

FCC Part 15C Measurement and Test Report

For

SparkLAN Communications, Inc

8F., No. 257, Sec.2, Tiding Blvd., Neihu District, Taipei

11493, Taiwan

FCC ID: RYK-WSDB104GNIBT

FCC Rule(s):	<u>FCC Part 15.247</u>
Product Description:	<u>802.11b/g/n WiFi+BT IOT Module</u>
Tested Model:	<u>WSDB-104GNI(BT)</u>
Report No.:	<u>STR17068025I-3</u>
Tested Date:	<u>2016-08-10 to 2016-08-16</u>
Issued Date:	<u>2017-06-17</u>
Tested By:	<u>Iven Guo / Engineer</u> <i>Iven Guo</i>
Reviewed By:	<u>Silin Chen / EMC Manager</u> <i>Silin Chen</i>
Approved & Authorized By:	<u>Jandy So / PSQ Manager</u> <i>Jandy So</i>
Prepared By:	

Shenzhen SEM.Test Technology Co., Ltd.
1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road,
Bao'an District, Shenzhen, P.R.C. (518101)
Tel.: +86-755-33663308 Fax.: +86-755-33663309 Website: www.semtest.com.cn

Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen SEM.Test Technology Co., Ltd.

TABLE OF CONTENTS

1. GENERAL INFORMATION	3
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	3
1.2 TEST STANDARDS	4
1.3 TEST METHODOLOGY	4
1.4 TEST FACILITY	4
1.5 EUT SETUP AND TEST MODE	5
1.6 MEASUREMENT UNCERTAINTY	5
1.7 TEST EQUIPMENT LIST AND DETAILS	6
2. SUMMARY OF TEST RESULTS	7
3. RF EXPOSURE	8
3.1 STANDARD APPLICABLE	8
3.2 TEST RESULT	8
4. ANTENNA REQUIREMENT	9
4.1 STANDARD APPLICABLE	9
4.2 EVALUATION INFORMATION	9
5. POWER SPECTRAL DENSITY	10
5.1 STANDARD APPLICABLE	10
5.2 TEST PROCEDURE	10
5.3 ENVIRONMENTAL CONDITIONS	10
5.4 SUMMARY OF TEST RESULTS/PLOTS	10
6. 6DB BANDWIDTH	13
6.1 STANDARD APPLICABLE	13
6.2 TEST PROCEDURE	13
6.3 ENVIRONMENTAL CONDITIONS	13
6.4 SUMMARY OF TEST RESULTS/PLOTS	13
7. RF OUTPUT POWER	16
7.1 STANDARD APPLICABLE	16
7.2 TEST PROCEDURE	16
7.3 ENVIRONMENTAL CONDITIONS	16
7.4 SUMMARY OF TEST RESULTS/PLOTS	16
8. FIELD STRENGTH OF SPURIOUS EMISSIONS	17
8.1 STANDARD APPLICABLE	17
8.2 TEST PROCEDURE	17
8.3 CORRECTED AMPLITUDE & MARGIN CALCULATION	18
8.4 ENVIRONMENTAL CONDITIONS	18
8.5 SUMMARY OF TEST RESULTS/PLOTS	19
9. OUT OF BAND EMISSIONS	26
9.1 STANDARD APPLICABLE	26
9.2 TEST PROCEDURE	26
9.3 ENVIRONMENTAL CONDITIONS	27
9.4 SUMMARY OF TEST RESULTS/PLOTS	27
10. CONDUCTED EMISSIONS	32
10.1 TEST PROCEDURE	32
10.2 BASIC TEST SETUP BLOCK DIAGRAM	32
10.3 ENVIRONMENTAL CONDITIONS	32
10.4 TEST RECEIVER SETUP	33
10.5 SUMMARY OF TEST RESULTS/PLOTS	33
10.6 CONDUCTED EMISSIONS TEST DATA	33

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: SparkLAN Communications, Inc
Address of applicant: 8F., No. 257, Sec.2, Tiding Blvd., Neihu District,
Taipei 11493, Taiwan

Manufacturer: SparkLAN Communications, Inc
Address of manufacturer: 8F., No. 257, Sec.2, Tiding Blvd., Neihu District,
Taipei 11493, Taiwan

General Description of EUT	
Product Name:	802.11b/g/n WiFi+BT IOT Module
Trade Name:	SparkLAN
Model No.:	WSDB-104GNI(BT)
Adding Model(s):	/
Rated Voltage:	DC 3.3V
Power Adapter Model:	/
<i>Note: The test data is gathered from a production sample provided by the manufacturer.</i>	

Technical Characteristics of EUT	
Bluetooth Version:	V4.1 (BLE mode)
Frequency Range:	2402-2480MHz
RF Output Power:	5.879dBm (Conducted)
Data Rate:	25Mbps
Modulation:	GFSK
Quantity of Channels:	40
Channel Separation:	2MHz
Type of Antenna:	PCB
Antenna Gain:	0dBi
Lowest internal frequency of EUT:	37.4MHz

1.2 Test Standards

The following report is prepared on behalf of the SparkLAN Communications, Inc in accordance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 of the Federal Communication Commissions rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices, and ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. The measurement guide KDB 558074 D01 v04 for digital transmission systems shall be performed also.

1.4 Test Facility

FCC – Registration No.: 934118

Shenzhen SEM.Test Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Registration is 934118.

Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Shenzhen SEM.Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

CNAS Registration No.: L4062

Shenzhen SEM.Test Technology Co., Ltd. is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L4062. All measurement facilities used to collect the measurement data are located at 1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road, Bao'an District, Shenzhen, P.R.C (518101).

1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	GFSK(BLE)	2402MHz, 2442MHz, 2480MHz

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
/	/	/	/

1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
RF Output Power	Conducted	$\pm 0.42\text{dB}$
Occupied Bandwidth	Conducted	$\pm 1.5\%$
Power Spectral Density	Conducted	$\pm 1.8\text{dB}$
Conducted Spurious Emission	Conducted	$\pm 2.17\text{dB}$
Conducted Emissions	Conducted	$\pm 2.88\text{dB}$
Transmitter Spurious Emissions	Radiated	$\pm 5.1\text{dB}$

1.7 Test Equipment List and Details

No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due Date
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2016-06-04	2017-06-03
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2016-06-04	2017-06-03
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2016-06-04	2017-06-03
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2016-06-04	2017-06-03
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2016-06-04	2017-06-03
SEMT-1011	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2016-06-04	2017-06-03
SEMT-1042	Horn Antenna	ETS	3117	00086197	2016-06-04	2017-06-03
SEMT-1121	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170582	2016-06-04	2017-06-03
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2016-06-04	2017-06-03
SEMT-1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2016-06-04	2017-06-03
SEMT-1003	L.I.S.N	Schwarz beck	NSLK8126	8126-224	2016-06-04	2017-06-03
SEMT-1002	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2016-06-04	2017-06-03

2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§ 2.1093	RF Exposure	Compliant
§ 15.203; § 15.247(b)(4)(i)	Antenna Requirement	Compliant
§15.205	Restricted Band of Operation	Compliant
§ 15.207(a)	Conducted Emission	Compliant
§ 15.247(e)	Power Spectral Density	Compliant
§ 15.247(a)(2)	6 dB Bandwidth	Compliant
§ 15.247(b)(3)	RF Output Power	Compliant
§ 15.209(a)	Radiated Emission	Compliant
§ 15.247(d)	Band Edge (Out of Band Emissions)	Compliant
This module is the same as FCC ID: PANCM43438V1, all the test data are copied from this ID.		

N/A: not applicable

3. RF Exposure

3.1 Standard Applicable

According to § 1.1307 and § 2.1093, the portable transmitter must comply the RF exposure requirements.

3.2 Test Result

This product complied with the requirement of the RF exposure, please see the RF Exposure Report.

4. Antenna Requirement

4.1 Standard Applicable

According to FCC Part 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

4.2 Evaluation Information

This product has a PCB antenna, fulfill the requirement of this section.

5. Power Spectral Density

5.1 Standard Applicable

According to 15.247(a)(1)(iii), For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

5.2 Test Procedure

According to the KDB 558074 D01 v04, the test method of power spectral density as below:

- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to 1.5 times the DTS bandwidth.
- c) Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- d) Set the VBW $\geq 3 \times \text{RBW}$.
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.
- j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

5.3 Environmental Conditions

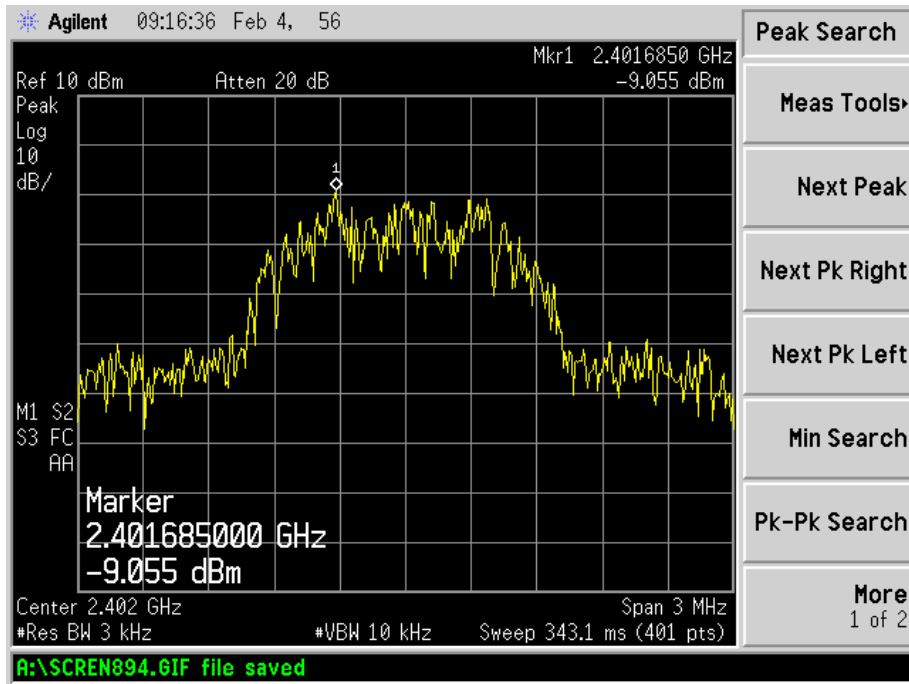
Temperature:	26° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

