

# CFR 47 FCC PART 15 SUBPART C

# **TEST REPORT**

For

### **IP Camera**

### MODEL NUMBER: IPC2124LR3-F40W-D

### ADDITIONAL NUMBER: IPC2124LR3-F60W-D, IPC2124LR3-F28W-D · IPC2124LR3-F40W-D-NB,IPC2124LR3-F60W-D-NB,IPC2124LR3-F28W-D-NB

### FCC ID: 2AL8S-0235C3KD

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Prepared for

### Zhejiang Uniview Technologies Co., Ltd.

Prepared by

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			Revision History		
Rev.	Issue Date	Revisions			Revised By
V0	07/03/2019	Initial Issue			



	Summary of Test Results									
Clause	Test Items	FCC/IC Rules	Test Results							
1	6dB Bandwidth	FCC Part 15.247 (a) (2)	Pass							
2	Peak Conducted Output Power	FCC Part 15.247 (b) (3)	Pass							
3	Power Spectral Density	FCC Part 15.247 (e)	Pass							
4	Conducted Bandedge and Spurious Emission	FCC Part 15.247 (d)	Pass							
5	Radiated Bandedge and Spurious Emission	FCC Part 15.247 (d) FCC Part 15.209 FCC Part 15.205	Pass							
6	Conducted Emission Test For AC Power Port	FCC Part 15.207	Pass							
7	Antenna Requirement	FCC Part 15.203	Pass							



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# 1. ATTESTATION OF TEST RESULTS

#### **Applicant Information**

Company Name: Address:

Zhejiang Uniview Technologies Co., Ltd. 88 JIANGLING RD, BINJIANG DISTRICT, HANGZHOU, ZHEJIANG 310051 CHINA

#### **Manufacturer Information**

Company Name: Address:

Zhejiang Uniview Technologies Co., Ltd. 88 JIANGLING RD, BINJIANG DISTRICT, HANGZHOU, ZHEJIANG 310051 CHINA

#### **Factory Information**

Factory 1: Company Name: Address:

Zhejiang Uniview Systems Technology Co., Ltd. No.1277 South Qingfeng South Road, Tongxiang City, Jiaxing City

# Factory 2:

Company Name: Address:

Factory 3: Company Name: Address:

### **EUT Description**

EUT Name: Model: Additional Number

Sample Status: Sample Received Date: Date of Tested:

TDG Technology Co.,Ltd. YATAI ROAD NO.1, NANHU DISTRICT, JIAXING, ZHEJIANG, 314050, CHINA

SUZHOU QIAOXIN ELECTRONIC Technology Co., Ltd. NO.77, YITANG ROAD, ECONOMIC DEVELOPMENT ZONE, WUJIANG DISTRICT, SUZHOU JIANGSU CHINA

**IP** Camera IPC2124LR3-F40W-D IPC2124LR3-F60W-D, IPC2124LR3-F28W-D, IPC2124LR3-F40W-D-NB,IPC2124LR3-F60W-D-NB,IPC2124LR3-F28W-D-NB 2290751 May 16, 2019 May 16~ June 10, 2019



APPLICABLE STANDARDS					
STANDARD TEST RESULTS					
CFR 47 FCC PART 15 SUBPART C	PASS				

Prepared By:

Tom Tang

Checked By:

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Approved By:

Scholl Zhang

Scholl Zhang Laboratory Leader



# 2. TEST METHODOLOGY

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

# 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
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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, 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.

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 recognize 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	3.80dB		
Radiation Emission test(include Fundamental emission) (9KHz-30MHz)	3.32dB		
Radiation Emission test(include Fundamental emission) (30MHz-1GHz)	3.27dB		
Radiation Emission test (1GHz to 26GHz)( include Fundamental emission)	3.72dB (1GHz-18Gz)		
	4.11dB (18GHz-26Gz)		
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

EUT Name	IP Camera
Model	IPC2124LR3-F40W-D
Radio Technology	IEEE802.11b/g/n HT20&HT40
Operation frequency	IEEE 802.11b: 2412MHz—2462MHz IEEE 802.11g: 2412MHz—2462MHz IEEE 802.11n HT20: 2412MHz—2462MHz IEEE 802.11n HT40: 2422MHz—2452MHz
Modulation	IEEE 802.11b: DSSS(CCK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK) IEEE 802.11n HT40: OFDM (64QAM, 16QAM, QPSK,BPSK)
Power Supply	DC 12V

#### Remark:

Model No.:

Number	Name	Number	Name	Number:	Name
1	1 IPC2124LR3- 2		IPC2124LR3-	2	IPC2124LR3-
1	F40W-D	2	F60W-D	3	F28W-D
1	IPC2124LR3-	5	IPC2124LR3-		IPC2124LR3-
4	F40W-D-NB	5	F60W-D-NB		F28W-D-NB

Only the main model IPC2124LR3-F40W-D is tested and only the data of this model is shown in this test report. Since have the same technical construction including circuit diagram, PCB Layout, components and component layout, all electrical construction and mechanical construction with IPC2124LR3-F40W-D. The difference lies only for model designation, different sales markets and consumer.



