

FCC Test Report

Product Name	23.1 inches Bar type Digital Signage
Model No.	D230
FCC ID.	S8CD230

Applicant	Shuttle Inc.
Address	No.30,Lane76,Rei Kuang Rd.,Nei-Hu Dist.,Taipei, Taiwan R.O.C.

Date of Receipt	Aug. 29, 2019
Issued Date	Nov. 12, 2019
Report No.	1980460R-RFUSP01V00-A
Report Version	V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.

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Test Report

Issued Date: Nov. 12, 2019

Report No.: 1980460R-RFUSP01V00-A



Product Name	23.1 inches Bar type Digital Signage
Applicant	Shuttle Inc.
Address	No.30,Lane76,Rei Kuang Rd.,Nei-Hu Dist.,Taipei, Taiwan R.O.C.
Manufacturer	Shuttle Inc.
Model No.	D230
FCC ID.	S8CD230
EUT Rated Voltage	AC 100-240V, 50-60Hz
EUT Test Voltage	AC 120V / 60Hz
Trade Name	Shuttle
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C ANSI C63.4: 2014, ANSI C63.10: 2013
Test Result	Complied

Documented By :



(Senior Adm. Specialist / Rita Huang)

Tested By :



(Engineer / Jay Su)

Approved By :



(Director / Vincent Lin)

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Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	23.1 inches Bar type Digital Signage
Trade Name	Shuttle
Model No.	D230
FCC ID.	S8CD230
Frequency Range	2402 – 2480MHz
Channel Number	V5.0: 40CH
Type of Modulation	V5.0: GFSK(1Mbps)/(2Mbps)
Antenna Type	PCB Antenna
Channel Control	Auto
Antenna Gain	Refer to the table “Antenna List”
Power Adapter	MFR: APD, M/N: WA-24Q12FU Input: 100-240V, 50-60Hz, 0.7A Output: 12V, 2A Cable out: Non-Shielded, 1.8m, with one ferrite core bonded.

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	WGT	43R-D23001-0300	PCB Antenna	3.2dBi for 2.4 GHz

Note: The antenna of EUT is conforming to FCC 15.203.

Center Frequency of Each Channel: (For V5.0)

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 00:	2402 MHz	Channel 01:	2404 MHz	Channel 02:	2406 MHz	Channel 03:	2408 MHz
Channel 04:	2410 MHz	Channel 05:	2412 MHz	Channel 06:	2414 MHz	Channel 07:	2416 MHz
Channel 08:	2418 MHz	Channel 09:	2420 MHz	Channel 10:	2422 MHz	Channel 11:	2424 MHz
Channel 12:	2426 MHz	Channel 13:	2428 MHz	Channel 14:	2430 MHz	Channel 15:	2432 MHz
Channel 16:	2434 MHz	Channel 17:	2436 MHz	Channel 18:	2438 MHz	Channel 19:	2440 MHz
Channel 20:	2442 MHz	Channel 21:	2444 MHz	Channel 22:	2446 MHz	Channel 23:	2448 MHz
Channel 24:	2450 MHz	Channel 25:	2452 MHz	Channel 26:	2454 MHz	Channel 27:	2456 MHz
Channel 28:	2458 MHz	Channel 29:	2460 MHz	Channel 30:	2462 MHz	Channel 31:	2464 MHz
Channel 32:	2466 MHz	Channel 33:	2468 MHz	Channel 34:	2470 MHz	Channel 35:	2472 MHz
Channel 36:	2474 MHz	Channel 37:	2476 MHz	Channel 38:	2478 MHz	Channel 39:	2480 MHz

Note:

1. The EUT is a 23.1 inches Bar type Digital Signage, Contains functions and so on WLAN (802.11a/b/g/n/ac) with Bluetooth (5.0 and V3.0, V2.1+EDR) combo card module transceiver, this report for BT 5.0
2. These tests were conducted on a sample for the purpose of demonstrating compliance of Bluetooth transmitter with Part 15 Subpart C Paragraph 15.247 for spread spectrum devices.
3. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
4. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

Test Mode	Mode 1: Transmit - BLE (GFSK)-1Mbps Mode 2: Transmit - BLE (GFSK)-2Mbps
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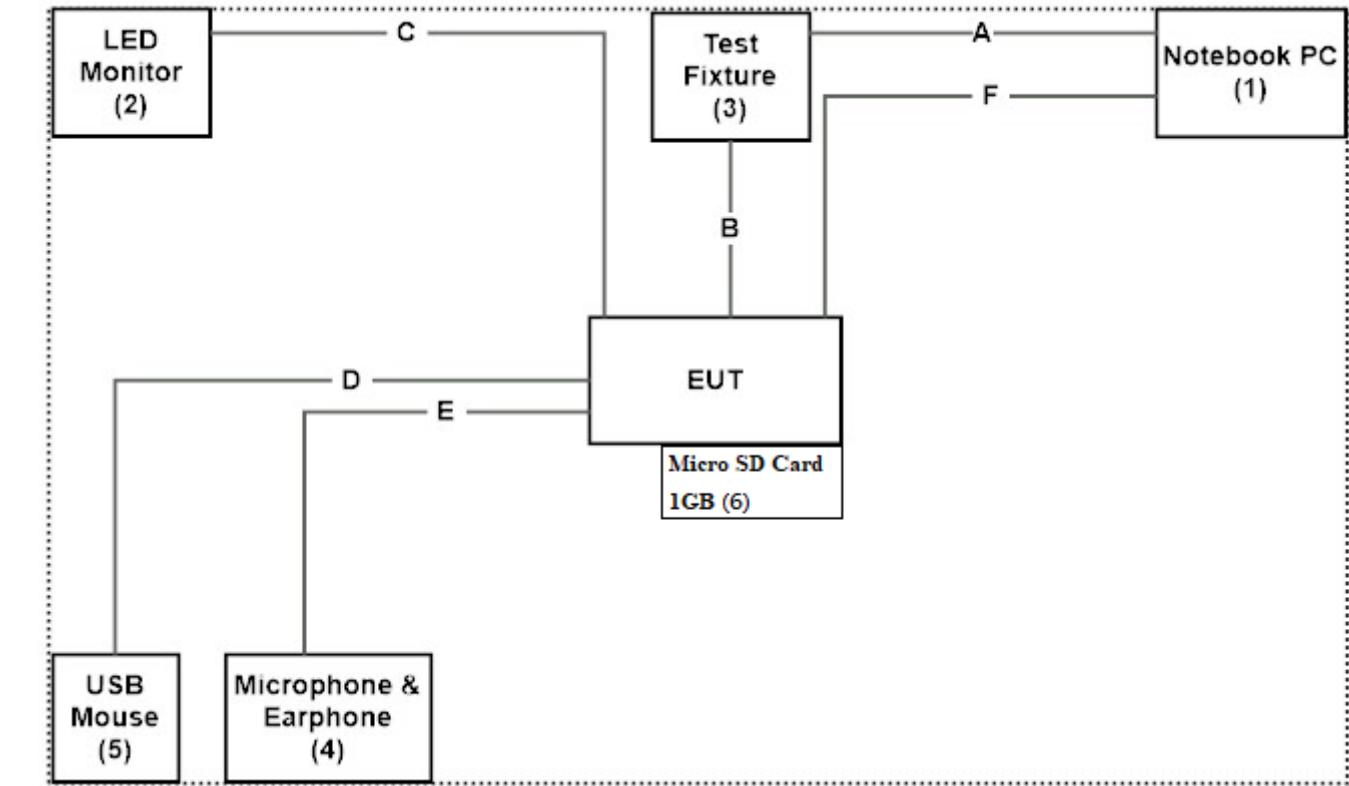
1.3. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product	Manufacturer	Model No.	Serial No.	Power Cord
1 Notebook PC	DELL	Latitude 5491	1PL56S2	Non-Shielded, 0.8m
2 LED Monitor	ViewSonic	VX2257-mhd	UFY163502150	Non-Shielded, 1.8m
3 Test Fixture	N/A	N/A	N/A	N/A
4 Microphone & Earphone	RONEVER	MOE241	N/A	N/A
5 USB Mouse	Logitech	M-U0026	1245HS0684F8	N/A
6 Micro SD Card 1GB	SanDisk	N/A	0801002841D2N	N/A

Signal Cable Type	Signal cable Description
A Test Fixture Cable	Non-Shielded, 1.2m
B Test Fixture Cable	Non-Shielded, 0.2m
C HDMI Cable	Non-Shielded, 1.8m
D USB Cable	Shielded, 1.8m
E Microphone & Earphone Cable	Non-Shielded, 1.2m
F LAN Cable	Non-Shielded, 2.0m

1.4. Configuration of Tested System



1.5. EUT Exercise Software

1. Setup the EUT as shown in Section 1.4.
2. Execute software "Ampak RF Test Tool (Ver6.1)" on the Notebook PC.
3. Configure the test mode, the test channel, and the data rate.
4. Press "OK" to start the continuous Transmit.
5. Verify that the EUT works properly.

1.6. Test Facility

Ambient conditions in the laboratory:

Performed Item	Items	Required	Actual
Conducted Emission	Temperature (°C)	10~40 °C	23°C
	Humidity (%RH)	10~90 %	70%
Radiated Emission	Temperature (°C)	10~40 °C	25°C
	Humidity (%RH)	10~90 %	72%
Conductive	Temperature (°C)	10~40 °C	23°C
	Humidity (%RH)	10~90 %	70%

USA : FCC Registration Number: TW3023

Canada : IC Registration Number: 4075A

Site Description: Accredited by TAF
Accredited Number: 3023

Test Laboratory: DEKRA Testing and Certification Co., Ltd

Address: No.5-22, Ruishukeng, Linkou Dist., New Taipei City 24451,
Taiwan, R.O.C.

Phone number: 886-2-8601-3788

Fax number: 886-2-8601-3789

Email address: info.tw@dekra.com

Website: <http://www.dekra.com.tw>

1.7. List of Test Equipment

For Conducted measurements /CB3/SR8

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Date	Due. Date
	Temperature Chamber	WIT GROUP	TH-1S-B	EQ-201-00146	2019/02/12	2020/02/11
X	Spectrum Analyzer	Agilent	N9010A	MY48030495	2019/10/13	2020/10/12
X	Peak Power Analyzer	Keysight	8990B	MY51000410	2019/08/01	2020/07/31
X	Wideband Power Sensor	Keysight	N1923A	MY56080003	2019/07/25	2020/07/24
X	Wideband Power Sensor	Keysight	N1923A	MY56080004	2019/07/25	2020/07/24
X	EMI Test Receiver	R&S	ESCS 30	100369	2019/11/07	2020/11/06
X	LISN	R&S	ESH3-Z5	836679/017	2019/02/09	2020/02/08
X	LISN	R&S	ENV216	100097	2019/02/09	2020/02/08
X	Coaxial Cable	DEKRA	RG 400	LC018-RG	2019/06/21	2020/06/20

For Radiated measurements /Site3/CB8

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Date	Due. Date
X	Spectrum Analyzer	R&S	FSP40	100170	2019/03/12	2020/03/11
X	Loop Antenna	Teseq	HLA6121	37133	2019/10/13	2020/10/12
X	Bilog Antenna	Schaffner Chase	CBL6112B	2707	2019/06/24	2020/06/23
X	Coaxial Cable	DEKRA	RG 214	LC003-RG	2019/06/14	2020/06/13
X	Pre-Amplifier	Jet-Power	JPA-10M1G33	170101000330010	2019/06/14	2020/06/13
X	Horn Antenna	ETS-Lindgren	3117	00135205	2019/05/03	2020/05/02
	Pre-Amplifier	EMCI	EMC012630SE	980210	2019/04/10	2020/04/09
	Horn Antenna	Com-Power	AH-1840	101043	2019/01/09	2020/01/08
	Amplifier + Cable	EMCI	EMC184045SE	980370	2019/03/21	2020/03/20
	Filter	MICRO-TRONICS	BRM50702	G270	2019/08/06	2020/08/05
	Filter	MICRO-TRONICS	BRM50716	G196	2019/08/06	2020/08/05

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version : QuieTek EMI 2.0 V2.1.113.

1.8. Uncertainty

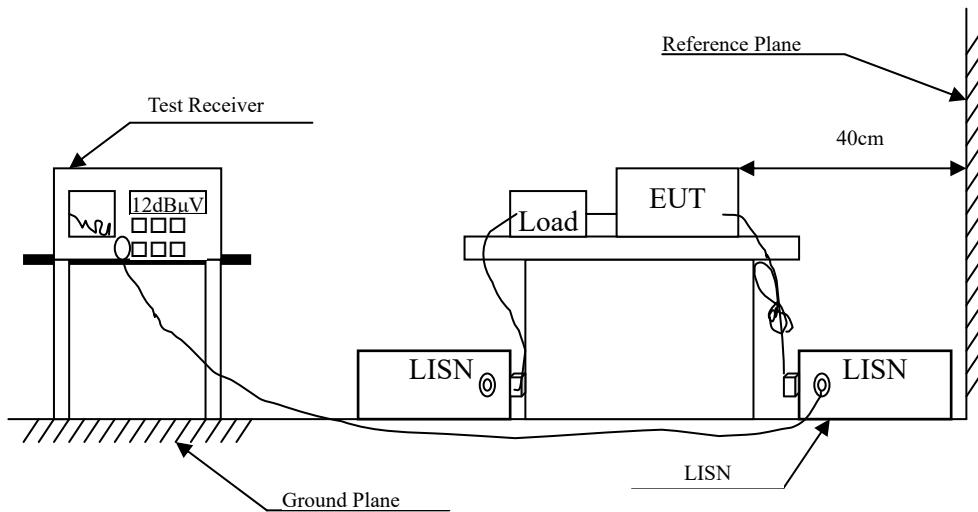
Uncertainties have been calculated according to the DEKRA internal document, and is described in each test chapter of this report.

The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%.

Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

2. Conducted Emission

2.1. Test Setup



2.2. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dB μ V) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

Remarks: In the above table, the tighter limit applies at the band edges.

2.3. Test Procedure

The EUT and Peripherals are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

The EUT was setup to ANSI C63.4, 2014; tested to DTS test procedure of FCC KDB-558074 for compliance to FCC 47CFR Subpart C requirements.

2.4. Uncertainty

± 2.26 dB

2.5. Test Result of Conducted Emission

Product : 23.1 inches Bar type Digital Signage
 Test Item : Conducted Emission Test
 Test date : 2019/10/04
 Test Mode : Mode 1: Transmit - BLE (GFSK)-1Mbps (2440MHz)

Line1



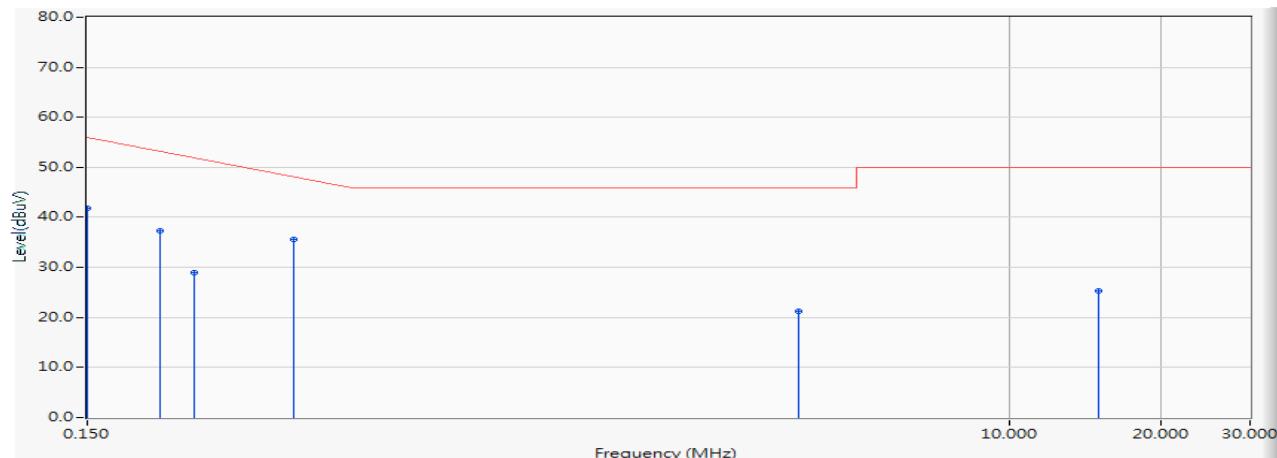
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1	*	0.150	9.668	45.140	54.808	-11.192	66.000	QUASIPEAK
2		0.209	9.671	39.480	49.151	-15.163	64.314	QUASIPEAK
3		0.244	9.673	31.740	41.413	-21.901	63.314	QUASIPEAK
4		0.384	9.680	30.340	40.020	-19.294	59.314	QUASIPEAK
5		3.822	9.837	20.720	30.557	-25.443	56.000	QUASIPEAK
6		15.017	10.103	22.020	32.123	-27.877	60.000	QUASIPEAK

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : 23.1 inches Bar type Digital Signage
 Test Item : Conducted Emission Test
 Test date : 2019/10/04
 Test Mode : Mode 1: Transmit - BLE (GFSK)-1Mbps (2440MHz)

Line1



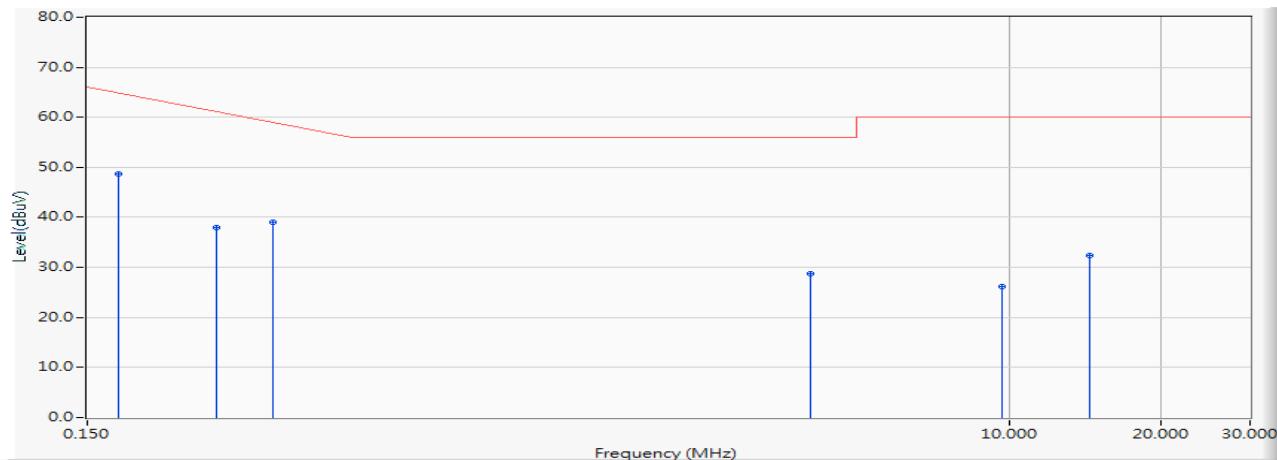
	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1	0.150	9.668	32.240	41.908	-14.092	56.000	AVERAGE
2	0.209	9.671	27.690	37.361	-16.953	54.314	AVERAGE
3	0.244	9.673	19.240	28.913	-24.401	53.314	AVERAGE
4	* 0.384	9.680	25.860	35.540	-13.774	49.314	AVERAGE
5	3.822	9.837	11.370	21.207	-24.793	46.000	AVERAGE
6	15.017	10.103	15.160	25.263	-24.737	50.000	AVERAGE

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : 23.1 inches Bar type Digital Signage
 Test Item : Conducted Emission Test
 Test date : 2019/10/04
 Test Mode : Mode 1: Transmit - BLE (GFSK)-1Mbps (2440MHz)

Line2



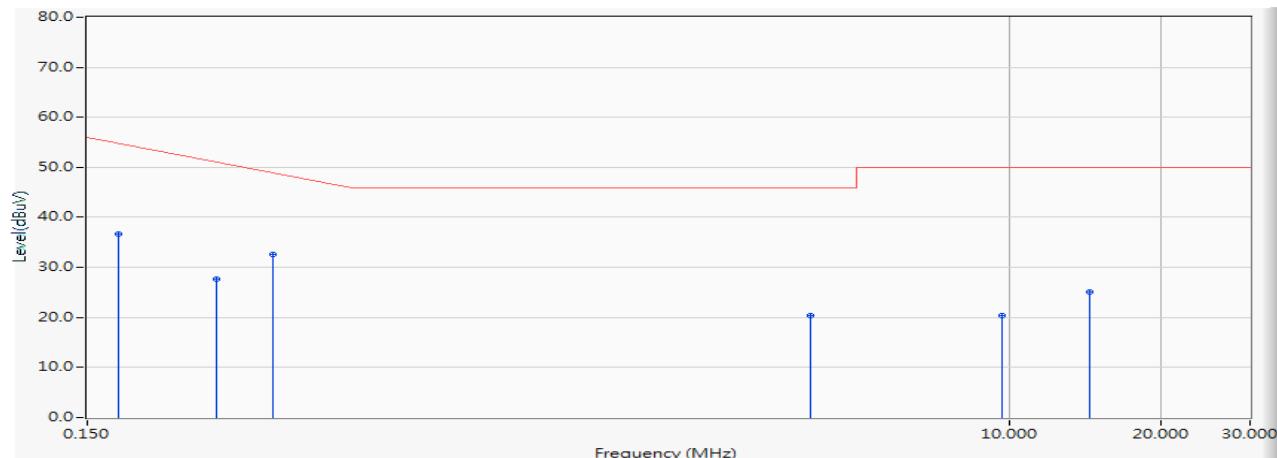
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1	*	0.173	9.704	38.920	48.624	-16.719	65.343	QUASIPEAK
2		0.271	9.704	28.300	38.004	-24.539	62.543	QUASIPEAK
3		0.349	9.709	29.400	39.109	-21.205	60.314	QUASIPEAK
4		4.052	9.882	18.940	28.822	-27.178	56.000	QUASIPEAK
5		9.713	10.082	16.100	26.182	-33.818	60.000	QUASIPEAK
6		14.478	10.213	22.180	32.393	-27.607	60.000	QUASIPEAK

