RF TEST REPORT

SIEMIC
A Bureau Veritas Group Company

Report No.: FCC_ IC_RF_SL18101502-JPS-003_Co-Location_Rev2.0
Supersede Report No.:

Applicant	:	Juniper Systems, Inc.
Product Name	:	Ultra-rugged Handheld computer
Model No. (system with BT/WiFi)	:	AG3
Model No. (Cellular Module)	:	WP7603
Test Standard	:	FCC 15.247, RSS-139 Issue 3,2015, RSS247 Issue 2, 2017, RSS-130 Issue 1 2013, RSS-132 Issue 3 2013, RSS-133 Issue 6 2013, FCC Part 22H, 24E, 27, 47CFR Part 24/27
Test Method	:	FCC 15.247, ANSI C63.10 2013, RSS Gen Issue 5,April 2018, TIA-603-E: 2016
FCC ID (BT/Wi-FI)	:	VSF-AG3
IC ID (BT/Wi-FI)	:	7980A-AG3
FCC ID (Cellular)	:	VSF27582
IC ID (Cellular)	:	7980A-27582
Dates of test	:	10/19/2018-10/29/2018
Issue Date	:	01/28/2019
Test Result	:	☒ Pass ☐ Fail
Equipment complied with the specification		**[X]**
Equipment did not comply with the specification		**[ ]**

This Test Report is Issued Under the Authority of:	
	
Cipher	**Chen Ge**
RF 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, CA 95035

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	EMC, RF/Wireless, Telecom, Safety
Europe	A2LA, NIST	EMC, RF, Telecom, Safety
Israel	MOC, 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 & RED 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
FCC_ IC_RF_SL18101502-JPS-003_Co-Location	None	Original	12/28/2018
FCC_ IC_RF_SL18101502-JPS-003_Co-Location_Rev1.0	Rev1.0	Updated as per reviewer	01/28/2019

2 Executive Summary

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

Company: Juniper Systems, Inc.
Product: Ultra-rugged Handheld computer
Model (BT/Wi-Fi): AG3
Model (Cellular): WP7603

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	:	Juniper Systems, Inc.
Applicant Address	:	1132 1700 N, Logan, UT 84321
Manufacturer Name	:	Juniper Systems, Inc.
Manufacturer Address	:	1132 1700 N, Logan, UT 84321

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	Ultra-rugged Handheld computer
Model (BT/Wi-Fi):	AG3
Model (Cellular):	WP7603
Trade Name	Juniper Systems, Inc.
Serial No.	AG3E107
Input Power	100-240VAC, 50-60Hz 0.5A
Power Adapter Manu/Model	PSAA20R-120L6
Date of EUT received	10/16/2018
Equipment Class/ Category	DTS ,DSSS, WCDMA/HSUPA/HSDPA, LTE
Port/Connectors	USB,Micro-USB, Serial
Antenna	Printed trace (BT/WiFi), FPC (Cellular)

6.2 Radio Description

Specifications for Radio:

Specs for WLAN

Radio Type	802.11b/g/n-20M	802.11n-40M	Bluetooth LE	Bluetooth(BDR,EDR)
Operating Frequency	2412-2462MHz	2412-2462MHz	2402MHz-2480MHz	2402MHz-2480MHz
Modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM (BPSK, QPSK, 16QAM, 64QAM)	GFSK	FHSS (BDR, EDR)
Channel Spacing	5MHz	5MHz	2MHz	1MHz
Number of Channels	11	7	39	79
Antenna Type	Printed trace			
Antenna Gain (Peak)	2.28 dBi			
Antenna Connector Type	SMA			
Note	N/A			

Specs for Cellular

Technology	Band	UL Freq. (Mhz)	DL Freq. (Mhz)
WCDMA/HSUPA/HSDPA	B2	1850 – 1910	1930 – 1990
	B4	1710 - 1755	2110 – 2155
	B5	824 - 849	869 – 894
LTE	B2	1850 – 1910	1930 – 1990
	B4	1710 – 1755	2110 – 2155
	B5	824 – 849	869 – 894
	B12	699 - 716	729 – 746

Table 5-1: WP7603 Antenna Gain Specifications

Device	Technology	Band	Frequency (MHz)	Maximum antenna gain (dBi)
AirPrime WP7603	LTE	2	1850–1910	6
		4	1710–1755	6
		5	824–849	6
		12	699–716	6
	UMTS	2	1850–1910	6
		4	1710–1755	6
		5	824–849	6

