ACCREDITED
TESTING LABORATORY
CERTIFICATE # 4821.01

BACL
Bay Area Compliance Labs Corp.

FCC PART 15.225

TEST REPORT

For

MATRIX COMSEC PVT. LTD.

394-GIDC, Makarpura, Vadodara, Gujarat 390 010, India

FCC ID: 2ADHNCOSECAT3

Report Type:	Product Type:
Original Report	COSEC ATOM

Report Number:	SZ6210224-04871E-00
Report Date:	2021-04-16
Reviewed By:	Jimmy Xiao RF Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 5F(B-West) ,6F,7F,the 3rd Phase of Wan Li Industrial Building D,Shihua Rd, FuTian Free Trade Zone, Shenzhen, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn

Note: This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "★".

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	COSEC ATOM
Tested Model	COSEC ATOM RD100KM
Series Model	COSEC ATOM RD100M
Model Differences	Refer to the DoS letter
Frequency Range	13.56 MHz
Modulation Technique	ASK
Antenna Specification	Induction coil antenna
Voltage Range	9-14V $_{DC}$
Date of Test	2021-03-08 to 2021-04-16
Sample serial number	SZ6210224-04871E-RF-S_VO (Assigned by BACL, Shenzhen)
Received date	2021-02-24
Sample/EUT Status	Good condition
Trade Name	MATRIX
Manufacturer	MATRIX COMSEC PVT LTD
Manufacturer Adress	15 & 19 – GIDC, WAGHODIA, VADODARA – 391760 (GUJARAT, INDIA)

Objective

This Type approval report is in accordance with Part 2- Subpart J, and Part 15-Subparts A and C of the Federal Communication Commissions rules.

The objective is to determine the compliance of the EUT with FCC rules, section 15.203, 15.205, 15.207, 15.209 and 15.225.

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 Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		±5%
AC Power Lines Conducted Emissions		±1.95dB
Radiated Emissions	Below 1GHz	±4.75dB
	Above 1GHz	±4.88dB
Temperature		±1℃
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 Bay Area Compliance Laboratories Corp. (Shenzhen) 5F(B-West) ,6F,7F,the 3rd Phase of Wan Li Industrial Building D,Shihua Rd, FuTian Free Trade Zone, Shenzhen, 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.: 342867, the FCC Designation No.: CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

SYSTEM TEST CONFIGURATION

Justification

The system was configured for testing in a typical fashion (as normally used by a typical user).

EUT Exercise Software

No Exercise Software was used.

Equipment Modifications

No modification on the EUT.