5.4 Summary of Test Results/Plots

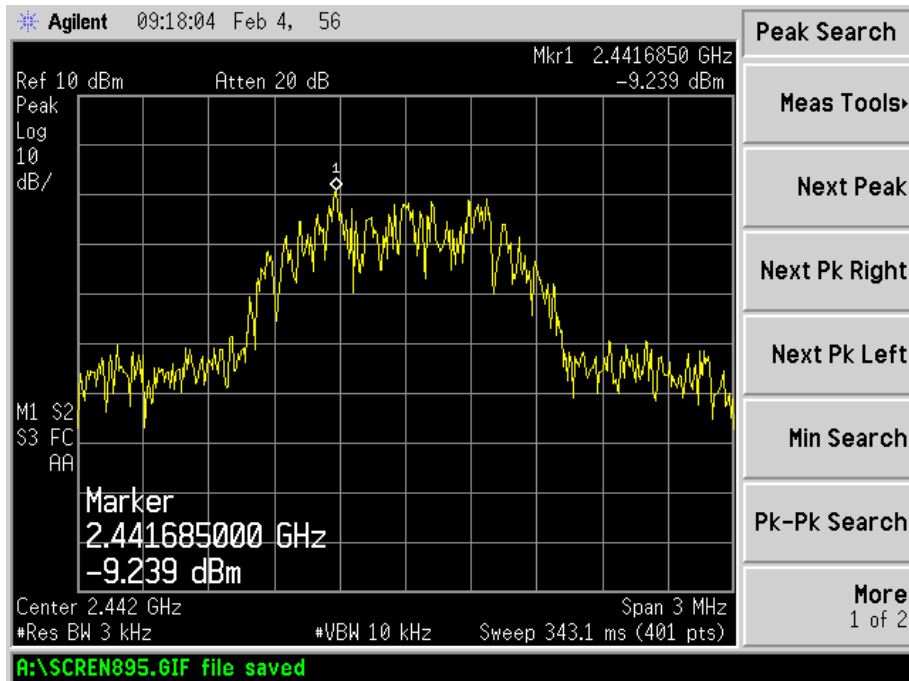
Test Mode	Test Channel MHz	Power Spectral Density dBm/3kHz	Limit dBm/3kHz
GFSK(BLE)	2402	-9.055	8
	2442	-9.239	8
	2480	-9.129	8

Please refer to the following test plots:

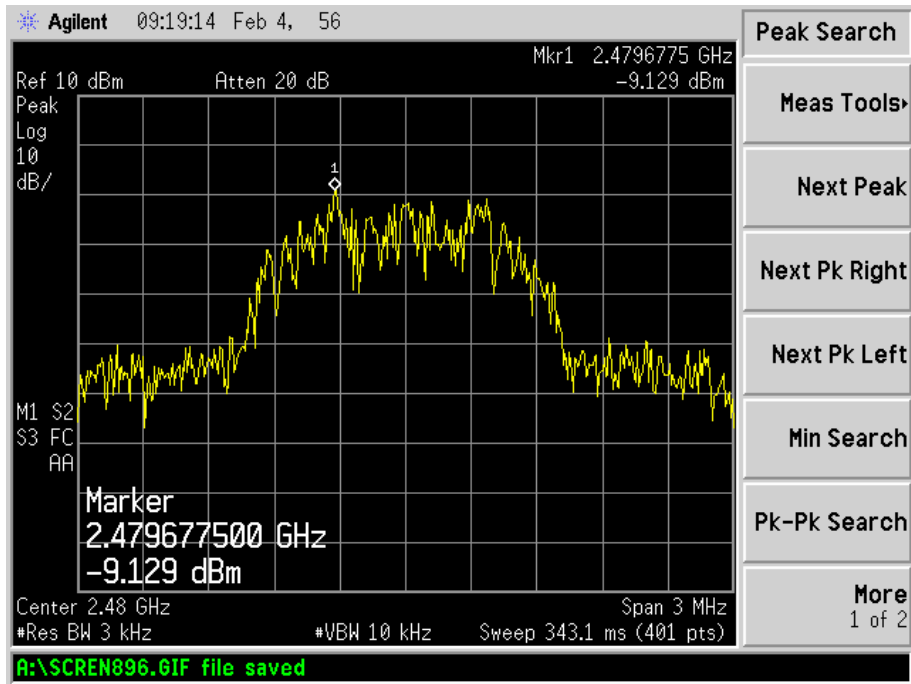
Low Channel



Middle Channel



High Channel



6. 6dB Bandwidth

6.1 Standard Applicable

According to 15.247(a)(2). Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

6.2 Test Procedure

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

6.3 Environmental Conditions

Temperature:	25° C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

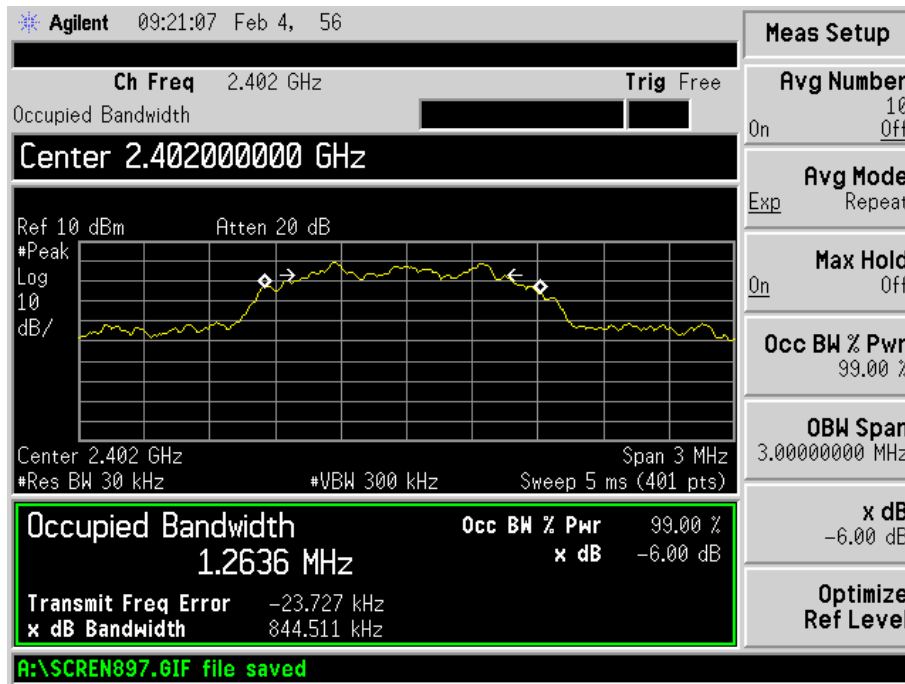
6.4 Summary of Test Results/Plots

Test Mode	Test Channel MHz	6 dB Bandwidth kHz	99% Bandwidth kHz	Limit kHz
GFSK(BLE)	2402	844.511	1263.6	≥ 500
	2442	835.024	1251.7	≥ 500
	2480	841.942	1260.2	≥ 500

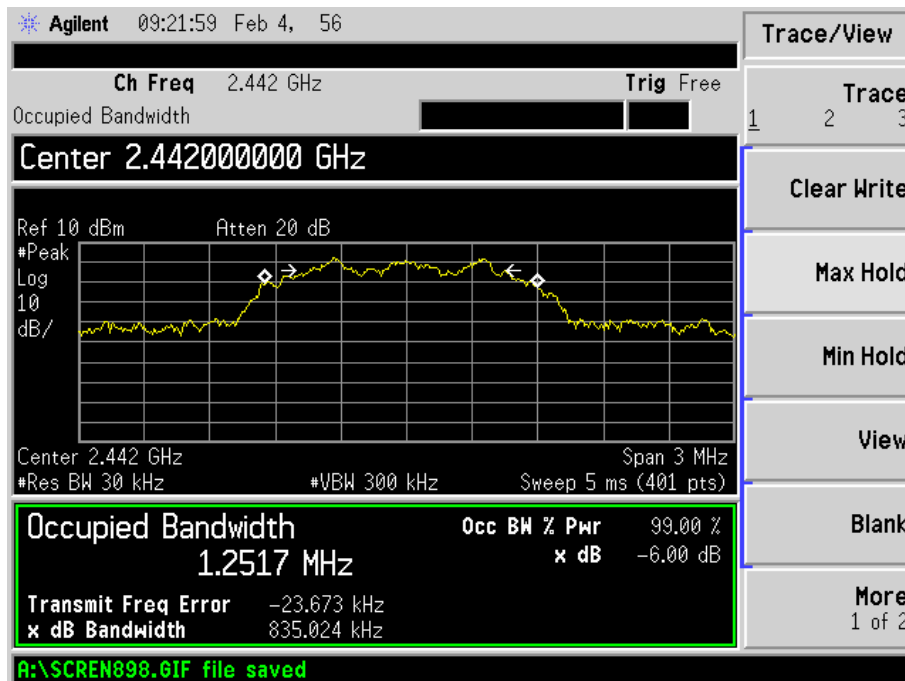
Please refer to the following test plots:

For BLE

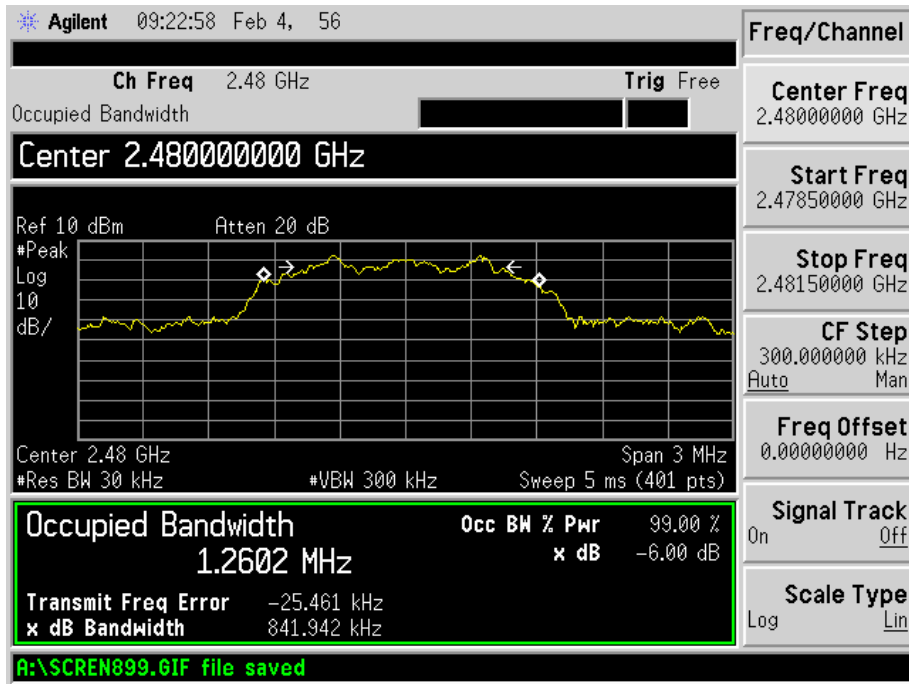
Low Channel:



Middle Channel:



High Channel:



7. RF Output Power

7.1 Standard Applicable

According to 15.247(b)(3). For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

7.2 Test Procedure

According to section KDB-558074 D01 v04 section 9.1.1, this procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the DTS bandwidth.

