



FCC PART 15C TEST REPORT

No.I19Z60464-IOT10

For

Samsung Electronics Co Ltd

Multi-band GSM/WCDMA/LTE phone with Bluetooth, WLAN

SM-T295

With

FCC ID: ZCASMT295

Hardware Version: V0.3

Software Version: T295XXU0ASE8

Issued Date: 2019-06-10



Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of CTTL.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S.Government.

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REPORT HISTORY

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1. TEST LATORATORY

1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2005 accredited test laboratory under NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM (NVLAP) with lab code 600118-0, and is also an FCC accredited test laboratory (CN5017), and ISED accredited test laboratory (CN0066). The detail accreditation scope can be found on NVLAP website.

1.2. Testing Location

Conducted testing Location: CTTL(huayuan North Road)

Address: No. 52, Huayuan North Road, Haidian District, Beijing,
P. R. China100191

Radiated testing Location: CTTL(BDA)

Address: No. 51 Shouxiang Science Building, Xueyuan Road,
Haidian District, Beijing, P. R. China100191

1.3. Testing Environment

Normal Temperature: 15-35°C

Extreme Temperature: -10/+55°C

Relative Humidity: 20-75%

1.4. Project data

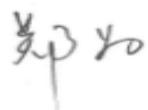
Testing Start Date: 2019-04-09
Testing End Date: 2019-05-27

1.5. Signature



Jiang Xue

(Prepared this test report)



Zheng Wei

(Reviewed this test report)



Gao Hong

(Approved this test report)

2. CLIENT INFORMATION

2.1. Applicant Information

Company Name: Samsung Electronics Co Ltd
Address: 19 Chapin Rd.,Building D Pine Brook, NJ 07058
Contact: Jenni Chun
Email: /
Tel: /
Fax: /

2.2. Manufacturer Information

Company Name: Jiaxing Yongrui Electron Technology Co., Ltd.
Address: NO.777 Yazhong Road, Daqiao Town, Nanhу District, Jiaxing City ,Zhejiang
Contact: /
Email: /
Tel: /
Fax: /

3. EQUIPMENT UNDER TEST (EUT) AND ANCILLARY EQUIPMENT(AE)

3.1. About EUT

Description	Multi-band GSM/WCDMA/LTE phone with Bluetooth, WLAN
Model name	SM-T295
FCC ID	ZCASMT295
WLAN Frequency Range	ISM Band: 5725MHz~5850MHz
Type of modulation	OFDM
Normal Voltage	3.8V
Extreme Low Voltage	3.6V
Extreme High Voltage	4.2V

Note: Photographs of EUT are shown in ANNEX C of this test report. Components list, please refer to documents of the manufacturer; it is also included in the original test record of Telecommunication Metrology Center of MIIT of People's Republic of China.

3.2. Internal Identification of EUT used during the test

EUT ID*	IMEI	HW Version	SW Version
EUT1	356136100027236	V0.3	T295XXU0ASE8
EUT2	356136100026212	V0.3	T295XXU0ASE8

*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	SN	Remarks
AE1	Battery	/	Inbuilt
AE2	Battery	/	Inbuilt
AE3	Charger	/	/
AE4	Charger	/	/
AE5	USB Cable	/	/

AE1

Model	SWD-WT-N8
Manufacturer	Sunwoda Electronic Co., Ltd .
Capacitance	4980mAh
Nominal voltage	3.82 V

AE2

Model	SCUD-WT-N8
Manufacturer	SCUD(Fujian) Electronic Co., Ltd.
Capacitance	4980mAh
Nominal voltage	3.82V

AE3

Model	EP-TA50JWS
Manufacturer	RFTECH ELECTRONICS (HuiZhou) Co.,Ltd.
Length of cable	/
AE4	
Model	EP-TA50JWE
Manufacturer	RFTECH ELECTRONICS (HuiZhou) Co.,Ltd.
Length of cable	/
AE5	
Model	GH39-02004A
Manufacturer	RFTECH ELECTRONICS (HuiZhou) Co.,Ltd.
Length of cable	/

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

3.4. General Description

Equipment Under Test (EUT) is a model of Multi-band GSM/WCDMA/LTE phone with Bluetooth, WLAN with integrated antenna. It consists of normal options: Battery and Charger.

Manual and specifications of the EUT were provided to fulfil the test.

Samples undergoing test were selected by the Client.

4. REFERENCE DOCUMENTS

4.1. Documents supplied by applicant

EUT feature information is supplied by the applicant 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.

FCC Part15	FCC CFR 47, Part 15, Subpart C and E: 15.205 Restricted bands of operation; 15.209 Radiated emission limits, general requirements; 15.407 General technical requirements Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz	2016
ANSI C63.10		2013
UNII: KDB 789033 D02	General U-NII Test Procedures New Rules v02r01	2017-12

5. LABORATORY ENVIRONMENT

Conducted RF performance testing is performed in shielding room.

EMC performance testing is performed in Semi-anechoic chamber.

6. SUMMARY OF TEST RESULTS

6.1. Summary of Test Results

SUMMARY OF MEASUREMENT RESULTS	Sub-clause of Part15C	Sub-clause of IC	Verdict
Maximum Peak Output Power	15.407 (a)	/	P
Peak Power Spectral Density	15.407 (a)	/	P
Occupied 6dB Bandwidth	15.407 (e)	/	P
Band Edges Compliance	15.407 (b)	/	P
Transmitter Spurious Emission - Conducted	15.407	/	P
Transmitter Spurious Emission - Radiated	15.407, 15.205, 15.209	/	P
AC Powerline Conducted Emission	15.107, 15.207	/	P
Transmitter Spurious Emission - Radiated < 30MHz	15.407, 15.209	/	P

Please refer to **ANNEX A** for detail.

Terms used in Verdict column

P	Pass, The EUT complies with the essential requirements in the standard.
NM	Not measured, The test was not measured by CTTL
NA	Not Applicable, The test was not applicable
F	Fail, The EUT does not comply with the essential requirements in the standard

6.2. Statements

CTTL has evaluated the test cases requested by the client/manufacturer as listed in section 6.1 of this report for the EUT specified in section 3 according to the standards or reference documents listed in section 4.1.

This report only deals with the WLAN function among the features described in section 3.

6.3. Test Conditions

For this report, all the test cases are tested under normal temperature and normal voltage, and also under norm humidity, the specific condition is shown as follows:

Temperature	26°C
Voltage	3.8V
Humidity	44%

7. TEST EQUIPMENTS UTILIZED

Conducted test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Vector Signal Analyzer	FSQ40	200089	Rohde & Schwarz	1 year	2020-05-15
2	LISN	ESH3-Z5	825562/028	Rohde & Schwarz	1 year	2019-08-22
3	Test Receiver	ESCI	100766	Rohde & Schwarz	1 year	2020-03-20
4	Shielding room	NQ(3.2*5.5*2.7)M	P1154	hankering	/	/

Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Test Receiver	ESU26	100376	Rohde & Schwarz	1 year	2019-11-27
2	BiLog Antenna	VULB9163	9163-482	Schwarzbeck	1 year	2019-09-21
4	Dual-Ridge Waveguide Horn Antenna	3117	00139065	ETS-Lindgren	1 year	2019-10-15
6	Dual-Ridge Waveguide Horn Antenna	3116	2663	ETS-Lindgren	1 year	2019-07-09
7	Vector Signal Analyzer	FSV40	101047	Rohde & Schwarz	1 year	2019-07-21

8. Measurement Uncertainty

8.1. Transmitter Output Power

Measurement Uncertainty: 0.387dB,k=1.96

8.2. Peak Power Spectral Density

Measurement Uncertainty: 0.705dB,k=1.96

8.3. Occupied 6dB Bandwidth

Measurement Uncertainty: 60.80Hz,k=1.96

8.4. Band Edges Compliance

Measurement Uncertainty : 0.62dB,k=1.96

8.5. Spurious Emissions

Conducted (k=1.96)

Frequency Range	Uncertainty(dB)
30MHz ≤ f ≤ 2GHz	1.22
2GHz ≤ f ≤ 3.6GHz	1.22
3.6GHz ≤ f ≤ 8GHz	1.22
8GHz ≤ f ≤ 12.75GHz	1.51
12.75GHz ≤ f ≤ 26GHz	1.51
26GHz ≤ f ≤ 40GHz	1.59

Radiated (k=2)

Frequency Range	Uncertainty(dB)
9kHz-30MHz	/
30MHz ≤ f ≤ 1GHz	5.40
1GHz ≤ f ≤ 18GHz	4.32
18GHz ≤ f ≤ 40GHz	5.26

8.6. AC Power-line Conducted Emission

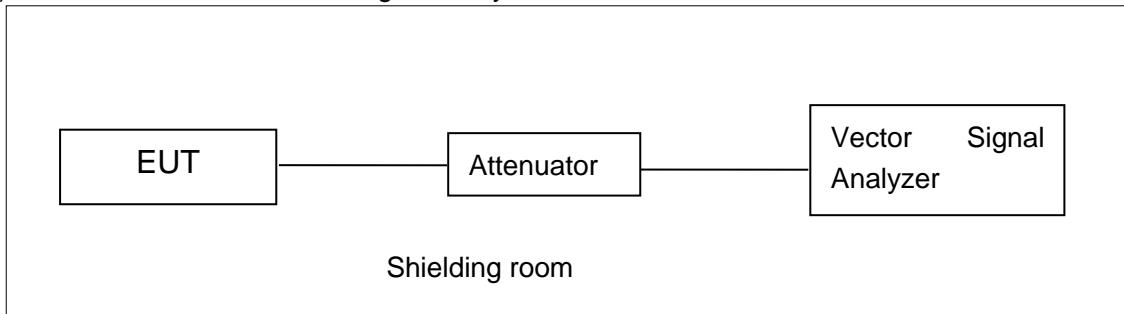
Measurement Uncertainty : 3.10dB,k=2

ANNEX A: MEASUREMENT RESULTS

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

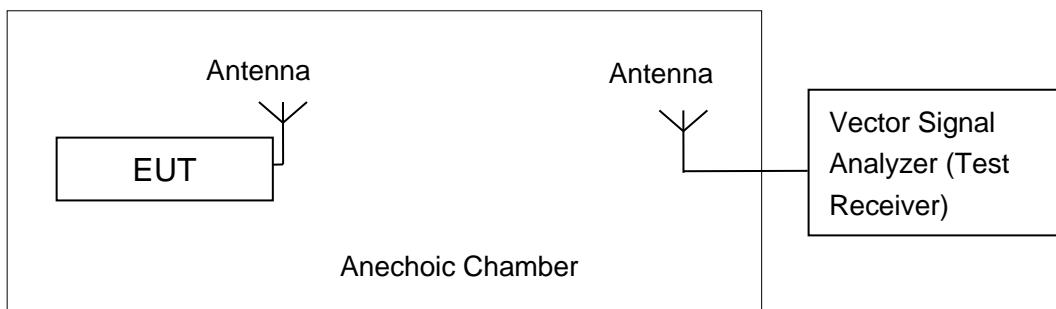


A.1.2. Radiated Emission Measurements

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.

A.2. Maximum Peak Output Power

Measurement Limit and Method:

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

A.2.1 Antenna Gain

Antenna gain is -1.22dBi and the value is supplied by the applicant or manufacturer.

A.2.2. Maximum Peak Output Power-conducted

Measurement Results:

802.11a mode

Mode	Data Rate (Mbps)	Test Result (dBm)		
		5745MHz (Ch149)	5785MHz (Ch157)	5825MHz (Ch165)
802.11a	6	20.46	/	/
	9	20.58	/	/
	12	20.47	/	/
	18	20.42	/	/
	24	20.87	/	/
	36	20.88	/	/
	48	20.96	21.25	20.79
	54	20.91	/	/

The data rate 48Mbps is selected as worse condition, and the following cases are performed with this condition.

802.11n-HT20 mode

Mode	Data Rate (Index)	Test Result (dBm)		
		5745MHz (Ch149)	5785MHz (Ch157)	5825MHz (Ch165)
802.11n (20MHz)	MCS0	20.66	/	/
	MCS1	20.57	/	/
	MCS2	20.60	/	/
	MCS3	21.06	/	/
	MCS4	21.04	/	/
	MCS5	21.15	21.48	21.78
	MCS6	21.14	/	/
	MCS7	21.09	/	/

The data rate MCS5 is selected as worse condition, and the following cases are performed with this condition.

802.11n-HT40 mode

Mode	Data Rate (Index)	Test Result (dBm)	
		5755MHz (Ch151)	5795MHz (Ch159)
802.11n (40MHz)	MCS0	20.17	/
	MCS1	20.13	/
	MCS2	20.11	/
	MCS3	20.49	/
	MCS4	20.53	/
	MCS5	20.51	/
	MCS6	20.51	/
	MCS7	20.59	20.46

The data rate MCS7 is selected as worse condition, and the following cases are performed with this condition.

Conclusion: PASS

A.2.3. Maximum Average Output Power-Conducted

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

802.11a mode

Mode	Test Result (dBm)		
	5745MHz (Ch149)	5785MHz (Ch157)	5825MHz (Ch165)
802.11a	12.42	13.26	13.44

802.11n-HT20 mode

Mode	Test Result (dBm)		
	5745MHz (Ch149)	5785MHz (Ch157)	5825MHz(Ch165)
802.11n-HT20	12.38	13.18	13.41

802.11n-HT40 mode

Mode	Test Result (dBm)	
	5755MHz (Ch151)	5795MHz(Ch159)
802.11n-HT40	12.26	12.77

Conclusion: PASS

A.3. Peak Power Spectral Density

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 Uncertainty:

Measurement Uncertainty	0.75dB
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Measurement Results:

Mode	Channel	Power Spectral Density (dBm/500kHz)	Conclusion
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802.11a	149	1.07	P
	157	1.70	P
	165	0.42	P

802.11n-HT20	149	0.57	P
	157	0.95	P
	165	0.36	P

802.11n-HT40	151	-2.36	P
	159	-1.81	P

Conclusion: PASS

A.4. Occupied 6dB Bandwidth

Measurement Limit:

Standard	Limit (kHz)
FCC 47 CFR Part 15.407 (e)	≥ 500

The measurement is made according to KDB789033 D02 .

Measurement Uncertainty:

Measurement Uncertainty	60.80Hz
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Measurement Result:

Mode	Channel	Occupied 6dB Bandwidth (MHz)	conclusion
802.11a	149	Fig.1	16.35
	157	Fig.2	16.40
	165	Fig.3	16.35
802.11n-HT20	149	Fig.4	17.60
	157	Fig.5	17.60
	165	Fig.6	17.60
802.11n-HT40	151	Fig.7	35.28
	159	Fig.8	35.52

Conclusion: PASS

Test graphs as below:

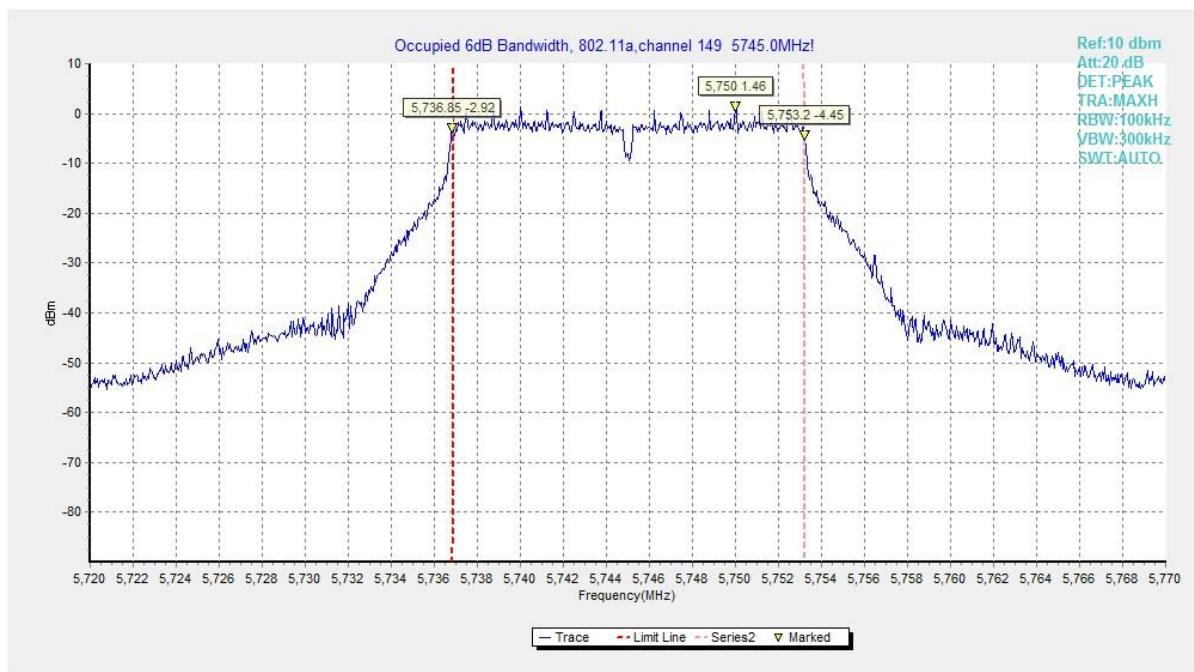


Fig. 1 Occupied 6dB Bandwidth (802.11a, Ch 149)

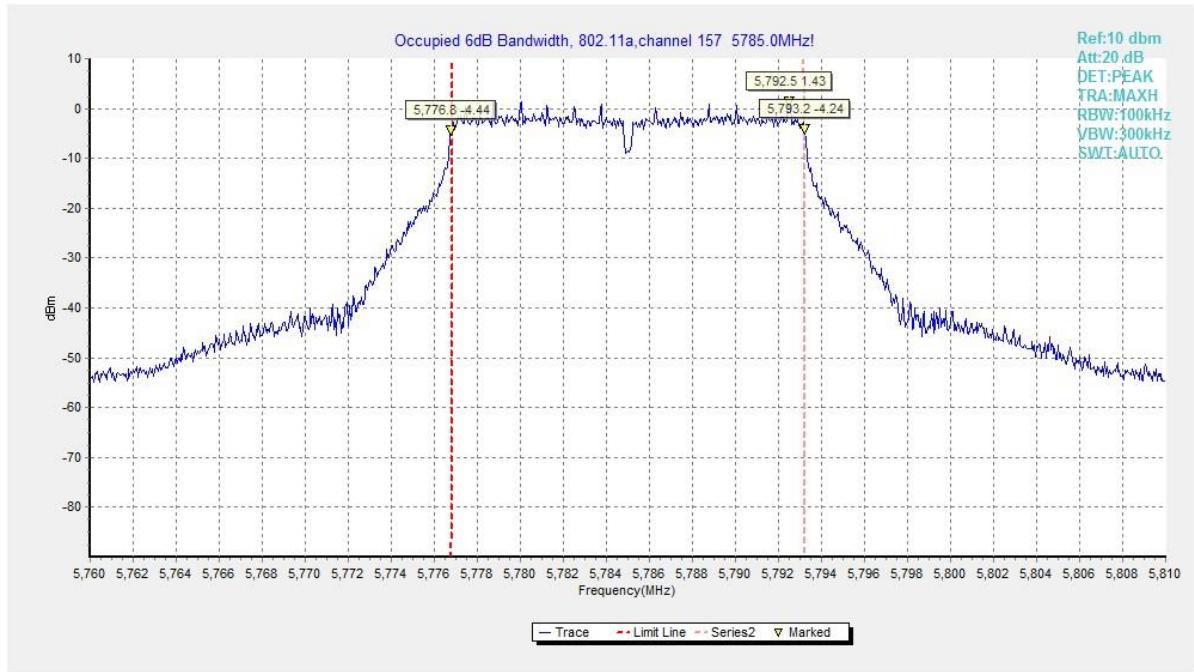


Fig. 2 Occupied 6dB Bandwidth (802.11a, Ch 157)

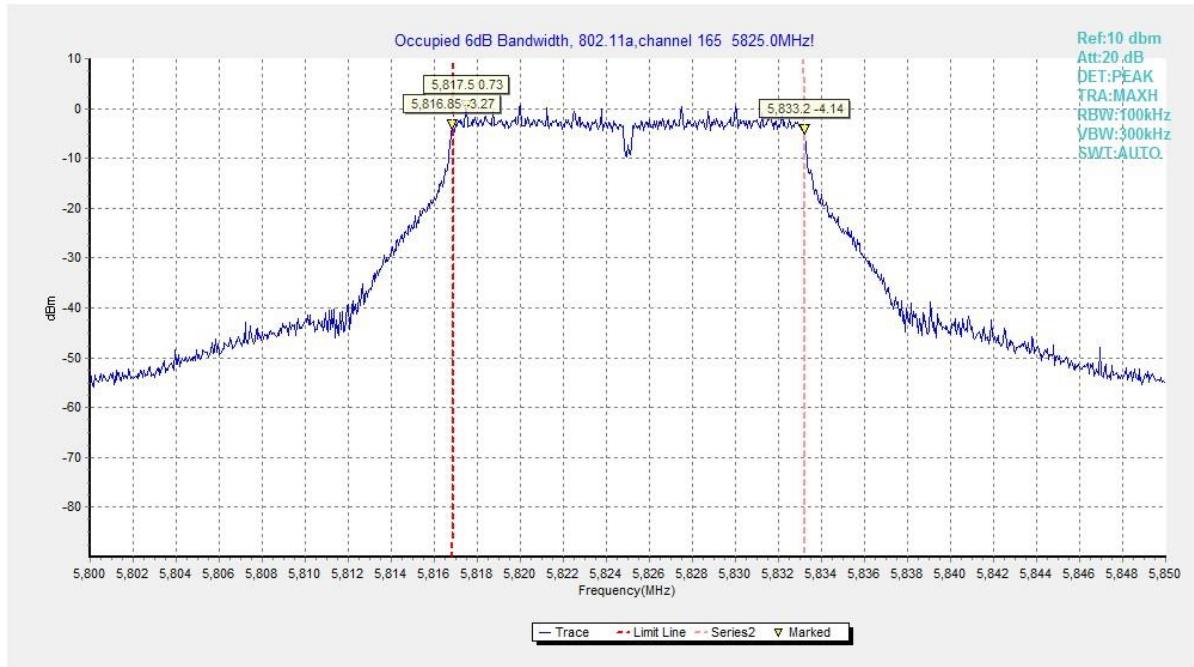


Fig. 3 Occupied 6dB Bandwidth (802.11a, Ch 165)

