

FCC 47 CFR PART 15 SUBPART C

CERTIFICATION TEST REPORT

For

CONSUMER CAMERA

MODEL NUMBER: IPC-F26FEP

ADDITIONAL MODEL NUMBER: IPC-F26FEP-0280B-imou; IPC-F26FEP-0360B-imou; IPC-F26FEN-0280B-imou; IPC-F26FEN-0360B-imou; IPC-F26FEP-imou; IPC-F26FEN-imou; IPC-F26FEN

PROJECT NUMBER: 4790350228-3

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Prepared for

Hangzhou Huacheng Network Technology Co., Ltd

Prepared by

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Revision History

Rev.	Issue Date	Revisions	Revised By
V0	05/18/2022	Initial Issue	



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1. ATTESTATION OF TEST RESULTS

Company Name: Address:	Hangzhou Huacheng Network Technology Co., Ltd No.2930, Nanhuan Road, Binjiang District, Hangzhou, China
Manufacturer Information	No.2330, Namuar Koad, Dinjiang District, Hangzhou, Omna
Company Name:	Hangzhou Huacheng Network Technology Co., Ltd
Address:	No.2930, Nanhuan Road, Binjiang District, Hangzhou, China
EUT Description	
Product Name:	CONSUMER CAMERA
Model Name:	IPC-F26FEP
Additional No.:	IPC-F26FEP-0280B-imou; IPC-F26FEP-0360B-imou;
	IPC-F26FEN-0280B-imou; IPC-F26FEN-0360B-imou;
	IPC-F26FEP-imou; IPC-F26FEN-imou; IPC-F26FEN
Model Difference:	Their electrical circuit design, layout, components used and internal
	wiring are identical, only the color and model name is different.
	The model IPC-F26FEP was selected as the representative model
	for compliance test.
Sample Number:	4807774
Data of Receipt Sample:	Mar. 29, 2022
Date Tested:	Mar. 29, 2022 ~ May. 17, 2022

APPLICABLE STANDARDS				
STANDARD	TEST RESULTS			
CFR 47 Part 15 Subpart C	PASS			



es Test Results (a) (2) Complied
(b) (2) Complied
(b) (3) Complied
17 (e) Complied
17 (d) Complied
17 (d) 209 Complied 205
207 Complied

FCC CFR 47 Part 2, FCC CFR 47 Part 15C > when <Accuracy Method> decision rule is applied.

Prepared By:

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2. TEST METHODOLOGY

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

3. FACILITIES AND ACCREDITATION

Test Location	UL-CCIC Company Limited, EMC&RF Lab
Address	No. 2, Chengwan Road, Suzhou Industrial Park, Suzhou 215122, China
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.

Note 1: All tests measurement facilities use to collect the measurement data are located at No. 2, Chengwan Road, Suzhou Industrial Park, Suzhou 215122, People's Republic of 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 based on KDB 414788.

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)	3.9dB (1GHz-18Gz)			
	4.2dB (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

Product Name:	CONSUMER CAMERA
Model No.:	IPC-F26FEP
Operating Frequency:	IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz IEEE 802.11n(HT40): 2422MHz to 2452MHz
Type of Modulation:	IEEE for 802.11B: DSSS (CCK, DQPSK, DBPSK) IEEE for 802.11G: OFDM (BPSK, QPSK, 16QAM, 64QAM)) IEEE for 802.11N(HT20 and HT40): OFDM (BPSK, QPSK, 16QAM, 64QAM)
Channels Step:	Channels with 5MHz step
Test software of EUT:	SecureCRT (manufacturer declare)
Antenna Type:	Rod Antenna
Antenna Gain:	Antenna1: 1.79 dBi Antenna2: 1.79 dBi
	Remark: This data is provided by customer and our lab isn't responsible for this data



5.2. MAXIMUM OUTPUT POWER

Number of Transmit Chains	IEE Std. 802.11	Channel Number	Max AV Conducted Power (dBm)			
(NTX)	122 Std. 602.11	Channer Number	Ant 1 Ant2		Total	
1	IEEE 802.11b	1-11[11]	16.26	/	/	
1	IEEE 802.11g	1-11[11]	16.09	/	/	
1/2	IEEE 802.11n HT20	1-11[11]	15.03	14.87	17.96	
1/2	IEEE 802.11n HT40	3-9[7]	14.43	14.46	17.46	

5.3. CHANNEL LIST

	Channel List for 802.11b/g/n (20 MHz)								
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)		
1	2412	4	2427	7	2442	10	2457		
2	2417	5	2432	8	2447	11	2462		
3	2422	6	2437	9	2452				

Channel List for 802.11n (40 MHz)								
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	
3	2422	5	2432	7	2442	9	2452	
4	2427	6	2437	8	2447			

5.4.	TEST CHANNEL CONFIGURATION	
------	----------------------------	--

Test Mode	Test Channel	Frequency
WiFi TX (802.11b)	CH1, CH6, CH11	2412MHz, 2437MHz, 2462MHz
WiFi TX (802.11g)	CH1, CH6, CH11	2412MHz, 2437MHz, 2462MHz
WiFi TX (802.11n HT20)	CH1, CH6, CH11	2412MHz, 2437MHz, 2462MHz
WiFi TX (802.11n HT40)	CH3, CH6, CH9	2422MHz, 2437MHz, 2452MHz

5.5. THE WORSE CASE POWER SETTING PARAMETER

The V	The Worse Case Power Setting Parameter under 2400 ~ 2483.5MHz Band							
Test Software				Secur	e CRT			
	Transmit			Test C	Channel			
Modulation Mode	Antenna	1	NCB: 20MHz			NCB: 40MHz		
Mode	Number	CH 1	CH 6	CH 11	CH 3	CH 6	CH 9	
802.11b	1	default	default	default				
802.11g	1	default	default	default				
802.11n HT20	1/2	default default default						
802.11n HT40	1/2		/		default	default	default	



5.6. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)	Directional gain(dBi)
1	2400-2483.5	Rod antenna	1.79	4.9
2	2400-2483.5	Rod antenna	1.79	4.8

Note:

1) Directional gain= $10\log [(10^{G1/20} + 10^{G2/20})^2/N_{ANT}] = 4.8 \text{ dBi}$

2) N_{ANT}: the number of Antenna

3) For this product, it has two antennas, antenna1 and antenna2, but only the 802.11N HT20 and 802.11N HT40 modes can support both the SISO and MIMO technical. For the modes of 11B&11G only the antenna1 is working.

Test Mode	Transmit and Receive Mode	Description
IEEE 802.11b	⊠1TX, 1RX	Antenna1 can be used as transmitting/receiving antenna independently.
IEEE 802.11g	⊠1TX, 1RX	Antenna1 can be used as transmitting/receiving antenna independently.
IEEE 802.11N (HT20) MIMO	⊠2TX, 2RX	Antenna1 or Antenna2 can be used as transmitting/receiving antenna independently.
IEEE 802.11N (HT20) MIMO	⊠2TX, 2RX	Antenna1 or Antenna2 can be used as transmitting/receiving antenna independently.

