

Radio Test Report (BT-LE)

Report No.: RJBEMI-WTW-P22010621A-3

Test Model: N506

Received Date: 2022/6/28

Test Date: 2022/7/8

Issued Date: 2022/8/10

Applicant: NETRONIX, INC.

Address: No 945, Boai St, Jubei City, Hsinchu, 30265 Taiwan

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

Lab Address: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan

Test Location: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan



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Release Control Record

Issue No.	Description	Date Issued
RJBEMI-WTW-P22010621A-3	Original release.	2022/8/10

1 Certificate of Conformity

Product: Electronic Display Device

Brand: Rakuten kobo

Test Model: N506

Sample Status: Engineering sample

Applicant: NETRONIX, INC.

Test Date: 2022/7/8

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 : Vivian Huang , **Date:** 2022/8/10
Vivian Huang / Specialist

Approved by : May Chen , **Date:** 2022/8/10
May Chen / 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				
E	3.2 (6)	4.1	Spurious emissions	C
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)	4.2	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	Radio 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

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.
3. This report is prepared for supplementary report.

2.1 Test Instruments

Description & Manufacturer	Model no.	Serial No.	Calibrated Date	Calibrated Until	Calibration Authority	Calibration Method
Spectrum Analyzer R&S	FSV40	101516	2022/3/7	2023/3/6	ETC	(c)
ESG Vector signal generator Agilent	E4438C	MY45094468	2021/11/21	2022/11/20	ETC	(c)
Power Meter Anritsu	ML2495A	1529002	2022/6/22	2023/6/21	ETC	(c)
Pulse Power Sensor Anritsu	MA2411B	1339443	2022/5/29	2023/5/28	ETC	(c)
DC POWER SUPPLY Topward	6603D	795558	Note 3	Note 3	BV CPS E&E	(d)
AC Power Source GOOD WILL	6905S	1991551	Note 3	Note 3	BV CPS E&E	(d)
True RMS Clamp Meter Fluke	325	31130711WS	2022/6/9	2023/6/8	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 before each testing.
 4. Tested Date: 2022/7/8

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	Electronic Display Device
Brand	Rakuten kobo
Test Model	N506
Status of EUT	Engineering sample
Nominal Voltage	3.7Vdc from battery or 5 Vdc from USB interface
Modulation Type	GFSK
Modulation Technology	DTS
Transfer Rate	Up to 2 Mbps
Operating Frequency	2.402 ~ 2.480GHz
Number of Channel	40
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
Cable Supplied	USB cable x1 (Shielded, 1m)

Note:

- This is a supplementary report of Report No.: RJBEMI-WTW-P22010621-3. The differences between them are as below information:
 - ◆ Change EPD PMIC Power.
- According to above conditions, only spurious emissions (below 1GHz) to be performed. And all data are verified to meet the requirements.
- For input voltage of EUT, the worse case was found at the voltage 5 Vdc condition. Therefore only the test data of the mode was recorded in this report individually.
- There are WLAN and Bluetooth technology used for the EUT.
- Simultaneously transmission condition.

Condition	Technology	
1	WLAN 2.4GHz	Bluetooth
2	WLAN 5GHz	Bluetooth

- The EUT must be supplied battery as following table:

No.	Brand	Model No.	Spec.
1	EVE Energy CO., LTD	PR-284983N	DC Output: 3.7V, 1500mAH, 5.25Wh

- The EUT could be supplied with MicroSD card and following different models could be chosen:

No.	Model	Remark
1	SDSDQAB-016G	1st source MicroSD
2	SDSDQAB-032G-1	2 nd source MicroSD

Note: In the original report, from the above models, the worst case were found in **Model: SDSDQAB-016G**. Therefore only the test data of the mode was recorded in this report.

- The EUT could be supplied with USB cable as following table:

Brand	Material	Model	Signal Line
Yih Fone	PVC	SH-0422	Shielded : Y , 1.0M , Core: N/A
Yih Fone	TPE	SH-0418	

- 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	2.748	3.155
BT-LE 2M	3	2.742	3.148

10. 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

40 channels are provided for BT-LE mode:

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

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 (Run Tera Term Ver 4.77.0.0) 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	1	0	1
19	1	19	1
39	1	39	1

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
Spurious Emissions for Transmitter	25 deg.C, 76 % RH
Spurious Emissions for Receiver	25 deg.C, 76 % RH

3.4 Assembly

The EUT is constructed as an Electronic Display Device. The housing consists of two parts, and the plastic enclosure was assembled with glue and covered by rubbers, separating the two parts was only possible by means of brute force.

3.5 Antenna Specifications

3.5.1 Antenna Gain

Brand	Model	Antenna Gain (dBi)	Frequency Range (GHz)	Antenna Type	Connector Type	Cable Length (mm)
INPAQ	ACM3-3216-P1-CC-S	0.6	2.4~2.4835	Chip Ant.	NA	NA
		2	5.15~5.85			

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 Spurious Emissions for Transmitter Measurement

4.1.1 Limits of Spurious Emissions

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

4.1.2 Test Setup



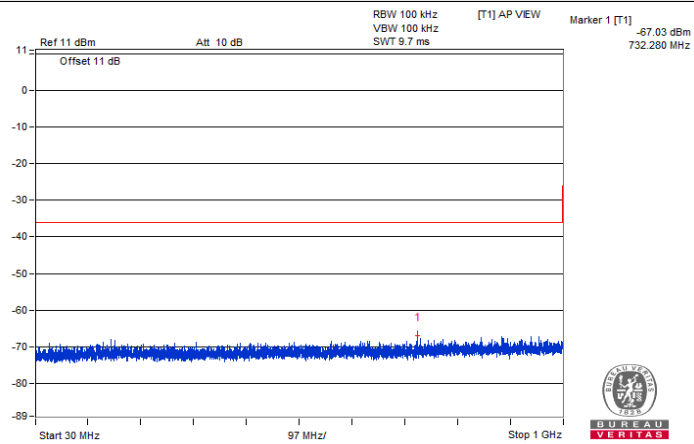
4.1.3 Test Results

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	732.280	0.000198	0.25	PASS
V _{max.}	30MHz to 1000MHz	944.831	0.000213	0.25	PASS
V _{min.}	30MHz to 1000MHz	894.876	0.000180	0.25	PASS
TEST CHANNEL		CH 19 (2440MHz)			
V _{normal}	30MHz to 1000MHz	972.840	0.000190	0.25	PASS
V _{max.}	30MHz to 1000MHz	622.063	0.000223	0.25	PASS
V _{min.}	30MHz to 1000MHz	919.368	0.000198	0.25	PASS
TEST CHANNEL		CH 39 (2480MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(uW)	LIMIT (uW)	RESULT
V _{normal}	30MHz to 1000MHz	916.458	0.000199	0.25	PASS
V _{max.}	30MHz to 1000MHz	971.506	0.000233	0.25	PASS
V _{min.}	30MHz to 1000MHz	897.786	0.000217	0.25	PASS

