

## FCC PART 15.225


### TEST REPORT

For

## MATRIX COMSEC PVT. LTD.

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

**FCC ID: 2ADHNCOSEC02**

<b>Report Type:</b> Original Report	<b>Product Type:</b> COSEC VEGA CPM
<b>Report Number:</b> RSZ201223006-00	
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## GENERAL INFORMATION

### Product Description for Equipment under Test (EUT)

Product	COSEC VEGA CPM
Tested Model	COSEC VEGA CPM MIFARE SMART
Frequency Range	13.56 MHz
Transmit Power	84.73dBuV/m@3m
Modulation Technique	ASK
Antenna Specification	Induction coil antenna
Voltage Range	DC5V from Host devices
Date of Test	2020-12-30 to 2021-01-10
Sample serial number	RSZ201223006-RF-S1 (Assigned by BACL, Shenzhen)
Received date	2020-12-23
Sample/EUT Status	Good condition

### 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 °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 Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, 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.

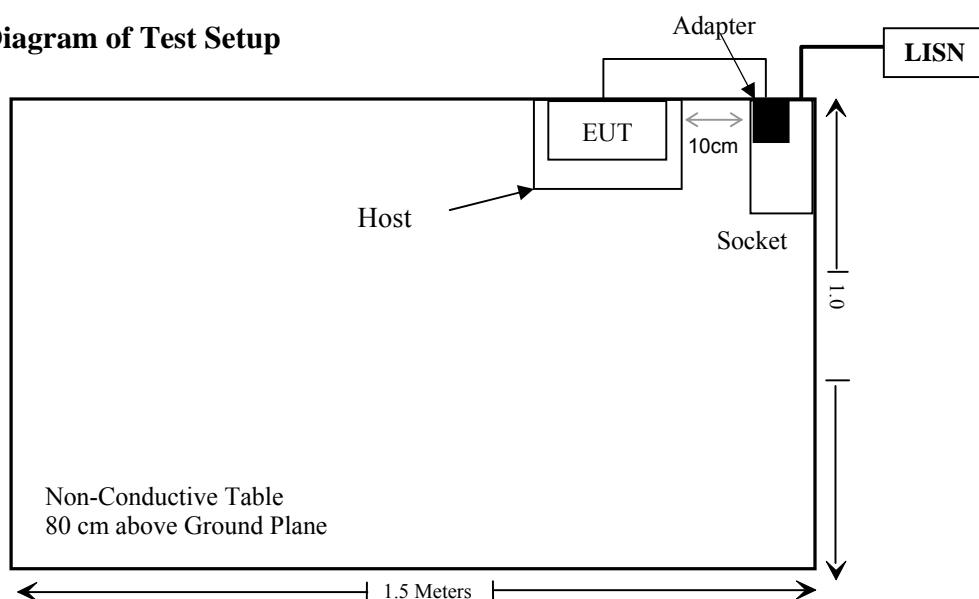
### Local Support Equipment

Manufacturer	Description	Model	Serial Number
MATRIX COMSEC	Host	COSEC VEGA CAX	10001656
SHENZHEN HONOR ELECTRONIC CO.,LTD.	Adapter	ADS-25SGP-12024E	K321346

### External I/O Cable

Cable Description	Length (m)	From Port	To
Unshielded Un-detachable AC Cable	1.0	Socket	LISN
Unshielded Un-Detachable DC Cable	1.5	Adapter	Host

### 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
<b>Conducted Emissions Test</b>					
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 Limiter	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	NCR	NCR
<b>Radiated Emission Test</b>					
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	NCR	NCR
Yijia	Temperature & Humidity Meter	TA218B	E0938	2020/09/30	2021/09/29

**\* 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).

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## **FCC§15.203 - ANTENNA REQUIREMENT**

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### **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 a PCB antenna arrangement, fulfill the requirement of this section. Please refer to EUT photos for details.

