



FCC PART 15C

TEST REPORT

For

AEI Protect-On Systems Limited

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FCC ID: OGJ-DK2822-1

Report Type: Original Report	Product Type: RFID ACCESS CONTROL KEYPAD
Report Number: SZNS210901-45673E-RF	
Report Date: 2021-09-16	
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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

Product	RFID ACCESS CONTROL KEYPAD
Tested Model	DK-2822
Frequency Range	125 kHz
Modulation:	PSK
Antenna Specification	Coil
Voltage Range	DC 12V
Date of Test	2021-09-09 to 2021-09-15
Sample serial number	SZNS210901-45673E-RF-S1
Received date	2021-09-01
Sample/EUT Status	Good Condition

Objective

This report is in accordance with Part 2, Subpart J, and Part 15, Subparts A and C of the Federal Communications Commission's rules.

The objective is to determine the compliance of EUT with FCC rules, section 15.203, 15.205, 15.209, 15.207 and 15.215(c).

Related Submittal(s)/Grant(s)

No Related Submittal(s)/Grant(s).

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All emissions measurement was performed at Shenzhen Accurate Technology Co., Ltd. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		5%
Emissions, Radiated	9KHz-30MHz	2.66 dB
	30MHz - 1GHz	4.28dB
Conducted Emissions	AC Mains	2.72 dB
Temperature		1°C
Humidity		6%
Supply voltages		0.4%

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The test site used by Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 708358, the FCC Designation No.: CN1189. Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 429 7.01.

Listed by Innovation, Science and Economic Development Canada (ISED), the Registration Number is 5077A.

SYSTEM TEST CONFIGURATION

Justification

The system was configured for testing in engineering mode.

EUT Exercise Software

No software used in test.

Support Equipment List and Details

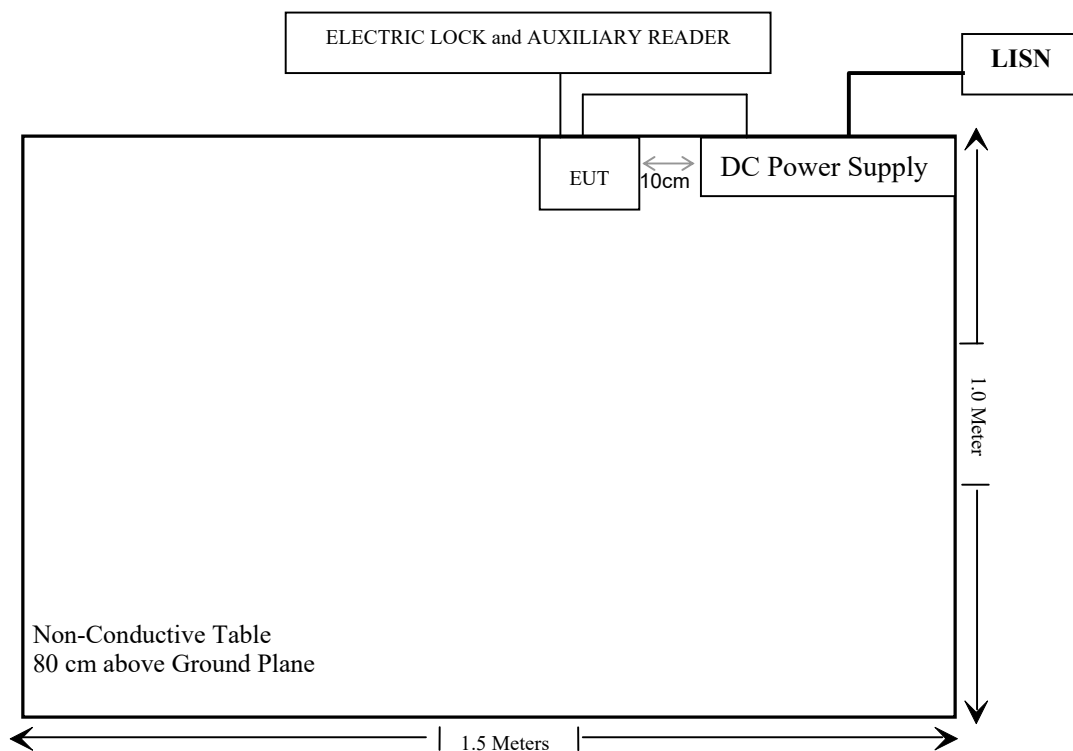
Manufacturer	Description	Model	Serial Number
UNI-T	DC Power Supply	UTP3333TD	Unknown
AEI Protect-On Systems Limited	ELECTRIC LOCK	Lock1	Unknown
AEI Protect-On Systems Limited	AUXILIARY READER	AR-2802	Unknown

