TEST REPORT

Application No.:	SZEM2001000110CR
Applicant:	ZKTECO CO., LTD.
Address of Applicant:	No.26, Pingshan 188 Industry zone, Tangxia Town, Dongguan City, Guangdong Province, China 523728
Manufacturer:	ZKTECO CO., LTD.
Address of Manufacturer:	No.26, Pingshan 188 Industry zone, Tangxia Town, Dongguan City, Guangdong Province, China 523728
Factory:	ZKTECO CO., LTD.
Address of Factory:	No.26, Pingshan 188 Industry zone, Tangxia Town, Dongguan City, Guangdong Province, China 523728
Equipment Under Test (EUT):	
EUT Name:	Smart Access Control Terminal
Model No.:	SpeedFace-H5L
FCC ID:	2AJ9T-H5MW
Standard(s) :	47 CFR Part 15, Subpart C 15.225
Date of Receipt:	2020-01-03
Date of Test:	2020-01-07 to 2020-05-12
Date of Issue:	2020-06-01
Test Result:	**Pass***

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

Keny Xu
EMC Laboratory Manager

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch Testing Center, EMC Laboratory.

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Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2020-06-01		Original

Authorized for issue by:				
				
		Damon Su /Project Engineer		
				
		Eric Fu /Reviewer		

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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

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3 Contents

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4 General Information

4.1 Details of E.U.T.

	Power Supply:	Input: DC 12V 3A. Adapter Model: ADS-40SI-12-3 12036E Input: AC 100-240V 50/60Hz 1.0A Output: DC 12V 3A
	Cable:	AC Cable:150cm unshielded
	Operation Frequency:	13.56MHz
	Modulation Type:	ASK
	Antenna Type:	Loop Antenna

4.2 Description of Support Units

The EUT has been tested as an independent unit.

4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	± 7.25 x 10^{-8}
2	Duty cycle	± 0.37%
3	Occupied Bandwidth	± 3%
4	Conduction emission	± 3.0dB (150kHz to 30MHz)
5	RF conducted power	± 0.75dB
6	RF power density	± 2.84dB
7	Conducted Spurious emissions	± 0.75dB
8	RF Radiated power	± 4.5dB (Below 1GHz)
		± 4.8dB (Above 1GHz)
9	Radiated Spurious emission test	± 4.5dB (Below 1GHz)
		± 4.8dB (Above 1GHz)
10	Temperature test	± 1℃
11	Humidity test	± 3%
12	Supply voltages	± 1.5%
13	Time	± 3%

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4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China. 518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

4.5 Test Facility

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

- **A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

- **VCCI**

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

- **FCC –Designation Number: CN1178**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

- **Innovation, Science and Economic Development Canada**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

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5 Equipment List

20dB Bandwidth, Emission Mask, Frequency tolerance					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Shielding Room	SAEMC	MSR733	SEM001-09	2019-06-13	2022-06-12
Programmable Temperature & Humidity Chamber	Votsch Industrietechnik GmbH	VT 4002	SEM002-15	2019-03-26	2020-03-25
Programmable Temperature & Humidity Chamber	Votsch Industrietechnik GmbH	VT 4002	SEM002-15	2020-03-25	2021-03-24
Coaxial Cable	SGS	N/A	SEM031-01	2019-07-11	2020-07-10
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	N/A	N/A
DC Power Supply	Rohde & Schwarz	NGSM 32/10	SEM011-04	2019-03-25	2020-03-24
DC Power Supply	Rohde & Schwarz	NGSM 32/10	SEM011-04	2020-03-24	2021-03-23
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2019-09-24	2020-09-23
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2019-09-24	2020-09-23
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2019-09-24	2020-09-23
Programmable Temperature & Humidity Chamber	Votsch Industrietechnik GmbH	VT 4002	SEM002-15	2019-03-26	2020-03-25
Programmable Temperature & Humidity Chamber	Votsch Industrietechnik GmbH	VT 4002	SEM002-15	2020-03-25	2021-03-24
Electric and Magnetic Field Analyzer	Narda	EHP-50F	SEM022-05	2019-11-28	2020-11-27

Conducted Emissions at AC Power Line (150kHz-30MHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Shielding Room	ZhongYu Electron	GB-88	SEM001-06	2019-06-13	2022-06-12
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM024-01	2019-07-11	2020-07-10
LISN	Rohde & Schwarz	ENV216	SEM007-01	2019-09-24	2020-09-23
LISN	ETS-LINDGREN	3816/2	SEM007-02	2020-04-01	2021-03-31
EMI Test Receiver	Rohde & Schwarz	ESCI	SEM004-02	2020-03-24	2021-03-23

Radiated Emissions(9kHz-30MHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
10m Semi-Anechoic Chamber	SAEMC	FSAC1018	SEM001-03	2018-03-31	2021-03-30

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Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM029-01	2019-07-11	2020-07-10
MXE EMI receiver	KEYSIGHT	N9038A	SEM004-16	2019-12-16	2020-12-15
Trilog-Broadband Antenna	Schwarzbeck	VULB9168	SEM003-18	2019-08-08	2022-08-07
Pre-amplifier	Sonoma Instrument Co	310N	SEM005-04	2020-04-09	2021-04-08
Active Loop Antenna	ETS-Lindgren	6502	SEM003-08	2017-08-22	2020-08-21

Radiated Emissions(30MHz-1GHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
10m Semi-Anechoic Chamber	SAEMC	FSAC1018	SEM001-03	2018-03-31	2021-03-30
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM029-01	2019-07-11	2020-07-10
MXE EMI receiver	KEYSIGHT	N9038A	SEM004-16	2019-12-16	2020-12-15
Trilog-Broadband Antenna	Schwarzbeck	VULB9168	SEM003-18	2019-08-08	2022-08-07
Pre-amplifier	Sonoma Instrument Co	310N	SEM005-04	2020-04-09	2021-04-08
Active Loop Antenna	ETS-Lindgren	6502	SEM003-08	2017-08-22	2020-08-21

General used equipment					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-03	2019-09-26	2020-09-25
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-04	2019-09-26	2020-09-25
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2019-09-26	2020-09-25
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2020-04-07	2021-04-06

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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 a 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.

Antenna location: Refer to Internal photos.

