RADIO TEST REPORT
FCC 47 CFR PART 15 SUBPART C

Test Standard	**FCC Part 15.247**
Brand name	SIMPNIC
Product name	**IoT Gateway**
Model No.	**S1**
Test Result	**Pass**

The test Result was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in ANSI C63.10: 2013 and compliance standards.

The test results of this report relate only to the tested sample (EUT) identified in this report.
The test Report of full or partial shall not copy. Without written approval of Compliance Certification Services Inc. (Wugu Laboratory).

Approved by:

Sam Chuang
Manager

Tested by:

Jerry Chuang
Engineer

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.
除非另有說明，此報告結果僅對測試之樣品負責，同時此樣品僅保留90天。本報告未經本公司書面許可，不可部分複製。
This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at www.sgs.com/terms_and_conditions.htm and for electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sgs.com/terms_e-document.htm. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

Revision History

Rev.	Issue Date	Revisions	Revised By
00	November 19, 2018	Initial Issue	Allison Chen
01	November 26, 2018	1. Revised antenna brand in page.5.	Allison Chen

This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

Table of contents

1. GENERAL INFORMATION 4
1.1 EUT INFORMATION 4
1.2 EUT CHANNEL INFORMATION 5
1.3 ANTENNA INFORMATION 5
1.4 MEASUREMENT UNCERTAINTY 6
1.5 FACILITIES AND TEST LOCATION 6
1.6 INSTRUMENT CALIBRATION 7
1.7 SUPPORT AND EUT ACCESSORIES EQUIPMENT 8
1.8 TEST METHODOLOGY AND APPLIED STANDARDS 8
2. TEST SUMMERY 9
3. DESCRIPTION OF TEST MODES 10
3.1 THE WORST MODE OF OPERATING CONDITION 10
3.2 THE WORST MODE OF MEASUREMENT 11
4. EUT DUTY CYCLE 12
5. TEST RESULT 13
5.1 AC POWER LINE CONDUCTED EMISSION 13
5.2 6dB BANDWIDTH AND OCCUPIED BANDWIDTH (99%) 16
5.3 OUTPUT POWER MEASUREMENT 34
5.4 POWER SPECTRAL DENSITY 38
5.5 CONDUCTED BANDEDGE AND SPURIOUS EMISSION 48
5.6 RADIATION BANDEDGE AND SPURIOUS EMISSION 73
APPENDIX 1 - PHOTOGRAPHS OF EUT

This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

1. GENERAL INFORMATION

1.1 EUT INFORMATION

<table>
<tr><td>Applicant</td><td>CONNECTION TECHNOLOGY SYSTEMS INC.
18F-6, No.79, Sec.1, Xintai 5th Rd., Xizhi Dist., New Taipei City 221, TAIWAN, R.O.C.</td></tr>
<tr><td>Manufacturer</td><td>CONNECTION TECHNOLOGY SYSTEMS INC.
18F-6, No.79, Sec.1, Xintai 5th Rd., Xizhi Dist., New Taipei City 221, TAIWAN, R.O.C.</td></tr>
<tr><td>Equipment</td><td>IoT Gateway</td></tr>
<tr><td>Model Name</td><td>S1</td></tr>
<tr><td>Model Discrepancy</td><td>N/A</td></tr>
<tr><td>Received Date</td><td>August 7, 2018</td></tr>
<tr><td>Date of Test</td><td>September 10 ~ September 17, 2018</td></tr>
<tr><td>Output Power(W)</td><td><table><tr><th>Mode</th><th>Output Power (W)</th></tr><tr><td>IEEE 802.11b Mode</td><td>0.2495</td></tr><tr><td>IEEE 802.11g Mode</td><td>0.7870</td></tr><tr><td>IEEE 802.11n HT20 Mode</td><td>0.8630</td></tr><tr><td>IEEE 802.11n HT40 Mode</td><td>0.8147</td></tr></table></td></tr>
<tr><td>Power Supply</td><td>Power from AC adapter.
I/P: 100-240Vac, 50/60Hz, 0.3A
O/P: 5Vdc, 2000mA</td></tr>
</table>

This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

1.2 EUT CHANNEL INFORMATION

Frequency Range	802.11b/g/n HT 20: 2412MHz ~ 2462MHz 802.11n HT 40: 2422MHz ~ 2452MHz
Modulation Type	1. IEEE 802.11b Mode: DSSS(DBPSK/DQPSK/CCK) 2. IEEE 802.11g Mode: OFDM (BPSK/QPSK/16QAM/64QAM) 3. IEEE 802.11n HT20 Mode : OFDM (BPSK/QPSK/16QAM/64QAM) 4. IEEE 802.11n HT40 Mode : OFDM (BPSK/QPSK/16QAM/64QAM)
Number of channel	1. IEEE 802.11b Mode: 11 Channels 2. IEEE 802.11g Mode: 11 Channels 3. IEEE 802.11n HT20 Mode : 11 Channels 4. IEEE 802.11n HT40 Mode : 7 Channels

Remark:
Refer as ANSI 63.10:2013 clause 5.6.1 Table 4 for test channels

Number of frequencies to be tested

Frequency range in which device operates	Number of frequencies	Location in frequency range of operation
☐ 1 MHz or less	1	Middle
☐ 1 MHz to 10 MHz	2	1 near top and 1 near bottom
☒ More than 10 MHz	3	1 near top, 1 near middle, and 1 near bottom

1.3 ANTENNA INFORMATION

Antenna Type	☒ PIFA ☐ PCB ☐ Dipole ☐ Coils
Antenna Gain	

	Brand	P/N	Peak Gain
Antenna 1	Aristotle Enterprises Inc.	RFA-02-AP633-70B-40	3.24dBi
Antenna 2	Aristotle Enterprises Inc.	RFA-02-AP633-70-35	3.46dBi
Power Directional Gain		3.35dBi	

Antenna Connector	IPEX

Notes:
*1. Power Directional Gain: 10*Log(((10^(Ant1/10)+10^(Ant2/10))/2))*

This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

1.4 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	+/- 1.2575
Emission bandwidth, 20dB bandwidth	+/- 1.4003
RF output power, conducted	+/- 1.1372
Power density, conducted	+/- 1.4003
3M Semi Anechoic Chamber / 30M~200M	+/- 4.0138
3M Semi Anechoic Chamber / 200M~1000M	+/- 3.9483
3M Semi Anechoic Chamber / 1G~8G	+/- 2.5975
3M Semi Anechoic Chamber / 8G~18G	+/- 2.6112
3M Semi Anechoic Chamber / 18G~26G	+/- 2.7389

***Remark**:*
1.This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2
2. ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report.

1.5 FACILITIES AND TEST LOCATION

All measurement facilities used to collect the measurement data are located at

No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)

Test site	Test Engineer	Remark
AC Conduction Room	Dally Hong	-
Radiation	Jerry Chuang	-
RF Conducted	Jerry Chuang	-

***Remark:** The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.*

This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

1.6 INSTRUMENT CALIBRATION

RF Conducted Test Site					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal Date**	**Cal Due**
Coaxial Cable	Woken	WC12	CC001	06/29/2018	06/28/2019
Power Meter	Anritsu	ML2495A	1149001	02/06/2018	02/05/2019
Power Seneor	Anritsu	MA2491A	030982	02/07/2018	02/06/2019
Signal Analyzer	R&S	FSV 40	101073	10/02/2017	10/01/2018

3M 966 Chamber Test Site					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal Date**	**Cal Due**
Band Reject Filters	MICRO TRONICS	BRM 50702	120	05/14/2018	05/13/2019
Bilog Antenna	Sunol Sciences	JB3	A030105	07/13/2018	07/12/2019
Cable	HUBER SUHNER	SUCOFLEX 104PEA	25157	06/29/2018	06/28/2019
Cable	HUBER SUHNER	SUCOFLEX 104PEA	20995	06/29/2018	06/28/2019
Digital Thermo-Hygro Meter	WISEWIND	1206	D07	02/08/2018	02/07/2019
double Ridged Guide Horn Antenna	ETC	MCTD 1209	DRH13M02003	08/20/2018	08/19/2019
Loop Ant	COM-POWER	AL-130	121051	03/21/2018	03/20/2019
Pre-Amplifier	EMEC	EM330	060609	06/29/2018	06/28/2019
Pre-Amplifier	HP	8449B	3008A00965	06/29/2018	06/28/2019
PSA Series Spectrum Analyzer	Agilent	E4446A	MY46180323	05/31/2018	05/30/2019
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R

AC Conducted Emissions Test Site					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal Date**	**Cal Due**
CABLE	EMCI	CFD300-NL	CERF	06/29/2018	06/28/2019
EMI Test Receiver	R&S	ESCI	100064	07/24/2018	07/23/2019
LISN	SCHWARZBECK	NSLK 8127	8127-541	02/09/2018	02/08/2019
LISN	SCHAFFNER	NNB41	03/10013	02/06/2018	02/05/2019

Remark: *Each piece of equipment is scheduled for calibration once a year.*

This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

1.7 SUPPORT AND EUT ACCESSORIES EQUIPMENT

EUT Accessories Equipment					
No.	**Equipment**	**Brand**	**Model**	**Series No.**	**FCC ID**
	N/A				

Support Equipment					
No.	**Equipment**	**Brand**	**Model**	**Series No.**	**FCC ID**
1	NB(B)	Toshiba	PORTEGE R30-A	N/A	PD97260H

1.8 TEST METHODOLOGY AND APPLIED STANDARDS

The test methodology, setups and results comply with all requirements in accordance with ANSI C63.10:2013, FCC Part 2, FCC Part 15.247, KDB 558074 D01, KDB 662911 D01.

This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

2. TEST SUMMERY

FCC Standard Section	Report Section	Test Item	Result
15.203	1.3	Antenna Requirement	Pass
15.207(a)	5.1	AC Conducted Emission	Pass
15.247(a)(2)	5.2	6 dB Bandwidth	Pass
2.1049	5.2	Occupied Bandwidth (99%)	Pass
15.247(b)	5.3	Output Power Measurement	Pass
15.247(e)	5.4	Power Spectral Density	Pass
15.247(d)	5.5	Conducted Band Edge	Pass
15.247(d)	5.5	Conducted Spurious Emission	Pass
15.247(d)	5.6	Radiation Band Edge	Pass
15.247(d)	5.6	Radiation Spurious Emission	Pass

This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

3. DESCRIPTION OF TEST MODES

3.1 THE WORST MODE OF OPERATING CONDITION

Operation mode	IEEE 802.11b Mode :1Mbps IEEE 802.11g Mode :6Mbps IEEE 802.11n HT20 Mode: MCS8 IEEE 802.11n HT40 Mode: MCS8
Test Channel Frequencies	**IEEE 802.11b Mode:** 1. Lowest Channel: 2412MHz 2. Middle Channel: 2437MHz 3. Highest Channel: 2462MHz **IEEE 802.11g Mode:** 1. Lowest Channel: 2412MHz 2. Middle Channel: 2437MHz 3. Highest Channel: 2462MHz **IEEE 802.11n HT20 Mode:** 1. Lowest Channel: 2412MHz 2. Middle Channel: 2437MHz 3. Highest Channel: 2462MHz **IEEE 802.11n HT40 Mode:** 1. Lowest Channel: 2422MHz 2. Middle Channel: 2437MHz 3. Highest Channel: 2452MHz
Operation Transmitter	IEEE 802.11b Mode: 1T1R IEEE 802.11g Mode: 1T1R IEEE 802.11n HT20 Mode: 2T2R IEEE 802.11n HT40 Mode: 2T2R

Remark:
1. EUT pre-scanned data rate of output power for each mode, the worst data rate were recorded in this report.

This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

3.2 THE WORST MODE OF MEASUREMENT

AC Power Line Conducted Emission	
Test Condition	AC Power line conducted emission for line and neutral
Power supply Mode	Mode 1:EUT power by adapter
Worst Mode	☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4

Radiated Emission Measurement Above 1G	
Test Condition	Band edge, Emission for Unwanted and Fundamental
Power supply Mode	Mode 1:EUT power by adapter
Worst Mode	☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4
Worst Position	☐ Placed in fixed position. ☐ Placed in fixed position at X-Plane (E2-Plane) ☒ Placed in fixed position at Y-Plane (E1-Plane) ☐ Placed in fixed position at Z-Plane (H-Plane)
Worst Polarity	☒ Horizontal ☐ Vertical

Radiated Emission Measurement Below 1G	
Test Condition	Radiated Emission Below 1G
Power supply Mode	Mode 1:EUT power by adapter
Worst Mode	☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4

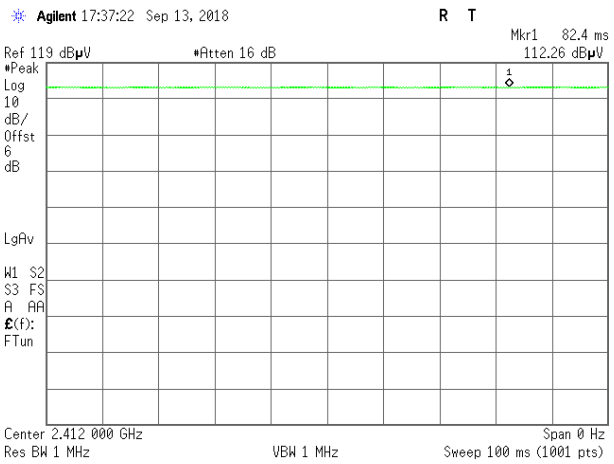
Remark:
1. The worst mode was record in this test report.
2. EUT pre-scanned in three axis ,X,Y, Z and two polarity, Horizontal and Vertical for radiated measurement. The worst case(Y-Plane and Horizontal) were recorded in this report
3. AC power line conducted emission and for below 1G radiation emission were performed the EUT transmit at the highest output power channel as worse case.

This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

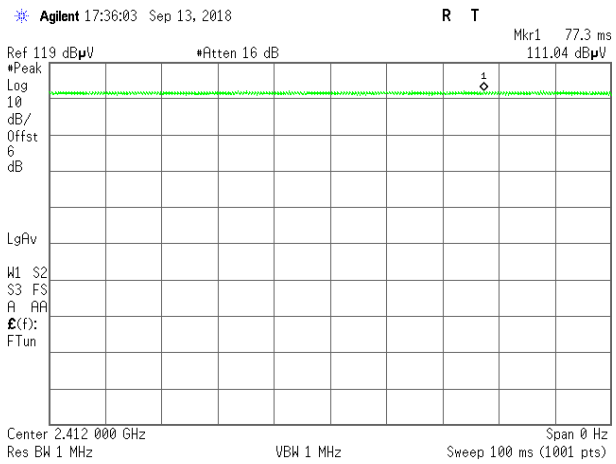
4. EUT DUTY CYCLE

Duty Cycle			
Configuration	TX ON (ms)	TX ALL (ms)	Duty Cycle (%)
802.11b	1.0000	1.0000	100.00%
802.11g	1.0000	1.0000	100.00%
802.11n HT20	1.0000	1.0000	100.00%
802.11n HT40	1.0000	1.0000	100.00%

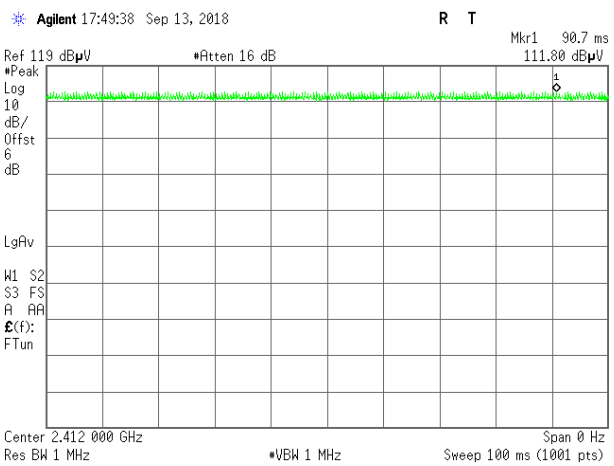
802.11b



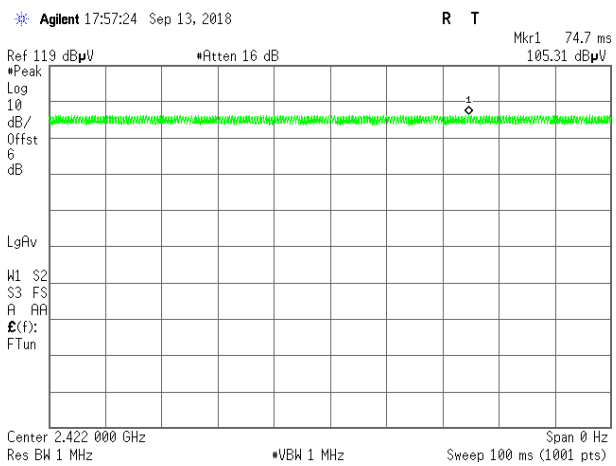
802.11g



802.11n HT20



802.11n HT40



This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

5. TEST RESULT

5.1 AC POWER LINE CONDUCTED EMISSION

5.1.1 Test Limit

According to §15.207(a),

Frequency Range (MHz)	Limits(dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

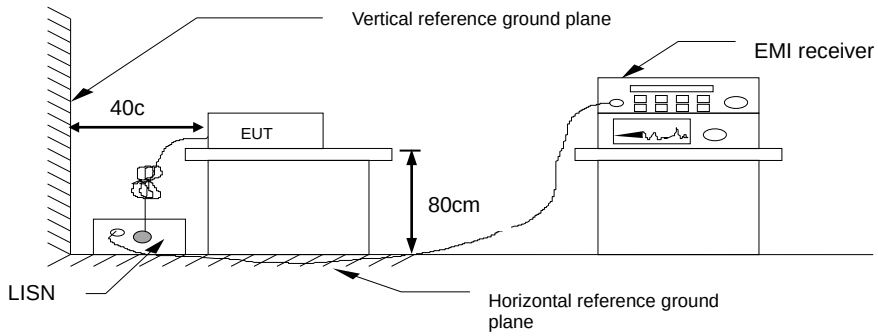
* Decreases with the logarithm of the frequency.

