Audix Technology Corp.
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FCC 15.209
(Class II Permissive Change)
Wireless Power Transfer Report

for

Hitachi-LG Data Storage Korea, Inc.

189, Gasan digital 1-ro, Geumcheon-gu, Seoul, Republic of Korea.

Product Name	**:**	**WIRELESS CHARGER**
Model Name	**:**	**(1)HLW-TNMP7A (2)HLW-TNMP7B**
Brand	**:**	**Charge Ai**
FCC ID	**:**	**2AQ9F-HLW-TNMP7-R1**

Prepared by: : AUDIX Technology Corporation, EMC Department

Testing Laboratory
1724

TESTING
NVLAP LAB CODE 200077-0

The test report is based on a single evaluation of one sample of the above-mentioned products. It does not imply an assessment of the whole production and does not permit the use of the test lab logo.
The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the U.S. Government.

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TEST REPORT CERTIFICATION
(Class II Permissive Change)

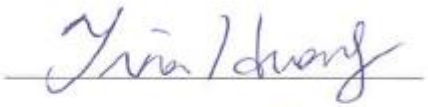
Applicant	:	Hitachi-LG Data Storage Korea, Inc.
Manufacture	:	#1 Hitachi-LG Data Storage (Huizhou), Ltd.
		#2 HITACHI ELECTRONIC PRODUCTS (M) SDN. BHD.
EUT Description		
(1) Product	:	WIRELESS CHARGER
(2) Model	:	(1)HLW-TNMP7A (2)HLW-TNMP7B
(3) Brand	:	Charge Ai
(4) Power Rating	:	DC 5V ~ 12V

Applicable Standards:

47 CFR FCC Part 15 Subpart C
ANSI C63.10:2013

Audix Technology Corp. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.
Audix Technology Corp. does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens and samples.

Date of Report: 2019. 08. 27

Reviewed by:  (Tina Huang/Administrator)

Approved by:  (Ben Cheng/Manager)

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1. REVISION RECORD OF TEST REPORT

Edition No	Issued Data	Revision Summary	Report Number
0	2019. 08. 27	Original Report	EM-F190286

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2. SUMMARY OF TEST RESULTS

Rule	Description	Results
15.207	Conducted Emission	**PASS**
15.209	Radio Spurious Emission	**PASS**
15.215 (c)	20dB Bandwidth	**PASS**
15.203	Antenna Requirement	**Compliance**

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3. GENERAL INFORMATION

3.1. Description of Application

Applicant	Hitachi-LG Data Storage Korea, Inc. 189, Gasan digital 1-ro, Geumcheon-gu, Seoul, Republic of Korea.
Manufacture	#1 Hitachi-LG Data Storage (Huizhou), Ltd. #2 HITACHI ELECTRONIC PRODUCTS (M) SDN. BHD.
Product	WIRELESS CHARGER
Model	(1)HLW-TNMP7A (2)HLW-TNMP7B
Brand	Charge Ai

3.2. Description of EUT

Test Model	HLW-TNMP7A
Serial Number	N/A
Power Rating	DC 5 ~ 12V
RF Features	Wireless Power Transfer
I/O Ports List	• USB Port x1
Accessories	• USB Type-C Cable
Date of Receipt	2019. 08. 15
Date of Test	2019. 08. 19 ~ 21

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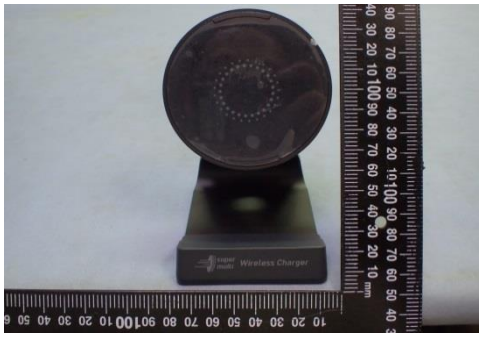
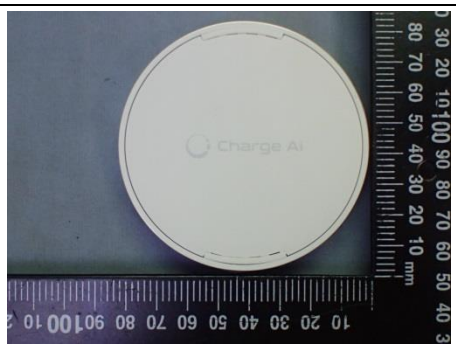
3.3. Information for Class II Change Permissive

- The EUT is an addition version with original FCC ID: 2AQ9F-HLW-TNMP7-R1.
- The difference with original as following:
  (a) For model HLW-NMP7B: To add new product name, brand, appearance and multiple colors, others are totally identical. The differences between this application and original as clarify in following list.

Item	Original	this time application
Product name	Super multi wireless charger	WIRELESS CHARGER
Brand	H • L Data Storage	Charge Ai
Model	(1)HLW-TNMP7 (2)HLW-TNMP7A (3)HLW-TNMP7B (4)HLW-TNMP7C (5)HLW-TNMP7* (Where symbol "*" can be any number, character or blank)	HLW-NMP7B
Appearance		

(a) For model HLW-NMP7A: to add new product name, brand, appearance and change type C connection, internal parts location and layout, others are totally identical. The differences between this application and original as clarify in following list.

Item	Original	this time application
Product name	Super multi wireless charger	WIRELESS CHARGER
Brand	H • L Data Storage	Charge Ai
Model	(1)HLW-TNMP7 (2)HLW-TNMP7A (3)HLW-TNMP7B (4)HLW-TNMP7C (5)HLW-TNMP7* (Where symbol "*" can be any number, character or blank)	HLW-NMP7A

Continued on the next page list…

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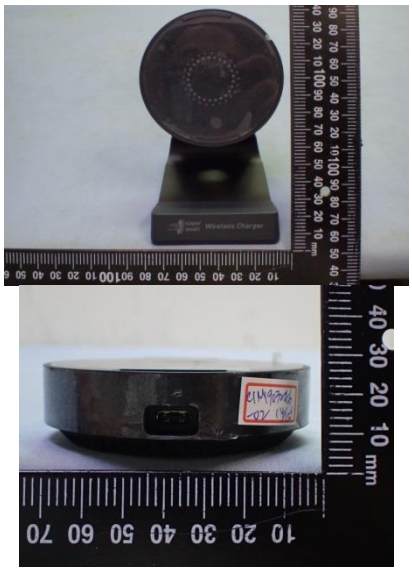
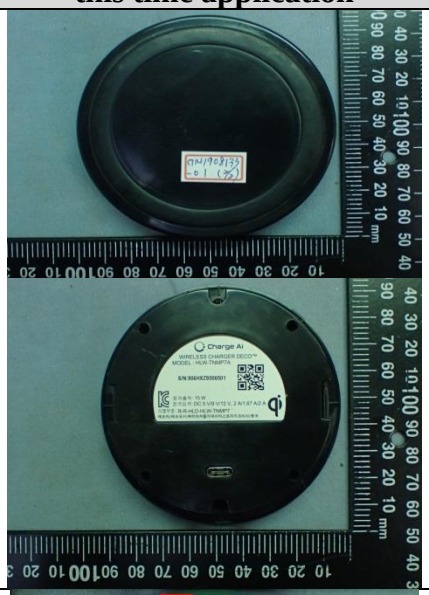
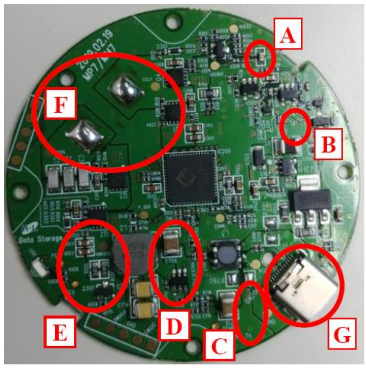
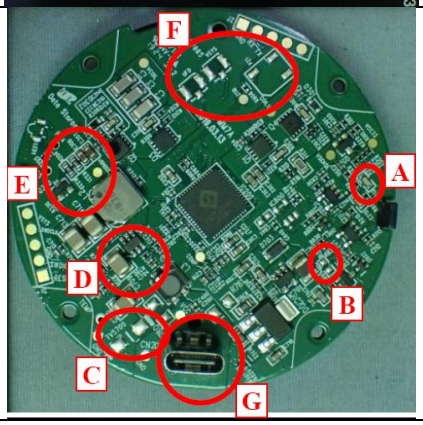
Item	Original	this time application
Appearance		
PCB Board		
Remark	**(1) The letter A: To change part position** **(2) The letter B: Power source for UFL Connector (F Position: Not Used)** **(3) The letter C: TVS Diode(Not Use)** **(4) The letter D: To change Capacitor and Resistor position**	**(5) The letter E: To Change Resistor and Switching MOSFET position** **(6) The letter F: Reverse Coil Soldering Position Buzzer U.FL Receptacle Connector(Not Used)** **(7) The letter G: To change type C connection location**

- Due to above differences, the model HLW-NMP7A should be test and all test times (see section 2) test data are recorded in this report.