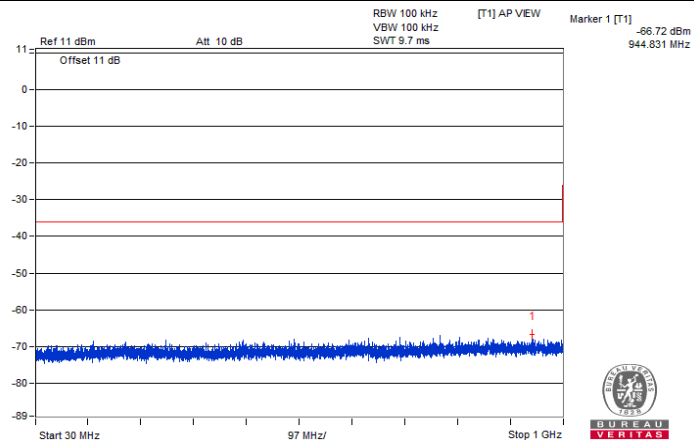
NOTE: 1. The spectrum plots are attached on the following pages.

V_{normal}



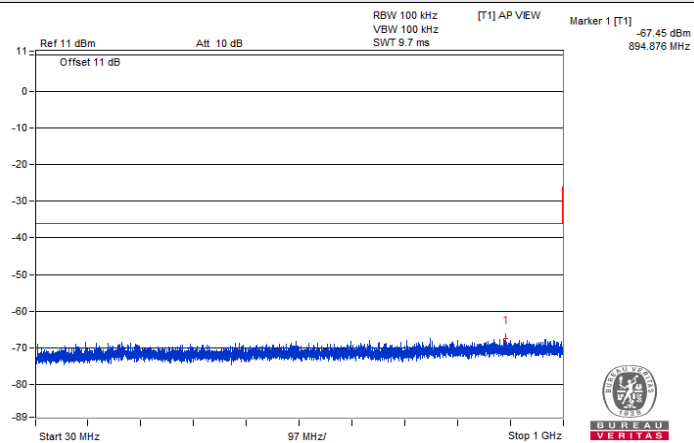
CH 0 (2402MHz)

V_{max.}



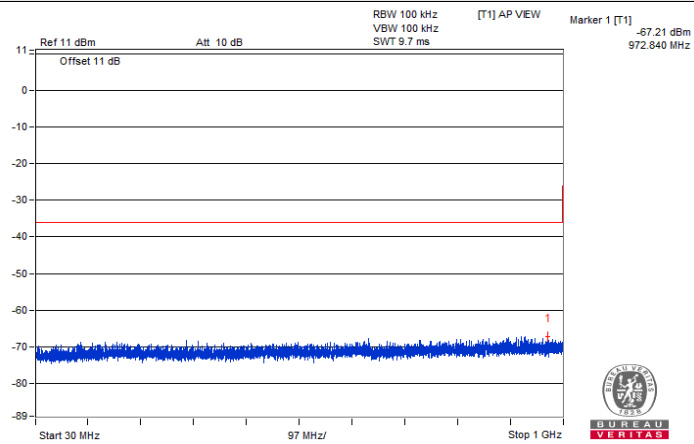
CH 0 (2402MHz)

V_{min.}



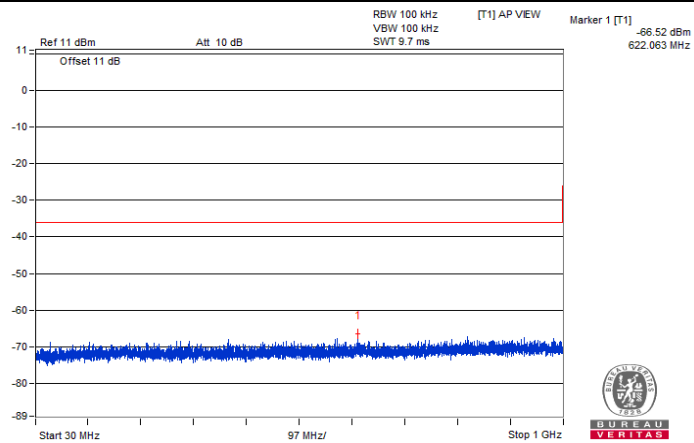
CH 0 (2402MHz)

V_{normal}



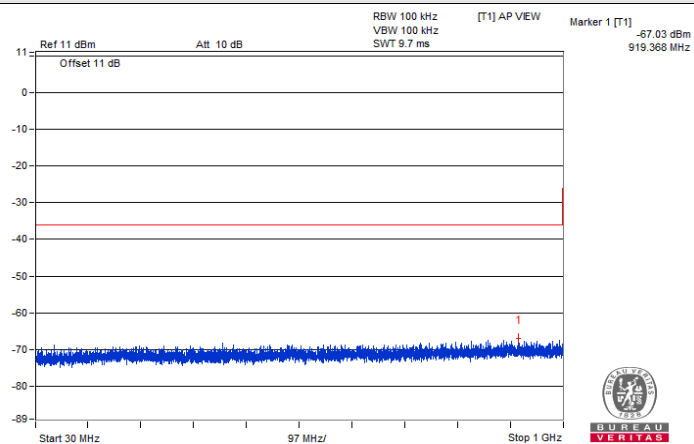
CH 19 (2440MHz)

