

Page: 1 of 287

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART E AND INDUSTRY CANADA RSS 247 REQUIREMENT

FCC Applicant: Murata Manufacturing Co., Ltd.

10-1, Higashikotari 1-chome, Nagaokakyo-shi, Kyoto 617-8555

Japan

IC Applicant: Murata Manufacturing Co., Ltd.

10-1, Higashikotari 1-chome, Nagaokakyo-shi, Kyoto 617-8555

Japan

Product Name: Communication Module

Brand Name: MURATA

Model No.: LBEQ6ZZ1PN

Model Difference: N/A

FCC ID: VPYLB1PN IC: 772C-LB1PN **Report Number:** ER/2018/80101

FCC Rule Part: §15.407, Cat:NII

IC Rule: RSS-247 issue 2 Feb. 2017

Oct. 18, 2018 **Issue Date:**

Date of Test: Aug. 28, 2018 ~ Oct. 01, 2018

Date of EUT Received: Aug. 22, 2018

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

The test results of this report relate only to the tested sample identified in this report.

Tested By:

HUN CHIEH CHEN / Asst. Supervisor

Approved By:

Jim Chang / Manager





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

Manage of the Company Subject to its General Conditions of Service printed overleaf, available on request or accessible at <u>www.sqs.com/terms_and_conditions.htm</u> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sqs.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.

SGS Taiwan Ltd.

| No.134,WuKungRoad,NewTaipeiIndustrialPark,WukuDistrict,NewTaipeiCity,Taiwan24803/新北市五股區新北產業園區五工路 134 號



Page: 2 of 287

Revision History

Report Number	Revision	Description	Effected Page	Issue Date	Revised By
ER/2018/80101	Rev.00	Initial creation of docu- ment	All	Oct. 18, 2018	Elle Chang

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.

Unless otherwise stated the results snown in this test report reter only to the sample(s) tested and such sample(s) not sample(s) tested and such sample(s) tested and sample(s) tested and such sample(s) tested and sample(s) te may be prosecuted to the fullest extent of the law.

SGS Taiwan Ltd. No.134, WuKung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路 134 號

t (886-2) 2299-3279

f (886-2) 2298-0488



Page: 3 of 287

Contents

1	GENERAL INFORMATION	4
2	SYSTEM TEST CONFIGURATION	8
3	SUMMARY OF TEST RESULT	10
4	DESCRIPTION OF TEST MODES	11
5	MEASUREMENT UNCERTAINTY	17
6	CONDUCTED EMISSION TEST	18
7	DUTY CYCLE TEST SIGNAL	22
8	26dB & 6dB EMISSION BANDWIDTH MEASUREMENT	26
9	MAXIMUM CONDUCTED OUTPUT POWER MEASUREMENT	60
10	MAXIMUM POWER SPECTRAL DENSITY	71
11	UNDESIRABLE RADIATED EMISSION MEASUREMENT	84
12	TRANSMISSION IN THE ABSENCE OF DATA	256
13	FREQUENCY STABILITY	257
14	ANTENNA REQUIREMENT	287

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,同時此樣品僅保留卯天。本報告未經本公司書面許可,不可部份複製。

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 <a href="www.sgs.com/terms and <a may be prosecuted to the fullest extent of the law.

SGS Taiwan Ltd. No.134, WuKungRoad, NewTaipeilndustrialPark, WukuDistrict, NewTaipeiCity, Taiwan 24803/新北市五股區新北產業園區五工路 134 號



Page: 4 of 287

GENERAL INFORMATION

1.1 Product Description

General:

Product Name:	Communication Module
Brand Name:	MURATA
Model No.:	LBEQ6ZZ1PN
Model Difference:	N/A
Hardware version:	N/A
Software version:	N/A
Power Supply:	Typ. 3.3V, Min 3.0V, Max 3.6V from DC power supply

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.

Unless otherwise stated the results snown in this test report reter only to the sample(s) tested and such sample(s) are retained for 90 days only.
Personal Results snown in this test report reter only to the sample(s) tested and such sample(s) are retained for 90 days only.
Personal Results are retained for 90 days only.
Pers may be prosecuted to the fullest extent of the law.

SGS Taiwan Ltd. No.134, WuKungRoad, NewTaipeilndustrialPark, WukuDistrict, NewTaipeiCity, Taiwan 24803/新北市五股區新北產業園區五工路 134 號



Page: 5 of 287

FCC WLAN 5GHz:

Wi-Fi	Frequency Range	Channels	Avg. Power (dBm)	Modulation Technology
	5150~5250	4	12.48	
11- 20	5250~5350	4	12.51	OFDM
11a_20	5470~5725	12	12.35	OFDM
	5725-5850	5	12.42	
	5150~5250	4	HT: 15.83	
11n_HT /	5250~5350	4	HT: 15.63	OFDM
ac_VHT 20M	5470~5725	12	HT: 15.40	OFDIVI
	5725-5850	5	HT: 15.32	
	5150~5250	2	HT: 15.64	
11n_HT / ac_VHT 40M	5250~5350	2	HT: 15.49	OFDM
	5470~5725	6	HT: 15.63	
	5725-5850	2	HT: 15.30	
	5150~5250	1	10.38	
11ac	5250~5350	1	10.56	OEDM
VHT80M	5470~5725	2	12.44	OFDM
	5725-5850	1	12.26	
Antenna Designation:		Model No.: G 5150~5250M 5250~5350M 5470~5725M	na, Supplier: Taoglas W.59.3153 Hz Peak Gain: 2.93dl Hz Peak Gain: 2.93dl Hz Peak Gain: 2.93dl Hz Peak Gain: 2.93dl	3i 3i

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,同時此樣品僅保留卯天。本報告未經本公司書面許可,不可部份複製。

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 prospected to the fullest extent of the law. may be prosecuted to the fullest extent of the law.

SGS Taiwan Ltd. No.134, WuKungRoad, NewTaipeilndustrialPark, WukuDistrict, NewTaipeiCity, Taiwan 24803/新北市五股區新北產業園區五工路 134 號

t (886-2) 2299-3279



Page: 6 of 287

IC WLAN 5GHz:

AN SUNZ:					
Wi-Fi	Frequency Range	Channels	Avg. or EIRP	Rated Power(dBm) (Worst Case)	Modulation Technology
	5150~5250	4	EIRP	15.41	
11a	5250~5350	4	Avg.	12.51	OFDM
Па	5470~5725	12	Avg.	12.35	OFDIN
	5725-5850	5	Avg.	12.42	
	5150~5250	4	EIRP	HT: 21.77	
11n_HT / ac VHT	5250~5350	4	Avg.	HT: 15.63	OFDM
20M	5470~5725	12	Avg.	HT: 15.40	OFDIVI
	5725-5850	5	Avg.	HT: 15.32	
	5150~5250	2	EIRP	HT: 21.58	OFDM
11n_HT / ac_VHT 40M	5250~5350	2	Avg.	HT: 15.49	
	5470~5725	6	Avg.	HT: 15.63	
	5725-5850	2	Avg.	HT: 15.30	
	5150~5250	1	EIRP	16.32	
11ac	5250~5350	1	Avg.	10.56	OFDM
VHT80M	5470~5725	2	Avg.	12.44	OFDIVI
	5725-5850	1	Avg.	12.26	
Modulation type				PSK, BPSK for OFDM in 802.11ac only	
Transition Rate:		802.11 n_ 802.11 n_ 802.11 ac 802.11 ac	20MHz: 6. 40MHz: 13 220MHz: 6 240MHz: 6	24/36/48/54 Mbps 5 – 144.4Mbps 3.5 - 300.0Mbps 6.5 –173.3Mbps 13.5 – 400 .0Mbps 29.3 – 866.7Mbps	

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,同時此樣品僅保留卯天。本報告未經本公司書面許可,不可部份複製。

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 prospected to the fullest extent of the law. may be prosecuted to the fullest extent of the law.

SGS Taiwan Ltd. No.134, WuKungRoad, NewTaipeilndustrialPark, WukuDistrict, NewTaipeiCity, Taiwan 24803/新北市五股區新北產業園區五工路 134 號



Page: 7 of 287

1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart E §15.407

FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

RSS-247 issue 2 Feb. 2017

RSS-Gen. issue 5 Apr. 2018

ANSI C63.10:2013

Note: All test items have been performed and record as per the above standards.

1.3 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803. (TAF code 0513)

FCC Registration Numbers are: 509634 / TW0001

Canada Registration Number: 4620A-4

1.4 Special Accessories

There are no special accessories used while test was conducted.

1.5 Equipment Modifications

There was no modification incorporated into the EUT.

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.

t (886-2) 2299-3279

documents, subject to Terms and Conditions for Electronic Documents at www.sqs.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.

SGS Taiwan Ltd. No.134, WuKungRoad, NewTaipeiIndustrialPark, WukuDistrict, NewTaipeiCity, Taiwan24803/新北市五股區新北產業園區五工路 134 號



Page: 8 of 287

SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

2.3 Test Procedure

2.3.1 **Conducted Emissions**

The EUT is a placed on as turn table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz,. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

2.3.2 **Radiated Emissions**

The EUT is a placed on as turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plan. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

2.4 Measurement Results Explanation

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

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

Manage of the Company Subject to its General Conditions of Service printed overleaf, available on request or accessible at <u>www.sqs.com/terms_and_conditions.htm</u> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sqs.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.

SGS Taiwan Ltd. │No.134,WuKungRoad,NewTaipeiIndustrialPark,WukuDistrict,NewTaipeiCity,Taiwan24803/新北市五股區新北產業園區五工路 134 號



Page: 9 of 287

2.5 Configuration of Tested System

Fig. 2-1 Radiated Emission Configuration

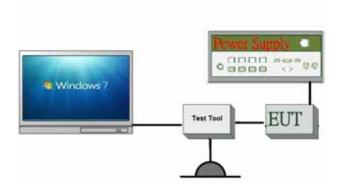


Fig.2-3 Conducted Emission (Antenna Port) Configuration

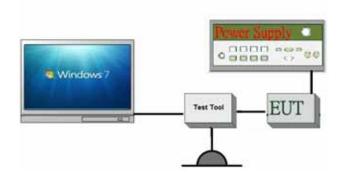


Fig. 2-2 Conducted Emission (AC Power Line) Configuration

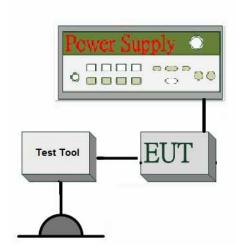


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1	WLAN Test Software	N/A	N/A	N/A	N/A	N/A
2	Notebook	Lenovo	L440	R9-007LAZ	Shielded	Unshielded
3	DC power supply	Agilent	E3634A	MY53180030	N/A	Unshielded
4	Test tool kit	N/A	N/A	N/A	N/A	N/A

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.

