TESTING LABORATORY
CERTIFICATE #4820.01

FCC PART 15.247

TEST REPORT

For

Hytera Communications Corporation Limited

Hytera Tower, Hi-Tech Industrial Park North, 9108# Beihuan Road, Nanshan District, Shenzhen, 518057 China

FCC ID: YAMHM78XVHFS

Report Type:	**Product Name:**
Original Report	DIGITAL MOBILE RADIO

Report Number:	DG2210702-26804E-00B
Report Date:	2021-07-23
Reviewed By:	Gavin Xu RF Engineer
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Dongguan) No.12, Pulong East 1st Road, Tangxia Town, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

TABLE OF CONTENTS

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:	DIGITAL MOBILE RADIO
EUT Model:	HM782 VHF
Multiple Models:	HM785 VHF, HM786 VHF, HM788 VHF HDM782 VHF, HDM785 VHF, HDM786 VHF, HDM788 VHF
Model Difference:	Refer to the DOS letter
Rated Input Voltage:	DC 13.6V
Serial Number:	DG2210702-26804E-RF-S1
EUT Received Date:	2021.07.03
EUT Received Status:	Good

Technical Specification

Operation Frequency Range (MHz):	2402-2480
Max. RF Output Power (EIRP) (dBm):	0.62
Antenna Gain (dBi)▲:	0
Modulation Type:	GFSK

Objective

This report is prepared on behalf of ***Hytera Communications Corporation Limited*** in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communications Commission's rules.

The tests were performed in order to determine the compliance of the EUT with FCC Rules Part 15-Subpart C, section 15.203, 15.205, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

FCC Part 15C DSS submissions with FCC ID: YAMHM78XVHFS
FCC Part 22&74&80&90 TNB submissions with FCC ID: YAMHM78XVHFS

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices and KDB 558074 D01 DTS Meas Guidance v05r02.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan).

Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.61dB
Power Spectral Density, conducted	±0.61 dB
Unwanted Emissions, radiated	30M~200MHz: 4.55 dB,200M~1GHz: 5.92 dB,1G~6GHz: 4.98 dB, 6G~18GHz: 5.89 dB,18G~26.5G:5.47 dB,26.5G~40G:5.63 dB
Unwanted Emissions, conducted	±1.5 dB
Temperature	±1℃
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	3.12 dB (150 kHz to 30 MHz)

Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.12, Pulong East 1st Road, Tangxia Town, Dongguan, Guangdong, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 897218, the FCC Designation No. : CN1220.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0022.

Declarations

BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with a triangle symbol "▲". Customer model name, addresses, names, trademarks etc. are not considered data.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

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This report may contain data that are not covered by the accreditation scope and shall be marked with an asterisk "★".

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in Engineering Mode, which was provided by the manufacturer.

For Bluetooth LE mode, 40 channels are provided for testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404	…	…
…	…	…	…
…	…	…	…
..	…	38	2478
19	2440	39	2480

EUT was tested with channel 0, 19 and 39.

Equipment Modifications

No modification was made to the EUT tested.

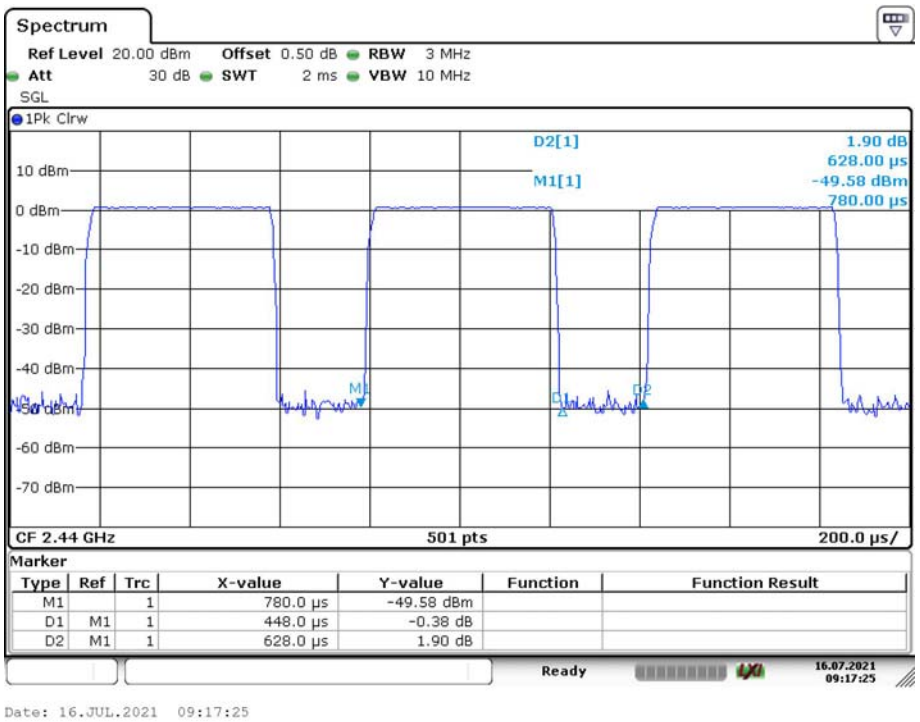
EUT Exercise Software

The software: " Blue test2.5.8.exe▲" was used during test, which was provided by manufacturer.
The maximum power level was configured by the software as below table:

Channel	Frequency (MHz)	Power level Setting
Low	2402	6
Middle	2440	6
High	2480	6

The maximum duty cycle as following table:

T_{on} (ms)	T_{on+off} (ms)	Duty Cycle (%)
0.448	0.628	71.34



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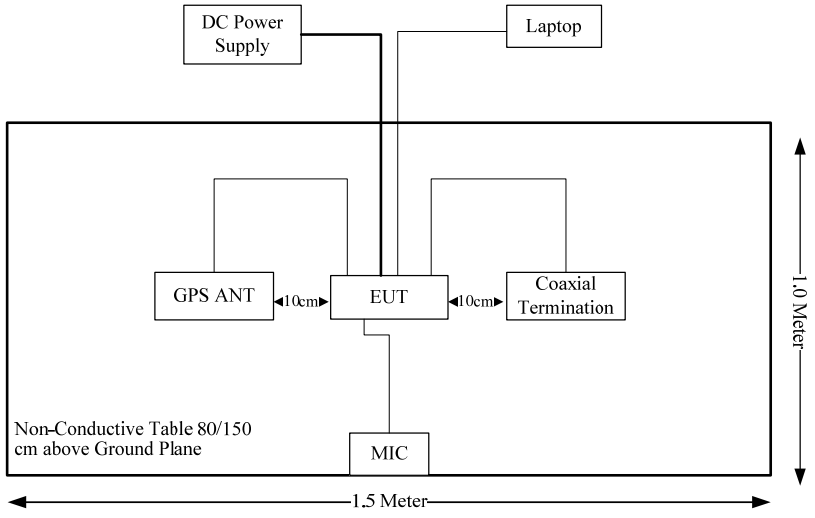
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Proinstrument	DC Power Supply	pps3300	3300012
DELL	Laptop	E6410	CB30920865
BEW	Coaxial Termination	TF300-6-B	/

