Microtest
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Test Report

Report No.:	MTi230330019-11E1
Date of issue:	2023-05-17
Applicant:	Shenzhen Worgo Technology Limited
Product:	Wireless headphones
Model(s):	T13187, T13120, T13144, T13088, T13013, T13180, T13051, T13027, T13026, T13064, T13168, T13122, T13011, T13094, T13181, T13037, T13148, T13197, T13065, T13198, T13162, T13060, T13103, T13075, T13166

Shenzhen Microtest Co., Ltd.

http://www.mtitest.com

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Instructions

1. This test report shall not be partially reproduced without the written consent of the laboratory.

2. The test results in this test report are only responsible for the samples submitted

3. This test report is invalid without the seal and signature of the laboratory.

4. This test report is invalid if transferred, altered, or tampered with in any form without authorization.

5. Any objection to this test report shall be submitted to the laboratory within 15 days from the date of receipt of the report.

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Test Result Certification	
Applicant:	**Shenzhen Worgo Technology Limited**
Address:	26th Floor, Building 1, COFCO Innovation R&D Center, 69 District, Xingdong Community, Xin'an Street, Bao'an District, Shenzhen, China
Manufacturer:	**Guangxi Cannice Precision Technology Co.Ltd.**
Address:	Block C, South of Longtuan West Road Zhongshan Town, Zhongshan County Hezhou Guangxi 542600 China
Product description	
Product name:	Wireless headphones
Trademark:	TOZO
Model name:	T13187
Series Model:	T13120, T13144, T13088, T13013, T13180, T13051, T13027, T13026, T13064, T13168, T13122, T13011, T13094, T13181, T13037, T13148, T13197, T13065, T13198, T13162, T13060, T13103, T13075, T13166
Standards:	ETSI EN 300 328 V2.2.2 (2019-07)
Date of Test	
Date of test:	2023-05-11 ~ 2023-05-17
Test result:	Pass

Test Engineer : David. Lee

(David Lee)

Reviewed By: : Leon chen

(Leon Chen)

Approved By: : Tom Xue

(Tom Xue)

1 General Description

1.1 Description of EUT

Product name:	Wireless headphones
Model name:	T13187
Series Model:	T13120, T13144, T13088, T13013, T13180, T13051, T13027, T13026, T13064, T13168, T13122, T13011, T13094, T13181, T13037, T13148, T13197, T13065, T13198, T13162, T13060, T13103, T13075, T13166
Model difference:	All the models are the same circuit and module, except the model name.
Accessories:	N/A
Electrical rating:	Input: DC 5V Battery: Charging case: DC 3.7V 650mAh 2.405Wh Bluetooth earphone: DC 3.85V 70mAh 0.269Wh
Hardware version:	V0B
Software version:	V0E
Test sample(s) number:	MTi230330019-11S1001
RF specification	
Bluetooth version:	V5.2
Operating frequency range:	2402MHz - 2480MHz
Modulation type:	GFSK
Antenna(s) information:	Antenna type: FPC antenna Antenna gain: R: -0.23 L: -0.32 dBi

1.2 Description of test modes

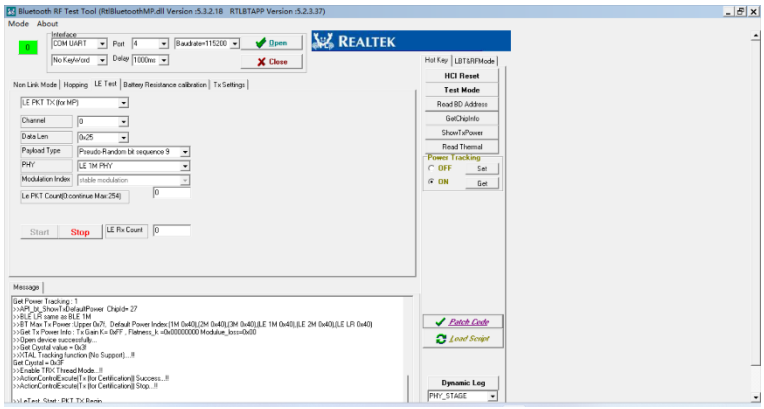
1.2.1 Operation channel list

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

Note: The test software has been used to control EUT for working in engineering mode, that enables selectable channel, and capable of continuous transmitting and constant receiving mode.

Mode	Test Software	RTLBTAPP Version 5.2.3.37		
	Channel	2402MHz	2440MHz	2480MHz
BLE_1M	Power setting	Default	Default	Default
BLE_2M		Default	Default	Default

The test software:



1.3 Environmental conditions for testing

Environment of test site:

Temperature:	15ºC~35ºC
Humidity:	20 % RH ~ 75 % RH

For extreme test conditions

Test Conditions	NTNV	LTNV	HTNV
Temperature (℃)	25	0	45
Power supply	DC 3.7V		

Notes:
The extremes of the operating temperature ranges are declared by the manufacture.
NTNV: normal temperature and normal voltage
LTNV: lowest temperature and normal voltage
HTNV: highest temperature and normal voltage

1.4 Description of support units

Support equipment list			
Description	Model	Serial No.	Manufacturer
/	/	/	/
Support cable list			
Description	Length (m)	From	To
/	/	/	/

2 Measurement uncertainty

Parameter	Measurement uncertainty
Occupied channel bandwidth	±3 %
RF output power, conducted	±1 dB
Power Spectral Density, conducted	±1 dB
Unwanted Emissions, conducted	±1 dB
All emissions, radiated	±4.7 dB
Temperature	±1 °C
Supply voltages	±1 %
Time	±1 %

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3 Summary of Test Result

No.	Description of Test	Reference clause No.	Result
1	RF Output Power	4.3.2.2	Pass
2	Power Spectral Density	4.3.2.3	Pass
3	Occupied Channel Bandwidth	4.3.2.7	Pass
4	Transmitter unwanted emissions in the OOB domain	4.3.2.8	Pass
5	Transmitter unwanted emissions in the spurious domain	4.3.2.9	Pass
6	Receiver spurious emissions	4.3.2.10	Pass
7	Adaptivity	4.3.2.6	N/A
8	Receiver Blocking	4.3.2.11	Pass
9	Geo-location capability	4.3.2.12	N/A

Notes:

N/A means not applicable.
Adaptivity: this requirement does not apply for non-FHSS equipment with a maximum declared RF Output power level of less than 10 dBm e.i.r.p. or for non-FHSS equipment when operating in a mode where the RF Output power is less than 10 dBm e.i.r.p.
Geo-location capability: this requirement only applies to non-FHSS equipment with geo-location capability

4 Test Laboratory

Test laboratory:	Shenzhen Microtest Co., Ltd.
Test site location:	101, No.7, Zone 2, Xinxing Industrial Park, Fuhai Avenue, Xinhe Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
Telephone:	(86-755)88850135
Fax:	(86-755)88850136
CNAS Registration No.:	CNAS L5868

5 List of Test Equipment

No.	Equipment	Manufacturer	Model	Serial No.	Cal. date	Cal. Due
MTI-E043	EMI test receiver	R&S	ESCI7	101166	2023/04/26	2024/04/25
MTI-E044	Broadband antenna	Schwarzbeck	VULB9163	9163-1338	2021/05/30	2024/05/29
MTI-E045	Horn antenna	Schwarzbeck	BBHA9120D	9120D-2278	2021/05/30	2024/05/29
MTI-E047	Pre-amplifier	Hewlett-Packard	8447F	3113A06184	2023/04/26	2024/04/25
MTI-E048	Pre-amplifier	Agilent	8449B	3008A01120	2023/05/05	2024/05/04
MTi-E120	Broadband antenna	Schwarzbeck	VULB9163	9163-1419	2021/05/30	2024/05/29
MTi-E121	Pre-amplifier	Hewlett-Packard	8447D	2944A09365	2023/05/05	2024/05/04
MTi-E123	Pre-amplifier	Agilent	8449B	3008A04723	2023/05/05	2024/05/04
MTi-E057	Wideband Radio Communication Tester	R&S	CMW500	149155	2023/04/26	2024/04/25
MTi-E058	ESG Series Analog Signal Generator	Agilent	E4421B	GB40051240	2023/04/26	2024/04/25
MTi-E062	PXA Signal Analyzer	Agilent	N9030A	MY51350296	2023/04/26	2024/04/25
MTi-E065	DC Power Supply	Agilent	E3632A	MY40027695	2023/05/05	2024/05/04
MTi-E066	MXA Signal Analyzer	Agilent	N9020A	MY50143483	2023/04/26	2024/04/25
MTi-E067	RF Control Unit	Tonscend	JS0806-1	19D8060152	2023/04/26	2024/04/25
MTi-E068	RF Control Unit	Tonscend	JS0806-2	19D8060153	2023/04/26	2024/04/25
MTi-E069	Band Reject Filter Group	Tonscend	JS0806-F	19D8060160	2023/05/05	2024/05/04
MTi-E071	ESG Vector Signal Generator	Agilent	N5182A	MY50143762	2023/04/26	2024/04/25
MTi-E141	Temperature and Humidity Chamber	Kingpo	TLHW-64B	/	2023/04/14	2024/04/13
MTI-E014S	RF Test System	Tonscend	TS®JS1120 V2.6.88.0330	/	/	/

Note: the calibration interval of the test equipment is 12 or 24 months and the calibrations are traceable to international system unit(SI)

6 Test Result

6.1 RF output power

6.1.1 Description

The RF output power is defined as the mean equivalent isotopically radiated power (e.i.r.p.) of the equipment during a transmission burst.