Unless otherwise stated the results snown in this test report reter only to the sample(s) tested and such sample(s) are retained for 90 days only.
Personal Results and the sample(s) tested and such sample(s) tested and sample(s) tested and such sample(s) tested and such sample(s) tested and s may be prosecuted to the fullest extent of the law.

<mark>SGS Taiwan Ltd. │</mark>No.134,WuKungRoad,NewTaipeiIndustrialPark,WukuDistrict,NewTaipeiCity,Taiwan24803/新北市五股區新北產業園區五工路 134 號



Page: 10 of 287

SUMMARY OF TEST RESULT

FCC Rules	IC Rules	Description Of Test	Result
§15.207	RSS-Gen §8.8	AC Power Line Conducted Emission	Compliant
§15.403(i) §15.407(e)	RSS-247 §6.2.1~ 4 (1) RSS-Gen §6.6	26 dB & 6dB & 99% Emission Bandwidth	Compliant
§15.407(a)	RSS-247 §6.2.1~ 4 (1)	Maximum Conducted Output Power	Compliant
§15.407(a)	RSS-247 §6.2.1~ 4 (1)	Power Spectral Density	Compliant
§15.407(b)	RSS-247 §6.2.1~ 4 (2)	Undesirable Radiated Emissions	Compliant
§15.407(c)	RSS-247 §6.4	Transmission in case of Absence of Information	Compliant
§15.407(g)	RSS-Gen §6.11	Frequency Stability	Compliant
§15.203 §15.407(a)	RSS- Gen §6.7 RSS- Gen §8.3	Antenna Requirement	Compliant

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.

Unless otherwise stated the results snown in this test report reter only to the sample(s) tested and such sample(s) are retained for 90 days only.
Personal Results snown in this test report reter only to the sample(s) tested and such sample(s) are retained for 90 days only.
Personal Results are retained for 90 days only.
Pers may be prosecuted to the fullest extent of the law.

SGS Taiwan Ltd. No.134, WuKungRoad, NewTaipeilndustrialPark, WukuDistrict, NewTaipeiCity, Taiwan 24803/新北市五股區新北產業園區五工路 134 號



Page: 11 of 287

DESCRIPTION OF TEST MODES

4.1 Operated in U-NII Bands

Operated band in 5150 MHz ~5250 MHz:

Operated band in 5150 Min		
802.11a / n HT20 Mode,		
802.11ac VHT20 Mode		
Channel	Frequency	
36	5180	
40	5200	
44	5220	
48	5240	

802.11 n HT40 Mode, 802.11ac VHT40 Mode			
channel	Frequency		
38	5190		
46	5230		

802.11ac VHT80 Mode		
channel	Frequency	
42 5210		

Operated band in 5250 MHz ~5350 MHz:

802.11a / n HT20 Mode, 802.11ac VHT20 Mode		
channel	Frequency	
52	5260	
56	5280	
60	5300	
64 5320		

802.11 n HT40 Mode, 802.11ac VHT40 Mode		
channel	Frequency	
54	5270	
62	5310	

802.11ac VHT80 Mode				
Channel	Frequency			
Charlie	Troquericy			

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.

Unless otherwise stated the results snown in this test report reter only to the sample(s) tested and such sample(s) are retained for 90 days only.
Personal Results and the sample(s) tested and such sample(s) tested and sample(s) tested and such sample(s) tested and such sample(s) tested and s may be prosecuted to the fullest extent of the law.

SGS Taiwan Ltd. No.134, WuKung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路 134 號



Page: 12 of 287

Operated band in 5470 MHz ~5725 MHz:

Operated band in 5470 Mil						
802.11a / n HT20 Mode,						
802.11ac VHT20 Mode						
Channel	Frequency					
100	5500					
104	5520					
108	5540					
112	5560					
116	5580					
120	5600					
124	5620					
128	5640					
132	5660					
136	5680					
140	5700					
144	5720					

802.11 n HT40 Mode,						
802.11ac V	802.11ac VHT40 Mode					
channel	Frequency					
102	5510					
110	5550					
118	5590					
126	5630					
134	5670					
142	5710					

802.11ac VHT80 Mode					
channel	Frequency				
106	5530				
122	5610				
138	5690				

Operated band in 5745 MHz ~5850 MHz:

802.11a / n HT20 Mode, 802.11ac VHT20 Mode					
Channel	Frequency				
149	5745				
153	5765				
157	5785				
161	5805				

802.11 n HT40 Mode, 802.11ac VHT40 Mode				
channel	Frequency			
151	5755			
159	5795			

802.11ac VHT80 Mode				
channel	Frequency			
155	5775			

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.

Unless otherwise stated the results snown in this test report reter only to the sample(s) tested and such sample(s) are retained for 90 days only.
Personal Results and the sample(s) tested and such sample(s) tested and sample(s) tested and such sample(s) tested and such sample(s) tested and s may be prosecuted to the fullest extent of the law.

SGS Taiwan Ltd. No.134, WuKung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路 134 號



Page: 13 of 287

4.2 The Worst Test Modes and Channel Details

- 1. The EUT has been tested under operating condition.
- Test program used to control the EUT for staying in continuous transmitting mode is programmed.
- 3. Investigation has been done on all the possible configurations for searching the worst case.
- 4. The given UE is pre-scanned among 802.11n and ac modes, and 802.11ac yields the highest reading that generates the highest emission.

RADIATED EMISSION TEST:

SISO

RADIATED EMISSION TEST (ABOVE 1 GHz)						
MODE	FREQUENCY	AVAILABLE	TESTED	MODULATION	DATA RATE	ANTENNA
MODE BA	BAND (MHz)	CHANNEL	CHANNEL	MODULATION	(Mbps)	PORT
802.11n_HT40	5190~5230	38 to 46	38,46	OFDM	MCS0	Ch0
802.11ac_VHT80	5210	42	42	OFDM	MCS0	Ch0
802.11n_HT40	5270~5310	54 to 62	54,62	OFDM	MCS0	Ch0

MODE	FREQUENCY BAND (MHz)		TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11ac_VHT20	5500~5720	100 to 144	140	OFDM	MCS0	Ch0
802.11ac_VHT40	5510~5710	102 to 142	102	OFDM	MCS0	Ch0
802.11ac_VHT80	5530~5690	106 to 138	106	OFDM	MCS0	Ch0

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.

公式 Anniel Company Subject to its General Conditions of Service printed overleaf, available on request or accessible at <u>www.sqs.com/terms_and_conditions.htm</u> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sqs.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.

SGS Taiwan Ltd. No.134, WuKungRoad, NewTaipeiIndustrialPark, WukuDistrict, NewTaipeiCity, Taiwan24803/新北市五股區新北產業園區五工路 134 號

台灣檢驗科技股份有限公司 t (886-2) 2299-3279



Page: 14 of 287

MIMO

MIMO						
RADIATED EMISSION TEST (BELOW 1 GHz)						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a	5180~5240	36 to 48	44	OFDM	6	Ch0
802.11a	5260~5320	52 to 64	60	OFDM	6	Ch0
802.11a	5500~5720	100 to 144	116	OFDM	6	Ch0
802.11a	5745~5825	149 to 165	157	OFDM	6	Ch0
RADIATED EMISSION TEST (ABOVE 1 GHz)						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a 802.11n HT20	5180~5240	36 to 48	36,44,48	OFDM OFDM	6 MCS8	Ch0 MIMO
802.11n_HT40	5190~5230	38 to 46	38,46	OFDM	MCS8	MIMO
802.11ac_VHT80	5210	42	42	OFDM	MCS0	MIMO
802.11a	5260~5320	52 to 64	FO CO C4	OFDM	6	Ch0
802.11n_HT20	5200~5320	32 10 04	52,60,64	OFDM	MCS8	MIMO
802.11n_HT40	5270~5310	54 to 62	54,62	OFDM	MCS8	MIMO
802.11ac_VHT80	5290	58	58	OFDM	MCS0	MIMO

MODE	FREQUENCY BAND (MHz)		TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11a	5500~5720	100 to 144	100,116,140	OFDM	6	Ch0
802.11n_HT20	3500~5720	100 10 144	100,110,140	OFDM	MCS8	MIMO
802.11n_HT40	5510~5710	102 to 142	102,110,134	OFDM	MCS8	MIMO
802.11ac_VHT80	5530~5610	106 to 122	106,122	OFDM	MCS0	MIMO
802.11a	5745~5825	140 to 165	140 157 165	OFDM	6	Ch0
802.11n_HT20	3745~5625	149 to 165	149,157,165	OFDM	MCS8	MIMO
802.11n_HT40	5755~5795	151 to 159	151,159	OFDM	MCS8	MIMO
802.11ac_VHT80	5775	155	155	OFDM	MCS0	MIMO

Note:

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for 802.11a/n/ac WLAN Transmitter for channel Low, Mid and High, the worst case E2 position was reported.

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.

t (886-2) 2299-3279

Unless otherwise stated the results snown in this test report reter only to the sample(s) tested and such sample(s) are retained for 90 days only.
Personal Results and the sample(s) tested and such sample(s) tested and sample(s) tested and such sample(s) tested and such sample(s) tested and s may be prosecuted to the fullest extent of the law.