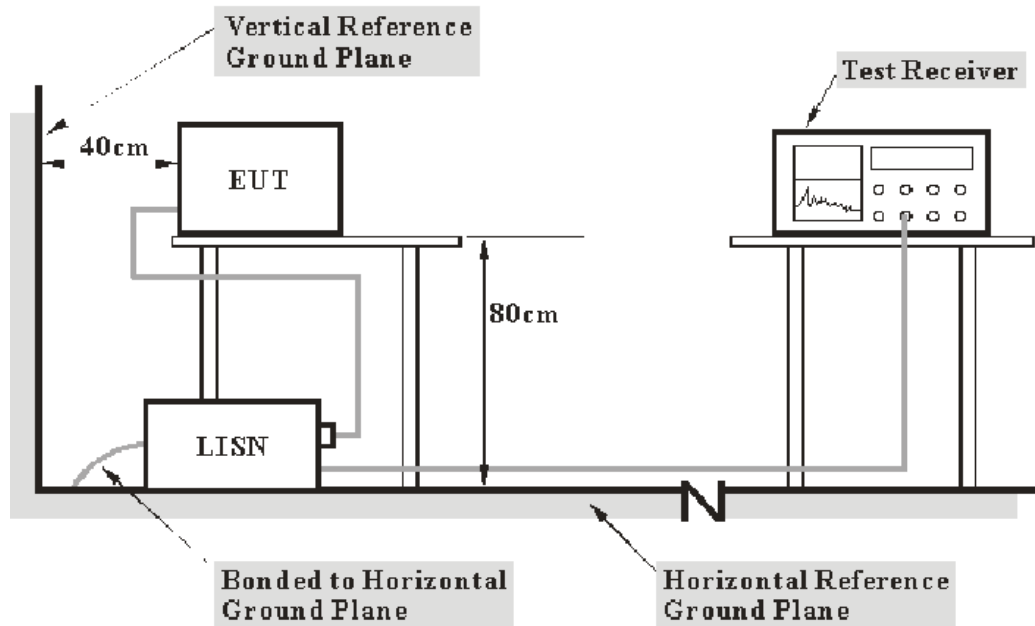


## FCC §15.207 – AC LINE CONDUCTED EMISSION

### 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 of Host 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:

$$\text{Correction Factor} = \text{LISN VDF} + \text{Cable Loss} + \text{Transient Limiter Attenuation}$$

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:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

## Test Results Summary

According to the EUT complied with the FCC Part 15.207.