# 5.2. MAXIMUM OUTPUT POWER

Number of Transmit Chains (NTX)	IEE Std. 802.11	Frequency (MHz)	Channel Number	Max PK Conducted Power (dBm)
1	IEEE 802.11b	2412-2462	1-11[11]	12.86
1	IEEE 802.11g	2412-2462	1-11[11]	18.07
1	IEEE 802.11nHT20	2412-2462	1-11[11]	17.97
1	IEEE 802.11nHT40	2422-2452	3-9[7]	19.08

# 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	Channel Frequency (MHz) Channel Frequenc y(MHz) Channel Frequency (MHz) Channel Frequency (MHz) Channel (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)	CH 1, CH 6, CH 11	2412MHz, 2437MHz, 2462MHz
WiFi TX(802.11g)	CH 1, CH 6, CH 11	2412MHz, 2437MHz, 2462MHz
WiFi TX(802.11n HT20)	CH 1, CH 6, CH 11	2412MHz, 2437MHz, 2462MHz
WiFi TX(802.11n HT40)	CH 3, CH 6, CH 9	2422MHz, 2437MHz, 2452MHz

# 5.5. THE WORSE CASE CONFIGURATIONS

The W	The Worse Case Power Setting Parameter under 2400 ~ 2483.5MHz Band								
Test Softw	vare		SecureCRT						
т	Transmit			Test C	Channel				
Modulation Mode	Antenna	NCB: 20MHz			NCB: 40MHz				
Wiode	Number	CH 1	CH 6	CH 11	CH 3	CH 6	CH 9		
802.11b	1	N/A	N/A	N/A					
802.11g	1	N/A	N/A N/A N/A			/			
802.11n HT20	1	N/A N/A N/A							
802.11n HT40	1		/		N/A	N/A	N/A		



# 5.6. DESCRIPTION OF AVAILABLE ANTENNAS

Antenna	Frequency (MHz)	Antenna Type	MAX Antenna Gain (dBi)
1	2412-2462	External Antenna	2.69

Test Mode	Transmit and Receive Mode	Description
IEEE 802.11b	⊠1TX, 1RX	ANT 1 can be used as transmitting/receiving antenna.
IEEE 802.11g	⊠1TX, 1RX	ANT 1 can be used as transmitting/receiving antenna.
IEEE 802.11n HT20	⊠1TX, 1RX	ANT 1 can be used as transmitting/receiving antenna.
IEEE 802.11n HT40	⊠1TX, 1RX	ANT 1 can be used as transmitting/receiving antenna.

# 5.7. THE WORSE CASE CONFIGURATIONS

For the product, there is only one transmission antenna, so only the worst data for the antenna is recorded in the report.

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

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



# 5.8. DESCRIPTION OF TEST SETUP

#### SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	P/N
1	Laptop	ThinkPad	E550c	N/A

#### I/O CABLES

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

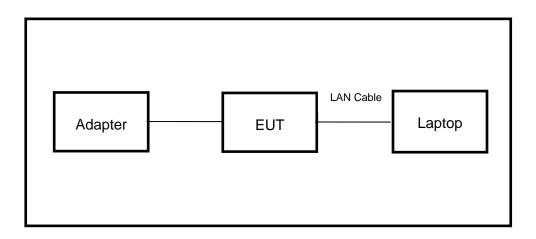
#### ACCESSORIES

Item	Accessory	Brand Name	Model Name	Description
1	Adapter	GUCF	UWP-24W-1220T	N/A

#### TEST SETUP

The EUT can work in engineering mode with a software through a Laptop.