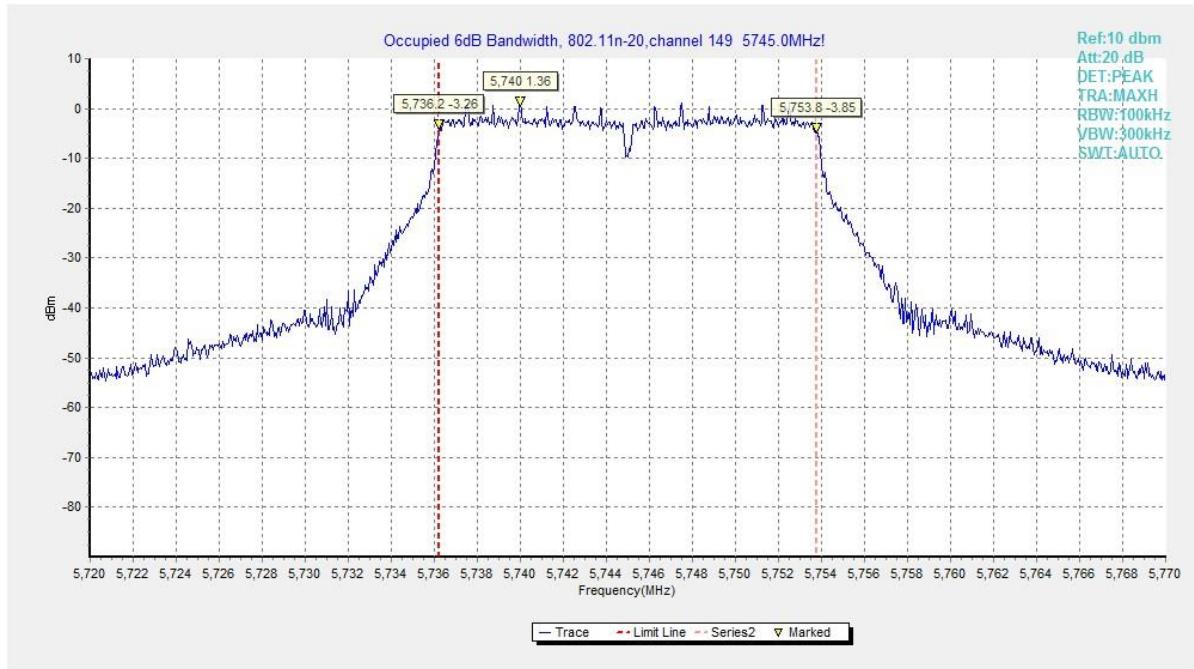


Fig. 4 Occupied 6dB Bandwidth (802.11n20, Ch 149)

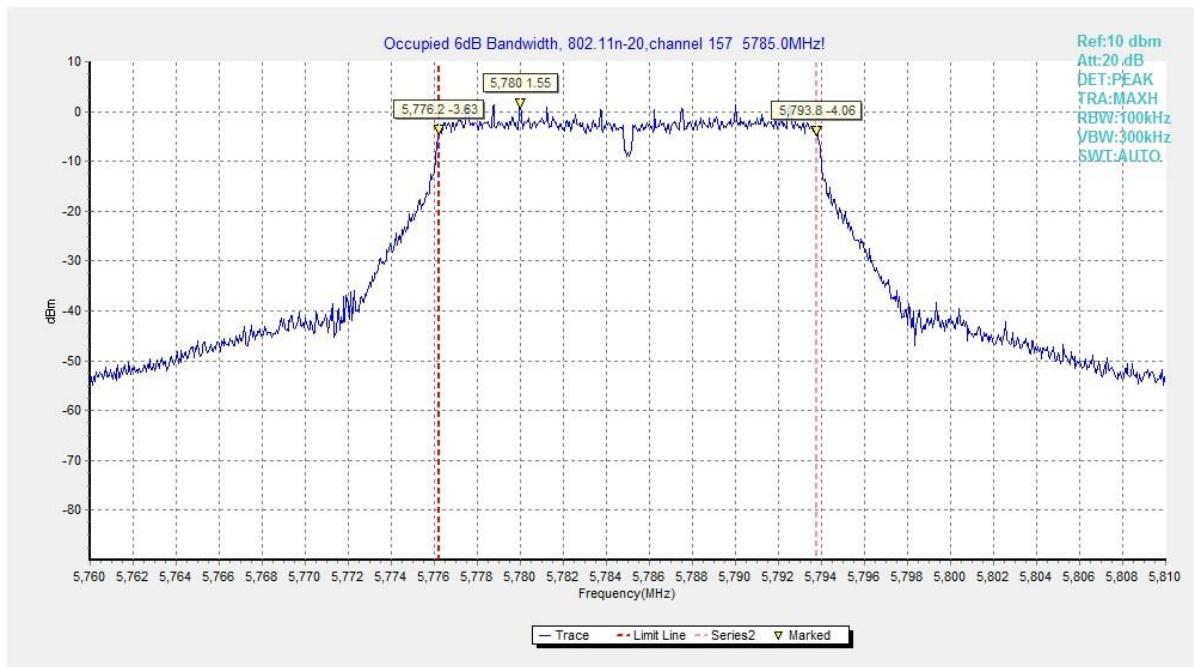


Fig. 5 Occupied 6dB Bandwidth (802.11n20, Ch 157)

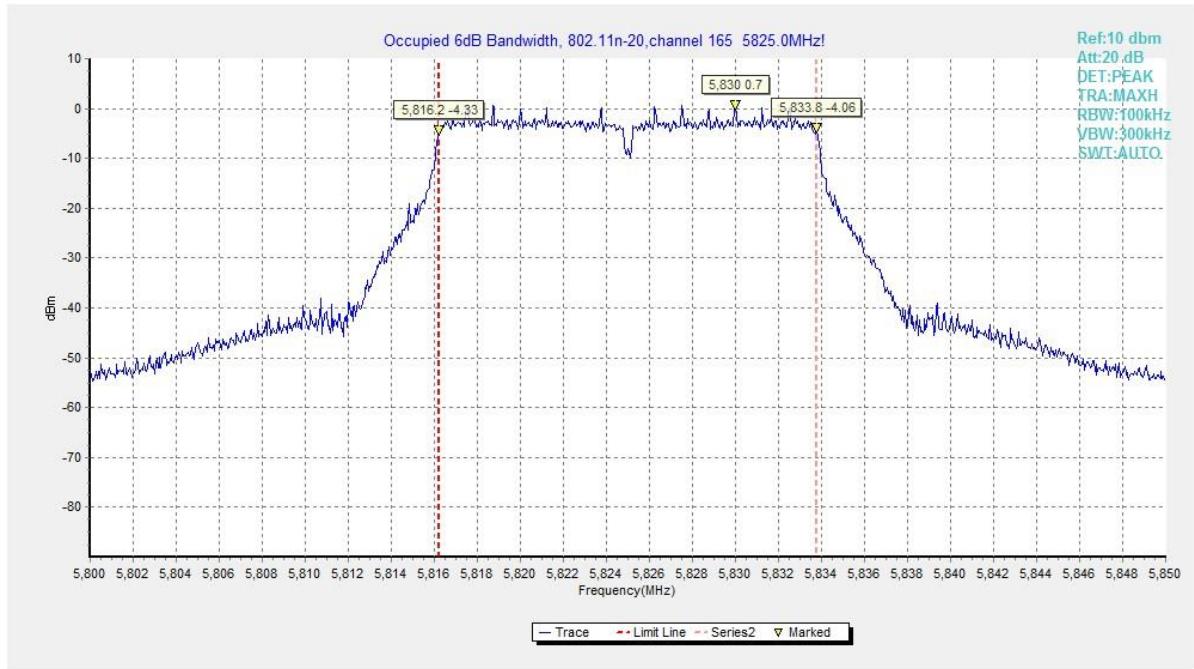


Fig. 6 Occupied 6dB Bandwidth (802.11n20, Ch 165)

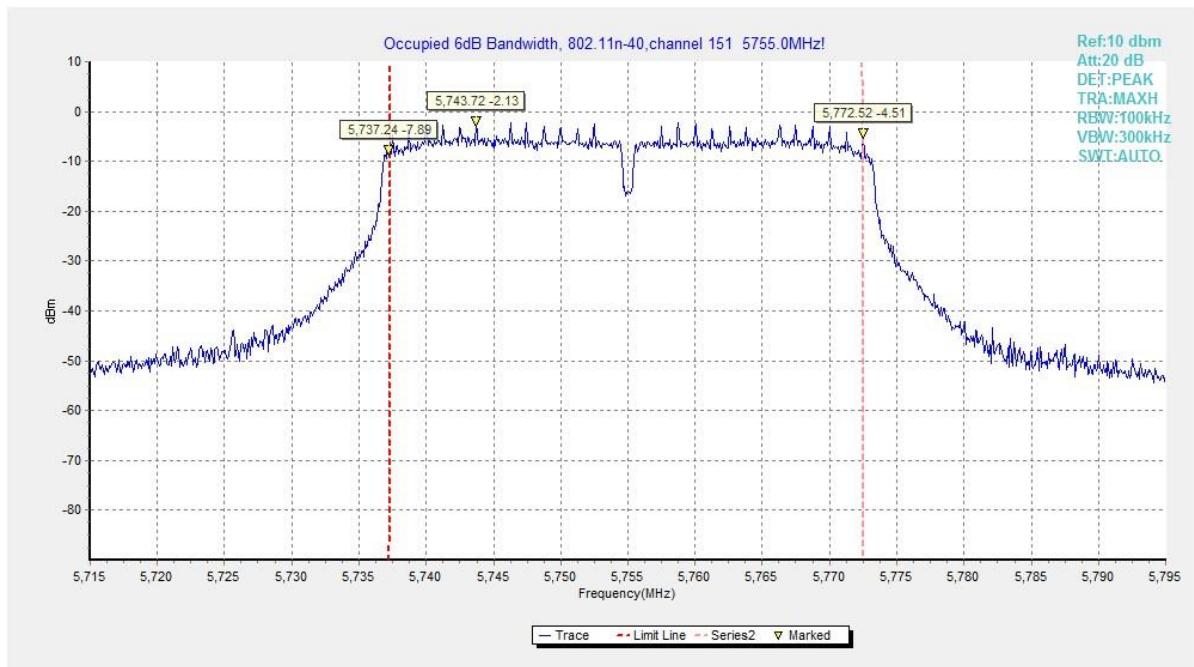


Fig. 7 Occupied 6dB Bandwidth (802.11n40, Ch 151)

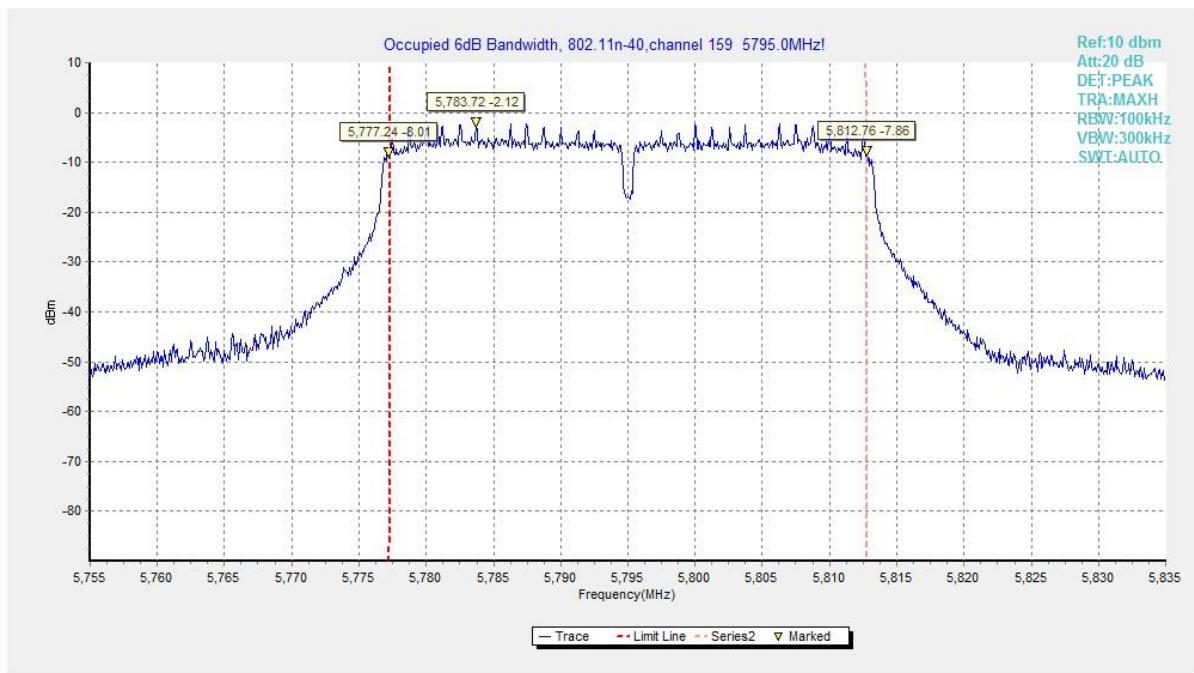


Fig. 8 Occupied 6dB Bandwidth (802.11n40, Ch 159)

A.5. 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)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Measurement Uncertainty:

Frequency Range	Uncertainty(dB)
30MHz ≤ f ≤ 2GHz	0.63
2GHz ≤ f ≤ 3.6GHz	0.82
3.6GHz ≤ f ≤ 8GHz	1.55
8GHz ≤ f ≤ 20GHz	1.86
20GHz ≤ f ≤ 22GHz	1.90
22GHz ≤ f ≤ 26GHz	2.20

A.5.1 Transmitter Spurious Emission - Conducted

Measurement Results:

802.11a mode

MODE	Channel	Frequency Range	Test Results	Conclusion
802.11a	149	30 MHz ~ 1 GHz	Fig.9	P
		1 GHz ~ 12 GHz	Fig.10	P
		12 GHz ~ 25 GHz	Fig.11	P
		25 GHz ~ 40 GHz	Fig.12	P
	157	30 MHz ~ 1 GHz	Fig.13	P
		1 GHz ~ 12 GHz	Fig.14	P
		12 GHz ~ 25 GHz	Fig.15	P
		25 GHz ~ 40 GHz	Fig.16	P
	165	30 MHz ~ 1 GHz	Fig.17	P
		1 GHz ~ 12 GHz	Fig.18	P
		12 GHz ~ 25 GHz	Fig.19	P
		25 GHz ~ 40 GHz	Fig.20	P

802.11n-HT20 mode

MODE	Channel	Frequency Range	Test Results	Conclusion
802.11n-HT 20	149	30 MHz ~ 1 GHz	Fig.21	P
		1 GHz ~ 12 GHz	Fig.22	P
		12 GHz ~ 25 GHz	Fig.23	P
		25 GHz ~ 40 GHz	Fig.24	P
	157	30 MHz ~ 1 GHz	Fig.25	P
		1 GHz ~ 12 GHz	Fig.26	P
		12 GHz ~ 25 GHz	Fig.27	P
		25 GHz ~ 40 GHz	Fig.28	P
	165	30 MHz ~ 1 GHz	Fig.29	P
		1 GHz ~ 12 GHz	Fig.30	P
		12 GHz ~ 25 GHz	Fig.31	P
		25 GHz ~ 40 GHz	Fig.32	P

802.11n-HT40 mode

MODE	Channel	Frequency Range	Test Results	Conclusion
802.11n-HT 40	151	30 MHz ~ 1 GHz	Fig.33	P
		1 GHz ~ 12 GHz	Fig.34	P
		12 GHz ~ 25 GHz	Fig.35	P
		25 GHz ~ 40 GHz	Fig.36	P
	159	30 MHz ~ 1 GHz	Fig.37	P
		1 GHz ~ 12 GHz	Fig.38	P
		12 GHz ~ 25 GHz	Fig.39	P
		25 GHz ~ 40 GHz	Fig.40	P

Conclusion: PASS**Test graphs as below:**

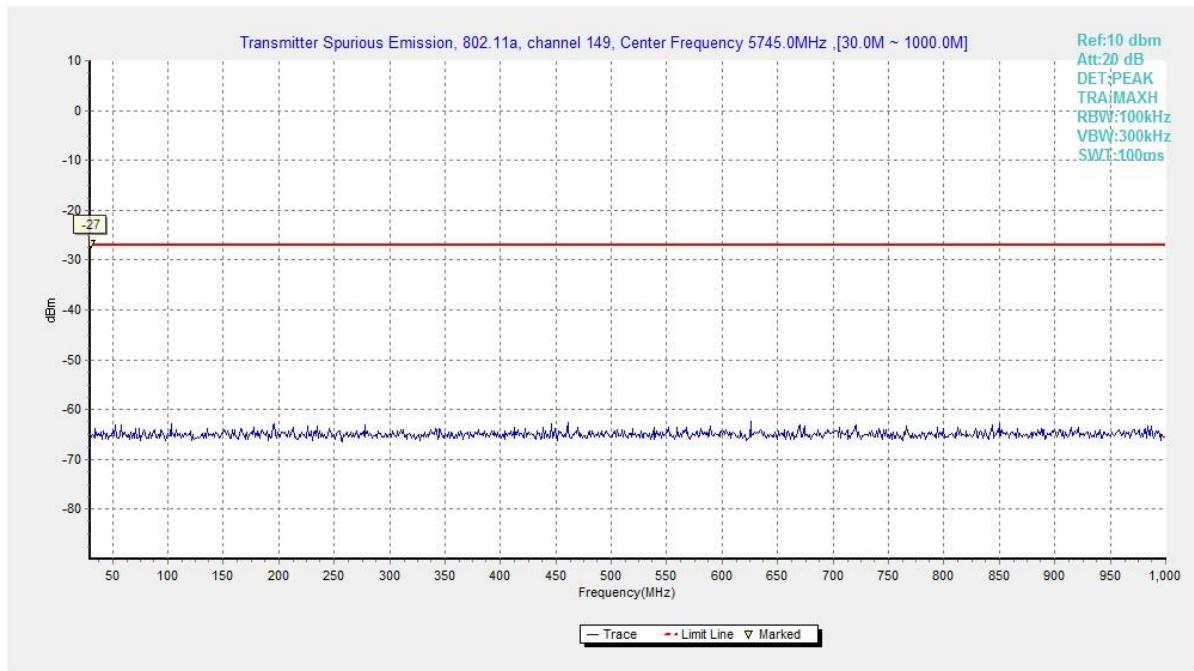


Fig. 9 Conducted Spurious Emission (802.11a, Ch149 , 30 MHz ~ 1 GHz)

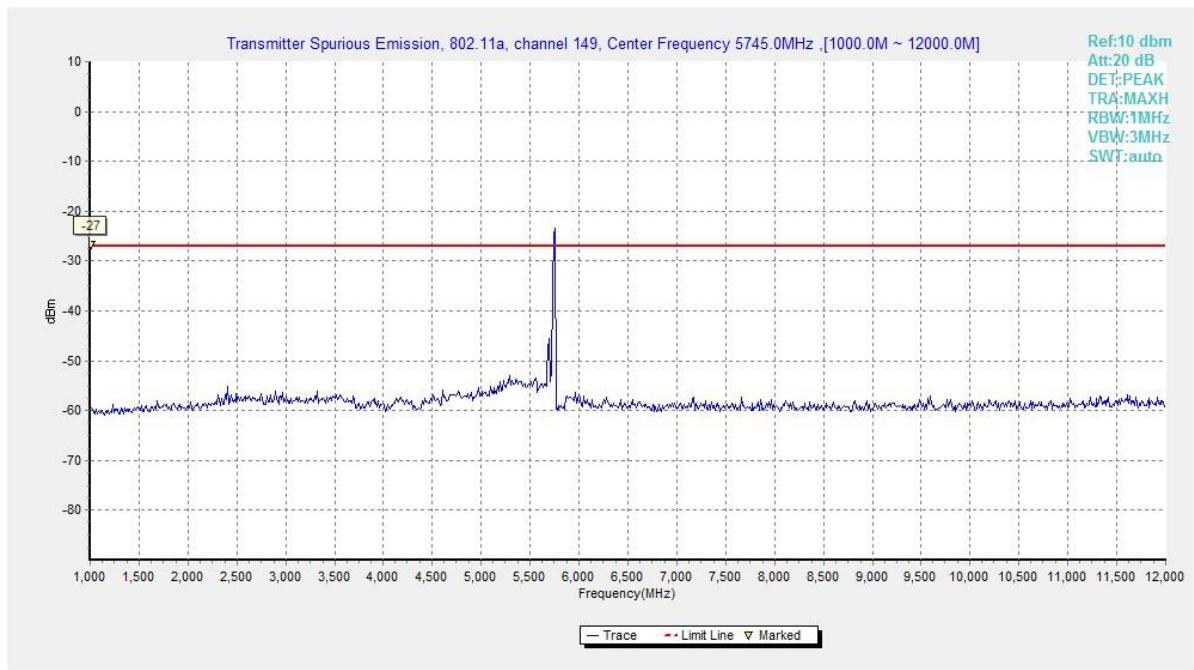


Fig. 10 Conducted Spurious Emission (802.11a, Ch149 , 1 GHz ~ 12 GHz)

