



FCC Test Report

FCC ID	:	NKR-MB43
Equipment	:	Wireless module
Model No.	:	DHSC-MB43
Brand Name	:	WNC
Applicant	:	Wistron NeWeb Corporation
Address	:	20 Park Avenue II, Hsinchu Science Park, Hsinchu 308,Taiwan,R.O.C.
Standard	:	47 CFR FCC Part 15.247
Received Date	:	Jul. 13, 2022
Tested Date	:	Jul. 26 ~ Aug. 01, 2022

We, International Certification Corporation, would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by:

Approved by:

ong Cher

Along Cheid/ Assistant Manager

Gary Chang / Manager



Table of Contents

1	GENERAL DESCRIPTION	5
1.1	Information	5
1.2	Local Support Equipment List	7
1.3	Test Setup Chart	
1.4	Test Equipment List and Calibration Data	8
1.5	Test Standards	9
1.6	Reference Guidance	9
1.7	Deviation from Test Standard and Measurement Procedure	
1.8	Measurement Uncertainty	
2	TEST CONFIGURATION	10
2.1	Testing Facility	10
2.2	The Worst Test Modes and Channel Details	10
3	TRANSMITTER TEST RESULTS	11
3.1	6dB and Occupied Bandwidth	
3.2	Conducted Output Power	12
3.3	Power Spectral Density	13
3.4	Unwanted Emissions in Restricted Frequency Bands	14
3.5	Emissions in non-restricted Frequency Bands	16
3.6	AC Power Line Conducted Emissions	17
4	TEST LABORATORY INFORMATION	

- Appendix A. 6dB and Occupied Bandwidth
- Appendix B. Conducted Output Power
- Appendix C. Power Spectral Density
- Appendix D. Unwanted Emissions into Restricted Frequency Bands
- Appendix E. Emissions in Non-Restricted Frequency Bands
- Appendix F. AC Power Line Conducted Emissions



Release Record

Report No.	Version	Description	Issued Date
FR271305AE	Rev. 01	Initial issue	Nov. 25, 2022



Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	AC Power Line Conducted Emissions	[dBuV]: 0.555MHz 34.34 (Margin -11.66dB) - AV	Pass
15.247(d)	Unwanted Emissions	[dBuV/m at 3m]: 179.38MHz	Pass
15.209		35.04 (Margin -8.46dB) - PK	F 855
15.247(b)(3)	Conducted Output Power	Power [dBm]: 8.52	Pass
15.247(a)(2)	6dB Bandwidth	Meet the requirement of limit	Pass
15.247(e)	Power Spectral Density	Meet the requirement of limit	Pass
15.203	Antenna Requirement	Meet the requirement of limit	Pass

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.



1 General Description

1.1 Information

1.1.1 Specification of the Equipment under Test (EUT)

RF General Information							
Frequency Range (MHz)Bluetooth ModeCh. Freq. (MHz)Channel NumberData Rate							
2400-2483.5 V5.3 LE 2402-2480 0-39 [40] 1 Mbps							
Note: Bluetooth LE (L	Note: Bluetooth LE (Low energy) uses GFSK modulation.						

1.1.2 Antenna Details

Ant. No.	Туре	Connector	Gain (dBi)
1	PIFA	No	2.6

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	12.7Vdc from host
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1.1.4 Accessories

N/A



1.1.5 Channel List

Frequency band (MHz)					2400~2	2483.5	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
37	2402	9	2422	18	2442	28	2462
0	2404	10	2424	19	2444	29	2464
1	2406	38	2426	20	2446	30	2466
2	2408	11	2428	21	2448	31	2468
3	2410	12	2430	22	2450	32	2470
4	2412	13	2432	23	2452	33	2472
5	2414	14	2434	24	2454	34	2474
6	2416	15	2436	25	2456	35	2476
7	2418	16	2438	26	2458	36	2478
8	2420	17	2440	27	2460	39	2480

