2496.5MHz	2487.989	0.070469	25	PASS
	2496.5MHz to 12500MHz	2531.512	0.071285	2.5	PASS
TEST CHANNEL		CH 19 (2440MHz)			
V_{normal}	30MHz to 1000MHz	526.276	0.000117	0.25	PASS
	1000MHz to 2387MHz	2311.755	0.071121	2.5	PASS
	2387MHz to 2400MHz	2395.922	0.048978	25	PASS
	2483.5MHz to 2496.5MHz	2485.240	0.044361	25	PASS
	2496.5MHz to 12500MHz	2504.002	0.058479	2.5	PASS
V_{max.}	30MHz to 1000MHz	833.160	0.000120	0.25	PASS
	1000MHz to 2387MHz	2311.755	0.069183	2.5	PASS
	2387MHz to 2400MHz	2394.223	0.046989	25	PASS
	2483.5MHz to 2496.5MHz	2486.280	0.043853	25	PASS
	2496.5MHz to 12500MHz	2567.774	0.050466	2.5	PASS
V_{min.}	30MHz to 1000MHz	851.105	0.000137	0.25	PASS
	1000MHz to 2387MHz	2376.250	0.079433	2.5	PASS
	2387MHz to 2400MHz	2393.651	0.050234	25	PASS
	2483.5MHz to 2496.5MHz	2486.260	0.044361	25	PASS
	2496.5MHz to 12500MHz	2502.752	0.064565	2.5	PASS

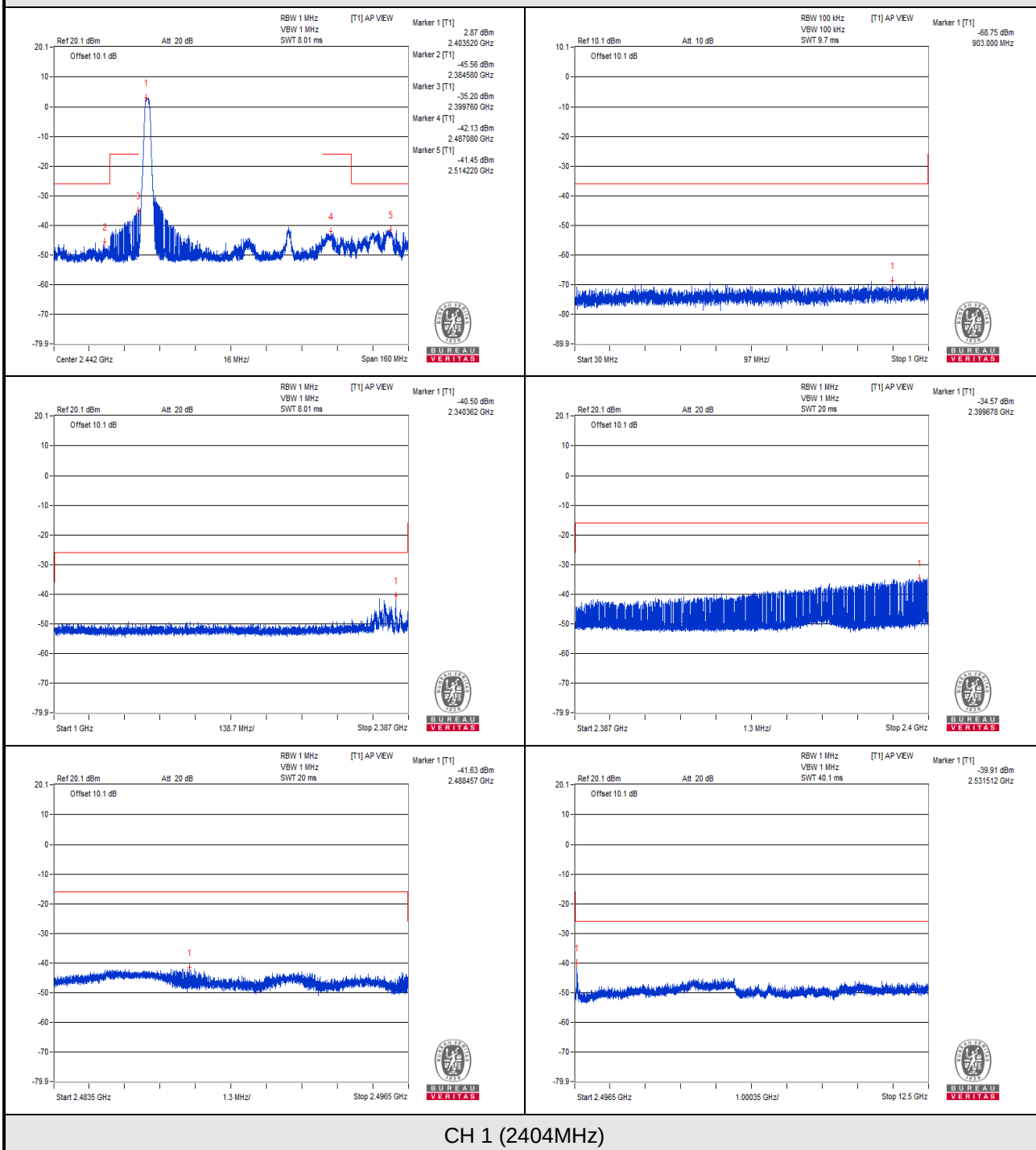
TEST CHANNEL		CH 38 (2478MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(uW)	LIMIT (uW)	RESULT
V_{normal}	30MHz to 1000MHz	925.067	0.000136	0.25	PASS
	1000MHz to 2387MHz	2367.582	0.070958	2.5	PASS
	2387MHz to 2400MHz	2393.878	0.062087	25	PASS
	2483.5MHz to 2496.5MHz	2483.617	0.478630	25	PASS
	2496.5MHz to 12500MHz	2605.288	0.071450	2.5	PASS
V_{max.}	30MHz to 1000MHz	937.435	0.000118	0.25	PASS
	1000MHz to 2387MHz	2349.551	0.063973	2.5	PASS
	2387MHz to 2400MHz	2396.525	0.064565	25	PASS
	2483.5MHz to 2496.5MHz	2483.651	0.487528	25	PASS
	2496.5MHz to 12500MHz	2605.288	0.075509	2.5	PASS
V_{min.}	30MHz to 1000MHz	978.053	0.000133	0.25	PASS
	1000MHz to 2387MHz	2350.417	0.061802	2.5	PASS
	2387MHz to 2400MHz	2393.753	0.065615	25	PASS
	2483.5MHz to 2496.5MHz	2483.542	0.519996	25	PASS
	2496.5MHz to 12500MHz	2605.288	0.059429	2.5	PASS

