RF TEST REPORT

SIEMIC
GLOBAL TESTING & CERTIFICATIONS
YOUR CHOICE FOR- TCB FCB CB NB CAB RCB

Report No.: FCC_RF_SL14091201-ZBR-031_NFC Rev1.0
Supersede Report No.: FCC_RF_SL14091201-ZBR-031_NFC

Applicant	Zebra Technologies Corporation
Product Name	NFC Radio Module
Model No.	1356NFC-ZQ500
Test Standard	47CFR15.225 RSS210 Issue 8: 2010, RSS Gen Issue 4: 2014
Test Method	ANSI C63.4: 2014
FCC ID	I28MD-1356NFC
IC ID	3798B-1356NFC
Date of test	11/26/2014 - 12/06/2014
Issue Date	01/13/2015
Test Result	Pass 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
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	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 & R&TTE Directive
Japan	MIC (RCB 208)	RF , Telecom
HongKong	OFTA (US002)	RF , Telecom

CONTENTS

1 Report Revision History

Report No.	Report Version	Description	Issue Date
FCC_RF_SL14091201-ZBR-031_NFC	Original	Original	01/05/2015
FCC_RF_SL14091201-ZBR-031_NFC Rev1.0	Rev1.0	Update standard information	01/13/2015

2 Executive Summary

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

Company: Zebra Technologies Corporation
Product: NFC Radio Module
Model: 1356NFC-ZQ500

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	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	NFC Radio Module
Model No.	1356NFC-ZQ500
Trade Name	ZEBRA
Serial No.	P1067148-01 Rev F
Input Power	5VDC
Power Adapter Manu/Model	-
Power Adapter SN	-
Hardware version	N/A
Software version	N/A
Date of EUT received	11/26/2014
Equipment Class/ Category	DXX
Clock Frequencies	13.56 MHz
Port/Connectors	USB
Remark	-
AC Power Cord Type	-
DC Power Cable Type	-

6.2 Radio Description

Spec for Radio –

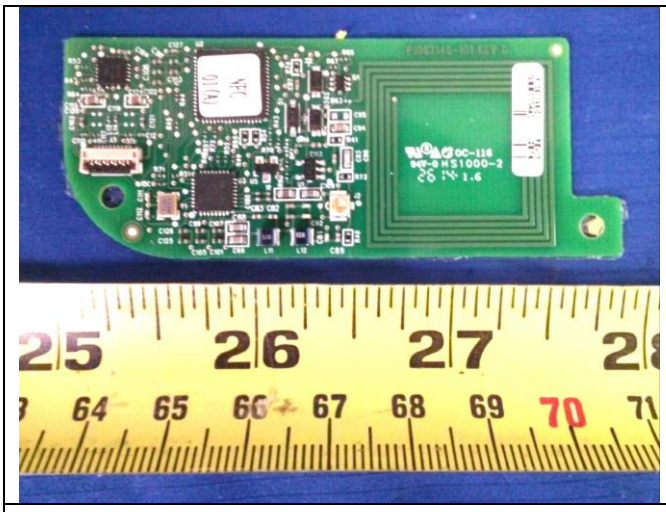
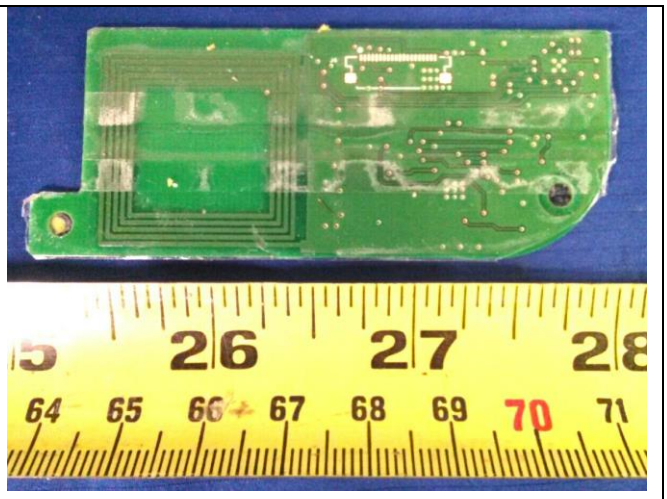
Radio Type	RFID
Operating Frequency	13.56MHz
Modulation	AM
Antenna Type	PCB Loop Antenna

6.3 EUT test modes/configuration Description

Test mode

Final Test Mode		Note
Final_test_mode_1	Continuous TX at 13.56MHz	-
Final_test_mode_2	-	-
Final_test_mode_3	-	-
Final_test_mode_4	-	-
Final_test_mode_5	-	-
Final_test_mode_6	-	-
Final_test_mode_7	-	-
Final_test_mode_8	-	-
Final_test_mode_9	-	-
Remark:		

6.4 EUT Photos

	
NFC Board Top View	NFC Board Bottom View

6.5 Host Printer Photos

Host Printer – Front View (ZQ520)

Host Printer – Rear View (ZQ520)

Host Printer – Left View (ZQ520)

Host Printer – Right View (ZQ520)

Host Printer - Top View (ZQ520)

Host Printer – Bottom View (ZQ520)

Host Printer – Front View (ZQ520)

Host Printer – Rear View (ZQ520)

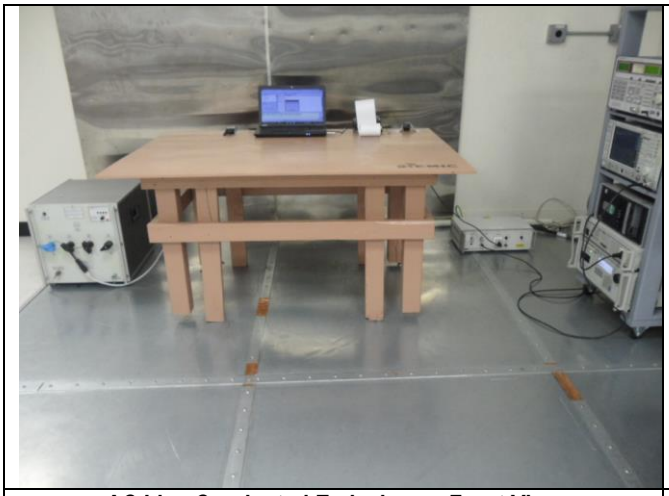
Host Printer – Left View (ZQ520)

Host Printer – Right View (ZQ520)

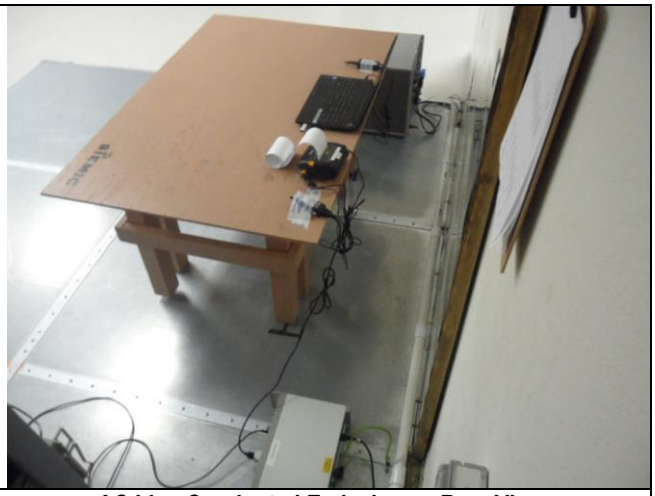
Host Printer – Top View (ZQ520)

Host Printer – Bottom View (ZQ520)

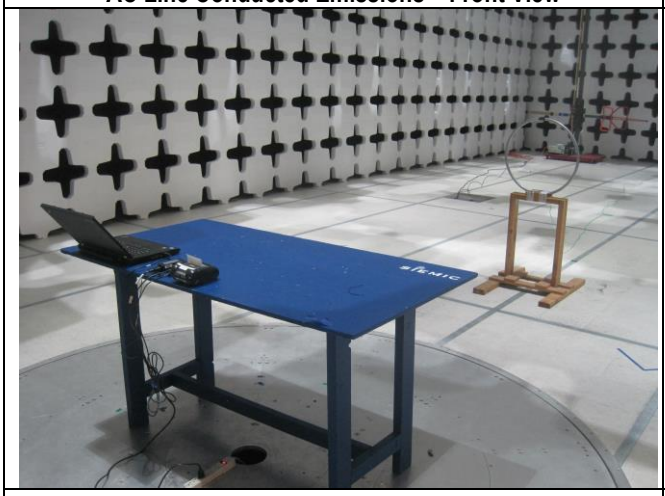
6.6 EUT Test Setup Photos



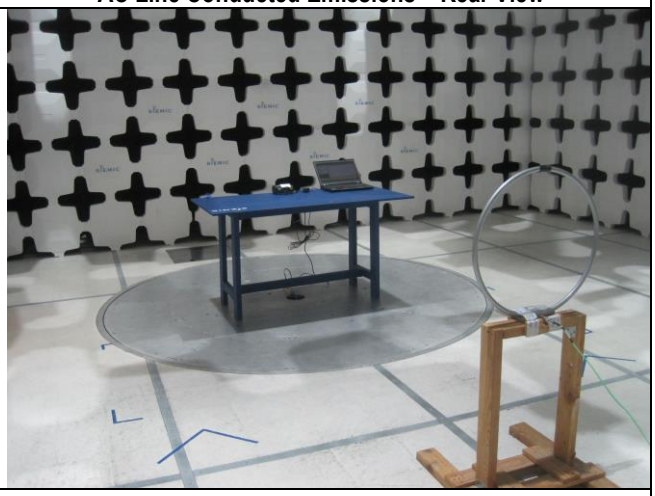
AC Line Conducted Emissions – Front View