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length(m)	From	To
DC Line	No	No	3	DC Power Supply	EUT
Coaxial Cable	Yes	No	0.5	EUT	Termination
GPS Antenna Cable	Yes	No	3	EUT	GPS Antenna
Network Cable	No	Yes	10	EUT	Laptop
MIC Cable	No	No	1	EUT	MIC

Block Diagram of Test Setup



Test Equipment List

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiation Below 1GHz Test					
Sunol Sciences	Antenna	JB3	A060611-2	2020-08-25	2023-08-25
R&S	EMI Test Receiver	ESCI	100224	2020-09-12	2021-09-12
Unknown	Coaxial Cable	C-NJNJ-50	C-1000-01	2020-09-05	2021-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-02	2020-09-05	2021-09-05
Unknown	Coaxial Cable	C-NJNJ-50	C-0530-01	2020-09-24	2021-09-24
Sonoma	Amplifier	310N	185914	2020-10-13	2021-10-13
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
Radiation Above 1GHz Test					
ETS-Lindgren	Horn Antenna	3115	000 527 35	2018-10-12	2021-10-12
Ducommun Technolagies	Horn Antenna	ARH-4223-02	1007726-01 1304	2020-12-05	2023-12-04
Agilent	Spectrum Analyzer	E4440A	SG43360054	2021-07-07	2022-07-07
Unknown	Coaxial Cable	C-SJSJ-50	C-0800-01	2020-09-05	2021-09-05
Mini-Circuit	Amplifier	ZVA-213-S+	54201245	2020-09-05	2021-09-05
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2021-06-27	2022-06-27
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
E-Microwave	Band-stop Filters	OBSF-2400-2483.5-S	OE01601525	2021-06-16	2022-06-16
Mini Circuits	High Pass Filter	VHF-6010+	31118	2021-06-16	2022-06-16
RF Conducted					
R&S	EMI Test Receiver	ESR3	102724	2021-06-22	2022-06-21
Unknown	Coaxial Cable	C-SJ00-0010	C0010/01	Each time	N/A
E-Microwave	Blocking Control	EMDCB-00036	0E01201047	2021-05-06	2022-05-05
E-Microwave	Coaxial Attenuators	EMCA10-5RN-6	OE01203239	2020-09-06	2021-09-06
Agilent	USB Wideband Power Sensor	U2022XA	MY5417006	2020-09-12	2021-09-12

* Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Environmental Conditions

Test Items	Radiated Emissions (Below 1GHz)	Radiated Emissions (Above 1GHz)	RF Conducted
Temperature:	25.8 °C	29.4 °C	26.2 °C
Relative Humidity:	56%	29 %	47 %
ATM Pressure:	100.3kPa	100.5kPa	100.3 kPa
Tester:	Alex Hu	Jeremy Liang	Wayne Wei
Test Date:	2021.07.15	2021.07.14	2021-07-16

SUMMARY OF TEST RESULTS

S/N	FCC Rules	Description of Test	Result
2	§15.203	Antenna Requirement	Compliance
3	§15.207 (a)	AC Line Conducted Emissions	Not Applicable
4	§15.205 §15.209 §15.247(d)	Spurious Emissions	Compliance
5	§15.247 (a)(2)	6 dB Bandwidth	Compliance
6	§15.247(b)(3)	Maximum Conducted Output Power	Compliance
7	§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
8	§15.247(e)	Power Spectral Density	Compliance

Note:
Not Applicable: EUT is used in the vehicular conditon.

2 - ANTENNA REQUIREMENT

Applicable Standard

According to § 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. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.
c. Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

Antenna Connector Construction

The EUT has one internal FPC antennas arrangement, fulfill the requirement of this section. Please refer to the EUT photos.

Antenna Type	input impedance (Ohm)	Antenna Gain /Frequency Range
FPC	50	0 dBi/2.4~2.5GHz

Result: Compliance.

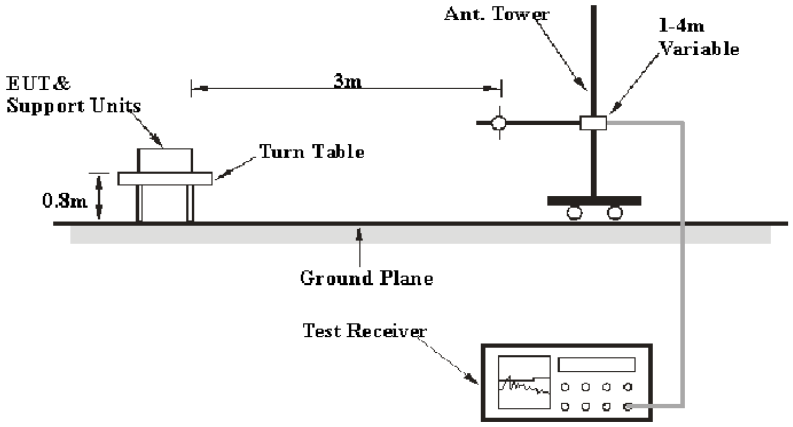
4 - SPURIOUS EMISSIONS

Applicable Standard

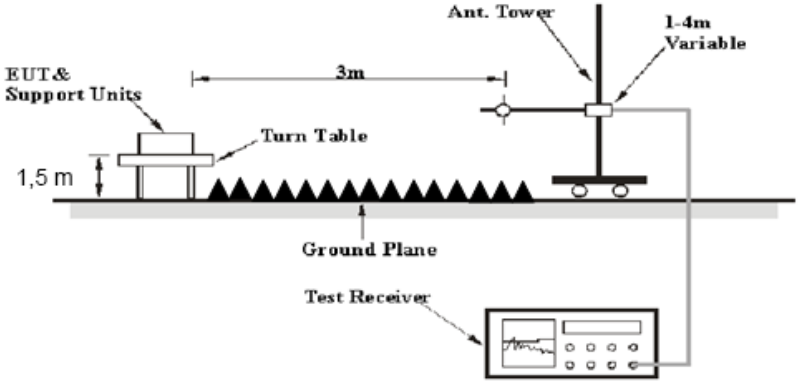
FCC §15.247 (d); §15.209; §15.205

Test System Setup

Below 1GHz:



Above 1GHz:



The radiated emission below 1GHz tests were performed in the 3meters chamber, above 1GHz tests were performed in the 3 meters chamber B, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits.