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : 23.1 inches Bar type Digital Signage
 Test Item : Conducted Emission Test
 Test date : 2019/10/04
 Test Mode : Mode 1: Transmit - BLE (GFSK)-1Mbps (2440MHz)

Line2



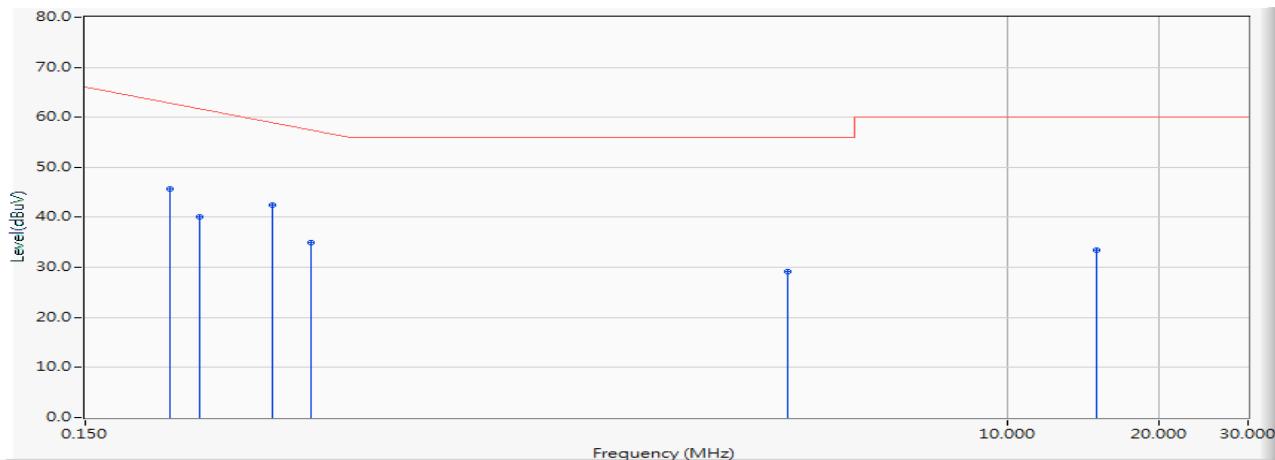
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.173	9.704	27.010	36.714	-18.629	55.343	AVERAGE
2		0.271	9.704	18.000	27.704	-24.839	52.543	AVERAGE
3	*	0.349	9.709	22.820	32.529	-17.785	50.314	AVERAGE
4		4.052	9.882	10.410	20.292	-25.708	46.000	AVERAGE
5		9.713	10.082	10.300	20.382	-29.618	50.000	AVERAGE
6		14.478	10.213	14.910	25.123	-24.877	50.000	AVERAGE

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : 23.1 inches Bar type Digital Signage
 Test Item : Conducted Emission Test
 Test date : 2019/10/04
 Test Mode : Mode 2: Transmit - BLE (GFSK)-2Mbps (2440MHz)

Line1



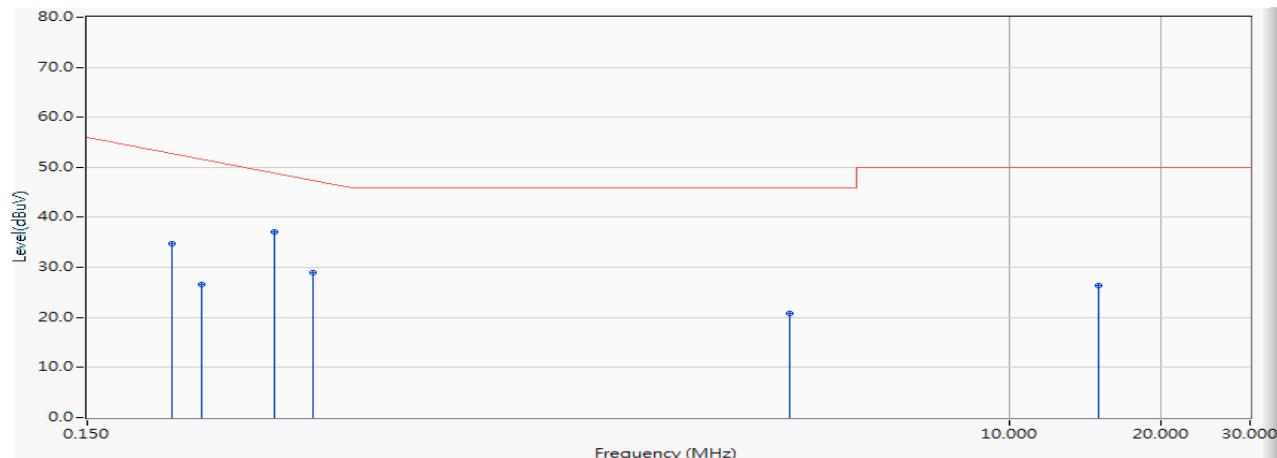
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.220	9.672	35.920	45.592	-18.408	64.000	QUASIPEAK
2		0.252	9.673	30.540	40.213	-22.873	63.086	QUASIPEAK
3	*	0.353	9.679	32.880	42.559	-17.641	60.200	QUASIPEAK
4		0.420	9.682	25.240	34.922	-23.364	58.286	QUASIPEAK
5		3.681	9.833	19.440	29.273	-26.727	56.000	QUASIPEAK
6		15.041	10.103	23.260	33.363	-26.637	60.000	QUASIPEAK

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : 23.1 inches Bar type Digital Signage
 Test Item : Conducted Emission Test
 Test date : 2019/10/04
 Test Mode : Mode 2: Transmit - BLE (GFSK)-2Mbps (2440MHz)

Line1



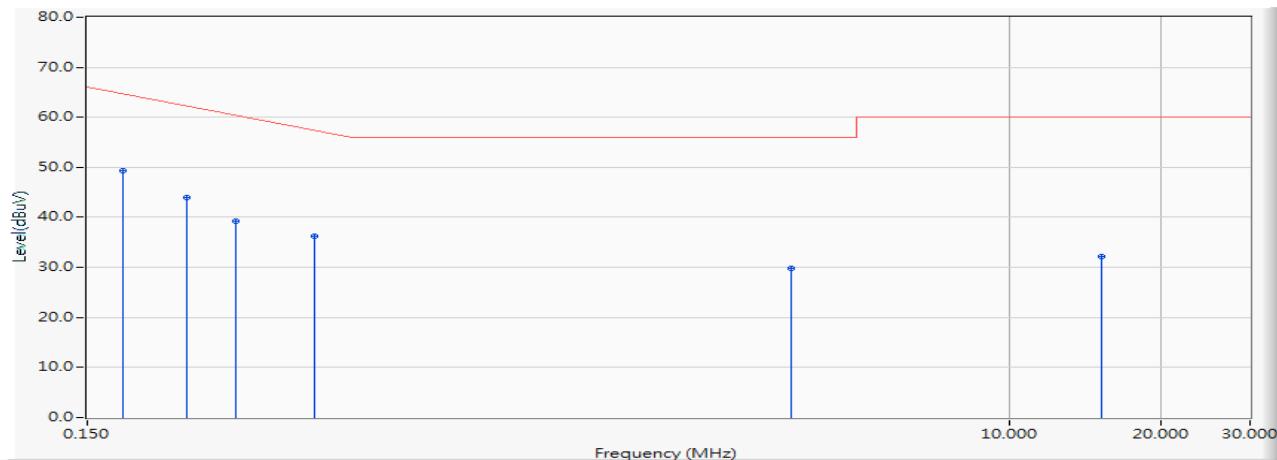
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.220	9.672	25.110	34.782	-19.218	54.000	AVERAGE
2		0.252	9.673	17.000	26.673	-26.413	53.086	AVERAGE
3	*	0.353	9.679	27.390	37.069	-13.131	50.200	AVERAGE
4		0.420	9.682	19.170	28.852	-19.434	48.286	AVERAGE
5		3.681	9.833	10.930	20.763	-25.237	46.000	AVERAGE
6		15.041	10.103	16.270	26.373	-23.627	50.000	AVERAGE

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : 23.1 inches Bar type Digital Signage
 Test Item : Conducted Emission Test
 Test date : 2019/10/04
 Test Mode : Mode 2: Transmit - BLE (GFSK)-2Mbps (2440MHz)

Line2



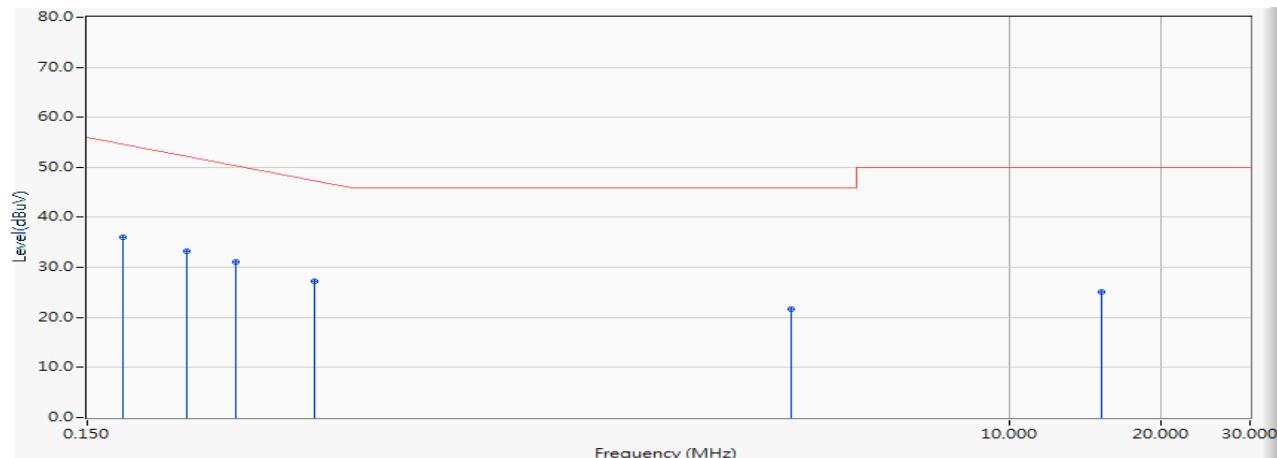
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1	*	0.177	9.703	39.700	49.403	-15.826	65.229	QUASIPEAK
2		0.236	9.702	34.280	43.982	-19.561	63.543	QUASIPEAK
3		0.295	9.706	29.480	39.186	-22.671	61.857	QUASIPEAK
4		0.423	9.713	26.480	36.193	-22.007	58.200	QUASIPEAK
5		3.705	9.874	20.000	29.874	-26.126	56.000	QUASIPEAK
6		15.298	10.238	21.880	32.118	-27.882	60.000	QUASIPEAK

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : 23.1 inches Bar type Digital Signage
 Test Item : Conducted Emission Test
 Test date : 2019/10/04
 Test Mode : Mode 2: Transmit - BLE (GFSK)-2Mbps (2440MHz)

Line2



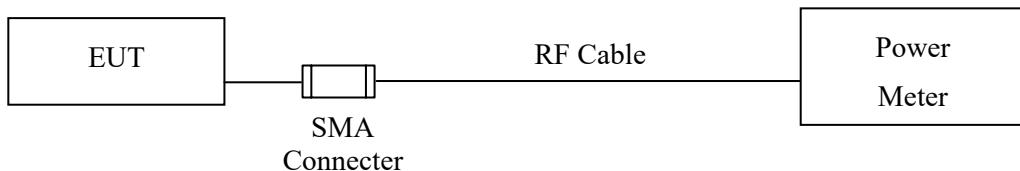
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1	*	0.177	9.703	26.360	36.063	-19.166	55.229	AVERAGE
2		0.236	9.702	23.560	33.262	-20.281	53.543	AVERAGE
3		0.295	9.706	21.370	31.076	-20.781	51.857	AVERAGE
4		0.423	9.713	17.540	27.253	-20.947	48.200	AVERAGE
5		3.705	9.874	11.700	21.574	-24.426	46.000	AVERAGE
6		15.298	10.238	14.850	25.088	-24.912	50.000	AVERAGE

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

3. Peak Power Output

3.1. Test Setup



3.2. Limit

The maximum peak power shall be less 1Watt.

3.3. Test Procedure

Tested according to C63.10:2013 for compliance to FCC 47CFR 15.247 requirements. The maximum peak conducted output power using KDB 558074 section 8.3.1.3 PKPM1 Peak power meter method. The maximum average conducted output power using C63.10:2013 Section 11.9.1.3 PKPM1 Peak power meter method.

3.4. Uncertainty

± 1.19 dB

3.5. Test Result of Peak Power Output

Product : 23.1 inches Bar type Digital Signage
Test Item : Peak Power Output
Test Site : No.3 OATS
Test date : 2019/11/04
Test Mode : Mode 1: Transmit - BLE (GFSK)-1Mbps

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit	Result
Channel 00	2402.00	5.62	1 Watt= 30 dBm	Pass
Channel 19	2440.00	5.79	1 Watt= 30 dBm	Pass
Channel 39	2480.00	5.67	1 Watt= 30 dBm	Pass

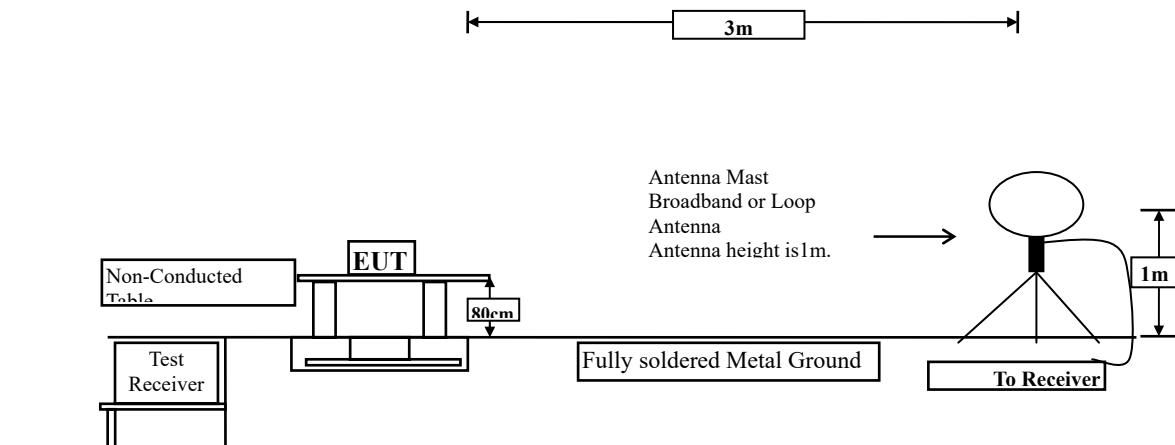
Product : 23.1 inches Bar type Digital Signage
Test Item : Peak Power Output
Test Site : No.3 OATS
Test date : 2019/11/04
Test Mode : Mode 2: Transmit - BLE (GFSK)-2Mbps

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit	Result
Channel 00	2402.00	5.90	1 Watt= 30 dBm	Pass
Channel 19	2440.00	5.93	1 Watt= 30 dBm	Pass
Channel 39	2480.00	5.90	1 Watt= 30 dBm	Pass

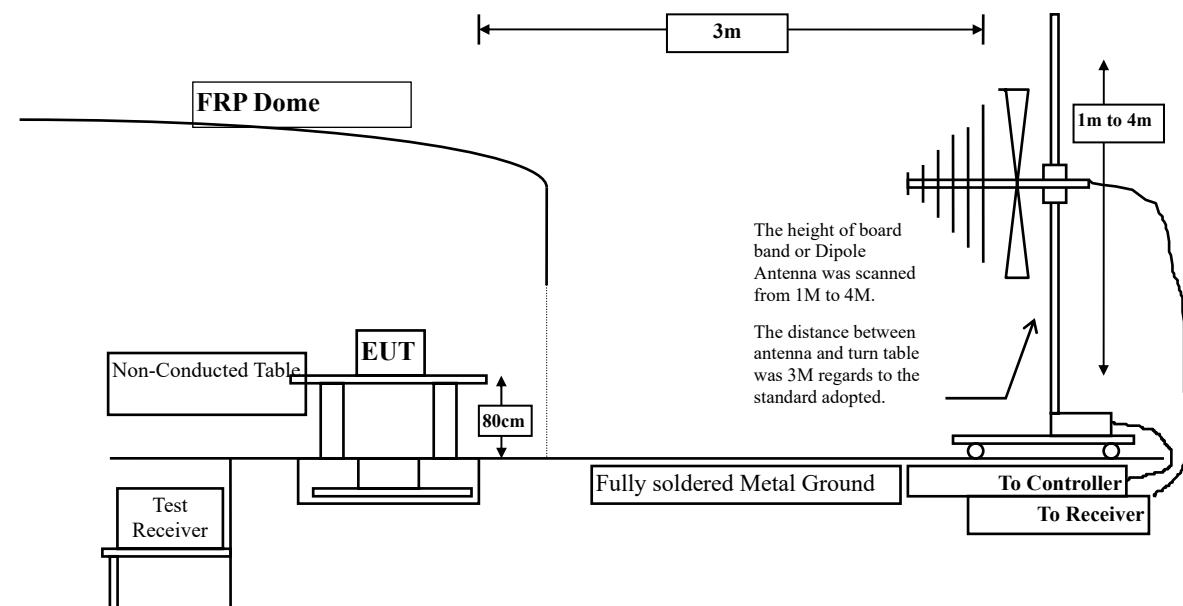
4. Radiated Emission

4.1. Test Setup

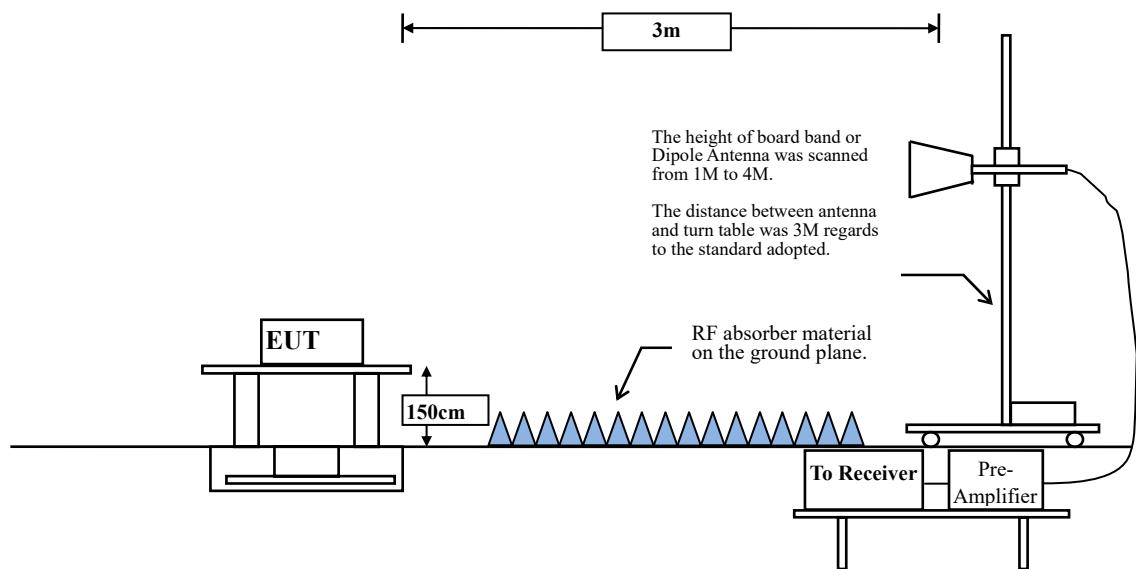
Under 30MHz



Below 1GHz



Above 1GHz



4.2. Limits

➤ General Radiated Emission Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

FCC Part 15 Subpart C Paragraph 15.209 Limits		
Frequency MHz	Field strength (microvolts/meter)	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remarks:

1. RF Voltage (dB μ V) = 20 log RF Voltage (uV)
2. In the Above Table, the tighter limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

4.3. Test Procedure

The EUT was setup according to ANSI C63.10: 2013 and tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

Measuring the frequency range below 1GHz, the EUT is placed on a turn table which is 0.8 meter above ground, when measuring the frequency range above 1GHz, the EUT is placed on a turn table which is 1.5 meter above ground.

The turn table is rotated 360 degrees to determine the position of the maximum emission level.

The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned between 1 meter and 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10: 2013 on radiated measurement.

The resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and 30MHz~1GHz is 120kHz and above 1GHz is 1MHz.

Radiated emission measurements below 30MHz are made using Loop Antenna and 30MHz~1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.

The worst radiated emission is measured in the Open Area Test Site on the Final Measurement.

The measurement frequency range from 9kHz - 10th Harmonic of fundamental was investigated.

RBW and VBW Parameter setting:

According to C63.10 Section 11.12.2.4 Peak measurement procedure

RBW = as specified in Table 1.

VBW $\geq 3 \times$ RBW.

Table 1 —RBW as a function of frequency

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

According to C63.10 Section 11.12.2.5 Average measurement procedure

RBW = 1MHz.

VBW = 10Hz, when duty cycle $\geq 98\%$

VBW $\geq 1/T$, when duty cycle $< 98\%$

(T refers to the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.)