AC Line Conducted Emissions – Rear View

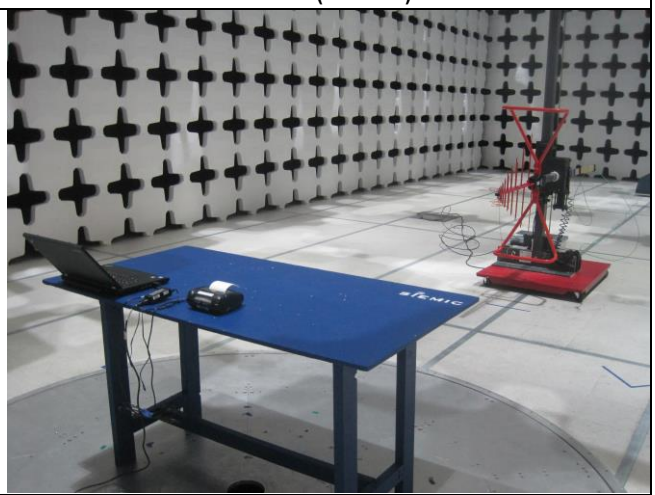


Radiated Emissions (<30MHz) – Front View



Radiated Emissions (<30MHz) – 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
-	-	-	-	-	-

7.2 Test Software Description

Test Item	Software	Description
1	Toolbox.exe	Send command to set module into continuous TX mode

8 Test Summary

Test Item	Test standard		Test Method/Procedure		Pass / Fail
Antenna Requirement	FCC	15.203	FCC	-	☒ Pass ☐ N/A
	IC	N/A	IC	-	
AC Conducted Emissions Voltage	FCC	15.207(a)	FCC	ANSI C63.4 2014	☒ Pass ☐ N/A
	IC	RSS Gen (8.8)	IC	RSS Gen (8.8)	

Test Item	Test standard		Test Method/Procedure		Pass / Fail
Limit in the band of 13.553 – 13.567 MHz	FCC	15.225(a)	FCC	ANSI C63.4 2014	☒ Pass ☐ N/A
	IC	RSS210(A2.6)	IC	RSS Gen 6.13	
Limit in the band of 13.410 – 13.553 MHz and 13.567 – 13.710 MHz	FCC	15.225(b)	FCC	ANSI C63.4 2014	☒ Pass ☐ N/A
	IC	RSS210(A2.6)	IC	RSS Gen 6.13	
Limit in the band of 13.110 – 13.410 MHz and 13.710 – 14.010 MHz	FCC	15.225(c)	FCC	ANSI C63.4 2014	☒ Pass ☐ N/A
	IC	RSS210(A2.6)	IC	RSS Gen 6.13	
Limit outside the band of 13.110 – 14.010 MHz	FCC	15.225(d), 15.209	FCC	ANSI C63.4 2014	☒ Pass ☐ N/A
	IC	RSS210(A2.6)	IC	RSS Gen 6.13	
Frequency Stability	FCC	15.225(e)	FCC	-	☒ Pass ☐ N/A
	IC	RSS210(A2.6)	IC	RSS Gen 6.11	
Occupied Bandwidth	FCC	-	FCC	-	☒ Pass ☐ N/A
	IC	RSS-210(5.9.1)	IC	RSS Gen 6.6	
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. Test Method: ANSI C63.4: 2014 / RSS – Gen Issue 4: November 2014				

9 Measurement Uncertainty

Test Item	Frequency Range	Description	Uncertainty
AC Conducted Emissions Voltage	150KHz – 30MHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2	±3.5dB
Limit in the band of 13.553 – 13.567 MHz	13.553 – 13.567 MHz	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
Limit in the band of 13.410 – 13.553 MHz and 13.567 – 13.710 MHz	13.410 – 13.553 MHz and 13.567 – 13.710 MHz		+5.6dB/-4.5dB
Limit in the band of 13.110 – 13.410 MHz and 13.710 – 14.010 MHz	13.110 – 13.410 MHz and 13.710 – 14.010 MHz		+5.6dB/-4.5dB
Limit outside the band of 13.110 – 14.010 MHz	9KHz – 30MHz		+5.6dB/-4.5dB
Radiated Spurious Emissions	30MHz – 1GHz		+5.6dB/-4.5dB

10 Measurements, Examination and Derived Results

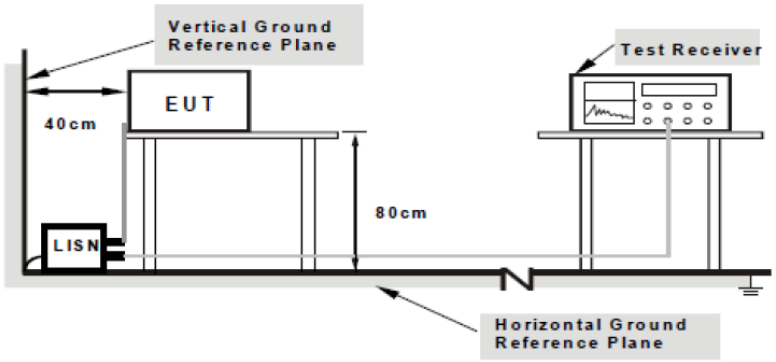
10.1 Antenna Requirement

Spec	Requirement	Applicable
§15.203	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. Antenna requirement must meet at least one of the following: a) Antenna must be permanently attached to the device. b) The antenna must use a unique type of connector to attach to the device. c) Device must be professionally installed. The installer shall be responsible for ensuring that the correct antenna is employed by the device.	☒
Remark	The RFID antenna is integral to the PCB board permanently to the device which meets the requirement (See Internal Photographs submitted as another Exhibit).	
Result	☒ PASS ☐ FAIL	

10.2 Conducted Emissions

Conducted Emission Limit

Frequency ranges (MHz)	Limit (dBuV)	
	QP	Average
0.15 ~ 0.5	66 – 56	56 – 46
0.5 ~ 5	56	46
5 ~ 30	60	50

Spec	Item	Requirement	Applicable
47CFR§15.207, RSS210(A8.1)	a)	For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 [mu]H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequency ranges.	☒
Test Setup	 Note: 1.Support units were connected to second LISN. 2.Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.		
Procedure	- The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table, as shown in Annex B. - The power supply for the EUT was fed through a 50Ω/50μH EUT LISN, connected to filtered mains. - The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable. - All other supporting equipment were powered separately from another main supply.		
Remark	There're two printer host models, ZQ510 and ZQ520. They're very similar in the design the testing was performed on the worst case model of ZQ520 to represent both. Testing on ZQ520 were done with 2 configuration, which are with or without battery eliminator.		
Result	☒ Pass ☐ Fail		

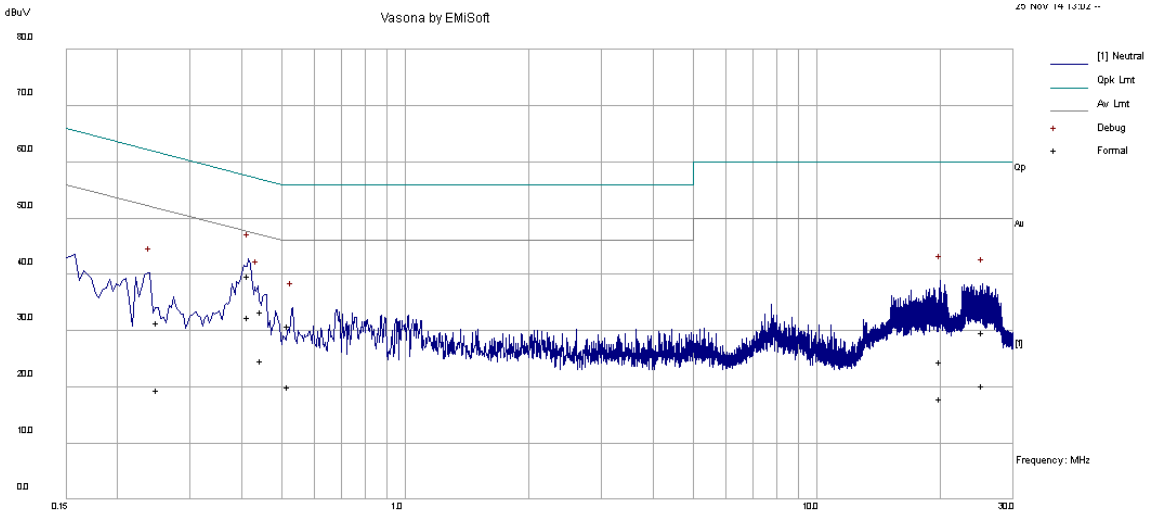
Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Conducted Emission Test Results (AC Line Test Result)

