FCC / ISED Test Report

For:
Hanchett Entry Systems, Inc.

Model:
CER

Product Description:
The DR80 is an access control device that provides access via relay actuation when activated from BLE credentials or RFID credentials.

FCC ID: VC3DR80
IC: 7160ADR80

Applied Rules and Standards:
47 CFR Part 15.209 and 15.225
RSS-210 Issue 10 & RSS-Gen Issue 5

REPORT #: EMC_HANC1_007_22001_FCC_15_225_Rev1

DATE: 2023-03-03

A2LA Accredited

IC recognized #
3462B-1

ilac-MRA

A2LA ACCREDITED
TESTING LABORATORY
Certificate #2135.01

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1   Assessment

The following device was evaluated against the applicable radiated emissions criteria specified in FCC rules Parts 15.209, and 15.225 of Title 47 of the Code of Federal Regulations and the relevant ISED Canada standard RSS-210 Issue 10, and RSS-Gen Issue 5.

Company	Description	Model #
Hanchett Entry Systems, Inc.	The DR80 is an access control device that provides access via relay actuation when activated from BLE credentials or RFID credentials.	CER

Responsible for Testing Laboratory:

		Arndt Stoecker	
2023-03-03	Compliance	(Director of Regulatory Services)	
Date	**Section**	**Name**	**Signature**

Responsible for the Report:

		Cheng Song	
2023-03-03	Compliance	(EMC Engineer)	
Date	**Section**	**Name**	**Signature**

2   Administrative Data

2.1   Identification of the Testing Laboratory Issuing the EMC Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Street Address:	411 Dixon Landing Road
City/Zip Code	Milpitas, CA 95035
Country	USA
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
EMC Lab Manager:	Arndt Stoecker
Responsible Project Leader:	Cathy Palacios

2.2   Identification of the Client

Client's Name:	Hanchett Entry Systems, Inc.
Street Address:	10027 S. 51st St., Suite 102
City/Zip Code	Phoenix, AZ 85044
Country	USA

2.3   Identification of the Manufacturer

Manufacturer's Name:	Same as Client
Manufacturers Address:	
City/Zip Code	
Country	

3   Equipment Under Test (EUT)

3.1   EUT Specifications

Model No:	CER
HW Version :	1.6
SW Version :	nrf52_6.1.1_softdevice
FCC ID:	VC3DR80
IC:	7160ADR80
PMN:	Centrios
Product Description:	The DR80 is an access control device that provides access via relay actuation when activated from BLE credentials or RFID credentials.
Radio Information:	**RFID:** • Module: NXP CLRC66303
Power Supply/ Rated Operating Voltage Range:	12 V (min) / 24 V (max)
Operating Temperature Range	Tmin: -40 ºC / Tmax: 60 ºC / Tnom: 20 ºC
Sample Revision	☐Prototype Unit; ☐Production Unit; ■Pre-Production

3.2   EUT Sample details

EUT #	Model Number	HW Version	SW Version	Notes/Comments
1	CER	1.6	nrf52_6.1.1_softdevice	

3.3   Accessory Equipment (AE) details

AE #	Type	Manufacturer	Serial Number
1			

3.3   Test Sample Configuration

EUT Set-up #	EUT / AE used for set-up	Comments
1	EUT#1	

3.4   Justification for Worst Case Mode of Operation

During the testing process, the EUT was tested with transmitter sets on low, mid and high channels, and highest possible duty cycle. For radiated measurements, all data in this report shows the worst case between horizontal and vertical antenna polarizations and for all orientations of the EUT. The worst is with EUT in Y-axis and antenna in vertical polarization.

4   Subject of Investigation

The objective of the measurements done by CETECOM Inc. was to assess the performance of the EUT according to the relevant radiated emissions requirements specified in FCC rules part 15.209 and 15.225 of Title 47 of the Code of Federal Regulations and Radio Standard Specification RSS-210 Issue 10 of ISED Canada.