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

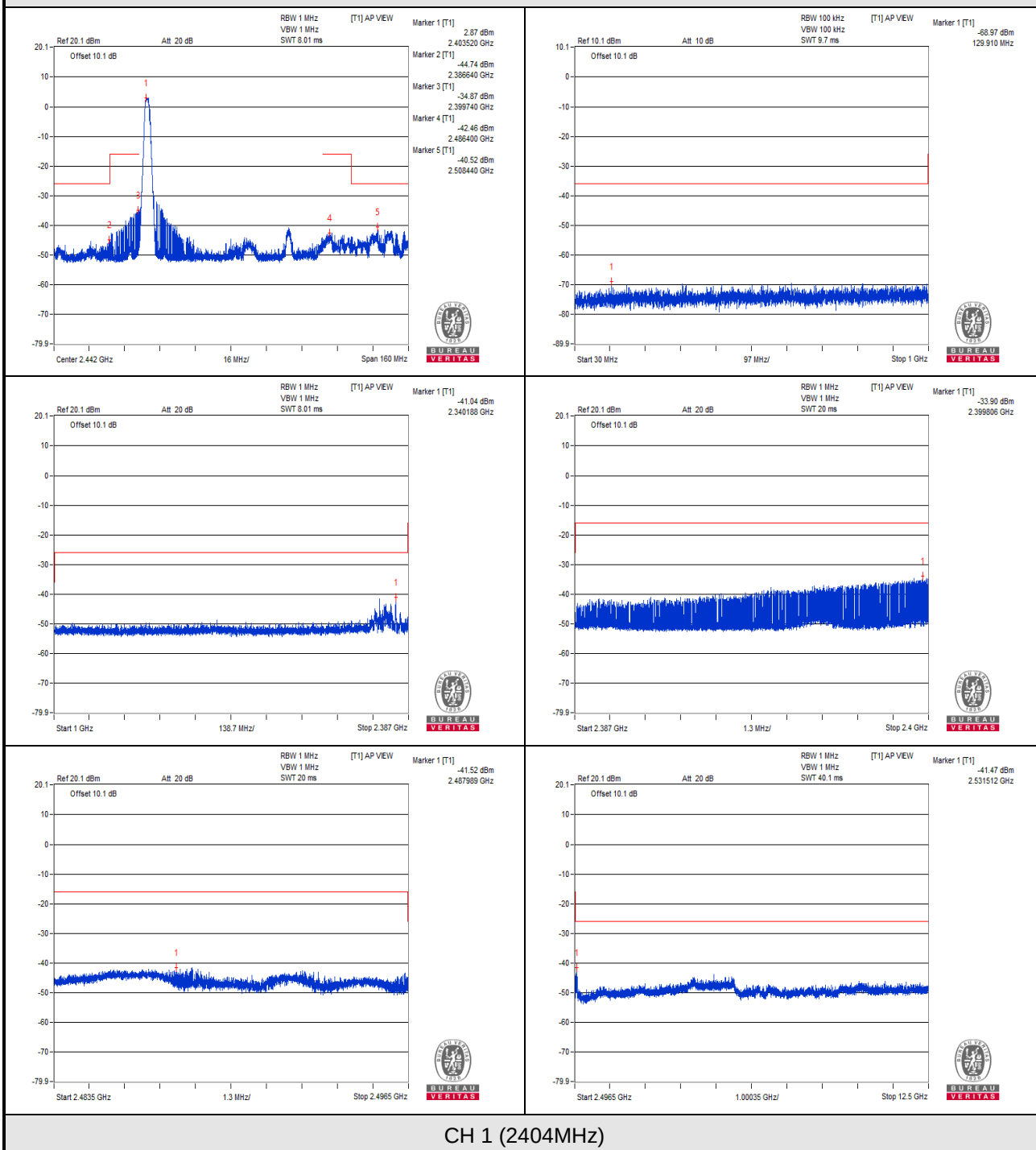
Vnormal



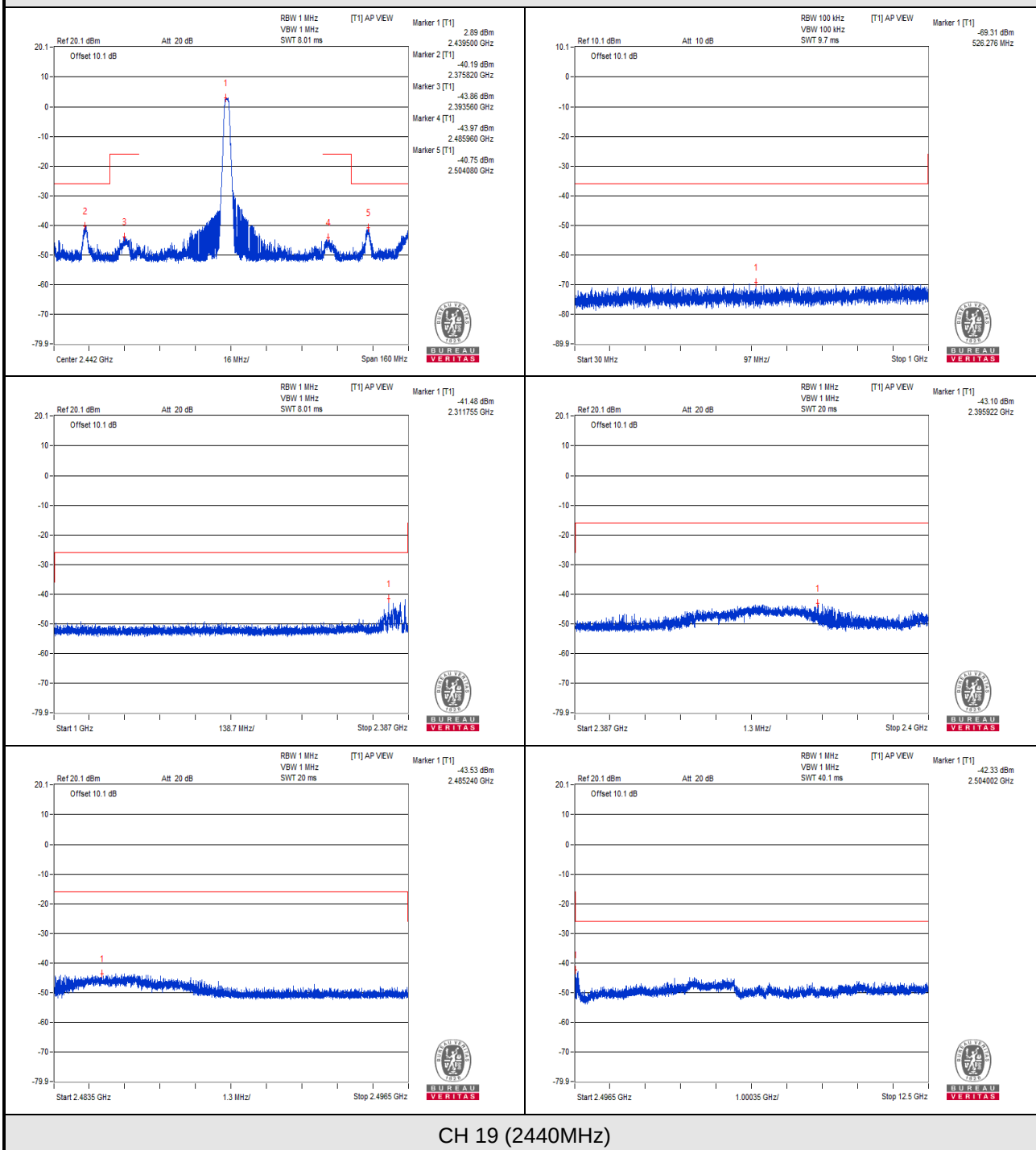
V_{max}.



V_{min}.

