TEST REPORT

Application No.:	GZEM2008014221CR
Applicant:	Guangzhou Andea Electronics Technology Co., Ltd.
Address of Applicant:	Room 401, Building H, Jingye San Street, Yushu Industrial Park, Economic And Technological Development Zone, Guangzhou
Manufacturer:	Guangzhou Andea Electronics Technology Co., Ltd.
Address of Manufacturer:	Room 401, Building H, Jingye San Street, Yushu Industrial Park, Economic And Technological Development Zone, Guangzhou
Factory:	Guangzhou Andea Electronics Technology Co., Ltd.
Address of Factory:	Room 401, Building H, Jingye San Street, Yushu Industrial Park, Economic And Technological Development Zone, Guangzhou
Equipment Under Test (EUT):	
EUT Name:	HF RFID Pad Reader
FCC ID:	2AFI8-TPAD10M
Model No.:	TPAD10M
Trademark:	
Standard(s):	47 CFR Part 15, Subpart C 15.225
Date of Receipt:	2020-08-05
Date of Test:	2020-08-06 to 2020-08-31
Date of Issue:	2020-09-01
Test Result:	**Pass***

* In the configuration tested, the EUT complied with the standards specified above.

Kobe Jian
EMC Laboratory Manager

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Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2020-09-01		Original

Authorized for issue by:				
Tested By		**Jackson_Yuan /Project Engineer**		2020-08-06 to 2020-08-31 **Date**
Checked By		**Ricky_Liu /Reviewer**		2020-09-01 **Date**

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2 Test Summary

Radio Spectrum Technical Requirement				
Item	**Standard**	**Method**	**Requirement**	**Result**
Antenna Requirement	47 CFR Part 15, Subpart C 15.225	N/A	47 CFR Part 15, Subpart C 15.203	Pass

Radio Spectrum Matter Part				
Item	**Standard**	**Method**	**Requirement**	**Result**
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.225	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
20dB Bandwidth	47 CFR Part 15, Subpart C 15.225	ANSI C63.10 (2013) Section 6.9	47 CFR Part 15, Subpart C 15.215	Pass
Emission Mask	47 CFR Part 15, Subpart C 15.225	ANSI C63.10 (2013) Section 6.4	47 CFR Part 15, Subpart C 15.225(a)&(b)&(C)	Pass
Frequency tolerance	47 CFR Part 15, Subpart C 15.225	ANSI C63.10 (2013) Section 6.8	47 CFR Part 15, Subpart C 15.225(e)	Pass
Radiated Emissions(9kHz-30MHz)	47 CFR Part 15, Subpart C 15.225	ANSI C63.10 (2013) Section 6.4&6.5	47 CFR Part 15, Subpart C 15.225(d) & 15.209	Pass
Radiated Emissions(30MHz-1GHz)	47 CFR Part 15, Subpart C 15.225	ANSI C63.10 (2013) Section 6.4&6.5	47 CFR Part 15, Subpart C 15.225(d) & 15.209	Pass

N/A: Not Applicable

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4 General Information

4.1 Details of E.U.T.

Power Supply:	DC 5V
Test Voltage:	AC 120 V, 60 Hz powered by USB ports of PC
Cable:	USB cables with Ferrite (unshielded, 1.2 m)
Antenna Gain	0dBi declared by applicant
Antenna Type	PCB Antenna
Channel Spacing	N/A
Modulation Type	ASK declared by applicant
Number of Channels	1
Operation Frequency	13.56MHz
Function:	13.56MHz HF RFID Pad Reader
S/N	GZ_SP_20200836989
Hardware Version	TPAD10M_V00.04
Firmware	SV01
Test Software	R-Tool.exe
Power Setting	Default

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Laptop	Lenovo	T430u	REF. No.SEA1800
RFID Card	Offered by client	none	none

4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	±5.5 x 10^{-8}
2	Duty cycle	±0.57%
3	Occupied Bandwidth	±3%
4	RF Conducted power	±0.68dB
5	RF Power Density	±1.50dB
6	Conducted Spurious Emissions	±1.04dB
7	RF Radiated Power	±4.5dB (below 1GHz)
		±4.8dB (above 1GHz)
8	Radiated Spurious Emission Test	±4.5dB (30MHz-1GHz)
		±4.8dB (1GHz-18GHz)
9	Temperature	±0.4℃
10	Humidity	±1.3%
11	Supply Voltages	±1.5%
12	Time	±3%

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4.4 Test Location

All tests were performed at:

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No tests were sub-contracted.

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4.5 Test Facility

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

- **NVLAP (Lab Code: 200611-0)**

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200611-0.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

- **ACMA**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our NVLAP accreditation.

- **SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO**

Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.

- **CNAS (Lab Code: L0167)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been assessed and in compliance with CNAS-CL01:2018 accreditation criteria for testing laboratories (identical to

ISO/IEC 17025:2017 General Requirements) for the Competence of Testing Laboratories.

- **FCC Recognized 2.948 Listed Test Firm(Registration No.: 282399)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 282399, May 31, 2002.

- **FCC Recognized Accredited Test Firm(Registration No.: 486818)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been accredited and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Designation Number: CN5016, Test Firm Registration Number: 486818, Jul 13, 2017.

- **Industry Canada (Registration No.: 4620B, CAB identifier: CN0052)**

SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Innovation Science and Economic Development Canada for Wireless Device Testing laboratories to test to Canadian radio equipment requirements. Registration No. 4620B, CAB identifier: CN0052.

- **VCCI (Registration No.: R-12460, C-12584, G-10449 and T-11179)**

The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-12460, C-12584，G-10449 and T-11179 respectively.

- **CBTL (Lab Code: TL129)**

SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2005, the Basic Rules, IECEE 01 and Rules of procedure IECEE 02, and the relevant IECEE CB-Scheme Operational documents.

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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	ChangZhou ZhongYu	8m x 3m x 3.8m	EMC0306	N/A	N/A
Two-Line V-Network	Rohde & Schwarz	ENV216	EMC0118	2020-01-10	2021-01-09
LISN	Rohde & Schwarz	ENV216	EMC2135	2019-09-16	2020-09-15
EMI Test Receiver	Rohde & Schwarz	ESCS30	EMC0506	2019-11-18	2020-11-17
Coaxial Cable	HangTianXing	2m	EMC0107	2018-09-20	2020-09-19
Test Software E3c	Audix	Ver. 5.4.1221b	GZE100-62	N/A	N/A

20dB Bandwidth					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2019-11-18	2020-11-17
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01
MI CABLE	SGS-EMC	0.8M	EMC2137	2019-11-02	2021-11-01

Frequency tolerance					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer	AgilentTechnologies	N9010A	EMC2138	2019-11-18	2020-11-17
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01
MI CABLE	SGS-EMC	0.8M	EMC2137	2019-11-02	2021-11-01
Temperature Chamber	GZ GongWen Co.Ltd.	GDJW-100	EMC0039	2020-07-01	2021-06-30

Emission Mask & Radiated Spurious Emissions					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EMI Test Receiver	Rohde & Schwarz	ESIB26	EMC0522	2020-01-10	2021-01-09
Chamber cable	HangTianXing	N/A	EMC0542	2019-06-28	2021-06-27
Trilog Broadband Antenna 30MHz-1GHz	SCHWARZBECKMESS-ELEKTRONIK	VULB 9168	SEM003-18	2019-02-22	2022-02-22
Amplifier	HP	8447F	EMC2065	2020-05-26	2021-05-25
Pre-Amplifier MH648A	ANRITSU CORP	MH648A	EMC2086	2019-11-18	2020-11-17
Active Loop Antenna	ETS-Lindgren	6502	EMC2190	2019-12-27	2021-12-26
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2019-10-20	2022-10-19
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A

