



Report No.: SZEM201201249703
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TEST REPORT

Application No.: SZEM2012012497CR
Applicant: ZK Technology LLC DBA ZK Teco
Address of Applicant: 200 Centennial Ave, Suite 211, Piscataway, New Jersey, United States 08854
Manufacturer: ZK Technology LLC DBA ZKTeco
Address of Manufacturer: 200 Centennial Ave, Suite 211, Piscataway, New Jersey, United States 08854
Factory: ZKTECO CO., LTD.
Address of Factory: No.32, Pingshan Industrial Avenue, Tangxia Town, Dongguan City, Guangdong Province, China 523728

Equipment Under Test (EUT):

EUT Name: Data Collection Terminal
Model No.: US20C, US20C[HID], US20C[ELATEC], US20C[MiFARE], US20C[iCLASS], US20CR[ID], US20CR[HID], US20CR[ELATEC], US20CR[MiFARE], US20CR[iCLASS], US20C-B, US20C-M, US20CE, US20CRE, US20CS, US20C[MultiCard], US20CG *

* Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.

FCC ID: 2AUC7-858420
Standard(s) : 47 CFR Part 15, Subpart C 15.225
Date of Receipt: 2020-12-23
Date of Test: 2020-12-08 to 2021-01-29
Date of Issue: 2021-01-29

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards specified above.

Keny Xu
EMC Laboratory Manager



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Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2021-01-29		Original

Authorized for issue by:			
		 _____ Harry Wu/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
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
Conducted Emissions at Mains Terminals (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
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 (30MHz-1GHz)	47 CFR Part 15, Subpart C 15.225	ANSI C63.10 (2013) Section 6.5	47 CFR Part 15, Subpart C 15.225(d) & 15.209	Pass
Radiated Emissions (9kHz-30MHz)	47 CFR Part 15, Subpart C 15.225	ANSI C63.10 (2013) Section 6.4	47 CFR Part 15, Subpart C 15.225(d) & 15.209	Pass

Declaration of EUT Family Grouping:

Model No.: US20C, US20C[HID], US20C[ELATEC], US20C[MiFARE], US20C[iCLASS], US20CR[ID], US20CR[HID], US20CR[ELATEC], US20CR[MiFARE], US20CR[iCLASS], US20C-B, US20C-M, US20CE, US20CRE, US20CS, US20C[MultiCard], US20CG

Only the model US20C[ELATEC] was tested. According to the declaration from the applicant, the electrical circuit design, layout, components used, internal wiring and functions were identical for the above models, with only difference on model name.

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4 General Information

4.1 Details of E.U.T.

Power Supply:	AC100-240V, 50/60Hz
Power adapter:	Model:ADS-26FSG-12 12018EPCU Input: AC100-240V, 50/60Hz, 0.7A Output: DC12.0V, 1.5A
Operation Frequency:	13.56MHz
Number of Channels:	1
Modulation Type:	ASK
Antenna Type:	Loop Antenna
Antenna Gain:	0dBi

4.2 Cable

Cable	Length	Shielding	Core
AC Cable	1.5 Meters	Unshielded	With-Core

4.3 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
--	--	--	--

The EUT has been tested as an independent unit.

4.4 Measurement Uncertainty

Test Item	Measurement Uncertainty
20dB Bandwidth	± 3%
Conducted Emissions at Mains Terminals (150kHz-30MHz)	± 3.0dB
Emission Mask	± 4.5dB (Below 1GHz)
Frequency tolerance	± 3%
Radiated Emissions (30MHz-1GHz)	± 4.5dB (Below 1GHz)
Radiated Emissions (9kHz-30MHz)	± 4.5dB (Below 1GHz)

Remark:

The U_{lab} (lab Uncertainty) is less than U_{cispr} (CISPR Uncertainty), so the test results

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

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4.5 Test Location

All tests were performed at:

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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.

4.6 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.

4.7 Deviation from Standards

None

4.8 Abnormalities from Standard Conditions

None

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5 Equipment List

20dB Bandwidth					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	SAEMC	MSR733	SEM001-09	2019-06-13	2022-06-12
DC Power Supply	Rohde & Schwarz	NGSM 32/10	SEM011-04	2020-03-24	2021-03-23
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2020-04-01	2021-03-31
Measurement Software	TST	TST PASS V1.0.5	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-02	2020-07-10	2021-07-09
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	2020-05-21	2021-05-20

Conducted Emissions at Mains Terminals (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
EMI Test Receiver	Rohde&Schwarz	ESCI	SEM004-02	2020-03-24	2021-03-23
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM024-01	2020-07-10	2021-07-09
LISN	Rohde&Schwarz	ENV216	SEM007-01	2020-09-23	2021-09-22
LISN	ETS-LINDGREN	3816/2	SEM007-02	2020-04-01	2021-03-31

Emission Mask					
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
MXE EMI receiver	KEYSIGHT	N9038A	SEM004-16	2020-11-02	2021-11-01
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
Loop Antenna	ETS-Lindgren	6502	SEM003-08	2020-08-14	2023-08-13
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM029-01	2020-07-10	2021-07-09

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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
DC Power Supply	Rohde & Schwarz	NGSM 32/10	SEM011-04	2020-03-24	2021-03-23
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2020-04-01	2021-03-31
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2020-09-23	2021-09-22
Measurement Software	TST	TST PASS V1.0.5	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-02	2020-07-10	2021-07-09
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	2020-05-21	2021-05-20

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
MXE EMI receiver	KEYSIGHT	N9038A	SEM004-16	2020-11-02	2021-11-01
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
Loop Antenna	ETS-Lindgren	6502	SEM003-08	2020-08-14	2023-08-13
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM029-01	2020-07-10	2021-07-09

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
MXE EMI receiver	KEYSIGHT	N9038A	SEM004-16	2020-11-02	2021-11-01
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
Loop Antenna	ETS-Lindgren	6502	SEM003-08	2020-08-14	2023-08-13
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM029-01	2020-07-10	2021-07-09

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General used equipment					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-04	2020-09-15	2021-09-14
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2020-09-15	2021-09-14
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

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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

6.1.2 Conclusion

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 0dBi.

