



TEST REPORT

No. I19D00119-SRD08

For

Client : Inseego Corp.

**Production : Industrial Cellular Gateway with Ethernet,WiFi,
Bluetooth,GPS/GLNSS and USB Connectivity**

Model Name : SKG1EM7455

Brand Name : SKYUS 160NE

FCC ID : PKRISGSKG1EM7455

IC ID : 3229A-SKG1EM7455

Hardware Version : P2

Software Version : 2.110.1.2

Issued date : 2019-11-7

NOTE

1. The test results in this test report relate only to the devices specified in this report.
2. This report shall not be reproduced except in full without the written approval of East China Institute of Telecommunications.
3. KDB 789033 standard has not been accredited by A2LA.
4. For the test results, the uncertainty of measurement is not taken into account when judging the compliance with specification, and the results of measurement or the average value of measurement results are taken as the criterion of the compliance with specification directly.

Test Laboratory:

East China Institute of Telecommunications

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Revision Version

Report Number	Revision	Date	Memo
I19D00119-SRD08	00	2019-08-12	Initial creation of test report
I19D00119-SRD08	01	2019-11-07	Second creation of test report

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1. Test Laboratory

1.1. Testing Location

Company Name	East China Institute of Telecommunications
Address	7-8/F., Area G, No.668, Beijing East Road, Shanghai, China
Postal Code	200001
Telephone	+86 21 63843300
Fax	+86 21 63843301
FCC registration No	CN1177
IC registration No	10766A-1

1.2. Testing Environment

Normal Temperature	15°C-35°C
Relative Humidity	20%-75%

1.3. Project Data

Project Leader	Chen Minfei
Testing Start Date	2019-08-03
Testing End Date	2019-08-04

1.4. Signature



Wang Liang
(Prepared this test report)



Fan Songyan
(Reviewed this test report)



Zheng Zhongbin
(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name	Inseego Corp.
Address	9605 Scranton Road, Suite 300, San Diego, CA 92121, USA
Telephone	+1 858-812-0606
Postcode	/

2.2. Manufacturer Information

Company Name	Inseego Corp.
Address	9605 Scranton Road, Suite 300, San Diego, CA 92121, USA
Telephone	+1 858-812-0606
Postcode	/

3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

Production	Industrial Cellular Gateway with Ethernet,WiFi, Bluetooth,GPS/GLNSS and USB Connectivity
Model name	SKG1EM7455
WLAN(5G)	802.11 a/n20/ac20
Frequency Range	ISM Bands: 5725MHz-5850MHz
WLAN type of modulation	OFDM
Extreme Temperature	-30/+60℃
Nominal Voltage	12V
Extreme High Voltage	32V
Extreme Low Voltage	9V
Maximum of Antenna Gain	WIFI5.8Ghz: 5dBi

Note:

- Photographs of EUT are shown in ANNEX A of this test report.
- The value of the antenna gain is provided by the customer. For specific antenna information, please check the antenna specifications of the customer.

3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version	Date of receipt
N04	/	2.110.1.2	P2	2019-07-30
N16	/	2.110.1.2	P2	2019-07-30

*EUT ID: is used to identify the test sample in the lab internally.

3.3. Internal Identification of AE used during the test

AE ID*	Description	Type	Manufacturer
AE1	RF cable	---	AE1

*AE ID: is used to identify the test sample in the lab internally.

4. Reference Documents

4.1. Documents supplied by applicant

All technical documents are supplied by the client or manufacturer, which is the basis of testing.

4.2. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
FCC Part15	FCC CFR 47, Part 15, Subpart C: 15.205 Restricted bands of operation; 15.209 Radiated emission limits, general requirements; Subpart E—Unlicensed National Information Infrastructure Devices	2018-10-01
ANSI 63.10	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz	2013
KDB 789033	Information Infrastructure (U-NII) Devices - Part 15, Subpart E	2017
KDB 905462	COMPLIANCE MEASUREMENT PROCEDURES FOR UNLICENSED-NATIONAL INFORMATION INFRASTRUCTURE DEVICES OPERATING IN THE 5250-5350 MHz AND 5470-5725 MHz BANDS INCORPORATING DYNAMIC FREQUENCY SELECTION	2016
RSS-247	Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSS) and Licence-Exempt Local Area Network (LE-LAN) Devices	2017-02
RSS-Gen	General Requirements for Compliance of Radio Apparatus	2018-04

5. Test Results

5.1. Summary of Test Results

Measurement Items	Sub-clause of Part15E	Sub-clause of IC	Verdict
Maximum Output Power	15.407	RSS-247,6.2	P
Power Spectral Density	15.407	RSS-247,6.2	P
Occupied 6dB Bandwidth	15.403	RSS-247,6.2	P
Band edge compliance	15.407	RSS-247,6.2	P
Transmitter Spurious Emission - Conducted	15.407	RSS-GEN,8.8	P
Transmitter Spurious Emission - Radiated	15.407	RSS-GEN,8.8	P
AC Powerline Conducted Emission	15.407	RSS-247 Gen 3.2	P

Note: Please refer to section 6 for detail; please refer to Annex A in this test report for the detailed test results.

The following terms are used in the above table.

P	Pass, the EUT complies with the essential requirements in the standard.
NP	Not Perform, the test was not performed by ECIT.
NA	Not Applicable, the test was not applicable.
F	Fail, the EUT does not comply with the essential requirements in the standard.

Test Conditions

Tnom	Normal Temperature
Tmin	Low Temperature
Tmax	High Temperature
Vnom	Normal Voltage
Vmin	Low Voltage
Vmax	High Voltage
Hnom	Norm Humidity
Anom	Norm Air Pressure

For this report, all the test case listed above are tested under Normal Temperature and Normal Voltage, and also under norm humidity, the specific conditions as following:

Temperature	Tnom	25℃
Voltage	Vnom	3.8V
Humidity	Hnom	48%
Air Pressure	Anom	1010hPa

5.2. Statements

The SKG1EM7455 is an initial product for testing.

ECIT only performed test cases which identified with P/NP/NA/F results in Annex A.

ECIT has verified that the compliance of the tested device specified in section 3 of this test report is successfully evaluated according to the procedure and test methods as defined in type certification requirement listed in section 4 of this test report.

6. Test Equipments Utilized

6.1. Conducted Test System

Item	Instrument Name	Type	SN	Manufacturer	Cal. Date	Cal. interval
1	Vector Signal Analyzer	FSQ40	200063	R&S	2019-05-10	1 year
2	DC Power Supply	ZUP60-14	LOC-220Z006-0007	TDL-Lambda	2019-05-10	1 year

6.2. Radiated Emission Test System

Item	Instrument Name	Type	SN	Manufacturer	Cal. Date	Cal. interval
1	Universal Radio Communication Tester	CMU200	123123	R&S	2019-05-10	1 year
2	EMI Test Receiver	ESU40	100307	R&S	2019-05-10	1 year
3	TRILOG Broadband Antenna	VULB9163	VULB9163-515	Schwarzbeck	2017-02-25	3 years
4	Double- ridged Waveguide Antenna	ETS-3117	00135890	ETS	2017-01-11	3 years
5	2-Line V-Network	ENV216	101380	R&S	2019-05-10	1 year
6	Loop Antenna	AL-130R	121083	COM-POWER	2016-11-21	3 years

6.3. Conducted Test Software

Software Name	Version
Eagle1.0	20181112

6.4. Radiated Test Software

Software Name	Version
EMC32	V10.35.02

Anechoic chamber

Fully anechoic chamber by ETS.

7. Measurement Uncertainty

Measurement uncertainty for all the testing in this report are within the limit specified in ECIT documents .

The detailed measurement uncertainty is defined in ECIT documents.

Measurement Items	Range	Confidence Level	Calculated Uncertainty
Peak Output Power-Conducted	5100MHz-5850MHz	95%	$\pm 1.024\text{dB}$
Peak Power Spectral Density	5100MHz-5850MHz	95%	$\pm 1.024\text{dB}$
Occupied 6dB Bandwidth	5100MHz-5850MHz	95%	$\pm 62.04\text{Hz}$
Frequency Band Edges-Conducted	5100MHz-5850MHz	95%	$\pm 1.024\text{dB}$
Conducted Emission	30MHz-2GHz	95%	$\pm 0.90\text{dB}$
Conducted Emission	2GHz-3.6GHz	95%	$\pm 0.88\text{dB}$
Conducted Emission	3.6GHz-8GHz	95%	$\pm 0.96\text{dB}$
Conducted Emission	8GHz-20GHz	95%	$\pm 0.94\text{dB}$
Conducted Emission	20GHz-22GHz	95%	$\pm 0.88\text{dB}$
Conducted Emission	22GHz-26GHz	95%	$\pm 0.86\text{dB}$
Transmitter Spurious Emission-Radiated	9KHz-30MHz	95%	$\pm 5.66\text{dB}$
Transmitter Spurious Emission-Radiated	30MHz-1000MHz	95%	$\pm 4.98\text{dB}$
Transmitter Spurious Emission-Radiated	1000MHz -18000MHz	95%	$\pm 5.06\text{dB}$
Transmitter Spurious Emission-Radiated	18000MHz -40000MHz	95%	$\pm 5.20\text{dB}$
AC Power line Conducted Emission	0.15MHz-30MHz	95%	$\pm 3.66\text{ dB}$

8. Test Environment

Shielding Room1 (6.0 meters×3.0 meters×2.7 meters) did not exceed following limits along the conducted RF performance testing:

Temperature	Min. = 15 °C , Max. = 35 °C
Relative humidity	Min. = 20 % , Max. = 75 %
Shielding effectiveness	> 100 dB
Ground system resistance	< 0.5 Ω

Control room did not exceed following limits along the EMC testing:

Temperature	Min. = 15 °C , Max. = 35 °C
Relative humidity	Min. = 30 % , Max. = 60 %
Shielding effectiveness	> 100 dB
Electrical insulation	> 10 kΩ
Ground system resistance	< 0.5 Ω

Fully-anechoic chamber1 (6.9 meters×10.9 meters×5.4 meters) did not exceed following limits along the EMC testing:

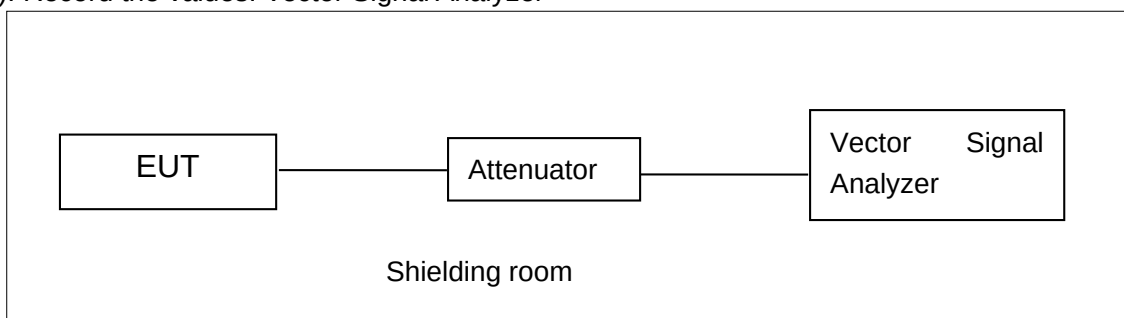
Temperature	Min. = 15 °C , Max. = 35 °C
Relative humidity	Min. = 25 % , Max. = 75 %
Shielding effectiveness	> 100 dB
Electrical insulation	> 10 kΩ
Ground system resistance	< 0.5 Ω
VSWR	Between 0 and 6 dB, from 1GHz to 18GHz
Site Attenuation Deviation	Between -4 and 4 dB, 30MHz to 1GHz
Uniformity of field strength	Between 0 and 6 dB, from 80MHz to 3000 MHz

ANNEX A. Detailed Test Results

ANNEX A.1. Measurement Method

A.1.1. Conducted Measurements

- 1). Connect the EUT to the test system correctly.
- 2). Set the EUT to the required work mode.
- 3). Set the EUT to the required channel.
- 4). Set the spectrum analyzer to start measurement.
- 5). Record the values. Vector Signal Analyzer

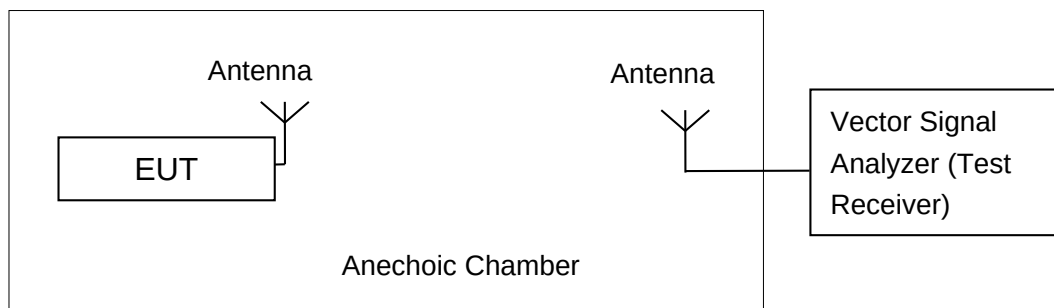


A.1.2. Radiated Emission Measurements

In the case of radiated emission, the used settings are as follows,

Sweep frequency from 30 MHz to 1GHz, RBW = 100 kHz, VBW = 300 kHz;

Sweep frequency from 1 GHz to 26GHz, RBW = 1MHz, VBW = 10Hz;



The measurement is made according to ANSI C63.10.

The radiated emission test is performed in semi-anechoic chamber. The distance from the EUT to the reference point of measurement antenna is 3m. The test is carried out on both vertical and horizontal polarization and only maximization result of both polarizations is kept. During the test, the turntable is rotated 360° and the measurement antenna is moved from 1m to 4m to get the maximization result.

ANNEX A.2. Maximum Average Output Power-Conducted

Measurement Limit and Method:

Standard	Limit (dBm)
FCC CRF Part 15.407(a)	< 30

Method of Measurement: See ANSI C63.10-clause 12.3.2.2 Method SA-1

Set the spectrum analyzer in the following:

Detector: RMS.

RBW=1MHz.

VBW=3MHz.

Sweep time = AUTO.

Span:30MHz (for 20MHz); 50MHz (for 40MHz).

802.11a mode

U-NII-3

Mode	Test Level	Data Rate(Mbps)	Output power(dBm)		
			5745MHz	5785MHz	5825MHz
802.11a	PCL17	6	13.49	13.40	12.58
Mode	Test Level	Data Rate(Mbps)	EIRP(dBm)		
			5745MHz	5785MHz	5825MHz
802.11a	PCL17	6	18.49	18.40	17.58

The data rate 6Mbps is selected as worse condition, and the following cases are performed with this condition.

802.11n-HT20 mode

U-NII-3

Mode	Test Level	Data Rate(Index)	Output power(dBm)		
			5745MHz	5785MHz	5825MHz
802.11n(20MHz)	PCL17	MCS0	13.78	13.46	12.95
Mode	Test Level	Data Rate(Index)	EIRP(dBm)		
			5745MHz	5785MHz	5825MHz
802.11n(20MHz)	PCL17	MCS0	18.78	18.46	17.95

The data rate MCS0 is selected as worse condition, and the following cases are performed with this condition.

802.11ac-VHT20 mode**U-NII-3**

Mode	Test Level	Data Rate(Mbps)	Output power(dBm)		
			5745MHz	5785MHz	5825MHz
802.11ac(20M Hz)	PCL17	6	13.93	13.70	12.96
Mode	Test Level	Data Rate(Mbps)	EIRP(dBm)		
			5745MHz	5785MHz	5825MHz
802.11ac(20M Hz)	PCL17	6	18.93	18.70	17.96

The data rate MCS0 is selected as worse condition, and the following cases are performed with this condition.