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General used equipment					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
DMM	Fluke	73	EMC0006	2020-07-16	2021-07-15
DMM	Fluke	73	EMC0007	2020-07-16	2021-07-15

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6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

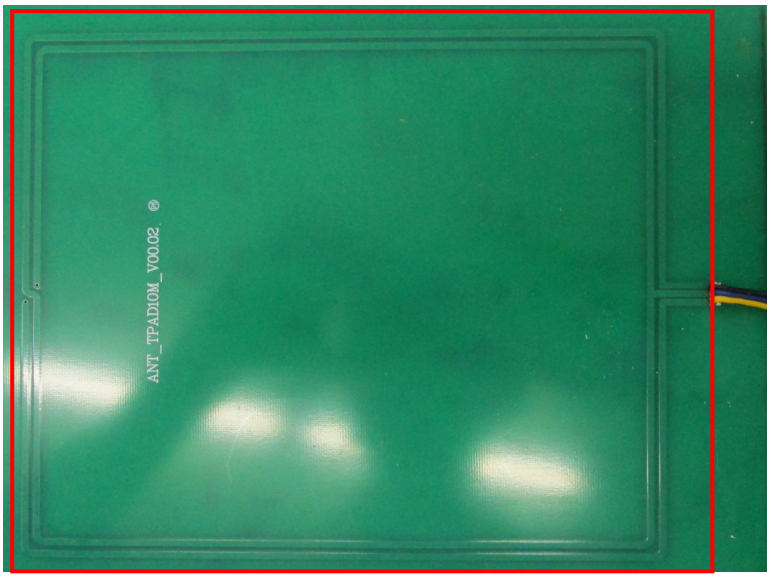
6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203

6.1.2 Conclusion

Standard 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 an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit permanently attached antenna or of an 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. The best case gain of the antenna is 0 dBi.

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7 Radio Spectrum Matter Test Results

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

Test Requirement 47 CFR Part 15, Subpart C 15.207
Test Method: ANSI C63.10 (2013) Section 6.2
Limit:

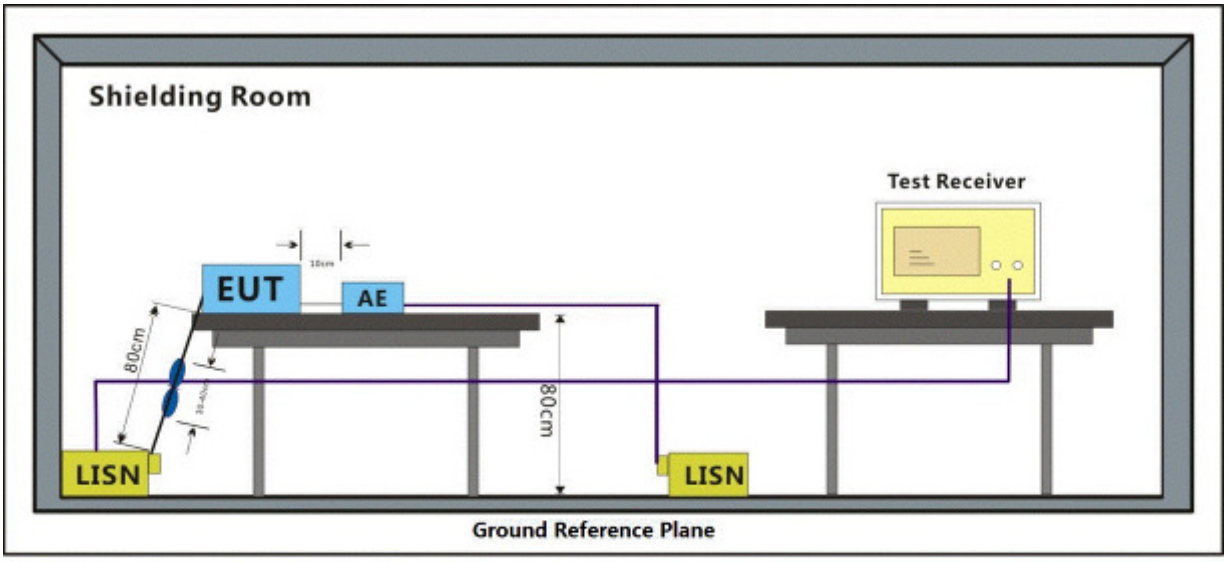
Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

7.1.1 E.U.T. Operation

Operating Environment:
Temperature: 25 °C Humidity: 52 % RH Atmospheric Pressure: 1020 mbar
Test Mode: b:TX mode_Keep the EUT in transmitting with modulation mode.

7.1.2 Test Setup Diagram



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7.1.3 Measurement Procedure and Data

1) The mains terminal disturbance voltage test was conducted in a shielded room.

2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50μH + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,

4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Remark: LISN=Read Level+ Cable Loss+ LISN Factor

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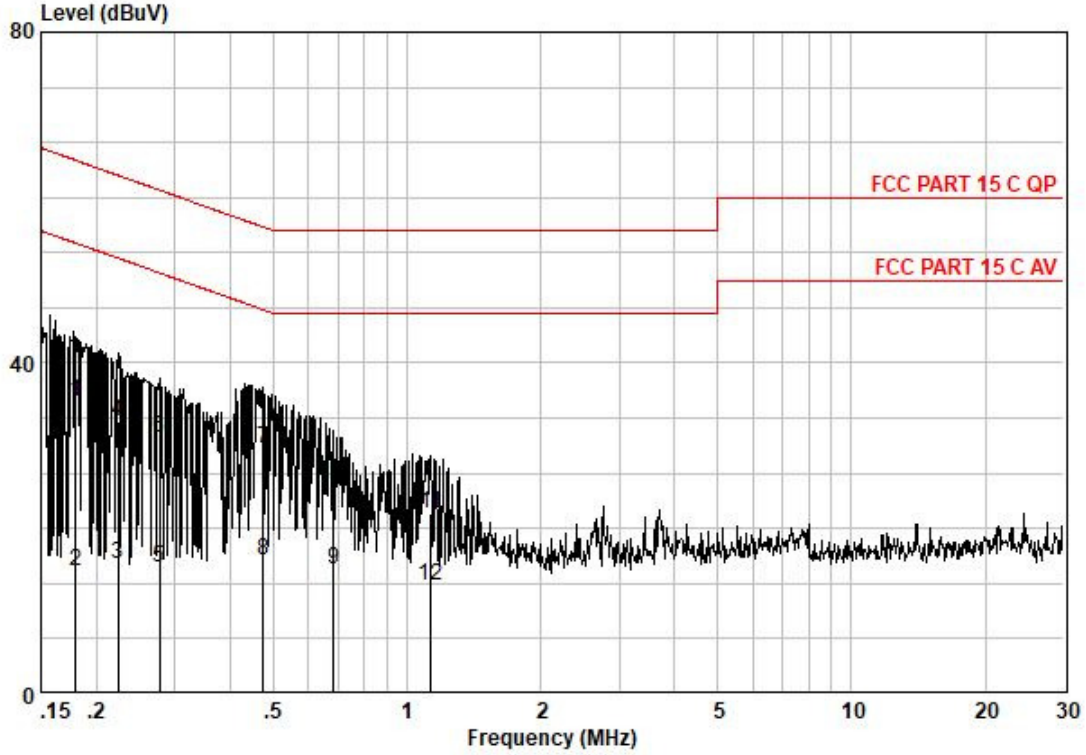
Mode:b; Line:Live Line