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3.4. EUT Specifications Assessed in Current Report

Mode	Fundamental Range	Modulation
WPC	115-130kHz	FSK

3.5. Antenna Information

No.	Antenna Part Number	Manufacture	Antenna Type	Frequency (MHz)	Max Gain (dBi)
1	---	---	Loop	---	---

3.6. Description of Key Components

None.

3.7. Test Configuration

AC Conduction	
Test Case	5W Charge with AC 5V Adapter
	10W Charge with AC 9V Adapter
	15W Charge with AC 12V Adapter

Item		Test Frequency	Mode
Radiated Test Case	Radiated Spurious Emission	127.99kHz	5W Charge with DC 5V Adapter
		127.93kHz	10W Charge with DC 9V Adapter
		126.39kHz	15W Charge with DC 12V Adapter
Conducted Test Case	20dB Bandwidth	126kHz	5W Charge with DC 5V Adapter
		128kHz	10W Charge with DC 9V Adapter
		124.1kHz	15W Charge with DC 12V Adapter

Note 1:

■ Mobile Device:.

☐ Portable Device, and 3 axis were assessed.

- ☐ Lie
- ☐ Side
- ☐ Stand

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3.8. Tested Supporting System List

3.8.1. Support Peripheral Unit

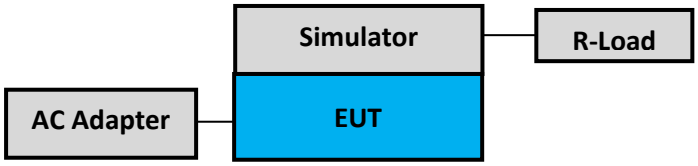
No.	Product	Supplier or Brand	Model No.	Serial No.	Approval
1.	Simulator with 9.6Ω R-Load	Hitachi-LG	N/A	N/A	N/A
	Simulator with 5.6Ω R-Load	Hitachi-LG	N/A	N/A	N/A
	Simulator with 14.6Ω R-Load	Hitachi-LG	N/A	N/A	N/A
2	Adapter (O/P: 12V)	Samsung	EP-TA300	N/A	N/A
	Adapter (O/P: 9V)	LG	MCS-H06KR	N/A	N/A
	Adapter (O/P: 5V)	Samsung	EP-TA12KWK	N/A	N/A

3.8.2. Cable Lists

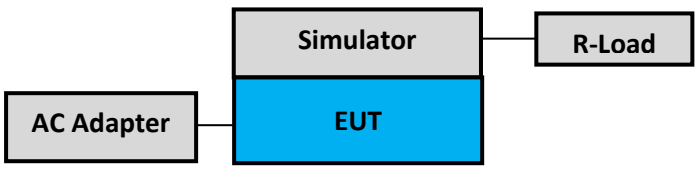
No.	Cable Description Of The Above Support Units
1.	Data Cable: Unshielded, Detachable, 0.28m (For 9.6Ω R-Load) Data Cable: Unshielded, Detachable, 0.35m (For 5.6Ω R-Load) Data Cable: Unshielded, Detachable, 0.56m (For 14.6Ω R-Load)
2.	N/A

3.9. Setup Configuration

3.9.1. For AC Conduction Test



3.9.2. For Radiated Spurious Emission Test



3.10. Operating Condition of EUT

To Set EUT on RF function under continues transmitting.

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3.11.Description of Test Facility

Name of Test Firm	Audix Technology Corporation / EMC Department No. 53-11, Dingfu, Linkou Dist., New Taipei City 244, Taiwan Tel: +886-2-26092133 Fax: +886-2-26099303 Website : www.audixtech.com Contact e-mail: attemc_report@audixtech.com
Accreditations	The laboratory is accredited by following organizations under ISO/IEC 17025:2005 (1) NVLAP(USA) NVLAP Lab Code 200077-0 (2) TAF(Taiwan) No. 1724
Test Facilities	FCC OET Designation Number under APEC MRA by NCC is : TW1724 ISED CAB Identifier Number under APEC TEL MRA by NCC is TW1724 (1) No.8 Shielded Room (2) No.1 3m Semi Anechoic Chamber (3) No.3 3m Semi Anechoic Chamber

3.12.Measurement Uncertainty

Test Item	Frequency Range	Uncertainty
Conduction Test	150kHz~30MHz	±3.50dB
Radiation Test (Distance: 3m)	30MHz~1000MHz	± 3.68dB
	Above 1GHz	± 5.82dB

Remark：Uncertainty = $ku_c(y)$

Test Item	Uncertainty
20dB Bandwidth	± 0.2kHz

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4. MEASUREMENT EQUIPMENT LIST

4.1. Conducted Emission Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Test Receiver	R&S	ESR3	101774	2019. 01. 23	1 Year
2.	A.M.N.	R&S	ENV4200	100169	2018. 11. 14	1 Year
3.	L.I.S.N.	Kyoritsu	KNW-407	8-855-9	2018. 12. 19	1 Year
4.	Pulse Limiter	R&S	ESH3-Z2	100354	2019. 01. 12	1 Year
5.	Signal Cable	Yeida	RG/58AU	CE-08	2018. 09. 21	1 Year
6.	Digital Thermo-Hygro Meter	iMax	HTC-1	No.8 S/R	2019. 04. 20	1 Year
7.	Test Software	Audix	e3	V6.120619c	N.C.R.	N.C.R.

4.2. Radiated Emission Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
1.	Spectrum Analyzer	Agilent	N9010A-526	MY53400071	2018. 09. 12	1 Year
2.	Spectrum Analyzer	Agilent	N9010A-526	MY52220368	2018. 11. 02	1 Year
3.	Test Receiver	R & S	ESCS30	100338	2019. 06. 12	1 Year
4.	Test Receiver	R & S	ESCI7	100923	2019. 03. 27	1 Year
5.	Amplifier	HP	8447D	2944A06305	2019. 01. 30	1 Year
6.	Amplifier	HP	8447D	2944A06669	2019. 05. 16	1 Year
7.	Loop Antenna	R&S	HFH2-Z2	891847/27	2017. 12. 18	2 Years
8.	Biconical Antenna	TESEQ	VBA6106A	33043	2019. 02. 15	1 Year
9.	Bilog Antenna	TESEQ	CBL6112D	33820	2019. 01. 19	1 Year
10.	Coaxial Cable	MIYAZAKI	5D2W	CLAMP-01	2018. 09. 21	1 Year
11.	Coaxial Cable	HUBER+SUHNER	S07212BD	ACC3CL	2019. 05. 24	1 Year
12.	Digital Thermo-Hygro Meter	iMax	HTC-1	No.1 3m A/C	2019. 04. 20	1 Year
13.	Digital Thermo-Hygro Meter	iMax	HTC-1	No.3 3m A/C	2019. 04. 20	1 Year
14.	Test Software	Audix	e3	V6.120619c	N.C.R.	N.C.R.

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4.4. RF Radiated Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
1.	Spectrum Analyzer	Agilent	N9010A-526	MY52220368	2018. 11. 02	1 Year
2.	Amplifier	HP	8447D	2944A06669	2019. 05. 16	1 Year
3.	Biconical Antenna	TESEQ	VBA6106A	33043	2019. 02. 15	1 Year
4.	Bilog Antenna	TESEQ	CBL6112D	33820	2019. 01. 19	1 Year
5.	Coaxial Cable	HUBER+SUHNER	S07212BD	ACC3CL	2019. 05. 24	1 Year
6.	Digital Thermo-Hygro Meter	iMax	HTC-1	No.3 3m A/C	2019. 04. 20	1 Year
7.	Test Software	Audix	e3	V6.120619c	N.C.R.	N.C.R.

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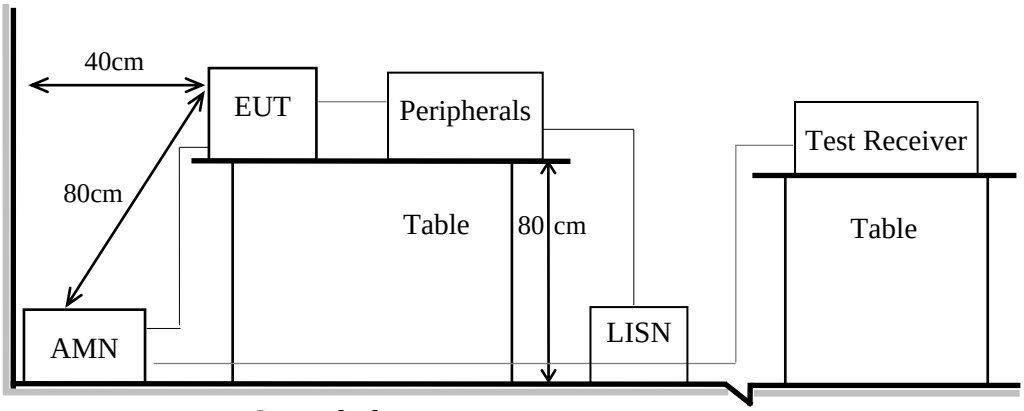
5. CONDUCTED EMISSION

5.1. Block Diagram of Test Setup

5.1.1. Block Diagram of EUT

Indicated as section 3.9

5.1.2. Shielded Room Setup Diagram



5.2. Conducted Emission Limit

Frequency	Conducted Limit	
	Quasi-Peak Level	Average Level
150kHz ~ 500kHz	66 ~ 56 dBμV	56 ~ 46 dBμV
500kHz ~ 5MHz	56 dBμV	46 dBμV
5MHz ~ 30MHz	60 dBμV	50 dBμV

Remark 1.: If the average limit is met when using a Quasi-Peak detector, the measurement using the average detector is not required.
2.: The lower limit applies to the band edges.

