

FCC 47 CFR PART 15 SUBPART C ISED RSS-247 ISSUE 2

CERTIFICATION TEST REPORT

For

CLEAN STATION

MODEL NUMBER: AA2237

PROJECT NUMBER: 4790804027

REPORT NUMBER: 4790804027-2

FCC ID: 2AV7A-AA01

IC: 26039-AA01

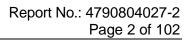
ISSUE DATE: May 29, 2023

Prepared for

Tineco Intelligent Technology Co.,Ltd.

Prepared by

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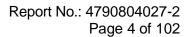
Revision History

Rev.	Issue Date	Revisions	Revised By
V0	05/29/2023	Initial Issue	



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1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name:Tineco Intelligent Technology Co.,Ltd.Address:No. 108 Shihu Road West, Wuzhong Zone Suzhou ,Jiangsu,China
215128Manufacturer
Information
Company Name:Tineco Intelligent Technology Co.,Ltd.

Address:

EUT Description Product Name: Model Number: Sample Number: Data of Receipt Sample: Date Tested:

Tineco Intelligent Technology Co.,Ltd. No. 108 Shihu Road West, Wuzhong Zone Suzhou ,Jiangsu,China 215128

CLEAN STATION AA2237 5947707 Apr. 04, 2023 Apr. 04, 2023~ May 28, 2023

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	PASS
ISED RSS-247 Issue 2	PASS
ISED RSS-GEN Issue 5	PASS

Test Results

PASS

PASS

PASS

PASS

PASS

PASS

PASS

Reviewed By:

Note: The measurement result for the sample received is <Pass> according to < ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15C, RSS-Gen and RSS 247> when <Accuracy Method> decision rule is applied. Prepared By:

Tom Tang

Tom Tang

Authorized By:

Chris Zhong

Chris Zhong EMC&RF Lab Operations Manager

Summary of Test Results

FCC and ISED Rules FCC 15.247 (a) (2)

RSS-247 Clause 5.2 (a)

RSS-Gen Clause 6.7 FCC 15.247 (b) (3)

RSS-247 Clause 5.4 (d)

RSS-Gen Clause 6.12 FCC 15.247 (e)

RSS-247 Clause 5.2 (b) FCC 15.247 (d)

RSS-247 Clause 5.5

RSS-GEN Clause 6.13 FCC 15.247 (d) FCC 15.209

FCC 15.205

RSS-247 Clause 5.5 **RSS-GEN Clause 8.9** RSS-GEN Clause 6.13

FCC 15.207

RSS-GEN Clause 8.8

FCC 15.203

RSS-GEN Clause 6.8

Test Items

6dB Bandwidth and

99% Occupied Bandwidth

Conducted Power

Power Spectral Density

Conducted Band edge And

Spurious emission

Radiated Band edges and Spurious

emission

Conducted Emission Test for

AC Power Port

Antenna Requirement

Leon Wu

Leon Wu

Solutions

Clause

1

2

3

4

5

6

7



2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with KDB 558074 D01 15.247 Meas Guidance v05r02, 414788 D01 Radiated Test Site v01r01, CFR 47 FCC Part 2, CFR 47 FCC Part 15, ANSI C63.10-2013, ISED RSS-247 Issue 2 and ISED RSS-GEN Issue 5.

3. FACILITIES AND ACCREDITATION

Accreditation Certificate	A2LA (Certificate No.: 4829.01) UL-CCIC COMPANY LIMITED has been assessed and proved to be in compliance with A2LA. FCC (FCC Designation No.: CN1247) UL-CCIC COMPANY LIMITED has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules. IC (IC Designation No.: 25056; CAB No.: CN0073) UL-CCIC COMPANY LIMITED has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules.
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Note 1: All tests measurement facilities use to collect the measurement data are located at No. 2, Chengwan Road, Suzhou Industrial Park, Suzhou 215122, China

Note 2: For below 30MHz, lab had performed measurements at test anechoic chamber and comparing to measurements obtained on an open field site. These measurements below 30MHz had been correlated to measurements performed on an OFS.

Note 3: The test anechoic chamber in UL-CCIC COMPANY LIMITED had been calibrated and compared to the open field sites and the test anechoic chamber is shown to be equivalent to or worst case from the open field site.



4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

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

Test Item	Uncertainty	
Conduction emission	3.1dB	
Radiation Emission test(include Fundamental emission) (9KHz-30MHz)	3.4dB	
Radiation Emission test(include Fundamental emission) (30MHz-1GHz)	3.4dB	
Radiation Emission test (1GHz to 26GHz)(include Fundamental emission)	3.5dB (1GHz-18Gz)	
	3.9dB (18GHz-26.5Gz)	
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.		



5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

Equipment	CLEAN STATION			
Model Name	AA2237			
	Operation Frequency 2402 MHz ~ 2480 MHz		z ~ 2480 MHz	
Product Description	Modulation Type		Data Rate	
	GFSK		1Mbps, 2Mbps	
Test software of EUT:	RD Tool			
Antenna Type: PCB antenna				
	-0.66 dBi			
Antenna Gain:	Note: This data is provided by customer and our lab isn't responsible for this data.			



5.2. MAXIMUM OUTPUT POWER

Bluetooth Mode	Frequency (MHz)	Channel Number	Max Output Power(dBm)
BLE-1M	2402-2480	0-39[40]	15.43
BLE-2M	2402-2480	0-39[40]	15.76

Remark: For this product can support both BLE-1M and BLE-2M modes.

5.3. CHANNEL LIST

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

5.4. TEST CHANNEL CONFIGURATION

Test Mode	Test C	Frequency	
	Low Channel	CH 0	2402MHz
GFSK	Middle Channel	CH 19	2440MHz
	High Channel	CH 39	2480MHz

5.5. THE WORSE CASE POWER SETTING PARAMETER

The Worse Case Power Setting Parameter under 2400 ~ 2483.5MHz Band					
Test So	oftware	RD Tool			
Modulation Type	Transmit Antenna	Test Channel			
	Number	LCH	MCH	HCH	
GFSK(1M)	1	3	3	3	
GFSK(2M)	1	3	3	3	



5.6. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
1	2400-2483.5	PCB antenna	-0.66 dBi

Note: This data is provided by customer and our lab isn't responsible for this data.