2.4GHz band	Duty Cycle (%)	T (ms)	1/T (Hz)	VBW (Hz)
BLE-1Mbps	62.21	0.3893	2569	3000
BLE-2Mbps	33.07	0.2070	4832	5000

Note: Duty Cycle Refer to Section 9

4.4. Uncertainty

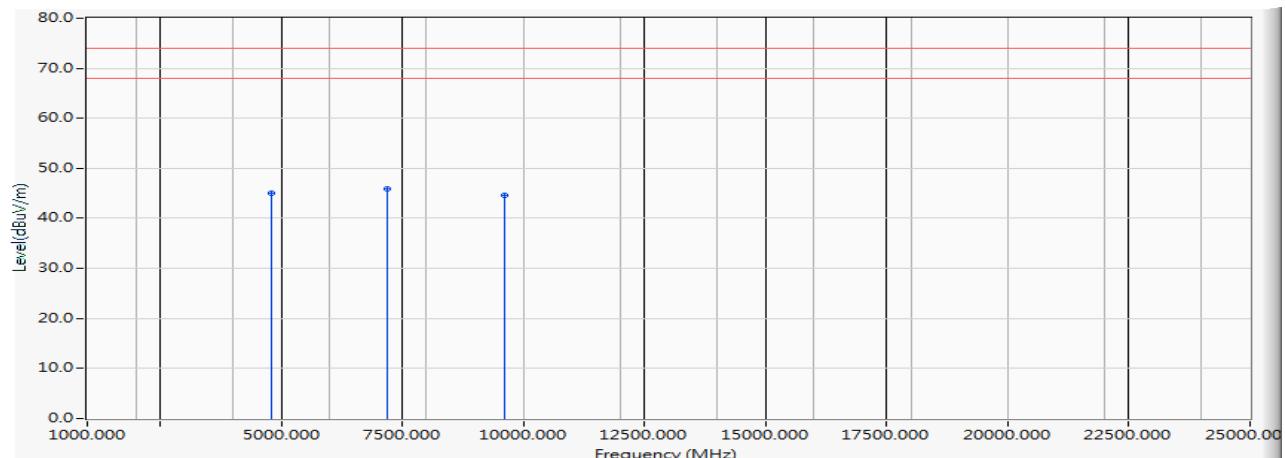
± 4.08 dB above 1GHz

± 4.22 dB below 1GHz

4.5. Test Result of Radiated Emission

Product : 23.1 inches Bar type Digital Signage
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/11/01
 Test Mode : Mode 1: Transmit - BLE (GFSK)-1Mbps(2402MHz)

Horizontal



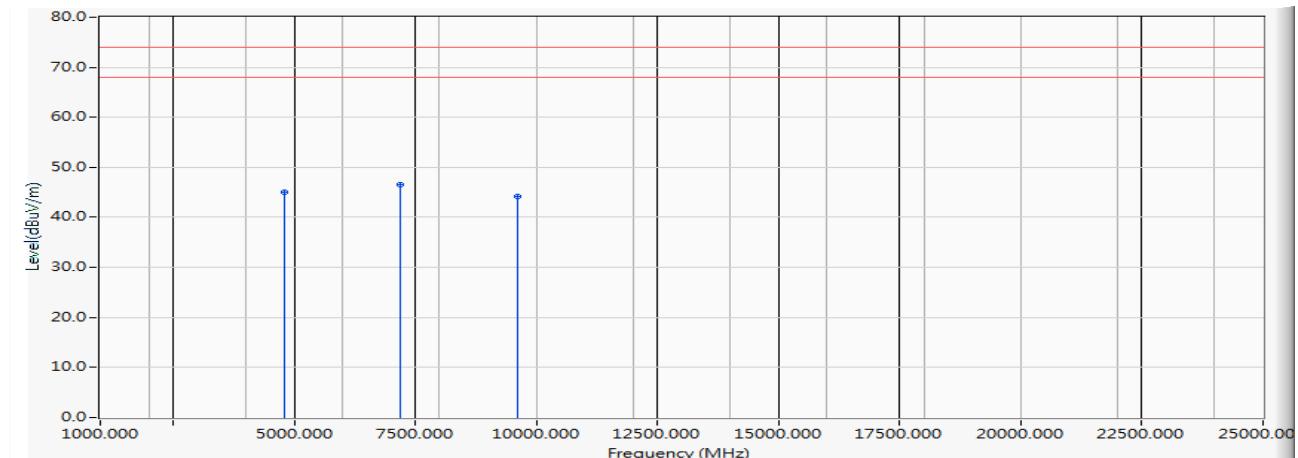
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4804.000	40.735	57.270	45.122	-28.878	74.000	PEAK
2	*	7206.000	-13.147	59.120	45.973	-28.027	74.000	PEAK
3		9608.000	-13.430	57.990	44.560	-29.440	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report..

Product : 23.1 inches Bar type Digital Signage
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/11/01
 Test Mode : Mode 1: Transmit - BLE (GFSK)-1Mbps(2402MHz)

Vertical



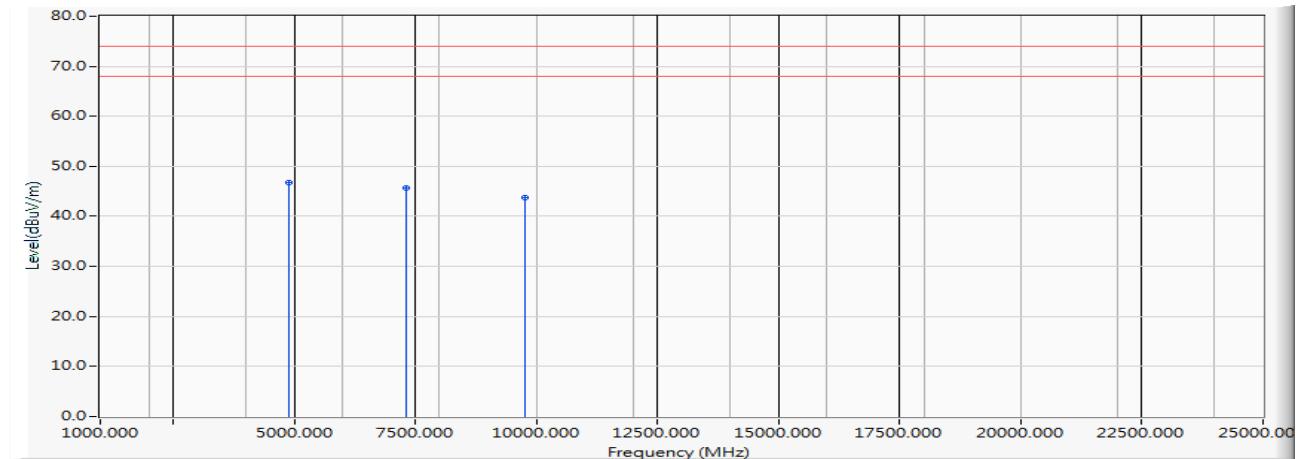
	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	4804.000	-12.148	57.200	45.052	-28.948	74.000	PEAK
2 *	7206.000	-13.147	59.730	46.583	-27.417	74.000	PEAK
3	9608.000	-13.430	57.540	44.110	-29.890	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report..

Product : 23.1 inches Bar type Digital Signage
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/11/01
 Test Mode : Mode 1: Transmit - BLE (GFSK)-1Mbps (2440MHz)

Horizontal



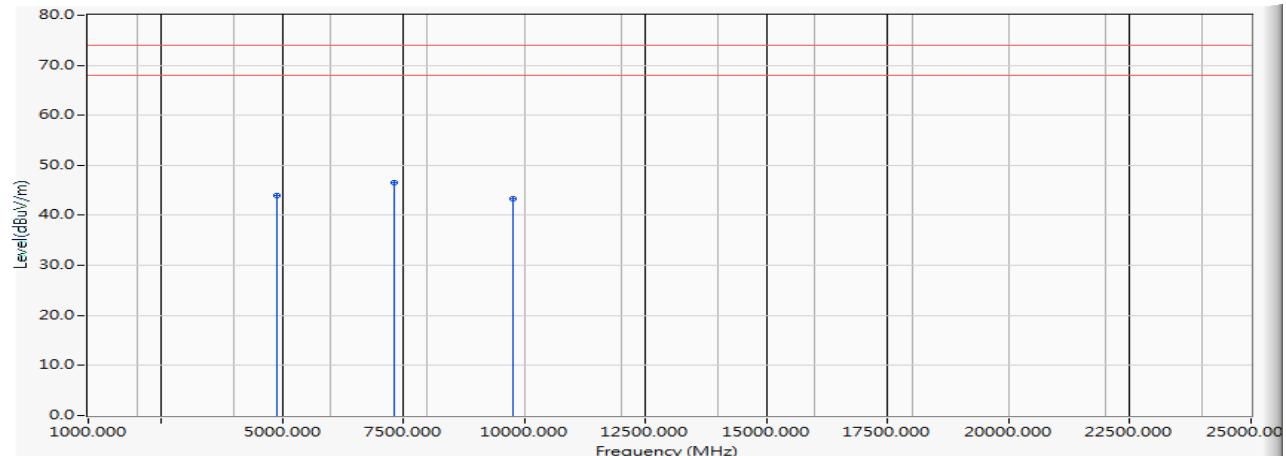
	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type	
1	*	4880.000	-11.601	58.450	46.849	-27.151	74.000	PEAK
2		7320.000	-13.547	59.250	45.703	-28.297	74.000	PEAK
3		9760.000	-12.486	56.190	43.705	-30.295	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : 23.1 inches Bar type Digital Signage
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/11/01
 Test Mode : Mode 1: Transmit - BLE (GFSK)-1Mbps (2440MHz)

Vertical



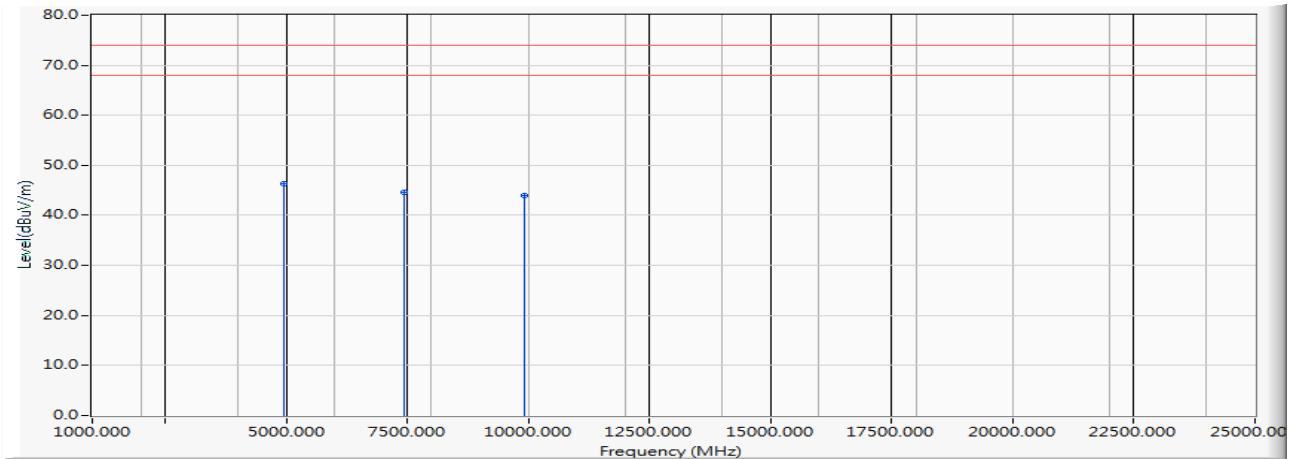
	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type	
1	4880.000	-11.601	55.580	43.979	-30.021	74.000	PEAK	
2	*	7320.000	-13.547	60.030	46.483	-27.517	74.000	PEAK
3		9760.000	-12.486	55.780	43.295	-30.705	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : 23.1 inches Bar type Digital Signage
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/11/01
 Test Mode : Mode 1: Transmit - BLE (GFSK)-1Mbps (2480MHz)

Horizontal



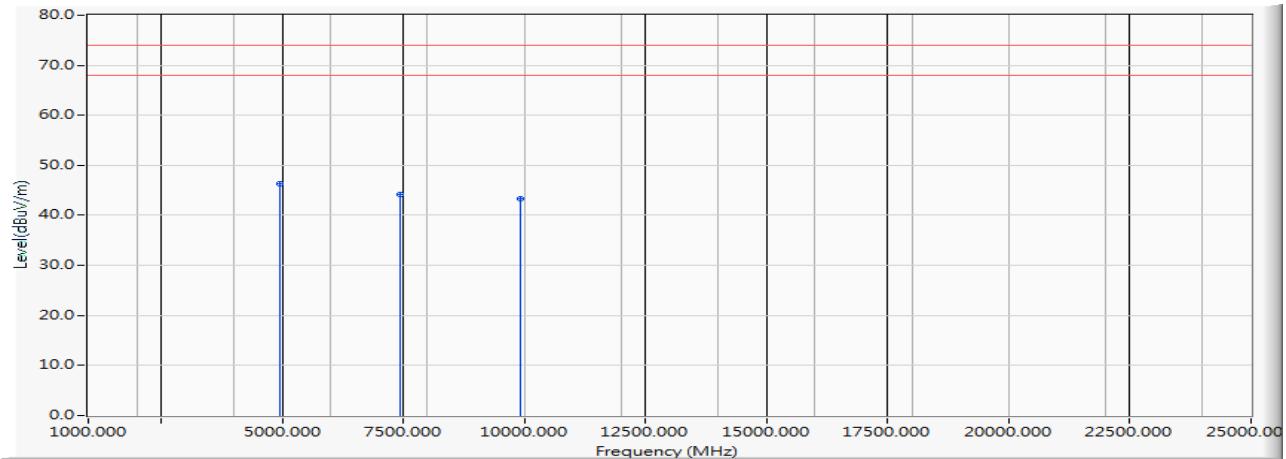
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	4960.000	-10.882	57.220	46.338	-27.662	74.000	PEAK
2		7440.000	-14.622	59.330	44.708	-29.292	74.000	PEAK
3		9920.000	-14.231	58.120	43.889	-30.111	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : 23.1 inches Bar type Digital Signage
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/11/01
 Test Mode : Mode 1: Transmit - BLE (GFSK)-1Mbps (2480MHz)

Vertical



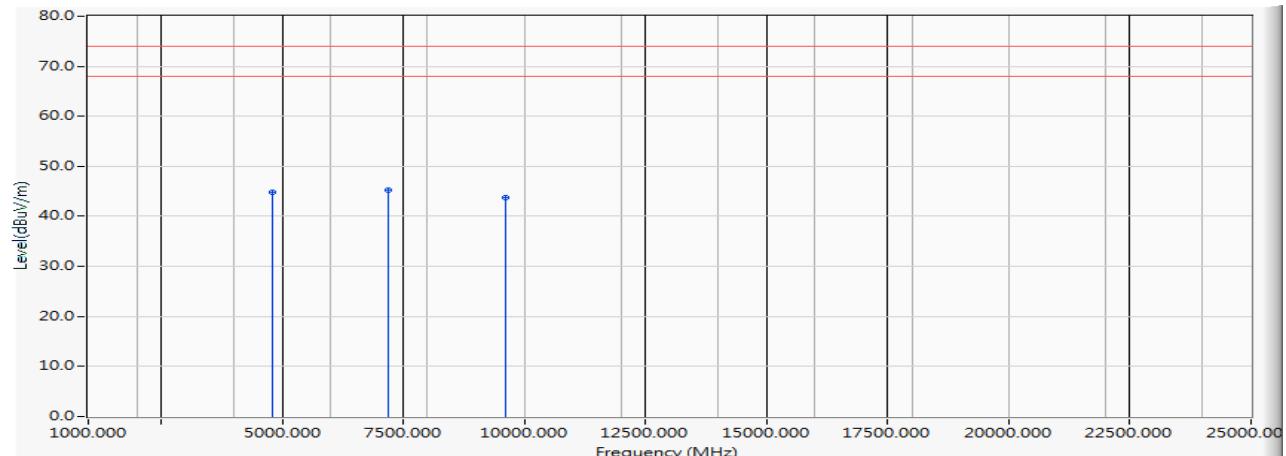
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	4960.000	-10.882	57.140	46.258	-27.742	74.000	PEAK
2		7440.000	-14.622	58.850	44.228	-29.772	74.000	PEAK
3		9920.000	-14.231	57.550	43.319	-30.681	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : 23.1 inches Bar type Digital Signage
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/11/01
 Test Mode : Mode 2: Transmit - BLE (GFSK)-2Mbps (2402MHz)

Horizontal



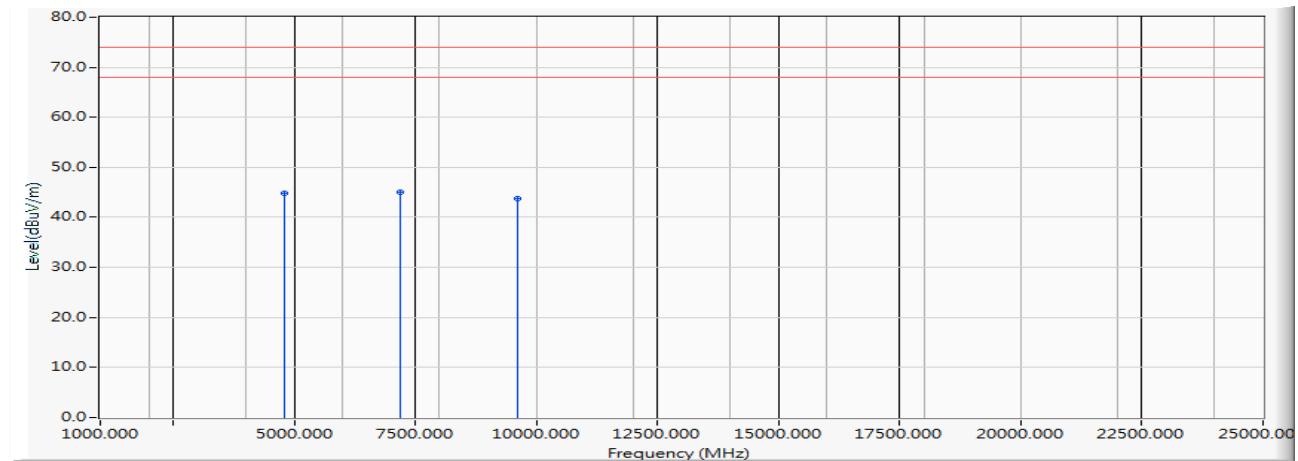
	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type	
1	4804.000	-12.148	56.930	44.782	-29.218	74.000	PEAK	
2	*	7206.000	-13.147	58.430	45.283	-28.717	74.000	PEAK
3		9608.000	-13.430	57.110	43.680	-30.320	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report..

Product : 23.1 inches Bar type Digital Signage
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/11/01
 Test Mode : Mode 2: Transmit - BLE (GFSK)-2Mbps (2402MHz)

Vertical



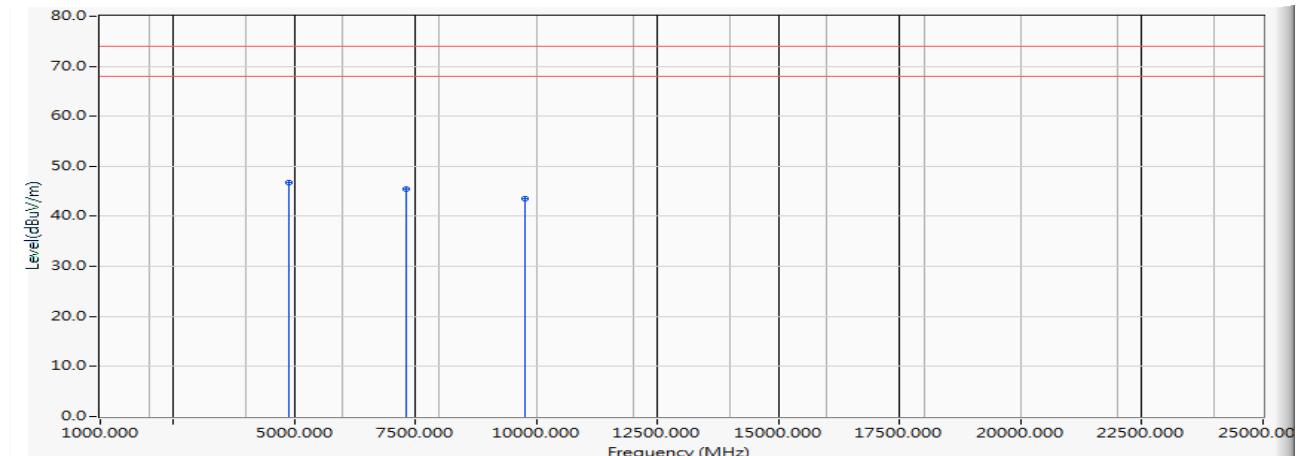
	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	4804.000	-12.148	56.930	44.782	-29.218	74.000	PEAK
2 *	7206.000	-13.147	58.160	45.013	-28.987	74.000	PEAK
3	9608.000	-13.430	57.280	43.850	-30.150	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report..