6.1.2 Limits

The RF output power for non-FHSS equipment shall be equal to or less than 20 dBm.
This limit shall apply for any combination of power level and intended antenna assembly.

6.1.3 Test method

See clause 5.4.2 of EN 300 328.

6.1.4 Test result

Note: see the Appendix A

6.2 Power spectral Density

6.2.1 Definition

The Power Spectral Density (PSD) is the mean equivalent isotropically radiated power (e.i.r.p.) spectral density in a 1 MHz bandwidth during a transmission burst.

6.2.2 Limits

The maximum Power Spectral Density for non-FHSS equipment is 10 dBm per MHz

6.2.3 Test Procedures

See clause 5.4.3 of EN 300 328

6.2.4 Test Result

Note: see the appendix B

6.3 Occupied Channel Bandwidth

6.3.1 Definition

The Occupied Channel Bandwidth is the bandwidth that contains 99% of the power of the signal.

6.3.2 Limits

The Occupied Channel Bandwidth shall be within the band given in table 1.

	Service frequency bands
Transmit	2400 MHz to 2483.5 MHz
Receive	2400 MHz to 2483.5 MHz

6.3.3 Test Procedures

See clause 5.4.7 of EN 300 328

6.3.4 Test Result

Note: see the appendix C

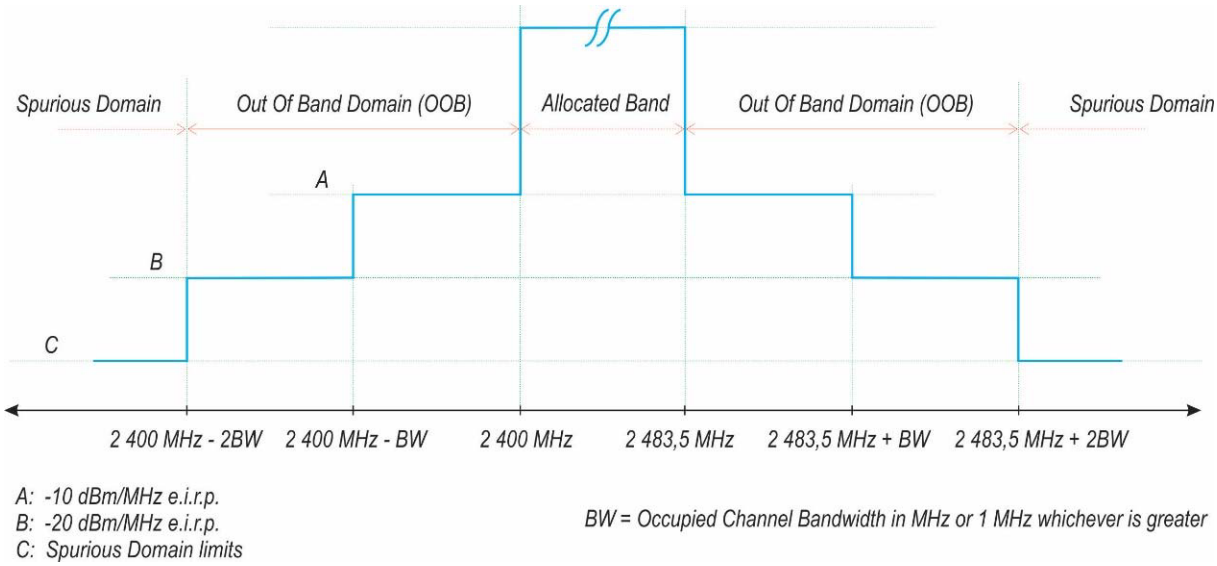
6.4 Transmitter Unwanted Emissions in the out-of-band Domain

6.4.1 Definition

Transmitter unwanted emissions in the out-of-band domain are emissions when the equipment is in Transmit mode, on frequencies immediately outside the allocated band, but excluding unwanted emissions in the spurious domain.

6.4.2 Limits

The transmitter unwanted emissions in the out-of-band domain shall not exceed the values provided by the mask in figure below.



6.4.3 Test Procedures

See clause 5.4.8 of EN 300 328.

6.4.4 Test Result

Note: see the appendix D

6.5 Transmitter Unwanted Emissions in the Spurious Domain

6.5.1 Definition

Transmitter unwanted emissions in the spurious domain are emissions outside the allocated band and outside the out-of-band domain as the specified band when the equipment is in Transmit mode.

6.5.2 Limit

Frequency range	Maximum power e.i.p. (≤ 1GHz) e.i.r.p. (＞1GHz)	Bandwidth
30MHz to 47MHz	-36dBm	100kHz
47MHz to 74MHz	-54dBm	100kHz
74MHz to 87.5MHz	-36dBm	100kHz
87.5MHz to 118MHz	-54dBm	100kHz
118MHz to 174MHz	-36dBm	100kHz
174MHz to 230MHz	-54dBm	100kHz
230MHz to 470MHz	-36dBm	100kHz
470MHz to 694MHz	-54dBm	100kHz
694MHz to 1GHz	-36dBm	100kHz
1GHz to 12.75GHz	-30dBm	1MHz

6.5.3 Test Procedures

See clause 5.4.9 of EN 300 328.

6.5.4 Test Result

Note: only the data of worst mode is reported.

Power supply:	DC 3.7V	Test site:	RE chamber 2
Environment conditions:	24.6°C, 48% RH	Tested by:	James
Test mode:	BLE-1M (TX)		

Left earphone:

Polar (H/V)	Frequency (MHz)	Reading Level (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Detector Type
Operation frequency: 2402 MHz							
V	208.1236	-62.47	-9.76	-72.23	-54.00	-18.23	QP
V	288.2430	-73.39	-6.43	-79.82	-36.00	-43.82	QP
H	182.1596	-59.80	-11.22	-71.02	-54.00	-17.02	QP
H	208.6717	-57.12	-9.81	-66.93	-54.00	-12.93	QP
V	7206.000	-75.21	23.79	-51.42	-30.00	-21.42	Peak
V	9608.000	-9682.	9635.9	-46.87	-30.00	-16.87	Peak
H	7206.000	-74.17	23.66	-50.51	-30.00	-20.51	peak
H	9608.000	-9683.	9635.8	-47.29	-30.00	-17.29	peak
Operation frequency: 2480 MHz							
V	208.1236	-62.47	-9.76	-72.23	-54.00	-18.23	QP
V	288.2430	-73.39	-6.43	-79.82	-36.00	-43.82	QP
H	212.6420	-55.01	-9.57	-64.58	-54.00	-10.58	QP
H	300.3672	-70.28	-6.86	-77.14	-36.00	-41.14	QP
V	7440.000	-75.24	24.85	-50.39	-30.00	-20.39	peak
V	9920.000	-9993.	9948.2	-44.74	-30.00	-14.74	peak
H	7440.000	-75.86	24.71	-51.15	-30.00	-21.15	peak
H	9920.000	-74.50	28.24	-46.26	-30.00	-16.26	peak

Power supply:	DC 3.7V	Test site:	RE chamber 2
Environment conditions:	24.6°, 48% RH	Tested by:	James
Test mode:	BLE-2M (TX)		

Right earphone:

Polar (H/V)	Frequency (MHz)	Reading Level (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Detector Type
Operation frequency: 2402 MHz							
V	169.0054	-67.97	-10.70	-78.67	-36.00	-42.67	QP
V	207.1226	-61.06	-9.84	-70.90	-54.00	-16.90	QP
H	212.3626	-57.30	-9.59	-66.89	-54.00	-12.89	QP
H	300.3672	-69.77	-6.86	-76.63	-36.00	-40.63	QP
V	4960.000	-60.04	19.02	-41.02	-30.00	-11.02	Peak
V	7440.000	-75.98	24.85	-51.13	-30.00	-21.13	Peak
H	4960.000	-61.27	19.22	-42.05	-30.00	-12.05	peak
H	7440.000	-75.32	24.71	-50.61	-30.00	-20.61	peak
Operation frequency: 2480 MHz							
V	215.3622	-62.52	-9.18	-71.70	-54.00	-17.70	QP
V	263.4723	-71.79	-7.68	-79.47	-36.00	-43.47	QP
H	216.8779	-59.43	-9.32	-68.75	-54.00	-14.75	QP
H	277.2150	-68.65	-7.24	-75.89	-36.00	-39.89	QP
V	4804.000	-60.16	18.51	-41.65	-30.00	-11.65	peak
V	7206.000	-74.85	23.79	-51.06	-30.00	-21.06	peak
H	7206.000	-77.49	23.66	-53.83	-30.00	-23.83	peak
H	9608.000	-77.95	27.82	-50.13	-30.00	-20.13	peak

Notes:

Emission Level= Reading Level+ Factor

Margin= Emission Level - Limit

6.6 Receiver Spurious Emissions

6.6.1 Definition

Receiver spurious emissions are emissions at any frequency when the equipment is in receive mode.