1.1.6 Test Tool and Duty Cycle

Test Tool	Tera Term, V 4.66	
Modulation Mode	Duty Cycle Of Test Signal (%)	Duty Factor (dB)
BT-LE(1Mbps)	63.44%	1.98

1.1.7 Power Index of Test Tool

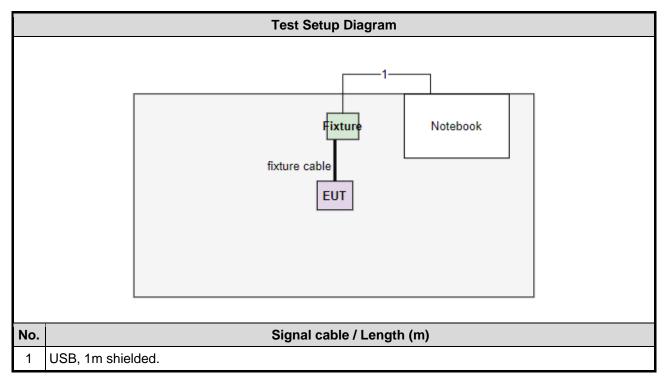
Modulation Mode	Test Frequency (MHz)			
	2402	2440	2480	
BT-LE(1Mbps)	Default	Default	Default	



1.2 Local Support Equipment List

	Support Equipment List							
No.	No. Equipment Brand Model FCC ID Remarks							
1	Notebook	DELL	Latitude E5400	DoC				
2	Fixture				Provided by applicant.			

1.3 Test Setup Chart





Test Equipment List and Calibration Data 1.4

Test Item	Conducted Emission								
Test Site	Conduction room 1 / (Conduction room 1 / (CO01-WS)							
Tested Date	Jul. 29, 2022								
Instrument	Brand	Brand Model No. Serial No. Calibration Date Calibration Until							
Receiver	R&S	ESR3	101658	Feb. 16, 2022	Feb. 15, 2023				
LISN	R&S	ENV216	101579	Apr. 21, 2022	Apr. 20, 2023				
LISN (Support Unit)	SCHWARZBECK	NSLK 8127	8127667	Jan .07, 2022	Jan .06, 2023				
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Oct. 19, 2021	Oct. 18, 2022				
50 ohm terminal (Support Unit)	NA	50	04	May 10, 2022	May 09, 2023				
Measurement Software	AUDIX e3 6.120210k NA NA								
Note: Calibration Inter	rval of instruments liste	d above is one year.	·	·					

Test Item	Radiated Emission						
Test Site	966 chamber1 / (03CH01-WS)						
Tested Date	Jul. 26 ~ Jul. 27, 2022						
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until		
Receiver	R&S	ESR3	101657	Mar. 15, 2022	Mar. 14, 2023		
Spectrum Analyzer	R&S	FSV40	101498	Nov. 29, 2021	Nov. 28, 2022		
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 08, 2021	Nov. 07, 2022		
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-685	Jun. 28, 2022	Jun. 27, 2023		
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 03, 2021	Dec. 02, 2022		
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170508	Jan. 11, 2022	Jan. 10, 2023		
Preamplifier	EMC	EMC02325	980225	Jun. 28, 2022	Jun. 27, 2023		
Preamplifier	Agilent	83017A	MY39501308	Sep. 28, 2021	Sep. 27, 2022		
Preamplifier	EMC	EMC184045B	980192	Jul. 08, 2022	Jul. 07, 2023		
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 05, 2021	Oct. 04, 2022		
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Oct. 05, 2021	Oct. 04, 2022		
LF cable 11M	EMC	EMCCFD400-NW-N W-11000	200801	Oct. 05, 2021	Oct. 04, 2022		
LF cable 1M	EMC	EMCCFD400-NM-N M-1000	160502	Oct. 05, 2021	Oct. 04, 2022		
RF Cable	EMC	EMC104-35M-35M- 8000	210920	Oct. 05, 2021	Oct. 04, 2022		
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Oct. 05, 2021	Oct. 04, 2022		
Measurement Software	AUDIX	e3	6.120210g	NA	NA		