#### SETUP DIAGRAM FOR TESTS





# 6. MEASURING INSTRUMENT AND SOFTWARE USED

		Cor	nducted	Emis	sions (Instrur	nent)		
Used	Equipment	Manufacturer	Model	No.	Serial No.	Upper Last Cal.	Last Cal.	Next Cal.
$\checkmark$	EMI Test Receiver	R&S	ESR	3	126700	2017-12-14	2018-12-13	2019-12-12
$\checkmark$	Two-Line V-Network	R&S	ENV2	16	126701	2017-12-14	2018-12-13	2019-12-12
$\checkmark$	Artificial Mains Networks	R&S	ENY8	31	126711	2017-12-14	2018-12-13	2019-12-12
				Soft	ware			
Used	Des	cription		Ма	nufacturer	Name	Version	
$\checkmark$	Test Software for (	Conducted distur	bance		R&S	EMC32	Ver. 9.25	
		Ra	diated E	miss	<b>ions (</b> Instrum	ent)		
Used	Equipment	Manufacturer	Model	No.	Serial No.	Upper Last Cal.	Last Cal.	Next Cal.
$\checkmark$	Spectrum Analyzer	Keysight	N9010		MY57110128	2018-05-30	2019-05-29	2020-05-28
$\checkmark$	EMI test receiver	R&S	ESR2	26	1267603	2017-12-14	2018-12-13	2019-12-22
	Receiver Antenna (9kHz-30MHz)	Schwarzbeck	FMZB 1	513	513-265	2018-06-17	2019-06-16	2020-06-15
	Receiver Antenna (30MHz-1GHz)	SunAR RF Motion	JB1		126704	N/A	2019-01-28	2022-01-27
$\checkmark$	Receiver Antenna (1GHz-18GHz)	R&S	HF907		126705	2018-01-27	2019-01-26	2020-01-26
	Receiver Antenna (18GHz-26.5GHz)	Schwarzbeck	BBHA9170		126706	2018-02-07	2019-02-06	2020-02-05
$\checkmark$	Receiver Antenna (26.5GHz-40GHz)	ΤΟΥΟ	HAP 26-	40W	00000012	2017-07-26	2018-07-25	2019-07-24
$\checkmark$	Pre-amplification (To 1GHz)	R&S	SCU-0	3D	134666	2018-02-07	2019-02-06	2020-02-05
$\checkmark$	Pre-amplification (To 18GHz)	TDK	PA-02-0	)118	TRS-305- 00066	2017-12-12	2018-12-11	2019-12-10
$\checkmark$	Pre-amplification (To 26.5GHz)	R&S	SCU-2	6D	134668	2018-02-07	2019-02-06	2020-02-05
	Band Reject Filter	Wainwright	WRCJ 2350-24 2483.5-25 40SS	400- 533.5-	1	2018-05-30	2019-05-29	2020-05-28
V	Highpass Filter	Wainwright	WHKX 2700-30 18000-4	000-	2	2018-05-30	2019-05-29	2020-05-28
				Soft	ware			
Used	Desci	ription	Ma	nufac	turer	Name	Version	
$\checkmark$	Test Software for R	adiated disturbar	nce T	onsce	end	JS32	V1.0	
			Oth	er ins	truments			
Used	Equipment	Manufacturer	Model	No.	Serial No.	Upper Last Cal.	Next Cal.	
	Spectrum Analyzer	Keysight	N9010	)B	MY57110128	2018-05-30	2019-05-29	2020-05-28
$\checkmark$	Power Meter	Keysight	U2021	XA	MY57110002	2018-06-13	2019-06-12	2020-06-11



# 7. MEASUREMENT METHODS

No.	Test Item	KDB Name	Section
1	6dB Bandwidth	KDB 558074 D01 15.247 Meas Guidance v05r02	8.2
2	Peak Output Power	KDB 558074 D01 15.247 Meas Guidance v05r02	8.3.1.3/8.3.2.3
3	Power Spectral Density	KDB 558074 D01 15.247 Meas Guidance v05r02	8.4
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



# 8. ANTENNA PORT TEST RESULTS

# 8.1. ON TIME AND DUTY CYCLE

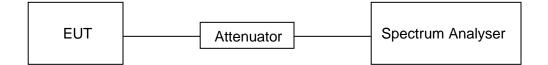
#### LIMITS

None; for reporting purposes only

#### PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method

#### TEST SETUP



#### **TEST ENVIRONMENT**

Temperature	20°C	Relative Humidity	56%
Atmosphere Pressure	101kPa	Test Voltage	DC 12V

#### **RESULTS**

Mode	On Time (msec)	Period (msec)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (db)	1/T Minimum VBW (KHz)	Final setting For VBW (KHz)
11B	100.3	100.3	1	100%	0	0.01	0.01
11G	100.3	100.3	1	100%	0	0.01	0.01
11N20	100.3	100.3	1	100%	0	0.01	0.01
11N40	100.3	100.3	1	100%	0.	0.01	0.01

Note:

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

Where: x is Duty Cycle (Linear)

Where: T is On Time

If that calculated VBW is not available on the analyzer then the next higher value should be used.