Antenna location: Refer to Internal photos



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7 Radio Spectrum Matter Test Results

7.1 20dB Bandwidth

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

7.1.1 E.U.T. Operation

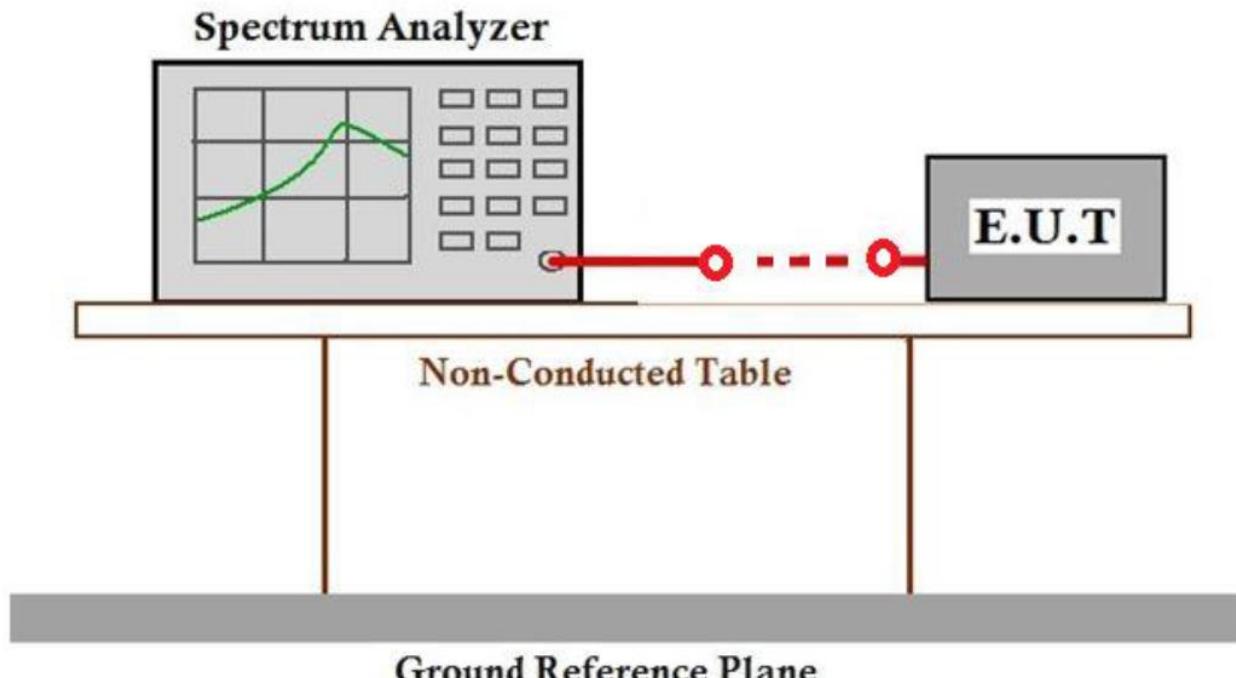
Operating Environment:

Temperature: 23.8 °C Humidity: 41.6 % RH Atmospheric Pressure: 1010 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX mode with modulation

7.1.3 Test Setup Diagram

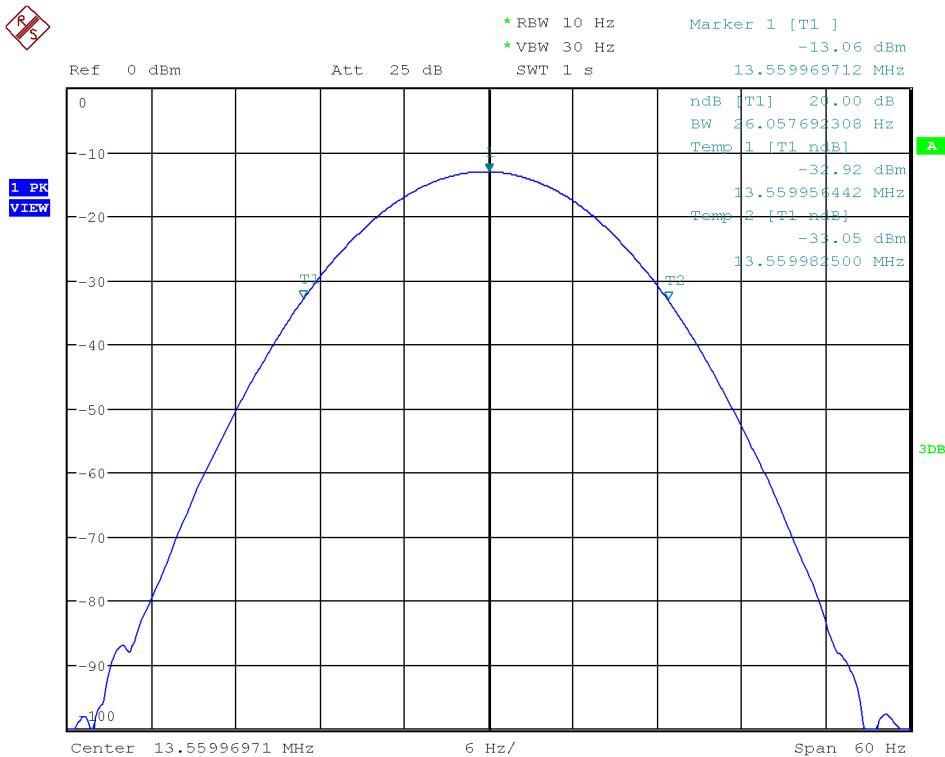


7.1.4 Measurement Procedure and Data



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7.2 Conducted Emissions at Mains Terminals (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.