Pol :LIVE
No :
Model :

Frequency MHz	read level dBuV	Cable Loss dB	LISN Factor dB	Measured level dBuV	Limit Line dBuV	Over limit dB	Remark
0.18	25.61	0.10	9.66	35.37	64.50	-29.13	QP
0.18	5.01	0.10	9.66	14.77	54.50	-39.73	AVERAGE
0.22	5.95	0.10	9.67	15.72	52.70	-36.98	AVERAGE
0.22	23.25	0.10	9.67	33.02	62.70	-29.68	QP
0.28	5.45	0.10	9.67	15.22	50.90	-35.68	AVERAGE
0.28	21.17	0.10	9.67	30.94	60.90	-29.96	QP
0.47	19.93	0.10	9.67	29.70	56.45	-26.75	QP
0.47	6.27	0.10	9.67	16.04	46.45	-30.41	AVERAGE
0.68	5.18	0.10	9.67	14.95	46.00	-31.05	AVERAGE
0.68	15.49	0.10	9.67	25.26	56.00	-30.74	QP
1.13	12.01	0.10	9.68	21.79	56.00	-34.21	QP
1.13	3.31	0.10	9.68	13.09	46.00	-32.91	AVERAGE

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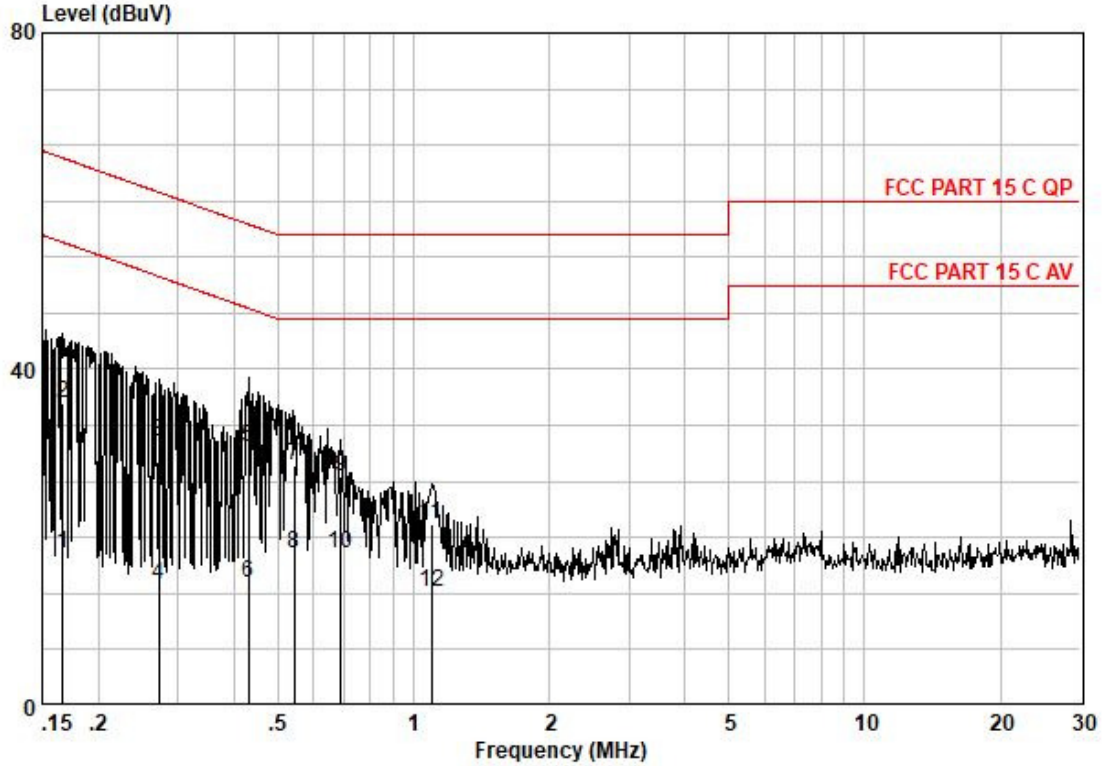
Mode:b; Line:Neutral Line



Pol :NEUTRAL
No :
Model :

Frequency MHz	read level dBuV	Cable Loss dB	LISN Factor dB	Measured level dBuV	Limit Line dBuV	Over limit dB	Remark
0.17	8.37	0.10	9.60	18.07	55.12	-37.05	AVERAGE
0.17	26.37	0.10	9.60	36.07	65.12	-29.05	QP
0.27	21.71	0.10	9.59	31.40	61.07	-29.67	QP
0.27	4.62	0.10	9.59	14.31	51.07	-36.76	AVERAGE
0.43	21.11	0.10	9.59	30.80	57.24	-26.44	QP
0.43	4.96	0.10	9.59	14.65	47.24	-32.59	AVERAGE
0.54	18.86	0.10	9.60	28.56	56.00	-27.44	QP
0.54	8.29	0.10	9.60	17.99	46.00	-28.01	AVERAGE
0.69	17.61	0.10	9.60	27.31	56.00	-28.69	QP
0.69	8.50	0.10	9.60	18.20	46.00	-27.80	AVERAGE
1.09	11.95	0.10	9.61	21.66	56.00	-34.34	QP
1.09	3.75	0.10	9.61	13.46	46.00	-32.54	AVERAGE

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7.2 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.215
Test Method: ANSI C63.10 (2013) Section 6.9
Limit: N/A

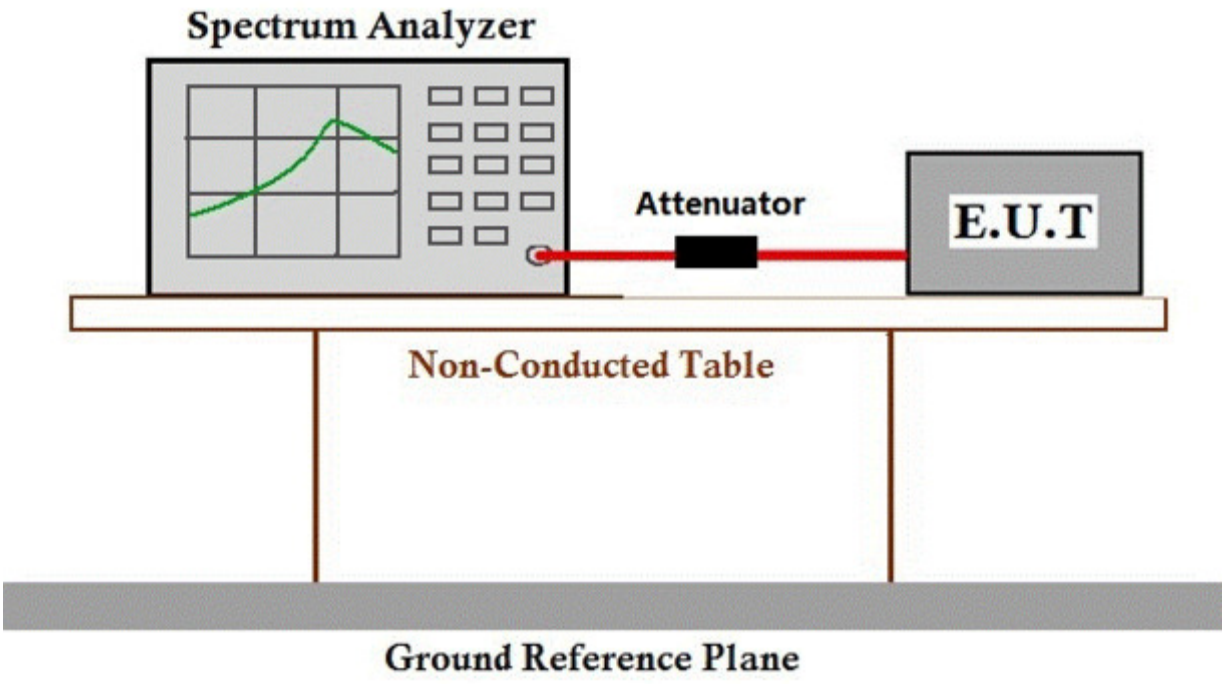
7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 25.9 °C Humidity: 52.1 % RH Atmospheric Pressure: 1020 mbar

Test Mode: b:TX mode_Keep the EUT in transmitting with modulation mode.

