

# **CERTIFICATION TEST REPORT**

# Report Number.: 13492511A

- Applicant : Alliance Laundry Systems LLC 221 Shepard St. PO Box 990 Ripon, WI 54971 US
  - Model : 205131
  - FCC ID : 2ANOT-205131
    - **IC** : 23166-205131
- **EUT Description** : USB NFC Reader/Writer
- Test Standard(s) : FCC 47 CFR PART 15 SUBPART C INDUSTRY CANADA RSS-210 ISSUE 10

Date Of Issue: 2020-11-18

Prepared by: UL LLC 333 Pfingsten Road Northbrook, IL 60062 US



## **Revision History**

			Revised by
Rev	Date	Povisions	Povisod By

Page 2 of 47

# TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS	4
2. TEST METHODOLOGY	5
3. FACILITIES AND ACCREDITATION	5
4. DECISION RULES AND MEASUREMENT UNCERTAINTY	6
4.1. METROLOGICAL TRACEABILITY	6
4.2. DECISION RULES	6
4.3. MEASUREMENT UNCERTAINTY	6
4.4. SAMPLE CALCULATION	6
5. EQUIPMENT UNDER TEST	7
5.1. DESCRIPTION OF EUT	7
5.2. MAXIMUM OUTPUT POWER	7
5.2.1. EUT WITH AC/DC ADAPTER	7
5.3. SOFTWARE AND FIRMWARE	7
5.4. WORST-CASE CONFIGURATION AND MODE	7
5.5. DESCRIPTION OF TEST SETUP	8
6. TEST AND MEASUREMENT EQUIPMENT	9
7. OCCUPIED BANDWIDTH	11
7.1. 20dB and 99% Bandwidth	12
8. RADIATED EMISSION TEST RESULTS	14
8.1. LIMITS AND PROCEDURE	14
8.2. FUNDAMENTAL AND SPURIOUS EMISSIONS (0.009 - 30 MHz)	16
8.2.1. Data with Tag, EUT X-Axis, Parallel to Ground	16
8.2.1. Data without Tag, EUT X-Axis, Parallel to Ground	19
8.2.1. Data with Tag, EUT Y-Axis, Perpendicular to Ground	22
8.2.1. Data without Tag, EUT Y-Axis, Perpendicular to Ground	25
8.3. TX SPURIOUS EMISSION 30 TO 1000 MHz	28
8.3.1. Data with Tag, EUT X-Axis, Parallel to Ground	28
8.3.1. Data without Tag, EUT X-Axis, Parallel to Ground	30
8.3.1. Data with Tag, EUT Y-Axis, Parallel to Ground	32
8.3.1. Data without Tag, EUT Y-Axis, Perpendicular to Ground	34
9. FREQUENCY STABILITY	36
9.1. Frequecny Stablility Data	37
9.1.1. Tabular Data	37
10. AC MAINS LINE CONDUCTED EMISSIONS	38
10.1. Line Conducted Emissions with Tag	39
10.1. Line Conducted Emissions without Tag	41
11. SETUP PHOTOS	43

## **1. ATTESTATION OF TEST RESULTS**

COMPANY NAME:	Alliance Laundry Systems LLC 221 Shepard St PO Box 990 Ripon, WI 54971 US	
EUT DESCRIPTION:	USB NFC Reader/Writer	
MODEL:	205131	
SERIAL NUMBER:	non-serialized	
SAMPLE RECEIPT DATE:	2020-10-26	
DATE TESTED:	2020-10-26 - 2020-11-12	
	APPLICABLE STANDARDS	
ST	ANDARD	TEST RESULTS
FCC PART	15 SUBPART C	Complies
ISED RSS-210	Issue 10, Annex B.6	Complies
ISED RS	S-GEN Issue 5	Complies

UL LLC. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

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Approved & Released For UL LLC By:

More

Jeff Moser Operations Manager Consumer Technology Division UL LLC

**UL LLC** 

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Page 4 of 47

FORM NO: CCSUP4701I

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# 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 5, and RSS-210 Issue 10 Annex B.6.

# 3. FACILITIES AND ACCREDITATION

	Address	ISED CABID	ISED Company Number	FCC Registration
$\mathbf{X}$	333 Pfingsten Road, Northbrook, IL 60062-2096, USA	US0065	2180A	152210

333	Pfingsten	Road
$\times$	Chamber	10m

Page 5 of 47

# 4. DECISION RULES AND MEASUREMENT UNCERTAINTY

## 4.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

## 4.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

## 4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	U <sub>Lab</sub>
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.40 dB
Worst Case Radiated Disturbance Loop, 9KHz to 30 MHz	2.87 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	5.86 dB
Worst Case Frequency Error with Spectrum Analyzer	141.16 Hz
Worst Case Occupied Bandwidth	0.09dB / 2.00%

Uncertainty figures are valid to a confidence level of 95%.

## 4.4. SAMPLE CALCULATION

## RADIATED EMISSIONS

UL LLC

Where relevant, the following sample calculation is provided: Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB) 36.5 dBuV + 18.7 dB/m + 0.6 dB - 26.9 dB = 28.9 dBuV/m

## MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided: Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss. 36.5 dBuV + 0 dB + 10.1 dB + 0 dB = 46.6 dBuV

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## 5. EQUIPMENT UNDER TEST

#### 5.1. **DESCRIPTION OF EUT**

The EUT, Model 205131 is a USB NFC RFID reader/writer

#### 5.2. MAXIMUM ELECTRIC FIELD STRENGTH

The transmitter has a maximum peak radiated magnetic field strength as follows:

## 5.2.1. EUT WITH AC/DC ADAPTER

Frequency Range (MHz)	Mode		E Field at 30m distance (dBuV/m	
12 50	Maximum flield	no tag	37.93	
13.50	strength	with tag	37.31	

#### 5.3. SOFTWARE AND FIRMWARE

The test utility software used during testing was ST25R3911B Discovery GUI and firmware version for the EUT was 1.2.6.

