



TEST REPORT

Application No.: SZEM2011012056CR
Applicant: Loctek Ergonomic Technology Corp.
Address of Applicant: 588 Qihang South Road Binhai Industrial Zone Yinzhou District Ningbo, Zhejiang 315145 P.R. China
Manufacturer: Loctek Ergonomic Technology Corp.
Address of Manufacturer: 588 Qihang South Road Binhai Industrial Zone Yinzhou District Ningbo, Zhejiang 315145 P.R. China
Factory: MUV Technology Co., Ltd
Address of Factory: Unit 1511, Block A, Baoyuan Huafeng Economic Building, Xixiang Avenue, Bao'an District, Shenzhen, China
Equipment Under Test (EUT):
EUT Name: MS104 Dual Coil wireless charging
Model No.: MS104WXCD
FCC ID: 2ARK8-MS104WXCD
Standard(s) : 47 CFR Part 15, Subpart C
Date of Receipt: 2020-12-01
Date of Test: 2020-12-02 to 2021-01-05
Date of Issue: 2021-01-05

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



Keny Xu

Keny Xu
EMC Laboratory Manager



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Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2021-01-05		Original

Authorized for issue by:			
			
		<hr/> Leo Li/Project Engineer	
			
		<hr/> Eric Fu/Reviewer	

2 Test Summary

Radio Spectrum Technical Requirement				
Item	Standard	Method	Requirement	Result
Antenna Requirement	47 CFR Part 15, Subpart C	47 CFR Part 15, Subpart C 15.203	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	ANSI C63.10 (2013) Section 6.9.2	47 CFR Part 15, Subpart C 15.215	Pass
Restricted Bands	47 CFR Part 15, Subpart C	ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205	Pass
Radiated Emissions (9kHz-30MHz)	47 CFR Part 15, Subpart C	ANSI C63.10 (2013) Section 6.4	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Emissions (30MHz-1GHz)	47 CFR Part 15, Subpart C	ANSI C63.10 (2013) Section 6.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass



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4 General Information

4.1 Details of E.U.T.

Rated voltage:	DC 12V
Test voltage:	DC 12V
Power adapter:	Input: DC 12V Output: 5/7.5/10/15W
Antenna type:	Loop Antenna
Modulation type:	Load modulation
Operation frequency:	115.54kHz to 175.48kHz
Remark:	The wireless charger contains two coil antenna, vertical and horizontal. They cannot charge two client devices simultaneously. The client device (e.g. mobile phone) can be placed to the charger in two different polarity for efficiency accordingly. All tests were conducted in two different location and the worst case(vertical) is reported only.

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
DC power supply	XANTREX	XFR 100-12	REF. No.SEA27A00
Dummy Load	Client Supply	NuVolta	DN3000002

4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
20dB Bandwidth	$\pm 3\%$
Restricted Bands	$\pm 3\%$
Radiated Emissions (9kHz-30MHz)	$\pm 4.5\text{dB}$
Radiated Emissions (30MHz-1GHz)	$\pm 4.5\text{dB}$
<p>Remark:</p> <p>The U_{lab} (lab Uncertainty) is less than U_{CISPR} (CISPR Uncertainty), so the test results</p> <ul style="list-style-type: none"> – 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. 	

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

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
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

Restricted Bands					
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 (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

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

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





6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203

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 permanently attached antenna or of an antenna that uses an unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

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.

This requirement does not apply to carrier current devices or to devices operated under the provisions of §§ 15.211, 15.213, 15.217, 15.219, 15.221, or § 15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site.

However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

6.1.2 Conclusion

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement.

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 6.9.2
 Limit: For report reference only

