

TEST REPORT

Application No.: FYCR2302000029AT
Applicant: Armatura LLC
Address of Applicant: 190 Bluegrass Valley Parkway Alpharetta Georgia 30005 United States
Manufacturer: Armatura LLC
Address of Manufacturer: 190 Bluegrass Valley Parkway Alpharetta Georgia 30005 United States
Factory: Armatura Tech Co., Ltd
Address of Factory: 1. 999/43 Moo15 Bangsaothong, Samutprakarn 10570, Thailand
 2. 999/120-121 Moo15 Bangsaothong, Samutprakarn 10570, Thailand

Equipment Under Test (EUT):

EUT Name: Smart Reader
Model No.: EP30CF
Trade Mark:



FCC ID: 2A5UQ-EP30CF
Standard(s) : 47 CFR Part 15, Subpart C
Date of Receipt: 2023-02-02
Date of Test: 2023-02-16 to 2023-02-28
Date of Issue: 2023-03-03

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards specified above.

Winkey Wang

Winkey Wang
EMC Technical Manager



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Shenzhen Branch

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Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2023-03-03		Original

Authorized for issue by:				
		Tree Zhan		
		Tree Zhan/Project Engineer		
		Winkey Wang		
		Winkey Wang/Reviewer		



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2 Test Summary

Radio Spectrum Technical Requirement				
Item	Standard	Method	Requirement	Result
Antenna Requirement	47 CFR Part 15, Subpart C	N/A	47 CFR Part 15, Subpart C 15.203	Pass

Radio Spectrum Matter Part				
Item	Standard	Method	Requirement	Result
Conducted Emissions at AC Mains Power Port (150kHz-30MHz)	47 CFR Part 15, Subpart C	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
Field Strength of the Fundamental Signal (15.209(c))		ANSI C63.10 (2013) Section 6.5	47 CFR Part 15, Subpart C 15.209(c)	Pass
20dB Bandwidth		ANSI C63.10 (2013) Section 6.9.2	47 CFR Part 15, Subpart C 15.215	Pass
Radiated Emissions (9kHz-30MHz)		ANSI C63.10 (2013) Section 6.4	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Emissions (30MHz-1GHz)		ANSI C63.10 (2013) Section 6.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass



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4 General Information

4.1 Details of E.U.T.

Power supply:	Input: DC 9V-24V
Operation Frequency:	125KHz
Modulation Type:	ASK
Antenna Type:	Loop Antenna

Remark: The information in this section is provided by the applicant or manufacturer, CCS is not liable to the accuracy, suitability, reliability or/and integrity of the information.

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Switching Power	Shenzhen HONOR electronic co., LTD	ADS-40SI-12-3 12036E	N/A

4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Field Strength of the Fundamental Signal (15.209(c))	$\pm 0.3\%$
20dB Bandwidth	$\pm 0.3\%$
Radiated Emissions (9kHz-30MHz)	$\pm 2.7\text{dB}$
Radiated Emissions (30MHz-1GHz)	$\pm 5.6\text{dB}$
Conducted Emissions at AC Mains Power Port (150kHz-30MHz)	$\pm 2.1\text{ dB (9kHz to 30MHz)}$

Remark:

The U_{lab} (lab Uncertainty) is less than $U_{\text{CISPR/ETSI}}$ (CISPR/ETSI Uncertainty), so the test results
 – compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
 – non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.



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4.4 Test Location

All tests were performed at:

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Fuyong lab. Xinlong TechnoPark, Fengtang Road, Fuyong Subdistrict, Bao'an, Shenzhen, China

Tel: +86 755 8866 3988 Fax: +86 755 2671 0594

No tests were sub-contracted.

4.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• A2LA (Certificate No. 6606.01)

Compliance Certification Services (Kunshan) Inc. Shenzhen branch is accredited by the American Association for Laboratory Accreditation (A2LA). Certificate No. 6606.01.

• FCC –Designation Number: CN1322

Compliance Certification Services (Kunshan) Inc. Shenzhen branch has been recognized as an accredited testing laboratory.

Designation Number: CN1322. Test Firm Registration Number: 718073

• Innovation, Science and Economic Development Canada

Compliance Certification Services (Kunshan) Inc. Shenzhen branch has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0129.