Product : 23.1 inches Bar type Digital Signage
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/11/01
 Test Mode : Mode 2: Transmit - BLE (GFSK)-2Mbps (2440MHz)

Horizontal



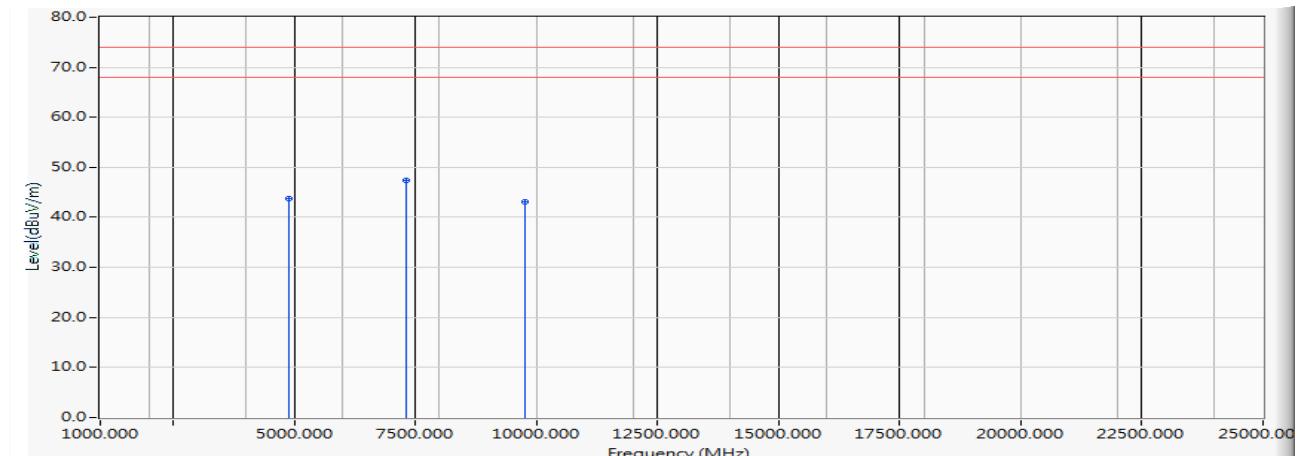
	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type	
1	*	4880.000	-11.601	58.320	46.719	-27.281	74.000	PEAK
2		7320.000	-13.547	59.110	45.563	-28.437	74.000	PEAK
3		9760.000	-12.486	56.080	43.595	-30.405	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : 23.1 inches Bar type Digital Signage
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/11/01
 Test Mode : Mode 2: Transmit - BLE (GFSK)-2Mbps (2440MHz)

Vertical



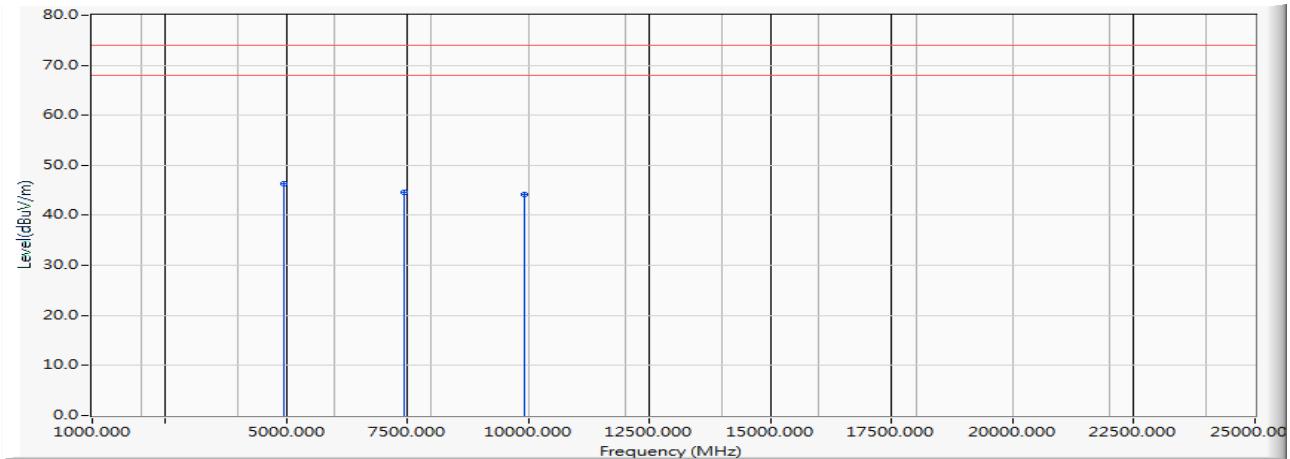
	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type	
1	4880.000	-11.601	55.380	43.779	-30.221	74.000	PEAK	
2	*	7320.000	-13.547	60.840	47.293	-26.707	74.000	PEAK
3		9760.000	-12.486	55.580	43.095	-30.905	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : 23.1 inches Bar type Digital Signage
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/11/01
 Test Mode : Mode 2: Transmit - BLE (GFSK)-2Mbps (2480MHz)

Horizontal



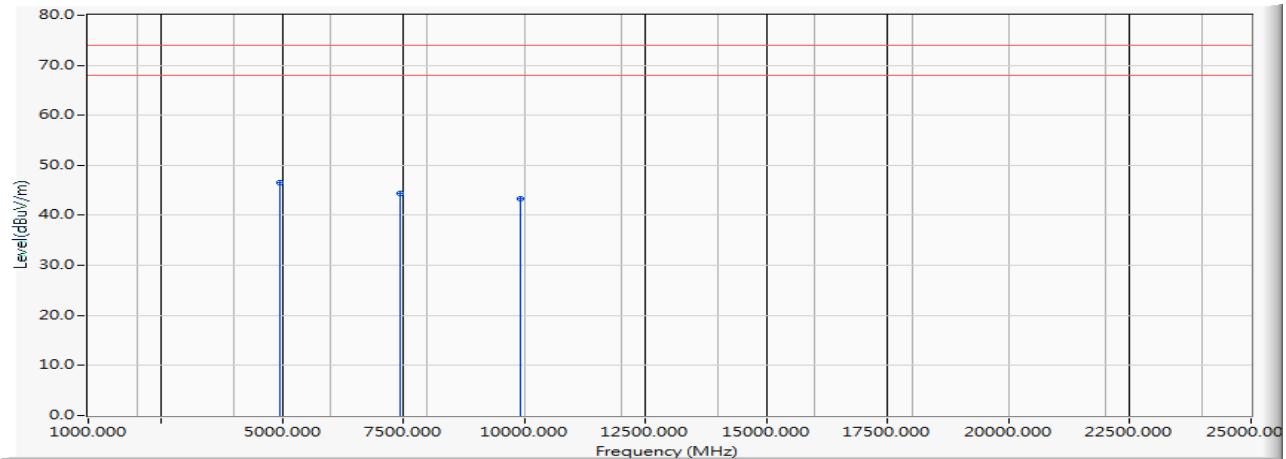
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	4960.000	-10.882	57.250	46.368	-27.632	74.000	PEAK
2		7440.000	-14.622	59.280	44.658	-29.342	74.000	PEAK
3		9920.000	-14.231	58.340	44.109	-29.891	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : 23.1 inches Bar type Digital Signage
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/11/01
 Test Mode : Mode 2: Transmit - BLE (GFSK)-2Mbps (2480MHz)

Vertical



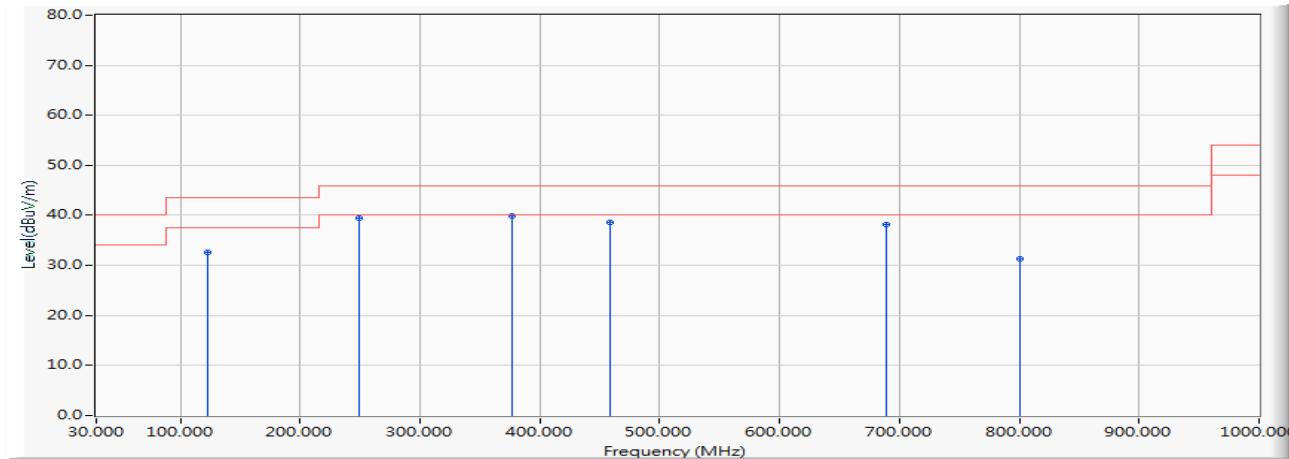
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	4960.000	-10.882	57.380	46.498	-27.502	74.000	PEAK
2		7440.000	-14.622	58.940	44.318	-29.682	74.000	PEAK
3		9920.000	-14.231	57.650	43.419	-30.581	74.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : 23.1 inches Bar type Digital Signage
 Test Item : General Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/11/01
 Test Mode : Mode 1: Transmit - BLE (GFSK)-1Mbps (2440MHz)

Horizontal



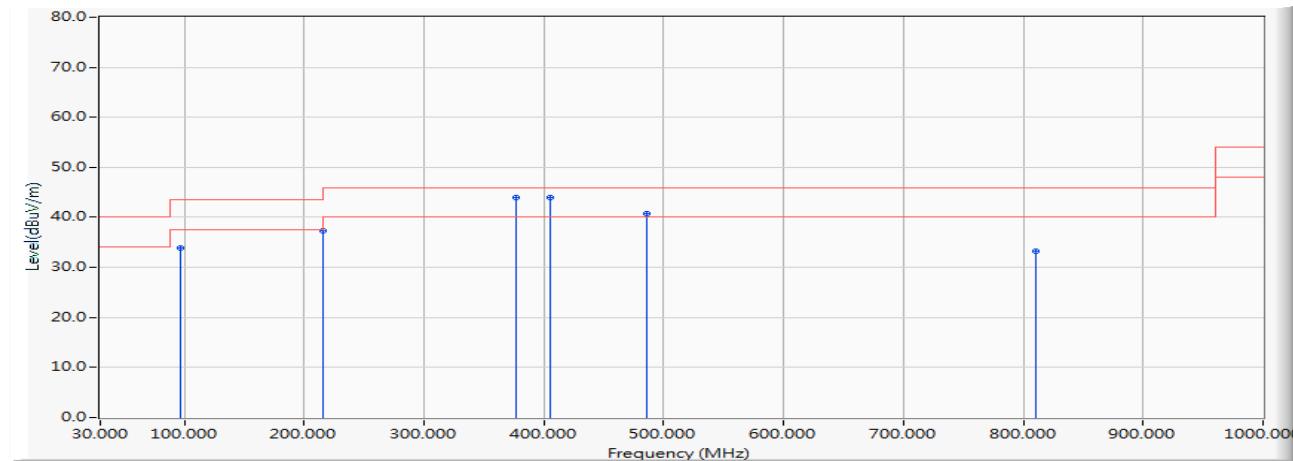
	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	122.783	-16.678	49.353	32.675	-10.825	43.500	PEAK
2	249.304	-17.969	57.486	39.517	-6.483	46.000	PEAK
3	*	-12.123	51.993	39.870	-6.130	46.000	PEAK
4	458.768	-10.460	48.991	38.531	-7.469	46.000	PEAK
5	689.319	-9.230	47.449	38.218	-7.782	46.000	PEAK
6	800.377	-8.930	40.294	31.364	-14.636	46.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.
5. No emission found between lowest internal used/generated frequency to 30MHz.

Product : 23.1 inches Bar type Digital Signage
 Test Item : General Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/11/01
 Test Mode : Mode 1: Transmit - BLE (GFSK)-1Mbps (2440MHz)

Vertical



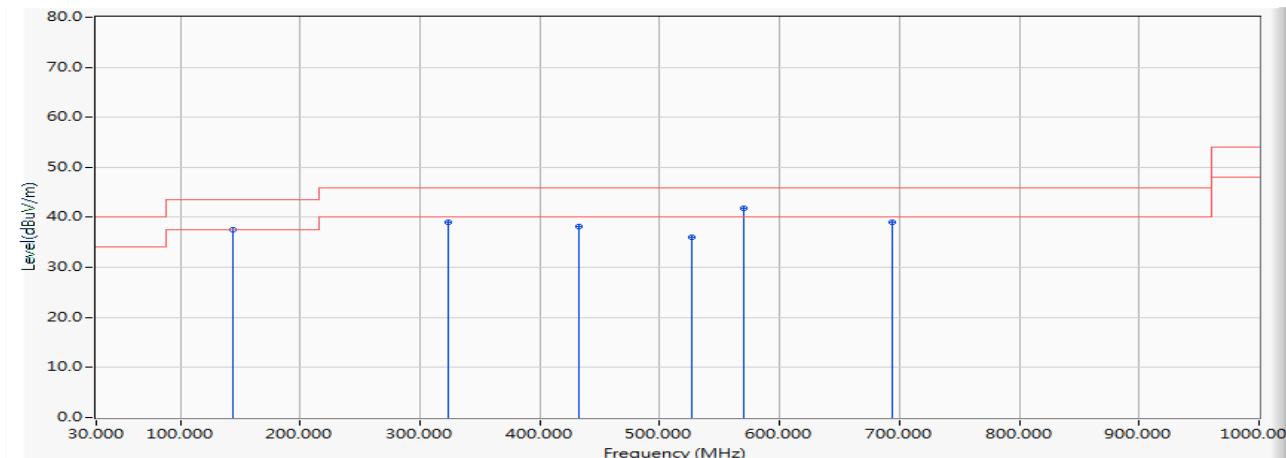
	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type	
1	97.478	-16.559	50.398	33.839	-9.661	43.500	PEAK	
2	215.565	-18.132	55.424	37.292	-6.208	43.500	PEAK	
3	*	377.232	-12.123	56.049	43.926	-2.074	46.000	PEAK
4		405.348	-13.330	57.209	43.879	-2.121	46.000	PEAK
5		485.478	-11.794	52.566	40.771	-5.229	46.000	PEAK
6		810.217	-8.944	42.095	33.151	-12.849	46.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.
5. No emission found between lowest internal used/generated frequency to 30MHz.

Product : 23.1 inches Bar type Digital Signage
 Test Item : General Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/11/01
 Test Mode : Mode 2: Transmit - BLE (GFSK)-2Mbps (2440MHz)

Horizontal



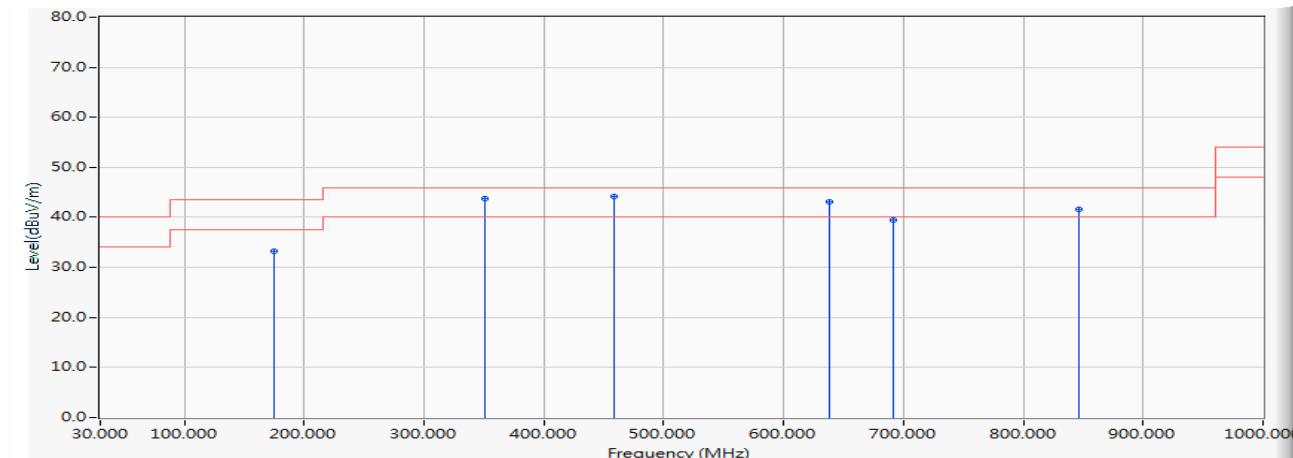
	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type	
1	143.870	-18.476	56.113	37.637	-5.863	43.500	PEAK	
2	323.812	-14.026	52.956	38.930	-7.070	46.000	PEAK	
3	432.058	-10.761	48.976	38.215	-7.785	46.000	PEAK	
4	526.246	-11.281	47.418	36.137	-9.863	46.000	PEAK	
5	*	569.826	-9.047	50.828	41.781	-4.219	46.000	PEAK
6		693.536	-9.218	48.150	38.932	-7.068	46.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.
5. No emission found between lowest internal used/generated frequency to 30MHz.

Product : 23.1 inches Bar type Digital Signage
 Test Item : General Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/11/01
 Test Mode : Mode 2: Transmit - BLE (GFSK)-2Mbps (2440MHz)

Vertical



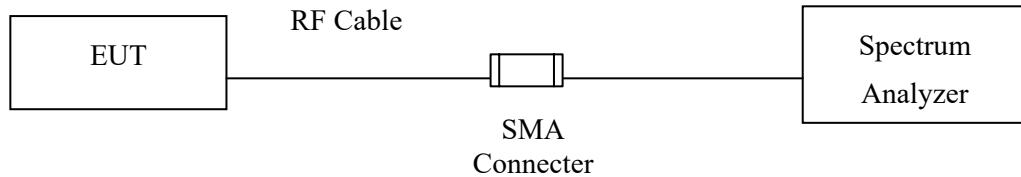
	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	174.797	-19.781	53.065	33.284	-10.216	43.500	PEAK
2	350.522	-13.279	57.004	43.724	-2.276	46.000	PEAK
3	*	-10.460	54.667	44.207	-1.793	46.000	PEAK
4	638.710	-8.780	51.844	43.063	-2.937	46.000	PEAK
5	692.130	-9.218	48.731	39.513	-6.487	46.000	PEAK
6	846.768	-8.302	49.989	41.687	-4.313	46.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss -Amplifier gain.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.
5. No emission found between lowest internal used/generated frequency to 30MHz.

5. RF Antenna Conducted Test

5.1. Test Setup



5.2. Limits

According to FCC Section 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 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, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

5.3. Test Procedure

The EUT was tested according to C63.10:2013 Section 11.11 for compliance to FCC 47CFR 15.247 requirements.

Set RBW = 100 kHz, Set VBW > RBW, scan up through 10th harmonic.

5.4. Uncertainty

± 1.20dB

5.5. Test Result of RF Antenna Conducted Test

Product : 23.1 inches Bar type Digital Signage
 Test Item : RF Antenna Conducted Test
 Test Site : No.3 OATS
 Test date : 2019/11/01
 Test Mode : Mode 1: Transmit - BLE (GFSK)-1Mbps

Figure Channel 00:

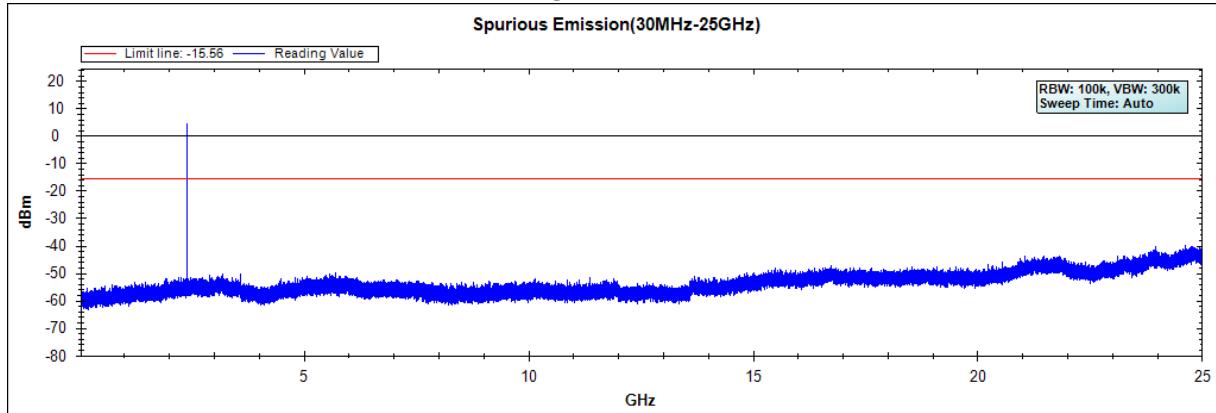


Figure Channel 19:

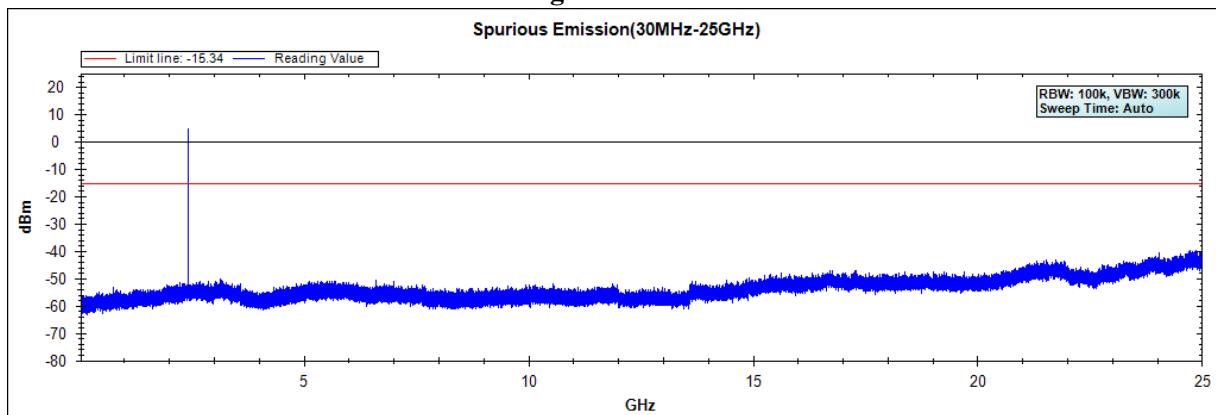
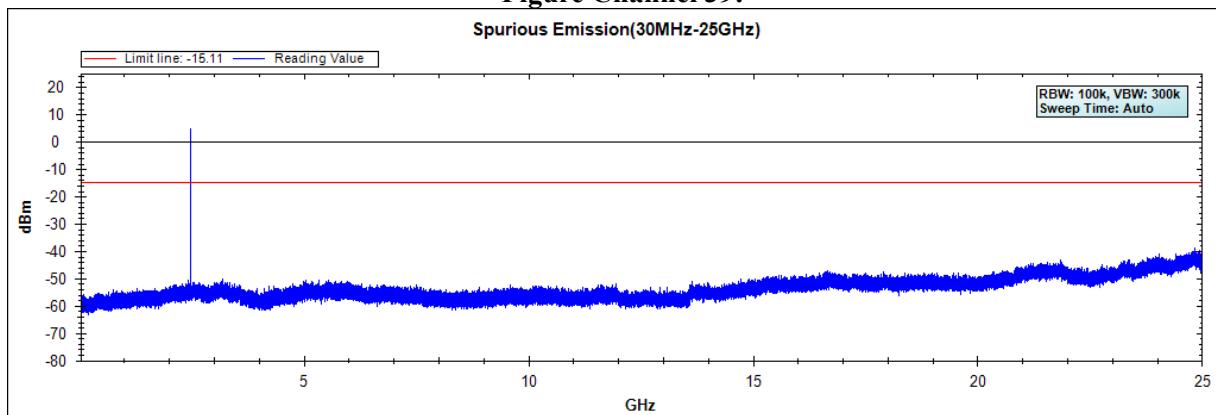


