

RF TEST REPORT



Report No.: FCC_RF_SL13091901-ZBR-052_RFID Rev1.0
Supersede Report No.: FCC_RF_SL13091901-ZBR-052_RFID

Applicant	Zebra Technologies Corporation		
Product Name	RFID Module		
Model No.	M5E		
Test Standard	47CFR15.247: 2013, RSS-210 Issue8: 2010		
Test Method	ANCI C63.4:2009 FCC Public Notice DA 00-705, RSS-Gen Issue 3: 2010		
FCC ID	I28-URFIDM5E		
IC ID	3798B-URFIDM5E		
Date of test	01/13/2014 – 01/16/2014		
Issue Date	02/19/2014		
Test Result	<u>Pass</u> Fail		
Equipment complied with the specification	[x]		
Equipment did not comply with the specification	[]		
			
David Zhang		Nima Molaei	
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
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Laboratory Introduction

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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/RRR, 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

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
HongKong	OFTA (US002)	RF , Telecom

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1 Report Revision History

Report No.	Report Version	Description	Issue Date
FCC_RF_SL13091901-ZBR-052_RFID	None	Original	01/23/2014
FCC_RF_SL13091901-ZBR-052_RFID Rev1.0	Rev1.0	Correct typo	02/19/2014

2 Executive Summary

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

Company: Zebra Technologies Corporation
Product: RFID Module
Model: M5E

, which is FCC certified radio module(FCC ID: I28-URFIDM5E, IC ID: 3798B-URFIDM5E), to be installed into a printer host (Printer Model: ZE500R (ZE500-4)) and simultaneously transmission with FCC certified WLAN radio module (FCC ID: I28MD-CXLAN11G, IC ID: 3798B-CXLAN11G), against the current Stipulated Standards. The specified model product stated above to be installed into this specific host has demonstrated compliance with the Stipulated Standard listed on 1st page.

3 Customer information

Applicant Name	Zebra Technologies Corporation
Applicant Address	333 Corporate Woods Pkwy. Vernon Hills,IL 60061, USA
Manufacturer Name	Zebra Technologies Corporation
Manufacturer Address	333 Corporate Woods Pkwy. Vernon Hills,IL 60061, 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	RFID Module
Model No.	M5E
Trade Name	Zebra
Host Serial No.	67J134300114
Host Input Power	100-240VAC_47/63Hz
Power Adapter Manu/Model	N/A
Power Adapter SN	-
Hardware version	N/A
Software version	N/A
Date of EUT received	01/13/2013
Equipment Class/ Category	DSS
Clock Frequencies	-
Port/Connectors	RJ-45, SER MGT, Parallel, USB, Antenna Port
Remark	NONE

6.2 Radio Description

Spec for Radio -

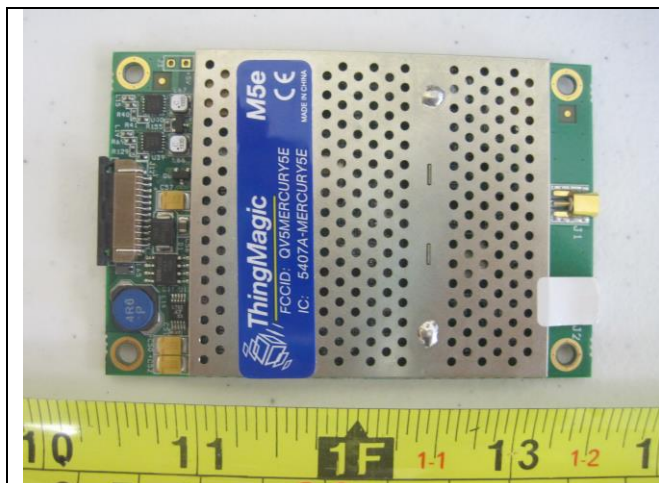
Radio Type	UHF RFID
Operating Frequency	902.75-927.25 MHz
Modulation	ASK
Channel Spacing	500KHz
Number of Channels	50
Antenna Type	External PCB antenna
Antenna Gain	-28.1 dBi
Antenna Connector Type	MMCX