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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:

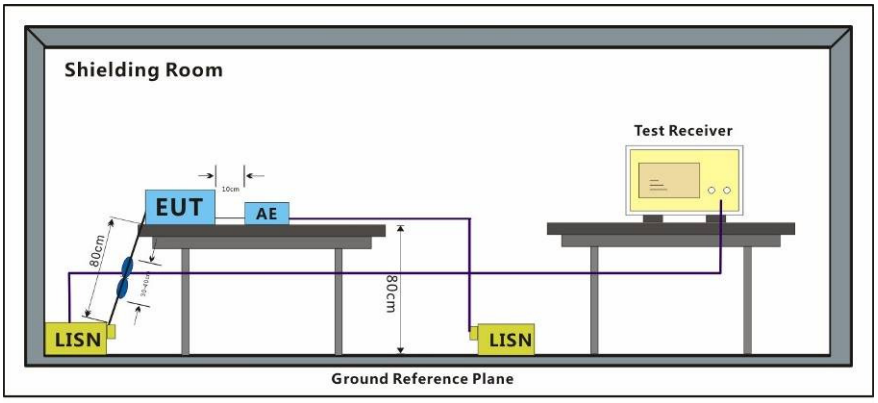
Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

7.1.1 E.U.T. Operation

Operating Environment:
Temperature: 21.6 °C Humidity: 53.5 % 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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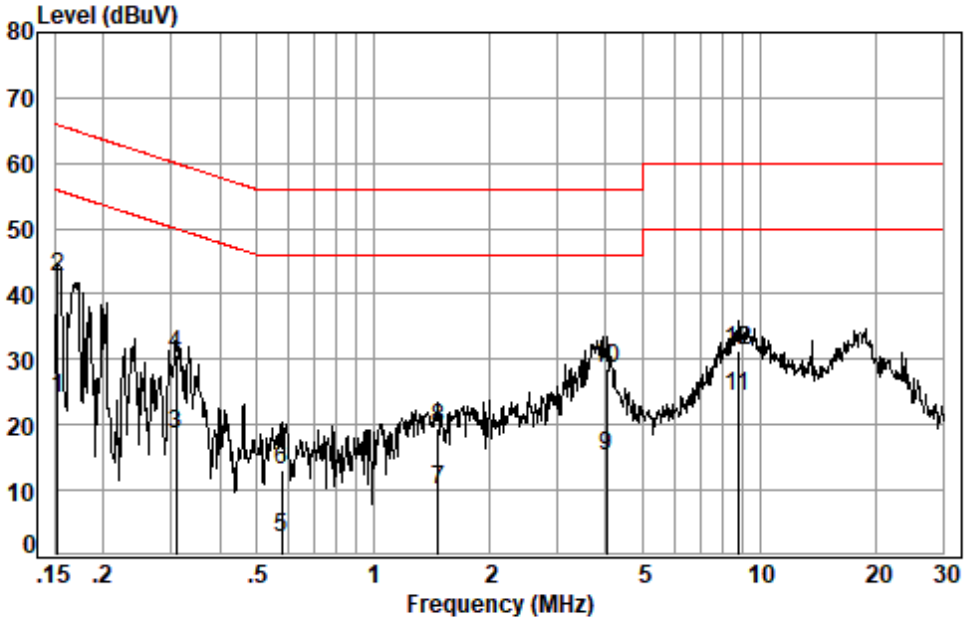
Mode:b; Line:Live Line



Site : Shielding Room
Condition: Line
Job No. : 00110CR
Test mode: b

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.1524	0.01	9.59	14.54	24.14	55.87	-31.73	Average
2	0.1524	0.01	9.59	33.06	42.66	65.87	-23.21	QP
3	0.3083	0.04	9.59	8.86	18.49	50.02	-31.53	Average
4	0.3083	0.04	9.59	21.10	30.73	60.02	-29.29	QP
5	0.5792	0.07	9.60	-6.94	2.73	46.00	-43.27	Average
6	0.5792	0.07	9.60	3.37	13.04	56.00	-42.96	QP
7	1.4718	0.13	9.61	0.31	10.05	46.00	-35.95	Average
8	1.4718	0.13	9.61	9.84	19.58	56.00	-36.42	QP
9	4.0275	0.16	9.65	5.48	15.29	46.00	-30.71	Average
10	4.0275	0.16	9.65	18.76	28.57	56.00	-27.43	QP
11	8.7757	0.17	9.78	14.31	24.26	50.00	-25.74	Average
12	8.7757	0.17	9.78	21.53	31.48	60.00	-28.52	QP

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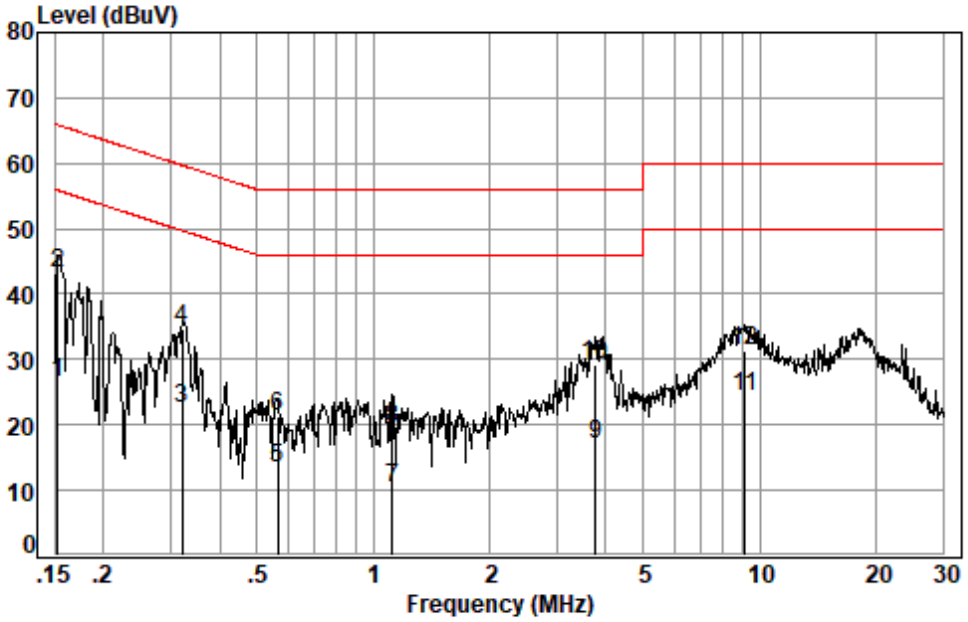
Mode:b; Line:Neutral Line



