Prüfbericht-Nr.: *Test report No.:*	**50315559 001**	**Auftrags-Nr.:** *Order No.:*	168137657	**Seite 1 von 26** *Page 1 of 26*
Kunden-Referenz-Nr.: *Client reference No.:*	N/A	**Auftragsdatum:** *Order date.:*	30.10.2019	
Auftraggeber: *Client:*	**THUMBS UP(UK) LTD** Unit L, Braintree Industrial Estate, Braintree Road, HA4 0EJ, Ruislip, London, United Kindom			
Prüfgegenstand: *Test item:*	True Wireless Earphones			
Bezeichnung / Typ-Nr.: *Identification / Type No.:*	TWSEBBKV2PRM-FOB, TWSEBWHV2PRM-FOB, TWSEBPKV2PRM-FOB (Trademark: Primark)			
Auftrags-Inhalt: *Order content:*	FCC approval			
Prüfgrundlage: *Test specification:*	CFR47 FCC Part 15: Subpart C Section 15.247 CFR47 FCC Part 15: Subpart C Section 15.207 CFR47 FCC Part 15: Subpart C Section 15.209 CFR47 FCC Part 15: Subpart B Section 15.107 CFR47 FCC Part 15: Subpart B Section 15.109 CFR47 FCC Part 2: Section 2.1093			

Wareneingangsdatum: *Date of receipt:*	31.10.2019	Please refer to photo documents
Prüfmuster-Nr.: *Test sample No.:*	A001012715-002 A001012715-001	
Prüfzeitraum: *Testing period:*	31.10.2019 - 14.11.2019	
Ort der Prüfung: *Place of testing:*	TÜV Rheinland (Shenzhen) Co., Ltd.	
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (Shenzhen) Co., Ltd.	
Prüfergebnis*: *Test result*:*	Pass	

geprüft von / *tested by:*			**kontrolliert von /** *reviewed by:*		
06.01.2020	Ryan Yang / Assistant Project Manager		06.01.2020	Winnie Hou / Technical Certifier	
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

Sonstiges / *Other:*

FCC ID: 2AHHETWSEBV2PRM

Zustand des Prüfgegenstandes bei Anlieferung: *Condition of the test item at delivery:* Prüfmuster vollständig und unbeschädigt *Test item complete and undamaged:*

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhalt
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
Legend:	1 = very good	2 = good	3 = satisfactory	4 = sufficient	5 = poor
	P(ass) = passed a.m. test specifications(s)		F(ail) = failed a.m. test specifications(s)	N/A = not applicable	N/T = not tested

Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.

This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.

Test Summary

5.1.1 ANTENNA REQUIREMENT
RESULT: Pass

5.1.2 MAXIMUM PEAK CONDUCTED OUTPUT POWER
RESULT: Pass

5.1.3 99% BANDWIDTH
RESULT: Pass

5.1.4 20DB BANDWIDTH
RESULT: Pass

5.1.5 CARRIER FREQUENCY SEPARATION
RESULT: Pass

5.1.6 NUMBER OF HOPPING FREQUENCY
RESULT: Pass

5.1.7 TIME OF OCCUPANCY
RESULT: Pass

5.1.8 CONDUCTED SPURIOUS EMISSIONS MEASURED IN 100 KHZ BANDWIDTH
RESULT: Pass

5.1.9 RADIATED SPURIOUS EMISSION
RESULT: Pass

5.1.10 CONDUCTED EMISSION ON AC MAINS
RESULT: Pass

5.1.11 RADIATED EMISSION
RESULT: Pass

Contents

1 GENERAL REMARKS 4
1.1 COMPLEMENTARY MATERIALS 4
2 TEST SITES 5
2.1 TEST FACILITIES 5
2.2 LIST OF TEST AND MEASUREMENT INSTRUMENTS 5
2.3 TRACEABILITY 7
2.4 CALIBRATION 7
2.5 MEASUREMENT UNCERTAINTY 7
2.6 LOCATION OF ORIGINAL DATA 7
2.7 STATUS OF FACILITY USED FOR TESTING 7
3 GENERAL PRODUCT INFORMATION 8
3.1 PRODUCT FUNCTION AND INTENDED USE 8
3.2 RATINGS AND SYSTEM DETAILS 8
3.3 INDEPENDENT OPERATION MODES 10
3.4 NOISE GENERATING AND NOISE SUPPRESSING PARTS 10
3.5 SUBMITTED DOCUMENTS 10
4 TEST SET-UP AND OPERATION MODES 11
4.1 PRINCIPLE OF CONFIGURATION SELECTION 11
4.2 TEST OPERATION AND TEST SOFTWARE 11
4.3 SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT 12
4.4 COUNTERMEASURES TO ACHIEVE EMC COMPLIANCE 12
4.5 TEST SETUP DIAGRAM 13
5 TEST RESULTS 15
5.1 TRANSMITTER REQUIREMENT & TEST SUITES 15
5.1.1 Antenna Requirement 15
5.1.2 Maximum Peak Conducted Output Power 16
5.1.3 99% Bandwidth 17
5.1.4 20dB Bandwidth 18
5.1.5 Carrier Frequency Separation 19
5.1.6 Number of Hopping Frequency 20
5.1.7 Time of Occupancy 21
5.1.8 Conducted Spurious Emissions Measured in 100 kHz Bandwidth 22
5.1.9 Radiated Spurious Emission 23
5.1.10 Conducted Emission on AC Mains 24
5.1.11 Radiated Emission 25
6 PHOTOGRAPHS OF THE TEST SET-UP 26
7 LIST OF TABLES 26

1 General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix A: Photographs of the Test Set-up

Appendix B: Test Results of Bluetooth

Appendix C: Test Results of Part 15B

2 Test Sites

2.1 Test Facilities

TÜV Rheinland (Shenzhen) Co., Ltd.
1F East & 2-4F, Cybio Technology Building No. 1, No. 16 Kejibei 2nd Road, High-Tech Industrial Park North Nanshan District, Shenzhen, 518057

FCC accredited testing laboratory: CN1260

ISED wireless device testing laboratory: 25069

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

TÜV Rheinland (Shenzhen) Co., Ltd.

Radio Spectrum Testing (TS8997)					
Equip. No.	**Equipment**	**Manufacturer**	**Model**	**Serial No.**	**Cal. until**
1825795	Signal Analyzer	Rohde & Schwarz	FSV 40	101441	20.08.2020
1825798	OSP	Rohde & Schwarz	OSP 150	101017	20.12.2019
1825799	Control PC	DELL	OptiPlex 7050	FTJZ9P2	N/A
1825800	Test Software	Rohde & Schwarz	WMS32 (V10.40.10)	N/A	N/A
1825801	Power Meter	Rohde & Schwarz	NRP2	107105	20.12.2019
1825802	Wideband Power Sensor	Rohde & Schwarz	NRP-Z81	105350	20.12.2019
1826431	Shielding Room 8#	Albatross	SR8	APC17151-SR8	23.07.2020
Unwanted Emission Testing (TS9975)					
Equip. No.	**Equipment**	**Manufacturer**	**Model**	**Serial No.**	**Cal. until**
1826021	EMI Test Receiver	Rohde & Schwarz	ESR 7	102021	19.08.2020
1826023	Signal Analyzer	Rohde & Schwarz	FSV 40	101439	21.08.2020
1826024	System Controller Interface	Rohde & Schwarz	SCI-100	S10010038	N/A
1826025	Filterbank	Rohde & Schwarz	Wlan	100759	21.08.2020
1826026	OSP	Rohde & Schwarz	OSP 120	102040	N/A
1826028	Pre-amplifier	Rohde & Schwarz	SCU08F1	08320031	20.08.2020
1826029	Amplifier	Rohde & Schwarz	SCU-18F	180070	20.08.2020
1826030	Amplifier	Rohde & Schwarz	SCU40A	100475	20.09.2020
1826031	Trilog Broadband Antenna (30 MHz - 7 GHz)	Schwarzbeck	VULB 9162	193	02.09.2020
1826032	Double-Ridged Antenna (1 -18 GHz)	ETS-LINDGREN	3117	00218717	02.09.2020
1826033	Wideband Ridged Horn Antenna (18-40 GHz)	Steatite	QMS-00880	19067	02.09.2020

1826034	Active Loop Antenna	Schwarzbeck	FMZB 1513	302	01.09.2020
1826035	Wideband Ridged Horn Antenna (12-18 GHz)	Steatite	QMS-00208	18313	02.09.2020
1826036	Test software	Rohde & Schwarz	V10.40.10-EMC32	N/A	N/A
1826037	Control PC	Dell	OptiPlex 7050	36NV9P2	N/A
1826433	3m Semi-Anechoic Chamber	Albatross	SAC-3m	APC17151-SAC	06.07.2020

Conducted Emission on AC Mains					
Equip. No.	**Equipment**	**Manufacturer**	**Model**	**Serial No.**	**Cal. until**
1822625	EMI Test Receiver	R&S	ESR3	102428	03.09.2020
1822627	Artificial Mains Network	R&S	ENV216	102333	19.08.2020
1822626	Artificial Mains Network	R&S	ENV432	101411	19.08.2020
1822629	Attenuator	R&S	ESH2Z31	100300	19.08.2020
1825090	EMC32 test software	R&S	EMC32(Ver.10.50.01)	N/A	N/A
Radiated Emission (3m chamber)					
Equip. No.	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Cali. until**
1822620	3m SAC	ETS	SAC3	CT001632-Q1362	23.08.2021
1825044	EMI Test Receiver	R&S	ESR7	102111	23.01.2020
1825004	Horn Antenna	R&S	HF907	102706	01.09.2020
1825005	Preamplifier	FIT	SCU-18F	180077	19.08.2020
1825042	Trilog-Broadband antenna	SCHWARZBECK	VULB9168	0945	12.09.2020
1825072	Switching Controller Interface	R&S	OSP 120	102039	N/A
1825090	EMC32 test software	R&S	EMC32(Ver.10.50.01)	N/A	N/A

2.3 Traceability

All measurement equipment calibrations are traceable to NIM (National Institute of Metrology) or where calibration is performed in other countries, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basics using in house standards or comparisons.

2.5 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements as below table.

Parameter	Uncertainty
Radio Frequency	±1 x 10-7
RF Power (conducted)	±2.5 dB
Radiated Emission of Transmitter, valid up to 26.5 GHz	±6 dB
Radiated Emission of Receiver, valid up to 26.5 GHz	±6 dB
Conducted Emission, (9kHz to 150kHz)/(150kHz to 30MHz)	± 3.70 dB / ± 3.30 dB
Radiated Emission (3m SAC), 30MHz to 1000MHz	± 4.52 dB
Radiated Emission (3m SAC), above 1000MHz	± 4.37 dB
Temperature	±1 °C
Humidity	±5 %
Voltage (DC)	±1 %
Voltage (AC, <10kHz)	±2 %

2.6 Location of Original Data

The original copies of all test data taken during actual testing were attached at Appendix A & B & C of this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Shenzhen) Co., Ltd. file for certification follow-up purposes.

2.7 Status of Facility Used for Testing

The TÜV Rheinland (Shenzhen) Co., Ltd. Test facility located at 1F East & 2-4F, Cybio Technology Building No. 1, No. 16 Kejibei 2nd Road, High-Tech Industrial Park North Nanshan District, Shenzhen, 518057 is listed on the US Federal Communications Commission list of facilities approved to perform measurements.

3 General Product Information

3.1 Product Function and Intended Use

The EUT is a True Wireless Earphones which consists of a left earphone and a right earphone, they are totally identical and support Bluetooth 5.0 technology.

According to the declaration of the applicant, the electrical circuit design, PCB layout and construction Design are identical for all models, only the model No. and color are different.

Model Name	Color
TWSEBWHV2PRM-FOB	White
TWSEBPKV2PRM-FOB	Pink
TWSEBBKV2PRM-FOB	Black

Note: When the EUT is charged, other functions cannot be used.
For details refer to the User Manual, Technical Description and Circuit Diagram.

3.2 Ratings and System Details

Table 2: Technical Specification of EUT

General Information of EUT	Value
Kind of Equipment	True Wireless Earphones
Type Designation	TWSEBBKV2PRM-FOB, TWSEBWHV2PRM-FOB, TWSEBPKV2PRM-FOB
Trademark	Primark
FCC ID	2AHHETWSEBV2PRM
Operating Voltage	DC 5.0V via USB port for charging DC 3.7V@40mAh input via internal battery
Testing Voltage	Fully charged battery DC 5V from USB port
Battery	DC 3.7V@40mAh lithium battery
Technical Specification of Bluetooth	
Operating Frequency	2402.0 to 2480.0 MHz
Type of Modulation	GFSK(BDR), π/4DQPSK(EDR)
Channel Number	79 channels
Channel Separation	1MHz
Antenna Type	Integral Antenna
Antenna Gain	0 dBi

Table 3: Operating Frequencies/Channels of EUT

Operating Mode	Description
Bluetooth®	☒ BDR/EDR f_c = 2402 + k MHz, where k = 0 ~ 78 ☐ Low Energy f_c = 2402 + k*2 MHz, where k = 0 ~ 39

Table 4: Frequency Hopping Information

Technical Specification	Description
Hopping Range	Hereby we declare that the frequency range of this device is: 2402-2480MHz. This is according the Bluetooth Core Specification V5.0 + EDR for devices which will be operated in the USA. This was checked during the Bluetooth Qualification tests (Test Case: TRM/CA/04-E).
Hopping Sequence	Example of a 79 hopping sequence in data mode: 33,04,21,44,23,42,53,46,55,48,40,59,72,29,76,31,08,73, 07,75,09,45,60,39,58,13,47,11,77,52,35,50,65,54,67,56, 69,62,71,64, 7,25,27,66,57,70,74,61,78,63,10,41,05,43, 15,44,64,68,02,70,06,01,51,03,55,05,03,66,53,49,36,47,
Receiver input bandwidth	The input bandwidth of the receiver is 1MHz. In every connection one Bluetooth device is the master and the other one is the slave. The master determines the hopping sequence. The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master. Additionally the type of connection is set up at the beginning of the connection. The master adapts its hopping frequency and its TX/RX timing according to the packet type of the connection. Also the slave of the connection will use these settings. Repeating of a packer has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case. That means a repeated packet will not be send on the same frequency, it is send on the next frequency of the hopping sequence.

3.3 Independent Operation Modes

The basic operation modes are:

A. On, Bluetooth transmitting mode (BDR & EDR mode)
   1) Low Channel
   2) Middle Channel
   3) High Channel

B. On, Transmitting on Hopping channel

C. On, Bluetooth connecting mode

D. On, Charging mode for charger box

E. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

3.5 Submitted Documents

- Block Diagram
- FCC/IC Label and Location Info
- Schematics
- User Manual

4 Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

Radio Spectrum: The equipment under test (EUT) was configured at its highest power output in order to measure its highest possible radiation and conducted level. The test modes were adapted accordingly in reference to the instructions for use.

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5. All tests were performed according to the procedures in ANSI C63.10: 2013 and ANSI C63.4: 2014.
According to clause 3.1, all tests were performed on model TWSEBBKV2PRM-FOB(right earphone) in this report.

Table 5: List of Frequencies under Test

☒ Bluetooth				
Operation mode	**Frequencies under Test (MHz)**			**Power Level setting (dBm)**
	CH_{Low}	**CH_{Mid}**	**CH_{High}**	
☒ BDR/EDR	2402.0	2441.0	2480.0	10.0

4.3 Special Accessories and Auxiliary Equipment

Table 6: Auxiliary Equipment Used during Test

Description	Manufacturer	Model	S/N	Rating
Laptop	Lenovo	T480	PF-16A6N8	N/A
Adapter	N/A	N/A	N/A	DC 5V

4.4 Countermeasures to Achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Technical Construction File (TCF).

No additional measures were employed to achieve compliance.