6.6.2 Limits

Frequency range	Maximum power e.i.p. (≤ 1GHz) e.i.r.p. (＞1GHz	Bandwidth
30MHz to 1GHz	-57dBm	100kHz
1GHz to 12.75GHz	-47dBm	1MHz

6.6.3 Test Procedures

See clause 5.4.10 of EN 300 328.

6.6.4 Test Result

Note: only the data of worst mode is reported.

Power supply:	DC 3.7V	Test site:	RE chamber 2
Environment conditions:	24.3°C, 48% RH	Tested by:	James
Test mode:	BLE-1M (RX)		

Left earphone:

Polar (H/V)	Frequency (MHz)	Reading Level (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Detector Type
Operation frequency: 2402 MHz							
V	188.7431	-63.45	-9.47	-72.92	-57.00	-15.92	QP
V	211.1559	-58.04	-9.52	-67.56	-57.00	-10.56	QP
H	214.3263	-55.78	-9.47	-65.25	-57.00	-8.25	QP
H	300.7625	-70.74	-6.84	-77.58	-57.00	-20.58	QP
V	4035.906	-83.31	17.40	-65.91	-47.00	-18.91	peak
V	5074.313	-83.05	19.01	-64.04	-47.00	-17.04	peak
H	2805.094	-82.45	15.35	-67.10	-47.00	-20.10	peak
H	4557.313	-82.85	17.90	-64.95	-47.00	-17.95	peak
Operation frequency: 2480 MHz							
V	187.5063	-62.86	-9.60	-72.46	-57.00	-15.46	QP
V	210.7860	-60.21	-9.55	-69.76	-57.00	-12.76	QP
H	145.7332	-62.10	-13.77	-75.87	-57.00	-18.87	QP
H	218.4042	-55.77	-9.23	-65.00	-57.00	-8.00	QP
V	2800.688	-82.05	15.22	-66.83	-47.00	-19.83	peak
V	3999.188	-82.08	17.39	-64.69	-47.00	-17.69	peak
H	3247.188	-82.76	16.02	-66.74	-47.00	-19.74	peak
H	4946.531	-82.78	19.17	-63.61	-47.00	-16.61	peak

Power supply:	DC 3.7V	Test site:	RE chamber 2
Environment conditions:	24.3°, 48% RH	Tested by:	James
Test mode:	BLE-2M (RX)		

Right earphone:

Polar (H/V)	Frequency (MHz)	Reading Level (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Detector Type
Operation frequency: 2402 MHz							
V	34.8232	-53.92	-15.30	-69.22	-57.00	-12.22	QP
V	65.0705	-68.57	-9.31	-77.88	-57.00	-20.88	QP
H	212.3626	-57.30	-6.25	-63.55	-57.00	-6.55	QP
H	300.3672	-69.77	-13.30	-83.07	-57.00	-26.07	QP
V	3057.719	-81.87	16.07	-65.80	-47.00	-18.80	peak
V	4727.688	-83.29	18.26	-65.03	-47.00	-18.03	peak
H	2430.563	-80.74	14.17	-66.57	-47.00	-19.57	peak
H	4204.813	-83.10	17.75	-65.35	-47.00	-18.35	peak
Operation frequency: 2480 MHz							
V	34.9588	-53.91	-15.30	-69.21	-57.00	-12.21	QP
V	65.2287	-68.56	-9.31	-77.87	-57.00	-20.87	QP
H	208.3975	-54.95	-9.82	-64.77	-57.00	-7.77	QP
H	300.7625	-67.37	-6.84	-74.21	-57.00	-17.21	QP
V	2997.500	-82.39	16.10	-66.29	-47.00	-19.29	peak
V	4771.750	-84.34	18.41	-65.93	-47.00	-18.93	peak
H	2990.156	-82.05	16.04	-66.01	-47.00	-19.01	peak
H	4235.656	-83.53	17.74	-65.79	-47.00	-18.79	peak

Notes:

Emission Level= Reading Level+ Factor

Margin= Emission Level - Limit

6.7 Receiver Blocking

6.7.1 Definition

Receiver blocking is a measure of the ability of the equipment to receive a wanted signal on its operating channel without exceeding a given degradation due to the presence of an unwanted input signal (blocking signal) on frequencies other than those of the operating band and spurious responses.

6.7.2 Limits

Performance Criteria

For equipment that supports a PER or FER test to be performed, the minimum performance criterion shall be a PER or FER less than or equal to 10 %.

For equipment that does not support a PER or a FER test to be performed, the minimum performance criterion shall be no loss of the wireless transmission function needed for the intended use of the equipment.

Receiver Category 1:

Table 14: Receiver Blocking parameters for Receiver Category 1 equipment

Wanted signal mean power from companion device (dBm) (see notes 1 and 4)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 4)	Type of blocking signal
(-133 dBm + 10 × $\log_{10}$(OCBW)) or -68 dBm whichever is less (see note 2)	2 380 2 504	-34	CW
(-139 dBm + 10 × $\log_{10}$(OCBW)) or -74 dBm whichever is less (see note 3)	2 300 2 330 2 360 2 524 2 584 2 674		

NOTE 1: OCBW is in Hz.

NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 26 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

NOTE 3: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 20 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

NOTE 4: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

Receiver Category 2:

Table 15: Receiver Blocking parameters receiver Category 2 equipment

Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	Type of blocking signal
(-139 dBm + 10 × $\log_{10}$(OCBW) + 10 dB) or (-74 dBm + 10 dB) whichever is less (see note 2)	2 380 2 504 2 300 2 584	-34	CW
NOTE 1: OCBW is in Hz. NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 26 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.			

Receiver Category 3:

Table 16: Receiver Blocking parameters receiver Category 3 equipment

Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	Type of blocking signal
(-139 dBm + 10 × $\log_{10}$(OCBW) + 20 dB) or (-74 dBm + 20 dB) whichever is less (see note 2)	2 380 2 504 2 300 2 584	-34	CW
NOTE 1: OCBW is in Hz. NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 30 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.			

Table 8: Receiver Blocking parameters receiver Category 3 equipment

Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	Type of blocking signal
(-139 dBm + 10 x $\log_{10}$(OCBW) + 20 dB) or (-74 dBm + 20 dB) whichever is less (see note 2)	2 380 2 504 2 300 2 584	-34	CW
NOTE 1: OCBW is in Hz. NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative the test may be performed using a wanted signal up to P_{min} + 30 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal. NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.			

6.7.3 Test Procedures

See clause 5.4.6 of EN 300 328.