Site : Shielding Room
Condition: Neutral
Job No. : 00110CR
Test mode: b

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.1524	0.01	9.55	16.91	26.47	55.87	-29.40	Average
2	0.1524	0.01	9.55	33.66	43.22	65.87	-22.65	QP
3	0.3200	0.04	9.54	13.08	22.66	49.71	-27.05	Average
4	0.3200	0.04	9.54	25.10	34.68	59.71	-25.03	QP
5	0.5671	0.07	9.55	3.63	13.25	46.00	-32.75	Average
6	0.5671	0.07	9.55	11.77	21.39	56.00	-34.61	QP
7	1.1233	0.10	9.55	0.58	10.23	46.00	-35.77	Average
8	1.1233	0.10	9.55	9.85	19.50	56.00	-36.50	QP
9	3.7594	0.16	9.60	7.42	17.18	46.00	-28.82	Average
10	3.7594	0.16	9.60	19.32	29.08	56.00	-26.92	QP
11	9.1557	0.17	9.80	14.37	24.34	50.00	-25.66	Average
12	9.1557	0.17	9.80	21.33	31.30	60.00	-28.70	QP

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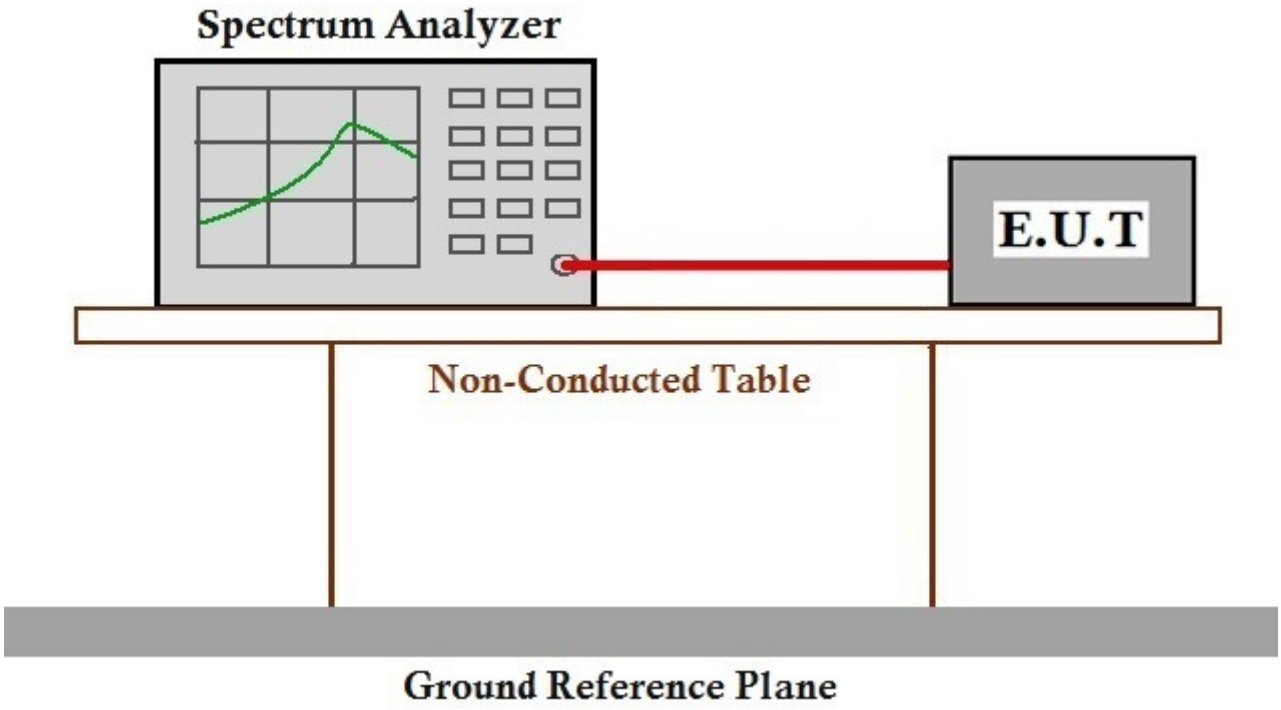
7.2 20dB Bandwidth

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 °C Humidity: 45 % RH Atmospheric Pressure: 1020 mbar
Test mode b:TX mode_Keep the EUT in transmitting with modulation mode.

7.2.2 Test Setup Diagram



7.2.3 Measurement Procedure and Data

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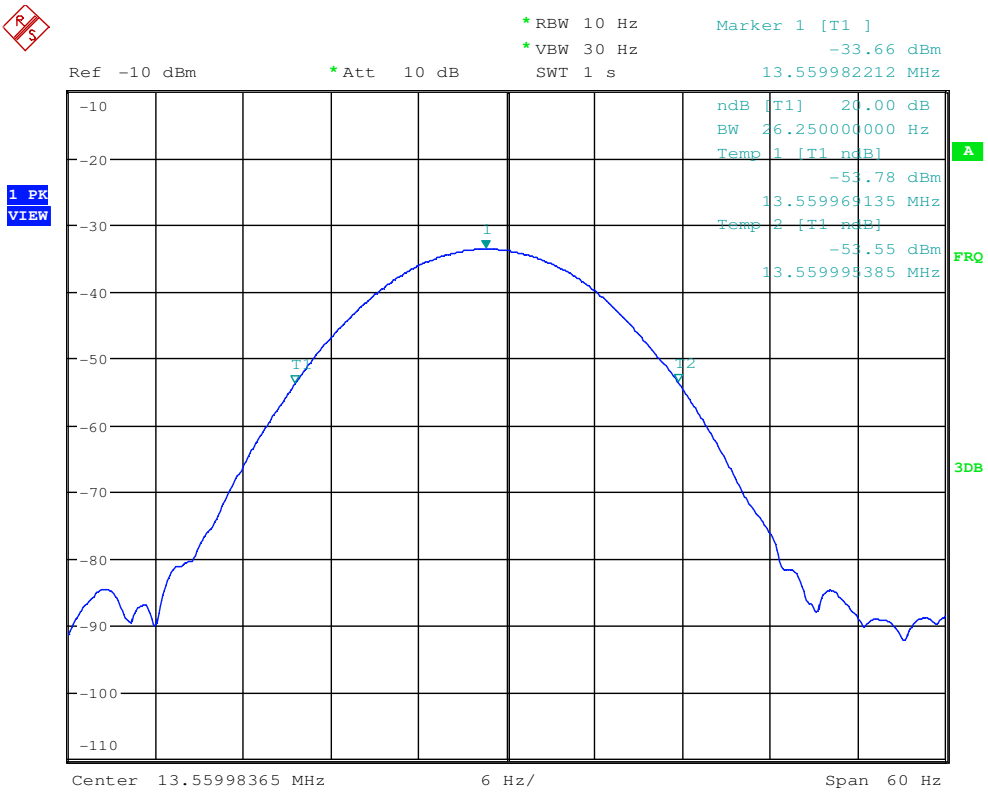
Mode:b



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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
Measurement Distance: 10m
Limit:

(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.