Test specification:	Conducted Emissions			
Environmental Conditions:	Temp(°C):	24.4°C	Result:	☒ Pass ☐ Fail
	Humidity (%):	28.1%		
	Atmospheric(mbar):	1014 mbar		
Mains Power:	120VAC, 60Hz			
Tested by:	Osvaldo Casorla			
Test Date:	11/25/2014			
Remarks:	ZQ520 without Eliminator.			

Neutral Plot at V=120VAC, *f*=60Hz

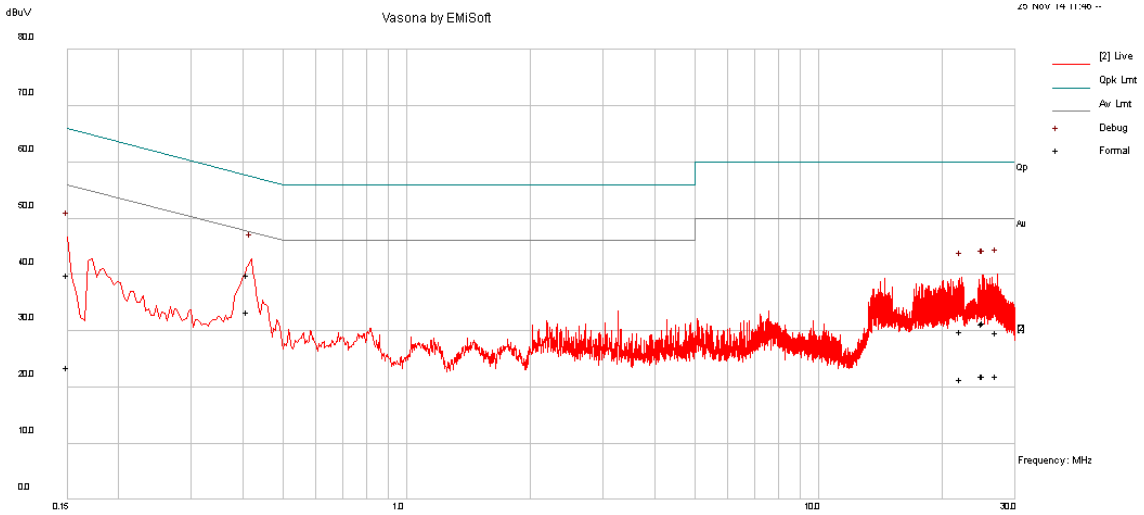


Neutral Measurement

Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail
0.25	20.74	10.00	0.73	31.47	Quasi Peak	Neutral	61.74	-30.28	Pass
0.41	29.01	10.01	0.73	39.74	Quasi Peak	Neutral	57.55	-17.81	Pass
0.45	22.66	10.01	0.73	33.40	Quasi Peak	Neutral	56.93	-23.53	Pass
0.52	20.04	10.01	0.74	30.79	Quasi Peak	Neutral	56.00	-25.21	Pass
20.00	12.16	10.07	2.27	24.50	Quasi Peak	Neutral	60.00	-35.50	Pass
25.24	17.27	10.08	2.27	29.62	Quasi Peak	Neutral	60.00	-30.38	Pass
0.25	8.70	10.00	0.73	19.43	Average	Neutral	51.74	-32.32	Pass
0.41	21.75	10.01	0.73	32.49	Average	Neutral	47.55	-15.06	Pass
0.45	13.97	10.01	0.73	24.71	Average	Neutral	46.93	-22.23	Pass
0.52	9.27	10.01	0.74	20.02	Average	Neutral	46.00	-25.98	Pass
20.00	5.50	10.07	2.27	17.84	Average	Neutral	50.00	-32.16	Pass
25.24	7.88	10.08	2.27	20.23	Average	Neutral	50.00	-29.77	Pass

Test specification:	Conducted Emissions			
Environmental Conditions:	Temp(°C):	25.6°C	Result:	☒ Pass ☐ Fail
	Humidity (%):	25%		
	Atmospheric(mbar):	1014 mbar		
Mains Power:	120VAC, 60Hz			
Tested by:	Osvaldo Casorla			
Test Date:	11/25/2014			
Remarks:	ZQ520 without Eliminator.			

Line Plot at V=120VAC, *f*=60Hz

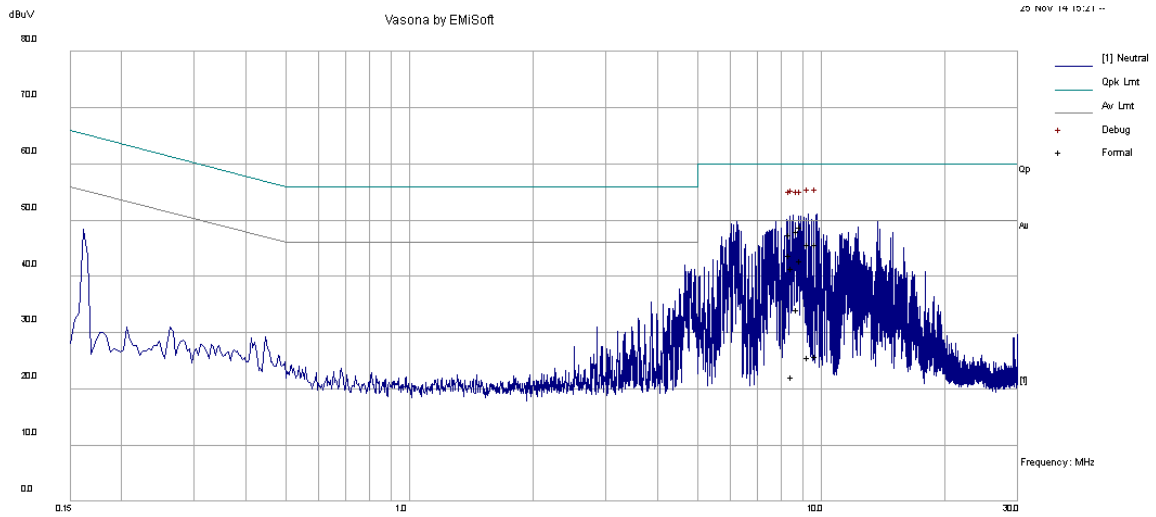


Line Measurements

Frequency MHz	Raw dBµV	Cable Loss	Factors dB	Level dBµV	Measurement Type	Line	Limit dBµV	Margin dB	Pass /Fail
0.15	29.20	10.00	0.76	39.96	Quasi Peak	Line	65.99	-26.04	Pass
0.41	29.23	10.01	0.73	39.96	Quasi Peak	Line	57.63	-17.67	Pass
22.17	17.62	10.07	2.27	29.97	Quasi Peak	Line	60.00	-30.03	Pass
24.96	19.00	10.08	2.27	31.35	Quasi Peak	Line	60.00	-28.65	Pass
25.17	19.10	10.08	2.27	31.45	Quasi Peak	Line	60.00	-28.55	Pass
27.10	17.45	10.08	2.27	29.80	Quasi Peak	Line	60.00	-30.20	Pass
0.15	12.75	10.00	0.76	23.51	Average	Line	55.99	-32.48	Pass
0.41	22.58	10.01	0.73	33.32	Average	Line	47.63	-14.32	Pass
22.17	9.02	10.07	2.27	21.36	Average	Line	50.00	-28.64	Pass
24.96	9.57	10.08	2.27	21.92	Average	Line	50.00	-28.08	Pass
25.17	9.57	10.08	2.27	21.92	Average	Line	50.00	-28.08	Pass
27.10	9.57	10.08	2.27	21.92	Average	Line	50.00	-28.08	Pass

Test specification:	Conducted Emissions			
Environmental Conditions:	Temp(°C):	24.9°C	Result:	☒ Pass ☐ Fail
	Humidity (%):	28%		
	Atmospheric(mbar):	1016 mbar		
Mains Power:	120VAC, 60Hz			
Tested by:	Osvaldo Casorla			
Test Date:	11/26/2014			
Remarks:	ZQ520 with Eliminator			