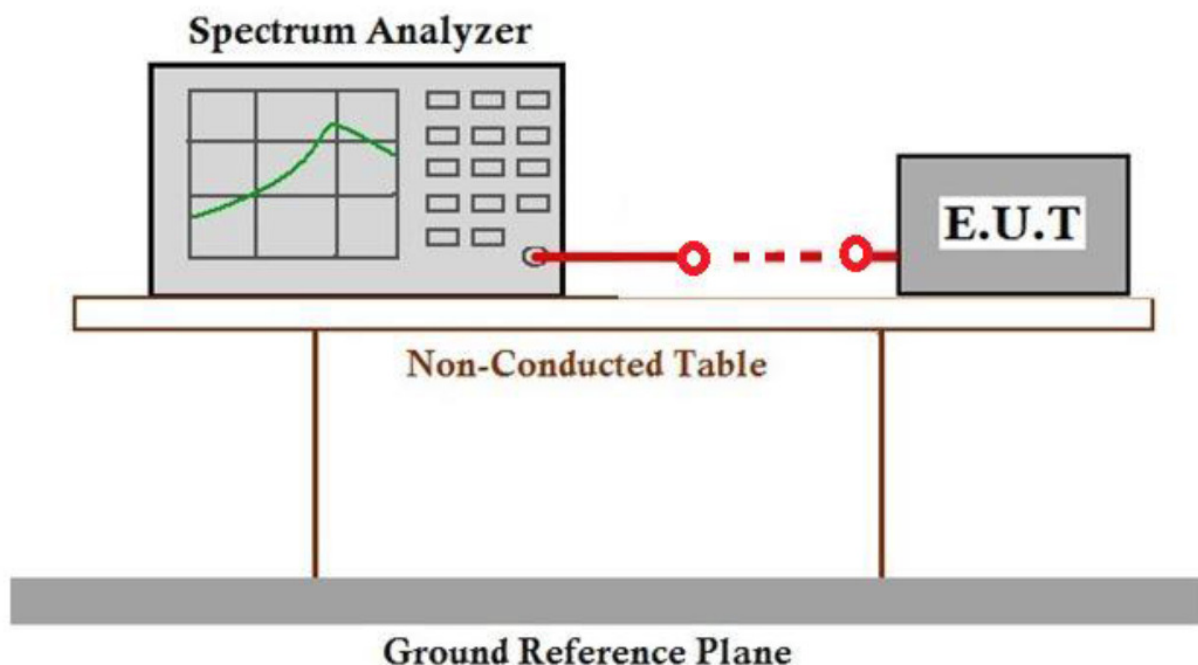
7.1.1 E.U.T. Operation

Operating Environment:
 Temperature: 26.6 °C Humidity: 55.3 % RH Atmospheric Pressure: 1010 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Pre-scan	00	Charge mode_Keep the EUT charging(5W)
Pre-scan	01	Charge mode_Keep the EUT charging(7.5W)
Pre-scan	02	Charge mode_Keep the EUT charging(10W)
Final test	03	Charge mode_Keep the EUT charging(15W)