EUT test modes/configuration Description

Mode	Note
RF test	EUT is set to continuously transmit
Note: None	

7 Supporting Equipment/Software and cabling Description

7.1 Supporting Equipment

Item	Supporting Equipment Description	Model	Serial Number	Manufacturer	Note
1	Laptop	LATITUDE E6530	N/A	Dell	-

7.2 Cabling Description

Name	Connection Start		Connection Stop		Length / shielding Info		Note
	From	I/O Port	To	I/O Port	Length (m)	Shielding	
USB	EUT	Micro USB	Laptop	USB	1	Unshielded	-
USB to Serial	EUT	Serial	Laptop	USB	1	Unshielded	-
USB to Ethernet	EUT	USB	Laptop	Ethernet	1	Unshielded	-

7.3 Test Software Description

Test Item	Software	Description
RF Testing	QRCT	Set the EUT to transmit continuously in diferent test mode

8 Test Summary

Test Item	Test standard		Test Method/Procedure		Pass / Fail
Radiated Spurious Emission	FCC	15.209,15.247(d),FCC Part 22H, 24E, 27	FCC	ANSI C63.10-2013, TIA-603-E: 2016	☒ Pass ☐ N/A
	IC	RSS-130 Issue 1, RSS-132 Issue 3, RSS-133 Issue 6 ,RSS139(6.5)	IC	RSS Gen Issue 5, April 2018	
Remark	1. All measurement uncertainties are not taken into consideration for all presented test result. 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. 3. Only Radiated Spurious Emission for colocation has been tested for this report				

9 Measurement Uncertainty

9.1 Radiated Emissions (30MHz to 1GHz)

The test is to measure the radiated emissions of the EUT.

Some error sources that can contribute to the total uncertainty:
- Uncertainty of the receiver
- Uncertainty of the antenna
- Uncertainty of cables
- Uncertainty due to the mismatches
- NSA Calibration
- Etc., details see the below table

Source of Uncertainty	Value (dB)	Probability Distribution	Division	Sensitivity Coefficient	Expanded Uncertainty
Receiver Reading	0.12	Rectangular	1.732	1	0.069284
Cable Insertion Loss	0.21	Normal	2	1	0.105
Filter Insertion Loss	0.25	Normal	2	1	0.125
Antenna Factor	0.65	Normal	2	1	0.325
Receiver CW accuracy	0.5	Rectangular	1.732	1	0.2886836
Pulse Amplitude Response	1.5	Rectangular	1.732	1	0.86605081
PRF Response	1.5	Rectangular	1.732	1	0.86605081
Mismatch Filter - Receiver	0.25	U-Shape	1.414	1	0.1768033
NSA Calibration	4.0	U-Shape	1.414	1	2.8288543
Combined Standard Uncertainty					3.0059131
Expanded Uncertainty (K=2)					**6.0118262**

The total derived measurement uncertainty is +/- 6.00 dB.

9.2 Radiated Emissions (1GHz to 40GHz)

The test is to measure the radiated emissions of the EUT.

Some error sources that can contribute to the total uncertainty:
- Uncertainty of the receiver
- Uncertainty of the antenna
- Uncertainty of cables
- Uncertainty due to the mismatches
- VSWR Calibration
- Etc., details see the below table

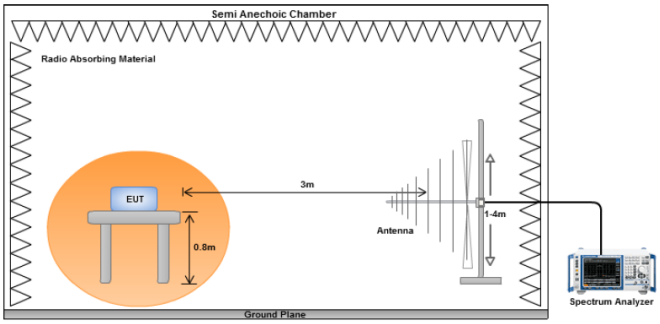
Source of Uncertainty	Value (dB)	Probability Distribution	Division	Sensitivity Coefficient	Expanded Uncertainty
Receiver Reading	0.12	Rectangular	1.732	1	0.0692840
Cable Insertion Loss	0.21	Normal	2	1	0.1050000
Filter Insertion Loss	0.25	Normal	2	1	0.1250000
Antenna Factor	0.65	Normal	2	1	0.3250000
Receiver CW accuracy	0.5	Rectangular	1.732	1	0.2886836
Pulse Amplitude Response	1.5	Rectangular	1.732	1	0.8660508
PRF Response	1.5	Rectangular	1.732	1	0.8660508
Mismatch Filter - Receiver	0.25	U-Shape	1.414	1	0.1768033
VSWR Calibration	2.0	U-Shape	1.414	1	1.4144272
Combined Standard Uncertainty					4.2363
Expanded Uncertainty (K=2)					**8.4726**

The total derived measurement uncertainty is +/- 8.47 dB.