Figure Channel 39:



Product : 23.1 inches Bar type Digital Signage
Test Item : RF Antenna Conducted Test
Test Site : No.3 OATS
Test date : 2019/11/01
Test Mode : Mode 2: Transmit - BLE (GFSK)-2Mbps

Figure Channel 00:

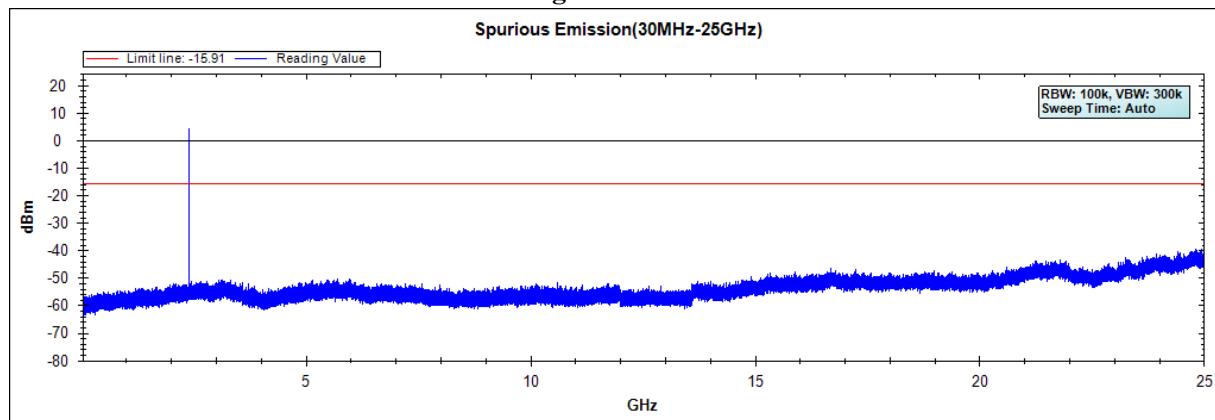


Figure Channel 19:

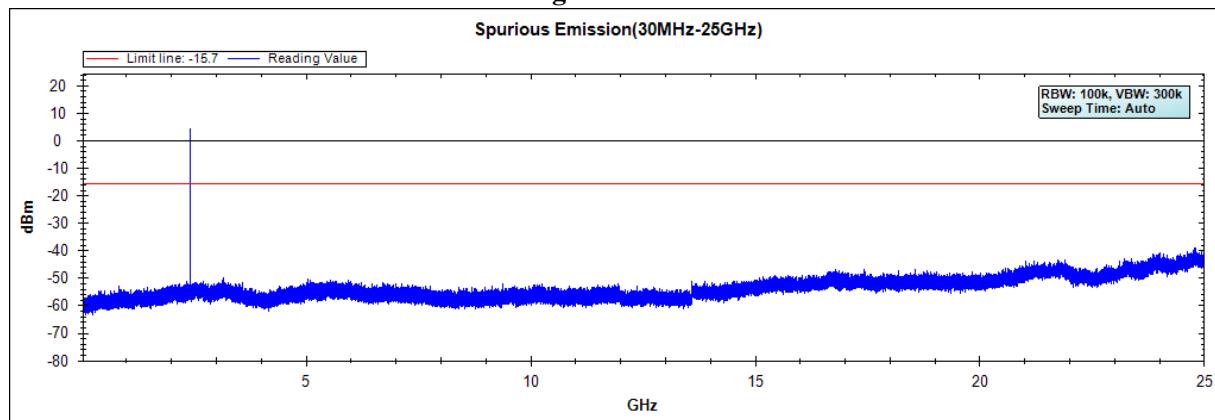
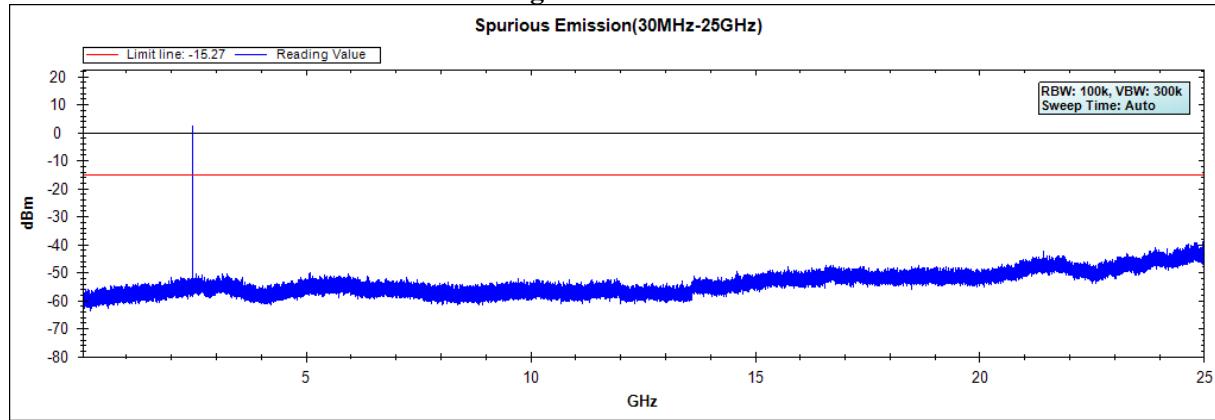


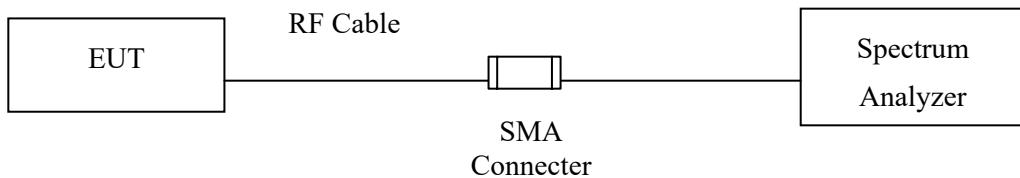
Figure Channel 39:



6. Band Edge

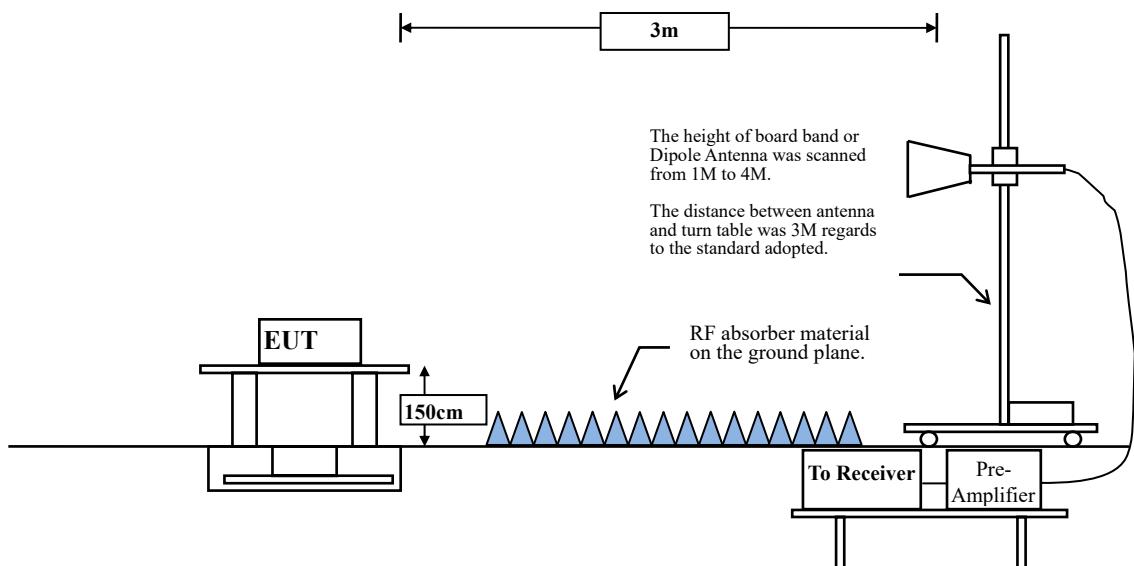
6.1. Test Setup

RF Conducted Measurement



RF Radiated Measurement:

Above 1GHz



6.2. Limit

According to FCC Section 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 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, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

6.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013 and tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.

RBW and VBW Parameter setting:

According to C63.10 Section 11.12.2.4 Peak measurement procedure

RBW = as specified in Table 1.

VBW $\geq 3 \times$ RBW.

Table 1 —RBW as a function of frequency

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

According to C63.10 Section 11.12.2.5 Average measurement procedure

RBW = 1MHz.

VBW = 10Hz, when duty cycle $\geq 98\%$

VBW $\geq 1/T$, when duty cycle $< 98\%$

(T refers to the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.)

2.4GHz band	Duty Cycle (%)	T (ms)	1/T (Hz)	VBW (Hz)
BLE-1Mbps	62.21	0.3893	2569	3000
BLE-2Mbps	33.07	0.2070	4832	5000

Note: Duty Cycle Refer to Section 9

6.4. Uncertainty

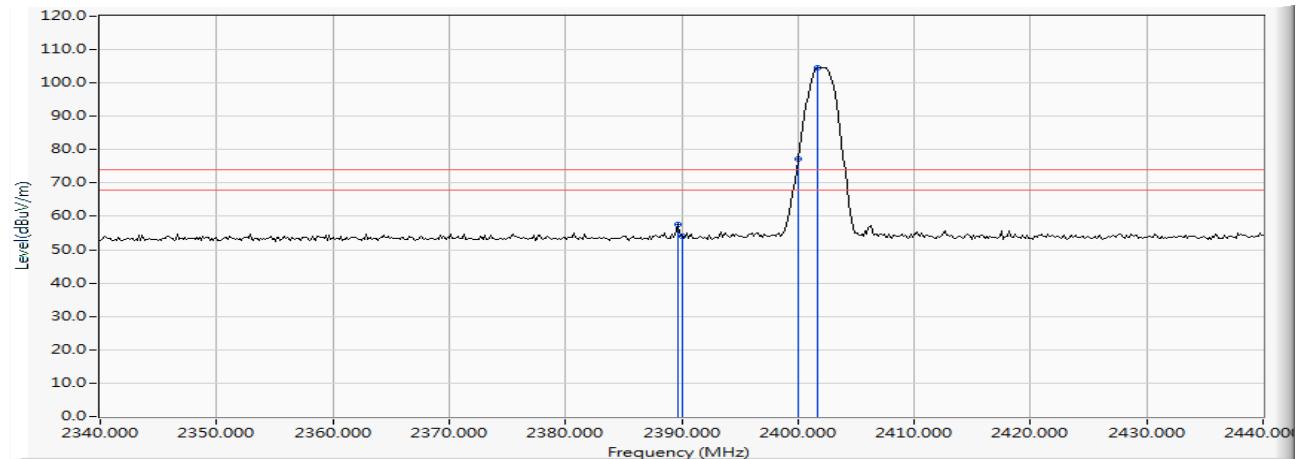
± 4.08 dB above 1GHz

± 4.22 dB below 1GHz

6.5. Test Result of Band Edge

Product : 23.1 inches Bar type Digital Signage
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/10/24
 Test Mode : Mode 1: Transmit - BLE (GFSK)-1Mbps (2402MHz)

Horizontal



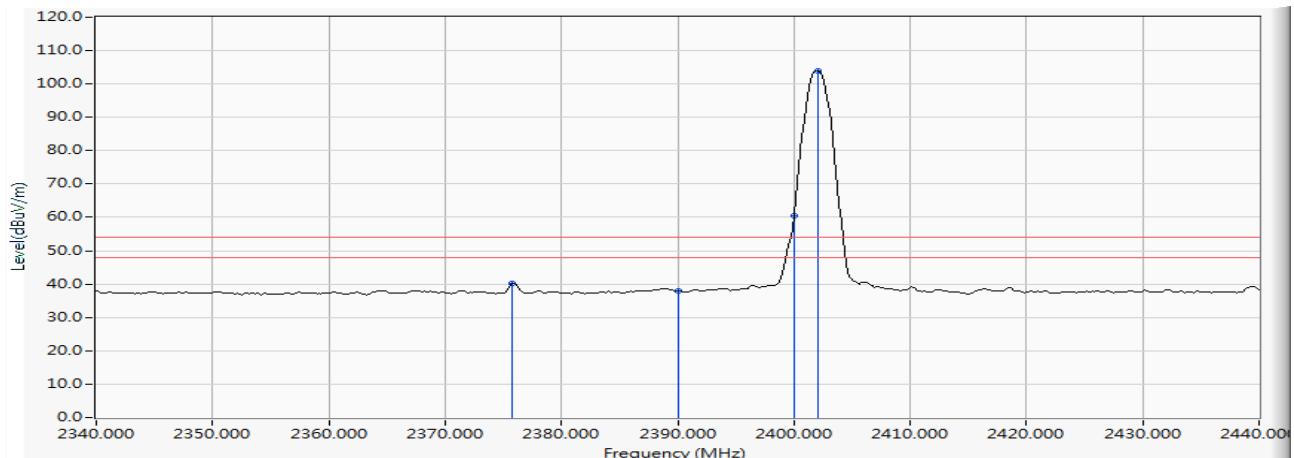
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2389.710	12.898	44.562	57.459	-16.541	74.000	PEAK
2		2390.000	12.899	41.197	54.096	-19.904	74.000	PEAK
3		2400.000	12.961	64.123	77.084	--	--	PEAK
4	*	2401.739	12.972	91.604	104.577	--	--	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 23.1 inches Bar type Digital Signage
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/10/24
 Test Mode : Mode 1: Transmit - BLE (GFSK)-1Mbps (2402MHz)

Horizontal



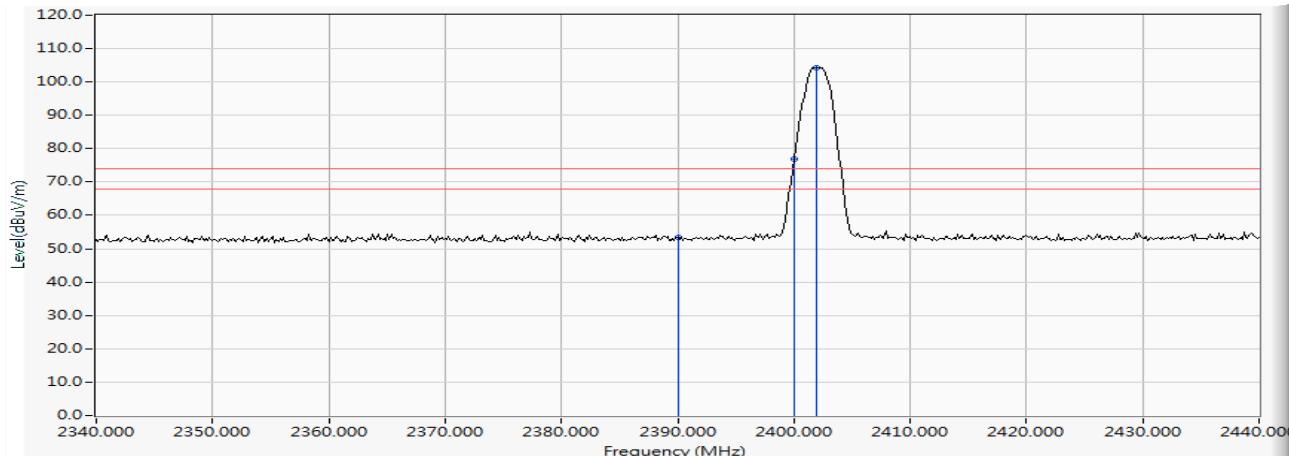
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2375.797	12.821	27.254	40.075	-13.925	54.000	AVERAGE
2		2390.000	12.899	24.949	37.848	-16.152	54.000	AVERAGE
3		2400.000	12.961	47.577	60.538	--	--	AVERAGE
4	*	2402.029	12.975	91.079	104.054	--	--	AVERAGE

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 23.1 inches Bar type Digital Signage
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/10/24
 Test Mode : Mode 1: Transmit - BLE (GFSK)-1Mbps (2402MHz)

Vertical

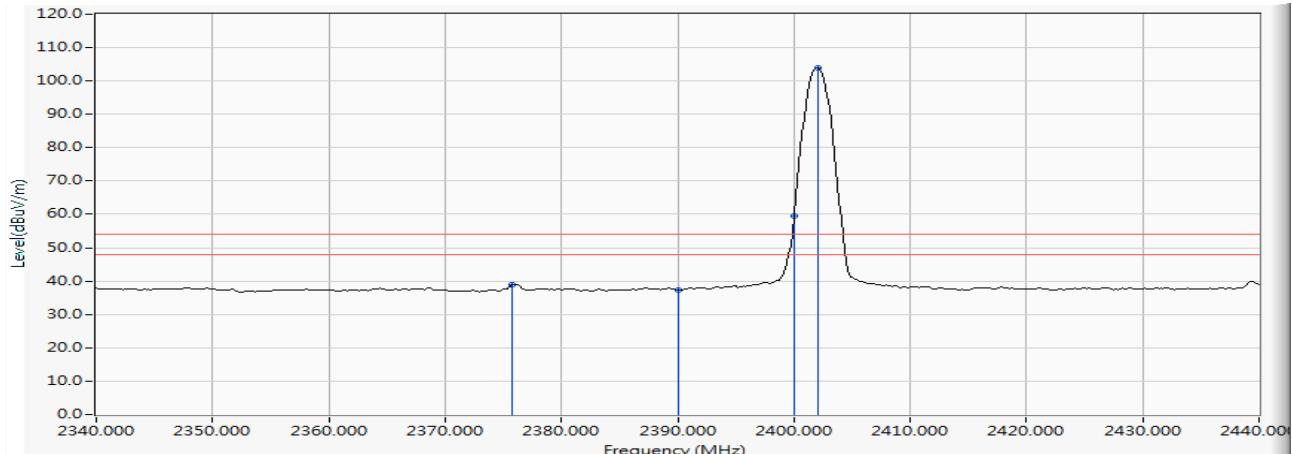


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	2390.000	12.899	40.553	53.452	-20.548	74.000	PEAK
2	2400.000	12.961	63.976	76.937	--	--	PEAK
3	*	2401.884	12.974	91.362	104.336	--	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 23.1 inches Bar type Digital Signage
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/10/24
 Test Mode : Mode 1: Transmit - BLE (GFSK)-1Mbps (2402MHz)

Vertical


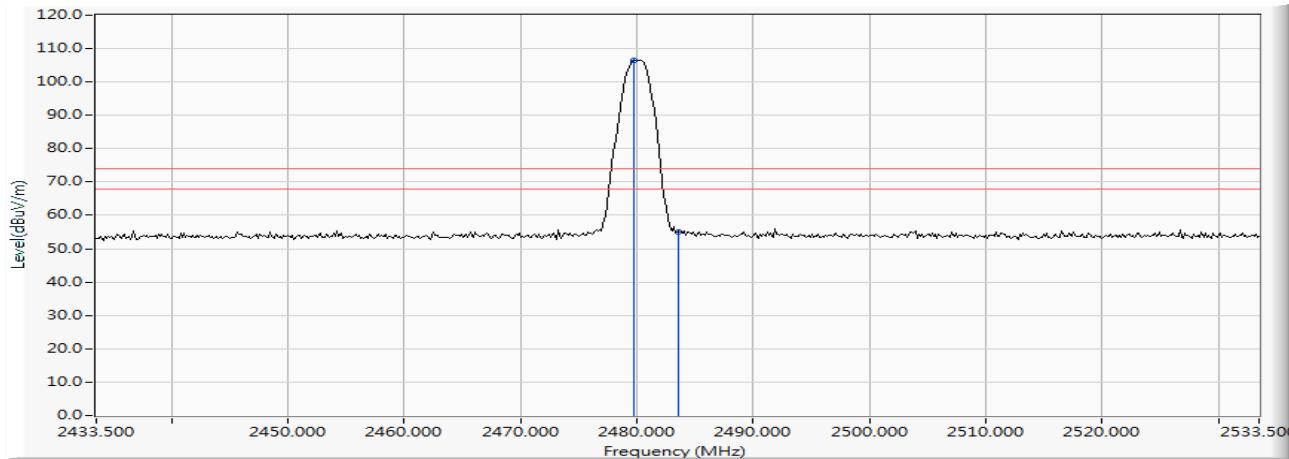
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2375.797	12.821	25.989	38.810	-15.190	54.000	AVERAGE
2		2390.000	12.899	24.332	37.231	-16.769	54.000	AVERAGE
3		2400.000	12.961	46.668	59.629	--	--	AVERAGE
4	*	2402.029	12.975	90.854	103.829	--	--	AVERAGE

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 23.1 inches Bar type Digital Signage
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/10/24
 Test Mode : Mode 1: Transmit - BLE (GFSK)-1Mbps (2480MHz)