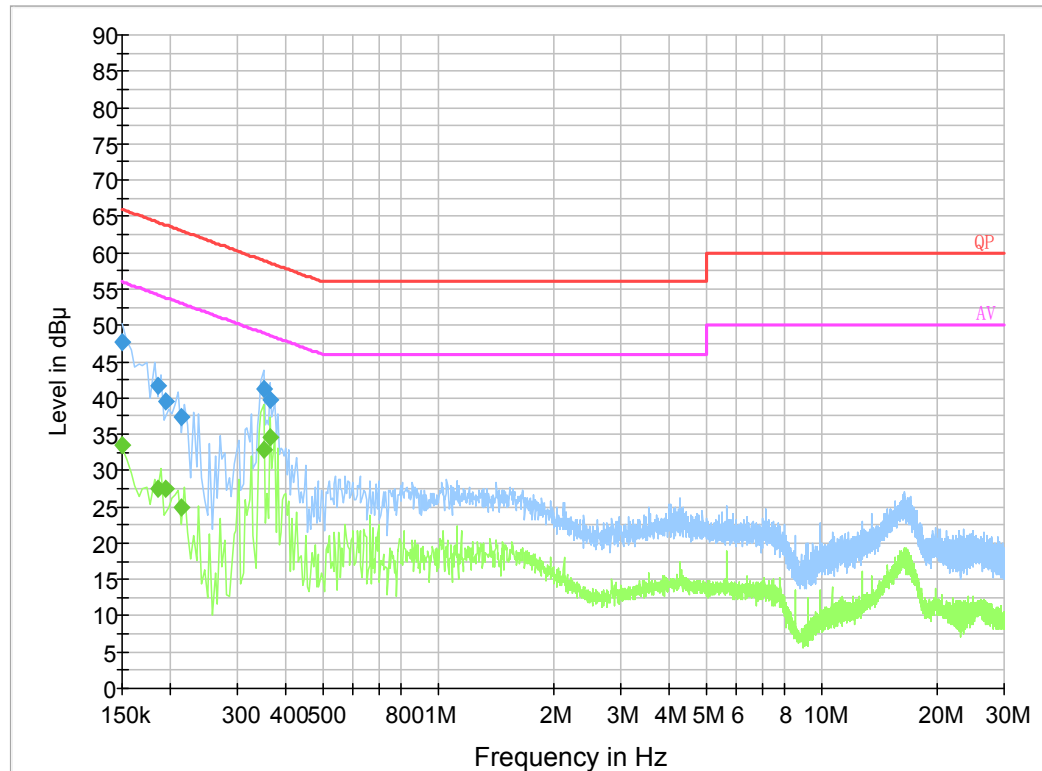
## Test Data

### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	65 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Haiguo Li on 2020-12-30.*

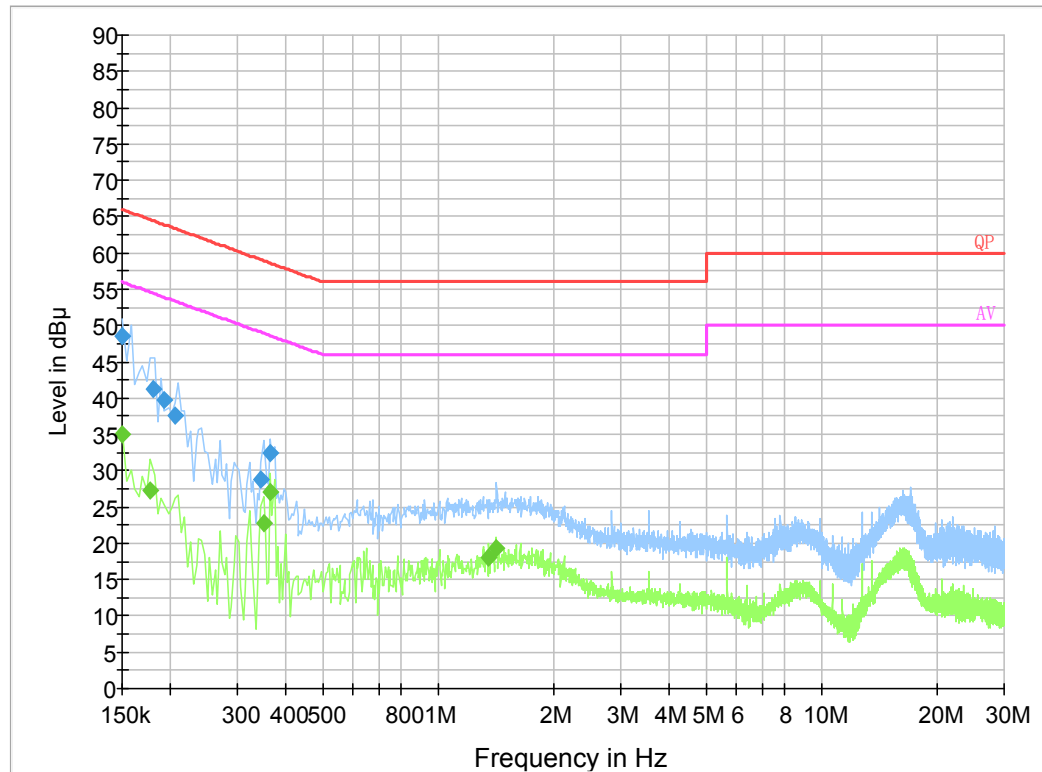
*Test mode: Working*

**AC 120 V/60 Hz, Line:****Final Result 1**

Frequency (MHz)	QuasiPeak (dB $\mu$ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)
0.150000	47.7	0.200	L1	19.8	18.3	66.0
0.185500	41.6	9.000	L1	19.8	22.6	64.2
0.194500	39.5	9.000	L1	19.8	24.3	63.8
0.213500	37.4	9.000	L1	19.8	25.7	63.1
0.352750	41.2	9.000	L1	19.9	17.7	58.9
0.364510	39.8	9.000	L1	19.9	18.8	58.6