10 Measurements, examination and derived results

10.1 Radiated Measurements 30MHz to 1GHz

Requirement(s):

<table>
<tr><td>Spec</td><td>Requirement</td><td>Applicable</td></tr>
<tr><td>47 CFR 15.247(d)
RSS-247</td><td>Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges
<table>
<tr><th>Frequency range (MHz)</th><th>Field Strength (uV/m)</th></tr>
<tr><td>30 – 88</td><td>100</td></tr>
<tr><td>88 – 216</td><td>150</td></tr>
<tr><td>216 960</td><td>200</td></tr>
<tr><td>Above 960</td><td>500</td></tr>
</table></td><td>☒</td></tr>
<tr><td>47CFR24.238
47CFR27.53</td><td colspan="2">Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.</td></tr>
<tr><td>Test Setup</td><td colspan="2"> 
</td></tr>
<tr><td>Procedure</td><td colspan="2">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. A Quasi-peak measurement was then made for that frequency point.
4. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.</td></tr>
<tr><td>Test Date</td><td>10/19/2018-10/29/2018</td><td>Environmental conditions: Temperature 20.1°C; Relative Humidity 36%; Atmospheric Pressure 1026mbar</td></tr>
<tr><td>Remark</td><td colspan="2">All different modulation and bandwidth configuration has been verified and only the test data of worst case with QPSK modulation and greatest bandwidth was presented in this report.</td></tr>
<tr><td>Result</td><td colspan="2">☒ Pass ☐ Fail</td></tr>
</table>

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test was done by Cipher at 10meter chamber.

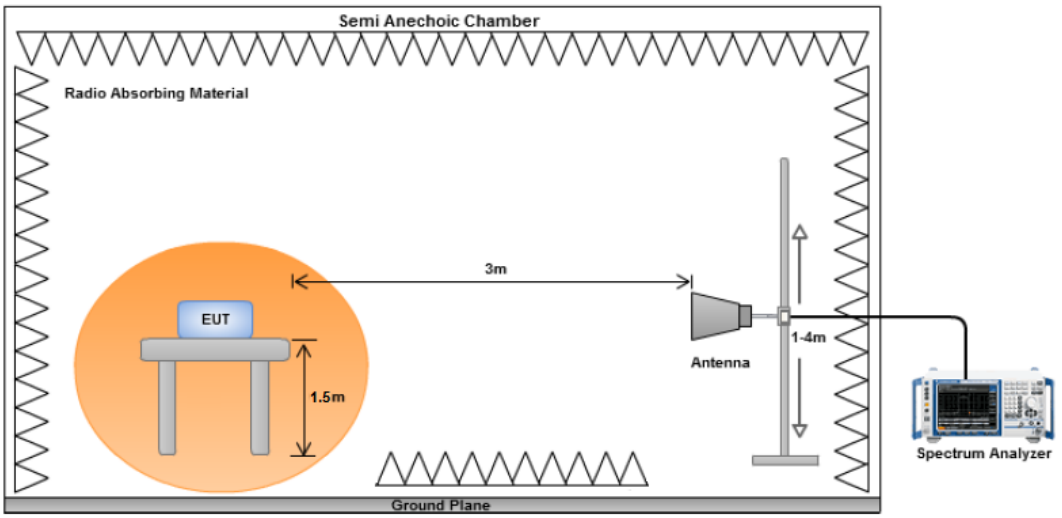
Test specification:	Radiated Emissions			
Mains Power:	120VAC		Result:	☒ Pass ☐ Fail
Tested by:	Cipher			
Test Date:	10/19/2018-10/29/2018			
Remarks:	WLAN and LTE Band 4 (20MHz BW QPSK) transmit simultaneously			

Frequency MHz	Raw dBm	Azt Deg	Hgt cm	Pol	Frequency MHz	Level dBm	Ant Gain dBi	Cable Loss	Absolute Level dBm	Limit dBm	Margin dB
41.82	-67.65	258	100	V	41.82	-52.16	0	0.31	-52.47	-13	-39.47
41.82	-69.51	166	199	H	41.82	-54.27	0	0.31	-54.58	-13	-41.58
783.25	-62.29	360	102	V	783.25	-49.59	0	0.53	-50.12	-13	-37.12
783.25	-64.11	244	205	H	783.25	-48.82	0	0.53	-49.35	-13	-36.35

Note: Dipole antenna was used for substitution method. Both horizontal and vertical polarities were investigated. The results above show only the worst case.