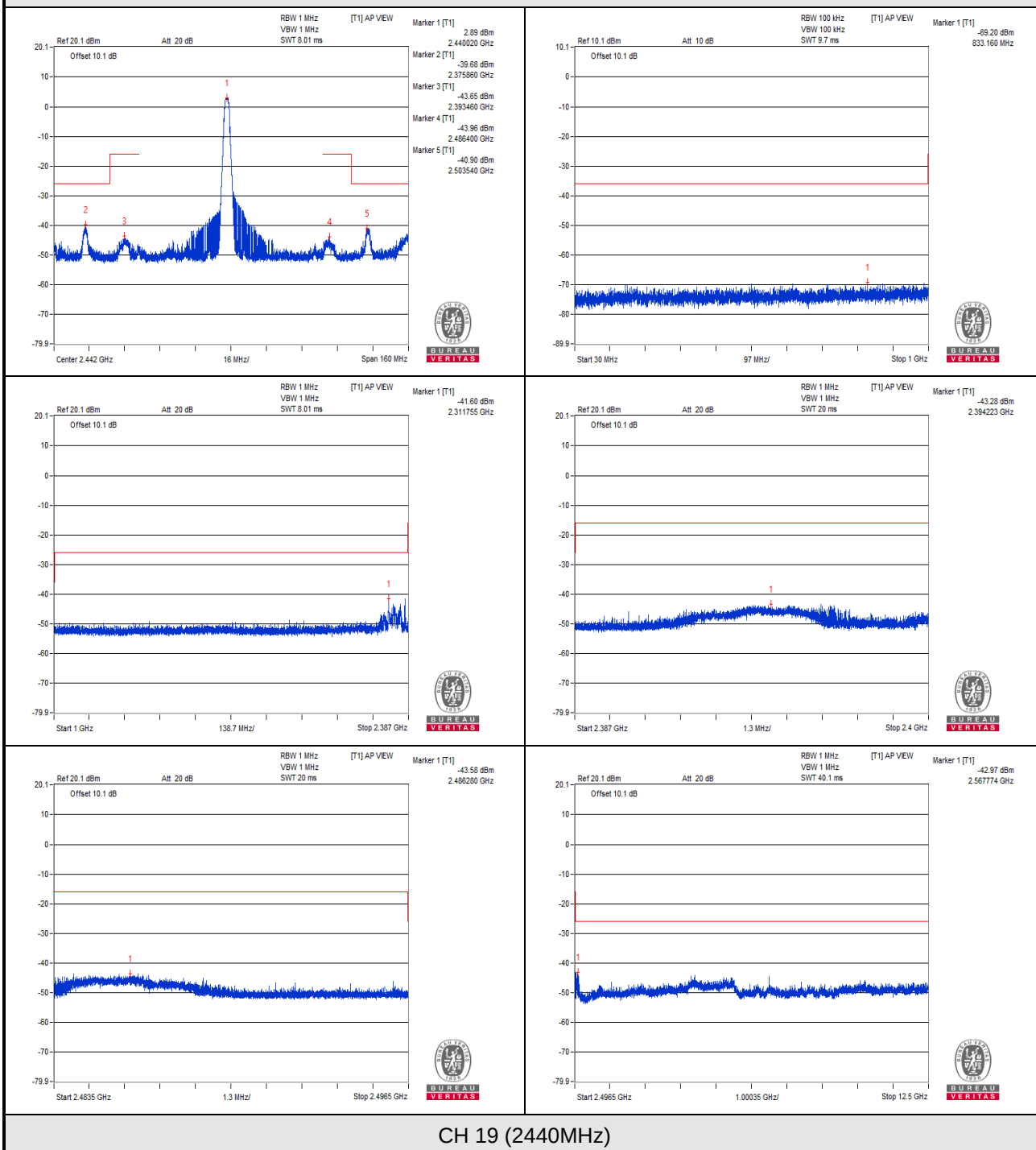


Vnormal

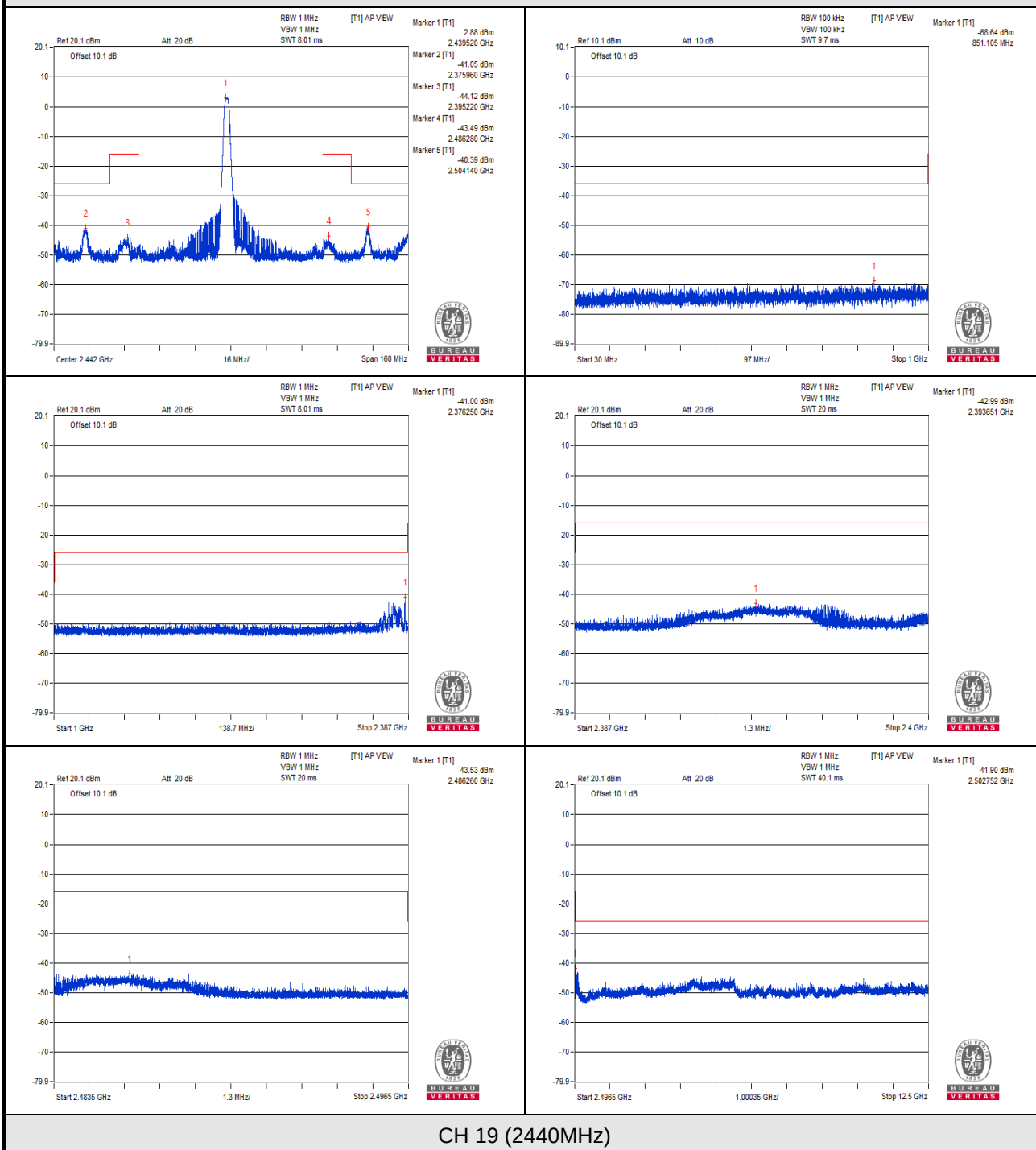


CH 19 (2440MHz)

V_{max}.

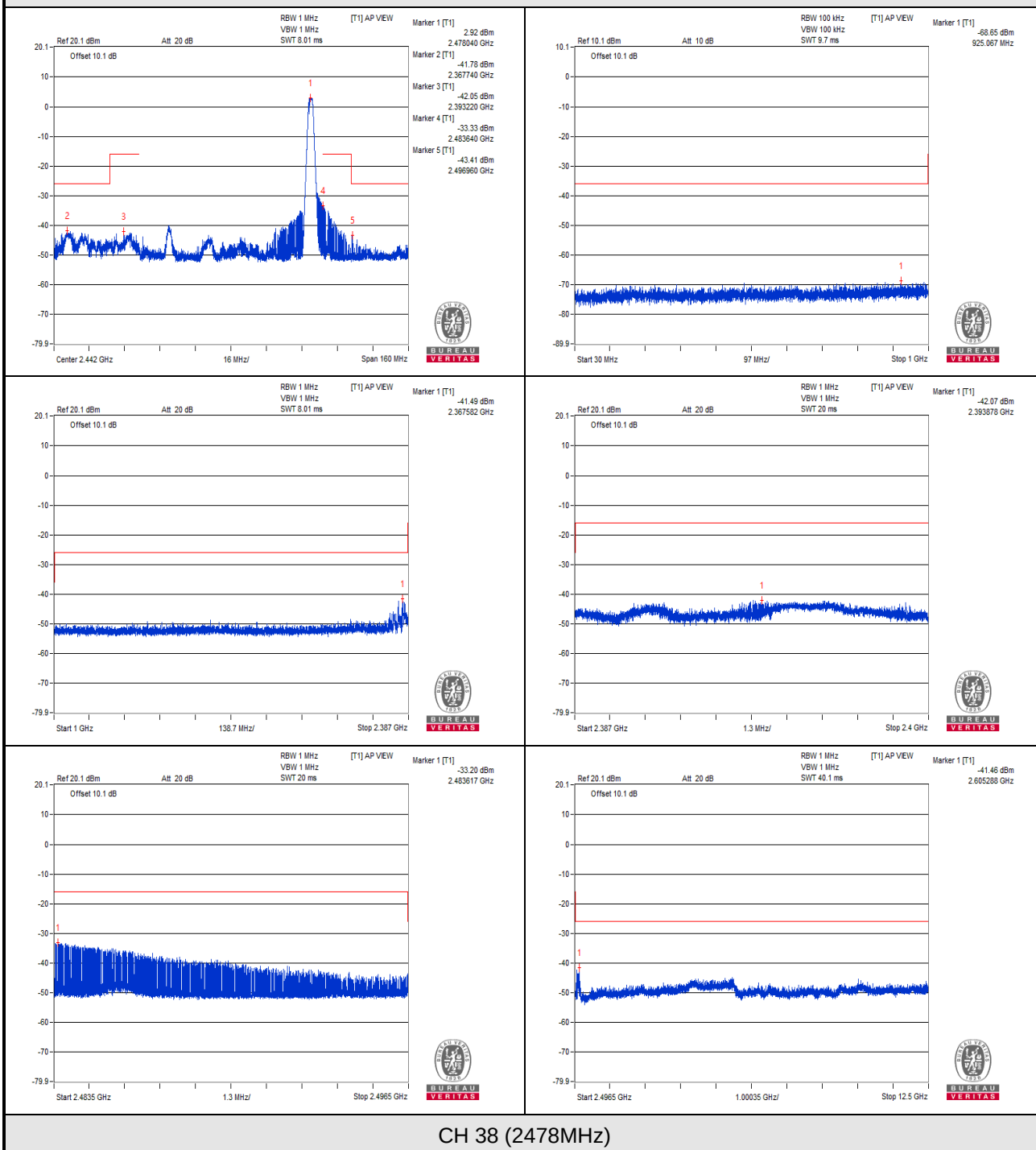


V_{min}.



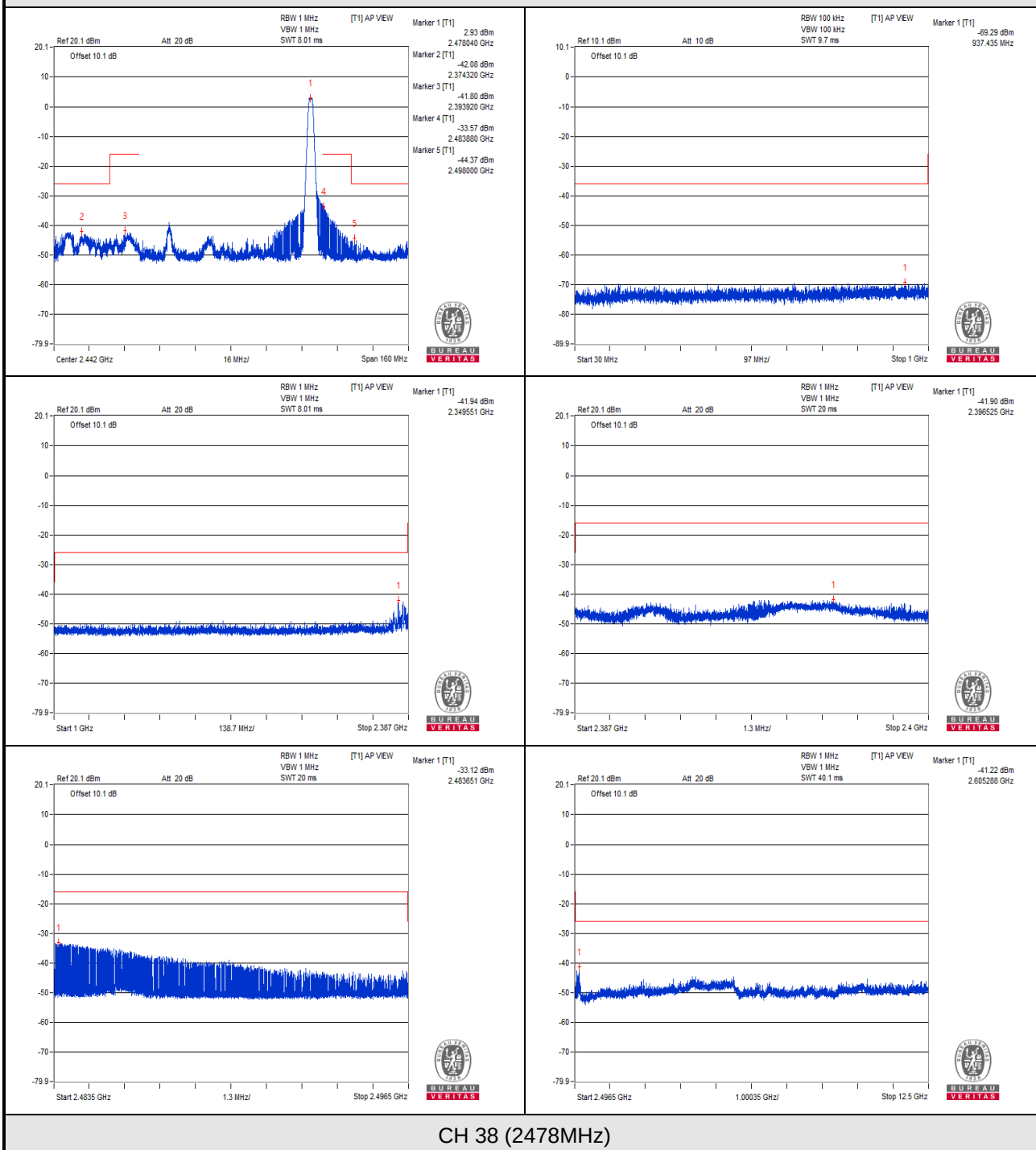
CH 19 (2440MHz)