External I/O Cable

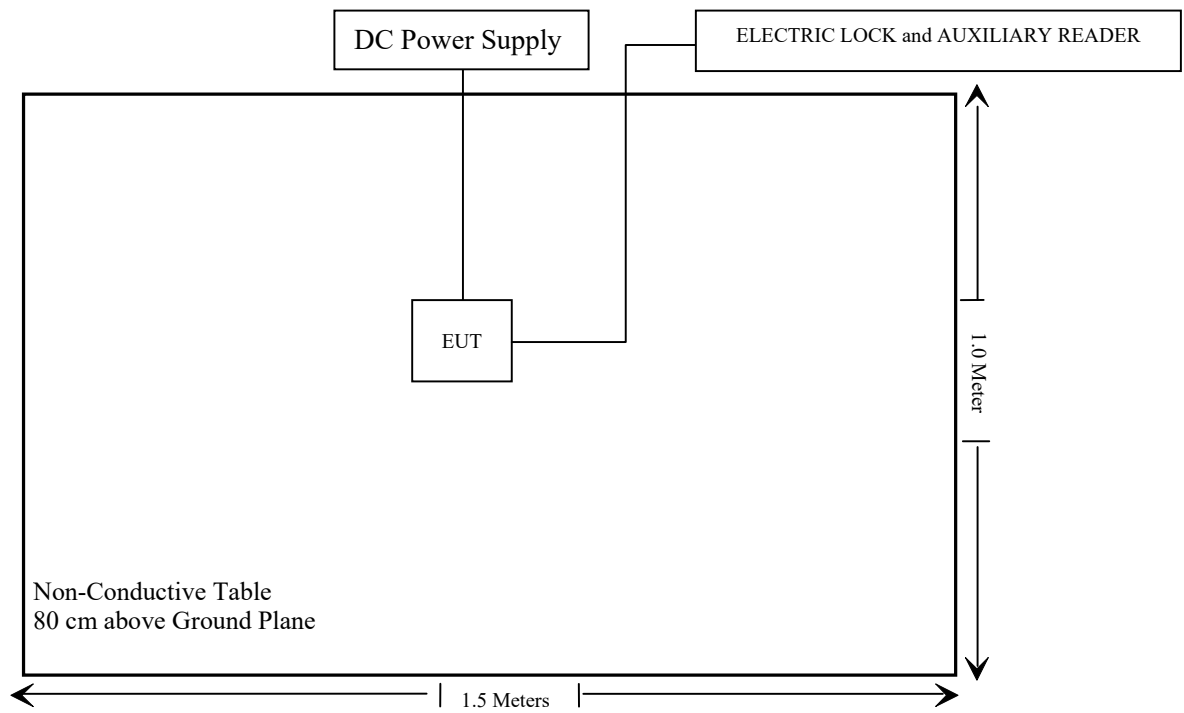
Cable Description	Length (m)	From Port	To
Un-Shielding Detachable DC Cable 1	0.2	DC Power Supply	EUT
Un-Shielding Detachable DC Cable 2	1.2	DC Power Supply	EUT
Un-Shielding Detachable I/O Cable	6.5	ELECTRIC LOCK and AUXILIARY READER	EUT

Block Diagram of Test Setup

For Conducted Emission



For Radiated Emission



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC§15.203	Antenna Requirement	Compliant
FCC§15.207	AC Line Conducted Emission	Compliant
§15.205, §15.209	Radiated Emission Test	Compliant
§15.215 (c)	20 dB Bandwidth	Compliant