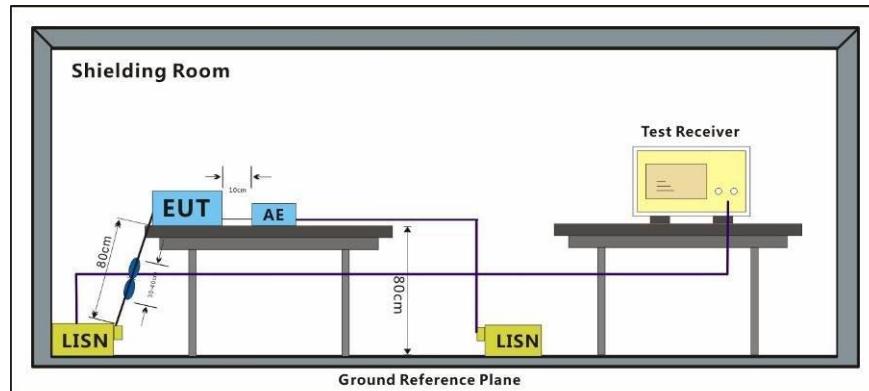
7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 23.6 °C Humidity: 46.7 % RH Atmospheric Pressure: 1010 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX mode with modulation

7.2.3 Test Setup Diagram

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7.2.4 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.

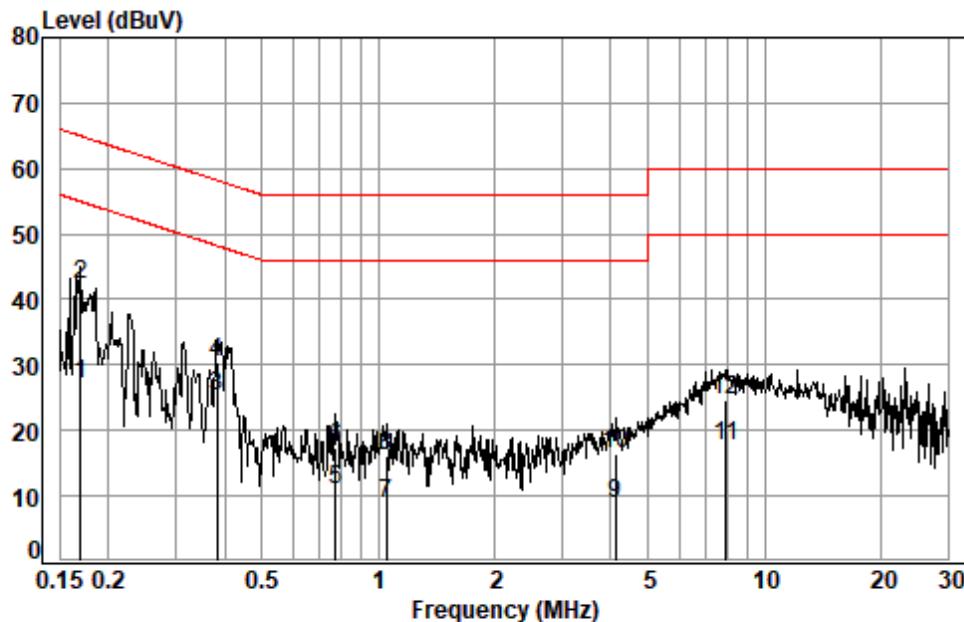
Remark: LISN=Read Level+ Cable Loss+ LISN Factor



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Test Mode: 01; Line: Live line