5.3. Test Procedure

5.3.1. To set up the EUT as indicated in ANSI C 63.10. The EUT was placed on the table which has 80 cm height to the ground and 40 cm distance to the conducting wall.

5.3.2. Power supplier of the EUT was connected to the AC mains through an Artificial Mains Network (A.M.N.).

5.3.3. The AC power supplies to all peripheral devices must be provided through line impedance stabilization network (L.I.S.N.)

5.3.4. Checking frequency range from 150 kHz to 30 MHz and record the emission which does not have 20 dB below limit.

5.4. Test Results

Please refer to Appendix A.

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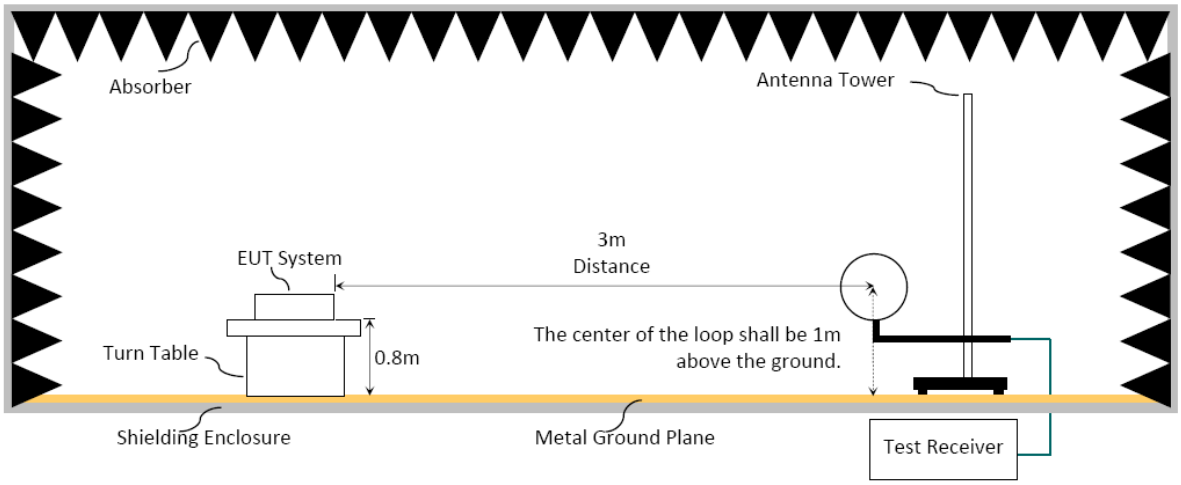
6. RADIATED SPURIOUS EMISSION

6.1. Block Diagram of Test Setup

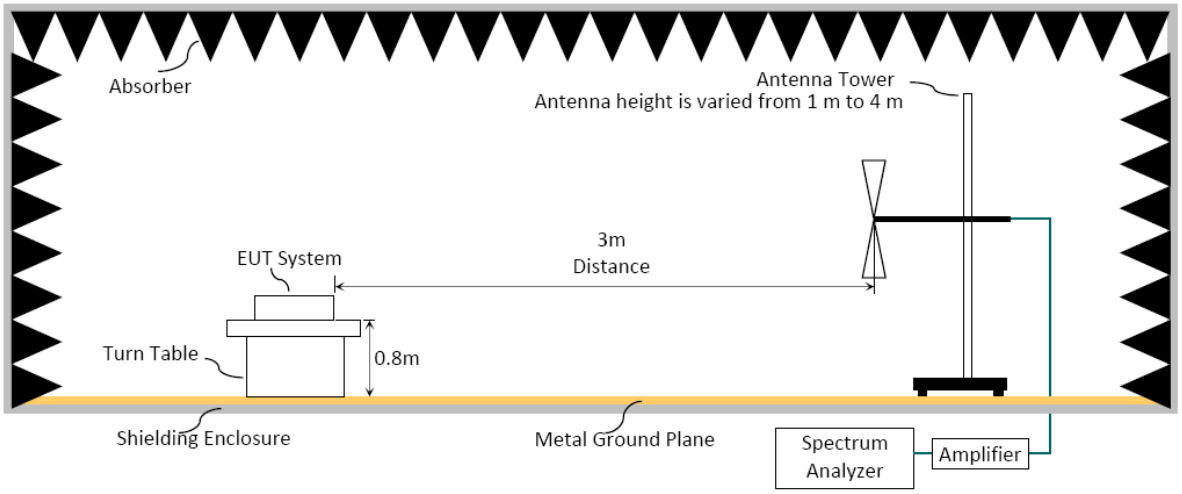
6.1.1. Block Diagram of EUT

Indicated as section 3.9

6.1.2. Setup Diagram for 9kHz-30MHz



6.1.3. Setup Diagram for 30-1000 MHz



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6.2. Radiated Emission Limits

Frequency (MHz)	Distance (m)	Limits	
		dBμV/m	μV/m
0.009 - 0.490	300	67.6	2400/kHz
0.490 - 1.705	30	87.6	24000/kHz
1.705 - 30	30	29.5	30
30 - 88	3	40.0	100
88- 216	3	43.5	150
216- 960	3	46.0	200
Above 960	3	54.0	500
Above 1000	3	74.0 dBμV/m (Peak) 54.0 dBμV/m (Average)	

Remark：(1) dBμV/m = 20 log (μV/m)
(2) The tighter limit applies to the edge between two frequency bands.
(3) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
(4) Fundamental and emission fall within operation band are exempted from this section.
(5) Pursuant to ANSI C63.10: 6.6.4.3, if the maximized peak measured value complies with the average limit, then it is unnecessary to perform an average measurement.

6.3. Test Procedure

Frequency Range 9kHz~30MHz:

The EUT setup on the turn table which has 0.8 m height to the ground. The turn table rotated 360 degrees and antenna fixed to 1 m to find the maximum emission level.
In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

(1) RBW = 9kHz with peak and average detector.
(2) Detector: average and peak (10kHz-490kHz)
Q.P. (490kHz-30MHz)

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Frequency Range 30MHz ~ 1000MHz:
The EUT setup on the turn table which has 0.8 m height to the ground. The turn table rotated 360 degrees and antenna varied from 1 m to 4 m to find the maximum emission level. Both horizontal and vertical polarization are required. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10: 2013 regulation.

Spectrum Analyzer is used for pre-testing with following setting:

(1) RBW = 120KHz
(2) VBW ≥ 3 x RBW.
(3) Detector = Peak.
(4) Sweep time = auto.
(5) Trace mode = max hold.
(6) Allow sweeps to continue until the trace stabilizes.
(7) When peak-detected value is lower than limit that the measurement using the Q.P. detector is not required. Otherwise using Q.P. for finally measurement.

6.4. Measurement Limit Formula

Frequency (MHz)	Formula
0.009 - 0.490MHz	3 Limit (dBμV/m) = 20log(2400/F^{Note})+ 40log(300m/3m)
0.490 - 1.705MHz	3 Limit (dBμV/m) = 20log(24000/F^{Note})+ 40log(300m/3m)
1.750- 30MHz	3 Limit (dBμV/m) = 20log(30)+ 40log(300m/3m)
Note: F is test frequency	

6.5. Test Results

Please refer to Appendix A.

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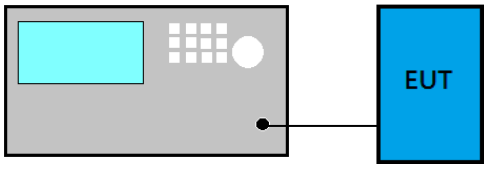
7. 20dB BANDWIDTH

7.1. Block Diagram of Test Setup



7.2. Specification Limits

The 20dB bandwidth shall be specified in operating frequency band.

7.3. Test Procedure

Following measurement procedure:

(1) Set RBW close to1% of OBW.
(2) Set the video bandwidth (VBW) ≥ 3 × RBW.
(3) Detector = Peak.
(4) Trace mode = max hold.
(5) Sweep = auto couple.
(6) Allow the trace to stabilize.
(7) Setting channel bandwidth function x dB to -20 dB to record the final bandwidth.