Vnormal

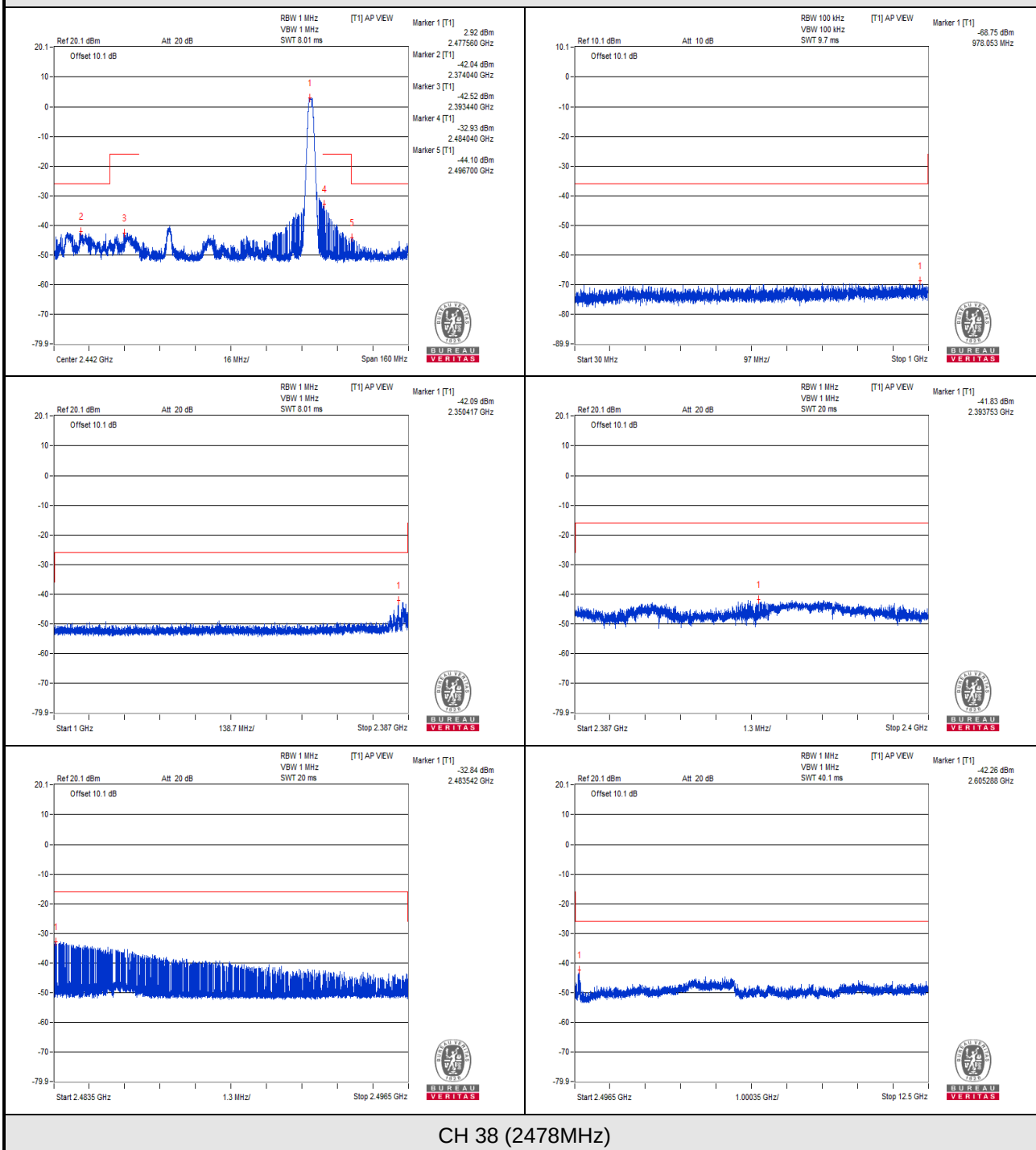


CH 38 (2478MHz)

V_{max}.



V_{min}.



4.4 Antenna Power Measurement

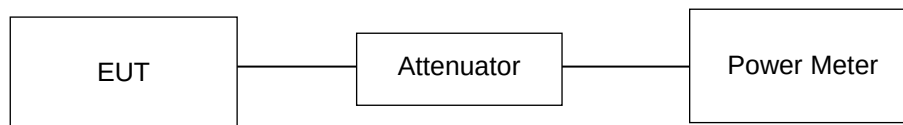
4.4.1 Limits of Antenna Power

Modulation System	Frequency Band Used	Antenna Power (Max.)	EIRP Limit (Note 3)
DS	2400 – 2483.5 MHz	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)
Other than the above	2400 – 2483.5 MHz	10 mW	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 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 $A = \text{EIRP}/(2.14 \text{ dBi} + \text{“Antenna Power (limit)”})$.
4. Tolerance of antenna power shall be +20% (upper value) and –80% (lower value).

4.4.2 Test Setup



4.4.3 Test Results

BT-LE 1M

Voltage (Vdc)	Channel Number	Frequency (MHz)	Conducted RF Output Power (mW)	Radiated RF Output Power (mW)
5	0	2402	2.239	3.524
	19	2440	2.244	3.532
	39	2480	2.239	3.524
5.5	0	2402	2.208	3.475
	19	2440	2.193	3.452
	39	2480	2.138	3.365
4.5	0	2402	2.307	3.631
	19	2440	2.188	3.444
	39	2480	2.163	3.405
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 1.97 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

BT-LE 2M

Voltage (Vdc)	Channel Number	Frequency (MHz)	Conducted RF Output Power (mW)	Radiated RF Output Power (mW)
5	1	2404	2.244	3.532
	19	2440	2.244	3.532
	38	2478	2.244	3.532
5.5	1	2404	2.198	3.46
	19	2440	2.143	3.373
	38	2478	2.218	3.491
4.5	1	2404	2.244	3.532
	19	2440	2.259	3.556
	38	2478	2.312	3.639
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 1.97 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	$\leq 4\text{nW}/100\text{kHz}$ (-54dBm)
Above 1GHz	$\leq 20\text{nW}/\text{MHz}$ (-47dBm)

4.5.2 Test Setup

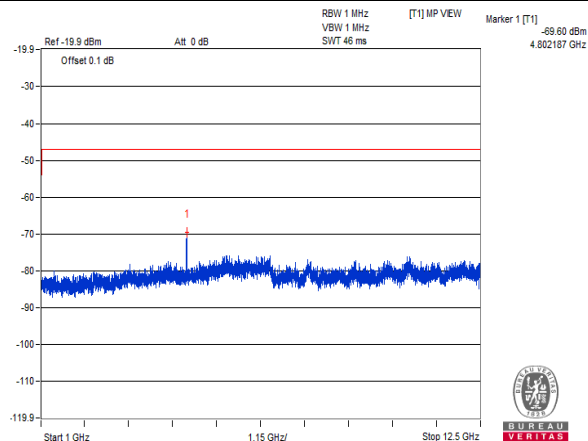
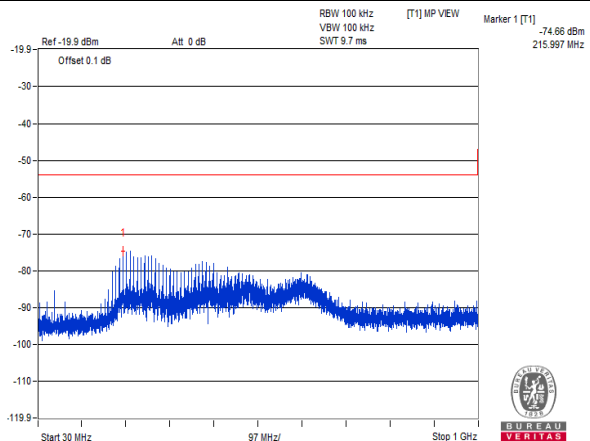