6.3 EUT test modes/configuration Description

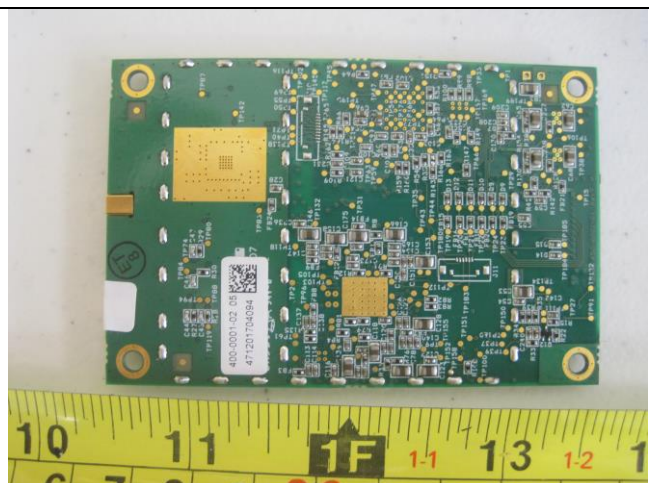
Test mode

Test Mode		Note
Test_mode_1	Below 1GHz-Mode1: UHF cont TX at 915.75MHz	-
Test_mode_2	Below 1GHz-Mode2: UHF (915.75MHz) + WLAN at 802.11b (2437MHz) all transmit simultaneously	-
Test_mode_3	Above 1GHz-Mode1: UHF cont TX at 915.75MHz	-
Test_mode_4	Above 1GHz-Mode2: UHF cont TX at 902.75MHz	-
Test_mode_5	Above 1GHz-Mode3: UHF cont TX at 927.25MHz	-
Test_mode_6	Above 1GHz-Mode4: UHF (915.75MHz) + WLAN at 802.11b (2437MHz) all transmit simultaneously	-
Test_mode_7	-	-
Test_mode_8	-	-
Test_mode_9	-	-
Remark:		

