

2.4GHz Wideband Low Power Data Communication System Test Report

Product Name : BLUETOOTH EARPHONES

Model No. : LTI800

Applicant : Libratone A/S

Address : Sundkaj 9, 2150 Nordhavn, Denmark

Date of Receipt : Apr. 30, 2019

Test Date : May. 01, 2019 ~ May. 15, 2019

Issued Date : May. 17, 2019

Report No. : 1942211R-RF-JP-P01V08

Report Version : V1.0

The test results relate only to the samples tested.

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

This report must not be used to claim product endorsement by any agency of the government.

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Test Report Certification

Issued Date: May. 17, 2019

Report No.: 1942211R-RF-JP-P01V08



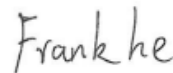
Product Name : BLUETOOTH EARPHONES
Applicant : Libratone A/S
Address : Sundkaj 9, 2150 Nordhavn, Denmark
Manufacturer : Libratone A/S
Address : Sundkaj 9, 2150 Nordhavn, Denmark
Model No. : LTI800
EUT Voltage : DC 3.7V
Test Voltage : AC 100V/60Hz
Brand Name : LIBRATONE
Applicable Standard : ARIB STD-T66
Article 2 Paragraph 1 Item 19 of the Ordinance Concerning Technical Regulations
Test Result : Complied
Performed Location : DEKRA Testing and Certification (Suzhou) Co., Ltd.
No.99 Hongye Rd., Suzhou Industrial Park, Suzhou, 215006, Jiangsu, China
TEL: +86-512-6251-5088 / FAX: +86-512-6251-5098

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Reviewed By :



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Approved By :



(Engineering Supervisor: Jack Zhang)

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History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
1942211R-RF-JP-P01V08	V1.0	Initial Issued Report	May. 17, 2019

1. General Information

1.1. EUT Description

Product Name	BLUETOOTH EARPHONES					
Model No.	LTI800					
EUT Voltage	DC 3.7V					
Test Voltage	AC 100V/60Hz					
HW Version (Product)	TBD					
SW Version (Product)	TBD					
BT						
Bluetooth Specification	V5.0					
Frequency Range	2402- 2480 MHz					
Channel Number	V5.0: 40					
Channel Separation	V5.0: 2MHz					
Type of Modulation	V5.0: GFSK					
PHYs	<input checked="" type="checkbox"/>	LE 1M	<input type="checkbox"/>	LE 2M	<input type="checkbox"/>	LE Coded S=2/8
Data Rate	<input checked="" type="checkbox"/>	1Mbit/s	<input type="checkbox"/>	2Mbit/s	<input type="checkbox"/>	500/125 Kbit/s
Antenna Type	Reference to Antenna List					
Peak Antenna Gain	Reference to Antenna List					

Channel List

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

Antenna List

Antenna manufacturer	N/A				
Antenna Delivery	<input checked="" type="checkbox"/> 1*TX+1*RX	<input type="checkbox"/> 2*TX+2*RX	<input type="checkbox"/> 3*TX+3*RX		
Antenna technology	<input checked="" type="checkbox"/> SISO				
	<input type="checkbox"/> MIMO	<input type="checkbox"/> Basic			
		<input type="checkbox"/> CDD			
		<input type="checkbox"/> Beam-forming			
Antenna Type	<input type="checkbox"/> External	<input type="checkbox"/> Dipole			
	<input checked="" type="checkbox"/> Internal	<input type="checkbox"/> PIFA			
		<input type="checkbox"/> PCB			
		<input checked="" type="checkbox"/> Ceramic Chip Antenna			
		<input type="checkbox"/> Stamping Antenna			
		<input type="checkbox"/> Metal plate type F antenna			
		<input type="checkbox"/> Monopole antenna			
Antenna Gain	2.7dBi				

1.2. Mode of Operation

DEKRA Testing & Certification (Suzhou) Co., Ltd. has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode
Mode1: Transmit by BLE
Mode2: Receive by BLE

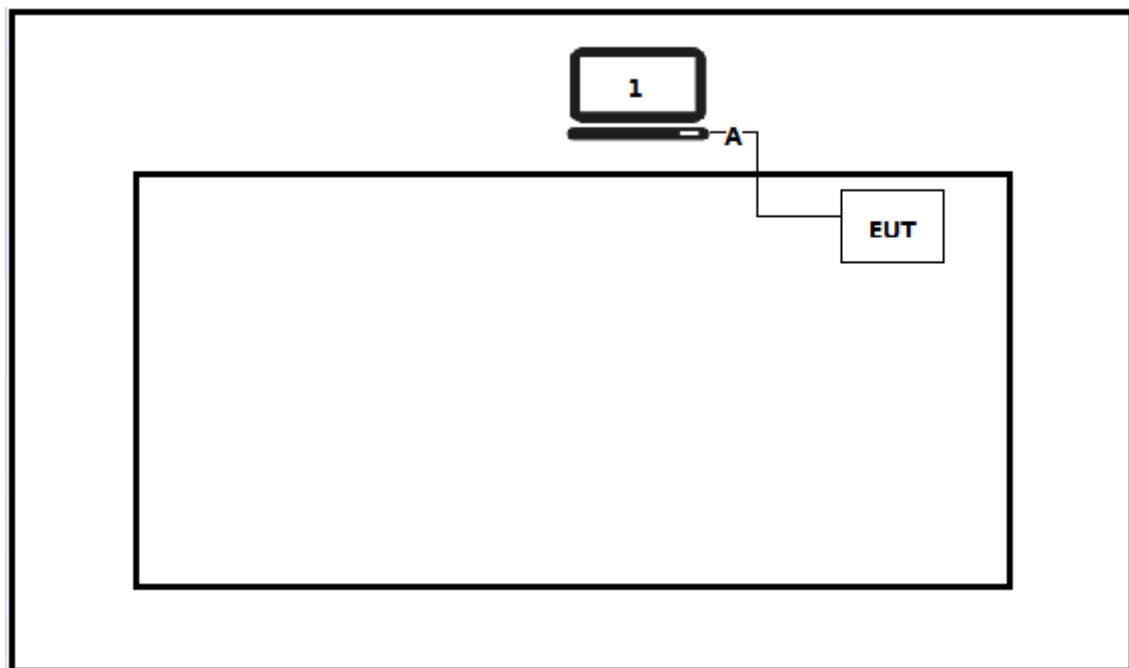
1.3. Tested System Details

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

No.	Product	Manufacturer	Model No.	Serial No.	Power Cord
1	Notebook	Think Pad	2526	LV-A3285	Power by adapter
A	USB cable	N/A	N/A	N/A	Shielded,0.5m

1.4. Configuration of Tested System

Test setup Diagram- Conducted Test



1.5.EUT Exercise Software

1	Setup the EUT and simulators as shown on above.
2	Turn on the power of all equipment.
3	Input the RF commands, and set the test mode and channel, then press OK to start continue Transmit.

2. Technical Test

2.1. Summary of Test Result

- ☒ No deviations from the test standards
☐ Deviations from the test standards as below description:

Performed Test Item	Normative References	Test Performed	Deviation
Output Power and Output Power Tolerance	Ministry of Internal Affairs and Communications notification Article 88	Yes	No
Spread Bandwidth	Ministry of Internal Affairs and Communications notification Article 88	Yes	No
Occupied Bandwidth	Ministry of Internal Affairs and Communications notification Article 88	Yes	No
Frequency Tolerance	Ministry of Internal Affairs and Communications notification Article 88	Yes	No
Transmitter Spurious Emissions	Ministry of Internal Affairs and Communications notification Article 88	Yes	No
Receiver Spurious Emissions	Ministry of Internal Affairs and Communications notification Article 88	Yes	No

2.2. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Parameter	Uncertainty
Output Power and Output Power Tolerance	$\pm 1.27\text{dB}$
Spread Bandwidth	$\pm 150\text{Hz}$
Occupied Bandwidth	$\pm 1.27\text{dB}$
Frequency Tolerance	$\pm 150\text{Hz}$
Transmitter Spurious Emissions	$\pm 1.27\text{dB}$
Receiver Spurious Emissions	$\pm 1.27\text{dB}$

2.3. Test Environment

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	21
Humidity (%RH)	25-75	50
Barometric pressure (mbar)	860-1060	950-1000