4.5.3 Test Result

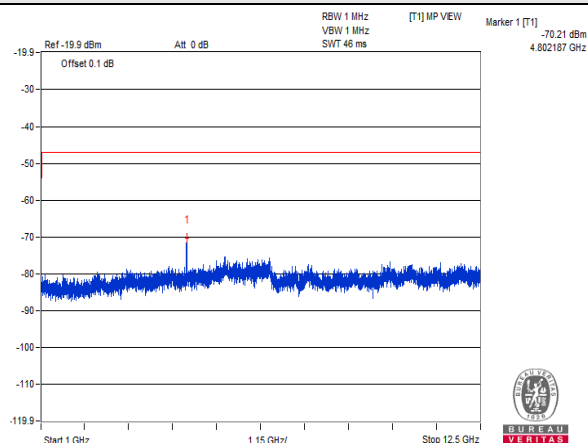
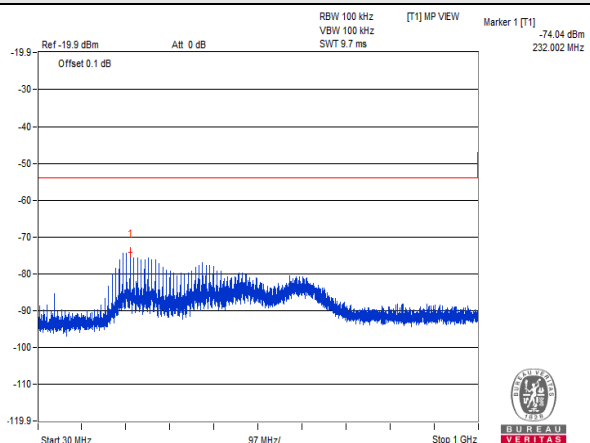
BT-LE 1M

TEST CHANNEL		CH 0 (2402MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(nW)	LIMIT (nW)	RESULT
V_{normal}	30MHz to 1000MHz	215.997	0.034198	4.0	PASS
	1000MHz to 12500MHz	4802.187	0.109648	20.0	PASS
V_{max.}	30MHz to 1000MHz	232.002	0.039446	4.0	PASS
	1000MHz to 12500MHz	4802.187	0.095280	20.0	PASS
V_{min.}	30MHz to 1000MHz	232.002	0.041400	4.0	PASS
	1000MHz to 12500MHz	4802.187	0.099083	20.0	PASS
TEST CHANNEL		CH 19 (2440MHz)			
V_{normal}	30MHz to 1000MHz	232.002	0.038459	4.0	PASS
	1000MHz to 12500MHz	4878.375	0.072946	20.0	PASS
V_{max.}	30MHz to 1000MHz	232.002	0.035727	4.0	PASS
	1000MHz to 12500MHz	4878.375	0.076913	20.0	PASS
V_{min.}	30MHz to 1000MHz	215.997	0.040551	4.0	PASS
	1000MHz to 12500MHz	4878.375	0.068234	20.0	PASS
TEST CHANNEL		CH 39 (2480MHz)			
V_{normal}	30MHz to 1000MHz	232.002	0.038548	4.0	PASS
	1000MHz to 12500MHz	4957.437	0.063241	20.0	PASS
V_{max.}	30MHz to 1000MHz	215.997	0.038107	4.0	PASS
	1000MHz to 12500MHz	4957.437	0.047098	20.0	PASS
V_{min.}	30MHz to 1000MHz	232.002	0.036141	4.0	PASS
	1000MHz to 12500MHz	4957.437	0.037154	20.0	PASS

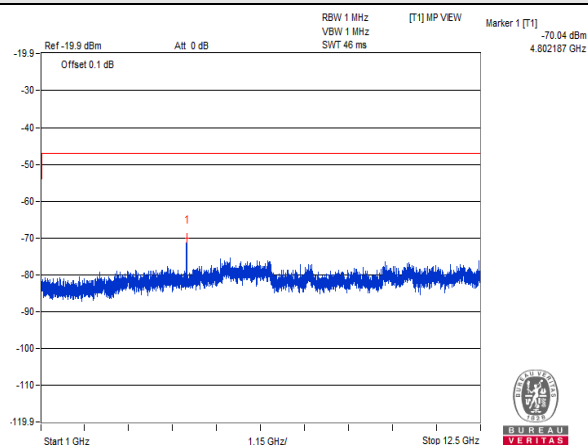
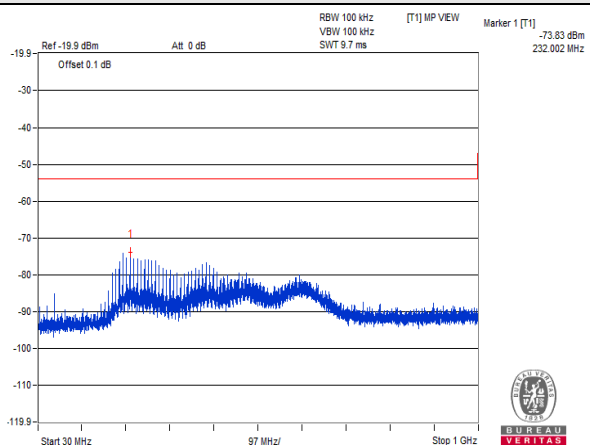
V_{normal}



V_{max.}

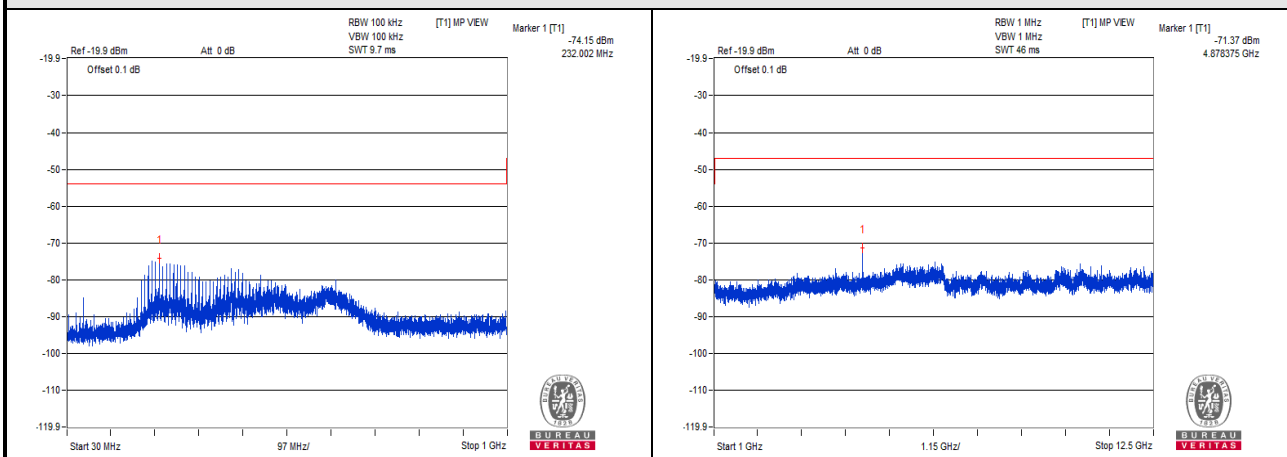


V_{min.}

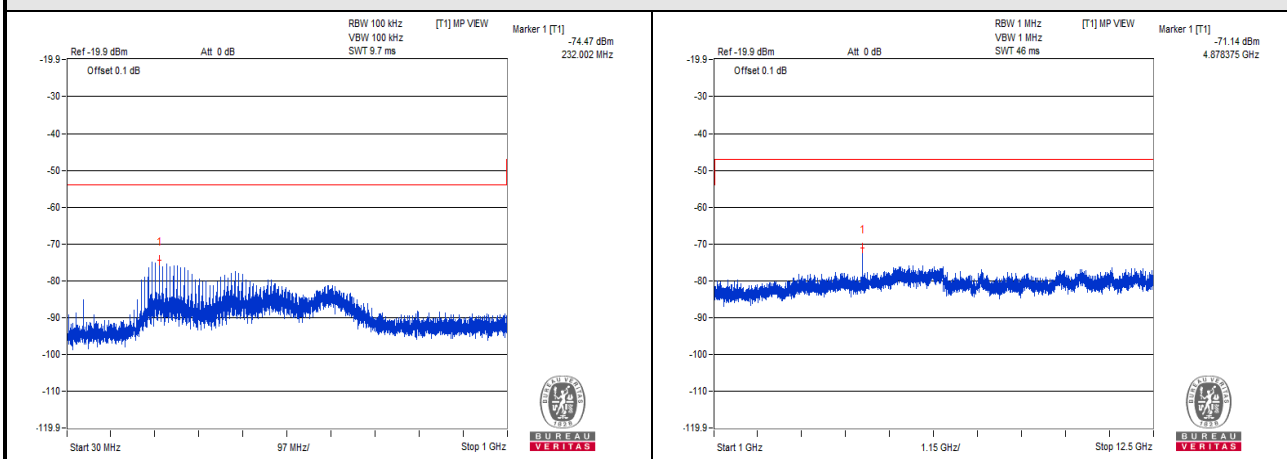


CH 0 (2402MHz)

