FCC PART 15 SUBPART C TEST REPORT

Report Reference No.....:	**CTA21112400103**
FCC ID..... :	**2AVAI-NF4X**
Compiled by (position+printed name+signature)..:	File administrators Kevin Liu
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Date of issue.....:	Nov. 24, 2021
Testing Laboratory Name .....:	**Shenzhen CTA Testing Technology Co., Ltd.**
Address.....:	Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao‘an District, Shenzhen, China
Applicant’s name.....:	**Serialio Ltd.**
Address .....:	715 Discovery Blvd, Ste 510, Cedar Park, TX 78613, USA
Test specification .....**:**	
Standard .....:	**FCC Rules and Regulations Part 15 Subpart C (Section 15.207 &15.209),ANSI C63.10: 2013**

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Test item description .....:	IdChamp NF4 Reader/Writer
Trade Mark .....:	**idChamp®**
Manufacturer .....:	Serialio Ltd.
Model/Type reference.....:	NF4x
Listed Models .....:	NF4x-SM-STD, NF4x-SM-iCL, NF4x-DM-STD, NF4x-DM-iCL
Modulation Type .....:	ASK
Operation Frequency.....:	125KHz
Hardware Version .....:	4
Software Version .....:	BLE FW NF4-1.0.1.59 MG App 6.12
Rating .....:	DC 5.0V From external circuit
Result.....:	Pass

TEST REPORT

Equipment under Test	:	IdChamp NF4 Reader/Writer
Model /Type	:	NF4x
Listed Models	:	NF4x-SM-STD, NF4x-SM-iCL, NF4x-DM-STD, NF4x-DM-iCL
Applicant	:	**Serialio Ltd.**
Address	:	715 Discovery Blvd, Ste 510, Cedar Park, TX 78613, USA
Manufacturer	:	**Serialio Ltd.**
Address	:	715 Discovery Blvd, Ste 510, Cedar Park, TX 78613, USA

Test Result:	**PASS**

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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1 TEST STANDARDS

The tests were performed according to following standards:
FCC Rules and Regulations Part 15 Subpart C (Section 15.207): Conducted limits.
FCC Rules and Regulations Part 15 Subpart C (Section 15.209): Radiated emission limits; general requirements.
ANSI C63.10: 2013: American National Standard for Testing Unlicensed Wireless Devices

2 SUMMARY

2.1 General Remarks

Date of receipt of test sample	:	Nov. 01, 2021
Testing commenced on	:	Nov. 01, 2021
Testing concluded on	:	Nov. 24, 2021

2.2 Product Description

Product Name:	IdChamp NF4 Reader/Writer
Model/Type reference:	NF4x
Power supply:	DC 5.0V From external circuit
Adapter:	Model: EP-TA20CBC Input:AC 100-240V 50/60Hz Output:DC 5V 2A
Testing sample ID:	CTA211124001-1# (Engineer sample), CTA211124001-2# (Normal sample)
125KHz	
Operation frequency:	125KHz
Modulation :	ASK
No. of Channel :	1
Antenna type:	Loop Antenna
Antenna gain:	0.00 dBi

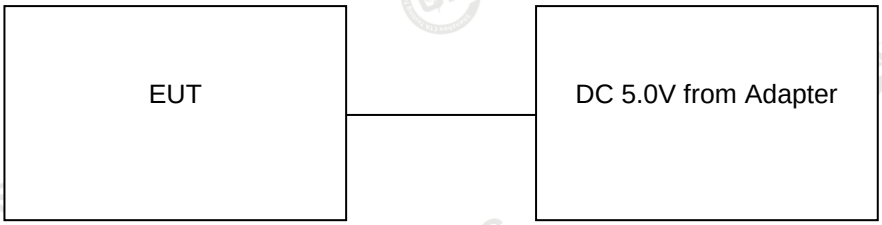
2.3 Equipment under Test

Power supply system utilised

Power supply voltage	:	○	230V / 50 Hz	○	120V / 60Hz
		○	12 V DC	○	24 V DC
		●	Other (specified in blank below)		

DC 5.0V From External circuit

2.4 Block Diagram of Test Setup



2.5 Description of the test mode

Operation Frequency each of channel	
Channel	Frequency
1	125KHz

Operating Mode
The mode is used: Transmitting mode

2.6 Special Accessories

Follow auxiliary equipment(s) test with EUT that provided by the manufacturer or laboratory is listed as follow:

Description	Manufacturer	Model	Technical Parameters	Certificate	Provided by
/	/	/	/	/	/
/	/	/	/	/	/

2.7 Modifications

No modifications were implemented to meet testing criteria.

