



Full

TEST REPORT

No. I18D00223-SRD03

For

Client : Shanghai Sunmi Technology Co.,Ltd.

Production : Self-Checkout Kiosk

Model Name : F4600

Brand Name : SUNMI

FCC ID : 2AH25F4600

Hardware Version: V2.1

Software Version: 1.0.13

Issued date: 2019-01-10

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 ECIT Shanghai.

The standards accredited by A2LA except KDB558074.

Test Laboratory:

ECIT Shanghai, East China Institute of Telecommunications

Add: 7-8F, G Area, No.668, Beijing East Road, Huangpu District, Shanghai, P. R. China

Tel: (+86)-021-63843300, E-Mail: welcome@ecit.org.cn

Revision Version

Report Number	Revision	Date	Memo
I18D00223-SRD03	00	2019-01-02	Initial creation of test report
I18D00223-SRD03	01	2019-01-10	Second creation of test report

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1. Test Laboratory

1.1. Testing Location

Company Name:	ECIT Shanghai, East China Institute of Telecommunications
Address:	7-8F, G Area, No. 668, Beijing East Road, Huangpu District, Shanghai, P. R. China
Postal Code:	200001
Telephone:	(+86)-021-63843300
Fax:	(+86)-021-63843301
FCC registration No	958356

1.2. Testing Environment

Normal Temperature:	15-35℃
Extreme Temperature:	0/+40℃
Relative Humidity:	25-75%

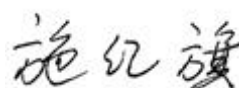
1.3. Project data

Project Leader:	Chen Minfei
Testing Start Date:	2018-12-17
Testing End Date:	2018-12-29

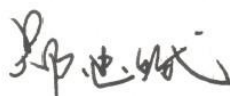
1.4. Signature



Yang Dejun
(Prepared this test report)



Shi Hongqi
(Reviewed this test report)



Zheng Zhongbin
(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name: Shanghai Sunmi Technology Co.,Ltd.
Address: Room 605,Block 7,KIC Plaza,No.388 Song Hu Road Yang Pu District
Telephone: 18721763396
Postcode: 200433

2.2. Manufacturer Information

Company Name: Shanghai Sunmi Technology Co.,Ltd.
Address: Room 605,Block 7,KIC Plaza,No.388 Song Hu Road Yang Pu District
Telephone: 18721763396
Postcode: 200433

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

3.1. About EUT

EUT Description	Self-Checkout Kiosk
Model name	F4600
WLAN Frequency(2.4G)	2412MHz-2462MHz
WLAN Channel(2.4G)	Channel1-Channel11
WLAN type of modulation	802.11b:DSSS 802.11g/n: OFDM
GSM Frequency Band	/
UMTS Frequency Band	/
CDMA Frequency Band	/
LTE Frequency Band	/
Additional Communication Function	BT4.0,BLE; WiFi 802.11b,g,n.
Extreme Temperature	0/+40℃
Nominal Voltage	12V
Extreme High Voltage	220V
Extreme Low Voltage	5V

Note: Photographs of EUT are shown in ANNEX A of this test report.

3.2. Internal Identification of EUT used during the test

EUT ID*	Model Name	SN or IMEI	HW Version	SW Version	Date of receipt
N01	F4600	/	V2.1	1.0.13	2018-11-20
N02	F4600	/	V2.1	1.0.13	2018-11-20

*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	RF cable	---
AE2	---	---

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

4. Reference Documents

4.1. 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; 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz.	2018/10/ 1
ANSI 63.10	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices	2013
KDB558074	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247	2018/08/ 24

5. Summary of Test Results

A brief summary of the tests carried out is shown as following.

Measurement Items	Sub-clause of Part15C	Sub-clause of IC	Verdict
Maximum Peak Output Power	15.247(a)	/	P
Peak Power Spectral Density	15.247(e)	/	P
Occupied 6dB Bandwidth	15.247(d)	/	P
Band Edges Compliance	15.247(b)	/	P
Transmitter Spurious Emission-Conducted	15.247	/	P
Transmitter Spurious Emission-Radiated	15.247,15.209,	/	P
AC Powerline Conducted Emission	15.107,15.207	/	P

Please refer to part 5 for detail.

The measurements are according to Public notice KDB558074 and ANSI C63.10.

Terms used in Verdict column

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	12V
Humidity	Hnom	48%
Air Pressure	Anom	1010hPa

5.1. Notes

All reported tests were carried out on a sample equipment to demonstrate limited compliance with section 3.

The test results of this test report relate exclusively to the item(s) tested as specified in section 5.

5.2. Statements

The F4600, supporting BT/BLE/ WLAN, manufactured by Shanghai Sunmi Technology Co.,Ltd., Ltd., which is a new product for testing.

ECIT has verified that the compliance of the tested device specified in section 5 of this test report is successfully evaluated according to the procedure and test methods as defined in type certification requirement listed in section 5 of this test report.

6. Test result

6.1. Maximum Output Power

6.1.1 Measurement Limit and method:

Standard	Limit(dBm)
FCC CRF 15.247(b)	< 30

6.1.2 Test procedure

The measurement is according to ANSI C63.10 clause 11.2

1. The output power of EUT was connected to the spectrum analyzer. The path loss was compensated to the results for each measurement.
2. Enable EUT transmitter maximum power continuously.
3. Set RBW $\geq$ OBW(1MHz), VBW $\geq$ 3RBW(3MHz).
4. Span : 80MHz
5. Detector : Peak/RMS.
6. Trace mode: Max Hold
7. Spectrum Analyzer setting : Meas—channel PWR ACP—CP/ACP Config—channel bandwidth—20/40MHz

6.1.3 Measurement Uncertainty:

Measurement Uncertainty	$\pm 0.88\text{dB}$
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6.1.4 Maximum Peak Output Power-conducted

Measurement Results:

802.11b/g mode

Mode	Data Rate(Mbps)	Test Result(dBm)		
		2412MHz(Ch1)	2437MHz(Ch6)	2462MHz(Ch11)
802.11b	1	20.35	/	/
	2	20.74	/	/
	5.5	21.98	/	/
	11	23.50	23.13	23.25
802.11g	6	23.99	/	/
	9	24.26	/	/
	12	24.37	/	/

	18	24.34	/	/
	24	24.71	/	/
	36	24.91	/	/
	48	24.84	/	/
	54	24.97	24.28	24.65

The data rate 11 Mbps and 54 Mbps are selected as worse condition, and the following cases are performed with this condition.

802.11n mode

Mode	Data Rate(Index)	Test Result(dBm)		
		2412MHz(Ch1)	2437MHz(Ch6)	2462MHz(Ch11)
802.11n(20MHz)	MCS0	23.52	/	/
	MCS1	23.85	/	/
	MCS2	23.92	/	/
	MCS3	24.37	24.12	24.01
	MCS4	24.23	/	/
	MCS5	24.07	/	/
	MCS6	24.24	/	/
	MCS7	23.50	/	/

The data rate MCS3 for 802.11n(20M) is selected as worse condition, and the following case are performed with this condition.

6.1.5 Maximum Average Output Power-conducted
802.11b/g mode

Mode	Test Result(dBm)		
	2412MHz (Ch1)	2437MHz (Ch6)	2462MHz (Ch11)
802.11b	19.49	17.35	19.22
802.11g	19.04	18.73	18.79

802.11n mode

Mode	Test Result(dBm)		
	2412MHz (Ch1)	2437MHz (Ch6)	2462MHz (Ch11)
802.11n(20MHz)	18.31	18.54	18.09

Conclusion: PASS

6.2. Peak Power Spectral Density

6.2.1 Measurement Limit:

Standard	Limit
FCC CFR Part 15.247(e)	< 8dBm/3 KHz

6.2.2 Test procedures

The measurement is according to ANSI C63.10 clause 11.10.

