

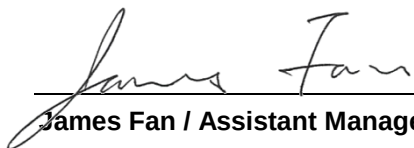
Japan Test Report

Equipment : Steel HR
Model No. : HWA03B
Brand Name : Withings
Applicant : Withings
Address : 2 rue Maurice Hartmann
92130 Issy-Les-Moulineaux
France
Standard : ARIB STD-T66 Ver. 3.7
Received Date : Aug. 02, 2017
Tested Date : Aug. 24 ~ Aug. 25, 2017

Measurement was conducted by the following test method:
the test method of Ordinance Concerning Technical Regulations Conformity Certification
etc. of Specified Radio Equipment in Annex 1, the Ministry of Internal Affairs and
Communication notification in Annex "43" of Article 88, Paragraph 1 or the test method
more than equivalent.

We, International Certification Corp., 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 may be duplicated completely for
legal use with the approval of the applicant. It shall not be reproduced except in full without
the written approval of our laboratory.

Reviewed by:


James Fan / Assistant Manager

Approved by:


Gary Chang / Manager



Table of Contents

1	GENERAL DESCRIPTION	5
1.1	Information.....	5
1.2	Test Equipment and Calibration Data	8
1.3	Testing Applied Standards	8
1.4	Measurement Uncertainty	8
2	TEST CONFIGURATION	9
2.1	Testing Location and Conditions	9
2.2	The Worst Test Modes and Channel Details	9
3	TRANSMITTER TEST RESULTS.....	10
3.1	Antenna Power	10
3.2	Frequency Tolerance	11
3.3	Occupied Bandwidth	12
3.4	Transmitter Spurious Emissions.....	13
3.5	Interference prevention function.....	14
4	RECEIVER TEST RESULTS	15
4.1	Receiver Spurious Emissions.....	15
5	PHOTOGRAPHS OF THE TEST CONFIGURATION	16
6	TEST LABORATORY INFORMATION	17
 APPENDIX A.1 TEST RESULTS FOR ANTENNA POWER		
APPENDIX A.2 TEST RESULTS FOR ANTENNA POWER		
APPENDIX B. TEST RESULTS FOR FREQUENCY TOLERANCE		
APPENDIX C. TEST RESULTS FOR OCCUPIED BANDWIDTH		
APPENDIX D. TEST RESULTS FOR TRANSMITTER SPURIOUS EMISSIONS		
APPENDIX E. TEST RESULTS FOR INTERFERENCE PREVENTION FUNCTION		
APPENDIX F. TEST RESULTS FOR RECEIVER SPURIOUS EMISSIONS		
APPENDIX G. ANTENNA INFORMATION		

Release Record

Report No.	Version	Description	Issued Date
JR672802-08	Rev. 01	Initial issue	Jul. 04, 2018

Summary of Test Results

Ref. Std. Clause	Description	Result
3.2(2)(3)	Antenna Power	Pass
3.2(4)	Frequency Tolerance	Pass
3.2(6)	Transmitter Spurious Emission	Pass
3.2(7)	Occupied Bandwidth	Pass
3.3(1)	Receiver Emission	Pass
3.4.1	Interference prevention function	Pass

1 General Description

1.1 Information

This report is issued as a duplicate report to original ICC report no. JR672802-04. The modification is changing applicant and brand name.

1.1.1 Specification of the Equipment under Test (EUT)

Power Type	3.7Vdc from Rechargeable li-ion battery 5Vdc from host
Type(s) of Modulation / Technology	GFSK = 1Mbps
Frequency Range (MHz)	2402 ~ 2480 MHz
Total Channel Number	40
HW Version	v6a
SW Version	v1041

1.1.2 Accessories

Accessories		
No.	Equipment	Description
1	Rechargeable li-ion battery	Brand Name: Routejade Model Name: PD2430C1 Rating: 3.7Vdc, 110mAh
2	USB cable (for charging use only)	1m shielded cable without core.

1.1.3 Antenna Details

Ant. No.	Band	Mode	Type	Connector	Gain(dBi)
1	ethertronics	1001312	Ceramic Antenna	NA	1.72

Note: Please refer to Appendix G for more details about antenna pattern and other information.

1.1.4 Antenna Power

Operating Mode	Rated Power (mW)	Measured Conducted Power (mW)	Radiated Power (mW)
LE	1	0.96	1.43

1.1.5 Channel List

Frequency band (MHz)				2400~2483.5			
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 Power Setting

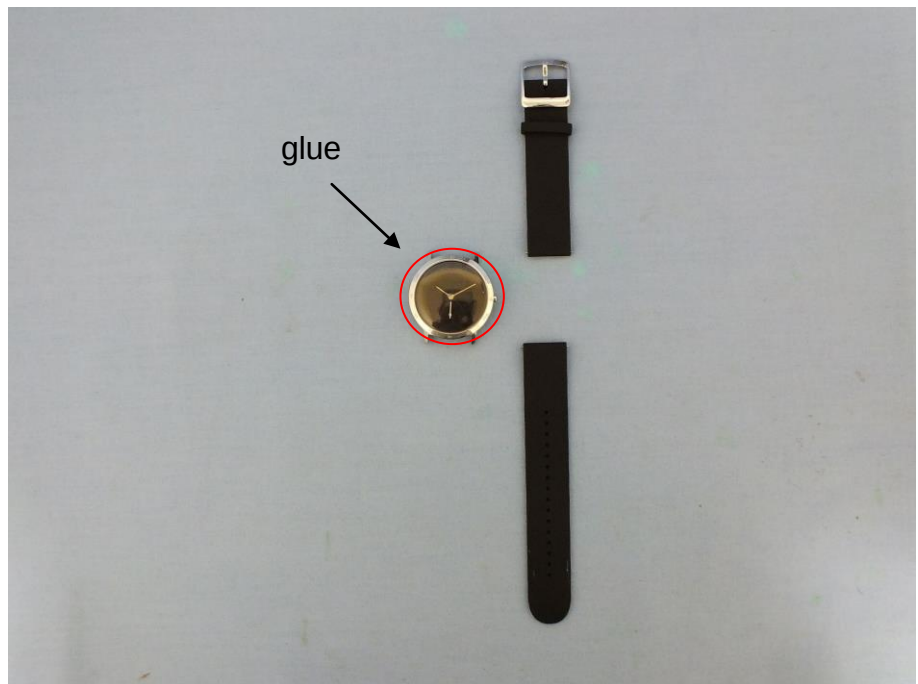
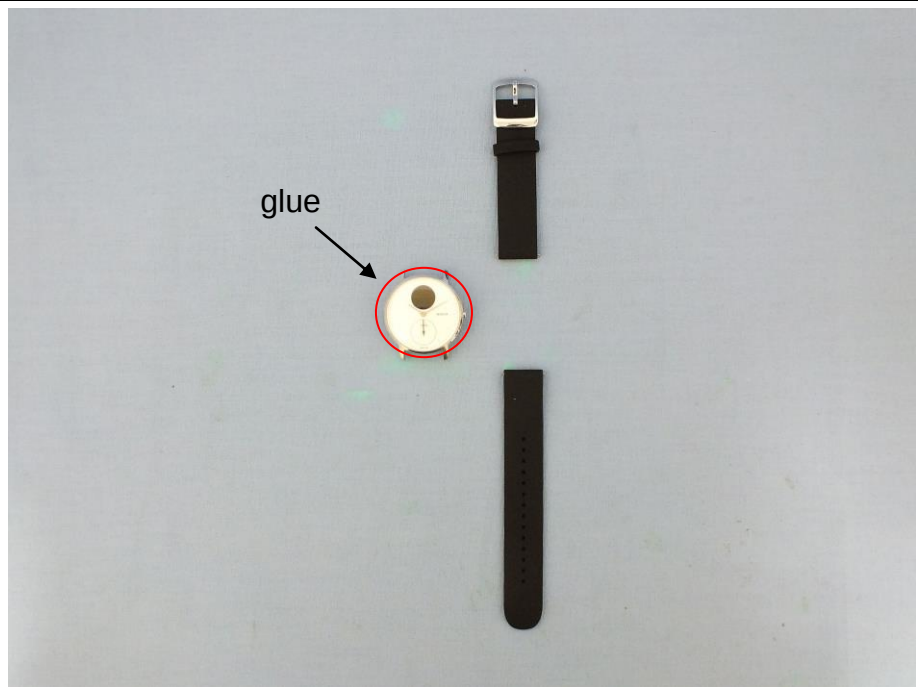
Test Tool
nRFGo Studio v. 1.21.0.2

Modulation Mode	Test Frequency (MHz)		
	2402	2440	2480
GFSK/1Mbps	Default	Default	Default

1.1.7 Protection Method for High Frequency and Modulation Section

Protected Method	Description
Glue Case	RF and Modulation components are covered within case of EUT and this case used Glue to protect anybody to open this case. Then use the glue to compress tightly and protect the outer cover is not opened easily. The glue will be damaged and calibration function will be broken that causes measured value will be incorrect if the cover was opened.

Photo



1.2 Test Equipment and Calibration Data

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101063	Mar. 15, 2017	Mar. 14, 2018
Power Meter	Anritsu	ML2495A	1241002	Oct. 06, 2016	Oct. 05, 2017
Power Sensor	Anritsu	MA2411B	1207366	Oct. 06, 2016	Oct. 05, 2017
DC POWER SOURCE	GW INSTEK	GPC-6030D	EM892433	Oct. 20, 2016	Oct. 19, 2017
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA
Note 1: Calibration Interval of instruments listed above is one year. Note 2: Above instruments are calibrated by Electronics Testing Center					

1.3 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

ARIB STD-T66 Ver. 3.7

1.4 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))

Measurement Uncertainty	
Parameters	Uncertainty
Frequency error	±33.988 Hz
Bandwidth	±33.988 Hz
Conducted power	±0.537 dB
TX Conducted emission	±2.308 dB
RX Conducted emission	±2.525 dB

2 Test Configuration

2.1 Testing Location and Conditions

Test Site	Site Category	Ambient Condition	Tested By
TH01-WS	OVEN Room	25°C / 65%	Chris Zeng

2.2 The Worst Test Modes and Channel Details

Test item	Mode	Test Frequency (MHz)
Antenna Power Frequency Tolerance Transmitter Spurious Emission Occupied Bandwidth Spreading Bandwidth Collateral Emission of Receiver Spreading Factor Interference prevention function	BT LE	2402 / 2440 / 2480

3 Transmitter Test Results

3.1 Antenna Power

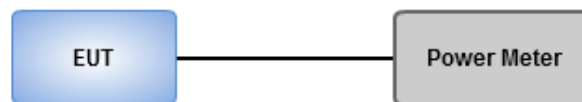
3.1.1 Limit of Antenna Power

Mode	Limit	Tolerance
1) FH, FH+DS, FH+OFDM	3 mW / MHz	+20 % , -80 %
2) OFDM(Narrow- bandwidht), DS	10 mW / MHz	
3) Other than 1) & 2)	10mW	
4) OFDM (Wide-band)	5 mW / MHz	

3.1.2 Test Procedures

Measure the total power by Power Meter

3.1.3 Test Setup



3.1.4 Test Result of Maximum Transmit Power

Refer to Appendix A1, A2

3.2 Frequency Tolerance

3.2.1 Limit of Frequency Tolerance

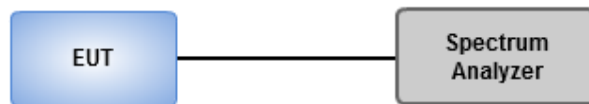
Frequency tolerance shall be +/- 50ppm.

3.2.2 Test Procedures

1. Set Span = 150kHz, RBW = 1kHz, VBW = 30kHz, Sweep time = Auto, detector = Peak.
2. Use Peak search function to find the max peak value and record this value (RF).
3. Calculate frequency tolerance by below formula
$$FT(ppm) = \{ (RF) - (MF) / (MF) \} \times 1000000$$

(FT: Frequency Tolerance, RF: Reading Frequency, MF: Measurement Frequency.)

3.2.3 Test Setup



3.2.4 Test Result of Frequency Tolerance

Refer to Appendix B

3.3 Occupied Bandwidth

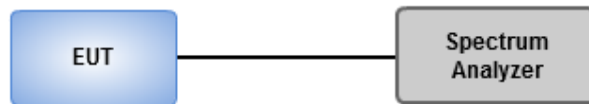
3.3.1 Limit of Occupied Bandwidth

Mode	Limit (MHz)
FH	83.5
FH+DS	83.5
FH+OFDM	83.5
OFDM(Narrow- bandwidht), DS	26
Others	26
OFDM (Wide-band)	38

3.3.2 Test Procedures

1. Set Span = 40MHz, RBW = VBW = 300kHz, detector = Peak, Sweep time = Auto.
2. Enable OBW function of spectrum analyzer to measure OBW and capture test plot.