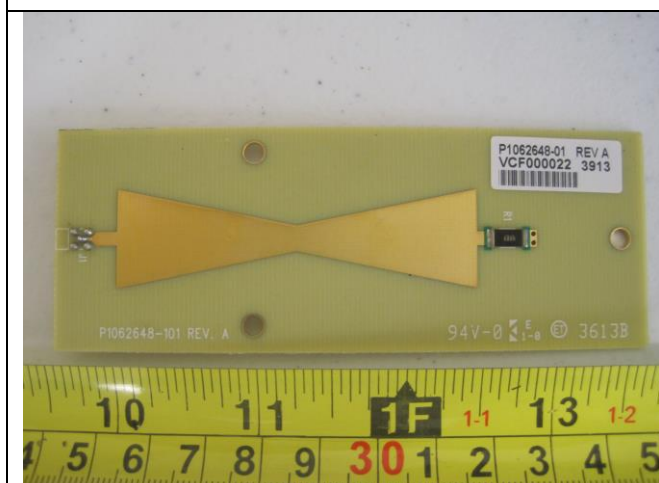
6.4 EUT Photos - External



EUT – Top View



EUT – Bottom View

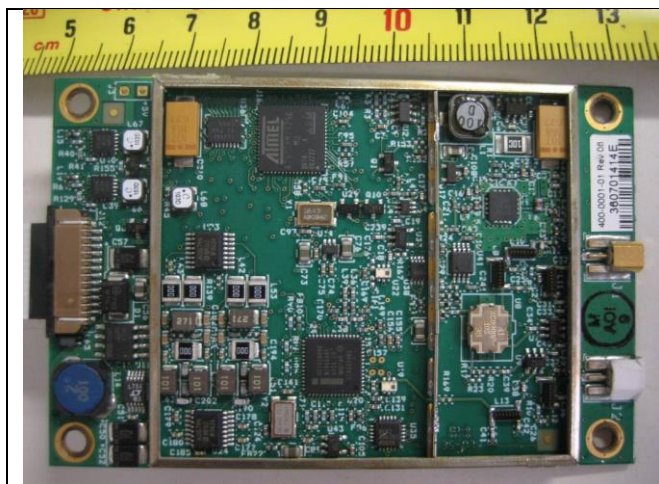


RFID Antenna – Top view

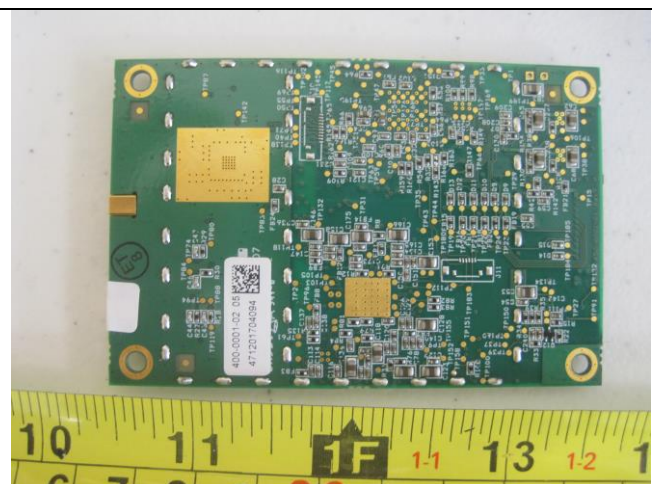


RFID Antenna – Bottom view

6.5 EUT Photos - Internal

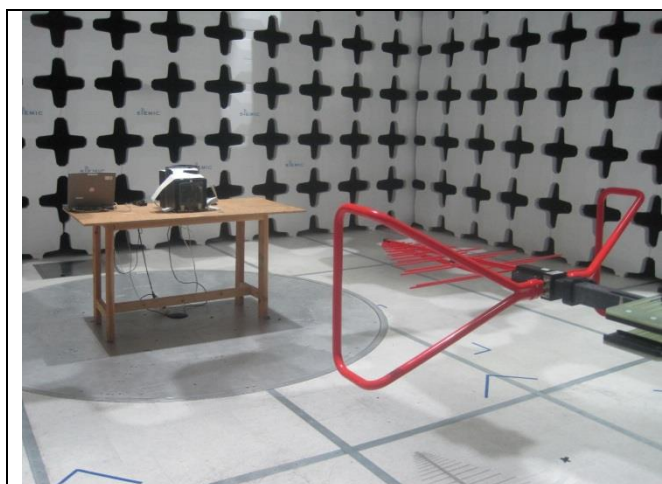


EUT – Top View

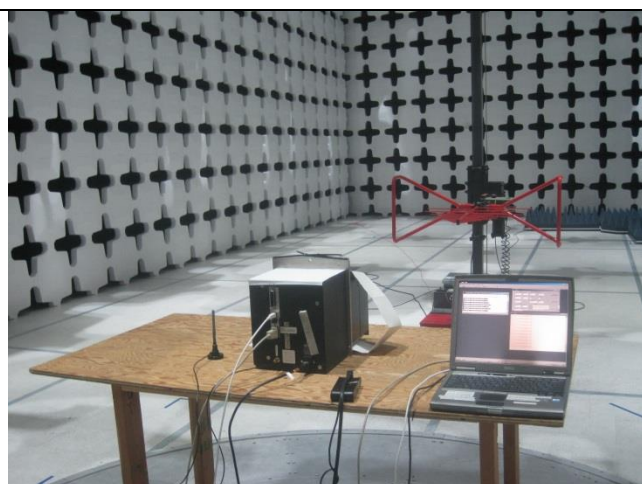


EUT – Bottom View

6.6 EUT Test Setup Photos



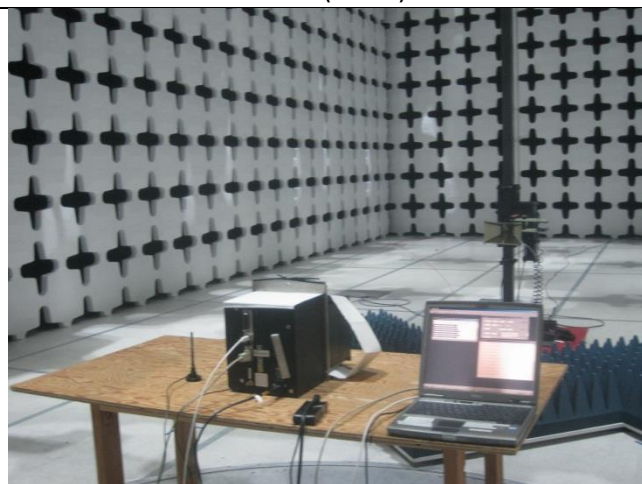
Radiated Emissions (<1GHz) – Front View



Radiated Emissions (<1GHz) – Rear View



Radiated Emissions (>1GHz) – Front View



Radiated Emissions (>1GHz) – Rear View

7 Supporting Equipment/Software and cabling Description

7.1 Supporting Equipment

Item	Supporting Equipment Description	Model	Serial Number	Manufacturer	Note
1	D600	Laptop PC	9444352681	Dell	