**Final Result 2**

Frequency (MHz)	Average (dB $\mu$ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)
0.150000	33.5	9.000	L1	19.8	22.5	56.0
0.185500	27.5	9.000	L1	19.8	26.7	54.2
0.194500	27.5	9.000	L1	19.8	26.3	53.8
0.213500	24.8	9.000	L1	19.8	28.3	53.1
0.352750	32.8	9.000	L1	19.9	16.1	48.9
0.364510	34.7	9.000	L1	19.9	13.9	48.6

**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)
0.150000	48.6	0.200	N	19.8	17.4	66.0
0.181500	41.3	9.000	N	19.8	23.1	64.4
0.193500	39.6	9.000	N	19.8	24.3	63.9
0.205500	37.5	9.000	N	19.8	25.9	63.4
0.344750	28.8	9.000	N	19.8	30.3	59.1
0.364510	32.3	9.000	N	19.9	26.3	58.6

**Final Result 2**

Frequency (MHz)	Average (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.150000	35.0	9.000	N	19.8	21.0	56.0
0.178000	27.3	9.000	N	19.8	27.3	54.6
0.350000	22.8	9.000	N	19.9	26.2	49.0
0.366000	27.2	9.000	N	19.9	21.4	48.6
1.358000	18.1	9.000	N	19.8	27.9	46.0
1.422000	19.3	9.000	N	19.8	26.7	46.0

**Note:**

- 1) Correction Factor = LISN VDF (Voltage Division Factor) + Cable Loss + Transient Limiter Attenuation
- 2) Corrected Amplitude = Reading + Correction Factor
- 3) Margin = Limit – Corrected Amplitude

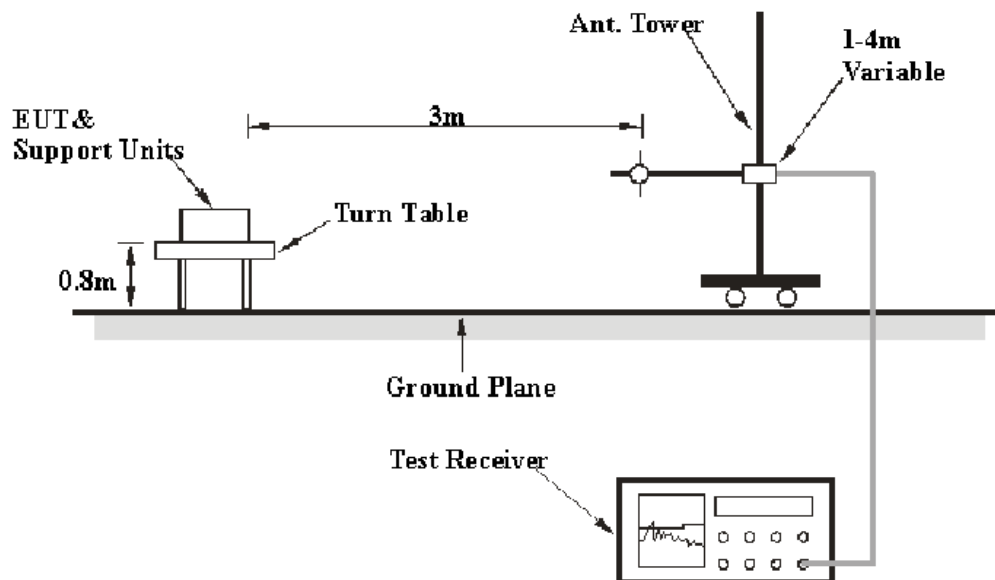
## FCC§15.225, §15.205 & §15.209 - RADIATED EMISSIONS TEST

### 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:

$$\begin{aligned}\text{Corrected Factor} &= \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain} \\ \text{Corrected Amplitude} &= \text{Meter Reading} + \text{Corrected Factor}\end{aligned}$$

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:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

### Test Results Summary

According to the EUT complied with the FCC §15.209.