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.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

30MHz-1000MHz:

Measurement	RBW	Video B/W	IF B/W
QP	120 kHz	300 kHz	120kHz

1GHz- 25GHz:

Measurement	Duty cycle	RBW	Video B/W
PK	Any	1MHz	3 MHz
AV	>98%	1MHz	10 Hz
	<98%	1MHz	1/T

Note: T is minimum transmission duration

If the maximized peak measured value complies with under the QP/Average limit more than 6dB, then it is unnecessary to perform an QP/Average measurement.

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

Corrected Amplitude & Margin Calculation

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

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit –Corrected Amplitude

Test Data

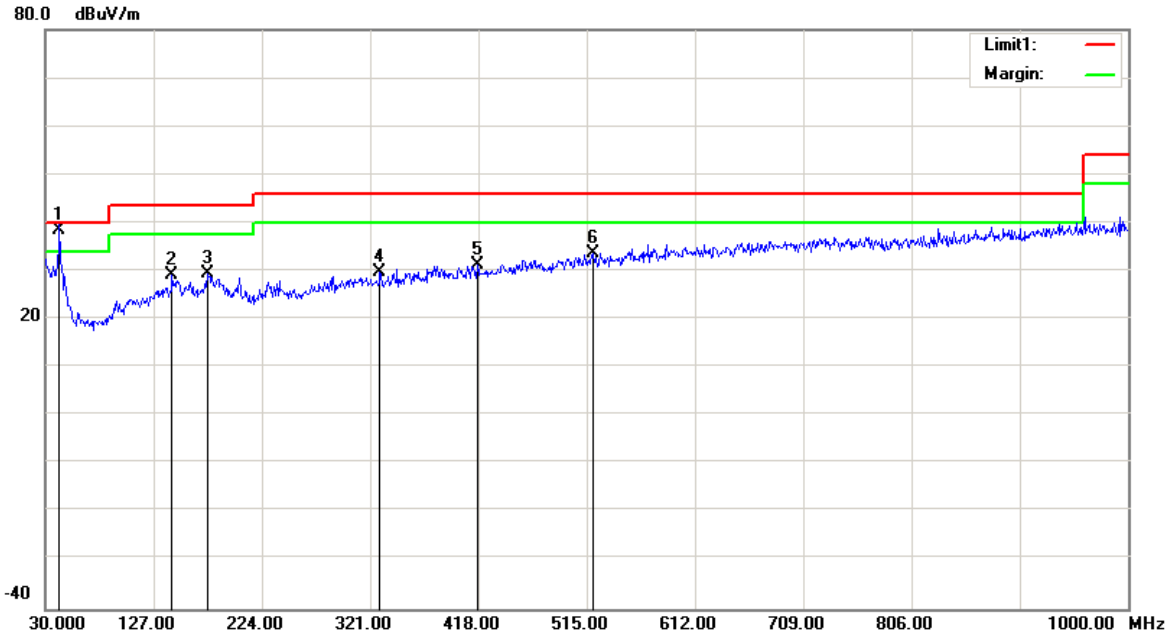
Test Mode: Transmitting

Test Result: Compliance

Please Refer to the following data.

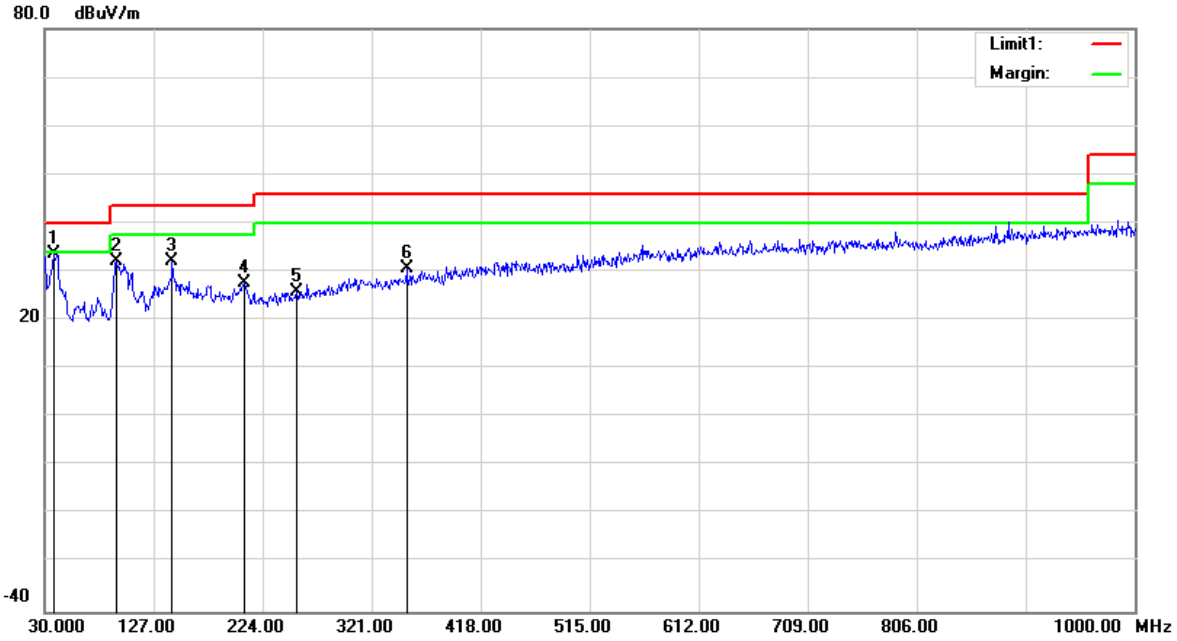
1) 30MHz-1GHz *(High channel was the worst)*

Horizontal:



Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
42.6100	18.56	QP	19.94	38.50	40.00	1.50
143.4900	7.49	peak	21.63	29.12	43.50	14.38
175.5000	8.67	peak	20.92	29.59	43.50	13.91
329.7300	5.93	peak	23.72	29.65	46.00	16.35
417.0300	5.37	peak	25.79	31.16	46.00	14.84
520.8200	5.81	peak	27.94	33.75	46.00	12.25

Vertical:



Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
38.7300	11.32	peak	22.41	33.73	40.00	6.27
94.0200	15.81	peak	16.22	32.03	43.50	11.47
143.4900	10.56	peak	21.63	32.19	43.50	11.31
207.5100	7.64	peak	19.90	27.54	43.50	15.96
254.0700	4.70	peak	21.09	25.79	46.00	20.21
352.0400	6.28	peak	24.26	30.54	46.00	15.46

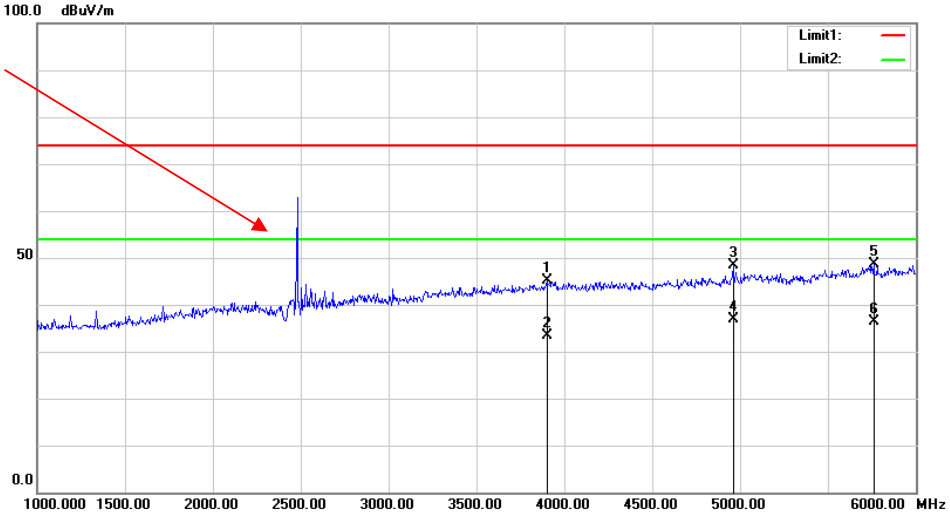
2) 1-25GHz:

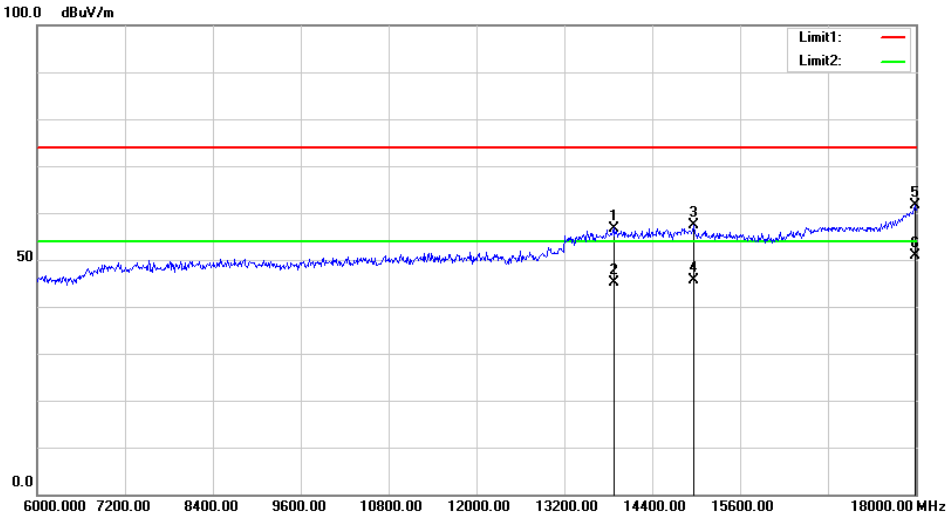
Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB/m)					
Low Channel: 2402 MHz									
2402.00	66.68	PK	H	28.10	1.80	0.00	96.58	N/A	N/A
2402.00	65.01	AV	H	28.10	1.80	0.00	94.91	N/A	N/A
2402.00	67.02	PK	V	28.10	1.80	0.00	96.92	N/A	N/A
2402.00	65.89	AV	V	28.10	1.80	0.00	95.79	N/A	N/A
2390.00	26.37	PK	V	28.08	1.80	0.00	56.25	74.00	17.75
2390.00	14.01	AV	V	28.08	1.80	0.00	43.89	54.00	10.11
4804.00	39.89	PK	V	32.91	3.17	25.60	50.37	74.00	23.63
4804.00	33.73	AV	V	32.91	3.17	25.60	44.21	54.00	9.79
7206.00	34.67	PK	V	35.74	4.82	25.60	49.63	74.00	24.37
7206.00	22.15	AV	V	35.74	4.82	25.60	37.11	54.00	16.89
Middle Channel: 2440 MHz									
2440.00	65.53	PK	H	28.18	1.82	0.00	95.53	N/A	N/A
2440.00	64.43	AV	H	28.18	1.82	0.00	94.43	N/A	N/A
2440.00	67.79	PK	V	28.18	1.82	0.00	97.79	N/A	N/A
2440.00	66.98	AV	V	28.18	1.82	0.00	96.98	N/A	N/A
4880.00	40.85	PK	V	33.06	3.27	25.66	51.52	74.00	22.48
4880.00	33.21	AV	V	33.06	3.27	25.66	43.88	54.00	10.12
7320.00	34.26	PK	V	36.03	4.62	25.72	49.19	74.00	24.81
7320.00	22.73	AV	V	36.03	4.62	25.72	37.66	54.00	16.34
High Channel: 2480 MHz									
2480.00	66.31	PK	H	28.26	1.84	0.00	96.41	N/A	N/A
2480.00	65.35	AV	H	28.26	1.84	0.00	95.45	N/A	N/A
2480.00	66.82	PK	V	28.26	1.84	0.00	96.92	N/A	N/A
2480.00	66.04	AV	V	28.26	1.84	0.00	96.14	N/A	N/A
2483.50	24.47	PK	V	28.27	1.84	0.00	54.58	74.00	19.42
2483.50	15.13	AV	V	28.27	1.84	0.00	45.24	54.00	8.76
4960.00	41.48	PK	V	33.22	3.23	25.63	52.30	74.00	21.70
4960.00	33.88	AV	V	33.22	3.23	25.63	44.70	54.00	9.30
7440.00	38.45	PK	V	36.34	4.41	25.85	53.35	74.00	20.65
7440.00	26.37	AV	V	36.34	4.41	25.85	41.27	54.00	12.73