Below 30MHz

The test was performed at a 10m test site.

The factor calculated by the following equation:

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

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_{measure} is the distance of the measurement point from the EUT
d_{limit} is the reference distance or the distance of the $\lambda/2\pi$ point

The limit at 10m test distance is below:

The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 103.08 dBuV/m at 10 meters.

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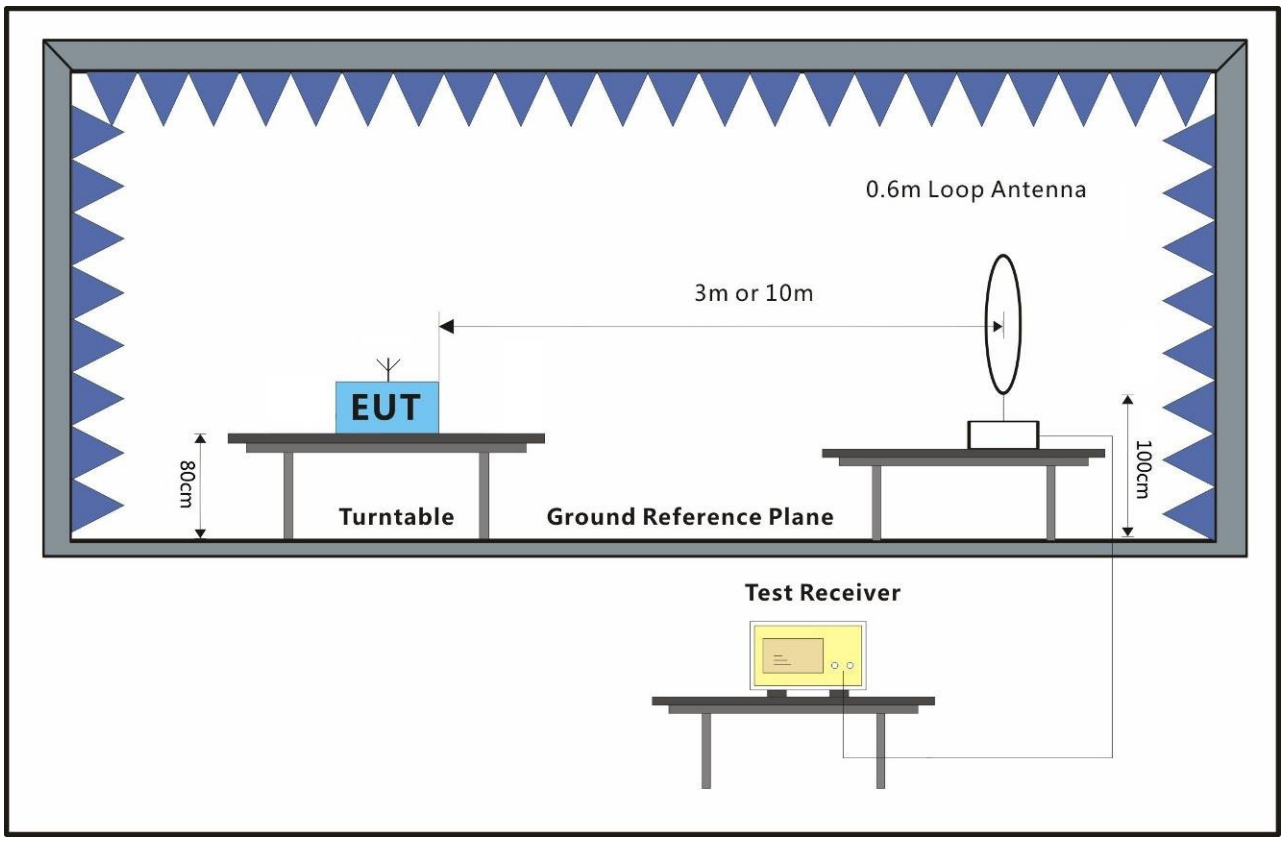
7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 45 % 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. Only the worst position of vertical was shown in the report.

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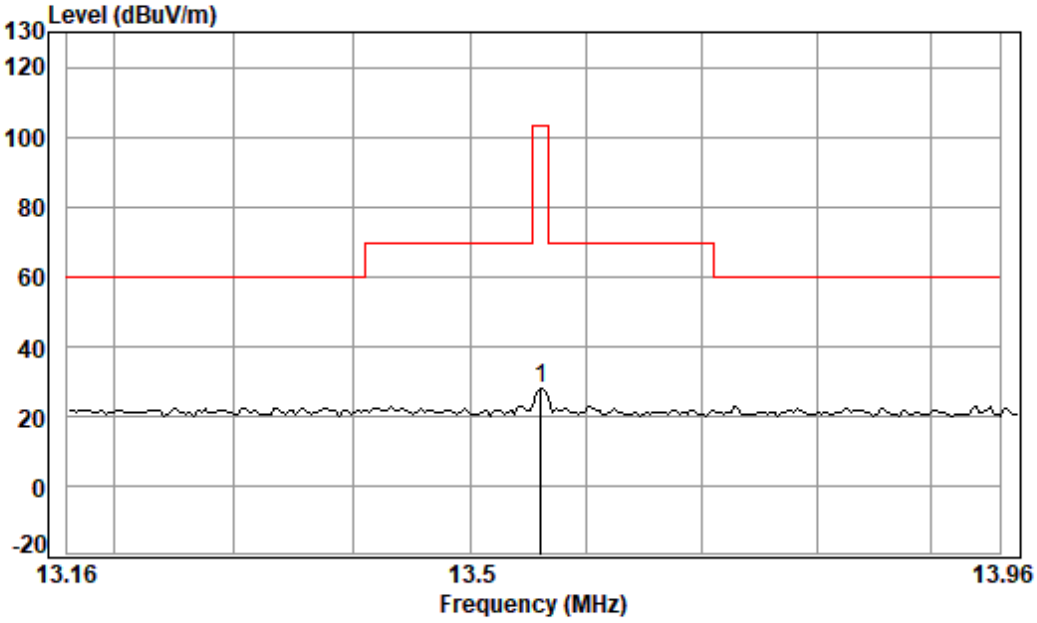
Mode:b



Condition: 10m
Job No. : 00110CR
Test Mode: b

	Freq	Ant Factor	Preamp Factor	Cable Loss	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
1 pp	13.561	13.30	32.35	0.52	46.59	28.06	103.08	-75.02	QP

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Below 30MHz

The test was performed at a 10m test site.