Conclusion: PASS

ANNEX A.3. Peak Power Spectral Density (conducted)

Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.407(a)	< 30 dBm/500 kHz

The measurement is made according to ANSI C63.10 and KDB789033 D02

Measurement Results:

Mode	Channel	Power Spectral Density (dBm/500kHz)		Conclusion
802.11a	149	Fig.1	5.109	P
	157	Fig.2	4.380	P
	165	Fig.3	4.019	P
802.11n HT20	149	Fig.4	4.265	P
	157	Fig.5	4.460	P
	165	Fig.6	4.778	P
802.11ac VHT20	149	Fig.7	4.685	P
	157	Fig.8	4.356	P
	165	Fig.9	3.871	P

Conclusion: PASS

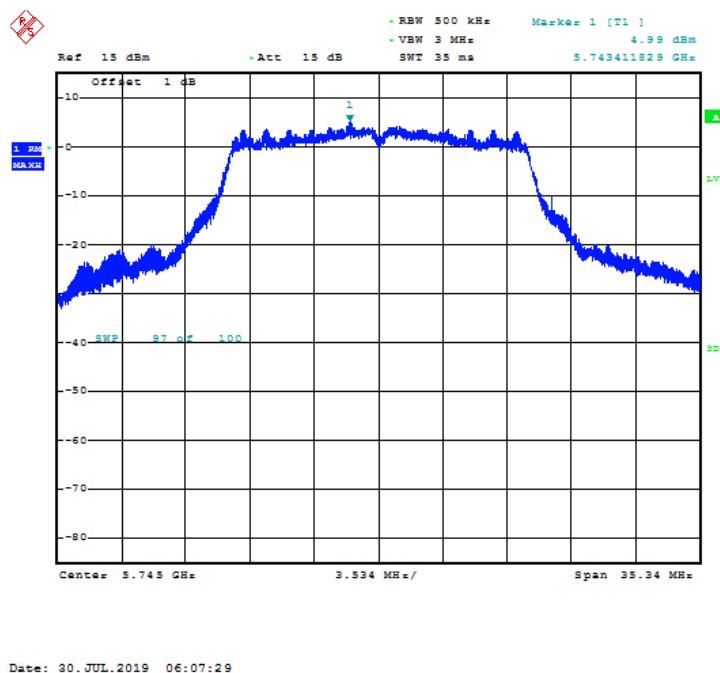
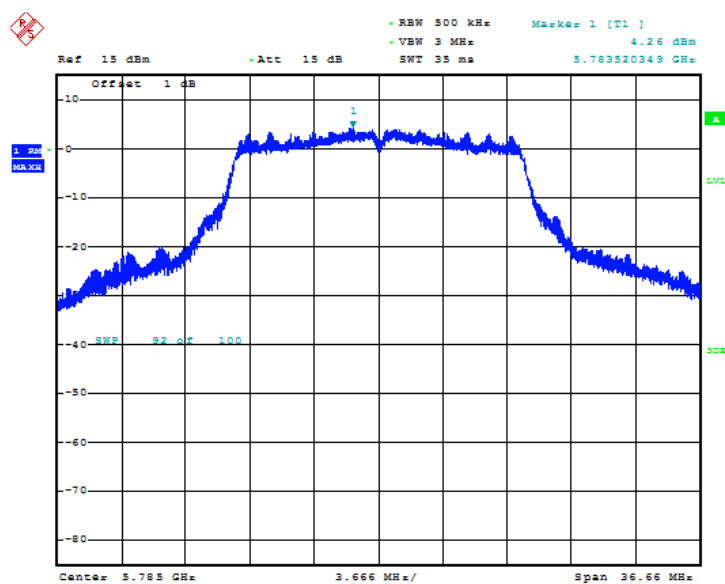
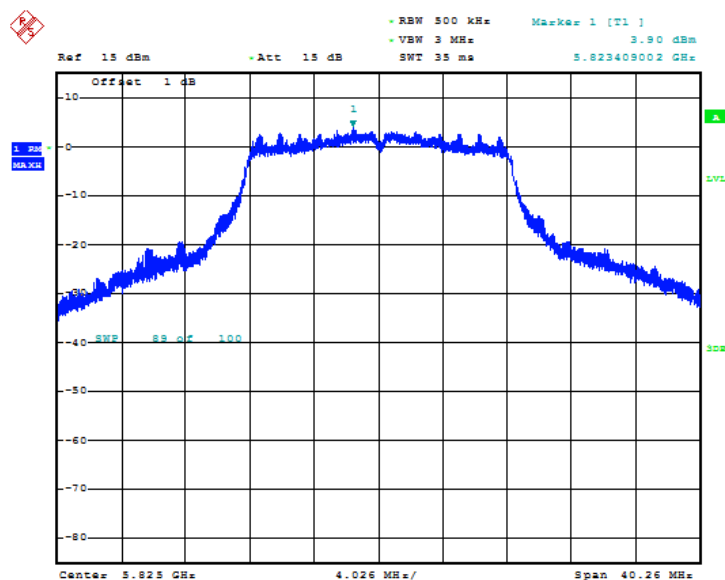


Fig. 1 Power Spectral Density (802.11a, Ch 149)



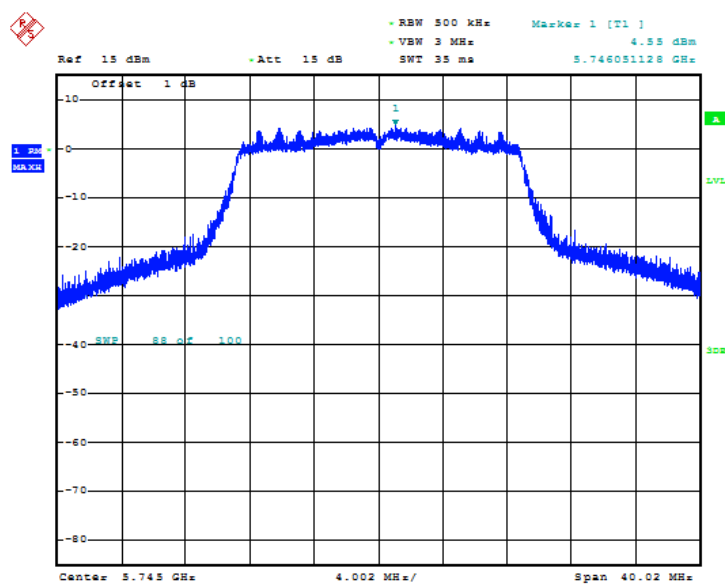
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Fig. 2 Power Spectral Density (802.11a, Ch 157)



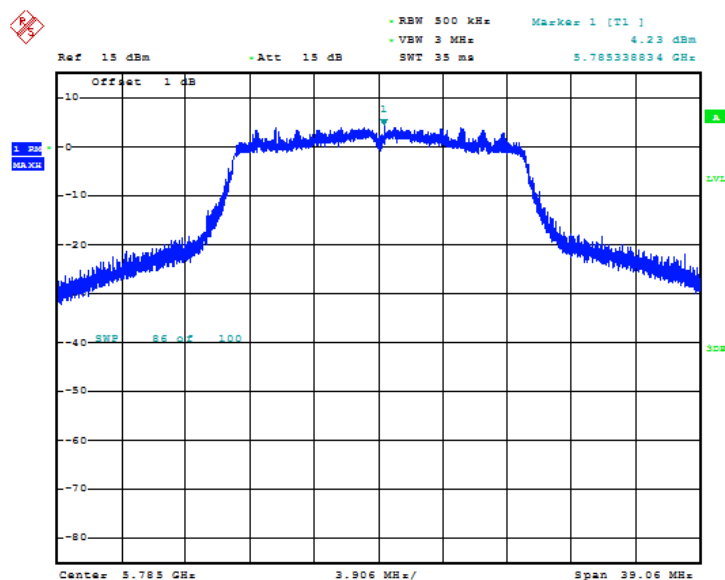
Date: 30.JUL.2019 06:09:08

Fig. 3 Power Spectral Density (802.11a, Ch 165)



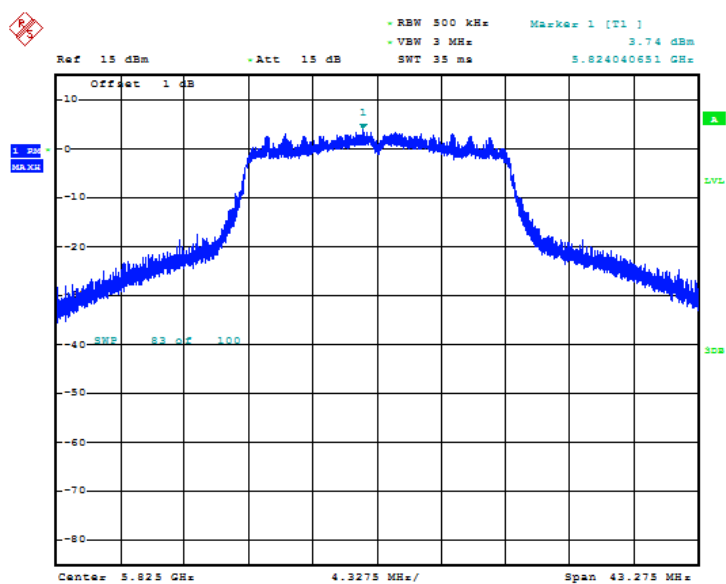
Date: 30.JUL.2019 08:13:44

Fig. 4 Power Spectral Density (802.11n-HT20, Ch 149)



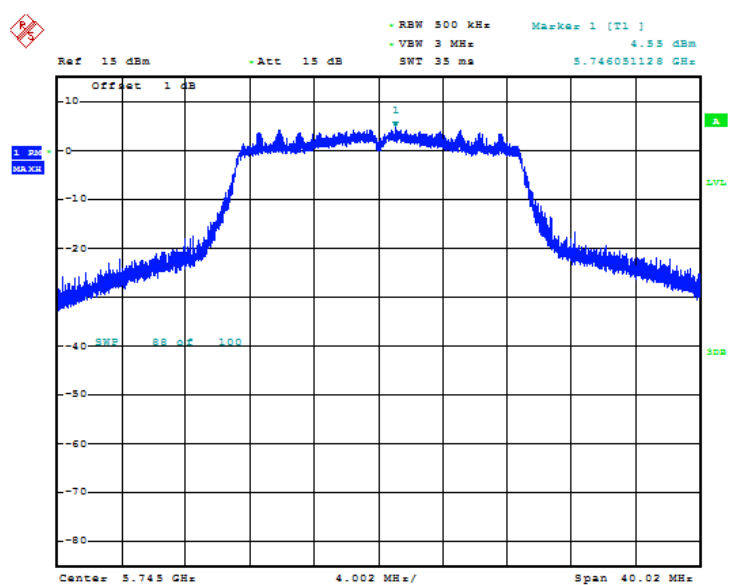
Date: 30.JUL.2019 08:14:36

Fig. 5 Power Spectral Density (802.11n-HT20, Ch 157)



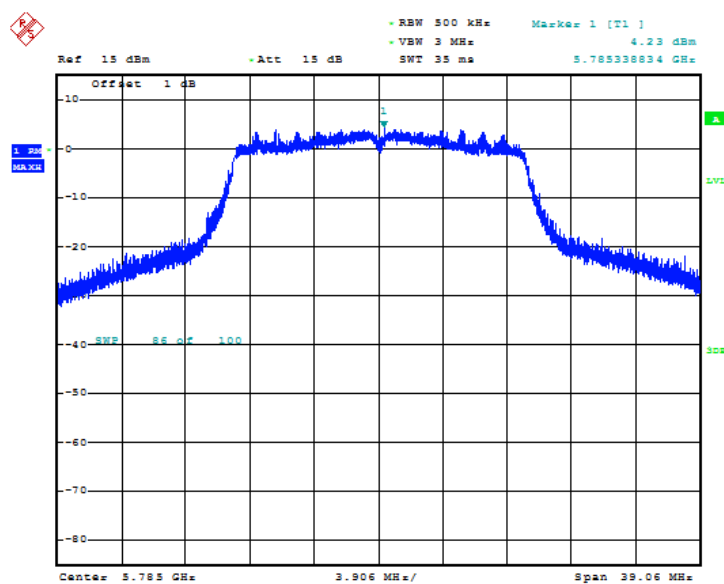
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Fig. 6 Power Spectral Density (802.11n-HT20, Ch 165)



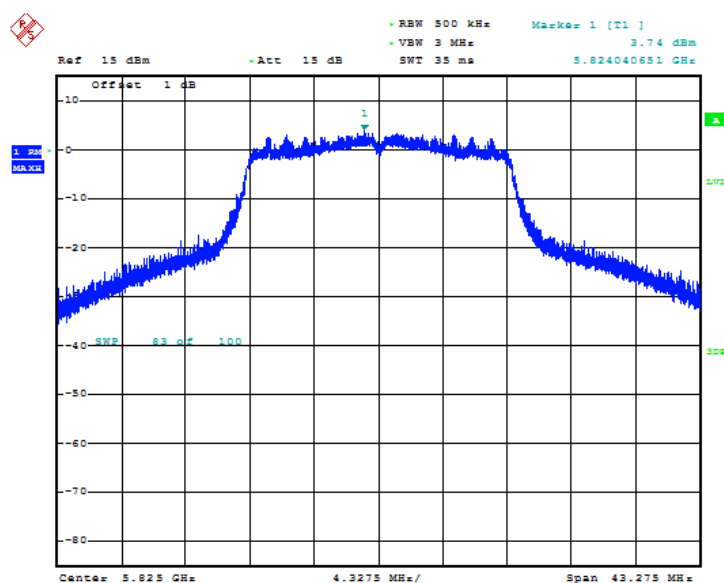
Date: 30.JUL.2019 08:19:44

Fig. 7 Power Spectral Density (802.11ac-VHT20, Ch 149)



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Fig. 8 Power Spectral Density (802.11ac-VHT20, Ch 157)



Date: 20.JUL.2019 08:15:45

Fig. 9 Power Spectral Density (802.11ac-VHT20, Ch 165)

ANNEX A.4. Occupied 26dB Bandwidth(conducted)

Measurement Limit:

Standard	Limit (kHz)
FCC 47 CFR Part 15.403 (i)	/

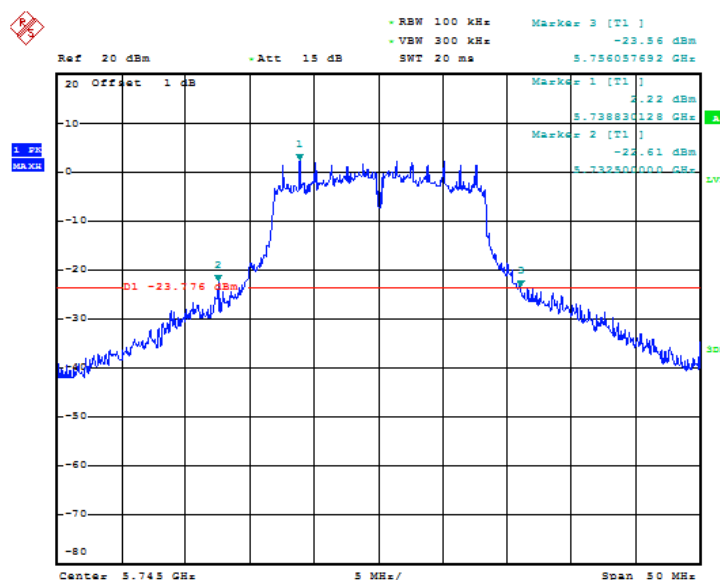
The measurement is made according to KDB 789033

Measurement Result:

Mode	Channel	Occupied 26dB Bandwidth (MHz)		conclusion
802.11a	149	Fig.10	23.56	P
	157	Fig.11	24.44	P
	165	Fig.12	26.84	P
802.11n HT20	149	Fig.13	25.40	P
	157	Fig.14	27.32	P
	165	Fig.15	27.64	P
802.11ac VHT20	149	Fig.16	26.68	P
	157	Fig.17	26.04	P
	165	Fig.18	28.85	P

Conclusion: PASS

Test graphs as below:



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Fig. 10 Occupied 26dB Bandwidth (802.11a, Ch 149)

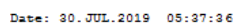


Fig. 11 Occupied 26dB Bandwidth (802.11a, Ch 157)

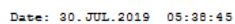


Fig. 12 Occupied 26dB Bandwidth (802.11a, Ch 165)

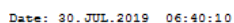


Fig. 13 Occupied 26dB Bandwidth (802.11n-HT20, Ch 149)

