RF TEST REPORT

SIEMIC
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Report No.: RF_SL15013001-MIM-002-Part90_Rev2.0
Supersede Report No.: RF_SL15013001-MIM-002-Part90_Rev1.0

Applicant	Mimosa Networks, Inc.
Product Name	Point to Point Device
Model No.	C5 & B5-Lite
Test Standard	47 CFR Part 90 Subpart Y
Test Procedure	47 CFR Part 90 Subpart Y 971168D01 Power Meas License Digital System v02r01
FCC ID	2ABZJ-100-00010
Date of test	01/09/2015 to 04/08/2015
Issue Date	06/12/2015
Test Result	☒ Pass ☐ Fail
Equipment complied with the specification	**[x]**
Equipment did not comply with the specification	**[ ]**

	
Nima Molaei	**David Zhang**
Test Engineer	**Engineer Reviewer**

This test report may be reproduced in full only
Test result presented in this test report is applicable to the tested sample only

Issued By:
SIEMIC Laboratories
775 Montague Expressway, Milpitas, 95035 CA

ilac-MRA
A2LA ACCREDITED
TESTING CERT # 2742-01

Laboratory Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.

In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

Accreditations for Conformity Assessment

Country/Region	Accreditation Body	Scope
USA	FCC, A2LA	EMC, RF/Wireless, Telecom
Canada	IC, A2LA, NIST	EMC, RF/Wireless, Telecom
Taiwan	BSMI, NCC, NIST	EMC, RF, Telecom, Safety
Hong Kong	OFTA, NIST	RF/Wireless, Telecom
Australia	NATA, NIST	EMC, RF, Telecom, Safety
Korea	KCC/RRA, NIST	EMI, EMS, RF, Telecom, Safety
Japan	VCCI, JATE, TELEC, RFT	EMI, RF/Wireless, Telecom
Mexico	NOM, COFETEL, Caniety	Safety, EMC, RF/Wireless, Telecom
Europe	A2LA, NIST	EMC, RF, Telecom, Safety
Israel	COM, NIST	EMC, RF, Telecom, Safety

Accreditations for Product Certifications

Country	Accreditation Body	Scope
USA	FCC TCB, NIST	EMC, RF, Telecom
Canada	IC FCB, NIST	EMC, RF, Telecom
Singapore	iDA, NIST	EMC, RF, Telecom
EU	NB	EMC & R&TTE Directive
Japan	MIC (RCB 208)	RF, Telecom
Hong Kong	OFTA (US002)	RF, Telecom

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1 Report Revision History

Report No.	Report Version	Description	Issue Date
RF_SL15013001-MIM-002-Part90	-	Original	03/24/2015
RF_SL15013001-MIM-002-Part90_Rev1.0	1.0	Correct power measurements	04/08/2015
RF_SL15013001-MIM-002-Part90_Rev2.0	2.0	Correct Power data	06/12/2015

2 Executive Summary

The purpose of this test program was to demonstrate compliance of following product

Company: Mimosa Networks, Inc.
Product: Point to Point Device
Model: C5 & B5-Lite

against the current Stipulated Standards. The specified model product stated above has demonstrated compliance with the Stipulated Standard listed on 1st page.

3 Customer information

Applicant Name	Mimosa Networks, Inc.
Applicant Address	300 Orchard City Dr. Suite 100, Campbell, CA 95008, USA
Manufacturer Name	Mimosa Networks, Inc.
Manufacturer Address	300 Orchard City Dr. Suite 100, Campbell, CA 95008, USA

4 Test site information

Lab performing tests	SIEMIC Laboratories
Lab Address	775 Montague Expressway, Milpitas, CA 95035
FCC Test Site No.	881796
IC Test Site No.	4842D-2
VCCI Test Site No.	A0133

5 Modification

Index	Item	Description	Note
-	-	-	-

6 EUT Information

6.1 EUT Description

Product Name	:	Point to Point Device
Model No.	:	C5 & B5-Lite
Trade Name	:	Mimosa
Serial No.	:	N/A
Input Power	:	48VDC
Power Adapter Manu/Model	:	PHIHONG /POE16R-560
Power Adapter SN	:	N/A
Product Hardware version	:	Rev. C
Product Software version	:	1.1.1
Radio Hardware version	:	Rev. C
Radio Software version	:	1.1.1
Test Software version	:	1.1.1
Date of EUT received	:	01/05/2015
Equipment Class/ Category	:	UNII
Clock Frequencies	:	N/A
Port/Connectors	:	PoE, Ethernet
Remark	:	The C5 is a client only device and the B5-Lite is a master device for a point to point short distance back haul that is powered with a 48v PoE injector. The C5 & B5-Lite are physically identical. The results which was presented in this report is related to B5-Lite model.

6.2 Radio Description

Spec for Radio -

Radio Type	Description
Operating Frequency	4950MHz – 4980MHz
Modulation	OFDM, 16-QAM, 64-QAM
Channel Spacing	5MHz
Number of Channels	3
Antenna Gain	20dBi
Antenna Type	Integrated Folded Dipole
Antenna Connector Type	N/A

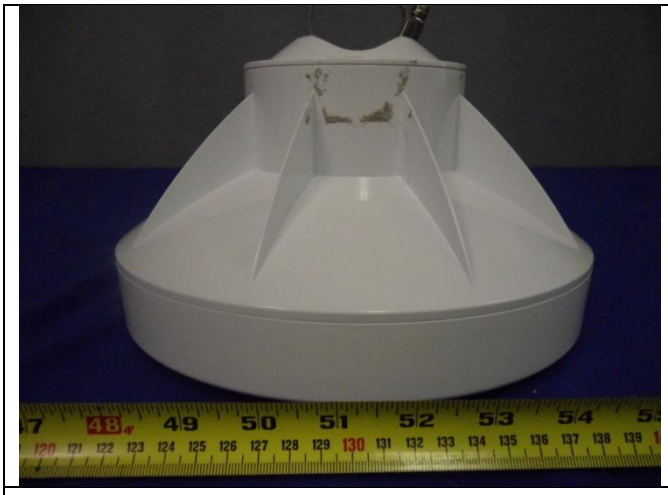
6.3 EUT test modes/configuration Description

Test Mode		Note
Test_mode_1	Continuous Transmit	-
Test_mode_2	-	-
Remark:		

EUT Power Level Settings

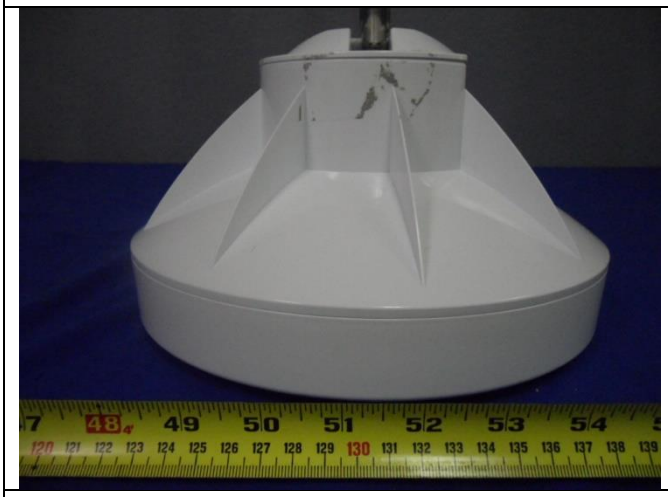
Channel	Frequency	Bandwidth	Power Setting
190	4950	20	23
193	4965	20	23
196	4980	20	23