Test Mode	Transmit and Receive Mode	Description
BLE-1M	⊠1TX, 1RX	Antenna1 can be used as transmitting/receiving antenna independently.
BLE-2M	⊠1TX, 1RX	Antenna1 can be used as transmitting/receiving antenna independently.



5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	Description
1	Laptop	ThinkPad	E590	N/A
2	Fixed Frequency Board	N/A	N/A	Supply by Customer
3	USB Cable	N/A	N/A	Supply by UL Lab(100cm length)

I/O PORT

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	N/A	N/A	N/A	N/A	N/A

ACCESSORY

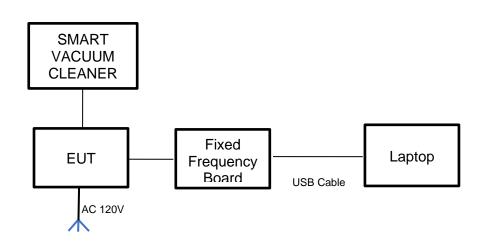
Item	Accessory	Brand Name	Model Name	Description
1	SMART VACUUM CLEANER	SMART VACUUM CLEANER	VS1B0100US	Voltage:14.4DC Rated Power:270W
2	SMART VACUUM CLEANER	SMART VACUUM CLEANER	VS1A0100US	Voltage:14.4DC Rated Power:270W

Remark: Pre-testing with these accessories and AC adapter, only the data of worse case (Working with VS1B0100US model SMART VACUUM CLEANER) is included in this report.

TEST SETUP

The EUT can work in an engineer mode with a software through a table PC.

SETUP DIAGRAM FOR TESTS



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5.8. MEASURING INSTRUMENT AND SOFTWARE USED

	Conducted Emissions (Instrument)								
Used	Equipment	Manufacturer	Model	No.	Serial No	Upper Last Cal.	Last Cal.	Next Cal.	
\checkmark	EMI Test Receiver	R&S	ESR3		126700	2021-12-04	2022-12-19	2023-12-18	
	Two-Line V- Network	R&S	ENV2	16	126701	2021-12-04	2022-12-03	2023-12-02	
	Software								
Used	Des	cription		Ma	nufacturer	Name	Version		
\checkmark	Test Software for C	Conducted distu	irbance		R&S	EMC32	Ver. 9.25		
		Ra	diated E	missi	ons (Instru	iment)			
Used	Equipment	Manufacturer	Model	No.	Serial No	Upper Last Cal.	Last Cal.	Next Cal.	
\checkmark	Spectrum Analyzer	Keysight	N901	0B	155727	2022-04-09	2023-04-08	2024-04-07	
	EMI test receiver	R&S	ESR		221694	2022-05-20	2023-04-08	2024-04-07	
V	EMI test receiver	R&S	ESR2	26	126703	2020-12-05	2022-12-03	2023-12-02	
	Receiver Antenna (9kHz-30MHz)	Schwarzbeck	FMZB 1	1513	155456	2018-06-15	2021-06-03	2024-06-02	
	Receiver Antenna (30MHz-1GHz)	Schwarzbeck	VULB 9163		126704	2019-02-15	2022-01-18	2025-01-17	
	Receiver Antenna (1GHz-18GHz)	R&S	HF907		126705	2018-01-29	2022-02-28	2025-02-27	
V	Receiver Antenna (18GHz-26.5GHz)	ETS	3160-10		155565	2019-01-05	2021-07-15	2024-07-14	
V	Pre-amplification (To 18GHz)	R&S	SCU-18D		134667	2021-12-04	2022-12-03	2023-12-02	
\checkmark	Pre-amplification (To 18GHz)	Tonsend	TAP010 0	1805	224539	/	2022-10-20	2023-10-19	
V	Pre-amplification (To 26.5GHz)	R&S	SCU-2	26D	135391	2021-12-05	2022-12-03	2023-12-02	
V	Band Reject Filter	Wainwright	WRCJ 2350-24 2483 2533.5-4	400- .5- 40SS	1	2022-04-09	2023-04-08	2024-04-07	
V	Highpass Filter	Wainwright	WHKX 2700-30 18000-4	000-	2	2022-04-09	2023-04-08	2024-04-07	
\checkmark	Attenuator	Wainwright	BW-N1-	W5+	3	2022-04-09	2023-04-08	2024-04-07	
V	Chamber A	Albatross	9*6*	6	126721	2019-05-31	2022-05-30	2025-05-29	
\checkmark	Chamber B	SAEMC	9*6*6		220350	/	2022-07-03	2025-06-01	
	Temperature and Humidity Datalogger	Omega Engineering Inc.	iTHX-SD-5		183135	/	2022-07-20	2023-07-19	
				Soft					
Used	Desci	•		nufac		Name	Version		
\checkmark	Test Software for R	adiated disturba	ance T	onsce	end .	JS36-RSE	4.0.0.1		

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	Other instruments								
Used	Equipment	Manufacturer	Model No.	Serial No.	Upper Last Cal.	Last Cal.	Next Cal.		
\checkmark	Spectrum Analyzer	Keysight	N9010B	155368	2022-04-09	2023-04-08	2024-04-07		
V	Attenuator	PASTERNAC K	PE7087-6	1624	2022-05-23	2023-04-08	2024-04-07		
\checkmark	Shilding Room	Albatross	/	126723	2019-12-27	2022-05-30	2025-05-29		
V	Temperature and Humidity Datalogger	Omega Engineering Inc.	iTHX-SD-5	199847	2021-10-15	2022-10-14	2023-10-13		



6. MEASUREMENT METHODS

No.	Test Item	KDB Name	Section
1	6dB Bandwidth	KDB 558074 D01 15.247 Meas Guidance v05r02	8.2
2	Output Power	KDB 558074 D01 15.247 Meas Guidance v05r02	8.3.1.1
3	Power Spectral Density	KDB 558074 D01 15.247 Meas Guidance v05r02	8.4 (Method PKPSD)
4	Out-of-band emissions in non- restricted bands	KDB 558074 D01 15.247 Meas Guidance v05r02	8.5
5	Out-of-band emissions in restricted bands	KDB 558074 D01 15.247 Meas Guidance v05r02	8.6
6	Band-edge	KDB 558074 D01 15.247 Meas Guidance v05r02	8.7
7	Conducted Emission Test for AC Power Port	ANSI C63.10-2013	6.2