RF Conducted						
(TH01-WS)						
Aug. 01, 2022						
Brand	Model No.	Serial No.	Calibration Date	Calibration Until		
R&S	FSV40	101910	Apr. 18, 2022	Apr. 17, 2023		
Anritsu	ML2495A	1241002	Nov. 07, 2021	Nov. 06, 2022		
Anritsu	MA2411B	1207366	Nov. 07, 2021	Nov. 06, 2022		
Sporton	SENSE-15247_DTS	V5.10	NA	NA		
	Aug. 01, 2022 Brand R&S Anritsu Anritsu	(TH01-WS) Aug. 01, 2022 Brand Model No. R&S FSV40 Anritsu ML2495A Anritsu MA2411B	Model No. Serial No. Brand Model No. Serial No. R&S FSV40 101910 Anritsu ML2495A 1241002 Anritsu MA2411B 1207366	Model No. Serial No. Calibration Date R&S FSV40 101910 Apr. 18, 2022 Anritsu ML2495A 1241002 Nov. 07, 2021 Anritsu MA2411B 1207366 Nov. 07, 2021		

1.5 Test Standards

47 CFR FCC Part 15.247 ANSI C63.10-2013

1.6 Reference Guidance

FCC KDB 558074 D01 15.247 Meas Guidance v05r02

1.7 Deviation from Test Standard and Measurement Procedure

None

1.8 Measurement Uncertainty

The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)).

Measurement Uncertainty				
Parameters	Uncertainty			
Bandwidth	±34.130 Hz			
Conducted power	±0.808 dB			
Power density	±0.583 dB			
Conducted emission	±2.715 dB			
AC conducted emission	±2.92 dB			
Unwanted Emission ≤ 1GHz	±3.41 dB			
Unwanted Emission > 1GHz	±4.59 dB			



Test Configuration 2

2.1 **Testing Facility**

Test Laboratory	International Certification Corporation
Test Site	CO01-WS, 03CH01-WS, TH01-WS
Address of Test Site	No.3-1, Lane 6, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 33381, Taiwan (R.O.C.)
> ECC Designation No.	TN/0700

FCC Designation No.: TW2732

FCC site registration No.: 181692

➢ ISED#: 10807A

➤ CAB identifier: TW2732

The Worst Test Modes and Channel Details 2.2

Test item	Mode	Test Frequency (MHz)	Test Configuration	
AC Power Line Conducted Emissions	BT-LE(1Mbps)	2440		
Unwanted Emissions ≤ 1GHz	BT-LE(1Mbps)	2440		
Unwanted Emissions > 1GHz				
Conducted Output Power		0.400 0.440 0.400		
6dB bandwidth	BT-LE(1Mbps)	2402, 2440, 2480		
Power spectral density				
NOTE:	•	•	•	

1. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The X-plane results were found as the worst case and were shown in this report.



3 Transmitter Test Results

3.1 6dB and Occupied Bandwidth

3.1.1 Limit of 6dB Bandwidth

The minimum 6dB bandwidth shall be at least 500 kHz.

3.1.2 Test Procedures

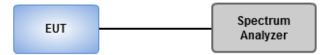
6dB Bandwidth

- 1. Set resolution bandwidth (RBW) = 100 kHz, Video bandwidth = 300 kHz.
- 2. Detector = Peak, Trace mode = max hold.
- 3. Sweep = auto couple, Allow the trace to stabilize.
- 4. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6dB relative to the maximum level measured in the fundamental emission.

Occupied Bandwidth

- 1. Set resolution bandwidth (RBW) = $1\% \sim 5\%$ of OBW, Video bandwidth = $3 \times RBW$
- 2. Detector = Sample, Trace mode = max hold.
- 3 Sweep = auto couple, Allow the trace to stabilize.
- 4. Use the OBW measurement function of spectrum analyzer to measure the occupied bandwidth.