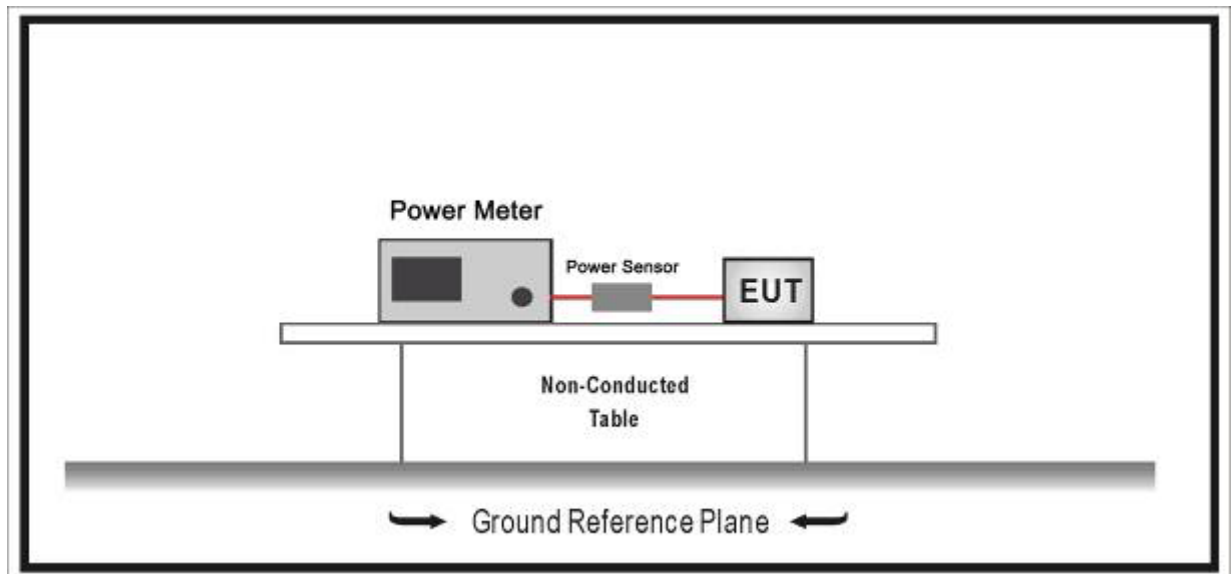
3. Output Power and Output Power Tolerance

3.1. Test Equipment

Output Power and Output Power Tolerance / TR8				
Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Power Meter	Anritsu	ML2495A	0905006	2019.10.29
Power Sensor	Anritsu	MA2411B	0846014	2019.10.29
DC Power Supply	IDRC	CD-035-020PR	977272	2019.09.16
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2020.04.09
Note: All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.				

3.2. Test Setup

For Conducted Measurement



3.3. Limit

Output Power		
<input type="checkbox"/>	Channel Power of DSSS, the limit should	10mW/MHz
<input type="checkbox"/>	Channel Power of FHSS, the limit should	3mW/MHz
<input type="checkbox"/>	Channel Power of OFDM	
<input type="checkbox"/>	Nominal Bandwidth = 20MHz, the limit should	10mW/MHz
<input type="checkbox"/>	Nominal Bandwidth = 40MHz, the limit should	5mW/MHz
<input checked="" type="checkbox"/>	Channel Power of other situation, the limit should	10mW
Output Power Tolerance		
<input checked="" type="checkbox"/>	Output Power Tolerance: +20% to -80%	

3.4. Test Procedure

Output Power and Output Power Tolerance			
	References Rule	Chapter	Description
<input checked="" type="checkbox"/>	ARIB STD-T66	3.2.(2),(3)	Output Power and Output Power Tolerance

3.5. Test Result

Product	:	BLUETOOTH EARPHONES
Test Item	:	Output Power
Test Site	:	TR8
Test Mode	:	Mode 1:Transmit by BLE

Antenna Gain = 2.7dBi				
Frequency (MHz)	Reading Value (dBm)	Limit (dBm)	Real Value (EIRP) (dBm)	Limit (EIRP) (dBm)
2402	-0.98	10	1.72	12.14
2440	-1.06	10	1.64	12.14
2480	-0.51	10	2.19	12.14
Real Value (EIRP) = Reading Value + Antenna Gain				

Product	:	BLUETOOTH EARPHONES
Test Item	:	Output Power Tolerance
Test Site	:	TR8
Test Mode	:	Mode 1:Transmit by BLE

Frequency (MHz)	Declared Output Power (mW)	Output Power (mW)	Tolerance (%)	Limit (%)
2402	1.5	1.49	-0.67	+20% to -80%
2440	1.5	1.46	-2.67	+20% to -80%
2480	1.5	1.66	10.67	+20% to -80%
Note: Deviation = (Channel Power - Declared Output Power) / Declared Output Power * 100%				

Test Result	PASS
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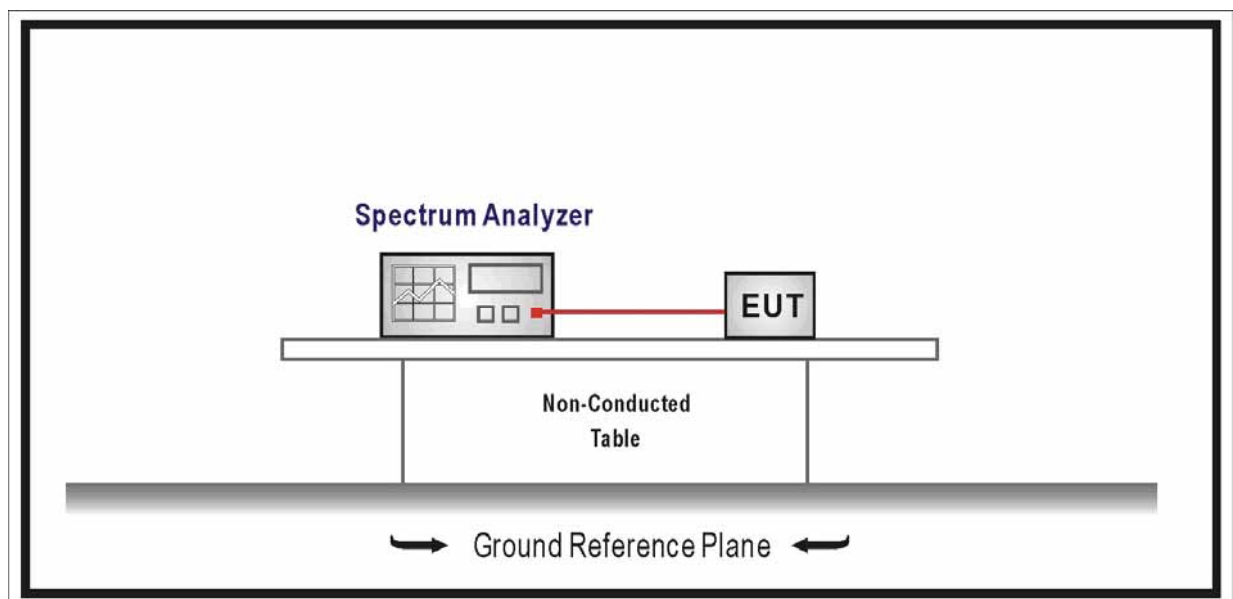
4. Spread Bandwidth

4.1. Test Equipment

Spread Bandwidth / TR8				
Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2020.01.15
EXA Spectrum Analyzer	Keysight	N9010A	MY55370495	2020.04.08
MXA Signal Analyzer	Keysight	N9020A	MY56060147	2020.04.08
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2020.04.09