#### WORST-CASE CONFIGURATION AND MODE 5.4.

The fundamental of the EUT was investigated under two orthogonal orientations X (parallel to ground), Y (long edge perpendicular to ground). Worst case fundamental was recorded with EUT in Y position (perpendicular to ground) and RX antenna in X-Axis (parallel to EUT). The test software was anabled to read multiple NFC standards however the tag used for testing was the iso15693. Per manufacturer this is the only standard that will be enabled in productions software.

The worst case position of the EUT was investigated under two configurations:

- Reading mode with no tag near by
- Reading mode with tag present near by

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788

Page 7 of 47

## 5.5. DESCRIPTION OF TEST SETUP

## SUPPORT EQUIPMENT

Support Equipment List						
Description	Manufacturer	Model	Serial Number	FCC ID		
Laptop Computer	Lenovo	4236-NUU	R8-MG97W	-		
Power Supply	Lenovo	-	-	-		

## I/O CABLES

I/O Cable List						
Cable	Port	# of identical	Connector	Cable Type	Cable	Remarks
No		ports	Туре		Length (m)	
1	USB	1	MicoUSB	USB	50cm	102-1092-BL-F0100
						supplied with EUT

## TEST SETUP

The EUT is a NFC reader/writer contained in plastic enclosure. EUT is powered with 5VDC via USB and power source is a laptop computer.

## SETUP DIAGRAM



Page 8 of 47

# 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

UL SOFTWARE					
*Radiated Software	UL	UL EMC	Below 30MHz, 6/24/15		
*AC Line Conducted Software	UL	UL EMC	Ver 9.5, April 3, 2015		

Note: \* indicates automation software version used in the compliance certification testing

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC4328	2019-12-28	2020-12-31
Bicon Antenna	Electro-Metrics	EM6912A	EMC4070	2019-12-31	2020-12-31
Log-P Antenna	Chase	UPA6109	EMC4258	2019-12-31	2020-12-31
Loop Antenna	EMCO	6502/1	EMC4026	2020-01-28	2021-01-31
EMI Test Receiver	Rohde & Schwarz	ESR	EMC4377	2019-12-30	2020-12-31
Transient Limiter	Electro-Metrics	EM7600-2	EMC4224	N/A	N/A
High-Pass Filter	Solar Electronics	2803-150	EMC4327	N/A	N/A
Attenuator	HP	8494B	2831A00838	N/A	N/A
LISN - L1	Solar Electronics	8602-50-TS- 50-N	EMC4066	2019-12-16	2020-12-31
LISN - L2	Solar Electronics	8602-50-TS- 50-N	EMC4064	2019-12-16	2020-12-31
Environmental Chamber	Espec	BTX-475	EMC4378	2020-05-07	2021-05-31
Signal Analyzer	Aglient	N9030A PXA	EMC4360	2019-12-22	2020-12-31

Page 9 of 47

## 7. MEASUREMENT METHOD

Occupied BW (20dB): ANSI C63.10-2013 Section 6.9.2

Occupied BW (99%): ANSI C63.10-2013 Section 6.9.3

Frequency Stability : ANSI C63.10-2013 Clause 6.8

General Radiated emissions: ANSI C63.10 Section 6.3 to 6.5

AC Power Line Conducted Emissions: ANSI C63.10-2013, Section 6.2.

Page 10 of 47

## 8. OCCUPIED BANDWIDTH

## <u>LIMITS</u>

None; for reporting purposes only.

#### TEST PROCEDURE

The transmitter output is coupled to the spectrum analyzer via near filed probe. The RBW is set to 3kHz. The VBW is set to minimum 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized and 20dB bandwidth measurement.

Note: Since the transmitter signal is mainly CW-like it is impractical to use an RBW setting of 1 - 5% of the emission bandwidth since the emission bandwidth will be proportional to the RBW.

#### **RESULTS**

#### 99% and 20dB BW

Mode	Frequency (MHz)	99% Bandwidth (KHz)	20dB Bandwidth (KHz)
No Tag	13.56	331.77	58.69
With Tag	13.56	407.78	66.34

Page 11 of 47

## 8.1. 20dB and 99% Bandwidth

Bandwidth with Tag				
Keysight Spectrum Analyzer - Occupied BW				
X    L    RF    50 Ω    DC      Sweep Time 103 ms    NFE    #FC	Gain:Low SENSE:II Sense: Center Freq: ' Trig: Free Run #Atten: 10 dB	NT ALIGN A 13.560000 MHz n Avg Hold:>10/10	AUTO 12:07:13 PM № Radio Std: No 0 Radio Device:	me Trace/Detector BTS
15 dB/div Ref 15.00 dBm	·		Mkr1 13.56 -1.3368	dBm
-15.0		Wryne a		Clear Write
-45.0 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2			Mr.M. May Mr. Market	Average
-90.0 -105 -120				Max Hold
Center 13.56 MHz #Res BW 3 kHz	VBW 3	0 kHz	Span Sweep 10	1 MHz 2.6 ms Min Hold
Occupied Bandwidth 407 Transmit Freq Error x dB Bandwidth	To . <b>78 kHz</b> 6.017 kHz % 66.34 kHz x d	tal Power of OBW Power IB	1.05 dBm 99.00 % -20.00 dB	Detector Peak▶ Auto <u>Man</u>
MSG		5	STATUS	

Page 12 of 47

#### Bandwidth without Tag



Page 13 of 47

# 9. RADIATED EMISSION TEST RESULTS

## 9.1. LIMITS AND PROCEDURE

## <u>LIMIT</u>

§15.225 IC RSS-210, Annex B.6 IC RSS-GEN, Section 8.9 (Transmitter)

(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 and shall not exceed the general radiated emission limits in § 15.209 as follows: §15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Limits for radiated disturbance of an intentional radiator									
Frequency range (MHz)	Limits (µV/m)	Measurement Distance (m)							
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							

\*\* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g. §§ 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

Formula for converting the filed strength from uV/m to dBuV/m is: Limit (dBuV/m) = 20 log limit (uV/m)

Note: The limits in CFR 47, Part 15, Subpart C, paragraph 15.209(a), are identical to those in RSS-Gen section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as report in the table) using free space impedance of 377 Ohms. For example, the measurement frequency 15.965 KHz resulted in a level of -12.57 dBuV/m, which is equivalent to -12.57-51.5 = -64.07 dBuA/m, which has the same margin, -56.1 dB, to the corresponding RSS-GEN Table 6 limit as it has to be 15.209(a) limit.