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Spectrum Anal Swept SA	yzer 1	+					Frequen	cy y 🕌
(EYSIGHT RL ↔ ₪ Spectrum	Input: RF Coupling: DC Align: Auto/No RF	Input Z: 50 Ω Corrections: Off Freq Ref: Int (S)	#Atten: 40 dB Preamp: Off	PNO: Fast Gate: Off IF Gain: Low Sig Track: Off	#Avg Type: Pow Trig: Free Run	wer (RMS <mark>1</mark> 2 3 4 5 6 W <del>WWWWW</del> A A A A A A A	Center Frequency 2.437000000 GHz Span 0.0000000 Hz	Settings
cale/Div 10 c			Ref Level 23.00	dBm			Swept Span Zero Span	
3.0 .00 .00			ريجي				Full Span	
							Start Freq 2.437000000 GHz	
37.0 47.0 57.0							Stop Freq 2.437000000 GHz	
enter 2.4370	000000 GHz		#Video BW 8.0 I	MHz*		Span 0 Hz	AUTO TUNE	
es BW 8 MH Marker Table					Sweep	0 100.3 ms (8001 pts)		
Marker Table Mode	Trace Scale	X	Y	Function F	Function Width	Function Value	Auto Man	
1 2 3							Freq Offset 0 Hz	
4 5 6							X Axis Scale Log Lin	
15		May 18, 2019				N - X	Signal Track	





pectrum Analyzer wept SA	'' <b>'</b> +						Frequent	sy y 🕌
	ut: RF upling: DC gn: Auto/No RF	Input Ζ: 50 Ω Corrections: Off Freq Ref: Int (S)	#Atten: 40 dB Preamp: Off	PNO: Fast Gate: Off IF Gain: Low Sig Track: O	Trig: Free Run	wer (RMS <mark>1</mark> 2 3 4 5 6 W <del>WWWW</del> A A A A A A	2.437000000 GHz	Settings
Spectrum	•						0.00000000 Hz	
cale/Div 10 dB			Ref Level 23.00	dBm			Swept Span Zero Span	
3.00							Full Span	
17.0 27.0 37.0							Start Freq 2.437000000 GHz	
17.0 57.0							Stop Freq 2.437000000 GHz	
enter 2.4370000	00 GHz		#Video BW 8.0	MH7*		Span 0 Hz	AUTO TUNE	
es BW 8 MHz					Sweep	0 100.3 ms (8001 pts)	CF Step	1
Marker Table Mode Tra	v ce Scale	X	Y	Function	Function Width	Function Value	8.000000 MHz Auto Man	
2 3 4							Freq Offset 0 Hz	
5							X Axis Scale Log Lin	



pectrum Analyzer 1 wept SA	<b>+</b> •							Ö	Frequency	一邊
EYSIGHT Inpu L +++ Cou Align	pling: DC	Input Ζ: 50 Ω Corrections: Off Freq Ref: Int (S)	#Atten: 40 dB Preamp: Off	PNO: Fast Gate: Off IF Gain: Low Sig Track: Off		₩₩	₩₩₩₩ А А А А	Center Fre 2.4370000 Span		Settings
Spectrum	v		B-61100.00	-17				0.000000		
cale/Div 10 dB			Ref Level 23.00	dBm				Swept		
								Full	Span	
7.0								Start Freq 2.4370000	000 GHz	
7.0								Stop Freq 2.4370000	000 GHz	
enter 2.43700000	) CH7		#Video BW 8.0 I	MH7*		Sr.	oan 0 Hz	AUTO	TUNE	
es BW 8 MHz Marker Table	v v			<b>MI 12</b>	Sweep	o 100.3 ms (8		CF Step 8.000000	MHz	
Mode Trac	e Scale	Х	Y	Function	Function Width	Function V	'alue	Auto Man		
2 3 4								Freq Offse 0 Hz	t	
5 6								X Axis Sca Log Lin	le	



# 8.2. 6 dB DTS BANDWIDTH

#### <u>LIMITS</u>

CFR 47 FCC Part15 (15.247) Subpart C					
Section Test Item Limit Frequency Range (MHz)					
CFR 47 FCC 15.247(a)(2)	6 dB Bandwidth	≥ 500KHz	2400-2483.5		

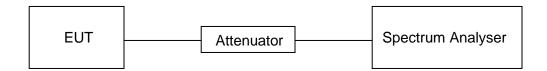
#### TEST PROCEDURE

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	100K
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 to the maximum level measured in the fundamental emission.

#### TEST SETUP





#### TEST ENVIRONMENT

Temperature	20°C	Relative Humidity	56%
Atmosphere Pressure	101kPa	Test Voltage	DC 12V

#### **RESULTS**

#### 8.2.1. 802.11b MODE

Channel	6dB bandwidth (MHz)	Limit (kHz)	Result
Low	9.061	≥500	Pass
Middle	9.075	≥500	Pass
High	9.055	≥500	Pass