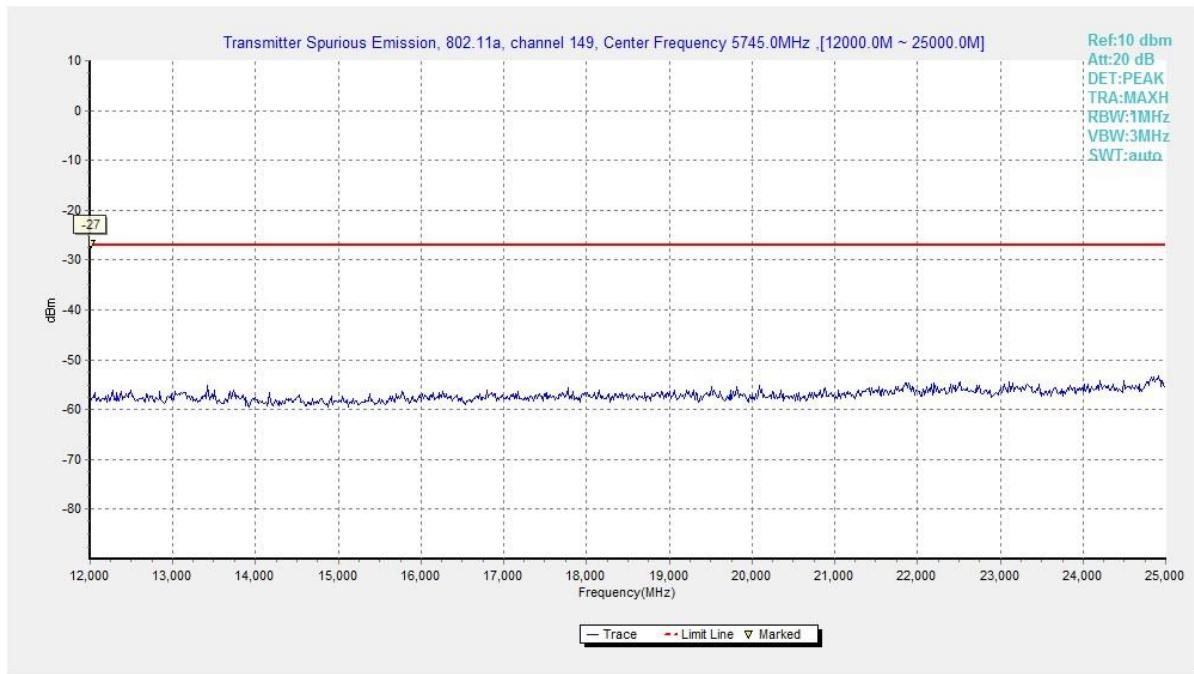


Fig. 11 Conducted Spurious Emission (802.11a, Ch149 , 12 GHz ~ 25 GHz)

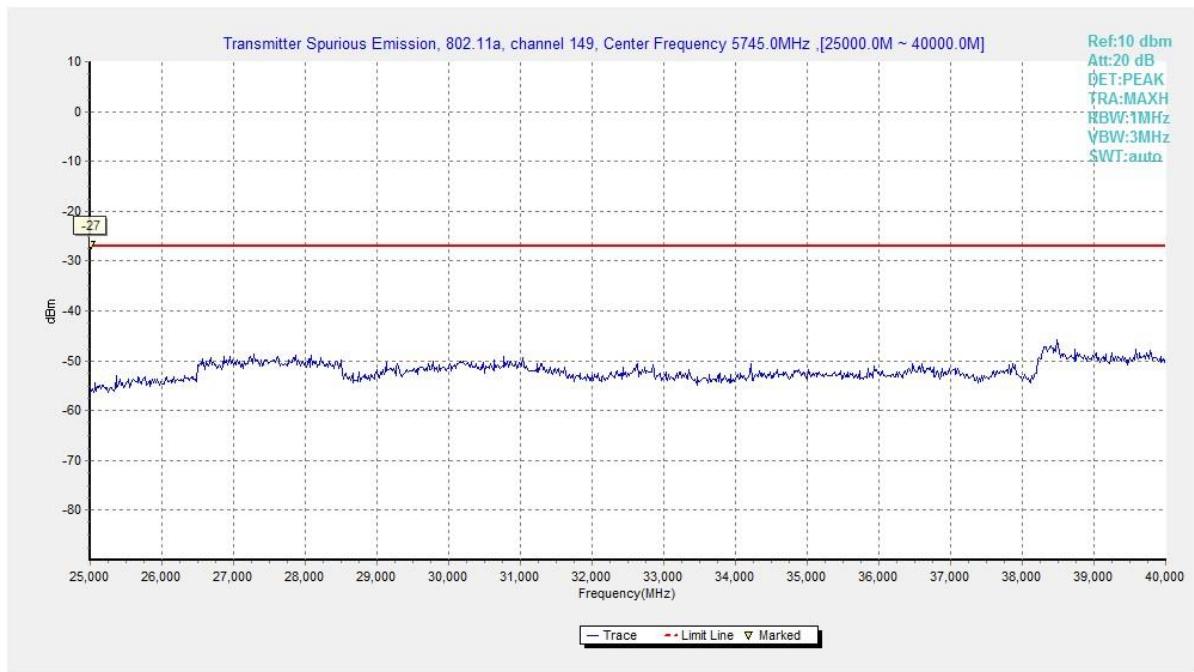


Fig. 12 Conducted Spurious Emission (802.11a, Ch149 , 25 GHz ~ 40 GHz)

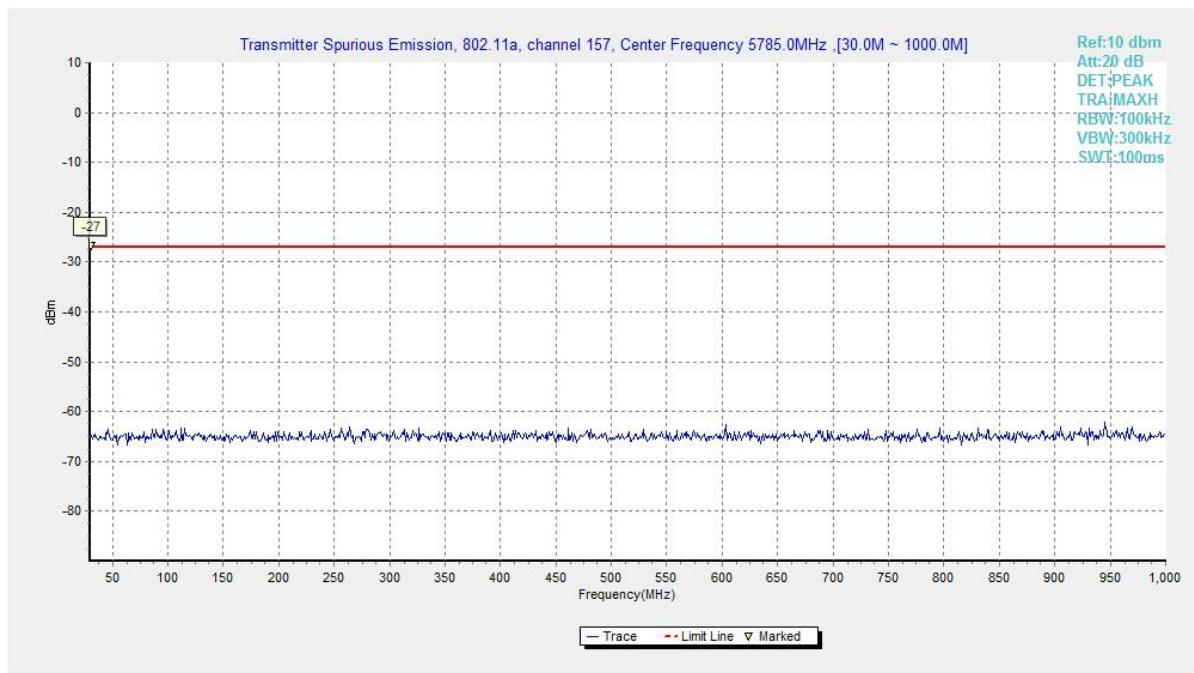


Fig. 13 Conducted Spurious Emission (802.11a, Ch157 , 30 MHz ~ 1 GHz)

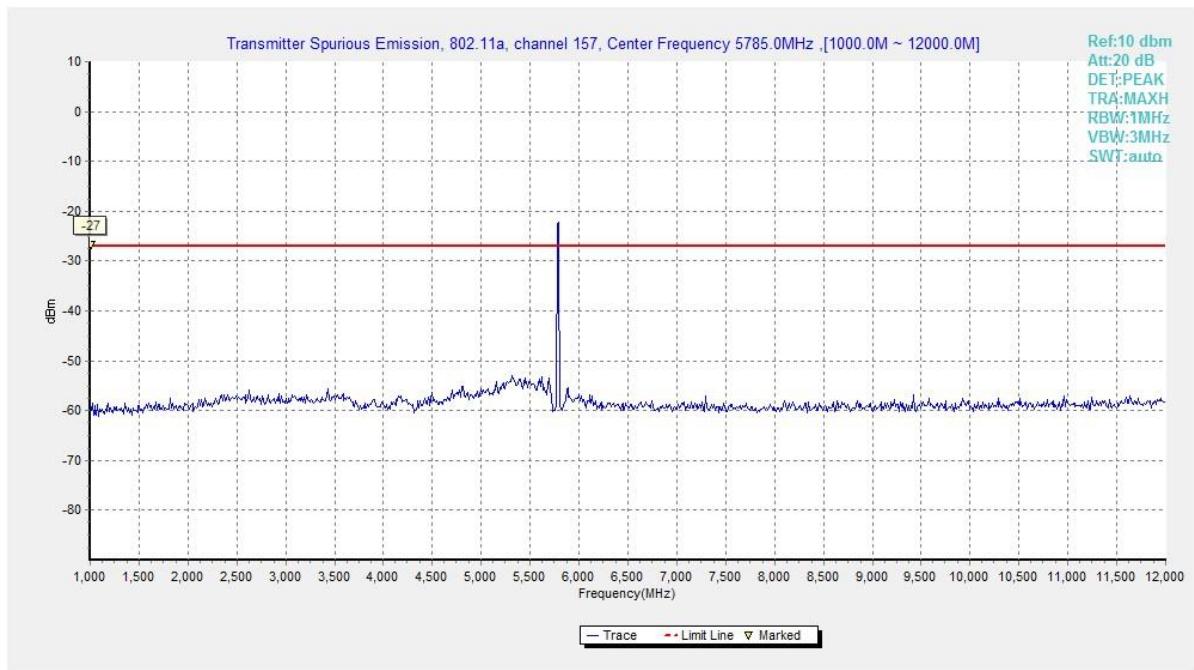


Fig. 14 Conducted Spurious Emission (802.11a, Ch157 , 1 GHz ~ 12 GHz)

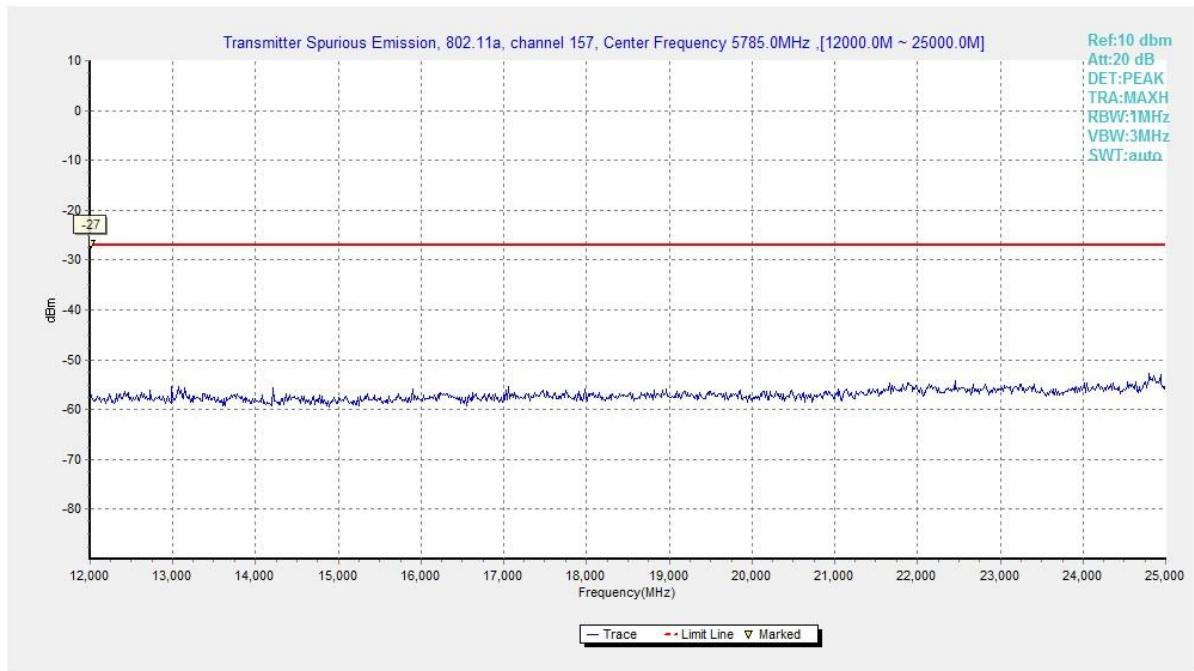


Fig. 15 Conducted Spurious Emission (802.11a, Ch157 , 12 GHz ~ 25 GHz)

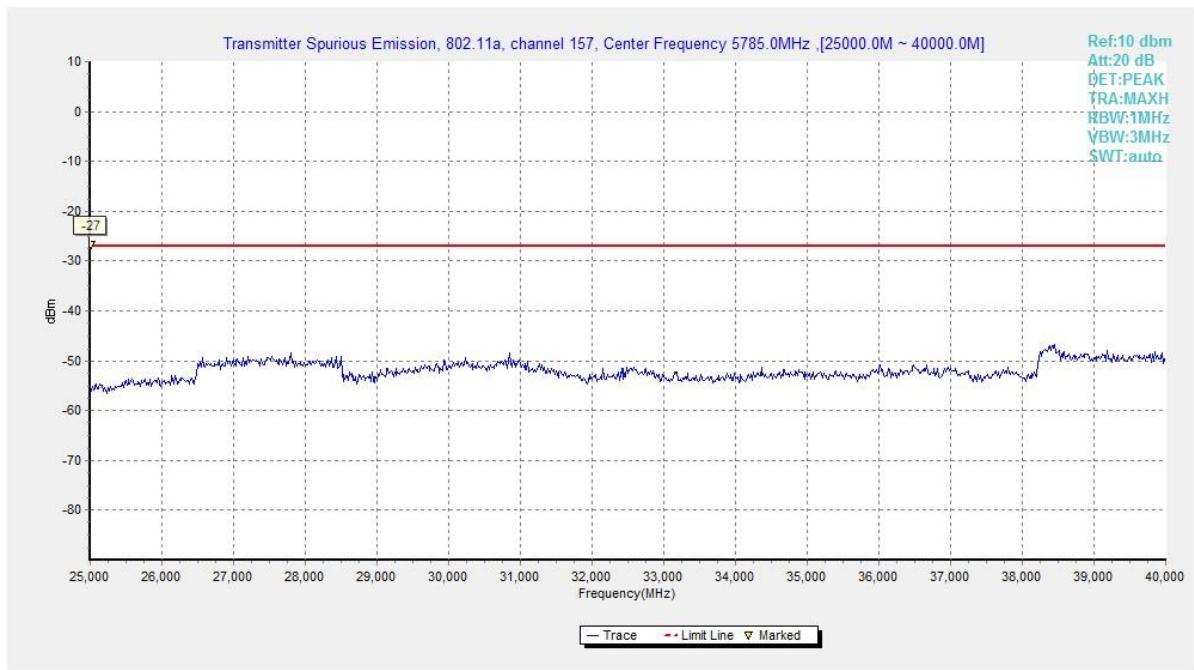


Fig. 16 Conducted Spurious Emission (802.11a, Ch157 , 25 GHz ~ 40 GHz)

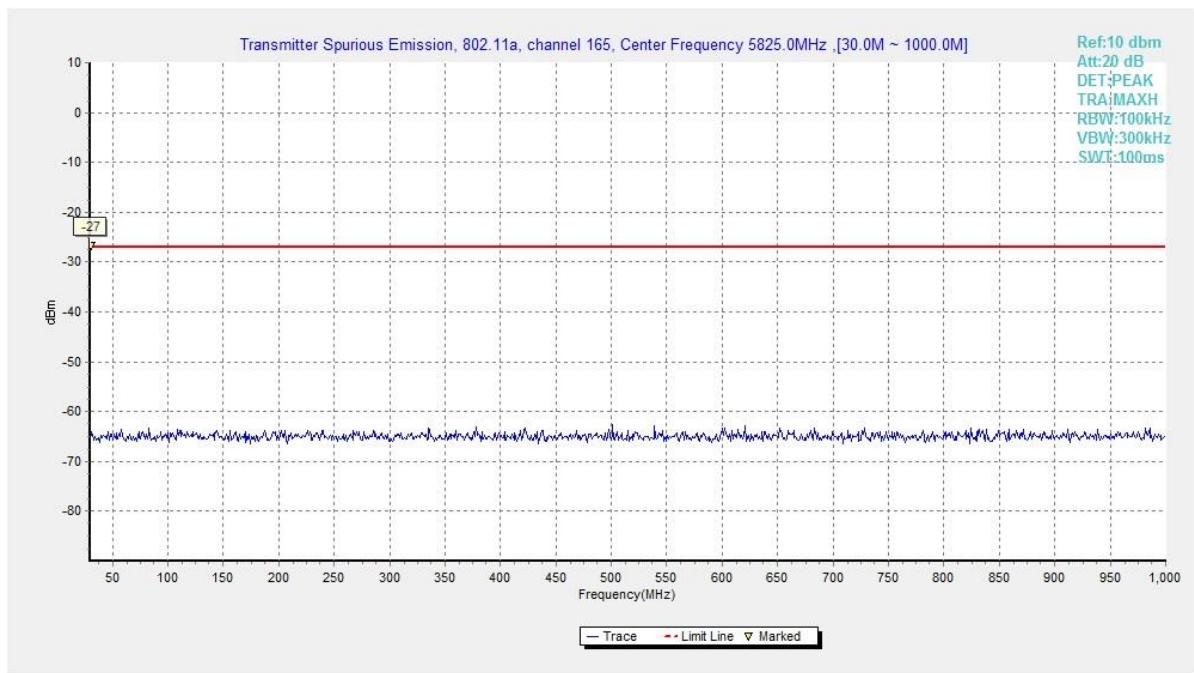


Fig. 17 Conducted Spurious Emission (802.11a, Ch165 , 30 MHz ~ 1 GHz)

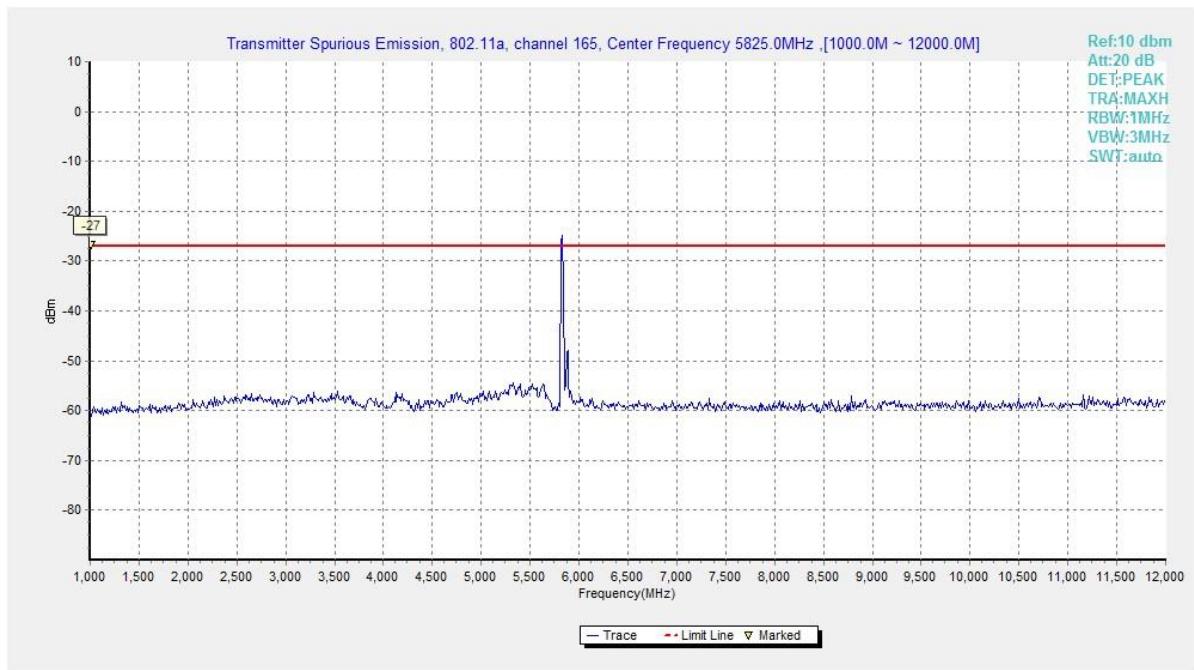


Fig. 18 Conducted Spurious Emission (802.11a, Ch165 , 1 GHz ~ 12 GHz)