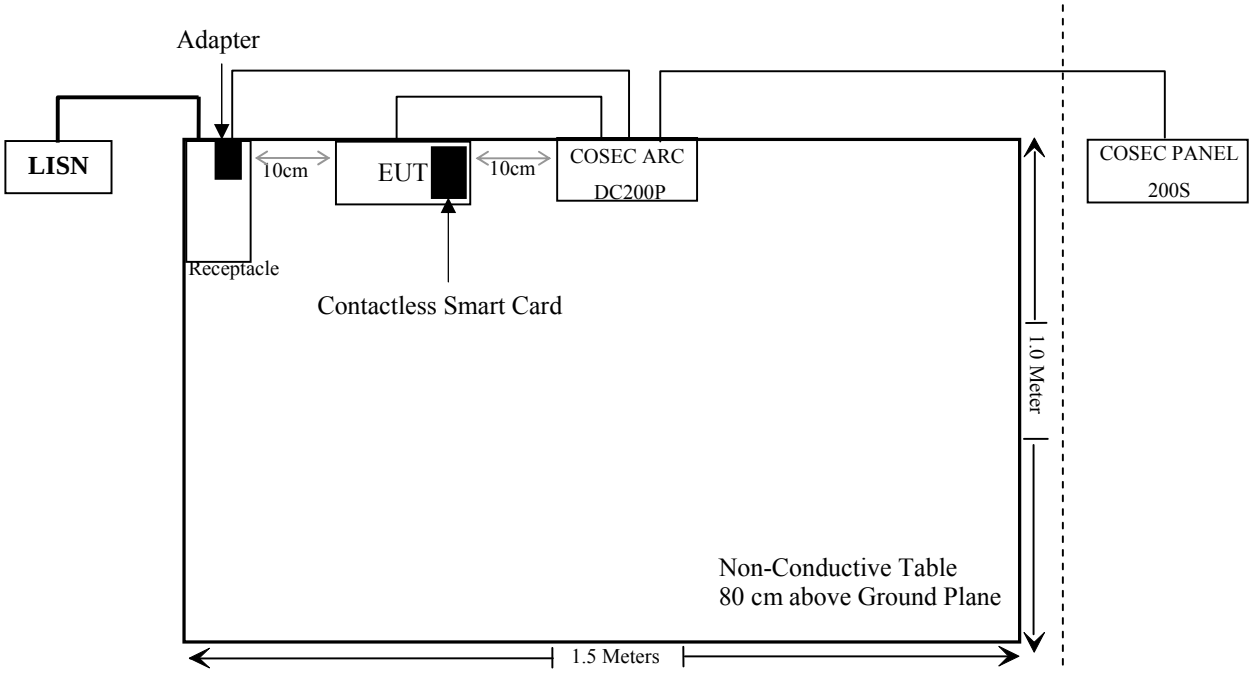
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
SHENZHEN HONOR	Adapter	ADS-25SGP-12	120224E
MATRIX	COSEC ARC	COSEC ARC DC200P	10000687
MATRIX	COSEC PANEL	COSEC PANEL 200S	10002750
Unknown	Contactless Smart Card	Unknown	Unknown

External I/O Cable

Cable Description	Length (m)	From/Port	To
Un-shielding Un-Detachable AC Cable	1.2	LISN	Receptacle
Un-shielding Un-Detachable DC Cable	1.2	Adapter	COSEC ARC DC200P
Un-shielding Detachable Signal Cable	3.2	COSEC ARC DC200P	EUT
Un-shielding Detachable RJ45 Cable	8.0	COSEC ARC DC200P	COSEC PANEL 200S

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207	AC Line Conducted Emission	Compliance
§15.225 §15.209 §15.205	Radiated Emission Test	Compliance
§15.225(e)	Frequency Stability	Compliance
§15.215(c)	20dB Emission Bandwidth	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2020/08/04	2021/08/03
Rohde & Schwarz	LISN	ENV216	101613	2020/08/04	2021/08/03
Rohde & Schwarz	Transient Limitor	ESH3Z2	DE25985	2020/11/29	2021/11/28
Unknown	CE Cable	CE Cable	UF A210B-1-0720-504504	2020/11/29	2021/11/28
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	No-need calibration	No-need calibration
Radiated Emission Test					
R&S	EMI Test Receiver	ESR3	102455	2020/08/04	2021/08/03
Sonoma instrument	Pre-amplifier	310 N	186238	2020/08/04	2021/08/03
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2018/12/22	2021/12/21
ETS	Passive Loop Antenna	6512	29604	2018/07/14	2021/07/13
Unknown	Cable 2	RF Cable 2	F-03-EM197	2020/11/29	2021/11/28
Unknown	Cable	Chamber Cable 1	F-03-EM236	2020/11/29	2021/11/28
Unknown	Cable	Chamber Cable 4	EC-007	2020/11/29	2021/11/28
Rohde & Schwarz	Auto test software	EMC 32	V9.10	No-need calibration	No-need calibration
Yijia	Temperature & Humidity Meter	TA218B	E0938	2020/09/30	2021/09/29
instek	DC Power Supply	GPS-3030DD	EM832096	No-need calibration	No-need calibration
ESPEC	Temperature & Humidity Chamber	EL-10KA	9107726	2021/01/05	2022/01/05
Fluke	Digital Multimeter	287	19000011	2020/07/23	2021/07/22

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) 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 antenna arrangement for NFC which was permanently attached, fulfill the requirement of this section. Please refer to the EUT photos.