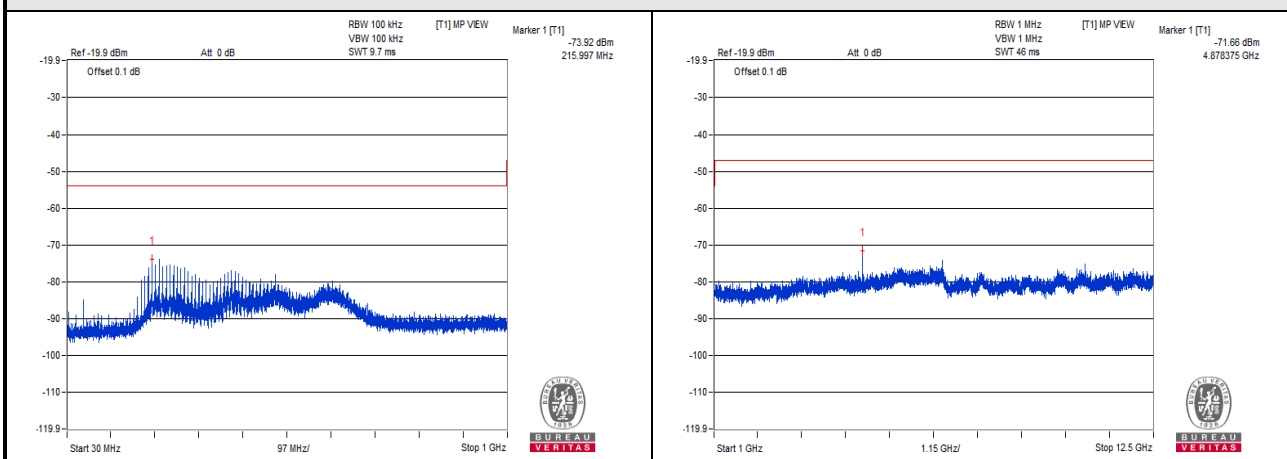
V_{normal}



V_{max}

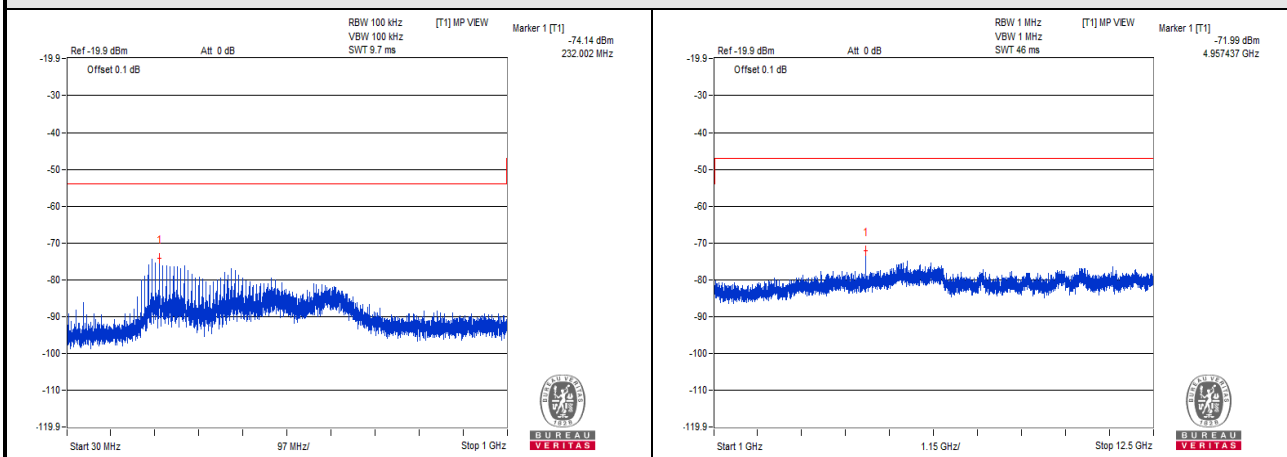


V_{min}

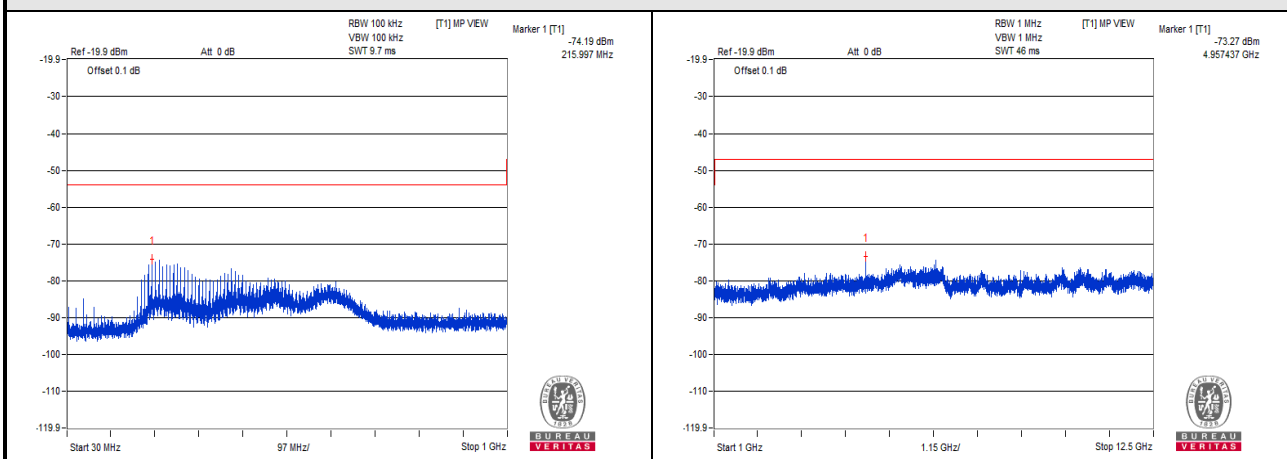


CH 19 (2440MHz)

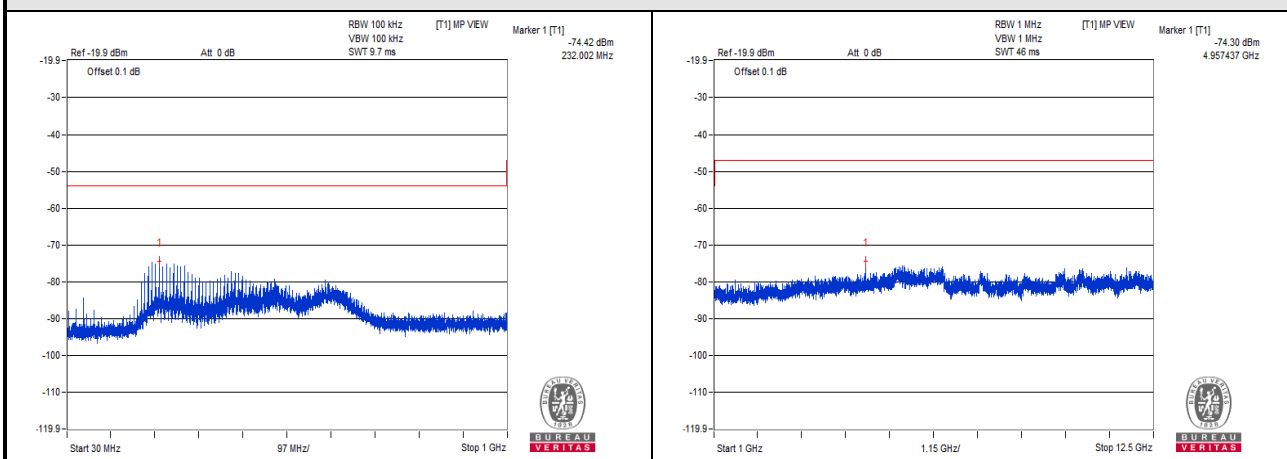
V_{normal}



V_{max.}



V_{min.}

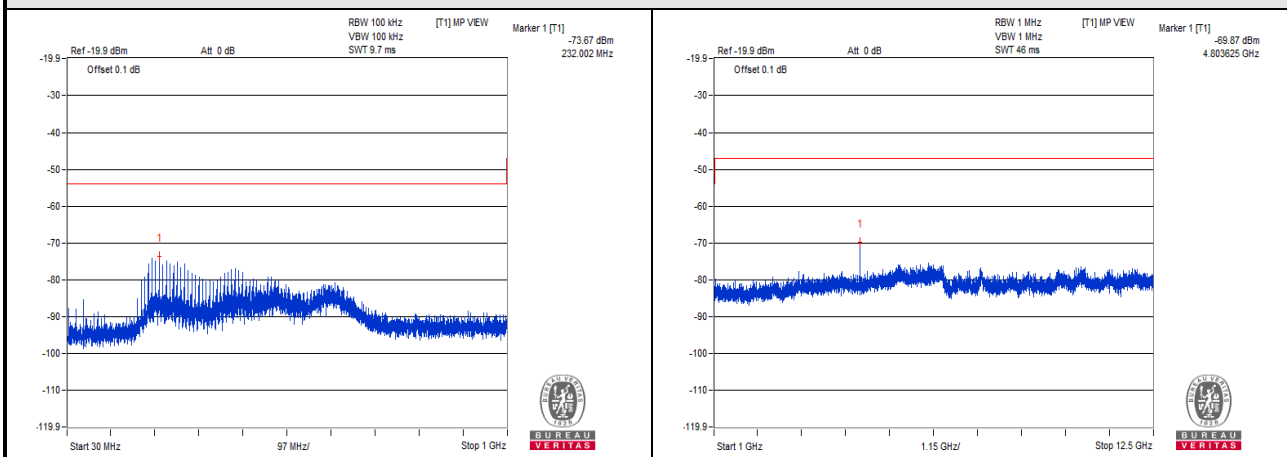


CH 39 (2480MHz)