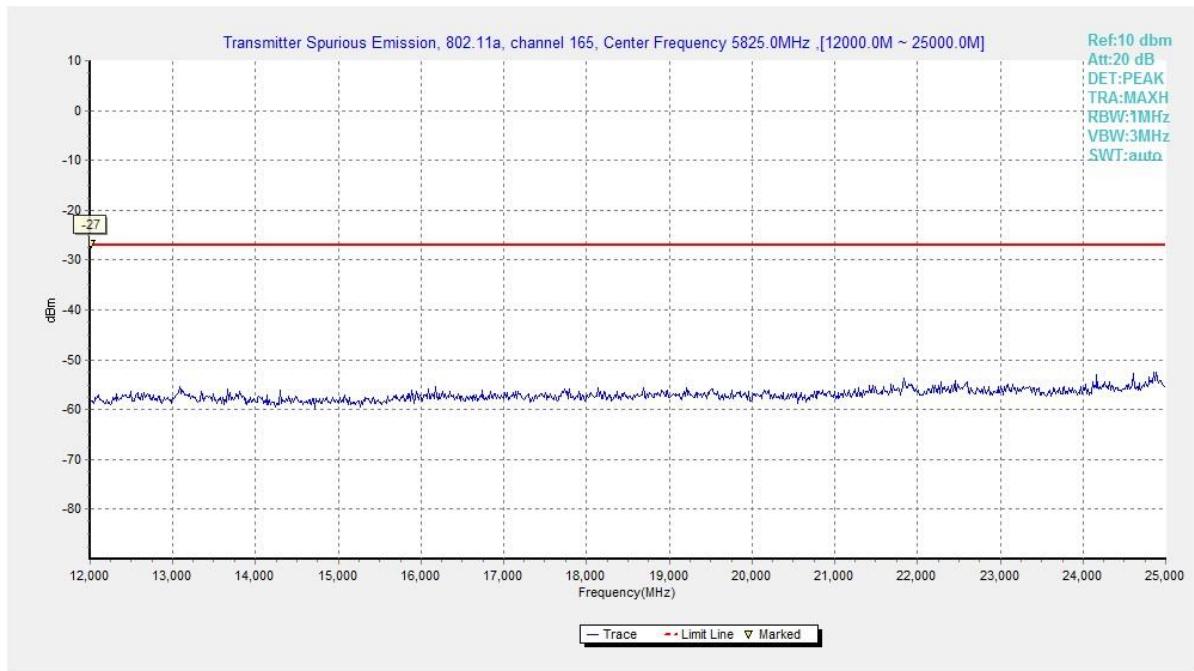


Fig. 19 Conducted Spurious Emission (802.11a, Ch165 , 12 GHz ~ 25 GHz)

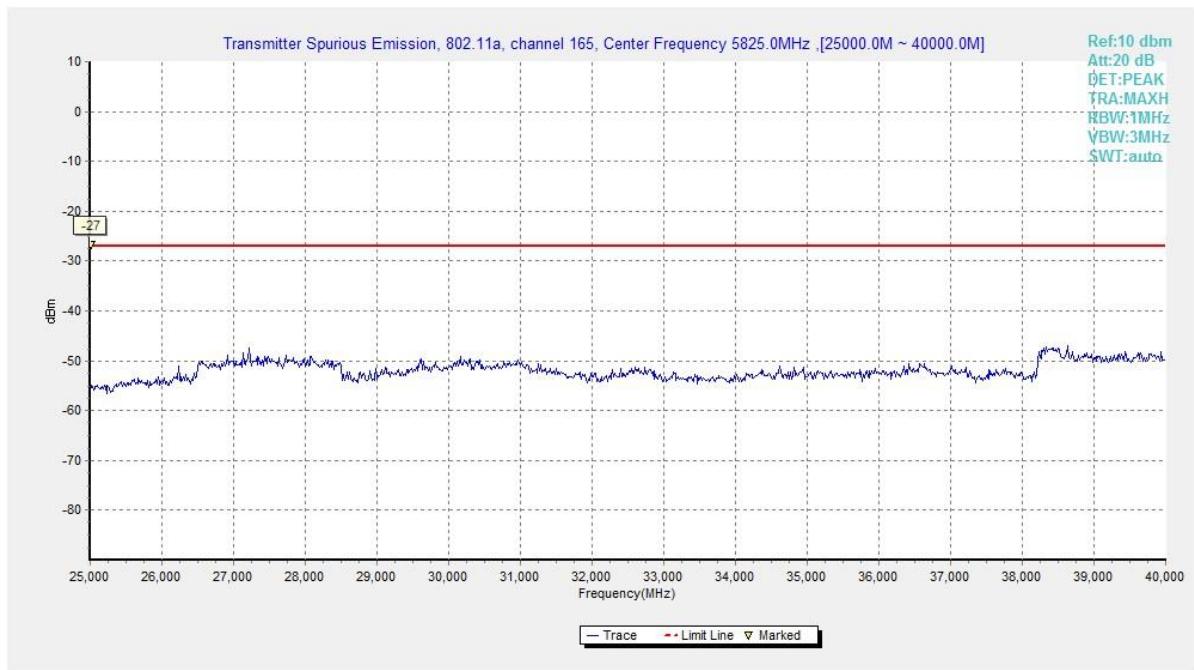


Fig. 20 Conducted Spurious Emission (802.11a, Ch165 , 25 GHz ~ 40 GHz)

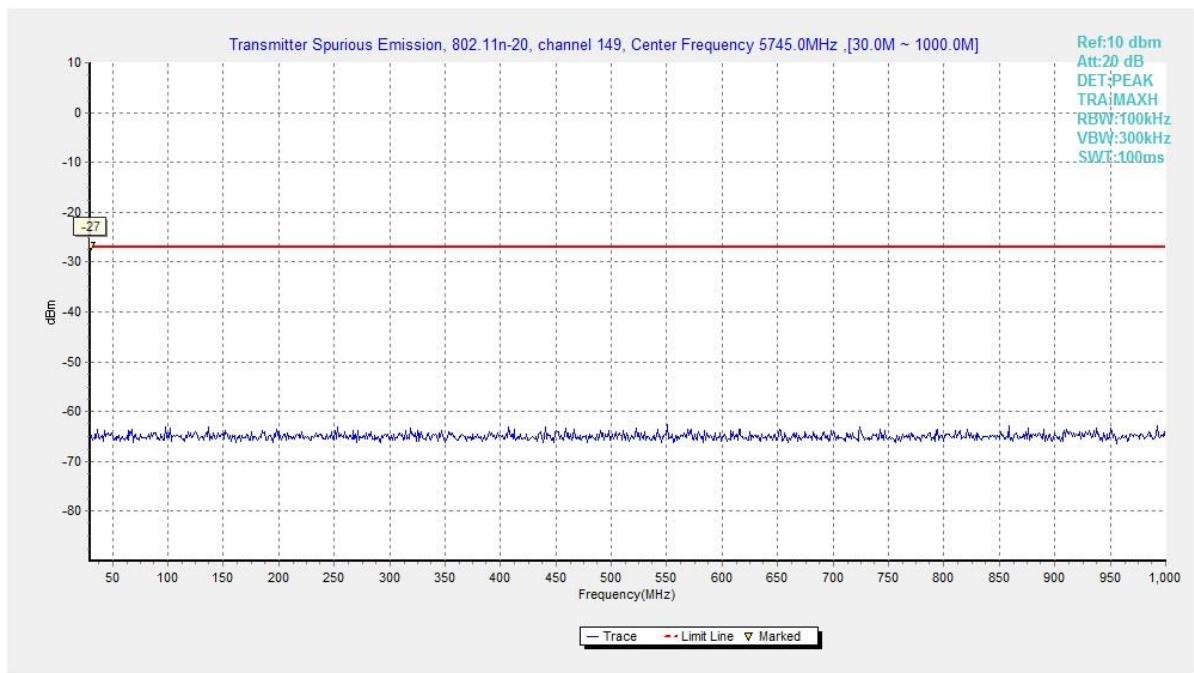


Fig. 21 Conducted Spurious Emission (802.11n20, Ch149 , 30 MHz ~ 1 GHz)

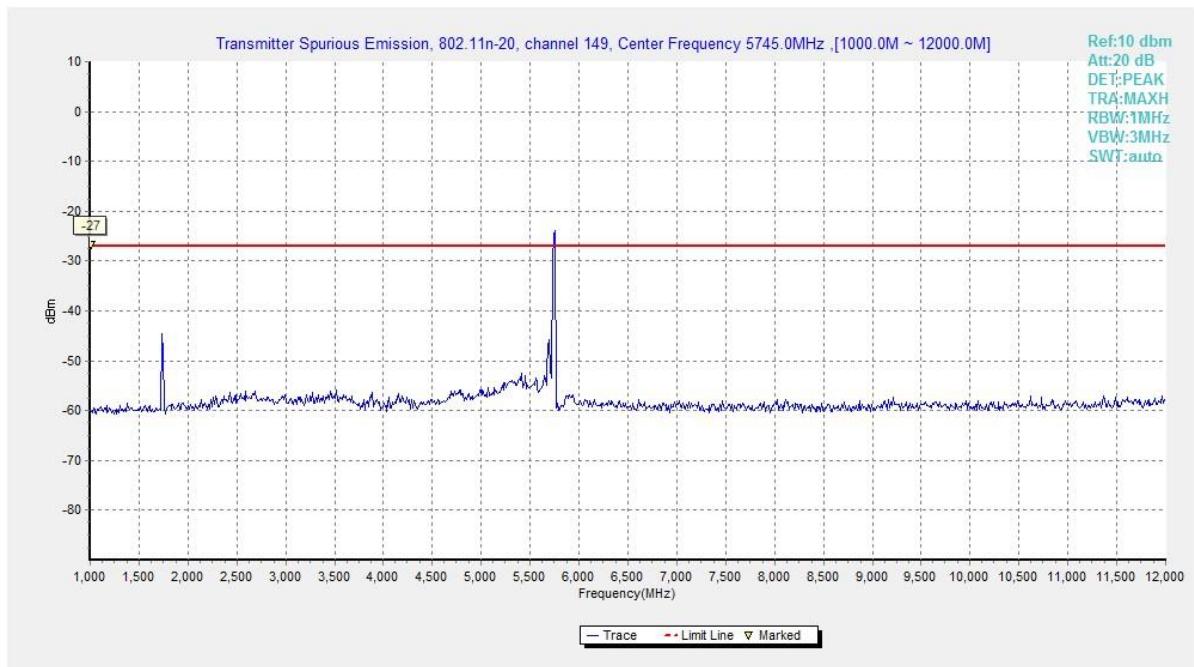


Fig. 22 Conducted Spurious Emission (802.11n20, Ch149 , 1 GHz ~ 12 GHz)

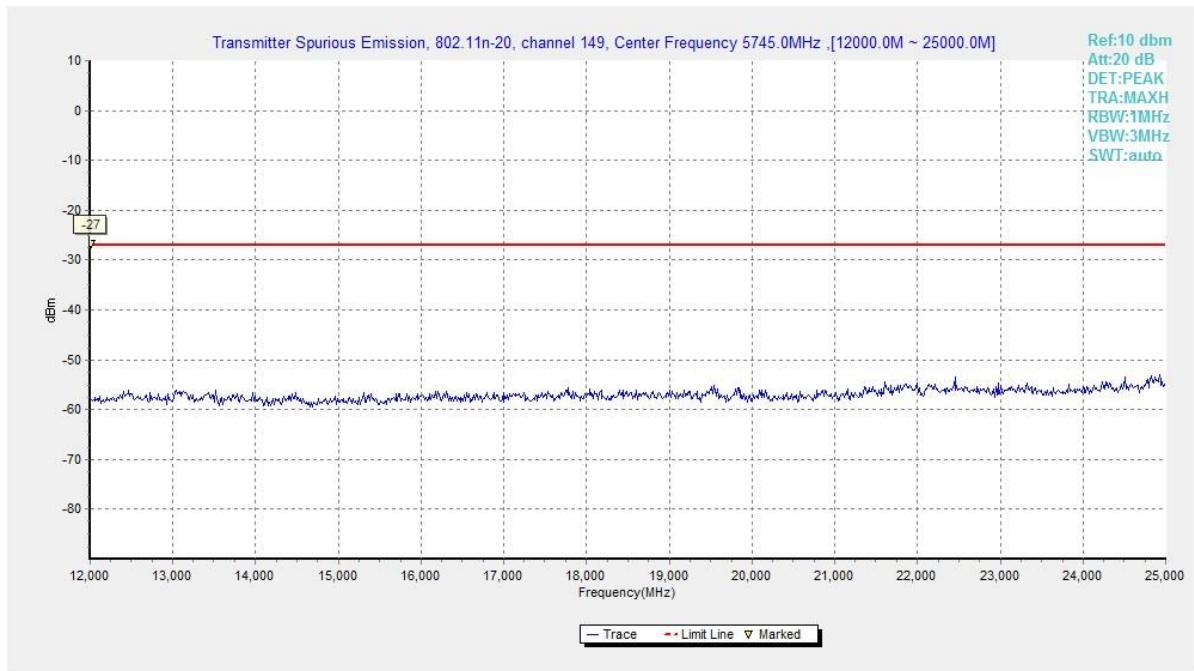


Fig. 23 Conducted Spurious Emission (802.11n20, Ch149 , 12 GHz ~ 25 GHz)

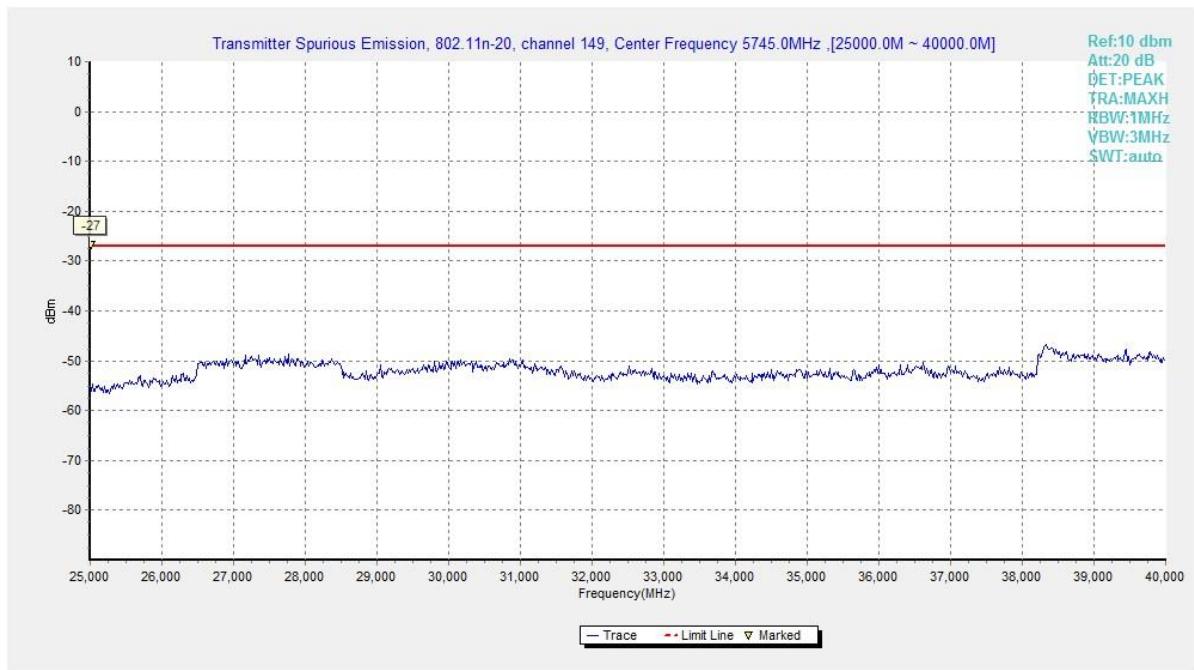


Fig. 24 Conducted Spurious Emission (802.11n20, Ch149 , 25 GHz ~ 40 GHz)

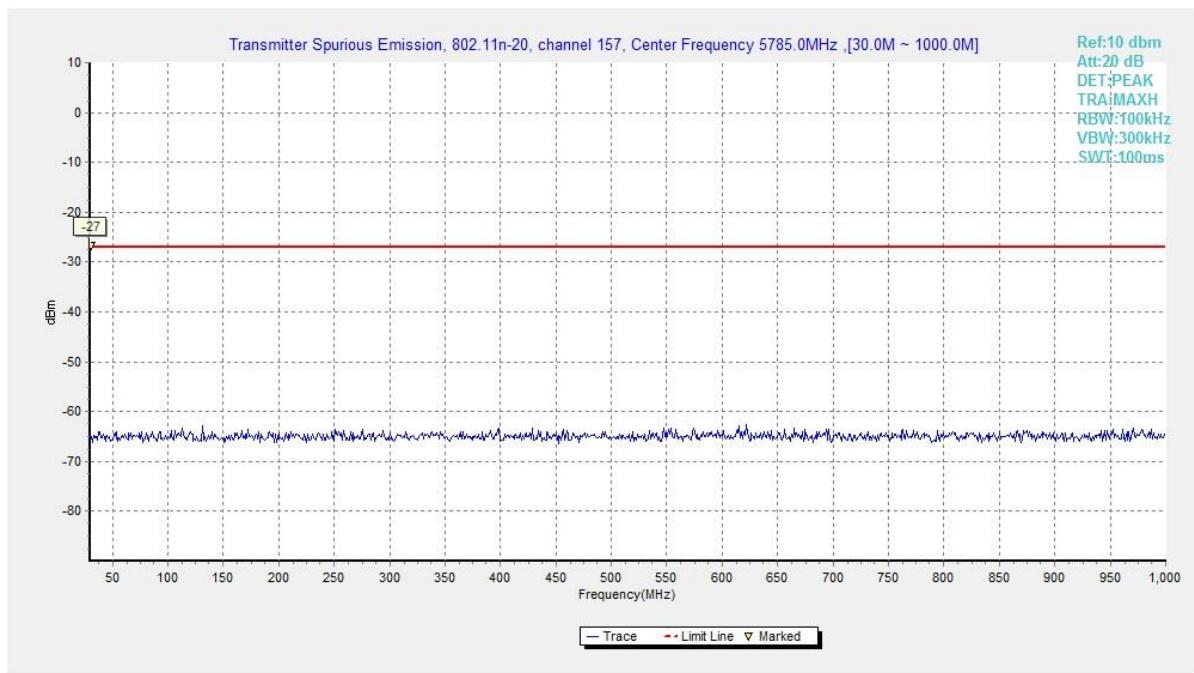


Fig. 25 Conducted Spurious Emission (802.11n20, Ch157 , 30 MHz ~ 1 GHz)

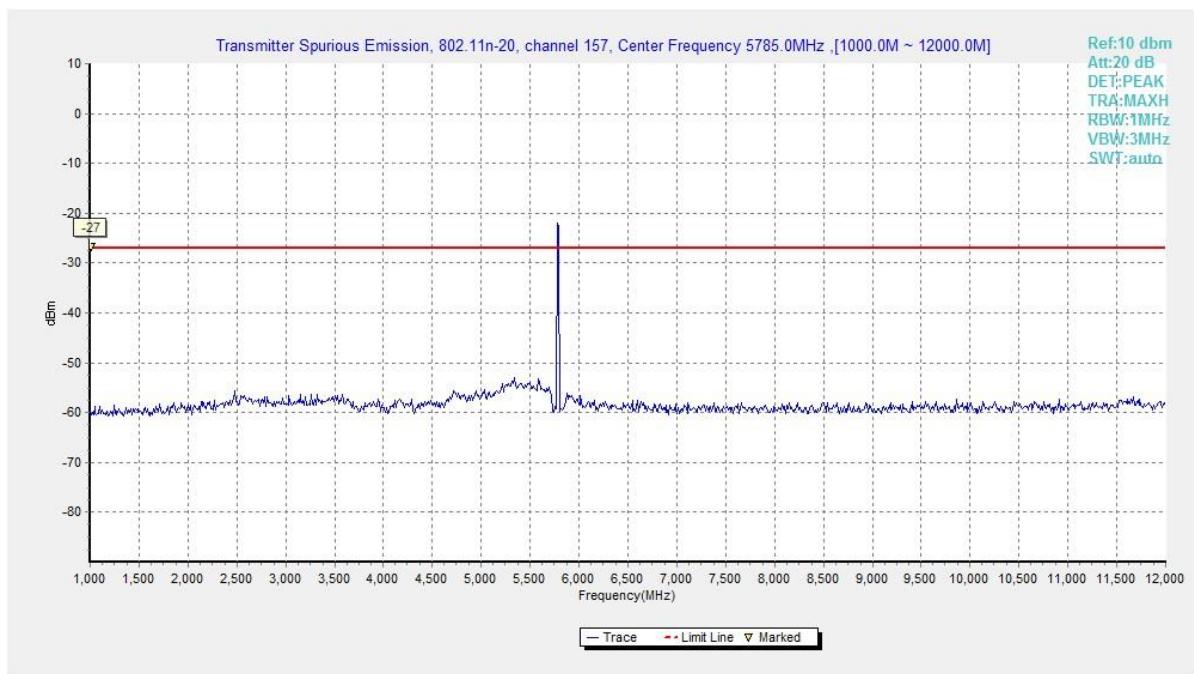


Fig. 26 Conducted Spurious Emission (802.11n20, Ch157 , 1 GHz ~ 12 GHz)

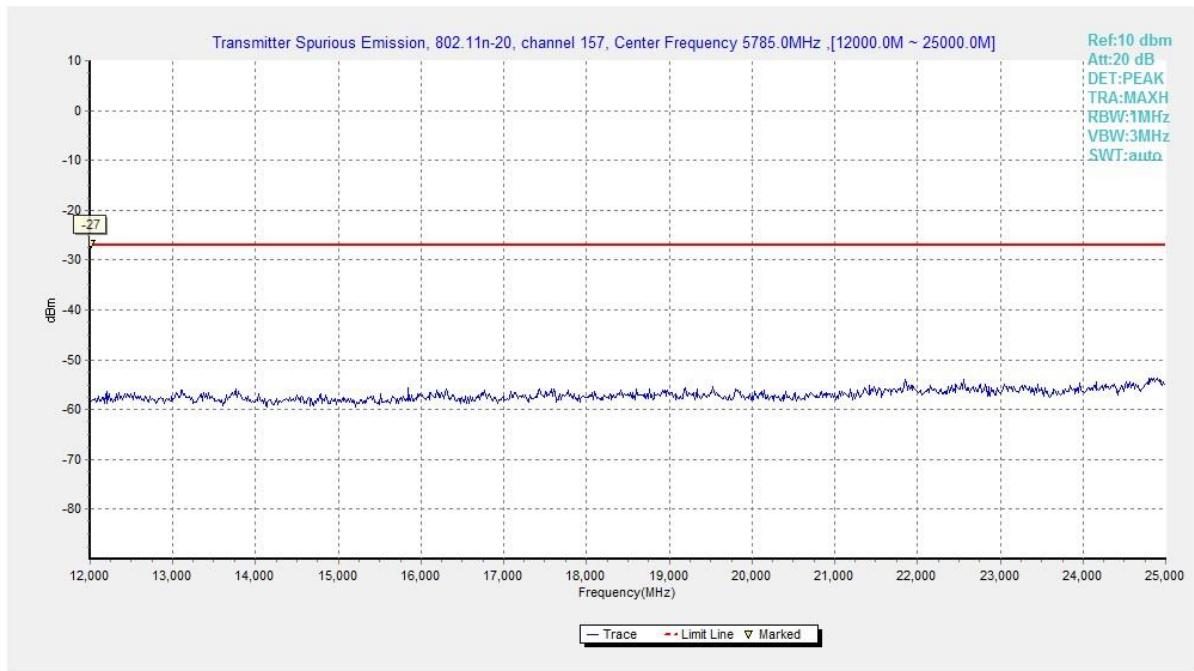


Fig. 27 Conducted Spurious Emission (802.11n20, Ch157 , 12 GHz ~ 25 GHz)

