RF TEST REPORT

SIEMIC
A Bureau Veritas Group Company

Report No.: FCC_IC_RF_SL19022201-JAD-004-Rev3
Supersede Report No.: FCC_IC_RF_SL19022201-JAD-004-Rev2

Applicant	:	JADAK, a business unit of Novanta Corporation
Product Name	:	Handheld Scanner
Model No.	:	HS-1RL, HS-1RS, HS1RL, HS1RS, FlexTap, FlexTap RL, FlexTap RS
Test Standard	:	FCC 15.209 RSS-210 Issue 9: 2016
Test Method	:	FCC 15.209 ANSI C63.10 2013 RSS Gen Issue 5 2019
FCC ID	:	QV5HS1RL
IC ID	:	5407A-HS1RL
Dates of test	:	03/18/2019
Issue Date	:	04/23/2019
Test Result	:	☒ Pass ☐ Fail
Equipment complied with the specification		**[X]**
Equipment did not comply with the specification		**[ ]**

Cipher	**Chen Ge**
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 & R&TTE Directive
Japan	MIC (RCB 208)	RF, Telecom
Hong Kong	OFTA (US002)	RF, Telecom

CONTENTS

1 Report Revision History

Report No.	Report Version	Description	Issue Date
FCC_IC_RF_SL19022201-JAD-004	-	Original	03/25/2019
FCC_IC_RF_SL19022201-JAD-004-Rev1	Rev1	Review comment	04/02/2019
FCC_IC_RF_SL19022201-JAD-004-Rev2	Rev2	Review comment	04/04/2019
FCC_IC_RF_SL19022201-JAD-004-Rev3	Rev3	Review comment	04/23/2019

2 Executive Summary

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

Company: JADAK, a business unit of Novanta Corporation
Product: Handheld Scanner
Model: HS-1RL, HS-1RS, HS1RL, HS1RS, FlexTap, FlexTap RL, FlexTap RS

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	:	JADAK, a business unit of Novanta Corporation
Applicant Address	:	125 Middlesex Turnpike, Bedford, MA 01730
Manufacturer Name	:	JADAK, a business unit of Novanta Corporation
Manufacturer Address	:	7279 William Barry Blvd., N. Syracuse, NY 13212

4 Test site information

Lab performing tests	:	SIEMIC, Inc.
Lab Address	:	775 Montague Expressway, Milpitas, CA 95035
FCC Test Site No.	:	540430
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	Handheld Scanner
Serial No.	SN19
Model No.	HS-1RL, HS-1RS, HS1RL, HS1RS, FlexTap, FlexTap RL, FlexTap RS
Trade Name	JADAK, a business unit of Novanta Corporation
Input Power	5VDC
Date of EUT received	03/18/2019
Equipment Class/ Category	DCD
Working Frequencies	125KHz / 134.2KHz
Port/Connectors	I/O

6.2 Radio Description

Specifications for Radio:

Radio Type	RFID
Operating Frequency	125KHz / 134.2KHz
Modulation	ASK
Number of Channels	None
Antenna Type	Ferrite Core Loop Antenna
Antenna Gain	0dBi
Antenna Connector Type	N/A

Channel List:

Type	Mode	Channel No.	Frequency (KHz)	Available (Y/N)
RFID	125KHz	1	125	Y
RFID	134.2KHz	1	134.2	Y

The following FlexTap model numbers: HS-1RL, HS-1RS, HS1RL, HS1RS, FlexTap, FlexTap RL, FlexTap RS

are equivalent for worst case regulatory compliance emissions, both intentional and unintentional, when operated at 125 kHz and or at 134.2 kHz nominal transmission frequency. 125 kHz and 134.2 kHz are in the LF RFID band.

Across the above model numbers, the signal source for the 125 kHz and 134.2 kHz RFID signals are one of four part numbers from the signal source component vendor. The differences in those four part numbers are firmware enablement of features not related to 125 kHz or 134.2 kHz transmission. The emissions characteristic from the signal source component, both intentional and unintentional, for 125 kHz and for 134.2 kHz, are identical across the four vendor part numbers as attested by the vendor in an associated document. The four part numbers from the vendor are:

T4NM-FDB0-P
T4NM-FDB0-PT20WT
T4NM-FDC0-P
T4NM-FDC0-PI

The circuitry connecting the signal source component to the FlexTap's antenna is identical across all model numbers. The antenna is also identical across all model numbers.