5.1.2 Test Procedure

Test method Refer as ANSI 63.10:2013 clause 6.2,

1. The EUT was placed on a non-conducted table, which is 0.8m above horizontal ground plane and 0.4m above vertical ground plane.
2. EUT connected to the line impedance stabilization network (LISN)
3. Receiver set RBW of 9kHz and Detector Peak, and note as quasi-peak and average.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. Recorded Line for Neutral and Line.

5.1.3 Test Setup



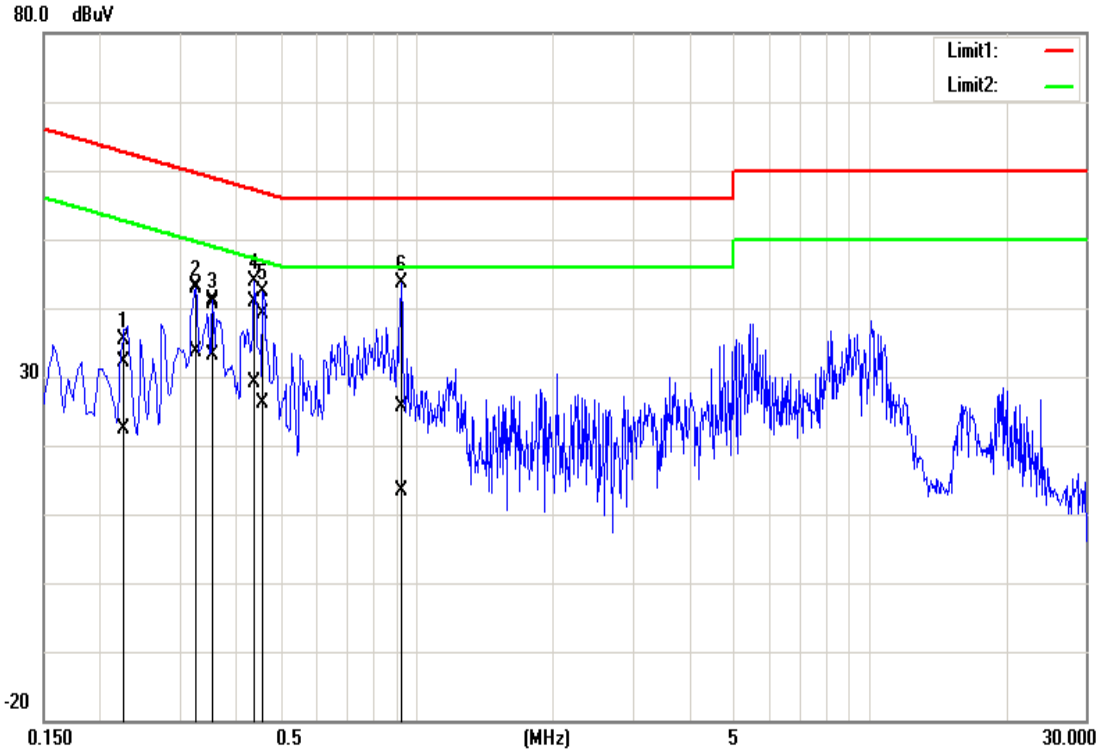
5.1.4 Test Result

Pass.

This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

Test Data

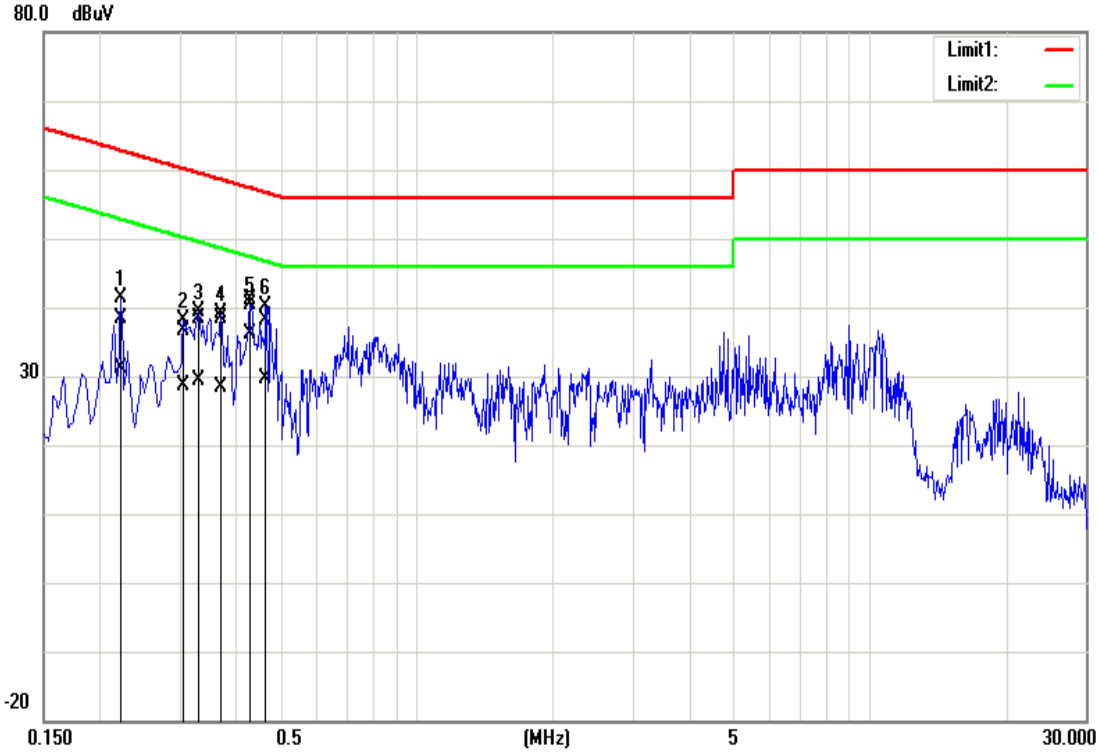
Test Mode:	Mode 1	Temp/Hum	24(℃)/ 50%RH
Phase:	Line	Test Date	September 17, 2018
Test Voltage:	120V	Test Engineer	Dally Hong



No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1	0.2220	31.92	22.29	0.11	32.03	22.40	62.74	52.74	-30.71	-30.34	Pass
2	0.3260	43.12	33.44	0.12	43.24	33.56	59.55	49.55	-16.31	-15.99	Pass
3*	0.3540	40.47	32.90	0.12	40.59	33.02	58.87	48.87	-18.28	-15.85	Pass
4	0.4380	40.76	29.05	0.12	40.88	29.17	57.10	47.10	-16.22	-17.93	Pass
5	0.4580	38.94	25.94	0.12	39.06	26.06	56.73	46.73	-17.67	-20.67	Pass
6	0.9260	25.40	13.31	0.13	25.53	13.44	56.00	46.00	-30.47	-32.56	Pass

This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

Test Mode:	Mode 1	Temp/Hum	24(℃)/ 50%RH
Phase:	Neutral	Test Date	September 17, 2018
Test Voltage:	120V	Test Engineer	Dally Hong



No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1	0.2220	38.37	31.09	0.13	38.50	31.22	62.74	52.74	-24.24	-21.52	Pass
2	0.3060	36.52	28.48	0.13	36.65	28.61	60.08	50.08	-23.43	-21.47	Pass
3	0.3300	38.28	29.29	0.13	38.41	29.42	59.45	49.45	-21.04	-20.03	Pass
4	0.3700	38.31	28.37	0.13	38.44	28.50	58.50	48.50	-20.06	-20.00	Pass
5*	0.4300	41.02	36.04	0.13	41.15	36.17	57.25	47.25	-16.10	-11.08	Pass
6	0.4660	38.00	29.61	0.13	38.13	29.74	56.58	46.58	-18.45	-16.84	Pass

This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

5.2 6dB BANDWIDTH AND OCCUPIED BANDWIDTH (99%)

5.2.1 Test Limit

According to §15.247(a)(2),

6 dB Bandwidth ：

Limit	Shall be at least 500kHz

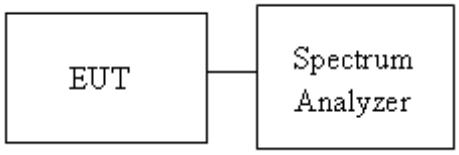
Occupied Bandwidth(99%) ： For reporting purposes only.

5.2.2 Test Procedure

Test method Refer as KDB 558074 D01 and ANSI 63.10:2013 clause 6.9.2,

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT
3. SA set RBW = 100kHz, VBW = 300kHz and Detector = Peak, to measurement 6 dB Bandwidth.
4. SA set RBW = 1% ~ 5% OBW, VBW = three times the RBW and Detector = Peak, to measurement 99% Bandwidth
5. Measure and record the result of 6 dB Bandwidth and 99% Bandwidth. in the test report.

5.2.3 Test Setup



This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

5.2.4 Test Result

Test mode: IEEE 802.11b Mode / 2412-2462 MHz						
Channel	Frequency (MHz)	Chain A OBW(99%) (MHz)	Chain B OBW(99%) (MHz)	Chain A 6dB BW (MHz)	Chain B 6dB BW (MHz)	6dB limit (kHz)
Low	2412	14.2836	14.1968	10.0435	10.0435	≥500
Mid	2437	14.2836	14.1534	10.0435	10.0435	
High	2462	14.2836	14.1534	10.0435	10.0435	

Test mode: IEEE 802.11g Mode / 2412-2462 MHz						
Channel	Frequency (MHz)	Chain A OBW(99%) (MHz)	Chain B OBW(99%) (MHz)	Chain A 6dB BW (MHz)	Chain B 6dB BW (MHz)	6dB limit (kHz)
Low	2412	16.4109	16.3241	16.3913	16.3913	≥500
Mid	2437	16.3675	16.3241	16.3913	16.3913	
High	2462	16.3675	16.3241	16.3913	16.3913	

Test mode: IEEE 802.11n HT20 Mode / 2412-2462 MHz						
Channel	Frequency (MHz)	Chain A OBW(99%) (MHz)	Chain B OBW(99%) (MHz)	Chain A 6dB BW (MHz)	Chain B 6dB BW (MHz)	6dB limit (kHz)
Low	2412	17.2793	17.2793	16.9565	16.6087	≥500
Mid	2437	17.2358	17.2358	16.9565	16.5652	
High	2462	17.2358	17.2793	17.0000	16.7826	

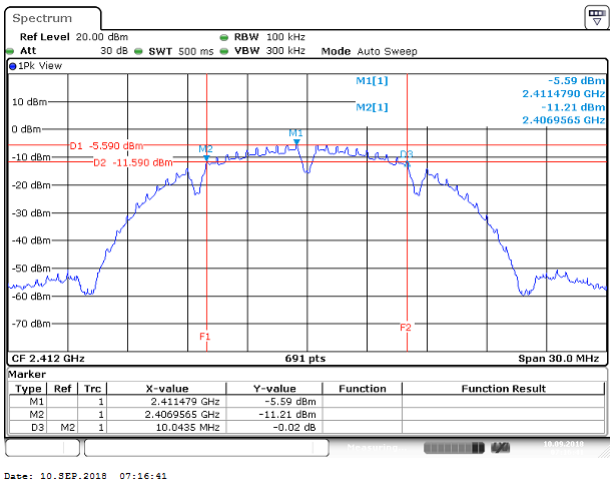
Test mode: IEEE 802.11n HT40 Mode / 2422-2452 MHz						
Channel	Frequency (MHz)	Chain A OBW(99%) (MHz)	Chain B OBW(99%) (MHz)	Chain A 6dB BW (MHz)	Chain B 6dB BW (MHz)	6dB limit (kHz)
Low	2422	35.5426	35.0795	35.362	33.739	>500
Mid	2437	35.5426	35.0795	35.362	33.739	
High	2452	35.5426	35.3111	35.362	35.13	

This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

Test Data (6dB BANDWIDTH)