5   Measurement Results Summary

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	PASS	NA	NP	Result
§15.225(d); §15.209 RSS-210 I10; RSS-Gen I5 8.9	TX Spurious emissions-Radiated	Nominal	RFID	■	□	□	Complies
§15.225(a,b,c); RSS-210 I10 B6 a;	Field strength in band mask	Nominal	RFID	■	□	□	Complies
§15.225(e); RSS-210 I10 B6 b);	Frequency stability	Nominal and Extreme Voltage and Temperature	RFID	■	□	□	Complies
§15.207(a) RSS Gen I5 8.8	AC Conducted Emissions	Nominal	RFID	■	□	□	Complies

Note 1: NA= Not Applicable; NP= Not Performed.

6   Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus, with 95% confidence interval (in dB delta to result), based on a coverage factor k=2.

Measurement System	EMC 1	EMC 2
Conducted Emissions (mains port)	1.12 dB	0.46 dB
Radiated Emissions (<30 MHz) (30 MHz – 1 GHz) (1 GHz – 3 GHz) (> 3 GHz)	 3.66 dB 3.17 dB 5.01 dB 4.0 dB	 3.88 dB 3.34 dB 4.45 dB 4.79 dB

6.1   Environmental Conditions During Testing:

The following environmental conditions were maintained during the course of testing:
- Ambient Temperature: 20-25° C
- Relative humidity: 40-60%
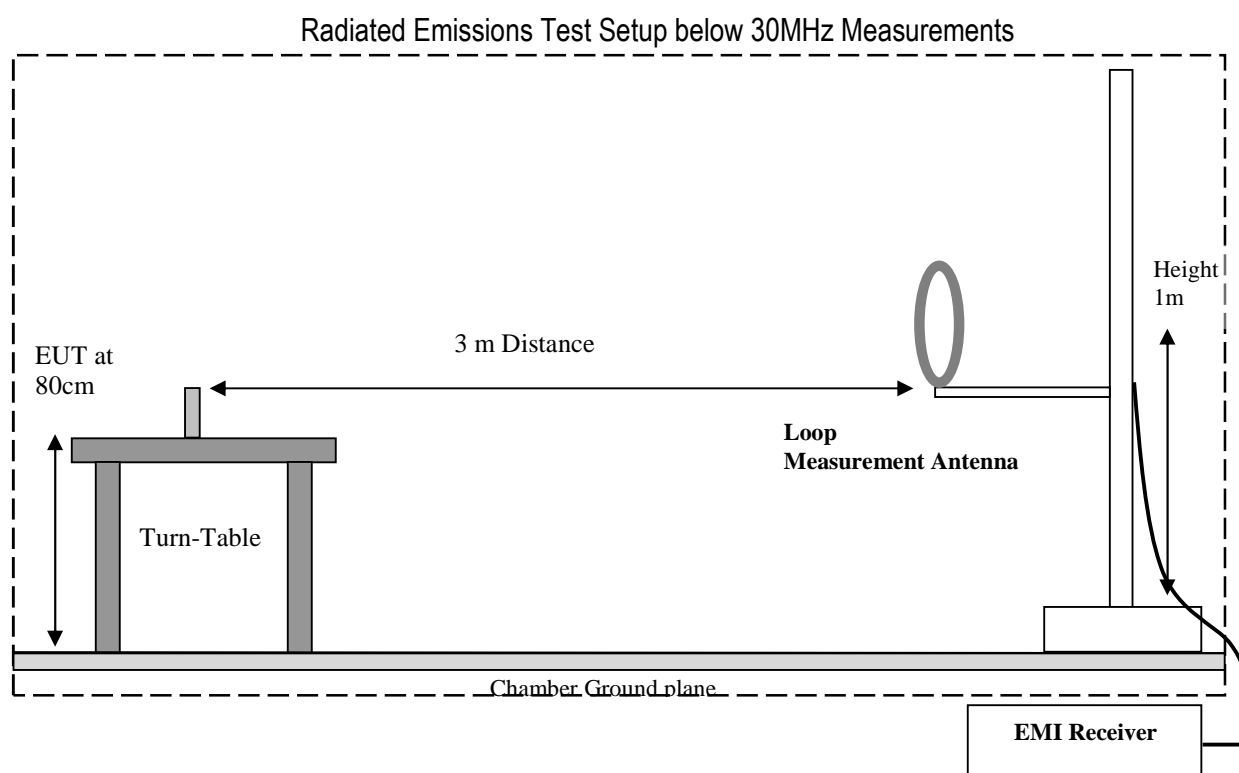
6.2   Dates of Testing:
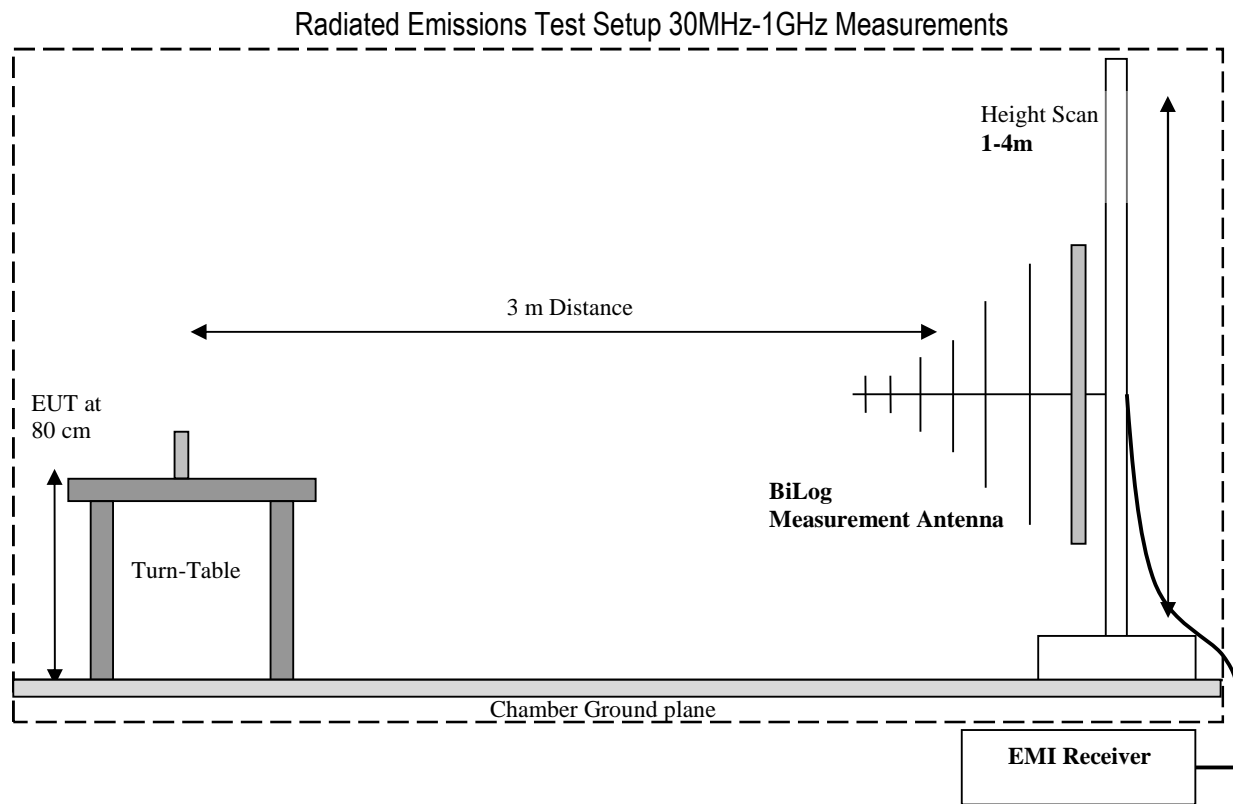
10/20/2022 – 10/22/2022

7   Measurement Procedures

7.1   Radiated Measurement

The radiated measurement is performed according to ANSI C63.10 (2013)

- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 4 positions of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to cover the 3 orthogonal axis of the EUT. A max peak detector is utilized during the exploratory measurement. The Test-SW creates an overall maximum trace for all 12 sweeps and saves the settings for each point of this trace. The maximum trace is part of the test report.
- The 10 highest emissions are selected with an automatic algorithm of EMC32 searching for peaks in the noise floor and ensuring that broadband signals are not selected multiple times.
- The maxima are then put through the final measurement and again maximized in a 90deg range of the turntable, fine search in frequency domain and height scan between 1m and 4m.
- The above procedure is repeated for all possible ways of power supply to EUT and for all supported modulations.
- In case there are no emissions above noise floor level only the maximum trace is reported as described above.
- The results are split up into up to 4 frequency ranges due to antenna bandwidth restrictions. A magnetic loop is used from 9 kHz to 30 MHz, a Biconilog antenna is used from 30 MHz to 1 GHz, and two different horn antennas are used to cover frequencies up to 40 GHz.