SGS Taiwan Ltd. No.134, WuKungRoad, NewTaipeiIndustrialPark, WukuDistrict, NewTaipeiCity, Taiwan24803/新北市五股區新北產業園區五工路 134 號



Page: 15 of 287

ANTENNA PORT CONDUCTED MEASUREMENT: SISO

0100						
CONDUCTED TEST						
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11n_HT40 802.11ac_VHT40	5190~5230	38 to 46	38	OFDM	MCS0	Ch0
802.11ac_VHT80	5210	42	42	OFDM	MCS0	Ch0
802.11n_HT40 802.11ac_VHT40	5270~5310	54 to 62	62	OFDM	MCS0	Ch0
802.11n_HT20 802.11ac_VHT20	5500~5700	100 to 140	140	OFDM	MCS0	Ch0
802.11n_HT40 802.11ac_VHT40	5510~5710	102 to 142	102	OFDM	MCS0	Ch0
802.11ac_VHT80	5530~5610	106 to 122	106	OFDM	MCS0	Ch0

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,不可部份複製。

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 prospected to the fullest extent of the law. may be prosecuted to the fullest extent of the law.

SGS Taiwan Ltd. No.134, WuKungRoad, NewTaipeilndustrialPark, WukuDistrict, NewTaipeiCity, Taiwan 24803/新北市五股區新北產業園區五工路 134 號

t (886-2) 2299-3279

f (886-2) 2298-0488



Page: 16 of 287

MIMO

MIMO							
		CONDU	CTED TEST				
MODE	FREQUENCY BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT	
802.11a				OFDM	6	Ch0	
802.11n_HT20	5180~5240	36 to 48	36,44,48	OFDM	MCS8	MIMO	
802.11ac_VHT20				OFDIVI	MCS0	IVIIIVIO	
802.11n_HT40	5190~5230	38 to 46	38,46	OFDM	MCS8	MIMO	
802.11ac_VHT40	5190~5230	30 10 40	36,40	OFDIVI	MCS0	IVIIIVIO	
802.11ac_VHT80	5210	42	42	OFDM	MCS0	MIMO	
802.11a				OFDM	6	Ch0	
802.11n_HT20	5260~5320	52 to 64	52,60,64	OFDM	MCS8	MIMO	
802.11ac_VHT20				OFDIVI	MCS0	IVIIIVIO	
802.11n_HT40	5270~5310	54 to 62	54,62	OFDM	MCS8	MIMO	
802.11ac_VHT40	5270~5510	54 (0 62			MCS0		
802.11ac_VHT80	5290	58	58	OFDM	MCS0	MIMO	
802.11a				OFDM	6	CH0	
802.11n_HT20	5500~5700	100 to 140	100,116,140	OFDM	MCS8	MIMO	
802.11ac_VHT20				OI DIVI	MCS0	IVIIIVIO	
802.11n_HT40	5510~5670	102 to 134	102,110,134	OFDM	MCS8	MIMO	
802.11ac_VHT40	3310 3070	102 to 134	102,110,104	OI DIVI	MCS0	IVIIIVIO	
802.11ac_VHT80	5530~5610	106 to 122	106,122	OFDM	MCS0	MIMO	
802.11a				OFDM	6	Ch0	
802.11n_HT20	5745~5825	149 to 165	149,157,165	OFDM	MCS8	MIMO	
802.11ac_VHT20				OI BIVI	MCS0	IVIIIVIO	
802.11n_HT40	5755~5795	151 to 159	151,159	OFDM	MCS8	MIMO	
802.11ac_VHT40			,		MCS0	IVIIIVIO	
802.11ac_VHT80	5775	155	155	OFDM	MCS0	MIMO	

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,同時此樣品僅保留卯天。本報告未經本公司書面許可,不可部份複製。

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 preserved to the fullest extent of the law. may be prosecuted to the fullest extent of the law.



Page: 17 of 287

MEASUREMENT UNCERTAINTY

Test Items	Uncertainty	
AC Power Line Conducted Emission	+/- 2.586 dB	
26dB & 6dB Emission Bandwidth	+/- 123.36 Hz	
The Maximum Output Power Measurement	+/- 0.96 dB	
Peak Power Spectral Density Measurement	+/- 1.67 dB	
Frequency Stability	+/- 123.36 Hz	
Temperature	+/- 0.65 °C	
Humidity	+/- 4.6 %	
DC / AC Power Source	DC= +/- 0.13%, AC=+/- 0.2%	

Radiated Spurious Emission:

	9kHz-30MHz: +/-2.87dB	
	30MHz - 180MHz: +/- 3.37dB	
Measurement uncertainty	180MHz -417MHz: +/- 3.19dB	
(Polarization : Vertical)	0.417GHz-1GHz: +/- 3.19dB	
	1GHz - 18GHz: +/- 4.04dB	
	18GHz - 40GHz: +/- 4.04dB	

	9kHz-30MHz: +/-2.87dB
	30MHz - 167MHz: +/- 4.22dB
Measurement uncertainty	167MHz -500MHz: +/- 3.44dB
(Polarization : Horizontal)	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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.

Unless otherwise stated the results snown in this test report reter only to the sample(s) tested and such sample(s) not sample(s) tested and such sample(s) tested and sample(s) tested and such sample(s) tested and sample(s) te may be prosecuted to the fullest extent of the law.

SGS Taiwan Ltd. No.134, WuKungRoad, NewTaipeiIndustrialPark, WukuDistrict, NewTaipeiCity, Taiwan24803/新北市五股區新北產業園區五工路 134 號

www.tw.sgs.com



Page: 18 of 287

CONDUCTED EMISSION TEST

6.1 Standard Applicable

Frequency range within 150 kHz to 30 MHz shall not exceed the Limit table as below.

Frequency range	Lin dB(nits (uV)
MHz	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

Note

6.2 Measurement Equipment Used

Conducted Emission Test Site							
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.		
EMI Test Receiver	R&S	ESCI7		2018/02/02	2019/02/01		
DC Power Supply	Anritsu	E3640A	KR93300208	2018/08/15	2019/08/14		
LISN	SCHWARZ- BECK	NSLK 8127	8127-649	2018/05/18	2019/05/17		

6.3 EUT Setup

- 1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.10:2013.
- 2. The AC/DC Power adaptor of EUT was plug-in LISN. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.
- 3. The LISN was connected with 120Vac/60Hz power source.

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

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <u>www.sqs.com/terms_and_conditions.htm</u> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sqs.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.

SGS Taiwan Ltd. No.134, WuKungRoad, NewTaipeiIndustrialPark, WukuDistrict, NewTaipeiCity, Taiwan24803/新北市五股區新北產業園區五工路 134 號

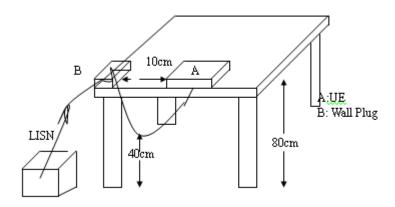
^{1.} The lower limit shall apply at the transition frequencies

^{2.} The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50



Page: 19 of 287

6.4 Test SET-UP



6.5 Measurement Procedure

- 1. The EUT was placed on a table which is 0.8m above ground plane.
- 2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 3. Repeat above procedures until all phases of power being supplied by given UE are completed.

6.6 Measurement Result

Note: Refer to next page for measurement data and plots.

Note2: The * reveals the worst-case results that closet to the limit

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.

Unless otherwise stated the results snown in this test report reter only to the sample(s) tested and such sample(s) are retained for 90 days only. 除非另有說明,此根告结果僅對測試之樣品負責,同時此樣品僅保留的天。本根告未起本公司書面하可,不可部份複製。
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. may be prosecuted to the fullest extent of the law.



Page: 20 of 287

AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode: Operation mode Test By: Jerry

Site Conduction Room

Phase:

Temperature:

Limit: FCC Class B Conduction(QP)

AC 120V/60Hz Power:

L1

25 % Humidity: 85 %

Mode: Operation

Note: Adapter:DA-65C19

Conducted Emission File : Data Data :#2 Date: 2018/9/10 Time: 下午 10:38:47 80.0 dBuV FCC Class B Conduction(QP) FCC Class B Conduction(AVG) 0.150 0.5 (MHz) 30.000

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over			
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment	
1	*	0.1580	50.18	0.04	50.22	65.57	-15.35	peak		
2	į.	0.1820	46.09	0.04	46,13	64.39	-18.26	peak		
3		0.2060	43.43	0.04	43.47	63.37	-19.90	peak		
4		0.2300	36.64	0.04	36.68	62.45	-25.77	peak		
5	9	0.4020	34.59	0.04	34.63	57.81	-23.18	peak		
6		5.4460	38.41	0.22	38.63	60.00	-21.37	peak		

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.

Unless otherwise stated the results snown in this test report reter only to the sample(s) tested and such sample(s) are retained for 90 days only.
Personal Results and the sample(s) tested and such sample(s) tested and sample(s) tested and such sample(s) tested and such sample(s) tested and s may be prosecuted to the fullest extent of the law.

SGS Taiwan Ltd. No.134, WuKungRoad, NewTaipeiIndustrialPark, WukuDistrict, NewTaipeiCity, Taiwan24803/新北市五股區新北產業園區五工路 134 號 t (886-2) 2299-3279



Humidity: 85 %

25 %

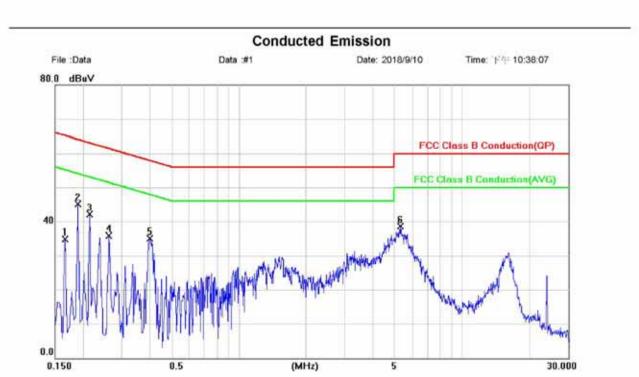
Page: 21 of 287

Temperature: Site Conduction Room Phase: Power: AC 120V/60Hz

Limit: FCC Class B Conduction(QP)

Mode: Operation

Note: Adapter:DA-65C19



No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over			
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment	
1	0.1660	34.78	0.04	34.82	65.16	-30.34	peak		
2 *	0.1900	44.99	0.04	45.03	64.04	-19.01	peak		
3	0.2140	42.09	0.04	42.13	63.05	-20.92	peak		
4	0.2620	35.77	0.04	35.81	61.37	-25.56	peak		
5	0.3980	35.15	0.04	35.19	57.90	-22.71	peak		
6	5.3100	38.30	0.21	38.51	60.00	-21.49	peak		

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.