4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test (Below 1GHz)

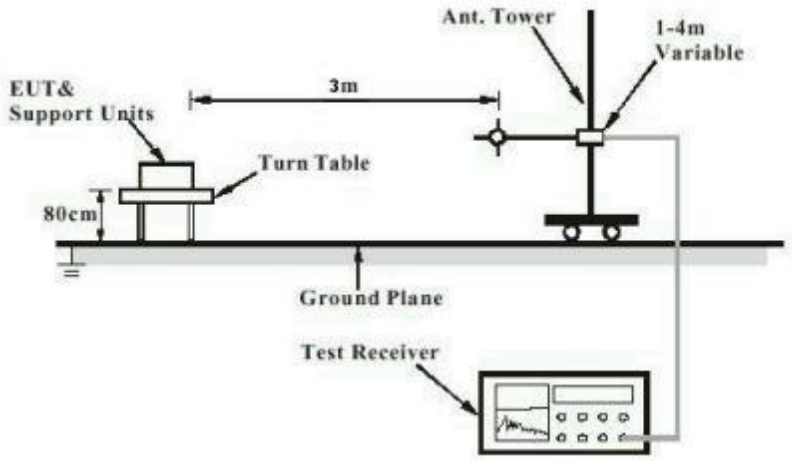


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

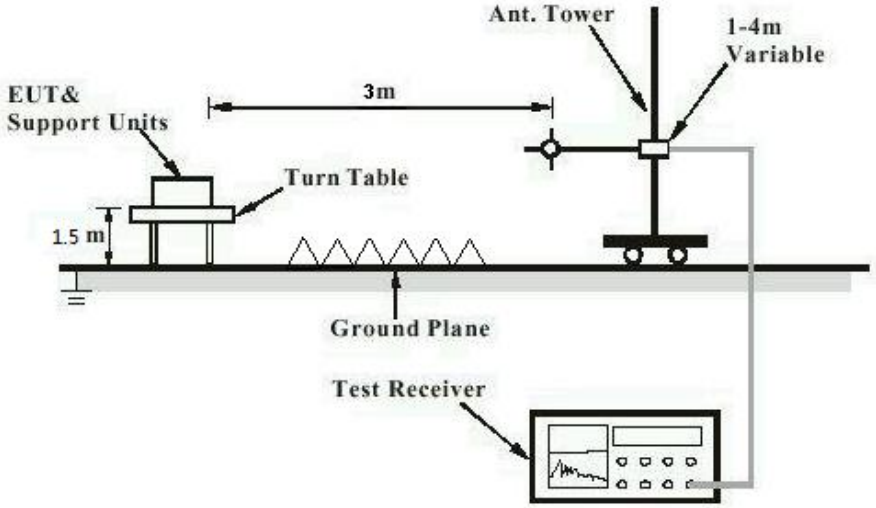


Diagram of Measurement Configuration for Mains Conduction Measurement

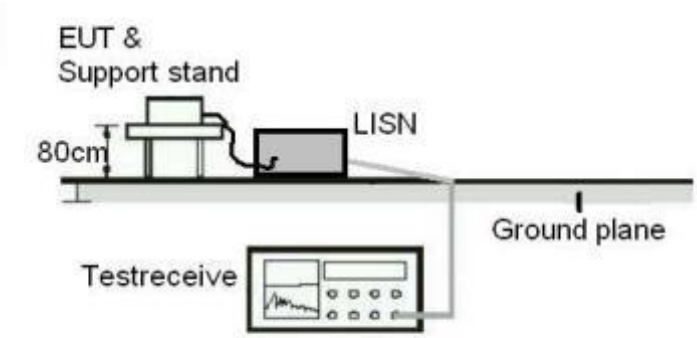
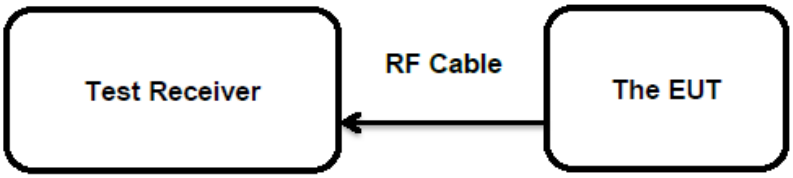


Diagram of Measurement Configuration for Conducted Transmitter Measurement



5 Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

RESULT: **Pass**

Test Specification

Test standard : FCC Part 15.247(b)(4) and Part 15.203

According to the manufacturer declared, the EUT has an internal antenna, the directional gain of antenna is 0 dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement. Therefore the EUT is considered sufficient to comply with the provision.

Therefore the EUT is considered sufficient to comply with the provision.

Refer to EUT Photo for further details.

5.1.2 Maximum Peak Conducted Output Power

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.247(b)(1)
Basic standard	:	ANSI C63.10: 2013
Limits	:	DSS < 0.125 Watts
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	14.11.2019
Input voltage	:	Fully charged battery
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	25 °C
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

Table 7: Test Result of Maximum Peak Conducted Output Power, Bluetooth

Test Mode	Test Channel (MHz)	Measured Peak Power		Limit (W)
		(dBm)	(W)	
GFSK (BDR)	2402.0	-3.61	0.0004	< 0.125
	2441.0	-3.91	0.0004	
	2480.0	-4.25	0.0004	
Maximum Measured Value		-3.61	0.0004	

Test Mode	Test Channel (MHz)	Measured Peak Power		Limit (W)
		(dBm)	(W)	
π/4DQPSK (EDR)	2402.0	-2.75	0.0005	< 0.125
	2441.0	-3.01	0.0005	
	2480.0	-3.41	0.0005	
Maximum Measured Value		-2.75	0.0005	

Note:
1) The cable loss is taken into account in results.
2) Antenna gain(G): 0 dBi,
e.i.r.p. = $P_{(Peak\ power)}$+ G, which is far below the 4 W

5.1.3 99% Bandwidth

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.247(a)
Basic standard	:	ANSI C63.10: 2013
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	12.11.2019
Input voltage	:	Fully charged battery
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

For the measurement records, refer to the appendix B.

5.1.4 20dB Bandwidth

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.247(a)(1)
Basic standard	:	ANSI C63.10: 2013
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	12.11.2019
Input voltage	:	Fully charged battery
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

For the measurement records, refer to the appendix B.

5.1.5 Carrier Frequency Separation

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.247(a)(1)
Basic standard	:	ANSI C63.10: 2013
Limits	:	≥ 25kHz or 2/3 of 20dB bandwidth, whichever is greater
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	12.11.2019
Input voltage	:	Fully charged battery
Operation mode	:	B
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

For the measurement records, refer to the appendix B.

5.1.6 Number of Hopping Frequency

RESULT: **Pass**

Test Specification

Test standard	:	FCC part 15.247(a)(1)(iii)
Basic standard	:	ANSI C63.10: 2013
Limits	:	≥ 15 non-overlapping channels
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	12.11.2019
Input voltage	:	Fully charged battery
Operation mode	:	B
Ambient temperature	:	25 °C
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

For the measurement records, refer to the appendix B.

5.1.7 Time of Occupancy

RESULT: **Pass**

Test Specification

Test standard	:	FCC part 15.247(a)(1)(iii)
Basic standard	:	ANSI C63.10: 2013
Limits	:	< 0.4s
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	12.11.2019
Input voltage	:	Fully charged battery
Operation mode	:	B
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

Note:
Dwell time = Pulse width x Number of channels in Period
Period = 0.4 (seconds/ channel) x 79 (channel) = 31.6 seconds

For the measurement records, refer to the appendix B.

5.1.8 Conducted Spurious Emissions Measured in 100 kHz Bandwidth

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.247(d)
Basic standard	:	ANSI C63.10: 2013
Limits	:	20dB (below that in the 100kHz bandwidth within the band that contains the highest level of the desired power); In addition, radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified in 15.209(a)
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	12.11.2019
Input voltage	:	Fully charged battery
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	25 ℃
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

Test results of 100kHz Bandwidth of Frequency Band Edge by Conducted method refer to test plots, and compliance is achieved as well.

For the measurement records, refer to the appendix B.

5.1.9 Radiated Spurious Emission

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.247(d) & FCC Part 15.205
Basic standard	:	ANSI C63.10: 2013
Limits	:	Refer to 15.209(a) of FCC part 15.247(d)
Kind of test site	:	3m Semi-anechoic Chamber

Test Setup

Date of testing	:	Refer to test result
Input voltage	:	Fully charged battery
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	23 ℃
Relative humidity	:	49 %
Atmospheric pressure	:	101 kPa

Remark:
Testing was carried out within frequency range 9kHz to the tenth harmonics. Only the worst case spurious emissions configuration of the each mode were reported.

For the measurement records, refer to the appendix B.

5.1.10 Conducted Emission on AC Mains

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.107(a)
Basic standard	:	ANSI C63.4: 2014
Frequency range	:	0.15 – 30MHz
Limits	:	FCC Part 15.107(a)
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	Refer to test result
Input voltage	:	DC 5V input by the micro USB port
Operation mode	:	D
Earthing	:	Not connected
Ambient temperature	:	22 ℃
Relative humidity	:	64 %
Atmospheric pressure	:	101 kPa

For the measurement records, refer to the appendix C.

5.1.11 Radiated Emission

RESULT: **Pass**

Test Specification

Test standard	:	FCC Part 15.109(a)
Basic standard	:	ANSI C63.4: 2014
Frequency range	:	30 - 6000MHz
Classification	:	Class B
Limits	:	FCC Part 15.109(a)
Kind of test site	:	3m Semi-anechoic Chamber

Test Setup

Date of testing	:	Refer to test result
Input voltage	:	DC 5V input by the micro USB port
Operation mode	:	D
Earthing	:	Not connected
Ambient temperature	:	24 ℃
Relative humidity	:	50 %
Atmospheric pressure	:	101 kPa

For the measurement records, refer to the appendix C.

6 Photographs of the Test Set-Up

For photographs of the test set-up, refer to the appendix A.

7 List of Tables

Table 1: List of Test and Measurement Equipment 5
Table 2: Technical Specification of EUT 8
Table 3: Operating Frequencies/Channels of EUT 9
Table 4: Frequency Hopping Information 9
Table 5: List of Frequencies under Test 11
Table 6: Auxiliary Equipment Used during Test 12
Table 7: Test Result of Maximum Peak Conducted Output Power, Bluetooth 16

Appendix B: Test Results of Bluetooth

APPENDIX B: TEST RESULTS OF BLUETOOTH **1**
APPENDIX B.1: TEST RESULTS OF 99% BANDWIDTH 2
BDR mode (GFSK) *2*
EDR mode (π/4-DQPSK) *5*
APPENDIX B.2: TEST RESULTS OF 20DB BANDWIDTH 8
BDR mode (GFSK) *8*
EDR mode (π/4-DQPSK) *11*
APPENDIX B.3: TEST RESULTS OF CARRIER FREQUENCY SEPARATION 14
BDR mode (GFSK) *14*
EDR mode (π/4-DQPSK) *20*
APPENDIX B.4: TEST RESULTS OF NUMBER OF HOPPING FREQUENCY 26
BDR mode (GFSK) *26*
EDR mode (π/4-DQPSK) *27*
APPENDIX B.5: TEST RESULTS OF TIME OF OCCUPANCY 28
BDR mode (GFSK) *28*
EDR mode (π/4-DQPSK) *34*
APPENDIX B.6: TEST RESULTS OF CONDUCTED SPURIOUS EMISSIONS MEASURED IN 100 KHZ BANDWIDTH 40
BDR mode (GFSK) *40*
Low Channel *40*
Middle Channel *40*
High Channel *41*
Band Edge, Low Channel *42*
Band Edge, High Channel *42*
Band Edge, Hopping Mode, Low Channel *43*
Band Edge, Hopping Mode, High Channle *43*
EDR mode (π/4-DQPSK) *44*
Low Channel *44*
Middle Channel *44*
High Channel *45*
Band Edge, Low Channel *46*
Band Edge, High Channel *46*
Band Edge, Hopping Mode, Low Channel *47*
Band Edge, Hopping Mode, High Channle *47*
APPENDIX B.7: TEST RESULTS OF RADIATED SPURIOUS EMISSIONS 48
30MHz - 1GHz *48*
Above 1GHz *52*
APPENDIX B.8: TEST RESULTS OF RADIATED EMISSIONS IN RESTRICTED BANDS 58

Appendix B.1: Test Results of 99% Bandwidth

BDR mode (GFSK)

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Occupied Channel Bandwidth 99% (2402 MHz; 10.000 dBm; 1 MHz; Test Mode)

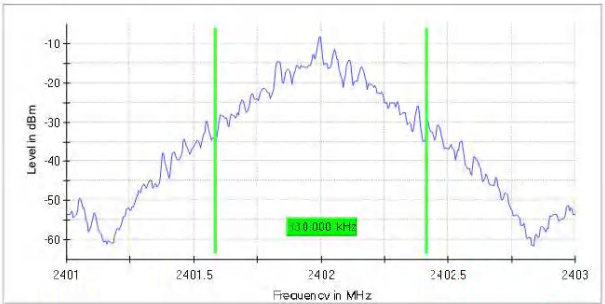
Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013

99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2402.000000	0.830000	---	---	2401.587500	2402.417500

(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
2402.000000	PASS



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.40100 GHz	2.40100 GHz
Stop Frequency	2.40300 GHz	2.40300 GHz
Span	2.000 MHz	2.000 MHz
RBW	10.000 kHz	>= 10.000 kHz
VBW	30.000 kHz	>= 30.000 kHz
SweepPoints	400	~ 400
Sweeptime	189.648 µs	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	500	500
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	5 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.09 dB	0.30 dB

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Occupied Channel Bandwidth 99% (2441 MHz; 10.000 dBm; 1 MHz; Test Mode)

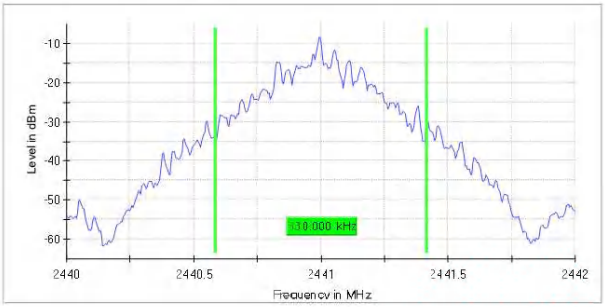
Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013

99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2441.000000	0.830000	---	---	2440.587500	2441.417500

(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
2441.000000	PASS



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.44000 GHz	2.44000 GHz
Stop Frequency	2.44200 GHz	2.44200 GHz
Span	2.000 MHz	2.000 MHz
RBW	10.000 kHz	>= 10.000 kHz
VBW	30.000 kHz	>= 30.000 kHz
SweepPoints	400	~ 400
Sweeptime	189.648 µs	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	500	500
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	5 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.10 dB	0.30 dB

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Occupied Channel Bandwidth 99% (2480 MHz; 10.000 dBm; 1 MHz; Test Mode)

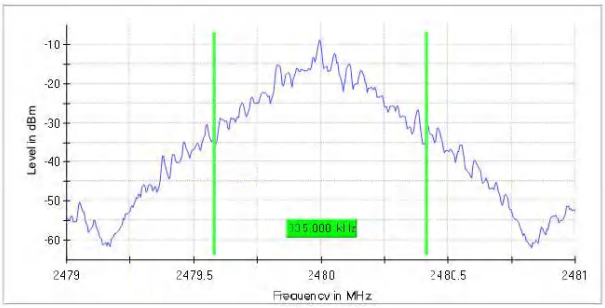
Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013

99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2480.000000	0.835000	---	---	2479.582500	2480.417500

(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
2480.000000	PASS



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.47900 GHz	2.47900 GHz
Stop Frequency	2.48100 GHz	2.48100 GHz
Span	2.000 MHz	2.000 MHz
RBW	10.000 kHz	>= 10.000 kHz
VBW	30.000 kHz	>= 30.000 kHz
SweepPoints	400	~ 400
Sweeptime	189.648 µs	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	500	500
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	4 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.08 dB	0.30 dB

EDR mode (π/4-DQPSK)

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Occupied Channel Bandwidth 99% (2402 MHz; 10.000 dBm; 1 MHz; Test Mode)

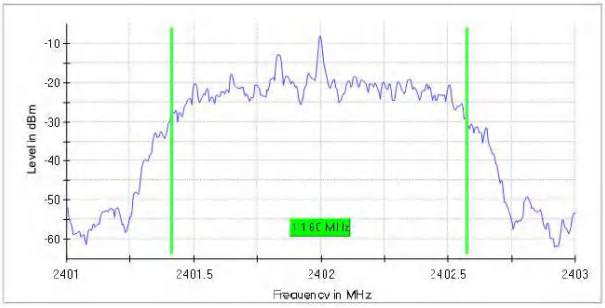
Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013

99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2402.000000	1.160000	---	---	2401.417500	2402.577500

(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
2402.000000	PASS



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.40100 GHz	2.40100 GHz
Stop Frequency	2.40300 GHz	2.40300 GHz
Span	2.000 MHz	2.000 MHz
RBW	10.000 kHz	>= 10.000 kHz
VBW	30.000 kHz	>= 30.000 kHz
SweepPoints	400	~ 400
Sweeptime	189.648 µs	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	500	500
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	5 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.11 dB	0.30 dB

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Occupied Channel Bandwidth 99% (2441 MHz; 10.000 dBm; 1 MHz; Test Mode)

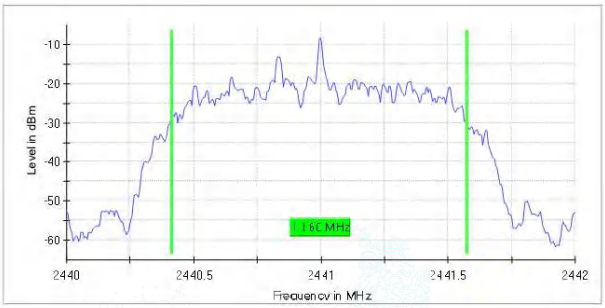
Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013

99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2441.000000	1.160000	---	---	2440.417500	2441.577500

(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
2441.000000	PASS



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.44000 GHz	2.44000 GHz
Stop Frequency	2.44200 GHz	2.44200 GHz
Span	2.000 MHz	2.000 MHz
RBW	10.000 kHz	>= 10.000 kHz
VBW	30.000 kHz	>= 30.000 kHz
SweepPoints	400	~ 400
Sweeptime	189.648 µs	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	500	500
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	4 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.03 dB	0.30 dB

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Occupied Channel Bandwidth 99% (2480 MHz; 10.000 dBm; 1 MHz; Test Mode)

