

FCC Part 15C Measurement and Test Report

For

Mizco International Inc.

80 Essex Avenue East Avenel, NJ07001, USA

FCC ID: RZO-TT-SP45

FCC Rule(s): FCC Part 15.247

Product Description: Bluetooth Speaker

Tested Model: TT-SP45

Report No.: STR17128216I-2

Sample Receipt Date: 2017-12-18

Tested Date: 2017-12-19 to 2018-01-04

Issued Date: 2018-01-04

Tested By: Long Tang / Engineer

Reviewed By: Silin Chen / EMC Manager

Approved & Authorized By: Jandy So / PSQ Manager

Prepared By:

Long Tang
Silin Chen
Jandy So

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	19
8.1 STANDARD APPLICABLE	19
8.2 TEST PROCEDURE	19
8.3 CORRECTED AMPLITUDE & MARGIN CALCULATION	20
8.4 ENVIRONMENTAL CONDITIONS	20
8.5 SUMMARY OF TEST RESULTS/PLOTS	21
9. OUT OF BAND EMISSIONS	28
9.1 STANDARD APPLICABLE	28
9.2 TEST PROCEDURE	28
9.3 ENVIRONMENTAL CONDITIONS	29
9.4 SUMMARY OF TEST RESULTS/PLOTS	29
10. CONDUCTED EMISSIONS	34
10.1 TEST PROCEDURE	34
10.2 BASIC TEST SETUP BLOCK DIAGRAM	34
10.3 ENVIRONMENTAL CONDITIONS	34
10.4 TEST RECEIVER SETUP	35
10.5 SUMMARY OF TEST RESULTS/PLOTS	35
10.6 CONDUCTED EMISSIONS TEST DATA	35

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: Mizco International Inc.
Address of applicant: 80 Essex Avenue East Avenel, NJ07001, USA

Manufacturer: Shenzhen Trendwoo Tech. Co.,Ltd.
Address of manufacturer: 12th Floor, Block B, Building 6, Baoneng Tech Park, No.1
Qingxiang Road, Longhua Street, Longhua District,
Shenzhen

General Description of EUT	
Product Name:	Bluetooth Speaker
Brand Name:	TOUGHTTESTED®
Model No.:	TT-SP45
Adding Model(s):	/
Rated Voltage:	Battery: DC 3.7V
Battery Capacity:	4400mAh
Note: The test data is gathered from a production sample, provided by the manufacturer.	

Technical Characteristics of EUT	
Bluetooth Version:	V4.1 (BLE mode)
Frequency Range:	2402-2480MHz
RF Output Power:	-4.468dBm (Conducted)
Data Rate:	1Mbps
Modulation:	GFSK
Quantity of Channels:	40
Channel Separation:	2MHz
Type of Antenna:	PCB
Antenna Gain:	0dBi
Lowest Internal Frequency:	26MHz

1.2 Test Standards

The following report is prepared on behalf of the Mizco International 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.: 125990

Shenzhen SEM Test Technology Co., Ltd. Laboratory has been recognized to perform compliance testing on equipment subject to the Commissions Declaration Of Conformity (DOC). The Designation Number is CN5010, and Test Firm Registration Number is 125990.

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.

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, 2440MHz, 2480MHz

Accessories Equipment List and Details			
Description	Manufacturer	Model No.	Serial Number
Adapter	/	/	/
Accessories Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With Core/Without Core
USB Line	1	Unshielded	Without Core
EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With Core/Without Core
/	/	/	/

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	9-150kHz $\pm 3.74\text{dB}$
		0.15-30MHz $\pm 3.34\text{dB}$
Transmitter Spurious Emissions	Radiated	30-200MHz $\pm 4.52\text{dB}$
		0.2-1GHz $\pm 5.56\text{dB}$
		1-6GHz $\pm 3.84\text{dB}$
		6-18GHz $\pm 3.92\text{dB}$

1.7 Test Equipment List and Details

No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due Date
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2017-06-12	2018-06-11
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2017-06-12	2018-06-11
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2017-06-12	2018-06-11
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2017-06-12	2018-06-11
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2017-06-12	2018-06-11
SEMT-1011	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2017-06-08	2018-06-07
SEMT-1042	Horn Antenna	ETS	3117	00086197	2017-06-08	2018-06-07
SEMT-1121	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170582	2017-06-08	2018-06-07
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2017-06-08	2018-06-07
SEMT-1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2017-06-12	2018-06-11
SEMT-1003	L.I.S.N	Schwarz beck	NSLK8126	8126-224	2017-06-12	2018-06-11
SEMT-1002	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2017-06-12	2018-06-11
SEMT-1168	Pre-amplifier	Direction Systems Inc.	PAP-0126	14141-12838	2017-08-15	2018-08-14
SEMT-1169	Pre-amplifier	Direction Systems Inc.	PAP-2640	14145-14153	2017-08-15	2018-08-14
SEMT-1163	Spectrum Analyzer	Rohde & Schwarz	FSP40	100612	2017-06-12	2018-06-11
SEMT-1170	DRG Horn Antenna	A.H. SYSTEMS	SAS-574	571	2017-03-09	2018-03-08

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

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:

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

5.3 Environmental Conditions

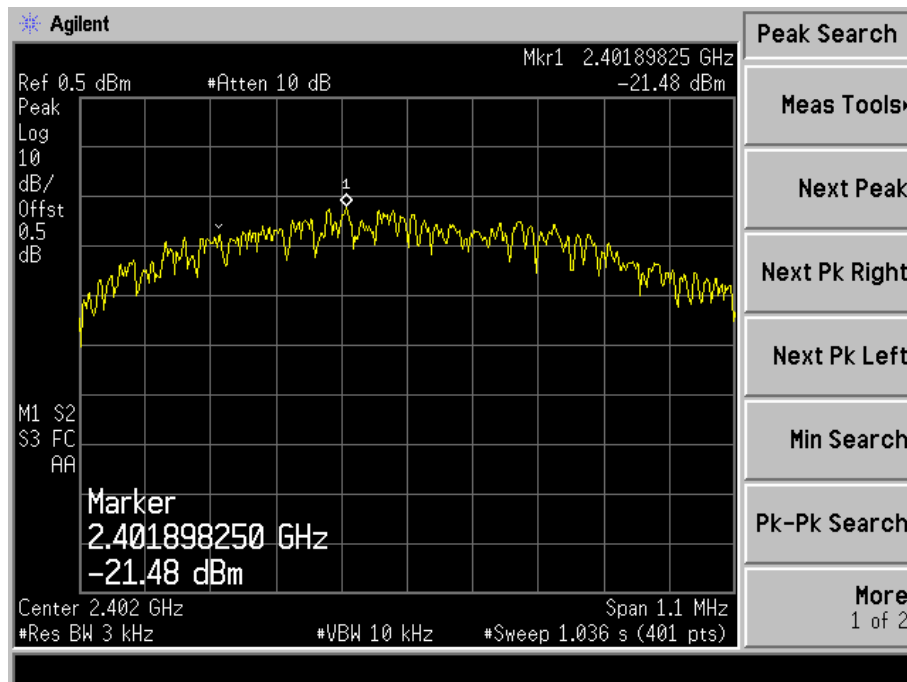
Temperature:	26° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

5.4 Summary of Test Results/Plots

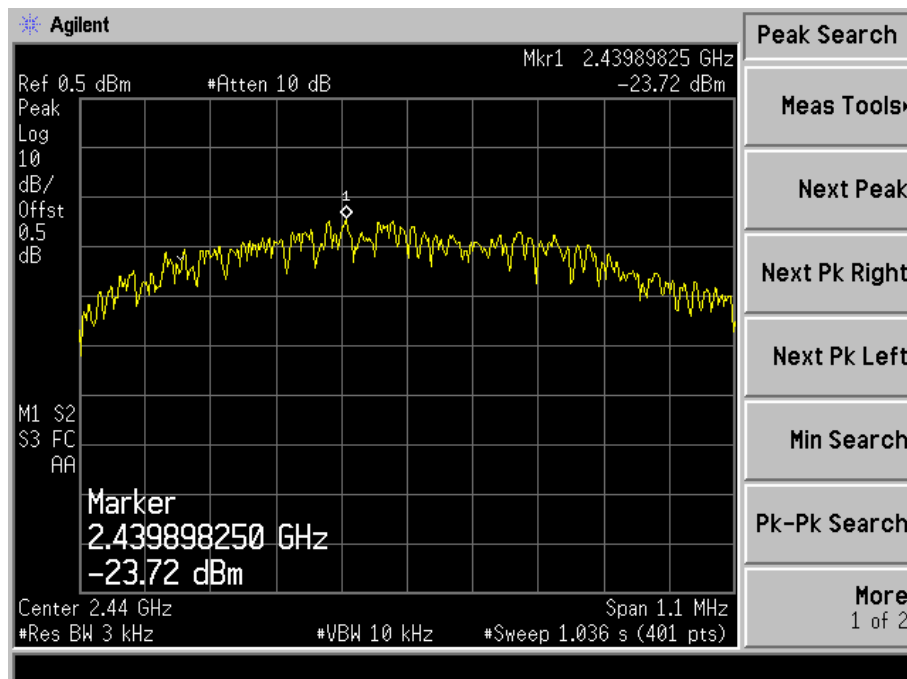
Test Mode	Test Channel MHz	Power Spectral Density dBm/3kHz	Limit dBm/3kHz
GFSK(BLE)	2402	-21.48	8
	2440	-23.72	8
	2480	-26.39	8

Please refer to the following test plots:

