



FCC PART 15C TEST REPORT

No. I17Z60076-SRD16

for

HMD Global Oy

Smart Phone

TA-1021

with

FCC ID: 2AJOTTA-1021

Hardware Version: 3

Software Version: 000C_3_110

Issued Date: 2017-04-15



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.

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
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1. TEST LATORATORY

1.1. 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. 18 Jia Kangding Street, BDA District, Beijing, P. R.
China 100191

1.2. Testing Environment

Normal Temperature: 15-35°C

Extreme Temperature: -10/+55°C

Relative Humidity: 20-75%

1.3. Project data

Testing Start Date: 2017-02-20

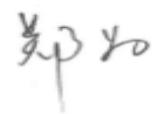
Testing End Date: 2017-04-14

1.4. Signature



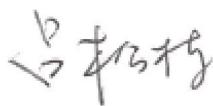
Jiang Xue

(Prepared this test report)



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2. CLIENT INFORMATION

2.1. Applicant Information

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City: Espoo
Postal Code: 201203
Country: Finland
Contact: Mikko Kahlos
Telephone: +358-408036126
Fax: /

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

3.1. About EUT

Description	Smart Phone
Model name	TA-1021
FCC ID	2AJOTTA-1021
WLAN Frequency Range	ISM Band: 5725MHz~5850MHz
Type of modulation	OFDM
Voltage	3.84V DC by Battery

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	/	3	000C_3_110
EUT2	/	3	000C_3_050

*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
AE1	Battery	INBUILT
AE2	Battery	INBUILT
AE3	Travel charger	/
AE4	Travel charger	/
AE5	USB cable	/
AE6	Headset	/

AE1

Model	HE316
Manufacturer	SCUD(FUJIAN) ELECTRONICS CO LTD
Capacitance	3000mAh
Nominal voltage	3.82V

AE2

Model	HE317
Manufacturer	SCUD(FUJIAN) ELECTRONICS CO LTD
Capacitance	3000mAh
Nominal voltage	3.84V



AE3/AE4

Model	FC0102
Manufacturer	Salcomp
Length of cable	/

AE5

Model	CUBB01M-FA010-DH
Manufacturer	FOXCONN
Length of cable	99cm

AE6

Model	5CAB5422B-N01-DG
Manufacturer	FOXCONN
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 Smart Phone 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: 15.205 Restricted bands of operation; 15.209 Radiated emission limits, general requirements; Subpart E—Unlicensed National Information Infrastructure Devices	2015
ANSI C63.10	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz	2013

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	15.407,15.205	/	P
Transmitter Spurious Emission - Radiated	15.407, 15.205, 15.209	/	P
AC Powerline Conducted Emission	15.107, 15.207	/	P
99% Occupied Bandwidth	/	/	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.

This model is a variant product which model name is TA-1025; all the test result has been derived from test report of TA-1025.

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	3.84V
Humidity	44%

7. TEST EQUIPMENTS UTILIZED

Conducted test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration date	Calibration Due date
1	Vector Signal Analyzer	FSQ40	200089	Rohde & Schwarz	2016-06-07	2017-06-06
2	Shielding Room	S81	/	ETS-Lindgren	/	/

Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration Period	Calibration Due date
1	Test Receiver	ESU26	100376	Rohde & Schwarz	1 year	2017-11-30
2	BiLog Antenna	VULB9163	514	Schwarzbeck	3 years	2017-11-24
3	Dual-Ridge Waveguide Horn Antenna	3116	2661	ETS-Lindgren	3 years	2017-06-17
4	Dual-Ridge Waveguide Horn Antenna	3115	6914	ETS-Lindgren	3 years	2017-09-21
5	Vector Signal Analyzer	FSV	101047	Rohde & Schwarz	1 year	2017-06-28
6	Test Receiver	ESCI7	100948	Rohde & Schwarz	1 year	2017-07-05
7	AMN	ESH3-Z5	825562/028	Rohde & Schwarz	1 year	2017-07-06

8. Measurement Uncertainty

8.1. Transmitter Output Power

Measurement Uncertainty: 0.339dB, k=1.96

8.2. Peak Power Spectral Density

Measurement Uncertainty: 0.705dBm/MHz, k=1.96

8.3. Occupied 6dB Bandwidth

Measurement Uncertainty: 60.80Hz, k=1.96

8.4. Band Edges Compliance

Measurement Uncertainty : 0.62dBm, k=1.96

8.5. Spurious Emissions

Conducted (k=1.96)

Frequency Range	Uncertainty(dBm)
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(dBm)
9kHz-30MHz	
30MHz ≤ f ≤ 1GHz	4.86
1GHz ≤ f ≤ 18GHz	5.26
18GHz ≤ f ≤ 40GHz	5.28

8.6. AC Power-line Conducted Emission

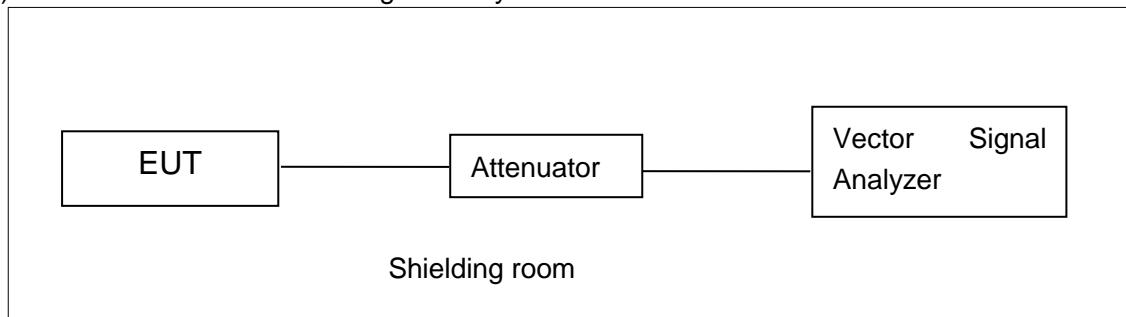
Measurement Uncertainty : 3.38dBm, k=2

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

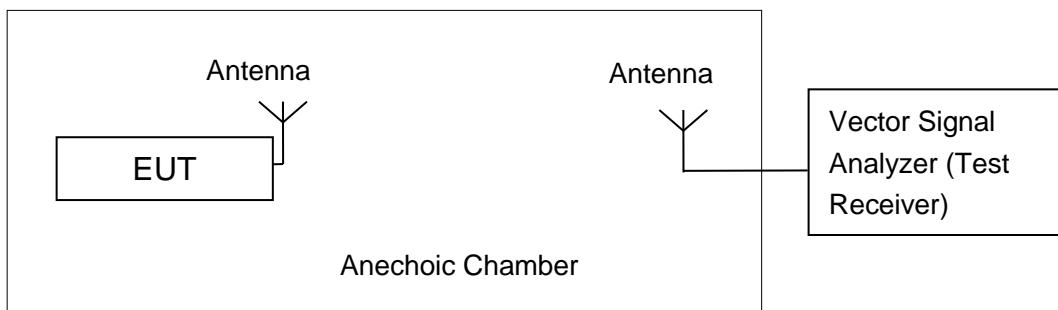


A.1.2. Radiated Emission Measurements

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 -3.6 dBi 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	20.23	/	/
	9	20.02	/	/
	12	20.03	/	/
	18	20.06	/	/
	24	20.46	/	/
	36	20.47	/	/
	48	20.55	20.06	19.29
	54	20.40	/	/

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	19.06	/	/
	MCS1	18.89	/	/
	MCS2	18.88	/	/
	MCS3	19.36	19.07	18.25
	MCS4	19.23	/	/
	MCS5	19.26	/	/
	MCS6	19.30	/	/
	MCS7	19.25	/	/

The data rate MCS3 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	19.27	/
	MCS1	19.16	/
	MCS2	18.97	/
	MCS3	19.55	19.08
	MCS4	19.34	/
	MCS5	19.24	/
	MCS6	19.25	/
	MCS7	19.17	/

The data rate MCS3 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	11.48	11.25	10.45

802.11n-HT20 mode

Mode	Test Result (dBm)		
	5745MHz (Ch149)	5785MHz (Ch157)	5825MHz(Ch165)
802.11n(20MHz)	10.39	9.93	9.33

802.11n-HT40 mode

Mode	Test Result (dBm)	
	5755MHz (Ch151)	5795MHz(Ch159)
802.11n(40MHz)	10.11	9.73

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
802.11a	149	6.33	P
	157	5.74	P
	165	5.07	P
802.11n HT20	149	5.67	P
	157	5.04	P
	165	5.00	P
802.11n HT40	151	2.15	P
	159	2.76	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 (kHz)		Conclusion
802.11a	149	Fig.1	16.45	P
	157	Fig.2	16.50	P
	165	Fig.3	16.45	P
802.11n HT20	149	Fig.4	17.70	P
	157	Fig.5	17.65	P
	165	Fig.6	17.70	P
802.11n HT40	151	Fig.7	36.00	P
	159	Fig.8	35.44	P

Conclusion: PASS
Test graphs as below:

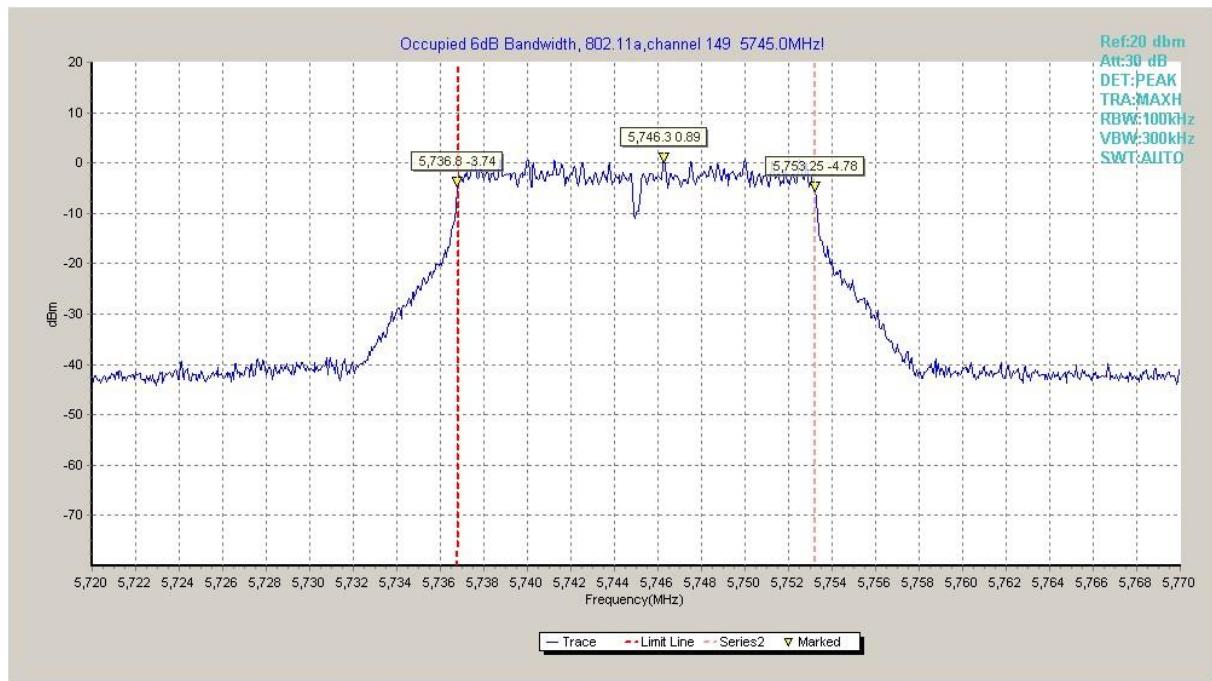


Fig. 1 Occupied 6dB Bandwidth (802.11a, Ch 149)

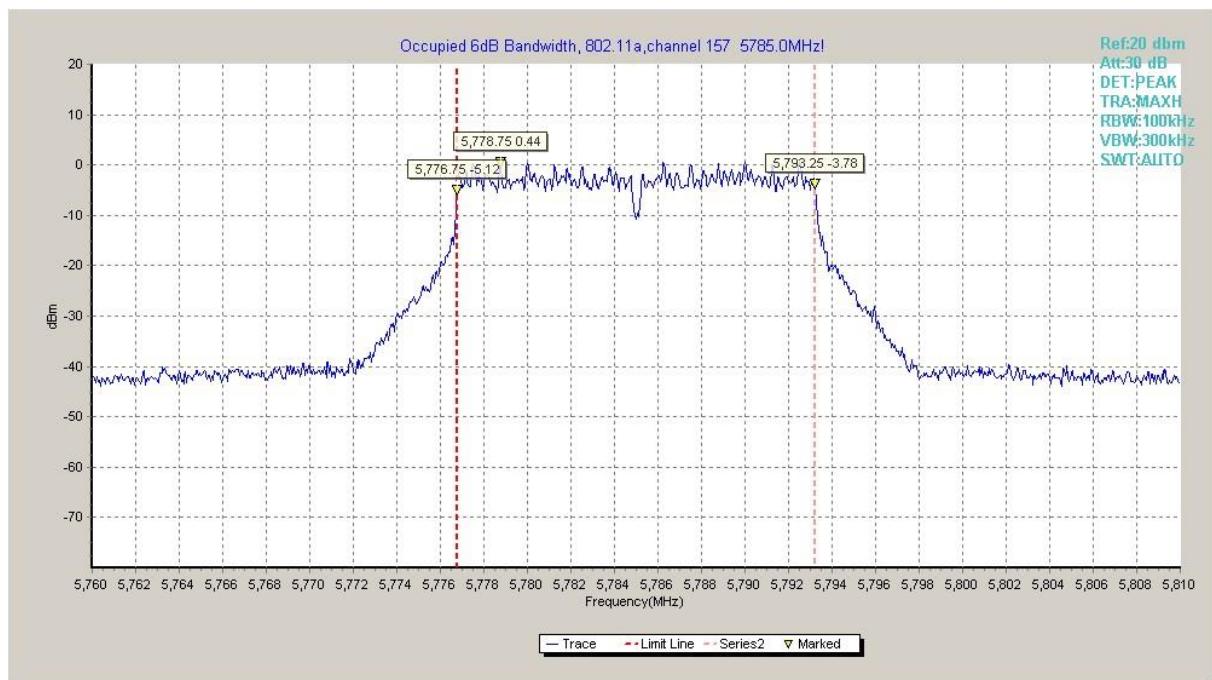


Fig. 2 Occupied 6dB Bandwidth (802.11a, Ch 157)