### Test Data

#### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	51 %
<b>ATM Pressure:</b>	101.0 kPa

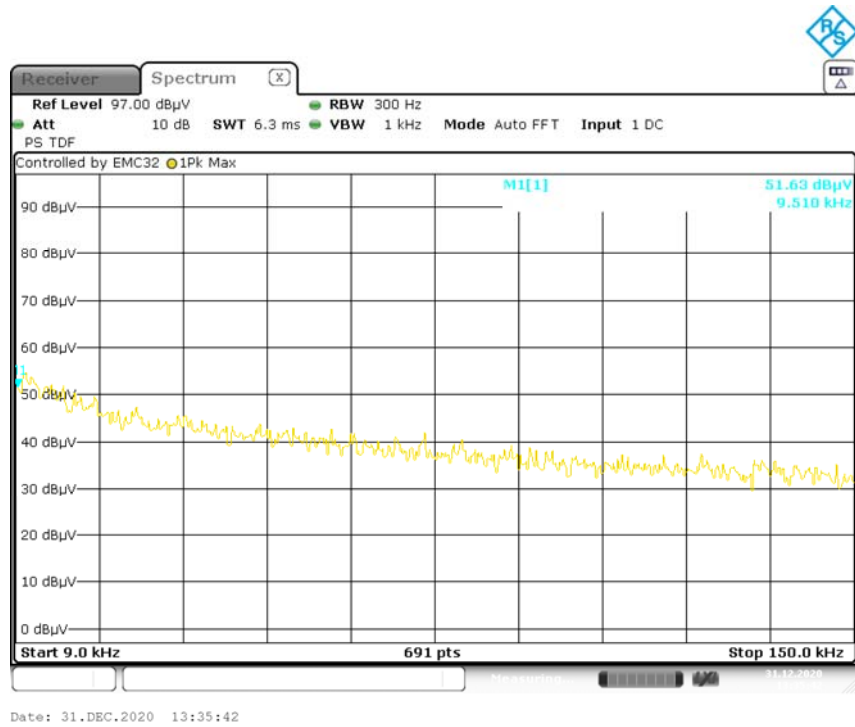
*The testing was performed by Holland Yang on 2020-12-31.*

*Test mode: Working*

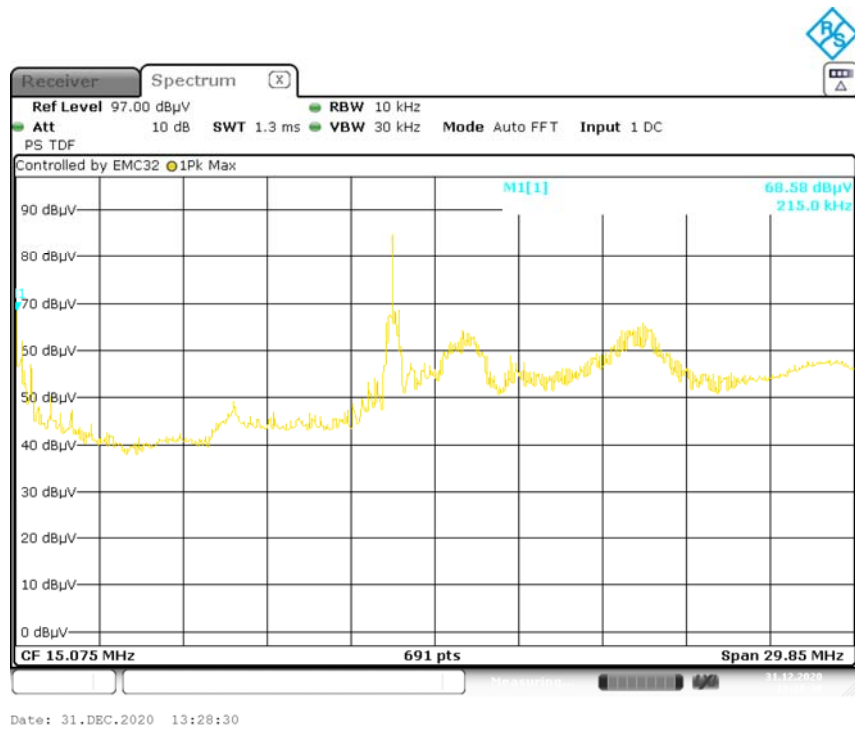
1) Spurious Emissions (9 kHz~30 MHz):

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
0.00951	51.63	0	1	QP	88.6	0.2	30.2	128.04	Pass
0.215	68.58	0	1	QP	60.1	0.3	30.2	100.96	Pass