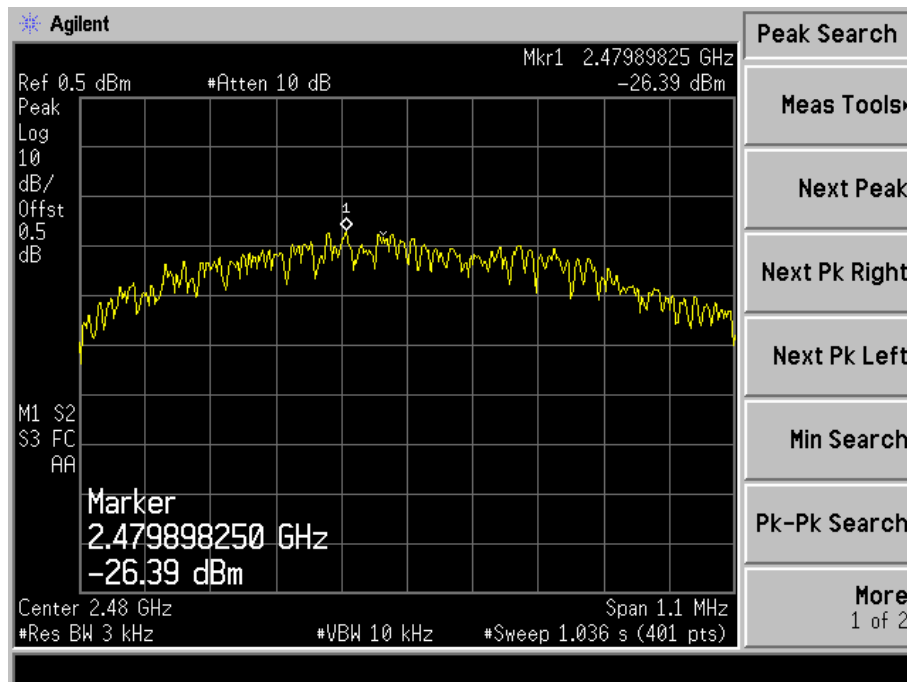
Low Channel



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

- Set RBW = 100 kHz.
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize.
- 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

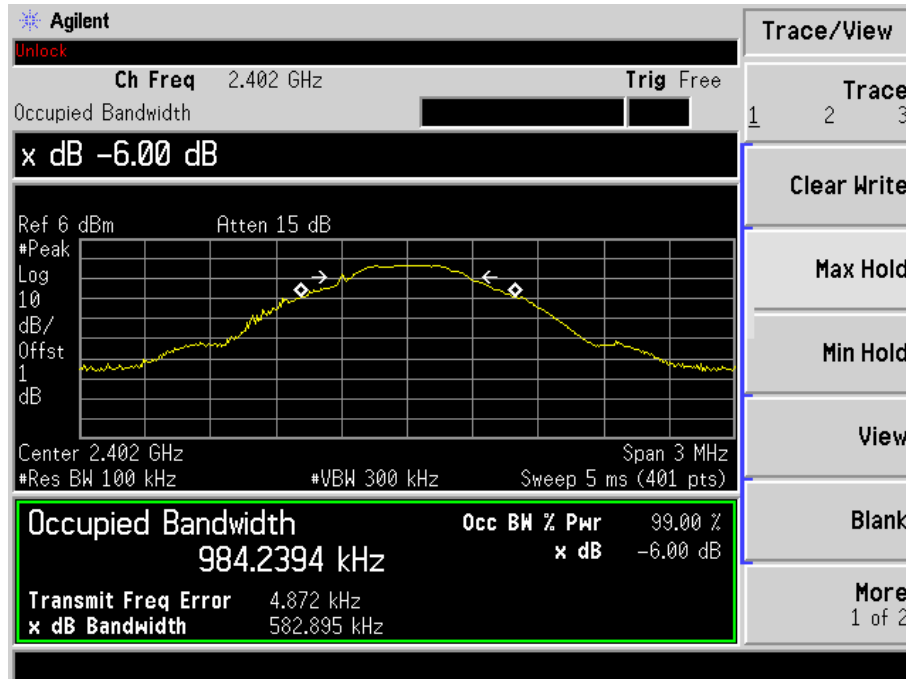
6.4 Summary of Test Results/Plots

Test Mode	Test Channel MHz	6 dB Bandwidth kHz	99% Bandwidth kHz	Limit kHz
GFSK(BLE)	2402	582.895	984.2384	≥ 500
	2440	571.554	1001.7	≥ 500
	2480	542.356	1005.2	≥ 500

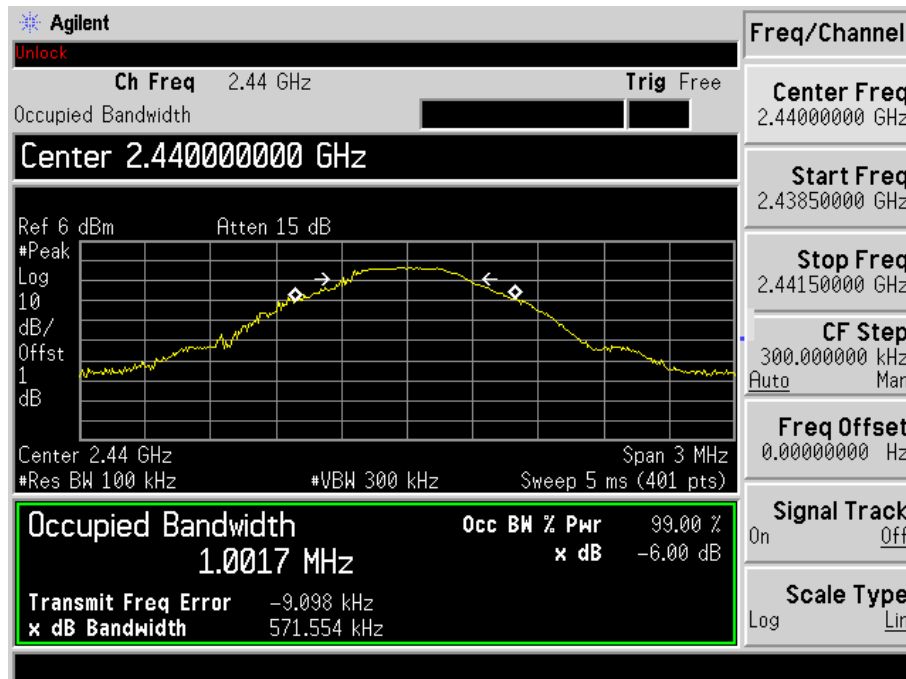
Please refer to the following test plots:

For BLE

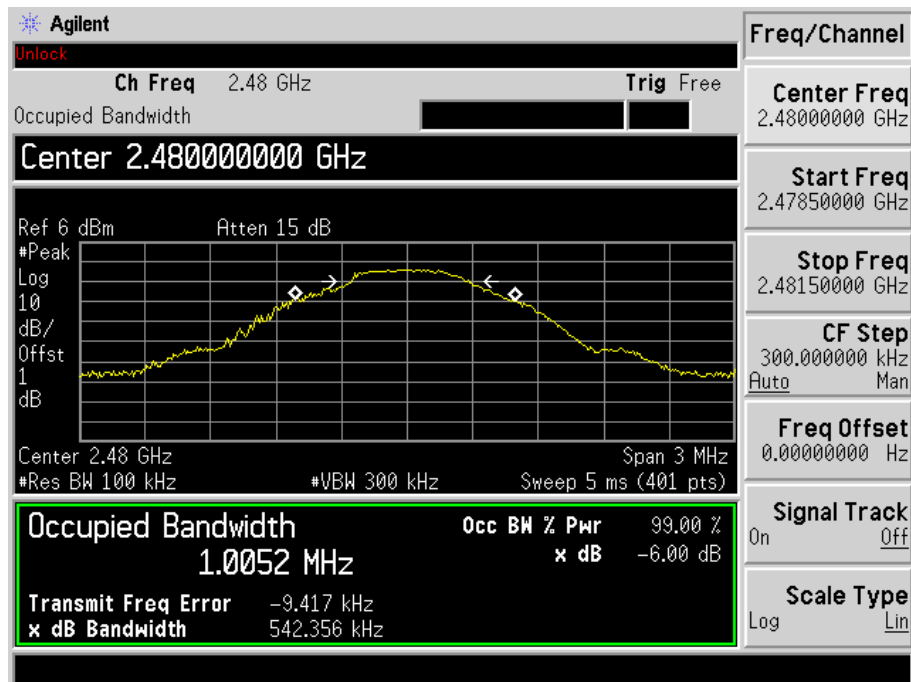
Low Channel:



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.

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

7.3 Environmental Conditions

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

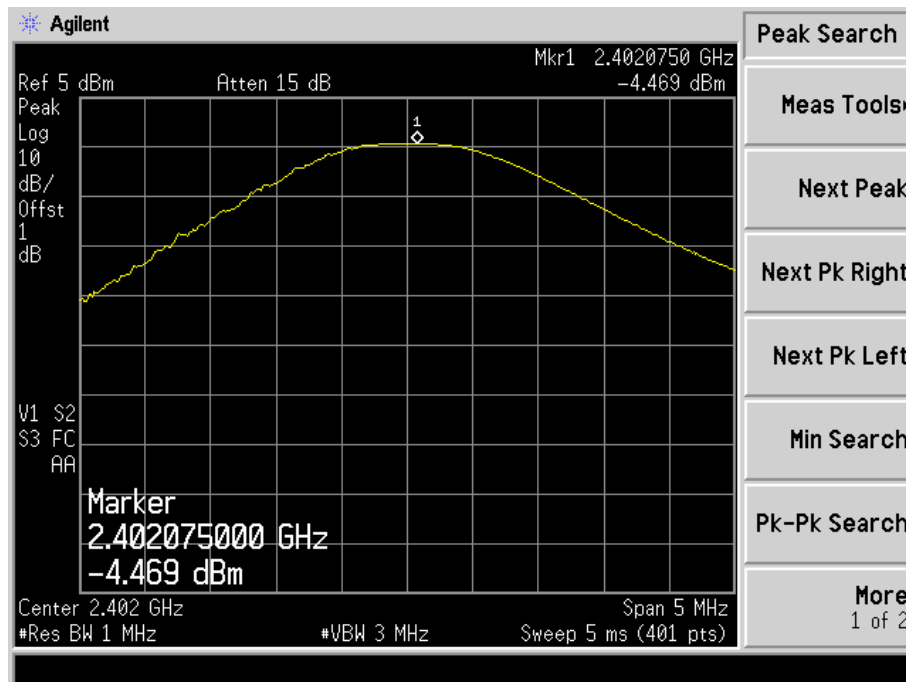
7.4 Summary of Test Results/Plots

Test Mode	Frequency MHz	Reading dBm	Output Power mW	Limit mW
GFSK(BLE)	2402	-4.469	0.36	1000
	2440	-4.468	0.36	1000
	2480	-5.039	0.31	1000