Radiated Emissions Test Setup below 30MHz Measurements

Radiated Emissions Test Setup 30MHz-1GHz Measurements

Height Scan
1-4m

3 m Distance

EUT at
80 cm

**BiLog
Measurement Antenna**

Turn-Table

Chamber Ground plane

EMI Receiver

7.1.1   Sample Calculations for Field Strength Measurements

Field Strength is calculated from the Spectrum Analyzer/ Receiver readings, taking into account the following parameters:
1. Measured reading in dBµV
2. Cable Loss between the receiving antenna and SA in dB and
3. Antenna Factor in dB/m

All radiated measurement plots in this report are taken from a test SW that calculates the Field Strength based on the following equation:

$$FS (dBµV/m) = \text{Measured Value on SA (dBµV)} + \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$$

Example:

Frequency (MHz)	Measured SA (dBµV)	Cable Loss (dB)	Antenna Factor Correction (dB)	Field Strength Result (dBµV/m)
1000	80.5	3.5	14	98.0

To correct for distance when measuring at a distance other than the specification distance;
- For measurements below 30 MHz, Distance Factor = 40log(SpecDistance/TestDistance)
- For measurements above 30 MHz, Distance Factor = 20log(SpecDistance/TestDistance).

Example:

Frequency (MHz)	FCC 15.209 limit @ 30m (uV/m)	FCC 15.209 limit @ 30m (dBuV/m)	FCC 15.209 limit @ 3m (dBuV/m)
10	30	29.54	69.54

8   Test Result Data

8.1   Radiated Transmitter Spurious Emissions and Restricted Bands

8.1.1   Measurement according to ANSI C63.10

Spectrum Analyzer Settings:
- Frequency = 9 KHz – 30 MHz
- RBW = 9 KHz
- Detector: Peak

- Frequency = 30 MHz – 1 GHz
- Detector = Peak / Quasi-Peak
- RBW= 120 KHz (<1GHz)

- Radiated spurious emissions shall be measured for the transmit frequencies, transmit power, and data rate for the lowest, middle and highest channel in each frequency band of operation and for the highest gain antenna for each antenna type, and using the appropriate parameters and test requirements.
- The highest (or worst-case) data rate shall be recorded for each measurement.
- For testing frequencies below 30 MHz at distance other than the specified in the standard, the limit conversion is calculated by using the FCC materials for the ANSI 63 committee issued on January, 27 1991.

8.1.2   Limits:

FCC §15.225

- 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.

FCC §15.209 & RSS-210 / RSS-Gen 8.9
- 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:

Frequency of emission (MHz)	Field strength (µV/m)	Measurement Distance (m)	Field strength @ 3m (dBµV/m)
0.009–0.490	2400/F(kHz) / ---------	300	-
0.490–1.705	24000/F(kHz) / --------	30	-
1.705–30.0	30 / (29.5)	30	-
30–88	100	3	40 dBµV/m
88–216	150	3	43.5 dBµV/m
216–960	200	3	46 dBµV/m
Above 960	500	3	54 dBµV/m

FCC §15.205 & RSS-Gen 8.10

- Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

- Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).
  *PEAK LIMIT= 74 dBµV/m
  *AVG. LIMIT= 54 dBµV/m

8.1.3   Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
22° C	1	RFID	12 VDC

8.1.4   Measurement result:

| Plot #	Operating Mode	Scan Frequency	Limit	Result
1	RFID	9 kHz – 30 MHz	See section 8.1.2	Pass
2	RFID	30 MHz – 1 GHz	See section 8.1.2	Pass
3	RFID	13.11 – 14.01 MHz	13.553-13.567 MHz:15,848 uV/m @ 30 m 13.410-13.553 MHz: 334 uV/m @ 30 m 13.567-13.710 MHz: 334 uV/m @ 30 m 13.110-13.410 MHz: 106 uV/m @ 30 m 13.710-14.010 MHz: 106 uV/m @ 30 m	Pass