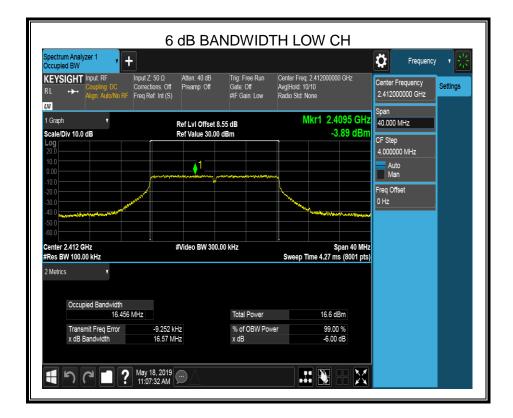






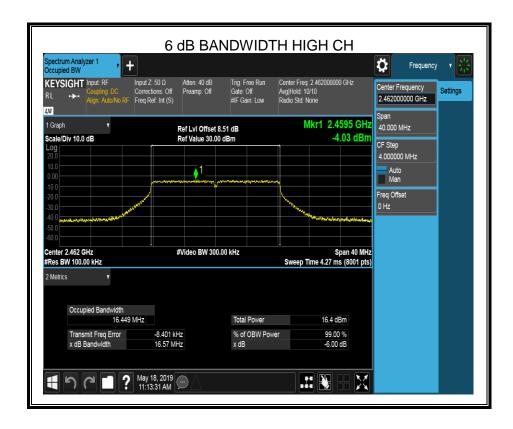
# 8.2.2. 802.11g MODE

Channel	6dB bandwidth (MHz)	Limit (kHz)	Result
Low	16.57	≥500	Pass
Middle	16.57	≥500	Pass
High	16.57	≥500	Pass







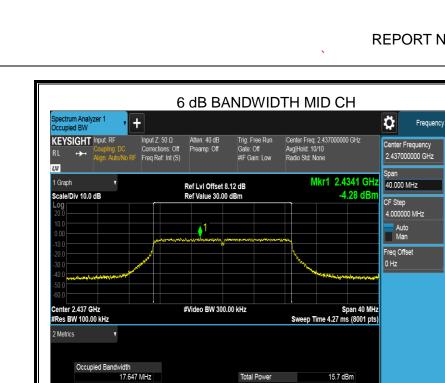


# 8.2.3. 802.11n HT20 MODE

Channel	6dB bandwidth (MHz)	Limit (kHz)	Result
Low	17.77	≥500	Pass
Middle	17.75	≥500	Pass
High	17.78	≥500	Pass



Settings



12.955 kHz

17.75 MHz

May 18, 2019 ...

Transmit Freq Error

x dB Bandwidth

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Total Power

x dB

% of OBW Power

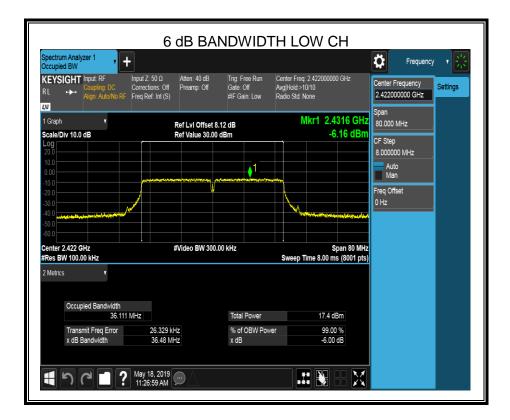
15.7 dBm

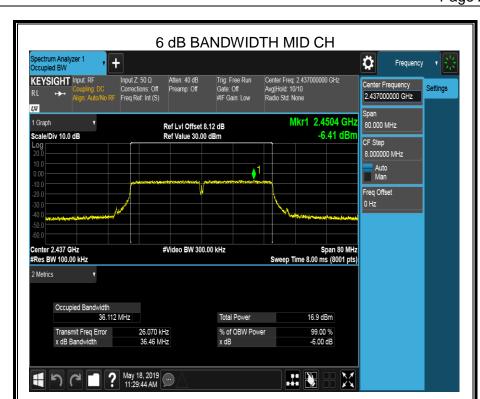
99.00 % -6.00 dB

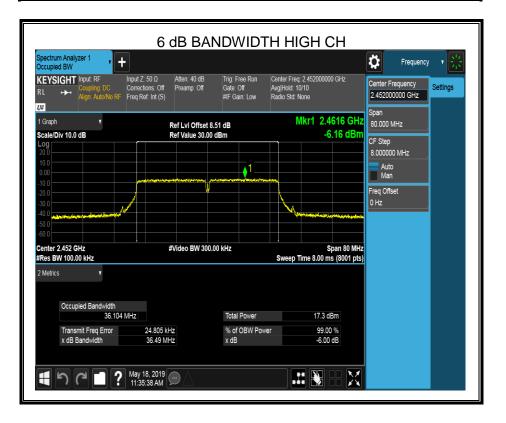
X

# 8.2.4. 802.11n HT40 MODE

Channel	6dB bandwidth (MHz)	Limit (kHz)	Result
Low	36.48	≥500	Pass
Middle	36.46	≥500	Pass
High	36.49	≥500	Pass









# 8.3. PEAK CONDUCTED OUTPUT POWER

#### **LIMITS**

CFR 47 FCC Part15 (15.247) Subpart C					
Section	Test Item	Limit	Frequency Range (MHz)		
CFR 47 FCC 15.247(b)(3)	Peak Output Power	1 watt or 30dBm (See note1)	2400-2483.5		

Note:

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.