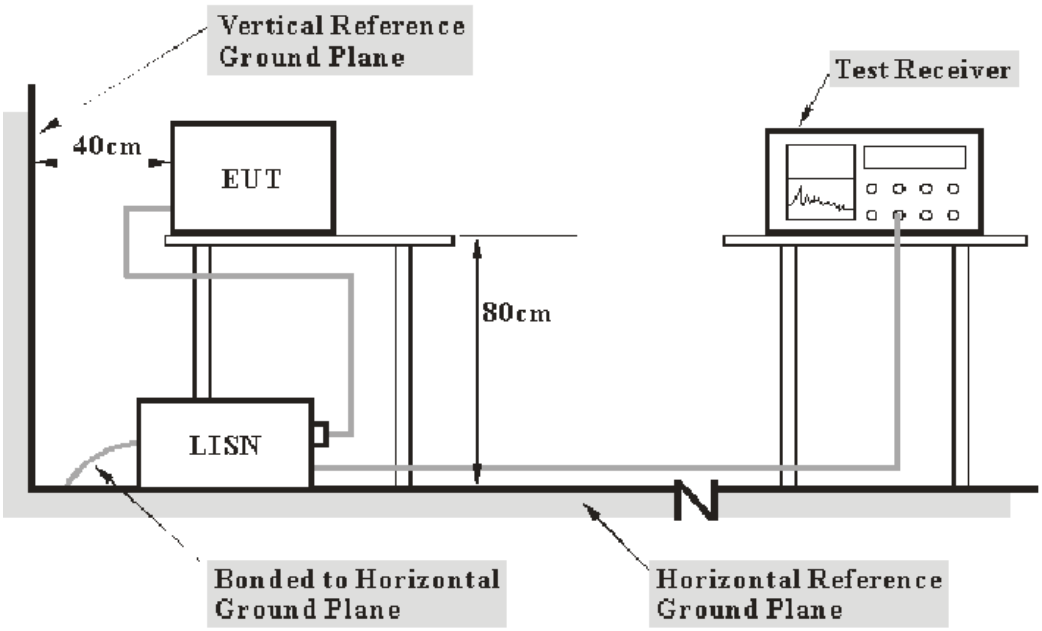
Result: Compliance.

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.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

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 adapter 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 Corrected factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

Correction Factor = LISN VDF + Cable Loss + Transient Limiter Attenuation

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

Margin = Limit – Corrected Amplitude

Test Results Summary

The EUT complied with the FCC Part 15.207.