- a) Set the RBW \geq DTS bandwidth.
- b) Set VBW $\geq 3 \times$ RBW.
- c) Set span $\geq 3 \times$ RBW
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.

7.3 Environmental Conditions

Temperature:	26° C
Relative Humidity:	57%
ATM Pressure:	1011 mbar

7.4 Summary of Test Results/Plots

Test Mode	Frequency MHz	Reading dBm	Output Power mW	Limit mW
GFSK(BLE)	2402	5.879	3.87	1000
	2442	5.722	3.73	1000
	2480	5.722	3.73	1000

Note: the antenna gain of 0dBi less than 6dBi maximum permission antenna gain value based on 1 watt peak output power limit.

8. Field Strength of Spurious Emissions

8.1 Standard Applicable

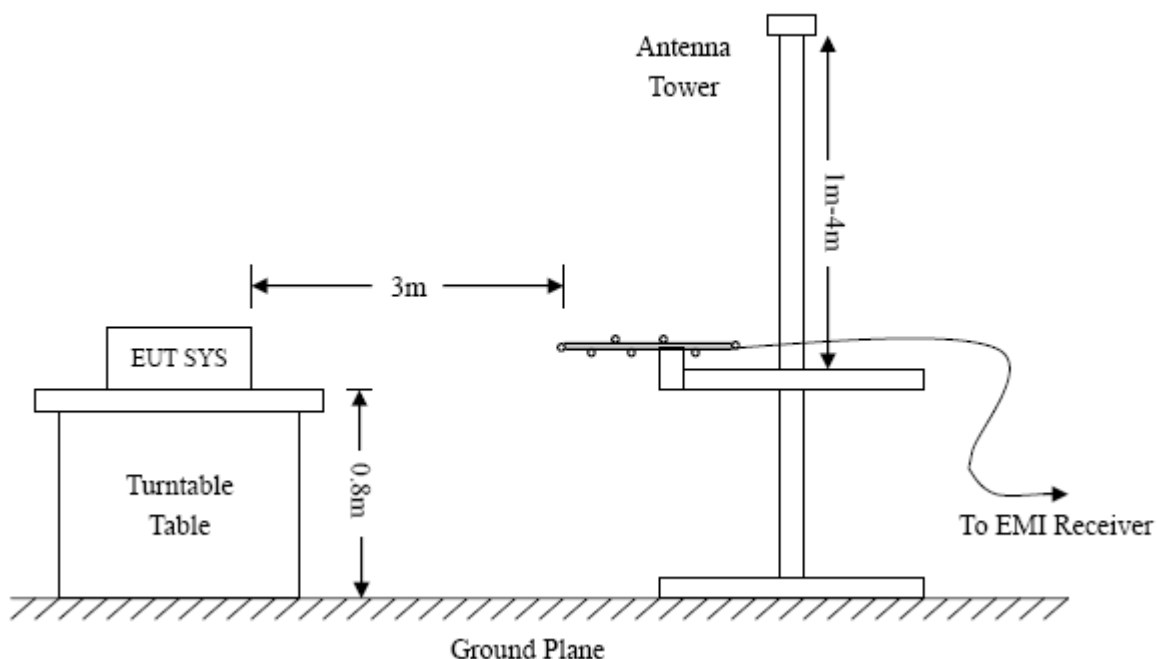
According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

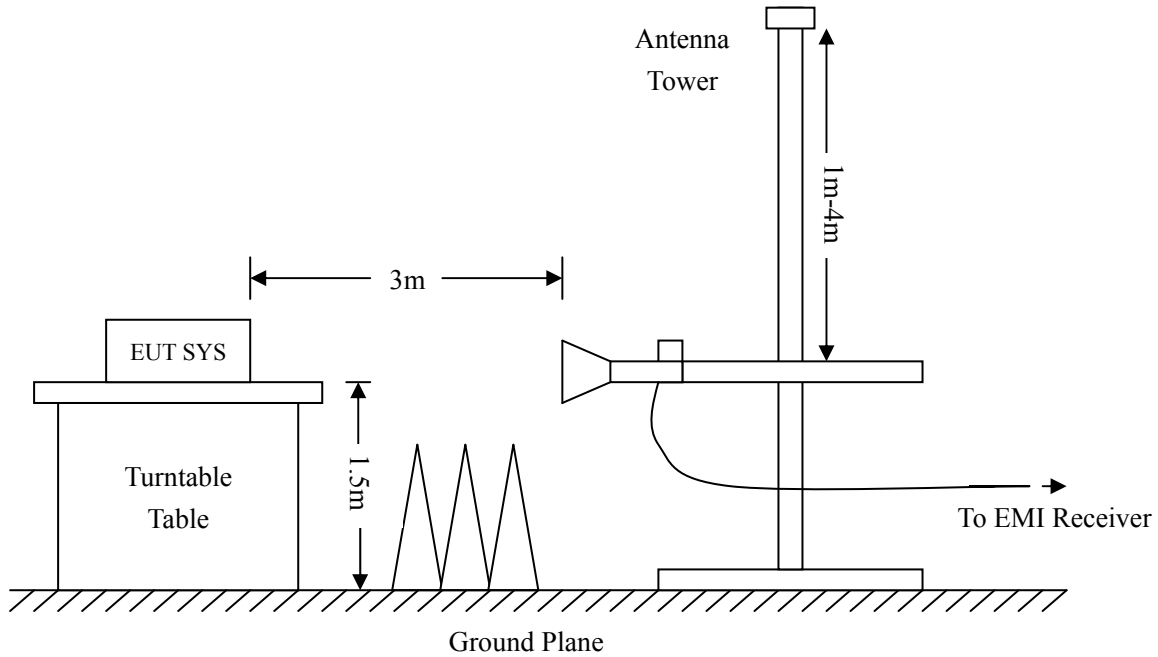
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

8.2 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.205 15.247(a) and FCC Part 15.209 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle. The spacing between the peripherals was 10 cm.





Frequency :9kHz-30MHz
 RBW=10KHz,
 VBW =30KHz
 Sweep time= Auto
 Trace = max hold
 Detector function = peak

Frequency :30MHz-1GHz
 RBW=120KHz,
 VBW=300KHz
 Sweep time= Auto
 Trace = max hold
 Detector function = peak, QP

Frequency :Above 1GHz
 RBW=1MHz,
 VBW=3MHz(Peak), 10Hz(AV)
 Sweep time= Auto
 Trace = max hold
 Detector function = peak, AV

8.3 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Ant. Factor} + \text{Cable Loss} - \text{Ampl. Gain}$$

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dBμV means the emission is 6dBμV below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15 Limit}$$

8.4 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

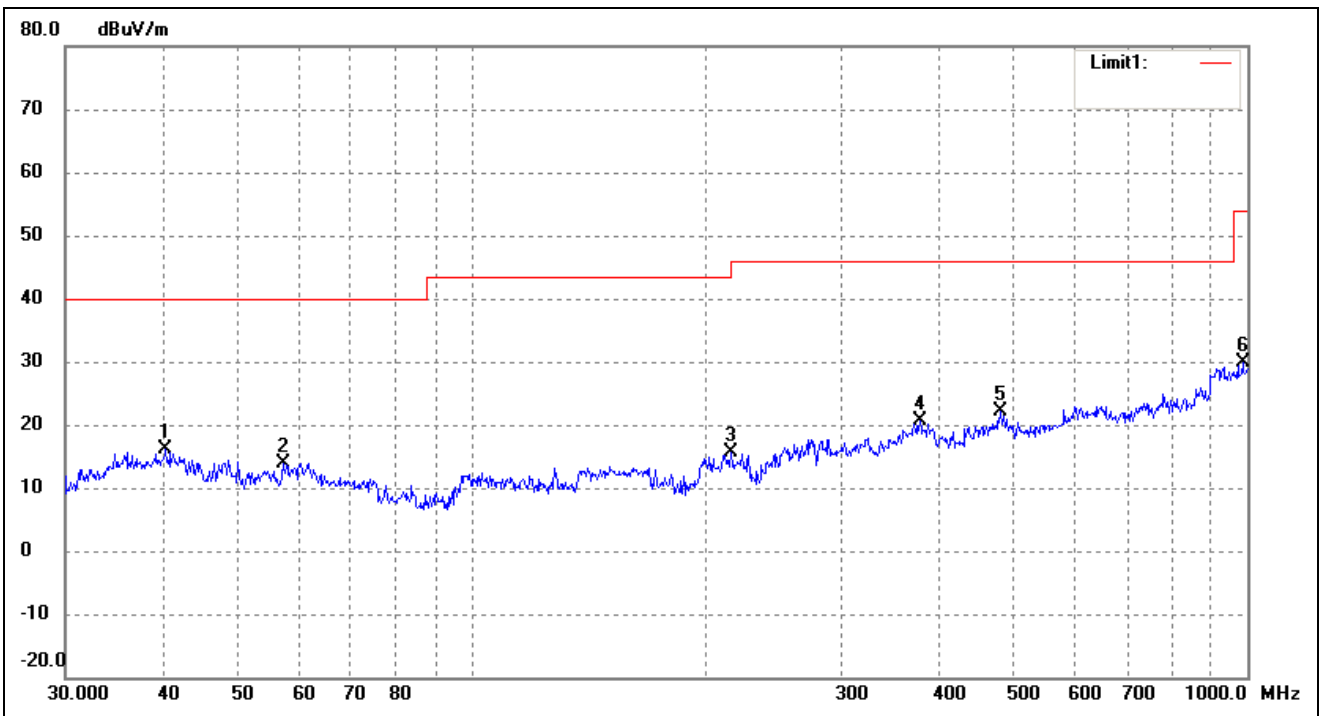
8.5 Summary of Test Results/Plots

According to the data below, the FCC Part 15.205, 15.209 and 15.247 standards, and had the worst cases:

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

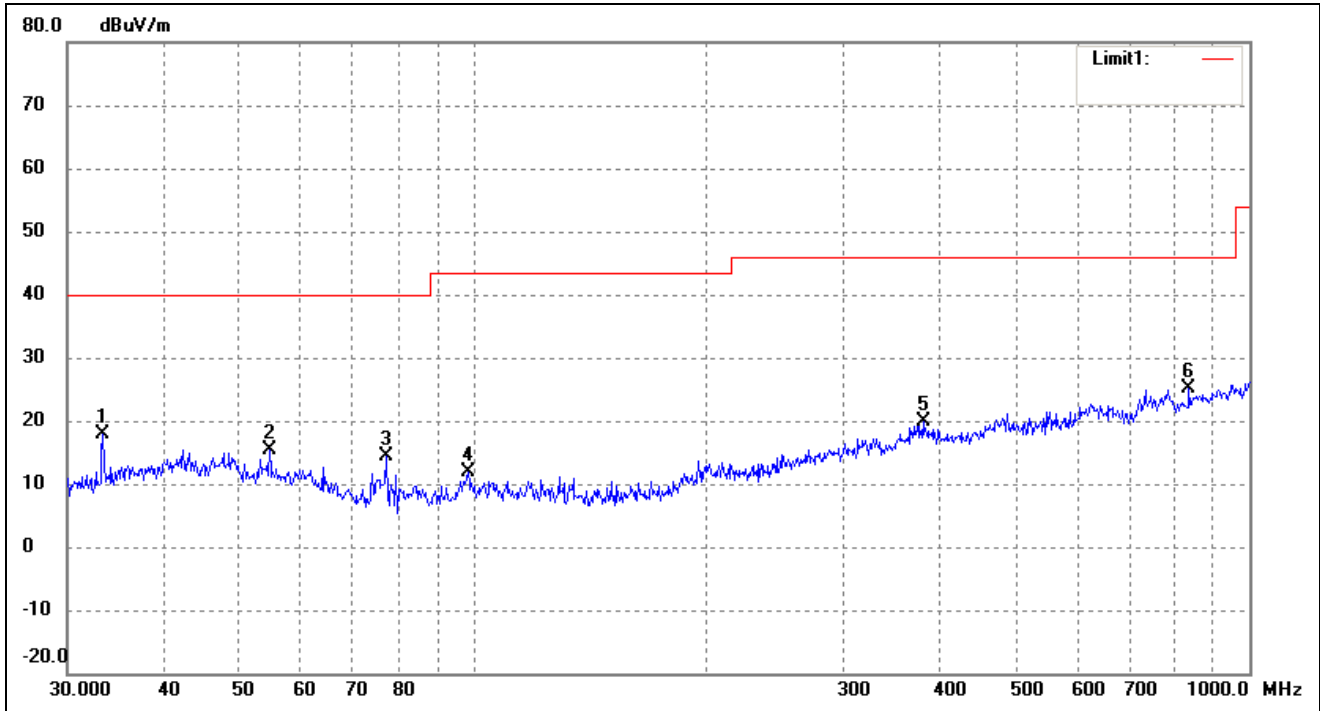
Plot of Radiated Emissions Test Data

EUT: 802.11b/g/n WiFi+BT IOT Module
 Tested Model: WSDB-104GNI(BT)
 Operating Condition: Transmitting-Low channel (2402MHz)
 Comment: DC 3.3V
 Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	40.4172	23.89	-7.70	16.19	40.00	-23.81	0	100	peak
2	57.1914	23.21	-9.22	13.99	40.00	-26.01	0	100	peak
3	216.0240	24.55	-8.81	15.74	46.00	-30.26	0	100	peak
4	378.5843	22.70	-2.17	20.53	46.00	-25.47	0	100	peak
5	480.5276	23.15	-1.08	22.07	46.00	-23.93	0	100	peak
6	986.0717	25.80	4.16	29.96	54.00	-24.04	0	100	peak

Test Specification: Vertical

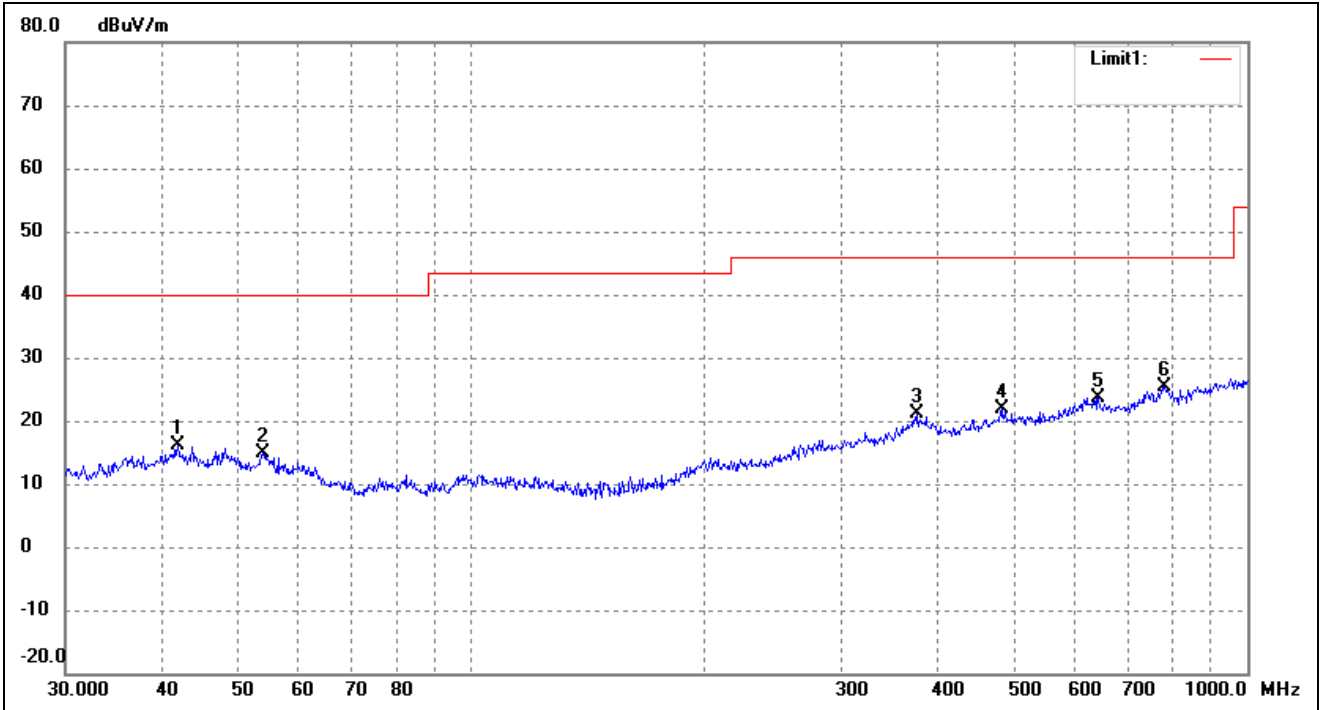


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	33.3279	27.24	-9.46	17.78	40.00	-22.22	0	100	peak
2	54.6429	24.23	-8.91	15.32	40.00	-24.68	0	100	peak
3	77.3212	26.57	-12.21	14.36	40.00	-25.64	0	100	peak
4	98.4866	23.13	-11.21	11.92	43.50	-31.58	0	100	peak
5	379.9141	22.08	-2.11	19.97	46.00	-26.03	0	100	peak
6	836.2443	23.25	1.84	25.09	46.00	-20.91	0	100	peak

Plot of Radiated Emissions Test Data

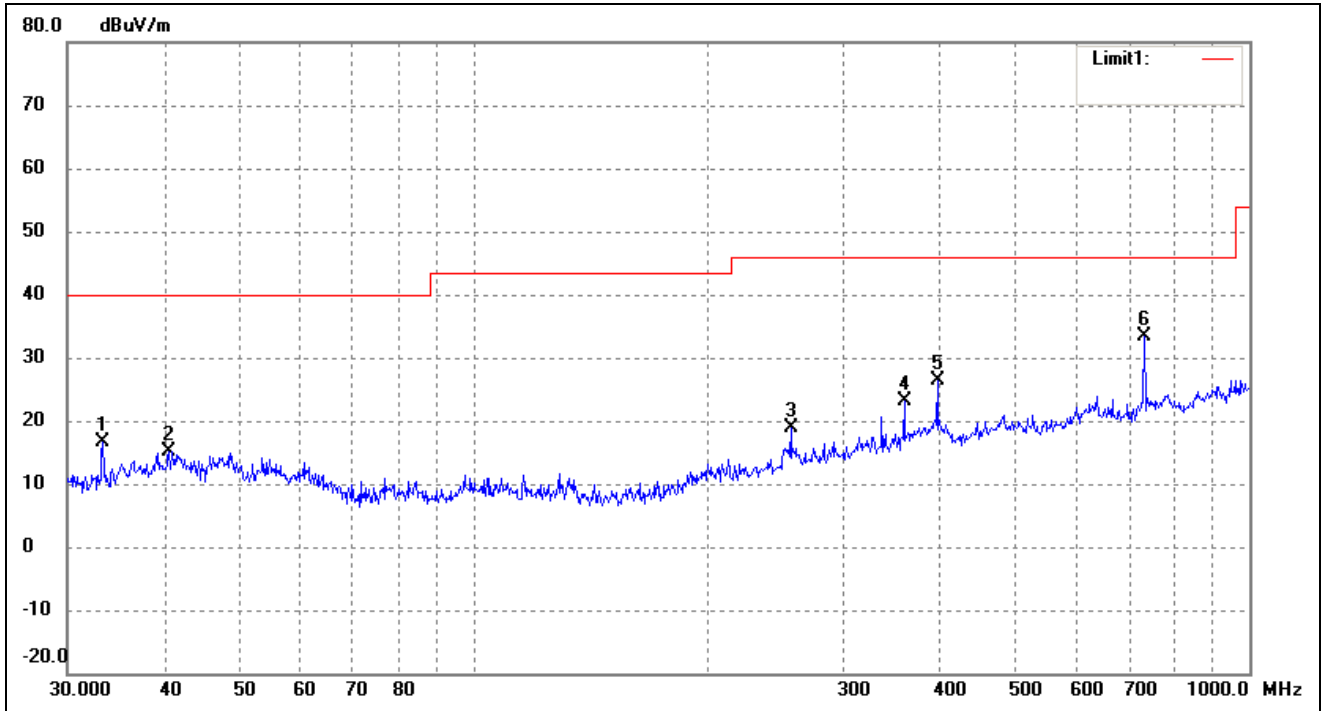
EUT: 802.11b/g/n WiFi+BT IOT Module
 Tested Model: WSDB-104GNI(BT)
 Operating Condition: Transmitting-Middle channel (2442MHz)
 Comment: DC 3.3V

 Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	41.8596	23.85	-7.79	16.06	40.00	-23.94	0	100	peak
2	53.8818	23.75	-8.81	14.94	40.00	-25.06	0	100	peak
3	375.9385	23.42	-2.33	21.09	46.00	-24.91	0	100	peak
4	483.9094	23.03	-1.27	21.76	46.00	-24.24	0	100	peak
5	642.8613	22.99	0.65	23.64	46.00	-22.36	0	100	peak
6	782.3453	22.63	2.78	25.41	46.00	-20.59	0	100	peak

Test Specification: Vertical

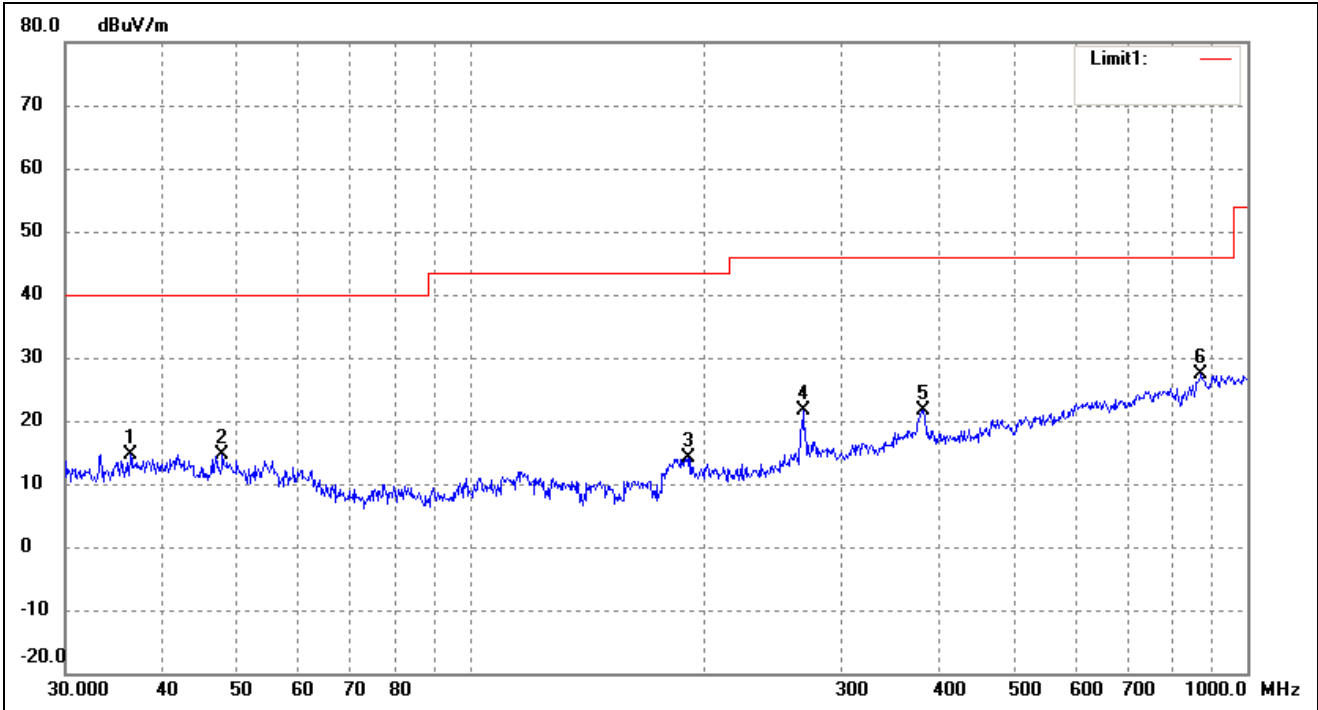


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	33.3279	26.14	-9.46	16.68	40.00	-23.32	0	100	peak
2	40.5591	22.85	-7.70	15.15	40.00	-24.85	0	100	peak
3	256.5211	26.02	-7.18	18.84	46.00	-27.16	0	100	peak
4	359.1860	26.57	-3.32	23.25	46.00	-22.75	0	100	peak
5	396.2415	29.28	-2.95	26.33	46.00	-19.67	0	100	peak
6	731.9203	31.73	1.66	33.39	46.00	-12.61	0	100	peak

Plot of Radiated Emissions Test Data

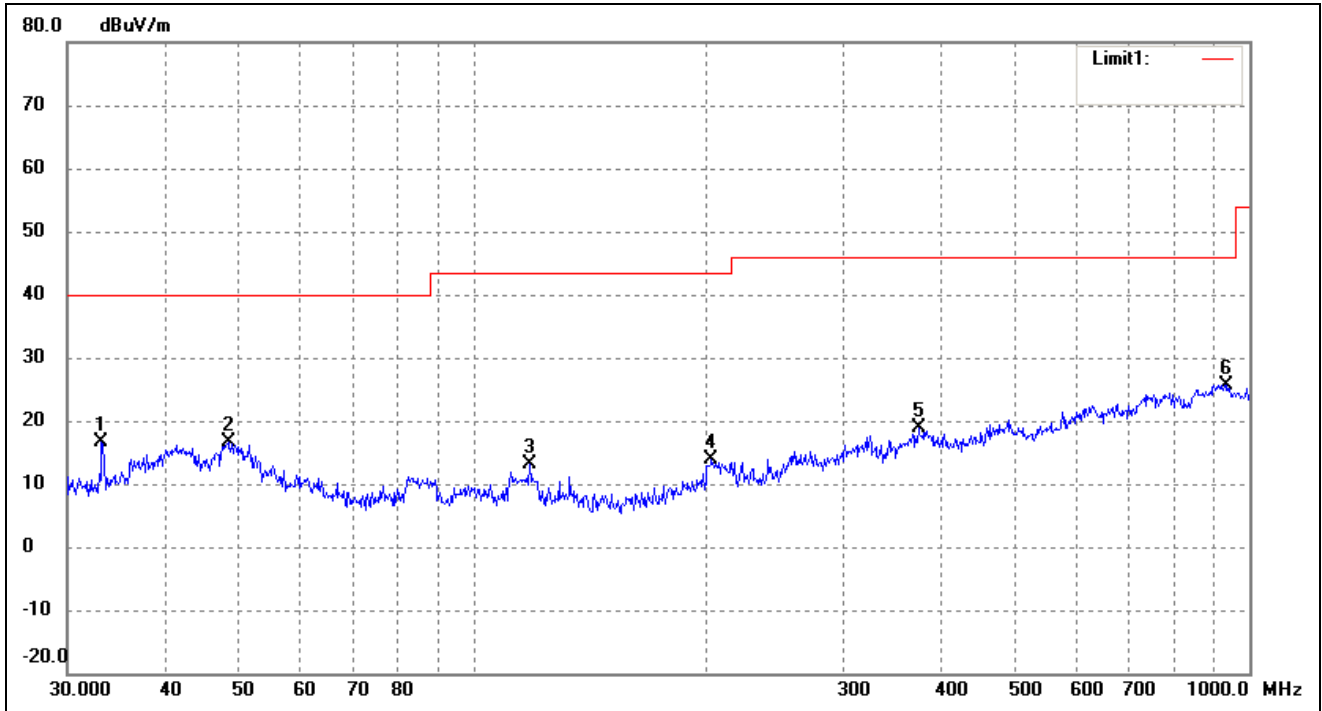
EUT: 802.11b/g/n WiFi+BT IOT Module
 Tested Model: WSDB-104GNI(BT)
 Operating Condition: Transmitting-High channel (2480MHz)
 Comment: DC 3.3V

 Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	36.3814	23.36	-8.66	14.70	40.00	-25.30	0	100	peak
2	47.8260	22.92	-8.18	14.74	40.00	-25.26	0	100	peak
3	190.4050	23.97	-9.96	14.01	43.50	-29.49	0	100	peak
4	267.5455	28.23	-6.63	21.60	46.00	-24.40	0	100	peak
5	382.5879	23.97	-2.23	21.74	46.00	-24.26	0	100	peak
6	872.1832	24.34	3.05	27.39	46.00	-18.61	0	100	peak

Test Specification: Vertical



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	33.2112	26.04	-9.50	16.54	40.00	-23.46	0	100	peak
2	48.3318	24.80	-8.21	16.59	40.00	-23.41	0	100	peak
3	118.1862	24.59	-11.38	13.21	43.50	-30.29	0	100	peak
4	202.8104	22.51	-8.68	13.83	43.50	-29.67	0	100	peak
5	374.6226	21.32	-2.41	18.91	46.00	-27.09	0	100	peak
6	935.5463	21.57	4.13	25.70	46.00	-20.30	0	100	peak

Spurious Emissions Above 1GHz
Transmitting: BLE mode:

Frequency (MHz)	Reading (dBuV/m)	Correct dB	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Polar H/V	Detector
Low Channel-2402MHz							
4804	60.42	-3.59	56.83	74	-17.17	H	PK
4804	41.95	-3.59	38.36	54	-15.64	H	AV
7206	58.91	-0.52	58.39	74	-15.61	H	PK
7206	40.68	-0.52	40.16	54	-13.84	H	AV
4804	60.73	-3.59	57.14	74	-16.86	V	PK
4804	38.81	-3.59	35.22	54	-18.78	V	AV
7206	60.9	-0.52	60.38	74	-13.62	V	PK
7206	40.57	-0.52	40.05	54	-13.95	V	AV
Middle Channel-2442MHz							
4884	59.42	-3.49	55.93	74	-18.07	H	PK
4884	38.16	-3.49	34.67	54	-19.33	H	AV
7326	60.65	-0.47	60.18	74	-13.82	H	PK
7326	38.66	-0.47	38.19	54	-15.81	H	AV
4884	59.59	-3.49	56.1	74	-17.9	V	PK
4884	41.43	-3.49	37.94	54	-16.06	V	AV
7326	59.94	-0.47	59.47	74	-14.53	V	PK
7326	41.59	-0.47	41.12	54	-12.88	V	AV
High Channel-2480MHz							
4960	60.56	-3.41	57.15	74	-16.85	H	PK
4960	39.24	-3.41	35.83	54	-18.17	H	AV
7440	60.43	-0.42	60.01	74	-13.99	H	PK
7440	39.9	-0.42	39.48	54	-14.52	H	AV
4960	60.25	-3.41	56.84	74	-17.16	V	PK
4960	40.71	-3.41	37.3	54	-16.7	V	AV
7440	59.29	-0.42	58.87	74	-15.13	V	PK
7440	39.55	-0.42	39.13	54	-14.87	V	AV

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, other than listed in the table above are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

9. Out of Band Emissions

9.1 Standard Applicable

According to §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

9.2 Test Procedure

According to the KDB 558074 D01 v04, the band-edge radiated test method as follows:

Set span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation (2310MHz to 2420MHz for low bandedge, 2460MHz to 2500MHz for the high bandedge)

RBW = 1MHz, VBW = 1MHz for peak value measured

RBW = 1MHz, VBW = 10Hz for average value measured

Sweep = auto; Detector function = peak/average; Trace = max hold

All the trace to stabilize, set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. Those emission must comply with the 15.209 limit for fall in the restricted bands listed in section 15.205. Note that the method of measurement KDB publication number: 913591 may be used for the radiated bandedge measurements.