3.3.3 Test Setup



3.3.4 Test Result of Occupied Bandwidth

Refer to Appendix C

3.4 Transmitter Spurious Emissions

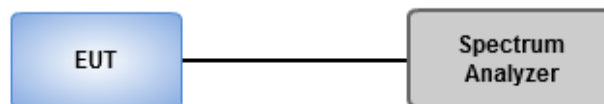
3.4.1 Limit of Transmitter Spurious Emissions

Item	Limits
Tx Spurious Emission	$\leq 2.5 \mu\text{W}$ ($2387\text{MHz} > f$; $2496.5\text{MHz} < f$).
	$\leq 25 \mu\text{W}$. ($2387\text{MHz} \leq f < 2400\text{MHz}$) and ($2483.5\text{MHz} < f \leq 2496.5\text{MHz}$).

3.4.2 Test Procedures

1. Set EUT to transmit at rated power and channel to perform test.
2. Set RBW = VBW = 1MHz, Detector type = Peak, Sweep time = Auto.
3. Following above setting of spectrum analyzer to measure spurious emission of 30~12500 MHz.

3.4.3 Test Setup



3.4.4 Test Result of Transmitter Spurious Emissions

Refer to Appendix D

3.5 Interference prevention function

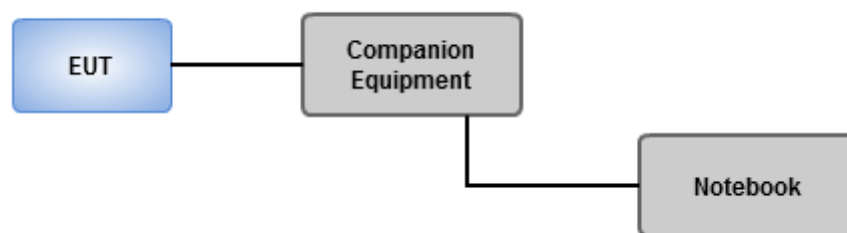
3.5.1 Limit of Interference Prevention Function

Limits
The identification code shall be 48 bits long

3.5.2 Test Procedures

1. Set EUT under operating mode and link up with companion equipment
2. Check communication status between EUT and companion equipment is normal
3. Confirm the MAC address of EUT

3.5.3 Test Setup



3.5.4 Test Result of Interference Prevention Function

Refer to Appendix E

4 Receiver Test Results

4.1 Receiver Spurious Emissions

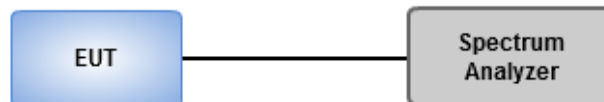
4.1.1 Limit of Receiver Spurious Emissions

Item	Limits
Rx Spurious Emission	$\leq 4\text{nW}$ ($f < 1\text{GHz}$).
	$\leq 20\text{nW}$ ($1\text{GHz} \leq f$).

4.1.2 Test Procedures

1. Set EUT under receiving condition to perform test
2. Set RBW = VBW = 100kHz, detector = Peak, Sweep time = Auto for emission measurement below 1GHz.
3. Set RBW = VBW=1MHz, detector = Peak, Sweep time = Auto for emission measurement above 1GHz.

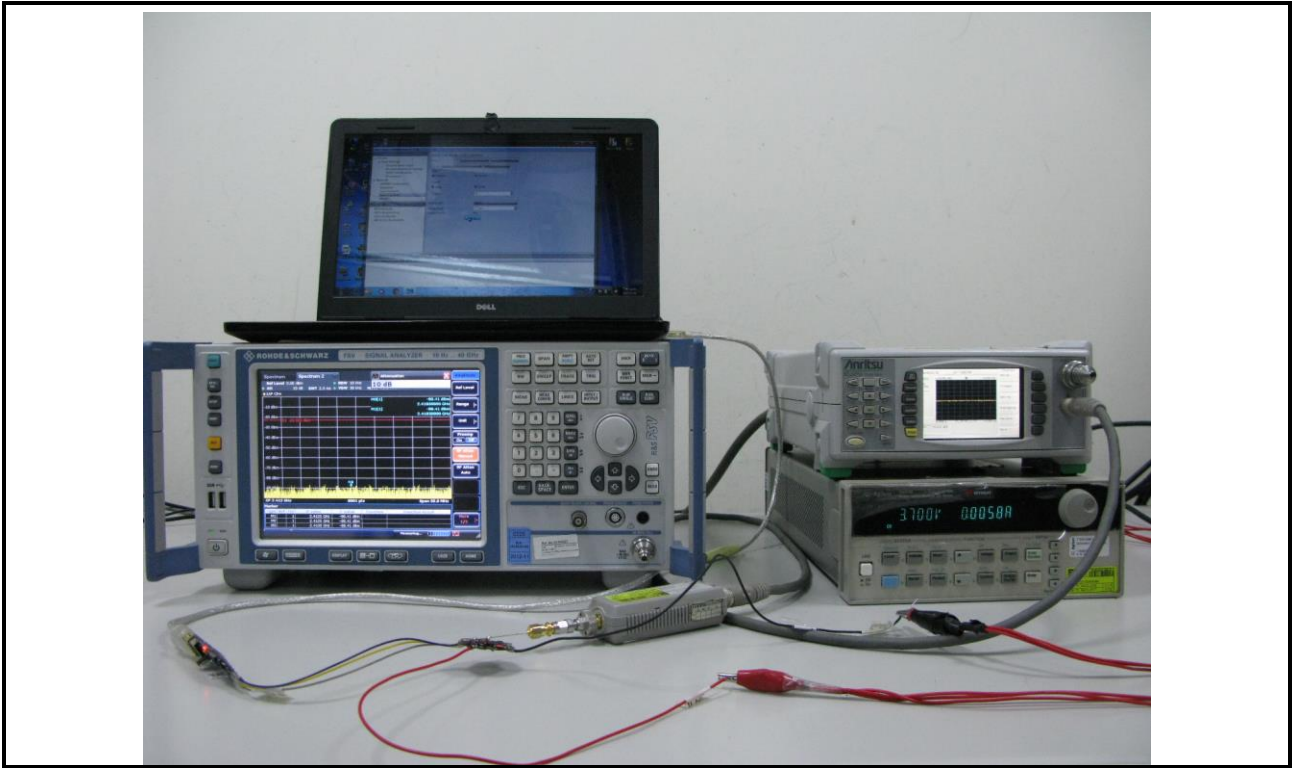
4.1.3 Test Setup



4.1.4 Test Result of Receiver Spurious Emissions

Refer to Appendix F

5 Photographs of the Test Configuration



6 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 Corp (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 <http://www.icertifi.com.tw>.

Linkou

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No. 30-2, Ding Fwu Tsuen, Lin Kou
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St., Kwei Shan District, Tao Yuan
City 333, Taiwan, R.O.C.

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Tel: 886-3-271-8640

No. 14-1, Lane 19, Wen San 3rd
St., Kwei Shan District, 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	Result	Power (dBm)	Power (mW)	Declare (dBm)	Declare (mW)	Tolerance (%)	Limit+ (%)	Limit- (%)
BT-LE(1Mbps)	-	-	-	-	-	-	-	-
2.4-2.4835GHz	Pass	-0.16	0.96383	0.00	1.00	-3.62	20	-80

Result

Mode	Result	Power (dBm)	Power (mW)	Declare (dBm)	Declare (mW)	Tolerance (%)	Limit+ (%)	Limit- (%)
BT-LE(1Mbps)	-	-	-	-	-	-	-	-
2402MHz_Vnom	Pass	-0.16	0.96383	0.00	1.00	-3.62	20	-80
2402MHz_Vmin	Pass	-0.19	0.95719	0.00	1.00	-4.28	20	-80
2402MHz_Vmax	Pass	-0.18	0.95940	0.00	1.00	-4.06	20	-80
2440MHz_Vnom	Pass	-0.31	0.93111	0.00	1.00	-6.89	20	-80
2440MHz_Vmin	Pass	-0.23	0.94842	0.00	1.00	-5.16	20	-80
2440MHz_Vmax	Pass	-0.29	0.93541	0.00	1.00	-6.46	20	-80
2480MHz_Vnom	Pass	-0.39	0.91411	0.00	1.00	-8.59	20	-80
2480MHz_Vmin	Pass	-0.45	0.90157	0.00	1.00	-9.84	20	-80
2480MHz_Vmax	Pass	-0.43	0.90573	0.00	1.00	-9.43	20	-80



Total Power-DTS Result

Appendix A.2

Summary

Mode	Power (dBm)	Power (mW)	EIRP (dBm)	EIRP (mW)
BT-LE(1Mbps)	-	-	-	-
2.4-2.4835GHz	-0.16	0.96	1.56	1.43

P1 = Port 1 output power;

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power (mW)	Power Lim. (mW)	EIRP (dBm)	EIRP (mW)	EIRP Lim. (mW)	P1 (dBm)
BT-LE(1Mbps)	-	-	-	-	-	-	-	-	-
2402MHz_Vnom	Pass	1.72	-0.16	0.964	10	1.56	1.432	16.368	-0.16
2402MHz_Vmin	Pass	1.72	-0.19	0.957	10	1.53	1.422	16.368	-0.19
2402MHz_Vmax	Pass	1.72	-0.18	0.959	10	1.54	1.426	16.368	-0.18
2440MHz_Vnom	Pass	1.72	-0.31	0.931	10	1.41	1.384	16.368	-0.31
2440MHz_Vmin	Pass	1.72	-0.23	0.948	10	1.49	1.409	16.368	-0.23
2440MHz_Vmax	Pass	1.72	-0.29	0.935	10	1.43	1.390	16.368	-0.29
2480MHz_Vnom	Pass	1.72	-0.39	0.914	10	1.33	1.358	16.368	-0.39
2480MHz_Vmin	Pass	1.72	-0.45	0.902	10	1.27	1.340	16.368	-0.45
2480MHz_Vmax	Pass	1.72	-0.43	0.906	10	1.29	1.346	16.368	-0.43

P1 = Port 1 output power;



Summary

Mode	Result	Ch (MHz)	Center (Hz)	ppm	Limit (ppm)	Port	Remark
BT-LE(1Mbps)	-	-	-	-	-	-	-
2.4-2.4835GHz	Pass	2.44G	2.439946G	+ 22.054	+ / - 50	1	-

**Result**

Mode	Result	Ch (MHz)	Center (Hz)	ppm	Limit (ppm)	Port	Remark
BT-LE(1Mbps)	-	-	-	-	-	-	-
2402MHz_Vnom	Pass	2.402G	2.401953G	- 19.749	+ / - 50	1	-
2402MHz_Vmin	Pass	2.402G	2.401955G	- 18.578	+ / - 50	1	-
2402MHz_Vmax	Pass	2.402G	2.40196G	- 16.705	+ / - 50	1	-
2440MHz_Vnom	Pass	2.44G	2.439946G	- 22.054	+ / - 50	1	-
2440MHz_Vmin	Pass	2.44G	2.439959G	- 16.983	+ / - 50	1	-
2440MHz_Vmax	Pass	2.44G	2.439956G	- 18.212	+ / - 50	1	-
2480MHz_Vnom	Pass	2.48G	2.479953G	- 18.826	+ / - 50	1	-
2480MHz_Vmin	Pass	2.48G	2.479953G	- 18.826	+ / - 50	1	-
2480MHz_Vmax	Pass	2.48G	2.47996G	- 16.104	+ / - 50	1	-

**Summary**

Mode	Max-OBW (MHz)	ITU-Code	Min-OBW (MHz)
BT-LE(1Mbps)	-	-	-
2.4-2.4835GHz	1.31	1M31F1D	1.295

Max-OBW = Maximum 99% occupied bandwidth; **Min-OBW** = Minimum 99% occupied bandwidth;