1. The output power of EUT was connected to the spectrum analyzer. The path loss was compensated to the results for each measurement.
2. Enable EUT transmitter maximum power continuously.
3. Set analyzer center frequency to DTS channel center frequency.
4. Set the span to 1.5 times the DTS bandwidth.
5. Set the RBW to 3 kHz $\leq$ RBW $\leq$ 100 kHz.
6. Set the VBW $\geq$ $[3 \times \text{RBW}]$.
7. Detector = peak.
8. Sweep time = auto couple.
9. Trace mode = max hold.
10. Allow trace to fully stabilize.
11. Use the peak marker function to determine the maximum amplitude level within the RBW.
12. If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.

6.2.3 Measurement Uncertainty:

Measurement Uncertainty	$\pm 0.88\text{dB}$
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6.2.4 Measurement Results:

802.11b/g mode

Mode	Channel	Power Spectral Density(dBm/3kHz)	Conclusion
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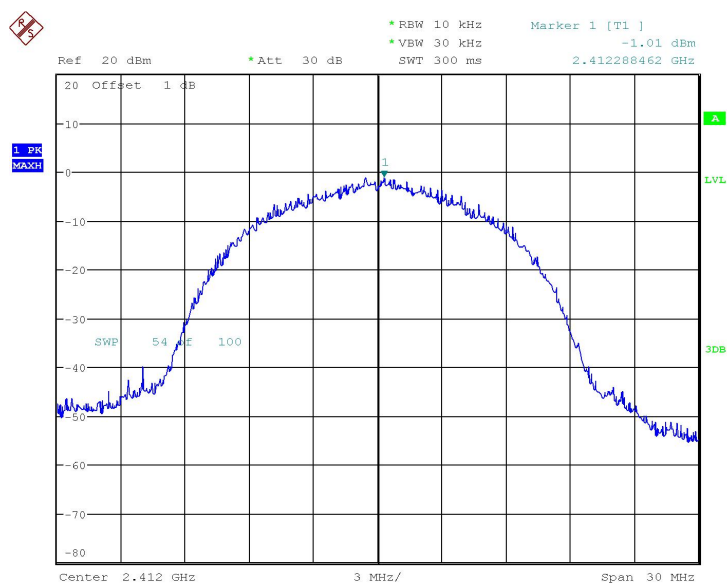
802.11b	1	Fig 1.	-1.01	P
	6	Fig 2.	-1.04	P
	11	Fig 3.	-1.21	P
802.11g	1	Fig 4.	-4.22	P
	6	Fig 5.	-3.39	P
	11	Fig 6.	-3.01	P

802.11n mode

Mode	Channel	Power Spectral Density(dBm/3kHz)	Conclusion
802.11n(20MHz)	1	Fig 7.	P
	6	Fig 8.	P
	11	Fig 9.	P

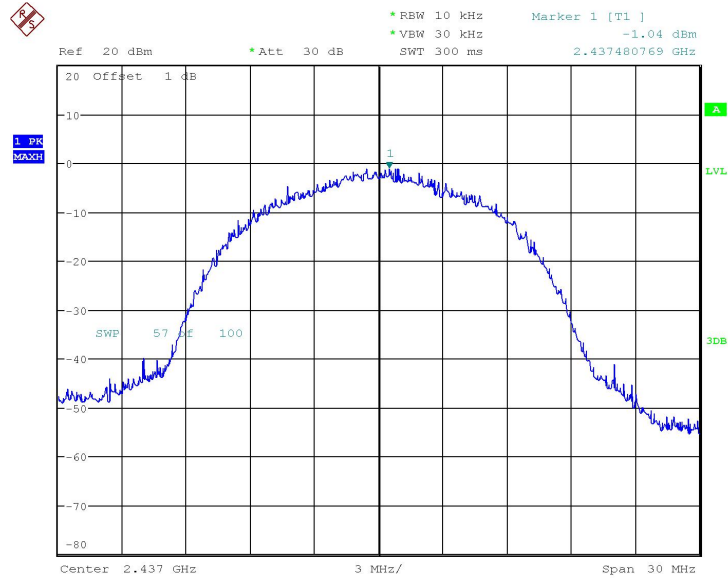
Conclusion: PASS

Test graphs as below:



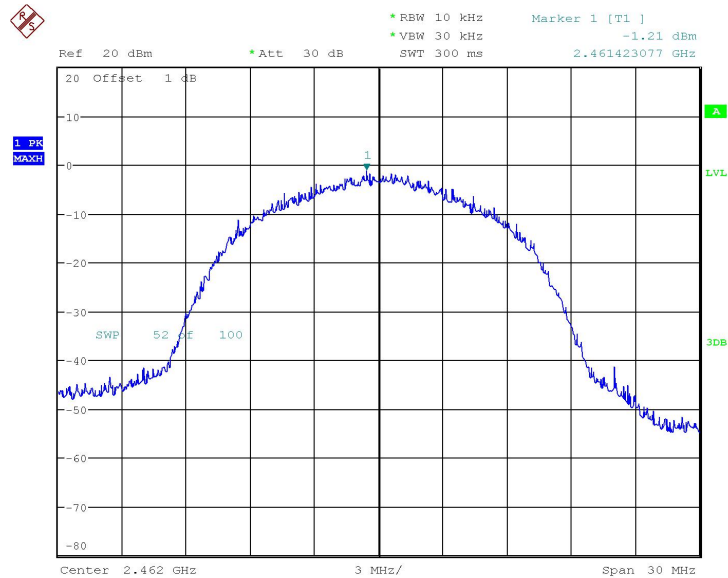
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Fig 1. Power Spectral Density (802.11b,Ch1)



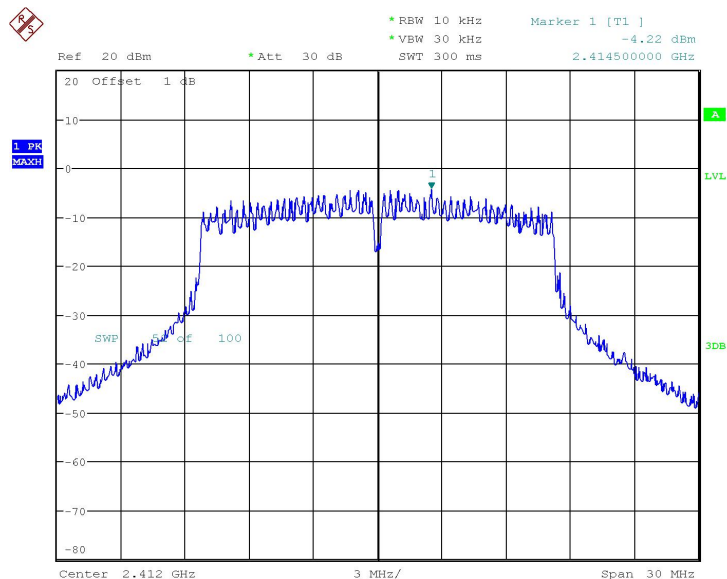
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Fig 2. Power Spectral Density (802.11b,Ch6)