Test Data

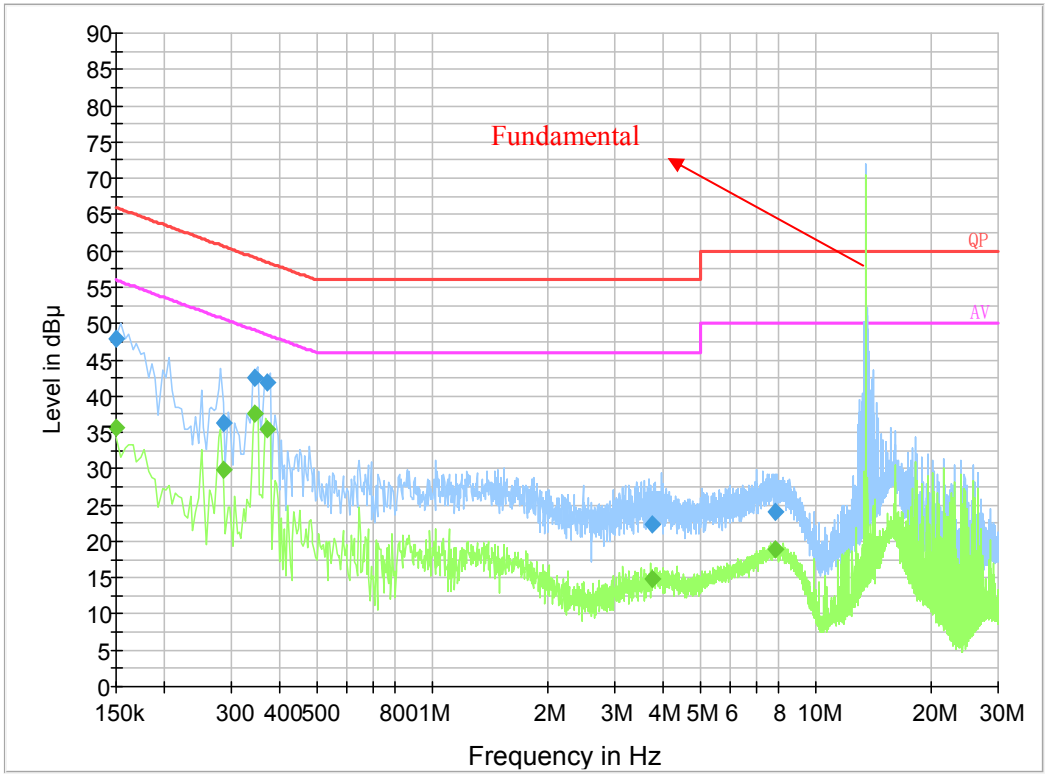
Environmental Conditions

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

The testing was performed by Haiguo Li on 2021-03-08.

Test mode: Transmitting

AC 120 V/60 Hz, Line:



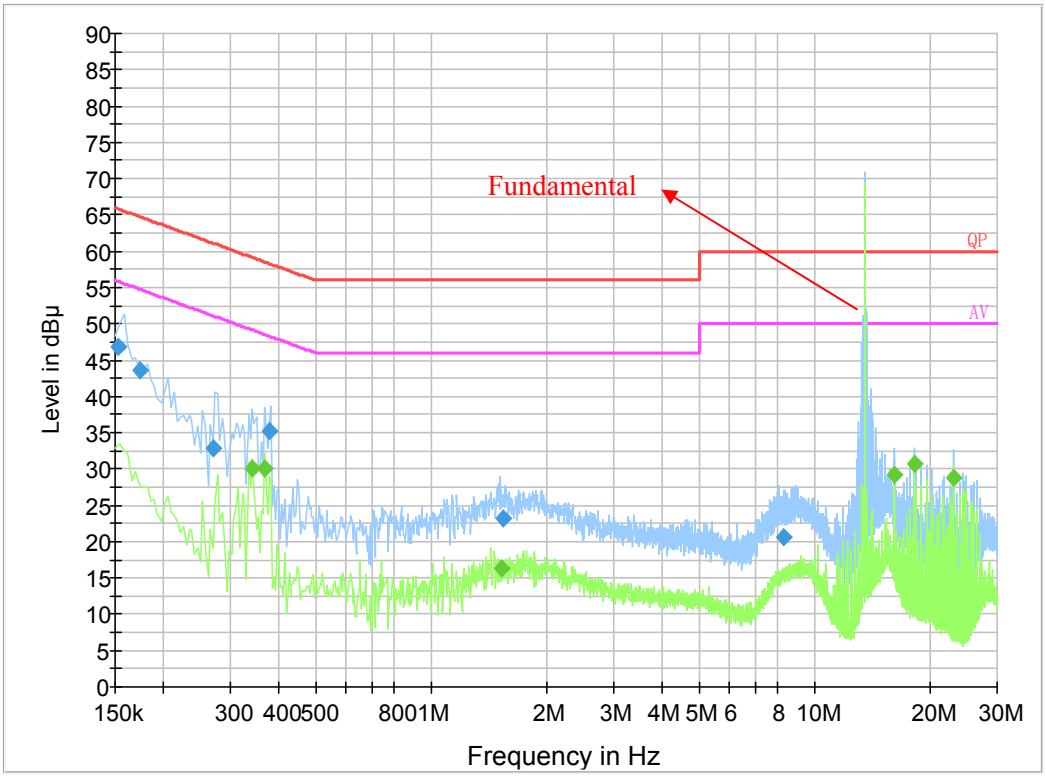
Final Result 1

Frequency (MHz)	QuasiPeak (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.150000	47.9	0.200	L1	19.8	18.1	66.0
0.285500	36.3	9.000	L1	19.7	24.4	60.7
0.344750	42.5	9.000	L1	19.9	16.6	59.1
0.372330	41.9	9.000	L1	19.9	16.5	58.4
3.741870	22.4	9.000	L1	19.9	33.6	56.0
7.863590	24.0	9.000	L1	19.9	36.0	60.0