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
EMI					
Rohde & Schwarz	Test Receiver	ESPI3	100396	2020/12/24	2021/12/23
Rohde & Schwarz	L.I.S.N.	ESH3-Z5	100305	2020/12/25	2021/12/24
Anritsu Corp	50Ω Coaxial Switch	MP59B	6200506474	2020/12/25	2021/12/24
Schwarzbeck	RF Coaxial Cable	N-2m	No.2	2020/01/04	2023/01/03
Conducted Emission Test Software: ES-K1 V1.71					
Rohde& Schwarz	Test Receiver	ESPI3	100396	2020/12/24	2021/12/23
Rohde& Schwarz	Test Receiver	ESR	102725	2020/12/25	2021/12/24
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2020/01/05	2023/01/04
Schwarzbeck	LOOP Antenna	FMZB1516	1516131	2020/01/05	2023/01/04
SONOMA INSTRUMENT	Amplifier	310 N	186131	2020/12/25	2021/12/24
Anritsu Corp	50 Coaxial Switch	MP59B	6100237248	2020/12/25	2021/12/24
Schwarzbeck	RF Coaxial Cable	N-5m	No.1	2020/01/04	2023/01/03
Schwarzbeck	RF Coaxial Cable	N-1m	No.6	2020/01/04	2023/01/03
SUHNER	RF Coaxial Cable	N-6m	No.10	2020/01/04	2023/01/03
SUHNER	RF Coaxial Cable	N-0.5m	No.15	2020/01/04	2023/01/03
Radiated Emission Test Software: EZ EMC V 1.1.4.2					

* **Statement of Traceability:** Shenzhen Accurate Technology Co., Ltd. attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC§15.203 – ANTENNA REQUIREMENT

Applicable Standard

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 shall be considered sufficient to comply with the provisions of this section.

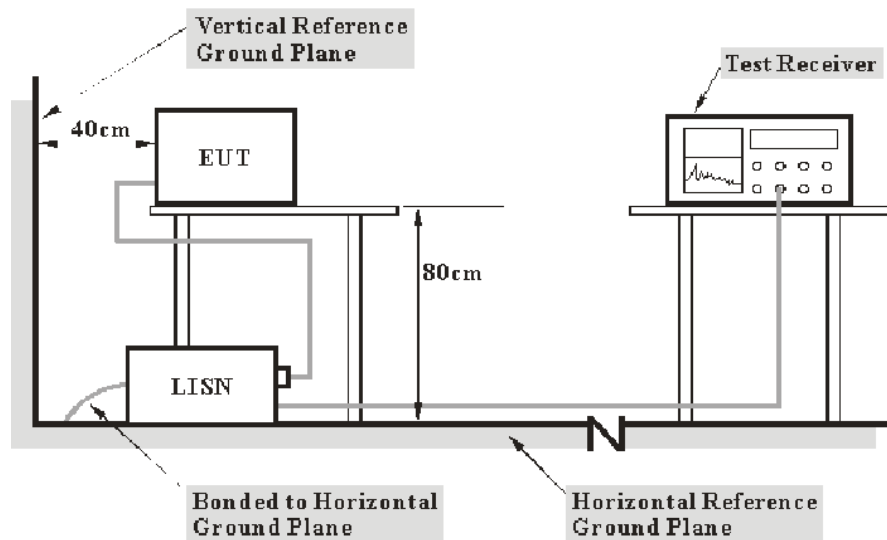
Antenna Connected Construction

The EUT has one internal coil antenna arrangement, which was permanently attached, fulfill the requirement of this section. Please refer to the EUT photos.

Result: Compliant.

FCC §15.207 – AC LINE CONDUCTED EMISSION**Applicable Standard**

FCC§15.207

EUT Setup

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

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the DC supply power was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

Corrected Factor & Margin Calculation

The basic equation is as follows:

Level (QuasiPeak or Average) = Reading Level + Transd Factor

Note:

Transd Factor = Cable loss + Factor of coupling device

The “**Margin**” column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Level

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207.