The level at 30m test distance is below:

The factor calculated by the following equation:

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

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_{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

Frequency (MHz)	Cable loss (dB)	ANT Factor (dB)	Preamp Factor (dB)	Read Level @ 10m (dBuV)	Level @ 10m (dBuV/m)	Level @ 30m (dBuV/m)	Limit @ 30m (dBuV/m)	Margin (dB)
13.561	0.52	13.3	32.35	46.59	28.06	8.98	84.00	-75.02

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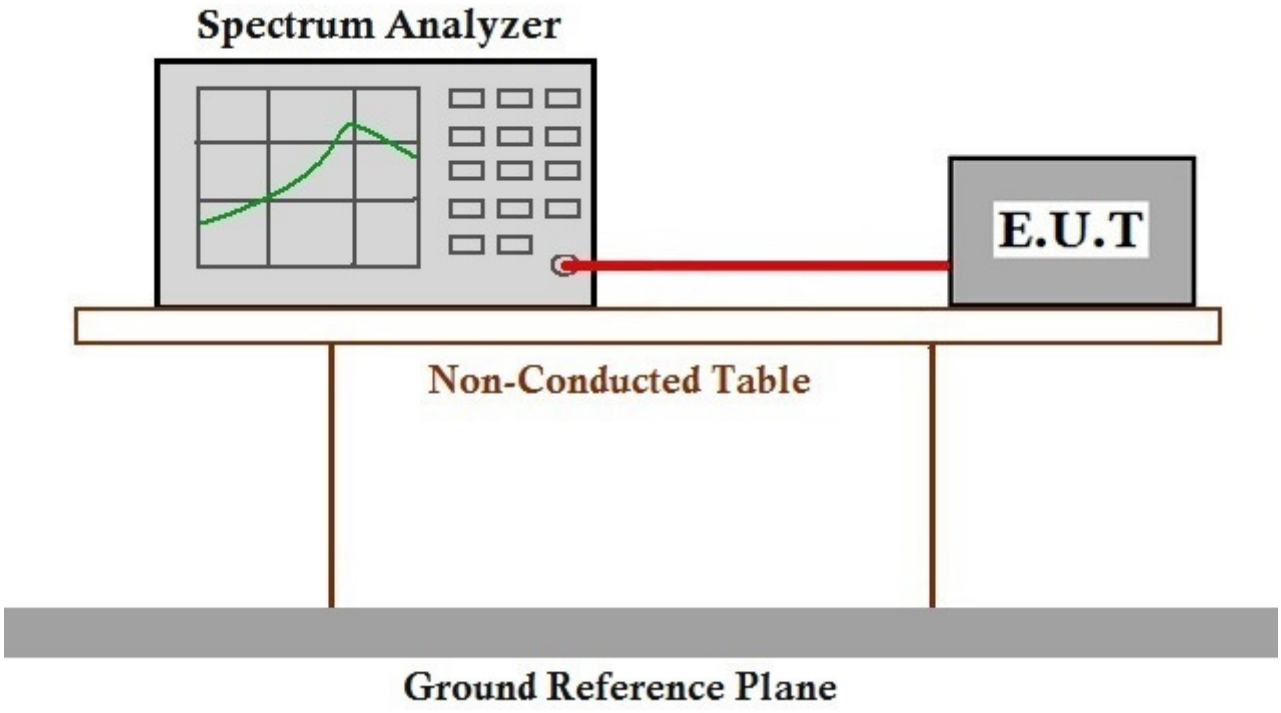
7.4 Frequency tolerance

Test Requirement 47 CFR Part 15, Subpart C 15.225(e)
Test Method: ANSI C63.10 (2013) Section 6.8
Measurement Distance: 10m
Limit: 1.356kHz

7.4.1 E.U.T. Operation

Operating Environment:
Temperature: 25 °C Humidity: 42 % RH Atmospheric Pressure: 1020 mbar
Test mode b:TX mode_Keep the EUT in transmitting with modulation mode.

7.4.2 Test Setup Diagram



7.4.3 Measurement Procedure and Data

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Mode:b

Declared Frequency (MHz)	13.56MHz	

Temperature (℃)	Voltage(VAC)	Measurement Frequency(MHz)	Frequency Tolerance (%)	Limit (%)	Result
50	120	13.559728	-0.0020	±0.01	Pass
40		13.559724	-0.0020		Pass
30		13.559723	-0.0020		Pass
20		13.559758	-0.0018		Pass
10		13.559767	-0.0017		Pass
0		13.559773	-0.0017		Pass
-10		13.559771	-0.0017		Pass
-20		13.559732	-0.0020		Pass
20	138	13.559747	-0.0019		Pass
	102	13.559753	-0.0018		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

Below 30MHz

If field strength is measured at only a single point, then that point shall be at the radial from the EUT that produces the maximum emission at the frequency being measured, as described in 5.4. If that point is closer to the EUT than λ/2π and the limit distance is greater than λ/2π, the measurement shall be extrapolated to the limit distance by conservatively presuming that the field strength decreases at a 40 dB/decade of distance rate to the λ/2π distance, and at a 20 dB/decade of distance rate beyond λ/2π. This shall be accomplished using Equation (2):

$$FS_{(10m)} = FS_{(30/300m)} + 40\log\{d_{(\text{near field})}/d_{(10m)}\} + 20\log\{d_{(30/300m)}/d_{(\text{near field})}\} \quad (2)$$

If the single point measured is at a distance greater than λ/2π, then extrapolation to the limit distance shall be calculated using Equation (3):

$$FS_{(10m)} = FS_{(30/300m)} + 20\log\{d_{(30/300m)}/d_{(10m)}\} \quad (3)$$

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):

$$FS_{(10m)} = FS_{(30/300m)} + 40\log\{d_{(30/300m)}/d_{(10m)}\} \quad (4)$$

Remark:

$$d_{\text{near field}} = 47.77 / f_{MHz}$$

where f_{MHz} is the frequency of the emission being measured in MHz.