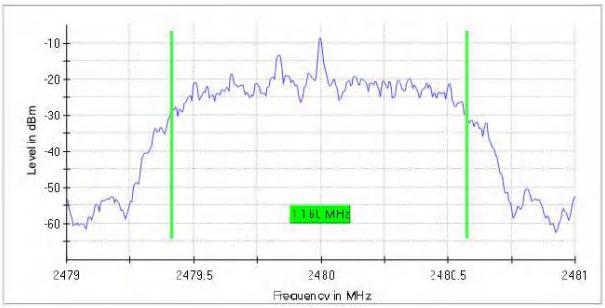
Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013

99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2480.000000	1.160000	---	---	2479.417500	2480.577500

(continuation of the "99 % Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Result
2480.000000	PASS



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.47900 GHz	2.47900 GHz
Stop Frequency	2.48100 GHz	2.48100 GHz
Span	2.000 MHz	2.000 MHz
RBW	10.000 kHz	>= 10.000 kHz
VBW	30.000 kHz	>= 30.000 kHz
SweepPoints	400	~ 400
Sweeptime	189.648 µs	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	500	500
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30 dB	0.30 dB
Run	5 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.01 dB	0.30 dB

Appendix B.2: Test Results of 20dB Bandwidth

BDR mode (GFSK)

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Emission Bandwidth 20 dB (2402 MHz; 10.000 dBm; 1 MHz; Test Mode)

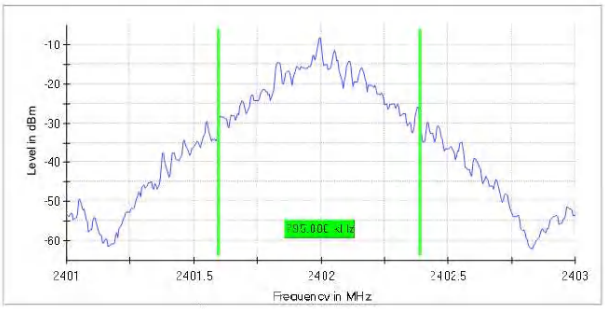
Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013

20 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2402.000000	0.795000	---	---	2401.597500	2402.392500

(continuation of the "20 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
2402.000000	-8.2	PASS



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.40100 GHz	2.40100 GHz
Stop Frequency	2.40300 GHz	2.40300 GHz
Span	2.000 MHz	2.000 MHz
RBW	10.000 kHz	>= 10.000 kHz
VBW	30.000 kHz	>= 30.000 kHz
SweepPoints	400	~ 400
Sweeptime	189.648 µs	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	8 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.05 dB	0.50 dB

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Emission Bandwidth 20 dB (2441 MHz; 10.000 dBm; 1 MHz; Test Mode)

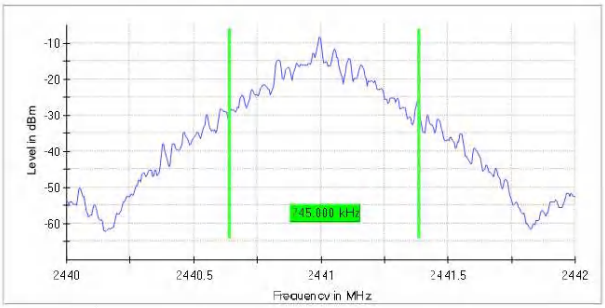
Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013

20 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2441.000000	0.745000	---	---	2440.642500	2441.387500

(continuation of the "20 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
2441.000000	-8.3	PASS



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.44000 GHz	2.44000 GHz
Stop Frequency	2.44200 GHz	2.44200 GHz
Span	2.000 MHz	2.000 MHz
RBW	10.000 kHz	>= 10.000 kHz
VBW	30.000 kHz	>= 30.000 kHz
SweepPoints	400	~ 400
Sweeptime	189.648 µs	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	7 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.07 dB	0.50 dB

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Emission Bandwidth 20 dB (2480 MHz; 10.000 dBm; 1 MHz; Test Mode)

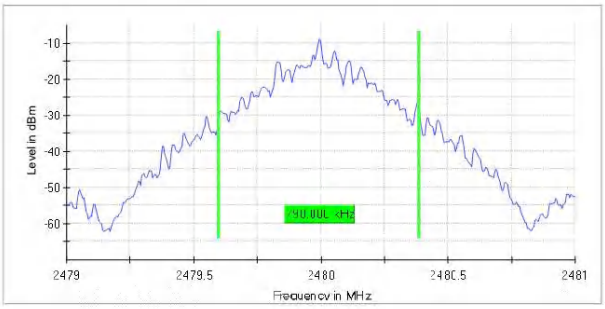
Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013

20 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2480.000000	0.790000	---	---	2479.597500	2480.387500

(continuation of the "20 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
2480.000000	-8.9	PASS



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.47900 GHz	2.47900 GHz
Stop Frequency	2.48100 GHz	2.48100 GHz
Span	2.000 MHz	2.000 MHz
RBW	10.000 kHz	>= 10.000 kHz
VBW	30.000 kHz	>= 30.000 kHz
SweepPoints	400	~ 400
Sweeptime	189.648 µs	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	7 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.31 dB	0.50 dB

EDR mode (π/4-DQPSK)

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Emission Bandwidth 20 dB (2402 MHz; 10.000 dBm; 1 MHz; Test Mode)

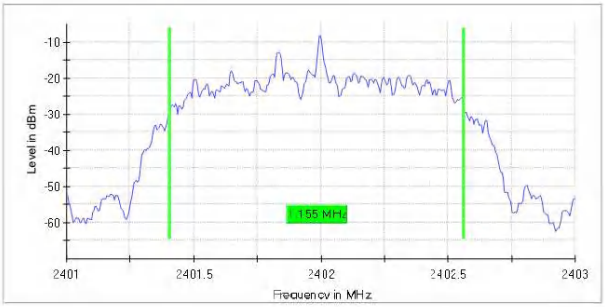
Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013

20 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2402.000000	1.155000	---	---	2401.407500	2402.562500

(continuation of the "20 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
2402.000000	-8.2	PASS



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.40100 GHz	2.40100 GHz
Stop Frequency	2.40300 GHz	2.40300 GHz
Span	2.000 MHz	2.000 MHz
RBW	10.000 kHz	>= 10.000 kHz
VBW	30.000 kHz	>= 30.000 kHz
SweepPoints	400	~ 400
Sweeptime	189.648 µs	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	7 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.00 dB	0.50 dB

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Emission Bandwidth 20 dB (2441 MHz; 10.000 dBm; 1 MHz; Test Mode)

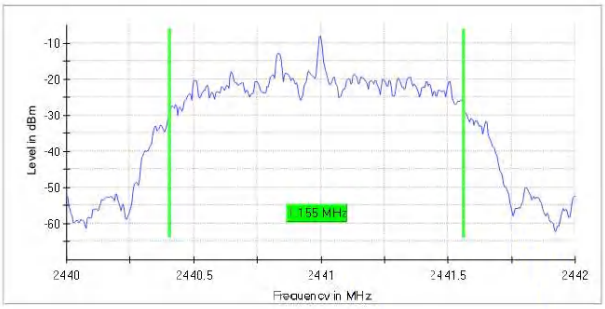
Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013

20 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2441.000000	1.155000	---	---	2440.407500	2441.562500

(continuation of the "20 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
2441.000000	-8.2	PASS



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.44000 GHz	2.44000 GHz
Stop Frequency	2.44200 GHz	2.44200 GHz
Span	2.000 MHz	2.000 MHz
RBW	10.000 kHz	>= 10.000 kHz
VBW	30.000 kHz	>= 30.000 kHz
SweepPoints	400	~ 400
Sweeptime	189.648 µs	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	9 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.07 dB	0.50 dB

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Emission Bandwidth 20 dB (2480 MHz; 10.000 dBm; 1 MHz; Test Mode)

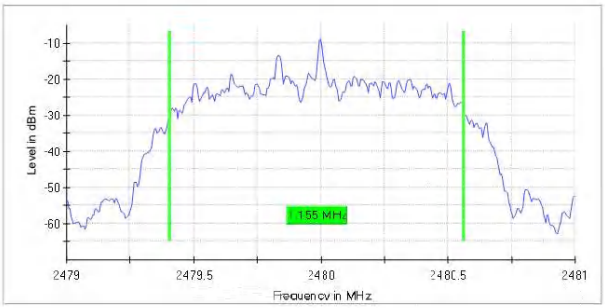
Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013

20 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2480.000000	1.155000	---	---	2479.407500	2480.562500

(continuation of the "20 dB Bandwidth" table from column 6 ...)

DUT Frequency (MHz)	Max Level (dBm)	Result
2480.000000	-8.9	PASS



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.47900 GHz	2.47900 GHz
Stop Frequency	2.48100 GHz	2.48100 GHz
Span	2.000 MHz	2.000 MHz
RBW	10.000 kHz	>= 10.000 kHz
VBW	30.000 kHz	>= 30.000 kHz
SweepPoints	400	~ 400
Sweeptime	189.648 µs	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	9 / max. 150	max. 150
Stable	5 / 5	5
Max Stable Difference	0.01 dB	0.50 dB

Appendix B.3: Test Results of Carrier Frequency Separation

BDR mode (GFSK)

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Carrier Frequency Separation (2402 MHz; 10.000 dBm; 1 MHz; Test Mode)

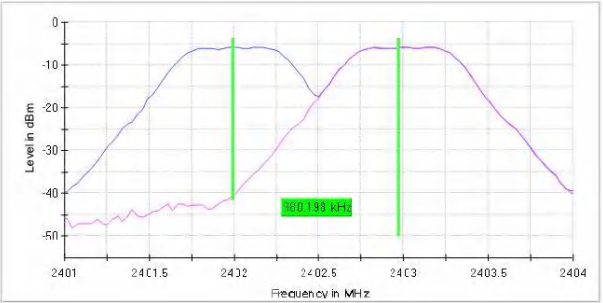
Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013

Result

DUT Frequency (MHz)	Frequency Separation (MHz)	Limit Min (MHz)	Limit Max (MHz)	Center Frequency low Channel (MHz)	Center Frequency high Channel (MHz)
2402.000000	0.980198	0.530000	---	2401.995050	2402.975248

(continuation of the "Result" table from column 6 ...)

DUT Frequency (MHz)	Result
2402.000000	PASS



Measurement 1

Setting	Instrument Value	Target Value
Start Frequency	2.40100 GHz	2.40100 GHz
Stop Frequency	2.40400 GHz	2.40400 GHz
Span	3.000 MHz	3.000 MHz
RBW	300.000 kHz	<= 300.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	101	~ 10
Sweeptime	1.000 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	Sweep
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	13 / max. 150	max. 150
Stable	10 / 10	10
Max Stable Difference	0.01 dB	0.50 dB

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Measurement 2

Setting	Instrument Value	Target Value
Start Frequency	2.40100 GHz	2.40100 GHz
Stop Frequency	2.40400 GHz	2.40400 GHz
Span	3.000 MHz	3.000 MHz
RBW	300.000 kHz	<= 300.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	101	~ 10
Sweeptime	1.000 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	Sweep
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	16 / max. 150	max. 150
Stable	10 / 10	10
Max Stable Difference	0.00 dB	0.50 dB

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Carrier Frequency Separation (2441 MHz; 10.000 dBm; 1 MHz; Test Mode)

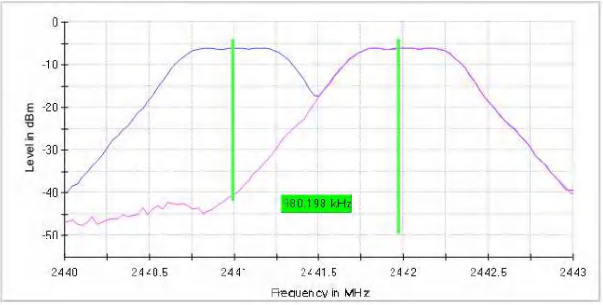
Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013

Result

DUT Frequency (MHz)	Frequency Separation (MHz)	Limit Min (MHz)	Limit Max (MHz)	Center Frequency low Channel (MHz)	Center Frequency high Channel (MHz)
2441.000000	0.980198	0.496667	---	2440.995050	2441.975248

(continuation of the "Result" table from column 6 ...)

DUT Frequency (MHz)	Result
2441.000000	PASS



Measurement 1

Setting	Instrument Value	Target Value
Start Frequency	2.44000 GHz	2.44000 GHz
Stop Frequency	2.44300 GHz	2.44300 GHz
Span	3.000 MHz	3.000 MHz
RBW	300.000 kHz	<= 300.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	101	~ 10
Sweeptime	1.000 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	Sweep
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	14 / max. 150	max. 150
Stable	10 / 10	10
Max Stable Difference	0.02 dB	0.50 dB

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Measurement 2

Setting	Instrument Value	Target Value
Start Frequency	2.44000 GHz	2.44000 GHz
Stop Frequency	2.44300 GHz	2.44300 GHz
Span	3.000 MHz	3.000 MHz
RBW	300.000 kHz	<= 300.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	101	~ 10
Sweeptime	1.000 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	Sweep
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	12 / max. 150	max. 150
Stable	10 / 10	10
Max Stable Difference	0.03 dB	0.50 dB

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Carrier Frequency Separation (2480 MHz; 10.000 dBm; 1 MHz; Test Mode)

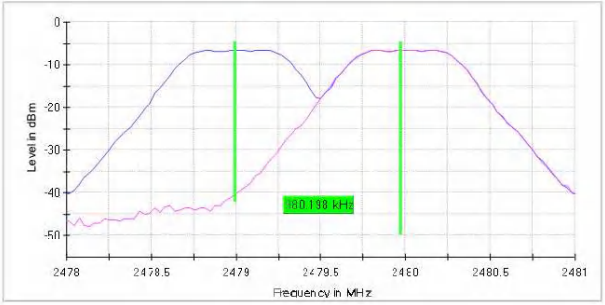
Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013

Result

DUT Frequency (MHz)	Frequency Separation (MHz)	Limit Min (MHz)	Limit Max (MHz)	Center Frequency low Channel (MHz)	Center Frequency high Channel (MHz)
2480.000000	0.980198	0.526667	---	2478.995050	2479.975248

(continuation of the "Result" table from column 6 ...)

DUT Frequency (MHz)	Result
2480.000000	PASS



Measurement 1

Setting	Instrument Value	Target Value
Start Frequency	2.47800 GHz	2.47800 GHz
Stop Frequency	2.48100 GHz	2.48100 GHz
Span	3.000 MHz	3.000 MHz
RBW	300.000 kHz	<= 300.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	101	~ 10
Sweeptime	1.000 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	Sweep
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	17 / max. 150	max. 150
Stable	10 / 10	10
Max Stable Difference	0.01 dB	0.50 dB

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Measurement 2

Setting	Instrument Value	Target Value
Start Frequency	2.47800 GHz	2.47800 GHz
Stop Frequency	2.48100 GHz	2.48100 GHz
Span	3.000 MHz	3.000 MHz
RBW	300.000 kHz	<= 300.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	101	~ 10
Sweeptime	1.000 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	Sweep
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	21 / max. 150	max. 150
Stable	10 / 10	10
Max Stable Difference	0.00 dB	0.50 dB

EDR mode (π/4-DQPSK)

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Carrier Frequency Separation (2402 MHz; 10.000 dBm; 1 MHz; Test Mode)

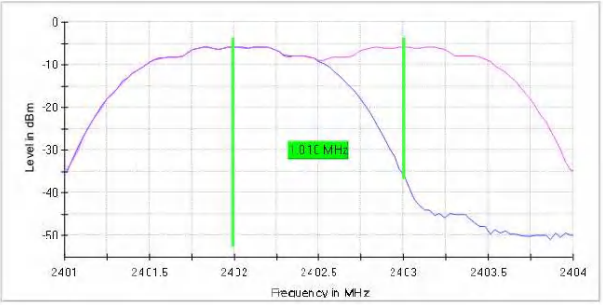
Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013

Result

DUT Frequency (MHz)	Frequency Separation (MHz)	Limit Min (MHz)	Limit Max (MHz)	Center Frequency low Channel (MHz)	Center Frequency high Channel (MHz)
2402.000000	1.009900	0.770000	---	2401.995050	2403.004950

(continuation of the "Result" table from column 6 ...)

DUT Frequency (MHz)	Result
2402.000000	PASS



Measurement 1

Setting	Instrument Value	Target Value
Start Frequency	2.40100 GHz	2.40100 GHz
Stop Frequency	2.40400 GHz	2.40400 GHz
Span	3.000 MHz	3.000 MHz
RBW	300.000 kHz	<= 300.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	101	~ 10
Sweeptime	1.000 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	Sweep
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	11 / max. 150	max. 150
Stable	10 / 10	10
Max Stable Difference	0.20 dB	0.50 dB

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Measurement 2

Setting	Instrument Value	Target Value
Start Frequency	2.40100 GHz	2.40100 GHz
Stop Frequency	2.40400 GHz	2.40400 GHz
Span	3.000 MHz	3.000 MHz
RBW	300.000 kHz	<= 300.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	101	~ 10
Sweeptime	1.000 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	Sweep
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	17 / max. 150	max. 150
Stable	10 / 10	10
Max Stable Difference	0.01 dB	0.50 dB

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Carrier Frequency Separation (2441 MHz; 10.000 dBm; 1 MHz; Test Mode)

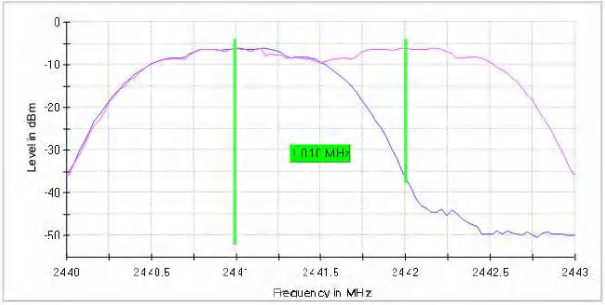
Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013

Result

DUT Frequency (MHz)	Frequency Separation (MHz)	Limit Min (MHz)	Limit Max (MHz)	Center Frequency low Channel (MHz)	Center Frequency high Channel (MHz)
2441.000000	1.009900	0.770000	---	2440.995050	2442.004950

(continuation of the "Result" table from column 6 ...)