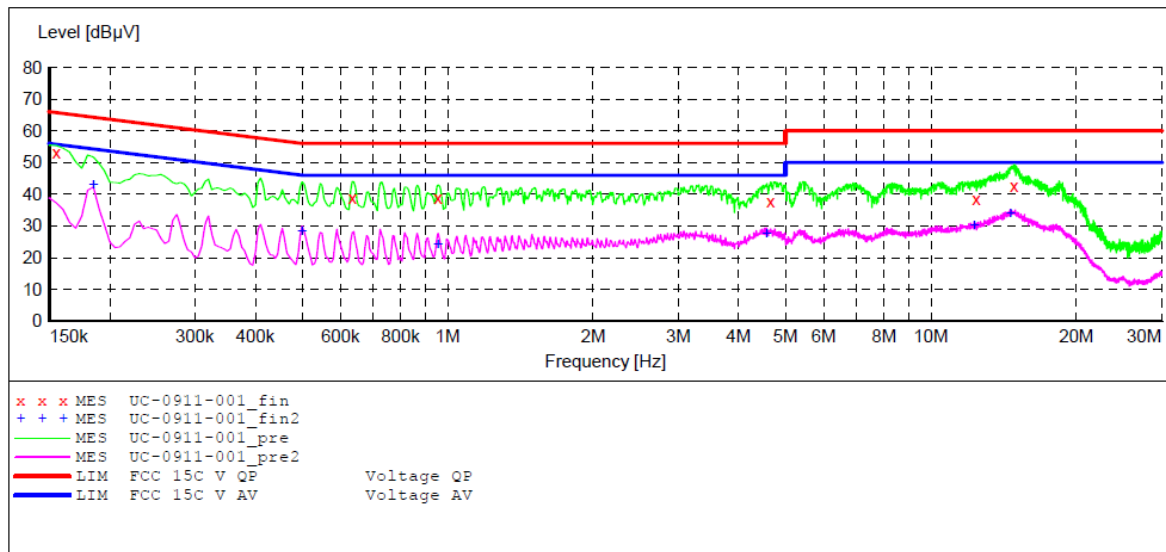
Test Data

Environmental Conditions

Temperature:	25°C
Relative Humidity:	65 %
ATM Pressure:	101.0 kPa

The testing was performed by Black Ding on 2021-09-11.

Test mode: Transimitting

AC 120 V/60 Hz, Line:**MEASUREMENT RESULT: "UC-0911-001_fin"**

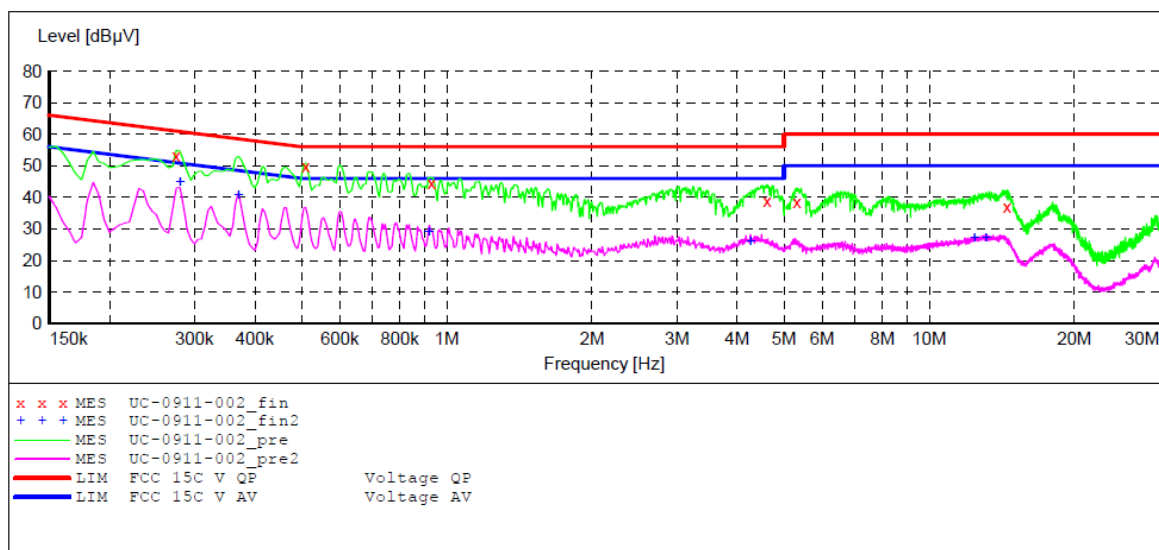
9/11/2020 9:24AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.155000	53.20	10.5	66	12.8	QP	L1	GND
0.635000	38.90	10.8	56	17.1	QP	L1	GND
0.955000	38.70	10.8	56	17.3	QP	L1	GND
4.660000	37.70	11.1	56	18.3	QP	L1	GND
12.400000	38.60	11.3	60	21.4	QP	L1	GND
14.860000	42.60	11.4	60	17.4	QP	L1	GND