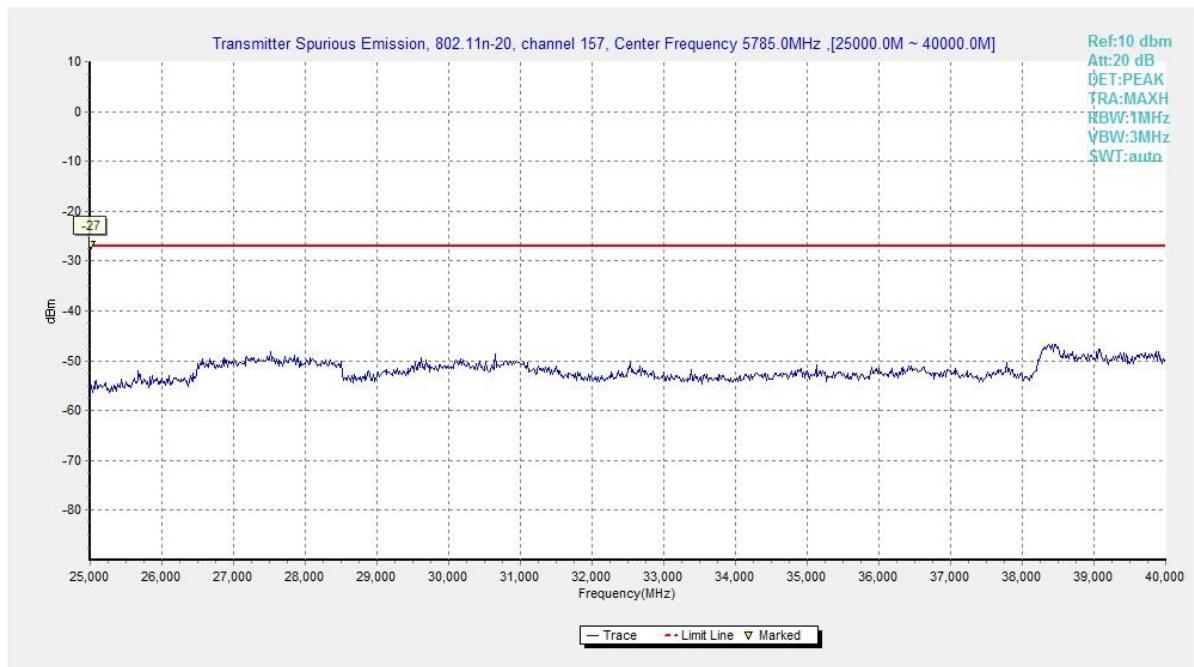


Fig. 28 Conducted Spurious Emission (802.11n20, Ch157 , 25 GHz ~ 40 GHz)

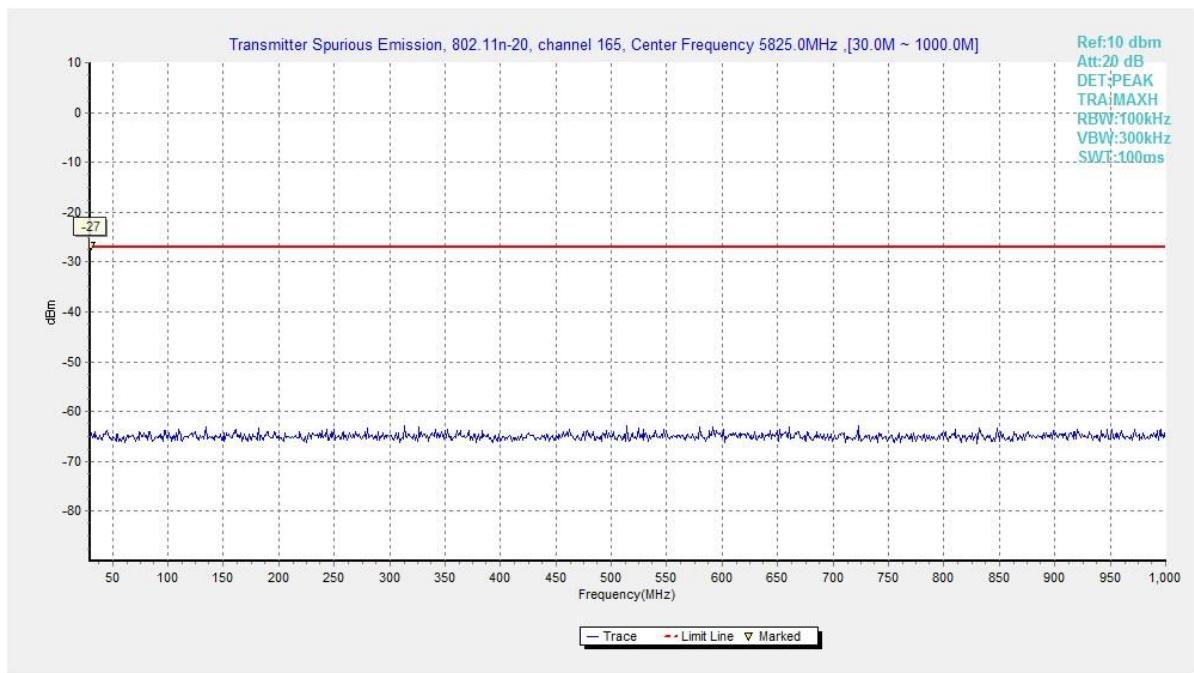


Fig. 29 Conducted Spurious Emission (802.11n20, Ch165 , 30 MHz ~ 1 GHz)

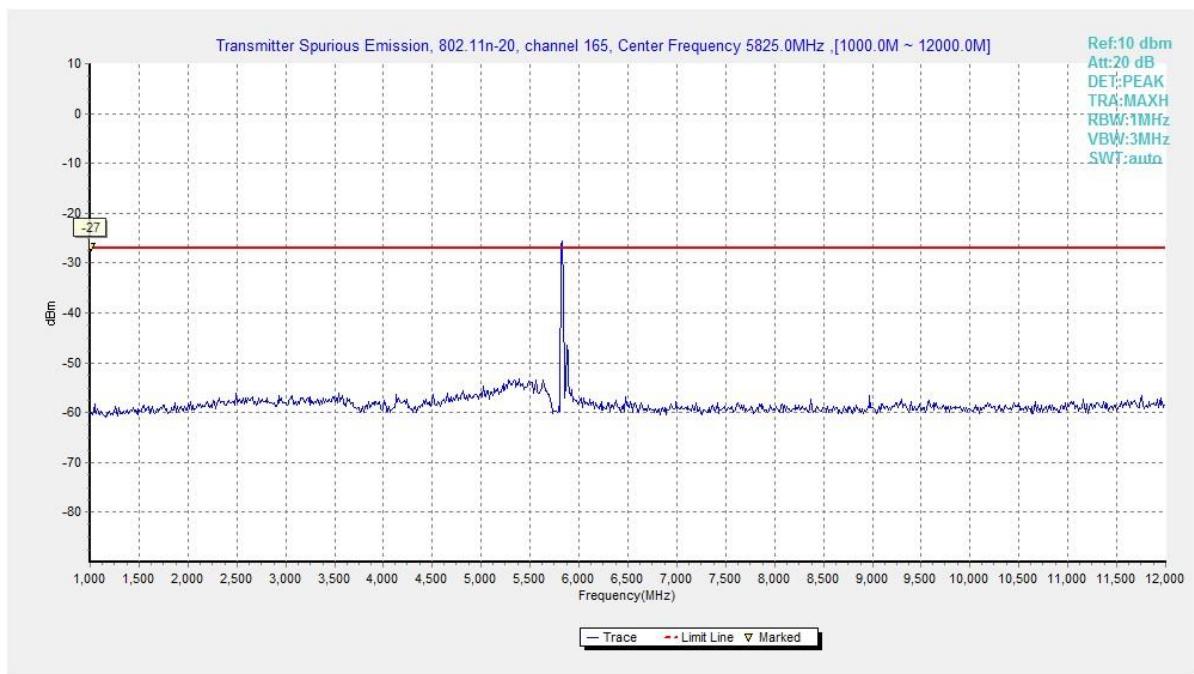


Fig. 30 Conducted Spurious Emission (802.11n20, Ch165 , 1 GHz ~ 12 GHz)

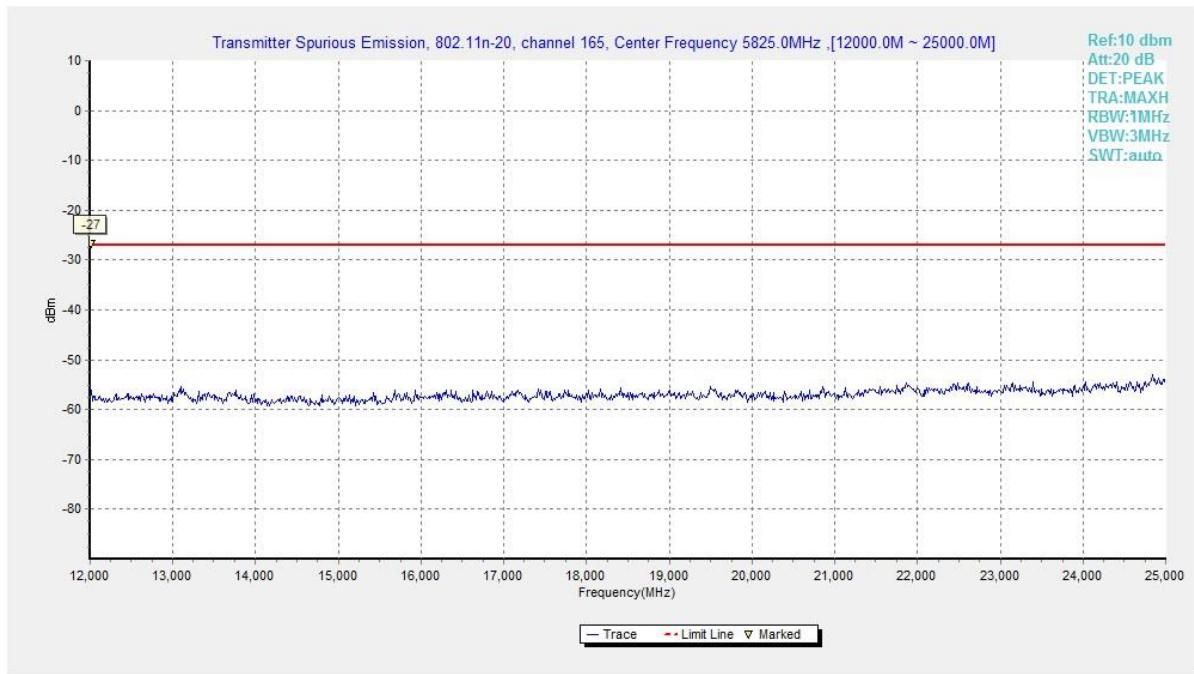


Fig. 31 Conducted Spurious Emission (802.11n20, Ch165 , 12 GHz ~ 25 GHz)

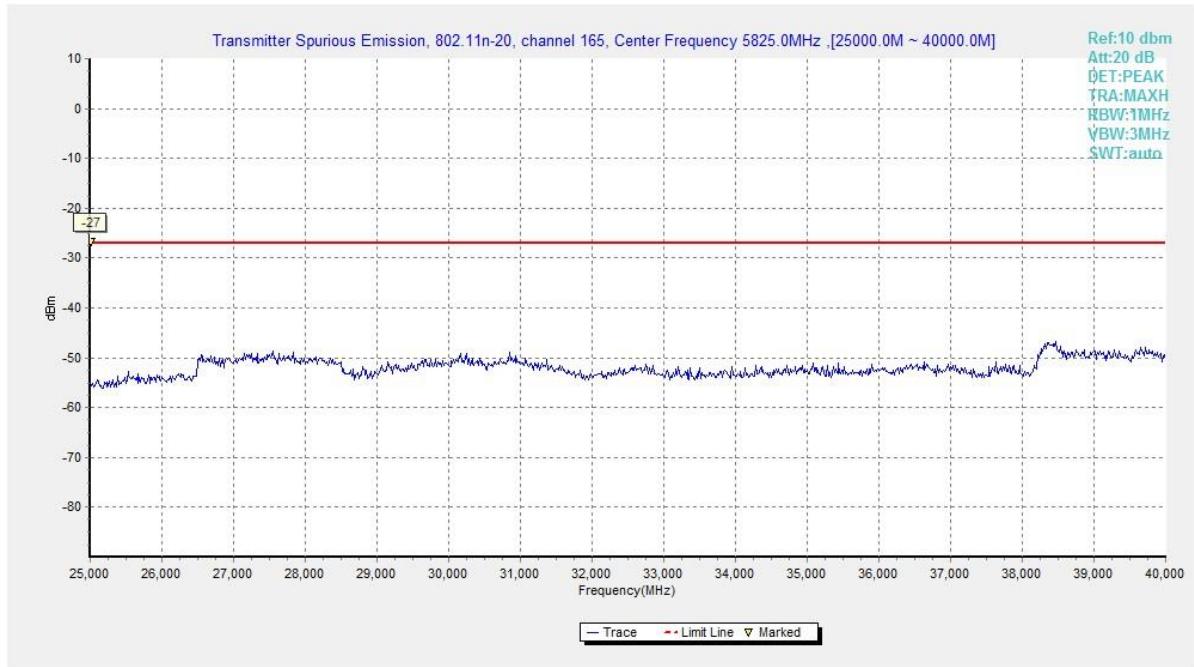


Fig. 32 Conducted Spurious Emission (802.11n20, Ch165 , 25 GHz ~ 40 GHz)

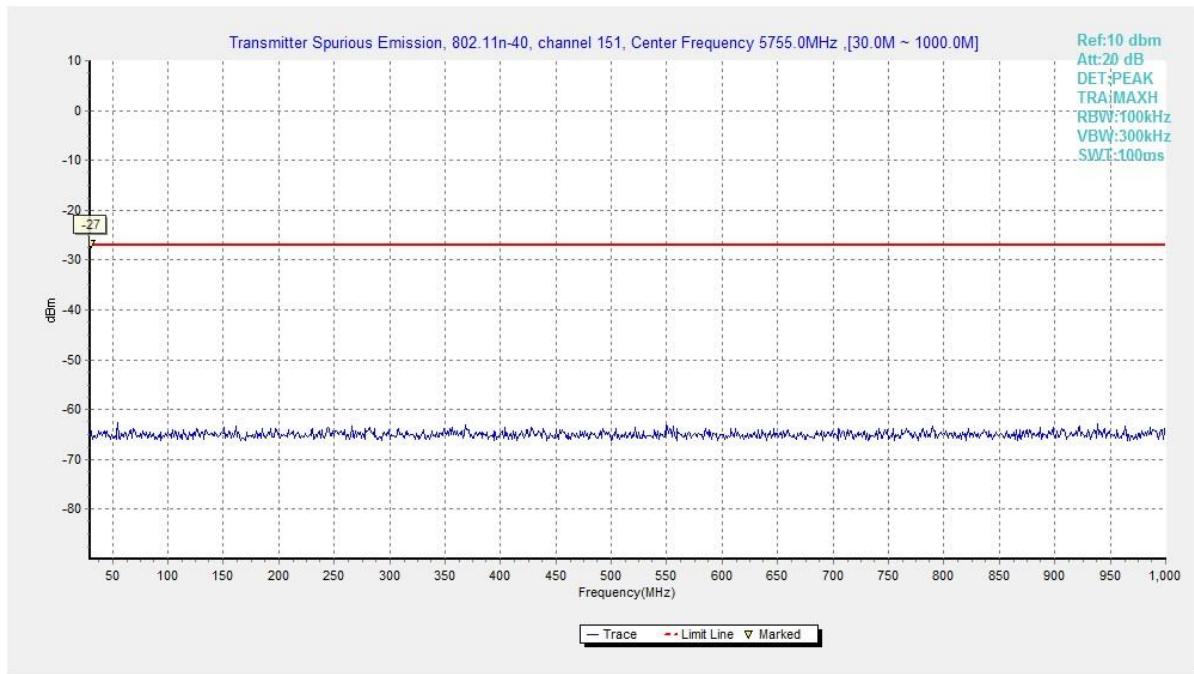


Fig. 33 Conducted Spurious Emission (802.11n40, Ch151 , 30 MHz ~ 1 GHz)

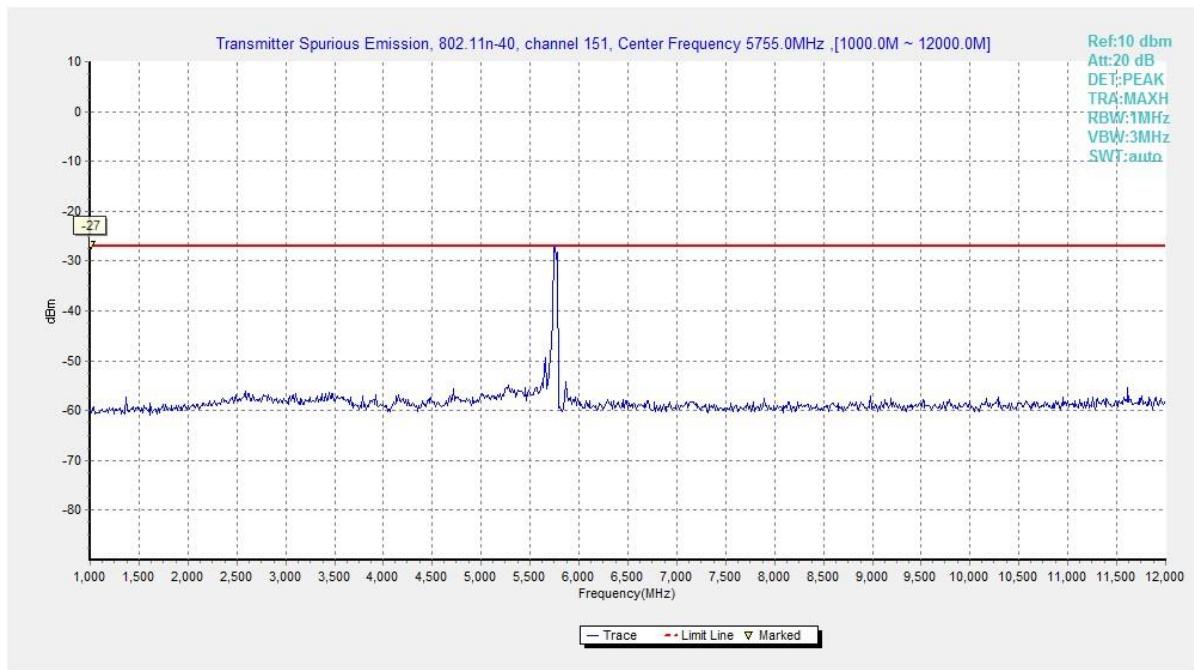


Fig. 34 Conducted Spurious Emission (802.11n40, Ch151 , 1 GHz ~ 12 GHz)

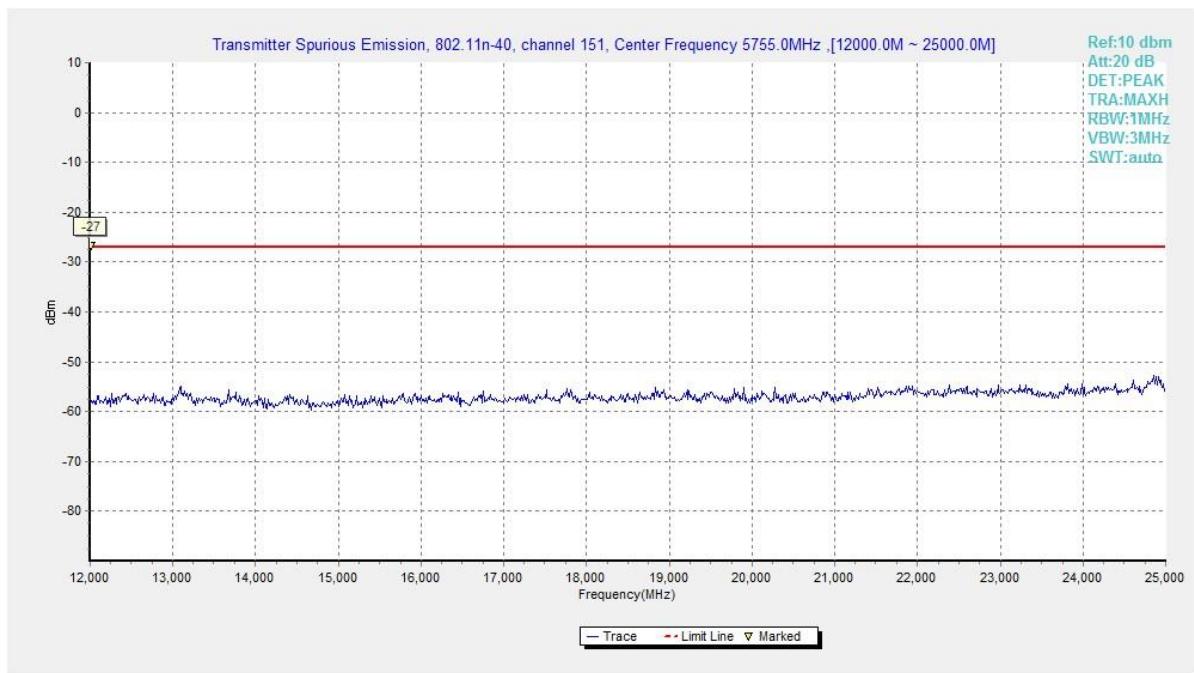


Fig. 35 Conducted Spurious Emission (802.11n40, Ch151 , 12 GHz ~ 25 GHz)