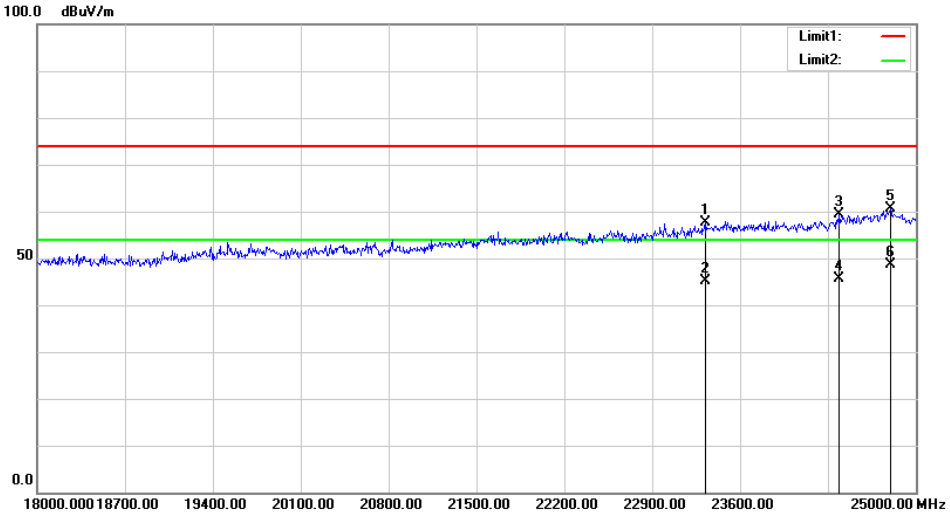
3) Test Plots *(High channel was the worst)*

Horizontal:

Fundamental Test with Band Rejection Filter

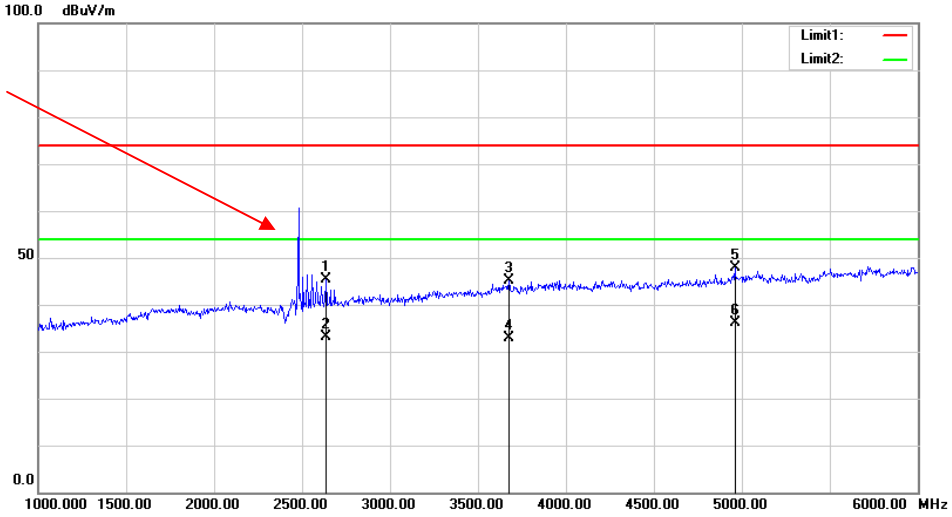


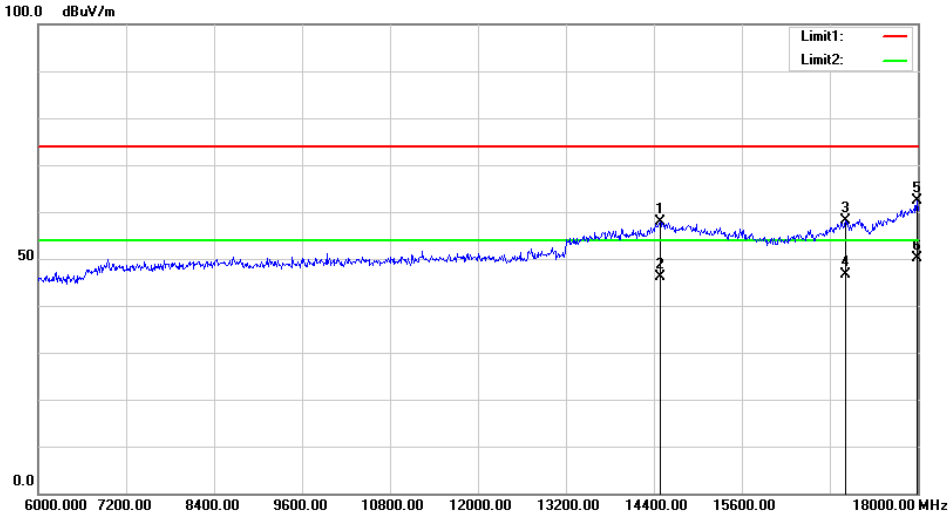


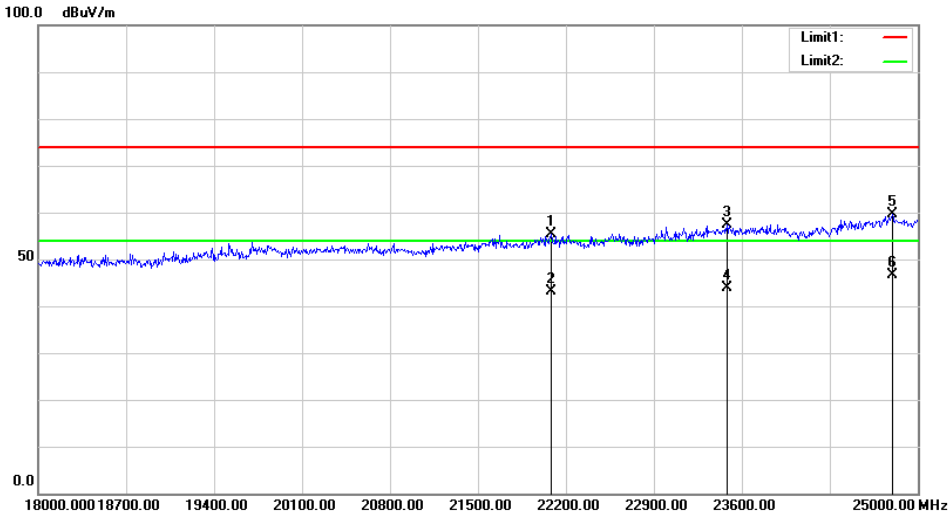


Vertical:

Fundamental Test with Band Rejection Filter







5 – 6 DB EMISSION BANDWIDTH

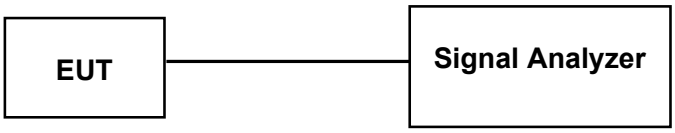
Applicable Standard

According to FCC §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.