8.1.5   Measurement Plots:

Plot # 1

Frequency	MaxPeak (dBμV/m	QuasiPeak	Limit (dBμV/m	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr. (dB/m	Comment
20.21	39.56	---	55.91	16.34	1000.	3.0	100.0	V	167.0	16.5	
27.12	41.17	---	52.28	11.11	1000.	3.0	100.0	H	289.0	16.0	
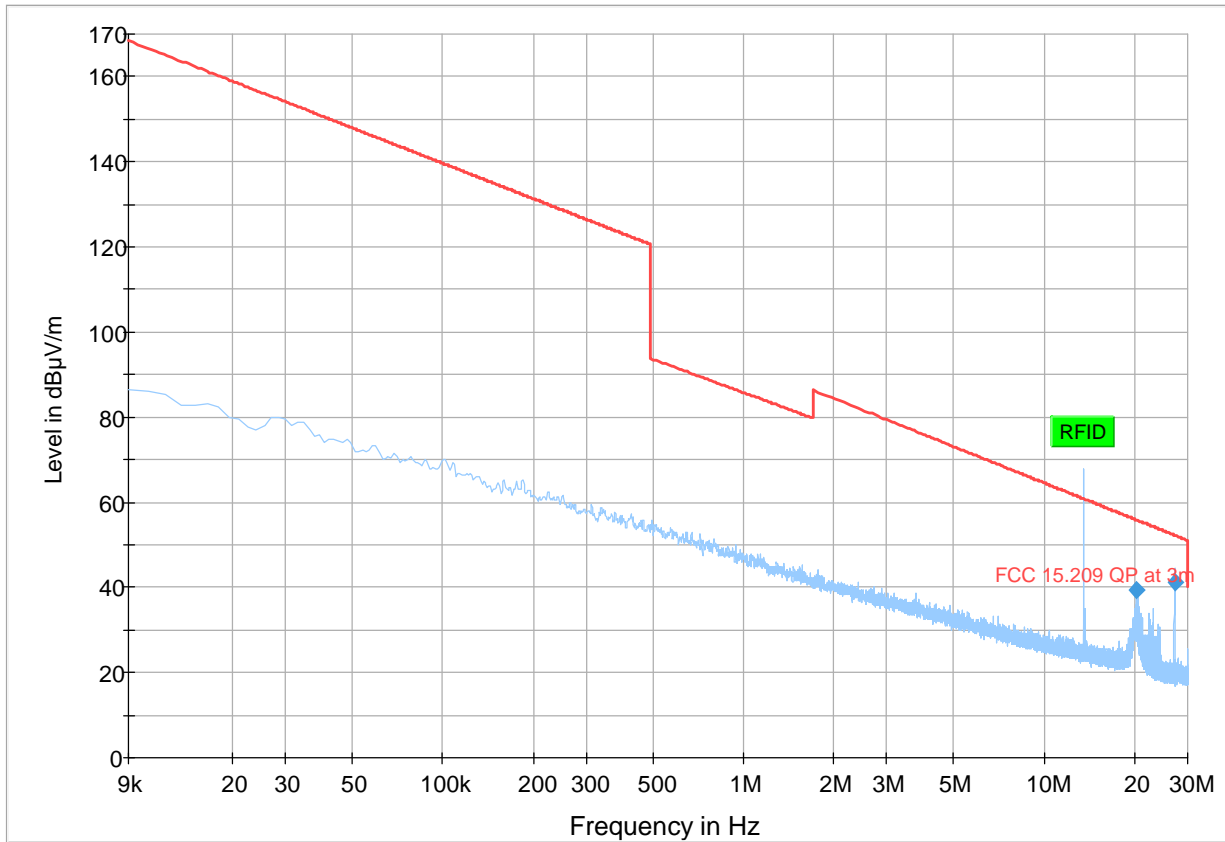
Legend: Preview Result 1-PK+ — FCC 15.209 QP at 3m ◆ Final_Result PK+ ◆ Final_Result QPK