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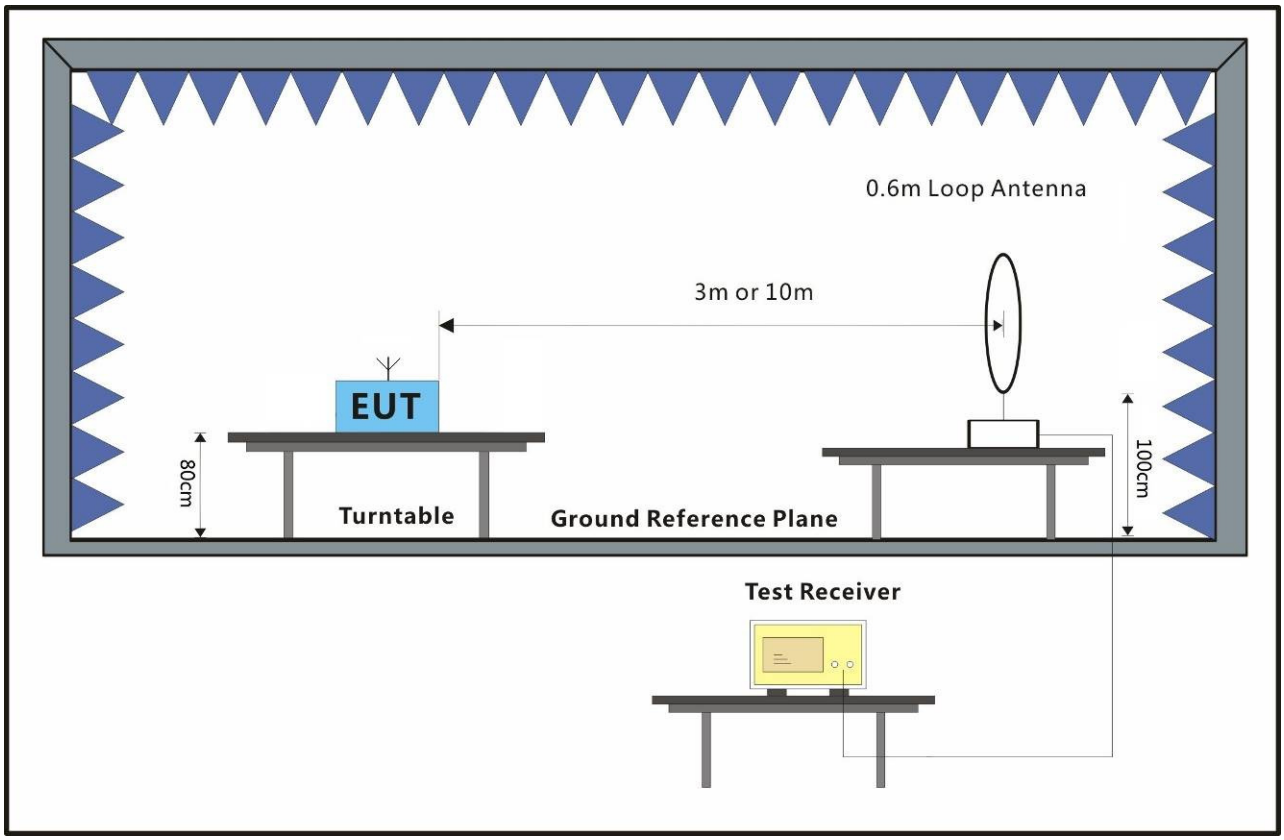
7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 45 % 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. Only the worst position of vertical was shown in the report.

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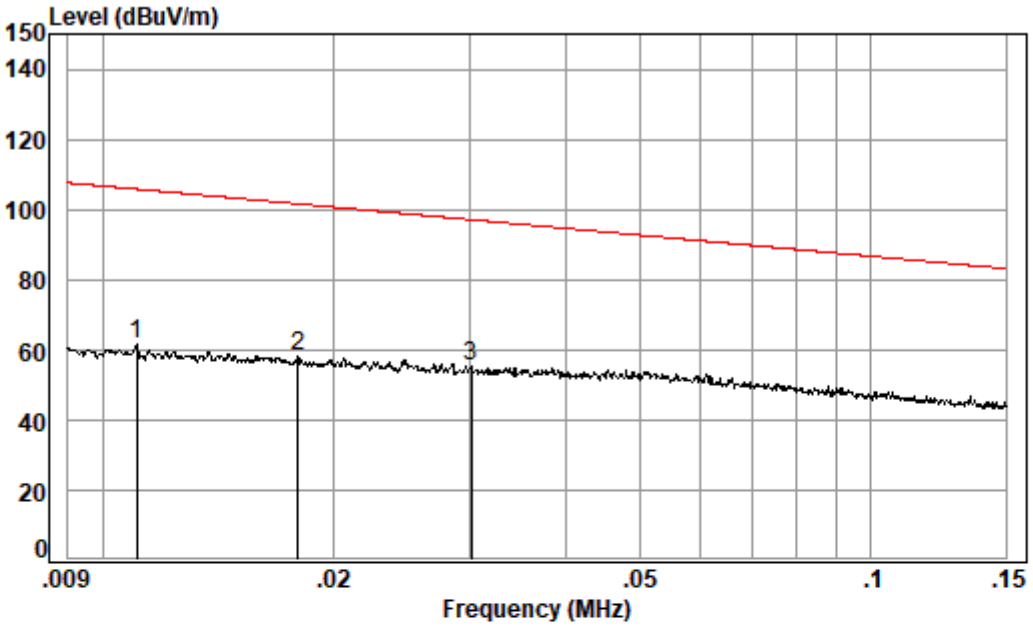
9K-150K



Condition: 10m
Job No. : 00110CR
Test Mode: b

	Freq	Ant Factor	Preamp Factor	Cable Loss	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
1	0.011	20.34	30.71	0.83	70.98	61.44	105.82	-44.38	Average
2	0.018	17.61	31.03	0.24	71.20	58.02	101.62	-43.60	Average
3 pp	0.030	15.49	31.38	0.01	71.12	55.24	97.10	-41.86	Average

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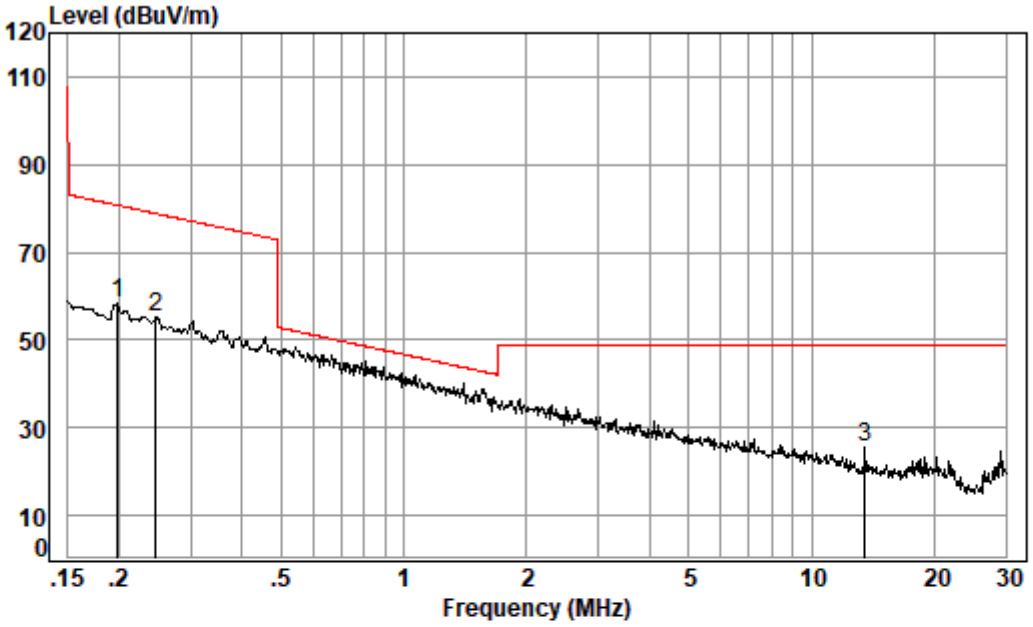
150K-30M