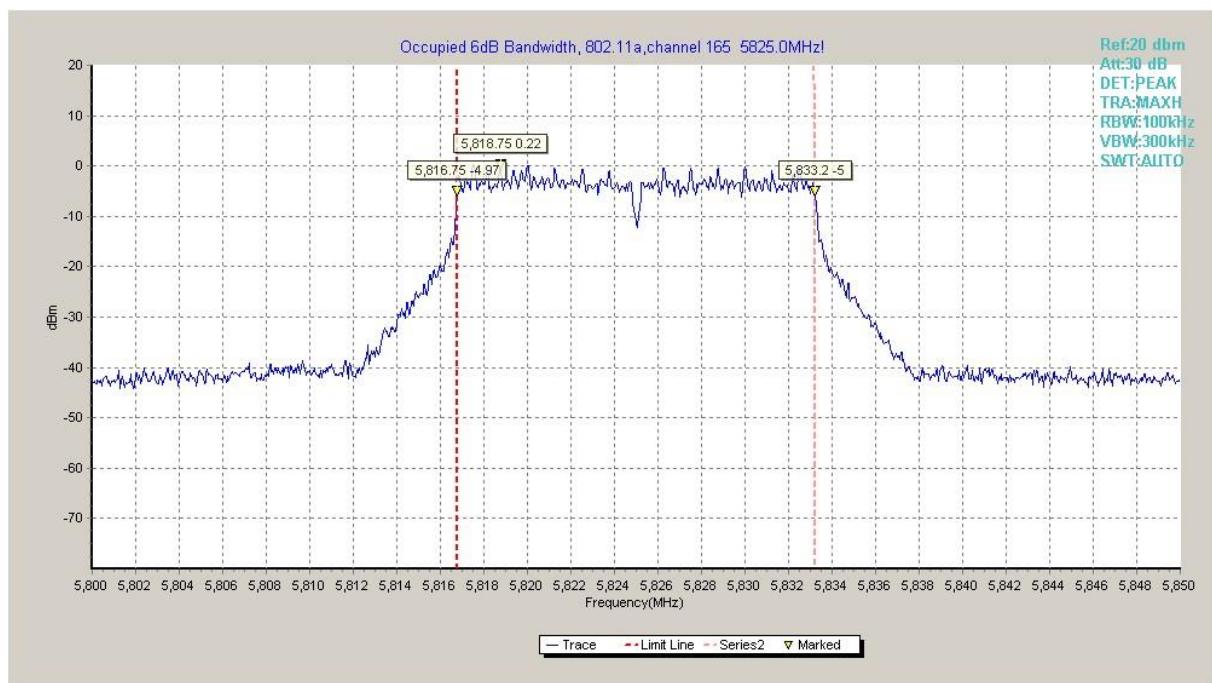


Fig. 3 Occupied 6dB Bandwidth (802.11a, Ch 165)

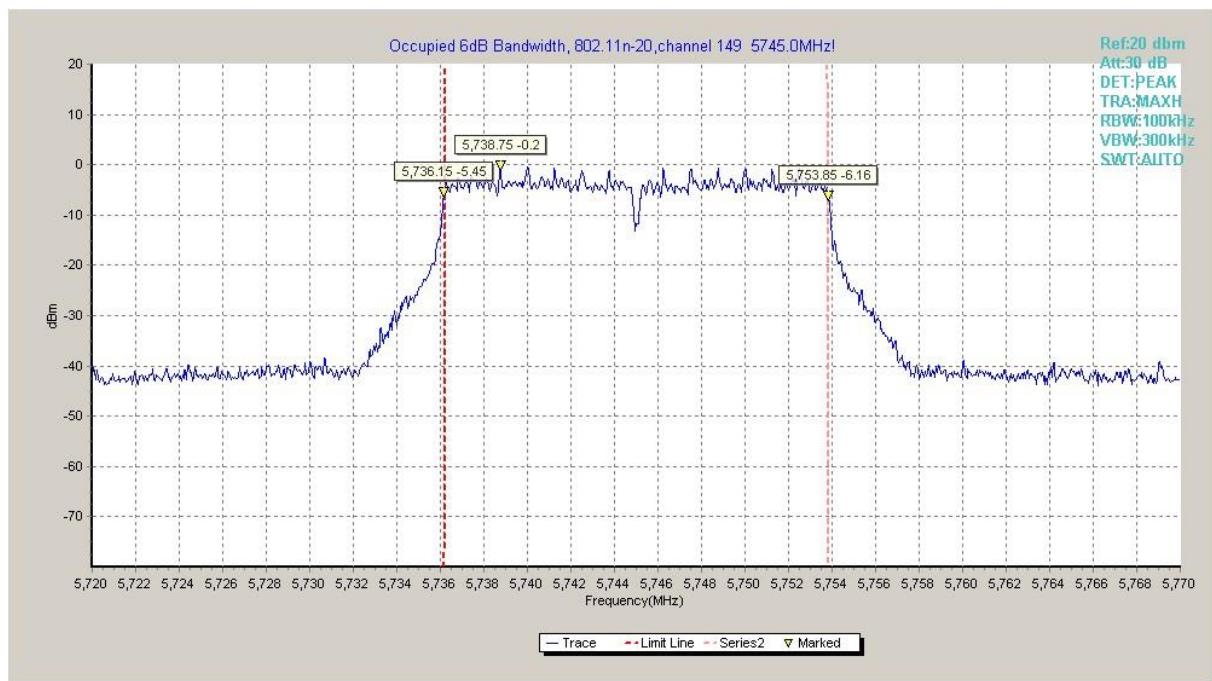


Fig. 4 Occupied 6dB Bandwidth (802.11n-HT20, Ch 149)



Fig. 5 Occupied 6dB Bandwidth (802.11n-HT20, Ch 157)

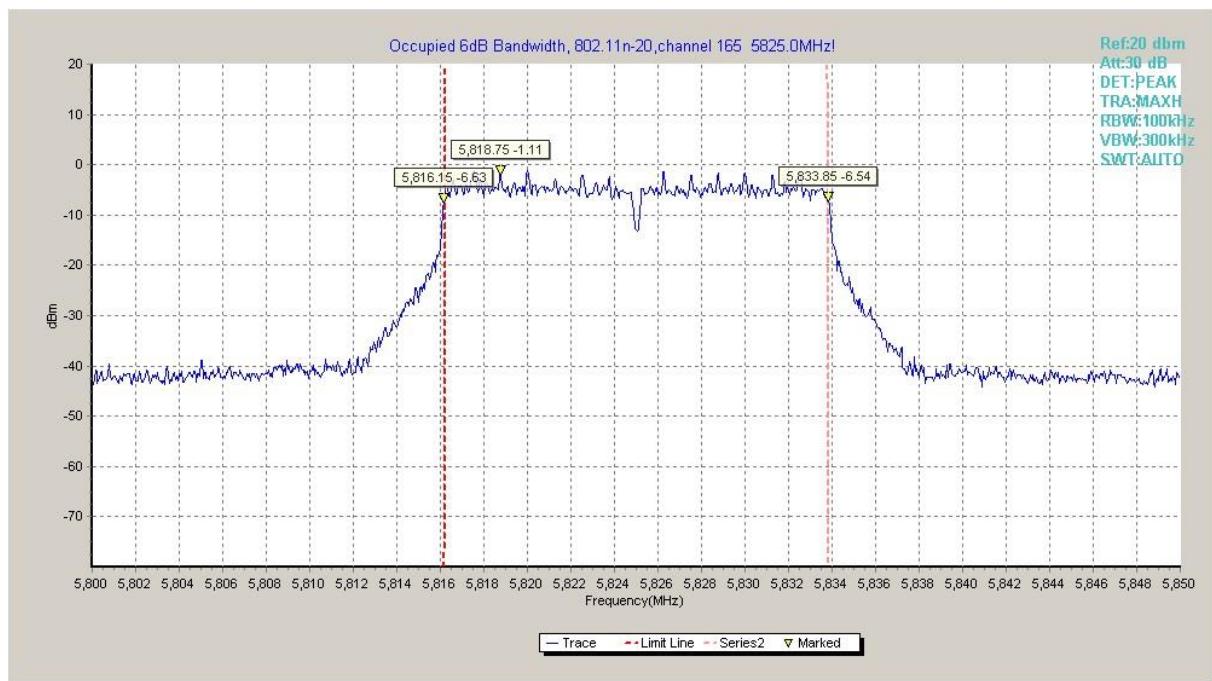


Fig. 6 Occupied 6dB Bandwidth (802.11n-HT20, Ch 165)

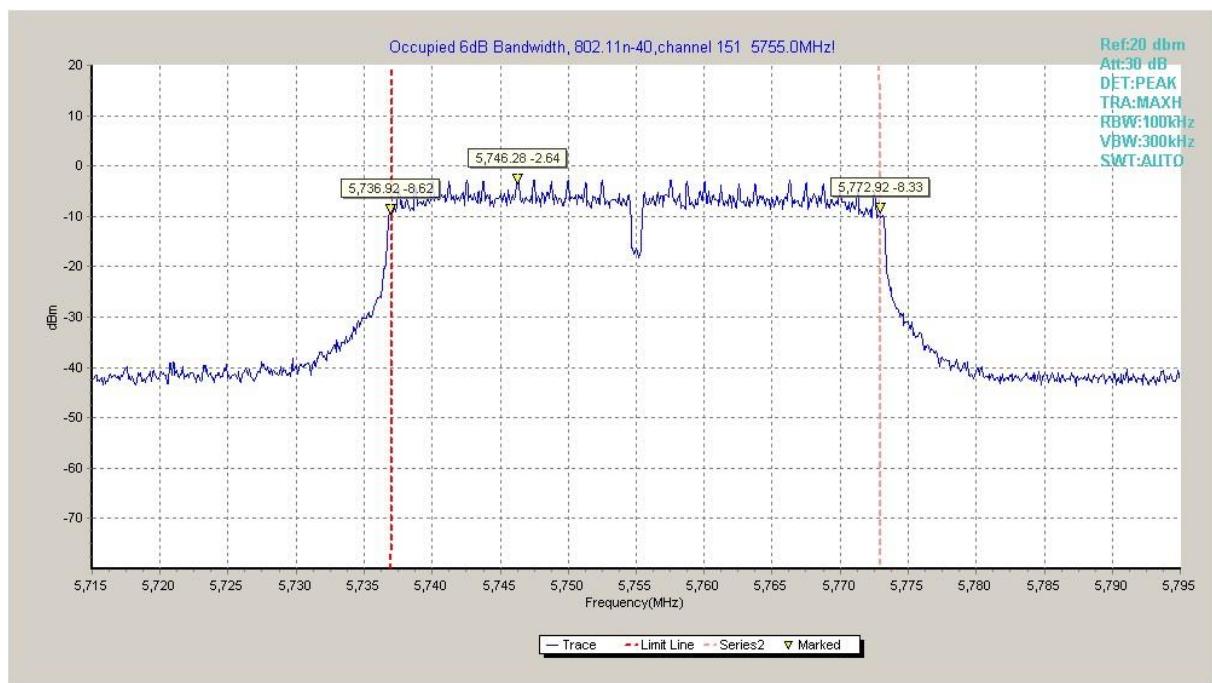


Fig. 7 Occupied 6dB Bandwidth (802.11n-HT40, Ch 151)

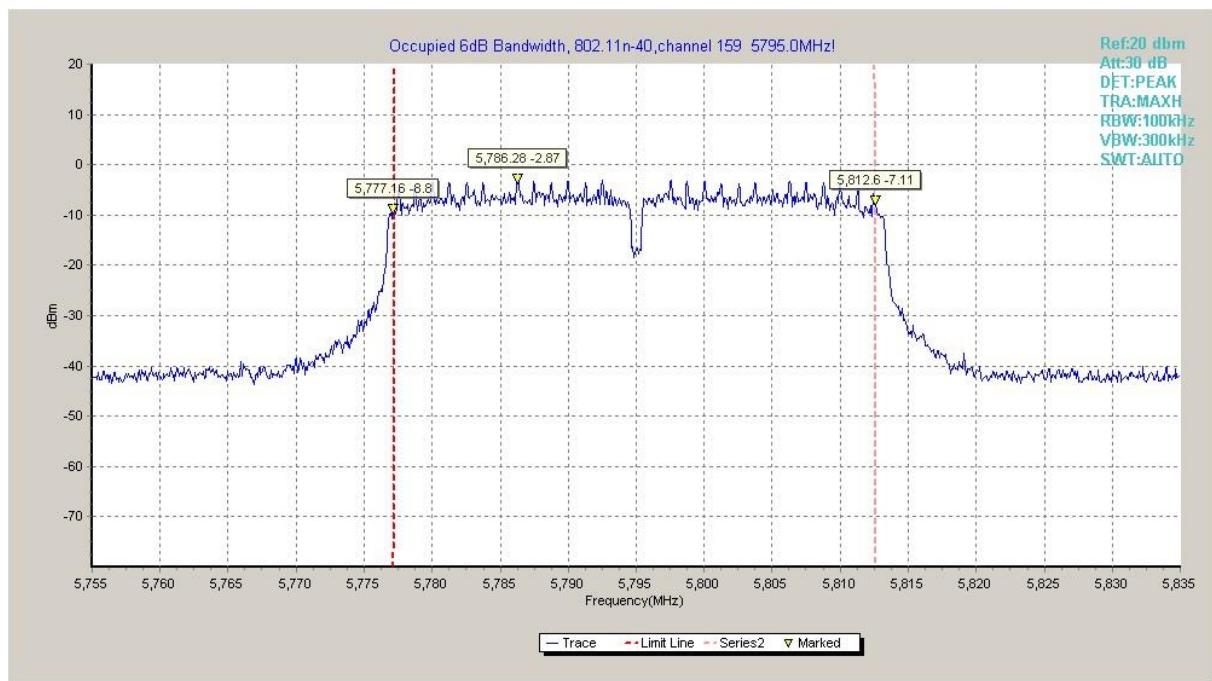


Fig. 8 Occupied 6dB Bandwidth (802.11n-HT40, Ch 159)

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 HT20	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 HT40	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:

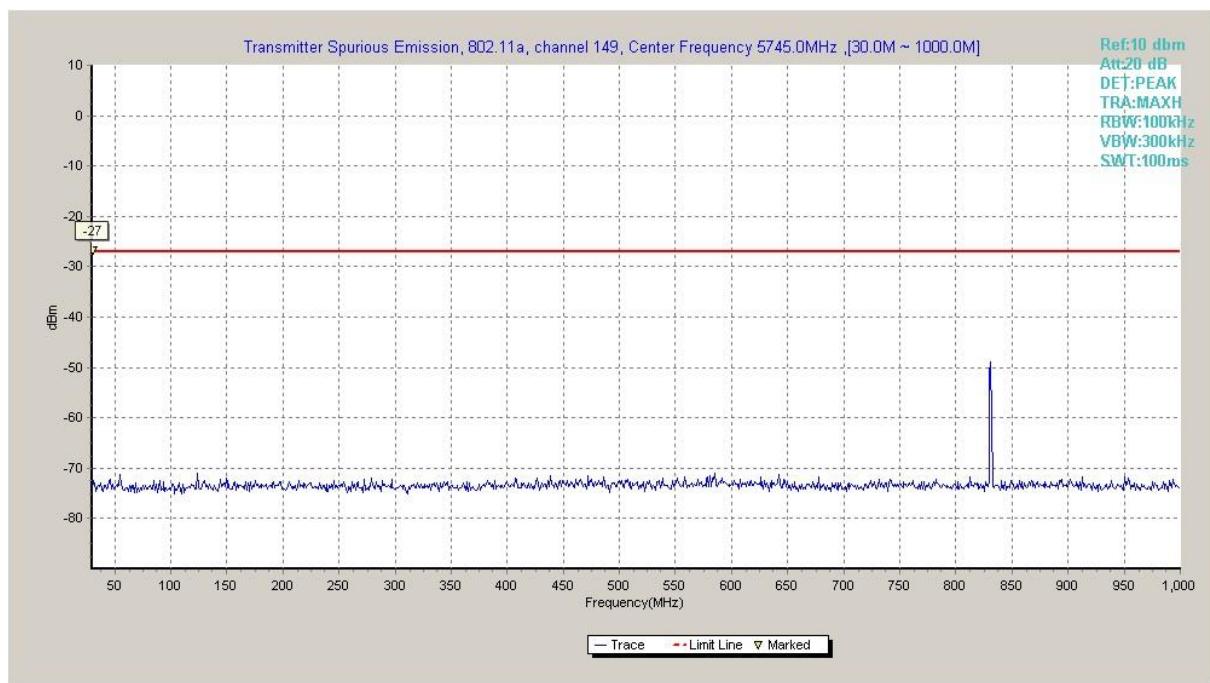


Fig. 9 Conducted Spurious Emission (802.11a, Ch149, 30 MHz-1 GHz)

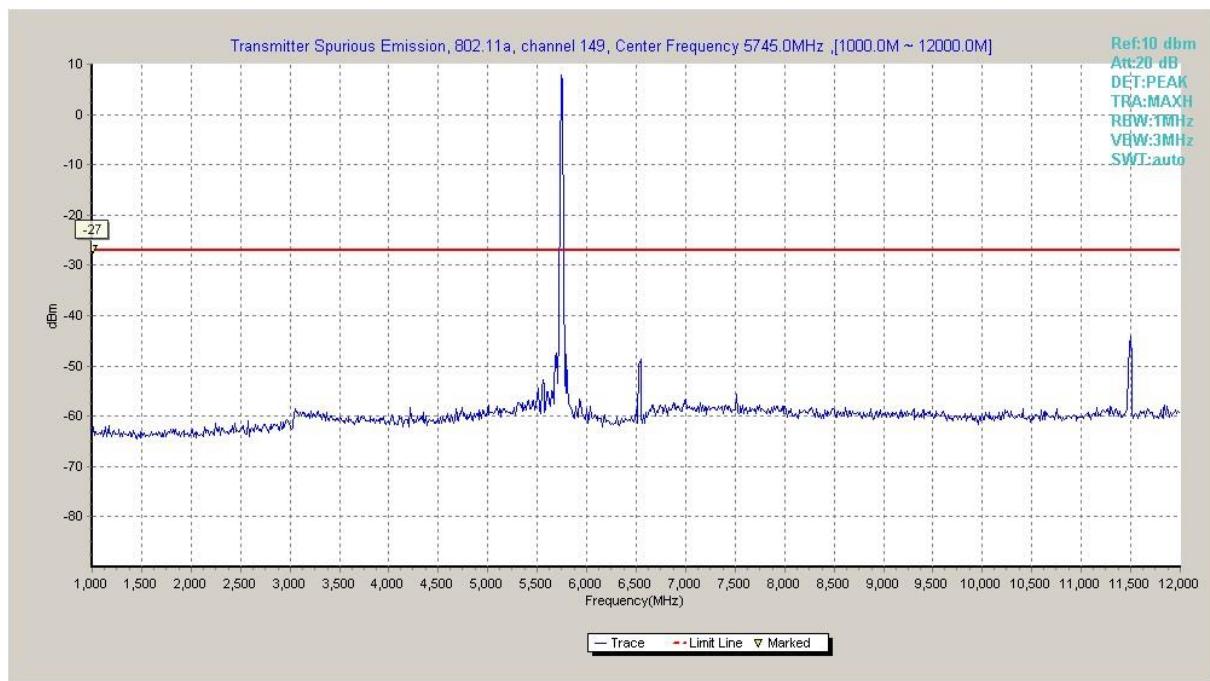


Fig. 10 Conducted Spurious Emission (802.11a, Ch149, 1 GHz -12 GHz)

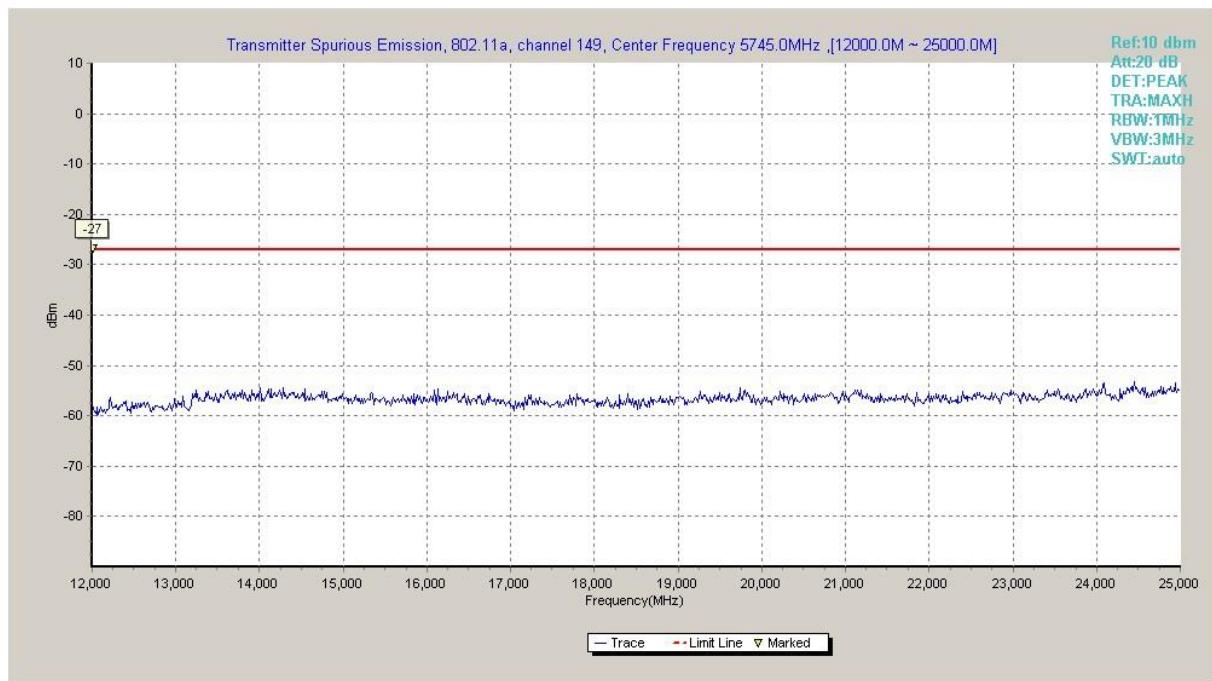


Fig. 11 Conducted Spurious Emission (802.11a, Ch149, 12 GHz-25 GHz)

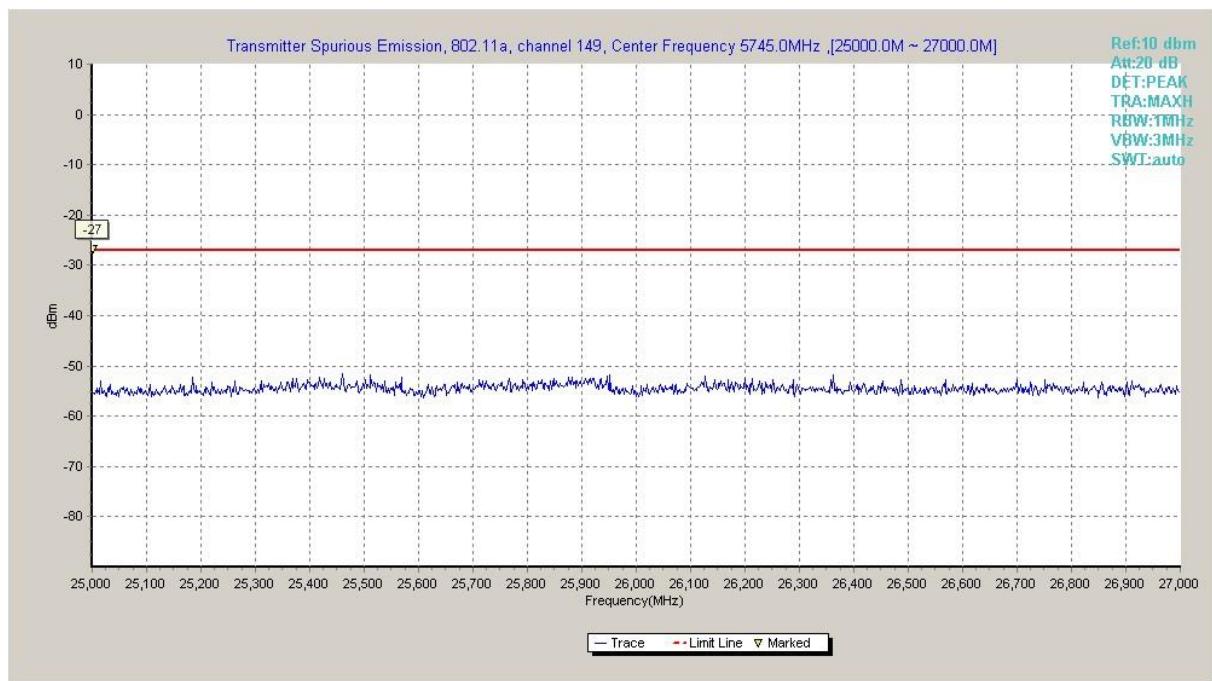


Fig. 12 Conducted Spurious Emission (802.11a, Ch149, 25 GHz-40 GHz)

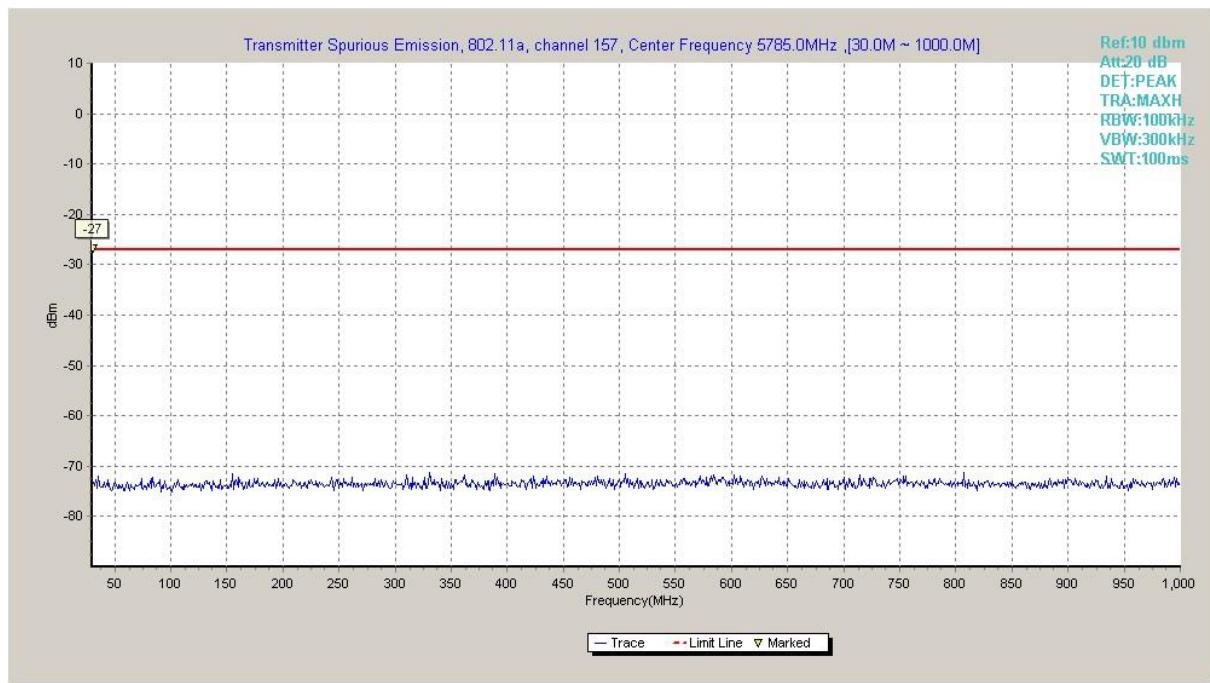


Fig. 13 Conducted Spurious Emission (802.11a, Ch157, 30 MHz-1 GHz)

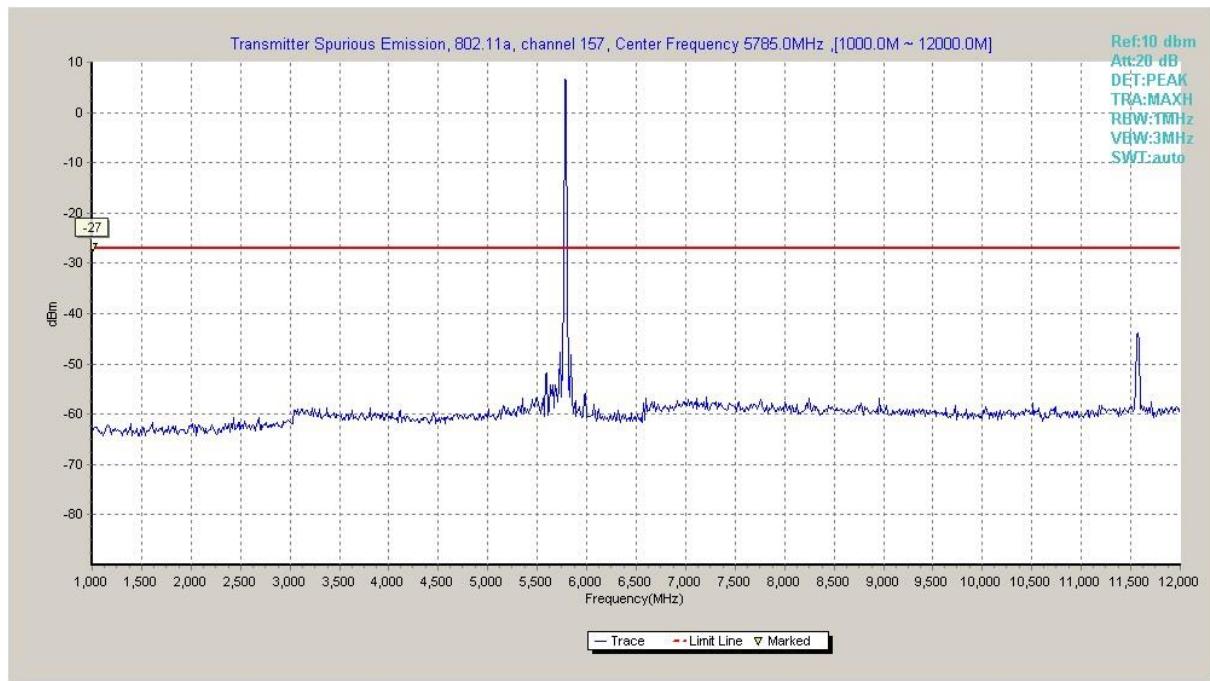


Fig. 14 Conducted Spurious Emission (802.11a, Ch157, 1 GHz -12 GHz)