6.4 EUT Photos – External

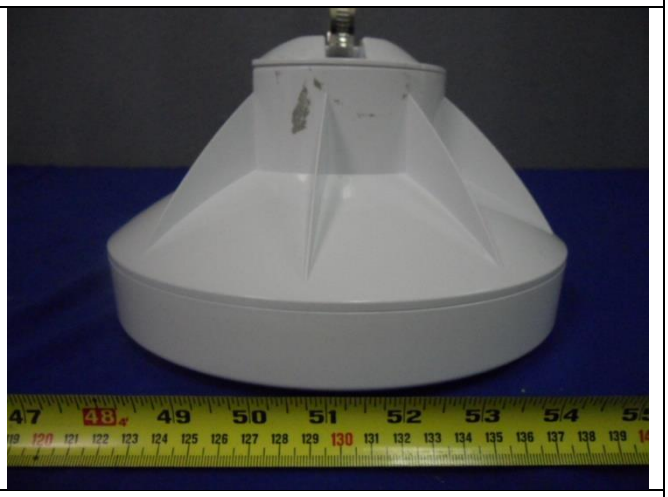


EUT – Front View

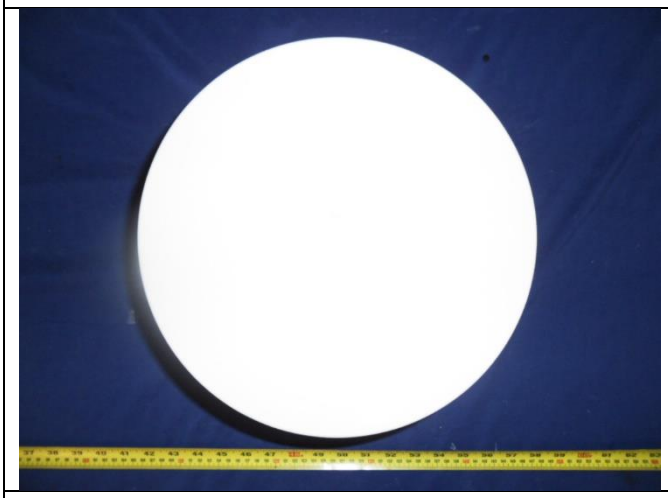
EUT – Rear View



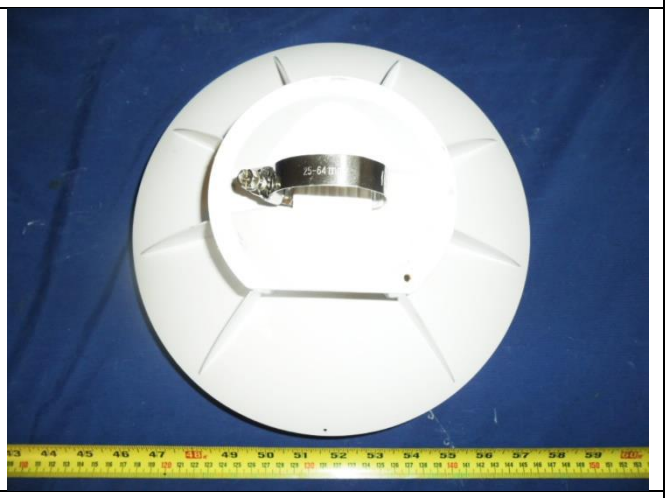
EUT – Left View



EUT – Right View

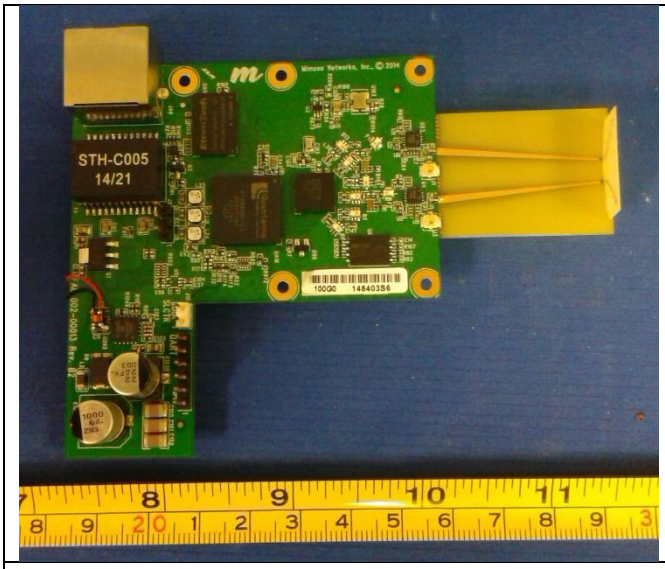
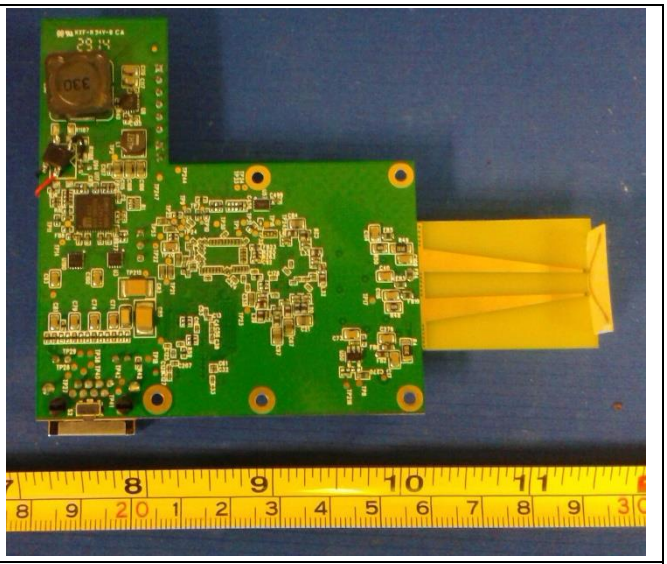


EUT – Top View

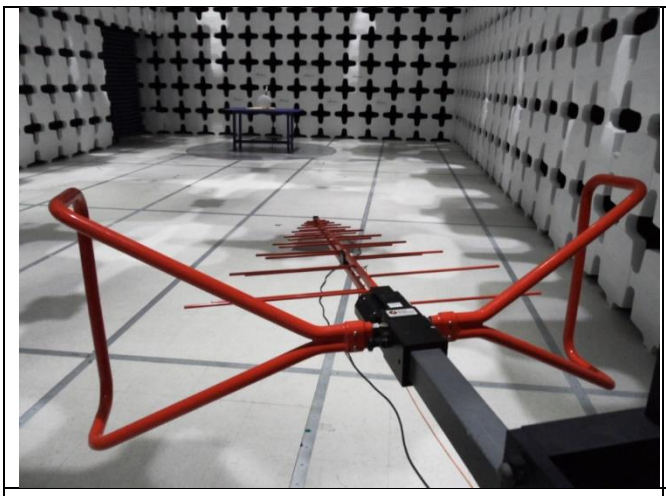
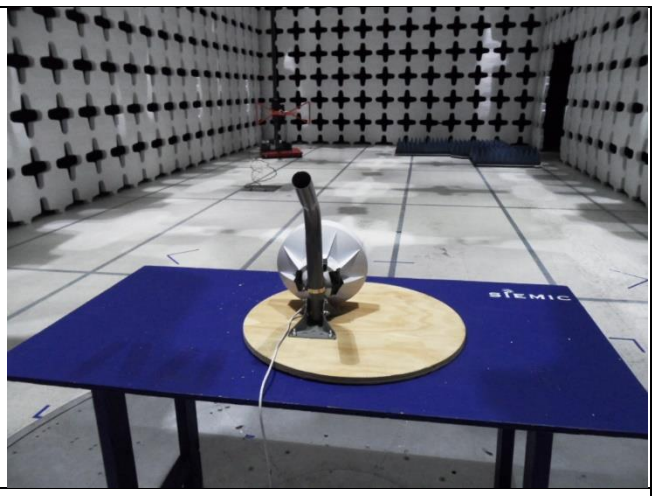
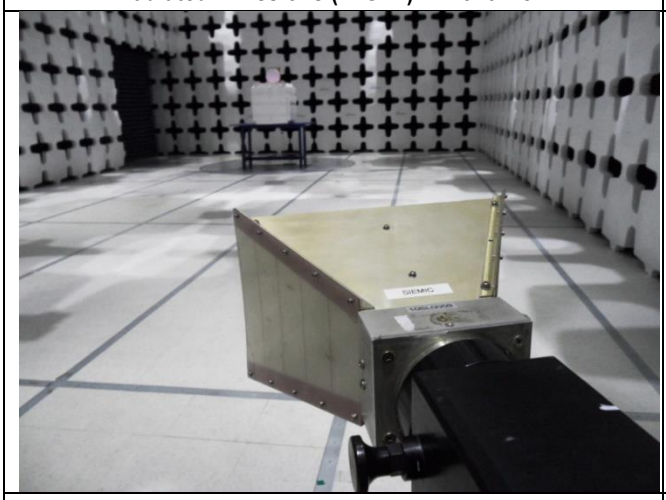
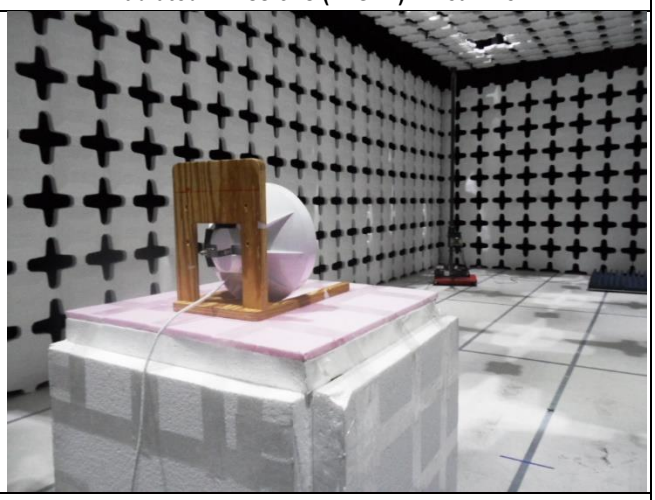


EUT – Bottom View

6.5 EUT Photos – Internal

	
EUT – Front View	**EUT – Rear View**

6.6 EUT Test Setup Photos

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>Radiated Emissions (<1GHz) – Front View</td><td>Radiated Emissions (<1GHz) – Rear View</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Radiated Emissions (>1GHz) – Front View</td><td>Radiated Emissions (>1GHz) – Rear View</td></tr>
</table>

Note: The spurious emission in different EUT orientation was investigated, including the EUT standing up position and the laying down position. The EUT orientation shown in above setup photo is the worst case position.