Unless otherwise stated the results snown in this test report reter only to the sample(s) tested and such sample(s) are retained for 90 days only.
Personal Results and the sample(s) tested and such sample(s) tested and sample(s) tested and such sample(s) tested and such sample(s) tested and s may be prosecuted to the fullest extent of the law.

<mark>SGS Taiwan Ltd. │</mark>No.134,WuKungRoad,NewTaipeiIndustrialPark,WukuDistrict,NewTaipeiCity,Taiwan24803/新北市五股區新北產業園區五工路 134 號



Page: 22 of 287

DUTY CYCLE TEST SIGNAL

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle.

All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percentage.

Formula:

Duty Cycle = Ton / (Ton+Toff)

Measurement Procedure:

- 1. Set span = Zero
- 2. RBW = 8MHz
- 3. VBW = 8MHz,
- 4. Detector = Peak

Duty Cycle:

Mode	Duty Cycle (%)	Duty Factor (dB) =10*log (1/Duty Cycle)	1/T (kHz)	VBW setting (kHz)
802.11a	98.99	0.04	0.48	1.00
802.11n_20	97.81	0.10	1.02	2.00
802.11ac_20	98.97	0.04	0.52	1.00
802.11n_40	95.75	0.19	2.02	3.00
802.11ac_40	97.61	0.11	1.05	2.00
802.11ac_80	95.56	0.20	2.16	3.00

Duty Cycle Factor: $10 * \log(1/0.9899) = 0.04$ Duty Cycle Factor: $10 * \log(1/0.9781) = 0.1$ Duty Cycle Factor: $10 * \log(1/0.9897) = 0.04$ Duty Cycle Factor: $10 * \log(1/0.9575) = 0.19$ Duty Cycle Factor: $10 * \log(1/0.9761) = 0.11$ Duty Cycle Factor: $10 * \log(1/0.9556) = 0.2$

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.

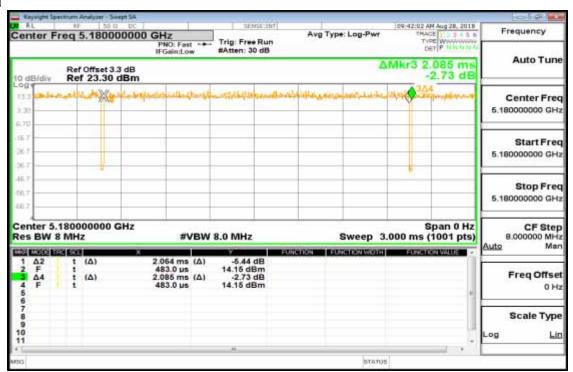
Unless otherwise stated the results snown in this test report refer only to the sample(s) tested and such sample(s) are retained for south sample(s) are retained for southern southern southern sample(s) are retained for sample(s) are retained for southern sample(s) are retained for sample(s) are retained for sample(s) are retained for southern sample(s) are retained for sample(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.

SGS Taiwan Ltd. No.134, WuKungRoad, NewTaipeilndustrialPark, WukuDistrict, NewTaipeiCity, Taiwan 24803/新北市五股區新北產業園區五工路 134 號



Page: 23 of 287

DUTY CYCLE TEST SIGNAL Measurement Result 802.11a



802.11n HT20



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.

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.sqs.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.

SGS Taiwan Ltd. No.134,WuKungRoad,NewTaipeiIndustrialPark,WukuDistrict,NewTaipeiCity,Taiwan24803/新北市五股區新北產業園區五工路 134 號



Page: 24 of 287

802.11ac VHT 20



802.11n HT 40



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.

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 Inis document is issued by the Company subject to its General Conditions or Service printed overlear, available on request or accessible at www.sgs.com/terms and conditions.htm and conditions.htm and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at <a href="https://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.

SGS Taiwan Ltd. No.134,WuKungRoad,NewTaipeiIndustrialPark,WukuDistrict,NewTaipeiCity,Taiwan24803/新北市五股區新北產業園區五工路 134 號



Page: 25 of 287

802.11 ac VHT 40



802.11 ac VHT 80



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.

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.sqs.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.

SGS Taiwan Ltd. No.134,WuKungRoad,NewTaipeiIndustrialPark,WukuDistrict,NewTaipeiCity,Taiwan24803/新北市五股區新北產業園區五工路 134 號



Page: 26 of 287

26DB & 6DB EMISSION BANDWIDTH MEASUREMENT

8.1 Standard Applicable

There is no limit bandwidth for U-NII-1, U-NII-2-A and U-NII-2-C.

The minimum of 6dB Bandwidth measurement is 0.5 MHz for U-NII-3

8.2 Measurement Procedure

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules .
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the Antenna port to the spectrum analyzer.
 - a. 26dB Band width Measurement: Set the spectrum analyzer as 1% of emission BW Sweep=auto, Detector = Peak, Trace Mode = Max Hold, Manually readjust RBW until the RBW/EBW ratio is 1% based on EBW as observed on the result of pre-sequence measurement.
 - b. Mark the peak frequency and –26dB (upper and lower) frequency.
- 4. Repeat the procedures as list above until all test default channels (low, middle, and high) are completed.
- 5. Minimum Emission Bandwidth for the band 5.725-5.850GHz.
 - a. Set the spectrum analyzer as RBW = 100 kHz, VBW = 3*RBW, Span = 30M/50MHz, Detector=Peak,
 - Sweep=auto
 - b. Mark the peak frequency and -6dB (upper and lower) frequency.
- For 99% Bandwidth:

Set the spectrum analyzer as RBW=1%, VBW = 3*RBW, Span = 30M/50MHz, Detector=Sample, Sweep=auto.

- 7. Turn on the 99% bandwidth function, max reading.
- 8. Repeat above procedures until all frequency of interest measured was complete.

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

Manage of the Company Subject to its General Conditions of Service printed overleaf, available on request or accessible at <u>www.sqs.com/terms_and_conditions.htm</u> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sqs.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.

<mark>SGS Taiwan Ltd. │</mark> No.134,WuKungRoad,NewTaipeiIndustrialPark,WukuDistrict,NewTaipeiCity,Taiwan24803/新北市五股區新北產業園區五工路 134 號

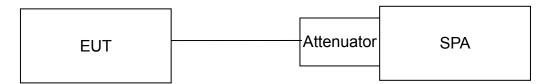


Page: 27 of 287

8.3 Measurement Equipment Used

SGS Conducted Room							
Name of Equip- ment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due		
Spectrum Analyzer	R&S	FSV-30	101398	2017/10/19	2018/10/18		
DC Power Supply	Anritsu	E3640A	MY52410006	2017/11/28	2018/11/27		
Temperature Chamber	TERCHY	MHG-120LF	911009	2018/05/18	2019/05/17		
Attenuator	Mini-Circuit	BW-S10W2+	2	2018/01/02	2019/01/01		
DC Block	Mini-Circuits	BLK-18-S+	1	2018/01/02	2019/01/01		
Coaxial Cables	N/A	WK CE Cable	N/A	2018/01/02	2019/01/01		
Notebook	Lenovo	L430	R9-WGNK5	N/A	N/A		

8.4 Test Set-up



8.5 Measurement Result

26dB and 6dB Bandwidth SISO

802.11n HT20 Ch0

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5700	19.27	12.849

802.	11n	HT40	Ch0

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5190	38.03	15.801
5310	38.12	15.812
5510	38.23	15.824

802.11ac VHT80 Ch0

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5210	79.16	18.985
5290	79.15	18.985

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.

Unless otherwise stated the results snown in this test report reter only to the sample(s) tested and such sample(s) are retained for 90 days only.
Personal Results and the sample(s) tested and such sample(s) tested and sample(s) tested and such sample(s) tested and such sample(s) tested and s may be prosecuted to the fullest extent of the law.

<mark>SGS Taiwan Ltd. │</mark>No.134,WuKungRoad,NewTaipeiIndustrialPark,WukuDistrict,NewTaipeiCity,Taiwan24803/新北市五股區新北產業園區五工路 134 號



Page: 28 of 287

MIMO

802.11a_Ch0

002.11a_0110					
Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)			
5180	18.63	12.701			
5220	18.51	12.674			
5240	18.58	12.690			
5260	18.69	12.716			
5300	18.65	12.707			
5320	18.51	12.674			
5500	18.61	12.697			
5580	18.53	12.679			
5700	18.46	12.662			
5720(U-NII 2C)	14.76	11.691			
5720 (U-NII 3)	4.80	6.812			

802.11a_Ch0

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	16.35	12.134
5785	16.35	12.134
5825	16.37	12.139

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,同時此樣品僅保留卯天。本報告未經本公司書面許可,不可部份複製。

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 <a href="www.sgs.com/terms and <a may be prosecuted to the fullest extent of the law.

SGS Taiwan Ltd. No.134, WuKungRoad, NewTaipeilndustrialPark, WukuDistrict, NewTaipeiCity, Taiwan 24803/新北市五股區新北產業園區五工路 134 號



Page: 29 of 287

802.11n_HT20_Ch0

802.11n_HT20_Ch1

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5180	19.84	12.975	5180	19.83	12.973
5220	19.90	12.988	5220	19.64	12.932
5240	20.15	13.043	5240	19.94	12.997
5260	20.00	13.011	5260	19.98	13.006
5300	19.83	12.972	5300	19.88	12.984
5320	19.31	12.858	5320	19.82	12.971
5500	20.05	13.022	5500	19.56	12.914
5580	19.77	12.961	5580	19.72	12.949
5700	19.92	12.992	5700	19.82	12.971
5720(U-NII 2C)	14.80	11.703	5720(U-NII 2C)	14.96	11.749
5720 (U-NII 3)	4.76	6.776	5720 (U-NII 3)	4.96	6.955

802.11n_HT20_Ch0

802.11n HT20 Ch1

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	16.95	12.292	5745	17.58	12.451
5785	17.56	12.445	5785	17.54	12.440
5825	17.59	12.452	5825	17.57	12.448

802.11n _HT40_Ch0

802.11n _HT40_Ch1

Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5190	40.02	16.023	5190	40.51	16.075
5230	40.40	16.064	5230	40.20	16.042
5270	40.07	16.028	5270	40.32	16.055
5310	40.10	16.032	5310	40.16	16.038
5510	39.99	16.019	5510	39.94	16.014
5550	39.91	16.010	5550	40.27	16.050
5670	39.90	16.010	5670	40.80	16.107
5710 (U-NII 2C)	35.00	15.441	5710 (U-NII 2C)	34.84	15.421
5710 (U-NII 3)	5.00	6.990	5710 (U-NII 3)	5.08	7.059

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,同時此樣品僅保留卯天。本報告未經本公司書面許可,不可部份複製。
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 Documents at the tested 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 preserved to the fullest extent of the law may be prosecuted to the fullest extent of the law.