Test Procedure

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



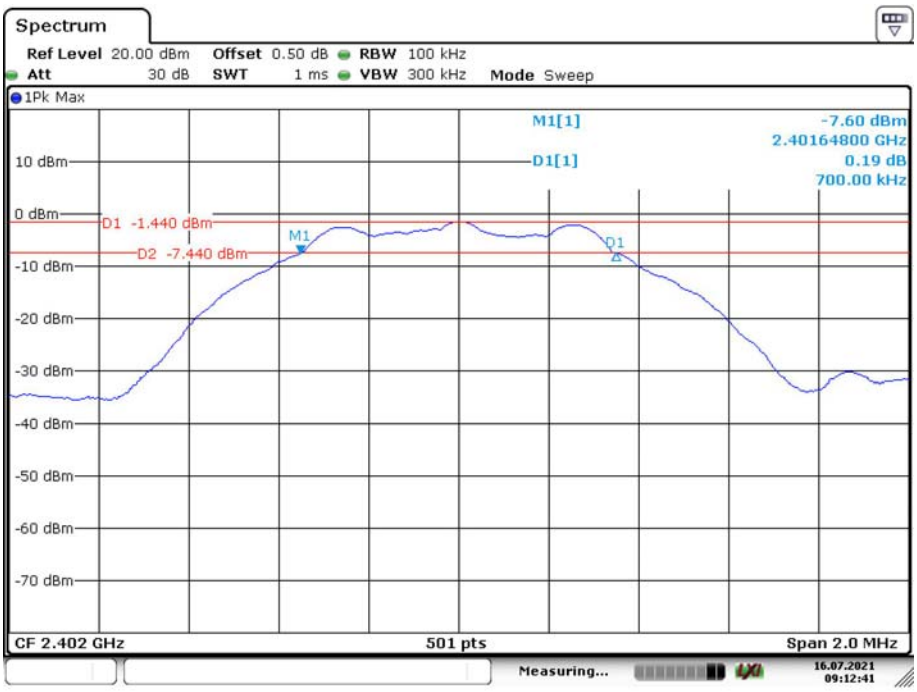
Test Data

Test Mode: Transmitting

Test Result: Compliance. Please refer to following tables and plots.

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (MHz)
Low	2402	0.700	≥0.5
Middle	2440	0.692	≥0.5
High	2480	0.696	≥0.5

BLE Low Channel



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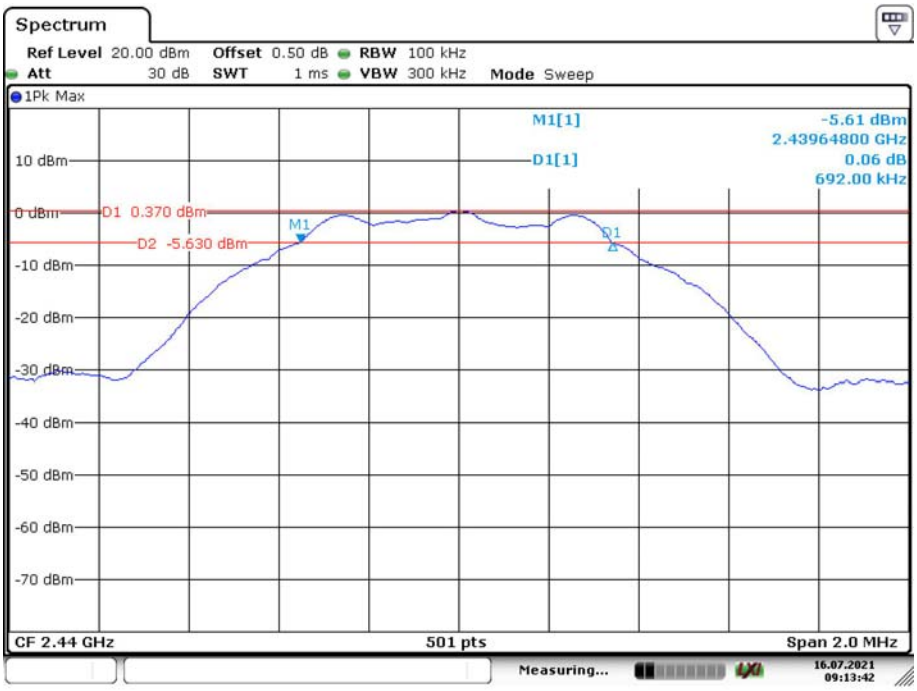
BLE Middle Channel



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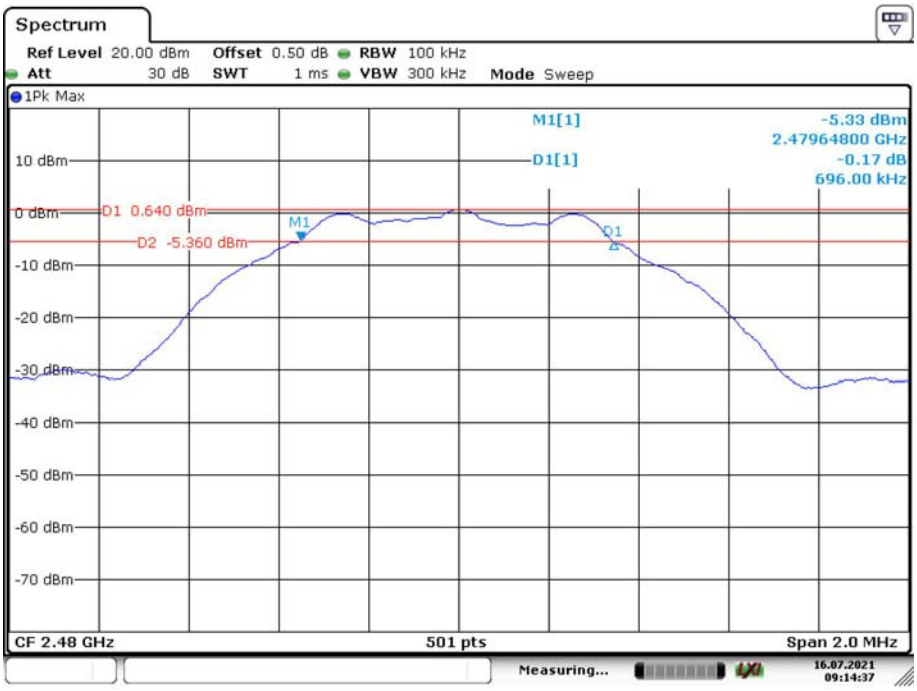
BLE High Channel



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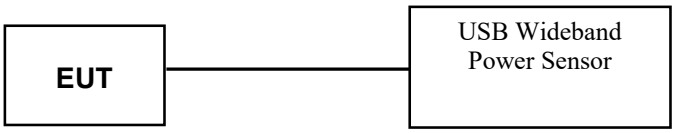
6 - MAXIMUM PEAK CONDUCTED OUTPUT POWER

Applicable Standard

According to FCC §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. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to test equipment.
3. Add a correction factor to the display.