3 TEST ENVIRONMENT

3.1 Address of the test laboratory

Shenzhen Global Test Service Co.,Ltd.
Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community,Fuhai Street, Bao'an District, Shenzhen, China

3.2 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:
FCC-Registration No.: 517856 Designation Number: CN1318

Shenzhen CTA Testing Technology Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

A2LA-Lab Cert. No.: 6534.01

Shenzhen CTA Testing Technology Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010.

3.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:
Radiated Emission:

Temperature:	24 ° C
Humidity:	45 %
Atmospheric pressure:	950-1050mbar

AC Power Conducted Emission:

Temperature:	25 ° C
Humidity:	46 %
Atmospheric pressure:	950-1050mbar

Conducted testing:

Temperature:	25 ° C
Humidity:	44 %
Atmospheric pressure:	950-1050mbar

3.4 Summary of measurement results

DESCRIPTION OF TEST	RESULT
CONDUCTED EMISSIONS TEST	COMPLIANT
RADIATED EMISSION TEST	COMPLIANT
OCCUPIED BANDWIDTH MEASUREMENT	COMPLIANT
ANTENNA REQUIREMENT	COMPLIANT

3.5 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen CTA Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen CTA laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.06 dB	(1)
Radiated Emission	1~18GHz	5.14 dB	(1)
Radiated Emission	18-40GHz	5.38 dB	(1)
Conducted Disturbance	0.15~30MHz	2.14 dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3.6 Equipments Used during the Test

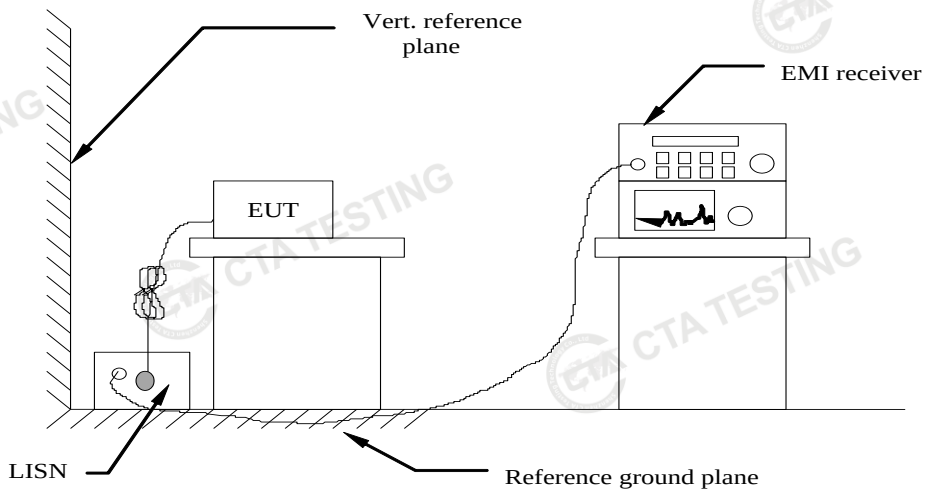
Test Equipment	Manufacturer	Model No.	Equipment No.	Calibration Date	Calibration Due Date
LISN	R&S	ENV216	CTA-308	2021/08/06	2022/08/05
LISN	R&S	ENV216	CTA-314	2021/08/06	2022/08/05
EMI Test Receiver	R&S	ESPI	CTA-307	2021/08/06	2022/08/05
EMI Test Receiver	R&S	ESCI	CTA-306	2021/08/06	2022/08/05
Spectrum Analyzer	Agilent	N9020A	CTA-301	2021/08/06	2022/08/05
Spectrum Analyzer	R&S	FSP	CTA-337	2021/08/06	2022/08/05
Vector Signal generator	Agilent	N5182A	CTA-305	2021/08/06	2022/08/05
Analog Signal Generator	R&S	SML03	CTA-304	2021/08/06	2022/08/05
Universal Radio Communication	CMW500	R&S	CTA-302	2021/08/06	2022/08/05
Temperature and humidity meter	Chigo	ZG-7020	CTA-326	2021/08/06	2022/08/05
Ultra-Broadband Antenna	Schwarzbeck	VULB9163	CTA-310	2021/08/07	2022/08/06
Horn Antenna	Schwarzbeck	BBHA 9120D	CTA-309	2021/08/07	2022/08/06
Loop Antenna	Zhinan	ZN30900C	CTA-311	2021/08/07	2022/08/06
Horn Antenna	Beijing Hangwei Dayang	OBH100400	CTA-336	2021/08/06	2022/08/05
Amplifier	Schwarzbeck	BBV 9745	CTA-312	2021/08/06	2022/08/05
Amplifier	Taiwan chengyi	EMC051845B	CTA-313	2021/08/06	2022/08/05
Directional coupler	NARDA	4226-10	CTA-303	2021/08/06	2022/08/05
High-Pass Filter	XingBo	XBLBQ-GTA18	CTA-402	2021/08/06	2022/08/05
High-Pass Filter	XingBo	XBLBQ-GTA27	CTA-403	2021/08/06	2022/08/05
Automated filter bank	Tonscend	JS0806-F	CTA-404	2021/08/06	2022/08/05
Power Sensor	Agilent	U2021XA	CTA-405	2021/08/06	2022/08/05
Amplifier	Schwarzbeck	BBV9719	CTA-406	2021/08/06	2022/08/05