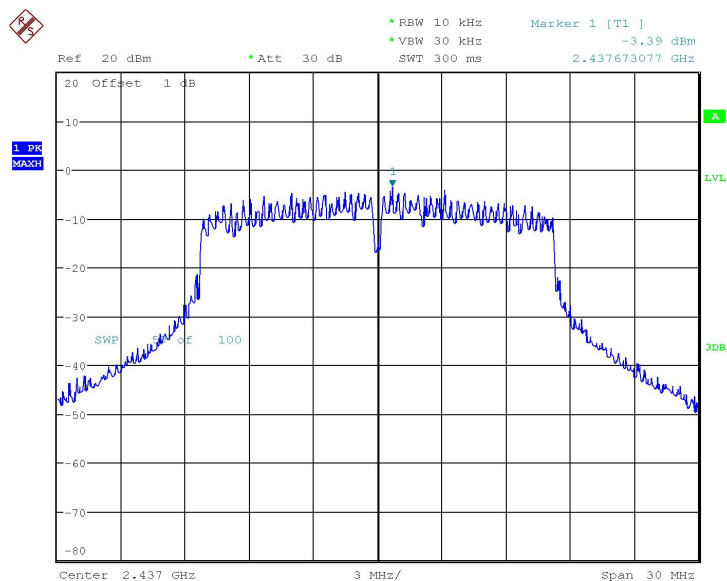
Date: 4.DEC.2018 07:57:59

Fig 3. Power Spectral Density (802.11b,Ch11)



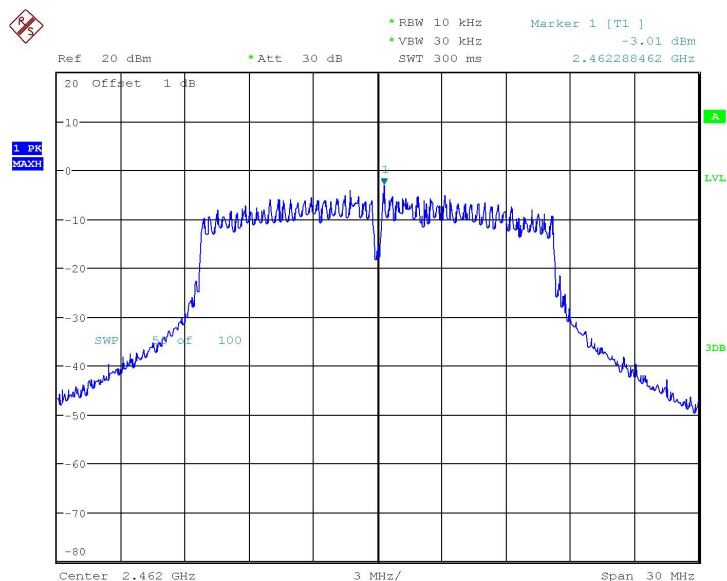
Date: 4.DEC.2018 07:59:03

Fig 4. Power Spectral Density (802.11g,Ch1)



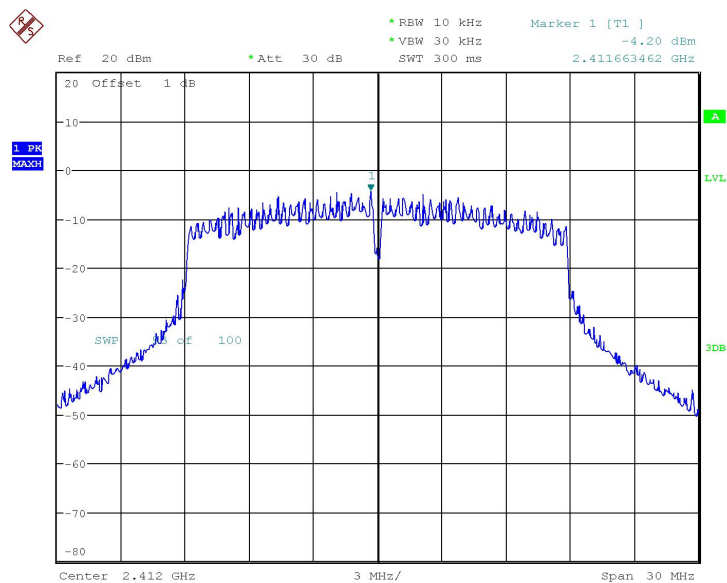
Date: 4.DEC.2018 08:00:05

Fig 5. Power Spectral Density (802.11g,Ch6)



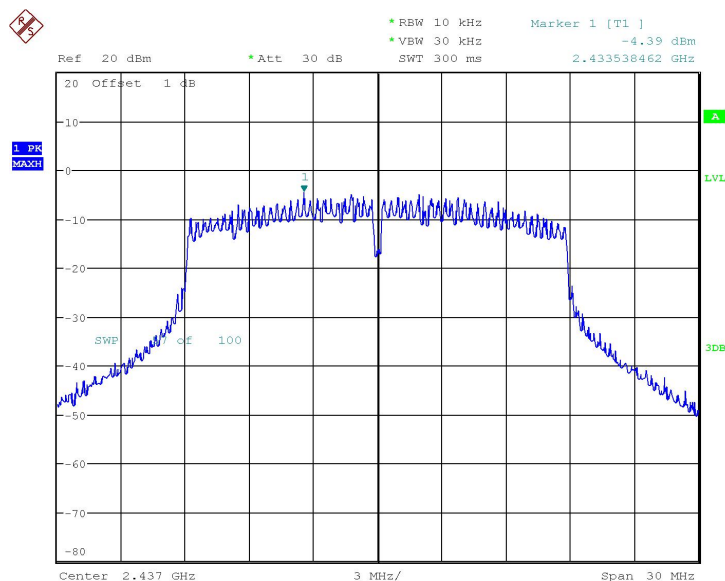
Date: 4.DEC.2018 08:01:14

Fig 6. Power Spectral Density (802.11g,Ch11)



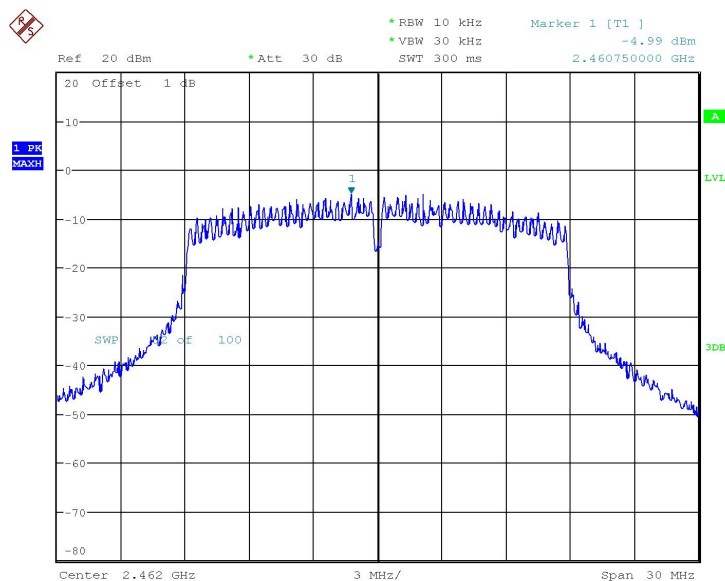
Date: 4.DEC.2018 08:02:39

Fig 7. Power Spectral Density (802.11n-20MHz,Ch1)



Date: 4.DEC.2018 08:03:39

Fig 8. Power Spectral Density (802.11n-20MHz,Ch6)



Date: 4.DEC.2018 08:04:23

Fig 9. Power Spectral Density (802.11n-20MHz,Ch11)

6.3. Occupied 6dB Bandwidth

6.3.1 Measurement Limit:

Standard	Limit(KHz)
FCC 47 CFR Part 15.247(a)	≥500

6.3.2 Test procedure

The measurement is according to ANSI C63.10 clause 11.8.