MEASUREMENT RESULT: "UC-0911-001_fin2"

9/11/2020 9:24AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.185000	43.10	10.5	54	10.9	AV	L1	GND
0.500000	28.30	10.7	46	17.7	AV	L1	GND
0.955000	24.20	10.8	46	21.8	AV	L1	GND
4.570000	27.70	11.1	46	18.3	AV	L1	GND
12.295000	30.20	11.3	50	19.8	AV	L1	GND
14.605000	33.90	11.4	50	16.1	AV	L1	GND

AC 120V/ 60 Hz, Neutral:**MEASUREMENT RESULT: "UC-0911-002_fin"**

9/11/2020 9:28AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.275000	53.30	10.6	61	7.7	QP	N	GND
0.510000	49.60	10.7	56	6.4	QP	N	GND
0.930000	44.30	10.8	56	11.7	QP	N	GND
4.610000	38.80	11.1	56	17.2	QP	N	GND
5.320000	38.60	11.2	60	21.4	QP	N	GND
14.485000	37.10	11.4	60	22.9	QP	N	GND

MEASUREMENT RESULT: "UC-0911-002_fin2"

9/11/2020 9:28AM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.280000	44.70	10.6	51	6.3	AV	N	GND
0.370000	40.70	10.7	49	8.3	AV	N	GND
0.920000	29.10	10.8	46	16.9	AV	N	GND
4.260000	26.20	11.1	46	19.8	AV	N	GND
12.400000	27.00	11.3	50	23.0	AV	N	GND
13.120000	27.20	11.3	50	22.8	AV	N	GND

FCC §15.205 & §15.209 - RADIATED EMISSIONS TEST

Applicable Standard

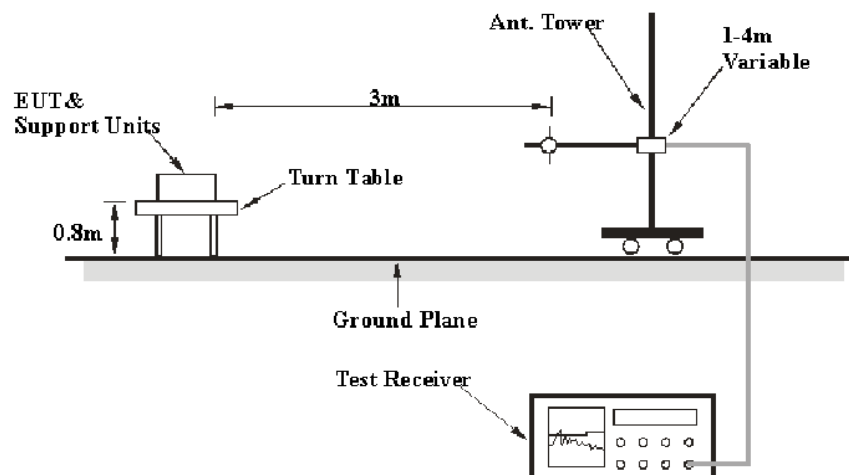
As per FCC Part 15.209

(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:

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

**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.

EUT Setup



The radiated emission tests were performed in the 3-meter chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC Part Subpart C limits.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The system was investigated from 9 kHz to 1 GHz.