Site : Shielding Room

Condition: Line

Job No. : 12497CR

Test mode: 01

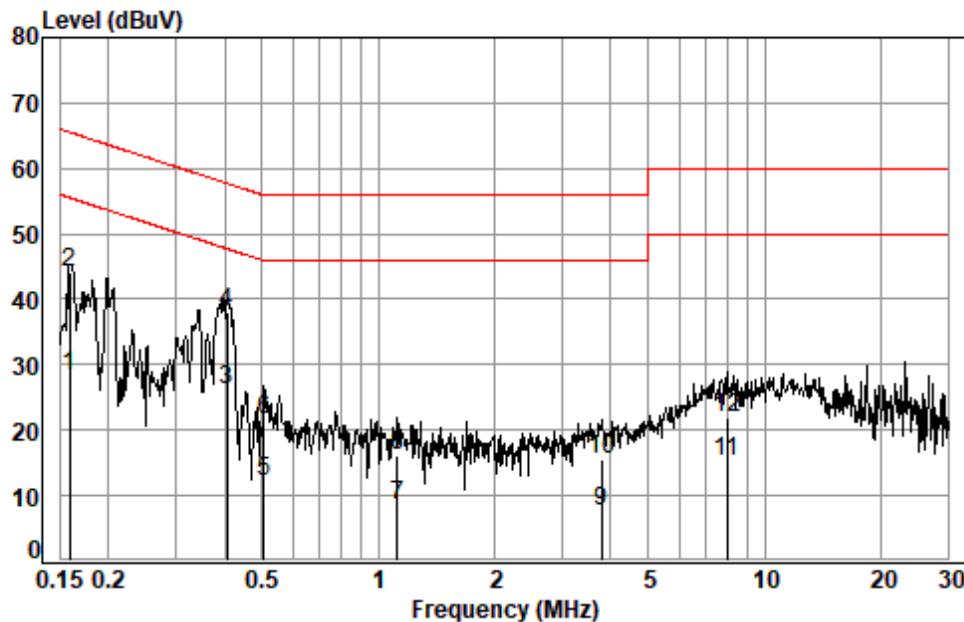
	Freq	Cable	LISN	Read	Limit	Over	Remark
		Loss	Factor	Level			
	MHz	dB	dB	dBuV	dBuV	dBuV	dB
1	0.1694	0.03	9.71	17.38	27.12	54.99	-27.87 Average
2	0.1694	0.03	9.71	32.42	42.16	64.99	-22.83 QP
3	0.3832	0.06	9.76	15.36	25.18	48.21	-23.03 Average
4	0.3832	0.06	9.76	20.59	30.41	58.21	-27.80 QP
5	0.7752	0.09	9.78	1.18	11.05	46.00	-34.95 Average
6	0.7752	0.09	9.78	7.43	17.30	56.00	-38.70 QP
7	1.0485	0.10	9.78	-0.96	8.92	46.00	-37.08 Average
8	1.0485	0.10	9.78	6.23	16.11	56.00	-39.89 QP
9	4.1137	0.15	9.89	-1.07	8.97	46.00	-37.03 Average
10	4.1137	0.15	9.89	6.48	16.52	56.00	-39.48 QP
11	7.9353	0.16	10.09	7.51	17.76	50.00	-32.24 Average
12	7.9353	0.16	10.09	14.35	24.60	60.00	-35.40 QP



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Test Mode: 01; Line: Neutral Line



Site : Shielding Room

Condition: Neutral

Job No. : 12497CR

Test mode: 01

Freq	Cable	LISN	Read	Limit	Over	Limit	Remark
	Loss	Factor	Level				
	MHz	dB	dB	dBuV	dBuV	dBuV	dB
1	0.1590	0.03	9.71	18.53	28.27	55.52	-27.25 Average
2	0.1590	0.03	9.71	34.26	44.00	65.52	-21.52 QP
3	0.4061	0.06	9.75	16.24	26.05	47.73	-21.68 Average
4	0.4061	0.06	9.75	28.28	38.09	57.73	-19.64 QP
5	0.5047	0.07	9.76	2.36	12.19	46.00	-33.81 Average
6	0.5047	0.07	9.76	11.90	21.73	56.00	-34.27 QP
7	1.1233	0.10	9.79	-1.49	8.40	46.00	-37.60 Average
8	1.1233	0.10	9.79	6.23	16.12	56.00	-39.88 QP
9	3.7794	0.15	9.87	-2.35	7.67	46.00	-38.33 Average
10	3.7794	0.15	9.87	5.58	15.60	56.00	-40.40 QP
11	8.0198	0.16	10.10	4.98	15.24	50.00	-34.76 Average
12	8.0198	0.16	10.10	11.55	21.81	60.00	-38.19 QP



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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: 3m

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 3m 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 dB μ V/m
 FS_{max} is the measured field strength, expressed in dB μ V/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 3m test distance is below:

The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 124 dB μ V/m at 3 meters.

7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 23.8 °C Humidity: 49 % RH Atmospheric Pressure: 1010 mbar



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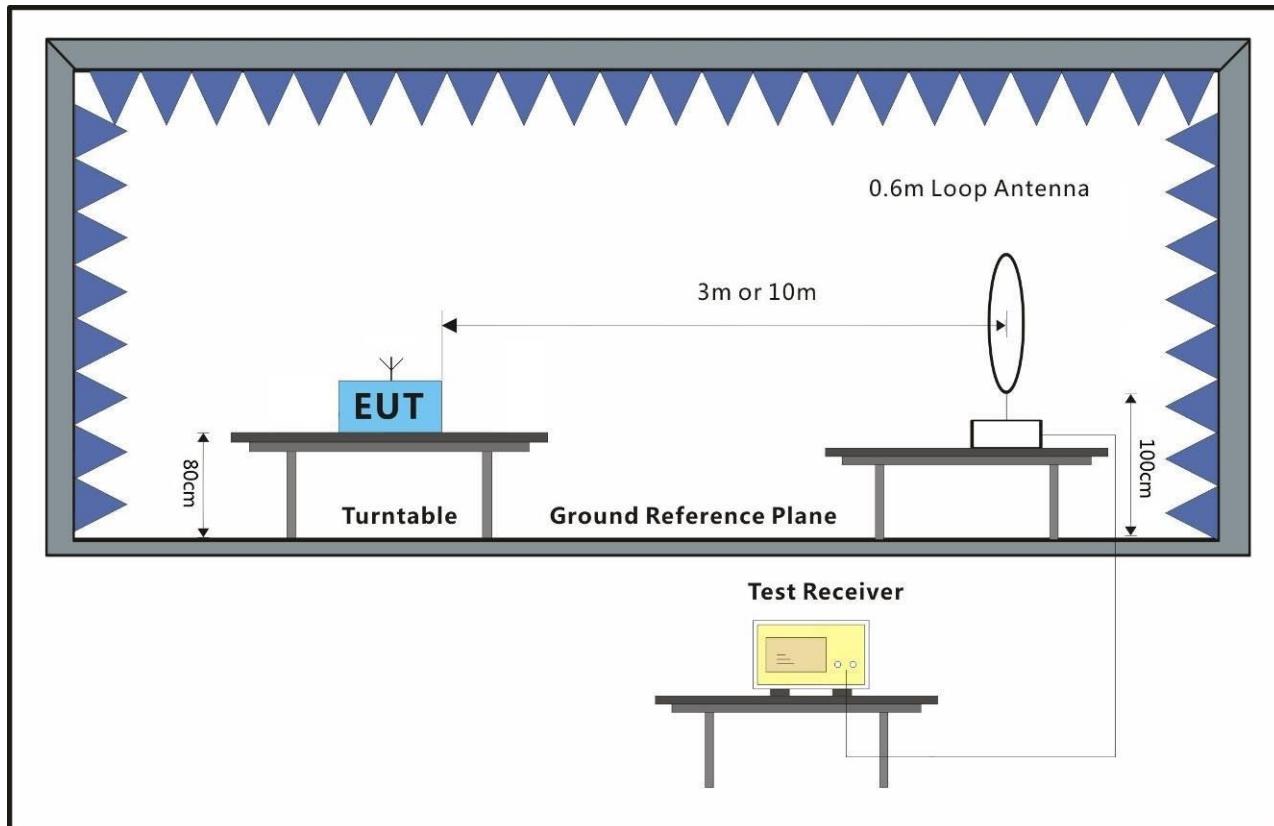
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7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX mode with modulation