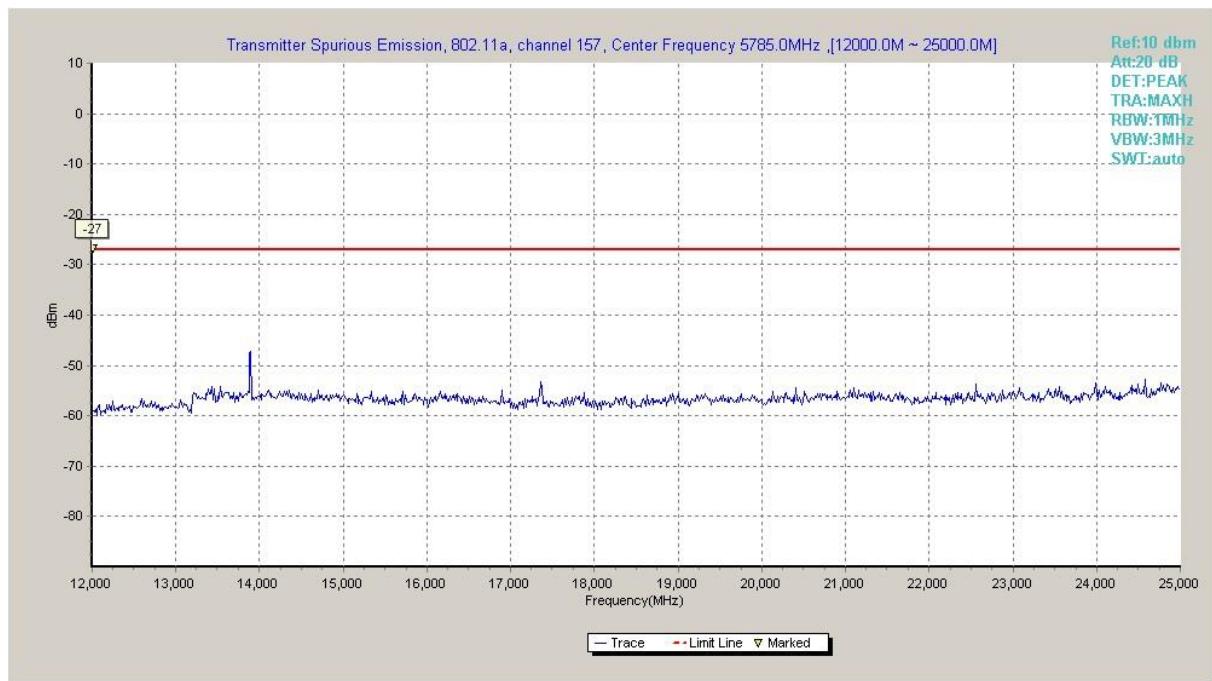


Fig. 15 Conducted Spurious Emission (802.11a, Ch157, 12 GHz-25 GHz)

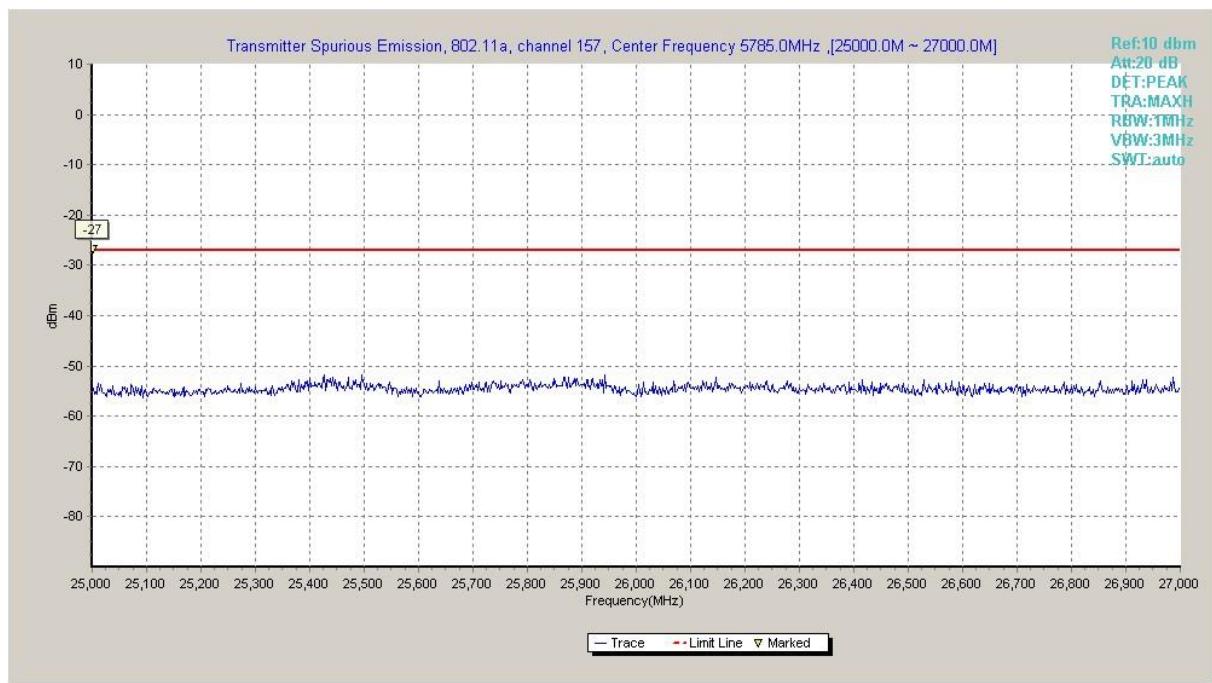


Fig. 16 Conducted Spurious Emission (802.11a, Ch157, 25 GHz-40 GHz)

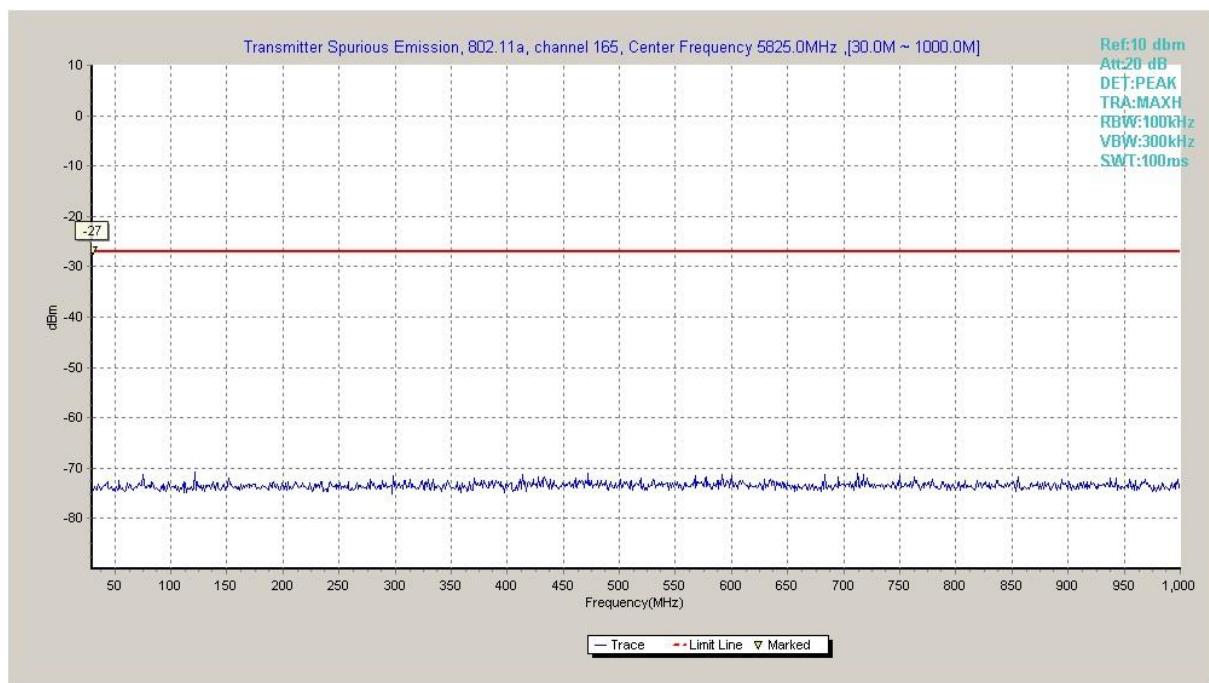


Fig. 17 Conducted Spurious Emission (802.11a, Ch165, 30 MHz-1 GHz)

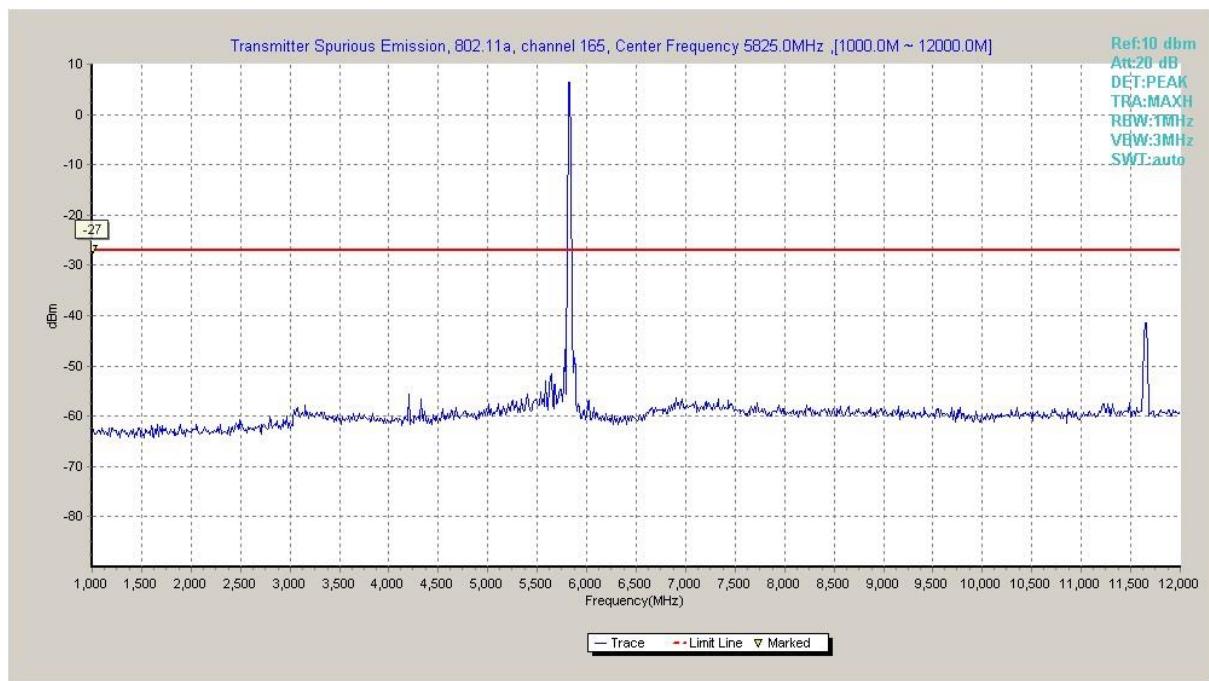


Fig. 18 Conducted Spurious Emission (802.11a, Ch165, 1 GHz -12 GHz)

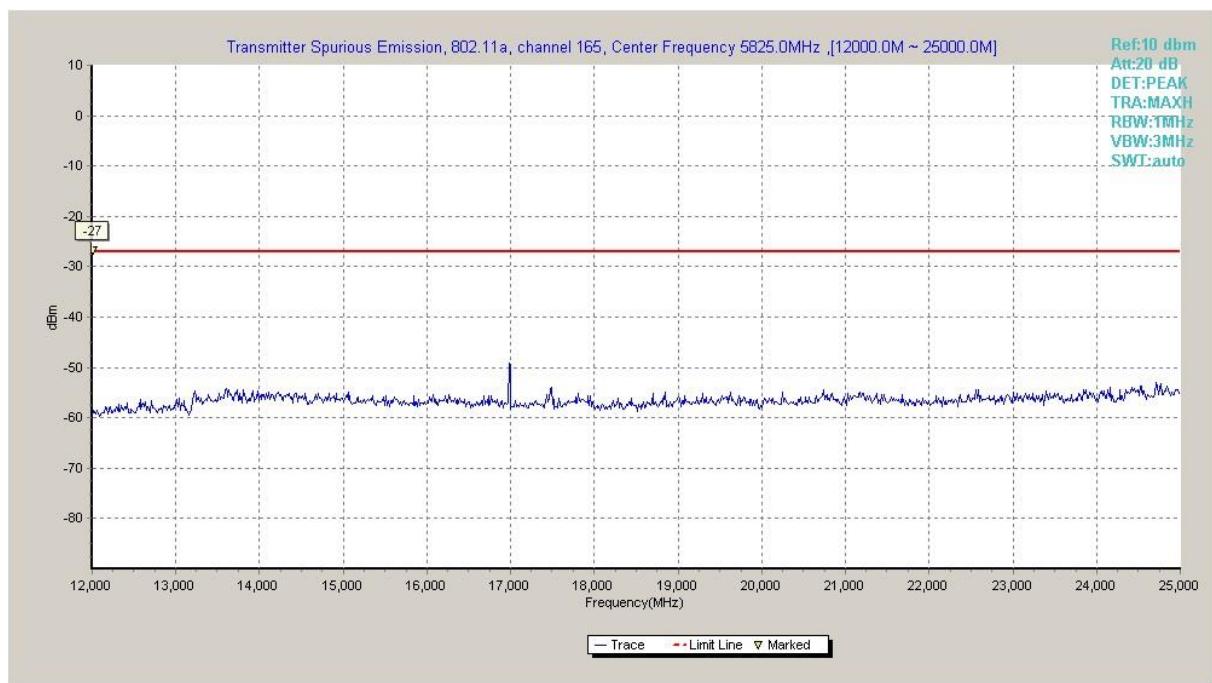


Fig. 19 Conducted Spurious Emission (802.11a, Ch165, 12 GHz-25 GHz)