7.2.2 Test Setup Diagram



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7.2.3 Measurement Procedure and Data

Cable Loss= 0.9dB

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7.3 Emission Mask

Test Requirement 47 CFR Part 15, Subpart C 15.225(a)&(b)&(C)

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

Limit:

(a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15848 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.

According to ANSI C63.10 Section 6.4, the test data shall convert by below formula:

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

$$FS_{\text{limit}} = FS_{\max} - 40\log\left(\frac{d_{\text{limit}}}{d_{\text{measure}}}\right) \quad (4)$$

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
$d_{\text{near field}}$	is the λ/2π distance
d_{measure}	is the distance of the measurement point from the EUT
d_{limit}	is the reference distance or the distance of the λ/2π point

Table 5—Relationship of frequency and wavelength (informative)

Frequency (MHz)	λ (m)	0.625λ (m)	λ/2π
0.009	33333.3	20833.3	5305.2
0.1	3000.0	1875.0	477.5
0.3	1000.0	625.0	159.2
1	300.0	187.5	47.7
4.76	63.0	39.4	10.0
16	18.8	11.7	3.0
30	10.0	6.3	1.6

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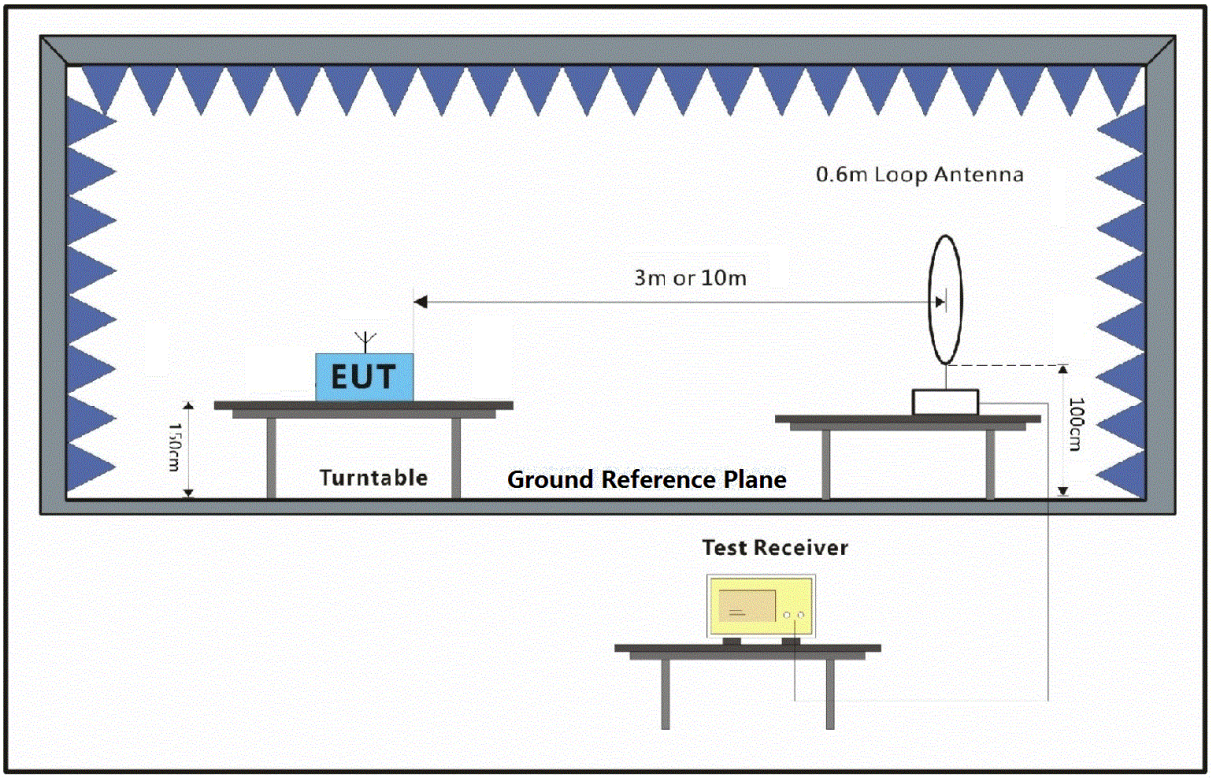
7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 25.9 °C Humidity: 52 % RH Atmospheric Pressure: 1020 mbar

Test Mode: b:TX mode_Keep the EUT in transmitting with modulation mode.

7.3.2 Test Setup Diagram



7.3.3 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.

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.

Measured Level l=Read Level + Antenna Factor + Cable Loss - Preamp Factor

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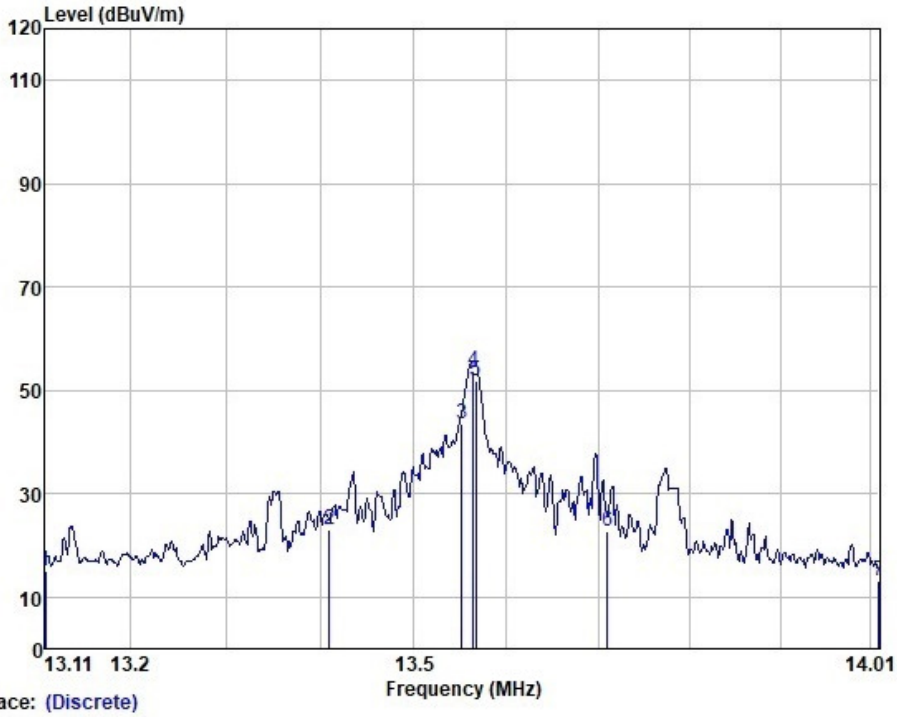
Mode:b; Polarization:X