Note: All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

4.2. Test Setup



4.3. Limit

Spread Bandwidth	
<input checked="" type="checkbox"/>	Spread Bandwidth 500 kHz

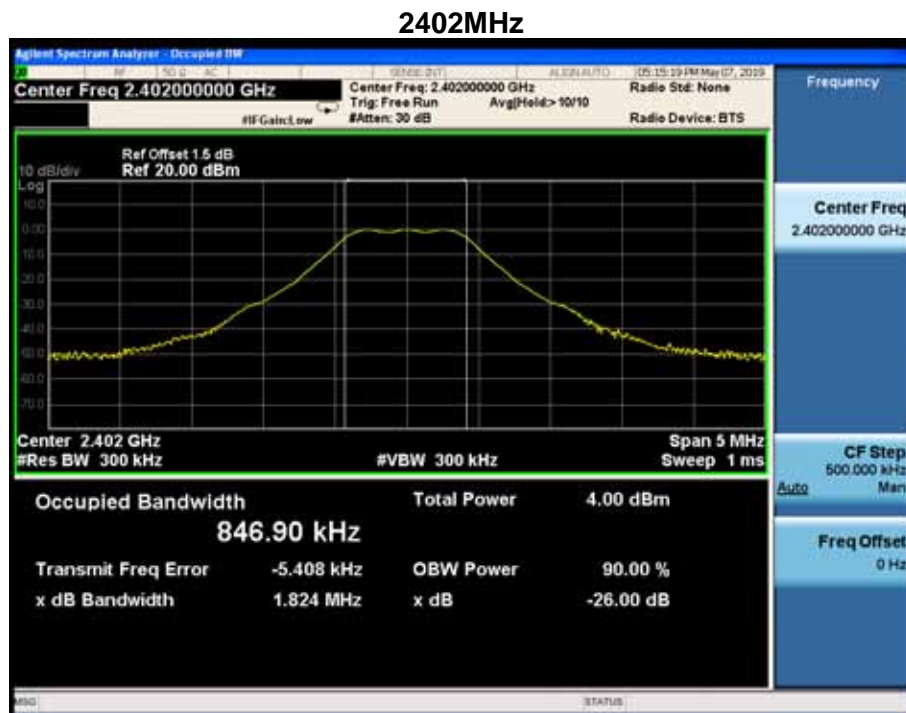
4.4. Test Procedure

Spread Bandwidth and Spread Factor			
	References Rule	Chapter	Description
<input checked="" type="checkbox"/>	ARIB STD-T66	3.2.(8)	Output Power

4.5. Test Result

Product	:	BLUETOOTH EARPHONES
Test Item	:	Spread Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 1:Transmit by BLE

Frequency (MHz)	Reading Value (kHz)	Limit (kHz)
2402	846.90	500
2440	846.26	500
2480	845.95	500



2440MHz



2480MHz



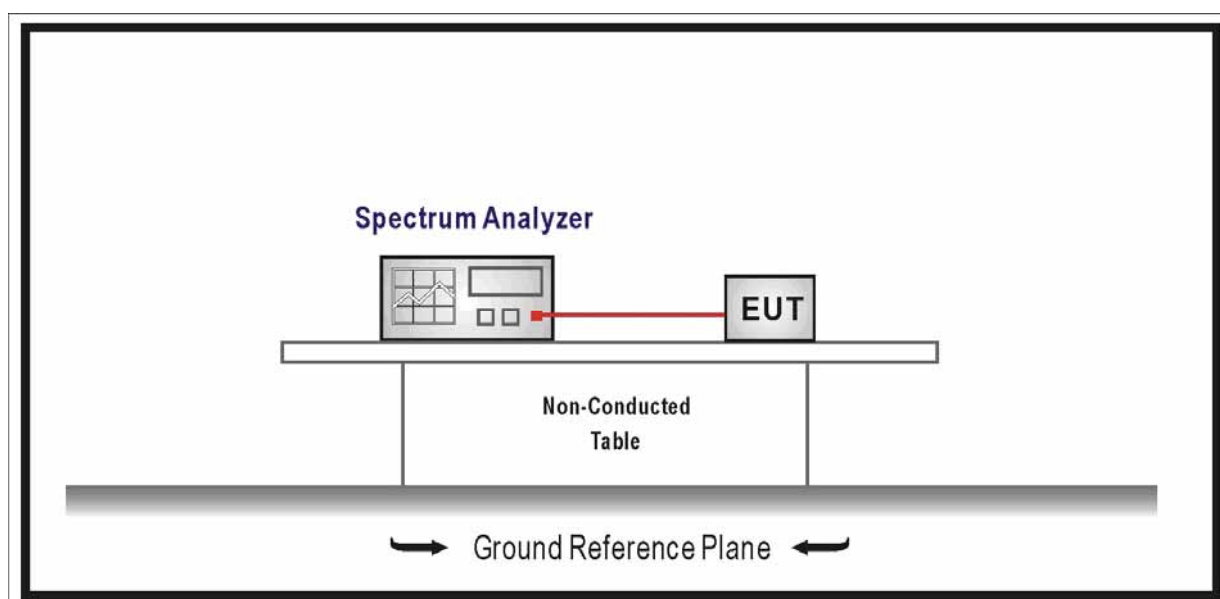
Test Result	Pass
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5. Occupied Bandwidth

5.1. Test Equipment

Occupied Bandwidth / TR8				
Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2020.01.15
EXA Spectrum Analyzer	Keysight	N9010A	MY55370495	2020.04.08
MXA Signal Analyzer	Keysight	N9020A	MY56060147	2020.04.08
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2020.04.09
Note: All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.				

5.2. Test Setup



5.3. Limit

Occupied Bandwidth		
<input type="checkbox"/>	Channel Power of DSSS, the limit should	26MHz
<input type="checkbox"/>	Channel Power of FHSS, the limit should	83.5MHz
<input type="checkbox"/>	Channel Power of OFDM	
	<input type="checkbox"/>	Nominal Bandwidth=20MHz, the limit should 26MHz
	<input type="checkbox"/>	Nominal Bandwidth=40MHz, the limit should 38MHz
<input checked="" type="checkbox"/>	Channel Power of other situation, the limit should	26MHz

5.4. Test Procedure

Occupied Bandwidth			
	References Rule	Chapter	Description
<input checked="" type="checkbox"/>	ARIB STD-T66	3.2.(7)	Occupied Bandwidth

5.5. Test Result

Product	:	BLUETOOTH EARPHONES
Test Item	:	Occupied Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 1:Transmit by BLE

Frequency (MHz)	Reading Value (MHz)	Limit (MHz)
2402	1262.5	26
2440	1257.1	26
2480	1250.5	26

2402MHz



2440MHz



2480MHz



Test Result

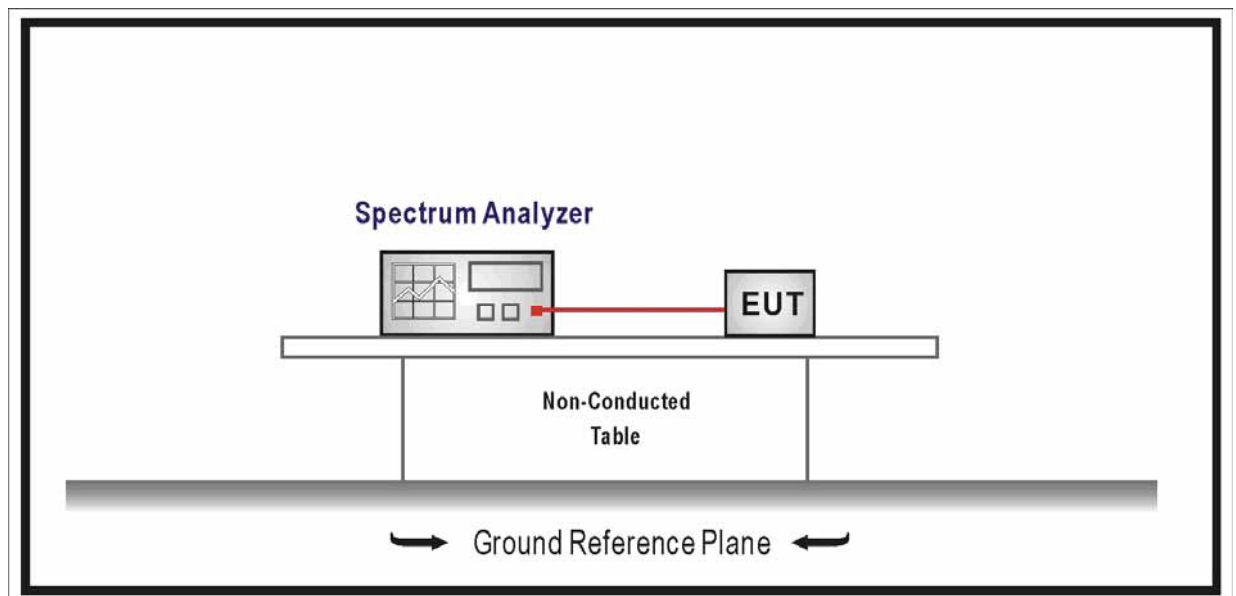
Pass

6. Frequency Tolerance

6.1. Test Equipment

Frequency Tolerance / TR8				
Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2020.01.15
EXA Spectrum Analyzer	Keysight	N9010A	MY55370495	2020.04.08
MXA Signal Analyzer	Keysight	N9020A	MY56060147	2020.04.08
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2020.04.09
Note: All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.				