V_{max.}



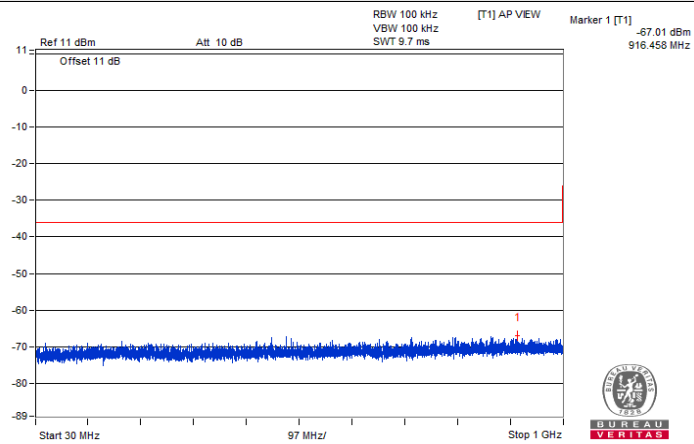
CH 19 (2440MHz)

V_{min.}



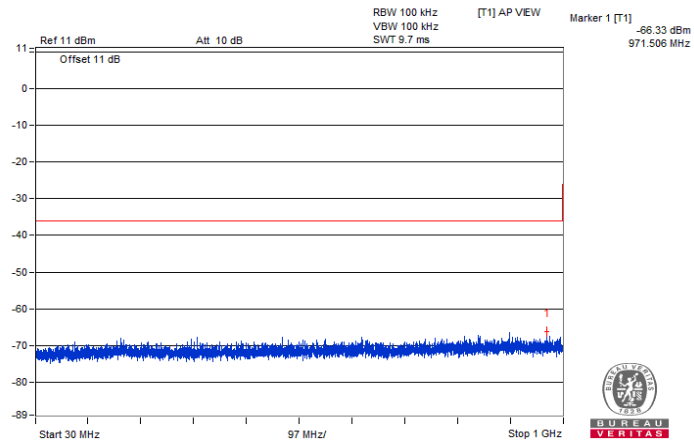
CH 19 (2440MHz)

V_{normal}



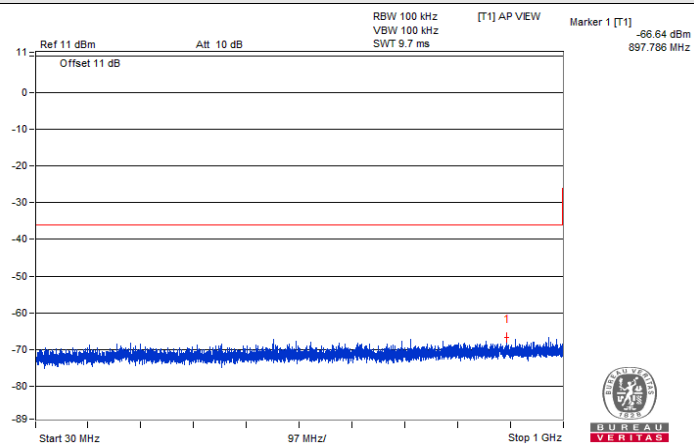
CH 39 (2480MHz)

V_{max.}



CH 39 (2480MHz)

V_{min.}



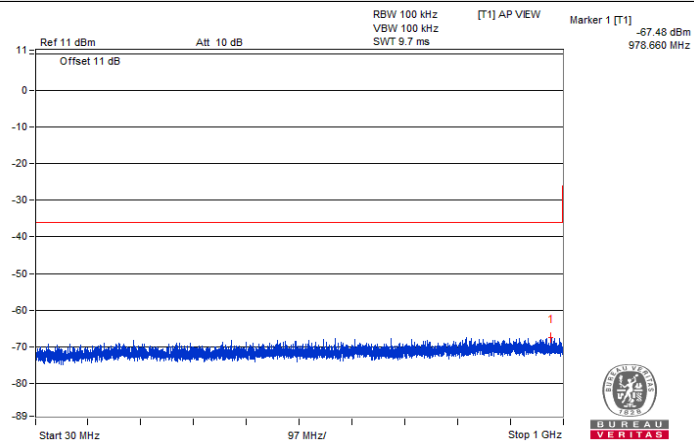
CH 39 (2480MHz)

BT-LE 2M

TEST CHANNEL		CH 0 (2402MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(uW)	LIMIT (uW)	RESULT
V_{normal}	30MHz to 1000MHz	978.660	0.000179	0.25	PASS
V_{max.}	30MHz to 1000MHz	911.608	0.000200	0.25	PASS
V_{min.}	30MHz to 1000MHz	987.147	0.000176	0.25	PASS
TEST CHANNEL		CH 19 (2440MHz)			
V_{normal}	30MHz to 1000MHz	952.227	0.000254	0.25	PASS
V_{max.}	30MHz to 1000MHz	762.107	0.000192	0.25	PASS
V_{min.}	30MHz to 1000MHz	901.908	0.000256	0.25	PASS
TEST CHANNEL		CH 39 (2480MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(uW)	LIMIT (uW)	RESULT
V_{normal}	30MHz to 1000MHz	921.793	0.000200	0.25	PASS
V_{max.}	30MHz to 1000MHz	829.765	0.000192	0.25	PASS
V_{min.}	30MHz to 1000MHz	925.673	0.000212	0.25	PASS

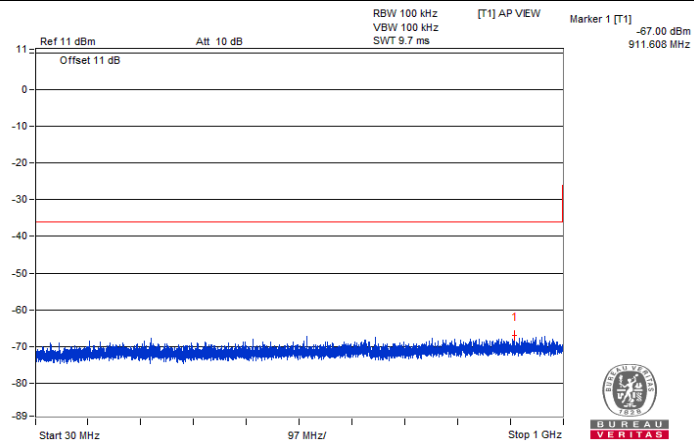
NOTE: 1. The spectrum plots are attached on the following pages.