Trace: (Discrete)
Site : SGS
Condition: 10m
Job :
Model :
Power :
Test Mode:

	Freq	ReadLevel	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	13.110	34.72	9.07	0.40	29.27	14.92	------	------	
2	13.410	42.92	8.99	0.40	29.27	23.04	------	------	
3	13.553	63.42	8.96	0.40	29.27	43.51	------	------	
4	13.560	73.60	8.96	0.40	29.27	53.69	------	------	
5	13.567	71.84	8.96	0.40	29.27	51.93	------	------	
6	13.710	42.52	8.93	0.40	29.27	22.58	------	------	
7	14.010	33.04	8.87	0.40	29.26	13.05	------	------	

Frequency (MHz)	Level (dBuV/m) @10m	Limit (dBuV/m) @30m	Convert Factor (dB)	Level (dBuV/m) @ 30m	Over limit (dB)
13.110	14.92	29.54	19.08	-4.16	-33.7
13.410	23.04	40.51	19.08	3.96	-36.55
13.553	43.51	50.47	19.08	24.43	-26.04
**13.560	53.69	84.00	19.08	34.61	-49.39
13.567	51.93	50.47	19.08	32.85	-17.62
13.710	22.58	40.51	19.08	3.50	-37.01
14.010	13.05	29.54	19.08	-6.03	-35.57

**Remark: This is the main operating frequency of the EUT.

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7.4 Frequency tolerance

Test Requirement 47 CFR Part 15, Subpart C 15.225(e)

Test Method: ANSI C63.10 (2013) Section 6.8

Limit: ±0.01%(1.356kHz)

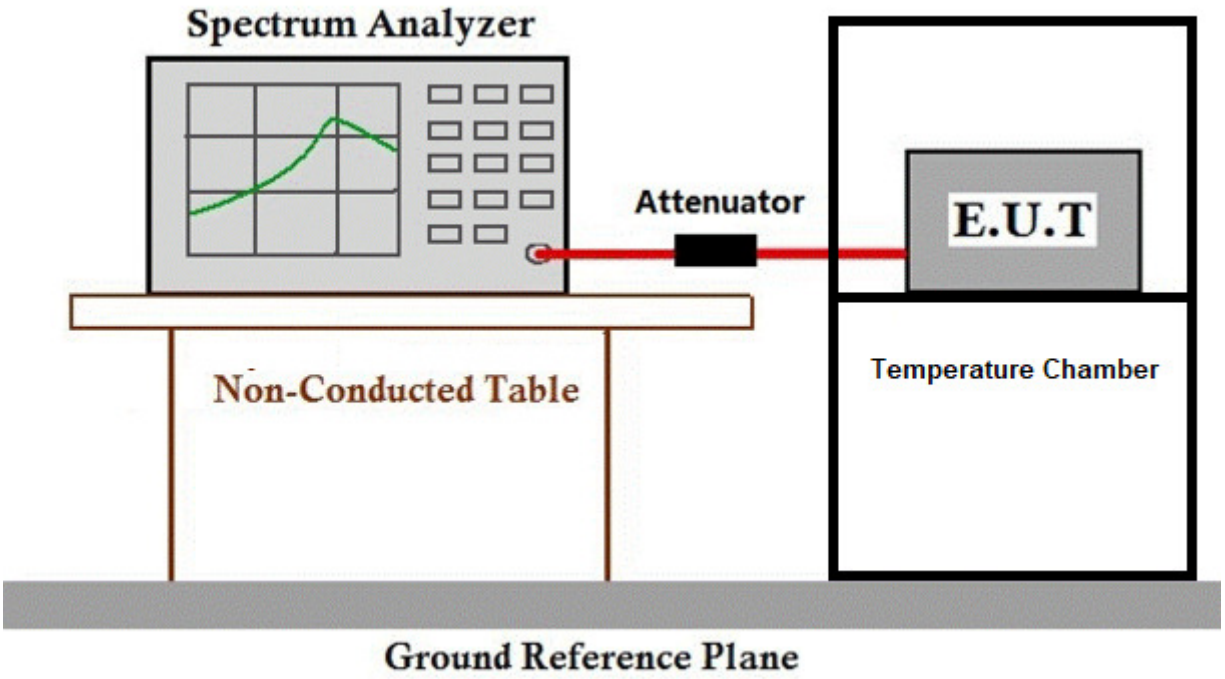
7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 25.9 °C Humidity: 52.1 % RH Atmospheric Pressure: 1020 mbar

Test Mode: b:TX mode_Keep the EUT in transmitting with modulation mode.

7.4.2 Test Setup Diagram



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7.4.3 Measurement Procedure and Data

At startup:

Measurement Conditions		Limit: ±0.01%(1.356kHz)		Verdict
Voltage (V DC)	Temperature (℃)	Frequency Measured (MHz)	Deviation (kHz)	
V_{norm} : 5	-20	13.561218	1.218	PASS
	-10	13.561341	1.341	PASS
	0	13.561158	1.158	PASS
	+10	13.561213	1.213	PASS
	T_{normal} : +20	13.561074	1.074	PASS
	+30	13.561249	1.249	PASS
	+40	13.561200	1.200	PASS
	+50	13.561245	1.245	PASS
V_{max} : 5.5	T_{normal} : +20	13.561173	1.173	PASS
V_{min} : 4.5		13.561178	1.178	PASS

At 2 minutes later:

Measurement Conditions		Limit: ±0.01%(1.356kHz)		Verdict
Voltage (V DC)	Temperature (℃)	Frequency Measured (MHz)	Deviation (kHz)	
V_{norm} : 5	-20	13.561232	1.232	PASS
	-10	13.561295	1.295	PASS
	0	13.561179	1.179	PASS
	+10	13.561339	1.339	PASS
	T_{normal} : +20	13.561124	1.124	PASS
	+30	13.561317	1.317	PASS
	+40	13.561088	1.088	PASS
	+50	13.561067	1.067	PASS
V_{max} : 5.5	T_{normal} : +20	13.561233	1.233	PASS
V_{min} : 4.5		13.561207	1.207	PASS

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At 5 minutes later:

Measurement Conditions		Limit: ±0.01%(1.356kHz)		Verdict
Voltage (V DC)	Temperature (℃)	Frequency Measured (MHz)	Deviation (kHz)	
V_{norm} : 5	-20	13.561077	1.077	PASS
	-10	13.561101	1.101	PASS
	0	13.561252	1.252	PASS
	+10	13.561049	1.049	PASS
	T_{normal} : +20	13.561097	1.097	PASS
	+30	13.561130	1.130	PASS
	+40	13.561127	1.127	PASS
	+50	13.561342	1.342	PASS
V_{max} : 5.5	T_{normal} : +20	13.561315	1.315	PASS
V_{min} : 4.5		13.561294	1.294	PASS

At 10 minutes later:

Measurement Conditions		Limit: ±0.01%(1.356kHz)		Verdict
Voltage (V DC)	Temperature (℃)	Frequency Measured (MHz)	Deviation (kHz)	
V_{norm} : 5	-20	13.561159	1.159	PASS
	-10	13.561242	1.242	PASS
	0	13.561271	1.271	PASS
	+10	13.561148	1.148	PASS
	T_{normal} : +20	13.561336	1.336	PASS
	+30	13.561134	1.134	PASS
	+40	13.561056	1.056	PASS
	+50	13.561188	1.188	PASS
V_{max} : 5.5	T_{normal} : +20	13.561117	1.117	PASS
V_{min} : 4.5		13.561196	1.196	PASS