10.2 Radiated Spurious Emissions above 1G

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR§15.247(d), RSS-247	b)	or restricted band, emission must also comply with the radiated emission limits specified in 15.209	☒
47CFR24.238 47CFR27.53	-	Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.	☒
Test Setup			
Procedure	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. An average measurement was then made for that frequency point. 4. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.	
Remark	The EUT was scanned up to 40GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case. All different modulation and bandwidth configuration has been verified and only the test data of worst case with QPSK modulation and greatest bandwidth was presented in this report.		
Result	☒ Pass		

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

Test was done by Cipher at 10meter chamber.

Test specification:	Radiated Emissions			
Mains Power:	120VAC		Result:	☒ Pass ☐ Fail
Tested by:	Cipher			
Test Date:	10/19/2018-10/29/2018			
Remarks:	WLAN and LTE Band 4 (20M BW QPSK) transmit simultaneously			

Low CH

Frequency MHz	Raw dBm	Azt Deg	Hgt cm	Pol	Frequency MHz	Level dBm	Ant Gain dBi	Cable Loss	Absolute Level dBm	Limit dBm	Margin dB
3442.25	-55.68	102	100	V	3442.25	-47.88	9.43	2.39	-40.84	-13	-27.84
3442.25	-66.28	255	198	H	3442.25	-58.03	9.43	2.39	-50.99	-13	-37.99
4826.35	-60.16	6	120	V	4826.35	-52.61	10.88	3.95	-45.68	-13	-32.68
4826.35	-59.33	214	202	H	4826.35	-51.64	10.88	3.95	-44.71	-13	-31.71

Mid CH

Frequency MHz	Raw dBm	Azt Deg	Hgt cm	Pol	Frequency MHz	Level dBm	Ant Gain dBi	Cable Loss	Absolute Level dBm	Limit dBm	Margin dB
3465.5	-53.72	359	102	V	3465.5	-45.71	9.43	2.39	-38.67	-13	-25.67
3465.5	-61.54	100	210	H	3465.5	-53.22	9.43	2.39	-46.18	-13	-33.18
5189.5	-57.71	155	110	V	5189.5	-49.73	10.81	3.51	-42.43	-13	-29.43
5189.5	-58.76	125	200	H	5189.5	-50.78	10.81	3.51	-43.48	-13	-30.48

High CH

Frequency MHz	Raw dBm	Azt Deg	Hgt cm	Pol	Frequency MHz	Level dBm	Ant Gain dBi	Cable Loss	Absolute Level dBm	Limit dBm	Margin dB
3501.5	-54.67	211	131	V	3501.5	-46.99	9.71	2.61	-39.89	-13	-26.89
3501.5	-60.72	204	200	H	3501.5	-53.47	9.71	2.61	-46.37	-13	-33.37
4925.65	-57.29	344	102	V	4925.65	-49.6	11.11	3.81	-42.3	-13	-29.3
4925.65	-57.01	12	188	H	4925.65	-49.13	11.11	3.81	-41.83	-13	-28.83

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Cycle	Cal Due	In use
Radiated Emissions						
EMI Test Receiver	ESIB 40	100179	06/03/2018	1 Year	06/03/2019	☑
Bi-Log antenna (30MHz~2GHz)	JB1	A030702	08/15/2018	1 Year	08/15/2019	☑
Horn Antenna (1-18GHz)	3115	10SL0059	08/25/2018	1 Year	08/25/2019	☑
Horn Antenna (18-40 GHz)	AH-840	101013	08/28/2018	1 Year	08/28/2019	☑
Tuned Dipole Antenna Set	AD-100	40133:40149	10/02/2018	1 Year	10/01/2019	☑
Pre-Amplifier	LPA-6-30	11140711	02/08/2018	1 Year	02/10/2019	☑
Pre-Amplifier (1-26.5GHz)	8449B	3008A00715	05/30/2018	1 Year	05/30/2019	☑
Agilent Signal Generator	MXG N5182A	MY47071065	04/06/2018	1 Year	04/06/2019	☑

Annex A. 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 Equipment: EN45011:** EN ISO/IEC 17065
		Electromagnetic Compatibility: EN45011 – EN ISO/IEC 17065
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
		Radiocommunications: 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