Page 14 of 47

In addition:

§15.209 (d) The emission limits shown the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emissions limits in these three bands are based on measurements employing an average detector.

§15.209 (d) The provisions in §§ 15.225, measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.

Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

## KDB 414788 Open Field Site(OFS) and Chamber Correlation Justification

OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

## **TEST PROCEDURE**

ANSI C63.10, 2013

The EUT is an intentional radiator that incorporates a digital device, the highest fundamental frequency generated or used in the device is 13.56 MHz; therefore, the frequency range was investigated from 0.15 MHz to the 10<sup>th</sup> harmonic of the highest fundamental frequency, or 1000 MHz, whichever is greater.

## RESULTS

Note for below 30 MHz scans: All measurements were made at a test distance of 3 m. The measured data was extrapolated from the test distance (3m) to the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz - 30 MHz) to clearly show the relative levels of fundamental and spurious emissions and demonstrate compliance with the requirement that the level of any spurious emissions be below the level of the intentionally transmitted signal. The extrapolation factor for the limits were 40\*Log (test distance / specification distance).

Page 15 of 47

## 9.2. FUNDAMENTAL AND SPURIOUS EMISSIONS (0.009 - 30 MHz)



## RX Antenna Y-Axis Plot (Perpendicular to EUT)



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Page 16 of 47

#### RX Antenna Z-Axis Plot (Parallel go Ground)



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Page 17 of 47

## Tabular Data with worst case RX antenna orientation maximized

Alliance													
USB NF	C Reader Pa	rallel to GN	D WithTag										
w/ 102-1	1092-BL-F010	0 cable											
5VDC via	a Lenovo Lar	ptop USB											
RED: X,	GRN: Y, CY	N: Z											
Trace M	Arkers												
	Test	Meter		Antenna	Path	Distance		Limit 15.209 9- 490kHz		Limit 15.225 490kHz- 30MHz			
Marker	Frequency	Reading	1	Factor	Factor	Correction	Level	300m	Margin	30m		Margin	Azimuth
No.	(MHz)	(dBuV)	Detector	dB/m	dB	Factor dB	dBuV/m	dBuV/m	(dB)	dBuV/m		(dB)	[Degs]
X-Axis (I	Parallel to EU	T)								1	_		I
4	13.56063	46.55	Pk	11.3	0.4	-40	18.25	-	-		84	-65.75	0-360
Y-Axis (F	Perpendicular	to EUT)											
5	13.56063	28.06	Pk	11.3	0.4	-40	-0.24	-	-		84	-84.24	0-360
Z-Axis (F	Parallel to Gro	ound)											
1	0.015965	46.43	Pk	20.9	0.1	-80	-12.57	43.53	-56.1	-		-	0-360
2	0.02391	43.14	Pk	18.3	0.1	-80	-18.46	40.03	-58.49	-		-	0-360
3	0.031855	40.8	Pk	17.2	0.1	-80	-21.9	37.53	-59.43	-		-	0-360
6	13.56063	55.97	Pk	11.3	0.4	-40	27.67	-	-		84	-56.33	0-360
Radiated	Emission Da	ata											
	Test Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Path Factor dB	Distance Correction Factor dB	Lev el dBuV/m	Limit 15.209 9- 490kHz 300m dBuV/m	Margin (dB)	Limit 15.225 490kHz- 30MHz 30m dBuV/m		Margin (dB)	Azimuth [Degs]
Z-Axis (I	Parallel to Gr	ound)											
	13.56	55.94	Pk	11.3	0.4	-40	27.64	-	-		84	-56.36	16
	13.56	55.33	Qp	11.3	0.4	-40	27.03	-	-		84	-56.97	16
Pk - Pea	ak detector									<u> </u>			
Qp - Qua	asi-Peak dete	ctor											

Page 18 of 47



## 9.2.1. Data without Tag, EUT X-Axis, Parallel to Ground

50 UL EMC Test System 2020 Nov 3 13:13:37 09 9-490kHz 300m dBuV/m 25 490kHz-30MHz 30m dBuV/ Radiated Emissions Alliance USB NFC Reader Parallel to GND NaTag w/ 182-182-8L-F8188 cable SUDC via Lenava Laptap USB RED: X, GRN: Y, CYN: Z 40 30 GND \$ 20 Ð Parall 10 P (Leu) dB(uUalts/me1 9 -10 2 -30 1 -40 . 000 Frequency (MH<sub>Z</sub>) Range (MHz) R6U/UBU Ref/Attn Det/Avn Mode Pts #Sups/Mnde Position Range (MHz) RBIJ/UBIJ Ref/Attn Det/Avg Mode Sweep Pts #Sups/Node Position Sueen

RE 9kHz-30MHz 3m E-Field Loop 3 axis with CorrectDistances FCC 15.225 ESCI.TST

Page 19 of 47

## RX Antenna Y-Axis Plot (Perpendicular to EUT)

30

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#### RX Antenna Z-Axis Plot (Parallel go Ground)