Therefore, all FlexTap model numbers have the same worst case regulatory compliance emissions. Measurement of one model, e.g. HS-1RL, is sufficient evidence to demonstrate regulatory compliance for all model numbers.

6.3 EUT test modes/configuration Description

Mode	Note
RF test	EUT is set to continuously transmit at 125KHz / 134.2KHz
Note: None	

7 Supporting Equipment/Software and cabling Description

7.1 Supporting Equipment

Index	Supporting Equipment Description	Model	Serial No	Manu	Note
1	Laptop Computer	N/A	N/A	Hewlett Packard	-

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	Laptop	USB1	EUT	Fixed	2.5	Yes	-

7.3 Test Software Description

Test Item	Software	Description
RF Testing	Image View	Set the EUT to transmit continuously at 125KHz / 134.2KHz

8 Test Summary

Test Item	Test standard		Test Method/Procedure	Pass / Fail
Antenna Requirement	FCC	15.203	ANSI C63.10 – 2013 558074 D01 DTS Meas. Guidance v03r02	☒ Pass ☐ N/A
	IC			
AC Conducted Emissions Voltage	FCC	15.207	ANSI C63.10 2013 RSS Gen. 8.8	☒ Pass ☐ N/A
	IC	RSS Gen (7.2.2)		
Remark	1. AC Line tests were performed on the support equipment's power adapter, laptop.			

Test Item	Test standard		Test Method/Procedure		Pass / Fail
Radiated Spurious Emission	FCC	15.209	FCC	RSS Gen 7.1	☒ Pass ☐ N/A
	IC	RSS-210	IC		
Occupied Bandwidth	FCC	-	FCC	-	☒ Pass ☐ N/A
	IC	RSS-210(5.9.1)	IC	RSS Gen 6.6	
Remark	2. All measurement uncertainties are not taken into consideration for all presented test result. 3. 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. 4. Tested HS-1RL (verified worst case model). RS qualified for LF operation by similarity for the following models: HS-1RS, HS1RL, HS1RS, FlexTap, FlexTap RL, FlexTap.				

9 Measurement Uncertainty

9.1 Conducted Emissions

The test is to measure the conducted emissions to the mains port of the EUT.
Some error sources that can contribute to the total uncertainty:

- Uncertainty of the receiver
- Uncertainty of the LISN
- Uncertainty of cables
- Uncertainty due to the mismatches
- Etc, see the below table for details

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
LISN Insertion Loss	0.40	Normal	2	1	0.20
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 LISN - Receiver	0.25	U-Shape	1.414	1	0.1768033
LISN Impedance	2.5	Triangular	2.449	1	1.0208248
Combined Standard Uncertainty					1.928133
Expanded Uncertainty (K=2)					**3.856266**

The total derived measurement uncertainty is +/- 3.86 dB.

9.2 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.

9.3 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.

9.4 Radiated Emissions (9kHz to 30MHz)

The test is to measure the RF output power from the EUT.

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

10 Measurements, examination and derived results

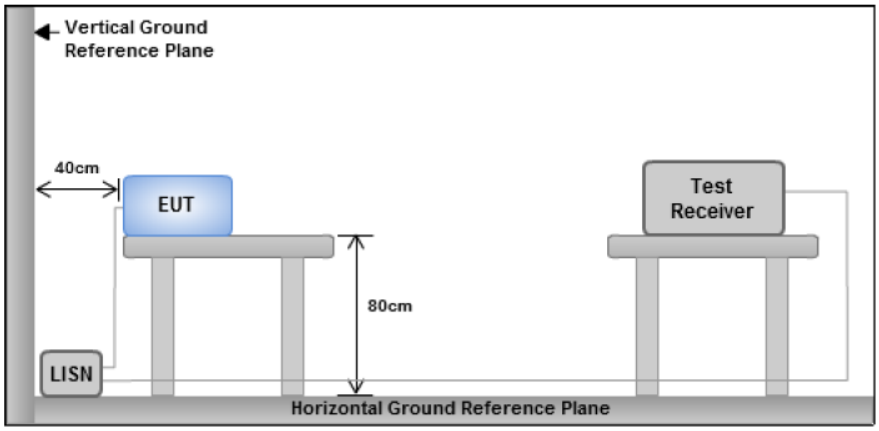
10.1 Antenna Requirement

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 Exhibit).	
Result	☒ PASS ☐ FAIL	

10.2 Conducted Emissions Test Result

Spec	Item	Requirement	Applicable
§ 15.207, RSS210(A8.1)	a)	For an intentional radiator 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 set in § 15.207, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). AC Line conducted emission within the band 150kHz to 30MHz	☒

Test Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

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 was powered separately from another main supply.