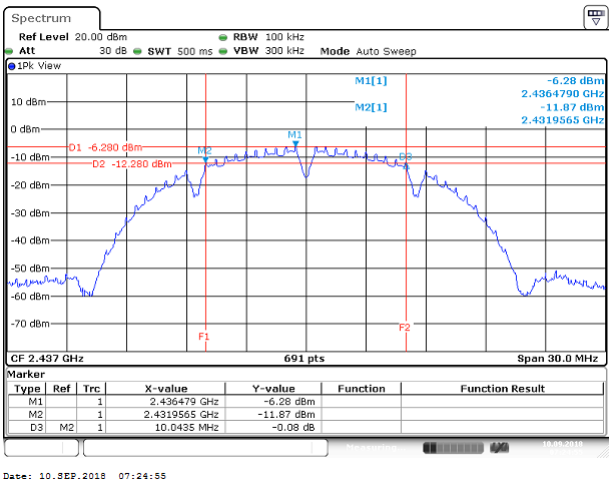
IEEE 802.11b Mode Chain A

Low CH



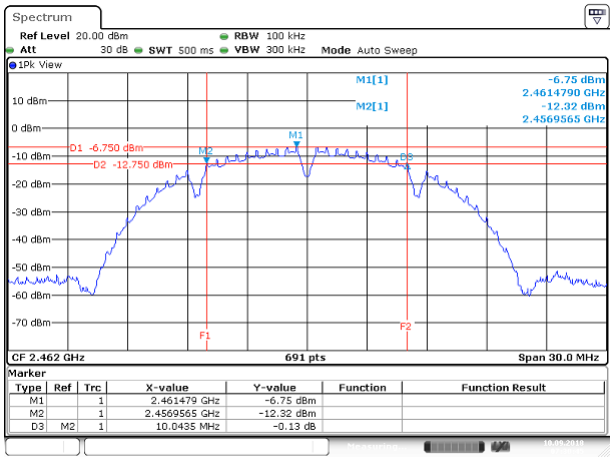
Date: 10.SEP.2018 07:16:41

Mid CH



Date: 10.SEP.2018 07:24:55

High CH

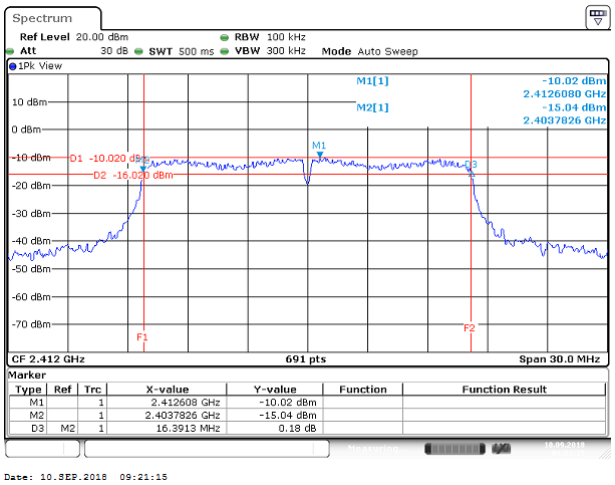


Date: 10.SEP.2018 07:30:45

This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

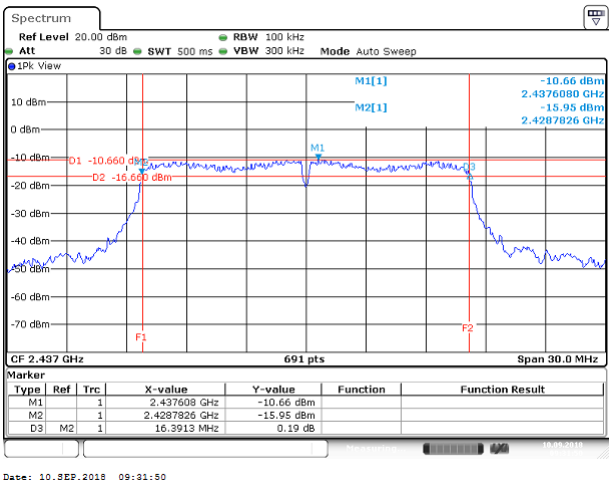
IEEE 802.11g Mode Chain A

Low CH



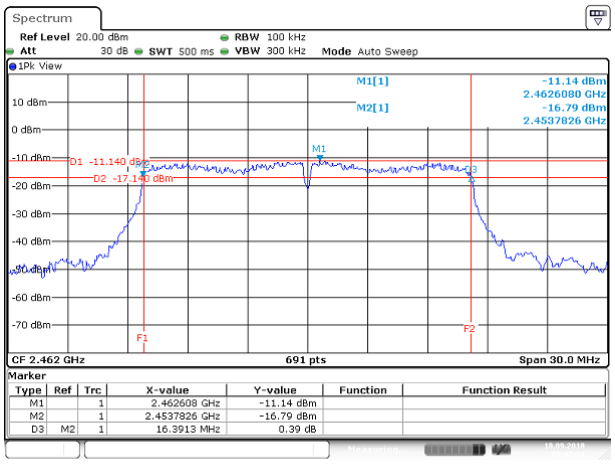
Date: 10.SEP.2018 09:21:15

Mid CH



Date: 10.SEP.2018 09:31:50

High CH

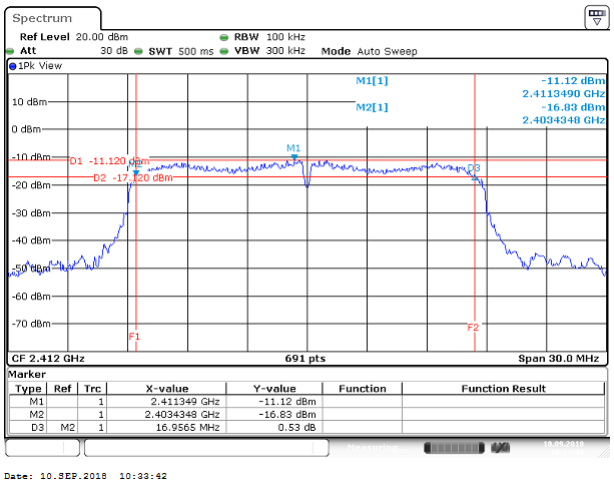


Date: 10.SEP.2018 09:42:34

This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

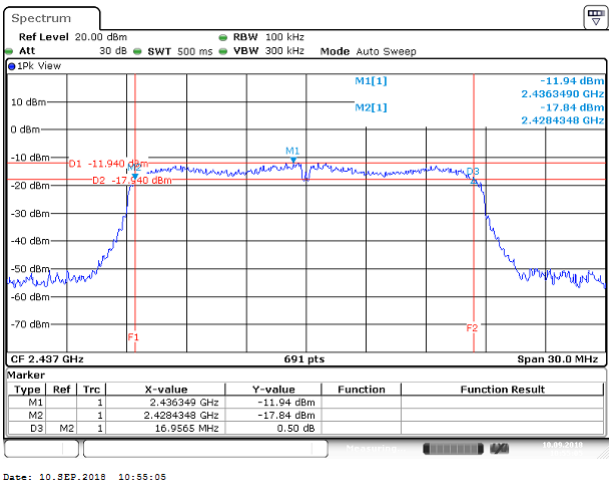
IEEE 802.11n HT20 Mode Chain A

Low CH



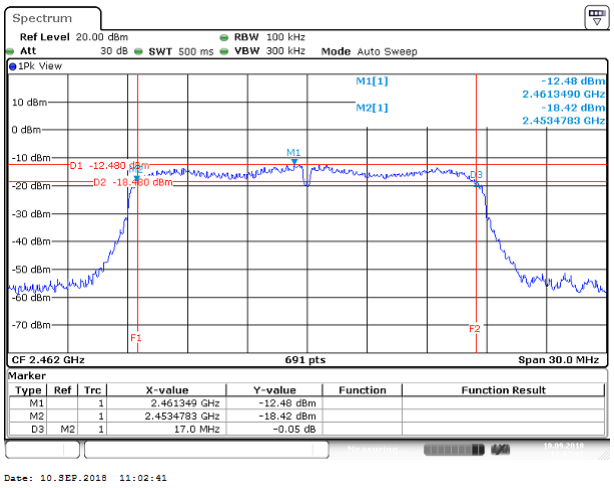
Date: 10.SEP.2018 10:33:42

Mid CH



Date: 10.SEP.2018 10:55:05

High CH

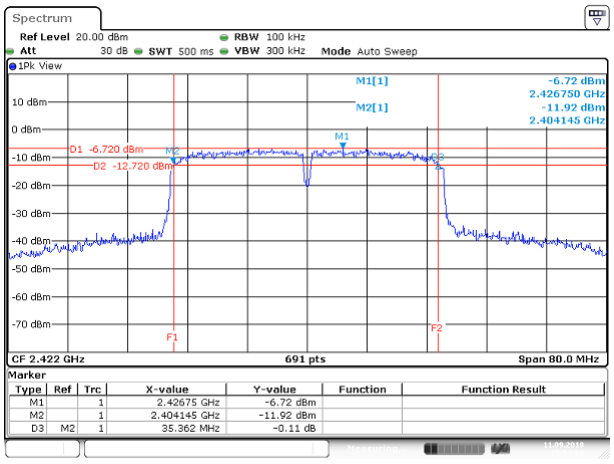


Date: 10.SEP.2018 11:02:41

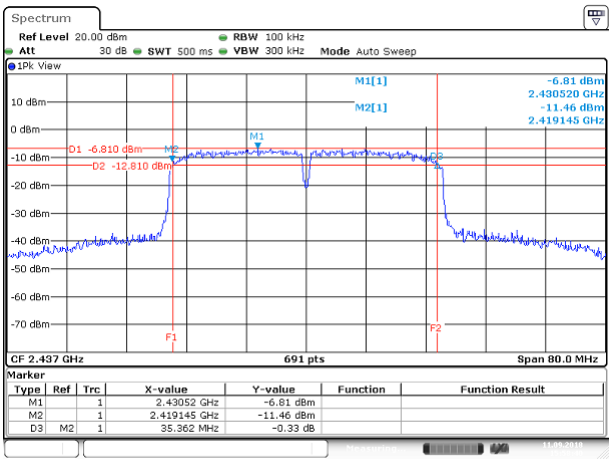
This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11n HT40 Mode Chain A

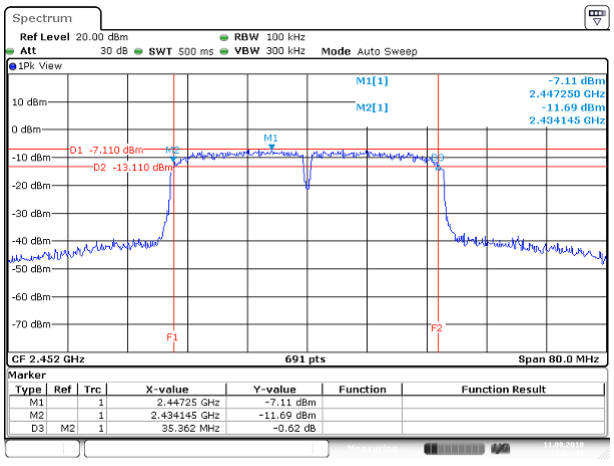
Low CH



Mid CH



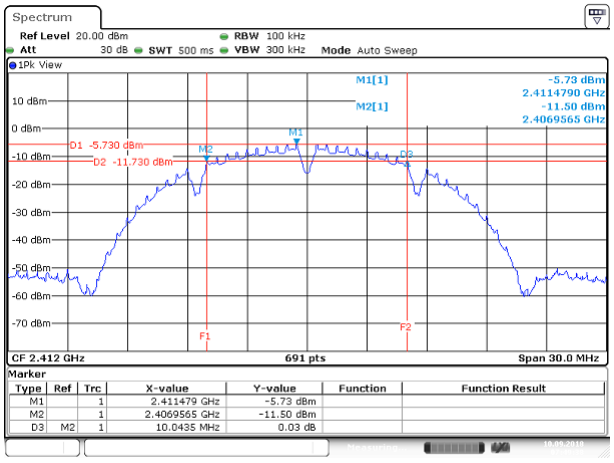
High CH



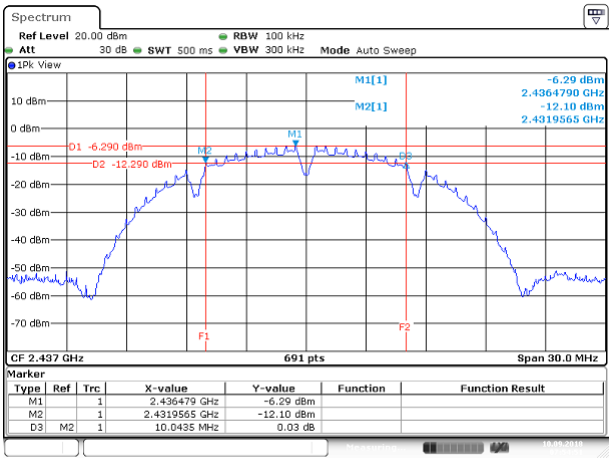
This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11b Mode Chain B

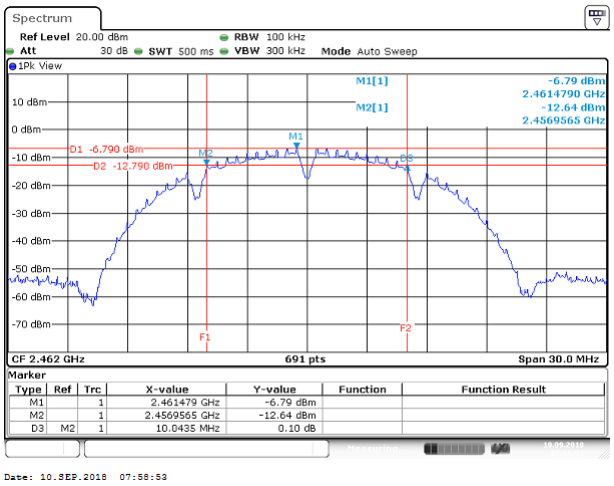
Low CH



Mid CH



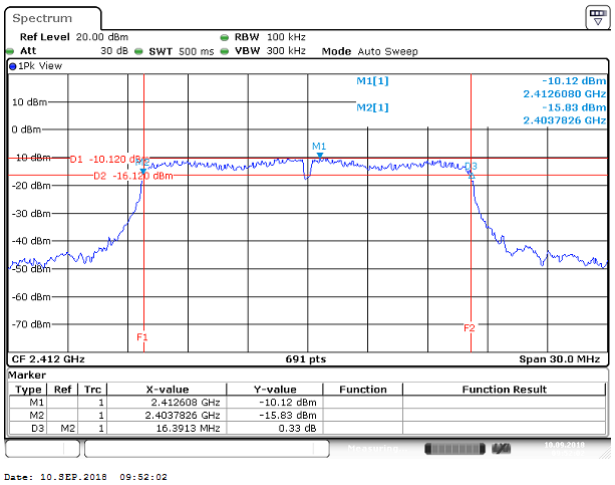
High CH



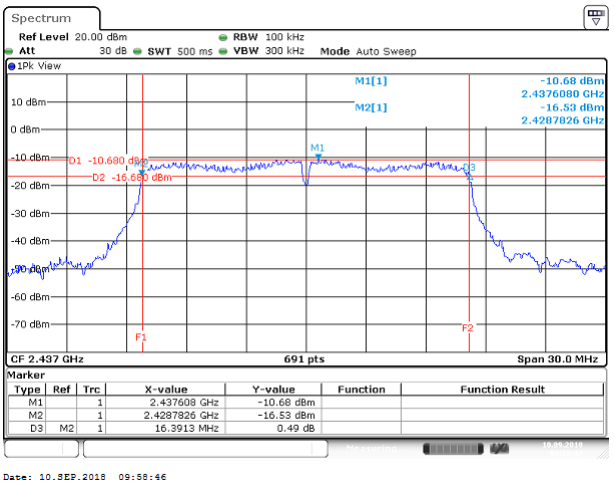
This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11g Mode Chain B

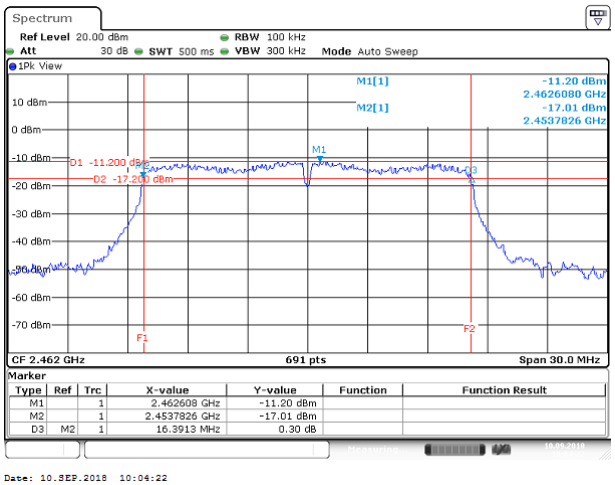
Low CH



Mid CH



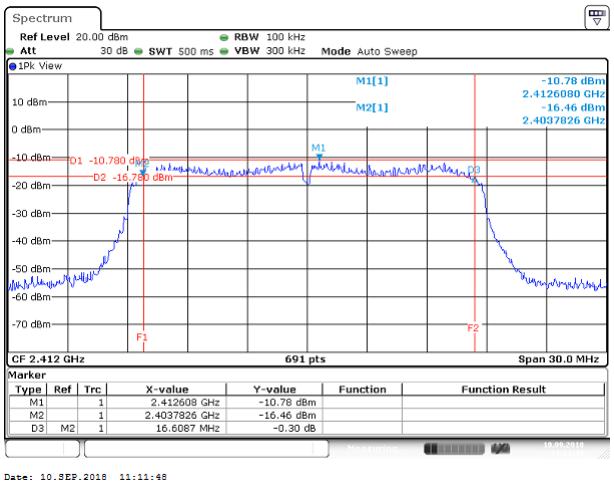
High CH



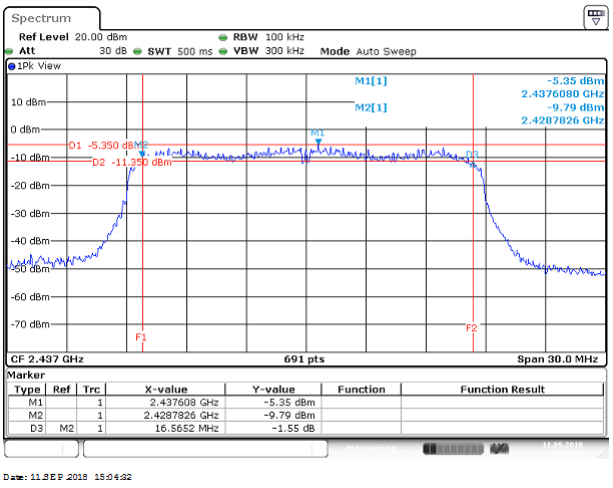
This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11n HT20 Mode Chain B

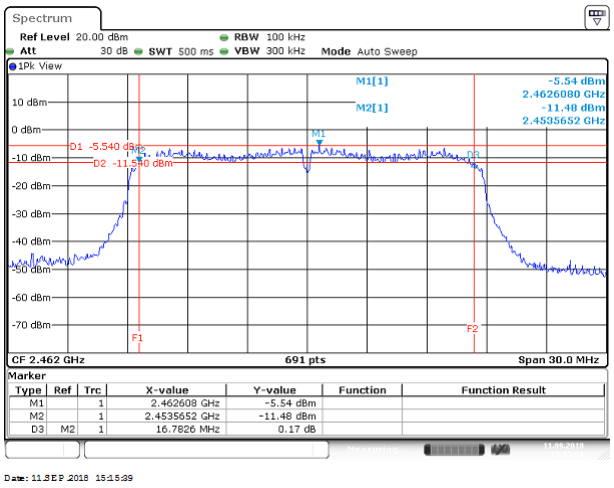
Low CH



Mid CH



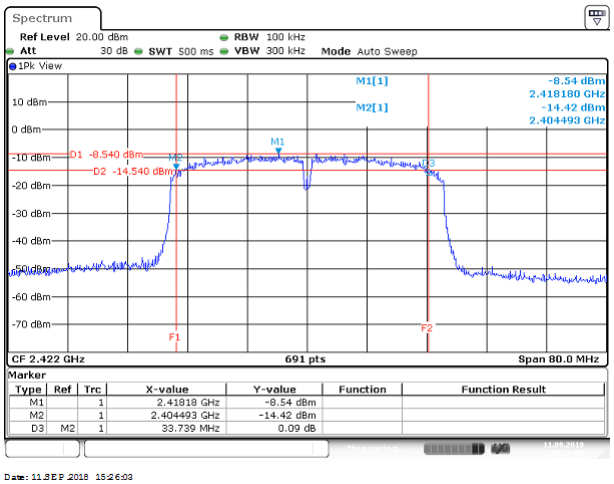
High CH



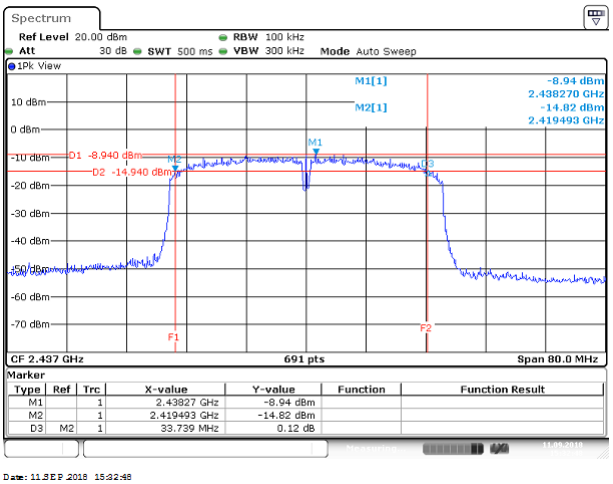
This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11n HT40 Mode Chain B