Result

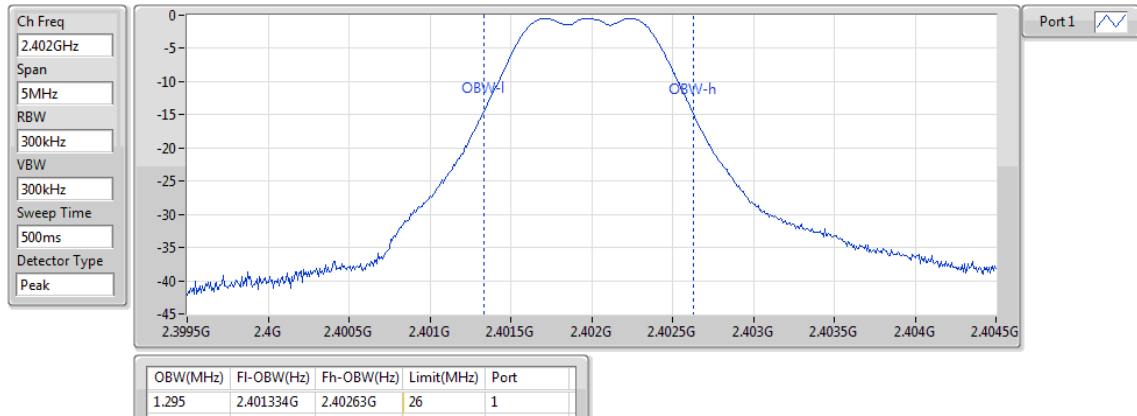
Mode	Result	Limit (MHz)	P1-OBW (MHz)
BT-LE(1Mbps)	-	-	-
2402MHz_Vnom	Pass	26	1.295
2402MHz_Vmin	Pass	26	1.295
2402MHz_Vmax	Pass	26	1.295
2440MHz_Vnom	Pass	26	1.302
2440MHz_Vmin	Pass	26	1.302
2440MHz_Vmax	Pass	26	1.302
2480MHz_Vnom	Pass	26	1.31
2480MHz_Vmin	Pass	26	1.31
2480MHz_Vmax	Pass	26	1.31

P1-OBW = Port 1 99% occupied bandwidth;

BT-LE(1Mbps)

OBW

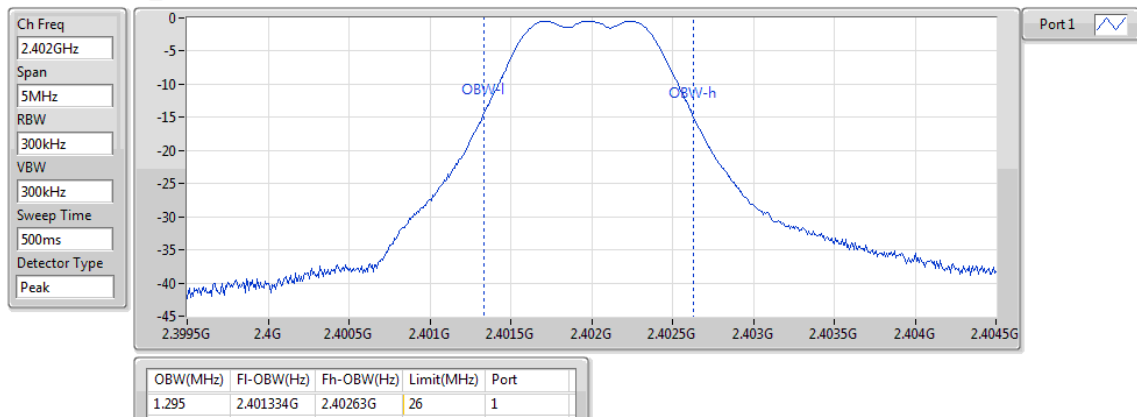
2402MHz_Vnom



BT-LE(1Mbps)

OBW

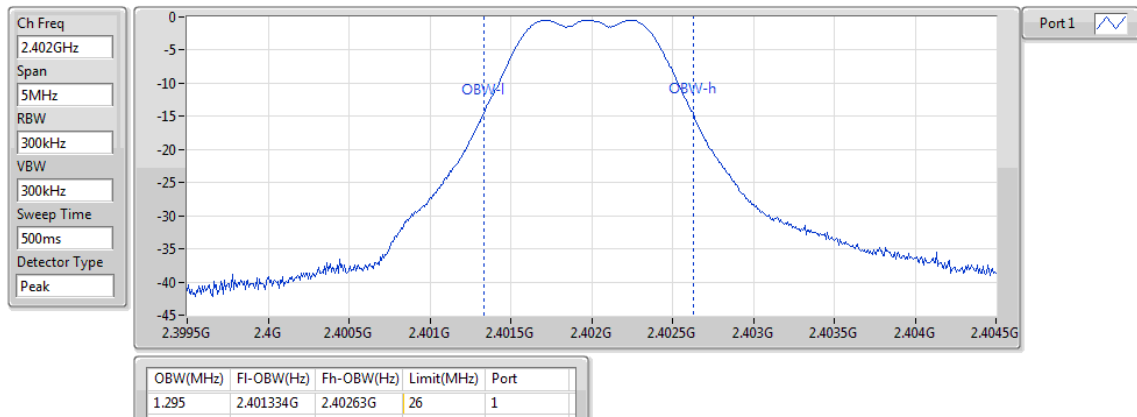
2402MHz_Vmin



BT-LE(1Mbps)

OBW

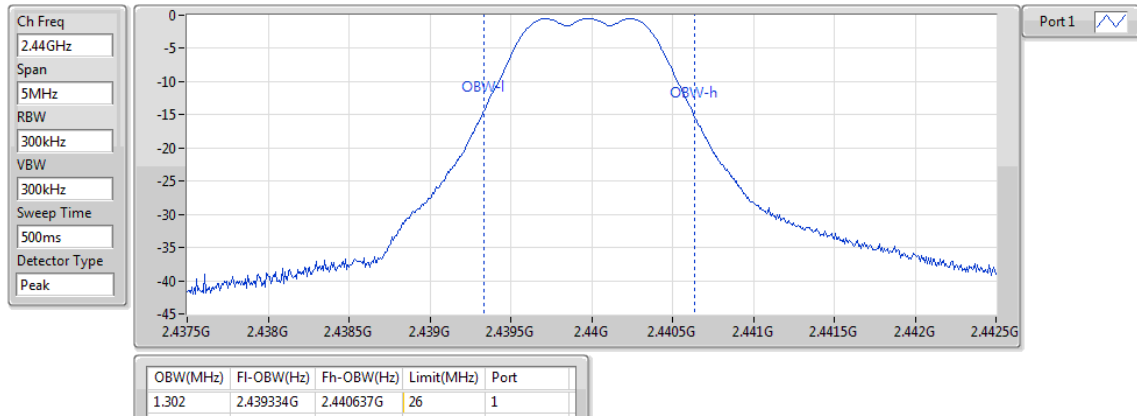
2402MHz_Vmax



BT-LE(1Mbps)

OBW

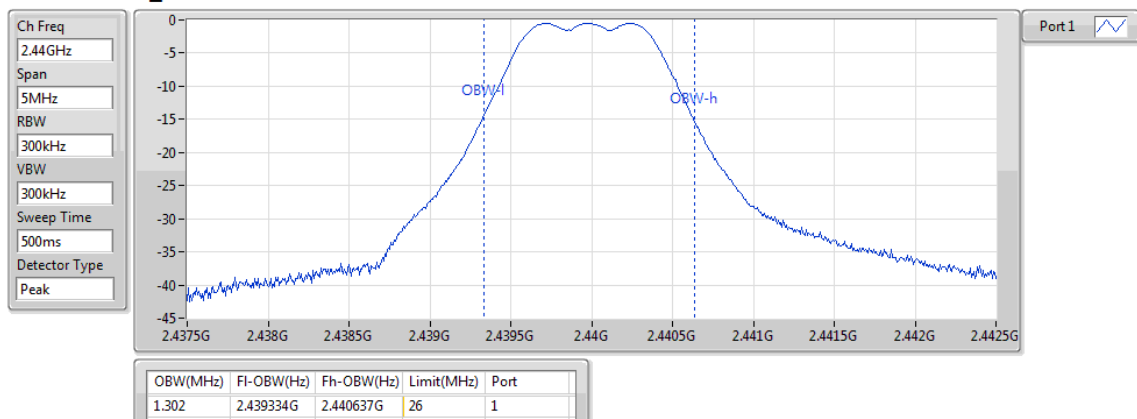
2440MHz_Vnom



BT-LE(1Mbps)

OBW

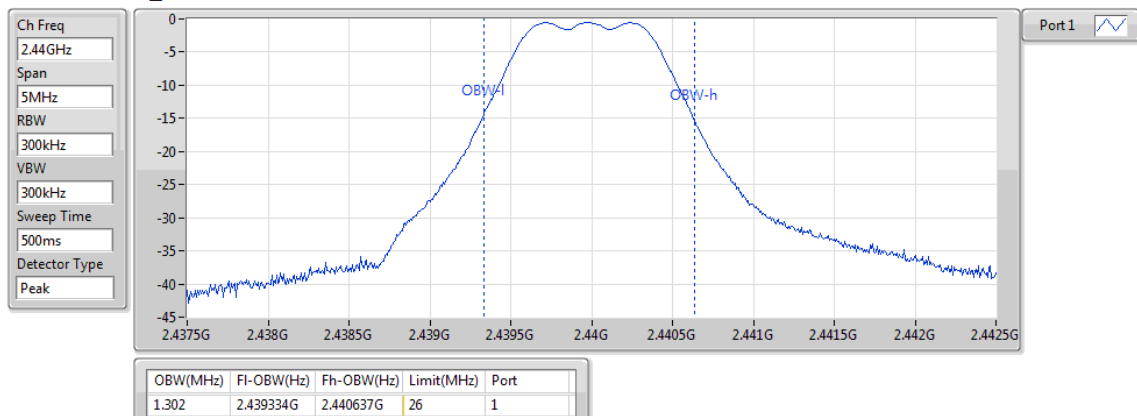
2440MHz_Vmin



BT-LE(1Mbps)

OBW

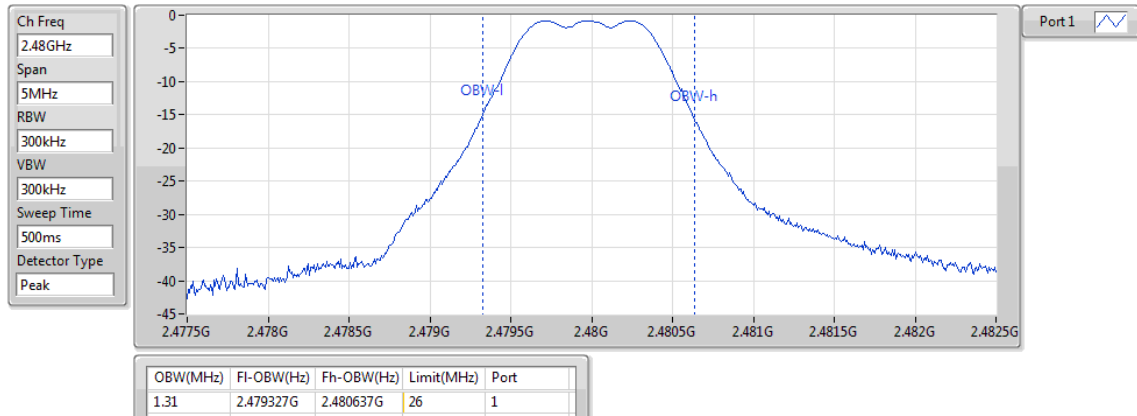
2440MHz_Vmax



BT-LE(1Mbps)

OBW

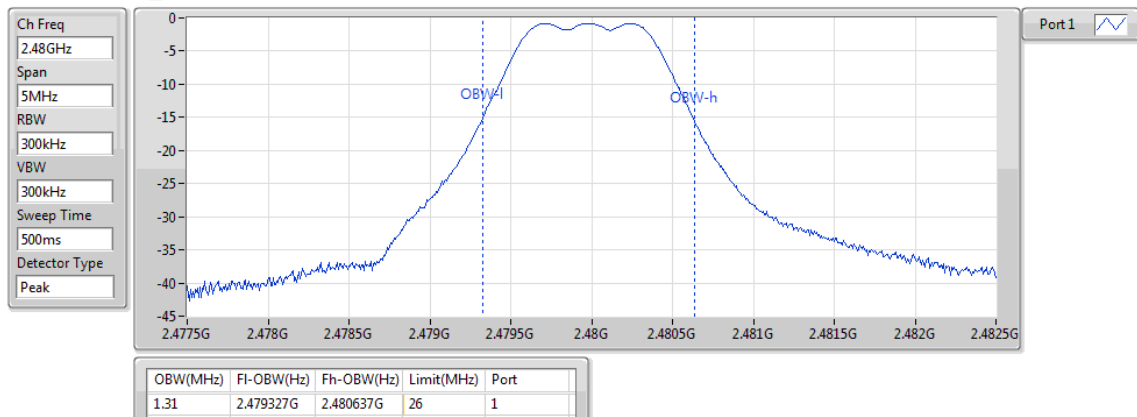
2480MHz_Vnom



BT-LE(1Mbps)