Note: The Cal.Interval was one year.

4 TEST CONDITIONS AND RESULTS

4.1 AC Power Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

1, The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10.
2, Support equipment, if needed, was placed as per ANSI C63.10.
3, All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
4, If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5, All support equipments received AC power from a second LISN, if any.
6, The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7, Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.

AC Power Conducted Emission Limit

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following：

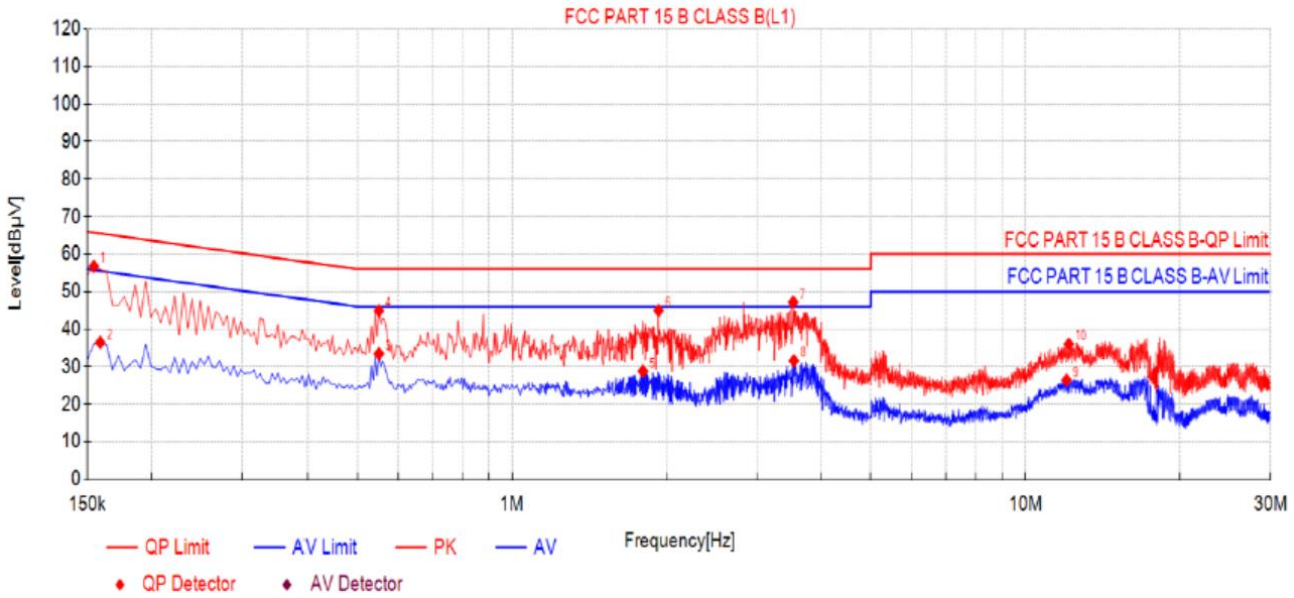
Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
* Decreases with the logarithm of the frequency.		

TEST RESULTS

Remark:

1. Both 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz power supply have been tested, only the worst result of 120 VAC, 60 Hz was reported as below:.