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Page 20 of 47

## Tabular Data with wors case RX antenna orientation maximized

Alliance												
USB NF	C Reader Pa	rallel to GN	D NoTag									
w/ 102-1	092-BL-F010	)0 cable										
5VDC vi	a Lenovo La	ptop USB										
RED: X,	GRN: Y, CY	'N: Z										
Trace M	Arkers											
Marker	Test Frequency	Meter Reading	Detector	Antenna Factor	Path Factor	Distance Correction	Lev el	Limit 15.209 9- 490kHz 300m dBuV/m	Margin	Limit 15.225 490kHz- 30MHz 30m	Margin	Azimuth
X-Axis (	Parallel to EU	IT	Delector	ub/m	ub		ubuv/m	ubuv/m	(00)			[Dogo]
4	13.56063	46.87	Pk	11.3	0.4	-40	18.57	-	-	84	-65.43	0-360
Y-Axis (I	Perpendicula	r to EUT)										
5	13.56063	22.63	Pk	11.3	0.4	-40	-5.67	-	-	84	-89.67	0-360
8	27.12356	17.82	Pk	9.4	0.6	-40	-12.18		-	29.54	-41.72	0-360
Z-Axis (I	Parallel to Gro	ound)										
1	0.01593	45.95	Pk	20.9	0.1	-80	-13.05	43.55	-56.6	-	-	0-360
2	0.02398	41.42	Pk	18.3	0.1	-80	-20.18	40	-60.18	-	-	0-360
3	0.03175	39.3	Pk	17.3	0.1	-80	-23.3	37.56	-60.86	-	-	0-360
6	13.56063	56.36	Pk	11.3	0.4	-40	28.06	-	-	84	-55.94	0-360
7	27.12175	19.54	Pk	9.4	0.6	-40	-10.46	-	-	29.54	-40	0-360
9	27.12175	19.54	Pk	9.4	0.6	-40	-10.46	-	-	29.54	-40	0-360
Radiated	Emission Da	ata										
	Test	Meter		Antenna	Path	Distance		Limit 15.209 9- 490kHz 200m	Margin	Limit 15.225 490kHz- 30MHz 20m	Margin	Azimuth
	(MHz)	(dBuV)	Detector	dB/m	dB	Factor dB	dBuV/m	dBuV/m	(dB)	dBuV/m	(dB)	IDeas]
Z-Axis (I	Parallel to Gr	ound)	Dolociol	QD/11	45	1 40101 42	dbav,	dbav,	(00)	0507/11	(40)	[5030]
	13.5601	56.27	Pk	11.3	0.4	-40	27.97	-	-	84	-56.03	360
	13.5601	55.7	Qp	11.3	0.4	-40	27.4	-	-	84	-56.6	360
Pk - Pea	k detector									,		
Qp - Qua	asi-Peak dete	ctor										

Page 21 of 47



# 9.2.1. Data with Tag, EUT Y-Axis, Perpendicular to Ground

50 UL EMC Test System 2020 Nov 3 12:26:02 09 9-490kHz 300m dBuV/m 25 490kHz-30MHz 30m dBuV/ Radiated Emissions Alliance Perpendicular to GND WithTag w/ 182-182-8L-F0180 cable 5UDC via Lenavo Laptop US8 RED: X, GRN: Y, CYN: Z 40 30 GND \$ 20 Ð Parall 10 P (La) dB(uUalts/me1 -10 2 -30 A LANGA MARKED -40 and hale be . 000 30 Frequency (MH<sub>Z</sub>) Range (MHz) R6U/UBU Ref/Atto Det/Ava Mode Pts #Sups/Mnde Position Range (MHz) RBIJ/UBIJ Ref/Attn Det/Avg Mode Sweep Pts #Sups/Node Position Sueen RE 9kHz-30MHz 3m E-Field Loop 3 axis with CorrectDistances FCC 15.225 ESCI.TST Rev 9.5 01 Jun 2020

## RX Antenna Y-Axis Plot (Perpendicular to EUT)

RE 9kHz-30MHz 3m E-Field Loop 3 axis with CorrectDistances FCC 15.225 ESCI.TST

Page 22 of 47

Rev 9.5 01 Jun 2020

#### RX Antenna Z-Axis Plot (Parallel go Ground)



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Page 23 of 47

## Tabular Data with wors case RX antenna orientation maximized

Alliance												
Perpend	licular to GNE	D WithTag										
w/ 102-1	092-BL-F010	0 cable										
5VDC via	a Lenovo Lap	otop USB										
RED: X,	GRN: Y, CY	N: Z										
Trace M	Arkers											
										Limit		
								Limit		15.225		
	<b>-</b> (				<b>D</b> #			15.209 9-		490kHz-		
Morkor	l est	Meter		Antenna Fastar	Path	Distance		490kHz	Marain	30MHz	Maraia	A = increation
No	(MH <sub>7</sub> )	(dBu\/)	Detector	racior dB/m	dB	Eactor dB	dBuV/m	dBu\//m	(dB)	dBu\//m	(dB)	
X-Avis (F	Parallel to EU		Delection	db/m	uD		abav/iii	abaviii	(00)	abav/iii	(00)	[Dog3]
7-74x13 (1 1	13 56063	65.95	Pk	11 3	0.4	-10	37.65	_	_	8/	-16 35	0-360
4	27 12356	18 11		0.4	0.4	-40	11 80	-	-	20.54	40.00	0-360
J V Avic /I	27.12000			9.4	0.0	-40	-11.09	-	-	29.34	-41.43	0-300
1-AXIS (I		0 L01)		11.2	0.4	40	20.61			04	51.20	0.260
5	13.30003	10.40		11.3	0.4	-40	32.01	-	-	04	-01.09	0-300
8	27.12175	18.48	РК	9.4	0.6	-40	-11.52	-	-	29.54	-41.06	0-360
Z-Axis (I	Parallel to Gro	ound)	-					10.55				
1	0.01593	46.87	Pk	20.9	0.1	-80	-12.13	43.55	-55.68	-	-	0-360
2	0.02389	42.43	Pk	18.3	0.1	-80	-19.17	40.03	-59.2	-	-	0-360
3	0.03182	39.81	Pk	17.2	0.1	-80	-22.89	37.54	-60.43	-	-	0-360
6	13.56063	60.84	Pk	11.3	0.4	-40	32.54	-	-	84	-51.46	0-360
7	27.12175	18.92	Pk	9.4	0.6	-40	-11.08	-	-	29.54	-40.62	0-360
Radiated	Emission Da	ata										
X-Axis (F	Parallel to EU	T)										
										Limit		
										15.225		
	Tost	Motor		Antenna	Path	Distance		15.209 9- 490kH <del>7</del>		490KHZ- 30MH <del>7</del>		
	Frequency	Reading		Factor	Factor	Correction	l ev el	300m	Margin	30m	Margin	Azimuth
	(MHz)	(dBuV)	Detector	dB/m	dB	Factor dB	dBuV/m	dBuV/m	(dB)	dBuV/m	(dB)	[Degs]
	13.560063	65.61	Pk	11.3	0.4	-40	37.31	-	-	84	-46.69	360
	13.560063	65.05	Qp	11.3	0.4	-40	36.75	-	-	84	-47.25	360
Pk - Pea	k detector											
Qp - Qua	asi-Peak dete	ctor										
<u> </u>												