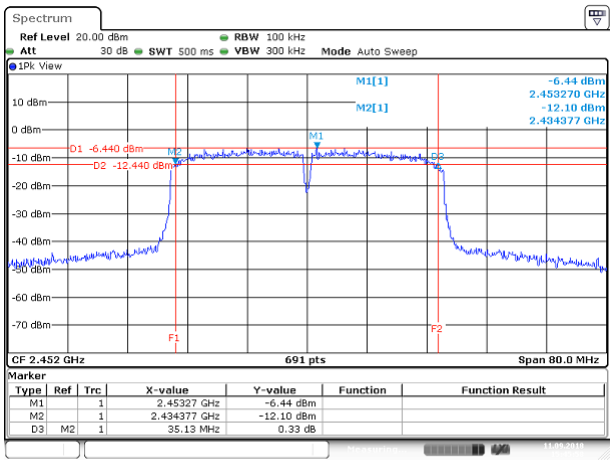
Low CH



Mid CH



High CH

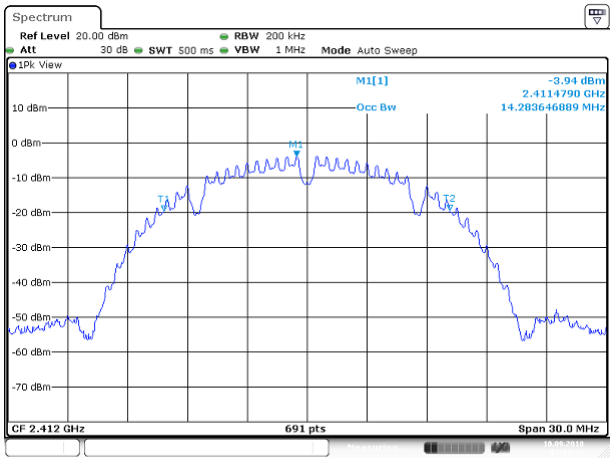


This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

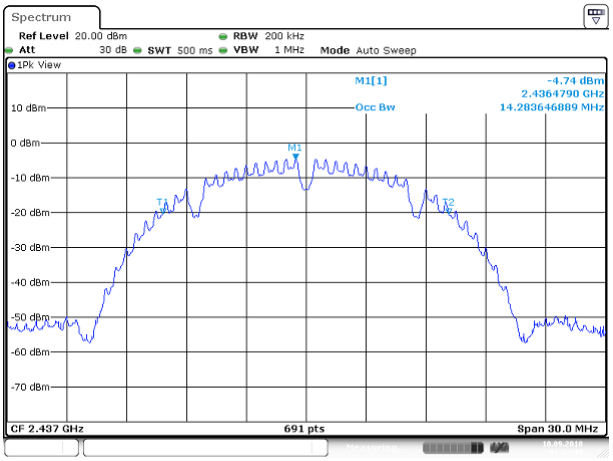
Test Data (BANDWIDTH 99%)

IEEE 802.11b Mode Chain A

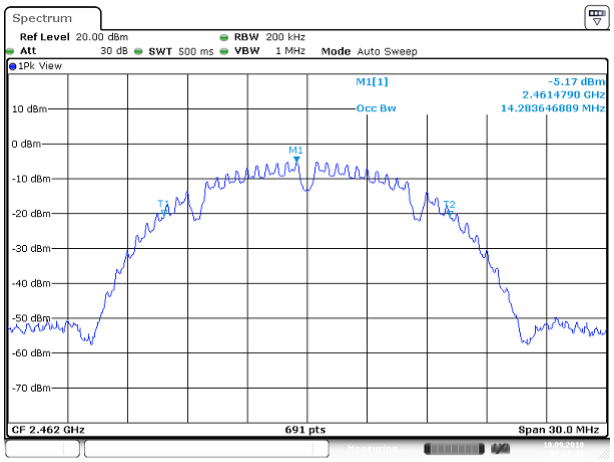
Low CH



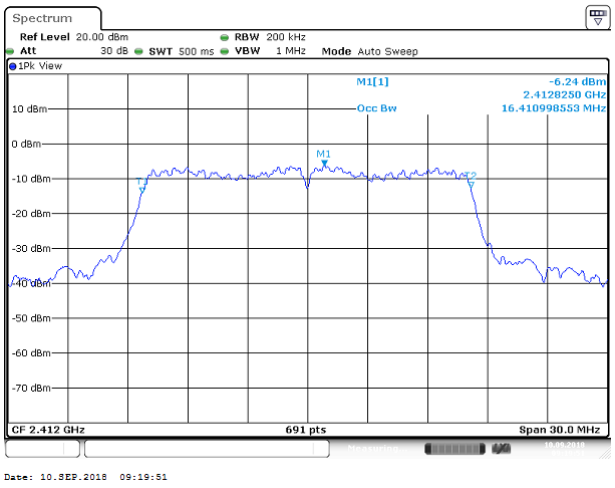
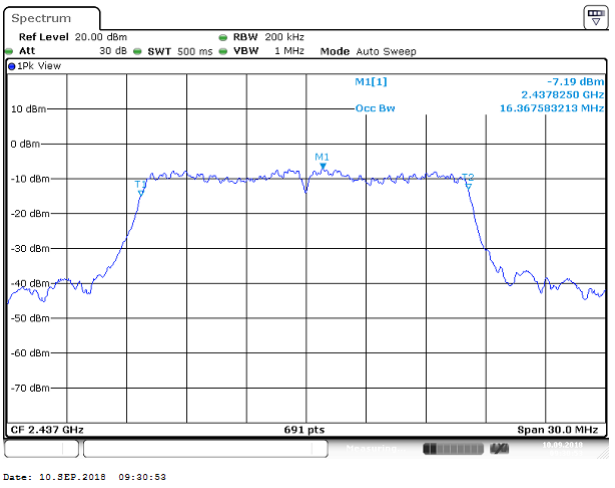
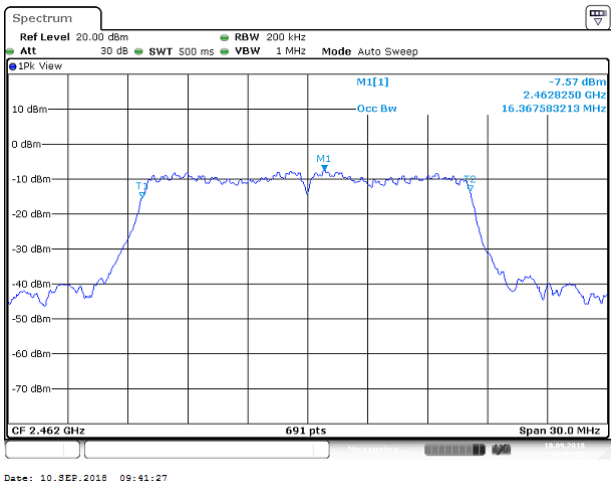
Mid CH



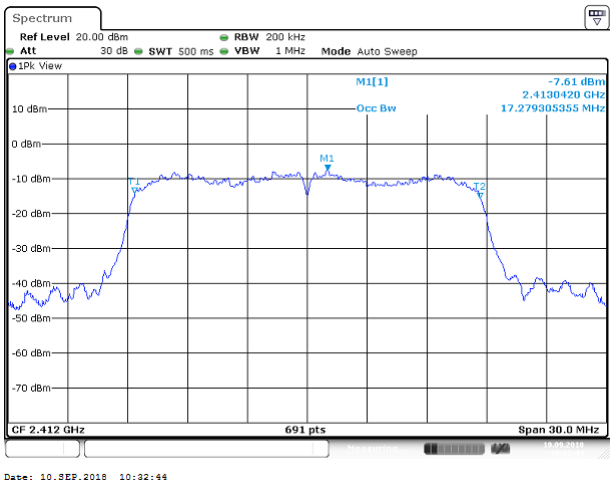
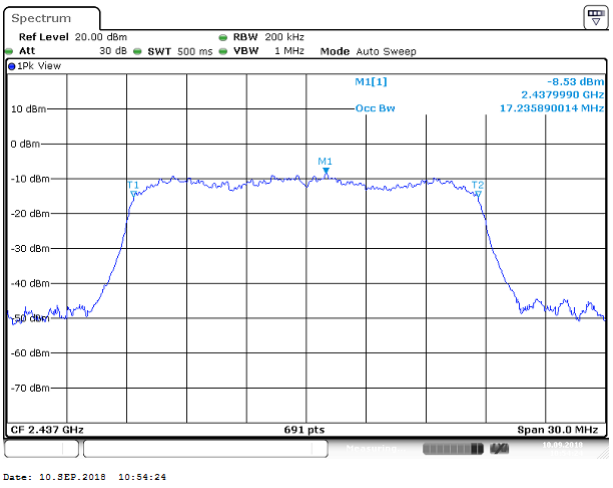
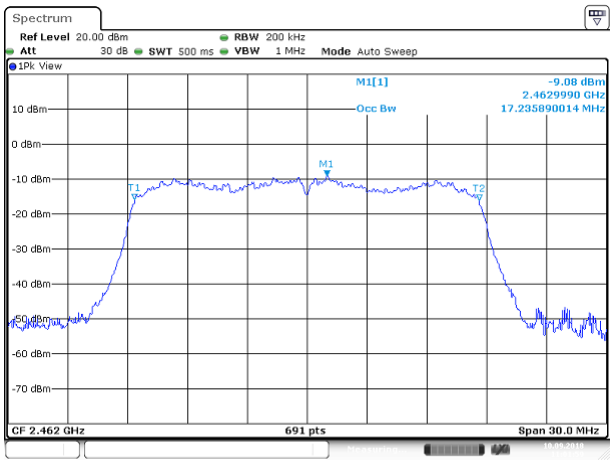
High CH



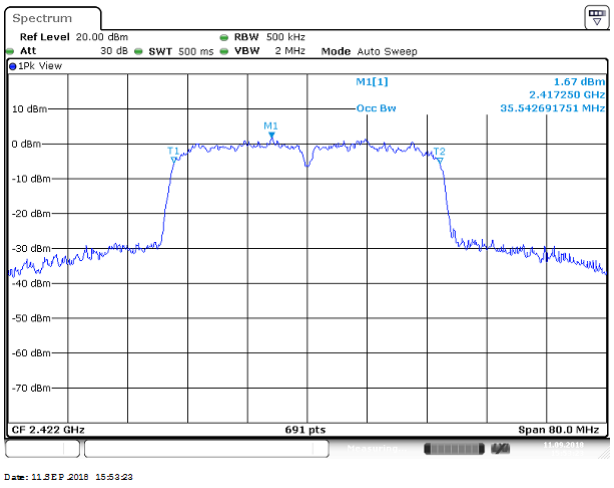
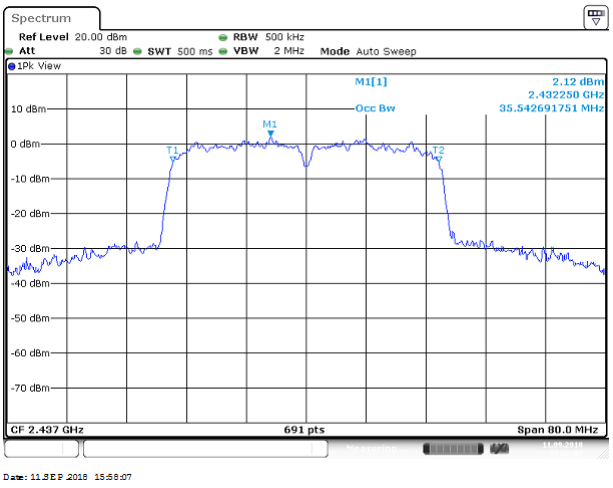
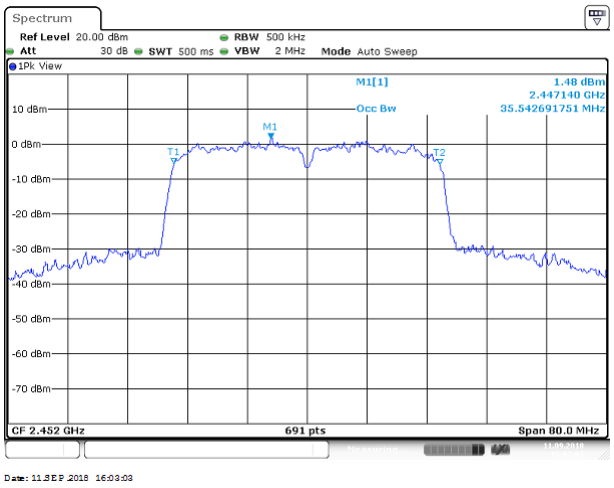
This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11g Mode Chain A	
Low CH	**Mid CH**
	
High CH	
	

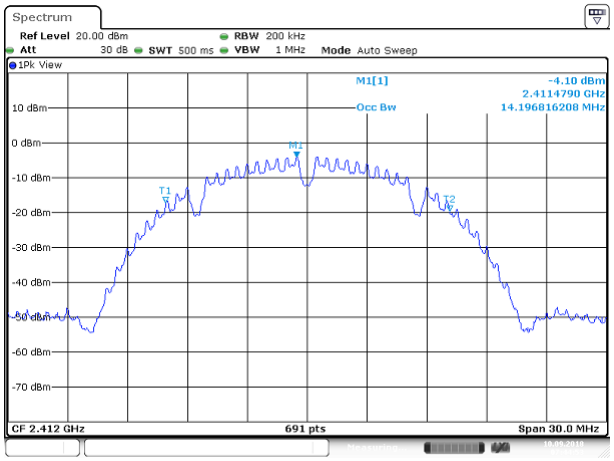
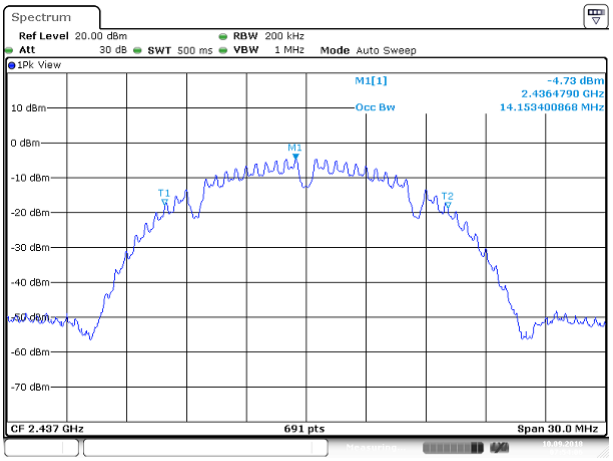
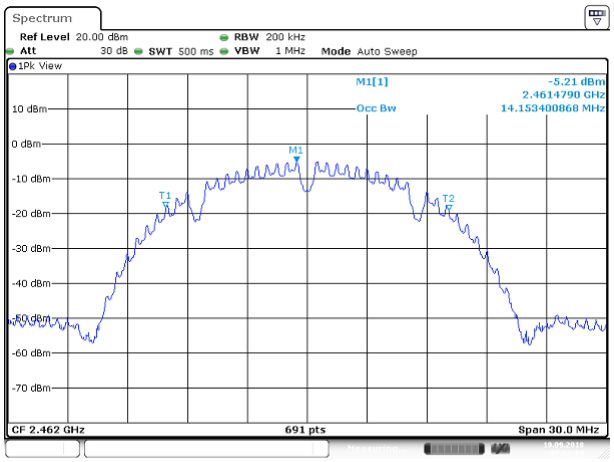
This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11n HT20 Mode Chain A	
Low CH	**Mid CH**
	
High CH	
	

This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11n HT40 Mode Chain A	
Low CH	**Mid CH**
	
High CH	
	

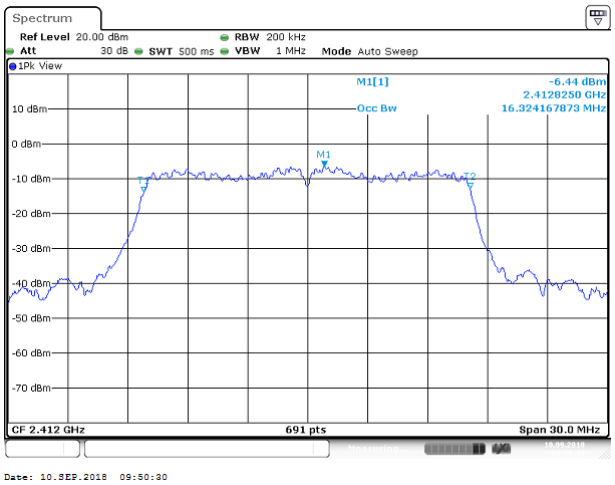
This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11b Mode Chain B	
Low CH	**Mid CH**
	
High CH	
	

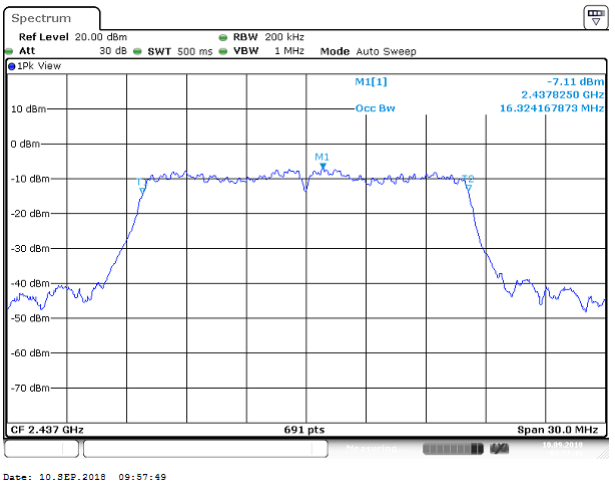
This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11g Mode Chain B