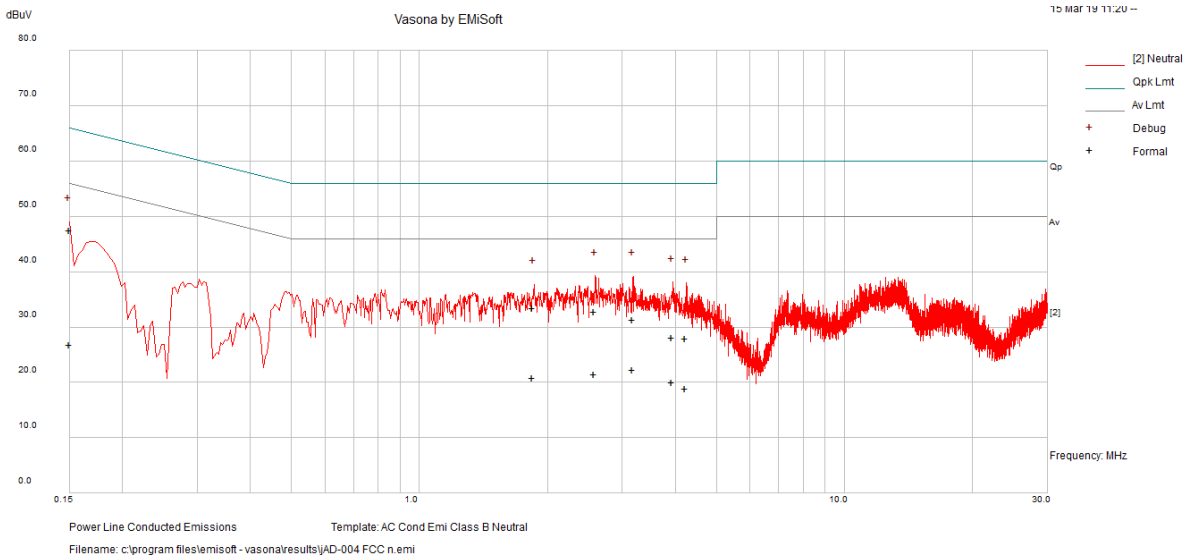
Test Date	03/15/2019	Environmental conditions	Temperature 21°C Relative Humidity 38 % Atmospheric Pressure 1025 mbar
Remark	The EUT was tested at 120VAC, 60Hz.		
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes ☐ N/A

Test was done by Han He at Conducted Emission test site.

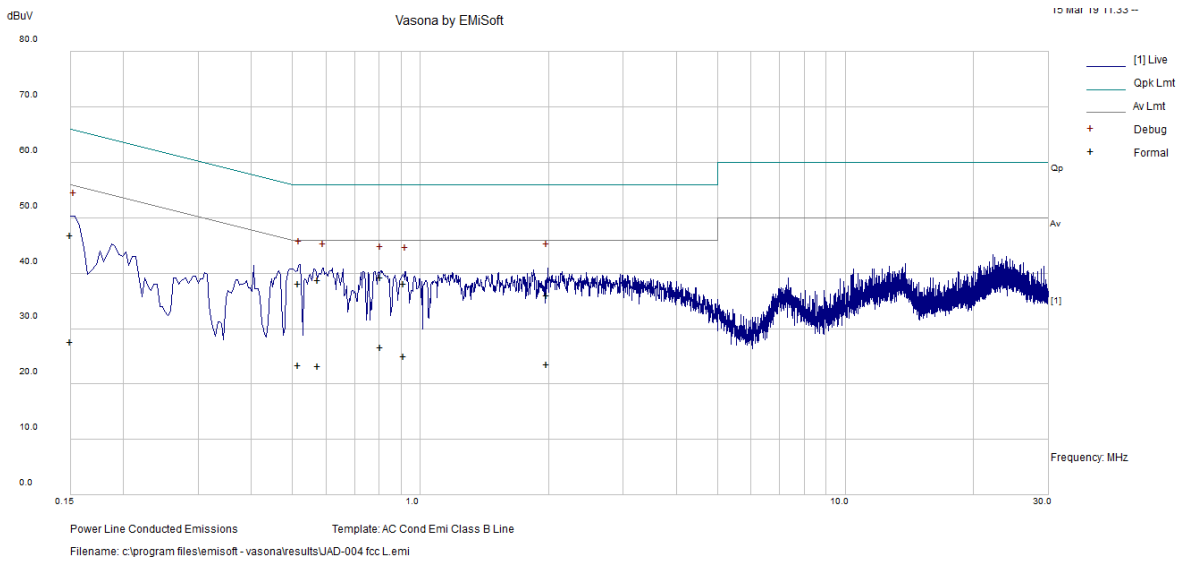
Test specification:	Conducted Emissions			
Mains Power:	120VAC, 60Hz		Result:	☒ Pass ☐ Fail
Tested by:	Han He			
Test Date:	03/15/2019			
Remarks:	AC Line @ Neutral			