7 Supporting Equipment/Software and cabling Description

7.1 Supporting Equipment

Item	Supporting Equipment Description	Model	Serial Number	Manufacturer	Note
1	Laptop	T530	-	Lenovo	-
2	PoE Adapter	POE16R-560	-	PHIHONG	-

7.2 Cabling Description

Name	Connection Start		Connection Stop		Length / shielding Info		Note
	From	I/O Port	To	I/O Port	Length (m)	Shielding	
RJ45	EUT	RJ45	POE	RJ45	2	Unshielded	-
RJ45	POE	RJ45	Laptop	RJ45	3	Unshielded	-

7.3 Test Software Description

Test Item	Software	Description
RF Testing	Putty	Set the EUT to transmit continuously in different test modes and channels

8 Test Summary

Test Item	Test standard		Test Method/Procedure	Pass / Fail
Occupied Bandwidth & Emissions Mask	FCC	§90 Subpart Y	FCC §2.1049 FCC §90.210	☒ Pass ☐ N/A
Peak Output Power	FCC	§90 Subpart Y	FCC §2.1046 FCC §90.1215(a)	☒ Pass ☐ N/A
Power Spectral Density	FCC	§90 Subpart Y	FCC §2.1046 FCC §90.1215(a)	☒ Pass ☐ N/A
Peak Excursion	FCC	§90 Subpart Y	FCC §90.1215	☒ Pass ☐ N/A
Conducted Spurious Emissions at the Antenna Terminals	FCC	§90 Subpart Y	FCC §2.1051 FCC §90.210	☒ Pass ☐ N/A
Radiated Spurious Emissions	FCC	§90 Subpart Y	FCC §2.1053 FCC §90.210	☒ Pass ☐ N/A
Frequency Stability	FCC	§90 Subpart Y	FCC §2.1055 FCC §90.213	☒ Pass ☐ N/A
Remark	1. All measurement uncertainties do not take into consideration for all presented test results. 2. The applicant shall ensure frequency stability by showing that an emission is maintained within the band of operation under all normal operating conditions as specified in the user's manual.			

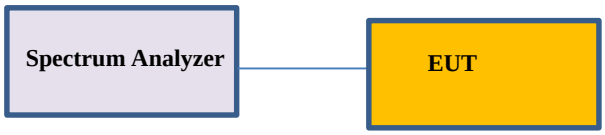
9 Measurement Uncertainty

Emissions			
Test Item	**Frequency Range**	**Description**	**Uncertainty**
Radiated Spurious Emissions	30MHz – 1GHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+5.6dB/-4.5dB
Radiated Spurious Emissions	1GHz – 40GHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+4.3dB/-4.1dB

10 Measurements, Examination and Derived Results

10.1 Occupied Bandwidth & Emissions Mask

Requirement(s):

<table>
<tr><td>Spec</td><td>Requirement</td><td>Applicable</td></tr>
<tr><td>FCC §2.1049
FCC §90.210</td><td>For low power transmitters (20 dBm or less) and high power transmitters (greater than 20 dBm operating in the 4940-4990 MHz frequency band, the power spectral density of the emissions must be attenuated below the output power of the transmitter as follows:
<table>
<tr><th rowspan="2">Frequency Offset f_d</th><th colspan="2">Minimum Attenuation</th></tr>
<tr><th>Low Power Transmitter</th><th>High Power Transmitter</th></tr>
<tr><td>$0 < f_d \leq 45$</td><td>0</td><td>0</td></tr>
<tr><td>$45 < f_d \leq 50$</td><td>$219 \log(f_d/45)$</td><td>$568 \log(f_d/45)$</td></tr>
<tr><td>$50 < f_d \leq 55$</td><td>$10 + 242 \log(f_d/50)$</td><td>$26 + 145 \log(f_d/50)$</td></tr>
<tr><td>$55 < f_d \leq 100$</td><td>$20 + 31 \log(f_d/55)$</td><td>$32 + 31 \log(f_d/55)$</td></tr>
<tr><td>$100 < f_d \leq 150$</td><td>$28 + 68 \log(f_d/100)$</td><td>$40 + 57 \log(f_d/100)$</td></tr>
<tr><td>$f_d > 150$</td><td>40</td><td>50 dB or 55 + 10 log (P) dB, whichever is the lesser attenuation.</td></tr>
</table>
f_d is the percentage of the equipment's channel bandwidth.</td><td>☒</td></tr>
<tr><td>Test Setup</td><td colspan="2"> 
</td></tr>
<tr><td>Test Procedure</td><td colspan="2">The zero dB reference is measured relative to the highest average power of the fundamental emission measured across the designated channel bandwidth using a resolution bandwidth of at least one percent of the occupied bandwidth of the fundamental emission and a video bandwidth of 30 kHz.</td></tr>
<tr><td>Test Date</td><td>02/18/2015</td><td>Environmental condition
Temperature 23ºC
Relative Humidity 38%
Atmospheric Pressure 1020mbar</td></tr>
<tr><td>Remark</td><td colspan="2">Total power is higher than 20dBm so the device was considered as a high power device.</td></tr>
<tr><td>Result</td><td colspan="2">☒ Pass ☐ Fail</td></tr>
</table>

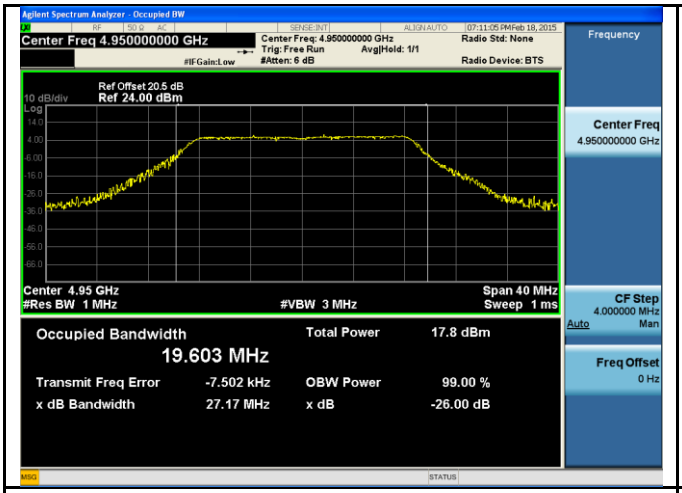
Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes ☐ N/A

High Power Setting – 20dBi Antenna Gain Measurement Results

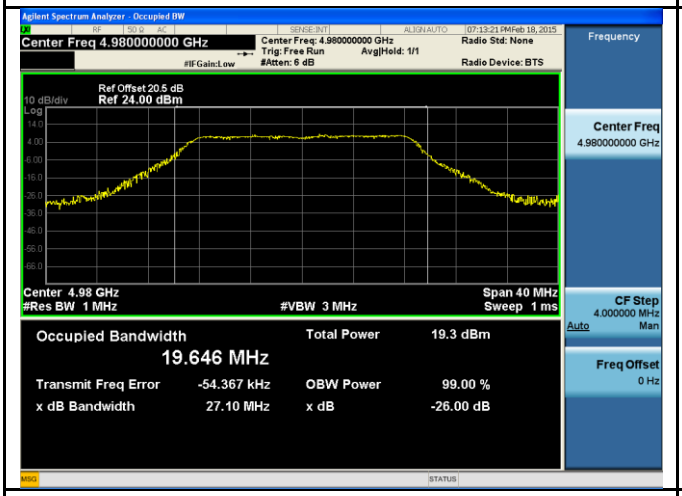
Frequency (MHz)	Channel	26dB Bandwidth (MHz)	99% Bandwidth (MHz)
4950	Low	27.17	19.603
4965	Middle	27.43	19.515
4980	High	27.10	19.646

Occupied Bandwidth Test Plots



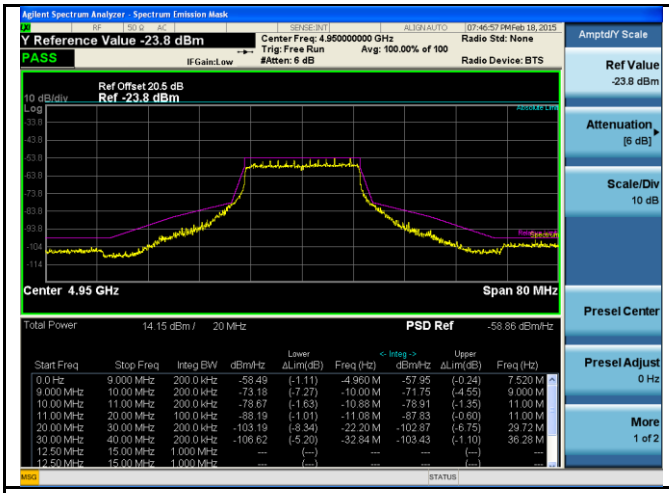
26dB & 99% Bandwidth (20dBi Antenna) - Low CH 4950MHz