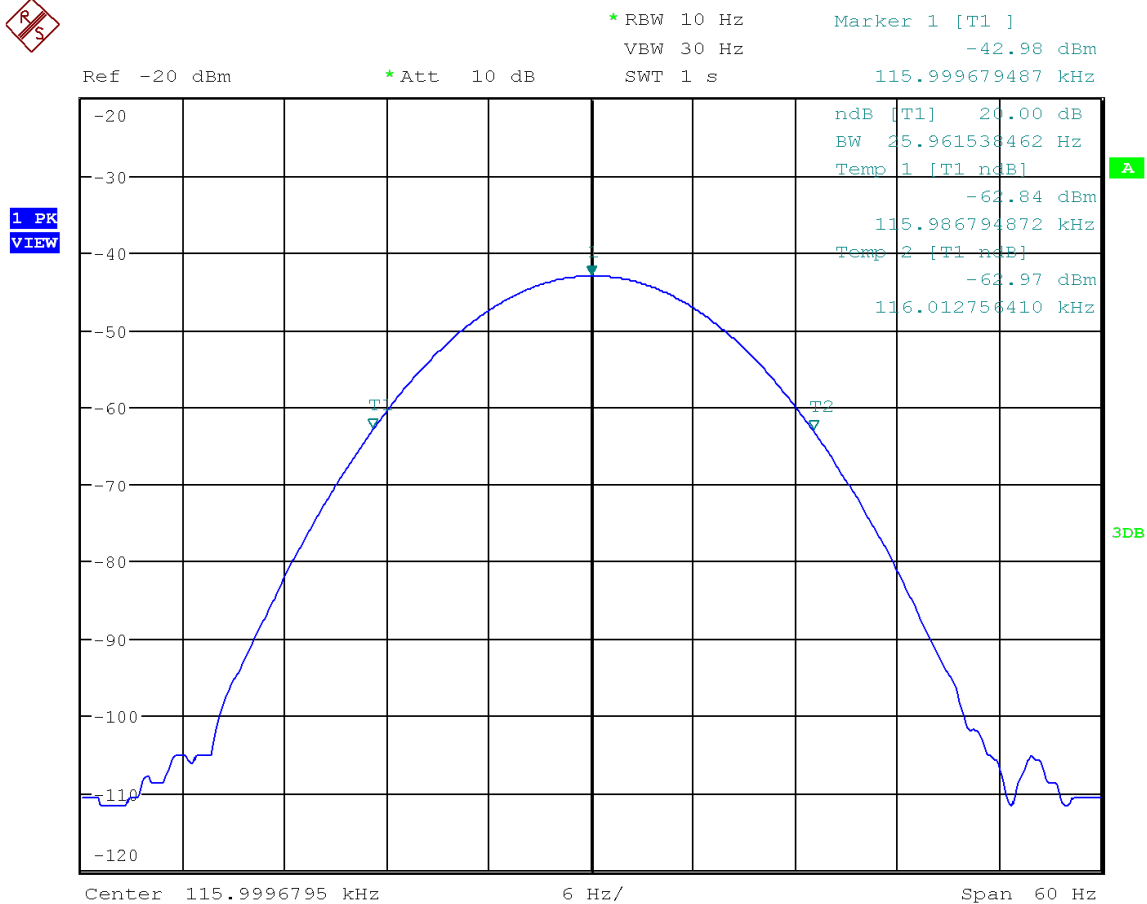
7.1.3 Test Setup Diagram





7.1.4 Measurement Procedure and Data

Test Frequency(KHz)	20dB bandwidth (KHz)	Limit (KHz)	Results
115.99	0.026	N/A	Pass



7.2 Restricted Bands

Test Requirement 47 CFR Part 15, Subpart C 15.205
Test Method: ANSI C63.10 (2013) Section 6.10.5
Limit:

The fundamental wave could not fall in the restricted band 90KHz-110KHz

7.2.1 E.U.T. Operation

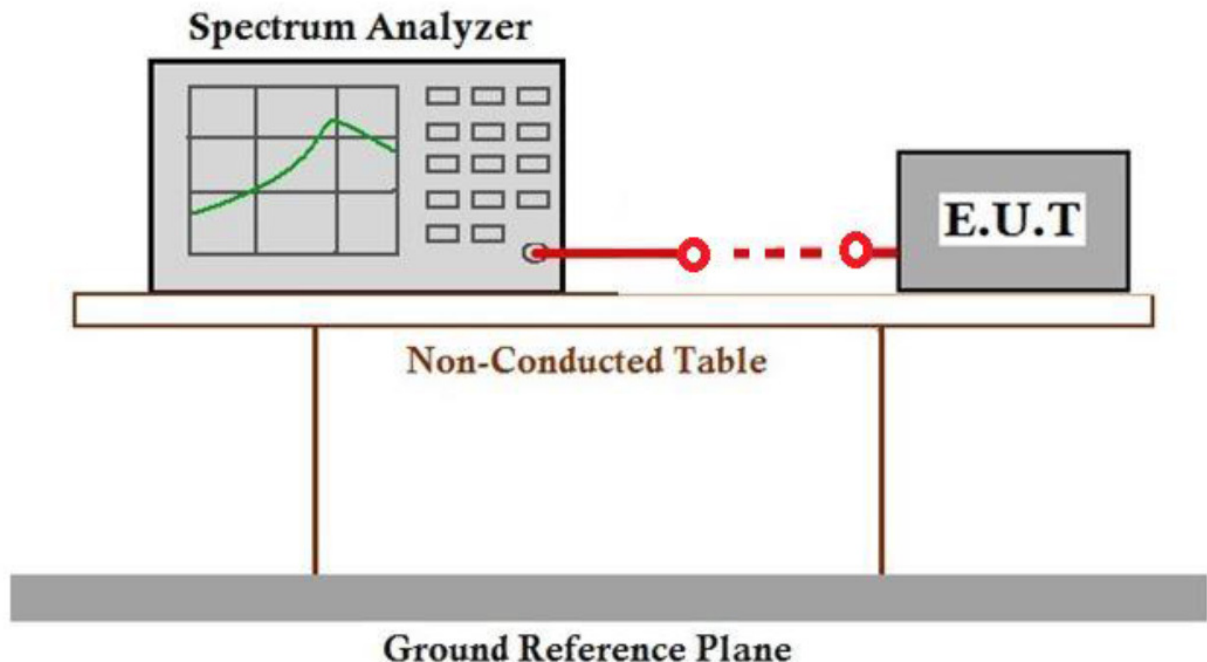
Operating Environment:

Temperature: 26.6 °C Humidity: 55.3 % RH Atmospheric Pressure: 1010 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Pre-scan	00	Charge mode_Keep the EUT charging(5W)
Pre-scan	01	Charge mode_Keep the EUT charging(7.5W)
Pre-scan	02	Charge mode_Keep the EUT charging(10W)
Final test	03	Charge mode_Keep the EUT charging(15W)