Final Result 2

Frequency (MHz)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.150000	35.6	9.000	L1	19.8	20.4	56.0
0.285500	29.9	9.000	L1	19.7	20.8	50.7
0.344750	37.6	9.000	L1	19.9	11.5	49.1
0.372330	35.5	9.000	L1	19.9	12.9	48.4
3.741870	14.7	9.000	L1	19.9	31.3	46.0
7.863590	18.8	9.000	L1	19.9	31.2	50.0

AC 120V/ 60 Hz, Neutral:



Final Result 1

Frequency (MHz)	QuasiPeak (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.153500	46.8	9.000	N	19.8	19.0	65.8
0.173500	43.5	9.000	N	19.8	21.3	64.8
0.269500	32.8	9.000	N	19.7	28.3	61.1
0.380270	35.3	9.000	N	19.8	23.0	58.3
1.543170	23.1	9.000	N	19.8	32.9	56.0
8.299970	20.6	9.000	N	19.9	39.4	60.0

Final Result 2

Frequency (MHz)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.342000	30.2	9.000	N	19.8	19.0	49.2
0.370000	30.0	9.000	N	19.9	18.5	48.5
1.522000	16.4	9.000	N	19.8	29.6	46.0
16.226000	29.2	9.000	N	20.1	20.8	50.0
18.242000	30.7	9.000	N	20.3	19.3	50.0
23.126000	28.7	9.000	N	20.3	21.3	50.0

Test Result: Pass

FCC§15.225, §15.205 & §15.209 - RADIATED EMISSIONS TEST

Applicable Standard

As per FCC Part 15.225

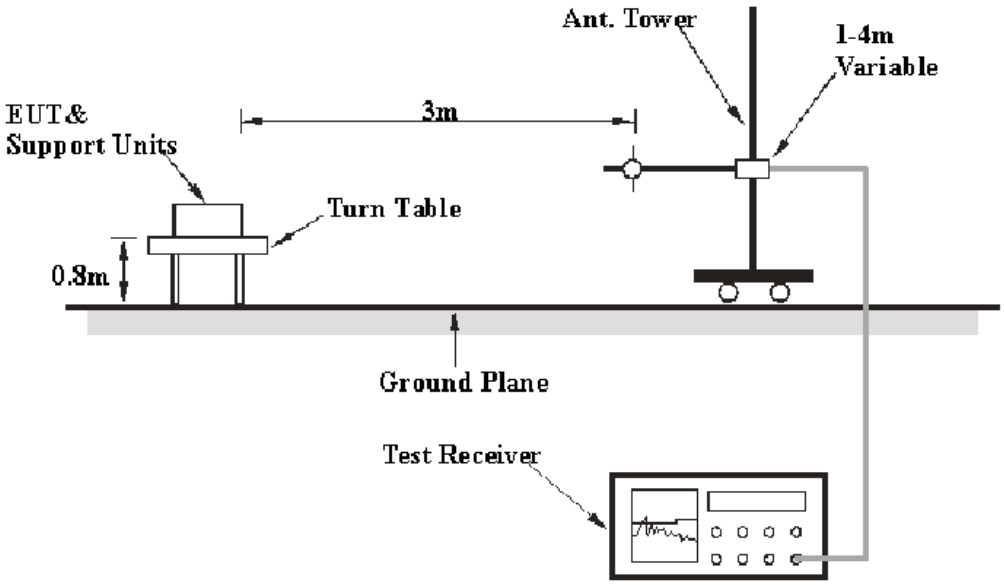
(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

(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 band shall not exceed the general radiated emission limits in §15.209.

EUT Setup



Note: Antenna is set up at 1m during test for below 30MHz.