26dB & 99% Bandwidth (20dBi Antenna) - Mid CH 4965MHz

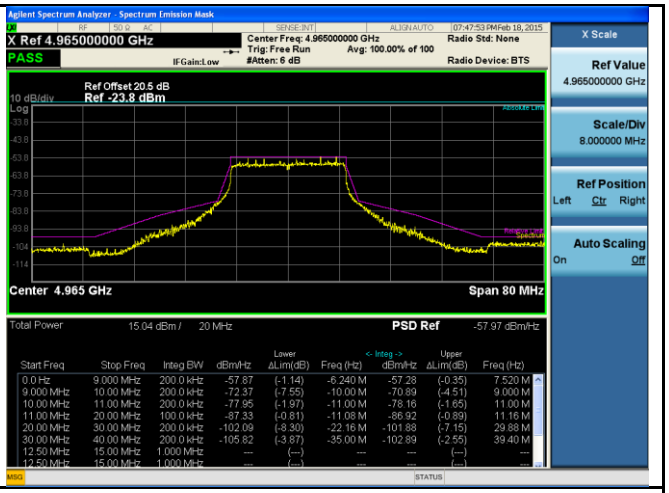


26dB & 99% Bandwidth (20dBi Antenna) - High CH 4980MHz

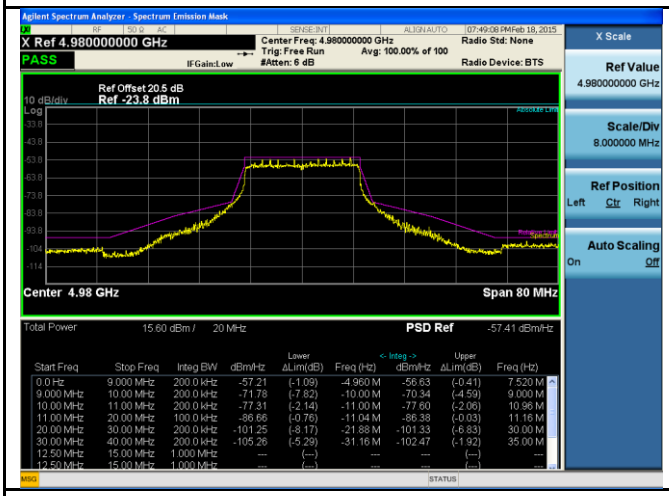
Emission Mask Test Plots



Emission Mask (20dBi Antenna) - Low CH 4950MHz



Emission Mask (20dBi Antenna) - Mid CH 4965MHz



Emission Mask (20dBi Antenna) - High CH 4980MHz

10.2 Peak Output Power

Requirement(s):

Spec	Requirement	Applicable
FCC §2.1046 FCC §90.1215(a)	Per FCC §90.1215, the transmitting power of stations operating in the 4940-4990 MHz band must not exceed the maximum limits in this section. The maximum conducted output power should not exceed:	☒

Channel bandwidth (MHz)	Low power maximum conducted output power (dBm)	High power maximum conducted output power (dBm)
1	7	20
5	14	27
10	17	30
15	18.8	31.8
20	20	33

If transmitting antennas of directional gain greater than 9 dBi are used, both the maximum conducted output power and the peak power spectral density should be reduced by the amount in decibels that the directional gain of the antenna exceeds 9 dBi. However, high power point-to-point and point-to-multipoint operations (both fixed and temporary-fixed rapid deployment) may employ transmitting antennas with directional gain up to 26 dBi without any corresponding reduction in the maximum conducted output power or spectral density. Corresponding reduction in the maximum conducted output power and peak power spectral density should be the amount in decibels that the directional gain of the antenna exceeds 26 dBi

Test Setup				
Test Procedure	971168D01 Power Meas License Digital System v02r01. Method 5.2.2.3 Maximum spectral density measurement procedure - Set span to at least 1.5 times the OBW - Set RBW = 1-5 % of the OBW, not to exceed 1MHz - Set VBW ≥ 3 MHz - Detector = RMS - Sweep time = auto couple. - Trace mode = max hold.			
Test Date	04/08/2015	Environmental condition	Temperature Relative Humidity Atmospheric Pressure	23°C 38% 1020mbar
Remark	Total power is higher than 20dBm so the device was considered as a high power device.			
Result	☒ Pass ☐ Fail			

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

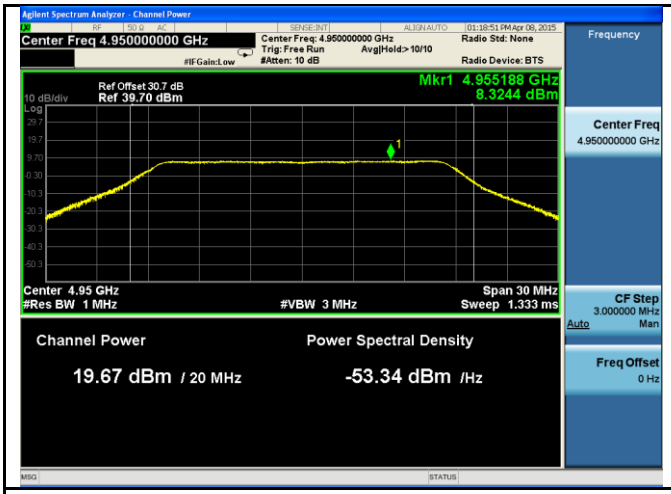
Equipment Setting

Test	RBW	VBW	Span	Detector	Sweep	Trace	Notes
Average Output Power	1MHz	≥3MHz	1.5 X OBW	RMS	Auto	Max Hold	-

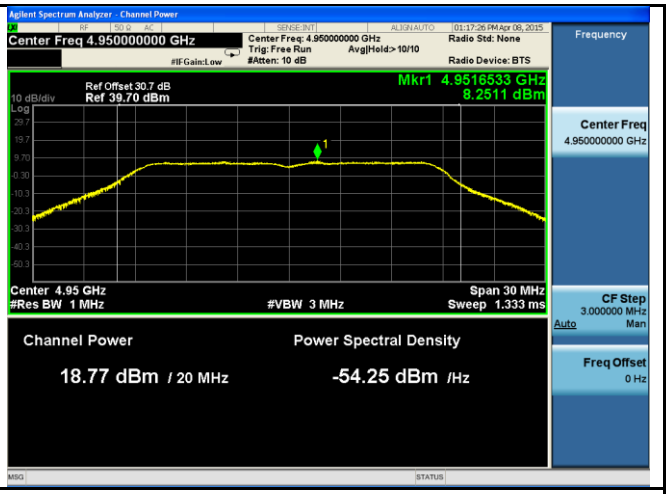
Average Output Power measurement results (20dBi Antenna Gain)

Channel	Frequency (MHz)	Conducted Power (dBm)			Output Power Limit (dBm)	Result
		Chain 1	Chain 2	Combined Power or Highest Power		
Low	4950	19.67	18.77	22.25	33	Pass
Mid	4965	20.03	19.15	22.62	33	Pass
High	4980	20.55	19.05	22.87	33	Pass

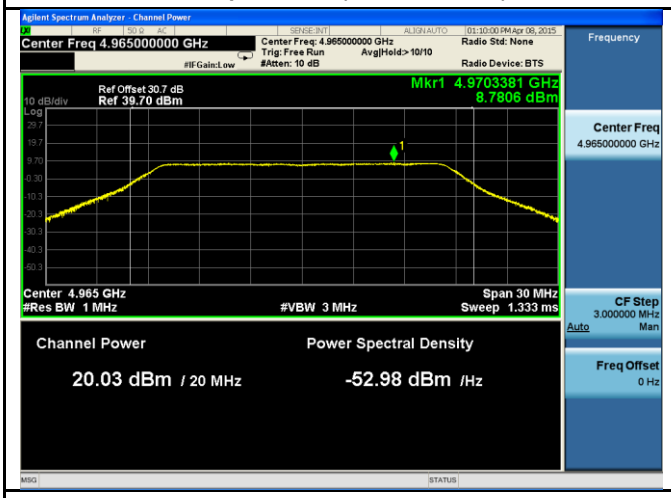
Ave Output Power Test Plots



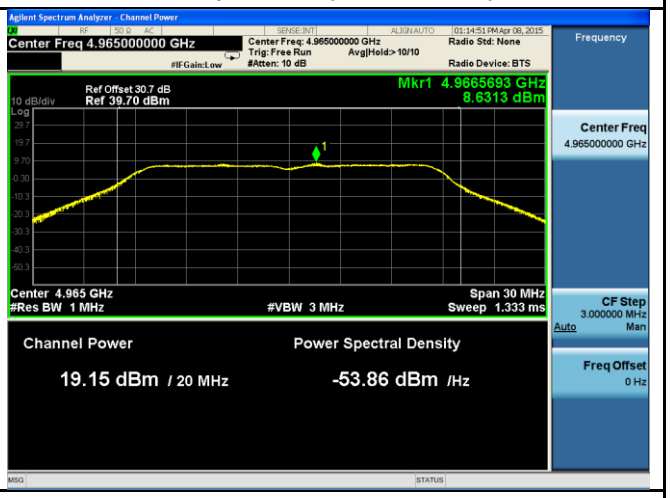
Chain 1 Ave Output Power (20dBi Antenna) - 4950MHz