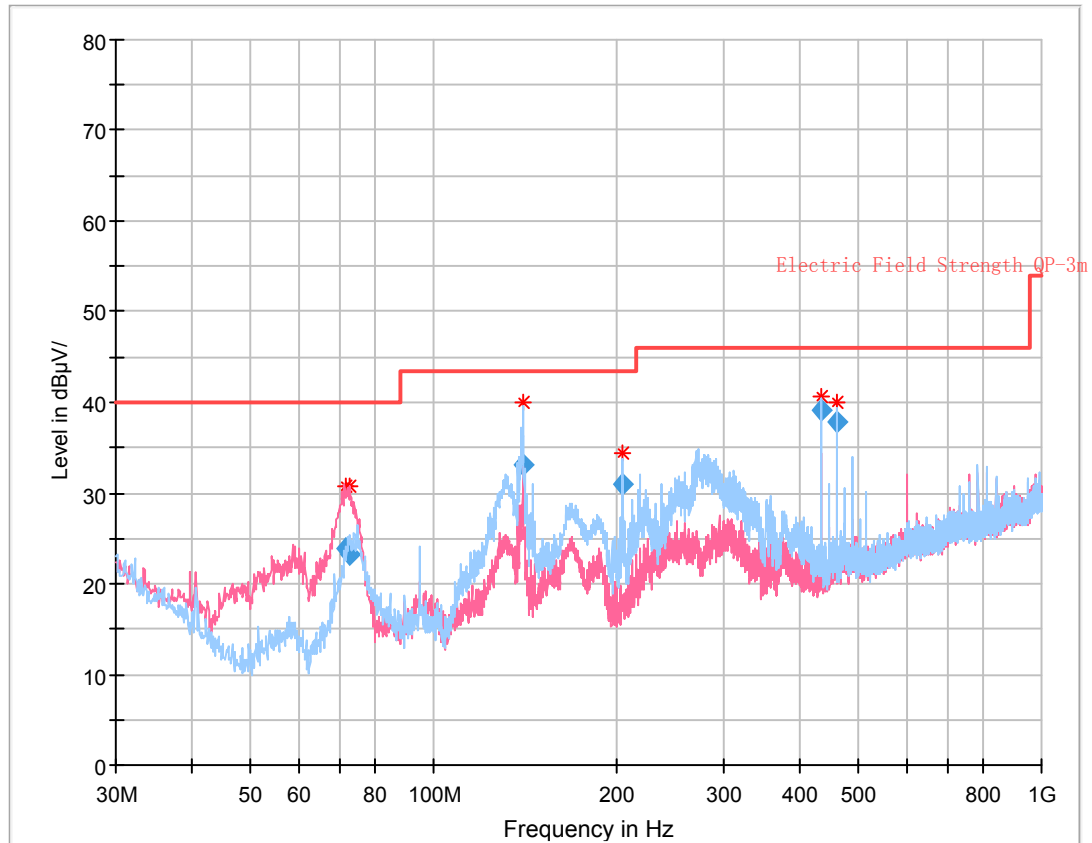
9 kHz~150 kHz



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)
71.542000	23.83	40.00	16.17	148.0	V	180.0	-17.4
72.804375	23.18	40.00	16.82	241.0	V	255.0	-17.3
140.679250	33.05	43.50	10.45	210.0	H	0.0	-11.1
205.255750	30.95	43.50	12.55	199.0	H	276.0	-10.7
433.966000	39.09	46.00	6.91	215.0	H	91.0	-6.5
461.081875	37.95	46.00	8.05	214.0	H	89.0	-5.7

## Note:

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



## 3) Inband:

Indicated		Corrected Amplitude (dB $\mu$ V/m) @3m	Table Angle Degree	Antenna Height (m)	Detector	Correction Factor			FCC part 15.225	
Frequency Range (MHz)	Mark Point (MHz)					Ant. Factor (dB)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Limit (dB $\mu$ V/m) @3m	Result
13.110-13.410	13.363	80.10	0	1.2	QP	32.3	0.2	30.2	80.5	Pass
13.410-13.553	13.518	82.42	0	1.1	QP	32.3	0.2	30.2	90.5	Pass
13.553-13.567	13.542	84.73	0	1	QP	32.3	0.2	30.2	124	Pass
13.567-13.710	13.539	83.12	0	1	QP	32.3	0.2	30.2	90.5	Pass
13.710-14.010	13.857	80.20	0	1.1	QP	32.3	0.2	30.2	80.5	Pass