Neutral Measurements

Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line/ Neutral	Limit dBuV	Margin dB	Pass /Fail
2.589141	24.9	7.91	0.06	32.87	Quasi Peak	Neutral	56	-23.13	Pass
3.186155	23.29	7.95	0.07	31.3	Quasi Peak	Neutral	56	-24.7	Pass
0.150097	40.37	7.11	0.04	47.52	Quasi Peak	Neutral	65.99	-18.47	Pass
3.942082	20.06	8.02	0.07	28.15	Quasi Peak	Neutral	56	-27.85	Pass
4.236382	19.79	8.06	0.08	27.92	Quasi Peak	Neutral	56	-28.08	Pass
1.850164	25.59	7.86	0.06	33.51	Quasi Peak	Neutral	56	-22.49	Pass
2.589141	13.6	7.91	0.06	21.58	Average	Neutral	46	-24.42	Pass
3.186155	14.26	7.95	0.07	22.28	Average	Neutral	46	-23.72	Pass
0.150097	19.68	7.11	0.04	26.84	Average	Neutral	55.99	-29.16	Pass
3.942082	11.94	8.02	0.07	20.03	Average	Neutral	46	-25.97	Pass
4.236382	10.83	8.06	0.08	18.97	Average	Neutral	46	-27.03	Pass
1.850164	12.98	7.86	0.06	20.9	Average	Neutral	46	-25.1	Pass

Test specification:	Conducted Emissions			
Mains Power:	120VAC, 60Hz		Result:	☒ Pass ☐ Fail
Tested by:	Han He			
Test Date:	03/15/2019			
Remarks:	AC Line @ Line			



Line Measurements

Frequency MHz	Raw dBµV	Cable Loss	Factors dB	Level dBµV	Measurement Type	Line/ Neutral	Limit dBµV	Margin dB	Pass /Fail
0.518008	30.81	7.37	0.04	38.22	Quasi Peak	Line	56	-17.78	Pass
0.576073	31.39	7.42	0.04	38.85	Quasi Peak	Line	56	-17.15	Pass
1.993743	28.13	7.88	0.07	36.08	Quasi Peak	Line	56	-19.92	Pass
0.150312	39.78	7.11	0.05	46.94	Quasi Peak	Line	65.98	-19.04	Pass
0.807174	31.69	7.58	0.04	39.32	Quasi Peak	Line	56	-16.68	Pass
0.914946	30.55	7.64	0.04	38.23	Quasi Peak	Line	56	-17.77	Pass
0.518008	16.1	7.37	0.04	23.51	Average	Line	46	-22.49	Pass
0.576073	15.74	7.42	0.04	23.2	Average	Line	46	-22.8	Pass
1.993743	15.62	7.88	0.07	23.57	Average	Line	46	-22.43	Pass
0.150312	20.45	7.11	0.05	27.61	Average	Line	55.98	-28.37	Pass
0.807174	19.03	7.58	0.04	26.65	Average	Line	46	-19.35	Pass
0.914946	17.4	7.64	0.04	25.08	Average	Line	46	-20.92	Pass

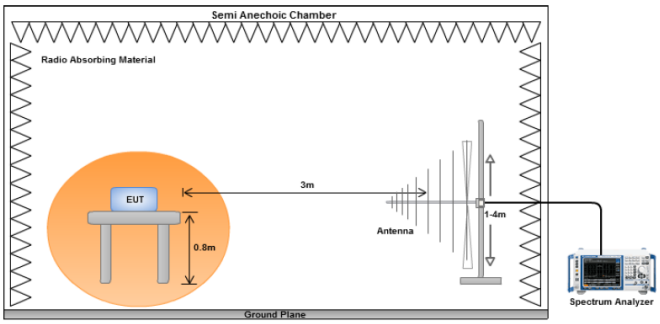
10.3 Radiated Measurements

10.3.1 Radiated Measurements 30MHz to 1GHz

Requirement(s):