During the radiated emission test, the EMI test Receiver was set with the following configurations:

Frequency Range	RBW	Video B/W	Measurement
9 kHz – 150 kHz	200 Hz	1 kHz	QP/Average
150 kHz – 30 MHz	9 kHz	30 kHz	QP/Average
30 MHz – 1000 MHz	120 kHz	300 kHz	QP

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

If the maximized peak measured value complies with the limit, then it is unnecessary to perform an QP/Average measurement

Corrected Amplitude & Margin Calculation

For 9kHz-30MHz:

The basic equation is as follows:

Level (QuasiPeak or Average) = Reading Level + Transd Factor

Note:

Transd Factor = Cable loss + Factor of coupling device

The “**Margin**” column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Level-Limit

For above 30MHz:

The basic equation is as follows:

Result = Meter Reading+ Factor

Note:

Factor = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Result - Limit

Test Results Summary

According to the data in the following table, the EUT complied with the FCC Part 15.205&15.209.

Test Data

Environmental Conditions

Temperature:	23 °C
Relative Humidity:	49 %
ATM Pressure:	101.0 kPa

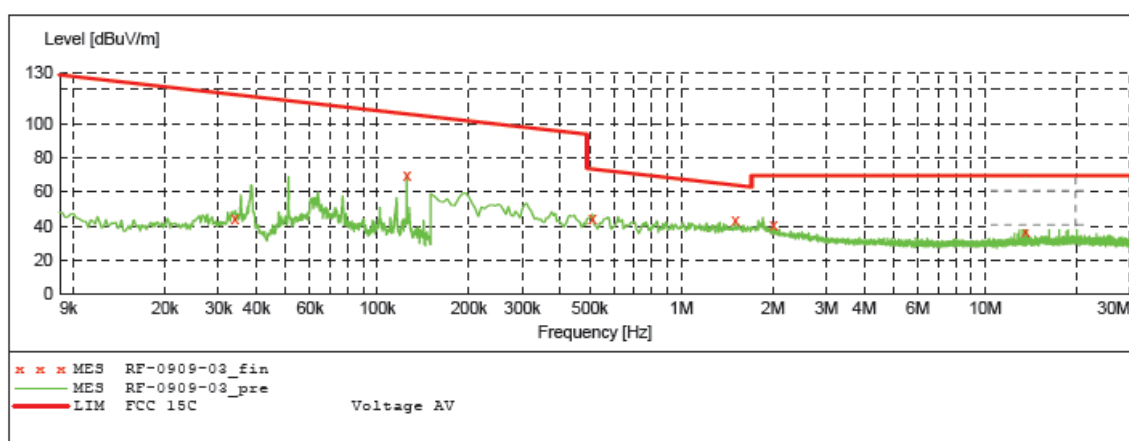
The testing was performed by Black Ding on 2021-09-09 for Below 30MHz and on 2021-09-15 for Above 30MHz.

Test mode: Transmitting

Result: Compliant

9 kHz~30MHz:

Worst case (Transmitting, X Axis) was recorded in the report.



MEASUREMENT RESULT: "RF-0909-03_fin"

2021-9-9 10:57

Frequency MHz	Level dBuV	Transd dB/m	Limit dBuV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
0.034000	44.20	20.1	117.0	-72.8	QP	105.0	0.00	X
0.125000	69.60	20.1	105.7	-36.1	QP	105.0	0.00	X
0.510000	44.80	20.3	73.5	-28.7	QP	105.0	0.00	X
1.505000	43.50	20.4	64.1	-20.6	QP	105.0	0.00	X
2.010000	40.60	20.4	69.5	-28.9	QP	105.0	0.00	X
13.570000	36.70	21.0	69.5	-32.8	QP	105.0	0.00	X