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

EMI Test Receiver Setup

According to FCC Rules, 47 CFR 15.33, the EUT emissions were investigated up to 1000 MHz.

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

Frequency Range	RBW	Video B/W	IF B/W	Detector
9 kHz – 150 kHz	300 Hz	1 kHz	/	QP
150 kHz –30 MHz	10 kHz	30 kHz	/	QP
30 MHz – 1000 MHz	100 kHz	300 kHz	/	QP

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

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

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

Margin = Limit – Corrected Amplitude

Test Results Summary

EUT complied with the FCC §15.209.

Test Data

Environmental Conditions

Temperature:	24 °C
Relative Humidity:	52~56 %
ATM Pressure:	101.0 kPa

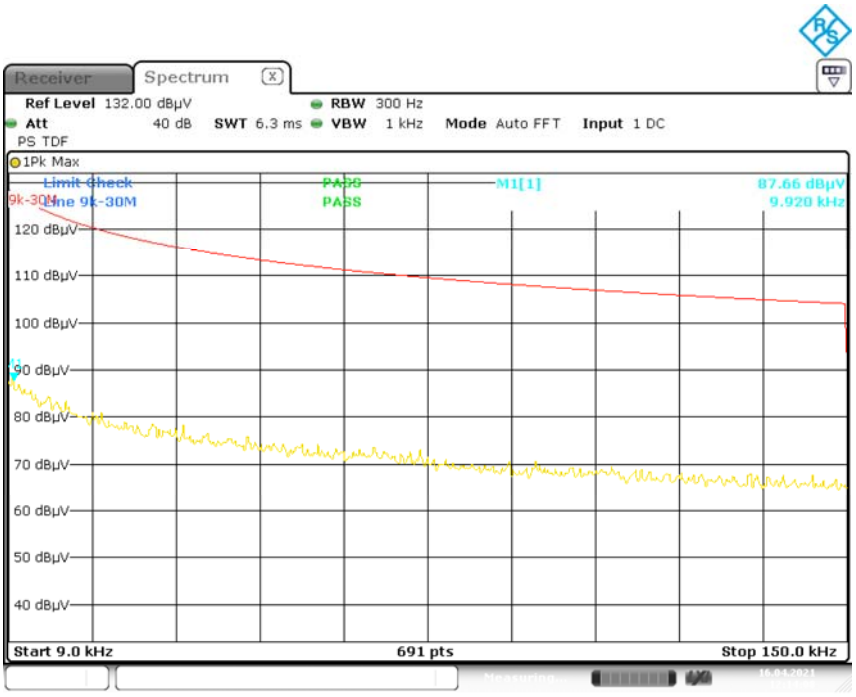
The testing was performed by Zero Yan on 2021-04-16.

Test mode: NFC Transmitting

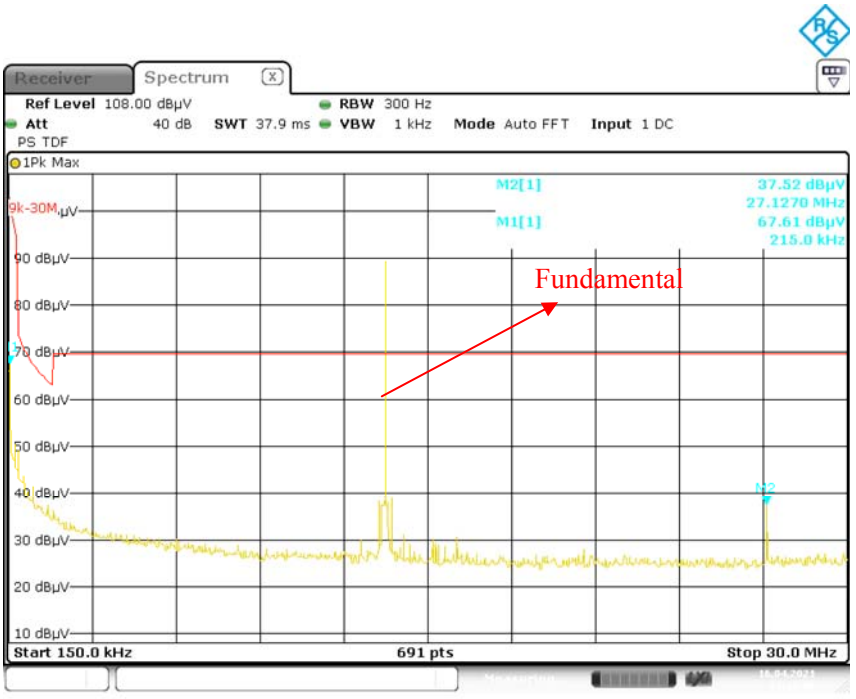
1) Spurious Emissions (9 kHz~30 MHz):