Power supply:	DC 5V from Adapter AC 120V/60Hz	Polarization	L



Suspected List

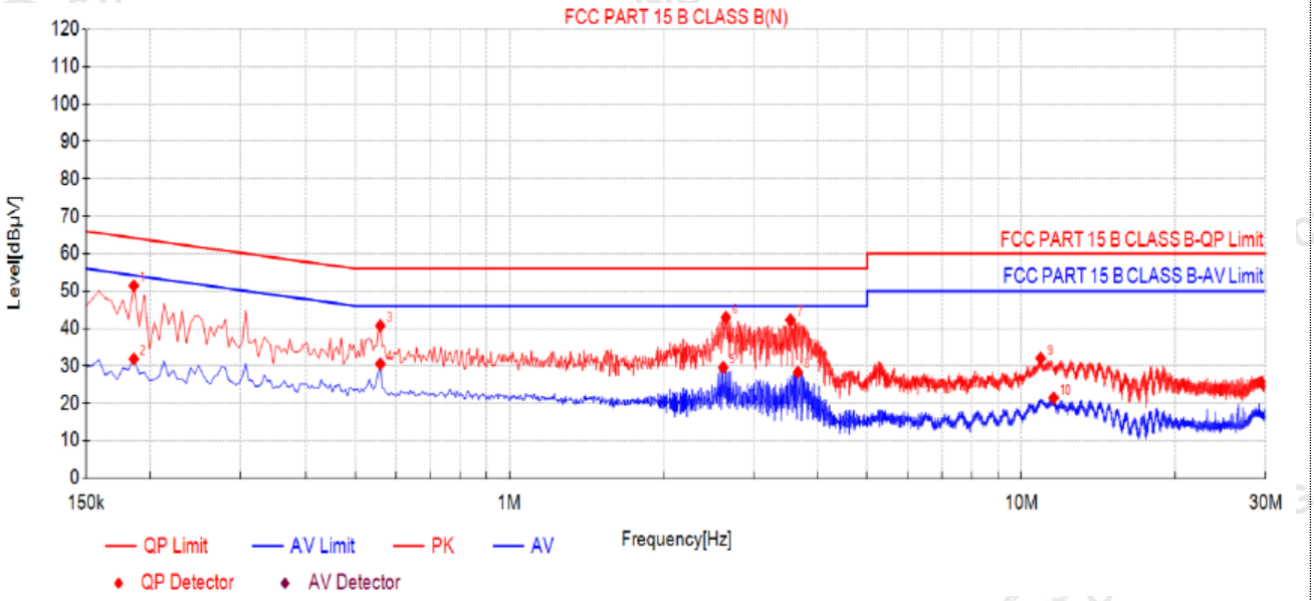
NO.	Freq. [MHz]	Reading [dBµV]	Level [dBµV]	Factor [dB]	Limit [dBµV]	Margin [dB]	Detector	Type	Verdict
1	0.1545	46.27	56.77	10.50	65.75	8.98	Qp	L1	PASS
2	0.159	25.95	36.45	10.50	55.52	19.07	AV	L1	PASS
3	0.5505	22.92	33.42	10.50	46.00	12.58	AV	L1	PASS
4	0.5505	34.41	44.91	10.50	56.00	11.09	Qp	L1	PASS
5	1.8015	18.29	28.79	10.50	46.00	17.21	AV	L1	PASS
6	1.932	34.48	44.98	10.50	56.00	11.02	Qp	L1	PASS
7	3.534	36.67	47.17	10.50	56.00	8.83	Qp	L1	PASS
8	3.543	21.09	31.59	10.50	46.00	14.41	AV	L1	PASS
9	12.0255	15.93	26.43	10.50	50.00	23.57	AV	L1	PASS
10	12.1515	25.51	36.01	10.50	60.00	23.99	Qp	L1	PASS

Note:1). Level (dBµV)= Reading (dBµV) + Factor (dB)

2)Factor (dB)=insertion loss of LISN (dB) + Cable loss (dB)

3). Margin(dB) = Limit (dBµV) - Level (dBµV)