7. ANTENNA PORT TEST RESULTS

7.1. ON TIME AND DUTY CYCLE

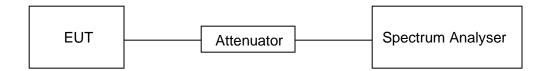
<u>LIMITS</u>

None; for reporting purposes only

PROCEDURE

FCC KDB 558074 Zero-Span Spectrum Analyzer Method

TEST SETUP



TEST ENVIRONMENT

Temperature	22.3℃	Relative Humidity	47.8%
Atmosphere Pressure	102.1kpa	Test Voltage	AC120V/60Hz

TEST RESULTS TABLE

Mode	On Time (msec)	Period (msec)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (db)	1/T Minimum VBW (kHz)	Final VBW (kHz)
BLE-1M	0.38	0.63	0.603	60.3	2.20	2.63	3
BLE-2M	0.20	0.63	0.317	31.7	4.99	5	5

Note: 1) Duty Cycle Correction Factor=10log(1/x).

2) Where: x is Duty Cycle (Linear)

3) Where: T is On Time (transmit duration)



TEST GRAPHS







7.2. 6 dB BANDWIDTH AND 99% OCCUPIED BANDWIDTH

LIMITS

FCC Part15 (15.247), Subpart C					
Section	Test Item	Limit	Frequency Range (MHz)		
CFR 47 FCC 15.247(a)(2) ISED RSS-247 5.2 (a)	6dB Bandwidth	>= 500kHz	2400-2483.5		
ISED RSS-Gen Clause 6.7	99 % Occupied Bandwidth	For reporting purposes only	2400-2483.5		

TEST PROCEDURE

Refer to ANSI C63.10-2013 clause 11.8 for DTS bandwidth and clause 6.9 for Occupied Bandwidth.

Connect the EUT to the spectrum analyser and use the following settings:

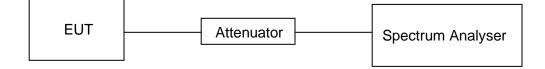
Center Frequency	The centre frequency of the channel under test
Frequency Span	For 6 dB Bandwidth: enough to capture all products of the modulation carrier emission For 99 % Occupied Bandwidth: Between 1.5 times and 5 times the OBW
Detector	Peak
IRR///	For 6 dB Bandwidth: 100 kHz For 99 % Occupied Bandwidth: 1 % to 5 % of the occupied bandwidth
IV RW	For 6 dB Bandwidth: ≥3 × RBW For 99 % Occupied Bandwidth: ≥3 × RBW
Trace	Max hold
Sweep	Auto couple

a) Use the 99 % power bandwidth function of the instrument, allow the trace to stabilize and report the measured bandwidth.

b) Allow the trace to stabilize and measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.



TEST SETUP



TEST ENVIRONMENT

Temperature	22.3 ℃	Relative Humidity	47.8%
Atmosphere Pressure	102.1kpa	Test Voltage	AC120V/60Hz

TEST RESULTS TABLE

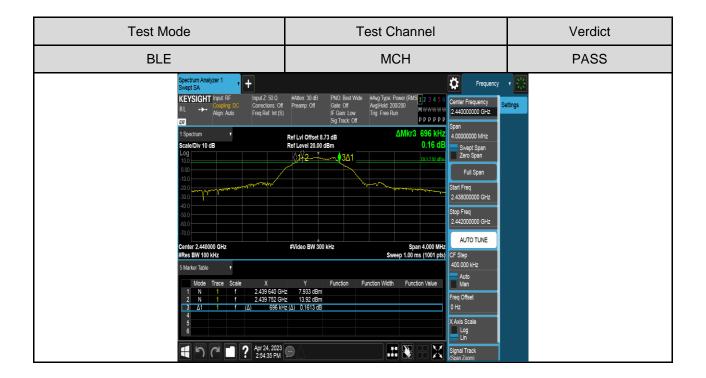
Test Mode	Test Channel	6dB bandwidth (MHz)	99% bandwidth (MHz)	Result
BLE-1M	LCH	0.696	1.0316	Pass
	MCH	0.696	1.0332	Pass
	HCH	0.692	1.0320	Pass
	LCH	1.152	2.0130	Pass
BLE-2M	MCH	1.160	2.0159	Pass
	НСН	1.168	2.0182	Pass



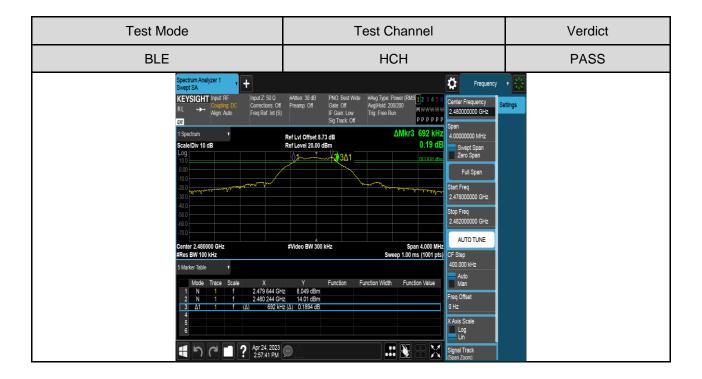
TEST GRAPHS

6dB Bandwdith_For 1M Part:









6dB Bandwdith_For 2M Part:





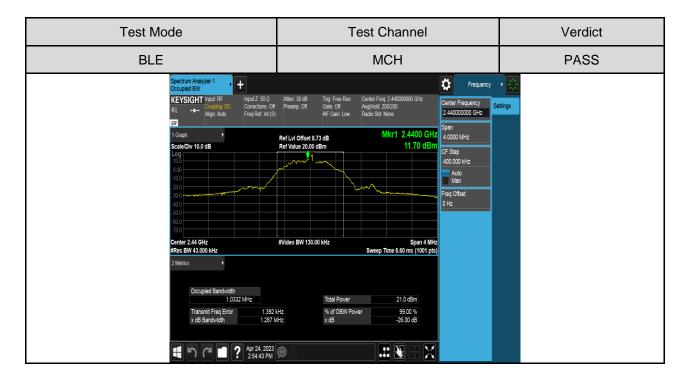




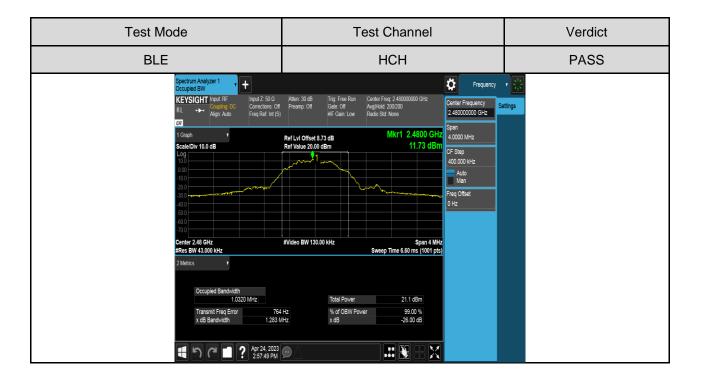


99% Bandwdith_For 1M Part:

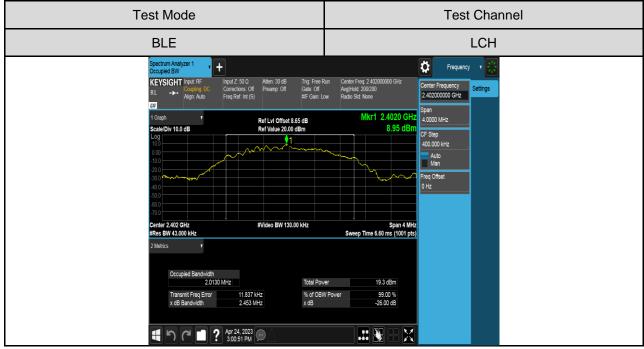








99% Bandwdith_For 2M Part:











7.3. CONDUCTED OUTPUT POWER

LIMITS

FCC Part15 (15.247), Subpart C, RSS-247			
Section Test Item Limit Frequency Range (MHz)			
FCC 15.247(b)(3) RSS-247 Clause 5.4 (d) RSS-Gen Clause 6.12	Output Power	1 watt or 30dBm	2400-2483.5

TEST PROCEDURE

The following procedure shall be used when an instrument with a resolution bandwidth that is greater than

the DTS bandwidth is available to perform the measurement:

a) Set the RBW \geq DTS bandwidth.

b) Set VBW \geq [3 × RBW].

c) Set span \geq [3 × RBW].

d) Sweep time = auto couple.

e) Detector = peak.

f) Trace mode = max hold.

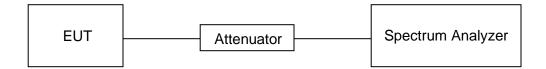
g) Allow trace to fully stabilize.

h) Use peak marker function to determine the peak amplitude level.

TEST ENVIRONMENT

Temperature	22.3 ℃	Relative Humidity	47.8%
Atmosphere Pressure	102.1kpa	Test Voltage	AC120V/60Hz

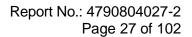
TEST SETUP





TEST RESULTS TABLE

Test Mode	Frequency[MHz]	Conducted Sensor power[dBm]	Limit [dBm]	Verdict
	2402	14.25	≤30.00	PASS
BLE_1M	2440	15.39	≤30.00	PASS
	2480	15.43	≤30.00	PASS
	2402	14.53	≤30.00	PASS
BLE_2M	2440	15.68	≤30.00	PASS
	2480	15.76	≤30.00	PASS

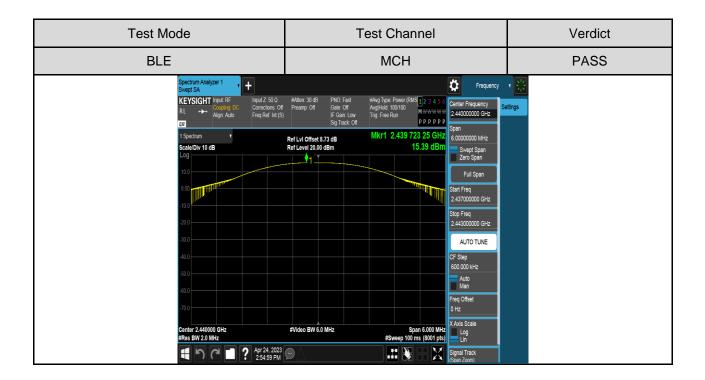




TEST GRAPHS

For 1M Part:

Test Mode	Test Channel	Verdict
BLE	LCH	PASS
Spectrum Analyzer 1 Swept SA KEYSIGHT RL Country: 00 Controllone: 00 File Ref. Int (S ScaleDiv 10 dB Log 10 20 2	IF Gam Low Sg Track Off Trig: Fee Run WWWWW 2 40200000 GHz Sg Track Off Mkr1 2.401 718 00 GHz Span 60000000 MHz Ref Livi Offset 8.65 dB Mkr1 2.401 718 00 GHz Sweet Span Zero Span Image Start Freq 2.39900000 GHz Start Freq Start Freq 2.39900000 GHz Start Freq 2.400000 GHz Start Freq 2.4000000 GHz Start Freq Image Start Freq 2.4000000 GHz Start Freq 2.4000000 GHz Start Freq Image Start Freq 2.4000000 GHz Start Freq 2.4000000 GHz Start Freq Image Start Freq 2.4000000 GHz Start Freq 2.4000000 GHz Start Freq Image Start Freq 2.4000000 GHz Start Freq 2.4000000 GHz To TUNE GF Stap G0.000 KHz Man Auto Man Freq Offset OHz #Video BW 6.0 MHz Span 6.000 MHz Span 6.000 MHz Lin Lin Lin	iettings