IC#: 28189.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None



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5 Equipment List

Conducted Emissions at AC Power Line (150kHz-30MHz)

Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
Shielding Room	CRT	N/A	SEM001-14	2021/7/13	2024/7/12
EMI Test Receiver	Rohde & Schwarz	ESCI	SEM004-01	2022/7/12	2023/7/11
Two-Line V-Network	Rohde & Schwarz	ENV216	SEM007-16	2022/7/12	2023/7/11
Two-Line V-Network	Rohde & Schwarz	ESH3-Z5	SEM007-22	2023/1/9	2024/1/8
Coaxial Cable	CCS	N/A	SEM033-02	2022/5/16	2023/5/15
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A

Field Strength of the Fundamental Signal (15.209(c))

Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
3m Anechoic Chamber	CRT	N/A	SEM001-13	2021/7/13	2024/7/12
Loop Antenna	ETS-LINDGREN	6502	SEM003-36	2021/9/26	2024/9/25
MXE EMI receiver	Agilent	N9038A	SEM004-05	2022/7/12	2023/7/11
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A

20dB Bandwidth

Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
MXA Signal Analyzer	KEYSIGHT	N9020A	SEM004-25	2022/5/30	2023/5/29
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	2022/7/12	2023/7/11
Measurement Software	TST PASS	TST PASS V2.0	N/A	N/A	N/A

Radiated Emissions (9kHz-30MHz)

Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
3m Anechoic Chamber	CRT	N/A	SEM001-13	2021/7/13	2024/7/12
Loop Antenna	ETS-LINDGREN	6502	SEM003-36	2021/9/26	2024/9/25
MXE EMI receiver	Agilent	N9038A	SEM004-05	2022/7/12	2023/7/11
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A



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Radiated Spurious Emissions Below 1GHz					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
3m Anechoic Chamber	CRT	N/A	SEM001-13	2021/7/13	2024/7/12
Trilog-Broadband Antenna	Schwarzbeck	VULB9168	SEM003-33	2021/9/25	2024/9/24
MXE EMI receiver	Agilent	N9038A	SEM004-05	2022/7/12	2023/7/11
Pre-amplifier	HP	8447D	SEM005-02	2022/7/12	2023/7/11
Coaxial Cable	CCS	N/A	SEM035-01	2022/5/16	2023/5/15
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A

General used equipment					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
Humidity/ Temperature Indicator	Mingle	TH607	SEM002-22	2022-07-11	2023-07-10
Humidity/ Temperature Indicator	Mingle	TH607	SEM002-23	2022-07-11	2023-07-10
Barometer	DUMAI	DYM3	SEM002-24	2022-07-11	2023-07-10



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6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203

6.1.2 Conclusion

15.203 requirement:

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement.

Antenna location: Refer to Internal photos



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7 Radio Spectrum Matter Test Results

7.1 Conducted Emissions at Mains Terminals (150kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.207

Test Method: ANSI C63.10 (2013) Section 6.2

Limit:

Frequency range (MHz)	Limit (dBuV)	
	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.

7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 22.3 °C

Humidity: 51.4 % RH

Atmospheric Pressure: 1020 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode(125KHz)_Keep the EUT in continuously transmitting mode



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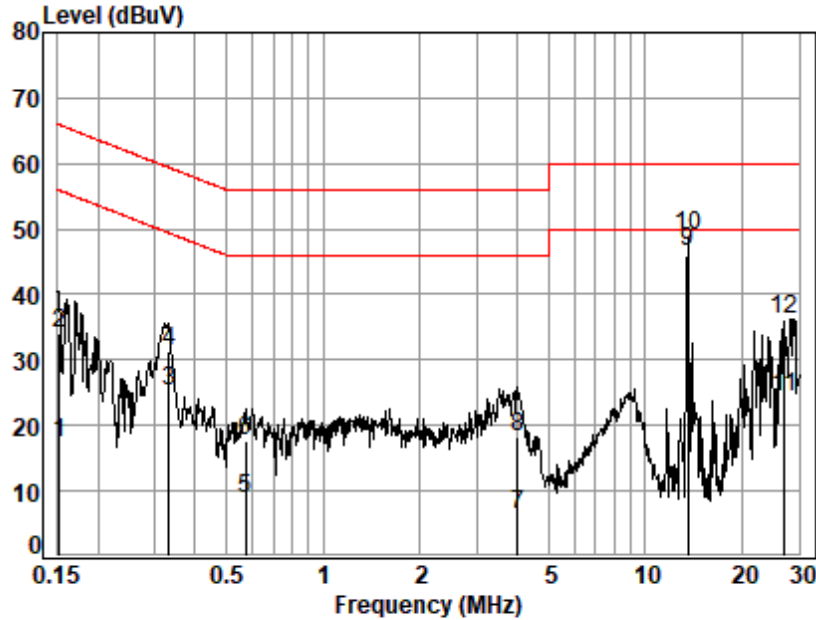
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Test Mode: 02; Line: Live line