V_{normal}



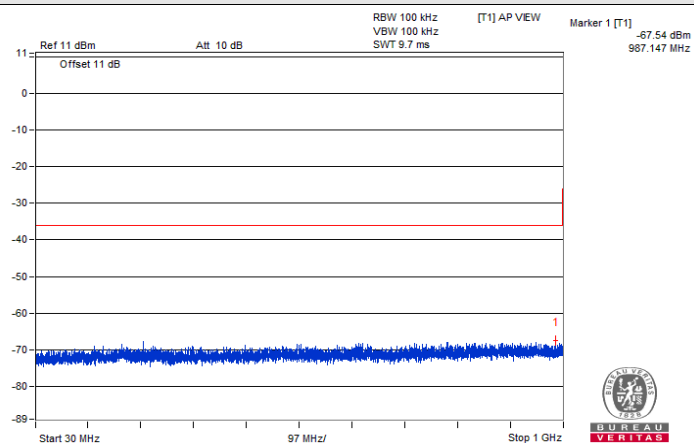
CH 0 (2402MHz)

V_{max.}



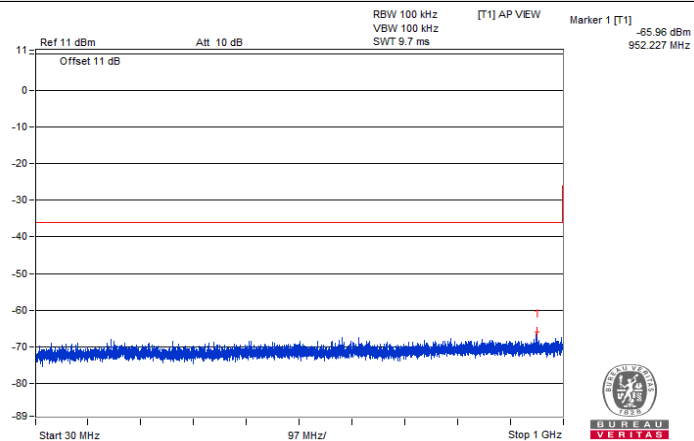
CH 0 (2402MHz)

V_{min.}



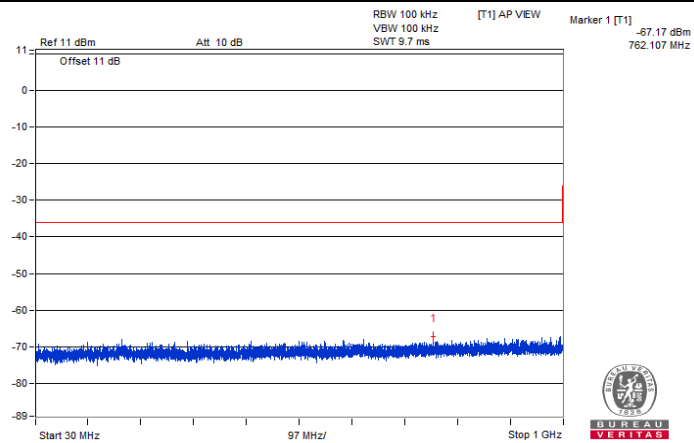
CH 0 (2402MHz)

V_{normal}



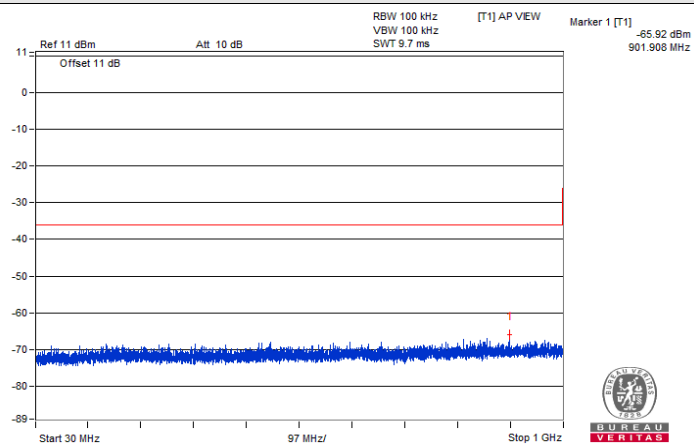
CH 19 (2440MHz)

V_{max.}



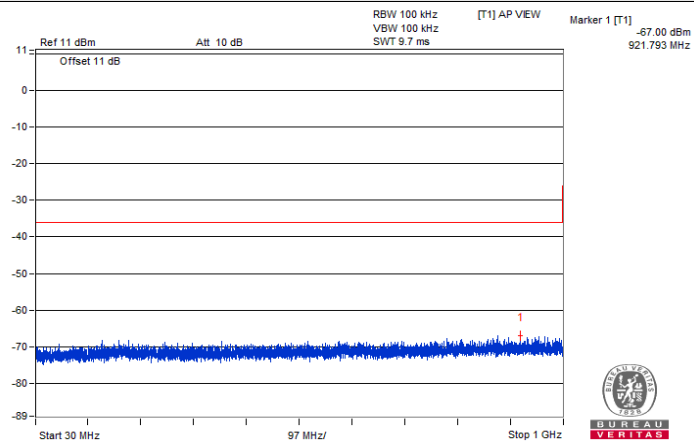
CH 19 (2440MHz)

V_{min.}



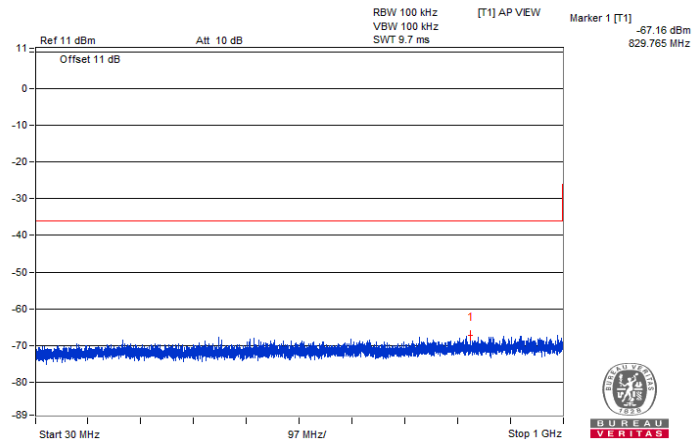
CH 19 (2440MHz)