Neutral Plot at V=120VAC, *f*=60Hz

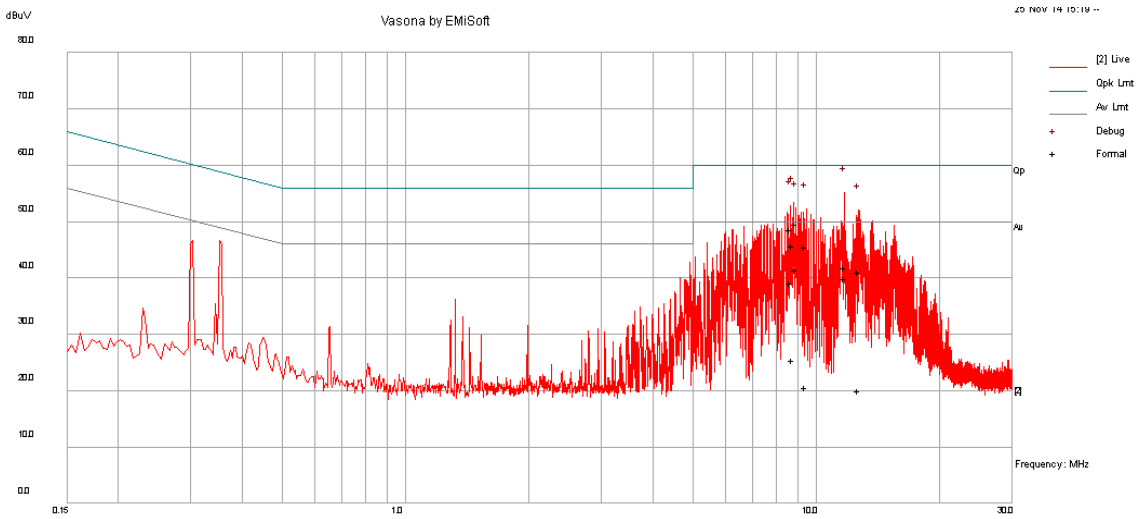


Neutral Measurement

Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail
8.38	36.23	10.05	1.28	47.56	Quasi Peak	Neutral	60.00	-12.44	Pass
8.53	30.19	10.05	1.29	41.53	Quasi Peak	Neutral	60.00	-18.47	Pass
8.78	36.71	10.05	1.32	48.07	Quasi Peak	Neutral	60.00	-11.93	Pass
8.91	37.39	10.05	1.33	48.76	Quasi Peak	Neutral	60.00	-11.24	Pass
9.31	34.39	10.05	1.36	45.80	Quasi Peak	Neutral	60.00	-14.20	Pass
9.71	34.22	10.05	1.40	45.66	Quasi Peak	Neutral	60.00	-14.34	Pass
8.38	32.50	10.05	1.28	43.83	Average	Neutral	50.00	-6.17	Pass
8.53	10.83	10.05	1.29	22.17	Average	Neutral	50.00	-27.83	Pass
8.78	22.83	10.05	1.32	34.19	Average	Neutral	50.00	-15.81	Pass
8.91	31.55	10.05	1.33	42.92	Average	Neutral	50.00	-7.08	Pass
9.31	14.25	10.05	1.36	25.66	Average	Neutral	50.00	-24.34	Pass
9.71	14.38	10.05	1.40	25.82	Average	Neutral	50.00	-24.18	Pass

Test specification:	Conducted Emissions			
Environmental Conditions:	Temp(°C):	25.5°C	Result:	☒ Pass ☐ Fail
	Humidity (%):	25%		
	Atmospheric(mbar):	1016 mbar		
Mains Power:	120VAC, 60Hz			
Tested by:	Osvaldo Casorla			
Test Date:	11/26/2014			
Remarks:	ZQ520 with Eliminator.			

Line Plot at V=120VAC, *f*=60Hz



Line Measurements

Frequency MHz	Raw dBµV	Cable Loss	Factors dB	Level dBµV	Measurement Type	Line	Limit dBµV	Margin dB	Pass /Fail
8.65	37.31	10.05	1.30	48.66	Quasi Peak	Line	60.00	-11.34	Pass
8.79	34.34	10.05	1.32	45.70	Quasi Peak	Line	60.00	-14.30	Pass
8.91	38.18	10.05	1.33	49.55	Quasi Peak	Line	60.00	-10.45	Pass
9.45	34.07	10.05	1.38	45.49	Quasi Peak	Line	60.00	-14.51	Pass
11.70	30.34	10.05	1.57	41.96	Quasi Peak	Line	60.00	-18.04	Pass
12.67	29.50	10.06	1.65	41.20	Quasi Peak	Line	60.00	-18.80	Pass
8.65	27.91	10.05	1.30	39.26	Average	Line	50.00	-10.74	Pass
8.79	14.04	10.05	1.32	25.40	Average	Line	50.00	-24.60	Pass
8.91	30.13	10.05	1.33	41.50	Average	Line	50.00	-8.50	Pass
9.45	9.20	10.05	1.38	20.62	Average	Line	50.00	-29.38	Pass
11.70	28.35	10.05	1.57	39.97	Average	Line	50.00	-10.03	Pass
12.67	8.43	10.06	1.65	20.13	Average	Line	50.00	-29.87	Pass

10.3 Radiated Measurement below 30MHz

Requirement(s):

Spec	Item	Requirement	Applicable
47 CFR §15.225 RSS-210 (A2.6)	a)	Operation within the band 13.110–14.010 MHz. (a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters. (b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters. (c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters. (d) The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in §15.209.	☒

Test Setup	1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m X 1.0m X 0.8m high, non-metallic table. 2. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable. 3. The relevant loop antenna was set at the required test distance away from the EUT and supporting equipment boundary.			
Procedure	For < 30MHz, Radiated emissions were measured according to ANSI C63.4. The EUT was set to transmit at the highest output power. The EUT was set 10 meters away from the measuring antenna. The loop antenna was positioned 1 meter above the ground from the center of the loop. The measuring bandwidth was set to 10 kHz. The limit is converted from microvolt/meter to decibel microvolt/meter.			
Test Date	12/06/2014	Environmental conditions	Temperature Relative Humidity Atmospheric Pressure	22°C 46% 1008mbar
Remark	1. There're two printer host models, ZQ510 and ZQ520. They're very similar in the design the testing was performed on the worst case model of ZQ520 to represent both. Testing on ZQ520 were done with 2 configuration, which are with or without battery eliminator. 2. The measurement was also verified when either the N radio WLAN or BT were turned on and transmit simultaneously with NFC, but didn't find any impact on the emission characteristic of the NFC radio module.			
Result	☒ Pass ☐ Fail			

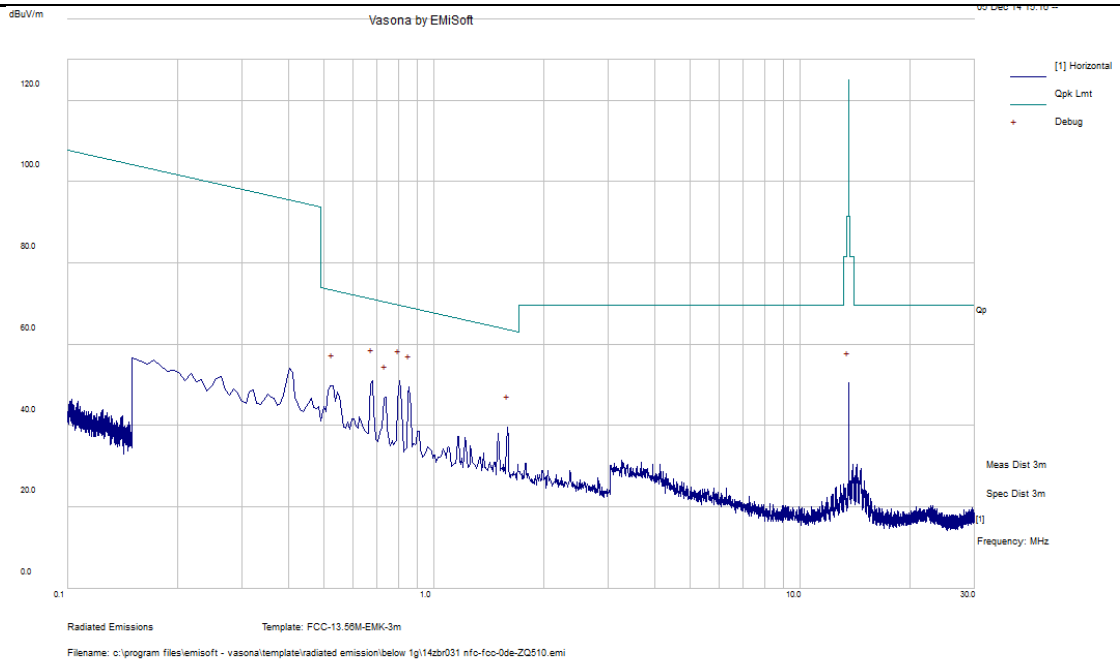
Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