SGS Taiwan Ltd. No.134,WuKungRoad,NewTaipeiIndustrialPark,WukuDistrict,NewTaipeiCity,Taiwan24803/新北市五股區新北產業園區五工路 134 號



Page: 30 of 287

802.11n_HT40_Ch0

802.11n_HT40_Ch1

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5755	35.59	15.513	5755	35.06	15.448
5795	34.55	15.385	5795	35.24	15.470

802.11ac _VHT80_Ch0

802.11ac _VHT80_Ch1

	_		_	_	
Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	26dB BW (MHz)	10 Log (B) (dB)
5210	81.64	19.119	5210	81.36	19.104
5290	81.30	19.101	5290	81.09	19.090
5530	81.14	19.092	5530	81.05	19.087
5610	82.31	19.155	5610	81.73	19.124
5690 (U-NII 2C)	75.64	18.788	5690 (U-NII 2C)	75.32	18.769
5690 (U-NII 3)	5.00	6.990	5690 (U-NII 3)	5.80	7.634

802.11ac _VHT80_Ch0

802.11ac _VHT80_Ch1

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5775	76.38	18.830	5775	76.37	18.829

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.

Unless otherwise stated the results snown in this test report reter only to the sample(s) tested and such sample(s) not sample(s) tested and such sample(s) tested and sample(s) tested and such sample(s) tested and sample(s) te may be prosecuted to the fullest extent of the law.

SGS Taiwan Ltd. No.134, WuKungRoad, NewTaipeiIndustrialPark, WukuDistrict, NewTaipeiCity, Taiwan24803/新北市五股區新北產業園區五工路 134 號



Page: 31 of 287

99% Bandwidth SISO

802.11n _HT40_Ch0

802.11n_HT20_Ch0

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5700	17.671	12.473

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5190	36.051	15.569
5310	36.048	15.569
5510	36.029	15.567

802.11ac _VHT80_Ch0

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5210	75.862	18.800
5290	75.896	18.802

MIMO

802.11a_Ch0

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5180	16.660	12.217
5220	16.712	12.230
5240	16.672	12.220
5260	16.680	12.222
5300	16.709	12.230
5320	16.621	12.207
5500	16.685	12.223
5580	16.694	12.226
5700	16.588	12.198
5720(U-NII 2C)	12.600	11.004
5720 (U-NII 3)	4.054	6.079

802.11a_Ch0

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	16.46	12.163
5785	16.34	12.132
5825	16.42	12.154

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.

Unless otherwise stated the results snown in this test report reter only to the sample(s) tested and such sample(s) not sample(s) tested and such sample(s) tested and sample(s) tested and such sample(s) tested and sample(s) te may be prosecuted to the fullest extent of the law.

SGS Taiwan Ltd. No.134, WuKungRoad, NewTaipeiIndustrialPark, WukuDistrict, NewTaipeiCity, Taiwan24803/新北市五股區新北產業園區五工路 134 號



Page: 32 of 287

802.11n_HT20_Ch0

802.11n_HT20_Ch1

<u>, </u>						
Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)	
5180	17.664	12.471	5180	17.667	12.472	
5220	17.648	12.467	5220	17.656	12.469	
5240	17.667	12.472	5240	17.674	12.473	
5260	17.672	12.473	5260	17.650	12.467	
5300	17.666	12.471	5300	17.647	12.467	
5320	17.687	12.477	5320	17.675	12.474	
5500	17.635	12.464	5500	17.661	12.470	
5580	17.696	12.479	5580	17.652	12.468	
5700	17.661	12.470	5700	17.660	12.470	
5720(U-NII 2C)	13.370	11.261	5720(U-NII 2C)	13.360	11.258	
5720 (U-NII 3)	4.300	6.335	5720 (U-NII 3)	4.297	6.332	

802.11n_HT20_Ch0

802.11n_HT20_Ch1

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5745	17.63	12.461	5745	17.49	12.429
5785	17.60	12.455	5785	17.58	12.451
5825	17.57	12.449	5825	17.55	12.442

802.11n _HT40_Ch0

802.11n _HT40_Ch1

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5190	36.025	15.566	5190	36.057	15.570
5230	36.002	15.563	5230	36.085	15.573
5270	36.047	15.569	5270	36.007	15.564
5310	35.985	15.561	5310	36.072	15.572
5510	36.028	15.566	5510	36.040	15.568
5550	36.027	15.566	5550	36.044	15.568
5670	36.033	15.567	5670	36.042	15.568
5710(U-NII 2C)	31.497	14.983	5710(U-NII 2C)	31.533	14.988
5710 (U-NII 3)	4.499	6.531	5710 (U-NII 3)	4.500	6.532

802.11n HT40 Ch0

802.11n _HT40_Ch1

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5755	36.01	15.565	5755	36.16	15.583
5795	36.20	15.587	5795	36.23	15.590

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,同時此樣品僅保留卯天。本報告未經本公司書面許可,不可部份複製。
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 Documents at the tested 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 preserved to the fullest extent of the law may be prosecuted to the fullest extent of the law.

SGS Taiwan Ltd. No.134,WuKungRoad,NewTaipeiIndustrialPark,WukuDistrict,NewTaipeiCity,Taiwan24803/新北市五股區新北產業園區五工路 134 號



Page: 33 of 287

802.11ac VHT80 Ch0

802.11ac VHT80 Ch1

Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	99% BW (MHz)	10 Log (B) (dB)
5210	75.835	18.799	5210	75.870	18.801
5290	75.923	18.804	5290	75.898	18.802
5530	75.848	18.799	5530	75.744	18.793
5610	75.742	18.793	5610	75.927	18.804
5690(U-NII 2C)	71.057	18.516	5690(U-NII 2C)	71.079	18.517
5690 (U-NII 3)	4.700	6.721	5690 (U-NII 3)	4.706	6.727

802.11ac _VHT80_Ch0

802.11ac _VHT80_Ch1

Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)	Frequency (MHz)	6dB BW (MHz)	10 Log (B) (dB)
5775	76.56	18.840	5775	76.51	18.837

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,同時此樣品僅保留卯天。本報告未經本公司書面許可,不可部份複製。

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 <a href="www.sgs.com/terms and <a may be prosecuted to the fullest extent of the law.

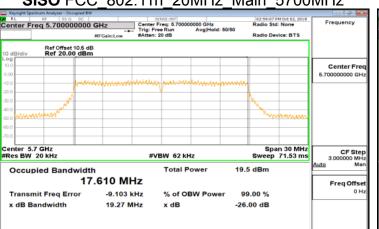
f (886-2) 2298-0488

SGS Taiwan Ltd. No.134, WuKung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路 134 號

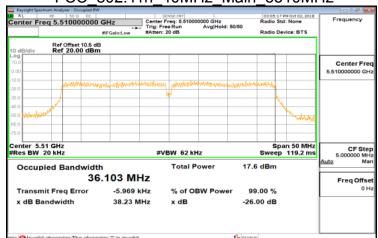


Page: 34 of 287

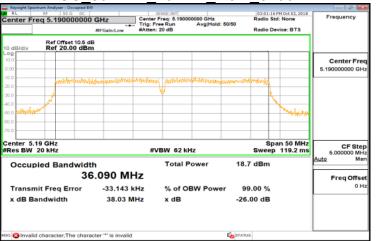
SISO FCC 802.11n 20MHz Main 5700MHz



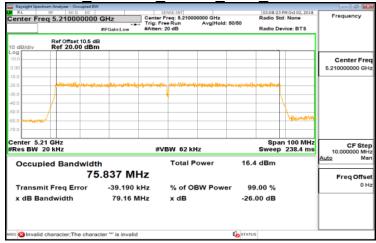
FCC 802.11n 40MHz Main 5510MHz



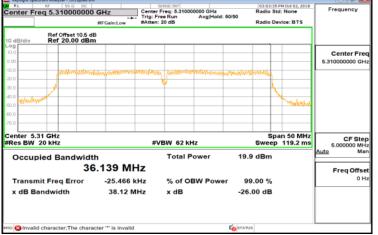
FCC 802.11n 40MHz Main 5190MHz



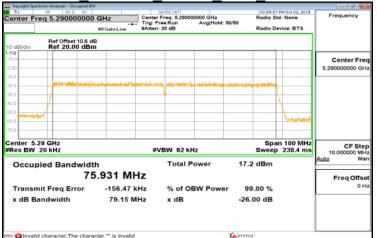
FCC 802.11ac 80MHz Main 5210MHz



FCC 802.11n 40MHz Main 5310MHz







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,同時此樣品僅保留別天。本報告未經本公司書面許可,不可部份複製。
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

f (886-2) 2298-0488

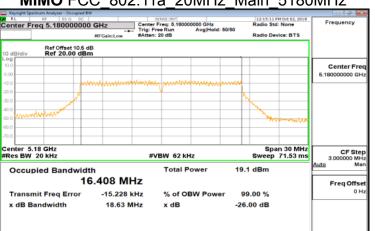
SGS Taiwan Ltd. No.134, WuKungRoad, NewTaipeiIndustrialPark, WukuDistrict, NewTaipeiCity, Taiwan24803/新北市五股區新北產業園區五工路 134 號