6.2. Test Setup



6.3. Limit

Frequency Tolerance	
<input checked="" type="checkbox"/>	Frequency Tolerance should be ± 50 ppm

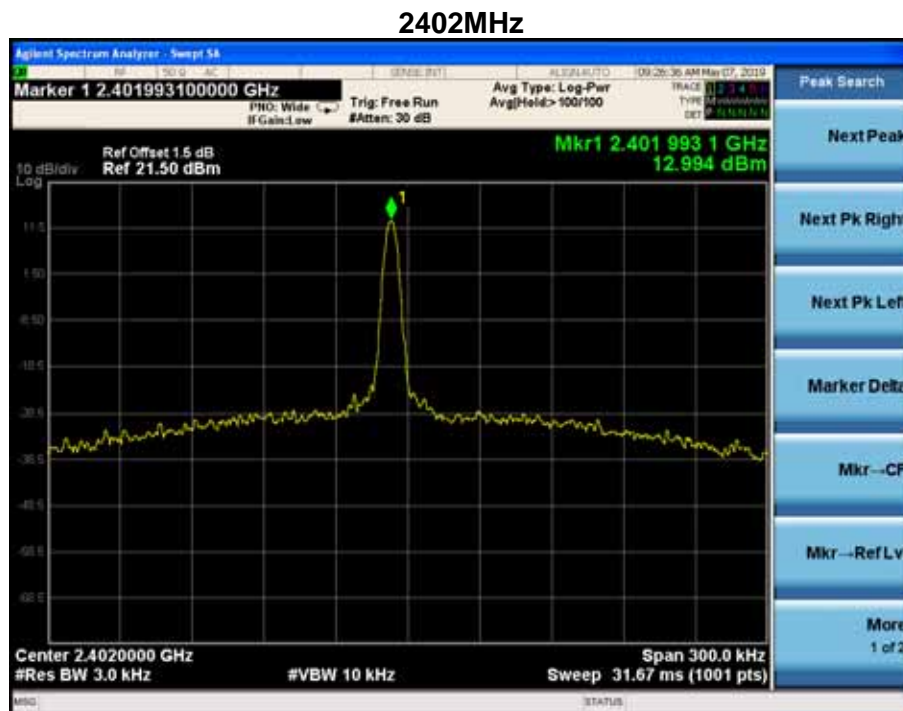
6.4. Test Procedure

Frequency Tolerance			
	References Rule	Chapter	Description
<input checked="" type="checkbox"/>	ARIB STD-T66	3.2.(4)	Frequency Tolerance

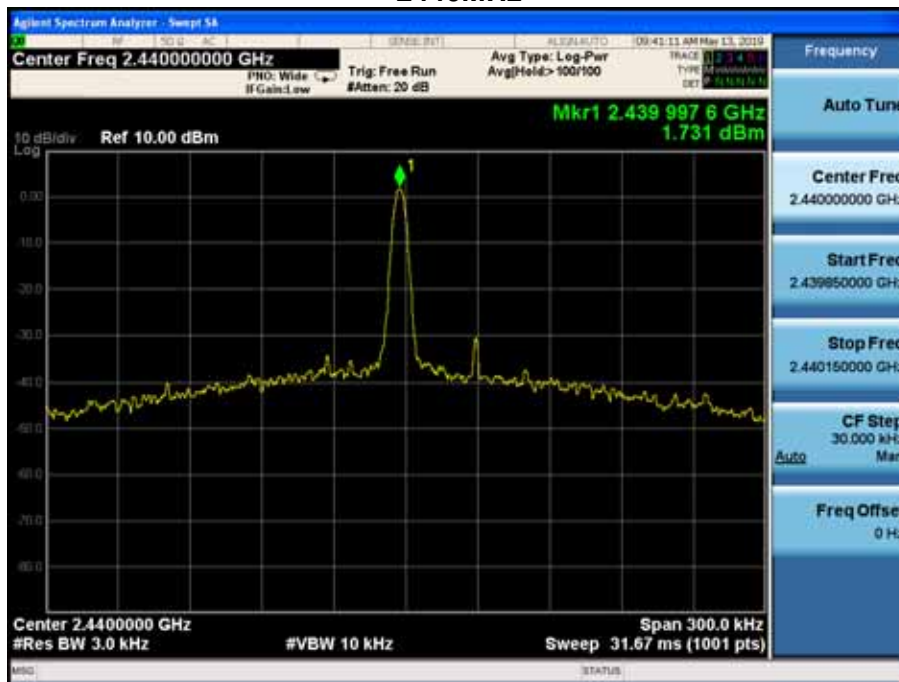
6.5. Test Result

Product	:	BLUETOOTH EARPHONES
Test Item	:	Frequency Tolerance
Test Site	:	TR-8
Test Mode	:	Mode 1:Transmit

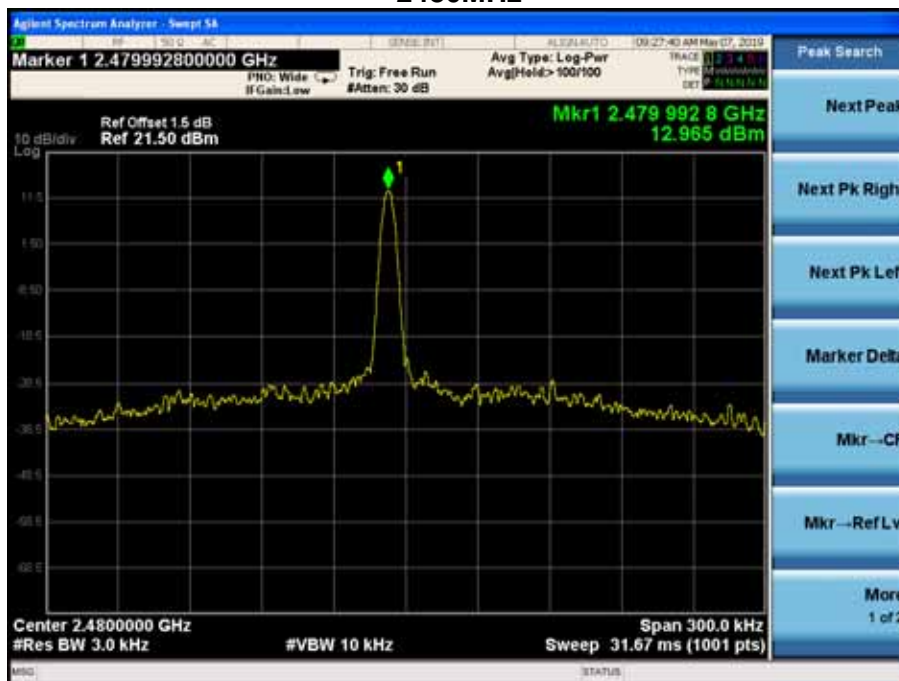
Frequency (MHz)	Reading Value (MHz)	Tolerance (ppm)	Limit (ppm)
2402	2401.99	-4.16	± 50
2440	2440.00	0.00	± 50
2480	2479.99	-4.03	± 50