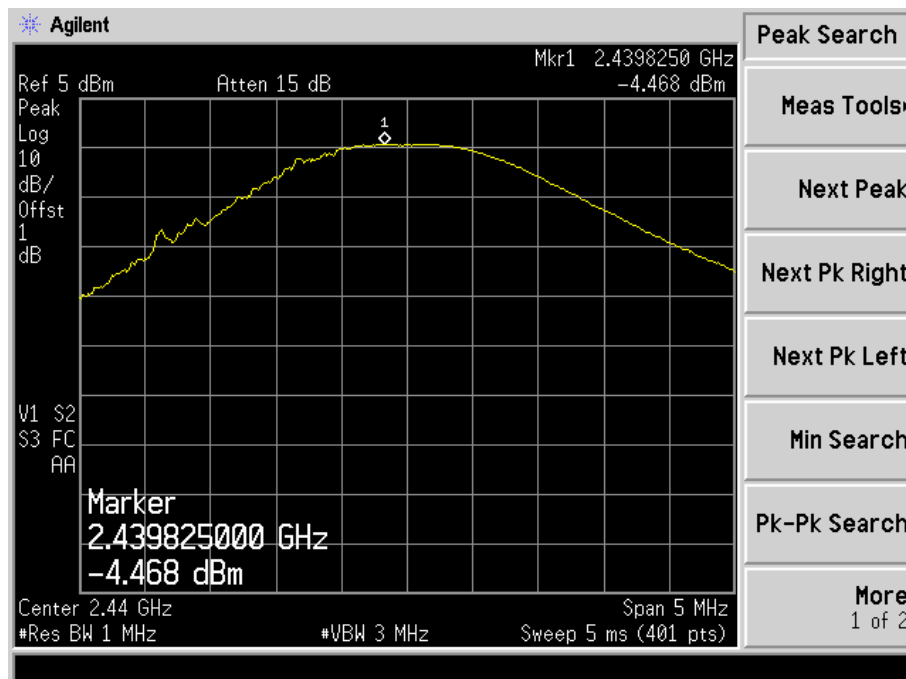
Note: the antenna gain of 0dBi less than 6dBi maximum permission antenna gain value based on 1 watt peak output power limit.

For BLE

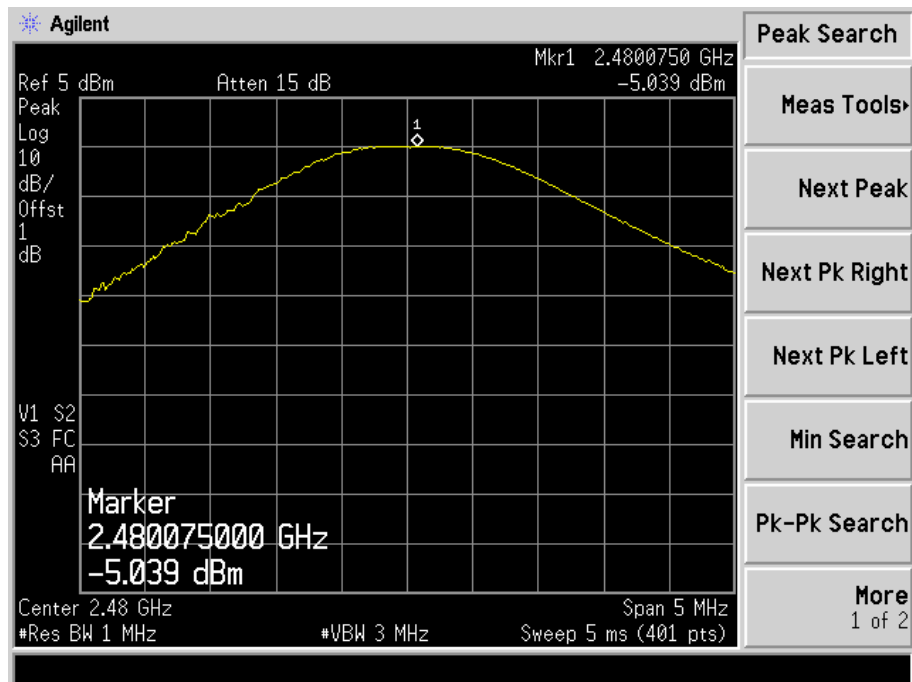
Low Channel:



Middle Channel:



High Channel:



8. Field Strength of Spurious Emissions

8.1 Standard Applicable

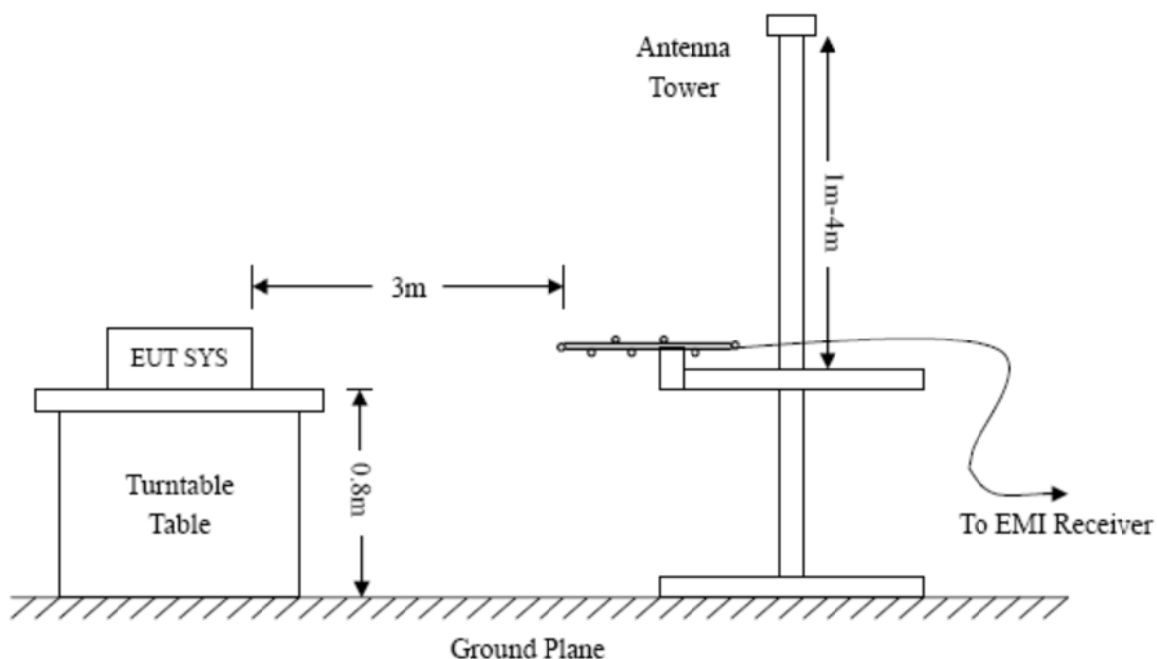
According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within 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).

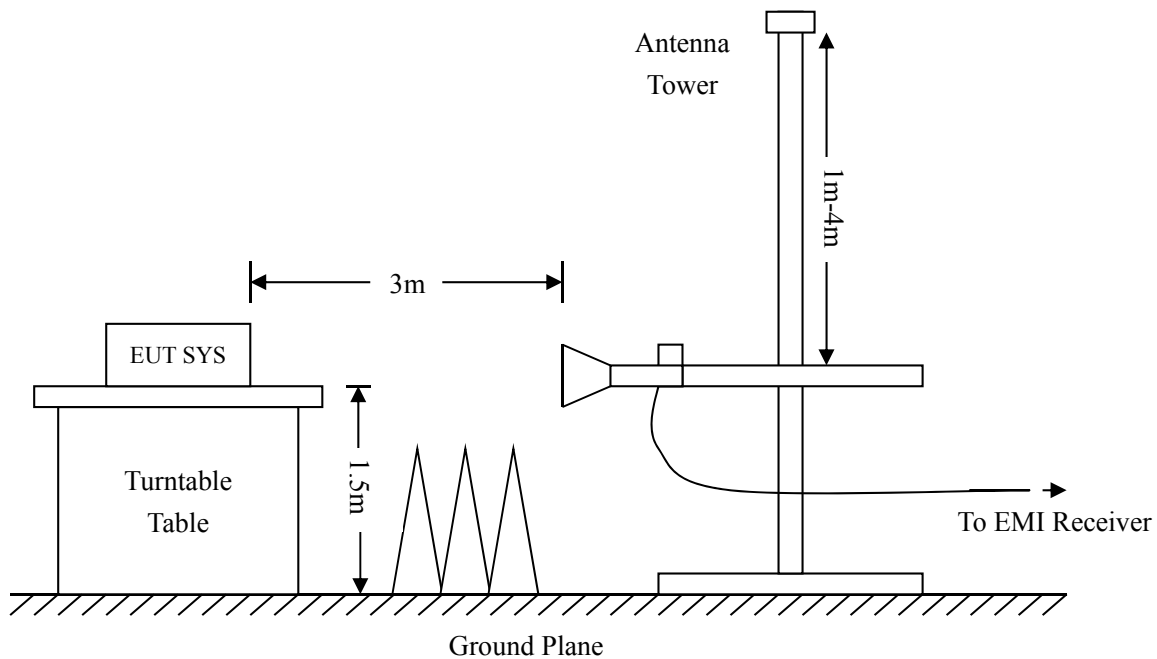
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