DUT Frequency (MHz)	Result
2441.000000	PASS



Measurement 1

Setting	Instrument Value	Target Value
Start Frequency	2.44000 GHz	2.44000 GHz
Stop Frequency	2.44300 GHz	2.44300 GHz
Span	3.000 MHz	3.000 MHz
RBW	300.000 kHz	<= 300.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	101	~ 10
Sweeptime	1.000 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	Sweep
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	17 / max. 150	max. 150
Stable	10 / 10	10
Max Stable Difference	0.14 dB	0.50 dB

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Measurement 2

Setting	Instrument Value	Target Value
Start Frequency	2.44000 GHz	2.44000 GHz
Stop Frequency	2.44300 GHz	2.44300 GHz
Span	3.000 MHz	3.000 MHz
RBW	300.000 kHz	<= 300.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	101	~ 10
Sweeptime	1.000 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	Sweep
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	12 / max. 150	max. 150
Stable	10 / 10	10
Max Stable Difference	0.08 dB	0.50 dB

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Carrier Frequency Separation (2480 MHz; 10.000 dBm; 1 MHz; Test Mode)

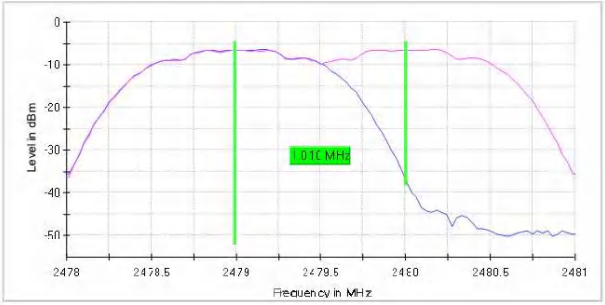
Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013

Result

DUT Frequency (MHz)	Frequency Separation (MHz)	Limit Min (MHz)	Limit Max (MHz)	Center Frequency low Channel (MHz)	Center Frequency high Channel (MHz)
2480.000000	1.009900	0.770000	---	2478.995050	2480.004950

(continuation of the "Result" table from column 6 ...)

DUT Frequency (MHz)	Result
2480.000000	PASS



Measurement 1

Setting	Instrument Value	Target Value
Start Frequency	2.47800 GHz	2.47800 GHz
Stop Frequency	2.48100 GHz	2.48100 GHz
Span	3.000 MHz	3.000 MHz
RBW	300.000 kHz	<= 300.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	101	~ 10
Sweeptime	1.000 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	Sweep
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	12 / max. 150	max. 150
Stable	10 / 10	10
Max Stable Difference	0.16 dB	0.50 dB

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Measurement 2

Setting	Instrument Value	Target Value
Start Frequency	2.47800 GHz	2.47800 GHz
Stop Frequency	2.48100 GHz	2.48100 GHz
Span	3.000 MHz	3.000 MHz
RBW	300.000 kHz	<= 300.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	101	~ 10
Sweeptime	1.000 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	200	200
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	Sweep
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	15 / max. 150	max. 150
Stable	10 / 10	10
Max Stable Difference	0.02 dB	0.50 dB

Appendix B.4: Test Results of Number of Hopping Frequency

BDR mode (GFSK)

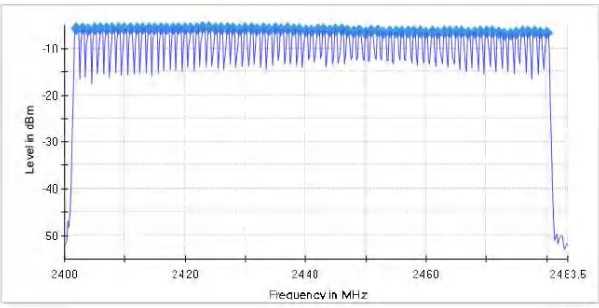
FCC Part 47 §15.247 2400-2483.5 MHz 2017

Hopping Frequencies (frequency independent; 10.000 dBm; 1 MHz)

Test according to FCC title 47 part 15 §15.247(a),(g), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013

Channels

Channels	Limit Min	Limit Max	Result
79	15	---	PASS



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.40000 GHz	2.40000 GHz
Stop Frequency	2.48350 GHz	2.48350 GHz
Span	83.500 MHz	83.500 MHz
RBW	200.000 kHz	<= 299.000 kHz
VBW	200.000 kHz	>= 200.000 kHz
SweepPoints	418	~ 418
Sweeptime	1.060 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	44 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.46 dB	0.50 dB

EDR mode (π/4-DQPSK)

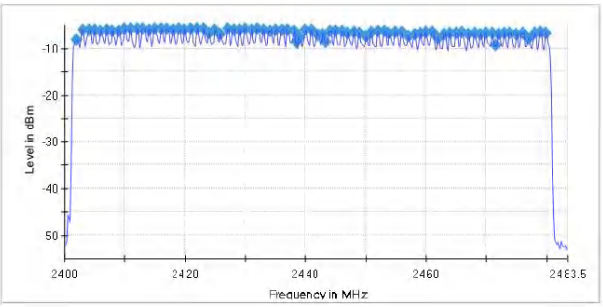
FCC Part 47 §15.247 2400-2483.5 MHz 2017

Hopping Frequencies (frequency independent; 10.000 dBm; 1 MHz)

Test according to FCC title 47 part 15 §15.247(a),(g), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013

Channels

Channels	Limit Min	Limit Max	Result
79	15	---	PASS



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.40000 GHz	2.40000 GHz
Stop Frequency	2.48350 GHz	2.48350 GHz
Span	83.500 MHz	83.500 MHz
RBW	200.000 kHz	<= 299.000 kHz
VBW	200.000 kHz	>= 200.000 kHz
SweepPoints	418	~ 418
Sweeptime	1.060 ms	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	74 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.43 dB	0.50 dB

Appendix B.5: Test Results of Time of Occupancy

BDR mode (GFSK)

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Time of Channel Occupancy (2441 MHz; 10.000 dBm; 1 MHz)

Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013

Result

DUT Frequency (MHz)	Result	Number of Hops	Average time of occupancy (ms)	Threshold (dBm)
2441.000000	PASS	319	137.830	-10.0

Periode

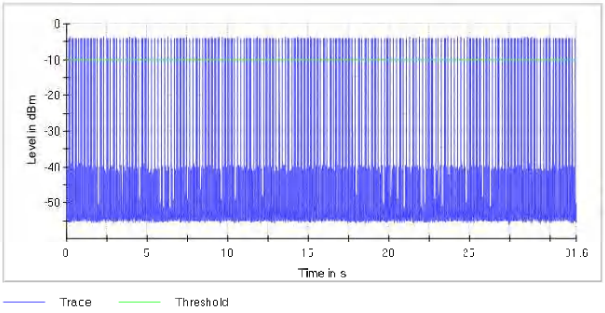
Min (ms)	Max (ms)	Mean (ms)
2.500	198.750	98.732

Transmit Time per Hop

Min (ms)	Max (ms)	Limit Max for Max (ms)	Limit Min for Max (ms)	Mean (ms)
0.43	0.44	400.000	0.000	0.431

DwellTime

Min (ms)	Max (ms)	Mean (ms)
0.43	0.44	0.431



FCC Part 47 §15.247 2400-2483.5 MHz 2017

Measurement

Setting	Instrument Value	Target Value
Center Frequency	2.44100 GHz	2.44100 GHz
Span	ZeroSpan	ZeroSpan
RBW	500.000 kHz	~ 500.000 kHz
VBW	1.000 MHz	~ 1.500 MHz
SweepPoints	30001	~ 30001
Sweeptime	31.600 s	31.600 s
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	0.000 dB	0.000 dB
Detector	MaxPeak	MaxPeak
SweepCount	1	1
Filter	Channel	Channel
Trace Mode	Clear Write	Clear Write
Sweeptype	Sweep	AUTO
Preamp	off	off
Trigger	External	External
Trigger Offset	0.000 s	0.000 s

OSP

Setting	Instrument Value	Target Value
Measurement Time	31.600 s	31.600 s
Tracepoints	31600000	31600000
Time resolution	1.000 µs	1.000 µs
Detector	RMS	RMS

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Time of Channel Occupancy(2) (2441 MHz; 10.000 dBm; 1 MHz)

Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013

Result

DUT Frequency (MHz)	Result	Number of Hops	Average time of occupancy (ms)	Threshold (dBm)
2441.000000	PASS	150	258.180	-10.0

Periode

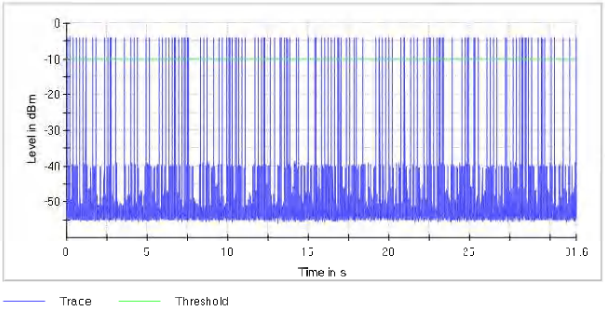
Min (ms)	Max (ms)	Mean (ms)
7.500	804.990	209.291

Transmit Time per Hop

Min (ms)	Max (ms)	Limit Max for Max (ms)	Limit Min for Max (ms)	Mean (ms)
1.680	3.380	400.000	0.000	1.710

DwellTime

Min (ms)	Max (ms)	Mean (ms)
1.680	4.190	1.721



FCC Part 47 §15.247 2400-2483.5 MHz 2017

Measurement

Setting	Instrument Value	Target Value
Center Frequency	2.44100 GHz	2.44100 GHz
Span	ZeroSpan	ZeroSpan
RBW	500.000 kHz	~ 500.000 kHz
VBW	1.000 MHz	~ 1.500 MHz
SweepPoints	30001	~ 30001
Sweeptime	31.600 s	31.600 s
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	0.000 dB	0.000 dB
Detector	MaxPeak	MaxPeak
SweepCount	1	1
Filter	Channel	Channel
Trace Mode	Clear Write	Clear Write
Sweeptype	Sweep	AUTO
Preamp	off	off
Trigger	External	External
Trigger Offset	0.000 s	0.000 s

OSP

Setting	Instrument Value	Target Value
Measurement Time	31.600 s	31.600 s
Tracepoints	31600000	31600000
Time resolution	1.000 µs	1.000 µs
Detector	RMS	RMS

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Time of Channel Occupancy(3) (2441 MHz; 10.000 dBm; 1 MHz)

Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013

Result

DUT Frequency (MHz)	Result	Number of Hops	Average time of occupancy (ms)	Threshold (dBm)
2441.000000	PASS	100	296.460	-10.0

Periode

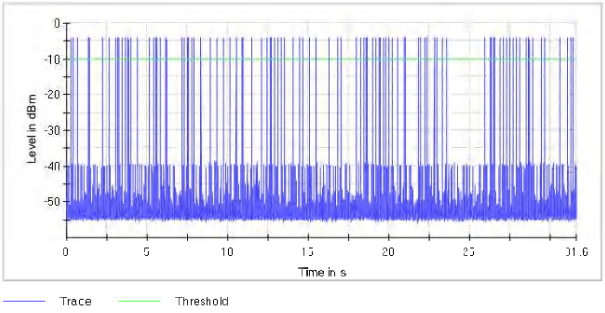
Min (ms)	Max (ms)	Mean (ms)
26.250	2369.950	313.403

Transmit Time per Hop

Min (ms)	Max (ms)	Limit Max for Max (ms)	Limit Min for Max (ms)	Mean (ms)
2.930	2.940	400.000	0.000	2.935

DwellTime

Min (ms)	Max (ms)	Mean (ms)
2.930	2.940	2.935



FCC Part 47 §15.247 2400-2483.5 MHz 2017

Measurement

Setting	Instrument Value	Target Value
Center Frequency	2.44100 GHz	2.44100 GHz
Span	ZeroSpan	ZeroSpan
RBW	500.000 kHz	~ 500.000 kHz
VBW	1.000 MHz	~ 1.500 MHz
SweepPoints	30001	~ 30001
Sweeptime	31.600 s	31.600 s
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	0.000 dB	0.000 dB
Detector	MaxPeak	MaxPeak
SweepCount	1	1
Filter	Channel	Channel
Trace Mode	Clear Write	Clear Write
Sweeptype	Sweep	AUTO
Preamp	off	off
Trigger	External	External
Trigger Offset	0.000 s	0.000 s

OSP

Setting	Instrument Value	Target Value
Measurement Time	31.600 s	31.600 s
Tracepoints	31600000	31600000
Time resolution	1.000 µs	1.000 µs
Detector	RMS	RMS

EDR mode (π/4-DQPSK)

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Time of Channel Occupancy (2441 MHz; 10.000 dBm; 1 MHz)

Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013

Result

DUT Frequency (MHz)	Result	Number of Hops	Average time of occupancy (ms)	Threshold (dBm)
2441.000000	PASS	319	97.500	-10.0

Periode

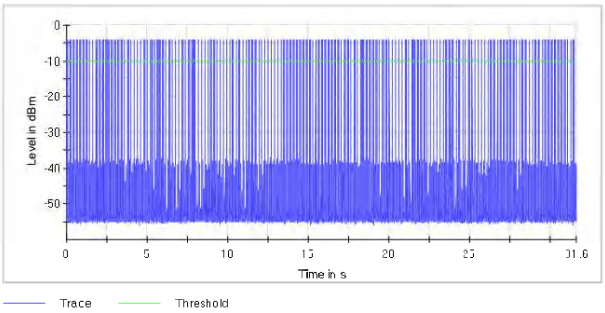
Min (ms)	Max (ms)	Mean (ms)
8.750	193.750	98.736

Transmit Time per Hop

Min (ms)	Max (ms)	Limit Max for Max (ms)	Limit Min for Max (ms)	Mean (ms)
0.23	0.35	400.000	0.000	0.305

DwellTime

Min (ms)	Max (ms)	Mean (ms)
0.37	0.45	0.429



FCC Part 47 §15.247 2400-2483.5 MHz 2017

Measurement

Setting	Instrument Value	Target Value
Center Frequency	2.44100 GHz	2.44100 GHz
Span	ZeroSpan	ZeroSpan
RBW	500.000 kHz	~ 500.000 kHz
VBW	1.000 MHz	~ 1.500 MHz
SweepPoints	30001	~ 30001
Sweeptime	31.600 s	31.600 s
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	0.000 dB	0.000 dB
Detector	MaxPeak	MaxPeak
SweepCount	1	1
Filter	Channel	Channel
Trace Mode	Clear Write	Clear Write
Sweeptype	Sweep	AUTO
Preamp	off	off
Trigger	External	External
Trigger Offset	0.000 s	0.000 s

OSP

Setting	Instrument Value	Target Value
Measurement Time	31.600 s	31.600 s
Tracepoints	31600000	31600000
Time resolution	1.000 µs	1.000 µs
Detector	RMS	RMS

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Time of Channel Occupancy(2) (2441 MHz; 10.000 dBm; 1 MHz)

Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013

Result

DUT Frequency (MHz)	Result	Number of Hops	Average time of occupancy (ms)	Threshold (dBm)
2441.000000	PASS	153	139.790	-10.0

Periode

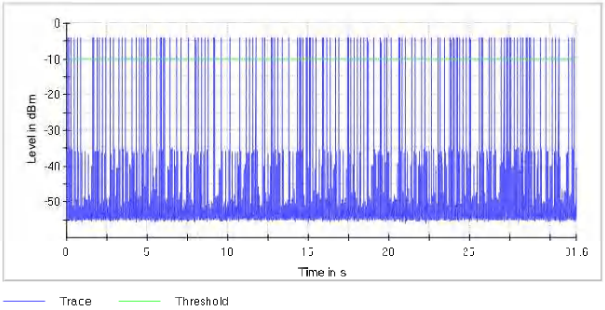
Min (ms)	Max (ms)	Mean (ms)
7.500	784.990	205.407

Transmit Time per Hop

Min (ms)	Max (ms)	Limit Max for Max (ms)	Limit Min for Max (ms)	Mean (ms)
0.72	1.070	400.000	0.000	0.908