Page 24 of 47



# 9.2.1. Data without Tag, EUT Y-Axis, Perpendicular to Ground



## RX Antenna Y-Axis Plot (Perpendicular to EUT)

Page 25 of 47

### RX Antenna Z-Axis Plot (Parallel go Ground)



Page 26 of 47

## Tabular Data with wors case RX antenna orientation maximized

Alliance												
Perpend	licular to GNE	) NoTag										
w/ 102-1	092-BL-F010	0 cable										
5VDC vi	a Lenovo Lap	otop USB										
RED: X,	GRN: Y, CY	N: Z										
Trace M	Arkers											
										Limit		
								Limit	1	15.225		
	_		1					15.209 9-	1	490kHz-		ĺ
	Test	Meter	1	Antenna	Path	Distance		490kHz	l	30MHz		
Marker	Frequency	Reading		Factor	Factor	Correction	Level	300m	Margin	30m	Margin	Azimuth
No.	(MHz)	(dBuV)	Detector	dB/m	dB	Factor dB	dBuV/m	dBuV/m	(dB)	dBuV/m	(dB)	[Degs]
X-Ax is (I	Parallel to EU	Т)										
4	13.56063	65.92	Pk	11.3	0.4	-40	37.62	-	-	84	-46.38	0-360
7	27.12538	16.56	Pk	9.4	0.6	-40	-13.44	-	-	29.54	-42.98	0-360
2	0.01593	43.75	Pk	20.9	0.1	-80	-15.25	43.55	-58.8	-	-	0-360
Y-Axis (I	Perpendicular	to EUT)										
5	13.56063	61.26	Pk	11.3	0.4	-40	32.96	-	-	84	-51.04	0-360
8	27.12175	17.87	Pk	9.4	0.6	-40	-12.13	-	-	29.54	-41.67	0-360
Z-Ax is (I	Parallel to Gro	ound)										
1	0.01194	43.51	Pk	23	0.1	-80	-13.39	46.06	-59.45	-	-	0-360
3	0.023805	44.34	Pk	18.3	0.1	-80	-17.26	40.06	-57.32	-	-	0-360
6	13.56063	61.29	Pk	11.3	0.4	-40	32.99	-	-	84	-51.01	0-360
9	27.12175	18.74	Pk	9.4	0.6	-40	-11.26	-	-	29.54	-40.8	0-360
Radiated	Emission Da	ata										
	Test	Meter		Antenna	Path	Distance		Limit 15.209 9- 490kHz		Limit 15.225 490kHz- 30MHz		
	Frequency	Reading		Factor	Factor	Correction	Level	300m	Margin	30m	Margin	Azimuth
	(MHz)	(dBuV)	Detector	dB/m	dB	Factor dB	dBuV/m	dBuV/m	(dB)	dBuV/m	(dB)	[Degs]
	X-Axis (Para	allel to EUT	)									
	13.560125	66.23	Pk	11.3	0.4	-40	37.93	-	-	84	-46.07	354
	13.560125	65.64	Qp	11.3	0.4	-40	37.34	-	-	84	-46.66	354
Pk - Pea	k detector											
Qp - Qua	asi-Peak dete	ctor										

Page 27 of 47

#### **TX SPURIOUS EMISSION 30 TO 1000 MHz** 9.3. 9.3.1. Data with Tag, EUT X-Axis, Parallel to Ground



#### 100 UL EMC Test System 2020 Nov 3 08:08:41 Radiated Emissions Alliance USB NFC Reader Parallel to GND WithTag w/ 102-1092-BL-F0100 cable 5VDC via Lenova Laptop USB RED: Horizontal GRN: Vertical 90 80 70 ğ Vert 60 dB(uU/m) 50 1 imit 47 CER 15 209 dBuU/m 3n 40 \_\_\_\_\_ 30 20 1 6 100 1000 ЪŻ Frequency (MHz) Range (MHz) 2:38-280 RBU/UBN Ref/Attn Det/Avg Mode 128k(-6dB)/IM 92/8 PEAK/LogPur-Video Sweep 38nsec (Auto) Pts #Sups/Made Position 4081 MAXH 8-368degs V Range (MHz) 4:200-1000 RBU/UBU Ref/Attn Det/Avg Made Sweep Pts #Swps/Made Pasition 128k(-5dB)/1M 92/0 PERK/LogPwr-Video 135maec(Ruto) 8801 MAXH 0-360degs U TST Rev 9.5 01 Jun 2020