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

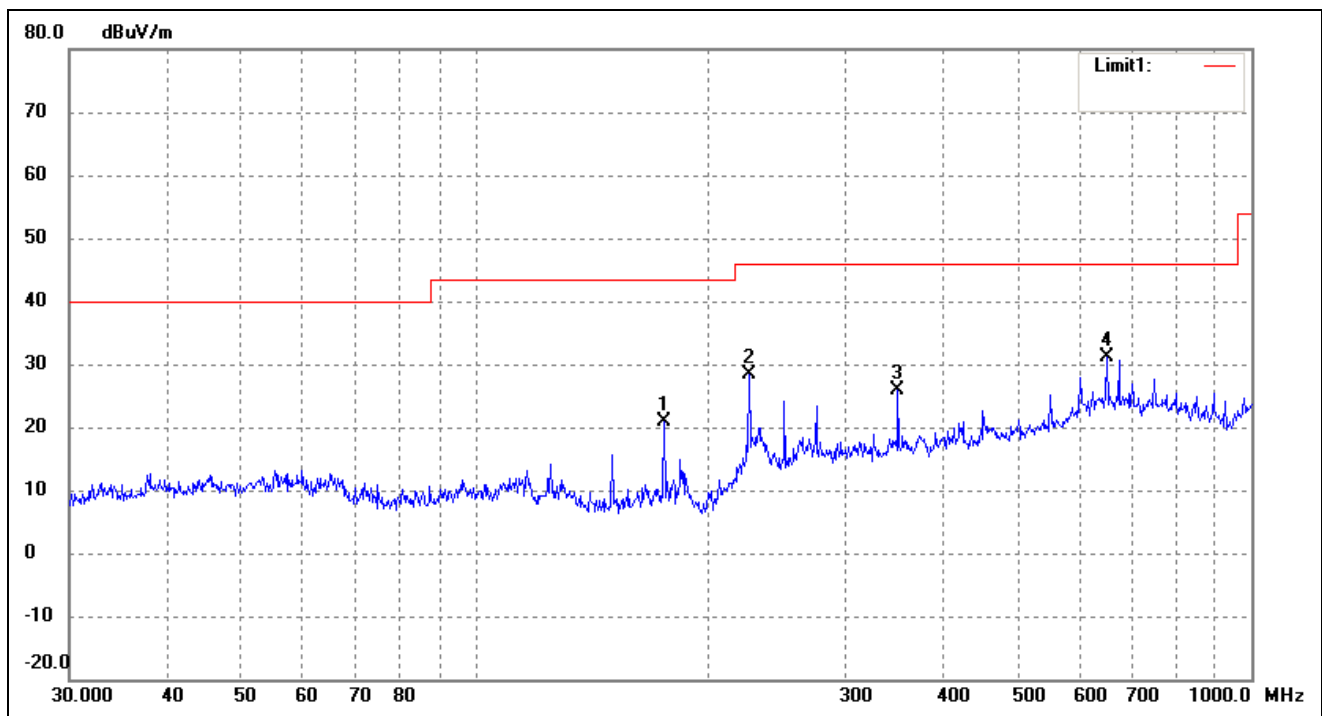
8.5 Summary of Test Results/Plots

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.

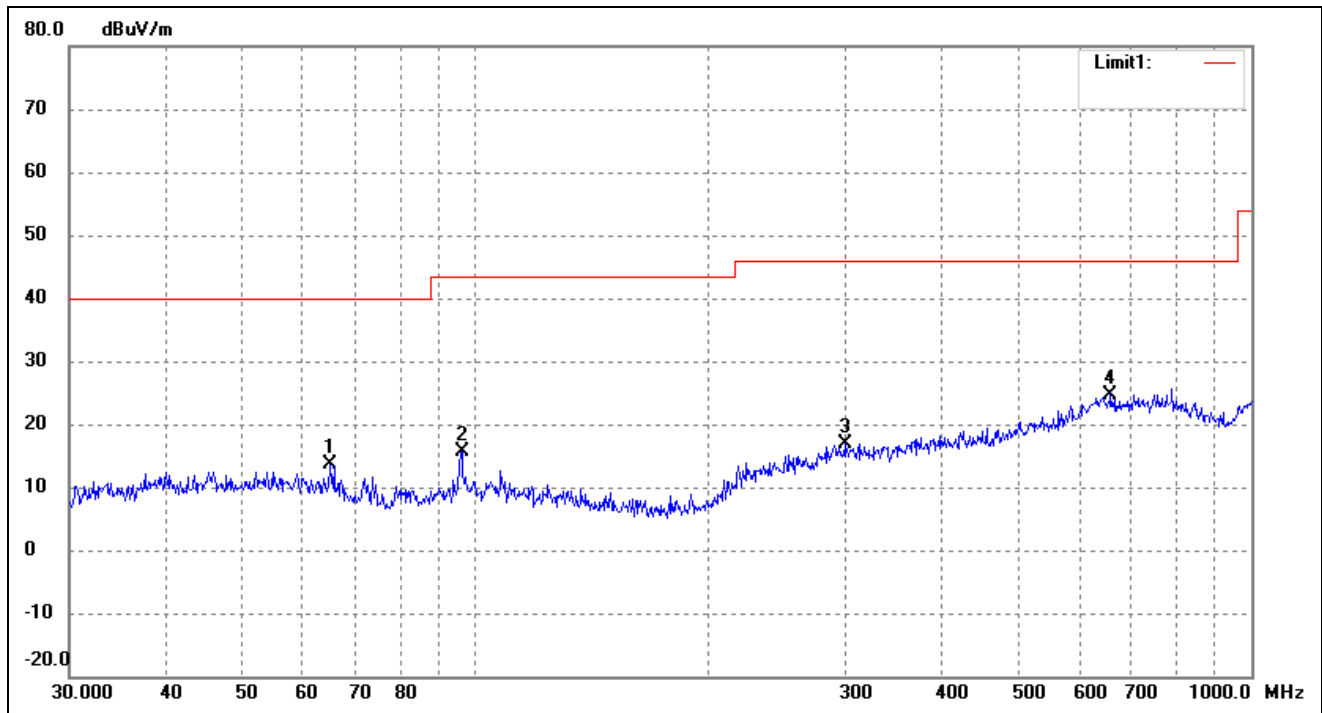
Plot of Radiated Emissions Test Data

EUT: Bluetooth Speaker
 Tested Model: TT-SP45
 Operating Condition: Transmitting-Low channel (2402MHz)
 Comment: DC 3.7V by Battery
 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	175.0368	40.03	-19.07	20.96	43.50	-22.54	211	100	peak
2	225.3080	41.91	-13.51	28.40	46.00	-17.60	99	100	peak
3	350.4768	35.12	-9.26	25.86	46.00	-20.14	315	100	peak
4	651.9417	32.53	-1.32	31.21	46.00	-14.79	106	100	peak

Test Specification: Vertical

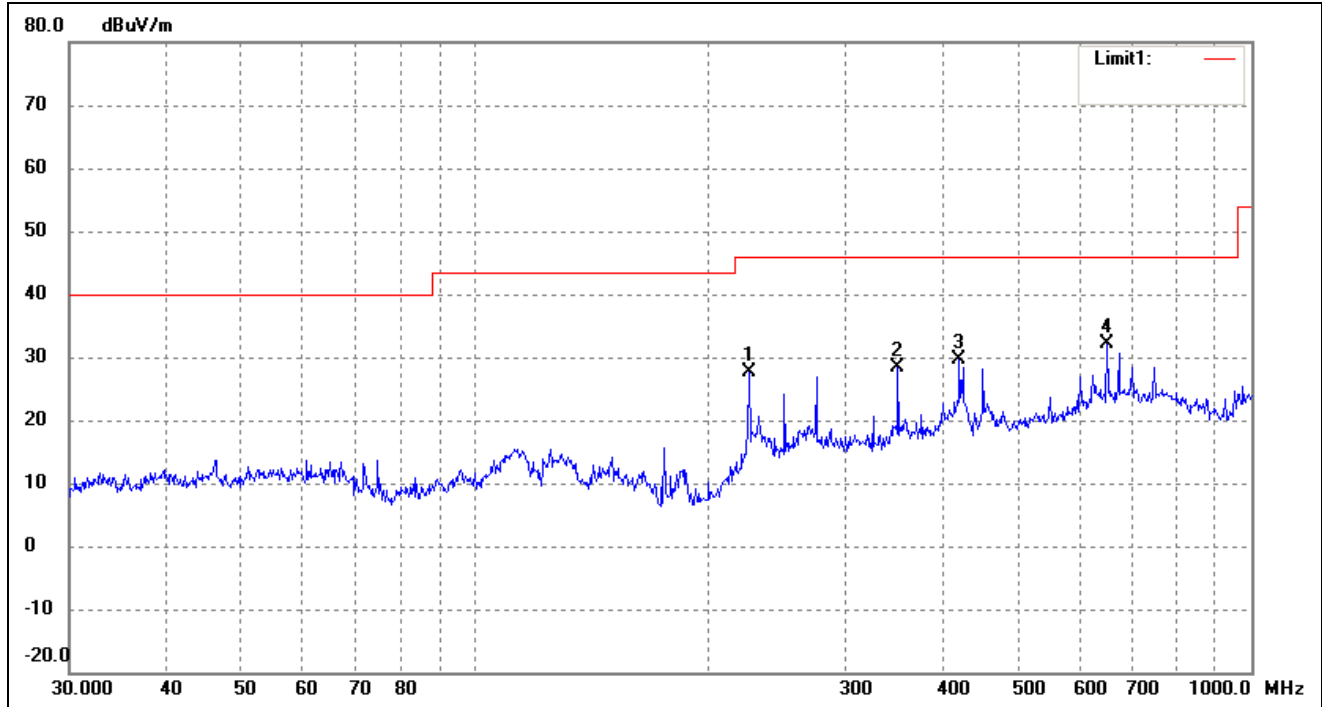


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	65.1145	31.33	-17.61	13.72	40.00	-26.28	285	100	peak
2	96.0986	32.88	-17.14	15.74	43.50	-27.76	97	100	peak
3	299.3158	26.59	-9.62	16.97	46.00	-29.03	210	100	peak
4	658.8362	26.22	-1.47	24.75	46.00	-21.25	100	100	peak

Operating Condition: Transmitting-Middle channel (2440MHz)