3.1.3 Test Setup



3.1.4 Test Results

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Refer to Appendix A.



3.2 Conducted Output Power

3.2.1 Limit of Conducted Output Power

Conducted power shall not exceed 1Watt.

Antenna gain <= 6dBi, no any corresponding reduction is in output power limit.

3.2.2 Test Procedures

A broadband RF power meter is used for output power measurement. The video bandwidth of power meter is greater than DTS bandwidth of EUT. If duty cycle of test signal is not 100 %, trigger and gating function of power meter will be enabled to capture transmission burst for measuring output power.

3.2.3 Test Setup



3.2.4 Test Results

Ambient Condition25°C / 61%Tested ByRoger Lu
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Refer to Appendix B.



3.3 **Power Spectral Density**

3.3.1 Limit of Power Spectral Density

Power spectral density shall not be greater than 8 dBm in any 3 kHz band.

3.3.2 Test Procedures

- 1. Set the RBW = 3 kHz, VBW = 10 kHz.
- 2. Detector = Peak, Sweep time = auto couple.
- 3. Trace mode = max hold, allow trace to fully stabilize.
- 4. Use the peak marker function to determine the maximum amplitude level.

3.3.3 Test Setup



3.3.4 Test Results

|--|

Refer to Appendix C.



3.4 Unwanted Emissions in Restricted Frequency Bands

3.4.1 Limit of Unwanted Emissions in Restricted Frequency Bands

Restricted Band Emissions Limit						
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)			
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300			
0.490~1.705	24000/F(kHz)	33.8 - 23	30			
1.705~30.0	30	29	30			
30~88	100	40	3			
88~216	150	43.5	3			
216~960	200	46	3			
Above 960	500	54	3			

Note 1:

Qusai-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit **Note 2**:

Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

3.4.2 Test Procedures

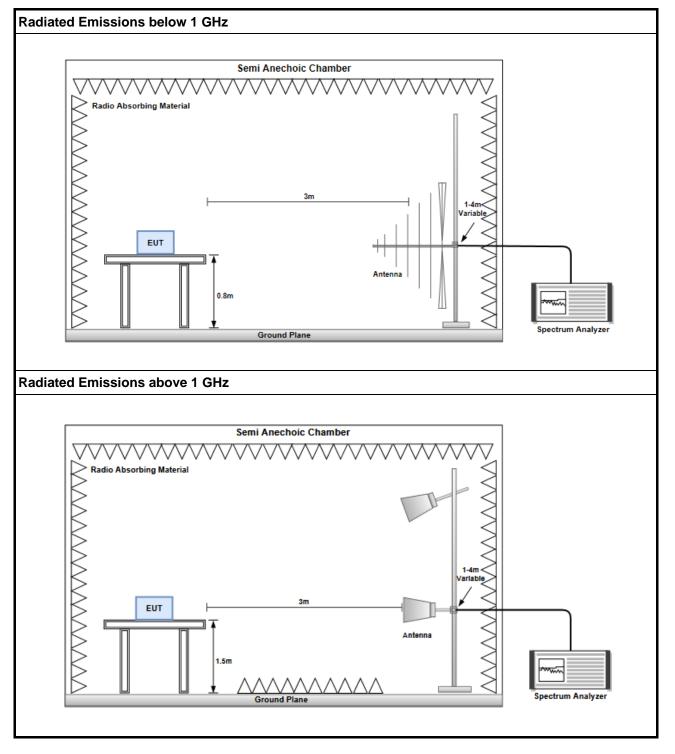
- Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at test table. For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m
- Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
- 3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Note:

- 1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
- 2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
- 3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above 1GHz.



3.4.3 Test Setup



3.4.4 Test Results

Refer to Appendix D.