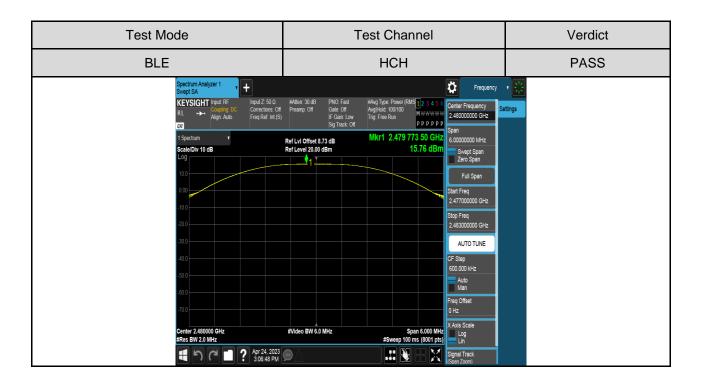
Test Mode	Test Channel	Verdict
BLE	НСН	PASS
Spectrum Analyzer 1 Swept SA KEYSIGHT laput RF RL → Agan Ado U ScaleDiv 10 dB Log 1 Spectrum ScaleDiv 10 dB Log 10 00 00 00 00 00 00 00 00 00	IF Cam Low Sq Track Off Trig: Free Run WWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWW	ettings

For 2M Part:





Test Mode	Test Channel	Verdict
BLE	MCH	PASS
Spectrum Analyzer 1 + Skept SA Input RF KEYSIGHT Input RF RL → Agin Auto Correctors: 00 1 Spectrum SaleDby 10 dB 0 Log 0 -10 0 - -20 0 - -30 0 <t< td=""><td>IF Gam. Low Sig Track Off Trig: Free Run MWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWW</td><td>ettings</td></t<>	IF Gam. Low Sig Track Off Trig: Free Run MWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWW	ettings





7.4. POWER SPECTRAL DENSITY

LIMITS

FCC Part15 (15.247), Subpart C, RSS-247			
Section Test Item Limit Frequency Range (MHz)			
FCC §15.247 (e) RSS-247 Clause 5.2 (b)	Power Spectral Density	8 dBm/3 kHz	2400-2483.5

TEST PROCEDURE

Refer to FCC KDB 558074, connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	3 kHz ≤ RBW ≤100 kHz
VBW	≥3 × RBW
Span	1.5 x DTS bandwidth
Trace	Max hold
Sweep time	Auto couple.

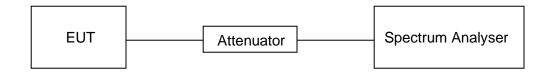
Allow trace to fully stabilize and use the peak marker function to determine the maximum amplitude level within the RBW.

If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

TEST ENVIRONMENT

Temperature	22.3℃	Relative Humidity	47.8%
Atmosphere Pressure	102.1kpa	Test Voltage	AC120V/60Hz

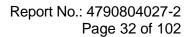
TEST SETUP





TEST RESULTS TABLE

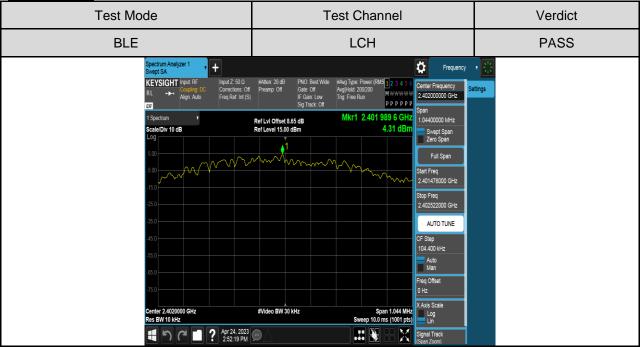
Test Mode	Test Channel	Maximum Peak power spectral density (dBm/10kHz)	Result
	LCH	4.31	Pass
BLE_1M	MCH	5.26	Pass
	HCH	5.28	Pass
	LCH	1.85	Pass
BLE_1M	MCH	2.95	Pass
	HCH	3.13	Pass

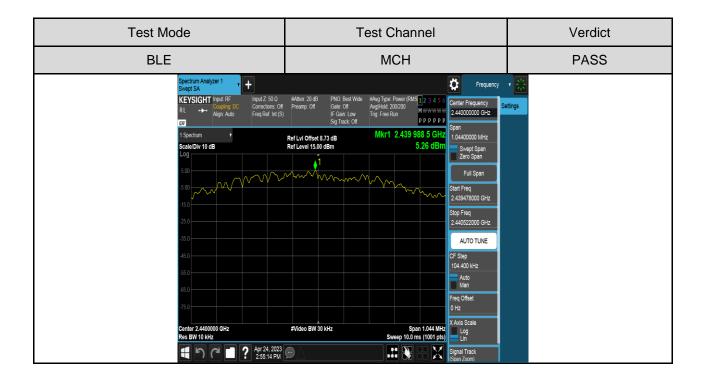




TEST GRAPHS

For 1M Part:

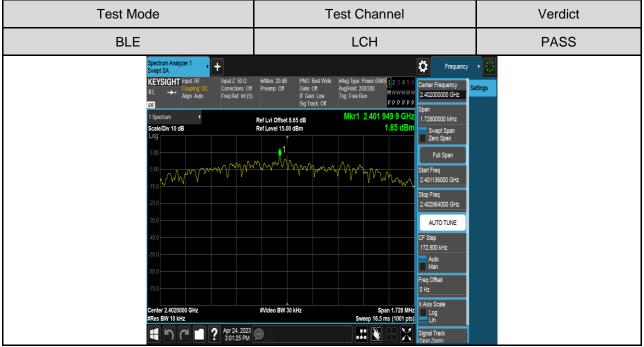






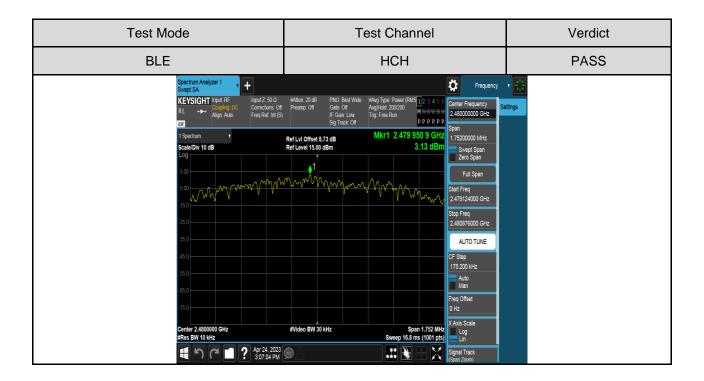
Test Mode	Test Channel	Verdict
BLE	НСН	PASS
Spectrum Analyzer 1 + Swept SA Input RF KEYSIGHT Input RF Concentors Offere Ref. Int (S) RL → Aggn Audo Concentors Offere Ref. Int (S) 1 Spectrum ScaleDiv 10 dB Concentors Offere Ref. Int (S) 250	IF Claim Low Sig Track: Off Ting: Free Run WWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWW	Pettings