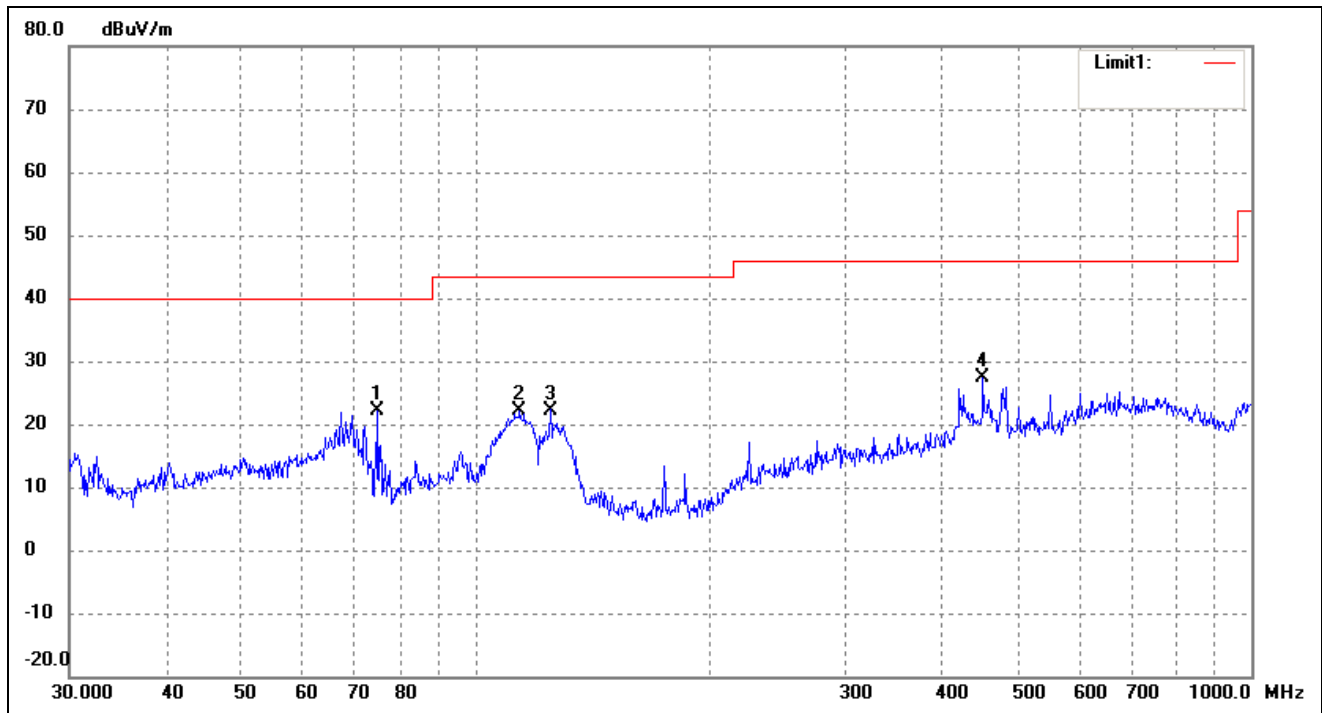
Comment: DC 3.7V by Battery

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	225.3080	41.03	-13.51	27.52	46.00	-18.48	51	100	peak
2	350.4768	37.59	-9.26	28.33	46.00	-17.67	317	100	peak
3	420.5803	37.83	-8.32	29.51	46.00	-16.49	93	100	peak
4	651.9417	33.46	-1.32	32.14	46.00	-13.86	99	100	peak

Test Specification: Vertical

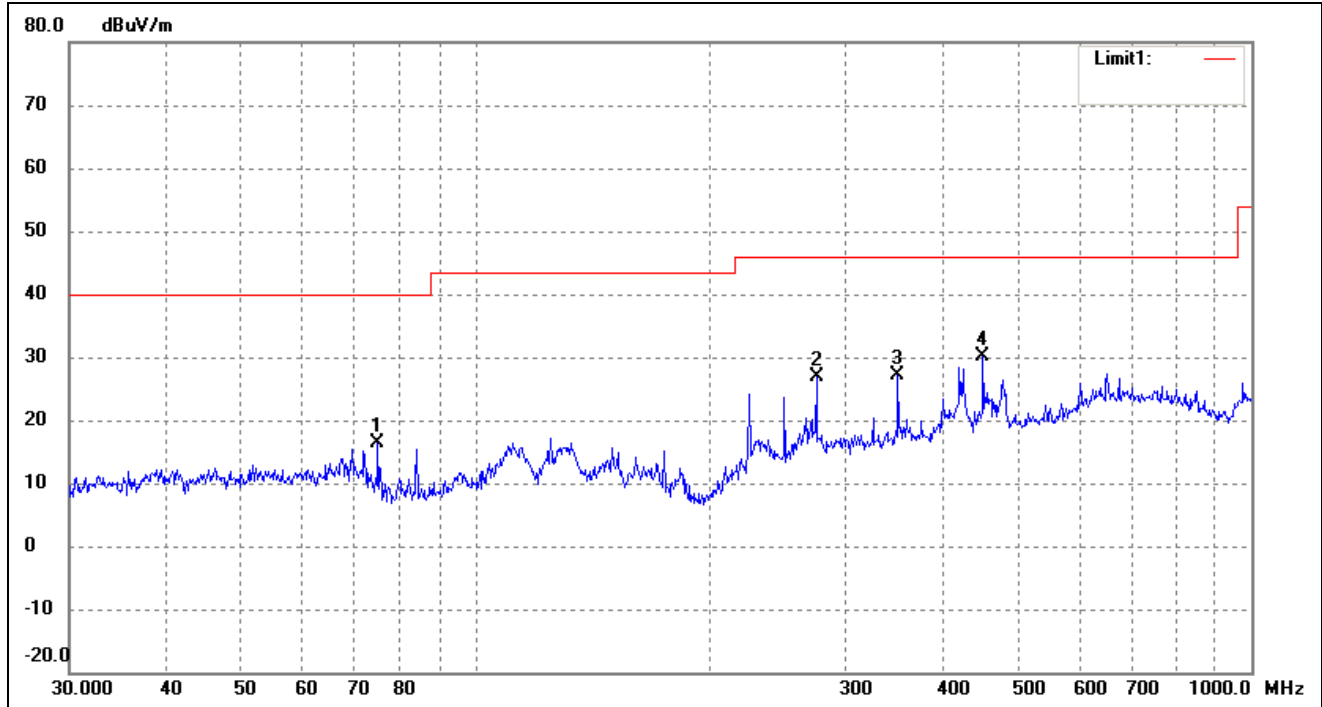


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	74.9191	41.42	-19.27	22.15	40.00	-17.85	203	100	peak
2	114.1138	38.78	-16.63	22.15	43.50	-21.35	184	100	peak
3	125.0066	39.33	-17.08	22.25	43.50	-21.25	88	100	peak
4	451.1350	34.53	-7.05	27.48	46.00	-18.52	125	100	peak

Operating Condition: Transmitting-High channel (2480MHz)

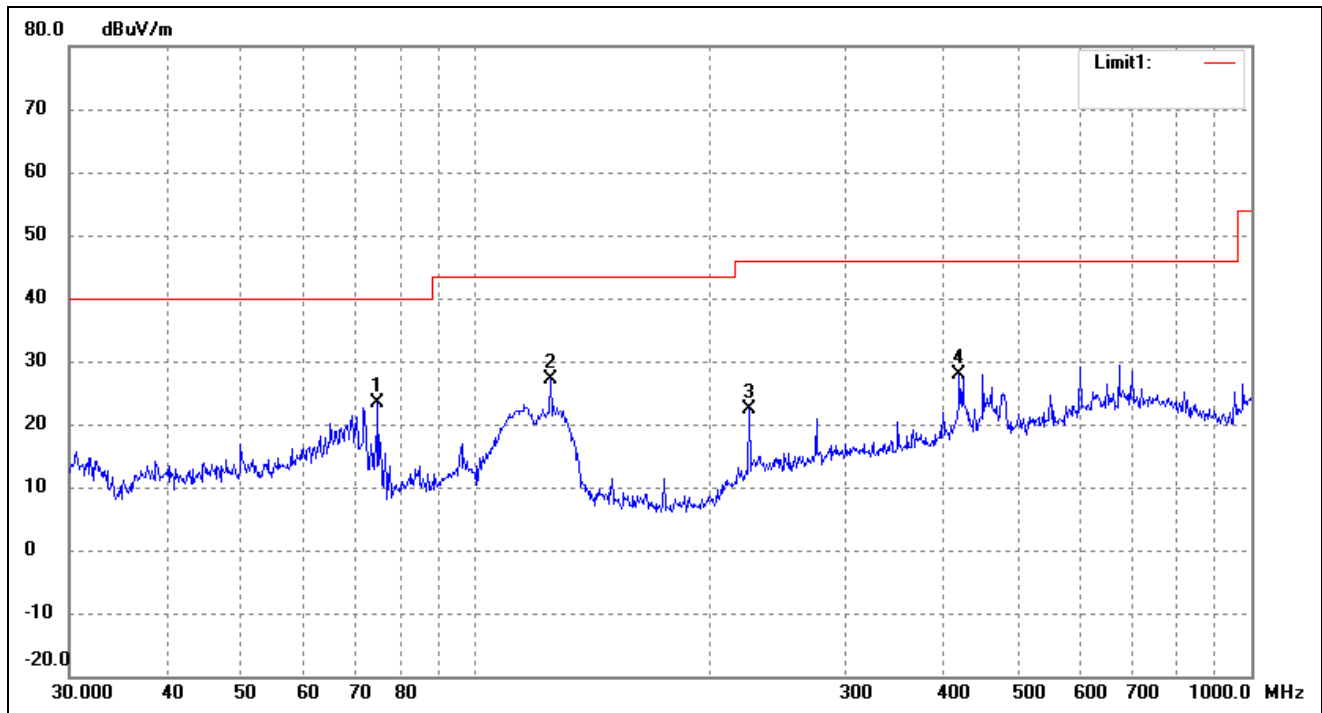
Comment: DC 3.7V by Battery

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	74.9191	35.73	-19.27	16.46	40.00	-23.54	143	100	peak
2	275.1570	37.66	-10.70	26.96	46.00	-19.04	99	100	peak
3	350.4768	36.50	-9.26	27.24	46.00	-18.76	141	100	peak
4	451.1350	37.12	-7.05	30.07	46.00	-15.93	113	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	74.9191	42.63	-19.27	23.36	40.00	-16.64	89	100	peak
2	125.0066	44.19	-17.08	27.11	43.50	-16.39	104	100	peak
3	225.3080	35.81	-13.51	22.30	46.00	-23.70	55	100	peak
4	420.5803	36.31	-8.32	27.99	46.00	-18.01	116	100	peak

Spurious Emissions Above 1GHz

Transmitting: BLE mode:

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2402MHz							
4804	57.46	-3.59	53.87	74	-20.13	H	PK
4804	46.25	-3.59	42.66	54	-11.34	H	AV
7206	56.38	-0.52	55.86	74	-18.14	H	PK
7206	45.42	-0.52	44.9	54	-9.1	H	AV
4804	59.42	-3.59	55.83	74	-18.17	V	PK
4804	43.92	-3.59	40.33	54	-13.67	V	AV
7206	58.54	-0.52	58.02	74	-15.98	V	PK
7206	46.17	-0.52	45.65	54	-8.35	V	AV
Middle Channel-2440MHz							
4880	58.88	-3.49	55.39	74	-18.61	H	PK
4880	48.47	-3.49	44.98	54	-9.02	H	AV
7320	59.63	-0.47	59.16	74	-14.84	H	PK
7320	46.24	-0.47	45.77	54	-8.23	H	AV
4880	58.69	-3.49	55.2	74	-18.8	V	PK
4880	46.21	-3.49	42.72	54	-11.28	V	AV
7320	57.41	-0.47	56.94	74	-17.06	V	PK
7320	43.69	-0.47	43.22	54	-10.78	V	AV
High Channel-2480MHz							
4960	56.32	-3.41	52.91	74	-21.09	H	PK
4960	45.54	-3.41	42.13	54	-11.87	H	AV
7440	56.38	-0.42	55.96	74	-18.04	H	PK
7440	42.58	-0.42	42.16	54	-11.84	H	AV
4960	59.65	-3.41	56.24	74	-17.76	V	PK
4960	46.35	-3.41	42.94	54	-11.06	V	AV
7440	56.32	-0.42	55.9	74	-18.1	V	PK
7440	48.32	-0.42	47.9	54	-6.1	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

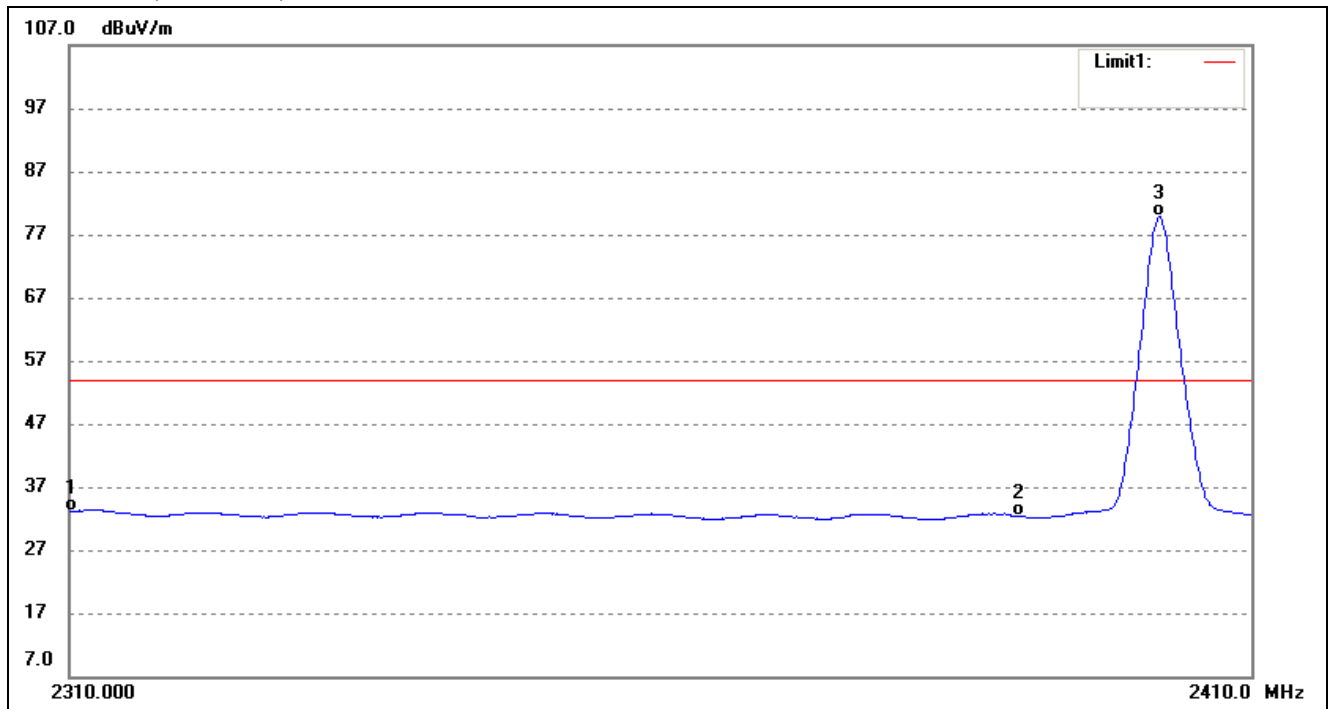
Temperature:	23°C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

9.4 Summary of Test Results/Plots

Bandedge (Radiated)

Lowest Bandedge-BLE

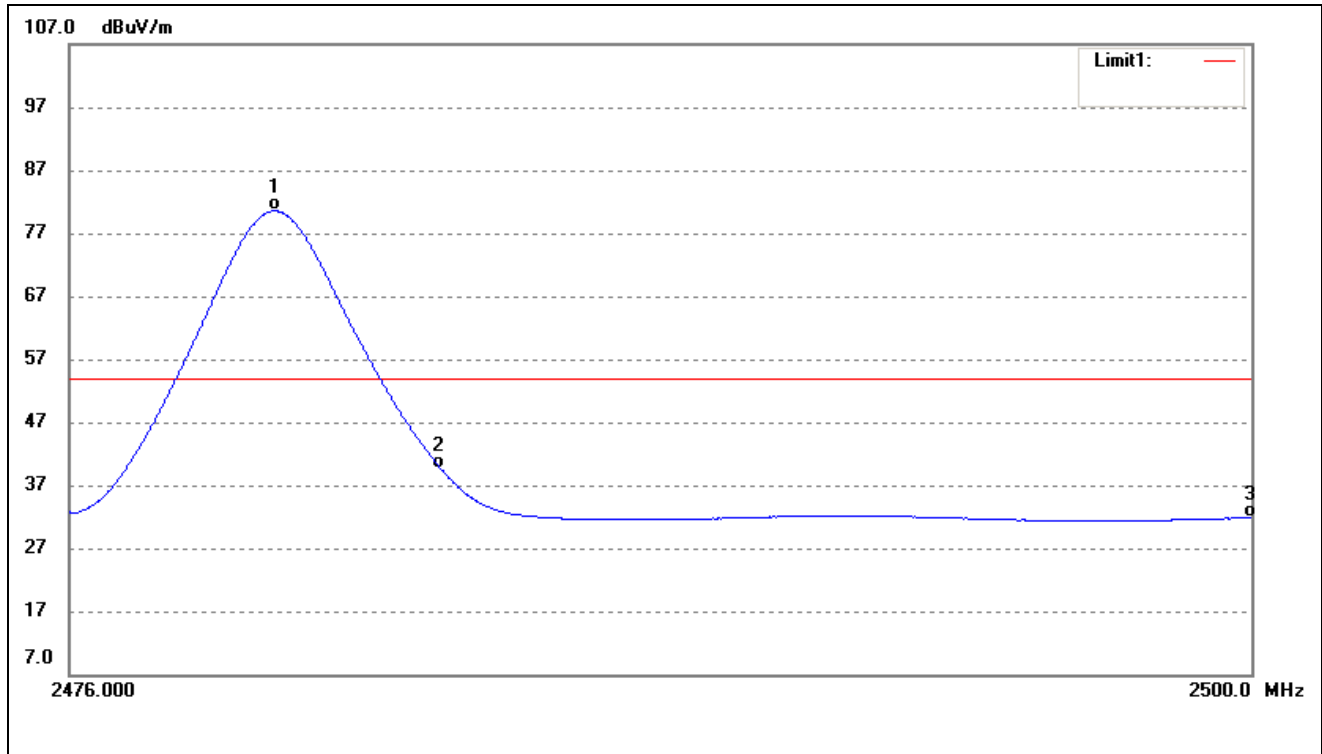
Horizontal (Worst case)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.00	39.50	-6.38	33.12	54.00	-20.88	Average Detector
	2310.00	51.87	-6.38	45.49	74.00	-28.51	Peak Detector
2	2390.00	39.62	-7.26	32.36	54.00	-21.64	Average Detector
	2390.00	52.21	-7.26	44.95	74.00	-29.05	Peak Detector
3	2402.05	87.26	-7.39	79.87	/	/	Average Detector
	2401.84	90.96	-7.39	83.57	/	/	Peak Detector

Highest Bandedge-BLE

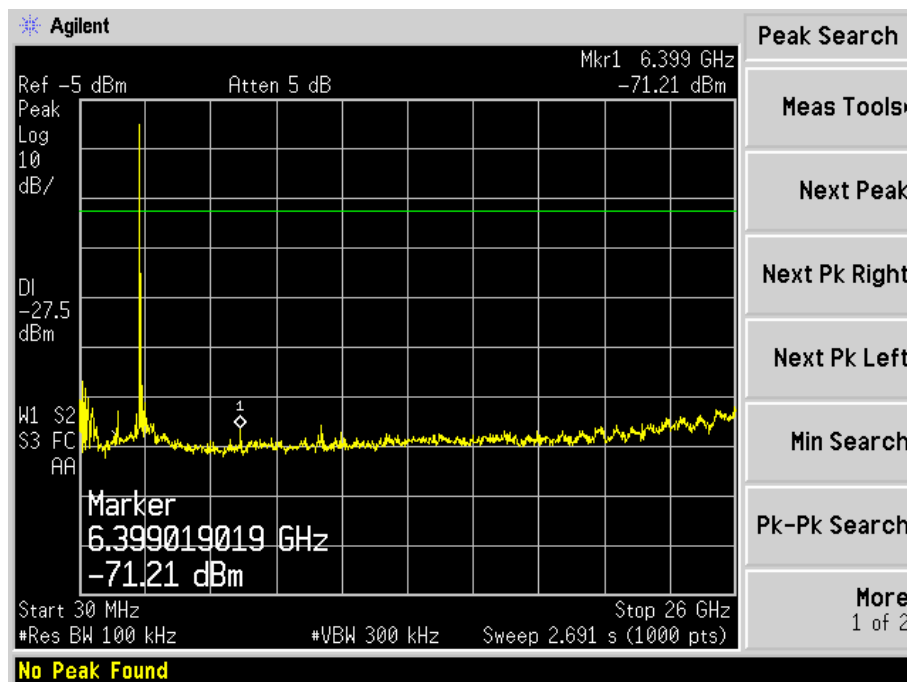
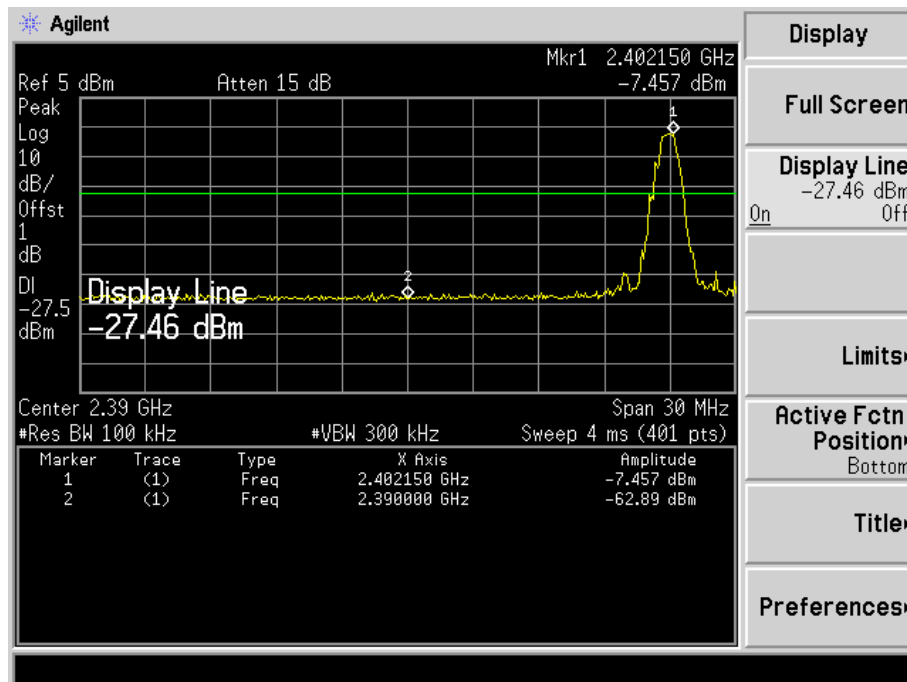
Horizontal (Worst case)