DwellTime

Min (ms)	Max (ms)	Mean (ms)
1.620	1.700	1.687



FCC Part 47 §15.247 2400-2483.5 MHz 2017

Measurement

Setting	Instrument Value	Target Value
Center Frequency	2.44100 GHz	2.44100 GHz
Span	ZeroSpan	ZeroSpan
RBW	500.000 kHz	~ 500.000 kHz
VBW	1.000 MHz	~ 1.500 MHz
SweepPoints	30001	~ 30001
Sweeptime	31.600 s	31.600 s
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	0.000 dB	0.000 dB
Detector	MaxPeak	MaxPeak
SweepCount	1	1
Filter	Channel	Channel
Trace Mode	Clear Write	Clear Write
Sweeptype	Sweep	AUTO
Preamp	off	off
Trigger	External	External
Trigger Offset	0.000 s	0.000 s

OSP

Setting	Instrument Value	Target Value
Measurement Time	31.600 s	31.600 s
Tracepoints	31600000	31600000
Time resolution	1.000 µs	1.000 µs
Detector	RMS	RMS

FCC Part 47 §15.247 2400-2483.5 MHz 2017

Time of Channel Occupancy(3) (2441 MHz; 10.000 dBm; 1 MHz)

Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v04 and ANSI C63.10-2013

Result

DUT Frequency (MHz)	Result	Number of Hops	Average time of occupancy (ms)	Threshold (dBm)
2441.000000	PASS	110	166.700	-10.0

Periode

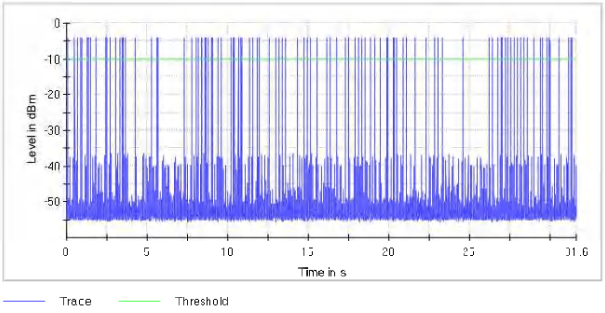
Min (ms)	Max (ms)	Mean (ms)
7.500	1608.710	286.164

Transmit Time per Hop

Min (ms)	Max (ms)	Limit Max for Max (ms)	Limit Min for Max (ms)	Mean (ms)
1.370	1.760	400.000	0.000	1.500

DwellTime

Min (ms)	Max (ms)	Mean (ms)
2.870	2.950	2.926



FCC Part 47 §15.247 2400-2483.5 MHz 2017

Measurement

Setting	Instrument Value	Target Value
Center Frequency	2.44100 GHz	2.44100 GHz
Span	ZeroSpan	ZeroSpan
RBW	500.000 kHz	~ 500.000 kHz
VBW	1.000 MHz	~ 1.500 MHz
SweepPoints	30001	~ 30001
Sweeptime	31.600 s	31.600 s
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	0.000 dB	0.000 dB
Detector	MaxPeak	MaxPeak
SweepCount	1	1
Filter	Channel	Channel
Trace Mode	Clear Write	Clear Write
Sweeptype	Sweep	AUTO
Preamp	off	off
Trigger	External	External
Trigger Offset	0.000 s	0.000 s

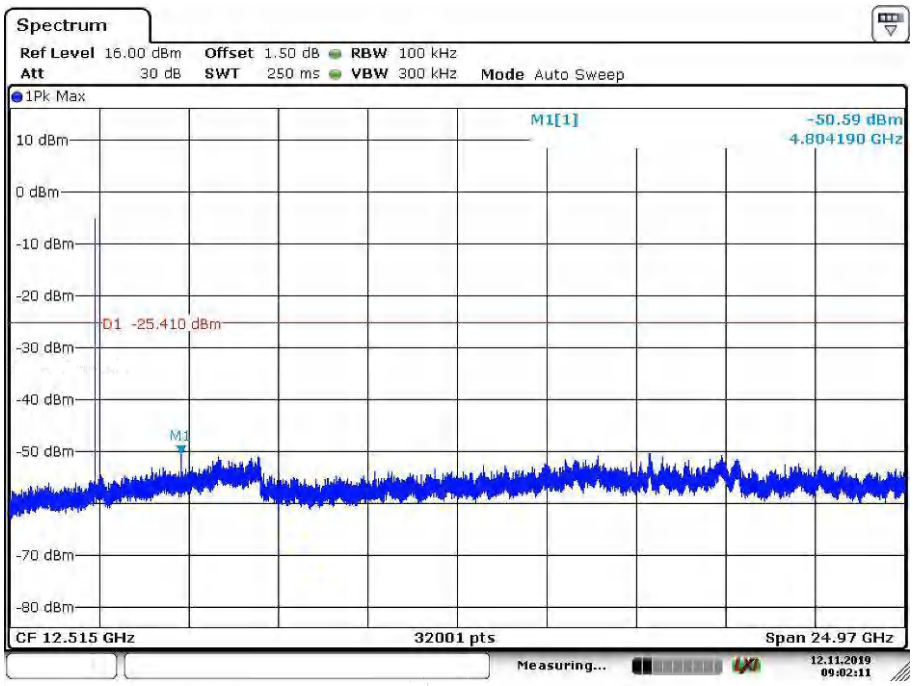
OSP

Setting	Instrument Value	Target Value
Measurement Time	31.600 s	31.600 s
Tracepoints	31600000	31600000
Time resolution	1.000 µs	1.000 µs
Detector	RMS	RMS

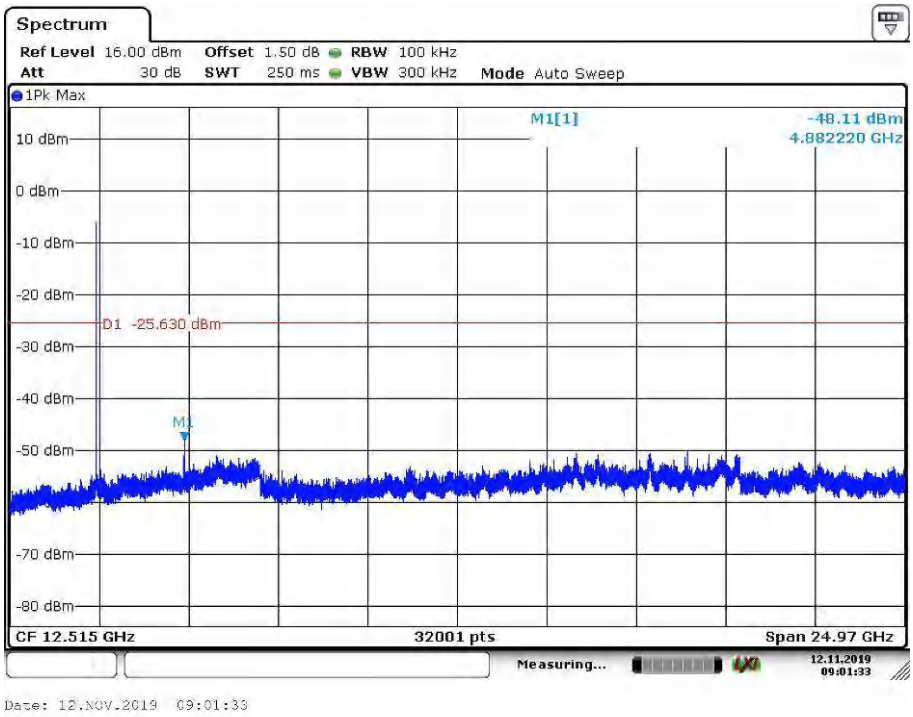
Appendix B.6: Test Results of Conducted Spurious Emissions Measured in 100 kHz Bandwidth

BDR mode (GFSK)