Site : Shielding Room
Condition: Line
Job No. : 00029AT
Test mode: 02

	Cable	LISN	Read	Limit	Over	
Freq	Loss	Factor	Level	Level	Line	Limit Remark
MHz	dB	dB	dBuV	dBuV	dBuV	dB
1	0.1516	0.02	0.13	17.30	17.45	55.91 -38.46 Average
2	0.1516	0.02	0.13	34.07	34.22	65.91 -31.69 QP
3	0.3321	0.03	0.11	25.21	25.35	49.40 -24.05 Average
4	0.3321	0.03	0.11	31.16	31.30	59.40 -28.10 QP
5	0.5731	0.04	0.12	8.63	8.79	46.00 -37.21 Average
6	0.5731	0.04	0.12	17.48	17.64	56.00 -38.36 QP
7	4.0062	0.03	0.25	5.97	6.25	46.00 -39.75 Average
8	4.0062	0.03	0.25	17.96	18.24	56.00 -37.76 QP
9	13.5600	0.05	0.54	45.99	46.58	50.00 -3.42 Average
10	13.5600	0.05	0.54	48.49	49.08	60.00 -10.92 QP
11	27.1200	0.08	1.33	22.80	24.21	50.00 -25.79 Average
12	27.1200	0.08	1.33	34.80	36.21	60.00 -23.79 QP



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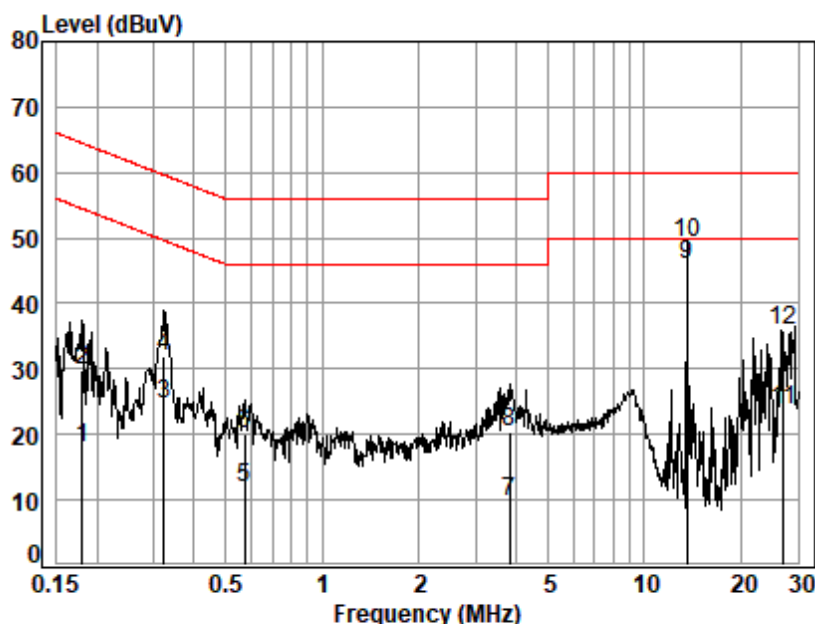
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Test Mode: 02; Line: Neutral Line



Site : Shielding Room
Condition: Neutral
Job No. : 00029AT
Test mode: 02

	Freq	Cable Loss	LISN Factor	Read Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dB	
1	0.1806	0.02	0.12	17.70	17.84	54.46	Average
2	0.1806	0.02	0.12	29.59	29.73	64.46	QP
3	0.3217	0.03	0.13	24.38	24.54	49.66	Average
4	0.3217	0.03	0.13	31.75	31.91	59.66	QP
5	0.5731	0.04	0.14	11.65	11.83	46.00	Average
6	0.5731	0.04	0.14	19.80	19.98	56.00	QP
7	3.8196	0.03	0.23	9.61	9.87	46.00	Average
8	3.8196	0.03	0.23	20.11	20.37	56.00	QP
9	13.5600	0.05	0.40	45.50	45.95	50.00	Average
10	13.5600	0.05	0.40	48.80	49.25	60.00	QP
11	27.1200	0.08	1.18	22.50	23.76	50.00	Average
12	27.1200	0.08	1.18	34.60	35.86	60.00	QP



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7.2 Field Strength of the Fundamental Signal (15.209(c))

Test Requirement 47 CFR Part 15, Subpart C 15.209(c)