6.7.4 Test Result

Note: see the Appendix E

Appendix A: RF Output Power

Test Result

Test Condition	Test Mode	Antenna	Frequency [MHz]	Burst Power [dBm]	Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	Verdict
NTNV	BLE_1M	Ant1	2402	3.45	-0.32	3.13	20	PASS
		Ant2	2402	2.82	-0.23	2.59	20	PASS
		Ant1	2440	2.98	-0.32	2.66	20	PASS
		Ant2	2440	2.17	-0.23	1.94	20	PASS
		Ant1	2480	2.12	-0.32	1.8	20	PASS
		Ant2	2480	1.14	-0.23	0.91	20	PASS
	BLE_2M	Ant1	2402	2.71	-0.32	2.39	20	PASS
		Ant2	2402	3.01	-0.23	2.78	20	PASS
		Ant1	2440	2.35	-0.32	2.03	20	PASS
		Ant2	2440	2.33	-0.23	2.1	20	PASS
		Ant1	2480	1.45	-0.32	1.13	20	PASS
		Ant2	2480	1.29	-0.23	1.06	20	PASS
LTNV	BLE_1M	Ant1	2402	3.43	-0.32	3.11	20	PASS
		Ant2	2402	2.94	-0.23	2.71	20	PASS
		Ant1	2440	2.99	-0.32	2.67	20	PASS
		Ant2	2440	2.18	-0.23	1.95	20	PASS
		Ant1	2480	1.21	-0.32	0.89	20	PASS
		Ant2	2480	1.18	-0.23	0.95	20	PASS
	BLE_2M	Ant1	2402	2.67	-0.32	2.35	20	PASS
		Ant2	2402	3.00	-0.23	2.77	20	PASS
		Ant1	2440	2.33	-0.32	2.01	20	PASS
		Ant2	2440	2.33	-0.23	2.1	20	PASS
		Ant1	2480	1.49	-0.32	1.17	20	PASS
		Ant2	2480	1.35	-0.23	1.12	20	PASS
HTNV	BLE_1M	Ant1	2402	3.42	-0.32	3.1	20	PASS
		Ant2	2402	2.78	-0.23	2.55	20	PASS
		Ant1	2440	2.96	-0.32	2.64	20	PASS
		Ant2	2440	2.15	-0.23	1.92	20	PASS
		Ant1	2480	2.11	-0.32	1.79	20	PASS
		Ant2	2480	1.13	-0.23	0.9	20	PASS
	BLE_2M	Ant1	2402	2.75	-0.32	2.43	20	PASS
		Ant2	2402	3.02	-0.23	2.79	20	PASS
		Ant1	2440	2.29	-0.32	1.97	20	PASS
		Ant2	2440	2.37	-0.23	2.14	20	PASS
		Ant1	2480	1.48	-0.32	1.16	20	PASS
		Ant2	2480	1.31	-0.23	1.08	20	PASS

Notes:

EIRP (dBm) = the highest of burst power [dBm] + antenna gain [dBi].
The offset of cable loss has been in compensation during the testing.
Ant1 is Left earphone
Ant2 is Right earphone

Appendix B: Power Spectral Density

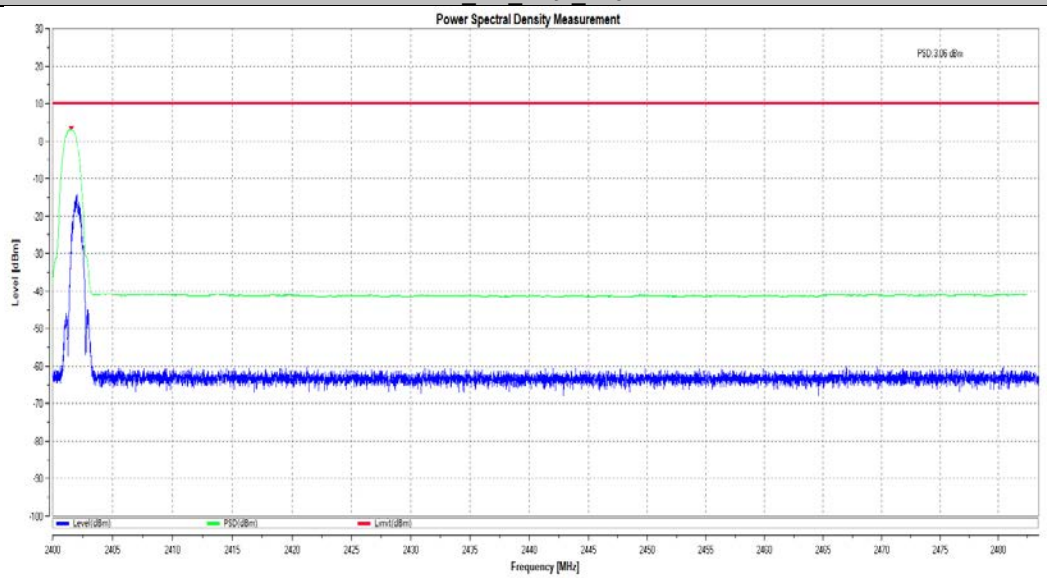
Test Result

Test Mode	Antenna	Frequency [MHz]	EIRP PSD [dBm/MHz]	Limit [dBm/MHz]	Verdict
BLE_1M	Ant1	2402	3.06	10	PASS
		2440	2.58	10	PASS
		2480	1.72	10	PASS
BLE_2M	Ant1	2402	1.30	10	PASS
		2440	0.98	10	PASS
		2480	0.05	10	PASS

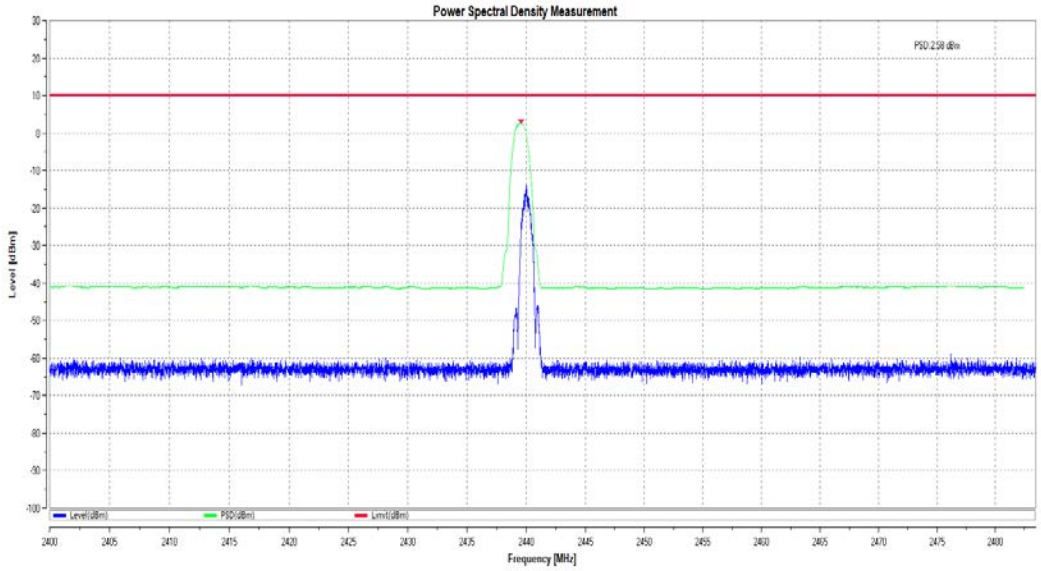
Note: The offset of cable loss has been in compensation during the testing.