Power supply:	DC 5V from Adapter AC 120V/60Hz	Polarization	N



Suspected List

NO.	Freq. [MHz]	Reading [dBµV]	Level [dBµV]	Factor [dB]	Limit [dBµV]	Margin [dB]	Detector	Type	Verdict
1	0.186	40.95	51.45	10.50	64.21	12.76	Qp	N	PASS
2	0.186	21.36	31.86	10.50	54.21	22.35	AV	N	PASS
3	0.5595	30.23	40.73	10.50	56.00	15.27	Qp	N	PASS
4	0.5595	20.02	30.52	10.50	46.00	15.48	AV	N	PASS
5	2.6205	19.07	29.57	10.50	46.00	16.43	AV	N	PASS
6	2.652	32.43	42.93	10.50	56.00	13.07	Qp	N	PASS
7	3.543	31.74	42.24	10.50	56.00	13.76	Qp	N	PASS
8	3.6645	17.81	28.31	10.50	46.00	17.69	AV	N	PASS
9	10.914	21.52	32.02	10.50	60.00	27.98	Qp	N	PASS
10	11.5665	10.93	21.43	10.50	50.00	28.57	AV	N	PASS

Note:1). Level (dBµV)= Reading (dBµV) + Factor (dB)
2)Factor (dB)=insertion loss of LISN (dB) + Cable loss (dB)
3). Margin(dB) = Limit (dBµV) - Level (dBµV)

4.2 Radiated Emission

Limit

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission out of authorized band shall not exceed the following table at a 3 meters measurement distance.

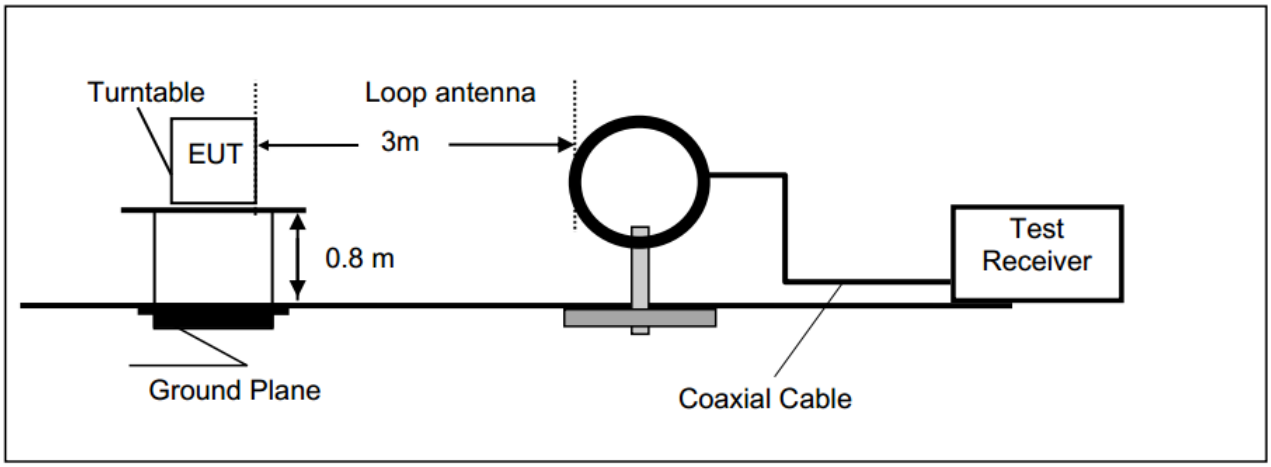
In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a)