For 2M Part:





Test Mode	Test Channel	Verdict
BLE	МСН	PASS
Spectrum Analyzer 1 Swept SA + KEYSIGHT Input IP RL → Input IP Contectors: Off Freq Ref Int (S) 1 Spectrum ScaleDbv 10 dB 0 Log - 0 - - - <	IF Cant. Low Sig Track. Off Tig: Free Run WWWWW 2.44000000 GHz Ref.Lvi Offset 8.73 dB Mkr1 2.439 951 3 GHz 1.74000000 MHz Ref.Lvi Offset 8.73 dB 2.95 GBm Swept Span 1 2.95 GBm Swept Span 1 1 Swept Span 2 4/00000 GHz Swept Span 2 1 Swept Span 2 1 Swept Span 2 2 Swept Span 2 2 Swept Span 2 3 Start Freq 2 4 Start Freq 2 4 Start Freq 2 4 Man Freq Offset 1 Auto Man Freq Offset OHz 4 Span 17.740 MHz Xavis Scale 5 Lun Lun	Settings





7.5. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS

LIMITS

FCC Part15 (15.247), Subpart C, RSS-247				
Section	Test Item	Limit		
FCC §15.247 (d) RSS-247 Clause 5.5 RSS-GEN Clause 6.13	Conducted Bandedge and Spurious Emissions	20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power		

TEST PROCEDURE

Refer to FCC KDB 558074, connect the UUT to the spectrum analyser and use the following settings:

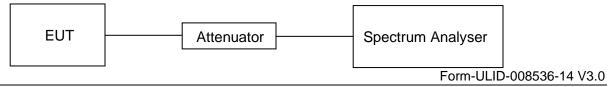
Center Frequency	The centre frequency of the channel under test	
Detector	Peak	
RBW	100 kHz	
VBW	≥3 × RBW	
Span	1.5 x DTS bandwidth	
Trace	Max hold	
Sweep time	Auto couple.	

Use the peak marker function to determine the maximum PSD level.

	Set the center frequency and span to encompass frequency range to be measured	
Detector	Peak	
RBW	100 kHz	
VBW	≥3 × RBW	
measurement points	≥span/RBW	
Trace	Max hold	
Sweep time	Auto couple.	

Use the peak marker function to determine the maximum amplitude level.

TEST SETUP



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TEST ENVIRONMENT

Temperature	22.3 ℃	Relative Humidity	47.8%
Atmosphere Pressure	102.1kpa	Test Voltage	AC120V/60Hz

PART 1: REFERENCE LEVEL MEASUREMENT

TEST RESULTS TABLE

Test Mode	Test Channel	Result[dBm]
BLE-1M	LCH	12.80
	MCH	13.91
	HCH	13.99
BLE-2M	LCH	12.83
	MCH	14.00
	НСН	14.10



TEST GRAPHS

For 1M Part:



Test Mode			Channel
BLE			MCH
Spectrum Analyzer 1 Swept SA	' +	Frequ	ency V
KEYSIGHT Input RF RL ++ Couping DC Align: Auto	Input Z: 50 Ω #Atten: 30 dB PNO: Best Wi C Corrections: Off Preamp: Off Gate: Off Freq Ref. Int (S) IF Gain: Low Sig Track: Off	de #AvgTiype: Power (RMS 1 2 3 4 5 6 AvgHold: 200200 Trig: Free Run p p p p p p 2 p P p p p p p p p p p p p	Settings
1 Spectrum v Scale Div 10 dB Log	Ref Lvi Offset 8.73 dB Ref Level 28.73 dBm	Mkr1 2.440 241 2 GHz 1.04400000 MHz 13.91 dBm Swept Span Zero Span	
18.7		Full Span	
-1.27		Start Freq 2.439478000 GH;	2
-11.3		Stop Freq 2.440522000 GH;	2
-21.3		AUTO TUNE OF Step	
413		104.400 kHz	
-51.3		Man Freq Offset	
-61.3 Center 2.4400000 GHz	#Video BW 300 kHz	0 Hz Span 1.044 MHz	
		Span 1.044 MHz Log Sweep 1.00 ms (1001 pts) Lin Lin Signal Track (Span Zoom)	



Test Mode			Channel
BLE			HCH
Spectrum Analyzer 1 Swept SA KEYSIGHT Input RF RL →→ Changing DC Align: Auto	Input Z: 50 Ω #Atten: 30 dB PNO: Best V Correctors: Off Preamp: Off Gate: Off Freq Ref. Int (S) Sig Track Sig Track	Nide ==Avg Type: Power (RMS 1 2 3 4 5 6 Avg Hold: 200/200 v Trig: Free Run	Frequency Frequency Settings
1 Spectrum Scale/Div 10 dB	Ref Lvi Offset 8.73 dB Ref Level 28.73 dBm		Span 1.03900000 MHz Swept Span Zero Span
187 875 -127		manne	Full Span Start Freq 2.479431000 GHz
-113			Stop Freq 2.480519000 GHz AUTO TUNE
			DF Step Hz 103.800 Hz Auto
-61.3 Center 2.4800000 GHz	#Video BW 300 kHz	Span 1.038 MHz	Freq Offset 0 Hz K Avis Scale
#Res BW 100 kHz		Sweep 1.00 ms (1001 pts)	Lin Signal Track Span Zoom)

For 2M Part:

Test Mode		Channel
BLE		LCH
Spectrum Analyzer 1 Swept SA KEYSIGHT Input RF RL →→ Congeng DC Align Auto	#Atten:30.dB PNOBest Wide #Avg Type Power(RMS <mark>1</mark> 234.56 Pleamp Off Gete:01 AvgHobt.200200 IF Gant.Low Trig:Free Run PP P P P P	2.40200000 GHz
1 Spectrum Scale/Div 10 dB Log	Ref Lvi Offset 8.65 dB Mkr1 2.401 987 9 GHz Ref Level 28.65 dBm 12.83 dBm	
18.7 8.65 -1.35		Full Span Start Freq 2.401136000 GHz Stop Freq
-11.4		2.402864000 GHz AUTO TUNE CF Step
-114		172.800 KHz Auto Man Freq Offset
41.4 Center 2.4020000 GHz #Res BW 100 kHz	#Video BW 300 kHz Span 1.728 MHz Sweep 1.00 ms (100 Hz)	Lin
📲 🕤 C ^a 🖬 ? Apr 24, 2023 3.01:31 PM		Signal Track (Span Zoom)



