

FCC Test Report

Report No.: CGDX-ESH-P22101588B-1

FCC ID: 2AUB7-CKENC1R

Product: TWS earbuds

Test Model: CKENC1

Received Date: Oct.25, 2022

Test Date: Oct.25 to Nov.07, 2022

Issued Date: Nov.18, 2022

Applicant: Shenzhen BEB Electronics CO., Limited

Address: Xinhuiteng Technology
Park, Baoan District, Shenzhen, 518102, Guangdong, China

Manufacturer: Shenzhen BEB Electronics CO., Limited

Address: Xinhuiteng Technology
Park, Baoan District, Shenzhen, 518102, Guangdong, China

Issued By: BUREAU VERITAS ADT (Shanghai) Corporation

Address: No. 829, Xinzhuang Road, Shanghai, P.R.China (201612)



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Release Control Record

Issue No.	Description	Date Issued
CGDX-ESH-P22101588B-1	Original release	Nov.18, 2022



1 Certificate of Conformity

Product: TWS earbuds

Brand: --

Model: CKENC1

Applicant: Shenzhen BEB Electronics CO., Limited

Test Date: Oct.25 to Nov.05, 2022

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10:2020

The above equipment has been tested by **BUREAU VERITAS ADT (Shanghai) Corporation**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by :

, Date:

Nov.18, 2022

Yan ZHOU

Project Engineer

Approved by :

, Date:

Nov.18, 2022

Sean YU

RF Supervisor

2 Summary of Test Results

The EUT has been tested according to the following specifications:

47 CFR FCC Part 15, Subpart C (SECTION 15.247)			
FCC Clause	Test Item	Result	Remarks
15.203	Antenna Requirement	PASS	No antenna connector is used.
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit.
15.247(a) (1)	20dB Bandwidth	PASS	Meet the requirement of limit.
15.247(b)	Conducted Peak Output Power	PASS	Meet the requirement of limit.
15.247(a)(1)	Carrier Frequency Separation	PASS	Meet the requirement of limit.
15.247(a)(1)(iii)	Number of Hopping Frequencies	PASS	Meet the requirement of limit.
15.247(a)(1)(iii)	Dwell Time	PASS	Meet the requirement of limit.
15.247(d)	Conducted Band Edges Measurement	PASS	Meet the requirement of limit.
15.247(d)	Conducted Spurious Emissions	PASS	Meet the requirement of limit.
15.247(d)	Emissions in restricted frequency bands	PASS	Meet the requirement of limit.
15.205 / 15.209 / 15.247(d)	Radiated Emissions	PASS	Meet the requirement of limit.

Note: The data shown in the report is the worst case data when the EUT is powered by AC120V, 60Hz(Via Adaptor)

2.1 Test Instruments

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Hybrid Antenna(25MHz-1.5GHz)	Schwarzbeck	VULB9168	E1A1012	Jul.26, 22	Jul.25, 23
Horn Antenna(1GHz -18GHz)	Schwarzbeck	BBHA9120D	E1A1017	Jul.25, 22	Jul.24, 23
Double Ridge Horn Antenna(18G-40G)	COM-POWER	AH-840	E1A1040	Jul.25, 22	Jul.24, 23
Pre-Amplifier(100kHz-1.3GHz)	Agilent	8447D	E1A2001	Mar.03, 22	Mar.02, 23
Pre-Amplifier(0.5GHz-18GHz)	EMCI	EMC184045SE	E1A2009	Aug.04, 22	Aug.03, 23
Pre-Amplifier(18GHz-40GHz)	EMCI	EMC051845SE	E1A2008	Aug.04, 22	Aug.03, 23
EMI test receiver	R&S	ESR7	E1R1005	Mar.03, 22	Mar.02, 23
Spectrum Analyzer	Keysight	N9030B	E1S1003	Sep.14, 22	Sep.13, 23
Spectrum Analyzer	Keysight	N9020A	E1S1004	Mar.03, 22	Mar.02, 23
EMI test receiver	R&S	ESR3	E1R1008	Jun.20, 22	Jun.19, 23
LISN	R&S	ENV216	E1L1011	Jun.20, 22	Jun.19, 23
RF Control Unit	Toscend	JS0806-2	E1C5003	N/A	N/A
Test Software	ADT	ADT_COND_V7 .3.1	N/A	N/A	N/A
Test Software	Toscend	JS32-RE	N/A	N/A	N/A
Test Software	Toscend	JS1120	N/A	N/A	N/A
Test Software	Toscend	JS1120-3	N/A	N/A	N/A