Spec	Requirement	Applicable
47 CFR §15.209 RSS-210 (A2.6)	See table below	☒

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

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.			
Test Date	03/18/2019	Environmental conditions	Temperature Relative Humidity Atmospheric Pressure	20.1°C 36% 1026mbar
Remark	-			
Result	☒ Pass ☐ Fail			

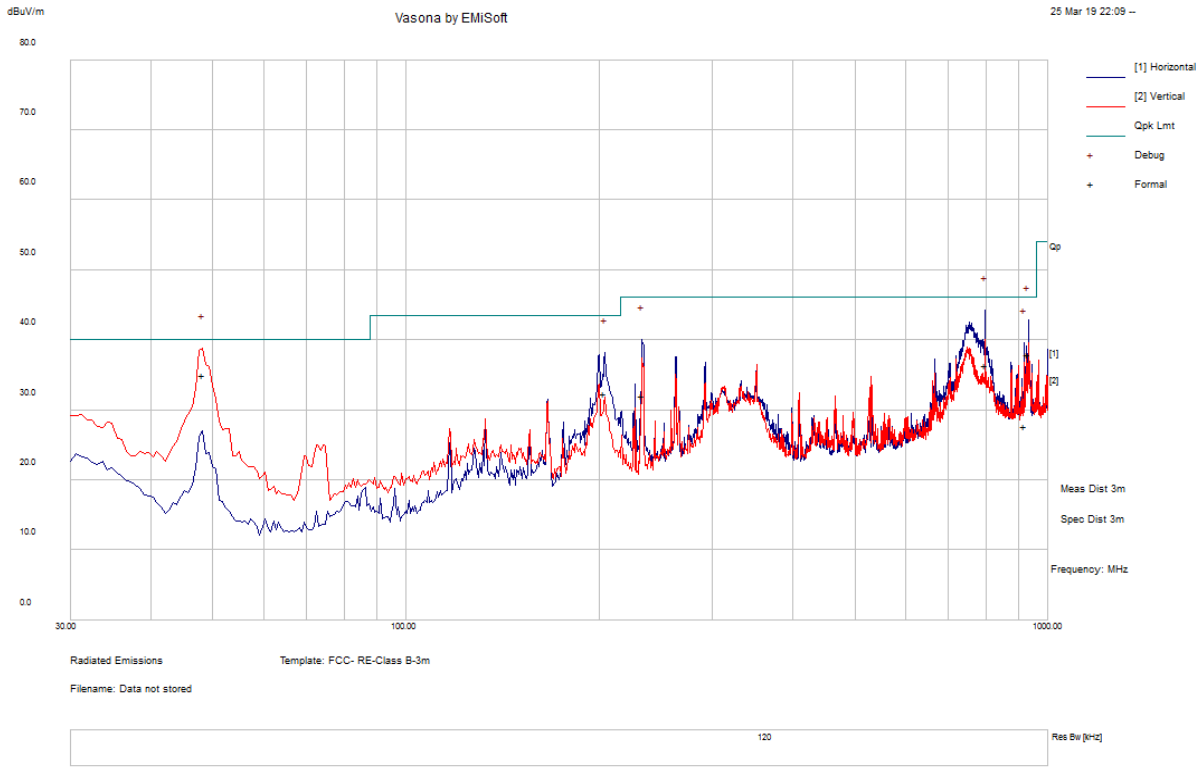
Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test was done by Cipher at 10 meter chamber.

Test specification:	Radiated Emissions			
Mains Power:	120VAC, 60Hz		Result:	☒ Pass ☐ Fail
Tested by:	Cipher			
Test Date:	03/18/2019			
Remarks:	N/A			