Test Mode		Char	nnel
BLE		MC	H
Spectrum Analyzer 1 Swept SA		Frequency •	214 1
KEYSIGHT Input RF RL →→ Coupling DC Align: Auto	Input Z: 50 Ω #Atten: 30 dB PNO: Best V Corrections: Off Preamp: Off Gate: Off Freq Ref: Int (S) IF Gain: Low Sig Track: O	Avg Hold 200200 Center Frequency Setting Trig. Free Run M******** 2.440000000 GHz Setting	IS
1 Spectrum v Scale/Div 10 dB Log	Ref Lvi Offset 8.73 dB Ref Level 28.73 dBm	Mkr1 2.439 993 0 GHz Span 14.00 dBm swept Span	
18.7	1-	Zero Span Full Span	
8.73 -1.27	when when the second	Start Freq 2.439130000 GHz Stop Freq	
-113		2.440670000 GHz	
-313		CF Step 174.000 kHz	
-51.3		Auto Man Freq Offset	
-6f.3		0 Hz X Avis Scale	
Center 2.4400000 GHz #Res BW 100 kHz	#Video BW 300 kHz	Span 1.740 MHz Sweep 1.00 ms (1001 pts)	
.	Apr 24, 2023 3:04:26 PM	Signal Track (Span Zoom)	





PART 2: CONDUCTED BANDEDGE

TEST RESULTS TABLE

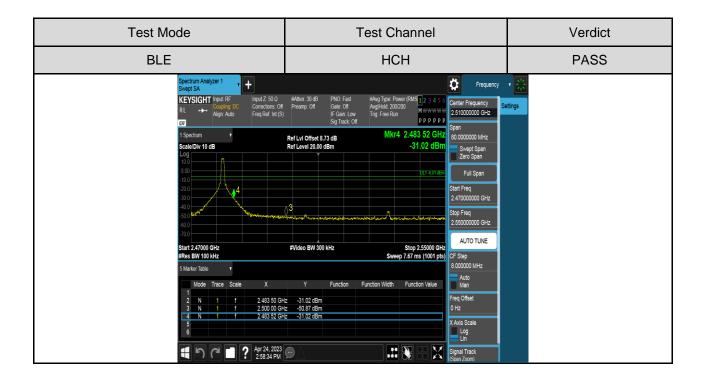
Test Mode	Test Channel	Result	Verdict
BLE-1M	LCH	Refer to the Test Graph	PASS
DLC-TIVI	HCH	Refer to the Test Graph	PASS
BLE-2M	LCH	Refer to the Test Graph	PASS
DLC-2IVI	HCH	Refer to the Test Graph	PASS



TEST GRAPHS

For 1M Part:

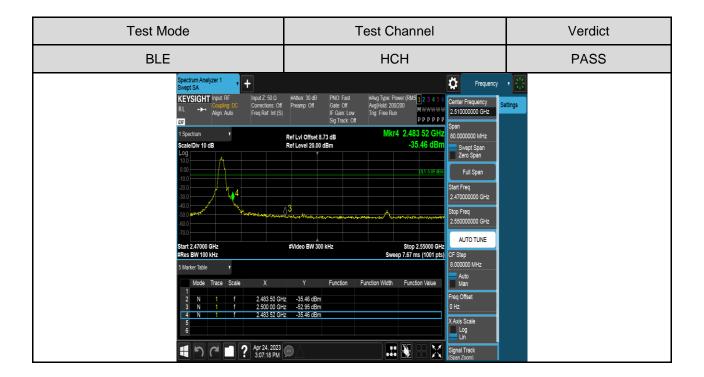






For 2M Part:

Test Mode	Test Channel	Verdict
BLE	LCH	PASS
Spectrum Analyzer 1 + Swept SA Imput Z 50 0 RL → Align Auto Topectrum * Sale Div 10 dB * 1 Spectrum * Sale Div 10 dB * 00 - 00	#Atten 30 dB Preamp Off PNO Fast Gate Off #Avg Type Power (RMS 12 3 4 5 0 Avg/Held 200200 Trg: Free Run Center Frequency P P P P P S Ref Lvi Offset 8.65 dB Ref Level 20.00 dBm MKr5 2.399 960 GHz -24.18 dBm Span 105.000000 MHz Span Ref Level 20.00 dBm -24.18 dBm Swept Span Zaro Span Full Span Start Freq 2.0000000 GHz	ettings





PART 3: CONDUCTED SPURIOUS EMISSION

TEST RESULTS TABLE

Test Mode	Test Channel	Result	Verdict
	LCH	Refer to the Test Graph	PASS
BLE-1M	MCH	Refer to the Test Graph	PASS
	HCH	Refer to the Test Graph	PASS
	LCH	Refer to the Test Graph	PASS
BLE-2M	MCH	Refer to the Test Graph	PASS
	HCH	Refer to the Test Graph	PASS



TEST GRAPHS

For 1M Part:

Test Mode	Channel	Verdict
BLE	LCH	PASS

LCH SPURIOUS EMISSION_30MHz~1GHz pectrum Analyzer 1 vept SA Ö + Frequency KEYSIGHT Input RF out Ζ: 50 Ω ter Frequer Corrections: Off Freq Ref: Int (S) Avg|Hold: 30/ Trig: Free Ru 515.000000 MHz Alian: Aut ррррр LUI Span 970.000000 MHz Mkr1 800.67 MH Ref LvI Offset 8.65 dB Ref Level 15.00 dBm -47.23 dBn /Div 10 dB Swept Span Zero Span Start Freq 30.000000 MHz Stop Freq 1.000000000 GHz AUTO TUNE CF Step 97.000000 MHz Auto Man req Offse 0 Hz X Axis Scal tart 0.0300 GHz Res BW 100 kHz #Video BW 300 kHz Stop 1.0000 GHz weep 94.0 ms (30001 pts) Log Lin モア C* エア Apr 24, 2023 🗩 X Signal Track