7.4. Test Results

Please refer to Appendix A

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8. DEVIATION TO TEST SPECIFICATIONS

【NONE】

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APPENDIX A

TEST DATA AND PLOTS

(Model: HLW-TNMP7A)

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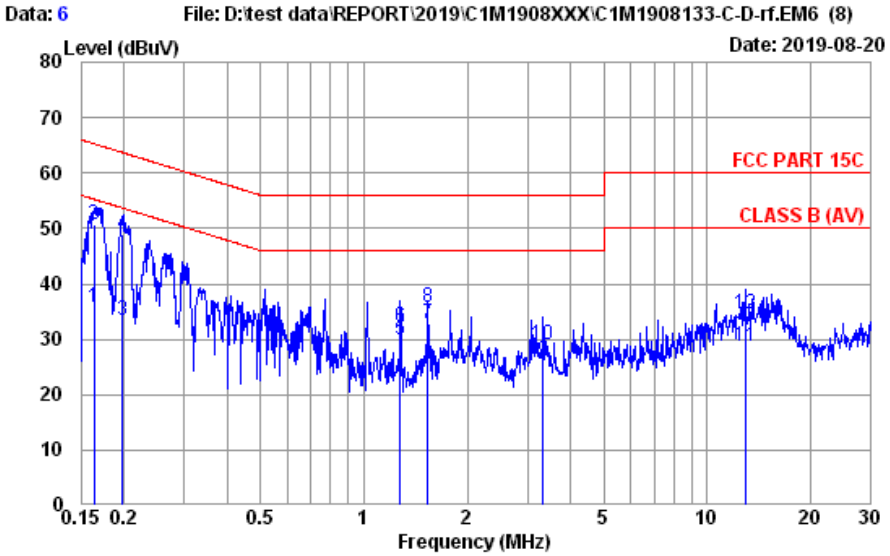
A.1 CONDUCTED EMISSION

Test Date	2019/08/20	Temp./Hum.	23℃/52%
Test Mode	5W	Test Model	HLW-TNMP7A
Test Voltage	AC 120V/60Hz (Via DC 5V Adapter)		



Site no. : No.8 Shielded Room
Data no. : 6
Condition : ENV4200 100169
LISN Phase : NEUTRAL
Limit : FCC PART 15C
Env. / Ins. : 23°C / 52% ESR3 (1774)
Engineer : Chucky Chiu
EUT : HLW-TNMP7A
Power Rating : 120Vac/60Hz
Test Mode : Operating
5W

	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Pulse Att. (dB)	Reading (dBµV)	Emission Level (dBµV)	Limits (dBµV)	Margin (dB)	Remark
1	0.163	10.68	0.03	9.86	15.07	35.64	55.30	19.66	Average
2	0.163	10.68	0.03	9.86	30.00	50.57	65.30	14.73	QP
3	0.198	10.62	0.03	9.86	12.87	33.38	53.71	20.33	Average
4	0.198	10.62	0.03	9.86	28.31	48.82	63.71	14.89	QP
5	1.276	10.48	0.06	9.86	9.40	29.80	46.00	16.20	Average
6	1.276	10.48	0.06	9.86	11.77	32.17	56.00	23.83	QP
7	1.535	10.49	0.06	9.86	12.51	32.92	46.00	13.08	Average
8	1.535	10.49	0.06	9.86	15.20	35.61	56.00	20.39	QP
9	3.328	10.61	0.10	9.87	5.45	26.03	46.00	19.97	Average
10	3.328	10.61	0.10	9.87	8.45	29.03	56.00	26.97	QP
11	12.920	12.18	0.22	9.91	6.48	28.79	50.00	21.21	Average
12	12.920	12.18	0.22	9.91	12.28	34.59	60.00	25.41	QP

Remarks: 1. Emission Level= AMN Factor + Cable Loss + Pulse Att. + Reading.
2. If the average limit is met when useing a quasi-peak detector, the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.

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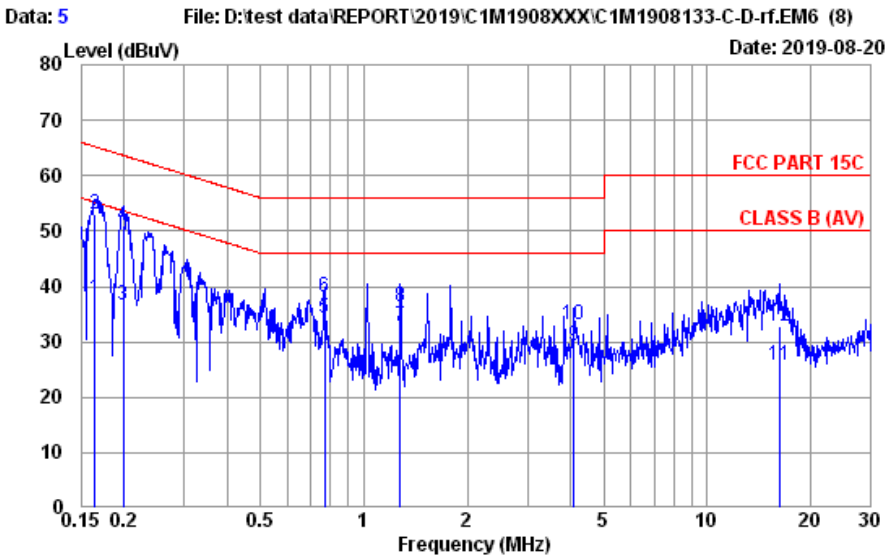
Test Date	2019/08/20	Temp./Hum.	23℃/52%
Test Mode	5W	Test Model	HLW-TNMP7A
Test Voltage	AC 120V/60Hz (Via DC 5V Adapter)		



Site no. : No.8 Shielded Room
Condition : ENV4200 100169
Limit : FCC PART 15C
Env. / Ins. : 23*C / 52% ESR3 (1774)
EUT : HLW-TNMP7A
Power Rating : 120Vac/60Hz
Test Mode : Operating
5W

Data no. : 5
LISN Phase : LINE
Engineer : Chucky Chiu

	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Pulse Att. (dB)	Reading (dBµV)	Emission Level (dBµV)	Limits (dBµV)	Margin (dB)	Remark
1	0.164	10.59	0.03	9.86	17.35	37.83	55.25	17.42	Average
2	0.164	10.59	0.03	9.86	32.68	53.16	65.25	12.09	QP
3	0.199	10.54	0.03	9.86	16.13	36.56	53.67	17.11	Average
4	0.199	10.54	0.03	9.86	30.69	51.12	63.67	12.55	QP
5	0.767	10.43	0.05	9.86	13.84	34.18	46.00	11.82	Average
6	0.767	10.43	0.05	9.86	17.85	38.19	56.00	17.81	QP
7	1.276	10.43	0.06	9.86	12.40	32.75	46.00	13.25	Average
8	1.276	10.43	0.06	9.86	16.02	36.37	56.00	19.63	QP
9	4.092	10.56	0.11	9.87	8.84	29.38	46.00	16.62	Average
10	4.092	10.56	0.11	9.87	12.66	33.20	56.00	22.80	QP
11	16.226	12.53	0.24	9.93	3.21	25.91	50.00	24.09	Average
12	16.226	12.53	0.24	9.93	10.26	32.96	60.00	27.04	QP

Remarks: 1. Emission Level= AMN Factor + Cable Loss + Pulse Att. + Reading.
2. If the average limit is met when useing a quasi-peak detector, the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.

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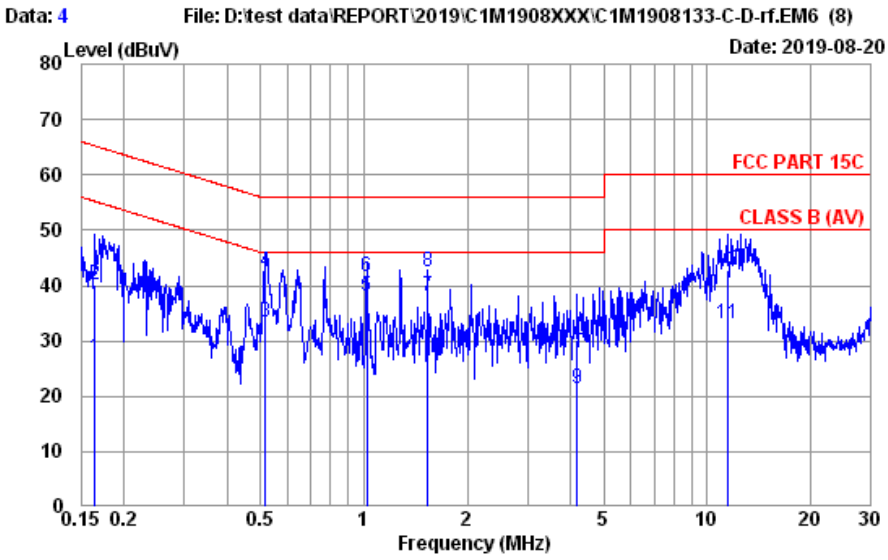
Test Date	2019/08/20	Temp./Hum.	23℃/52%
Test Mode	10W	Test Model	HLW-TNMP7A
Test Voltage	AC 120V/60Hz (Via DC 9V Adapter)		