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7.5 Radiated Emissions(9kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.225(d) & 15.209
Test Method: ANSI C63.10 (2013) Section 6.4&6.5
Measurement Distance: 10m
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
30-88	100	40.0	QP	3
88-216	150	43.5	QP	3
216-960	200	46.0	QP	3
960-1000	500	54.0	QP	3
Above 1000	500	54.0	AV	3

According to ANSI C63.10 Section 6.4, the test data shall convert by below formula:

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

$$FS_{\text{limit}} = FS_{\max} - 40\log\left(\frac{d_{\text{limit}}}{d_{\text{measure}}}\right) \quad (4)$$

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
$d_{\text{near field}}$ is the λ/2π distance
d_{measure} is the distance of the measurement point from the EUT
d_{limit} is the reference distance or the distance of the λ/2π point

Table 5—Relationship of frequency and wavelength (informative)

Frequency (MHz)	λ (m)	0.625λ (m)	λ/2π
0.009	33333.3	20833.3	5305.2
0.1	3000.0	1875.0	477.5
0.3	1000.0	625.0	159.2
1	300.0	187.5	47.7
4.76	63.0	39.4	10.0
16	18.8	11.7	3.0
30	10.0	6.3	1.6

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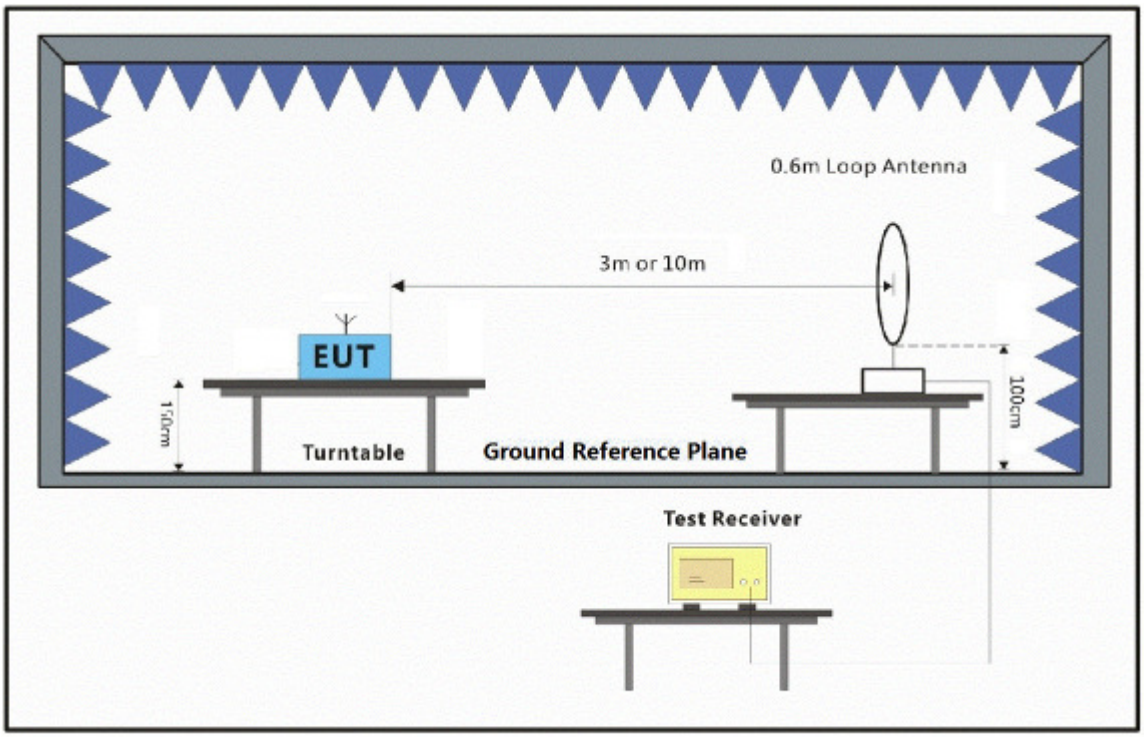
7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 52 % RH Atmospheric Pressure: 1020 mbar

Test Mode: b:TX mode_Keep the EUT in transmitting with modulation mode.

7.5.2 Test Setup Diagram



7.5.3 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.

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.

Measured Level l=Read Level + Antenna Factor + Cable Loss - Preamp Factor

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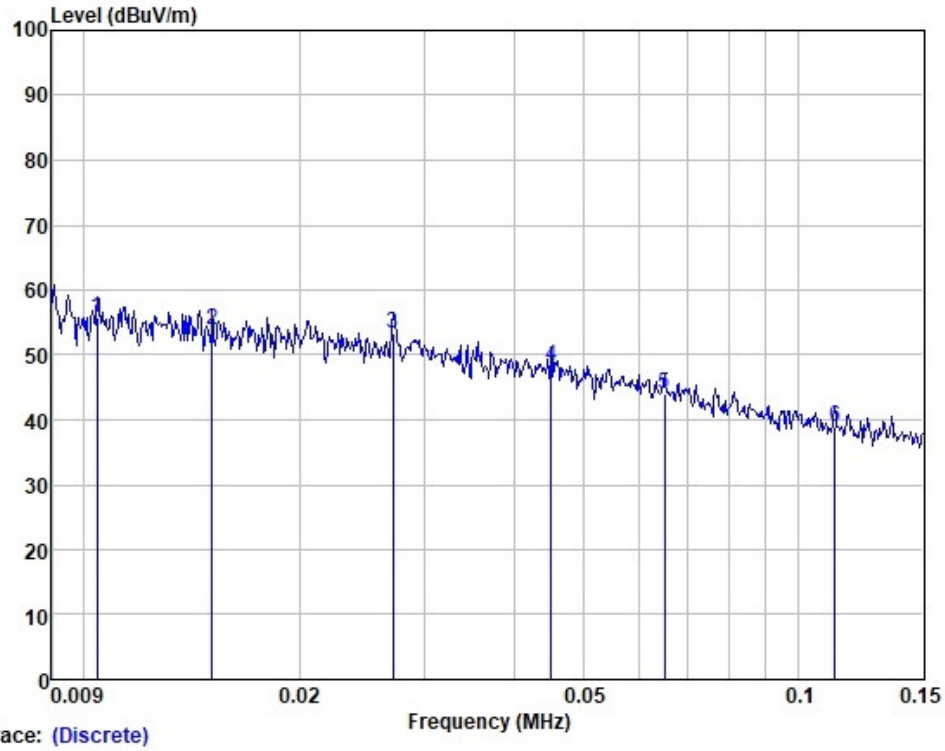
Mode:b; Polarization:X



Trace: (Discrete)
Site : SGS
Condition: 10m
Job :
Model :
Power :
Test Mode:

	Freq	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	0.010	67.96	15.72	0.00	28.07	55.61	------	------	
2	0.015	68.21	13.90	0.00	28.17	53.94	------	------	
3	0.027	69.26	12.75	0.00	28.55	53.46	------	------	
4	0.045	65.56	11.96	0.00	29.21	48.31	------	------	
5	0.065	61.89	11.46	0.00	29.36	43.99	------	------	
6	0.113	58.00	10.44	0.00	29.46	38.98	------	------	