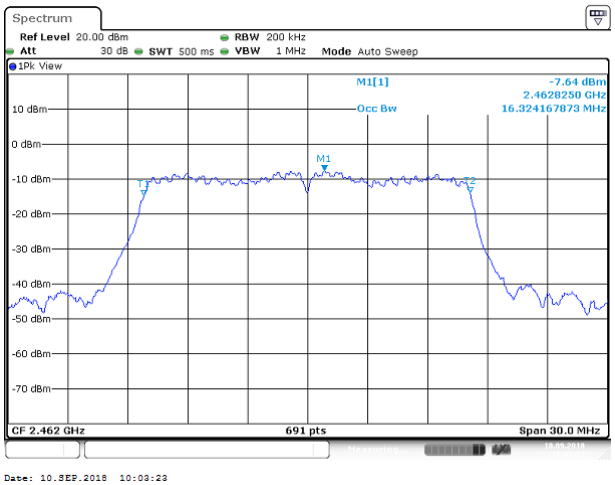
Low CH



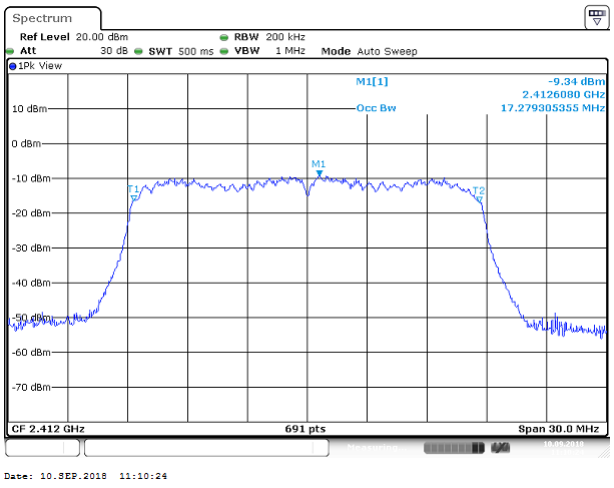
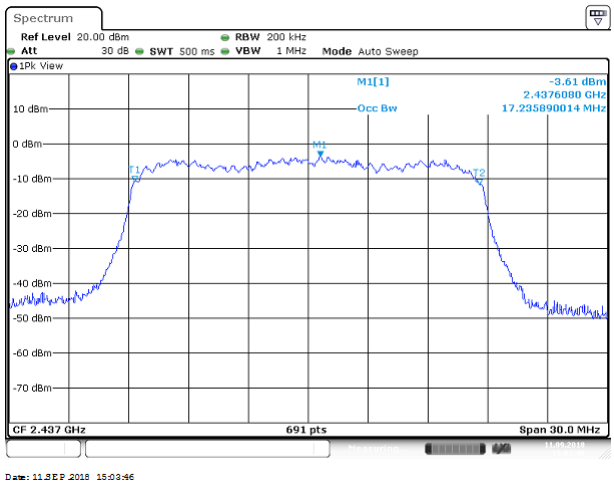
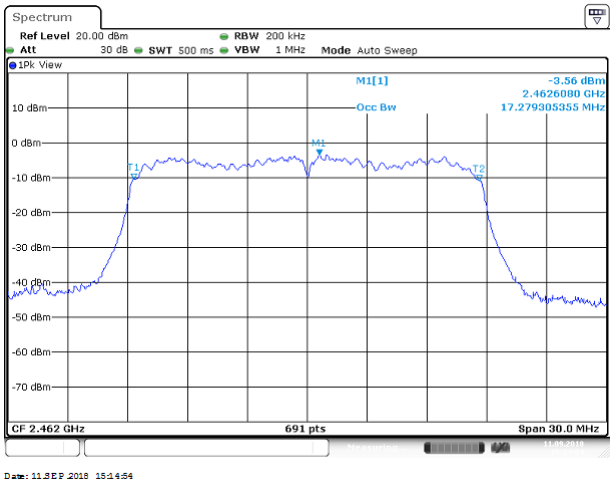
Mid CH



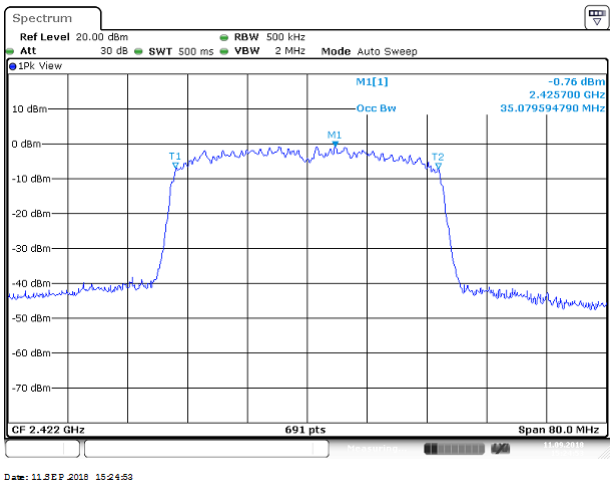
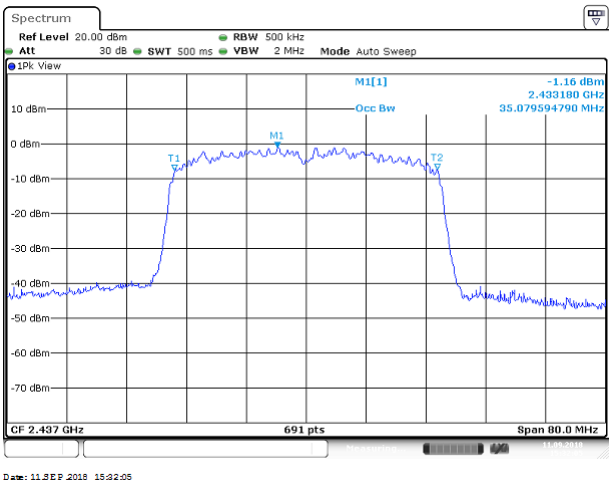
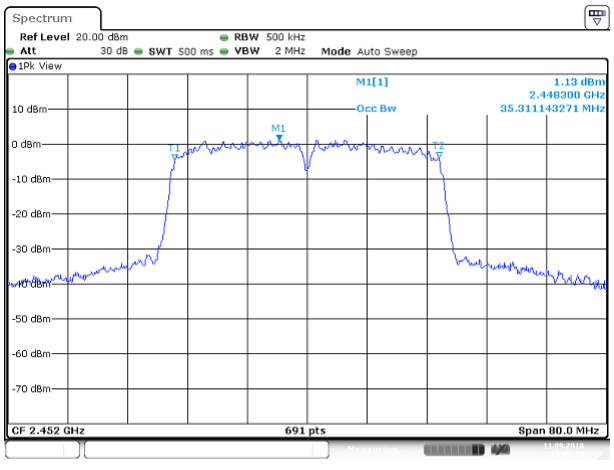
High CH



This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11n HT20 Mode Chain B	
Low CH	**Mid CH**
	
High CH	
	

This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11n HT40 Mode Chain B	
Low CH	**Mid CH**
	
High CH	
	

This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

5.3 OUTPUT POWER MEASUREMENT

5.3.1 Test Limit

According to §15.247(b),

Peak output power：

For systems using digital modulation in the 2400-2483.5 MHz: 1 Watt(30 dBm), base on the use of antennas with directional gain not exceed 6 dBi If transmitting antennas of directional gain greater than 6dBi are used the peak output power the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

Limit	☒ Antenna not exceed 6 dBi：30dBm ☐ Antenna with DG greater than 6 dBi： [Limit = 30 – (DG – 6)] ☐ Point-to-point operation：

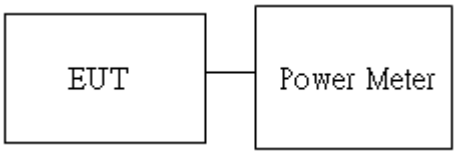
Average output power：For reporting purposes only.

5.3.2 Test Procedure

Test method Refer as KDB 558074 D01.

1. The EUT RF output connected to the power meter by RF cable.
2. Setting maximum power transmit of EUT.
3. The path loss was compensated to the results for each measurement.
4. Measure and record the result of Peak output power and Average output power. in the test report.

5.3.3 Test Setup



This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

5.3.4 Test Result

Peak output power：

Wifi 2.4G							
Config	CH	Freq. (MHz)	power set	PK Power (dBm)	PK Total Power (dBm)	PK Total Power (W)	Limit (dBm)
			chain A	chain A			
IEEE 802.11b Data rate: 1Mbps	Low	2412	16	23.22	23.22	0.2099	30
	Mid	2437	18	23.78	23.78	0.2388	
	High	2462	20	23.97	23.97	0.2495	
IEEE 802.11g Data rate: 6Mbps	Low	2412	27	28.34	28.34	0.6823	
	Mid	2437	30	28.77	28.77	0.7534	
	High	2462	30	28.83	28.83	0.7638	

Wifi 2.4G							
Config	CH	Freq. (MHz)	power set	PK Power (dBm)	PK Total Power (dBm)	PK Total Power (W)	Limit (dBm)
			chain B	chain B			
IEEE 802.11b Data rate: 1Mbps	Low	2412	16	22.99	22.99	0.1991	30
	Mid	2437	18	23.59	23.59	0.2286	
	High	2462	20	23.84	23.84	0.2421	
IEEE 802.11g Data rate: 6Mbps	Low	2412	27	28.35	28.35	0.6839	
	Mid	2437	30	28.96	28.96	0.7870	
	High	2462	30	28.76	28.76	0.7516	

This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

Wifi 2.4G									
Config	CH	Freq. (MHz)	power set		PK Power(dBm)		PK Total Power (dBm)	PK Total Power (W)	Limit (dBm)
			chain A	chain B	chain A	chain B			
IEEE 802.11n HT 20 Data rate: MCS8	Low	2412	25	25	26.43	26.27	29.36	0.8630	30
	Mid	2437	25	25	26.66	25.80	29.26	0.8433	
	High	2462	27	27	26.59	25.48	29.08	0.8091	
IEEE 802.11n HT 40 Data rate: MCS8	Low	2422	20	20	26.08	25.60	28.86	0.7691	
	Mid	2437	27	27	26.31	25.88	29.11	0.8147	
	High	2452	26	26	26.01	25.33	28.69	0.7396	

This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

Average output power：

Chain A:

Wifi 2.4G			
Config	**CH**	**Freq. (MHz)**	**AV Power (dBm)**
IEEE 802.11b Data rate: 1Mbps	Low	2412	20.76
	Mid	2437	21.19
	High	2462	21.27
IEEE 802.11g Data rate: 6Mbps	Low	2412	19.87
	Mid	2437	20.84
	High	2462	20.82

Chain B:

Wifi 2.4G			
Config	**CH**	**Freq. (MHz)**	**AV Power (dBm)**
IEEE 802.11b Data rate: 1Mbps	Low	2412	16.50
	Mid	2437	16.68
	High	2462	15.68
IEEE 802.11g Data rate: 6Mbps	Low	2412	17.63
	Mid	2437	17.96
	High	2462	14.89

Wifi 2.4G					
Config	**CH**	**Freq. (MHz)**	**AV Power (dBm)**	**AV Power (dBm)**	**AV Total Power (dBm)**
			Chain A	**Chain B**	
IEEE 802.11n HT20 Data rate: MCS0	Low	2412	17.61	17.51	20.57
	Mid	2437	17.73	17.01	20.40
	High	2462	17.62	16.85	20.26
IEEE 802.11n HT40 Data rate: MCS0	Low	2422	17.37	16.75	20.08
	Mid	2437	17.71	17.18	20.46
	High	2452	17.55	16.46	20.05

This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

5.4 POWER SPECTRAL DENSITY

5.4.1 Test Limit

According to §15.247(e),

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

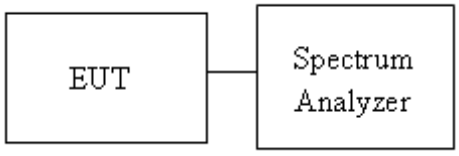
Limit	☒ Antenna not exceed 6 dBi：8dBm ☐ Antenna with DG greater than 6 dBi： [Limit = 8 – (DG – 6)] ☐ Point-to-point operation：

5.4.2 Test Procedure

Test method Refer as KDB 558074 D01

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT
3. SA set RBW = 3kHz, VBW = 30kHz, Span = 1.5 times DTS Bandwidth (6 dB BW), Detector = Peak, Sweep Time = Auto and Trace = Max hold.
4. The path loss and Duty Factor were compensated to the results for each measurement by SA.
5. Mark the maximum level.
6. Measure and record the result of power spectral density. in the test report.

5.4.3 Test Setup



This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

5.4.4 Test Result

Test mode: IEEE 802.11b Mode / 2412-2462 MHz				
Channel	Frequency (MHz)	Chain A PPSD (dBm)	Chain B PPSD (dBm)	Limit (dBm)
Low	2412	-15.87	-15.87	8
Mid	2437	-16.48	-16.45	
High	2462	-16.63	-16.83	

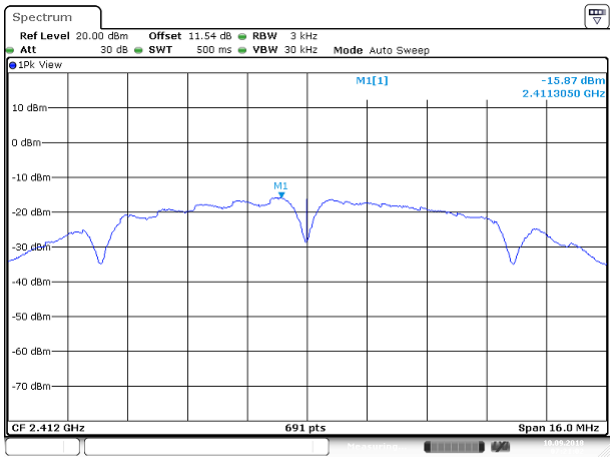
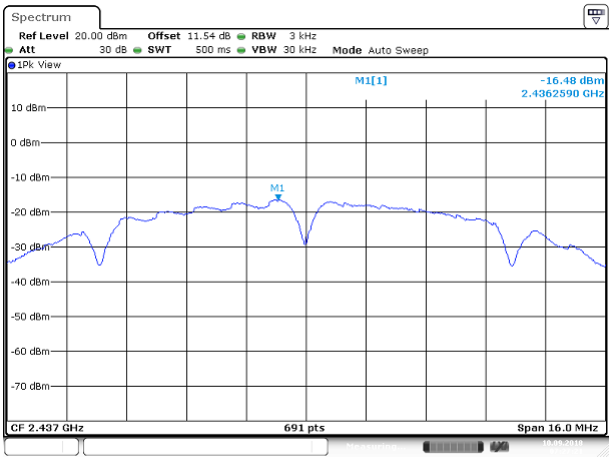
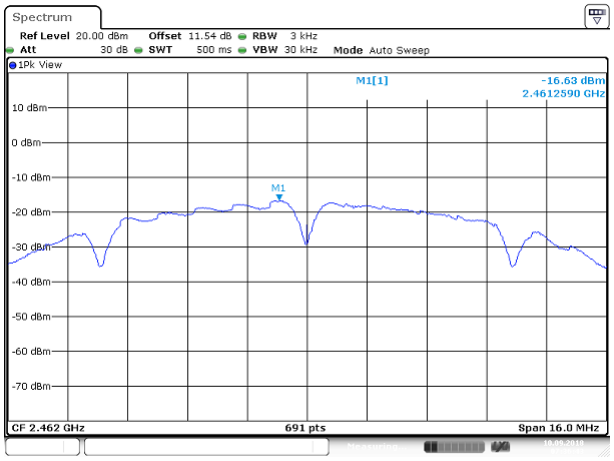
Test mode: IEEE 802.11g Mode / 2412-2462 MHz				
Channel	Frequency (MHz)	Chain A PPSD (dBm)	Chain B PPSD (dBm)	Limit (dBm)
Low	2412	-14.99	-16.23	8
Mid	2437	-15.76	-15.92	
High	2462	-15.80	-15.88	

Test mode: IEEE 802.11n HT20 Mode / 2412-2462 MHz					
Channel	Frequency (MHz)	Chain A PPSD (dBm)	Chain B PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)
Low	2412	-15.60	-16.15	-12.86	8
Mid	2437	-16.10	-15.54	-12.80	
High	2462	-14.86	-16.10	-12.43	

Test mode: IEEE 802.11n HT40 Mode / 2422-2452 MHz					
Channel	Frequency (MHz)	Chain A PPSD (dBm)	Chain B PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)
Low	2422	-19.41	-19.22	-16.30	8
Mid	2437	-15.83	-15.47	-12.64	
High	2452	-16.91	-16.29	-13.58	

This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

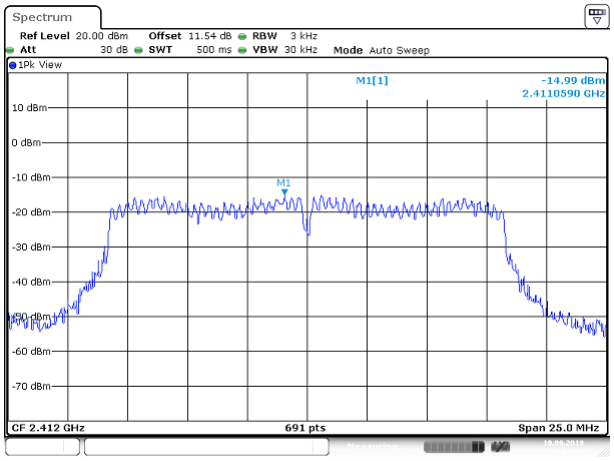
Test Data

IEEE 802.11b Mode Chain A	
Low CH	**Mid CH**
	
High CH	
	

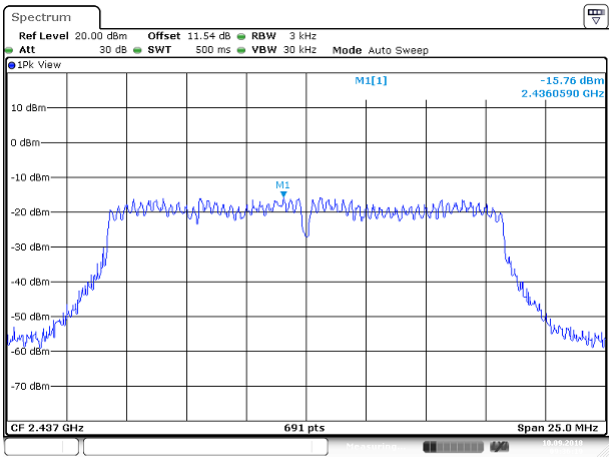
This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11g Mode Chain A