Site no. : No.8 Shielded Room
Data no. : 4
Condition : ENV4200 100169
LISN Phase : LINE
Limit : FCC PART 15C
Env. / Ins. : 23*C / 52% ESR3 (1774)
Engineer : Chucky Chiu
EUT : HLW-TNMP7A
Power Rating : 120Vac/60Hz
Test Mode : Operating
10W

	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Pulse Att. (dB)	Reading (dBµV)	Emission Level (dBµV)	Limits (dBµV)	Margin (dB)	Remark
1	0.165	10.59	0.03	9.86	6.34	26.82	55.21	28.39	Average
2	0.165	10.59	0.03	9.86	19.72	40.20	65.21	25.01	QP
3	0.516	10.44	0.05	9.86	13.09	33.44	46.00	12.56	Average
4	0.516	10.44	0.05	9.86	22.14	42.49	56.00	13.51	QP
5	1.021	10.42	0.06	9.86	17.61	37.95	46.00	8.05	Average
6	1.021	10.42	0.06	9.86	21.39	41.73	56.00	14.27	QP
7	1.535	10.44	0.06	9.86	17.83	38.19	46.00	7.81	Average
8	1.535	10.44	0.06	9.86	22.07	42.43	56.00	13.57	QP
9	4.180	10.58	0.11	9.87	0.88	21.44	46.00	24.56	Average
10	4.180	10.58	0.11	9.87	9.57	30.13	56.00	25.87	QP
11	11.438	11.53	0.20	9.90	11.50	33.13	50.00	16.87	Average
12	11.438	11.53	0.20	9.90	21.05	42.68	60.00	17.32	QP

Remarks: 1. Emission Level= AMN Factor + Cable Loss + Pulse Att. + Reading.
2. If the average limit is met when useing a quasi-peak detector, the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.

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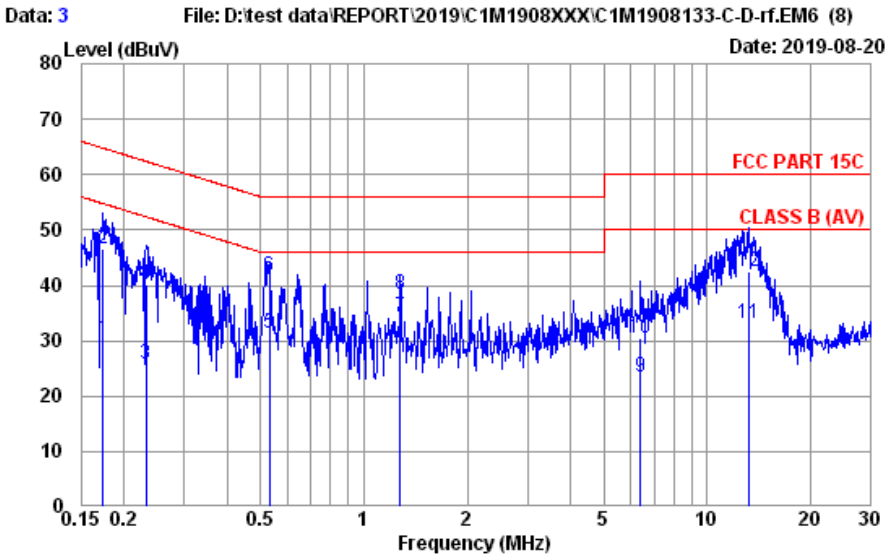
Test Date	2019/08/20	Temp./Hum.	23℃/52%
Test Mode	10W	Test Model	HLW-TNMP7A
Test Voltage	AC 120V/60Hz (Via DC 9V Adapter)		



Site no. : No.8 Shielded Room
Data no. : 3
Condition : ENV4200 100169
LISN Phase : NEUTRAL
Limit : FCC PART 15C
Env. / Ins. : 23*C / 52% ESR3 (1774)
Engineer : Chucky Chiu
EUT : HLW-TNMP7A
Power Rating : 120Vac/60Hz
Test Mode : Operating
10W

	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Pulse Att. (dB)	Reading (dBµV)	Emission Level (dBµV)	Limits (dBµV)	Margin (dB)	Remark
1	0.174	10.66	0.03	9.86	9.61	30.16	54.77	24.61	Average
2	0.174	10.66	0.03	9.86	26.16	46.71	64.77	18.06	QP
3	0.232	10.59	0.03	9.86	5.26	25.74	52.39	26.65	Average
4	0.232	10.59	0.03	9.86	19.71	40.19	62.39	22.20	QP
5	0.529	10.48	0.05	9.86	10.95	31.34	46.00	14.66	Average
6	0.529	10.48	0.05	9.86	21.08	41.47	56.00	14.53	QP
7	1.276	10.48	0.06	9.86	13.91	34.31	46.00	11.69	Average
8	1.276	10.48	0.06	9.86	18.03	38.43	56.00	17.57	QP
9	6.386	11.01	0.15	9.88	2.27	23.31	50.00	26.69	Average
10	6.386	11.01	0.15	9.88	9.52	30.56	60.00	29.44	QP
11	13.197	12.24	0.22	9.91	10.60	32.97	50.00	17.03	Average
12	13.197	12.24	0.22	9.91	19.99	42.36	60.00	17.64	QP

Remarks: 1. Emission Level= AMN Factor + Cable Loss + Pulse Att. + Reading.
2. If the average limit is met when useing a quasi-peak detector, the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.

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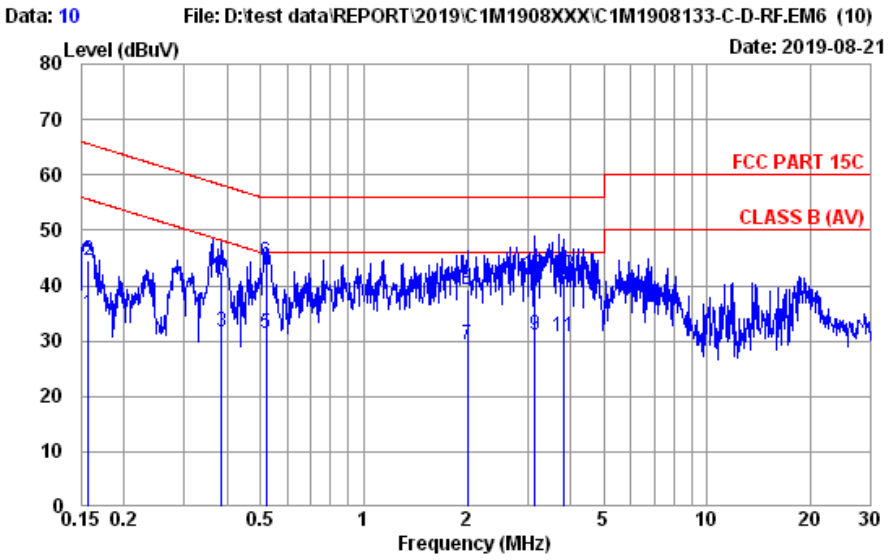
Test Date	2019/08/21	Temp./Hum.	23℃/52%
Test Mode	15W	Test Model	HLW-TNMP7A
Test Voltage	AC 120V/60Hz (Via DC 12V Adapter)		




```
Site no.      : No.8 Shielded Room          Data no.    : 10
Condition     : ENV4200 100169              LISN Phase  : NEUTRAL
Limit         : FCC PART 15C
Env. / Ins.   : 23*C / 52% ESR3 ( 1774 )    Engineer    : Chucky Chiu
EUT           : HLW-TNMP7A
Power Rating  : 120Vac/60Hz
Test Mode     : Operating
                15W
```

	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Pulse Att. (dB)	Reading (dBµV)	Emission Level (dBµV)	Limits (dBµV)	Margin (dB)	Remark
1	0.157	10.69	0.03	9.86	14.40	34.98	55.60	20.62	Average
2	0.157	10.69	0.03	9.86	24.08	44.66	65.60	20.94	QP
3	0.385	10.50	0.04	9.86	11.24	31.64	48.17	16.53	Average
4	0.385	10.50	0.04	9.86	22.08	42.48	58.17	15.69	QP
5	0.518	10.48	0.05	9.86	11.09	31.48	46.00	14.52	Average
6	0.518	10.48	0.05	9.86	23.91	44.30	56.00	11.70	QP
7	2.001	10.51	0.08	9.86	8.93	29.38	46.00	16.62	Average
8	2.001	10.51	0.08	9.86	18.88	39.33	56.00	16.67	QP
9	3.140	10.59	0.10	9.87	10.43	30.99	46.00	15.01	Average
10	3.140	10.59	0.10	9.87	21.27	41.83	56.00	14.17	QP
11	3.799	10.63	0.11	9.87	10.17	30.78	46.00	15.22	Average
12	3.799	10.63	0.11	9.87	21.36	41.97	56.00	14.03	QP

```
Remarks: 1. Emission Level= AMN Factor + Cable Loss + Pulse Att. + Reading.
         2. If the average limit is met when useing a quasi-peak detector,
            the EUT shall be deemed to meet both limits and measurement
            with average detector is unnecessary.
```