## FCC§15.225(e) - FREQUENCY STABILITY

### Applicable Standard

The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  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

Frequency Stability vs. Temperature: The equipment under test was connected to PC, then to an external AC power supply and inductive antenna was connected to a Spectrum Analyzer. The EUT was placed inside the temperature chamber.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the Spectrum Analyzer.

Frequency Stability vs. Voltage: An external variable AC power supply Source. The voltage was set to 115% of the nominal value and was then decreased until the transmitter light no longer illuminated; i.e., the end point. The output frequency was recorded for each voltage.

### Test Data

#### Environmental Conditions

<b>Temperature:</b>	26 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	101.0 kPa

The testing was performed by Gavin Guo on 2020-12-31.

Test Mode: Transmitting

Test Result: Pass

Voltage Supply (V <sub>AC</sub> )	Temperature (°C)	Measured Frequency (MHz)	Frequency Error (%)	Part 15.225 Limit
120	-20	13.561216	0.00897	$\pm 0.01\%$
	-10	13.561219	0.00899	$\pm 0.01\%$
	0	13.561225	0.00903	$\pm 0.01\%$
	10	13.561233	0.00909	$\pm 0.01\%$
	20	13.561238	0.00913	$\pm 0.01\%$
	30	13.561242	0.00916	$\pm 0.01\%$
	40	13.561243	0.00917	$\pm 0.01\%$
	50	13.561244	0.00917	$\pm 0.01\%$
108	20	13.561249	0.00921	$\pm 0.01\%$
132	20	13.561249	0.00921	$\pm 0.01\%$

**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**

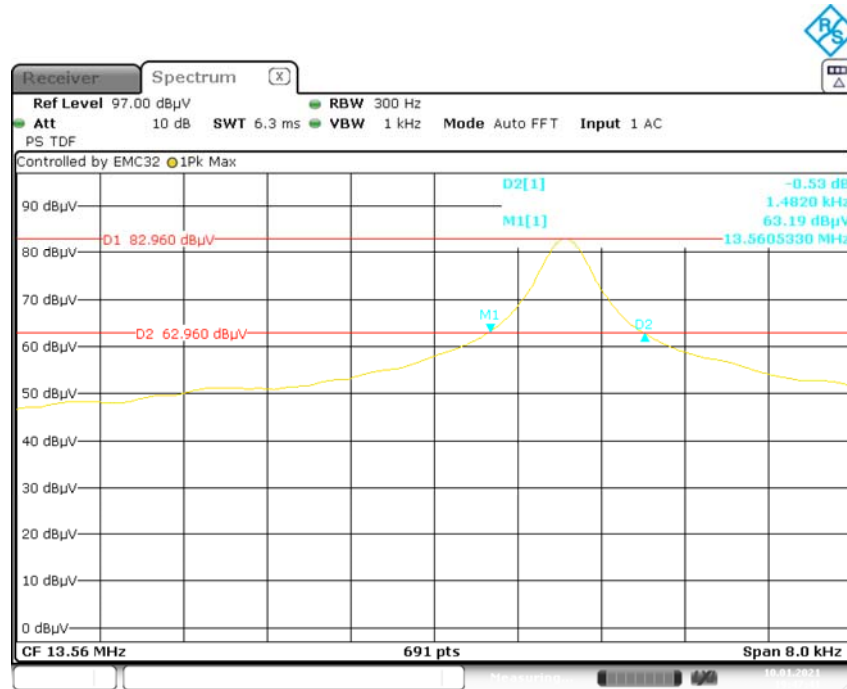
<b>Temperature:</b>	26 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	101.0 kPa

*The testing was performed by Gavin Guo on 2021-01-10.*

*Test Mode: Transmitting*

*Test Result: Pass*

## 20 dB Emission Bandwidth



Date: 10.JAN.2021 19:47:42

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