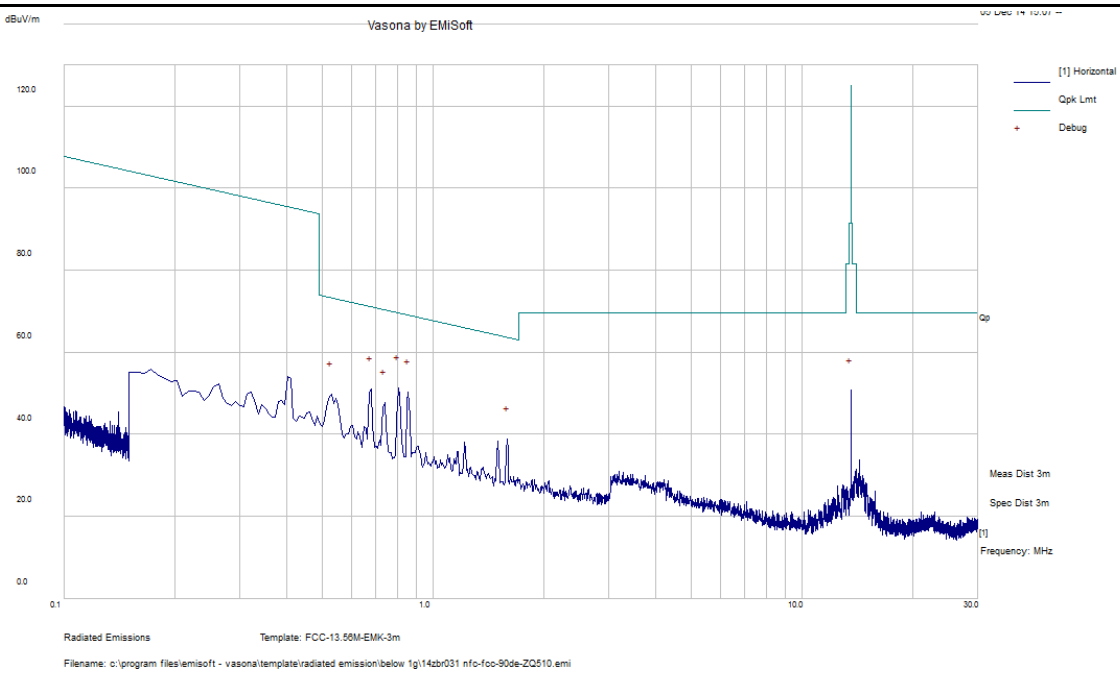
Radiated Emission Test Results (Below 30MHz)

Plot: 100 kHz – 30 MHz emission @ 3m

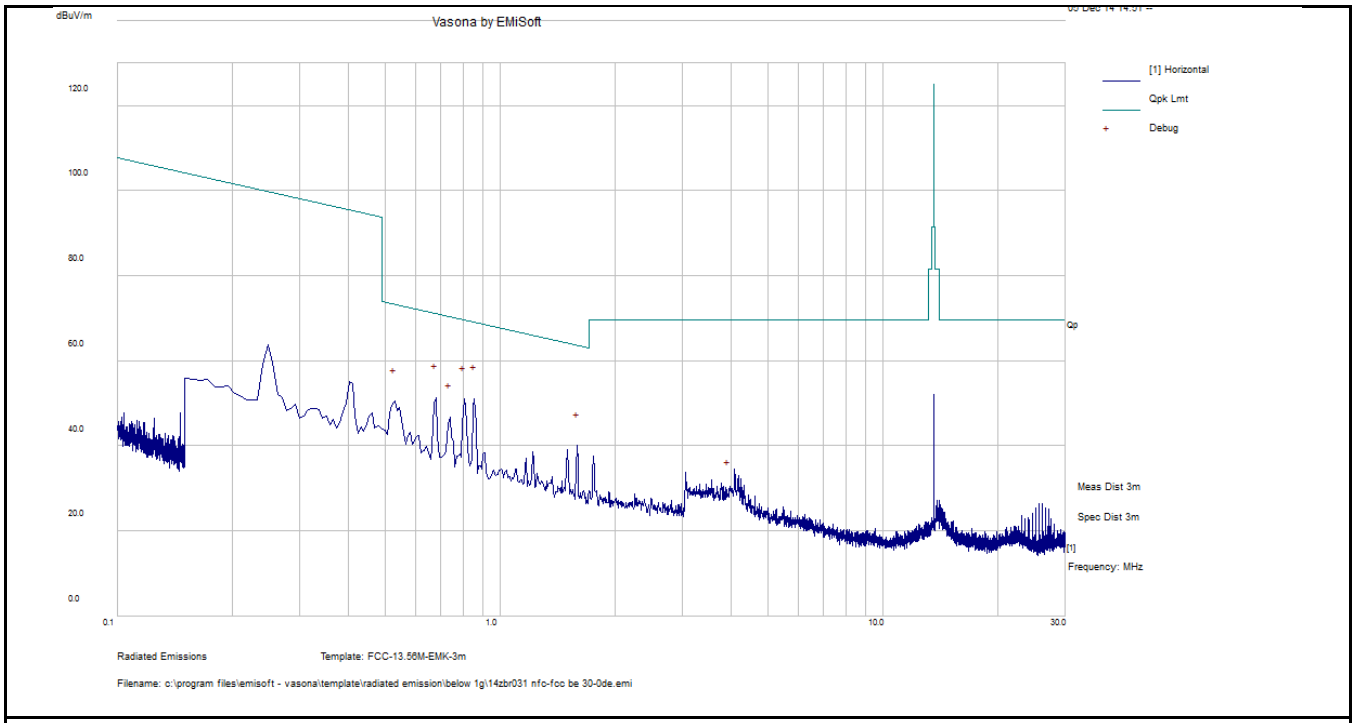
Loop Antenna at 0 & 90 degree



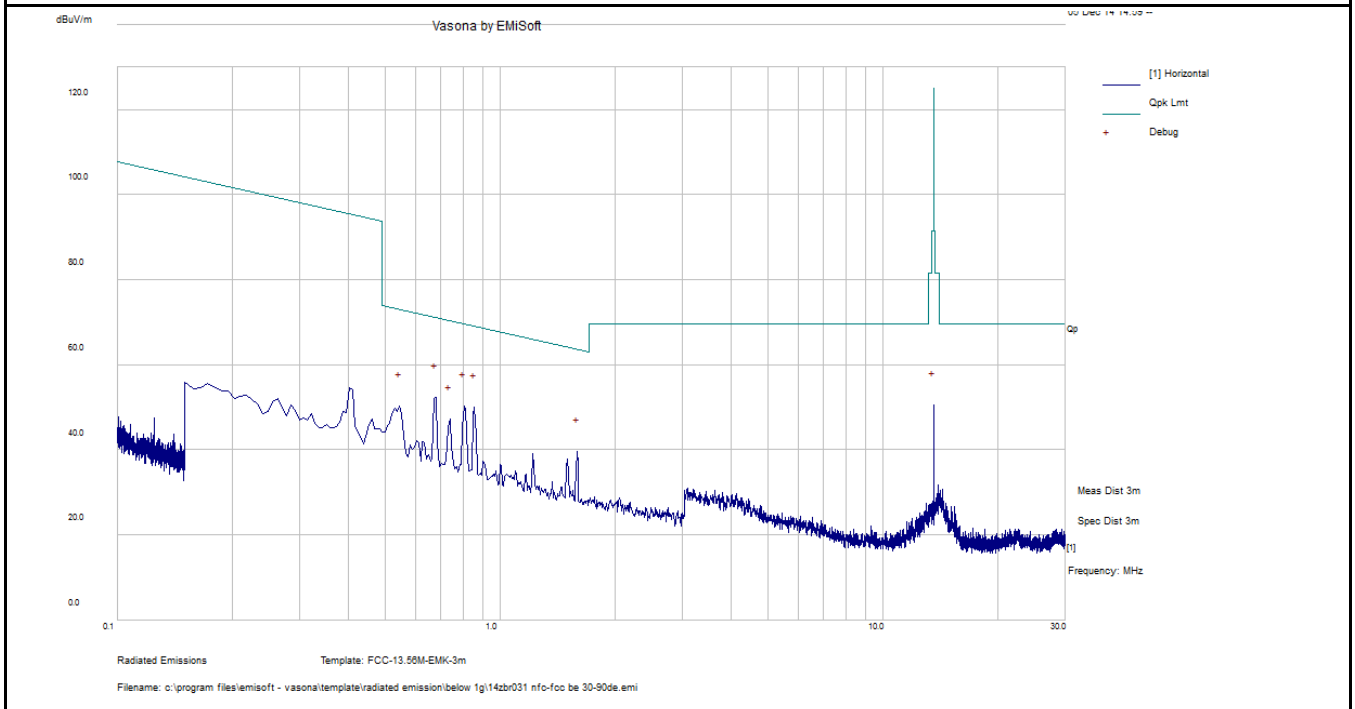
FCC 15.225-13.56MHz-TX-RSE-0 deg with printer host ZQ520, with eliminator