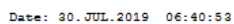
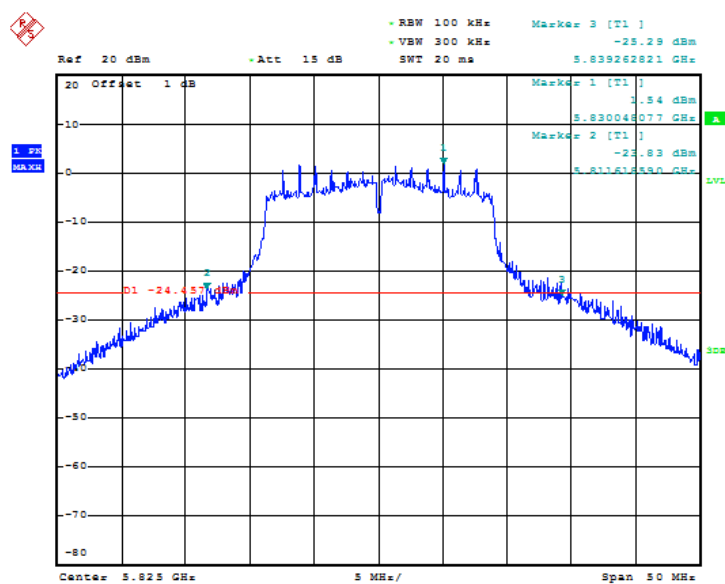
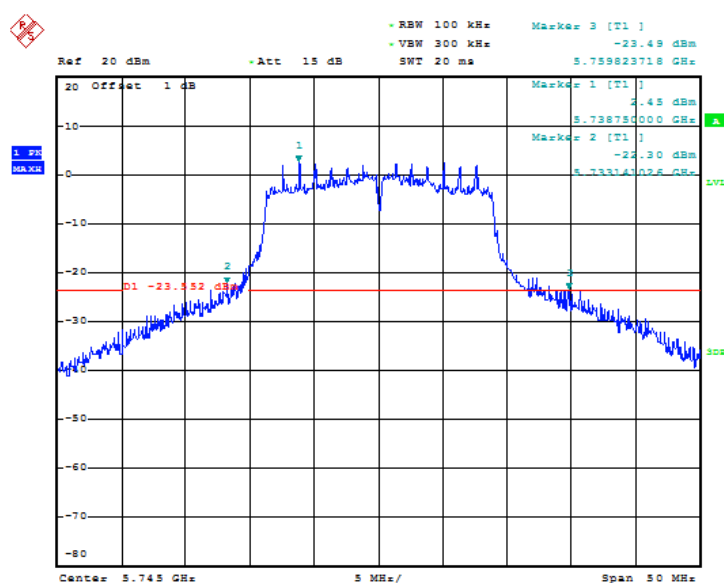


Fig. 14 Occupied 26dB Bandwidth (802.11n-HT20, Ch 157)



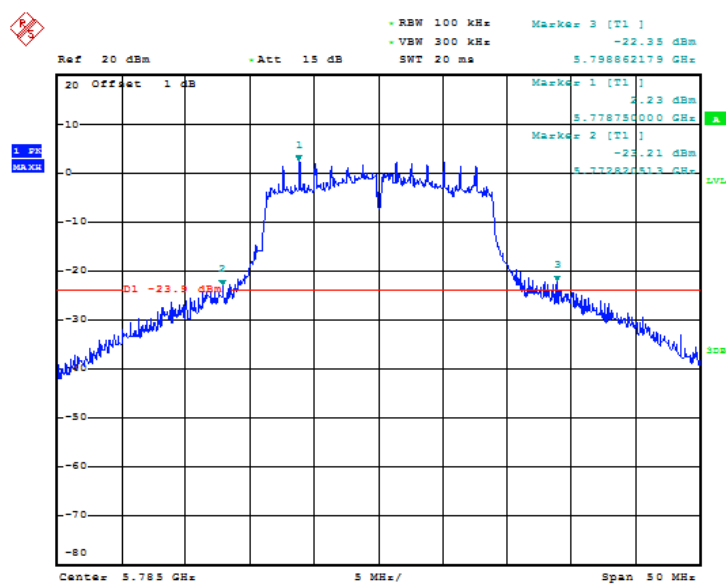
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Fig. 15 Occupied 26dB Bandwidth (802.11n-HT20, Ch 165)



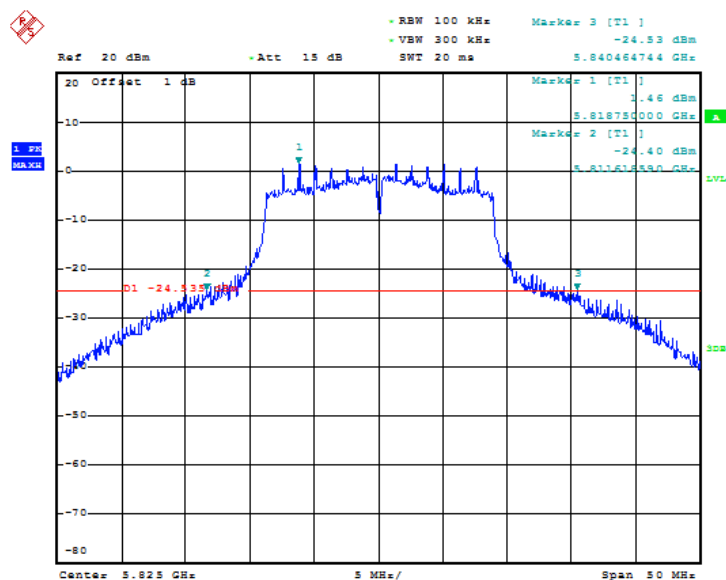
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Fig. 16 Occupied 26dB Bandwidth (802.11ac-VHT20, Ch 149)



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Fig. 17 Occupied 26dB Bandwidth (802.11ac-VHT20,Ch 157)



Date: 20.JUL.2019 08:00:57

Fig. 18 Occupied 26dB Bandwidth (802.11ac-VHT20, Ch 165)

ANNEX A.5. 99% Occupied Bandwidth(conducted)

Measurement Limit:

Standard	Limit (MHz)
FCC 47 CFR Part 15.407 (e)	/

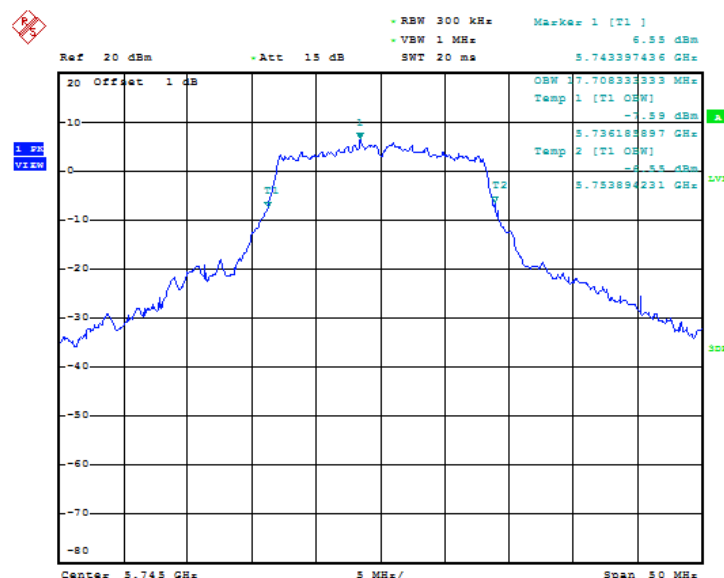
The measurement is made according to KDB 789033

Measurement Result:

Mode	Channel	99% Occupied Bandwidth (MHz)		conclusion
802.11a	149	Fig.19	17.708	P
	157	Fig.20	17.708	P
	165	Fig.21	17.949	P
802.11n HT20	149	Fig.22	18.990	P
	157	Fig.23	18.990	P
	165	Fig.24	19.311	P
802.11ac VHT20	149	Fig.25	18.990	P
	157	Fig.26	19.071	P
	165	Fig.27	19.391	P

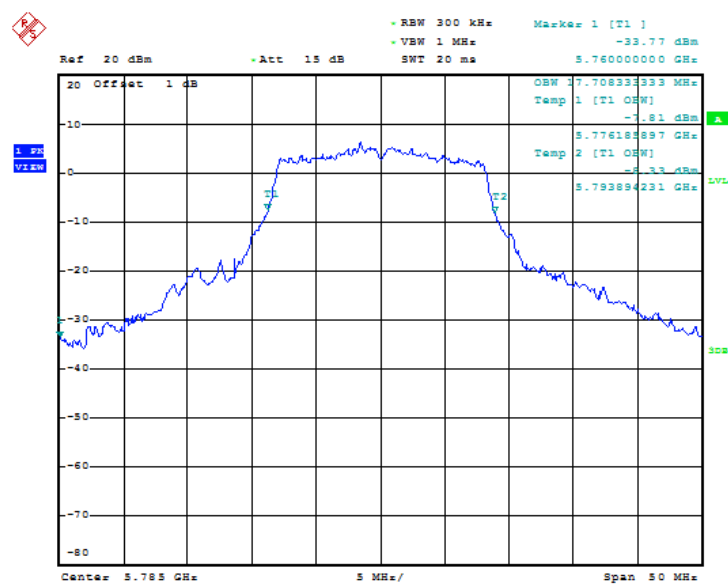
Conclusion: PASS

Test graphs as below:



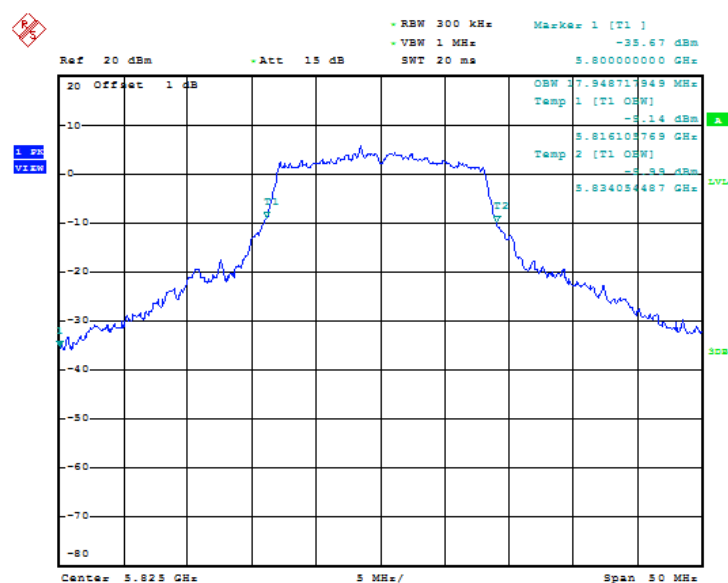
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Fig. 19 99% Occupied Bandwidth (802.11a, CH 149)



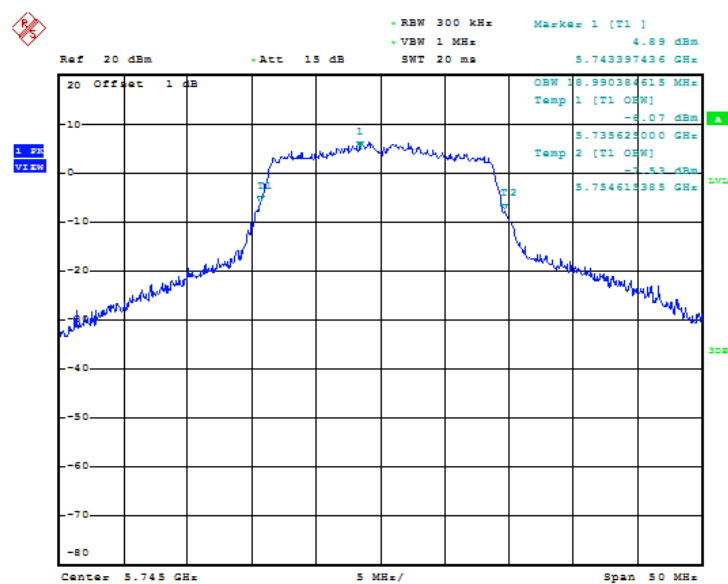
Date: 30.JUL.2019 05:40:54

Fig. 20 99% Occupied Bandwidth (802.11a, CH 157)



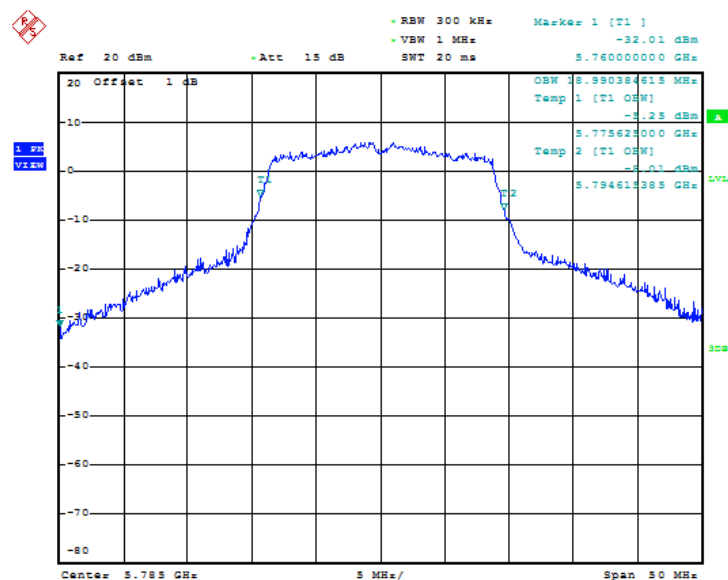
Date: 30.JUL.2019 05:42:21

Fig. 21 99% Occupied Bandwidth (802.11a, CH 165)



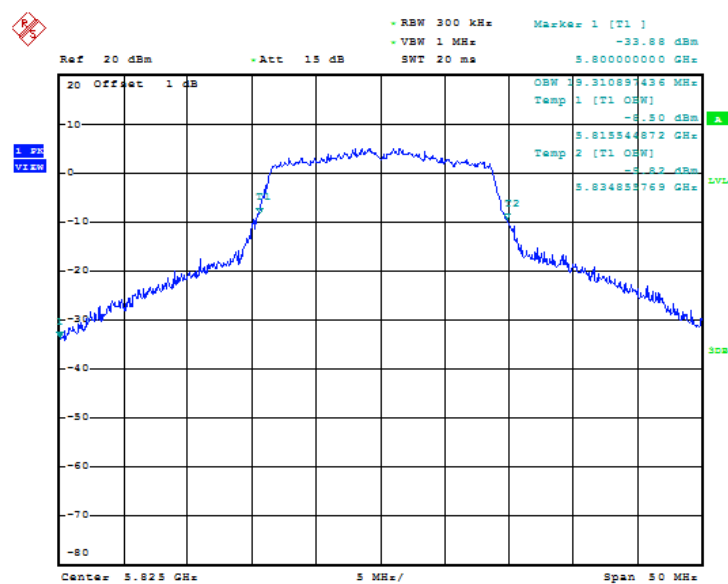
Date: 30.JUL.2019 06:42:56

Fig. 22 99% Occupied Bandwidth (802.11n-HT20, CH 149)



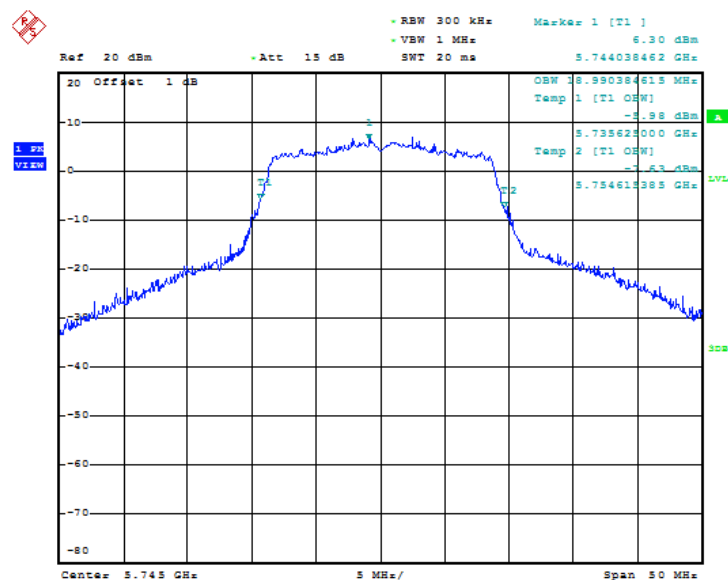
Date: 30.JUL.2019 06:44:11

Fig. 23 99% Occupied Bandwidth (802.11n-HT20, CH 157)