1. The output power of EUT was connected to the spectrum analyzer. The path loss was compensated to the results for each measurement.
2. Enable EUT transmitter maximum power continuously.
3. Set RBW = 100 kHz.
4. Set the VBW $\geq [3 \times \text{RBW}]$.
5. Detector = peak.
6. Trace mode = max hold.
7. Sweep = auto couple.
8. Allow the trace to stabilize.
9. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

6.3.3 Measurement Uncertainty:

Measurement Uncertainty	$\pm 0.0031\text{MHz}$
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6.3.4 Measurement Result:

802.11b/g mode

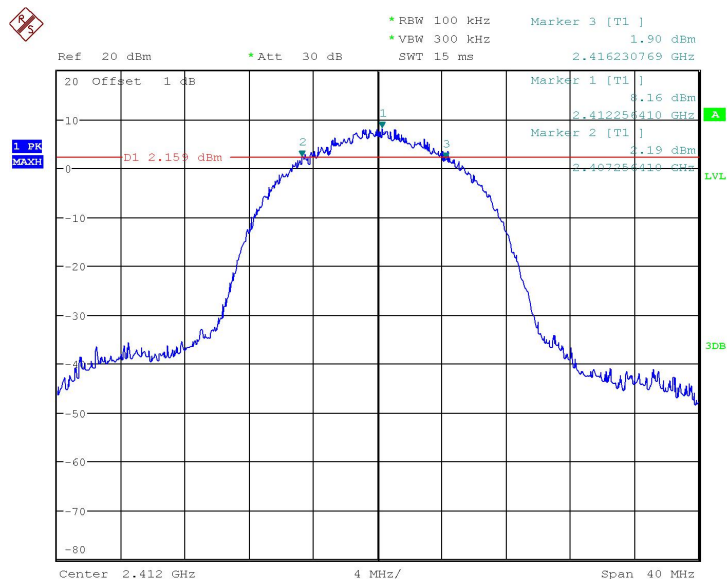
Mode	Channel	Occupied 6dB Bandwidth(MHz)		Conclusion
802.11b	1	Fig 10.	8.97	P
	6	Fig 11.	7.88	P
	11	Fig 12.	7.82	P
802.11g	1	Fig 13.	15.26	P
	6	Fig 14.	15.26	P
	11	Fig 15.	15.26	P

802.11n mode

Mode	Channel	Occupied 6dB Bandwidth(MHz)		Conclusion
802.11n(20MHz)	1	Fig 16.	15.26	P
	6	Fig 17.	15.45	P
	11	Fig 18.	15.26	P

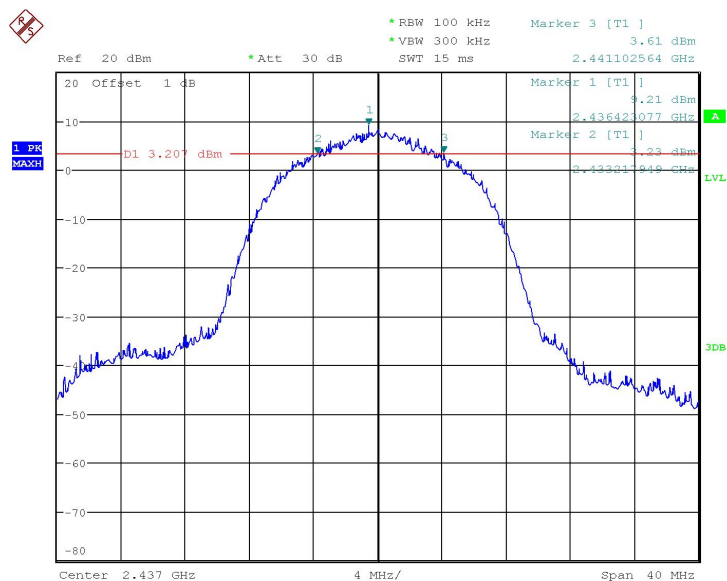
Conclusion: PASS

Test graphs as below:



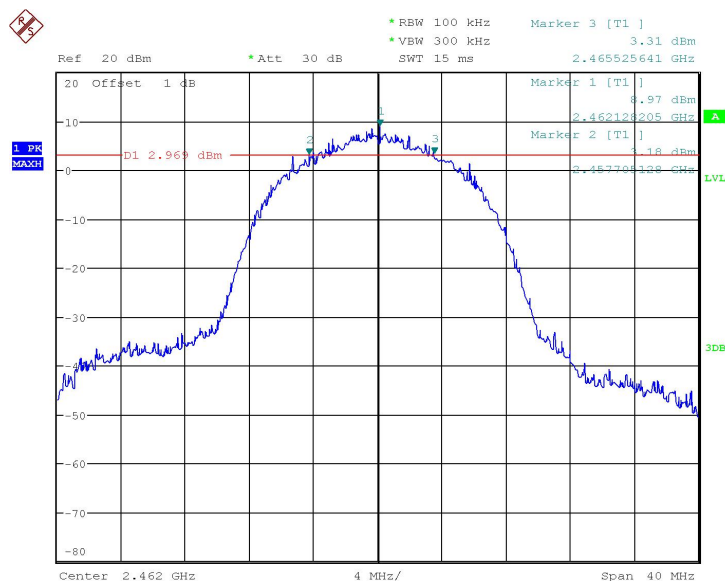
Date: 4.DEC.2018 07:40:02

Fig 10. Occupied 6dB Bandwidth (802.11b, Ch1)



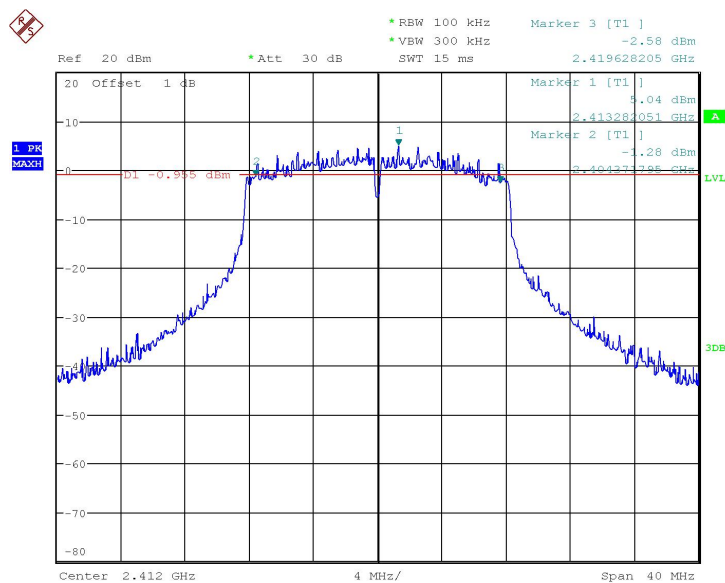
Date: 4.DEC.2018 07:40:51

Fig 11. Occupied 6dB Bandwidth (802.11b, Ch6)