Test Data

Test Mode: Transmitting

Test Result: Compliance. Please refer to following tables and plots.

Channel	Frequency (MHz)	Max Peak Conducted Output Power (dBm)	Limit (dBm)
Low	2402	-1.37	≤30
Middle	2440	0.61	≤30
High	2480	**0.62**	≤30

Note: The data above was tested in conducted mode, the antenna gain is 0 dBi.

7 – 100 KHZ BANDWIDTH OF FREQUENCY BAND EDGE

Applicable Standard

According to FCC§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) (see §15.205(c)).

Test Procedure

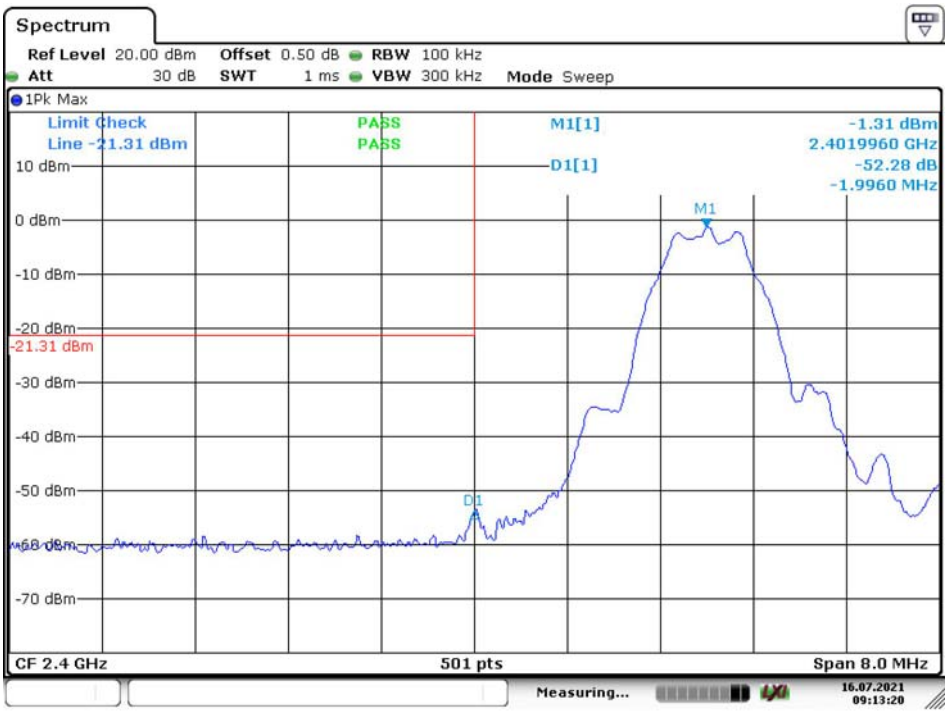
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

Test Data

Test Mode: Transmitting

Test Result: Compliance. Please refer to following tables and plots.

BLE Band Edge, Left Side



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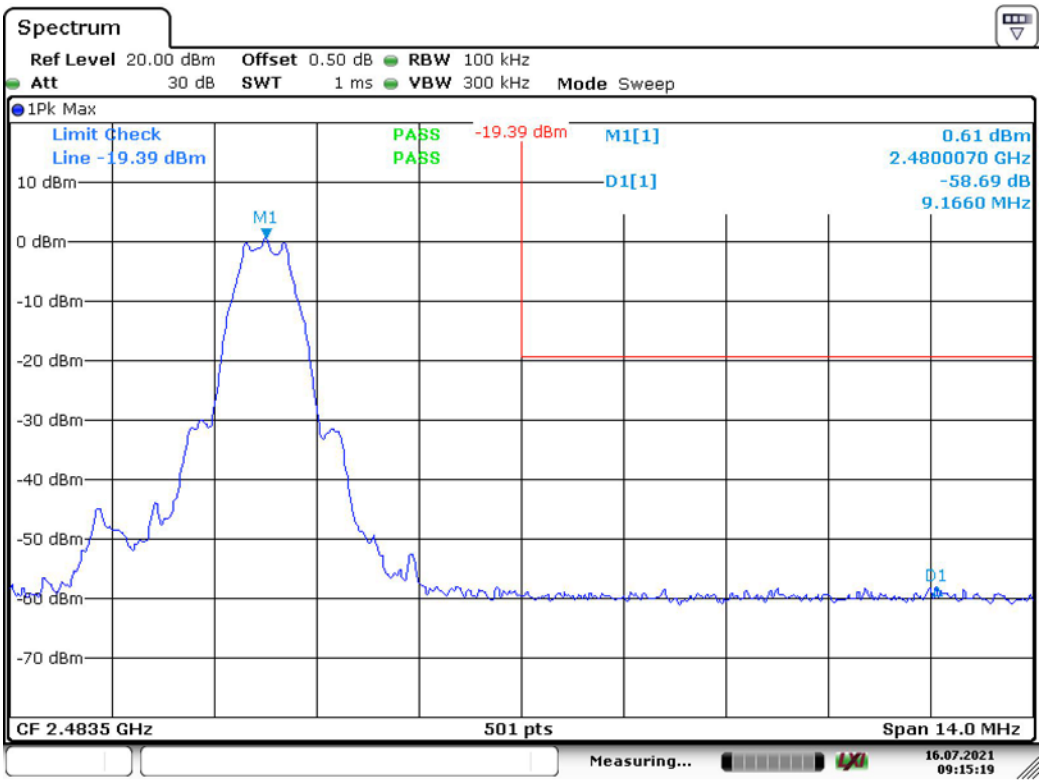
BLE Band Edge, Right Side



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8 - POWER SPECTRAL DENSITY

Applicable Standard

According to FCC§15.247(e):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. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set the RBW = 3 kHz, VBW = 10 kHz, Set the span to 1.5 times the DTS bandwidth.
4. Use the peak marker function to determine the maximum amplitude level.