FCC 15.225-13.56MHz-TX-RSE-90 deg with printer host ZQ520, with eliminator

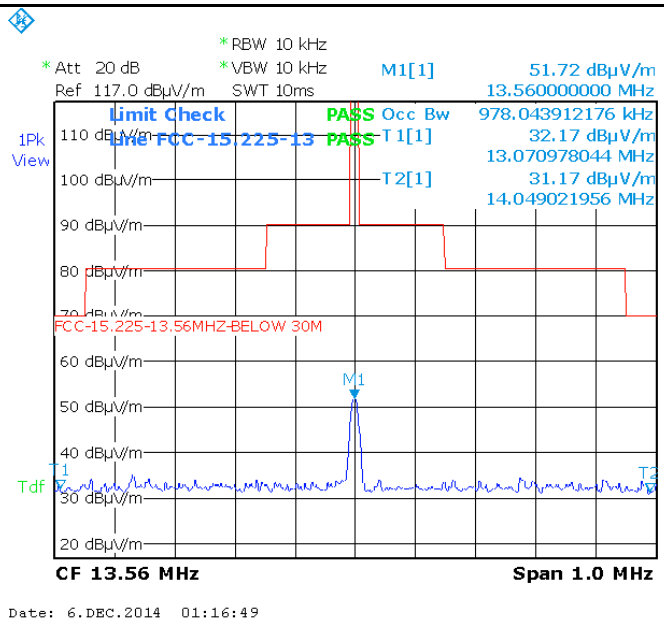


FCC 15.225-13.56MHz-TX-RSE-0 deg with printer host ZQ520, without eliminator

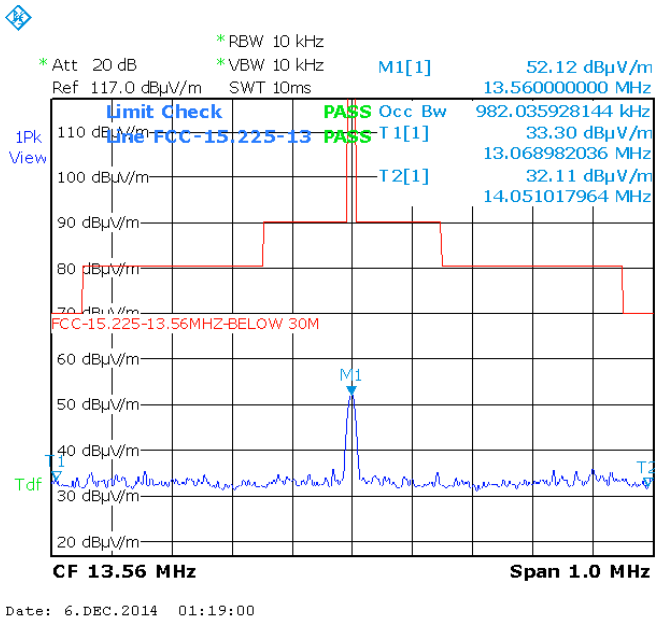


FCC 15.225-13.56MHz-TX-RSE-90 deg with printer host ZQ520, without eliminator

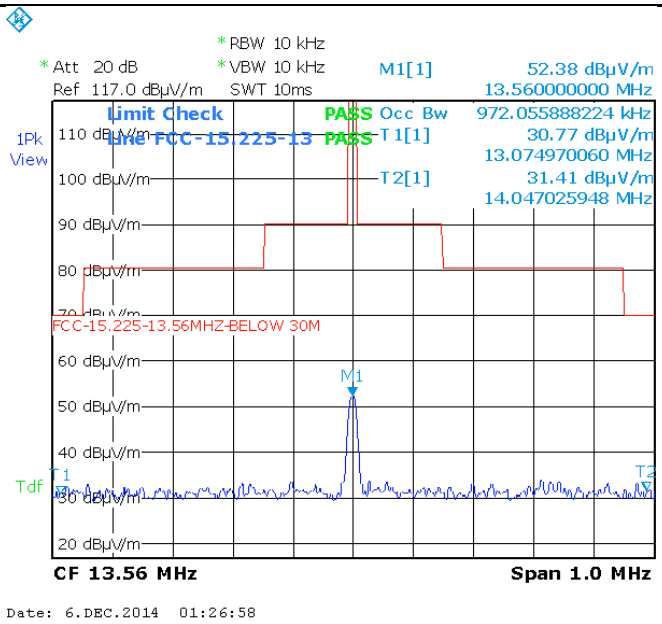
Plot: Prescan Emission Mask Measurement @ 3m between 13.06 MHz – 14.06 MHz



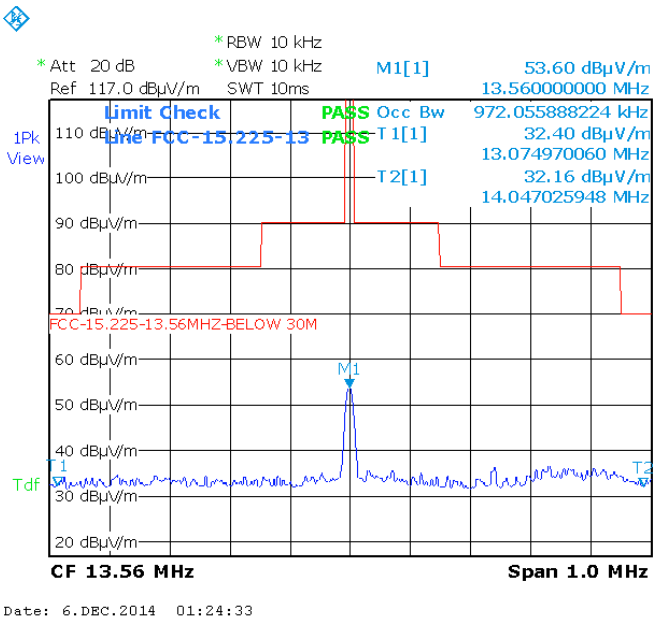
FCC 15.225-13.56MHz-TX-EMK-0 deg - with printer host ZQ520, with eliminator



FCC 15.225-13.56MHz-TX-EMK-90 deg - with printer host ZQ520, with eliminator



FCC 15.225-13.56MHz-TX-EMK-0 deg - with printer host ZQ520, without eliminator



FCC 15.225-13.56MHz-TX-EMK-90 deg - with printer host ZQ520, without eliminator

10.4 Occupied bandwidth

Requirement(s):

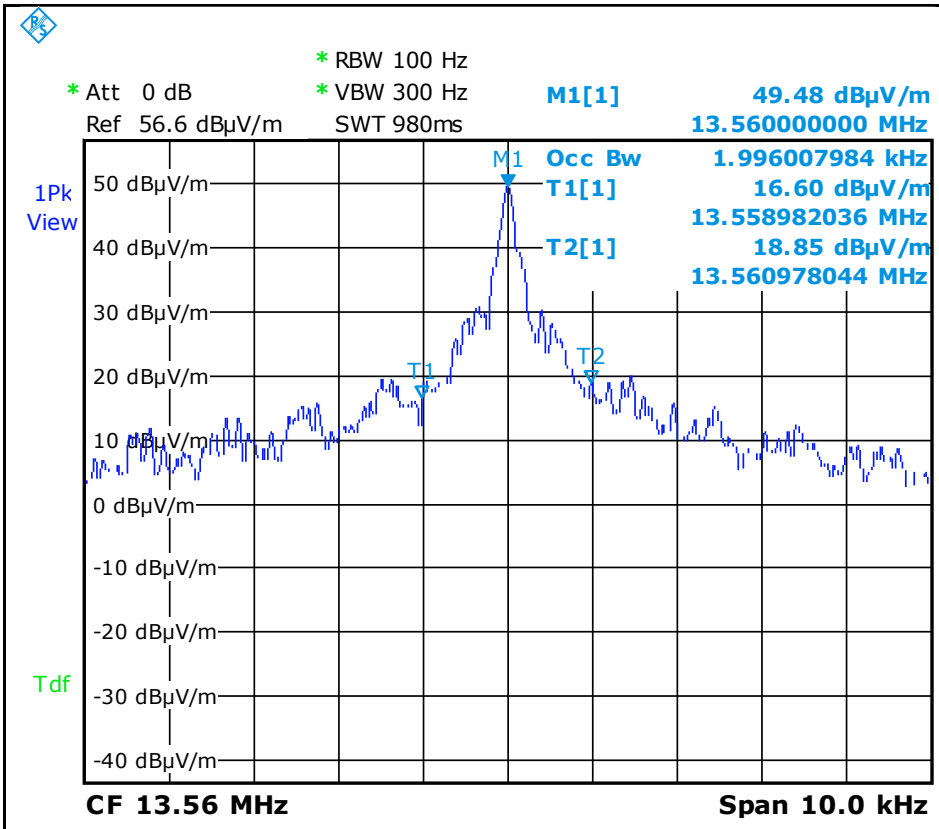
Spec	Requirement	Applicable
RSS-Gen 4.6.1	The transmitter shall be operated at its maximum carrier power measured under normal test conditions. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual. The trace data points are recovered and directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded. The span between the two recorded frequencies is the occupied bandwidth.	☒