Plot # 2

Frequency	MaxPeak (dBµV/m	QuasiPeak	Limit (dBµV/m	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr. (dB/m	Comment
35.98	29.76	---	40.00	10.24	1000.	120.0	100.0	V	97.0	-14.1	
35.98	---	27.05	---	---	1000.	120.0	100.0	V	97.0	-14.1	
59.97	---	37.05	---	---	1000.	120.0	100.0	V	161.0	-22.4	
59.97	38.60	---	40.00	1.40	1000.	120.0	100.0	V	161.0	-22.4	
107.96	33.42	---	43.50	10.08	1000.	120.0	100.0	V	0.0	-13.3	
107.96	---	31.49	---	---	1000.	120.0	100.0	V	0.0	-13.3	
131.98	33.34	---	43.50	10.16	1000.	120.0	241.0	H	99.0	-11.0	
131.98	---	31.23	---	---	1000.	120.0	241.0	H	99.0	-11.0	
293.97	43.82	---	46.02	2.20	1000.	120.0	205.0	V	31.0	-14.3	
293.97	---	41.46	---	---	1000.	120.0	205.0	V	31.0	-14.3	
305.97	44.01	---	46.02	2.01	1000.	120.0	243.0	V	87.0	-13.8	
305.97	---	41.33	---	---	1000.	120.0	243.0	V	87.0	-13.8	
419.97	37.62	---	46.02	8.40	1000.	120.0	133.0	H	46.0	-11.7	
419.97	---	36.50	---	---	1000.	120.0	133.0	H	46.0	-11.7	

Plot # 3

Frequency	MaxPeak (dBµV/m	QuasiPeak	Limit (dBµV/m	Margin	Meas.	Bandwidth	Height	Pol	Azimuth	Corr. (dB/m	Comment
---	---	---	---	---	---	---	---		---	---	
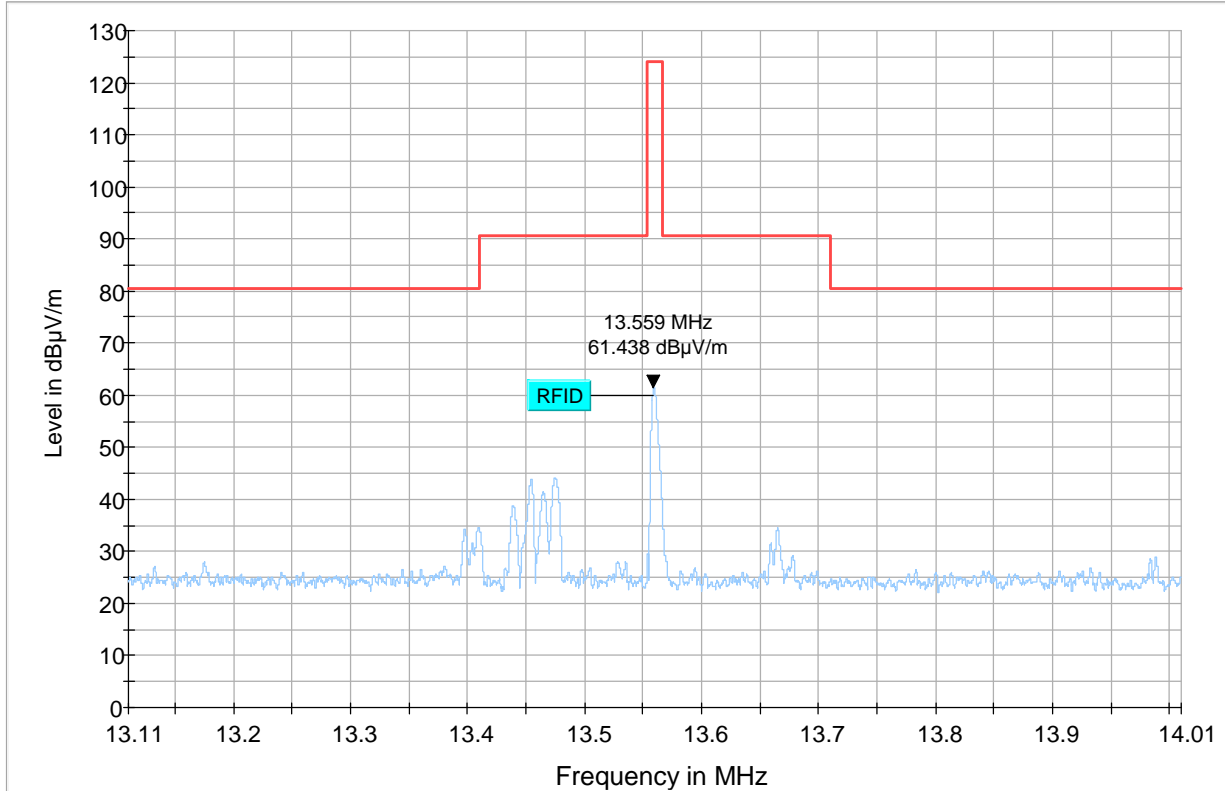
Legend:
- Preview Result 1-PK+
- FCC 15.225 Fundamental converted to 3m
- Final_Result QPK
- Critical_Freqs PK+
- Final_Result PK+