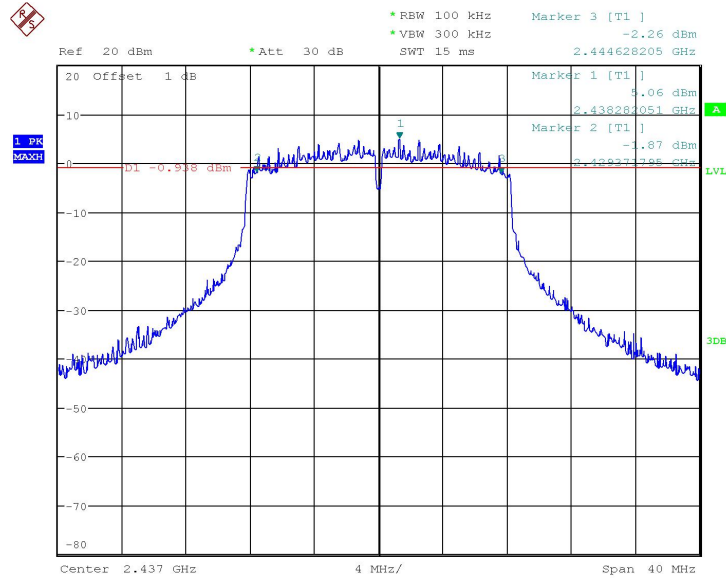
Date: 4.DEC.2018 07:42:17

Fig 12. Occupied 6dB Bandwidth (802.11b, Ch11)



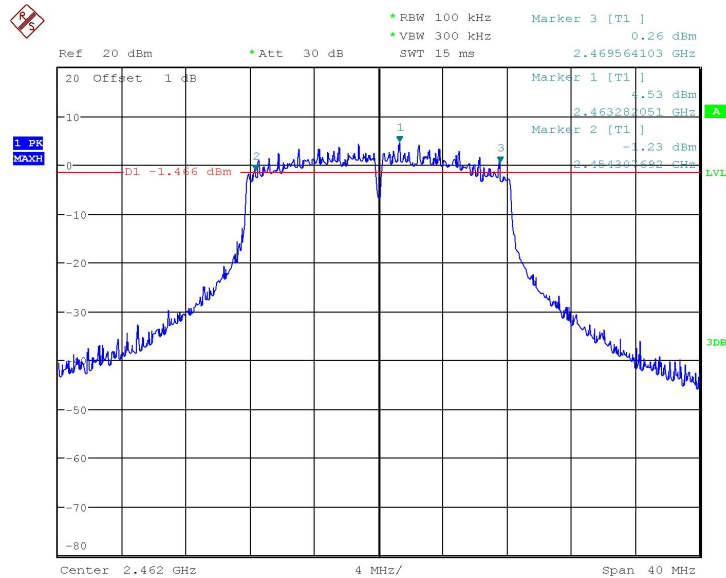
Date: 4.DEC.2018 07:43:36

Fig 13. Occupied 6dB Bandwidth (802.11g, Ch1)



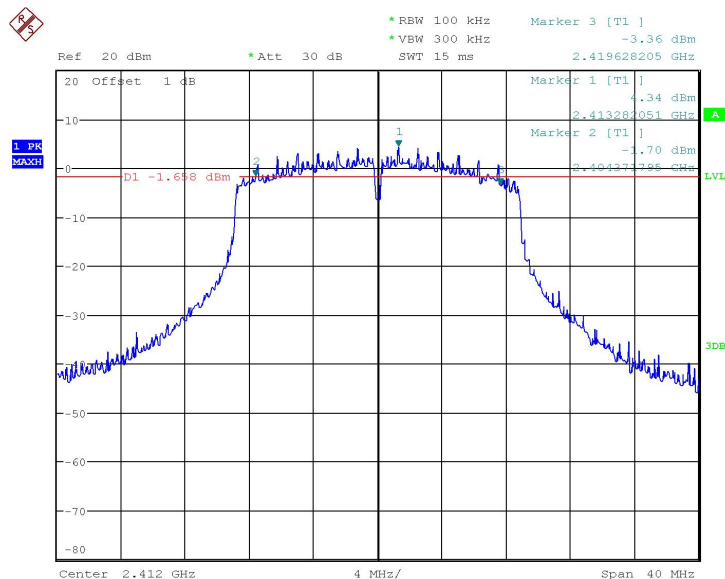
Date: 4.DEC.2018 07:44:53

Fig 14. Occupied 6dB Bandwidth (802.11g, Ch6)



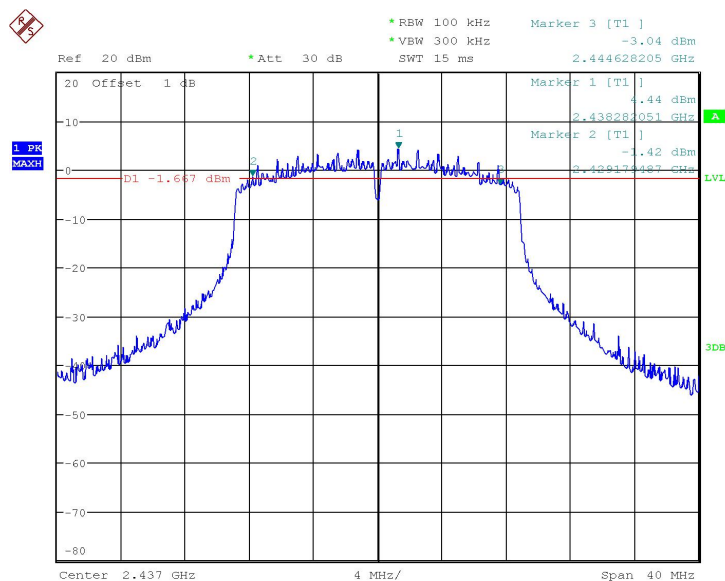
Date: 4.DEC.2018 07:46:07

Fig 15. Occupied 6dB Bandwidth (802.11g, Ch11)



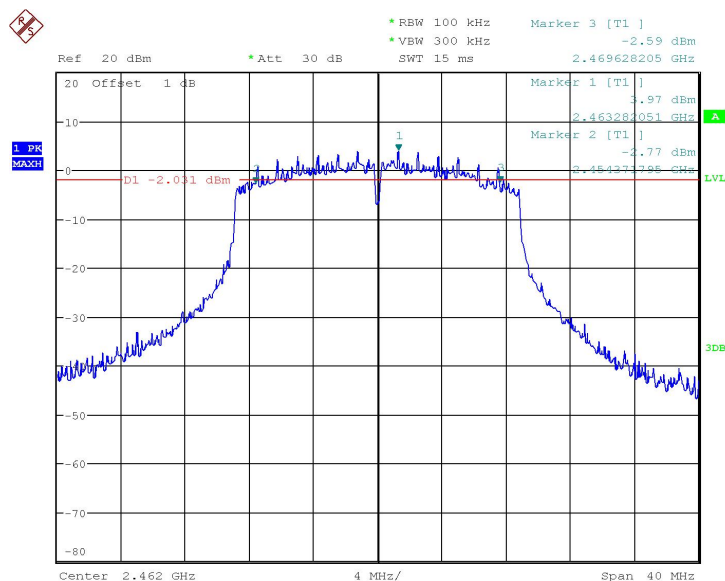
Date: 4.DEC.2018 07:47:46

Fig 16. Occupied 6dB Bandwidth (802.11n-20MHz, Ch1)



Date: 4.DEC.2018 07:49:06

Fig 17. Occupied 6dB Bandwidth (802.11n-20MHz, Ch6)



Date: 4.DEC.2018 07:50:27

Fig 18. Occupied 6dB Bandwidth (802.11n-20MHz, Ch11)

6.4. Band Edges Compliance

6.4.1 Measurement Limit:

Standard	Limited(dBc)
FCC 47 CFR Part 15.247(d)	>20

6.4.2 Test procedures

The measurement is according to ANSI C63.10 clause11.13.