7.2.3 Test Setup Diagram

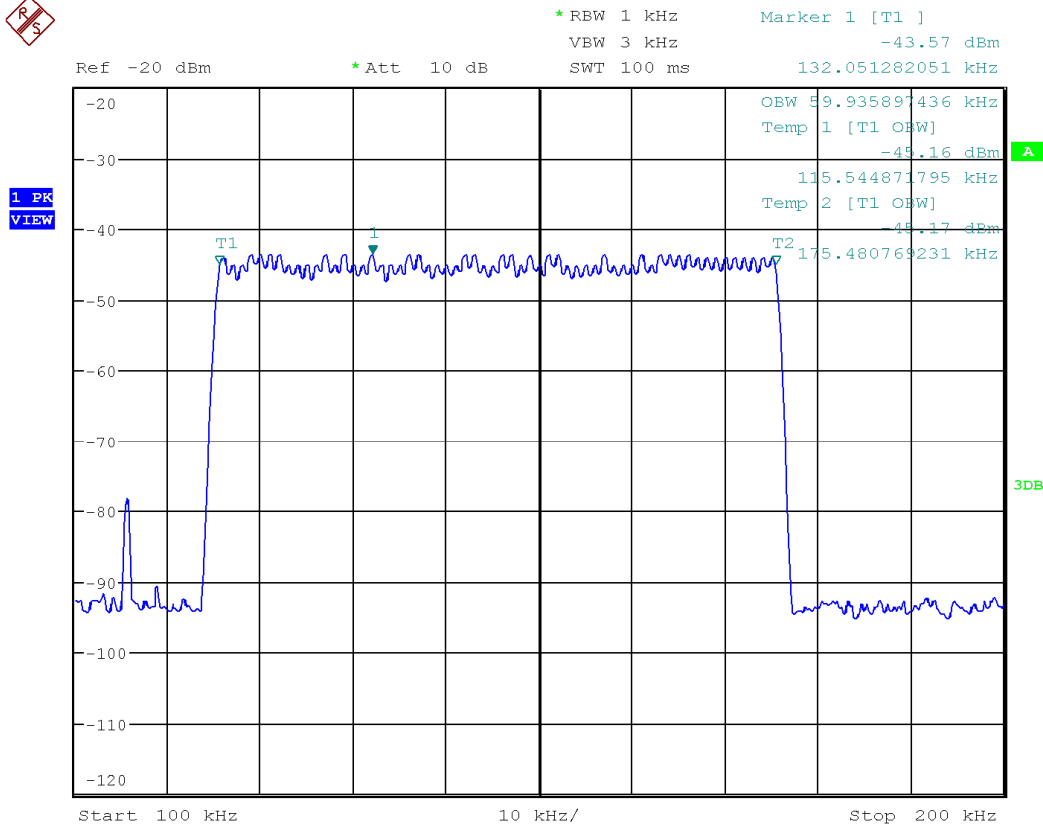


7.2.4 Measurement Procedure and Data



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According the test data above, the fundamental wave is not fall in the restricted band 90KHz-110KHz, the field strength also meets the 15.209 requirement, please refer to clause 7.3.





7.3 Radiated Emissions (9kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

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

Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz. 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.

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):

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

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

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

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



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7.3.1 E.U.T. Operation

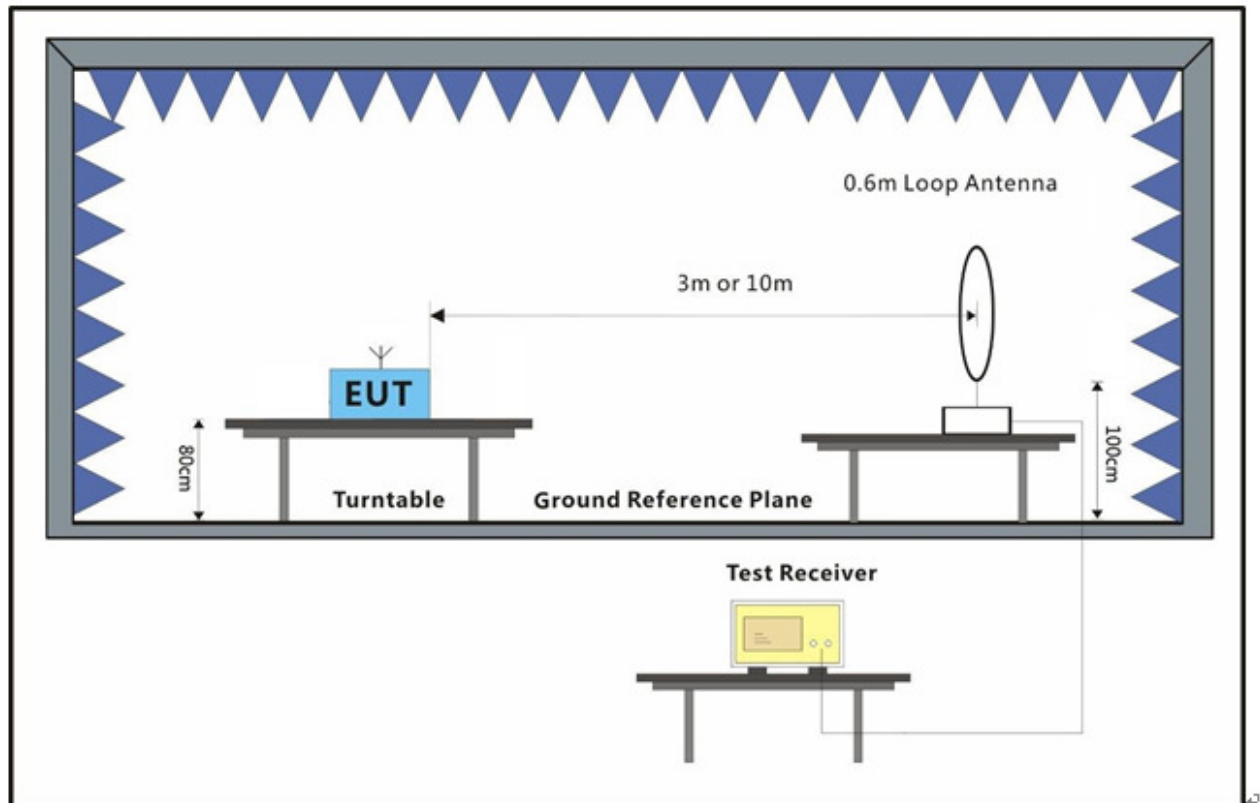
Operating Environment:

Temperature: 23.6 °C Humidity: 56.9 % RH Atmospheric Pressure: 1010 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Pre-scan	00	Charge mode_Keep the EUT charging(5W)
Pre-scan	01	Charge mode_Keep the EUT charging(7.5W)
Pre-scan	02	Charge mode_Keep the EUT charging(10W)
Final test	03	Charge mode_Keep the EUT charging(15W)

7.3.3 Test Setup Diagram

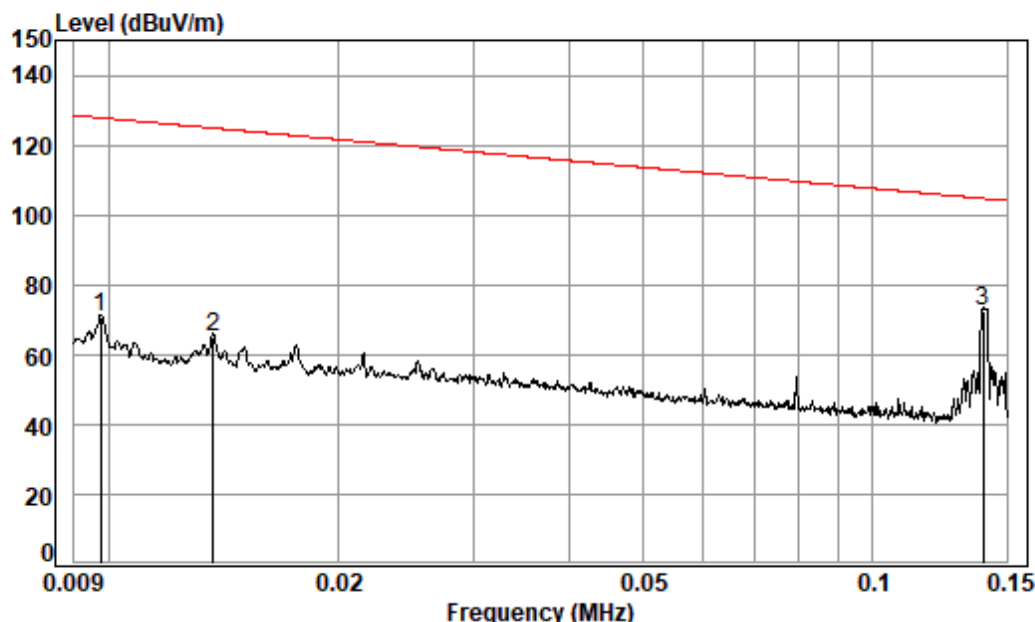


7.3.4 Measurement Procedure and Data

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.