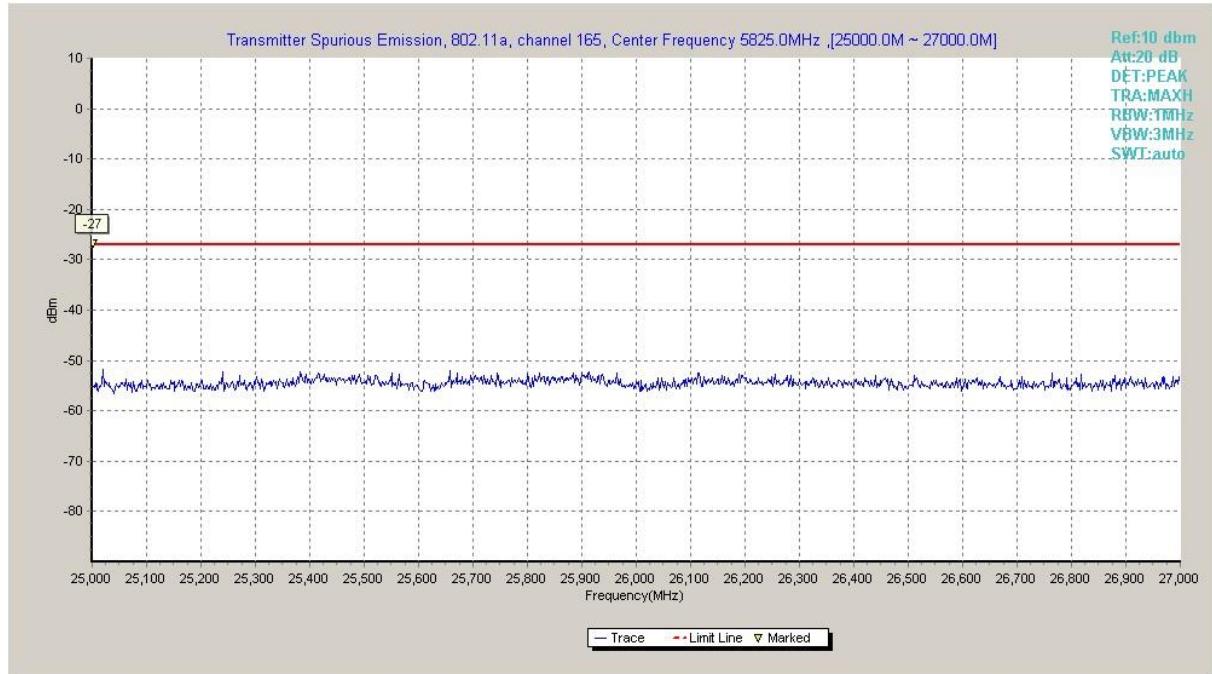


Fig. 20 Conducted Spurious Emission (802.11a, Ch165, 25 GHz-40 GHz)

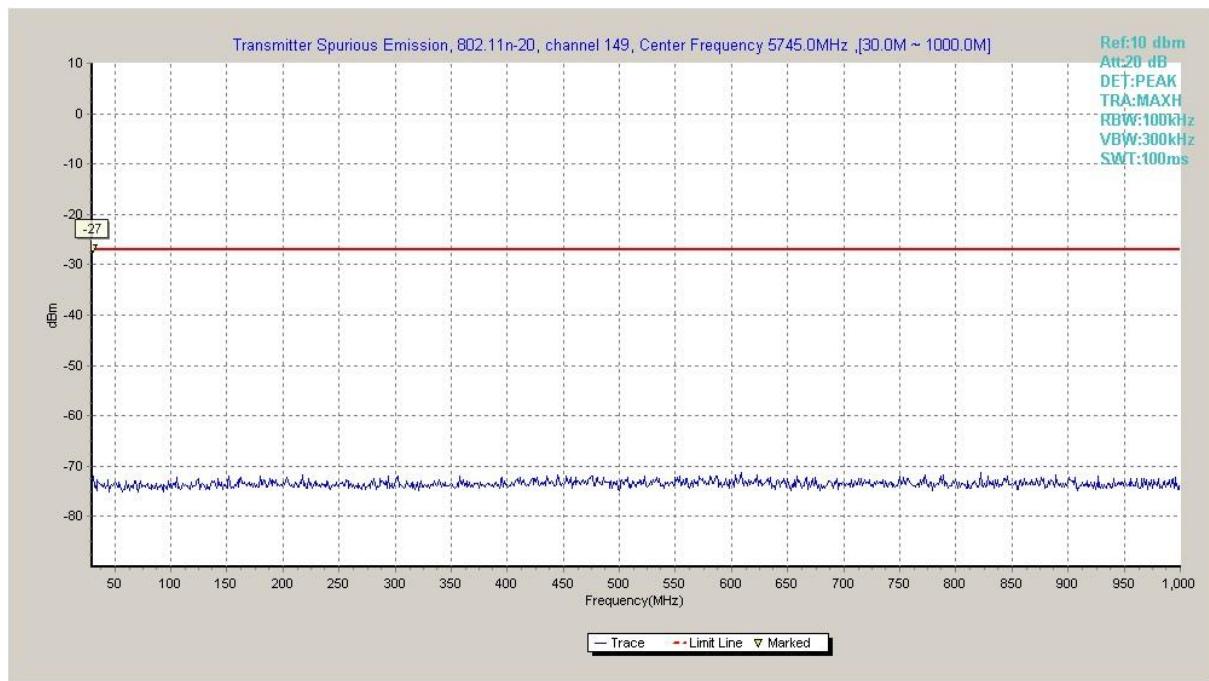


Fig. 21 Conducted Spurious Emission (802.11n-HT20, Ch149, 30 MHz-1 GHz)

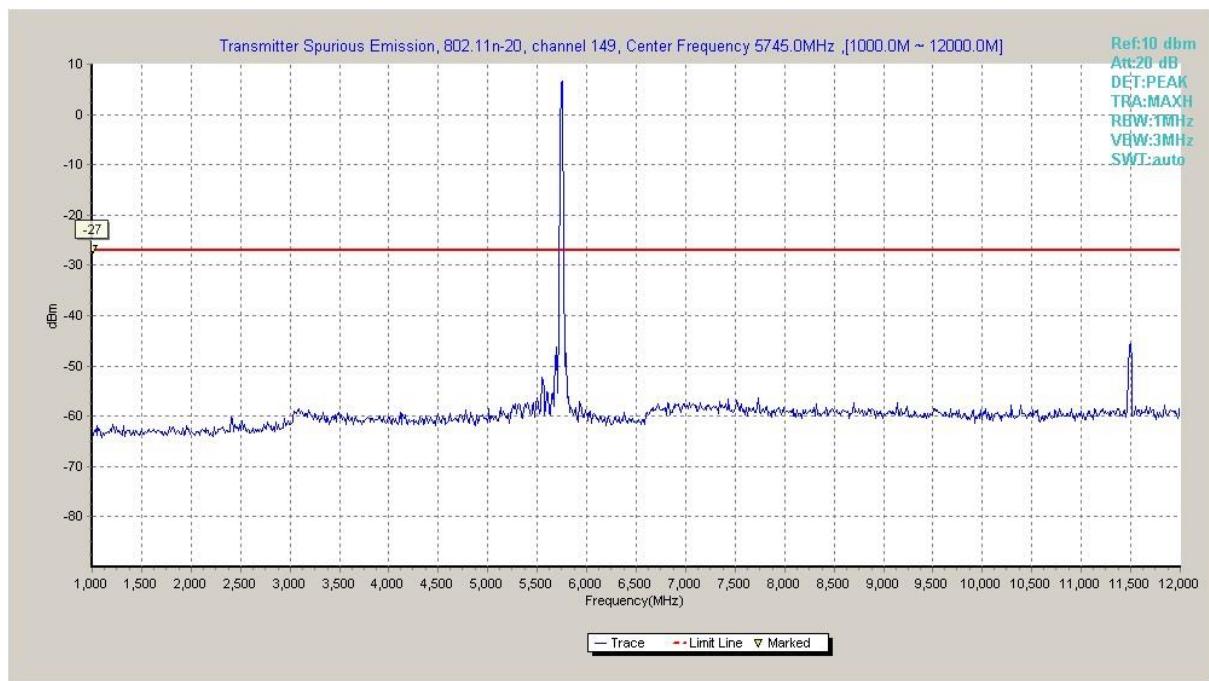


Fig. 22 Conducted Spurious Emission (802.11n-HT20, Ch149, 1 GHz -12 GHz)

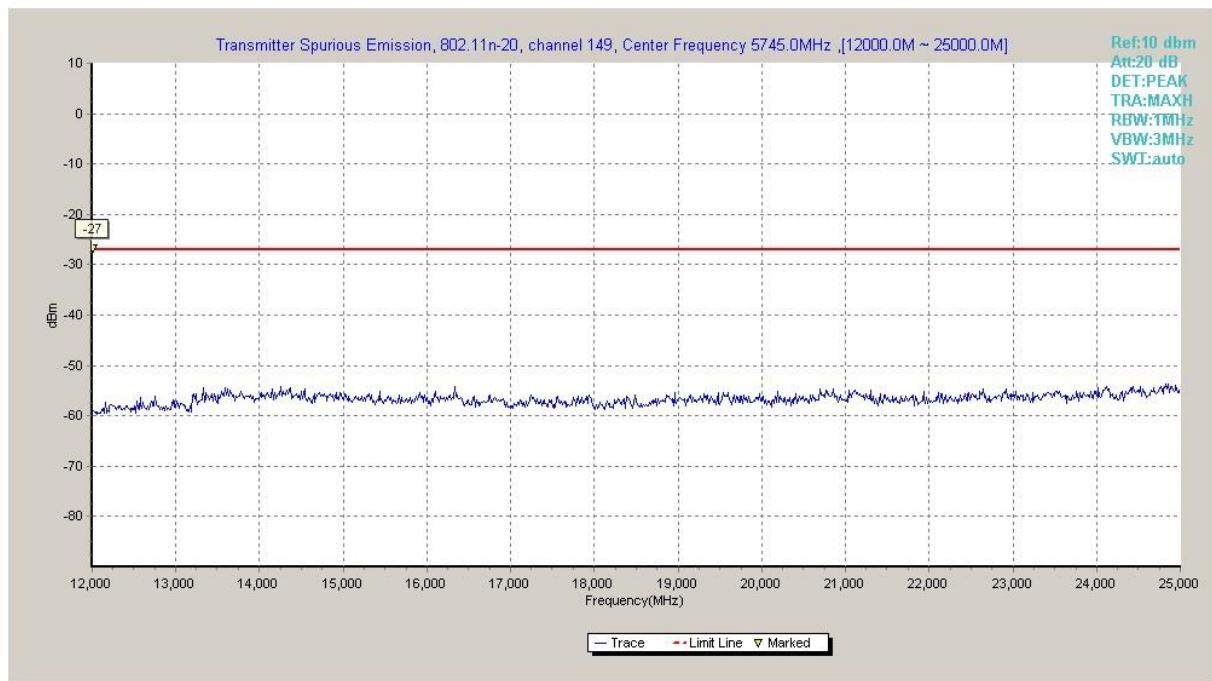


Fig. 23 Conducted Spurious Emission (802.11n-HT20, Ch149, 12 GHz-25 GHz)

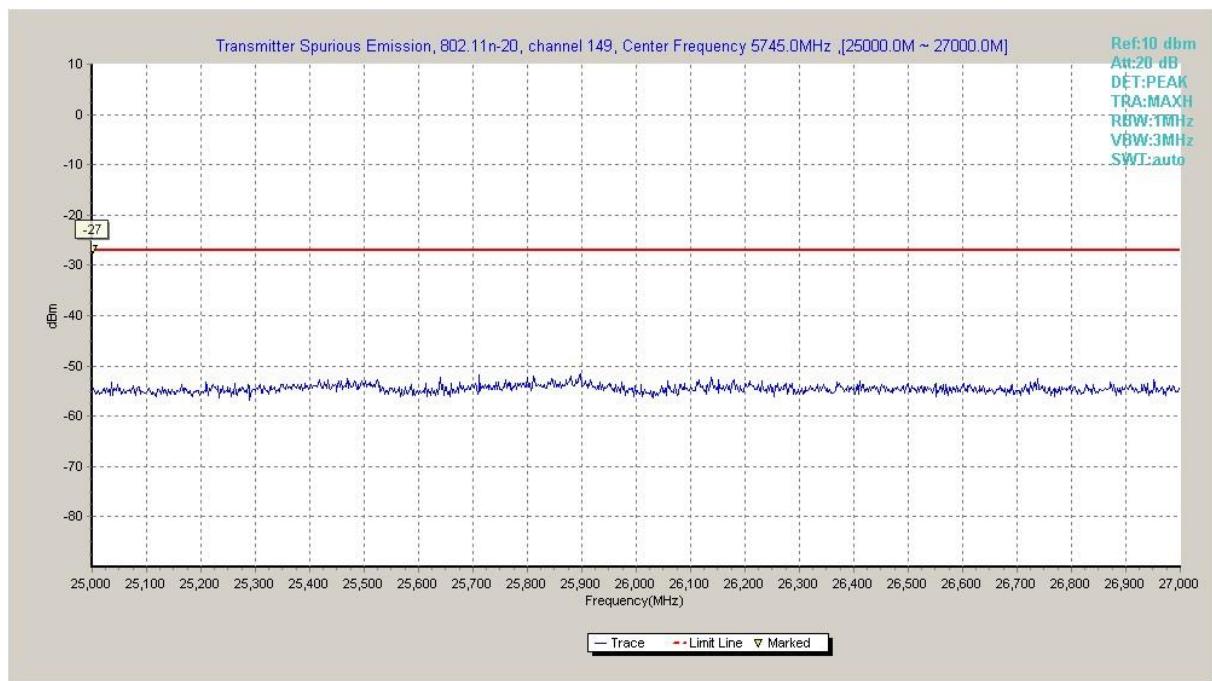


Fig. 24 Conducted Spurious Emission (802.11n-HT20, Ch149, 25 GHz-40 GHz)