2440MHz



2480MHz



Test Result

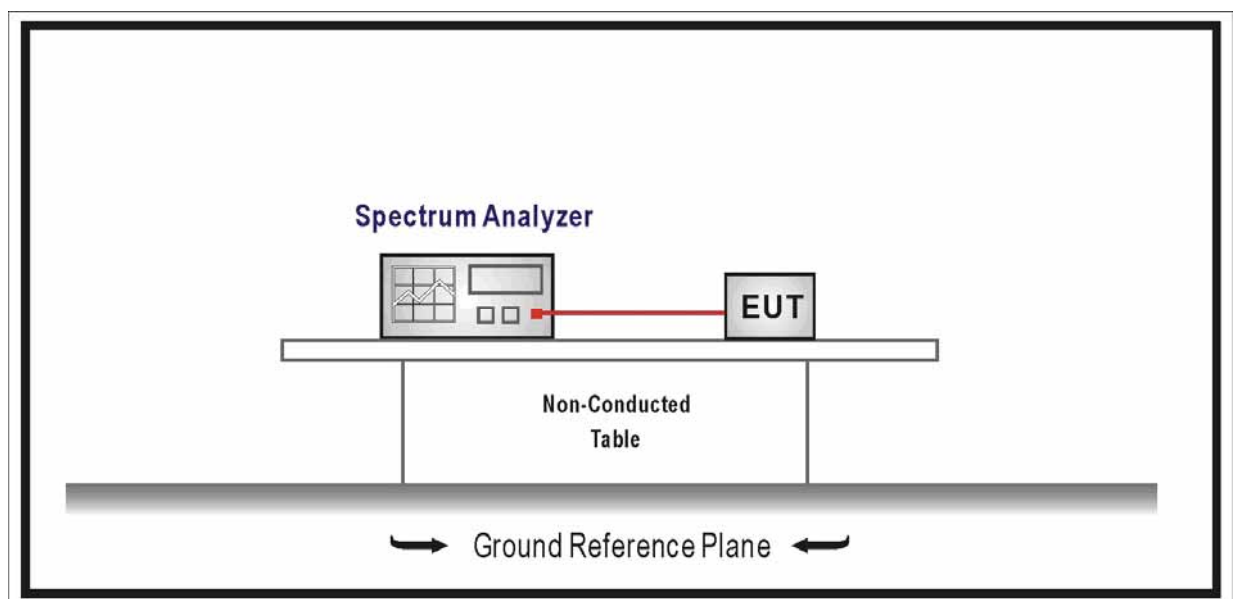
Pass

7. Transmitter Spurious Emissions

7.1. Test Equipment

Transmitter Spurious Emissions / TR8				
Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2020.01.15
EXA Spectrum Analyzer	Keysight	N9010A	MY55370495	2020.04.08
MXA Signal Analyzer	Keysight	N9020A	MY56060147	2020.04.08
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2020.04.09
Note: All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.				

7.2. Test Setup



7.3. Limit

Transmitter Spurious Emissions	
<input checked="" type="checkbox"/>	Frequency between 10 – 2387 MHz, $\leq 2.5\mu\text{W}$
<input checked="" type="checkbox"/>	Frequency between 2387 – 2400 MHz, $\leq 25\mu\text{W}$
<input checked="" type="checkbox"/>	Frequency between 2483.5 – 2496.5 MHz, $\leq 25\mu\text{W}$
<input checked="" type="checkbox"/>	Frequency between 2496.5 – 12750, $\leq 2.5\mu\text{W}$

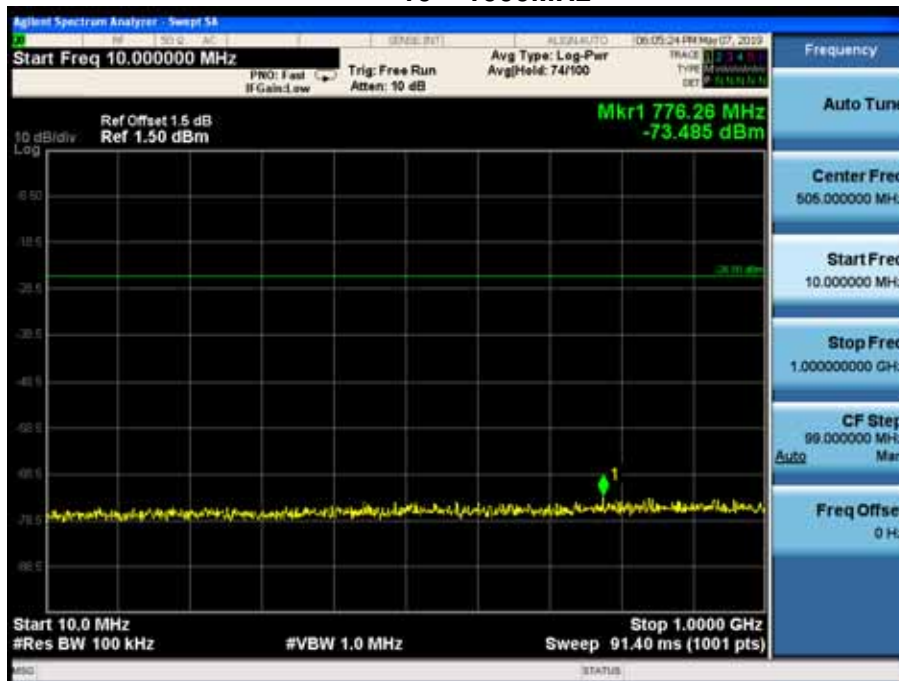
7.4. Test Procedure

Frequency Tolerance			
	References Rule	Chapter	Description
<input checked="" type="checkbox"/>	ARIB STD-T66	3.2.(6)	Frequency Tolerance

7.5. Test Result

Product	:	BLUETOOTH EARPHONES
Test Item	:	Transmitter Spurious Emissions
Test Site	:	TR-8
Test Mode	:	Mode 1:Transmit by BLE
Test Frequency	:	2402MHz