Freq. (MHz)	Corrected Amplitude (dBμV/m) @3m	Table Angle Degree	Antenna Height (m)	Detector	Correction Factor			FCC part 15.225	
					Ant. Factor (dB)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Limit (dBμV/m) @3m	Result
0.00992	87.66	0	1	QP	88.6	0.2	30.2	127.67	Pass
0.215	67.61	0	1	QP	60.1	0.3	30.2	100.96	Pass

9 kHz~150 kHz



150 kHz~30 MHz



2) Spurious Emissions (30 MHz~1GHz):

Final_Result

Frequency (MHz)	QuasiPeak (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
67.822250	32.87	40.00	7.13	103.0	V	208.0	-16.3
162.738125	41.84	43.50	1.66	227.0	H	70.0	-11.9

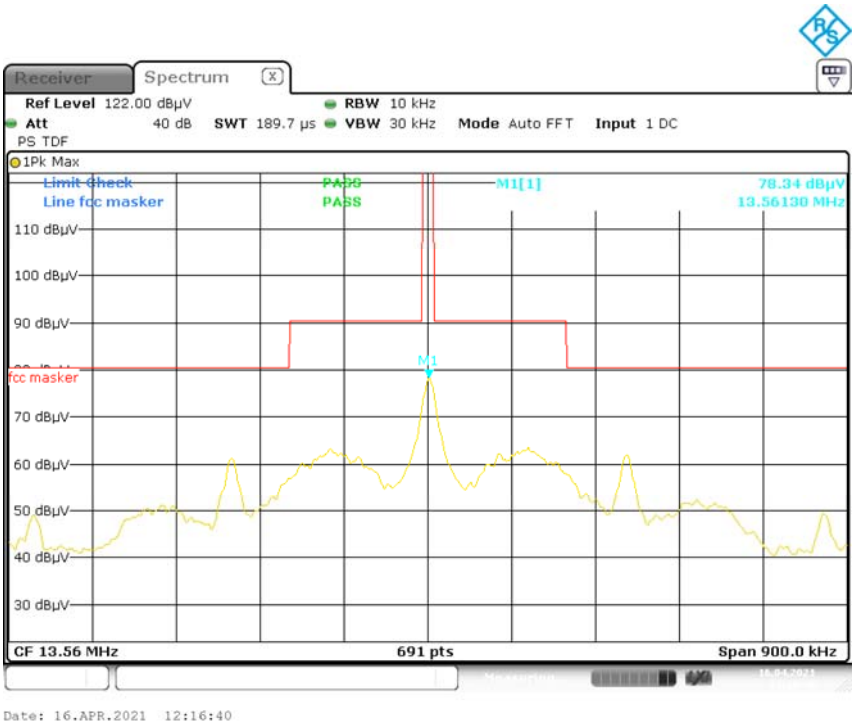
Critical_Freqs

Frequency (MHz)	MaxPeak (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
149.067500	35.51	43.50	7.99	200.0	H	98.0	-11.3
349.978750	38.32	46.00	7.68	200.0	V	336.0	-8.9
374.956250	37.99	46.00	8.01	200.0	V	116.0	-8.1
499.965000	36.23	46.00	9.77	200.0	H	118.0	-5.1