Remark:

- For this product, it has two antennas, antenna1 and antenna2, only the 802.11N HT20 and 802.11N HT40 modes can support both the SISO and MIMO technical. For the modes of 11B&11G only the antenna1 is working.
- For the 11N mode (including the 11N HT20 SISO,11N HT20 MIMO,11N HT40 SISO,11N HT40 MIMO), pre-testing all test modes, only the worst case modes is included in this report.

5.7. THE WORSE CASE CONFIGURATIONS

For the product, there two transmission antennas, and pre-testing both of them, only the worse data for the antenna is recorded in the report.

Worst-case data rates as provided by the client were:

802.11b mode: 1 Mbps 802.11g mode: 6 Mbps 802.11n HT20 mode: MCS0 802.11n HT40 mode: MCS0



5.8. TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests		
Relative Humidity	55 ~ 65%		
Atmospheric Pressure:	101kPa		
Temperature	TN	21 ~ 28°C	
	VL	N/A	
Voltage:	VN	AC 120V	
	VH	N/A	

Note: VL= Lower Extreme Test Voltage VN= Nominal Voltage VH= Upper Extreme Test Voltage TN= Normal Temperature



5.9. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	Description
1	Laptop	ThinkPad	E550c	N/A
2	Fixed Frequency Board	N/A	N/A	Supply by UL Lab
3	Adaptor	HONOTO	ADS-12AM-12 12012EPCU	INPUT: 100-240V~50/60Hz Max. 0.3A OUTPUT: 12.0V-1.0A

I/O PORT

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	USB	USB	USB to TTL	100cm Length (Supply by UL Lab)	/
2	RJ45	RJ45	LAN Cable	100cm Length (Supply by UL Lab)	/

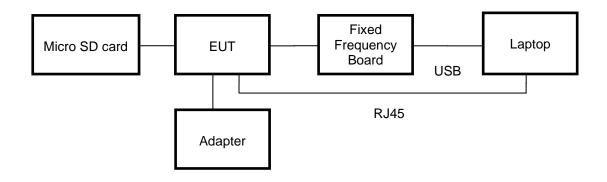
ACCESSORY

Item	Accessory	Brand Name	Model Name	Description
1	Micro SD card	Sandisk	A1	32GB

TEST SETUP

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

SETUP DIAGRAM FOR TESTS





5.10. MEASURING INSTRUMENT AND SOFTWARE USED

Conducted Emissions (Instrument)									
Used	Equipment	Manufacturer	Mo	del No.	Seri	al No.	Upper Last Cal.	Last Cal.	Next Cal.
\checkmark	EMI Test Receiver	R&S	E	SR3	12	6700	2020-12-05	2021-12-04	2022-12-03
\checkmark	Two-Line V-Network	R&S	E١	V216	12	6701	2020-12-05	2021-12-04	2022-12-03
V	Artificial Mains Networks	R&S	E	NY81	12	6711	2020-10-13	2021-10-12	2022-10-11
				Soft	ware				
Used	Des	cription		Ma	inufac	turer	Name	Version	
\checkmark	Test Software for (Conducted distur	bance		R&S	5	EMC32	Ver. 9.25	
		Ra	diate	d Emissi	ions (Instrum	nent)		
Used	Equipment	Manufacturer	Mo	del No.	Seri	al No.	Upper Last Cal.	Last Cal.	Next Cal.
\checkmark	Spectrum Analyzer	Keysight	NS	9010B	15	5727	2021-05-09	2022-04-09	2023-04-08
\checkmark	EMI test receiver	R&S	E	SR26	12	6703	2020-12-05	2021-12-04	2022-12-03
\checkmark	Receiver Antenna (9kHz-30MHz)	Schwarzbeck	FMZ	ZB 1513	15	5456	2018-06-15	2021-06-03	2022-06-02
\checkmark	Receiver Antenna (30MHz-1GHz)	SunAR RF Motion		JB1	17	7821	2019-01-19	2022-01-18	2025-01-17
\checkmark	Receiver Antenna (1GHz-18GHz)	R&S	HF907		12	6705	2019-01-27	2022-02-28	2025-02-27
\checkmark	Receiver Antenna (18GHz-26.5GHz)	Schwarzbeck	BBHA9170		12	6706	2019-02-29	2022-02-28	2025-02-27
	Pre-amplification (To 18GHz)	Compliance Direction System Inc.	PAP-1G18-50		17	7825	2021-03-26	2022-03-01	2023-02-28
\checkmark	Pre-amplification (To 26.5GHz)	R&S	SC	U-26D	13	5391	2020-12-05	2021-12-04	2022-12-03
	Band Reject Filter	Wainwright	235 2483.	RCJV8- 0-2400- 5-2533.5- I0SS		1	2021-05-09	2022-05-08	2023-05-07
V	Highpass Filter	Wainwright	270	IKX10- 0-3000- 00-40SS		2	2021-05-09	2022-05-08	2023-05-07
				Soft	ware				
Used		ription		Manufac			Name	Version	
\checkmark	Test Software for R	adiated disturbar		Tonsce			TS+	Ver. 2.5	
			C	Other ins	trum	ents			
Used	Equipment	Manufacturer	Model No.		Seri	al No.	Upper Last Cal.	Last Cal.	Next Cal.
\checkmark	Spectrum Analyzer	Keysight	NS	9010B	15	5368	2021-05-09	2022-04-09	2023-04-08
\checkmark	Power Meter	Keysight	U2	021XA	15	5370	2021-05-09	2022-04-09	2023-04-08



6. MEASUREMENT METHODS

No.	Test Item	KDB Name	Section
1	6dB Bandwidth and 99% Bandwidth	KDB 558074 D01 15.247 Meas Guidance v05r02	8.2
2	Conducted Output Power	KDB 558074 D01 15.247 Meas Guidance v05r02	8.3.2.3 (Method AVG PM)
3	Power Spectral Density	KDB 558074 D01 15.247 Meas Guidance v05r02	8.4 (Method PK PSD)
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

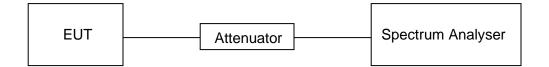
<u>LIMITS</u>

None; for reporting purposes only

PROCEDURE

FCC KDB 558074 Zero-Span Spectrum Analyzer Method

TEST SETUP



RESULTS

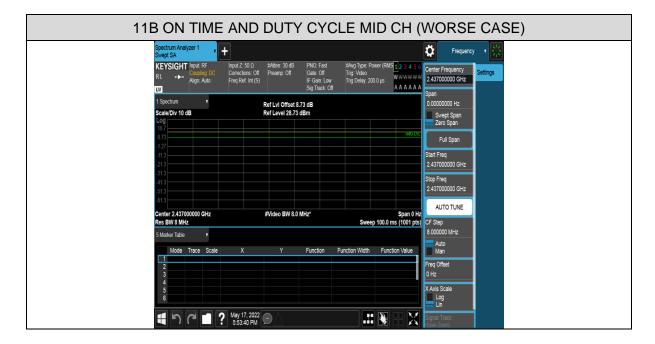
Mode	On Time (msec)	Period (msec)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (db)	1/T Minimum VBW (kHz)
11B	100	100	1	100	0	0.01
11G	100	100	1	100	0	0.01
11N HT20	100	100	1	100	0	0.01
11N HT40	100	100	1	100	0	0.01

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

- 2) Where: x is Duty Cycle (Linear)
- 3) Where: T is On Time (transmit duration)
- 4) Pre-testing Antenna 1 and Antenna 2, and pre-testing SISO and MIMO modes, only the data of worse case is shown in this test repot.