Test Setup	1. The EUT was set up inside a semi-anechoic chamber in accordance with the standard. 2. The EUT was placed on top of a 0.8m high, non-metallic table in a typical configuration.		
Procedure	1. The EUT was switched on and allowed to warm up to its normal operating condition. 2. To measure conducted, a SMA cable was used to replace the EUT antenna. To measure radiated, an external antenna was used to detect EUT transmission signal. 3. Measurement of the 99% Occupied Bandwidth of EUT transmission signal and make record.		
Test Date	12/06/2014	Environmental conditions	Temperature 22°C Relative Humidity 46% Atmospheric Pressure 1008mbar
Remark	-		
Result	☒ Pass ☐ Fail		

Test Data ☐ Yes (See below) ☒ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test Plots



IC-99% BW (13.56MHz)

10.5 Frequency Stability

Requirement(s):

Spec	Requirement			Applicable
47 CFR §15.225 e) RSS-210 (A2.6)	Limit: ±0.01% of 13.56 MHz = 1356 Hz			☒
Test Setup	1. The EUT was set up inside an environmental chamber. 2. The EUT was placed in the centre of the environmental.			
Procedure	Frequency Stability was measured according to 47 CFR §2.1055. Measurement was taken with spectrum analyzer. The spectrum analyzer bandwidth and span was set to read in hertz. A voltmeter was used to monitor when varying the voltage.			
Test Date	12/06/2014	Environmental conditions	Temperature 22°C Relative Humidity 46% Atmospheric Pressure 1008mbar	
Remark	None			
Result	☒ Pass ☐ Fail			

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

Test Result

Frequency Stability versus Temperature: The Frequency tolerance of the carrier signal shall be maintained within ± 0.01% of the operating frequency over a temperature variation of -20ºC to +50ºC at normal supply voltage.

Reference Frequency: 13.560118 MHz at 20°C at 7.4VDC

Temperature (ºC)	Measured Freq. (MHz)	Freq. Drift (Hz)	Freq. Deviation (Limit: 0.01%)	Pass/Fail
50	13.560110	-8	<0.01	Pass
40	13.560095	-23	<0.01	Pass
30	13.560091		<0.01	Pass
20	Reference (13. 560118 MHz)			
10	13.560088	-30	<0.01	Pass
0	13.560163	45	<0.01	Pass
-10	13.560102	-16	<0.01	Pass
-20	13.560100	-18	<0.01	Pass

Frequency Stability versus Input Voltage: The Frequency tolerance of the carrier signal shall be maintained within ± 0.01%, the frequency of the transmitter was measured at 85% and at 115% of the rated power supply voltage at a 20ºC environmental temperature.

Carrier Frequency: 13.560118 MHz at 20°C at 7.4VDC

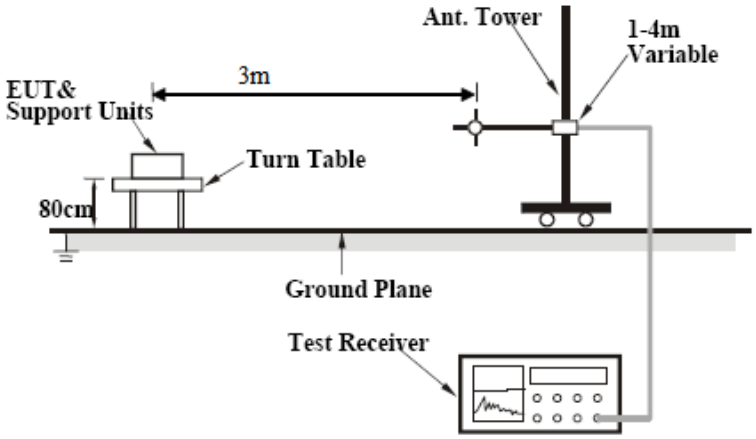
Measured Voltage ±15% of nominal (VDC)	Measured Freq. (MHz)	Freq. Drift (Hz)	Freq. Deviation (Limit: 0.01%)	Pass/Fail
10.2	13.560115	-3	<0.01	Pass
13.8	13.560118	0	<0.01	Pass

10.6 Radiated Emissions below 1GHz

Requirement(s):

Spec	Item	Requirement	Applicable
47 CFR §15.225 RSS-210 (A2.6)	a)	Operation within the band 13.110–14.010 MHz. (a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters. (b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters. (c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters. (d) The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in §15.209.	☒

Frequency range (MHz)	Field Strength (uV/m)
30 – 88	100
88 – 216	150
216 960	200
Above 960	500

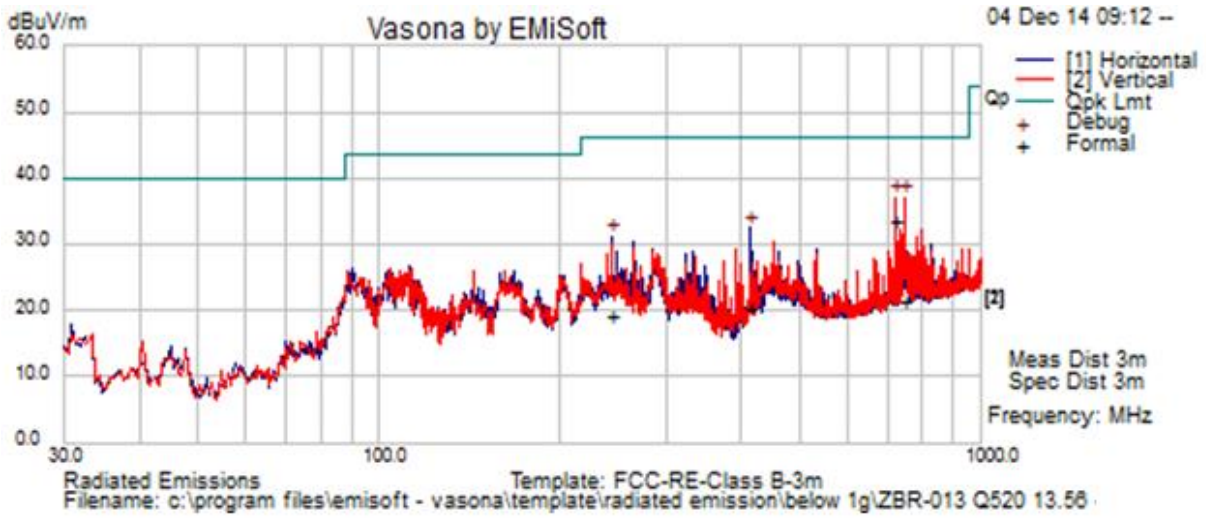
Test Setup	
Procedure	1. The EUT was switched on and allowed to warm up to its normal operating condition. 2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, 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	There're two printer host models, ZQ510 and ZQ520. They're very similar in the design the testing was performed on the worst case model of ZQ520 to represent both.
Result	☒ Pass ☐ Fail