Horizontal



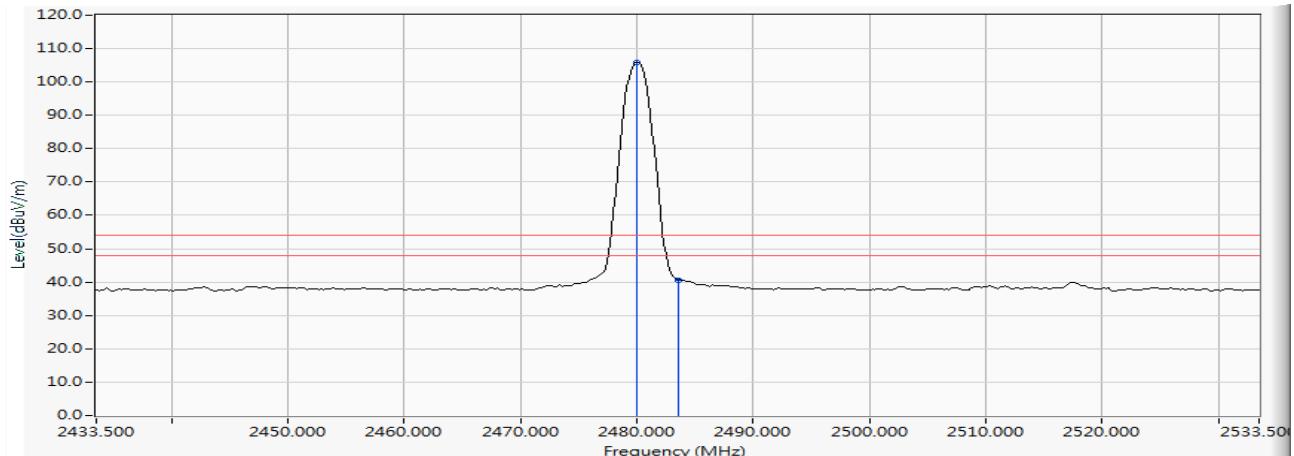
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2479.732	13.369	93.052	106.421	--	--	PEAK
2		2483.500	13.375	41.772	55.146	-18.854	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 23.1 inches Bar type Digital Signage
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/10/24
 Test Mode : Mode 1: Transmit - BLE (GFSK)-1Mbps (2480MHz)

Horizontal



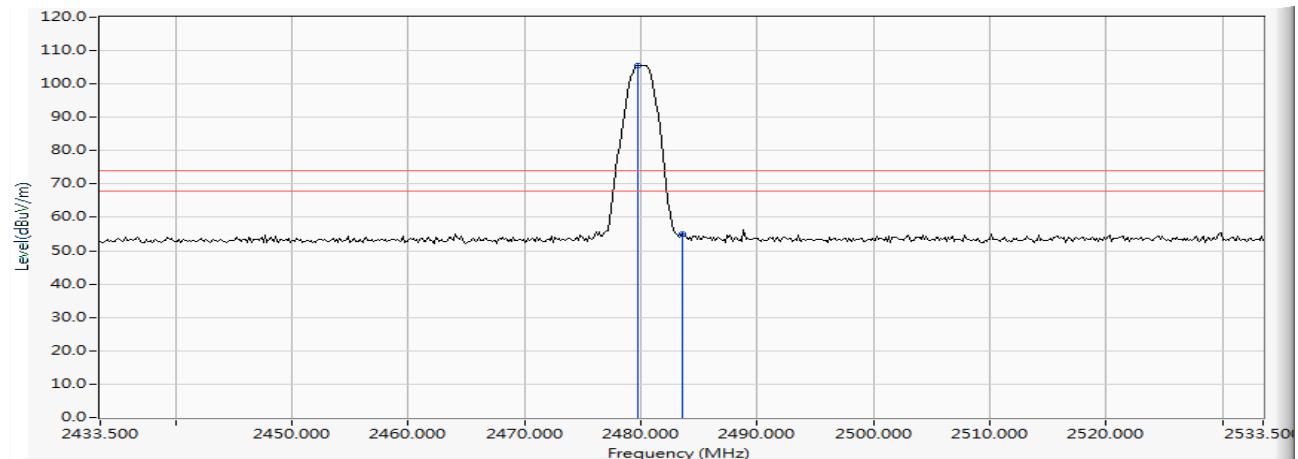
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2480.022	13.369	92.463	105.832	--	--	AVERAGE
2		2483.500	13.375	27.309	40.683	-13.317	54.000	AVERAGE

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 23.1 inches Bar type Digital Signage
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/10/24
 Test Mode : Mode 1: Transmit - BLE (GFSK)-1Mbps (2480MHz)

Vertical



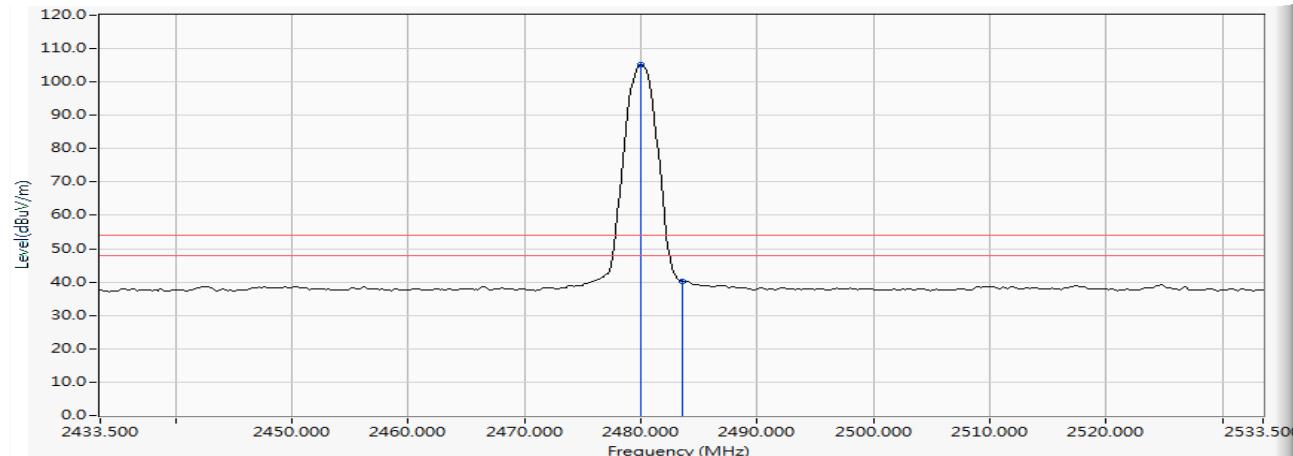
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2479.732	13.369	92.312	105.681	--	--	PEAK
2		2483.500	13.375	41.582	54.956	-19.044	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 23.1 inches Bar type Digital Signage
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/10/24
 Test Mode : Mode 1: Transmit - BLE (GFSK)-1Mbps (2480MHz)

Vertical



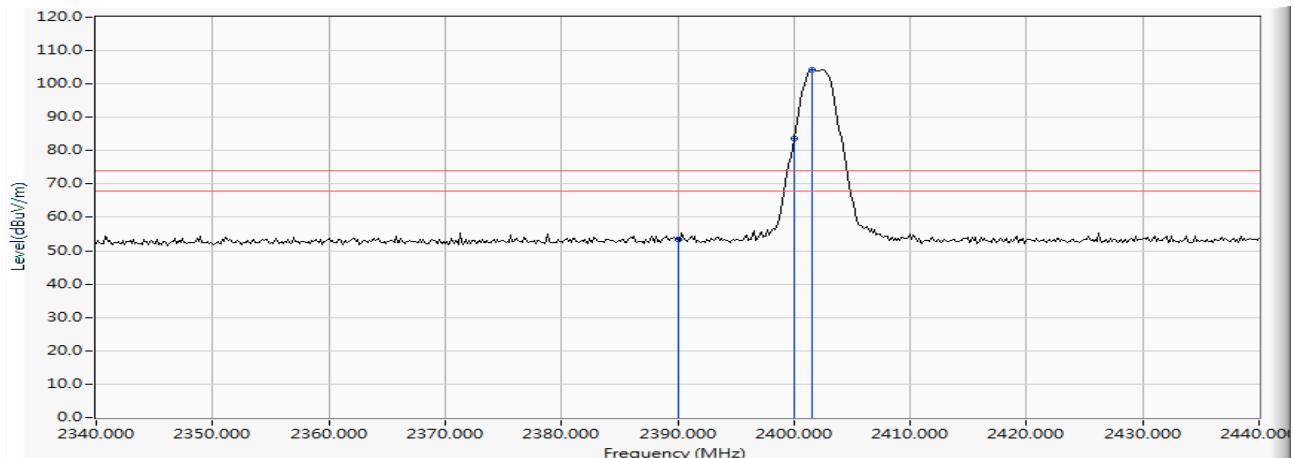
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2480.022	13.369	91.712	105.081	--	--	AVERAGE
2		2483.500	13.375	26.851	40.225	-13.775	54.000	AVERAGE

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 23.1 inches Bar type Digital Signage
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/10/24
 Test Mode : Mode 2: Transmit - BLE (GFSK)-2Mbps (2402MHz)

Horizontal



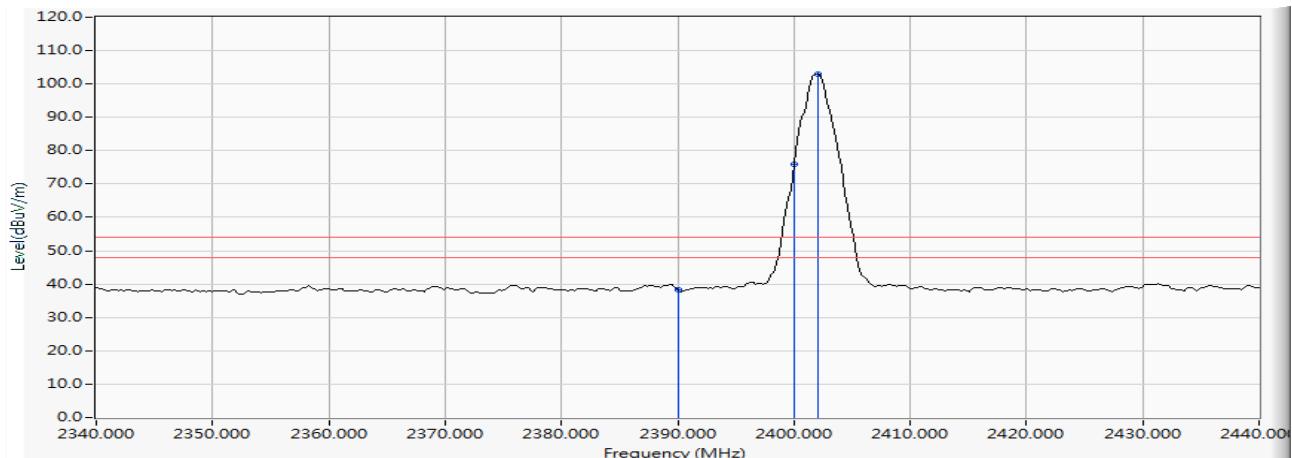
	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	2390.000	12.899	40.542	53.441	-20.559	74.000	PEAK
2	2400.000	12.961	70.678	83.639	--	--	PEAK
3	*	2401.594	12.971	91.419	104.391	--	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 23.1 inches Bar type Digital Signage
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/10/24
 Test Mode : Mode 2: Transmit - BLE (GFSK)-2Mbps (2402MHz)

Horizontal



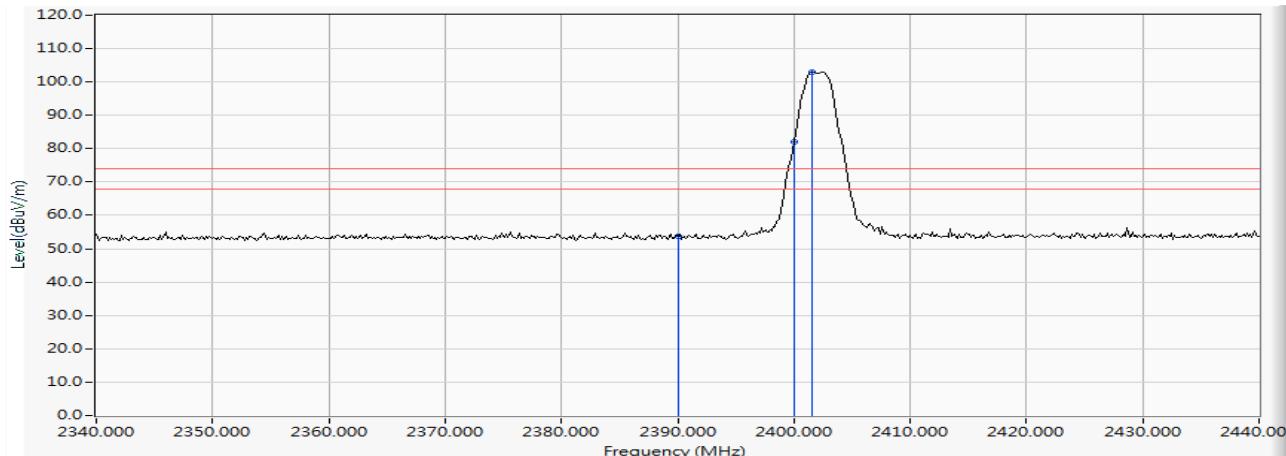
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2390.000	12.899	25.419	38.318	-15.682	54.000	AVERAGE
2		2400.000	12.961	62.889	75.850	--	--	AVERAGE
3	*	2402.029	12.975	90.101	103.076	--	--	AVERAGE

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 23.1 inches Bar type Digital Signage
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/10/24
 Test Mode : Mode 2: Transmit - BLE (GFSK)-2Mbps (2402MHz)

Vertical



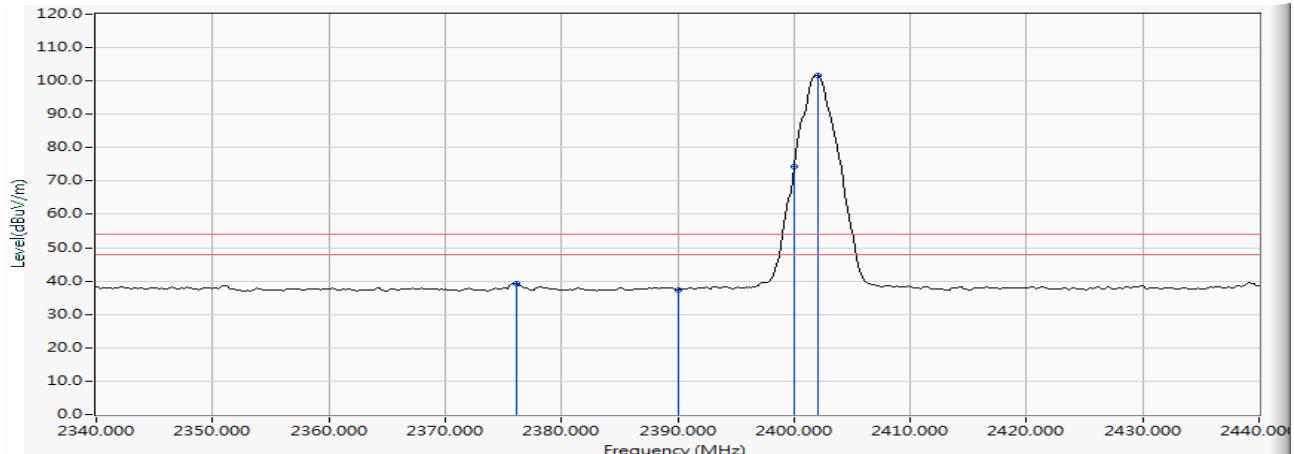
	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	2390.000	12.899	40.895	53.794	-20.206	74.000	PEAK
2	2400.000	12.961	69.207	82.168	--	--	PEAK
3	*	2401.594	12.971	90.110	103.082	--	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 23.1 inches Bar type Digital Signage
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/10/24
 Test Mode : Mode 2: Transmit - BLE (GFSK)-2Mbps (2402MHz)

Vertical



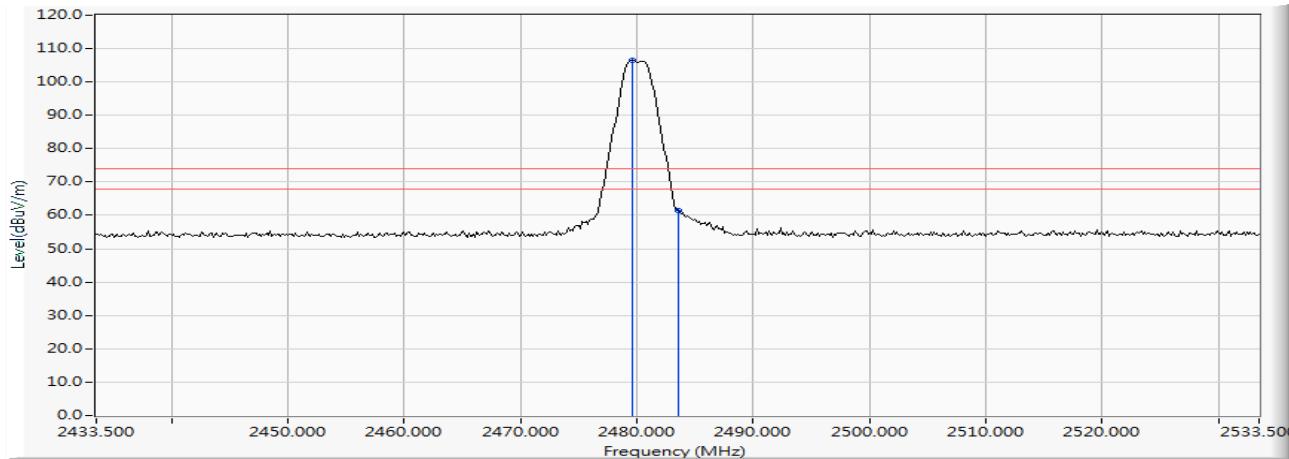
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2376.087	12.822	26.539	39.361	-14.639	54.000	AVERAGE
2		2390.000	12.899	24.425	37.324	-16.676	54.000	AVERAGE
3		2400.000	12.961	61.416	74.377	--	--	AVERAGE
4	*	2402.029	12.975	88.725	101.700	--	--	AVERAGE

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 23.1 inches Bar type Digital Signage
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/10/24
 Test Mode : Mode 2: Transmit - BLE (GFSK)-2Mbps (2480MHz)

Horizontal



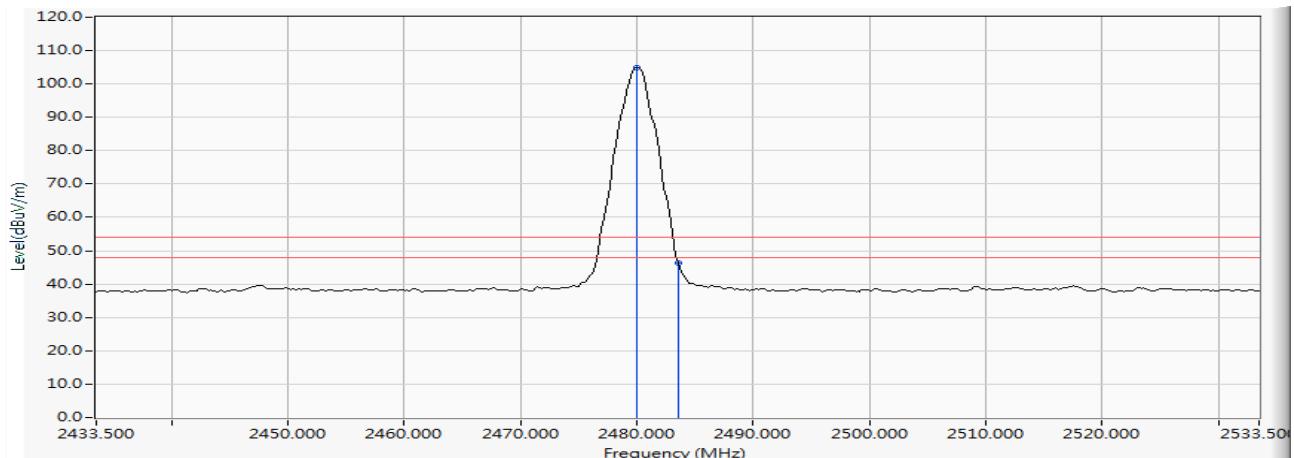
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2479.587	13.369	93.107	106.475	--	--	PEAK
2		2483.500	13.375	48.183	61.557	-12.443	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 23.1 inches Bar type Digital Signage
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/10/24
 Test Mode : Mode 2: Transmit - BLE (GFSK)-2Mbps (2480MHz)

Horizontal



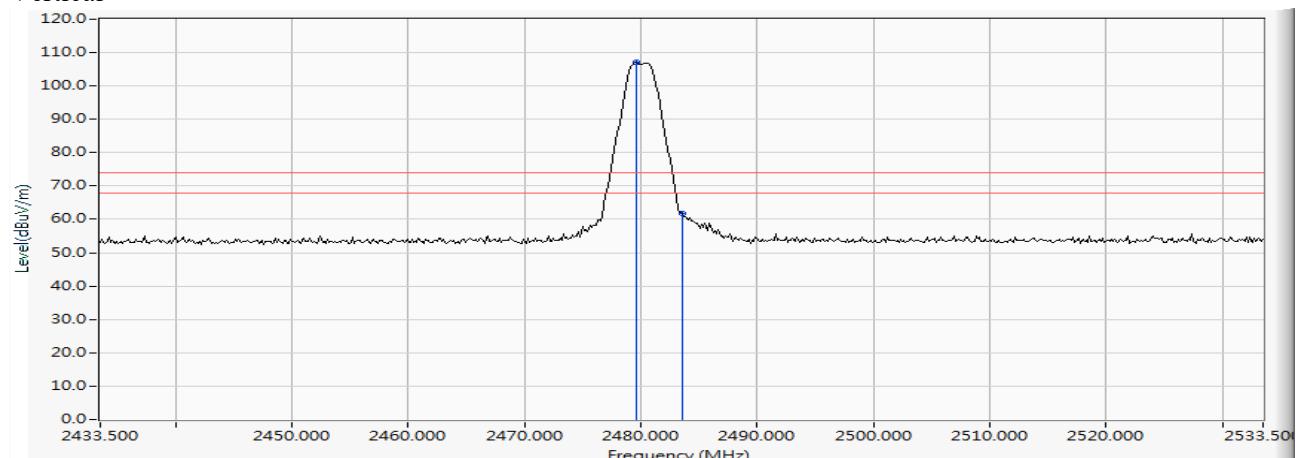
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2480.022	13.369	91.611	104.980	--	--	AVERAGE
2		2483.500	13.375	32.812	46.186	-7.814	54.000	AVERAGE