2.2 Measurement Uncertainty

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

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

Measurement	Frequency	Expanded Uncertainty ($k=2$) ($\pm$)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.83 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.36 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	3.47 dB
	6GHz ~ 18GHz	3.75 dB
	18GHz ~ 40GHz	3.30 dB

2.3 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	TWS earbuds
Brand	--
Test Model	CKENC1
Power Rating	Powered by USB 5Vdc or battery
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8DPSK
Modulation Technology	BT-EDR, FHSS
Operating Frequency	2402MHz ~ 2480MHz
Number of Channel	79
Output Power	6.03 dBm
Antenna Type	Chip Antenna
Antenna Connector	--
Antenna Gain	1.95 dBi

Note:

1. For more details, please refer to the User's manual of the EUT.

3.2 Description of Test Modes

79 channels are provided for BT-EDR mode:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

3.2.1 Test Mode Applicability:

EUT Configure Mode	Applicable to				Description
	RE ≥ 1G	RE < 1G	PLC	APCM	
-	√	√	-	√	-

Where **RE≥1G**: Radiated Emission above 1GHz **RE<1G**: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **APCM**: Antenna Port Conducted Measurement

Radiated Emission Test (Above 1 GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
-	0 to 78	0, 39, 78	FHSS	GFSK	DH5
-	0 to 78	0, 39, 78	FHSS	π/4-DQPSK	2DH5
-	0 to 78	0, 39, 78	FHSS	8DPSK	3DH5

Radiated Emission Test (Below 1 GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
-	0 to 78	78	FHSS	GFSK	DH5

Power Line Conducted Emission Test:

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
-	0 to 78	78	FHSS	π/4-DQPSK	2DH5

Antenna Port Conducted Measurement

- ☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
-	0 to 78	0, 39, 78	FHSS	GFSK	DH5
-	0 to 78	0, 39, 78	FHSS	$\pi/4$ -DQPSK	2DH5
-	0 to 78	0, 39, 78	FHSS	8DPSK	3DH5

3.2.2 Test Condition:

Applicable to	Normal Environmental Conditions	Normal Input Power
RE $\geq$ 1G	23deg. C, 58%RH	Battery
RE < 1G	23deg. C, 58%RH	Battery
PLC	22deg. C, 54%RH	Battery
APCM	25deg. C, 60%RH	Battery

3.3 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units.

3.4 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standard:

FCC Part 15, Subpart C (15.247)

FCC DA 00705

ANSI C63.10:2020

All relaxed test items have been performed and recorded as per the above standard.