Test Method: ANSI C63.10 (2013) Section 6.5

Measurement Distance: 3m

7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 24.9 °C

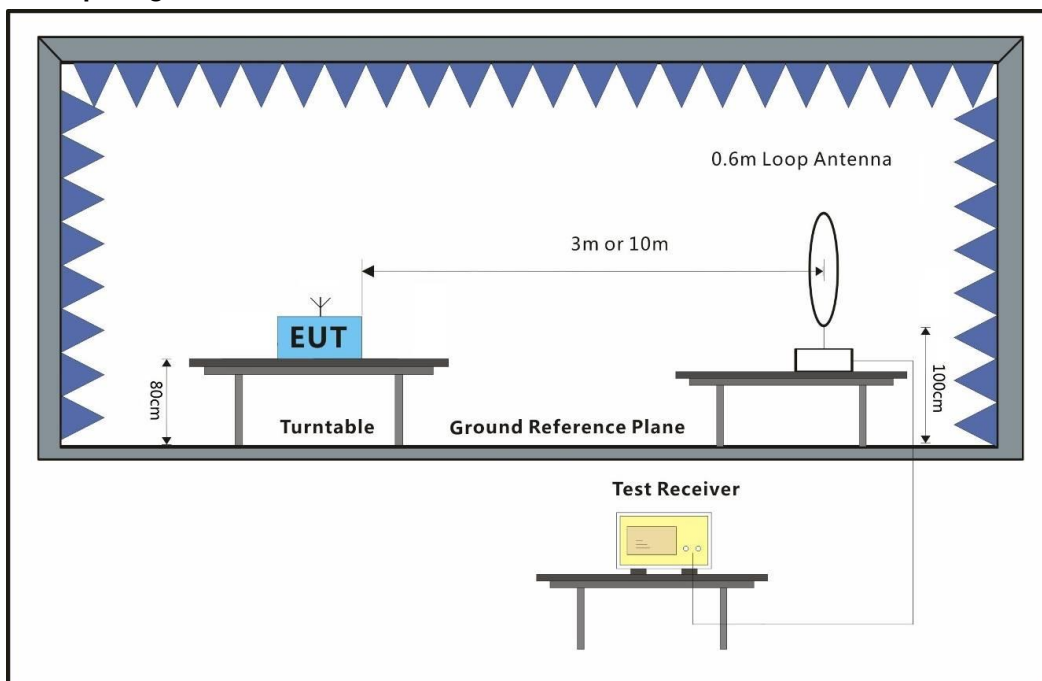
Humidity: 42.8 % RH

Atmospheric Pressure: 1020 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode(125KHz)_Keep the EUT in transmitting mode

7.2.3 Test Setup Diagram



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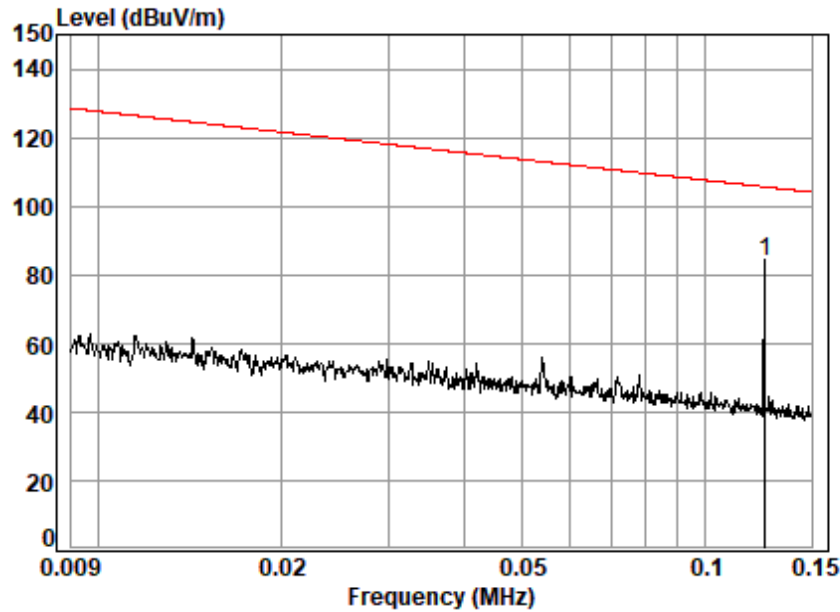
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7.2.4 Measurement Procedure and Data



Site : chamber
Condition: 3m
Job No. : 00029AT
Test Mode: 02

	Freq	Cable Loss	Ant Factor	Preamplifier Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	0.126	0.29	10.43	31.89	105.26	84.09	105.62	-21.53	Average



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7.3 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.215

Test Method: ANSI C63.10 (2013) Section 6.9

7.3.1 E.U.T. Operation

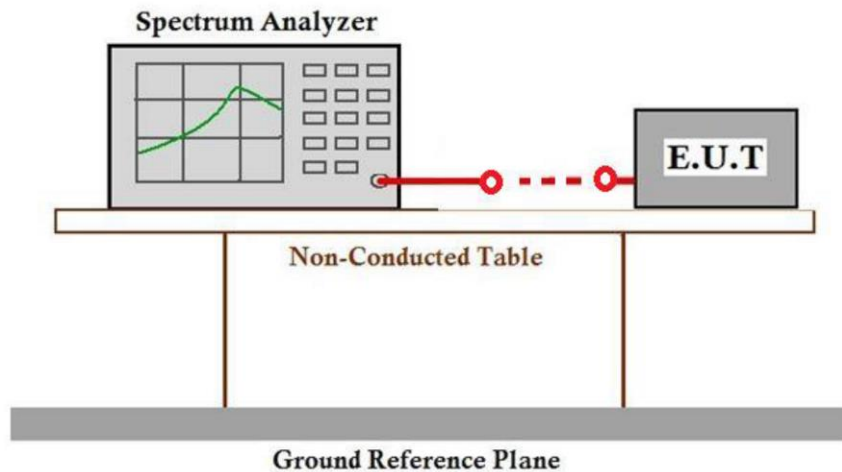
Operating Environment:

Temperature: 24.9 °C Humidity: 42.8 % RH Atmospheric Pressure: 1020 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode(125KHz)_Keep the EUT in continuously transmitting mode

7.3.3 Test Setup Diagram



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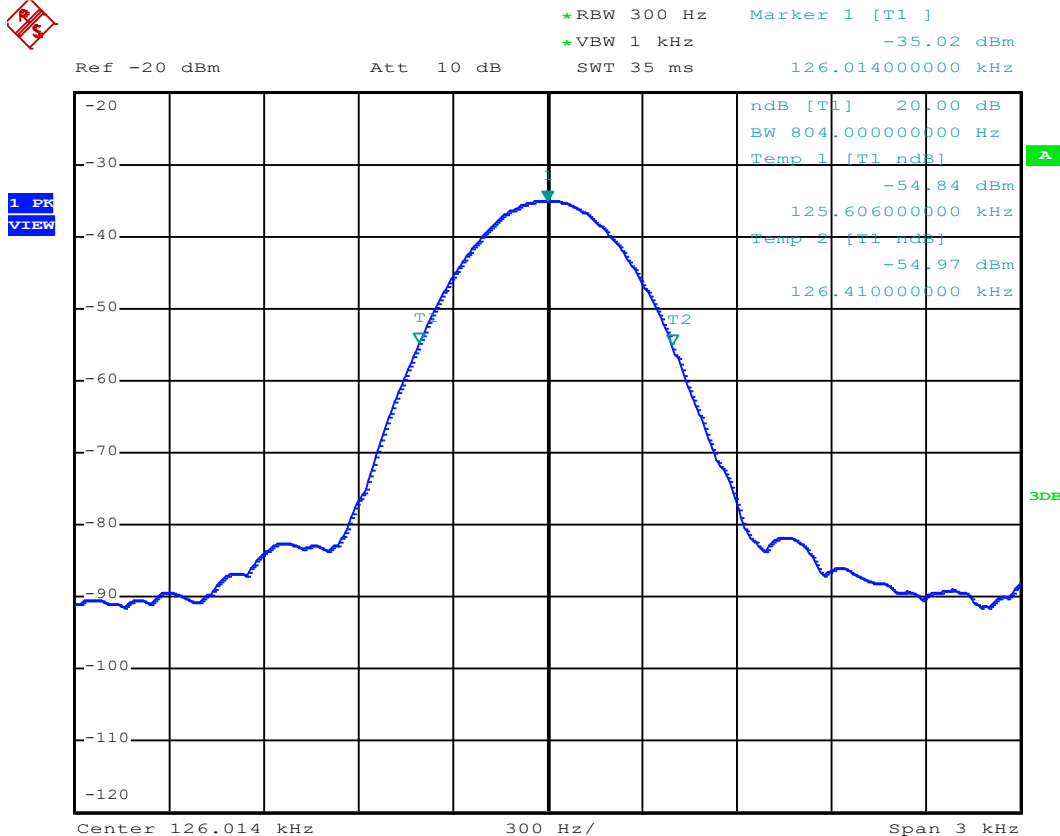
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7.3.4 Measurement Procedure and Data

Test Frequency(kHz)	20dB bandwidth(kHz)	Limit(kHz)	Results
126	0.804	N/A	Pass



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7.4 Radiated Emissions (9kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.4&6.5

Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength (microvolts/meter)	Limit (dBuV/m)	Detector	Measurement Distance (meters)
0.009-0.490	2400/F(kHz)	-	-	300
0.490-1.705	24000/F(kHz)	-	-	30
1.705-30	30	-	-	30

Below 30MHz

If field strength is measured at only a single point, then that point shall be at the radial from the EUT that produces the maximum emission at the frequency being measured, as described in 5.4. If that point is closer to the EUT than $\lambda/2\pi$ and the limit distance is greater than $\lambda/2\pi$, the measurement shall be extrapolated to the limit distance by conservatively presuming that the field strength decreases at a 40 dB/decade of distance rate to the $\lambda/2\pi$ distance, and at a 20 dB/decade of distance rate beyond $\lambda/2\pi$. This shall be accomplished using Equation (2):

$$FS_{(10m)} = FS_{(30/300m)} + 40\log\{d_{(near\ field)}/d_{(10m)}\} + 20\log\{d_{(30/300m)}/d_{(near\ field)}\} \quad (2)$$