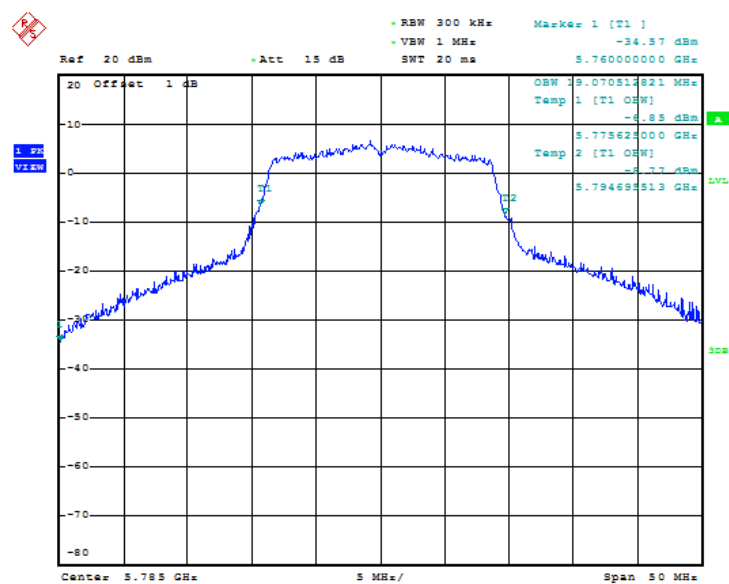
Date: 30.JUL.2019 06:45:20

Fig. 24 99% Occupied Bandwidth (802.11n-HT20, CH 165)



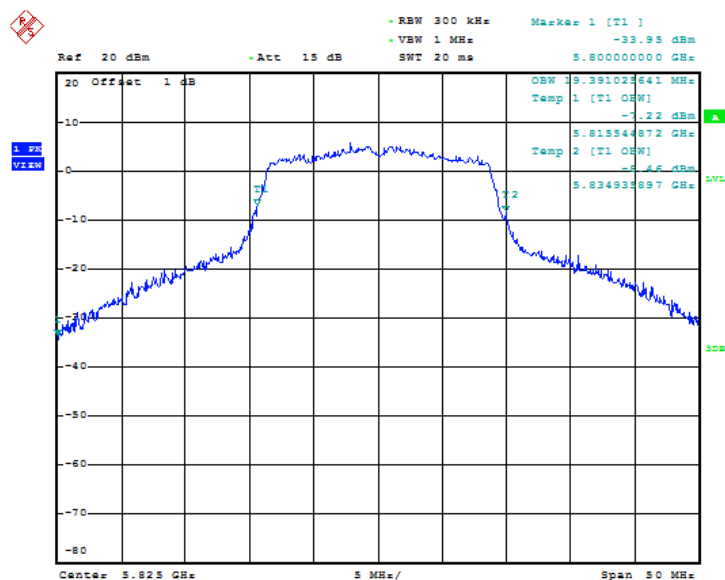
Date: 30.JUL.2019 08:02:58

Fig. 25 99% Occupied Bandwidth (802.11 ac-VHT20, CH 149)



Date: 30.JUL.2019 08:03:54

Fig. 26 99% Occupied Bandwidth (802.11 ac-VHT20, CH 157)



Date: 30.JUL.2019 08:04:47

Fig. 27 99% Occupied Bandwidth (802.11 ac-VHT20, CH 165)

ANNEX A.6. Transmitter Spurious Emission

Measurement Limit:

Standard	Frequency (MHz)	Limit (dBm/MHz)
FCC 47 CFR Part 15.407	5725MHz~5850MHz	< -27

The measurement is made according to ANSI C63.10 .

In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

Frequency of emission (MHz)	Field strength(uV/m)	Field strength(dBuV/m)
0.009-0.490	2400/F(kHz)	/
0.490-1.705	24000/F(kHz)	/
1.705-30	30	/
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

A.5.1 Transmitter Spurious Emission – Conducted

Modulation type and data rate tested (Only worst case result is given below):

Mode	Data rate	Channel
802.11a	6Mbps	149(5745MHz)
802.11n-HT20	MCS0	149(5745MHz)
802.11ac-HT20	MCS0	149(5745MHz)

Measurement Results:

802.11a mode

MODE	Channel	Frequency Range	Test Results	Conclusion
802.11a	149(5745MHz)	30 MHz ~ 1 GHz	Fig.28	P
		1 GHz ~ 5.7 GHz	Fig.29	P
		5.9 GHz ~ 40 GHz	Fig.30	P

802.11n-HT20 mode

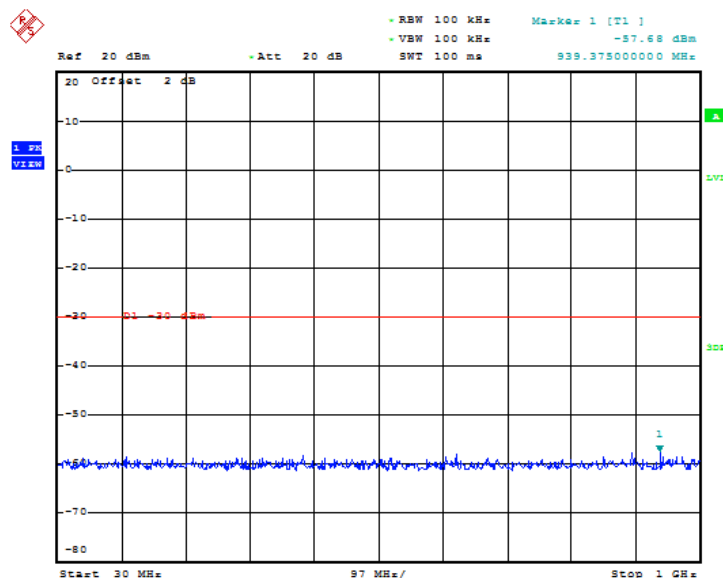
MODE	Channel	Frequency Range	Test Results	Conclusion
802.11n HT20	149(5745MHz)	30 MHz ~ 1 GHz	Fig.31	P
		1 GHz ~ 5.7 GHz	Fig.32	P
		5.9 GHz ~ 40 GHz	Fig.33	P

802.11ac-HT20 mode

MODE	Channel	Frequency Range	Test Results	Conclusion
802.11ac HT20	149(5745MHz)	30 MHz ~ 1 GHz	Fig.34	P
		1 GHz ~ 5.7 GHz	Fig.35	P
		5.9 GHz ~ 40 GHz	Fig.36	P

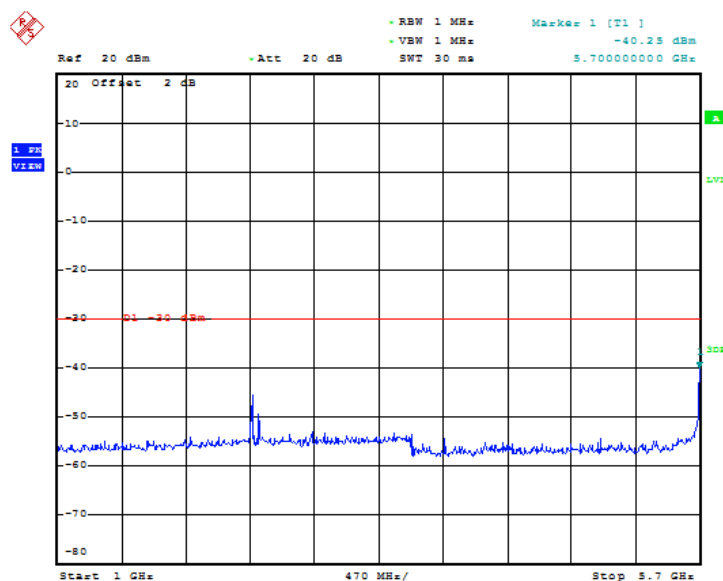
Conclusion: PASS

Test graphs as below:



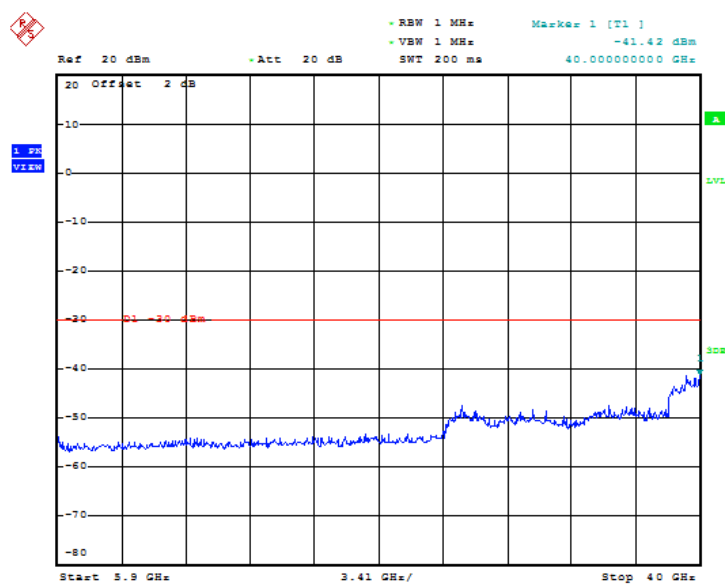
Date: 3.AUG.2019 14:42:44

Fig. 28 Conducted Spurious Emission (802.11a, Ch149, 30 MHz-1 GHz)



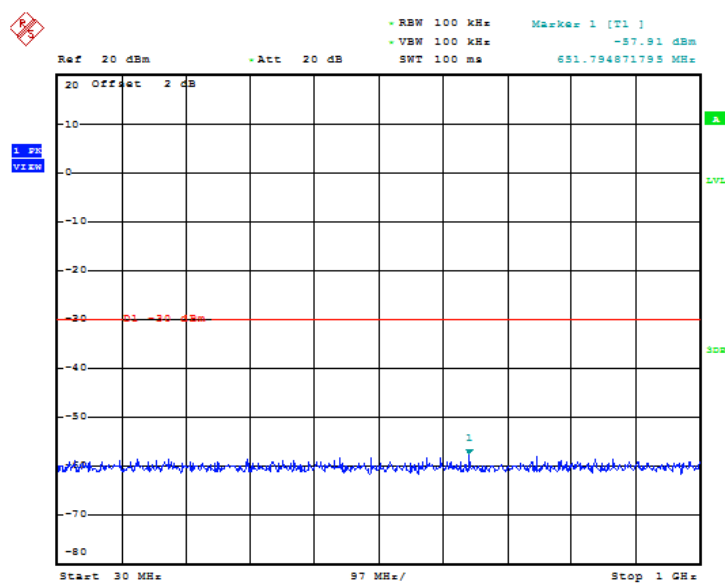
Date: 3.AUG.2019 14:43:14

Fig. 29 Conducted Spurious Emission (802.11a, Ch149, 1 GHz-5.7 GHz)



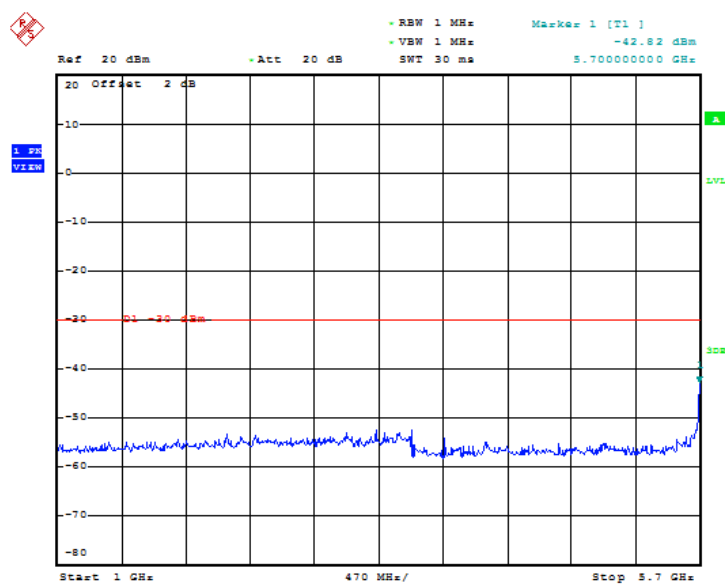
Date: 3.AUG.2019 14:43:45

Fig. 30 Conducted Spurious Emission (802.11a, Ch149, 5.9 GHz-40 GHz)



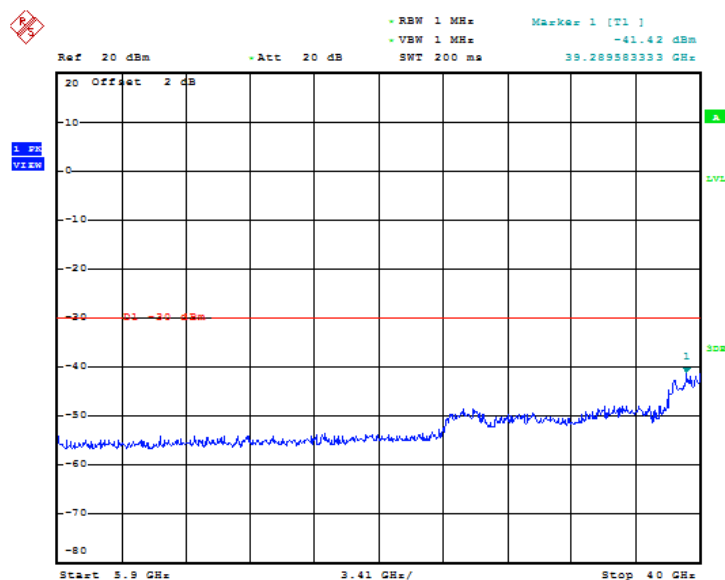
Date: 3.AUG.2019 14:51:25

Fig. 31 Conducted Spurious Emission (802.11n-HT20, Ch149, 30 MHz-1 GHz)



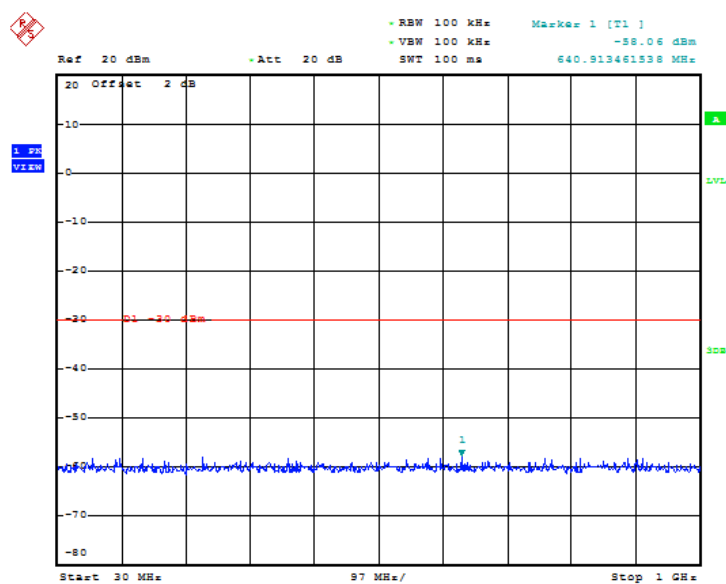
Date: 3.AUG.2019 14:51:55

Fig. 32 Conducted Spurious Emission (802.11n-HT20, Ch149, 1 GHz -5.7 GHz)



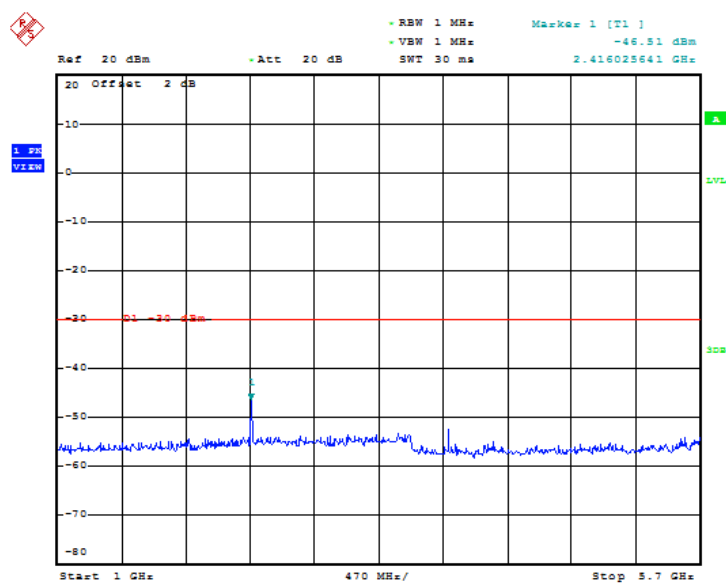
Date: 3.AUG.2019 14:52:25

Fig. 33 Conducted Spurious Emission (802.11n-HT20, Ch149, 5.9 GHz-40 GHz)