7.3.3 Test Setup Diagram

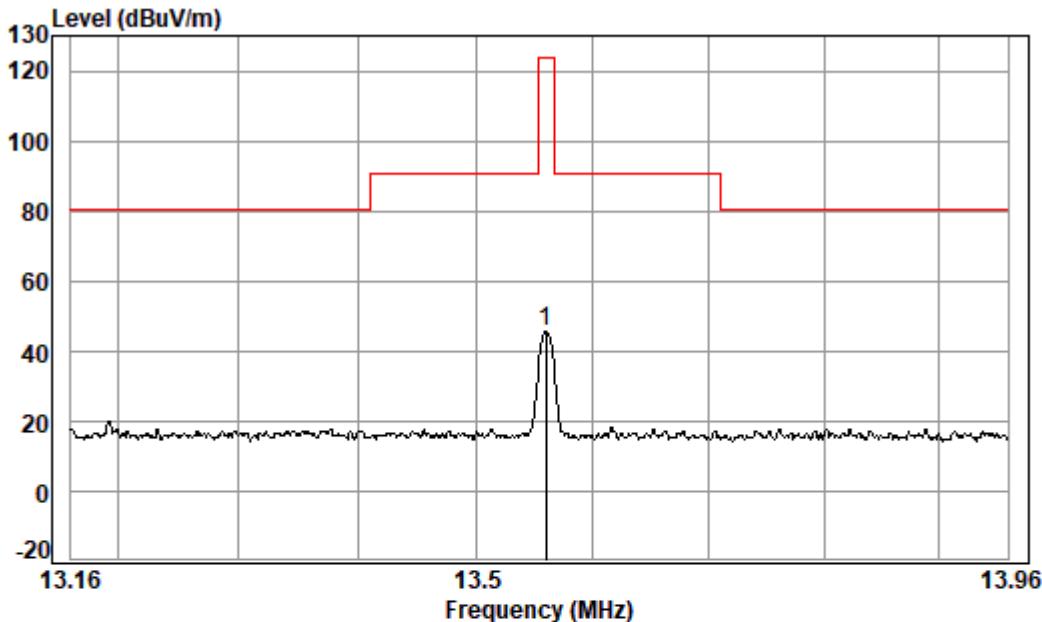


7.3.4 Measurement Procedure and Data

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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**Below 30MHz**

The test was performed at a 10m test site with 3m test distance.

The level at 30m test distance is below:

The factor calculated by the following equation:



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

where

FS_{limit} is the calculation of field strength at the limit distance, expressed in dB μ V/m
 FS_{max} is the measured field strength, expressed in dB μ V/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

Frequency (MHz)	Cable loss (dB)	ANT Factor (dB)	Preamp Factor (dB)	Read Level @ 3m (dB μ V)	Level @ 3m (dB μ V/m)	Level @ 30m (dB μ V/m)	Limit @ 30m (dB μ V/m)	Margin (dB)
13.56	0.62	8.88	32.5	68.52	45.52	5.52	84.00	-78.48



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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: 13.56MHz±0.01%

7.4.1 E.U.T. Operation

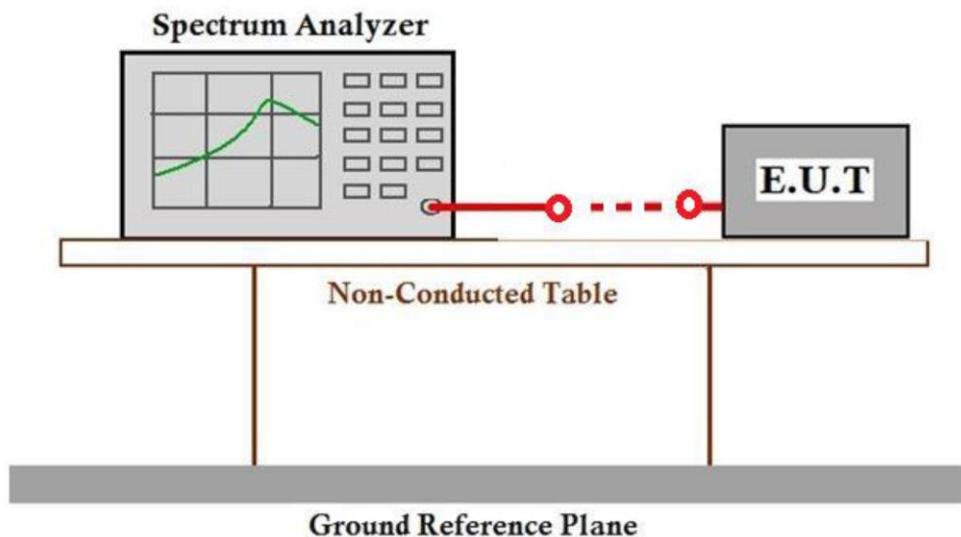
Operating Environment:

Temperature: 23.8 °C Humidity: 41.4 % RH Atmospheric Pressure: 1010 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX mode with modulation

7.4.3 Test Setup Diagram



7.4.4 Measurement Procedure and Data

The EUT was placed in an environmental test chamber and powered such that control element received normal voltage and the transmitter provided maximum RF output.



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Declared Frequency (MHz)	13.56MHz
--------------------------	----------

Temperature (°C)	Voltage(VAC)	Measurement Frequency(MHz)	Frequency Tolerance (%)	Limit (%)	Result
50	120	13.559921	-0.0006	±0.01	Pass
40		13.559932	-0.0005		Pass
30		13.559926	-0.0005		Pass
20		13.559926	-0.0005		Pass
10		13.559936	-0.0005		Pass
0		13.559981	-0.0001		Pass
-10		13.559960	-0.0003		Pass
-20		13.559950	-0.0004		Pass
20	138	13.559941	-0.0004		Pass
	102	13.559932	-0.0005		Pass



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7.5 Radiated Emissions (30MHz-1GHz)

Test Requirement 47 CFR Part 15, Subpart C 15.225(d) & 15.209

Test Method: ANSI C63.10 (2013) Section 6.5

Measurement Distance: 10m

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 23.5 °C

Humidity: 46 % RH

Atmospheric Pressure: 1010 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX mode with modulation

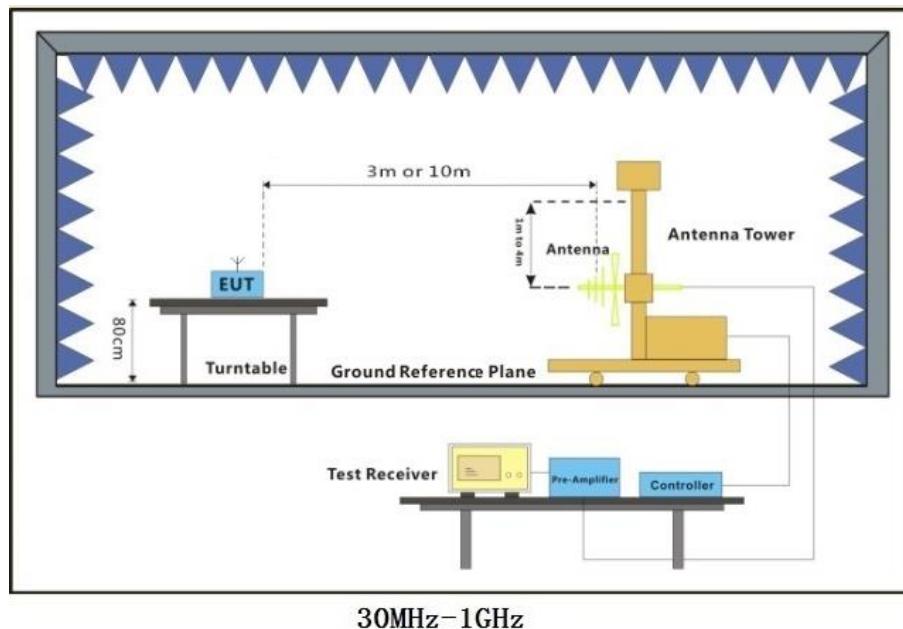
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7.5.3 Test Setup Diagram



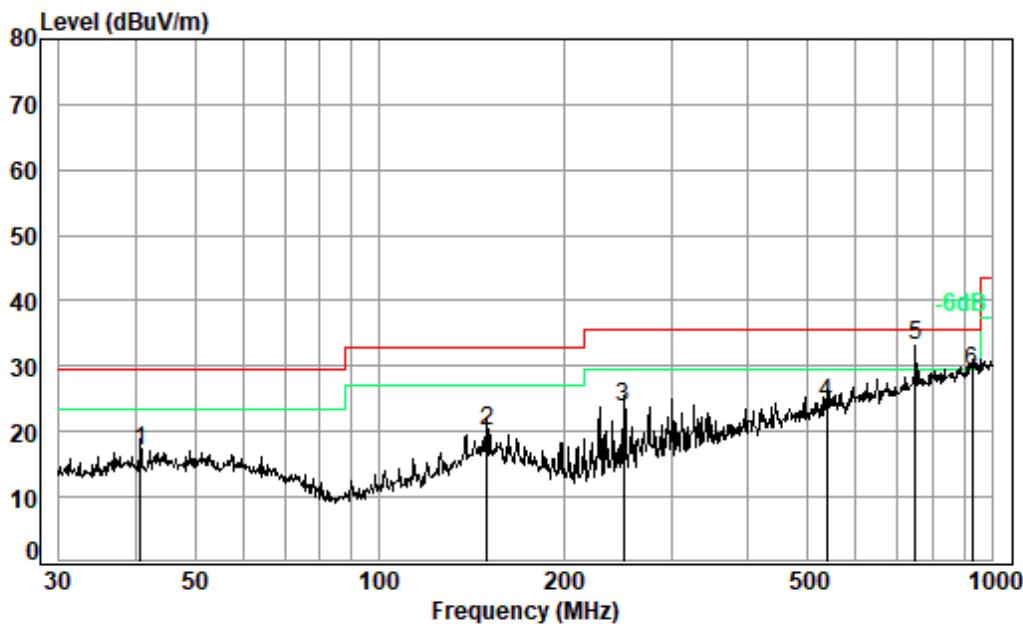
7.5.4 Measurement Procedure and Data

- 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.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 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.
- 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.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- 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.
- 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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Test Mode: 01; Polarity: Horizontal