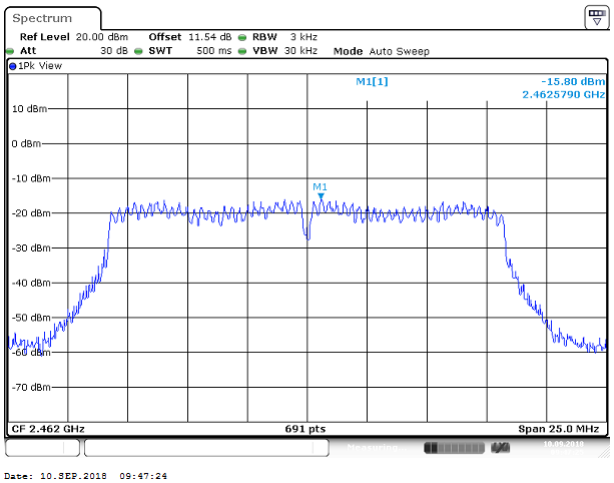
Low CH



Mid CH



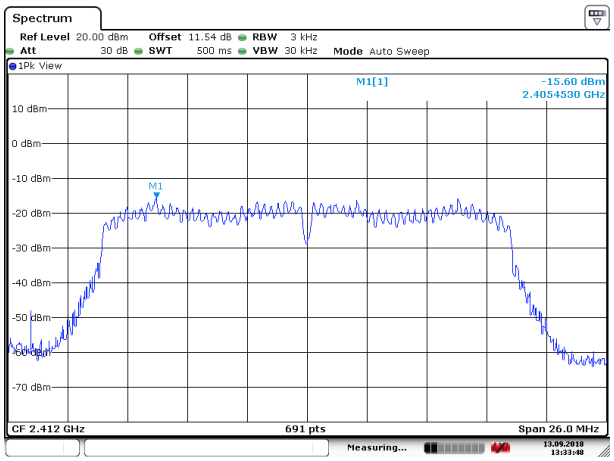
High CH



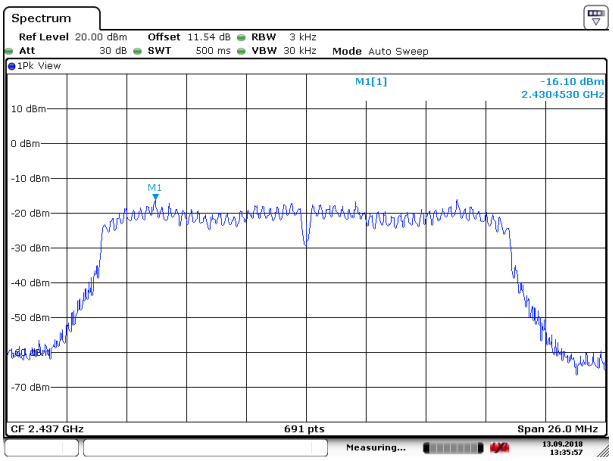
This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11n HT20 Mode Chain A

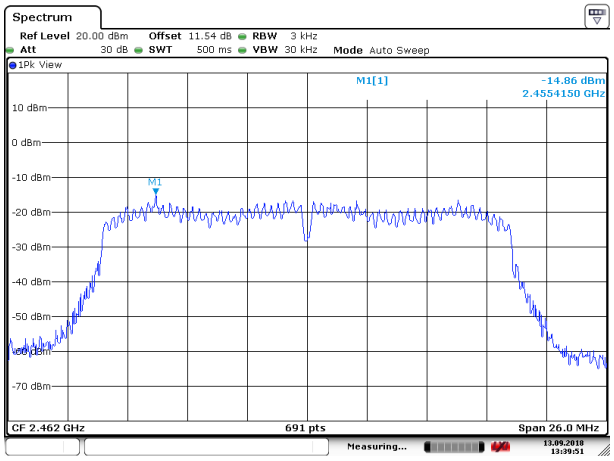
Low CH



Mid CH



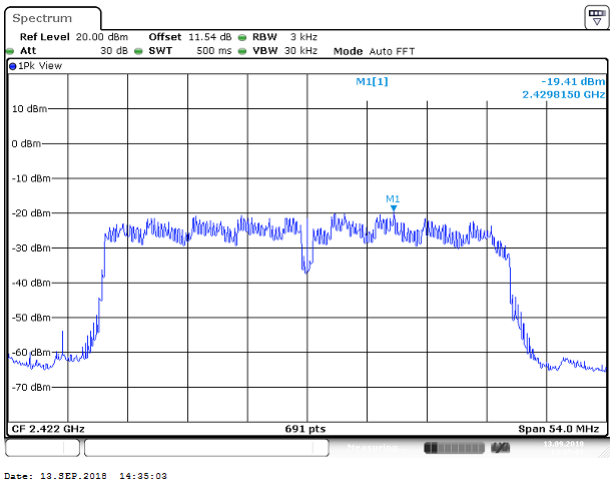
High CH



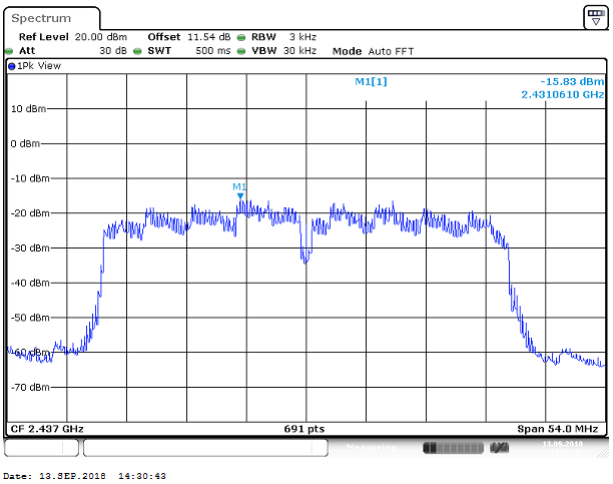
This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11n HT40 Mode Chain A

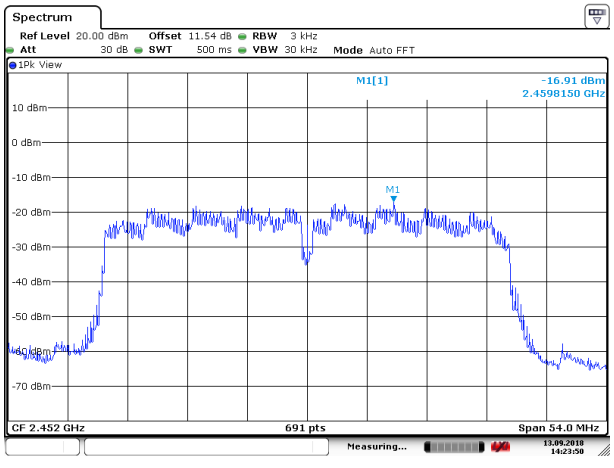
Low CH



Mid CH



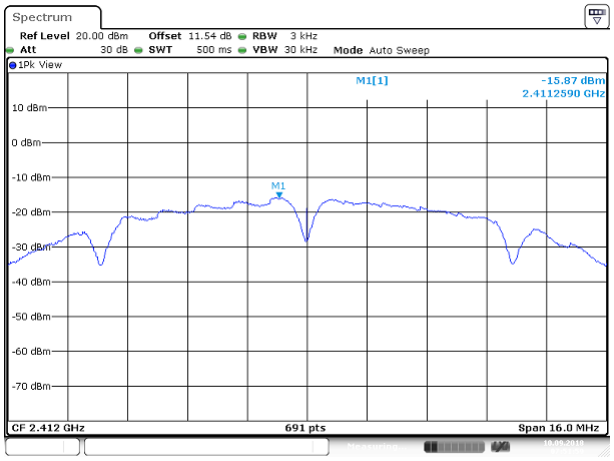
High CH



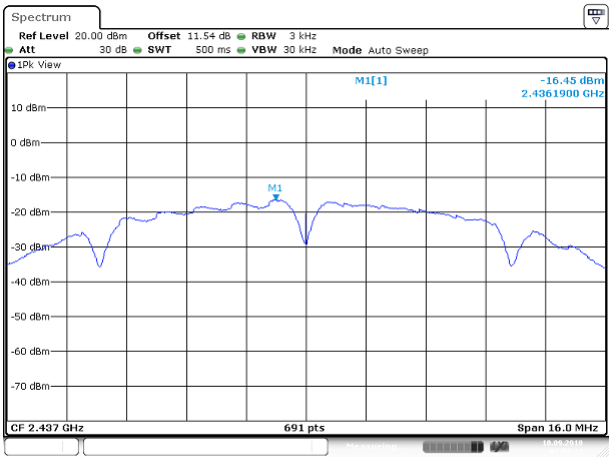
This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11b Mode Chain B

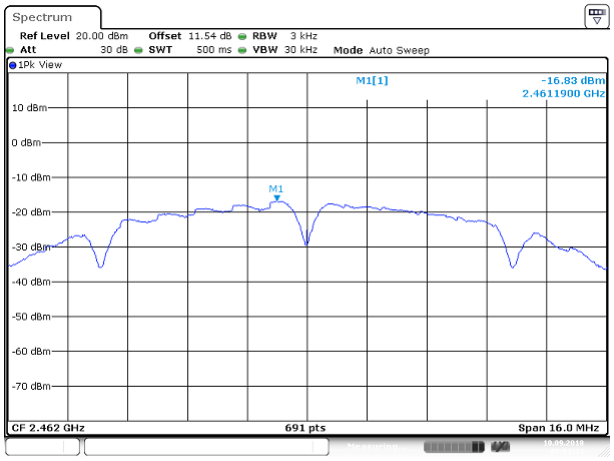
Low CH



Mid CH



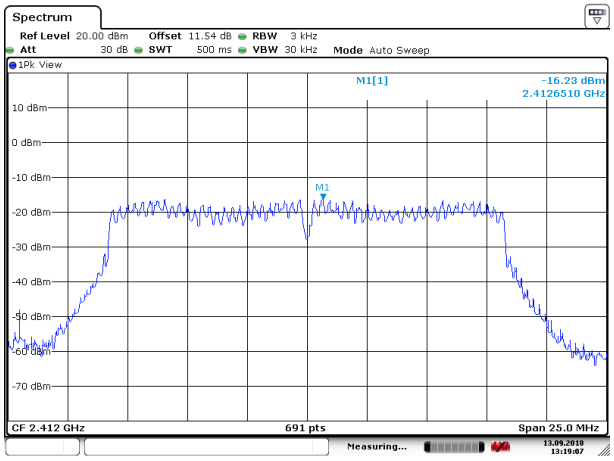
High CH



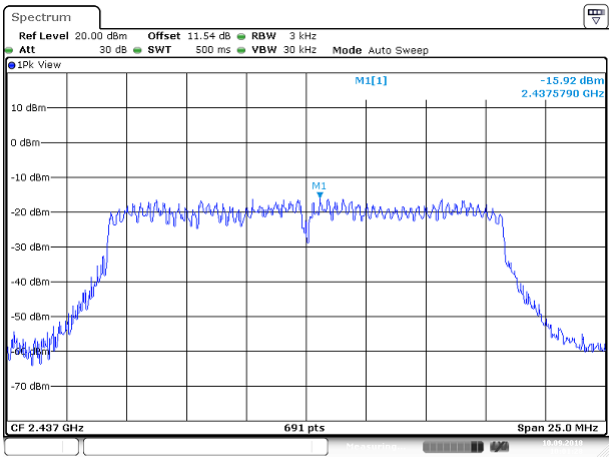
This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11g Mode Chain B

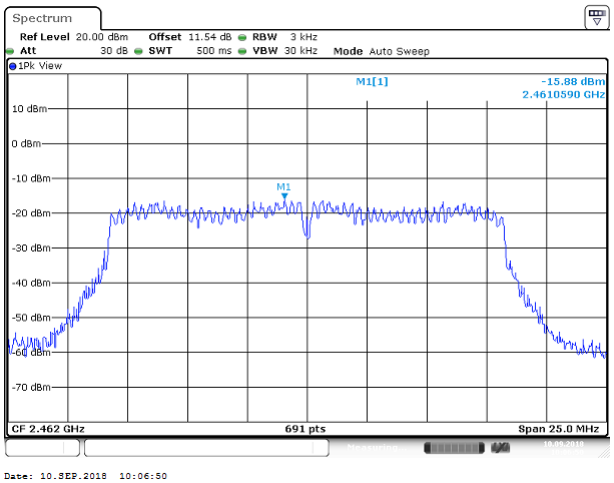
Low CH



Mid CH



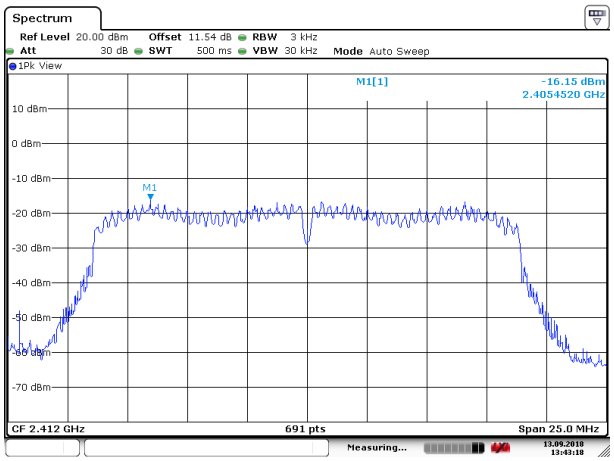
High CH



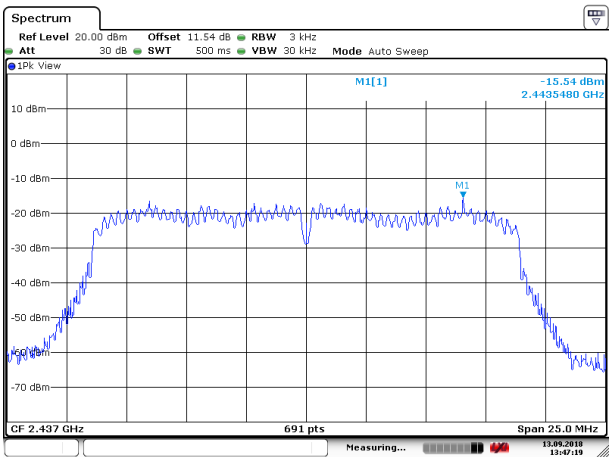
This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11n HT20 Mode Chain B

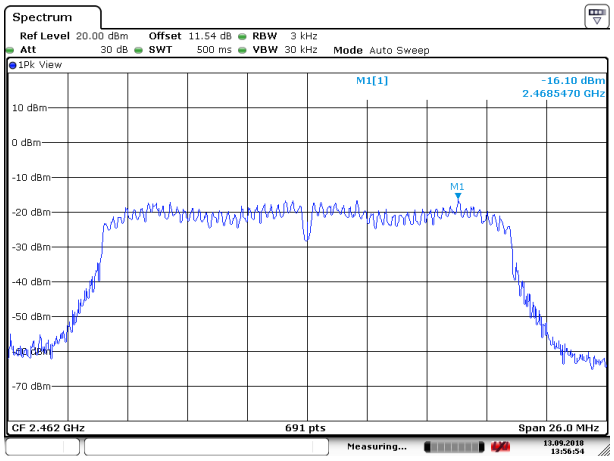
Low CH



Mid CH



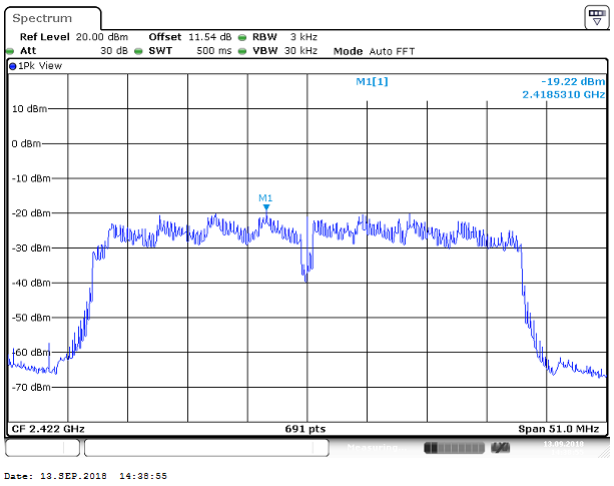
High CH



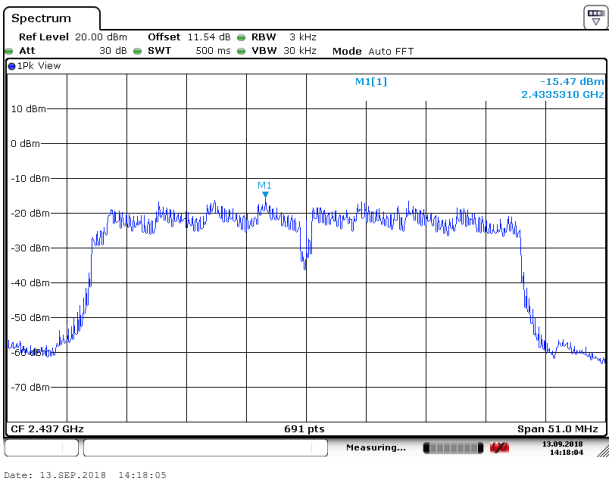
This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11n HT40 Mode Chain B

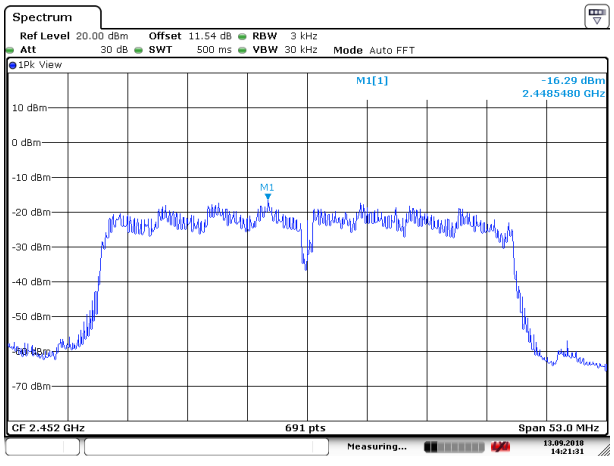
Low CH



Mid CH



High CH



This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

5.5 CONDUCTED BANDEDGE AND SPURIOUS EMISSION

5.5.1 Test Limit

According to §15.247(d)

In any 100 kHz bandwidth outside the authorized frequency band,

Non-restricted bands shall be attenuated at least 20 dB/30 dB relative to the maximum PSD level in 100 kHz by RF conducted or a radiated measurement 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).