www.tw.sas.com

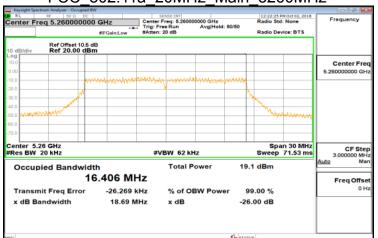


Page: 35 of 287

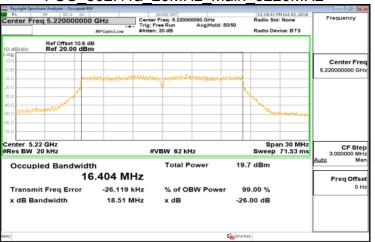
MIMO FCC 802.11a 20MHz Main 5180MHz



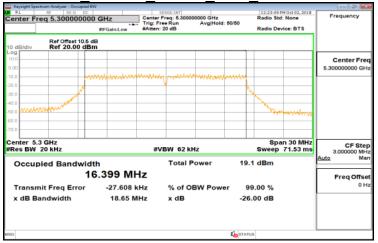
FCC 802.11a 20MHz Main 5260MHz



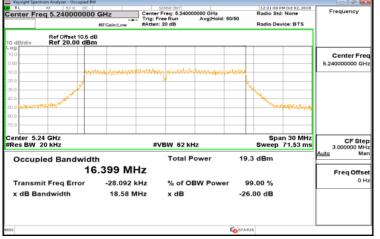
FCC 802.11a 20MHz Main 5220MHz



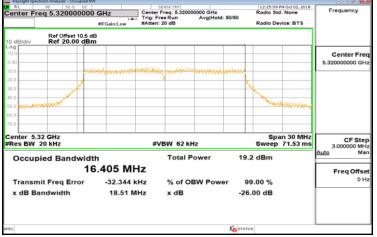
FCC 802.11a 20MHz Main 5300MHz



FCC 802.11a 20MHz Main 5240MHz



FCC 802.11a 20MHz Main 5320MHz



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,同時此樣品僅保留別天。本報告未經本公司書面許可,不可部份複製。
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

SGS Taiwan Ltd. No.134, WuKungRoad, NewTaipeiIndustrialPark, WukuDistrict, NewTaipeiCity, Taiwan24803/新北市五股區新北產業園區五工路 134 號



Occupied Bandwidth

Transmit Freg Error

x dB Bandwidth

16.411 MHz

-31 684 kHz

18.61 MHz

Report No.: ER/2018/80101

Page: 36 of 287

FCC 802.11a 20MHz Main 5500MHz

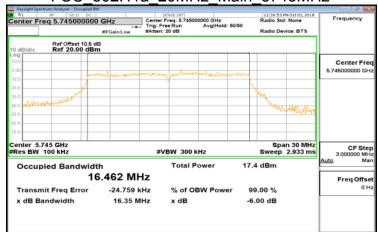
Ref Offset 10.5 dB Ref 20.00 dBm Center Free enter 5.5 GHz Res BW 20 kHz CF Step 3.000000 MHz

18.8 dBm

99 00 %

-26.00 dB

FCC 802.11a 20MHz Main 5745MHz



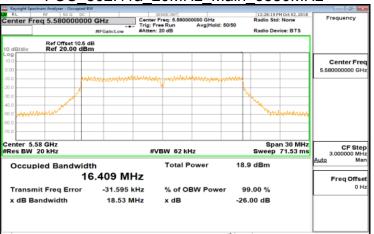
FCC 802.11a 20MHz Main 5580MHz

#VBW 62 kHz

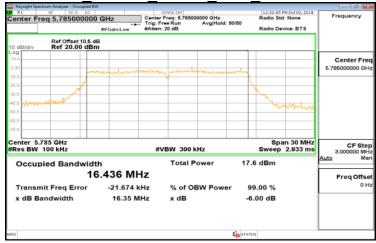
x dB

Total Power

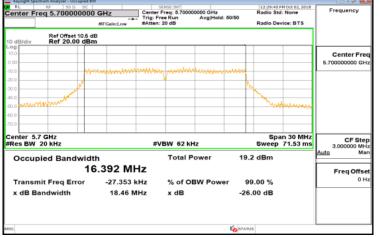
% of OBW Powe



FCC 802.11a 20MHz Main 5785MHz



FCC 802.11a 20MHz Main 5700MHz



FCC 802.11a 20MHz Main 5825MHz



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,同時此樣品僅保留別天。本報告未經本公司書面許可,不可部份複製。
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

SGS Taiwan Ltd. No.134, WuKungRoad, NewTaipeiIndustrialPark, WukuDistrict, NewTaipeiCity, Taiwan24803/新北市五股區新北產業園區五工路 134 號



er Freq 5,720000000 GHz

Ref Offset 10.5 dB Ref 20.00 dBm

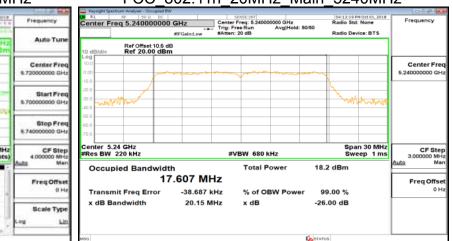
nter 5.72000 GHz es BW 220 kHz

Report No.: ER/2018/80101

Page: 37 of 287

FCC 802.11a 20MHz Chain0 5720MHz

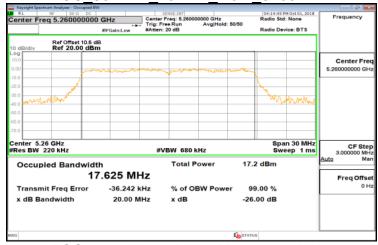
FCC 802.11n 20MHz Main 5240MHz





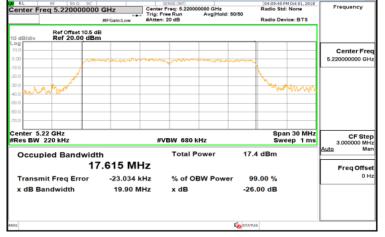
FCC 802.11n 20MHz Main 5260MHz

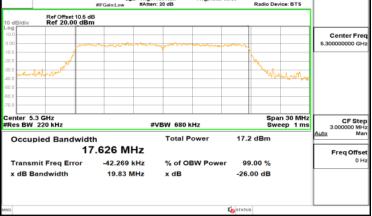




FCC 802.11n 20MHz Main 5220MHz

FCC 802.11n 20MHz Main 5300MHz





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,同時此樣品僅保留別天。本報告未經本公司書面許可,不可部份複製。
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

SGS Taiwan Ltd. No.134, WuKungRoad, NewTaipeiIndustrialPark, WukuDistrict, NewTaipeiCity, Taiwan24803/新北市五股區新北產業園區五工路 134 號

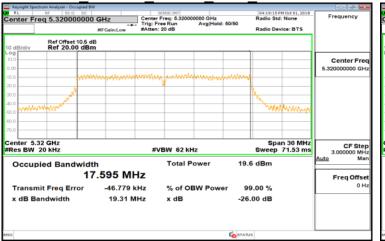
Center Freq 5.300000000 GHz

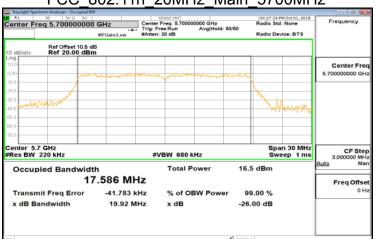


Page: 38 of 287

FCC 802.11n 20MHz Main 5320MHz

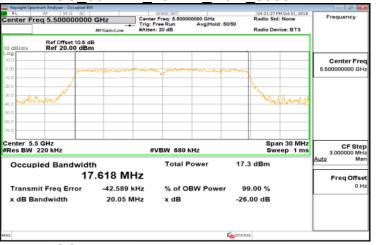
FCC 802.11n 20MHz Main 5700MHz

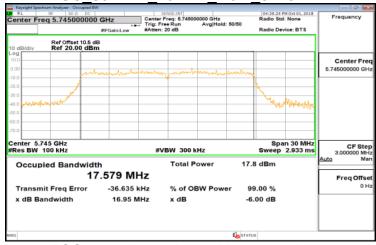




FCC 802.11n 20MHz Main 5500MHz

FCC 802.11n 20MHz Main 5745MHz





FCC 802.11n 20MHz Main 5580MHz

FCC 802.11n 20MHz Main 5785MHz





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,同時此樣品僅保留別天。本報告未經本公司書面許可,不可部份複製。
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



Transmit Freg Error

x dB Bandwidth

Report No.: ER/2018/80101

Page: 39 of 287

FCC 802.11n 20MHz Main 5825MHz

Ref Offset 10.5 dB Ref 20.00 dBm Center Free enter 5.825 GHz Res BW 100 kHz Span 30 MHz Sweep 2.933 ms CF Step 3.000000 MH• #VBW 300 kHz 17.7 dBm Total Power Occupied Bandwidth 17.583 MHz

% of OBW Powe

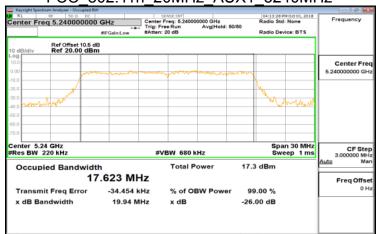
99 00 %

-6.00 dB

-41.751 kHz

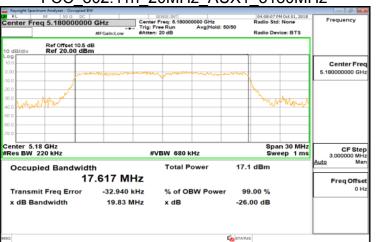
17.59 MHz

FCC 802.11n 20MHz AUX1 5240MHz



FCC 802.11n 20MHz AUX1 5180MHz

x dB



FCC 802.11n 20MHz AUX1 5260MHz



FCC 802.11n 20MHz AUX1 5220MHz



FCC 802.11n 20MHz_AUX1 5300MHz



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,同時此樣品僅保留別天。本報告未經本公司書面許可,不可部份複製。
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