OBW

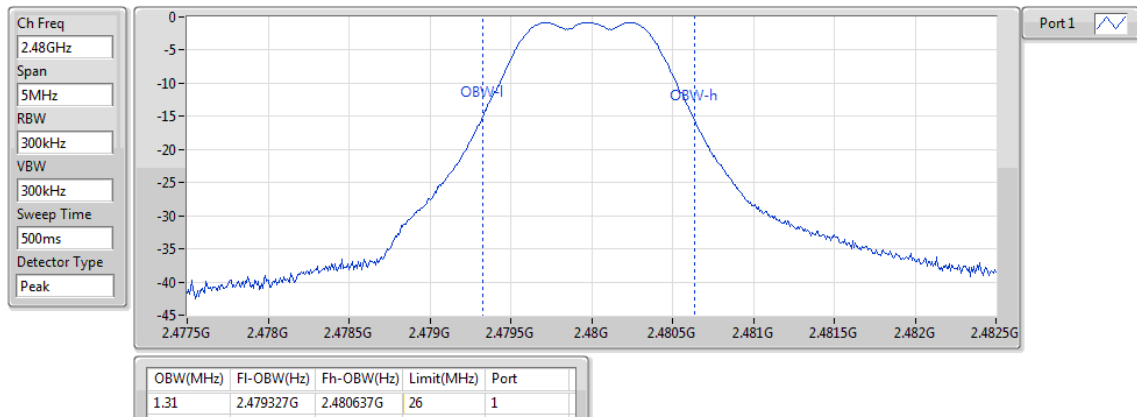
2480MHz_Vmin



BT-LE(1Mbps)

OBW

2480MHz_Vmax



**Summary**

Mode	Result	F-Start (Hz)	F-Stop (Hz)	RBW (Hz)	Freq (MHz)	Psum (dBm)	Psum (uW/MHz)	Limit (dBm)	Limit (uW/MHz)	Margin (dB)	Loss (dB)	P1 (dBm)	P1 (uW/MHz)
BT-LTE(1Mbps)	-	-	-	-	-	-	-	-	-	-	-	-	-
2.4-2.4835GHz	Pass	30M	2.387G	1M	1711.719	-37.03	0.19805	-26.02	2.50035	-11.01	1.18	-37.03	0.19805



CSE-TX Unwanted Emission Strength-DTS Result

Appendix D

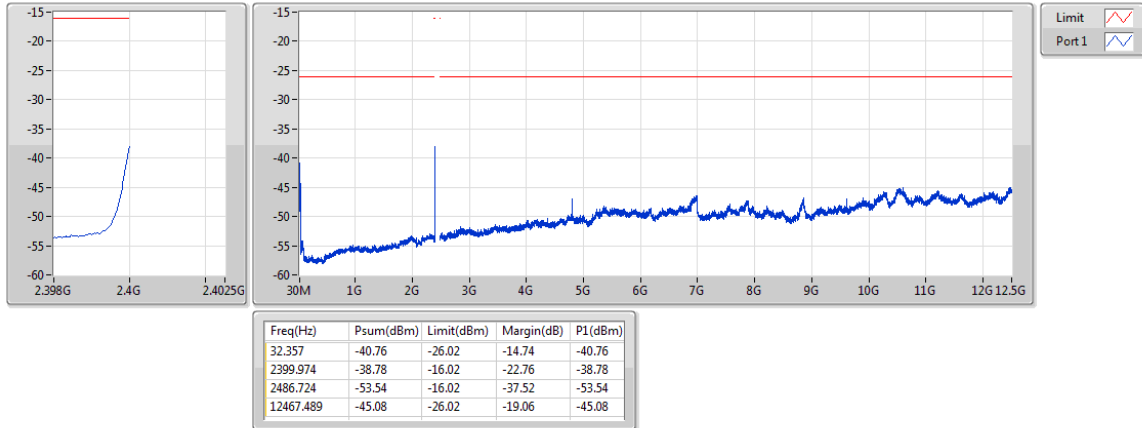
Result

Mode	Result	F-Start (Hz)	F-Stop (Hz)	RBW (Hz)	Freq (MHz)	Psum (dBm)	Psum (uW/MHz)	Limit (dBm)	Limit (uW/MHz)	Margin (dB)	Loss (dB)	P1 (dBm)	P1 (uW/MHz)
BT-LE(1Mbps)	-	-	-	-	-	-	-	-	-	-	-	-	-
2402MHz_Vnom	Pass	30M	2.387G	1M	32.357	-40.76	0.08403	-26.02	2.50035	-14.74	0.26	-40.76	0.08403
2402MHz_Vnom	Pass	2.387G	2.4G	1M	2399.974	-38.78	0.13238	-16.02	25.00345	-22.76	1.47	-38.78	0.13238
2402MHz_Vnom	Pass	2.4835G	2.4965G	1M	2486.724	-53.54	0.00443	-16.02	25.00345	-37.52	1.49	-53.54	0.00443
2402MHz_Vnom	Pass	2.4965G	12.5G	1M	12467.489	-45.08	0.03106	-26.02	2.50035	-19.06	5.66	-45.08	0.03106
2402MHz_Vmin	Pass	30M	2.387G	1M	32.357	-41.15	0.07667	-26.02	2.50035	-15.13	0.26	-41.15	0.07667
2402MHz_Vmin	Pass	2.387G	2.4G	1M	2399.974	-38.80	0.13192	-16.02	25.00345	-22.78	1.47	-38.80	0.13192
2402MHz_Vmin	Pass	2.4835G	2.4965G	1M	2485.684	-53.53	0.00444	-16.02	25.00345	-37.51	1.49	-53.53	0.00444
2402MHz_Vmin	Pass	2.4965G	12.5G	1M	10538.064	-44.88	0.03254	-26.02	2.50035	-18.86	4.62	-44.88	0.03254
2402MHz_Vmax	Pass	30M	2.387G	1M	32.357	-41.49	0.07098	-26.02	2.50035	-15.47	0.26	-41.49	0.07098
2402MHz_Vmax	Pass	2.387G	2.4G	1M	2399.974	-38.76	0.13296	-16.02	25.00345	-22.74	1.47	-38.76	0.13296
2402MHz_Vmax	Pass	2.4835G	2.4965G	1M	2488.466	-53.46	0.00451	-16.02	25.00345	-37.44	1.49	-53.46	0.00451
2402MHz_Vmax	Pass	2.4965G	12.5G	1M	12492.497	-44.88	0.03251	-26.02	2.50035	-18.86	5.68	-44.88	0.03251
2440MHz_Vnom	Pass	30M	2.387G	1M	1718.791	-39.97	0.1006	-26.02	2.50035	-13.95	1.18	-39.97	0.1006
2440MHz_Vnom	Pass	2.387G	2.4G	1M	2397.582	-53.90	0.00407	-16.02	25.00345	-37.88	1.47	-53.90	0.00407
2440MHz_Vnom	Pass	2.4835G	2.4965G	1M	2485.216	-53.49	0.00448	-16.02	25.00345	-37.47	1.49	-53.49	0.00448
2440MHz_Vnom	Pass	2.4965G	12.5G	1M	10529.31	-45.02	0.03148	-26.02	2.50035	-19.00	4.61	-45.02	0.03148
2440MHz_Vmin	Pass	30M	2.387G	1M	32.357	-41.15	0.07672	-26.02	2.50035	-15.13	0.26	-41.15	0.07672
2440MHz_Vmin	Pass	2.387G	2.4G	1M	2391.602	-53.95	0.00402	-16.02	25.00345	-37.93	1.47	-53.95	0.00402
2440MHz_Vmin	Pass	2.4835G	2.4965G	1M	2487.01	-53.50	0.00446	-16.02	25.00345	-37.48	1.49	-53.50	0.00446
2440MHz_Vmin	Pass	2.4965G	12.5G	1M	12466.238	-44.71	0.03383	-26.02	2.50035	-18.69	5.66	-44.71	0.03383
2440MHz_Vmax	Pass	30M	2.387G	1M	32.357	-41.00	0.07937	-26.02	2.50035	-14.98	0.26	-41.00	0.07937
2440MHz_Vmax	Pass	2.387G	2.4G	1M	2392.954	-53.92	0.00406	-16.02	25.00345	-37.90	1.47	-53.92	0.00406
2440MHz_Vmax	Pass	2.4835G	2.4965G	1M	2483.656	-53.55	0.00441	-16.02	25.00345	-37.53	1.49	-53.55	0.00441
2440MHz_Vmax	Pass	2.4965G	12.5G	1M	12498.75	-44.86	0.03267	-26.02	2.50035	-18.84	5.68	-44.86	0.03267
2480MHz_Vnom	Pass	30M	2.387G	1M	1711.719	-37.03	0.19805	-26.02	2.50035	-11.01	1.18	-37.03	0.19805
2480MHz_Vnom	Pass	2.387G	2.4G	1M	2391.706	-53.96	0.00402	-16.02	25.00345	-37.94	1.47	-53.96	0.00402
2480MHz_Vnom	Pass	2.4835G	2.4965G	1M	2483.552	-52.72	0.00534	-16.02	25.00345	-36.70	1.49	-52.72	0.00534
2480MHz_Vnom	Pass	2.4965G	12.5G	1M	12489.996	-44.82	0.03297	-26.02	2.50035	-18.80	5.67	-44.82	0.03297
2480MHz_Vmin	Pass	30M	2.387G	1M	2355.18	-52.80	0.00525	-26.02	2.50035	-26.78	1.45	-52.80	0.00525
2480MHz_Vmin	Pass	2.387G	2.4G	1M	2395.45	-53.99	0.00399	-16.02	25.00345	-37.97	1.47	-53.99	0.00399
2480MHz_Vmin	Pass	2.4835G	2.4965G	1M	2483.578	-52.58	0.00552	-16.02	25.00345	-36.56	1.49	-52.58	0.00552
2480MHz_Vmin	Pass	2.4965G	12.5G	1M	10586.831	-45.14	0.03063	-26.02	2.50035	-19.12	4.65	-45.14	0.03063
2480MHz_Vmax	Pass	30M	2.387G	1M	1719.969	-41.61	0.06899	-26.02	2.50035	-15.59	1.18	-41.61	0.06899
2480MHz_Vmax	Pass	2.387G	2.4G	1M	2392.018	-53.97	0.00401	-16.02	25.00345	-37.95	1.47	-53.97	0.00401
2480MHz_Vmax	Pass	2.4835G	2.4965G	1M	2483.526	-52.65	0.00543	-16.02	25.00345	-36.63	1.49	-52.65	0.00543
2480MHz_Vmax	Pass	2.4965G	12.5G	1M	12496.249	-44.74	0.03355	-26.02	2.50035	-18.72	5.68	-44.74	0.03355