4 Test Procedure and Results

4.1 AC Power Conducted Emission Measurement

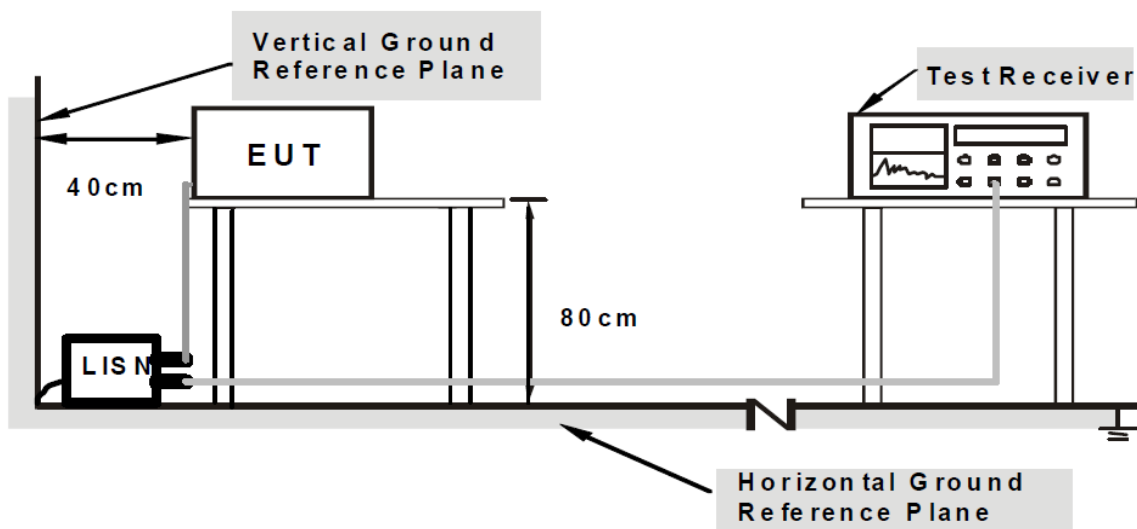
4.1.1 Limit

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.1.2 Test Setup



4.1.3 Test Procedures

- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

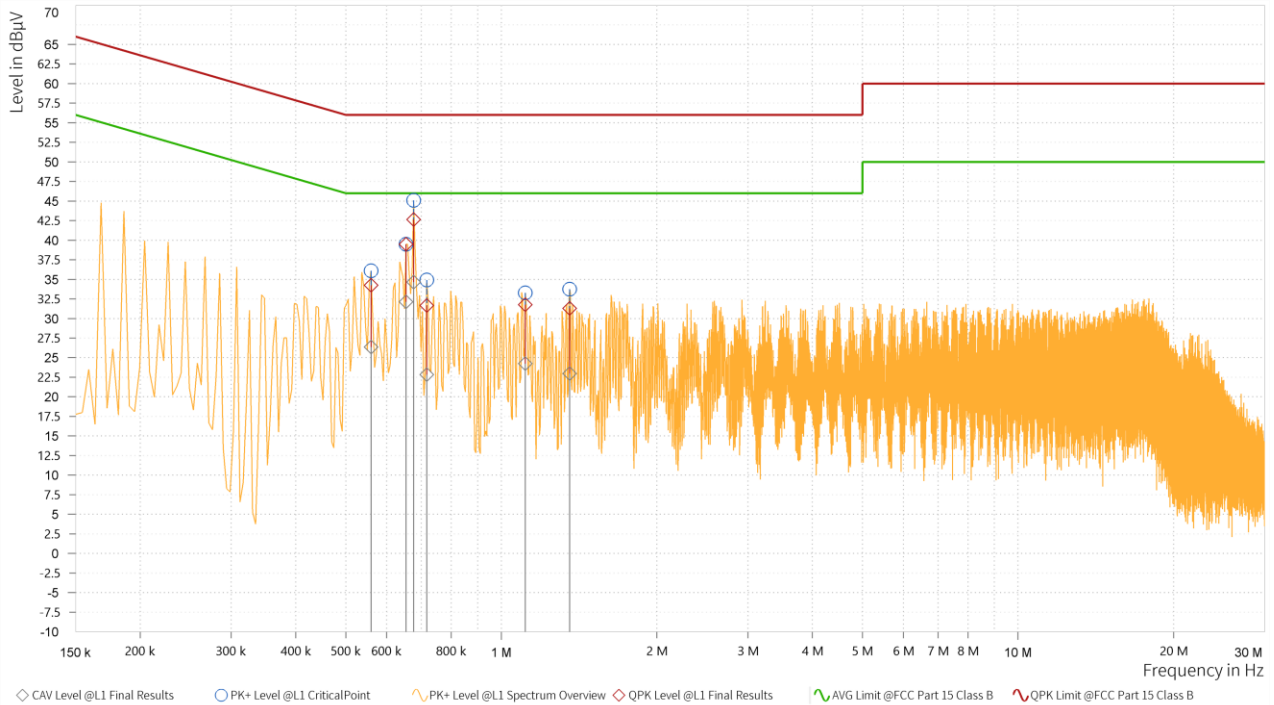
NOTE: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.1.4 Deviation of Test Standard

No deviation.