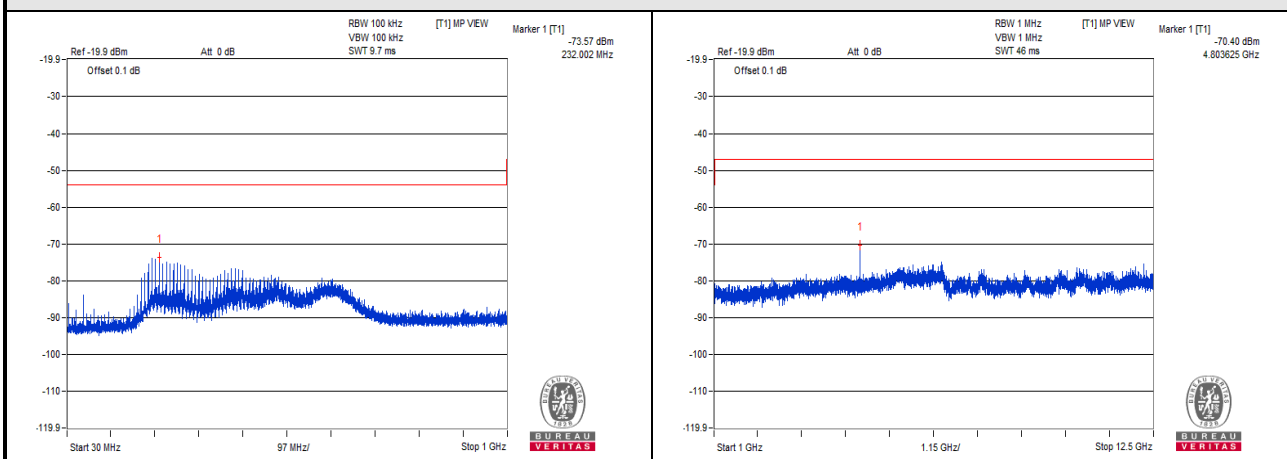
BT-LE 2M

TEST CHANNEL		CH 0 (2404MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(nW)	LIMIT (nW)	RESULT
V_{normal}	30MHz to 1000MHz	232.002	0.042954	4.0	PASS
	1000MHz to 12500MHz	4803.625	0.103039	20.0	PASS
V_{max.}	30MHz to 1000MHz	232.002	0.043954	4.0	PASS
	1000MHz to 12500MHz	4803.625	0.091201	20.0	PASS
V_{min.}	30MHz to 1000MHz	215.997	0.038905	4.0	PASS
	1000MHz to 12500MHz	4803.625	0.100693	20.0	PASS
TEST CHANNEL		CH 19 (2440MHz)			
V_{normal}	30MHz to 1000MHz	232.002	0.038637	4.0	PASS
	1000MHz to 12500MHz	4875.500	0.066527	20.0	PASS
V_{max.}	30MHz to 1000MHz	232.002	0.040551	4.0	PASS
	1000MHz to 12500MHz	4875.500	0.065766	20.0	PASS
V_{min.}	30MHz to 1000MHz	232.002	0.038726	4.0	PASS
	1000MHz to 12500MHz	4875.500	0.072444	20.0	PASS
TEST CHANNEL		CH 38 (2478MHz)			
V_{normal}	30MHz to 1000MHz	215.997	0.037239	4.0	PASS
	1000MHz to 12500MHz	4951.687	0.048641	20.0	PASS
V_{max.}	30MHz to 1000MHz	232.002	0.042462	4.0	PASS
	1000MHz to 12500MHz	4951.687	0.057280	20.0	PASS
V_{min.}	30MHz to 1000MHz	232.002	0.038726	4.0	PASS
	1000MHz to 12500MHz	4951.687	0.069823	20.0	PASS

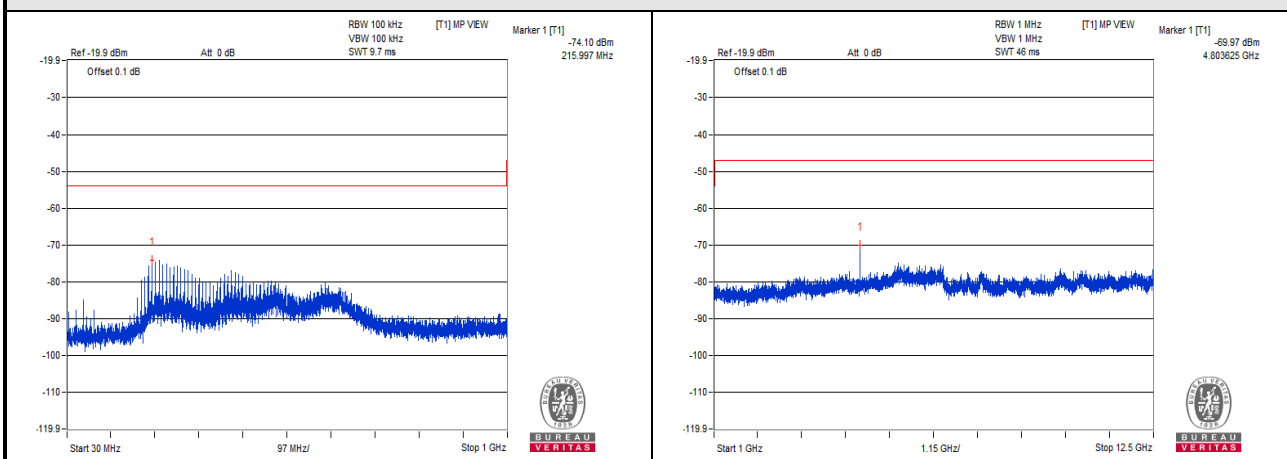
V_{normal}



V_{max.}

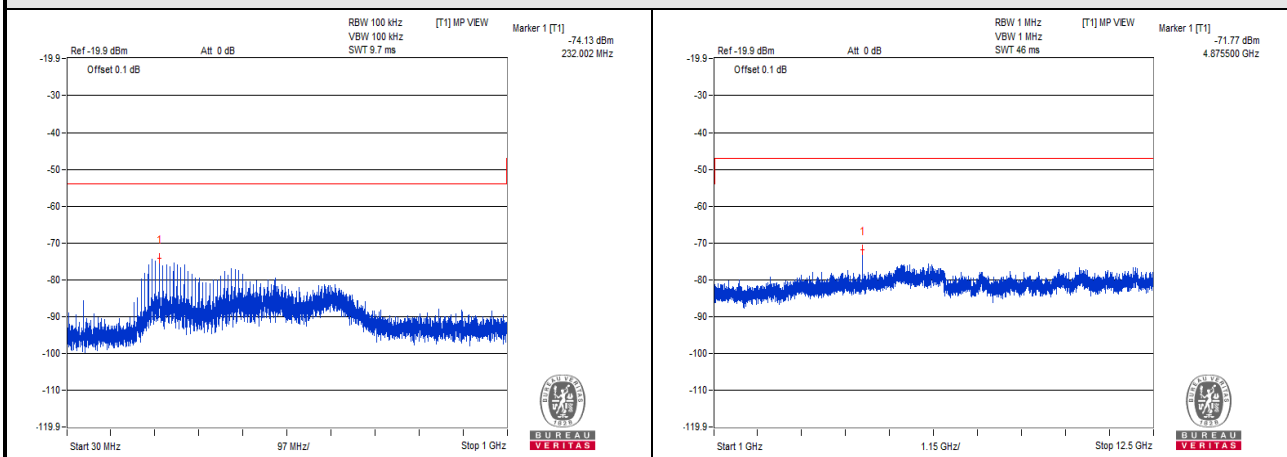


V_{min.}

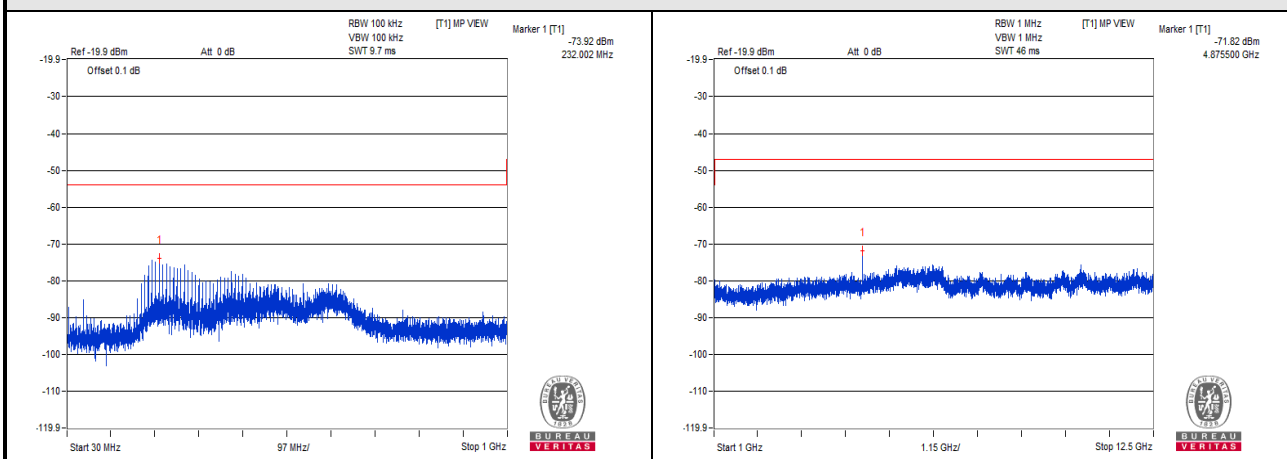


CH 0 (2404MHz)