Marker: 13.559 MHz, 61.438 dBµV/m — RFID

8.2   Frequency Stability

8.2.1   Measurement according to ANSI C63.10

8.2.2   Limits:

Deviation: 0.01%

8.2.3   Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
22° C	1	RFID	12 VDC

8.2.4   Measurement Result:

Temp (°C)	Measured Frequency (MHz)	Test Voltage (V DC)	Frequency Error (Hz)	Limit (+/- Hz)	Result
20	13.560283	12	283	1356	Pass
20	13.560283	10.2	283	1356	Pass
20	13.560285	13.8	285	1356	Pass
-20	13.560291	12	291	1356	Pass
-10	13.560288	12	288	1356	Pass
0	13.560284	12	284	1356	Pass
10	13.560283	12	283	1356	Pass
30	13.560284	12	284	1356	Pass
40	13.560283	12	283	1356	Pass
50	13.560285	12	285	1356	Pass

8.3   AC Power Line Conducted Emissions

8.3.1   Measurement according to ANSI C63.10

Analyzer Settings:
- RBW = 9 KHz (CISPR Bandwidth)
- Detector: Peak / Average for Pre-scan
- Quasi-Peak/Average for Final Measurements

8.3.2   Limits: §15.207 & RSS-Gen 8.8

FCC §15.207(a) & RSS-Gen 8.8
- Except as shown in paragraphs (b) and (c) of this section of the CFR, 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 (1), as measured using a 50 µH/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 boundary between frequency ranges.

Frequency of emission (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

 *Decreases with the logarithm of the frequency.

8.3.3   Test conditions and setup:

Ambient Temperature ©	EUT Set-Up #	EUT operating mode	Power line (L1, L2, L3, N)	Power Input
22° C	1	RFID	Line & Neutral	120V / 60Hz

8.3.4   Measurement Result:

Plot #	Port	EUT Set-Up #:	EUT operating mode	Scan Frequency	Limit	Result
1	AC Mains	1	RFID	150 kHz – 30 MHz	See section 8.3.2	Pass