Mode: 03

9kHz-150kHz



Condition: 3m

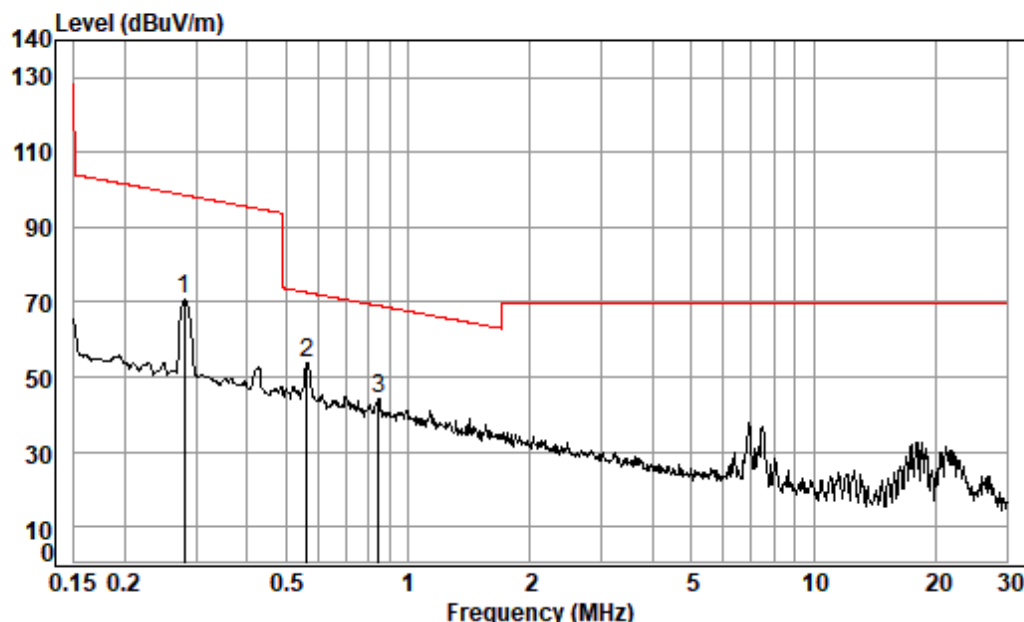
Job No. : 12056CR

Test Mode: 03

	Ant Freq	Preamp Factor	Cable Loss	Read Level	Limit Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	0.010	18.73	31.45	0.01	83.17	70.46	127.81	-57.35 Average
2	0.014	16.57	31.67	0.01	80.26	65.17	124.88	-59.71 Average
3 pp	0.140	11.00	32.50	0.02	93.79	72.31	104.69	-32.38 Average

Mode: 03

150kHz-30MHz



Condition: 3m

Job No. : 12056CR

Test Mode: 03

		Ant	Preamp	Cable	Read	Limit	Over	
	Freq	Factor	Factor	Loss	Level	Level	Line	Limit Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB
1	av	0.280	10.90	32.50	0.24	91.96	70.60	98.65 -28.05 Average
2	pp	0.564	10.84	32.50	0.54	75.02	53.90	72.58 -18.68 QP
3		0.844	10.83	32.50	0.59	65.15	44.07	69.08 -25.01 QP

7.4 Radiated Emissions (30MHz-1GHz)

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

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

Measurement Distance: 10m

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
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 9-90kHz, 110-490kHz and 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.