4.1.5 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
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Rg	Frequency [MHz]	QPK Level [dBμV]	QPK Limit [dBμV]	QPK Margin [dB]	CAV Level [dBμV]	CAV: AVG Limit [dBμV]	CAV Margin [dB]	Correction [dB]	Line	Meas. BW [kHz]	Meas. Time [ms]	Time of Meas.	Source
1	0.560	34.25	56.00	21.75	26.37	46.00	19.63	9.55	L1	9.000	1,000.000	13:53:51	Critical Points
1	0.654	39.50	56.00	16.50	32.14	46.00	13.86	9.50	L1	9.000	1,000.000	13:53:54	Critical Points
1	0.677	42.63	56.00	13.37	34.66	46.00	11.34	9.49	L1	9.000	1,000.000	13:53:56	Critical Points
1	0.717	31.65	56.00	24.35	22.84	46.00	23.16	9.47	L1	9.000	1,000.000	13:54:01	Critical Points
1	1.113	31.77	56.00	24.23	24.25	46.00	21.75	9.51	L1	9.000	1,000.000	13:54:03	Critical Points
1	1.356	31.29	56.00	24.71	22.96	46.00	23.04	9.56	L1	9.000	1,000.000	13:54:05	Critical Points

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
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Rg	Frequency [MHz]	QPK Level [dBμV]	QPK Limit [dBμV]	QPK Margin [dB]	CAV Level [dBμV]	CAV: AVG Limit [dBμV]	CAV Margin [dB]	Correction [dB]	Line	Meas. BW [kHz]	Meas. Time [ms]	Time of Meas.	Source
1	0.411	29.71	57.63	27.92	19.59	47.63	28.04	9.57	N	9.000	1,000.000	13:54:08	Critical Points
1	0.452	30.02	56.85	26.83	17.96	46.85	28.88	9.58	N	9.000	1,000.000	13:54:11	Critical Points
1	0.573	30.62	56.00	25.38	23.76	46.00	22.24	9.54	N	9.000	1,000.000	13:54:13	Critical Points
1	0.663	38.46	56.00	17.54	31.73	46.00	14.27	9.48	N	9.000	1,000.000	13:54:16	Critical Points
1	0.681	38.61	56.00	17.39	32.40	46.00	13.60	9.47	N	9.000	1,000.000	13:54:19	Critical Points
1	0.807	28.68	56.00	27.32	22.51	46.00	23.49	9.51	N	9.000	1,000.000	13:54:21	Critical Points

REMARKS:

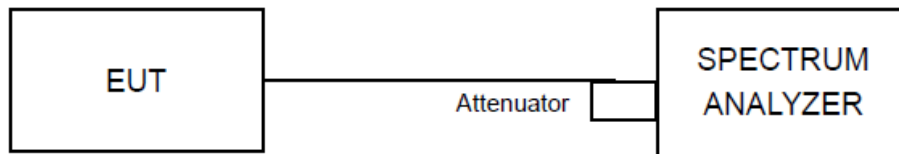
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

4.2 20dB Bandwidth

4.2.1 Limit

For frequency hopping system operating in the 2400-2483.5MHz, If the 20dB bandwidth of hopping channel is greater than 25kHz, two-thirds 20dB bandwidth of hopping channel shall be a minimum limit for the hopping channel separation.

4.2.2 Test Setup



4.2.3 Test Procedures

- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
- Repeat above procedures until all frequencies measured were complete.

4.2.4 Deviation of Test Standard

No deviation.

4.2.5 EUT Operating Condition

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.2.6 Test Results

TestMode	Antenna	Channel	20db EBW[MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.936	2401.556	2402.492	---	PASS
		2441	0.942	2440.550	2441.492	---	PASS
		2480	0.891	2479.559	2480.450	---	PASS
2DH5	Ant1	2402	1.329	2401.355	2402.684	---	PASS
		2441	1.323	2440.355	2441.678	---	PASS
		2480	1.296	2479.382	2480.678	---	PASS
3DH5	Ant1	2402	1.275	2401.379	2402.654	---	PASS
		2441	1.272	2440.370	2441.642	---	PASS
		2480	1.278	2479.370	2480.648	---	PASS