2	PA-1650-05D2	AC Power Adapter	F7970	Dell	

7.2 Test Software Description

Test Item	Software	Description
Spurious Emission	Zebra printer toolbox	Enable RF Test mode for RFID

8 Test Summary

Spurious Emissions			
Test Item	Test standard	Test Method/Procedure	Pass / Fail
Radiated Spurious Emissions<1GHz	FCC-15.247	ANSI C63.4: 2009 FCC Public Notice DA 00-705	☒ Pass ☐ Fail
Radiated Spurious Emissions<1GHz	IC-RSS 210	RSS-Gen Issue 3: 2010	☒ Pass ☐ Fail
Radiated Spurious Emissions>1GHz	FCC-15.247	ANSI C63.4: 2009 FCC Public Notice DA 00-705	☒ Pass ☐ Fail
Radiated Spurious Emissions>1GHz	IC-RSS 210	RSS-Gen Issue 3: 2010	☒ Pass ☐ Fail

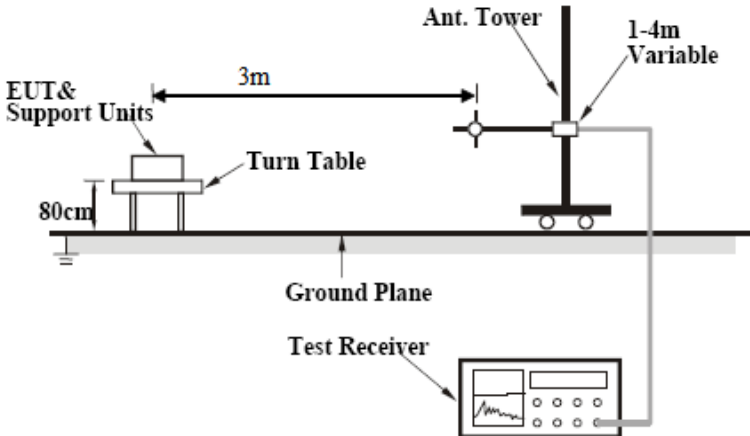
9 Measurement Uncertainty

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 Radiated Emissions below 1GHz

Requirement(s):