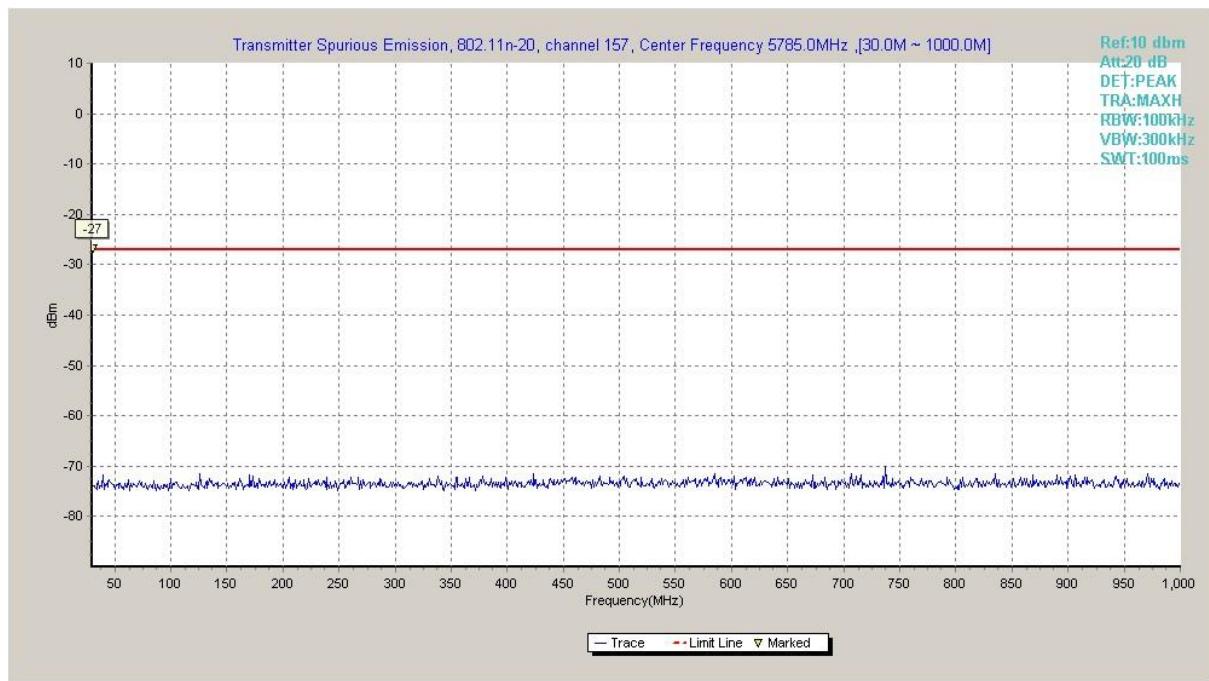


Fig. 25 Conducted Spurious Emission (802.11n-HT20, Ch157, 30 MHz-1 GHz)

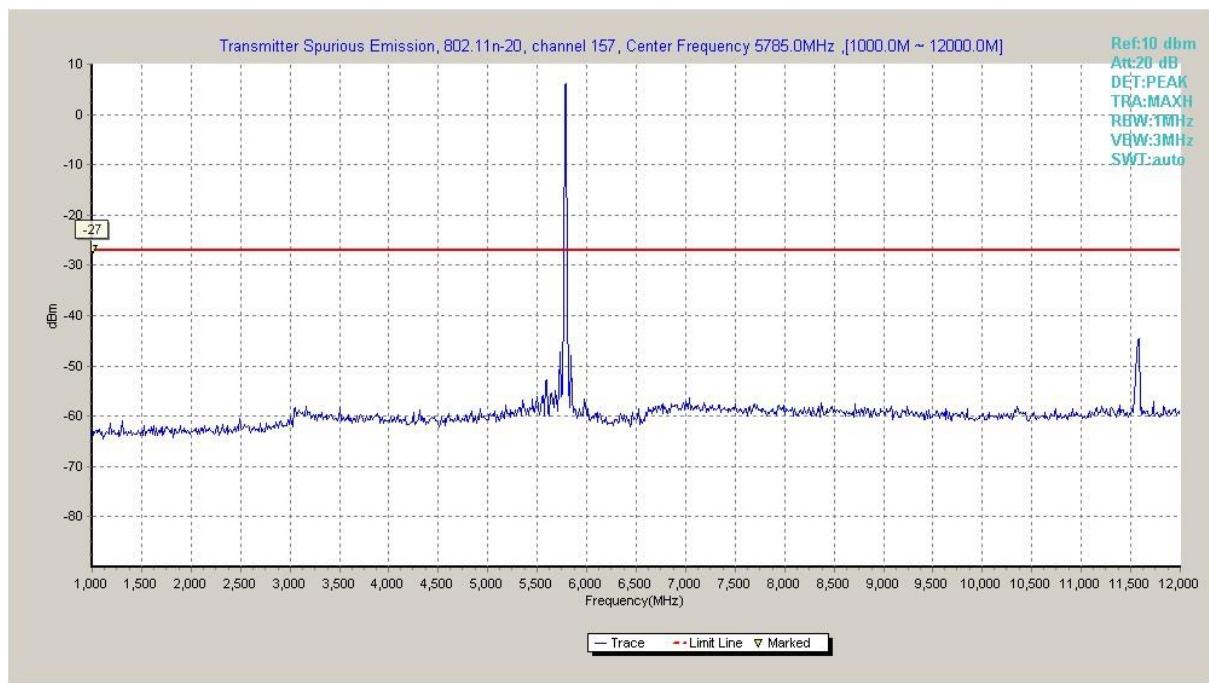


Fig. 26 Conducted Spurious Emission (802.11n-HT20, Ch157, 1 GHz -12 GHz)

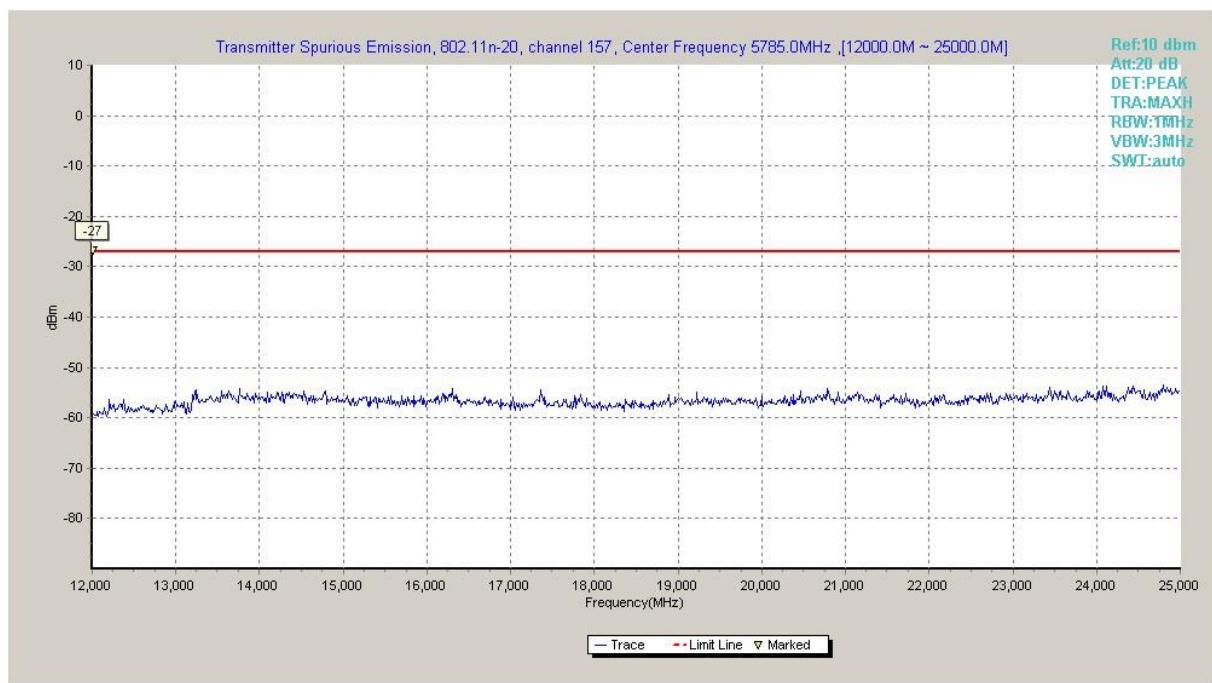


Fig. 27 Conducted Spurious Emission (802.11n-HT20, Ch157, 12 GHz-25 GHz)

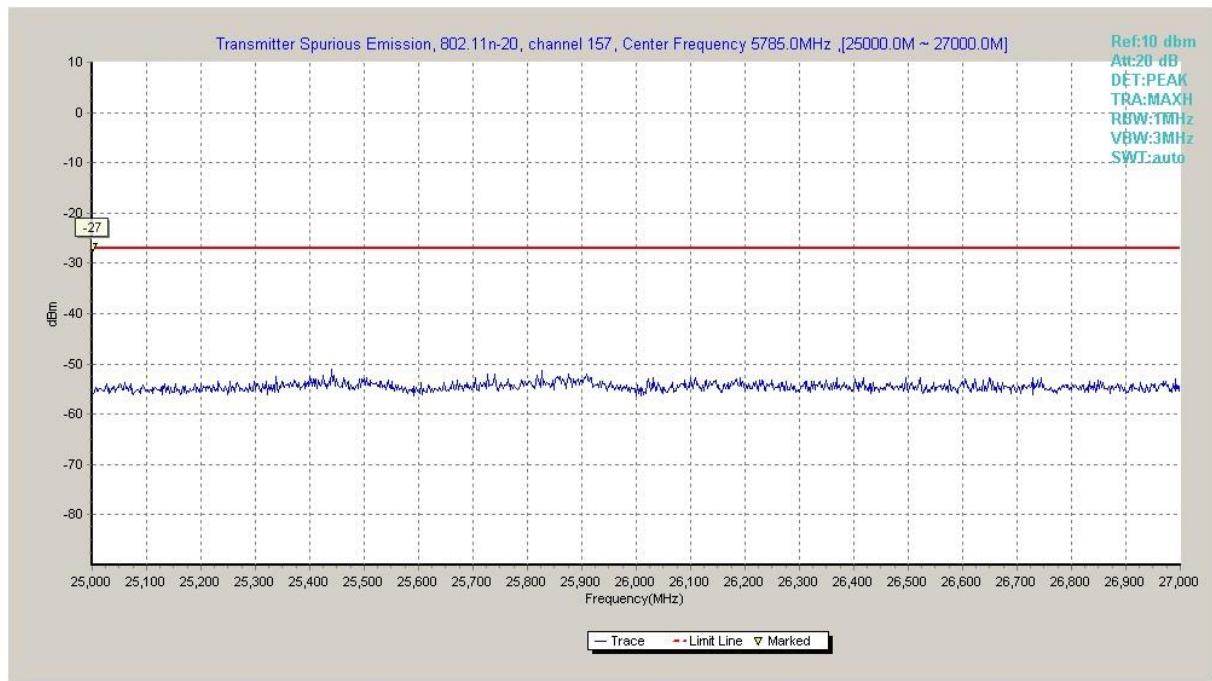


Fig. 28 Conducted Spurious Emission (802.11n-HT20, Ch157, 25 GHz-40 GHz)

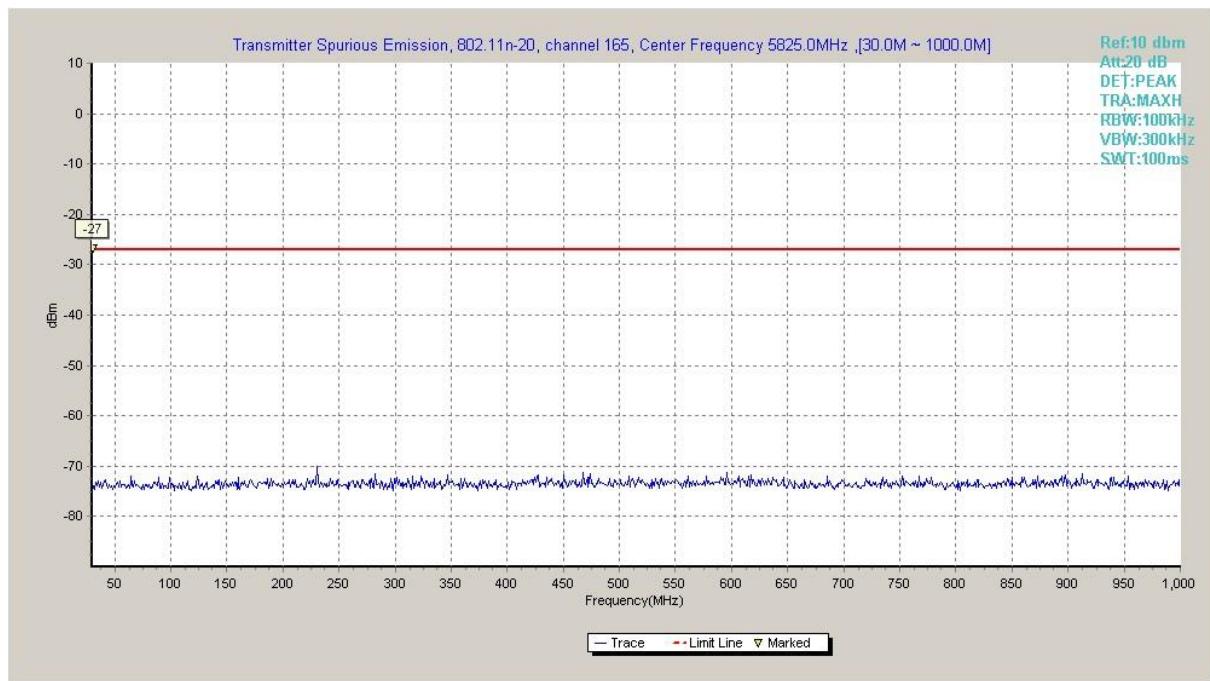


Fig. 29 Conducted Spurious Emission (802.11n-HT20, Ch165, 30 MHz-1 GHz)