DH5_Ant1_2402



DH5_Ant1_2441



DH5_Ant1_2480



2DH5_Ant1_2402



2DH5_Ant1_2441



2DH5_Ant1_2480



3DH5_Ant1_2402



3DH5_Ant1_2441



3DH5_Ant1_2480

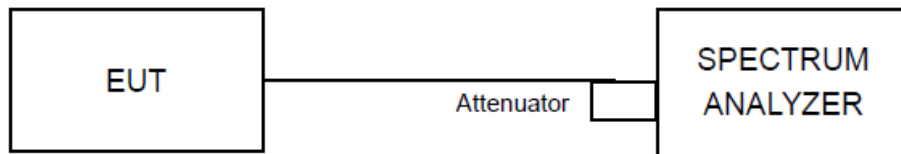


4.3 Conducted Peak Output Power

4.3.1 Limit

The Maximum Output Power Measurement is 125mW(21dBm).

4.3.2 Test Setup



4.3.3 Test Procedures

- 1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
- 2) RBW > 20 dB bandwidth of the emission being measured.
- 3) VBW $\geq$ RBW.
- 4) Sweep: Auto.
- 5) Detector function: Peak.
- 6) Trace: Max hold.
- b) Allow trace to stabilize.
- c) Use the marker-to-peak function to set the marker to the peak of the emission.
- d) The indicated level is the peak output power, after any corrections for external attenuators and cables.
- e) A plot of the test results and setup description shall be included in the test report.

4.3.4 Deviation of Test Standard

No deviation.

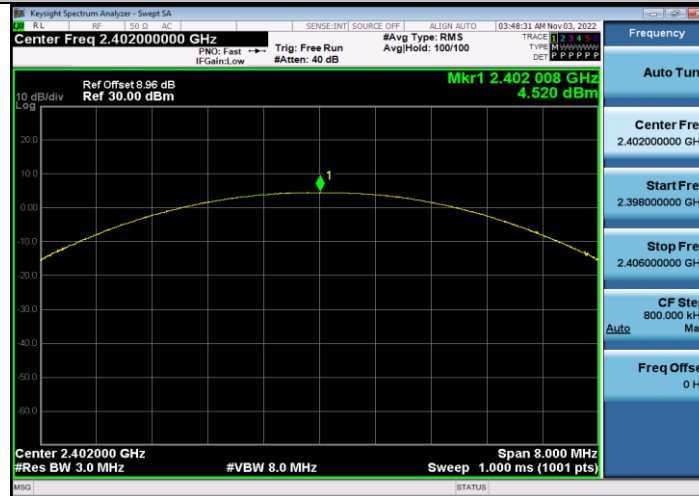
4.3.5 EUT Operating Condition

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

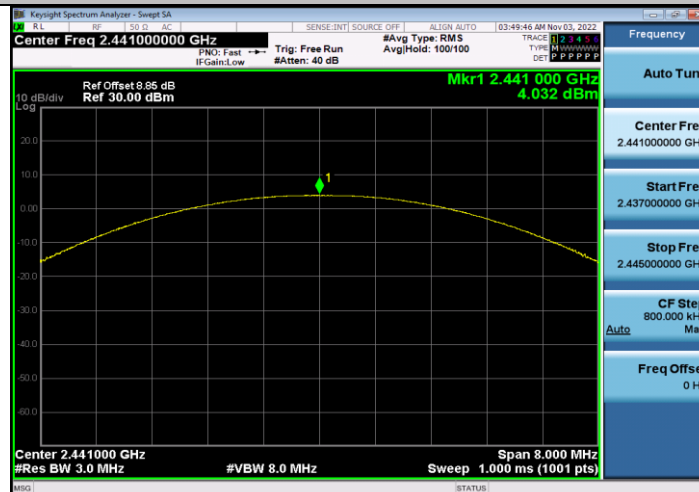
4.3.6 Test Results

TestMode	Antenna	Channel	Result	Limit	Verdict
DH5	Ant1	2402	4.52	≤ 30	PASS
		2441	4.03	≤ 30	PASS
		2480	4.47	≤ 30	PASS
2DH5	Ant1	2402	5.37	≤ 20.97	PASS
		2441	4.75	≤ 20.97	PASS
		2480	5.2	≤ 20.97	PASS
3DH5	Ant1	2402	6.03	≤ 20.97	PASS
		2441	5.29	≤ 20.97	PASS
		2480	5.8	≤ 20.97	PASS