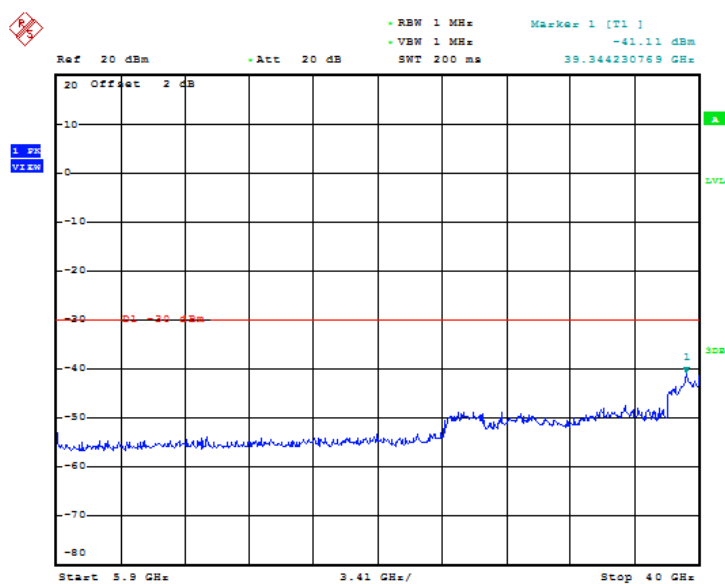
Date: 3.AUG.2019 15:15:42

Fig. 34 Conducted Spurious Emission (802.11ac-HT20, Ch149, 30 MHz-1 GHz)



Date: 3.AUG.2019 15:18:46

Fig. 35 Conducted Spurious Emission (802.11ac-HT20, Ch149, 1 GHz -5.7 GHz)



Date: 3.AUG.2019 15:16:42

Fig. 36 Conducted Spurious Emission (802.11ac-HT20, Ch149, 5.9 GHz-40 GHz)

A.5.2 Transmitter Spurious Emission - Radiated

Modulation type and data rate tested (Only worst case result is given below):

Mode	Data rate	Channel
802.11a	6Mbps	149(5745MHz)
802.11n-HT20	MCS0	165(5825MHz)
802.11ac-HT20	MCS0	165(5825MHz)

Measurement Uncertainty:

Frequency Range	Uncertainty(dB)
$f \leq 1\text{GHz}$	3.9
$f > 1\text{GHz}$	4.3

Measurement Results:

802.11a mode

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11a	149(5745MHz)	30 MHz ~1 GHz	Fig.37	P
		1 GHz ~ 8 GHz	Fig.38	P
		8 GHz ~ 18 GHz	Fig.39	P
		18 GHz ~ 26.5 GHz	Fig.40	P
		26.5 GHz~ 40 GHz	Fig.41	P

802.11n-HT20 mode

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11n (HT20)	165(5825MHz)	30 MHz ~1 GHz	Fig.42	P
		1 GHz ~ 8 GHz	Fig.43	P
		8 GHz ~ 18 GHz	Fig.44	P
		18 GHz ~ 26.5 GHz	Fig.45	P
		26.5 GHz~ 40 GHz	Fig.46	P

802.11ac-HT20 mode

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11ac (HT20)	165(5825MHz)	30 MHz ~1 GHz	Fig.47	P
		1 GHz ~ 8 GHz	Fig.48	P
		8 GHz ~ 18 GHz	Fig.49	P
		18 GHz ~ 26.5 GHz	Fig.50	P
		26.5 GHz~ 40 GHz	Fig.51	P

Conclusion: PASS

Note:

A "reference path loss" is established and the A_{Rpl} is the attenuation of "reference path loss", and including the gain of receive antenna, the gain of the preamplifier, the cable loss.

P_{Mea} is the field strength recorded from the instrument.

802.11a

Channel 149 (30MHz ~ 1GHz)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
34.2	17.19	-27.3	44.49	V
41.2	29.29	-25.7	54.99	V
119.0	19.13	-28.8	47.93	H
175.0	23.59	-29.3	52.89	H
225.0	20.61	-27.4	48.01	H
750.0	29.78	-16.6	46.38	H

Channel 149 (1GHz ~ 8GHz) (Peak)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
5478.0	45.92	4.5	41.42	H
6182.0	44.96	5.1	39.86	H
6447.6	47.27	5.9	41.37	V
6755.6	47.14	6.7	40.44	V
7150.2	46.46	7.2	39.26	H
7724.6	47.2	8.3	38.9	H

Channel 149 (8GHz ~ 18GHz) (Peak)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
9169.4	48.96	10.4	38.56	H
11234.6	51.53	13.9	37.63	H
13357.6	53.38	18	35.38	V
15259.6	54.93	20.7	34.23	V
16225.2	55.68	22.3	33.38	V
17187.2	57.02	24.1	32.92	H

Channel 149 (8GHz ~ 18GHz) (Average)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
15259.6	42.28	20.7	21.58	V

16225.2	43.23	22.3	20.93	V
17187.2	44.81	24.1	20.71	H

Channel 149 (18GHz ~ 26.5GHz)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
19007.2	39.91	-5.5	45.41	H
20516.8	40.75	-4.3	45.05	V
22099.6	43.16	-3.1	46.26	H
23526.7	43.99	-2.8	46.79	H
24917.3	44.53	-2.4	46.93	H
26050.4	47.38	-2	49.38	V

Channel 149 (26.5GHz ~ 40GHz)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
28431.8	43.78	-1.2	44.98	V
30856.4	45.88	0.3	45.58	H
32911.2	44.68	0.9	43.78	V
34934.8	46.11	-0.2	46.31	V
36881.5	46.77	2	44.77	H
39327.7	50.06	4	46.06	H

802.11n-HT20

Channel 149 (30MHz ~ 1GHz)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
33.3	16.17	-27.3	43.47	V
34.6	15.22	-27.3	42.52	V
40.8	29.47	-25.9	55.37	V
125.0	22.34	-29.7	52.04	H
250.0	30.54	-26.9	57.44	H
375.0	23.03	-24	47.03	H

Channel 149 (1GHz ~ 8GHz)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2992.0	58.23	-1.3	59.53	V
6332.6	45.87	5.6	40.27	V
6707.8	47.42	6.6	40.82	H
7110.0	46.77	7.3	39.47	V
7484.2	46.8	7.3	39.5	V
7834.6	47.97	8.5	39.47	H

Channel 149 (1GHz ~ 8GHz) (Average)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
2992.0	29.64	-1.3	30.94	V

Channel 149 (8GHz ~ 18GHz) (Peak)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
8868.8	50.01	9.9	40.11	V
10554.2	50.71	13.1	37.61	H
12620.4	53.06	16.8	36.26	H
14058.8	53.4	19.2	34.2	H
15735.0	55.78	22	33.78	V
17271.2	57.12	24.2	32.92	H

Channel 149 (8GHz ~ 18GHz) (Average)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
15735.0	43.19	22	21.19	V
17271.2	44.67	24.2	20.47	H

Channel 149 (18GHz ~ 26.5GHz)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
19222.3	40.35	-5.7	46.05	V
20468.4	41.08	-4.3	45.38	V

21948.2	42.06	-3.4	45.46	H
23025.2	44.18	-3	47.18	V
24075.0	43.71	-2.8	46.51	V
25672.1	44.45	-2.4	46.85	V

Channel 149 (26.5GHz ~ 40GHz)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
28905.7	42.25	-1.7	43.95	V
30852.4	45.97	0.3	45.67	H
32799.1	44.1	0.7	43.4	V
35050.9	46.82	-0.2	47.02	V
36877.4	46.97	2	44.97	H
38883.6	49.35	3.7	45.65	V

802.11ac-HT20

Channel 165 (30MHz ~ 1GHz)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
34.5	14.03	-27.3	41.33	V
40.8	27.12	-25.9	53.02	V
125.0	17.47	-29.7	47.17	V
250.0	26.17	-26.9	53.07	H
375.0	21.82	-24	45.82	H
750.0	28.76	-16.6	45.36	H

Channel 165 (1GHz ~ 8GHz)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
3883.2	45.05	0.5	44.55	V
4436.6	43.97	2.2	41.77	V
6330.6	45.88	5.6	40.28	V
6716.2	46.5	6.6	39.9	V
7053.2	46.48	7.3	39.18	V

7468.6	46.32	7.3	39.02	V
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Channel 165 (8GHz ~ 18GHz) (Peak)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
9158.8	49.45	10.4	39.05	V
11501.4	51.93	15.1	36.83	V
13302.8	53.78	18.2	35.58	H
14940.6	54.91	20.1	34.81	V
16475.8	55.17	22.8	32.37	V
17615.2	56.94	24.5	32.44	V

Channel 165 (8GHz ~ 18GHz) (Average)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
14940.6	42.15	20.1	22.05	V
16475.8	42.91	22.8	20.11	V
17615.2	44.76	24.5	20.26	V

Channel 165 (18GHz ~ 26.5GHz)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
18724.2	40.26	-5.6	45.86	V
20097.8	41.81	-4.8	46.61	V
21557.2	43.25	-3.5	46.75	H
23099.2	44.58	-3	47.58	H
24590.9	44.51	-2.5	47.01	H
26019.8	46.16	-2	48.16	H

Channel 165 (26.5GHz ~ 40GHz)

Frequency (MHz)	Result (dBμV/m)	ARpl (dB)	PMea (dBμV/m)	Polarity
27732.6	45.5	-0.6	46.1	H
29533.4	42.47	-0.6	43.07	H
31335.7	45.24	0.2	45.04	V

33583.4	44.25	1.3	42.95	V
35813.6	47.18	1	46.18	H
38956.4	50.64	3.9	46.74	H

Test graphs as below:

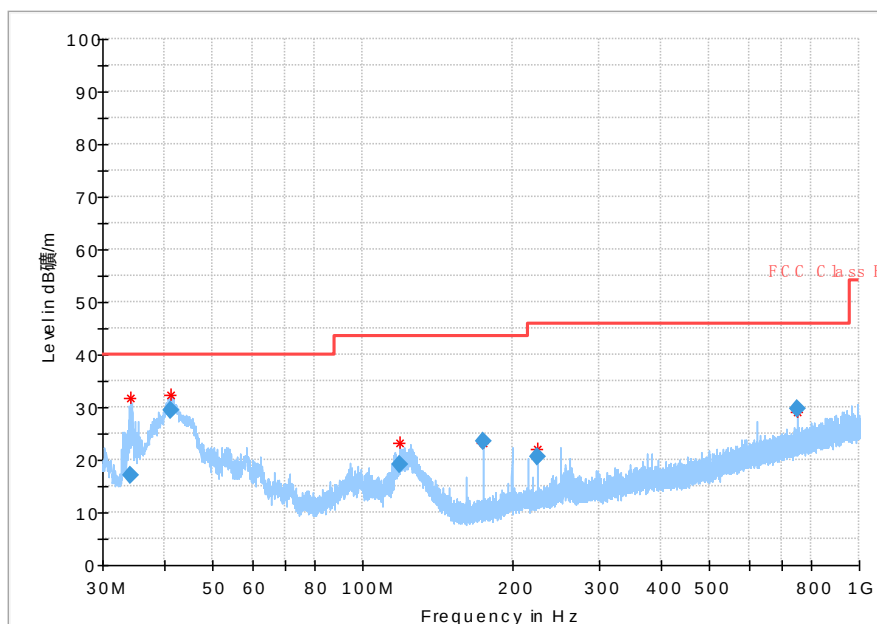


Fig. 37 Radiated Spurious Emission (802.11a, Ch149, 30 MHz-1 GHz)

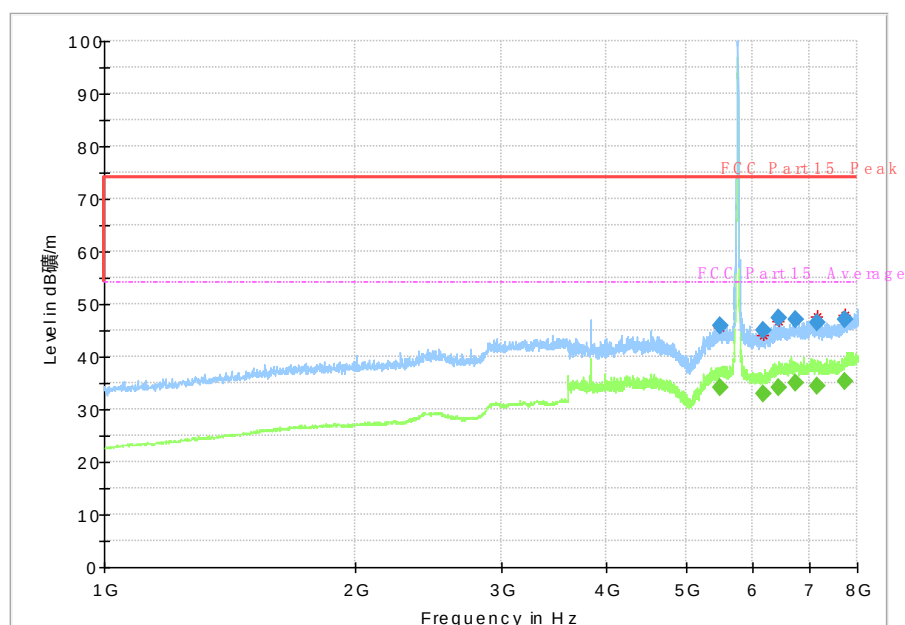


Fig. 38 Radiated Spurious Emission (802.11a, Ch149, 1 GHz-8 GHz)

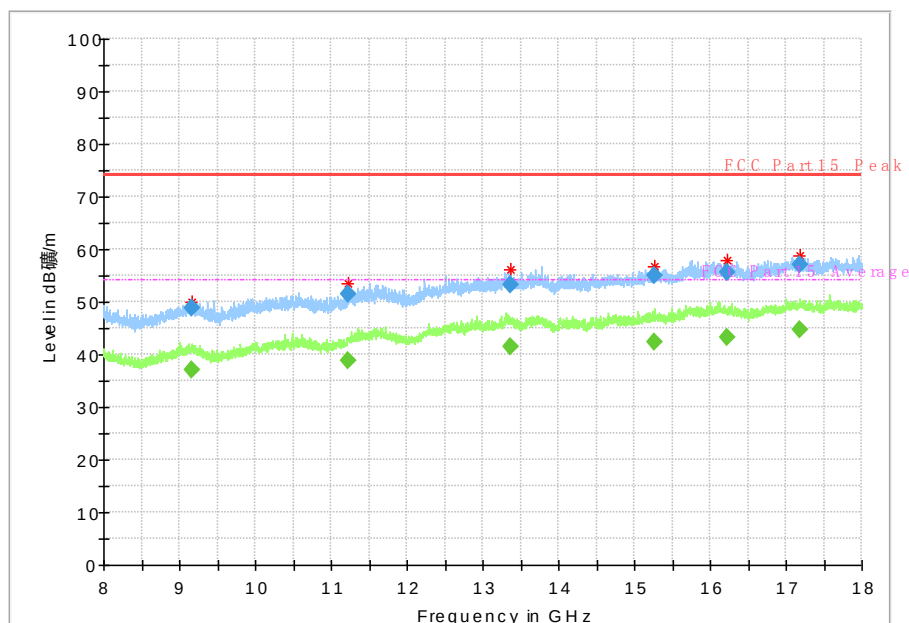


Fig. 39 Radiated Spurious Emission (802.11a, Ch149, 8 GHz-18 GHz)

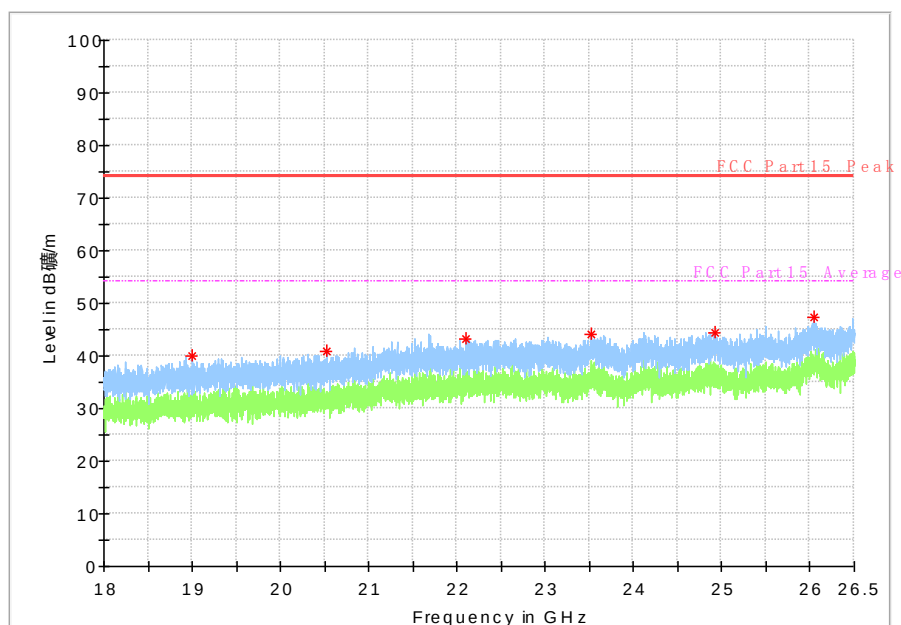


Fig. 40 Radiated Spurious Emission (802.11a, Ch149, 18 GHz-26.5 GHz)