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

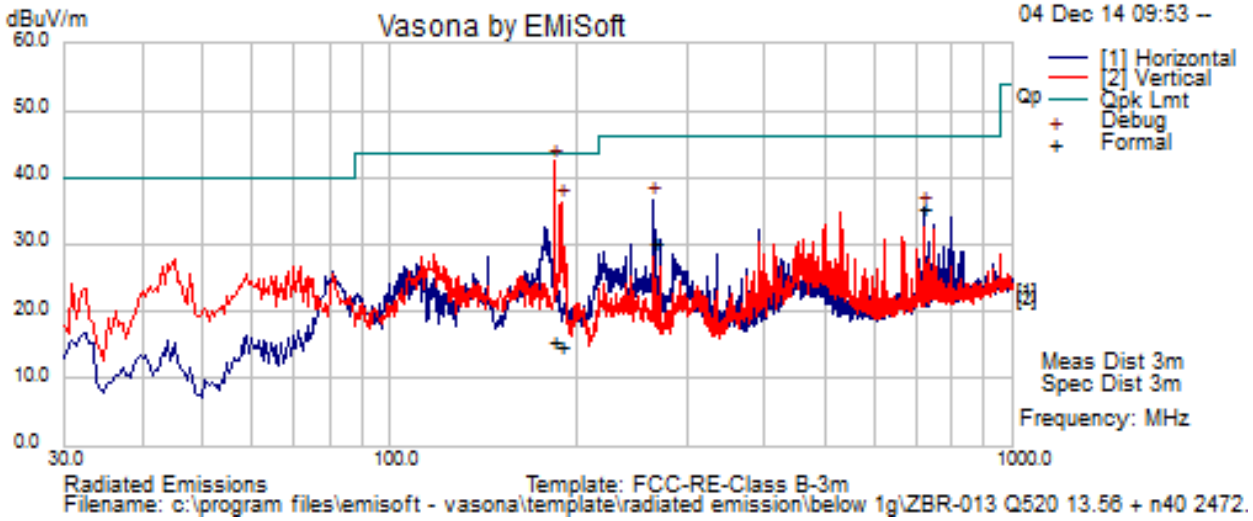
Radiated Emission Test Results (Below 1GHz)

Test specification	below 1GHz		Result	Pass
Environmental Conditions:	Temp (°C):	22		
	Humidity (%)	50		
	Atmospheric (mbar):	1009		
Mains Power:	110VAC, 60Hz			
Tested by:	Teody Manansala			
Test Date:	12/04/2014			
Remarks:	Testing with worst case model – ZQ520, without eliminator			



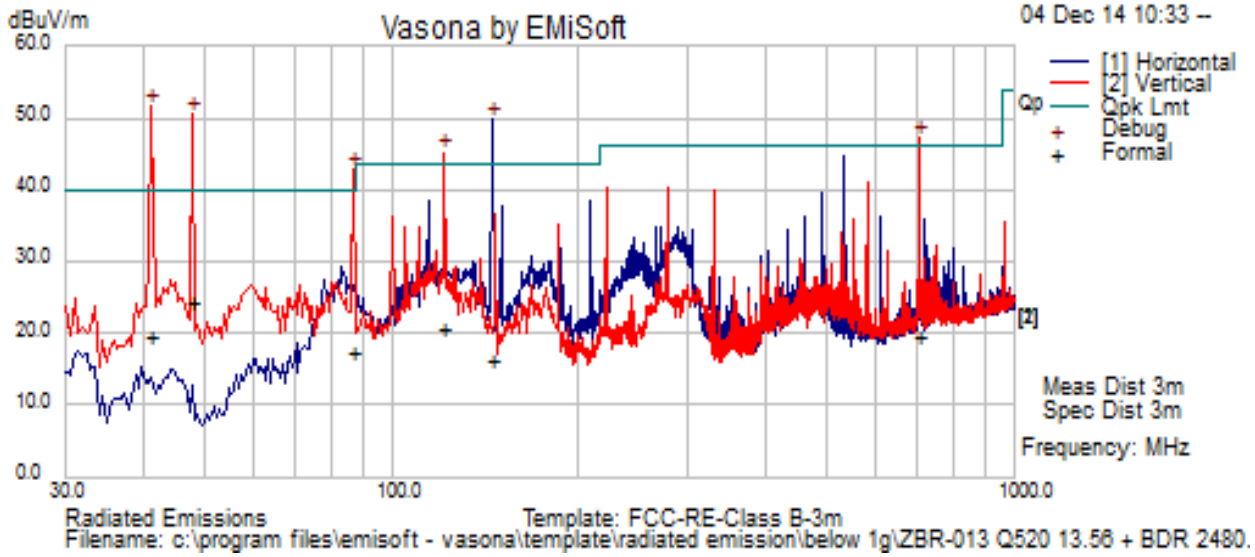
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
720.00	47.79	4.57	-18.99	33.37	Quasi Max	V	109.00	136.00	46.00	-12.63	Pass
748.80	35.16	4.67	-18.47	21.37	Quasi Max	V	118.00	73.00	46.00	-24.63	Pass
415.12	40.03	3.47	-23.44	20.06	Quasi Max	H	236.00	225.00	46.00	-25.94	Pass
243.99	44.41	2.75	-28.05	19.11	Quasi Max	H	104.00	171.00	46.00	-26.89	Pass

Test specification	below 1GHz		Result	Pass
Environmental Conditions:	Temp (°C):	22		
	Humidity (%)	50		
	Atmospheric (mbar):	1009		
Mains Power:	110VAC, 60Hz			
Tested by:	Teody Manansala			
Test Date:	12/04/2014			
Remarks:	Testing with worst case model – ZQ520, without eliminator, co-location with N radio WLAN at 11n20 2472MHz			



Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
183.66	42.04	2.42	-28.89	15.56	Quasi Max	V	153.00	7.00	43.50	-27.94	Pass
188.96	40.90	2.45	-28.74	14.60	Quasi Max	V	125.00	295.00	43.50	-28.90	Pass
265.96	53.96	2.85	-26.76	30.05	Quasi Max	H	108.00	200.00	46.00	-15.95	Pass
720.03	49.63	4.57	-18.99	35.21	Quasi Max	H	206.00	210.00	46.00	-10.79	Pass

Test specification	below 1GHz		Result	Pass
Environmental Conditions:	Temp (°C):	22		
	Humidity (%)	50		
	Atmospheric (mbar):	1009		
Mains Power:	110VAC, 60Hz			
Tested by:	Teody Manansala			
Test Date:	12/04/2014			
Remarks:	Testing with worst case model – ZQ520, with eliminator, co-location with N radio BT at BDR 2480MHz			



Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
41.09	44.94	1.16	-26.64	19.46	Quasi Max	V	114.00	201.00	40.00	-20.54	Pass
48.01	52.41	1.16	-29.45	24.11	Quasi Max	V	104.00	248.00	40.00	-15.89	Pass
145.60	41.12	2.19	-27.00	16.31	Quasi Max	H	247.00	336.00	43.50	-27.19	Pass
86.52	47.81	1.62	-32.05	17.37	Quasi Max	V	139.00	97.00	40.00	-22.63	Pass
121.67	44.78	2.02	-26.03	20.78	Quasi Max	V	100.00	167.00	43.50	-22.72	Pass
703.28	34.30	4.51	-19.22	19.59	Quasi Max	V	375.00	277.00	46.00	-26.41	Pass

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Cycle	Cal Due	In use
Conducted Emissions						
R & S Receiver	ESIB 40	100179	05/24/2014	1 Year	05/24/2015	☑
LISN	Schwarzbeck	NNLK 8129	08/11/2014	1 Year	08/11/2015	☑
CHASE LISN	MN2050B	1018	07/31/2014	1 Year	07/31/2015	☑
Sekonic Hygro Hermograph	ST-50	HE01-000092	05/25/2014	1 Year	05/25/2015	☑
Radiated Emissions						
R & S Receiver	ESL6	100178	03/01/2014	1 Year	03/01/2015	☑
R & S Receiver	ESIB 40	100179	04/20/2014	1 Year	04/20/2015	☐
ETS-Lingren Loop Antenna	6512	00049120	05/13/2014	1 Year	05/13/2015	☑
Bi-Log antenna (30MHz~2GHz)	JB1	A030702	08/12/2014	1 Year	08/12/2015	☑
Horn Antenna (1-26.5GHz)	3115	10SL0059	04/26/2014	1 Year	04/26/2015	☐
Horn Antenna (18-40 GHz)	AH-840	101013	04/23/2014	1 Year	04/23/2015	☐
Pre-Amplifier (1-26.5GHz)	8449B	3008A00715	05/30/2014	1 Year	05/30/2015	☑
Microwave Preamplifier (18-40 GHz)	PA-840	181251	05/30/2014	1 Year	05/30/2015	☐
3 Meters SAC	3M	N/A	10/13/2014	1 Year	10/13/2015	☐
10 Meters SAC	10M	N/A	06/05/2014	1 Year	06/05/2015	☑
Sekonic Hygro Hermograph	ST-50	HE01-000092	05/25/2014	1 Year	05/25/2015	☑
RF Conducted Measurement						
Spectrum Analyzer	N9010A	MY50210206	05/30/2014	1 Year	05/30/2015	☐
Spectrum Analyzer	E4407B	US88441016	05/31/2014	1 Year	05/31/2015	☐
R & S 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
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 Measuremet
Australia CAB Regocnition		**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