3.5 Emissions in non-restricted Frequency Bands

3.5.1 Emissions in non-restricted frequency bands limit

Peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz.

3.5.2 Test Procedures

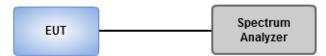
Reference level measurement

- 1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
- 2. Trace = max hold , Allow Trace to fully stabilize
- 3. Use the peak marker function to determine the maximum PSD level

Emission level measurement

- 1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
- 2. Trace = max hold , Allow Trace to fully stabilize
- 3. Scan Frequency range is up to 25GHz
- 4. Use the peak marker function to determine the maximum amplitude level

3.5.3 Test Setup



3.5.4 Test Results

Ambient Condition25°C / 61%Tested ByRoger Lu
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Refer to Appendix E.



AC Power Line Conducted Emissions 3.6

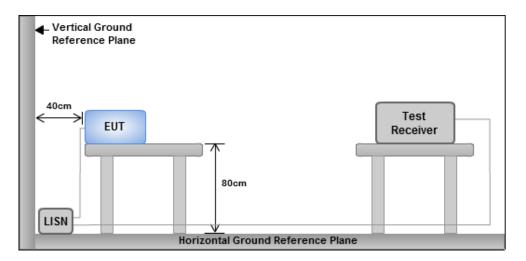
Limit of AC Power Line Conducted Emissions 3.6.1

Conducted Emissions Limit							
Frequency Emission (MHz)	Frequency Emission (MHz) Quasi-Peak Average						
0.15-0.5	66 - 56 *	56 - 46 *					
0.5-5	56	46					
5-30 60 50							
Note 1: * Decreases with the logarithm of the frequency.							

3.6.2 Test Procedures

- 1. The device is placed on a test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the rear of the device.
- The device is connected to line impedance stabilization network (LISN) and other accessories are 2. connected to other LISN. Measured levels of AC power line conducted emission are across the 50 Ω LISN port.
- 3. AC conducted emission measurements is made over frequency range from 150 kHz to 30 MHz.
- This measurement was performed with AC 120V/60Hz 4.

3.6.3 Test Setup



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

2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

3.6.4 Test Results

Refer to Appendix F.



4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corporation (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website <u>http://www.icertifi.com.tw</u>.

Linkou

Tel: 886-2-2601-1640 No.30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City, Taiwan (R.O.C.)

Kwei Shan

Tel: 886-3-271-8666 No.3-1, Lane 6, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 33381, Taiwan (R.O.C.) No.2-1, Lane 6, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 33381, Taiwan (R.O.C.)

Kwei Shan Site II

Tel: 886-3-271-8640 No.14-1, Lane 19, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 333, Taiwan (R.O.C.)

If you have any suggestion, please feel free to contact us as below information.

Tel: 886-3-271-8666 Fax: 886-3-318-0155 Email: ICC_Service@icertifi.com.tw

—END—



Summary

Mode	Max-N dB	Max-OBW	ITU-Code	Min-N dB	Min-OBW
	(Hz)	(Hz)		(Hz)	(Hz)
2.4-2.4835GHz	-	-	-	-	-
BT-LE(1Mbps)	688.406k	1.056M	1M06F1D	681.159k	1.053M

 $\label{eq:max-NdB} \begin{array}{l} \mbox{Max-NdB} = \mbox{Maximum 6dB down bandwidth; Max-OBW} = \mbox{Maximum 99\% occupied bandwidth; Min-OBW} = \mbox{Minimum 99\% occupied bandwidth} \end{array}$