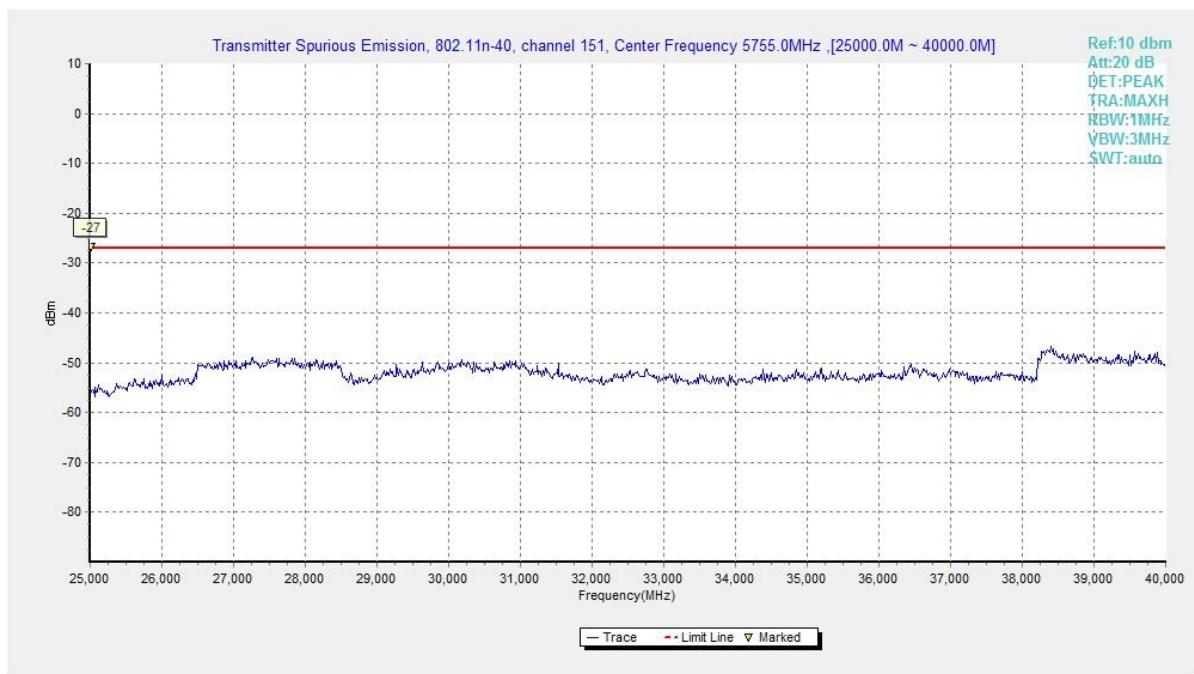


Fig. 36 Conducted Spurious Emission (802.11n40, Ch151 , 25 GHz ~ 40 GHz)

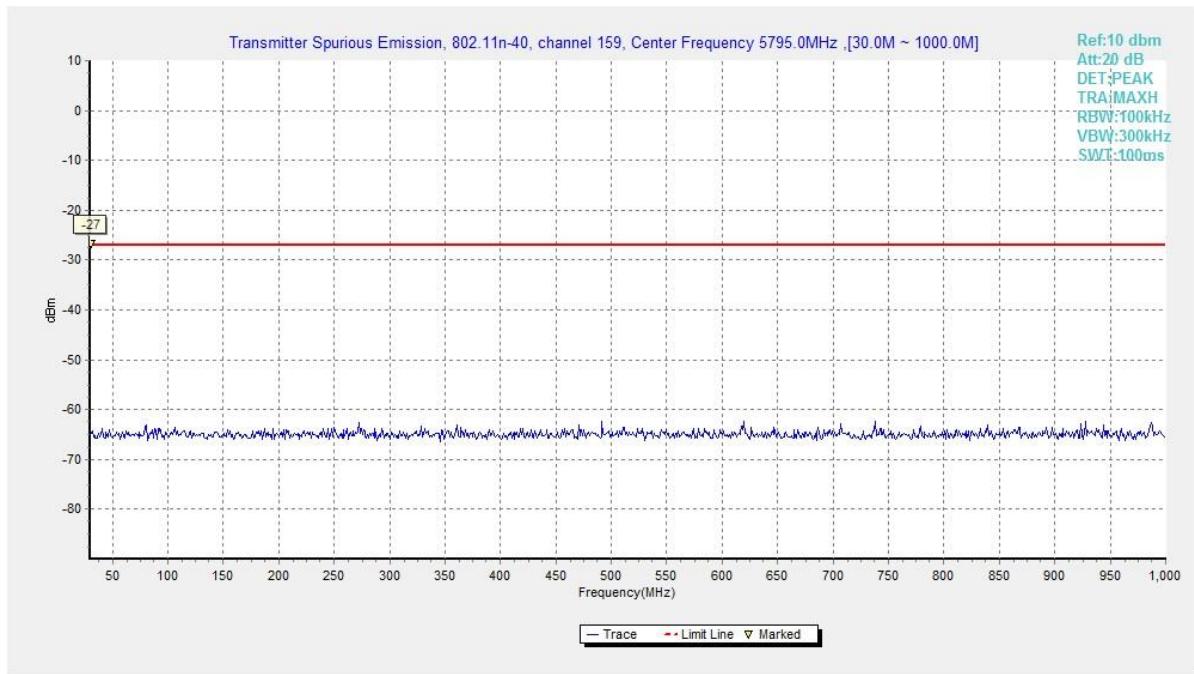


Fig. 37 Conducted Spurious Emission (802.11n40, Ch159 , 30 MHz ~ 1 GHz)

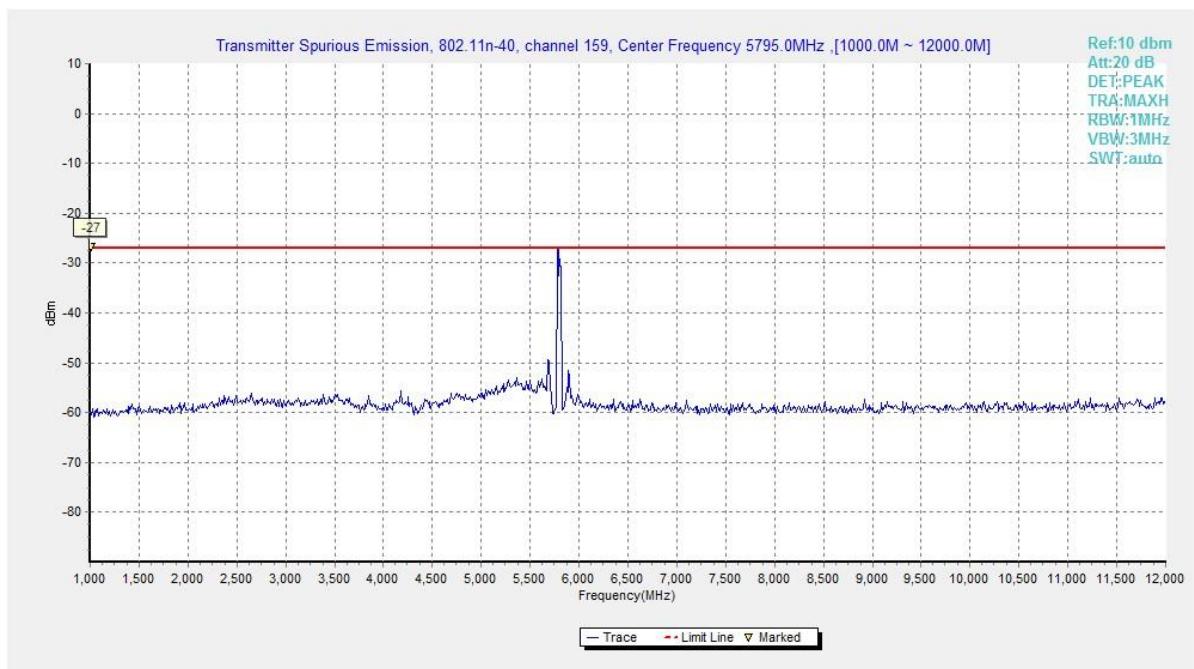


Fig. 38 Conducted Spurious Emission (802.11n40, Ch159 , 1 GHz ~ 12 GHz)

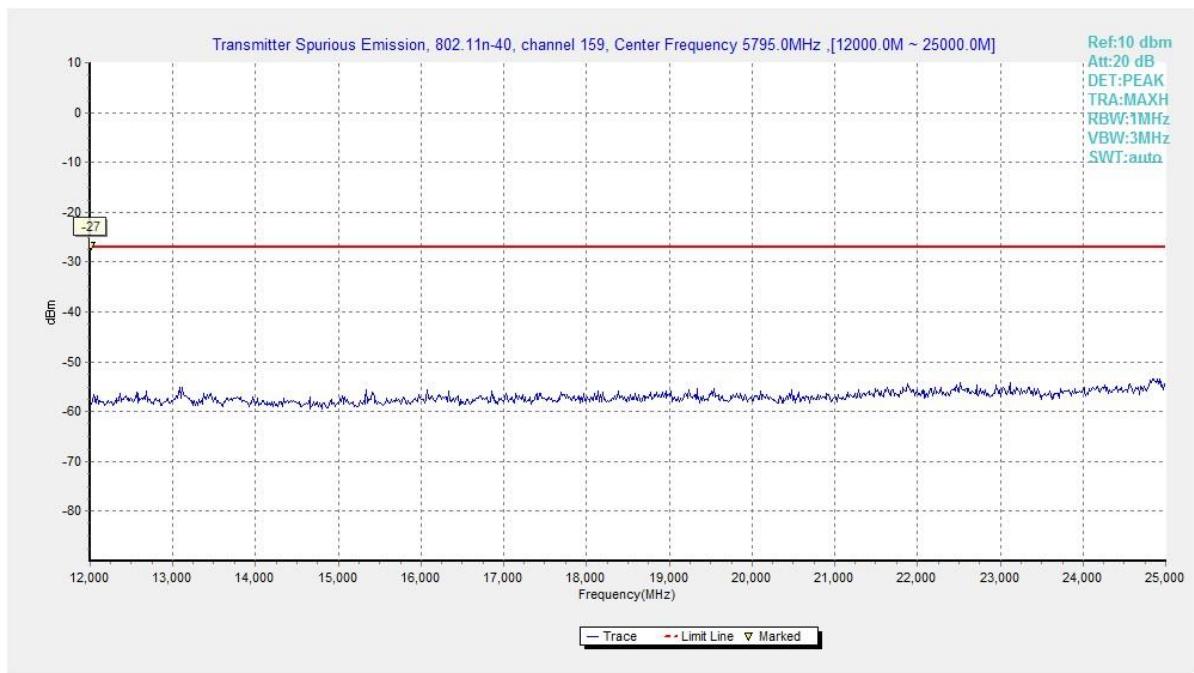


Fig. 39 Conducted Spurious Emission (802.11n40, Ch159 , 12 GHz ~ 25 GHz)

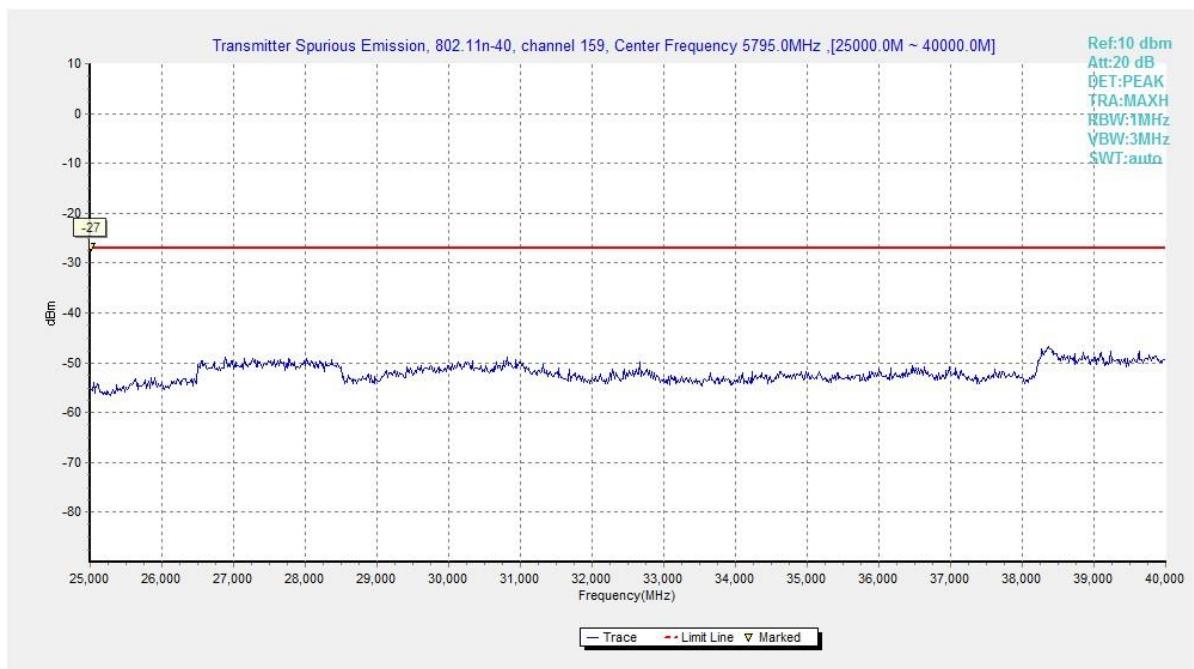


Fig. 40 Conducted Spurious Emission (802.11n40, Ch159 , 25 GHz ~ 40 GHz)

A.5.2 Transmitter Spurious Emission - Radiated

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)).

Limit in restricted band:

Frequency of emission (MHz)	Field strength (uV/m)	Field strength (dB μ V/m)	Measurement distance(m)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Measurement Limit:

Frequency Range	Uncertainty(dB)
$f \leq 1\text{GHz}$	5.40
$f > 1\text{GHz}$	4.32

Measurement Results:

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.

Average Results:**802.11a**

Ch149

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
5651.200	36.8	-33.0	34.7	35.11	49.1	12.3	H	155	135
5650.890	37.1	-33.0	34.7	35.47	48.9	11.7	H	155	160
11490.000	39.4	-30.8	38.2	32.04	48.3	8.9	H	155	92
17235.000	38.7	-26.6	41.5	23.79	48.3	9.6	H	155	115
16896.800	38.6	-27.0	41.6	23.96	48.3	9.7	H	155	112
17589.800	38.4	-26.4	41.2	23.66	48.3	9.9	H	155	85

Ch157

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
5723.400	39.5	-33.6	34.8	38.20	48.3	8.8	H	155	6
5837.600	41.0	-33.6	35.0	39.59	48.3	7.3	H	155	48
11570.000	39.5	-30.8	38.3	32.01	48.3	8.8	H	155	92
17355.000	38.9	-26.6	41.3	24.19	48.3	9.4	H	155	48
16938.620	38.6	-27.1	41.7	24.03	48.3	9.7	H	155	68
17591.500	38.6	-26.4	41.2	23.81	48.3	9.7	H	155	92

Ch165

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
5921.860	36.8	-32.5	35.1	34.18	50.5	13.7	H	155	20
5913.200	36.8	-32.4	35.1	34.17	56.9	20.1	H	155	18
11650.000	39.4	-30.6	38.4	31.62	48.3	8.9	H	155	90
17475.000	38.6	-26.3	41.2	23.71	48.3	9.7	H	155	114
16759.600	38.7	-26.7	41.5	23.93	48.3	9.6	H	155	36
17579.560	38.6	-26.4	41.2	23.84	48.3	9.7	H	155	2

802.11n-HT20

Ch149

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
5653.240	36.7	-33.0	34.7	34.99	50.6	13.9	H	155	175
5654.800	36.8	-32.9	34.7	34.99	51.8	15.0	H	155	5
11490.000	39.5	-30.8	38.2	32.11	48.3	8.8	H	155	26
17235.000	38.7	-26.6	41.5	23.85	48.3	9.6	H	155	355
16962.400	38.7	-27.0	41.7	23.94	48.3	9.6	H	155	6
17580.300	38.6	-26.4	41.2	23.79	48.3	9.7	H	155	12

Ch157

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
5733.200	39.5	-33.7	34.8	38.40	48.3	8.8	H	155	175
5837.200	41.0	-33.6	35.0	39.60	48.3	7.3	H	155	5
11570.000	39.4	-30.8	38.3	31.91	48.3	8.9	H	155	26
17355.000	38.5	-26.6	41.3	23.78	48.3	9.8	H	155	355
16788.500	38.8	-26.8	41.5	24.04	48.3	9.5	H	155	6
17591.600	38.7	-26.4	41.2	23.93	48.3	9.6	H	155	12

Ch165

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
5918.400	37.1	-32.5	35.1	34.46	53.1	16.0	V	155	44
5924.800	36.9	-32.5	35.1	34.35	48.3	11.4	H	155	66
11650.000	39.6	-30.6	38.4	31.86	48.3	8.7	H	155	88
17475.000	38.7	-26.3	41.2	23.76	48.3	9.6	V	155	110
16855.500	38.7	-26.9	41.6	24.01	48.3	9.6	V	155	132
17540.900	38.7	-26.4	41.2	23.85	48.3	9.6	H	155	154

802.11n-HT40

Ch151

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
5650.000	36.9	-33.1	34.7	35.26	48.2	11.3	H	155	4
5652.000	37.3	-33.0	34.7	35.61	49.7	12.4	H	155	2
11510.000	39.2	-30.8	38.2	31.86	48.3	9.1	H	155	25
17265.000	38.7	-26.8	41.4	24.06	48.3	9.6	H	155	350
17550.780	39.5	-26.4	41.2	24.64	48.3	8.8	H	155	92
16978.650	38.7	-26.8	41.7	23.88	48.3	9.6	H	155	85

Ch159

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
5919.200	36.9	-32.5	35.1	34.28	52.5	15.6	H	155	20
5924.800	36.8	-32.5	35.1	34.23	48.3	11.5	H	155	45
11590.000	39.1	-30.8	38.3	31.60	48.3	9.2	H	155	240
17385.000	38.8	-26.5	41.3	24.05	48.3	9.5	H	155	180
17555.890	39.5	-26.4	41.2	24.64	48.3	8.8	H	155	85
16973.500	38.7	-26.9	41.7	23.88	48.3	9.6	H	155	25

Peak Results:**802.11a**

Ch149

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
5650.345	49.4	-33.0	34.7	47.72	68.5	19.1	H	155	132
5651.139	49.3	-33.0	34.7	47.65	69.0	19.7	H	155	154
11490.000	50.3	-30.8	38.2	42.88	68.3	18.0	V	155	88
17235.000	54.5	-26.6	41.5	39.63	68.3	13.8	H	155	110
16948.400	56.2	-27.0	41.7	41.63	68.3	12.1	V	155	110
17593.000	55.6	-26.4	41.2	40.86	68.3	12.7	V	155	88

Ch157

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
5732.400	51.1	-33.7	34.8	50.01	68.3	17.2	H	155	0
5837.400	51.2	-33.6	35.0	49.87	68.3	17.1	H	155	44
11570.000	50.8	-30.8	38.3	43.35	68.3	17.5	V	155	88
17355.000	54.7	-26.6	41.3	40.03	68.3	13.6	V	155	44
16945.860	56.2	-27.1	41.7	41.64	68.3	12.1	V	155	66
17590.860	55.6	-26.4	41.2	40.85	68.3	12.7	H	155	88

Ch165

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
5923.459	45.6	-32.5	35.1	42.97	69.3	23.8	H	155	22
5924.931	46.2	-32.5	35.1	43.59	68.3	22.1	H	155	22
11650.000	51.1	-30.6	38.4	43.29	68.3	17.2	H	155	88
17475.000	54.3	-26.3	41.2	39.34	68.3	14.0	V	155	110
16895.680	56.2	-27.0	41.6	41.59	68.3	12.1	V	155	44
17589.670	55.6	-26.4	41.2	40.85	68.3	12.7	H	155	0

802.11n-HT20

Ch149

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
5650.023	44.9	-33.1	34.7	43.21	68.2	23.3	H	155	176
5650.598	44.9	-33.0	34.7	43.21	68.6	23.8	H	155	0
11490.000	50.3	-30.8	38.2	42.93	68.3	18.0	V	155	22
17235.000	54.5	-26.6	41.5	39.61	68.3	13.8	V	155	352
16945.000	56.2	-27.1	41.7	41.60	68.3	12.1	V	155	0
17586.500	55.6	-26.4	41.2	40.80	68.3	12.7	V	155	0

Ch157

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
5733.600	49.7	-33.8	34.8	48.60	68.3	18.6	H	155	176
5837.400	52.2	-33.6	35.0	50.85	68.3	16.1	H	155	0
11570.000	50.7	-30.8	38.3	43.27	68.3	17.6	V	155	22
17355.000	54.7	-26.6	41.3	39.93	68.3	13.7	V	155	352
16938.500	56.1	-27.1	41.7	41.50	68.3	12.2	V	155	0
17576.000	55.4	-26.4	41.2	40.63	68.3	12.9	V	155	0

Ch165

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
5923.229	46.7	-32.5	35.1	44.05	69.5	22.9	V	155	88
5924.310	46.4	-32.5	35.1	43.83	68.7	22.3	H	155	110
11650.000	51.2	-30.6	38.4	43.44	68.3	17.1	V	155	132
17475.000	54.3	-26.3	41.2	39.37	68.3	14.0	H	155	154
16868.200	56.4	-26.9	41.6	41.73	68.3	11.9	V	155	176
17546.300	55.5	-26.4	41.2	40.69	68.3	12.8	V	155	198

802.11n-HT40

Ch151

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
5650.219	46.8	-33.1	34.7	45.18	68.4	21.5	H	155	0
5652.070	47.8	-33.0	34.7	46.05	69.7	22.0	H	155	0
11510.000	50.3	-30.8	38.2	42.92	68.3	18.0	V	155	22
17265.000	54.7	-26.8	41.4	40.00	68.3	13.6	V	155	352
17556.150	55.4	-26.4	41.2	40.59	68.3	12.9	V	155	88
16984.760	56.0	-26.8	41.7	41.10	68.3	12.3	V	155	88

Ch159

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
5923.747	45.8	-32.5	35.1	43.23	69.1	23.3	H	155	22
5924.609	46.2	-32.5	35.1	43.57	68.5	22.3	H	155	44
11590.000	50.8	-30.8	38.3	43.34	68.3	17.5	H	155	242
17385.000	54.7	-26.5	41.3	39.91	68.3	13.6	H	155	176
17560.890	55.4	-26.4	41.2	40.62	68.3	12.9	H	155	88
16985.670	56.0	-26.8	41.7	41.07	68.3	12.3	V	155	22

A.6. Band Edges Compliance

A6.1 Band Edges - conducted

Measurement Limit:

Standard	Limit (dBm/MHz)
FCC 47 CFR Part 15.407(b)(4)	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.