Radiated emission limits

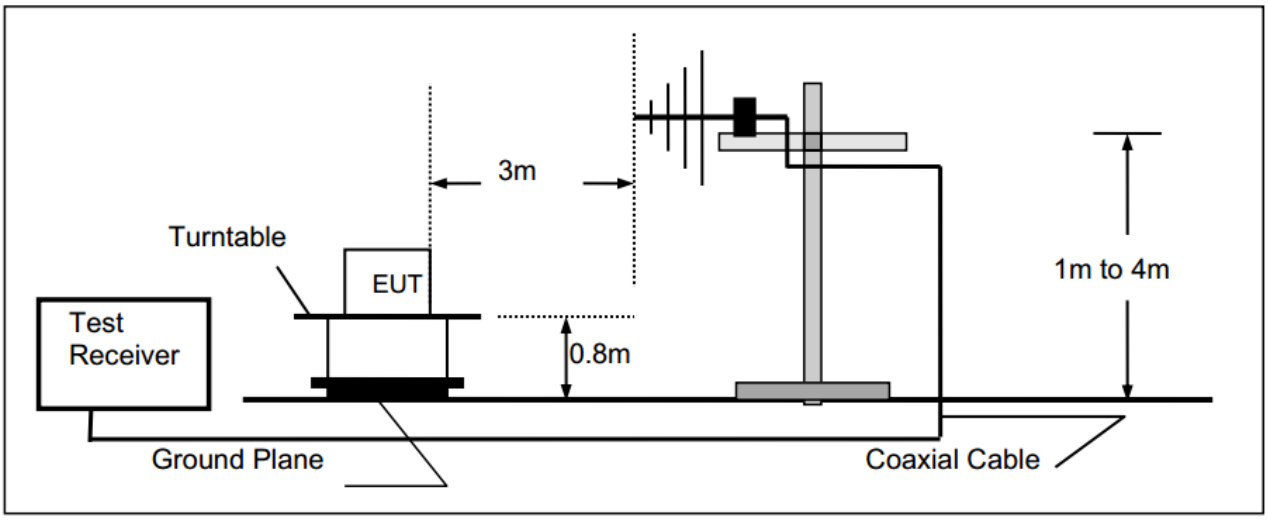
Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
1.705-30	3	20log(30)+ 40log(30/3)	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

TEST CONFIGURATION

Radiated Emission Test Set-Up, Frequency Below 30MHz



Radiated Emission Test Set-Up, Frequency below 1000MHz



Test Procedure

1. Below 1GHz measurement the EUT is placed on a turntable which is 0.8m above ground plane.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. Radiated emission test frequency band from 9KHz to 1000MHz.
6. The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Bilog Antenna	3

7. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz,Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz,Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz,Sweep time=Auto	QP

TEST RESULTS

For 9 KHz-30MHz

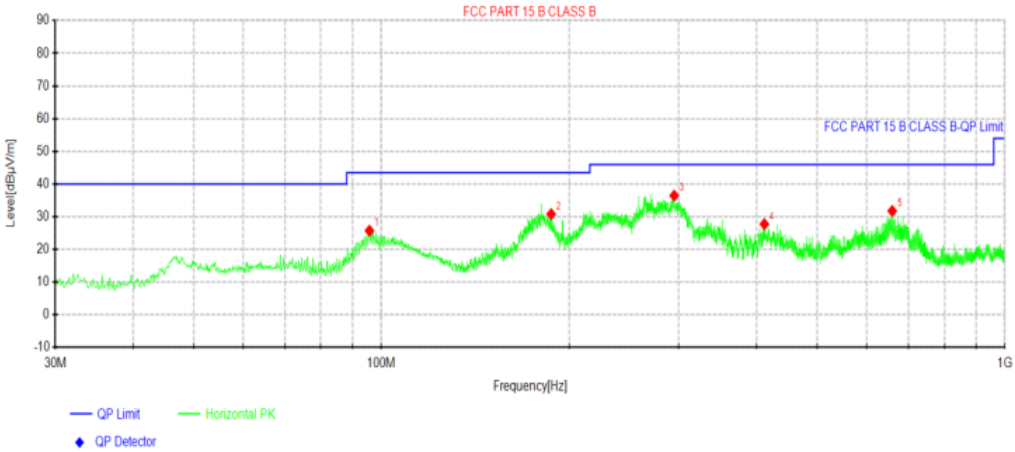
WORST-CASE RADIATED EMISSION BELOW 30 MHz

Frequency	Reading	Polar	Antenna Factor	Cable Loss	Emission Levels	Limits at 3m	Margin	Detector Mode
(MHz)	(dBμV/m)	Loop	(dB/m)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
0.125(F)	42.70	Loop	23.6	0.02	66.32	105.67	39.35	PK
0.125(F)	24.87	Loop	23.6	0.02	48.49	85.67	37.18	AV
0.110	31.79	Loop	23.51	0.02	55.32	106.78	51.46	PK
0.110	23.34	Loop	23.51	0.02	46.87	86.78	39.91	AV
0.25	27.98	Loop	23.7	-0.15	51.53	99.65	48.12	QP
0.375	23.45	Loop	24.1	-0.23	47.32	96.12	48.80	QP
2.525	20.76	Loop	24.55	-0.49	44.82	69.54	24.72	QP
––	––	––	––	––	––	––		––

Remark:
1. Data of measurement within this frequency range shown "-- in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits and not recorded.
2. The test limit distance is 3m limit.
3. PK means Peak Value, QP means Quasi Peak Value, AV means Average Value.
4. F means Fundamental Frequency.
5. Emission level (dBuV/m) =Reading + Antenna Factor + Cable Loss.
6. Margin value = Limit value- Emission level.