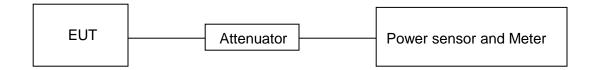
Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Power sensor.

Measure the power of each channel.

Peak Detector use for Peak result.

AVG Detector use for AVG result.

#### TEST SETUP



#### TEST ENVIRONMENT

Temperature	20°C	Relative Humidity	56%
Atmosphere Pressure	101kPa	Test Voltage	DC 12V



#### RESULTS

### 8.3.1. 802.11b MODE

		Maximum Conducted	Maximum Conducted	LIMIT
Test Channel	ANT.	Output Power(PK) (dBm)	Output Power(AV) (dBm)	dBm
Low	1	12.86	9.51	30
Middle	1	11.91	8.83	30
High	1	12.50	9.03	30

#### 8.3.2. 802.11g MODE

Test Channel		Maximum Conducted	Maximum Conducted	LIMIT
Test Channel	ANT.	Output Power(PK) (dBm)	Output Power(AV) (dBm)	dBm
Low	1	18.07	10.01	30
Middle	1	17.23	9.21	30
High	1	17.89	9.38	30

#### 8.3.3. 802.11n HT20 MODE

T (O)		Maximum Conducted	Maximum Conducted	LIMIT
Test Channel	ANT.	Output Power(PK) (dBm)	Output Power(AV) (dBm)	dBm
Low	1	17.92	9.88	30
Middle	1	17.19	9.10	30
High	1	17.97	9.30	30

# 8.3.4. 802.11n HT40 MODE

Tast Ohannal		Maximum Conducted	Maximum Conducted	LIMIT
Test Channel	ANT.	Output Power(PK) (dBm)	Output Power(AV) (dBm)	dBm
Low	1	19.00	10.78	30
Middle	1	18.53	10.26	30
High	1	19.08	10.37	30



# 8.4. POWER SPECTRAL DENSITY

#### <u>LIMITS</u>

CFR 47 FCC Part15 (15.247) Subpart C				
Section Test Item Limit Frequency Range (MHz)				
CFR 47 FCC §15.247 (e)	Power Spectral Density	8 dBm/3 kHz (See note1)	2400-2483.5	
Note: 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				

#### TEST PROCEDURE

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.

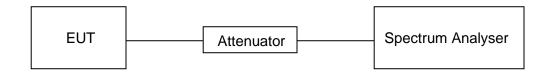
Connect the UUT to the spectrum analyser and use the following settings:

amount in dB that the directional gain of the antenna exceeds 6dBi.

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



#### **TEST ENVIRONMENT**

Temperature	20°C	Relative Humidity	56%
Atmosphere Pressure	101kPa	Test Voltage	DC 12V



#### **RESULTS**

# 8.4.1. 802.11b MODE

Test Channel	Power Spectral Density (dBm/100kHz)	Limit (dBm/3kHz)	Result
Low	0.67	8	PASS
Middle	-0.29	8	PASS
High	0.32	8	PASS







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### 8.4.2. 802.11g MODE

Test Channel	Power Spectral Density (dBm/100kHz)	Limit (dBm/3kHz)	Result
Low	-3.99	8	PASS
Middle	-4.89	8	PASS
High	-4.15	8	PASS









### 8.4.3. 802.11n HT20 MODE

Test Channel	Power Spectral Density (dBm/100kHz)	Limit (dBm/3kHz)	Result
Low	-3.87	8	PASS
Middle	-4.62	8	PASS
High	-3.97	8	PASS





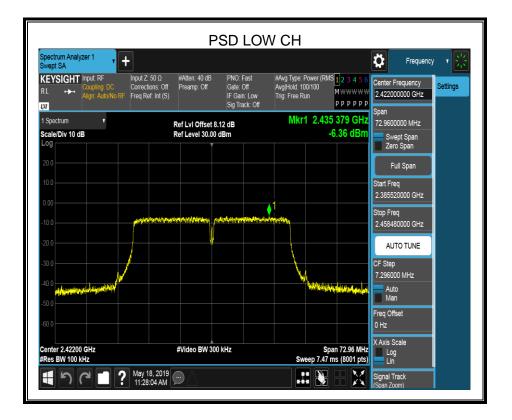






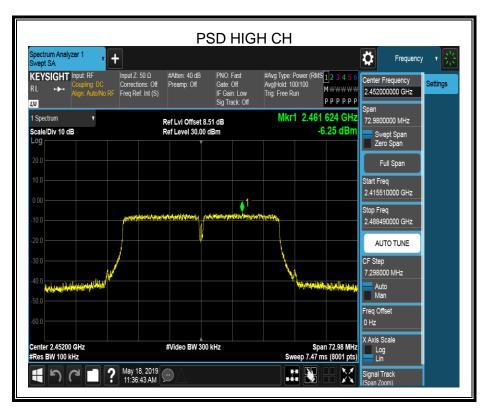
# 8.4.1. 802.11n HT40 MODE

Test Channel	Power Spectral Density (dBm/100kHz)	Limit (dBm/3kHz)	Result
Low	-6.36	8	PASS
Middle	-6.84	8	PASS
High	-6.25	8	PASS