5.5.2 Test Procedure

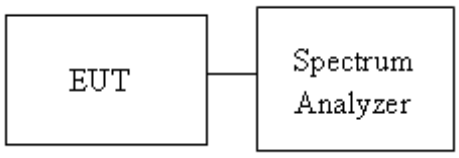
Test method Refer as, KDB 558074 D01.

1. EUT RF output port connected to the SA by RF cable, and the path loss was compensated to result.

2. SA setting, RBW=100kHz, VBW=300kHz, Detector=Peak, Trace mode = max hold, SWT = Auto.

3. In any 100 kHz bandwidth outside the authorized frequency band, shall be attenuated at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when conducted power procedure is used. f the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

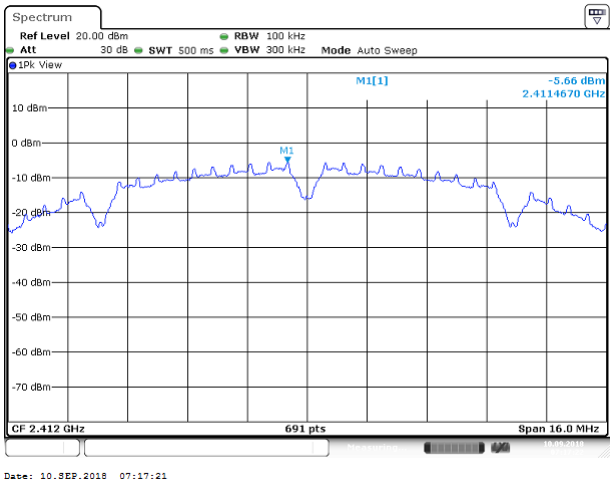
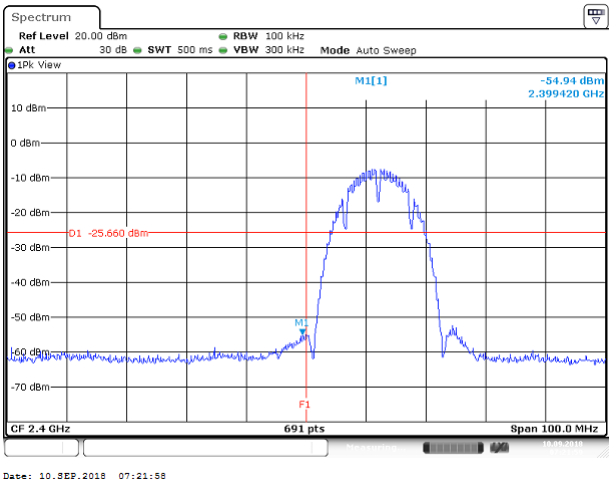
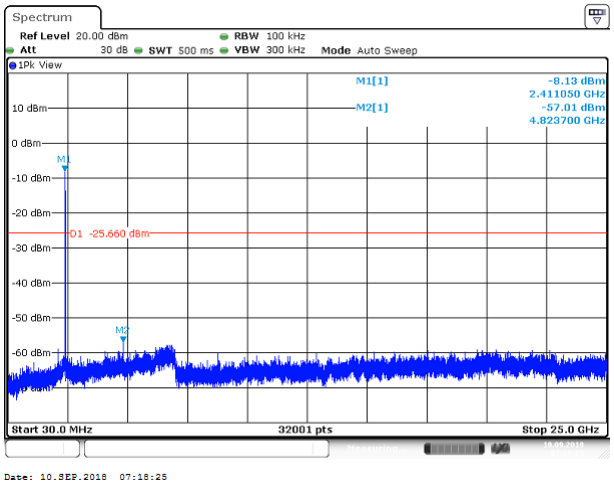
5.5.3 Test Setup



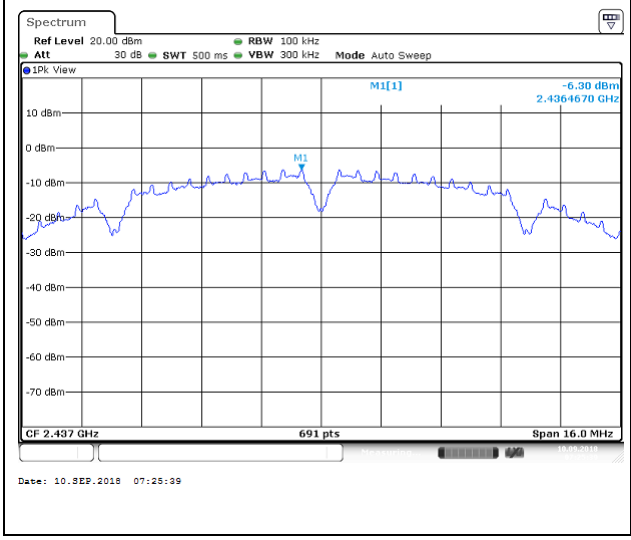
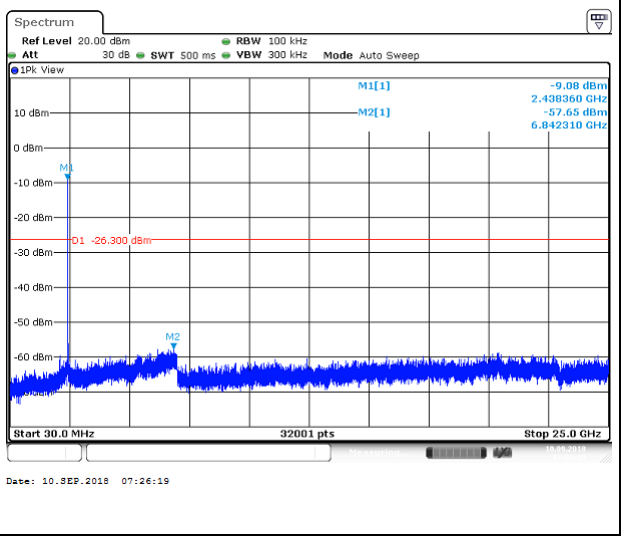
This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

5.5.4 Test Result

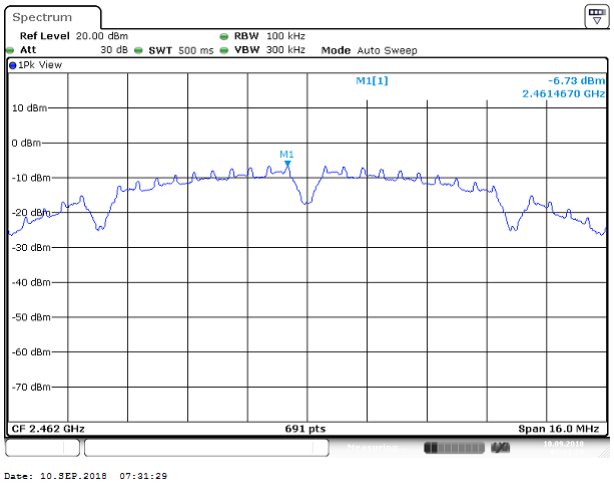
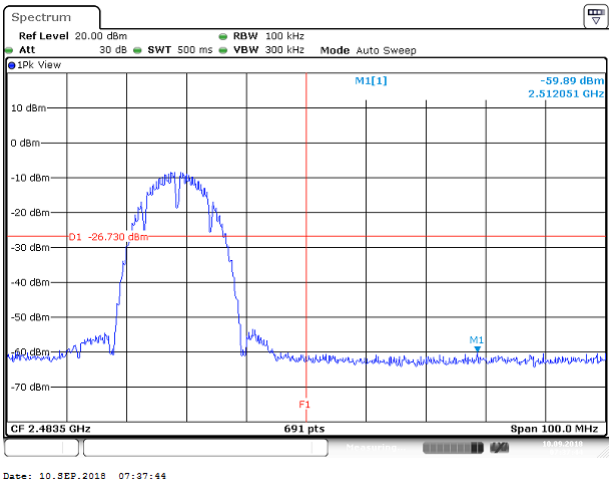
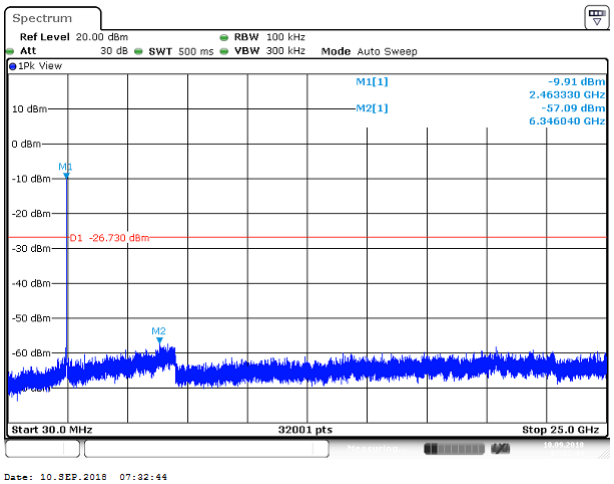
Test Data

IEEE 802.11b Mode Low CH (Chain A)	
Reference Level of PSD in 100kHz	**Band Edge**
	
Spurious Emission 30MHz-25GHz	
	

This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11b Mode Mid CH (Chain A)	
Reference Level of PSD in 100kHz	**Spurious Emission 30MHz-25GHz**
	

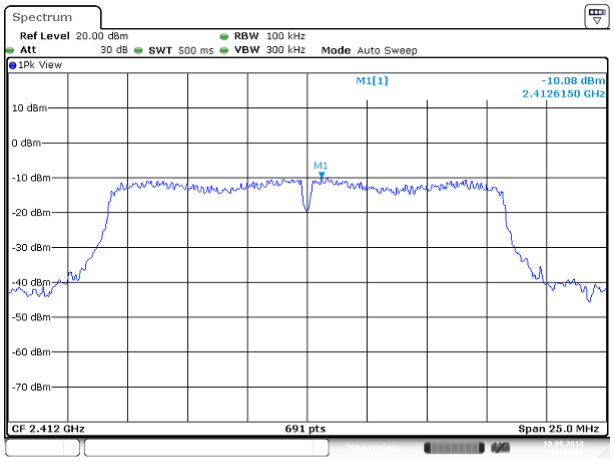
This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11b Mode High CH (Chain A)	
Reference Level of PSD in 100kHz	**Band Edge**
	
Spurious Emission 30MHz-25GHz	
	

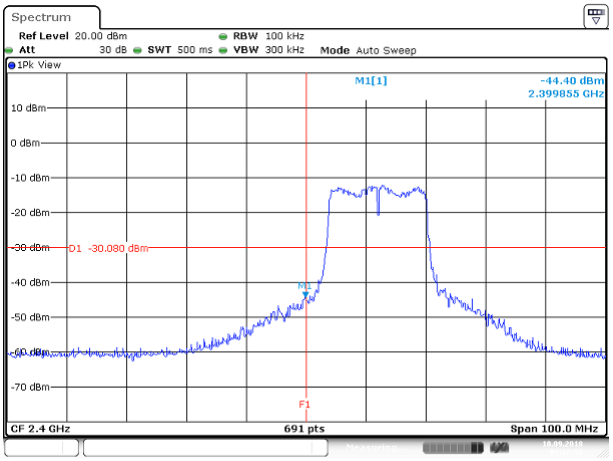
This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11g Mode Low CH (Chain A)

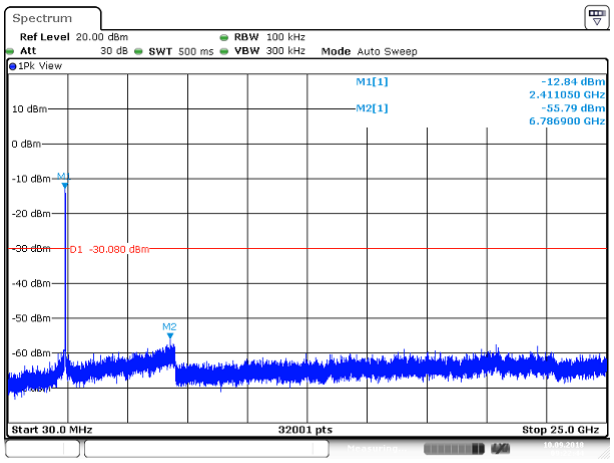
Reference Level of PSD in 100kHz



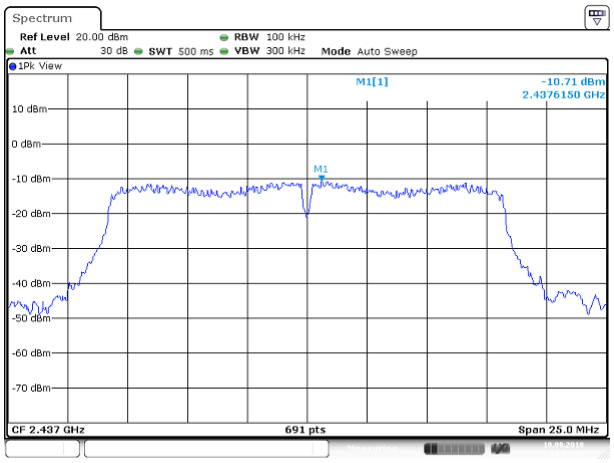
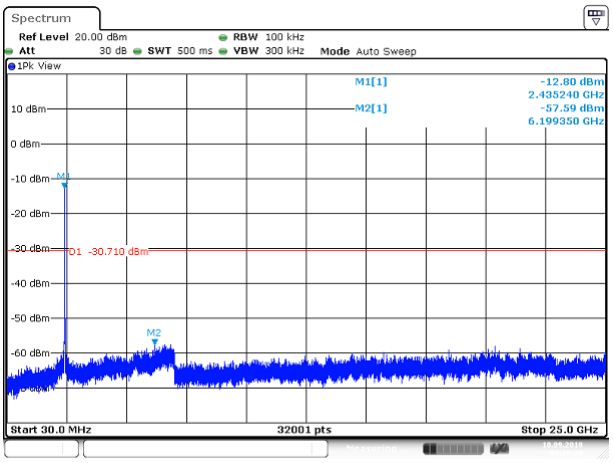
Band Edge



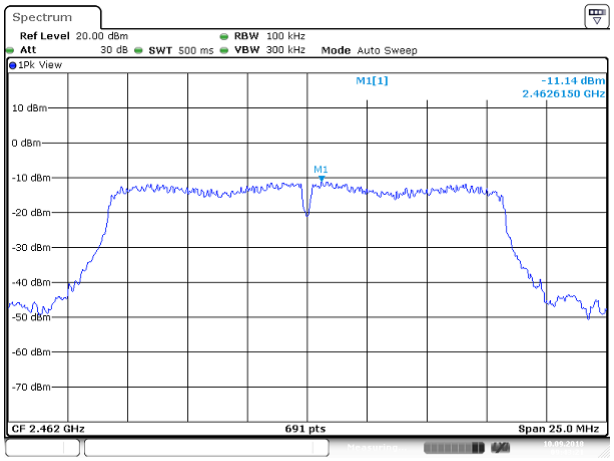
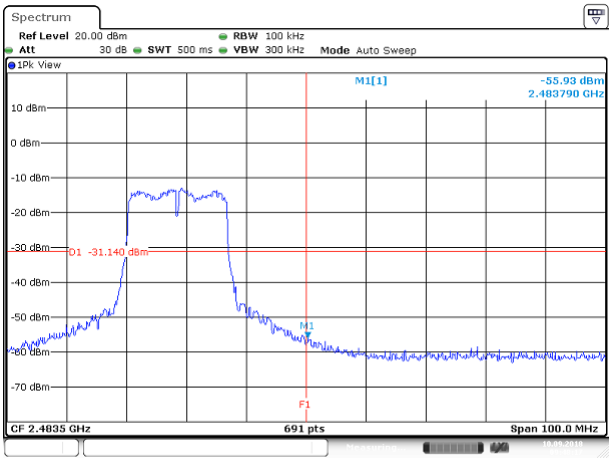
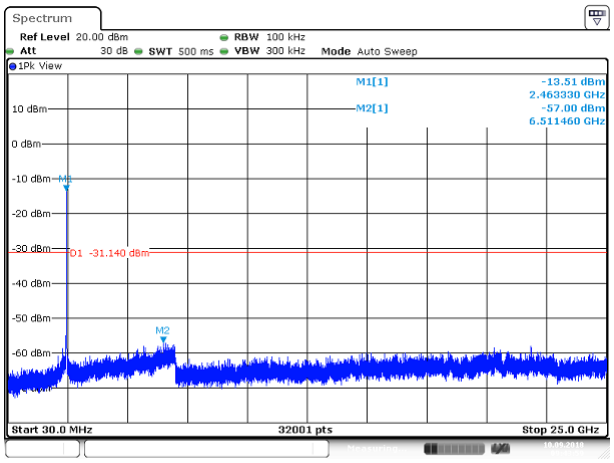
Spurious Emission 30MHz-25GHz