## **RX** Antenna Vertical

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Page 28 of 47

#### REPORT NO:13492511A FCC ID: 2ANOT-205131

## Tabular Data

Alliance												
USB NF	C Reader Pa	rallel to GN	ND WithTa	9								
w/ 102-	1092-BL-F010	00 cable										
5VDC v	ia Lenovo La	ptop USB										
RED: Ho	orizontal GRN	: Vertical										
Trace N	IArkers											
	Tast	Matan		Antenna	Dette	10m to		Limit 47				
Markor	Frequency	Reading		dB	Factor	Factor	Level @	0FK 15.200 @	Margin	Azimuth	Height	
No.	(MHz)	(dBuV)	Detector	dB/m	dB	dB	dBuV/m	3m dBuV/m	(dB)	[Deas]	[cm]	Polaritv
1	60.1325	43	Pk	6.4	-30	10.5	29.9	40	-10.1	0-360	251	V
2	70.5875	44.77	Pk	6.4	-29.9	10.5	31.77	40	-8.23	0-360	399	V
3	73.9875	44.76	Pk	6.8	-30	10.5	32.06	40	-7.94	0-360	399	V
4	271.2	40.27	Pk	13.3	-29	10.5	35.07	46.02	-10.95	0-360	299	Н
5	298.3	44.7	Pk	13.9	-28.8	10.5	40.3	46.02	-5.72	0-360	299	Н
6	325.4	45.94	Pk	14.7	-28.6	10.5	42.54	46.02	-3.48	0-360	199	Н
7	352.5	45.17	Pk	15.7	-28.5	10.5	42.87	46.02	-3.15	0-360	299	Н
8	379.7	37.44	Pk	15.8	-28.3	10.5	35.44	46.02	-10.58	0-360	299	Н
Radiated	d Emission D	ata										
	Test	Meter		Antenna Factor	Path	10m to 3m	Level @	Limit 47 CFR	Morain	Azimuth	Hoight	
	(MH <sub>7</sub> )	(dBu\/)	Detector	dB/m	dB	dB	om dBuV/m	15.209 @ 3m dBuV/m	(dB)	Azimum [Deas]	⊓eigni [cm]	Polarity
	352 5593	45 22	Qn	15 7	-28.5	10.5	42.92	46 02	-3 1	45	243	H
	325.4452	45.74	p Qp	14.7	-28.6	10.5	42.34	46.02	-3.68	38	295	н
	298.3232	45.66	Qp	13.9	-28.8	10.5	41.26	46.02	-4.76	36	258	Н
Pk - Pea	ak detector		r.									
Qp - Qu	asi-Peak dete	ector										

Page 29 of 47



#### **RX** Antenna Vertical 100 UL EMC Test System 2020 Nov 3 07:21:27 Radiated Emissions Alliance 90 HILIONCE USB NFC Reader Parallel to GND NoTag w/ 102-1092-BL-F0100 cable SUDC via Lenova Laptop USB RED: Horizontal GRN: Vertical 80 70 ğ 60 Uer dB(uU/m) 50 Limit...47...CFR...15...209...dBuU/m...3m 40 0<0 2 30 20 10 100 1000 Frequency (MHz) #Sups/Mode Position Range (MHz) MAXH 0-368degs V 4:280-1888 RBW/UBW Ref/Attn Det/Avg Mode 128k(-6dB)/IM 92/8 PEAK/LogPur-V Pts 4081 RBU/UBU Ref/Attn Det/Avg Mode 120k(-6dB)/1M 92/8 PEAK/LogPwr-Video Pts #Swps/Node Position 8801 MAXH R-340Adams Range (MHz) 2:38-280 Sweep Auto Sweep Auto ideo Rev 9.5 01 Jun 2020 . TST

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Page 30 of 47

9.3.1. Data without Tag, EUT X-Axis, Parallel to Ground

#### REPORT NO:13492511A FCC ID: 2ANOT-205131

#### Tabular Data

Alliance												
USB NF	C Reader Pa	rallel to GN	ND NoTag									
w/102-	1092-BL-F010	0 cable										
5VDC v	ia Lenovo La	ptop USB										
RED: Ho	orizontal GRN	: Vertical										
Trace N	IArkers											
	Test	Meter		Antenna Factor	Path	10m to 3m	Level @	Limit 47 CFR				
Marker	Frequency	Reading		dB	Factor	Factor	3m	15.209 @	Margin	Azimuth	Height	
No.	(MHz)	(dBuV)	Detector	dB/m	dB	dB	dBuV/m	3m dBuV/m	(dB)	[Degs]	[cm]	Polarity
1	60.8975	43.8	Pk	6.3	-30	10.5	30.6	40	-9.4	0-360	251	V
2	74.71	45.22	Pk	6.9	-30	10.5	32.62	40	-7.38	0-360	400	V
3	271.2	41.05	Pk	13.3	-29	10.5	35.85	46.02	-10.17	0-360	299	Н
4	298.3	44.96	Pk	13.9	-28.8	10.5	40.56	46.02	-5.46	0-360	299	Н
5	325.4	45.75	Pk	14.7	-28.6	10.5	42.35	46.02	-3.67	0-360	199	Н
6	352.5	45.36	Pk	15.7	-28.5	10.5	43.06	46.02	-2.96	0-360	299	Н
7	379.7	36.68	Pk	15.8	-28.3	10.5	34.68	46.02	-11.34	0-360	199	Н
Radiated	d Emission D	ata										
	Test	Meter		Antenna Factor	Path	10m to 3m	Level @	Limit 47 CFR				
	Frequency	Reading		dB	Factor	Factor	3m	15.209 @	Margin	Azimuth	Height	
	(MHz)	(dBuV)	Detector	dB/m	dB	dB	dBuV/m	3m dBuV/m	(dB)	[Degs]	[cm]	Polarity
	352.5586	45.35	Qp	15.7	-28.5	10.5	43.05	46.02	-2.97	42	244	Н
	325.4431	45.7	Qp	14.7	-28.6	10.5	42.3	46.02	-3.72	37	291	Н
	298.3235	45.42	Qp	13.9	-28.8	10.5	41.02	46.02	-5	37	251	Н
Pk - Pea	ak detector											
Qp - Qu	asi-Peak dete	ector										