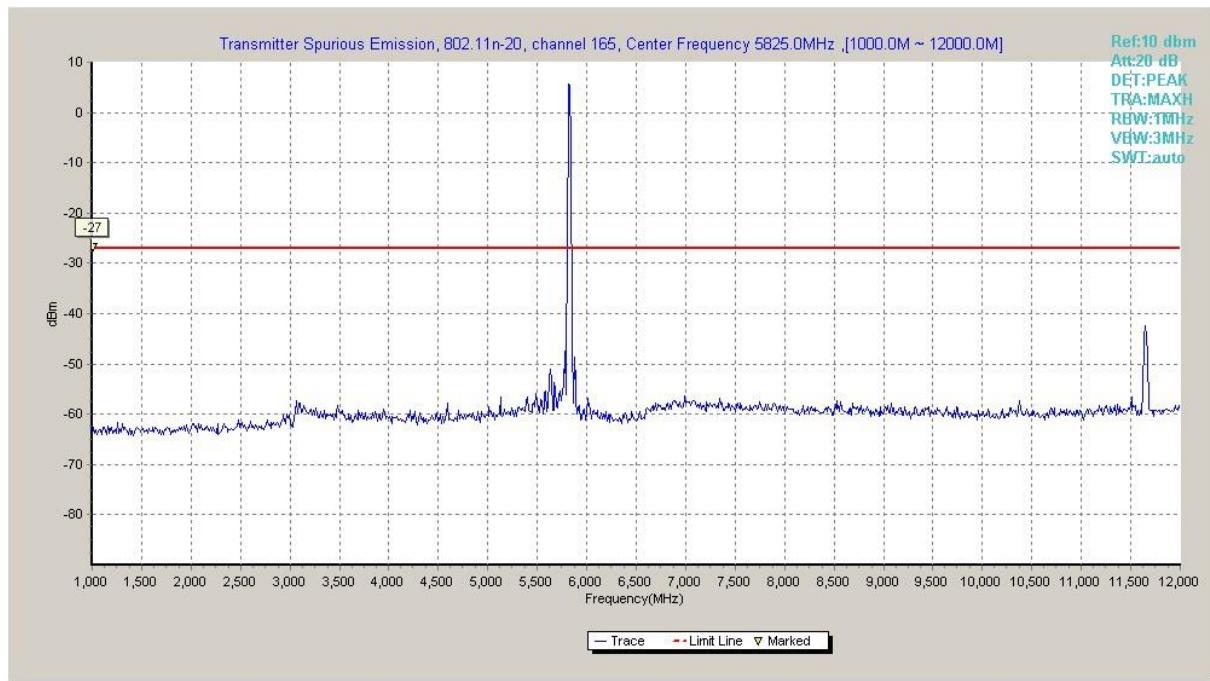


Fig. 30 Conducted Spurious Emission (802.11n-HT20, Ch165, 1 GHz -12 GHz)

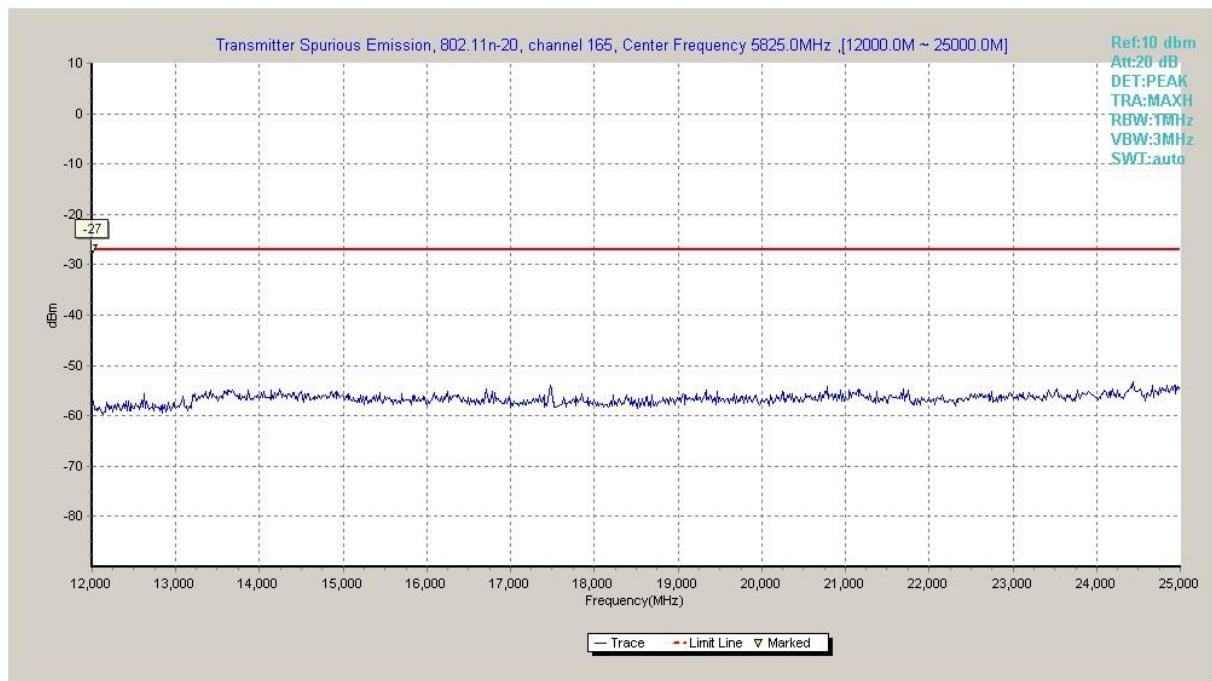


Fig. 31 Conducted Spurious Emission (802.11n-HT20, Ch165, 12 GHz-25 GHz)

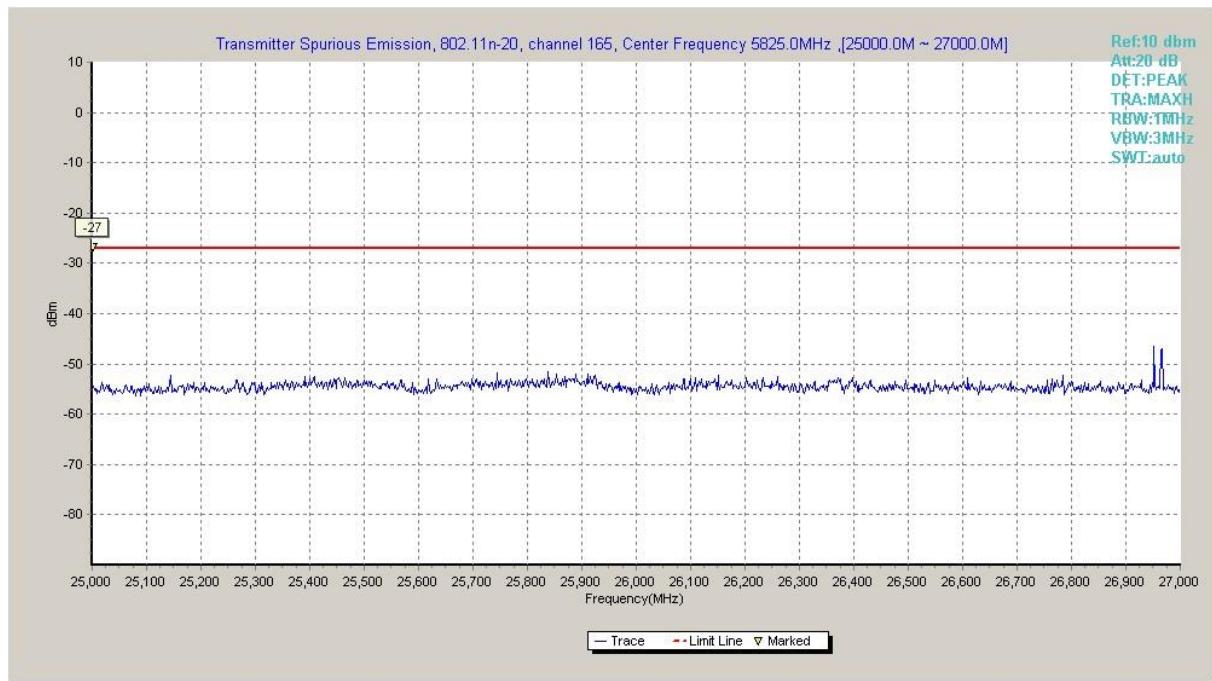


Fig. 32 Conducted Spurious Emission (802.11n-HT20, Ch165, 25 GHz-40 GHz)

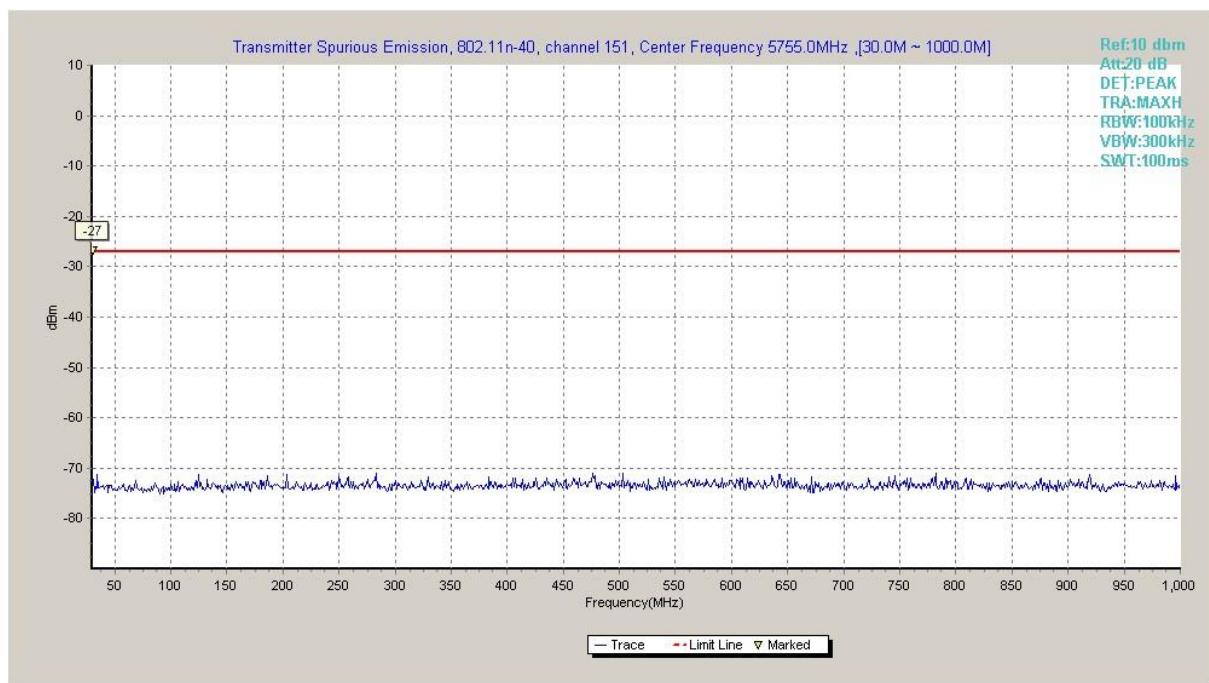


Fig. 33 Conducted Spurious Emission (802.11n-HT40, Ch151, 30 MHz-1 GHz)

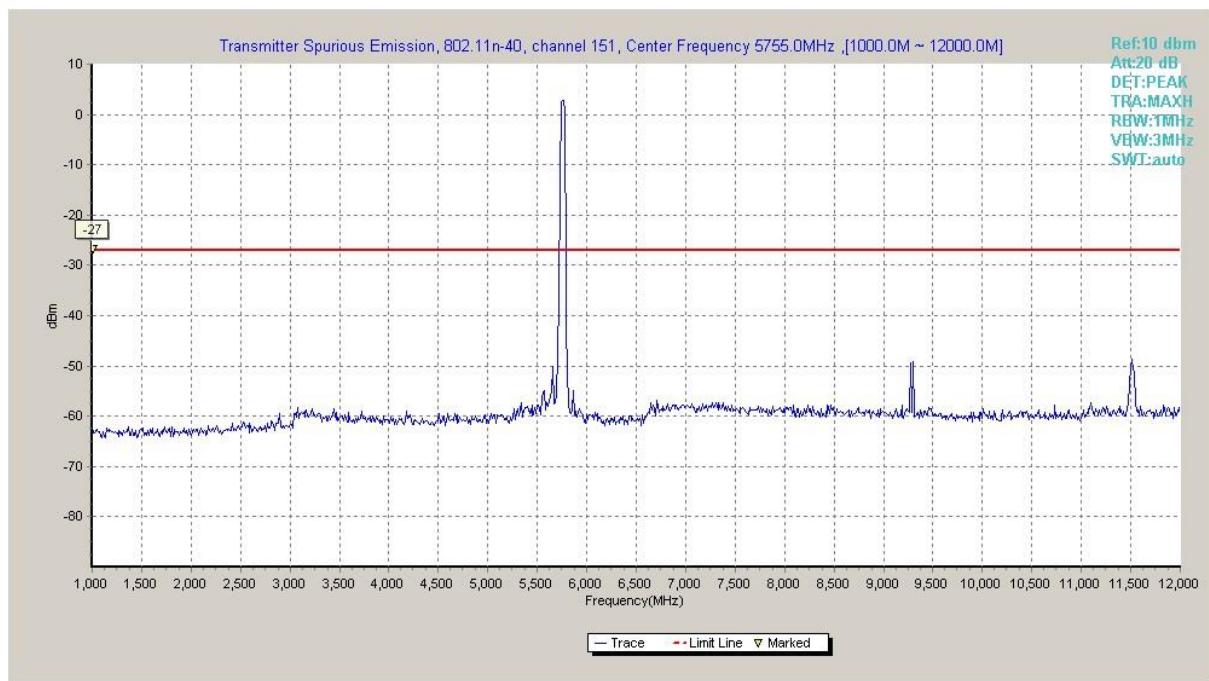


Fig. 34 Conducted Spurious Emission (802.11n-HT40, Ch151, 1 GHz -12 GHz)

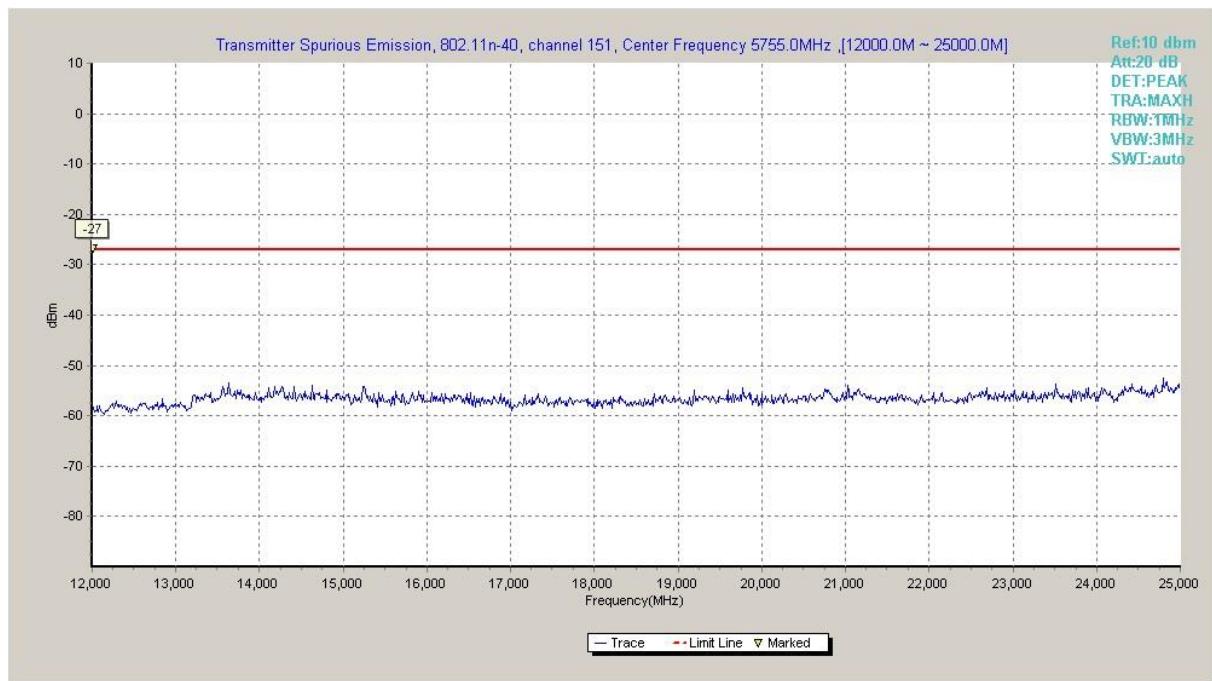


Fig. 35 Conducted Spurious Emission (802.11n-HT40, Ch151, 12 GHz-25 GHz)