V_{normal}



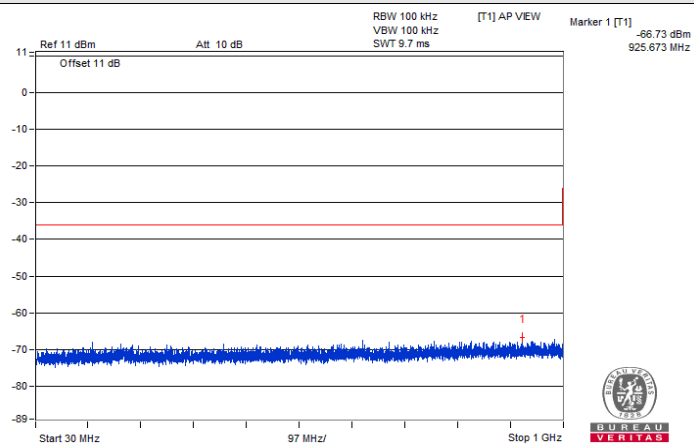
CH 39 (2480MHz)

V_{max.}



CH 39 (2480MHz)

V_{min.}



CH 39 (2480MHz)

4.2 Spurious Emissions for Receiver

4.2.1 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)

4.2.2 Test Setup

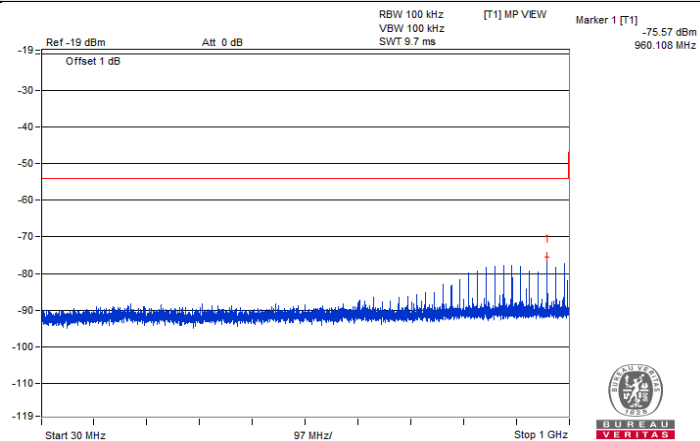


4.2.3 Test Result

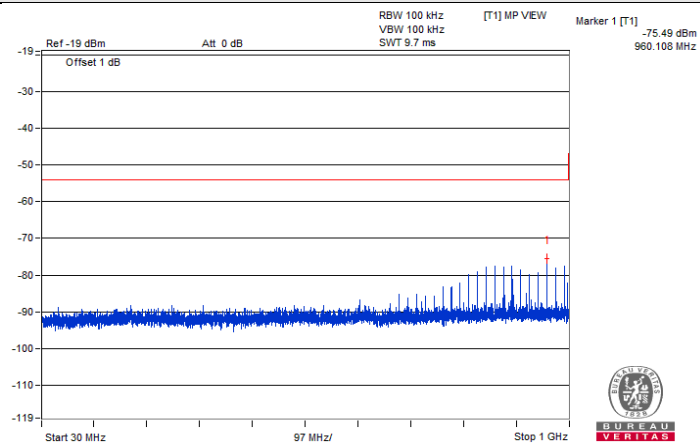
BT-LE 1M

TEST CHANNEL		CH 0 (2402MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(nW)	LIMIT (nW)	RESULT
V _{normal}	30MHz to 1000MHz	960.108	0.027733	4.0	PASS
V _{max.}	30MHz to 1000MHz	960.108	0.028249	4.0	PASS
V _{min.}	30MHz to 1000MHz	960.108	0.026730	4.0	PASS
TEST CHANNEL		CH 19 (2440MHz)			
V _{normal}	30MHz to 1000MHz	960.108	0.029580	4.0	PASS
V _{max.}	30MHz to 1000MHz	960.108	0.029107	4.0	PASS
V _{min.}	30MHz to 1000MHz	960.108	0.028774	4.0	PASS
TEST CHANNEL		CH 39 (2480MHz)			
V _{normal}	30MHz to 1000MHz	960.108	0.030130	4.0	PASS
V _{max.}	30MHz to 1000MHz	960.108	0.029242	4.0	PASS
V _{min.}	30MHz to 1000MHz	960.108	0.030903	4.0	PASS