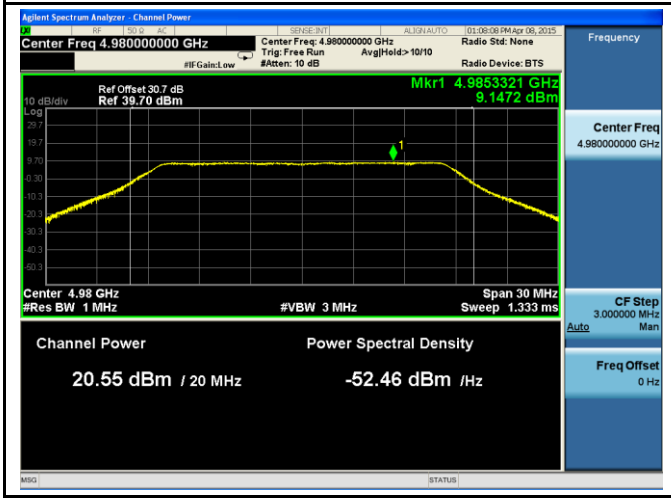
Chain 2 Ave Output Power (20dBi Antenna) - 4950MHz



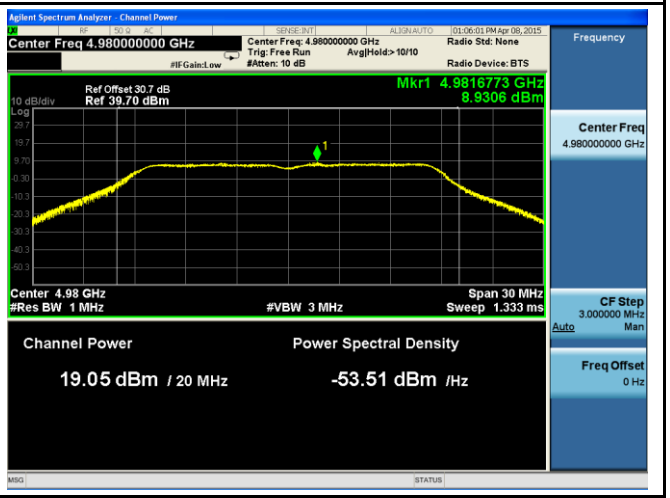
Chain 1 Ave Output Power (20dBi Antenna) - 4965MHz



Chain 2 Ave Output Power (20dBi Antenna) - 4965MHz



Chain 1 Ave Output Power (20dBi Antenna) - 4980MHz



Chain 2 Ave Output Power (20dBi Antenna) - 4980MHz

10.3 Power Spectral Density

Requirement(s):

Spec	Requirement	Applicable
FCC §2.1046 FCC §90.1215	High power devices are also limited to a peak power spectral density of 21 dBm per one MHz. If transmitting antennas of directional gain greater than 9 dBi are used, the peak power spectral density should be reduced by the amount in decibels that the directional gain of the antenna exceeds 9 dBi. Low power devices are also limited to a peak power spectral density of 8 dBm per one MHz. Low power devices using channel bandwidths other than those listed above are permitted; however, they are limited to a peak power spectral density of 8 dBm/MHz. If transmitting antennas of directional gain greater than 9 dBi are used, the peak power spectral density should be reduced by the amount in decibels that the directional gain of the antenna exceeds 9 dBi. However, high power point-to-point and point-to-multipoint operations (both fixed and temporary-fixed rapid deployment) may employ transmitting antennas with directional gain up to 26 dBi without any corresponding reduction in the maximum conducted output power or spectral density. Corresponding reduction in the maximum conducted output power and peak power spectral density should be the amount in decibels that the directional gain of the antenna exceeds 26 dBi	☒

Test Setup			
Test Procedure	971168D01 Power Meas License Digital System v02r01. Method 5.4.2.3 Maximum spectral density measurement procedure - Set span to minimum of 1.5 times the OBW - Set RBW = 1 MHz - Set VBW ≥ 3 MHz - Detector = RMS - Sweep time = auto couple. - Trace mode = max hold. - Use the peak marker function to determine the maximum amplitude level within the RBW.		
Test Date	04/08/2015	Environmental condition	Temperature 23ºC Relative Humidity 38% Atmospheric Pressure 1020mbar
Remark	Total power is higher than 20dBm so the device was considered as a high power device.		
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

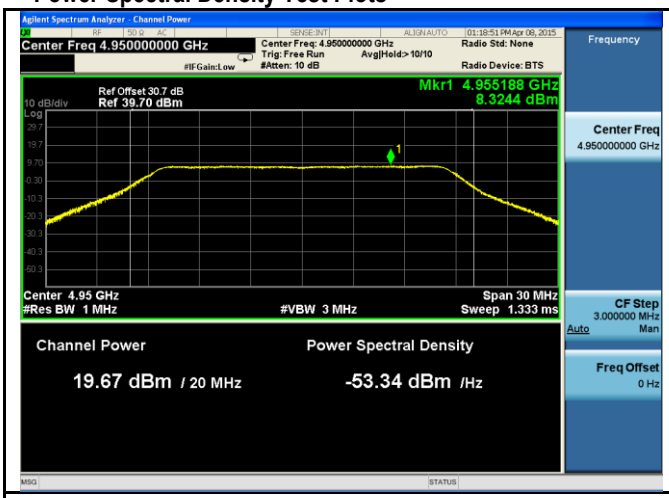
Equipment Setting

Test	RBW	VBW	Span	Detector	Sweep	Trace	Notes
PSD	1MHz	≥3MHz	1.5 OBW	RMS	Auto	Max Hold	-

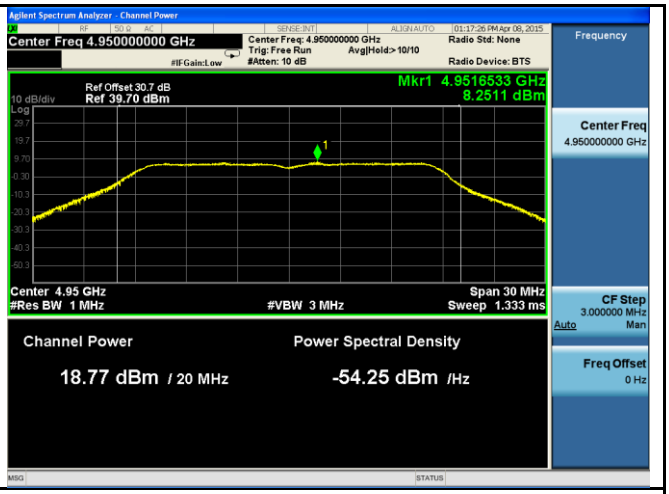
Power Spectral Density measurement results (20dBi Antenna Gain)

Channel	Frequency (MHz)	Conducted Power (dBm)			PSD Limit (dBm/MHz)	Result
		Chain 1	Chain 2	Combined Power or Highest Power		
Low	4950	8.32	8.25	11.30	21.00	Pass
Mid	4965	8.78	8.63	11.72	21.00	Pass
High	4980	9.15	8.93	12.05	21.00	Pass

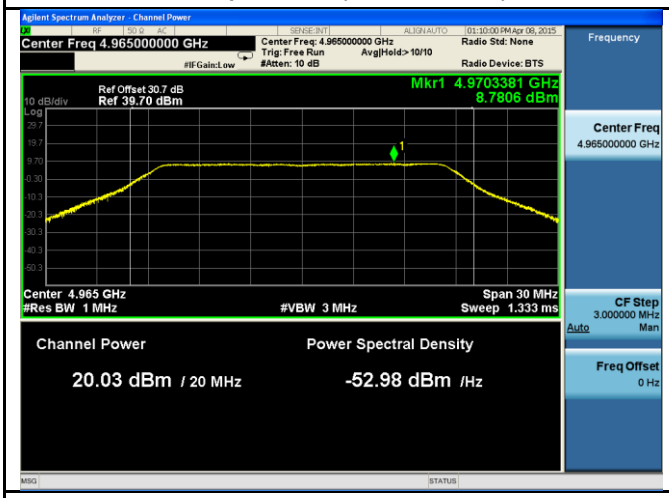
Power Spectral Density Test Plots



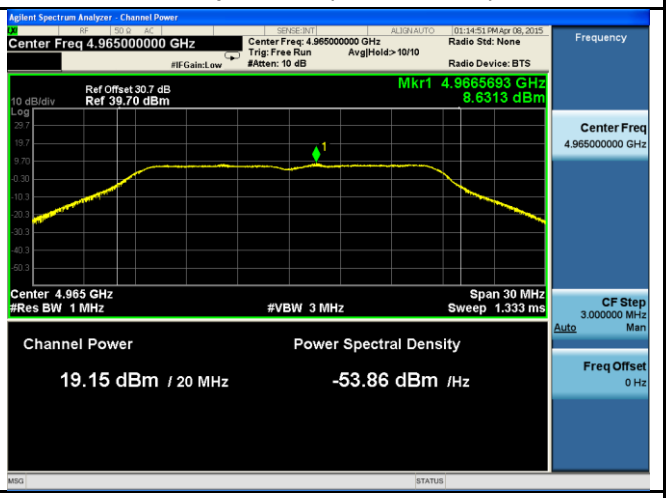
Chain 1 Ave Output Power (20dBi Antenna) - 4950MHz