# 8.5. CONDUCTED BANDEDGE AND SPURIOUS EMISSIONS

### **LIMITS**

CFR 47 FCC Part15 (15.247) Subpart C		
Section Test Item		Limit
CFR 47 FCC §15.247 (d)	Conducted Bandedge and Spurious Emissions	at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power

### TEST PROCEDURE

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	100K
VBW	≥3 × RBW
Span	1.5 x DTS bandwidth
Trace	Max hold
Sweep time	Auto couple.

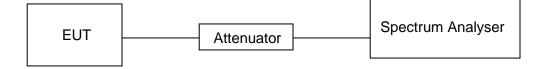
Use the peak marker function to determine the maximum PSD level.

5040	Set the center frequency and span to encompass frequency range to be measured
Detector	Peak
RBW	100K
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



### **TEST ENVIRONMENT**

Temperature	20°C	Relative Humidity	56%
Atmosphere Pressure	101kPa	Test Voltage	DC 12V



### **RESULTS**

## 8.5.1. 802.11b MODE

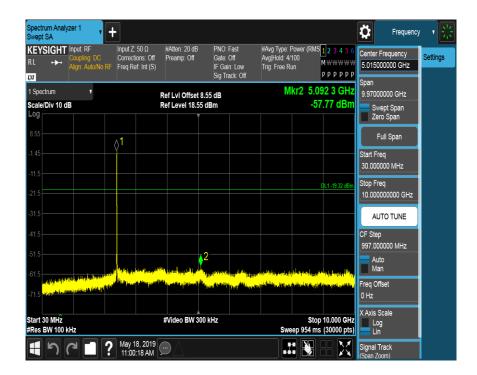


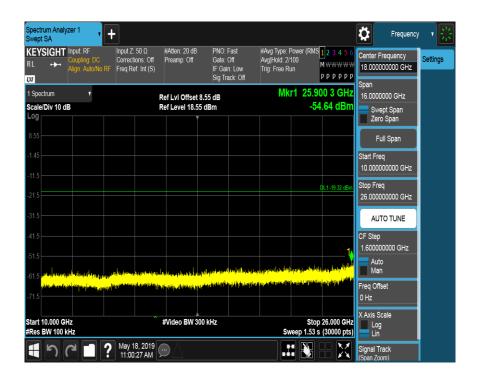
LOW CH BANDEDGE

### LOW CH SPURIOUS EMISSIONS





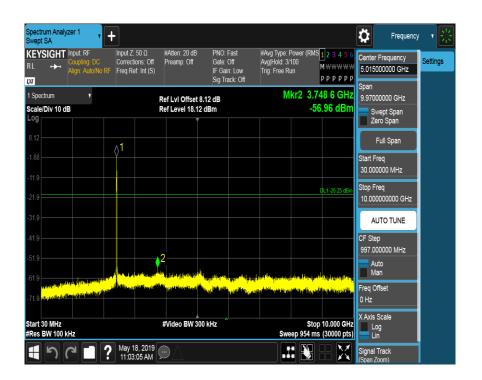




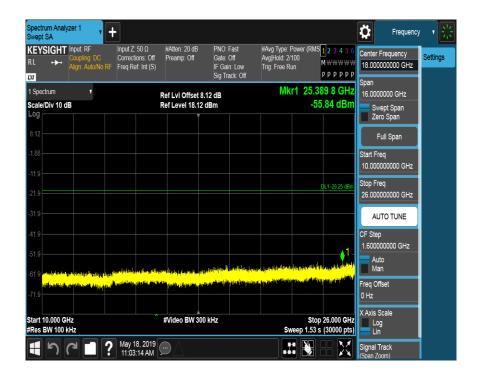


#### pectrum Analyzer 1 wept SA + Ö Frequency Input: RF Input Z: 50 Ω Coupling: DC Corrections: Off Align: Auto/No RF Freq Ref: Int (S) PNO: Fast Gate: Off IF Gain: Low Sig Track: Off #Avg Type: Power (RMS 1 2 3 4 5 Avg|Hold: 100/100 Trig. Free Run #Atten: 40 dB Preamp: Off KEYSIGHT Input RF Center Frequency Settings ++-MWWWW 2.437000000 GHz рррррр L)J Spar Mkr1 2.436 500 GHz 1 Spectrum ۲ 40.000000 MHz Ref LvI Offset 8.12 dB Ref Level 30.00 dBm -0.25 dBr Scale/Div 10 dB Swept Span Zero Span .00 Full Span Start Freq AMMM M 2.417000000 GHz MMMM Stop Freq 2.457000000 GHz M 1º AUTO TUNE CF Step 4.000000 MHz Auto Man Freq Offset X Axis Scale Span 40.00 MHz Sweep 4.27 ms (8001 pts) Center 2.43700 GHz #Res BW 100 kHz #Video BW 300 kHz Log Lin C ? May 18, 2019 11:02:54 AM X H ち П Signal Track