The measurement is made according to KDB 789033 D02

Measurement Uncertainty:

Measurement Uncertainty	0.75dB
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Measurement Result:

Mode	Channel	Test Results	Conclusion
802.11a	5745 MHz	Fig.41	P
	5825 MHz	Fig.42	P
802.11n-HT20	5745 MHz	Fig.43	P
	5825 MHz	Fig.44	P
802.11n-HT40	5755 MHz	Fig.45	P
	5795 MHz	Fig.46	P

Conclusion: PASS

Test graphs as below:

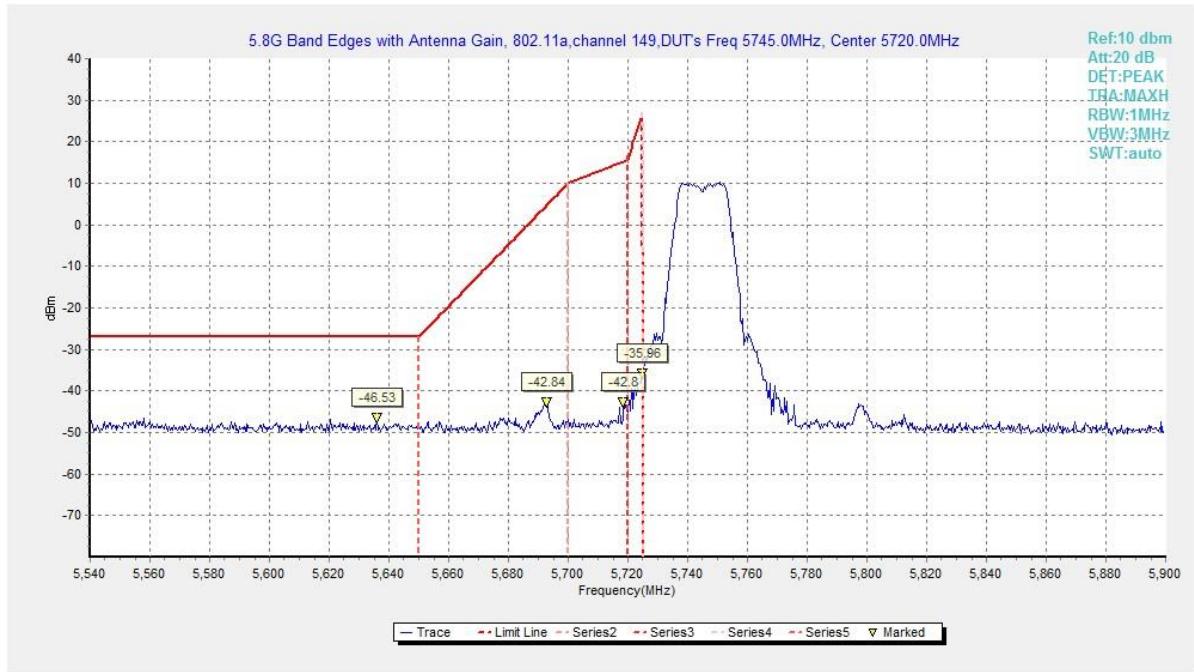


Fig. 41 Band Edges (802.11a, 5745MHz)

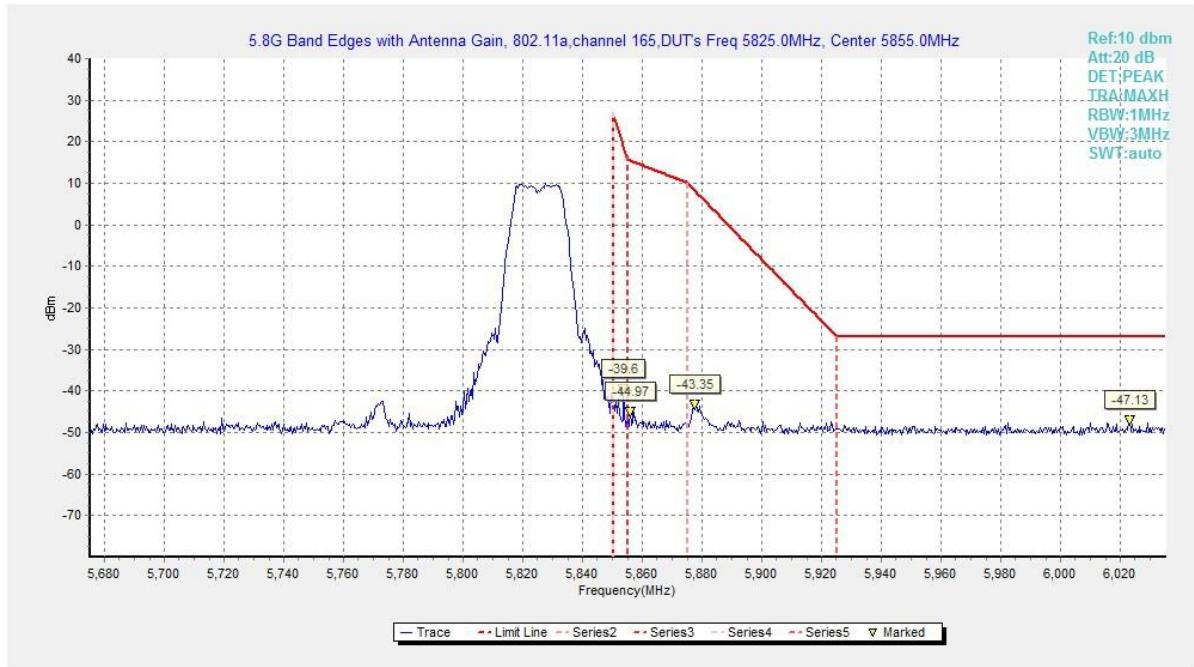


Fig. 42 Band Edges (802.11a, 5825MHz)

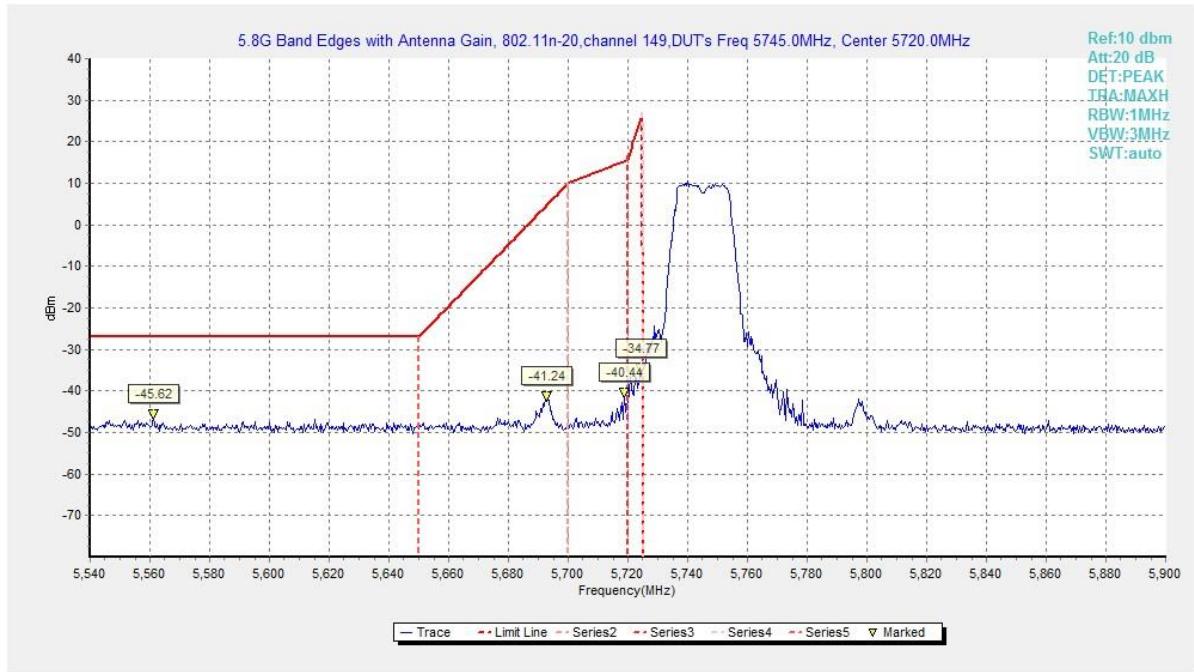


Fig. 43 Band Edges (802.11n20, 5745MHz)

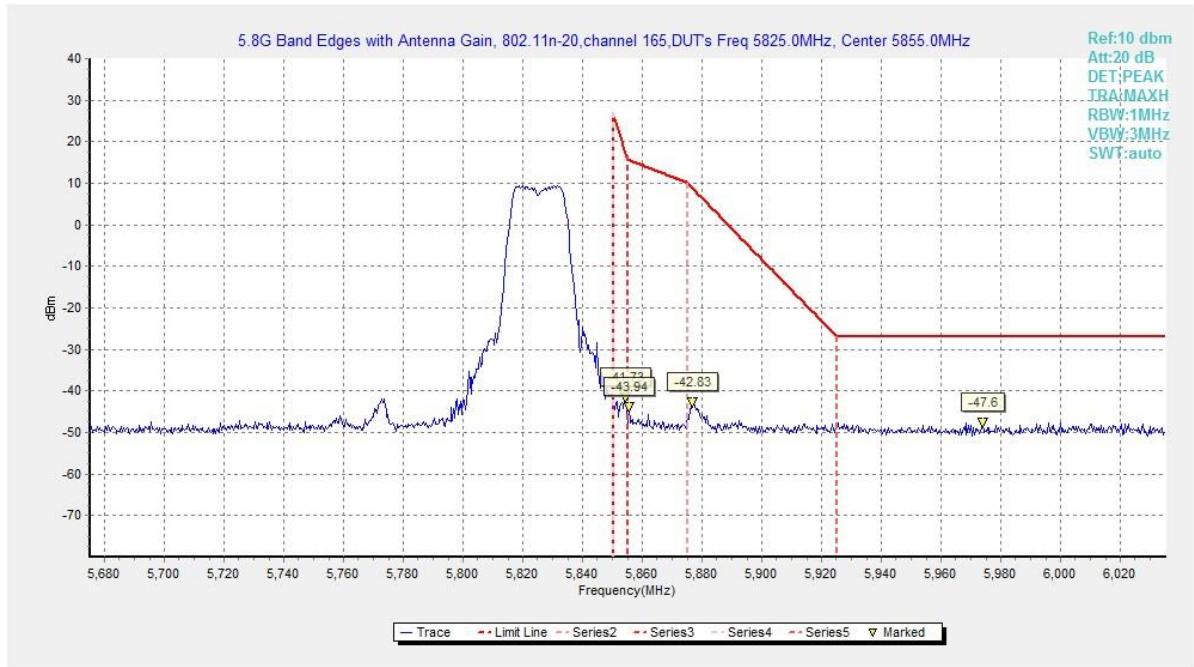


Fig. 44 Band Edges (802.11n20, 5825MHz)

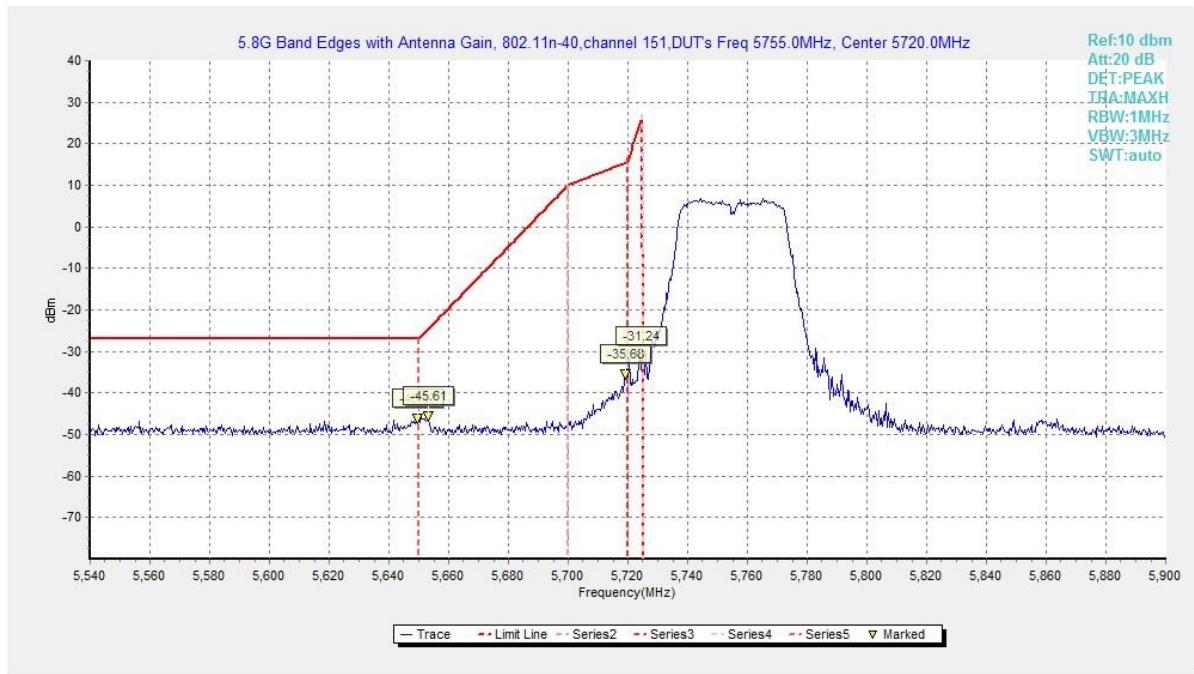


Fig. 45 Band Edges (802.11n40, 5755MHz)

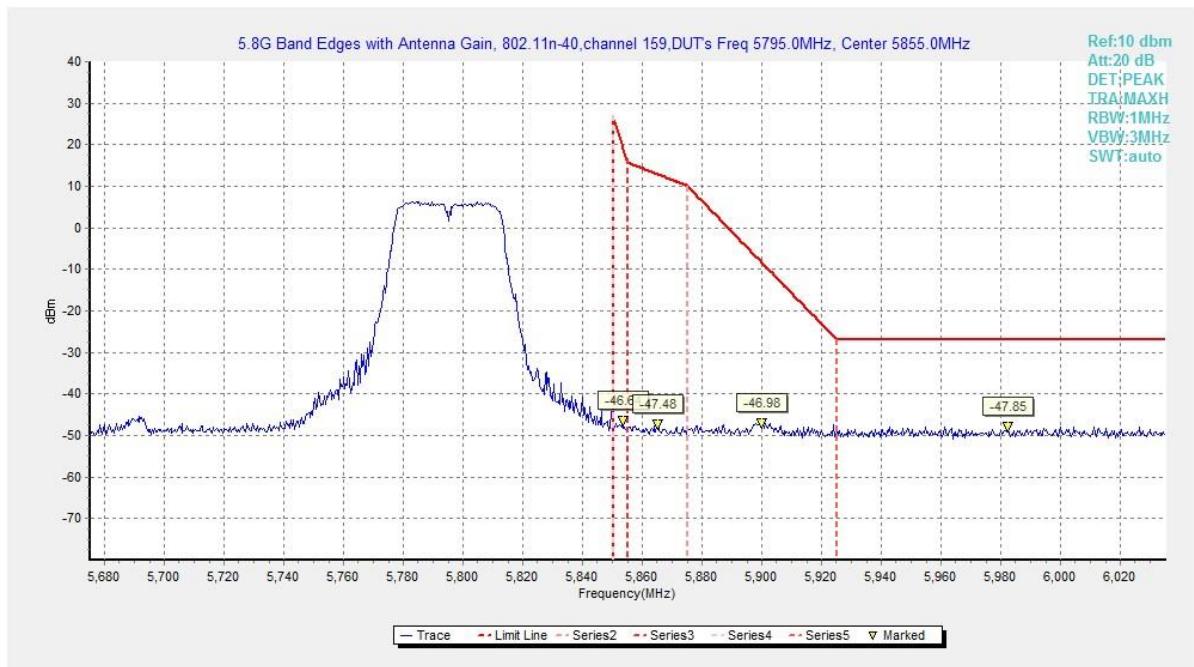


Fig. 46 Band Edges (802.11n40, 5795MHz)

A6.2 Band Edges - Radiated

Measurement Limit:

Standard	Limit (dBm/MHz)	
FCC 47 CFR Part 15.407	at the band edge	27
	at 5 MHz above or below the band edge	15.6
	at 25 MHz above or below the band edge	10
	at 75 MHz or more above or below the band edge	-27
Note: Increasing linearly from point to point.		

The measurement is made according to KDB 789033 D02

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)).

Measurement Result:

Mode	Channel	Test Results	Conclusion
802.11a	5745 MHz	Fig.47	P
	5825 MHz	Fig.48	P
802.11n HT20	5745 MHz	Fig.49	P
	5825 MHz	Fig.50	P
802.11n HT40	5755 MHz	Fig.51	P
	5795 MHz	Fig.52	P

Conclusion: PASS

Test graphs as below:

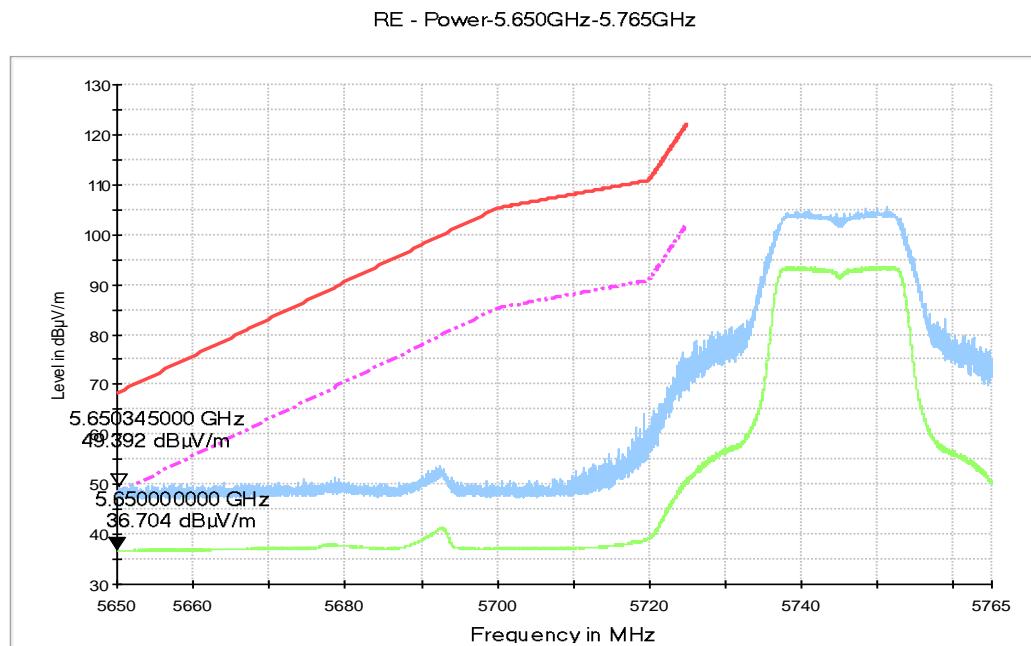


Fig. 47 Band Edges (802.11a, 5745MHz)

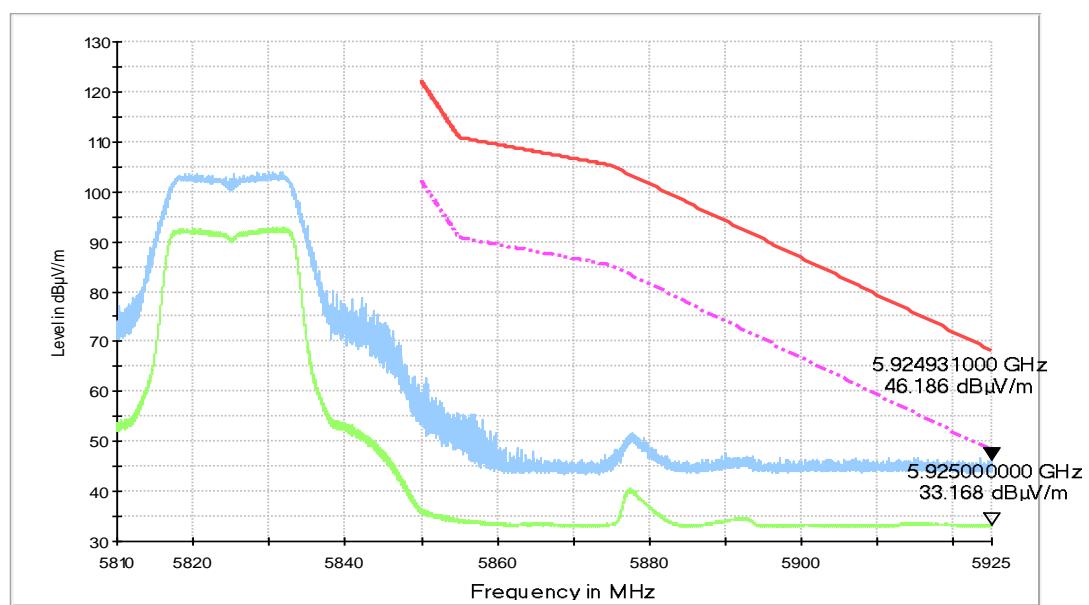


Fig. 48 Band Edges (802.11a, 5825MHz)