Test Graphs

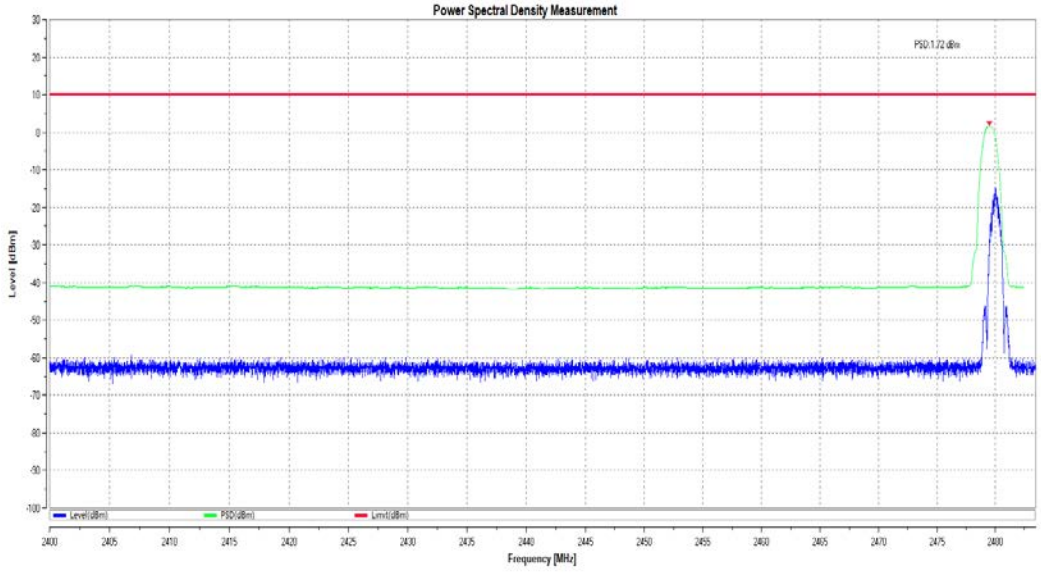
BLE_1M_Ant1_2402



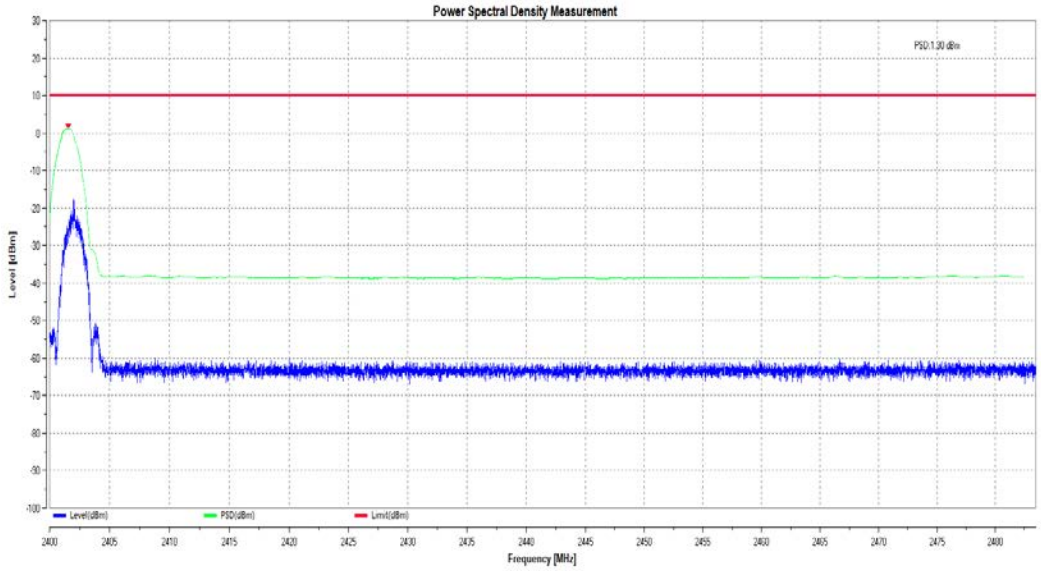
BLE_1M_Ant1_2440



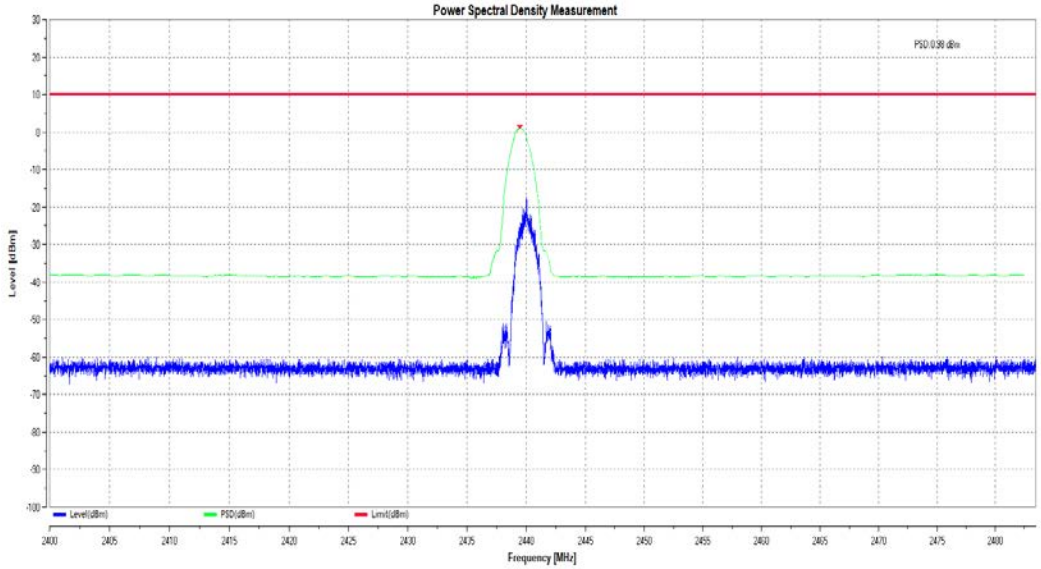
BLE_1M_Ant1_2480



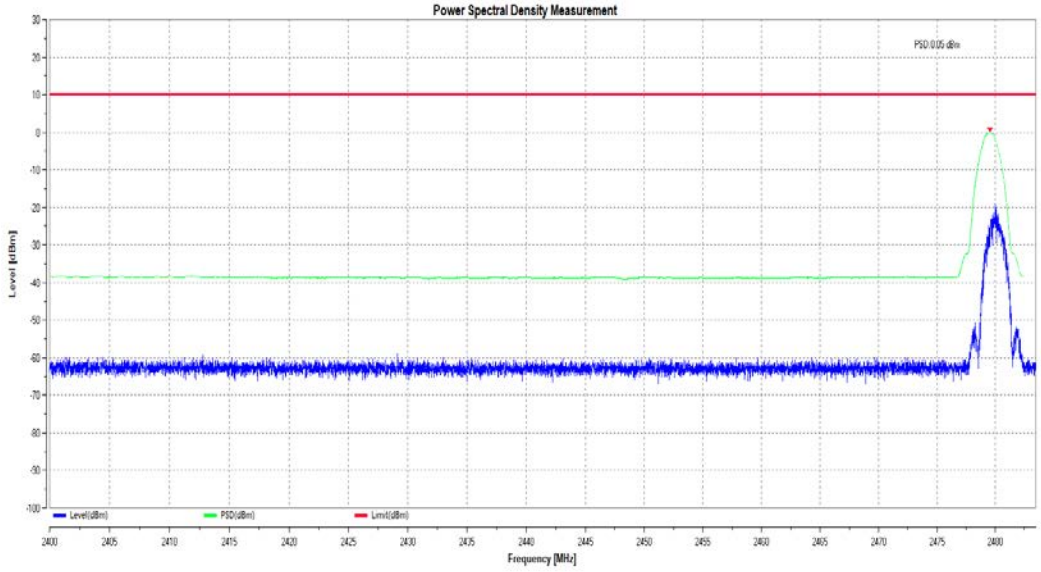
BLE_2M_Ant1_2402



BLE_2M_Ant1_2440



BLE_2M_Ant1_2480



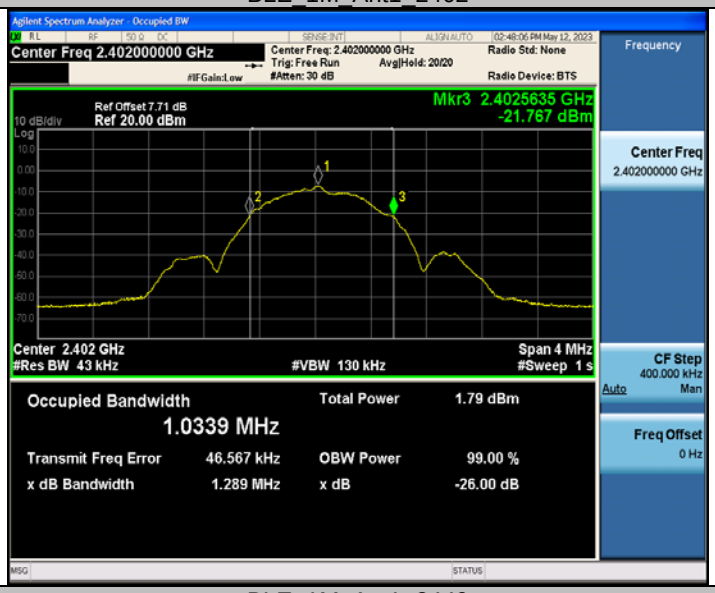
Appendix C: Occupied Channel Bandwidth

Test Result

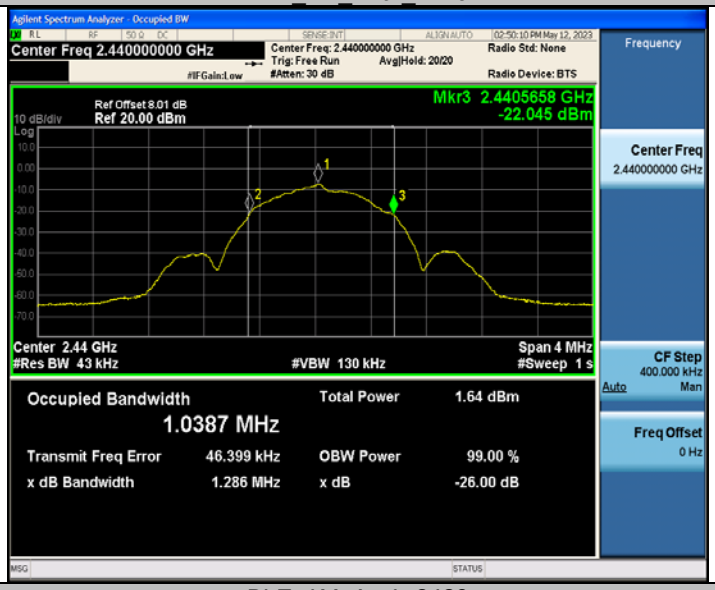
Test Mode	Antenna	Frequency [MHz]	OCB [MHz]	FL [MHz]	FH [MHz]	Limit [MHz]	Verdict
BLE_1M	Ant1	2402	1.0339	2401.5296	2402.5635	2400 to 2483.5	PASS
		2440	1.0387	2439.5271	2440.5658	2400 to 2483.5	PASS
		2480	1.0468	2479.5171	2480.5639	2400 to 2483.5	PASS
BLE_2M	Ant1	2402	2.0490	2401.0362	2403.0852	2400 to 2483.5	PASS
		2440	2.0557	2439.0387	2441.0944	2400 to 2483.5	PASS
		2480	2.0558	2479.0285	2481.0843	2400 to 2483.5	PASS