According to the KDB 558074 D01 v04, the conducted spurious emissions test method as follows:

1. Set start frequency to DTS channel edge frequency.
2. Set stop frequency so as to encompass the spectrum to be examined.
3. Set RBW = 100 kHz.
4. Set VBW \geq 300 kHz.
5. Detector = peak.
6. Trace Mode = max hold.
7. Sweep = auto couple.
8. Allow the trace to stabilize (this may take some time, depending on the extent of the span).
9. Use peak marker function to determine maximum amplitude of all unwanted emissions within any 100 kHz bandwidth.

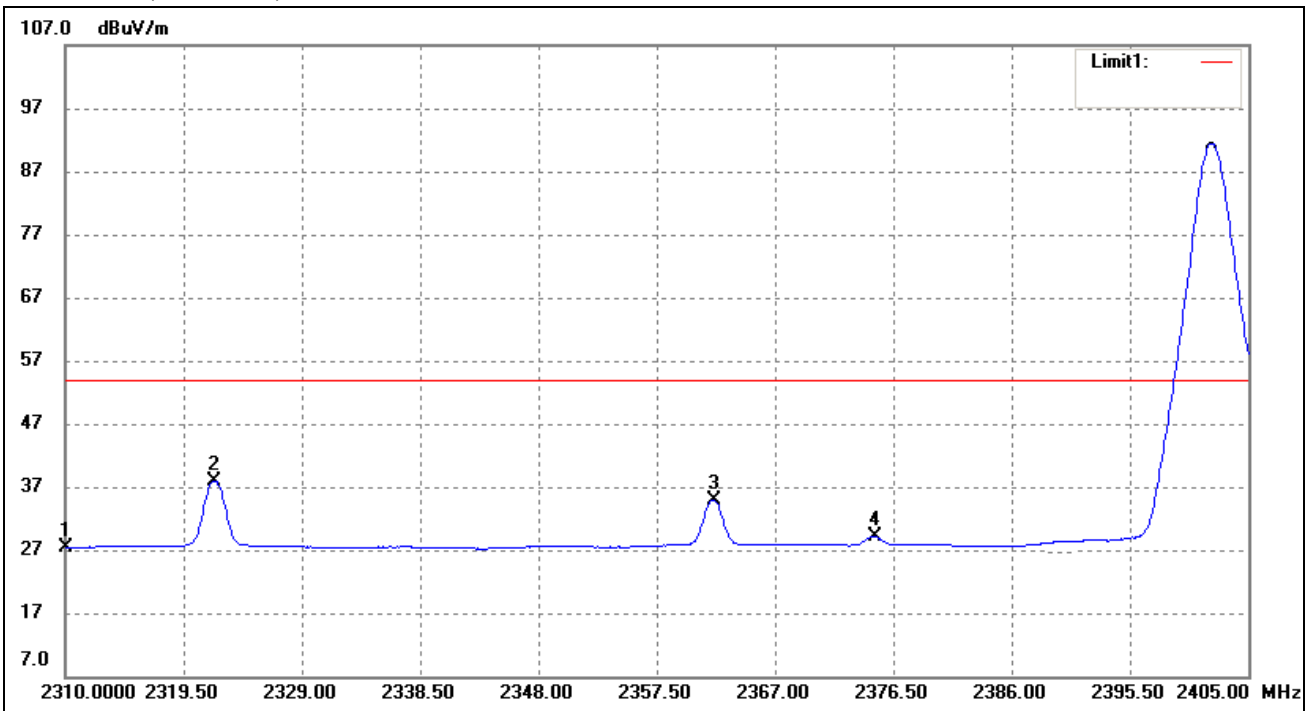
Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements specified in section 8.1. Report the three highest emissions relative to the limit.

9.3 Environmental Conditions

Temperature:	23°C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

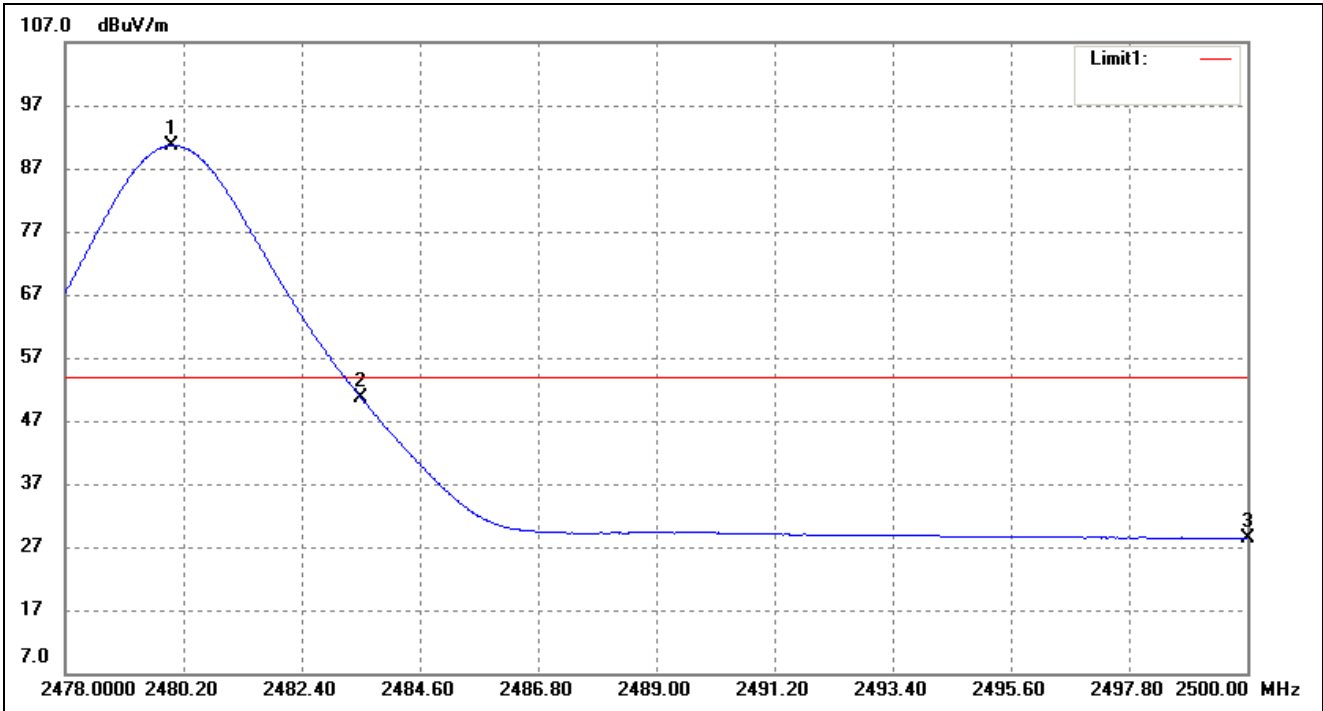
9.4 Summary of Test Results/Plots

Restricted Bandedge (Radiated)
 Lowest Bandedge-BLE
 Horizontal (Worst case)



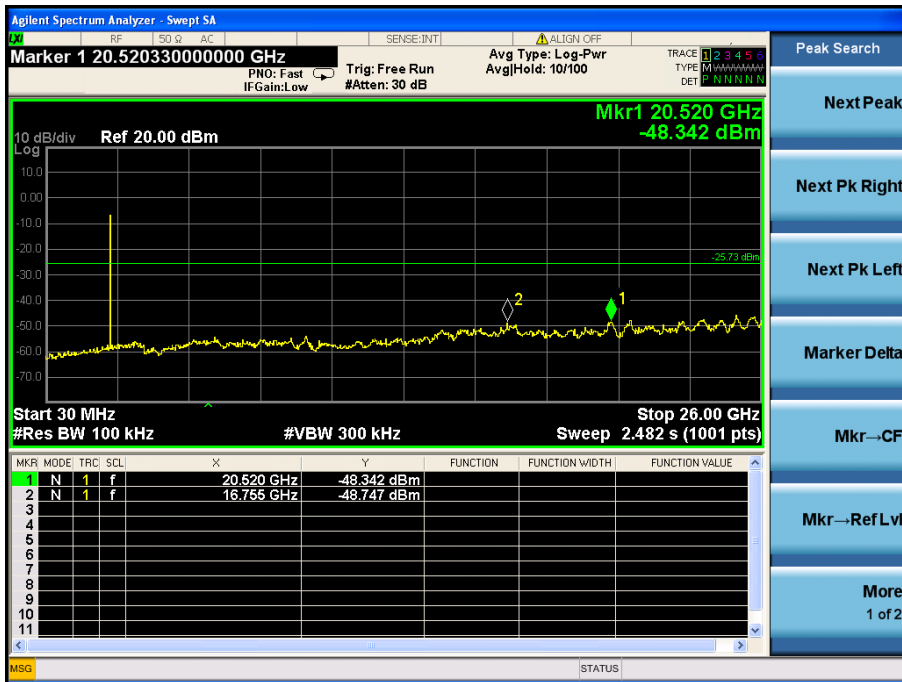
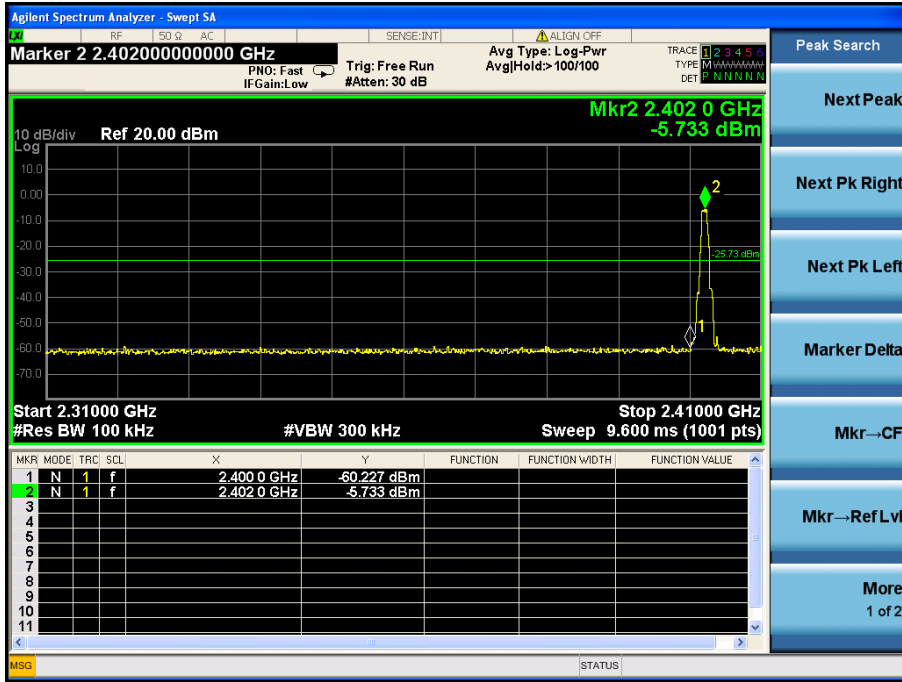
No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	31.11	-3.71	27.40	54.00	-26.60	Average Detector
	2310.000	45.03	-3.71	41.32	74.00	-32.68	Peak Detector
2	2390.000	31.74	-3.54	28.20	54.00	-25.80	Average Detector
	2390.000	46.16	-3.54	42.62	74.00	-31.38	Peak Detector
3	2400.000	72.31	-3.51	68.80	54.00	14.80	Average Detector
	2400.000	80.32	-3.51	76.81	74.00	2.81	Peak Detector
4	2402.055	94.94	-3.51	91.43	54.00	37.43	Average Detector
	2401.960	99.87	-3.51	96.36	74.00	22.36	Peak Detector