10 – 1000MHz



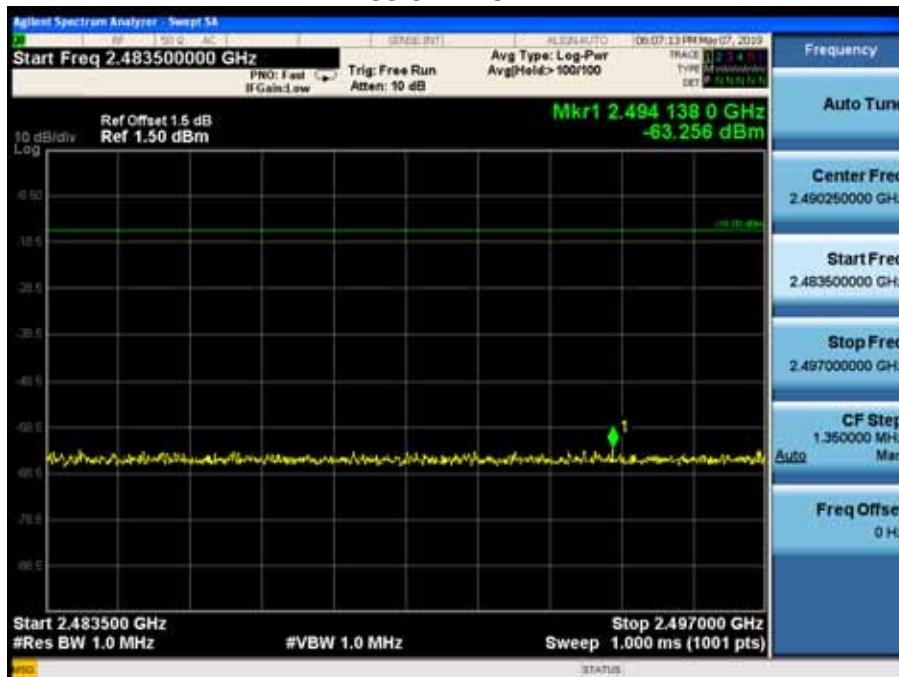
1000 – 2387MHz



2387 – 2400 MHz



2483.5 – 2497 MHz



2497 – 8000MHz

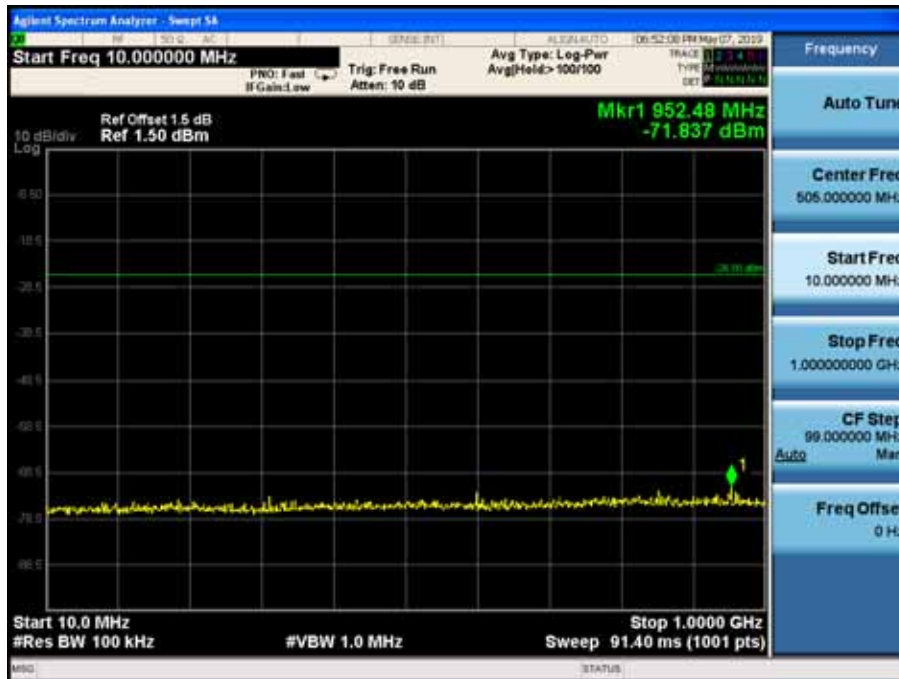


8000 – 12750MHz



Product	:	BLUETOOTH EARPHONES
Test Item	:	Transmitter Spurious Emissions
Test Site	:	TR-8
Test Mode	:	Mode 1:Transmit by BLE
Test Frequency	:	2440MHz