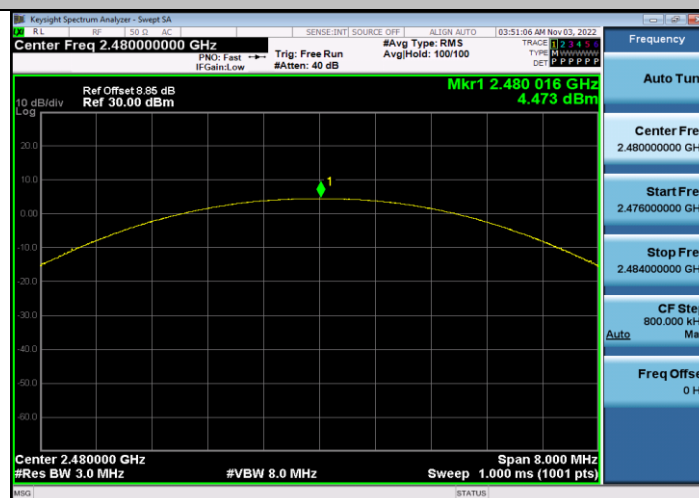
DH5_Ant1_2402



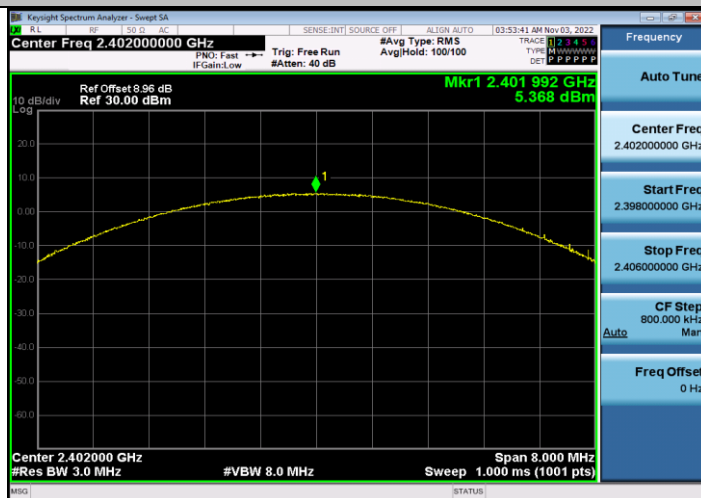
DH5_Ant1_2441



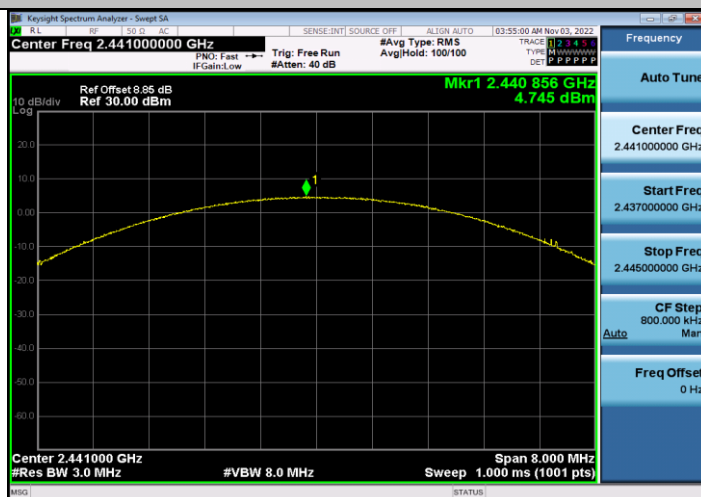
DH5_Ant1_2480



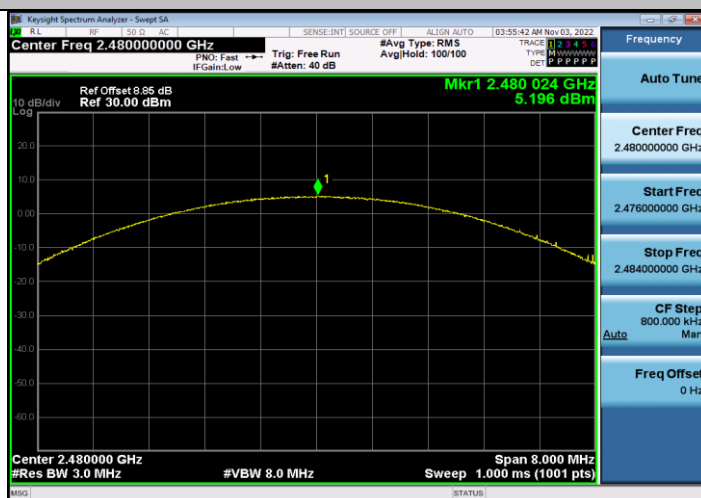
2DH5_Ant1_2402



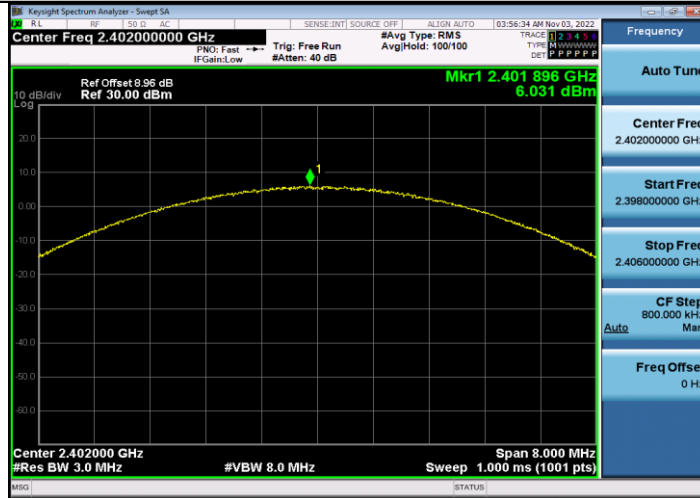
2DH5_Ant1_2441



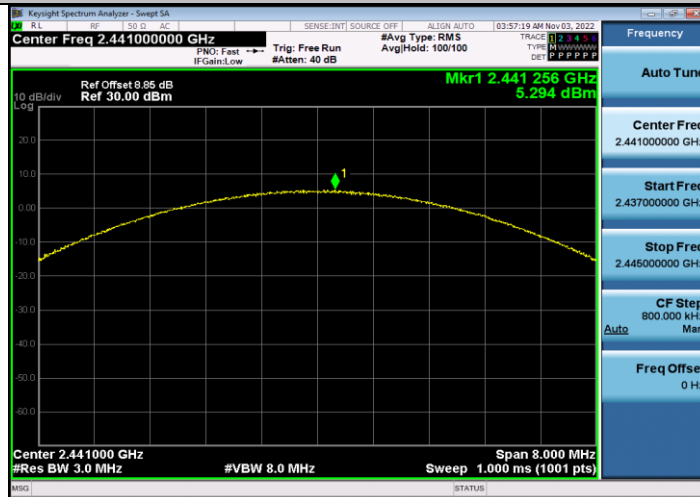
2DH5_Ant1_2480



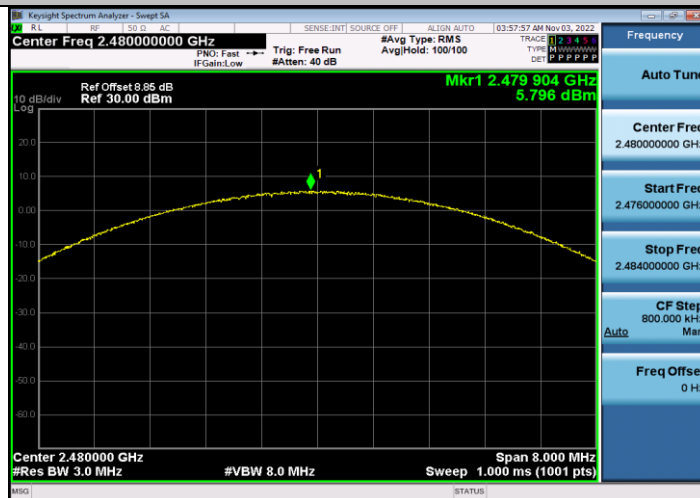
3DH5_Ant1_2402



3DH5_Ant1_2441



3DH5_Ant1_2480

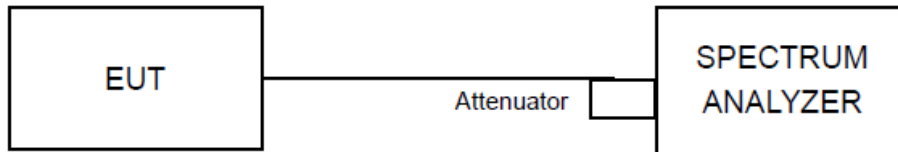


4.4 Carrier Frequency Separation

4.4.1 Limit

At least 25kHz or two-third of 20dB hopping channel bandwidth (whichever is greater)

4.4.2 Test Setup



4.4.3 Test Procedures