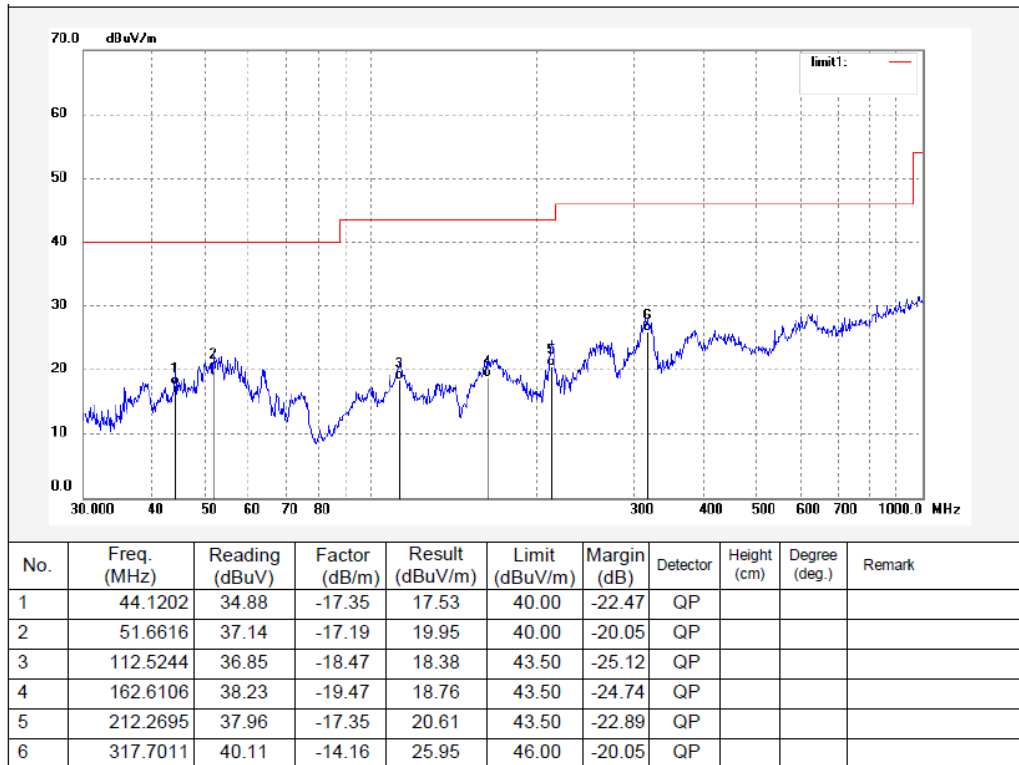
Part 15 Section 15.31(f)(2) (9kHz-30MHz)

Limit at 3m=Limit at 300m-40*log(3(m)/300(m))