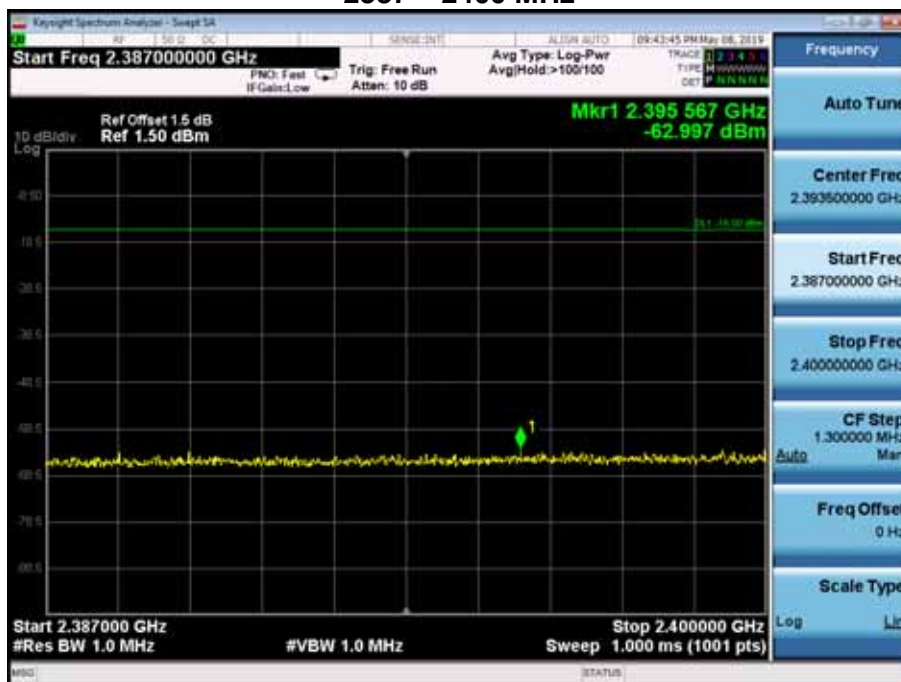
10 – 1000MHz



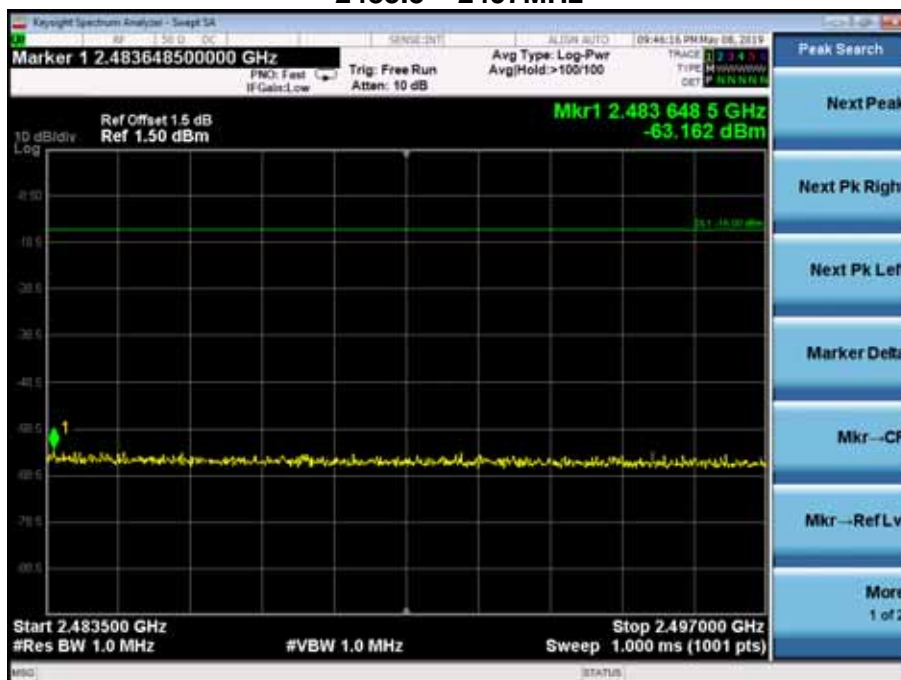
1000 – 2387MHz



2387 – 2400 MHz



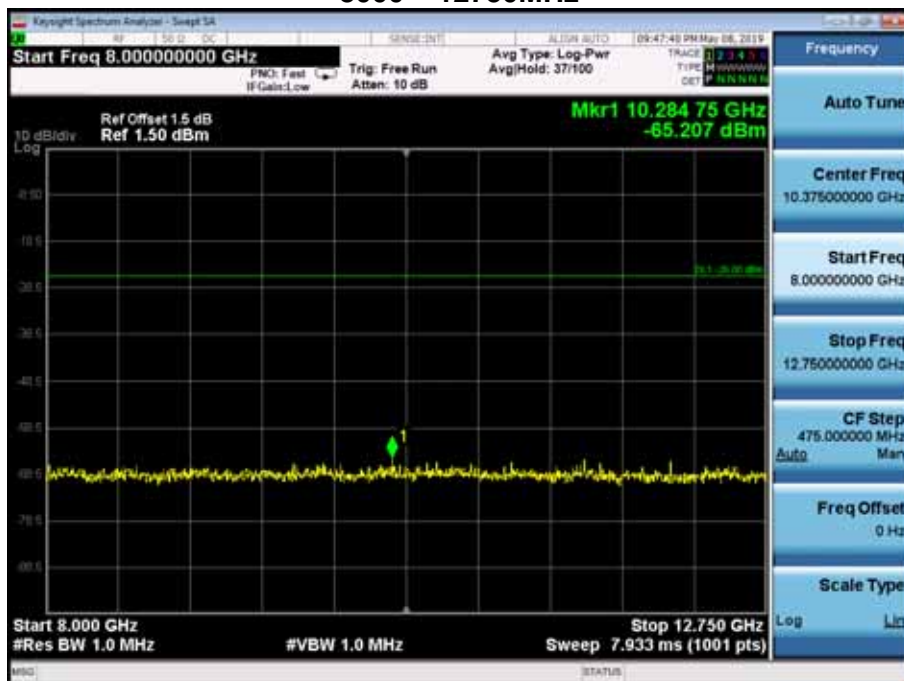
2483.5 – 2497MHz



2497 – 8000MHz

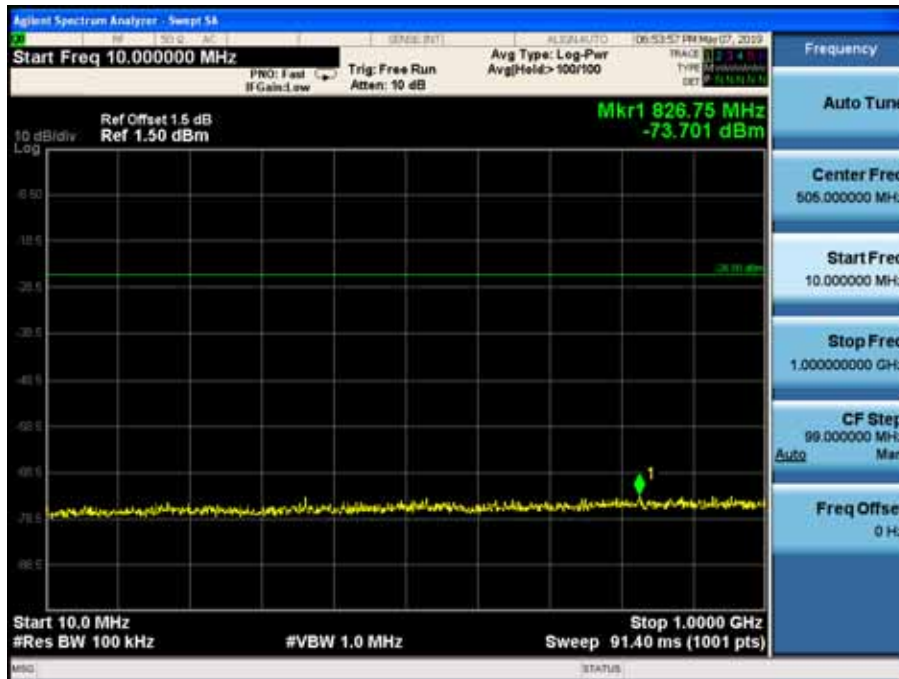


8000 – 12750MHz



Product	:	BLUETOOTH EARPHONES
Test Item	:	Transmitter Spurious Emissions
Test Site	:	TR-8
Test Mode	:	Mode 1:Transmit by BLE
Test Frequency	:	2480MHz

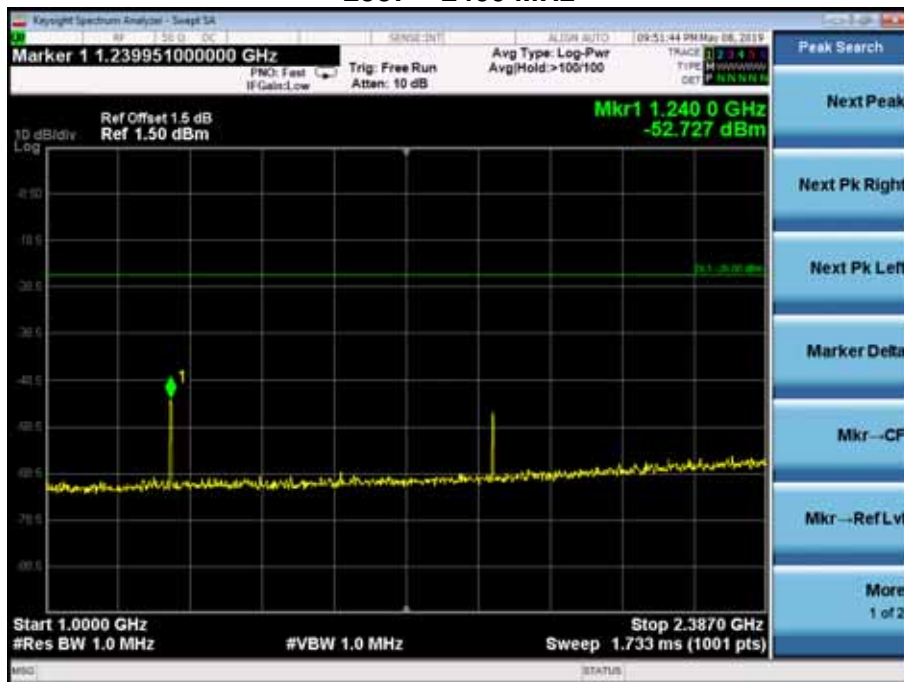
10 – 1000MHz



1000 – 2387MHz



2387 – 2400 MHz



2483.5 – 2497MHz



2497 – 8000MHz



8000 – 12750MHz



Test Result

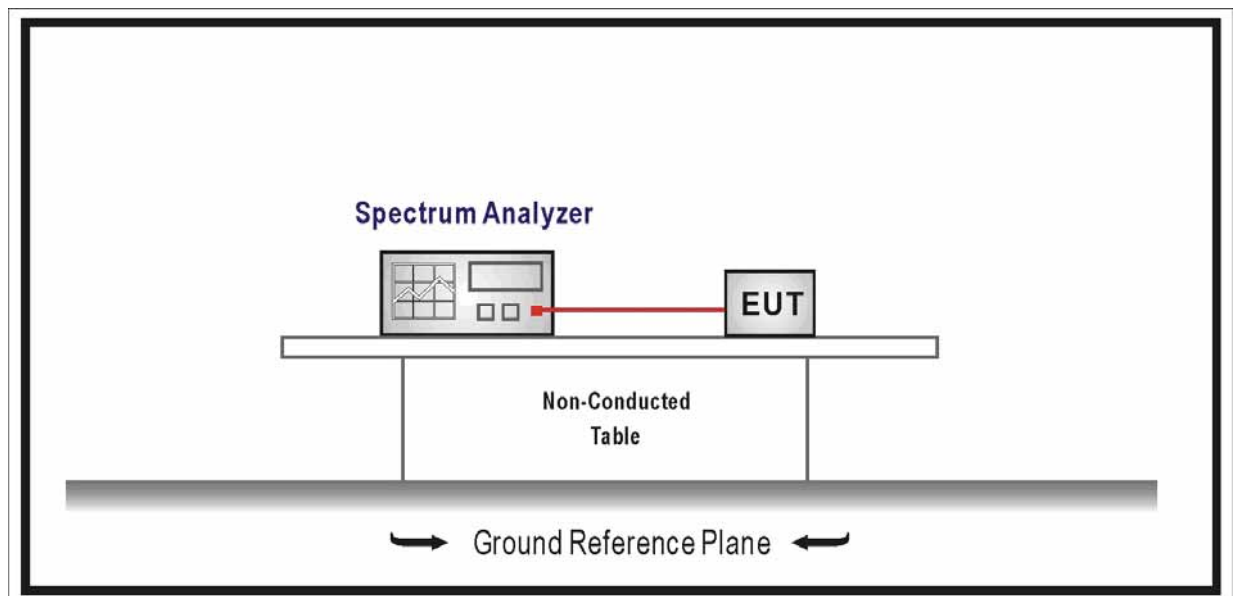
PASS

8. Receiver Spurious Emission

8.1. Test Equipment

Receiver Spurious Emission / TR8				
Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2020.01.15
EXA Spectrum Analyzer	Keysight	N9010A	MY55370495	2020.04.08
MXA Signal Analyzer	Keysight	N9020A	MY56060147	2020.04.08
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2020.04.09
Note: All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.				

8.2. Test Setup



8.3. Limit

Receiver Spurious Emissions	
<input checked="" type="checkbox"/>	Frequency between 10 – 1000 MHz, $\leq 4\text{nW}$
<input checked="" type="checkbox"/>	Frequency between 1000 – 12750 MHz, $\leq 20\text{nW}$