f=30MHz – 1000MHz plot and 3 meter distance

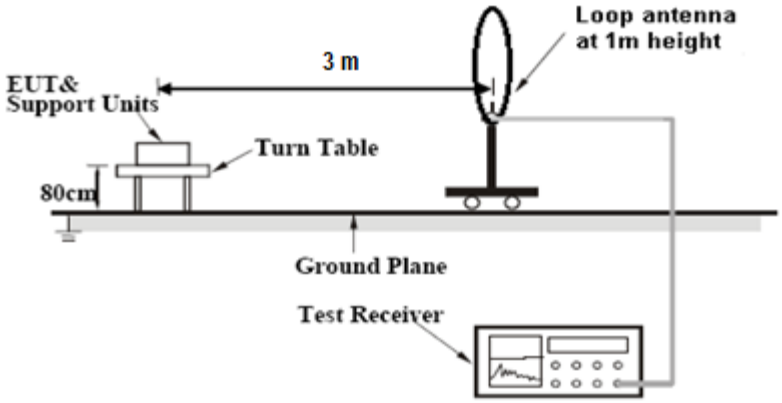


f=30MHz – 1000MHz Measurements

Frequency MHz	Raw dBµV/m	Cable Loss	AF dB	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
48.21	49.06	11.43	-25.54	34.96	Quasi Max	V	113	106	40	-5.04	Pass
797.99	35.19	15.47	-14.28	36.38	Quasi Max	H	171	107	46	-9.62	Pass
931.02	34.76	15.89	-12.69	37.95	Quasi Max	H	101	61	46	-8.05	Pass
203.75	44.03	12.66	-24.25	32.44	Quasi Max	H	133	149	43.5	-11.06	Pass
233.23	43.8	12.87	-24.52	32.15	Quasi Max	H	150	105	46	-13.86	Pass
917.37	24.21	15.86	-12.32	27.75	Quasi Max	H	125	237	46	-18.25	Pass

10.3.2 Radiated Measurements below 30MHz

Requirement(s):

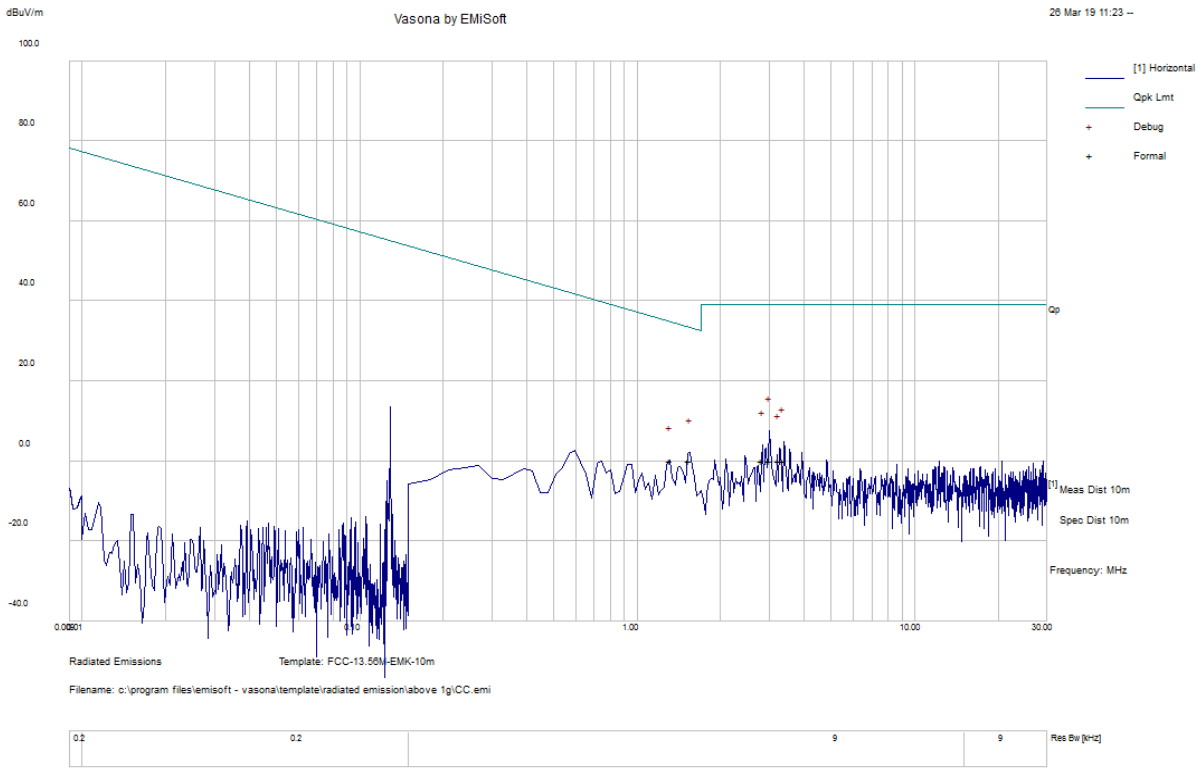
Spec	Requirement			Applicable
47 CFR §15.209 RSS-210 (A2.6)	**Frequency (MHz)**	**Field strength (microvolts/meter)**	**Measurement distance (meters)**	☒
	0.009-0.490	2400/F(kHz)	300	
	0.490-1.705	24000/F(kHz)	30	
	1.705-30.0	30	30	
	30-88	100**	3	
	88-216	150**	3	
	216-960	200**	3	
	Above 960	500	3	
Test Setup				
Procedure	For < 30MHz, Radiated emissions were measured according to ANSI C63.10. The EUT was set to transmit at the highest output power. The EUT was set 10 meter 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	03/18/2019	Environmental conditions	Temperature 22°C Relative Humidity 40% Atmospheric Pressure 1026mbar	
Remark	-			
Result	☒ Pass ☐ Fail			