8.3.5   Measurement Plots

Plot # 1

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.57	43.58	---	56.00	12.42	500.0	9.0	N	GND	9.98
0.57	---	22.46	46.00	23.54	500.0	9.0	N	GND	9.98
1.11	---	12.36	46.00	33.64	500.0	9.0	N	GND	10.05
1.11	37.30	---	56.00	18.70	500.0	9.0	N	GND	10.05
1.13	38.69	---	56.00	17.31	500.0	9.0	N	GND	10.05
1.13	---	13.54	46.00	32.46	500.0	9.0	N	GND	10.05
2.29	---	18.67	46.00	27.33	500.0	9.0	L1	GND	10.05
2.29	42.05	---	56.00	13.95	500.0	9.0	L1	GND	10.05
3.45	---	15.29	46.00	30.71	500.0	9.0	N	GND	10.06
3.45	42.41	---	56.00	13.59	500.0	9.0	N	GND	10.06
15.90	---	22.74	50.00	27.26	500.0	9.0	N	GND	10.21
15.90	41.15	---	60.00	18.85	500.0	9.0	N	GND	10.21
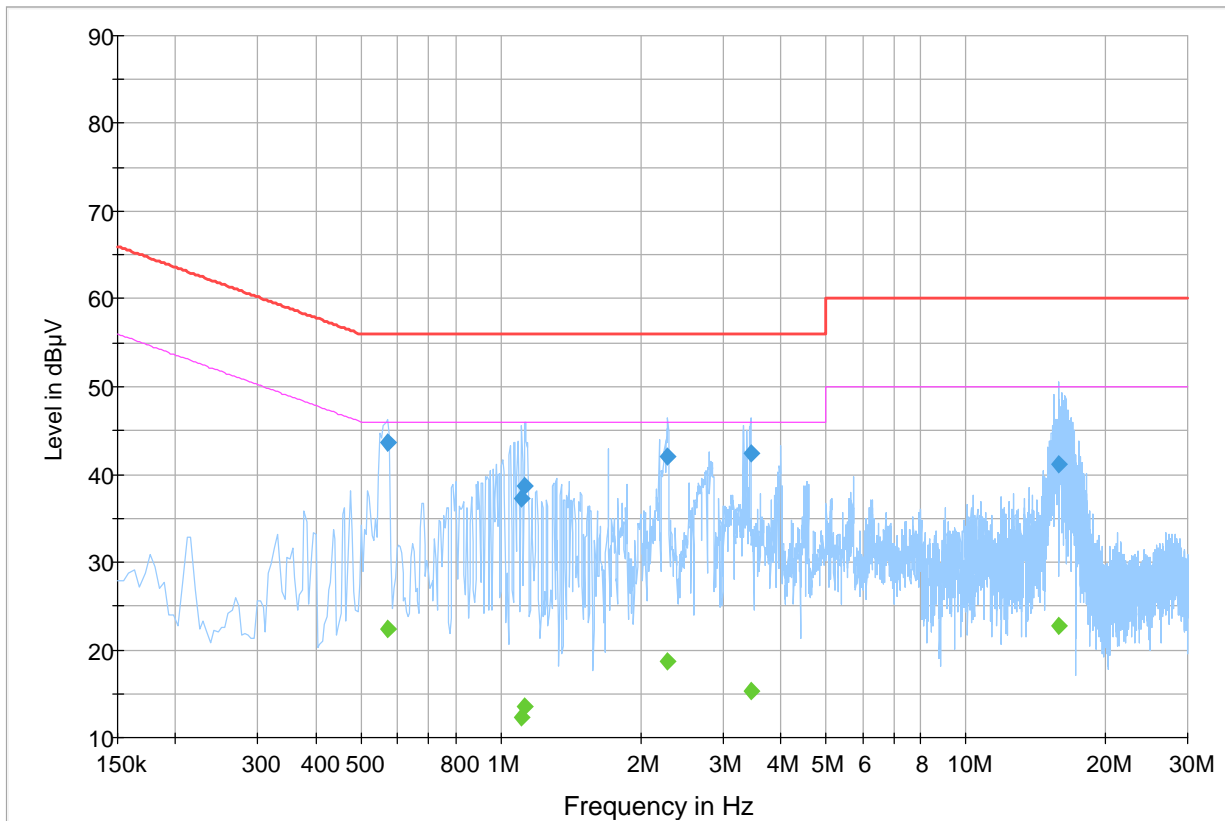
9   Test setup photos

Setup photos are included in supporting file name: "EMC_HANC1_007_22001_FCC_Setup_Photos_Rev1"

10   Test Equipment And Ancillaries Used For Testing

Equipment Name/Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
Biconilog Antenna	A.H. Systems	BiLA2G	569343	3 years	12/01/2020
Active Loop Antenna	ETS Lindgren	6507	161344	3 years	10/30/2020
Spectrum Analyzer	R&S	ESU40	100251	3 years	09/13/2021
Thermometer Humidity Monitor	CONTROL COMPANY	36934-164	191871986	3 years	10/20/2021
Temperature Humidity Chamber	TestEquity	123H	246902000003	-	-

Note: Equipment used meets the measurement uncertainty requirements as required per applicable standards for 95% confidence levels.

Calibration due dates, unless defined specifically, falls on the last day of the month. Items indicated "N/A" for cal status either do not specifically require calibration or is internally characterized before use.

11 History

Date	Report Name	Changes to report	Prepared by
2023-01-12	EMC_HANC1_007_22001_FCC_15_225	Initial Version	Cheng Song
2023-03-03	EMC_HANC1_007_22001_FCC_15_225_Rev1	Updated section 8.3 AC Line Conducted Emissions Updated section 8.1.5 RFID Fundamental Field Strength limit @ 3m	Cheng Song

<<< The End >>>