Test Graphs

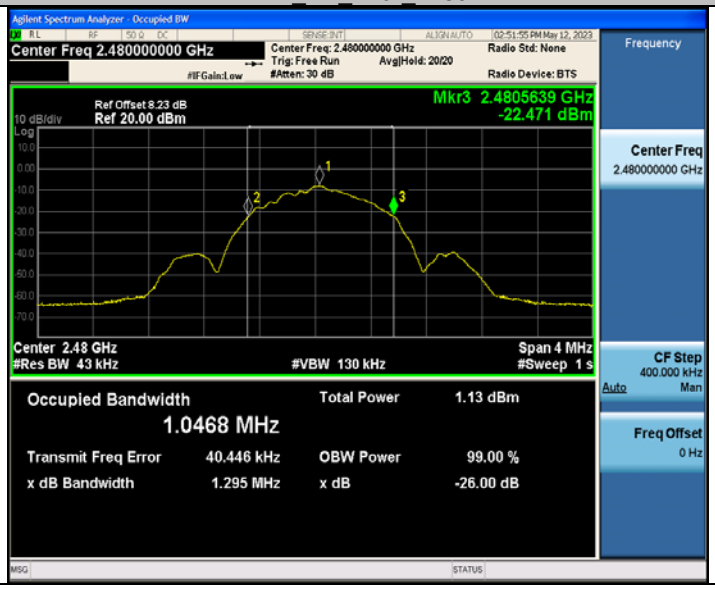
BLE_1M_Ant1_2402



BLE_1M_Ant1_2440



BLE_1M_Ant1_2480



BLE_2M_Ant1_2402

BLE_2M_Ant1_2440

BLE_2M_Ant1_2480

Appendix D: Transmitter Unwanted Emissions in The Out-Of-Band Domain

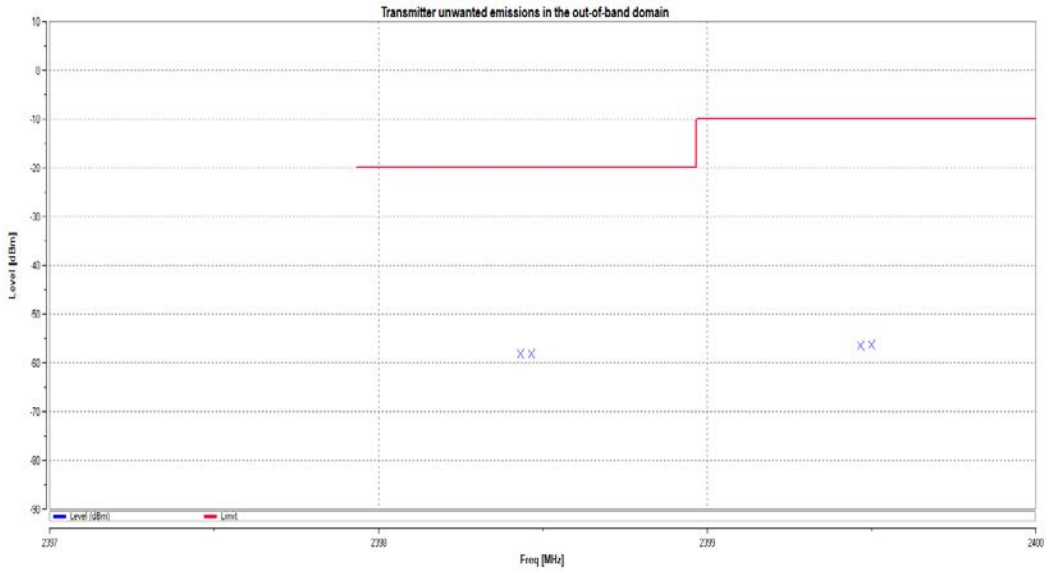
Test Result

Test Mode	Antenna	Frequency [MHz]	Freq. [MHz]	Level [dBm]	Limit [dBm]	Verdict
BLE_1M	Ant1	2402	2398.4322	-58.15	-20.00	PASS
			2398.4661	-58.09	-20.00	PASS
			2399.4661	-56.51	-10.00	PASS
			2399.5	-56.35	-10.00	PASS
		2480	2484	-58.54	-10.00	PASS
			2484.0468	-58.54	-10.00	PASS
			2485.0468	-59.17	-20.00	PASS
			2485.0936	-59.19	-20.00	PASS
BLE_2M	Ant1	2402	2396.402	-59.32	-20.00	PASS
			2396.451	-59.29	-20.00	PASS
			2397.451	-59.20	-20.00	PASS
			2398.451	-57.50	-10.00	PASS
			2398.5	-57.23	-10.00	PASS
			2399.5	-38.37	-10.00	PASS
		2480	2484	-59.06	-10.00	PASS
			2485	-59.80	-10.00	PASS
			2485.0558	-59.62	-10.00	PASS
			2486.0558	-60.06	-20.00	PASS
			2487.0558	-60.21	-20.00	PASS
			2487.1116	-60.22	-20.00	PASS

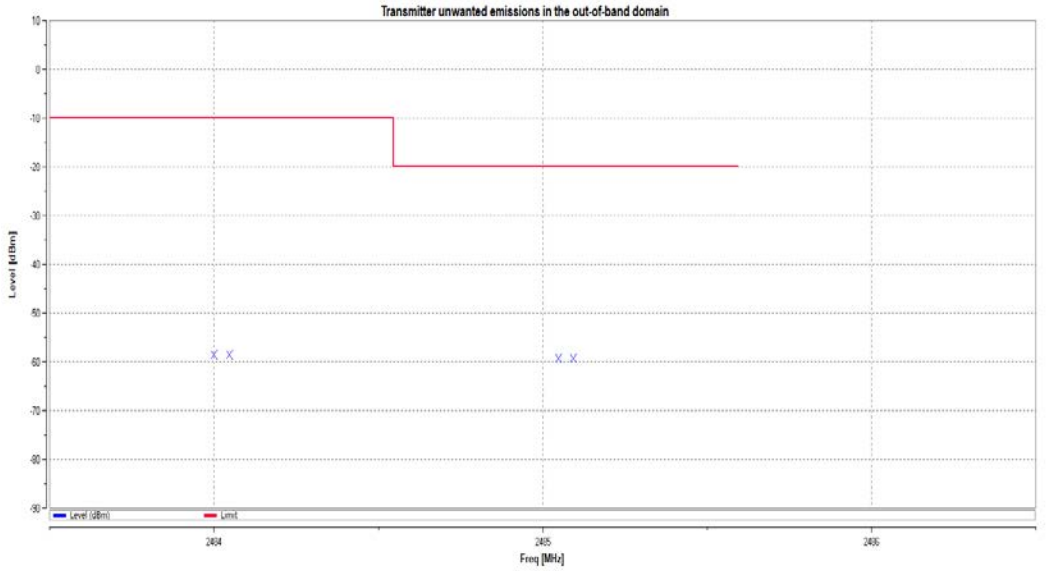
Note: The offset of cable loss and antenna gain has been in compensation during the testing.