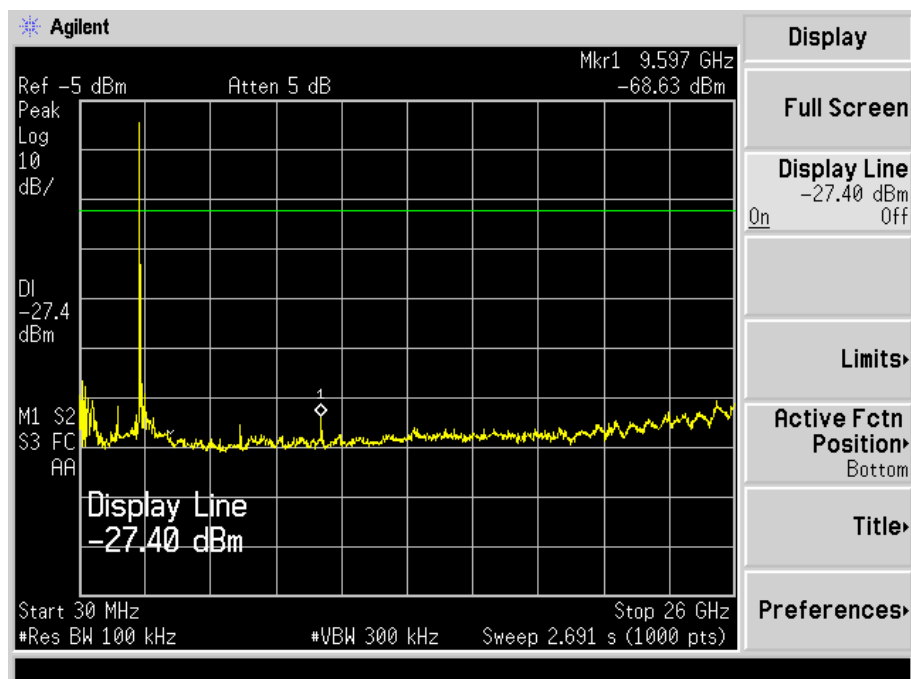
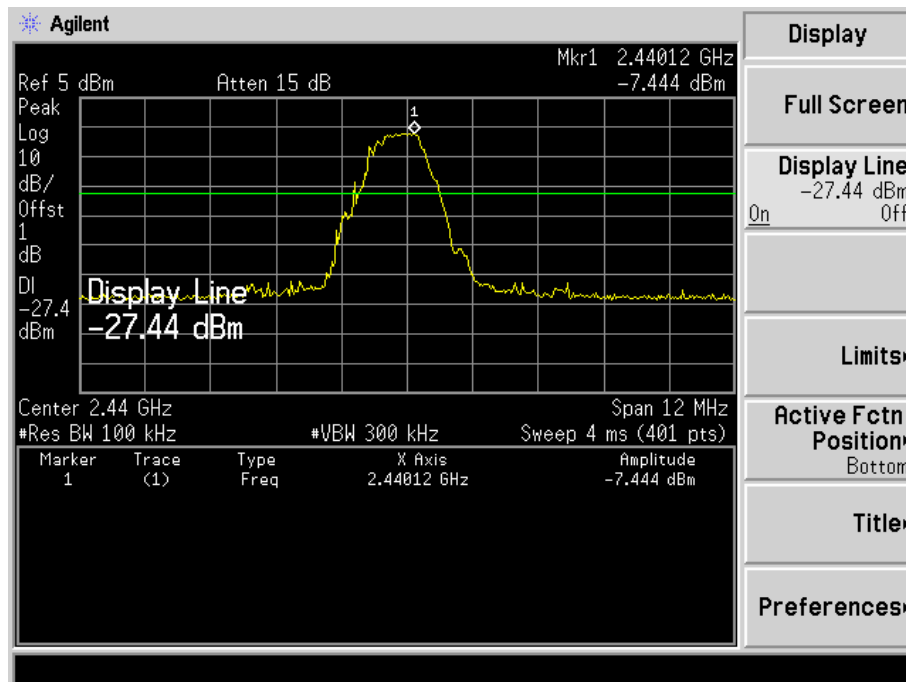
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2480.14	87.83	-7.28	80.55	/	/	Average Detector
	2480.30	88.35	-7.28	81.07	/	/	Peak Detector
2	2483.50	46.99	-7.28	39.71	54.00	-14.29	Average Detector
	2483.50	53.40	-7.28	46.12	74.00	-27.88	Peak Detector
3	2500.00	39.16	-7.25	31.91	54.00	-22.09	Average Detector
	2500.00	50.10	-7.25	42.85	74.00	-31.15	Peak Detector

Bandedge (Conducted)

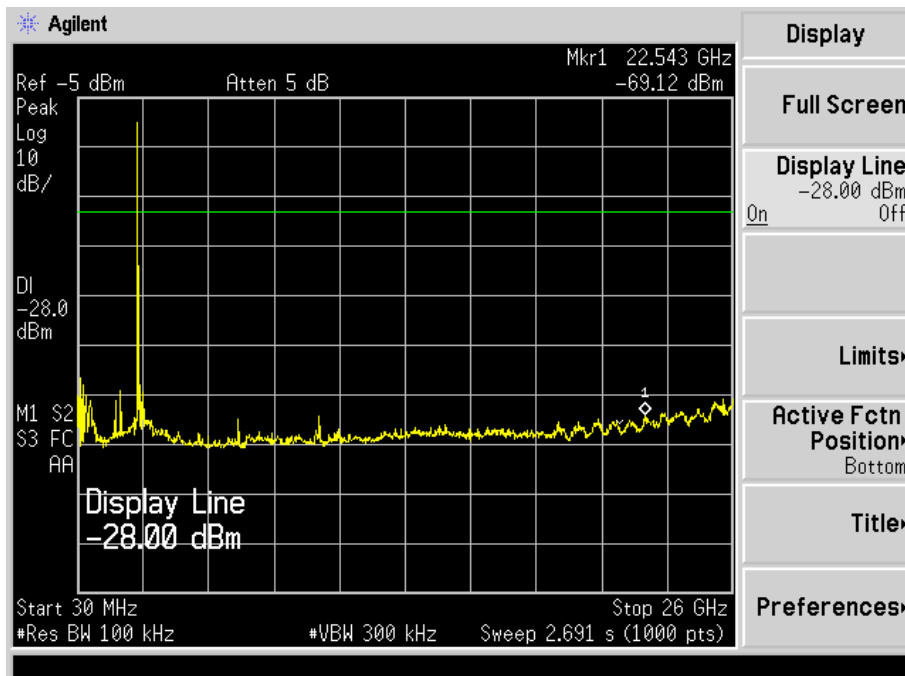
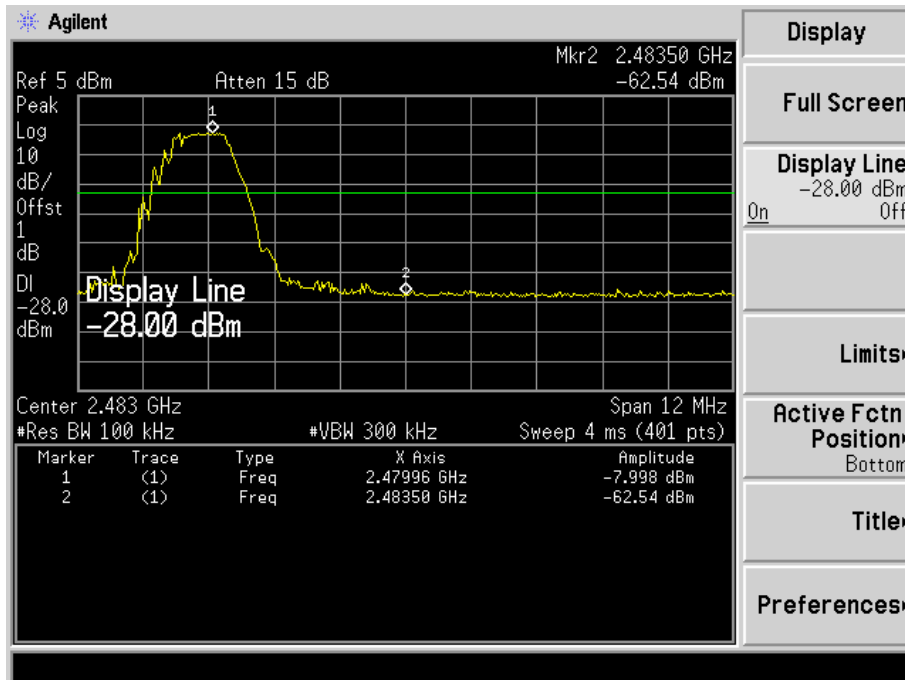
Lowest