Condition: 10m
Job No. : 00110CR
Test Mode: b

	Freq	Ant Factor	Preamp Factor	Cable Loss	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
1 pp	0.199	13.90	32.21	0.00	76.54	58.23	80.73	-22.50	Average
2	0.247	13.85	32.22	0.00	73.53	55.16	78.84	-23.68	Average
3 qp	13.551	13.30	32.35	0.00	44.71	25.66	48.63	-22.97	QP

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Frequency (MHz)	Level @ 10m (dBuV/m)	Limit @ 300m (dBuV/m)	Limit @ 30m (dBuV/m)	Factor (dB)	Level @ 300m (dBuV/m)	Level @ 30m (dBuV/m)	Margin (dB)
0.011	61.44	46.78	-	59.08	2.36	-	-44.42
0.018	58.02	42.50	-	59.08	-1.06	-	-43.56
0.030	55.24	38.06	-	59.08	-3.84	-	-41.90
0.199	58.23	21.63	-	59.08	-0.85	-	-22.48
0.247	55.16	19.75	-	59.08	-3.92	-	-23.67
13.551	25.66		29.54	19.08	-	6.58	-22.96

Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

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

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_{measure} is the distance of the measurement point from the EUT

d_{limit} is the reference distance or the distance of the $\lambda/2\pi$ point

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7.6 Radiated Emissions(30MHz-1GHz)

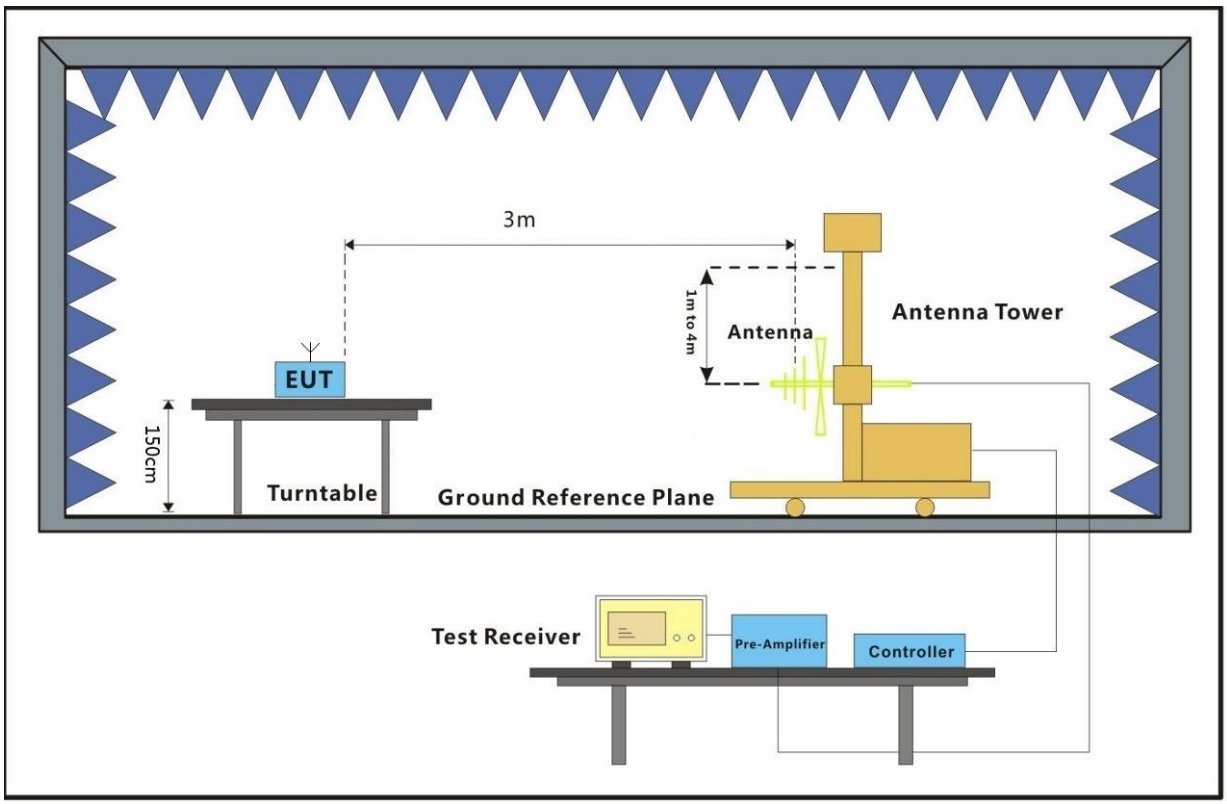
Test Requirement 47 CFR Part 15, Subpart C 15.225(d) & 15.209
Test Method: ANSI C63.10 (2013) Section 6.4&6.5
Measurement Distance: 10m
Limit:

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: 25 °C Humidity: 45 % 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.

g. 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.