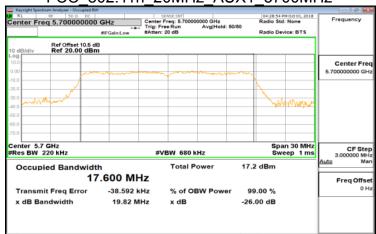


Page: 40 of 287

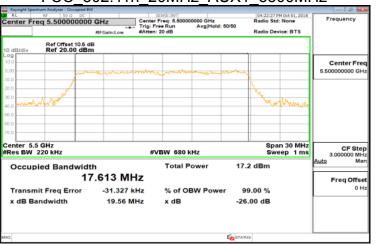
FCC 802.11n 20MHz AUX1 5320MHz

Appropriate Freq 5.320000000 GHz Ref Offset 10.5 dB Ref 20.00 dBm Center Free enter 5.32 GHz Res BW 220 kHz Span 30 MHz Sweep 1 ms CF Step 3.000000 MH• #VBW 680 kHz 17.3 dBm Total Power Occupied Bandwidth 17.618 MHz % of OBW Powe Transmit Freg Error -48.512 kHz 99 00 % x dB Bandwidth 19.82 MHz x dB -26.00 dB

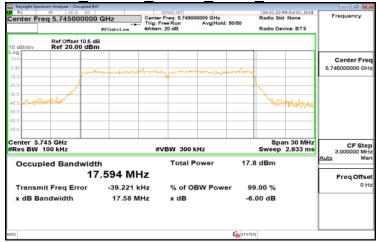
FCC 802.11n 20MHz AUX1 5700MHz



FCC_802.11n_20MHz_AUX1_5500MHz



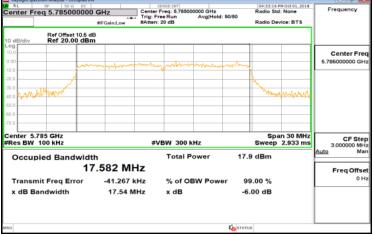
FCC 802.11n 20MHz AUX1 5745MHz



FCC 802.11n 20MHz AUX1 5580MHz







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,同時此樣品僅保留別天。本報告未經本公司書面許可,不可部份複製。
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

f (886-2) 2298-0488

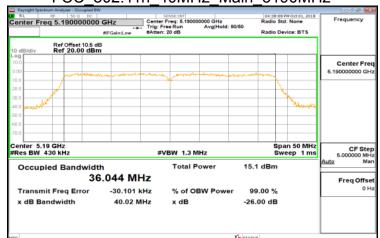


Page: 41 of 287

FCC 802.11n 20MHz AUX1 5825MHz

Xeynight Spectrum Analyzer - Occupied BW RL BF SO D BC SINGE SINT SINGE Freq 5.825000000 GHz Trig: Free Run 4-4-m: 20 dB Ref Offset 10.5 dB Ref 20.00 dBm Center Free enter 5.825 GHz Res BW 100 kHz Span 30 MHz Sweep 2.933 ms CF Step 3.000000 MHz Man 18.0 dBm Total Power Occupied Bandwidth 17.577 MHz % of OBW Powe Transmit Freq Error -48.934 kHz 99.00 % x dB Bandwidth 17.57 MHz x dB -6.00 dB

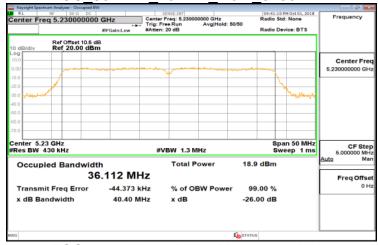
FCC 802.11n 40MHz Main 5190MHz



FCC 802.11n 20MHz Chain0 5720MHz



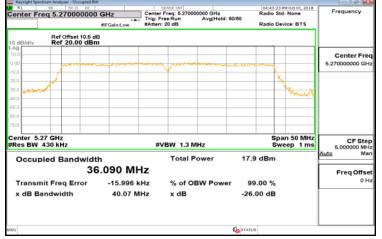
FCC 802.11n 40MHz Main 5230MHz



FCC 802.11n 20MHz Chain1 5720MHz







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,同時此樣品僅保留別天。本報告未經本公司書面許可,不可部份複製。
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

f (886-2) 2298-0488

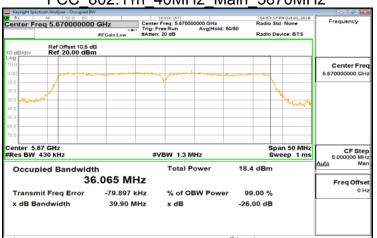


Page: 42 of 287

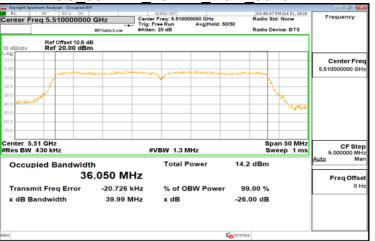
FCC 802.11n 40MHz Main 5310MHz

Ref Offset 10.5 dB Ref 20.00 dBm Center Free Span 50 MHz Sweep 1 ms enter 5.31 GHz Res BW 430 kHz CF Step 5.000000 MHz #VBW 1.3 MHz Total Power 17.0 dBm Occupied Bandwidth 36.038 MHz % of OBW Powe Transmit Freq Error -54 562 kHz 99.00 % x dB Bandwidth 40.10 MHz x dB -26.00 dB

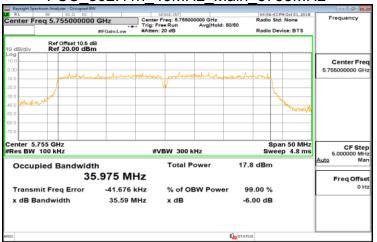
FCC 802.11n 40MHz Main 5670MHz



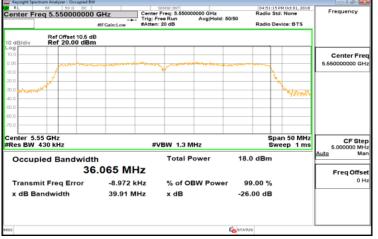
FCC 802.11n 40MHz Main 5510MHz



FCC 802.11n 40MHz Main 5755MHz



FCC 802.11n 40MHz Main 5550MHz



FCC 802.11n 40MHz Main 5795MHz



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.

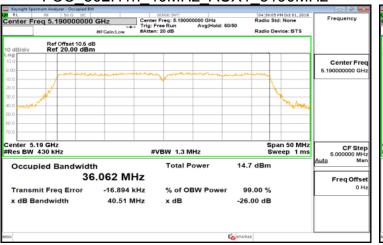
除非另有說明,此報告結果僅對測試之樣品負責,同時此樣品僅保留別天。本報告未經本公司書面許可,不可部份複製。
This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at www.sgs.com/terms and conditions.htm and, for electronic format documents, subject to Terms and Conditions 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

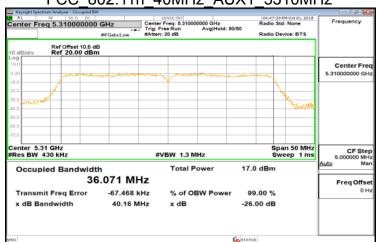


Page: 43 of 287

FCC 802.11n 40MHz AUX1 5190MHz

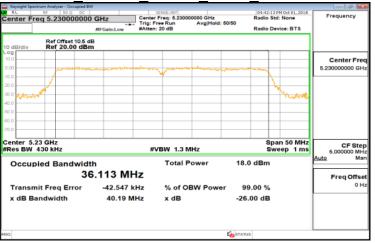
FCC 802.11n 40MHz AUX1 5310MHz

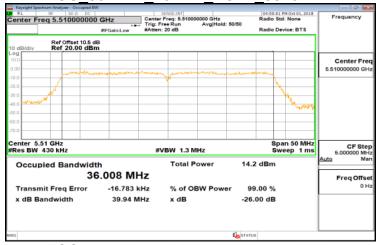




FCC_802.11n_40MHz_AUX1_5230MHz

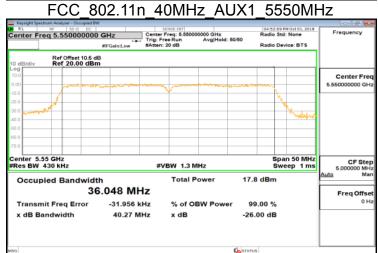
FCC 802.11n 40MHz AUX1 5510MHz





FCC 802.11n 40MHz AUX1 5270MHz

enter Freq 5.270000000 GHz Center Free CF Step 5.000000 MHz Man #VBW 1.3 MHz Occupied Bandwidth Total Power 17.8 dBm 36.083 MHz Transmit Freq Error -49.735 kHz % of ORW Po 99.00 % x dB Bandwidth 40.32 MHz x dB -26.00 dB



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,同時此樣品僅保留別天。本報告未經本公司書面許可,不可部份複製。
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



Page: 44 of 287

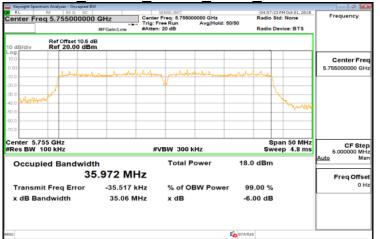
FCC 802.11n 40MHz AUX1 5670MHz

Reputit Spectrum Analyzer - Decupies BW RL NF 50 D DC NTEF Freq 5.670000000 GHz Trig: Free Run Anan: 20 dB Ref Offset 10.5 dB Ref 20.00 dBm Center Free CF Step 5.000000 A** enter 5.67 GHz Res BW 430 kHz Span 50 MHz Sweep 1 ms #VBW 1.3 MHz Total Power 18.7 dBm Occupied Bandwidth 36.086 MHz % of OBW Powe Transmit Freq Error -68 582 kHz 99.00 % x dB Bandwidth 40.80 MHz x dB -26.00 dB

FCC 802.11n 40MHz Chain0 5710MHz



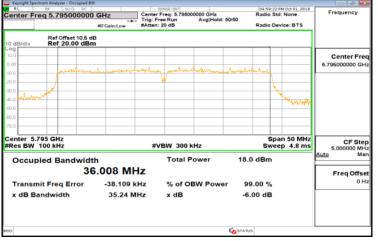
FCC_802.11n_40MHz_AUX1_5755MHz



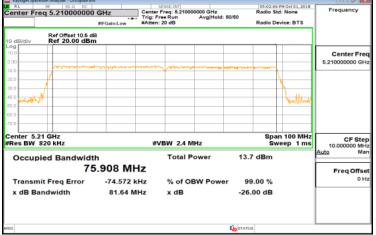
FCC 802.11n 40MHz Chain1 5710MHz



FCC 802.11n 40MHz AUX1 5795MHz







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,同時此樣品僅保留別天。本報告未經本公司書面許可,不可部份複製。
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