Middle Channel:



High Channel:



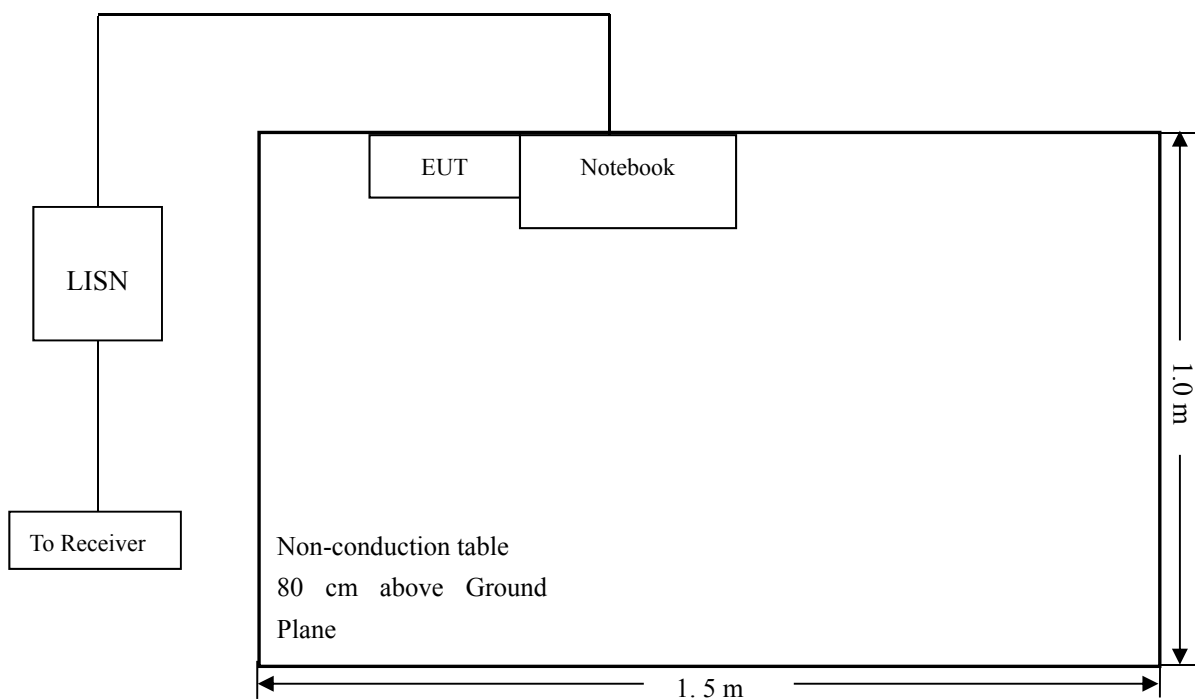
10. Conducted Emissions

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:

-2.58 dB at 0.9140 MHz in the **Neutral, QP** detector, 0.15-30MHz

10.6 Conducted Emissions Test Data

Plot of Conducted Emissions Test Data

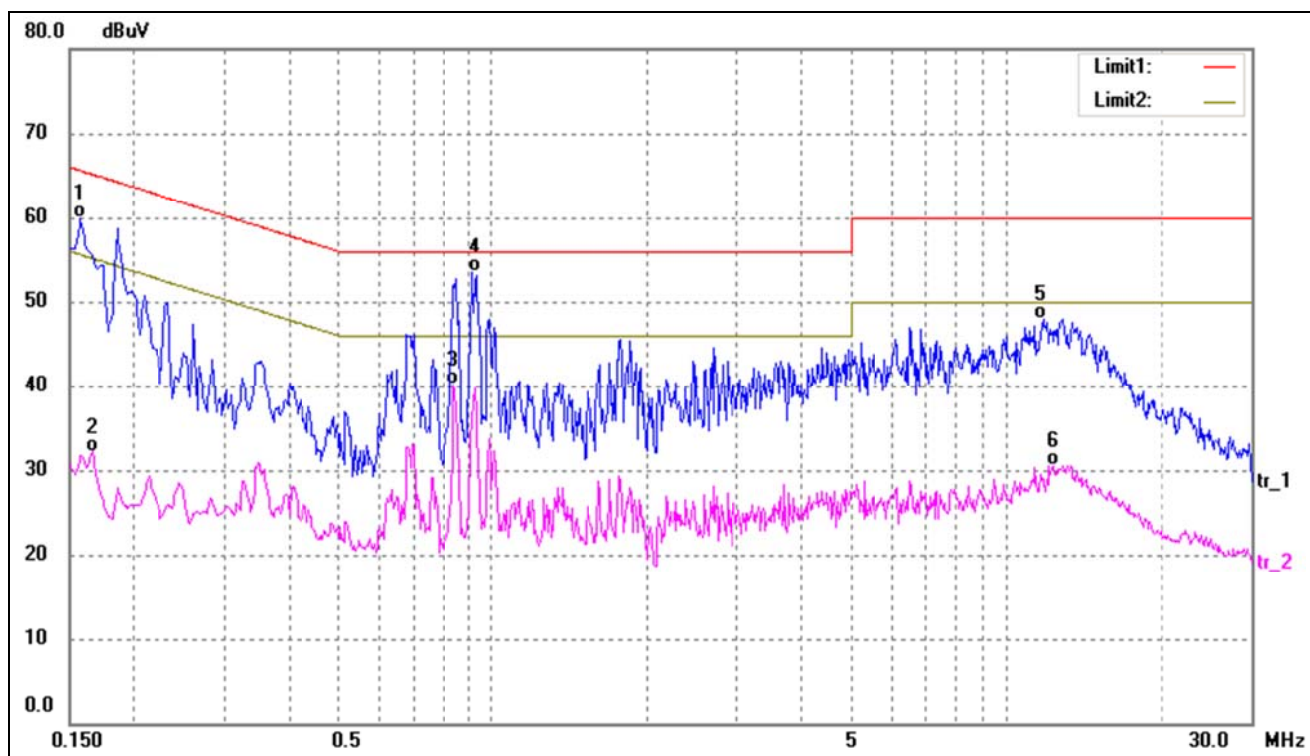
EUT: Bluetooth Speaker

Tested Model: TT-SP45

Operating Condition: Transmitting

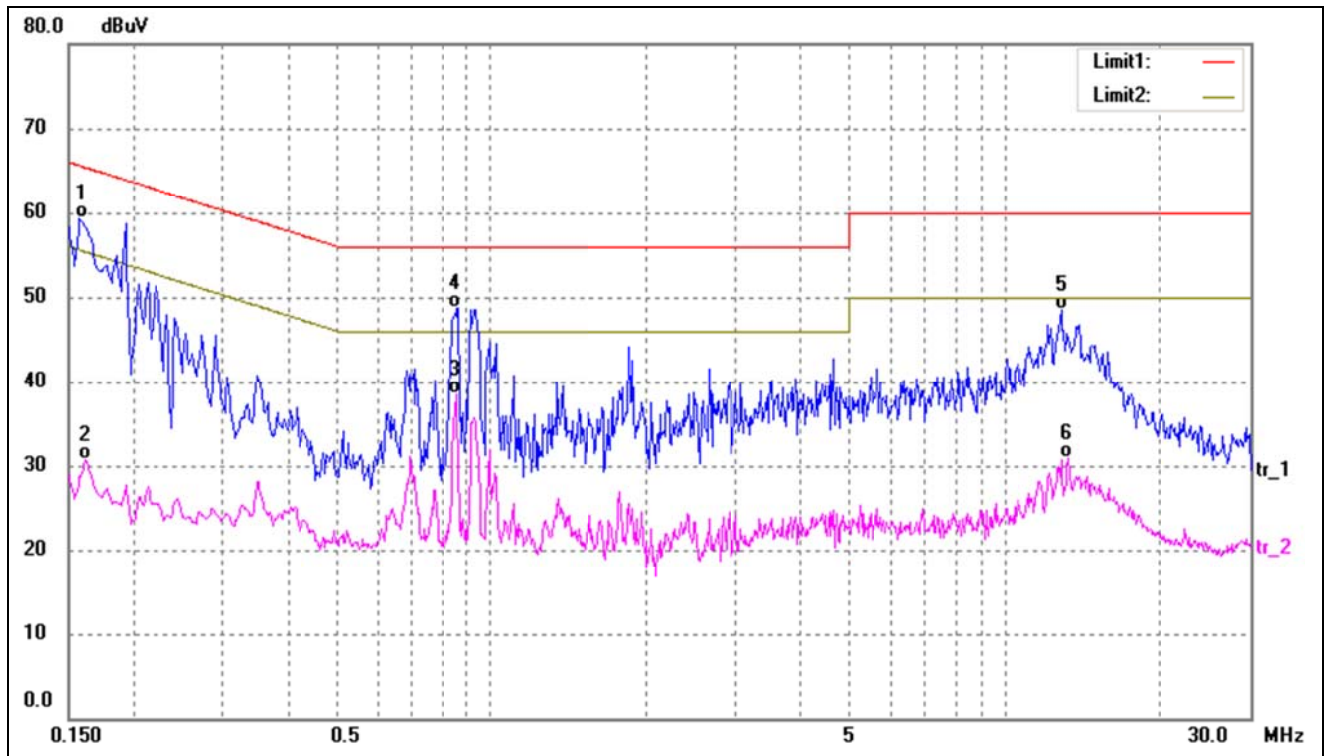
Comment: AC 120V/60Hz

Test Specification: Neutral



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1580	50.08	9.84	59.92	65.57	-5.65	QP
2	0.1660	22.37	9.83	32.20	55.16	-22.96	AVG
3	0.8420	30.26	9.77	40.03	46.00	-5.97	AVG
4*	0.9140	43.65	9.77	53.42	56.00	-2.58	QP
5	11.8340	38.31	9.55	47.86	60.00	-12.14	QP
6	12.3980	20.97	9.56	30.53	50.00	-19.47	AVG

Test Specification: Line



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1*	0.1580	49.42	9.84	59.26	65.57	-6.31	QP
2	0.1620	20.89	9.84	30.73	55.36	-24.63	AVG
3	0.8540	28.68	9.77	38.45	46.00	-7.55	AVG
4	0.8620	39.00	9.77	48.77	56.00	-7.23	QP
5	12.8740	39.03	9.57	48.60	60.00	-11.40	QP
6	13.2820	21.32	9.58	30.90	50.00	-19.10	AVG

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