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

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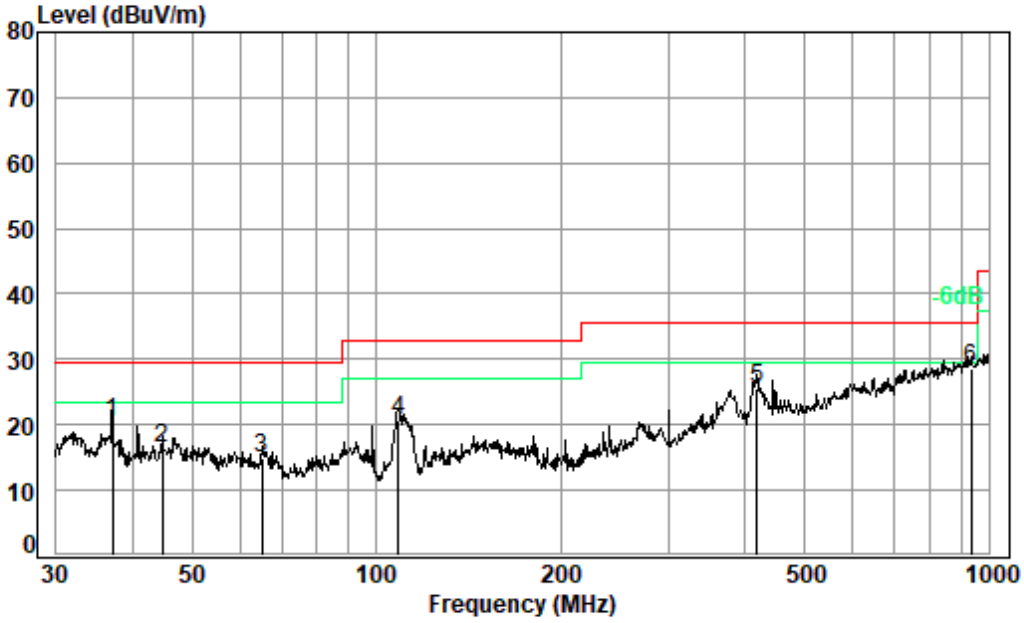
Mode:b; Polarization:Vertical



Condition: 10m VERTICAL
Job No. : 00110CR
Test Mode: b

	Freq	Ant Factor	Preamp Factor	Cable Loss	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
1	37.155	19.79	32.41	0.90	31.98	20.26	29.50	-9.24	QP
2	44.743	20.38	32.44	0.96	27.38	16.28	29.50	-13.22	QP
3	65.114	18.34	32.40	1.06	27.80	14.80	29.50	-14.70	QP
4	108.647	16.18	32.31	1.29	35.45	20.61	33.00	-12.39	QP
5	417.641	22.23	32.16	2.61	33.00	25.68	35.60	-9.92	QP
6 pp	935.546	29.80	31.33	3.47	26.60	28.54	35.60	-7.06	QP

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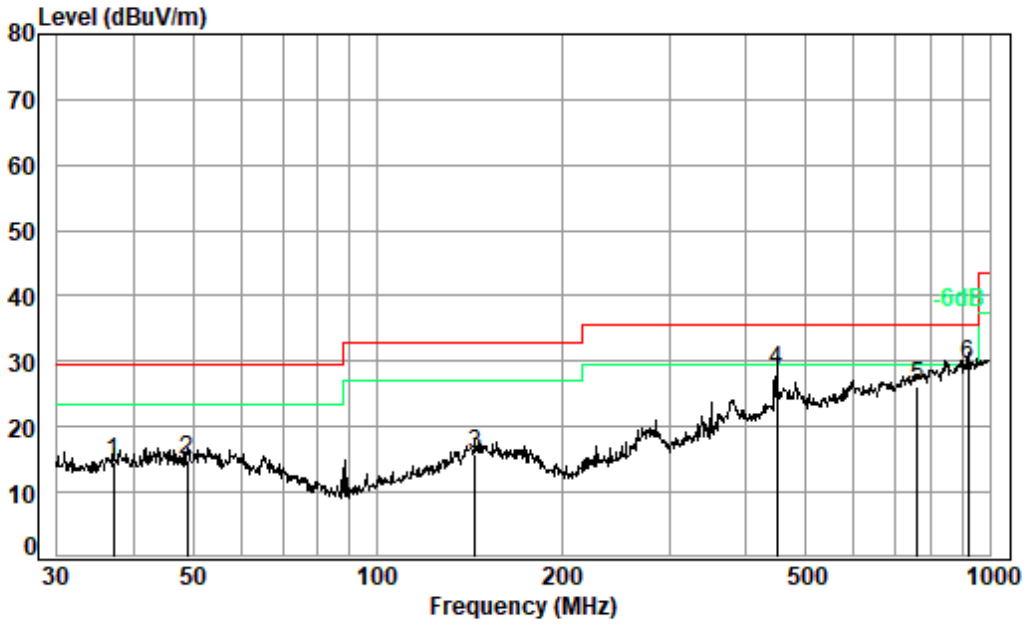
Mode:b; Polarization:Horizontal



Condition: 10m HORIZONTAL
Job No. : 00110CR
Test Mode: b

	Freq	Ant Factor	Preamp Factor	Cable Loss	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
1	37.155	19.79	32.41	0.90	26.42	14.70	29.50	-14.80	QP
2	49.014	20.25	32.46	0.98	26.06	14.83	29.50	-14.67	QP
3	144.335	19.92	32.30	1.45	26.76	15.83	33.00	-17.17	QP
4	449.556	23.48	32.29	2.70	34.84	28.73	35.60	-6.87	QP
5	760.704	28.30	32.04	3.27	26.61	26.14	35.60	-9.46	QP
6 pp	922.516	29.80	31.40	3.45	27.59	29.44	35.60	-6.16	QP

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Radiated Emission below 1GHz

The test was performed at a 10m test site. According to below formulate and the test data at 10m test distance,

$L_3 / L_{10} = D_{10} / D_3$

Note:

L_3: Level @ 3m distance. Unit: uV/m;

L_{10}: Level @ 10m distance. Unit: uV/m;

D_3: 3m distance. Unit: m

D_{10}: 10m distance. Unit: m

The level at 3m test distance is below:

Mode b:

Frequency (MHz)	Level @ 10m (dBuV/m)	Level @ 10m (uV/m)	Level @ 3m (uV/m)	Level @ 3m (dBuV/m)	Limit @ 3m (dBuV/m)	Margin (dB)	Ant. Polarization
37.16	20.26	10.30	34.35	30.72	40.00	-9.28	V
44.74	16.28	6.52	21.72	26.74	40.00	-13.26	V
65.11	14.80	5.50	18.32	25.26	40.00	-14.74	V
108.65	20.61	10.73	35.76	31.07	43.50	-12.43	V
417.64	25.68	19.23	64.10	36.14	46.00	-9.86	V
935.55	28.54	26.73	89.10	39.00	46.00	-7.00	V
37.16	14.70	5.43	18.11	25.16	40.00	-14.84	H
49.01	14.83	5.51	18.38	25.29	40.00	-14.71	H
144.34	15.83	6.19	20.62	26.29	43.50	-17.21	H
449.56	28.73	27.32	91.07	39.19	46.00	-6.81	H
760.70	26.14	20.28	67.59	36.60	46.00	-9.40	H
922.52	29.44	29.65	98.83	39.90	46.00	-6.10	H

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8 Photographs

8.1 Test Setup

Please refer to setup photos.

8.2 EUT Constructional Details (EUT Photos)

Please Refer to external and internal photos for details.

- End of the Report -

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