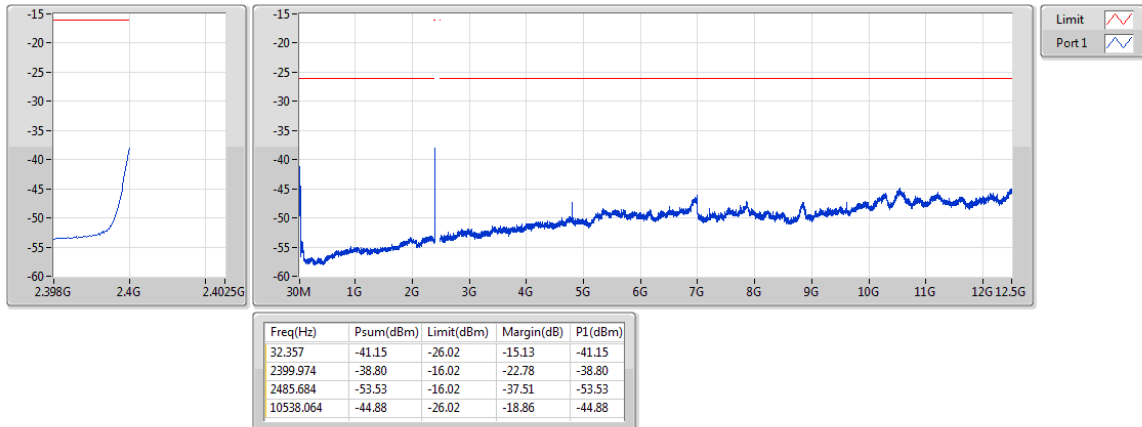
BT-LE(1Mbps)
2402MHz_Vnom

CSE-TX-



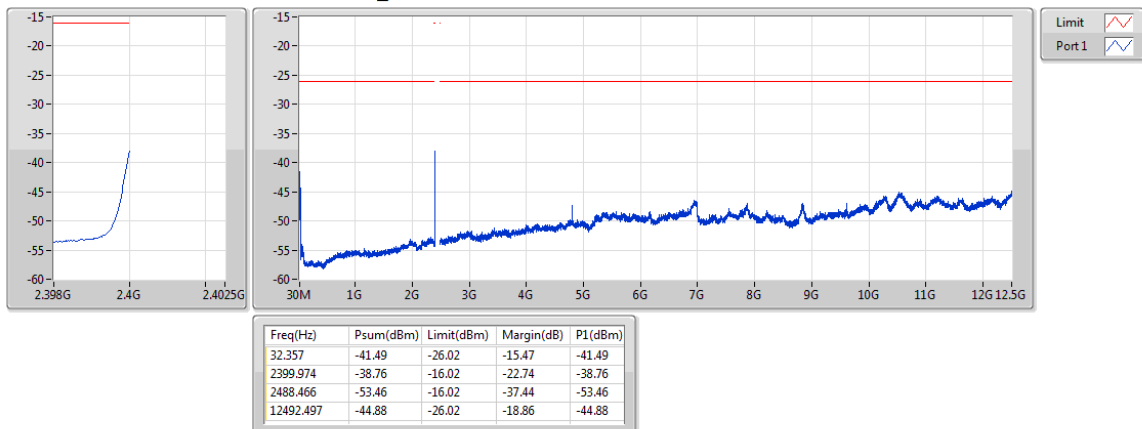
BT-LE(1Mbps)
2402MHz_Vmin

CSE-TX-



BT-LE(1Mbps)
2402MHz_Vmax

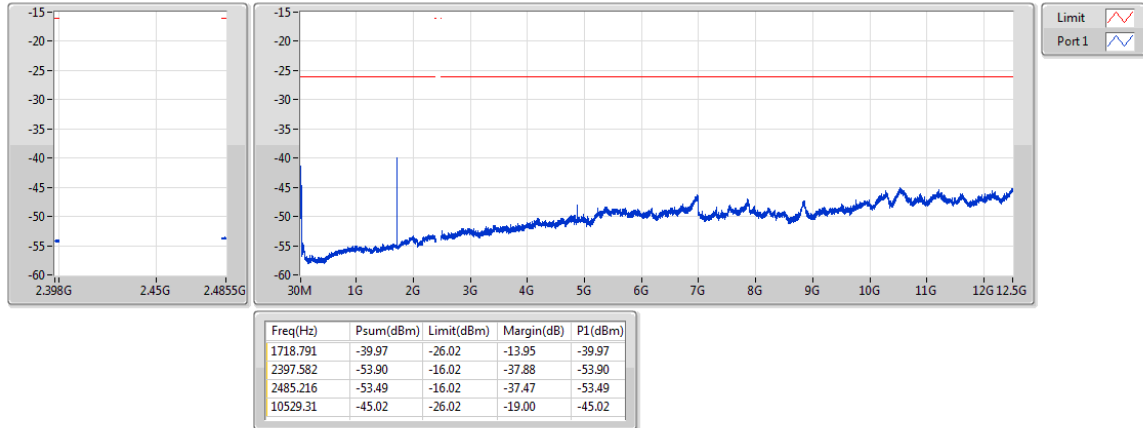
CSE-TX-





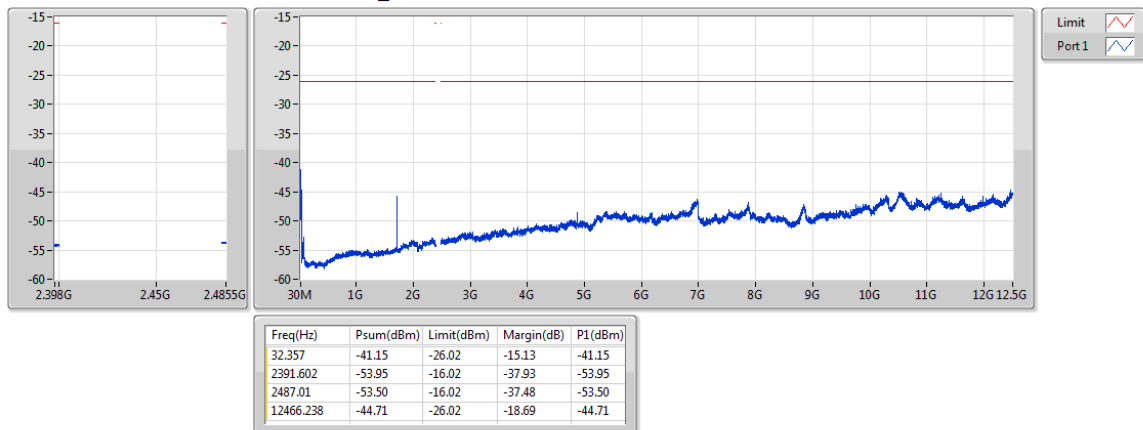
BT-LE(1Mbps)
2440MHz_Vnom

CSE-TX-



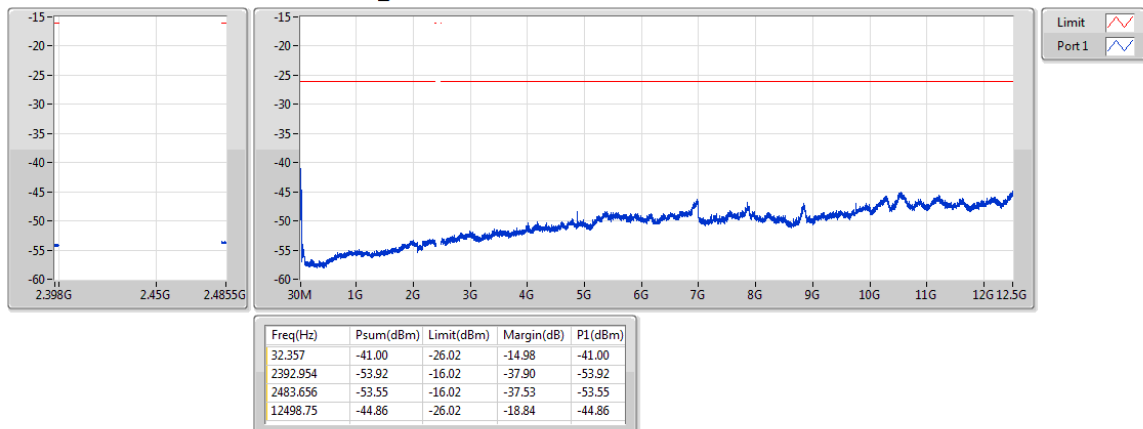
BT-LE(1Mbps)
2440MHz_Vmin

CSE-TX-



BT-LE(1Mbps)
2440MHz_Vmax

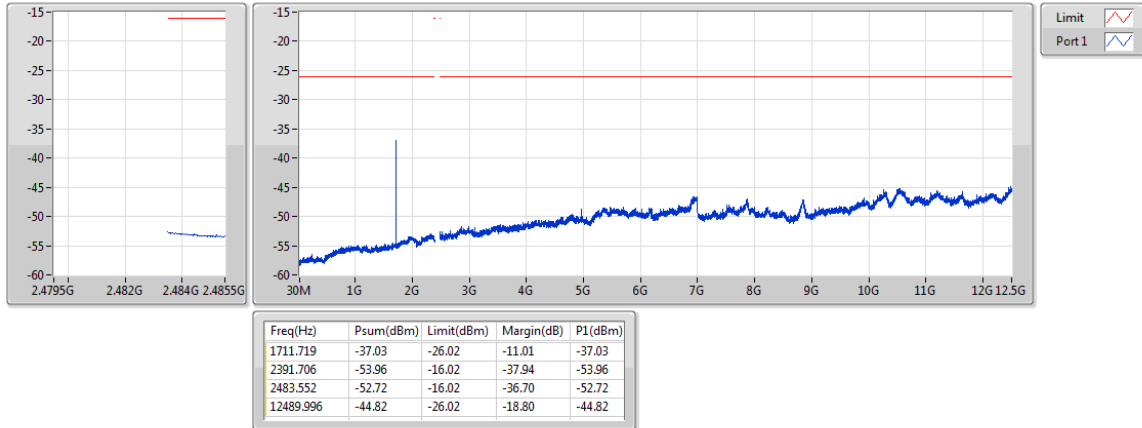
CSE-TX-





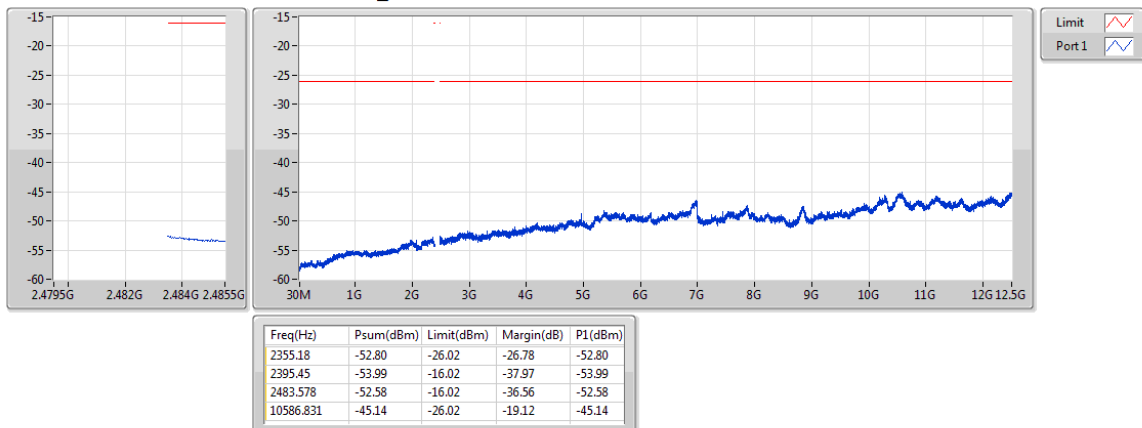
BT-LE(1Mbps)
2480MHz_Vnom

CSE-TX-



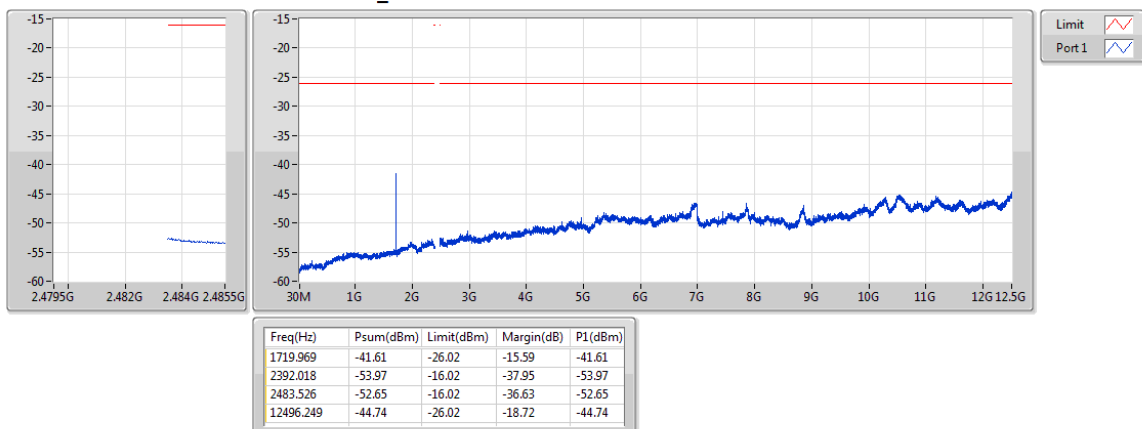
BT-LE(1Mbps)
2480MHz_Vmin

CSE-TX-



BT-LE(1Mbps)
2480MHz_Vmax

CSE-TX-





Summary

Mode	Result	ID Length	ID Limit	Function
BT-LE(1Mbps)	-	-	-	-
2.4-2.4835GHz	Pass	00:24:e4:6b:20:74	48 bits	Good

**Result**

Mode	Result	ID Length	ID Limit	Function
BT-LE(1Mbps)	-	-	-	-
2402MHz_Vnom	Pass	00:24:e4:6b:20:74	48 bits	Good
2402MHz_Vmin	Pass	00:24:e4:6b:20:74	48 bits	Good
2402MHz_Vmax	Pass	00:24:e4:6b:20:74	48 bits	Good
2440MHz_Vnom	Pass	00:24:e4:6b:20:74	48 bits	Good
2440MHz_Vmin	Pass	00:24:e4:6b:20:74	48 bits	Good
2440MHz_Vmax	Pass	00:24:e4:6b:20:74	48 bits	Good
2480MHz_Vnom	Pass	00:24:e4:6b:20:74	48 bits	Good
2480MHz_Vmin	Pass	00:24:e4:6b:20:74	48 bits	Good
2480MHz_Vmax	Pass	00:24:e4:6b:20:74	48 bits	Good