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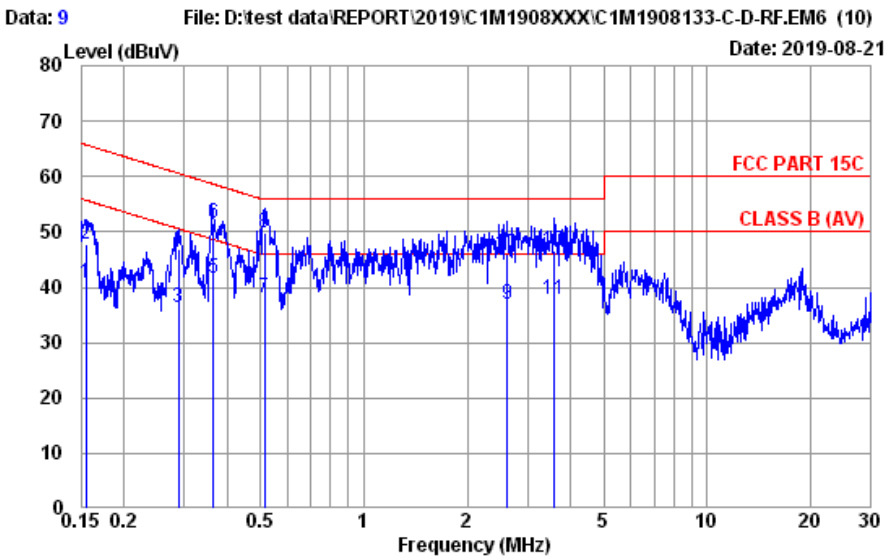
Test Date	2019/08/21	Temp./Hum.	23℃/52%
Test Mode	15W	Test Model	HLW-TNMP7A
Test Voltage	AC 120V/60Hz (Via DC 12V Adapter)		



Site no. : No.8 Shielded Room
Data no. : 9
Condition : ENV4200 100169
LISN Phase : LINE
Limit : FCC PART 15C
Env. / Ins. : 23°C / 52% ESR3 (1774)
Engineer : Chucky Chiu
EUT : HLW-TNMP7A
Power Rating : 120Vac/60Hz
Test Mode : Operating
15W

	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Pulse Att. (dB)	Reading (dBµV)	Emission Level (dBµV)	Limits (dBµV)	Margin (dB)	Remark
1	0.155	10.61	0.03	9.86	20.21	40.71	55.74	15.03	Average
2	0.155	10.61	0.03	9.86	27.27	47.77	65.74	17.97	QP
3	0.288	10.49	0.04	9.86	16.04	36.43	50.59	14.16	Average
4	0.288	10.49	0.04	9.86	26.35	46.74	60.59	13.85	QP
5	0.365	10.46	0.04	9.86	21.29	41.65	48.62	6.97	Average
6	0.365	10.46	0.04	9.86	31.21	51.57	58.62	7.05	QP
7	0.513	10.44	0.05	9.86	17.83	38.18	46.00	7.82	Average
8	0.513	10.44	0.05	9.86	29.47	49.82	56.00	6.18	QP
9	2.622	10.49	0.09	9.87	16.53	36.98	46.00	9.02	Average
10	2.622	10.49	0.09	9.87	25.60	46.05	56.00	9.95	QP
11	3.586	10.53	0.11	9.87	17.16	37.67	46.00	8.33	Average
12	3.586	10.53	0.11	9.87	26.01	46.52	56.00	9.48	QP

Remarks: 1. Emission Level= AMN Factor + Cable Loss + Pulse Att. + Reading.
2. If the average limit is met when useing a quasi-peak detector, the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.

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A.2 RADIATED SPURIOUS EMISSION AND TX FUNDAMENTAL

A.2.1. Frequency 9kHz~30MHz

Test Date	2019/08/21	Temp./Hum.	24℃/55%
Test Mode	5W	Test Model	HLW-TNMP7A
Test Frequency	TX 127.99kHz	Test Voltage	AC 120V/60Hz (Via DC 5V Adapter)

Antenna at 0 Degree

Test Frequency (kHz)	Test Result (dBμV/m at 3m)	Limits (dBμV/m at 3m)	Margin (dB)	Detector
127.990	87.60	105.46	17.86	Peak
383.970	64.00	95.92	31.92	Peak
639.950	56.50	71.48	14.98	QP
895.930	51.70	68.56	16.86	QP

Antenna at 90 Degree

Test Frequency (kHz)	Test Result (dBμV/m at 3m)	Limits (dBμV/m at 3m)	Margin (dB)	Detector
127.990	81.10	105.46	24.36	Peak
383.970	58.00	95.92	37.92	Peak
639.950	60.60	71.48	10.88	QP
895.930	53.80	68.56	14.76	QP

Note: 1. All emissions are lower than the ambient level cannot be measured.
2. The Peak value has been compliance with Average limit, thus measurement with Average is not needed.

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Test Date	2019/08/21	Temp./Hum.	24℃/55%
Test Mode	10W	Test Model	HLW-TNMP7A
Test Frequency	TX 127.93kHz	Test Voltage	AC 120V/60Hz (Via DC 9V Adapter)

Antenna at 0 Degree

Test Frequency (kHz)	Test Result (dBμV/m at 3m)	Limits (dBμV/m at 3m)	Margin (dB)	Detector
127.930	83.50	105.46	21.96	Peak
383.790	60.31	95.92	35.61	Peak
639.650	53.30	71.49	18.19	QP
895.510	49.10	68.56	19.46	QP

Antenna at 90 Degree

Test Frequency (kHz)	Test Result (dBμV/m at 3m)	Limits (dBμV/m at 3m)	Margin (dB)	Detector
127.930	79.00	105.46	26.46	Peak
383.790	57.00	95.92	38.92	Peak
639.650	59.50	71.49	11.99	QP
895.510	52.50	68.56	16.06	QP

Note: 1. All emissions are lower than the ambient level cannot be measured.
2. The Peak value has been compliance with Average limit, thus measurement with Average is not needed.

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Test Date	2019/08/21	Temp./Hum.	24℃/55%
Test Mode	15W	Test Model	HLW-TNMP7A
Test Frequency	TX 126.39kHz	Test Voltage	AC 120V/60Hz (Via DC 12V Adapter)

Antenna at 0 Degree

Test Frequency (kHz)	Test Result (dBμV/m at 3m)	Limits (dBμV/m at 3m)	Margin (dB)	Detector
126.390	90.60	105.57	14.97	Peak
379.170	75.10	96.03	20.93	Peak
631.940	59.50	71.59	12.09	QP
884.730	53.10	68.67	15.57	QP

Antenna at 90 Degree

Test Frequency (kHz)	Test Result (dBμV/m at 3m)	Limits (dBμV/m at 3m)	Margin (dB)	Detector
126.390	97.00	105.57	8.57	Peak
383.600	83.10	95.93	12.83	Peak
631.950	59.00	71.59	12.59	QP
884.730	51.40	68.67	17.27	QP

Note: 1. All emissions are lower than the ambient level cannot be measured.
2. The Peak value has been compliance with Average limit, thus measurement with Average is not needed.

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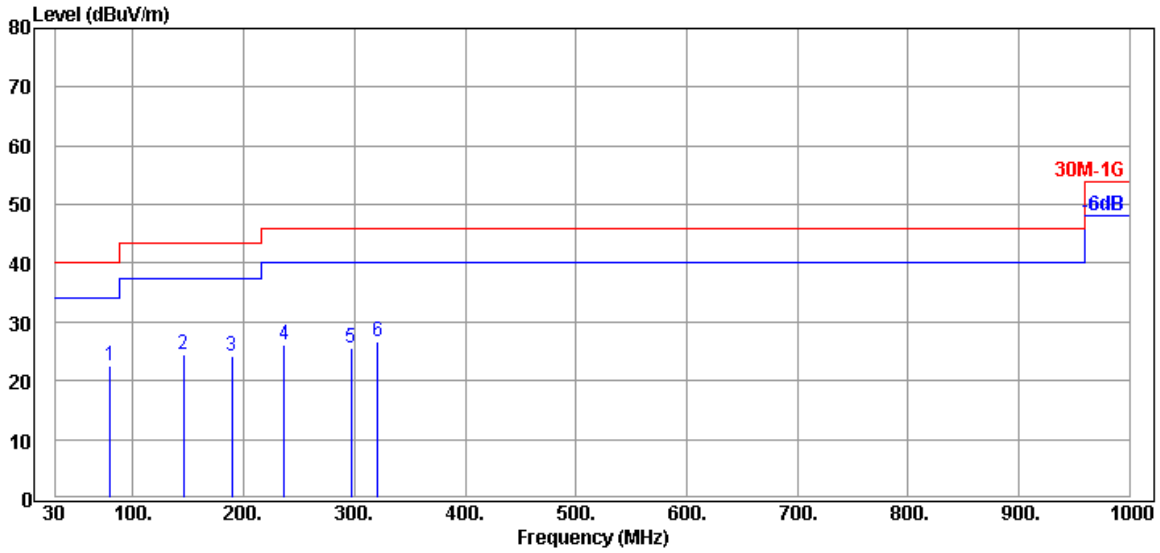
A.2.2. Frequency 30MHz ~ 1000MHz