Note:
1) Correction Factor =Antenna factor(Rx) + Cable Loss – Amplifier factor
2) Corrected Amplitude = Reading + Correction Factor
3) Margin = Limit – Corrected Amplitude

3) Emission Mask & Fundamental:

Indicated Frequency (MHz)	Corrected Amplitude (dBµV/m) @3m	Table Angle Degree	Antenna Height (m)	Detector	Correction Factor			FCC part 15.225	
					Ant. Factor (dB)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Limit (dBµV/m) @3m	Result
13.56	78.34	0	1	QP	32.3	0.2	30.2	124	Pass



Test Result: Pass

FCC§15.225(e) - FREQUENCY STABILITY

Applicable Standard

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.

Test Procedure

Refer to ANSI C63.10-2013 Section 6.8.

Test Data

Environmental Conditions

Temperature:	24 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

The testing was performed by Zero Yan on 2021-04-16.

Test Mode: Transmitting

Test Result: Pass

Voltage Supply (V_{AC})	Temperature (℃)	Measured Frequency (MHz)	Frequency Error (%)	Part 15.225 Limit
120	-20	13.560998	0.00736	±0.01%
	-10	13.561266	0.00934	±0.01%
	0	13.561175	0.00866	±0.01%
	10	13.561211	0.00893	±0.01%
	20	13.561277	0.00942	±0.01%
	30	13.561180	0.00870	±0.01%
	40	13.561176	0.00867	±0.01%
	50	13.561080	0.00797	±0.01%
102	20	13.560988	0.00729	±0.01%
138	20	13.560892	0.00658	±0.01%

FCC§15.215(c) - 20dB EMISSION BANDWIDTH

Requirement

Per 15.215 (c) 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. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

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 on the table of the chamber, Turn on the EUT. 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 were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.

Test Data

Environmental Conditions

Temperature:	24 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

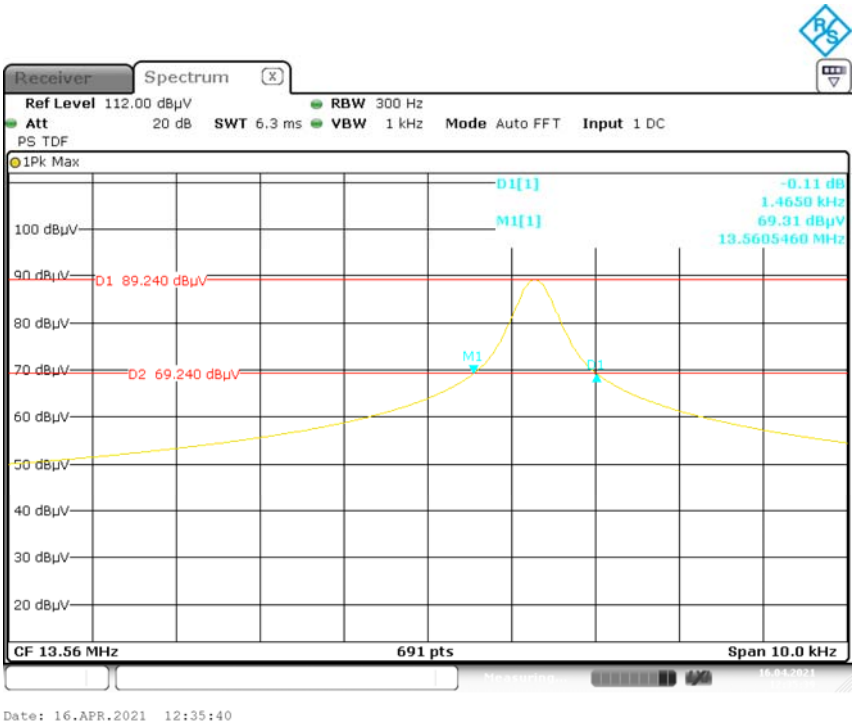
The testing was performed by Zero Yan on 2021-04-16.

Test Mode: Transmitting

Test Result: Pass

Test Frequency (MHz)	20dB Bandwidth (kHz)
13.56	1.465

20 dB Emission Bandwidth



Test Result: Pass

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