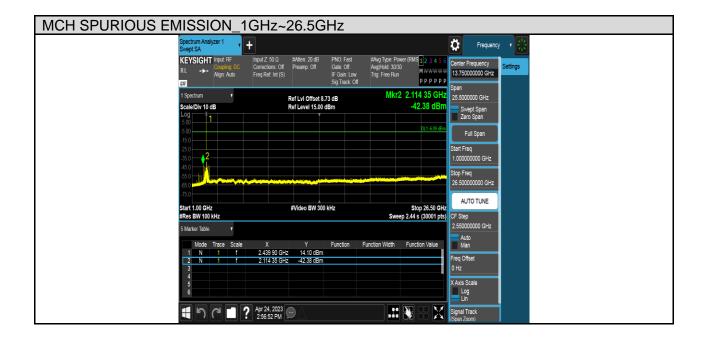




Test Mode	Channel	Verdict
BLE	MCH	PASS

MCH SPURIOUS EMISSION_30MHz~1GHz

Spectrum / Swept SA	Analyzer 1 +			Frequency v
		#Atten: 20 dB PNO: Fast Preamp: Off Gate: Off IF Gain: Low Sig Track: Off	#Avg Type: Power (RMS 1 2 3 4 5 6 Avg Hold: 30/30 Trig: Free Run P P P P P P	Center Frequency 515.000000 MHz Span
1 Spectrum Scale/Div Log		Ref Lvi Offset 8.73 dB Ref Level 15.00 dBm	Mkr1 813.34 MHz -47.30 dBm	970.000000 MHz Swept Span Zero Span
5.00			Di 1.6.19.15m	Full Span Start Freq
-15.0				30.000000 MHz Stop Freq 1.000000000 GHz
-35.0			1	AUTO TUNE CF Step
-55 0 -65 0 <mark>1909</mark>	n article and forward play with the south forward to			97.000000 MHz Auto Man Freq Offset
-75 0 Start 0.03		#Video BW 300 kHz	Stop 1.0000 GHz	0 Hz X Axis Scale
#Res BW	7 100 kHz 7 C 2:55:28 PM	ÐA	Sweep 94.0 ms (30001 pts)	Lin Signal Track (Span Zoom)





Frequency 🕇 🗦

Test Mode	Channel	Verdict
BLE	НСН	PASS

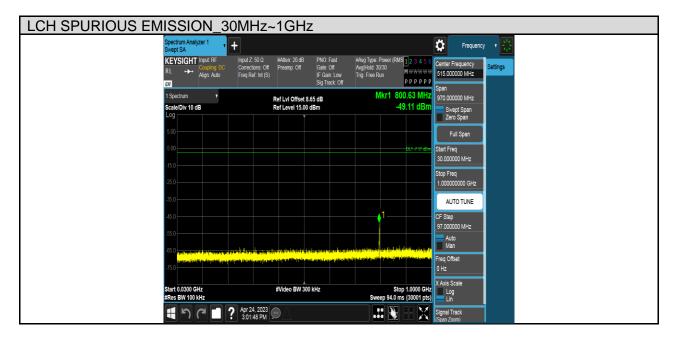
HCH SPURIOUS EMISSION_30MHz~1GHz

KEYSIGH RL ↔ ⊠	Coupling: DC	Input Z: 50 Ω Corrections: Off Freq Ref: Int (S)	#Atten: 20 dB Preamp: Off	PNO: Fast Gate: Off IF Gain: Low Sig Track: Off	#Avg Type: Power (Avg Hold: 30/30 Trig: Free Run	M******* PPPPPP	515.000000 MHz	Settings	
1 Spectrum Scale/Div 10 Log	r dB		Ref LvI Offset 8 Ref Level 15.00			826.69 MHz -46.50 dBm	Span 970.000000 MHz Swept Span Zero Span		
5.00							Full Span		
-5.00							Start Freq 30.000000 MHz		
-25.0							Stop Freq 1.000000000 GHz		
-35.0					 1		AUTO TUNE CF Step		
-55.0							97.000000 MHz		
-65.0				nglenstigten steration (* 1	n pátra is la bian de na para a composition de		Man Freq Offset		
Start 0.0300			#Video BW 30	0 kHz		Stop 1.0000 GHz	0 Hz X Axis Scale Log		
#Res BW 10		Apr 24, 2023 2:58:43 PM			Sweep 94.	0 ms (30001 pts)	Lin Signal Track (Span Zoom)		





Test ModeChannelVerdictBLELCHPASS







Test Mode	Channel	Verdict
BLE	MCH	PASS

MCH SPURIOUS EMISSION_30MHz~1GHz

			_			
Spectru Swept 1	ım Analyzer 1 🛛 🕇 🕇				Frequency 🔹	te te
KEYS RL RU	Coupling: DC C	put Z: 50 Ω #Atten: 20 dB orrections: Off Preamp: Off req Ref: Int (S)	PNO: Fast Gate: Off IF Gain: Low Sig Track: Off	#Avg Type: Power (RMS 1 2 3 4 5 6 Avg Hold: 30/30 Trig: Free Run P P P P P P	Center Frequency 515.000000 MHz	
	irum v Div 10 dB	Ref Lvi Offset 8 Ref Level 15.00		Mkr1 813.31 MHz -47.32 dBm	Swept Span	
Log – 5.00 –					Zero Span Full Span	
-5.00 <u>-</u> -15.0 -				DI 1-6.00 dBm	Start Freq 30.000000 MHz	
-25.0 -					Stop Freq 1.000000000 GHz	
-35.0 - -45.0 -				1	AUTO TUNE CF Step	
-55.0 —					97.000000 MHz Auto Man	
-65.0 . -75.0	land film til i Vitanus transform film film Historie Indensitieren er i State film film	Mananga panganga Kong Pri paka Ali na Kanaka Pangan pangangan pangangan pangahinta ana di Pr	n fan sjerke sterne in finster In fan sjerke sterne in finster		Freq Offset 0 Hz	
	.0300 GHz W 100 kHz	#Video BW 300	0 kHz	Stop 1.0000 GHz Sweep 94.0 ms (30001 pts)	X Axis Scale Log Lin	
		Apr 24, 2023 3:04:34 PM			Signal Track (Span Zoom)	