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 23.1 inches Bar type Digital Signage
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/10/24
 Test Mode : Mode 2: Transmit - BLE (GFSK)-2Mbps (2480MHz)

Vertical



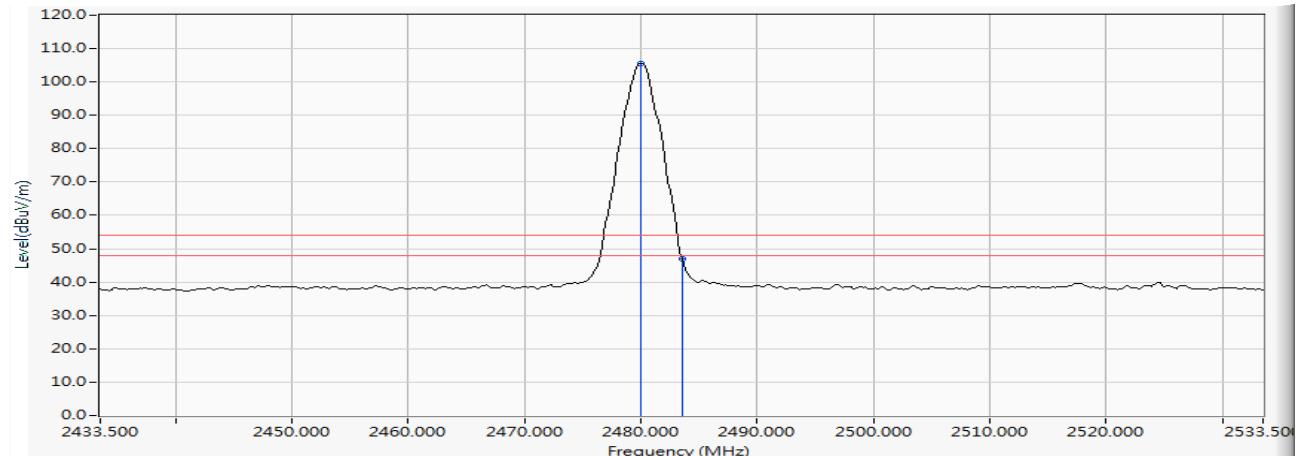
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2479.587	13.369	93.680	107.048	--	--	PEAK
2		2483.500	13.375	48.242	61.616	-12.384	74.000	PEAK

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 23.1 inches Bar type Digital Signage
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/10/24
 Test Mode : Mode 2: Transmit - BLE (GFSK)-2Mbps (2480MHz)

Vertical



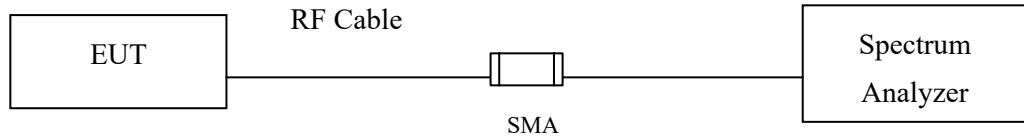
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2480.022	13.369	92.238	105.607	--	--	AVERAGE
2		2483.500	13.375	33.584	46.958	-7.042	54.000	AVERAGE

Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

7. **6dB Bandwidth**

7.1. **Test Setup**



7.2. **Limits**

The minimum bandwidth shall be at least 500 kHz.

7.3. **Test Procedure**

The EUT was setup according to ANSI C63.10, 2013; tested according to ANSI C63.10 Section 11.8 for compliance to FCC 47CFR 15.247 requirements.

Set RBW = 1-5% of the emission bandwidth, $VBW \geq 3 * RBW$

7.4. **Uncertainty**

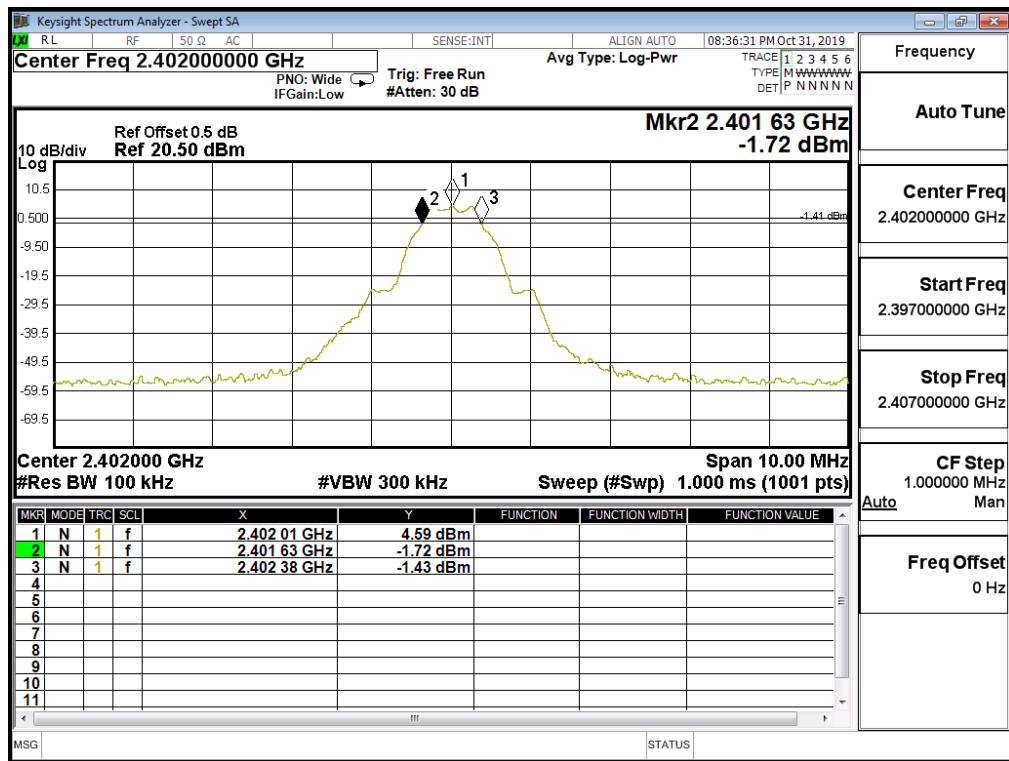
$\pm 283\text{Hz}$

7.5. Test Result of 6dB Bandwidth

Product : 23.1 inches Bar type Digital Signage
 Test Item : 6dB Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - BLE (GFSK)-1Mbps (2402MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	750	>500	Pass

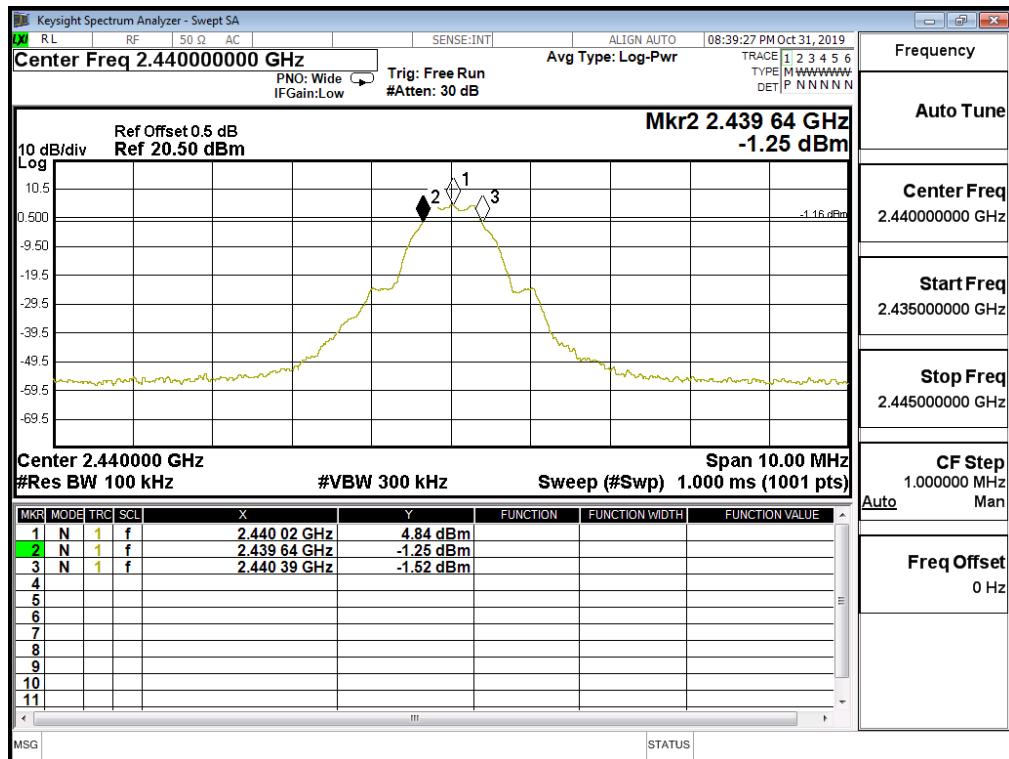
Figure Channel 00:



Product : 23.1 inches Bar type Digital Signage
 Test Item : 6dB Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - BLE (GFSK)-1Mbps (2440MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
19	2440	750	>500	Pass

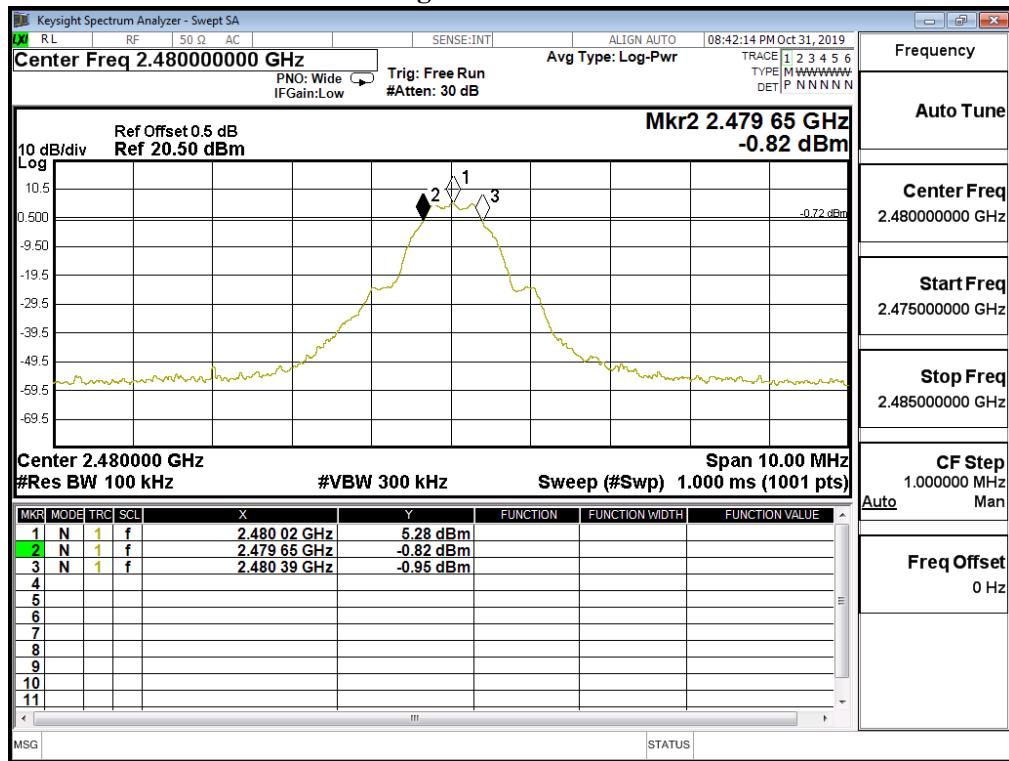
Figure Channel 19:



Product : 23.1 inches Bar type Digital Signage
 Test Item : 6dB Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - BLE (GFSK)-1Mbps (2480MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
39	2480	740	>500	Pass

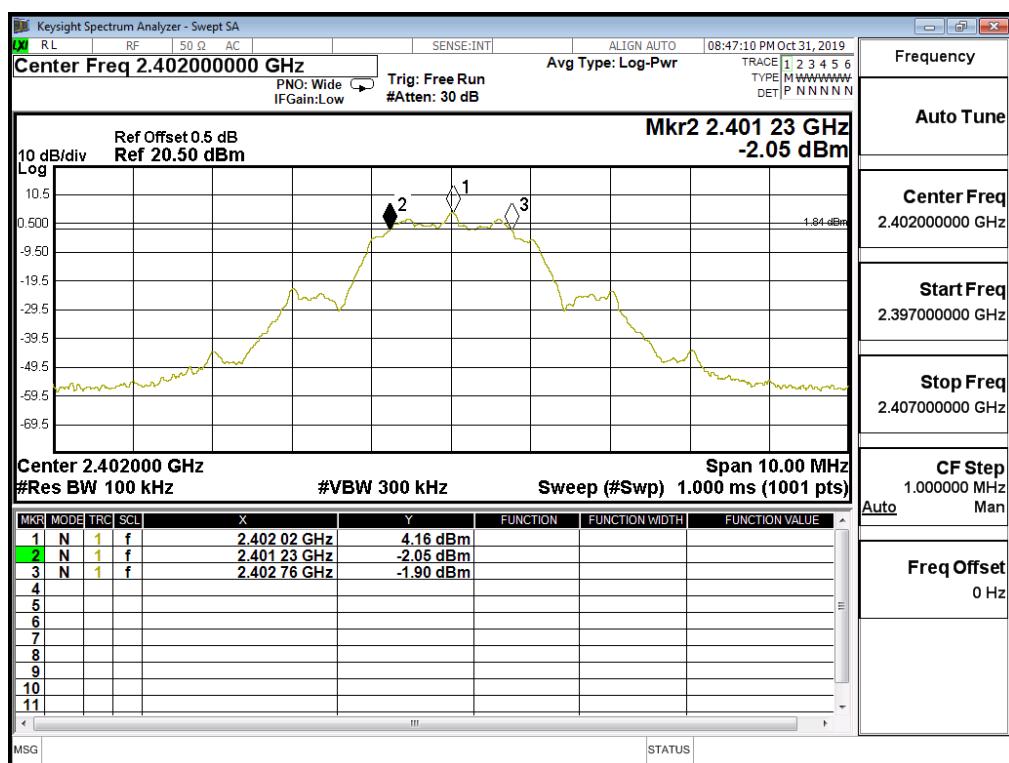
Figure Channel 39:



Product : 23.1 inches Bar type Digital Signage
 Test Item : 6dB Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit - BLE (GFSK)-2Mbps (2402MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	1530	>500	Pass

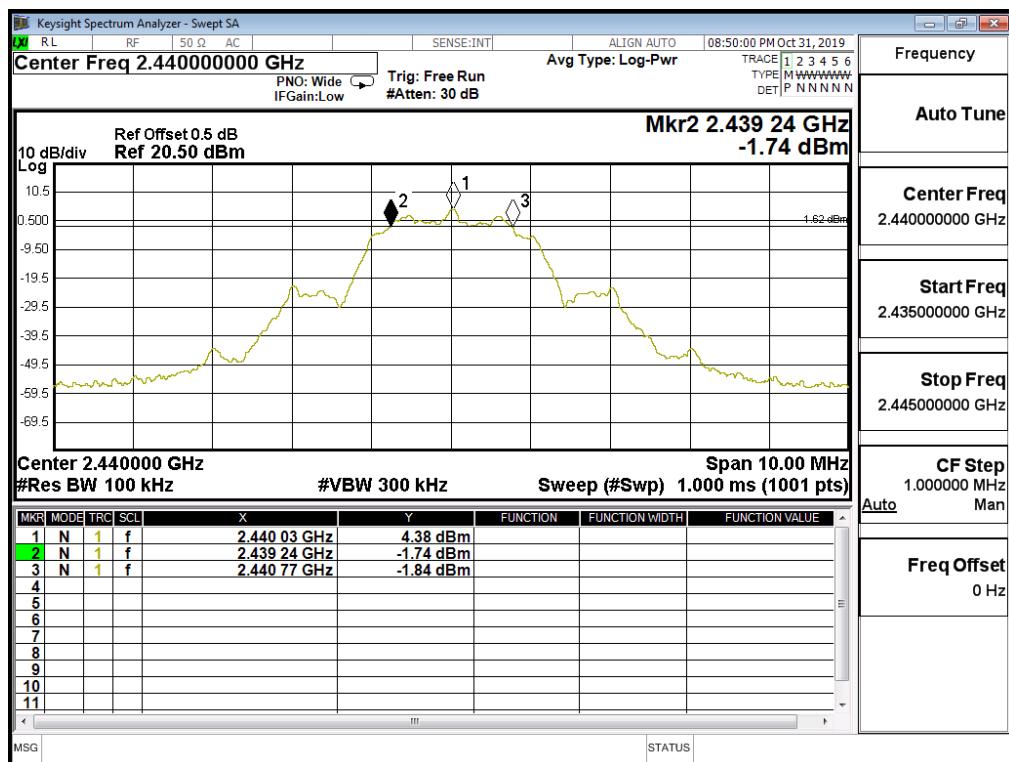
Figure Channel 00:



Product : 23.1 inches Bar type Digital Signage
 Test Item : 6dB Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit - BLE (GFSK)-2Mbps (2440MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
19	2440	1530	>500	Pass

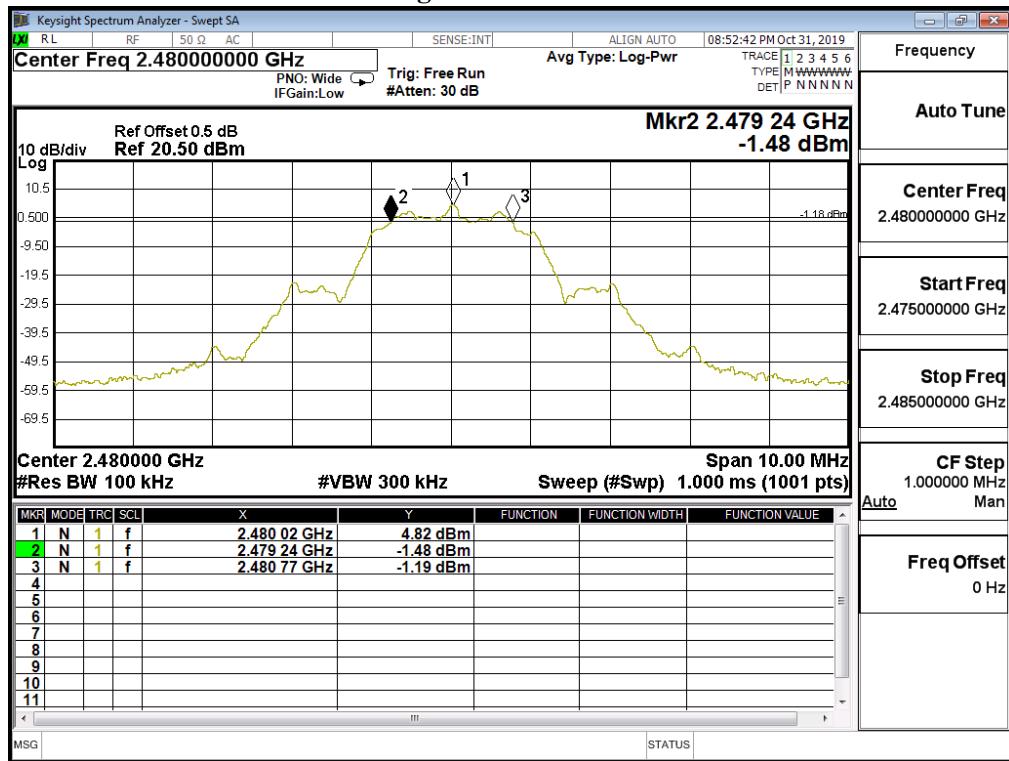
Figure Channel 19:



Product : 23.1 inches Bar type Digital Signage
 Test Item : 6dB Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit - BLE (GFSK)-2Mbps (2480MHz)

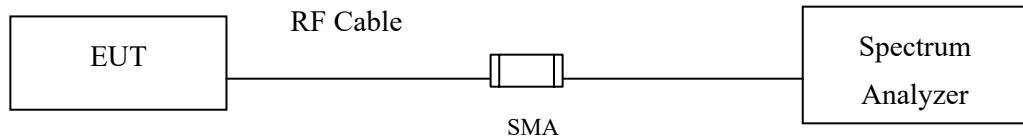
Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
39	2480	1530	>500	Pass

Figure Channel 39:



8. Power Density

8.1. Test Setup



8.2. Limits

The transmitted power density averaged over any 1 second interval shall not be greater +8dBm in any 3kHz bandwidth.

8.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013; tested according to DTS test procedure of C63.10 Section 11.10.2 for compliance to FCC 47CFR 15.247 requirements.

The maximum power spectral density using C63.10 Section 11.10.2 Method PKPSD (peak PSD).