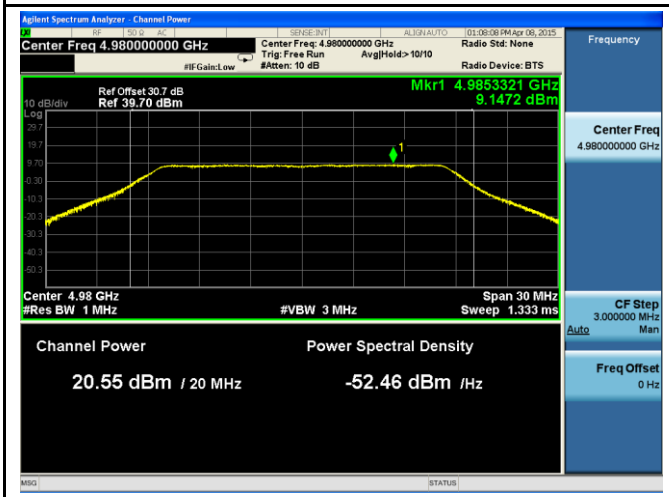
Chain 2 Ave Output Power (20dBi Antenna) - 4950MHz



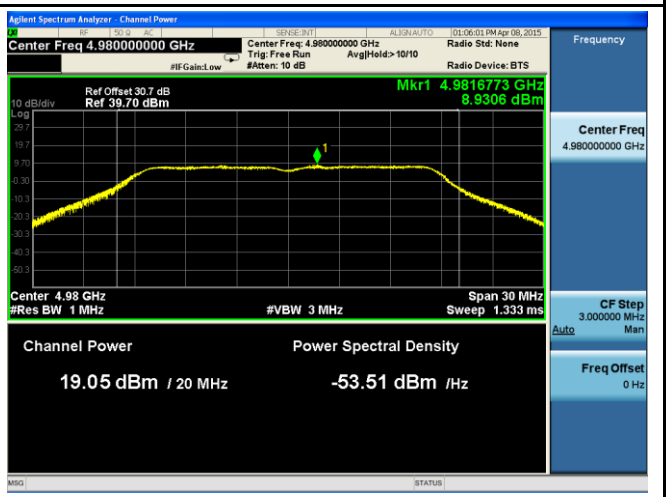
Chain 1 Ave Output Power (20dBi Antenna) - 4965MHz



Chain 2 Ave Output Power (20dBi Antenna) - 4965MHz



Chain 1 Ave Output Power (20dBi Antenna) - 4980MHz



Chain 2 Ave Output Power (20dBi Antenna) - 4980MHz

10.4 Peak Excursion

Requirement(s):

Spec	Requirement	Applicable
FCC §90.1215	The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.	☒

Test Setup				
Test Procedure	The EUT was set to transmit continuously; The following setting were set on the spectrum analyzer: Trace 1: - RBW = 1MHz - VBW = 3 x RBW - Span = 40MHz - Detector = Peak - Trace = Maxhold Trace 2: - RBW = 1MHz - VBW = 3 x RBW - Span = 40MHz - Detector = Average (RMS) - Trace = 100 Trace average			
Test Date	02/18/2015	Environmental condition	Temperature Relative Humidity Atmospheric Pressure	21°C 38% 1020mbar
Remark	-			
Result	☒ Pass ☐ Fail			

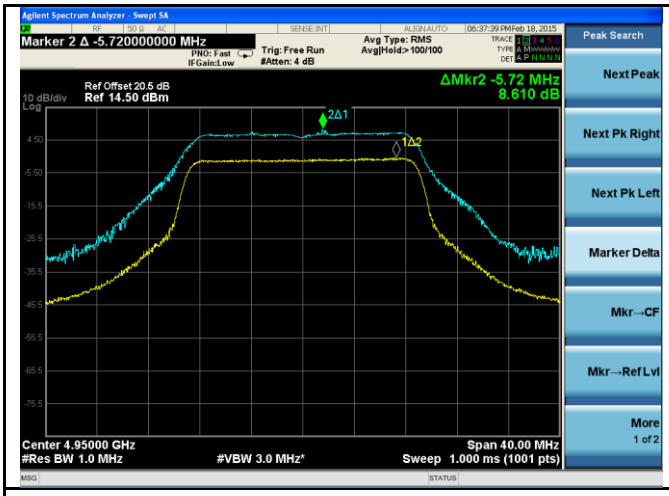
Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

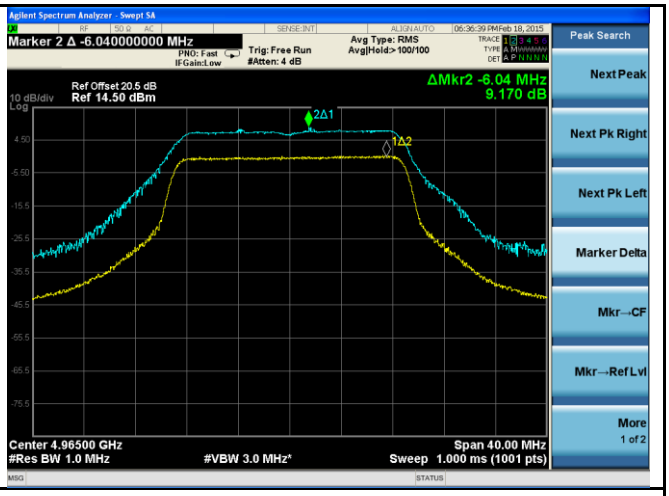
Peak Excursion Measurement Results (20dBi Antenna Gain)

Channel	Frequency (MHz)	Peak Excursion (dBm)	Limit (dBm)	Result
Low	4950	8.610	13.00	Pass
Mid	4965	9.170	13.00	Pass
High	4980	8.941	13.00	Pass

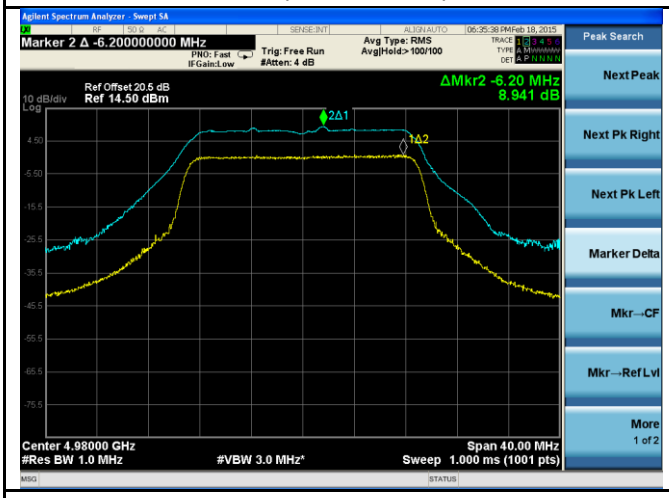
Peak Excursion Test Plots



Peak Excursion (20dBi Antenna) - 4950MHz



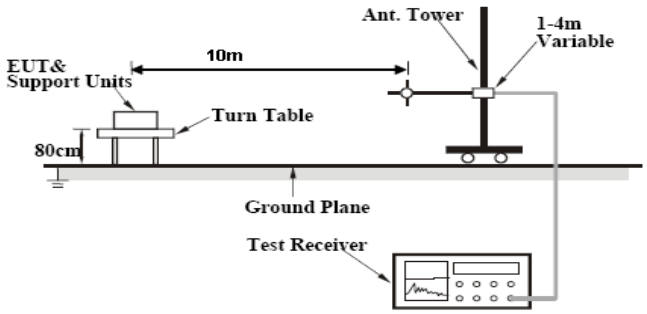
Peak Excursion (20dBi Antenna) - 4965MHz



Peak Excursion (20dBi Antenna) - 4980MHz

10.5 Radiated Spurious Emissions Below 1GHz

Requirement(s):

<table>
<tr><th>Spec</th><th>Requirement</th><th>Applicable</th></tr>
<tr><td>FCC §2.1053
FCC §90.210</td><td>For low power transmitters (20 dBm or less) and high power transmitters (greater than 20 dBm operating in the 4940-4990 MHz frequency band, the power spectral density of the emissions must be attenuated below the output power of the transmitter as follows:
<table>
<tr><th rowspan="2">Frequency Offset f_d</th><th colspan="2">Minimum Attenuation</th></tr>
<tr><th>Low Power Transmitter</th><th>High Power Transmitter</th></tr>
<tr><td>$0 < f_d \leq 45$</td><td>0</td><td>0</td></tr>
<tr><td>$45 < f_d \leq 50$</td><td>$219 \log(f_d/45)$</td><td>$568 \log(f_d/45)$</td></tr>
<tr><td>$50 < f_d \leq 55$</td><td>$10 + 242 \log(f_d/50)$</td><td>$26 + 145 \log(f_d/50)$</td></tr>
<tr><td>$55 < f_d \leq 100$</td><td>$20 + 31 \log(f_d/55)$</td><td>$32 + 31 \log(f_d/55)$</td></tr>
<tr><td>$100 < f_d \leq 150$</td><td>$28 + 68 \log(f_d/100)$</td><td>$40 + 57 \log(f_d/100)$</td></tr>
<tr><td>$f_d > 150$</td><td>40</td><td>50 dB or 55 + 10 log (P) dB, whichever is the lesser attenuation.</td></tr>
</table>
f_d is the percentage of the equipment's channel bandwidth..</td><td>☒</td></tr>
<tr><td>Test Setup</td><td> 
</td><td></td></tr>
<tr><td>Test Procedure</td><td>Substitution method:

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
b. The EUT was then rotated to the direction that gave the maximum emission.
c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
3. Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter.
4. Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a nonradiating cable. With the antennas at both ends horizontally polarized, and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained.
5. Steps 4 were repeated for the next frequency point, until all selected frequency points were measured.</td><td></td></tr>
<tr><td>Remark</td><td>The EUT was scanned up to 1GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case. Total power is higher than 20dBm so the device was considered as a high power device.
High Power Device Limit:
Power limit = P_{dBm} – [55+ 10 log (P_W)] ➔ 10log(1000 x P_W) - 55 - 10log(P_W) ➔ 30-55 = -25dBm</td><td></td></tr>
<tr><td>Result</td><td>☒ Pass ☐ Fail</td><td></td></tr>
</table>

Test Data ☒ Yes ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

Radiated Emission Test Results (Below 1GHz)

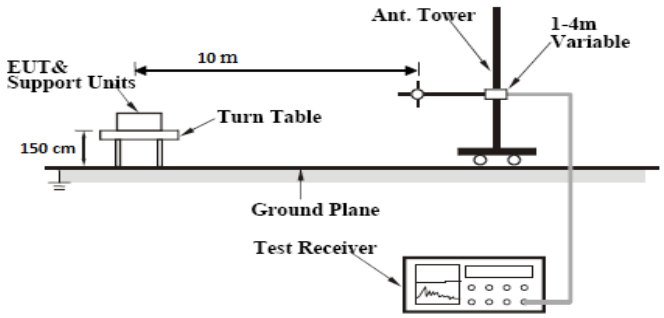
Test specification	Radiated Spurious Emissions			
Environmental Conditions:	Temp (°C):	22	Result	PASS
	Humidity (%)	41		
	Atmospheric (mbar):	1021		
Mains Power:	120VAC/60Hz			
Tested by:	Teody			
Test Date:	02/26/2015			
Remarks:	All chains transmitting simultaneously, 20dBi antenna gain			

Frequency MHz	SG Level dBm	Cable Loss dB	Antenna Gain dBd	Substituted Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB	Pass /Fail
995.84	-63.38	10.78	7.86	-66.30	Average Max	V	222.00	163.00	-25.00	-41.30	Pass
408.02	-52.51	14.12	6.91	-59.72	Average Max	H	182.00	94.00	-25.00	-34.72	Pass
320.02	-55.33	14.69	6.60	-63.42	Average Max	V	100.00	9.00	-25.00	-38.42	Pass
312.00	-54.72	14.75	6.58	-62.89	Average Max	V	115.00	24.00	-25.00	-37.89	Pass
360.00	-55.45	14.42	6.63	-63.24	Average Max	V	103.00	8.00	-25.00	-38.24	Pass
352.02	-57.03	14.47	6.63	-64.87	Average Max	V	101.00	8.00	-25.00	-39.87	Pass

- Both horizontal and vertical polarizations were verified.

10.6 Radiated Spurious Emissions Above 1GHz

Requirement(s):

Spec	Requirement	Applicable
FCC §2.1053 FCC §90.210	For low power transmitters (20 dBm or less) and high power transmitters (greater than 20 dBm operating in the 4940-4990 MHz frequency band, the power spectral density of the emissions must be attenuated below the output power of the transmitter as follows: **Frequency Offset f_d** / **Minimum Attenuation** (Low Power Transmitter / High Power Transmitter) $0 < f_d \leq 45$: 0 / 0 $45 < f_d \leq 50$: $219 \log(f_d/45)$ / $568 \log(f_d/45)$ $50 < f_d \leq 55$: $10 + 242 \log(f_d/50)$ / $26 + 145 \log(f_d/50)$ $55 < f_d \leq 100$: $20 + 31 \log(f_d/55)$ / $32 + 31 \log(f_d/55)$ $100 < f_d \leq 150$: $28 + 68 \log(f_d/100)$ / $40 + 57 \log(f_d/100)$ $f_d > 150$: 40 / 50 dB or 55 + 10 log (P) dB, whichever is the lesser attenuation. f_d is the percentage of the equipment's channel bandwidth..	☒
Test Setup		
Test Procedure	Substitution method: 1. The EUT was switched on and allowed to warm up to its normal operating condition. 2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner: a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen. b. The EUT was then rotated to the direction that gave the maximum emission. c. Finally, the antenna height was adjusted to the height that gave the maximum emission. 3. Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter. 4. Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a nonradiating cable. With the antennas at both ends horizontally polarized, and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. 5. Steps 4 were repeated for the next frequency point, until all selected frequency points were measured.	
Test Date	02/18/2015	Environmental condition: Temperature 21ºC; Relative Humidity 38%; Atmospheric Pressure 1020mbar	
Remark	The EUT was scanned up to 40GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case. Total power is higher than 20dBm so the device was considered as a higher power device. High Power Device Limit: Power limit = PdBm – [55+ 10 log (PW)] ➔ 10log(1000 x PW) - 55 - 10log(PW) ➔ 30-55 = -25dBm	
Result	☒ Pass ☐ Fail	

Test Data ☒ Yes ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

Radiated Emission Test Results (1GHz-40GHz) – 20dBi Antenna

Chains 1 and 2 transmitting simultaneously at 4950MHz with 20dBi antenna

Frequency MHz	SG Level dBm	Cable Loss dB	Antenna Gain dBd	Substituted Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB	Pass /Fail
17796.75	-49.41	27.00	10.11	-66.30	Average Max	H	243.00	283.00	-25.00	-29.11	Pass
4033.00	-35.49	34.14	9.91	-59.72	Average Max	V	154.00	37.00	-25.00	-36.88	Pass
9617.45	-47.86	27.72	12.16	-63.42	Average Max	V	228.00	297.00	-25.00	-32.46	Pass
Remark	Emissions were scanned up to 40GHz; no emissions were detected above the noise floor which was at least 20dB below the specification limit. Both horizontal and vertical polarizations were verified.										

Chains 1 and 2 transmitting simultaneously at 4965MHz with 20dBi antenna

Frequency MHz	SG Level dBm	Cable Loss dB	Antenna Gain dBd	Substituted Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB	Pass /Fail
4065.03	-42.17	34.11	9.98	-66.30	Average Max	V	166.00	111.00	-25.00	-37.31	Pass
9927.76	-42.74	28.66	11.68	-59.72	Average Max	H	177.00	114.00	-25.00	-32.94	Pass
14592.45	-47.51	26.74	10.83	-63.42	Average Max	H	226.00	319.00	-25.00	-30.80	Pass
Remark	Emissions were scanned up to 40GHz; no emissions were detected above the noise floor which was at least 20dB below the specification limit. Both horizontal and vertical polarizations were verified.										

Chains 1 and 2 transmitting simultaneously at 4980MHz with 20dBi antenna

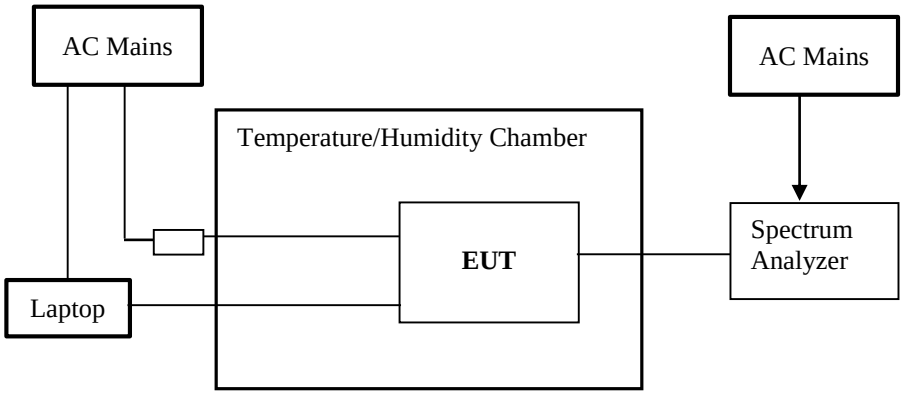
Frequency MHz	SG Level dBm	Cable Loss dB	Antenna Gain dBd	Substituted Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB	Pass /Fail
9789.95	-50.05	28.25	12.00	-66.30	Average Max	H	0.00	0.00	-25.00	-32.43	Pass
14695.01	-43.94	26.55	10.77	-59.72	Average Max	V	243.00	191.00	-25.00	-31.58	Pass
3929.86	-38.90	34.21	9.69	-63.42	Average Max	H	100.00	291.00	-25.00	-37.35	Pass
Remark	Emissions were scanned up to 40GHz; no emissions were detected above the noise floor which was at least 20dB below the specification limit. Both horizontal and vertical polarizations were verified.										