### MID CH SPURIOUS EMISSIONS







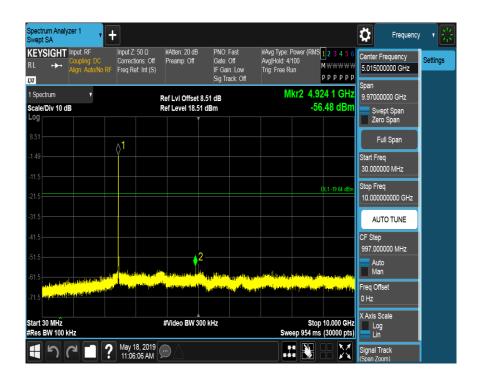
### HIGH CH BANDEDGE







# HIGH CH SPURIOUS EMISSIONS



KEYSIGHT Input RF Input Z Couping DC Correctiv Align AutoNo RF Freq Re Scale/Div 10 dB	ons: Off Preamp: Off	Gate: Off IF Gain: Low Sig Track: Off et 8.51 dB	#Avg Type: Power (RMS Avg]Hold: 2/100 Trig: Free Run Mkr1 25.7 -5:	M	Center Frequency 18.00000000 GHz Span 16.0000000 GHz Swept Span Zero Span	Settings
Spectrum   v     scale/Div 10 dB				64 8 GHz	16.0000000 GHz Swept Span	
<b>og</b> 151 						
					Full Span	
1.5					Start Freq 10.000000000 GHz	
1.5				DL1 -19.64 dBm	Stop Freq 26.000000000 GHz	
					AUTO TUNE	
				4	CF Step 1.600000000 GHz	
5 ster hadelendered in	nya dana kana kana kana kana kana kana kan			danto a der parter	Auto Man	
in the test test of proceeding to the set of	<mark>h (hole bille statiki dig hole bilisti</mark>	<mark>na kana dan kana dan publika kana kana kana kana kana kana kana k</mark>	e kay kay dia kara di kata di kaya manangi kalan Ang kay dia kara di kana di kaya di kanangi kalan	ki skatini kati	Freq Offset 0 Hz	
art 10.000 GHz es BW 100 kHz	#Video BW	300 kHz	Stop Sweep 1.53 s	o 26.000 GHz	X Axis Scale Log Lin	

# 8.5.2. 802.11g MODE

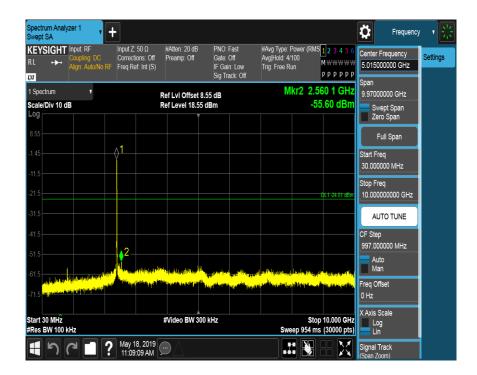


LOW CH BANDEDGE

### LOW CH SPURIOUS EMISSIONS











#### pectrum Analyzer 1 wept SA + Ö Frequency Input Z: 50 Ω Corrections: Off Freq Ref: Int (S) PNO: Fast Gate: Off IF Gain: Low Sig Track: Off #Avg Type: Power (RMS 1 2 3 4 5 Avg|Hold: 100/100 Trig. Free Run #Atten: 40 dB Preamp: Off KEYSIGHT Input RF Center Frequency Settings ++-Joupiing. DC Alian: Auto/No RF MWWWW 2.437000000 GHz рррррр L)J Spar Mkr1 2.434 505 GHz 1 Spectrum ۲ 40.000000 MHz Ref LvI Offset 8.12 dB Ref Level 30.00 dBm -4.83 dBr Scale/Div 10 dB Swept Span Zero Span .00 Full Span Start Freq 2.417000000 GHz 1 Stop Freq 2.457000000 GHz AUTO TUNE CF Step 4.000000 MHz Auto Man Freq Offset X Axis Scale Span 40.00 MHz Sweep 4.27 ms (8001 pts) Center 2.43700 GHz #Res BW 100 kHz #Video BW 300 kHz Log Lin C ? May 18, 2019 11:12:02 AM X H ち П Signal Track

## MID CH SPURIOUS EMISSIONS