Condition: 10m HORIZONTAL

Job No. : 12497CR

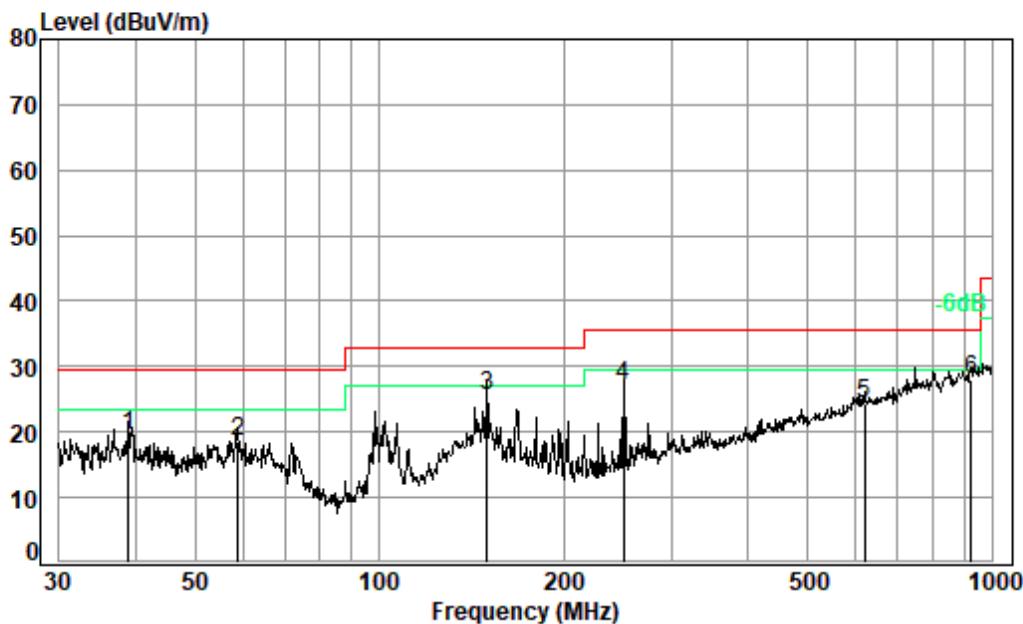
Test Mode: 01

Freq	Ant	Preamp	Cable	Read	Limit		Over	Remark
					Factor	Factor		
MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
1	40.702	20.14	32.50	0.93	28.41	16.98	29.50	-12.52 QP
2	150.011	20.20	32.42	1.49	30.75	20.02	33.00	-12.98 QP
3	250.301	18.09	32.40	1.96	36.00	23.65	35.60	-11.95 QP
4	537.589	24.48	32.30	2.99	29.22	24.39	35.60	-11.21 QP
5 pp	750.108	28.30	32.20	3.33	33.84	33.27	35.60	-2.33 QP
6	929.008	29.80	31.33	3.51	27.10	29.08	35.60	-6.52 QP

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Test Mode: 01; Polarity: Vertical



Condition: 10m VERTICAL

Job No. : 12497CR

Test Mode: 01

Freq	Ant Factor	Preamp Factor	Cable Loss	Read Level	Limit		Over Limit	Remark
					dB	dBuV	dBuV/m	dBuV/m
MHz	dB/m	dB	dB	dB	dBuV	dBuV/m	dBuV/m	dB
1	39.024	20.00	32.50	0.92	31.12	19.54	29.50	-9.96 QP
2	58.819	19.45	32.49	1.04	30.59	18.59	29.50	-10.91 QP
3 pp	150.011	20.20	32.42	1.49	36.28	25.55	33.00	-7.45 QP
4	250.301	18.09	32.40	1.96	39.47	27.12	35.60	-8.48 QP
5	620.710	26.29	32.30	3.12	27.11	24.22	35.60	-11.38 QP
6	925.756	29.80	31.36	3.50	25.93	27.87	35.60	-7.73 QP

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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:

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
39.02	19.54	9.48	31.61	30.00	40.00	-10.00	V
58.82	18.59	8.50	28.34	29.05	40.00	-10.95	V
150.01	25.55	18.95	63.15	36.01	43.50	-7.49	V
250.30	27.12	22.70	75.66	37.58	46.00	-8.42	V
620.71	24.22	16.26	54.18	34.68	46.00	-11.32	V
925.76	27.87	24.75	82.49	38.33	46.00	-7.67	V
40.70	16.98	7.06	23.54	27.44	40.00	-12.56	H
150.01	20.02	10.02	33.41	30.48	43.50	-13.02	H
250.30	23.65	15.22	50.74	34.11	46.00	-11.89	H
537.59	24.39	16.58	55.26	34.85	46.00	-11.15	H
750.11	33.27	46.08	153.60	43.73	46.00	-2.27	H
929.01	29.08	28.44	94.82	39.54	46.00	-6.46	H



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7.6 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

Measurement Distance: 3m

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

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 $\lambda/2\pi$ and the limit distance is greater than $\lambda/2\pi$, 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 $\lambda/2\pi$ distance, and at a 20 dB/decade of distance rate beyond $\lambda/2\pi$. This shall be accomplished using Equation (2):