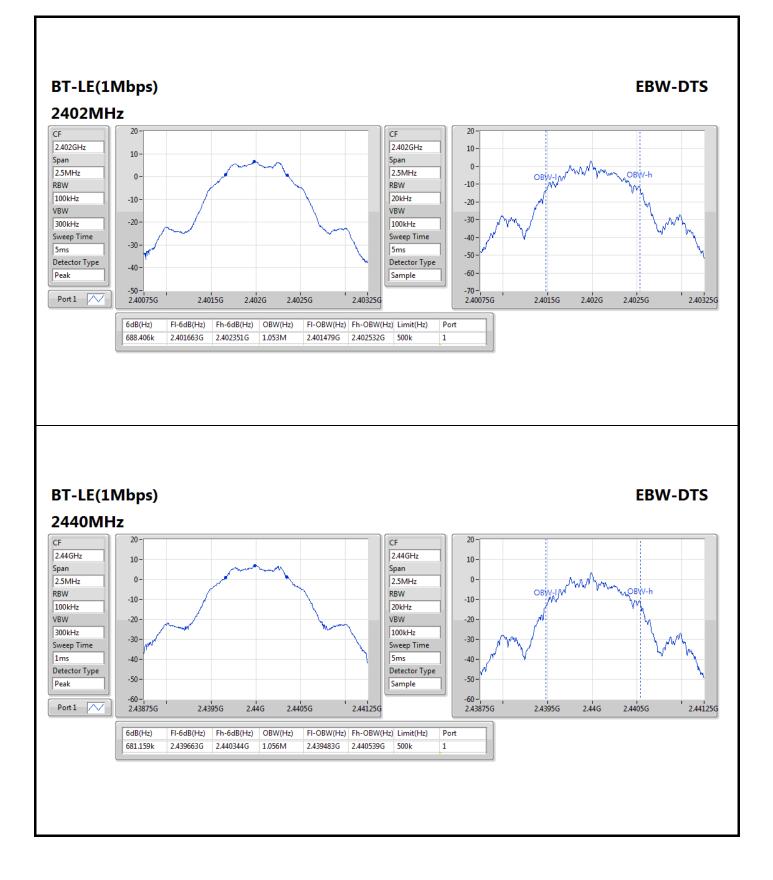
Result

Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	500k	688.406k	1.053M
2440MHz	Pass	500k	681.159k	1.056M
2480MHz	Pass	500k	681.159k	1.056M

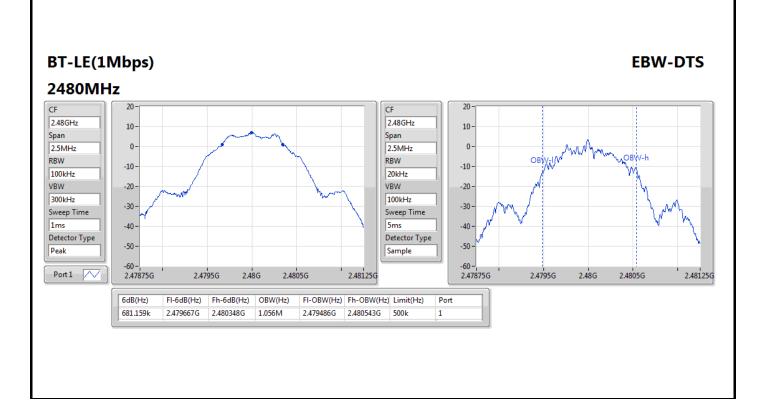
Port X-N dB = Port X 6dB down bandwidth;

Port X-OBW = Port X 99% occupied bandwidth











Conducted Output Power (Peak)

Appendix B.1

Summary

Mode	Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-LE(1Mbps)	8.52	0.00711

Result

Mode	Result	Antenna Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	2.60	8.25	30.00
2440MHz	Pass	2.60	8.52	30.00
2480MHz	Pass	2.60	8.45	30.00



Conducted Output Power (Average)

Appendix B.2

Summary

Mode	Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-LE(1Mbps)	8.43	0.00697

Result

Mode	Result	Antenna Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	2.60	8.15	-
2440MHz	Pass	2.60	8.43	-
2480MHz	Pass	2.60	8.36	-

Note: Average power is for reference only.