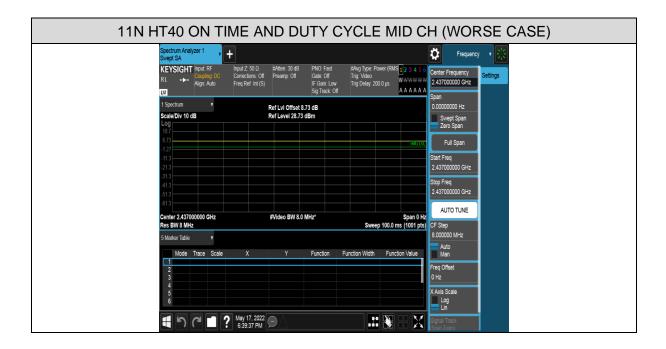
TEST GRAPHS







11N HT20 ON TIME AND DUTY CYCLE MID C	H (WORSE CASE)
Spectrum Analyzer 1 τ + Swept SA KEYSIGHT Input RF Input Z 50 Ω #Atten: 30 dB PNO: Fast #Avg Type: Power (RMS 1 2 3 4 5 6	Center Frequency
RL →→ Align Auto Freq Ref. Int (S) Sig Track Off Data Off AA A A A A	
1 Spectrum • Ref Lvi Offset 8,73 dB Scale/Div 10 dB Ref Level 28,73 dBm Log	0.00000000 Hz Swept Span
107 107 107 107	Zero Span Full Span
-113 -213 -213	Start Freq 2.43700000 GHz
-313 -413 -513	Stop Freq 2.43700000 GHz
-613 Center 2,437000000 GHz #Video BW 8.0 MHz' Span 0 Hz Res BW 8 MHz Sweep 100.0 ms (1001 pts)	AUTO TUNE CF Step
5 Marker Table •	8.00000 MHz
Mode Trace Scale X Y Function Function Width Function Value	Man Freq Offset DHz
4 5 6	X Avis Scale
📲 🏷 🥂 🗖 ? May 17, 2022 🗩 🛄 📰 🔛 🗶	Lin Signal Track Usaa Zoom)





7.2. 6 dB BANDWIDTH

LIMITS

FCC Part15 (15.247) Subpart C			
Section Test Item Limit Frequency Range (MHz)			
FCC 15.247(a)(2)	6dB Bandwidth	>= 500kHz	2400-2483.5

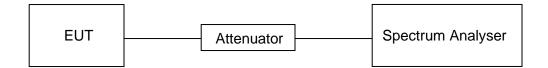
TEST PROCEDURE

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

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	100 kHz
VBW	≥3 × RBW
Trace	Max hold
Sweep	Auto couple

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





RESULTS

Test Mode	Test Antenna	Test Channel	6dB bandwidth (MHz)	Result
		LCH	10.04	Pass
11B	Antenna 1	MCH	10.04	Pass
		HCH	10.08	Pass
		LCH	16.52	Pass
11G	Antenna 1	MCH	16.52	Pass
		HCH	16.52	Pass
		LCH	17.72	Pass
	Antenna 1	MCH	17.76	Pass
11N20 MIMO		HCH	17.68	Pass
		LCH	17.72	Pass
	Antenna 2	MCH	17.68	Pass
		HCH	17.76	Pass
		LCH	36.32	Pass
	Antenna 1	MCH	36.32	Pass
11N40 MIMO		HCH	36.32	Pass
		LCH	36.32	Pass
	Antenna 2	MCH	36.32	Pass
		HCH	36.32	Pass

Remark:

1) For this product, it has two antennas, antenna 1 and antenna 2, but only the 802.11N HT20 and 802.11N HT40 modes can support both the SISO and MIMO technical. But for the modes of 11B &11G, only the antenna 1 is working.

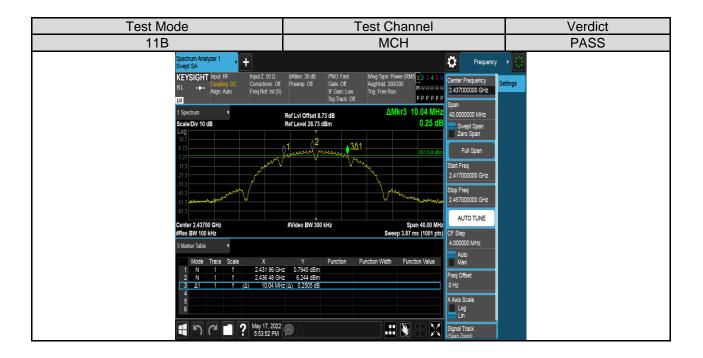
2) Through pre-testing all the test modes of 11N 20 and 11N40, including SISO and MIMO, but only the data if worse case is included in this test report.



TEST GRAPHS

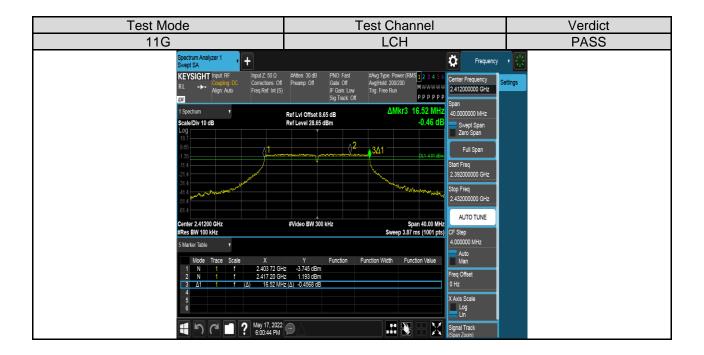
Antenna 1:





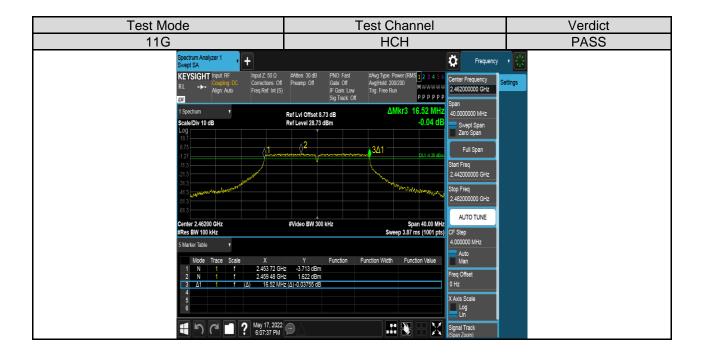


Test Mode	Test Channel	Verdict
11B	НСН	PASS
Spectrum Analyzer 1 Swept SA KEYSIGHT Input RF RL →→ Align: Auto COTECTIONS OF Freq Ref. Int (S)		• 🔀
1 Spectrum Scale Div 10 dB Log	Ref Lvl Offset 8.73 dB ΔMkr3 10.08 MHz 40.0000000 MHz Ref Level 28.73 dBm 0.75 dB Swept Span Zero Span	
873 1.27 -113	1 CL1034.660 Full Span V™u Start Freq	
213 313 413 513	2.44200000 GHz Stop Freq 2.45200000 GHz	
Center 2.46200 GHz #Res BW 100 kHz	#Video BW 300 kHz Span 40.00 MHz AUTO TUNE Sweep 3.87 ms (1001 pts) CF Step	
5 Marker Table Mode Trace Scale X	Y Function Function Width Function Value Auto zz 0.4374 dBm Man Man	
2 N 1 f 2.46144 G 3 Δ1 1 f (Δ) 10.08 M 4	iz 6.335 dBm Freq Offset [z (Δ): 0.7491 dB 0 Hz	
5	X Avis Scale Log Lin	
May 17, 2022	Contract (Span Zoom)	