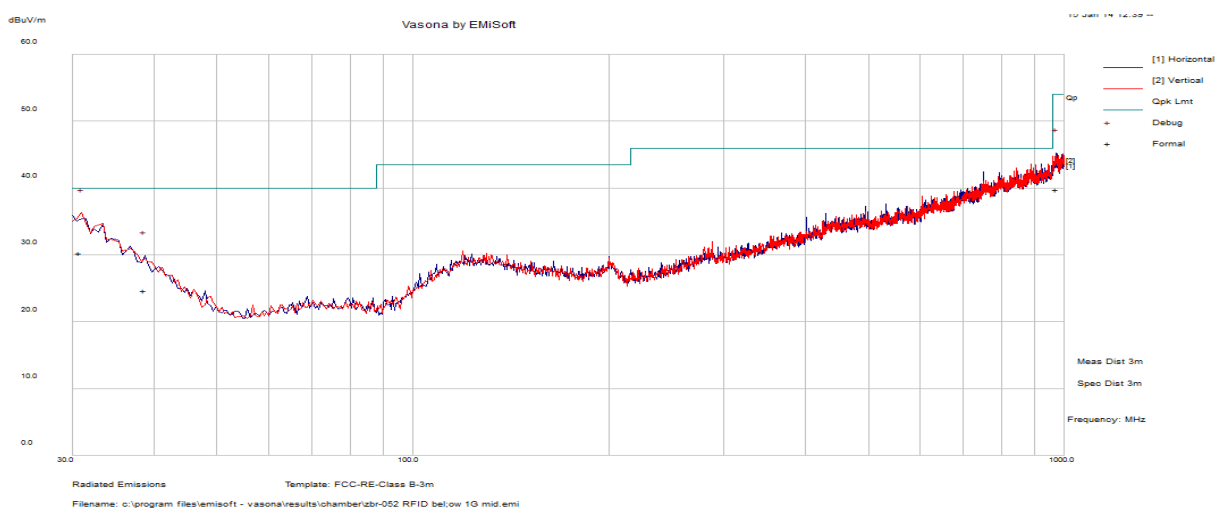
Spec	Item	Requirement	Applicable										
47CFR§15.247(d), RSS210(A8.5)	a)	Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions 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>		Frequency range (MHz)	Field Strength (uV/m)	30 – 88	100	88 – 216	150	216 960	200	Above 960	500
		Frequency range (MHz)		Field Strength (uV/m)									
		30 – 88		100									
		88 – 216		150									
		216 960		200									
Above 960	500												
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. 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.												
Remark	NONE												
Result	☒ Pass ☐ Fail												

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

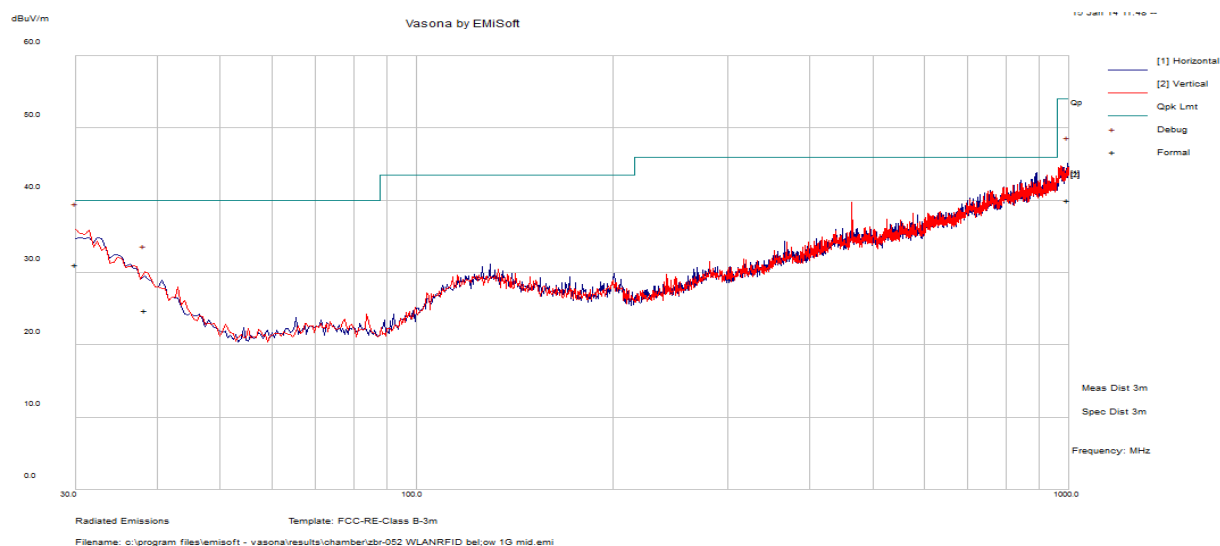
Radiated Emission Test Results (Below 1GHz)

Test specification	below 1GHz		Result	Pass
Environmental Conditions:	Temp (°C):	22		
	Humidity (%)	45		
	Atmospheric (mbar):	1008		
Mains Power:	110VAC,60Hz			
Tested by:	Teody Manansala			
Test Date:	01-13-2014			
Remarks:	Below 1GHz-Mode1: UHF cont TX at 915.75MHz			



Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Polarization	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
30.72	30.14	1.26	-1.15	30.26	Quasi Max	V	254	161.00	40.00	-9.74	Pass
971.25	31.36	6.47	1.96	39.79	Quasi Max	H	270	45.00	54.00	-14.21	Pass
38.61	29.94	1.39	-6.72	24.62	Quasi Max	H	350	283.00	40.00	-15.38	Pass

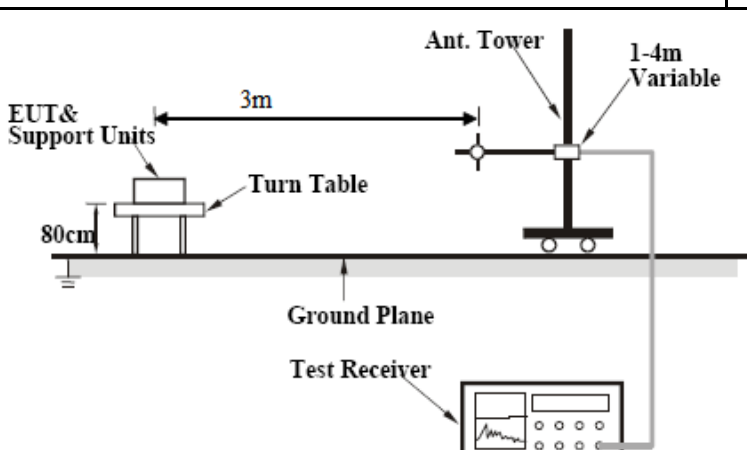
Test specification	below 1GHz		Result	Pass
Environmental Conditions:	Temp (°C):	20.3		
	Humidity (%)	45		
	Atmospheric (mbar):	1008		
Mains Power:	110VAC,60Hz			
Tested by:	Teody Manansala			
Test Date:	01-15-2014			
Remarks:	Below 1GHz-Mode2: UHF (915.75MHz) + WLAN at 802.11b (2437MHz) all transmit simultaneously			



Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Polarization	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass/Fail
30.02	30.33	1.25	-0.51	31.06	Quasi Max	V	177.00	34.00	40.00	-8.94	Pass
996.21	31.44	6.57	2.05	40.07	Quasi Max	H	160.00	36.00	54.00	-13.93	Pass
38.35	29.92	1.38	-6.56	24.74	Quasi Max	V	208.00	87.00	40.00	-15.26	Pass

10.2 Radiated Spurious Emissions above 1GHz

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR§15.247(d), RSS210(A8.5)	a)	For non-restricted band, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB or 30dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, determined by the measurement method on output power to be used. Attenuation below the general limits specified in § 15.209(a) is not required ☒ 20 dB down ☐ 30 dB down	☒
	b)	or restricted band, emission must also comply with the radiated emission limits specified in 15.209.	☒
Test Setup			
Procedure	- The EUT was switched on and allowed to warm up to its normal operating condition. - 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: - Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen. - The EUT was then rotated to the direction that gave the maximum emission. - Finally, the antenna height was adjusted to the height that gave the maximum emission. - An average measurement was then made for that frequency point. - Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.		
Remark	Test date: 4-Dec-13 Temp (°C): 23 Humidity (%): 22 Atmospheric (mbar): 1008		
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

Radiated Emission Test Results (Above 1GHz)

Above 1GHz-25GHz -Mode1: UHF cont TX at 915.75MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Polarization	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
1215.50	46.76	0.93	-6.75	40.94	Peak Max	V	123	269	74	-33.06	Pass
3995.44	42.93	2.31	-0.19	45.05	Peak Max	V	140	83	74	-28.95	Pass
1215.50	31.87	0.93	-6.75	26.05	Average Max	V	123	269	54	-27.95	Pass
3995.44	30.44	2.31	-0.19	32.56	Average Max	V	140	83	54	-21.44	Pass