Test Date	2019/08/21	Temp./Hum.	24℃/55%
Test Mode	5W	Test Model	HLW-TNMP7A
Test Frequency	TX 127.99kHz	Test Voltage	AC 120V/60Hz (Via DC 5V Adapter)

Antenna at Horizontal Polarization



Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
79.47	13.30	0.76	8.36	22.42	40.00	17.58	Peak
145.43	17.26	1.04	6.16	24.46	43.50	19.04	Peak
189.08	15.69	1.21	7.38	24.28	43.50	19.22	Peak
236.61	18.02	1.37	6.62	26.01	46.00	19.99	Peak
296.75	19.53	1.56	4.43	25.52	46.00	20.48	Peak
321.00	20.22	1.63	4.82	26.67	46.00	19.33	Peak

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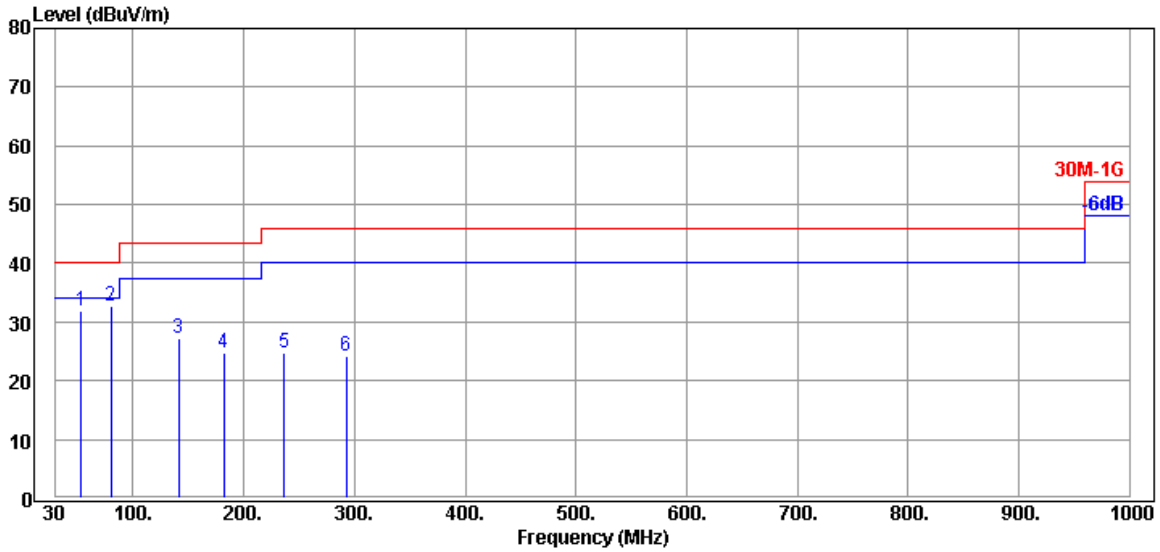
Antenna at Vertical Polarization



Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
53.28	13.65	0.61	17.74	32.00	40.00	8.00	Peak
80.44	13.40	0.76	18.43	32.59	40.00	7.41	Peak
141.55	17.51	1.03	8.59	27.13	43.50	16.37	Peak
182.29	15.38	1.18	8.06	24.62	43.50	18.88	Peak
236.61	18.02	1.37	5.48	24.87	46.00	21.13	Peak
292.87	19.45	1.55	3.25	24.25	46.00	21.75	Peak

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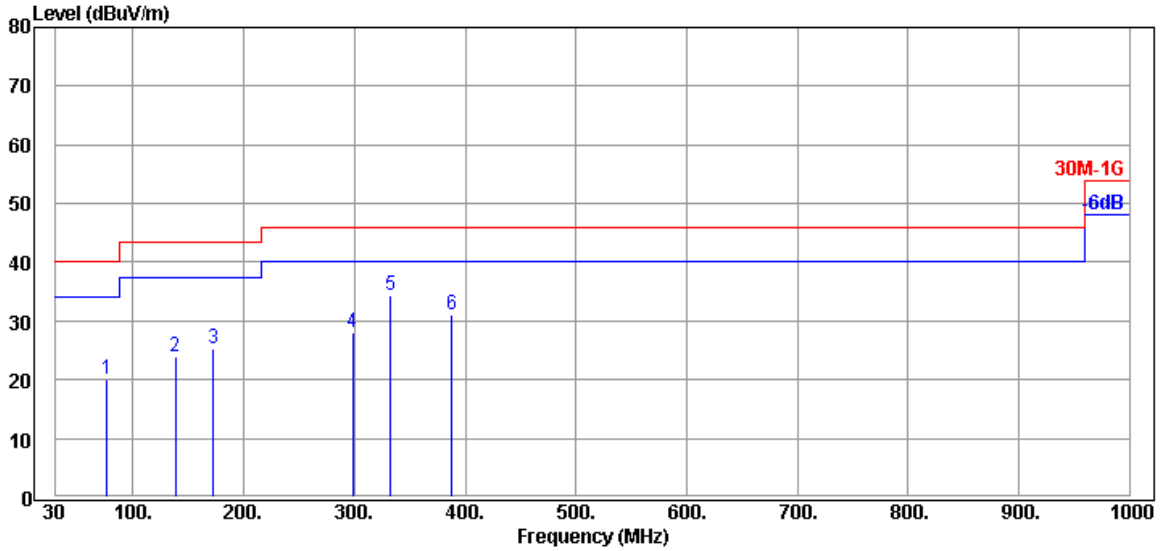
Test Date	2019/08/21	Temp./Hum.	24℃/55%
Test Mode	10W	Test Model	HLW-TNMP7A
Test Frequency	TX 127.93kHz	Test Voltage	AC 120V/60Hz (Via DC 9V Adapter)

Antenna at Horizontal Polarization



Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
76.56	13.00	0.74	6.32	20.06	40.00	19.94	Peak
138.64	17.65	1.01	5.16	23.82	43.50	19.68	Peak
172.59	15.66	1.14	8.37	25.17	43.50	18.33	Peak
298.69	19.54	1.57	6.96	28.07	46.00	17.93	Peak
332.64	20.56	1.66	12.17	34.39	46.00	11.61	Peak
387.93	22.04	1.82	7.10	30.96	46.00	15.04	Peak

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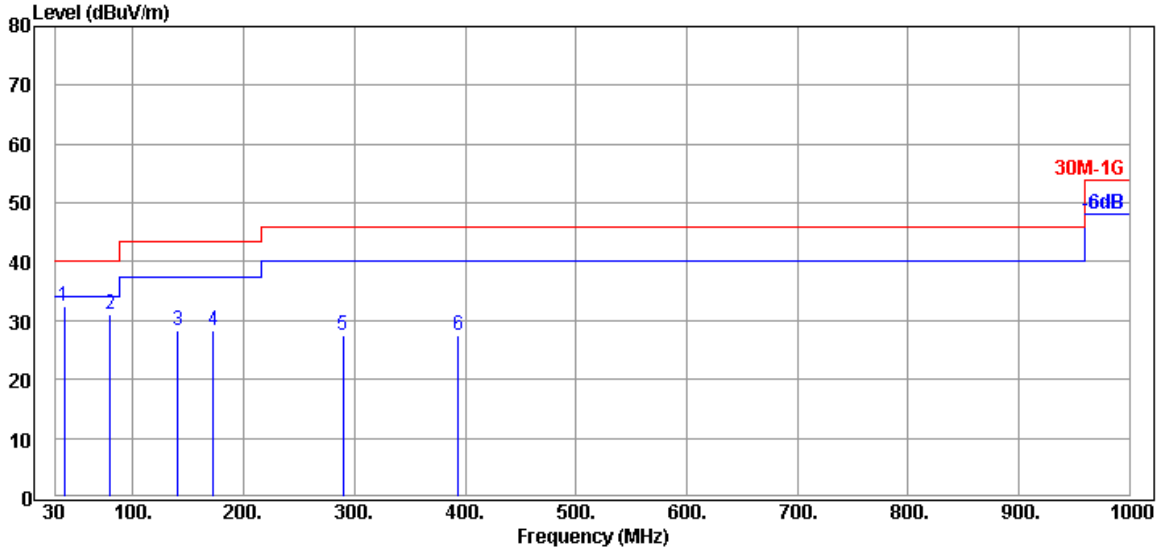
Antenna at Vertical Polarization



Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
37.76	20.71	0.51	11.15	32.37	40.00	7.63	Peak
79.47	13.30	0.76	16.90	30.96	40.00	9.04	Peak
140.58	17.58	1.02	9.65	28.25	43.50	15.25	Peak
172.59	15.66	1.14	11.55	28.35	43.50	15.15	Peak
289.96	19.40	1.54	6.43	27.37	46.00	18.63	Peak
393.75	22.17	1.84	3.41	27.42	46.00	18.58	Peak