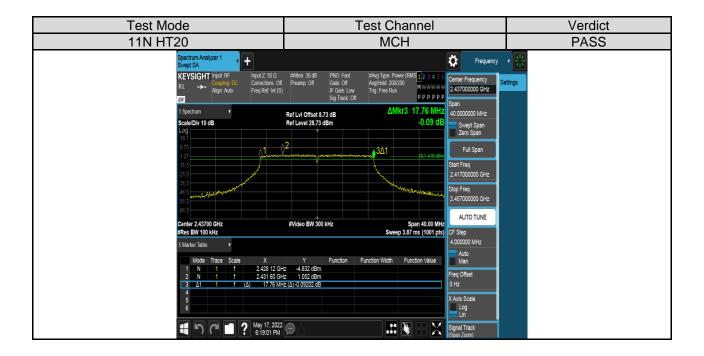


Test Mode	Test Channel	Verdict
11G	MCH	PASS
Spectrum Analyzer 1 ↓ + Swept SA KEYSIGHT Input RF RL →→ Align Auto Freq Ref. Int (s) LU	#Atten: 30 dB PNO: Fast #Avg Type: Power (RMS] 2 3 4 5 6 Preamp: Off Gate: Off AvgHold: 200200 IF Gain: Low Ting: Free Run P P P P P P Sig Track: Off Sean Low San Power P P P P P P	• 🐹
	Ref Lvi Offset 8.73 dB △MKr3 16.52 MHz 40.000000 MHz Ref Level 28.73 dBm 0.01 dB Swept Span Zero Span	
673 .127 .113 .213	2 3∆1 211-177 der Stat Freq 2.41700000 GHz	
313 413 513 613	Stop Freq 2.45700000 GHz	
Center 2.43700 GHz #Res BW 100 KHz	#Video BW 300 KHz Span 40.00 MHz Sweep 3.87 ms (1001 pts) 4.000000 MHz	
	Y Function Function Width Function Value Man	
	2 (J) 001454 dB Freq Offset 0 Hz VANIS Scale	
。 ・ ・ ・ ・ ・ ・ ・ ・ ・ ・ ・ ・ ・		
4 -) (-) (6 .04:18 PM	Designal Track (Span Zoom)	





Test Mode	Test Channel	Verdict
11N HT20	LCH	PASS
Spectrum Analyzer 1 Snept SA KEVSIGHT Input RF RL + Align Audo Correctors Off Freq Ref Int (S)		• Kings
1 Spectrum Scale/Div 10 dB	Ref Lvi Offset 8.65 dB ΔMkr3 17.72 MHz 40000000 MHz Ref Level 28.65 dBm -0.05 dB Swept Span Zero Span Zero Span	
8.65 1.35	2 Full Span Start Freq	
214 314 414	2.35200000 GHz Stop Freq	
5.14 6.1.4 Center 2.41200 GHz	#Video BW 300 kHz Span 40.00 MHz ALTO TUNE	
Senier z+1z0 or Z #Res BW 100 kHz 5 Marker Table ▼ Mode Trace Scale X	www.edu Swi sou knz System 300 kmz CF Step Sweep 3.87 ms (1001 pt) 4.000000 MHz 4.000000 MHz Y Function Function Wath Function Value	
1 N 1 f 2.403 12 GH 2 N 1 f 2.403 12 GH 3 Δ1 f (Δ) 17.72 MH 4	z 4.753 dBm z 1.006 dBm Freq Offset z (Δ)-0.05404 dB U Hz	
5 6	X Avis Scale Log Lin	
May 17, 2022 6:11:18 PM	💬 🔄 👬 🔛 🔛 🔛 Signal Track (Span Zoom)	





Test Mode	Test Channel	Verdict
11N HT20	НСН	PASS
Spectrum Analyzer 1 Swept SA KEYSIGHT Input RF RL →→ Agm Auto Contections Off Freq Ref. Int (S)	IF Gain: Low Trig: Free Run P P P P P P Sig Track: Off Soan	۱ 😥
1 Spectrum v Scale/Div 10 dB Log	Ref Lvl Offset 8.73 dB ΔMkr3 17.68 MHz 40.0000000 MHz Ref Level 28.73 dBm -0.69 dB Swept Span Zero Span	
873 4.27 	2 3Δ1 2156 @ Full Span 2 tart Freq 2 tart Straft	
-1.3 313 413 513 613	244200000 GHz	
Center 2.46200 GHz #Res BW 100 KHz	#Video BW 300 kHz Span 40.00 MHz Span 40.00 KHz Sweep 3.87 ms (1001 pts) CF Step 4.000000 MHz	
5 Marker Table v Mode Trace Scale X 1 N 1 f 2453 15 GH	Y Function Function Width Function Value	
2 Ν 1 f 245912 G+ 3 Δ1 1 f (Δ) 17.88 M+ 4	z (0.8400 dBm Freq Offset z (Δ) -0.6942 dB 0 Hz	
5	X Avis Scale Log Lin	
H つ で 且 ? May 17, 2022 62632 PM 62632 62632 PM 62632 62632 PM 62632 6	💬 🔄 👬 🔛 🔛 Signal Track (Span Zoom)	





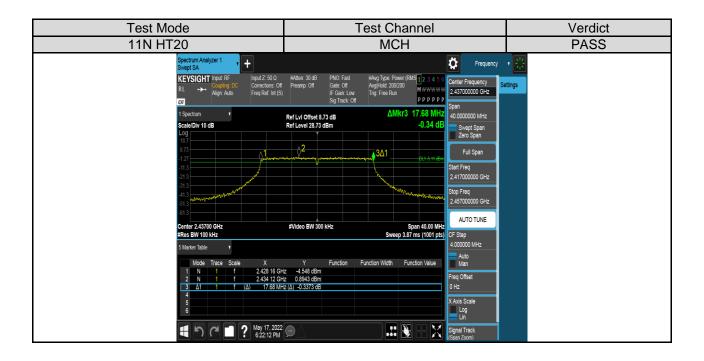
Test Mode	Test Channel	Verdict
11N HT40	MCH	PASS
Spectrum Analyzer 1 Swept SA KEYSIGHT Input RF RL →→ Align Auto KI SA	#Atten: 30 dB PNO Fast #Avg Type: Power (RMS] 2 3 4 5 6 Preamp: Off Gate: Off AvgHold: 200200 IF Gain: Low Trig: Fae Run P P P P P P P Sig Track: Off Span	• 🔀
	Ref Lvi Offset 8.73 dB ΔMkr3 36.32 MHz 80.000000 MHz Ref Level 28.73 dBm 0.42 dB Swept Span Zero Span Zero Span Zero Span	
0.73 -1.27 -113 -2.15	2 Full Span Start Freq 2.39700000 GHz	
313 -413 -513 -613	Stop Freq 2.47700000 GHz	
Center 2.43700 GHz #Res BW 100 kHz 5 Marker Table v	#Video BW 300 KHz Span 80.00 MHz Sweep 7.67 ms (1001 pts) 8.000000 MHz	
Mode Trace Scale X 1 N 1 f 2.418 84 GH	Y Function Function Width Function Value Man	
	1.2.103.0m Freq Offset -2.733 dBm 0 Hz 0 Hz XAvis Scale	
6		
H つ で 目 ? May 17, 2022 639 51 PM 639 51 P	💬 III Signal Track (Span Zoom)	