Above 1GHz-25GHz-Mode2: UHF cont TX at 902.75MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Polarization	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
1350.07	43.95	1.04	-6.52	38.47	Peak Max	V	133	278	74	-35.53	Pass
2239.85	44.83	1.63	-3.9	42.56	Peak Max	H	181	346	74	-31.44	Pass
2800.01	43.76	1.77	-2.51	43.03	Peak Max	H	124	104	74	-30.97	Pass
1350.07	30.86	1.04	-6.52	25.38	Average Max	V	133	278	54	-28.62	Pass
2239.85	31.89	1.63	-3.9	29.62	Average Max	H	181	346	54	-24.38	Pass
2800.01	31.00	1.77	-2.51	30.27	Average Max	H	124	104	54	-23.73	Pass

Above 1GHz-25GHz-Mode3: UHF cont TX at 927.25MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Polarization	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
1202.06	43.31	0.92	-6.78	37.45	Peak Max	H	154	256	74	-36.55	Pass
1326.67	53.09	1.02	-6.56	47.55	Peak Max	V	147	276	74	-26.45	Pass
1202.06	30.43	0.92	-6.78	24.57	Average Max	H	154	256	54	-29.43	Pass
1326.67	34.16	1.02	-6.56	28.62	Average Max	V	147	276	54	-25.38	Pass

Above 1GHz-25GHz- Mode4: UHF (915.75MHz) + WLAN at 802.11b (2437MHz) all transmit simultaneously

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Polarization	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
2748.39	44.3	1.77	-2.64	43.43	Peak Max	H	189	22	74	-30.57	Pass
1011.14	53.53	0.75	-7.17	47.12	Peak Max	V	146	104	74	-26.88	Pass
1330.99	48.45	1.02	-6.55	42.93	Peak Max	V	187	264	74	-31.07	Pass
2748.39	31.29	1.77	-2.64	30.42	Average Max	H	189	22	54	-23.58	Pass
1011.14	46.19	0.75	-7.17	39.77	Average Max	V	146	104	54	-14.23	Pass
1330.99	31.81	1.02	-6.55	26.28	Average Max	V	187	264	54	-27.72	Pass

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Cycle	Cal Due	In use
Conducted Emissions						
R & S Receiver	ESIB 40	100179	04/20/2013	1 Year	04/20/2014	☐
R&S LISN	ESH2-Z5	861741/013	05/18/2013	1 Year	05/18/2014	☐
CHASE LISN	MN2050B	1018	07/24/2013	1 Year	07/24/2014	☐
Sekonic Hygro Hermograph	ST-50	HE01-000092	05/25/2013	1 Year	05/25/2014	☐
Radiated Emissions						
R & S Receiver	ESL6	100178	03/01/2013	1 Year	03/01/2014	☒
R & S Receiver	ESIB 40	100179	04/20/2013	1 Year	04/20/2014	☒
ETS-Lingren Loop Antenna	6512	00049120	05/13/2013	1 Year	05/13/2014	☒
Bi-Log antenna (30MHz~2GHz)	JB1	A030702	02/09/2013	1 Year	02/09/2014	☒
Horn Antenna (1-26.5GHz)	3115	10SL0059	04/26/2013	1 Year	04/26/2014	☒
Horn Antenna (18-40 GHz)	AH-840	101013	04/23/2013	1 Year	04/23/2014	☒
Pre-Amplifier (1-26.5GHz)	8449B	3008A00715	05/30/2013	1 Year	05/30/2014	☒
Microwave Preamplifier (18-40 GHz)	PA-840	181251	05/30/2013	1 Year	05/30/2014	☒
3 Meters SAC	3M	N/A	10/13/2013	1 Year	10/13/2014	☐
10 Meters SAC	10M	N/A	06/05/2013	1 Year	06/05/2014	☒
Sekonic Hygro Hermograph	ST-50	HE01-000092	05/25/2013	1 Year	05/25/2014	☒
RF Conducted Measurement						
Spectrum Analyzer	N9010A	MY50210206	05/30/2013	1 Year	05/30/2014	☐
Spectrum Analyzer	E4407B	US88441016	05/31/2013	1 Year	05/31/2014	☐
R & S Receiver	ESIB 40	100179	04/20/2013	1 Year	04/20/2014	☐

Annex B. USER MANUAL, BLOCK & CIRCUIT DIAGRAM

Please see attachment

Annex C. 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
HongKong 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