10.7 Frequency Stability

Requirement(s):

Spec	Requirement	Applicable
FCC §2.1055 FCC §90.213	The test shall be performed at normal and extreme test conditions. From -30°C to +50°C and vary the primary supply voltage from 85% to 115% of the nominal value.	☒

Test Setup



Test Procedure	- The EUT was switched on and allowed to warm up to its normal operating condition. - The EUT output was connected to a spectrum analyser and the frequency stability was measured. - Measurements were taken after a thermal balance was obtained. - Normal and extreme test conditions were measured		
Test Date	02/18/2015	Environmental condition	Temperature 21ºC Relative Humidity 38% Atmospheric Pressure 1020mbar
Remark	-		
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

Test Results

Temperature Vs Frequency Stability: Low Channel

Temperature (°C)	Center Frequency (MHz)	Measured Frequency (MHz)	Deviation (ppm)
50	4950.00	4949.967	-6.764
40	4950.00	4949.954	-9.369
30	4950.00	4949.972	-5.667
20	4950.00	4949.985	-3.126
10	4950.00	4949.982	-3.667
0	4950.00	4950.008	1.587
-10	4950.00	4950.008	1.653
-20	4950.00	4949.951	-9.812
-30	4950.00	4949.937	-12.757

Voltage Vs Frequency Stability: Low Channel

Voltage (AC)	Center Frequency (MHz)	Measured Frequency (MHz)	Deviation (ppm)
138	4950.00	4950.013	2.582
120	4950.00	4950.001	0.287
102	4950.00	4950.005	1.066

Temperature Vs Frequency Stability: Middle Channel

Temperature (°C)	Center Frequency (MHz)	Measured Frequency (MHz)	Deviation (ppm)
50	4965.00	4964.963	-7.417
40	4965.00	4964.943	-11.414
30	4965.00	4964.986	-2.838
20	4965.00	4964.982	-3.600
10	4965.00	4964.979	-4.260
0	4965.00	4965.005	1.106
-10	4965.00	4965.004	0.863
-20	4965.00	4964.962	-7.651
-30	4965.00	4964.943	-11.520

Voltage Vs Frequency Stability: Middle Channel

Voltage (AC)	Center Frequency (MHz)	Measured Frequency (MHz)	Deviation (ppm)
138	4965.00	4965.011	2.154
120	4965.00	4965.004	0.753
102	4965.00	4965.004	0.831

Temperature Vs Frequency Stability: High Channel

Temperature (°C)	Center Frequency (MHz)	Measured Frequency (MHz)	Deviation (ppm)
50	4980.00	4979.964	-7.204
40	4980.00	4979.952	-9.588
30	4980.00	4979.953	-9.447
20	4980.00	4979.972	-5.544
10	4980.00	4979.974	-5.257
0	4980.00	4979.994	-1.136
-10	4980.00	4980.001	0.273
-20	4980.00	4979.949	-10.285
-30	4980.00	4979.926	-14.900

Voltage Vs Frequency Stability: High Channel

Voltage (AC)	Center Frequency (MHz)	Measured Frequency (MHz)	Deviation (ppm)
138	4980.00	4980.022	4.482
120	4980.00	4980.008	1.578
102	4980.00	4980.010	2.002

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Cycle	Cal Due	In use
Conducted Emissions						
EMI Test Receiver (9 kHz – 30 MHz)	ESHS10	830223/0009	04/08/2014	1 Year	04/08/2015	☐
Spectrum Analyzer	FSIQ7	825555/013	05/31/2014	1 Year	05/31/2015	☐
V-LISN (150 kHz – 30 MHz)	NNLK 8129	8129-190	08/11/2014	1 Year	08/11/2015	☐
LISN (9 kHz – 30 MHz)	MN2050B	1018	07/31/2014	1 Year	07/31/2015	☐
Hygro Hermograph	ST-50	HE01-000092	05/25/2014	1 Year	05/25/2015	☐
Radiated Emissions						
EMI Test Receiver	ESIB 40	100179	05/24/2014	1 Year	05/24/2015	☑
Bi-Log antenna (30MHz~2GHz)	JB1	A030702	08/12/2014	1 Year	08/12/2015	☑
Horn Antenna (1-18GHz)	3115	10SL0059	08/11/2014	1 Year	08/11/2015	☑
Horn Antenna (18-40 GHz)	AH-840	101013	08/11/2014	1 Year	08/11/2015	☑
Pre-Amplifier	LPA-6-30	11140711	02/19/2015	1 Year	02/19/2016	☑
Microwave Preamplifier (18-40 GHz)	PA-840	181251	02/19/2015	1 Year	02/19/2016	☑
3 Meters SAC	3M	N/A	08/29/2014	1 Year	08/29/2015	☐
10 Meters SAC	10M	N/A	09/05/2014	1 Year	09/05/2015	☑
Hygro Hermograph	ST-50	HE01-000092	05/25/2014	1 Year	05/25/2015	☑
RF Conducted Measurement						
Spectrum Analyzer	N9010A	MY50210206	08/13/2014	1 Year	08/13/2015	☑
EMI Test Receiver	ESIB 40	100179	05/24/2014	1 Year	05/24/2015	☑

Annex B. SIEMIC Accreditation

Accreditations	Document	Scope / Remark
ISO 17025 (A2LA)		Please see the documents for the detailed scope
ISO Guide 65 (A2LA)		Please see the documents for the detailed scope
TCB Designation		A1, A2, A3, A4, B1, B2, B3, B4, C
FCC DoC Accreditation		FCC Declaration of Conformity Accreditation
FCC Site Registration		3 meter site
FCC Site Registration		10 meter site
IC Site Registration		3 meter site
IC Site Registration		10 meter site
EU NB		**Radio & Telecommunications Terminal Equipment:** EN45001 – EN ISO/IEC 17025
		Electromagnetic Compatibility: EN45001 – EN ISO/IEC 17025
Singapore iDA CB(Certification Body)		Phase I, Phase II
Vietnam MIC CAB Accreditation		Please see the document for the detailed scope
Hong Kong OFCA		**(Phase II)** OFCA Foreign Certification Body for Radio and Telecom
		(Phase I) Conformity Assessment Body for Radio and Telecom
Industry Canada CAB		**Radio:** Scope A – All Radio Standard Specification in Category I
		Telecom: CS-03 Part I, II, V, VI, VII, VIII

Japan Recognized Certification Body Designation		**Radio**: A1. Terminal equipment for purpose of calling **Telecom**: B1. Specified radio equipment specified in Article 38-2, Paragraph 1, Item 1 of the Radio Law
Korea CAB Accreditation		**EMI:** KCC Notice 2008-39, RRL Notice 2008-3: CA Procedures for EMI KN22: Test Method for EMI **EMS:** KCC Notice 2008-38, RRL Notice 2008-4: CA Procedures for EMS KN24, KN61000-4-2, -4-3, -4-4, -4-5, -4-6, -4-8, -4-11: Test Method for EMS
		Radio: RRL Notice 2008-26, RRL Notice 2008-2, RRL Notice 2008-10, RRL Notice 2007-49, RRL Notice 2007-20, RRL Notice 2007-21, RRL Notice 2007-80, RRL Notice 2004-68
		Telecom: President Notice 20664, RRL Notice 2007-30, RRL Notice 2008-7 with attachments 1, 3, 5, 6; President Notice 20664, RRL Notice 2008-7 with attachment 4
Taiwan NCC CAB Recognition		LP0002, PSTN01, ADSL01, ID0002, IS6100, CNS14336, PLMN07, PLMN01, PLMN08
Taiwan BSMI CAB Recognition		CNS 13438
Japan VCCI		R-3083: Radiation 3 meter site C-3421: Main Ports Conducted Interference Measurement T-1597: Telecommunication Ports Conducted Interference Measurement
Australia CAB Recognition		**EMC:** AS/NZS CISPR 11, AS/NZS CISPR 14.1, AS/NZS CISPR22, AS/NZS 61000.6.3, AS/NZS 61000.6.4
		Radio-communications: AS/NZS 4281, AS/NZS 4268, AS/NZS 4280.1, AS/NZS 4280.2, AS/NZS 4295, AS/NZS 4582, AS/NZS 4583, AS/NZS 4769.1, AS/NZS 4769.2, AS/NZS 4770, AS/NZS 4771
		Telecommunications: AS/ACIF S002:05, AS/ACIF S003:06, AS/ACIF S004:06 AS/ACIF S006:01, AS/ACIF S016:01, AS/ACIF S031:01, AS/ACIF S038:01, AS/ACIF S040:01, AS/ACIF S041:05, AS/ACIF S043.2:06, AS/ACIF S60950.1
Australia NATA Recognition		AS/ACIF S002, AS/ACIF S003, AS/ACIF S004, AS/ACIF S006, AS/ACIF S016,AS/ACIF S031, AS/ACIF S038, AS/ACIF S040, AS/ACIF S041, AS/ACIF S043.2