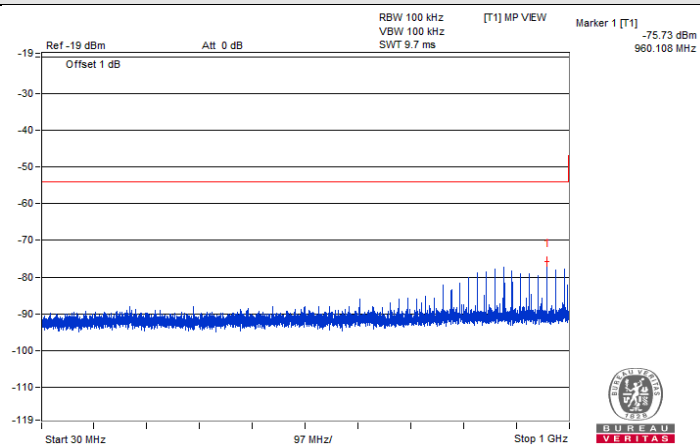
V_{normal}



V_{max.}

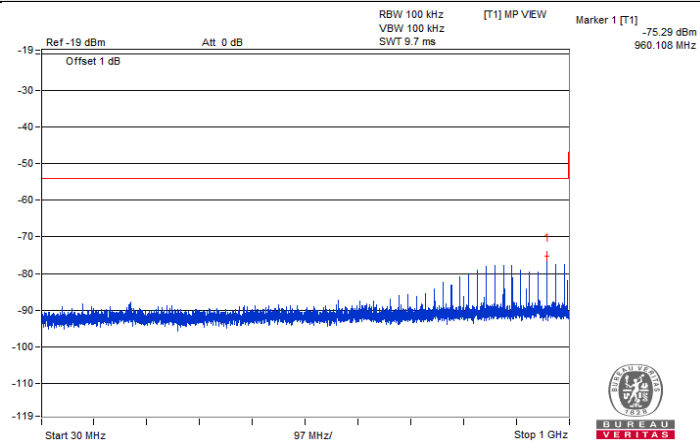


V_{min.}

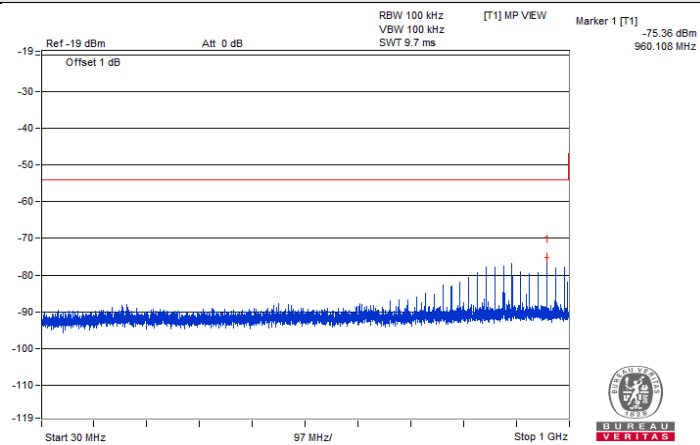


CH 0 (2402MHz)

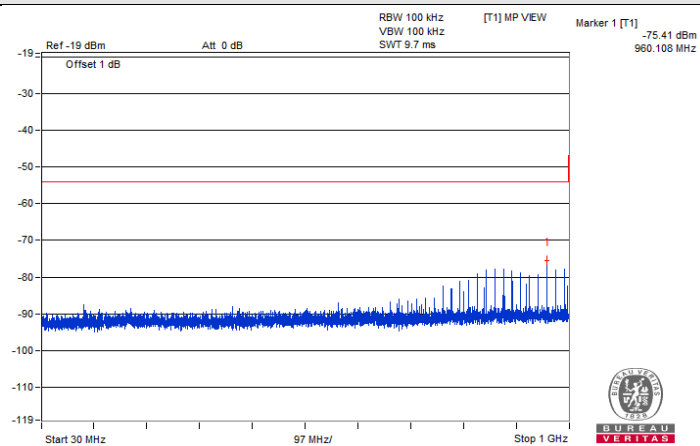
V_{normal}



V_{max.}

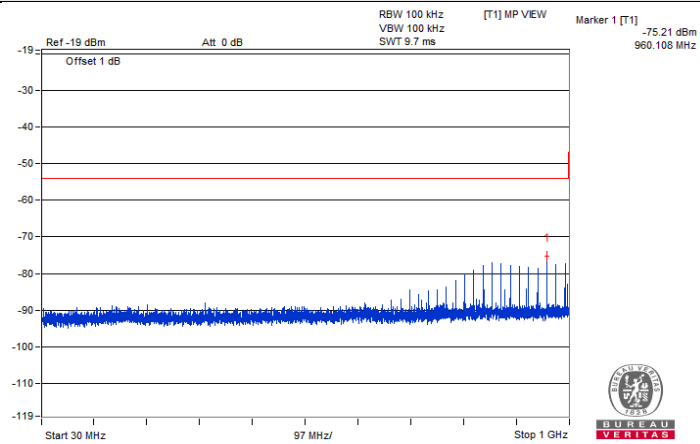


V_{min.}

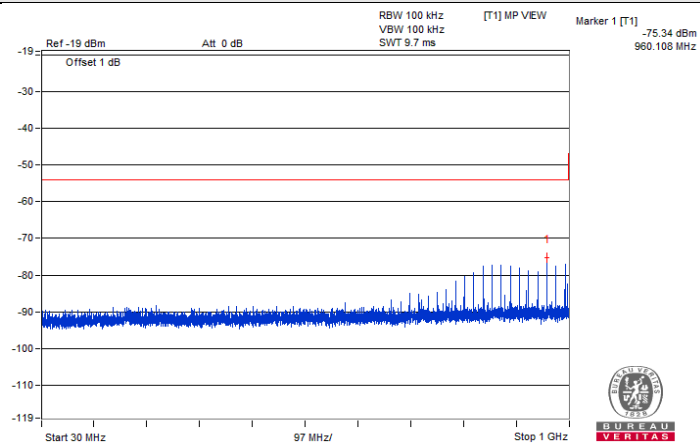


CH 19 (2440MHz)

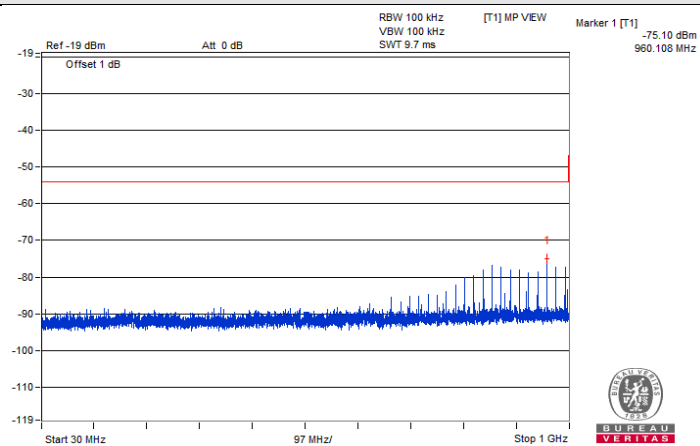
V_{normal}



V_{max}



V_{min}

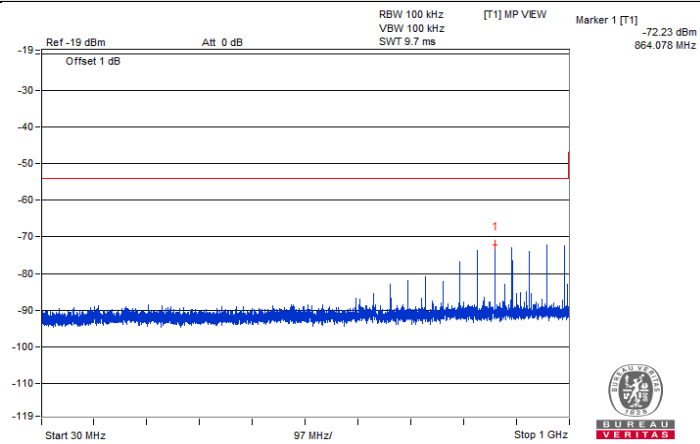


CH 39 (2480MHz)