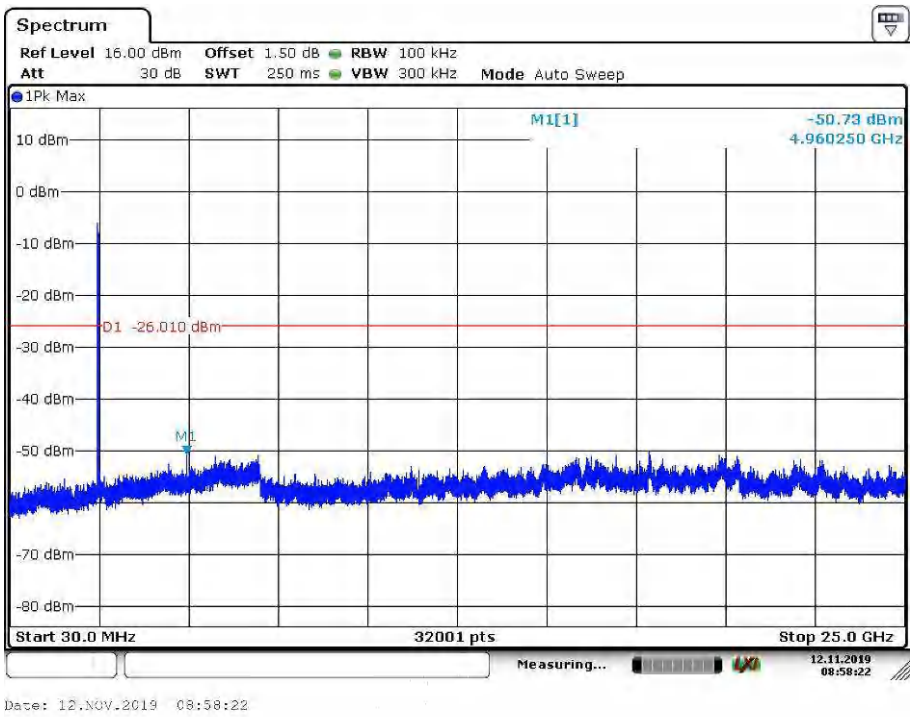
Low Channel



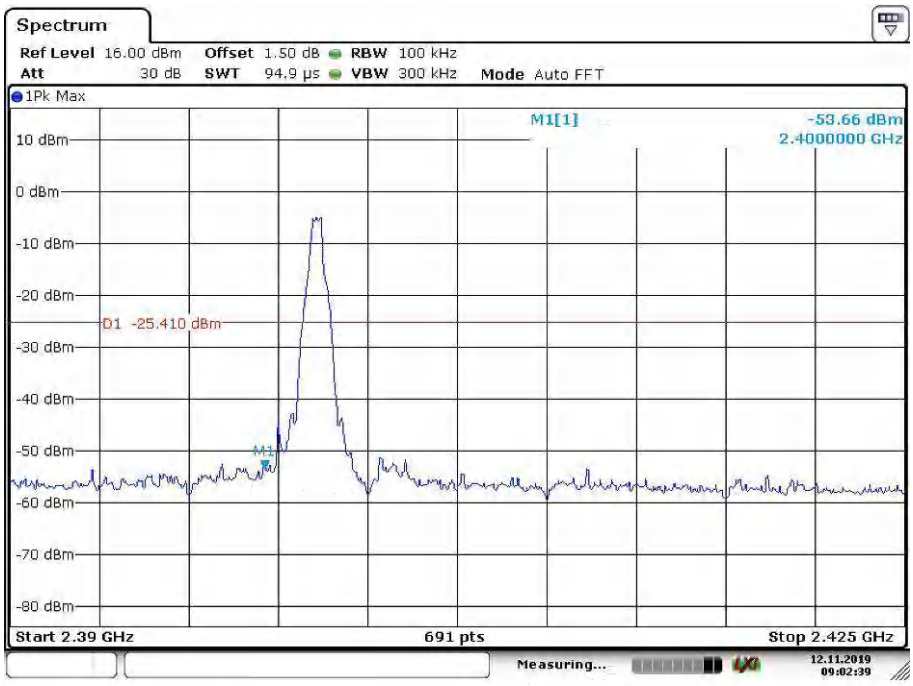
Middle Channel



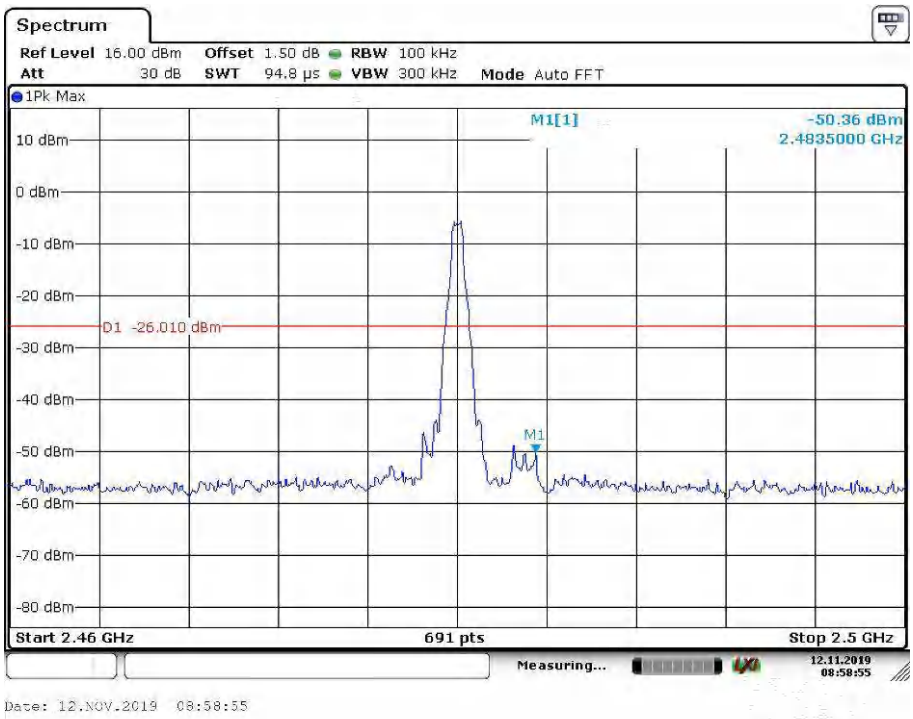
High Channel



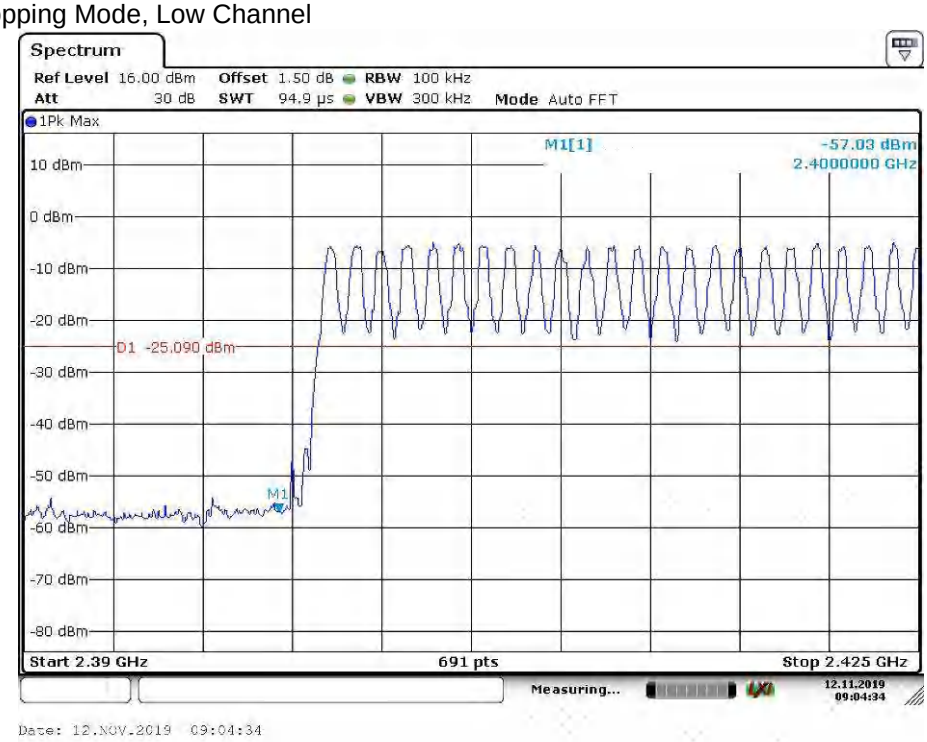
Band Edge, Low Channel



Band Edge, High Channel



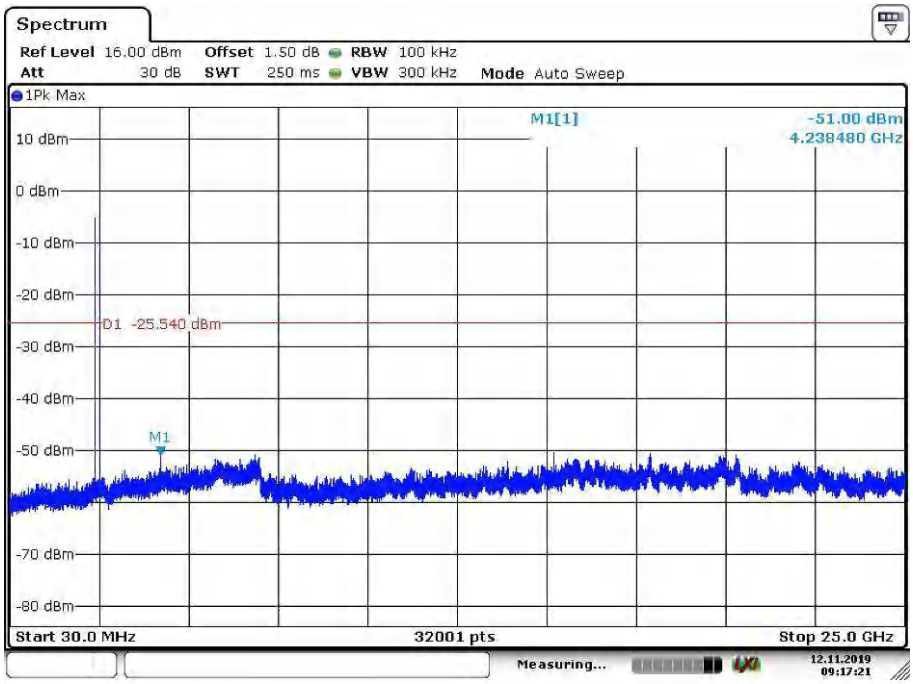
Band Edge, Hopping Mode, Low Channel



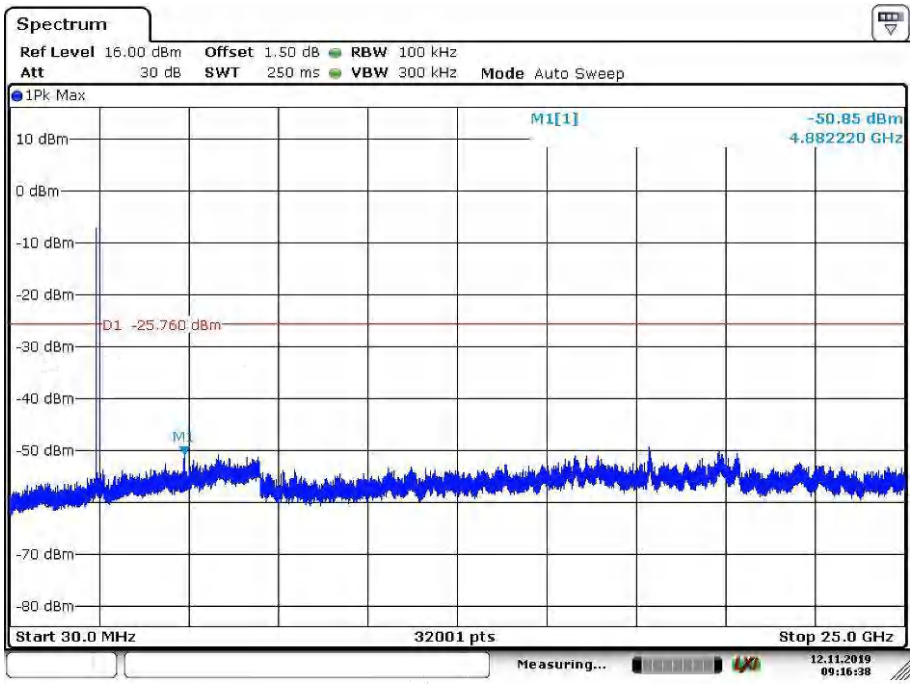
Band Edge, Hopping Mode, High Channle

EDR mode (π/4-DQPSK)

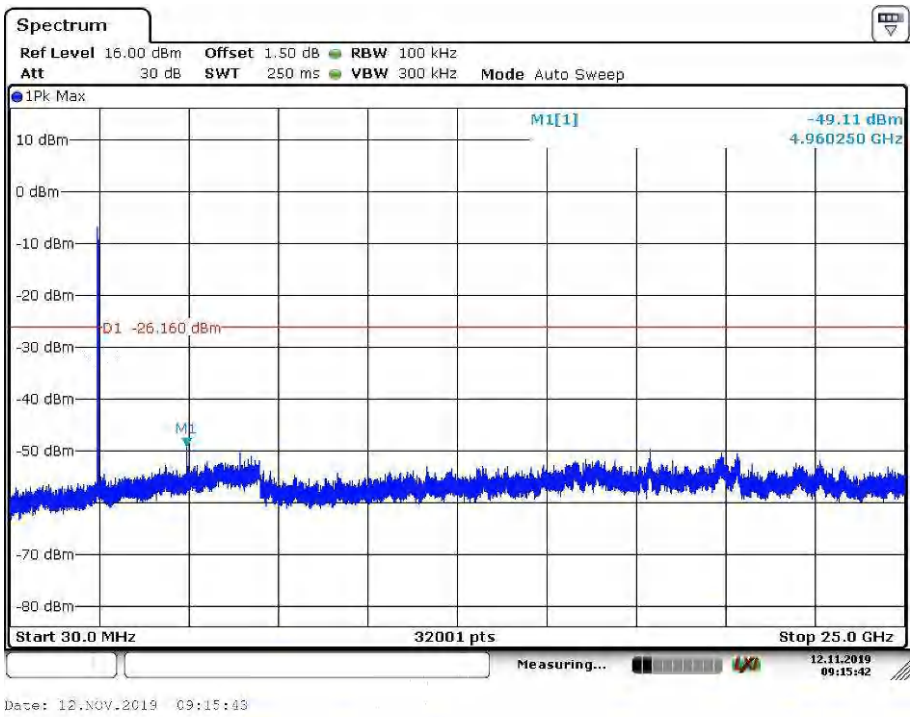
Low Channel



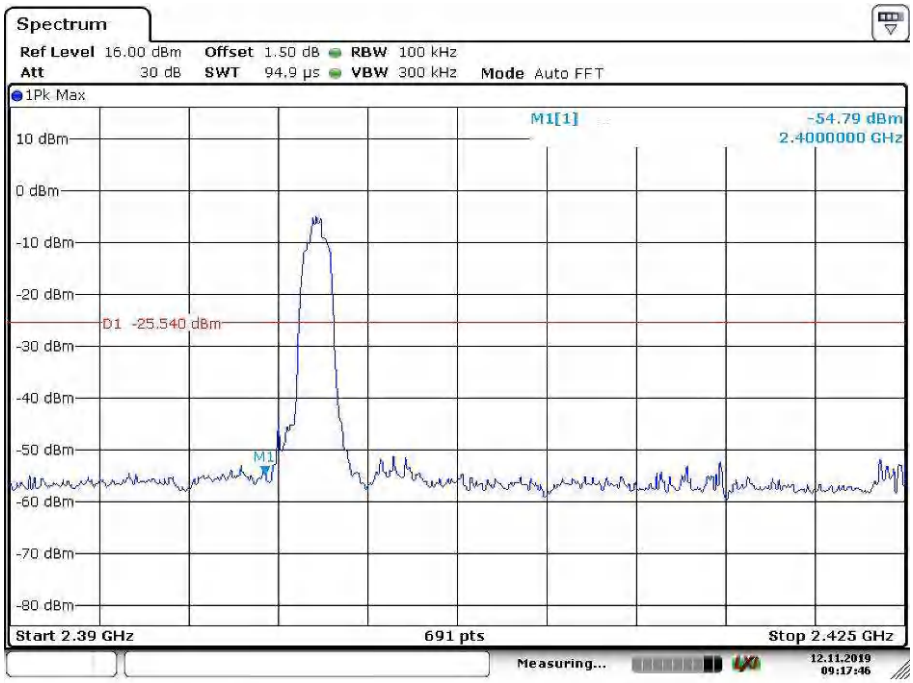
Middle Channel



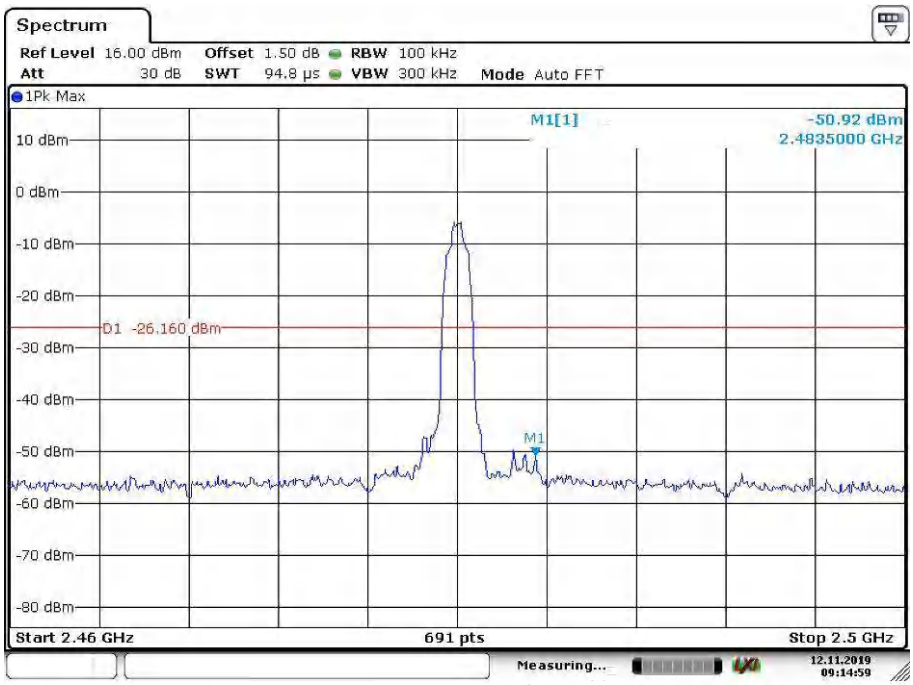
High Channel



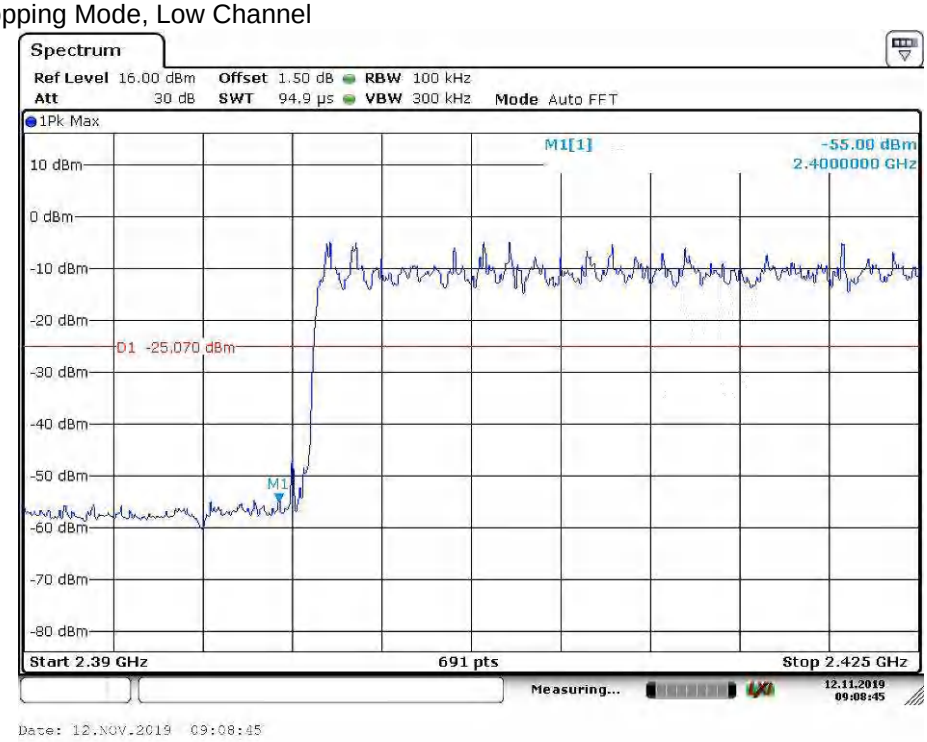
Band Edge, Low Channel



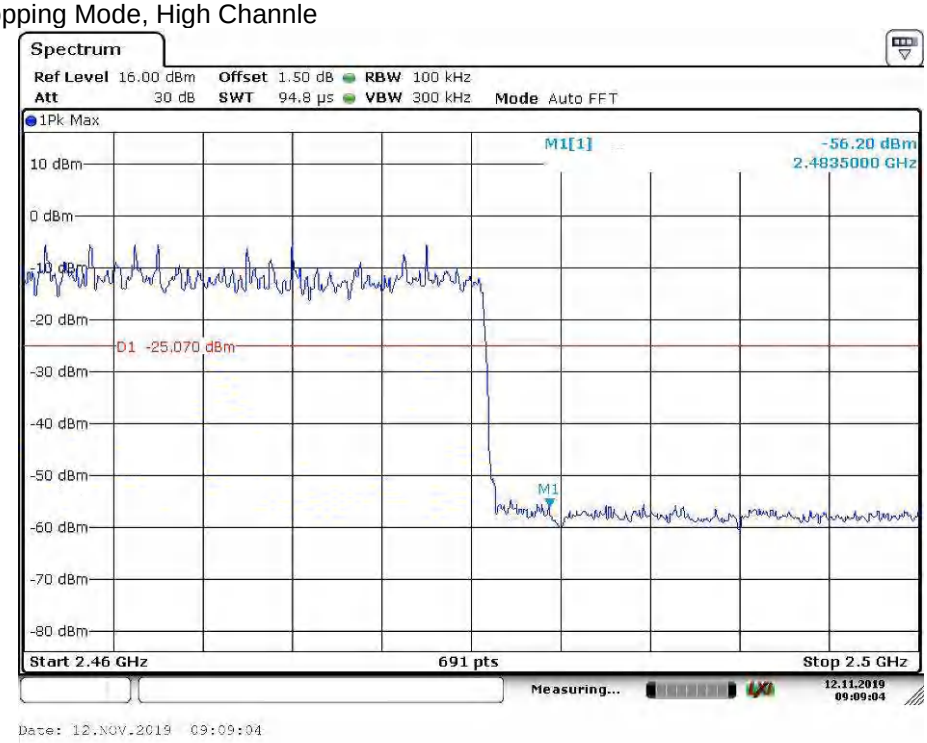
Band Edge, High Channel



Band Edge, Hopping Mode, Low Channel



Band Edge, Hopping Mode, High Channle



Note: Testing was carried out within frequency range 9kHz to the tenth harmonics. The measurement results below 30MHz and 18GHz - 26.5GHz were greater than 20dB below the limit, so only the radiated spurious emissions from 30MHz to 18GHz were reported.

Appendix B.7: Test Results of Radiated Spurious Emissions

Note: This testing was carried out on different modulations, but only the worst case (GFSK) was presented in this report.

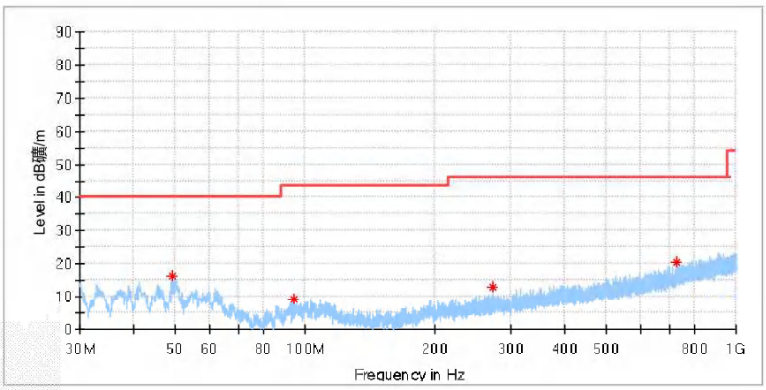
30MHz - 1GHz

Test 1 / 1

Test Report

EUT Information

EUT Name:	TWS EARBUDS
Model:	TWSEBWHV2PRM
Test Mode:	TX_Low Channel
Test Voltage::	Fully charged battery
Remark:	Temp:23; Humi:49%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	DET 2 (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
49.109000	16.25	---	40.00	23.75	100.0	H	141.0	-18.6
93.874500	9.32	---	43.50	34.18	100.0	H	318.0	-20.3
271.869500	12.92	---	46.00	33.08	100.0	H	252.0	-17.2
728.497000	20.43	---	46.00	25.57	100.0	H	35.0	-7.9

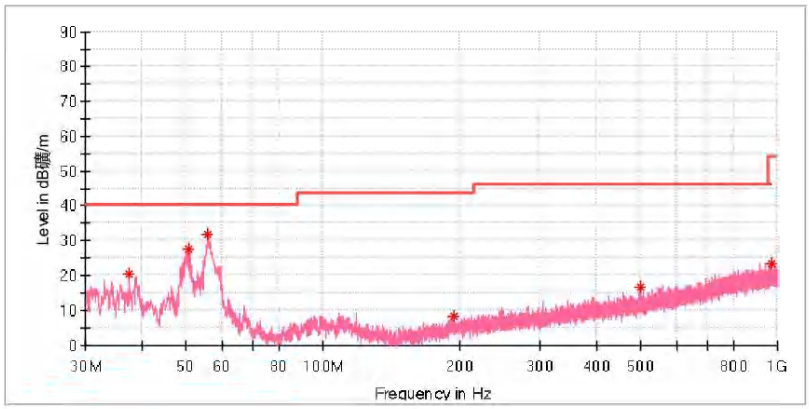
13/11/2019 5:23:49 PM

Test 1 / 1

Test Report

EUT Information

EUT Name:	TWS EARBUDS
Model:	TWSEBWHV2PRM
Test Mode:	TX_Low Channel
Test Voltage::	Fully charged battery
Remark:	Temp:23; Humi:49%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	DET 2 (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
37.517500	20.50	---	40.00	19.51	100.0	V	335.0	-21.2
50.855000	27.67	---	40.00	12.33	100.0	V	131.0	-18.6
55.802000	31.72	---	40.00	8.28	100.0	V	291.0	-18.8
193.930000	8.46	---	43.50	35.04	100.0	V	147.0	-19.6
499.092000	16.72	---	46.00	29.28	100.0	V	306.0	-12.3
967.602000	23.57	---	46.00	22.43	100.0	V	58.0	-4.6