**Summary**

Mode	Result	F-Start (Hz)	F-Stop (Hz)	RBW (Hz)	Freq (MHz)	Psum (dBm)	Psum (nW)	Limit (dBm)	Limit (nW)	Margin (dB)	Loss (dB)	P1 (dBm)	P1 (nW)
BT-LTE(1Mbps)	-	-	-	-	-	-	-	-	-	-	-	-	-
2.4-2.4835GHz	Pass	1G	12.5G	1M	4957.437	-67.19	0.19119	-46.99	19.99862	-20.20	1.73	-67.19	0.19119

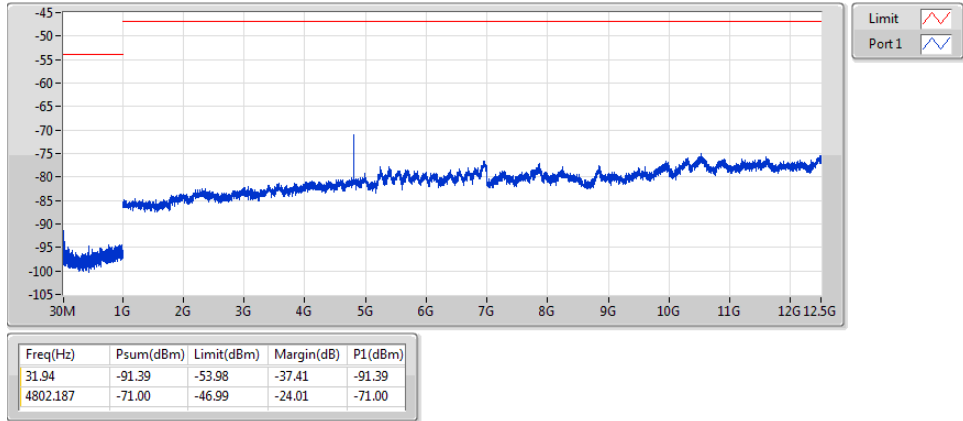
**Result**

Mode	Result	F-Start (Hz)	F-Stop (Hz)	RBW (Hz)	Freq (MHz)	Psum (dBm)	Psum (nW)	Limit (dBm)	Limit (nW)	Margin (dB)	Loss (dB)	P1 (dBm)	P1 (nW)
BT-LE(1Mbps)	-	-	-	-	-	-	-	-	-	-	-	-	-
2402MHz_Vnom	Pass	30M	1G	100k	31.94	-91.39	0.00073	-53.98	3.99945	-37.41	0.26	-91.39	0.00073
2402MHz_Vnom	Pass	1G	12.5G	1M	4802.187	-71.00	0.07939	-46.99	19.99862	-24.01	1.72	-71.00	0.07939
2402MHz_Vmin	Pass	30M	1G	100k	32.91	-90.34	0.00092	-53.98	3.99945	-36.36	0.26	-90.34	0.00092
2402MHz_Vmin	Pass	1G	12.5G	1M	4802.187	-71.18	0.0762	-46.99	19.99862	-24.19	1.72	-71.18	0.0762
2402MHz_Vmax	Pass	30M	1G	100k	32.425	-89.14	0.00122	-53.98	3.99945	-35.16	0.26	-89.14	0.00122
2402MHz_Vmax	Pass	1G	12.5G	1M	4802.187	-71.40	0.07239	-46.99	19.99862	-24.41	1.72	-71.40	0.07239
2440MHz_Vnom	Pass	30M	1G	100k	31.94	-91.17	0.00076	-53.98	3.99945	-37.19	0.26	-91.17	0.00076
2440MHz_Vnom	Pass	1G	12.5G	1M	4878.375	-68.48	0.14201	-46.99	19.99862	-21.49	1.72	-68.48	0.14201
2440MHz_Vmin	Pass	30M	1G	100k	31.94	-88.80	0.00132	-53.98	3.99945	-34.82	0.26	-88.80	0.00132
2440MHz_Vmin	Pass	1G	12.5G	1M	4878.375	-68.46	0.14262	-46.99	19.99862	-21.47	1.72	-68.46	0.14262
2440MHz_Vmax	Pass	30M	1G	100k	32.91	-88.58	0.00139	-53.98	3.99945	-34.60	0.26	-88.58	0.00139
2440MHz_Vmax	Pass	1G	12.5G	1M	4878.375	-68.44	0.1431	-46.99	19.99862	-21.45	1.72	-68.44	0.1431
2480MHz_Vnom	Pass	30M	1G	100k	32.91	-89.14	0.00122	-53.98	3.99945	-35.16	0.26	-89.14	0.00122
2480MHz_Vnom	Pass	1G	12.5G	1M	4957.437	-67.39	0.18244	-46.99	19.99862	-20.40	1.73	-67.39	0.18244
2480MHz_Vmin	Pass	30M	1G	100k	32.425	-90.14	0.00097	-53.98	3.99945	-36.16	0.26	-90.14	0.00097
2480MHz_Vmin	Pass	1G	12.5G	1M	4957.437	-67.19	0.19119	-46.99	19.99862	-20.20	1.73	-67.19	0.19119
2480MHz_Vmax	Pass	30M	1G	100k	31.94	-90.93	0.00081	-53.98	3.99945	-36.95	0.26	-90.93	0.00081
2480MHz_Vmax	Pass	1G	12.5G	1M	4957.437	-67.22	0.18945	-46.99	19.99862	-20.23	1.73	-67.22	0.18945

BT-LE(1Mbps)

CSE-RX-

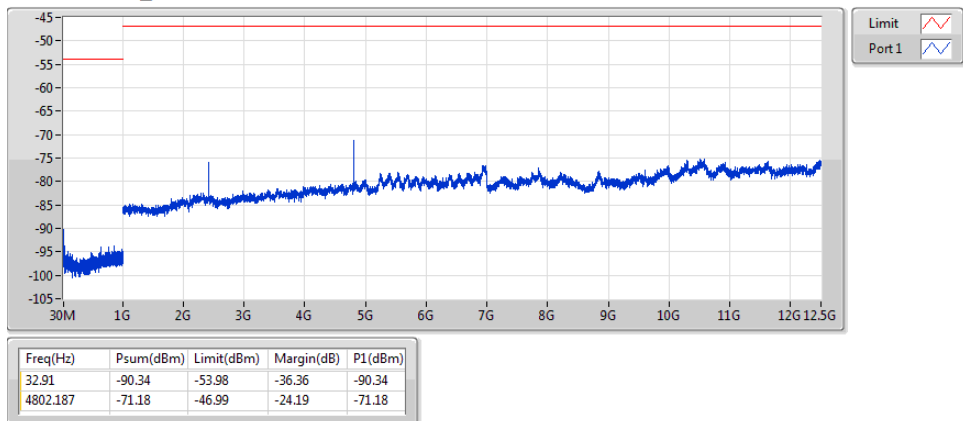
2402MHz_Vnom



BT-LE(1Mbps)

CSE-RX-

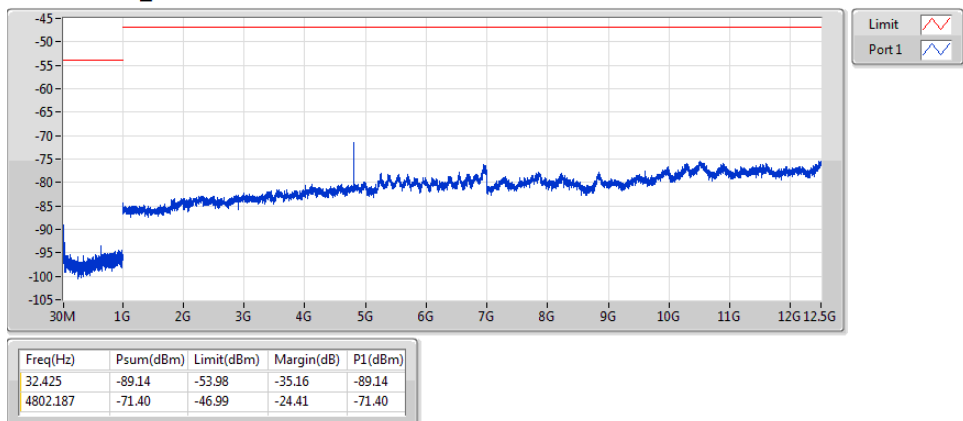
2402MHz_Vmin



BT-LE(1Mbps)

CSE-RX-

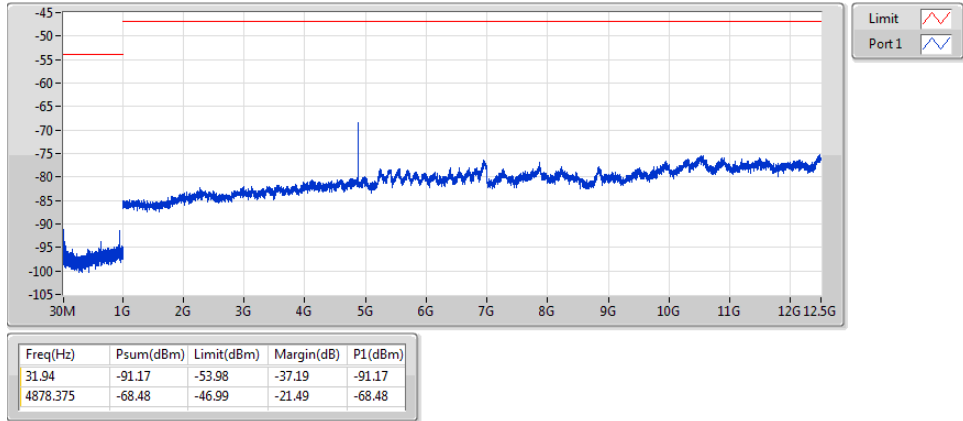
2402MHz_Vmax



BT-LE(1Mbps)

CSE-RX-

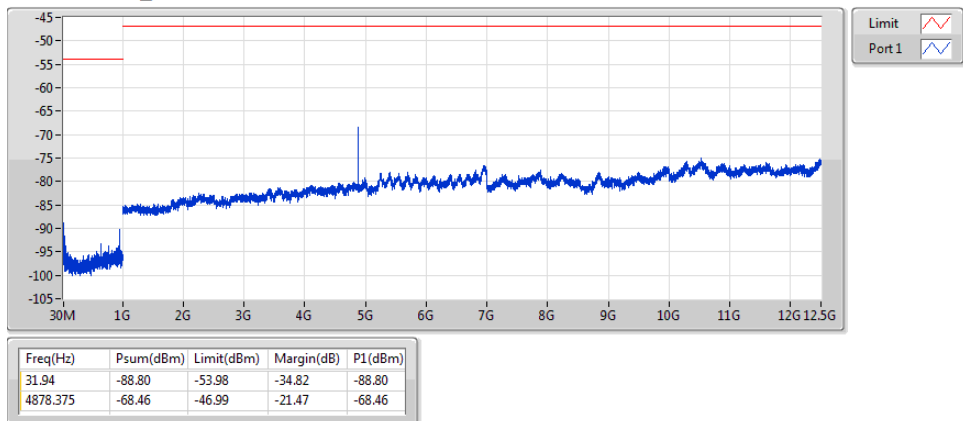
2440MHz_Vnom



BT-LE(1Mbps)

CSE-RX-

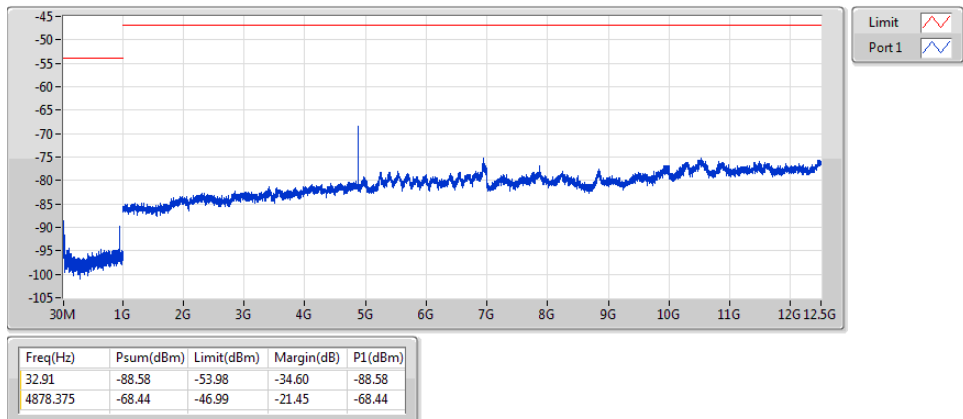
2440MHz_Vmin



BT-LE(1Mbps)