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test was done by Cipher at 10 meter chamber.

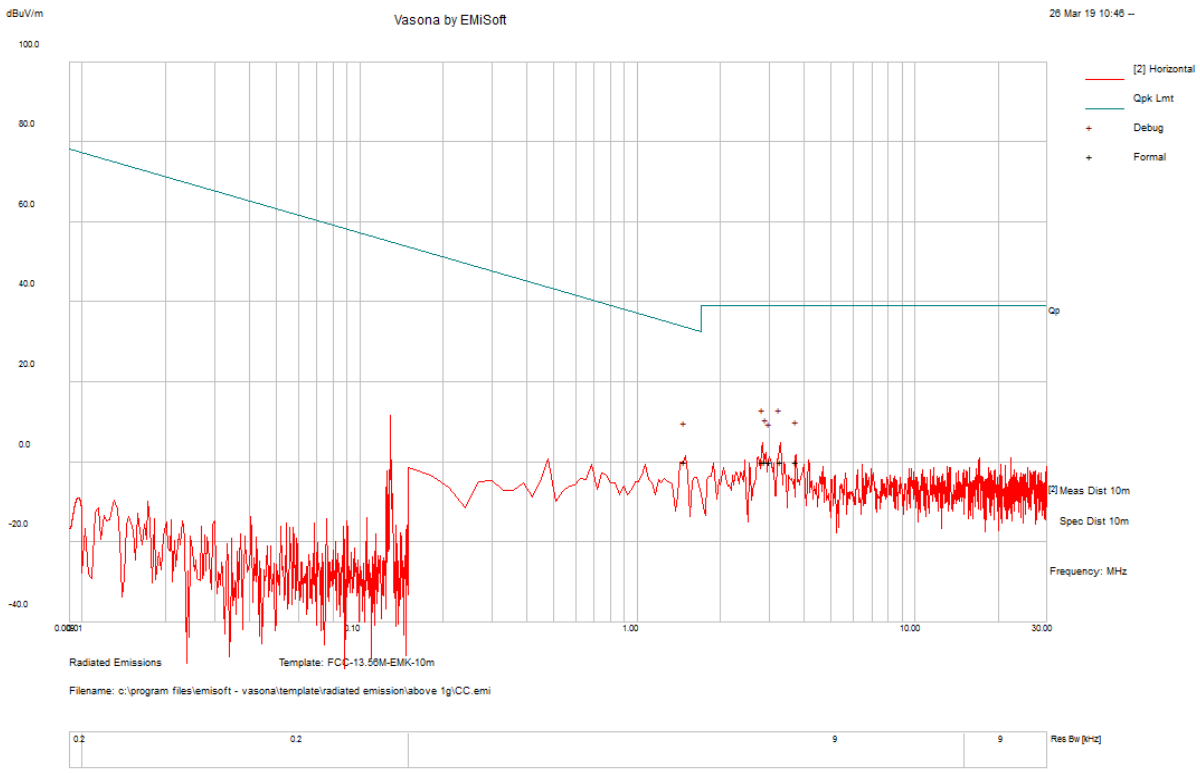
Test specification:	Radiated Spurious Emissions			
Mains Power:	120VAC, 60Hz		Result:	☒ Pass ☐ Fail
Tested by:	Cipher			
Test Date:	03/18/2019			
Remarks:	***f*= 100kHz – 30MHz plot, and loop antenna at 0 degree**			