For 30MHz-1GHz

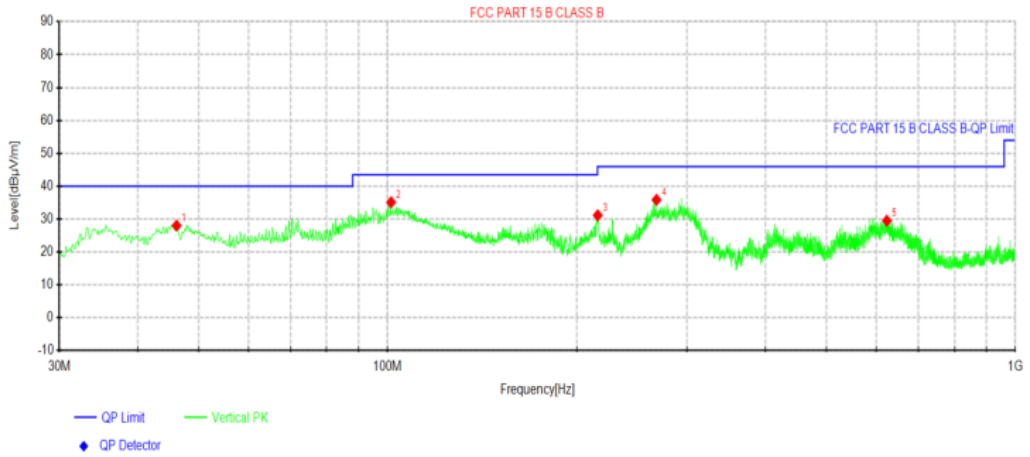
Horizontal



Suspected Data List									
NO.	Freq. [MHz]	Reading [dBµV]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	95.7175	44.79	25.76	-19.03	43.50	17.74	100	148	Horizontal
2	187.261	50.90	30.82	-20.08	43.50	12.68	100	163	Horizontal
3	294.931	53.90	36.48	-17.42	46.00	9.52	100	327	Horizontal
4	411.452	43.21	27.77	-15.44	46.00	18.23	100	357	Horizontal
5	659.772	43.80	31.80	-12.00	46.00	14.20	100	94	Horizontal

Note:1).Level (dBµV/m)= Reading (dBµV)+ Factor (dB/m)
2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)
3). Margin(dB) = Limit (dBµV/m) - Level (dBµV/m)

Vertical



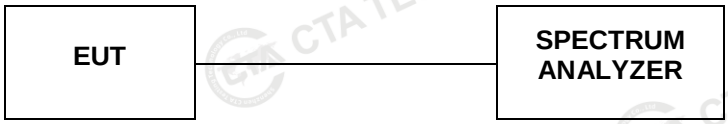
Suspected Data List

NO.	Freq. [MHz]	Reading [dBµV]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	46.1262	44.39	28.03	-16.36	40.00	11.97	100	71	Vertical
2	101.295	53.56	35.14	-18.42	43.50	8.36	100	118	Vertical
3	216.118	50.09	31.17	-18.92	46.00	14.83	100	71	Vertical
4	268.135	53.58	35.88	-17.70	46.00	10.12	100	171	Vertical
5	624.125	41.70	29.52	-12.18	46.00	16.48	100	156	Vertical

Note:1).Level (dBµV/m)= Reading (dBµV)+ Factor (dB/m)
2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)
3). Margin(dB) = Limit (dBµV/m) - Level (dBµV/m)