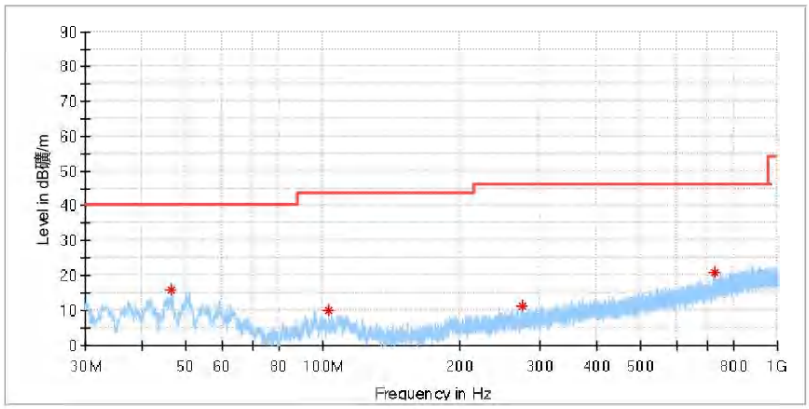
13/11/2019 5:20:56 PM

Test 1 / 1

Test Report

EUT Information

EUT Name:	TWS EARBUDS
Model:	TWSEBWHV2PRM
Test Mode:	TX_High Channel
Test Voltage::	Fully charged battery
Remark:	Temp:23; Humi:49%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	DET 2 (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
46.538500	15.71	---	40.00	24.29	100.0	H	0.0	-18.9
103.138000	10.20	---	43.50	33.30	100.0	H	200.0	-19.2
275.022000	11.28	---	46.00	34.72	100.0	H	309.0	-17.2
728.691000	21.02	---	46.00	24.98	100.0	H	162.0	-7.9

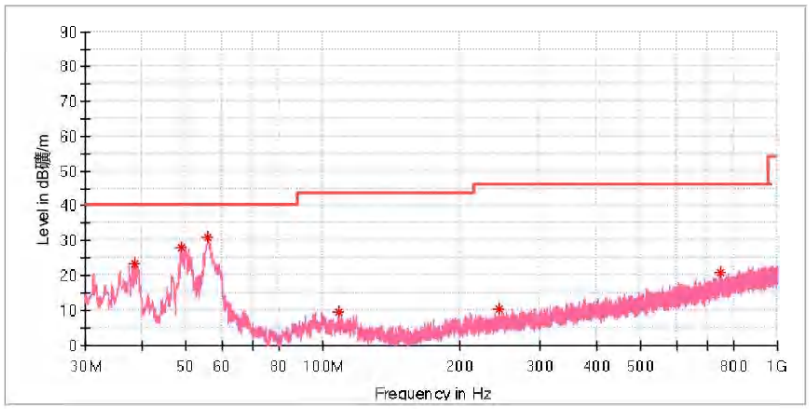
13/11/2019 5:26:30 PM

Test 1 / 1

Test Report

EUT Information

EUT Name:	TWS EARBUDS
Model:	TWSEBWHV2PRM
Test Mode:	TX_High Channel
Test Voltage::	Fully charged battery
Remark:	Temp:23; Humi:49%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	DET 2 (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
38.633000	23.40	---	40.00	16.60	100.0	V	114.0	-20.8
48.721000	27.92	---	40.00	12.08	100.0	V	114.0	-18.6
55.850500	31.07	---	40.00	8.93	100.0	V	293.0	-18.8
108.036500	9.45	---	43.50	34.05	100.0	V	302.0	-19.3
243.691000	10.60	---	46.00	35.40	100.0	V	182.0	-17.9
750.176500	20.97	---	46.00	25.03	100.0	V	293.0	-7.6

13/11/2019 5:29:13 PM

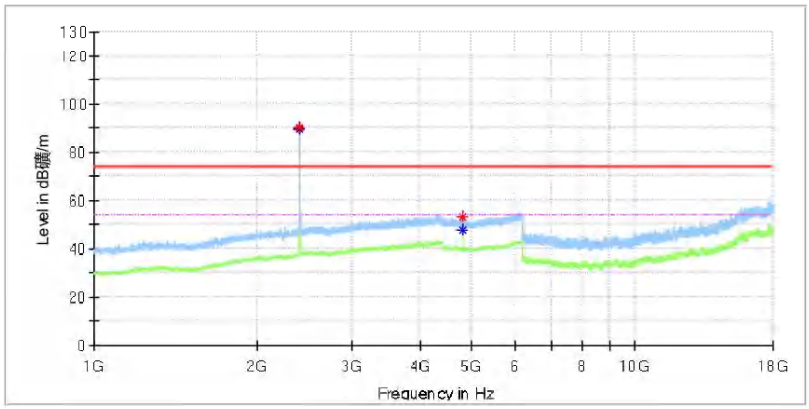
Above 1GHz

Test 1 / 1

Test Report

EUT Information

EUT Name:	TWS EARBUDS
Model:	TWSEBWHV2PRM
Test Mode:	TX_Low Channel
Test Voltage::	Fully charged battery
Remark:	Temp:23; Humi:49%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2402.000000	---	89.39	54.00	-35.39	100.0	H	122.0	7.0
2402.000000	89.89	---	74.00	-15.89	100.0	H	122.0	7.0
4801.000000	53.23	---	74.00	20.77	100.0	H	340.0	13.6
4801.000000	---	47.70	54.00	6.31	100.0	H	340.0	13.6

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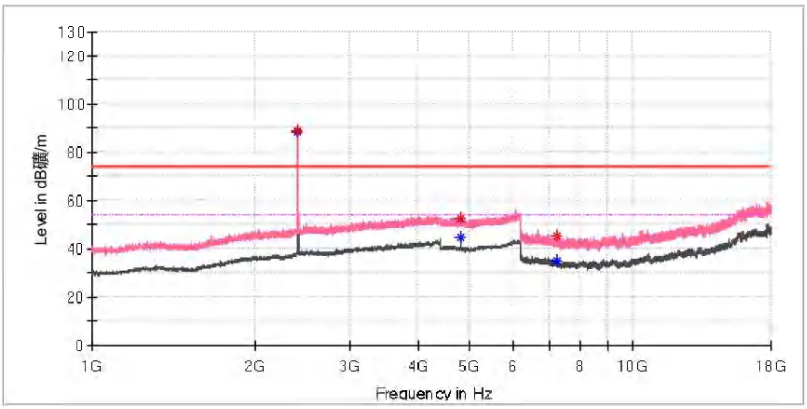
Test 1 / 1

Test Report

EUT Information

EUT Name:	TWS EARBUDS
Model:	TWSEBWHV2PRM
Test Mode:	TX_Low Channel
Test Voltage::	Fully charged battery
Remark:	Temp:23; Humi:49%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2402.000000	---	88.45	54.00	-34.45	100.0	V	72.0	7.0
2402.000000	88.86	---	74.00	-14.86	100.0	V	72.0	7.0
4801.000000	52.79	---	74.00	21.21	100.0	V	93.0	13.6
4801.000000	---	44.51	54.00	9.49	100.0	V	93.0	13.6
7219.716667	45.16	---	74.00	28.84	100.0	V	358.0	8.7
7238.891667	---	35.22	54.00	18.78	100.0	V	57.0	8.6

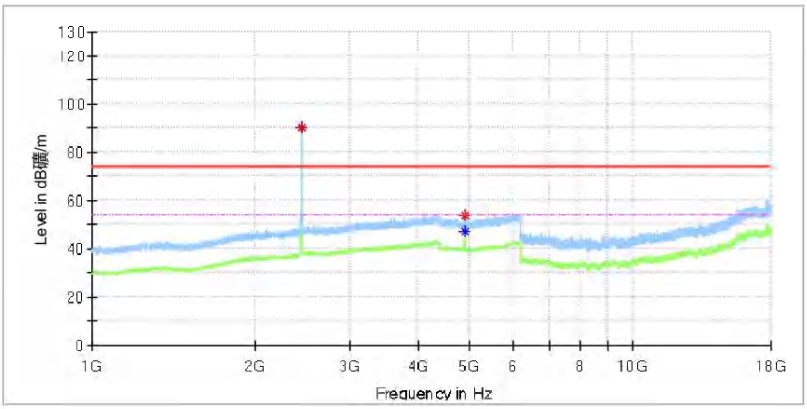
13/11/2019 9:26:42 AM

Test 1 / 1

Test Report

EUT Information

EUT Name:	TWS EARBUDS
Model:	TWSEBWHV2PRM
Test Mode:	TX_Mid Channel
Test Voltage::	Fully charged battery
Remark:	Temp:23; Humi:49%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

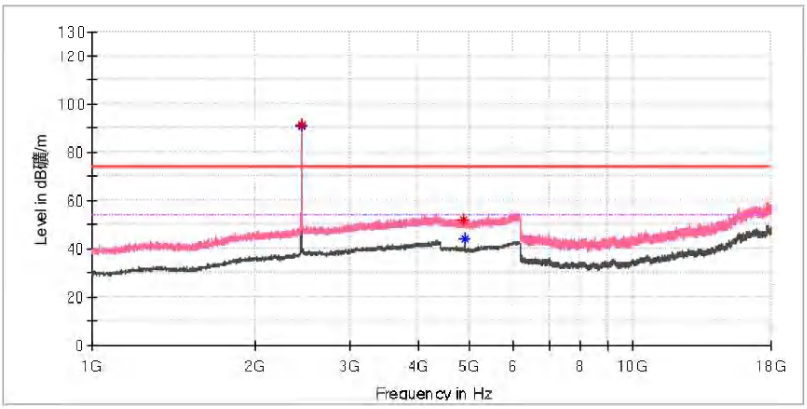
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2441.000000	---	89.80	54.00	-35.80	100.0	H	324.0	7.4
2441.000000	90.29	---	74.00	-16.29	100.0	H	324.0	7.4
4879.000000	53.59	---	74.00	20.41	100.0	H	341.0	13.4
4879.000000	---	47.30	54.00	6.70	100.0	H	341.0	13.4

Test 1 / 1

Test Report

EUT Information

EUT Name:	TWS EARBUDS
Model:	TWSEBWHV2PRM
Test Mode:	TX_Mid Channel
Test Voltage::	Fully charged battery
Remark:	Temp:23; Humi:49%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2441.000000	---	90.47	54.00	-36.47	100.0	V	72.0	7.4
2441.000000	91.01	---	74.00	-17.01	100.0	V	72.0	7.4
4871.500000	52.18	---	74.00	21.82	100.0	V	93.0	13.4
4879.000000	---	44.12	54.00	9.88	100.0	V	6.0	13.4

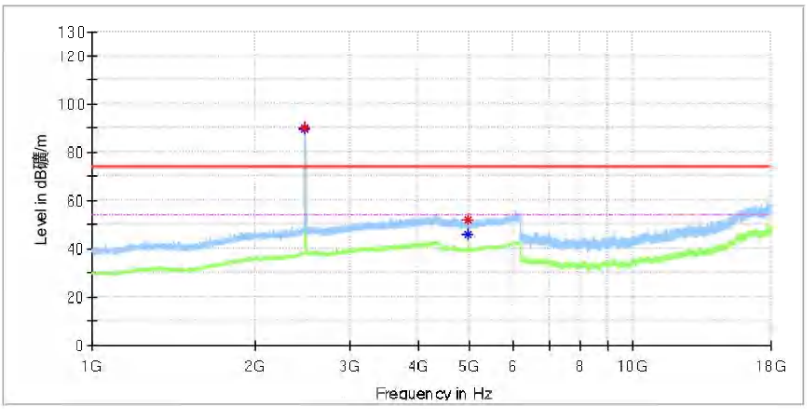
13/11/2019 10:06:15 AM

Test 1 / 1

Test Report

EUT Information

EUT Name:	TWS EARBUDS
Model:	TWSEBWHV2PRM
Test Mode:	TX_High Channel
Test Voltage::	Fully charged battery
Remark:	Temp:23; Humi:49%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2480.000000	---	89.38	54.00	-35.38	100.0	H	281.0	7.4
2480.000000	89.87	---	74.00	-15.87	100.0	H	281.0	7.4
4957.000000	52.08	---	74.00	21.92	100.0	H	358.0	13.2
4957.000000	---	46.03	54.00	7.97	100.0	H	358.0	13.2

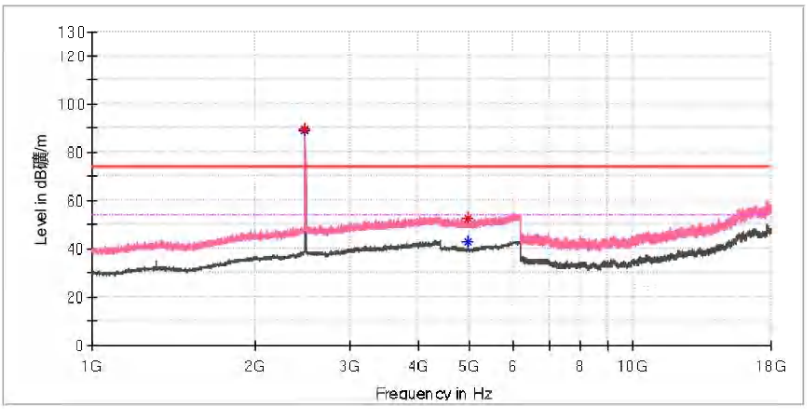
13/11/2019 9:53:36 AM

Test 1 / 1

Test Report

EUT Information

EUT Name:	TWS EARBUDS
Model:	TWSEBWHV2PRM
Test Mode:	TX_High Channel
Test Voltage::	Fully charged battery
Remark:	Temp:23; Humi:49%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2480.000000	---	88.90	54.00	-34.90	100.0	V	0.0	7.4
2480.000000	89.34	---	74.00	-15.34	100.0	V	0.0	7.4
4957.000000	---	42.82	54.00	11.18	100.0	V	51.0	13.2
4958.500000	52.79	---	74.00	21.21	100.0	V	257.0	13.2

13/11/2019 9:48:20 AM

Appendix B.8: Test Results of Radiated Emissions in Restricted Bands

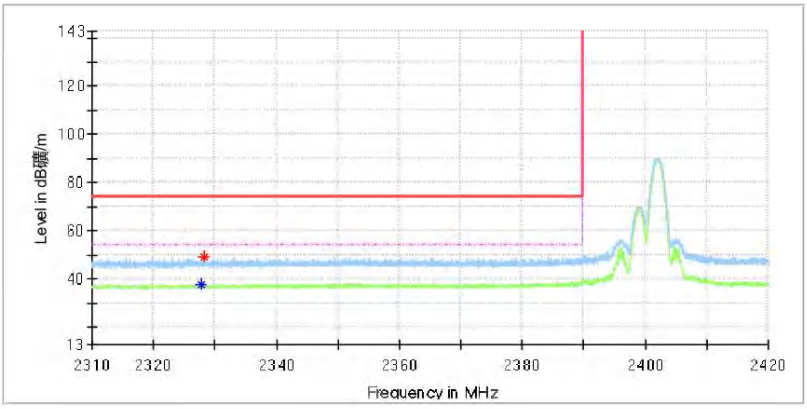
Note: This testing was carried out on different modulations, but only the worst case (GFSK) was presented in this report.