Antenna 2:

Test Mode	Test Channel	Verdict
11N HT20	LCH	PASS
Spectrum Analyzer 1 ↓ + Swept 3A KEYSIGHT Input: RF RL →→ Align: Auto Corrections: Of Freq Ref: Int (S	#Atten: 30.dB PNO Fast. #Avg Type. Power (RMS 2.3.4.5.4 Center Frequency Preamp. Off Gate Off AvgHeid 200200 IF Gan Low Trg. Free Run W WWW WW 2.412000000 GHz Set So Track Off So Track Off Set	1 International Action of the
1 Spectrum v Scale/Div 10 dB Log	Amiliar Amiliar T.72 MHz Span Ref Level 28.65 dBm -1.16 dB Sweet Span Sweet Span Zero Span Zero Span Zero Span	
8.65 -1.35 -11.4 -21.4	2 3Δ1 Rt 3 6 cm Stat Freq 2.38200000 GHz	
314 414 514	Stop Freq 2.43200000 GHz	
Center 2.4.1200 GHz #Res BW 100 KHz 5 Marker Table •	#Video BW 300 kHz Span 40.00 HHz Sweep 3.87 ms (1001 pts) CF Step 4.000000 MHz 4.000000 MHz 4.000000000 MHz 4.0000000 MHz 4.0000000 MHz 4.000000 MHz 4.0000000 MHz 4.0000000 MHz 4.000000000 MHz 4.0000000000 MHz 4.0000000000 MHz 4.00000000000000 MHz 4.000000000000000000000000000000000000	
2 N 1 f 2.409 12 G	Y Function Function Wath izz -4.149 dBm Freq Offset Freq Offset izz 0.539 dBm 0 Hz 0 Hz izz 0.539 dBm 0 Hz 0 Hz izz 0.539 dBm 0 Hz 0 Hz	



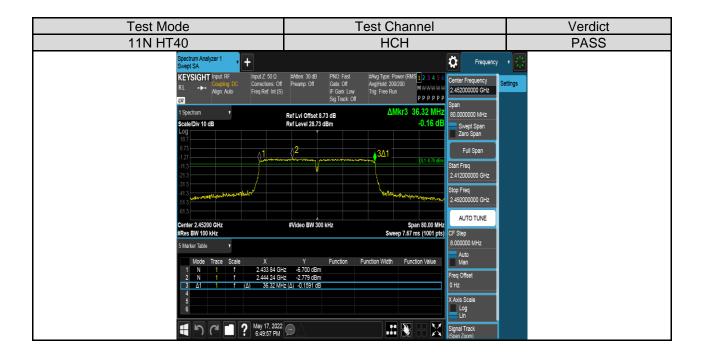


Test Mode	Test Channel	Verdict
11N HT20	НСН	PASS
Spectrum Analyzer 1 Swept SA KEYSIGHT Input RF RL → Align: Auto Freq Ref. Int (S)	IF Gain: Low Trig: Free Run P P P P P P Soan	۱ 🔀
1 Spectrum Scale Div 10 dB Log 10	Ref Lvi Offset 8.73 dB ΔMkr3 17.76 MHz 40.000000 MHz Ref Level 28.73 dBm -0.05 dB Swept Span Zero Span Zero Span Zero Span	
873 473 -127 -113	Ç ² S∆1 Full Span Start Freq	
213 313 413	2.44200000 GHz	
513 613 Center 2.46200 GHz	#Video BW 300 KHz Span 40.00 MHz	
#Res BW 100 kHz 5 Marker Table • Mode Trace Scale X	Sweep 3.87 ms (1001 pts) CF Step 4 000000 MHz 4 000000 MHz Y Function Width Function Value	
1 N 1 f 2.453 12 GF 2 N 1 f 2.459 12 GF	iz - 5.166 dBm iz - 0.7731 dBm Σ (Δ)-0.04771 dB 0 Hz	
5	X Avis Scale Log Lin	
May 17, 2022 628.51 PM	💬 🛆 👬 👬 👬 🔛 🔀 Signal Track (Shan Zoom)	





Test Mode	Test Channel	Verdict
11N HT40	MCH	PASS
Spectrum Analyzer 1 Swept SA KEYSIGHT Input RF RL →→ Align Auto EV	IF Gain: Low Trig: Free Run P P P P P P Sig Track Off Soan	• 🔀
1 Spectrum v Scale/Div 10 dB Log 10	Ref Lvi Offset 8.73 dB ΔMkr3 36.32 MHz 60.000000 MHz Ref Level 28.73 dBm 0.21 dB Swept Span Zero Span Zero Span	
8.73 -1.27 +1.3	2 Full Span Start Freq	
213	2.39700000 GHz	
-41.3 .51.3 4 protocols .2000 4 protocols .400	2.47700000 GHz	
Center 2.43700 GHz #Res BW 100 kHz	#Video BW 300 kHz Span 80.00 MHz AUTO TUNE Sweep 7.67 ms (1001 pts) CF Step	
5 Marker Table Mode Trace Scale X	Y Function Function Width Function Value -7.083 dBm	
2 N 1 f 2.429 24 GH	: -2.756 dBm Freq Offset (Δ) 0.2141 dB 0 Hz	
5 6	X Avis Scale	
4 5 C I ? May 17,2022 64306 PM	💬 🔄 📰 🔛 🔛 🔀 Signal Track (Shara Zoom)	





7.3. CONDUCTED POWER

LIMITS

FCC Part15 (15.247) Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	
FCC 15.247(b)(3)	Output Power	1 watt or 30dBm	2400-2483.5	
1)If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.				

TEST PROCEDURE

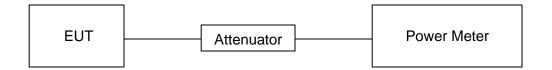
Place the EUT on the table and set it in the transmitting mode.

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Power sensor.

Measure the power of each channel.

AVG Detector use for AVG result.