Page 31 of 47



## 9.3.1. Data with Tag, EUT Y-Axis, Parallel to Ground



#### **RX** Antenna Vertical

Page 32 of 47

## Tabular Data

Alliance												
USB NF	C Reader Pe	erpendicula	r to GND V	VithTag								
w/ 102-	1092-BL-F010	00 cable										
5VDC v	ia Lenovo La	ptop USB										
RED: Ho	orizontal GRN	I: Vertical										
Trace M	IArkers											
	<b>-</b> .			Antenna	<b>D</b> #	10m to		Limit 47				
Markar	l est Fraguenav	Meter		Factor	Path	3m Footor	Level @	CFR 15 200 @	Morain	Azimuth	Hoight	
No	(MH <sub>7</sub> )	(dBu\/)	Detector	uB dB/m	dB	dB	dBu\//m	15.209 @ 3m dBu\//m	(dB)		⊓eignt [cm]	Polarity
1	(IVIT IZ) 40 6675	(UDUV) 30.03	Delector	13.6	-30 1	10.5	33.03		(ub) _6.07	0-360	101	1 Olaniy
2	59 6225	42 44	Pk	6.5	-30.1	10.5	29.44	40	-10.56	0-360	251	V
3	71 2675	45.5	Pk	6.4	-30	10.5	32.4	40	-7.6	0-360	399	V
4	73 35	45.86		6.7	-30	10.5	33.06	40	-6.94	0-360	251	V
5	94.94	38 71	Pk	10.5	-29.9	10.5	29.81	43 52	-13 71	0-360	101	V
6	298.3	44 91	Pk	13.9	-28.8	10.5	40.51	46.02	-5 51	0-360	299	ч
7	325.4	45.32		14.7	-20.0	10.5	41.92	46.02	-0.01	0-360	100	н
8	352.5	44.83	Pk	15.7	-20.0	10.5	42.53	46.02	-3 49	0-360	299	н
0 0	352.5	41.00	Pk	15.7	-20.5	10.5	39.61	46.02	-6.41	0-360	200	V
Radiated	T Emission D	ata		10.7	20.0	10.0	00.01	40.02	0.41	0.000		•
Taulatot		ata										
				Antenna		10m to		Limit 47				
	Test	Meter		Factor	Path	3m	Level @	CFR				
	Frequency	Reading		dB	Factor	Factor	3m	15.209 @	Margin	Azimuth	Height	
	(MHz)	(dBuV)	Detector	dB/m	dB	dB	dBuV/m	3m dBuV/m	(dB)	[Degs]	[cm]	Polarity
	40.6784	37.94	Qp	13.6	-30.1	10.5	31.94	40	-8.06	242	137	V
	352.559	45.49	Qp	15.7	-28.5	10.5	43.19	46.02	-2.83	34	234	Н
	325.4435	45.24	Qp	14.7	-28.6	10.5	41.84	46.02	-4.18	34	289	Н
	298.323	44.97	Qp	13.9	-28.8	10.5	40.57	46.02	-5.45	38	257	Н
	298.323	44.98	Qp	13.9	-28.8	10.5	40.58	46.02	-5.44	38	257	Н
Pk - Pea	ak detector											
Qp - Qu	asi-Peak dete	ector										

Page 33 of 47



#### **RX** Antenna Vertical 100 UL EMC Test System 2020 Nov 3 10:07:30 Radiated Emissions Alliance 90 HILIAnce USB NFC Reader Perpendicular to GND NoTag w/ 102-1092-BL-F0100 cable SUDC via Lenova Laptop USB RED: Horizontal GRN: Vertical 80 70 ğ 60 Uer dB(uU/m) 50 Limit...47...CFR...15...209...dBuV/m...3m 46 0<0 4 30 20 10 100 1000 Frequency (MHz) #Sups/Mode Position Range (MHz) MAXH 0-368degs V 4:280-1888 RBW/UBW Ref/Attn Det/Avg Mode 128k(-6dB)/IM 92/8 PEAK/LogPur-V Sweep 3Bnsec (Auto) Pts 4081 RBM/UBM Ref/Attn Det/Avg Mede 120k(-6dB)/1M 92/8 PEAK/LogPwr-Video Range (MHz) 2:38-280 Sweep Pts #Swps/Mode Position 135msec(Auto) 8801 MAXH 8-350deae ideo Rev 9.5 01 Jun 2020 . TST

## 9.3.1. Data without Tag, EUT Y-Axis, Perpendicular to Ground

Page 34 of 47

## Tabular Data

Alliance												
USB NF	C Reader Pe	erpendicula	r to GND N	NoTag								
w/102-	1092-BL-F010	00 cable										
5VDC v	ia Lenovo La	ptop USB										
RED: Ho	orizontal GRN	I: Vertical										
Trace N	IArkers											
	Taat	Motor		Antenna	Doth	10m to		Limit 47				
Markor	Frequency	Reading		dB	Factor	Factor	Sm	0FK 15.200 @	Margin	∆zimuth	Height	
No.	(MHz)	(dBuV)	Detector	dB/m	dB	dB	dBuV/m	3m dBuV/m	(dB)	[Deqs]	[cm]	Polarity
1	40.6675	39.03	Pk	13.6	-30.1	10.5	33.03	40	-6.97	0-360	101	V
2	59.3675	41.95	Pk	6.5	-30	10.5	28.95	40	-11.05	0-360	251	V
3	67.485	44.69	Pk	6.2	-30	10.5	31.39	40	-8.61	0-360	251	V
4	73.9025	45.24	Pk	6.8	-30	10.5	32.54	40	-7.46	0-360	400	V
5	271.2	40.13	Pk	13.3	-29	10.5	34.93	46.02	-11.09	0-360	299	Н
6	298.3	44.25	Pk	13.9	-28.8	10.5	39.85	46.02	-6.17	0-360	299	Н
7	325.4	44.95	Pk	14.7	-28.6	10.5	41.55	46.02	-4.47	0-360	299	Н
8	352.5	44.76	Pk	15.7	-28.5	10.5	42.46	46.02	-3.56	0-360	299	Н
9	379.7	37.26	Pk	15.8	-28.3	10.5	35.26	46.02	-10.76	0-360	299	Н
Radiated	d Emission D	ata										
	Test	Meter		Antenna Factor	Path	10m to 3m	Level @	Limit 47 CFR				
	Frequency	Reading		dB	Factor	Factor	3m	15.209 @	Margin	Azimuth	Height	
	(MHz)	(dBuV)	Detector	dB/m	dB	dB	dBuV/m	3m dBuV/m	(dB)	[Degs]	[cm]	Polarity
	352.5592	45.49	Qp	15.7	-28.5	10.5	43.19	46.02	-2.83	37	236	Н
	325.4439	45	Qp	14.7	-28.6	10.5	41.6	46.02	-4.42	38	283	Н
Pk - Pea	ak detector											
Qp - Qu	asi-Peak dete	ector										