1. The output power of EUT was connected to the spectrum analyzer. The path loss was compensated to the results for each measurement.
2. Enable EUT transmitter maximum power continuously.
3. Set instrument center frequency to the frequency of the emission to be measured (must be within 2MHz of the authorized band edge).
4. Set span to 2 MHz.
5. RBW = 100 kHz.
6. $VBW \geq [3 \times RBW]$.
7. Detector = Peak.
8. Sweep time = auto.
9. Trace mode = max hold.
10. Allow sweep to continue until the trace stabilizes

6.4.3 Measurement Uncertainty:

Measurement Uncertainty	$\pm 4.56\text{dB}$
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6.4.4 Measurement results

802.11b/g mode

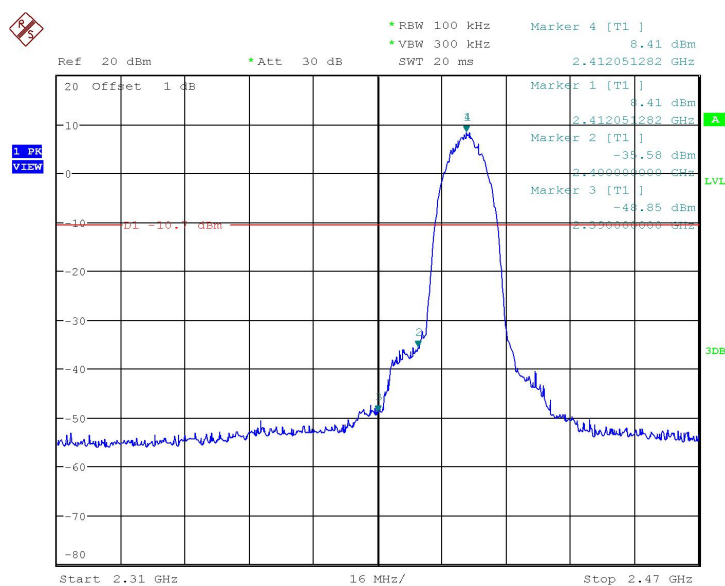
Mode	Channel	Test Results	Conclusion
802.11b	1	Fig 19.	P
	11	Fig 20.	P
802.11g	1	Fig 21.	P
	11	Fig 22.	P

802.11n mode

Mode	Channel	Test Results	Conclusion
802.11n(20MHz)	1	Fig 23.	P
	11	Fig 24.	P

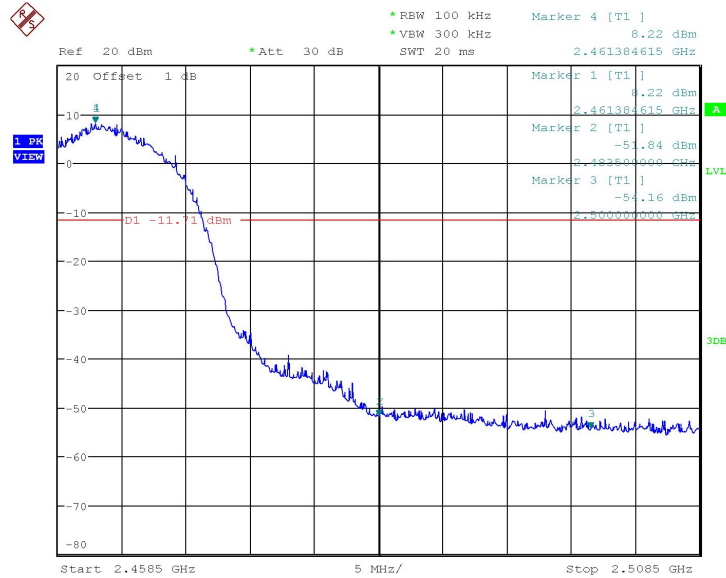
Conclusion: PASS

Test graphs as blew:



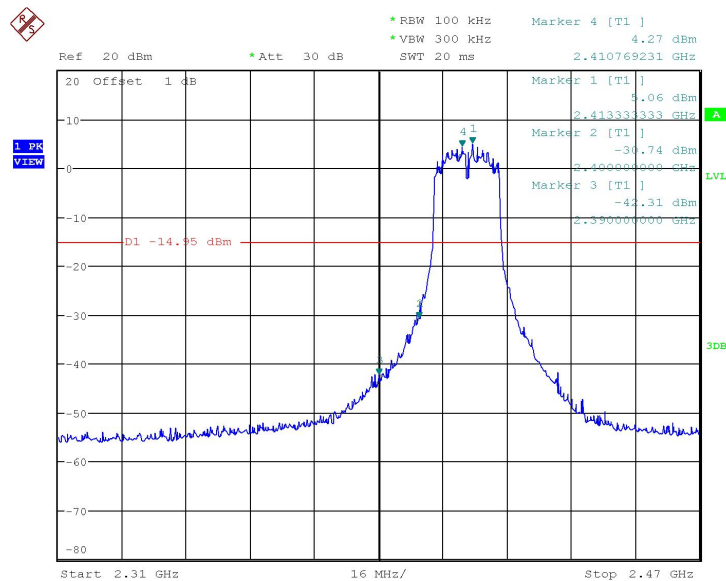
Date: 4.DEC.2018 08:06:54

Fig 19. Band Edges (802.11b, Ch1)



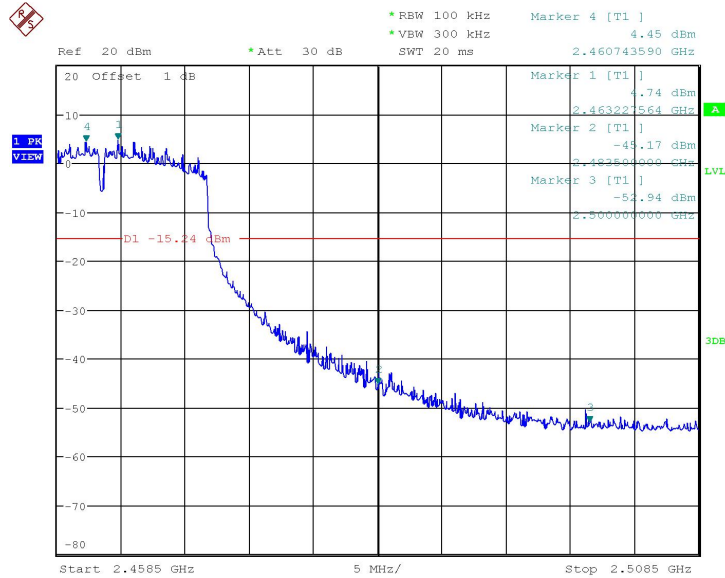
Date: 4.DEC.2018 08:14:49

Fig 20. Band Edges (802.11b, Ch11)



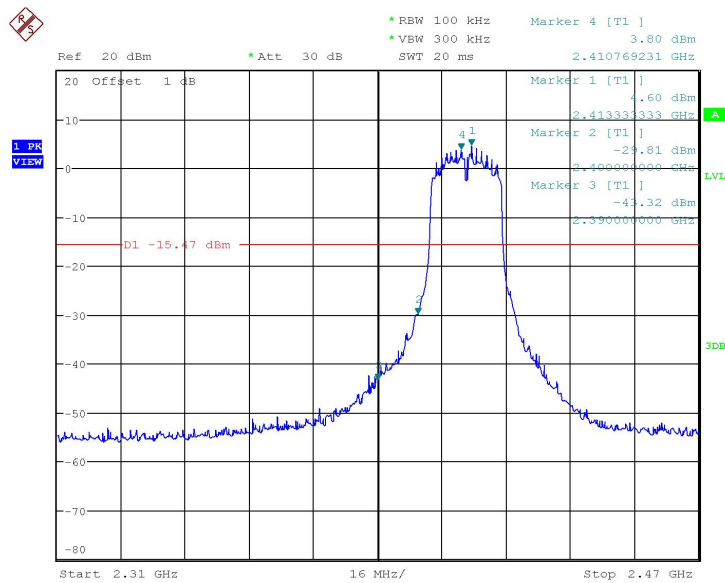
Date: 4.DEC.2018 08:17:25

Fig 21. Band Edges (802.11g, Ch1)