RE - Power-5.650GHz-5.765GHz

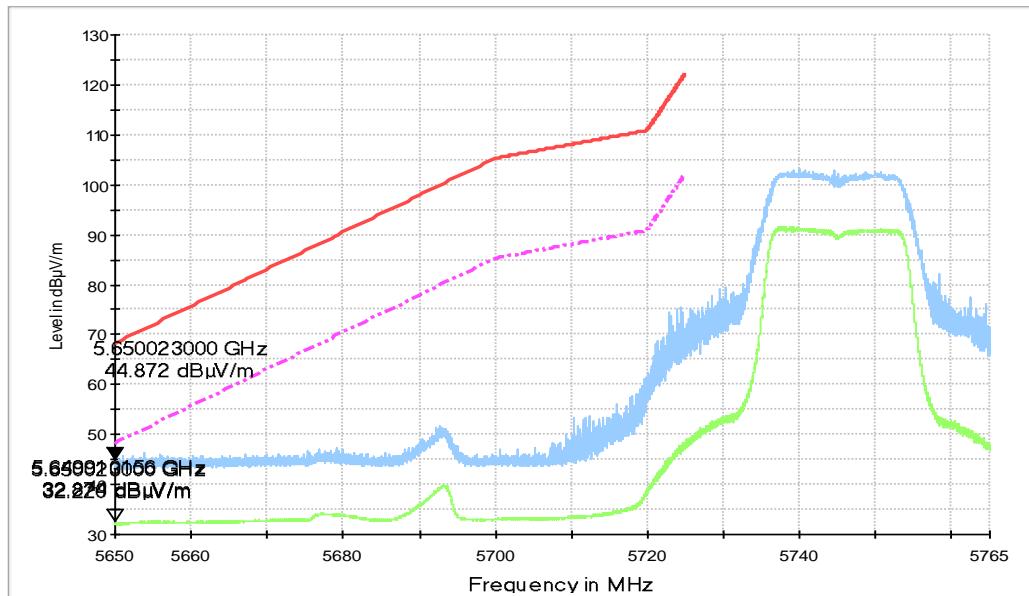


Fig. 49 Band Edges (802.11n-HT20, 5745MHz)

RE - Power-5.810GHz-5.925GHz

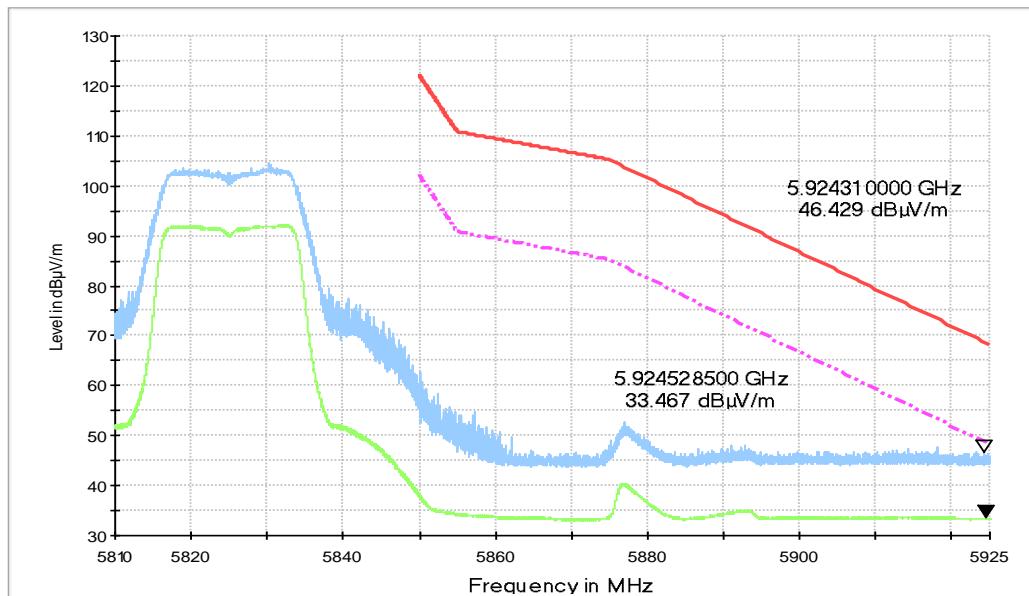


Fig. 50 Band Edges (802.11n-HT20, 5825MHz)

RE - Power-5.650GHz-5.765GHz

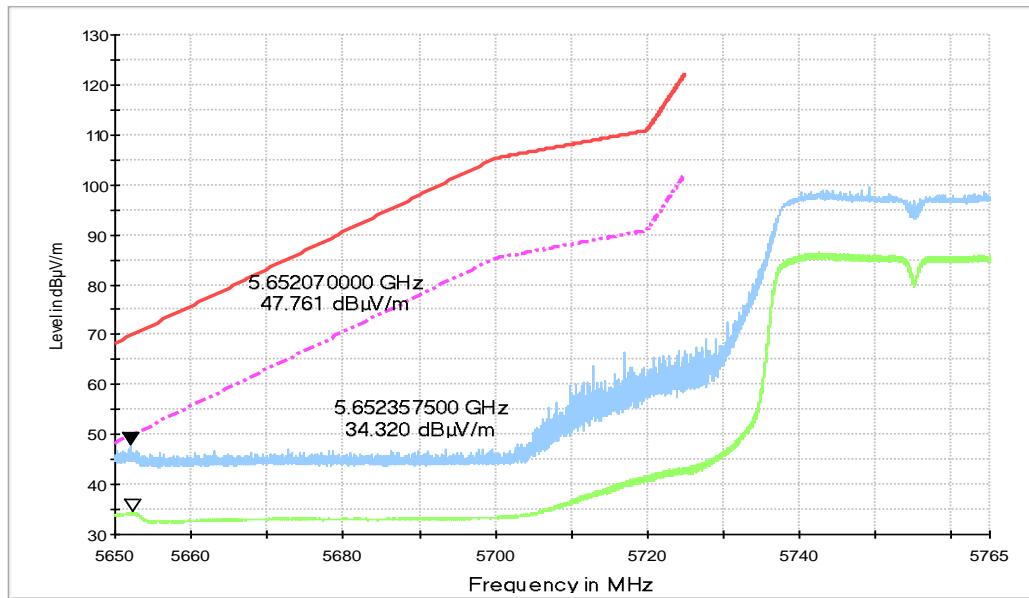


Fig. 51 Band Edges (802.11n-HT40, 5755MHz)

RE - Power-5.810GHz-5.925GHz

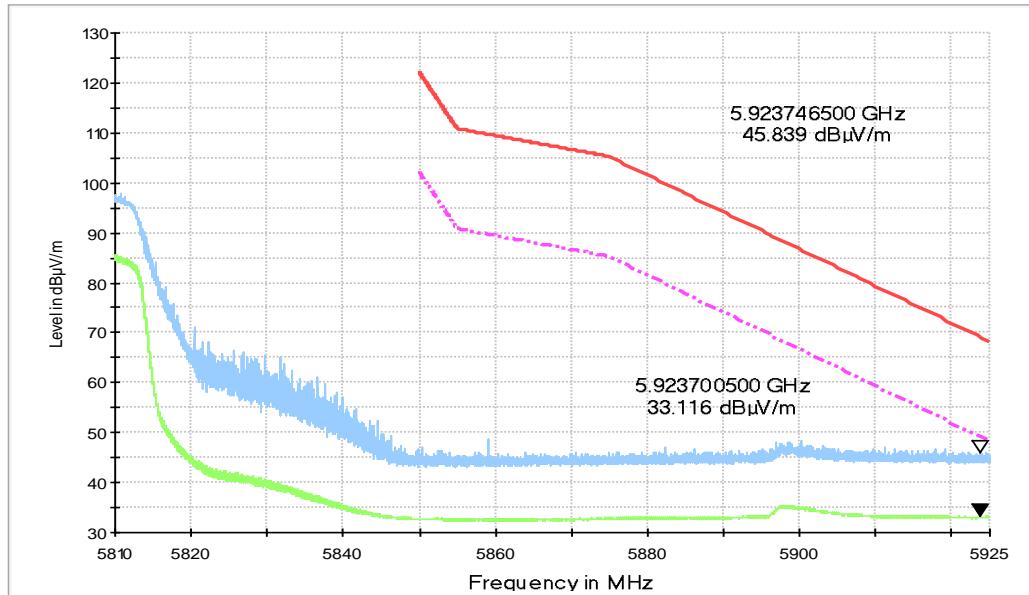


Fig. 52 Band Edges (802.11n-HT40, 5795MHz)

A.7. AC Powerline Conducted Emission

Test Condition:

Voltage (V)	Frequency (Hz)
110	60

Measurement uncertainty:

Expanded measurement uncertainty for this test item is U = 3.10dB, k=2.

Measurement Result and limit:

WLAN (Quasi-peak Limit)

Frequency range (MHz)	Quasi-peak Limit (dB μ V)	Result (dB μ V)		Conclusion	
		With charger			
		802.11a	Idle		
0.15 to 0.5	66 to 56	Fig.53	Fig.54	P	
0.5 to 5	56	Fig.55			
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 (dB μ V)	Result (dB μ V)		Conclusion	
		With charger			
		802.11a	Idle		
0.15 to 0.5	56 to 46	Fig.53	Fig.54	P	
0.5 to 5	46	Fig.55			
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:

Traffic (With AE3):

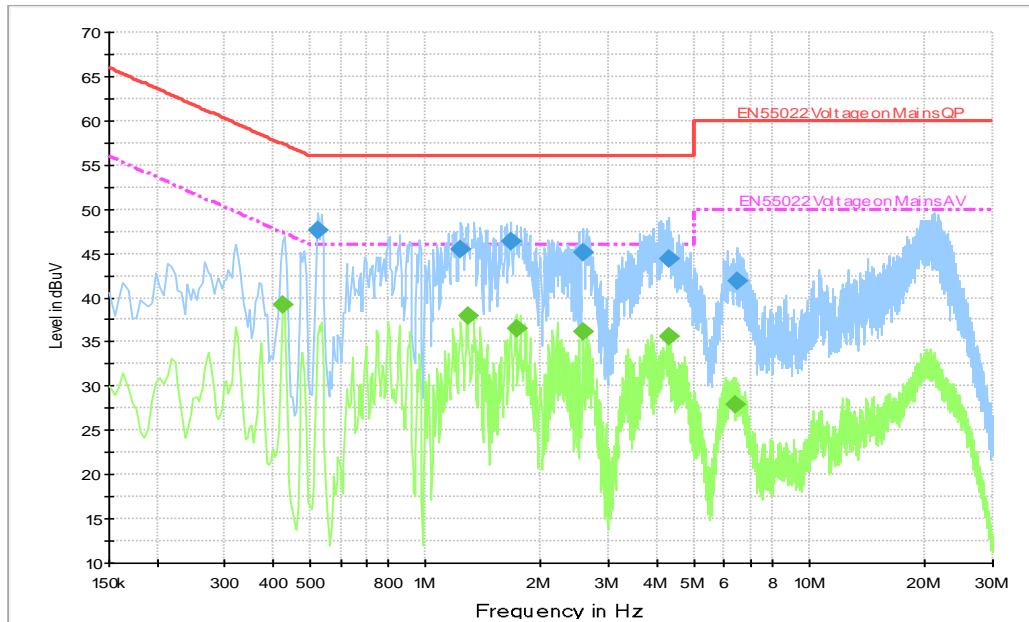


Fig. 53 AC Powerline Conducted Emission-802.11a

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.523500	47.7	10000.	9.000	GND	L1	10.3	8.3	56.0
1.234500	45.5	10000.	9.000	GND	L1	10.4	10.5	56.0
1.671000	46.4	10000.	9.000	GND	L1	10.4	9.6	56.0
2.571000	45.2	10000.	9.000	GND	L1	10.5	10.8	56.0
4.285500	44.3	10000.	9.000	GND	L1	10.5	11.7	56.0
6.508500	41.9	10000.	9.000	GND	L1	10.7	18.1	60.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.424500	39.2	10000.	9.000	GND	L1	10.3	8.2	47.4
1.284000	37.9	10000.	9.000	GND	L1	10.4	8.1	46.0
1.720500	36.5	10000.	9.000	GND	L1	10.4	9.5	46.0
2.571000	36.1	10000.	9.000	GND	L1	10.5	9.9	46.0
4.285500	35.6	10000.	9.000	GND	L1	10.5	10.4	46.0
6.436500	27.9	10000.	9.000	GND	L1	10.7	22.1	50.0

Idle (With AE3):

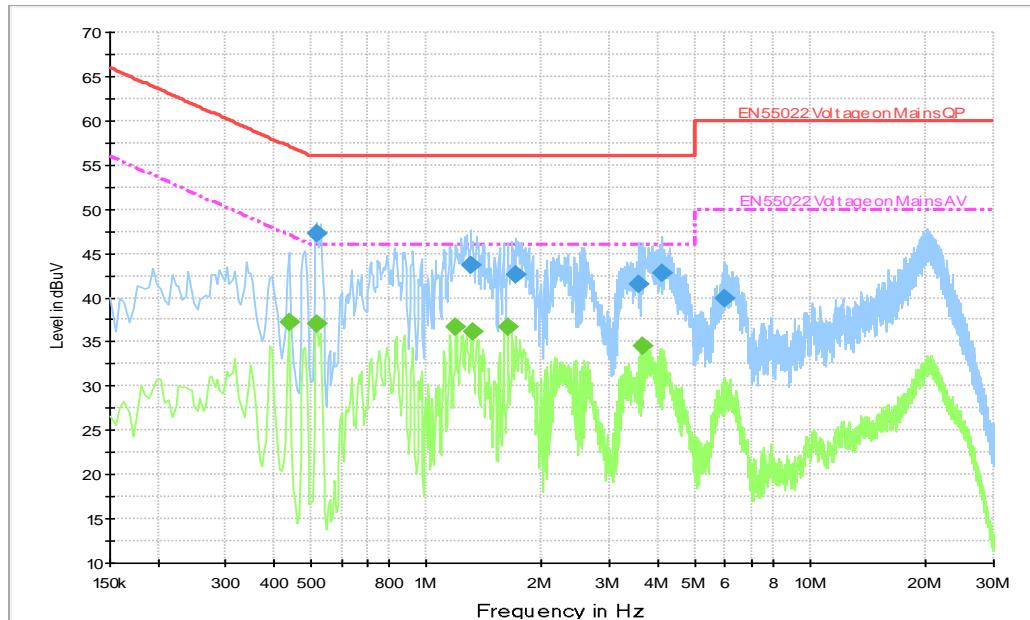


Fig. 54 AC Powerline Conducted Emission-Idle

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.519000	47.2	10000.	9.000	GND	L1	10.3	8.8	56.0
1.306500	43.6	10000.	9.000	GND	L1	10.4	12.4	56.0
1.716000	42.5	10000.	9.000	GND	L1	10.4	13.5	56.0
3.574500	41.5	10000.	9.000	GND	L1	10.4	14.5	56.0
4.092000	42.8	10000.	9.000	GND	L1	10.5	13.2	56.0
6.000000	39.9	10000.	9.000	GND	L1	10.6	20.1	60.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.438000	37.1	10000.	9.000	GND	L1	10.3	10.0	47.1
0.519000	37.1	10000.	9.000	GND	L1	10.3	8.9	46.0
1.194000	36.7	10000.	9.000	GND	L1	10.4	9.3	46.0
1.315500	36.1	10000.	9.000	GND	L1	10.4	9.9	46.0
1.630500	36.7	10000.	9.000	GND	L1	10.4	9.3	46.0
3.660000	34.5	10000.	9.000	GND	L1	10.5	11.5	46.0

Traffic (With AE4):

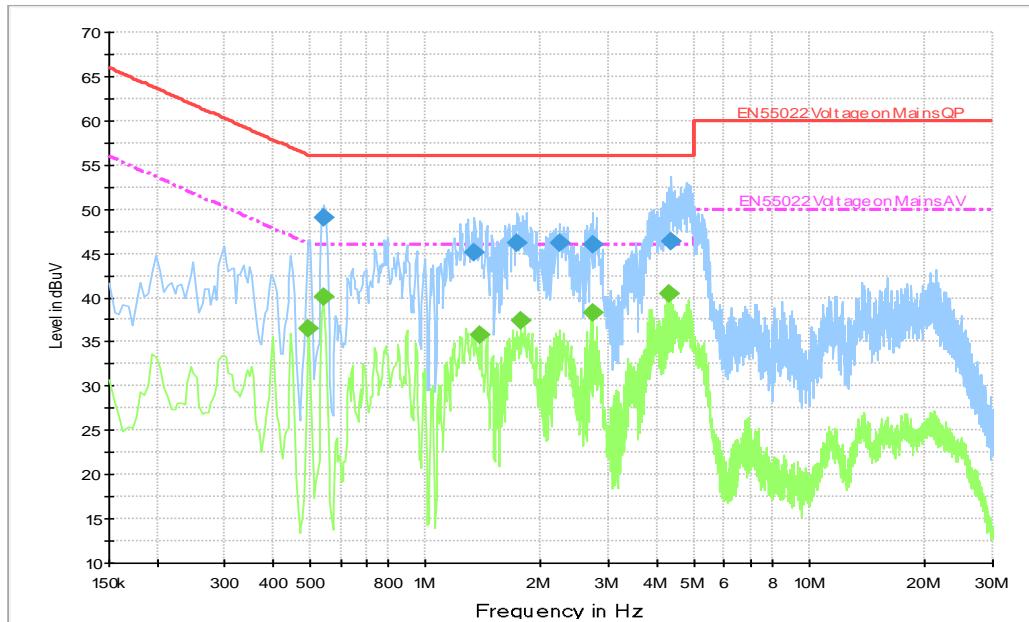


Fig. 55 AC Powerline Conducted Emission-802.11a

Final Result 1

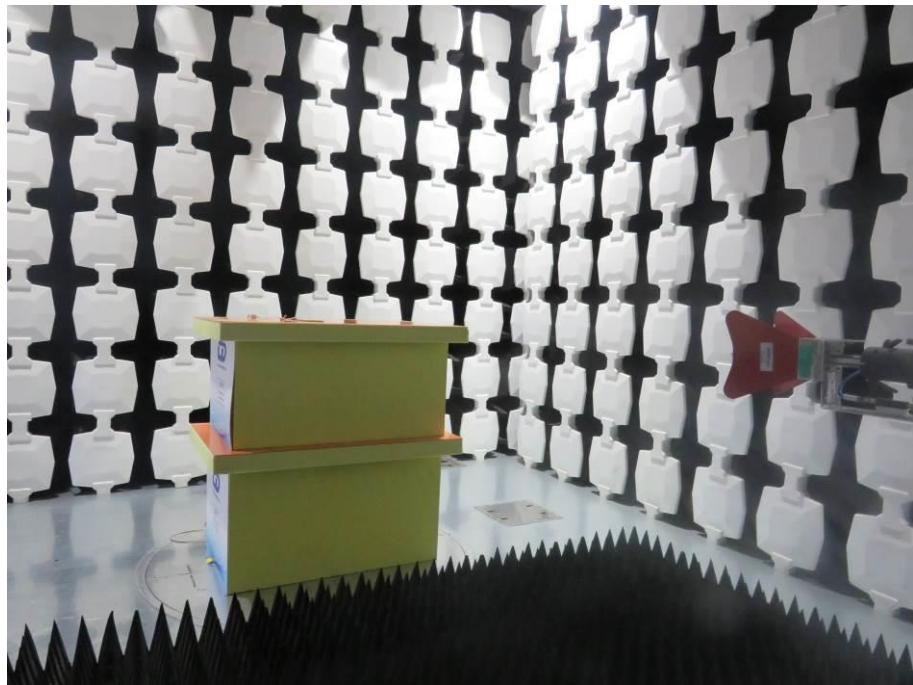
Frequency (MHz)	QuasiPeak (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.546000	49.0	10000.	9.000	GND	L1	10.3	7.0	56.0
1.342500	45.1	10000.	9.000	GND	L1	10.3	10.9	56.0
1.738500	46.1	10000.	9.000	GND	L1	10.4	9.9	56.0
2.233500	46.1	10000.	9.000	GND	L1	10.4	9.9	56.0
2.733000	46.0	10000.	9.000	GND	L1	10.5	10.0	56.0
4.380000	46.4	10000.	9.000	GND	L1	10.5	9.6	56.0

Final Result 2

Frequency (MHz)	Average (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.496500	36.5	10000.	9.000	GND	L1	10.3	9.6	46.1
0.541500	40.1	10000.	9.000	GND	L1	10.3	5.9	46.0
1.387500	35.8	10000.	9.000	GND	L1	10.4	10.2	46.0
1.765500	37.3	10000.	9.000	GND	L1	10.4	8.7	46.0
2.733000	38.3	10000.	9.000	GND	L1	10.5	7.7	46.0
4.321500	40.5	10000.	9.000	GND	L1	10.5	5.5	46.0

ANNEX B: PHOTOGRAPHS OF THE TEST SET-UP

Layout of Radiated Spurious Emission Test



Layout of Conducted Emission Test



ANNEX C: Accreditation Certificate

United States Department of Commerce
National Institute of Standards and Technology



Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 600118-0

Telecommunication Technology Labs, CAICT

Beijing
China

*is accredited by the National Voluntary Laboratory Accreditation Program for specific services,
listed on the Scope of Accreditation, for:*

Electromagnetic Compatibility & Telecommunications

*This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005.
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality
management system (refer to joint ISO-ILAC-IAF Communiqué dated January 2009).*

2018-09-28 through 2019-09-30

Effective Dates



For the National Voluntary Laboratory Accreditation Program

A handwritten signature in blue ink that reads "Debra S. Lamm".

*** END OF REPORT BODY ***