TEST SETUP





RESULTS

Test Mode	Test Antenna	Test Channel	Measurement Output Power (AV)	10log(1/x) Factor	Maximum Conducted Output Power (AV)	Verdict
			dBm	dBm	dBm	
		LCH	15.71	0	15.71	Pass
11B	Antenna 1	MCH	16.03	0	16.03	Pass
		HCH	16.26	0	16.26	Pass
		LCH	15.59	0	15.59	Pass
11G	Antenna 1	MCH	16.09	0	16.09	Pass
		HCH	15.91	0	15.91	Pass
		LCH	14.73	0	14.73	Pass
	Antenna 1	MCH	15.03	0	15.03	Pass
		HCH	14.64	0	14.64	Pass
		LCH	14.43	0	14.43	Pass
11N20 MIMO	Antenna 2	MCH	14.87	0	14.87	Pass
		HCH	14.66	0	14.66	Pass
	_	LCH	17.59	0	17.59	Pass
	Antenna 1+2	MCH	17.96	0	17.96	Pass
	112	HCH	17.66	0	17.66	Pass
		LCH	14.23	0	14.23	Pass
	Antenna 1	MCH	14.43	0	14.43	Pass
		HCH	14.36	0	14.36	Pass
		LCH	14.23	0	14.23	Pass
11N40 MIMO Antenna 2	Antenna 2	MCH	14.46	0	14.46	Pass
		HCH	14.33	0	14.33	Pass
	_	LCH	17.24	0	17.24	Pass
	Antenna 1+2	MCH	17.46	0	17.46	Pass
	1+2	HCH	17.36	0	17.36	Pass

Remark:

1) For all the test results has been adjusted the duty cycle factor.

2) For Correction Factor is refer to the result in section 7.1

3) For this product, it has two antennas, antenna1 and antenna2, but only the 802.11N HT20 and 802.11N HT40 modes can support both the SISO and MIMO technical. But for the modes of 11B &11G, only the antenna 1 is working.

4) Through pre-testing all the test modes of 11N 20 and 11N40, including SISO and MIMO, but only the data if worse case is included in this test report.



7.4. POWER SPECTRAL DENSITY

LIMITS

FCC Part15 (15.247) Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	
FCC §15.247 (e)	Power Spectral Density	8 dBm in any 3 kHz band	2400-2483.5	
1)If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.				

TEST PROCEDURE

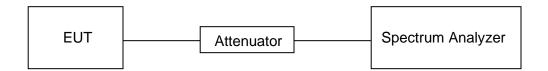
Refer to FCC KDB 558074, connect the UUT to the spectrum analyser and use the following settings:

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 SETUP





RESULTS

Test Mode	Test Antenna	Test Channel	Maximum Peak power spectral density(dBm/30kHz)	Verdict
		LCH	0.75	Pass
11B	Antenna 1	MCH	1.05	Pass
		HCH	1.29	Pass
		LCH	-1.44	Pass
11G	Antenna 1	MCH	-1.07	Pass
		HCH	-1.25	Pass
		LCH	-2.18	Pass
	Antenna 1	MCH	-1.84	Pass
		HCH	-2.23	Pass
	Antenna 2	LCH	-2.41	Pass
11N20 MIMO		MCH	-2.02	Pass
		HCH	-2.23	Pass
		LCH	0.72	Pass
	Antenna 1+2	MCH	1.08	Pass
		HCH	0.78	Pass
		LCH	-5.51	Pass
	Antenna 1	MCH	-5.62	Pass
		HCH	-5.59	Pass
		LCH	-5.50	Pass
11N40 MIMO	Antenna 2	MCH	-5.44	Pass
		HCH	-5.65	Pass
		LCH	-2.49	Pass
	Antenna 1+2	MCH	-2.52	Pass
		HCH	-2.61	Pass

Remark:

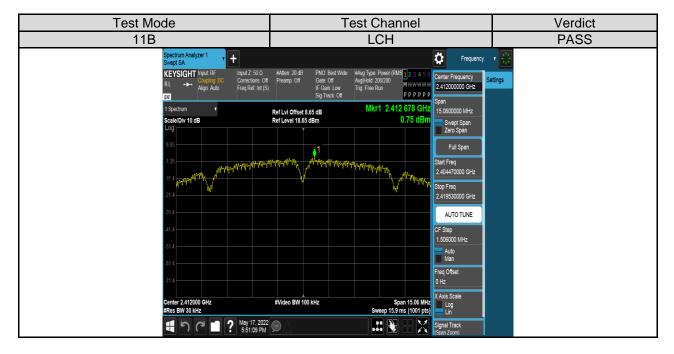
1) For this product, it has two antennas, antenna1 and antenna2, but only the 802.11N HT20 and 802.11N HT40 modes can support both the SISO and MIMO technical. But for the modes of 11B &11G, only the antenna 1 is working.

2) Through pre-testing all the test modes of 11N 20 and 11N40, including SISO and MIMO, but only the data if worse case is included in this test report.

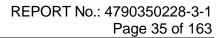


TEST GRAPHS

Antenna 1:



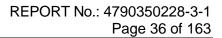






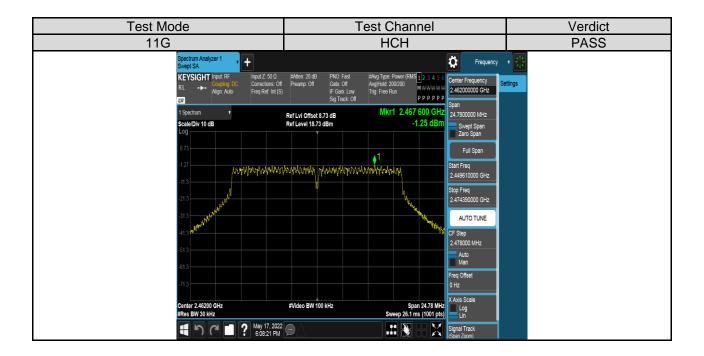
Test Mode	Test Channel	Verdict
11B	НСН	PASS
Spectrum Analyzer 1 Swept 2A KEYSIGHT Input RF RL + Align Auto Comentions C Fires Ref Int (1 Spectrum) IF Gain: Low Trig: Free Run P P P P P P Sig Track: Off Vert 2, 46200000 GHz Span	۲ <mark>بنی</mark> tings
Scale Div 10 dB	Ref Lvi Offset 8.73 dB MKT 2.452 680 GHZ 15.1200000 MHz Ref Level 18.73 dBm 1.29 dBm Swept Span Zero Span	
873 127 	1 	
-113 gr 114 117 1	2.4544000 GHz	
313	AUTO TUNE CF Site	
-513	1.51200 MHz 4.151200 MHz Man	
-713	Freq Offset 0 Hz	
Center 2.462000 GHz #Res BW 30 kHz	#Video BW 100 kHz Span 15.12 MHz Log Sweep 16.0 ms (1001 pts)	
📢 🏷 🍽 ? May 17. 202 5.57:52 PM	2 💬 🔤 🔛 🔛 🔛 Signal Track (Span Zoom)	