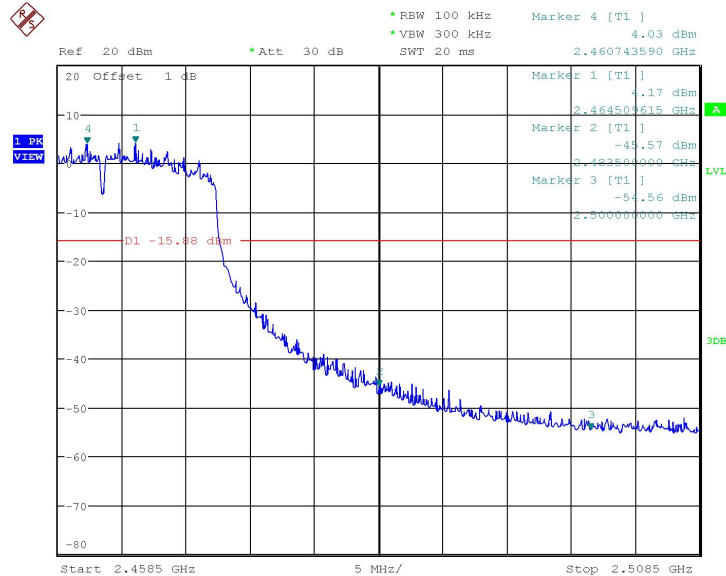
Date: 4.DEC.2018 08:21:48

Fig 22. Band Edges (802.11g, Ch11)



Date: 4.DEC.2018 08:25:25

Fig 23. Band Edges (802.11n-20MHz, Ch1)



Date: 4.DEC.2018 08:30:20

Fig 24. Band Edges (802.11n-20MHz, Ch11)

6.5. Transmitter Spurious Emission-conducted

6.5.1 Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247(d)	20dB below peak output power in 100KHz bandwidth

6.5.2 Test procedures

This measurement is according to ANSI C63.10 clause 11.11.

1. The output power of EUT was connected to the spectrum analyzer. The path loss was compensated to the results for each measurement.
2. Enable EUT transmitter maximum power continuously.

Reference level measurement

3. Set instrument center frequency to DTS channel center frequency.
4. Set the span to ≥ 1.5 times the DTS bandwidth.
5. Set the RBW = 100 kHz.
6. Set the VBW $\geq [3 \times \text{RBW}]$.
7. Detector = peak.
8. Sweep time = auto couple.
9. Trace mode = max hold.
10. Allow trace to fully stabilize.
11. Use the peak marker function to determine the maximum PSD level.

Emission level measurement

12. Set the center frequency and span to encompass frequency range to be measured.
13. Set the RBW = 100 kHz.

14. Set the VBW $\geq [3 \times \text{RBW}]$.
15. Detector = peak.
16. Sweep time = auto couple.
17. Trace mode = max hold.
18. Allow trace to fully stabilize.
19. Use the peak marker function to determine the maximum amplitude level.

6.5.3 Measurement Uncertainty:

Frequency Range	Uncertainty
$30\text{MHz} \leq f \leq 2\text{GHz}$	0.63
$2\text{GHz} \leq f \leq 3.6\text{GHz}$	0.88
$3.6\text{GHz} \leq f \leq 8\text{GHz}$	1.55
$8\text{GHz} \leq f \leq 20\text{GHz}$	1.86
$20\text{GHz} \leq f \leq 22\text{GHz}$	1.90
$22\text{GHz} \leq f \leq 26\text{GHz}$	2.20

6.5.4 Measurement Result:

802.11b/g mode

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11b	1	2.412GHz	Fig 25.	P
		30MHz~26GHz	Fig 26.	P
	6	2.437GHz	Fig 27.	P
		30MHz~26GHz	Fig 28.	P
	11	2.462GHz	Fig 29.	P
		30MHz~26GHz	Fig 30.	P
802.11g	1	2.412GHz	Fig 31.	P
		30MHz~26GHz	Fig 32.	P
	6	2.437GHz	Fig 33.	P
		30MHz~26GHz	Fig 34.	P
	11	2.462GHz	Fig 35.	P

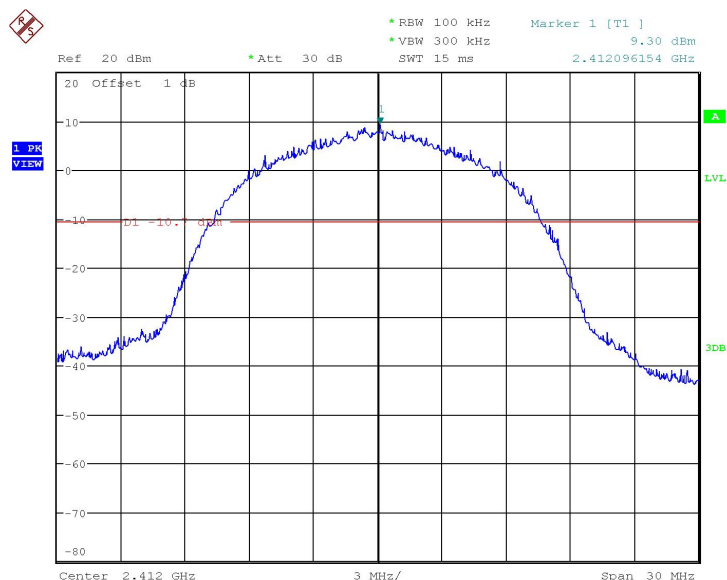
		30MHz~26GHz	Fig 36.	P
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802.11n mode

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11n(20MHz)	1	2.412GHz	Fig 37.	P
		30MHz~26GHz	Fig 38.	P
	6	2.437GHz	Fig 39.	P
		30MHz~26GHz	Fig 40.	P
	11	2.462GHz	Fig 41.	P
		30MHz~26GHz	Fig 42.	P

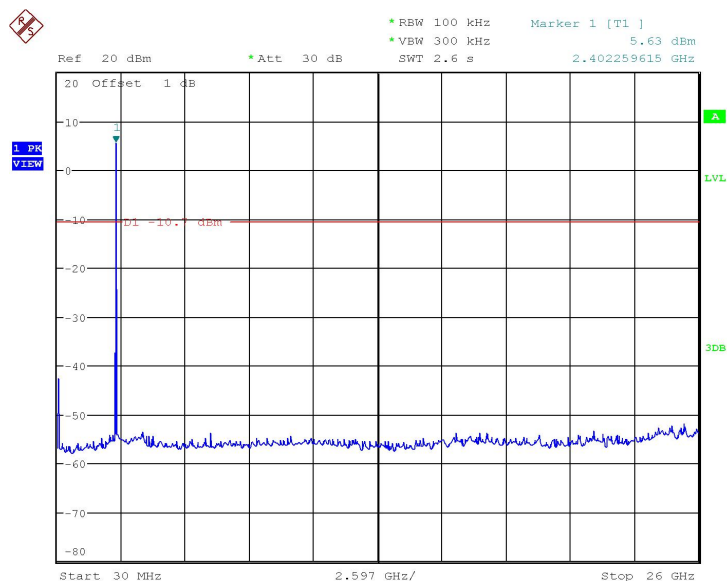
Conclusion: PASS

Test graphs as below:



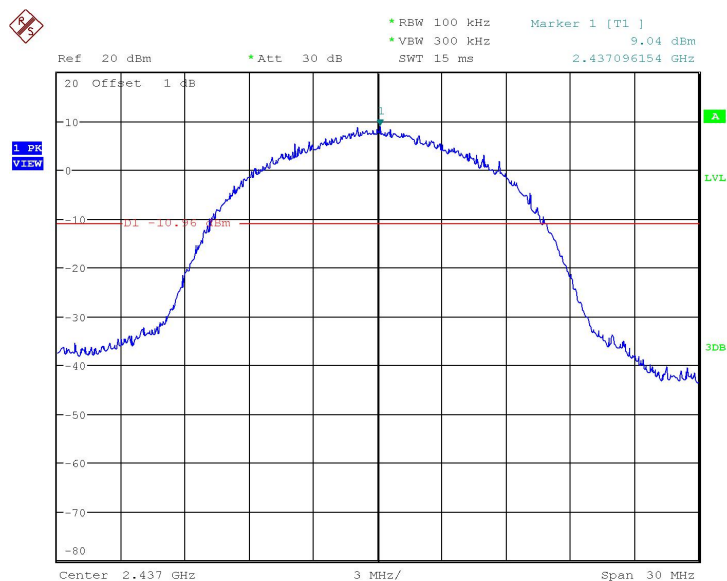
Date: 4.DEC.2018 08:06:18

Fig 25. Conducted Spurious Emission (802.11b, Ch1)



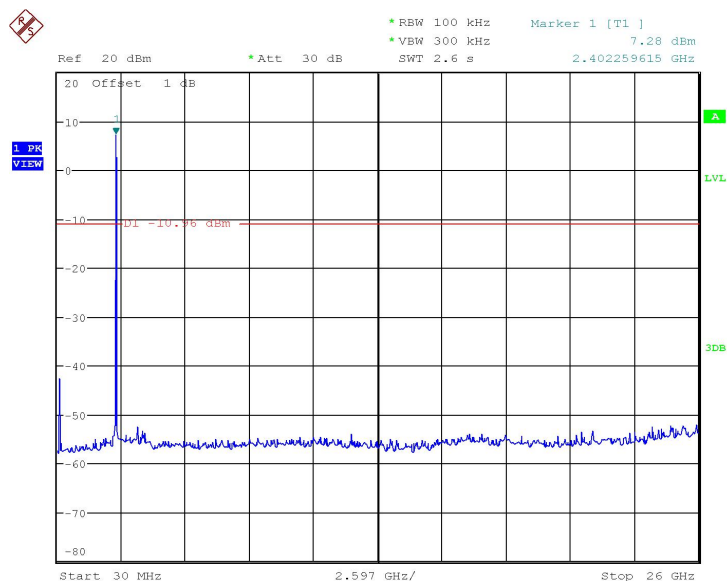
Date: 4.DEC.2018 08:07:28

Fig 26. Conducted Spurious Emission (802.11b, Ch1, 30MHz~26GHz)



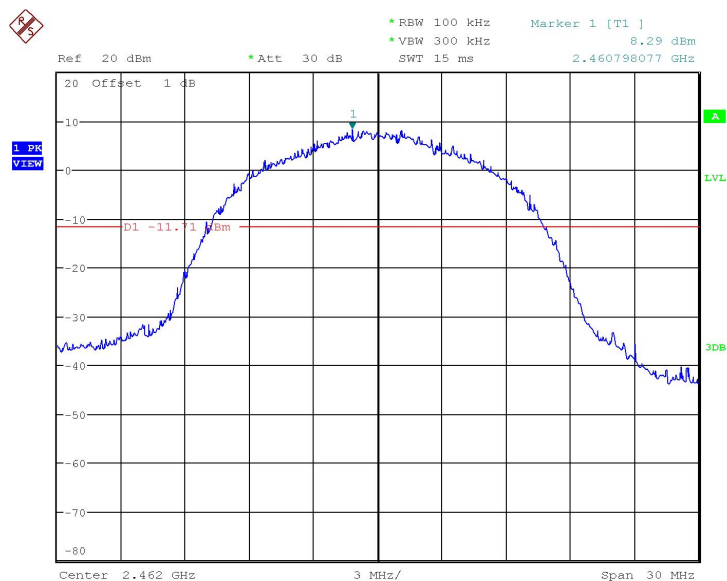
Date: 4.DEC.2018 08:11:04

Fig 27. Conducted Spurious Emission (802.11b, Ch6)



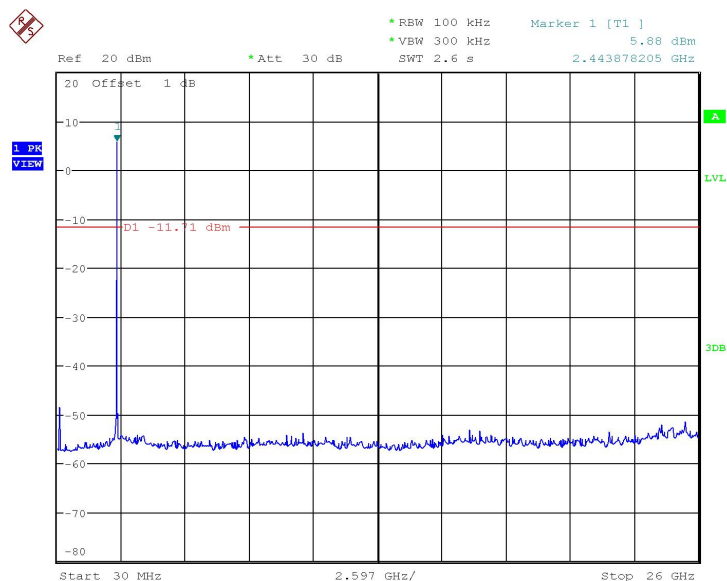
Date: 4.DEC.2018 08:12:20

Fig 28. Conducted Spurious Emission (802.11b, Ch6, 30MHz~26GHz)



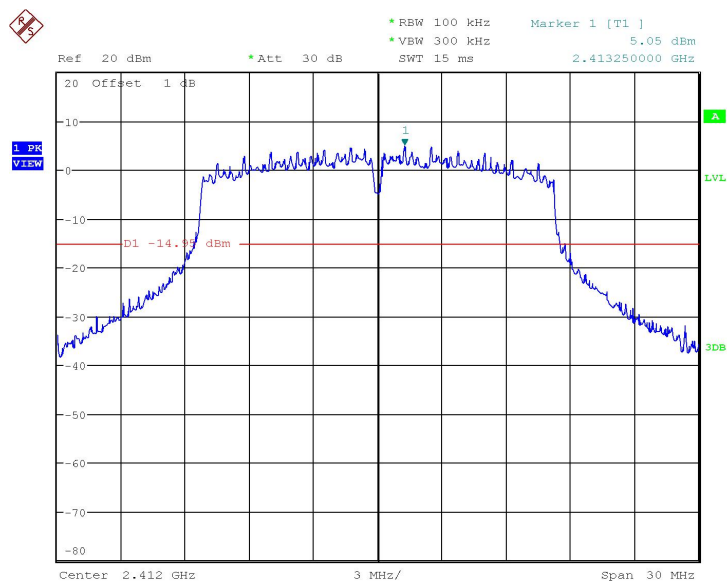
Date: 4.DEC.2018 08:14:13

Fig 29. Conducted Spurious Emission (802.11b, Ch11)



Date: 4.DEC.2018 08:15:23

Fig 30. Conducted Spurious Emission (802.11b, Ch11, 30MHz~26GHz)



Date: 4.DEC.2018 08:16:49

Fig 31. Conducted Spurious Emission (802.11g, Ch1)