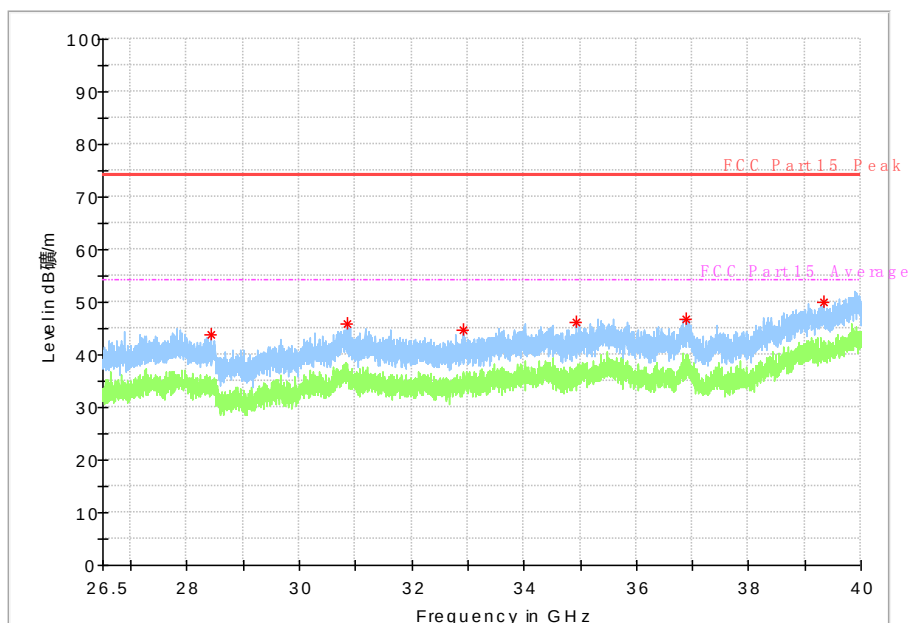


Fig. 41 Radiated emission: 802.11n, (802.11a, Ch149, 26.5 GHz - 40 GHz)

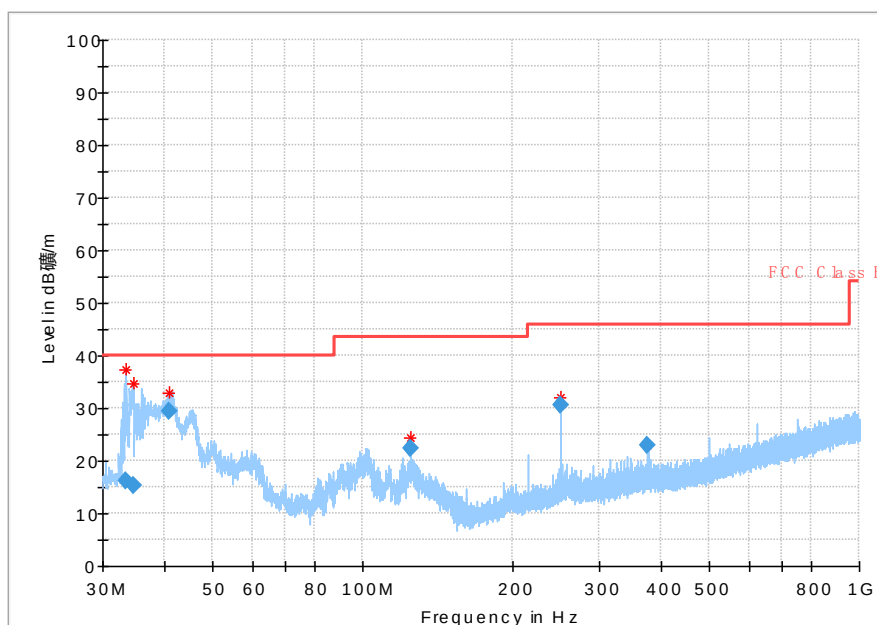


Fig. 42 Radiated Spurious Emission (802.11n-HT20, Ch165, 30 MHz-1 GHz)

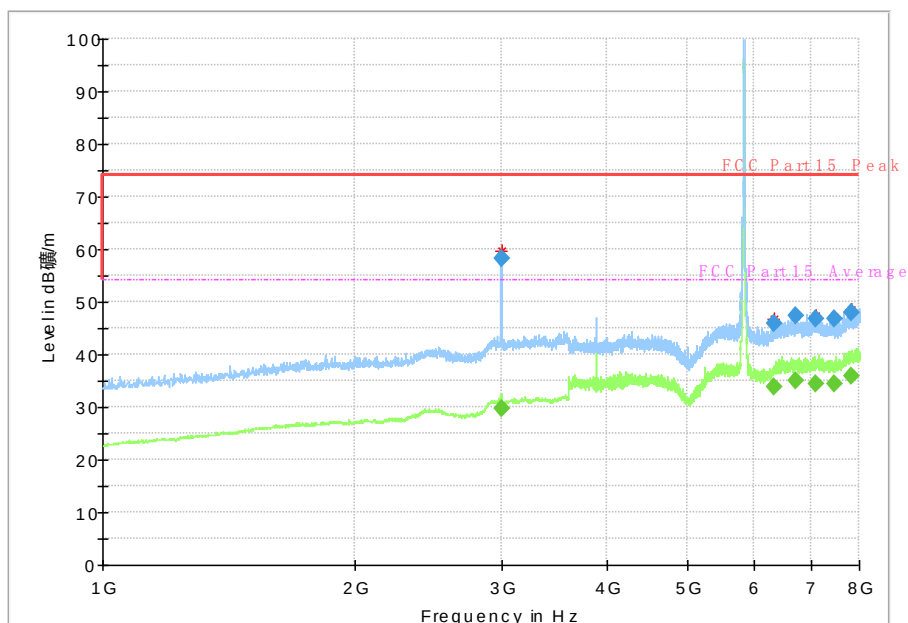


Fig. 43 Radiated Spurious Emission (802.11n-HT20, Ch165, 1 GHz-8 GHz)

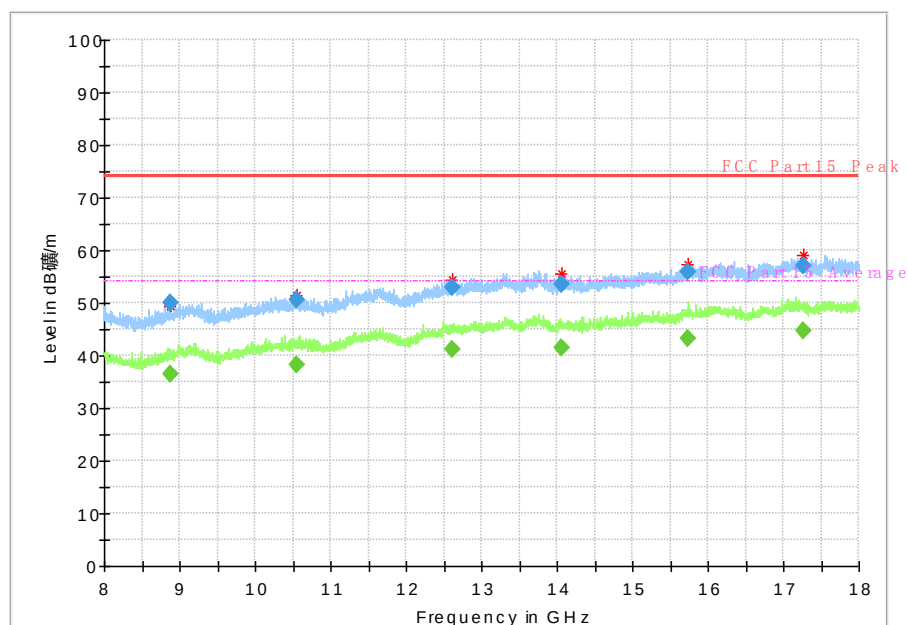


Fig. 44 Radiated Spurious Emission (802.11n-HT20, Ch165, 8 GHz-18 GHz)

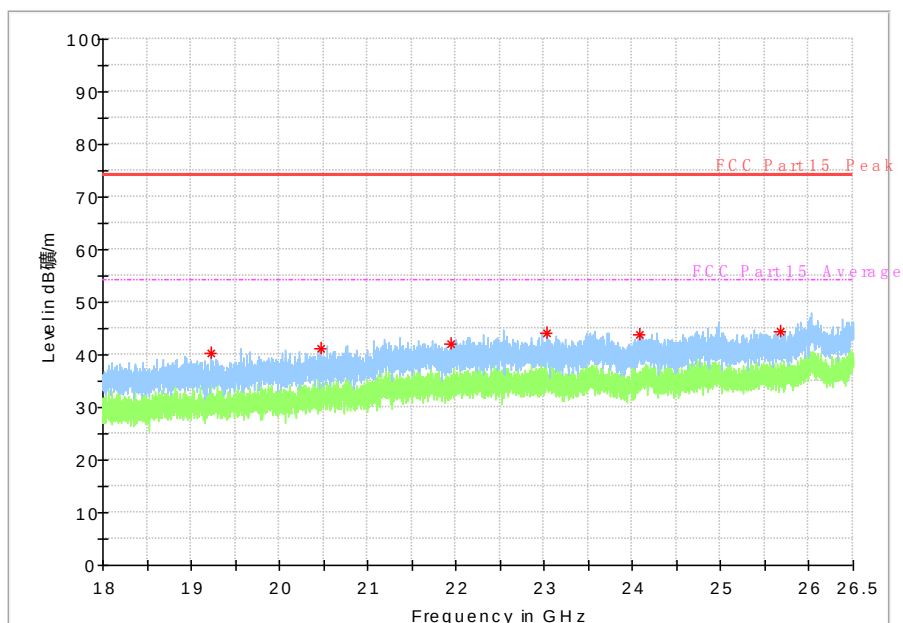


Fig. 45 Radiated Spurious Emission (802.11n-HT20, Ch165, 18 GHz-26.5 GHz)

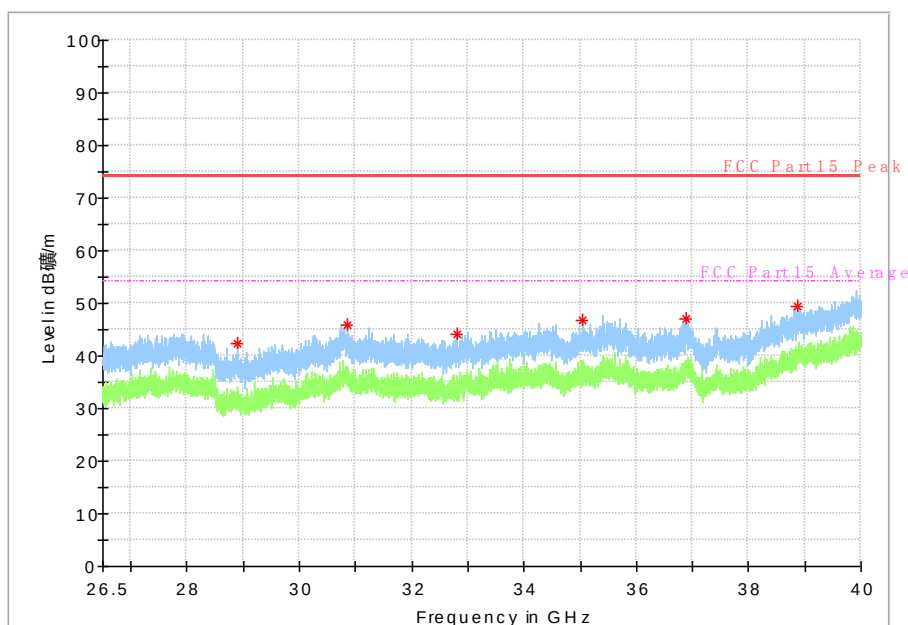


Fig. 46 Radiated emission: 802.11n, (802.11n-HT20, Ch165, 26.5 GHz - 40 GHz)

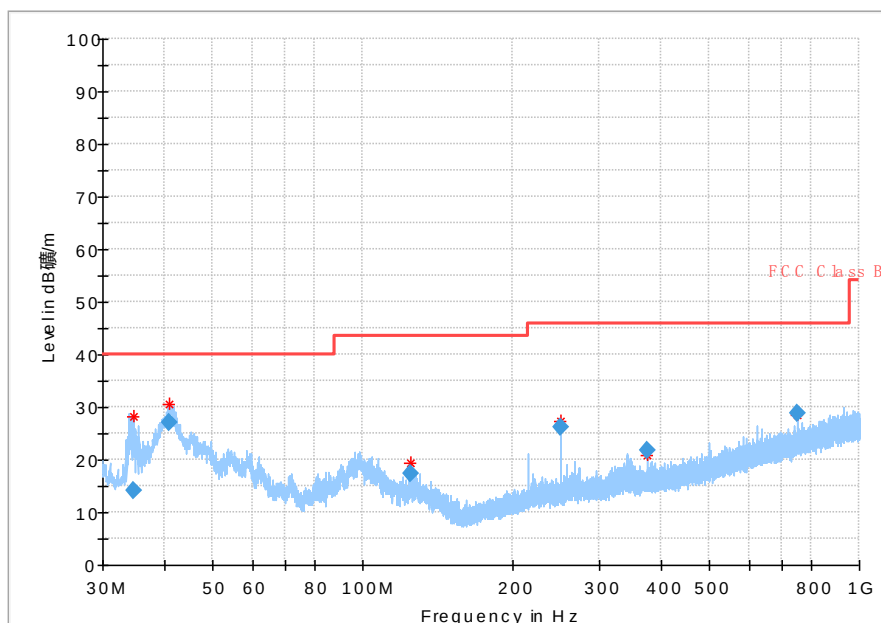


Fig. 47 Radiated Spurious Emission (802.11ac-HT20, Ch165, 30 MHz-1 GHz)

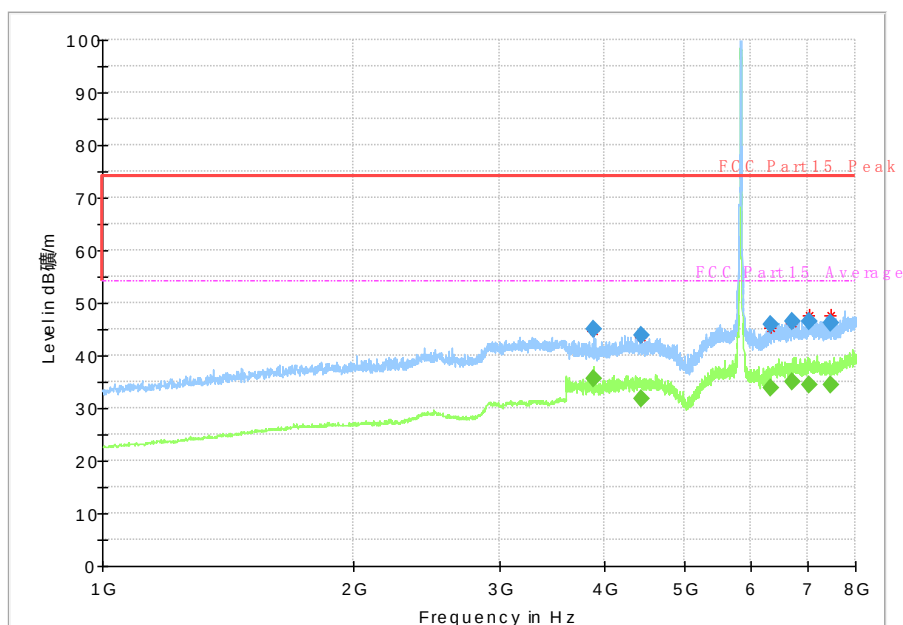


Fig. 48 Radiated Spurious Emission (802.11ac-HT20, Ch165, 1 GHz-8 GHz)