This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11g Mode Mid CH (Chain A)	
Reference Level of PSD in 100kHz	**Spurious Emission 30MHz-25GHz**
	

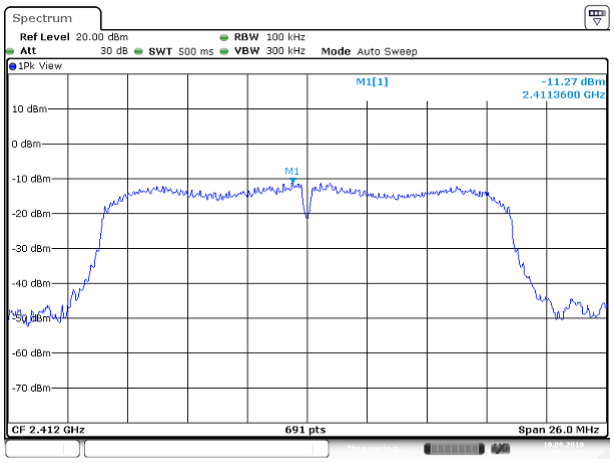
This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11g Mode High CH (Chain A)	
Reference Level of PSD in 100kHz	**Band Edge**
	
Spurious Emission 30MHz-25GHz	
	

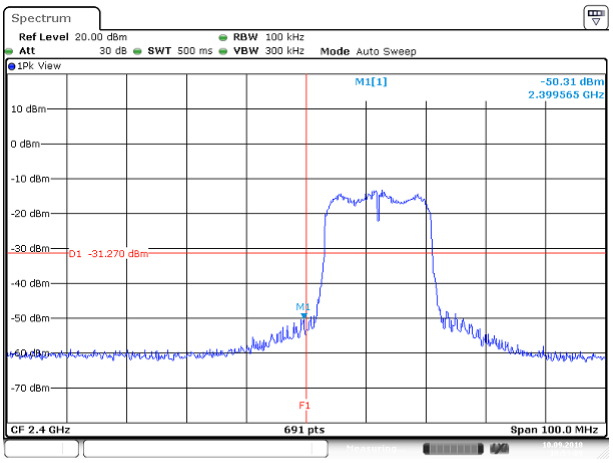
This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11 n HT20 Mode Low CH (Chain A)

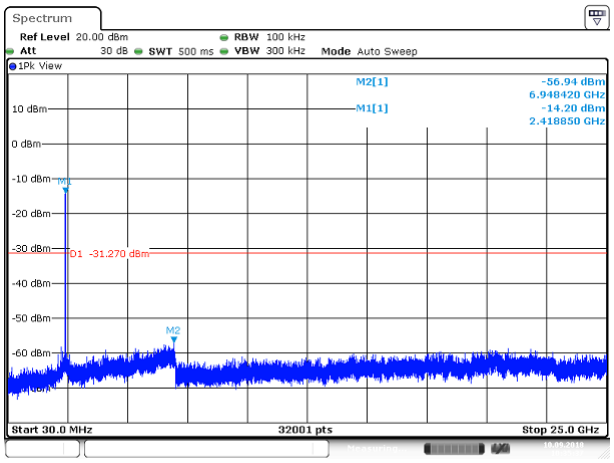
Reference Level of PSD in 100kHz



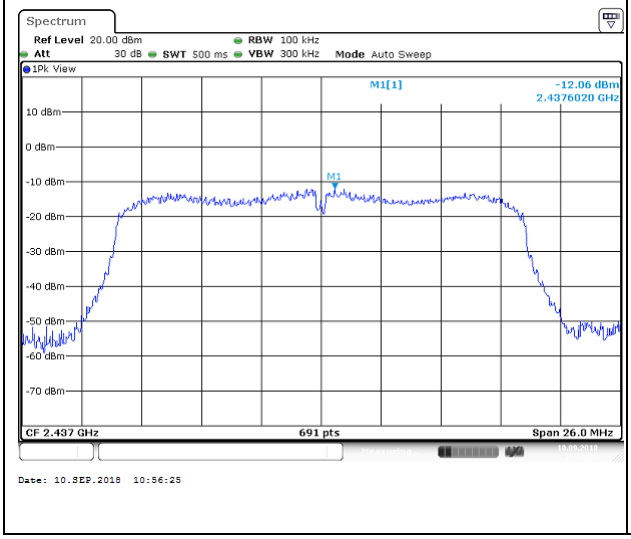
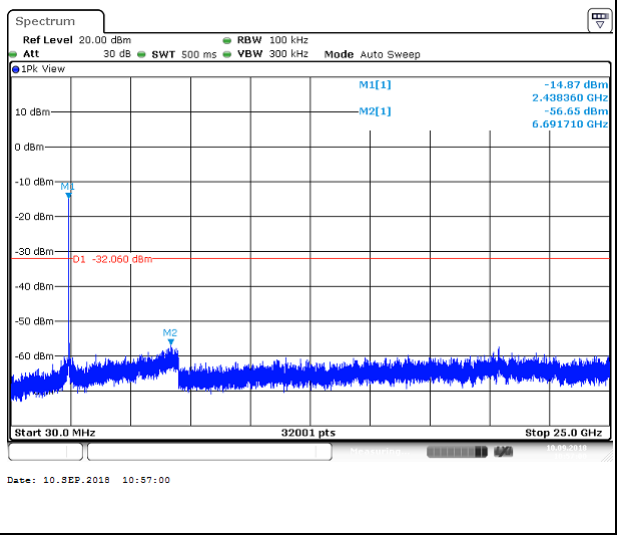
Band Edge



Spurious Emission 30MHz-25GHz



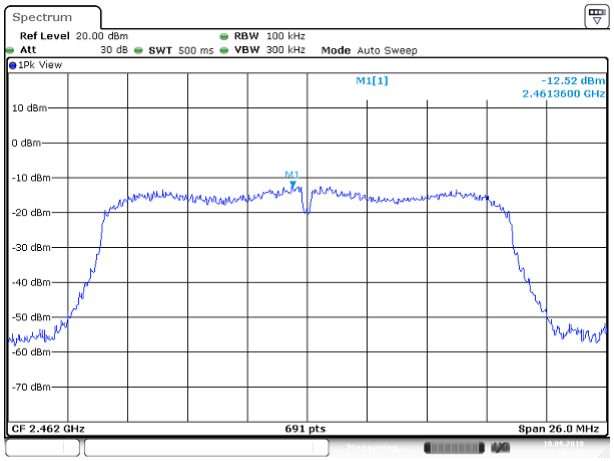
This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11 n HT20 Mode Mid CH (Chain A)	
Reference Level of PSD in 100kHz	**Spurious Emission 30MHz-25GHz**
	

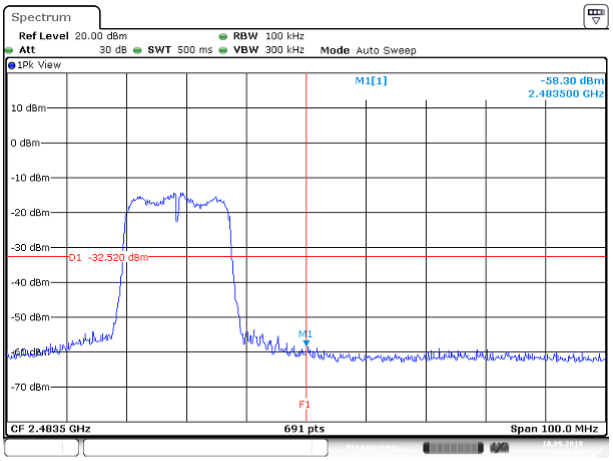
This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11n HT20 Mode High CH (Chain A)

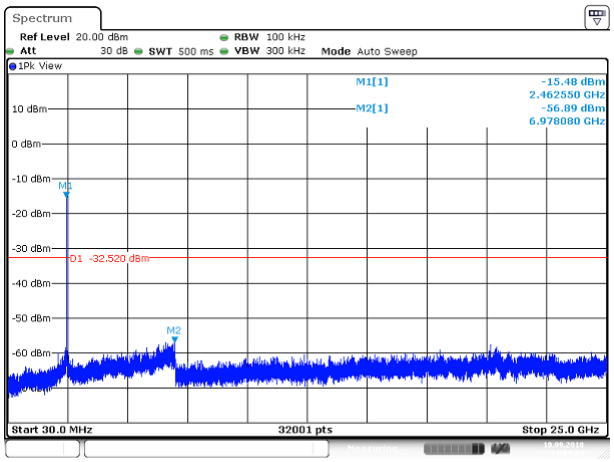
Reference Level of PSD in 100kHz



Band Edge



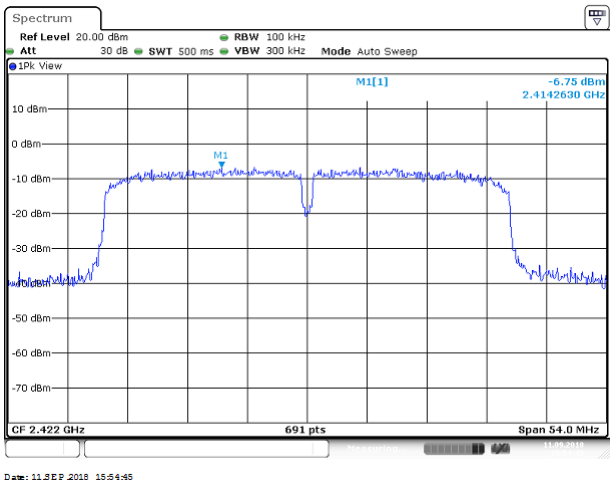
Spurious Emission 30MHz-25GHz



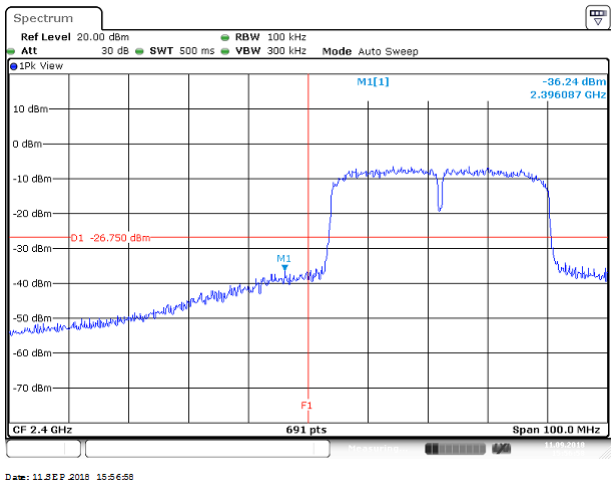
This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11 n HT40 Mode Low CH (Chain A)

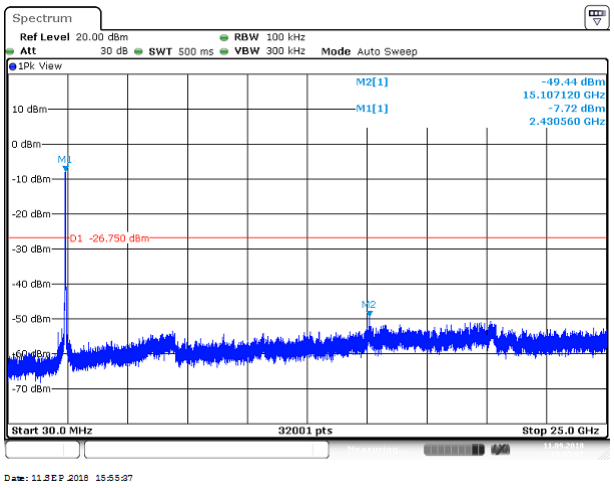
Reference Level of PSD in 100kHz



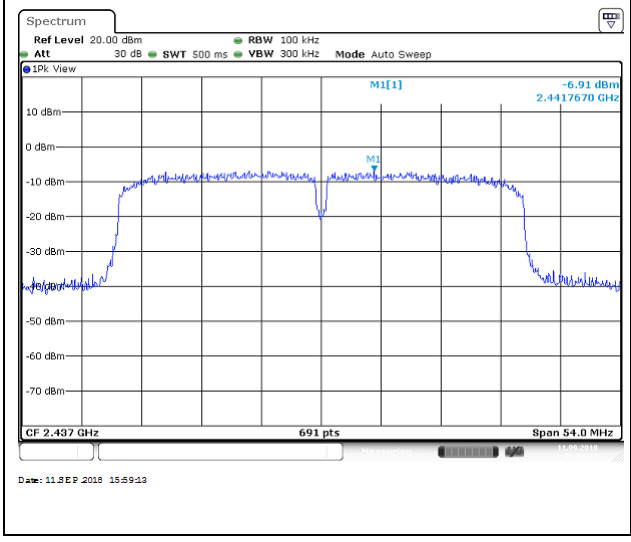
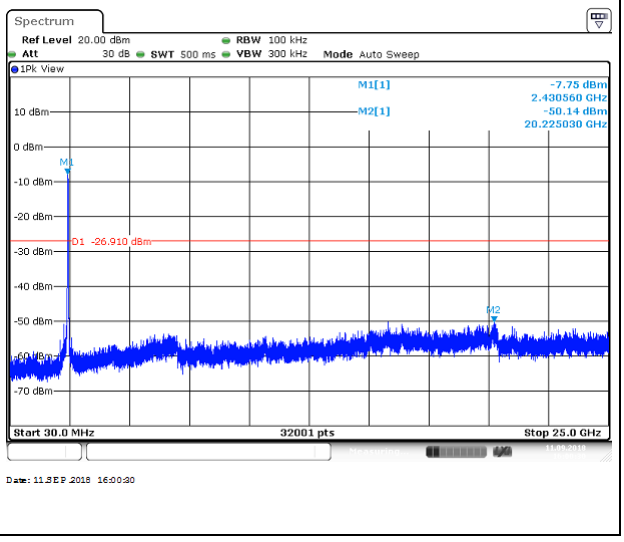
Band Edge



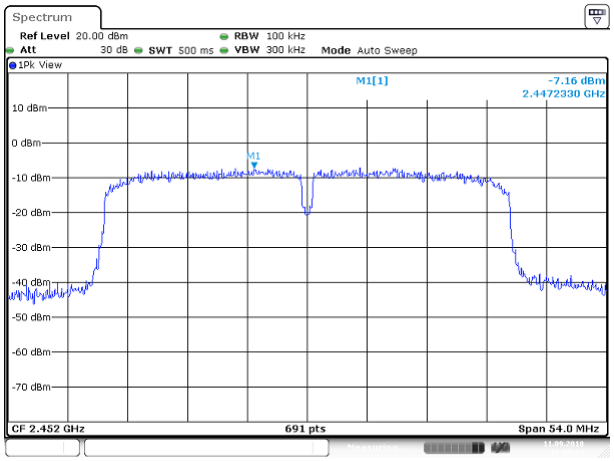
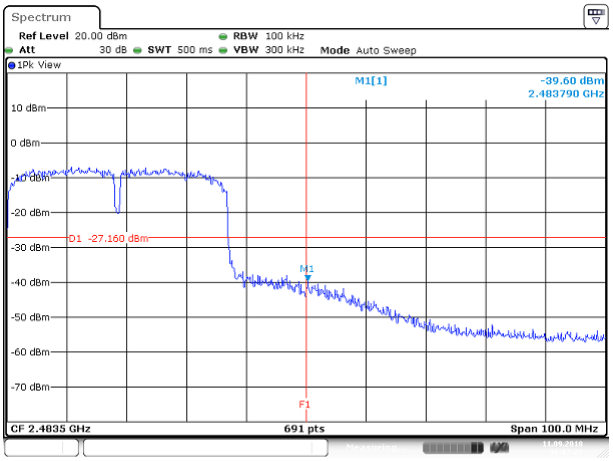
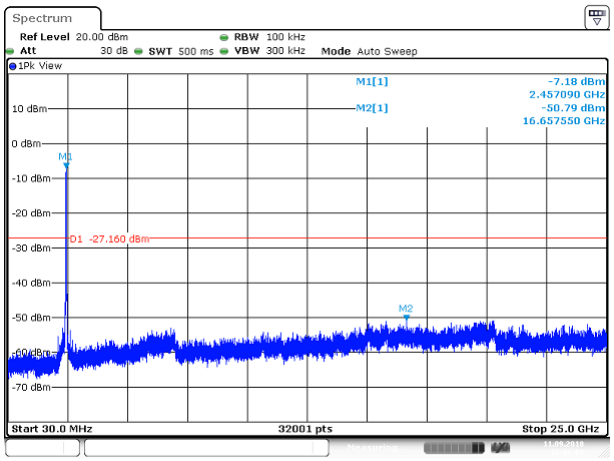
Spurious Emission 30MHz-25GHz



This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11 n HT40 Mode Mid CH (Chain A)	
Reference Level of PSD in 100kHz	**Spurious Emission 30MHz-25GHz**
	

This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。

IEEE 802.11n HT40 Mode High CH (Chain A)	
Reference Level of PSD in 100kHz	**Band Edge**
	
Spurious Emission 30MHz-25GHz	
	

This document cannot be reproduced except in full, without prior written approval of the Company. 本報告未經本公司書面許可，不可部份複製。