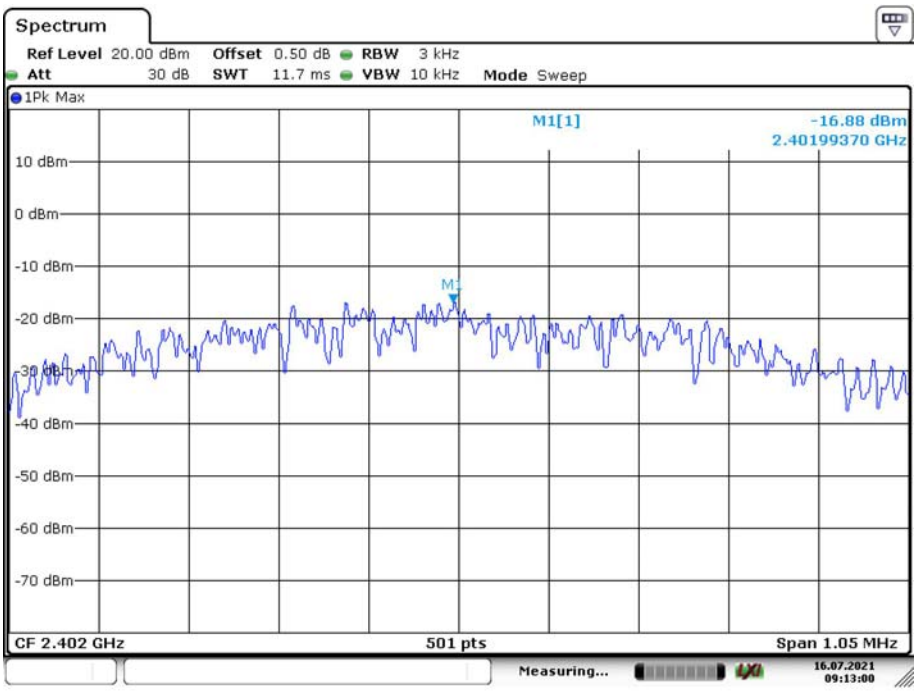
Test Data

Test Mode: Transmitting

Test Result: Compliance. Please refer to following tables and plots.

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
Low	2402	-16.88	≤8
Middle	2440	-15.14	≤8
High	2480	-14.91	≤8

Power Spectral Density, BLE Low Channel



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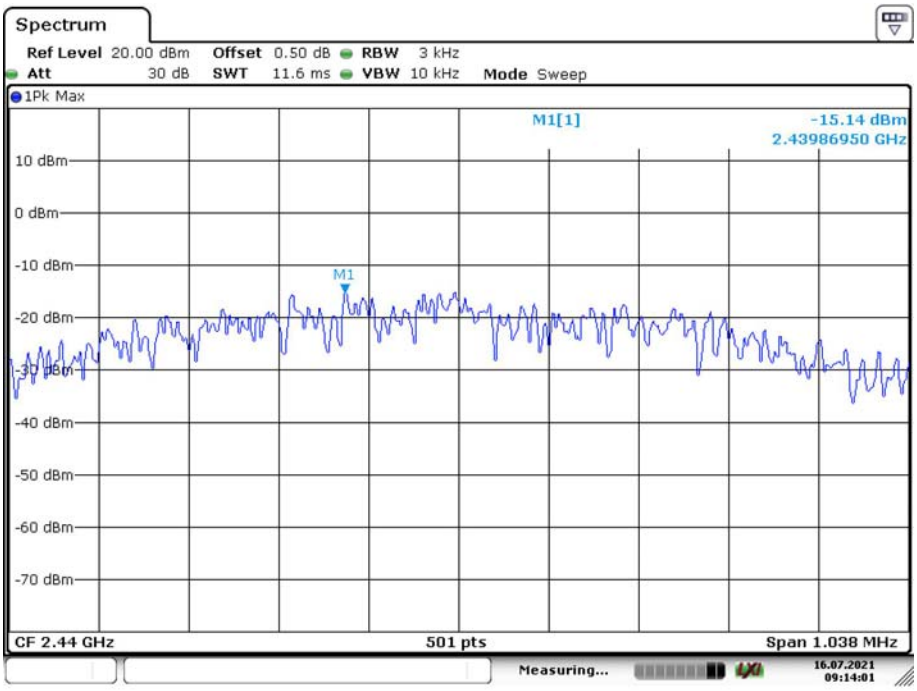
Power Spectral Density, BLE Middle Channel



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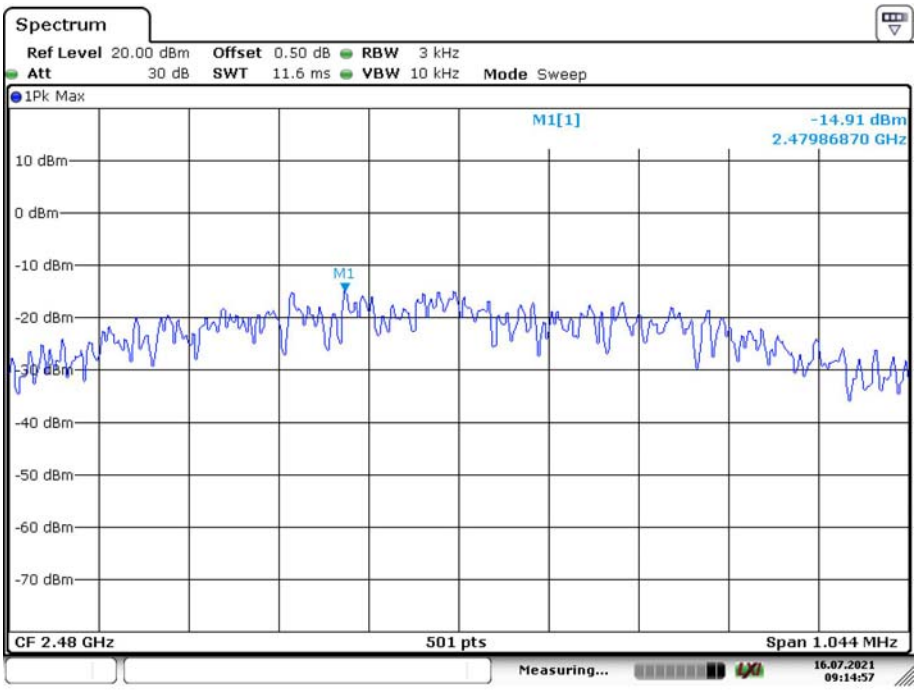
Power Spectral Density, BLE High Channel



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