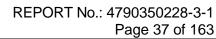






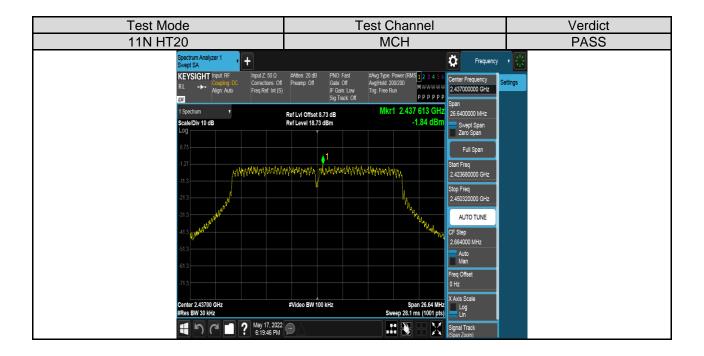
Test Mode	Test Channel	Verdict
11G	MCH	PASS
Spectrum Analyzer 1 Swept SA KEYSIGHT Input RF RL Ager Auto Comment Inc.		1 Ings
1 Spectrum Scale/Div 10 dB Log	Ref Lvi Offset 8.73 dB Mkr1 2.442 600 GHz 24,780000 MHz Ref Level 18,73 dBm -1.07 dBm Swept Span Zero Span Zero Span	
6.73 1.27 -113	1 Full Span Start Freq 2.424610000 GHz	
-21.3	Stop Freq 2.445390000 GHz	
413 <mark>4^{3 497}</mark>	2.478000 MHz Auto Man	
-513	Freq Offset 0 Hz	
Center 2.43700 GHz #Res BW 30 kHz	#Video BW 100 kHz Span 24.78 MHz Log Sweep 26.1 ms (1001 pts)	
📕 🏷 (7) 🔳 ? May 17, 2027 6.05.02 PM	2 💬 🔤 🔛 🔛 🔛 Signal Track (Span Zoom)	

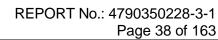






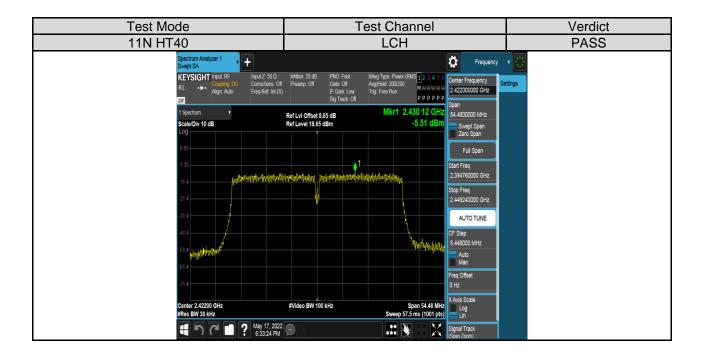
Test Mode	Test Channel	Verdict
11N HT20	LCH	PASS
Spectrum Analyzer 1 Swept SA KEVSIGHT Input RF Counted DC RL ++ Align Audo Corrections Of Freq Ref. Int (S		1 tings
1 Spectrum Scale/Div 10 dB Log	Ref Lvi Offset 8.65 dB Mkr1 2.412 611 GHz 265600000 MHz 255600000 MHz Swept Span Swept Span Zero Span	
-11.35 	Full Span Start Freq 2.398710000 GHz	
-21.4	Stop Freq 2.42520000 GHz	
414 and a state of the state of	AUTO TUNE CF Step 2.656000 MHz Auto	
-51.4	Man Freq Offset 0 Hz	
Center 2.41200 GHz #Res BW 30 KHz	#Video BW 100 kHz Span 26.58 MHz Log Sweep 28.1 ms (1001 pts)	
E 7 C I ? May 17, 2022 6:12:03 PM	2 💬 🛆 👬 👬 👬 🔛 🔀 Signal Track (Sean Zoom)	





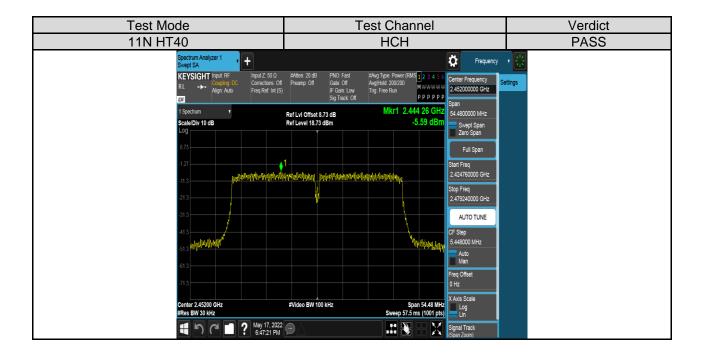


Test Mode	Test Channel	Verdict
11N HT20	НСН	PASS
Spectrum Analyzer 1 + Swept SA + KEVSIGHT Input RF RL ->→ Align: Auto Freq Ref. Int (5		• Kings
1 Spectrum Scale/Div 10 dB Log	Ref Lvi Offset 8,73 dB Mkr1 2.462 610 GHz 26,520000 MHz Ref Level 18,73 dBm -2.23 dBm Swept Span Zero Span	
873 -127 -113	Full Span Start Freq 2.445740000 GHz	
-213 -213 -313	Stop Freq 2.475280000 GHz	
413 000000	AUTO TUNE 2 65000 MHz Auto	
.613 .713	Man Freq Offset 0 Hz	
Center 2.46200 GHz #Res BW 30 kHz	#Video BW 100 kHz Span 26.52 MHz Log Sweep 28.0 ms (1001 pts) Lin	
E n n n n n n n n n n n n n n n n n n n	2 💬 🔄 🔛 🔛 🔛 Signal Track (Span Zoom)	





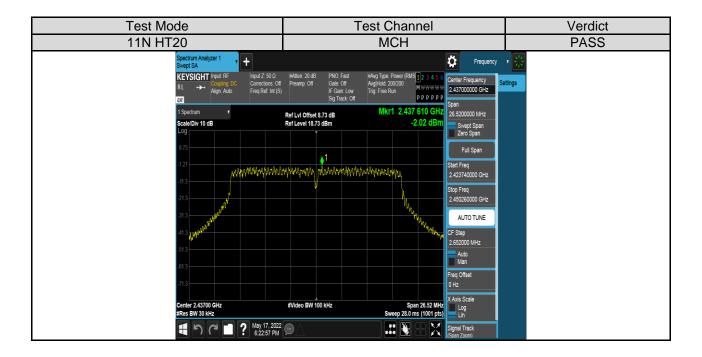
Test Mode	Test Channel	Verdict
11N HT40	MCH	PASS
Spectrum Analyzer 1 Swept SA KEYSIGHT Input RF RL → KEYSIGHT Cooping DC Align: Audo Freq Ref. Int (S) U	IF Gain Low Trig: Free Run P P P P P P Soan Soan Soan	۲ <mark>کی</mark>
1 Spectrum v Scale/Div 10 dB Log	Ref Lvl Offset 8.73 dB Mkr1 2.445 12 GHz 54.4800000 MHz Ref Level 18.73 dBm -5.62 dBm Swept Span Zero Span	
8 73 -1 27	Full Span	
-11.3	유사님님니()()() 전 10,000 GHz 유사님님()()() 전 10,000 GHz 2,464240000 GHz	
-413	AUTO TUNE CF Step 5.448000 MHz	
-513	Yon yokano miz	
-71 3 Center 2.43700 GHz	0 Hz X Avis Scale	
#Res BW 30 kHz	Sweep 57.5 ms (1001 pts)	
	Sweep 57.5 ms (1001 pts)	

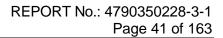




Antenna 2:

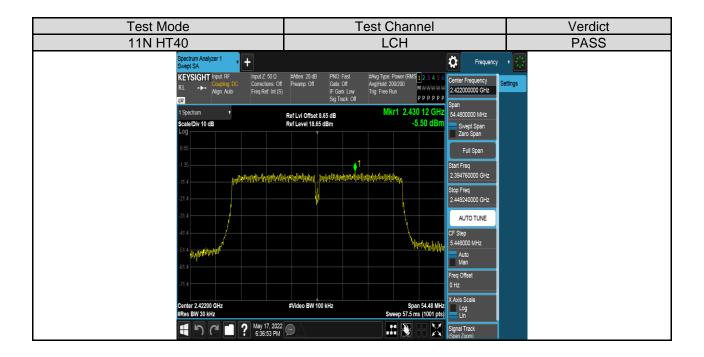
Test Mode	Test Channel	Verdict
11N HT20	LCH	PASS
Spectrum Analyzer 1 V Swept SA KEYSIGHT Input RF Common DC RL Agra Audo	#Atten: 20 dB PNO. Fast #Avg Type: Power (RMS 2 3 4 5 6 Preamp: Off Gate: Off AvgHoid: 200200 Center Frequency Se	• 😿
1 Spectrum Scale Div 10 dB Log	Ref Lvil Offset 8,65 dB Mkr1 2.412 611 GHz 26,580000 MHz Ref Level 18,65 dBm -2.41 dBm Swept Span Zero Span Zero Span	
8.65	Full Span	
-1.30 -11.4 MARKARANDARI	2.396710000 GHz	
-214	Stop Freq 2.42520000 GHz	
-41.4 Hope Section 2014	AUTO TUNE CF Sisp 2.655000 MHz	
514	Auto	
-71.4	Freq Offset 0 Hz X Avis Scale	
Center 2.41200 GHz #Res BW 30 kHz	#Video BW 100 kHz Span 26.58 MHz Log Sweep 28.1 ms (1001 pts)	
	💬 👬 🔛 🔛 🔀 Signal Track (Span Zoom)	





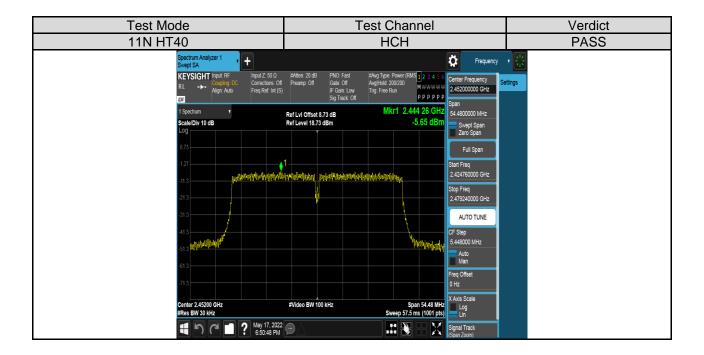


Test Mode	Test Channel	Verdict
11N HT20	НСН	PASS
Spectrum Analyzer 1 Swept SA KEYSIGHT Input RF RL → Input RF Align Auto V	#Atten: 20 dB PNO: Fast #Avg Type: Power (RMS12 3 4 5 6 Contra Foreward)	• 🔀
	Ref Lvi Offset 8.73 dB Mkr1 2.462 613 GHz Span Span <th< td=""><td></td></th<>	
873 -127 -113		
-21.3	Stop Freq 2.475320000 GHz	
-413	AUTO TUNE CF Step 2.64000 MHz Auto Man	
	Freq Offset 0 Hz X Axis Scale	
Center 2.46200 GH2 #Res BW 30 kHz C	#Video BW 100 kHz Span 26.64 WHz Log Sweep 28.1 ms (1001 pts) Lin Span 26.00 kHz Span 27.00 kHz	





Test Mode	Test Channel	Verdict
11N HT40	MCH	PASS
Spectrum Analyzer 1 + KEYSIGHT Input RF RL → Coopting OC 1 Spectrum * Scale/Div 10 dB Log 0.73	#Atten 20 dB PNO Fast #Avg Type Power (RMS] 12 3 4 5 6 Center Frequency Pearing: Off Gale: Off Augited: 202020 Center Frequency Center Frequen	rASS
-1.27 -11.3 -21.3 -31.3	Stat Freq 2:40976000 GHz Stop Freq 2:45240000 GHz AUTO TUNE	
-413 -513 provide a state of the state of th	CF Step S 448000 MHz Auto Man Freq Offset	
713 Center 2.43700 GHz #Res BW 30 kHz Image: Control of the state of the	#Video BW 100 kHz Span 51.48 MHz Log Sweep 57.5 ms (100 rbs) Compared to the state of the state	





7.5. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS

<u>LIMITS</u>

FCC Part15 (15.247) Subpart C			
Section	Test Item	Limit	
FCC §15.247 (d)	Conducted Bandedge and Spurious Emissions	At least 30 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:

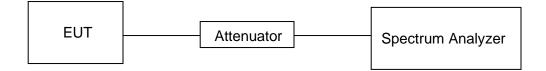
Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	100 kHz
VBW	≥3 × RBW
Span	1.5 x DTS bandwidth
Trace	Max hold
Sweep time	Auto couple.

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

Span	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





PART 1: REFERENCE LEVEL MEASUREMENT

TEST RESULTS TABLE

Test Mode	Test Antenna	Test Channel	Result[dBm]
11B	Antenna 1	LCH	5.83
		MCH	6.19
		HCH	6.42
	Antenna 1	LCH	1.11
11G		MCH	1.72
		HCH	1.55
	Antenna 1	LCH	0.27
		MCH	0.68
11N20 MIMO		HCH	0.65
	Antenna 2	LCH	0.58
		MCH	0.91
		HCH	0.87
11N40 MIMO	Antenna 1	LCH	-2.95
		MCH	-2.78
		HCH	-3.09
	Antenna 2	LCH	-2.98
		MCH	-2.83
		HCH	-2.84

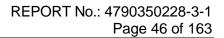


TEST GRAPHS

Antenna 1:









Test Mode		Channel	
11B		НСН	
Spectrum Analyzer 1 + Swept SA		Frequency • 🔆	
Coupling: DC	Input Z: 50 Ω #Atten: 30 dB PNO: Best W Corrections: Off Preamp: Off Gate: Off Freq Ref: Int (S) IF Gain: Low Sig Track: Off	AvgiHold: 200/200 MWWWWW 2.452000000 GHz	
1 Spectrum v Scale Div 10 dB Log	Ref LvI Offset 8.73 dB Ref Level 28.73 dBm	Mkr1 2.461 471 GHz 6.42 dBm Swept Span Zero Span	
187 873 -127	nunnun 1	Full Span Start Freq 2.454440000 GHz	
-127 -113 -213		Stop Freq 2.45550000 GHz AUTO TUNE	
313 413		CF Step 1.512000 MHz Auto Man	
513 413		Freq Offset 0 Hz	
Center 2.462000 GHz #Res BW 100 kHz	#Video BW 300 kHz	Span 15.12 MHz Sweep 1.47 ms (1001 pts)	
■ ? ? ■ ?	May 17, 2022 💭 🛆	Signal Track (Span Zoom)	