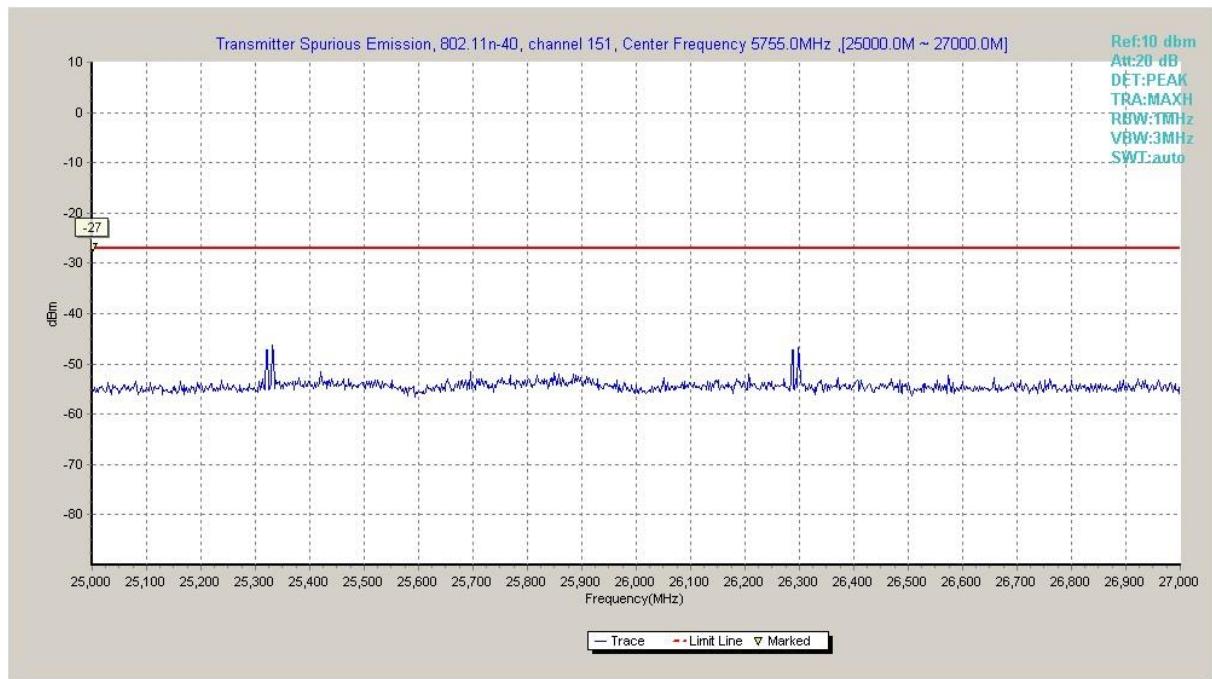


Fig. 36 Conducted Spurious Emission (802.11n-HT40, Ch151, 25 GHz-40 GHz)

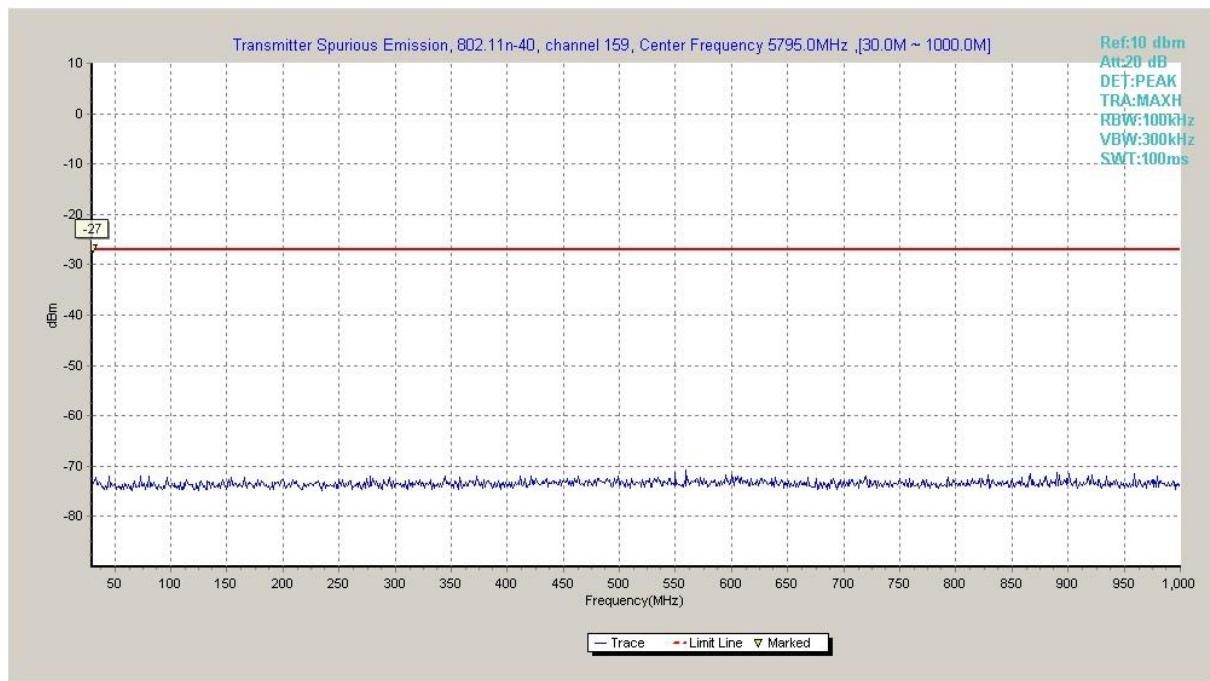


Fig. 37 Conducted Spurious Emission (802.11n-HT40, Ch159, 30 MHz-1 GHz)

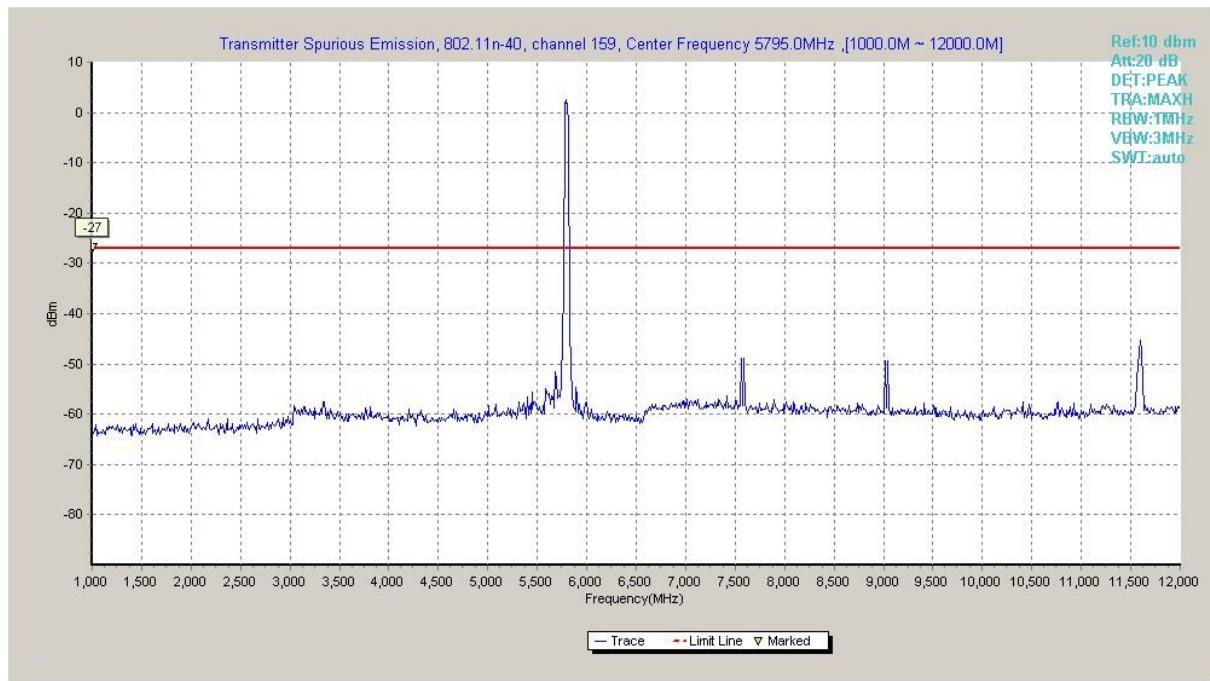


Fig. 38 Conducted Spurious Emission (802.11n-HT40, Ch159, 1 GHz -12 GHz)

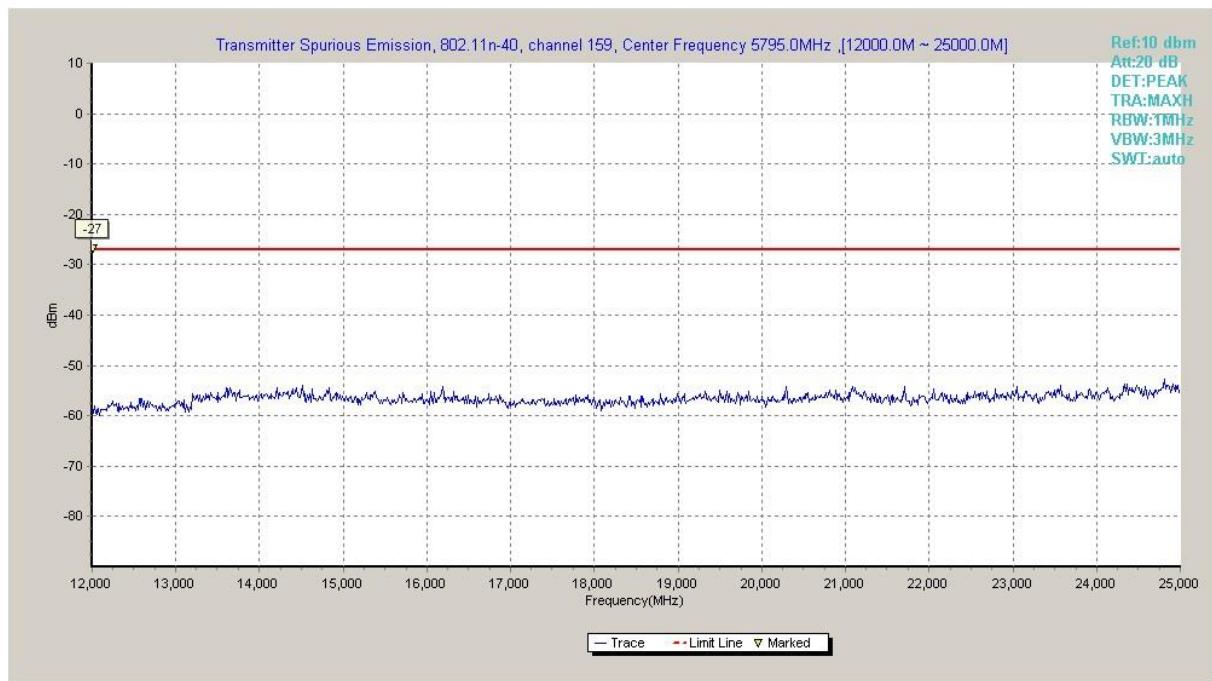


Fig. 39 Conducted Spurious Emission (802.11n-HT40, Ch159, 12 GHz-25 GHz)

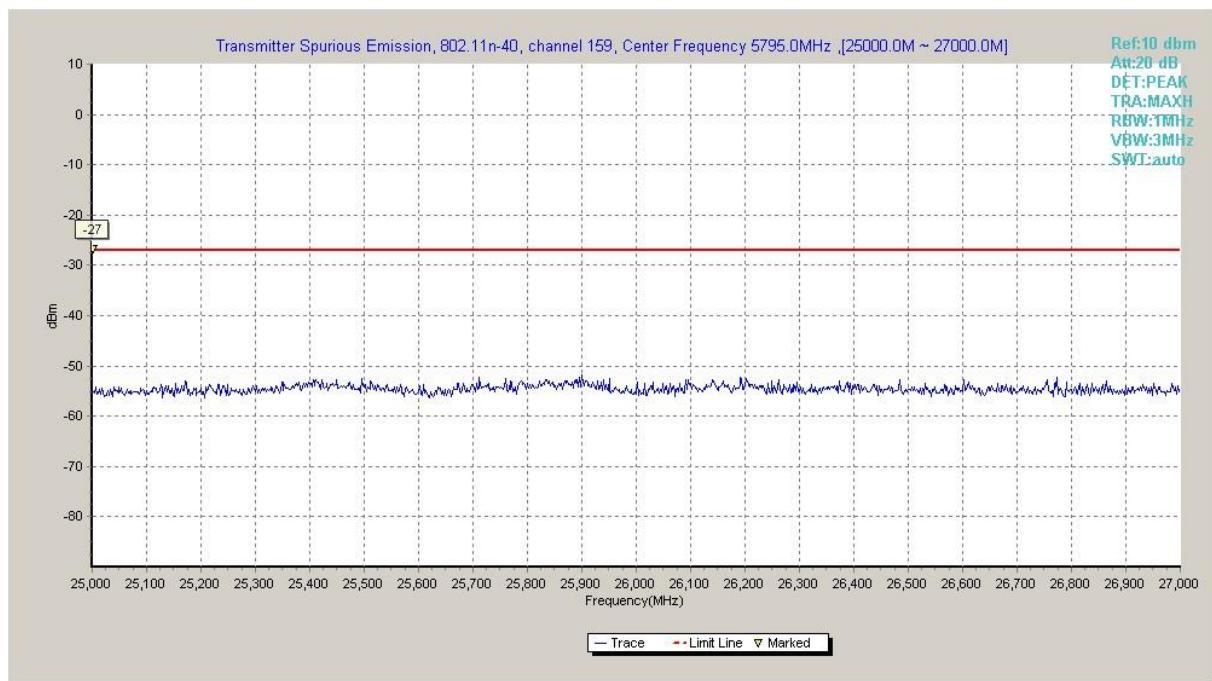


Fig. 40 Conducted Spurious Emission (802.11n-HT40, Ch159, 25 GHz-40 GHz)