Page 35 of 47

FORM NO: CCSUP4701I

## **10. FREQUENCY STABILITY**

## <u>LIMIT</u>

§15.225 (e) The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency, over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

IC RSS-210, Annex B.6 Carrier frequency stability shall be maintained to  $\pm 0.01\%$  ( $\pm 100$  ppm).

#### TEST PROCEDURE

ANSI C63.10-2013 Clause 6.8

<u>RESULTS</u> No non-compliance noted.

Page 36 of 47

## 10.1. Frequecny Stablility Data

## 10.1.1. Tabular Data

		Reference Frequency: EUT Channel 13.56 MHz @ 20ºC											
			Limit: ± 100 ppm = 1.356 kHz										
Power Supply	Envir. Temp		Frequency Deviation Measureed with Time Elapse										
(Vac)	(°C)	Startup (MHz)	Delta (ppm)	@ 2 mins (MHz)	Delta (ppm)	@ 5 mins (MHz)	Delta (ppm)	@ 10 mins (MHz)	Delta (ppm)	Limit (ppm)			
120.00	50	13.5600513	1.616	13.5600518	1.574	13.5600571	1.188	13.5601356	-4.606	± 100			
120.00	40	13.5600589	1.056	13.5600503	1.691	13.5600219	3.784	13.5600477	1.881	± 100			
120.00	30	13.5601480	-5.517	13.5600679	0.393	13.5600559	1.278	13.5601299	-4.184	± 100			
120.00	20	13.5600732	0.000	13.5600731	0.004	13.5600732	-0.002	13.5600732	-0.004	± 100			
120.00	10	13.5601416	-5.043	13.5600795	-0.464	13.5601090	-2.644	13.5600938	-1.520	± 100			
120.00	0	13.5601486	-5.561	13.5601506	-5.710	13.5601410	-5.004	13.5601322	-4.349	± 100			
120.00	-10	13.5599662	7.893	13.5601394	-4.880	13.5601567	-6.162	13.5601539	-5.954	± 100			
120.00	-20	13.5600959	-1.678	13.5601407	-4.978	13.5601498	-5.653	13.5601683	-7.012	± 100			
102.00	20	13.5600733	-0.007	13.5600732	-0.003	13.5600611	0.891	13.5601963	-9.081	± 100			
138.00	20	13.5600733	-0.011	13.5600637	0.697	13.5600734	-0.013	13.5601200	-3.449	± 100			

Page 37 of 47

# 11. AC MAINS LINE CONDUCTED EMISSIONS

## <u>LIMITS</u>

§15.207 IC RSS-GEN, Section 8.8

(a) Except as shown in paragraphs (b) and (c) of this section, 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 in the following table, as measured using a  $50\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency range	Limit	s (dBµV)
(MHz)	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Notes:		

1. The lower limit shall apply at the transition frequencies

2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

## TEST PROCEDURE

ANSI C63.10:2013

## <u>RESULTS</u>

No non-compliance noted:

Page 38 of 47

#### Line Conducted Emissions with Tag 11.1.



Page 39 of 47

## Line Conducted Emissions Tabular Data

Alliance										
USB NFC Reader, TX NoTag										
w/ 102-1092-BL-F0100 cable										
5VDC via Laptop (120V/60Hz)										
RED: QP GRN: AV										
Trace MArkers										
							47 CFR		47 CFR	
	Test	Meter		LISN	Path		Part		Part	
Marker	Frequency	Reading		Factor	Factor	Lev el	15.207 QP	Margin	15.207 Av	Margin
No.	(MHz)	(dBuV)	Detector	dB	dB	dBuV	dBuV	(dB)	dBuV	(dB)
Line 1										
1	13.56	38.87	Qp	0	11.2	50.07	60	-9.93	-	-
2	13.56	38	Са	0	11.2	49.2	60	-10.8	50	-0.8
Line 2										
3	13.56	39.17	Qp	0	11.1	50.27	60	-9.73	-	•
4	13.56	38.32	Са	0	11.1	49.42	60	-10.58	50	-0.58
Qp - Quasi-Peak detector										
Ca - CISPR Average detection										

Page 40 of 47

#### Line Conducted Emissions without Tag 11.1.





Page 41 of 47

## Line Conducted Emissions Tabular Data

Alliance										
USB NFC Reader, TX NoTag										
w/ 102-1092-BL-F0100 cable										
5VDC via Laptop (120V/60Hz)										
RED: QP GRN: AV										
Trace MArkers										
							47 CFR		47 CFR	
	Test	Meter		LISN	Path		Part		Part	
Marker	Frequency	Reading		Factor	Factor	Level	15.207 QP	Margin	15.207 Av	Margin
No.	(MHz)	(dBuV)	Detector	dB	dB	dBuV	dBuV	(dB)	dBuV	(dB)
Line 1										
1	13.56	39.17	Qp	0	11.2	50.37	60	-9.63	-	-
2	13.56	38.28	Са	0	11.2	49.48	60	-10.52	50	-0.52
Line 2										
3	13.56	39.44	Qp	0	11.1	50.54	60	-9.46	-	•
4	13.56	38.57	Са	0	11.1	49.67	60	-10.33	50	-0.33
Qp - Quasi-Peak detector										
Ca - CISPR Average detection										

Page 42 of 47