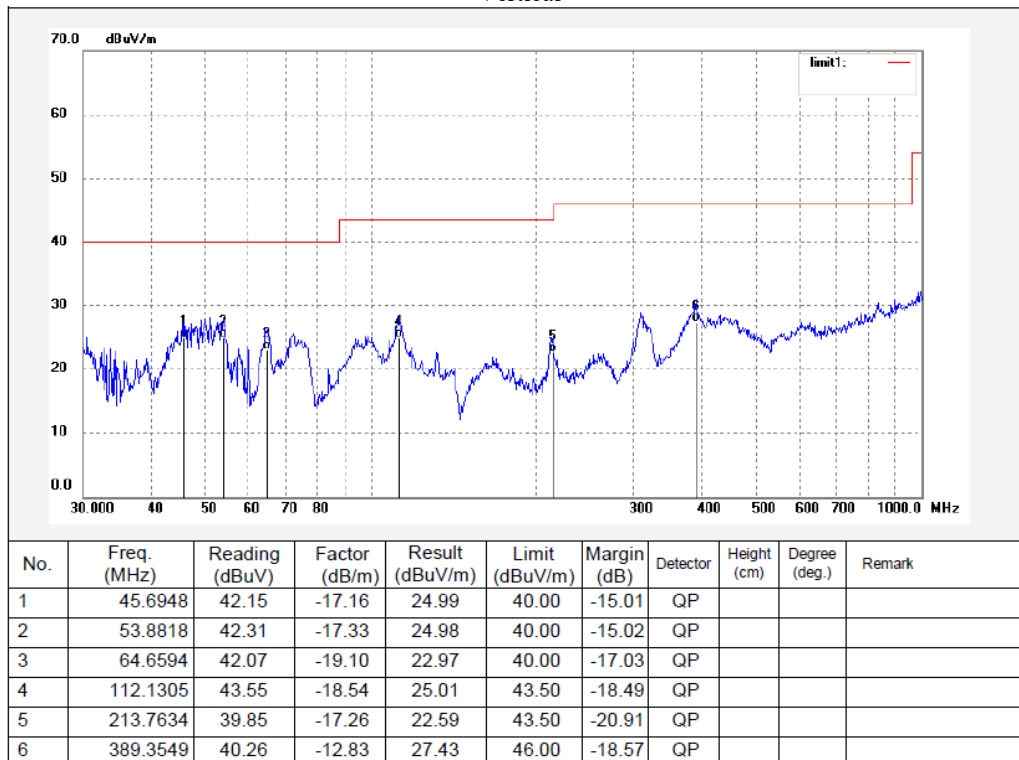
Limit at 3m=Limit at 30m-40*log(3(m)/30(m))

30 MHz ~ 1GHz

Horizontal



Vertical



FCC§15.215(c) - 20dB EMISSION BANDWIDTH

Applicable Standard

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 the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that indicated 20dB bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

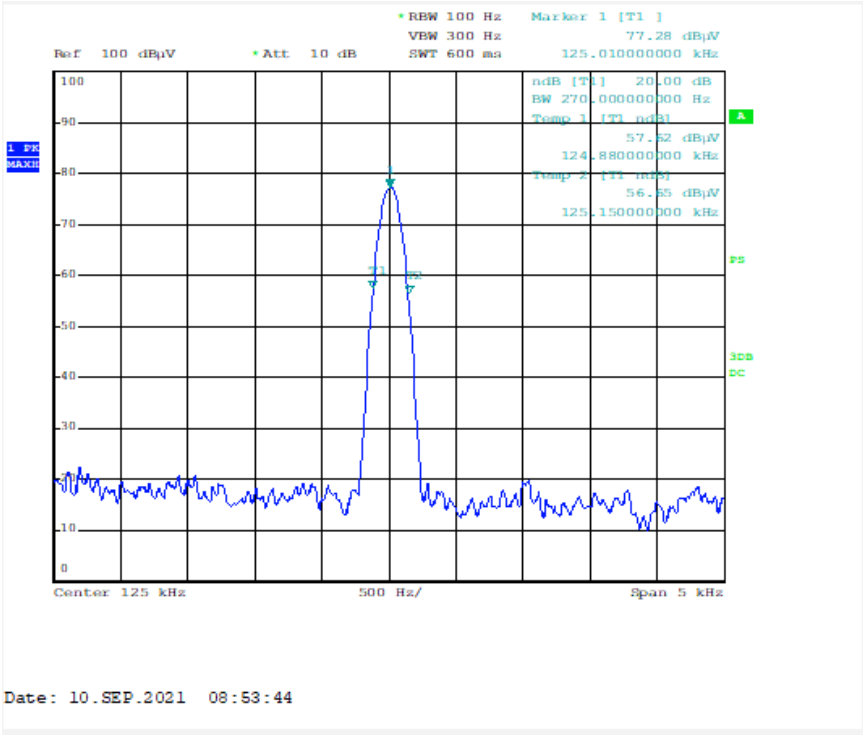
The testing was performed by Black Ding on 2021-09-10.

Test Mode: Transmitting

Please refer to the following table and plots.

Test Frequency (kHz)	20dB Bandwidth (kHz)
125	0.27

125kHz



***** END OF REPORT *****