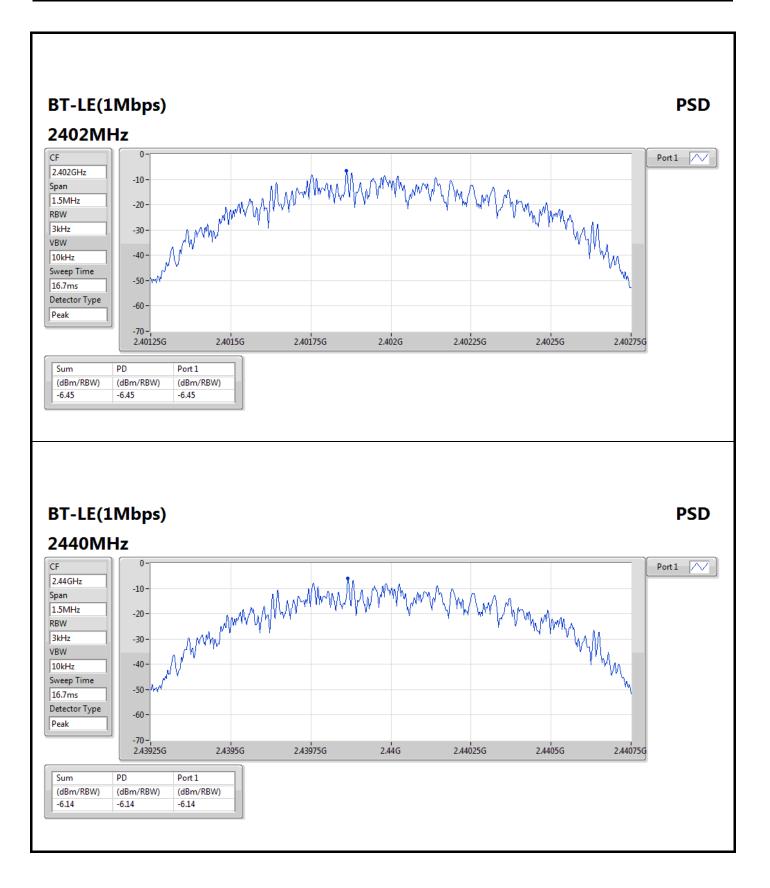
Summary

Mode	PD
	(dBm/3kHz)
2.4-2.4835GHz	-
BT-LE(1Mbps)	-6.14

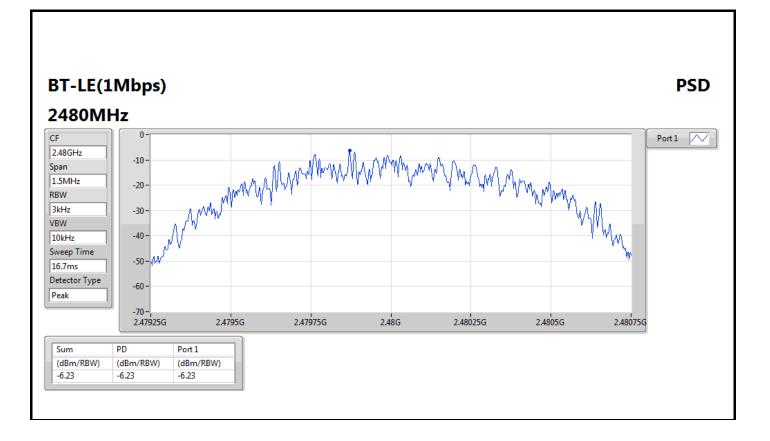
Result

Mode	Result	Antenna Gain (dBi)	Power Density (dBm/3kHz)	Power Density Limit (dBm/3kHz)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	2.60	-6.45	8.00
2440MHz	Pass	2.60	-6.14	8.00
2480MHz	Pass	2.60	-6.23	8.00