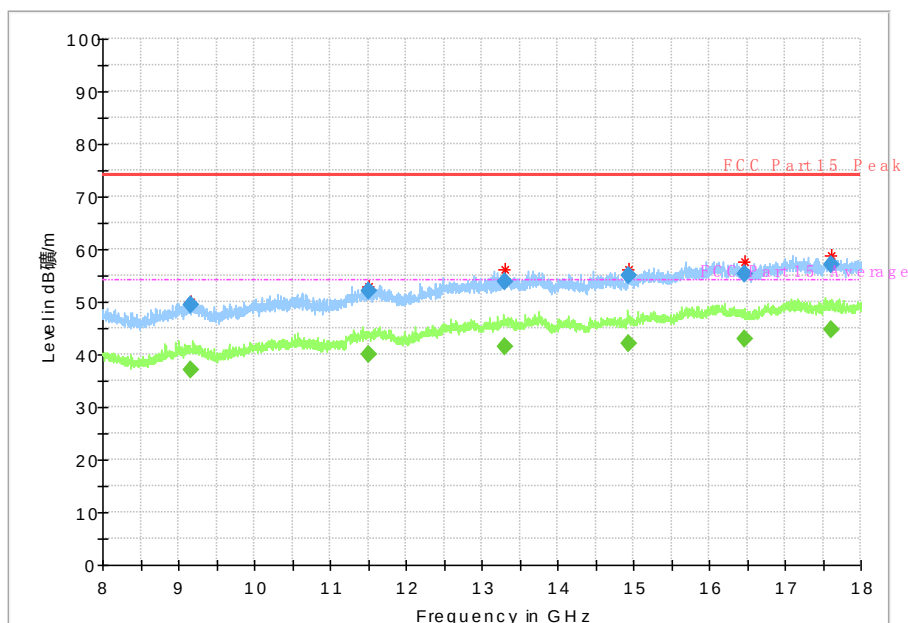


Fig. 49 Radiated Spurious Emission (802.11ac-HT20, Ch165, 8 GHz-18 GHz)

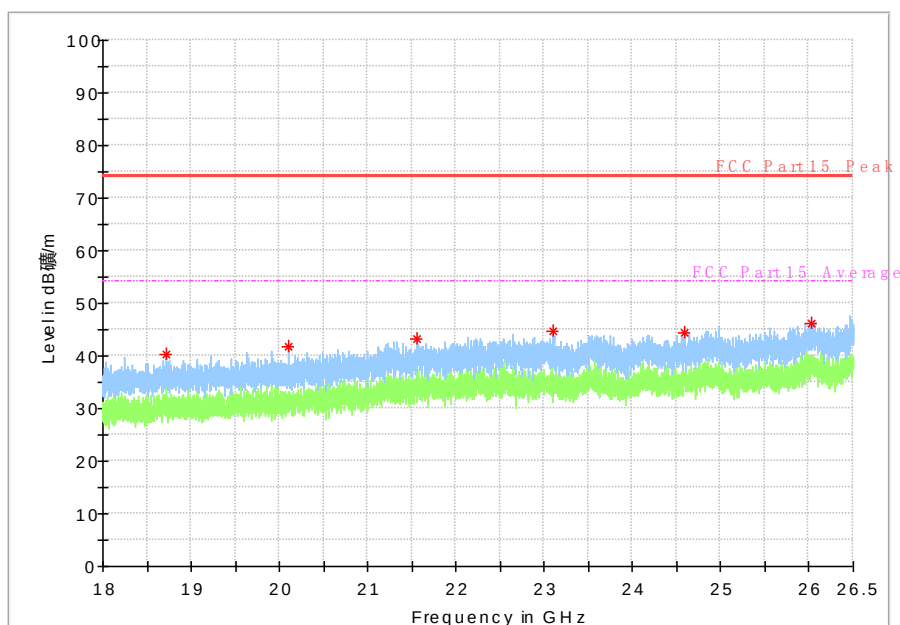


Fig. 50 Radiated Spurious Emission (802.11ac-HT20, Ch165, 18 GHz-26.5 GHz)

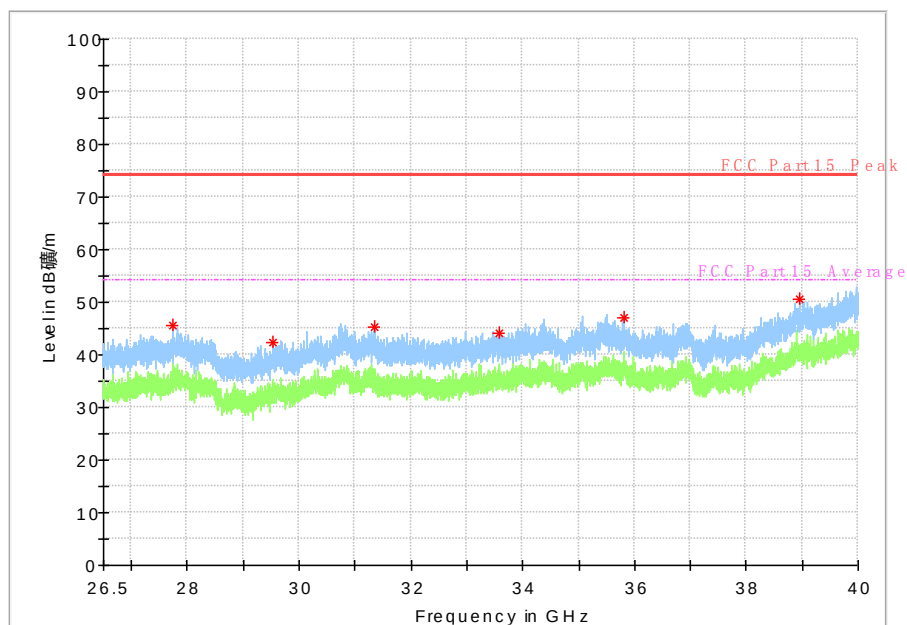


Fig. 51 Radiated emission: 802.11n, (802.11ac-HT20, Ch165, 26.5 GHz - 40 GHz)

ANNEX A.7. Band Edges Compliance

Band Edges - Radiated

Measurement Limit:

- (1) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.
- (2) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (3) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (4) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (5) In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

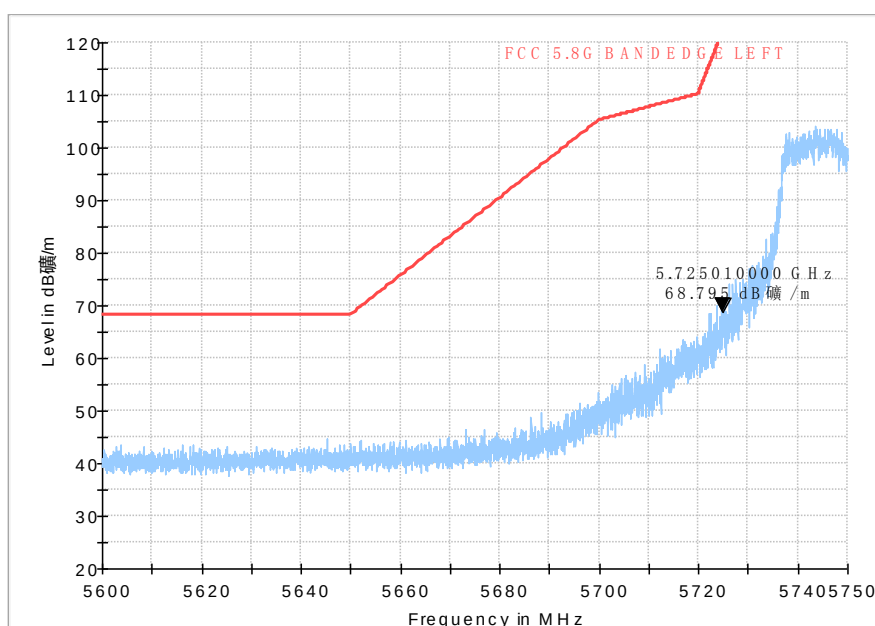
MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
10.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(²)
13.36-13.41			

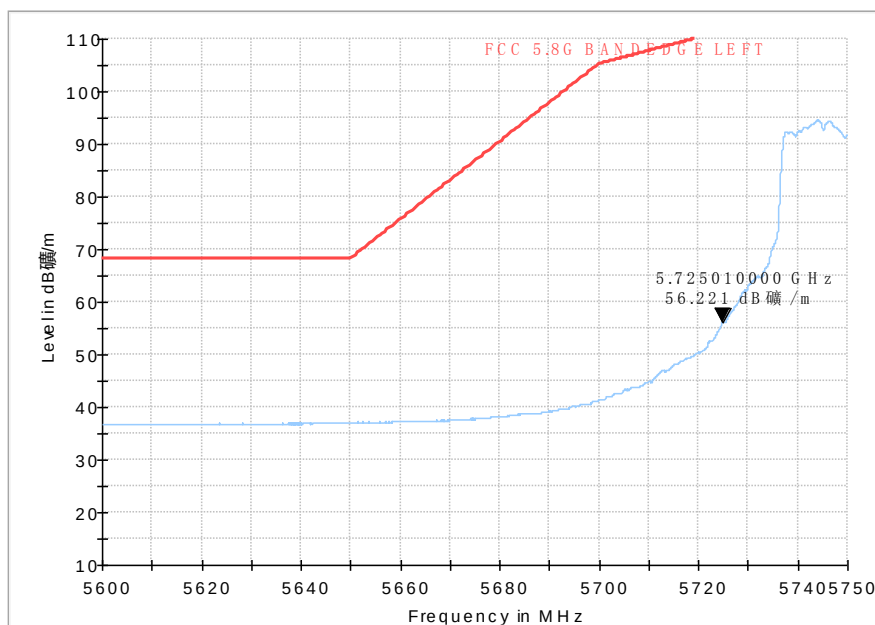
Set the spectrum analyzer in the following:

- (a) Sweep mode :SweepAnalyzer6db.
- (b) PEAK: RBW=1MHz / VBW=3MHz / Sweep=2.5ms, Sweep point;5001
- (c) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=2.5ms, Sweep point;5001

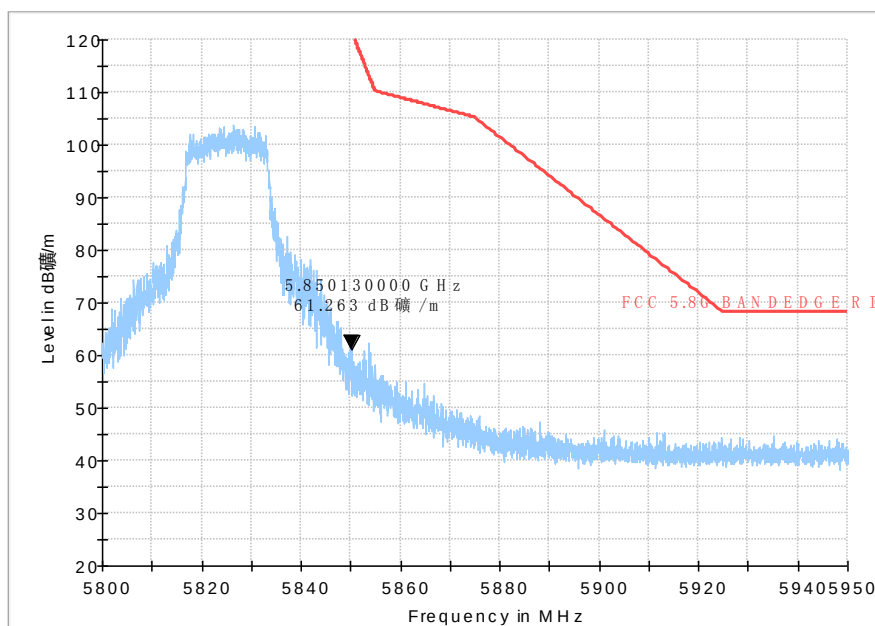
Measurement Result:

Mode	Channel	Test Results	Conclusion
802.11a	5745 MHz	Fig.52	P
	5825 MHz	Fig.53	P
802.11n HT20	5745 MHz	Fig.54	P
	5825 MHz	Fig.55	P
802.11ac HT20	5745 MHz	Fig.56	P
	5825 MHz	Fig.57	P

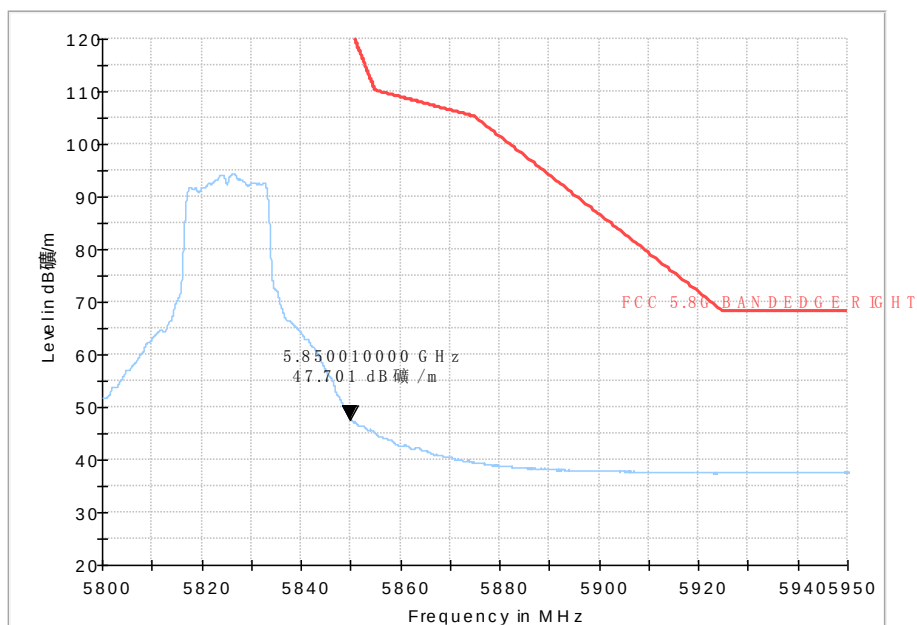
Conclusion: PASS
Test graphs as below:

Peak



Average
Fig. 52 Band Edges (802.11a, 5745MHz)

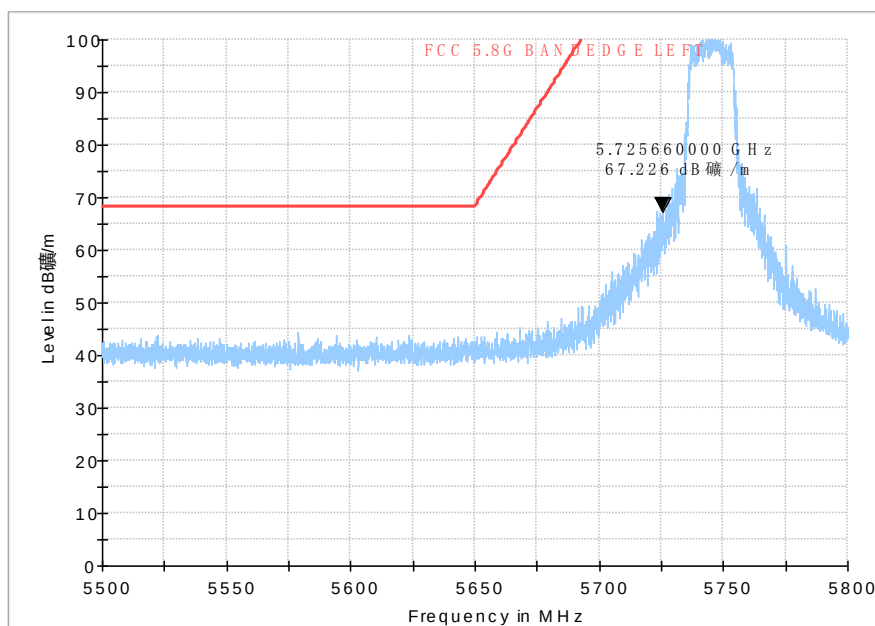


Peak

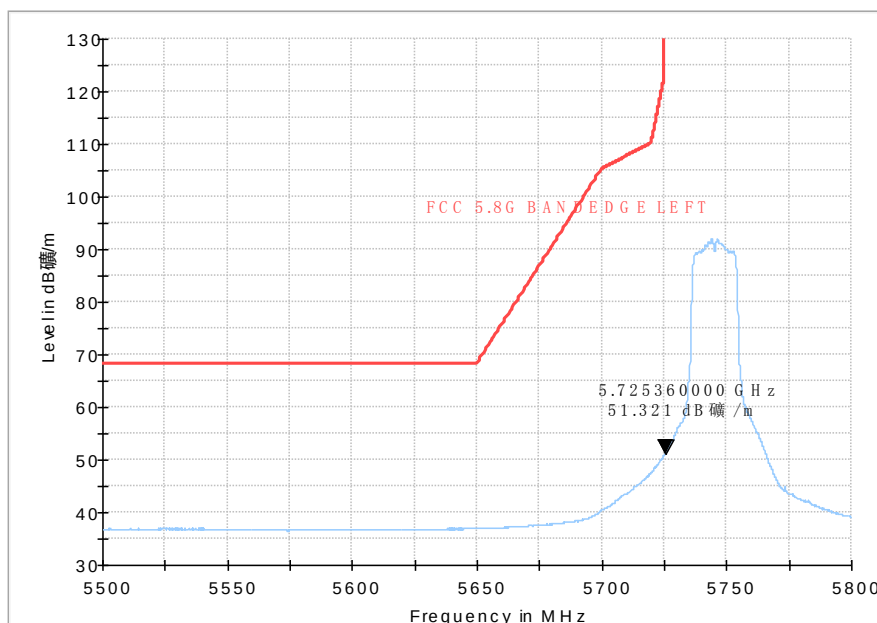


Average

Fig. 53 Band Edges (802.11a, 5825MHz)