If the single point measured is at a distance greater than $\lambda/2\pi$, then extrapolation to the limit distance shall be calculated using Equation (3):

$$FS_{(10m)} = FS_{(30/300m)} + 20\log\{d_{(30/300m)}/d_{(10m)}\} \quad (3)$$

If both the single point and the limit distance are equal to or closer to the EUT than $\lambda/2\pi$, then extrapolation to the limit distance shall be calculated using Equation (4):

$$FS_{(10m)} = FS_{(30/300m)} + 40\log\{d_{(30/300m)}/d_{(10m)}\} \quad (4)$$

Remark:

$$d_{near\ field} = 47.77 / f_{MHz}$$

where f_{MHz} is the frequency of the emission being measured in MHz.

Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor



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$$FS_{\text{limit}} = FS_{\text{max}} - 40 \log \left(\frac{d_{\text{limit}}}{d_{\text{measure}}} \right)$$

where

FS_{limit} is the calculation of field strength at the limit distance, expressed in dBμV/m
 FS_{max} is the measured field strength, expressed in dBμV/m
 d_{measure} is the distance of the measurement point from the EUT
 d_{limit} is the reference distance or the distance of the $\lambda/2\pi$ point

r

7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 22.2 °C Humidity: 51.3 % RH Atmospheric Pressure: 1020 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode(125KHz)_Keep the EUT in continuously transmitting mode



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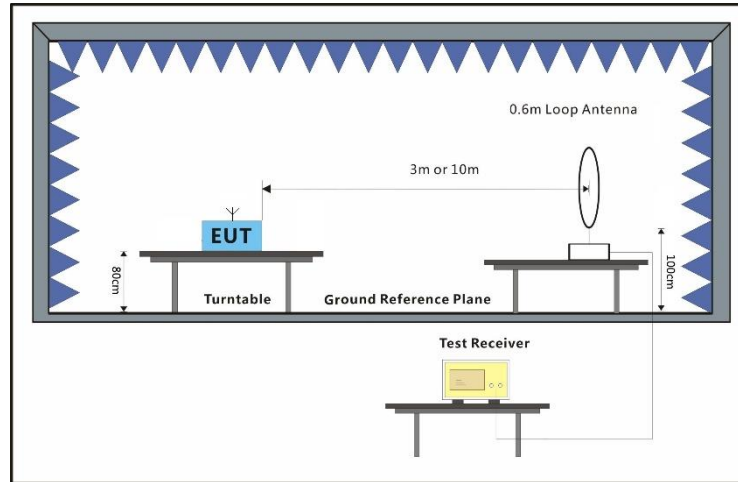
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7.4.3 Test Setup Diagram



7.4.4 Measurement Procedure and Data

For testing performed with the loop antenna, the center of the loop was positioned 1 m above the ground and positioned with its plane vertical at the specified distance from the EUT. During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane. Only the worst position of vertical was shown in the report.



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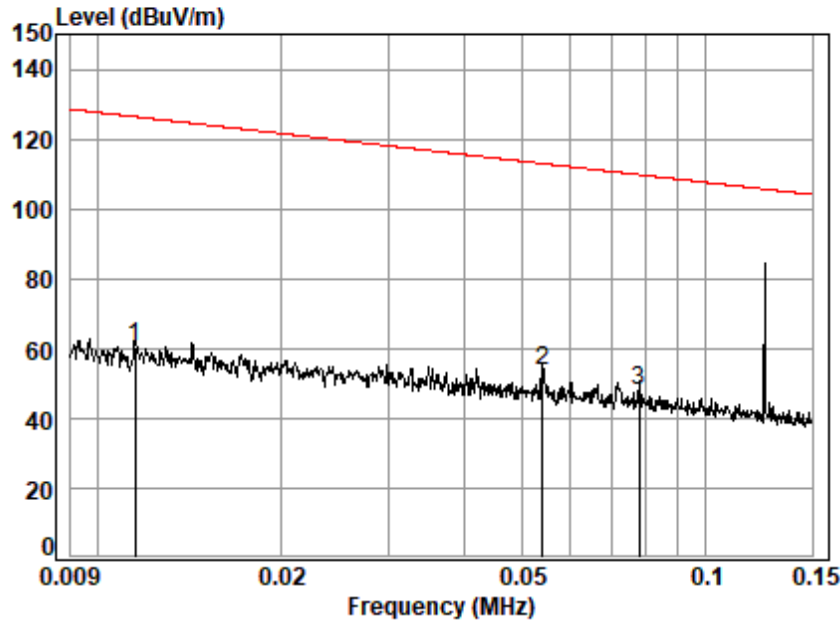
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9KHz-150KHz