Highest Bandedge-BLE
Horizontal (Worst case)

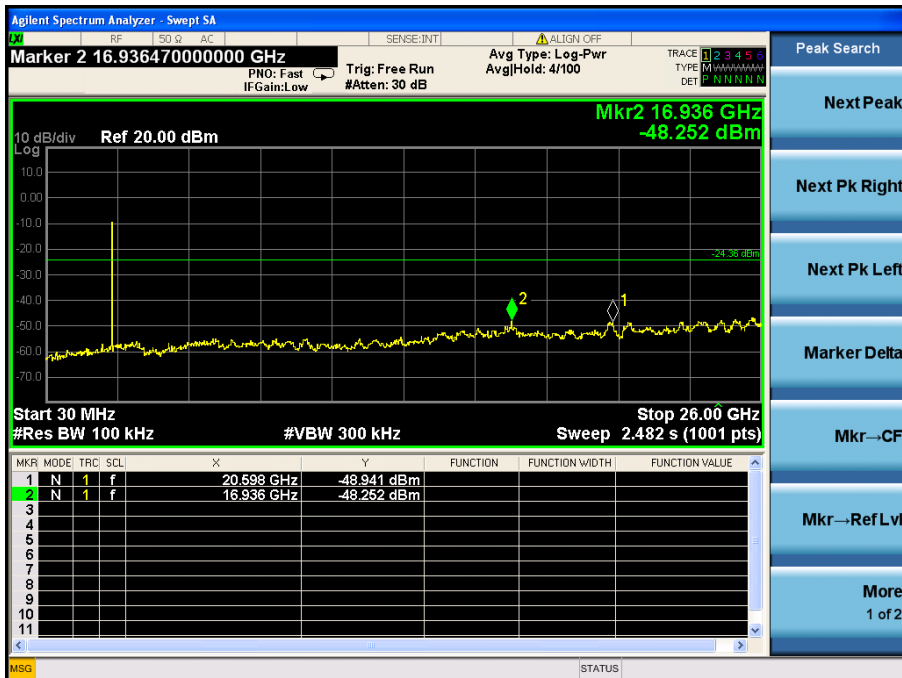
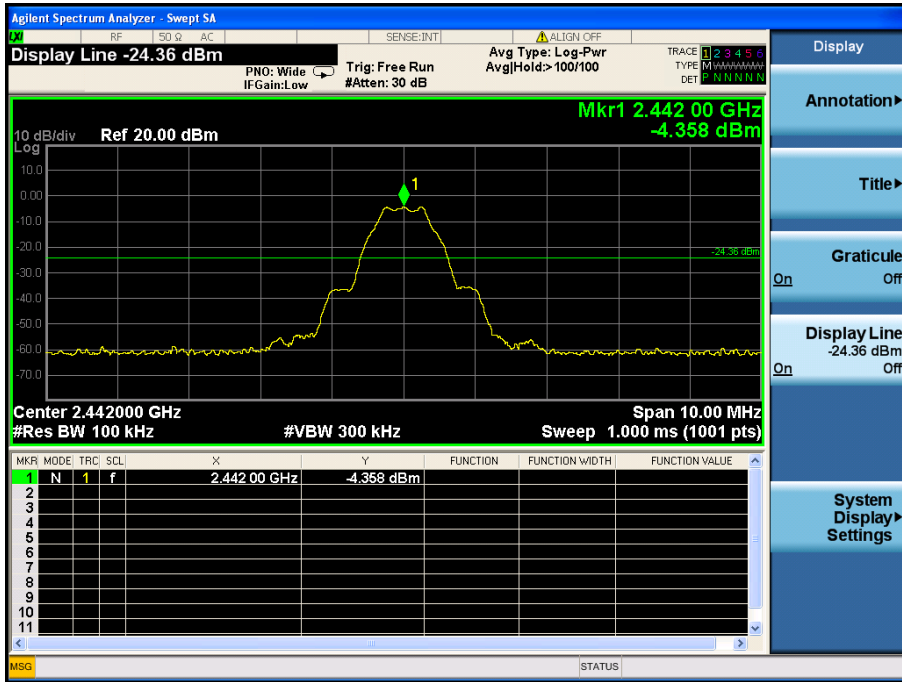


No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2479.980	93.99	-3.33	90.66	54.00	36.66	Average Detector
	2480.002	97.98	-3.33	94.65	74.00	20.65	Peak Detector
2	2483.500	Delta = 39.97dBc		50.69	54.00	-3.31	Average Detector
	2483.500			55.80	74.00	-18.20	Peak Detector
3	2500.000	31.57	-3.28	28.29	54.00	-25.71	Average Detector
	2500.000	44.04	-3.28	40.76	74.00	-33.24	Peak Detector

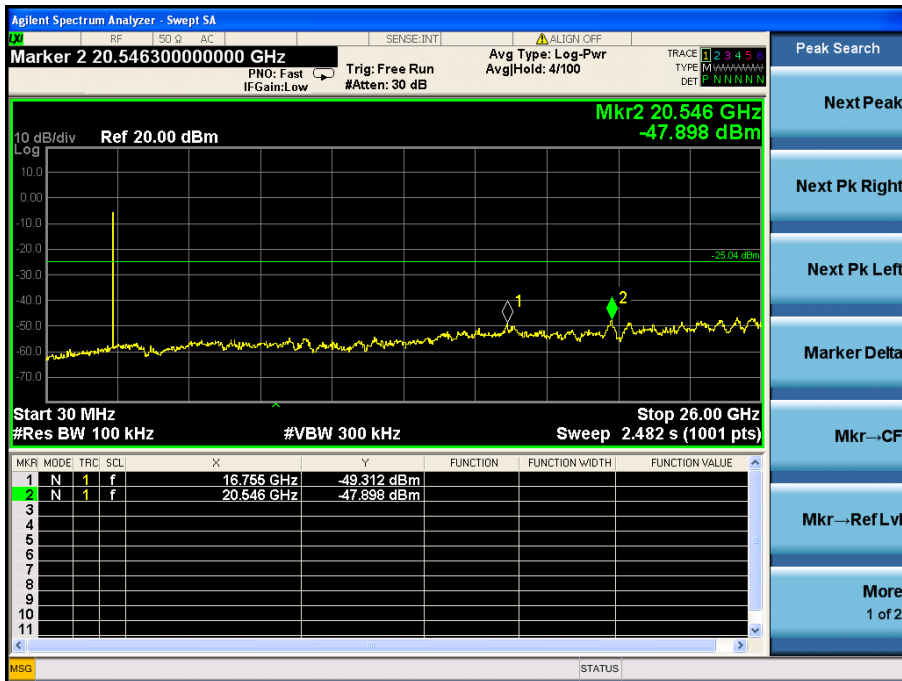
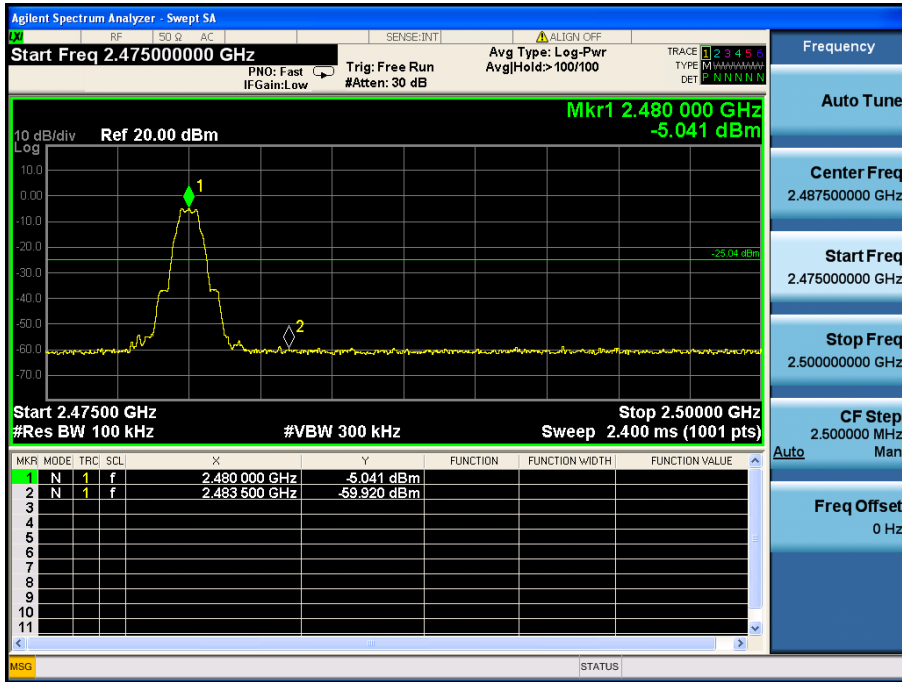
Out of Bandedge and Spurious Emission (Conducted)
Lowest



Middle Channel:



High Channel:



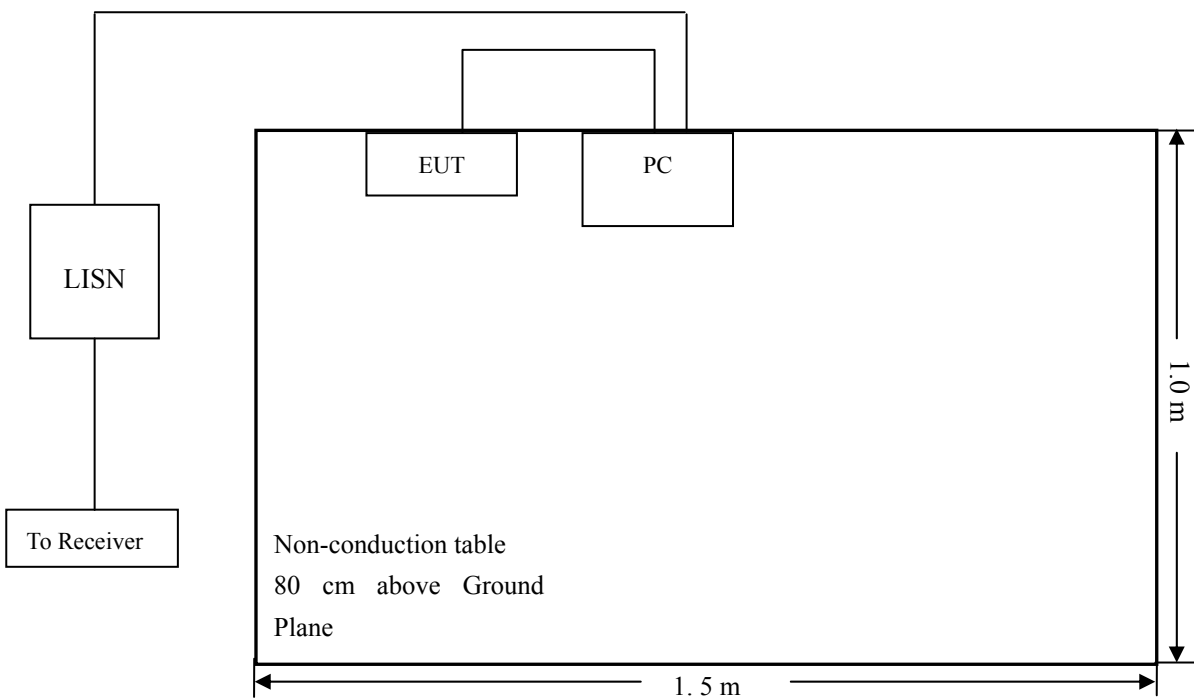
10. Conducted Emissions

10.1 Test Procedure

The setup of EUT is according with per ANSI C63.4-2014 measurement procedure. The specification used was with the FCC Part 15.207 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle. The spacing between the peripherals was 10 cm.

10.2 Basic Test Setup Block Diagram



10.3 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

10.4 Test Receiver Setup

During the conducted emission test, the test receiver was set with the following configurations:

Start Frequency 150 kHz
Stop Frequency..... 30 MHz
Sweep Speed Auto
IF Bandwidth..... 10 kHz
Quasi-Peak Adapter Bandwidth 9 kHz
Quasi-Peak Adapter Mode Normal

10.5 Summary of Test Results/Plots

According to the data in section 10.6, the EUT complied with the FCC Part 15.207 Conducted margin for this device, with the *worst* margin reading of:

-8.30 dB at 16.5380 MHz in the **Neutral** mode, **Peak** detector, 0.15-30MHz

10.6 Conducted Emissions Test Data

Plot of Conducted Emissions Test Data

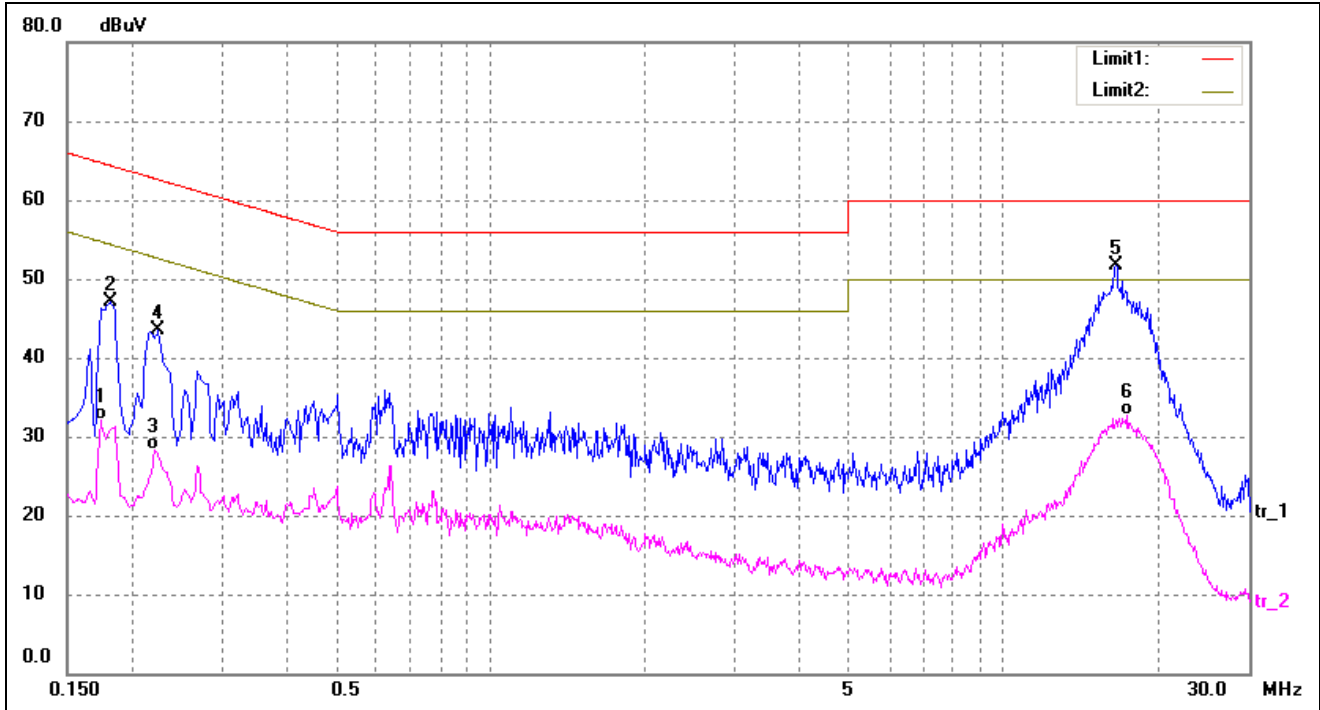
EUT: 802.11b/g/n WiFi+BT IOT Module

Tested Model: WSDB-104GNI(BT)

Operating Condition: Transmitting

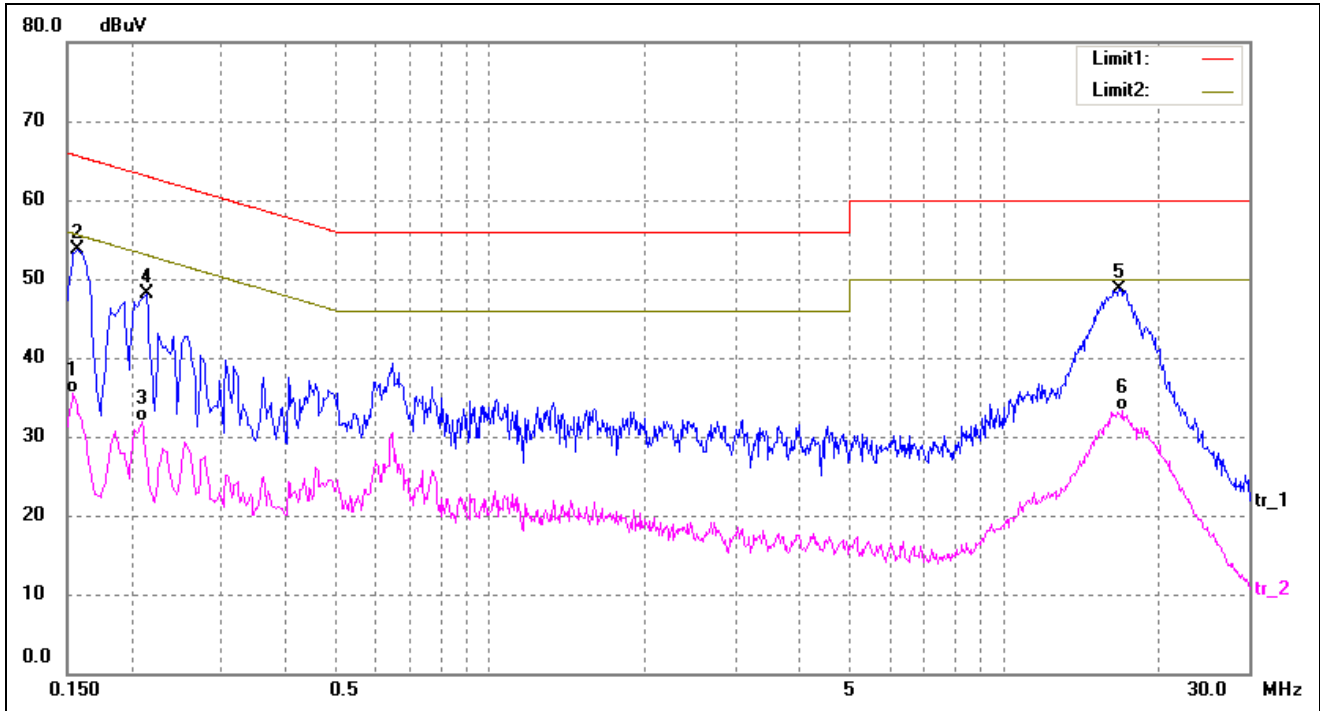
Comment: DC 3.3V

Test Specification: Neutral



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1740	22.53	9.50	32.03	54.77	-22.74	AVG
2	0.1820	37.64	9.50	47.14	64.39	-17.25	peak
3	0.2220	18.82	9.50	28.32	52.74	-24.42	AVG
4	0.2260	33.94	9.50	43.44	62.60	-19.16	peak
5*	16.5380	41.27	10.43	51.70	60.00	-8.30	peak
6	17.4740	22.18	10.44	32.62	50.00	-17.38	AVG

Test Specification: Line



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1540	26.07	9.50	35.57	55.78	-20.21	AVG
2	0.1580	44.30	9.50	53.80	65.57	-11.77	peak
3	0.2100	22.35	9.50	31.85	53.21	-21.36	AVG
4	0.2140	38.53	9.50	48.03	63.05	-15.02	peak
5*	16.8060	38.24	10.43	48.67	60.00	-11.33	peak
6	17.0460	22.84	10.44	33.28	50.00	-16.72	AVG

***** END OF REPORT *****