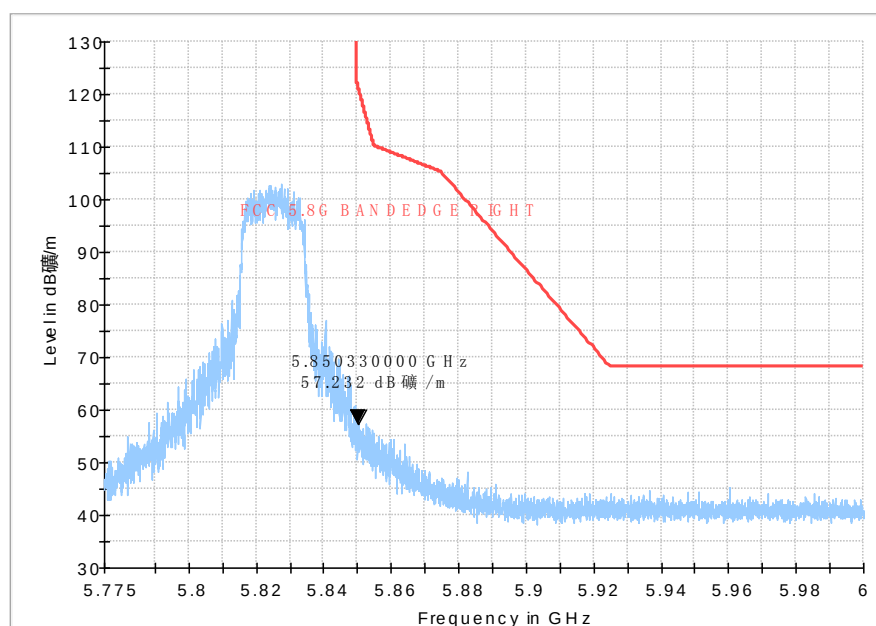


Peak

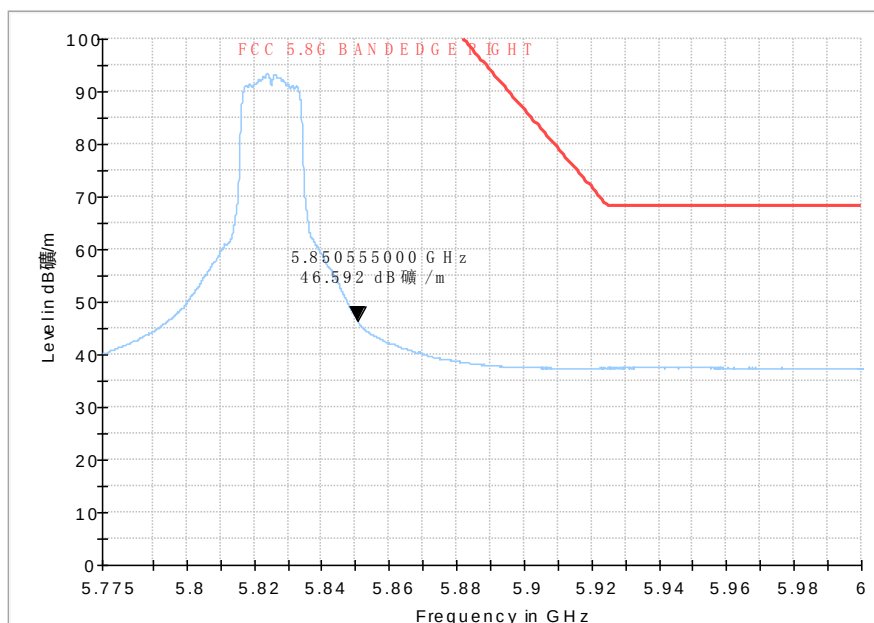


Average

Fig. 54 Band Edges (802.11n-HT20, 5745MHz)

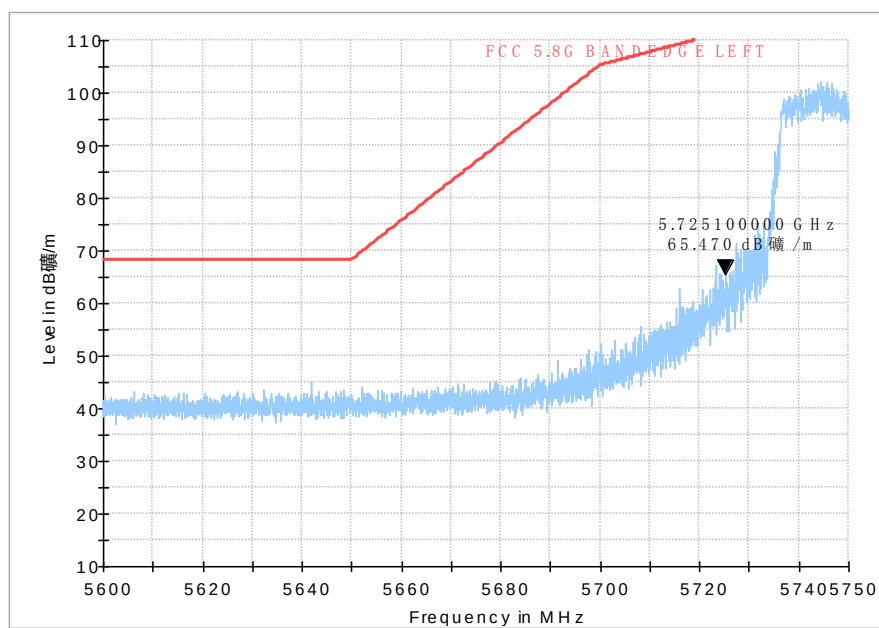


Peak

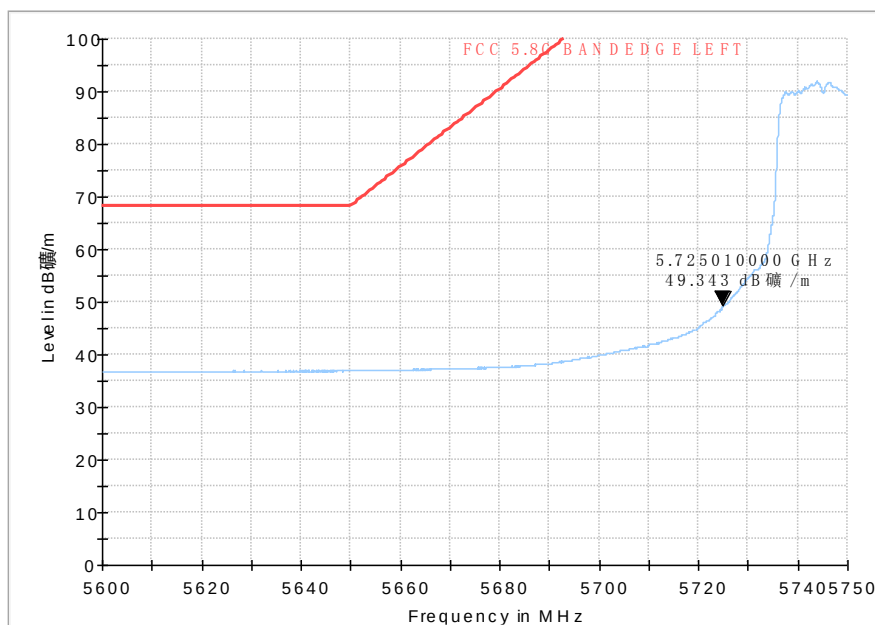


Average

Fig. 55 Band Edges (802.11n-HT20, 5825MHz)

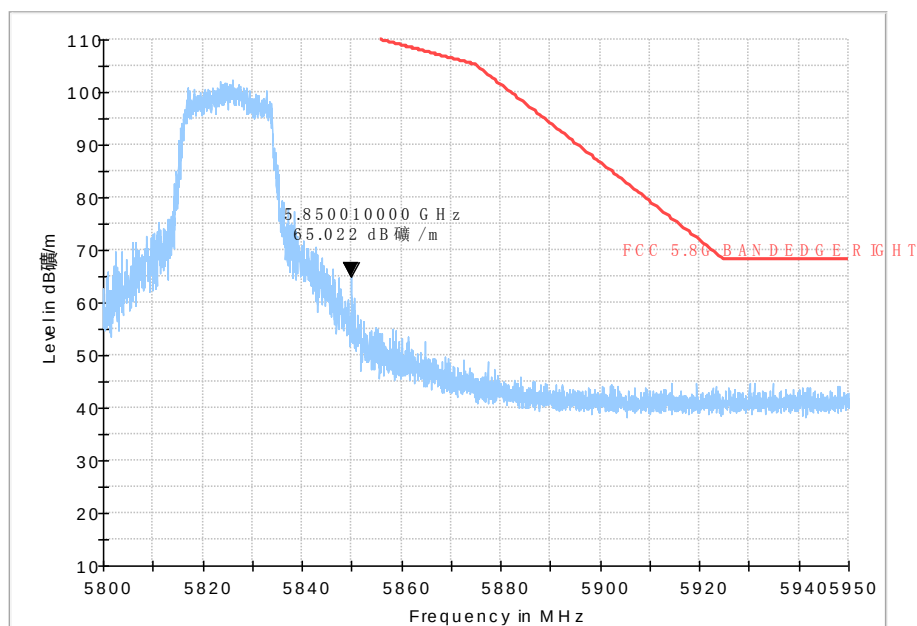


Peak

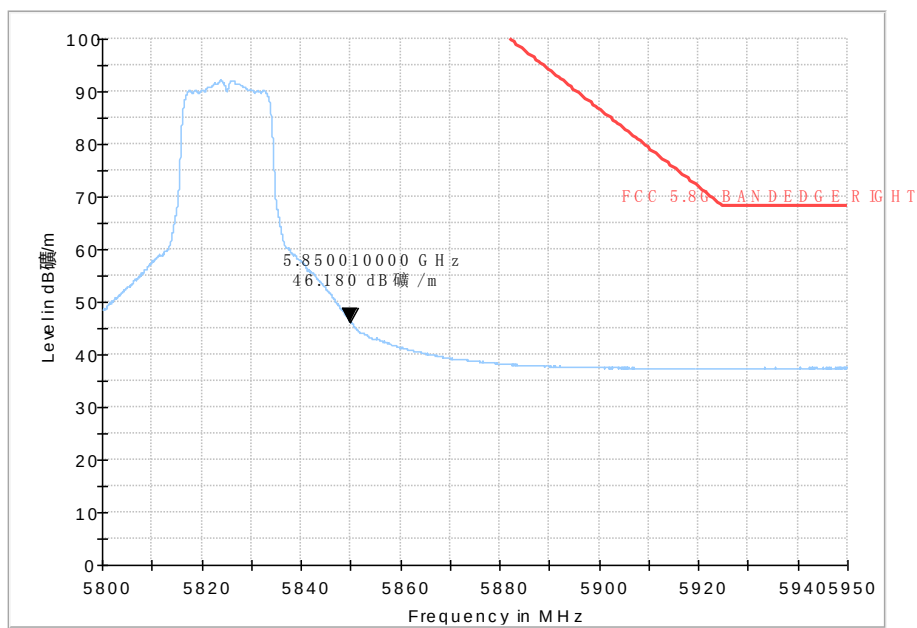


Average

Fig. 56 Band Edges (802.11ac-HT20, 5745MHz)



Peak



Average

Fig. 57 Band Edges (802.11ac-HT20, 5825MHz)

ANNEX A.8. AC Powerline Conducted Emission

Test Condition:

Voltage (V)	Frequency (Hz)
110	60

Measurement Result and limit:

WLAN (Quasi-peak Limit)

Frequency range (MHz)	Quasi-peak Limit (dBμV)	Result (dBμV)		Conclusion
		With charger		
		802.11a	Idle	
0.15 to 0.5	66 to 56	Fig.58		P
0.5 to 5	56			
5 to 30	60			

NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

WLAN (Average Limit)

Frequency range (MHz)	Average Limit (dBμV)	Result (dBμV)		Conclusion
		With charger		
		802.11a	Idle	
0.15 to 0.5	56 to 46	Fig.58		P
0.5 to 5	46			
5 to 30	50			

NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

The measurement is made according to ANSI C63.10 .

Conclusion: PASS

Test graphs as below:

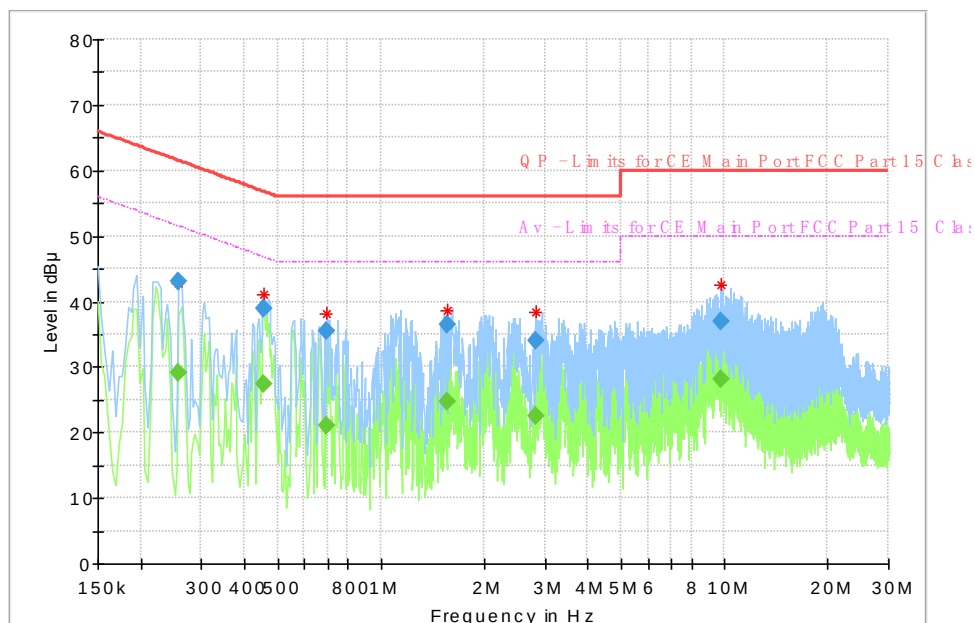


Fig. 58 AC Powerline Conducted Emission-802.11a

Measurement Result :

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.258206	---	29.09	51.49	22.40	15000.0	9.000	L1	ON	9.8
0.258206	42.97	---	61.49	18.52	15000.0	9.000	L1	ON	9.8
0.455963	38.94	---	56.77	17.83	15000.0	9.000	N	ON	9.8
0.455963	---	27.32	46.77	19.45	15000.0	9.000	N	ON	9.8
0.691031	35.58	---	56.00	20.42	15000.0	9.000	N	ON	9.8
0.691031	---	21.00	46.00	25.00	15000.0	9.000	N	ON	9.8
1.564144	36.53	---	56.00	19.47	15000.0	9.000	N	ON	9.9
1.564144	---	24.80	46.00	21.20	15000.0	9.000	N	ON	9.9
2.810381	33.89	---	56.00	22.11	15000.0	9.000	N	ON	10.0
2.810381	---	22.47	46.00	23.53	15000.0	9.000	N	ON	10.0
9.761700	---	28.02	50.00	21.98	15000.0	9.000	L1	ON	11.2
9.761700	37.03	---	60.00	22.97	15000.0	9.000	L1	ON	11.2

ANNEX B. Accreditation Certificate

*****END OF REPORT*****