Frequency (MHz)	Level (dBuV/m) @10m	Limit (dBuV/m) @30m	Limit (dBuV/m) @300m	Convert Factor (dB)	Level (dBuV/m) @ 30m	Level (dBuV/m) @ 300m	Over limit (dB)
0.010	55.61	-	47.60	59.08	-	-3.47	-51.07
0.015	53.94	-	44.08	59.08	-	-5.14	-49.22
0.027	53.46	-	38.98	59.08	-	-5.62	-44.60
0.045	48.31	-	34.54	59.08	-	-10.77	-45.31
0.065	43.99	-	31.35	59.08	-	-15.09	-46.44
0.113	38.98	-	26.54	59.08	-	-20.1	-46.64

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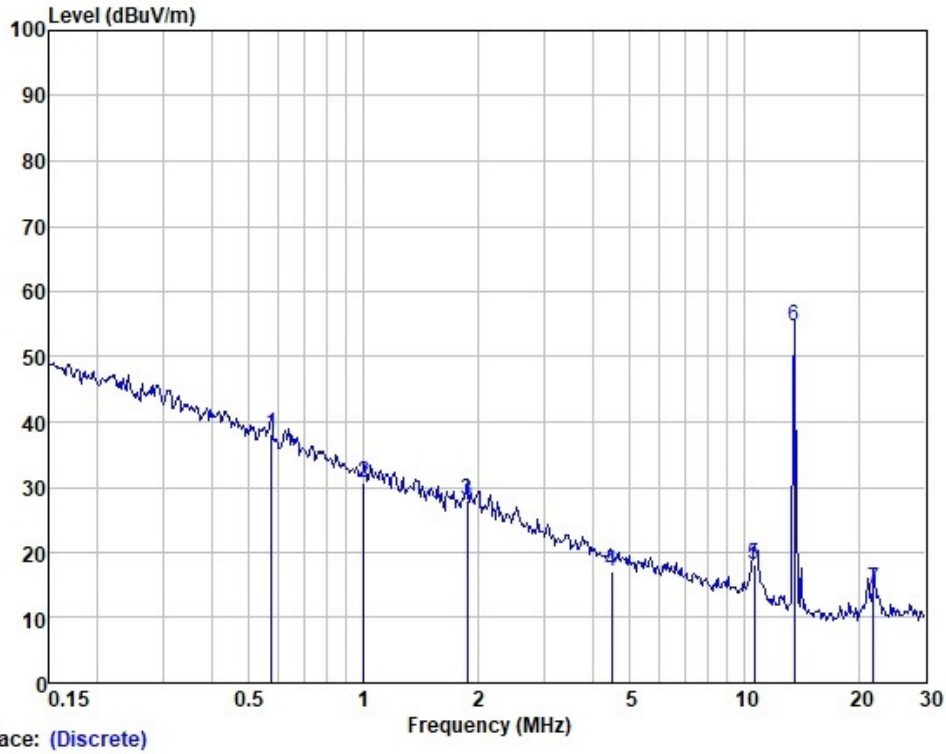
Mode:b; Polarization:X



Trace: (Discrete)

```
Site      : SGS
Condition: 10m
Job       :
Model     :
Power     :
Test Mode:
```

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	0.573	56.75	10.67	0.10	29.40	38.12	------	------	
2	1.005	49.63	10.40	0.10	29.38	30.75	------	------	
3	1.878	46.23	10.97	0.10	29.36	27.94	------	------	
4	4.478	35.75	10.53	0.20	29.33	17.15	------	------	
5	10.620	37.27	9.98	0.30	29.29	18.26	------	------	
7	21.830	34.75	8.36	0.50	29.23	14.38	------	------	

Frequency (MHz)	Level (dBuV/m) @10m	Limit (dBuV/m) @30m	Limit (dBuV/m) @300m	Convert Factor (dB)	Level (dBuV/m) @ 30m	Level (dBuV/m) @ 300m	Over limit (dB)
0.573	38.12	32.44	-	19.08	19.04	-	-13.40
1.005	30.75	27.56	-	19.08	11.67	-	-15.89
1.878	27.94	29.54	-	19.08	8.86	-	-20.68
4.478	17.15	29.54	-	19.08	-1.93	-	-31.47
10.62	18.26	29.54	-	19.08	-0.82	-	-30.36
21.83	14.38	29.54	-	19.08	-4.7	-	-34.24

Remark: The point 6 is the main operating frequency of the EUT and refer to section 7.3 for details.

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7.6 Radiated Emissions(30MHz-1GHz)

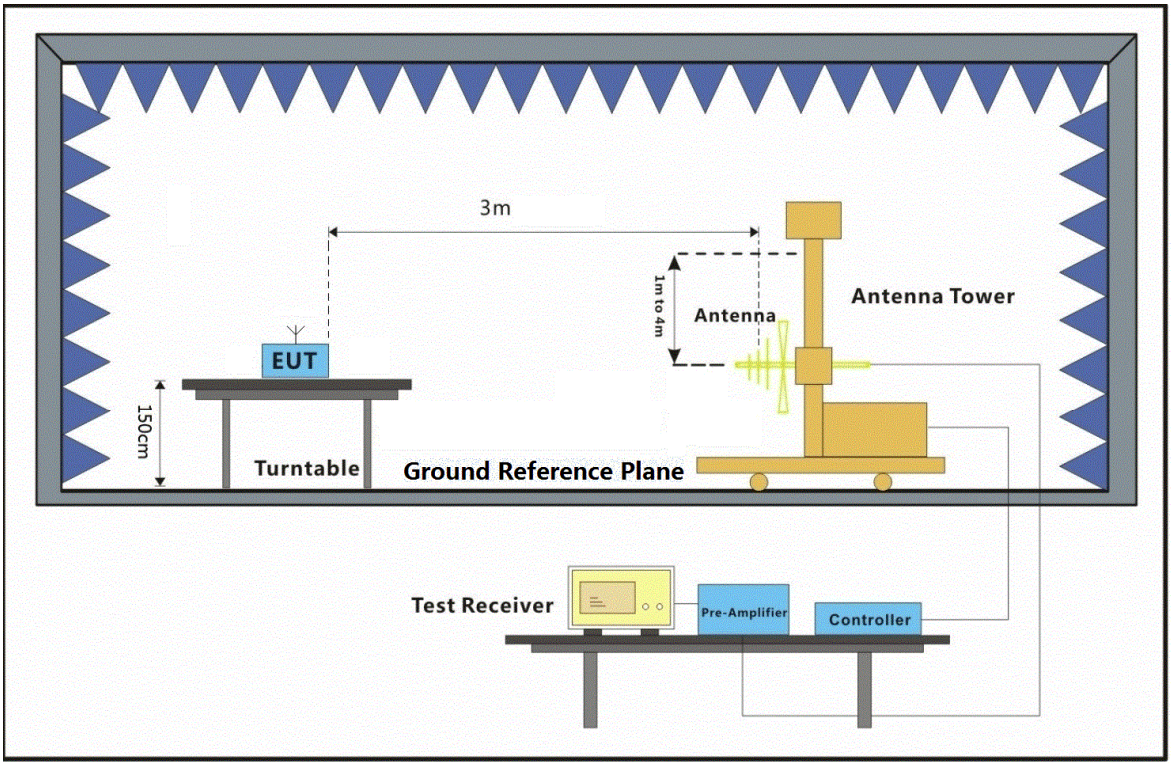
Test Requirement 47 CFR Part 15, Subpart C 15.225(d) & 15.209
Test Method: ANSI C63.10 (2013) Section 6.4&6.5
Measurement Distance: 3m
Limit:

Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3

7.6.1 E.U.T. Operation

Operating Environment:
Temperature: 22 °C Humidity: 52 % RH Atmospheric Pressure: 1020 mbar
Test Mode: b:TX mode_Keep the EUT in transmitting with modulation mode.