SGS Taiwan Ltd. No.134, WuKungRoad, NewTaipeiIndustrialPark, WukuDistrict, NewTaipeiCity, Taiwan24803/新北市五股區新北產業園區五工路 134 號

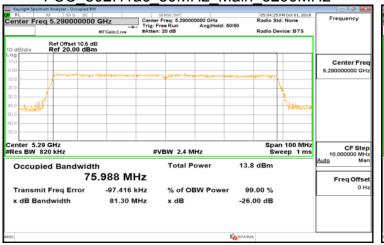
www.tw.sas.com

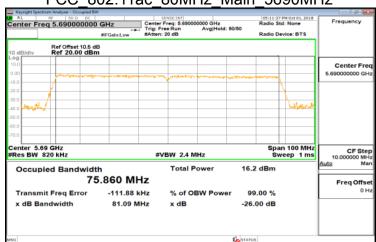


Page: 45 of 287

FCC 802.11ac 80MHz Main 5290MHz

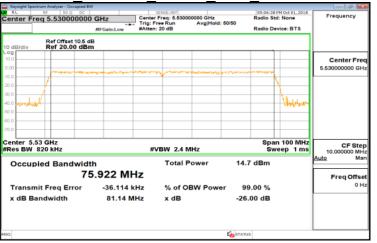
FCC 802.11ac 80MHz Main 5690MHz

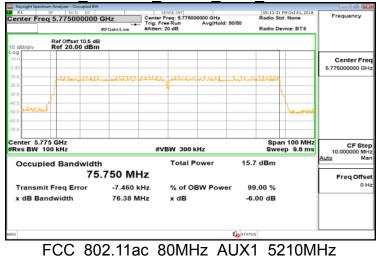




FCC 802.11ac 80MHz Main 5530MHz

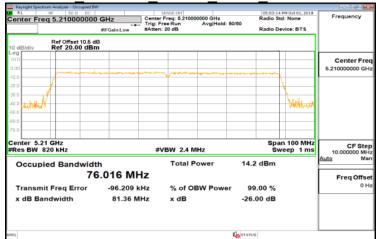






FCC 802.11ac 80MHz_Main_5610MHz





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.

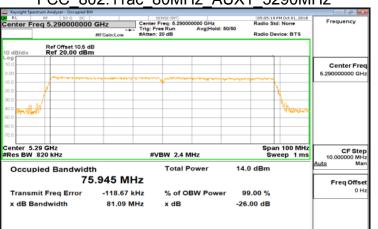
除非另有說明,此報告結果僅對測試之樣品負責,同時此樣品僅保留別天。本報告未經本公司書面許可,不可部份複製。
This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at www.sgs.com/terms and conditions.htm and, for electronic format documents, subject to Terms and Conditions 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

f (886-2) 2298-0488

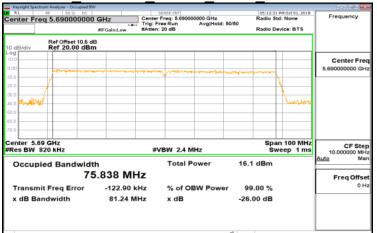


Page: 46 of 287

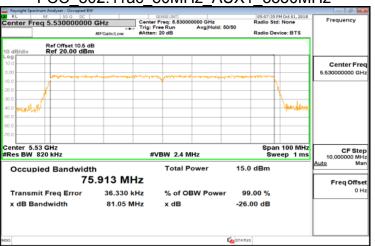
FCC 802.11ac 80MHz AUX1 5290MHz



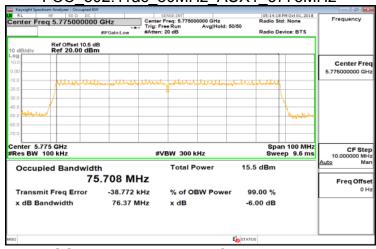
FCC 802.11ac 80MHz AUX1 5690MHz



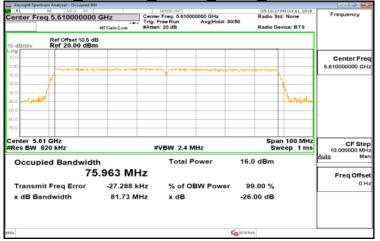
FCC 802.11ac 80MHz AUX1 5530MHz



FCC 802.11ac 80MHz AUX1 5775MHz



FCC_802.11ac_80MHz_AUX1_ 5610MHz







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,不可部份複製

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

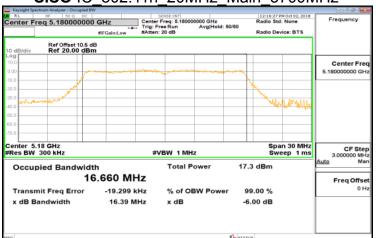


Page: 47 of 287

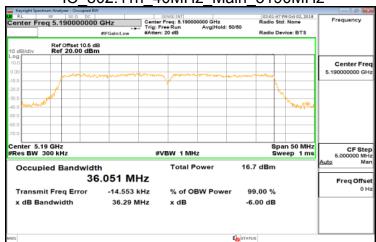
FCC 802.11ac 80MHz Chain1 5690MHz



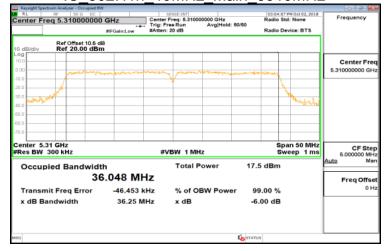
SISO IC 802.11n 20MHz Main 5700MHz



IC 802.11n 40MHz Main 5190MHz



IC 802.11n 40MHz Main 5310MHz



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.

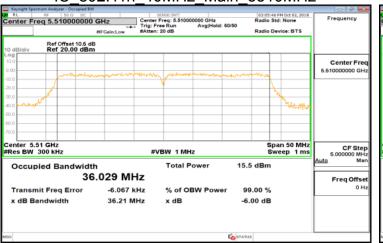
除非另有說明,此報告結果僅對測試之樣品負責,同時此樣品僅保留別天。本報告未經本公司書面許可,不可部份複製。
This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at www.sgs.com/terms and conditions.htm and, for electronic format documents, subject to Terms and Conditions 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

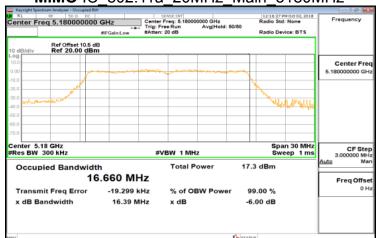


Page: 48 of 287

IC 802.11n 40MHz Main 5510MHz

MIMO IC 802.11a 20MHz Main 5180MHz

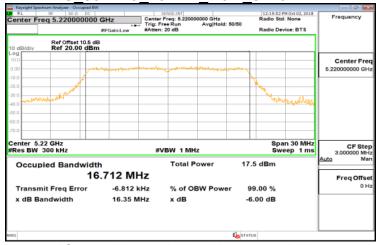




IC 802.11ac 80MHz Main 5210MHz

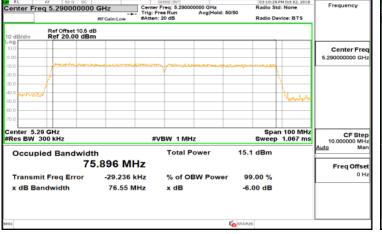
IC 802.11a 20MHz Main 5220MHz

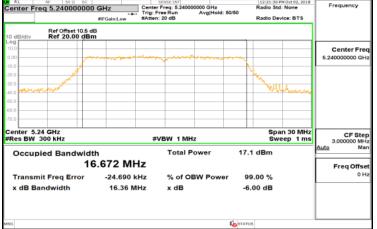




IC 802.11ac 80MHz Main 5290MHz

IC 802.11a 20MHz Main 5240MHz





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.

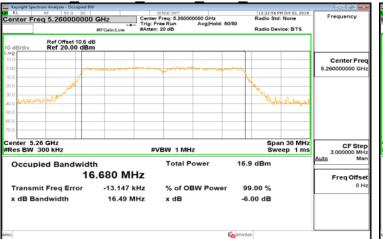
除非另有說明,此報告結果僅對測試之樣品負責,同時此樣品僅保留別天。本報告未經本公司書面許可,不可部份複製。
This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at www.sgs.com/terms and conditions.htm and, for electronic format documents, subject to Terms and Conditions 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

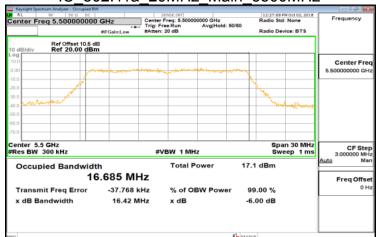


Page: 49 of 287

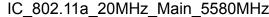
IC 802.11a 20MHz Main 5260MHz

IC 802.11a 20MHz Main 5500MHz

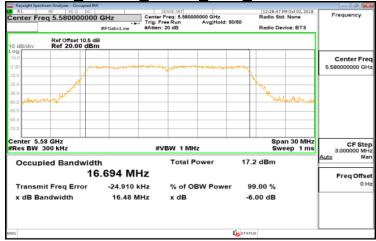




IC 802.11a 20MHz Main 5300MHz

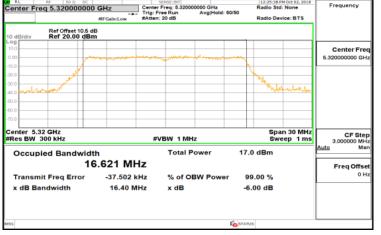






IC 802.11a 20MHz Main 5320MHz

IC 802.11a 20MHz Main 5700MHz





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,同時此樣品僅保留別天。本報告未經本公司書面許可,不可部份複製。
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

f (886-2) 2298-0488