Test Graphs

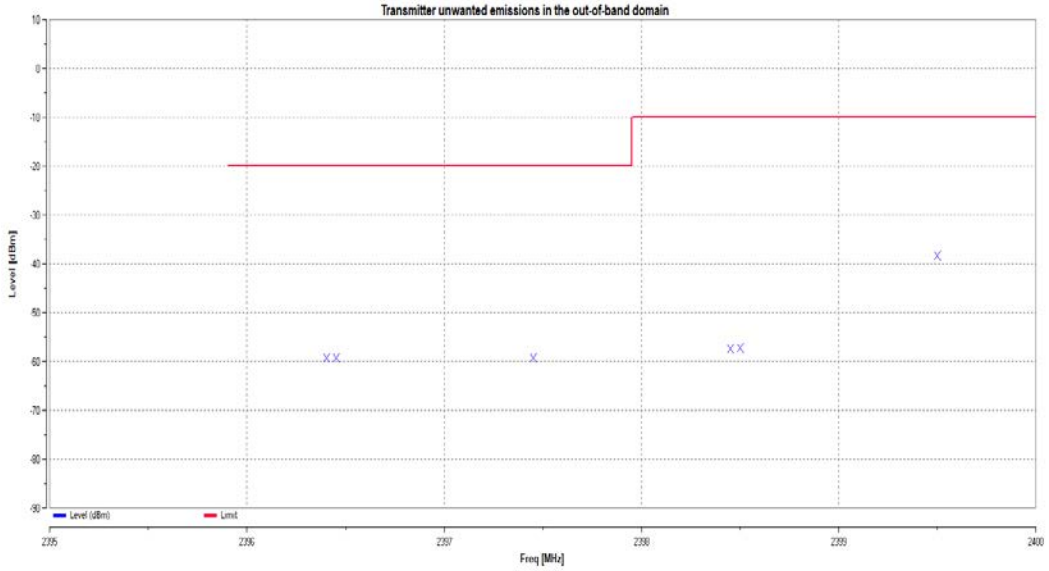
BLE_1M_Ant1_2402_2400MHz-2BW to 2400MHz



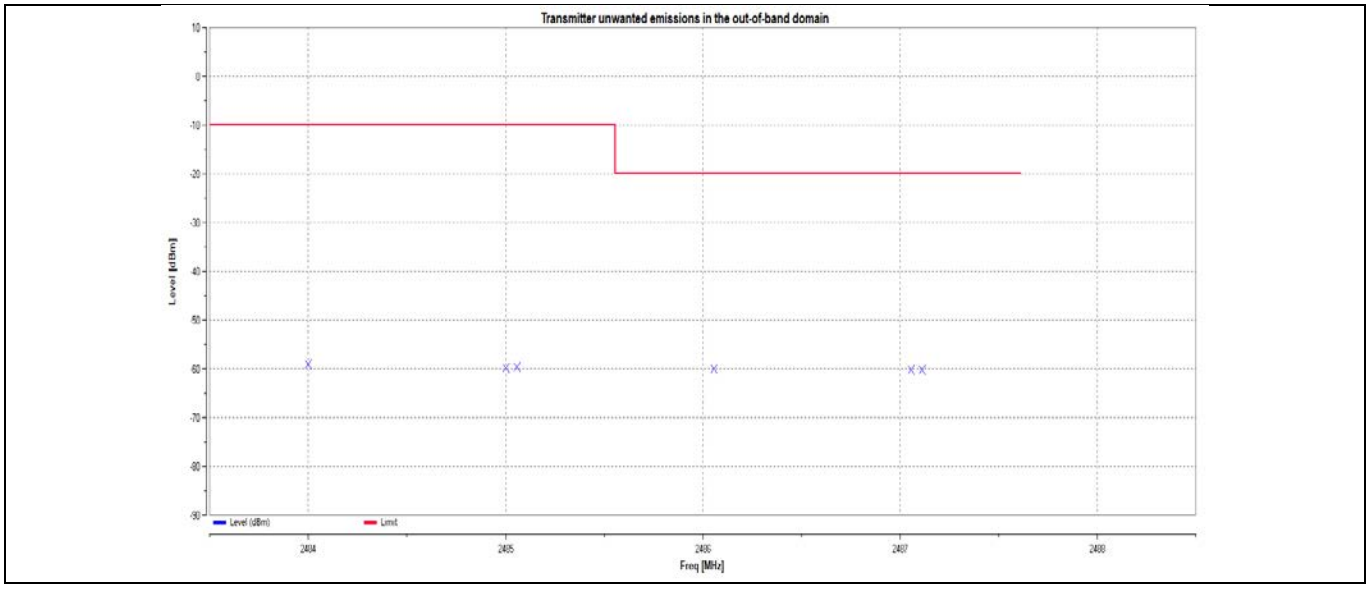
BLE_1M_Ant1_2480_2483.5MHz to 2483.5MHz+2BW



BLE_2M_Ant1_2402_2400MHz-2BW to 2400MHz



BLE_2M_Ant1_2480_2483.5MHz to 2483.5MHz+2BW


Transmitter unwanted emissions in the out-of-band domain
Level [dBm]
Level (dBm)
Limit
Freq [MHz]

Appendix E: Receiver Blocking

Test Result

Left earphone:

The EUT is comply with receiver category 2 equipment.

Mode	Blocking Signal Frequency (MHz)	Wanted Signal(dBm)	Blocking Signal Level (dBm)	PER (%)	PER Limit (%)
GFSK	2380	-68.9	-34.32	0.57	≤ 10
GFSK	2300	-68.9	-34.32	0.70	
GFSK	2504	-68.8	-34.32	0.79	
GFSK	2584	-68.8	-34.32	0.67	

Right earphone:

The EUT is comply with receiver category 2 equipment.

Mode	Blocking Signal Frequency (MHz)	Wanted Signal(dBm)	Blocking Signal Level (dBm)	PER (%)	PER Limit (%)
GFSK	2380	-65.9	-34.23	0.73	≤ 10
GFSK	2300	-65.9	-34.23	0.75	
GFSK	2504	-65.9	-34.23	0.62	
GFSK	2584	-65.9	-34.23	0.74	

Notes:
Only the data of worst mode is reported.
The antenna gain is -0.23 dBi, -0.32dBi

Appendix F: Information for testing

a) The type of wideband data transmission equipment:

☐ FHSS
☒ non-FHSS

b) In case of FHSS:

- In case of non-Adaptive FHSS equipment:
  The number of Hopping Frequencies:
- In case of Adaptive FHSS equipment:
  The maximum number of Hopping Frequencies:
  The minimum number of Hopping Frequencies:
- The (average) dwell time:

c) Adaptive/non-adaptive equipment:

☐ non-adaptive Equipment
☒ adaptive Equipment without the possibility to switch to a non-adaptive mode
☐ adaptive Equipment which can also operate in a non-adaptive mode

d) In case of adaptive equipment:

The maximum Channel Occupancy Time implemented by the equipment: ms
☒The equipment has implemented an LBT mechanism
• In case of non-FHSS equipment:
☐ The equipment is Frame Based equipment
☐ The equipment is Load Based equipment
☐ The equipment can switch dynamically between Frame Based and Load Based equipment
The CCA time implemented by the equipment: ..... µs
☐ The equipment has implemented a DAA mechanism
☐ The equipment can operate in more than one adaptive mode

e) In case of non-adaptive Equipment:

The maximum RF Output Power (e.i.r.p.): L: 3.13 dBm, R: 2.79dBm
The maximum (corresponding) Duty Cycle: %
Equipment with dynamic behaviour, that behaviour is described here. (e.g. the different combinations of duty cycle and corresponding power levels to be declared):

f) The worst case operational mode for each of the following tests:

- RF Output Power: GFSK
- Power Spectral Density: GFSK
- Duty cycle, Tx-Sequence, Tx-gap:
- Accumulated Transmit time, Frequency Occupation & Hopping Sequence (only for FHSS equipment):
- Hopping Frequency Separation (only for FHSS equipment):
- Medium Utilization: N/A
- Adaptivity & Receiver Blocking: GFSK
- Nominal Channel Bandwidth: 1 MHz
- Transmitter unwanted emissions in the OOB domain: GFSK
- Transmitter unwanted emissions in the spurious domain: GFSK
- Receiver spurious emissions: GFSK

g) The different transmit operating modes (tick all that apply):

☒ Operating mode 1: Single Antenna Equipment
☒ Equipment with only one antenna
☐ Equipment with two diversity antennas but only one antenna active at any moment in time
☐ Smart Antenna Systems with two or more antennas, but operating in a (legacy) mode where only one antenna is used (e.g. IEEE 802.11™ legacy mode in smart antenna systems)
☐ Operating mode 2: Smart Antenna Systems - Multiple Antennas without beam forming
☐ Single spatial stream/Standard throughput/(e.g. IEEE 802.11™ legacy mode)
☐ High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 1
☐ High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 2
NOTE 1: Add more lines if more channel bandwidths are supported.
☐ Operating mode 3: Smart Antenna Systems - Multiple Antennas with beam forming
☐ Single spatial stream/Standard throughput (e.g. IEEE 802.11™ legacy mode)
☐ High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 1
☐ High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 2
NOTE 2: Add more lines if more channel bandwidths are supported.