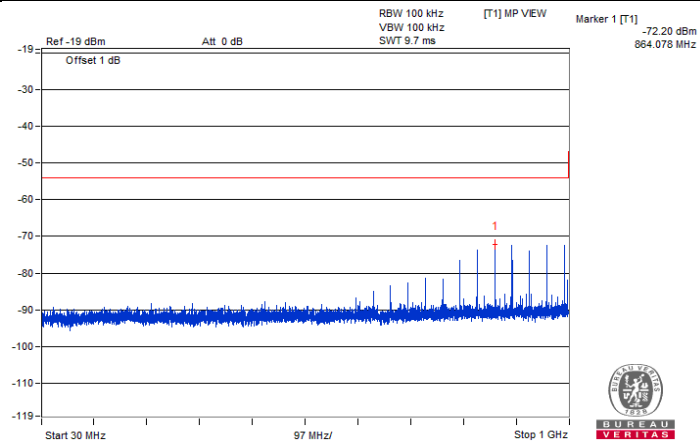
BT-LE 2M

TEST CHANNEL		CH 0 (2402MHz)			
TEST CONDITION	FREQUENCY RANGE(MHz)	FREQUENCY (MHz)	MEASURE. VALUE(nW)	LIMIT (nW)	RESULT
V_{normal}	30MHz to 1000MHz	864.078	0.059841	4.0	PASS
V_{max.}	30MHz to 1000MHz	864.078	0.060256	4.0	PASS
V_{min.}	30MHz to 1000MHz	896.088	0.065163	4.0	PASS
TEST CHANNEL		CH 19 (2440MHz)			
V_{normal}	30MHz to 1000MHz	992.118	0.059841	4.0	PASS
V_{max.}	30MHz to 1000MHz	960.108	0.059429	4.0	PASS
V_{min.}	30MHz to 1000MHz	896.088	0.060395	4.0	PASS
TEST CHANNEL		CH 39 (2480MHz)			
V_{normal}	30MHz to 1000MHz	875.840	0.065464	4.0	PASS
V_{max.}	30MHz to 1000MHz	875.840	0.066834	4.0	PASS
V_{min.}	30MHz to 1000MHz	875.840	0.067143	4.0	PASS

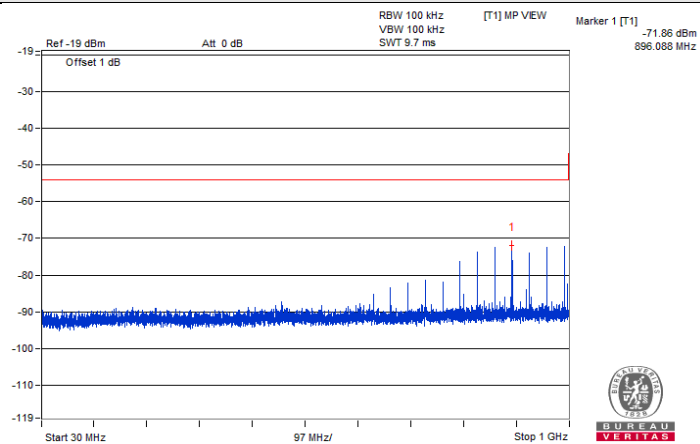
V_{normal}



V_{max}

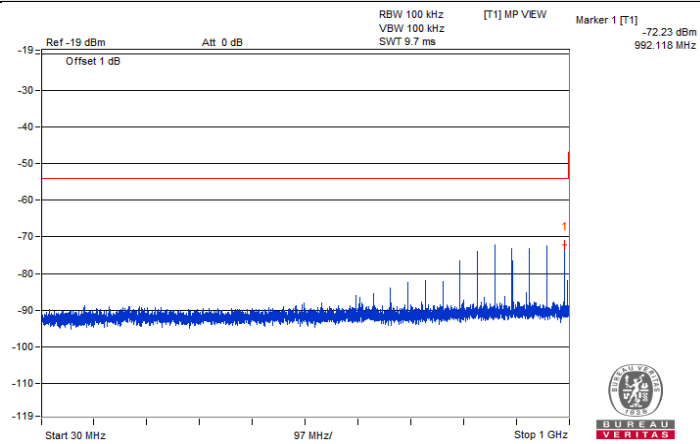


V_{min}

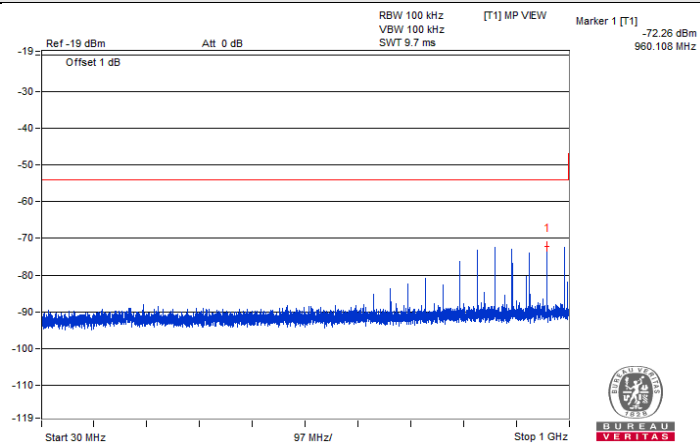


CH 0 (2402MHz)