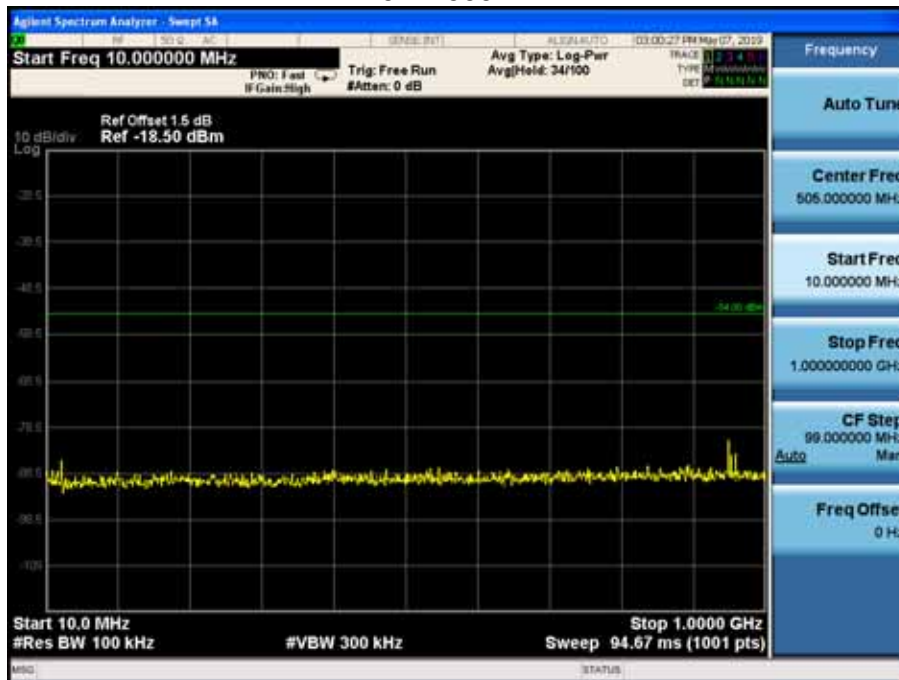
8.4. Test Procedure

Receiver Spurious Emissions			
	References Rule	Chapter	Description
<input checked="" type="checkbox"/>	ARIB STD-T66	3.3.(1)	Receiver Spurious Emissions

8.5. Test Result

Product	:	BLUETOOTH EARPHONES
Test Item	:	Receiver Spurious Emission
Test Site	:	TR8
Test Mode	:	Mode 2: Receive by BLE
Test Frequency	:	2402MHz

10 – 1000MHz

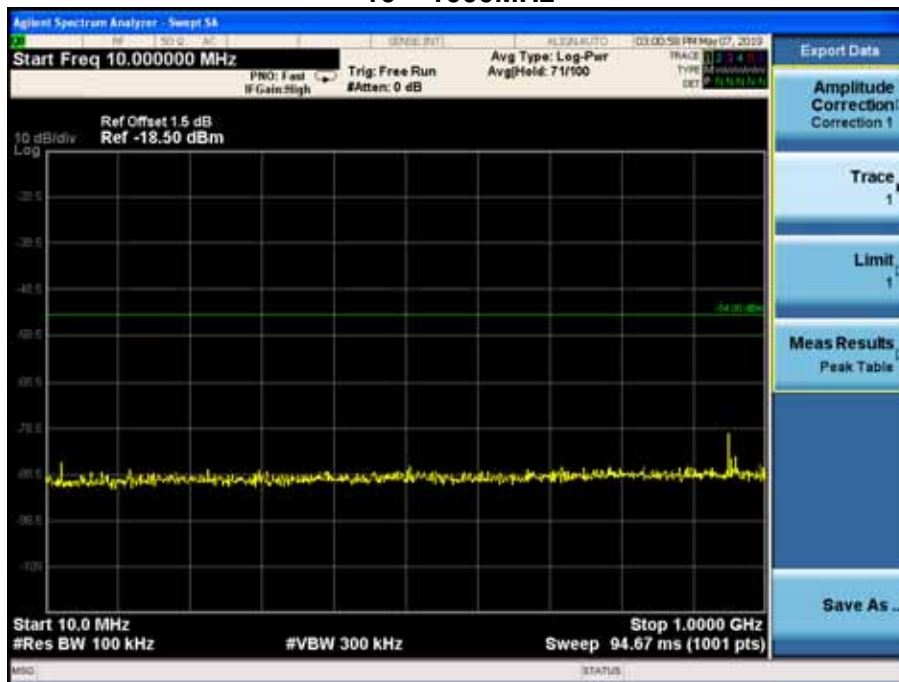


1000 – 12750MHz



Product	:	BLUETOOTH EARPHONES
Test Item	:	Receiver Spurious Emission
Test Site	:	TR8
Test Mode	:	Mode 2: Receive by BLE
Test Frequency	:	2440MHz

10 – 1000MHz

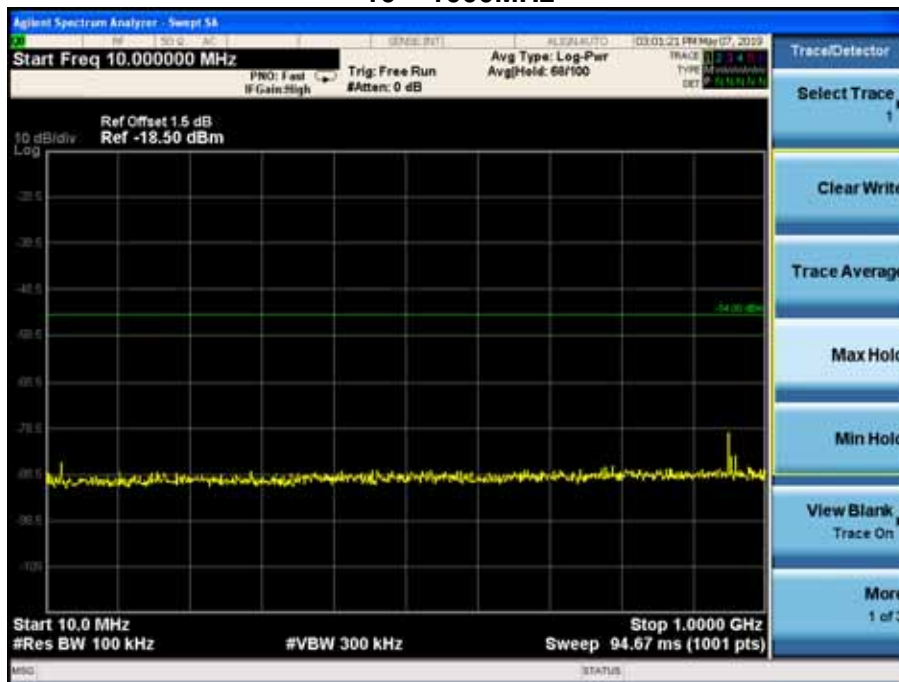


1000 – 12750MHz

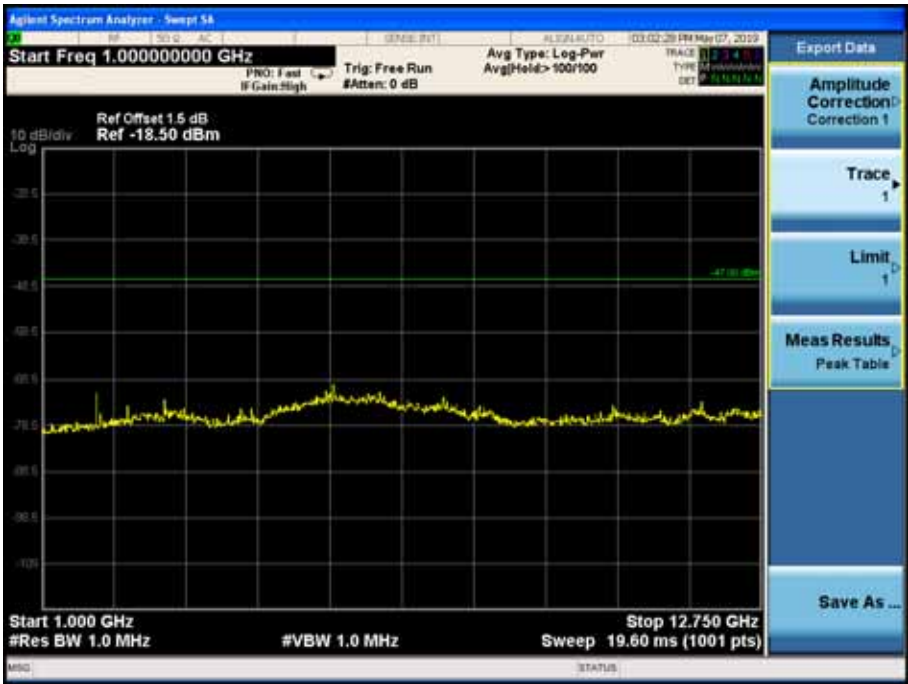


Product	:	BLUETOOTH EARPHONES
Test Item	:	Receiver Spurious Emission
Test Site	:	TR8
Test Mode	:	Mode 2: Receive by BLE
Test Frequency	:	2480MHz

10 – 1000MHz



1000 – 12750MHz



Test Result	PASS
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_____ The End _____