7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 23.5 °C

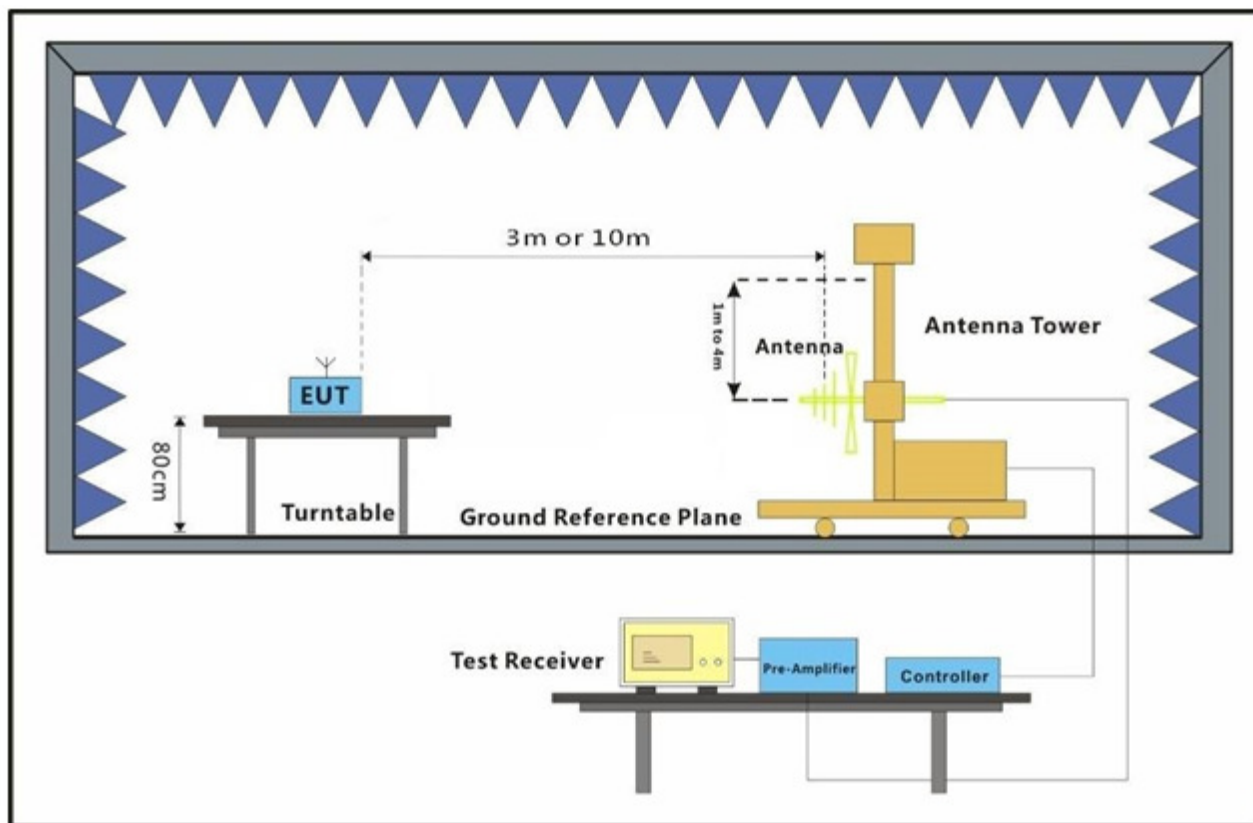
Humidity: 54.9 % RH

Atmospheric Pressure: 1010 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Pre-scan	00	Charge mode_Keep the EUT charging(5W)
Pre-scan	01	Charge mode_Keep the EUT charging(7.5W)
Pre-scan	02	Charge mode_Keep the EUT charging(10W)
Final test	03	Charge mode_Keep the EUT charging(15W)

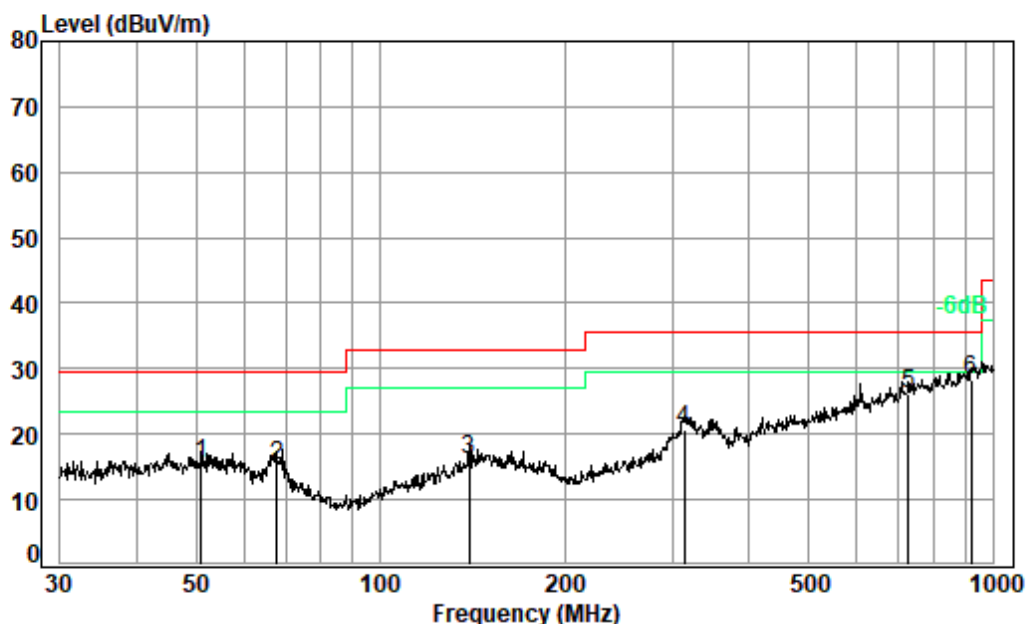
7.4.3 Test Setup Diagram



7.4.4 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. Test the EUT in the lowest channel,the middle channel,the Highest channel
 - h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode,And found the X axis positioning which it is worse case.
 - i. Repeat above procedures until all frequencies measured was complete.
- Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Test Mode: 03; Polarity: Horizontal