Site : chamber

Condition: 3m

Job No. : 00029AT

Test Mode: 02

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	0.011	0.29	17.34	30.49	73.10	60.24	126.39	-66.15	Average
2	0.054	0.30	10.93	31.50	74.06	53.79	112.95	-59.16	Average
3	0.078	0.30	10.62	31.74	68.49	47.67	109.78	-62.11	Average



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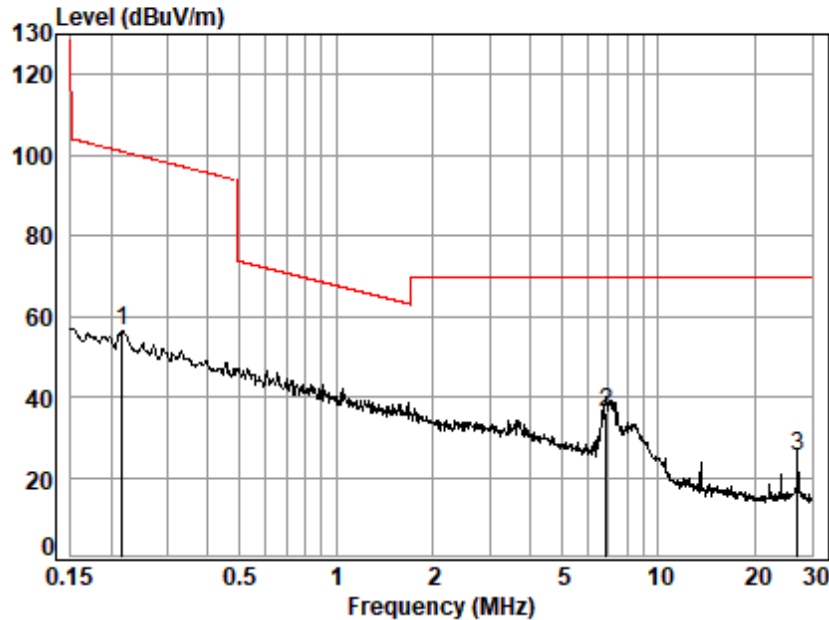
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150KHz-30MHz



Site : chamber

Condition: 3m

Job No. : 00029AT

Test Mode: 02

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	0.217	0.28	10.36	31.87	77.83	56.60	100.86	-44.26	Average
2	6.914	0.49	9.69	31.55	57.57	36.20	69.54	-33.34	QP
3	27.127	0.23	6.16	31.41	50.32	25.30	69.54	-44.24	QP



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7.5 Radiated Emissions (30MHz-1GHz)

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.4&6.5

Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 23.2 °C

Humidity: 52.6 % RH

Atmospheric Pressure: 1020 mbar

7.5.2 Test Mode Description

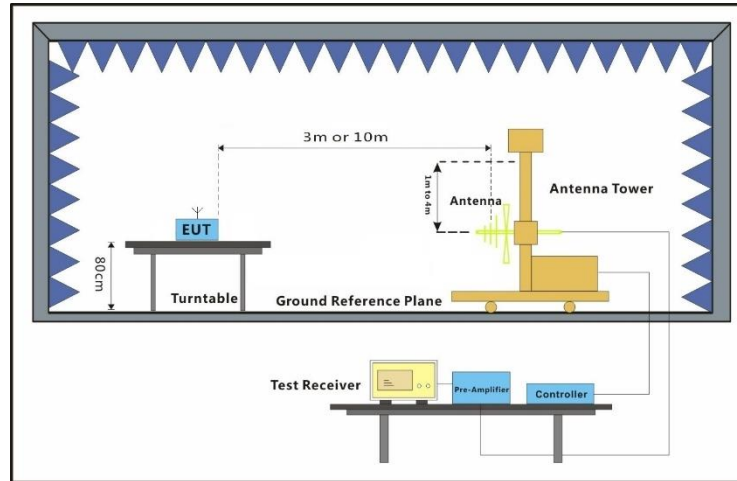
Pre-scan / Final test	Mode Code	Description
Final test	02	TX mode(125KHz)_Keep the EUT in continuously transmitting mode



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7.5.3 Test Setup Diagram



7.5.4 Measurement Procedure and Data

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground for below 1GHz at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. g. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report. Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor



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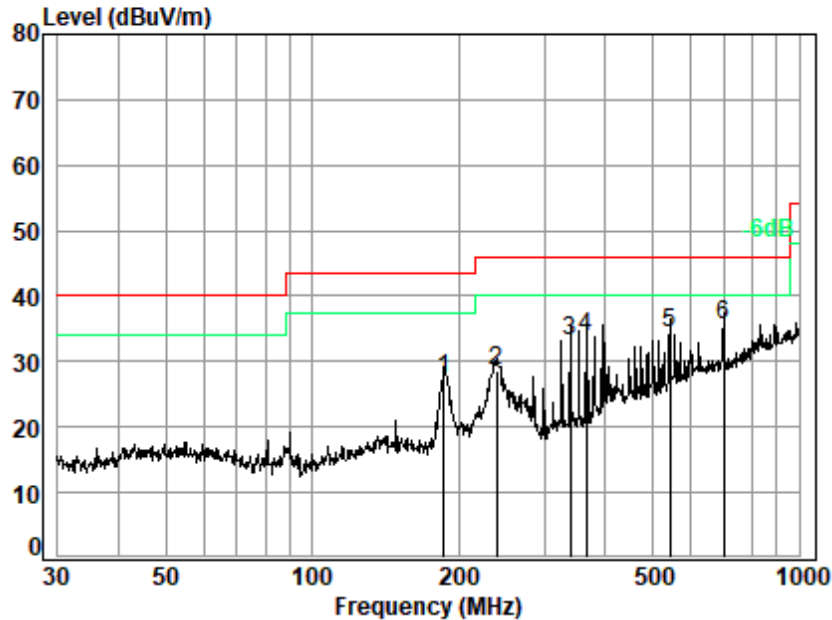
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Test Mode: 02; Polarity: Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 00029AT
Mode : 02

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	186.441	0.68	15.74	25.49	36.30	27.23	43.50	-16.27	QP
2	239.147	0.82	16.35	25.44	36.83	28.56	46.00	-17.44	QP
3	339.589	1.42	19.79	25.42	37.48	33.27	46.00	-12.73	QP
4	365.539	1.57	19.74	25.44	38.04	33.91	46.00	-12.09	QP
5	543.274	1.80	23.74	25.27	34.23	34.50	46.00	-11.50	QP
6	699.305	1.73	25.62	24.57	32.73	35.51	46.00	-10.49	QP



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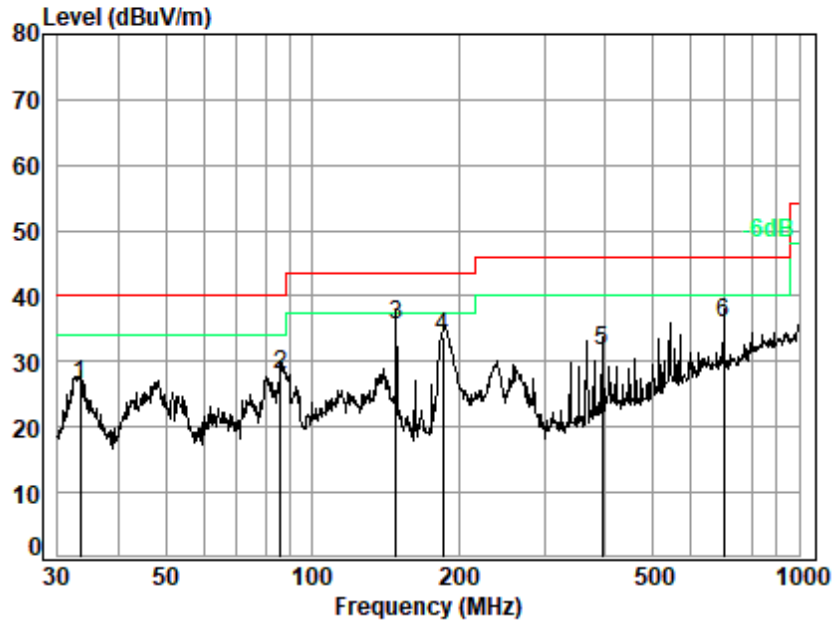
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Test Mode: 02; Polarity: Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 00029AT
Mode : 02

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	33.445	0.19	15.30	26.02	37.00	26.47	40.00	-13.53	QP
2	86.200	0.61	13.73	25.73	39.48	28.09	40.00	-11.91	QP
3	148.963	0.91	17.43	25.53	42.85	35.66	43.50	-7.84	QP
4	185.788	0.68	15.78	25.49	42.69	33.66	43.50	-9.84	QP
5	393.472	1.66	20.62	25.45	34.92	31.75	46.00	-14.25	QP
6	701.761	1.73	25.67	24.56	33.10	35.94	46.00	-10.06	QP



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8 Test Setup Photo

Refer to Appendix - Test Setup Photo for FYCR2302000029AT

9 EUT Constructional Details (EUT Photos)

Refer to Appendix – External and Internal Photos for FYCR2302000029AT

- End of the Report -



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