Quasi Max Measurement

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol (0/90)	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
1.55	-33.53	0.48	42.87	9.82	Quasi Max	0	100	7	33.36	-23.54	Pass
3.01	-28.25	0.54	37.98	10.27	Quasi Max	0	100	4	39.08	-28.81	Pass
3.37	-27.28	0.55	37.27	10.54	Quasi Max	0	100	7	39.08	-28.54	Pass
1.32	-34.45	0.47	44.07	10.09	Quasi Max	0	100	4	34.73	-24.64	Pass
2.82	-28.87	0.54	38.44	10.11	Quasi Max	0	100	7	39.08	-28.97	Pass
3.23	-28.75	0.55	37.53	9.33	Quasi Max	0	100	4	39.08	-29.75	Pass

Test specification:	Radiated Spurious Emissions			
Mains Power:	120VAC, 60Hz		Result:	☒ Pass ☐ Fail
Tested by:	Cipher			
Test Date:	03/18/2019			
Remarks:	**f= 100kHz – 30MHz plot, and loop antenna at 90 degree**			



Quasi Max Measurement

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol (0/90)	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
1.49	-33.41	0.48	43.15	10.22	Quasi Max	90	100	6	33.68	-23.46	Pass
3.28	-27.63	0.55	37.43	10.35	Quasi Max	90	100	4	39.08	-28.73	Pass
2.85	-28.76	0.54	38.37	10.15	Quasi Max	90	100	8	39.08	-28.93	Pass
2.91	-28.56	0.54	38.22	10.2	Quasi Max	90	100	4	39.08	-28.88	Pass
3.74	-27.91	0.56	36.62	9.27	Quasi Max	90	100	7	39.08	-29.81	Pass
3.00	-28.34	0.54	37.99	10.19	Quasi Max	90	100	4	39.08	-28.89	Pass

Loop antenna at 0 degree

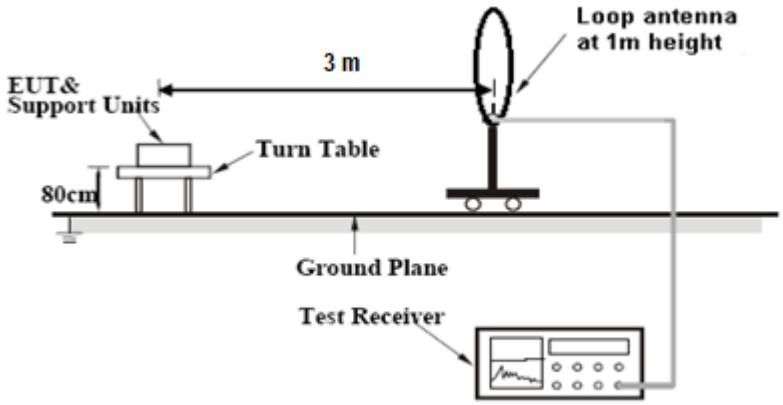
Frequency (kHz)	Amplitude (dBµV/m)
124.998	22.04
134.226	21.17

Loop antenna at 90 degree

Frequency (kHz)	Amplitude (dBµV/m)
124.998	18.72
134.226	17.15

10.3.3 Occupied bandwidth

Requirement(s):

Spec	Requirement	Applicable
RSS-Gen 6.7	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		
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	03/18/2019	Environmental conditions	Temperature 22°C Relative Humidity 39% Atmospheric Pressure 1025mbar
Remark	-		
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

Test was done by Cipher at 10 meter chamber.

Test results:

125 KHz

Frequency (kHz)	Occupied Bandwidth (Hz)
125.00	420

134.2 KHz

Frequency (KHz)	Occupied Bandwidth (KHz)
134.20	421

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Cycle	Cal Due	In use
Conducted Emissions						
EMI Test Receiver	ESIB 40	100179	08/28/2018	1 Year	08/28/2019	☑
LISN	3816/2NM	214372	01/10/2019	1 Year	01/10/2020	☑
Radiated Emissions						
R & S Receiver	ESL6	100178	05/27/2018	1 Year	05/27/2019	☑
Preamplifier (100KHz-7GHz)	LPA-6-30	11140711	02/10/2019	1 Year	02/10/2020	☑
ETS-Lingren Loop Antenna	6512	00049120	08/20/2018	1 Year	08/20/2019	☑
Bi-Log antenna (30MHz~2GHz)	JB1	A030702	08/15/2018	1 Year	08/15/2019	☑

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 Measurements
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