h) In case of Smart Antenna Systems:

- The number of Receive chains:
- The number of Transmit chains:

☐ symmetrical power distribution
☐ asymmetrical power distribution

In case of beam forming, the maximum (additional) beam forming gain: dB
NOTE: The additional beam forming gain does not include the basic gain of a single antenna

i) Operating Frequency Range(s) of the equipment:

- Operating Frequency Range 1: 2402 MHz to 2480 MHz
- Operating Frequency Range 2: MHz to MHz

NOTE: Add more lines if more Frequency Ranges are supported.

j) Nominal Channel Bandwidth(s):

- Nominal Channel Bandwidth 1: 2.0558 MHz
- Nominal Channel Bandwidth 2:
- NOTE: Add more lines if more Frequency Ranges are supported.

k) Type of Equipment (stand-alone, combined, plug-in radio device, etc.):

☒ Stand-alone
☐ Combined Equipment
☐ Plug-in radio device
☐ Other:

l) The normal and the extreme operating conditions that apply to the equipment:

Normal operating conditions (if applicable):
Operating temperature: °C
Other (please specify if applicable):

Extreme operating conditions:
Operating temperature range: Minimum: 0 °C Maximum 45 °C
Other (please specify if applicable): …… Minimum: …… Maximum ……
Details provided are for the: ☐ stand-alone equipment
☐ combined equipment
☐ test jig

m) The intended combination(s) of the radio equipment power settings and one or more antenna assemblies and their corresponding e.i.r.p. levels:

- Antenna Type:

☒ FPC Antenna (information to be provided in case of conducted measurements)
Antenna Gain: L:-0.32. dBi, R; -0.23 dBi
If applicable, additional beamforming gain (excluding basic antenna gain): ..... dB
☐ Temporary RF connector provided
☐ No temporary RF connector provided

☐ Dedicated Antennas (equipment with antenna connector)
☐ Single power level with corresponding antenna(s)
☐ Multiple power settings and corresponding antenna(s)
Number of different Power Levels: .....
Power Level 1: ..... dBm
Power Level 2: ..... dBm
Power Level 3: ..... dBm

NOTE 1: Add more lines in case the equipment has more power levels.
NOTE 2: These power levels are conducted power levels (at antenna connector).

- For each of the Power Levels, provide the intended antenna assemblies, their corresponding gains (G) and the resulting e.i.r.p. levels also taking into account the beamforming gain (Y) if applicable

Power Level 1: ..... dBm
Number of antenna assemblies provided for this power level:

Assembly #	Gain (dBi)	e.i.r.p. (dBm	Part number or model name
1			
2			
3			
4			

NOTE 3: Add more rows in case more antenna assemblies are supported for this power level.

Power Level 2: ..... dBm
Number of antenna assemblies provided for this power level: .....

Assembly #	Gain (dBi)	e.i.r.p. (dBm	Part number or model name
1			
2			
3			
4			

NOTE 4: Add more rows in case more antenna assemblies are supported for this power level.

Power Level 3: ..... dBm

Number of antenna assemblies provided for this power level: .....

Assembly #	Gain (dBi)	e.i.r.p. (dBm	Part number or model name
1			
2			
3			
4			

NOTE 5: Add more rows in case more antenna assemblies are supported for this power level.

n) The nominal voltages of the stand-alone radio equipment or the nominal voltages of the combined equipment or test jig in case of plug-in devices:

Details provided are for the: ☒ stand-alone equipment
☐ combined equipment
☐ test jig

Supply Voltage ☐ AC mains State AC voltage V
☒ DC State DC voltage 3.7. V

In case of DC, indicate the type of power source
☐ Internal Power Supply
☐ External Power Supply or AC/DC adapter
☒ Battery
☐ Other:

o) Describe the test modes available which can facilitate testing:

p) The equipment type (e.g. Bluetooth®, IEEE 802.11™, IEEE 802.15.4™, proprietary, etc.):

Bluetooth®

q) If applicable, the statistical analysis referred to in clause 5.4.1 q)

(to be provided as separate attachment)

r) If applicable, the statistical analysis referred to in clause 5.4.1 r)

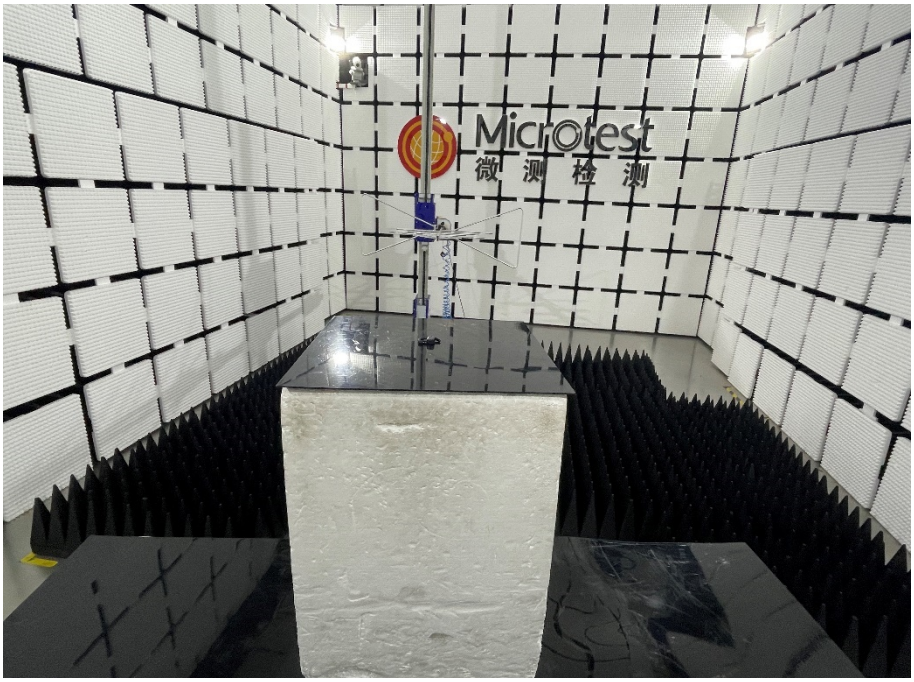
(to be provided as separate attachment)

s) Geo-location capability supported by the equipment:

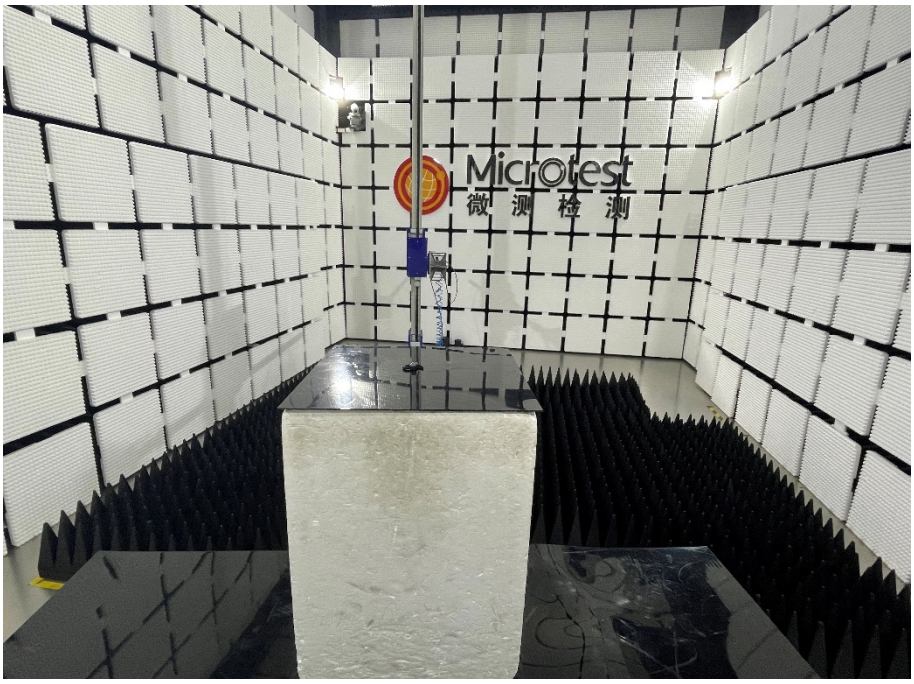
☐ Yes
☐ The geographical location determined by the equipment as defined in clause 4.3.1.13.2 or clause 4.3.2.12.2 is not accessible to the user
☒ No

Photographs of the Test Setup

Radiated emissions below 1 GHz



Radiated emissions above 1 GHz



Photographs of the EUT

See the Appendix - EUT Photos.

----End of Report----