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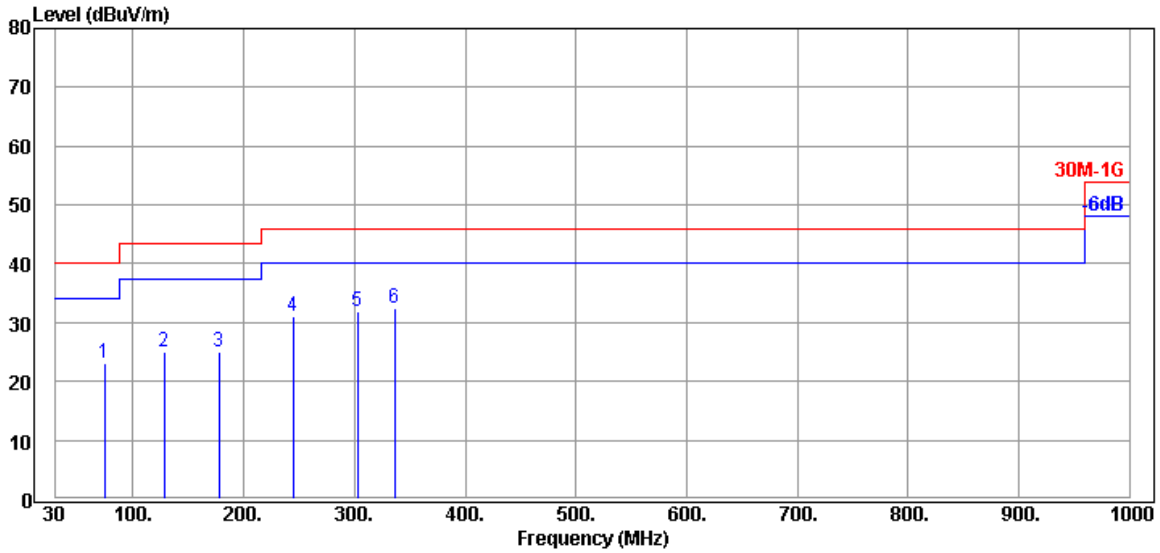
Test Date	2019/08/21	Temp./Hum.	24℃/55%
Test Mode	15W	Test Model	HLW-TNMP7A
Test Frequency	TX 126.39kHz	Test Voltage	AC 120V/60Hz (Via DC 12V Adapter)

Antenna at Horizontal Polarization



Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
74.62	12.82	0.73	9.50	23.05	40.00	16.95	Peak
127.97	18.11	0.97	5.93	25.01	43.50	18.49	Peak
177.44	15.39	1.16	8.51	25.06	43.50	18.44	Peak
244.37	18.36	1.40	11.28	31.04	46.00	14.96	Peak
302.57	19.65	1.58	10.77	32.00	46.00	14.00	Peak
336.52	20.66	1.67	10.10	32.43	46.00	13.57	Peak

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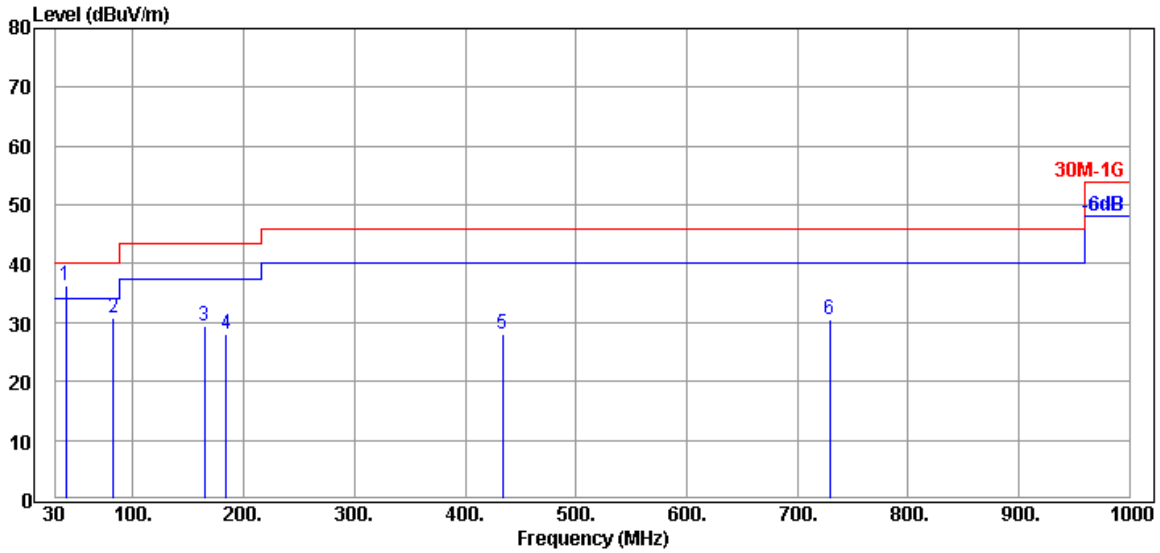
Antenna at Vertical Polarization



Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
39.70	19.69	0.52	16.00	36.21	40.00	3.79	Peak
82.38	13.77	0.77	16.32	30.86	40.00	9.14	Peak
164.83	16.10	1.12	12.09	29.31	43.50	14.19	Peak
184.23	15.47	1.19	11.43	28.09	43.50	15.41	Peak
433.52	22.80	1.95	3.24	27.99	46.00	18.01	Peak
729.37	25.83	2.66	2.11	30.60	46.00	15.40	Peak

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A.3 20dB BANDWIDTH

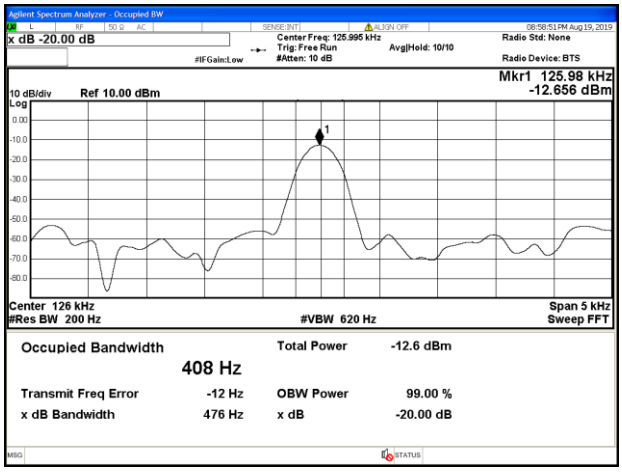
Test Date	2019/08/19	Temp./Hum.	23℃/50%

A.3.1 20dB Bandwidth Result

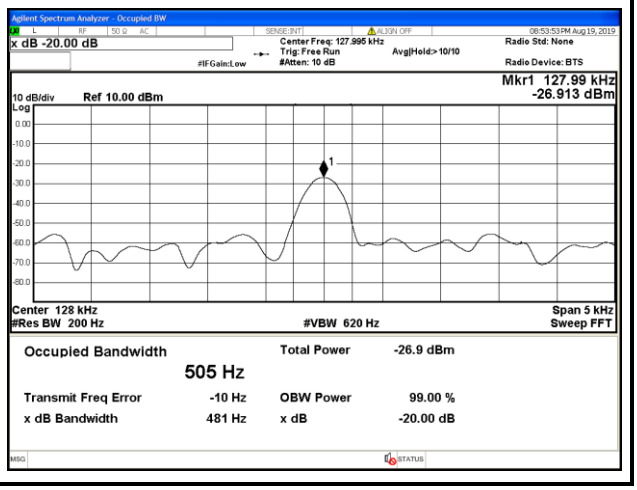
Test Mode	Test Voltage	Centre Frequency (kHz)	20dB Occupied Bandwidth (Hz)	99% Occupied Bandwidth (Hz)
5W	AC 120V/60Hz (Via DC 5V Adapter)	126.0	476	408
10W	AC 120V/60Hz (Via DC 9V Adapter)	128.0	481	505
15W	AC 120V/60Hz (Via DC 12V Adapter)	124.1	486	438

A.3.2 Measurement Plots

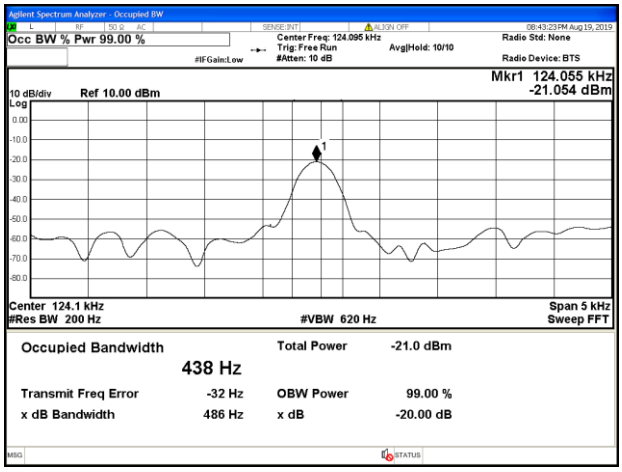
Test Mode: 5W



Test Mode: 10W



Test Mode: 15W



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APPENDIX B

TEST PHOTOGRAPHS

(Model: HLW-TNMP7A)