7.6.2 Test Setup Diagram



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7.6.3 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.

Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

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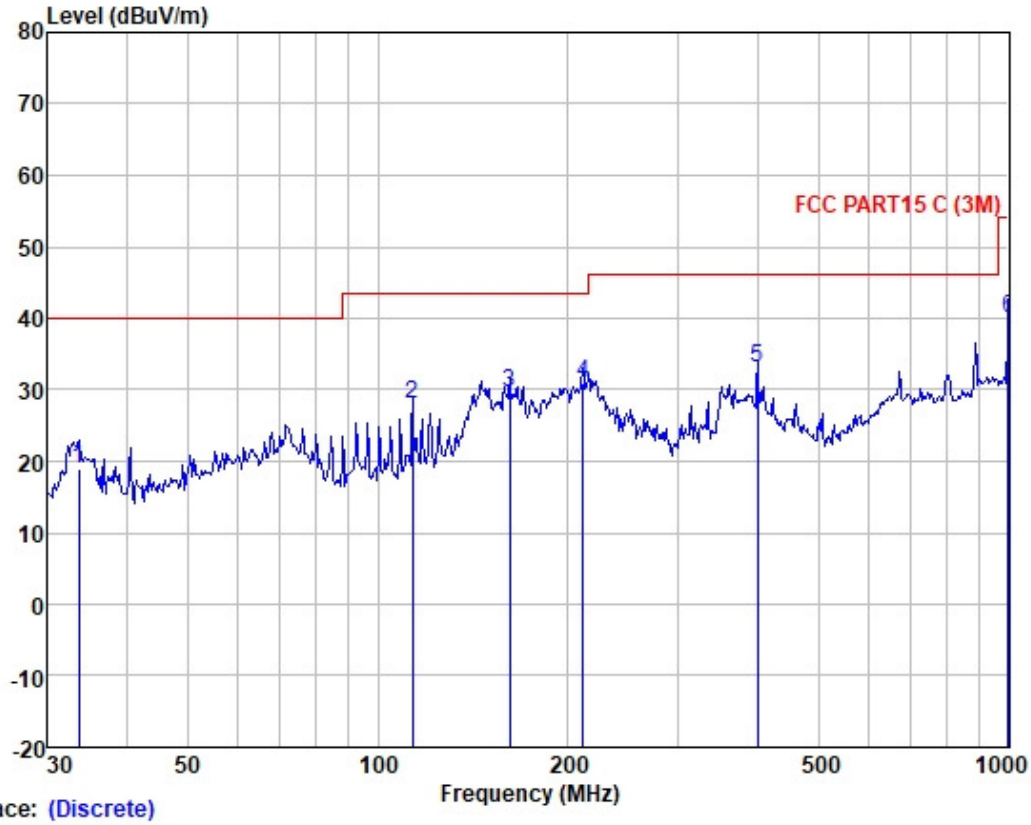
Mode:b; Polarization:Horizontal



Trace: (Discrete)

Site : SGS
Condition: FCC PART15 C (3M) 3m HORIZONTAL
Job :
Model :
Power :
Test Mode:

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	33.562	32.31	12.78	1.05	27.19	18.95	40.00	-21.05	HORIZONTAL	QP
2	113.316	42.83	10.57	1.74	27.07	28.07	43.50	-15.43	HORIZONTAL	QP
3	162.041	40.65	13.60	2.15	26.84	29.56	43.50	-13.94	HORIZONTAL	QP
4	211.527	45.51	9.80	2.55	26.82	31.04	43.50	-12.46	HORIZONTAL	QP
5	400.432	41.37	15.70	3.93	27.90	33.10	46.00	-12.90	HORIZONTAL	QP
6	1000.000	36.54	24.30	6.85	27.80	39.89	54.00	-14.11	HORIZONTAL	QP

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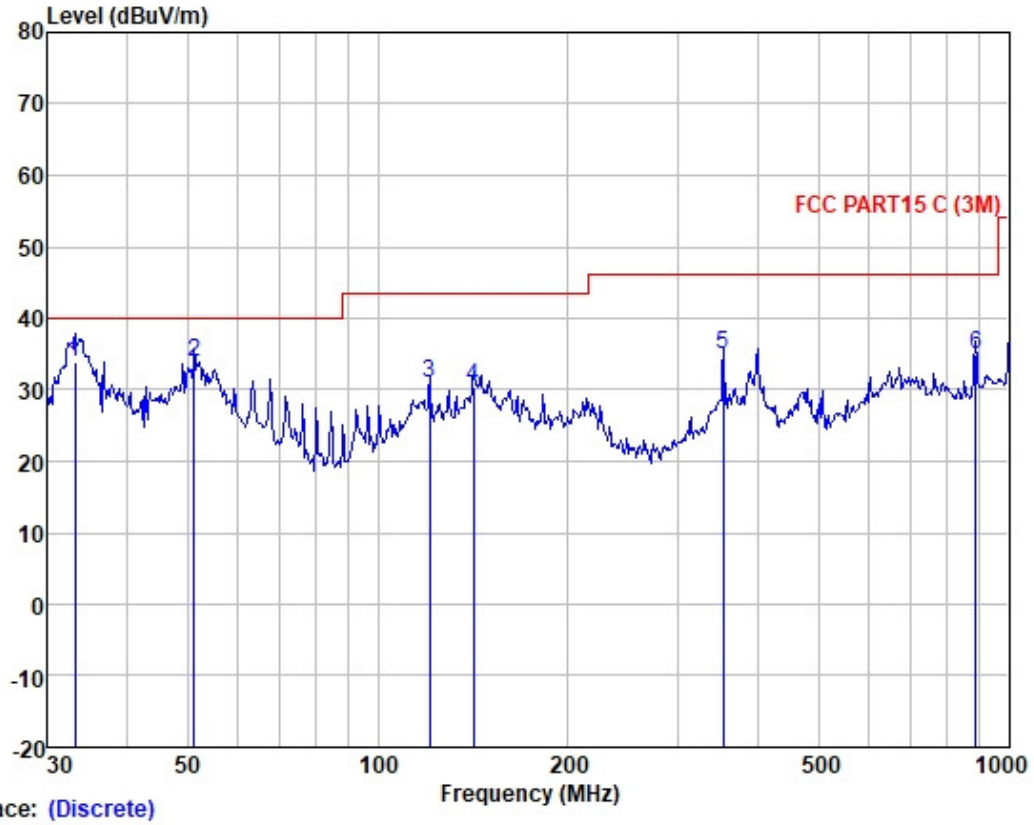
Mode:b; Polarization:Vertical



Trace: (Discrete)

Site : SGS
Condition: FCC PART15 C (3M) 3m VERTICAL
Job :
Model :
Power :
Test Mode:

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	33.095	47.14	12.76	1.04	27.19	33.75	40.00	-6.25	VERTICAL	QP
2	51.121	45.84	13.95	1.21	27.17	33.83	40.00	-6.17	VERTICAL	QP
3	120.699	45.32	10.96	1.77	27.06	30.99	43.50	-12.51	VERTICAL	QP
4	141.826	41.88	13.50	1.99	26.94	30.43	43.50	-13.07	VERTICAL	QP
5	352.943	44.91	14.55	3.20	27.75	34.91	46.00	-11.09	VERTICAL	QP
6	887.610	33.74	23.07	6.10	27.98	34.93	46.00	-11.07	VERTICAL	QP

--End of Report--

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