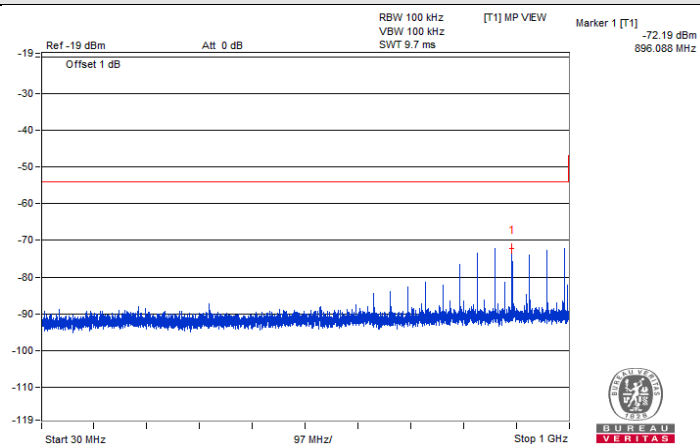
V_{normal}



V_{max}

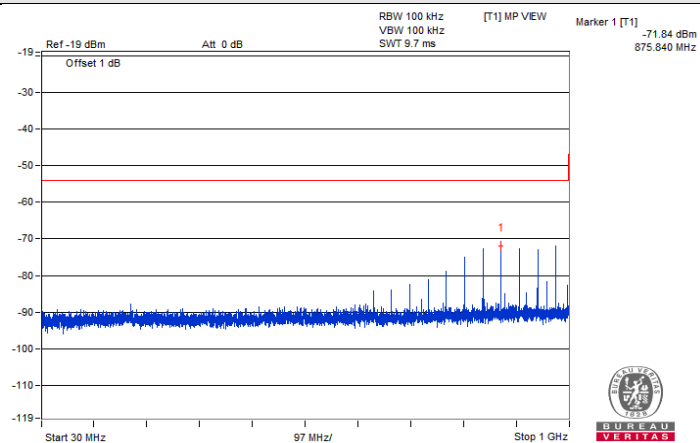


V_{min}

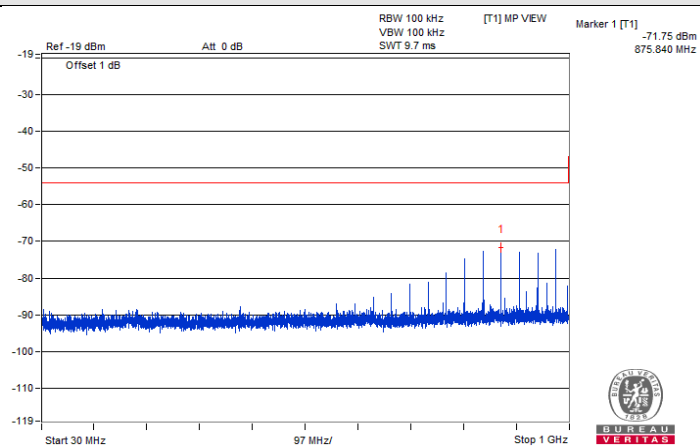


CH 19 (2440MHz)

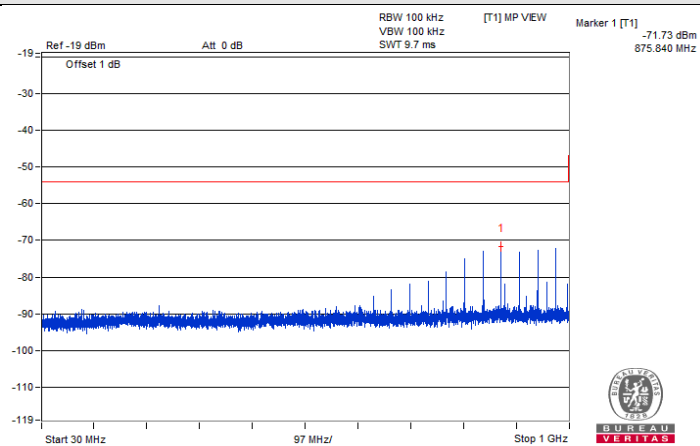
V_{normal}



V_{max.}

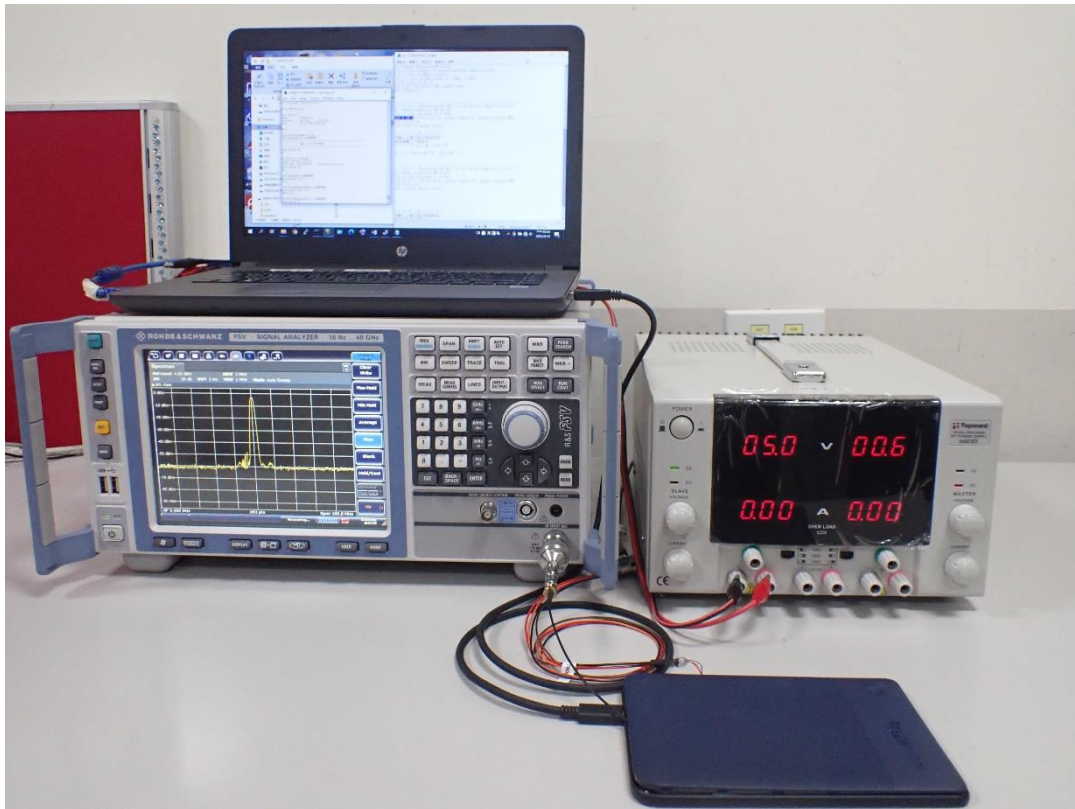


V_{min.}



CH 39 (2480MHz)

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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