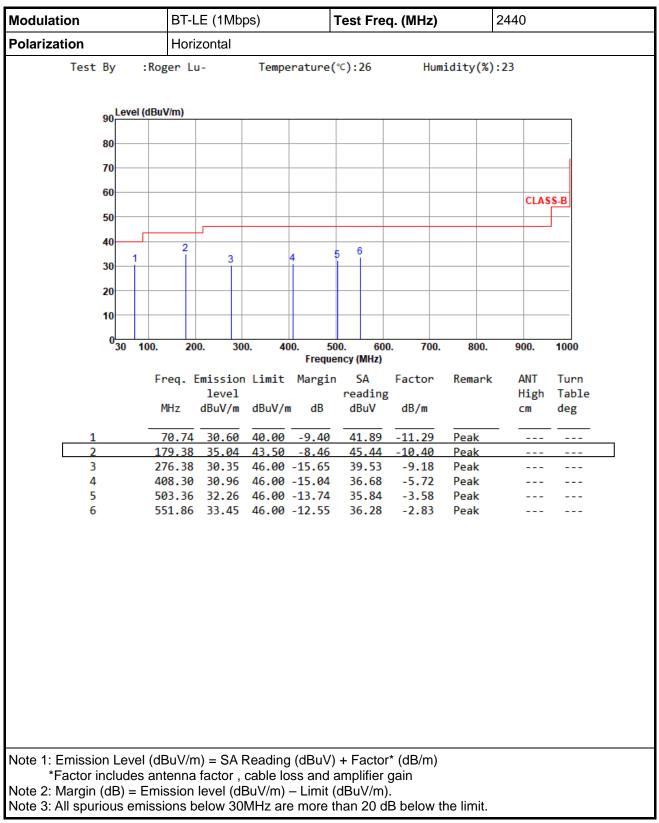




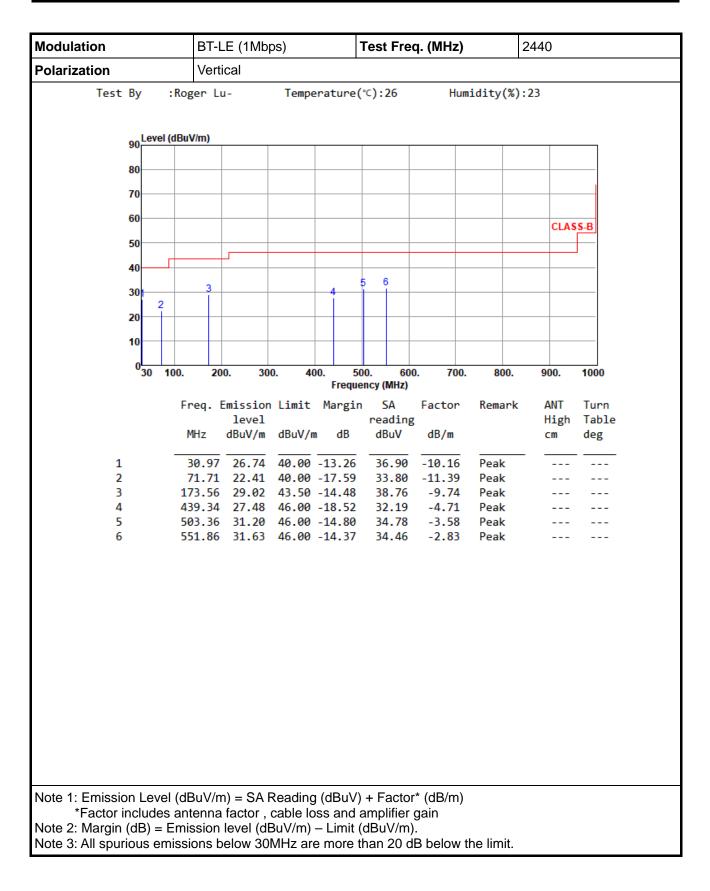




Unwanted Emissions (Below 1GHz)









Unwanted Emissions (Above 1GHz)