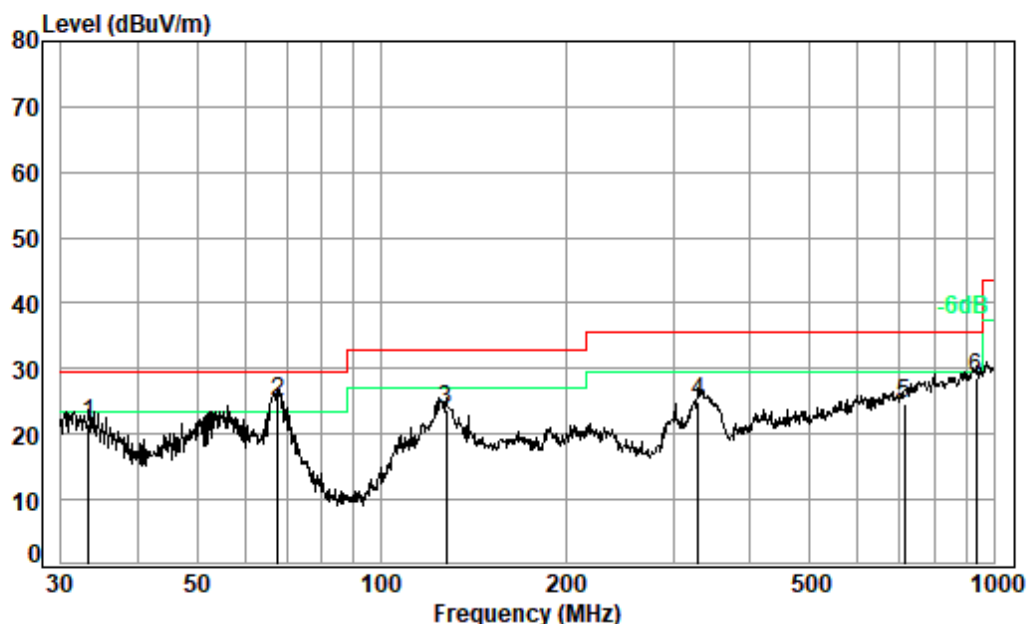
Condition: 10m HORIZONTAL

Job No. : 12056CR

Test Mode: 03

	Ant Freq	Preamp Factor	Cable Loss	Read Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dB	dBuV	dBuV/m	dB	
1	50.942	20.11	32.50	0.97	26.80	15.38	29.50 -14.12 QP
2	67.675	17.96	32.48	1.07	28.68	15.23	29.50 -14.27 QP
3	139.851	19.68	32.43	1.45	27.54	16.24	33.00 -16.76 QP
4	313.276	19.97	32.38	2.14	31.05	20.78	35.60 -14.82 QP
5	726.805	27.77	32.24	3.32	27.19	26.04	35.60 -9.56 QP
6 pp	922.516	29.80	31.39	3.50	26.35	28.26	35.60 -7.34 QP

Test Mode: 03; Polarity: Vertical



Condition: 10m VERTICAL

Job No. : 12056CR

Test Mode: 03

	Ant Freq	Preamp Factor	Cable Loss	Read Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dB	dBuV	dBuV/m	dB	
1	33.328	19.17	32.50	0.89	34.04	21.60	29.50 -7.90 QP
2	67.913	17.92	32.48	1.07	38.28	24.79	29.50 -4.71 QP
3	127.665	18.03	32.43	1.37	36.68	23.65	33.00 -9.35 QP
4	329.039	20.48	32.37	2.24	34.72	25.07	35.60 -10.53 QP
5	714.173	27.36	32.27	3.32	26.31	24.72	35.60 -10.88 QP
6	935.546	29.80	31.27	3.52	26.43	28.48	35.60 -7.12 QP

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: $\mu\text{V/m}$;

L_{10} : Level @ 10m distance. Unit: $\mu\text{V/m}$;

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 ($\mu\text{V/m}$)	Level @ 3m ($\mu\text{V/m}$)	Level @ 3m (dBuV/m)	Limit @ 3m (dBuV/m)	Margin (dB)	Ant. Polarization
33.328	21.60	12.02	40.08	32.06	40.00	-7.94	V
67.913	24.79	17.36	57.86	35.25	40.00	-4.75	V
127.665	23.65	15.22	50.74	34.11	43.50	-9.39	V
329.039	25.07	17.93	59.76	35.53	46.00	-10.47	V
714.173	24.72	17.22	57.40	35.18	46.00	-10.82	V
935.546	28.48	26.55	88.49	38.94	46.00	-7.06	V
50.942	15.38	5.87	19.58	25.84	40.00	-14.16	H
67.675	15.23	5.77	19.25	25.69	40.00	-14.31	H
139.851	16.24	6.49	21.62	26.70	43.50	-16.80	H
313.276	20.78	10.94	36.47	31.24	46.00	-14.76	H
726.805	26.04	20.04	66.82	36.50	46.00	-9.50	H
922.516	28.26	25.88	86.27	38.72	46.00	-7.28	H



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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