4.3 Occupied Bandwidth

TEST CONFIGURATION



TEST PROCEDURE

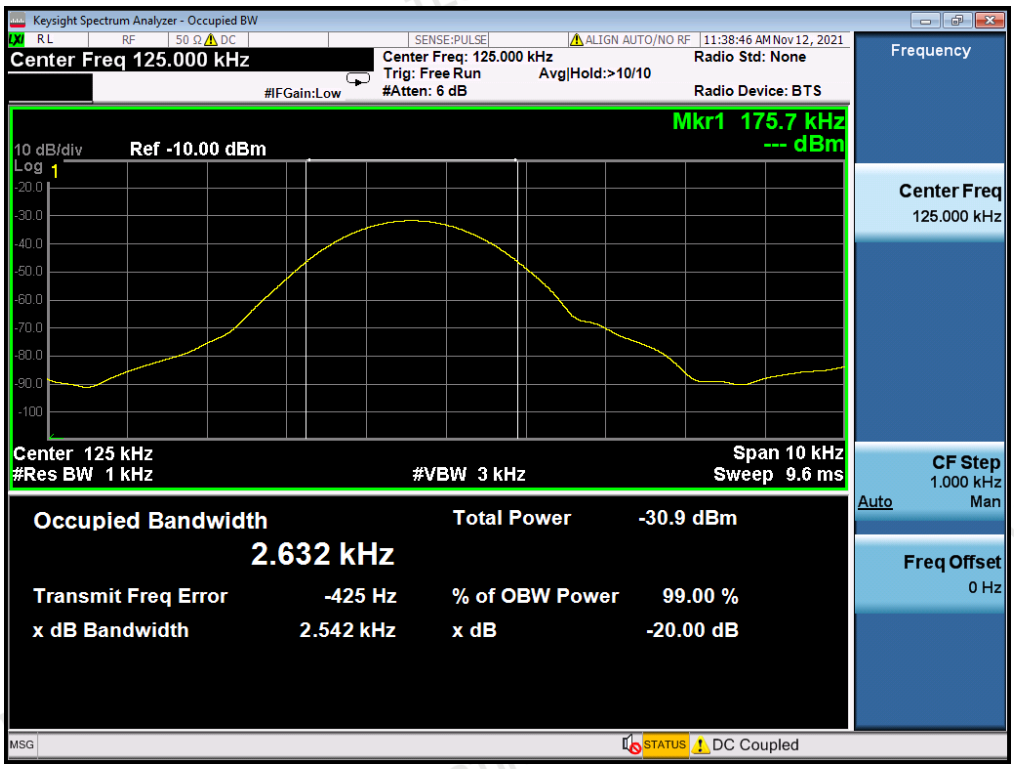
Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that 20dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equip compliance with the 20dB attenuation specification may base on measurement at the intentional radiator's antenna output terminal unless the intentional radiator uses a permanently attached antenna, in which case compliance shall be.deomonstrated by measuring the radiated emissions.

LIMIT

The 20dB bandwidth shall be less than 80% of the permitted frequency band.

TEST RESULTS

Mode	Freq (KHz)	20dB Bandwidth (KHz)	99% OBW (KHz)	Conclusion
Tx Mode	125	2.542	2.631	PASS



4.4 Antenna Requirement

Standard Applicable

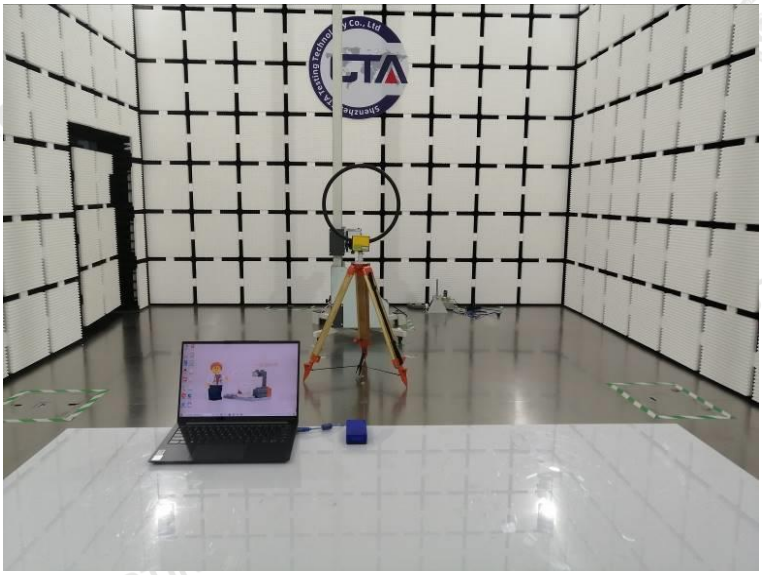
Standard Applicable

For intentional device, according to FCC 47 CFR Section 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 Information

The antenna used in this product is a Loop Antenna, The directional gains of antenna used for transmitting is 0dBi.

5 Test Setup Photos of the EUT



6 Photos of the EUT

Reference to the test report No. **CTA21112400101**

**********End of Report**********