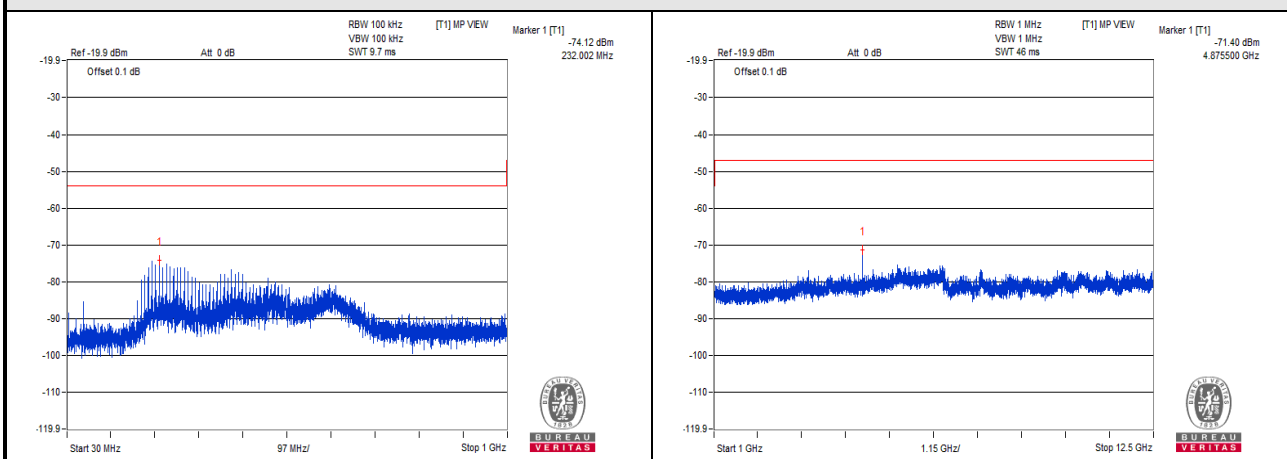
V_{normal}



V_{max}

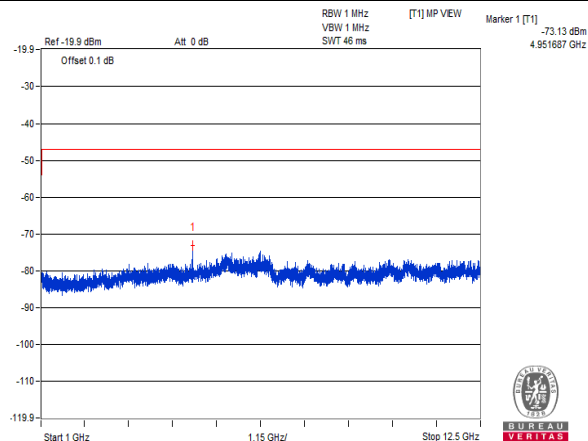
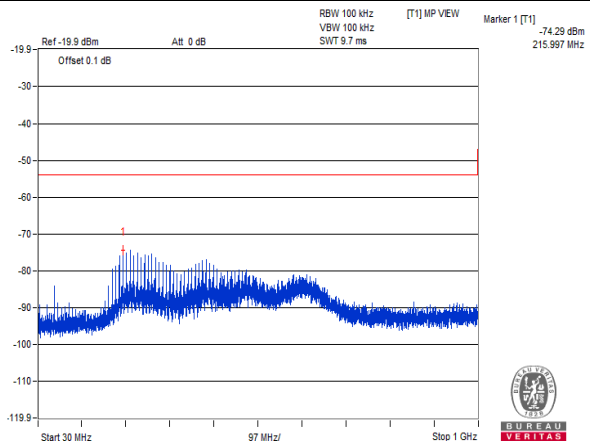


V_{min}

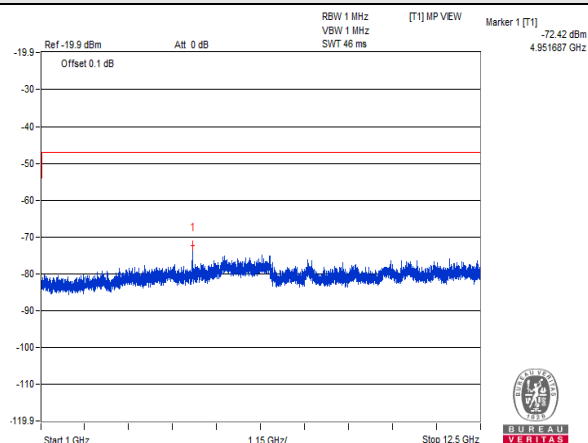
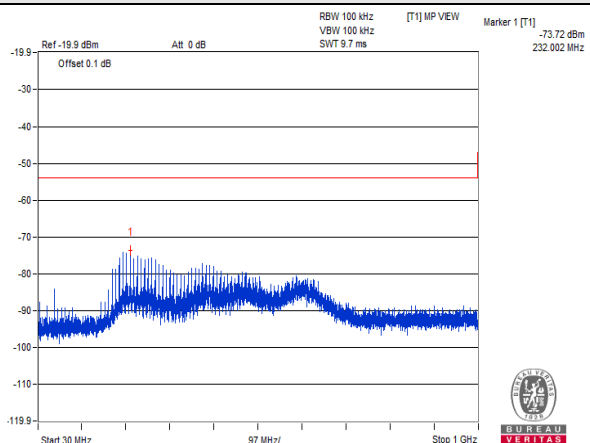


CH 19 (2440MHz)

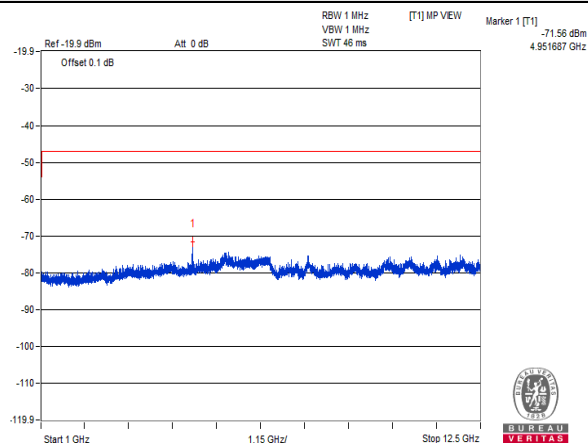
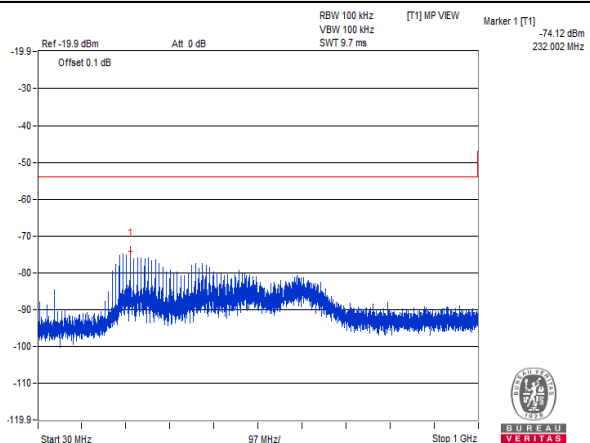
V_{normal}



V_{max}



V_{min}



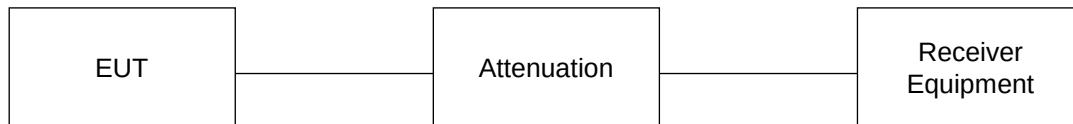
CH 38 (2478MHz)

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.

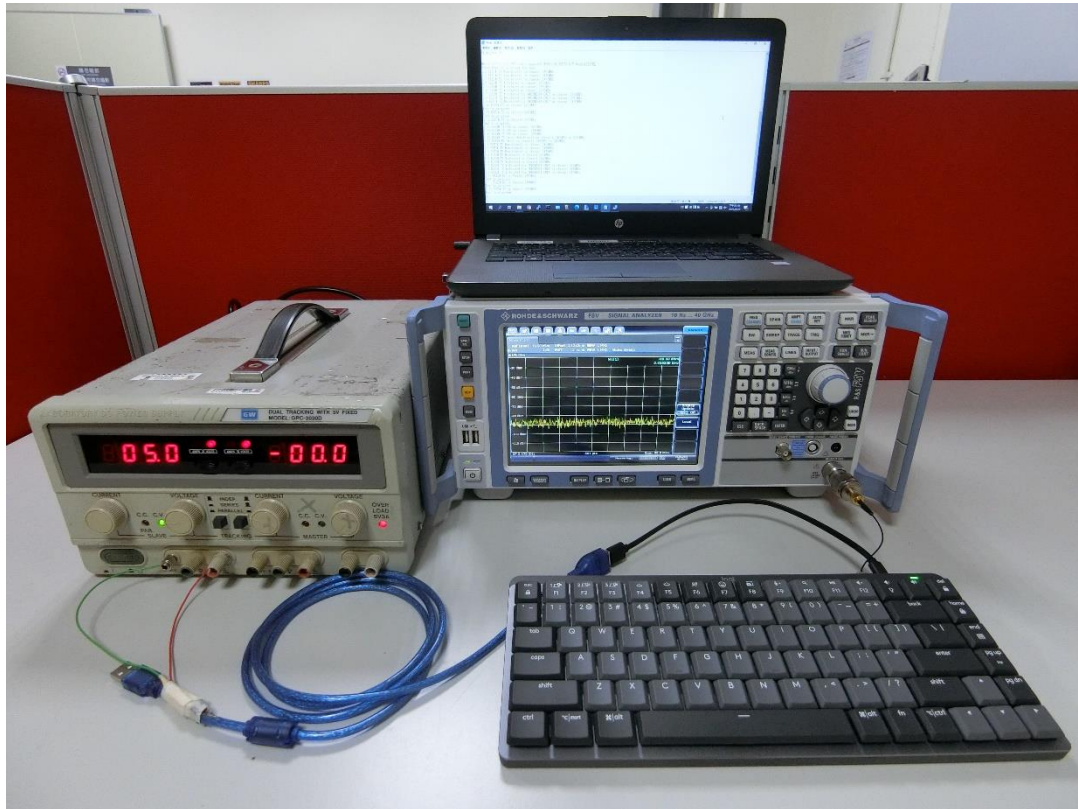
4.6.2 Test Setup



4.6.3 Test Results

Link Mode	Test Result
BT-LE	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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The address and road map of all our labs can be found in our web site also.

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