CSE-RX-

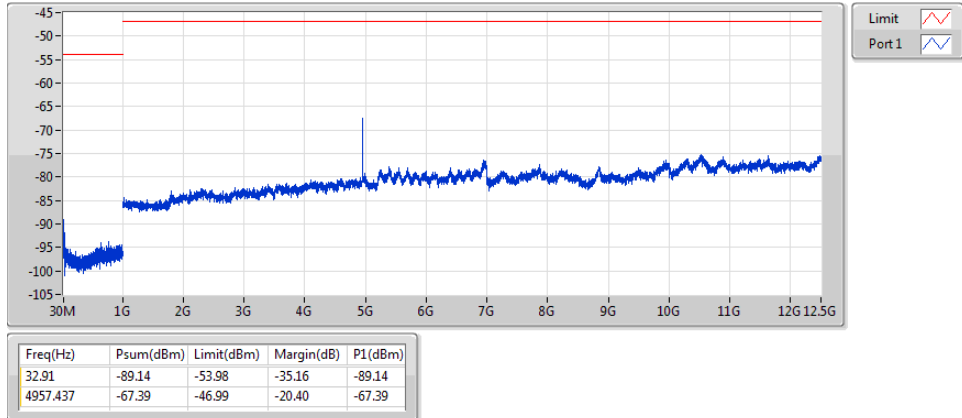
2440MHz_Vmax



BT-LE(1Mbps)

CSE-RX-

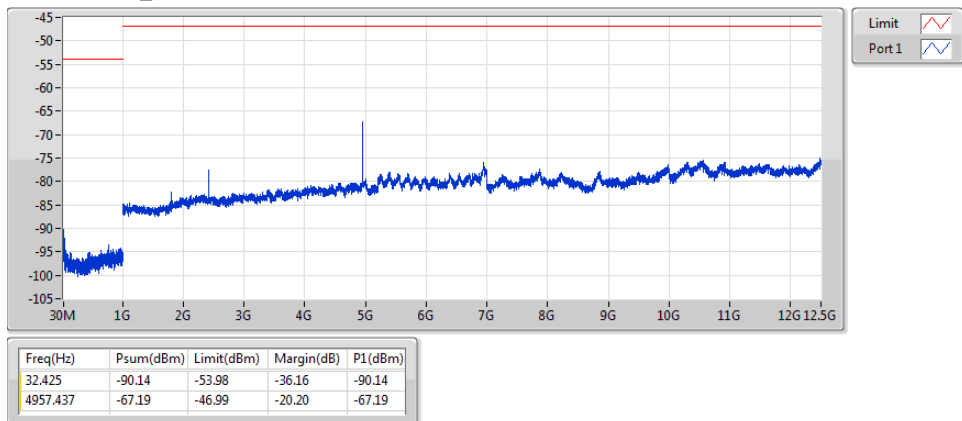
2480MHz_Vnom



BT-LE(1Mbps)

CSE-RX-

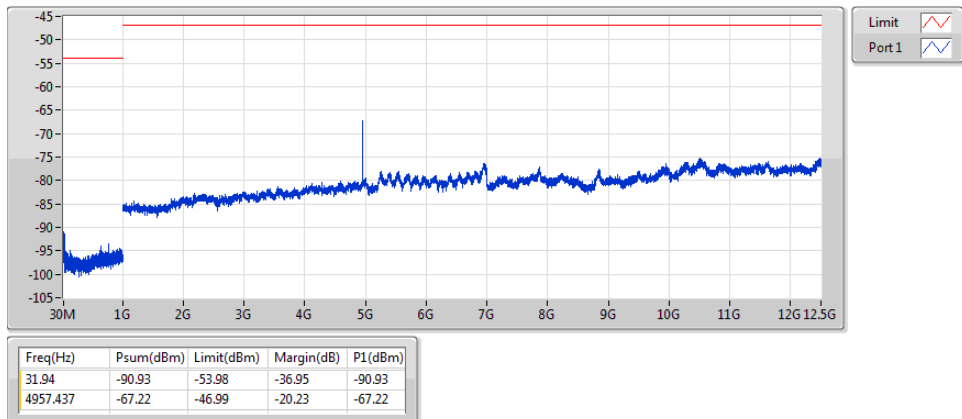
2480MHz_Vmin



BT-LE(1Mbps)

CSE-RX-

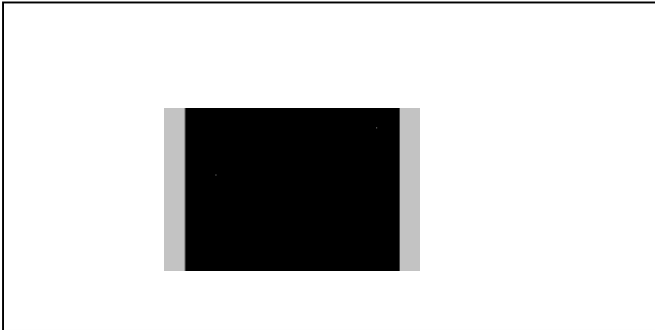
2480MHz_Vmax



Appendix G. Antenna Information

Embedded Bluetooth™ Ceramic Antenna

2.4 GHz, 2.0x1.2mm



Ethertronics' series of BT Ceramic Antennas deliver on the key needs of device designers for higher functionality and performance in smaller/thinner designs. These innovative antennas provide compelling advantages for Bluetooth enabled cell phones, media players and other mobile devices.

DESIGN ADVANTAGES

Best in Class Performance

- Minimal ground clearance and component "keep out" area.
- High selectivity eliminates the need for additional filters and frees up board space.

Quicker Time-to-Market

- Standard part means fewer design changes.
- Simple implementation.
- Single part works for various PCB sizes and layouts.

RoHS Compliant

- Ethertronics' antennas comply with the European RoHS Directive 2002/95/EC.



KEY BENEFITS

END USER ADVANTAGES

Superior Range

- Greater antenna efficiency means longer range and a better end user experience.

Exceptional Coverage

- Better coverage delivers more reliable wireless connections for mobile phones, laptops, stereo headsets, cars media players, audio systems and more.

SERVICE AND SUPPORT

Extensive RF Experience

- Our antennas are supported by extensive documentation, and when needed, by the expertise of RF engineers who have integrated hundreds of antenna designs into wireless devices.

Global Operations & Design Support

- Ethertronics' global operations encompass an integrated network of design centers that provide local customer support.

More information is available on our Website at www.ethertronics.com/resources/.

ETHERTRONICS
9605 Scranton Road, Suite 300 | San Diego, CA 92121 - USA | www.ethertronics.com
tel +(1) 858.550.3820 | fax +(1) 858.550.3821 | contact: info@ethertronics.com

PRODUCT: BT Antenna

Ethertronics' Embedded BT Ceramic Antenna Specifications
Ethertronics produces a wide variety of standard and custom antennas to meet user needs.
Below are the typical specs for a BT application.

Electrical Specifications

Typical Characteristics

All values are defined at

Pi matching circuit will be required

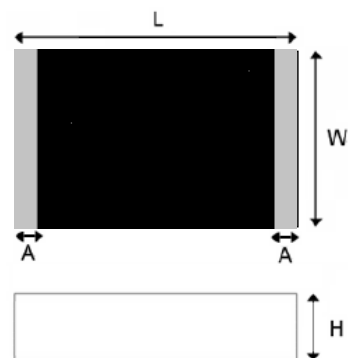
*Test board size = 110x55mm ground plane.

BT Antenna	Specifications
Frequency Band	2.400GHz-2.483GHz
VSWR	Less than 3
Polarization	Linear
*Peak Gain	1.72 dBi Typ.
*Peak Efficiency	72.3% Typ
Impedance	50Ω Typ.

Mechanical Specifications

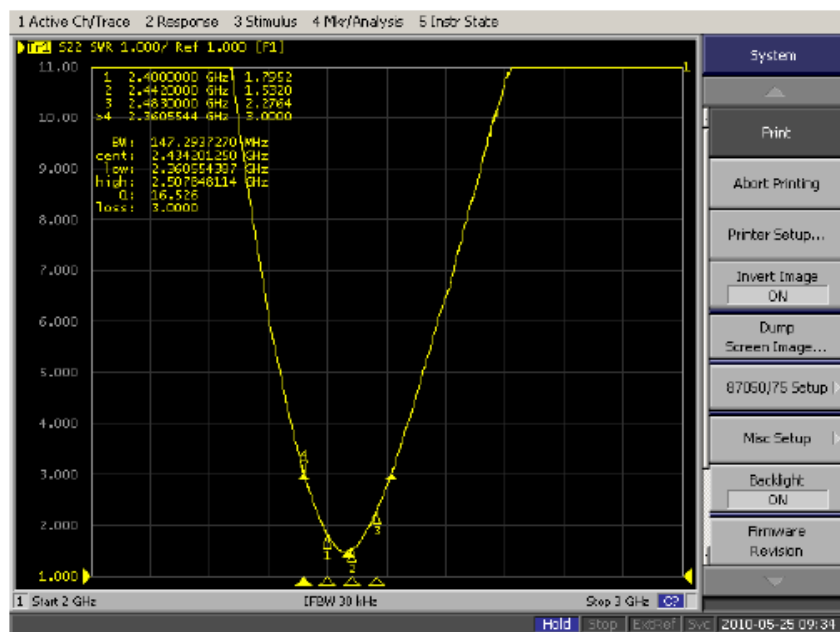
Size	2.00x1.20x0.55mm
Mounting	Surface Mount

L	W	H	A
2.0±0.3	1.2±0.3	.55±0.2	0.4±0.25



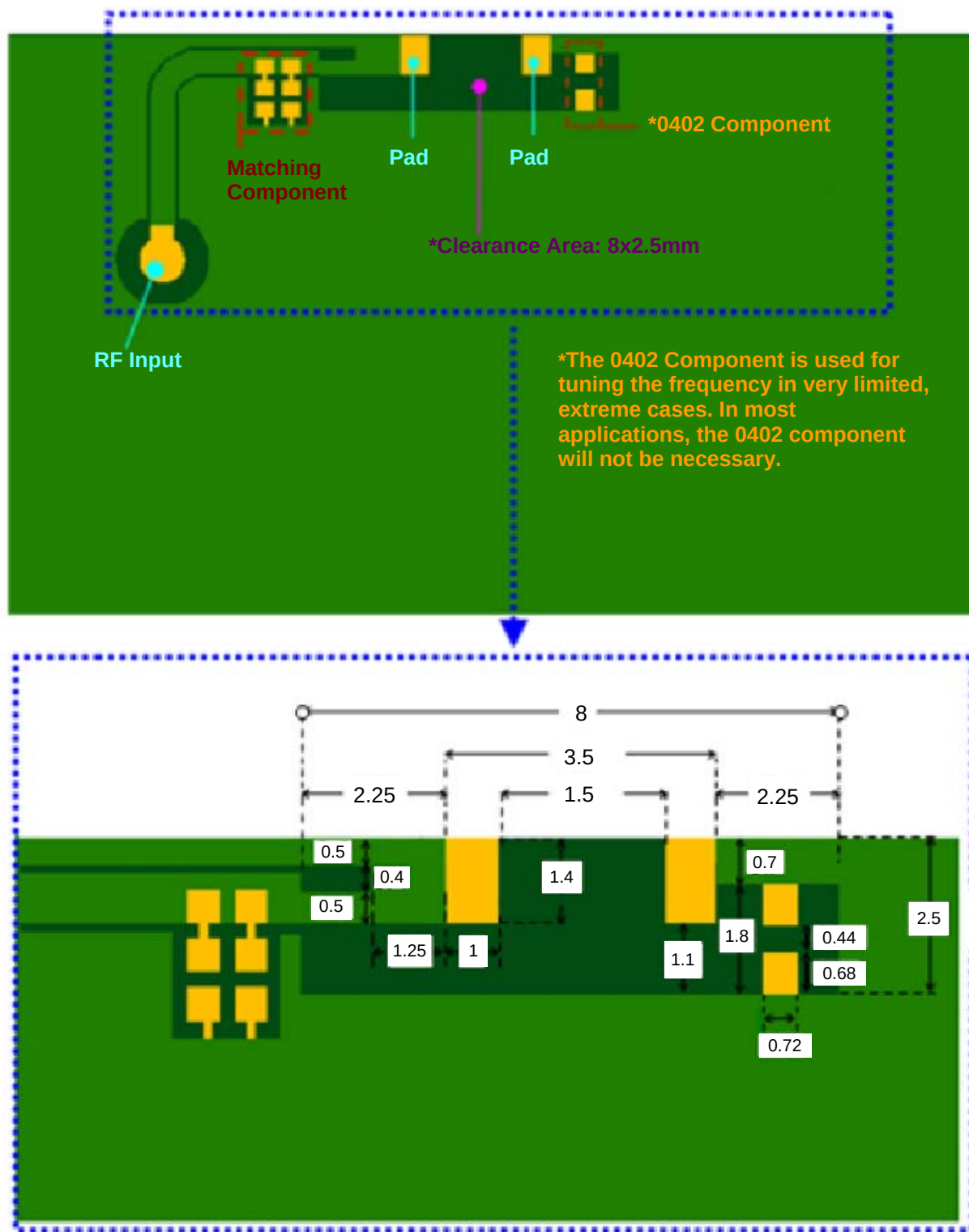
VSWR

Mark	Frequency	VSWR
1	2400 MHz	1.80
2	2442 MHz	1.53
3	2483 MHz	2.28



PRODUCT: BT Antenna

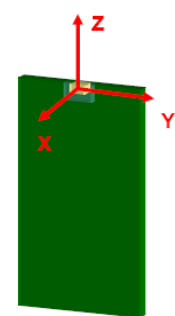
Recommended PCB Layout (Unit = mm)



Clearance area 8mm x 2.5mm. All metalization should be removed from this area.