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

If the single point measured is at a distance greater than $\lambda/2\pi$, 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 $\lambda/2\pi$, 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:

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

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

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



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

where

FS_{limit}	is the calculation of field strength at the limit distance, expressed in $\text{dB}\mu\text{V}/\text{m}$
FS_{max}	is the measured field strength, expressed in $\text{dB}\mu\text{V}/\text{m}$
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

7.6.1 E.U.T. Operation

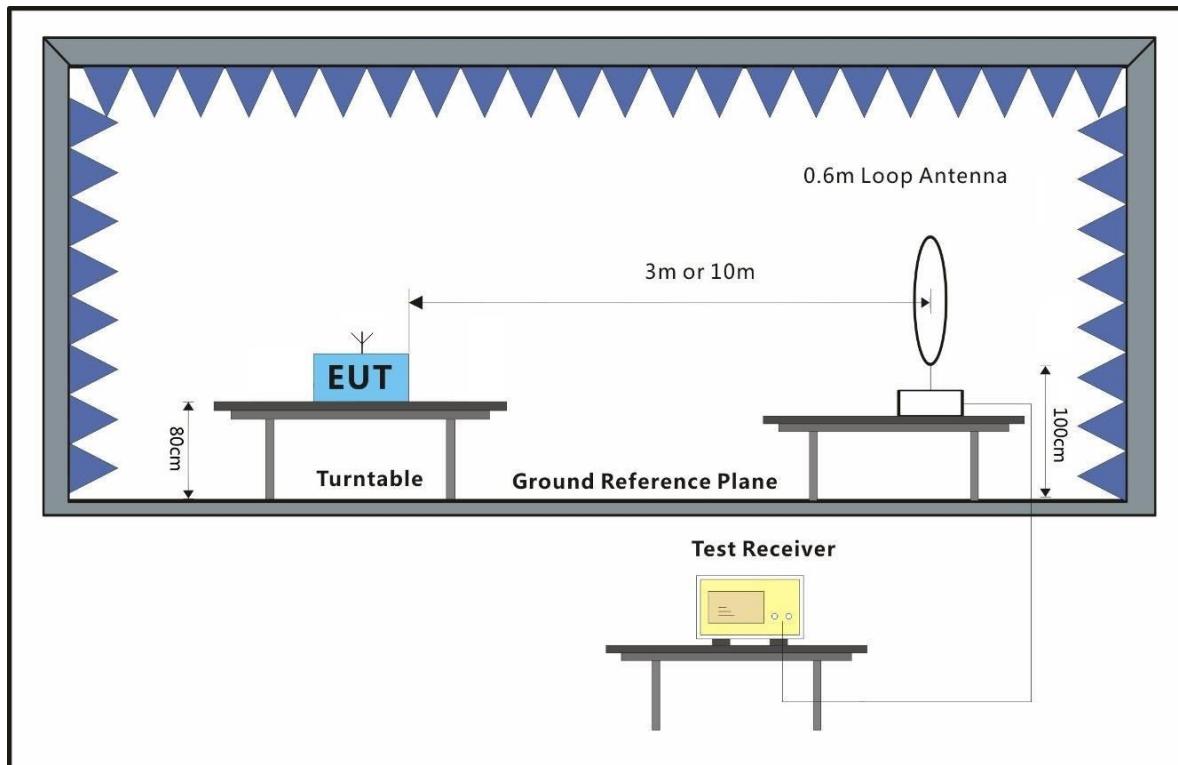
Operating Environment:

Temperature: 23.5 °C Humidity: 46 % RH Atmospheric Pressure: 1010 mbar

7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX mode with modulation

7.6.3 Test Setup Diagram



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7.6.4 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.

9kHz-150kHz

Freq (MHz)	Antenna Factor (dB/m)	Preamp Gain (dB)	Read Level (dBuV)	Cable Loss (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark
0.01498	16.00	31.73	79.11	0.01	43.39	124.08	-80.69	Average
0.02992	12.66	32.17	74.5	0.01	35.00	118.07	-83.07	Average
0.06998	11.26	32.50	68.5	0.01	37.27	110.70	-73.43	Average

150kHz-30MHz

Freq (MHz)	Antenna Factor (dB/m)	Preamp Gain (dB)	Read Level (dBuV)	Cable Loss (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Remark
0.30348	10.89	32.5	72.31	0.26	40.96	97.96	-57.00	Average
0.61726	10.84	32.5	68.23	0.58	37.15	71.78	34.63	QP
0.9381	10.83	32.5	60.45	0.52	39.30	68.12	-28.82	QP

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Frequency (MHz)	Level @ 3m (dB μ V/m)	Limit @ 300m (dB μ V/m)	Limit @ 30m (dB μ V/m)	Factor (dB)	Level @ 300m (dB μ V/m)	Level @ 30m (dB μ V/m)	Margin (dB)
0.01498	63.39	44.08	-	80	-16.61	-	-60.69
0.02992	55.00	38.07	-	80	-25.00	-	-63.07
0.06998	47.27	30.70	-	80	-32.73	-	-63.43
0.30348	50.96	17.96	-	80	-29.04	-	-47.00
0.61726	47.15	-	31.78	40	-	7.15	-24.63
0.9381	39.30	-	28.12	40	-	-0.7	-28.82

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 dB μ V/m

FS_{max} is the measured field strength, expressed in dB μ V/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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8 Test Setup Photo

Refer to Setup Photos

9 EUT Constructional Details (EUT Photos)

Refer to EUT External and Internal photos

- End of the Report -



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