Measurement Procedure REF

- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
- By using the MaxHold function record the separation of two adjacent channels.
- Measure the frequency difference of these two adjacent channels by SA MARK function. And then plot the result on SA screen.
- Repeat above procedures until all frequencies measured were complete.

4.4.4 Deviation of Test Standard

No deviation.

4.4.5 Test Results

TestMode	Antenna	Channel	Result	Limit	Verdict
DH5	Ant1	Hop	0.988	≥ 0.942	PASS
2DH5	Ant1	Hop	0.916	≥ 0.886	PASS
3DH5	Ant1	Hop	1.138	≥ 0.852	PASS

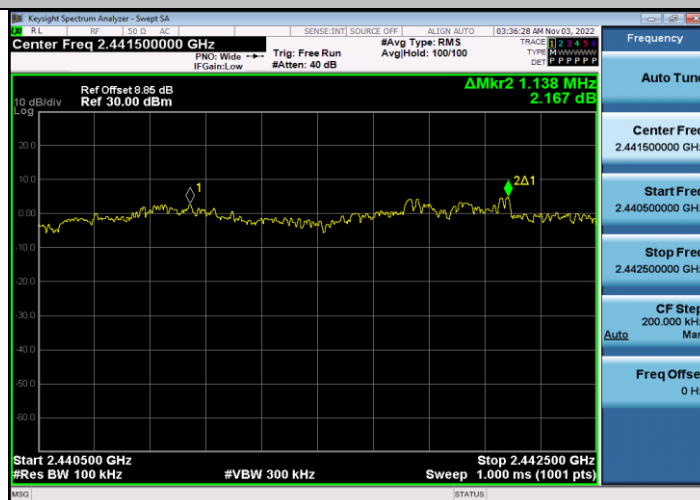
DH5_Ant1_Hop



2DH5_Ant1_Hop



3DH5_Ant1_Hop

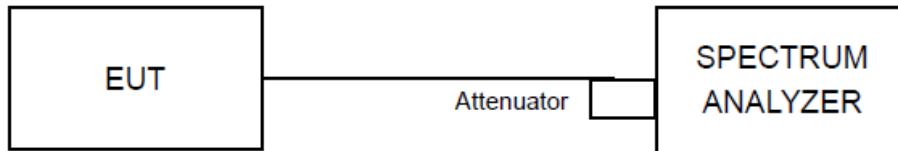


4.5 Number of Hopping Frequencies

4.5.1 Limit

At least 15 channels frequencies, and should be equally spaced.

4.5.2 Test Setup



4.5.3 Test Procedures

- Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
- Set the SA on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
- Set the SA on View mode and then plot the result on SA screen.
- Repeat above procedures until all frequencies measured were complete.

4.5.4 Deviation of Test Standard

No deviation.

4.5.5 Test Results

TestMode	Antenna	Channel	Result	Limit	Verdict
DH5	Ant1	Hop	79	≥ 15	PASS
2DH5	Ant1	Hop	79	≥ 15	PASS
3DH5	Ant1	Hop	79	≥ 15	PASS