Test 1 / 1

Test Report

EUT Information

EUT Name:	TWS EARBUDS
Model:	TWSEBWHV2PRM
Test Mode:	TX_Low Channel
Test Voltage::	Fully charged battery
Remark:	Temp:23; Humi:49%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2327.891177	---	37.96	54.00	16.04	100.0	H	331.0	6.7
2328.182353	49.36	---	74.00	24.64	100.0	H	268.0	6.7

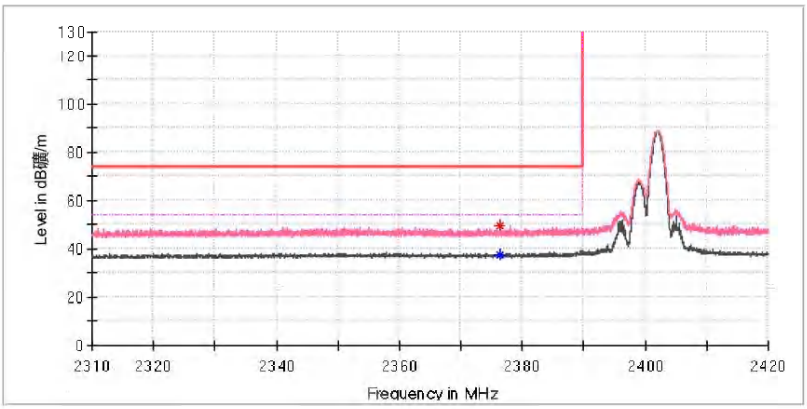
13/11/2019 9:39:06 AM

Test 1 / 1

Test Report

EUT Information

EUT Name:	TWS EARBUDS
Model:	TWSEBWHV2PRM
Test Mode:	TX_Low Channel
Test Voltage::	Fully charged battery
Remark:	Temp:23; Humi:49%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2376.355882	49.62	---	74.00	24.38	100.0	V	65.0	6.9
2376.404412	---	37.23	54.00	16.77	100.0	V	100.0	6.9

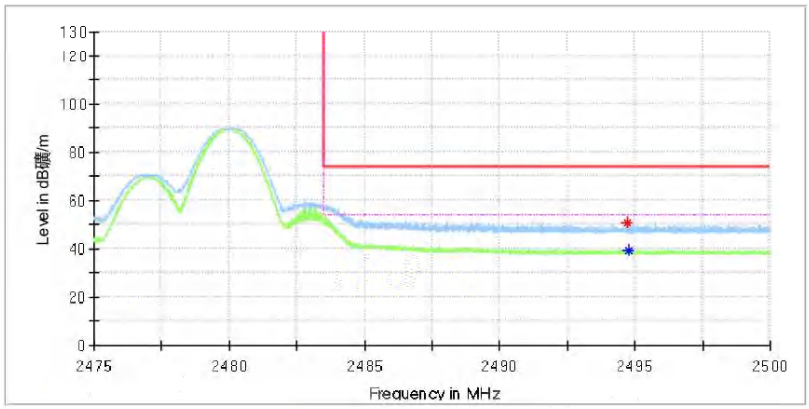
13/11/2019 9:43:14 AM

Test 1 / 1

Test Report

EUT Information

EUT Name:	TWS EARBUDS
Model:	TWSEBWHV2PRM
Test Mode:	TX_High Channel
Test Voltage::	Fully charged battery
Remark:	Temp:23; Humi:49%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2494.724265	50.56	---	74.00	23.44	100.0	H	348.0	7.4
2494.768382	---	39.27	54.00	14.73	100.0	H	348.0	7.4

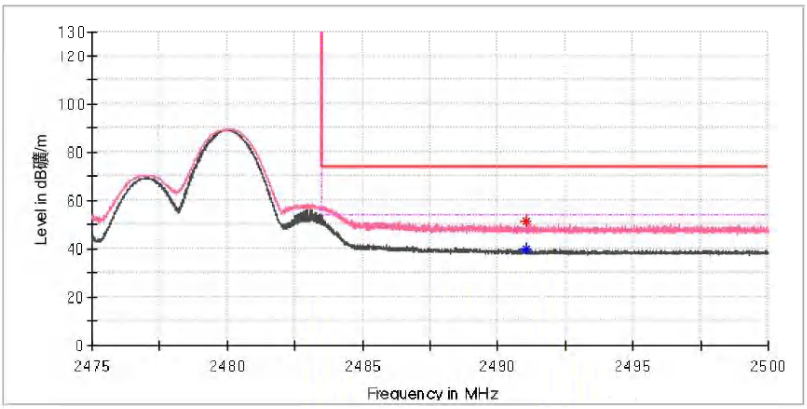
13/11/2019 9:59:22 AM

Test 1 / 1

Test Report

EUT Information

EUT Name:	TWS EARBUDS
Model:	TWSEBWHV2PRM
Test Mode:	TX_High Channel
Test Voltage::	Fully charged battery
Remark:	Temp:23; Humi:49%
Test Standard:	FCC 15.247
Tested By:	Kei Zhang
Reviewed By:	Terry Yin



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2491.055147	---	39.61	54.00	14.39	100.0	V	65.0	7.4
2491.069853	51.14	---	74.00	22.86	100.0	V	11.0	7.4

13/11/2019 10:02:31 AM

Appendix C: Test Results of FCC 15B

APPENDIX C: TEST RESULTS OF FCC 15B **1**
APPENDIX C.1: TEST PLOTS OF CONDUCTED EMISSION ON AC MAINS 2
Charging mode for charger box *2*
APPENDIX C.2: TEST PLOTS OF RADIATED EMISSION, BELOW 1GHZ 4
Charging mode for charger box *4*
APPENDIX C.3: TEST PLOTS OF RADIATED EMISSION, ABOVE 1GHZ 6
Charging mode for charger box *6*

Appendix C.1: Test Plots of Conducted Emission on AC Mains

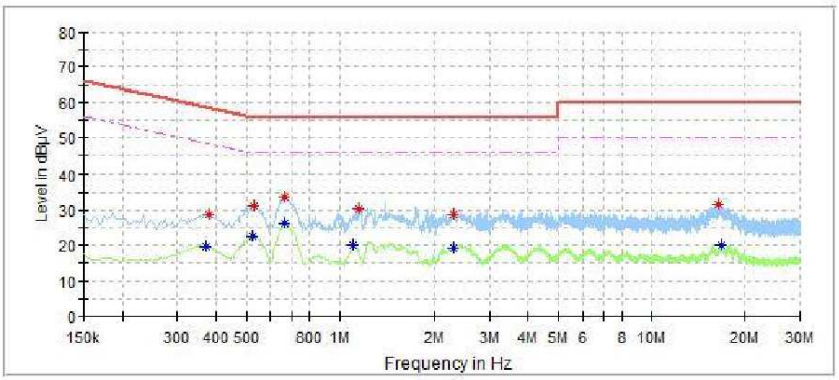
Charging mode for charger box

Charging_L 1 / 1

Test Report

EUT Information

EUT Name:	TWS EARBUDS
Model:	TWSEBWHV2PRM
Order No.:	168137657
Test Mode:	Charging
Test Voltage:	DC 5V
Test By:	Charlie Wang
Review By:	Gary Chen
Standard	L



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.370000	---	19.76	48.50	28.74	---	---	L1	9.7
0.378000	28.70	---	58.32	29.63	---	---	L1	9.7
0.524000	---	22.76	46.00	23.24	---	---	L1	9.7
0.528000	31.30	---	56.00	24.70	---	---	L1	9.7
0.664000	33.75	---	56.00	22.25	---	---	L1	9.7
0.668000	---	26.11	46.00	19.89	---	---	L1	9.7
1.108000	---	19.94	46.00	26.06	---	---	L1	9.7
1.156000	30.39	---	56.00	25.61	---	---	L1	9.7
2.288000	28.69	---	56.00	27.31	---	---	L1	9.8
2.300000	---	19.47	46.00	26.53	---	---	L1	9.8
16.356000	31.52	---	60.00	28.48	---	---	L1	10.4
16.796000	---	20.11	50.00	29.89	---	---	L1	10.4

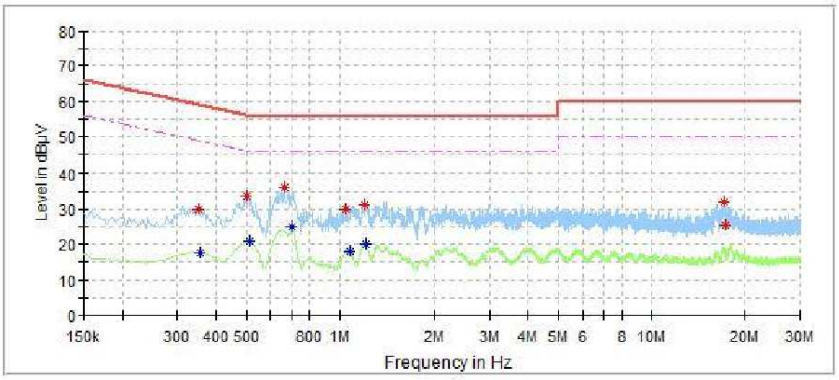
11/14/2019 9:38:15 AM

Charging_N 1 / 1

Test Report

EUT Information

EUT Name:	TWS EARBUDS
Model:	TWSEBWHV2PRM
Order No.:	168137657
Test Mode:	Charging
Test Voltage:	DC 5V
Test By:	Charlie Wang
Review By:	Gary Chen
Standard	N



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.350000	30.10	---	58.96	28.86	---	---	N	9.7
0.354000	---	17.79	48.87	31.08	---	---	N	9.7
0.500000	33.82	---	56.00	22.18	---	---	N	9.7
0.512000	---	20.84	46.00	25.16	---	---	N	9.7
0.664000	36.04	---	56.00	19.96	---	---	N	9.7
0.704000	---	25.04	46.00	20.96	---	---	N	9.7
1.048000	30.09	---	56.00	25.91	---	---	N	9.7
1.084000	---	17.94	46.00	28.06	---	---	N	9.7
1.208000	30.98	---	56.00	25.02	---	---	N	9.7
1.216000	---	20.07	46.00	25.93	---	---	N	9.7
17.148000	31.85	---	60.00	28.15	---	---	N	10.4
17.348000	25.56	---	60.00	34.44	---	---	N	10.4

Appendix C.2: Test Plots of Radiated Emission, Below 1GHz

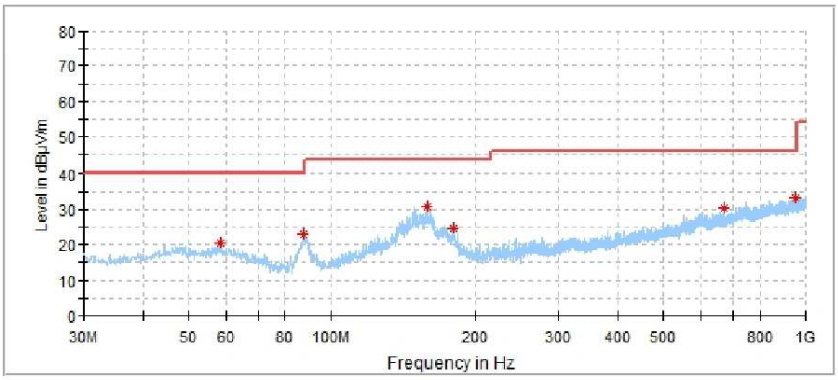
Charging mode for charger box

RE_Part 15B_Charging_H 1 / 1

EMC32 Report

EUT Information

EUT Name:	TWS EARBUDS
Model:	TWSEBWHV2PRM
Order No:	168137657
Test Mode:	Charging
Test Voltage:	DC 5V
Test By:	Charlie Wang
Review By:	Gary Chen
Remark:	3M Chamber



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
671.364000	30.25	46.00	15.75	---	---	100.0	H	0.0
954.410000	33.15	46.00	12.85	---	---	150.0	H	138.0
179.768000	24.60	43.50	18.90	---	---	150.0	H	172.0
158.137000	30.92	43.50	12.58	---	---	200.0	H	160.0
58.227000	20.32	40.00	19.68	---	---	200.0	H	178.0
87.424000	22.91	40.00	17.09	---	---	200.0	H	278.0

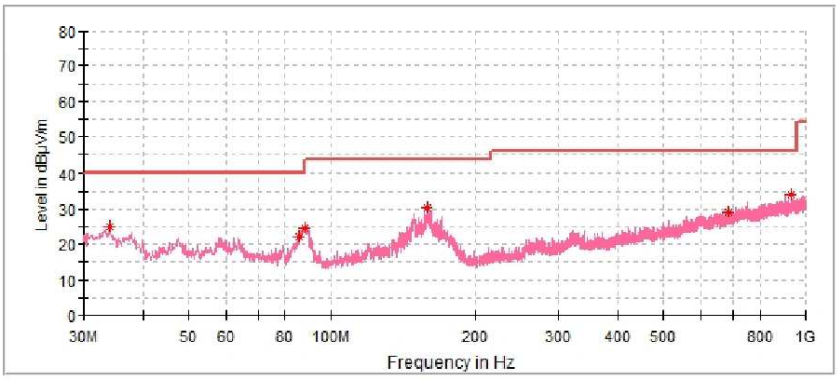
11/13/2019 EMC32 V10.50.0 3:42:45 PM

RE_Part 15B_Charging_V 1 / 1

EMC32 Report

EUT Information

EUT Name:	TWS EARBUDS
Model:	TWSEBWHV2PRM
Order No:	168137657
Test Mode:	Charging
Test Voltage:	DC 5V
Test By:	Charlie Wang
Review By:	Gary Chen
Remark:	3M Chamber



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
33.977000	25.06	40.00	14.94	---	---	100.0	V	0.0
158.428000	30.31	43.50	13.19	---	---	100.0	V	142.0
85.872000	22.22	40.00	17.78	---	---	150.0	V	134.0
87.909000	24.48	40.00	15.52	---	---	150.0	V	134.0
686.690000	29.19	46.00	16.81	---	---	150.0	V	157.0
929.190000	33.87	46.00	12.13	---	---	150.0	V	253.0

Appendix C.3: Test Plots of Radiated Emission, Above 1GHz

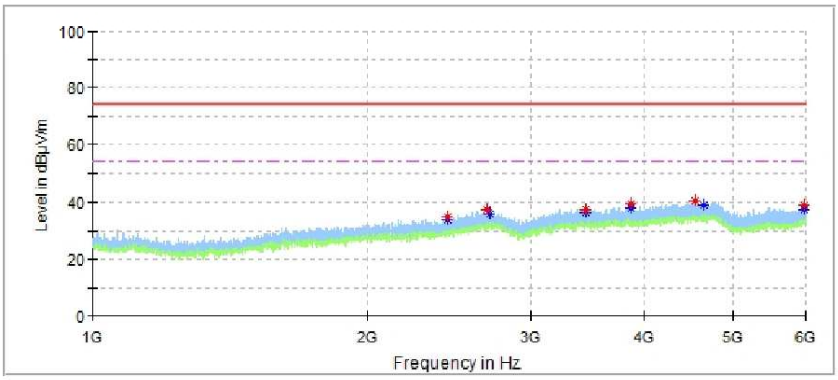
Charging mode for charger box

RE_Part 15B_Charging_H 1 / 1

EMC32 Report

EUT Information

EUT Name:	TWS EARBUDS
Model:	TWSEBWHV2PRM
Order No:	168137657
Test Mode:	Charging
Test Voltage:	DC 5V
Test By:	Charlie Wang
Review By:	Gary Chen
Remark:	3M Chamber



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol
3861.000000	---	38.05	54.00	15.95	---	---	100.0	H
3861.000000	39.33	---	74.00	34.67	---	---	100.0	H
3445.000000	37.50	---	74.00	36.50	---	---	100.0	H
3445.000000	---	36.25	54.00	17.75	---	---	100.0	H
2709.000000	---	35.67	54.00	18.33	---	---	100.0	H
2685.000000	37.40	---	74.00	36.60	---	---	100.0	H
5976.500000	38.76	---	74.00	35.24	---	---	100.0	H
5976.500000	---	37.33	54.00	16.67	---	---	100.0	H
4637.500000	---	38.99	54.00	15.01	---	---	100.0	H
2439.500000	---	33.72	54.00	20.28	---	---	100.0	H
2439.500000	34.96	---	74.00	39.04	---	---	100.0	H
4533.500000	40.60	---	74.00	33.40	---	---	100.0	H

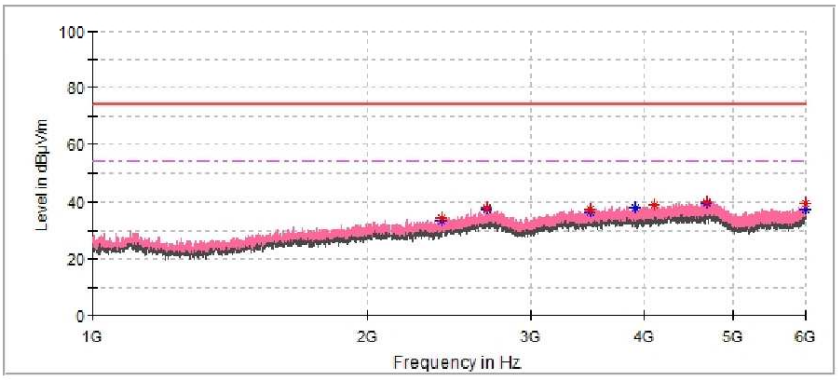
11/13/2019 EMC32 V10.50.0 10:21:12 AM

RE_Part 15B_BT_V 1 / 1

EMC32 Report

EUT Information

EUT Name:	TWS EARBUDS
Model:	TWSEBWHV2PRM
Order No:	168137657
Test Mode:	Charging
Test Voltage:	DC 5V
Test By:	Charlie Wang
Review By:	Gary Chen
Remark:	3M Chamber



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol
5995.500000	39.44	---	74.00	34.56	---	---	100.0	V
5991.500000	---	37.55	54.00	16.45	---	---	100.0	V
2403.000000	34.39	---	74.00	39.62	---	---	100.0	V
2403.000000	---	33.23	54.00	20.77	---	---	100.0	V
3490.000000	---	36.54	54.00	17.46	---	---	100.0	V
2692.000000	---	37.48	54.00	16.52	---	---	100.0	V
2692.000000	38.13	---	74.00	35.87	---	---	100.0	V
4105.000000	38.99	---	74.00	35.01	---	---	100.0	V
3903.500000	---	37.81	54.00	16.19	---	---	100.0	V
4672.000000	40.14	---	74.00	33.86	---	---	100.0	V
4672.000000	---	39.41	54.00	14.59	---	---	100.0	V
3493.000000	37.44	---	74.00	36.56	---	---	100.0	V

11/13/2019 EMC32 V10.50.0 10:14:31 AM

Remark:
This testing was carried out on all operation modes, but only the worst case was presented in this report.