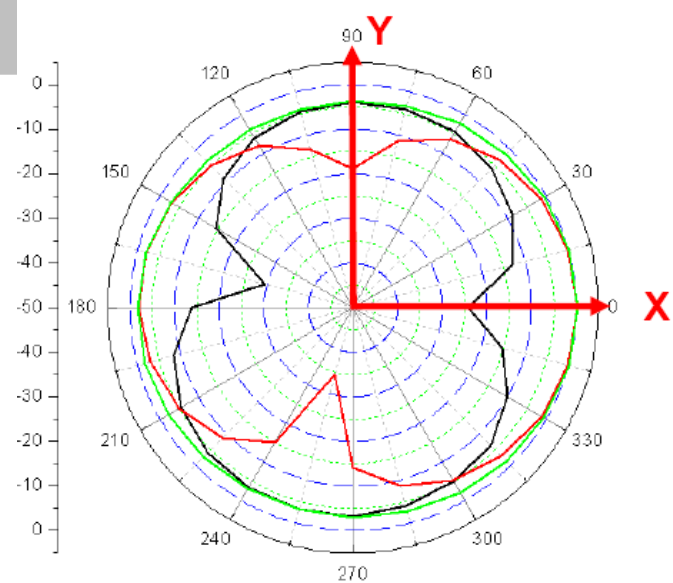
PRODUCT: BT Antenna

2D Gain Patterns (2442 MHz)

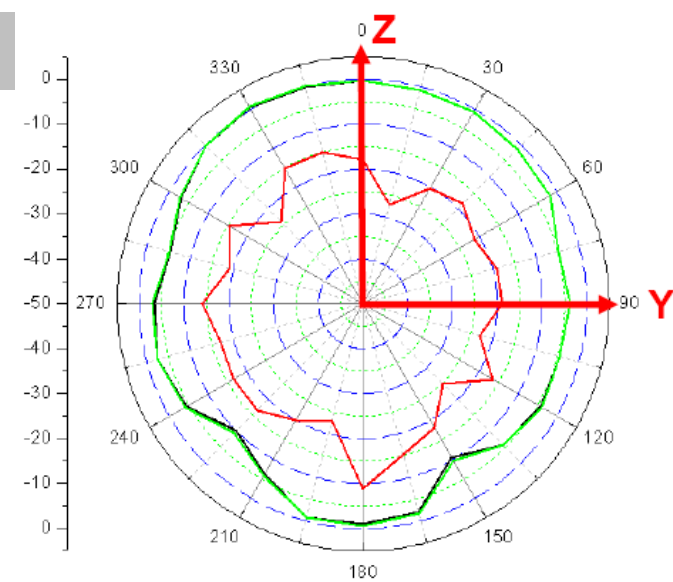


— E-theta
— E-phi
— E-total

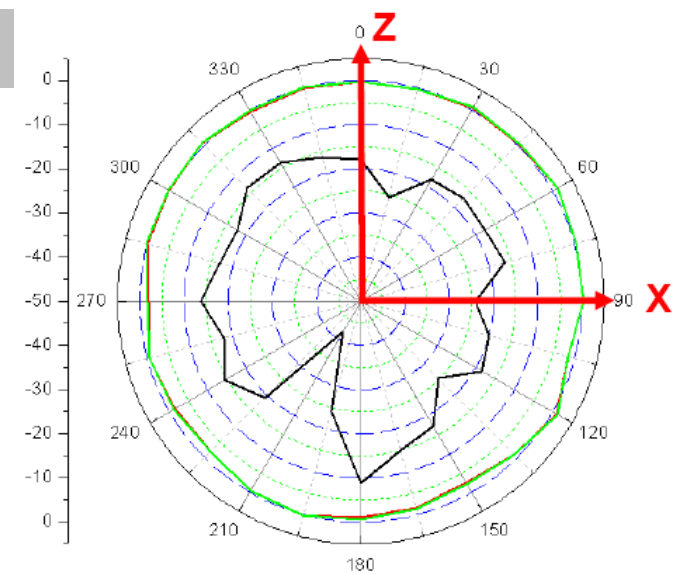
X-Y Plane



Y-Z Plane



X-Z Plane

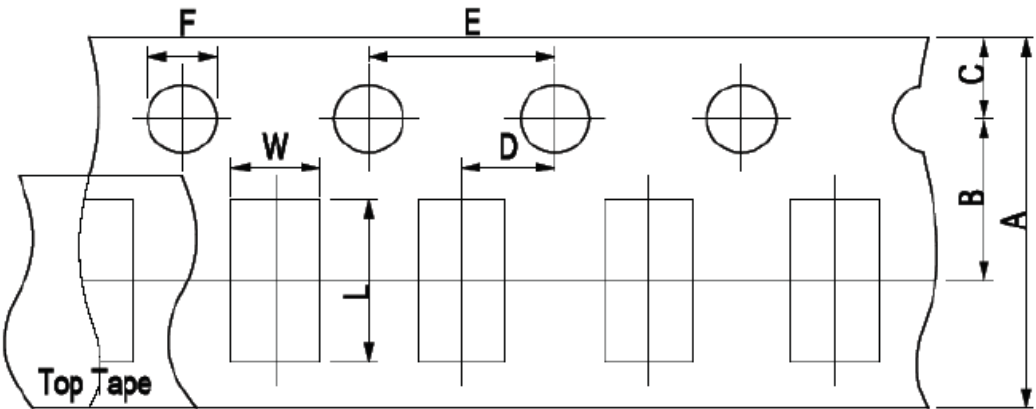


PRODUCT: BT Antenna

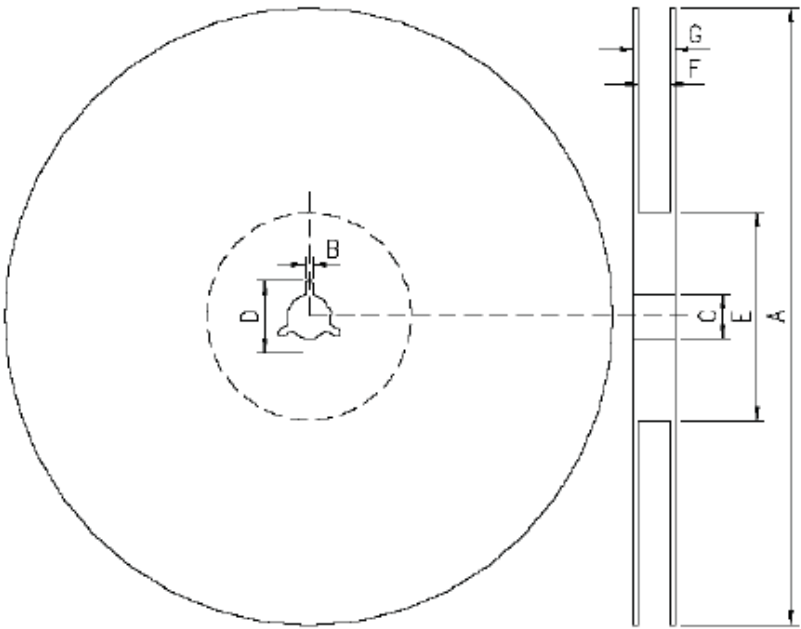
Tape & Reel Specifications

Quantity/Reel = 5,000

Unit = mm



A	B	C	D	E	F	L	W
8.00±0.30	3.5±0.05	1.75±0.10	2.00±0.05	4.00±0.10	1.50±0.10	2.30±0.10	1.55±0.10



Symbol	Spec.
A	178.0±2.0
B	2.0±0.5
C	13.0±0.5
D	21.0±0.8
E	62.0±1.5
F	9.0±0.5
G	13.0±1.0

PRODUCT: BT Antenna

Reliability Testing

Item	Condition	Specification
Thermal Shock	1. 30±3 minutes at -40°C±5°C 2. Convert to +105°C (5 minutes) 3. 30±3 minutes at +105°C±5°C 4. Convert to -40°C (5 minutes) 5. Total: 100 continuous cycles	No apparent damage. Fulfills the electrical spec after test.
Humidity Resistance	1. Humidity: 85% R.H. 2. Temperature: 85±5°C 3. Time: 1,000 hours	No apparent damage. Fulfills the electrical spec after test.
High Temperature Resistance	1. Temperature: 150°C±5°C 2. Time: 1,000 hours	No apparent damage. Fulfills the electrical spec after test.
Low Temperature Resistance	1. Temperature: -40°C±5°C 2. Time: 1,000 hours	No apparent damage. Fulfills the electrical spec after test.
Soldering Heat Resistance	1. Solder bath temperature: 260±5°C 2. Bathing time: 10±1 seconds	No apparent damage.
Solderability	The dipped surface of the terminal shall be at least 95% covered with solder after being dipped in a solder bath of 245±5°C for 3±1 seconds	No apparent damage.

Storage Conditions

Warehouse Temperature Range:

The temperature should be within 0~30°C and humidity should be less than 60% RH.
The product should be used within 1 year from the time of delivery

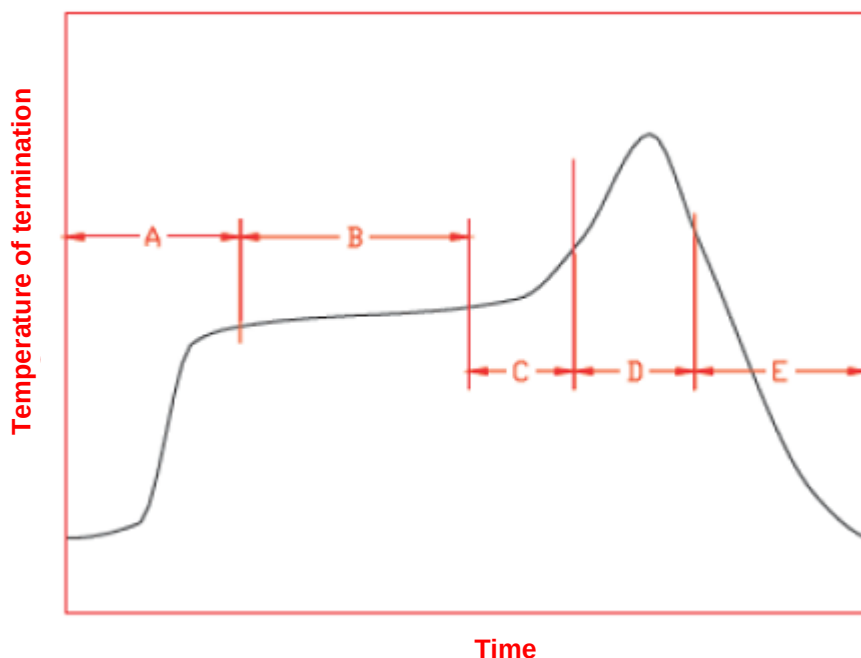
On Board Temperature Range:

The temperature should be within -40~85°C and humidity should be less than 85% RH.

Operating Temperature Range

Operating temperature range: -40°C to +105°C

Recommended Reflow Soldering



A	1 st Rising Temperature	The normal to preheating temperature	30s to 60s
B	Preheating	140°C to 160°C	60s to 120s
C	2 nd Rising Temperature	Preheating to 200°C	20s to 40s
D	Main Heating	if 220°C	50s~60s
		if 230°C	40s~50s
		if 240°C	30s~40s
		if 250°C	20s~40s
		if 260°C	20s~40s
E	Regular Cooling	200°C to 100°C	1°C /s ~ 4°C /s
*reference: J-STD-020C			

Soldering Gun Procedure

Note the following when using a solder gun to replace the antenna

1. The tip temperature must be less than 350°C for the period within 3 seconds when using a soldering gun under 30W.
2. The soldering gun tip shall not touch this part directly.

Soldering Volume

Note that excess of soldering volume will easily crack the body of this product.