8.4. Uncertainty

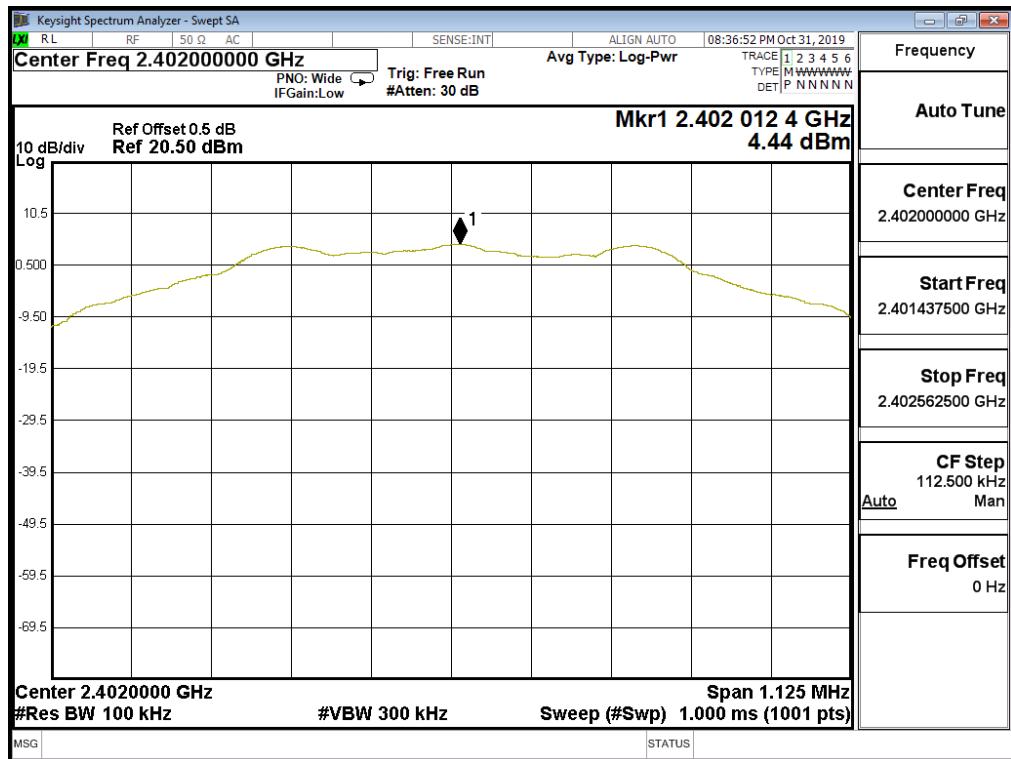
± 1.20 dB

8.5. Test Result of Power Density

Product : 23.1 inches Bar type Digital Signage
 Test Item : Power Density Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - BLE (GFSK)-1Mbps (2402MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
00	2402	4.44	≤8dBm	Pass

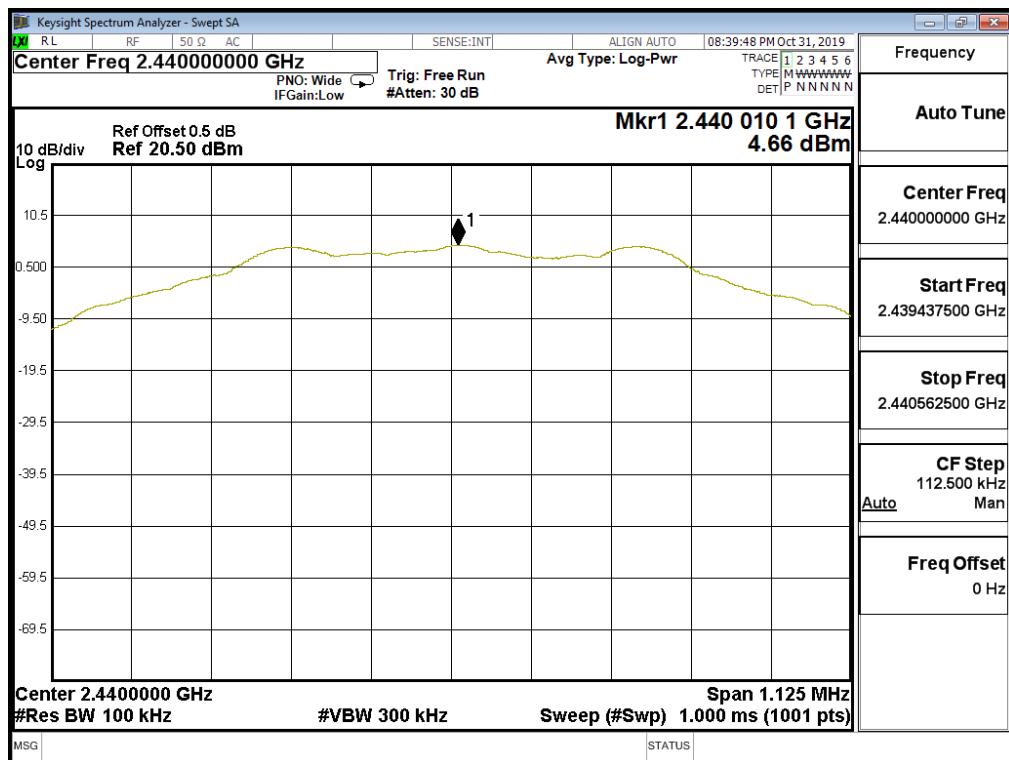
Figure Channel 00:



Product : 23.1 inches Bar type Digital Signage
 Test Item : Power Density Data
 Test Site : No.3OATS
 Test Mode : Mode 1: Transmit - BLE (GFSK)-1Mbps (2440MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
19	2440	4.66	≤8dBm	Pass

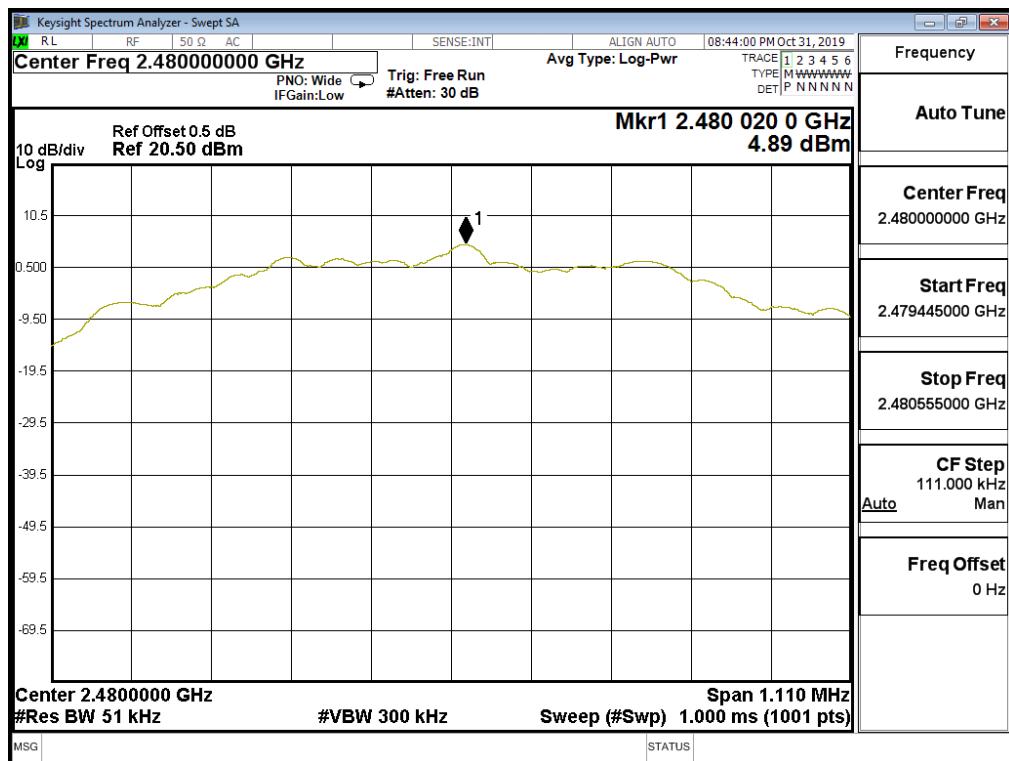
Figure Channel 19:



Product : 23.1 inches Bar type Digital Signage
 Test Item : Power Density Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - BLE (GFSK)-1Mbps (2480MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
39	2480	4.89	≤8dBm	Pass

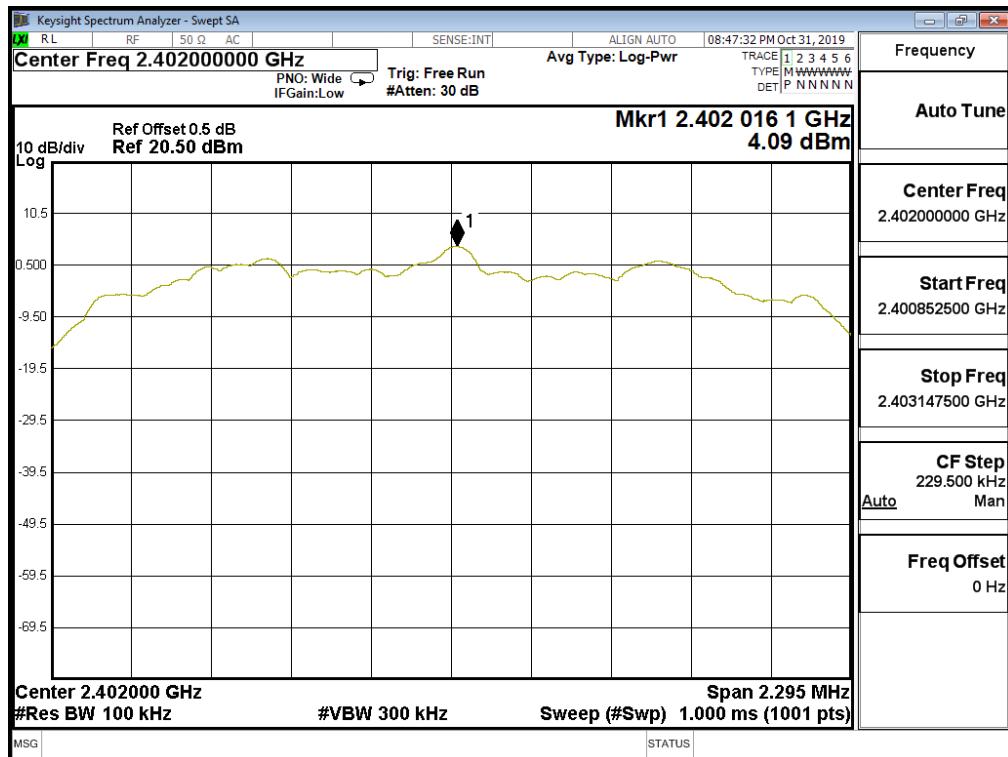
Figure Channel 39:



Product : 23.1 inches Bar type Digital Signage
 Test Item : Power Density Data
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit - BLE (GFSK)-2Mbps (2402MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
00	2402	4.09	≤8dBm	Pass

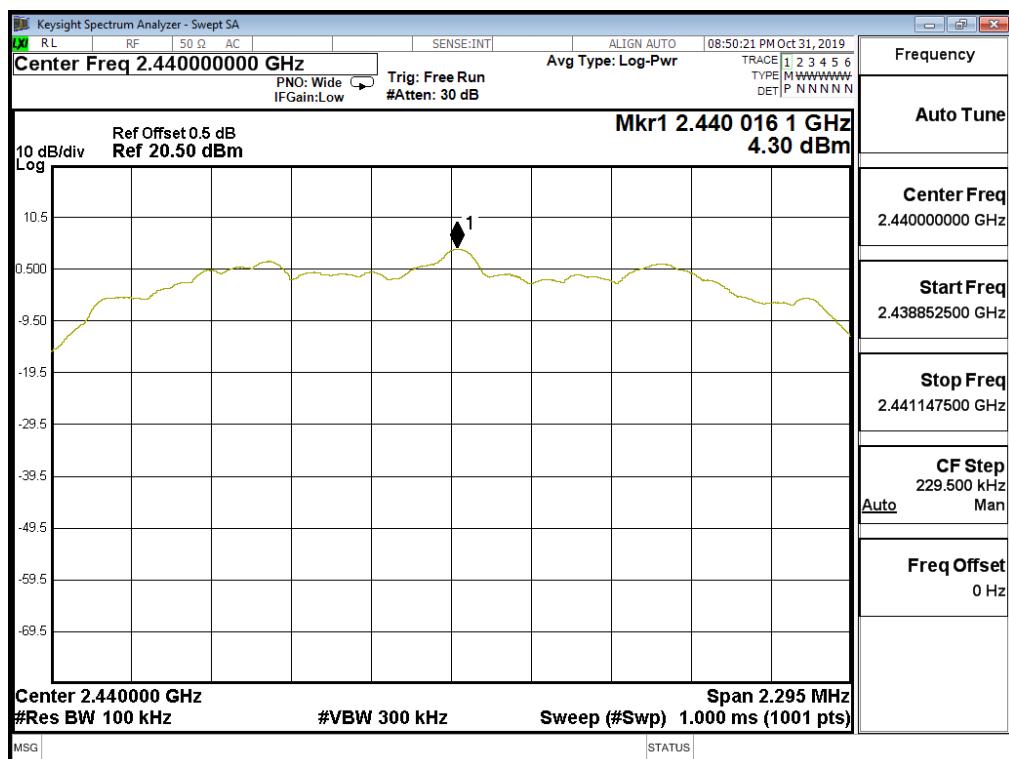
Figure Channel 00:



Product : 23.1 inches Bar type Digital Signage
 Test Item : Power Density Data
 Test Site : No.3OATS
 Test Mode : Mode 2: Transmit - BLE (GFSK)-2Mbps (2440MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
19	2440	4.30	≤8dBm	Pass

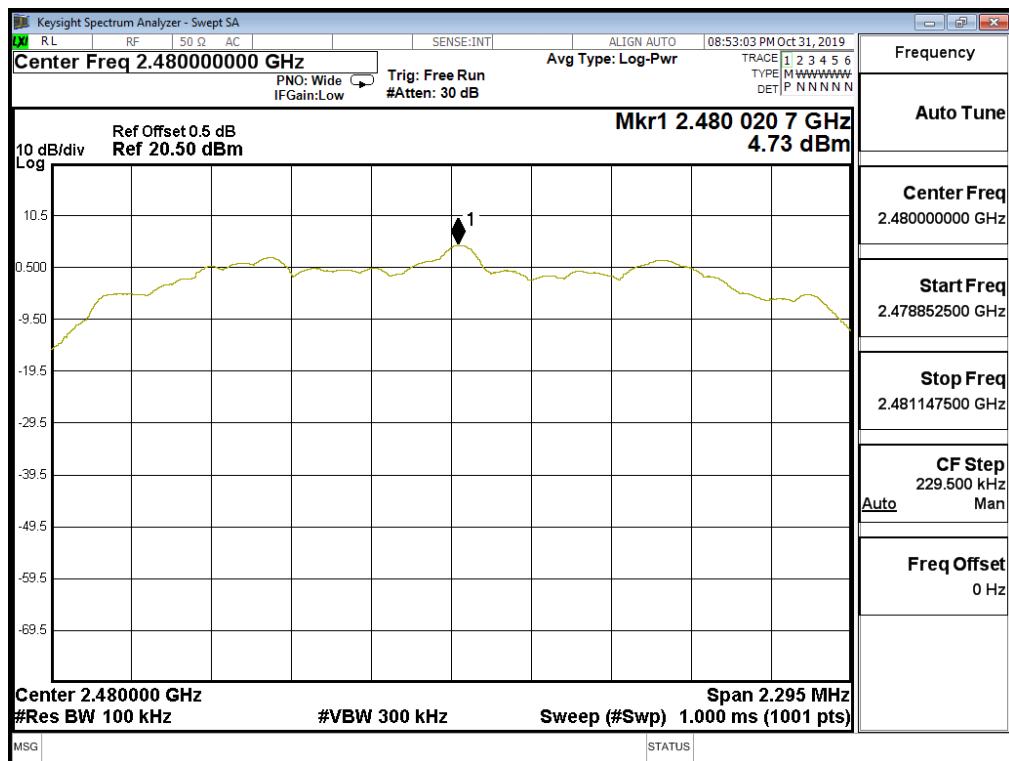
Figure Channel 19:



Product : 23.1 inches Bar type Digital Signage
 Test Item : Power Density Data
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit - BLE (GFSK)-2Mbps (2480MHz)

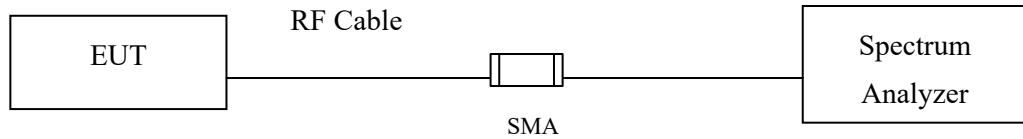
Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
39	2480	4.73	≤8dBm	Pass

Figure Channel 39:



9. Duty Cycle

9.1. Test Setup



9.2. Test Procedure

The EUT was setup according to ANSI C63.10 2013; tested according to ANSI C63.10 2013 for compliance to FCC 47CFR 15.247 requirements.

9.3. Uncertainty

± 2.31msec

9.4. Test Result of Duty Cycle

Product : 23.1 inches Bar type Digital Signage
 Test Item : Duty Cycle
 Test Mode : Mode 1: Transmit - BLE (GFSK)-1Mbps

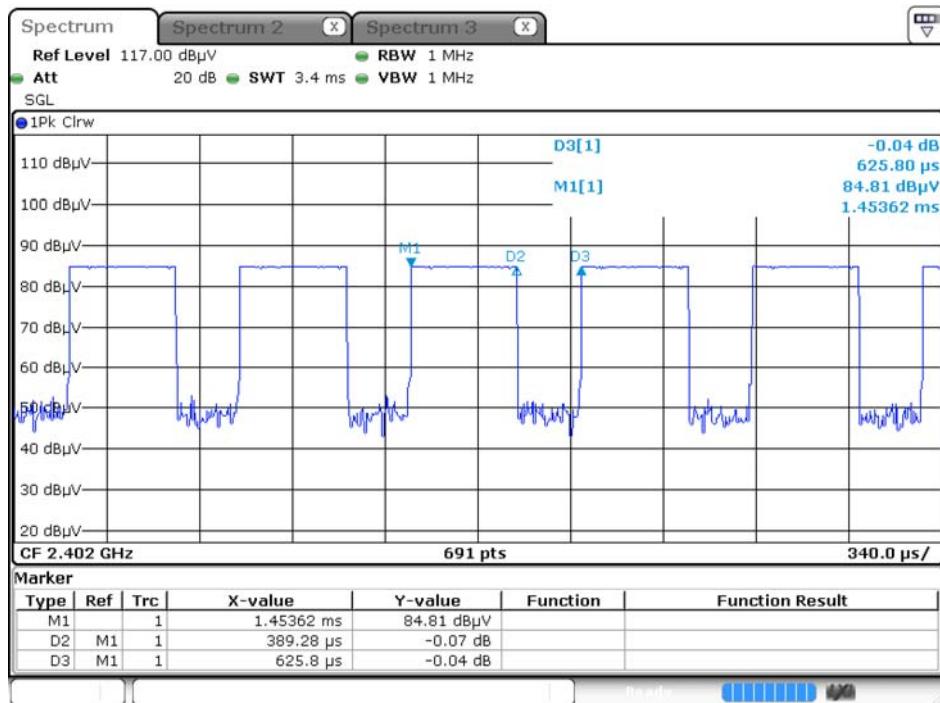
Duty Cycle Formula:

$$\text{Duty Cycle} = \text{Ton} / (\text{Ton} + \text{Toff})$$

$$\text{Duty Factor} = 10 \log (1/\text{Duty Cycle})$$

Results:

2.4GHz band	Ton (ms)	Ton + Toff (ms)	Duty Cycle (%)	Duty Factor (dB)
BLE-1Mbps	0.3893	0.6258	62.21	2.06



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Product : 23.1 inches Bar type Digital Signage
 Test Item : Duty Cycle
 Test Mode : Mode 2: Transmit - BLE (GFSK)-2Mbps

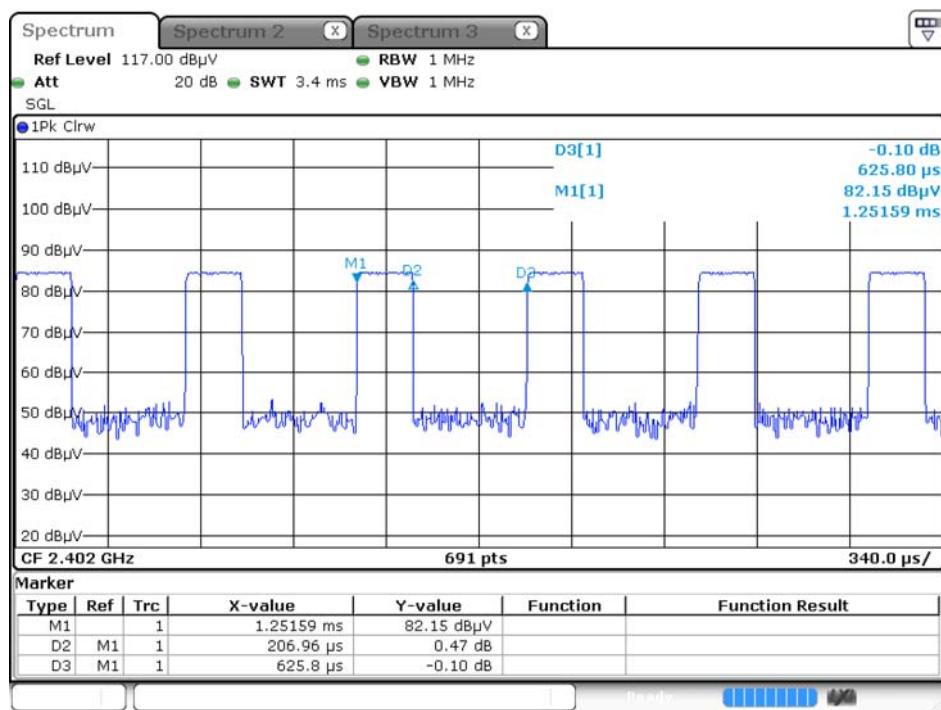
Duty Cycle Formula:

$$\text{Duty Cycle} = \text{Ton} / (\text{Ton} + \text{Toff})$$

$$\text{Duty Factor} = 10 \log (1/\text{Duty Cycle})$$

Results:

2.4GHz band	Ton (ms)	Ton + Toff (ms)	Duty Cycle (%)	Duty Factor (dB)
BLE-2Mbps	0.2070	0.6258	33.07	4.81



Date: 24.OCT.2019 16:15:28

10. EMI Reduction Method During Compliance Testing

No modification was made during testing.